TM 11-4031

WAR DEPARTMENT TECHNICAL MANUAL

RADIO TRANSMITTERS

T-14/TRC-1, T-14A/TRC-1, T-14B/TRC-1, T-14C/TRC-1, T-14D/TRC-1, and T-14E/TRC-1

REPAIR INSTRUCTIONS

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TM 11–4031, Radio Transmitters T–14/TRC–1, T–14A/TRC–1, T–14B/TRC–1, T–14C/TRC–1, T–14D/TRC–1, and T–14E/TRC–1, Repair Instructions is published for the information and guidance of all concerned.

[AG 300.7 (10 Oct. 45)]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL
Chief of Staff.

OFFICIAL:
EDWARD F. WITSELL
Major General
Acting The Adjutant General.

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

CONTENTS

SECTION I

DESCRIPTION OF RADIO TRANSMITTERS T-14/TRC-1, T-14A/TRC-1, T-14B/TRC-1, T-14C/TRC-1, T-14D/TRC-1, and T-14E/TRC-1*

1. General

a. Official nomenclature followed by (*) is used to indicate all models of the equipment included in this Technical Manual. Thus, Radio Transmitter T–14(*)/TRC–1 represents Radio Transmitters T–14/TRC–1, T–14A/TRC–1, T–14B/TRC–1, T–14C/TRC–1, T–14D/TRC–1 and T–14E/TRC–1, which are treated together in this manual. For brevity, equipment indicator letters are omitted. For example, T–14(*)/ is used to represent T–14 (*)/TRC–1, and T–14B/ represents T–14B/TRC–1.

Figure 1. Radio Transmitter T–14A/TRC–1.

b. Radio Transmitter T–14(*) / (fig. 1) is a basic component of Radio Set AN(*) /TRC–1, Radio Terminal Set AN(*) /TRC–3, and Radio Relay Set AN(*) /TRC–4. It is an 11–tube, 50–watt, frequency-modulated transmitter designed for operation at frequencies of 70 to 99.9 megacycles (mc). The transmitter oscillator is crystal-controlled. The phase shift method is utilized to obtain frequency deviation. Power may be supplied from commercial power lines, when available, or by means of gasoline-engine-driven alternator, Power Unit PE–75–(*). The transmitter nominal power output of 50 watts may be increased to 250 watts by using an auxiliary power amplifier which has been designed for this purpose and which is a basic component of Radio Set AN(*) /. The transmitter with its associated amplifier and power supply is illustrated in figure 2.

c. Operating Characteristics.

Type of modulation.	Phase shift.
Operating range	25 to 150 miles.
Crystal frequency	729.167 kc to 1,040.625 kc.
Crystal frequency multiplication.	96.
Operating frequency.	70.0 mc to 99.9 mc.
Frequency deviation.	30 kc maximum.
Preset channels	1.
Channels available.	300.
Channel spacing	100 kc.
Type of transmission.	Voice or multichannel, telephone, telegraph, or facsimile.

* See TM 11–2601 for installation, operation, and other maintenance data on this equipment.

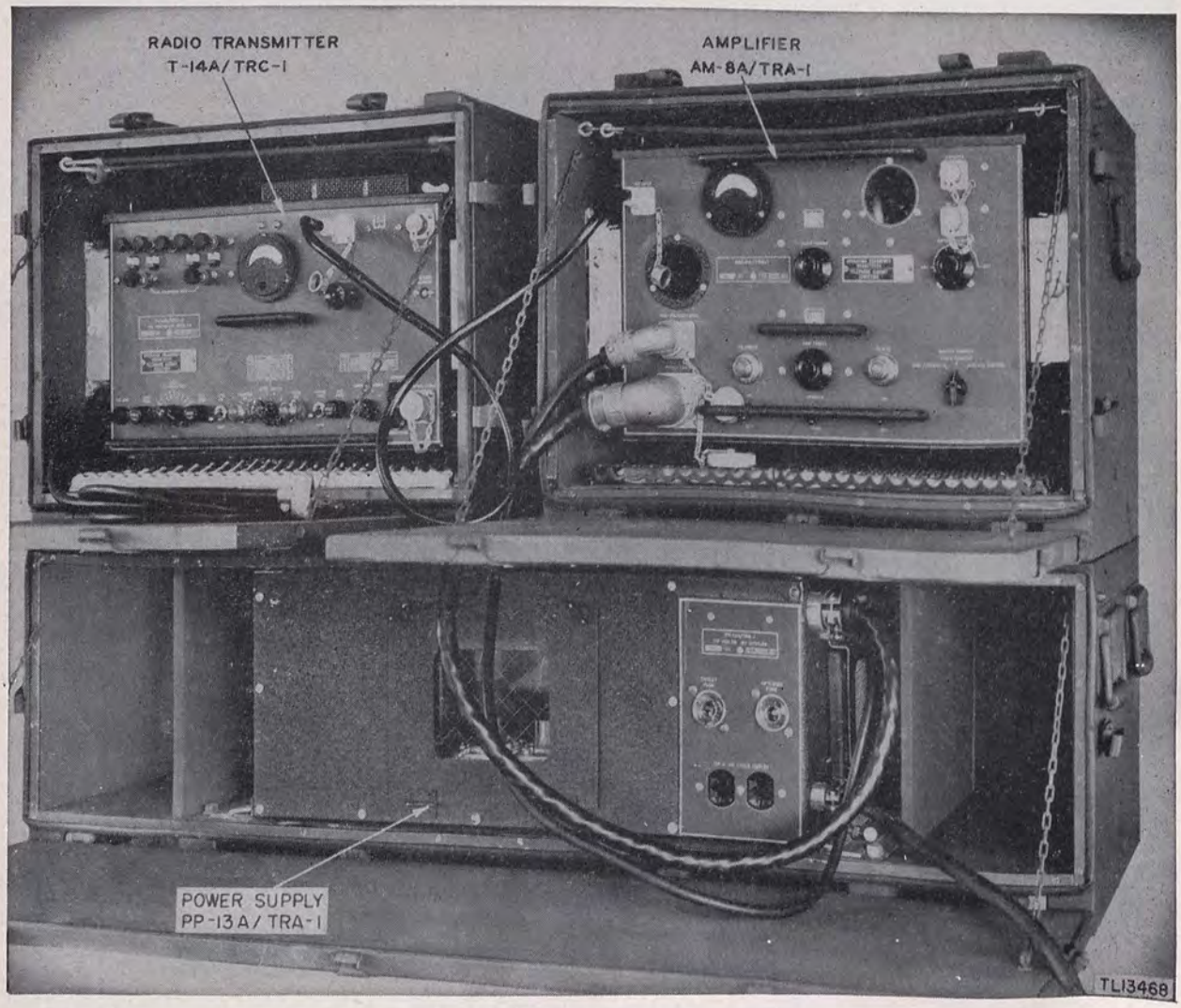

Figure 2. Radio Transmitter T–14A/, with associated power amplifying equipment.

Audio input level_0 to −12 dbm for 9-kc deviation.

Audio input impedance.

High fidelity_500 ohms.

Microphone___30–50 ohms for single button carbon microphone.

Output impedance. 50–100 ohms into a concentric line.

Audio response.

High fidelity_±½ db, 500–12,000 cps; −3 db at 200 cps.

Microphone__±3 db, 250–2,500 cps; −30 db at 3,000 cps and up.

Power input_____115 V, 50–60 cycles ac, 250 watts.

Power output____50 watts max, 10 watts on low power.

With power amplifier. 250 watts.

Number of tubes__11.

Antenna_____Half-wave dipole with director and reflector elements; supported by a 40-foot mast.

Weight_____108 pounds.

2. Over-all System Function

a. General. The electrical circuits of Radio Transmitter T–14(*)/ operate in a conventional manner as illustrated by the block diagram of figure 3 and the chart of tubes and their functions.

b. Tube and Function Chart. The symbol (U) denotes the unlettered model in this chart.

Circuit symbol	VT. No.	JAN No.	Function	Applicable models
V1___	VT–231__	6SN7GT___	Crystal oscillator, audio amplifier.	All models.
V2___	VT–112__	6AC7_____	Oscillator amplifier____	All models.
V3___	VT–229__	6SL7GT___	Phase modulator_____	All models.
			First doubler_____	D, E.
V4___	VT–112__	6AC7_____	Tripler_____	All models.
V5___	VT–107A_	6V6GT/G__	Quadrupler_____	(U)A, B, C.
			Second doubler_____	D, E.
V6___	VT–107A_	6V6GT/G__	First doubler_____	(U), A, B, C.
			Third doubler_____	D, E.
V7___	VT–107A_	6V6GT/G__	Second doubler_____	(U), A, B, C.
			Fourth doubler_____	D, E.
V8___	VT–107A_	6V6GT/G__	Third doubler_____	(U), A, B, C.
			Fifth doubler_____	D, E.
V9___	VT–259__	829_____	Power amplifier_____	All models.
V10__	VT–216__	816_____	Power rectifier_____	(U).
		5R4GY____	Power rectifier_____	A,B,C,D,E.
V11__	VT–216__	816_____	Power rectifier_____	(U).
		5R4GY____	Power rectifier_____	A,B,C,D,E.

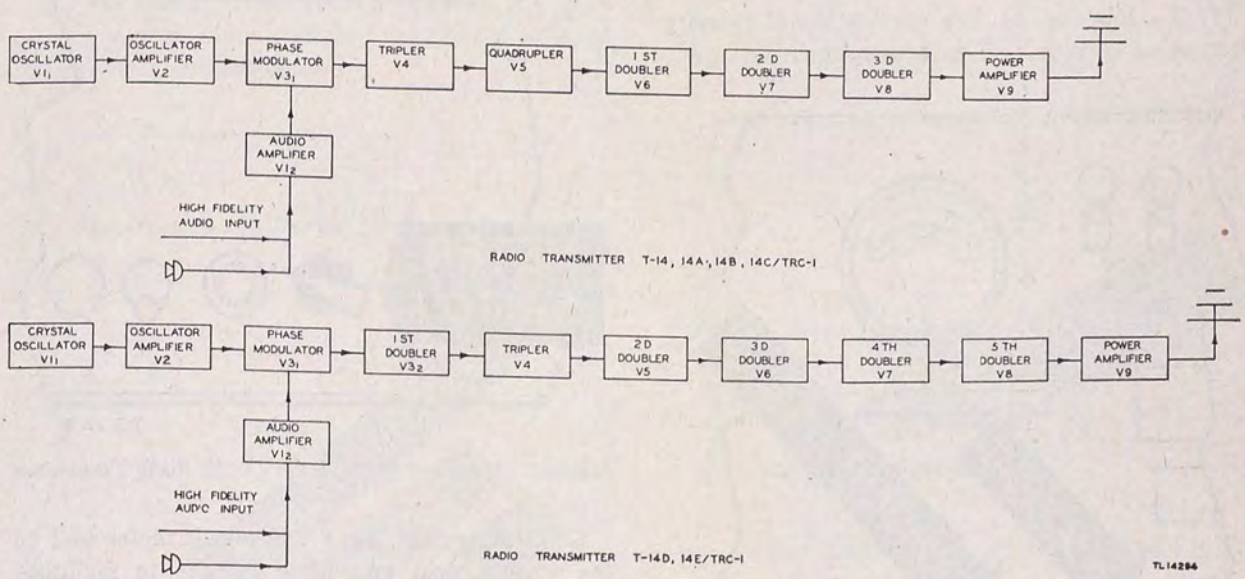

Figure 3. Block diagrams for Radio Transmitters T–14/, T–14A/, T–14B/, T–14C/, T–14D/, and T–14E/.

c. FUNCTION OF CONTROLS. The function of various controls on the transmitter panel is described below.

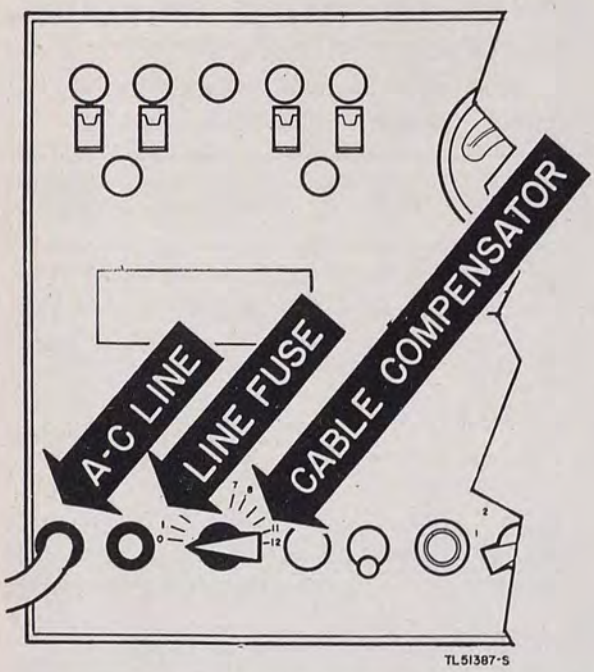

Figure 4. A-C LINE, LINE FUSE, and CABLE COMPENSATOR, Radio Transmitter T–14(*)/.

(1) *A-c line* (fig. 4). For application of primary alternating current (ac) to transmitter.

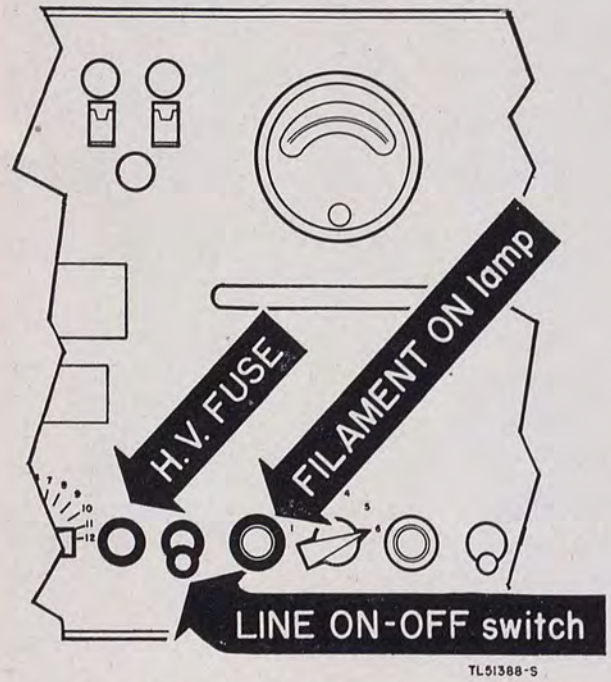

Figure 5. H. V. FUSE, FILAMENT ON lamp, and LINE ON-OFF switch, Radio Transmitter T–14(*)/.

(2) *Line fuse* (fig. 4). For protection from damage caused by shorts and overloads.

(3) *Cable compensator switch* (fig. 4). For adjusting amplification in the audio amplifier to compensate for varying degrees of attenuation due to varying lengths of telephone line or cable. Calibrated in decibels referred to 1 milliwatt in 600 ohms (dbm).

(4) *H. V. fuse* (fig. 5). A 250-milliampere (ma) fuse to protect transformer T8 and rectifier tubes V10 and V11.

(5) *Line on-off switch* (fig. 5). In the ON position 115-volt a-c primary power is connected to the transmitter.

(6) *Filament on lamp* (fig. 5). Lights when LINE ON-OFF switch is in ON position.

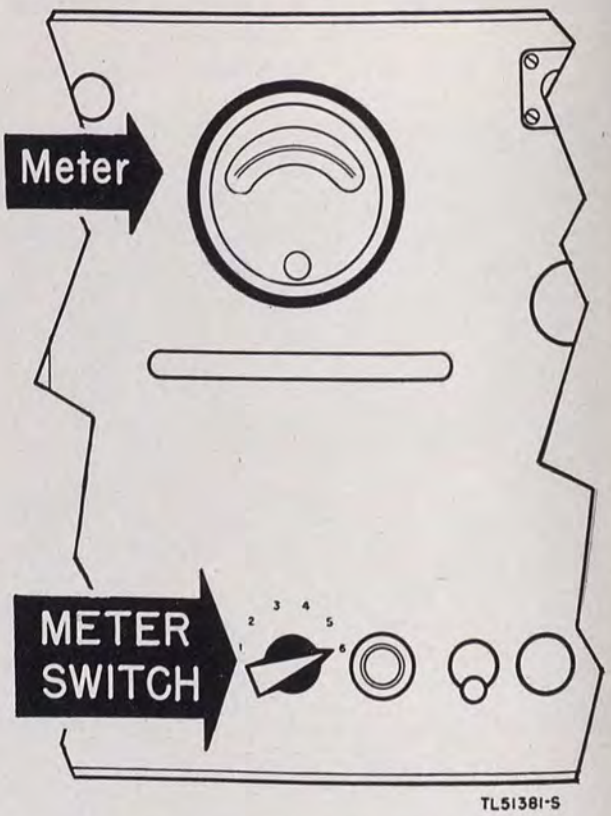

Figure 6. Meter and METER SWITCH, Radio Transmitter T–14(*)/.

(7) *Meter switch* (fig. 6). Connects meter M-1 to the various grid and plate circuits to facilitate tuning and operation.

(8) *Plate on lamp* (fig. 7). Lights when primary circuit is closed.

(9) *Power high-low switch* (fig. 7). In LOW POWER position, low screen voltage is applied to stage V9, limiting the plate current that can be drawn by this tube to a safe value during the ransmitter tuning operation.

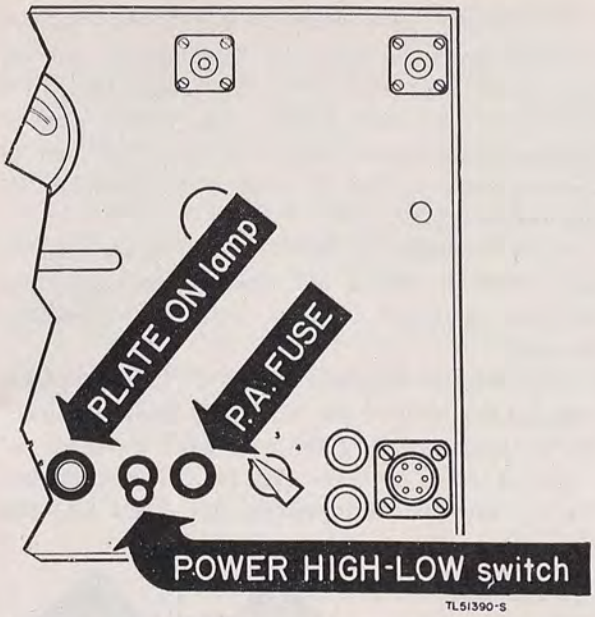

Figure 7. PLATE ON lamp, P. A. FUSE, and POWER HIGH-LOW switch, Radio Transmitter T–14(*)/.

(10) *P. A. fuse* (fig. 7). A 150-ma fuse to protect tube V9 from overload.

(11) *Carrier control switch* (fig. 8). A four-position switch determining how the carrier is to be controlled.

(*a*) *Position 1. Local control.* Carrier is turned on and may be modulated 100 percent by pressing the switch on the handset.

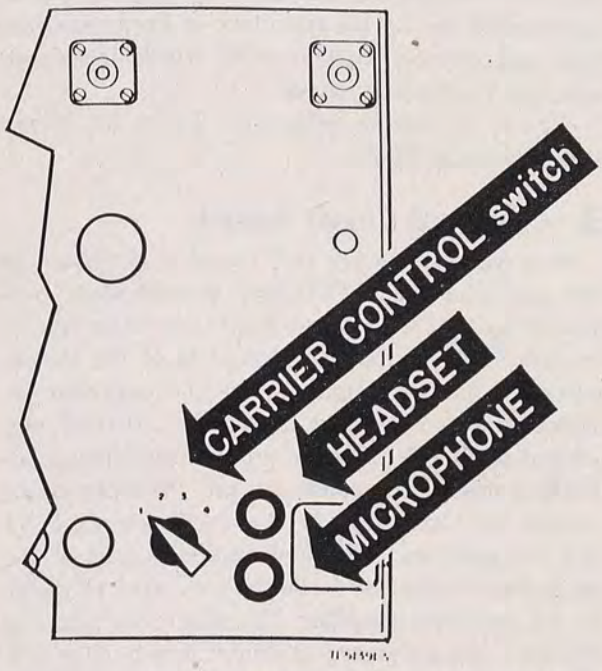

Figure 8. CARRIER CONTROL switch, HEADSET, and MICROPHONE, Radio Transmitter T–14(*)/.

(*b*) *Position 2. Single channel carrier operate.* Carrier may be controlled remotely by land wires or by an incoming signal through the squelch circuit of the associated receiver. The local operator can communicate over the system with 100-percent modulation by using the handset.

(*c*) *Position 3. Multichannel carrier operate.* In this position the transmitter is energized when either the carrier-operated relay in the associated receiver closes, or when the handset switch is pressed. The carrier is controlled, therefore, by an incoming signal or by the switch on the handset. The handset only modulates the transmitter 30 percent under these conditions.

(*d*) *Position 4. Multichannel continuous.* The carrier is on continuously when the switch is in this position. Channel 1 may be used, modulating the transmitter 30 percent without interfering with the other three communication channels being relayed through the circuit.

(12) *Headset and microphone jacks* (fig. 8).

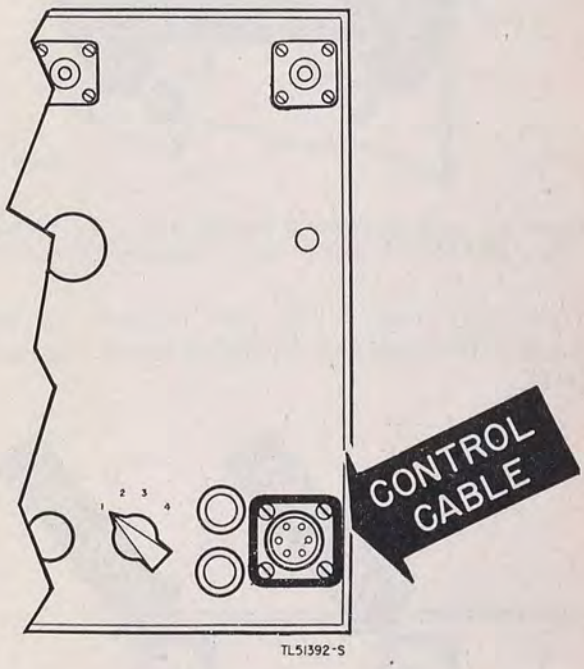

Figure 9. CONTROL CABLE, Radio Transmitter T–14(*)/.

(13) *Control cable receptacle* (fig. 9). Engages the plug of cord used to interconnect transmitter with associated receiver.

(14) *Cable connections* (fig. 10). (*a*) *REC.* At a terminal station, the REC. binding posts connect to the receiving pair of spiral-four cable from Telephone Terminal CF–1–(*) (Carrier). At a

relay station the REC. binding posts are connected to the TRSG. binding posts.

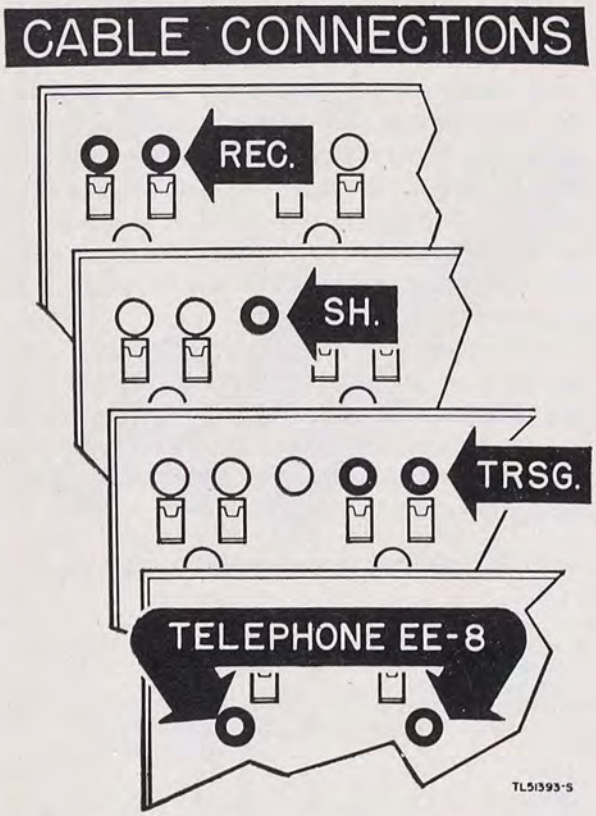

Figure 10. CABLE CONNECTIONS, REC., SH., TRSG., and TELEPHONE EE-8, Radio Transmitter T-14(*)/.

(*b*) *SH. Ground.* This post connects to the shield of the spiral-four cables and also to a ground stake.

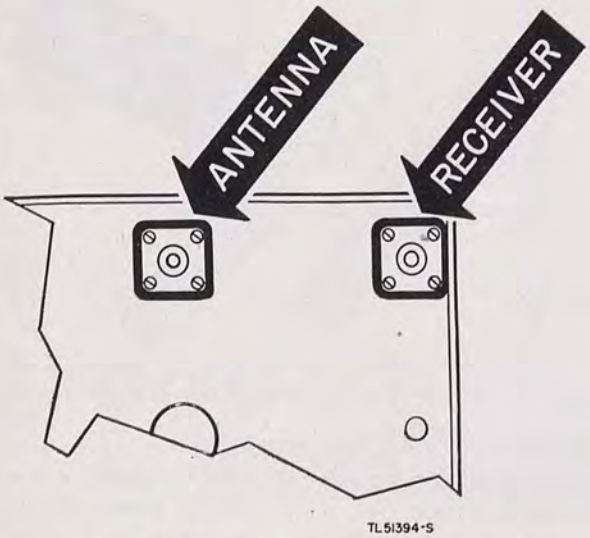

Figure 11. ANTENNA and RECEIVER, Radio Transmitter T-14(*)/.

(*c*) *TRSG.* At a terminal station, this pair of binding posts receives the transmitting pair of spiral-four cable from Telephone Terminal CF-1-(*) (Carrier). At relay station, the TRSG. pair of binding posts are connected to the REC. pair of binding posts so that the receiver can modulate its associated transmitter.

(*d*) *TELEPHONE EE-8.* These posts connect to Telephone EE-8 and enable communication between terminal station and the telephone terminal.

(15) *Receiver receptacle* (fig. 11). This receptacle engages the plug of the cord used to interconnect the antenna circuit of the associated receiver.

(16) *Antenna connector* (fig. 11). The receptacle for the antenna transmission line Cord CD-800 (50-foot).

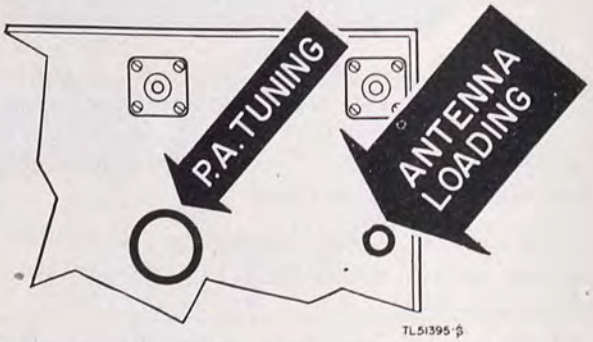

Figure 12. P. A. TUNING and ANTENNA LOADING, Radio Transmitter T-14(*)/.

(17) *Antenna loading capacitor* (fig. 12). The inductive reactance of the antenna coupling circuit is balanced out by the reactance of fixed capacitor C42 and variable capacitor C41 which acts as an antenna loading adjustment.

(18) *P. A. tuning capacitor.* Tunes the power amplifier tank circuit.

3. Condensed Circuit Analysis

a. A radio-frequency (r-f) signal is generated in the oscillator stage (V1) and is accurately controlled by a CT-cut, low-temperature drift, quartz crystal. The crystal operates at 1/96 of the output carrier frequency. Inductor L1 and capacitor C1 resonate at a frequency higher than that of any crystal used. This feature provides sufficient feedback of crystal harmonics, to provide more stable crystal activity. The crystal oscillator stage V1 has two sections. The first section is part of the oscillating circuit and feeds the generated r-f signal to the oscillator amplifier V2, where the signal is amplified and subjected to limiter action, thus providing a substantially constant r-f output to drive the grid of the modulator stage V3.

b. The second section of the crystal oscillator stage V1 is part of the audio input circuit and amplifies the audio input signal. This signal is then bypassed around the oscillator amplifier V2 and modulates the r-f signal on the grid of the modulator stage V3.

c. Phase modulation takes place in the first section of the modulator stage which results in a current in the r-f choke L2 that varies in phase and frequency.

d. The function of the second triode section of V3 varies according to the model letter. In Radio Transmitters T–14/, T–14A/, T–14B/, and T–14C/ this triode section is not used. In the D and E models it is used as a first frequency doubler.

e. At stage V4, the r-f frequency is not high enough to permit the 30–kc deviation required of this transmitter. The signal is therefore passed through stages V4, V5, V6, V7, and V8 for amplification and frequency multiplication. The output of stage V8 is a frequency-modulated (f-m) carrier of 96 times the crystal frequency. The signal is then passed through stages V9, V10, and V11 for voltage and power amplification.

SECTION II

DIFFERENCES BETWEEN MODELS

4. Design and Operational Differences

a. Transmitter T–14/ uses mercury vapor rectifier Tubes JAN–816 (V10 and V11).

b. Transmitter T–14A/ uses high-vacuum rectifier Tubes JAN–5R4GY (V10 and V11) (fig. 13) in place of the mercury vapor tubes V10 and V11 used in the unlettered model.

c. Transmitter T–14B/ ____ No design or operational differences from T–14A/.

d. Transmitter T–14C/ ____ No design or operational differences from T–14A/.

e. Transmitter T–14D/ has a changed carrier-control switch S4 and antenna relay RL1 to permit grounding the receiver speaker on LOCAL CONTROL (position 1) when MUTE ON-OFF switch S107 (added to Radio Receiver R–19D/TRC–1) is ON and the handset push-to-talk switch is depressed. The second triode section of the phase modulator V3 has been put to use as the first frequency doubler by the installation of transformer T11. (See fig. 14.) The quadrupler stage V5 of the unlettered, A, B, and C models has become the second frequency doubler. The over-all frequency multiplication is still 96 times the crystal frequency.

f. Radio Transmitter T–14E/ is the same as the D model.

SECTION III

INITIAL REPAIR PROCEDURE

Note. Before any repairs or adjustments are made, all authorized modification work orders should be applied. See FM 21–6 for applicable MWO's.

5. Tool, Test, and Cleaning Equipment

a. Tools. The usual radio repairman's assortment of hand tools such as soldering iron, screw drivers, pliers, alignment tools, etc., will suffice for repair of this equipment.

b. Cleaning Equipment. Solvent, Dry-cleaning should be used for general cleaning purposes. This should be supplemented with the customary shop cleaning materials and accessories such as compressed air, pipe cleaners, dental mirrors, paint brushes, sandpaper, crocus cloth, etc.

c. Test Equipment.

Item	*Description*
Handset TS–15–C	Standard handset with microphone and earphone. 50-ohm microphone impedance. 250-ohm earphone impedance. Butterfly type switch.
Power cord	To supply 115-v a-c power to transmitter.
Output meter	Nominal impedance of 10,000 ohms.
Voltohmmeter	20,000 ohms per volt on dc and 1,000 ohms per volt on ac. Capable of measuring up to 500 volts and up to 15 megohms.
Dummy antenna	50-ohm impedance noninductive.
R-f ammeter	Capable of measuring 1 ampere r-f.
Radio receiver	For checking deviation. Capable of receiving an f-m signal of 70 to 99.9 megacycles, deviated 30 kc. Radio Receiver R-19 (*)/TRC-1 is recommended.
Standard transmitter	Capable of transmitting an f-m signal of 70 to 99.9 megacycles, deviated 30 kc. A tested Radio Transmitter T–14/ is recommended.
Audio signal generator	An output of 1 volt is required.
F-m signal generator	Capable of generating f-m signals 70 to 99.9 megacycles, deviated 30 kc.

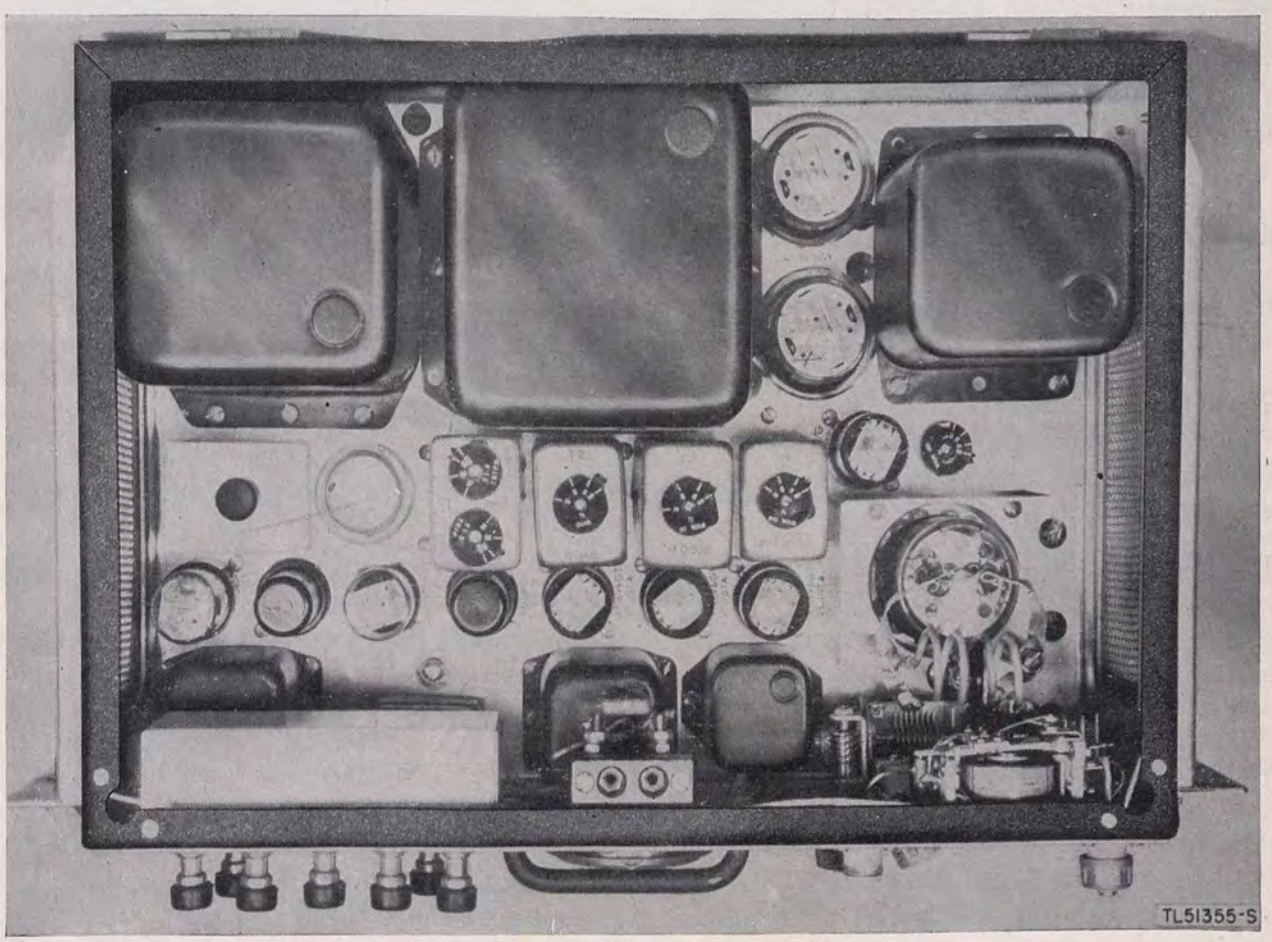

Figure 13. Top of chassis, Radio Transmitters T–14A/, T–14B/, and T–14C/.

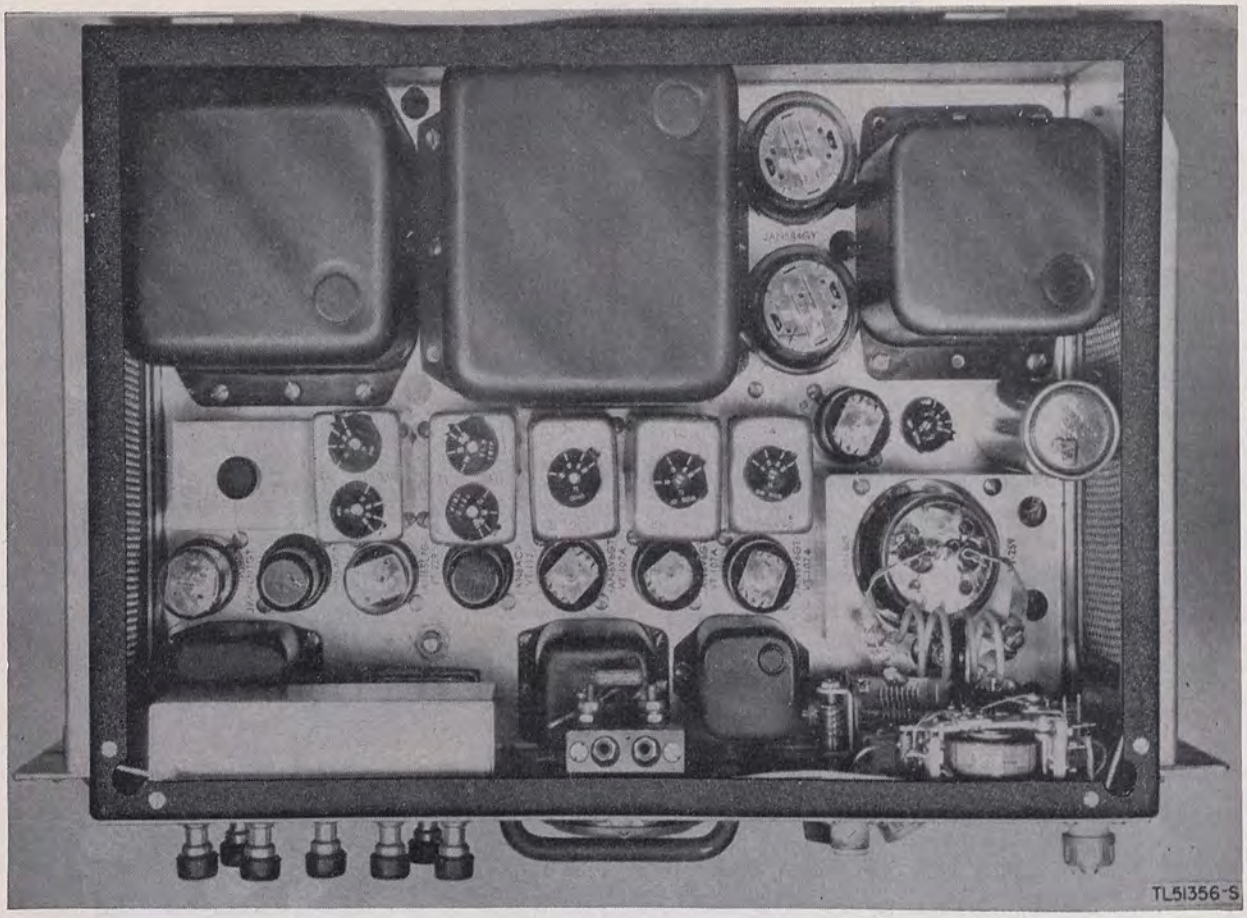

Figure 14. Top of chassis, Radio Transmitters T–14D/ and T–14E/.

6. Removal of Transmitter from Case

Loosen two Dzus fasteners on either side of transmitter. Grasp handle and slide transmitter out.

7. Removal of Bottom Plate

To remove the transmitter bottom plate, turn the four Dzus fasteners ¼ turn counterclockwise with screw driver.

8. Removal of Top Cover

Top cover may be removed by turning the two Dzus fasteners and shifting cover. Push cover to left to release hinges. Fan and motor are located on cover.

9. Removal of Tubes

a. Two Tubes JAN–5R4GY, located at the right rear of set are removed by loosening snap clamps at base of tube and lifting tube from socket.

b. To remove stubby glass tube VT-259, remove two Fahnestock clip connectors on top of tube and rock gently. When replacing this tube, be sure that prong with widest section goes into hole nearest front of set.

c. All other tubes are easily removable.

10. Removal of Fan Blade Shield

The fan blade shield located on top cover may be removed by loosening six screws from underside of top cover.

11. Removal of Fuses

a. LINE AND P. A. FUSES. These fuses may be removed by hand. Turn one-quarter way left and withdraw fuse.

b. H. V. FUSE. This must be removed with a screw driver. Turn three and a quarter times to the left and withdraw.

12. Removal of Pilot Lights

Unscrew top nut with a wrench and lift out. Remove light bulbs for testing.

13. Removal of Crystal

To remove crystal, pull cover off crystal oven (fig. 13) by grasping handle. Pull crystal out of socket by rocking gently.

14. Removal of Air Filters

The air filters are located within the runner assemblies on either side of the transmitter. They may be removed by pulling them out from the back.

15. Removal of Meter

Remove the wiring connected to the back of the meter by unscrewing the three nuts and lugs from the back of the meter. Remove the three screw and bolt assemblies attaching meter to panel and lift meter out.

16. Chassis Cleaning, Inspecting, and Lubricating

a. CLEANING. Thorough cleaning of the transmitter is necessary to insure optimum performance and to prevent corrosion, rust, and dirt from damaging parts or causing arc-over or low-resistance leakage between high-voltage parts and ground. Remove loose dust and dirt with a brush or blower. Remove dirt or grease which adheres to the chassis or parts with a brush or cloth and dry-cleaning solvent (SD). Remove shield covers from covered parts and clean with a small brush or pipe cleaner and dry-cleaning solvent (SD). Clean tuning capacitor bearings with dry-cleaning solvent (SD). If this is not available and there is no stenciling on the set, use alcohol for cleaning. If there is stenciling, use a solution of 50 percent alcohol and 50 percent xylol. The filters should be inspected and replaced when they appear dirty.

Caution: The use of carbon tetrachloride is to be avoided since this compound will slowly break down in the presence of water or moisture to form small amounts of hydrochloric acid.

b. INSPECTING. After the transmitter has been thoroughly cleaned, make a visual inspection of parts and wiring for rust, corrosion, loose connections, frayed or burned insulation, loose screws, and burned or charred resistors and coils. Make a thorough and careful inspection of tube sockets for broken contacts. The wave-band switches must be checked for loose or bent contacts or broken insulation, and terminal boards for broken lugs and signs of burning. Inspect all tuning-dial gears, setscrews and antenna-relay contacts. Inspect fuses on front panels for efficient operation, since they protect against accidental shorts and overloads in the unit.

c. LUBRICATING. (1) Lubricate the tuning capacitor gear drive assembly with Grease, Lubricating, Special. This is a light grease such as Army-issue machine-gun grease and is suitable for use at all temperatures at which this receiver is designed to operate.

(2) For other moving parts requiring an oil lubricant use Oil, Lubricating, Preservative, Special. This oil is similar to commercial high-grade, low-pour-test, oxidation-inhibited mineral oil, and is suitable for use at all temperatures at which this receiver is designed to operate.

(3) For general information on lubrication, see TB SIG 69.

17. Cleaning, Inspecting, and Testing of Tubes

a. CLEANING. Clean tubes with a cloth moistened with dry-cleaning solvent (SD) and, if necessary, clean grid caps and prongs with crocus cloth.

b. INSPECTING. Inspect tubes for cracks in glass or base and for bent or broken prongs.

c. TESTING. Test tubes for low emission, leakage, and short circuits with a tube tester, or place doubtful tubes in a transmitter known to be operating normally. This last method entails the replacement of a doubtful tube for a good tube in the other set. Failure of this second set to operate indicates that a defective tube was tested. Test all tubes, since two or more tubes may be defective.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

18. Input Resistance Measurements

a. GENERAL. Troubles within the transmitter can often be detected by checking the resistance of the filament and high-voltage circuits at the power-input terminals before applying power to the equipment, thereby preventing damage to the power supply. Make the following checks before attempting to place the transmitter into operation.

b. PREPARATION. (1) Leave power supply disconnected.

(2) Insert all tubes and dial lamps in their sockets.

(3) Turn CARRIER CONTROL switch to LOCAL CONTROL and place HIGH-LOW POWER switch in LOW POWER position. Throw LINE switch S1 to ON.

(4) Tune transmitter to any frequency.

c. PROCEDURE. By use of the following chart check all input circuits listed.

From pin of plug Pg	*Resistance to ground*
A	infinite.
B	infinite.
C	infinite.
D	Zero ohms.
E	infinite ____ with headset not connected.
E	zero ohms ____ with headset plug in.
F	infinite.
G	infinite.

19. Operating Test

a. PREPARATION. Insert all tubes in their proper sockets, making sure that they are fully seated. Connect grid caps firmly. Secure dial lamp. Connect POWER SUPPLY plug.

b. PROCEDURE. (1) Throw LINE switch to ON.

(2) Listen for crackling or buzzing noises which indicate arcing of high voltage.

(3) Check the transmitter for smoke and the odor of burned or overheated parts.

SECTION V

ALIGNMENT PROCEDURE

20. Preliminary Adjustment of Transmitter for Tuning

Before the transmitter can be operated, the operating frequency must be determined and the transmitter tuned for that operating frequency. Before tuning can be carried out, the following preliminary steps must be taken.

a. Remove all power from the transmitter. Check LINE FUSE, H. V. FUSE, and P. A. FUSE on front panel.

b. Remove Radio Transmitter T–14(*)/ from its shockmounting rack in Case CY–17/TRC–1 by turning the locking fasteners one-quarter turn counterclockwise and pulling on the handle located in the middle of the front panel. The set will slide forward and may then be slid and lifted out of the case.

c. Open the top cover of the transmitter cabinet and check to see that all tubes are in place.

d. Select the proper transmitting crystal for the operating frequency desired and install in the crystal oven.

e. Turn the CARRIER CONTROL switch to position 1 LOCAL CONTROL and place the HIGH-LOW POWER switch in the LOW position.

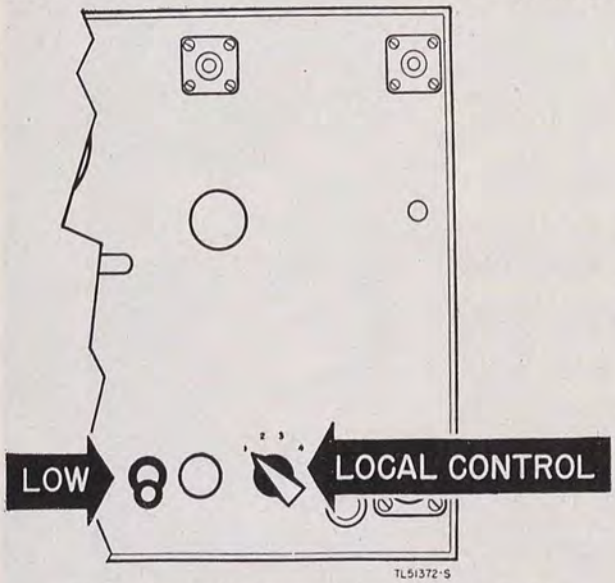

Figure 15. Preliminary panel adjustments, Radio Transmitter T–14(*)/.

f. Insert Plugs PL–55 and PL–68 of handset into the HEADSET and MICROPHONE jacks, respectively, on the front panel. The handset switch may be used to control the plate power while the transmitter is being tuned.

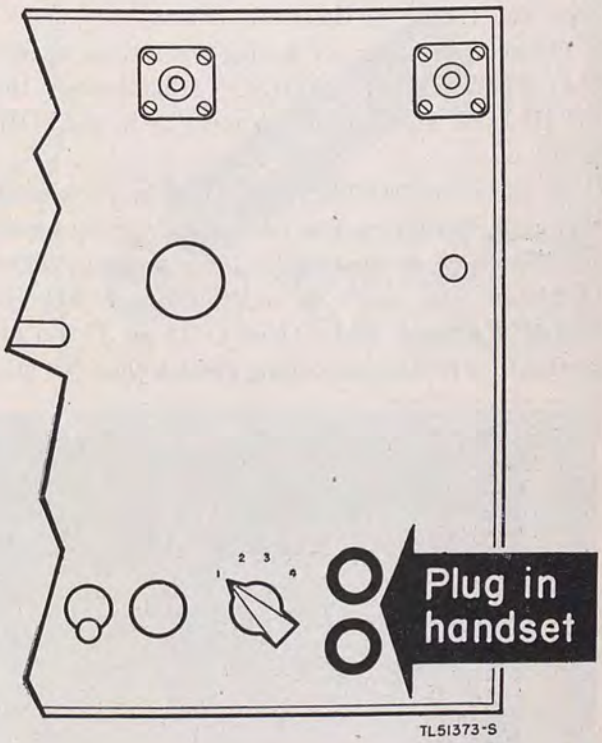

Figure 16. Preliminary panel adjustments, Radio Transmitter T–14(*)/.

21. Tuning Adjustments of Radio Transmitter T-14(*)/

Caution: Voltages dangerous to human life appear on the plate leads of the power-amplifier tube and the power-supply circuits. Do not touch these parts with the plate voltage ON.

All the tuning controls that must be adjusted each time the transmitter is tuned to a channel other than that for which it was preset, are marked to indicate their approximate settings. (See figs. 17 and 18.) With a small screw driver, set the tuning controls on the transformers marked T1, T2, T3, T4, T5, T6, and (in D and E models

only) T11 for the desired operating frequency. A small indicated dial is fastened to the shaft of each tuning capacitor that has to be adjusted over the 70– to 100–mc range. These dials are marked at every 10–mc point between 70 and 100 megacycles. To adjust any of these circuits to a given frequency of operation, rotate the dial until the proper dial marking is opposite the index pointer. Connect the primary power (115 volts ac) to the transmitter by means of the power cord. Throw line switch S1 to ON. The FILAMENT ON (green) pilot lamp should light, indicating that filament power has been applied. After waiting several minutes for the tubes to become thoroughly warm, proceed with the tuning as described below.

Caution: During all tuning operations except the ANTENNA LOADING adjustment, the HIGH-LOW POWER switch must be in the LOW position.

a. Place the METER SWITCH in position 1 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitors C55 and C56 on transformer T11 (in D and E models) and C11 and C12 on T1 (in all models) for maximum reading greater than 0.2 ma. On unlettered, A, B, and C models, tune capacitors C11 and C12 on transformer T1 for a maximum reading of 0.1 to 0.2 ma.

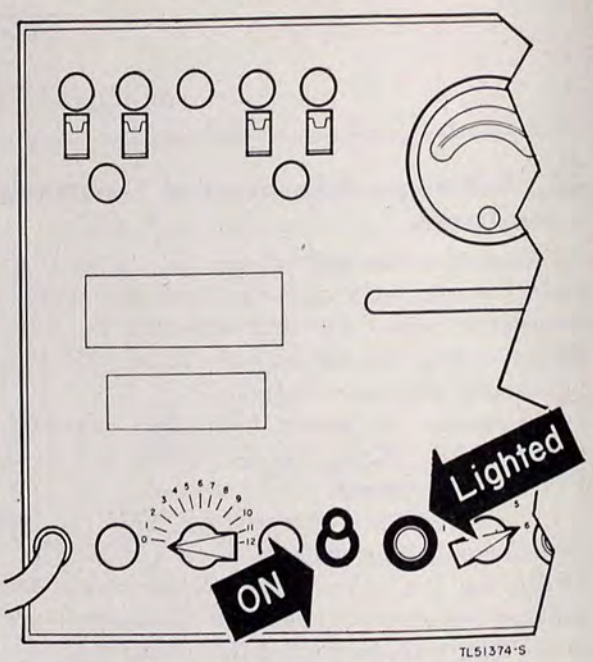

Figure 17. Tuning adjustments, panel controls, Radio Transmitter T–14(*)/.

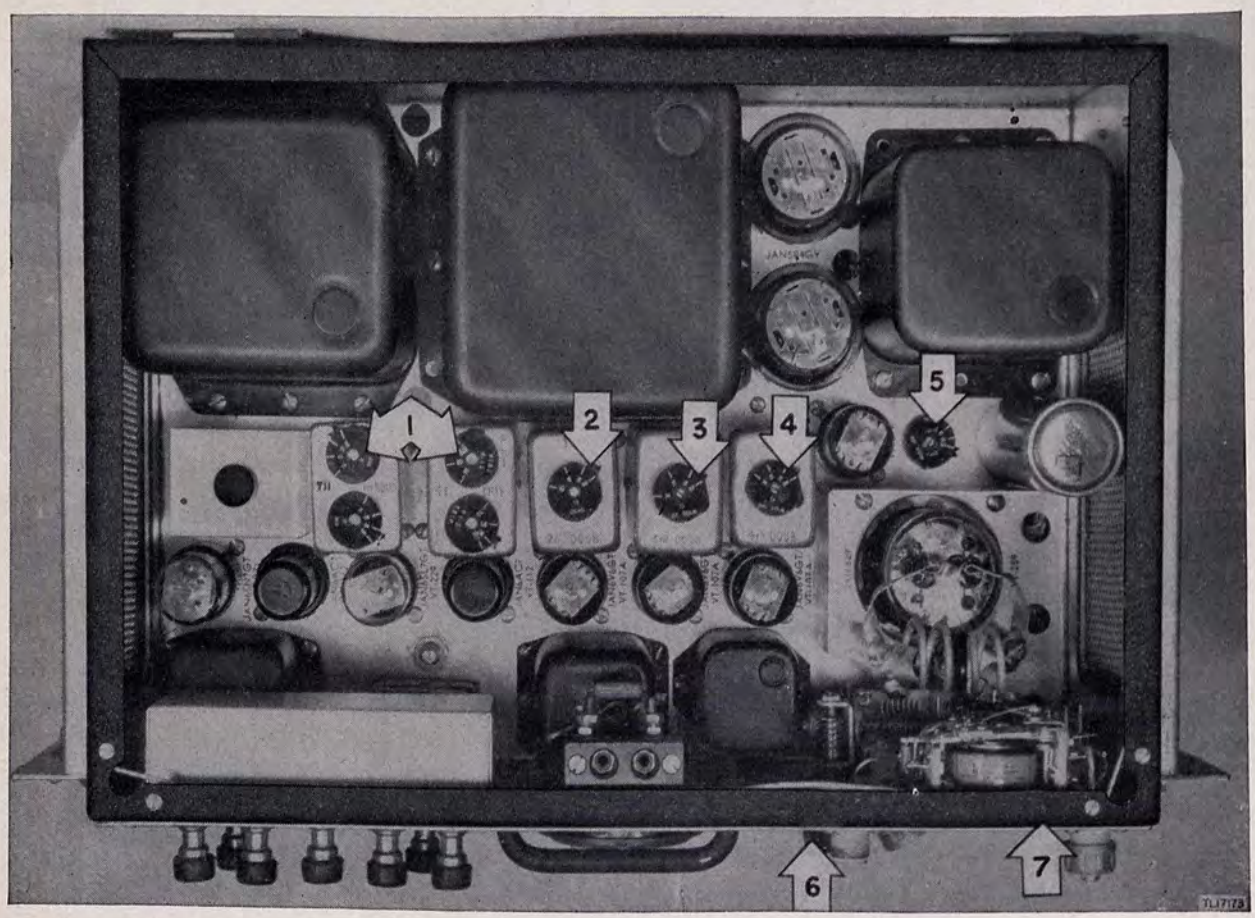

Figure 18. Tuning adjustments, controls, Radio Transmitters T–14/, T–14A/, T–14B/, T–14C/, T–14D/, and T–14E/.

b. Place the METER SWITCH in position 2 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitor C17 on transformer T2 for a maximum reading of 0.4 to 0.7 ma. Readjust capacitors adjusted in step 1 and 2 for maximum.

c. Place the METER SWITCH in position 3 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitors C68 and C69 on transformer T3 for maximum reading of about 2 ma.

d. Place the METER SWITCH in position 4 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitors C70 and C71 on transformer T4 for maximum reading of about 2.5 ma.

e. Place the METER SWITCH in position 5 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitor C32 at the right side of the chassis for a maximum reading of 1.2 to 2.5, actually about 6.0–ma p–a grid current when the correct multiplier is used. Leaving the METER SWITCH in position 5, re-tune T1, T2, T3, and T4 very carefully until maximum reading is obtained.

Note. This careful retuning is essential. Its accuracy materially reduces the interference caused by spurious radiations in the output of the transmitter.

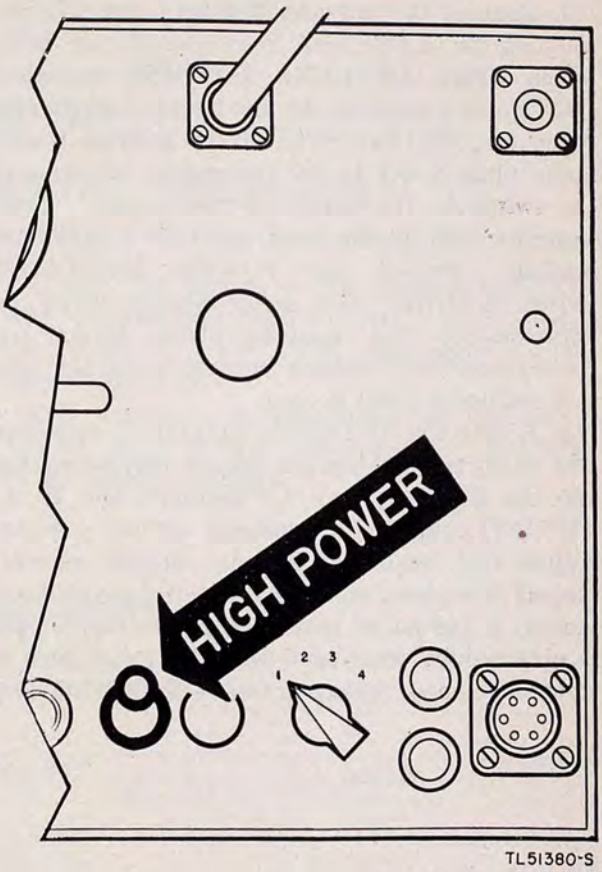

Figure 20. Tuning adjustments for Radio Transmitter T–14(*)/.

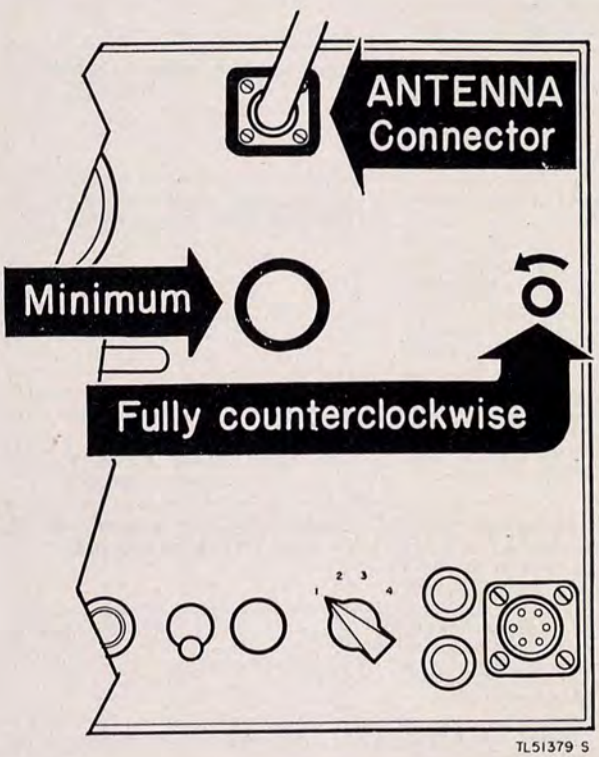

Figure 19. Tuning adjustments for Radio Transmitter T–14(*)/.

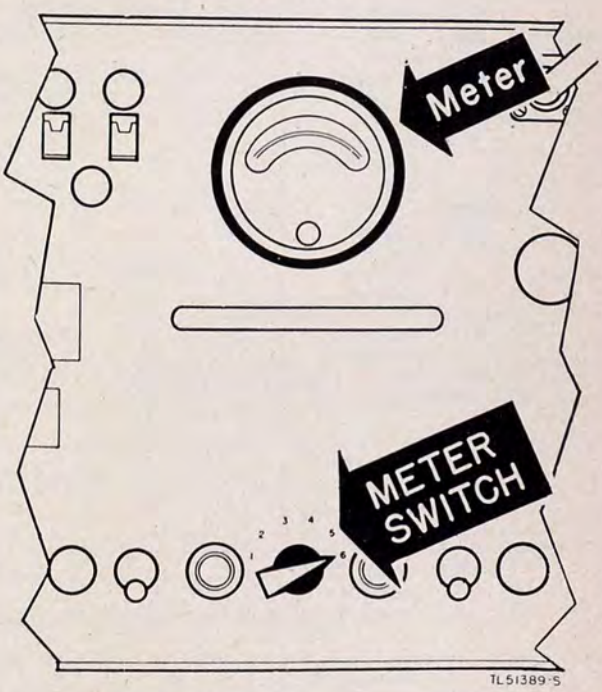

Figure 21. Tuning adjustments for Radio Transmitter T–14(*)/.

f. Connect the antenna through Cord CD–800 (50-foot) to ANTENNA connector P7 on front panel. Turn ANTENNA LOADING capacitor C41 counterclockwise to minimum capacitance. Place the METER SWITCH in position 6 and apply plate power to the transmitter by pressing the switch on the handle of the handset. Tune capacitor C40 on the front panel for a minimum reading. Switch the POWER HIGH-LOW switch to HIGH. The meter reading should be approximately 0.4, actually about 40–ma p-a (power-amplifier) cathode current when the correct multiplier (100) is used.

g. Rotate the ANTENNA LOADING capacitor C41 clockwise until the p-a cathode current reaches 165 ma (1.65 on meter). Readjust the P. A. TUNING controls for minimum cathode current. Adjust C41 again for 165-ma cathode current. Repeat this procedure until the loaded p-a cathode current is 165 ma at resonance and no further dip is obtained by rotating C40. The transmitter is now fully tuned; replace in Case CY–17/TRC–1.

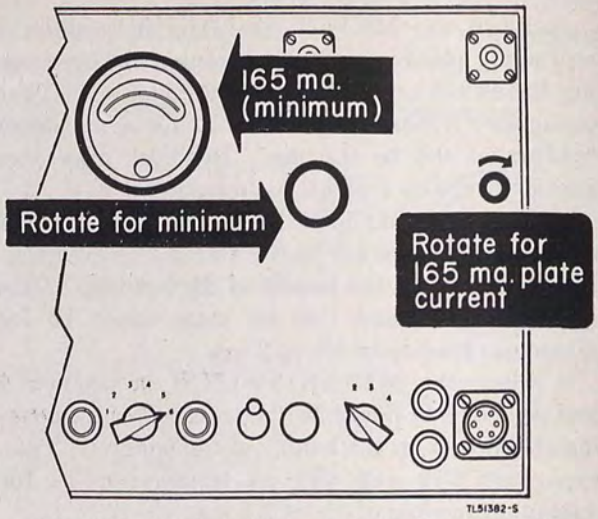

Figure 22. Tuning adjustments for Radio Transmitter T–14(*)/.

Note. D and E models have fixed bias for final plate protection and it is not necessary to exercise the same care in preventing excessive cathode current while tuning. In unlettered, A, B, and C models, it is necessary to exercise extreme care to keep the cathode current from rising excessively during tuning in order to prevent permanent damage to the final amplifier tube.

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

22. General Trouble-shooting Information

a. This section contains general information to aid in the location of trouble in a systematic time saving manner. The principal objective is to sectionalize trouble to a particular stage. When the trouble stage is sectionalized, detailed data to aid in localizing trouble to a particular part in each individual stage may be found in section VIII.

b. The first step in sectionalizing trouble is to take the resistance measurements from tube sockets to ground. For normal ohmmeter readings refer to figure 23.

c. If resistance measurements do not locate trouble, make voltage measurements. See figure 23 for normal readings.

23. Localizing Radio Trouble in Radio Transmitter T-14(*)/

If the cause of failure cannot be traced to misalignment or defective tubes, and it is not apparent from visual inspection, carefully note all trouble symptoms and see chart below.

Symptoms	Probable trouble	Corrections
1. Line fuse blown	1. Short in filament transformer T7 Short in plate transformer T8 Short in fan circuits	1. Replace. Replace. Repair.
2. High-voltage fuse blown	2. Shorted filter capacitors C46, C47 Shorted variable tuning capacitor Shorted bypass capacitors Grounded wiring or filter choke	2. Repair. Repair. Replace. Repair or replace.
3. Power-amplifier cathode fuse F1 blown.	3. Plate circuit of Tube JAN–829 (V9) detuned Failure in drive to Tube JAN–829 (V9) (tube failure, crystal failure). Defective grid leak capacitors C36, C37 Shorted coaxial cable (Cord CD–800)	3. Retune. Check and replace damaged part. Replace. Replace.
4. No plate voltage (not due to blown fuse or short circuit).	4. Open circuit in transformers T7, T8 Open circuit in choke CH1 Open plate dropping resistors R32, R33 Defective antenna transfer and plate control relay RL1 Defective plate thermal relay TD3 Defective selenium rectifier RE1 Defective CARRIER CONTROL switch S4 Defective rectifier tubes (V10, V11)	4. Replace. Replace. Replace. Repair or replace. Replace. Replace. Replace. Replace.
5. No filament voltage (not due to blown fuses).	5. Defective filament transformer T7 Open lead in filament circuits	5. Replace. Repair.
6. Low plate voltage and low filament voltage.	6. Line voltage low	6. Check power source.
7. No filament or plate voltage (not due to blown fuses).	7. Defective line switch S1 Poor contact of a-c line plug P6 Open or shorted a-c line cord Loose or open wires	7. Replace. Check contact. Repair. Repair.
8. Set overheats	8. Dust-clogged air intake filters Defective fan Partial shorts in power supply causing excessive load on power transformer.	8. Clean or replace. Replace Repair.
9. Transmitter is microphonic	9. Defective crystal Defective tubes V1, V2, or V3	9. Replace. Replace.
10. Handset not receiving	10. Control cable (Cord CX–104/TRC–1) defective Handset jack J2 defective	10. Replace. Repair.

23. Localizing Radio Trouble in Radio Transmitter T-14(*)/ (Contd.)

Symptoms	Probable trouble	Corrections
11. Tuning indicator M1 fails to read (voltages normal, stages tuned).	11. Defective meter Meter pointer sticking Meter circuit open METER SWITCH S3 defective	11. Replace. Tap on meter glass or replace. Repair. Repair.
12. Meter readings low	12. Tube deterioration	12. Replace.
13. Meter readings incorrect	13. Low line voltage Stage not properly tuned Defective meter shunts R34, R35	13. Check power source. Retune. Replace.
14. High-fidelity frequency response not uniform, causing one or more channel levels to be affected during multichannel system operation.	14. High-fidelity cable terminals P1, P2, P4, or P5 grounded through the lightning protector blocks.	14. Repair.
15. Motorboating from input at TRSG. terminals.	15. CABLE COMPENSATOR gain control (R4) setting too high.	15. Reset.
16. High hum level introduced in input at TRSG. terminals.	16. Binding posts P4 or P5 grounded through lightning protectors A3 or A4.	16. Repair protectors.
17. High hum level introduced in local microphone input at jack J1.	17. Defective selenium rectifier filtering (R40, R41, C50, C51).	17. Replace defective part.
18. High hum level in both local microphone circuit and high-fidelity input.	18. Hum filters C48, C49 defective, transmitter not yet grounded.	18. Replace capacitors. Ground transmitter.
19. Transformer T1 does not tune (power supply voltages normal).	19. No crystal in oven Crystal not making good contact in socket Defective tubes V1, V2, V3, V4 Open or short circuits in circuits of V1, V2, V3, V4 Defective crystal	19. Place crystal in oven. Replace. Replace.
20. One of the stages (T2, T3, T4, or T5) fails to tune.	20. Defective tube No drive from previous stage Open or shorted bypass capacitor, tuning capacitor, or coupling capacitor. Open or shorted resistors Defective r-f coils preceding stage	20. Replace. Retune previous stage. Repair or replace. Replace.
21. Power amplifier V9 fails to tune.	21. No or low grid drive Transmitter not tuned properly Defective power-amplifier tube V9 Defective grid-leak resistors or capacitors Defective plate tuning capacitor O40 or plate coil L3.	21. Replace power-amplifier tube. Retune. Replace. Replace. Repair.
22. No r-f output from transmitter.	22. Defective antenna loading capacitor C41 Defective antenna coupling capacitor C42 Defective antenna coupling coil L4 Defective contacts on antenna transfer and plate control relay RL1. Defective antenna connector P7 POWER HIGH-LOW switch S2 defective Defective antenna equipment	22. Replace. Replace. Replace. Repair or replace. Replace. Repair or replace.
23. No modulation from TRSG. terminals.	23. Defective input transformer T6 Defective CABLE COMPENSATOR R4 Binding posts P4 or P5 shorted to ground through lightning protectors. Open resistors R3, R5 Jumper from REC. terminals to TRSG. terminals missing (in relay operation). Control cable defective (in relay operation)	23. Replace. Replace. Repair lightning protectors. Replace. Connect jumper wire. Replace.

23. Localizing Radio Trouble in Radio Transmitter T-14(*) / (Contd.)

Symptoms	Probable trouble	Corrections
24. No modulation from local microphone circuit.	24. Bad contacts in microphone jack J1	24. Repair.
	Defective selenium rectifier RB1	Replace.
	Open or shorted rectifier filter net-work	Repair.
	Defective filament transformer T7	Replace.
	Defective low-pass filter T9	Replace.
	Defective CARRIER CONTROL switch S4	Replace.
	Defective CABLE COMPENSATOR R4	Replace.
	Defective microphone transformer T10	Replace.
	Defective handset	Replace.
25. Noisy operation of fan FM1.	25. Fan blades loose on shaft	25. Tighten blades.
	Transmitter cover not fastened tightly	Fasten cover.
26. Fan motor does not operate (when temperature is high enough).	26. Fan thermal relay TD2 defective	26. Replace.
	Defective fan motor	Replace.
	Bad contact of fan connectors P10, P11	Repair.

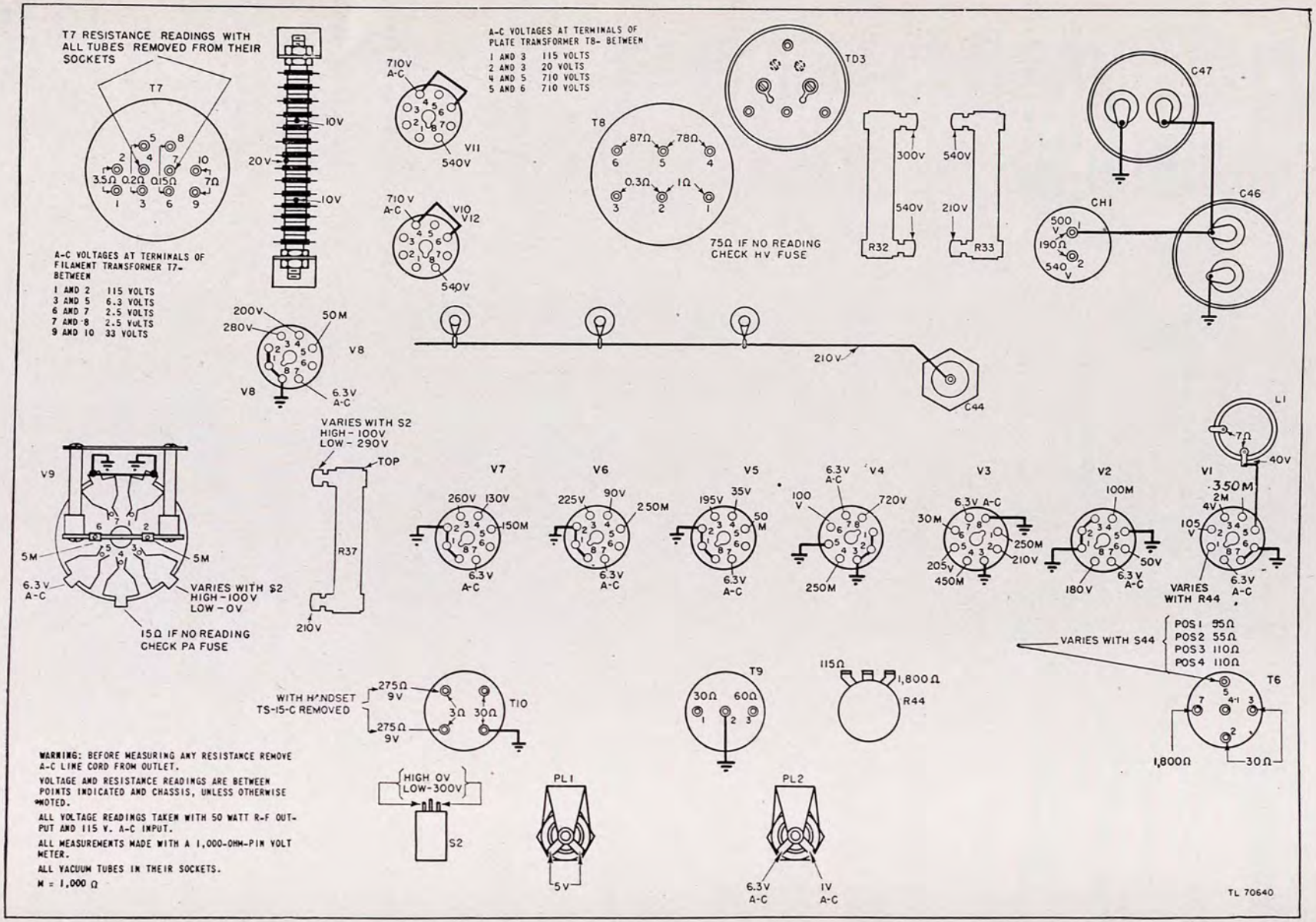

Figure 23. Radio Transmitter T-14(*)/—voltage and resistance diagram.

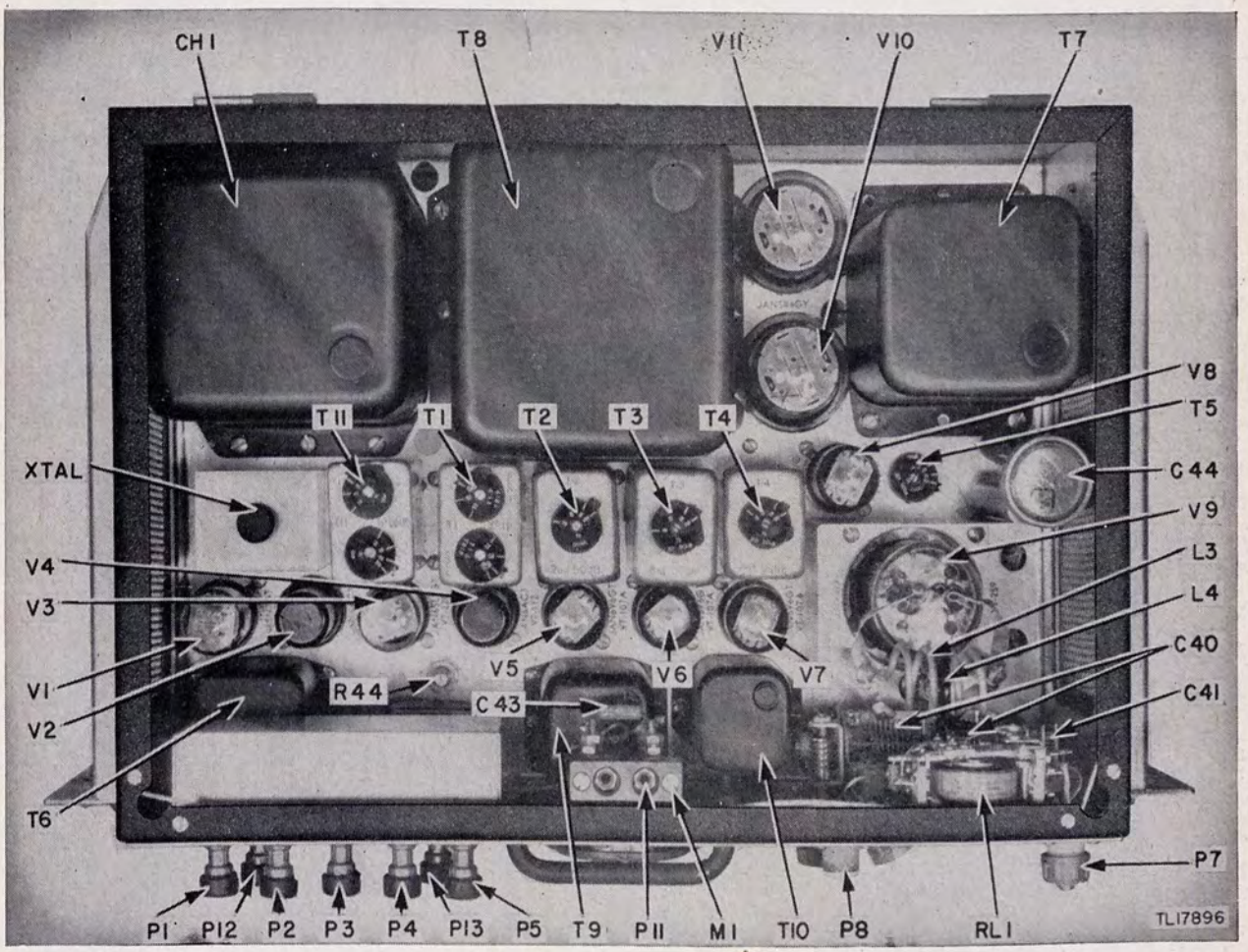

Figure 24. Radio Transmitter T–14(*)/—top view showing parts location.

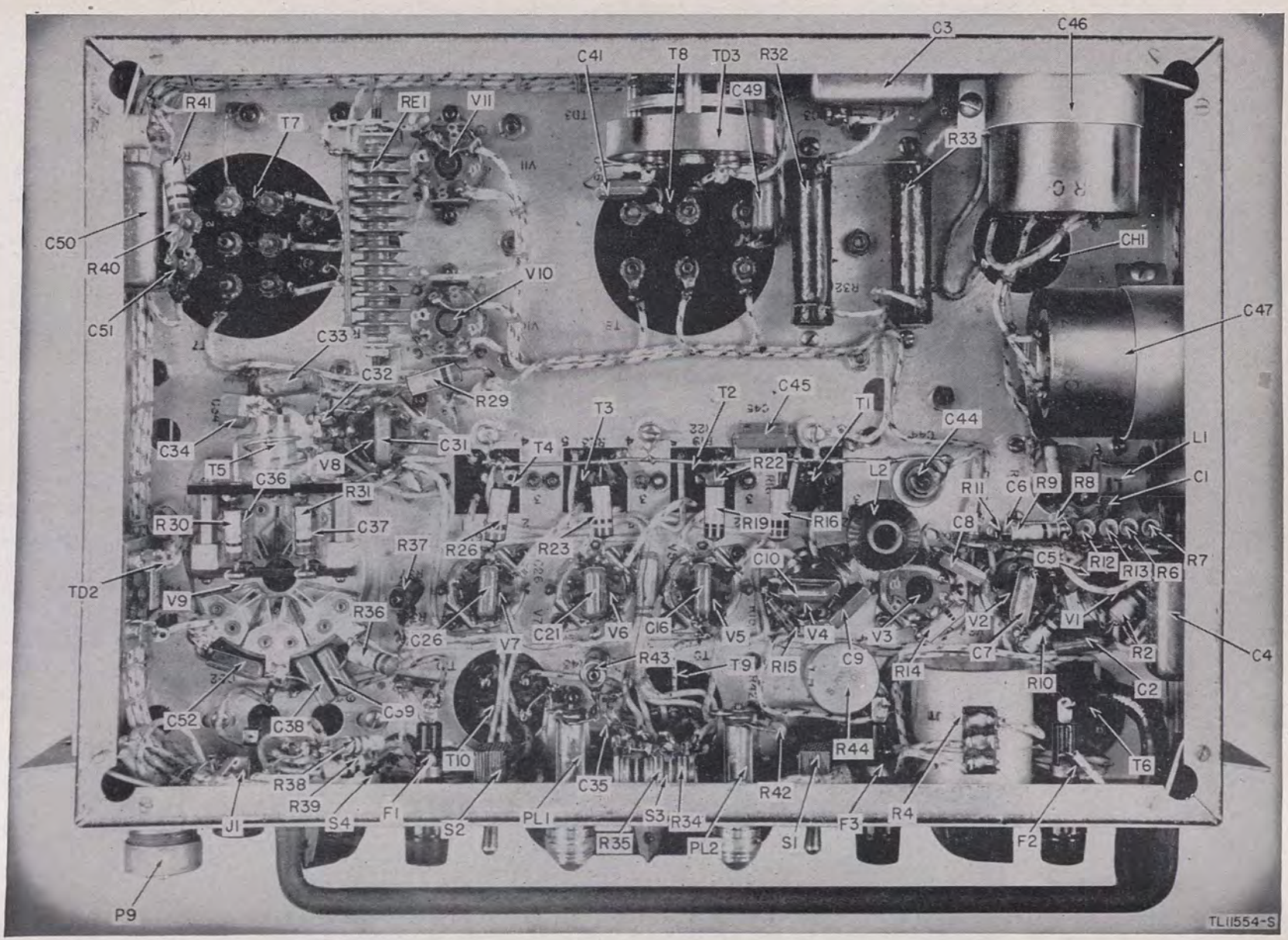

Figure 25. Radio Transmitter T-14(*)/—bottom view showing parts location.

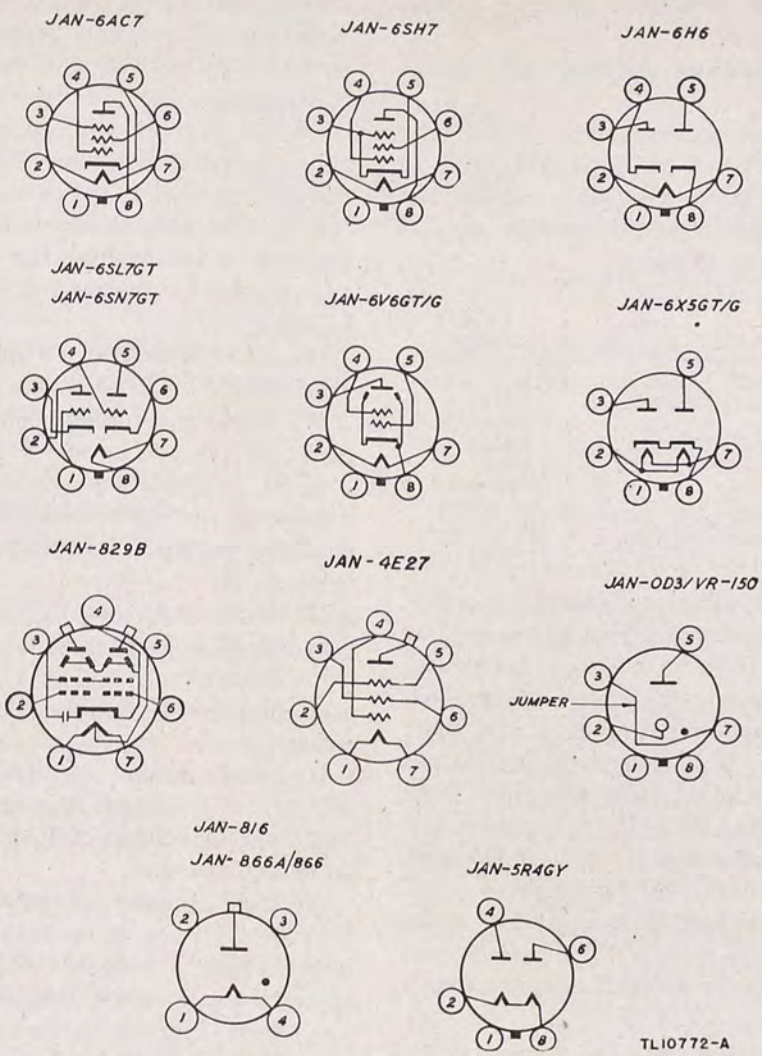

Figure 26. Tube base connections.

24. Trouble-shooting Recheck

a. If the cause of trouble still remains unknown, a recheck of troubles and their possible causes in the following manner may prove effective.

(1) *No operation.* (*a*) Check main line fuse F2.

(*b*) Check power circuits to see that primary voltage (110–120 v) is being applied to transmitter power supply. The line-voltage meter on Radio Receiver R–19(*)/ may be used to make this check.

(*c*) Check tubes.

(*d*) Check filament and plate-voltage output of transmitter power supply as follows:

Transformer No.	Pin No.	Voltage
T7	9–10	33.0
	3–5	6.3
	6–8	5.0
T8	6–4	340.0

(*e*) Check socket voltages on the transmitter against voltage charge in figure 23.

(*f*) Check resistance readings on transmitter chassis against resistance chart in figure 23. (All input power must be disconnected for this series of tests.)

(2) *Antenna will not load.* (*a*) Check microphone plug for proper contacts.

(*b*) Test antenna lead for breaks and poor contact.

(*c*) Listen for sidetone in receiver phones.

(*d*) Set METER SWITCH to positions 5 and 6 and check against table below. Follow directions given in (5) below for checking and repair.

(3) *Excessive antenna loading.* (*a*) Check antenna tuning in accordance with procedure outlined in section V.

(*b*) Follow procedure outlined in (2)(*d*) above.

(4) *Weak or dead sidetone.* (*a*) Test microphone and headset cords.

(*b*) Check all operating switches for correct position.

(5) *No operation or poor operation of V5, V6, V7, V8, or V9.* (*a*) Set METER SWITCH in position as given in table below and compare the grid current readings obtained against normal readings given in table below.

Meter switch position	Tuning adjustment	Circuit	Normal current
1	T1	V5 grid	0.1–0.2 ma
2	T2	V6 grid	0.2 ma
3	T3	V7 grid	0.5 ma
4	T4	V8 grid	1.3 ma
5	T4	V9 grid	6.0 ma 75–95 ma (unloaded)
6	C40	V9 plate	165 ma (loaded)

When a subnormal reading is obtained on one of the meter switch positions, check meter reading of preceding stage. If preceding stage appears to be normal, replace tube responsible for low reading and re-tune transformers in grid and plate circuits of new tube. If meter reading is then not up to normal, replace other tubes associated with the off-normal circuit until the discrepancy is rectified. If a normal reading is not then obtained, see (1) above and section VIII for repair.

(*b*) It may be noted here that each stage in the transmitter is acting as a class "C" amplifier and each stage is designed to give considerably more than the minimum output needed to "drive" the succeeding stage. For this reason, no drop in transmitter output will result from one or more tubes depreciating to a considerable extent. Furthermore, because of fm, no loss of quality or modulation level will result from such a condition. A drop in meter reading of less than 25 percent may be taken only as an indication of coming weakness and not as a need for immediate replacement.

(*c*) The condition of the 829 power-amplifier tube (V9) may be checked by observing the off-resonance plate current when p-a tuning capacitor C40 is adjusted for maximum p-a plate current. (Do not leave the plate voltage on longer than necessary to take a reading when C40 is detuned.) Assuming all previous stages are normal, plate current of a new 829 will rise to at least 200 ma off-resonance. As the tube deteriorates, this off-resonance current will approach normal loaded plate current of 165 ma. When the off-resonance current approaches so close to the on-resonance current that only a slight difference is observed, the tube is approaching the end of its useful life and should be replaced if full-power output is required.

(6) *Phase modulator V3 not operating.* (*a*) Set METER SWITCH at position 6.

(*b*) Speak into microphone. A deflection of meter M1 should be noted.

(*c*) If no deflection occurs, check voltages and resistances of phase modulator V3 and of audio amplifier section V1 against measurements given in figure 23.

(7) *Master oscillator V1 not operating.* (*a*) See that crystal is in its socket.

(*b*) Connect one lead of a VTVM to modulator grid (pin No. 4 of V3). Connect other lead to chassis.

(*c*) Read output of master oscillator upon VTVM. If no output is indicated, remove VTVM lead from modulator grid and connect it to oscillator amplifier grid.

(*d*) Read output of crystal oscillator upon VTVM. If there is no indication, the trouble is in this stage. Check tube 6SN7GT (V1) and voltage and resistances of stage as given in figure 23. See section VIII for repair data.

(*e*) If there is output from the crystal oscillator and none from the oscillator amplifier, the trouble is in the oscillator amplifier stage. Check Tube JAN–6AC7 (V2) and voltage and resistances of stage as given in figure 23. See section VIII for repair data.

25. Moistureproofing and Fungiproofing

See TB SIG 13 for general instructions.

26. Refinishing

In accordance with customary shop practice.

SECTION VII

FINAL TESTING

27. General

This section is intended for use in determining the quality of a repaired and overhauled Radio Transmitter T–14(*)/. When all the following requirements have been met, the transmitter is suitable for field operation.

28. Test Instruments Required

The following equipment is required for testing the transmitter:

Ammeter (0 to 250–ma direct current) with accuracy of 2 percent for full-scale deflection.

Dummy antenna carbon resistors (50–ohm d-c resistance) connected in series with an r-f ammeter (0 to 1 ampere).

Ohmmeter (0 to 10 megohms).

Audio oscillator (0 to 12,000 cps (cycles per second)).

Output meter (−10 to +5db).

Oscilloscope.

29. Moving Parts and Finish

In addition to making electrical tests described in paragraphs 30 to 44 inclusive, check the transmitter for smoothness of operation in moving or rotating parts and for condition of the finish.

a. Check the transmitter for cleanliness inside and outside.

b. Rotate all tuning and volume controls. Operation across the arc of rotation should be smooth. There should be no appreciable backlash or slipping of controls.

c. Try all switches, both rotary and toggle. They should snap firmly into each contact position.

d. Insert the plugs into the proper jacks. The plugs should seat firmly and make good contact.

e. Check the fuse holders to see that the fuses may be removed easily but will lock tightly when inserted.

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

30. Line On-Off Switch, Relays, and Pilot Lights

a. Set the LINE ON-OFF switch to OFF.

b. Insert the 99.9–mc crystal into socket in crystal oven.

c. Connect the A-C LINE to a 110- to 120-volt a-c power source.

d. Set the POWER HIGH-LOW switch to LOW.

e. Set the CARRIER CONTROL switch to position 1.

f. Set the LINE ON-OFF switch to ON.

g. Set the CARRIER CONTROL switch to position 4.

(1) Relay RL1 must close immediately with a clicking sound.

(2) After ½ minute has elapsed, plate time-delay relay TD3 must close with a clicking sound and PLATE ON (red) light must light.

31. Alignment

a. Set the POWER HIGH-LOW switch to LOW.

b. Set tuning transformer indicator dials T1, T2, T3, T4, and T5 (top of set) to 99.6 mc, the operating frequency at the high end of the band.

c. Set the METER SWITCH in turn to the position listed in table I.

d. Adjust the corresponding transformer adjustment shafts for maximum needle deflection of the transmitter meter as listed in table I.

e. Set the METER SWITCH to position 6 and rotate the P. A. TUNING control for minimum deflection of the needle on the panel meter.

(1) Tuning capacitors must not be at extreme counterclockwise position (minimum capacitance).

(2) Setting of indicator dials of each tuned stage must be at 100 mc ± 2.

Table I

METER SWITCH position	Transformer	Transmitter meter needle deflection
1	T1	Maximum
2	T2	Maximum
3	T3	Maximum
4	T4	Maximum
5	T5	Maximum
6	P. A. TUNING control.	Minimum

f. Remove the 99.6-mc crystal and replace it with a 71.2-mc crystal (low end of the band).

g. Set the tuning transformer indicator dials to 71.2-mc (low end of the band).

h. Repeat steps in *d* and *e* above.

(1) Tuning capacitors must not be at maximum capacitance position.

(2) The setting of the indicator dials of each tuned stage must be at 71.2 mc ± 2.

32. Meter and Meter Switch

a. Set LINE ON-OFF switch to OFF.

b. Connect the A-C LINE to 110–120 volts a-c power source.

c. Set the POWER HIGH-LOW switch to LOW.

d. Set the LINE ON-OFF switch to ON.

e. Rotate the METER SWITCH in turn to positions 1 through 6 as shown in table II.

TABLE II

METER SWITCH positions	Transmitter meter indication (ma)
1	0.2–0.4
2	0.2–0.5
3	0.4–0.8
4	1.5–3.0
5	1.5–2.5
6	–.2–0.5

f. If transmitter meter indications are not with in limits, repeat the alignment procedure described in paragraph 31.

33. Calibration Check on Meter Shunt R35

a. Set the POWER HIGH-LOW switch to LOW.

b. Set CARRIER CONTROL switch to position 1.

c. Connect the dummy antenna to the transmitter ANTENNA receptacle P7 by means of Cord CD–800.

d. Remove P. A. FUSE.

e. Connect the standard ammeter (0 to 250-ma direct current) to the P. A. FUSE holder terminals by means of the adapter.

f. Set the METER SWITCH to position 6.

g. Set the CARRIER CONTROL switch to position 4.

h. Repeat the tuning procedure described in paragraph 31.

i. Set the POWER HIGH-LOW switch to HIGH.

j. Rotate ANTENNA LOADING capacitor C41 slowly clockwise, while adjusting the P. A. TUNING control for minimum indication on the transmitter meter, until the standard ammeter indication is 150 ma. The transmitter meter indication must be 150 ± 5 ma.

34. Power Output

Repeat the procedures described in paragraph 33, adjusting the controls until the standard ammeter indicates 155 ma.

a. The transmitter meter indication must be 155 ± 5 milliamperes.

b. The dummy antenna meter must indicate 50-watt output minimum.

35. Fusing

a. Set the transmitter POWER HIGH-LOW switch to LOW.

b. Remove the LINE FUSE. FILAMENT ON and PLATE ON pilot lamps should go off.

c. Set the transmitter METER SWITCH in turn to positions 1 through 6. There should be no indication on the transmitter meter.

d. Replace the LINE FUSE.

e. Turn the LINE ON-OFF switch to OFF.

f. Remove the H. V. FUSE.

g. Turn the LINE switch to ON. FILAMENT ON and PLATE ON pilot lights should go on.

h. Set transmitter METER SWITCH in turn to positions 1 through 6.

i. There must be no indication on the transmitter meter.

j. Turn the LINE switch to OFF.

k. Turn the LINE ON-OFF switch to ON and the CARRIER CONTROL switch to position 4.

l. Set the transmitter METER SWITCH in turn to positions 1 through 6.

(1) Meter indications must be as listed in table II for positions 1 through 4.

(2) There must be no meter indications when METER SWITCH is at positions 5 or 6.

36. Heating of Crystal Oven

a. Operate set for 15 minutes.

b. Set the LINE ON-OFF switch to OFF.

c. Remove the crystal from the oven. The crystal must be warm and the metal disk of the crystal oven must be warm.

37. Continuity Test

a. Set the LINE ON-OFF switch to OFF.

b. Connect the ohmmeter to posts as listed in table III. The ohmmeter indications must be the same as listed in the table.

Table III

Ohmmeter	Connections	Ohmmeter indications
SH. post	Right REC. post	Open circuit.
SH. post	Left REC. post	Open circuit.
SH. post	Right TRSG. post	Open circuit.
SH. post	Left TRSG. post	Open circuit.
SH. post	Right TELEPHONE EE–8 post.	Open circuit.
SH. post	Left TELEPHONE EE–8 post.	Open circuit.
SH. post	Chassis frame	Closed circuit.
Right REC. post	Left REC. post	Open circuit.
Right TRSG. post	Left TRSG. post	50 ohms.
Right TELEPHONE EE–8 post.	Right TRSG. post	25 ohms.
Right TELEPHONE EE–8 post.	Left TRSG. post	25 ohms.
Left TELEPHONE EE–8 post.	Right REC. post	Open circuit.
Left TELEPHONE EE–8 post.	Left REC. post	Open circuit.
Chassis	ANTENNA receptacle.	Open circuit.
Chassis	RECEIVER receptacle.	Open circuit.

38. Modulation Control Setting

a. Align Radio Receiver R–19(*)/ to the frequency of Radio Transmitter T–14(*)/. (The AUDIO GAIN control of the receiver is preset for a 30-percent modulation input to transmitter.)

b. Connect the transmitter to the receiver by means of Cord CX–8 inserted into the CONTROL CABLE receptacle.

c. Place a 500-ohm resistor across the receiver RECEIVER OUTPUT terminals.

d. Place a 500-ohm resistor across the transmitter TRSG. terminals.

e. Connect the leads of the audio oscillator across the transmitter TRSG. terminals.

f. Place a 2,000-ohm resistor in series with one output lead of the audio oscillator.

g. Connect the output meter across the transmitter TRSG. terminals.

h. Connect the transmitter to a 110- to 120-volt a-c power source. The FILAMENT ON pilot lamp should light.

i. Set the transmitter CARRIER CONTROL switch to position 4. The PLATE ON pilot light should go on.

j. Set the receiver METER SWITCH to position 2. The receiver meter indication must be not less than 60 ma.

k. Set the receiver METER SWITCH to position 4 and then 5. The receiver meter indication must be 0 microamperes for both METER SWITCH positions.

l. Set the receiver channel switch to MULTI CHANNEL.

m. Turn the receiver SPEAKER switch to ON.

n. Rotate the receiver SPEAKER VOLUME control to the desired audible level.

o. Set the CABLE COMPENSATOR control to 0.

p. Adjust the audio oscillator for 1,000-cps frequency.

q. Adjust the audio oscillator gain control for a −8–db indication on the output meter.

r. Set the receiver METER SWITCH to position 6. The receiver meter should indicate 0 db ± 1.

(1) Zero db is the reference level based on 1 milliwatt across 500 ohms.

(2) For an output meter with 0–db reference level bases on 6 milliwatts across 600 ohms, the 0–db point required above will be −8 db on the output meter.

s. If receiver meter does not indicate 0 db ±1, the transmitter modulation control (potentiometer inside set) may be rotated from extreme counterclockwise position until the receiver meter indicates 0 db, with the receiver METER SWITCH at position 6. After this adjustment, put glyptal on potentiometer shaft to prevent change in position.

39. Over-all Audio Response Curve

Set the audio oscillator in turn to 250, 1,000, 5,000, and 12,000 cps. For each frequency adjust the audio oscillator grain control for −8–db indication on output meter. Indications on receiver meter must fall within the limits stated in table IV.

Table IV

Receiver meter indications (db)	*Frequencies (cps)*
−1 to 0	250
0 (reference level)	1,000
−½ to +½	5,000
−½ to +½	12,000

40. Audio Distortion

a. Connect the oscilloscope to the transmitter to the REC. or receiver RECEIVER OUTPUT terminals.

b. Set the audio oscillator to 1,000 cps.

c. Adjust the oscilloscope to obtain a pure sine wave pattern on the screen.

d. Adjust the audio oscillator in turn to 250, 5,000, and 12,000 cps.

e. Focus the pattern on the screen at each frequency. There should be no distortion of the oscilloscope pattern at any frequency.

41. Level Linearity and Cable Compensator

a. Set the audio oscillator to 1,000 cps.

b. Adjust the oscillator gain control to obtain a −8-db indication on the receiver meter.

c. Rotate the CABLE COMPENSATOR switch in turn from positions 1 to 12.

(1) The receiver meter indication must increase 1 db as the switch is rotated to each position.

(2) At position 12 of the CABLE COMPENSATOR switch, the receiver meter should indicate 4 db ±1, −0.

42. Filter in Local Microphone Circuit

a. Turn off the oscilloscope.

b. Disconnect the audio oscillator and the output meter leads from the TRSG. terminals.

c. Insert the audio oscillator plug into the MICROPHONE jack. (Use the adapter.)

d. Set the CABLE COMPENSATOR to 0.

e. Set the receiver METER SWITCH to position 6.

f. Set the audio oscillator to a frequency of 1,000 cps.

g. Adjust the gain control of the audio oscillator until receiver meter indicates 0 db.

h. Increase the audio oscillator frequency gradually to 3,500 cps, observing the receiver meter.

(1) Between 1,000 and 2,500 cps, the receiver meter indication must not fall below −0.5 db.

(2) Between 2,500 and 2,800 cps, the receiver meter indication must decrease.

(3) At 2,800 cps, the receiver meter indication must be below −5.0 db.

(4) The frequency indication must be not more than 3,200 cps when the receiver meter indication is 2 microamperes or one division to right of 0 (equivalent to —30-db attenuation).

43. Carrier Control Modulation Levels

a. Set the CARRIER CONTROL to position 4.

b. Adjust the audio oscillator to 1,000 cps, and set the receiver METER SWITCH to position 6.

c. Adjust the audio oscillator gain control until 4 db is indicated on the receiver meter.

d. Set the transmitter CARRIER CONTROL switch to position 3. The receiver meter indication should be −4 db.

e. Set the CARRIER CONTROL switch to position 2. The receiver meter indication must be +4 db ±1.

f. Disconnect the audio oscillator.

g. Plug Handset H–23/U into the MICROPHONE and HEADSET jacks.

h. Set and the CARRIER CONTROL switch to position 1.

(1) The PLATE ON pilot lamp must go off.

(2) The carrier operated relay must go off with a click.

i. Set the receiver SQUELCH switch to OFF. A rushing sound should be heard on the handset.

j. Push the PRESS-TO-TALK switch on the handset. The PLATE ON pilot light should light.

k. Whistle a sustained note into the microphone. The receiver meter should indicate 6 db.

l. Talk into the microphone at a moderate voice level. The receiver meter should indicate 0 db.

m. Set the CARRIER CONTROL switch to position 2.

n. Release the handset PRESS-TO-TALK switch. The PLATE ON pilot light must light.

o. Set the receiver LINE switch to OFF. The transmitter PLATE ON pilot light should go off.

p. Set the receiver SQUELCH to ON and set receiver LINE switch to ON. The transmitter PLATE ON pilot light should remain off.

q. Repeat steps described in *j* through *n* above.

r. Set the receiver SQUELCH to OFF.

s. Set the CARRIER CONTROL switch to position 3. The PLATE ON pilot light should go on.

t. Set receiver LINE switch to OFF. The PLATE ON pilot light should go OFF.

u. Set the receiver SQUELCH switch and the receiver LINE switch to ON. The PLATE ON pilot light must remain off.

v. Push the handset press-to-talk switch. The PLATE ON pilot light must go on.

w. Whistle a sustained note into the microphone. The receiver meter should indicate approximately 0 db.

x. Talk into the microphone at a moderate voice level. The receiver meter indication must be −8 db.

y. Release the press-to-talk switch and set the CARRIER CONTROL switch to position 4. The PLATE ON pilot light should go on.

z. Repeat steps described in *v* through *x* above.

44. Tapping Test

a. Connect an oscilloscope to the transmitter REC. or the receiver RECEIVER OUTPUT terminals.

b. Set the CABLE COMPENSATOR switch to position 1.

c. Adjust the audio oscillator output for a −8-db reading on the output meter.

d. Adjust the oscilloscope to obtain a sine wave pattern on the screen.

e. Tap the r-f transformer shields, tubes, and the inner side of the transmitter housing.

(1) There must be no distortion of waveform on the oscilloscope screen.

(2) There must be no interruption, noise, or breaking up of sound from the receiver speaker due to tapping.

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SECTION VIII
INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

45. General

a. The material in this section is intended as an aid to the repairman in localizing trouble to component parts of individual stages. A separate schematic diagram for each individual stage or circuit is presented here. A parts list for each stage with stock numbers, description, and the function of each part, in brief, is also presented as an aid and a timesaver to the repairman in finding and replacing faulty parts.

b In many instances, the values given on a schematic diagram will not correspond to those given in the parts list. This is due to the fact that many parts have been discontinued and others given a new stock number because of a supply standardization program. The values shown on the schematics are those used in the design of the equipment and are ideal and correct. The values and stock numbers given on the parts list are those considered a suitable substitution for parts which have been discontinued due to the standardization program.

c. As the individual stage schematics are intended as an aid in understanding the operation of the separate circuits, all changes in values of parts or in location of parts due to changes in the basic design have not been illustrated. These will be readily and more completely understood by checking the parts list when any apparent discrepancies occur. In such cases, find the schematic reference number of the part on the parts list, and a complete identification and description of all differences will be found there.

d. No distinction has been made between the unlettered model of the transmitter and the A model on the parts list because no differences exist in parts or design other than the tubes used in stages V10 and V11.

46. Crystal Oscillator and Audio Amplifier Stage (V1) (fig. 27)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C	x	x	x	---	---	3K2039022	CAPACITOR, fixed: mica; 39-mmf; ±5%; 500-vdcw.	Plate bypass.
C1	---	---	---	x	x	3K2022011	CAPACITOR, fixed: mica; 22-mmf; ±10%; 500-vdcw.	Plate bypass.
C2	x	x	x	x	x	3K2051112	CAPACITOR, fixed: mica; 510-mmf; ±10%; 500-vdcw.	R-f bypass plate audio amplifier.
C3	x	x	x	x	x	3DB25-17	CAPACITOR, fixed: electrolytic; 25-mf; 50-vdcw.	Cathode bypass audio amplifier.
C4	x	x	x	x	x	3DA50-44.1	CAPACITOR, fixed: paper; oil-filled; 50,000-mmf; ±20%; 600-vdcw.	Audio coupling.
C5	x	x	x	x	x	3K2010121	CAPACITOR, fixed: mica; 100-mmf; ±10%; 500-vdcw.	Grid coupling osc amplifier.
C44	x	x	x	x	x	3DB4-27	CAPACITOR, fixed: paper; oil-filled; 4-mf; 600-vdcw.	Bypass high voltage.
R1	x	x	x	x	x	3RC20AE364J	RESISTOR, fixed: composition; 360,000-ohms; ±5%; ½-w.	Grid bias crystal osc.
R2	x	x	x	x	x	3RC31BE202J	RESISTOR, fixed: composition; 2,000-ohms; ±5%; 1-w.	Cathode bias audio amplifier.
R4	x	x	x	---	---	2Z7270.69	RESISTOR, variable: carbon; 25,000-ohms; ±10%.	Audio gain control.
R6	---	---	---	x	x	3RC31BF154K	RESISTOR, fixed: composition; 150,000-ohms; ±10%; 1-w.	Plate load crystal osc.
R7	x	x	x	x	x	3RC31BE513J	RESISTOR, fixed: composition; 51,000-ohms; ±5%; 1-w.	Plate load audio amplifier.
R8	x	x	x	x	x	3RC20BF244J	RESISTOR, fixed: composition; 240,000-ohms; ±5%; ½-w.	Frequency correction modulator grid network.
R9	x	x	x	x	x	3RC21AE204J	RESISTOR, fixed: composition; 200,000-ohms; ±5%; ½-w.	Frequency correction modulator grid network.

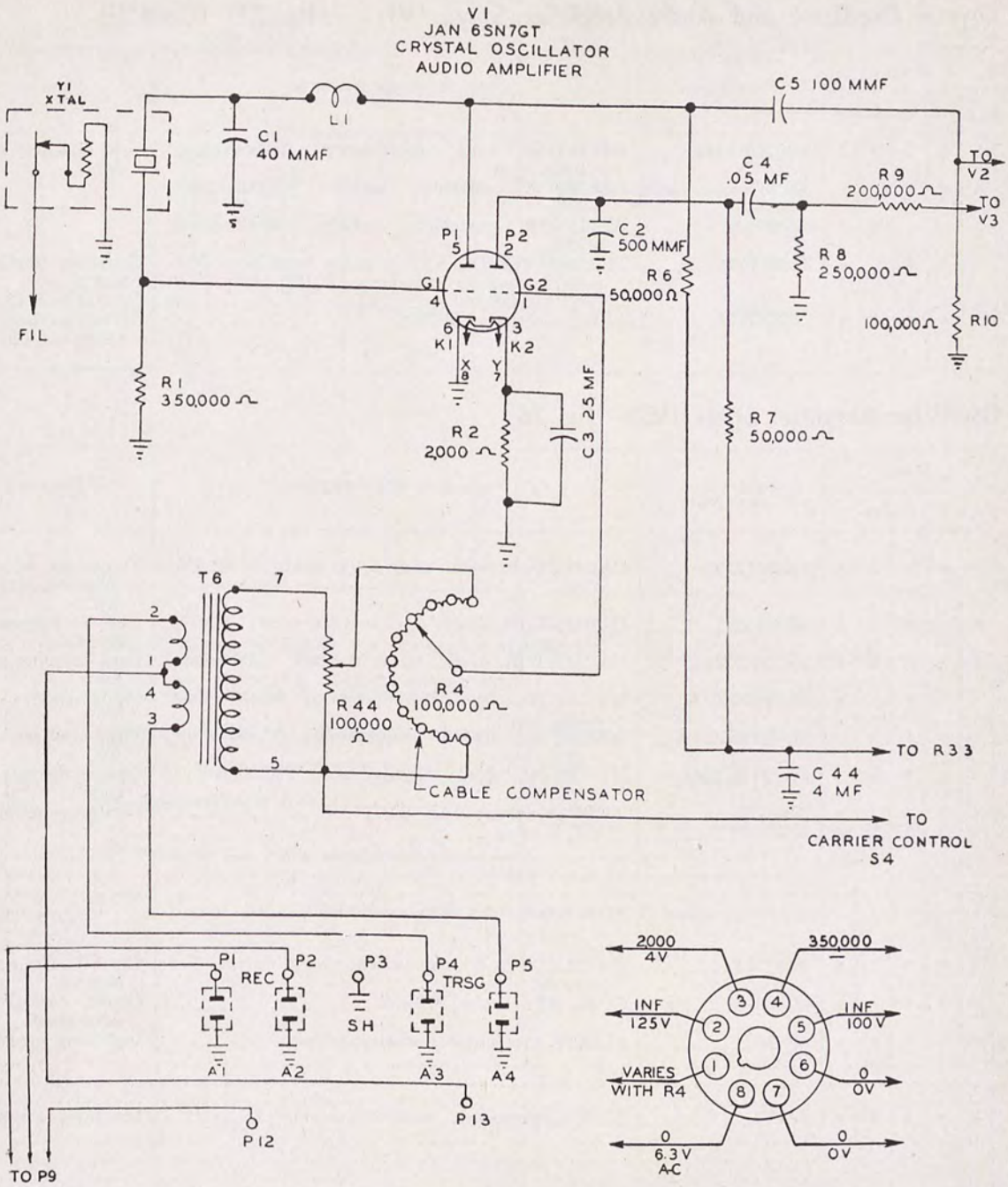

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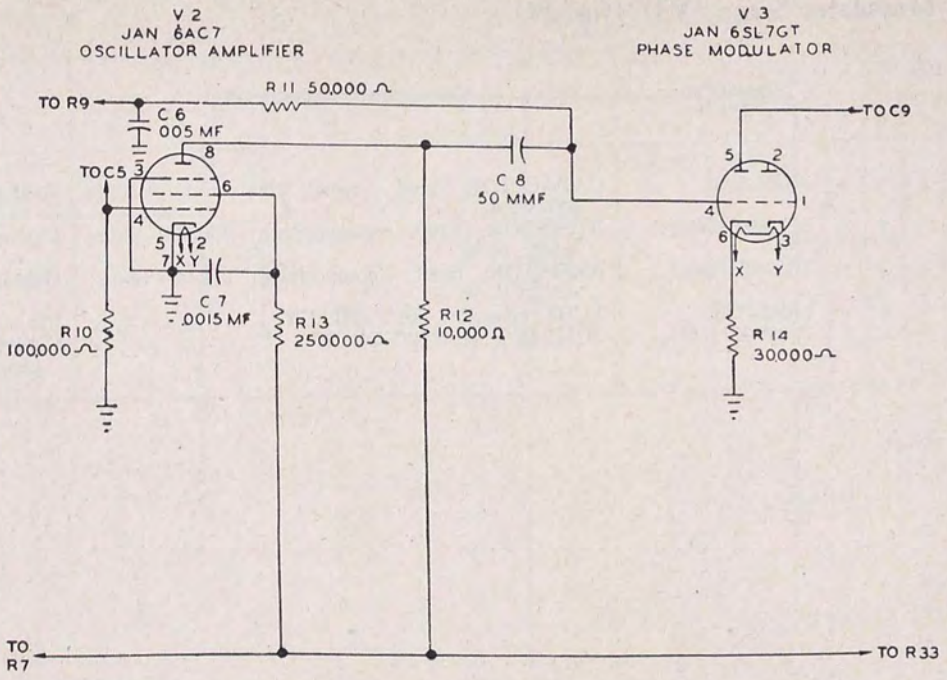
Figure 27. Crystal oscillator and audio amplifier circuit schematic.

46. Crystal Oscillator and Audio Amplifier Stage (V1) (fig. 27) (Cont'd)

Ref. symbol	Model A	B	C	D	E	Signal Corps stock No.	Name of part and description	Function
R10	x	x	x	x	x	3RC20BF104K	RESISTOR, fixed: composition; 100,000-ohms; ±10%; ½-w.	Grid bias osc amplifier.
R44	x	x	x			3Z7480-5	RESISTOR, variable: carbon; 100,000-ohms; ±20%.	
R44				x	x	3Z7480-6	RESISTOR, variable: carbon; 100,000-ohms; ±20%.	
T6	x	x	x	x	x	2Z9631.242	TRANSFORMER, AF: primary impedance 500-ohms; secondary impedance, 50,000-ohms.	Coupling, audio input to grid.
Y1	x	x	x	x	x		CRYSTAL, CT-cut	Crystal oscillator.
V1	x	x	x	x	x	2J6SN7GT	TUBE, electron; VT-231	Crystal oscillator and audio amplifier.

47. Oscillator Amplifier Stage (V2) (fig. 28)

Ref. symbol	Model A	B	C	D	E	Signal Corps stock No.	Name of part and description	Function
C6	x	x	x	x	x	3K3551212	CAPACITOR, fixed: mica; 5,100-mmf; ±5%; 500-vdcw.	Frequency correction modulator grid network.
C7	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Screen bypass osc amplifier.
C8	x	x	x	x	x	3K2051022	CAPACITOR, fixed: mica; 51-mmf; ±500-vdcw	Grid coupling modulator.
R11	x	x	x	x	x	3RC20BE513J	RESISTOR, fixed: composition; 51,000-ohms; ±5%; ½-w.	R-f isolation.
R12	x	x	x	x	x	3RC31BE103K	RESISTOR, fixed: composition; 10,000-ohms; ±10%; 1-w.	Plate load osc amplifier.
R13	x	x	x	x	x	3RC31BF244J	RESISTOR, fixed: composition; 240,000-ohms; ±5%; 1-w.	Screen dropping resistor.
V2	x	x	x	x	x	2J6AC7	TUBE; electron: JAN-6AC7	Oscillator amplifier.
P1	x	x	x	x	x	3Z737-21	POST, binding	
P2								
P3								
P4								
P5								
P12								
P13								
TD1	x	x	x	x	x	2Z5022.2	THERMOSTAT, snap-switch; single circuit; 7-v ac or dc.	Crystal temperature control.
L1	x	x	x	x	x	3C320-8	COIL, RF: choke; 770-mh	Choke, crystal oscillator plate.
A1	x	x	x	x	x	4E926	BLOCK, protector: one-wire; carbon	Lightning arrestor.
A2								
A3								
A4								
A1	x	x	x	x	x	4E927	BLOCK, protector: one-wire; ceramic	Lightning arrestor.
A2								
A3								
A4								



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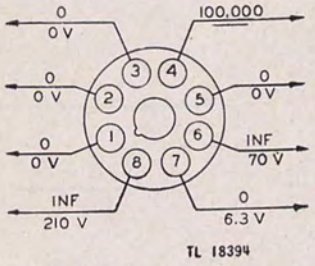
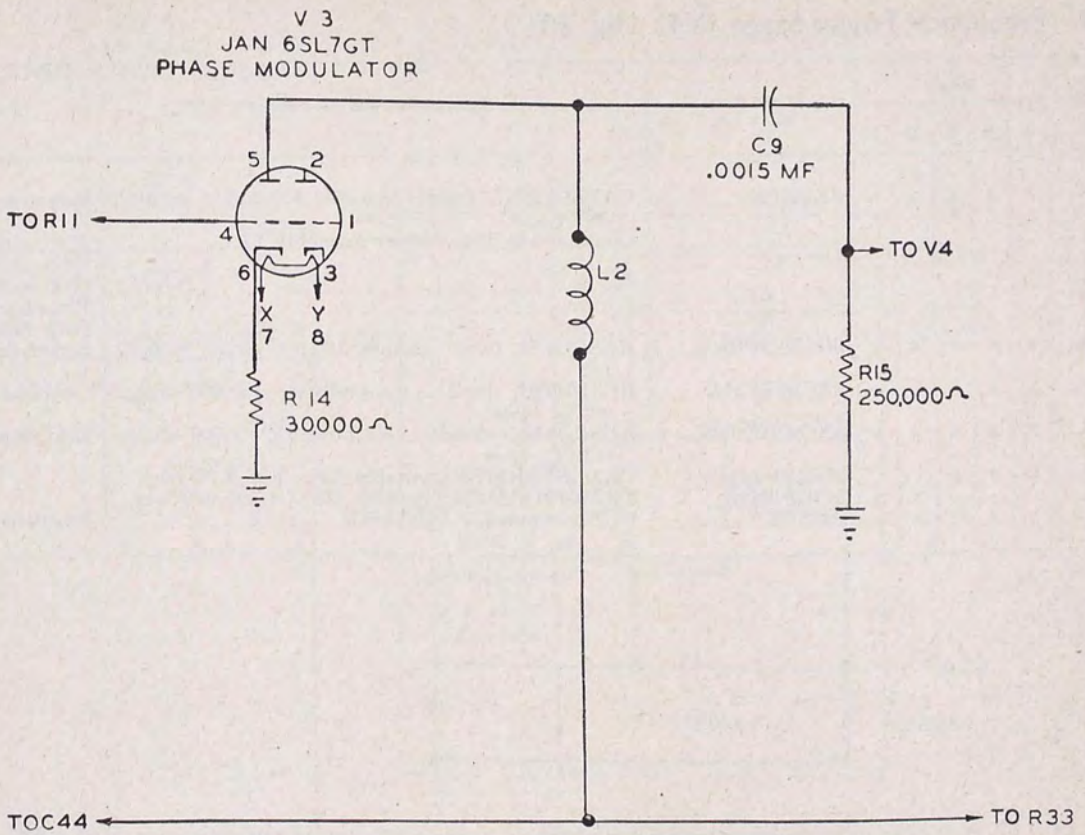


Figure 28. Oscillator amplifier circuit diagram.

48. Phase Modulator Stage (V3) (fig. 29)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C9	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Grid coupling.
R14	x	x	x	x	x	3RC20BE303J	RESISTOR, fixed: composition; 300,000-ohms; ±5%; ½-w.	Cathode bias.
R15	x	x	x	x	x	3RC20BF244J	RESISTOR, fixed: composition; 240,000-ohms; ±5%; ½-w.	Grid bias.
V3	x	x	x	x	x	2J6SL7GT	TUBE, electron: JAN-6SL7GT	Phase modulator.
L2	x	x	x	x	x	2C6900-14/C4	COIL, RF: choke; 5-mh	Choke, plate circuit phase modulator.



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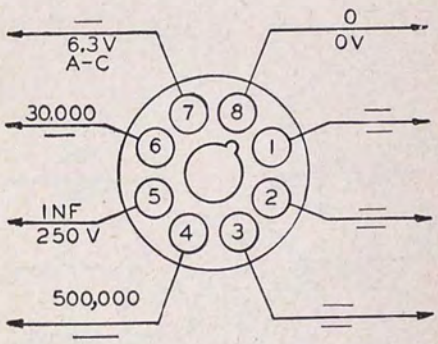

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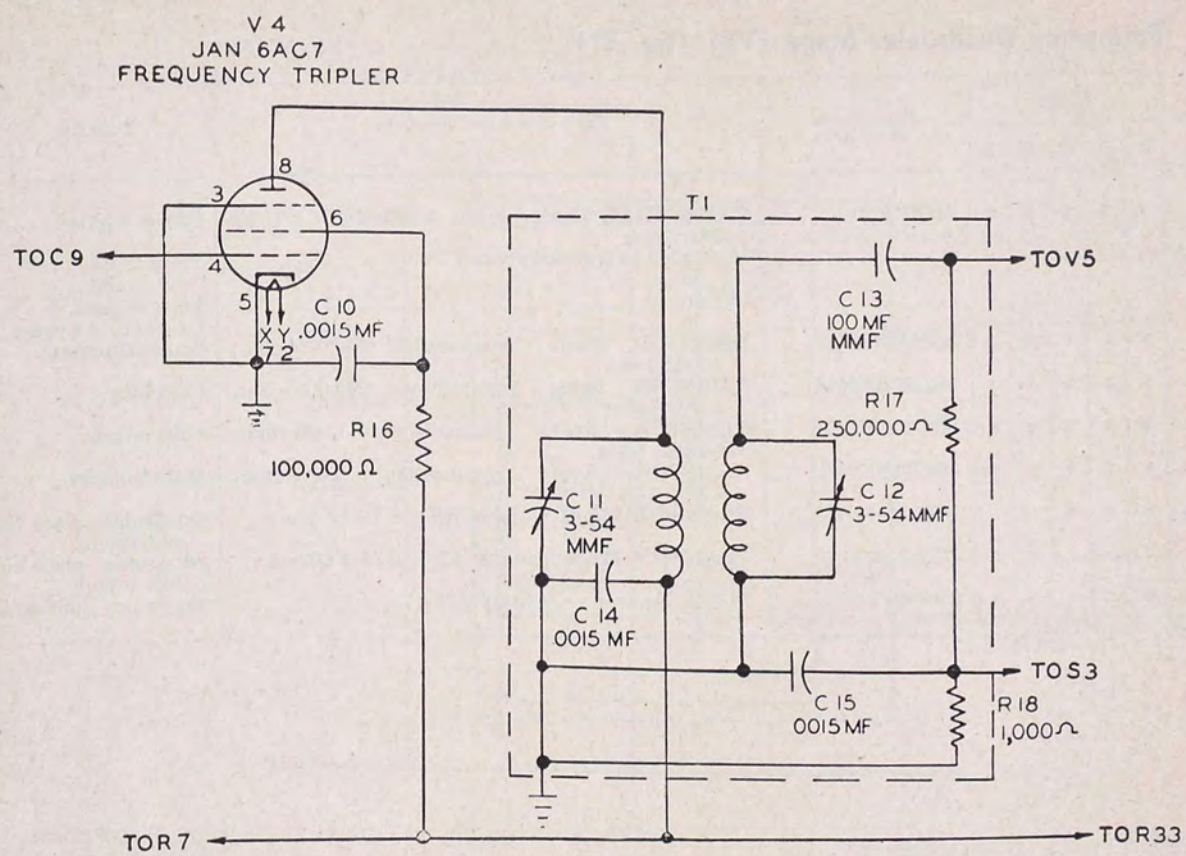
Figure 29. Phase modulator circuit diagram.

49. Frequency Tripler Stage (V4) (fig. 30)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C10	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Screen bypass.
C11	---	---	---	---	---	---	Contained in Transformer Assembly T1	Plate circuit tuning.
C12	---	---	---	---	---	---	do	Grid circuit tuning.
C13	---	---	---	---	---	---	do	Grid coupling.
C14	---	---	---	---	---	---	do	Plate bypass.
C15	---	---	---	---	---	---	do	Grid return bypass.
R16	x	x	x	x	x	3RC31BF104K	RESISTOR, fixed: carbon; 100,000-ohms; ±10%; 1-w.	Screen dropping.
R17	x	x	x	x	x	3RC20BF244J	RESISTOR, fixed: composition; 240,000-ohms; ±5%; ½-w.	Grid bias.
R18	x	x	x	x	x	3RC20BE102K	RESISTOR, fixed: composition; 1,000-ohms; ±10%; ½-w.	Grid return.
T1	x	x	x	---	---	2C4180-14/C1	TRANSFORMER, variable RF: 2.18-3.25-mc	
T1	---	---	---	x	x	3C323-3427	TRANSFORMER, variable RF: 4,360-6,240-kc	
V4	x	x	x	x	x	2J6AC7	TUBE, electron: JAN-6AC7	Frequency multiplier.



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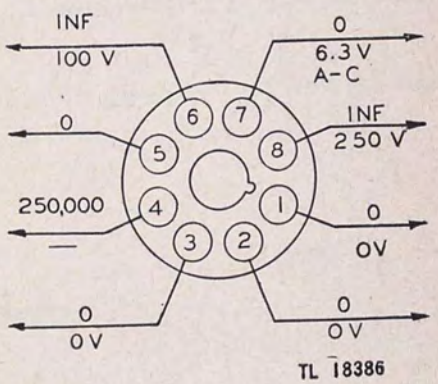
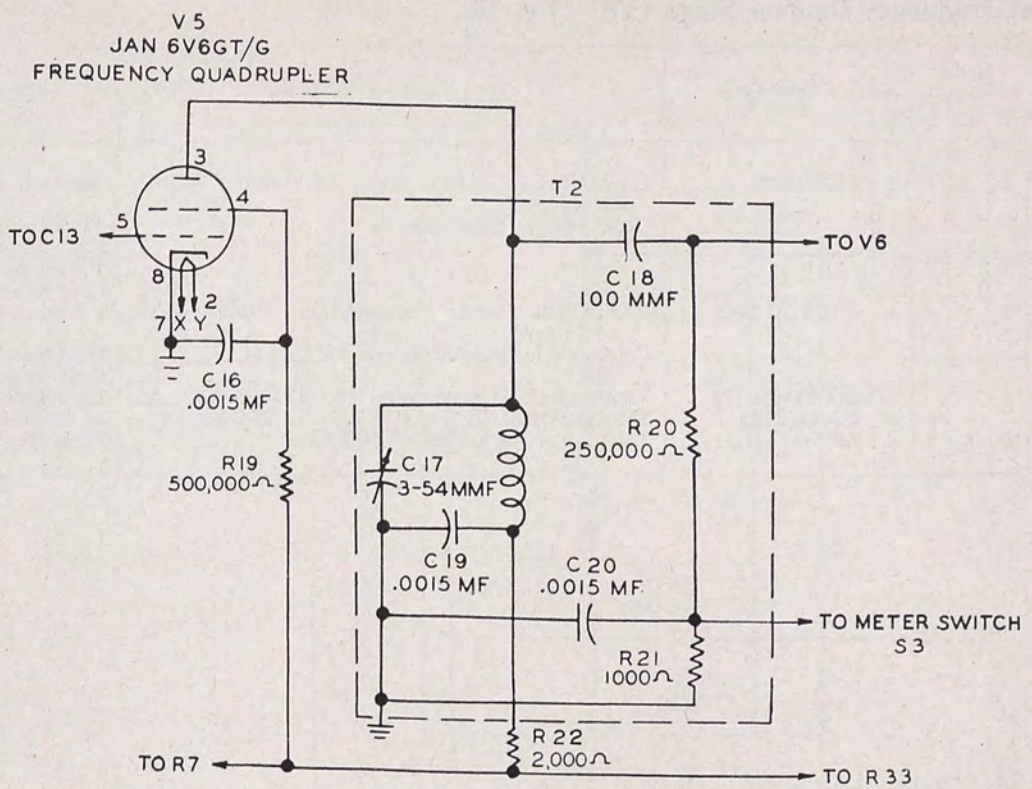


Figure 30. Frequency tripler circuit diagram.

50. Frequency Quadrupler Stage (V5) (fig. 31)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C16	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Screen bypass.
C17	---	---	---	---	---		Contained in transformer can T2	Plate tuning.
C18	---	---	---	---	---		do	Grid coupling.
C19	---	---	---	---	---		do	Plate bypass.
C20	---	---	---	---	---		do	Grid return bypass.
R19	x	x	x	x	x	3RC31BF514J	RESISTOR, fixed: composition; 510,000-ohm; ±5%; 1-w.	Screen dropping.
R20	x	x	x	x	x	3RC20BF244J	RESISTOR, fixed: composition; 240,000-ohm; ±5%; ½-w.	Grid bias.
R21	x	x	x	x	x	3RC20BE102K	RESISTOR, fixed: composition; 1,000-ohm; ±10%; ½-w.	Grid return.
R22	x	x	x	x	x	3RC31BE202J	RESISTOR; fixed: composition; 2,000-ohm; ±5%; 1-w.	Plate isolation.
T2	x	x	x	---	---	2C6900-14/C3	TRANSFORMER, variable RF: 8.75-12.5-mc	Quadrupler plate circuit tuning.
T2	---	---	---	x	x	3C323-3426	TRANSFORMER, variable RF: 8.74-13.02-mc	2d doubler plate circuit tuning.
V5	x	x	x	x	x	2J6V6GT/G	TUBE, electron: JAN-6V6GT/G	Frequency multiplier.



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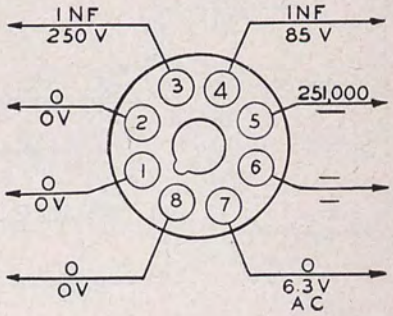

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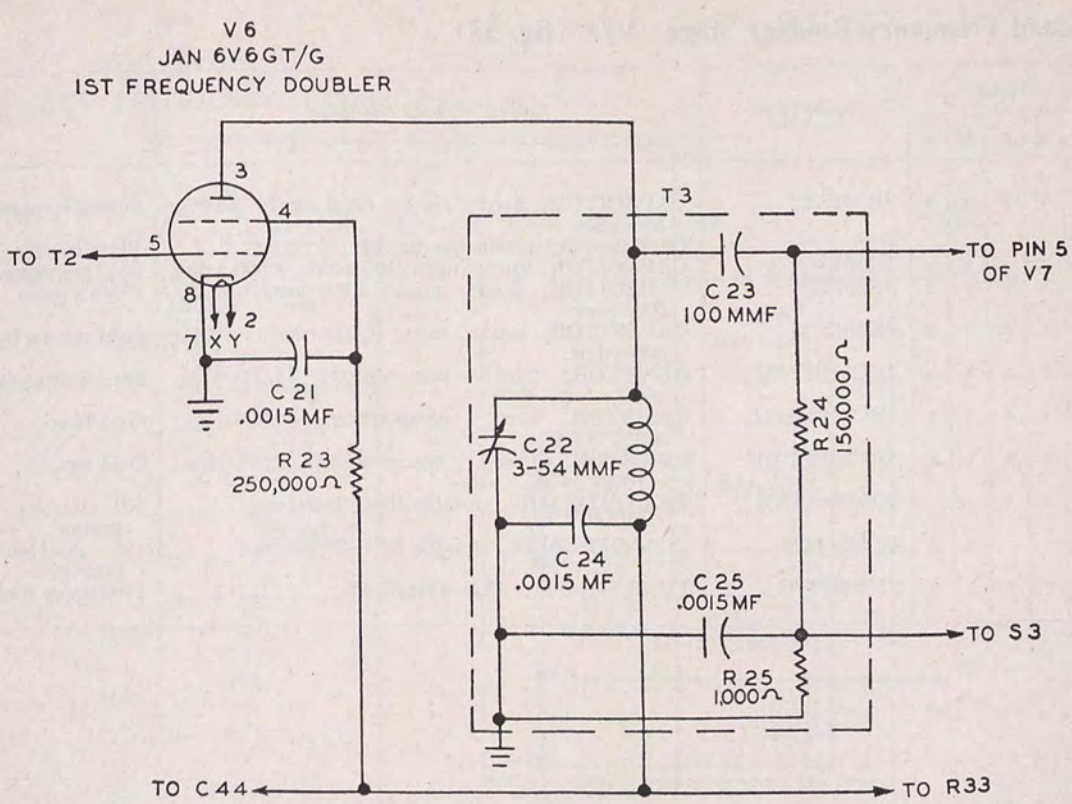
Figure 31. Frequency quadrupler circuit diagram.

51. First Frequency Doubler Stage (V6) (fig. 32)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C21	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Screen bypass.
C22							Contained in transformer can T3	Plate tuning.
C23							do	Grid coupling.
C24							do	Plate bypass.
C25							do	Grid return.
R23	x	x	x	x	x	3RC31BF244J	RESISTOR, fixed: composition; 240,000-ohm; ±5%; 1-w.	Screen dropping.
R24							Contained in transformer can T3	Grid bias.
R25							do	Grid return.
T3	x	x	x			2C6900-14/C2	TRANSFORMER, variable RF: 17.5-25-mc	1st doubler plate.
T3				x	x	3C323-34Z5	TRANSFORMER, variable RF: 17-25.5-mc	3d doubler plate.
V6	x	x	x	x	x	2J6V6GT/G	TUBE, electron: JAN-6V6GT/G	Frequency multiplier.



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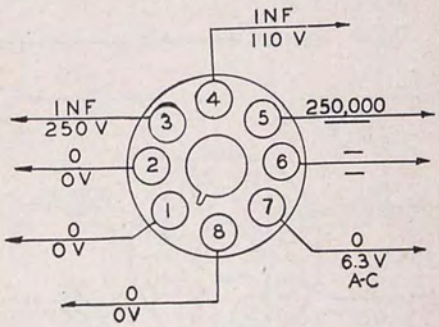
ALL MEASUREMENTS MADE WITH A 1,000 OHM PER VOLT METER.

ALL TUBES IN THEIR SOCKETS.



IS SYMBOL FOR FIXED CAPACITOR.

IS SYMBOL FOR VARIABLE CAPACITOR.

TL 10284

Figure 32. First frequency doubler circuit diagram.

52. Second Frequency Doubler Stage (V7) (fig. 33)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C26	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Screen bypass.
C27	---	---	---	---	---		Contained in transformer can T4	Plate tuning.
C28	x	x	x	x	x	3K2010121	CAPACITOR, fixed: mica; 100-mmf; ±500-vdcw.	Grid coupling.
C29	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900-mmf; ±5%; 500-vdcw.	Plate bypass.
C30	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Grid return bypass.
R26	x	x	x	x	x	3RC31BF753J	RESISTOR, fixed: composition; 75,000-ohm; ±5%; 1-w.	Screen dropping.
R27	x	x	x	x	x	3RC20BE513J	RESISTOR, fixed: composition; 51,000-ohm; ±5%; ½-w.	Grid bias.
R28	x	x	x	x	x	3RC20BE102K	RESISTOR, fixed: composition; 1,000-ohm; ±10%; ½-w.	Grid return.
T4	x	x	x	---	---	2C6900-14/C1	TRANSFORMER, variable RF: 35-50-mc	2d doubler plate-tuning.
T4	---	---	---	x	x	3C323-3423	TRANSFORMER, variable RF: 35-50-mc	4th doubler plate tuning.
V7	x	x	x	x	x	2J6V6GT/G	TUBE, electron: JAN-6V6GT/G	Frequency multiplier.

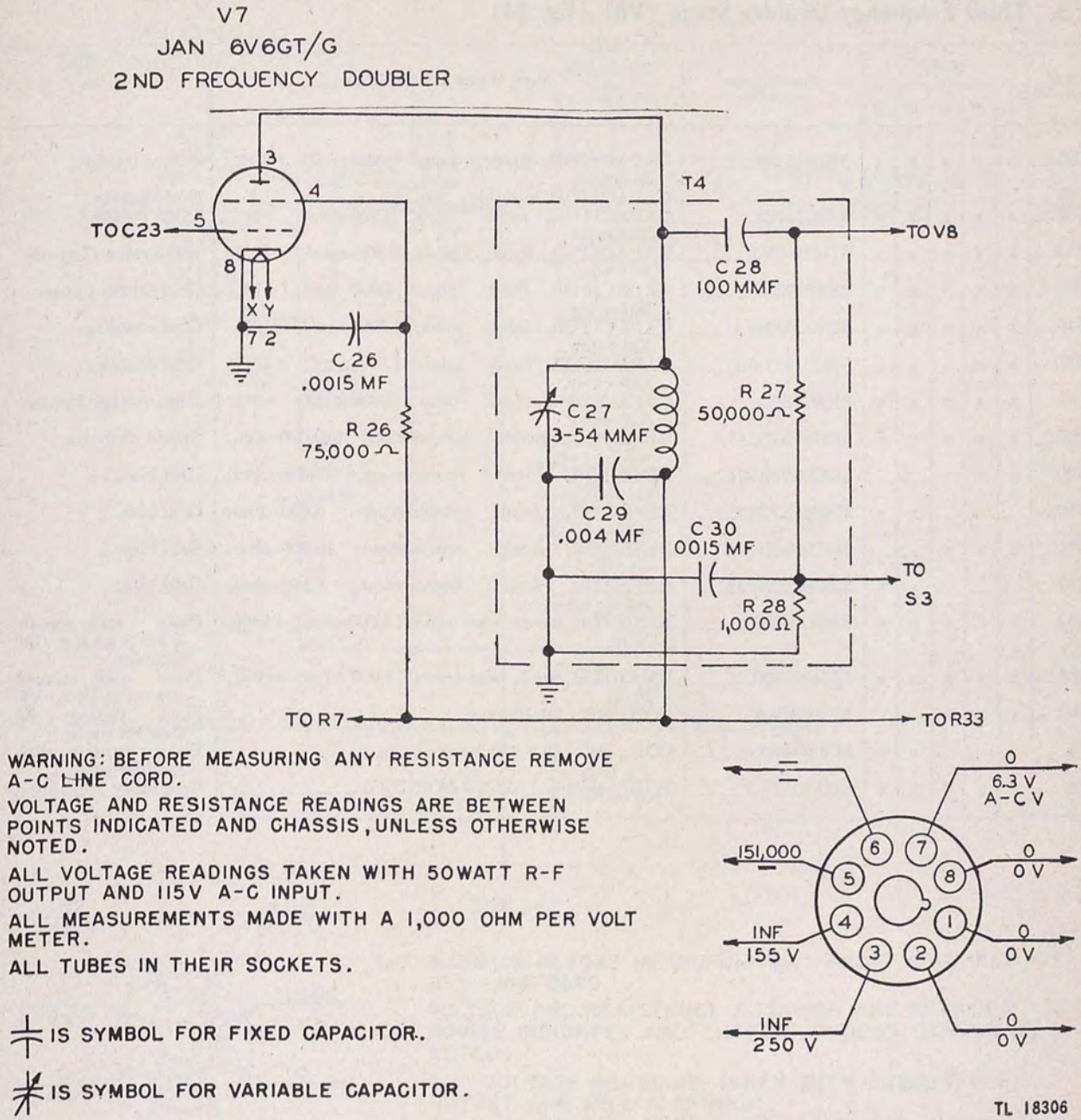
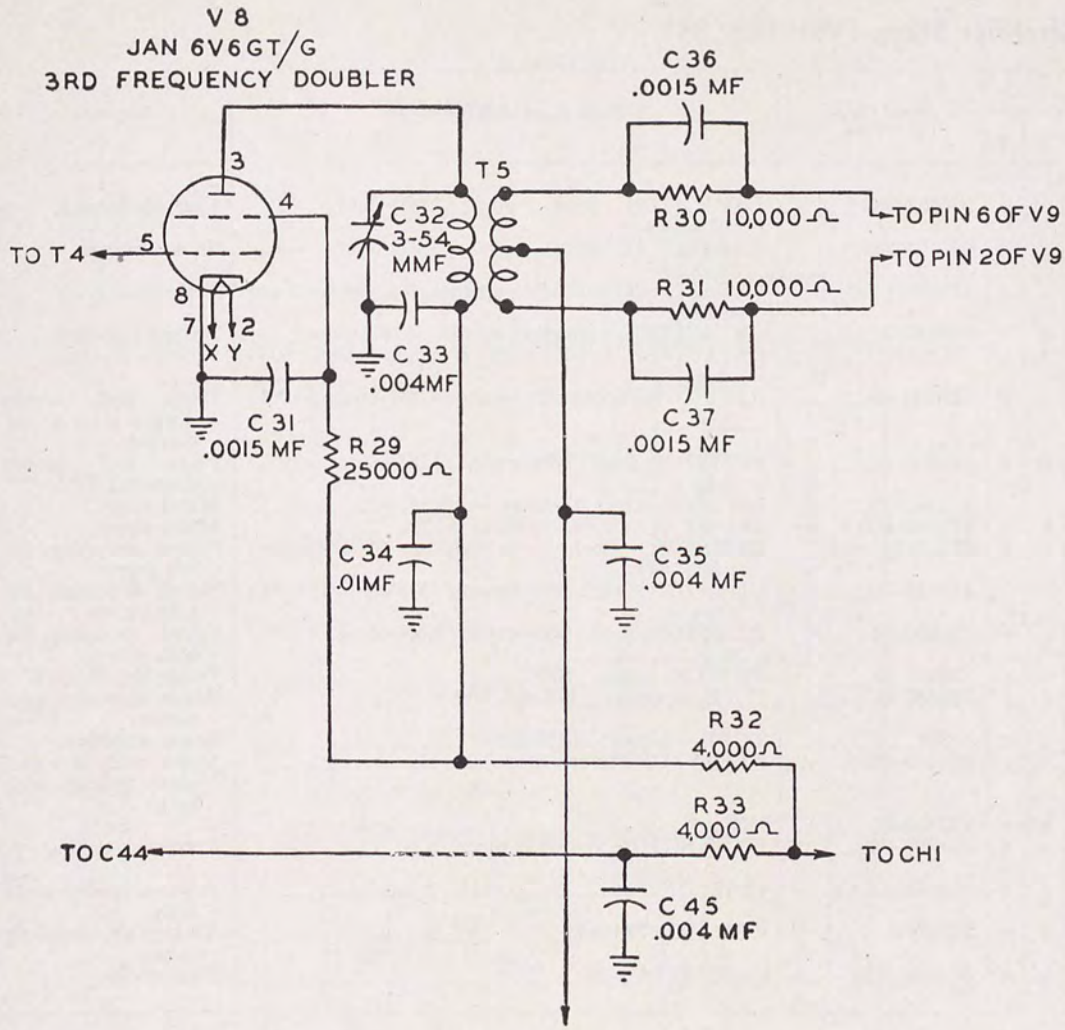
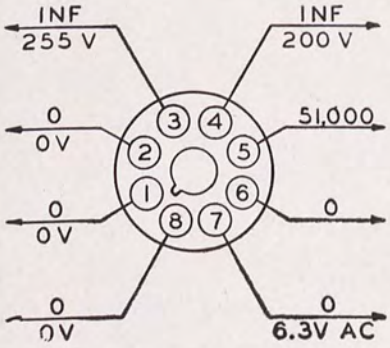


Figure 33. Second frequency doubler circuit diagram.

53. Third Frequency Doubler Stage (V8) (fig. 34)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C31	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 50-vdcw.	Screen bypass.
C32	---	---	---	---	---		CAPACITOR, variable: air	Plate tuning.
C33	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900-mmf; ±5%; 500-vdcw.	Plate bypass.
C34	x	x	x	x	x	3DA10-22.2	CAPACITOR, fixed: mica; 10,000-mmf; ±20%; 500-vdcw.	Plate return bypass.
C35	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900-mmf; ±5%; 500-vdcw.	Grid return bypass.
C36	x	x	x	x	x	3DA1.500-9.1	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Grid coupling.
C37	x	x	x	x	x	3DA1.500-9.1	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Grid coupling.
C45	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900-mmf; ±5%; 500-vdcw.	High voltage bypass.
R29	x	x	x	x	x	3RC31BF514J	RESISTOR, fixed: composition; 510,000-ohm; ±5%; 1-w.	Screen dropping.
R30	x	x	x	---	---	3RC20BE103K	RESISTOR, fixed: composition; 10,000-ohm; ±10%; ½-w.	Grid bias.
R30	---	---	---	x	x	3RC21AE512J	RESISTOR, fixed: composition; 5,100-ohm; ±5%; ½-w.	Grid bias.
R31	x	x	x	---	---	3RC20BE103K	RESISTOR, fixed: composition; 10,000-ohm; ±10%; ½-w.	Grid bias.
R31	---	---	---	x	x	3RC20BE103K	RESISTOR, fixed: composition; 5,100-ohm; ±5%; ½-w.	Grid bias.
R32	x	x	x	x	x	3Z6400-600	RESISTOR, fixed: wire-wound; 4,000-ohm; ±10%; 25-w.	Plate and screen dropping 3d doubler.
R33	x	x	x	x	x	3Z6400-600	RESISTOR, fixed: wire-wound; 4,000-ohm; ±10%; 25-w.	Plate and screen dropping V1 to V7.
T5	x	x	x	---	---	3C1084G-4	COIL, RF: 70-100 mc	Plate tuning 3d doubler plate.
T5	---	---	---	x	x	3C323-560	COIL, RF: 69.8-104.1 mc	Plate tuning 5th doubler plate.
V8	x	x	x	x	x	2J6V6GT/G	TUBE, electron: JAN—6V6GT/G	Frequency multiplier.





WARNING: BEFORE MEASURING ANY RESISTANCE REMOVE A-C LINE CORD.

VOLTAGE AND RESISTANCE READINGS ARE BETWEEN POINTS INDICATED AND CHASSIS, UNLESS OTHERWISE NOTED.

ALL VOLTAGE READINGS TAKEN WITH 50-WATT R-F OUTPUT AND 115 V A-C INPUT.

ALL MEASUREMENTS MADE WITH A 1,000 OHM PER VOLT METER.

ALL TUBES IN THEIR SOCKETS.

⊣⊢ IS SYMBOL FOR FIXED CAPACITOR.

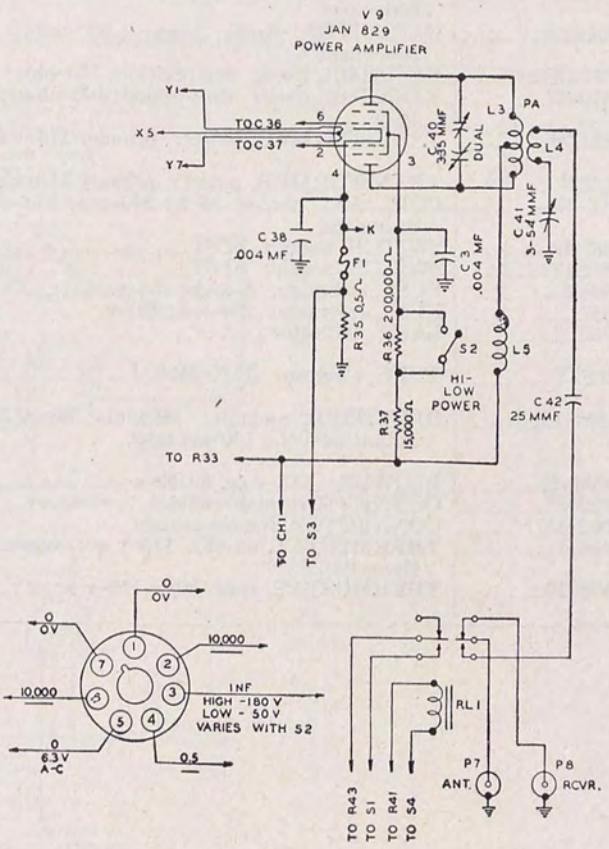
⊣↗⊢ IS SYMBOL FOR VARIABLE CAPACITOR.

TL 18351

Figure 34. Third frequency doubler circuit diagram.

54. Power Amplifier Stage (V9) (fig. 35)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C38	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900–mmf; ±5%; 500–vdcw.	Cathode bypass.
C39	x	x	x	x	x	3K3539232	CAPACITOR, fixed: mica; 3,900-mmf; ±5%; 500-vdcw.	Screen bypass.
C40	x	x	x	x	x	3D9035V–20	CAPACITOR, variable: air-dial; 3 to 35–mmf per section.	Plate tuning.
C41	x	x	x	x	x	3D9054V	CAPACITOR, variable: air-dial; 3 to 54–mmf	Antenna loading.
C42	x	x	x	x	x	3K2027021	CAPACITOR, fixed: mica; 27–mmf; ±10%; 500–vdcw.	Antenna loading.
R32	x	x	x	x	x	3Z6400–60	RESISTOR, fixed: wire-wound; 4,000–ohm; ±10%; 25–w.	Plate and screen dropping 3d doubler.
R33	x	x	x	x	x	3Z6400–60	RESISTOR, fixed: wire-wound; 4,000–ohm; ±10%; 25–w.	Plate and screen dropping V1 to V7.
R35	x	x	x	---	---	3Z5985–10	SHUNT, meter: 0.5–ohm; ±2%; 1–w	Meter shunt.
R35	---	---	---	x	x	3F3802–600.2	SHUNT, meter: 0.336–ohm; ±1%	Meter shunt.
R36	x	x	x	x	x	3RC31BF204J	RESISTOR, fixed: composition; 200,000–ohm; ±5%; 1–w.	Screen dropping for low power.
R37	x	x	x	---	---	3Z6615–50	RESISTOR, fixed: wire-wound; 15,000 ohms; ±5%; 10–w.	Screen dropping for high power.
R37	---	---	---	x	x	3Z6350–15	RESISTOR, fixed: wire-wound; 3,500 ohms; ±10%; 10–w.	Screen dropping for high power.
S2	x	x	x	x	x	3Z9857.42	SWITCH, toggle: SPST	Power HIGH-LOW.
F1	x	x	x	x	x	3Z2585.11	FUSE, cartridge: 175–ma, 250–v	Power amplifier protection.
V9	x	x	x	x	x	2J829	TUBE, electron: JAN–829B	Power amplifier.
RL1	x	x	x	---	---	2Z7589–58	RELAY, DPDT; two circuits	Antenna transfer and plate voltage control.
RL1	---	---	---	x	x	2Z7592–54	RELAY	do
P7	x	x	x	x	x	2Z8799–239	CONNECTOR, female contact	Antenna coupling.
P8	---	---	---	---	---	---	---	---
L3	x	x	x	x	x	2C6900–14/C6	COIL, RF	Power amplifier plate tank.
L4	x	x	x	x	x	3C320–8	COIL, RF; 770–mh	Antenna coupling loop.
L5	x	x	x	x	x	3C1082–2A	COIL, RF; 4.5–mh	Plate choke.



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ALL TUBES IN THEIR SOCKETS.

⫪ IS SYMBOL FOR FIXED CAPACITOR.

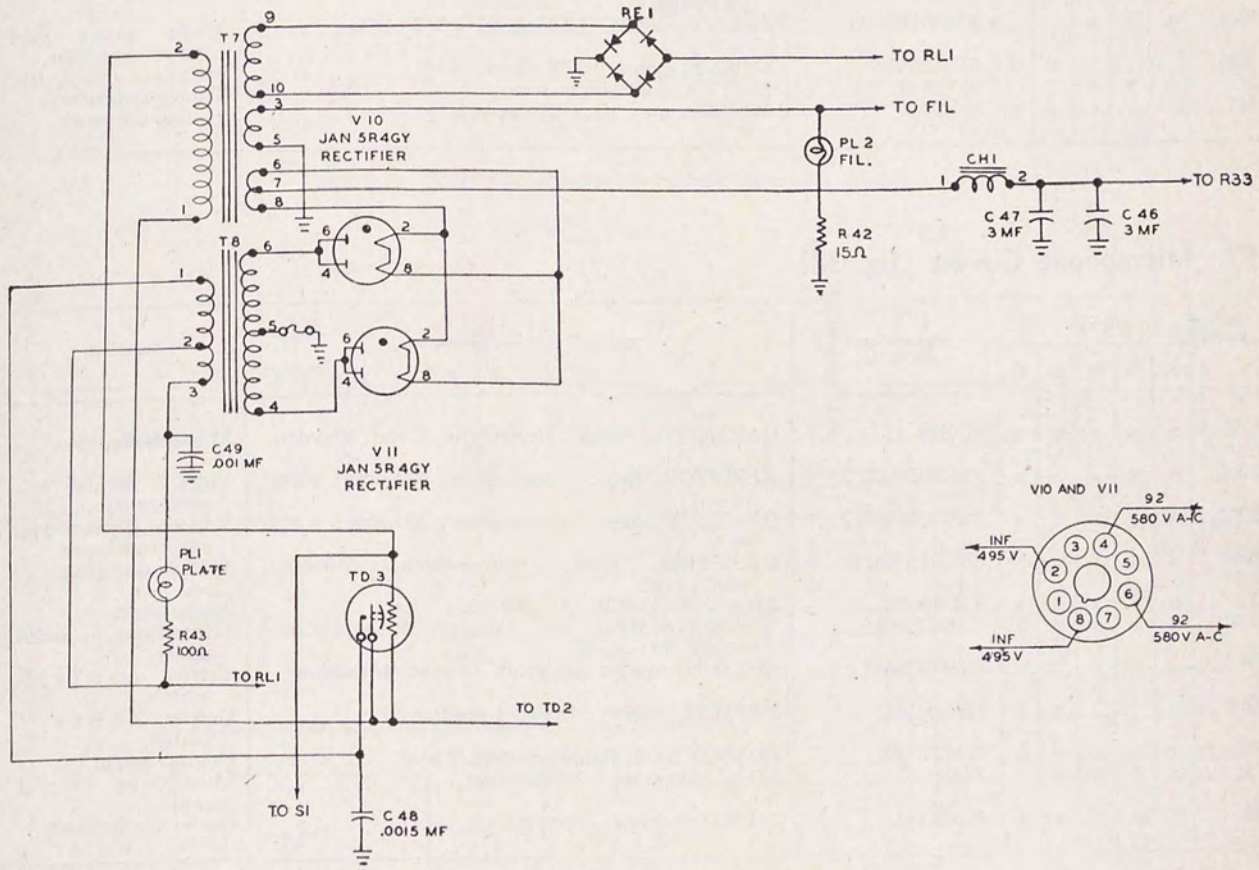
⫽ IS SYMBOL FOR VARIABLE CAPACITOR

TL 18342

Figure 35. Power amplifier circuit diagram.

55. Power Rectifier Stage (V10 and V11) (fig. 36)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C46, C47	x	x	x	x	x	3DB3.26	CAPACITOR, fixed: paper; oil-filled; 3-mf; ±10%; 600-vdcw.	High-voltage filter.
C48, C49	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	A-c line bypass.
R42	x	x	x	x	x	3RC31AE1S1K	RESISTOR, fixed: composition; 150-ohm; 1-w	Filament dropping.
R43	x	x	x	x		3Z6010-47	RESISTOR, fixed: wire-wound; 100-ohms; ±10%; 10-w.	Filament dropping.
T7	x	x	x	x	x	2Z9611.298	TRANSFORMER, power: primary 115-v ac; 60c	Filament and microphone supply.
T8	x	x	x	x	x	2Z9612.3	TRANSFORMER, power: primary 115-v ac; 60c	Plate supply.
CH1	x	x	x	x	x	3C317-47	COIL, AF: choke; 15 h; 250-ma; 174-ohm; dc resistance.	Filter choke.
S1	x	x	x			3Z9857.42	SWITCH, toggle: SPST	Line ON-OFF.
S1				x	x	3Z9849.172	SWITCH, toggle: SPST	Line ON-OFF.
F2	x	x	x	x	x	3Z2605.2	FUSE, cartridge: 5-amp; 250-v	A-c line.
F3	x	x	x	x	x	3Z2587	FUSE, cartridge: 250-ma; 250-v	High-voltage return.
PL1	x	x	x	x	x	2Z5952	LAMP, indicator	Plate on-off.
PL2								Filament on-off.
V10, V11	x	x	x	x	x	2J5R4GY	TUBE, electron: JAN-5R4GY	Power Rectifier.
RE1	x	x	x	x	x	3H4859-12	RECTIFIER, metallic: selenium; input 33-v ac, output 24-v dc, 150-ma max.	Relay and microphone voltage supply.
FM1	x	x	x	x	x	3H3000-42	BLOWER: 115-v ac, 50/60-c	Cooling.
P10	x	x	x	x	x	2Z3022-37	CONNECTOR, male-contact	
P11	x	x	x	x	x	2Z3063-33	CONNECTOR, female-contact	
TD2	x	x	x	x	x	2Z9486-1	THERMOSTAT, on-off: 115-v ac: opens 75° F., closes 85° F.	Blower motor control.
TD3	x	x	x	x	x	2Z7598-10	THERMOSTAT, time delay 110-v ac	High-voltage control.



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ALL MEASUREMENTS MADE WITH A 1,000 OHM-PER VOLT METER.

ALL TUBES IN THEIR SOCKETS.

⊣⊢ IS SYMBOL FOR FIXED CAPACITOR

TL 10283

Figure 36. Power rectifier circuit diagram.

56. Meter Switch (fig. 37)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C43	x	x	x	x	x	3K3015221	CAPACITOR, fixed: mica; 1,500-mmf; ±10%; 500-vdcw.	Meter bypass.
R34	x	x	x	---	---	3Z6001B2-20	SHUNT, meter: 12.5-ohms; ±2%; ½-w	Meter shunt grid power amplifier.
R34	---	---	---	x	x	3F3802-50	SHUNT, meter: 8.33-ohms; ±1%	Meter circuit selector.
M1	x	x	x	---	---	3F893-3	METER, ma: dc; 0-3-ma	Tuning indicator.
M1	---	---	---	x	x	3F893-5	METER, ma: dc; 0-3-ma	Tuning indicator.

57. Microphone Circuit (fig. 38)

Ref. symbol	Model					Signal Corps stock No.	Name of part and description	Function
	A	B	C	D	E			
C50, C51	x	x	x	x	x	3DB25-17	CAPACITOR, fixed: electrolytic; 25-mf; 50-vdcw	Microphone filter.
R38	x	x	x	x	x	3RC20BE301J	RESISTOR, fixed: composition; 300-ohm; ±5%; ½-w.	Voltage divider microphone input.
R39	x	x	x	x	x	3RC20BE201J	RESISTOR, fixed: composition; 200-ohm; ±5%; ½-w.	Voltage divider microphone input.
R40, R41	x	x	x	x	x	3RC31AE511J	RESISTOR, fixed: composition; 510-ohm; ±5%; 1-w.	Voltage dropping.
T9	x	x	x	x	x	3Z1893-22	TRANSFORMER, af: 500-ohm	Audio filter.
T10	x	x	x	x	x	3Z9631.243	TRANSFORMER, af: primary, 50-ohms; secondary, 500-ohms.	Microphone audio input.
S4	x	x	x	---	---	3Z9825-55-1	SWITCH, rotary: 3-circuit, 12-cont, 4-position	Carrier control switch.
S4	---	---	---	x	x	3Z9826-61	SWITCH, rotary: 4-pole, 4-position	Carrier control switch.
P9	x	x	x	x	x	2Z8677-49	CONNECTOR, female-contact, 7 cont	Control cable.
J1	x	x	x	x	x	2Z5595-7	JACK, telephone: 3-conductor	Microphone and control.
J2	x	x	x	x	x	4C4311-1	JACK, telephone: open-circuit	Outlet for headset.

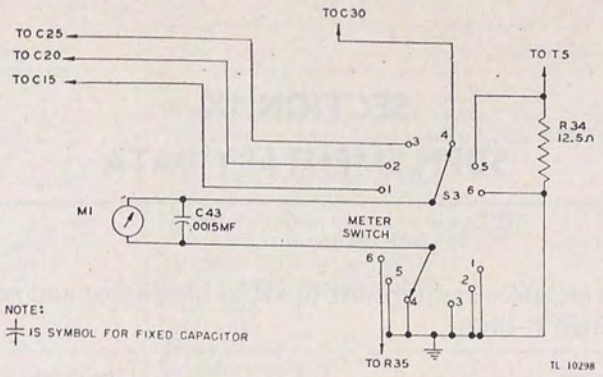


Figure 37. Meter switch circuit diagram.

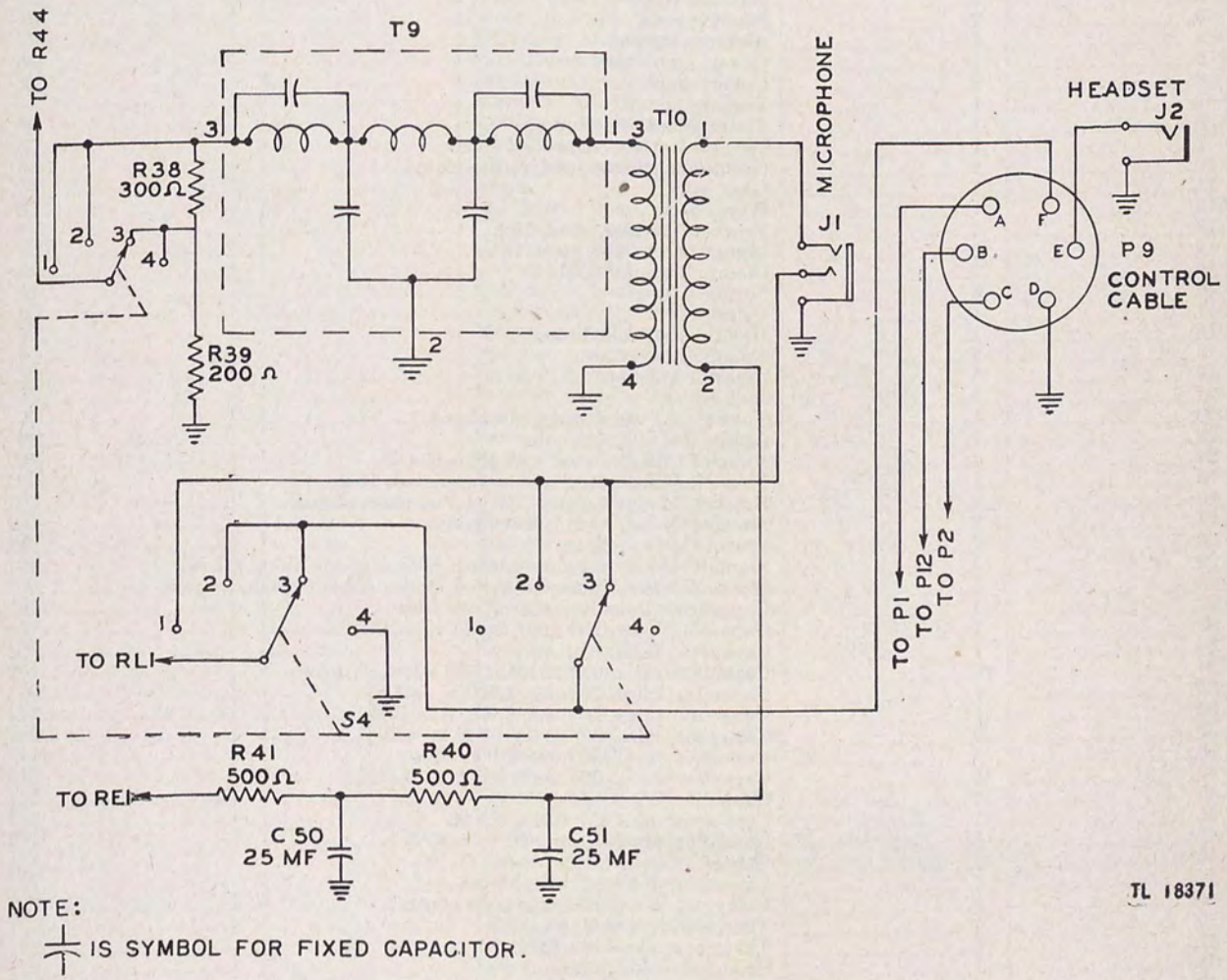


Figure 38. Microphone circuit diagram.

SECTION IX
SUPPLEMENTARY DATA

58. Parts Identification

The following illustrations or tables are provided to aid in identifying and servicing the various component parts of Radio Transmitter T–14(*)/.

Item	No. req.	Description
1	2	Capacitor, mounting ring.
2	1	Bakelite ring.
3	7	Binding post.
4	4	Arrestor, spring.
5	1	Cover, amphenol.
6	2	Cover, amphenol.
7	1	Resistor clamp.
8	1	Meter guard, aluminum.
9	1	Bar, protective, cold-rolled steel.
10	2	Grounding spring, steel, nickel-plated.
11	1	Gear, split.
12	1	Worm drive.
13	2	Bracket, rectifier, steel, 19 ga.
14	2	Mounting bracket, steel, 16 ga.
15	2	Clamp, Tube 5R4GY.
16	6	Spring, Dzus.
17	1	Pointer.
18	1	Handle, cold-rolled steel.
19	1	Conductivity clamp.
20	4	Arrestor bracket.
21	2	Jack cover.
22	1	Tube shield, steel, cadmium-plated.
23	1	Attenuator, 100,000 ohms.
24	4	Resistor bracket, steel, cadmium-plated.
25	1	Mounting plate, steel, cadmium-plated, 16 ga.
26	2	Bracket, mounting, steel, 16 ga, cadmium-plated.
27	2	Standoff, brass, 5/32 x 1/4 outside diam.
28	2	Spacer, 1/4 in. x 1/4 in.
29	4	Standoff, brass, cadmium-plated, 1/4-in. outside diam. x 1 in.
30	4	Standoff, brass, cadmium-plated, 1/4-in. outside diam. x 3/4 in.
31	3	Capacitor, electrolytic, 25 mf, 50 vdcw.
32	1	Capacitor, mica, 100 mmf, 1,000 v, ±10%.
33	1	Capacitor, mica, 0.01 mf.
34	10	Capacitor, mica, 0.0015 mf, 1,000 vdcw, 3/4 in. sq.
35	1	Capacitor, mica, 25 mmf, 1,000 v, ±20%.
36	1	Capacitor, mica, 40 mmf, 1,000 v, ±10%.
37	6	Capacitor, mica, 0.004 mf, 1,000 v, ±10%.
38	1	Capacitor, mica, 50 mmf, 1,000 vdcw.
39	1	Capacitor, mica, 500 mmf, 1,000 v, ±10%.
40	2	Capacitor, oil, 3 mf.
41	1	Capacitor, oil, 4 mf, 600 v, C–44.
42	1	Capacitor, oil, 0.05 mf, 600 v, ±20%.
43	1	Capacitor, 3–35 dual variable C–40.
44	2	Capacitor, 3–54 mf, variable air.
45	1	Relay, 24–v, antenna and plate control.
46	1	Thermostat, time delay TD3.
47	1	Thermostat, spencer TD2.
48	1	Grommet, 1/2-inch hole.
49	3	Grommet, 9/16 outside diam. x 9/32 mounting hole.
50	1	Rectifier, selenium.
51	4 1/2	Tubing, black, saturated, 3 mm.
52	5	Wire, copper-tinned, No. 18 solid.
53	1	Wire, bare, copper-tinned, No. 14 solid.
54	10	Wire, bare, copper-tinned, No. 20 solid.
55	24	Wire, vinylite, white-black tracer, No. 22 stranded.
56	5	Wire, vinylite, white-brown tracer, No. 22 stranded.
57	25	Wire, vinylite, white-red tracer, No. 22 stranded.
58	42	Wire, vinylite, white-orange tracer, No. 22 stranded.
59	3	Wire, vinylite, white-green tracer, No. 22 stranded.
60	19	Wire, vinylite, white-blue tracer, No. 22 stranded.

Item	No. req.	Description
61	18	Wire, vinylite, white-purple tracer, No. 22 stranded.
62	1	Transformer, microphone audio filter, 8306T10.
63	1	Band-pass filter assembly 7316–T9.
64	1	Plate choke assembly 5 mh.
65	1	Plate choke assembly, 770 μh.
66	1	Choke and plate assembly filter CH7.
67	1	Matching transformer 8305–T6.
68	1	Filament transformer 8359–T7.
69	1	Plate transformer 4891N–T8.
70	1	Coil, tank.
71	1	Coil, link.
72	1	Transformer.
73	1	Transformer T–2.
74	1	Transformer T–3.
75	1	Transformer T–4.
76	1	Transformer T–5.
77	1	Choke, p. a., L–5.
78	1	Meter, 0–3 mils, 2¼-in. round.
79	1	Frequency and direction plate.
80	1	Escutcheon panel.
81	2	Insulator type 1003, 2 x ½.
82	9	Standoff, American lava, ⅝ x ½.
83	1 pr	Insulator, American lava.
84	3	Knob, bar, 1 inch.
85	1	Grommet, bakelite, line cord.
86	1	Knob.
87	2	Calibration knob.
88	1	Calibration knob.
89	1	Calibration knob.
90	1	Calibration knob.
91	1	Calibration knob.
92	2	Washer, rubber, 0.060 x 9/16 x 1/32.
93	1	Meter, gasket, rubber.
94	1	Resistor, carbon, 100,000 ohms, ½ w, ±10%.
95	1	Resistor, carbon, 200 ohms, ½ w, ±10%.
96	1	Resistor, carbon, 250,000 ohms, ½ w, ±10%.
97	1	Resistor, carbon, 300 ohms, ½ w, ±10%.
98	1	Resistor, carbon, 30,000 ohms, ½ w, ±10%.
99	1	Resistor, carbon, 350,000 ohms, ½ w, ±10%.
100	1	Resistor, carbon, 100,000 ohms, 1 w, ±10%.
101	1	Resistor, carbon, 15 ohms, 1 w, ±10%.
102	2	Resistor, carbon, 2,000 ohms, 1 w, ±10%.
103	1	Resistor, carbon, 200,000 ohms, 1 w, ±10%.
104	1	Resistor, carbon, 25,000 ohms, 1 w, ±10%.
105	1	Resistor, carbon, 250,000 ohms, 1 w, ±10%.
106	3	Resistor, carbon, 500 ohms, 1 w, ±10%.
107	1	Resistor, carbon, 500,000 ohms, 1 w, ±10%.
108	1	Resistor, carbon, 75,000 ohms, 1 w, ±10%.
109	1	Potentiometer, 100,000 ohms, R-4.
110	1	Resistor, 0.505 ohms.
111	1	Resistor, 12.5 ohms.
112	1	Resistor, fixed, 100 ohms, 10 w.
113	1	Resistor, 15,000 ohms, 10 w, ±10%.
114	2	Resistor, fixed, 4,000 ohms, 25 w.
115	2	Female, chassis mounting, single connector.
116	1	Receptacle, chassis mounting 7-contact female.
117	1	Mounting jack, single, 5/16-inch hole, two-circuit.
118	1	Mounting jack, single, ⅜-inch hole, open circuit.
119	1	Fan socket assembly.
120	3	Fuse holder.
121	1	Dial light, green.
122	1	Dial light, red.
123	1	Socket, 7-pin, UT–107.
124	10	Tube socket, 8-pin octal.
125	21	Solder lug, shakeproof, No. 2623–8, 1 inch long.
126		Solder lug, shakeproof, No. 2106, No. 6.
127	4	Solder lug, shakeproof, No. 2101–10, No. 10.
128	12	Solder lug, shakeproof, No. 2104–6, No. 6.
129	6	Solder lug, No. 4.
130	8	Solder lug, cinch, No. 2444.
131	1	Solder lug, brass, cinch, No. 1412–P27.
132	6	Solder lug, Zierick No. 123, No. 6 double lug.
133	1	Terminal lug, cinch.
134	2	Shockmount slide assembly.
135	2	Lead and clip assembly.
136	1	Cover (crystal oven).

Item	No. req.	Description
137	1	Coupling assembly.
138	1	Crystal oven assembly.
139	1	Chassis welding assembly.
140	1	Arrestor assembly cover.
141	1	Resistor board assembly.
142	1	Line cord.
143	1	Cable No. 1.
144	1	Cable No. 2.
145	1	Cable No. 3.
146	1	Cable No. 4.
147	1	Cable No. 5.
148	1	Cable No. 6.
149	7	Flat washer, phosphor-bronze, nickel-plated, No. 8 5/8 outside diam.
150	3	Washer, phenolic.
151	6	Flat washer, phenolic, black, 5/8 x 5/32 x 3/16.
152	7	Washer, male, bakelite, 5/8 x 5/32 x 3/16, 1/16 shoulder.
153	16	Washer, treated fabric No. 6, inside diam 3/8 outside diam x 0.035.
154	2	Lockwasher, phosphor-bronze, nickel-plated, Shakeproof, No. 10.
155	18	Lockwasher, split, phosphor-bronze, nickel-plated, No. 8 5/64 x 3/64.
156	2	Lockwasher, split, phosphor-bronze, nickel-plated, 1/4 x 3/32 x 1/16.
157	121	Lockwasher, nickel-plated, Shakeproof, No. 6–1906, No. 6.
158	1	Lockwasher, phosphor-bronze, nickel-plated, Shakeproof, No. 1920.
159	42	Lockwasher, phosphor-bronze, nickel-plated, Shakeproof, No. 8.
160	2	Lockwasher, split, phosphor-bronze, nickel-plated, No. 10.
161	33	Lockwasher, phosphor-bronze, Shakeproof, No. 4.
162	2	Drive pin, steel, cadmium-plated, No. U/OX 1/8.
163	2	Switch, SPST.
164	1	Switch, Mallory, 2-pole, 6-position.
165	1	Switch, Mallory S–4, 3-pole, 3-position.
166	2	Screw, roundhead, machine, brass, nickel-plated, No. 10–32 x 1/2.
167	2	Screw, roundhead, machine, brass, nickel-plated, No. 10–32 x 3/8.
168	1	Screw, roundhead, machine, brass, nickel-plated, No. 6–32 x 1 1/2.
169	2	Screw, roundhead, machine, brass, nickel-plated, No. 6–32 x 1.
170	3	Screw, roundhead, machine, brass, nickel-plated, No. 4–36 x 3/4.
171	5	Screw, roundhead, machine, brass, nickel-plated, No. 6–32 x 1/4.
172	2	Washer, flat, 7/8 outside diam x 11/16 x 0.010.
173	20	Screw, bindinghead, machine, brass, nickel-plated, No. 8–32 x 3/8.
174	28	Screw, bindinghead, machine, brass, nickel-plated, No. 8–32 x 1/4.
175	62	Screw, bindinghead, brass, nickel-plated, No. 6–32 x 5/16.
176	2	Screw, bindinghead, brass, nickel-plated, No. 6–32 x 3/8.
177	26	Screw, bindinghead, machine, brass, nickel-plated, No. 6–32 x 1/4.
178	6	Screw, bindinghead, machine, brass, nickel-plated, No. 4–36 x 1/4.
179	16	Screw, bindinghead, machine, brass, nickel-plated, No. 4–36 x 3/8.
180	2	Screw, bindinghead, machine, brass, nickel-plated, No. 4–36 x 1/2.
181	4	Screw, bindinghead, machine, brass, nickel-plated, No. 4–36 x 3/16.
182	1	Screw, bindinghead, machine, brass, nickel-plated, No. 6–32 x 1 1/8.
183	6	Screw, bindinghead, machine, brass, nickel-plated, No. 6–32 x 3/16.
184	2	Screw, bindinghead, machine, brass, nickel-plated, No. 6–32 x 1/2.
185	2	Screw, bindinghead, machine, brass, nickel-plated, No. 8–32 x 5/16.
186	11	Screw, flathead, machine, brass, nickel-plated, No. 4–36 x 1/2.
187	2	Screw, flathead, machine, brass, nickel-plated, No. 4–36 x 1/4.
188	1	Screw, flathead, machine, brass, nickel-plated, No. 4–36 x 5/16.
190	28	Hex. nut, brass, nickel-plated, No. 8–32 x 5/16.
191	66	Hex. nut, brass, nickel-plated, No. 6–32 x 1/4.
192	18	Hex. nut, brass, nickel-plated, No. 4–36 x 1/4.
193	4	Speed nut, brass, nickel-plated, No. 6–32 x 1/4.
194	2	Washer, flat, 5/8 outside diam x 15/32 inside diam x 0.10.
195	2	Resistor, carbon, 560 ohms, 1/2 w, ±10%.
196	3	Wire, No. 16, bare, tinned copper.
197	2	Saturated sleeving.
198	1	Screw, flathead, machine, brass, nickel-plated, No. 6–32 x 1/2.
199	2	Flat washer, brass, nickel-plated.

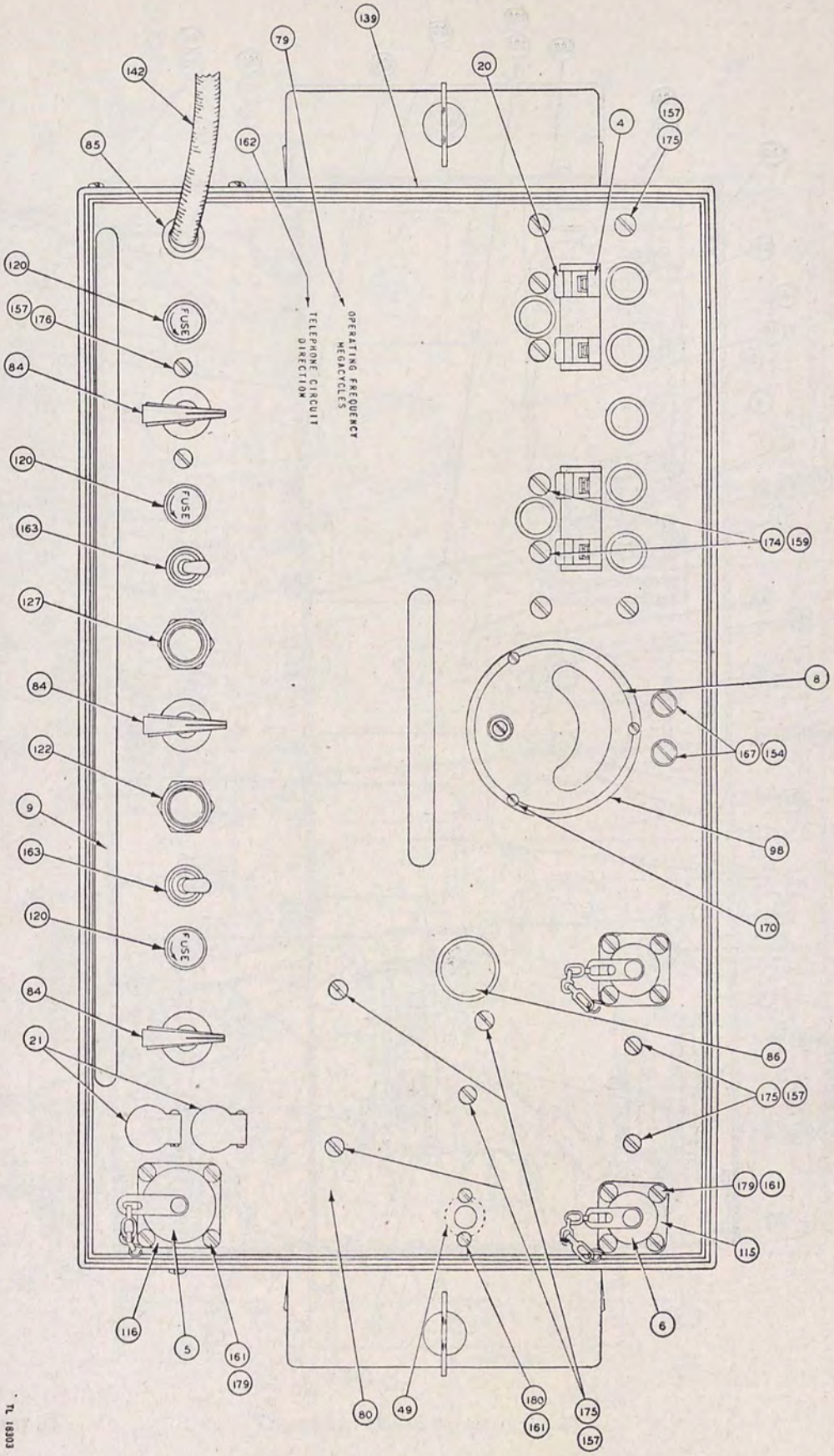


Figure 39. Radio Transmitter T–14/TRC–1—front panel.

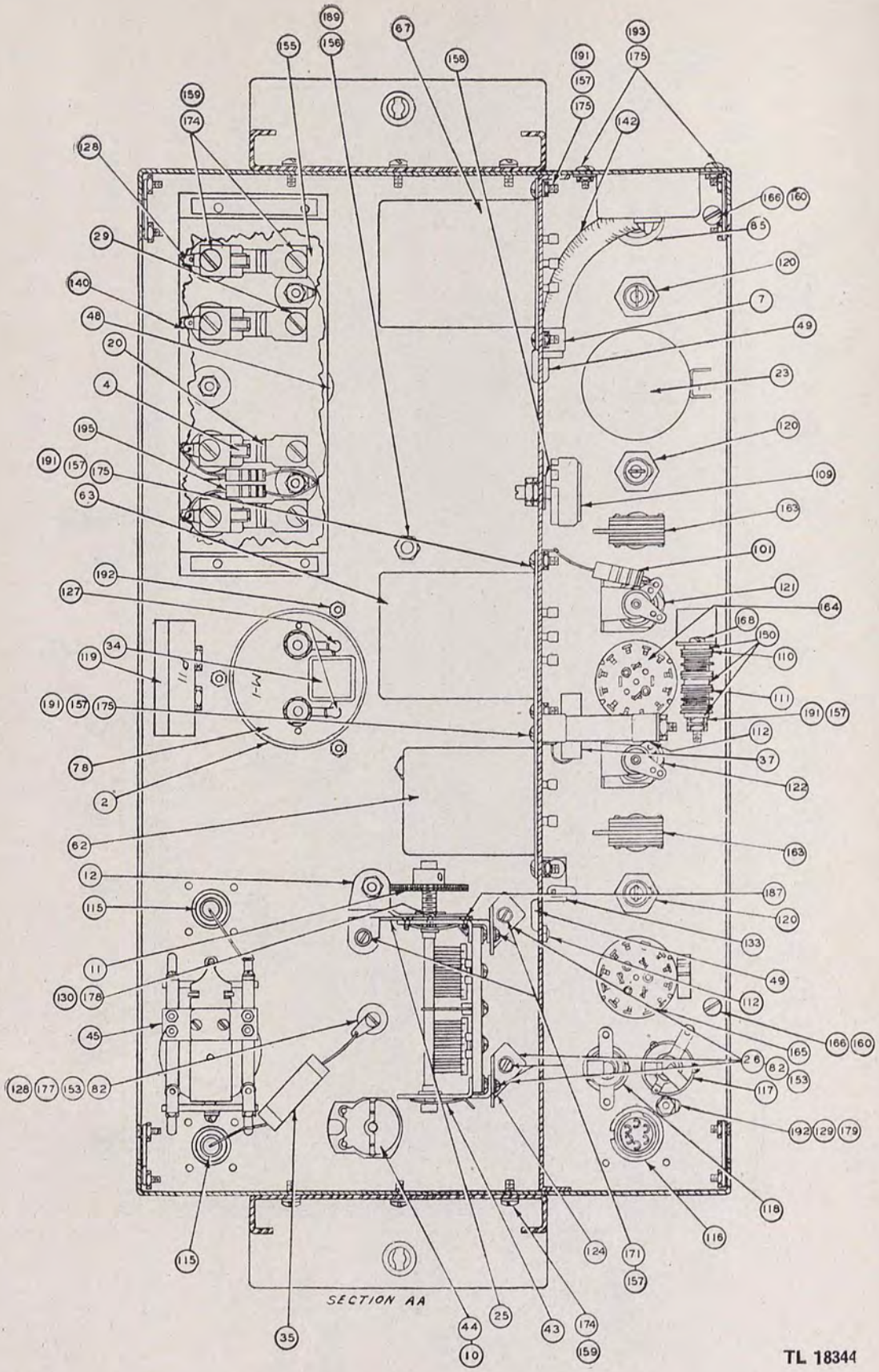


Figure 40. Chassis lay-out (section A).

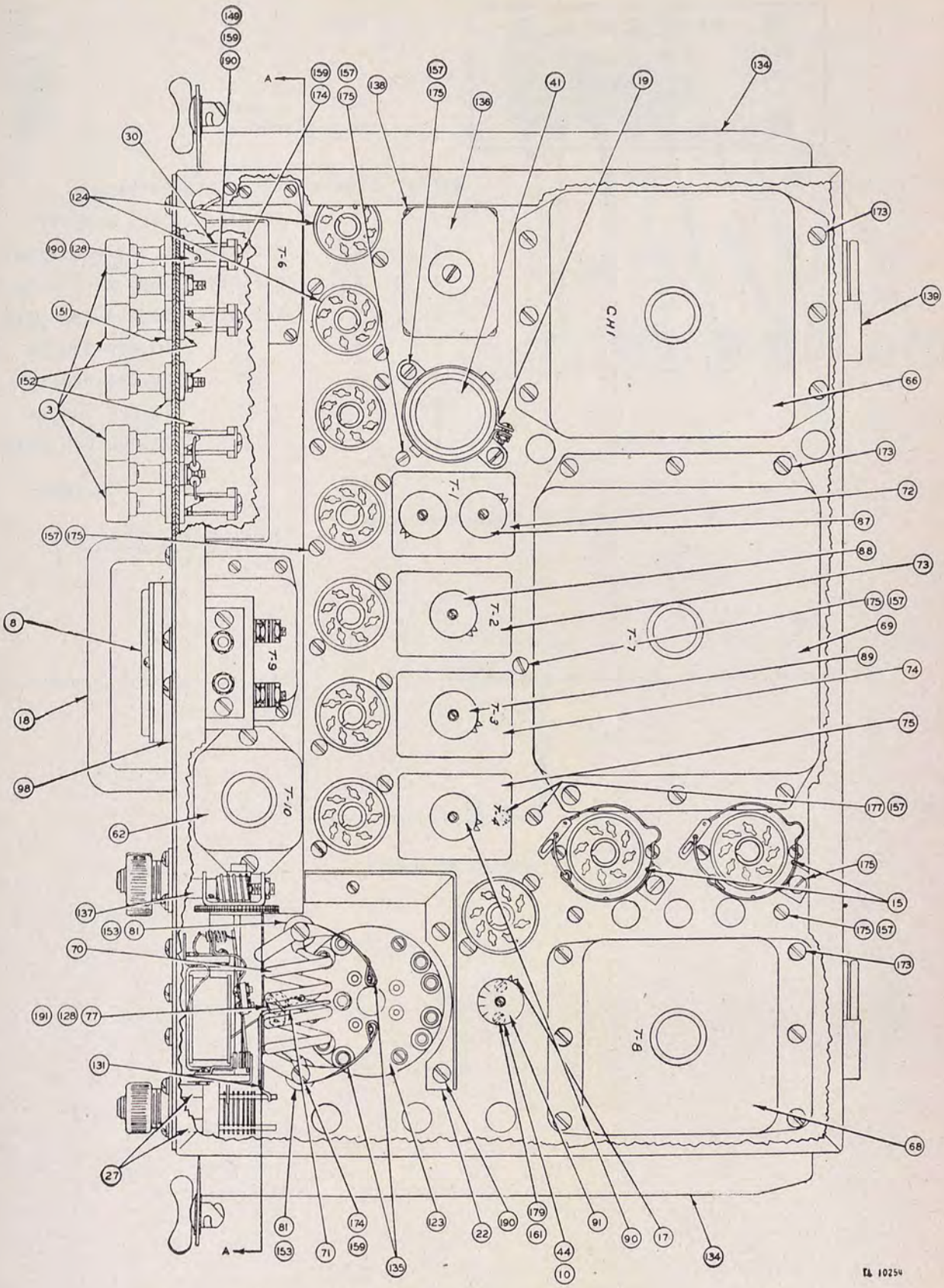
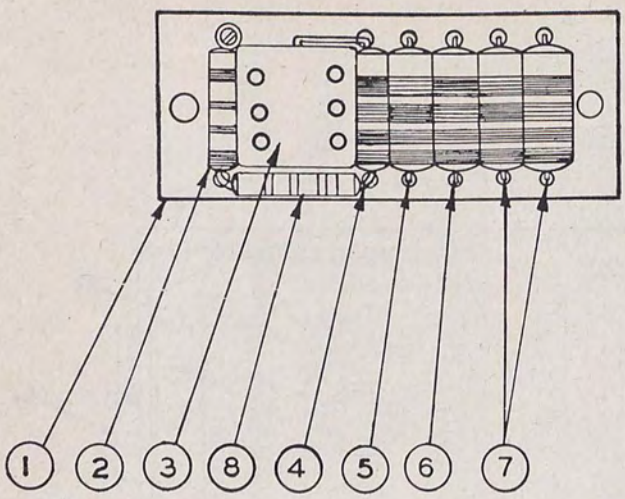


Figure 41. Chassis lay-out (section B).



REQ'D	ITEM	DESCRIPTION
1	1	TERMINAL BOARD ASSEMBLY
1	2	RESISTOR 50,000 OHM 1/2W
1	3	CAPACITOR .005 MF 3/4 SQ
1	4	RESISTOR 250,000 OHM 1/2W
1	5	" 10,000 OHM 1W
1	6	" 250,000 OHM 1W
2	7	" 50,000 OHM 1W
1	8	" 200,000 OHM 1/2W

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Figure 42. Resistor board assembly.

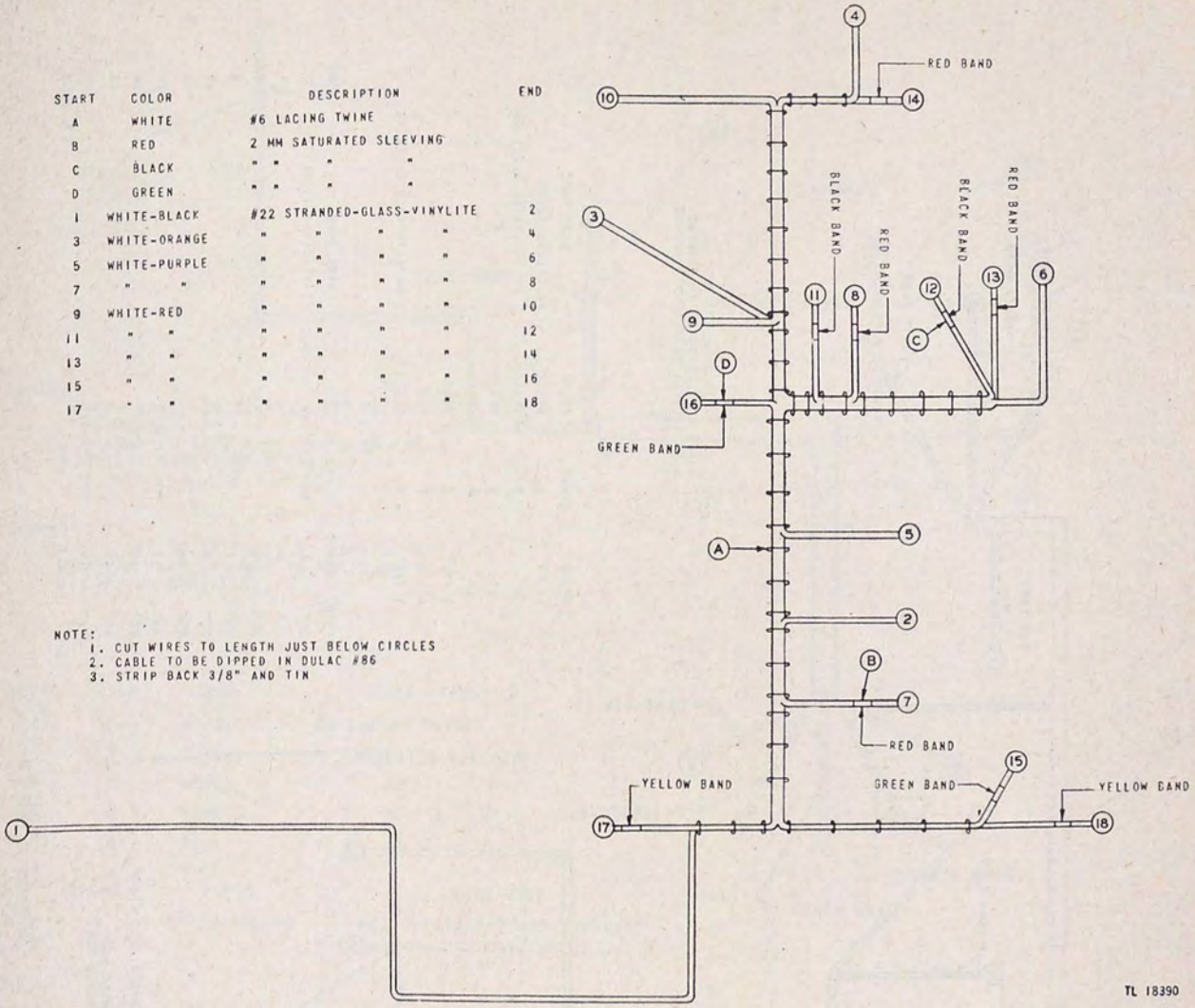
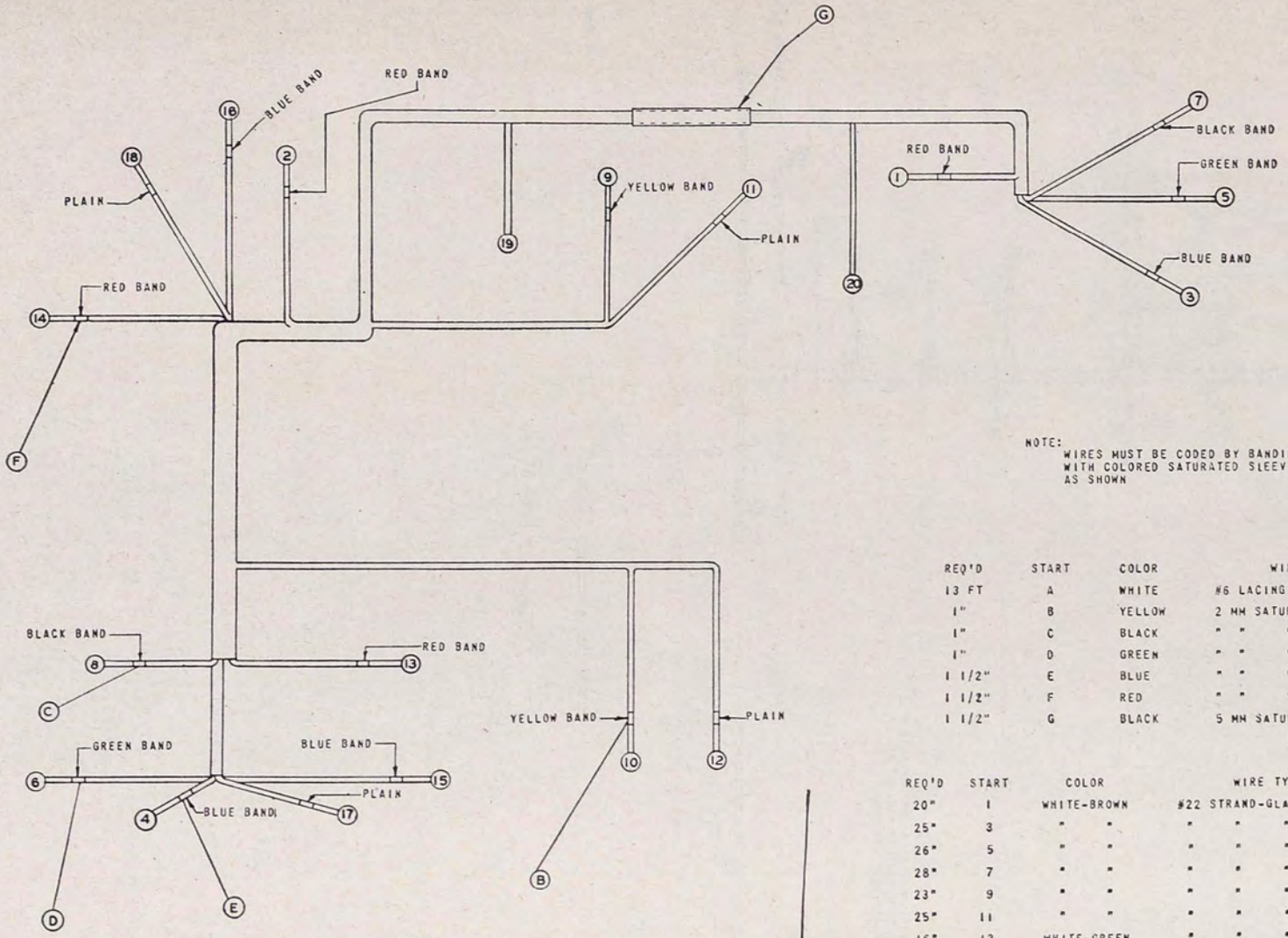


Figure 43. Cable No. 2.



NOTE:
WIRES MUST BE CODED BY BANDING WITH COLORED SATURATED SLEEVING AS SHOWN

REQ'D	START	COLOR	WIRE TYPE
13 FT	A	WHITE	#6 LACING TWINE
1"	B	YELLOW	2 MM SATURATED SLEEVING
1"	C	BLACK	" " " "
1"	D	GREEN	" " " "
1 1/2"	E	BLUE	" " " "
1 1/2"	F	RED	" " " "
1 1/2"	G	BLACK	5 MM SATURATED SLEEVING

REQ'D	START	COLOR	WIRE TYPE	END
20"	1	WHITE-BROWN	#22 STRAND-GLASS-VINYLITE	2
25"	3	" "	" " " "	4
26"	5	" "	" " " "	6
28"	7	" "	" " " "	8
23"	9	" "	" " " "	10
25"	11	" "	" " " "	12
16"	13	WHITE-GREEN	" " " "	14
19"	15	" "	" " " "	16
16"	17	" "	" " " "	18
9"	19	WHITE-BLACK	" " " "	20

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NOTE:
1. CUT WIRES TO LENGTH JUST BELOW CIRCLES
2. DIP CABLE IN DULAC #86
3. STRIP BACK 3/8" AND TIN

Figure 44. Cable No. 3.

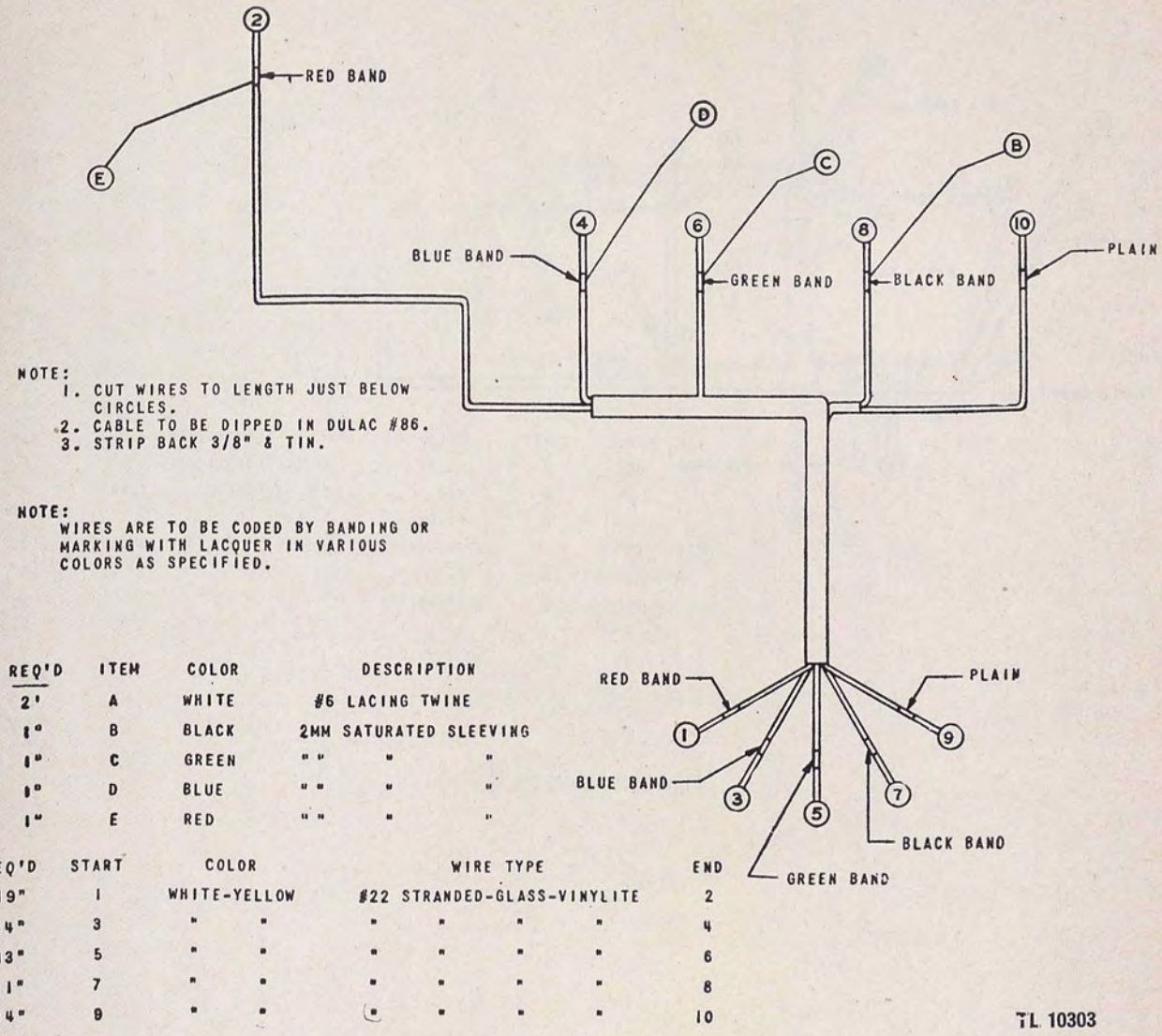


Figure 45. Cable No. 4.

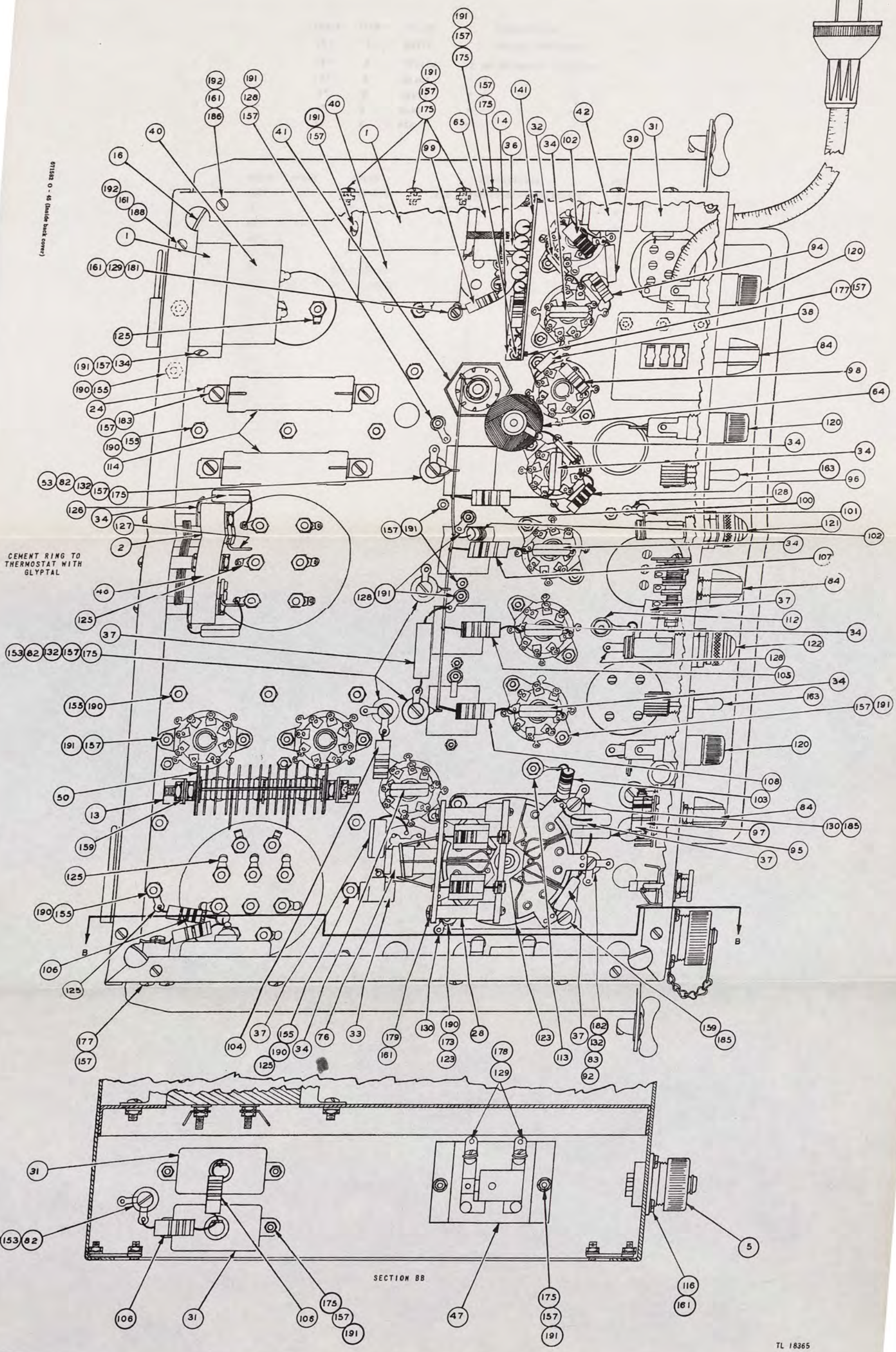
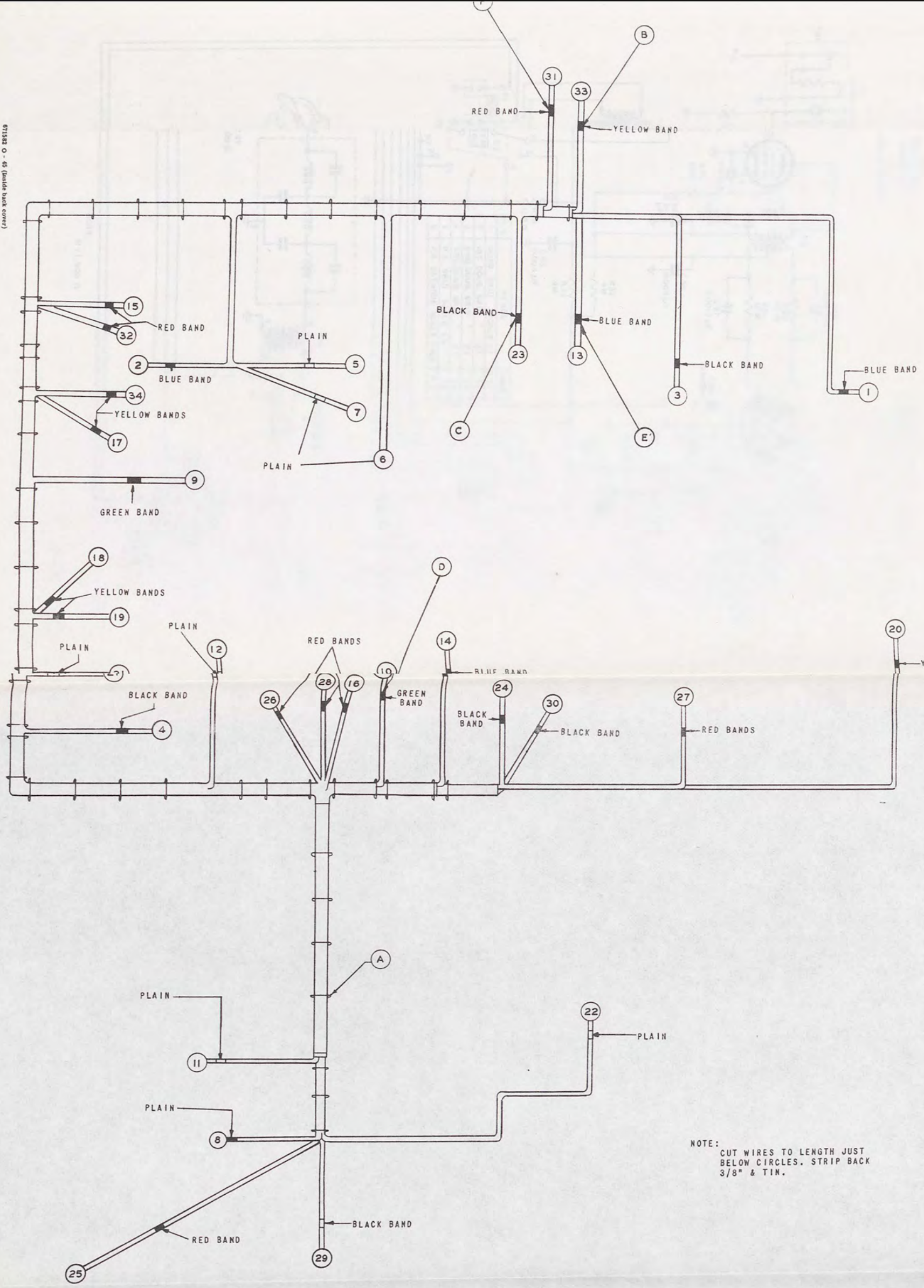


FIGURE 48. *Chassis lay-out (section C).*



NOTE:
CUT WIRES TO LENGTH JUST BELOW CIRCLES. STRIP BACK 3/8" & TIN.

REQ'D	ITEM	COLOR	DESCRIPTION
14'	A	WHITE	#6 LACING TWINE
3"	B	YELLOW	2 MM SATURATED SLEEVING
3"	C	BLACK	" " " "
1"	D	GREEN	" " " "
2"	E	BLUE	" " " "
4"	F	RED	" " " "

REQ'D	START	COLOR	DESCRIPTION	END
22"	1	WHITE-RED	#22 STRANDED-GLASS-VINYLITE	2
31"	3	" "	" " " "	4
16"	5	" "	" " " "	6
29"	7	" "	" " " "	8
22"	9	" "	" " " "	10
14"	11	WHITE-BLACK	" " " "	12
36"	13	WHITE-PURPLE	" " " "	14
21"	15	" "	" " " "	16
12"	17	" "	" " " "	18
27"	19	" "	" " " "	20
27"	21	" "	" " " "	22
34"	23	" "	" " " "	24
17"	25	" "	" " " "	26
15"	27	" "	" " " "	28
18"	29	" "	" " " "	30
20"	31	" "	" " " "	32
21	33	" "	" " " "	34

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FIGURE 49. *Cable No. 1.*

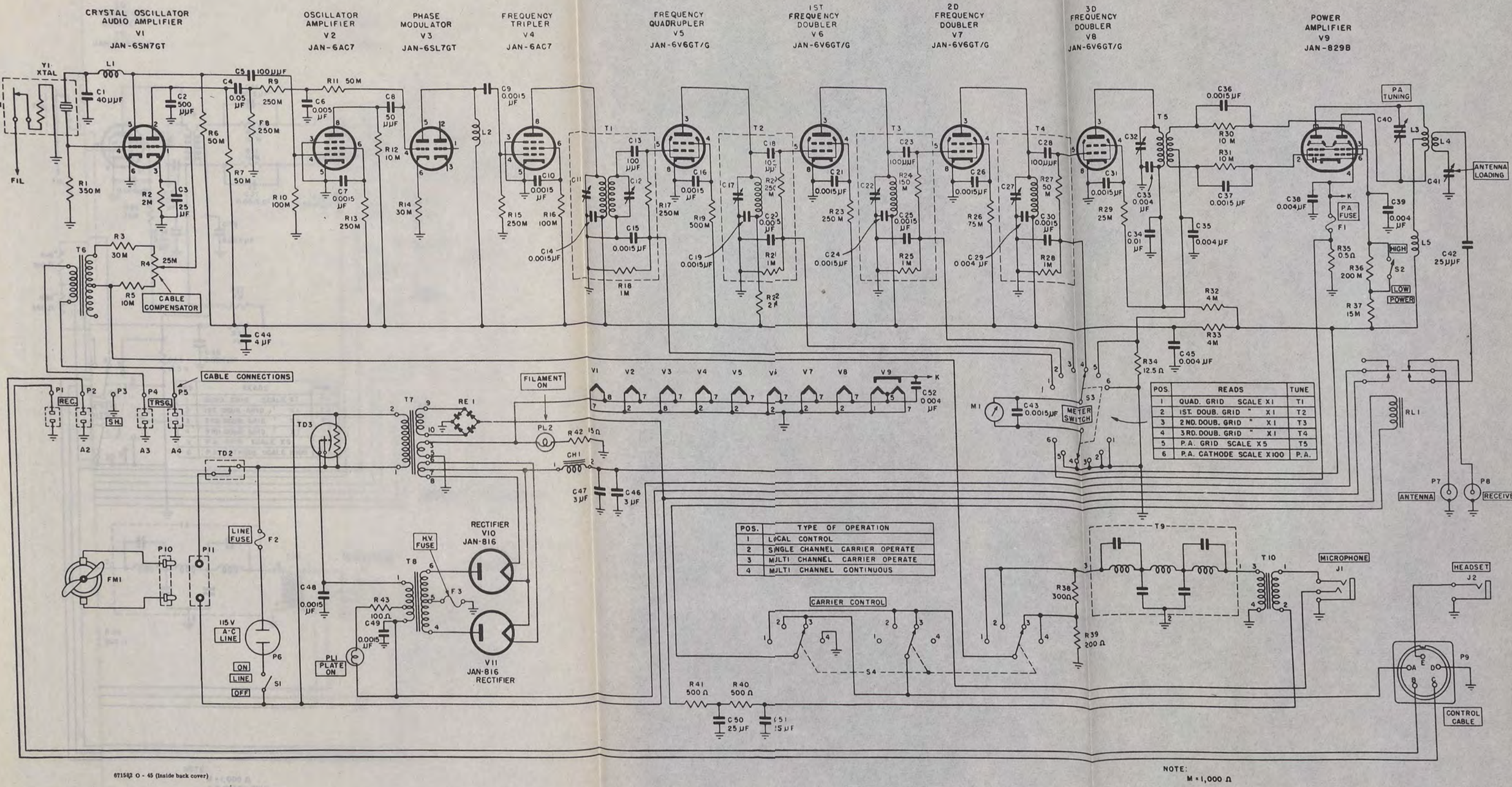

FIGURE 50. *Schematic diagram of Radio Transmitter T-14/TRC-1.*

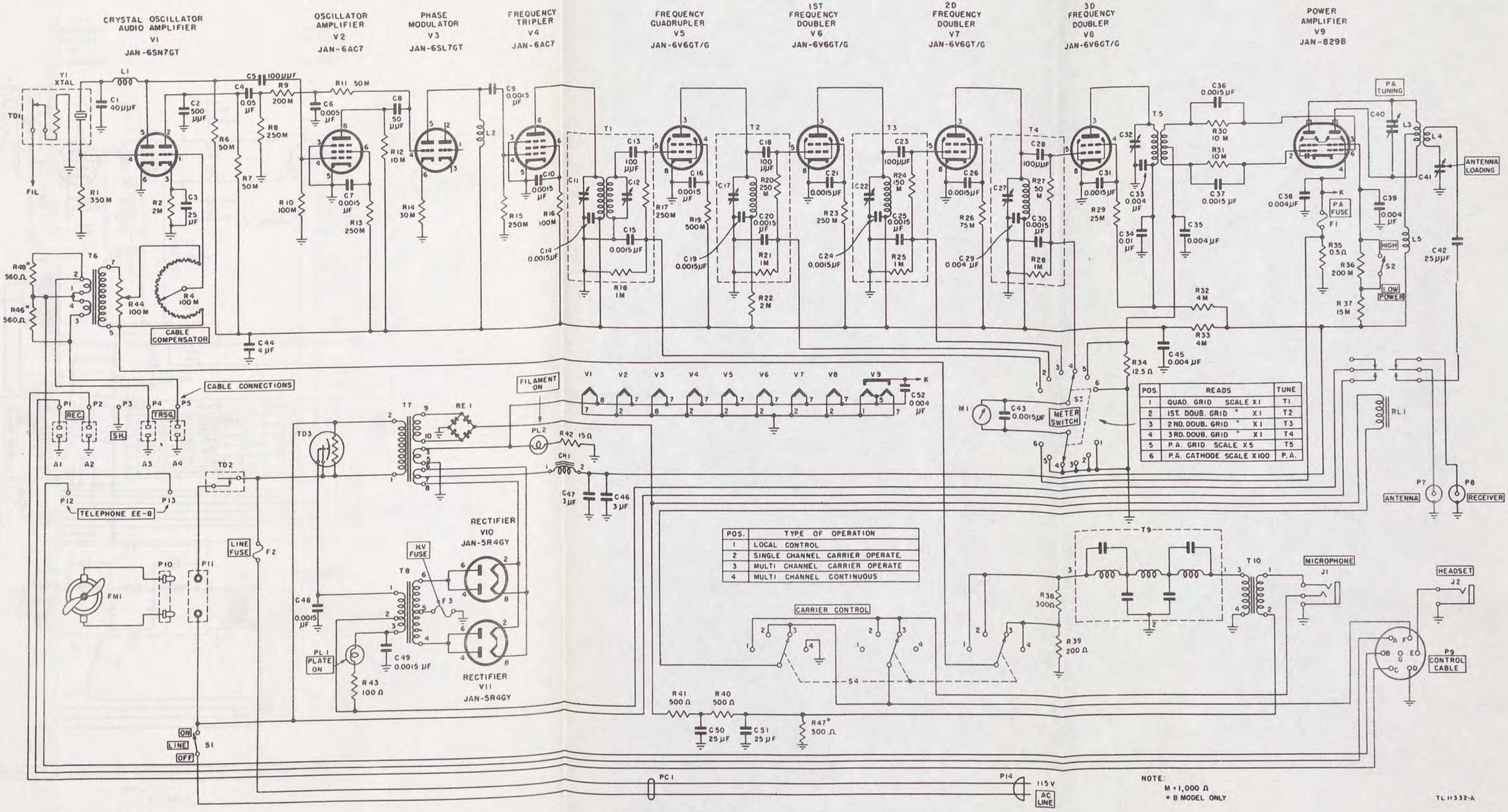

FIGURE 51. *Schematic diagram of Radio Transmitters T–14A/, T–14B/, and T–14C/.*

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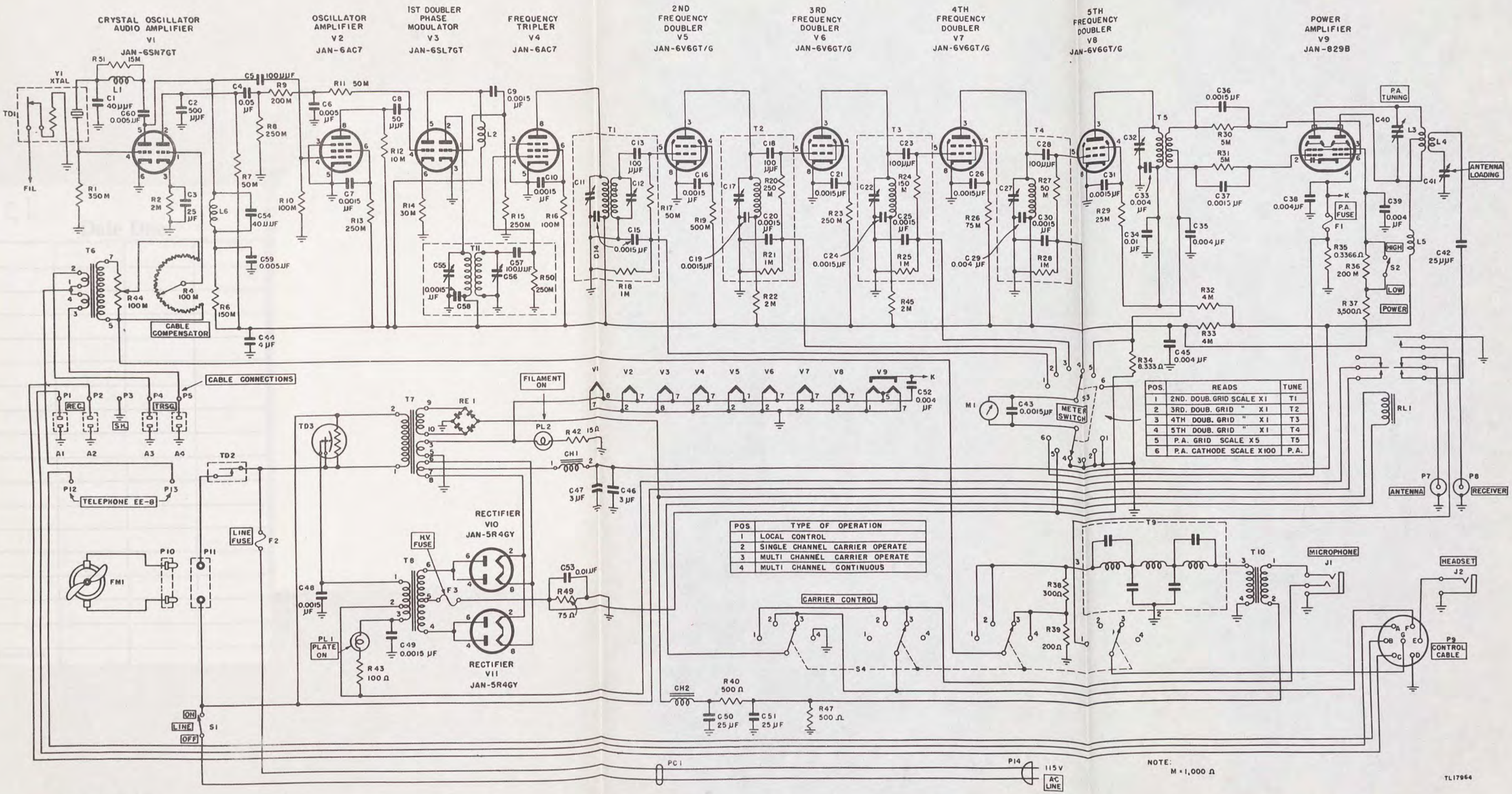

POS.	READS	TUNE
1	2ND. DOUB. GRID SCALE X1	T1
2	3RD. DOUB. GRID " X1	T2
3	4TH DOUB. GRID " X1	T3
4	5TH DOUB. GRID " X1	T4
5	P.A. GRID SCALE X5	T5
6	P.A. CATHODE SCALE X100	P.A.

POS	TYPE OF OPERATION
1	LOCAL CONTROL
2	SINGLE CHANNEL CARRIER OPERATE
3	MULTI CHANNEL CARRIER OPERATE
4	MULTI CHANNEL CONTINUOUS

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FIGURE 52. *Schematic diagram of Radio Transmitters T-14D/ and T-14E/*