TM 11-4062

WAR DEPARTMENT TECHNICAL MANUAL

RADIO TRANSMITTER

T-55/MRQ-2

REPAIR INSTRUCTIONS

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WAR DEPARTMENT • JANUARY 1946

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TM 11–4062, Radio Transmitter T–55/MRQ–2, Repair Instructions, is published for the information and guidance of all concerned.

[AG 300.7 (16 Oct 45)]

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

SAFETY NOTICE

This equipment uses *high voltages* which are *dangerous to life.* Electrical interlock switches are provided for your protection. They remove the high d-c voltage to the output circuits in the transmitter, when the hinged doors of the cover are open or when either the cover or the back is removed. Always be sure that back, cover, and cover doors are closed *before applying plate power.*

When the transmitter is in operation *extremely high r-f voltages* are present in and around the antenna tuning unit, all its connection leads, the antenna, and the antenna insulator. You can get *dangerous burns* from arcs caused by touching the *antenna circuit. Be careful.* Do not attempt to make an adjustment unless you are thoroughly familiar with this equipment.

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SECTION I

DESCRIPTION

1. General.

This manual provides repair procedure for Radio Transmitter T–55/MRQ–2† (figs. 1 and 3), which is a modified Radio Transmitter BC–610–E (fig. 2), a component of Radio Sets SCR–399–A and SCR–499–A. Radio Transmitter T–55/MRQ–2 with the associated components of Radio Set AN/MRQ–2 is housed in Shelter HO–17. The shelter with all of the installed radio equipment may be mounted on a cargo truck for mobile operation, or it may be removed from the truck and placed on level ground to be operated as a fixed station.

2. Electrical Characteristics

a. Operating Range. The normal operating range of Radio Transmitter T–55/MRQ–2 with a Radio Set AN/MRQ–2 for two-way voice communication is 100 miles. With the use of continuous-wave (c-w) transmission the range is increased to 250 miles or more, depending on the frequencies chosen and the time of day or year operated.

b. Frequency Range. Radio Transmitter T–55/MRQ–2 is capable of c-w or voice transmission throughout a continuous frequency range of 0.95 to 18.0 megacycles (mc). The frequency range is covered in eight bands, by means of plug-in tuning units and coil units, each of which covers a portion of the frequency range. Any one of three tuning units may be selected by a switch on the front panel. A three-gang capacitor with a single dial control on the front panel permits simultaneous tuning of the oscillator, buffer, and driver stages.

c. Frequency Control. Frequency control is by master oscillator or by crystal, and selection is made

† See TM 11–640 (when published) for installation, operation, and other maintenance data on this equipment.

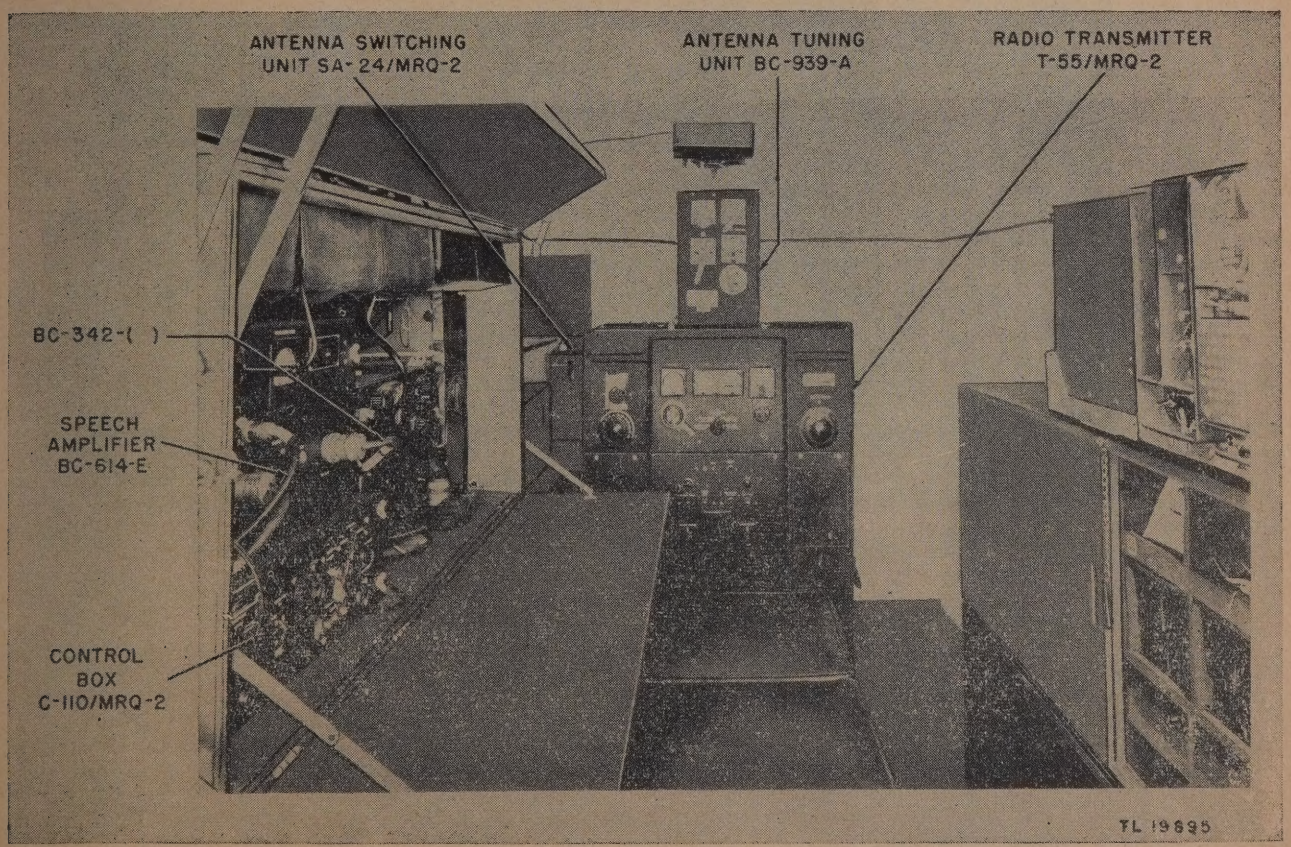


Figure 1. Radio Transmitter T–55/MRQ–2 with associated equipment installed in Shelter HO–17–( ), interior view, looking forward.

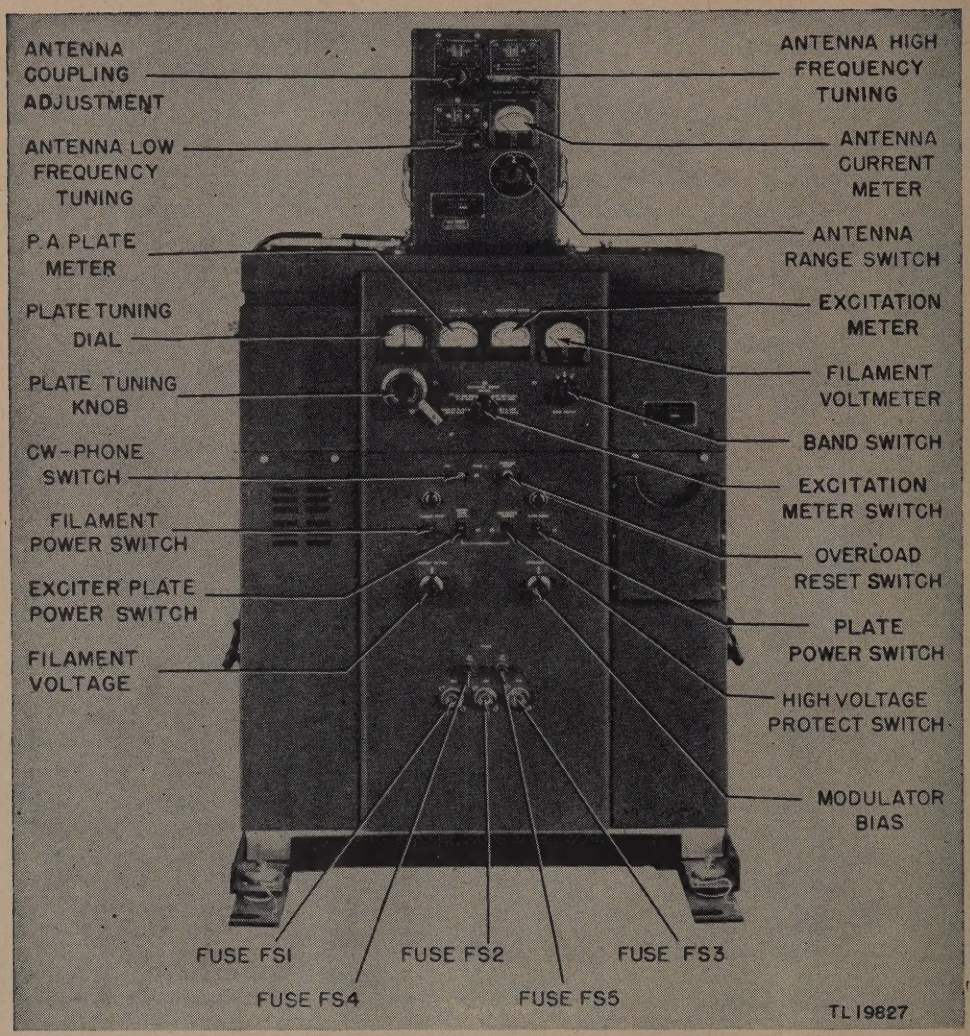


Figure 2. Radio Transmitter BC–610–E with Antenna Tuning Unit BC–939–A, front view.

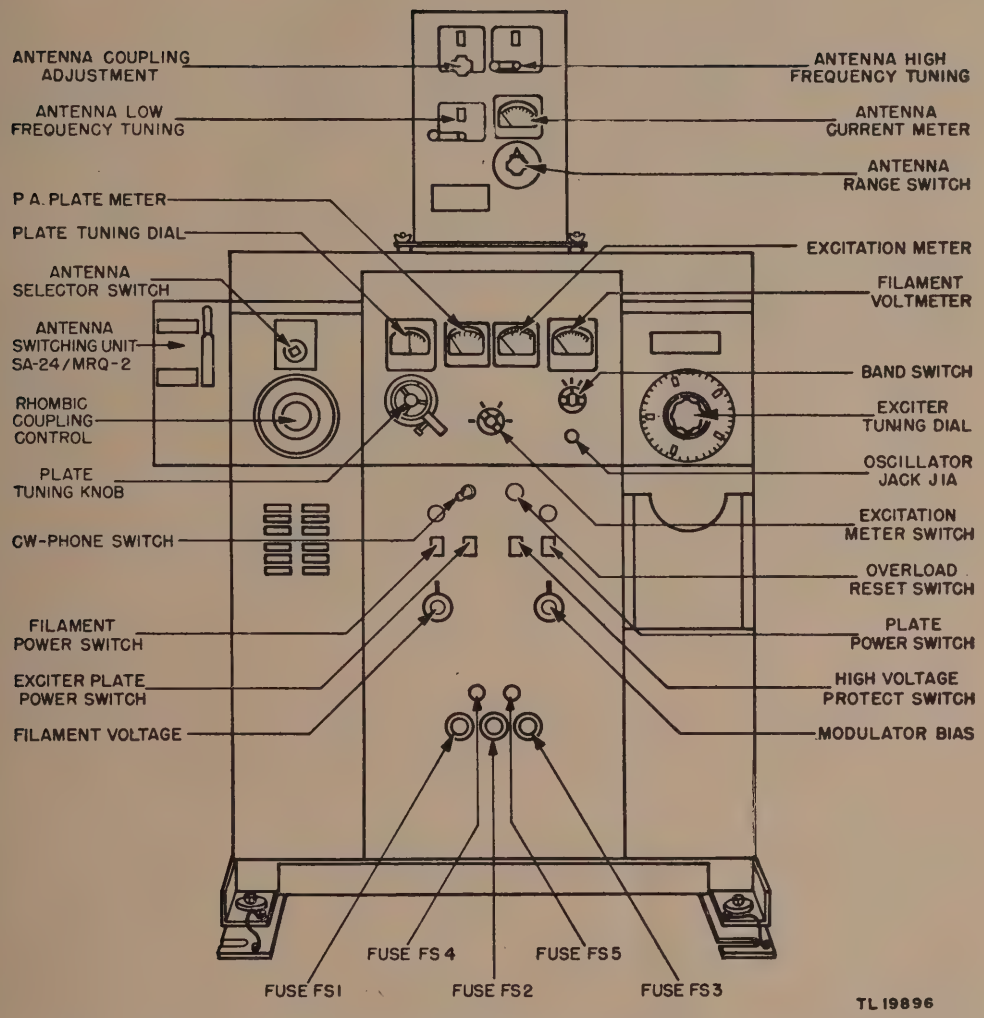


Figure 3. Radio Transmitter T-55/MRQ-2 with Antenna Tuning Unit BC-939-A and Antenna Switching Unit SA-24/MRQ-2, front view.

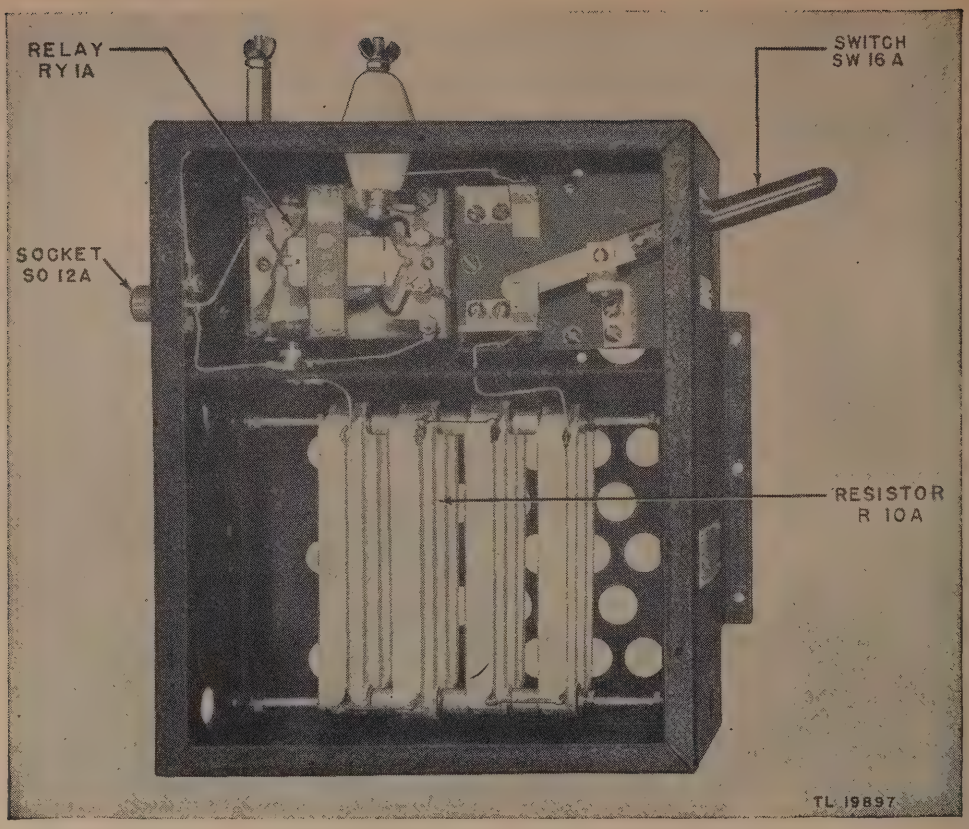


Figure 4. Antenna Switching Unit SA–24/MRQ–2, cover removed.

by a switch (M.O.–XTAL) which is on each tuning unit.

d. Type of Transmission. Radio Transmitter T–55/MRQ–2 is designed to send c-w or amplitude-modulated (a-m) voice signals.

e. Power Input. The transmitter power input requirements are 1,700 to 2,000 watts of 117-volt, 50- to 60-cycle alternating current.

f. Power Output. At frequencies below 8 mc, the power output of the transmitter exceeds 400 watts for c-w transmission and 300 watts for voice transmission. Power output is slightly less at higher frequencies.

g. Explanation of Symbol. Official nomenclature followed by (*) is used to indicate all models of the item of equipment included in this manual. Thus Power Unit PE–95–(*) represents Power Units PE–95–A, –B, –C, –D, –E, –F, –G, and –H, which are treated together in this manual.

3. Associated Equipment

a. Power Unit PE–95–(*). Radio Transmitter T–55/MRQ–2 is equipped with Power Unit PE–95–(*), installed on Trailer K–52. However, the transmitter may be operated from a commercial power source.

b. Receiving Equipment. Radio Receivers BC–342–(*) and BC–344–(*) are used to cover a frequency range of 150 kc to 16 mc.

c. Antenna Switching Unit SA–24/MRQ–2 (fig. 4). The antenna switching unit is mounted on the left-hand side of the transmitter. The lower section contains the dummy antenna. The upper section contains the antenna change-over relay and knife switch. The antenna change-over relay is so connected that the antenna is automatically switched to the transmitter for transmitter operation, or to the receivers for transmitter stand-by. The knife switch connects the output of the transmitter to either the dummy antenna or operating antenna.

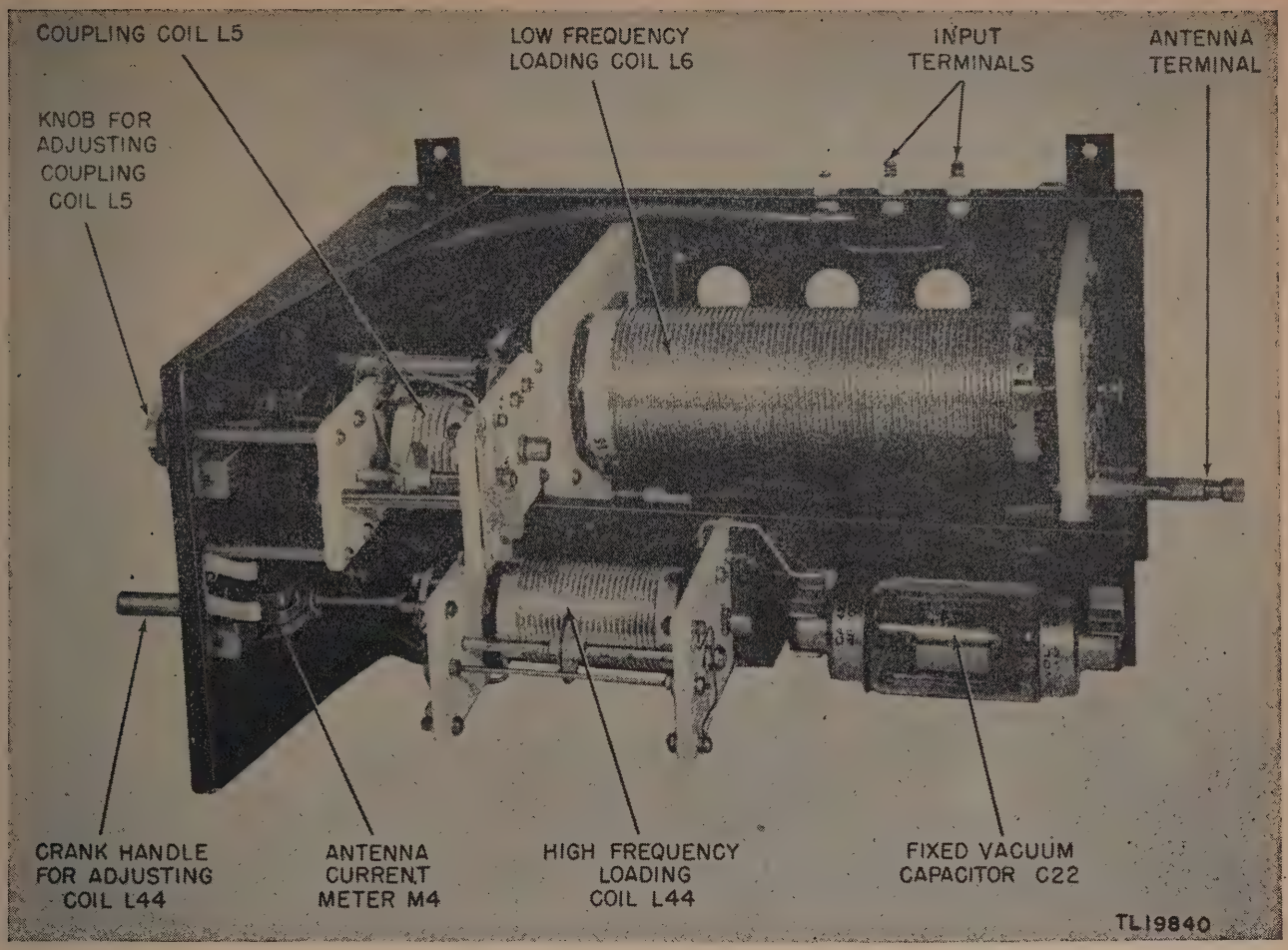


Figure 5. Antenna Tuning Unit BC–939–A, cover removed.

d. Antenna Systems. Because of the automatic switching accomplished by the antenna change-over relay located in Antenna Switching Unit SA–24/MRQ–2 (fig. 4) the following antennas are used for both transmitting and receiving:

(1) *Antenna A.* Antenna A is a vertically-polarized, half-rhombic antenna used when transmitting on a frequency range of 0.95 to 4.0 mc.

(2) *Antenna B.* Antenna B is a vertically-polarized half-rhombic antenna used when transmitting on a frequency range of 3 to 10 mc.

(3) *Antenna C.* Antenna C is a lance-pole supported antenna which is used when transmitting on all frequencies from 0.95 to 4.0 mc whenever it is undesirable to use antennas A or B.

(4) *Antenna D.* Antenna D is a five-section rod (whip) antenna which is used when operating in the frequency range of 4 to 18 mc whenever it is undesirable to use antenna A or B.

e. Antenna Control Box C–109/MRQ–2. A coaxial cable connects one socket on the antenna control box with Antenna Switching Unit SA–24/MRQ–2. The other two sockets in the antenna control box are connected with Radio Receivers BC–342–(*) and BC–344–(*), respectively, by means of coaxial cables. The purpose of the switch on the antenna control box is to switch the antenna (which is also used for transmitting) from Radio Receivers BC–342–( ) to Radio Receiver BC–344–( ), and vice versa.

f. Antenna Tuning Unit BC–939–A (fig. 5). This antenna tuning unit is mounted on top of the transmitter, and is connected to the transmitter to match its output to Antenna D.

g. Antenna Coupling Unit CU–45/MRQ–2 (fig. 31). This coupling unit serves to couple the transmitter to a long wire antenna (antenna C) when operating in a frequency range of 0.95 to 4.0 mc. For this frequency, it replaces Antenna Tuning Unit BC–939–A.

h. Control Box C–110/MRQ–2 (fig. 6). The transmitter control switch for Radio Transmitter

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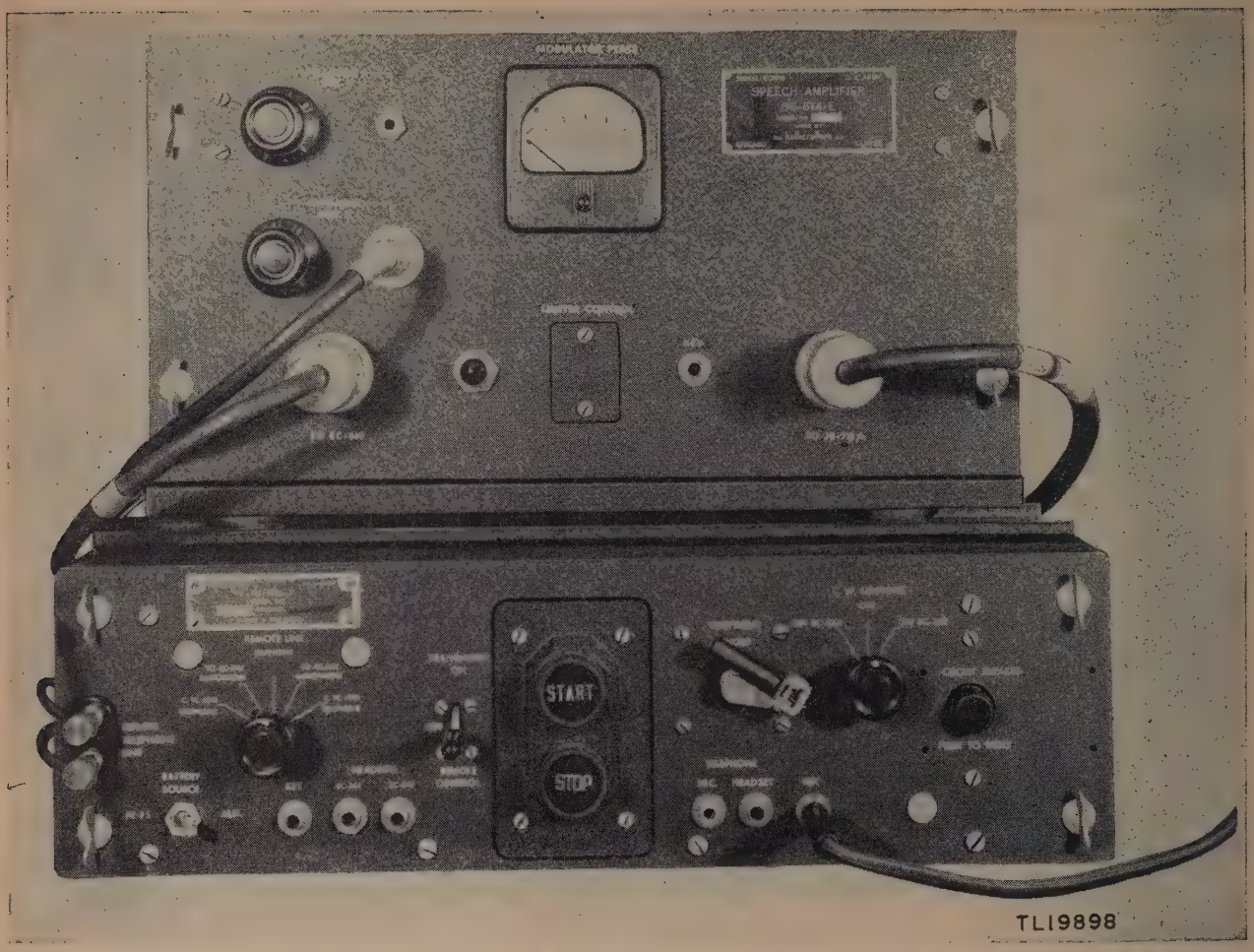


Figure 6. Control Box C–110/MRQ–2 and Speech Amplifier BC–614–E, front detail view.

T–55/MRQ–2 is located on Control Box C–110/MRQ–2, which is Junction Box JB–70–A modified to include Remote Control Unit RM–29.

i. Speech Amplifier BC–614–E (fig. 6). For voice transmission the transmitter is equipped with Speech Amplifier BC–610–E.

j. Microphone T–50–( ). For voice transmission Microphone T–50–( ) is connected to Speech Amplifier BC–614–E. (For further description of equipment associated with Radio Transmitter T–55/MRQ–2, see TM 11–281.)

4. Transmitter Assembly

Radio Transmitter T–55/MRQ–2 is ruggedly built. The assembly is composed of the following sections:

a. Upper Chassis. The upper chassis includes the radio-frequency (r-f) components. They are plug-in tuning units, a three-gang tuning capacitor, filament supply for the r-f tubes, and all indicating instruments.

b. Center Chassis. The center chassis contains all of the audio and modulator stages which are not included in Speech Amplifier BC–614–E. Also included on this chassis are power supplies for the bias and audio driver circuits as well as the plate transformer for the exciter plate voltage rectifier.

c. Lower Chassis. The lower chassis includes the complete high-voltage power supply, together with its overload relay. This chassis is bolted by large wing bolts to the shock-mounting cradle which holds the transmitter to the floor.

d. Front Panel. On the upper part of the front panel are mounted meters for indicating the following: Meter M1 measures buffer-doubler plate current, intermediate-amplifier grid current, intermediate-amplifier plate current, or power-amplifier (p-a) grid current; meter M2 measures p-a plate current; and meter M3 measures p-a filament voltage.

Also mounted on the front panel are switch SW11 for selecting any one of three tuning units, switch SW8 for connecting meter M1 into various circuits, and a control for tuning the p-a plate circuit. Besides these controls, to the right of the BAND SWITCH control is the EXCITER TUNING dial, and to the left of the PLATE TUNING dial is the RHOMBIC COUPLING control. The OSCILLATOR CATHODE KEY JACK is located directly below the BAND SWITCH. On the lower part of the front panel are mounted the CW-PHONE switch, a reset switch for the overload relay, switches for handling application of power, and controls for setting the filament voltage and the modulator bias. In addition to these controls, the fuses are mounted on this panel.

5. Over-all System Function

Radio Transmitter T–55/MRQ–2 is equipped with a circuit consisting of an r-f section, a modulator section, and a high-voltage power supply.

a. R-F Section (figs. 7, 8, 9, 10, and 11). The r-f section consists of the oscillator stage, the buffer-doubler stage, the intermediate-amplifier stage, and p-a stage. From the power amplifier the signal is delivered to the antenna tuning or coupling unit, the dummy antenna, or the rhombic antenna. The oscillator, buffer, and driver stages are tuned by a single three-gang tuning capacitor which is controlled from the front panel. As an alternative to the adjustable meter oscillator, frequency control may be had by plugging a crystal into the jack on the tuning unit.

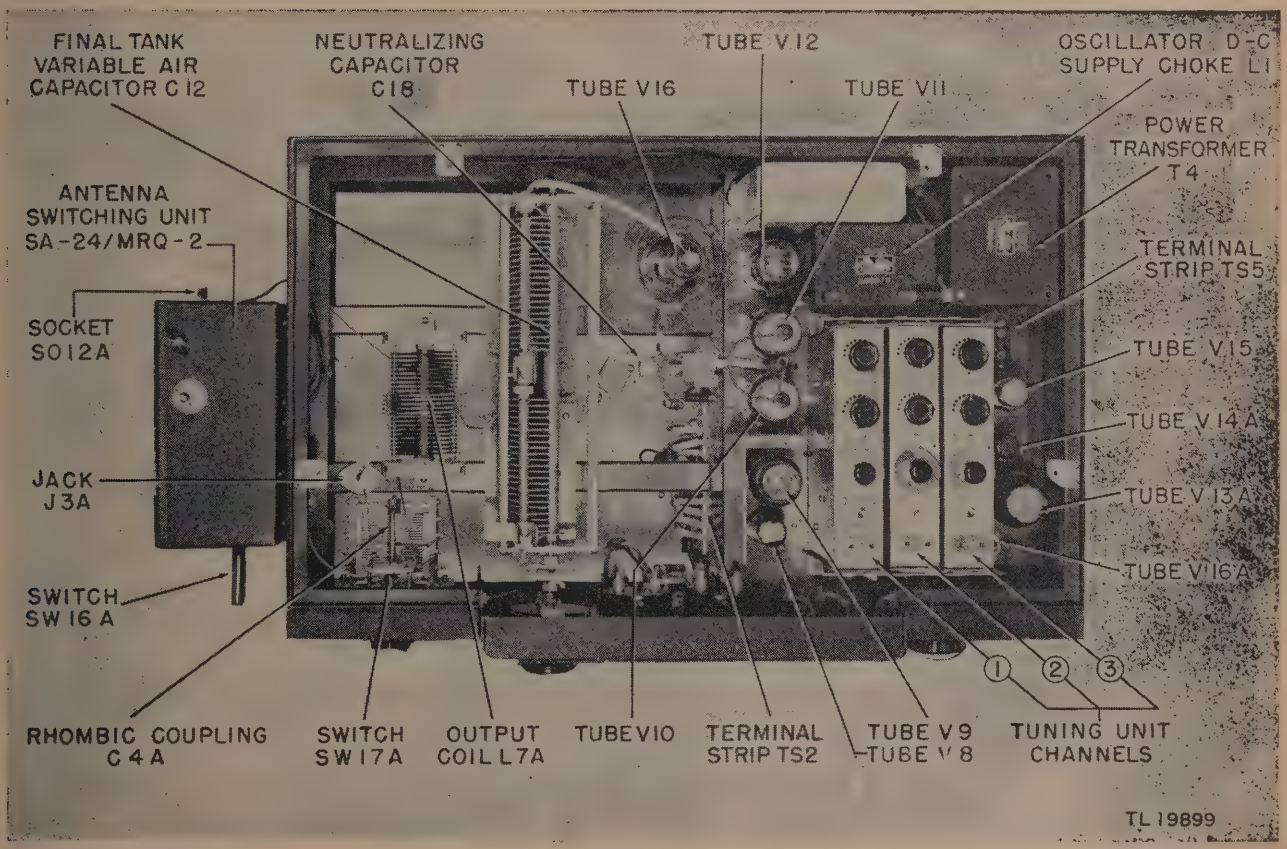


Figure 7. Radio Transmitter T–55/MRQ–2, r-f section, top view, cover removed.

The r-f section is equipped with a power supply which supplies filament voltage to the tubes of the r-f section. The voltage regulator system maintains constant voltages on the screen elements of the oscillator, buffer-doubler, and driver tubes, and on the plate element of the oscillator tube. This results in improved frequency stability when operating the transmitter with master-oscillator control.

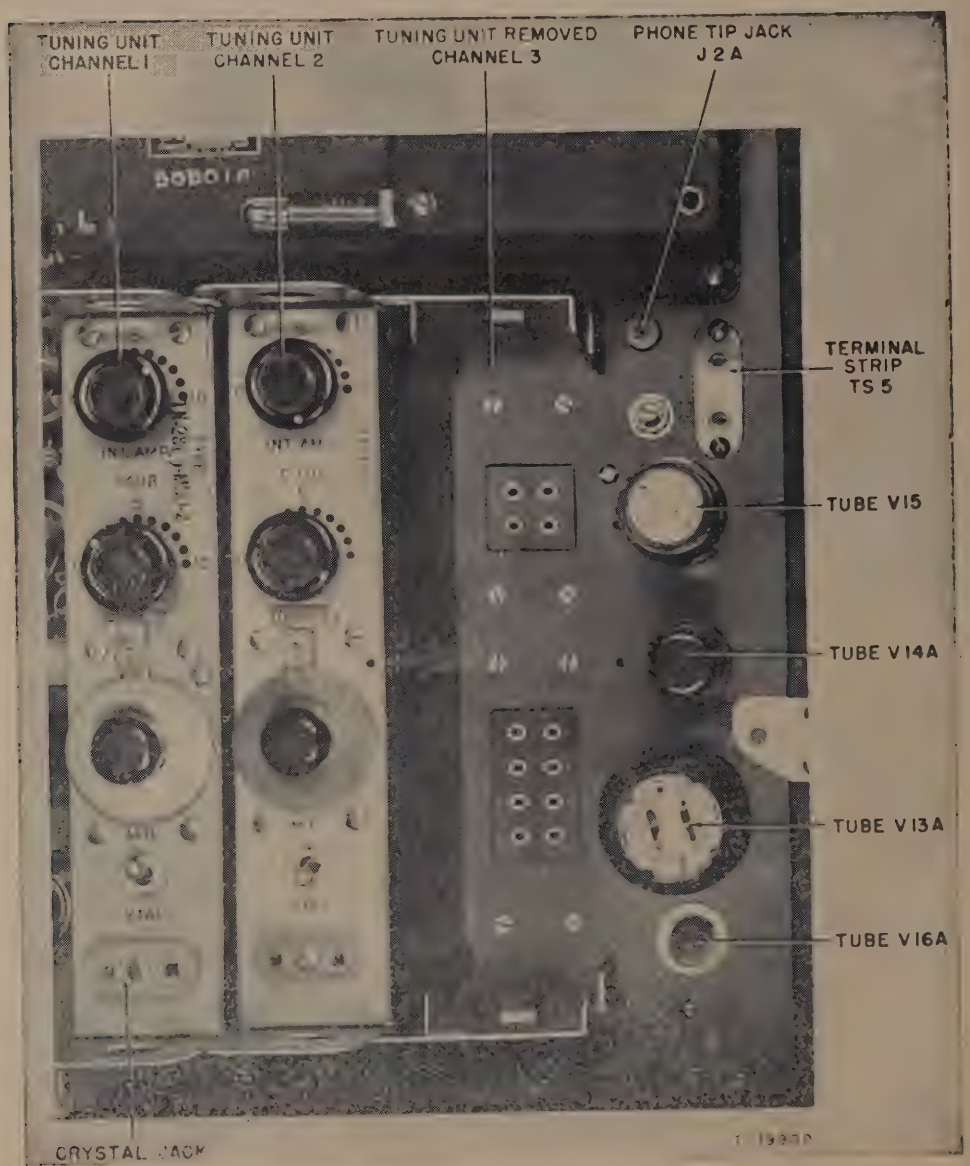


Figure 8. Radio Transmitter T–55/MRQ–2, exciter unit showing voltage regulator tubes, top detail view.

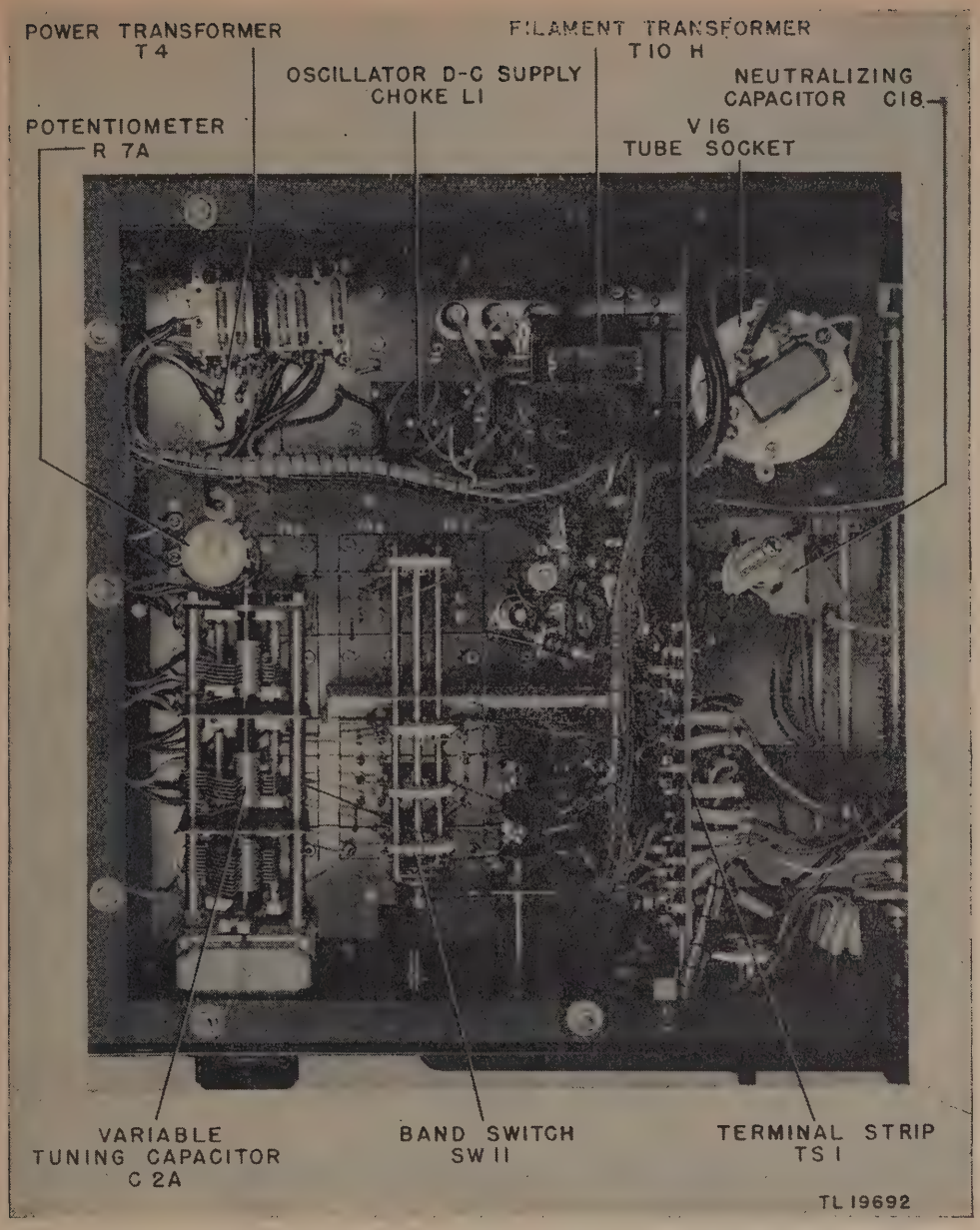


Figure 9. Radio Transmitter T–55/MRQ–2, exciter unit, bottom detail view.

b. Modulator Section (fig. 12). The modulator section contains the audio-driver stage which operates in a push-pull class A audio p-a circuit, and the modulator stage which operates in a push-pull class B amplifier circuit. The modulator tubes are biased near cut-off. The modulator section has a power supply to feed the audio-driver tubes.

c. High-voltage Power Supply (fig. 13). The high-voltage power supply rectifies the alternating-current (a-c) power input, and converts it to high-voltage direct-current (d-c) power to supply plate voltage to the modulator tubes and the r-f, p-a tube.

Figure 14 is a block diagram which shows the various stages of the transmitter.

6. Simplified Circuit Analysis

a. Master-oscillator or Crystal Control (fig. 38). Oscillator Tube JAN–6V6GT (V8), generates an alternating current at a radio frequency and holds this frequency constant. Under master-oscillator control the radio frequency is determined by the circuit inductance and capacity which are manually controlled. If crystal control is used, the crystal will determine the frequency generated by the oscillator.

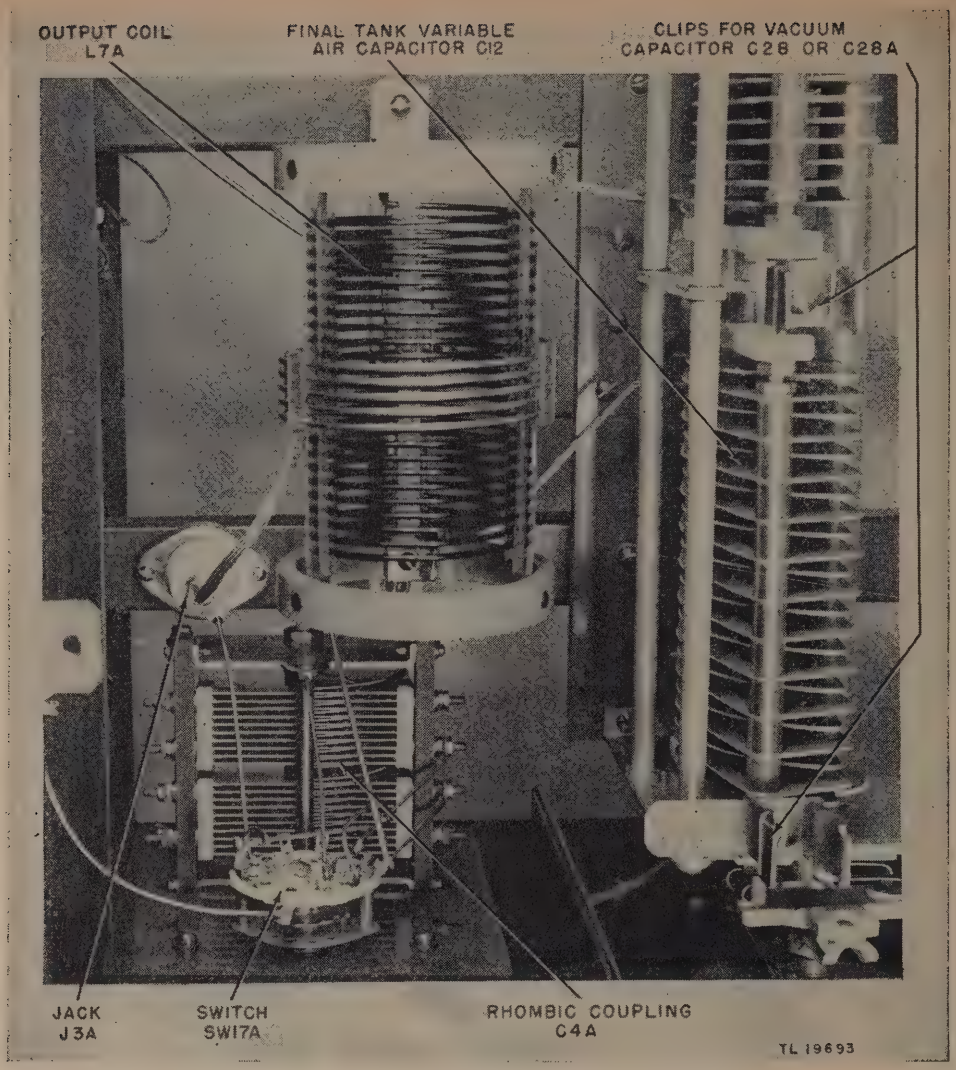


Figure 10. Radio Transmitter T–55/MRQ–2, power amplifier, top detail view.

b. C-w Transmission. In c-w transmission, the operation of the telegraph key, which is connected in series with the cathode circuit of oscillator tube JAN–6V6GT (V8), makes and breaks the generation of oscillation and provides the telegraph transmission. The buffer-doubler Tube JAN–6L6 (V9), is either tuned to the same frequency or to a multiple of the frequency of the master-oscillator circuit; thus, it prevents the succeeding stages from affecting the oscillator. The r-f signal is fed from Tube JAN–6L6 (V9) to the intermediate amplifier Tubes JAN–807 (V10 and V11), which provide amplification. Tube JAN–250TH (V16), functions as a neutralized class C power amplifier. With the key up, this tube becomes inoperative. Finally the r-f output is taken from the plate tank circuit and is fed to the antenna tuning unit or coupling unit, or to the dummy antenna, or the rhombic antenna.

c. Voice Transmission. In voice transmission, the modulator section is utilized. The audio-frequency (a-f) speech signal from Speech Amplifier BC–614–E enters the transmitter at socket SO5 (fig. 38) and is amplified in voltage in the coupling transformer. The audio-driver Tubes JAN–2A3 (V1 and V2), operate as push-pull class A audio-power amplifiers. From these tubes the signal is delivered to the modulator Tubes JAN–100TH (V3 and V4), which provide further amplification. The resultant amplified a-f signal is series-fed into the high-voltage plate power supply of Tube JAN–250TH (V16), which contains the amplified r-f signal. The presence of the a-f signal in the plate circuit of p-a Tube JAN–250TH (V16) causes a proportional fluctuation in the plate voltage of this tube and varies the output of the radio transmitter correspondingly. In this

manner the r-f carrier is amplitude-modulated. The modulated signal is fed from coupling transformer L7A to the antenna tuning unit, coupling unit, dummy antenna, or rhombic antenna. For detailed functioning of the circuit, see TM 11-281 which describes the circuit of Radio Transmitter BC-610-E of which the circuit of Radio Transmitter T-55/MRQ-2 is a modified form.

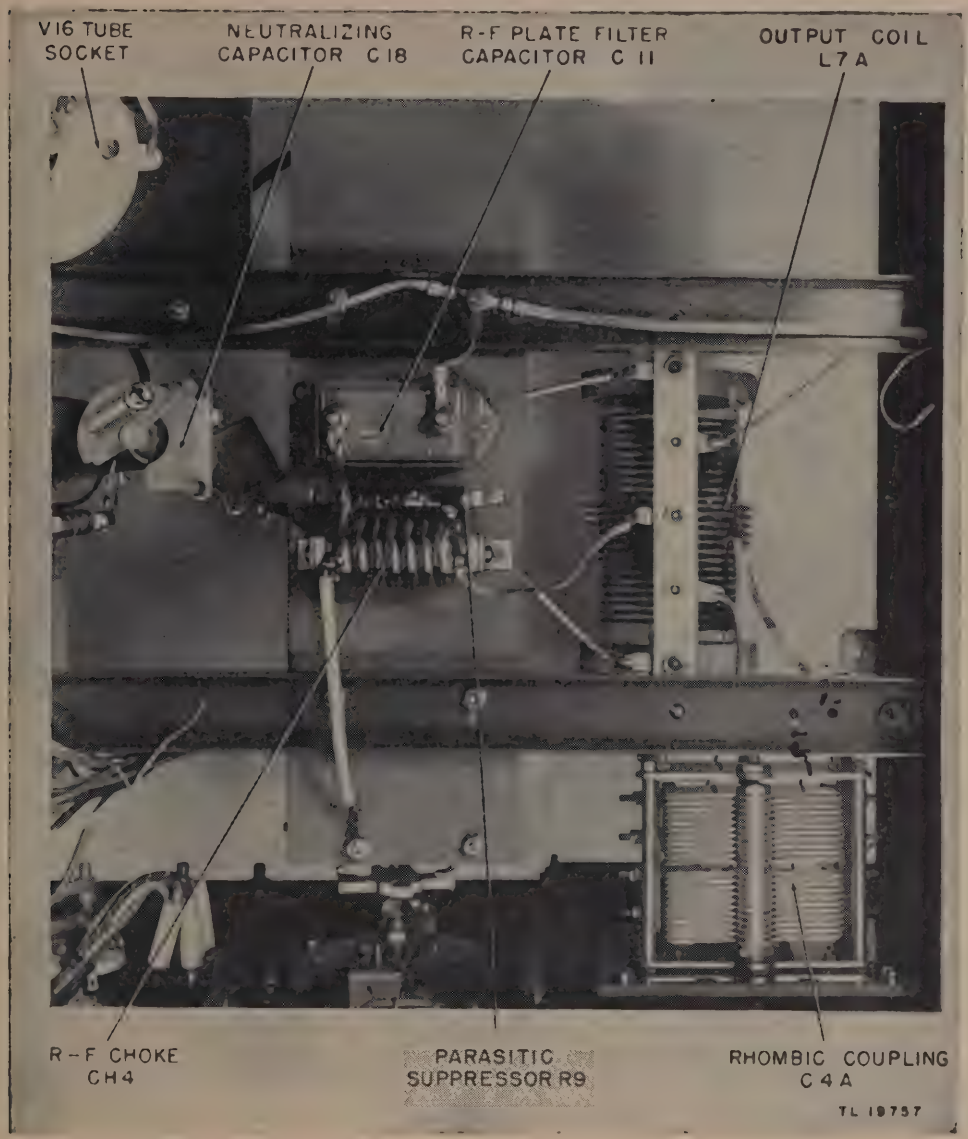


Figure 11. Radio Transmitter T-55/MRQ-2, power amplifier, bottom detail view.

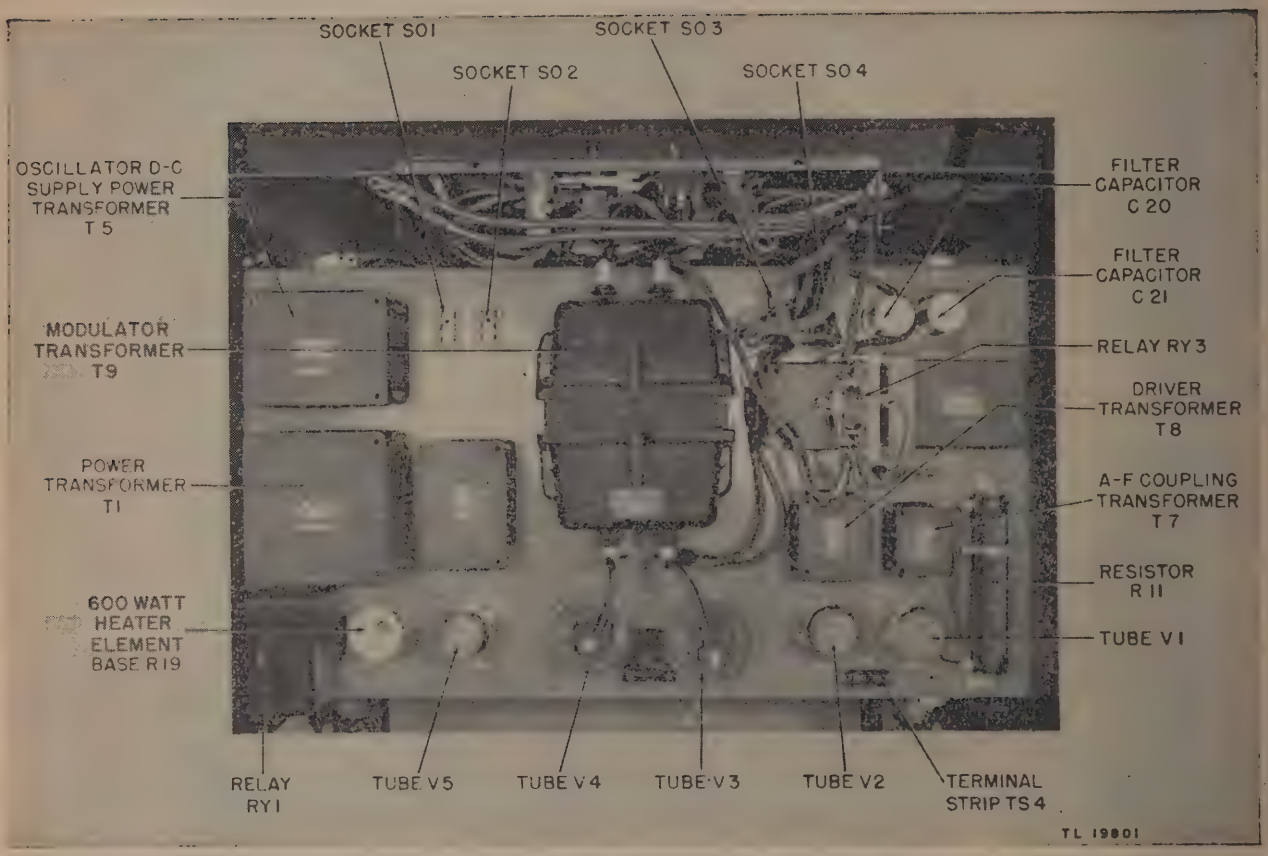


Figure 12. Radio Transmitter T–55/MRQ–2, modulator section, top view.

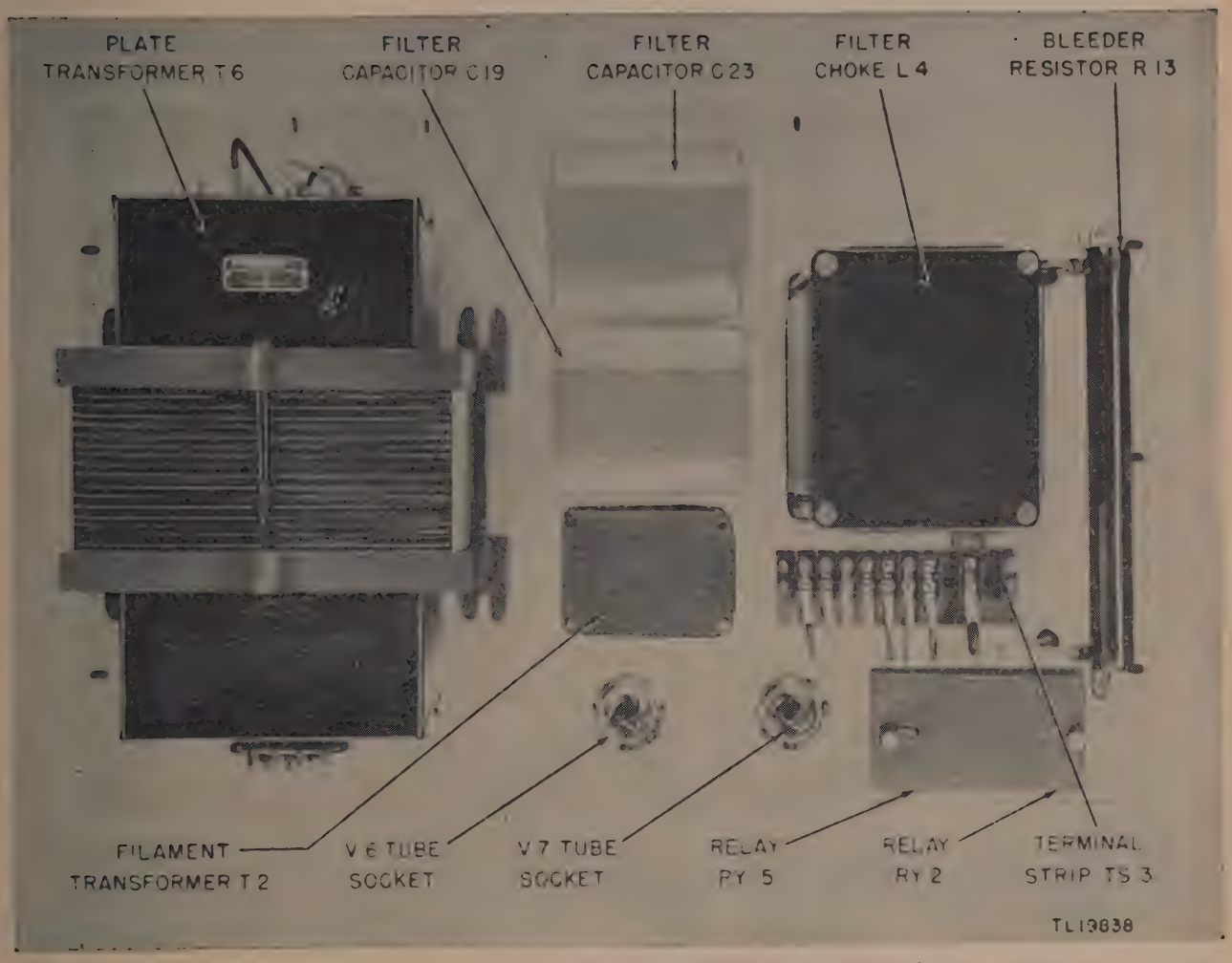


Figure 13. Radio Transmitter T–55/MRQ–2, power supply, top view.

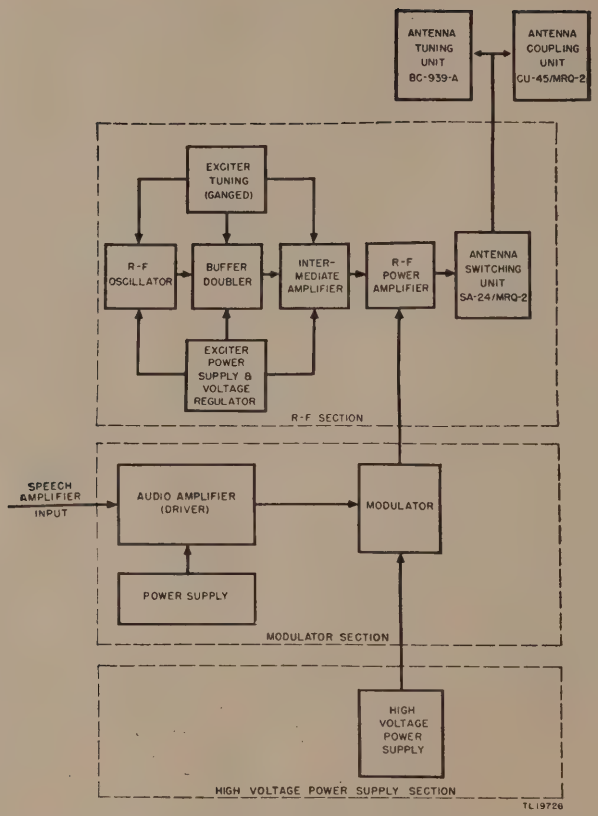


Figure 14. Radio Transmitter T–55/MRQ–2, with Antenna Tuning Unit BC–939–A and Antenna Switching Unit SA–24/MRQ–2, block diagram.

SECTION II

DIFFERENCES BETWEEN MODELS

Not applicable. Concerns only Radio Transmitter T–55/MRQ–2.

SECTION III

INITIAL REPAIR PROCEDURES

Note. Before any repairs or adjustments are made, all authorized Modification Work Orders must be applied. See FM 21-6 for list of applicable MWO's

7. General

Servicing personnel should follow the procedure outlined in this manual when repairing radio Transmitter T-55/MRQ-2. The repair information in this and the following sections is presented in the order in which the repairman actually should perform the various operations on the equipment in the repair shop. This procedure permits repair of the equipment in the shortest time possible.

8. Tools, Test, Cleaning, and Lubricating Equipment

The tool, test, cleaning, and lubricating equipment listed in table I is required for the inspection, testing, and repair of Radio Transmitter T-55/MRQ-2.

Table I. Tools, test, cleaning, and lubricating equipment.

a. TOOLS.

Item	Description
Screw drivers	Small, medium, and large types, insulated for 5,000 volts.
Pliers	Long-nose, gas, and cutting types, with insulated grips.
Knife	Electrician's knife.
Magnifying dental mirror.	
Socket wrenches	Small, medium, and large.
Files	Fine-cut and jeweler's.
Insulated probe	

b. TEST EQUIPMENT.

Item	Description
Tube tester	Such as tube tester in Test Set I-56-(*).
Voltohmmeter	Resistances, 0-10 megohms; a-c and d-c voltages, 0-3,000 volts; direct currents, 0.1 milliampere to 15 amperes, such as voltohmmeter in Test Set I-56-(*).
R-f ammeter	Thermocouple type; range 0 to 1.5 amperes.
Cathode-ray oscilloscope	3-inch screen or larger.
Frequency Meter Set SCR-211-( ).	Heterodyne-frequency type, or equivalent; range, 125 kilocycles (kc) to 20 mc.
Audio signal generator or oscillator.	Frequency, 400 cycles per second (cps) such as Signal Generator I-72-(*).
Associated equipment for audio signal generator.	Consisting of: 8-microfarad (mf) capacitor; 100-ohm, 2-watt, noninductive resistor; Three-contact phone plug.
A-c voltmeter or a-c vacuum-tube voltmeter.	Sensitivity 20,000 ohms per volt or greater.
Neon lamp	Approximately 5 watts.
Test leads	

c. OPERATING ACCESSORIES.

Item	Description
Speech Amplifier BC-614-E.	
Control Box C-110/MRQ-2.	
Antenna Control Box C-109/MRQ-2	
Power Unit PE-95-(*)	Acceptable substitute is a standard 12-volt, d-c battery and 5 kilowatt (kw) of 115-volt, 60-cycle, single-phase ac.
Receivers BC-342-(*) and BC-344-(*), or equivalent.	
Key J-37 or equivalent	
Microphone T-50-( ) or equivalent.	Dynamic type.
Cord CX-140/MRQ-2, or equivalent.	Provides connection between Control Box C-110/MRQ-2 and Loudspeaker LS-5 and the second audio jack of Radio Receiver BC-344-(*).
Cord CX-141/MRQ-2, or equivalent.	Provides connection between Speech Amplifier BC-614-E and Control Box C-110/-MRQ-2.
Cord CG-67/MRQ-2, or equivalent.	Provides connection between Antenna Control Box C-109/MRQ-2 and Antenna Switching Unit SA-24/-MRQ-2.
Cord CG-68/MRQ-2, or equivalent.	Provides connection between Antenna Control Box C-109/MRQ-2 and Radio Receiver BC-342-(*).

d. CLEANING EQUIPMENT.

Item	Description
Solvent dry-cleaning	
Assorted brushes	½-inch to 2-inch.
Blower	Bellows or compressed air.
Heater	
Pipe cleaners	Tobacco smoker's.
Clean cloths	Lint-free, 6 x 6 inches.
Sandpaper	#0000.
Crocus cloth	

e. LUBRICATING EQUIPMENT.

Item	Description
Oil, Engine (SAE 10 OE)	For temperatures above 0° F.
Oil, Lubricating, Preservative, Special.	For temperature below 0° F.
Grease, Lubricating, Special.	For all temperatures.

9. Removal of Plug-in Parts

a. TUBES. (1) *Tube JAN-250TH (V16)* (figs. 7 and 9) *and Tubes JAN-100TH (V3 and V4)*

(fig. 12). To remove these tubes, disconnect grid connection from side of tube, and plate spring clip from top of tube; turn the tube counterclockwise until unlocked, and lift out of socket.

(2) *Tubes JAN–807 (V10 and V11)* (fig. 7). To remove these tubes, disconnect plate spring clip from top of tube and remove base clamps. Lift tube out of socket.

(3) *Tubes JAN–866–A (V6 and V7)* (fig. 13). To remove these tubes, disconnect plate spring clip from top of tube, turn the tube counterclockwise until unlocked, and lift out of socket.

(4) *Tube JAN–991 (V16A)* (figs. 7 and 8). To remove this tube, turn the tube counterclockwise until unlocked, and lift out of socket.

(5) *All Other Tubes* (fig. 7). To remove tubes, pull them out of sockets.

b. Other Plug-in Parts. (1) *Vacuum capacitor* (fig. 7). To remove, grasp the glass shell firmly, but do not press shell excessively; pull up the capacitor and release it from one spring clip, then pull it out from the remaining spring clip.

(2) *Tuning units* (figs. 7 and 8). To remove place finger in the hole of the side plate and pull tuning unit out. If there is any difficulty in removal, rock the tuning unit gently. Do not hold tuning units at their dials.

(3) *Coil unit* (figs. 7 and 10). To remove, grasp the coil at ends of mounting strip, and pull up and out.

(4) *Crystal* (figs. 7 and 8). To remove crystal holder, grasp holder grip and lift out.

(5) *Fuses* (figs. 2 and 3). To remove, unscrew the retaining cap.

(6) *Heater element, R19* (fig. 12). To remove, grasp the top and unscrew. Do not touch coil winding.

(7) *Plugs.* To remove, grasp plug and pull out. Do not grasp the cord.

10. Access to Transmitter Components

a. Access to Chassis. (1) Disconnect the pair of leads connected to TS5 in the r-f section.

(2) Unscrew four wing bolts holding the cover down and lift cover straight up to remove.

(3) Remove seven wing bolts holding the back cover in place.

(4) Lay the transmitter on its *right side* (side opposite feed-through insulators) to reach the bottoms of the r-f chassis, modulator chassis, and power supply chassis.

b. Preparation for Repair Work on R-f Section (fig. 7). (1) Disconnect the two wires which lead from terminal strip TS1 on the r-f chassis apron to lower control panel.

(2) Disconnect both leads from P.A. PLATE meter M2.

(3) Disconnect the twisted part feeding the coil on antenna change-over relay RY1A.

(4) Disconnect the heavy black high-tension lead from the final tank capacitor mounting strip.

(5) Remove plugs PL1 and PL2 from sockets SO1 and SO2.

(6) Remove the 14 screws and nuts which tie the upper lip of the modulator section to the lower lip of the r-f section.

(7) Lift the r-f section from the remaining units.

11. 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, from causing arc-over and leakage, or flash-overs of high voltage between terminals. Remove dirt or grease which adheres to the chassis with a brush or cloth; or, in severe cases, use dry-cleaning solvent (SD). Clean specific parts in accordance with the following instructions:

(1) *Capacitors.* Clean dirty or corroded terminals and leads with a crocus cloth or cloth moistened with dry-cleaning solvent (SD), then polish with a clean dry cloth. In damp climates, beads of water form in capacitors. Under such conditions, dry the capacitor thoroughly with a small portable heater. Clean paper bodies of capacitors with a small, soft brush, and for ceramic and metal bodies use a dry, clean cloth. The plates of the variable capacitor may be cleaned with compressed air.

(2) *Crystals.* Hold each crystal carefully by the edges, and wash with dry-cleaning solvent (SD) or with soap and water. When using soap and water, rinse in clear water. Always air-dry crystals.

(3) *Resistors.* Clean ferrule type resistors by using a dry brush, or crocus cloth moistened with dry-cleaning solvent (SD). In severe cases use #0000 sandpaper. Finally wipe with a clean, dry cloth. Dust the pigtail type resistor with a brush.

(4) *Potentiometer and rheostat.* Clean dirt from contact arm and resistor winding with soft brush, and polish with a soft, clean cloth. Remove corrosion and grease with a brush dipped in dry-cleaning solvent (SD). Polish with a clean cloth. To clean burned

or pitted contact points of the sliding arm, place a piece of folded crocus cloth between the contact and the winding, and then slide the arm several times over the crocus cloth.

Caution: Take care not to nick the wires, as altering the thickness of the wire will change the resistance value.

(5) *Fuses.* Clean all fuse mounts and clips with #0000 sandpaper. Remove deep pits with a file, followed with sandpaper. Finally wipe with a clean, dry cloth. Excessive dust may cause fuses to continue to burn out. Make certain that all dust is removed from the bottom deck of the transmitter, particularly around tubes V6 and V7. Use a brush or cloth to remove dust.

(6) *Relays.* Clean dirty cases with a cloth moistened with dry-cleaning solvent (SD) and then polish with a clean, dry cloth.

(a) Hard contacts. To clean hard contacts, draw a strip of clean wrapping paper between them while holding them together. If necessary, moisten the paper with dry-cleaning solvent (SD). For corroded, burned, or pitted contacts, use a crocus cloth strip, or in extreme cases use a jeweler's file followed by #0000 sandpaper. Polish with a clean, dry cloth.

(b) Silver contacts. Clean with brush dipped in dry-cleaning solvent (SD). If corroded, dress first with crocus cloth. In extreme cases, resurface burned or pitted contacts with jeweler's file, then smooth with crocus cloth. Polish with a clean, dry cloth.

Caution: Make certain that the original shape of the contacts has not been changed.

(7) *Switches.* For the purpose of repair, switches may be separated into two groups, those with accessible contacts, and those with encased contacts.

(a) Nonaccessible contact switches. This group includes interlock switches, toggle switches, and push buttons. If a defect is detected in the switch assembly, replace the assembly.

(b) Accessible contact switches. This group includes the wafer type and rotary selector switches. Clean dirty, dusty, corroded, or pitted terminals with a clean, dry cloth. In extreme cases, rub the surface of corroded points with a cloth moistened with dry-cleaning solvent (SD). In very severe cases use #0000 sandpaper. Polish with a clean, dry cloth.

b. Inspection. After the transmitter has been carefully and thoroughly cleaned, make a visual inspection of wiring for loose or poorly soldered connections, frayed or burned insulation, and stretched leads. Inspect terminal boards for broken lugs and signs of previous arcing. Check all tuning dial gears and knobs for ease of operation. Make the necessary repairs and replacements. Inspect the following parts for typical defects.

(1) *Capacitors.* Check for loose terminals, cracked or broken insulators, loose bolts in mounting, excessive swelling, loose contact of terminal leads of the pigtail type capacitors, loose shafts, bushings, bearings, and couplings. Tighten and adjust loose units, and replace defective capacitors.

(2) *Crystals.* Check for chipped, cracked, or broken holders. Replace any defective crystal unit.

(3) *Resistors.* Check for loose mounting, blistering or discoloration caused by overheating, chipped or cracked bodies, loose ferrule ends, and insufficient tension at end clips. Tighten end clips by hand or with a pair of pliers. Make replacements wherever necessary.

(4) *Rheostat and potentiometer.* Check for loose control knob on the shaft, insufficient spring tension of sliding arm, and cracks and chipped places on insulating body. Using long-nose pliers, carefully tighten any part of rheostat or potentiometer assembly that is loose. Adjust the sliding contact to provide sufficient tension. For adjustment of potentiometer R7A, see paragraph 19*e*(8)(*c*).

(5) *Fuses.* Check for loose connections to fuse clips, insufficient tension of fuse clips, and loose and overheated end caps. Tighten loose connections. Adjust the tension of fuse clips by pressing sides together, using a pair of pliers.

(6) *Relays.* Check for contacts which are unevenly lined up and incorrectly spaced, contacts which do not close properly when the plunger is hand-operated, insufficient tension of spring contacts, overheated coils, and loose connections. Tighten all loose connections and mounting screws. Adjust relay contacts if necessary. Do not change the tension of spring contacts unless absolutely necessary. Contacts must retain their original shape during cleaning and repair. Make replacements where necessary.

Caution: Do not disassemble relays except in extreme cases. When disassembling, tag all leads as they are being removed.

(7) *Switches.* Check for loose terminal connections and mountings, loss of tension of fixed contacts, and broken wafers. Tighten all connections and mountings. Tighten the tension of fixed contacts with long-nose pliers. Replace defective switches of the sealed type. Replace broken wafers of the gang type switches. If parts are not available, replace the entire switch assembly.

(8) *Transformers and choke coils.* Check for loose mounting lugs, loose terminals, and loose rivets. Look for signs of overheating indicated by presence of insulating compound on the outside around the base of each transformer or coil. Tighten loose parts, and correct cause of overheating.

(9) *Meters.* Check meters for cracked or broken cases and glass, and for loose connections. Tighten mountings carefully to prevent breakage by holding the hexagonal nuts, which are beneath the connecting lugs, and tightening the outside nut. To decide whether zero adjustment is needed, first tap the meter case lightly with the tip of one finger. Make certain that the power is off. If adjustment is needed, insert the tip of a thin-blade screw driver in the slotted screw head located below the meter glass, and slowly turn the adjusting screw until the pointer rests at zero. Replace broken cases and glass. If the meter itself is damaged, replace it with one of identical type.

(10) *Pilot lamps.* Check for broken or cracked pilot lamp shields, loose bulbs with loose bases, and loose connections and mountings. Tighten mounting screws and resolder loose connections. Replace burned-out tubes. Screw bulbs tightly into their bases. (Use friction tape to grip the glass envelope.) Replace broken or cracked pilot lamp shields.

c. LUBRICATION. (Source of information is TM 11–280.) Use engine oil SAE (OE 10) for temperatures above 0° F; use special preservative lubricating oil (PS) for temperatures below 0° F; use special lubricating grease (GL) where indicated, and in all temperatures. Lubricate *only* at the points specified below, and wipe off superfluous lubricant. For a full description of lubrication procedure, see TB SIG 69.

(1) *Radio Transmitter T55/MRQ–2.* Points requiring lubrication every 256 hours:

(a) Capacitor-shaft bearings. Place 1 or 2 drops of oil on each of three bearings.

(b) Tuning-control-shaft bearings. Place 1 or 2 drops of oil on each of two bearings.

(c) Tuning-control gears. Lubricate teeth sparingly with oil.

(2) *Antenna Tuning Unit BC–939–A.* Points requiring lubrication every 256 hours:

(a) Loads-shaft bearing-coil. Place 1 or 2 drops of oil on each of three bearings.

(b) Primary-coil-control shaft. Place 1 or 2 drops of oil on shaft.

(c) Primary-coil-shaft bearings. Place 1 or 2 drops of oil on bearings.

(d) Capacitor-switch-shaft rear bearings. Place 1 or 2 drops of oil on bearing.

(e) Capacitor-switch front bearing. Use an oil can to lubricate this bearing.

(f) Primary-coil dial-control shaft. Use an oil can to lubricate any points requiring lubrication.

(g) Load-coil-control bevel pinions. Clean and coat teeth sparingly with special lubricating grease (GL).

(h) Ball-spring plunger and disk. Clean and coat sparingly with special lubricating grease (GL).

(i) Primary-control gear and pinion. Coat teeth sparingly with special lubricating grease (GL).

12. Cleaning, Inspecting, and Testing of Tubes

a. CLEANING. Clean tubes with a cloth moistened with dry-cleaning solvent (SD). Remove corrosion or rust from grid and plate caps with #0000 sandpaper or crocus cloth. Remove solder on pins of metal tubes with a penknife. Do not damage pin stud. Touch up with soldering iron. Polish pins with #0000 sandpaper, and a clean, dry cloth.

b. INSPECTING. Inspect tubes for cracks in glass or base, for bent or broken prongs, loose tube caps, looseness of glass envelope from tube base, and looseness in connection between spring clips and tube caps.

c. TESTING. Test tubes according to the following instructions:

(1) *Receiver type tubes.* Use a tube tester.

(a) Test tubes in accordance with instructions given in the manual furnished with the tube tester for the particular tube under test.

(b) Test tube for leakage or shorts between the elements of the tube. If the tube tester indicates tube is shorted, discard the defective tube.

(c) If leakage is not indicated, make emission test in accordance with chart. If the tube tester registers *weak, questionable,* or *bad,* replace the tube. (Replacement of voltage regulator tubes may make it necessary to adjust potentiometer R7A. For data on this adjustment see par. 19*e*(8)(*c*).)

(d) Place doubtful tubes in a transmitter known to be operating normally. Replace tube if operation of the transmitter is adversely affected.

(2) *Transmitter type tubes.* (*a*) Make continuity tests on large transmitter type tubes.

(b) Make comparative operating tests using a similar piece of equipment known to be operating normally. (For characteristics of tubes, see table VII.)

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

13. Tests of Resistance of Power Supplies

Troubles within the transmitter can be detected often by testing the resistance of the power supplies at the power input and output terminals before applying power to the equipment, thereby preventing damage to the power supplies. Perform the tests listed below with an ohmmeter. Make tests with a-c power turned off, tubes removed except where otherwise indicated, and all plugs disconnected. After these tests are completed make a careful inspection of the wiring on the lower and upper control panels to make certain that there are no short circuits or open circuits because of broken wiring, since the results of the tests outlined below give no indication of defects within these circuits. The values specified for the tests listed below are approximate. If the readings obtained are not within the specified tolerance, the circuit is defective. If the readings obtained in the tests indicate a defective circuit, test each component in the circuit with an ohmmeter for possible grounds, leakage, and short circuits or open circuits. Make the necessary repairs and replacement of defective parts.

a. High-voltage Power Supply. Before performing these tests remove connections from terminal strip TS3 on the high-voltage power side, taking precaution to prevent wires from touching one another.

(1) *Input resistance.* Adjust ohmmeter to scale which permits the lowest resistance measurement.

(a) Place ohmmeter test leads between terminals No. 1 and No. 3 of terminal strip TS3. Reading on ohmmeter will indicate:

Normal—1 ohm ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(b) Place ohmmeter test leads between terminals No. 4 and No. 7 of terminal strip TS3. Reading on ohmmeter will indicate:

Normal—11 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(2) *Output resistance.* Adjust ohmmeter to permit a resistance measurement on the 0- to 100,000-ohm scale. Place ohmmeter test leads between wire terminals No. 8 and No. 9 of terminal strip TS3. Reading on ohmmeter will indicate:

Normal—75,000 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

b. Modulator Bias Power Supply. (1) *Input resistance.* Adjust ohmmeter to scale which permits the lowest resistance measurement.

(a) Place ohmmeter test leads between terminals No. 1 and No. 6 of socket SO3. Reading on ohmmeter will indicate:

Normal—1.5 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(b) Place ohmmeter test leads between terminal No. 5 of socket SO3 and terminal No. 12 of socket SO4. Reading on ohmmeter will indicate:

Normal—1.5 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(c) Place ohmmeter test leads between terminals No. 4 and No. 5 of socket SO3. Reading on ohmmeter will indicate:

Normal—3 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(2) *Output resistance.* Adjust ohmmeter to permit a resistance measurement on the 0- to 100,000-ohm scale. Before performing the output resistance test, check resistor R11 whose value should be 2,500 ohms. Replace this resistor if its value is not correct within a tolerance of 10 percent. Place ohmmeter test leads between terminal No. 7 of socket SO1 and terminal No. 9 of socket SO4. Reading on ohmmeter will indicate:

Normal—50,000 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

c. Power Supply of R-f Section. (1) *Input resistance.* Perform this test with voltage regulator tube V15 in its socket. Adjust ohmmeter to scale which permits the lowest resistance measurement. Place ohmmeter test leads between terminals No. 7

and No. 8 of terminal strip TS1. Reading on ohmmeter will indicate:

Normal—1.4 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

(2) *Output resistance.* Adjust ohmmeter to permit a resistance measurement on the 0- to 100,000-ohm scale. Place ohmmeter test leads between chassis ground and terminal No. 8 of terminal strip TS2. Reading on ohmmeter will indicate:

Normal—40,000 ohms ± 10 percent.
Defective—zero, infinite resistance, or value outside tolerance limits.

14. Tests of Input Resistance at Power Input Plug

Perform the following tests with a-c power turned off, tubes removed, and all plugs disconnected.

a. Short Circuit Test. Place ohmmeter test leads across a-c socket SO6. Reading on ohmmeter will indicate:

Normal—infinite resistance.
Defective—zero resistance.

If the above measurement indicates a defective circuit, test each component in the circuit with an ohmmeter for short circuits. Make the necessary repairs and replace defective parts.

b. Open Circuit Test. Place a temporary jumper across the terminals of socket SO6, and place ohmmeter test leads across terminals No. 3 and No. 7 of socket SO3. Reading on ohmmeter will indicate:

Normal—zero resistance.
Defective—infinite resistance.

If the above measurement indicates a defective circuit, test each component in the circuit with an ohmmeter for open circuits. Make the necessary repairs and replace defective parts.

15. Continuity Tests for Cables and Terminal Strips

Defects in Radio Transmitter T–55/MRQ–2 can be detected by performing continuity tests through cables and terminals in accordance with the procedure outlined in table II below.

a. Perform these tests with a-c power off, tubes removed (except where indicated otherwise), and all plugs connected in their proper sockets.

b. Perform tests on an ohmmeter range that permits a reading close to the center of scale. If the readings obtained do not agree with those specified in table II, within a tolerance of ± 10 percent, the circuit is defective. If an infinite reading is obtained in a test for which zero is specified in table II, there is an open in the circuit under test. Check the circuit for poorly soldered or broken connections, burned-out fuses, poor contacts between plugs and sockets, and loose connections at terminal strips. Also, by these tests short circuits and defective parts may be located. Make the necessary repairs and replacements.

Caution: Make certain that the switches are in the position specified for the test.

Table II. Continuity tests for cables and terminal strips.

Part	Ref. symbol	Term. or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
Power supply terminal Strip T83.	T83	1		Terminal 0 of transformer T6	0
		2		Terminal 2600 of transformer T6	0
		3		Terminal 2000 of transformer T6	0
		4		Terminal ST of transformer T2	0
		5		Terminal 100 of transformer T2	0
		5		Terminal No. 7 of terminal strip TS3	0
		6		The open contact on relay RY2	700
		8		Terminal CT of transformer T2	50
		9		Any convenient ground point	0
Leads connecting to power supply terminal strip TS3.		1		Terminal No. 8 of plug PL4	0
		1	SW4 at NORMAL	Terminal No. 7 of plug PL4	0
		2	SW7 at CW. Fuses FS2 and FS3 must be in operating condition.	Terminal No. 7 of plug PL3	0
			SW7 at PHONE. Fuses FS2 and FS3 must be in operating condition.	Terminal No. 7 of plug PL3	
		4	SW12 closed (not pressed).	Terminal No. 8 of terminal strip TS3	0
		5	SW7 at PHONE	Terminal No. 2 of plug PL3	0
		7		Terminal No. 8 of plug PL3	0
		8		Terminal + of meter MS	0
		9		Terminal No. 9 of plug PL4	500

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Part	Ref. symbol	Term. or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
Modulator socket SO1..	SO1	7		Any convenient ground point.....	0
		8		Terminal No. 2 on socket SO5.....	0
		9		Terminal No. 11 on socket SO1.....	80
Modulator socket SO2..	SO2	7		Terminal No. 4 on socket SO3.....	0
		8		Terminal No. 5 on socket SO3.....	0
		10		Terminal No. 4 on socket SO5.....	0
		11		Tap on resistor R11.....	0
		12	Switch SW5 closed....	Terminal No. 8 on socket SO3.....	200
Modulator socket SO3..	SO3	1		Terminal No. 1 on socket SO3.....	0
		2		Terminal No. 6 on socket SO3.....	250
		3		One side of the a-c line at socket SO6..	0
		7		One side of the a-c line at socket SO6..	0
Modulator socket SO4..	SO4	7		Terminal No. 8 of socket SO4.....	16
		9		Terminal CT of 500–0–500 winding of transformer T1.	2750
		11		Terminal 4 of socket SO5.....	0
		12		Terminal 5 of socket SO3.....	1.5
Modulator plug connector PL1.		7		Any convenient ground point.....	0
		8		Terminal No. 3 of terminal strip TS1...	0
		9		Terminal No. 4 of terminal strip TS1...	0
		11		Terminal No. 5 of terminal strip TS1...	0
Modulator plug connector PL2.	PL2	7		Terminal No. 7 of terminal strip TS1...	0
		8		Terminal No. 8 of terminal strip TS1...	0
		10		Terminal No. 10 of terminal strip TS1..	0
		11		Terminal No. 9 of terminal strip TS1...	0
		12		Terminal No. 11 of terminal strip TS1..	0
Modulator plug connector PL3.	PL3	1	Fuse F35 must be in operating order.	Terminal No. 5 of plug PL3.....	0
		3	Fuse FS1 must be in operating order. Switch SW1 at ON.	Terminal No. 6 of plug PL3.....	0
		4	Switch SW12 closed...	Terminal No. 6 of terminal strip TS3...	0
		5	Fuses FS2 and FS4 must be in operating order.	Terminal No. 7 of plug PL3.....	0
Modulator plug connector PL4.	PL4	10		Variable arm of MODULATOR BIAS control R12.	0
		11	Switch SW6 at ON....	Variable arm of FILAMENT VOLTAGE control R18.	0
		12	Switch SW3 at ON....	Variable arm of FILAMENT VOLTAGE control R18.	0
Modulator socket connector SO5.	SO5	1		Terminal No. 1 of socket SO3.....	0
		3		Terminal No. 6 at socket SO3.....	0
		6		Terminal No. 7 of socket SO5.....	55
		8		Any convenient ground point.....	0
Exciter terminal strip TS1.	TS1	1		Any convenient ground point.....	0
		3		Terminal No. 8 at tube socket of tube V8	60
		4		Terminal No. 2 or 3 at tube socket of tube V12.	0
		5		Terminal No. 3 or 2 at tube socket of tube V12.	0
		7	Tube V15 must be in its socket.	Terminal 100 of transformer T4.....	0
		8		Terminal ST of transformer T4.....	0
		9		Terminal No. 6 at terminal strip TS2...	0
		10	Switches SW10, SW13, and SW2 closed.	Terminal No. 11 at terminal strip TS1..	0
Exciter terminal TS2...	TS2	3		Terminal F of tube socket of tube V16..	0
		4		Terminal F of tube socket of tube V16..	0
		5		Grid connection of tube V16.....	20
		7		Terminal No. 3 of tube socket of tube V10 or V11.	70
		8		Terminal CT of 5-volt 3-amp winding on Transformer T4.	125
		9		Ungrounded side of capacitor C26.....	50
		10		Ungrounded side of capacitor C24.....	20
		11		Ungrounded filament terminal of tube V8, V9, V10, and V11.	0
		12		Any convenient ground point.....	0

Part	Ref. symbol	Term. or lead No.	Switch adjustments when measuring	Where measured to	Resistance (ohms)
Leads connecting to exciter terminal strip TS2.	TS2	3		A terminal of meter M3	0
		4		Other terminal of meter M3	0
		5	Switch SW8 at P.A. GRID.	Negative terminal of meter M1	0
		6		Positive terminal of meter M1	0
		7	Switch SW8 at INT. AMP. GRID.	Negative terminal of meter M1	0
		8	Switch SW8 at DOUBLER-PLATE.	Positive terminal of meter M1	0
		9	Switch SW6 at DOUBLER-PLATE.	Negative terminal of meter M1	0
		10	Switch SW8 at INTERMEDIATE AMPLIFIER.	Negative terminal of meter M1	0
		11		Hot lead on lamp socket	0
		12		Any convenient ground point	0
Exciter chassis tuning unit sockets SO7, SO8, and SO9.	SO7, SO8, and SO9	1	Switch SW11 is in positions 1, 2, and 3, respectively, for the following checks on SO7, SO8, and SO9.	Ungrounded side of capacitor C2.1A	0
		2		Any convenient ground point	0
		3		Terminal No. 5 at tube socket of tube V8	0
		4		Terminal on capacitor C1 opposite to connection from this capacitor to the cathode of tube V8.	0
		5		Any convenient ground point	0
		6		Any convenient ground point	0
		7		Terminal No. 9 of terminal strip TS2	50
		8		Terminal No. 5 at tube socket of tube V9	0
		10		Any convenient ground point	0
		11		Terminal No. 10 at terminal strip TS2	20
		12		Plate caps of tubes V10 and V11	0

16. Preparation of Set for Operation

a. Replacement of Plug-in Parts. (1) *Tubes.* Insert all tubes into their proper sockets, making certain that they are locked and tight, and that grid connections and plate spring clips are firmly connected.

(2) *Tuning units.* Select three tuning units which cover the required frequencies, and plug them into the sockets provided in the right-hand side of the transmitter. The lowest frequency tuning unit should be placed in position No. 1 and the highest frequency tuning unit should be placed in position No. 3. Make certain that the switch marked M.O.–XTAL faces the front of the transmitter.

(3) *P.A. tank coil.* See the tuning charts (sec. IX), select the P.A. tank coil for the desired frequency, and plug it into the left-hand side of the transmitter. Be sure that it is properly seated and that the flexible lead from the end of the link is plugged into its jack on top of the stand-off insulator.

(4) *Capacitor CA–423.* Insert this capacitor for the lower frequencies when it is specified on the tuning charts. (See sec. IX.)

(5) *Other plug-in parts.* Put back all other plug-in parts such as fuses, plugs, pilot lamps, and the 600-watt heater element and make certain that they fit firmly in their sockets.

Table III. Tuning components for radio transmitter T–55/MRQ–2

Tuning unit	Frequency range (mc)
TN–28/MRQ–2	0.95 to 1.40.
TN–29/MRQ–2	1.35 to 2.00.
TN–30/MRQ–2	1.95 to 2.85.
TN–31/MRQ–2	2.80 to 4.10.
TN–32/MRQ–2	4.05 to 5.95.
TN–33/MRQ–2	5.90 to 8.60.
TN–34/MRQ–2	8.55 to 12.50.
TN–36/MRQ–2	12.45 to 18.05.
Coil	**Frequency range (mc)**
RF–13/MRQ–2	0.95 to 1.05.
RF–14/MRQ–2	1.05 to 1.56.
RF–15/MRQ–2	1.56 to 3.25.
RF–16/MRQ–2	3.25 to 4.10.
RF–17/MRQ–2	4.10 to 5.95.
RF–18/MRQ–2	5.95 to 8.60.
RF–19/MRQ–2	8.60 to 12.50.
RF–20/MRQ–2	12.50 to 16.00.
RF–21/MRQ–2	16.00 to 18.00.

b. Connection of Power Unit. Select a power source which can supply 5 kw of 117-volt, 50- or 60-cycle, single-phase alternating current. Connect to the transmitter, using Cord CD–763 or equivalent. When using Power Unit PE–95–( ), consult TM 11–904 for details of operation.

c. Adjustment of Operating Components. (1) *Keys.* Plug two Keys J–37 into the two KEY jacks located on Control Box C–110/MRQ–2.

(2) *Control Box C–109/MRQ–2.* When using a rhombic antenna, set the switch on Control Box C–109/MRQ–2 to BC–342 or BC–344, depending on the receiver required.

(3) *Receiver switches.* Set SEND-REC. switches on both receivers, at SEND.

Caution: These switches should be at SEND position at all times. This is necessary to prevent damage to input circuits of the receivers when transmitting.

(4) *Heater or blower.* Turn on electric heater or ventilating blower if either is needed.

d. Precautions Before Operation. Before attempting to operate Radio Transmitter T–55/MRQ–2 always observe the following precautions:

(1) Read carefully this paragraph and paragraphs 17 and 18 in order to become thoroughly familiar with the material included.

(2) If Radio Receivers BC–342–( ) and BC–344–( ) are used, check their operation and condition as outlined in TM 11–850, or Repair Instructions for Radio Receiver BC–342 and BC–344.

(3) When using antennas A, B, C, or D, read TM 11–2610 and follow all instructions carefully.

(4) Never throw the CW-PHONE switch with the plate power on.

(5) Rotate the GAIN control knobs of both CARBON MIC. 1 and DYNAMIC MIC. 2, on Speech Amplifier BC–614–E, to their extreme counterclockwise positions (minimum gain).

(6) Before starting operation or at the conclusion of operation the following must be observed:

(a) FILAMENT POWER switch and PLATE POWER switch on Radio Transmitter T–55/MRQ–2 are set at OFF position.

(b) HIGH VOLTAGE PROTECT switch on Radio Transmitter T–55/MRQ–2 is set at HIGH VOLTAGE PROTECT.

(c) EXCITER PLATE POWER switch on Radio Transmitter T–55/MRQ–2 is set at NORMAL (OFF).

(d) TRANSMITTER control switch on Control Box C–110/MRQ–2 is set at OFF.

(e) REMOTE LINE switch on Control Box C–100/MRQ–2 is set at TELEPHONE.

(f) Transmitter output switch on the front of Antenna Switching Unit JA–24/MRQ–2 is set at DUMMY ANTENNA (up position).

(g) Microphone Plug PL–68 is removed from jack marked MIC. on Control Box C–110/MRQ–2.

(h) Electric heater switch is turned to OFF.

Warning: Radio Transmitter T–55/MRQ–2 is equipped with extremely high voltages which are dangerous to life if contacted. The protective electrical interlock switches should not be relied upon. If the contact points of relay RY1 stick, high voltages are still present in the transmitter after the interlock switches are operated. Therefore, be sure that the back cover and cover doors are closed before applying plate power. A red bull's-eye pilot lamp, labeled PLATE POWER on the front panel of the transmitter indicates when the high-voltage supply is turned on. However, since this lamp may burn out, do not rely upon it to show that *no high voltage* is present. In addition, when the transmitter is in operation, extremely high r-f voltages are present around the antenna tuning unit or antenna coupling unit. Beware of r-f burns. Make certain that the voltage is off when changing parts and making repairs.

17. Operating Test

a. Preliminary Adjustments for C-W Transmission. Always adjust Radio Transmitter T–55/MRQ–2 initially for c-w transmission. Proceed as follows:

(1) See that the PLATE POWER switch of the transmitter is at OFF and is left there. If this is not done, automatic disabling of the receivers is not possible. This switch is used only in emergency or when tuning or servicing the transmitter.

(2) Always leave the receiver SEND-REC. switches at SEND to avoid burning out the receiver input circuits.

(3) Make sure that the transmitter central switch on Control Box C–110/MRQ–2 is set at OFF.

(4) Set the FILAMENT POWER switch of the transmitter at ON. The FIL. VOLTAGE meter should register. Allow at least 1 minute for the filaments to warm up.

(5) Adjust the FILAMENT VOLTAGE control of the transmitter until the FIL. VOLTAGE meter reads between 5 and 5.3 volts.

(6) Set the BAND SWITCH located on the front panel of the transmitter to select any one of the three tuning units.

(7) Set the CW-PHONE switch of the transmitter at CW.

b. Preliminary Operating Checks. (1) *Overheating of parts.* Check the transmitter for smoke and odor of burned parts.

Note. Recently moistureproofed and fungiproofed equipment may have a small amount of smoking, which is normal.

(a) Tubes. After transmitter has been operating at least 5 minutes, remove voltages and look for red-

dened plates within the envelopes of large transmitter type tubes as an indication of exceeding the normal plate dissipation. Feel the grid, plate, and filament terminals of the tubes for excessive heat due to contact resistance between the tube pin and socket connection.

Warning: Do not handle tubes that require heavy filament current or dangerously high plate voltage while the transmitter is in operation. Make the above checks after all voltages have been removed.

(b) Resistors. Watch for overheated or smoking resistors. Feel the tension of ferrule clips. Insufficient tension of ferrule clips may cause a poor electrical connection.

(c) Capacitors. Feel terminals and bodies of the capacitors for excessive heat.

(d) Transformers. Check transformers for signs of overheating.

(2) *Noises.* Listen for noises which indicate arcing.

(3) *FILAMENT VOLTAGE control.* If the FILAMENT VOLTAGE control on the transmitter cannot be adjusted for a reading of 5 to 5.3 volts on the FIL. VOLTAGE meter, or if the meter shows no indication, make the following checks:

(a) Fuses. Make certain that all fuses are tight in their sockets and in good operating condition.

(b) Source of power. Make certain that the cord and plug to the source of power are not defective. For detailed repair data on the internal power supplies see sections VI and VIII.

Warning: Touch only insulated parts. Use an insulated probe to find loose joints and disconnected wires. Keep one hand behind the body when making these checks.

(c) FILAMENT POWER switch. Check this switch to determine whether or not it is operating properly.

(d) Voltage regulator tubes. Make certain that tubes VI3A, VI4A, V15, and V16A are firmly inserted in their sockets.

(4) *Subsequent Tuning Adjustments.* If the above checks indicate that thus far the transmitter is operating satisfactorily, proceed to make the subsequent tuning adjustments.

c. Tuning with Master-oscillator (M.O.) Control. If the operation of the transmitter fails during the following tuning adjustments, see sections VI and VIII for detailed repair data.

(1) Set the M.O.–XTAL switch on each tuning unit at M.O.

(2) Set EXCITATION METER SWITCH to P.A. GRID.

(3) Rotate BAND SWITCH to position 1.

(4) Set EXCITER PLATE POWER switch of the transmitter at ON. The EXCITATION METER should read between 80 and 125 milliamperes (ma). If the EXCITATION METER does not read between 80 and 125 ma, the tuning unit must be aligned.

(5) Repeat step (4) above, for positions 2 and 3 of BAND SWITCH and be sure that the EXCITER PLATE POWER switch is set to OFF before moving the BAND SWITCH.

(6) Always realign a tuning unit which does not meet the above test.

d. Alignment of Tuning Units. (1) Set EXCITER TUNING dial to 500. This is the minimum capacity setting.

Caution: Do not spin this dial. If the dial is spun against the stop, serious damage to the dial mechanism can result.

(2) Turn on the receiver and tune it to a frequency exactly one-half the upper frequency limit of the tuning unit. For example, assume the tuning unit to be aligned covers a frequency range of 0.95 to 1.4 mc; the receiver should be tuned to $\frac{1.4}{2}$ 0.7 mc or 700 kc.

Note. When aligning the tuning units covering the frequency range of 8.55 to 12.5 mc and 12.45 to 18.05 mc, the receiver should be tuned to one-fourth the upper frequency limit of the tuning unit.

(3) Loosen the thumbscrew on the M.O. dial of the tuning unit.

(4) Adjust the M.O. dial for zero beat with the receiver.

(5) Tighten the thumbscrew on the M.O. dial of the tuning unit.

(6) Set EXCITATION METER SWITCH on the front panel of the transmitter at INT. AMP. GRID.

(7) Adjust the center knob of the tuning unit marked DOUB. for maximum reading, as indicated on EXCITATION METER.

(8) Set EXCITATION METER SWITCH on the front panel of the transmitter at P.A. GRID.

(9) Adjust the INT. AMP. knob of the tuning unit for maximum reading, as indicated by EXCITATION METER.

(10) Readjust DOUB. and INT. AMP. knobs for maximum possible deflection of the EXCITATION METER. (EXCITATION METER should now read between 80 and 125 ma.)

(11) Because of interaction of the tuning circuits, the M.O. dial may need readjustment to bring the

oscillator frequency back to zero beat with the receiver.

(12) For a more precise setting of the oscillator frequency, use Frequency Meter Set SCR–211–( ) to establish the upper frequency limit of the tuning unit in step (2) above. (See par 37.) This procedure will not be required ordinarily unless the receiver is seriously out of calibration.

e. P-A Tuning and Loading.

Note. Be sure tuning units have been checked for alignment, and realigned if necessary in accordance with instructions in paragraph 17*d*. Unless the M.O. dial lock has become loosened, steps (8) and (10) above, are usually sufficient.

(1) *Into dummy load.* *(a)* Set BAND SWITCH to select the desired tuning unit.

(b) Set EXCITER TUNING dial to the required frequency by reference to the tuning charts for Radio Transmitter T–55/MRQ–2 (sec. IX) and check by zero beating with receiver.

(c) Check to see that the HIGH VOLTAGE PROTECT switch is at HIGH VOLTAGE PROTECT.

(d) Check to see that the transmitter output switch on Antenna Switching Unit SA–24/MRQ–2 is set to DUMMY ANTENNA (upward position).

(e) Set ANTENNA SELECTOR SWITCH on the left front panel of the transmitter to RHOMBIC 0.95, 3MC if operating in that frequency range or RHOMBIC 3, 18MC if operating in the 3 to 18 mc frequency range.

(f) Set RHOMBIC COUPLING control at 0.

(g) Set EXCITER PLATE POWER switch at ON.

(h) Set PLATE POWER switch at ON.

(i) Tune PLATE TUNING DIAL to minimum dip in p-a plate current as indicated by P.A. PLATE meter.

(j) Rotate RHOMBIC COUPLING control towards 100 until a reading of approximately 110 ma is obtained on P.A. PLATE meter.

(k) Readjust PLATE TUNING dial until P.A. PLATE meter dips to minimum reading.

(l) Repeat steps (j) and (k) until 110 ma is indicated on P.A. PLATE meter at minimum dip.

(m) Set PLATE POWER and EXCITER PLATE POWER switches to OFF.

(n) Set the HIGH VOLTAGE PROTECT switch to NORMAL.

(o) Set PLATE POWER and EXCITER PLATE POWER switches to ON. The P.A. PLATE meter should read 290 ma. Repeat steps (*j*) and (*k*) above, if necessary, to secure a reading of 290 ma. Do not exceed a 290 ma. reading.

(p) Restore PLATE POWER and EXCITER PLATE POWER switches to OFF position.

(2) *Into rhombic antenna.* No preliminary tune-up operations should ever be attempted with the transmitter connected to the rhombic antenna. Because of the high-power gain and highly directional characteristics of the rhombic antenna, strong signals are radiated to great distances, and can be received by the enemy. Furthermore, when the power amplifier has been properly tuned into a dummy antenna, as in (1) above, only a slight readjustment of the PLATE TUNING and RHOMBIC COUPLING controls will be necessary, and these final adjustments can be made after transmission has actually begun.

(3) *Into a Rod Antenna or Long Wire Transmitting Antenna.* *(a)* Perform steps *(a)* through (*c*) in (1) above.

(b) Set ANTENNA SELECTOR SWITCH at WHIP.

(c) See the tuning chart (sec. IX) and set the dials on Antenna Tuning Unit BC–939–A or Antenna Coupling Unit CU–45/MRQ–2 to the approximate settings indicated on the chart for the frequency being used.

(d) Set the transmitter output switch at TRANSMIT.

Caution: To prevent unnecessary signals being radiated, wait until transmission is about to begin, then perform operations **(*e*)** through **(*n*)** below, quickly.

(e) Set the transmitter control switch to TRANSMITTER ON.

(f) Press Key J–37 and adjust PLATE TUNING dial for minimum dip of P.A. PLATE meter. Do not change this adjustment from this point.

(g) Adjust FREQUENCY INCREASE and COUPLING controls on the antenna tuning (or coupling) unit, until a reading of 110 ma. on the P.A. PLATE meter is obtained.

1. If operating frequency is in 2 to 10 mc range, use crank marked 10 MC — — — 2 MC.
2. If operating frequency is in 10 to 18 mc range, use crank marked 18 MC — — — 10 MC.

(h) Release key and set HIGH VOLTAGE PROTECT switch at NORMAL.

(i) Press Key J–37 and adjust COUPLING control on antenna tuning (or coupling) unit, if necessary, to obtain 290 ma. on P.A. PLATE meter.

(j) Carefully reset inductor crank for a maximum indicator on ANTENNA CURRENT meter.

(k) Readjust coupling control and inductor crank by repeating procedure specified in (*i*) and (*j*) above, until a maximum antenna current occurs when P.A. PLATE meter reads 290 ma.

Caution: Never exceed a value of 300 ma (cw) as indicated by the P.A. PLATE current meter; however, it is permissible to reduce coupling so plate current is as low as 200 ma if satisfactory c-w communication is still maintained.

(l) The transmitter is now ready for c-w operation on a rod antenna or long wire antenna.

(m) Keying of the transmitter may be checked by pressing the key and noting meter indications. For data on meter readings, see table IV.

(n) Set transmitter control switch on the control box to OFF.

f. Adjustment for Phone Transmission. (1) After the transmitter has been tuned for c-w operation it should be adjusted for phone operation as follows:

(a) Set the transmitter output switch at DUMMY ANTENNA.

(b) Set the transmitter control switch on Control Box C–110/MRQ–2 at OFF.

(c) Set MODULATOR BIAS control on the transmitter to the extreme counterclockwise position.

(d) Set C.W.-PHONE switch on the transmitter at PHONE.

Caution: Never change the position of the C.W.-PHONE switch when the plate voltage of the power amplifier is on. To do so will damage the relays.

(e) Connect Microphone T–50–( ) to receptacle marked DYNAMIC MIC. 2 on Speech Amplifier BC–614–E.

(f) Press the push-to-talk switch on the microphone and note reading of P.A. PLATE meter. It should be approximately 250 ma. If it is more than 260 ma or less than 230 ma, adjust the loading of the transmitter to obtain a reading of 250 ma.

(g) Depress the push-to-talk switch and adjust the MODULATOR BIAS control until the MODULATOR PLATE meter on Speech Amplifier BC–614–E reads 40 ma.

(h) With the push-to-talk switch still depressed, speak into the microphone and at the same time adjust the microphone gain control DYNAMIC MIC. 2 until the MODULATOR PLATE meter reads 200 ma on voice peaks.

(i) Release the push-to-talk switch.

(2) The transmitter can be modulated from the remote control point. In this event adjust the MODULATOR BIAS control and the microphone gain controls exactly as in (1) above. Make sure the MODULATOR PLATE meter does not read in excess of 200 ma on modulation peaks.

(3) The transmitter may also be modulated by a carbon microphone or other source plugged into jack CARBON MIC. 1 on Speech Amplifier BC–614–E. If this is done, adjust the MODULATOR BIAS control as in (1) above, but adjust the gain by means of gain control CARBON MIC. 1 so that modulation peaks do not exceed 200 ma on the MODULATOR PLATE meter.

g. Operation with Crystal Control. (1) Set M.O.-XTAL switch of tuning unit at XTAL.

(2) Insert Crystal Holder FT–171–B (or other suitable holder with crystal) of required frequency into XTAL jacks of tuning unit.

(3) Set EXCITATION METER SWITCH on the front panel of the transmitter at P.A. GRID.

(4) Set EXCITER PLATE POWER switch of transmitter at ON.

(5) Adjust EXCITER TUNING dial for maximum current as indicated on EXCITATION METER.

(6) EXCITATION METER should read between 80 and 125 ma. If meter does not read between these values, realign the tuning unit as described in *d* above.

(7) Tune power amplifier as instructed in *e*(1), (2), or (3) above.

h. Changing Type of Transmission. (1) After the transmitter has been tuned and adjusted for phone operation, it can be switched immediately to c-w operation by setting the C.W.-PHONE switch first at C.W., and then setting the TRANSMITTER control switch to ON without any additional tuning adjustment.

(2) The transmitter can be switched from continuous wave to voice operation by restoring the TRANSMITTER control switch to OFF first, and then setting the C.W.-PHONE switch at PHONE.

i. Operation on Dummy Antenna. For very short range communication, it may be desirable to operate on a dummy antenna. With the dummy antenna taking the full output of the transmitter, c-w signals can be heard for about 1 or 2 miles depending on local receiving conditions. Phone signals will be audible over a much shorter range. To operate on a dummy antenna proceed as follows:

(1) Tune transmitter as described in *e*(1) above.

(2) Set HIGH VOLTAGE PROTECT switch at NORMAL.

(3) Operate with as little p-a plate current as possible and in no case should the P.A. PLATE meter read in excess of 290 ma.

SECTION V

ALIGNMENT PROCEDURE

18. Neutralization

Radio Transmitter T–55/MRQ–2 will need adjustment for neutralization if neutralizing capacitor C18 has been tampered with. The transmitter may be readjusted as follows:

a. Install Tuning Unit TN–36/MRQ–2 and its associated Coil RF–21/MRQ–2.

b. Disconnect the concentric lead between Radio Transmitter T–55/MRQ–2 and Antenna Tuning Unit BC–939–A or Antenna Coupling Unit CU–45/MRQ–2.

c. Set the antenna switch at TRANSMIT.

d. Set FILAMENT POWER switch at ON.

Note. In this operation high-voltage plate power is not applied, so the transmitter control switch on Control Box C–110/MRQ–2 must be left at OFF; and the PLATE POWER switch on the transmitter be set at OFF.

e. Set EXCITATION METER switch at P.A. GRID.

f. Set EXCITER PLATE POWER switch at ON.

g. Adjust EXCITER TUNING dial to resonance at some frequency near the high-frequency end of the range.

h. Adjust PLATE TUNING wheel slowly through resonance. If the neutralization is faulty, resonance will be indicated by a sharp dip in the reading of the GRID CURRENT meter.

i. Adjust neutralizing capacitor C18, little by little, checking GRID CURRENT meter readings after each adjustment, until rotating the PLATE TUNING wheel through resonance causes only a slight dip in the reading of the GRID CURRENT meter. When properly neutralized this dip will not exceed 3 ma.

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

19. Tests for Defective Stage

If Radio Transmitter T–55/MRQ–2 fails to operate correctly, follow the procedure outlined below for detailed trouble shooting. In any analysis of failure a step-by-step procedure is necessary, starting first with the source of energizing power, testing stage by stage through the r-f section, and then the modulator stages. In actual operation strict adherence to the values specified in the respective table is necessary for satisfactory results.

a. Power Supply. In trouble shooting, first check the power supply to determine whether or not the correct voltages are available. Verify proper connection between transmitter socket SO6 and the external a-c source, checking the socket and the power cable and plug. If necessary, check the internal power supplies in accordance with the special repair data given below in *d*(1)(*a*), *e*(6), *f*(3), and *g*, and paragraphs 26, 29, and 30.

b. Meter Readings. A check of the meter readings aids in recognizing faulty operation of the transmitter, and a logical interpretation of the meter indications, combined with a circuit analysis, will aid in localizing the source of failure.

(1) Compare the meter current readings with those indicated in table IV.

Table IV. Performance characteristics of radio transmitter T–55/MRQ–2.

Description	Indicating meter	Meter switch position	Normal	Limits	
				Max.	Min.
Line voltage ac			117 v	125 v	105 v
Filament voltage	FIL. VOLTAGE		5.0 v	5.3 v	4.9 va
Buffer-doubler plate current	EXCITATION METER	DOUBLER PLATE	30 ma	.....	20 ma
Intermediate-amplifier grid current.	EXCITATION METER	INT. AMP. GRID	2 ma	7 ma	1 ma
Intermediate-amplifier plate current.	EXCITATION METER	INT. AMP. PLATE	150 ma	175 ma	.....
P.A. grid current (PLATE POWER OFF).	EXCITATION METER	P.A. GRID	90–125 ma	.....	80 ma
P.A. grid current (PLATE POWER OFF).	EXCITATION METER	P.A. GRID	80–100 ma	.....	65 ma
P.A. plate current (PHONE)	P.A. PLATE		250 ma	260 ma	230 ma
P.A. plate current (CW)	P.A. PLATE		290 ma	290 ma	200 ma
Mod plate current (no mod)	MOD. PLATE		40 ma	30 ma	35 ma
Mod plate current (100% mod)	MOD. PLATE		200 ma	.....	.....
Power output (voice) (4 mc)			320 watts	.....	210 watts
Power output (c-w)			400 watts	500 watts	325 watts
Input level to BC–614–E (max gain) for 100% mod.			46 db below 1.73 v.	.....	40 db below 1.73 v.
Hum level			40 db below 100% mod.	.....	35 db below 100% mod.

Note. Normal readings are subject to some variation. However, the maximum and minimum limits should not be exceeded.

(2) See table V for a listing of typical failures indicated by the meters, and the probable causes of these failures.

(3) Correct errors in tuning and make necessary repairs and replacements.

(4) See *e* below, for the detailed repair data for the defective stage.

Note. If fuses continue to burn out each time the transmitter is turned on, insert an electric lamp in place of the fuse and check circuit to determine the source of trouble.

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Table V. Typical failures in operation and their probable causes.

Typical failure	Probable cause
No filament voltage in Radio Transmitter T–55/MRQ–2.	One or all fuses FS1, FS2, and FS4 are burned out.
	Defective FILAMENT POWER switch.
	Defective filament resistor, R18.
	Damaged power cord or poor plug contacts.
	Tube V15 is not in its socket.
No excitation indicated on EXCITATION meter of Radio Transmitter T–55/MRQ–2.	Tuning unit improperly installed or missing.
	BAND SWITCH not set to proper channel.
	M.O.–XTAL switch on tuning unit in wrong position.
	Failure in keying circuits.
	Fuse FS4 burned out.
	Omission of or defective tubes on exciter deck.
	Open r-f choke, CH8.
	EXCITER PLATE POWER switch not turned on for tune-up purposes.
	Tuning unit not properly tuned.
No final-amplifier plate current indicated on the P.A. PLATE meter of Radio Transmitter T–55/MRQ–2 (assuming that the necessary P.A. grid current is present).	Reset necessary on overload relay.
	One or all fuses FS1, FS2, and FS3 burned out.
	Interlock switches are not all closed because of faulty closing of door if back screen has not been removed.
	Short circuit in high-voltage circuit continually tripping out the overload relay.
	Poor or no cable connection with Speech Amplifier BC–614–E.
	Rectifier tubes V6 and V7 defective or inoperative because of extreme cold.
	Output coil unit L7A missing or improperly installed on jack bar.
	Plate caps of tubes V6 and V7 removed.
	Heater element R19, used for tuning up on low power, is defective or missing.
Excessive power amplifier plate current indicated on the P.A. PLATE meter of Radio Transmitter T–55/MRQ–2.	R-f choke, CH8 is open.
	Improper tuning of output circuits; use of wrong coil unit L7A; failure to use vacuum capacitor C28 or C28A for frequency ranges 0.95 to 1.05 or 1.05 to 1.50 megacycles, respectively.
	Too much antenna coupling.
	Grid cap on tube V16 is loose or removed.
	No bias voltage because of blown fuse FS5, or defective rectifier tube V5.
	Voltage break-down between center tap of L7A and the coupling link.
Plate voltage of Radio Transmitter T–55/MRQ–2 final amplifier remains on after being switched off.	Relay RY1 has frozen during a *severe* overload. (CAUTION: Leave plug out of socket SO6 while working on this relay.)
Excessive modulator plate current indicated on MOD. PLATE meter of Radio Transmitter T–55/MRQ–2.	Fuse FS5 blown.
	Improper adjustment of the bias voltage controlled by the MODULATOR BIAS control on the front panel.
	Acoustical feedback caused by GAIN control on Speech Amplifier BC–614–E advanced too far.
	Grid caps of tubes V3 and V4 are disconnected.
	Lack of bias voltage because of defective tube V5 or blown fuse FS5.
No antenna current indicated on ANTENNA CURRENT meter of Antenna Tuning Unit BC–939–A or Coupling Unit CU–45/MRQ–2.	Incorrect control settings. (See tuning charts, sec. IX.)
	Sections of transmitting antenna missing.
	Coupling coil too loosely coupled to L5 in the Antenna Tuning Unit BC–939–A.
	Grounding bonds disconnected.
Microphone push - to - talk switch fails to operate.	The 12-volt battery not connected.
	Poor or broken microphone connection to Speech Amplifier BC–614–E.
	Faulty switch inside the microphone.

c. TUBE TESTING. Although the tubes were tested prior to operation (par. 12*c*), they may prove to be faulty later during operation because of a change in conditions. Therefore, to make certain that the tubes are not a source of trouble perform the trial substitution test (par. 12*c*(1)(*a*)) on each tube beginning with the oscillator and continuing through each successive stage, or test with an ohmmeter between the filaments and the other elements within the envelope of the tube. (For characteristics of the tubes, see table VII.)

d. VOLTAGE AND RESISTANCE TESTS. Voltage and resistance tests aid in disclosing defects in the circuits. Perform the tests as follows:

(1) *Voltage tests. (a) Voltage tests of power supply outputs.* Test the voltage from the power supply at each section to determine whether or not the section is receiving the required voltage. This should include a check of plate voltage, shield grid voltage, bias voltage, and filament voltage taken directly at the terminal strip for each section. See figure 38 for circuit diagram of Radio Transmitter T–55/MRQ–2. Use Analyzer BC–1052–E (or equivalent) for these tests. If these tests indicate normal values, proceed

to make voltage tests at the socket terminals of the stage under question.

(b) Voltage tests at socket terminals.

1. Test voltages at the socket terminals an effort to ascertain the defective part within the stage. These voltage values should be as specified on the chassis lay-out diagram. (See figs. 15, 16, and 17.) In general, the d-c voltage measurements shown on the chassis lay-out diagram are made between the socket terminals with a 1,000-ohm-per-volt voltmeter, such as Analyzer BC–1052–( ). A-c voltages are measured as indicated either to ground or between terminals.
2. True d-c voltages to tube V14A which is the control tube for the voltage regulator, cannot be measured with a 1,000-ohm-per-volt voltmeter because of high resistances in the plate, screen grid, and control grid circuits. Nor can this voltmeter be used to measure the voltage at the cathode of tube V14A, because the current drawn by the voltmeter may reduce the voltage across neon tube V16A in the cathode circuit to a value at which the tube will no longer glow. However, with a vacuum-tube voltmeter it is possible to obtain true voltage readings for tube V14A. All voltage measurements presented on the drawings (figs. 15, 16, and 17) are those of normal operation. Adhere to these values within a tolerance of ±10 percent.

Warning: Do not change fuses or make repairs with the high voltages on, because when they are on, a potential of 2,000 to 2,500 volts d-c is present on all three decks of the transmitter. Be very careful when making d-c- voltage tests.

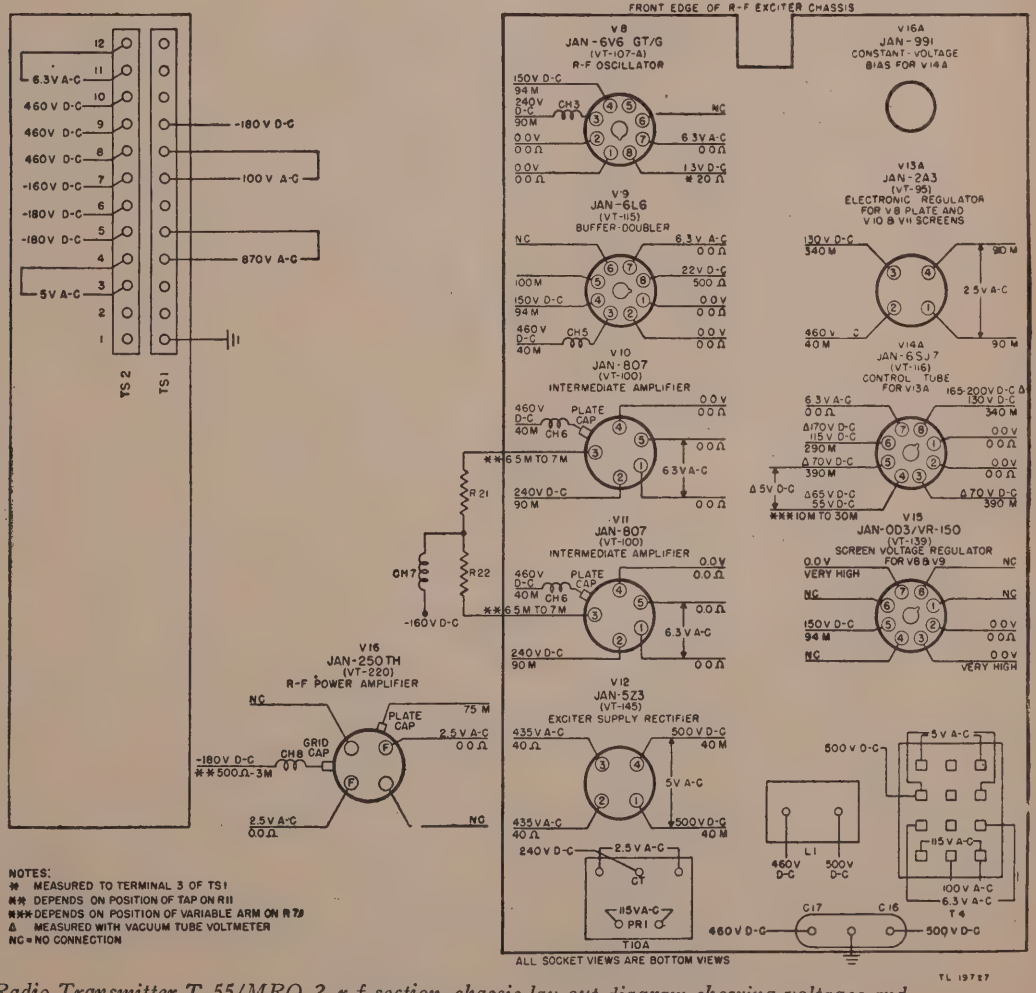


Figure 15. Radio Transmitter T–55/MRQ–2, r-f section, chassis lay-out diagram showing voltages and resistances at terminals and tube sockets.

(c) Instructions for use of Analyzer BC–1052–E (or equivalent) for a-c and d-c voltage measurements.

1. Connect the transmitter for c-w operation.
2. To prevent damaging the instrument by an overload, begin measurements with the instrument set at the highest range whenever the approximate voltage, current, or decibel (db) level is not known.
3. See voltmeter chart (accompanying the analyzer) for the correct settings of controls, switches, jacks, and test prods before making any measurements.
4. The DECIBEL calibration is for use across 500-ohm lines and loads. The scale is read directly in db.
5. The OUTPUT jacks are for measuring the voltage or db level of any a-c or audio voltage. Internal circuits are made through a 0.1-mf isolating capacitor inside the instrument so that a-c voltage or audio-frequency voltage superimposed on a d-c voltage may be read without harm to the analyzer.

(d) Instructions for making high-voltage measurements with Analyzer BC–1052–E (or equivalent).

Warning: It is *extremely dangerous* to make this measurement. The high voltage in Radio Transmitter T–55/MRQ–2 is deadly. When making this test, always arrange to have someone else present.

The recommended procedure for measuring the high voltage is as follows:

1. Insulate the voltmeter well above ground by placing it on dry boards or other insulating material at least 1 inch thick.
2. Set the voltmeter controls to the proper positions for measuring 3,000 volts d-c as indicated on the voltmeter chart.

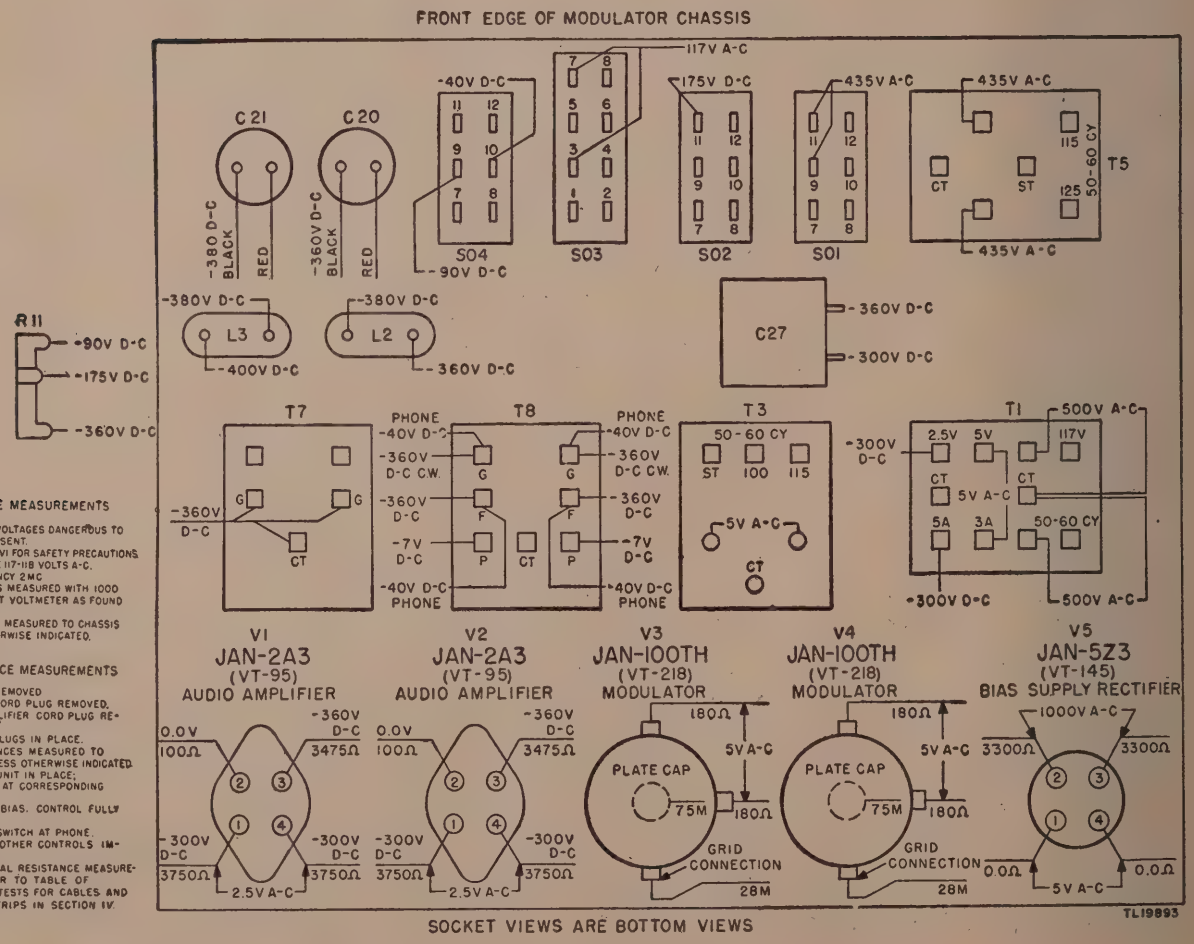


Figure 16. Radio Transmitter T–55/MRQ–2, modulator section, chassis lay-out diagram showing voltages and resistances at terminals and tube sockets.

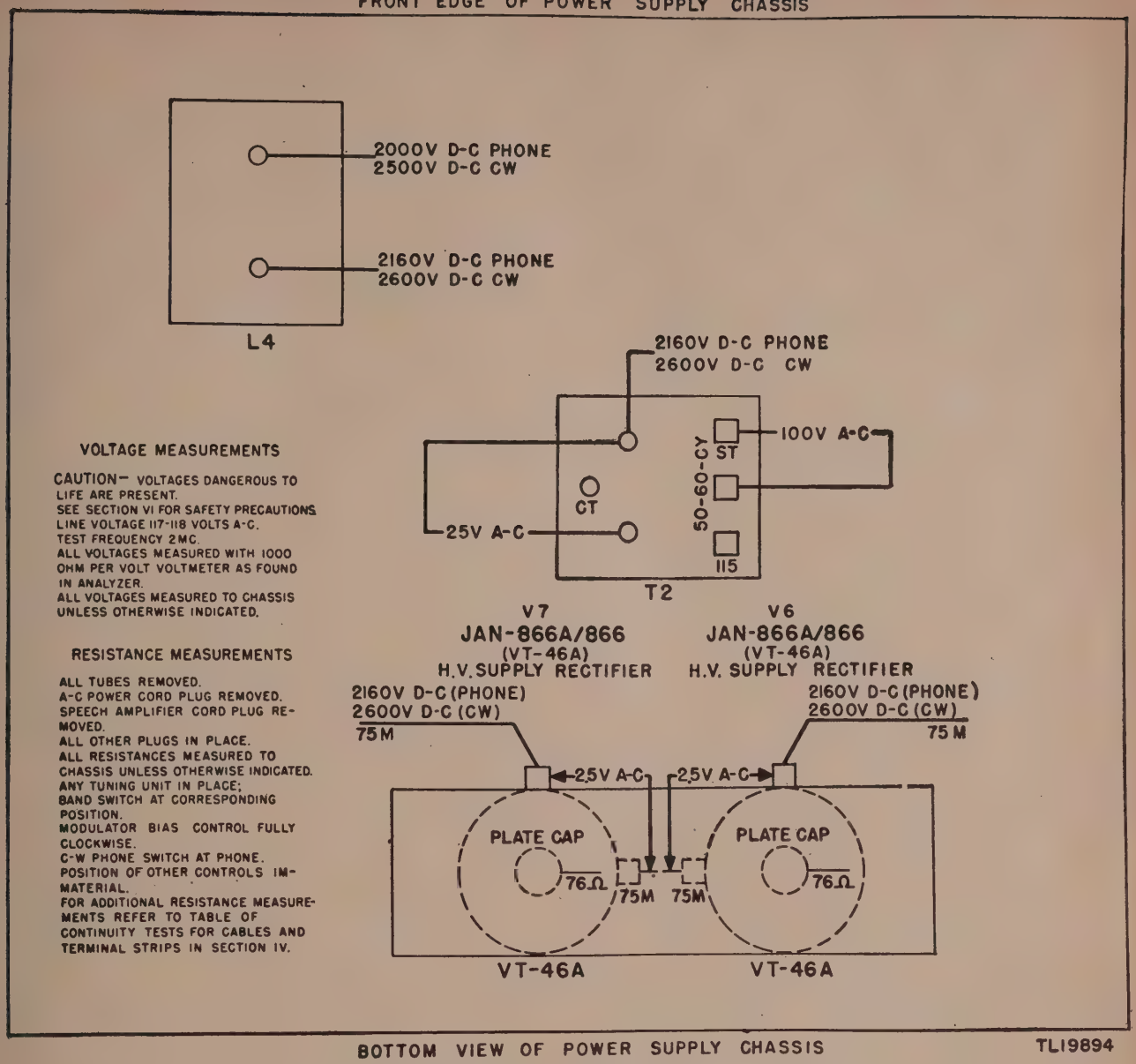


Figure 17. Radio Transmitter T–55/MRQ–2, power supply, chassis lay-out diagram showing voltages and resistances at terminals and tube sockets.

3. Remove coil unit L7.
4. Place red (positive) test lead prod in center jack of jack bar of the coil unit.
5. Connect black (negative) test lead to any convenient ground on the transmitter frame.
6. Open right-hand cover door (over tuning boxes or units) to open its interlock switch. (This switch will be used to close the circuit in step 13 below.)
7. Fasten down the interlock switch at the left-hand cover door so its circuit is closed.
8. See that the back screen is in place so that its interlock switch is closed.
9. Arrange the red (positive) test prod and cord so that it is extremely well insulated. It should be carefully supported, free and clear from the door and frame of the transmitter and any components.
10. *Stand clear of the red (positive) test lead, and see that neither you nor other personnel come in contact with it when voltage is on.*
11. Set PLATE POWER switch of transmitter at ON.

12. *Put your left hand in your pocket.*
13. With your right hand, turn on the high voltage by pressing the interlock switch at the right-hand cover door.
14. Read the voltage indication on the voltmeter and release the interlock switch.
15. Set PLATE POWER switch at OFF and remove fastening from left-hand cover interlock switch when finished.

(2) *Resistance tests.* If the voltage values are not as specified in figures 15, 16, and 17, perform the following resistance tests using Analyzer BC–1052–E (or equivalent). Make these tests with voltages removed.

(a) Preparation for resistance measurements.

1. Remove all tubes.
2. Remove a-c power plug from transmitter socket SO6.
3. Remove Speech Amplifier BC–614–E plug from socket S05.
4. Leave all other plugs in place.
5. With any tuning unit in place, set the BAND SWITCH at the correct corresponding position.
6. Turn MODULATOR BIAS control fully clockwise.
7. Set ON-PHONE SWITCH at PHONE.
8. Set analyzer switches and make test prod connections as indicated in the chart for the range into which the resistor falls.
9. Short the test prods and adjust the meter for full-scale deflection (zero ohm) by use of the OHMS ADJUST knob.
10. Touch the test prods to the end of the resistor. At least one end of the resistor should be disconnected from the circuit.
11. Read the resistance on the OHMS scale, and multiply that reading by the value indicated on the ohms range on the rotary selector switch.

Note. The OHMS adjustment must be made every time the range switch is changed from one range to another.

(b) D-c resistance tests.

1. Make d-c resistance tests between each terminal of the socket and chassis ground to ascertain any change in the electrical characteristics of the component parts within the stage. Check these resistance readings with the values specified on the chassis lay-out drawings. (See Figs. 15, 16, and 17.)
2. If the resistance values are normal, make the circuit continuity tests between the cables and terminal strips in accordance with table IV in order to discover possible broken leads and poorly soldered joints. Dress and resolder leads if necessary.
3. If the resistance values between chassis ground and socket terminals within the stage are not as required, make d-c resistance tests of the component parts within the defective stage (*e*, *f*, and *g* below and sec. VIII) to locate the defective part. If the value for any part is not as required, replace the defective part.

e. Special Tests and Repairs for R-f Stages. (1) *R-f oscillator stage.* If the r-f oscillator (master-oscillator control or crystal) does not develop sufficient oscillation to excite the r-f buffer-doubler stage, make the tests below. For other repair features see paragraph 22, and figure 20.

(a) Correct frequency of crystal. Make certain that the frequency value of the crystal is correct for the operating frequency of the tuning unit involved. See the appropriate tuning chart in section IX. Check the tuning unit. Make certain that tuning unit prongs and socket contacts are free from dirt and resin. If the tuning unit is defective, replace it.

(b) Proper function of crystal.

1. *Fractured crystal.* Make an operational check to determine that the crystal is not fractured and is in good operating condition. Do this by substituting a good crystal unit for the one in the tuning unit and comparing the performance of the transmitter with that previously obtained.
2. *Jack condition.* Inspect the jack to determine the presence of surface-to-surface contact.

(c) Keyer circuit continuity. Inspect the cordage, plugs, and terminal strip. (See table II.)

(d) Band switch. Inspect BAND SWITCH SW11 for defective operation. Clean and adjust the contacts.

(e) Exciter tuning capacitor and dial.

1. Check the connections of section C2.1A of three-gang tuning capacitor C2A to make certain that the connections are properly soldered.
2. Inspect to make certain that no dust, bits of solder, or iron filings are present between the plates of the capacitor.

3. Test capacitor C2.1A for shorting between rotor and stator plates. With the power off and tuning units removed, test with an ohmmeter. Rotate the rotor slowly from one extreme position to the other. The ohmmeter reading should show infinite resistance throughout. A zero reading during rotation indicates a shorting at that point. Find the bent plate which causes the shorting, and straighten it.

4. If three-gang capacitor C2A is damaged in any section, replace it following the instructions listed below.

a. Turn the tuning dial to 250 (springs on the back of the dial should be straight up and down), and remove it. Do not disturb the setting of the dial until it has been reassembled.

b. Remove the defective capacitor.

c. Turn the rotor plates of the new capacitor fully in.

d. Fasten the capacitor on the chassis using the four tapped holes provided for this purpose on the under side of the gear housing.

e. Place the dial on the capacitor shaft, and rotate the dial slowly to the left until it reads zero.

f. Tighten the setscrew. This is reached through a hole in the side of the knob.

g. Check the position of rotors at zero and 500. Make certain that the edges of the rotor plates are parallel to the edges of the stator plates at both positions. If a slight adjustment is necessary, loosen the setscrew, adjust the position of the dial, and tighten the setscrew again.

h. Do not force the dial on as far as it will go. Allow a running clearance of $\frac{1}{32}$ inch at least.

Caution: Make certain that the dial is mounted on the capacitor *with setscrew tight* before operating the dial. Since the dial is designed to rotate for only 10 revolutions (0 to 500), if it is turned farther than this, the mechanism will be damaged. When properly mounted on the capacitor, the capacitor-limit stops protect the dial.

5. Replacement of capacitor C2A will require physical adjustments of each section of the capacitor to achieve proper tracking. When making the adjustments use a Tuning Unit TN–36/MRQ–2 which is known to be in good operating condition.

(f) Frequency check. Use an absorption frequency meter or Frequency Meter Set SCR–211–( ) to determine whether the circuit is oscillating. Make this check with the switch at XTAL and at M.O. (See par. 37.) If the frequency meter indicates that the oscillator stage is oscillating, measure the voltage between terminal No. 3 of tuning unit socket SO7 and ground. This voltage value should be not less than 15 volts direct current for normal oscillator function. If a reading of less than 15 volts is obtained, make the tests listed below:

1. With all power off, test with an ohmmeter:
   a. Chokes CH2 and CH3 for open circuits.
   b. Capacitors C1, C2, C3, C5, and C13 for shorts, leakage, and correct values ±10 percent. A capacitor bridge may be used to test the value of the capacitors.
2. Make the necessary repairs and replace defective parts.

(2) *R-f buffer-doubler stage.* If the r-f buffer-doubler does not supply sufficient excitation to the r-f intermediate amplifier, make the tests listed below. For other repair features see paragraph 23 and figure 21.

(a) Check section C2.2A of three-gang tuning capacitor C2A in accordance with instructions outlined in (1) (*e*) above.

(b) With all power off, test with an ohmmeter:
1. Choke CH5 for an open circuit.
2. Resistors R23 and R24 for open circuits and correct values ±10 percent.
3. Capacitors C4, C8, C14, and C26 for short circuits, leakage, and correct values ±10 percent. A capacitor bridge may be used to test the value of the capacitors.

(c) Make the necessary repairs and replace defective parts.

(3) *R-f intermediate-amplifier stage.* If the r-f intermediate amplifier does not supply sufficient excitation to the r-f power amplifier, or if its behavior in operation is erratic, make the tests listed below. For other repair features see paragraph 24 and figure 22.

(a) Check section C2.3A of three-gang tuning capacitor C2A in accordance with instructions outlined in (1) (*e*) above.

(b) With all power off, test with an ohmmeter:
1. Chokes CH6 and CH7 for open circuits.
2. Resistors R8A, R9A, R21, and R22 for open circuits, and correct values ±10 percent. Resistors R8A and R9A provide a bias on the grids of tubes V10 and V11 but have been connected in the

meter switching circuit, and are shown in that stage.

3. Capacitors C1A, C6, C7, and C15 for short circuits, leakage, and correct values ±10 percent. A capacitor bridge may be used to test the value of the capacitors.

(c) Make the necessary repairs and replace defective parts.

(4) *R-f power-amplifier stage.* If the r-f power amplifier does not operate satisfactorily, as indicated by meter readings, make the tests listed below. For other repair features see paragraph 25 and figure 23.

(a) Test CW-PHONE switch SW7 and relay RY3 in the following manner:

1. Close switch SW7 to determine whether or not relay RY3 is operating.
2. Check relay RY3 (fig. 36) for possible defects, such as an open coil, improper spring tension, faulty spacing between contacts, incorrect contact pressure, and pitted or dirty contacts. Pitted contacts will make it difficult to load the transmitter to proper p-a plate current on c-w transmission. Also, pitted contacts will cause modulation transformer T9 to overheat and give off a burning odor.
3. Inspect for loose connections and broken leads at switch SW7 and relay RY3.
4. Make a continuity test of switch SW7 to determine whether it is effective in the circuit. Make sure that contacts engage and that the plunger is operative. Since this switch is of the inclosed type, replace it with one of the same type if it is defective.

(b) Test RHOMBIC COUPLING capacitor C4A in accordance with instructions for testing exciter tuning capacitor C2A, as outlined in (1)*(e)* above.

(c) Check antenna selector switch SW17A for solid connections, clean contacts, and proper pressure of contact arms.

(d) Check prongs of coils L7A to make certain that they are clean, and that positive contact is present between the prongs and jack bar contacts. When changing coils, make certain that there is at least a 1/8-inch clearance between any part of the coil and the antenna-coupling coil, thereby preventing arc-over between the center tap of the coil and the antenna coupling coil. Arc-over will cause relay RY5 to kick out each time the transmitter is turned on.

(e) Check jack J3A to make certain that contacts are clean, and pressure is firm.

(f) With all power off, test with an ohmmeter:

1. Chokes CH4 and CH8 for open circuits.
2. Resistor R9 for an open circuit and correct value ±10 percent. Resistor R9 overheats when the transmitter is operated on certain frequencies, and may be replaced with a 5,000-ohm, 2-watt, composition resistor.
3. Capacitors C3A, C9, C10, C11, C12, C18, and C29 for short circuits, leakage, and correct values ±10 percent. A capacitor bridge may be used to test the value of the capacitors.

(g) Make the necessary repairs and replace defective parts.

(5) *Antenna Switching Unit SA–24/MRQ–2.* If this switching unit fails to operate properly, as indicated by arcing at the switch contacts, or incorrect meter readings show on the antenna-coupling (or tuning) unit, make the checks listed below. For other repair features see paragraph 32 and figure 30.

(a) Check relay RY1A (fig. 36) for possible defects, such as an open coil, improper spring tension, faulty spacing and alignment of contacts, incorrect contact pressure, and dirty or pitted contacts.

(b) Check switch SW16A for clean contact surfaces. The knife must make contact with each switch terminal. In operation the switch must be in either DUMMY ANTENNA or TRANSMIT position, or arcing will occur causing switch points and the final tank coil to burn out.

(c) Test the dummy antenna resistors R10A with an ohmmeter for correct value.

(6) *Antenna Coupling Unit CU–45/MRQ–2.* If the antenna coupling unit is not operating properly, as indicated by the meter reading, make the checks listed below. For other repair features see paragraph 33 and figure 31.

(a) Check the tuning of each of the stages for resonance. (See par. 17.)

(b) Check the output frequency of the transmitter. (See par. 37.)

(c) Check the appropriate tuning chart in section IX to make certain that the tuning unit and associated coil unit which are being used are proper for the desired frequency.

(d) Make certain that the tuning control settings are in accordance with the appropriate tuning chart in section IX.

(e) Check the neutralization. (See par. 18.)

(f) Check BAND SWITCH SW11 for circuit continuity. Look for rosin joints, poorly soldered

leads, or broken connectors to the switch. Resolder to insure continuity.

(g) With power off, test with ohmmeter coils L6 and L44 for open circuits. Make the necessary repairs.

(7) *Antenna Tuning Unit BC–939–A.* If the antenna tuning unit is not operating properly, as indicated by the meter reading, make the checks listed above for Antenna Coupling Unit CU–45/MRQ–2. (See (6)(*a*) through (*e*) above.) Then make the tests listed below. For other repair features see paragraph 34 and figure 32.

(a) Check switches SW9.1 and SW9.2 for solid connections, clean contacts, and proper contact pressure.

(b) Check coils L5, L6, and L44 for cleanliness and proper pressure of variable contact arm.

(c) With power off, test with an ohmmeter:

1. Coils L5, L6, and L44 for open circuits.
2. Capacitors C22 and C30 for short circuits.

(8) *R-f power supply.* If the required voltages are not obtained from the r-f power supply, make the tests listed below. For other repair features see paragraph 26 and figure 24.

(a) With the power off, test with an ohmmeter:

1. Transformers T4, T5, and T10A for an open or shorted primary or secondary winding.
2. Filter reactor L1 for an open circuit.
3. Capacitors C16 and C17 for short circuits and leakage.
4. Resistors R1A, R2A, R3A, R4, R4A, R5A, R6A, R7A, and R10 for correct value ±10 percent.

(b) Make the necessary repairs and replace defective parts.

(c) Replacement of voltage regulator tubes V13A, V14A, or V16A may require readjustment of potentiometer R7A. Make this adjustment as follows:

1. Set FILAMENT POWER switch on front of transmitter at ON.
2. Allow about 1 minute for filaments to warm up, then adjust FILAMENT VOLTAGE control until FIL. VOLTAGE METER reads 5.0 to 5.3 volts.
3. With any d-c meter having a range of 0 to 300 volts or more, measure the output of the voltage regulator as follows:

a. Lift open the right-hand door in the cover of the transmitter and connect the positive lead of the voltmeter to the pin jack J2A located on the sub-base of the top deck of the transmitter, on the right-hand side near the rear.

b. Ground the negative lead of the voltmeter to the chassis.

4. Adjust potentiometer R7A until the voltmeter reads 240 volts. R7A is mounted close to the phone tip jack and can be adjusted by inserting a screw driver in the slotted shaft which protrudes through the sub-base of the transmitter.

(d) Tube JAN–991 (V16A) (NE–16), varies in its individual performance from other tubes of the same type. It may be necessary to try several tubes before one is found that will operate satisfactorily in the electronic voltage regulator system of a particular transmitter.

(e) Repeat input and output resistance tests. (See par. 13*c*.)

f. Special Tests and Repairs for Modulator Stages. (1) *Modulator stage.* If the normal value of the modulator plate current (35 to 50 ma with no modulation) cannot be obtained, make the tests listed below. For other repair features see paragraph 27 and figure 25.

(a) With the power off, test with an ohmmeter:

1. Transformer T8 for an open secondary winding.
2. Transformer T9 for an open or shorted primary or secondary winding.
3. Resistors R5, R16, and R17 for correct values ±10 percent.

(b) Make the necessary repairs and replace defective parts.

(2) *Audio driver stage.* If the modulator section as a whole does not operate satisfactorily, make the following tests. For other repair features see paragraph 28 and figure 26.

(a) With the power off, test with an ohmmeter:

1. Transformer T7 for open primary or secondary windings.
2. Transformer T8 for an open primary winding.
3. Resistors R14 and R15 for correct values ±10 percent.

(b) Make the necessary repairs and replace defective parts.

(c) Check the grounding connection of transformer T8 primary center tap. If there is an open circuit, resolder connection to ground.

(3) *Modulator bias power-supply stage.* If the required voltages are not obtained from the modulator bias power supply, make the tests listed below. For other repair features see paragraph 29 and figure 27.

(a) With the power off, test with an ohmmeter:

1. Transformers T1 and T3 for an open or shorted primary or secondary winding.
2. Filter reactors L2 and L3 for open circuits.
3. Capacitors C20, C21, and C27 for short circuits or leakage. When capacitor C27 is short-circuited, tubes V1 and V2 draw excessive plate current resulting in blown fuses or failure of rectifier tube V5.

(b) Make the necessary repairs and replace defective parts.

(c) Repeat input and output resistance tests. (See par. 13*b*.)

g. Special Tests and Repairs for High-voltage Power Supply Stage. If the required voltage is not obtained from the high-voltage power-supply stage, make the tests listed below. For other stage repair features see paragraph 30 and figure 28.

(1) With the power off, test with an ohmmeter:

(a) Transformers T2 and T6 for an open or shorted primary or secondary winding.

(b) Filter reactor L4 for an open circuit.

(c) Capacitors C19 and C23 for short circuits and leakage.

(d) Bleeder resistor R13 for correct value ±10 percent.

(e) Overload relays RY2 and RY5 for open circuit in coil windings.

(2) Make the necessary repairs and replace defective parts.

(3) Check relays RY2 and RY5 (figs. 35 and 37) for improper spring tension, faulty spacing between contacts, incorrect contact pressure, pitted or dirty contacts. If required, make overload reset for relay RY2 by pressing switch SW12.

(4) Repeat input and output resistance tests. (See par. 13*a*.)

20. Refinishing, Moistureproofing, and Fungiproofing

a. Refinishing. After the transmitter has been repaired and is operating correctly, remove any scarred or chipped spots with #0000 sandpaper and apply paint to the spots with a small brush. If the case is sufficiently scarred and chipped to warrant complete refinishing, remove the transmitter chassis from the case. Make certain that the case is free from dirt and rust. Spray the entire case with the proper paint authorized by existing regulations.

b. Moistureproofing and Fungiproofing. This treatment provides a degree of protection against moisture, salt spray, corrosion, fungus growth, and insects. The treatment is applied in the following manner:

(1) *Masking.* Clean transmitter thoroughly, remove shielding of components, and partially disassemble. Cover with masking tape certain points such as open switches, relays, variable capacitors, sockets, and bearings.

(2) *Spraying.* Dry all parts of the equipment thoroughly and spray with three coats of moistureproofing and fungiproofing varnish. Spray all surfaces supporting circuit elements, all circuit elements, and interconnecting wiring and soldered terminals. Use a brush to apply the varnish to all parts which cannot be reached by the spray.

Caution: Make certain that a complete job of masking has been done on the parts listed above. If the varnish gets on any of these parts the equipment will not operate satisfactorily.

(3) *General instructions.* For general instructions on the spray method of moistureproofing and fungiproofing, see TB SIG 13.

SECTION VII

FINAL TESTING

21. Power Output and Modulation Tests

a. General. After the repairs in the transmitter have been completed and the unit has been moisture-proofed and fungiproofed, make a final test to ascertain that the unit is in proper condition for tactical use. Although the transmitter was correctly adjusted during the repair procedure (par. 18), make a recheck of neutralization; then proceed to final testing of the power output and modulation.

b. Preparation for Testing. To measure the power output and modulation capability of the transmitter, connect the test circuits as shown in figure 18. Proceed as follows:

(1) Disconnect the end of the dummy antenna (part of Antenna Switching Unit SA–24/MRQ–2) which goes to the ground lug.

(2) Connect test ammeter between ground lug and the free end of the dummy antenna.

(3) Set switch SW16A of Antenna Switching Unit SA–24/MRQ–2 at DUMMY ANTENNA.

(4) Couple the transmitter output to the vertical deflection plates of the oscilloscope by means of a pick-up coil. To construct this coil, wind 2 to 4 turns of insulated wire (No. 14 gauge, soft-drawn copper) over a winding space of 3 inches around one of the r-f leads which connects the test ammeter to Antenna Switching Unit SA–24/MRQ–2. Connect the ends of the coil to the vertical deflection plates of the oscilloscope by means of a twisted-pair line.

(5) Connect the transmitter to an a-c power source of 5 kilowatts of single-phase, 60-cycle alternating current at 115 volts.

(6) Connect a Speech Amplifier BC–614–E, which is known to be in good operating condition, to the transmitter.

c. Power Output Test for C-W Transmission. (1) With the transmitter Key J–37 plugged into jack J101 on Speech Amplifier BC–614–E, adjust the transmitter for maximum c-w power output (key down). (See par. 17*a* through *e* and table IV.) Test at the middle of the 0.95- to 1.4-megacycle frequency band in accordance with table VI below.

Table VI. Power output and modulation capability with 400-ohm (500-watt) dummy antenna.

Frequency range in megacycles	Tuning unit	Power output (watts)		R-f output current in amperes		
		cw	Phone (unmodulated)	cw	Phone (unmodulated)	Phone (90 percent modulation)
0.95 to 1.40	TN–28/MRQ–2	400	300	1.00	0.86	1.00
1.35 to 2.00	TN–29/MRQ–2	400	300	1.00	0.86	1.00
1.95 to 2.85	TN–30/MRQ–2	400	300	1.00	0.86	1.00
2.80 to 4.10	TN–31/MRQ–2	400	300	1.00	0.86	1.00
4.05 to 5.95	TN–32/MRQ–2	400	300	1.00	0.86	1.00
5.90 to 8.60	TN–33/MRQ–2	400	300	1.00	0.86	1.00
8.55 to 12.50	TN–34/MRQ–2	300	250	0.86	0.79	0.93
12.45 to 18.05	TN–36/MRQ–2	275	200	0.82	0.70	0.83

(2) Maximum c-w power output for the frequency under test is obtained when a maximum reading is indicated on the external r-f ammeter. With the use of the 400-ohm dummy antenna, the required power outputs are obtained when the r-f output currents are as specified in table VI.

(3) The r-f ammeter reading should at least equal the r-f output current specified in table VI for c-w output.

(4) If the c-w, r-f current output is as specified in table VI, make power output test for unmodulated phone transmission as outlined below. (See *d*(1) through (6).)

(5) If the c-w, r-f current output reading is not as specified in table VI, the performance of the transmitter is unsatisfactory. Proceed as follows:

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part. (See par. 19.)

(b) Make necessary repairs and replacements, and

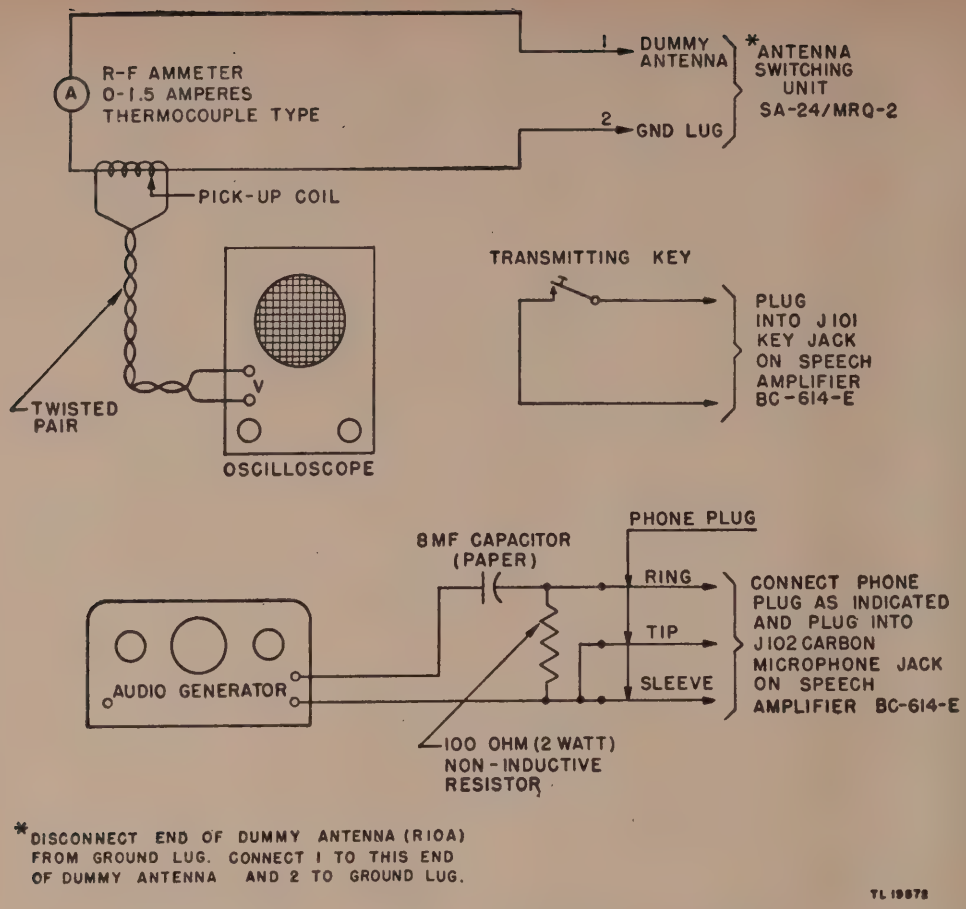


Figure 18. Radio Transmitter T–55/MRQ–2, test circuits for measuring power output and modulation capability, schematic diagram.

repeat c-w power output test as outlined above. (See *c*(1) through (4).)

(c) Repeat the test for c-w power output in this manner until the performance of the transmitter is satisfactory.

d. Power Output Test for Unmodulated Phone Transmission. (1) Remove the transmitter Key J–37 from jack J101 on Speech Amplifier BC–614–E.

(2) Change the transmitter from c-w to phone transmission. (See par. 17*f* and table IV.)

(3) Adjust the transmitter for maximum unmodulated phone power output at the same frequency as that used in the c-w power output test.

(4) The maximum reading on the external r-f ammeter will indicate the maximum unmodulated phone power output current for the frequency under test.

(5) The r-f ammeter reading should at least equal the r-f output current specified in table VI for unmodulated phone power output.

(6) If the unmodulated phone power output meter reading is as specified in table VI, make the test for modulation capability as outlined below. (See *e*(1) through (19).)

(7) If the unmodulated phone power output meter reading is *not* as specified in table VI, the performance of the transmitter is unsatisfactory. Proceed as follows:

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part. (See par. 19.)

(b) Make necessary repairs and replacements, and repeat the unmodulated phone power output test as outlined above (*d*(1) through (6)) until the performance of the transmitter is satisfactory.

e. Modulation Capability. (1) Keep the transmitter adjusted for maximum unmodulated phone power output at the same frequency that was used in the previous tests.

(2) Insert the audio signal generator plug into Jack J102 on Speech Amplifier BC–614–E.

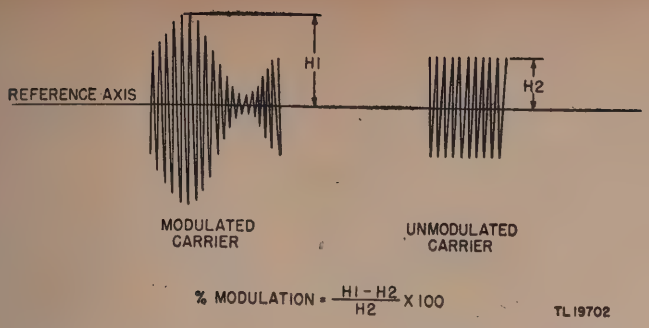


Figure 19. Radio Transmitter T–55/MRQ–2, oscilloscope pattern for modulation test.

(3) Turn on the oscilloscope.

(4) Adjust the sweep voltage on the oscilloscope to make the width of the pattern slightly more than half the diameter of the screen.

(5) The unmodulated r-f carrier wave will be seen on the oscilloscope.

(6) The height of the carrier pattern should be approximately one-third of the height of the screen.

(7) Since the height of the carrier pattern depends on the number of turns in the pick-up coil, it may be increased by increasing the number of turns and decreased by decreasing the number of turns in the coil.

(8) Measure the height of the unmodulated r-f wave (fig. 19(H2)) above the reference axis.

(9) Adjust the audio signal generator for a frequency of 400 cycles, and turn it on.

(10) Measure the audio output voltage from the audio signal generator to Speech Amplifier BC–614–E, using a high resistance a-c voltmeter or an a-c vacuum-tube voltmeter.

(11) Adjust the audio signal generator for an initial output of 0.15 volt.

(12) The transmitter output will now be modulated at 400 cycles.

(13) Ninety percent modulation is required for satisfactory operation of the transmitter.

(14) At 90 percent modulation, the r-f current in the external test ammeter will increase approximately 18 percent above the unmodulated value which was obtained in the preceeding test; it should at least equal the r-f output current specified in table VI for modulated phone power output.

(15) If the value specified in table VI is not obtained with 0.15 volt output from the audio signal generator, increase the output of the audio signal generator up to 0.30 volt, and set the speech amplifier volume control near maximum in order to obtain the specified value.

(16) Observe the modulated wave on the oscilloscope screen to make certain that the sine wave pattern remains undistorted.

(17) The maximum height of the modulated wave (fig. 19(H1)), as seen on the oscilloscope, should be 1.9 times as great as the height of the unmodulated wave (fig. 19(H2)). This indicates a modulation of 90 percent.

(18) If the modulated phone power output reading equals that specified in table VI, and if, with an audio signal generator output of 0.30 volt, wave height H1 is 1.9 times as high as wave height H2 without distortion, then the performance of the transmitter is satisfactory.

(19) If it has been impossible to meet the foregoing requirements of this test, the performance of the transmitter is unsatisfactory. Proceed as follows:

(a) Perform tests to localize the defect to the particular stage, and test further to determine the defective part. (See par. 19.)

(b) Make the necessary repairs and replacements, and repeat the test for modulation capability as outlined above. (See *e*(1) through (16).)

f. Test for All Bands. The foregoing tests present a procedure for testing the c-w power output, the unmodulated phone power output, and the modulation capability in the frequency band of 0.95 to 1.40 megacycles. Perform these three tests as outlined above on all of the other bands specified in table VI, testing each band in the order listed.

SECTION VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

22. R-f Oscillator Stage (fig. 20)

a. Circuit Repair Features. The r-f oscillator stage consists of tube V8 operating in a Hartley oscillator circuit. Frequency is determined either by master oscillator or crystal control in the grid circuit, depending on the setting of the M.O.-XTAL switch, SW15. When switch SW15 is set for master-oscillator control, the frequency can be varied by means of the exciter tuning dial over a range dependent on the particular tuning unit and the associated coil unit used. This is indicated on the tuning charts. (See tables VIII through XV.) The oscillator is tuned simultaneously with the buffer-doubler and intermediate-amplifier stages by three-gang tuning capacitor C2A, which is controlled by the EXCITER TUNING dial on the front panel. Capacitor C2.1A, one section of capacitor C2A, is connected in parallel with the oscillator capacitor in the tuning unit. When switch SW15 is in the position for crystal control, a fixed frequency is generated whose value depends on the particular crystal plugged into the jack provided for this purpose. Oscillations generated by the oscillator circuit are tapped from the plate of tube V8, and are fed to the grid circuit of buffer-doubler tube V9 through capacitor C13. Screen voltage is held constant by voltage regulator tube V15, connected between screen grid and ground. Plate voltage regulator system consisting of tubes V13A, V14A, and V16A. (See par. 26.) R-f voltage is prevented from returning the plate power circuit by choke CH3 and bypass capacitor C5.

b. Parts Data for R-F Oscillator Stage (fig. 20).

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C1	3DA6-2	CAPACITOR, fixed: paper; 0.006-mf, ±10%; 600 vdcw; Micamold No. 340.	Tube V8, cathode coupling.
C2	3DA6-2	CAPACITOR, fixed: paper; 0.006-mf, ±10%; 600 vdcw; Micamold No. 340.	Tube V8, screen bypass.
C2.1A	3D9240V-3	CAPACITOR, variable: section 1 of C2A; 240-mmf; National NPW3; Special, B & W No. WN701.	Exciter tuning capacitor for tube V8.
C3	3DA1D73.1	CAPACITOR, fixed: paper; 0.01-mf, ±20%; 500 vdcw; Sangamo type C.	Tube V8, cathode return bypass.
C5	3DA6-2	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; Micamold No. 340.	Tube V8, plate return bypass.
C13	3D9150-19	CAPACITOR, fixed: mica; 150-mmf, ±20%; 500 vdcw; Aerovox No. 1460.	Coupling between tubes V8 and V9.
C25	3DA6-2	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; Micamold No. 340.	Tube V8, filament bypass.
CH2	3C363	COIL, r-f: choke; 1-mh, ±10%; 20-ohm d-c resistance.	Tube V8, cathode return r-f choke.
CH3	3C550-1	COIL, r-f: 2.5-mh, ±5%; 25-ohm d-c resistance	Tube V8, plate return r-f choke.
J1A	2Z5534A.3	JACK: meter; single circuit; normally closed; Mallory No. 702.	Keying jack.
V8	2J6V6	TUBE: pentode; type JAN-6V6 (VT-107)	R-f oscillator.
V8	2J6V6GT/G	TUBE: pentode; alternate glass envelope; type JAN-6V6GT (VT-107-A).	R-f oscillator.

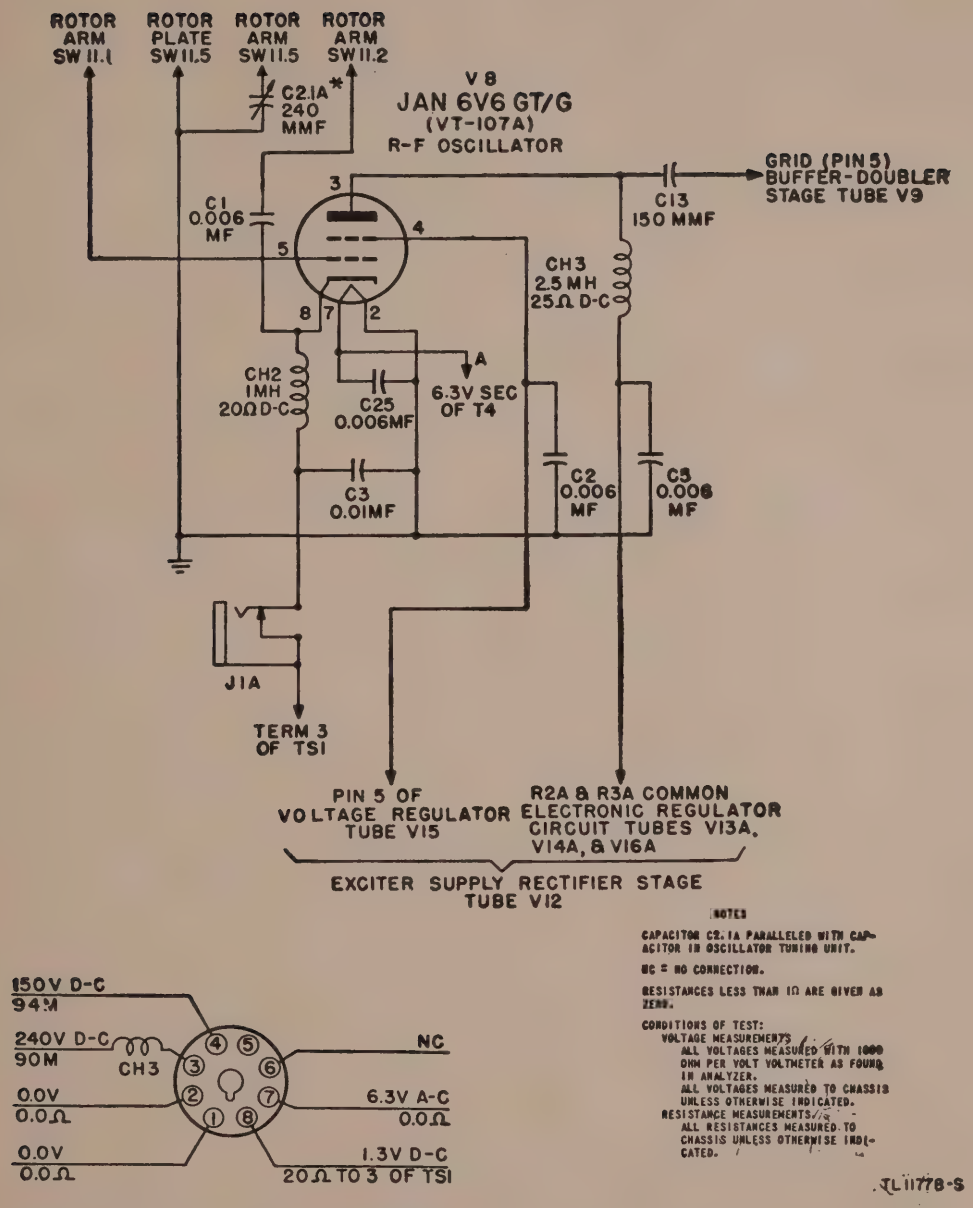


Figure 20. Radio Transmitter T–55/MRQ–2, r-f oscillator stage, schematic wiring diagram.

23. R-f Buffer-doubler Stage (fig. 21)

a. Circuit Repair Features. The r-f, buffer-doubler stage consists of tube V9 and its associated circuit elements. Grid voltage for this tube is obtained from resistors R23 and R24. Screen voltage is obtained through resistor R3A, and is bypassed by capacitor C4. Screen voltage is held constant by voltage regulator tube V15 connected between the screen grid and ground. The plate circuit of tube V9 is resonated by a tuned circuit consisting of a coil and capacitor in parallel, which are contained in the tuning units. This tuned circuit is connected in parallel with section C2.2A of three-gang exciter tuning capacitor C2A. This permits simultaneous tuning of the buffer-doubler stage with the oscillator and intermediate-amplifier stages. When using the master oscillator, the plate circuit of tube V9 is always tuned to twice the frequency of the master-oscillator circuit to prevent reaction from the succeeding stages. When using crystal control, tube V9 operates as a buffer amplifier in the frequency range between 0.95 and 4.0 megacycles, and as a doubler between 4.0 and 12.5 megacycles. In the frequency range from 12.5 to 18.0 megacycles the output frequency is four times the crystal frequency. R-f voltage from the tuned circuit of tube V9 is isolated from the power circuit by r-f choke CH5 and bypass capacitor C26. R-f voltage from the plate of tube V9 is fed to the grids of intermediate-amplifier tubes V10 and V11 through parasitic resistors R21 and R22 and blocking capacitor C14.

b. Parts Data for R-F Buffer-Doubler Stage (fig. 21).

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C2.2A	3D9240V-3	CAPACITOR, variable: section 2 of C2A; 135-mmf; National NPW3; special, B & W No. WW701.	Exciter tuning capacitor for tube V9.
C4	3DA6-2	CAPACITOR, fixed: paper; 0.006-mf, ±20%; 600 vdcw; Micamold No. 340.	Tube V9, screen bypass.
C8	3DA1D73.1	CAPACITOR, fixed: paper; 0.01-mf, ±20%; 500 vdcw; Sangamo type C.	Tube V9, cathode bypass.
C14	3D9200-35	CAPACITOR, fixed: mica; 200-mmf, ±10%; 500 vdcw; Aerovox No. 1460.	Coupling between tube V9 and tubes V10, V11.
C26	3K4510211	CAPACITOR, fixed: mica; 0.001-mf, ±10%; 2,500 vdcw; Aerovox No. 1447.	Tube V9, plate bypass.
CH5	3C326-100	COIL, r-f: choke; 2.5-mh, ±10%; 50-ohm d-c resistance; National type R100.	Tube V9, plate return r-f choke.
R23	3RC31BE104M	RESISTOR, fixed: carbon; 100,000-ohm, ±20%; 1-w; IRC type BT-1.	Tube V9, grid bias.
R24	3Z6050-99	RESISTOR, fixed: wire-wound; 300-ohm, ±10%; 10-w; IRC type AB, special.	Tube V9, cathode bias.
V9	2J6L6	TUBE: pentode; type JAN-6L6 (VT-115)	Buffer-doubler.
V9	2J6L6G	TUBE: pentode; type JAN-6L6G (VT-115-A)	Buffer-doubler.

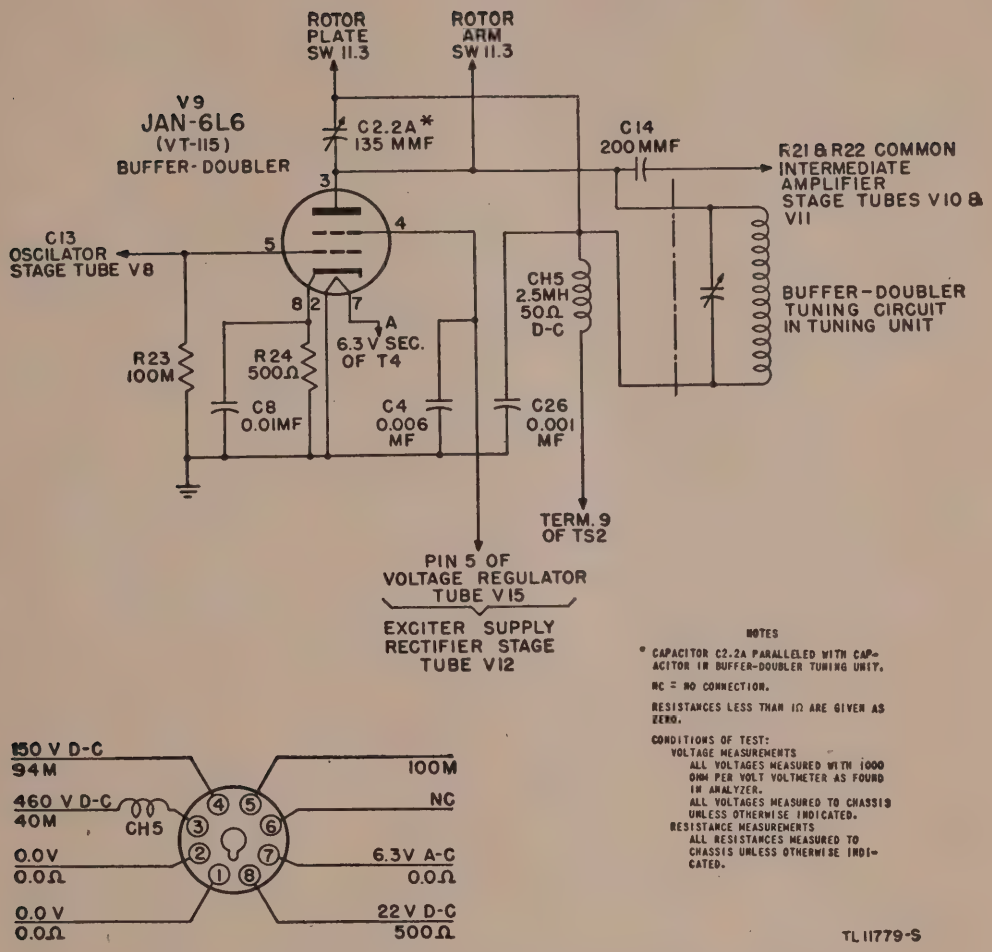


Figure 21. Radio Transmitter T-55/MRQ-2, r-f. buffer-doubler stage, schematic wiring diagram.

24. R-f Intermediate-amplifier Stage (fig. 22)

a. Circuit Repair Features. The r-f, intermediate-amplifier stage consists of tubes V10 and V11 which are biased to cut-off by r-f choke CH7 when no excitation is present, as during periods when the key is up. Screen-grid voltage for tubes V10 and V11 is held constant by the electronic voltage regulator system which consists of tubes V13A, V14A, and V16A. (See par. 26.) The screen grids are bypassed by capacitors C6 and C7. The plate circuits of tubes V10 and V11 are resonated by a tuned circuit consisting of a coil and capacitor located in the tuning unit. This tuned circuit is connected in parallel with section C2.3A of three-gang exciter tuning capacitor C2A. This permits simultaneous tuning of the intermediate-amplifier stage and the oscillator and buffer-doubler stages. Plate power is supplied through r-f choke CH6, and is bypassed by capacitor C24. The output of the r-f, intermediate-amplifier stage is fed to the grid of p-a tube V16 through capacitor C15.

b. Parts Data for R-F Intermediate Amplifier Stage.

	Signal Corps stock No.	Name of part and description	Function
C1A	3DA4–22	CAPACITOR, fixed: mica; 0.004-mf, ±10%; 500 vdcw; Aerovox No. 1467.	Tubes V10 and V11, grid bypass.
C2.3A	3D9240V–3	CAPACITOR, variable: section 3 of C2A; 135-mmf; National NPW3 Special, B & W No. WW701.	Exciter tuning capacitor for tubes V10 and V11.
C6	3DA2–116.1	CAPACITOR, fixed: paper; 0.002-mf, ±20%; 600 vdcw; Micamold No. 340–17.	Tube V11, screen bypass.
C7	3DA2–116.1	CAPACITOR, fixed: paper; 0.002-mf, ±20%; 600 vdcw; Micamold No. 340–17.	Tube V10, screen bypass.
C15	3DA2–101	CAPACITOR, fixed: mica; 0.002-mf, ±20%; 600 vdcw; Aerovox No. 1450.	Coupling between tubes V10, V11, and tube V16.
CH6	3C363	COIL, r-f: choke; 1-mh, ±10%; 20-ohm d-c resistance.	Tubes V10 and V11, plate return r-f choke.
CH7	3C363	COIL, r-f: choke; 1-mh, ±10%; 20-ohm d-c resistance.	Tubes V10 and V11, grid return on r-f choke.
R21	3Z6005–44	RESISTOR, fixed: carbon; 50-ohm, ±10%; ½-w; IRC type BT–½.	Tube V10, grid parasitic suppressor.
R22	3Z6005–44	RESISTOR, fixed: carbon; 50-ohm, ±10%; ½-w; IRC type BT–½.	Tube V11, grid parasitic suppressor.
V10, V11	2J807	TUBE: pentode; JAN–807 (VT–100)	Intermediate amplifier.

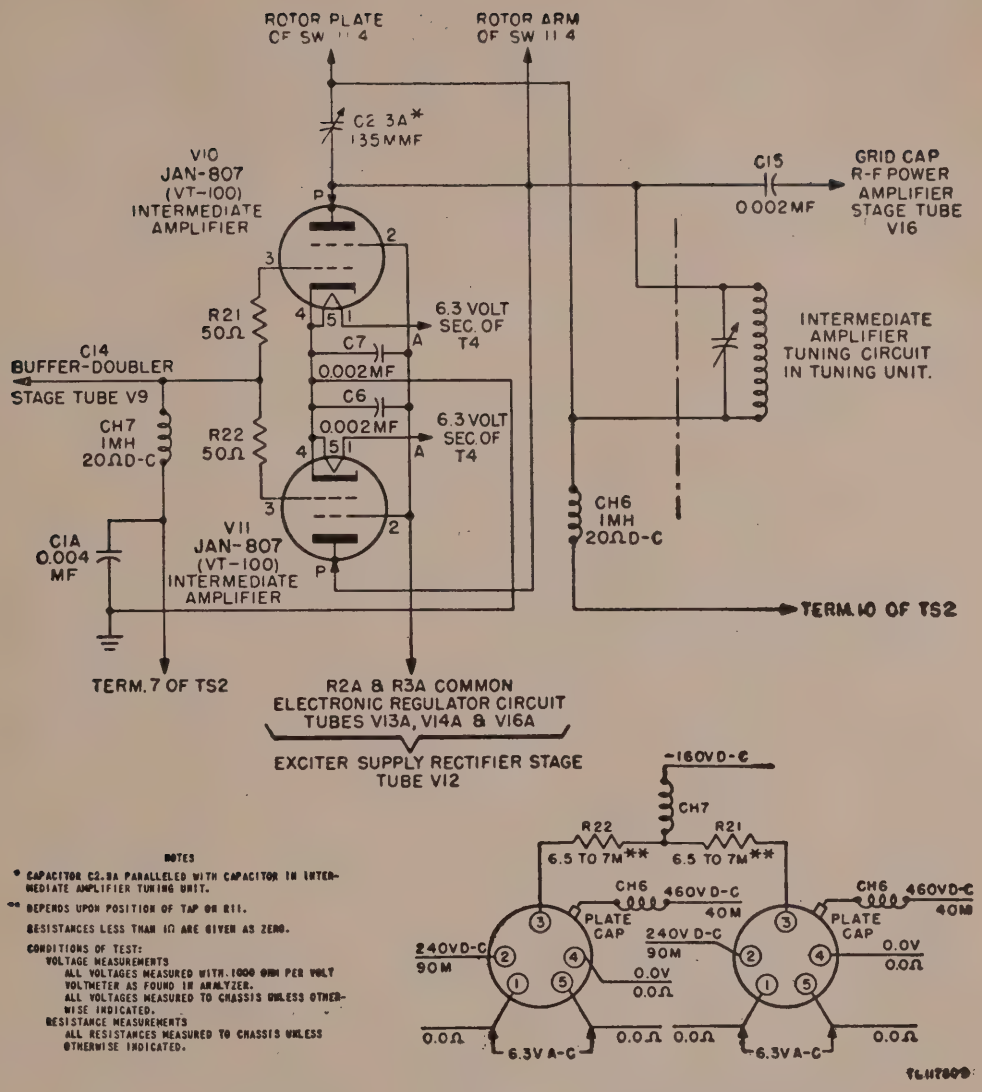


Figure 22. Radio Transmitter T–55/MRQ–2, r-f, intermediate-amplifier stage, schematic wiring diagram.

25 R-f Power-amplifier Stage (fig. 23)

a. Circuit Repair Features. The p-a stage consists of tube V16 operating in a neutralized class C p-a circuit. Grid-bias voltage is provided through CH8 by the main bias voltage power supply. With the key up, the tube is biased to cut off the plate current of the tube. With the key down, the r-f voltage supplied by the intermediate-amplifier stage causes the grid to draw a current of 80 to 125 milliamperes. The tuned plate circuit is center tapped so that an equal out-of-phase voltage is present for feeding back to the grid through blocking capacitor C29 and neutralizing capacitors C29 and C18. Neutralizing capacitor C18 cancels the effect of the grid-plate capacitance so that tube V16 will operate without spurious oscillations. The r-f output power is taken from the tank circuit by a coupling coil which is wound around the outside of the output coil unit. The output power so obtained is delivered through the ANTENNA SELECTOR SWITCH, which matches the transmitter output impedance to that of a vertical half-rhombic or a rod type antenna. The RHOMBIC COUPLING control is used to permit the transmitter to be properly loaded when connected to a vertical half-rhombic antenna, or when connected to the dummy antenna during tune-up operations.

b. Parts Data for R-F Power Amplifier.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C3A	3DA4–22	CAPACITOR, fixed: mica; 0.004-mf, ±10%; 500 vdcw; Aerovox No. 1467.	Tube V16, grid bypass.
C4A	3D9500V–2–1	CAPACITOR, variable: air; 2-section; 500- 500-mmf; Cardwell type XR500PD.	Rhombic coupling control.
C9, C10	3DA50–72	CAPACITOR, fixed: paper; oil-filled; 2-section; 0.05-0.05-mf, ±20%; 600 vdcw; Aerovox No. 616.	Tube V16, filament bypass.
C11	3DA2–85	CAPACITOR, fixed: mica; 0.002-mf, ±5%; 6,000 vdcw; Special Aerovox No. 1550.	Tube V16, plate return bypass.
C12	3D9150V–4	CAPACITOR, variable: air; 150-mmf; 7,000 vdcw; Johnson, E.F. No. 150DD70.	Final amplifier plate tuning.
C18	3D9005UES	CAPACITOR, variable: air; 5.5-mmf, max; 7,000 vdcw; Johnson, E.F. No. 6G70.	Final amplifier neutralizing.
C28	3D423	CAPACITOR, CA–423: fixed; vacuum; 50-mmf; 20,000 vdcw; type VG–50.	Final amplifier padding.
C28A	3D9100–133	CAPACITOR, fixed: vacuum; 100-mmf; 20,000 vdcw; type VG–100.	Final amplifier padding.
C29	3K4510211	CAPACITOR, fixed: mica; 200-mmf, ±10%; 2,500 vdcw; Aerovox No. 1447.	Neutralizing high-voltage isolation.
CH4	3C308–3	COIL, r-f: choke; 2.5-mh, ±10%; 8.50 ohm d-c resistance.	Tube V16, plate return r-f choke.
CH8	3C363	COIL, r-f: choke; 1-mh, ±10%; 20-ohm d-c resistance.	Tube V16, grid return r-f choke.
J3A	2Z5594.5	JACK, banana plugs: ceramic; Johnson No. 74.	L7A output jack.
L7A	3C6002–13	COIL UNIT RF–13/MRQ–2: 52-turn pri; 14-turn link; tapped at 3 turns; B & W 1718.	Final amplifier tank coil 0.95 to 1.05 mc.
L7A	3C6002–14	COIL UNIT RF–14/MRQ–2: 48-turn pri; 12-turn link; tapped at 3 turns; B & W 1719.	Final amplifier tank coil 1.05 to 1.56 mc.
L7A	3C6002–15	COIL UNIT RF–15/MRQ–2: 3-turn pri; 8-turn link; tapped at 2 turns; B & W 1720.	Final amplifier tank coil, 1.56 to 3.25 mc.
L7A	3C6002–16	COIL UNIT RF–16/MRQ–2: 24-turn pri; 7-turn link; tapped at 2 turns; B & W 1721.	Final amplifier tank coil 3.25 to 4.10 mc.
L7A	3C6002–17	COIL UNIT RF–17/MRQ–2: 24-turn pri; 5-turn link; tapped at 2 turns; B & W 1722.	Final amplifier tank coil, 4.10 to 5.95 mc.
L7A	3C6002–18	COIL UNIT RF–18/MRQ–2: 18-turn pri; 4-turn link; tapped at 2 turns; B & W 1723.	Final amplifier tank coil, 5.95 to 8.60 mc.
L7A	3C6002–19	COIL UNIT RF–19/MRQ–2: 14-turn pri; 4-turn link; tapped at 2 turns; B & W 1724.	Final amplifier tank coil, 8.60 to 12.50 mc.
L7A	3C6002–20	COIL UNIT RF–20/MRQ–2: 12-turn pri; 3-turn link; tapped at 1 turn; B & W 1725.	Final amplifier tank coil, 12.50 to 16.00 mc.
L7A	3C6002–21	COIL UNIT RF–21/MRQ–2: 8-turn pri; 3-turn link; tapped at 1 turn; B & W 1726.	Final amplifier tank coil, 16.00 to 18.00 mc.
R9	3Z6070–5	RESISTOR, fixed: wire-wound; 700-ohm, ±5%; 20-w; Utahrad type EE.	Tube V16, plate choke shunt.
SW17A	3ZK8310–8	SWITCH, ASSEM: 1-section; 3-circuit; 3-position; isolantite; Globe Union No. 2507.	Antenna selector switch.
V16	2J250TH	TUBE: triode; type JAN–250TH (VT–220).	Final r-f amplifier.

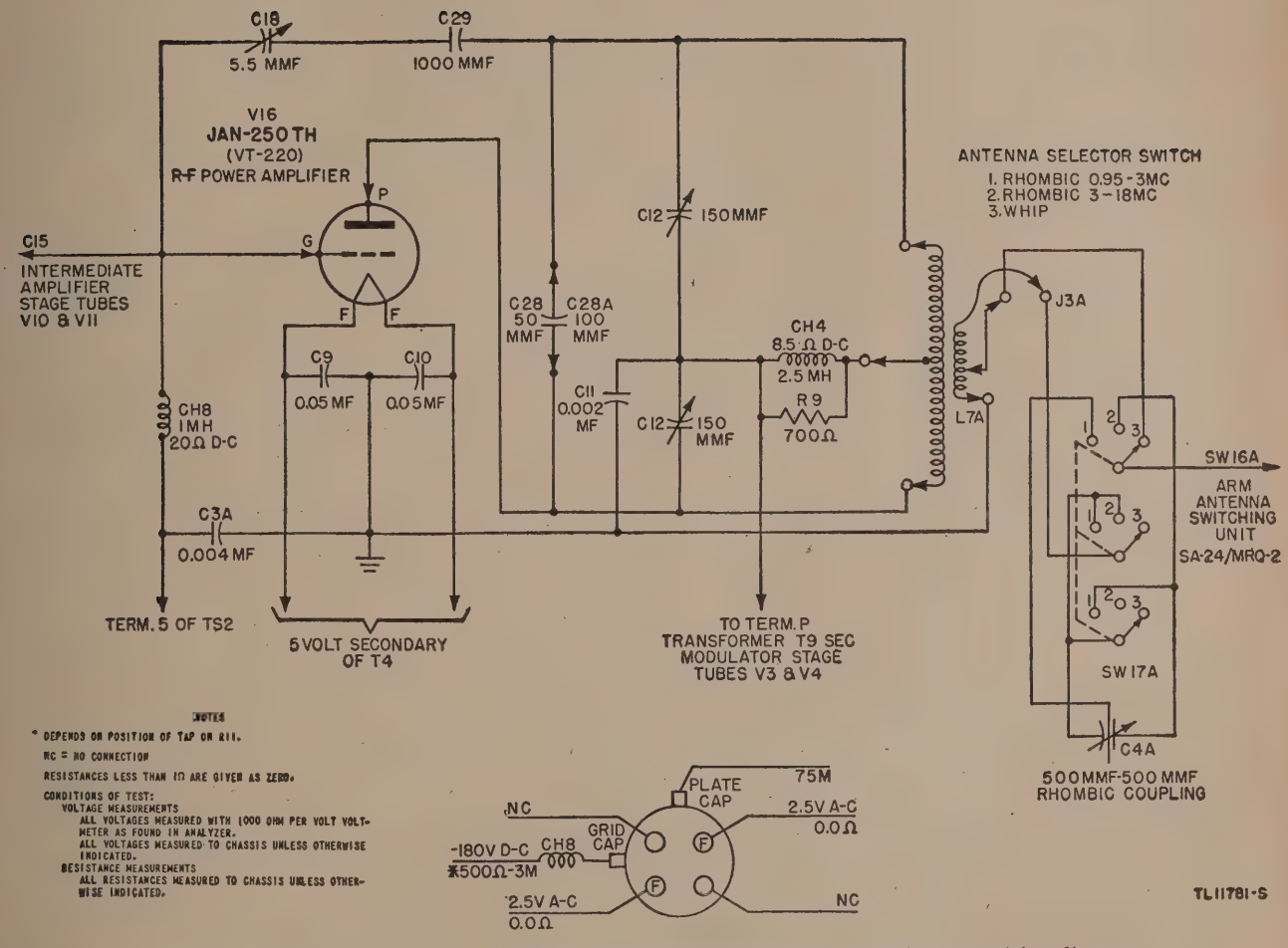


Figure 23. Radio Transmitter T-55/MRQ-2, r-f, power-amplifier stage, schematic wiring diagram.

26. R-f Power Supply Stage (fig. 24)

a. Circuit Repair Features. Filament voltage for the r-f section is supplied by transformer T4. One winding supplies the filaments of oscillator tube V8, buffer-doubler tube V9, and intermediate-amplifier tubes V10 and V11 with 6.3 volts of alternating current. Another winding, with grounded center tap, supplies the filament of class C amplifier tube V16. A third winding supplies 5 volts to tube V12, which is the rectifier for the r-f section. Tube V12 rectifies the power supplied from transformer T5 of the center chassis. The rectified power is filtered by capacitors C16 and C17, and by choke L1. Resistor R4 prevents keying surges, thus preventing shifts in the signal. Resistor R10 acts as a bleeder resistor to drain off any charge remaining when the plate power is removed. The r-f power supply includes the voltage regulator system consisting of tubes V15, V13A, V14A, and V16A. Tube V15, connected with its limiting resistor R3A, maintains the screen voltages of oscillator tube V8 and buffer-doubler tube V9 at a constant value. Tubes V13A, V14A, and V16A compose the electronic voltage regulator which maintains the plate voltage of the oscillator tube V8 and the screen voltage of intermediate-amplifier tubes V10 and V11 at a constant value. Tube V14A serves as the control tube of the voltage regulator system, and tube V16A functions as a constant voltage bias source for tube V14A. The variable resistor R7A is used to adjust the bias on the control tube to the proper operating value. Also, resistor R7A serves as an output voltage control to set the regulated voltage to the required value. For data on the adjustment of the voltage regulator system see paragraph 19*e*(8)(*c*).

b. Parts Data for R-F Power Supply Stage.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C16, C17	3DB8E5	CAPACITOR, fixed: paper; oil-filled; dual; 8.5-mf, —10% +20%; 1,000 vdcw; Incco Special.	Exciter power supply input filter.
J2A	2Z3062–12	JACK, tip: Mallory No. 520	Jack for checking regulated voltage.
L1	3C560	COIL, a-f: 6–H; 250–ma d-c; Standard Transf. No. 10C13.	Exciter power supply filter.
LM2	2Z5927	LAMP, LM–27: 6–8-v, 0.25-amp; T3–¼ clear; bayonet base; Mazda No. 44.	Tuning unit compartment illumination.
R1A	2Z6725	RESISTOR, fixed: insulated; 250,000-ohm, ±10%; 1-w; IRC type BT–1.	Tube V13A, grid bias.
R2A	3Z6660	RESISTOR, fixed: insulated; 60,000-ohm, ±10%; 1-w; IRC type BT–2.	Tube V14A, grid bias dropping.
R3A	3Z6400–12	RESISTOR, fixed: wire-wound; 4,000-ohm, ±10%; 10-w.	Tube V15, limiting.
R4	3Z4607	RESISTOR, fixed: insulated; 750-ohm, ±10%; 1-w; IRC type BT–1.	Filter network.
R4A	3Z6725	RESISTOR, fixed: insulated; 250,000-ohm, ±10%; 1-w; IRC type BT–1.	Tube V14A, screen voltage divider.
R5A	3RC31AE104K	RESISTOR, fixed: insulated; 100,000-ohm, ±10%; 1-w; IRC type BT–1.	Tube V14A, screen voltage divider.
R6A	3RC31AE	RESISTOR, fixed: insulated; 10,000-ohm, ±10%; 1-w; IRC type BT–1.	Tube V14A, grid bias dropping.
R7A	2Z7260–20M	POTENTIOMETER: 20,000-ohm, ±10%; 1-w; Mallory type A20MP.	Tube V14A, grid-bias control.
R10	3Z6640–16	RESISTOR, fixed: wire-wound; 40,000-ohm, ±5%; 20-w; Utahrad type CC.	Exciter power supply bleeder.
T4	2Z9614.2	TRANSFORMER: pri, 115-v a-c; sec, (1) 5-v ct at 10.5 amp, (2) 6-v at 3.5 amp, (3) 5-v ct at 3 amp; Standard Transf. No. 10P36.	Filament supply for tubes V8, V9, V10, V11, V12, and V16.
T5	2Z9612	TRANSFORMER: pri, 115–125-v a-c; sec, 870-v ct at 250 ma; Standard Transf. No. 10P37.	Plate transformer of exciter power supply.
T10A	2Z9611.164	TRANSFORMER: pri, 115-v a-c; sec, 2½-v ct at 3 amp; B & W. No. 61000.	Tube V13A, filament transformer.
V12	2J5Z3	TUBE: duo-diode; type JAN–5Z3 (VT–145)	Exciter supply rectifier.
V15	2JOD3/VR150.	TUBE: diode; gas-filled; type JAN–OD3/VR–150 (VT–139).	Tube V8, plate voltage regulator.
V13A	2J2A3	TUBE: triode; type JAN–2A3 (VT–95)	Tube V8, plate voltage regulator; tubes V10 and V11, screen-grid voltage regulator.
V14A	2J6SJ7	TUBE: pentode; type JAN–6SJ7 (VT–116)	Tube V8, plate voltage regulator; tubes V10 and V11, screen-grid voltage regulator.
V16A	2J991	TUBE: triode; mercury vapor; type JAN–991 (NE–16).	Tube V8, plate voltage regulator; tubes V10 and V11, screen-grid voltage regulator.

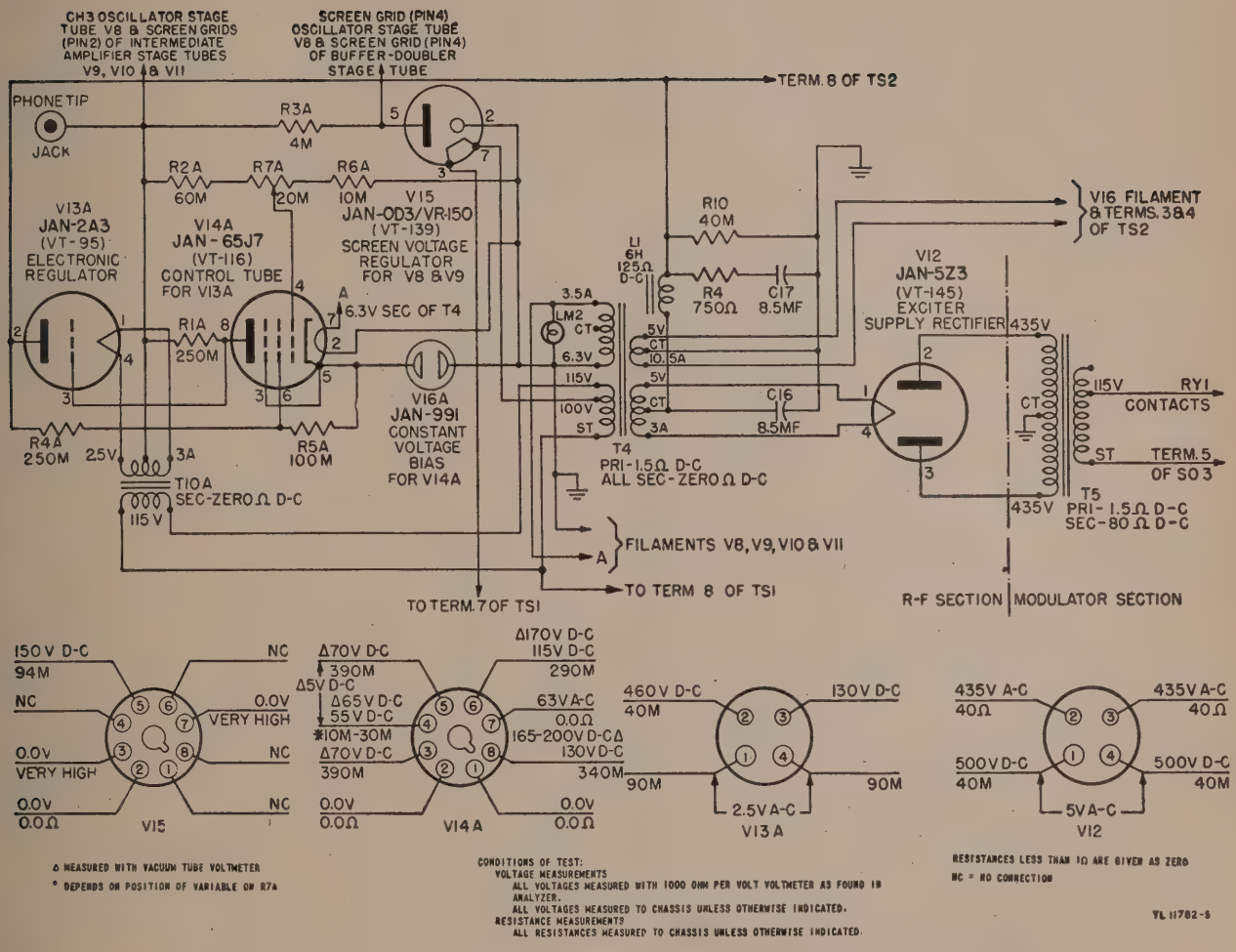


Figure 24. Radio Transmitter T-55/MRQ-2, r-f power supply stage, schematic wiring diagram.

27. Modulator Stage (fig. 25)

a. Circuit Repair Features. The modulator stage consists of tubes V3 and V4 operating in a push-pull class B amplifier circuit, the tubes being biased near cut-off. Grid bias and plate current are controlled by potentiometer R12. The plates of tubes V3 and V4 are connected to the primary winding of modulation transformer T9 whose secondary, during phone operation, is connected in series with the high-voltage plate power supply of r-f power-amplifier tube V16. The audio power output voltage of the modulator section plate modulates the r-f power-amplifier stage during phone operation, thus superimposing the audio-frequency voice wave on the radio-frequency carrier wave. In this way the r-f carrier is amplitude-modulated.

Caution: When taking high-voltage measurements on this stage, follow precautions outlined in paragraph 19*d*(1)(*d*).

b. Parts Data for Modulator Stage.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R5	3Z6018–12	RESISTOR, fixed: wire-wound; 180-ohm, ±10%; 20-w; IRC type DG Special.	Protective bias resistor for tubes V3 and V4.
R16, R17	3Z6620–12	RESISTOR, fixed: carbon; 20,000-ohm; ±10%; 2-w; IRC type BT–2.	Transformer T8 secondary loading.
R34	3Z6625–35	RESISTOR, fixed: wire-wound; 25,000-ohm, ±10%; 10-w; Utahrad type CC.	Tubes V3 and V4 grid return.
T3	2Z9614.1	TRANSFORMER: pri, 115-v a-c; sec, 3-v ct at 16 amp; Standard Transf. No. 10 P35.	Filament supply for tubes V3 and V4.
T8	2Z9634.3	TRANSFORMER, a-f: pri, 5,000-ohm, ratio 1:1.35; ½ pri to ½ sec; Standard Transf. No. 10A22	Driver tubes V1 and V2 plates to mod tubes V3 and V4 grids.
T9	2Z9634.3	TRANSFORMER, a-f: pri, 16,000-ohm ct; sec, 8330-ohm ct at 250 ma; Standard Transf. No. 10A38.	Mod tubes V3 and V4 plates to final amplr high-voltage circuit.
V3, V4	2J100TH	TUBE: triode; type JAN–100TH (VT–218)	Class B modulator.

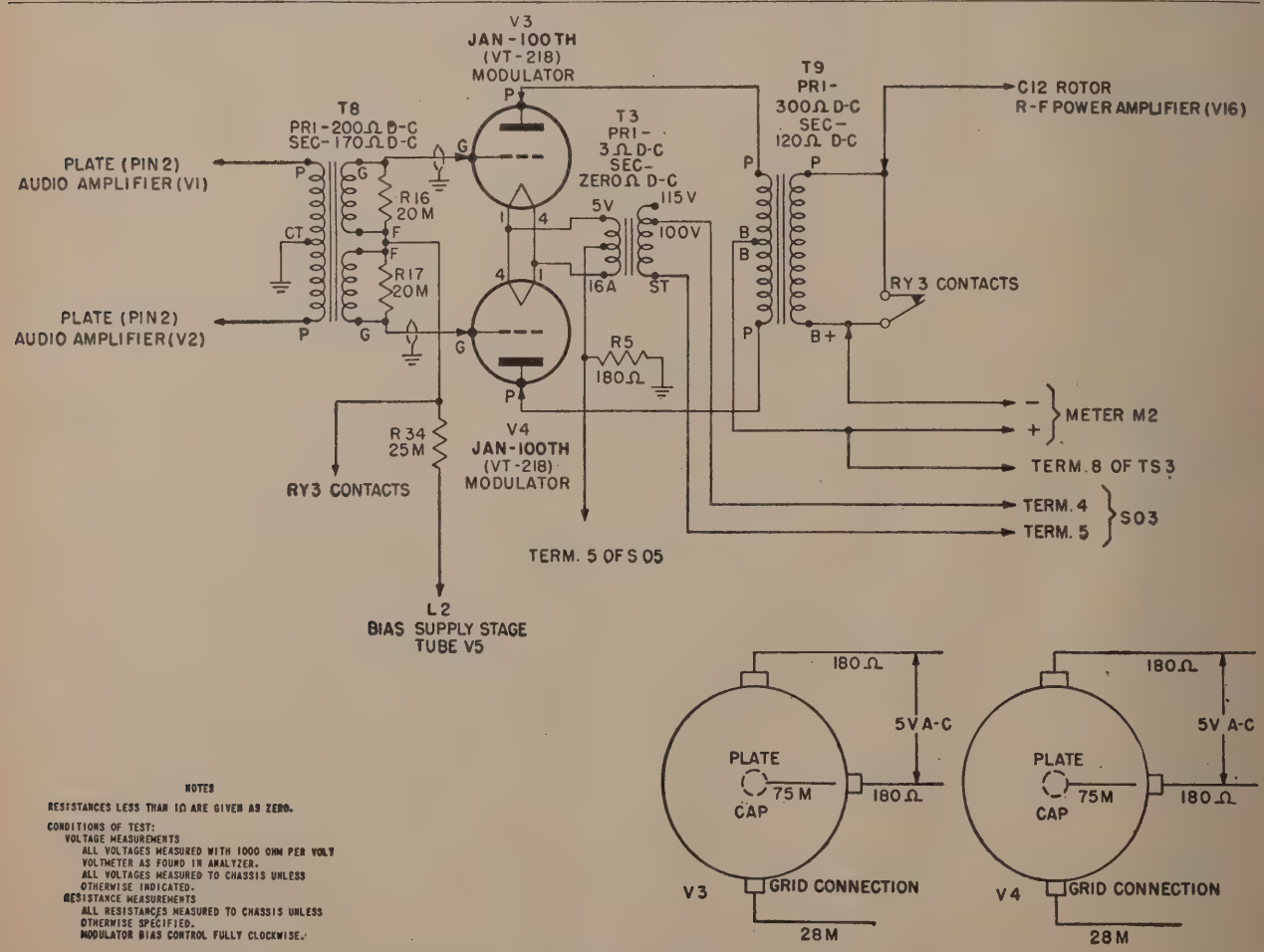


Figure 25. Radio Transmitter T–55/MRQ–2, modulator stage, schematic wiring diagram.

28. Audio-amplifier Stage (fig. 26)

a. Circuit Repair Features. Audio-frequency speech currents from Speech Amplifier BC–614–E enter the modulator section through transformer T7, the secondary of which connects to the grids of audio driver tubes V1 and V2. These tubes operate as push-pull class A audio power amplifiers. The plate circuits of tubes V1 and V2 deliver their power to the primary of driver transformer T8, whose secondary connects to the grids of modulator tubes V3 and V4.

b. Parts Data for Audio Amplifier Stage.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R14, R15	3RC21AE104K	RESISTOR, fixed: carbon; 100,000-ohm, ±10%; ½-w; IRC type BT–2.	Transformer T7 secondary loading.
T7	2Z9631.72	TRANSFORMER, a-f: input; pri, 500-ohm; sec, 20,000-ohm ct; Standard Transf. No. 10A21.	Interstage, BC–614–E to grids of tubes V1 and V2.
T8	2Z9634.5	TRANSFORMER, a-f: pri, 5,000-ohm, Ratio 1:1.35; ½ pri to ¼ sec; audio, type 10A22.	Driver tubes V1 and V2 plates to mod tubes V3 and V4 grids.
V1, V2	2J2A3	TUBE: triode; type JAN–2A3 (VT–95)	Audio amplifier.

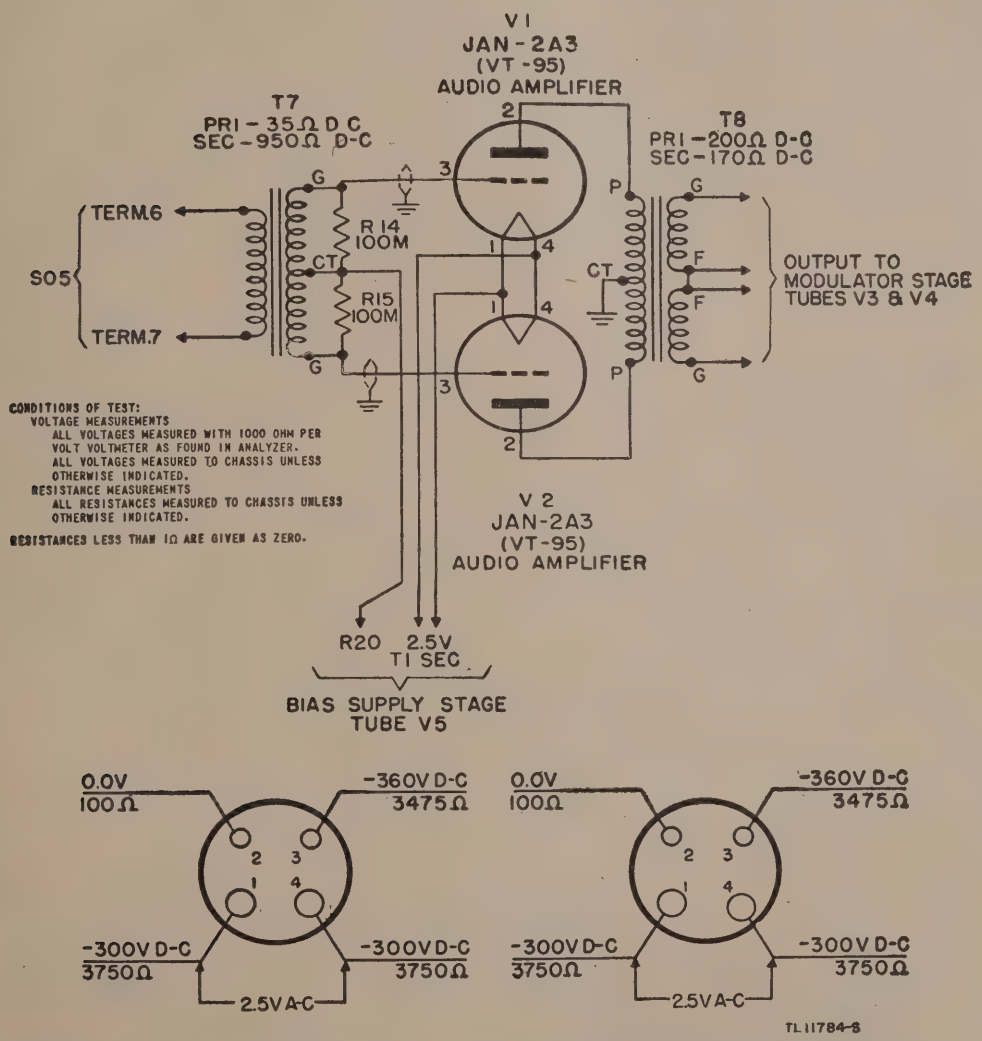


Figure 26. Radio Transmitter T–55/MRQ–2, audio amplifier stage, schematic wiring diagram.

29. Modulator Bias Power Supply Stage (fig. 27)

a. Circuit Repair Features. Transformer T3 supplies filament power for modulator tubes V3 and V4. Transformer T1 supplies filament power for audio driver tubes V1 and V2, and filament and plate power to rectifier tube V5. Tube V5 supplies plate power through a filter consisting of chokes L2 and L3 and capacitors C20 and C21 to the audio driver tubes V1 and V2. This power supply is operated with the positive terminal at ground potential. Thus, the negative potential will be below ground potential. This negative potential supplies plate power for tubes V1 and V2, and serves as a source of negative bias voltage for the modulator tubes V3 and V4, class C power amplifier tube V16, and intermediate-amplifier tubes V10 and V11. In order to obtain a bias voltage supply with good regulation, a bleeder consisting of resistor R11 and potentiometer R12 is connected across the output of the filter. These resistors may be adjusted to obtain voltages of the proper value.

b. Parts Data for Modulator Bias Power-supply Stage.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C20, C21	3DB8–106	CAPACITOR, fixed: electrolytic; 8-mf, —10% + 40%; 600 vdcw; Incco No. 60B5.	Bias power-supply filter.
C27	3DB40–5	CAPACITOR, fixed: electrolytic; 40-mf, —10% + 65%; 100 vdcw; Incco No. 10B281; Special.	Tubes V1 and V2, filament bypass.
L2, L3	3C560	COIL, a-f: 6-h; 250-ma; d-c; Standard Transf. No. 10C13.	Bias power-supply filter.
R11	3Z6250–27	POTENTIOMETER: 2,500-ohm, ±5%; 100-w; Ohmite type D1 WEV.	Bias supply bleeder.
R20	3Z6075–16	RESISTOR, fixed: wire-wound; 750-ohm, ±5%; 20-w; Utahrad type EE.	Tubes V1 and V2, cathode bias.
T1	2Z9613.3	TRANSFORMER: pri, 115-v a-c; sec, (1) 1,000-v ct at 220 ma; Standard Transf. No. 10PS7.	Filament supply for tubes V1, V2, and V5; and bias supply voltage.
V5	2J5Z3	TUBE: duo-diode; type JAN–5Z3 (VT–145)	Bias supply rectifier.

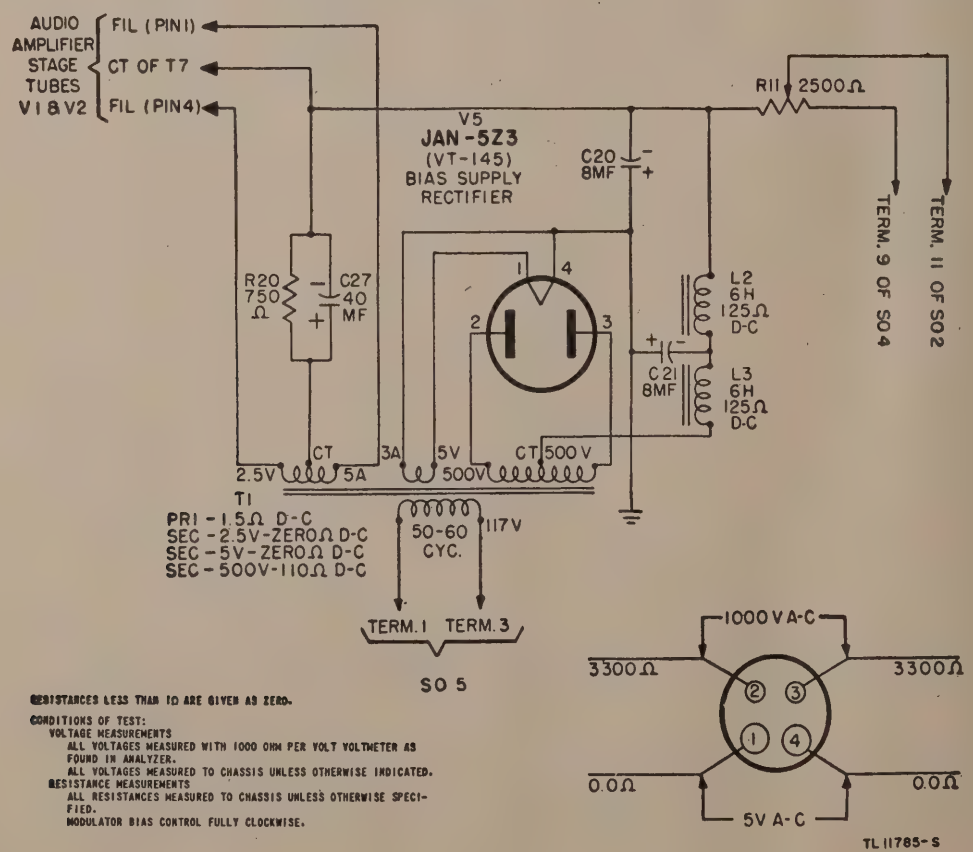


Figure 27. Radio Transmitter T–55/MRQ–2, modulator bias power-supply stage, schematic wiring diagram.

30. High-Voltage Power Supply Stage (fig. 28)

a. Circuit Repair Features. The high-voltage power supply is equipped with rectifier tubes V6 and V7. The secondary winding of transformer T2 supplies filament voltage for tubes V6 and V7. The secondary winding of transformer T6 supplies plate power. The primary of transformer T6 is connected to the a-c line, and is provided with a tap for raising the voltage applied to the plate of the class C amplifier during c-w transmission in order to obtain high power output. The rectified high-voltage supplied by tubes V6 and V7 is filtered by choke L4 and capacitors C19 and C23. The output of the high-voltage power supply is shunted by bleeder resistor R13. In making high-voltage measurements on this stage reread and follow the precautions and procedure outlined in paragraph 19*d*(1)(*d*).

b. Parts Data for High-voltage Power Supply.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C19, C23	3DB3.8	CAPACITOR, fixed: paper, oil-filled; 3-mf, —10% +40%; 4,000 vdcw.	Final amplifier h-v supply filter.
L4	3C560–1	COIL, a-f: filter; 11-h; 500-ma; 68-ohm, d-c; 5,000 vdct; Standard Transf. No. 10C16.	Final amplifier supply filter.
R13	3Z6675–15	RESISTOR, fixed: wire-wound; 75,000-ohm, ± 10%; 200-w; Ohmite type 0924.	Final amplifier h-v supply bleeder.
RY2	2Z7717.5	RELAY: dpdt; 117-v a-c; Guardian Elec. type G 32423.	Overload protector.
RY5	2Z7717.4	RELAY: dpst; 800-ma d-c; Guardian Elec. type G 32422.	Overload protection in h-v.
T2	2Z9611.163	TRANSFORMER: pri, 115-v a-c; sec, 2½-v ct 10 amp; 6,000-v rms; B & W No. 61001.	Filament supply for tubes V6 and V7.
T6	2Z9612–1	TRANSFORMER: 115-v a-c; tapped to provide sec of 4,000-v or 5,000-v ct at 500 ma; Standard Transf. No. 10P43.	Plate transformer of h-v power supply.
V6, V7	2J866A/866	TUBE: diode; type JAN–866 (VT–46–A)	High-voltage rectifier.

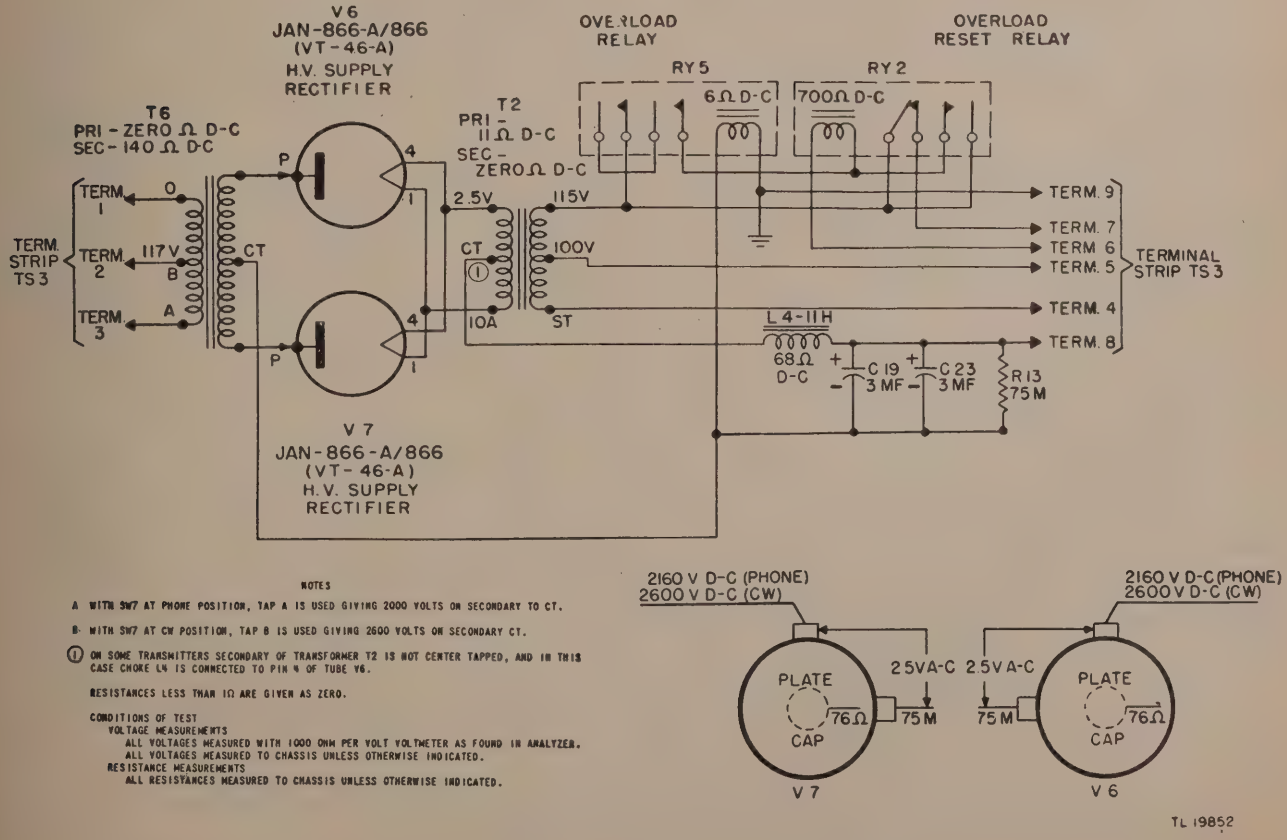


Figure 28. Radio Transmitter T–55/MRQ–2, high-voltage power supply stage, schematic wiring diagram.

31. Meter Switching for Radio Transmitter T–55/MRQ–2 (fig. 29)

a. Circuit Repair Features. (1) Meter M1 is a multiple-scale, d-c milliammeter which indicates the value of any one of the following depending on the position of switch SW8:

(a) Buffer-doubler (tube V9) plate current.

(b) Intermediate-amplifier (tubes V10 and V11) grid current.

(c) Intermediate-amplifier (tubes V10 and V11) plate current.

(d) Power-amplifier (tube V16) grid current. A meter shunt, which remains in the circuit at all times, is provided for each position of switch SW8. In switch position 1 (DOUB. PLATE), the meter shunt is resistor R33, and the meter is connected between the buffer-doubler plate and the B+ lead on the power supply in the r-f section. In switch position 2 (INT. AMP. GRID) the meter shunt is resistor R28, and the meter is connected between the intermediate-amplifier grids and bias resistor R11. In switch position 3 (INT. AMP. PLATE) the meter shunt is resistor R27, and the meter is connected between the intermediate-amplifier plates and the B+ lead on the power supply in the r-f section. In switch position 4 (P.A. GRID) the meter shunt is resistor R26, and the meter is connected between the power-amplifier grid and bias resistor R11.

(2) Meter M2 is a 0- to 500-milliampere, d-c instrument which indicates the plate current of class C power amplifier tube V16, and is connected between the plate of this tube and B+ of the high-voltage power supply.

(3) Meter M3 is a 0- to 10-volt, a-c voltmeter connected across the filament of tube V16 for the purpose of checking the filament voltages. The filament voltages are adjusted by means of variable resistor R18 which is controlled by the knob marked FILAMENT VOLTAGE on the front panel. A reading of 5.3 volts on this meter indicates that all of the filaments are operating at their proper value. Resistors R8A and R9A are connected in the meter switching circuit, but their essential function is to provide bias for the grids of intermediate-amplifier tubes V10 and V11.

b. Parts Data for Meter Switching of Radio Transmitter T–55/MRQ–2.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
LM1	2Z5927	LAMP, LM–27: 6–8-v; 0.25-amp; bayonet base: Mazda No. 44.	Final tank tuning dial illumination.
LM2	2Z5927	LAMP, LM–27: 6–8-v; 0.25-amp; bayonet base; Mazda No. 44.	Tuning unit compartment illumination.
M1	3F901E5–14	MILLIAMMETER: d-c; multiple scale; GE type DO–54; Hallicrafter No. 82A051.	Tube V16, V10, V11, and V9 current indicator.
M2	3F950–20	MILLIAMMETER: d-c: 0–500-ma; GE type DO–53.	Tube V16, plate current indicator.
M3	3F8010–8	VOLTMETER: a-c; 0–10-v; GE type DO–53.	Tube V16, filament voltage indicator.
PI11	2Z7228–1	PLUG, male: 8-contact Jones type P–408–LAB.	Lower control panel to mod chassis cable plug.
R8A	3Z6615–7	RESISTOR, fixed: insulated; 15,000-ohms, ± 10%; 2-w; IRC type BT–2.	Tubes V10 and V11, grid bias.
R9A	3Z6610–88	RESISTOR, fixed: insulated; 10,000-ohm, ± 10%; 2-w IRC.	Tubes V10 and V11, grid bias.
R26	3F3802–150	RESISTOR, fixed: wire-wound; 0.741-ohm, ± 5%; temp coef, —0.015%; ASSO Research Special.	Shunt for M1, 150-ma range.
R27	3F3802–300	RESISTOR, fixed: wire-wound; 0.351-ohm, ± 5%; temp coef, —0.015%; ASSO Research Special.	Shunt for M1, 300-ma range.
R28	3Z6050–65	RESISTOR, fixed: wire-wound; 500-ohm, ± 10%; ½-w.	Shunt for M1, 15-ma range.
R33	3F3802–150	RESISTOR, fixed: wire-wound; 0.741-ohm, ± 50%; temp coef, —0.015%; ASSO Research Special.	Shunt for M1, 150-ma range.
SO11	2Z8678.43	SOCKET, female; 8-terminal; Jones HB type S–408–AB modified.	Socket on upper control panel for plug PL 11.
SW8	3Z9825–62.5	SWITCH: 2-section; 4-position; OAK.	SWITCH for M1.
TS2	2Z9412.27	TERMINAL STRIP: 12-term; Jones No. S–12–6.	Exciter chassis cable connections.

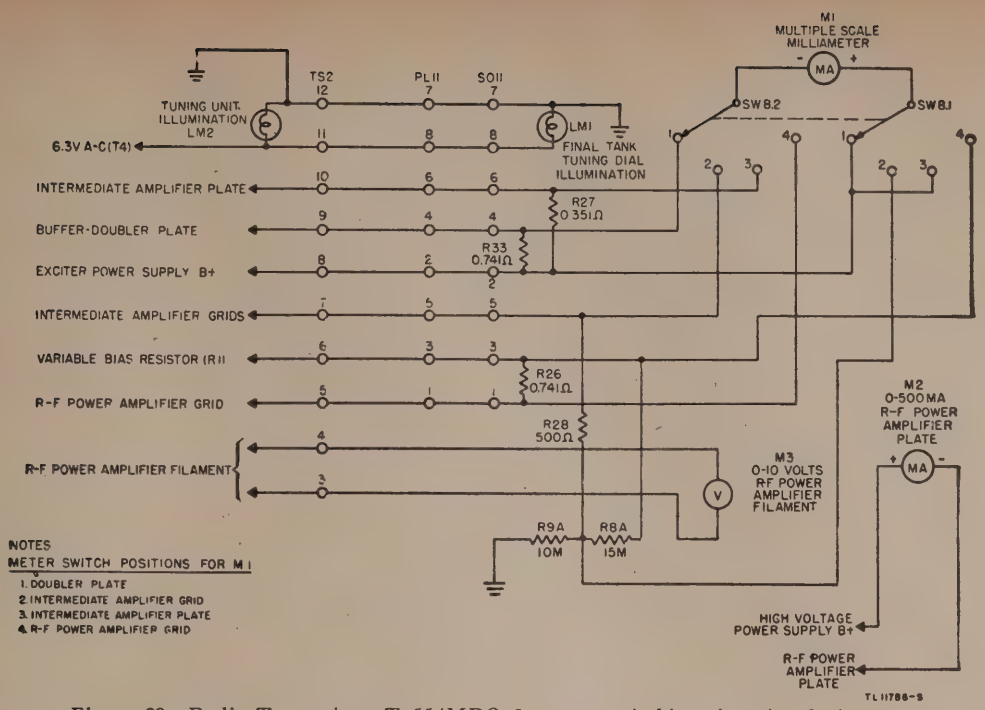


Figure 29. Radio Transmitter T–55/MRQ–2, meter switching, functional diagram.

32. Antenna Switching Unit SA–24/MRQ–2 (fig. 30)

a. Circuit Repair Features. Antenna Switching Unit SA–24/MRQ–2 consists of dummy antenna, change-over relay RY1A, and knife switch SW16A. The dummy antenna is composed of four 100-ohm, 125-watt, noninductive resistors R10A connected in series to obtain a resistance of 400 ohms capable of dissipating 500 watts without overheating. Antenna change-over relay RY1A automatically connects the antenna to the transmitter when transmitting and to the receivers when the transmitter is on stand-by. Knife switch SW16A is a single-pole, double-throw switch. When set to DUMMY ANTENNA, this switch connects the output of the transmitter to the dummy antenna, and when set to TRANSMIT, it connects the output of the transmitter to the transmitting antenna.

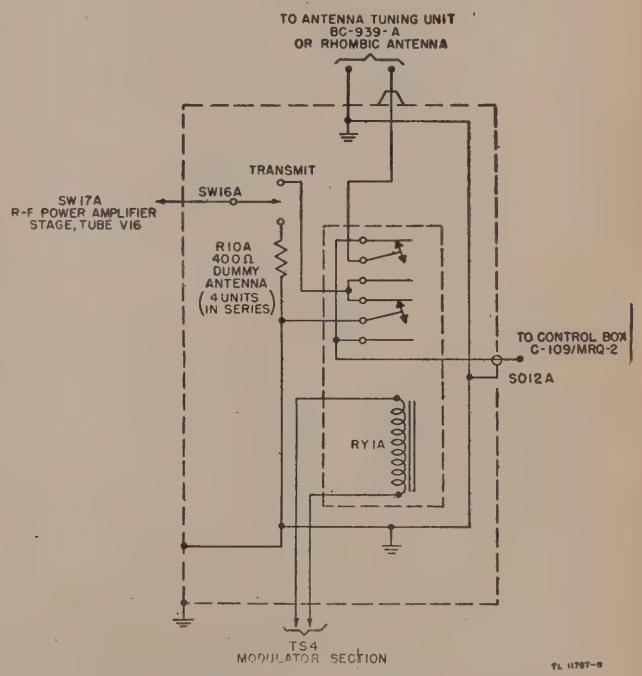


Figure 30. Antenna Switching Unit SA–24/MRQ–2, schematic wiring diagram.

b. Antenna Switching Unit SA–24/MRQ–2.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
R10A	3Z4900.15	RESISTOR, fixed: noninductive; wire-wound; 100-ohm; ± 10%; 125-watt; WL type 6511.7D.	Dummy antenna.
RY1A	2Z7717.2	RELAY: dpdt; 117-v a-c; Advance Electric No. 400.	Antenna change-over.
SO12A		SOCKET: coaxial cable; Amphenol SO–239	Socket for connection to Control Box C–109/MRQ–2.
SW16A	3Z9817–16	SWITCH: knife; spdt; B & WWW 218	TRANSMIT-DUMMY ANTENNA switch.

33. Antenna Coupling Unit CU–45/MRQ–2 (fig. 31)

a. Circuit Repair Features. Radio Transmitter T–55/MRQ–2 is equipped with Antenna Coupling Unit CU–45/MRQ–2 which couples the output of the transmitter to the long wire antenna, antenna C (par. 3*d*), when operating in a frequency range from 0.95 to 4.0 megacycles. Radio-frequency energy from the transmitter is fed to the primary of adjustable coupling coil L44 through a concentric transmission line. The coupling between primary and secondary of coupling coil L44 is adjustable from the front panel, and determines the amount of power fed from the transmitter to the antenna circuit. In series with coupling coil L44 are antenna current meter M4, loading coil L6, and the antenna. Meter M4 indicates the r-f current flowing in the antenna circuit, which is a measure of the performance of the transmitter. Antenna loading coil L6 is used to tune the antenna to resonance, and when it is so adjusted, the antenna circuit absorbs the greatest possible amount of energy from the transmitter.

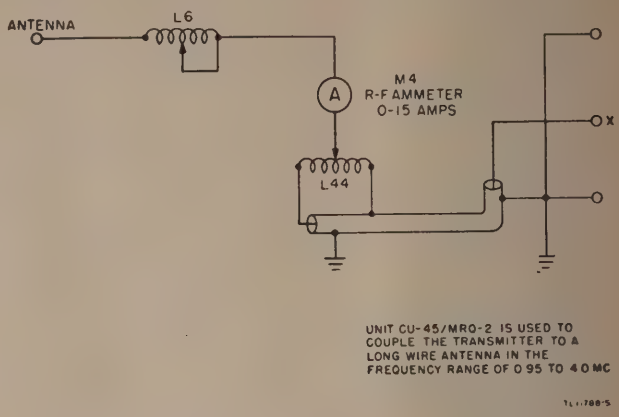


Figure 31. Antenna Coupling Unit CU–45/MRQ–2, schematic wiring diagram.

b. Parts Data for Antenna Coupling Unit CU–45/MRQ–2.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
L6	3C302B–2	COIL, r-f: variable inductance; Hallicrafters 51C486.	Low-frequency loading.
L44.....	3C302B–4	INDUCTOR: replacement; high-frequency; B & W per Hallicrafters 1C307.	Coupling inductor.
M4	3F1015–18	AMMETER, r-f: 0–15-amp; GE DO–53. *Note:* Substitute War Standard Meter MR55MO15RFAA.	Antenna current indicator.

34. Antenna Tuning Unit BC–939–A (fig. 32)

a. Circuit Repair Features. Radio Transmitter T–55/MRQ–2 is equipped with Antenna Tuning Unit BC–939–A, which couples the output of the transmitter to the rod antenna, antenna D (par. 3*d*) when operating in the frequency range of 4 to 18 megacycles. The radio-frequency energy is delivered to the primary of the adjustable coupling transformer L3 through a concentric transmission line. This coupling, which is controlled from the front panel, adjusts the amount of power taken from the transmitter and fed to the antenna circuit. In series with the coupling coil secondary are antenna current meter M 4, capacitors C22 and C30 which are selected by switch SW9, two variable inductors L6 and L44, and the antenna proper. Inductor L6 or L44 is an antenna-loading coil which tunes the antenna to resonance. Coupling transformer L5 can be adjusted until normal power-amplifier plate current is obtained as indicated on the P.A. PLATE meter. When inductor L6 or L44 is so adjusted that it tunes the antenna circuit to resonance, the antenna circuit absorbs the greatest possible amount of energy from the transmitter. Inductor L6 is used to tune at frequencies from 4 to 10 megacycles. Because of decreased antenna reactance at frequencies between 6 and 10 megacycles, capacitor C30 is introduced in series with the antenna-loading coil by means of switch SW9 so that adjustment of inductor L6 becomes less critical. At frequencies between 10 and 18 megacycles, inductor L44 and series capacitor C22 are switched into the series antenna circuit in place of inductor L6 by means of switch SW9.

Caution: Because the antenna is short, a high radio-frequency voltage is built up in the antenna tuning unit during operation. Guard against receiving severe radio-frequency burns.

b. Parts Data for Antenna Tuning Unit BC–939–A.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
C22	3D9012–32	CAPACITOR, fixed: vacuum; 12-mmf, —1% + ½%; 20,000 vdcw; E. McCullough VC–50.	Impedance-matching capacitor.
C30	3D423	CAPACITOR, fixed: vacuum; 50-mmf; 32,000-v, a-c; E. McCullough VC–50.	Impedance-matching capacitor.
L5	3C302B–3	INDUCTOR: replacement coupling: B & W per Hallicrafters 1C307.	Coupling inductor.
L6	3C302B–2	COIL, r-f: variable inductance; Hallicrafters 51C486.	Low-frequency loading.
L44	3C302B–4	INDUCTOR: replacement; high-frequency; B & W per Hallicrafters 1C307.	High-frequency loading.
M4	3F1015–18	AMMETER, r-f: 0–15-amp; GE DO–53	Antenna current indicator.
SW9.1		SWITCH: front section; isolantite; B & W per Hallicrafters dwg No. 1D305.	Inductor selector.
SW9.2		SWITCH: rear section; isolantite, B & W per Hallicrafters dwg No. 1D306.	Inductor selector.

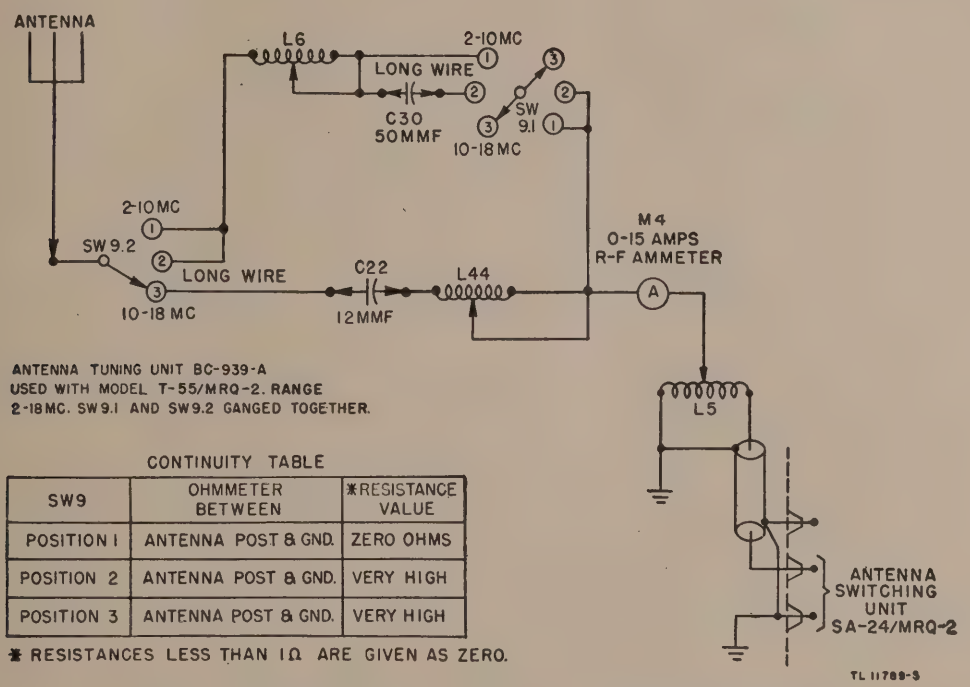


Figure 32. Antenna Tuning Unit BC–939–A, schematic wiring diagram.

35. Tuning Units for Radio Transmitter T–55/MRQ–2 (fig. 33)

a. Circuit Repair Features. Radio Transmitter T–55/MRQ–2 is equipped with eight tuning units and nine tank coils, each of which covers a specified band within the range of 0.95 to 18.0 megacycles. Provision is made for plugging three tuning units of different frequency ranges into the transmitter. Any one of the three tuning units can be selected by the BAND SWITCH on the front panel of the transmitter. For each frequency there is a particular combination of tuning unit, tank coil, and exciter tuning dial setting which is required for proper performance of the transmitter. For these combinations see the tuning charts. (See tables VIII through XV.) Since repair of the tuning unit is difficult, it is recommended that any tuning unit proving defective in operation be replaced.

b. PARTS DATA FOR TUNING UNITS FOR RADIO TRANSMITTER T–55/MRQ–2.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
	2C8101–28	TUNING UNIT TN–28/MRQ–2: per B & W WW710	For 0.95 to 1.40 mc band.
	2C8101–29	TUNING UNIT TN–29/MRQ–2: per B & W WW710–711.	For 1.35 to 2.00 mc band.
	2C8101–30	TUNING UNIT TN–30/MRQ–2: per B & W WW711	For 1.95 to 2.85 mc band.
	2C8101–31	TUNING UNIT TN–31/MRQ–2: per B & W WW711–712.	For 2.80 to 4.10 mc band.
	2C8101–32	TUNING UNIT TN–32/MRQ–2: per B & W WW712	For 4.05 to 5.95 mc band.
	2C8101–33	TUNING UNIT TN–33/MRQ–2: per B & W WW712–713.	For 5.90 to 8.60 mc band.
	2C8101–34	TUNING UNIT TN–34/MRQ–2: per B & W WW713	For 8.55 to 12.50 mc band.
	2C8101–36	TUNING UNIT TN–36/MRQ–2: per B & W WW713–714.	For 12.45 to 18.05 mc band.

Note. Data concerning the component parts of the tuning units are not provided, since it is recommended that the entire unit be replaced if it is defective.

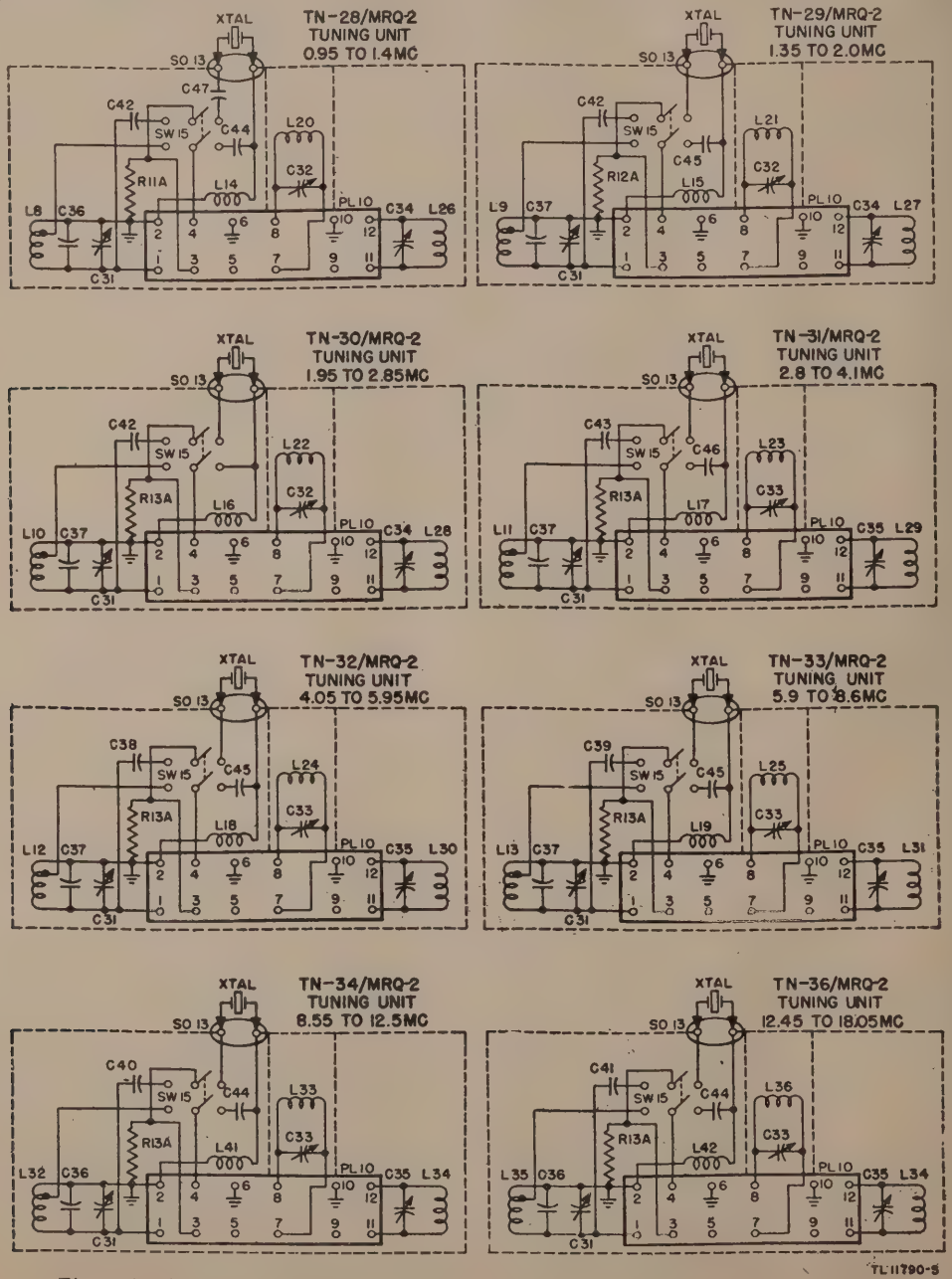


Figure 33. Radio Transmitter T–55/MRQ–2, tuning units, schematic wiring diagram.

36. Miscellaneous Parts for Radio Transmitter T–55/MRQ–2

a. General. There are parts in Radio Transmitter T–55/MRQ–2 which are not located in any particular stage, and for that reason have not been included on the stage diagrams and parts data for the stages. These parts are listed below as a miscellaneous group. (See fig. 38.)

b. Miscellaneous Parts Data for Radio Transmitter T–55/MRQ–2.

Ref. symbol	Signal Corps stock No.	Name of part and description	Function
FS1, FJ2	3Z2025	FUSE: 25-amp; 125-v; Edison Base; long delay	Line fuse.
FS3	3Z2020	FUSE: 20-amp; 125-v; Edison Base; long delay	Transformer T6, primary.
FS4	3Z1935	FUSE, FU–35: 5-amp; 25-v; Littelfuse 4AG No. 1095.	Protects T2, T3, T4, T5, RY1, RY2, RY3, RY4, and LM3.
FS5	3Z1950	FUSE, FU–50: 3-amp; 250-v; Littelfuse 3AG No. 1043.	Protects T1 and Speech Amplifier BC–614–E.
LM3	2Z5941	LAMP, LM–41: 110-v; candelabra; screw base; Mazda No. 6S6.	Filament ON-OFF indicator.
LM4	2Z5941	Same as LM3	High-voltage power supply ON-OFF indicator.
PL1, PL2	2Z7228–14.1	PLUG, male: 6-contact; Jones type P–406 LAB	R-F section to mod chassis cable plug.
PL3	2Z7228–1	PLUG, male: 8-contact; Jones type P–408 LAB	Lower control panel to mod chassis cable plug.
PL4	2Z7228141	PLUG, male: 6-contact; Jones HB type P–406–LAB	Lower control panel to mod chassis cable plug.
R12	2Z7261.1	POTENTIOMETER: 500-ohm, 50-w; IRC type PR–50.	Tube V3 and V4 bias voltage control.
R18	3Z7015–3	RESISTOR, adjustable: 15-ohm; 75-W; IRC type PR–75.	Filament voltage control.
R19	3Z6001F6–2	RESISTOR, fixed: wire-wound; 16-ohm; 600-w; Eagle Elec No. 415–A, heater element.	Transformer T6, primary voltage dropping.
RY1	2Z7590–106	RELAY: dpst; 115-v a-c; Hallicrafters dwg No. 21DO56.	Plate power ON-OFF.
RY3	2Z7717.2	RELAY: dpdt; 117-v a-c; Advance Elec No. 400	CW-PHONE switching.
SO1, SO2	2Z8639.1	SOCKET, female: 6-contact; Jones HB type S–406–AB.	Sockets on mod chassis for plugs PL1 and PL2.
SO3, SO4	2Z8679.43	SOCKET, female: 8-contact; Jones HB type S–408–AB.	Sockets on mod chassis for plugs P13 and P14.
SO5	2Z8678.78	SOCKET: amphenol connector; Amer. Mold type PO–8F1.	Speech amplifier input connection on Radio Transmitter T–55/MRQ–2.
SO6	6Z7588	SOCKET, male: flush base twist-lock; 20-amp; 250-v; Hubbell No. 8808.	110-v a-c power input connection on Radio Transmitter T–55/MRQ–2.
SO7	2Z8639–5	SOCKET, female: 12-terminal; bakelite; Jones HB Special.	Channel 1 tuning unit socket.
SO8	2Z8639–5	Same as SO7	Channel 2 tuning unit socket.
SO9	2Z5886–5	Same as SO7	Channel 3 tuning unit socket.
SW1	3Z9851	SWITCH, toggle: SPST; F & G Elec. Sup. type P & S No. 1311.	Filament ON–OFF.
SW2	3Z9812–2	SWITCH, interlock: SPST AH & H No. 3592D	Coil unit compartment safety.
SW3	3Z9861–1	SWITCH: DPST; bakelite; F & G Elec. Sup. type P & S No. 1312.	Exciter plate power ON-OFF.
SW4	3Z9851	SWITCH, toggle: SPST; F & G Elec. Sup. type P & S No. 1311, Special.	High-voltage protection switch.
SW5	3Z9812	SWITCH, interlock: SPST; AH & H No. 3592D	Transmitter rear-cover safety switch.
SW6	3Z9851	SWITCH, toggle: SPST; F & G Elec. Sup. type P & S No. 1311.	Transmitter plate power ON-OFF.
SW7	3Z9845–14	SWITCH, toggle: 4-PDT; C–H No. 8885KL	CW-PHONE switching.
SW10	3Z9812.2	SWITCH, interlock: SPST; AH & H No. 3592D	Transmitter top cover safety switch.
SW11.1	3C6500A/S1	SWITCH ASSEM: 4-section; 3-position; isolantite wafers; Globe Union.	Tube V8 grid circuit switching.
SW11.2	2C6500A/S1	Same as SW11.1	Tube V8 cathode circuit switching.
SW11.3	3C6500A/S1	Same as SW11.1	Tube V9 plate circuit switching.
SW11.4	3C6500A/S1	Same as SW11.1	Tube V10 and V11 plates circuit switching.
SW12	3Z9824–274	SWITCH, momentary push button; SPDT Utahrad type PS–3.	Overload relay reset.
SW13	3Z9812–2	SWITCH, interlock: SPST; AH & H No. 3592D	Tuning unit compartment switch.
TS1	2Z9412.27	TERMINAL STRIP: 12-term; Jones HB No. S–12–6	Exciter chassis cable connections.
TS3	2Z9408.1	TERMINAL STRIP: 8-term; Jones HB No. 10–142	Power-supply chassis cable connections.
TS4	2Z9402	TERMINAL STRIP: standard, 2-term; Cinch No. 1720.	A-c outlet for relay RY4.
TS5	2Z9402.1	TIP JACK STRIP: standard; 2-jack; Cinch No. 1490.	A-c outlet for cover interlock.

37. Measuring Oscillator Frequency

a. Absorption Frequency Meter. As the first stop in checking the oscillator frequency, use the absorption frequency meter to determine the fundamental frequency and the proper order of harmonic.

b. Frequency Meter Set SCR–211–( ). To make a highly accurate determination of the operating frequency and frequency stability, as well as to check the quality of the generated r-f signal, use Frequency Meter Set SCR–211–( ). Proceed as follows:

(1) The oscillator frequency of the transmitter at any of the dial settings may be checked by using Frequency Meter Set SCR–211–( ). Consult the frequency meter Technical Manual for detailed instructions. Recalibrate the instrument if necessary before using it. In order that the frequency meter may pick up an adequate signal from the transmitter, connect an antenna of 6 inches to 1 foot of #12 copper wire to the frequency meter. Plug the telephone headset, which is part of the Frequency Meter Set SCR–211–( ), into the phone jack. Turn on the frequency meter and allow it to heat for 15 to 20 minutes so that its operation will be stable. Always adjust the CORRECTOR control before taking readings.

(2) Operate Frequency Meter Set SCR–211–( ) within the vicinity of the transmitter. Do not place it any closer to the transmitter than is necessary to secure an adequate signal in the headset. The amount of coupling between the frequency meter and the transmitter may be changed by varying the distance between the frequency meter and the transmitter.

(3) Consult the tuning charts (sec. IX) of Radio Transmitter T–55/MRQ–2 for the approximate oscillator frequency. Find the approximate dial setting for the approximate transmitter oscillator frequency in the calibration book of the frequency meter.

(4) To measure the exact frequency of the transmitter, adjust the main tuning dial of the frequency meter until the frequency of the beat note heard in the headset is reduced to 0 cycles per second (zero beat); that is, until no signal is heard. In the calibration book find the frequency which corresponds with the frequency meter dial setting at which zero beat is heard in the headset. The frequency thus found is the *exact* oscillator frequency of the transmitter.

Table VII. Characteristics of tubes for Radio Transmitter T–55/MRQ–2.

VT–No. JAN–No.	VT–46–A 866A/866	VT–95 2A3	VT–100 807	VT–107 6V6	VT–115 6L6	VT–139 OD3/VR–150	VT–145 5Z3	VT–218 100TH	VT–220 250TH	VT–116 6SJ7	NE–16 991
A-c filament voltage (amp).	2.5	2.5	6.3	6.3	6.3	.....	5.0	5.0	5.0	6.3	.....
A-c filament current (amp).	5.0	2.5	0.9	0.45	0.9	.....	3.0	6.5	10.5	0.3	.....
D-c plate voltage.	.....	300	600	300	375	150	.....	2,000	2,500	250	55–60
D-c screen voltage.	.....	.....	250	150	200	.....	.....	.....	.....	100	.....
D-c grid bias voltage.	.....	–62	–50	–25	–35	.....	.....	.....	–220	–3	.....
Max a-c voltage per plate.	.....	.....	.....	.....	.....	500	.....	.....	.....	.....	.....
Max inverse peak voltage.	10,000	.....	.....	.....	.....	1,400	.....	.....	.....	.....	.....
D-c plate current (ma).	.....	40	100	35	88	.....	.....	225	290	3.0	.....
D-c screen current (ma).	.....	.....	9.0	5	9	.....	.....	.....	.....	0.8	.....
D-c grid current (ma).	.....	.....	3.0	3.0	3.5	.....	.....	.....	70	.....	.....
Max d-c output current (ma).	250	.....	.....	.....	.....	30	250	.....	.....	.....	2.0
Plate dissipation (watts).	.....	.....	25	12	20	.....	.....	100	250	.....	.....
Approx grid driving power (watts).	.....	.....	0.22	.....	0.18	.....	.....	.....	42	.....	.....
Approx output power (watts).	.....	15	37.5	.....	17	.....	.....	380	600	.....	.....
Plate resistance (ohms).	.....	800	.....	.....	.....	.....	.....	.....	.....	1,500,000	.....
Transconductance (microhms).	.....	5,250	.....	.....	.....	.....	.....	.....	.....	1,650	.....
Amplification factor.	.....	4.2	.....	.....	.....	.....	.....	30	32	2,500	.....
Load resistance (ohms).	.....	3,000	.....	.....	.....	.....	.....	16,000	.....	.....	.....

Table VIII. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–28( )/MRQ–2
Frequency Range 0.95 to 1.40 mc.

Transmitter tuning						Rhombic or dummy antenna		Wire antenna Antenna tuning unit special		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
0.95	950	0	0.95–1.30	100	28	1–3	74	(*)	15.4	1.7
0.96	960	11	0.95–1.30	100	32	1–3	67	(*)	15.2	4.0
0.98	980	26	0.95–1.30	100	46	1–3	62	(*)	15.1	5.2
1.00	1,000	41	0.95–1.30	100	57	1–3	57	(*)	15.0	7.9
1.02	1,020	57	0.95–1.30	100	66	1–3	57	(*)	15.0	10.2
1.04	1,040	73	0.95–1.30	100	78	1–3	57	(*)	15.0	12.6
1.06	1,060	89	1.30–2.00	100	18	1–3	74	(*)	13.6	14.9
1.08	1,080	106	1.30–2.00	100	28	1–3	74	(*)	13.6	17.3
1.10	1,100	123	1.30–2.00	100	38	1–3	74	(*)	13.6	19.6
1.12	1,120	141	1.30–2.00	100	44	1–3	74	(*)	13.6	21.3
1.14	1,140	160	1.30–2.00	100	56	1–3	74	(*)	13.6	23.1
1.16	1,160	179	1.30–2.00	100	64	1–3	74	(*)	13.7	24.8
1.18	1,180	199	1.30–2.00	100	74	1–3	74	(*)	13.8	26.6
1.20	1,200	219	1.30–2.00	100	82	1–3	74	(*)	13.9	28.3
1.22	1,220	240	1.30–2.00	100	90	1–3	74	(*)	14.0	29.6
1.24	1,240	262	1.30–2.00	50	10	1–3	58	(*)	14.1	31.0
1.26	1,260	285	1.30–2.00	50	17	1–3	58	(*)	14.4	32.3
1.28	1,280	309	1.30–2.00	50	24	1–3	57	(*)	14.4	33.7
1.30	1,300	335	1.30–2.00	50	29	1–3	57	(*)	14.4	35.0
1.32	1,320	363	1.30–2.00	50	33	1–3	57	(*)	14.4	36.0
1.34	1,340	393	1.30–2.00	50	40	1–3	56	(*)	14.4	36.9
1.36	1,360	425	1.30–2.00	50	45	1–3	56	(*)	14.4	37.9
1.38	1,380	460	1.30–2.00	50	50	1–3	55	(*)	14.4	38.8
1.40	1,400	500	1.30–2.00	50	56	1–3	55	(*)	14.4	39.8

* Used with 135 feet antenna length.

Table IX. Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–29( )/MRQ–2
Frequency Range 1.35 to 2.00 mc.

Transmitter tuning						Rhombic or dummy antenna		Wire antenna Antenna tuning unit special		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
1.35	1,350	0	1.30–2.00	50	42	1–3	30	(*)	15.2	37.7
1.36	1,360	7	1.30–2.00	50	45	1–3	30	(*)	15.2	38.1
1.38	1,380	17	1.30–2.00	50	50	1–3	30	(*)	15.2	39.0
1.40	1,400	27	1.30–2.00	50	56	1–3	30	(*)	15.2	39.8
1.42	1,420	37	1.30–2.00	50	60	1–3	29	(*)	15.2	40.6
1.44	1,440	47	1.30–2.00	50	66	1–3	29	(*)	15.2	41.4
1.46	1,460	57	1.30–2.00	50	70	1–3	29	(*)	15.5	42.3
1.48	1,480	67	1.30–2.00	50	76	1–3	29	(*)	15.7	43.1
1.50	1,500	77	1.30–2.00	50	80	1–3	28	(*)	15.7	43.9
1.52	1,520	88	1.30–2.00	50	84	1–3	28	(*)	15.7	44.6
1.54	1,540	99	1.30–2.00	50	89	1–3	28	(*)	15.7	45.2
1.56	1,560	110	1.30–2.00	50	92	1–3	28	(*)	15.7	45.9
1.58	1,580	121	2.00–3.50	100	6	1–3	26	(*)	14.5	46.5
1.60	1,600	133	2.00–3.50	100	11	1–3	26	(*)	14.5	47.2
1.62	1,620	145	2.00–3.50	100	16	1–3	26	(*)	14.5	48.1
1.64	1,640	158	2.00–3.50	100	22	1–3	26	(*)	14.5	49.1
1.66	1,660	172	2.00–3.50	100	28	1–3	26	(*)	14.5	50.0
1.68	1,680	186	2.00–3.50	100	33	1–3	25	(*)	14.5	51.0
1.70	1,700	200	2.00–3.50	100	39	1–3	25	(*)	14.5	51.9
1.72	1,720	215	2.00–3.50	100	42	1–3	25	(*)	14.5	53.7
1.74	1,740	230	2.00–3.50	100	49	1–3	25	(*)	14.5	55.5
1.76	1,760	246	2.00–3.50	100	56	1–3	25	(**)	13.0	5.5
1.78	1,780	262	2.00–3.50	100	63	1–3	25	(**)	13.0	6.8
1.80	1,800	278	2.00–3.50	100	69	1–3	25	(**)	13.3	8.1
1.85	1,850	324	2.00–3.50	100	74	1–3	25	(**)	13.6	10.9
1.90	1,900	374	2.00–3.50	100	79	1–3	24	(**)	13.9	13.7
1.95	1,950	431	2.00–3.50	50	19	1–3	24	(**)	14.0	16.1
2.00	2,000	500	2.00–3.50	50	30	1–3	24	(**)	15.7	18.5

* Used with 135 feet antenna length.
** Used with 35 feet antenna length.

Table X. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–30( )/MRQ–2
Frequency Range 1.95 to 2.85 mc.

Transmitter tuning						Rhombic or dummy antenna		Wire antenna Antenna tuning unit special		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
1.95	1,950	0	2.0–3.5	50	20	1–3	24	(**)	10.9	16.7
2.00	2,000	19	2.0–3.5	50	29	1–3	24	(**)	11.9	18.5
2.05	2,050	37	2.0–3.5	50	39	1–3	24	(**)	12.7	20.6
2.10	2,100	55	2.0–3.5	50	49	1–3	23	(**)	13.5	22.7
2.15	2,150	74	2.0–3.5	50	58	1–3	23	(**)	15.0	24.3
2.20	2,200	94	2.0–3.5	50	66	1–3	23	(**)	16.7	25.9
2.25	2,250	115	2.0–3.5	50	73	1–3	22	(**)	19.5	27.3
2.30	2,300	136	2.0–3.5	50	79	1–3	22	(**)	23.0	28.7
2.35	2,350	158	2.0–3.5	50	85	1–3	22	(**)	23.0	30.0
2.40	2,400	181	2.0–3.5	50	90	1–3	21	(**)	20.0	31.3
2.45	2,450	206	2.0–3.5		12	1–3	21	(**)	17.3	32.4
2.50	2,500	233	2.0–3.5		17	1–3	21	(**)	16.8	33.5
2.55	2,550	261	2.0–3.5		22	1–3	21	(**)	15.5	34.5
2.60	2,600	292	2.0–3.5		26	1–3	21	(**)	14.7	35.5
2.65	2,650	326	2.0–3.5		30	1–3	21	(**)	13.9	36.3
2.70	2,700	363	2.0–3.5		34	1–3	20	(**)	13.6	37.2
2.75	2,750	403	2.0–3.5		38	1–3	20	(**)	13.6	38.0
2.80	2,800	446	2.0–3.5		41	1–3	20	(**)	13.6	38.8
2.85	2,850	500	2.0–3.5		44	1–3	20	(**)	13.6	39.5

** Used with 35 feet antenna length.

Table XI. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–31( )/MRQ–2
Frequency Range 2.80 to 4.10 mc.

Transmitter tuning						Rhombic or dummy antenna		Wire antenna Antenna tuning unit special		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
2.80	2,800	0	2.0–3.5		41	1–3	20	(**)	13.6	38.8
2.85	2,850	14	2.0–3.5		41	1–3	20	(**)	13.5	39.5
2.90	2,900	27	2.0–3.5		47	1–3	20	(**)	13.4	40.2
2.95	2,950	39	2.0–3.5		50	1–3	20	(**)	13.2	40.8
3.00	3,000	52	2.0–3.5		53	1–3	20	(**)	13.1	41.5
3.05	3,050	65	2.0–3.5		56	3–18	78	(**)	12.7	42.1
3.10	3,100	78	2.0–3.5		58	3–18	78	(**)	12.3	42.7
3.15	3,150	91	2.0–3.5		61	3–18	78	(**)	12.0	43.2
3.20	3,200	105	2.0–3.5		63	3–18	78	(**)	11.6	43.8
3.25	3,250	119	3.5–4.5		11	3–18	77	(**)	11.3	44.3
3.30	3,300	133	3.5–4.5		15	3–18	77	(**)	11.0	44.8
3.35	3,350	148	3.5–4.5		19	3–18	77	(**)	10.7	45.3
3.40	3,400	164	3.5–4.5		22	3–18	77	(**)	10.5	45.8
3.45	3,450	181	3.5–4.5		25	3–18	77	(**)	10.4	46.3
3.50	3,500	198	3.5–4.5		28	3–18	76	(**)	10.2	46.7
3.55	3,550	216	3.5–4.5		31	3–18	76	(**)	10.1	47.2
3.60	3,600	235	3.5–4.5		34	3–18	76	(**)	10.0	47.6
3.65	3,650	255	3.5–4.5		37	3–18	76	(**)	10.0	48.0
3.70	3,700	276	3.5–4.5		40	3–18	76	(**)	10.0	48.4
3.75	3,750	298	3.5–4.5		43	3–18	75	(**)	10.0	48.7
3.80	3,800	322	3.5–4.5		45	3–18	75	(**)	10.0	49.1
3.85	3,850	346	3.5–4.5		48	3–18	75	(**)	10.0	49.4
3.90	3,900	372	3.5–4.5		50	3–18	74	(**)	10.0	49.8
3.95	3,950	400	3.5–4.5		52	3–18	74	(**)	10.0	50.1
4.00	4,000	430	3.5–4.5		54	3–18	74	(**)	10.0	50.5
4.05	4,050	462	3.5–4.5		56	3–18	74	(**)	10.0	50.7
4.10	4,100	500	3.5–4.5		58	3–18	74	(**)	10.0	51.0

** Used with 35 feet antenna length.

Table XII. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–32( )/MRQ–2
Frequency Range 4.05 to 5.95 mc.

Transmitter tuning						Rhombic or dummy antenna		Rod antenna Antenna tuning unit BC–939–A		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
4.05	2,025	0	4.5–5.7		4	3–18	74	2–10	1.8	44.5
4.10	2,050	10	4.5–5.7		7	3–18	72	2–10	1.8	44.8
4.15	2,075	18	4.5–5.7		10	3–18	71	2–10	1.8	45.2
4.20	2,100	27	4.5–5.7		13	3–18	70	2–10	1.8	45.4
4.25	2,125	35	4.5–5.7		16	3–18	69	2–10	1.8	45.7
4.30	2,150	43	4.5–5.7		18	3–18	68	2–10	1.8	46.0
4.35	2,175	52	4.5–5.7		21	3–18	68	2–10	1.8	46.3
4.40	2,200	61	4.5–5.7		23	3–18	68	2–10	1.8	46.5
4.45	2,225	70	4.5–5.7		26	3–18	67	2–10	1.8	46.7
4.50	2,250	79	4.5–5.7		28	3–18	67	2–10	1.8	47.0
4.55	2,275	88	4.5–5.7		31	3–18	66	2–10	1.8	47.3
4.60	2,300	97	4.5–5.7		33	3–18	66	2–10	1.8	47.5
4.65	2,325	106	4.5–5.7		35	3–18	65	2–10	1.8	47.7
4.70	2,350	116	4.5–5.7		37	3–18	65	2–10	1.8	47.9
4.75	2,375	126	4.5–5.7		39	3–18	65	2–10	1.8	48.2
4.80	2,400	137	4.5–5.7		41	3–18	64	2–10	1.8	48.3
4.85	2,425	148	4.5–5.7		43	3–18	64	2–10	1.8	48.5
4.90	2,450	159	4.5–5.7		45	3–18	64	2–10	1.8	48.7
4.95	2,475	170	4.5–5.7		47	3–18	63	2–10	1.8	48.9
5.00	2,500	181	4.5–5.7		49	3–18	63	2–10	1.8	49.1
5.10	2,550	205	4.5–5.7		52	3–18	63	2–10	1.8	49.5
5.20	2,600	230	4.5–5.7		56	3–18	62	2–10	1.9	49.8
5.30	2,650	257	4.5–5.7		58	3–18	62	2–10	1.9	50.2
5.40	2,700	287	4.5–5.7		61	3–18	61	2–10	1.9	50.6
5.50	2,750	318	4.5–5.7		64	3–18	61	2–10	1.9	50.9
5.60	2,800	351	4.5–5.7		67	3–18	60	2–10	1.9	51.2
5.70	2,850	388	4.5–5.7		69	3–18	60	2–10	1.9	51.6
5.80	2,900	428	4.5–5.7		71	3–18	60	2–10	1.9	51.7
5.90	2,950	473	4.5–5.7		74	3–18	59	2–10	1.9	51.9
5.95	2,975	500	4.5–5.7		75	3–18	59	2–10	1.9	52.0

Table XIII. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–33( )/MRQ–2
Frequency Range 5.90 to 8.60 mc.

Transmitter tuning						Rhombic or dummy antenna		Rod antenna Antenna tuning unit BC–939–A		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
5.90	2,950	0	5.7–8.0		36	3–18	34	2–10	1.8	51.9
6.00	3,000	14	5.7–8.0		40	3–18	34	2–10	1.7	52.1
6.10	3,050	26	5.7–8.0		43	3–18	34	2–10	1.6	52.3
6.20	3,100	38	5.7–8.0		46	3–18	34	2–10	1.6	52.6
6.30	3,150	50	5.7–8.0		49	3–18	34	2–10	1.6	52.8
6.40	3,200	63	5.7–8.0		52	3–18	35	2–10	1.5	53.0
6.50	3,250	76	5.7–8.0		54	3–18	35	2–10	1.5	53.2
6.60	3,300	89	5.7–8.0		56	3–18	35	2–10	1.4	53.4
6.70	3,350	102	5.7–8.0		58	3–18	35	2–10	1.4	53.6
6.80	3,400	115	5.7–8.0		61	3–18	36	2–10	1.3	53.8
6.90	3,450	129	5.7–8.0		63	3–18	36	2–10	1.3	54.0
7.00	3,500	143	5.7–8.0		65	3–18	36	2–10	1.3	54.2
7.10	3,550	157	5.7–8.0		67	3–18	36	2–10	1.2	54.4
7.20	3,600	172	5.7–8.0		69	3–18	36	2–10	1.2	54.5
7.30	3,650	188	5.7–8.0		71	3–18	37	2–10	1.2	54.7
7.40	3,700	205	5.7–8.0		73	3–18	37	2–10	1.1	54.9
7.50	3,750	223	5.7–8.0		74	3–18	37	2–10	1.1	55.1
7.60	3,800	242	5.7–8.0		76	3–18	37	2–10	1.1	55.2
7.70	3,850	261	5.7–8.0		77	3–18	37	2–10	1.1	55.4
7.80	3,900	281	5.7–8.0		79	3–18	38	2–10	1.0	55.5
7.90	3,950	303	5.7–8.0		80	3–18	38	2–10	1.0	55.7
8.00	4,000	326	5.7–8.0		82	3–18	38	2–10	1.0	55.8
8.10	4,050	350	5.7–8.0		83	3–18	38	2–10	0.9	55.9
8.20	4,100	375	5.7–8.0		84	3–18	38	2–10	0.9	56.0
8.30	4,150	402	5.7–8.0		85	3–18	39	2–10	0.8	56.2
8.40	4,200	431	5.7–8.0		87	3–18	39	2–10	0.8	56.3
8.50	4,250	463	5.7–8.0		89	3–18	39	2–10	0.8	56.4
8.60	4,300	500	5.7–8.0		90	3–18	39	2–10	0.8	56.6

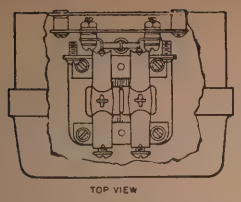
Table XIV. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–34( )/MRQ–2
Frequency Range 8.55 to 12.50 mc.

Transmitter tuning						Rhombic or dummy antenna		Rod antenna Antenna tuning unit BC–939–A		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
8.55	2,137.5	0	8.0–11.0		39	3–18	26	2–10	0.8	56.5
8.60	2,150	5	8.0–11.0		40	3–18	26	2–10	0.8	56.6
8.70	2,175	13	8.0–11.0		42	3–18	25	2–10	0.8	56.8
8.80	2,200	21	8.0–11.0		45	3–18	25	2–10	0.8	56.9
8.90	2,225	29	8.0–11.0		47	3–18	25	2–10	0.8	57.1
9.00	2,250	38	8.0–11.0		49	3–18	24	2–10	0.8	57.2
9.10	2,275	47	8.0–11.0		51	3–18	24	2–10	0.8	57.3
9.20	2,300	56	8.0–11.0		53	3–18	24	2–10	0.8	57.5
9.30	2,325	65	8.0–11.0		55	3–18	24	2–10	0.9	57.6
9.40	2,350	74	8.0–11.0		56	3–18	24	2–10	0.9	57.7
9.50	2,375	83	8.0–11.0		58	3–18	23	2–10	0.9	57.8
9.60	2,400	92	8.0–11.0		59	3–18	23	2–10	0.9	58.0
9.70	2,425	101	8.0–11.0		61	3–18	23	2–10	1.0	58.1
9.80	2,450	110	8.0–11.0		62	3–18	23	2–10	1.0	58.2
9.90	2,475	119	8.0–11.0		64	3–18	23	2–10	1.0	58.4
10.00	2,500	128	8.0–11.0		65	3–18	22	10–18	1.1	2.5
10.20	2,550	147	8.0–11.0		67	3–18	22	10–18	1.1	2.9
10.40	2,600	168	8.0–11.0		69	3–18	22	10–18	1.1	3.8
10.60	2,650	190	8.0–11.0		71	3–18	22	10–18	1.2	4.3
10.80	2,700	214	8.0–11.0		74	3–18	22	10–18	1.2	5.0
11.00	2,750	239	8.0–11.0		77	3–18	21	10–18	1.2	5.6
11.20	2,800	265	8.0–11.0		79	3–18	21	10–18	1.3	6.3
11.40	2,850	294	8.0–11.0		81	3–18	21	10–18	1.3	6.8
11.60	2,900	324	8.0–11.0		83	3–18	21	10–18	1.4	7.3
11.80	2,950	357	8.0–11.0		85	3–18	21	10–18	1.4	7.8
12.00	3,000	392	8.0–11.0		87	3–18	20	10–18	1.5	8.3
12.20	3,050	431	8.0–11.0		89	3–18	20	10–18	1.5	8.8
12.40	3,100	474	8.0–11.0		91	3–18	20	10–18	1.5	9.2
12.50	3,125	500	8.0–11.0		92	3–18	20	10–18	1.5	9.4

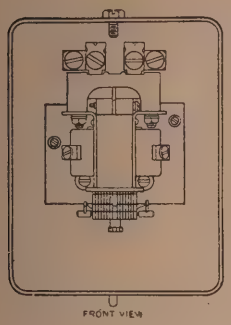
Table XV. Tuning Chart, Radio Transmitter T–55( )/MRQ–2 (XC–2) Transmitter Tuning Unit TN–36( )/MRQ–2
Frequency Range 12.45 to 18.10 mc.

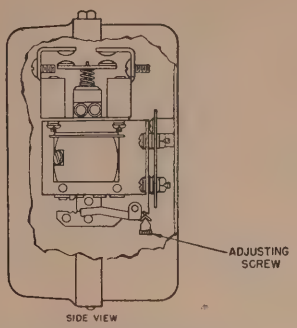
Transmitter tuning						Rhombic or dummy antenna		Rod antenna Antenna tuning unit BC–939–A		
Operating freq. (mc)	Xtal freq. (mc)	Exciter tuning dial	Power amplr. coil range (mc)	Vacuum cap (mmf)	P-a tuning dial	Ant. select sw	Rhombic cplg. dial	Band sw position	Cplg.	Loading
12.45	3,112.5	0	11.0–14.0		62	3.18	20	10–18	1.4	9.3
12.60	3,150	11	11.0–14.0		64	3.18	20	10–18	1.4	9.6
12.80	3,200	22	11.0–14.0		66	3.18	20	10–18	1.4	10.0
13.00	3,250	34	11.0–14.0		68	3.18	20	10–18	1.3	10.4
13.20	3,300	45	11.0–14.0		70	3.18	20	10–18	1.3	10.7
13.40	3,350	56	11.0–14.0		72	3.18	20	10–18	1.3	11.0
13.60	3,400	68	11.0–14.0		74	3.18	20	10–18	1.3	11.4
13.80	3,450	80	11.0–14.0		76	3.18	20	10–18	1.3	11.6
14.00	3,500	92	11.0–14.0		77	3.18	20	10–18	1.3	11.8
14.20	3,550	104	11.0–14.0		79	3.18	20	10–18	1.3	12.0
14.40	3,600	117	11.0–14.0		80	3.18	19	10–18	1.3	12.4
14.60	3,650	130	11.0–14.0		81	3.18	19	10–18	1.3	12.7
14.80	3,700	144	11.0–14.0		83	3.18	19	10–18	1.2	13.1
15.00	3,750	159	11.0–14.0		84	3.18	19	10–18	1.2	13.4
15.20	3,800	174	11.0–14.0		86	3.18	19	10–18	1.2	13.7
15.40	3,850	189	11.0–14.0		87	3.18	19	10–18	1.2	14.0
15.60	3,900	206	11.0–14.0		88	3.18	19	10–18	1.2	14.3
15.80	3,950	223	11.0–14.0		89	3.18	19	10–18	1.2	14.6
16.00	4,000	241	11.0–14.0		91	3.18	19	10–18	1.2	14.9
16.20	4,050	259	14.0–18.0		54	3.18	19	10–18	0.8	15.3
16.40	4,100	279	14.0–18.0		56	3.18	18	10–18	0.8	15.7
16.60	4,150	300	14.0–18.0		58	3.18	18	10–18	0.8	16.0
16.80	4,200	322	14.0–18.0		60	3.18	18	10–18	0.8	16.3
17.00	4,250	345	14.0–18.0		62	3.18	18	10–18	0.8	16.6
17.20	4,300	369	14.0–18.0		64	3.18	18	10–18	0.8	16.9
17.40	4,350	396	14.0–18.0		65	3.18	18	10–18	0.8	17.3
17.60	4,400	422	14.0–18.0		67	3.18	18	10–18	0.8	17.7
17.80	4,450	451	14.0–18.0		69	3.18	18	10–18	0.8	18.2
18.00	4,500	483	14.0–18.0		70	3.18	18	10–18	0.8	18.7
18.10	4,525	500	14.0–18.0		71	3.18	18	10–18	0.8	19.0

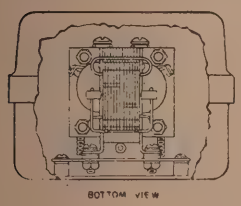
RELAY RY1
PART NO. 21D056
SIG. C. STOCK NO. 2Z7590-88
USED ON RADIO TRANSMITTER
T-55/MRQ-2



APPROVED TYPE
ALLEN BRADLEY A209(MODIFIED)







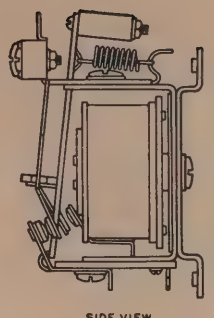
ELECTRICAL CHARACTERISTICS

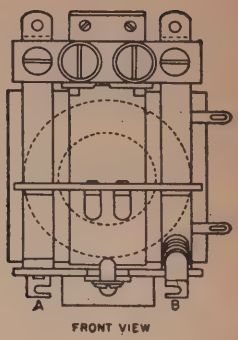
NOMINAL OPERATING VOLTAGE-117 V A-C 50/60 CYCLES
PULL IN VOLTAGE-A-C 60 CYC 90V OR LESS
RELAY MUST BE ADJUSTED TO OPERATE AT 95 V A-C WITHOUT BUZZING
COIL RESISTANCE 97 OHMS ± 10%
RELAY BUILT FOR TROPICAL SERVICE OPERATION
CIRCUIT-DOUBLE POLE SINGLE THROW NORMALLY OPEN
CONTACTS RATED AT 20 AMPS 90% P.F LOAD 25 AMPS NON-INDUCTIVE LOAD
CONTINUOUS DUTY AT 115 V A-C 60 CYCLES
TEMPERATURE RISE OF COIL MUST NOT EXCEED 70°C IN AIR AS MEASURED BY THE RESISTANCE METHOD.
ALL FERROUS PARTS OF RELAY ARE ZINC CHROMATE TREATED EXCEPT POLE FACES
ALL CONTACTS AND TERMINALS ARE SILVER PLATED

TL 11792-S

Figure 34. Radio Transmitter T–55/MRQ–2, relay RY1, front, top, bottom, and side views.

RELAY RY2
PART NO. 21A006-D
SIG. C. STOCK NO. 2Z7717.5
USED ON RADIO TRANSMITTER
T-55/MRQ-2







APPROVED TYPE
GUARDIAN NO. G32423

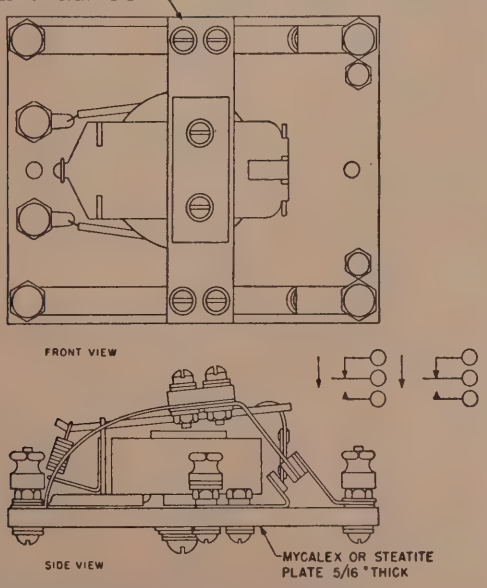
ELECTRICAL CHARACTERISTICS

NORMAL OPERATING VOLTAGE-115 V A-C 60 CYCLES.
MINIMUM OPERATING VOLTAGE-95 V A-C 60 CYCLES.
BREAK DOWN VOLTAGE BETWEEN WINDING AND FRAME-1500 V.
RESISTANCE OF COIL-750 OHMS.
CONTACTS TO BE FINE SILVER.
COIL TO BE VARNISH IMPREGNATED FOR TROPICAL SERVICE.
ARMATURE TO BE COUNTER-BALANCED FOR OPERATION UNDER VIBRATION.
A-CONTACT TO HAVE 50 GRAMS CONTACT PRESSURE.
B-CONTACT TO HAVE 25 GRAMS CONTACT PRESSURE.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR # 1539 WAX OR EQUAL.

TL 11793-S

Figure 35. Radio Transmitter T–55/MRQ–2, relay RY2, front and side views.

RY1A OR RY3
PART NO. 21B001
SIG. C. STOCK NO. 2Z7717.2
USED ON RADIO TRANSMITTER T-55/MRQ-2



ADVANCED ELECTRIC TYPE NO. 400 MODIFIED

ELECTRICAL CHARACTERISTICS

NORMAL OPERATING VOLTAGE-115 V A-C 50-60 CYCLES
PULL-IN VOLTAGE- 95 V A-C.
CONTACT RATING-1/2 AMP. @ 2000 V EACH
CONTACTS TO BE 1/4" DIA. FINE SILVER.
COILS TO BE IMPREGNATED FOR TROPICAL SERVICE.
RELAY SHALL OPERATE WITHOUT CHATTERING AT 95 VOLTS A-C. ①
RELAY SHALL NOT CHATTER WHEN OPERATED AT 110 VOLTS A-C AND SUBJECT TO A VIBRATION ACCELERATION OF 8G.
CONTACT PRESSURE TO BE NOT LESS THAN 30 GRAMS IN EITHER ENERGIZED OR NON-ENERGIZED POSITION.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR #1539 WAX OR EQUAL

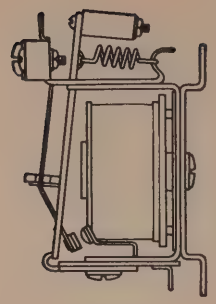
REVISION

① 95 VOLTS WAS 90 VOLTS

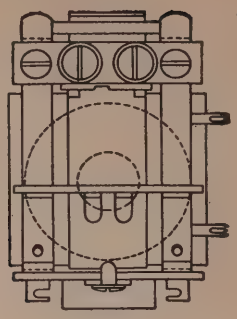
TL11794-S

Figure 36. Radio Transmitter T–55/MRQ–2, relay RY1A or RY3, front and side views.

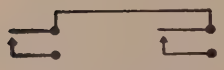
RELAY RY5
PART NO. 21A007
SIG. C. STOCK NO. 2Z7717.4
USED ON RADIO TRANSMITTER
T-55/MRQ-2



SIDE VIEW



FRONT VIEW



CONTACT ARRANGEMENT

APPROVED TYPE ①
GUARDIAN NO. 632422

ELECTRICAL CHARACTERISTICS

① PULL-IN CURRENT - 800MA② ±10MA
COIL RESISTANCE - 6 OHMS
BREAKDOWN VOLTAGE BETWEEN WINDING AND GROUND 900 V
COIL TO BE VARNISH IMPREGNATED FOR TROPICAL SERVICE
ARMATURE TO BE COUNTER-BALANCED FOR OPERATION UNDER VIBRATION.
ALL LAMINATED PHENOLIC TO BE VACUUM WAX IMPREGNATED BEFORE ASSEMBLY WITH ZOPHAR #1539 WAX OR EQUAL.

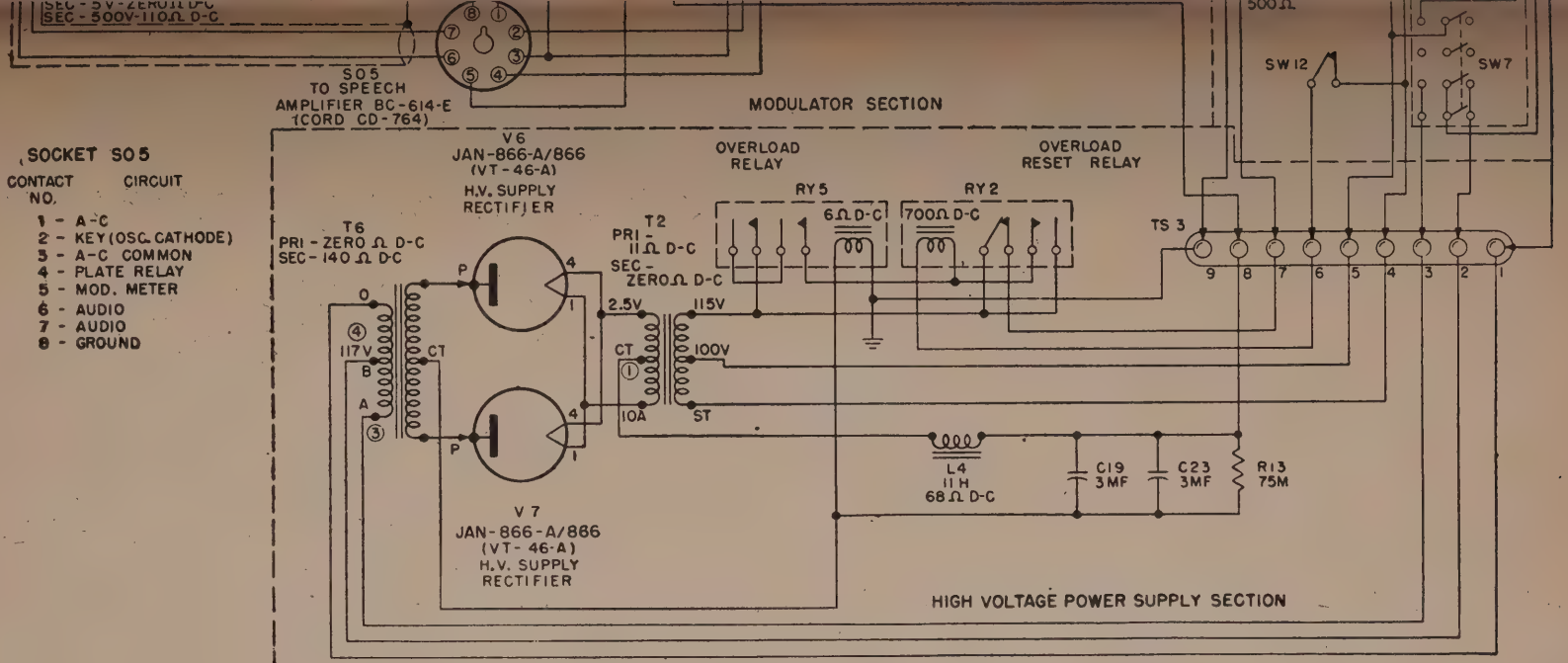
REVISIONS

① "PULL-IN" WAS TERMED "OPERATING"
② 800 MA WAS 750, 700 AND 650
③ G 32422 WAS G 32423

TL11795-B

Figure 37. Radio Transmitter T–55/MRQ–2, relay RY5, front and side views.

☆ U. S. Government Printing Office : 1946—677220



① ON SOME EQUIPMENTS SECONDARY OF TRANSFORMER T2 IS NOT CENTER TAPPED, & IN THIS CASE CHOKE L4 IS CONNECTED TO PIN 4 OF TUBE V6.

② CAPACITOR C29 REPLACED WITH 0.0002 MF, 5000 WORKING VOLTS D-C ON ORDER NO. 30204 PHILA-43 IN MODELS FOLLOWING NO. 5066.

③ WITH SW7 AT PHONE POSITION, TAP A IS USED GIVING 2000 VOLTS ON SECONDARY TO C.T

④ WITH SW7 AT CW POSITION, TAP B IS USED GIVING 2600 VOLTS ON SECONDARY TO C.T

NOTE: RESISTANCE VALUES APPLY ONLY TO COMPONENTS DISCONNECTED FROM CIRCUIT; RESISTANCES LESS THAN 1Ω ARE GIVEN AS ZERO