

Collins

KWM-1

AMATEUR TRANSCEIVER

INSTRUCTION BOOK

COLLINS RADIO COMPANY

INSTRUCTION BOOK

KWM-1 AMATEUR TRANSCEIVER

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SECTION I
Installation

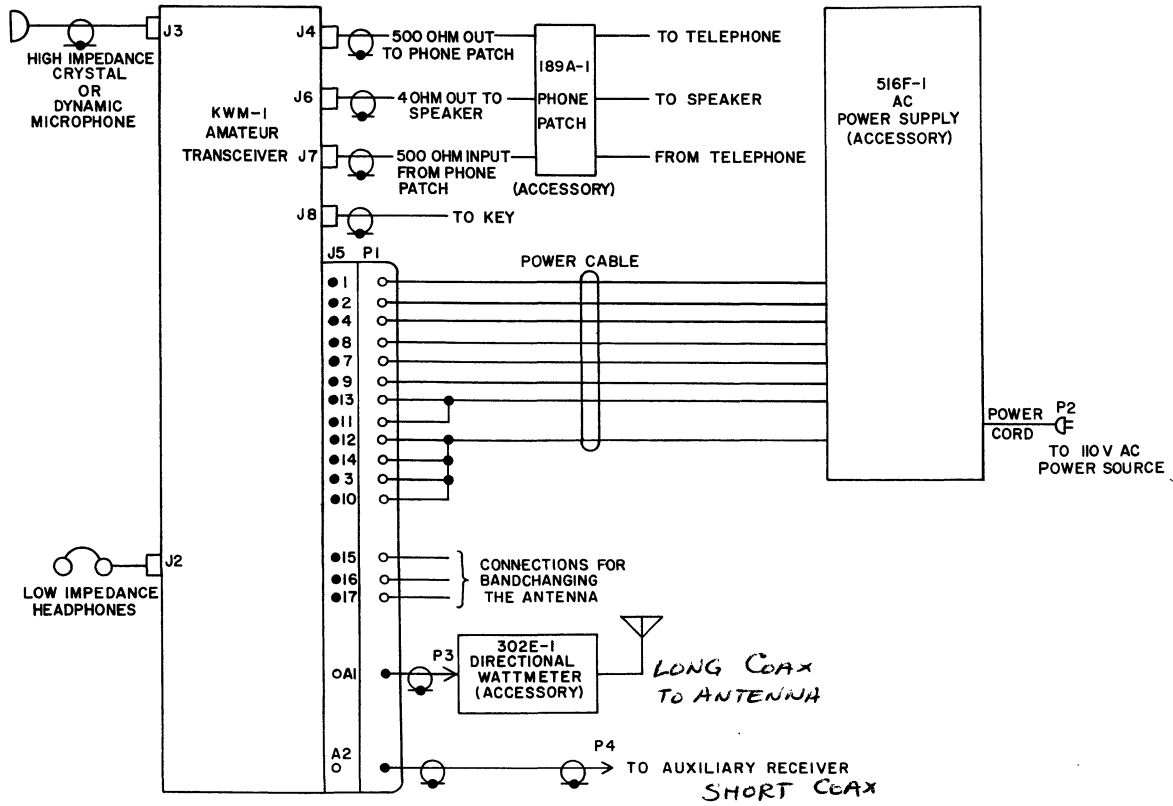


Figure 1-1. Fixed Station Interconnections

C204-07-3

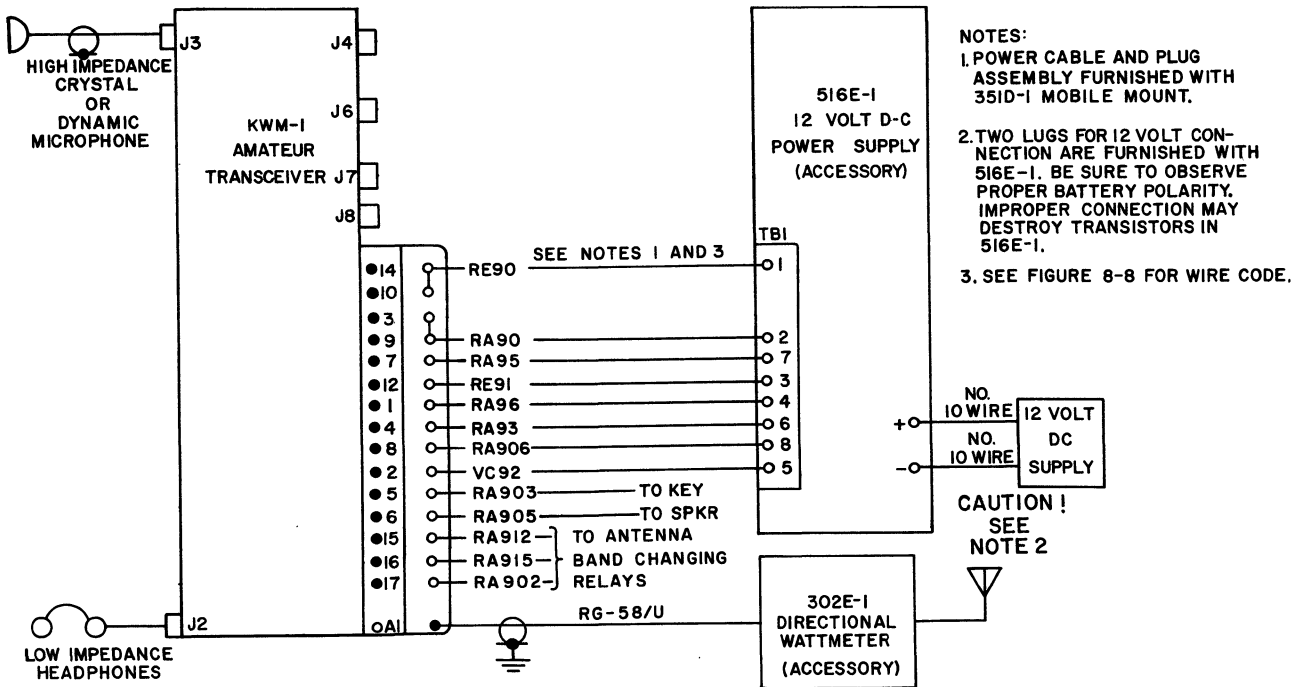


Figure 1-2. Mobile Interconnections

C204-06-3

*KWM-1 Operates upper side
band only*

SECTION I INSTALLATION

1.1 UNPACKING.

Account for all boxes on order (boxes are clearly labeled). The instructions stenciled on the outside of boxes describe unpacking procedure. Open boxes carefully to avoid damaging the equipment. Carefully lift equipment out of packing material. Examine equipment for visible damage. If it is damaged in shipment, save box and packing material, and notify the transportation company. Fill out and mail the guarantee card. Check that all tubes and crystals are seated in sockets properly. Remove blocks or straps holding down tubes.

1.2 INSTALLATION.

1.2.1 GENERAL.

For fixed station installation, refer to figure 1-1, and for mobile installation, refer to figure 1-2. Refer to section III for special mobile considerations.

1.2.2 FIXED STATION INSTALLATION.

a. Prepare r-f cable for antenna connection as shown in figure 8-7.

b. Connect associated equipment to the KWM-1 as shown in figure 1-1. Refer to figure 1-3 for KWM-1 jack locations.

1.2.3. MOBILE INSTALLATION.

a. Select location in vehicle, and mount KWM-1. Allow clearance on all sides to insure adequate ventilation. Drill holes and mount adapter bracket to transmission hump with self-tapping screws. Mount the 351D-1 Mobile Mount to the bracket. Swing the cantilever supports forward, and slide the KWM-1 onto them. Tighten the wing nuts on the sides of the KWM-1.

b. Select location in vehicle for mounting 516E-1 D-C Power Supply. This location must be as clean and dry as possible. Location in luggage compartment, under seat, or on passenger side of fire wall is satisfactory. **DO NOT MOUNT IN ENGINE COMPARTMENT.**

c. Determine necessary length of power cable (furnished) to connect 516E-1 to KWM-1, and cut to required length. Connect power supply, speaker, and microphone as shown in figure 1-2. Remove cover from the 516E-1 Power Supply terminal board to make connections to power supply terminal board.



Be sure to observe polarity of car battery when making connections to the 12-volt terminals of power supply. **DO NOT** connect the 516E-1 Power Supply to a system which has a positive ground. To do so will cause destruction of all six transistors in the power supply.

After the power cable and 12-volt power leads are connected, replace the terminal board cover.

d. Prepare r-f cable for antenna connection as shown in figure 8-7.

e. No mobile speaker is supplied. Connect the terminals of the car speaker to the shielded speaker lead which breaks out of the power cable. It is not necessary to disturb the existing speaker connections, unless car radio has transistor output stage. If so, break voice coil lead, and install a switch for transfer of speaker from car radio to KWM-1.

1.3 POSTINSTALLATION CHECK.

Set controls as follows:

- a. A.F. GAIN full counterclockwise.
- b. MIC. GAIN full counterclockwise.
- c. VOX. GAIN at 12:00 o'clock.
- d. EMISSION SWITCH from PWR OFF to TUNE.
- e. With car battery being charged (engine speed approximately 30 mph), adjust bias on power supply until meter reads S2.

Check to see that all tubes and pilot lamps are lighted. Check for possible shorts caused in shipment.

SECTION I
Installation

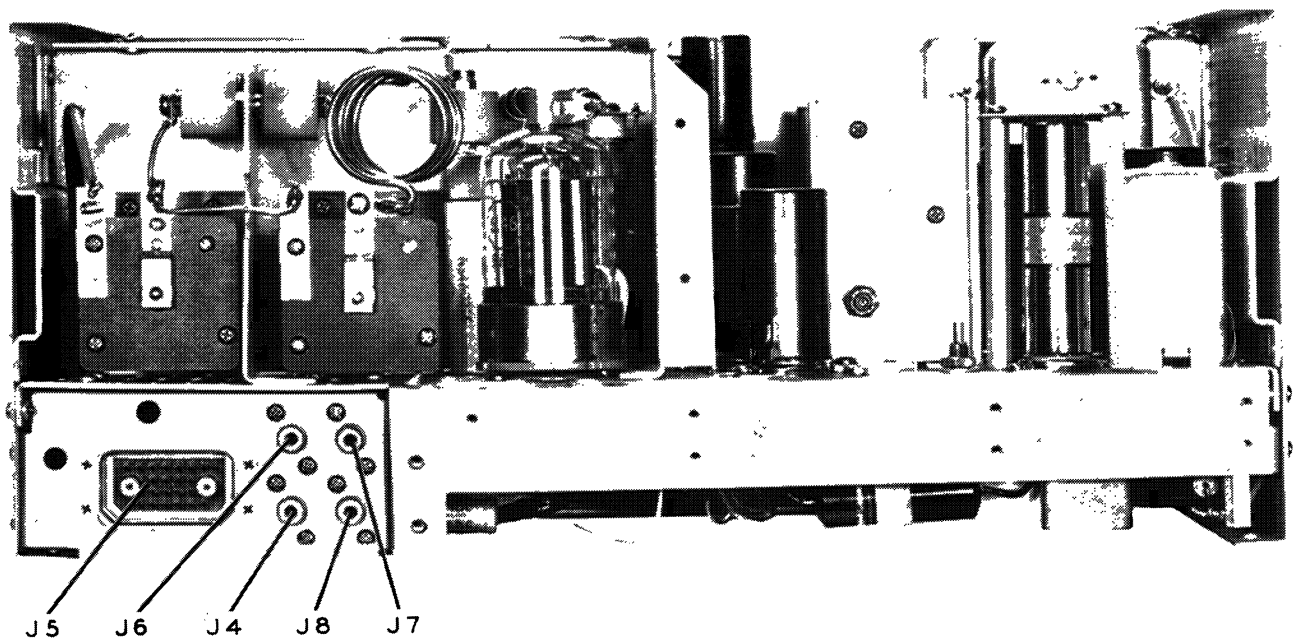


Figure 1-3. Jack Locations

C204-27-P

SECTION II OPERATION

2.1 GENERAL.

This section describes procedures for receiver tuning, transmitter CW tuning, and transmitter SSB tuning. Keep log books, magazines, or other station items off the top of KWM-1 or it will overheat.

2.2 RECEIVER TUNING.

a. Set controls as indicated on figure 2-1 (controls are numbered in the order of adjustment).

b. Select crystal (1) for lower edge of desired 100-kc band.

c. To calibrate, turn EMISSION SWITCH (2) to CAL.

d. Turn KILOCYCLES control (4) to 0 or 100, closest to desired frequency.

e. Adjust KILOCYCLES control until audio beat note from calibrator is zero beat or approaches zero frequency. It may be necessary to adjust A.F. GAIN to get sufficient indication of beat note.

f. Adjust ZERO SET (5) to indicate 0 or 100 on KILOCYCLES dial.

g. Set EMISSION SWITCH (2) to SSB.

h. Adjust EXCITER TUNE (3) for peak S-meter indication.

NOTE

Be sure the proper crystal is selected for the desired band and that EXCITER TUNE control is resonated to desired frequency rather than harmonic or fundamental of high-frequency crystal oscillator signal.

i. Turn KILOCYCLES control (4) to desired dial frequency, and use the KWM-1 as a normal receiver, setting EMISSION SWITCH to SSB or CW as desired for reception.

2.3 TRANSMITTER TUNING FOR CW OPERATION.

a. Tune KWM-1 for receive function on desired band as outlined in preceding paragraph. Turn A.F. GAIN full counterclockwise.

NOTE

CW output frequency is 2 kc higher than dial setting.

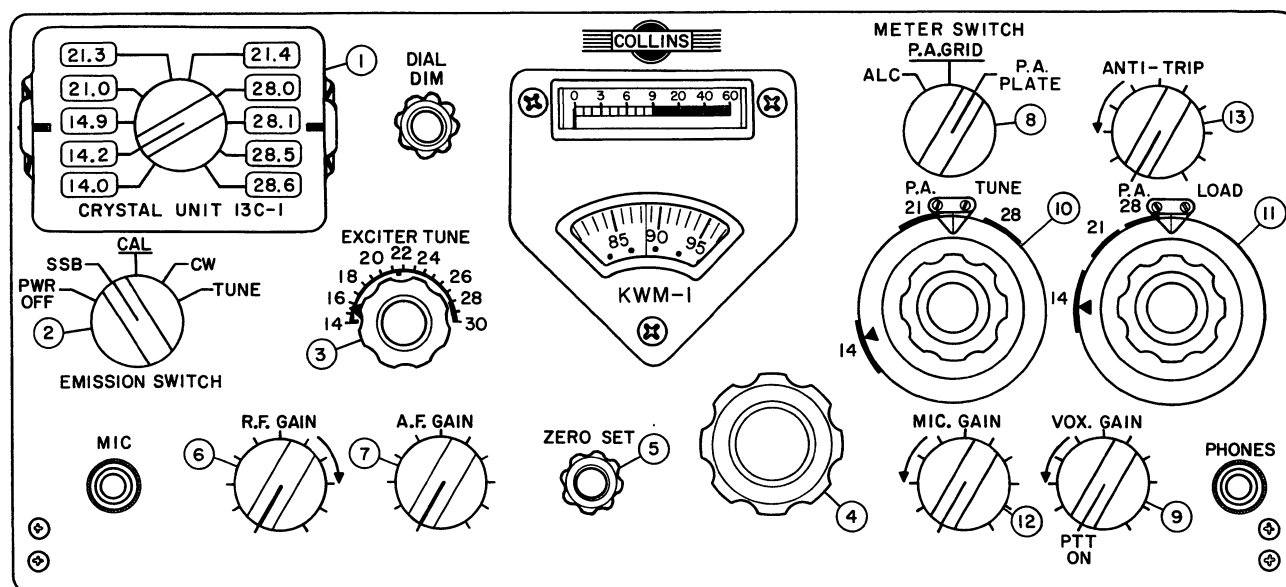


Figure 2-1. Operating Controls

SECTION II
Operation

- b. Set METER SWITCH (8) to P.A. PLATE.
c. Set VOX. GAIN (9) to PTT ON.
d. Set EMISSION SWITCH (2) to TUNE.
e. Set P.A. TUNE (10) and P.A. LOAD (11) controls to 0.
f. Turn MIC. GAIN (12) clockwise until a reading of S3 is obtained on the meter.
g. Adjust EXCITER TUNE control (3) to a maximum indication on meter, keeping MIC. GAIN adjusted to maintain peak S-meter reading below S4.
h. Adjust P.A. TUNE control (10) for plate current dip on meter.
i. Turn MIC. GAIN control (12) ~~three-fourths clockwise~~. *TO PRODUCE S-T GRID CURRENT*
j. Using the left hand on the P.A. TUNE control (10) and the right hand on the P.A. LOAD control (11), rotate P.A. LOAD control in a clockwise direction (at all times dipping the plate current with the P.A. TUNE control). As the P.A. LOAD control is rotated in a clockwise direction, the multimeter will indicate increased plate current at dip. Continue the procedure until the multimeter indicates S9 with the P.A. TUNE control adjusted to plate current dip.
k. Set METER SWITCH (8) to P.A. GRID.
l. Reduce grid current by rotating MIC. GAIN control (12) counterclockwise until the multimeter indicates S1.
m. Set the EMISSION SWITCH (2) to CW with VOX. GAIN control (9) advanced only enough to produce satisfactory relay operation when key is down. The KWM-1 now is ready for break-in CW operation.

NOTE

DO NOT operate with more vox gain than necessary.

n. If manual control of the transmit/receive function is desired, turn VOX. GAIN control (9) to PTT ON for transmit and slightly clockwise for receive. Adjust A.F. GAIN for desired level.

2.4 TRANSMITTER TUNING FOR SSB OPERATION.

a. Use the same tuning procedure as given in the preceding paragraph down through step j.

for SSB

- b. Set the METER SWITCH to ALC.
c. Set EMISSION SWITCH to SSB.
d. Set MIC. GAIN control (12) full counterclockwise.
e. Set ANTI-TRIP control (13) full counterclockwise.
f. Close-talk steadily into the microphone at normal level, and at the same time, adjust VOX. GAIN control (9) in a clockwise direction until the voice-operate relay closes.
g. Advance MIC. GAIN control (12) clockwise (while speaking into microphone) until multimeter indicates S6, METER SWITCH at ALC.



Do not operate with more than S6 indication of ALC. Too much audio voltage overdrives the balanced modulator and produces excessive distortion.

- h. Adjust A.F. GAIN control (7) for normal speaker level.
i. Turn ANTI-TRIP control (13) in clockwise direction with receiver tuned on signal, and set to level just above point at which receiver loud-speaker signal keys transmitter circuits.
j. It may be necessary to increase vox gain slightly after antitrip is set.
k. The KWM-1 now is ready for SSB operation. When the receiver is tuned so that the desired signal sounds natural, the transmitter is ready on the same frequency and will operate automatically with vox to transfer from receive to transmit condition. Close-talking provides better vox action and prevents normal room noises from tripping the KWM-1 from receive function into transmit. A differential microphone will produce best vox action during mobile operation.
l. For push-to-talk operation, turn VOX. GAIN control to PTT ON, but not far enough to click the switch. With push-to-talk microphone plugged in, pressing the microphone button actuates all relays to transfer from receive to transmit operation.

SECTION III SPECIAL CONSIDERATIONS FOR MOBILE INSTALLATION

3.1 ANTENNA INSTALLATIONS.

Best results are obtained with a center-loaded whip mounted on the rear deck or fender. Use high "Q" loading coils placed at least 18 inches above mounting base. General information on mobile antenna design and installation may be found in current amateur radio and mobile radio handbooks.

3.2 SPACE CONSIDERATIONS FOR MOUNTING KWM-1 AND ACCESSORIES.

3.2.1 CONVENIENCE OF OPERATION.

The KWM-1 generally will be mounted near the driver's position under the instrument panel. The 351D-1 Mobile Mount (accessory) may be mounted on the transmission hump in the floor panel to support the KWM-1 as shown in figure 3-1. This arrangement positions the transceiver so that the front panel controls are easily accessible and the panel dial and meter can be read. Figure 3-2 shows the KWM-1 in this operating position.

3.2.2 HEAT AND MOISTURE CONSIDERATIONS.

Figure 3-3 shows one possible mounting position of 516E-1 Power Supply in the luggage compartment between spare tire and car body. Do not mount in the engine compartment as dirt, moisture, and heat may damage the power supply. Be sure to allow clearance around both the KWM-1 and the 516E-1 for ventilation.

3.3 NOISE CONSIDERATIONS.

Use resistor-type spark plugs, and install coaxial bypass capacitors at ignition coil, generator and voltage

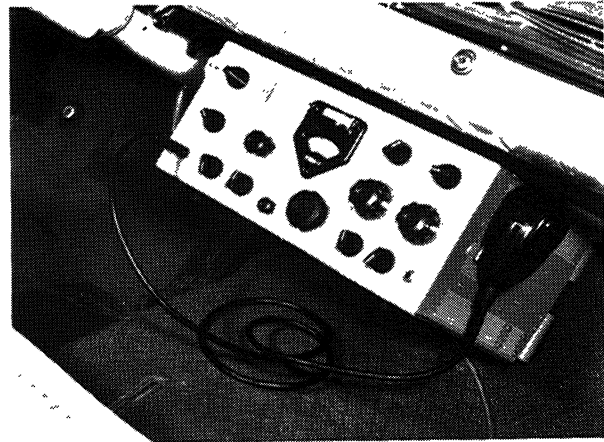


Figure 3-2. KWM-1 Amateur Transceiver
Mounted on 351D-1 Mobile Mount C204-29-P

regulator leads. Use bracket-mounted coaxial capacitors in the battery and generator leads to the voltage regulator and a 0.005 microfarad (or smaller) disk ceramic or mica capacitor from the field lead to ground. Do not use larger capacitor here unless a 4-ohm resistor is placed in series with it. Ground the rear end of the exhaust pipe to car body, using copper braid. General information concerning the problem of ignition noise and suggested methods of noise suppression are available in current handbooks.

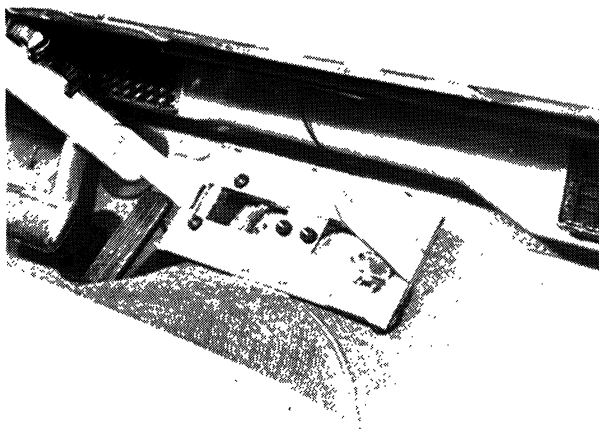


Figure 3-1. 351D-1 Mobile Mount in Place C204-28-P

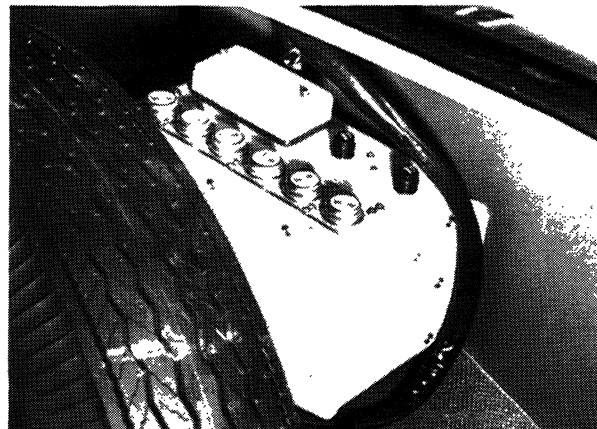
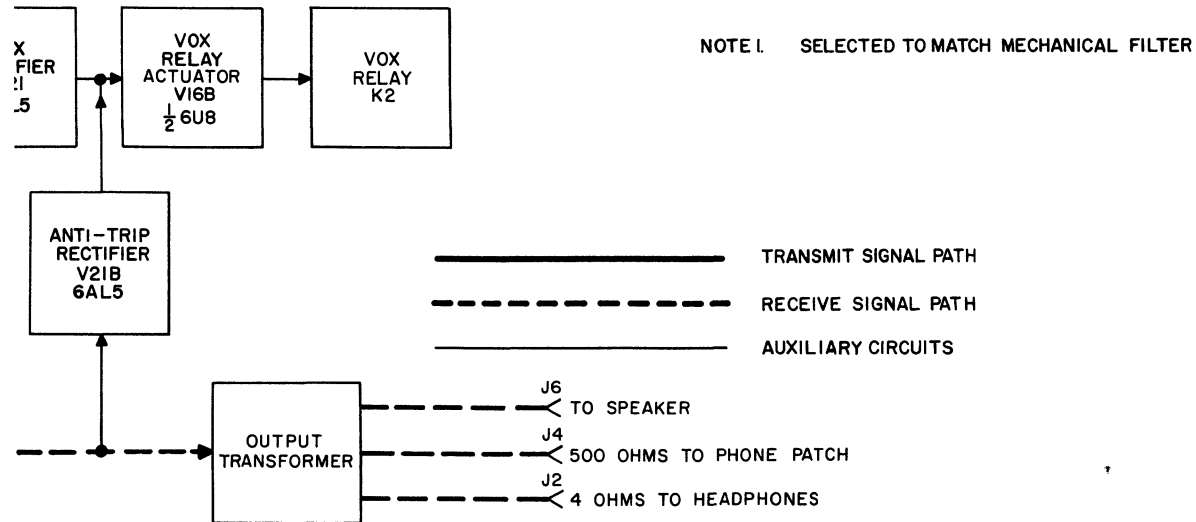
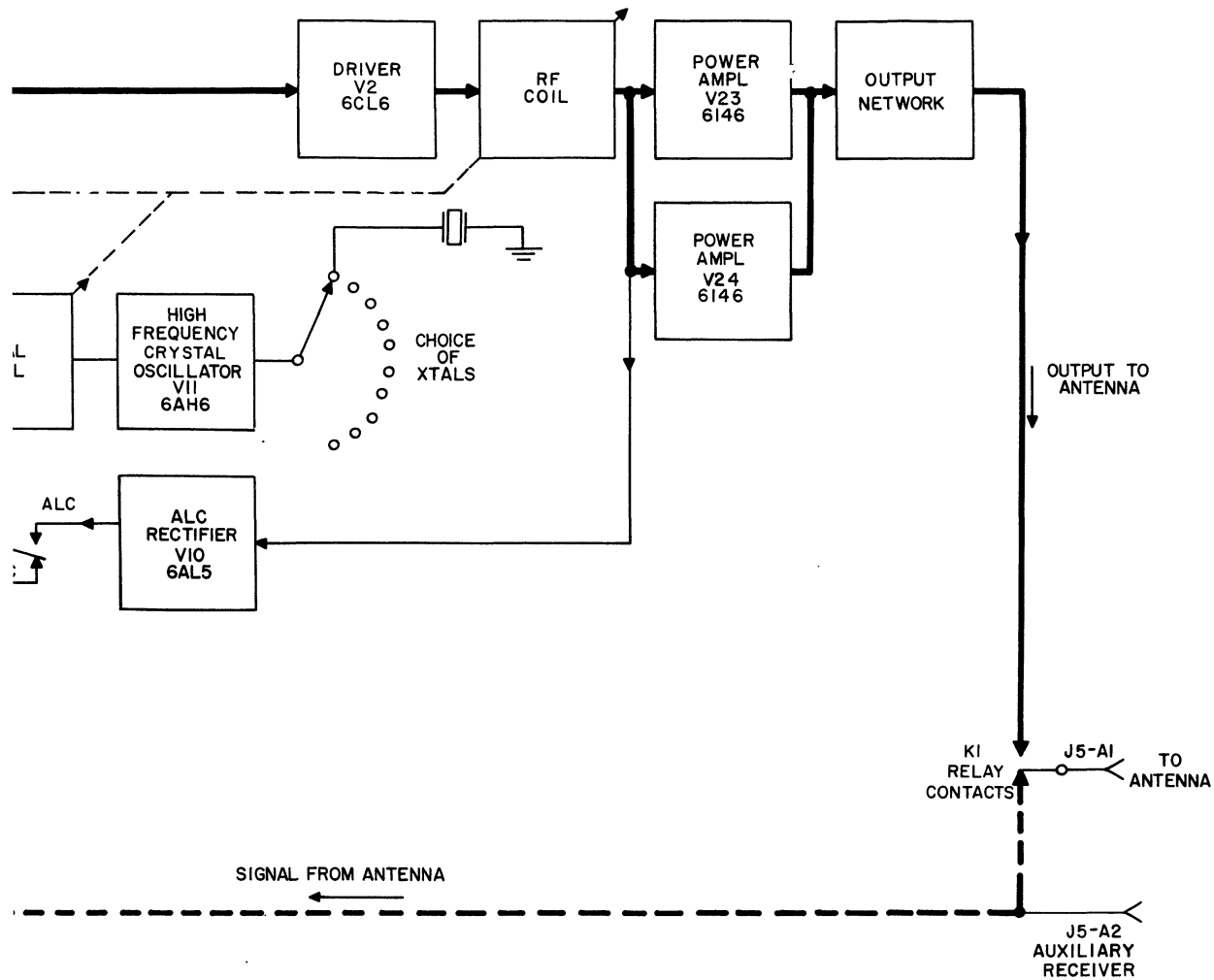
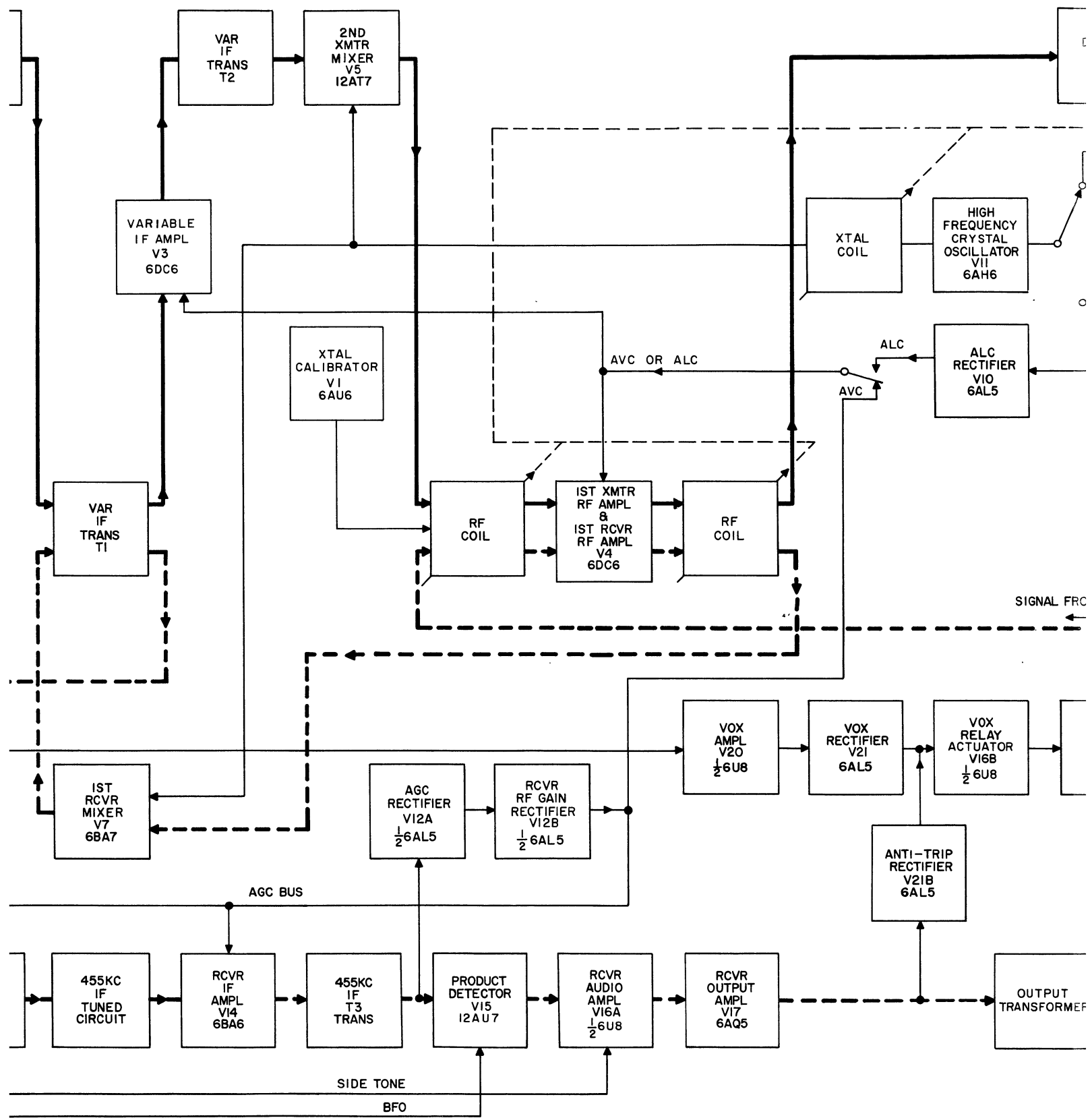


Figure 3-3. 516E-1 12-Volt D-C Power Supply
Mounted in Luggage Compartment C204-30-P





SECTION IV
Principles of Operation

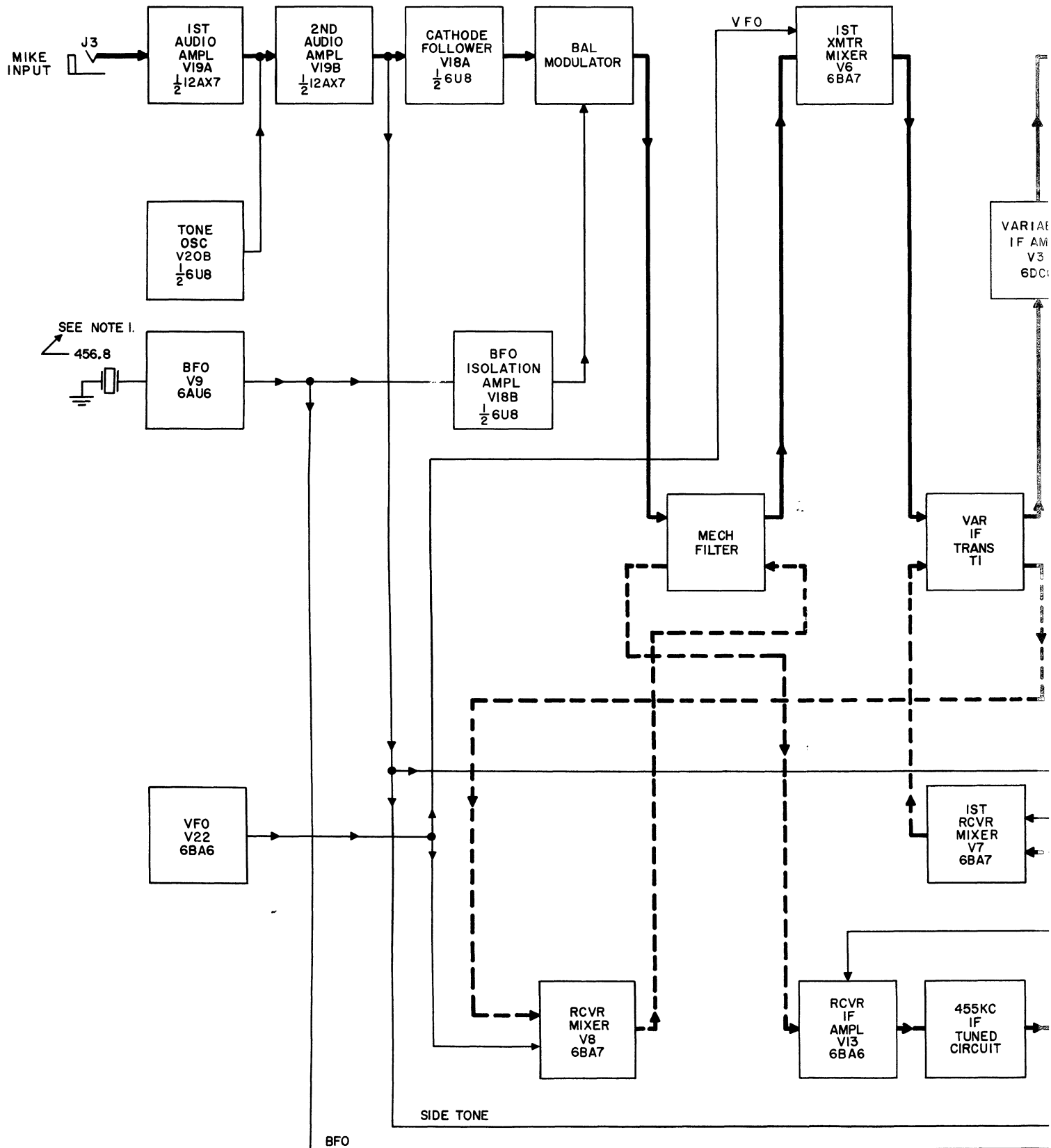


Figure 4-1. Block Diagram

C204-21-5

SECTION IV PRINCIPLES OF OPERATION

4.1 GENERAL.

4.1.1 ELECTRICAL CHARACTERISTICS.

The KWM-1 receives or transmits (on the same frequency) SSB or CW signals in the 14.0- to 30.0-mc

range. Blocking-bias control circuits switch from receive to transmit function by disabling some of the tubes. The vox and antitrip circuits permit voice operation on SSB and break-in operation on CW. Electrical characteristics are listed in table 4-1.

TABLE 4-1. ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	DESCRIPTION
Frequency Range	14.0 to 30.0 mc in 100-kc bands
Emission	SSB and CW (CW signal frequency is 2 kc higher than frequency indicated on dial)
Operation	Vox and break-in
Power Input	175 watts PEP
Power Output	100 watts PEP (nominal)
Impedances	
R-F	
Receiver Input	50 ohms (nominal)
Transmitter Output	50 ohms (nominal)
A-F	
Microphone Input	High-impedance crystal or dynamic
Phone Patch Input	500 ohms
Headphone and Speaker Output	4 ohms
Phone Patch Output	500 ohms
Power Requirements	
Filament	6.3 v a-c at 10 amp or 12.0 v d-c at 5.2 amp
L-V Plate	260 v d-c at 215 ma
H-V Plate	800 v d-c at 200 ma
Bias	-65 v d-c

SECTION IV
Principles of Operation

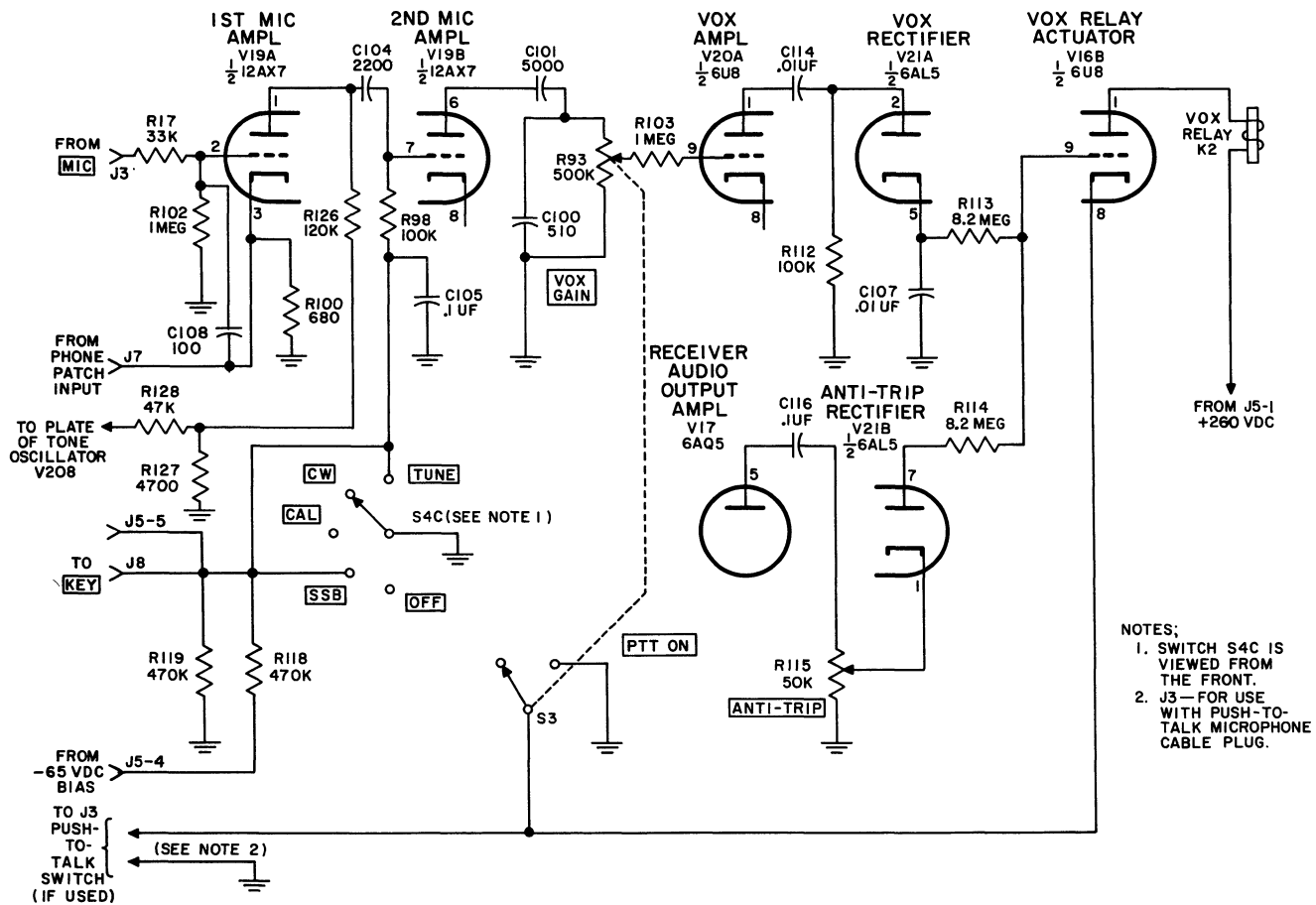


Figure 4-2. Vacuum-Tube Control Circuits, Partial Schematic Diagram

C20403-3

4.1.2 BLOCK DIAGRAM.

Figure 4-1 is a block diagram of the KWM-1. Transmit signal paths are shown in heavy solid lines, receive signal paths in heavy dashed lines, and control circuits in light dashed lines. Circuit details are shown in figure 8-1.

4.2 RECEIVE-TRANSMIT COMMON CIRCUITS.

See figures 4-1 and 8-1. Circuits common to both receive and transmit functions are:

- a. Receive-transmit amplifier V4 and its tunable grid and plate circuits. (These are gang tuned with other circuits tuned by EXCITER TUNE control on front panel.)
- b. The 3.9- to 4.0-mc band-pass i-f transformer T1.
- c. Mechanical filter FL1.
- d. High-frequency oscillator V11.
- e. Beat-frequency oscillator V9.
- f. Variable frequency oscillator V22.
- g. Control circuits.

4.3 RECEIVE CIRCUITS. (See figures 4-1 and 8-1.)

4.3.1 R-F CIRCUITS.

Signals from the antenna are connected from J5-A1 through contacts of relays K1 and K2 to the grid of r-f amplifier V4. Grid circuit (L1, C13, and C15) and plate circuit (L3, C10, and C21) are tracked and ganged to the EXCITER TUNE control on front panel. Output from V4 and high-frequency oscillator signal from V11 are fed to the first receiver mixer (V7).

4.3.2 I-F CIRCUITS.

Difference frequency (3.9 to 4.0 mc) is coupled through i-f transformer T1 to the receiver second mixer (V8). The 3.9- to 4.0-mc signal is mixed with the 3.445- to 3.545-mc vfo signal in V8 to produce the 455-kc i-f signal. This i-f signal is coupled through the mechanical filter FL1 to the grid of the receiver i-f amplifier (V13). A two-stage i-f strip, consisting of V13, and V14, amplifies the 455-kc signal and applies it to the agc rectifier (V12A) and the product detector (V15).

4.3.3 A-F CIRCUITS.

Beat-frequency oscillator signal is applied to the product detector which mixes the two signals to produce demodulated audio signal. The audio signal is filtered by L17, C86, C89, C88, and C77 and amplified by V16A and V17 for application to phone patch, speaker, and headphone circuits. Negative voltage, developed by V12A, provides automatic gain control to receiver amplifier circuits. The R.F. GAIN control

(R116) is used to set the level of operating gain for all receiver r-f and i-f amplifier stages. Audio output level is controlled by A.F. GAIN control R79.

4.4 TRANSMIT CIRCUITS. (See figures 4-1 and 8-1.)

4.4.1 A-F CIRCUITS AND SSB GENERATION.

Microphone signal is amplified by V19A and V19B and applied to cathode follower V18A. Signal level applied to the cathode follower is controlled by MIC. GAIN control R92. Output from the cathode follower is filtered (by L18, C96, and C98) and applied to the diode-ring balanced modulator (CR1 through CR4) consisting of four matched IN67's. Carrier energy is supplied from the bfo through an isolation stage (V18B) to the balanced modulator. Output of the balanced modulator (with carrier balanced out) is applied to mechanical filter FL1 which passes only the lower sideband energy to the first transmit mixer (V6).

4.4.2 R-F CIRCUITS.

Mixer V6 combines the 455-kc sideband signal and the 3.445- to 3.545-mc vfo signal to produce a 3.9- to 4.0-mc output. Two double-tuned circuits (T1 and T2) couple the 3.9- to 4.0-mc signal to the second transmit mixer V5. Mixer V5 combines the 3.9- to 4.0-mc signal with the high-frequency oscillator signal and inverts the sideband to produce the desired upper sideband output frequency. This output signal is amplified by V4, V3, and V2 and applied to the final amplifier. Both driver (V2) and final amplifier (V23 and V24) stages are neutralized by the capacity-bridge method, and negative feedback is coupled to the cathode of the driver to improve linearity. The Pi-L power-output circuit consists of C42, L10, L11, C43 and C44, and L12. Output power is connected from L12 through contacts of K1 and connector J5-A1 to the antenna.

4.5 CONTROL CIRCUITS.

4.5.1 GENERAL.

Figure 4-2 shows vacuum-tube control circuits, and figure 4-3 shows relay and switching circuits.

4.5.2 VOX AND ANTITRIP CIRCUITS.

Vox and antitrip circuits operate as follows:

A portion of the audio voltage developed across R93 (in output of V19B) is amplified by V20A and rectified by V21A. The positive d-c output of V21A is applied to the grid of V16B causing V16B to conduct current and actuate vox relay K2. Contacts of K2 switch the high-voltage plate power supply into operation, (on d-c supply only; these contacts are jumpered in the a-c supply) disconnect the antenna from V4 grid, and energize relays K1 and K3. Relay K1 switches the meter M1 from receiver S-meter circuits to transmitter multimeter circuits and switches antenna

SECTION IV
Principles of Operation

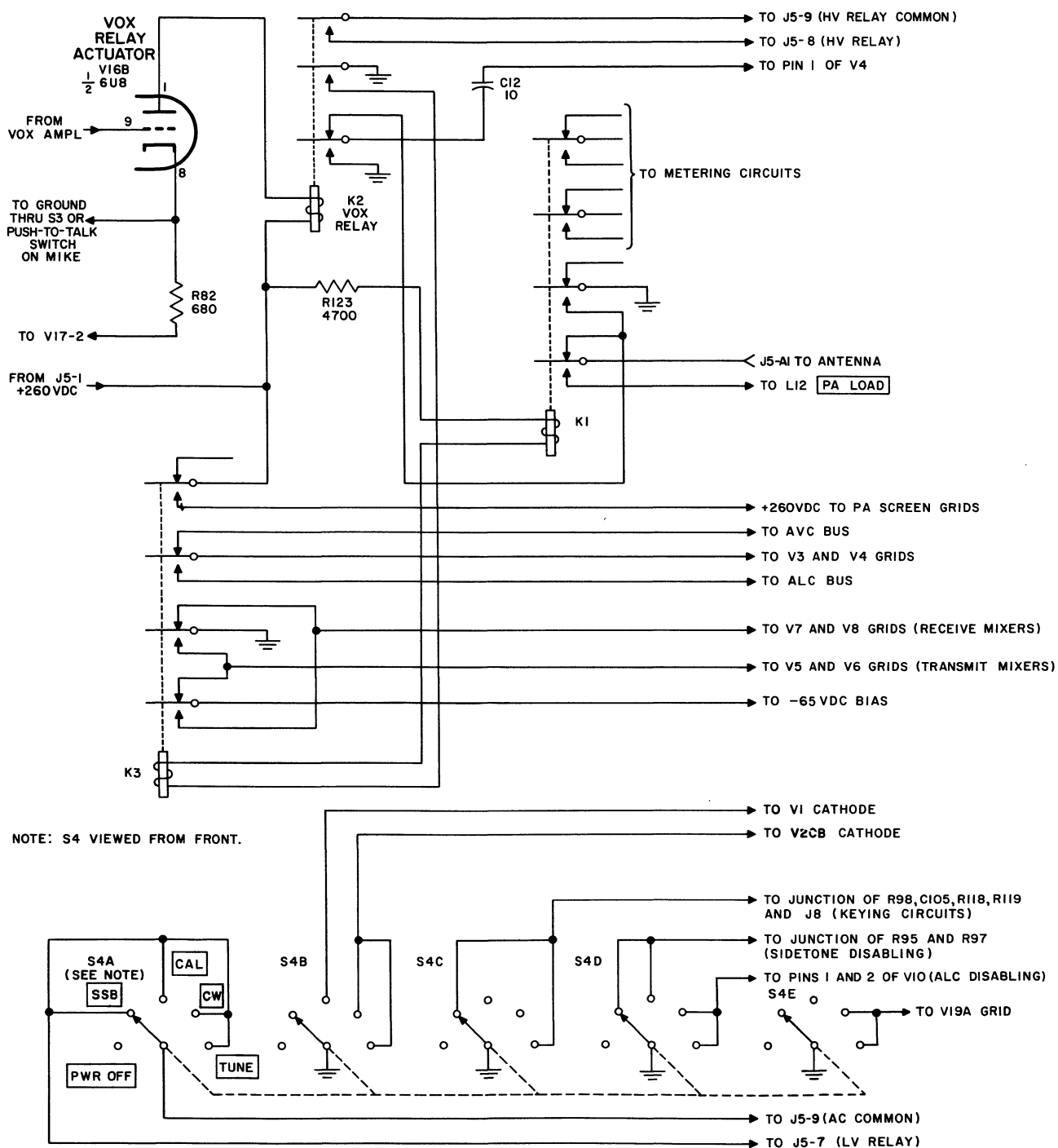


Figure 4-3. Relay and Switch Control Circuits, Partial Schematic Diagram

C204-05-4

connections so that receiver input is grounded and transmitter output is connected from L12 to the antenna through J1. Relay K3 applies screen voltage to the power amplifier, and plate voltage to V18A turns on transmitter tubes (V2, V5, V6, and V18B) and turns off receiver tubes (V7, V8, V12, V13, V14, and V15).

The antitrip circuit provides a threshold voltage to prevent loud-speaker output (picked up by the microphone circuits) from tripping the KWM-1 into transmit function. Some of the receiver audio output voltage is connected through C116 and R115 to the antitrip rectifier (21). Negative d-c output voltage from V21B, connected to the grid of V16B, provides the necessary antitrip threshold. ANTITRIP control R115 adjusts the value of the antitrip threshold so that loud-speaker output will not produce enough positive d-c output from the vox rectifier to exceed the negative d-c output from V21B and cause V16B to actuate K2. However, speech energy into the microphone will cause the positive vox voltage to overcome the negative antitrip voltage and produce the desired action of K2.

4.5.3 MANUALLY OPERATED SWITCHES.

VOX GAIN control R93 is ganged mechanically to switch S3 which may be used for transmit-standby manual control if desired. When R93 is turned down through minimum, S3 closes and shorts the cathode of V16B to ground, causing the tube to conduct and actuate the switching relays. (Refer to figure 3-1.) As the EXCITER TUNE control is adjusted near 14.0 mc, 21.0 mc, or 30.0 mc, S5 connects pins 15, 16, or 17 (respectively) of J5 to ground to operate any desired combination of antenna selecting relays (see figure 4-4). Crystal selector switch S1 selects the

proper crystal for high-frequency oscillator V11 to put the KWM-1 in the desired 100-kc portion of its operating range. Switch S2 selects metering function for M1 when the EMISSION SWITCH S4 is in SSB, CW, or TUNE position.

Emission switch section S4A turns on all low-voltage supplies in all positions except OFF; section S4B turns on the crystal calibrator V1 in CAL position and turns on the tone oscillator (V20B) in CW and TUNE positions. Section S4C removes cutoff bias from V19B when in SSB and TUNE positions and grounds the microphone input connection when in CW and TUNE position. Section S4D grounds sidetone signal when in SSB and CAL positions and grounds a/c voltage when in CW and TUNE positions. Section S4E grounds the microphone input when in CW and TUNE positions.

4.6 OSCILLATOR CIRCUITS.

The crystal-controlled bfo provides 455-kc (nominal frequency) carrier to the balanced modulator and bfo injection to the frequency product detector. Its crystal is selected to fall at the -20-db point on the high-frequency skirt of the mechanical filter band pass. The vfo is a series-tuned type circuit. Its operating frequency of 3.445 to 3.454 mc is controlled by a permeability-tuned coil. The high-frequency oscillator (V11) is crystal controlled by one of ten crystals selected by the crystal selector switch on the front panel. These crystals may be selected to operate at any frequency in the operating range. The tone oscillator (V20B) is an RC phase shift type which supplies a 1-kc tone for tuneup and CW operation. The 100-kc crystal calibrator (V1) supplies calibration check points for calibrating the receiver dial.

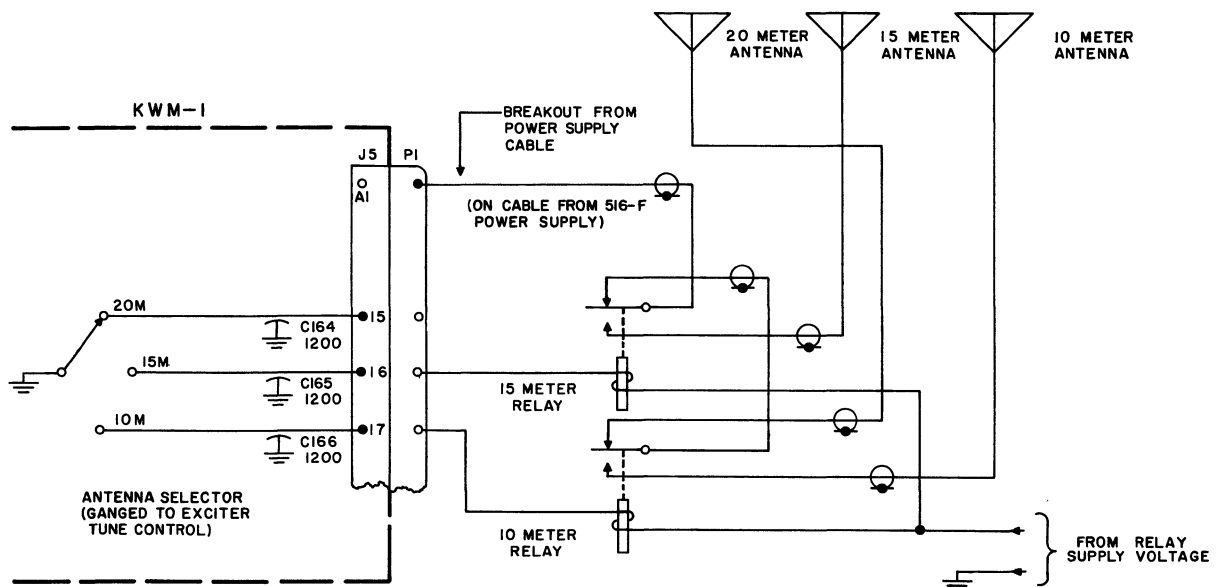


Figure 4-4. Suggested Circuit for Automatic Antenna Selection

C204-22-3

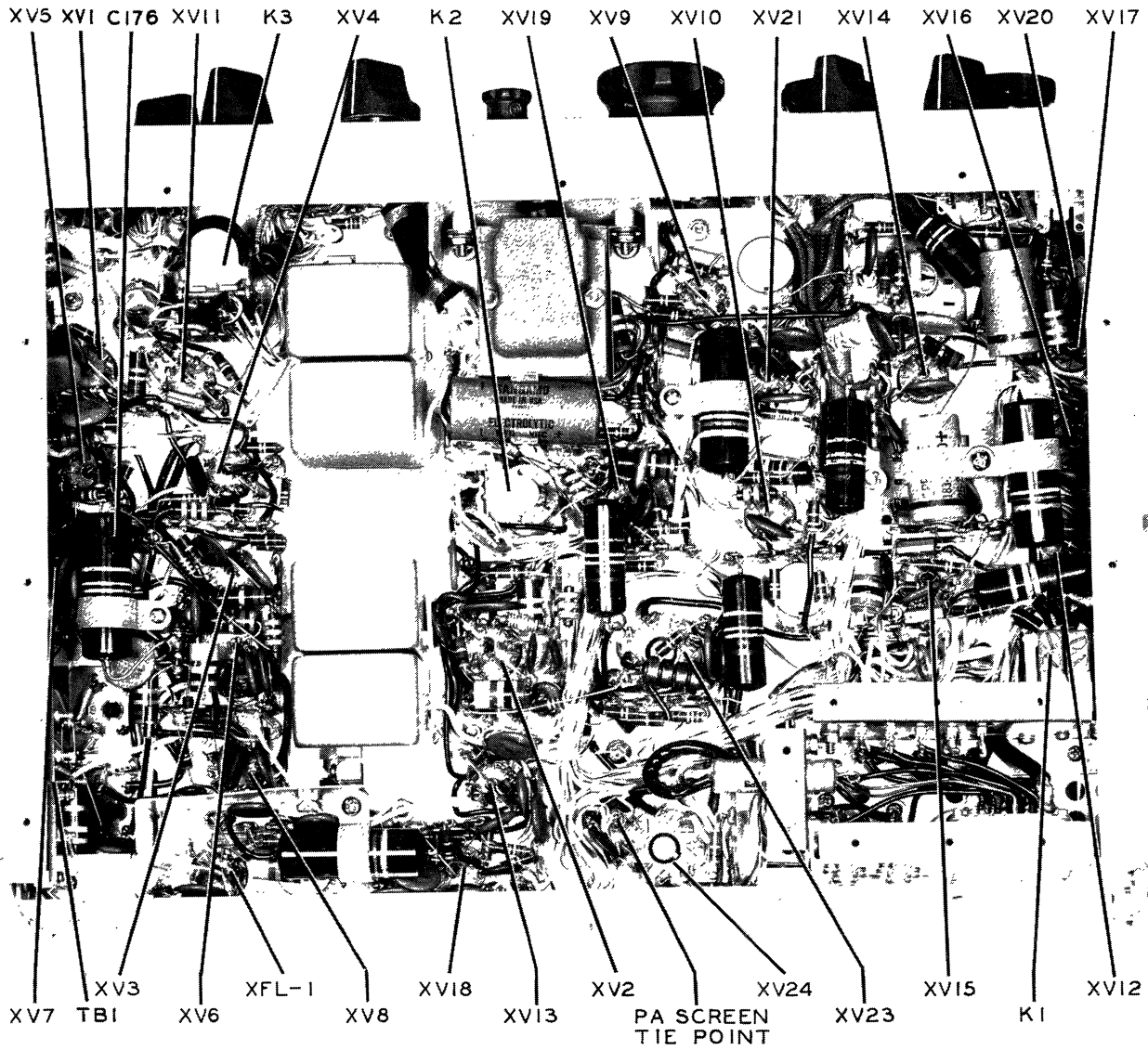


Figure 5-1. KWM-1, Underchassis, Socket Location

C204-10-P

SECTION V MAINTENANCE

5.1 GENERAL.

Included in this section are signal tracing procedures, alignment and neutralization procedures, voltage and resistance measurements, and a tube complement table.

5.2 SIGNAL TRACING.

Tables 5-1, 5-2, and 5-3 list significant test points and normal signal levels, and figure 5-1 shows socket locations. Necessary test equipment includes a signal

generator and a vacuum-tube voltmeter with r-f probe.

5.2.1 TRANSMIT SIGNAL TRACING.

The signal levels shown in table 5-1 are measured on a vtvm with a 2000-cps signal injected at MIC. jack J3 and with MIC. GAIN R92 adjusted so that the meter just begins to show power amplifier grid current. Disconnect power from the power amplifier screen grids before making these measurements (see paragraph 5.5.1 step a.), and set the KWM-1 for SSB operation (see section II). Values given are nominal. Set kc dial to 50.

TABLE 5-1. TRANSMIT LEVELS

TEST POINT	FREQUENCY	VOLTAGE
J3	1000 cps	0.024 volt
V19A-1	1000 cps	0.470 volt
V19B-6	1000 cps	11.0 volts
V18A-8	1000 cps	3.0 volts (with R92 adjusted for 5 volts at V18A-9)
V6-7	455 kc (transmitter on 14-mc band)	4,500 microvolts
	455 kc (transmitter on 21-mc band)	10,000 microvolts
	455 kc (transmitter on 28-mc band)	9,000 microvolts
T3-1	3.9-4 mc (transmitter on 14-mc band)	4,500 microvolts
	3.9-4 mc (transmitter on 21-mc band)	10,000 microvolts
	3.9-4 mc (transmitter on 28-mc band)	90,000 microvolts
V5-2	3.9-4 mc (transmitter on 14-mc band)	8,000 microvolts
	3.9-4 mc (transmitter on 21-mc band)	20,000 microvolts
	3.9-4 mc (transmitter on 28-mc band)	12,000 microvolts
V4-1	14 mc	33,000 microvolts
	21 mc	58,000 microvolts
	28 mc	44,000 microvolts
V2-2	14 mc	1.4 volts
	21 mc	1.6 volts
	28 mc	1.6 volts
V23-5 or V24-5	any	50.0 volts

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5.2.2 RECEIVE SIGNAL TRACING.

The signal levels of table 5-2 are signal generator output levels necessary at the test point to produce reference voltages. Values are nominal.

5.2.3 INJECTION LEVELS.

Signal levels listed in table 5-3 were measured on a vtvm. Values given are nominal.

TABLE 5-2. RECEIVE LEVELS

TEST POINT	FREQUENCY	VOLTAGE
J1*	14 mc	1.7 microvolts
	21 mc	2.6 microvolts
	28 mc	2.0 microvolts
V4-1	14 mc	7.2 microvolts
	21 mc	12.5 microvolts
	28 mc	7.2 microvolts
V7-7	14 mc	55 microvolts
	21 mc	65 microvolts
	28 mc	70 microvolts
V8-7	3.9-4.0 mc	200 microvolts
V13-1	455 kc	150 microvolts
V14-1	455 kc	15,000 microvolts
V15A-7	455 kc	70,000 microvolts
V16A-2**	a-f	150 millivolts
V17-1	a-f	5.7 volts

* All r-f and i-f levels are measured with agc threshold as reference.

**All a-f voltages measured with one-watt audio output as reference.

TABLE 5-3. INJECTION LEVELS

TEST POINT	FREQUENCY	VOLTAGE
V20-2	1000 cps	1.6 volts
V20-6	1000 cps	14 to 15 volts
V8-2	3.445-3.545 mc (vfo)	2.3 to 2.6 volts
V6-2	3.445-3.545 mc (vfo)	2.3 to 2.6 volts
V7-2	14-mc band	3.1 volts
	21-mc band	2.5 volts
	29.6-mc band	2.3 volts
V5-3	14-mc band	3.1 volts
	21-mc band	2.5 volts
	29.6-mc band	2.3 volts
R86 (slider)	455 kc	1.7 volts (transmit only)
V18B-2	455 kc	1.6 volts (transmit only)
V18B-6	455 kc	10.0 volts (transmit only)
V15-2	455 kc	1.8 volts

5.3 TUBE COMPLEMENT.

Table 5-4 lists all tubes of the KWM-1 by symbol number, function, and tube types.

5.4 VOLTAGE AND RESISTANCE MEASUREMENTS.

Table 5-5 lists voltage and resistance measurements on all tube sockets of the KWM-1 except that of the

TABLE 5-4. TUBE COMPLEMENT

SYMBOL	FUNCTION	TUBE TYPE
V1	Receive crystal calibrator	6AU6
V2	Transmit driver	6CL6
V3	Receive and transmit variable i-f amplifier	6DC6
V4	Transmitter r-f amplifier and receiver r-f amplifier	6DC6
V5	Second transmit mixer	12AT7
V6	First transmit mixer	6BA7
V7	First receive mixer	6BA7
V8	Second receive mixer	6BA7
V9	Transmitter carrier generator and receiver bfo	6AU6
V10	Transmitter alc rectifier	6AL5
V11	Transmit/receive high-frequency oscillator	6AH6
V12A	Receiver avc rectifier	1/2 6AL5
V12B	Avc isolation from R.F. GAIN	1/2 6AL5
V13	Receiver first i-f amplifier	6BA6
V14	Receiver second i-f amplifier	6BA6
V15	Product detector	12AU7
V16A	Receiver first a-f amplifier	1/2 6U8
V16B	Vox relay actuator	1/2 6U8
V17	Receiver audio output amplifier	6AQ5
V18A	Speech amplifier-cathode follower	1/2 6U8
V18B	Isolate bfo from balanced modulator	1/2 6U8
V19A	First speech amplifier	1/2 12AX7
V19B	Second speech amplifier	1/2 12AX7
V20A	Vox amplifier	1/2 6U8
V20B	Tone oscillator	1/2 6U8
V21A	Vox rectifier	1/2 6AL5
V21B	Antitrip rectifier	1/2 6AL5
V22	Transmit/receive vfo	6BA6
V23	Transmit power amplifier	6146
V24	Transmit power amplifier	6146

vfo tube V22. DO NOT OPEN the oscillator can. Measurements were taken under following conditions:

a. All measurements with vtvm and with all tubes in sockets.

b. Resistances of less than one ohm listed as zero.

c. Voltage measurements made with the tube under test operating in its normal function except as noted in the table.

d. Resistance measurements made with power supply plug removed from J5.

e. All measurements from socket pin to ground.

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TABLE 5-5. VOLTAGE AND RESISTANCE MEASUREMENTS

TUBE		PIN NUMBER									PLATE CAP
		1	2	3	4	5	6	7	8	9	
V1	D-C V	-73	0	-	-	270	120	0			
	Ohms	100K	0	0	0	20K	260K	0			
V2	D-C V	0.9	-3.2	165	-	-	250	0	165	-3.2	
	Ohms	10	45K	30K	0	0	20K	0	30K	45K	
V3	D-C V	-1.5	0.8	-	-	235	120	0			
	Ohms	3.5 meg	85**	0	0	20K	53K	0			
V4	D-C V	0.48	0	-	-	240	100	0			
	Ohms	3.5 meg	0	0	0	20K	53K	0			
V5	D-C V	245	-0.04	1.9	-	-	245	-0.12	1.9		
	Ohms	20K	120K	220	0	0	20K	120K	220		
V6	D-C V	80	-1.7	1.5	-	-	0	0.01	-	230	
	Ohms	38K	120K	120	0	0	0	120K	-	100K	
V7	D-C V	240	-1.4	1.7	-	-	0	0.01	-	230	
	Ohms	38K	100K	120	0	0	0	100K	-	55K	
V8	D-C V	240	-1.4	1.7	-	-	0	0.01	-	230	
	Ohms	38K	100K	120	0	0	0	100K	-	55K	
V9	D-C V	-8.4	0	-	-	84	100	0			
	Ohms	900K	0	0	0	120K	250K	0			
V10	D-C V	-	-	-	-	0	-	-1.3			
	Ohms	inf	inf	0	0	0	-	2 meg			
V11	D-C V	-4	0	-	-	250	100	0			
	Ohms	100K	0	0	0	20K	100K	0			
V12	D-C V	-1.6/-64*	-2/-64*	-	-	2.6/3*	-	-4/-64*			
	Ohms	18K**	2 meg	0	0	1000	-	2 meg			
V13	D-C V	-2	0			240	100	0.06**			
	Ohms	3.5 meg	0	0	0	20K	70K	4**			

TABLE 5-5. VOLTAGE AND RESISTANCE MEASUREMENTS (Cont)

TUBE		PIN NUMBER									PLATE CAP
		1	2	3	4	5	6	7	8	9	
V14	D-C V	-2	0	0	-	250	100	0			
	Ohms	3.5 meg	0	0	0	20K	70K	0			
V15	D-C V	80	-0.01	4.7	-	-	140	-0.01	4.7	-	
	Ohms	67K	500K	820	0	0	20K	500K	820	0	
V16	D-C V	275	-	70	-	-	25	0.25	-	-	
	Ohms	20K	3K*	290K	0	0	240K	3300	1000	inf	
V17	D-C V	0	13	-	-	260	270	-			
	Ohms	100K	330	0	0	20K	20K	100K			
V18	D-C V	250	-1.6	100	-	120	-1.25	13	10		
	Ohms	inf	inf/ 20K**	90K	0	0	55K	220	900	400K	
V19	D-C V	47	-0.6	0.07	-	-	88	-0.06	0.55	-	
	Ohms	70K	1 meg	680	0	0	120K	120K	1000	0	
V20	D-C V	64	-0.01	98	-	-	71	27.5	1.5	-0.01	
	Ohms	70K	270K	65K	0	0	60K	inf	1000	900K	
V21	D-C V	-	0.01	-	-	1.0	-	-0.85			
	Ohms	2K	0	0	0	inf	-	inf			
V23 and V24	D-C V	-	-	***	-	-64	-	-	-		
	Ohms	2	0	inf	2	60K	2	0	inf		

* First value given is for receive conditions; second value is for transmit condition.

** Varies with setting of potentiometer.

***Disconnected for test. PA sockets measured in receive condition.

5.5 ALIGNMENT AND NEUTRALIZATION.

If a vtm with r-f probe is available, it should be used in alignment for best results. Alignment with only grid current indication is satisfactory if 50-60 volts grid drive is available. Test equipment necessary for neutralization consists of a signal generator and a special test probe (see figure 5-3). Before attempting neutralization, tune up the KWM-1 into a 50-ohm resistive dummy load. If no oscillation is evident, the KWM-1 does not need neutralization. Check to see that antenna and feed system present proper impedance match.

5.5.1 ALIGNMENT.

a. Disconnect screen lead to V23 and V24. Refer to figure 5-1 for location. This lead is the last one to be soldered to the standoff terminal near the 6146 socket nearest the rear lip of the chassis.

b. Set the EMISSION SWITCH to TUNE. Turn the VOX. GAIN control counterclockwise until the switch clicks. Turn the EXCITER TUNE to 15 mc, and select the 14.2-mc crystal.

c. Set KILOCYCLES dial to 50.

d. Set the METER SWITCH to P.A. GRID. (If a vtm is available, connect its probe from pin 5 of V23 or

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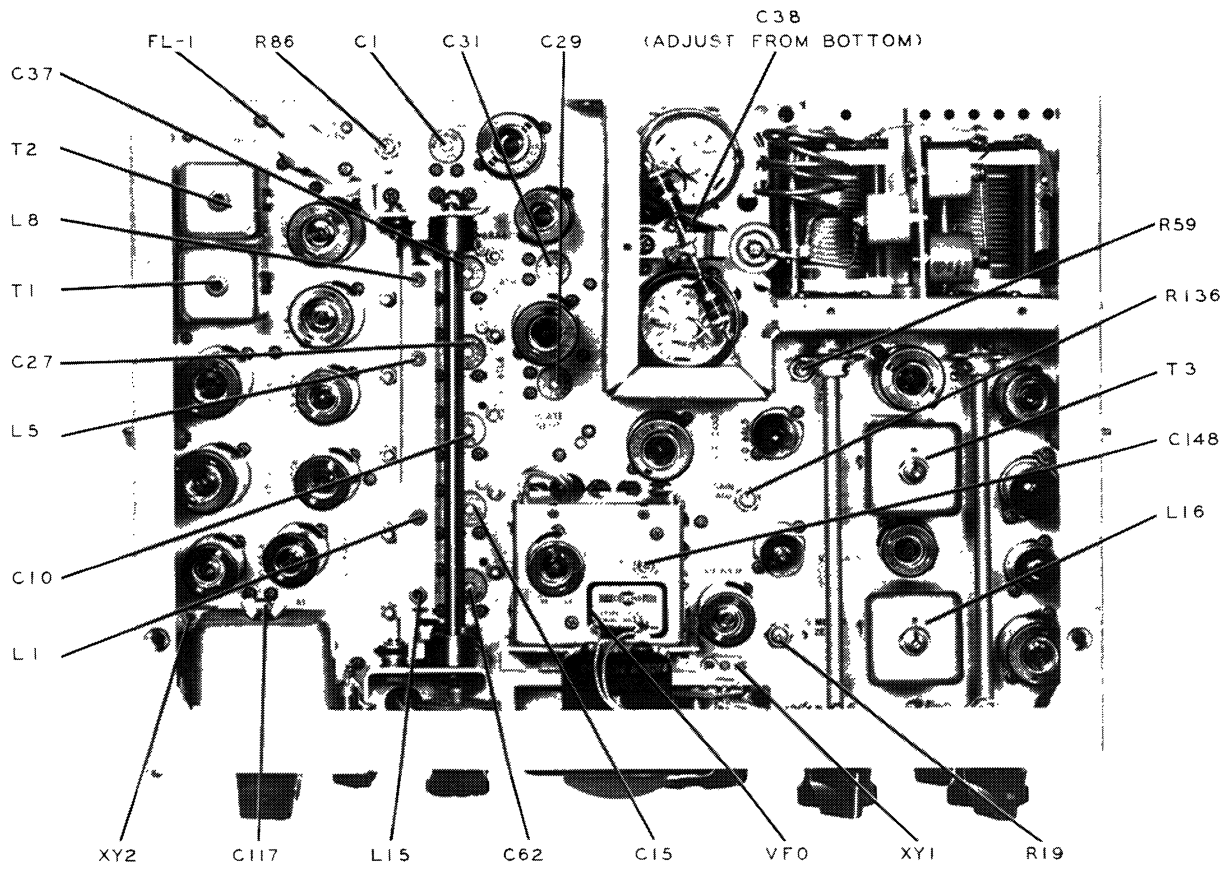


Figure 5-2. Location of Alignment and Neutralizing Adjustments

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V24 to ground, and make the following adjustments for maximum vtvm indication.)

e. Adjust MIC. GAIN control to obtain a meter indication of approximately S3.

f. Using an insulated tuning tool, adjust the slugs of T1 and T2 for maximum meter indication. Figure 5-2 shows location of alignment and neutralization adjustments. Adjust MIC. GAIN counterclockwise to bring meter indication to S5 or less.

g. Set the KILOCYCLES dial at 0, and adjust L1, L5, L8, and L15 for maximum meter indication, continually adjusting the MIC. GAIN to keep meter indication at S5 or less. Figure 5-2 shows location of adjustments.

NOTE

Be careful that tuned circuits are not resonated at crystal oscillator frequency rather than the desired frequency. To check for this, turn the MIC. GAIN control full counterclockwise, and watch the PA grid current. Grid current should drop to zero if the circuits are being resonated at the desired frequency.

h. Select the 28.5-mc crystal, and set the KILOCYCLES dial to 0. Set the EXCITER TUNE control to 28.0.

i. Using an insulated screw driver, adjust C15, C27, C37, and C62 for maximum meter indication, re-adjusting MIC. GAIN as necessary to keep meter indication at S5 or less. Refer to figure 5-2 for location of trimmer capacitors.

j. Repeat the slug adjustments at 14.2 mc and the capacitor adjustments at 28.5 mc until these adjustments do not produce any increase in meter indication. If a vtvm has been used for alignment, disconnect it, and readjust C37 for maximum grid current indication with KWM-1 tuned to 28.5 mc. The transmit circuits now are aligned.

k. Turn the EMISSION SWITCH to CAL.

l. Set MIC. GAIN completely counterclockwise.

m. Turn VOX. GAIN control only far enough to operate switch S3.

n. Set ANTI-TRIP completely counterclockwise.

o. Set the EXCITER TUNE control to 14.0 mc, and select the 14.0-mc crystal.

p. Turn the KILOCYCLES dial near 0, and adjust until a CW note is heard.

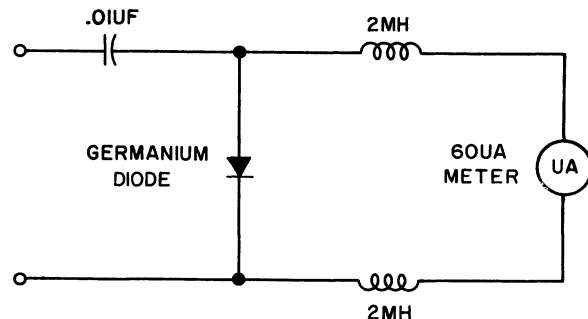
q. Adjust EXCITER TUNE control for maximum receiver output.

r. Adjust L16 and T3 for maximum S-meter indication.

5.5.2 NEUTRALIZATION.



If it is determined that neutralization is necessary to keep the equipment in temporary operation, follow exactly the procedure given below.



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Figure 5-3. Special Test Probe and Detector Circuit, Schematic Diagram

a. Remove power from PA plates and screen grids.
b. Turn on the KWM-1, and tune the transmitter to 21.0 mc.

c. Set up for receive condition, and insert a screw driver blade between the armature and stop of K1 to block the relay in closed position.

d. Tune a low-impedance signal generator to 21 mc, and feed at least one volt (and no more than two volts) r-f into the antenna jack (J1).

e. Connect a special test probe-detector circuit (see figure 5-3) from PA grid to neutralizing feed-through capacitor C34. Refer to the schematic diagram (figure 8-1).

f. Using an insulating screw driver, adjust C38 for minimum r-f indication on the detector meter as the EXCITER TUNE control is rocked through resonance.

g. Leave the PA screens disconnected. Turn EMISSION SWITCH to SSB, disconnect the microphone, and turn the VOX. GAIN control counterclockwise until the switch clicks. The KWM-1 now is set up for transmit condition with no PA grid drive.

h. Leave the signal generator tuned to 21 mc, and connect its output to the cathode of the driver (V2-1).

i. Connect the detector from driver grid V2-2 to the bottom of the grid tank (C28).

j. Using an insulating screw driver, adjust C31 for minimum r-f indication on the detector meter as the EXCITER TUNE control is rocked through resonance.

k. Leave the KWM-1 in transmit condition with the PA screens disconnected and with no drive to the PA grids.

l. Connect the signal generator output to the plate of the driver (V2-6).

m. Leave the detector connected as in step i.

n. Using an insulating screw driver, adjust C29 for minimum r-f indication on the detector meter as the EXCITER TUNE control is rocked through resonance.

o. Repeat steps c. through n. until adjustment of C38, C31, and C29 produces no change in the minimum values indicated on the detector meter.

SECTION VI ACCESSORIES

6.1 GENERAL.

Table 6-1 lists accessories which are available for use with the KWM-1 Amateur Transceiver. Figures 6-1 through 6-15 illustrate the accessories.

TABLE 6-1
KWM-1 ACCESSORIES

ACCESSORIES	COLLINS PART NO.
516E-1 12-Volt D-C Power Supply	522 0846 00
516E-2 28-Volt D-C Power Supply	522 0984 00
516F-1 A-C Power Supply	522 0847 00
312B-1 Speaker	522 0849 00
312B-2 Speaker Console (including Phone Patch and Directional Wattmeter)	522 0850 00
351D-1 Mobile Mount	543 2833 00
189A-1 Phone Patch (included in 312B-2)	522 0871 00
189A-2 Phone Patch	522 0872 00
302E-1 Directional Wattmeter	522 0870 00
399B-1 DX Adapter	522 1094 00
Mobile Power Cable	543 2830 003

6.2 516E-1 12-VOLT D-C POWER SUPPLY.

Figure 8-2 shows circuit details, and figures 6-1 through 6-3 identify parts. It includes an 800-volt 200-ma supply for the power amplifier plates and a 260-volt 215 ma supply for all other plate circuits. The 260-volt supply is tapped for -65 volts bias. The transistors for each supply are connected in a grounded-collector multivibrator circuit which switches the d-c input power to a-c power for application to the primary winding of the power transformer. Output from the transformer secondary is rectified in a silicon diode voltage doubler circuit. The voltage from the bias tap of the 260-volt supply is rectified by a half-wave silicon diode rectifier. Input current requirement is 25 amperes (maximum) in TUNE or CW condition.

6.3 516E-2 28-VOLT D-C POWER SUPPLY.

The 516E-2 Power Supply (figures 6-4, 6-5, 6-6, and 8-3) is similar in construction and layout to the 516E-1.

Input voltage and current requirements are 24 to 30 volts d-c at 12.5 amperes (maximum).

6.4 516F-1 A-C POWER SUPPLY.

Figure 8-4 is a schematic diagram of the 516F-1 Power Supply, and figures 6-7 and 6-8 show parts locations. The 516F-1 contains an 800-volt 200-ma power supply for the power amplifier plates and a 260-volt 215-ma power supply for all other plate circuits. The 260-volt supply is tapped for -65 volts bias. The input voltage requirement is 115 volts, 50 to 70 cps.

6.5 312B-2 SPEAKER CONSOLE.

Figure 8-5 is a schematic diagram of the 312B-2 Speaker Console shown in figure 6-10. It contains a 4-ohm oval speaker, a 189A-1 Phone Patch, and a 302E-1 Directional Wattmeter. The meter portion of 302E-1 is calibrated for 200 watts (forward or reverse power). Both the phone patch and directional wattmeter are available separately and are described in paragraphs 6.6 and 6.7.

6.6 189A-2 PHONE PATCH.

Figure 6-11 shows the 189A-2 Phone Patch. It is identical to the 189A-1 included in the 312B-1 Speaker Console except that a small escutcheon plate is supplied. Electrical schematic connections and input and output impedances are the same as those shown for the 189A-1 in figure 8-5. To operate, set up as follows:

- a. Set EMISSION SWITCH to SSB, ANTI-TRIP control full counterclockwise, MIC. GAIN control full counterclockwise, VOX. GAIN control full counterclockwise, but DO NOT turn far enough to click PTT ON switch, R.F. GAIN, and A.F. GAIN as required for normal operation.
- b. Tune in an AM. carrier to 700 to 800 cycles beat frequency.
- c. Set VOX BAL control on Phone Patch to either full clockwise or full counterclockwise.
- d. Lift telephone and dial any single digit to remove dial tone.
- e. Place PHONE PATCH ON-OFF switch to ON.
- f. Advance VOX. GAIN control on KWM-1 until vox relay just operates.
- g. SLOWLY readjust VOX BAL control until vox relay drops out.
- h. Repeat steps f. and g. until it is no longer possible to drop out vox relay with very small adjustments of VOX BAL control. Leave VOX BAL control at this setting.

NOTE

If an a-c vacuum-tube voltmeter is available, connect it from terminal 1 of TB1 (on 189A-2) to ground. SLOWLY adjust VOX BAL control for vtvm null (minimum indication).

i. Hang up telephone, turn off Phone Patch, reset all KWM-1 controls for normal VOX SSB operation.

j. The Phone Patch now is ready for use. Normal procedure is to call your party on telephone, then switch the Phone Patch on adjust R.F. GAIN to provide maximum noise-to-noise ratio and A.F. GAIN for normal telephone line level.

k. Depending upon telephone line characteristics and voice volume of incoming telephone signal, it may be necessary to make slight adjustments of MIC. GAIN and VOX. GAIN. In case of extremely weak signals from the telephone line, operate KWM-1 push-to-talk.

6.7 302E-1 DIRECTIONAL WATTMETER.

Figure 6-12 shows the coupler of the 302E-1 Directional Wattmeter. It is identical to that of the directional wattmeter included in the 312B-2 Speaker Console. Circuitry is shown in figure 8-5.

6.8 399B-1 DX ADAPTER.

Figure 8-6 is a schematic diagram of the 399B-1 DX Adapter, and figure 6-13 shows the terminal board portion of the adapter. The 399B-1 DX Adapter permits the vox circuits to transfer the transmit section of the KWM-1 to crystal control within the American phone band (the desired crystal may be plugged into the plug-in unit) while the receive sections are tuned into the foreign DX band. The crystal plug-in unit contains two transmit crystals and one receive crystal with provision for five additional transmit crystals. Transmit crystals are furnished for operation at 14.293 and 14.296 mc and the receive crystal is for operation from 14.250 to 14.350 mc. The export version of the DX Adapter is furnished with transmit crystals for operation at 14.303 and 14.306 mc and receive crystal for 14.250 to 14.350 mc. Transfer operation is accomplished automatically by relays and crystals included in the adapter.

6.8.1 INSTALLATION.

a. Remove KWM-1 bottom plate and open top cover. Remove screw securing C176 clamp to post (see figure 5-1). Remove and discard clamp. Bend C176 away from TB1. Unsolder 7 wires connected to TB1.

b. Remove the two screws securing TB1 mounting posts to chassis. These screw heads are accessible from the top of chassis.

c. Remove the two mounting posts from TB1. Save posts, screws, and washers, and assemble to 399B-1 DX Adapter terminal board as shown in figure 6-13.

d. Mount new terminal board in position from which TB1 was removed with relay facing C176.

e. Connect bus wire with black tubing to terminal 2 (all terminal numbers are shown in figure 6-13). This wire is the lead from pin 4 of XV7.

f. Connect the grounded bare wire to terminal 4.

g. Connect the coaxial lead to terminal 6.

h. Connect the white wire with red and blue tracer to terminal 8. If a white wire with orange tracer is used instead (in some early models), cut off the end of the white-orange wire and tape it. Strip ends of the white-red-blue wire which is furnished in this kit. Connect one end to terminal 8 and dress wire under cable up to front and back to center of chassis. Connect to relay (K2) terminal which already has a white wire with red and blue tracers connected to it. Also connected to this terminal is a .02 uf disk ceramic capacitor (C187).

i. Connect the white wire with green tracer to terminal 13.

j. Connect the white wire with brown and red tracers to terminal 14.

k. Connect the white wire with red tracer to terminal 16.

l. Plug the 3543.15-kc crystal into the new terminal board and replace KWM-1 top and bottom covers. Replace the 13C-1 Crystal Plug-in Unit with the crystal box portion of the 399B-1 DX Adapter.

6.8.2 OPERATION.

Select desired transmitting frequency with crystal switch. With the receive crystal furnished, the KWM-1 tunes from 14.250 to 14.350 mc in receive function. It is not advisable to tune (receive) more than 50 kc away from transmit frequency and repeak the EXCITER TUNE control to the receive frequency. This will cause drive to decrease (in transmit). If the EXCITER TUNE control is peaked to transmit frequency, receive circuits become less sensitive when tuning farther from transmit frequency.

If transmit operation is desired near the low end of the 14.0-mc phone band, replace the receive crystal in the crystal box with one which is selected according to the following formula:

$$f_X = \frac{f_R + 4}{2} \quad \text{where: } f_R = \text{lower edge of receive frequency band desired (in megacycles).}$$

$$f_X = \text{required crystal frequency (in megacycles).}$$

Example: $f_R = 14.150$ mc (band 14.150-14.250 mc)

$$f_X = \frac{14.150 + 4}{2} = 9.075 \text{ mc}$$

Mark a number in the RECEIVE space on the crystal box which is .05 mc less than f_R . For the example above, this would be 14.100 mc. When operating, add

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Accessories

the red dial numbers to this figure to determine the receive frequency.

The transmit frequency crystals may be selected according to the following formula:

$$f_X = \frac{f_0 + 4}{2} \text{ where } f_X = \text{required crystal frequency (megacycles)}$$

f_0 = desired output frequency (megacycles)

Example: $f_0 = 14.201 \text{ mc}$

$$f_X = \frac{14.201 + 4}{2} = 9.1005 \text{ mc.}$$

NOTE

The crystal box portion of the 399B-1 DX Adapter is furnished with one receive crystal and two transmit crystals. Sockets and switch positions are provided for 5 additional transmit crystals. For 14.0-mc operation near the upper band edge, be careful that the crystal is

selected to place operating frequency at least four kilocycles within the band. For 14.0-mc operation near the lower band edge, select the crystal to place the operating frequency at least one kilocycle within the band. For 21.0 megacycle operation, these margins should be at least 4.5 kc and 1.5 kc, respectively, from upper and lower band edges. These precautions are necessary because the KWM-1 now transmits and receives on different frequencies and a calibrated receive frequency does not assure a calibrated transmit frequency. Operation closer to band edges is possible if external calibration equipment is used.

6.9 351D-1 MOBILE MOUNT.

The 351D-1 Mobile Mount is shown in figure 6-14. It includes the mobile power supply cable and plug. The cable may be cut to required length. The two cantilever support arms may be folded down and secured with wing nuts when the KWM-1 is not installed in the car (figure 6-14). A small hinged cover protects the power plug when the KWM-1 is not installed.

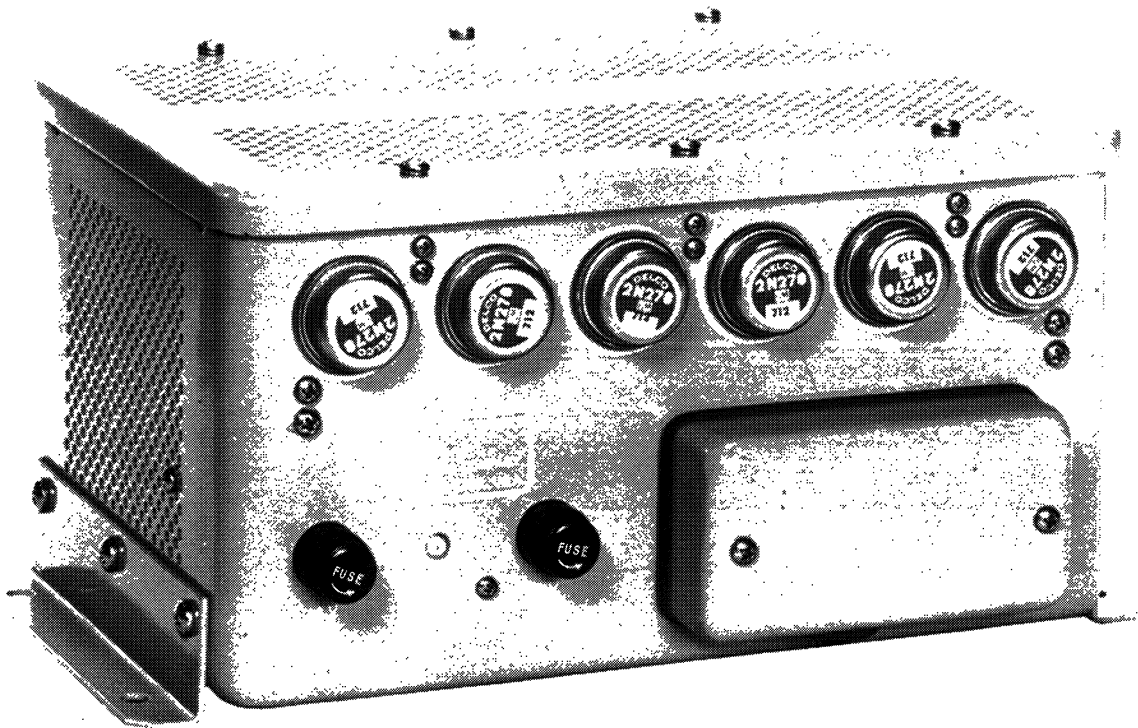


Figure 6-1. 516E-1 12-Volt D-C Power Supply

C204-12-P

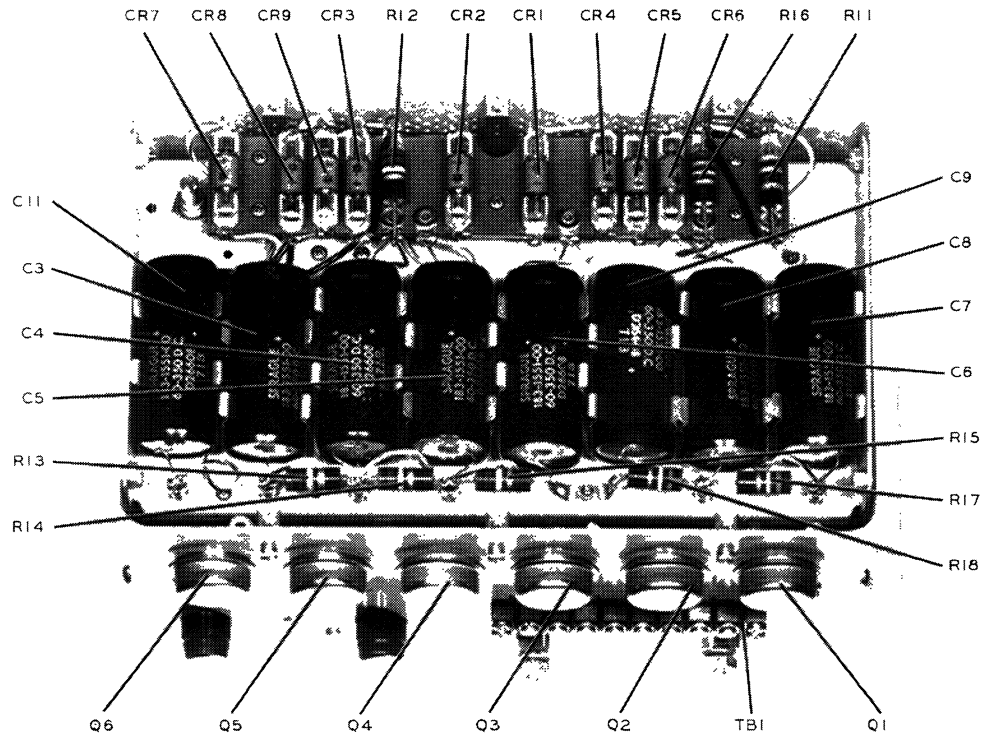


Figure 6-2. 516E-1, Top View, Cover Removed

C204-13-P

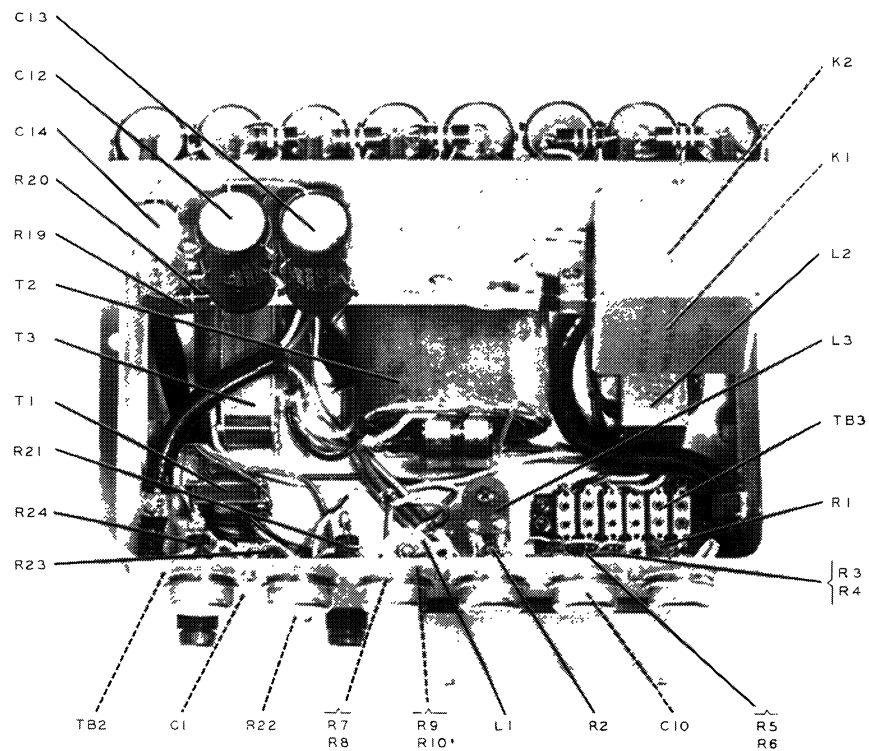


Figure 6-3. 516E-1, Top View, Chassis Swung Out

C204-14-P

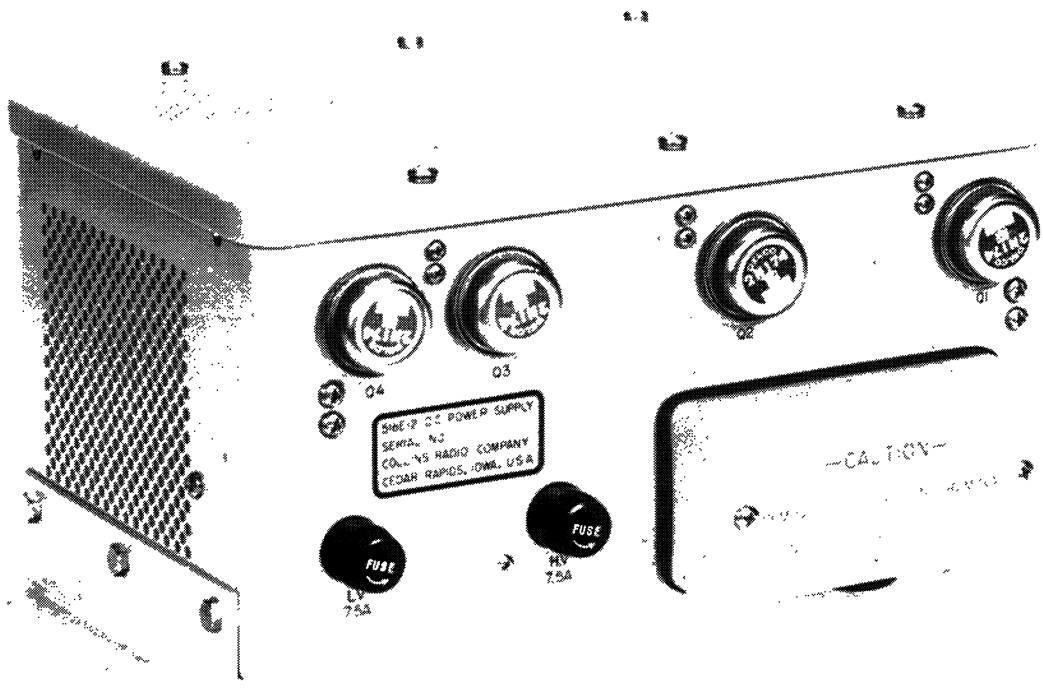


Figure 6-4. 516E-2 28-Volt D-C Power Supply

C204-34-P

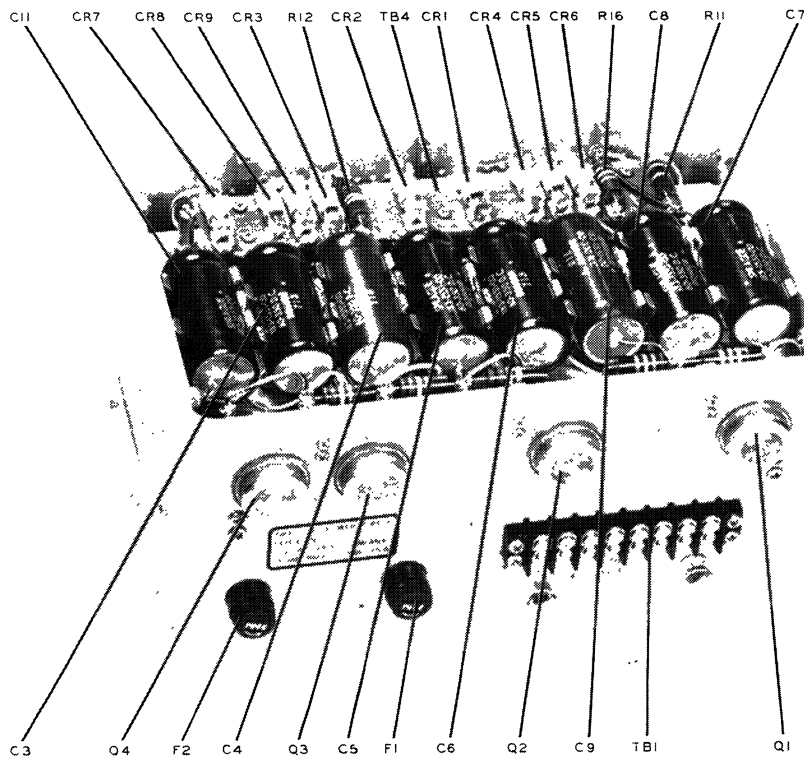


Figure 6-5. 516E-2, Top View, Cover Removed

C204-35-P

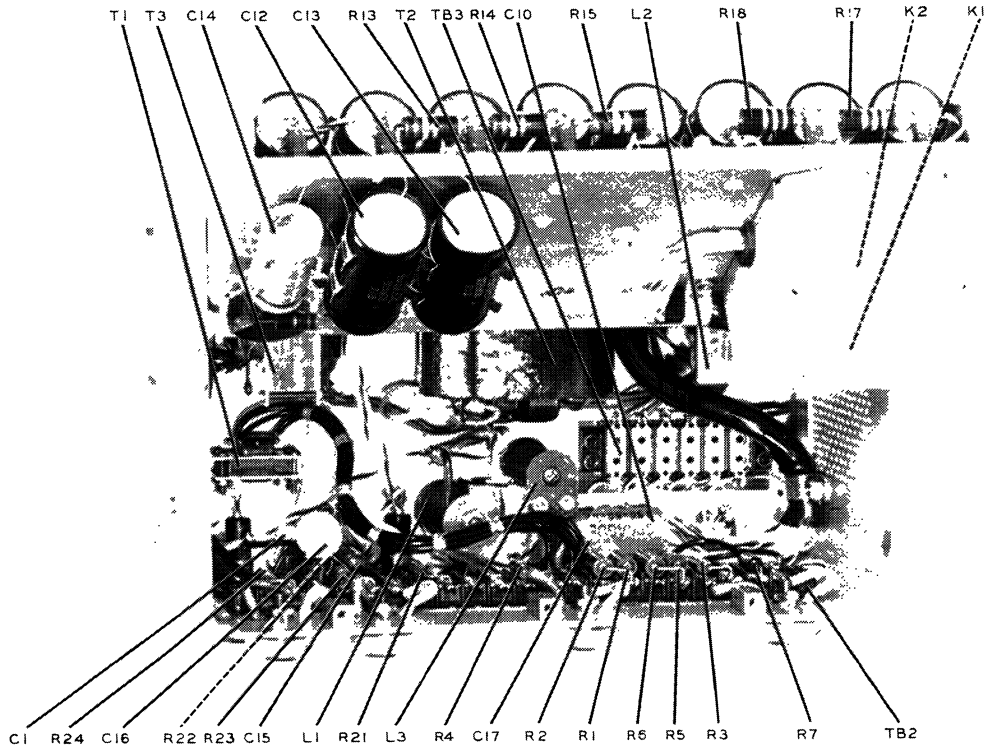


Figure 6-6. 516E-2, Top View, Chassis Swung Out

C204-36-P

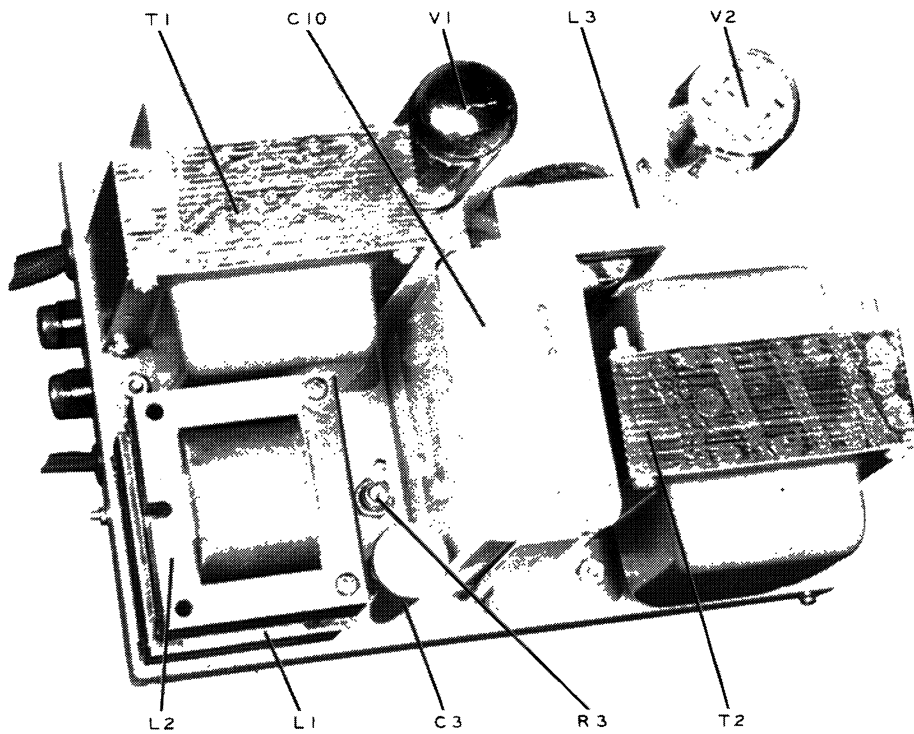


Figure 6-7. 516F-1 A-C Power Supply, Top View, Cover Removed

C204-15-P

SECTION VI
Accessories

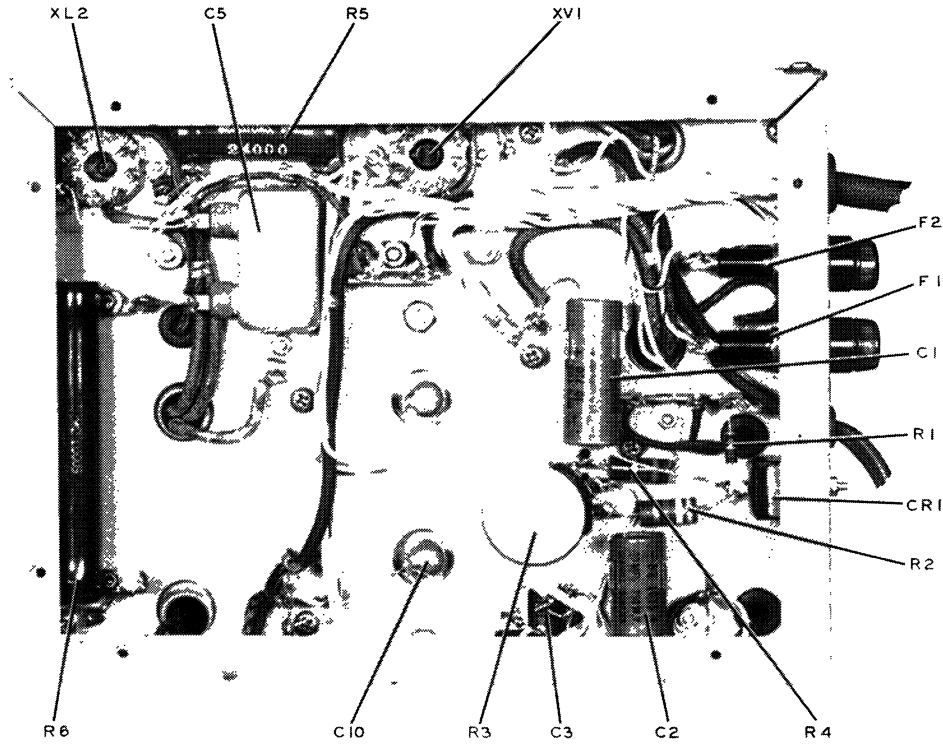


Figure 6-8. 516F-1 A-C Power Supply, Underchassis View

C204-16-P

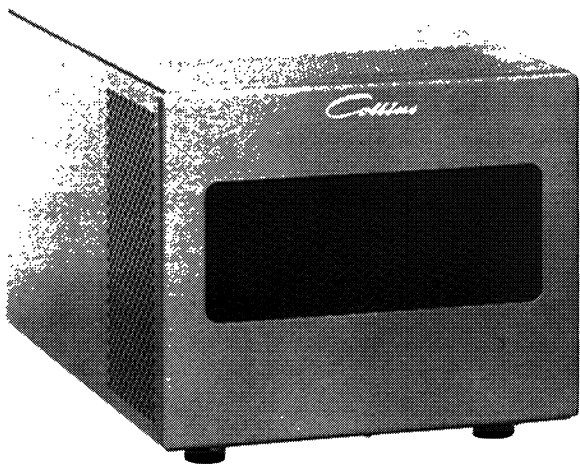


Figure 6-9. 312B-1 Speaker

C204-20-P

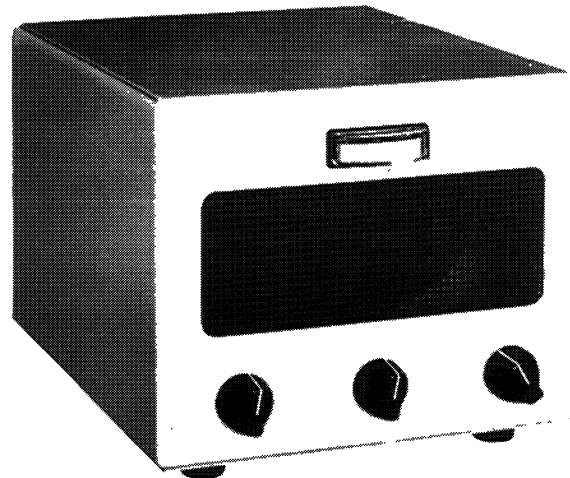


Figure 6-10. 312B-2 Speaker Console

C204-31-P

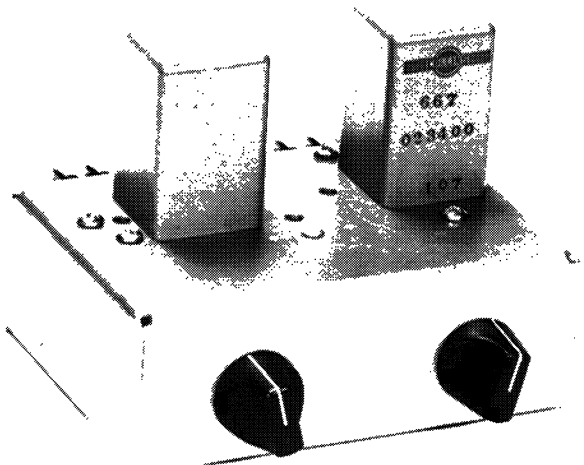


Figure 6-11. 189A-2 Phone Patch

C204-18-P

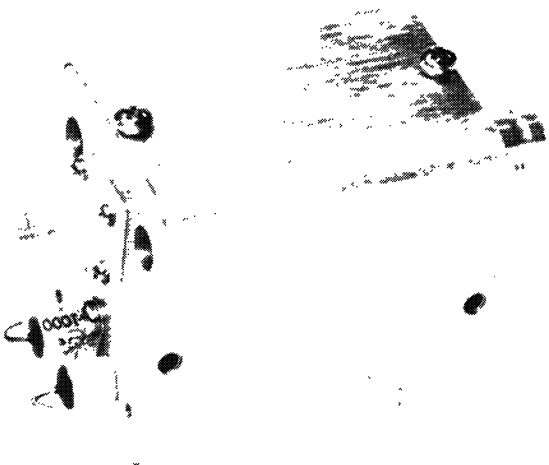


Figure 6-12. 302E-1 Directional Wattmeter
(Coupler Portion)

C204-19-P

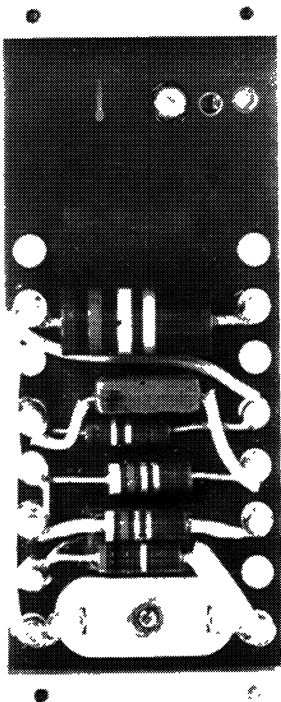
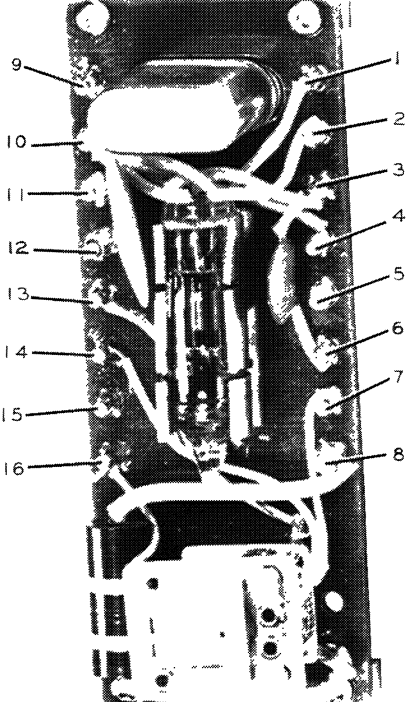


Figure 6-13. 399B-1 DX Adapter (Terminal Board Portion)

C204-32-P

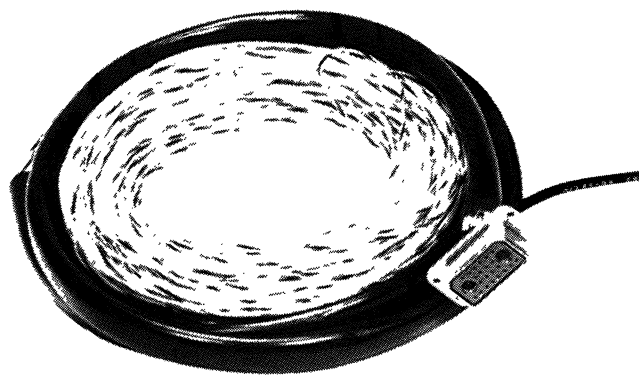


SECTION VI
Accessories



C204-17-P

Figure 6-14. 351D-1 Mobile Mount



C204-49-P

Figure 6-15. Mobile Power Cable

SECTION VII
PARTS LIST

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
C1	CAPACITOR, VARIABLE CERAMIC: rotary type, single section, 8.0 to 50 uuf, 350 vdcw	917 1075 00	C33	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C2	CAPACITOR, FIXED CERAMIC: 4,700 uuf +100% -20%, 500 vdcw	913 3012 00	C34	CAPACITOR, FIXED MICA: 470 uuf, ±10%, 500 vdcw	935 0249 00
C3	CAPACITOR, FIXED MICA: 100 uuf ±10%, 500 vdcw	912 0495 00	C35	CAPACITOR, FIXED CERAMIC: 5 uuf ±10%, 5000 vdcw	913 0092 00
C4	CAPACITOR, FIXED CERAMIC: 10,000 uuf +100% -20%, 500 vdcw	913 3013 00	C36	CAPACITOR, FIXED MICA: same as C6	913 3009 00
C5	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C37	CAPACITOR, VARIABLE CERAMIC: same as C15	917 1073 00
C6	CAPACITOR, FIXED CERAMIC: 1000 uuf +100% -20%, 500 vdcw	913 3009 00	C38	CAPACITOR, VARIABLE CERAMIC: same as C15	917 1073 00
C7	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C39	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C8	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C40	CAPACITOR, FIXED CERAMIC: 1000 uuf ±20%, 5000 vdcw	913 0101 00
C9	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C41	CAPACITOR, FIXED CERAMIC: 5000 uuf, G.M.V., 1000 vdcw	913 2349 00
C10	CAPACITOR, FIXED MICA: 10 uuf ±5%, 500 vdcw	912 0431 00	C42	CAPACITOR, FIXED CERAMIC: 25 uuf, 2500 v at 2.0 mc, 1000 v at 16.0 mc ±10%	913 4253 20
C11	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00	C43	CAPACITOR, FIXED CERAMIC: 75 uuf ±5%, 5000 vdcw	913 0830 00
C12	CAPACITOR, FIXED MICA: same as C10	912 0431 00	C44	CAPACITOR, FIXED CERAMIC: 100 uuf ±10%, 5000 vdcw	913 0821 00
C13	CAPACITOR, FIXED MICA: 15 uuf ±10%, 500 vdcw	912 0438 00	C45	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C14	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00	C46	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C15	CAPACITOR, VARIABLE CERAMIC: 5.0 uuf min to 25 uuf max, 350 vdcw	917 1073 00	C47	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C16	CAPACITOR, FIXED MICA: 470 uuf ±10%, 300 vdcw	912 0543 00	C48	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C17	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00	C49	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C18	Not Used		C50	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C19	CAPACITOR, FIXED MICA: 2 uuf ±1/2 uuf, 500 vdcw	916 0535 00	C51	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C20	CAPACITOR, FIXED MICA: 22 uuf ±10%, 500 vdcw	916 0586 00	C52	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C21	Not Used		C53	CAPACITOR, FIXED CERAMIC: 0.02 uf +100% -20%, 500 vdcw	913 2142 00
C22	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C54	CAPACITOR, FIXED MICA: 12 uuf ±5%, 500 vdcw	912 0434 00
C23	CAPACITOR, FIXED CERAMIC: .02 uf, +100% -20%, 500 vdcw	913 2142 00	C55	CAPACITOR, FIXED MICA: 15 uuf ±5%, 500 vdcw	912 0437 00
C24	CAPACITOR, FIXED MICA: 220 uuf ±10%, 500 vdcw	912 0519 00	C56	CAPACITOR, FIXED MICA: same as C3	912 0495 00
C25	CAPACITOR, FIXED MICA: 56 uuf ±10%, 500 vdcw	912 0477 00	C57	CAPACITOR, FIXED MICA: 510 uuf ±10%, 300 vdcw	912 0546 00
C26	CAPACITOR, FIXED CERAMIC: 10 uuf ±5%, 5000 vdcw	913 0972 00	C58	CAPACITOR, FIXED MICA: 51 uuf ±2%, 500 vdcw	912 0472 00
C27	CAPACITOR, VARIABLE CERAMIC: same as C15	917 1073 00	C59	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C28	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C60	CAPACITOR, FIXED MICA DIELECTRIC: 10 uuf ±5%, 500 vdcw	912 0431 00
C29	CAPACITOR, VARIABLE CERAMIC: 1.5 uuf min to 7.0 max, 350 vdcw	917 1071 00	C61	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C30	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00	C62	CAPACITOR, VARIABLE CERAMIC: same as C15	917 1073 00
C31	CAPACITOR, FIXED CERAMIC: same as C1	917 1075 00	C63	CAPACITOR, FIXED MICA: same as C57	912 0546 00
C32	CAPACITOR, FIXED MICA: 500 uuf ±20%, 500 vdcw	912 0717 00			

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
C64	CAPACITOR, FIXED PAPER: 0.0033 uf ±10%, 400 vdcw	931 0283 00	C104	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C65	CAPACITOR, MOLDED TUBULAR: 0.47 uf ±20%, 200 vdcw	931 6841 00	C105	CAPACITOR, FIXED PAPER: same as C67	931 0299 00
C66	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C106	CAPACITOR, FIXED DRY ELECTROLYTIC: 8 uf +50% -10%, 450 vdcw	183 1051 00
C67	CAPACITOR, FIXED PAPER: 0.1 uf ±10%, 1000 vdcw	931 0299 00	C107	CAPACITOR, FIXED CERAMIC: same as C53	913 2142 00
C68	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C108	CAPACITOR, FIXED MICA: same as C3	912 0495 00
C69	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00	C109	CAPACITOR, DRY ELECTROLYTIC: 25 uf, 25 vdcw	183 1034 00
C70	Not Used		C110	CAPACITOR, FIXED PAPER: same as C67	931 0299 00
C71	CAPACITOR, PAPER: 0.056 uf ±10%, 400 vdcw	931 0296 00	C111	CAPACITOR, FIXED MICA: 430 uuf ±5%, 300 vdcw	912 0539 00
C72	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C112	CAPACITOR, FIXED MICA: 390 uuf ±5%, 500 vdcw	912 0536 00
C73	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C113	CAPACITOR, FIXED MICA: same as C3	912 0495 00
C74	CAPACITOR, FIXED MICA: same as C3	912 0495 00	C114	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C75	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C115	CAPACITOR, PAPER, MOLDED: same as C67	931 0299 00
C76	CAPACITOR, FIXED MICA: same as C57	912 0546 00	C116	CAPACITOR, FIXED PAPER: same as C67	931 0299 00
C77	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C117	CAPACITOR, VARIABLE CERAMIC: same as C1	917 1075 00
C78	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C118	CAPACITOR, FIXED CERAMIC: 1.0 uuf ±1/2 uuf at N 750 ppm/°C, 500 vdcw	916 0593 00
C79	Not Used		C119	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C80	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C120	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C81	CAPACITOR, FIXED MICA: 330 uuf ±10%, 500 vdcw	912 0531 00	C121	CAPACITOR, FIXED MICA: same as C3	912 0495 00
C82	Not Used		C122	Not Used	
C83	CAPACITOR, FIXED MICA: same as C10	912 0431 00	C123	Not Used	
C84	CAPACITOR, FIXED MICA: 82 uuf ±5%, 500 vdcw	912 0488 00	C124	Not Used	
C85	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C125	CAPACITOR, FIXED MICA: 110 uuf ±5%, 500 vdcw	912 0497 00
C86	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C126	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C87	Not Used		C127	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C88	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C128	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C89	CAPACITOR, FIXED MICA: 56 uuf ±10%, 500 vdcw	912 0477 00	C129	CAPACITOR, FIXED MICA: 240 uuf ±10%, 500 vdcw	912 0522 00
C90	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C130	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C91	Not Used		C131	CAPACITOR, FIXED MICA: 20 uuf ±5%, 500 vdcw	912 0443 00
C92	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C132	CAPACITOR, FIXED MICA: same as C24	912 0519 00
C93	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C133	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C94	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C134	Not Used	
C95	CAPACITOR, FIXED MICA: same as C24	912 0519 00	C135	CAPACITOR, FIXED CERAMIC: 2200 uuf +100% -20%, 500 vdcw	913 3011 00
C96	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C136	CAPACITOR, MOLDED, TUBULAR: same as C109	183 1034 00
C97	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C137	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C98	CAPACITOR, MOLDED, TUBULAR: same as C65	931 6841 00	C138	CAPACITOR, FIXED PAPER: same as C67	931 0299 00
C99	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C139	VFO components	
C100	CAPACITOR, FIXED MICA: same as C57	912 0546 00	C140	VFO components	
C101	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	C141	VFO components	
C102	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00			
C103	CAPACITOR, FIXED MICA: same as C57	912 0546 00			

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
C142	Part of VFO unit		C182	CAPACITOR, FIXED CERAMIC: same as C53	913 2142 00
C143	Part of VFO unit		C183	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00
C144	Part of VFO unit		C184	CAPACITOR: Selected in manufacturing	
C145	Part of VFO unit		C185	CAPACITOR, FIXED MICA: 27 uuf $\pm 10\%$, 500 vdcw	912 0453 00
C146	Part of VFO unit		C186	CAPACITOR	
C147	Part of VFO unit		C187	CAPACITOR, FIXED CERAMIC: same as C23	913 2142 00
C148	Part of VFO unit		C188	CAPACITOR, FIXED CERAMIC: same as C2	913 3012 00
C149	FILTER-CAPACITOR, CERAMIC: 1,000 uuf 1 amp current rating, 500 vdcw, 40 to 1000 mc freq range	241 0235 00	C189	CAPACITOR, FIXED CERAMIC: same as C53	913 2142 00
C150	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	C190	CAPACITOR, FIXED CERAMIC: same as C4	913 3010 00
C151	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	C191	Not Used	
C152	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	C192	CAPACITOR, FIXED CERAMIC: 1.5 uuf $\pm 1/4$ uuf, 500 vdcw	916 0531 00
C153	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	C193	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00
C154	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	C194	CAPACITOR, FIXED MICA: 15 uuf $\pm 10\%$, 500 vdcw	912 0438 00
C155	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	CR1	SEMICONDUCTOR, DEVICE DIODE: germanium, 0.105 in. dia by 0.265 in. lg; type 1N67A	353 0147 00
C156	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	CR2	SEMICONDUCTOR, DEVICE DIODE: same as CR1	353 0147 00
C157	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	CR3	SEMICONDUCTOR, DEVICE DIODE: same as CR1	353 0147 00
C158	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	CR4	SEMICONDUCTOR, DEVICE DIODE: same as CR1	353 0147 00
C159	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	E1	Not Used	
C160	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	E2	SUPPRESSOR, PARASITIC:	542 5699 00
C161	CAPACITOR, FIXED PAPER DIELECTRIC: 0.01 uf +20% -10%, 1000 vdcw	241 0012 00	E3		543 0476 00
C162	CAPACITOR, FIXED MICA: 510 uuf $\pm 10\%$, 300 vdcw	912 0546 00	E4		542 7789 002
C163	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	E5		542 7789 002
C164	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	FL1	FILTER, MECHANICAL: 455 kc center frequency (nominal) with 3.1 kc bandwidth at 6.0 db points, upright type, plug in, 9 pin miniature base, Collins type F455J31 (FL-1 & crystal Y-1 supplied in matched set)	526 9089 00
C165	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	J1	CONNECTOR, RECEPTACLE ELECTRICAL: single rd female contact, straight type	357 9183 00
C166	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	J2	JACK, TELEPHONE: for 2 conductor plug 1/4 in. dia; 1-19/32 in. lg by 5/8 in. w by 1-3/64 in. h overall; J4 contact arrangement; incl 2 hex nuts and 1 washer; 3/8 in. mtg hole	360 1090 00
C167	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	J3	JACK, TELEPHONE: spring leaf; 0.728 in. lg by 49/64 in. dia; 2 conductor plug, 23/32 in. lg by 1/4 in. dia shank	358 1050 00
C168	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	J4	JACK, TELEPHONE: for use in audio circuits; brass cadmium pl contact; for single plug; 14/16 in. h by 13/32 in. w; two 0.136 in. dia mtg holes spaced 0.687 in. c to c	360 0088 00
C169	CAPACITOR, FIXED CERAMIC: same as C149	241 0235 00	J5	CONNECTOR, PLUG ELECTRICAL: 22 male contacts brass gold pl contacts; 5 amps rating	370 2088 00
C170	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00	J6	JACK, TELEPHONE: same as J4	360 0088 00
C171	CAPACITOR, FIXED MICA: same as C24	912 0519 00	J7	JACK, TELEPHONE: same as J4	360 0088 00
C172	CAPACITOR, FIXED MICA: same as C55	912 0437 00	J8	JACK, TELEPHONE: same as J4	360 0088 00
C173	CAPACITOR, FIXED MICA: same as C55	912 0437 00			
C174	CAPACITOR, FIXED MICA: same as C10	912 0431 00			
C175	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00			
C176	CAPACITOR, FIXED PAPER: 0.22 uf $\pm 10\%$, 400 vdcw	931 0303 00			
C177	CAPACITOR, FIXED MICA: same as C57	912 0546 00			
C178	CAPACITOR, PAPER: 0.1 uf $\pm 10\%$, 400 vdcw	931 0299 00			
C179	CAPACITOR, FIXED CERAMIC: same as C4	913 3013 00			
C180	CAPACITOR, DRY ELECTROLYTIC: 25 uf, -10% +100%, 25 vdcw	183 1034 00			
C181	CAPACITOR, FIXED CERAMIC: same as C6	913 3009 00			

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
K1	RELAY: general purpose, 4C arrangement, 50 ma contact, material gold alloy, coil voltage 115 v d-c, pull in voltage 77 v d-c, drop out voltage 53 v d-c, coil resistance 10,000 ohms $\pm 20\%$ continuous duty cycle	974 0576 00	M1	METER: panel mounted; 0-1 ma d-c; resistance, 40 ohms $\pm 5\%$, linear graduation, 0-9 red, 9-60 black, on a white background, 2 solder lug type term; for use on nonmagnetic panel	458 0406 00
K2	RELAY, ARMATURE: contact data; arrangement 1C, 2A, 1B; rating 1C, 10 ma at 100 v d-c and 20 v d-c at 3 ma; 2A, 300 ma at 115 v a-c, 1B, 50 ma at 250 v d-c; coil data; max operating cur. 15 ma d-c, coil resistance 10,000 ohms min.; duty cycle 5 min on, 5 min off	972 1353 00	P1	CONNECTOR, PLUG ELECTRICAL: 1 rd male contact; straight shape, 1 in. by 19/32 in. dia, brass, silver plated	357 9292 00
K3	RELAY, ARMATURE: contact data; arrangement 4C, rating 3 amp at 30 v d-c or 115 v a-c; coil data; max operating voltage 110% of specified nom voltage, nominal voltage 115 v d-c, coil resistance 10,000 ohms $\pm 20\%$, continuous duty cycle	972 1346 00	P2	Not Used	
L1	COIL, RADIO FREQUENCY:	542 5407 002	P3	Not Used	
L2	CHOKE, RADIO FREQUENCY: 220 uh inductance, 1 amp	240 0037 00	P4	CONNECTOR, PLUG ELECTRICAL: phono-type plug for use with shielded audio cable; brass cadmium pl; 13/16 in. lg by 1/8 in. dia	361 0045 00
L3	Not Used		P5	Not Used	
L4	CHOKE, RADIO FREQUENCY: 39 uh	240 0171 00	P6	CONNECTOR, PLUG ELECTRICAL: same as P4	361 0045 00
L5	COIL, RADIO FREQUENCY:	542 5729 00	P7	CONNECTOR, PLUG ELECTRICAL: same as P4	361 0045 00
L6	CHOKE, RADIO FREQUENCY: 500 uh	240 0073 00	P8	CONNECTOR, PLUG ELECTRICAL: same as P4	361 0045 00
L7	CHOKE, RADIO FREQUENCY: same as L2	240 0037 00	R1	RESISTOR, FIXED COMPOSITION: 56 ohm $\pm 10\%$, 1/2 w	745 1300 00
L8	COIL, RADIO FREQUENCY:	542 5408 002	R2	RESISTOR, FIXED COMPOSITION: 0.10 megohm $\pm 10\%$, 1/2 w	745 1436 00
L9	CHOKE, RADIO FREQUENCY:	542 5702 002	R3	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
L10	COIL, RADIO FREQUENCY:	542 5343 002	R4	RESISTOR, FIXED COMPOSITION: 18,000 ohms $\pm 10\%$, 2 w	745 5705 00
L11	COIL, RADIO FREQUENCY:	541 2496 002	R5	RESISTOR, FIXED COMPOSITION: 2,200 ohms $\pm 10\%$, 1/2 w	745 1366 00
L12	COIL, RADIO FREQUENCY:	541 2496 002	R6	RESISTOR, FIXED COMPOSITION: 33 ohms $\pm 10\%$, 1/2 w	745 1289 00
L13	CHOKE, RADIO FREQUENCY: same as L6	240 0073 00	R7	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
L14	Not Used		R8	RESISTOR, FIXED COMPOSITION: 220 ohms $\pm 10\%$, 1/2 w	745 1324 00
L15	COIL, RADIO FREQUENCY:	542 7773 002	R9	RESISTOR, FIXED COMPOSITION: same as R8	745 1324 00
L16	COIL ASSEMBLY: crystal filter grid coil assy for use with 455-kc IF unit, shall be used from filter to 6BA6 grid	278 0085 00	R10	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
L17	CHOKE, RADIO FREQUENCY: choke; single wound, 3 pi universal wound; unshielded; 2.0 mh $\pm 10\%$ at 350 kc	240 0084 00	R11	RESISTOR, FIXED COMPOSITION: 27 ohms $\pm 10\%$, 1/2 w	745 1286 00
L18	CHOKE, RADIO FREQUENCY: same as L17	240 0084 00	R12	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
L19	CHOKE, RADIO FREQUENCY: same as L2	240 0037 00	R13	RESISTOR, FIXED COMPOSITION: 10 ohms $\pm 10\%$, 1/2 w	745 1268 00
L20	Not Used		R14	RESISTOR, FIXED COMPOSITION: 33,000 ohms $\pm 10\%$, 1/2 w	745 1415 00
L21	Same as L2	240 0037 00	R15	RESISTOR, FIXED COMPOSITION: 68,000 ohms $\pm 10\%$, 1/2 w	745 1429 00
L22	COIL, RADIO FREQUENCY: 1.0 uh $\pm 20\%$, 0.15 ohms resistance, 19/32 in. lg by 7/32 in. OD; 2 wire leads	240 0154 00	R16	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
L23	Part of VFO unit	542 5447 002	R17	RESISTOR, FIXED COMPOSITION: same as K14	745 1415 00
L24	Part of VFO unit	542 5448 003	R18	RESISTOR, FIXED COMPOSITION: 68 ohms $\pm 10\%$, 1/2 w	745 1303 00
L25	Part of VFO unit		R19	RESISTOR, VARIABLE COMPOSITION: 100 ohms $\pm 20\%$, 1/2 w	380 6271 00
L26	COIL, RADIO FREQUENCY: 2.0 mh	240 0134 00	R20	RESISTOR, FIXED COMPOSITION: same as R14	745 1415 00
L27	Not Used		R21	RESISTOR, FIXED COMPOSITION: same as R15	745 1429 00
L28	Not Used		R22	RESISTOR, FIXED COMPOSITION: 82 ohms $\pm 10\%$, 1/2 w	745 1307 00
L29	COIL, RADIO FREQUENCY: same as L2	240 0037 00	R23	RESISTOR, FIXED COMPOSITION: same as R5	745 1366 00

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ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
R24	RESISTOR, FIXED COMPOSITION: 10,000 ohms ±10%, 1/2 w	745 1394 00	R60	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R25	RESISTOR, FIXED COMPOSITION: 47,000 ohms ±10%, 1/2 w	745 1422 00	R61	RESISTOR, FIXED COMPOSITION: same as R8	745 1324 00
R26	RESISTOR, FIXED COMPOSITION: 0.22 megohms ±10%, 1/2 w	745 1450 00	R62	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R27	RESISTOR, FIXED COMPOSITION: 10,000 ohms ±10%, 2 w	745 5694 00	R63	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R28	RESISTOR, FIXED COMPOSITION: 1000 ohms ±10%, 1/2 w	745 1352 00	R64	RESISTOR, FIXED COMPOSITION: same as R14	745 1415 00
R29	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R65	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00
R30	RESISTOR, FIXED COMPOSITION: 12 ohms ±10%, 1/2 w	745 1272 00	R66	RESISTOR, FIXED COMPOSITION: 150,000 ohms ±10%, 1/2 w	745 1443 00
R31	RESISTOR, FIXED COMPOSITION: same as R30	745 1272 00	R67	RESISTOR, FIXED COMPOSITION: same as R5	745 1366 00
R32	RESISTOR, FIXED COMPOSITION: same as R30	745 1272 00	R68	RESISTOR, FIXED COMPOSITION: 0.47 megohms ±10%, 1/2 w	745 1464 00
R33	RESISTOR, FIXED COMPOSITION: same as R30	745 1272 00	R69	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00
R34	RESISTOR, FIXED COMPOSITION: same as R30	745 1272 00	R70	RESISTOR, FIXED COMPOSITION: same as R5	745 1366 00
R35	RESISTOR, FIXED COMPOSITION: same as R30	745 1272 00	R71	RESISTOR, FIXED COMPOSITION: same as R28	745 1352 00
R36	RESISTOR, FIXED COMPOSITION: same as R28	745 1352 00	R72	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00
R37	RESISTOR, FIXED COMPOSITION: same as R4	745 5705 00	R73	RESISTOR, FIXED COMPOSITION: 3.3 megohms ±10%, 1/2 w	745 1499 00
R38	RESISTOR, FIXED COMPOSITION: 120 ohms ±10%, 1/2 w	745 1314 00	R74	RESISTOR, FIXED COMPOSITION: same as R5	745 1366 00
R39	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R75	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R40	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R76	RESISTOR, FIXED COMPOSITION: 820 ohms ±10%, 1/2 w	745 1349 00
R41	RESISTOR, FIXED COMPOSITION: same as R4	745 5705 00	R77	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R42	RESISTOR, FIXED COMPOSITION: same as R38	745 1314 00	R78	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00
R43	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R79	RESISTOR, VARIABLE COMPOSITION: 0.50 megohms ±20% of value, 1/2 w	376 3012 00
R44	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R80	RESISTOR, FIXED COMPOSITION: same as R26	745 1450 00
R45	RESISTOR, FIXED COMPOSITION: 1.0 megohm ±10%, 1/2 w	745 1478 00	R81	RESISTOR, FIXED COMPOSITION: 3,300 ohms ±10%, 1/2 w	745 1373 00
R46	RESISTOR, FIXED COMPOSITION: same as R26	745 1450 00	R82	RESISTOR, FIXED COMPOSITION: 680 ohms ±10%, 1 w	745 3345 00
R47	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R83	RESISTOR, FIXED COMPOSITION: 330 ohms ±10%, 2 w	745 5631 00
R48	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R84	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R49	RESISTOR, FIXED COMPOSITION: 82,000 ohms ±10%, 1 w	745 3433 00	R85	RESISTOR, FIXED FILM: 316 ohms ±1%, 1/4 w	705 7072 00
R50	RESISTOR, FIXED COMPOSITION: same as R5	745 1366 00	R86	RESISTOR, VARIABLE COMPOSITION: 100 ohms ±20%, 1/2 w	380 6271 00
R51	RESISTOR, FIXED COMPOSITION: 0.68 megohms ±10%, 1/2 w	745 1471 00	R87	RESISTOR, FIXED FILM: same as R85	705 7072 00
R52	RESISTOR, FIXED COMPOSITION: 3.3 megohms ±10%, 1/2 w	745 1499 00	R88	RESISTOR, FIXED CAPACITOR: same as R4	745 5705 00
R53	Not Used		R89	RESISTOR, FIXED COMPOSITION: same as R8	745 1324 00
R54	Not Used		R90	RESISTOR, FIXED COMPOSITION: 680 ohms ±10%, 1/2 w	745 1345 00
R55	RESISTOR, FIXED COMPOSITION: 82,000 ohms ±10%, 1/2 w	745 1433 00	R91	RESISTOR, FIXED COMPOSITION: same as R26	745 1450 00
R56	RESISTOR, FIXED COMPOSITION: 18,000 ohms ±10%, 1/2 w	745 1405 00	R92	RESISTOR, VARIABLE COMPOSITION: same as R79	376 3012 00
R57	RESISTOR, FIXED COMPOSITION: same as R28	745 1352 00	R93	RESISTOR, VARIABLE COMPOSITION: 500,000 ±20%, 2 w	376 5702 00
R58	RESISTOR, FIXED COMPOSITION: 6,800 ohms ±10%, 1/2 w	745 1387 00	R94	RESISTOR, FIXED COMPOSITION: same as 1500 ohms ±10%, 1/2 w	745 1359 00
R59	RESISTOR, VARIABLE COMPOSITION: 10,000 ohms ±20%, 1/2 w	380 6277 00	R95	RESISTOR, FIXED COMPOSITION: same as R68	745 1464 00

SECTION VII
Parts List

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ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
R96	RESISTOR, FIXED COMPOSITION: 0.10 megohm $\pm 10\%$, 1/2 w	745 1436 00	R134	RESISTOR, FIXED COMPOSITION: same as R11	745 1286 00
R97	RESISTOR, FIXED COMPOSITION: same as R68	745 1464 00	R135	RESISTOR, FIXED COMPOSITION: same as R14	745 1415 00
R98	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R136	RESISTOR, VARIABLE COMPOSITION: 2500 ohms $\pm 20\%$, 1/2 w	380 6275 00
R99	RESISTOR, FIXED COMPOSITION: same as R26	745 1450 00	R137	RESISTOR, FIXED COMPOSITION: 82,000 ohms $\pm 10\%$, 2 w	745 5733 00
R100	RESISTOR, FIXED COMPOSITION: same as R90	745 1345 00	R138	RESISTOR, FIXED COMPOSITION: same as R124	745 1457 00
R101	RESISTOR, FIXED COMPOSITION: same as R27	745 5694 00	R139	RESISTOR, FIXED COMPOSITION: same as R111	745 1454 00
R102	RESISTOR, FIXED COMPOSITION: same as R45	745 1478 00	R140	RESISTOR, FIXED COMPOSITION: same as R68	745 1464 00
R103	RESISTOR, FIXED COMPOSITION: same as R45	745 1478 00	R141	RESISTOR, FIXED COMPOSITION: 39 ohms $\pm 10\%$, 2 w	745 5593 00
R104	RESISTOR, FIXED COMPOSITION: same as R23	745 1352 00	R142	RESISTOR, FIXED COMPOSITION: 68 ohms $\pm 10\%$, 1 w	745 3303 00
R105	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00	R143	RESISTOR, FIXED COMPOSITION: same as R142	745 3303 00
R106	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00	R144	RESISTOR, FIXED COMPOSITION: same as R6	745 1289 00
R107	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00	R145	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00
R108	RESISTOR, FIXED COMPOSITION: same as R23	745 1352 00	R146	RESISTOR, FIXED COMPOSITION: 47 ohms $\pm 10\%$, 1/2 w	745 1296 00
R109	RESISTOR, FIXED COMPOSITION: same as R15	745 1429 00	R147	RESISTOR, FIXED COMPOSITION: 18,000 ohms $\pm 10\%$, 1/2 w	745 5705 00
R110	RESISTOR, FIXED COMPOSITION: 120,000 ohms $\pm 10\%$, 1/2 w	745 1440 00	R148	RESISTOR, VARIABLE COMPOSITION: 50 ohms, 4 w	750 8105 00
R111	RESISTOR, FIXED COMPOSITION: 270,000 ohms $\pm 10\%$, 1/2 w	745 1454 00	R149	RESISTOR, FIXED COMPOSITION: selected in manufacturing	
R112	RESISTOR, FIXED COMPOSITION: same as R2	745 1436 00	R150	RESISTOR, FIXED COMPOSITION: same as R6	745 1289 00
R113	RESISTOR, FIXED COMPOSITION: 8.2 megohms $\pm 10\%$, 1/2 w	745 1517 00	S1	SWITCH, ROTARY: 1 section, 10 position; 30° positioning detent, 1 pole, 11 fixed contacts, 1 moving contact, phenolic insulation	259 0860 00
R114	RESISTOR, FIXED COMPOSITION: same as R113	745 1517 00	S2	SWITCH, ROTARY: 1 section, 3 position, 30° positioning detent, 2 pole, 2 moving contacts, 8 fixed contacts, phenolic insulation	259 0861 00
R115	RESISTOR, VARIABLE COMPOSITION: 50,000 ohms $\pm 20\%$ of value, 1/2 w	376 3009 00	S3	Part of R93	
R116	RESISTOR, VARIABLE COMPOSITION: 0.10 megohms $\pm 20\%$ of value, 1/2 w	376 3510 00	S4	SWITCH, ROTARY: 2 section, 5 position, 30° positioning detent, 4 pole, 4 moving contacts, 20 fixed contacts, phenolic insulation	259 0862 00
R117	RESISTOR, FIXED COMPOSITION: 1500 ohms $\pm 10\%$, 1/2 w	745 1359 00	S5	SWITCH, ROTARY: 1 circuit, 12 position, clips, coin silver alloy bent 60°, rotor blades, shorting type, coin silver alloy, 1 pole, 1 moving contact, 4 fixed contacts, phenolic insulation	269 1867 00
R118	RESISTOR, FIXED COMPOSITION: same as R68	745 1464 00	T1	TRANSFORMER, INTERMEDIATE FREQUENCY: 3.95 mc center freq	278 0244 00
R119	RESISTOR, FIXED COMPOSITION: same as R68	745 1464 00	T2	TRANSFORMER, INTERMEDIATE FREQUENCY: same as T1	278 0244 00
R120	RESISTOR, FIXED COMPOSITION: same as R45	745 1478 00	T3	TRANSFORMER, INTERMEDIATE FREQUENCY: 455 kc center freq	278 0197 00
R121	Not Used		T4	TRANSFORMER, AUDIO FREQUENCY: primary 5,000 ohms $\pm 10\%$, current 35 ma; secondary 500 ohms, tapped, fully enclosed, 3 watts max	667 0018 00
R122	RESISTOR, FIXED COMPOSITION: same as R26	745 1450 00	V1	TUBE, ELECTRON: 6AU6	255 0202 00
R123	RESISTOR, FIXED COMPOSITION: 4,700 ohms $\pm 10\%$, 2 w	745 5680 00	V2	TUBE, ELECTRON: 6CL6	255 0216 00
R124	RESISTOR, FIXED COMPOSITION: 0.33 megohm $\pm 10\%$, 1/2 w	745 1457 00	V3	TUBE, ELECTRON: 6DC6	255 0226 00
R125	RESISTOR, FIXED COMPOSITION: same as R6	745 1289 00	V4	TUBE, ELECTRON: 6DC6	255 0226 00
R126	RESISTOR, FIXED COMPOSITION: same as R110	745 1440 00	V5	TUBE, ELECTRON: 12AT7	255 0205 00
R127	RESISTOR, FIXED COMPOSITION: 4700 ohms $\pm 10\%$, 1/2 w	745 1380 00			
R128	RESISTOR, FIXED COMPOSITION: same as R25	745 1422 00			
R129	Part of VFO unit				
R130	Part of VFO unit				
R131	Part of VFO unit				
R132	RESISTOR, FIXED COMPOSITION: 0.18 megohms $\pm 10\%$, 1/2 w	745 1447 00			
R133	Not Used				

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER
V6	TUBE, ELECTRON: 6BA7	255 0209 00
V7	TUBE, ELECTRON: 6BA7	255 0209 00
V8	TUBE, ELECTRON: 6BA7	255 0209 00
V9	TUBE, ELECTRON: 6AU6	255 0202 00
V10	TUBE, ELECTRON: 6AL5	257 0018 00
V11	TUBE, ELECTRON: 6AH6	255 0191 00
V12	TUBE, ELECTRON: 6AL5	257 0018 00
V13	TUBE, ELECTRON: 6BA6	255 0185 00
V14	TUBE, ELECTRON: 6BA6	255 0185 00
V15	TUBE, ELECTRON: 12AU7	255 0199 00
V16	TUBE, ELECTRON: 12AT7	255 0205 00
V17	TUBE, ELECTRON: 6AQ5	255 0195 00
V18	TUBE, ELECTRON: 6U8	255 0232 00
V19	TUBE, ELECTRON: 12AU7	255 0201 00
V20	TUBE, ELECTRON: 6U8	255 0232 00
V21	TUBE, ELECTRON: 6AL5	257 0018 00
V22	TUBE, ELECTRON	253 0005 00
V23	TUBE, ELECTRON: 6146	256 0101 00
V24	TUBE, ELECTRON: 6146	256 0101 00
XFL1	SOCKET, ELECTRON TUBE: 9 contact miniature	220 1216 00
XV1	SOCKET, ELECTRON TUBE: 7 pin miniature tube socket; molded construction, plastic	220 1111 00
XV2	SOCKET, ELECTRON TUBE: 9 pin miniature tube socket; molded plastic body	220 1103 00
XV3	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV4	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV5	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV6	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV7	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV8	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV9	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV10	SOCKET, ELECTRON TUBE: 7 contact miniature top mtg tube socket w/o shield base; ceramic, MFE	220 1152 00
XV11	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV12	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV13	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV14	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV15	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV16	SOCKET, ELECTRON TUBE: 9 contact miniature top mtg tube socket w/o shield base; plastic MFE	220 1274 00
XV17	SOCKET, ELECTRON TUBE: same as XV10	220 1152 00
XV18	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV19	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV20	SOCKET, ELECTRON TUBE: same as XV2	220 1103 00
XV21	SOCKET, ELECTRON TUBE: same as XV10	220 1152 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
XV22	SOCKET, ELECTRON TUBE: same as XV1	220 1111 00
XV23	SOCKET, ELECTRON TUBE: 8 prong octal tube socket; molded plastic construction	220 1005 00
XV24	SOCKET, ELECTRON TUBE: same as XV23	220 1005 00
XV25	SOCKET, ELECTRON TUBE: 9 contact UHF type miniature tube socket	220 1216 00
XY1	SOCKET, CRYSTAL: 2 regularly spaced contact positions, 0.486 in. c to c each contact 0.243 in. from center; cadmium plated phosphor bronze or beryllium copper	292 0082 00
XY2	SOCKET, CRYSTAL: same as XY1	292 0082 00
Y1	CRYSTAL UNIT: type CR-46/U Frequency 456.65 kc Frequency 456.75 kc Frequency 456.85 kc Frequency 456.95 kc Frequency 457.05 kc Y-1 and FL-1 matched set according to frequency	290 1605 00 290 1606 00 290 1607 00 290 1608 00 290 1609 00
Y2	CRYSTAL UNIT: CR-37/U type metal plated, plate, wire mounted in metal holder, holder HC-13/U, 100.000 KC/sec frequency range ±2% tolerance, 5,000 ohms resistance SWITCH UNIT: Assembly of S1, C59, and following 10 crystals:	290 8454 00 522 0879 00
Y3 14.0 mc	CRYSTAL UNIT: quartz CR-18/U 9,000,000 kc frequency	291 8083 00
Y4 14.2 mc	CRYSTAL UNIT: quartz CR-18/U, 9,100,000 kc frequency	291 8081 00
Y5 14.4 mc	CRYSTAL UNIT: quartz CR-18/U, 9450 kc frequency	291 8224 00
Y6 21.0 mc	CRYSTAL UNIT: quartz, CR-18/U, 12500,000 kc frequency	291 8141 00
Y7 21.3 mc	CRYSTAL UNIT: quartz, CR-18/U, 12.65 mc frequency	291 8225 00
Y8 21.4 mc	CRYSTAL UNIT: quartz CR-18/U, 12.7 frequency	291 8221 00
Y9 28.0 mc	CRYSTAL UNIT: quartz CR-18/U, 16 mc frequency	291 8226 00
Y10 28.1 mc	CRYSTAL UNIT: quartz CR-18/U, 16.05 mc	291 8227 00
Y11 28.2 mc	CRYSTAL UNIT: quartz CR-18/U, 16.25 mc frequency	291 8228 00
Y12 28.6 mc	CRYSTAL UNIT: quartz CR-18/U, 16.3 mc frequency	291 8222 00
	KNOB: zinc alloy bar knob to mount on single flatted shaft w/ one 8-36 multiple spline cup point setscrew; 3/4 in. h by 15/16 in. OD	281 0093 00
	CORE: ferrite type for permeability tuning; insert 0.020 inch diameter beryllium copper wire, rh on 0.022 in. dia mandrel to an OD of 0.063 inch; incl commercial brass slug screws, markings white and orange dots, frequency 0.5 to 32 mc	288 2214 00

Lower output freq = 2 (Crystal freq) - 4000
 ↑
 output freq
 VFO + 455 kc
 e.g. $F = 2 \times 9000 - 4000 = 14.0 \text{ mc}$

ITEM	DESCRIPTION	COLLINS PART NUMBER
516E-1 D-C POWER SUPPLY		
C1	CAPACITOR, FIXED DRY ELECTROLYTIC: 250 uf 25 vdcw	183 1305 00
C2	Not Used	
C3	CAPACITOR, FIXED ELECTROLYTIC: 60 uf -10% +40%, 350 vdcw	183 1551 00
C4	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C5	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C6	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C7	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C8	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C9	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C10	CAPACITOR, FIXED DRY ELECTROLYTIC: same as C1	183 1305 00
C11	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C12	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C13	CAPACITOR, FIXED ELECTROLYTIC: same as C3	183 1551 00
C14	CAPACITOR, FIXED DRY ELECTROLYTIC: 40 uf -10% +100%, 150 vdcw	183 1044 00
CR1	RECTIFIER: silicon, low power, 400 v max peak inverse, 0.5 amp at +100°C d-c current max, ferrule mounted	353 1567 00
CR2	RECTIFIER: same as CR1	353 1567 00
CR3	RECTIFIER: same as CR1	353 1567 00
CR4	RECTIFIER: same as CR1	353 1567 00
CR5	RECTIFIER: same as CR1	353 1567 00
CR6	RECTIFIER: same as CR1	353 1567 00
CR7	RECTIFIER: same as CR1	353 1567 00
CR8	RECTIFIER: same as CR1	353 1567 00
CR9	RECTIFIER: same as CR1	353 1567 00
E1	TERMINAL, LUG: phosphor bronze, hot tin, solder coat or electro-tinned finish; bent soldering lug; 5/764 in. lg, 5/16 in. wd overall w/ hole in one end for no. 4 screw and 0.218 in. lg by 0.093 in. w slot in other end	304 0317 00
E2	TERMINAL, LUG: rd tongue end; w/ clamping ears; 5/16 in. by 1/2 in. by 1-3/32 in. overall	304 1500 00
E3	TERMINAL, LUG: phosphor bronze, hot tin dipped; w/ shakeproof hole to fit 1/4 in. bolt; 7/8 in. lg, 1/2 in. w, 11/64 in. thk	304 1000 00
E4	TERMINAL, LUG: same as E1	304 0317 00
E5	TERMINAL, STUD: brass; 1/4 in. hex by 0.632 in. lg overall	306 0234 00
E6	TERMINAL, LUG: same as E1	304 0317 00
E7	TERMINAL, LUG: same as E5	306 0234 00
E8	TERMINAL, LUG: same as E5	306 0234 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
E9	TERMINAL, LUG: same as E5	306 0234 00
E10	TERMINAL, LUG: same as E1	304 0317 00
E11	TERMINAL, LUG: same as E5	306 0234 00
E12	TERMINAL, LUG: same as E5	306 0234 00
E13	TERMINAL, LUG: same as E1	304 0317 00
E14	TERMINAL, LUG: same as E1	304 0317 00
E15	TERMINAL, LUG: same as E5	306 0234 00
E16	TERMINAL, LUG: same as E5	306 0234 00
E17	TERMINAL, LUG: same as E1	304 0317 00
E18	TERMINAL, LUG: same as E1	304 0317 00
E19	TERMINAL, LUG: same as E1	304 0317 00
F1	FUSE, CARTRIDGE: 15 amp, 25 v d-c high speed instantaneous operation; ferrule type terminals, glass body	264 4150 00
F2	FUSE, CARTRIDGE: same as F1	264 4150 00
K1	RELAY, ARMATURE: 1A contact arrangement, 15 amp at 28 v d-c or 115 v a-c resistive; coil, 12 v d-c, 60 ohm $\pm 10\%$ resistance	970 1858 00
K2	RELAY, ARMATURE: same as K1	970 1858 00
L1	CHOKER, RADIO FREQUENCY: 5.5 uh $\pm 20\%$ at 1000 cycles, coil 15-3/4 turns, powdered iron core, 2-3/4 in. lg overall w/ 8-32 NC-2 thd one end	240 0002 00
L2	REACTOR: filter, 0.75 hy min inductance at 10 v rms, 210 ma d-c current, 25 ohms d-c resistance, 1400 v rms test volts, continuous duty cycle; exposed core and coil; wire lead terminals; 3-1/4 in. lg, 2 in. w, 2 in. h overall, two 3/16 in. dia holes for mtg	668 0270 00
L3	COIL, RADIO FREQUENCY: choke; single layer wound; unshielded; 26 turns no. 14 AWG wire; 2.218 in. max lg by 31/32 in. w by 3/4 in. d overall; phenolic form, powdered iron core	240 0021 00
Q1	TRANSISTOR: germanium, junction PNP type contact, 1-1/4 in. dia, 1-1/16 in. h overall, hermetically sealed, collector voltage 50 v, collector current 12 amp; saturation resistance 0.200 ohm max	352 0058 00
Q2	TRANSISTOR: same as Q1	352 0058 00
Q3	TRANSISTOR: same as Q1	352 0058 00
Q4	TRANSISTOR: same as Q1	352 0058 00
Q5	TRANSISTOR: same as Q1	352 0058 00
Q6	TRANSISTOR: same as Q1	352 0058 00
R1	RESISTOR, FIXED WIRE WOUND: 300 ohms $\pm 5\%$, 2 w	747 9321 00
R2	RESISTOR, FIXED WIRE WOUND: same as R1	747 9321 00
R3	RESISTOR, FIXED COMPOSITION: 10 ohms $\pm 10\%$, 1/2 w	745 1268 00
R4	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R5	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R6	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R7	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R8	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R9	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER
R10	RESISTOR, FIXED COMPOSITION: same as R3	745 1268 00
R11	RESISTOR, FIXED COMPOSITION: 33 ohms $\pm 10\%$, 2 w	745 5589 00
R12	RESISTOR, FIXED COMPOSITION: 0.22 megohms $\pm 10\%$, 1 w	745 3450 00
R13	RESISTOR, FIXED COMPOSITION: same as R12	745 3450 00
R14	RESISTOR, FIXED COMPOSITION: same as R12	745 3450 00
R15	RESISTOR, FIXED COMPOSITION: same as R12	745 3450 00
R16	RESISTOR, FIXED COMPOSITION: 0.27 ohms $\pm 10\%$, 1 w	745 3454 00
R17	RESISTOR, FIXED COMPOSITION: same as R16	745 3454 00
R18	RESISTOR, FIXED COMPOSITION: same as R16	745 3454 00
R19	RESISTOR, VARIABLE COMPOSITION: 5,000 ohms $\pm 20\%$, 2 w	380 0614 00
R20	RESISTOR, FIXED COMPOSITION: 6800 ohms $\pm 10\%$, 1 w	745 3387 00
R21	RESISTOR, FIXED COMPOSITION: 12 ohms $\pm 10\%$, 2 w	745 5572 00
R22	RESISTOR, FIXED COMPOSITION: 470 ohms $\pm 10\%$, 2 w	745 5638 00
R23	RESISTOR, FIXED COMPOSITION: 10 ohms $\pm 10\%$, 1 w	745 3268 00
R24	RESISTOR, FIXED COMPOSITION: same as R23	745 3268 00
T1	TRANSFORMER, POWER, STEP-UP: open frame, pri 1 ct, approx 27 v peak, 20 ohms max d-c resistance; sec 1 and 2, 0.5 ohms max ea; saturable core, 1-3/8 in. lg, 15/16 in. h, 15/16 in. w overall	664 1004 00
T2	TRANSFORMER, POWER, STEP-UP: open frame, d-c input 13.5 nom, d-c output cur 185 ma nom; pri 1 ct, 1000 v rms test voltage, sec 1 and 2, 1500 v rms; 400 cps operating freq continuous duty cycle, nonsaturating core, 3-11/16 in. lg, 3-5/16 in. h, 3-1/4 in. w overall	664 0276 00
T3	TRANSFORMER, POWER, STEP-UP: open frame, d-c input 13.8 nom, d-c output 265 v, min at 220 ma d-c load cur w/ nom input; d-c load cur 210 ma nom; 400 cps min operating freq, continuous duty cycle, 3-1/16 in. lg, 1-7/8 in. h, 2 in. w overall	664 1005 00
TB1	TERMINAL, STRIP: phenolic barrier type w/ lug for back connection, 8 terminals 3-3/8 in. lg approx, 13/32 in. h, 7/8 in. w overall	367 0016 00
TB2	TERMINAL, STRIP: electrical, barrier type w/ double ended solder terminals eyeletted to strip, brass, tin pl terminals, phenolic insulation, 15 amps, 1200 v rms w/ marker strip, 21 terminals, 8-17/32 in. lg, 1-7/32 in. w, 13/32 in. thk overall	367 0829 00
TB3	TERMINAL, STRIP: electrical, barrier type w/ double ended solder terminals eyeletted to strip, brass, tin pl terminals, phenolic insulation, 15 amps, 1200 v rms w/ marker strip, 8 terminals, 3-21/32 in. lg, 1-7/32 in. w, 13/32 in. thk overall	367 0819 00
XF1	FUSE, HOLDER: for 3 AG fuses, 1-1/4 by 1/4; bakelite, 1/16 in. locking, slug included	265 1002 00
XF2	FUSE, HOLDER: same as XF1	265 1002 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
516F-1 POWER SUPPLY		
C1	CAPACITOR, FIXED ELECTROLYTIC: 10 uf -15% to +100%, 250 vdcw	183 1046 00
C2	CAPACITOR, FIXED ELECTROLYTIC: 10 uf -10% to +100%, 150 vdcw	183 1040 00
C3	CAPACITOR, FIXED ELECTROLYTIC: triple section, 15, 15, 10 uf -10%, +50%, 450 vdcw each section	183 1091 00
C4	CAPACITOR, FIXED PAPER DIELECTRIC: 10 uf $\pm 10\%$, 1000 vdcw	962 4354 00
C5	CAPACITOR, FIXED PAPER DIELECTRIC: 0.05 uf $\pm 10\%$, 1000 vdcw	961 4201 00
CR1	RECTIFIER, METALLIC: selenium; single phase half wave, dry disk rectifier; 130 v max rms input voltage; 50 ma max d-c current; 45 ohms min. series resistance; 13/16 in. by 23/32 in. by 19/32 in.	353 0153 00
F1	FUSE, CARTRIDGE: 3 amp, 125 v d-c, time delay, 6 sec min at 300%; ferrule terminal 0.250 in. dia by 0.250 in. lg; glass covering 0.230 in. dia; one time; 1-1/4 in. lg overall	264 0009 00
F2	FUSE, CARTRIDGE: same as F1	264 0009 00
L1	REACTOR: filter type, 8.0 hy inductance, 150 ma d-c current, 190 ohms resistance, 3000 v test, wire lead-type terminals, 3 in. lg by 2-1/2 in. w overall	668 0253 00
L2	REACTOR: same as L1	668 0253 00
L3	REACTOR: filter type, 1.0 hy, 180 ma d-c current, 25 ohms d-c resistance, 1400 v d-c rms test voltage, exposed core & coil, wire lead-type terminals, 3-1/4 in. lg by 2 in. h, two 3/16 in. dia mtg holes	668 0254 00
P1	CONNECTOR, RECEPTACLE, ELECTRICAL: 22 female contacts, accommodates no. 20 AWG wire, 5 amps, includes 2 miniature coaxial connectors	370 2074 00
P2	A-C PLUG: part of cable	
P3	CONNECTOR, PLUG, ELECTRICAL: one rd contact; straight shape, 1 in. by 19/32 in. dia, brass, silver pl, for use w/ RG-55/U and RG-58/U coaxial cable	357 9292 00
P4	CONNECTOR, PLUG, ELECTRICAL: 1 rd contact, 50 ohms; straight shape, 1-5/32 in. lg, 9/16 in. dia overall	357 9317 00
R1	RESISTOR, FIXED COMPOSITION: 100 ohms $\pm 10\%$, 1/2 w	745 1310 00
R2	RESISTOR, FIXED COMPOSITION: 4,700 ohms $\pm 10\%$, 2 w	745 5680 00
R3	RESISTOR, VARIABLE, WIRE WOUND: 2500 ohms $\pm 10\%$, 2 w	750 0522 00
R4	RESISTOR, FIXED COMPOSITION: 4,700 ohms $\pm 10\%$, 2 w	745 5680 00
R5	RESISTOR, FIXED WIRE WOUND: 24,000 ohms $\pm 5\%$, 25 w	710 0374 00
R6	RESISTOR, FIXED WIRE WOUND: 50,000 ohms $\pm 5\%$, 50 w	710 4504 10
T1	TRANSFORMER	662 0251 00
T2	TRANSFORMER	662 0252 00
V1	ELECTRON TUBE: 5U4-GB	257 0109 00
V2	ELECTRON TUBE: 5R4	257 0142 00

SECTION VII
Parts List

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER
XF1	FUSEHOLDER: for 3 AG fuses, 1-1/4 by 1/4; bakelite, 1/16 in. locking slug included	265 1002 00
XF2	FUSEHOLDER: same as XF1	265 1002 00
XV1	SOCKET, ELECTRON TUBE: 9 pin miniature tube socket, brass nickel plated	220 1155 00
XV2	SOCKET, ELECTRON TUBE: same as XV1	220 1155 00
	CABLE: for 516F-1; electrical cable, no.18 AWG stranded, 3 amps, 250 v max, a-c plug mtg on one end, 6 ft lg	
351D-1 MOBILE MOUNT		
P1	CONNECTOR, RECEPTACLE ELECTRICAL: 22 contact socket insert, wall mtd w/ 2 miniature coaxial connectors; contacts 1 thru 22, bronze gold plated, 5 amp, 1,470 v a-c rms min.	370 2074 00
P2	CONNECTOR, PLUG, ELECTRICAL: 1 rd male contact, straight shape, 1 in. by 19/32 in. dia; brass, silver pl; for use w/ RG-55/U and RG-58/U coaxial cable	357 9292 00
MISCELLANEOUS PARTS		
	BUMPER: recess bumper w/ firmly imbedded metal washer insert, black natural rubber base, 65-70 durometer hardness, 3/4 in. OD, 1/8 in. ID, 1/4 in. thk	200 0950 00
	BUMPER: rd rubber recessed bumper, durometer hardness 75 ±5, 23/32 in. OD, 11/64 in. ID, 15/32 in. thk	200 5010 00
	PLATE BUMPER: 16 ga cold rolled steel; cadmium pl; 3-1/4 in. lg, 2-1/8 in. w, w/ four 0.234 in. dia holes spaced 1-1/2 in. by 2-5/8 in. c to c, 2 holes tapped 10-32 NF-2B spaced 1-1/2 in. c to c, 1-5/8 in. from end	543 2820 002
	COVER-PLUG, RIVETED: c/o 1 cover, type 304 CRES 26 ga, 1-1/2 in. h, 1-31/32 in. lg bent to 108°; w/ two 0.130 in. dia holes 13/16 in. c to c 1/4 in. from end; 2 rivets 3/16 in. lg; 1 butt hinge	543 2821 002
	CABLE-P.S.: c/o 1 adapter, brass silver pl, teflon insulated; 2 connectors, P1, P2, and elect. wire	543 2830 003
189A-2 PHONE PATCH		
C1	CAPACITOR, FIXED MICA DIELECTRIC: 470 uuf ±10%, 500 vdcw	935 0134 00
C2	CAPACITOR, FIXED MICA DIELECTRIC: same as C1	935 0134 00
C3	CAPACITOR, FIXED MICA DIELECTRIC: same as C1	935 0134 00
C4	CAPACITOR, FIXED MICA DIELECTRIC: same as C1	935 0134 00
C5	CAPACITOR, PAPER: 1.0 uf +20% -10%, 200 vdcw	931 0170 00
C6	CAPACITOR, FIXED DRY ELECTROLYTIC: 25 uf -10% +100%, 25 vdcw	183 1034 00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L1	COIL, RADIO FREQUENCY: universal wound; 4 pi, 139 turns no. 36 AWG ea section; 2.0 mh inductance, 50,000 ohms max resistance, 100 ma max current rating	240 0134 00
L2	COIL, RADIO FREQUENCY: same as L1	240 0134 00
R2	RESISTOR, VARIABLE COMPOSITION: 1000 ohms ±20%, 1/2 w	376 3504 00
R3	RESISTOR, FIXED COMPOSITION: 150 ohms ±10%, 1/2 w	745 1317 00
R4	RESISTOR, FIXED COMPOSITION: 470 ohms ±10%, 1/2 w	745 1338 00
R5	RESISTOR, FIXED COMPOSITION: same as R4	745 1338 00
R6	RESISTOR, FIXED COMPOSITION: 220 ohms ±10%, 1/2 w	745 1324 00
R7	RESISTOR, FIXED COMPOSITION: same as R6	745 1324 00
R8	RESISTOR, FIXED COMPOSITION: 820 ohms ±10%, 1/2 w	745 1349 00
S1	SWITCH, ROTARY: 2 section, 2 position; 30° positioning detent; 3 pole; 9 fixed contacts, 3 moving contacts; phenolic insulation	259 0866 00
T1	TRANSFORMER, AUDIO FREQUENCY: pri impedance 600 ohms, 1000 rms test volts; sec impedance, 1,200 ohms ct, 1000 rms test volts; zero d-c cur rating; 2-5/8 in. h by 1-5/16 in. w by 1-5/16 in. lg overall; freq response 200 cps ±1.5 db, 1000 cps 0 ref db, 20,000 cps ±1.5 db; power, -55 dbm to +12 dbm; solder-type terminals	667 0233 00
T2	TRANSFORMER, AUDIO FREQUENCY: line type pri impedance 600 ohms ±10%, 1000 rms test volts; sec impedance 600 ohms, 1000 rms test volts; zero d-c cur rating; 1-5/16 in. w by 1-5/16 in. lg by 2-7/16 in. h; freq response 200 cps ±1.0 db, 1000 cps 0 ref db, 20,000 cps ±1.0 db; 12 dbm max; solder-type terminals	667 0234 00
TB1	TERMINAL, BOARD: barrier-type strip w/ lug for back connection; 13/32 in. thk by 7/8 in. w by 4-1/8 in. lg; 10 terminals 3/8 in. between ϕ of terminals; phenolic insulation	367 0018 00
302E-1 DIRECTIONAL R-F WATTMETER		
C1	CAPACITOR, VARIABLE: 0.5 to 3.0 uuf, 500 vdcw	922 0149 00
C2	CAPACITOR, VARIABLE: same as C1	922 0149 00
C3	CAPACITOR, FIXED MICA: 500 uuf ±20%, 500 vdcw	912 0667 00
C4	CAPACITOR, FIXED MICA: same as C3	912 0667 00
C5	CAPACITOR, FIXED ELECTROLYTIC: 8 uf -15% +100%, 6 vdcw	183 1167 00
C6	CAPACITOR, FIXED ELECTROLYTIC: same as C5	183 1167 00
C8	CAPACITOR, FIXED CERAMIC: 1000 uuf +80% -20%, 500 vdcw	913 1292 00
C9	CAPACITOR, FIXED CERAMIC: same as C8	913 1292 00
CR1	SEMICONDUCTOR DEVICE DIODE: silicon crystal diode for use as RF mixer at freq to 1000 mc; avg rectified cur, 50 ma, peak rectified cur, 150 ma, surge cur (sec.) 500 ma; (Cont)	353 2542 00

KWM-1 Amateur Transceiver

ITEM	DESCRIPTION	COLLINS PART NUMBER	ITEM	DESCRIPTION	COLLINS PART NUMBER
CR1	(Cont) peak inverse voltage 5 v; conversion loss 8 db max; noise figure 14 db max; IF impedance 450 ohms, injection cur range 0.5 to 4.5 ma		R3	RESISTOR, FIXED FILM: 5,490 ohms $\pm 1\%$, 1/4 w	705 7258 00
CR2	SEMICONDUCTOR DEVICE DIODE: same as CR1	353 2542 00	R3	RESISTOR, FIXED FILM: 5,760 ohms $\pm 1\%$, 1/4 w	705 7259 00
J1	CONNECTOR, RECEPTACLE ELECTRICAL: single female contact; irregular shape; panel mtg; 1-1/16 in. lg by 0.348 in. dia	357 9129 00	R3	RESISTOR, FIXED FILM: 6,040 ohms $\pm 1\%$, 1/4 w	705 7260 00
J2	CONNECTOR, RECEPTACLE ELECTRICAL: same as J1	357 9129 00	R3	RESISTOR, FIXED FILM: 6,340 ohms $\pm 1\%$, 1/4 w	705 7261 00
L1	COIL, RADIO FREQUENCY: 3 universal wound pi sections 75 turns ea; no. 36 AWG copper wire; powdered iron coil form; 220 uh inductance, 1 amp	240 0037 00	R3	RESISTOR, FIXED FILM: 6,650 ohms $\pm 1\%$, 1/4 w	705 7262 00
L2	COIL, RADIO FREQUENCY: same as L1	240 0037 00	R3	RESISTOR, FIXED FILM: 6,980 ohms $\pm 1\%$, 1/4 w	705 7263 00
R1	RESISTOR, FIXED FILM: 21.5 ohms $\pm 1\%$, 1/4 w	705 7016 00	CHOOSE ACCORDING TO FREQUENCY		
R2	RESISTOR, FIXED FILM: same as R1	705 7016 00	R4	RESISTOR, FIXED FILM: 4,870 ohms $\pm 1\%$, 1/4 w	705 7129 00
CHOOSE ACCORDING TO FREQUENCY			R4	RESISTOR, FIXED FILM: 5,110 ohms $\pm 1\%$, 1/4 w	705 7130 00
R3	RESISTOR, FIXED FILM: 4,870 ohms $\pm 1\%$, 1/4 w	705 7129 00	R4	RESISTOR, FIXED FILM: 5,360 ohms $\pm 1\%$, 1/4 w	705 7131 00
R3	RESISTOR, FIXED FILM: 5,110 ohms $\pm 1\%$, 1/4 w	705 7130 00	R4	RESISTOR, FIXED FILM: 5,620 ohms $\pm 1\%$, 1/4 w	705 7132 00
R3	RESISTOR, FIXED FILM: 5,360 ohms $\pm 1\%$, 1/4 w	705 7131 00	R4	RESISTOR, FIXED FILM: 5,900 ohms $\pm 1\%$, 1/4 w	705 7133 00
R3	RESISTOR, FIXED FILM: 5,620 ohms $\pm 1\%$, 1/4 w	705 7132 00	R4	RESISTOR, FIXED FILM: 6,190 ohms $\pm 1\%$, 1/4 w	705 7134 00
R3	RESISTOR, FIXED FILM: 5,900 ohms $\pm 1\%$, 1/4 w	705 7133 00	R4	RESISTOR, FIXED FILM: 6,490 ohms $\pm 1\%$, 1/4 w	705 7135 00
R3	RESISTOR, FIXED FILM: 6,190 ohms $\pm 1\%$, 1/4 w	705 7134 00	R4	RESISTOR, FIXED FILM: 6,810 ohms $\pm 1\%$, 1/4 w	705 7136 00
R3	RESISTOR, FIXED FILM: 6,490 ohms $\pm 1\%$, 1/4 w	705 7135 00	R4	RESISTOR, FIXED FILM: 4,750 ohms $\pm 1\%$, 1/4 w	705 7255 00
R3	RESISTOR, FIXED FILM: 6,810 ohms $\pm 1\%$, 1/4 w	705 7136 00	R4	RESISTOR, FIXED FILM: 4,990 ohms $\pm 1\%$, 1/4 w	705 7256 00
R3	RESISTOR, FIXED FILM: 4,750 ohms $\pm 1\%$, 1/4 w	705 7255 00	R4	RESISTOR, FIXED FILM: 5,230 ohms $\pm 1\%$, 1/4 w	705 7257 00
R3	RESISTOR, FIXED FILM: 4,990 ohms $\pm 1\%$, 1/4 w	705 7256 00	R4	RESISTOR, FIXED FILM: 5,490 ohms $\pm 1\%$, 1/4 w	705 7258 00
R3	RESISTOR, FIXED FILM: 5,230 ohms $\pm 1\%$, 1/4 w	705 7257 00	R4	RESISTOR, FIXED FILM: 5,760 ohms $\pm 1\%$, 1/4 w	705 7259 00
			R4	RESISTOR, FIXED FILM: 6,040 ohms $\pm 1\%$, 1/4 w	705 7260 00
			R4	RESISTOR, FIXED FILM: 6,340 ohms $\pm 1\%$, 1/4 w	705 7261 00
			R4	RESISTOR, FIXED FILM: 6,650 ohms $\pm 1\%$, 1/4 w	705 7262 00
			R4	RESISTOR, FIXED FILM: 6,980 ohms $\pm 1\%$, 1/4 w	705 7263 00

SECTION VIII ILLUSTRATIONS

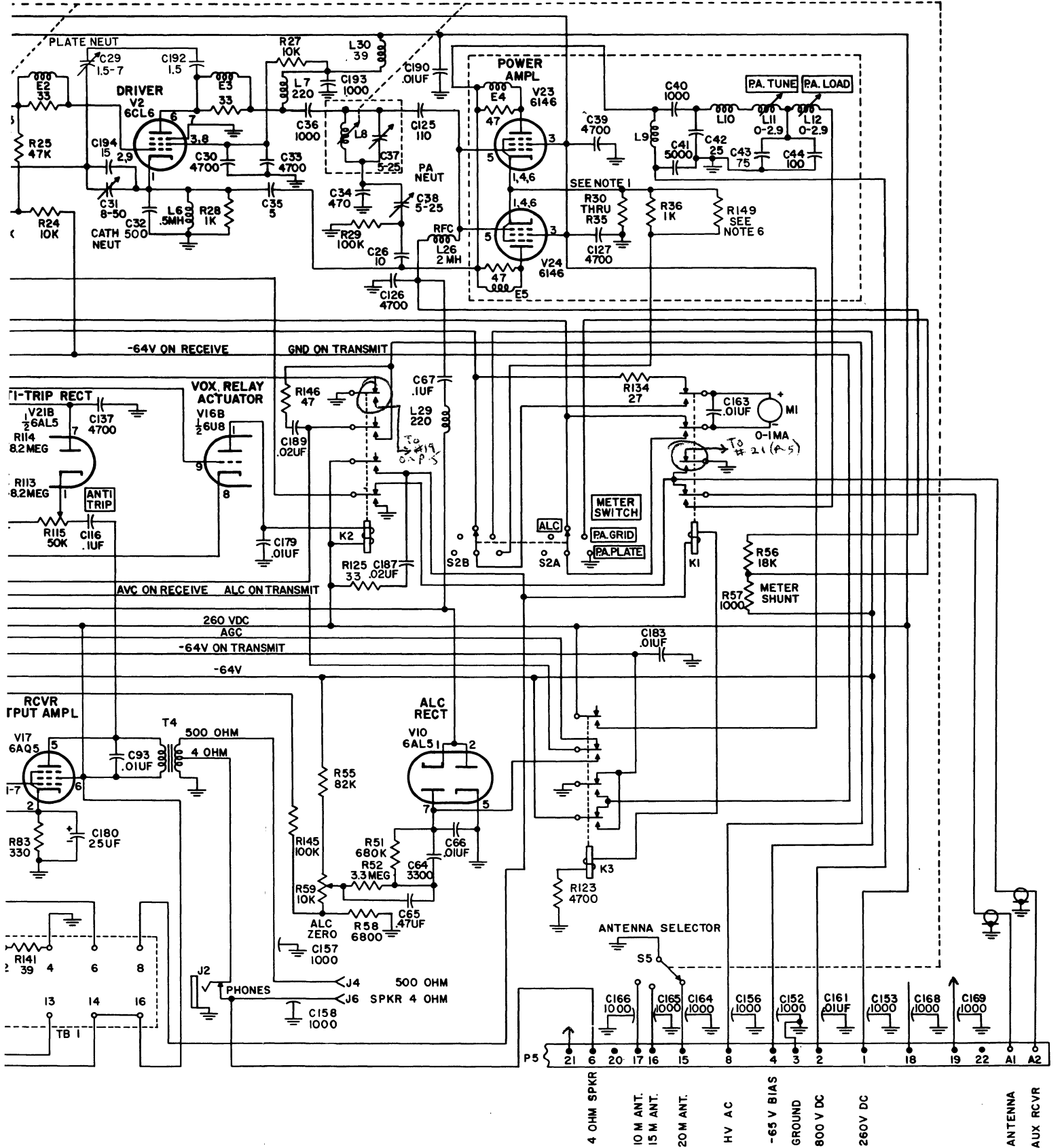
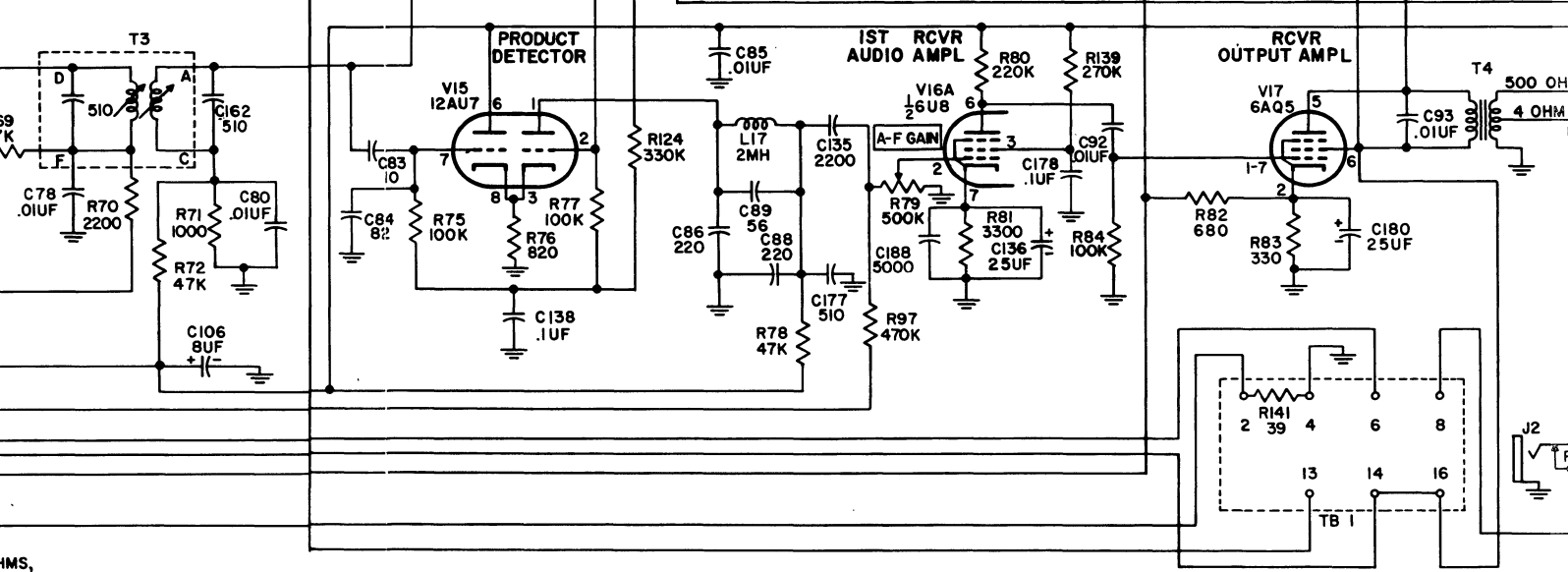
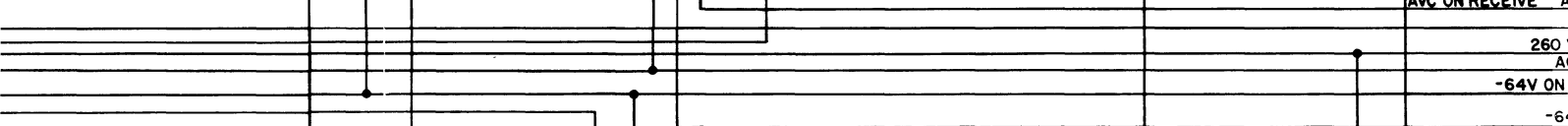
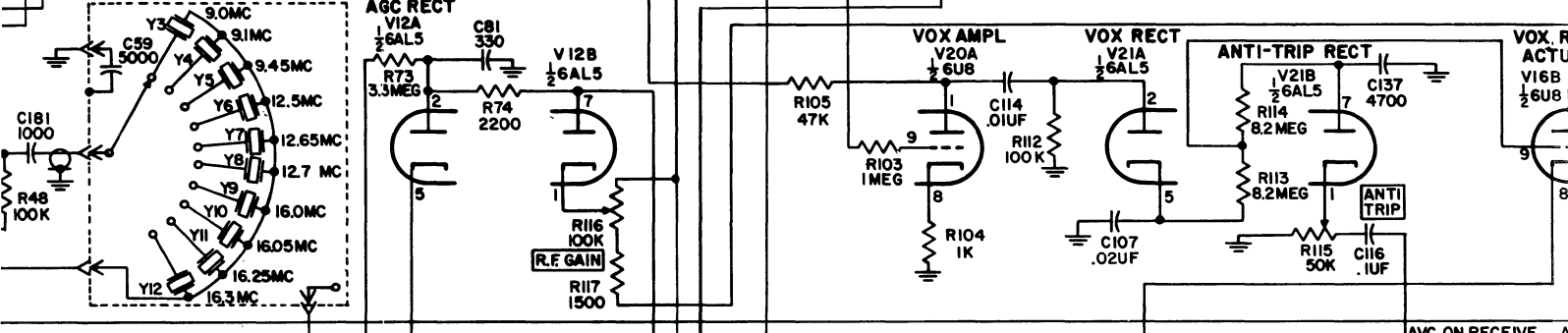
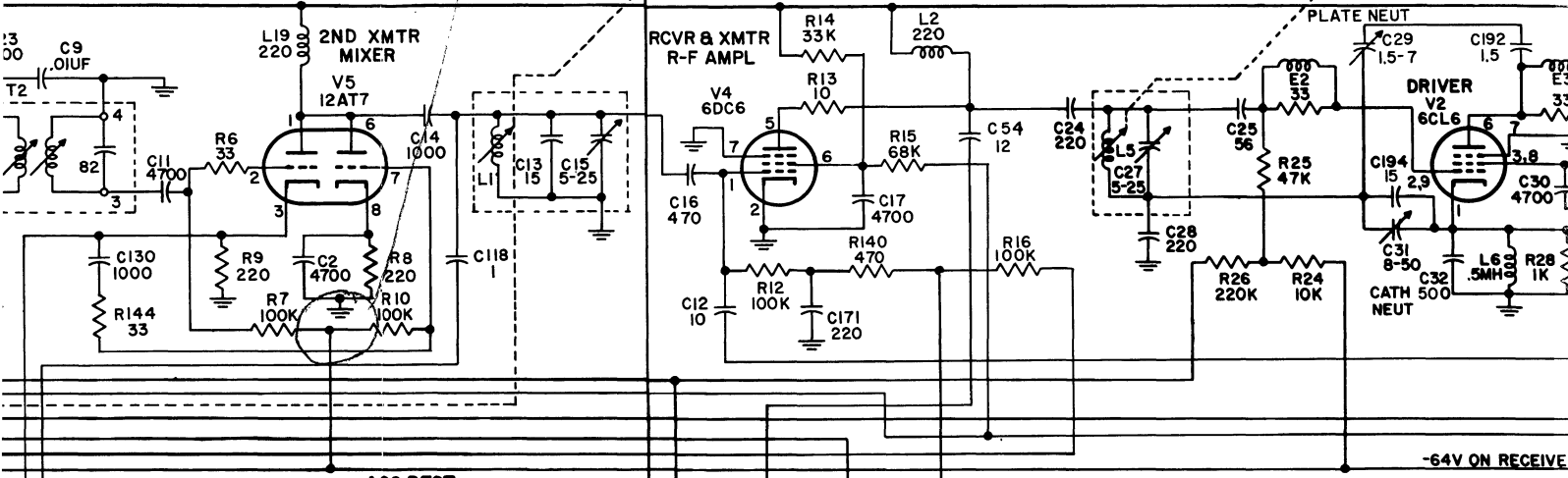


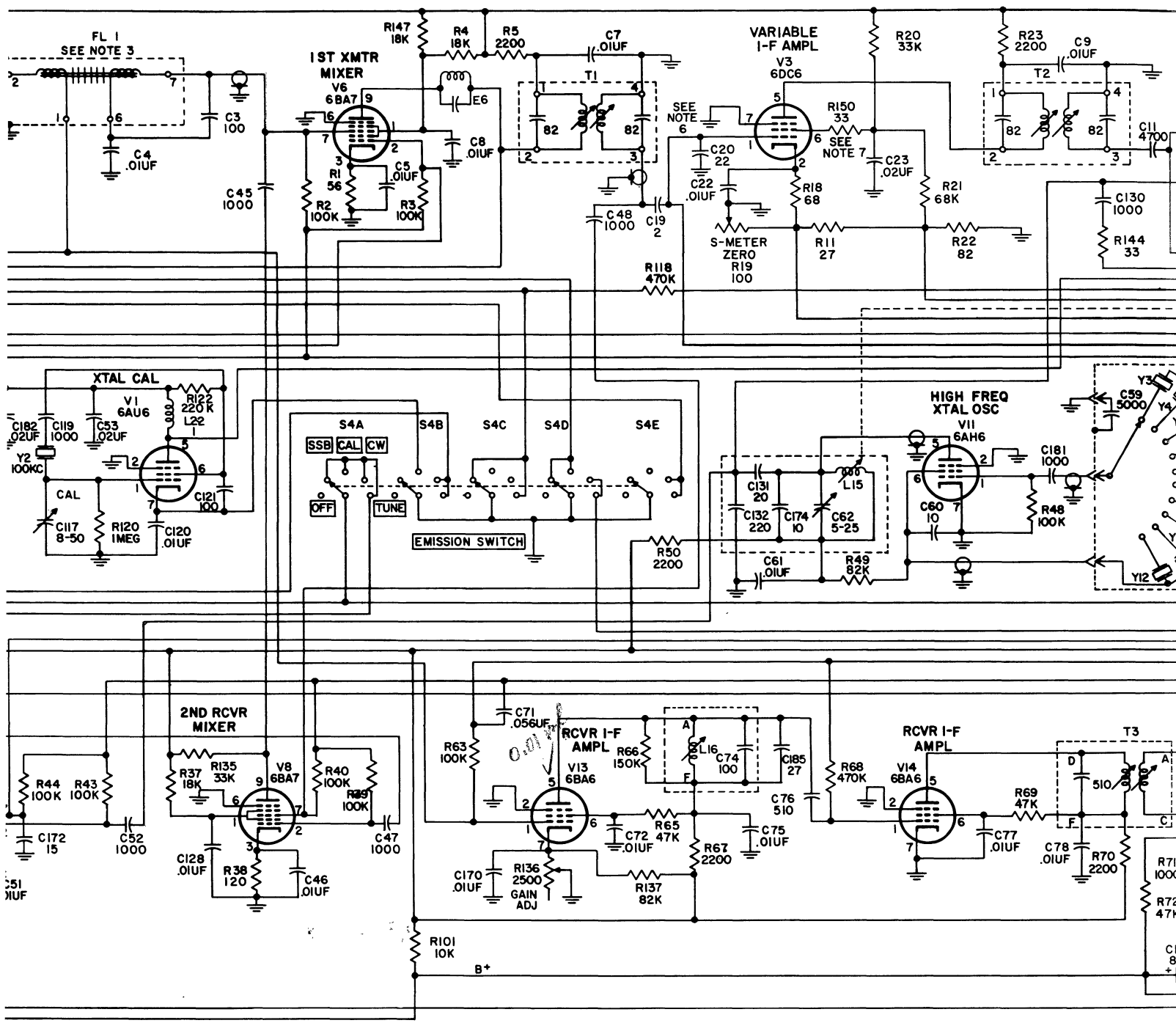
Figure 8-1. KWM-1 Amateur Transceiver, Schematic Diagram

R7
 R-10
 C 49
 .01 uf
 FACTORY CHANGE

RELAY CONTACTS

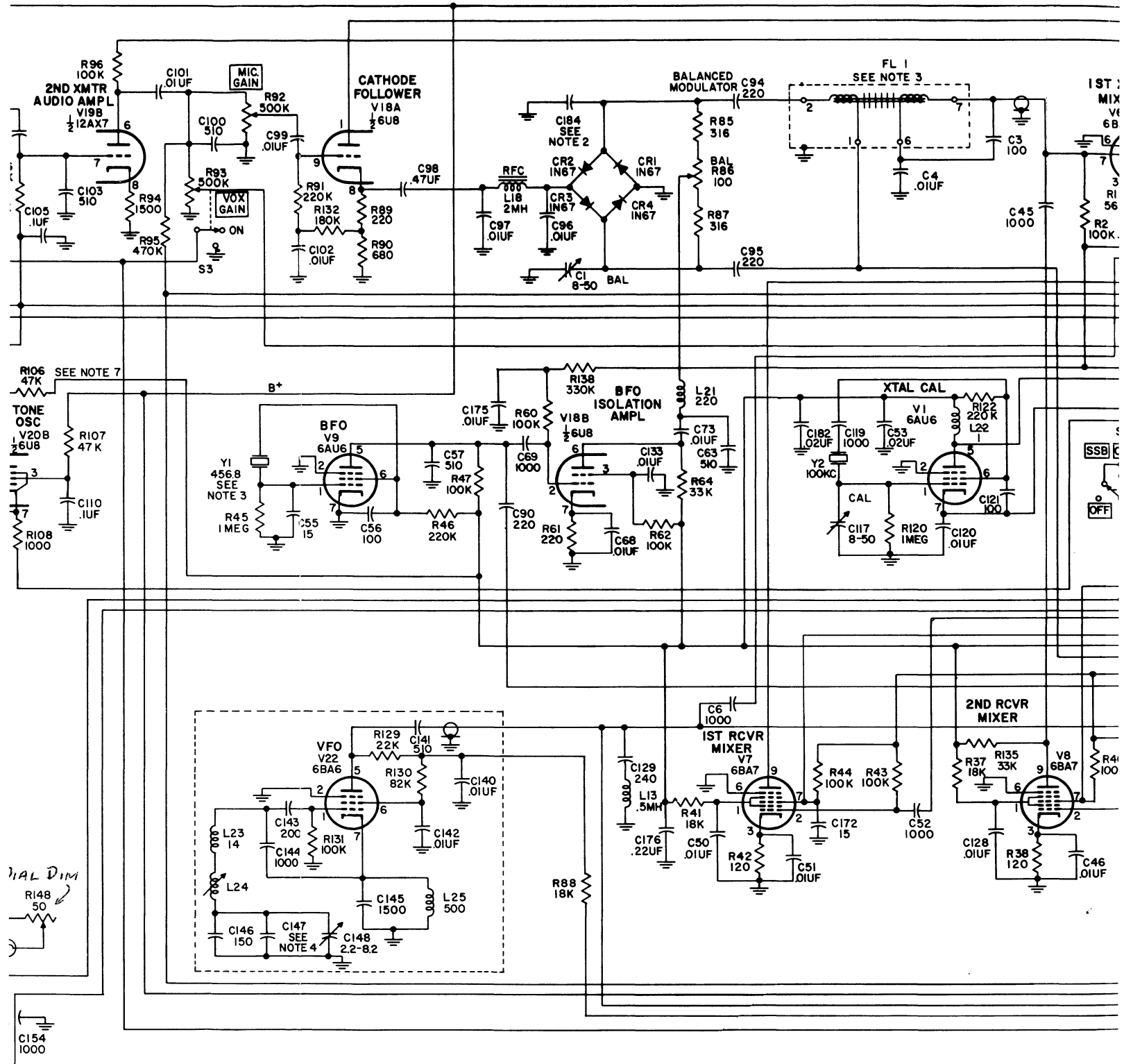


IMS,
 TO
 EARLY MODELS.



RESISTORS IN PARALLEL.
 TESTED IN MANUFACTURE. DO NOT CHANGE VALUE UNLESS FILTER FL-1 IS CHANGED.
 IF FL-1 NEEDS REPLACEMENT, REPLACE FL-1 AND CRYSTAL Y1 AS A MATCHED SET.
 FOR FREQ. COMPENSATION AT FACTORY.

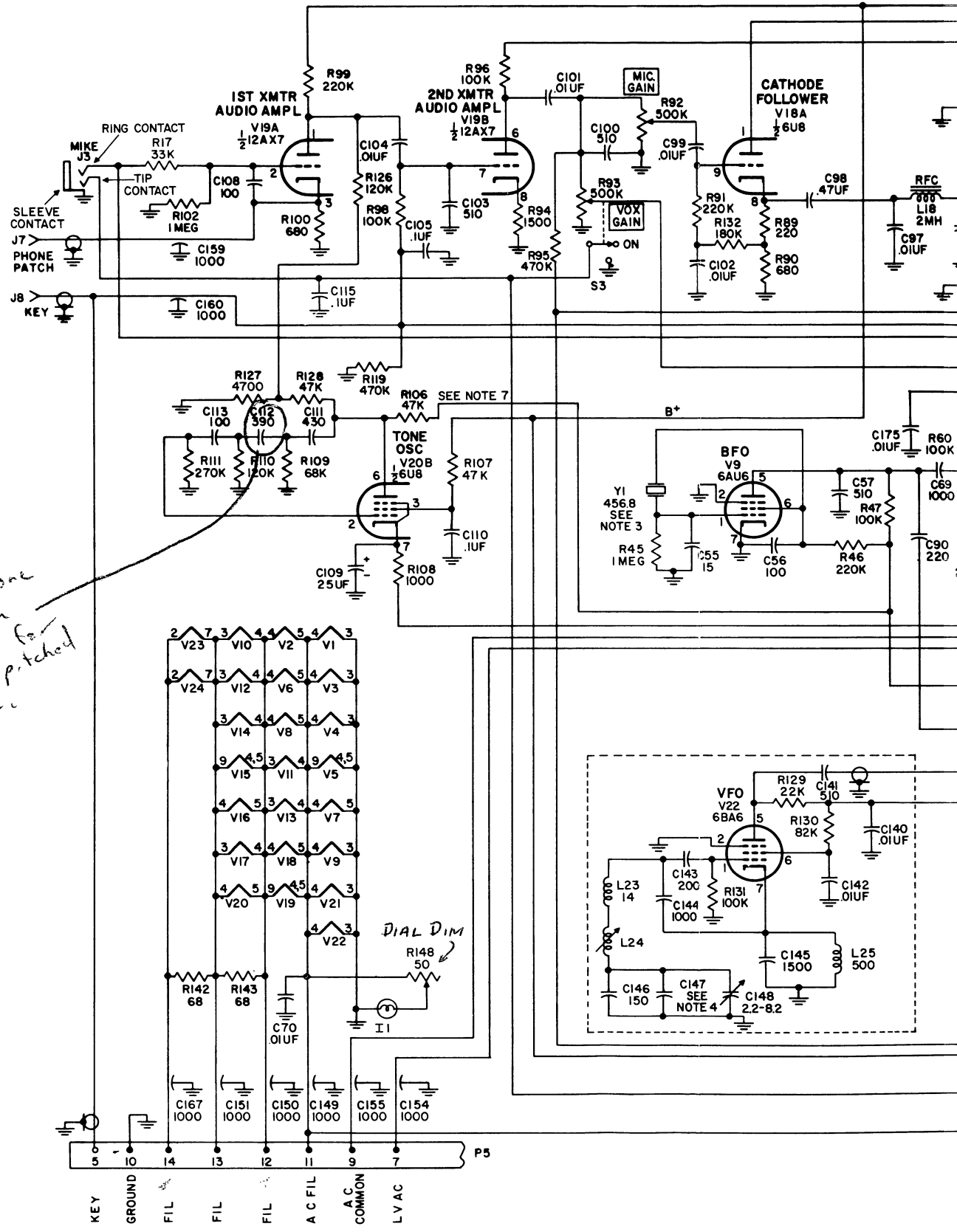
5. UNLESS OTHERWISE INDICATED ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
6. C20 IS SELECTED IN MANUFACTURE.
7. IN SOME EARLY MODELS; R107 IS 100K AND R106 IS CONNECTED TO 100V B+ BUS, R150 IS NOT USED.
8. L4-C58 FORM TRAP FOR VFO FREQ AND VALUES MAY VARY IN EARLY MODELS.



- NOTES:
1. 6-12 OHM RESISTORS IN PARALLEL.
 2. C184 SELECTED IN MANUFACTURE. DO NOT CHANGE VALUE UNLESS
 3. IF FILTER FL-1 NEEDS REPLACEMENT, REPLACE FL-1 AND CRYSTA
 4. SELECTED FOR FREQ. COMPENSATION AT FACTORY.

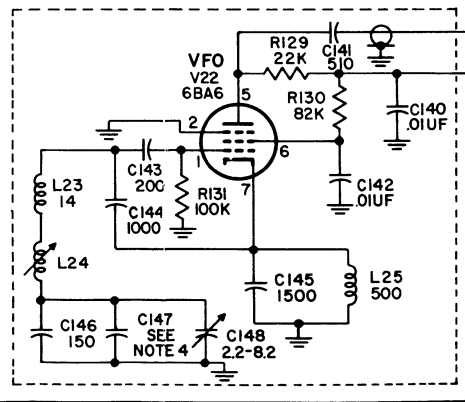
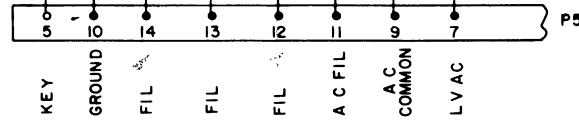
LV AC

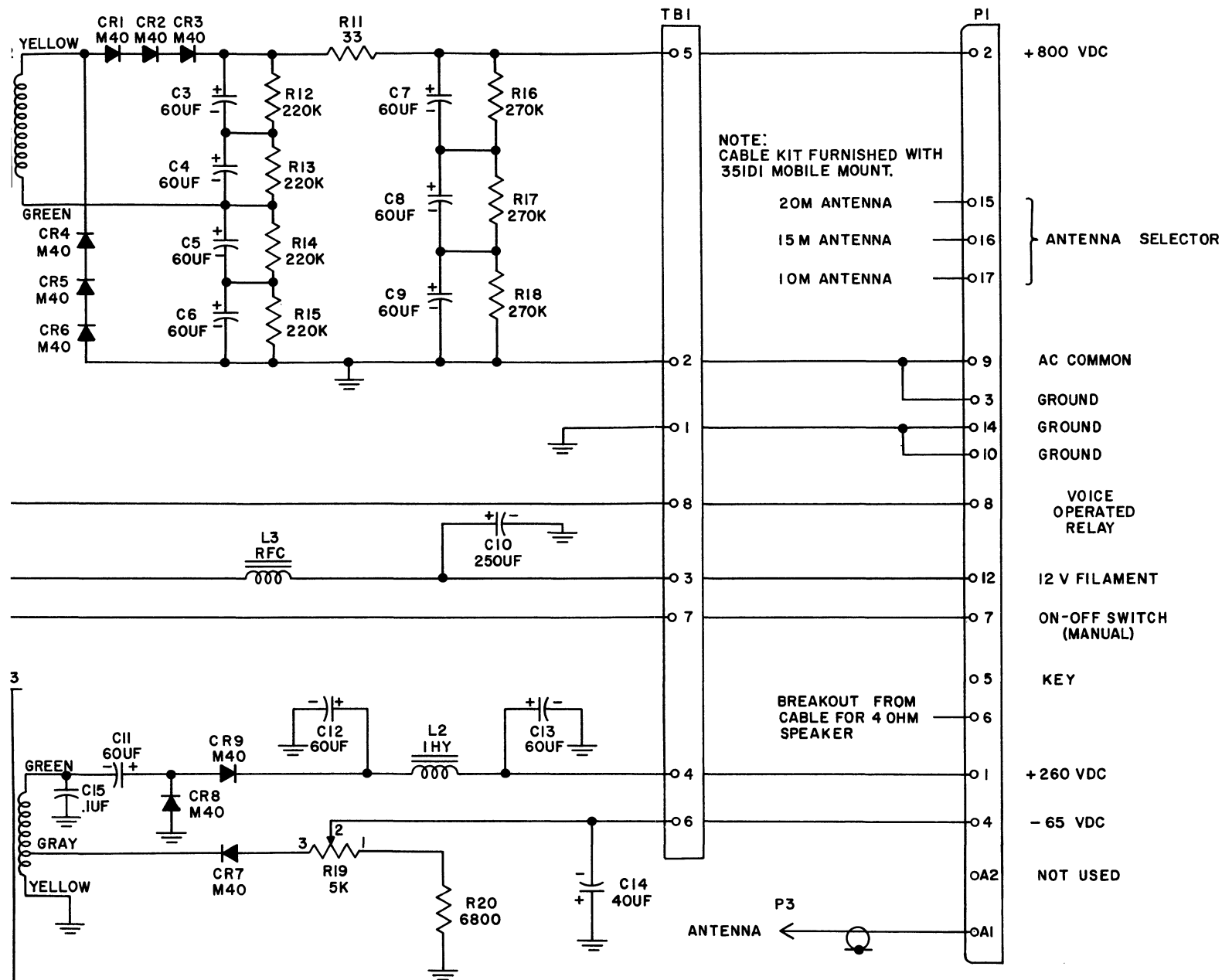
P5



This one has been changed for lower pitched note.

DIAL DIM



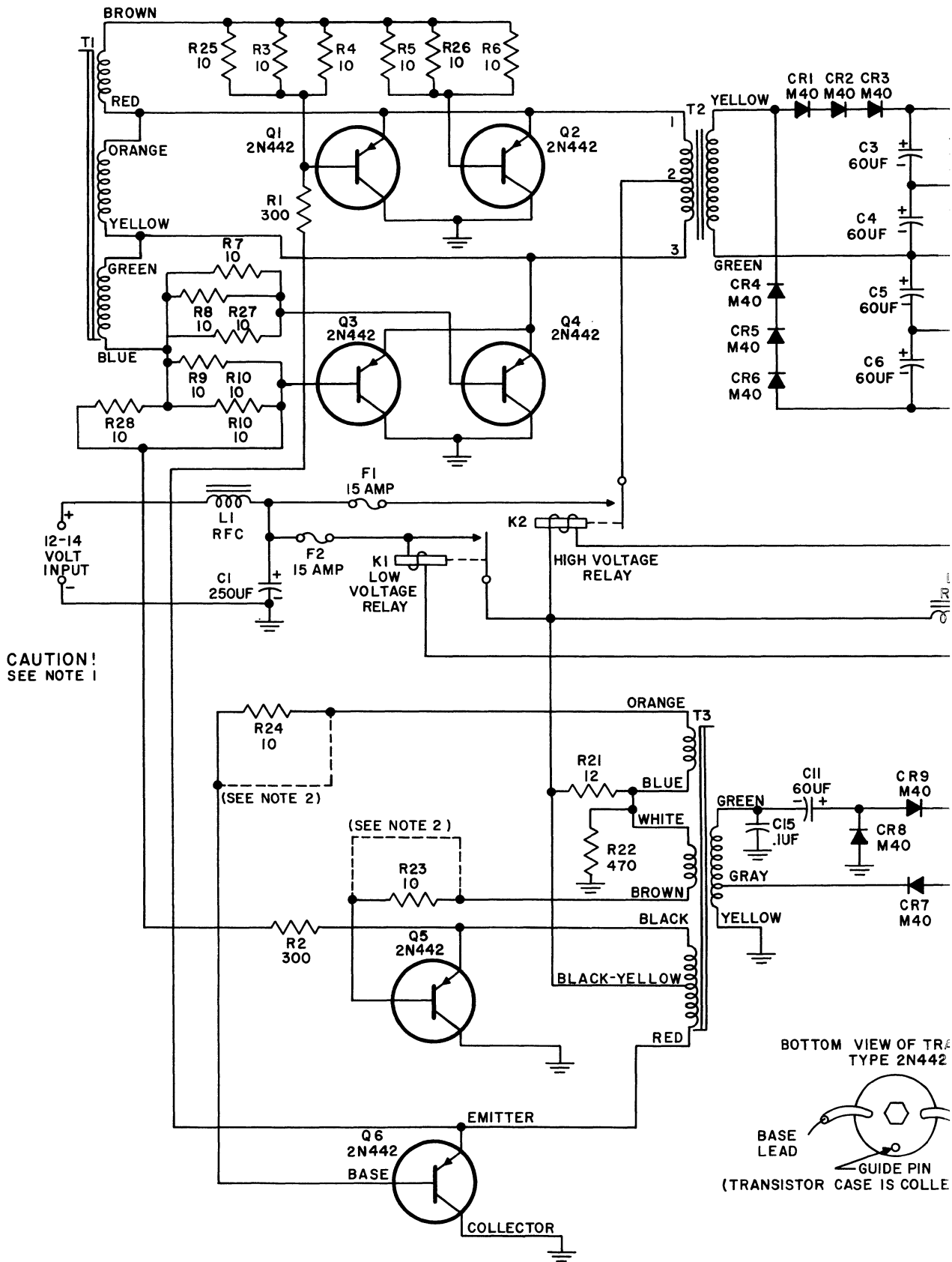


BOTTOM VIEW OF TRANSISTOR
TYPE 2N442



NOTE 1 FAILURE TO MAKE PROPER
POLARITY CONNECTIONS
MAY DESTROY TRANSISTORS.
NEGATIVE INPUT MUST BE GROUNDED.
2. R23 & R24 BYPASSED WHEN 2N442 USED IN
PLACE OF 2N278.

Figure 8-2. 516E-1 12-Volt D-C Power Supply,
Schematic Diagram

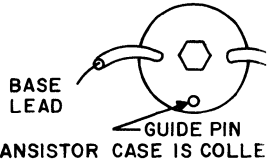


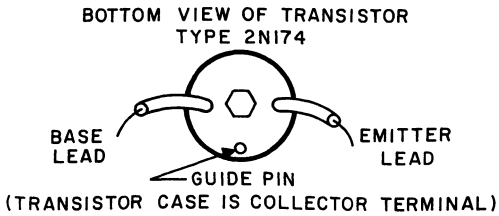
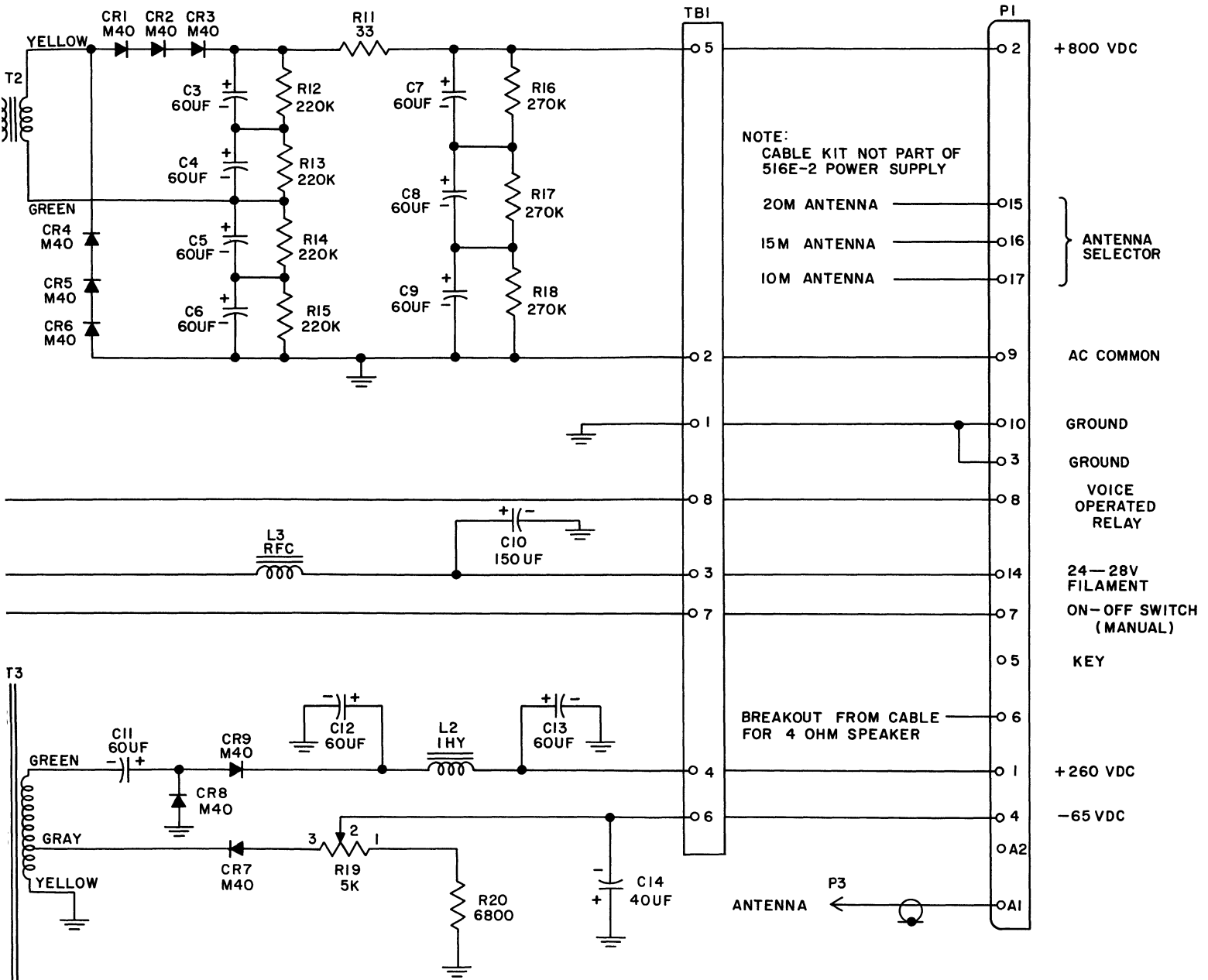
CAUTION!
SEE NOTE 1

(SEE NOTE 2)

(SEE NOTE 2)

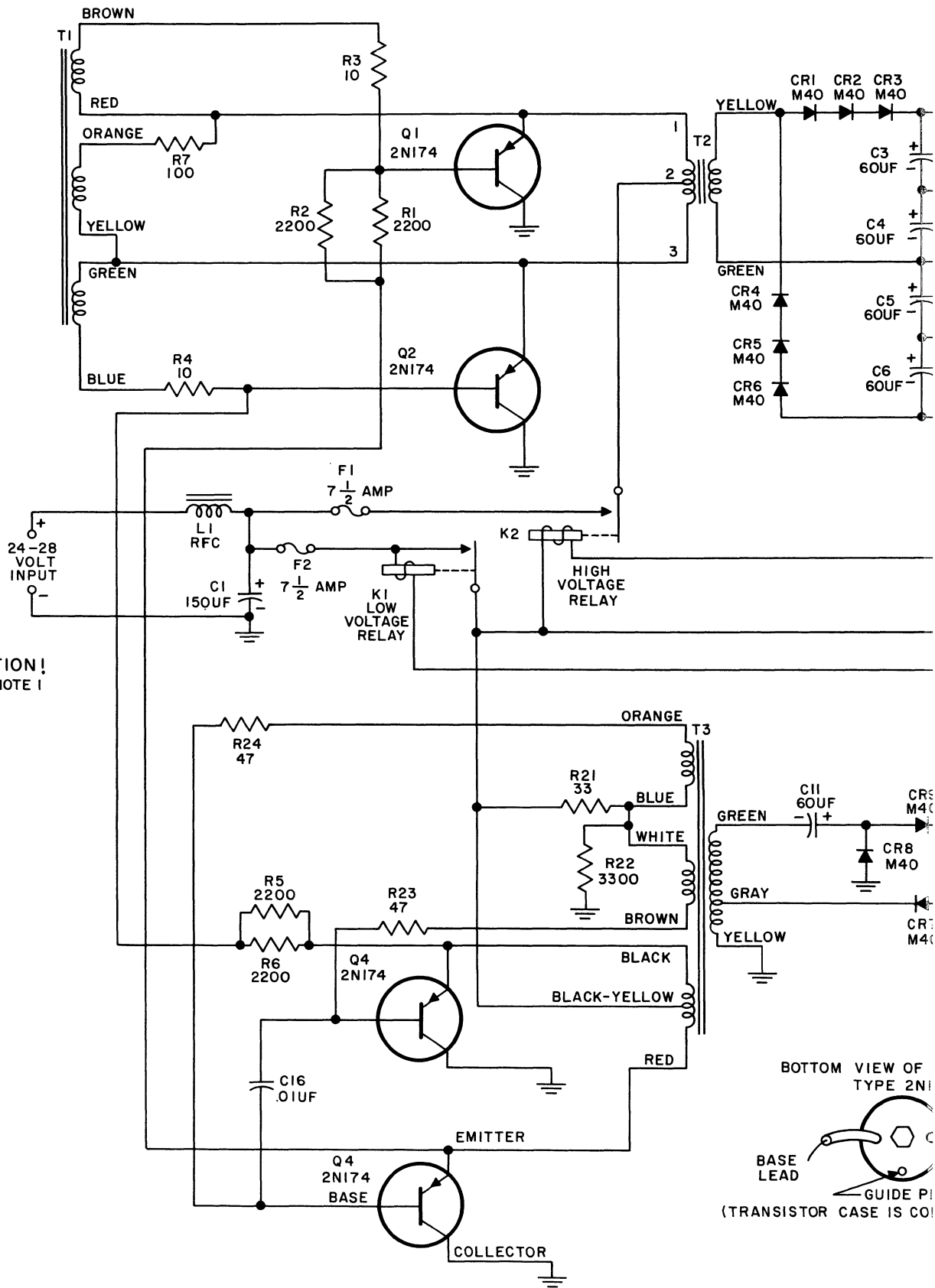
BOTTOM VIEW OF TRANSISTOR TYPE 2N442



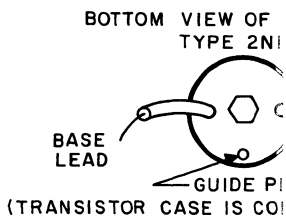


- NOTE 1: FAILURE TO MAKE PROPER POLARITY CONNECTIONS MAY DESTROY TRANSISTORS.
2. NEGATIVE INPUT MUST BE GROUNDED.

Figure 8-3. 516E-2 28-Volt D-C Power Supply,
Schematic Diagram



CAUTION!
SEE NOTE 1



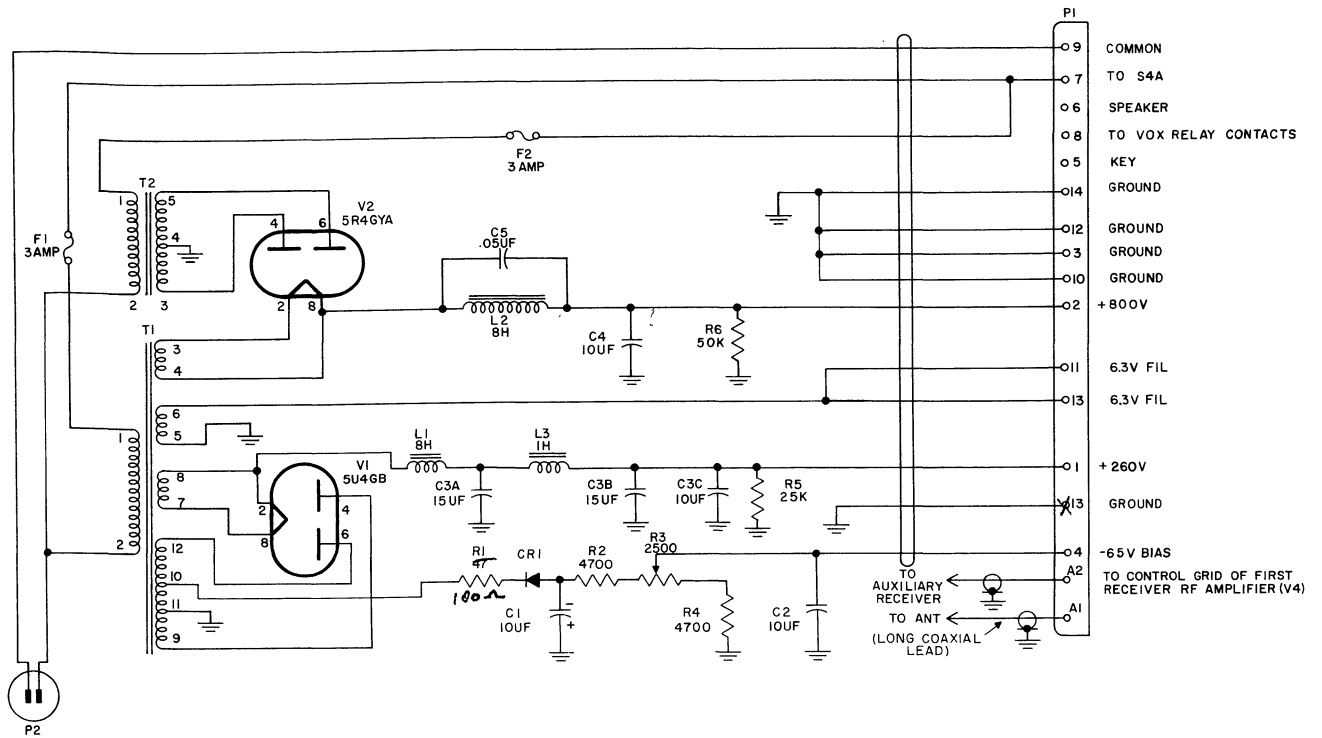


Figure 8-4. 516F-1 A-C Power Supply, Schematic Diagram

C204-04-3

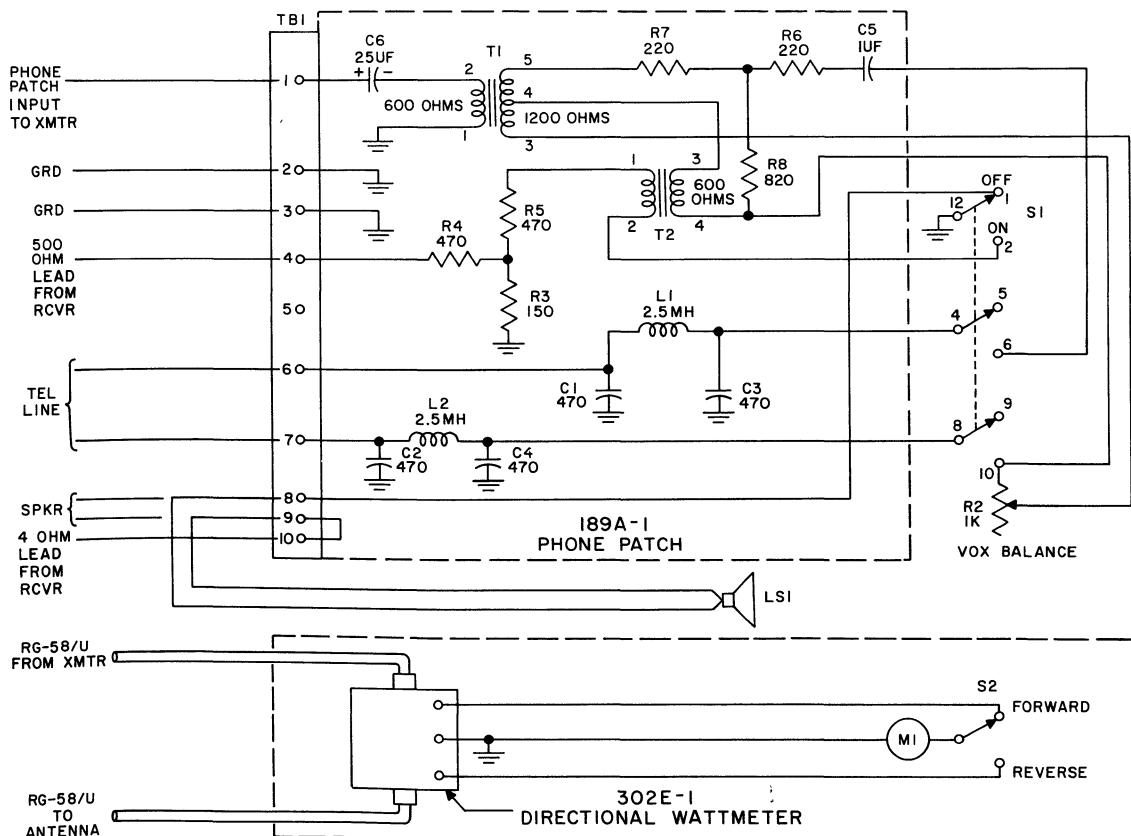


Figure 8-5. 312B-2 Speaker Console, Schematic Diagram

C204-08-3

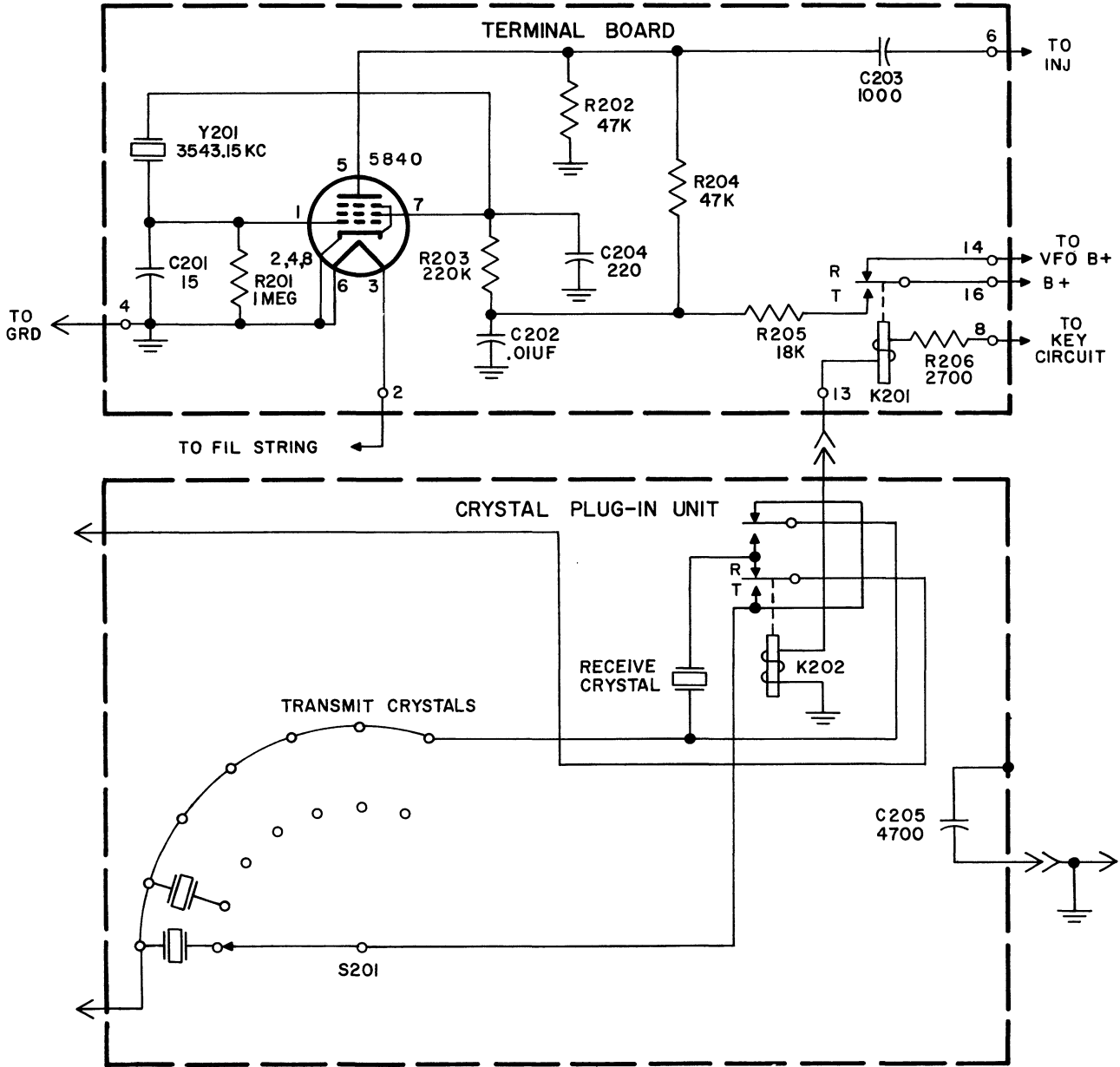


Figure 8-6. 399B-1 DX Adapter, Schematic Diagram

C204-26-3

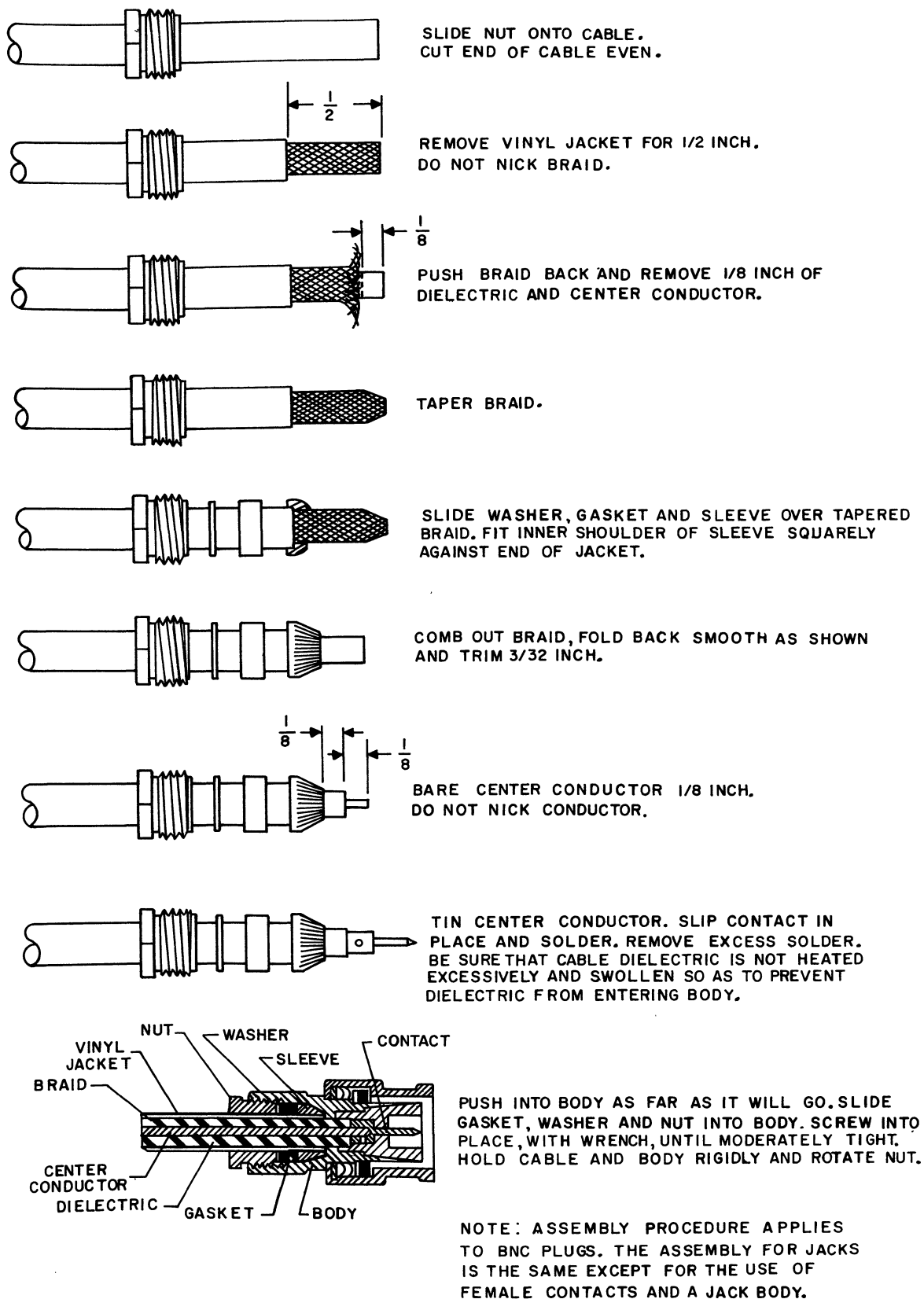


Figure 8-7. Assembly of RG-58/U Cable and UG-88/U Connector

HOOK-UP WIRE CODE

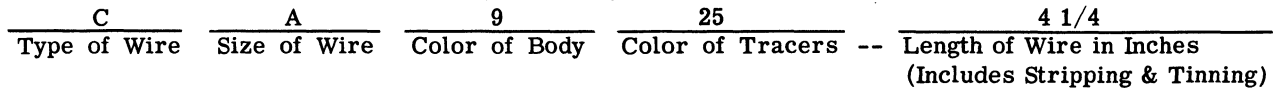
The characteristics of the hook-up wire used in this equipment are indicated by groups of symbols on the diagrams. Each symbol group consists of a maximum of three letters followed by a maximum of three numerals. When three letters are used the first indicates the type of wire, the second represents the size of wire, and the third is the letter "S", used only when the wire is shielded. When two letters are used, the first and second letters indicate either the type and size of wire or the size of wire and shielding, respectively. When one letter is used it indicates the wire size only. The first numeral indicates the color of the wire body and the second and third numerals, if any, represent the colors of tracers, all numerals being in accordance with the standard RTMA and JAN-C-76 color code.

The symbols are assigned according to the following table.

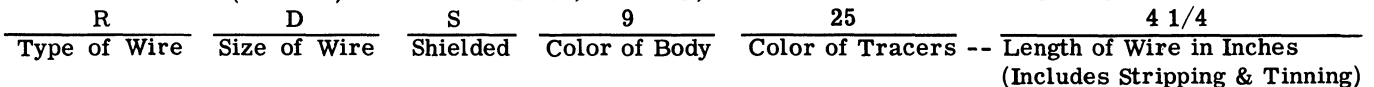
FIRST LETTER	TYPE OF WIRE	SECOND LETTER	AWG# WIRE SIZE	THIRD LETTER	
A	Cotton Braid Over Plastic (Formerly AN-J-C-48) Busbar, Round Tinned Jan Type WL(600 Volts) Miniature Jan Wire Extra Flexible Varnished Cambric General Electric Deltabeston KEL-F (Monochlorotrifluoroethylene) Neon Sign Cable (15,000 Volts) Silicone Single Conductor Stranded (Not Rubber Covered) Single Conductor Stranded (Rubber Covered) Jan Type SRIR(1000 Volts) Teflon (Polytetrafluoroethylene) Jan Type SRHV (2500 Volts)	A	#22	S	Shielded
B		B	#20	None	Unshielded
C		C	#18		
D		D	#16	NUMBER OR LETTER	BODY OR TRACER COLOR
E		E	#14		
F		F	#12		
G		G	#10		
H		H	#8	0	Black
J		J	#6	1	Brown
K		K	#4	2	Red
L		L	#2	3	Orange
M		M	#1	4	Yellow
N		N	#0	5	Green
P	P	#00	6	Blue	
Q	Q	#000	7	Violet	
R	R	#0000	8	Gray (Slate)	
T	T	#28	9	White	
V	V	#26	a	Clear	
W	W	#24	b	Tan	
X	X	#19	c	Pink	
Y	Y	#30	d	Maroon	
Z	Z		e	Light Green	
			f	Light Blue	
	Acetate Yarn, Telephone Type				

EXAMPLES

UNSHIELDED WIRE, JAN TYPE WL, #22AWG, WHITE WITH RED AND GREEN TRACERS:



SHIELDED WIRE (SINGLE). JAN TYPE SPIR, #16AWG, WHITE WITH RED AND GREEN TRACERS:



SHIELDED WIRE (MULTIPLE), MINIATURE JAN, #22AWG, WHITE, AND WHITE WITH RED TRACER:

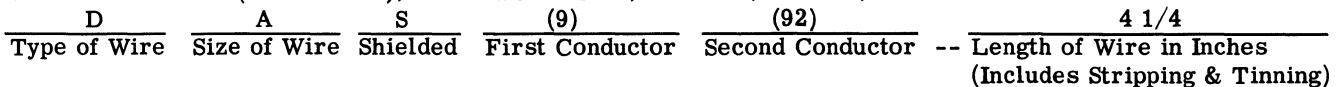


Figure 8-8. Wire Code Diagram

COLLINS AMATEUR EQUIPMENT GUARANTEE

The Collins Amateur 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 materials, and which are returned to Collins at its factory, transportation prepaid, provided:

- (a) Buyer has completed and returned to Collins promptly following his purchase the Registration Card included in the Instruction Book furnished with the equipment.
- (b) Notice of the claimed defect is given Collins within 90 days from the date of purchase and goods are returned in accordance with Collins' instructions.
- (c) 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.
- (d) 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 and proper manner.
- (e) Any failure due to use of equipment in excess of that contemplated in normal amateur operations shall not be deemed a defect within the meaning of these provisions.

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 said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in these paragraphs. 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.

IMPORTANT! It is necessary that the business reply card included herewith be filled out and mailed to the Company promptly in order for this guarantee to be effective.

HOW TO RETURN MATERIAL OR EQUIPMENT. If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

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:

Collins Radio Company
Sales Service Department
Cedar Rapids, Iowa

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 or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)