EO 35BG-5FRR502-2

ROYAL CANADIAN AIR FORCE

HANDBOOK WITH PART LIST

RECEIVING SET RADIO AN/FRR502

(TMC)

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

LIST OF RCAF REVISIONS

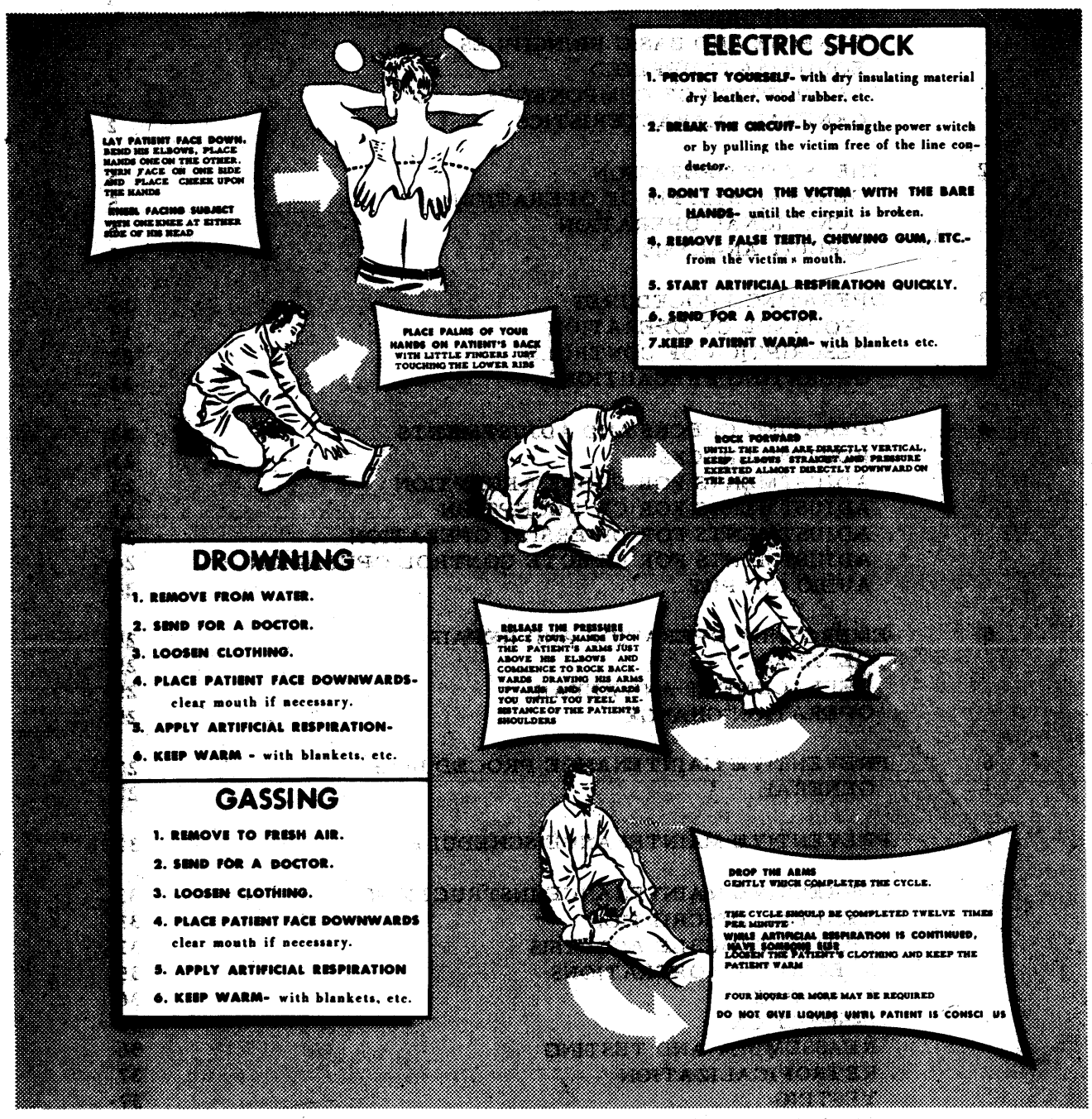
DATE	PAGE NO	DATE	PAGE NO

WARNING

THE VOLTAGES USED IN THIS RECEIVER ARE SUFFICIENTLY HIGH TO ENDANGER LIFE. PRECAUTIONS HAVE BEEN OBSERVED IN THE DESIGN TO SAFEGUARD THE OPERATING PERSONNEL. POWER SHOULD BE REMOVED COMPLETELY AND THE HIGH VOLTAGE CAPACITORS IN THE POWER SUPPLY DISCHARGED MANUALLY WITH A SHORTING BAR WHENEVER THE CHASSIS COVERS ARE REMOVED.

ARTIFICIAL RESPIRATION

HOLGER NIELSON METHOD



ELECTRIC SHOCK

1. **PROTECT YOURSELF-** with dry insulating material dry leather, wood rubber, etc.
2. **BREAK THE CIRCUIT-** by opening the power switch or by pulling the victim free of the line conductor.
3. **DON'T TOUCH THE VICTIM WITH THE BARE HANDS-** until the circuit is broken.
4. **REMOVE FALSE TEETH, CHEWING GUM, ETC.-** from the victim's mouth.
5. **START ARTIFICIAL RESPIRATION QUICKLY.**
6. **SEND FOR A DOCTOR.**
7. **KEEP PATIENT WARM-** with blankets etc.

DROWNING

1. **REMOVE FROM WATER.**
2. **SEND FOR A DOCTOR.**
3. **LOOSEN CLOTHING.**
4. **PLACE PATIENT FACE DOWNWARDS-** clear mouth if necessary.
5. **APPLY ARTIFICIAL RESPIRATION-**
6. **KEEP WARM -** with blankets, etc.

GASSING

1. **REMOVE TO FRESH AIR.**
2. **SEND FOR A DOCTOR.**
3. **LOOSEN CLOTHING.**
4. **PLACE PATIENT FACE DOWNWARDS** clear mouth if necessary.
5. **APPLY ARTIFICIAL RESPIRATION**
6. **KEEP WARM-** with blankets, etc.

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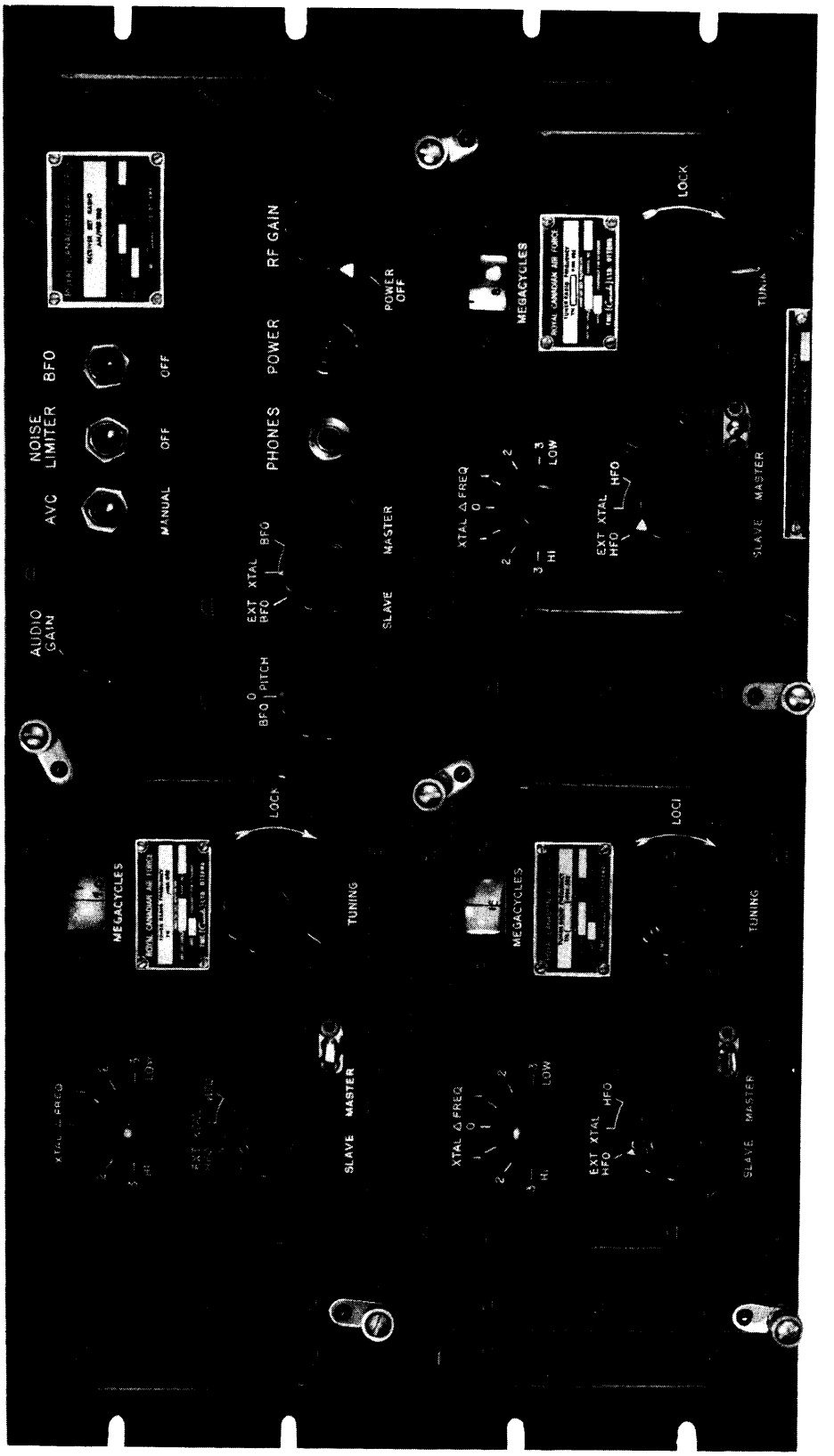


Frontispiece Radio Receiving Set AN/FRR-502

PART 1

GENERAL DESCRIPTION

INTRODUCTION

1 This publication provides operating instructions for the Radio Receiving Set, AN/FRR-502, manufactured by T. M. C. (Canada) Limited, Ottawa, Ontario, Canada.

PURPOSE AND BASIC PRINCIPLES

2 The equipment is designed to provide continuous reception of AM radio telephone, cw telegraph or teletype, and mcw telegraph signals over the frequency range of 2 to 16 mc, but can be extended to 32 mc if required. The equipment is particularly designed for remote control, and such is its prime application. Reference should be made to the Remote Control System described under EO 35BG-5FRA 501-2 prior to fitting of this equipment for remote control service. The receivers may be combined to provide space or frequency diversity reception.

(a) The outstanding feature of this system, which is a departure from the standard conventional single channel receiver, is its ability to provide either crystal or VFO operation of the high frequency oscillator (hfo) and beat frequency oscillator (bfo), plus the incorporation of a series of plug-in front ends (Radio Frequency Tuners), each of which covers an octave of frequency, thus eliminating many of the problems pertaining to multi-band receivers and maximum performance being obtained over each frequency octave.

EQUIPMENT SUPPLIED

3 The AN/FRR-502 is comprised of the following equipments:

Nomenclature	Description	RCAF Ref. No.	TMC Mod 1
R-5007/FRR-502	Receiver Subassembly c/w Cable, Power, TMC Part No. CA-103	10EA/34592	FFR
TN-5010/FRR-502	Tuner, Radio Frequency 2 to 4 mc	10EA/34608	FFRD-5
TN-5011/FRR-502	Tuner, Radio Frequency 4 to 8 mc	10EA/34609	FFRD-6
TN-5012/FRR-502	Tuner, Radio Frequency 8 to 16 mc	10EA/34610	FFRD-7
CY-5045/FRR-502	Cabinet, Electrical Equipment	10EA/37201	FFR-DP

Table 1 Equipment Supplied

DESCRIPTION OF COMPONENTS

4 The Receiver, type R-5007/FRR-502, contains the antenna circuit, power supply, intermediate frequency chain, beat frequency oscillator (bfo) circuit, detector, limiter, and audio stages. A power cable, part CA-103, is supplied with the equipment.

5 The Radio Frequency Tuners, type TN-5010, -5011, -5012/FRR-502 contain the first and second radio frequency (r-f) sections, mixer and oscillator stages. They cover the frequency ranges 2 to 4 mc, 4 to 8 mc, and 8 to 16 mc respectively. The Radio Frequency Tuners are directly interchangeable throughout the system and do not require alignment with any particular receiver. The Radio Frequency Tuners are inserted in the basic receiver chassis through a front panel access, making mechanical and electrical contact to the receiver proper by means of a combination coaxial-dc type multi-connector, the female end of which is permanently fastened to the rear of the tuner, and the male end within the receiver chassis. The Radio Frequency Tuner is locked in position by means of two locks permanently secured to the chassis.

6 The Cabinet, Electrical Equipment, type CY-5045/FRR-502, is a storage assembly for the purpose of stowing two Radio Frequency Tuners when not in operation. It is possible in this unit to wire in heater voltages from an external 6.3 v a-c source to the multi-connector to pre-heat the tubes, thereby eliminating a warm-up period when the drawers are inserted in the receiver.

7 The receiving set is connected to the 110 v a-c power supply by means of a single power cable, part CA-103. This cable is six feet in length, with a molded nonpolarized standard a-c plug at one end, and a "twist-lock" connector of molded phenolic on the other.

8 All operating controls are accessible from the front panels, and are permanently engraved with their titles and functions. See Frontispiece of this publication for details.

GENERAL CHARACTERISTICS

9 The general characteristics of the Receiving Set, AN/FRR-502 are:

Frequency Range	2 to 16 mc in three bands
Band Change	By means of removable drawers as follows: TN-5010/FRR-502 2 to 4 mc TN-5011/FRR-502 4 to 8 mc TN-5012/FRR-502 8 to 16 mc
Types of Reception	AM, cw, and mcw signals. FS when used with audio or i-f type FS converter. Diversity rear connections.
Tuning System	Single dial control
Antenna Input Connections	Balanced 300 ohms, 75 ohms unbalanced
High Frequency Oscillator	(a) Variable manual tuning (b) Fixed crystal control (c) External excitation from a master oscillator (d) Remote control, minimum shift ± 2 kc/mc, 2-8 mc; ± 1.5 kc/mc 8-16 mc for ± 4.5 v d-c control voltag
Beat Frequency Oscillator	(a) Variable manual tuning (b) Fixed crystal control

Beat Frequency Oscillator (cont'd)	(c) External xcitation from a master oscillator (d) Remote control, approx. ± 2.5 kc f r ± 4.5 v d-c control voltage
Sensitivity	1.5 uv for a 10 db S/N ratio
Image Ratio	Better than 60 db for 2-16 mc
AVC Characteristics	With an 80 db change in the input signal "O" r fer nc level, the output remains constant within 12 db. Note: "O" ref-modulated r-f signal of 10 uv.
IF Selectivity	6 db down for 5 kc bandwidth 60 db down for 25 kc bandwidth
Overall Selectivity	Minimum of 6 db down at 5 kc
Output Impedance	8 ohms, 600 ohms, ungrounded
Hum Level	60 db down referred to 2 watts
Output Power	2 watts
Input Power	110/220 volts, 50/60 cps, approx. 80 w
Noise Limited	A noise limiter circuit is provided which is ff ctiv in suppressing impulse noise.
Front Panel Controls	Receiver Subassembly R-5007/FRR-502: (a) NOISE LIMITER ON/OFF switch (b) Pilot light (c) AUDIO GAIN control (d) PHONES jack (e) BFO selector switch, EXT BFO, XTAL, BFO (f) AVC/MANUAL switch (g) BFO ON/OFF switch (h) RF GAIN control, POWER ON/OFF switch (j) BFO PITCH control Tuners, Radio Frequency, TN-5010, - 5011, -5012/FRR-502: (a) r-f TUNING control w/LOCK (b) tuning dial, directly calibrated in fr qu ncy (c) hfo selector switch, EXT HFO, XTAL, HFO (d) crystal trimmer, XTAL (e) hfo crystal socket
Rear Panel Facilities	antenna connections, ANT (E100) fuse, 2 amperes bfo interconnect, BFO OUT, BFO IN hfo interconnect, HFO OUT, HFO IN if. int rconnect, IF OUT audio output a-c pow r sock t hfo ext rnal, HFO EXT

Rear Panel Facilities (cont'd)	r-f gain external, EXT RF GAIN r-f gain internal, INT RF GAIN bfo relay, BFO RLY bfo external, BFO EXT avc relay, AVC RLY (E103) loudspeaker connections 8Ω, 600Ω avc buss connections, AVC audio detector output, DET polarized 4 pin receptacle (J105) carrying the following: (a) regulated high voltage (150) (b) ground (c) filament voltage (6.3)
Mounting	standard 19 inch rack mounting
Size and Weight	see Table 9
Tube Complement	R-5007/FRR-502: 3 ea 6BA6 amplifier 1 ea 6AL5 detector and avc 1 ea 6T8 noise limiter 1 ea 6AQ5 audio 1 ea 6J6 reactance tube 1 ea 6AG5 oscillator 1 ea 5Y3GT rectifier 1 ea OA2 voltage regulator TN-5010, -5011, -5012/FRR-502 each: 3 ea 6AG5 amplifier 1 ea 6AU6 mixer 1 ea 6AG5 reactance tube

PART 2

THEORY OF OPERATION

GENERAL SYSTEM OF OPERATION

1 The following is a general description of the circuits of the Receiving Set, AN/FRR-502.

(a) The Receiver Subassembly, R-5007/FRR-502, utilizes ten tubes plus five tubes for each radio frequency tuner, in a superheterodyne circuit, shown schematically in Figure 11-18. The circuitry employed consists of two stages of r-f amplification, a mixer, hfo, bfo, hfo reactance control, bfo reactance control, three stages of i-f amplification, detector, avc, noise limiter, an a-f amplifier, a power output stage, and an integral power supply to convert the available a-c power to d-c power for operating the various stages.

(b) Contained in each of three radio frequency tuners are two r-f amplifiers, a mixer, hfo, and hfo reactance tube. At the rear of each drawer is a multiple connector plug by which the antenna circuit (A1), the i-f input (A2), the hfo input (A3), the hfo output (A4), the external oscillator injection, the r-f gain control and the power supply voltages are connected to the receiver proper.

(c) The main chassis deck consists of the i-f strip, the audio amplifier, and the bfo assembly. The if. is centred at 455 kc. The associated operating controls are mounted on the front panel of the receiver.

FUNCTIONAL OPERATION

2 Figure 2-1 illustrates a block diagram of the receiver showing the arrangement and functions of the various circuit sections. The radio-frequency signal is amplified in two stages by tubes V500 and V501, and is combined with the output of the local hfo oscillator, V504. The heterodyning action takes place in V502 and produc s an int rm diat frequency f 455 kc, which is further amplified in succ ssiv stag s by V100, V101, V102. Th i-f signal is then detected by the rectifying action of V103 which also develops the d-c v ltag (avc) to vary the bias on the r-f and i-f amplifier tubes.

(a) A triode-diode, V104, provid s n is limiting reduction on cw or modulated cw r ception and audio amplification. The signal is then further amplified in the final audio stag V105, which actuates a loudspeaker or a h adset of 600 ohms impedance or high r.

(b) Continuous wave signals ar mad audible by heterodyning the i-f signal at th second detector V103, by the bfo oscillator V107. For remote control purpos s, s parat d-c voltages of 0 to $\pm$4.5 v each must b connected to the hfo and bfo "EXTernal" t rminal at the rear of the unit. These voltag s control the centre frequency of th hfo and bfo by varying the output impedance of th hfo and bfo reactance modulators, V503 and V106 respectively (refer to Figure 2-4 and 2-8).

CIRCUIT ANALYSIS

3 The main circuit of the R ceiv r AN/FRR-502 is divided for analysis into s cti ns which accomplish specific individual functions. These functions are combined to pr duc th overall receiver function.

R-f Amplifiers (Figure 2-2)

4 The design of the r-f amplifi rs assur s maximum sensitivity for a high signal to n is ratio. The coil assemblies are plac d dir ctly adjacent to their respective s ctions f th four-gang tuning capacitor (C501) at th ir associated tube circuitry. They ar ncl s d in grounded, shielded containers to nsur stability and to minimize oscillation and radiation. Transformers T500 and T501 ar th antenna and r-f transform rs which provid s lectivity, gain and th correct impedanc matching. Th four-gang tuning capacit r,

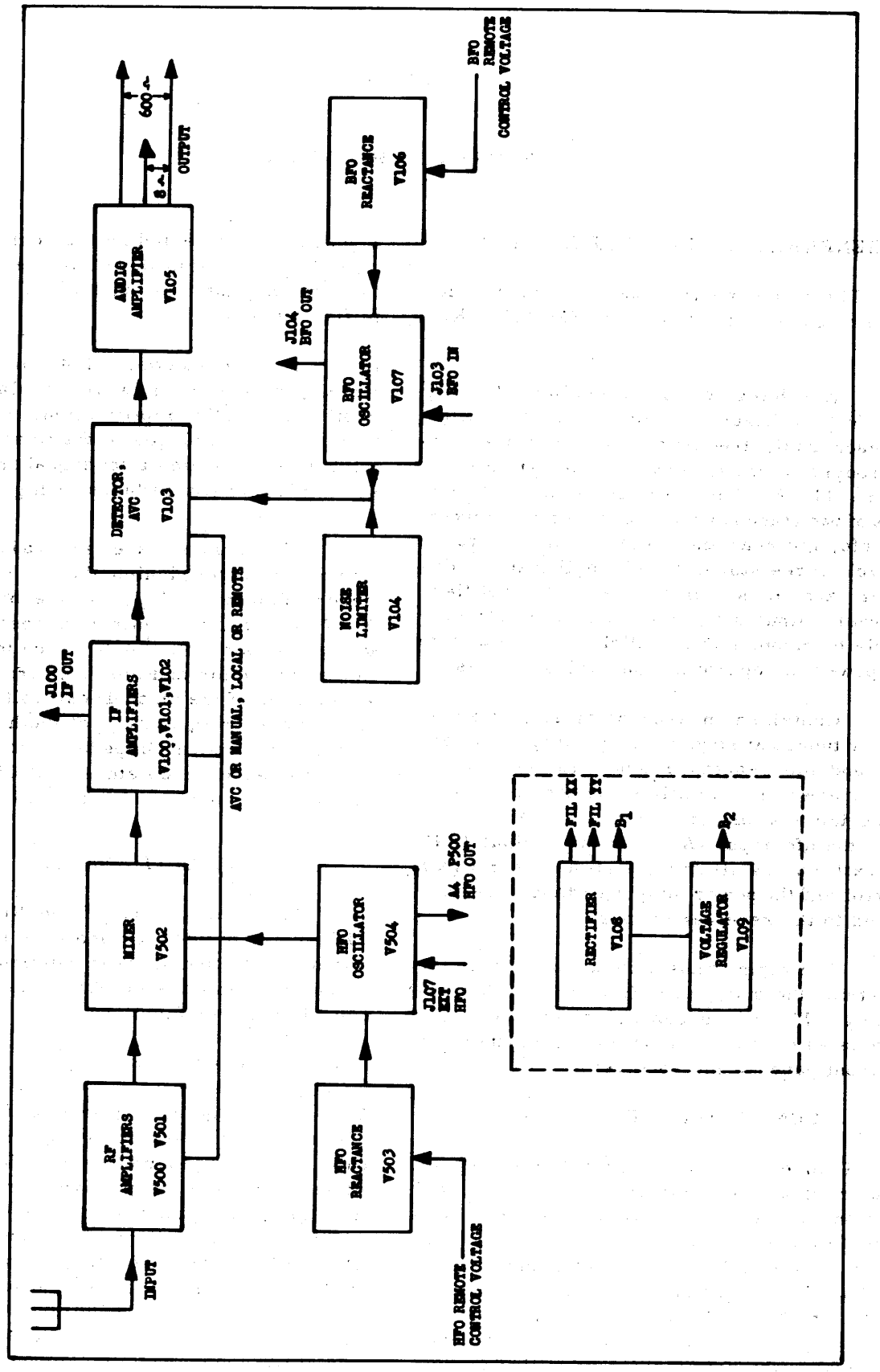


Figure 2-1 Block Diagram Receiver AN/FRR-502

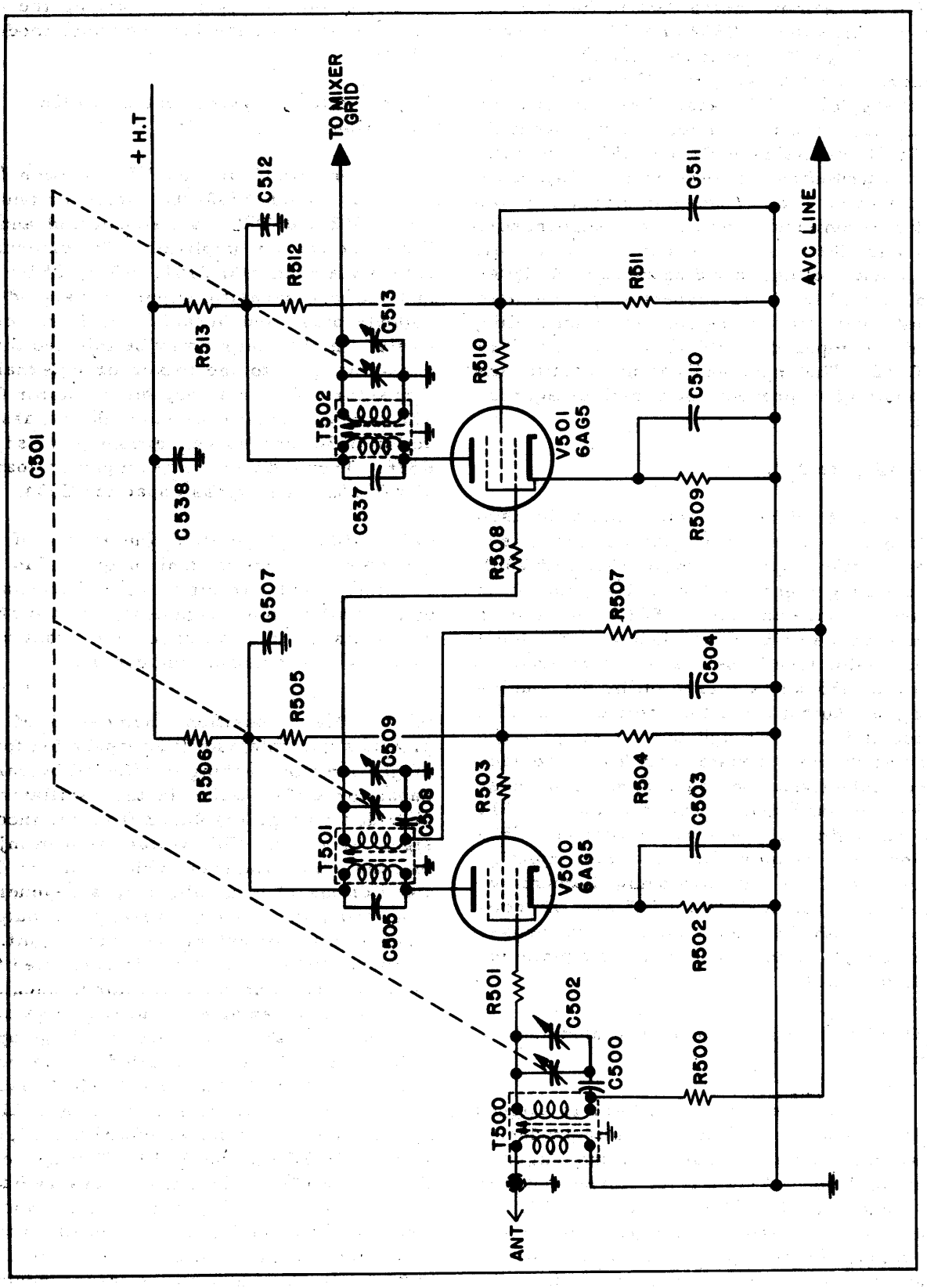


Figure 2-2 Simplifi d Diagram R. F. Amplifier Circuit Rec iver AN/FRR502

(C501), is th main tuning control for the rec iv r. Condensers C502 and C509 are variabl "trimmer" capacitors used for the high frequ ncy band adjustment. The "avc" is fed into th grid of V500 and V501 through the d coupling circuits of R500, C500 and R507 and C508. Resistors R501 and R508 are parasitic suppr ssors for prevention of spurious oscillations. The screen-grid circuits of the two tub s comprise parasitic suppressors R503 and R510, bypass capacitors C504 and C511, and voltage dividing networks R504, R505, and R511, R512 respectively. The plate circuits of the amplifiers consist of decoupling circuits composed of R506, C507, and R513 and C512. The input and output circuits are w ll isolat d to prevent any possible regeneration.

Mix r (Figure 2-3)

5 A 6AU6 triode connected mixer is used for maximum conversion-gain and low noise-factor. Aft r amplification by V500 and V501, th incoming signal is fed to the grid of the frequency converter tube V502, where it is mixed with the voltages produced by the local hfo oscillator tube V504. The difference-frequ ncy of 455 kc is picked off by the double-tun d plat output circuit of transformer T503, whenc it is fed through the i-f strip. The mix r stag input transformer T502 provides furth r s lectivity and added gain. Condenser C513 is th band adjustment "trimmer"; R514 is parasitic suppressor; condenser C535 provid s th coupling for the hfo injection voltag with C514 and C516 being filament bypass capacitors; R515 and C515 are the conv ntional cathode bias resistor and bypass capacitor; R516 and C519 make up a plate decoupling n twork.

Hfo Oscillator and Hfo Reactance Modulator (Figur 2-4)

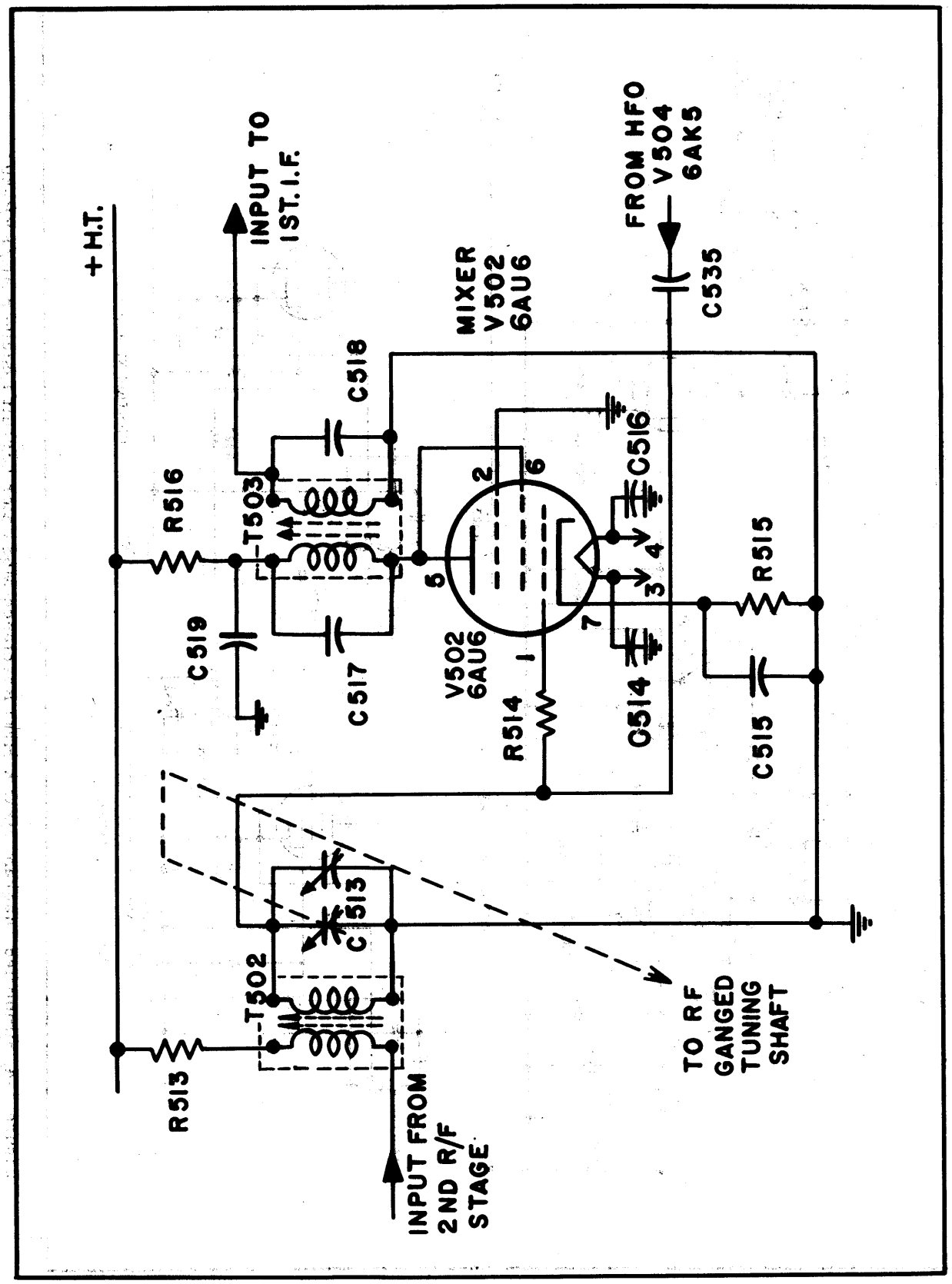
6 Th high frequency oscillator is aligned to track with the r-f amplifiers to produce a 455 kc int rmediate frequency in the output of th mixer tube. A two pole, three position front pan l switch (S500) controls the hfo for Mast r-Slav -Crystal controlled operation. For r mote control purposes, a d-c voltage of z ro to $\pm$4.5 volts is conn ct d to th "HFO EXT" t rminal at th r ar of th rec iv r. This voltag controls th c ntr fr qu ncy of th oscillator by varying th output impedance of the hfo reactance modulat r V503).

Master-Slave-Crystal Control Switch Operation: (Figure 2-4)

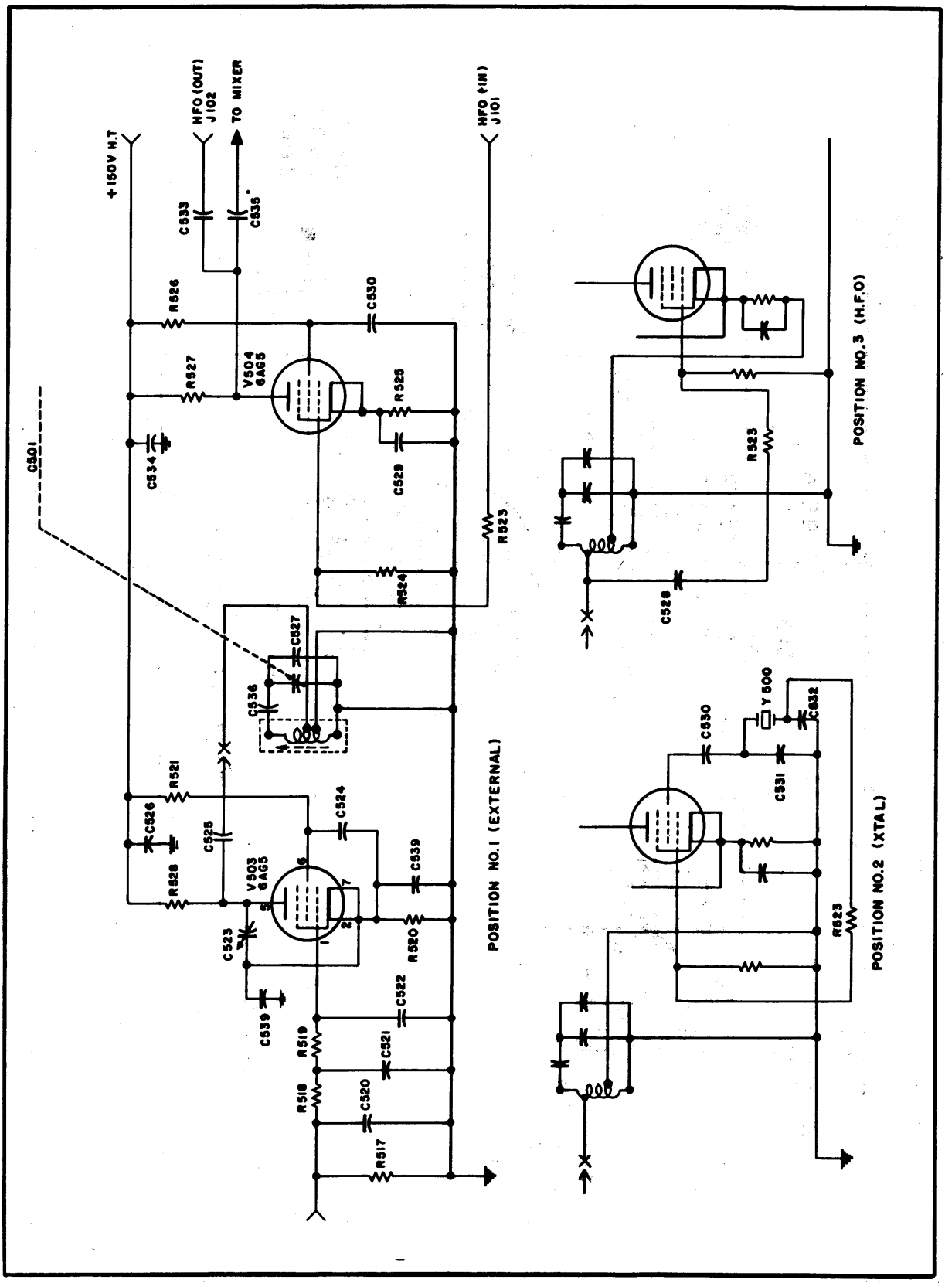
(a) On "EXT" or "SLAVE" position (number 1 of switch S500) the oscillator tank circuit (L502 and C501) is disconnected and tub V504 acts as an amplifier. The external hf enters via connector J101. R523, R524, R525 and C529 are parasitic suppressors, grid bias, cathode bias, and bypass capacitor, respectively. The hfo output may be injected through capacitor C535 to the mixer or externally to connector J102 via a coupling capacitor C533. The screen circuit consists of the bypass capacitor C530 and screen dropping resistor R526. The plate circuit comprises load resistor R527 and bypass capacitor C534.

(b) "XTAL" position (number 2 of S500) provides for cyrstal control of the hfo. Th oscillator tank circuit is again disconnect d by the switching arrangement, and the crystal (when placed in position on the front panel) replaces the resonant tank circuit.

(c) "HFO" position (number 3 of S500) provides variable oscillator operation for this stage. Proper tracking is effected by variabl capacitor C501, which in the oscillator tank provides voltage displaced from the incoming signal by 455 kc. This voltage is then inject d into the mixer stage through capacitor C535. Oscillations are sustained by a regenerativ type feed-back circuit, whereby the output is magnetically coupled to the input circuit. Th reactance modulator V503 is connected to the r-f tank circuit of the oscillator in such a way as to act as a variable capacity of a value d - pendent upon the value of d-c voltage applied to its grid. The dc is supplied by the remote control system to the "HFO EXT" lead on terminal E102, whence it is further filtered by the network comprised of C520, C521, C522, and R517, R518, and R519. The network of C523 and R520 provides the necessary balanc control and bias for operation of the reactanc modulator on the linear portion of its trans-conductance curve. Any variation from zero to $\pm$4.5 volts d-c chang s the transconductanc (G_m) of th tub , which chang s th ff ctiv capacitanc inj cted into th oscillator tank



Figur 2-3 Simplified Diagram Mix r Circuit R c iv r AN/FRR-502



Figur 2-4 Simplified Diagram HFO & HFO Reactance Modulator Circuit Rec iver AN/FRR-502

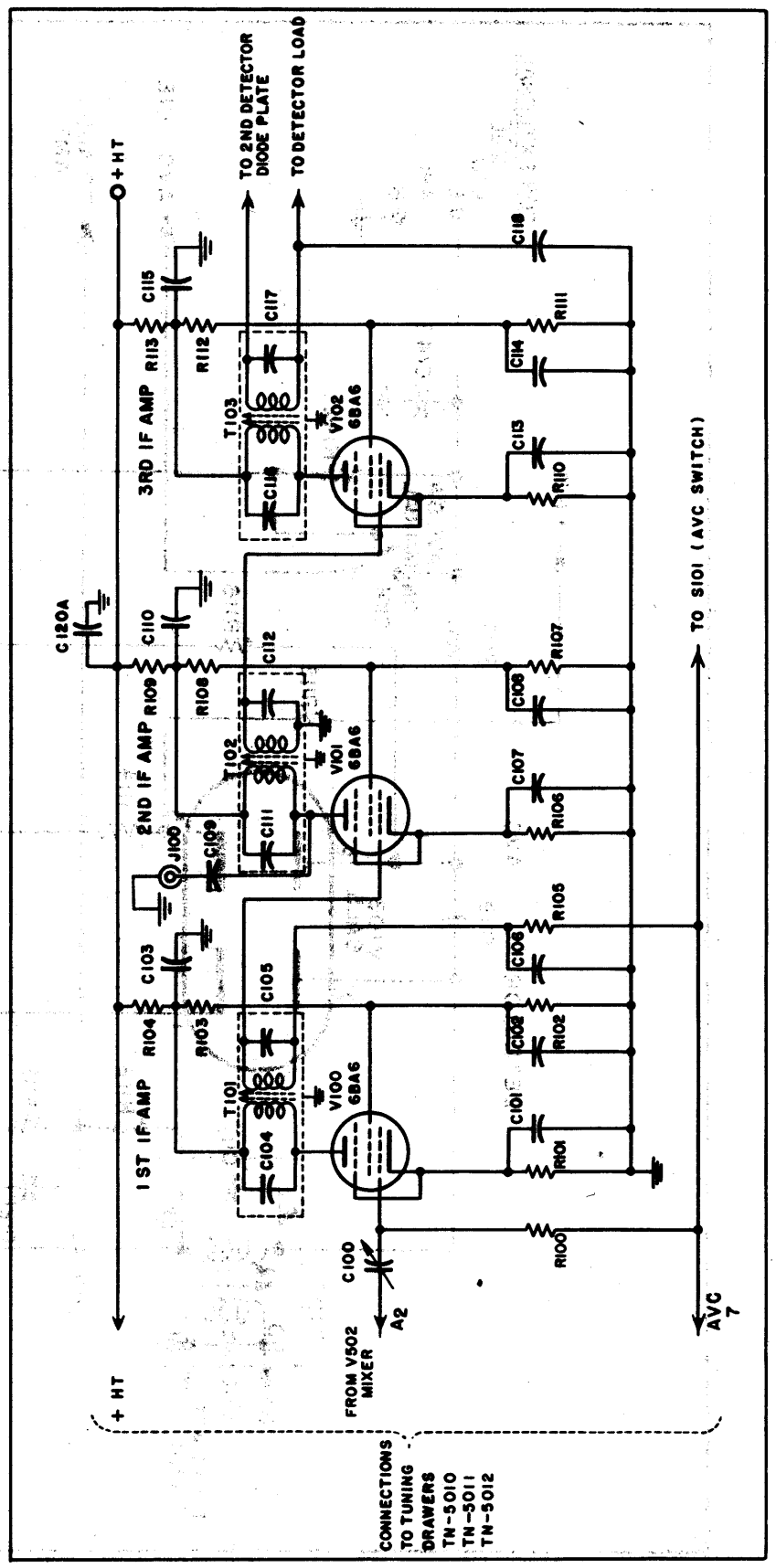
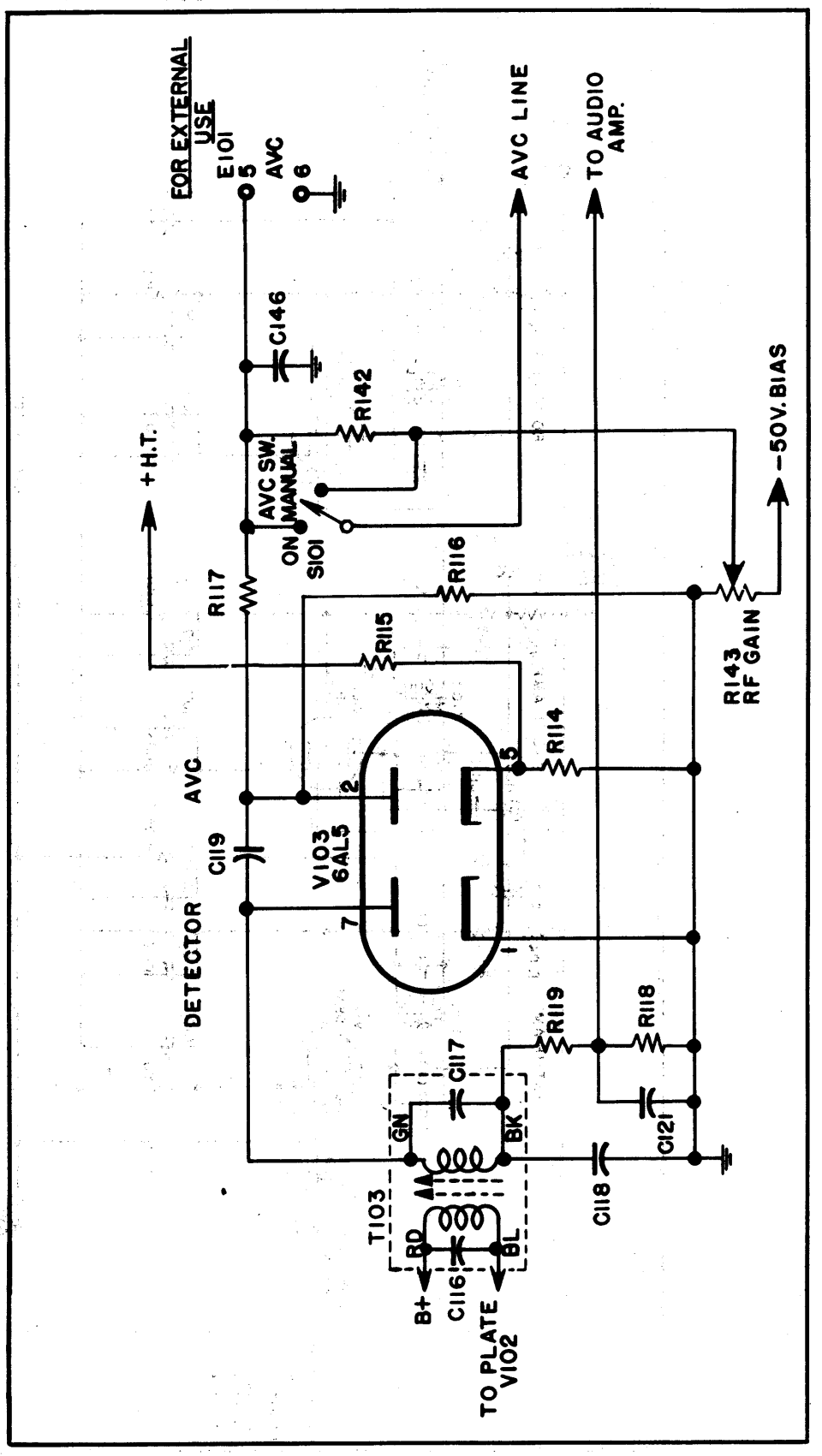


Figure 2-5 Simplified Diagram I. F. Amplifi rs Circuit R c iv r AN/FRR-502



Figur 2-6 Simplified Diagram Detector & AVC Circuit R c iv r AN/FRR-502

circuit through the coupling capacitor C525. The oscillator tank will then effect a ± 2 kc/mc and ± 1.5 kc/mc frequency shift adjustment over the range 2-8 mc and 8-16 mc, respectively. The design of the reactance tube modulator is such that a variation of from zero to + 4.5 volts d-c will decrease the frequency of the oscillator, while an excursion of zero to — 4.5 volts d-c will increase the oscillator frequency.

I-f Amplifiers (Figure 2-5)

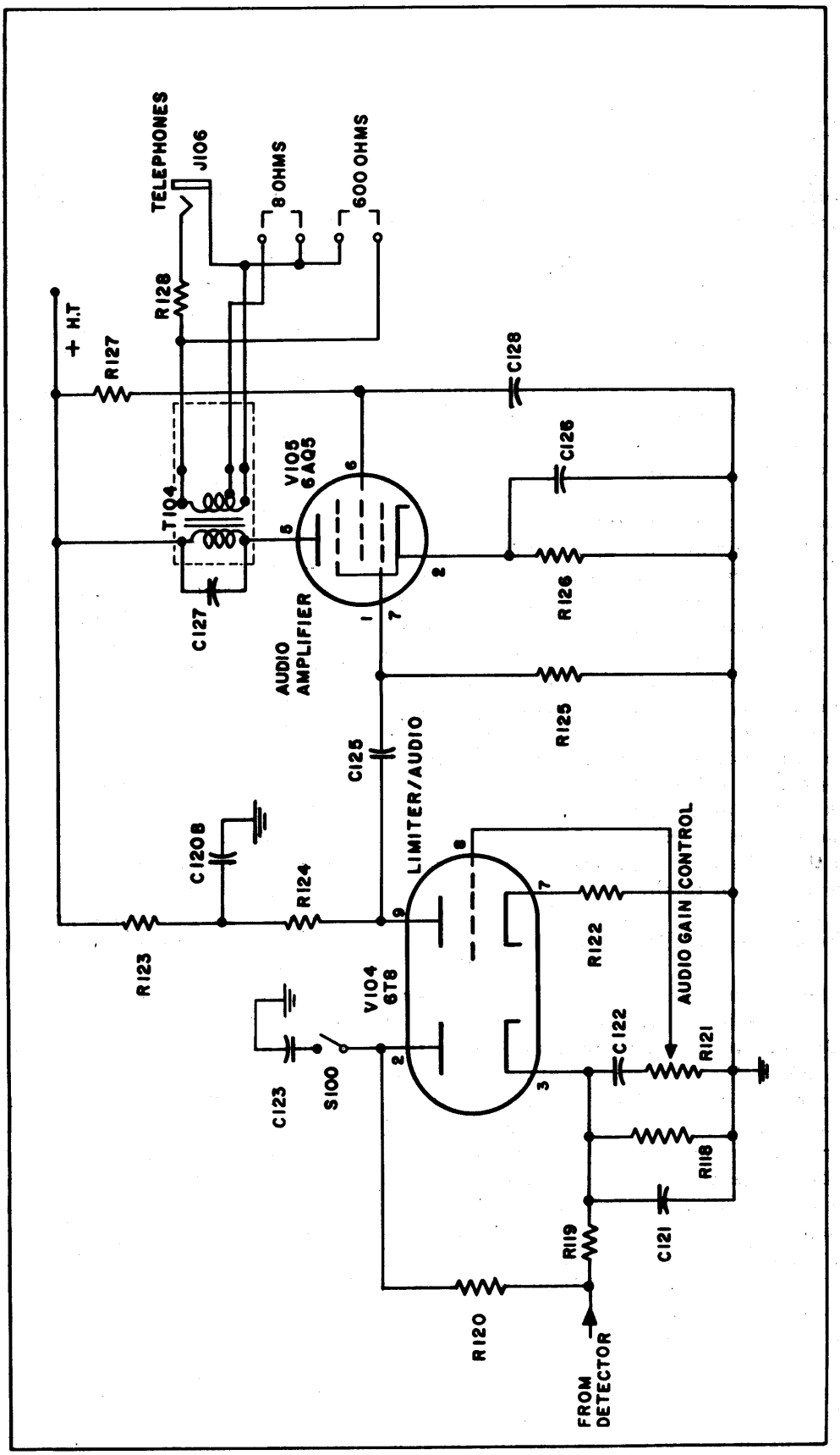
7 Three separate i-f stages of amplification are employed in the receiver to provide adequate gain. The tuned circuits of the i-f amplifiers are transformer coupled, each consisting of a shielding container in which the coils and fixed condensers are mounted. Each i-f transformer has its primary and secondary tuned by means of powdered iron cores, which provide excellent selectivity and gain. The design of the i-f circuit is such that the band-width ratio at 60 to 6 db is less than 5. The avc voltage is fed to the grids of the first and second i-f amplifiers. A connection is made through capacitor C109 to the plate of the second i-f amplifier V101, which supplies the i-f voltage (455 kc) to the i-f output jack (J100) at the rear of the unit. Variable-mu pentodes, V100, V101, and V102 are used in the i-f stages, and grid-bias control is applied to each of them.

Detector and Delayed AVC (Figure 2-6)

8 The detector and avc functions are performed by the duo-diode V103. One plate of the diode section is used for signal detection and the other for avc rectification. The detector circuit includes the i-f tuner circuit T103, the first half of diode V103, the load resistor R118, and bypass capacitors C118 and C121. The flow of rectified i-f current through R118 causes a pulsated d-c voltage to develop across its terminals, this voltage varying directly with the modulation on the signal. Variations in amplitude of the rectified signal with modulation causes corresponding variations in the value of the d-c voltage across R118. The filtering action of the diod rectifi r is carri d out by th n twork comprising C118, C121, R119. Automatic r gulation of the gain of the rec iver in invers proportion to th signal str ngth is accomplished by using the rectified d-c voltag d - veloped across a resistance (R116) in th d - tector-avc output to vary the bias on th r-f and i-f amplifier tubes. Since this voltage is proportional to the amplitude of th signal, the gain is reduced as the signal strength increas s. The if. is fed through the coupling capacitor C119 to the avc diode plate wh r a n gative bias from the rectified carrier curr nt is d - veloped across R116 and applied to th grids of the controlled stages through th delay d action of the network R114 and R115 and stage filtering resistors R500, R507, R100 and R105. The delayed action is accomplish d by the negative bias on the avc diode b ing made equal to the d-c drop through the cathod r - sistor R114. Thus, no rectification tak s place in the avc diode circuit until th carri r amplitude is large enough to overcom this bias. The avc constants are so designed as to d lay the avc action until a pre-determin d signal level has been obtained in order to not reduce the basic sensitivity of the receiv r. Th time constant of the R117 and C146 combination in the avc circuit is sufficient for th various types of modulation encountered in th pera- tion of the receiver.

Limiter, Audio (Figure 2-7)

9 A series-diode noise limiting circuit effects noise reduction on cw or modulat d reception when impulse noise is pr s nt. Th circuit "chops" noise peaks at th s cond detector by means of a diode (first half of V104) which becomes non-conducting abov a signal level predetermined by its associated time constant network (C123 and R120). A front panel switch, S100, permits th optional us of the noise limiter. The second s ction of V104 is a resistance-coupled audio-amplifi r triode, in whose grid is placed th conv ntional audio-volume control. The pulsating d-c voltage developed across the detector load r - sistor R118, is coupled through C122 to a potentiometer (R121) which varies th injection to the audio amplifier. Thus, th volum may be adjusted to any desired lev l. V105 is a beam power audio amplifier, driv n by th triode section of V104, and deliv rs 2 watts into an 8 or 600 ohm load. A phon jack (J106) located on th front pan l, permits us of a h ads t of 600 ohms impedanc through a dropping r sistor R128. The output transform r T104 provid s th prop r imp danc



Figur 2-7 Simplifi d Diagram Limiter, Audio Circuit Rec iv r AN/FRR-502

matching. Resistors R122 and R126 provide the necessary cathode bias for their respective tubes. Resistor R123 and capacitor C120 provide the plate filter network to the first audio tube. Resistor R127 and capacitor C128 are the screen filtering network in the final stage. C125 is a coupling capacitor; C126 is the conventional cathode bypass capacitor; C127 is the plate audio bypass capacitor. The resistor R124 is the first audio plate resistor, while R125 is the grid biasing resistor for V105.

BFO and BFO Reactance Circuit (Figure 2-8)

10 Continuous wave signals are made audible by beating another signal against the incoming signal to produce an audible tone. This is called heterodyning and is performed by the beat frequency oscillator which is set to differ in frequency from the if. by a suitable audio frequency. The bfo employs a magnetic-coupled Hartley circuit in the grid of V107 which is stable in operation and produces a minimum of oscillator harmonics. A front panel switch, S103 (similar to the one used in the hfo) selected either Master-Slave or crystal controlled bfo operation. To permit remote control operation of the bfo tuning, the input to the bfo reactance circuit is brought out to terminals on board E102. Maximum control is effected when ± 4.5 volts are applied to these terminals.

(a) On "EXT" or "SLAVE" position (number 1 of switch S103) no oscillations are sustained as the switching arrangement disconnects the oscillator circuit (L103 and C136) from the grid input to V107. The input is now fed from an external bfo voltage impressed upon it through connector J103. The bfo output is injected to the second detector stage through the coupling capacitor C144, and connector J104 is provided for external bfo injection. The bfo (ON/OFF) switch (S104) is always operated in its "BFO" position when bfo is required. This switch connects the HT to the bfo circuit.

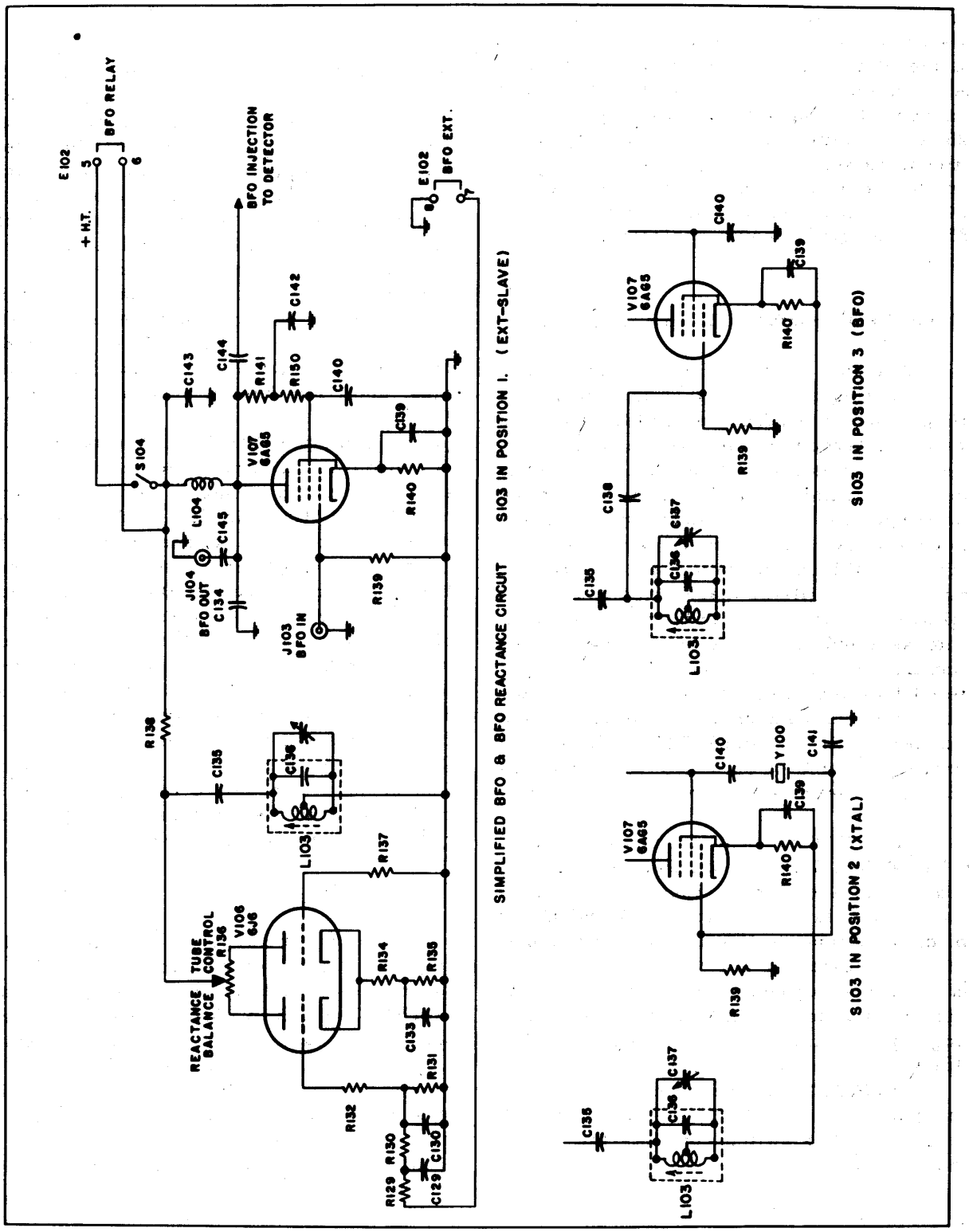
(b) "XTAL" position (number 2 of S103) provides for crystal control of the bfo. The oscillator circuit (L103, C136) is disconn ct d thr ugh th switching arrangem nt, and th circuit b com s a crystal oscillat r by ins rting crystal Y100 in its plac . Th amount of feedback to maintain oscillation is through th regeneration capacitor C140.

(c) "BFO" position (number 3 of S103) provides variable oscillator op ration of the bfo. The magnetic coupling betw n the two sections of the tank coil (L103) provides the feedback necessary to maintain oscillations. The bfo pitch may be controlled by tuning C137 which changes the resonant fr qu ncy of th oscillator (L103 and C136) and is variabl ± 2 kc either side of zero. The tub scr en circuit is grounded in this position of S103. Functions of the main components in th circuit are: L104 r-f choke, R141 scr n dropping resistor, R139 grid leak, R140 cathod bias, and C139 cathode bypass capacitor.

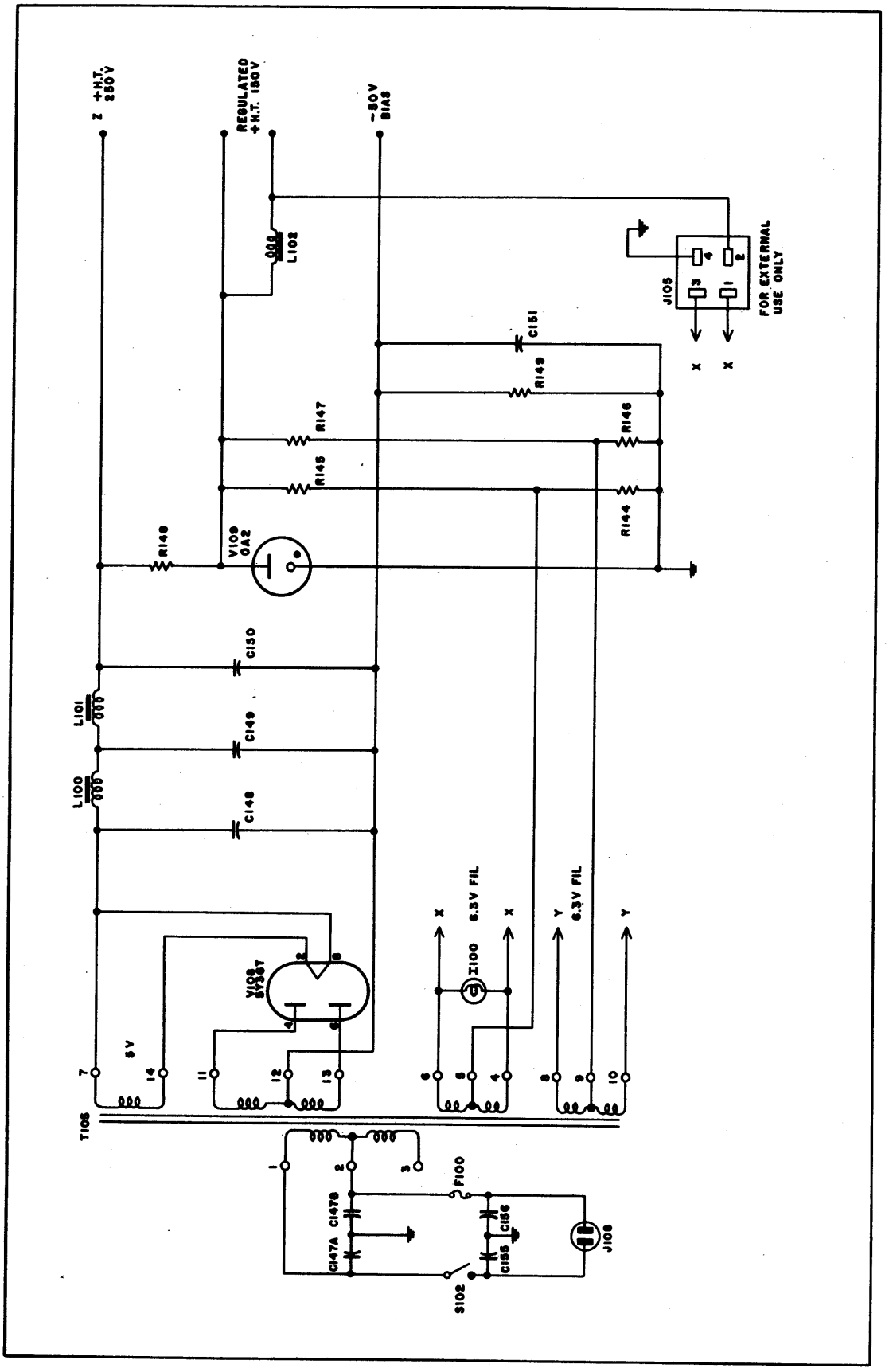
(d) Remote control of the centre-fr qu ncy of the bfo is made possible by th injection of a ± 4.5 volts d-c into a balanc d r actanc modulator (V106) similar to th operation of the hfo. A positive voltage on th grid of th first half of V106 increases its transconductance (G_m) and decreases its output inductanc . At the same time, the bias on th s cond half of V106 is increased, and its transconductance (G_m) is reduced, which causes a reduction of output capacitance. Thus, th simultan ous decrease of inductance and decr as of capacitance injected into the oscillatory circuit of the bfo increases the resonant frequ ncy. Conversely, a negative excursion of voltage on the grid of the first half of V106 will d - crease the resonant frequency.

Power Supply (Figure 2-9)

11 The power supply is self-contain d and consists of a power transformer (T105), rectifier (V108), voltage regulator (V109) and a double section pi-filter. Th transform r connections are shown for both 110 and 220 volts a-c, 50/60 cycle operati n. Th tub filaments are supplied with 6.3 volts a-c from terminals 8 and 10 on T105, the pilot light I100 from terminals 4 and 6, and the r ctifi r with 5 volts from terminals 7 and 14. Th filt r for the rectified voltage is compris d of C148, C149, C150, L100, and L101. Th voltag regulator compensates for chang s f load and lin voltag to provid a constant v ltag of 150 volts to th oscillator and r actanc tub circuits of th radio fr quency tun r and main r c iv r chassis.



Figur 2-8 Simplified Diagram BFO & BFO Reactanc Circuit R c iv r AN/FRR-502



Figur 2-9 Simplifi d Diagram Power Supply Circuit Receiv r AN/FRR-502

PART 3

OPERATING PROCEDURES

SEQUENCE OF OPERATION

Phone Reception

1 The steps required to put the receiver into operation are as noted hereunder (Figure 3-1). When these steps are accomplished, the receiver is then adjusted for phone reception and will tune to the frequency shown on the dial.

(a) Select the Radio Frequency Tuner covering the desired frequency range and plug it into the receiver proper.

(b) Turn the "RF GAIN" control (9) to the "ON" position. The front panel pilot light should be lighted as a result.

(c) Set the hfo "SLAVE MASTER" switch (2) to the "HFO" position. If crystal-controlled operation of the hfo is desired, insert the appropriate crystal in the hfo crystal socket and set the switch to the "XTAL" position.

(d) Set the "RF GAIN" control (9) fully on and the "AUDIO GAIN" volume control (4) to the desired audio level.

(e) Set the "NOISE LIMITER" (6) and "AVC-MANUAL" switch (5) to the desired mode of operation.

(f) Tune in to the desired station via the "TUNING" dial (3).

(g) Once the desired frequency is attained, adjust the "RF GAIN" control (9), the "AVC-MANUAL" switch (5), and the "AUDIO GAIN" (4) volume control to the desired value.

CW Reception

2 For cw reception, the receiver is tuned in the same manner as described above with the exception that the "BFO-OFF" switch is turned to its "BFO" position and the bfo "SLAVE-MASTER" switch is set to its "BFO" position. For crystal controlled operation of the bfo, in teletype reception, set the bfo "SLAVE-MASTER" switch S103 to the "XTAL" position and insert a 455 kc ± the required beat frequency crystal in socket XY100. Crystal socket XY100 is accessible either through the tuning drawer aperture, or by removal of the receiver top cover.

Diversity Operation

3 Two FFR receivers may be used for diversity reception. Figure 3-2 illustrates the proper connections for this type of operation. The following connections must be made:

(a) Connect the "AVC" terminals of the two receivers in parallel with a patch cable. (Terminals 5 and 6 of E101).

(b) Connect the "DETECTOR" terminals of the receivers in parallel with a patch cable. (Terminals 7 and 8 of E101).

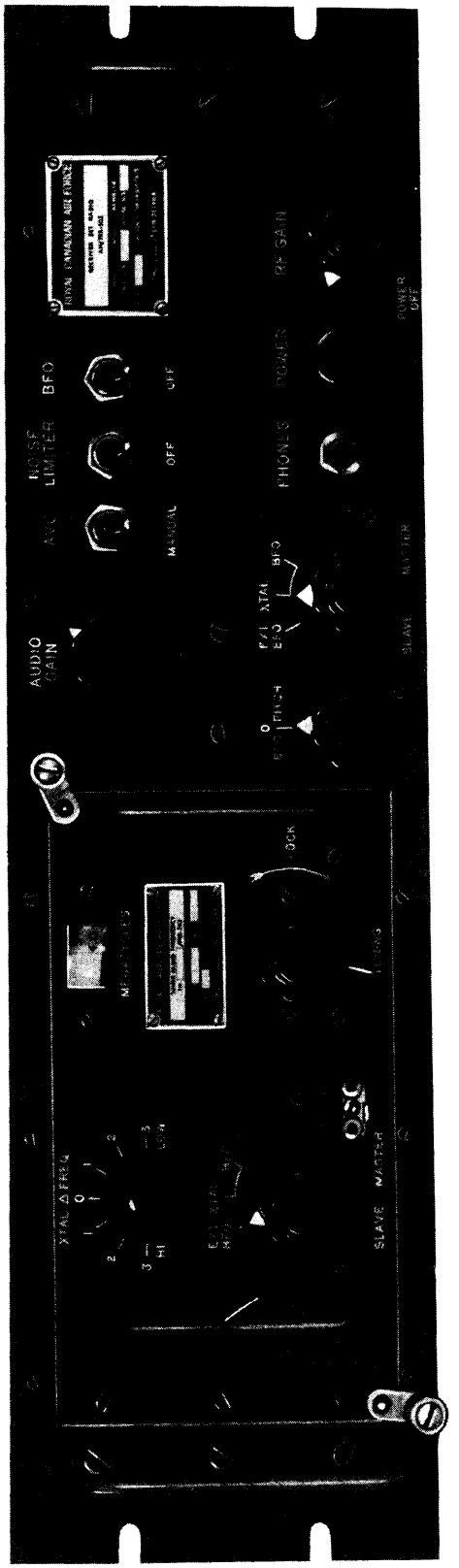
(c) Connect a shielded low capacitance cable from the hfo output connector of the receiver to be used as "Master" to the hfo input connector of the other receiver. (Terminals J102 and J101 respectively).

(d) Set the hfo "SLAVE-MASTER" switch of the "Master" receiver to the "HFO" position, and the "Slave" receiver to the "EXT" position.

(e) Set the bfo in exactly the same manner as described in steps (3) and (4) above, using output terminals J104, "BFO OUT" and J103, "BFO IN".

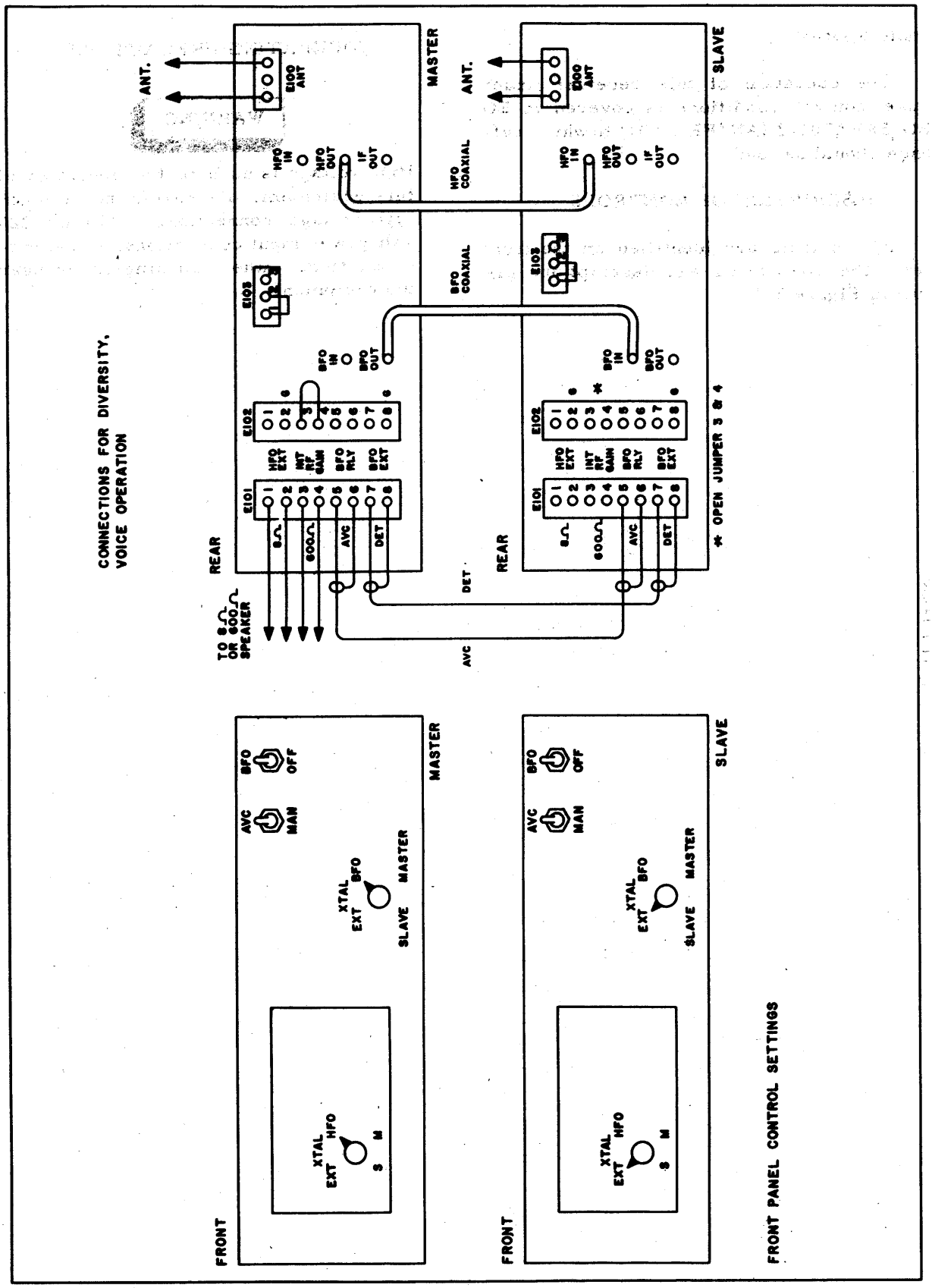
(f) Turn the "BFO-OFF" switches of both receiver to the "BFO" position.

(g) On the slave receiver, remove the jumper between points 3 and 4 on E102.



Index No.	Ref. Symbol	Panel Markings	Function
1	C532	"XTAL FREQ"	HFO Crystal Trimmer
2	S500	"SLAVE MASTER"	EXT, XTAL, or HFO
3	C501	"TUNING"	Tuning
4	R121	"AUDIO GAIN"	AF Gain Control
5	S101	"AVC-MANUAL"	AVC or Manual Control
6	S100	"NOISE LIMITER-OFF"	Noise Limiter ON/OFF
7	C137	"BFO PITCH"	BFO Pitch Control
8	S103	"SLAVE MASTER"	EXT, XTAL, or BFO
9	S102	"RF GAIN, POWER OFF"	RF Gain Control, Power ON/OFF Switch
10	S104	"BFO-OFF"	BFO ON or OFF

Figure 3-1 Operating Controls, R-5007/FRR502 & TN-5010/FRR-502



Figur 3-2 Conn ctions for Diversity Op ration R c iv r AN/FRR-502

R mote Control.

4 Th operation of this receiver under remote control conditions is covered in EO 35BG-5FRA501-2 (AN/FRA-501) to which reference should be made.

DESCRIPTION OF CONTROLS

5 All controls are identified on the front panel. The location and descriptions are shown in Figure 3-1.

OPERATING PRECAUTIONS

WARNING

High voltage is used in the operation of this equipment. Be careful not to touch high-voltage connections, 110 or 220 volt power input connections, or r-f output connections, when working on or near the equipment.

PART 4

OPERATING CHECKS AND ADJUSTMENTS

ROUTINE CHECKS

1 A minimum of time and effort is required daily to assure proper operating of the receiver.

(a) The receiver when shipped from the factory is wired for 110 volts a-c, 50/60 cycle operation only, and the operator should be careful to check his electrical supply voltage prior to connecting the receiver to it. If it is required to operate the receiver from a 220 v a-c, 50/60 cycle source, a simple wiring change in the tapped primary circuit of the power transformer is necessary. This change is made directly on the power transformer terminal lugs by connecting the power line to terminals 1 and 3 on the primary of the main transformer T105.

(b) Check that the antenna connections are made to the proper terminals at the rear of the unit (terminal board E100). The input impedance has been designed to match a balanced 300 ohm or an unbalanced 75 ohm transmission line. When using a balanced 300 ohm line, one side is to be connected to terminal number 1, and the other side to terminal number 2; when using a 75 ohm unbalanced line, connect the shield to the ground terminal, number 3, and the centre conductor to terminal number 1.

(c) Check that all the tubes are firmly seated in their respective sockets and the filaments are lighted. Make certain that the loudspeaker is connected to the proper terminals to match its impedance (either 8 or 600 ohms) on terminal strip E101 on the rear chassis.

(d) Once the desired tuning drawer has been selected, the operator should tighten the lock nuts on the front panel in order to secure th draw r to th main chassis.

( ) If r c ption is sub-normal aft r prop r conn cti ns, ch cks and c ntrol s ttings hav been made, then trouble shooting should b introduced to ascertain if the troubl is due to faulty circuits or components.

ADJUSTMENTS FOR PHONE RECEPTION

2 When the avc is being used, the "RF GAIN" control should be advanced as far as receiving conditions permit. How ver, th "RF GAIN" control may be retard d to r duc any objectionable disturbances or background noise. The operation of the avc will b restricted unless the "RF GAIN" control is fully advanced. The operator should adjust the audio output volume entirely by us of the "AUDIO GAIN" control.

ADJUSTMENTS FOR CW RECEPTION

3 When the bfo "SLAVE-MASTER" switch is on the "XTAL" position, the "BFO PITCH" control is inoperative. In the pr s nc of a strong cw signal, the bfo injection may not b sufficient to give good heterodyn action, in which case the "RF GAIN" should b r duc d to a desirable level. The bfo inj ction has been optimized around weak and m dium signals. A large bfo injection caus s a high r avc voltage to be developed and th r by d - creases the basic receiver sensitivity.

ADJUSTMENTS FOR DIVERSITY OPERATION

4 Since the audio output of only on r - ceiver is required, the operator should turn down the audio gain of the "Slav " rec iv r and use only the gain of the "Master" r ceiver. If an external oscillator is us d, both r - ceivers should be set to the "EXT-SLAVE" position. For crystal controlled op ration of either the hfo or bfo, insert a crystal in th "Master" receiver and set the "SLAVE-MASTER" switch to th "XTAL" position. Do not insert a crystal in th "Slav " r c iv r, but mer ly s t th "SLAVE-MASTER" switch to the "EXT" position. Th bfo switch of both

r c iv rs must b turn d to th "BFO" position.

NOTE

On th "Slave" receiver, remove the jump r between terminals 3 and 4 on board E102.

ADJUSTMENTS FOR REMOTE CONTROL OPERATION

5 Wh n the receiver is being controlled r motely, initial set-up in accordance with on of the foregoing types of reception will have b en accomplished. Further details on proc dures are contained in the separate publication covering th R mot Control Syst m, AN/FRA-501 (EO 35BG-5FRA501-2).

AUDIO OUTPUT

6 In some instances the receiver will b installed in a system where the audio output will be fed over telephone lines. Where telephone company lines are used, the input lev l to the line is usually limited by company regulations to a maximum of plus 8 dbm. Lin loss is about 2 db per loop mile at 1000 cycles for a 22 gauge unloaded cable. The above two requirements necessitate the use of a lin amplifier at the other end of the line to restor the level to a usual value. It is desirable to insert a pad of not less than 6 db between the receiver output and the telephone line.

PART 5

EMERGENCY OPERATION AND REPAIR

GENERAL

1 There are no emergency operational procedures for this equipment. In the event of a failure, first check that the receiver is set up in accordance with Part 4, and that line voltage is present at the receiver input receptacle.

REPLACEMENT AND REPAIR

2 The following are classed as minor replacements:

Fuse Replacement

(a) To replace the fuse (F100, Figure 11-13) turn the fuse holder counter-clockwise until it unscrews. Pull the holder out; change the fuse; and replace the holder.

Pilot Light Replacement

(b) To replace the pilot lamp, pull out the glass jewel of the pilot light assembly. Turn the bayonet base lamp counter-clockwis until it pops out of its socket. Replac th lamp by pushing down gently and turning clockwise. Replace the glass jewel.

Tube Replacement

(c) All tubes shown in Figur 11-4 are accessible from the top of the r c iv r. No circuit re-adjustments are nec ssary wh n changing tubes.

(d) For replacement of tubes in th Radio Frequency Tuners, refer to Figur s 11-5, 11-6, 11-7 respectively.

OPERATION CHANGE

3 When changing from mcw to cw op ration, set the "BFO-OFF" switch t th "BFO" position, the bfo "SLAVE-MASTER" control to the "BFO" position, and th "AVC-OFF" switch to the "AVC" position (if so desir d).

PART 6

PREVENTIVE MAINTENANCE PROCEDURES

GENERAL

1 For each of the following items refer to the corresponding item number on Table 2.

Item Number 1 - Tubes

2 Test for acceptable operation in a reliable tube tester. Make certain that the tube pins are not broken or bent. Replace the tube in the same socket from which it was removed if its measured characteristics are within the manufacturer's tolerances (usually ±20% from the tube manual values). No special selection is necessary in the event of tube replacement, but the operator should remember that tubes of the same type will vary slightly in their individual characteristics.

Item Number 2 - Controls

3 Inspect for freedom of action, and look for dust, dirt, or corrosion. In the case of the enclosed switch, check the switch action by flipping the toggle. For the rotary type, note the amount of pressure needed to overcome the tension.

Item Number 3 - Receiver

4 Inspect the receiver with respect to the following possible conditions:

Corrosion

(a) Corrosion is shown by the rust which forms on surfaces, screws, or nuts - usually where different metals are in contact.

Burning

(b) Overheating has occurred when parts show blistering, bulging, discoloration, or have a burnt odour.

L akag

(c) L akag is vid nc d by il or insulating compound at the terminals of s al d container parts.

Aging

(d) Aging of the receiver is evid nc d by non-positive or inconsistent operation of movable parts.

Dust and Dirt

(e) The need for cleaning is s lf- vid nt because of the inevitable accumulation of dust and dirt at the tube sockets, resistor boards, and other soldered joints and corn rs.

(f) Besides the physical damag vident by observation, the receiver controls should be checked for proper functioning. With the receiver turned on, check the "RF GAIN" and "AUDIO GAIN" controls for noisy peration, and if found to be defective, r place. Check all tube socket terminals for arcing and charring between terminals. Replac any tube sockets concerned. Check all witch s for arcing and charring between contacts; replace any defective switches.

Item Number 4 - Subassembly

5 The following preventiv maintenance procedures apply to the subass mbly:

(a) Check the dressing of each part, such as resistors, capacitors, coils, t rminal boards, chokes, and the electrical wir l ad lengths. Check the clearance betw n parts and their mounting, and the cod d valu s and tolerances of resistors and capacitors. Also check the part number of the coils, transformer shield assemblies, and th r f r nce symbol number designations.

(b) Check each soldered joint and the location and mann r of grounding.

(c) Ch ck th tightness of nuts, scr ws, clamps and locking of adjustabl tuning cores.

(d) Examine the bak lite boards for scratch s and cracks and the crystal porcelain hold rs for cracking and chipping.

( ) Ch ck the coil assemblies.

(f) Check each coil for continuity and for broken strands. Check for cuts and scratches on th coils and also check to see that the pro-t ctive varnish coating is not chipped.

It m Number 5 - Resistors

6 Almost all of the resistors used in the r c iv r ar of the pigtail, fixed, composition, insulat d type, rated at 1/2, 1 or 2 watts.

(a) Inspect the coating of the higher rating resistors for signs of cracking and chipping at the ends.

(b) Check the body of each resistor for blist ring, discoloration, and breaks due to po sible overheating.

(c) Inspect all leads for dirt, dust, corrosion and looseness. Check all mountings for tightn ss.

It m Number 6 - Capacitors

7 For inspection purposes, the silver mica mold d, the paper molded, and the ceramic capacitors are classified as the pigtail lead typ . Th l ctrolytic tubular and the oil filled paper tubular capacitors are of the terminal type.

Variabl Air Type

(a) Inspect the capacitor for dust, dirt, lint and broken soldering.

(1) Inspect the plate mountings, terminals, and overall condition with respect to loos ness, breaks, nicks, bending, wear or other damages.

CAUTION

Do not attempt to adjust the plates of the main tuning gang capacitor.

(2) Insp ct th r tor and stator plat s, making sur th y do not touch during m shing and that th y are c ntr d with r sp ct to plate spacing.

Pigtail Lead Type

(b) Inspect all the pigtail lead capacitors for lead looseness by applying a firm pull on each capacitor.

(1) Inspect each one for discoloration, breaks, chipping, and make certain that th molded casing completely encloses the capacitor body.

Terminal Type

(c) Inspect the capacitor terminals for insulation cracks, looseness, corrosion, and evidence of leakage in regard to the dry electrolytic capacitors.

(1) Inspect the metal case container of each condenser for bulges, cracks, dents, and other damage. Check to see that the terminal lugs are not loose.

Item Number 7 - Fuses

8 The fuse complement of the receiv r consists of a 2 ampere cartridge type fuse, located on the rear apron of the unit.

(a) Inspect the fuse holder and holder cup for signs of burning, charring, dirt, or corrosion.

(1) Check to see that the spring tension in the fuse holder is sufficient to keep the fus up against the fuse cap.

Item Number 8 - Coils and Chokes

9 Inspect each r-f coil, i-f coil and r-f choke for cleanliness, quality of soldering, firmness of terminals and assemblies, loos coil turns, and fungicidal varnishing. Do not attempt to remove the cans used for shielding purposes. Check to see that there are no nicks or cracks in the coil forms or in the varnish coating. Inspect the coils and chokes for continuity. Check the d-c resistance of each winding.

It m Numb r 9 - Pot ntiom t rs

10 Th rec iv r utiliz s pot ntiom t rs as

"RF GAIN" and "AUDIO GAIN" controls. Inspect the metal parts for dust, dirt, and corrosion. Check to see whether there are loose terminal lugs, a loose body assembly, or a loosely keyed shaft. Inspect the insulated body for cracks and chipping. Make sure that the shaft turns smoothly but firmly in its mounting. Do not touch the adjustments on R136, the Balance Reactance potentiometer.

Item Number 10 - Terminal Boards

11 Inspect each terminal board with regard to loose brackets, terminals, eyelets and rivets. Check the terminal board insulation for cracks, breaks, dirt, charring, or possible breakdown due to corrosion of the metal parts on the boards.

Item Number 11 - Cables and Cord

12 The main wiring cable, and the a-c power cord comprise the cord and cable complement. The main wiring cable is prefabricated at the factory and includes shielded cables. Inspect the insulation of all the cables and cord for cracks, deterioration, cuts and kinks. Check the cord and cables for broken strands and fraying of the insulation. Make certain that the braided shield of the shielded insulated lead cables does not short the cable lead wires.

Item Number 12 - Connectors and Sockets

13 The hfo and bfo input and output, the i-f output, the a-c input, the power supply jack, the phone jack, the r-f connectors, the lamp sockets, and the electron tube sockets comprise the connector and socket complement of the receiver. Inspect the insulation of each for dirt, dust, corrosion, charring and cracks. Inspect the contacts for dust, corrosion, breaks and looseness. Inspect each connector and socket with regard to the contact provided when its complementary plug or tube is inserted.

Item Number 13 - Transformer and Reactors

14 The audio and power transformers plus the power supply filter reactors are of the container type construction. The audio and power transformers are hermetically sealed and impregnated, while the filter reactors are semi-sealed. Inspect for blistering, bulging, or leakage from the containers. Check for broken, cracked, or charred insulation at the terminals. Inspect the terminals for looseness, and for any accumulation of dust, dirt, and lint.

PART 7

PREVENTIVE MAINTENANCE SCHEDULE

1 The operations outlined in the following Preventive Maintenance Schedule are intended as a guide only. When the receiver is used under adverse conditions, this schedule should be revised as necessary.

2 The "Operation" column of the sch dule makes use of the FITCAL syst m which consists of the following series of prev ntiv maintenance operations: Feel, Insp ct, Tighten, Clean, Adjust, Lubricate.

NOTE

None of the receiver parts requires lubrication.

Item No.	Operation	Item Description	When Performed					
			Daily	Weekly	Monthly	Quarterly	When Necessary	Maintenance Level
1	I	Tubes				X		1
2	I	Controls			X			1
	T						X	2
	C						X	2
3	I	Receiver				X		1
	C						X	1
4	I	Subassembly				X		2
	T						X	2
5	I	Resistors				X		2
	C						X	2
6	I	Capacitors				X		2
	C						X	2
7	I	Fuses					X	1
	C						X	1
8	I	Coils and Chokes					X	3
	C						X	3
9	I	Potentiometers			X			2
	T						X	2
	C						X	2
	A						X	2
10	I	Terminal Boards			X			2
	T						X	2
	C						X	2
11	I	Cables and Cord				X		1
12	I	Connectors and Sockets				X		1
	T						X	1
	C						X	1
	A						X	2
13	I	Transformers and Reactors				X		3
	C						X	3
	A						X	3

Table 2 Preventive Maintenance Schedule

PART 8

CORRECTIVE MAINTENANCE INSTRUCTIONS

GENERAL DESCRIPTION

1 The general characteristics of the Receiving Set, AN/FRR-502 have been covered in Part 1, paragraphs 4-6 of this manual. All parts are removed either by Dzus fasteners or standard machine screws and nuts. When dismantling a set of this type, care should always be taken that all hardware is placed in a separate container as it is disassociated from the equipment so that it may be re-used when reassembly is undertaken.

Pertinent Data

2 All the receiver inter-connecting facilities are located on the rear apron, except the phone jack on the front panel. The rear apron also contains a two-ampere cartridge type fuse in series with the power transformer primary winding. The front panel of the receiver contains all the receiver operating controls. The coil adjustable tuning cores and trimmer capacitors used to align the receiver maintain their alignment and adjustment s ttings for long periods of time. The rec iv r r-f coils, and r-f chokes are fungicidal varnished for tropicalization, and metal parts ar dipp d so that corrosion is kept to a minimum. Since all possible precautions are taken at th factory to ensure the perfect condition of ach receiver, overhaul and correctiv maint nance require a minimum of unsold ring and replacement of parts.

Tools

3 There are no special tools required to disassemble this receiving set.

SYSTEM TROUBLE ANALYSIS

4 In order to isolate a defect prior to corrective maintenance, the System Trouble Analysis Chart, Table 3, and Tables 6, 7 and 8 should be referred to and the steps perform d in the order in which they appear.

Step	Test Point	Test Equipment Control Position	Receiver Control Position	Normal Indication	Possibl Caus of Abnormal Indication
1	pin 1, V105 (1)	Inject a 1000 cps signal generator output through a 0.01 uf capacitor between pin 1 and ground, at level for 20 v rms receiver output across 600 ohms output load.	None	Receiver input approx 4 v rms	V105, T104, C126, C128, R126, R127, E101, R125, C127
2	pin 8, V104 (2)	Same as Step 1	"AUDIO GAIN" control set at maximum.	Receiver input approx .5 v rms	V104, R121, R122, C125, R124, E101, C120B

Table 3 (She t 1 of 3) System Trouble Analysis Chart

Step	Test Point	Test Equipment Control Position	Receiver Control Position	Normal Indication	Possible Cause of Abnormal Indication
3	pin 1, V102 (3)	Inject 455 kc modulated 30% at 1000 cps at level to give 20 v rms across a 600 ohm load.	"AUDIO GAIN" and "RF GAIN" controls at max., "BFO" and "NOISE LIMITER" off, "AVC" to "MANUAL"	Input to pin 1, V102, 50,000 uv.	C113, C114, C115, C118, C121, R110, R111, R112, R114, R116, R117, R118, R119, R120, T103, V102, V103
4	pin 1, V101 (4)	Same as Step 3	Same as Step 3	Receiver input approx 1100 uv.	C107, C108, C109, C110, J100, R106, R107, R108, R109, T102, V101
5	pin 1, V100 (5)	Same as Step 3	Same as Step 3	Receiver input approx 30 uv.	C101, C102, C103, C105, C106, R101, R102, R103, R104, R105, T101, V100
6	lead A2, J107 (6)	Same as Step 3 except output level of 40 v across 600 ohm load.	Same as Step 3	Receiver input approx 100 uv.	C100, R100
7	Receiver Antenna input (7)	Couple signal generator output, 30% mod. at 1000 cps at any receiver tuneable frequency through antenna input cable to test point at level for 20 v receiver output to 600 ohm output load.	"RF" and "AUDIO GAIN" at max., signal tuned in, "LIMITER" off, "AVC-MANUAL" to "MANUAL"	Receiver input approx 1 uv.	C111, E100, T100, C501, C502, C503, C504, C507, C509, C510, C512, C513, C515, C519, C525, C527, C529, C530, C535, L502, R501, R502, R503, R504, R505, R506, R508, R509, R512, R513, R515, R516, R525, R526, R527, S500, T500, T501, T502, T503, V500, V501, V502, V503, V504
8	Same as Step 7	Suitable frequency mod. 30% at 1000 cps level 100,000 uv. Set audio gain to give 20 v across 600 ohm load. Reduce input to 2 uv.	"RF GAIN" to max., "AVC-MANUAL" to "AVC"	Audio frequency to remain constant within 12 db.	C106, C119, C146, E103, J107, R100, R105, R116, R117, S101, C500, C508, R500, R507, V103

Table 3 (Sheet 2 of 3) System Trouble Analysis Chart

Step	Test Point	Test Equipment Control Position	Receiver Control Position	Normal Indication	Possibl Caus of Abnormal Indication
9	Same as Step 7	Same as Step 7, but with generator modulator "off".	Same as Step 7, but switch "BFO" on, and "SLAVE-MASTER" to "BFO" BFO tuning set for 1000 cps	Receiver input approx 1 uv.	C132, C135, C137, C138, C139, C140, C141, C142, C143, C144, J104, L103, L104, R136, R139, R140, R141, R150, S103, S104, V106, V107
10	Terminals 3 and 4 of E101.	Connect AF freq. meter across 600 ohm load at test point. Apply ± 4.5 v d-c to "EXT BFO" terminals on E102.	"RF" and "AUDIO" GAIN" at max., signal tuned in, "LIMITER" off, "BFO" on, and S103 to "BFO"	Frequency shift will be at least ± 2600 cycles.	C129, C130, C131, C133, C135, E102, R129, R130, R131, R132, R133, R134, R135, R137, R138, V106
11	Same as Step 10	Same as Step 10, but apply the ± 4.5 v d-c to "EXT HFO" terminals on E102.	Same as Step 7, but set S500 to "HFO". Set FRR dial to 2.5 mc	Frequency shift will be approx ± 5 kc.	C520, C521, C522, C523, C524, C525, C526, C539, J107, R517, R518, R519, R520, R521, R528, V503

Table 3 (Sheet 3 of 3) System Trouble Analysis Chart

SPECIALIZED OPERATIONS

Resistor Failure

5 After determining the circuit function of the receiver, note if it is isolated or whether it has a d-c voltage drop across it. If the resistor is isolated, use a volt-ohmmeter to see that it has no d-c voltage across it, and then measure the actual resistance value. If there is a d-c voltage across the resistor, turn off the receiver and measure the resistance. In the event that there is a network of resistors, unsolder one resistor lead to isolate the resistor from the whole network of which it is a part.

Open Capacitor

6 In checking for faulty capacitors, first determin the circuit function. An open capacitor provid s a high impedanc path and thus cannot b us d to tun a r sonant circuit. When an open capacitor is in series with th signal path, its input signal indication to ground is higher than its output signal indication to ground. When used for audio filtering, its away-from-ground terminal will show signs of excessive ripple, as compar d to wh n th open capacitor is shunted by a good capacitor. If an open capacitor is used for d coupling r-f circuits, more signal indicati n is obs rv d as compared to when the decoupling cap citor is shunted by a good capacitor.

Shorted Capacitor

7 A shorted capacitor will not hav any d-c or a-c voltage drop across its t rminals. When a trimmer capacitor is short d, it has no trimmer effect on tuned circuits. In this case, and when th capacitor is us d for parall l r sonanc of adjustabl c r s, th signal is usually no long r vident in th subs - quent circuitry.

Leaky Capacitor

8 Wher a suspected capacitor of approximat ly 0.01 uf or larger has no shunt d-c path it may be checked by the following method:

(a) After a thirty minute warm up period, turn off th receiver; set a sensitive volt-ohm-m ter to its highest resistance range and conn ct it across the capacitor terminals. If the capacitor is good, the meter needle should kick, falling back to read infinity as the capacitor charg s. The meter leads should then be r v rsed, and the needle should show a kick of doubl amplitude, again falling to infinity as th capacitor discharges and recharg s to the opposite polarity. This same m thod may be applied to capacitors which hav d-c shunt paths providing that one side of th capacitor is disconnected from its shunt circuit(s). An electrolytic capacitor will show a low and a high resistance value depending upon th ohmmeter polarity. If the higher resistance is l ss than 500,000 ohms or not comparabl to that of a new capacitor of similar type, it should be replaced.

CLEANING

Ov rall

9 It is recommended that the unit be cl an d of dirt, dampness, moulding, charring and corrosion at least semi-annually to prevent failur of the equipment due to corrosion, dust and oth r destructive ambient conditions. Th r c iv r may be blown out with filtered c mpr ss d air at a low pressure.

CAUTION

Under no circumstances should the air j t b dir cted at the vanes of the variabl capacitor.

El ctrical Parts

10 Wh n the receiver is dismantled, all wir d l ctrical parts may be blown out as outlin d above (r f r to paragraph 9). Acc ssibl parts may be wip d with a cl an cloth.

M chanical Parts

11 All mechanical parts such as hardwar , chassis, shields, etc., may be cleaned by brushing with clear carbon tetrachloride, or a similar approved cleaning fluid.

CAUTION

Care should be exercised in the use of carbon tetrachloride as the vapour is highly toxic.

Preservation After Cleaning

12 RF coils: The r-f coils used in the receiver are all treated by dipping in a fungus resistant varnish (JAN-C-173).

(a) Air trimmer capacitor; The four-gang variable air capacitor end bearings are lubricated at the factory with grease (Spec. AN-G-15A) and may be lubricated in the field when necessary.

INSPECTION

General

13 Careful observation while operating th various controls may sectionalize faults to a particular stage or circuit. Some faults, such as burnt out resistors, r-f arcing, and shorted transformers can often be located by sight, smell or hearing. Any minor receiver defect should be repaired as soon as possible since, if neglected, it may be the cause of a major breakdown.

REASSEMBLY AND TESTING

General

14 It is not necessary to reassemble th subassemblies and assemblies in any particular sequence. Since there are no intricat gears, or other mechanical items such as couplings, eccentrics, lever and roller or springs, the whole method of disassembly and reassembly is effected by screws, nuts, and bolts, and by the soldering of wires. The unit is broken down into five main subassemblies: the main chassis d ck, th wrap-around assembly, th pow r supply, th front pan l, and the r-f tuner.

Reassembly

15 The method of reassembly is as follows:

(a) Fasten the tube sockets, standoffs, grounding lugs, and the electrical components on the main chassis deck. Add the four terminal boards.

(b) Wire and solder the wires to the appropriate points.

(c) Lastly, fasten the pan assembly (which nvelops the tuning drawers) by screwing in the six 4-40 machine screws to the main deck.

(d) Add the terminal boards, connectors, plug, fuse and the Shakeproof connectors to the wrap-around assembly.

(e) Reassemble the power supply section following the same procedure as recommended in paragraph 15(a), but leave the free ends of the power supply cable loose to be soldered to the main chassis components.

(f) The front panel assembly is reassembled by fastening the switches, handles, phone jack, control knobs, nameplates, etc., with the appropriate screws to the panel proper.

16 To reassemble the Tuning Drawers:

(a) Fasten the tube sockets, i-f transformers, the variable air capacitor, shield partitions, standoffs, and the electrical components to the drawer deck and solder, remembering that the wiring is point-to-point.

(b) Fasten the r-f connector plug to the Radio Frequency Tuner wrap-around and assemble the wrap-around to the drawer deck by screwing in the light 6-32 machine head screws.

(c) Fasten the tuning dial to the shaft of the variable air condenser by screwing the three 8-32 set screws provided.

(d) Assemble the drawer front panel assembly by fastening the handles and nameplate, and then fasten the control knobs to the front panel using the nut located on each shaft bushing. Add th top and bottom cov rs by using seven and six No. 6-32 machin scr ws, r sp ctiv ly.

(e) Finally, fasten the front pan l assembly to the chassis using six N . 6-32 machine screws.

RETROPICALIZATION

17 The reassembly of the subassembli s requires that all chokes, coils and m tal be covered with fungicidal varnish (per JAN-C-173).

TESTING

18 It is not necessary to test the subassemblies individually. The test proc dure is to reassemble the repaired subassembly or a new one to the receiver and to test th r - ceiver, in accordance with the instructi ns set forth in the following "Alignm nt and Adjustment" procedures. Referenc should also be made to Table 5, "Performance Data" and Table 11, "Performance Standards".

ALIGNMENT AND ADJUSTMENT

General

19 The receiver is aligned and test d by the manufacturers, and it is recomm nded that all glyptol sealed adjustm nts be l ft sealed unless replacement of c mponents and/or tubes in r-f circuits nec sitates r - alignment.

CAUTION

Before realignment, it is ess ntial that suitable solvent be applied to the glyptol sealing, in order to free the scr w threads.

I-f Strip Alignment (Receiver)

20 The alignment procedure is as follows:

(a) Connect a 600 ohm, 10 w r sistor to terminals 3 and 4 of terminal strip E101.

(b) Connect a jumper betwe n t rminals 1 and 2 on E103, and 3 and 4 on E102.

(c) Conn ct an a-c voltm ter to t rminals 3 and 4 on E101.

(d) Insert a 455 kc crystal in th bfo circuit (Y100). Set the bfo "SLAVE-MASTER" switch to "XTAL".

( ) Connect the receiver to the power supply and switch on, setting the "RF GAIN" switch to th maximum, the "AVC-MANUAL" switch to "MANUAL" and the "BFO-OFF" switch to "BFO", the "NOISE LIMITER" switch to "OFF", and the "AUDIO GAIN" switch to the maximum. (Allow 1 hour for warm up.)

(f) Inject a 20 uv signal at 455 kc unmodulated through a 0.01 uf capacitor to socket A2 of J107. Adjust the signal generator frequency until a zero beat is obtained. Lock the ignal gen rator adjustment in this position.

(g) Switch the bfo "OFF" and modulate the ignal generator 30% at 1000 cps.

(h) Adjust the top and bottom cores of transformers T103, T102, T101 in that order f r maximum output.

(j) Increase the signal generator output lev l to 100 uv, and adjust capacitor C100 to give an output of between 36.5 and 40.0 v rms measur d across the 600 ohm load resistor. It is essential that a non-metallic screw driver be used wh n making this adjustment.

(k) At this point, turn off the modulation; switch th "BFO-OFF" to its "ON" position; and s t th bfo "SLAVE-MASTER" switch to its "BFO" position. Set the "BFO PITCH" control on the front panel to its "ZERO" position. At this setting the bfo should produce a "Z ro B at" with the 455 kc test signal. In th event that there is no "Zero Beat" at the "ZERO" s tting, turn the adjustable inductor (L103) on the bottom of the receiver until a "Z ro B at" occurs at the "ZERO" setting.

Adjustment f the R-f Tuning Drawers

21 Th following suggested procedure for alignment of the hfo, r-f amplifier, mixer, and hfo r actance tube requires an accurate signal gen rator, vacuum tube voltmeter, and an accurat bfo such as Technical Materiel Corporation PMO or VOX. If such an instrum nt is not available, th l ss accurate BC221 may b us d. A typical alignm nt of Band 5 will s rv as an exampl , which can b f llowed for all the bands included in the typ FRR.

(a) Place the tuning drawer in the r - ceiver, and set up the receiver and signal generator as in paragraph 20.

(b) Inject a 455 kc signal modulated 30% at 1000 cps to the hfo input jack, J101. Set the hfo "SLAVE-MASTER" switch to "EXT". In this position the hfo acts as an amplifi r and feeds the amplified 455 kc signal to grid number 1 of the mixer, and thence to the i-f strip. Adjust the cores of T503 (T603 or T703 in tuning drawers 6 and 7 respectively) for maximum output.

(c) Connect the signal generator to the antenna terminals. It is necessary that both the signal generator and the receiver impedances be matched, and where necessary a suitable pad should be used. Allowance should be made for the matching pad when setting the attenuator. The generator should be modulated 30% at 1000 cycles. (The hot side of th signal generator is to be connected to terminal 1 of E100, and the ground side to terminal 3.)

(d) Place a high-impedance voltmeter across a 600 ohm load on E101, and plug a s t of earphones into the phone jack if desired. Set the "BFO-OFF" switch to "OFF", th "NOISE LIMITER" to "OFF", the "AVC-MANUAL" to "MANUAL", the hfo "SLAVE-MASTER" switch to "HFO", and the "AUDIO GAIN" to its maximum. Set the signal generator to giv approximately 10 uv at 4 mc and set the drawer tuning dial to 4 mc.

(e) The hfo is set to operate at a frequency above the first detector and r-f amplifiers and not below. The fundamental-image relationship of this receiver is such that the signal image frequency always appears 910 kc higher on the dial of the signal generator (or 910 kc lower on the receiver dial). Referring to the oscillator trimmer C527, starting from th maximum capacity setting in clockwise rotation, two distinct peaks will be obtained. After one of the peaks has been tuned in and assumed to be correct, the signal generator dial is tun d from 4 mc to 4.910 mc. If a signal appears on this n w s tting, th n the peak s tting of the trimm r is corr ct. If th wrong

peak was chosen, the operator should tune the trimmer to its adjacent peak and recheck the 4.910 mc point on the signal generator. In all cases when checking the image frequency, the signal generator output should be increased because of preselector discrimination against image frequencies.

(f) The next step is to set the signal generator and the FRR dial to 3.8 mc and peak the mixer, r-f and antenna trimmers C513, C509, and C502 in that order, the "RF GAIN" being retarded to prevent any possibility of overloading. When adjusting the mixer trimmer, the signal generator should be reset slightly because of the slight pulling effect of the mixer on the hfo oscillator. The mixer trimmer may have two peak settings. One of these is due to the mixer being tuned to the frequency of the hfo oscillator, resulting in large oscillator injection voltage, thus giving an apparent indication of correct alignment. This, however, is the wrong setting. The correct setting is the one with maximum trimmer capacity.

(g) Then tune the signal generator and the FRR dial to 2 mc. Turn the "slug" of the hfo inductor L502 until a peak is noticed on the voltmeter. Check for its image at the 2.91 mc setting on the signal generator, at the same time increasing the signal generator output. Once the correct peak setting of the slug is chosen, set the signal generator and the FRR dial to 2.0 mc and peak the mixer, r-f and antenna slugs in that order. Again, the operator must remember to slightly retune the signal generator because of the slight pulling effect of the mixer on the hfo. Then, return the dial settings of the signal generator and the FRR to 4 mc and repeat the procedure.

(h) Table 4 gives a list of the frequency settings to be followed for the alignment of all bands in the Model FRR. Using the frequencies shown in the table, align the bands in the same procedure as described above.

HFO Reactance Tube

22 It is recommended that the hfo reactance tube be adjusted in the centre band of each head drawer. Set a standard crystal in the bfo circuit and "zero beat" an unmodulated 3 mc signal from a PMO or a VOX oscillator connected to the antenna and with a $\pm$ 4.5 v d-c source connected to the "HFO EXT" terminal on E102. Note the amount of shift when zero-beat has been re-established by turning the PMO or VOX oscillator. Repeat with the opposite polarity. Then trim C523 to give the specified shift and symmetrical balance when the $\pm$ 4.5 voltage has been applied to the reactance tube input. Then repeat the procedure for aligning the r-f head.

BFO Reactance Tube

23 Adjustment of the bfo reactance tube (V106) requires a $\pm$ 3 d-c voltage to be applied between point 7 and ground on terminal board E102 at the rear of the receiver. Connect a high impedance vacuum tube voltmeter, such as the RCA Volt-Ohmyst model, whose scale is thrown off "Zero" to obtain center scale reading, across the points 7 and 8 on E102. The bfo switch is set to its "BFO" position,

	BAND 5		BAND 6		BAND 7	
	LOW END	HIGH END	LOW END	HIGH END	LOW END	HIGH END
OSC.	2.0 mc	4.0 mc	4.0 mc	8.0 mc	8.0 mc	16.0 mc
MIXER	2.1 mc	4.0 mc	4.25 mc	8.0 mc	8.5 mc	16.0 mc
RF	2.1 mc	4.0 mc	4.25 mc	8.0 mc	8.5 mc	16.0 mc
ANT.	2.1 mc	4.0 mc	4.25 mc	8.0 mc	8.5 mc	16.0 mc

Table 4 RF and HFO Alignment Chart

and th "BFO PITCH" control is s t to its "ZERO" po ition. Then proceed as follows:

(a) Connect an oscilloscope across a 600 ohm load on terminal board E101, and plug a set f earphones into the phone jack if desired. Conn ct an audio-oscillator to the horizontal input of th oscilloscope, the vertical input of th oscilloscope being connected across the 600 ohm load. Inject an unmodulated 100 uv, 455 kc signal to A2, J107 and adjust the signal generator to obtain zero beat between the unmodulated signal and the bfo.

(b) Vary th d-c voltag from zero to ± 3.0 v d-c. At these maximum shift voltages, the frequency of the a-f oscillator should be adjusted to obtain a circle or ellipse on the screen of the oscilloscope indicating the fr - quencies of the beat note and the a-f oscillator are the same. The bfo shift should be symmetrical and not less than 2600 cycles either side of zero.

(c) To balance the bfo shift, adjust R136 located on the main deck behind L103. It is important to re-establish zero beat after this adjustment before rechecking the shift.

Radio Frequency Tuner	Frequency in Megacycles	Sensitivity in Microvolts for 1 volt across diode load (Approx. 2 watts output)	Antenna Input in Microvolts for 10 db Signal - Noise Ratio	Imag Ratio
TN-5010/ FRR-502 (FFRD-5)	2.1 3.0 3.9	0.35 uv 0.40 uv 0.40 uv	0.36 uv 0.40 uv 0.35 uv	86000 25000 9500
TN-5011/ FRR-502 (FFRD-6)	3.95 6.00 8.30	0.18 uv 0.25 uv 0.40 uv	0.32 uv 0.35 uv 0.42 uv	31000 7200 1400
TN-5012/ FRR-502 (FFRD-7)	8.00 12.00 16.00	0.9 uv 1.0 uv 0.8 uv	0.44 uv 0.53 uv 0.60 uv.	24500 2800 1000

Table 5 Performance Data (Approximate Values)

PART 9

SUPPLEMENTARY DATA

VACUUM TUBES

1 The replacement of vacuum tubes shall be in accordance with instructions as outlined in EO 35-1-1, "General Telecommunications Information and Instructions".

VOLTAGE DATA CHART

2 The voltages which appear at the contacts f vacuum tubes are presented in Tables 6 & 7.

RESISTANCE DATA CHART

3 The resistances which appear at the contacts of vacuum tubes are presented in Table 8.

ELECTRICAL CHARACTERISTICS OF ANTENNAS

4 75 ohms unbalanced, 300 ohms balanc d.

INPUT AND OUTPUT IMPEDANCES

5 Antenna Input: 300 ohms balanced or 75 ohms unbalanced. Audio Output: 8 ohms or 600 ohms.

POWER SUPPLY

6 The unit is designed for op ration from a 110 volt a-c, 50/60 cycle sourc , singl phase, with a power consumption of approximately 80 watts. If operation from a 200 volt source is required, re-wire the primary circuit of the power transformer T105 as outlin d in Part 4 - 1(a).

TN-5010 RF TUNER

TUNING CONTROL AT 2 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	DC	AC	DC	AC	5	6	7
V500	6AG5	1st RF	-0.01 (6)	+0.7	+6.0	6.0*	+6.0	6.0*	+145	+ 60	+0.7
V501	6AG5	2nd RF	-0.01 (6)	+0.7	+6.0	6.0*	+6.0	6.0*	+145	+ 59	+0.7
V502	6AU6	Mixer	0	—	+6.0	6.0*	+6.0	6.0*	+125	+125	+2.4
V503	6AG5	HFO React. Mod	0	+3.7	+6.0	6.0*	+6.0	6.0*	+140	+130	+3.9
V504	6AG5	HFO Osc.	-0.01 (6)	+0.5	+6.0	6.0*	+6.0	6.0*	+ 52	+80	+0.5

Tabl 6 Tub Socket Voltag s (Sh t 1 of 3)

TN-5011 RF TUNER

TUNING CONTROL AT 4 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	DC	AC	DC	AC	5	6	7
V600	6AG5	1st RF	-0.04①	+0.70	+6.0	6.0*	+6.0	6.0*	+155	+ 64	+0.70
V601	6AG5	2nd RF	-0.02①	+0.65	+6.0	6.0*	+6.0	6.0*	+155	+ 63	+0.65
V602	6AU6	Mixer	0	--	+6.0	6.0*	+6.0	6.0*	+115	+115	+2.3
V603	6AG5	HFO React. Mod.	0	+3.5	+6.0	6.0*	+6.0	6.0*	+142	+130	+3.5
V604	6AG5	HFO Osc.	-0.01①	+0.5	+6.0	6.0*	+6.0	6.0*	+ 45	+ 92	+0.5

TN-5012 RF TUNER

TUNING CONTROL AT 8 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	DC	AC	DC	AC	5	6	7
V700	6AG5	1st RF	-0.04①	+0.65	+6.0	6.0*	+6.0	6.0*	+150	+ 65	+0.65
V701	6AG5	2nd RF	-0.08①	+0.6	+6.0	6.0*	+6.0	6.0*	+165	+ 65	+0.6
V702	6AU6	Mixer	0	+2.5①	+6.0	6.0*	+6.0	6.0*	+115①	+115①	+2.5①
V703	6AG5	HFO React. Mod.	0	+3.7	+6.0	6.0*	+6.0	6.0*	+140	+135	+3.7
V604	6AG5	HFO Osc.	-0.03①	+0.5	+6.0	6.0*	+6.0	6.0*	+ 47	+ 92	+0.5

Table 6 Tube Socket Voltages (Sheet 2 of 3)

R-5007 RECEIVER SUB-ASSEMBLY

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS													
			1	2		3		4		5		6	7	8		9
				DC	AC	DC	AC	DC	AC	DC	AC			DC	AC	
V100	6BA6	1st I. F. Amp	-0.04ω	+1.5	--	+6.3	6.2*	+6.3	6.2*	+245	--	+ 75	+1.5	--	--	--
V101	6BA6	2nd I. F. Amp	-0.06ω	+1.4	--	+6.3	6.2*	+6.3	6.2*	+240	--	+ 75	+1.4	--	--	--
V102	6BA6	3rd I. F. Amp	0	+1.6	--	+6.3	6.2*	+6.3	6.2*	+240	--	+ 75	+1.6	--	--	--
V103	6AL5	2nd Det. & Avc	0	+0.04	--	+6.3	6.2*	+6.3	6.2*	+3.6	--	0	-0.65	--	--	--
V104	6T8	Noise Limiter & 1st Audio	NC	-.25	--	-0.6	--	+6.3	6.2*	+6.3	6.2*	NC	+1.4	0	--	+125
V105	6AQ5	Audio	0	+16.5	--	+6.3	6.2*	+6.3	6.2*	+255	--	+250	0	--	--	--
V106	6J6	Bfo React. Mod.	+ 47	+ 49	--	+6.3	6.2*	+6.3	6.2*	0	--	0	+1.9	--	--	--
V107	6AG5	Bfo Osc.	0	+0.4	--	+6.3	6.2*	+6.3	6.2*	+145	--	+ 65	+0.4	--	--	--
V108	5Y3GT	Rect.	--	290	5.2*	--	--	--	380**	--	--	380**	--	290	5.2*	--
V109	OA2	Voltage Reg.	+150	--	--	--	--	--	--	+150	--	--	--	--	--	--

TUBE SOCKET VOLTAGES

All d-c voltages measured to chassis with an AVO Meter Model 8, (20,000 ohms per volt), (with tuning drawer in place). AC voltages were taken with Simpson Model 260 Voltmeter. Filament voltages marked with asterisks were measured to th corresponding asterisk of the same tube socket. High voltage a-c, marked with a double asterisk, was measured to th chassis. Line voltage adjusted to 110 volts. Suffix ω denotes reading considered unreliable due to loading effect of meter on circuit.

CONTROLS	OPERATING POSITION DURING MEASUREMENT
HFO (SLAVE-MASTER) SW	HFO
AUDIO GAIN	FULLY CLOCKWISE
AVC MANUAL SW	AVC
NOISE LIMITER SW	ON
BFO SW	ON
BFO (SLAVE-MASTER) SW	BFO
RF GAIN	FULLY CLOCKWISE

Tabl 6 Tub Sock t Voltag s (Sh t 3 of 3)

TN-5010 RF TUNER

TUNING CONTROL AT 2 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	DC	AC	DC	AC	5	6	7
V500	6AG5	1st RF	0 ①	+0.7	+3.7	6.0*	+3.7	6.0*	+135	+ 54	+0.7
V501	6AG5	2nd RF	0 ①	+0.65	+3.7	6.0*	+3.7	6.0*	+135	+ 55	+0.65
V502	6AU6	Mixer	0	--	+3.7	6.0*	+3.7	6.0*	+115	+115	+1.95
V503	6AG5	HFO React. Mod.	0	+3.5	+3.7	6.0*	+3.7	6.0*	+140	+110	+3.5
V504	6AG5	HFO Osc.	-2.5 ①	+0.5	+3.7	6.0*	+3.7	6.0*	+ 51	+ 70	+0.5

TN-5011 RF TUNER

TUNING CONTROL AT 4 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	DC	AC	DC	AC	5	6	7
V600	6AG5	1st RF	0 ①	+0.70	+3.7	6.0*	+3.7	6.0*	+150	+ 60	+0.70
V601	6AG5	2nd RF	0 ①	+0.60	+3.7	6.0*	+3.7	6.0*	+150	+ 60	+0.60
V602	6AU6	Mixer	0	--	+3.7	6.0*	+3.7	6.0*	+ 95	+ 95	+2.0
V603	6AG5	HFO React. Mod.	0	+3.3	+3.7	6.0*	+3.7	6.0*	+140	+110	+3.3
V604	6AG5	HFO Osc.	0 ①	+0.5	+3.7	6.0*	+3.7	6.0*	+ 41	+ 79	+0.5

TN-5012 RF TUNER

TUNING CONTROL AT 8 MCS

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
					3		4				
			1	2	AC	AC	DC	AC	5	6	7
V700	6AG5	1st RF	0 ①	+0.65	+3.7	6.0*	+3.7	6.0*	+145	+ 52	+0.65
V701	6AG5	2nd RF	0 ①	+0.55	+3.7	6.0*	+3.7	6.0*	+155	+ 54	+0.55
V702	6AU6	Mixer	0	+2.1 ①	+3.7	6.0*	+3.7	6.0*	+110 ①	+110 ①	+2.1
V703	6AG5	HFO React. Mod.	0	+3.5	+3.7	6.0*	+3.7	6.0*	+135	+115	+4.6
V704	6AG5	HFO Osc.	0 ①	+0.55	+3.7	6.0*	+3.7	6.0*	+ 41	+ 77	+0.55

Table 7 Tube Socket Voltages (Sheet 1 of 2)

R-5007 RECEIVER SUB-ASSEMBLY

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS												
			1	2		3		4		5		6	7	8		9
				DC	AC	DC	AC	DC	AC	DC	AC			DC	AC	
V100	6BA6	1st I. F. Amp	-0.25①	+1.5	--	+6.2	6.2*	+6.2	6.2*	+240	--	+ 70	+1.5	--	--	--
V101	6BA6	2nd I. F. Amp	-0.05①	+1.4	--	+6.2	6.2*	+6.2	6.2*	+240	--	+ 75	+1.4	--	--	--
V102	6BA6	3rd I. F. Amp	0	+1.6	--	+6.2	6.2*	+6.2	6.2*	+235	--	+ 70	+1.6	--	--	--
V103	6AL5	2nd Det. & Avc	0	-0.01	--	+6.2	6.2*	+6.2	6.2*	+3.5	--	0	+8①	--	--	--
V104	6T8	Noise Limiter & 1st Audio	NC	-1	--	-1	--	+6.2	6.2*	+6.2	6.2*	NC	+1.4	0	--	+ 95
V105	6AQ5	Audio	0	+16.5	--	+6.2	6.2*	+6.2	6.2*	+255	--	+250	0	--	--	--
V106	6J6	BFO React. Mod.	+ 40	+ 41	--	+6.2	6.2*	+6.2	6.2*	0	--	0	+1.9	--	--	--
V107	6AG5	BFO Osc.	0	+0.3	--	+6.2	6.2*	+6.2	6.2*	+150	--	+ 45	+0.3	--	--	--
V108	5Y3GT	Rect.	--	290	5.2*	--	--	--	380**	--	--	380**	--	290	5.2*	--
V109	OA2	Voltage Reg.	+150	--	--	--	--	--	--	+150	--	--	--	--	--	--

TUBE SOCKET VOLTAGES

All d-c voltages measured to chassis with an AVO Meter Model 7, (1, 000 ohms per volt), (with tuning drawer in place). AC voltages were taken with Simpson Model 260 Voltmeter. Filament voltages marked with asterisks were measured to th corresponding asterisk of the same tube socket. High voltage a-c, marked with a double asterisk, was measured to th chassis. Line voltage adjusted to 110 volts. Suffix ① denotes reading considered unreliable due to loading effect of meter on circuit.

CONTROLS	OPERATING POSITION DURING MEASUREMENT
HFO (SLAVE-MASTER) SW	HFO
AUDIO GAIN	FULLY CLOCKWISE
AVC MANUAL SW	AVC
NOISE LIMITER SW	ON
BFO SW	ON
BFO (SLAVE-MASTER) SW	BFO
RF GAIN	FULLY CLOCKWISE

Tabl 7 Tub Sock t Voltages (Sh t 2 of 2)

TN-5010 RF TUNER

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS						
			1	2	3	4	5	6	7
V500	6AG5	1st RF Amp	1.5 M	220Ω	6.8 K	6.8 K	48 K	90 K	220Ω
V501	6AG5	2nd RF Amp	1.5 M	220Ω	6.8 K	6.8 K	48 K	90 K	220Ω
V502	6AU6	Mixer	10 Ω	0	6.8 K	6.8 K	78 K	78 K	820Ω
V503	6AG5	HFO React. Mod.	1.4 M	2.7 K	6.8 K	6.8 K	30 K	76 K	2.7 K
V504	6AG5	HFO Osc.	22 K	120Ω	6.8 K	6.8 K	68 K	68 K	120Ω

TN-5011 RF TUNER

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS						
			1	2	3	4	5	6	7
V600	6AG5	1st RF Amp	1.5 M	220Ω	6.8 K	6.8 K	50 K	95 K	220Ω
V601	6AG5	2nd RF Amp	1.5 M	220Ω	6.8 K	6.8 K	50 K	95 K	220Ω
V602	6AU6	Mixer	10 Ω	0	6.8 K	6.8 K	80 K	80 K	820Ω
V603	6AG5	HFO React. Mod.	1.4 M	2.2 K	6.8 K	6.8 K	30 K	75 K	2.2 K
V604	6AG5	HFO Osc.	22 K	120Ω	6.8 K	6.8 K	70 K	70 K	120Ω

TN-5012 RF TUNER

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS						
			1	2	3	4	5	6	7
V700	6AG5	1st RF Amp	1.5 M	220Ω	6.8 K	6.8 K	45 K	93 K	220Ω
V701	6AG5	2nd RF Amp	1.5 M	220Ω	6.8 K	6.8 K	45 K	93 K	220Ω
V702	6AU6	Mixer	0	950Ω	6.8 K	6.8 K	75 K	75 K	950Ω
V703	6AG5	HFO React. Mod.	1.4 M	3.3 K	6.8 K	6.8 K	33 K	75 K	3.3 K
V704	6AG5	HFO Osc.	22 K	120Ω	6.8 K	6.8 K	66 K	66 K	120Ω

Tabl 8 Tub Socket R sistances (She t 1 of 2)

R-5007 RECEIVER SUB-ASSEMBLY

TUBE	TYPE	FUNCTION	SOCKET PIN NUMBERS								
			1	2	3	4	5	6	7	8	9
V100	6BA6	1st I. F. Amp	1.7 M	220 Ω	6.8 K	6.8 K	32 K	50 K	220 Ω	--	--
V101	6BA6	2nd I. F. Amp	1.5 M	220 Ω	6.8 K	6.8 K	32 K	50 K	220 Ω	--	--
V102	6BA6	3rd I. F. Amp	5 Ω	220 Ω	6.8 K	6.8 K	32 K	50 K	220 Ω	--	--
V103	6AL5	2nd Det. & Avc	0	1.2 M	6.8 K	6.8 K	6.8 K	0	520 K	--	--
V104	6T8	Noise Limiter & 1st Audio	--	1.0 M	470 K	6.8 K	6.8 K	--	2.7 K	1.0 M	62 K
V105	6AG5	Audio	470 K	510 Ω	6.8 K	6.8 K	26 K	28 K	--	--	--
V106	6J6	BFO React. Mod.	95 K	95 K	6.8 K	6.8 K	33 K	590 K	1.0 K	--	--
V107	6AG5	BFO Osc.	47 K	120 Ω	6.8 K	6.8 K	37 K	150 K	120 Ω	--	--
V108	5Y3GT	Rectifier	--	32 K	--	730 Ω	--	750 Ω	--	32 K	--
V109	OA2	Voltage Reg.	32 K	--	--	--	32 K	--	--	--	--

Note: K = 1000 Ω
M = 1 Megohm

TUBE SOCKET RESISTANCES

R sistance measured from tube socket pins to ground. Line cord disconnected from power source and tuning drawer plugged into receiver. Operating controls were set as follows:

CONTROL	POSITION
HFO (SLAVE-MASTER) SW	HFO
AUDIO GAIN	FULLY CLOCKWISE
AVC-MANUAL SW	AVC
NOISE LIMITER SW	ON
BFO SW	ON
BFO (SLAVE-MASTER) SW	BFO
RF GAIN	FULLY CLOCKWISE

Tabl 8 Tub S cket Resistanc s (Sh t 2 of 2)

SENSITIVITY

7 Th ' s nsitivity is 1.5 microvolts for a 10 db signal to noise power ratio.

SELECTIVITY

8 The selectivity is 6 db down at 5 kc, and 60 db down at 25 kc.

TUBE COMPLEMENT

9 The tube complement is listed in Table 9.

QUANTITY	TYPE	FUNCTION	REFERENCE SYMBOL
3	6BA6	1st, 2nd, 3rd i-f amplifiers	V100, V101, V102
1	6AL5	2nd detector and avc	V103
1	6T8	noise limiter, 1st audio	V104
1	6AQ5	audio	V105
1	6J6	bfo reactance modulator	V106
13	6AG5	bfo, hfo, r-f amplifiers	V107, V500, V501, V503, V504, V600, V601, V603, V604, V700, V701, V703, V704.
3	6AU6	mixer	V502, V602, V702
1	5Y3GT	rectifier	V108
1	OA2	voltage regulator	V109

Table 9 Tube Complement

PART 10

FITTING INSTRUCTIONS

UNPACKING

1 The AN/FRR-502 is comprised of a number of component equipments which are easily handled and installed. Each unit is packed in its own individual container, and should be carefully unpacked and closely checked for physical damage. Reference to Table10 will indicate unit and shipping weights and dimensions.

MOUNTING

2 The Receiver Subassembly, R-5007/FRR-502 and the Cabinet Electrical Equipment, CY-5045/FRR-502 are designed for standard 19 in. rack mounting. The Radio Frequency Tuners are operated within the Receiver or stored in the cabinet as applicable for the intended use.

INSTALLATION

3 The Receiver shall be placed within the rack in accordance with local installation instructions. The Receiver should be placed where it can be conveniently operated and receive proper ventilation. As the Radio Frequency Tuners may be used interchangably without regard to any particular receiver, it is suggested that the "stand-by" Radio Frequency Tuners all be stored in a particular section of the communication station so as to be immediately available in the event of requirement.

ANTENNA CONNECTIONS

4 The input impedance of 300 or 75 ohms to the receiver is available at the rear of the equipment on terminal board E100, and connections are made according to the local plan.

NOMENCLATURE	WEIGHTS		DIMENSIONS (inches)	
	Net	Gross	Unit	Packing
R-5007	27 lb.	98 lb.	19 x 5-1/4 x 13-1/2	30-1/2 x 28-1/2 x 17
TN-5010, 5011, 5012,	6-1/2 lb.	14 lb.	7-5/8 x 4-1/8 x 8-5/8	14-1/2 x 10 x 7-1/2
CY-5045	11 lb.	63 lb.	19 x 5-1/4 x 9-7/8	30-1/2 x 28-1/2 x 17

Table 10 Unit Weights and Dimensions

POWER CONNECTIONS

5 The input receptacle to the receiver power supply is permanently mounted at the receiver left front lower corner, and the line cord CA-103 provided interconnects this receptacle with the 110 or 220 volt source.

REMOTE CONTROL CONNECTIONS

6 The connections for remote control operation are available on terminal boards E102 and E103 on the rear apron. Instructions for such interconnection are contained in EO 35BG-5FRA501-2.

OUTPUT CONNECTIONS

7 The output transformer of the receiver provides impedance matching to either 8 or 600 ohms and is available at terminal board E101.

PRELIMINARY TESTS

8 Reference should be made to Table 11, "Performance Standards". Vacuum tubes should be visually checked for damage, and unless damage is revealed, the receiver should be ready for operation. Turn the "RF GAIN" control switch "ON". Reference may now be made to Part 3, Operating Procedures.

FUNCTIONS	PERFORMANCE
Sensitivity	1.5 uv for a 10 db signal to noise power ratio
Image Ratio	Better than 60 db for 2-16 mc
AVC Characteristics	With an 80 db change in the input signal, "O" reference level, the output remains constant within 12 db. Note: "O" ref-modulated r-f signal of 10 uv
Selectivity	6 db down at 5 kc 60 db down at 25 kc
Overall Selectivity	Minimum of 6 db down at 5 kc
Hum Level	60 db down on rated power
Output Power	2 watts
Input Power	110/220 volts, 50/60 cycles per second, approximately 95 watts

Table 11 Performance Standards

PART 11

ILLUSTRATIONS

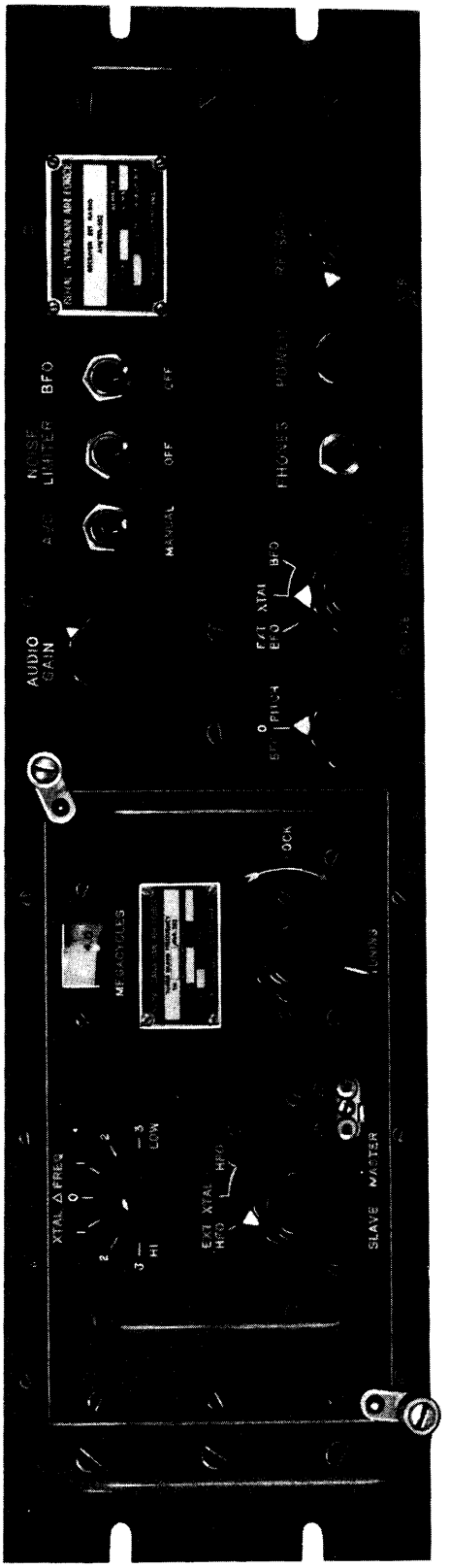


Figure 11-1 Front View, R-5007/FRR-502

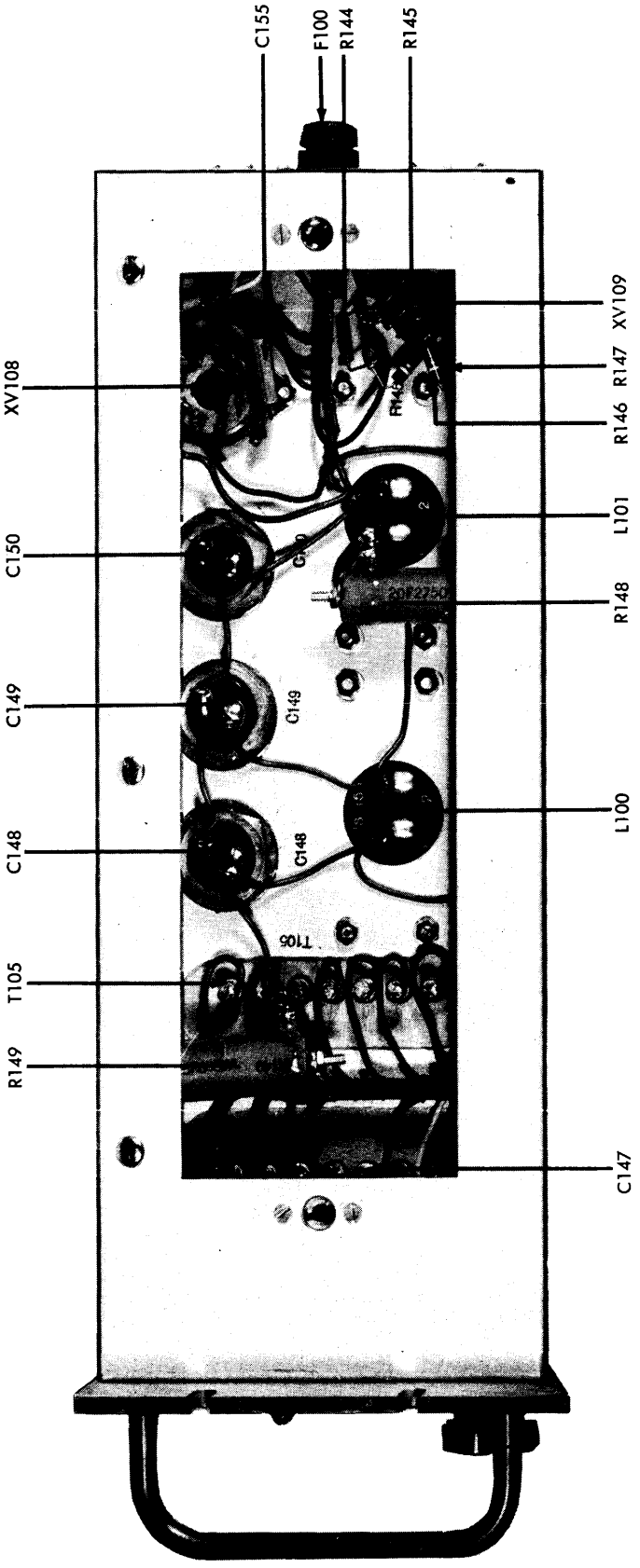


Figure 11-2 Right Side View, R-5007/FRR-502

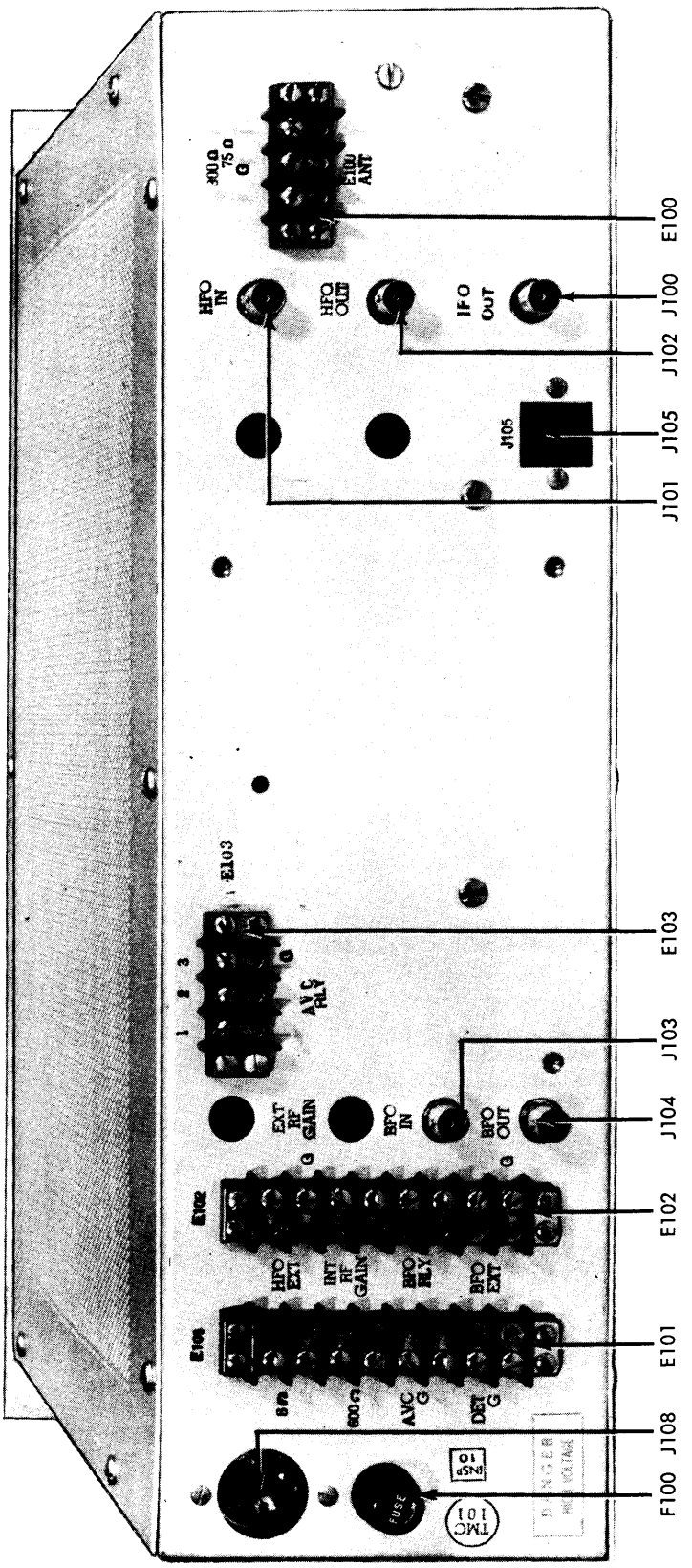


Figure 11-3 Rear View, R-5007/FRR-502

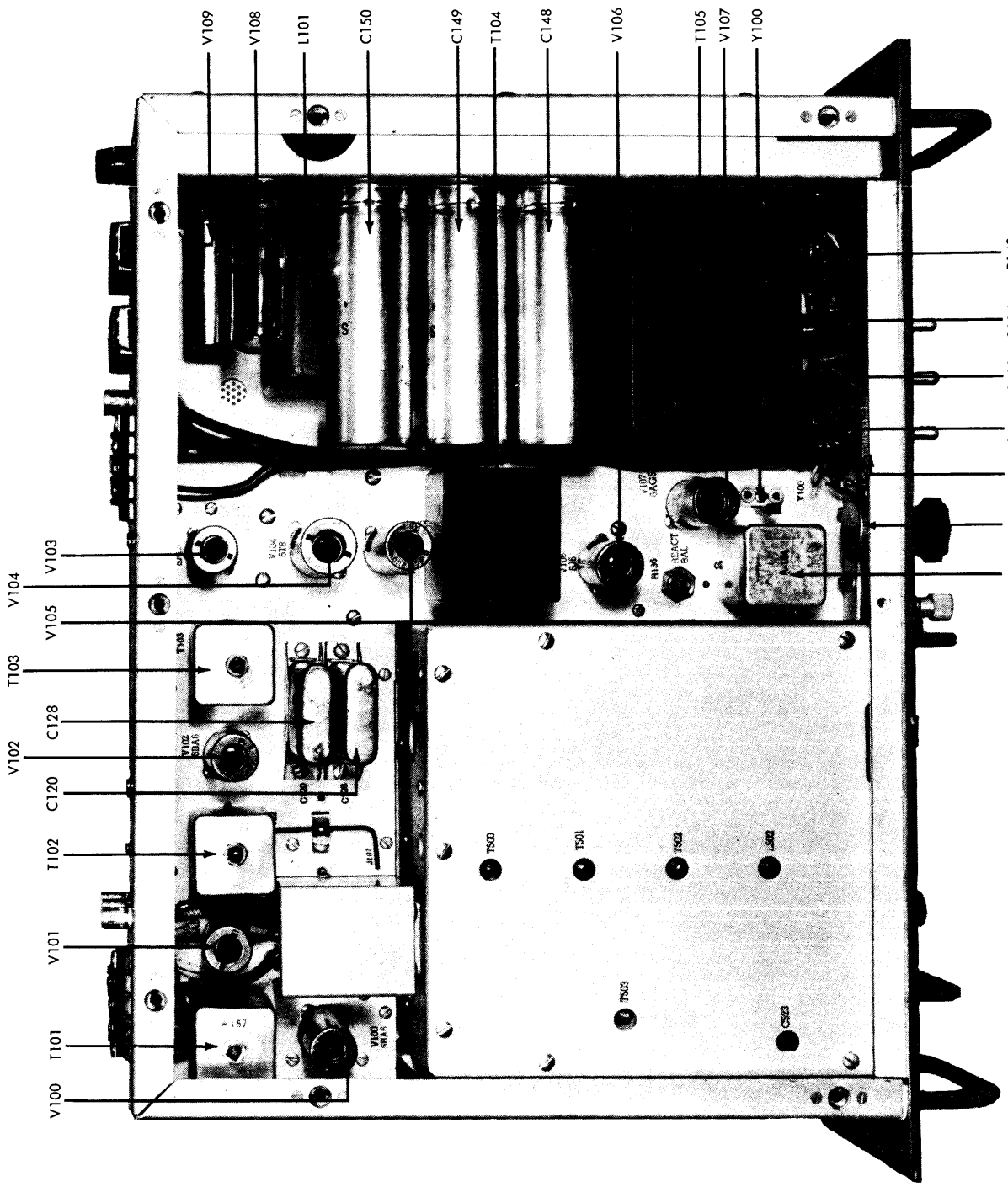


Figure 11-4 Top View, R-5007/FRR-502 with TN-5010/FRR-502 in place

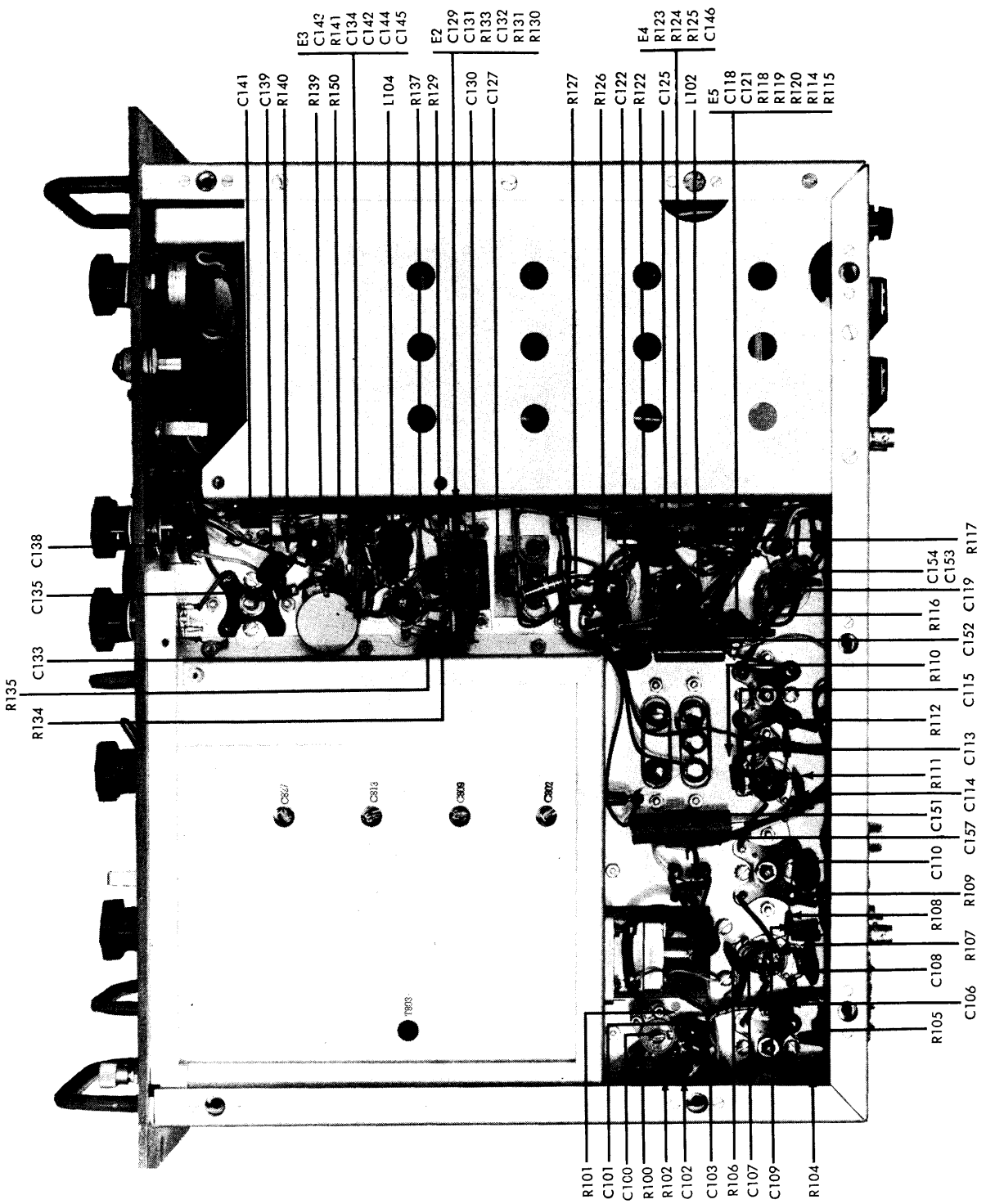


Figure 11-5 Bottom View (plate removed), R-5007/FRR-502

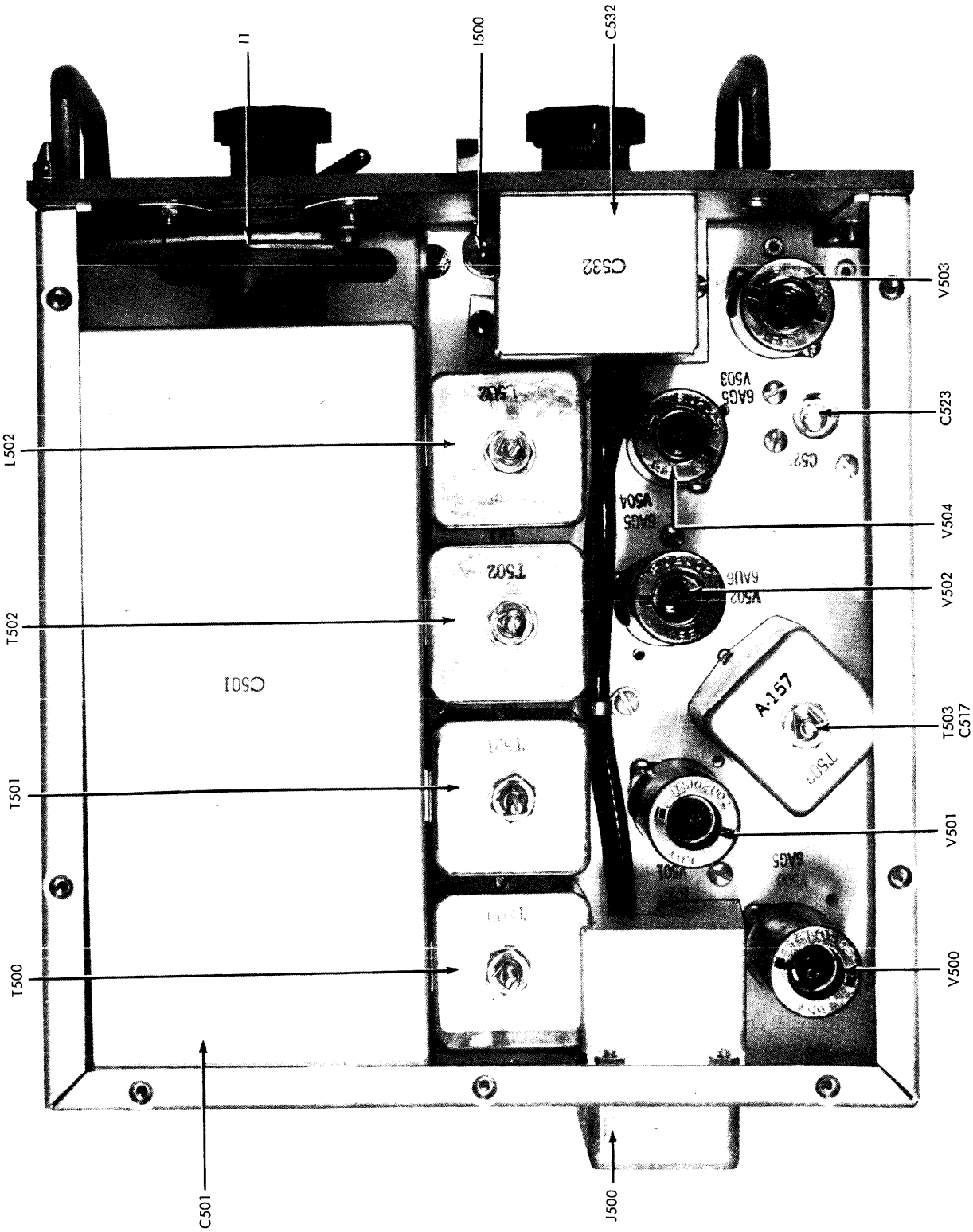


Figure 11-6 Top View (plate removed), TN-5010/FRR-502

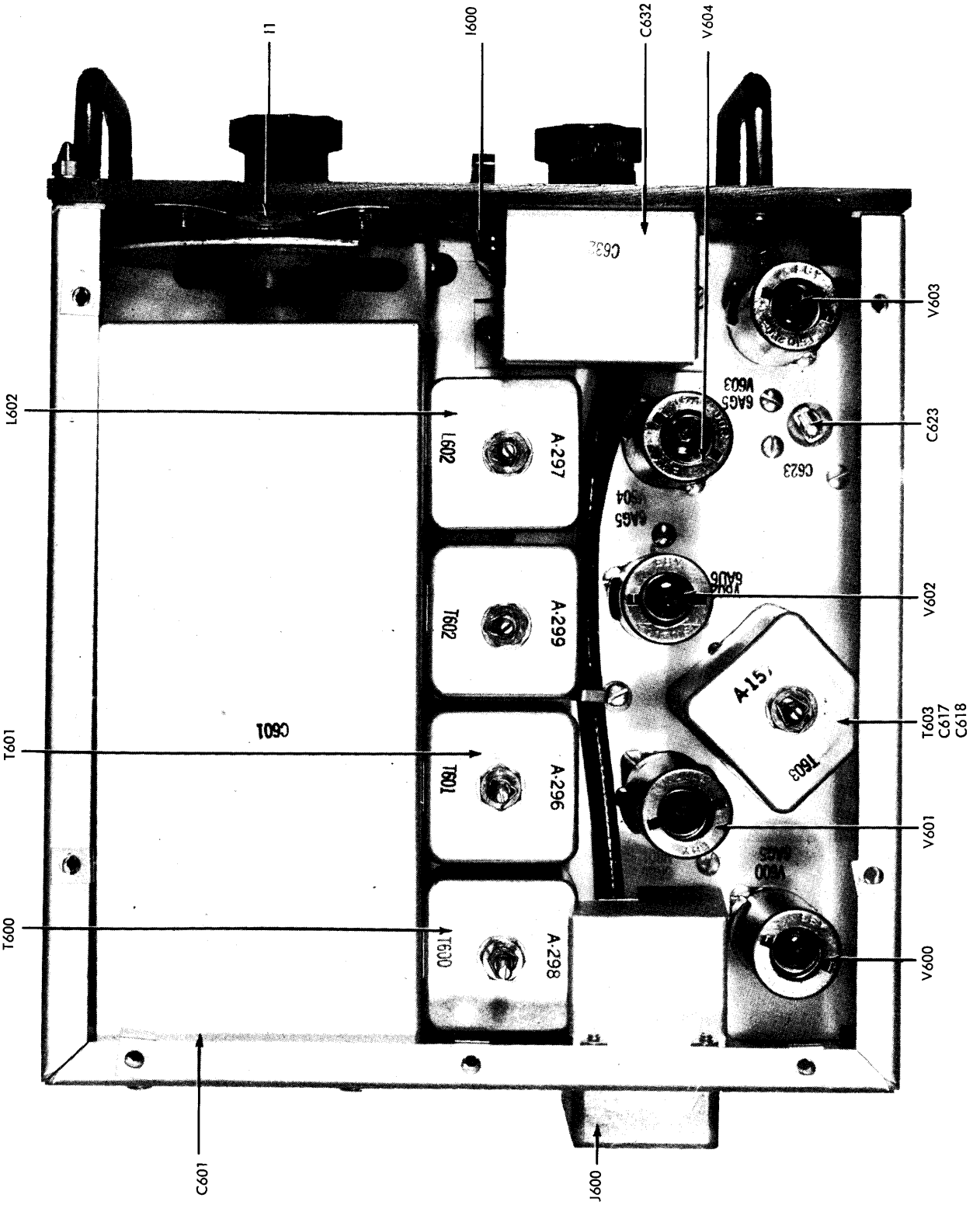


Figure 11-7 Top View (plate removed), TN-5011/FRR-502

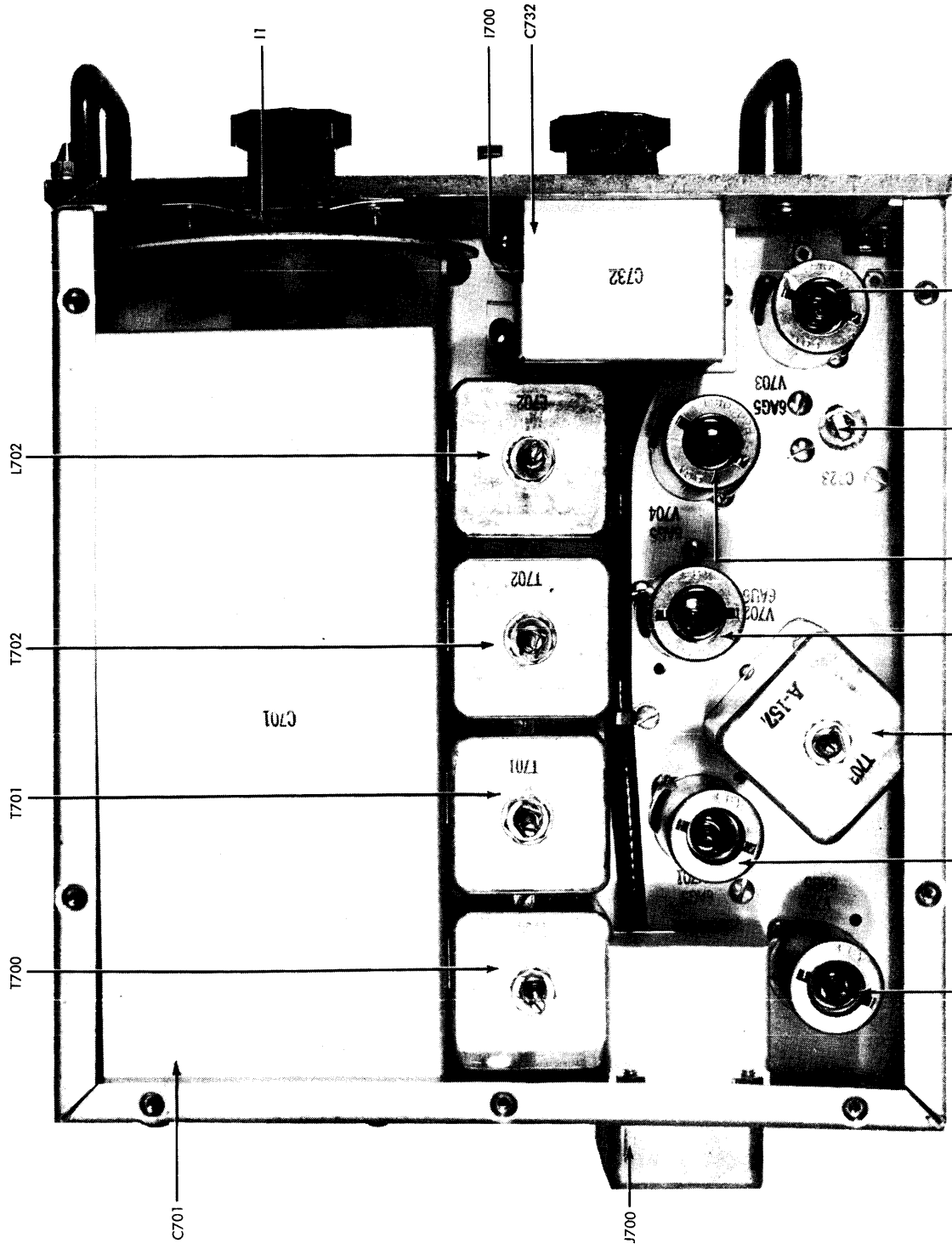


Figure 11-8 Top View (plate removed), TN-5012/FRR-502

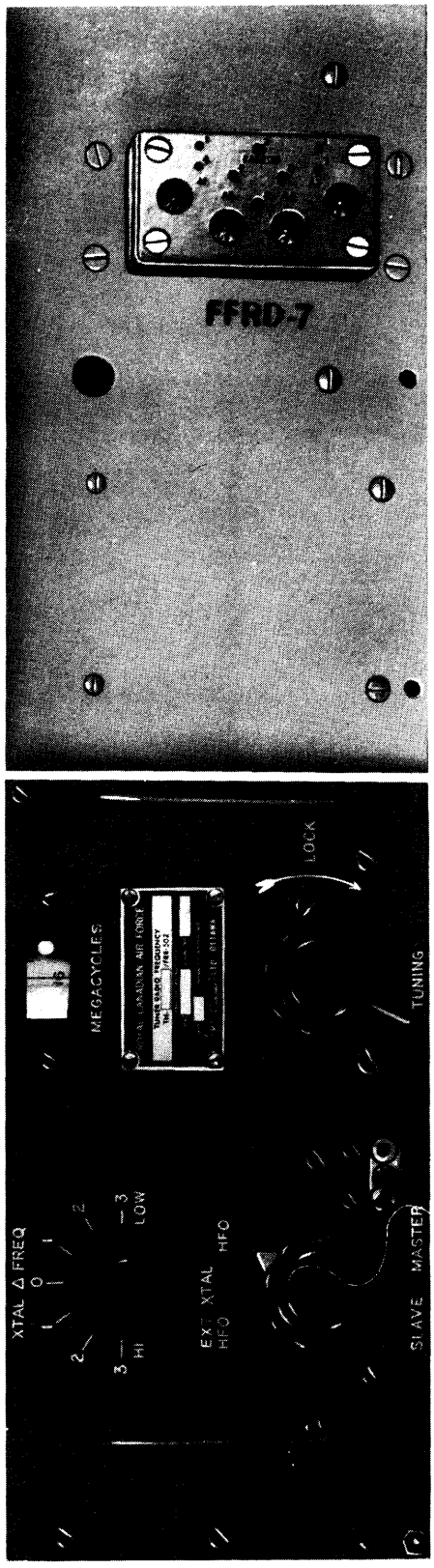


Figure 11-9 Front and Rear View, Radio Frequency Tuner

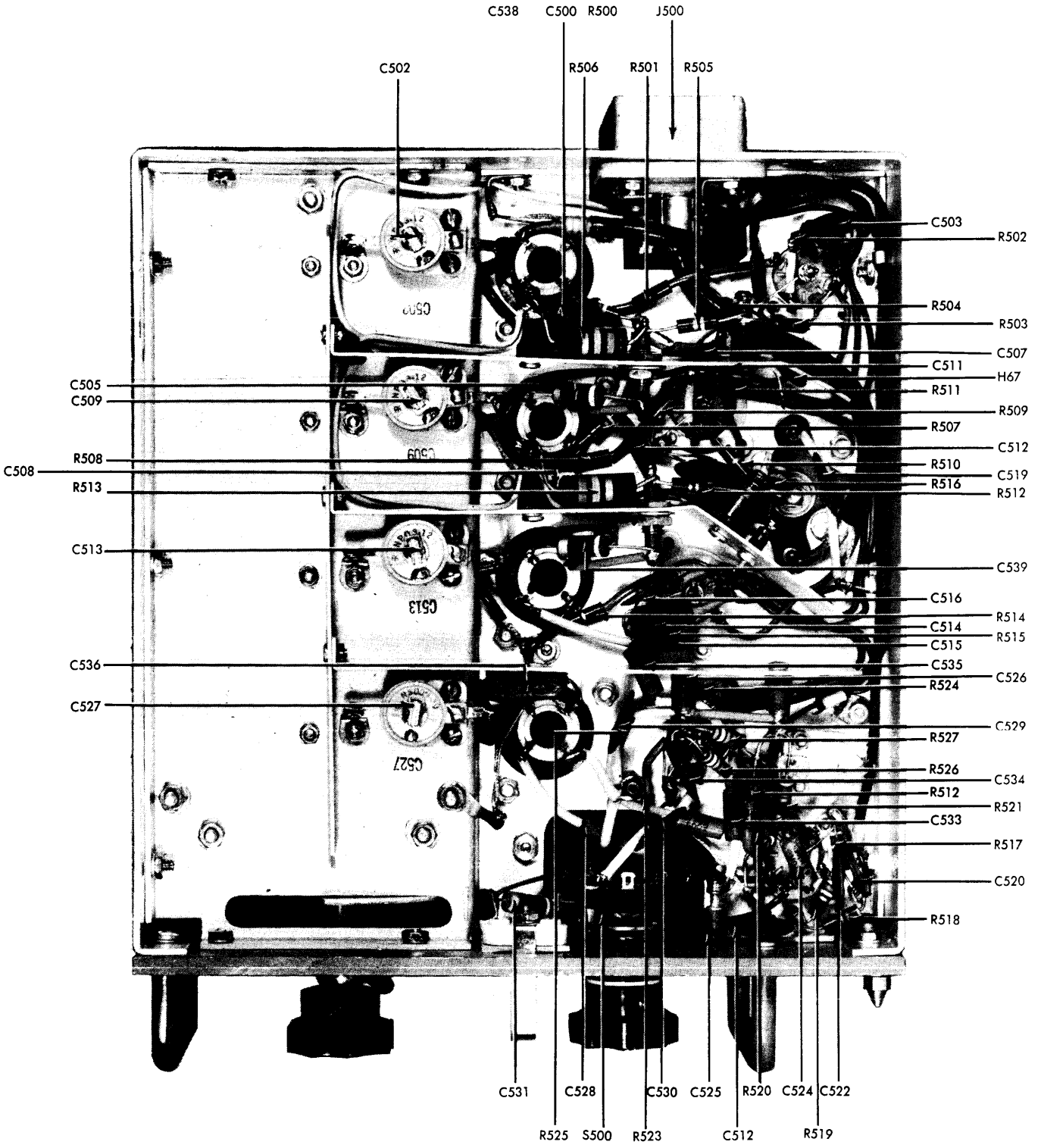


Figure 11-10 Bottom View (plate removed), TN-5010/FRR-502

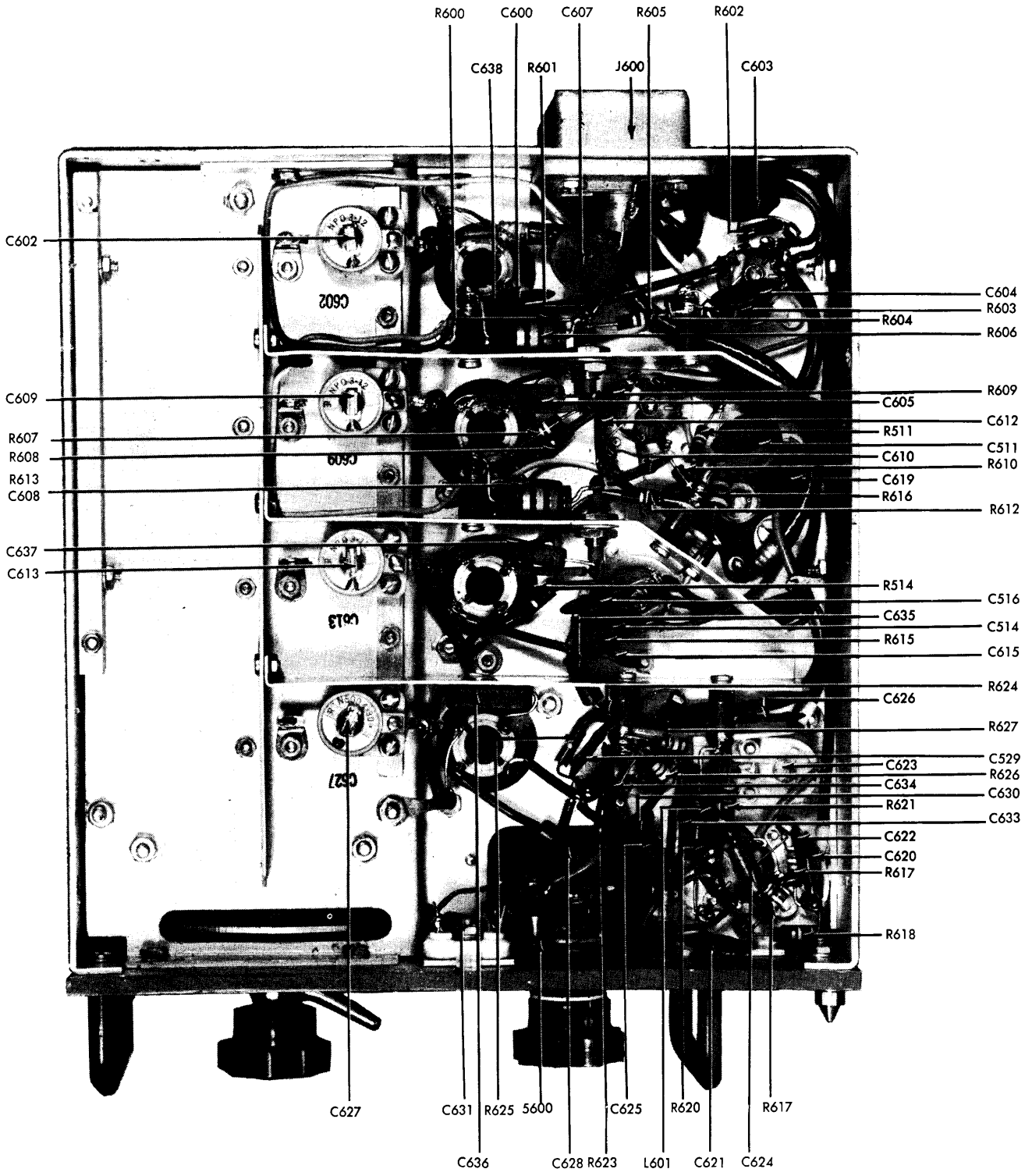


Figure 11-11 Bottom View (plate removed), TN-5011/FRR-502

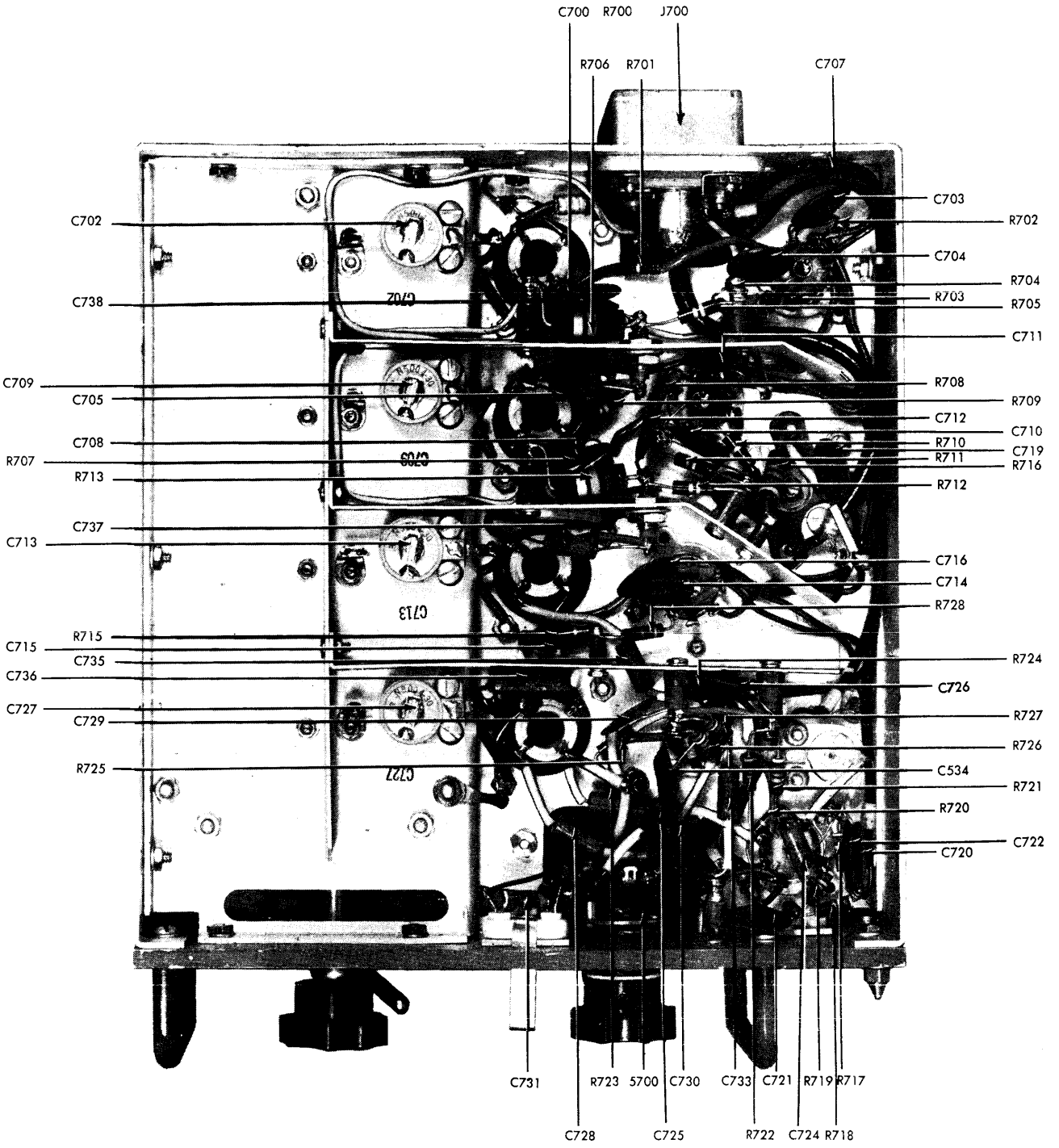


Figure 11-12 Bottom View (plate removed), TN-5012/FRR-502

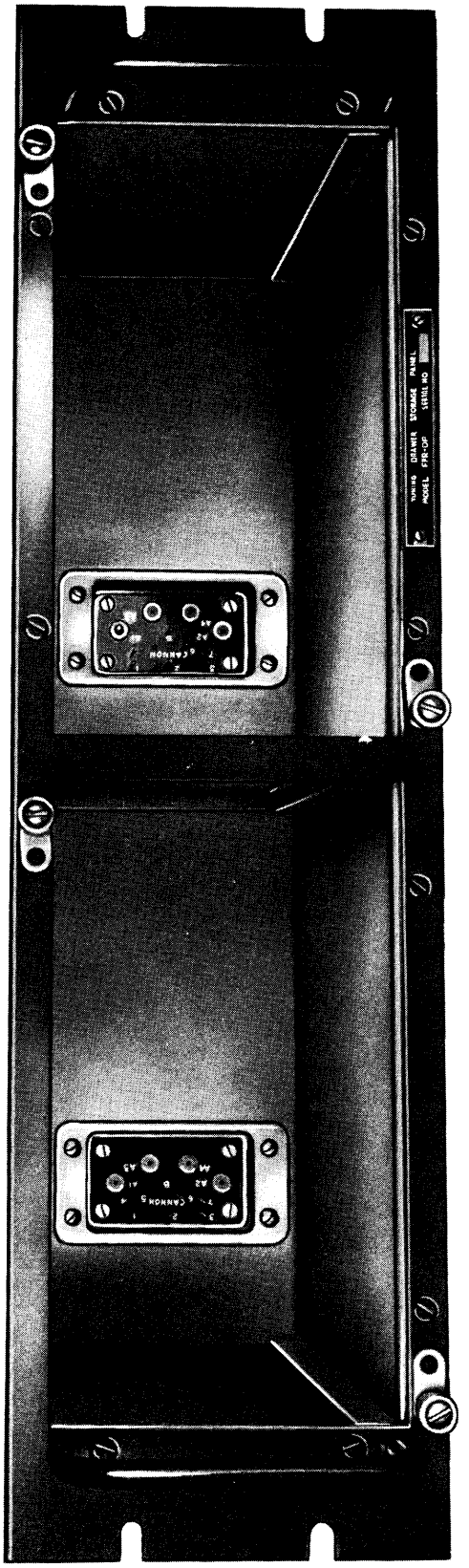
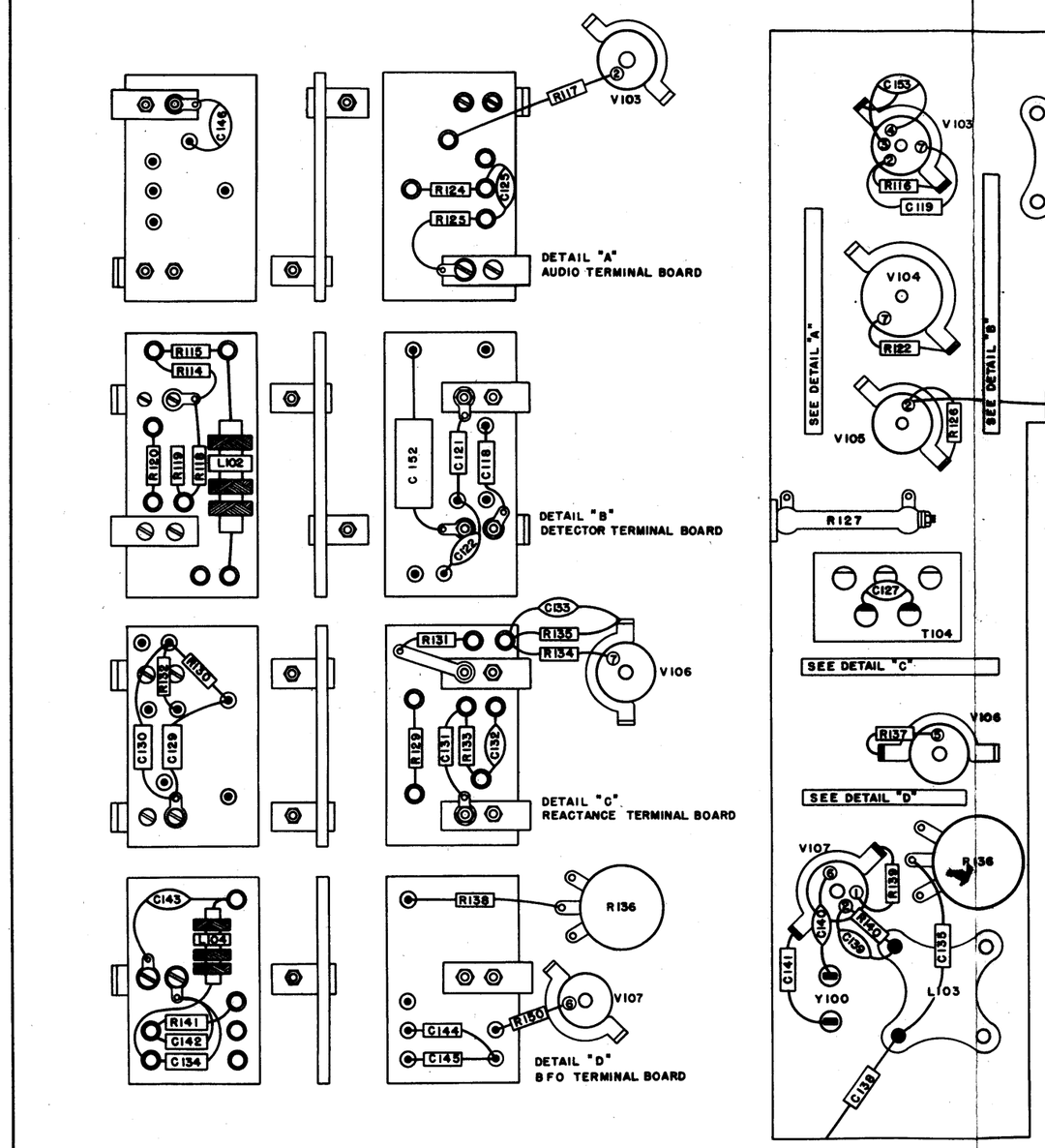
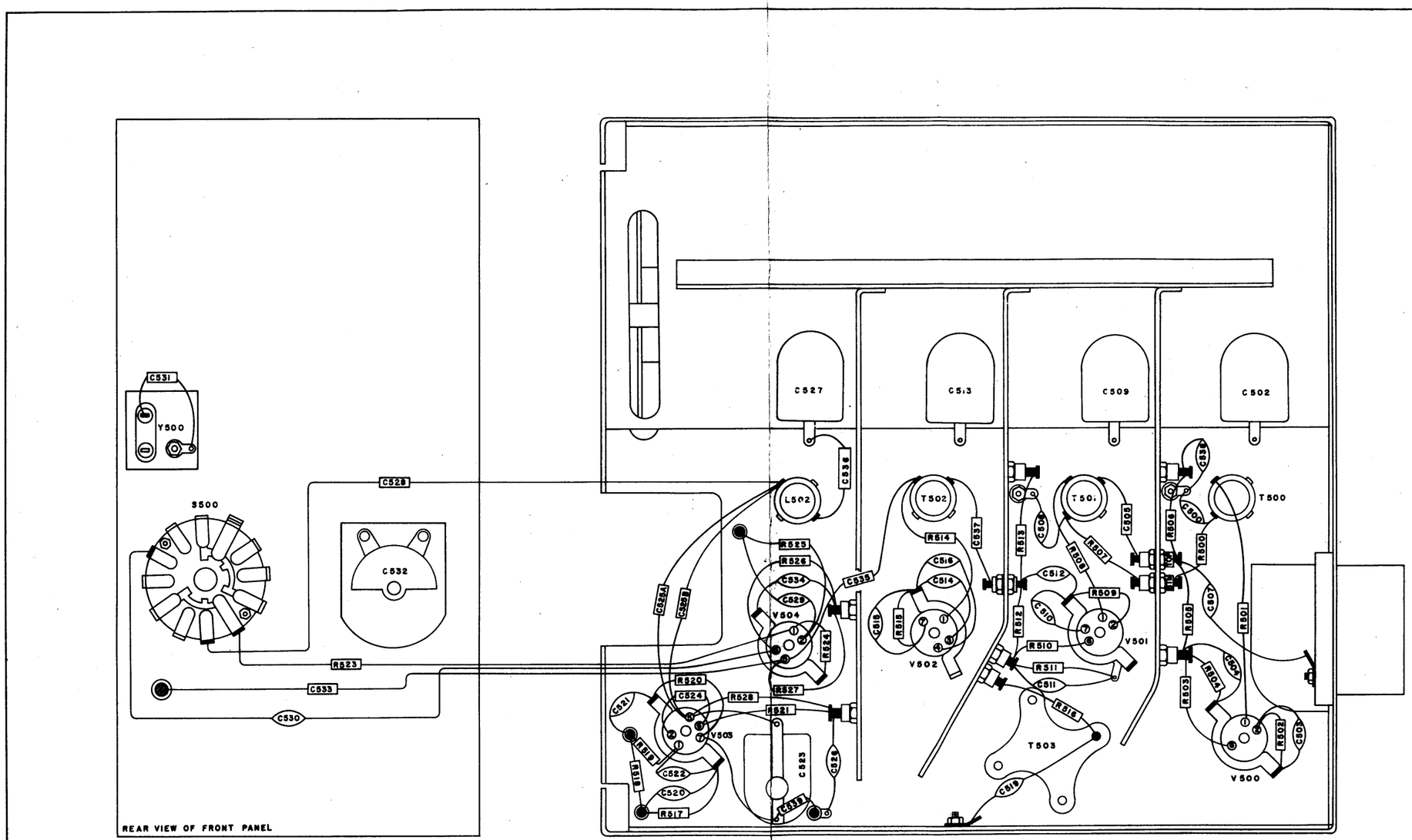


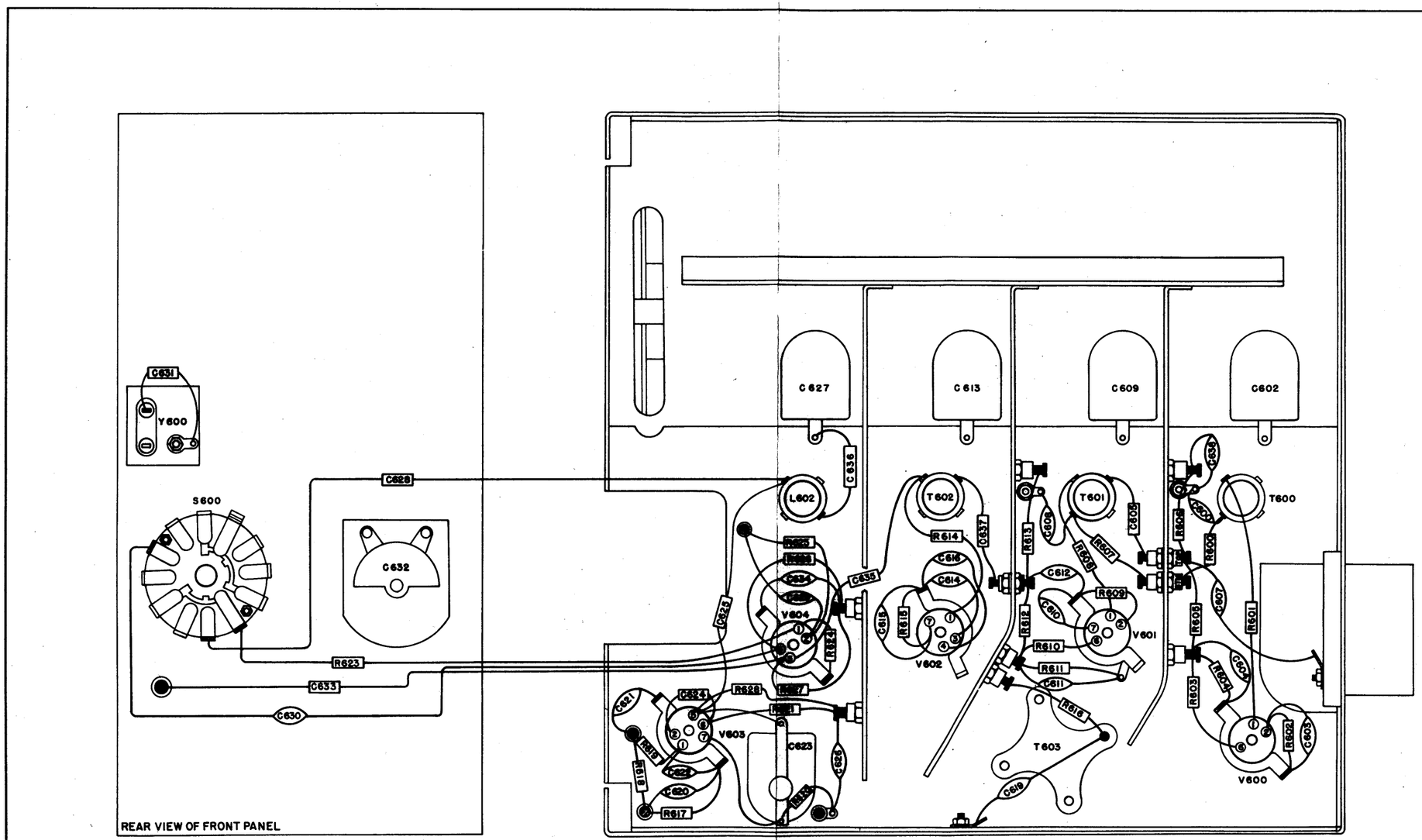
Figure 11-13 Front and Inside View, Cabinet, CY-5045/FRR-502



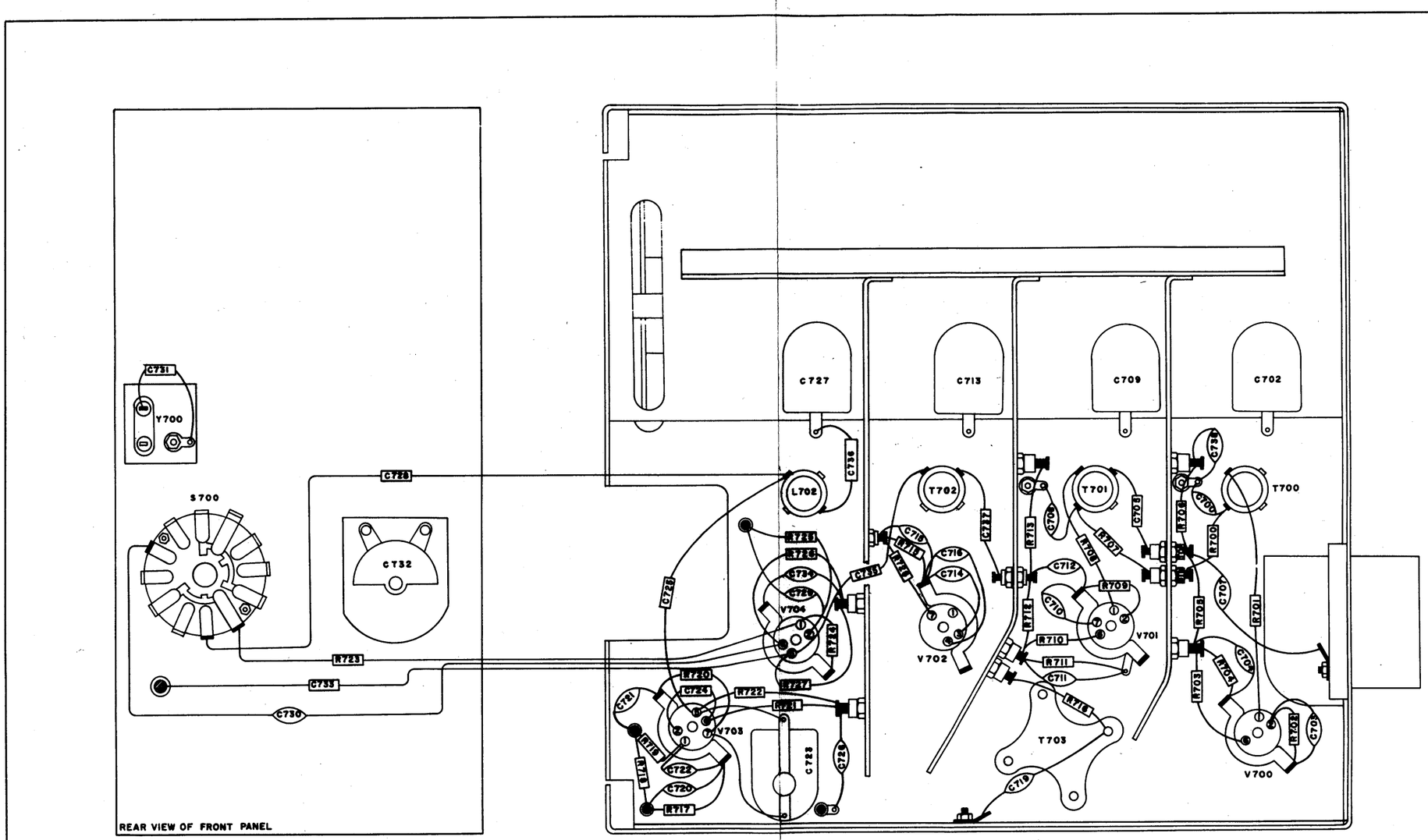
Figur 11-14 Pictorial Wiring Diagram, R-5007/FRR-502



Figur 11-15 Pictorial Wiring Diagram, TN-5010/FRR-502



Figur 11-16 Pictorial Wiring Diagram, TN-5011/FRR-502



Figur 11-17 Pictorial Wiring Diagram, TN-5012/FRR-502

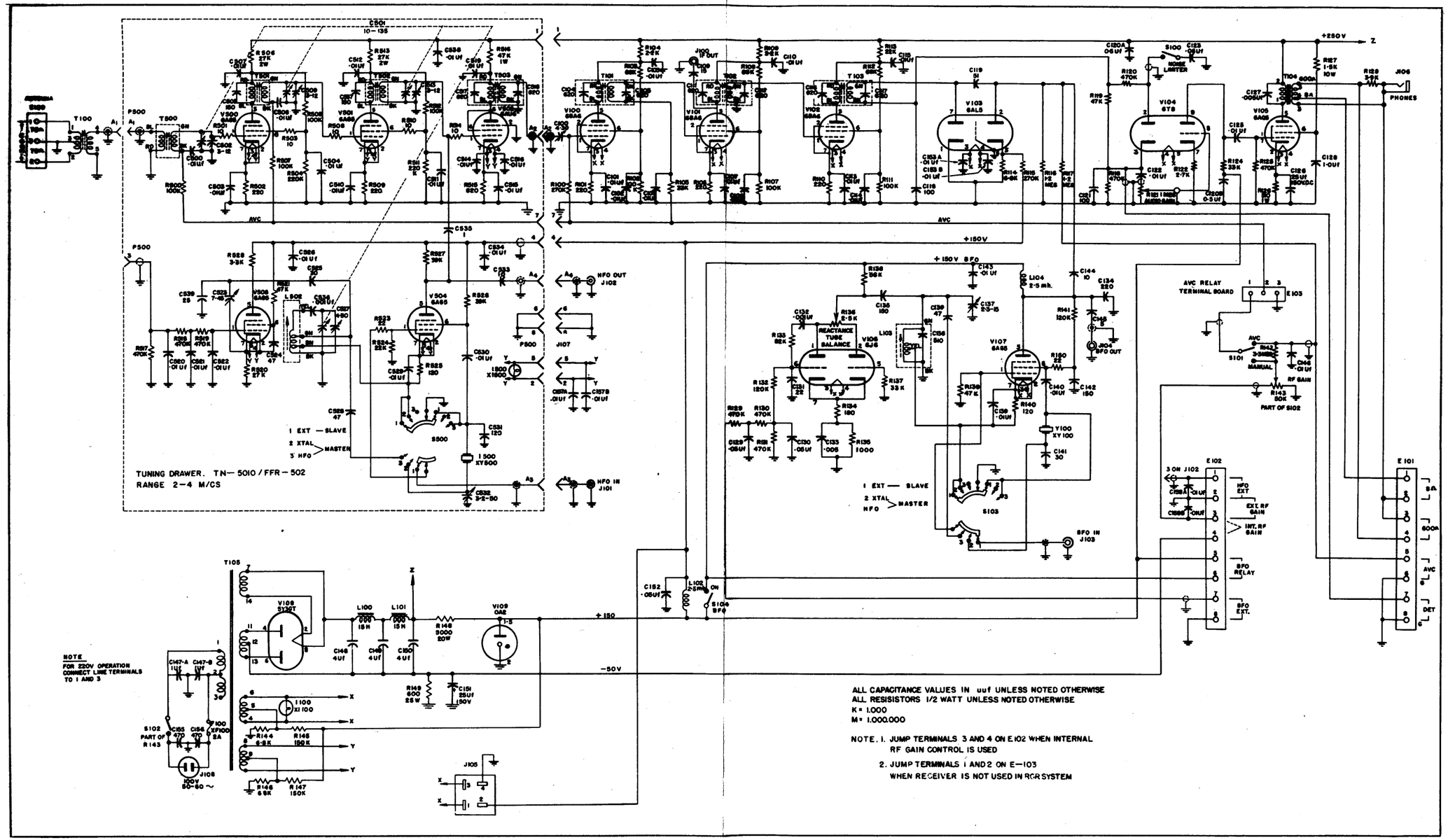


Figure 11-18 Schematic Diagram, R-5007/FRR-502, TN-5010/FRR-502

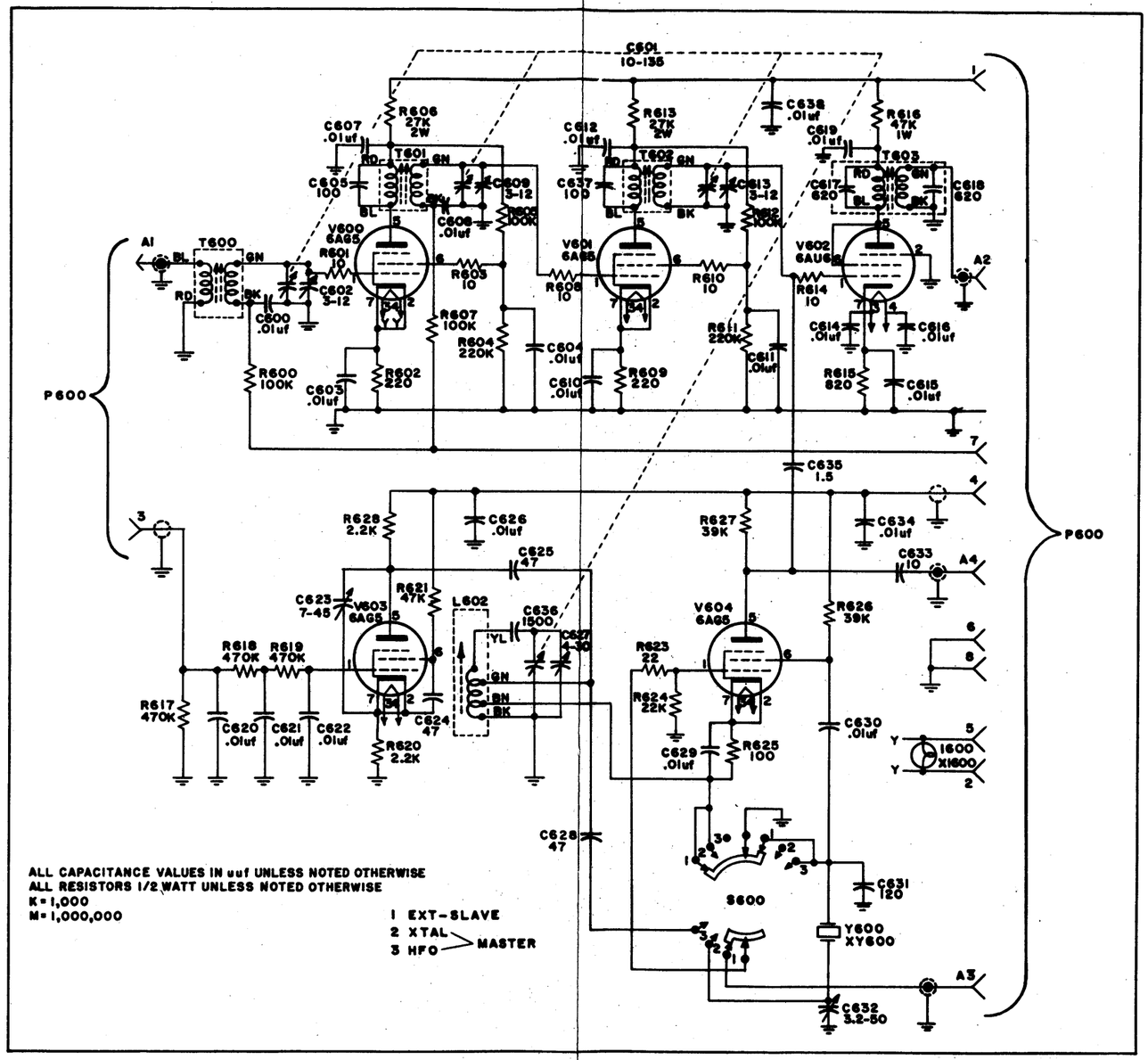


Figure 11-19 Schematic Diagram, TN-5011/FRR-502

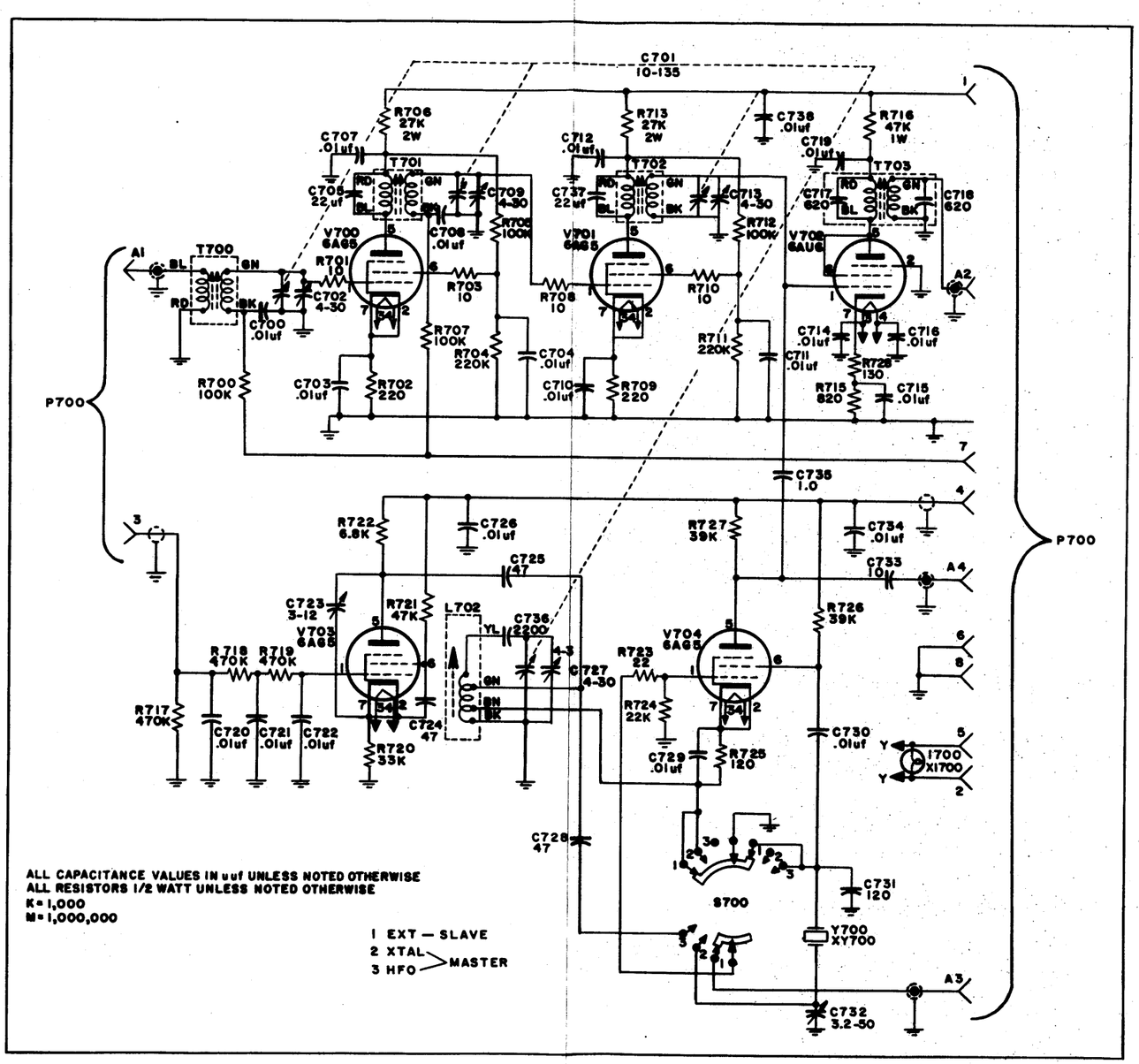


Figure 11-20 Schematic Diagram, TN-5012/FRR-502

PART 12

PART LIST

SECTION 1 - INTRODUCTION

CONTENT AND ARRANGEMENT

Content

1 This list constitutes those electrical and mechanical parts which are subject to loss or failure with the exception of structural and minor parts such as standard bolts, screws, nuts, etc.

Arrangement

2 Parts are listed alphabetically according to type and numerically under each type.

CIRCUIT REFERENCE SYMBOLS

General

3 Parts referred to in the text, schematics and illustrations are identified by a circuit reference symbol. Each symbol consists of an alphabetical portion and a numerical portion (example T101).

Alphabetical Portion

4 The alphabetical portion identifies the type of part.

Ref. Symbol	Type of Part
C	Capacitor
E	Miscellaneous electrical parts; soldering terminals
F	Fuse
I	Indicating parts: incandescent lamp, dial lens
J	Connector (stationary portion), jack
L	Coil, reactor choke, inductor
P	Connector (movable portion)
R	Resistor
S	Switch
T	Transformer
V	El ctron tube
W	Cabl assembly
XF	Fuse holder
XI	Lamp socket
XV	Tube socket
XY	Crystal socket
Y	Crystal unit

Numerical Portion

5 The numerical portions of th circuit reference symbols are classifi d as foll ws:

100 and above, Receiver Subassembly, AN/FRR-502 (FFR). 500 and abov , Radi Fr - quency Tuner, TN-5010/FRR-502 (FFRD-5). 600 and above, Radio Frequency Tun r, TN-5011/FRR-502 (FFRD-6). 700 and above, Radio Frequency Tuner, TN-5012/FRR-502 (FFRD-7).

ABBREVIATIONS

6 The abbreviations used in th Part List and throughout the text are as follows:

Description	Abbr viation
alternating current (a-c when used as an adjective)	ac
amplitude modulation	AM
ampere(s)	amp
audio frequency (a-f when used as an adjective)	af
automatic gain control	AGC
automatic volume control	avc
bayonet	bay
beat-frequency oscillator	bfo
by (used between dimensions)	x
center tap	C. T.
characteristic	char.
complete with	c/w
cycles per second	cps
continuous wave	cw
decibels	db
decibels above or below one milliwatt	dbm
diam ter	dia
direct curr nt (d-c wh n us d as an adj ctive)	dc

direct current working volts	vdcw	singl -pol , single-throw	SPST
double-pole, double throw	DPDT	ultra-high-frequency	uhf
ach	ea	volt(s)	v
figure	fig	watt(s)	w
fr qu ncy shift	FS	watt-hour(s)	wh
ground m tal case	GMC	wide	wd
high-fr quency oscillator	hfo		
high t nsion	HT		
inch(s)	in.		
int rm diat frequency (i-f when us d as an adjective)	if.		
Joint U.S. Army-Navy	JAN		
kilocycl (s)	kc		
long	lg		
m gacycl (s)	mc		
microfarads(s)	uf		
microh nry(s)	uh		
micromicrofarad(s)	uuf		
microv lt(s)	uv		
milliamp re(s)	ma		
modulated continuous wave	mcw		
numb r (with drill or gauge size)	#		
ov rall	OA		
plus or minus	±		
pound	lb		
primary	pri.		
radio frequ ncy (r-f when used as an adj ctive)	rf		
r sistanc	res.		
root m an square	rms		
s condary	secdy.		
s ction	sect.		
signal to n ise	S/N		

COMPONENT MANUFACTURERS

7 A list of abbreviations of basic component manufacturers follows:

Abbreviation	Manufacturer
BUS	Bussman Mfg. Co.
CAN	Cannon Electric Co.
CDC	Cornell-Dubilier Electrical Co.
CIN	Cinch-Jones (Cinch Mfg. Corp.)
COR	Cornish Wire Co.
CTD	Chicago Transformer Div., Essex Wire Corp.
DLC	Dial Light Co. of America, Inc.
EBY	Hugh H. Eby, Inc.
ERE	Erie Resistor Corp.
GEC	General Electric Co.
HAM	Hammarlund Mfg. Co.
HUB	Harvey Hubbell, Inc.
NAT	National Company, Inc.
OAK	Oak Mfg. Co.
RCC	Radio Condenser Co.
TMC	The Technical Materiel Corp.
WLC	Ward Leonard Electric Co.

NOTE

When possible, replacement of components should be to JAN or MIL specifications. Where such components are available, the preferred part number is quoted in brackets in the part list.

PART 12 TABLE OF PARTS

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C100	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw	IF Coupling	CV11C300	JAN-C-81
C101	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C102	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCKO5W103Z)	JCNAAF-C-26
C103	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Plate Decoupler	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C104	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2% char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C105	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2% char. D., 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C106	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C107	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C108	10EC/39956 (10EC/36578)	CAPACITOR: fixed, c ramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc typ	Scr n Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C109	10EC/37190	CAPACITOR: fixed, ceramic, 15 uuf, ±5%, 500 vdcw	IF Output	CC21SL150J	JAN-C-20A
C110	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Part of IF Tank	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C111	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ±2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C112	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ±2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C113	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C114	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C115	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Plate Decoupler	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C116	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ±2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C117	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ±2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C118	10EC/31924 (10EC/35246)	CAPACITOR: fixed, ceramic, 100 uuf, ±10%, 500 vdcw	IF Bypass	CC26SL101K (CC26SL101J)	JAN-C-20A JAN-C-20A

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit R ference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designatioh or JAN Type	Contractor or Governm nt Drawing or Specification
C119	10EC/35245	CAPACITOR: fixed, ceramic, 51 uuf, ±5%, 500 vdcw	DET-AVC Coupling	CC21SL510J	JAN-C-20A
C120 A & B	10EC/38122	CAPACITOR: fixed, paper, dual unit, .5 uuf, ±15% ea. sect., 600 vdcw, oil filled and impregnated, hermetically sealed metal case.	Filter Capacitor	CP69B4EF504L	MIL-C-25A
C121	10EC/31924 (10EC/35246)	CAPACITOR: fixed, ceramic, 100 uuf, ±10%, 500 vdcw	IF Bypass	CC26SL101K (CC26SL101J)	JAN-C-20A JAN-C-20A
C122	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type.	Audio Coupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C123	10EC/38164	CAPACITOR: fixed, paper, .05 uf, +40, -20%, 400 vdcw, plastic tubular case, one section	Noise Limiter Time Constant	TMC CN-100-3 CDC PJ4S5	
C124		NOT USED			
C125	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Audio Coupler	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C126	10EC/39320	CAPACITOR: fixed, electrolytic, 25 uf, ±10%, 150 vdcw, one sect., hermetically sealed aluminum cas .	Cathode Bypass	TMC CE-100 AVX E26E1934	
C127	(10EC/37191)	CAPACITOR: fixed, c ramic, .005 uf, (GMC), ±20%, 500 vdcw, disc typ	Audio Bypass	TMC CC-100-15 CDC TM5D5 (CCK04W472Z)	JCNAAF-C-26

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007-/FRR-502		
Circuit Referenc Symbol	RCAF Referenc Number	Nam & Description	Function	Manufacturer & D signation or JAN Type	Contractor or Government Drawing or Specification
C128	(10EC/30986)	CAPACITOR: fixed, paper, 1 uf, ± 10%, 600 vdcw, oil filled and impregnated, hermetically sealed case.	Audio Filter	CP69B1EF105 -L (CP69B1EF 105K)	JAN-C-25A MIL-C-25A
C129	10EC/38164	CAPACITOR: fixed, paper, .05 uf, +40, -20%, 400 vdcw, plastic tubular case, one section.	Reactance Tube Grid	TMC CN-100-3 CDC PJ4S5	
C130	10EC/38164	CAPACITOR: fixed, paper, .05uf, +40, -20%, 400 vdcw, plastic tubular case, one section.	Reactance Tube Grid Filter	TMC CN-100-3 CDC PJ4S5	
C131	10EC/37192	CAPACITOR: fixed, ceramic, 22 uuf, ± 5%, 500 vdcw.	Reactance Tube Phase Network	CC21SL220J	JAN-C-20A
C132	10EC/34911	CAPACITOR: fixed, ceramic, 1000 uuf, ± 20%, char. A, 500 vdcw, disc type.	Blocking	TMC CC-100-9 CDC TM5D1	
C133	(10EC/37191)	CAPACITOR: fixed, ceramic, .005 uf, (GMC), ± 20%, 500 vdcw, disc type.	Reactance Tube Cathode Bypass	TMC CC-100-15 CDC TM5D5 (CCK04W472Z)	JCNAAF-C-26
C134	10EC/37203	CAPACITOR: fixed, ceramic, 220 uuf, ± 10%, 500 vdcw.	P/O Output Tank	TMC CC-101-3 EREGP2K221K	
C135	10EC/37224	CAPACITOR: fixed, ceramic, 150 uuf, ± 10%, 500 vdcw.	Reactance Tube Coupling	TMC CC-101-2 EREGP2K151K (CCK22W151Z)	JCNAAF-C-26
C136	10EC/29267 (10EC/29843)	CAPACITOR: fixed, mica, 510 uuf, ± 2%, char. C, 500 vdcw.	P/O BFO Tank	CM20C511G (CM20D511J)	MIL-C-5A

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RECEIVING SET, RADIO AN/FRR-502 — RECEIVER SUB-ASSEMBLY R-5007/FRR-502

Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Governm nt Drawing or Specificati n
C137	10EC/39626	CAPACITOR: variable, air dielectric, 2.3 - 15 uuf, one sect., 500 vdcw plate meshing type.	BFO Pitch	TMC CT-104-2 ASP MAPC-15	
C138	10EC/36306	CAPACITOR: fixed, ceramic, 47 uuf, ± 10%, 500 vdcw.	BFO Grid Coupling	CC21SL470K	JAN-C-20A
C139	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type	BFO Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C140	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type	BFO Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C141	10TJ/182394	CAPACITOR: fixed, ceramic, 30 uuf ± 5%, 500 vdcw	Xtal BFO Grid Bypass	CC21SL300J	JAN-C-20A
C142	10EC/37224	CAPACITOR: fixed, ceramic, 150 uuf ± 10%, 500 vdcw	RF Screen Bypass	TMC CC-101-2 ERE GP2K151K (CCK22W151Z)	JCNAAF-C-26
C143	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	RF Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C144		CAPACITOR: fixed, ceramic, 10 uuf, ± .5 uuf.	BFO Inj ction	CC21SL100D	JAN-C-20A
C145	10EC/31923	CAPACITOR: fix d, c ramic, 5 uuf, ± .5 uuf, 500 vdcw.	BFO Output	CC21SL050D	JAN-C-20A

RECEIVING SET, RADIO AN/FRR-502 — RECEIVER SUB-ASSEMBLY R-5007/FRR-502

Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designati n or JAN Type	Contractor or Government Drawing or Specification
C146	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	AVC Time Constant	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	 JCNAAF-C-26
C147 A & B	10EC/37225 (10EC/27386)	CAPACITOR: fixed, paper, dual unit, .1 uf, ±10%, ea. sect., 600 vdcw, oil filled and impregnated, hermetically sealed metal case.	Line Bypass	CP53B4EF104K (CP53B4EF 104V)	JAN-C-25A MIL-C-25A
C148		CAPACITOR: fixed, paper, 4.0 uf, +20, -10%, 600 vdcw, oil filled and impregnated, hermetically sealed metal case.	Power Supply Filter	CP41B1FF 405V (CP41B1FF 405K)	JAN-C-25A MIL-C-25A
C149		CAPACITOR: fixed, paper, 4.0 uf, +20, -10%, 600 vdcw, oil filled and impregnated, hermetically sealed metal case.	Power Supply Filter	CP41B1FF 405V (CP41B1FF 405K)	JAN-C-25A MIL-C-25A
C150		CAPACITOR: fixed, paper, 4.0 uf, +20, -10%, 600 vdcw, oil filled and impregnated, hermetically sealed metal case.	Power Supply Filter	CP41B1FF 405V (CP41B1FF 405K)	JAN-C-25A MIL-C-25A
C151	10EC/39320	CAPACITOR: fixed, electrolytic, 25 uf, ±10%, 150 vdcw, one sect., hermetically sealed aluminum case.	Negative Supply Filter	TMC CE-100 AVX E26E1934	
C152	10EC/38164	CAPACITOR: fixed, paper .05 uf, +40, -20%, 400 vdcw, plastic tubular case, one section.	B + Filter	TMC CN-100-3 CDC PJ4S5	

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C153 A & B	10EC/39365	CAPACITOR: fixed, ceramic, dual unit .01 uf, ea. sect., 500 vdcw.	Filter Bypass	TMC CC-100-23 CDC TM5DS1	
C154		NOT USED			
C155	10EC/20089 (10EC/30486)	CAPACITOR: fixed, mica, 470 uuf, ± 10%, char. A, 500 vdcw.	RF Line Bypass	CM20B471K (CM20B471J)	MIL-C-5A
C156	10EC/20089 (10EC/30486)	CAPACITOR: fixed, mica, 470 uuf, ± 10%, char. A, 500 vdcw.	RF Line Bypass	CM20B471K (CM20B471J)	MIL-C-5A
C157 A & B	10EC/39365	CAPACITOR: fixed, ceramic, dual unit, .01 uf, ea. sect., 500 vdcw.	Filament Bypass	TMC CC-100-23 CDC TM5DS1	
C158 A & B	10EC/39365	CAPACITOR: fixed, ceramic, dual unit .01 uf, ea. sect., 500 vdcw.	RF Bypass	TMC CC-100-23 CDC TM5DS1	
E100	10EC/39376	BOARD: terminal, general purpose barrier type, three 6-32 binding head machine screws	Antenna Input Terminals	TMC TM-100-3 CIN 3-164-Y-D	
E101	10EC/39377	BOARD: terminal, general purpose barrier type, eight 6-32 binding head machine screws.	Diversity & Audio Terminals	TMC TM-100-8 CIN 8-164-Y-D	
E102	10EC/39377	BOARD: terminal, general purpose barrier type, eight 6-32 binding head machine screws.	Remote Control Terminals	TMC TM-100-8 CIN 8-164-Y-D	
E103	10EC/39376	BOARD: t rminal, g n ral purpos barri r typ , thr 6-32 binding h ad machin screws.	AVC T rminals	TMC TM-100-3 CIN 3-164-Y-D	

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufactur r & Designation or JAN Type	Contractor or Government Drawing or Specification
F100	5BC/232	FUSE: cartridge, 2 amp.	Line Fuse	TMC FU-100-2 BUS AGC-2	
I100	5L/777	LAMP: incandescent, 6-8 v, .250 amp, T-3-1/4 clear bulb.	Pilot Light	TMC BI-101-44 GEC 44	
J100	10EC/32927	CONNECTOR: coaxial, female contact, BNC type receptacle, 52 ohms impedance, single hole mounting.	IF Input	UG-625/U	MIL-C-3608
J101	10EC/32927	CONNECTOR: coaxial, female contact, BNC type receptacle, 52 ohms impedance, single hole mounting.	HFO Input	UG-625/U	MIL-C-3608
J102	10EC/32927	CONNECTOR: coaxial, female contact, BNC type receptacle, 52 ohms impedance, single hole mounting.	HFO Output	UG-625/U	MIL-C-3608
J102	10EC/32927	CONNECTOR: coaxial, female contact, BNC type receptacle, 52 ohms impedance, single hole mounting.	BFO Input	UG-625/U	MIL-C-3608
J104	10EC/32927	CONNECTOR: coaxial, female contact, BNC type receptacle, 52 ohms impedance, single hole mounting.	BFO Output	UG-625/U	MIL-C-3608
J105	5CC/2447	CONNECTOR: female contact, polarized four contact bracket type.	Power Supply Jack	TMC JJ-120-2 CINS-304-AB	
J106	10EC/4788	CONNECTOR: plug	Phone Jack	JJ-034	JAN-J-641
J107	10EC/39396	CONNECTOR: multiple contact, four coaxial female contacts, eight non-coaxial mal contacts	RF Connector	TMC JJ-104 CAN DPD-12C4-34P	

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
J108	10EC/29335	CONNECTOR: plug	AC Input	TMC JJ-115 HUB 7466(mod)	
L100	10EC/38255	COIL: audio frequency, 15 henries, 85 ma dc, 270 ohms d-c res., 2500 v rms test.	Power Supply Filter	TMC TF5000 CTD RS1585	
L101	10EC/38255	COIL: audio frequency, 15 henries, 85 ma dc, 270 ohms d-c res., 2500 v rms test.	Power Supply Filter	TMC TF5000 CTD RS1585	
L102	10EC/39480	COIL: radio frequency, 2.5 mh, 50 ma with axial leads.	BFO Filter	TMC CL-101-3 NAT R-50-3	
L103	10EC/40564	COIL: radio frequency	P/O Oscillator Tank	TMC A-164	
L104	10EC/39480	COIL: radio frequency, 2.5 mh, 50 ma with axial leads	BFO Plate Load	TMC CL-101-3 NAT R-50-3	
R100	10EC/36621	RESISTOR: fixed, composition 270,000 ohms ± 10%, 1/2 watt	IF Grid Resistor	RC20GF274K	MIL-R-11A
R101	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R102	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms ± 10%, 1/2 watt	P/O Screen Voltag Divid r	RC20GF104K	MIL-R-11A
R103	10EC/36638	RESISTOR: fix d, composition, 68,000 ohms, ± 10%, 1/2 watt	P/O Scr en Voltag Divid r	RC20GF683K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R104	10EC/32750	RESISTOR: fixed, composition, 2200 ohms ± 10%, 1/2 watt	Plate Decoupling	RC20GF222K	MIL-R-11A
R105	10EC/36124	RESISTOR: fixed, composition, 33,000 ohms, ± 5%, 1/2 watt	AVC Decoupling	RC20GF333J	MIL-R-11A
R106	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R107	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R108	10EC/36638	RESISTOR: fixed, composition, 68,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF683K	MIL-R-11A
R109	10EC/32750	RESISTOR: fixed, composition, 2200 ohms, ± 10%, 1/2 watt	Plate Decoupling	RC20GF222K	MIL-R-11A
R110	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R111	10EC/32734	RESITOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 2att	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R112	10EC/36638	RESISTOR: fixed, composition, 68,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF683K	MIL-R-11A
R113	10EC/32750	RESISTOR: fixed, composition, 2200 ohms ± 10%, 1/2 watt	Plate Decoupling	RC20GF222K	MIL-R-11A

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R114	10EC/32758	RESISTOR: fixed, composition, 6800 ohms, ± 5%, 1/2 watt	P/O AVC Delay	RC20GF682J	MIL-R-11A
R115	10EC/32877	RESISTOR: fixed, composition, 270,000 ohms, ± 5%, 1/2 watt	P/O AVC Delay	RC20GF274J	MIL-R-11A
R116	10EC/37228	RESISTOR: fixed, composition, 1.2 megohm, ± 10%, 1/2 watt	AVC Load	RC20GF125K	MIL-R11A
R117	10EC/37228	RESISTOR: fixed, composition, 1.2 megohm, ± 10%, 1/2 watt	P/O AVC Time Constant	RC20GF125K	MIL-R11A
R118	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	2nd Detector Load	RC20GF474K	MIL-R-11A
R119	10EC/32784	RESISTOR: fixed, composition, 47,000 ohms, ± 10%, 1/2 watt	P/O IF Filter	RC20GF473K	MIL-R-11A
R120	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	P/O Noise Limiter	RC20GF474K	MIL-R-11A
R121	10EC/37229	RESISTOR: variable, composition, 1 megohm, ± 20%, audio taper	Audio Gain Control	RV4ATSD105D	JAN-R-94
R122	10EC/32815	RESISTOR: fixed, composition, 2700 ohms ± 10%, 1/2 watt	Cathode Bias	RC20GF272K	MIL-R-11A
R123		NOT USED			
R124	10EC/32991	RESISTOR: fixed, composition, 33,000 ohms, ± 10%, 1/2 watt	Plat Load	RC20GF333K	MIL-R-11A
R125	10EC/32787	RESISTOR: fix d, composition, 470,000 ohms, ± 10%, 1/2 watt	Grid L ak	RC20GF474K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Governm nt Drawing or Specification
R126		RESISTOR: fixed, composition, 510 ohms, ± 10%, 1 watt	Plate Filter	RC30GF511K	MIL-R-11A
R127	10EC/39323	RESISTOR: fixed, wire wound, 1500 ohms, ± 10%, 10 watts.	Filter	TMC RW-109-26 WLC 10F1500 WL	
R128	10EC/36624	RESISTOR: fixed, composition, 3900 ohms, ± 5%, 1/2 watt.	Audio Level	RC20GF392J	MIL-R-11A
R129	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt.	Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R130	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R131	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R132	10EC/37230	RESISTOR: fixed, composition, 120,000 ohms, ± 10%, 1/2 watt	Grid Leak	RC20GF124K	MIL-R-11A
R133	10EC/36614	RESISTOR: fixed, composition, 82,000 ohms, ± 5%, 1/2 watt	Part of Reactance Tube Phase Circuit	RC20GF823J	MIL-R-11A
R134	10EC/36633	RESISTOR: fixed, composition, 180 ohms, ± 10%, 1/2 watt	Cathode Degeneration	RC20GF181K	MIL-R-11A

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RECEIVING SET, RADIO AN/FRR-502				RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description		Function	Manufacturer & Designation or JAN Type	Contractor or Governm nt Drawing or Specification
R135	10EC/32843	RESISTOR:	fixed, composition, 1000 ohms, ± 5%, 1/2 watt	Cathode Bias	RC20GF102J	MIL-R-11A
R136	10EC/37231	RESISTOR:	variable, composition, 2500 ohms, ± 10%, 2 watts.	Reactance Tube Balance	RV4ATSA252A	JAN-R-94
R137	10EC/36124	RESISTOR:	fixed, composition, 33, 000 ohms, ± 5%, 1/2 watt	Reactance Tube Grid Resistor	RC20GF333J	MIL-R-11A
R138	10EC/36592	RESISTOR:	fixed, composition, 56, 000 ohms, ± 10%, 1/2 watt	Reactance Tube Plate Resistor	RC20GF563K	MIL-R-11A
R139	10EC/32784	RESISTOR:	fixed, composition, 47, 000 ohms, ± 10%, 1/2 watt	Oscillator Grid Resistor	RC20GF473K	MIL-R-11A
R140	10EC/37232	RESISTOR:	fixed, composition, 120 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF121K	MIL-R-11A
R141	10EC/37230	RESISTOR:	fixed, composition, 120, 000 ohms, ± 10%, 1/2 watt	Oscillator Screen	RC20GF124K	MIL-R-11A
R142	10EC/35263	RESISTOR:	fixed, composition, 3. 3 megohms, ± 10%, 1/2 watt	AVC Decoupling	RC20GF335K	MIL-R-11A
R143		RESISTOR:	variable, composition, 50, 000 ohms, ± 20%, reverse log taper with SPST switch, 3/8-32 x 3/8 bushing, 1/4 in. dia shaft, 7/8 in. from mounting surfac .	RF Gain Control	RV4BTRD503E	JAN-R-94
R144	10EC/32758	RESISTOR:	fix d, c mposition, 6800 ohms, ± 5%, 1/2 watt	Voltag Divid r	RC20GF682J	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R145	10EC/33053	RESISTOR: fixed, composition, 150,000 ohms, ± 5%, 1/2 watt	Voltage Divider	RC20GF154J	MIL-R-11A
R146	10EC/32758	RESISTOR: fixed, composition, 6800 ohms, ± 5%, 1/2 watt	Voltage Divider	RC20GF682J	MIL-R-11A
R147	10 EC/33053	RESISTOR: fixed, composition, 150,000 ohms, ± 5%, 1/2 watt	Voltage Divider	RC20GF154J	MIL-R-11A
R148	10EC/39821 (10EC/41036)	RESISTOR: fixed, wire wound, 5000 ohms, ± 10%, 20 watts	Current Limiting	TMCRW-110-30 WLC 20F5000 (RW33V502)	
R149	10EC/39505	RESISTOR: fixed, wire wound, 600 ohms, ± 10%, 25 watts	Negative Bias	TMC RW-102 WLC 25F600	
R150	10EC/37234	RESISTOR: fixed, composition, 22 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF220K	MIL-R-11A
S100	10EC/32458	SWITCH: toggle, SPST, 3 amp. 250 v.	Noise-Limiter ON-OFF Switch	ST12A	JAN-S-23
S101	10EC/28992	SWITCH: toggle, DPDT, 3 amp, 250 v (one pole unused).	AVC/Manual Switch	ST22N	JAN-S-23
S102		SWITCH: rotary, SPST, 3 amp, 250 v (part of R143).			
S103	10EC/39540	SWITCH: rotary, single section, mycalex insulation.	Slave Master Xtal Operation Switch	TMC SW-100 OAK 53340FIX	
S104	10EC/32458	SWITCH: toggle, SPST, 3 amp, 250 v.	BFO ON-OFF Switch	ST12A	JAN-S-23

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
T100	10EC/39539	COUPLER: transmission line, 300 ohms balanced to 75 ohms unbalanced, open construction, plastic molded case.	Antenna Matching Transformer	TMC A-165	
T101	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
T102	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
T103	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
T104	10EC/39543	TRANSFORMER: audio frequency, 5000 ohms primary, 600 ohms, 8 ohms secondary.	Output Transformer	TMC TF-100	
T105	10EC/40566	TRANSFORMER: power, step up, step down, input 110/220 volts, 50/60 cycles single phase, four output windings.	Power Transformer	TMC TF-101	
V100	10EC/20489 (10EC/37057)	TUBE: electron, 6BA6, miniature 7 pin pentode.	1st IF	6BA6 (JAN 5749/ 6BA6W)	JCNAAF-T-1
V101	10EC/20489 (10EC/37057)	TUBE: electron, 6BA6, miniature 7 pin pentode.	2nd IF	6BA6 (JAN 5749/ 6BA6W)	JCNAAF-T-1
V102	10EC/20489 (10EC/37057)	TUBE: lectron, 6BA6, miniature 7 pin p ntod .	3rd IF	6BA6 (JAN 5749/ 6BA6W)	JCNAAF-T-1

RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Ref renc Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
V103	10EC/22058 (10EC/37819)	TUBE: electron, 6AL5, miniature 7 pin twin triode	2nd Detector and AVC	6AL5 (JAN 5726/ 6AL5W)	JCNAAF-T-1
V104	10EC/37235	TUBE: electron, 6T8, miniature 9 pin triple diode.	Noise Limiter and 1st Audio	6T8	
V105	10EC/20488 (10EC/35027)	TUBE: electron, 6AQ5, miniature 7 pin beam power amplifier	Audio Output	6AQ5 (JAN 6005/ 6AQ5W)	JCNAAF-T-1
V106	10EC/18874 (10EC/37236)	TUBE: electron, 6J6, miniature 7 pin uhf twin triode	Balance Reactance Modulator	6J6 (JAN 6J6W)	JCNAAF-T-1
V107	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin pentode	BFO Oscillator	6AG5 (JAN 6AG5)	JCNAAF-T-1
V108	10EC/31094 (10EC/21841)	TUBE: electron, 5Y3GT, duo-diode rectifier, octal	Rectifier	5Y3GT (JAN 5Y3WGT)	JCNAAF-T-1
V109	10EC/32226 (10EC/30134)	TUBE: electron, OA2, miniature 7 pin voltage regulator.	Voltage Regulator	OA2 (JAN OA2)	JCNAAF-T-1
W100	10EC/40567	CABLE ASSEMBLY: power, female twist-lock type, plug one end, non-polarized male plug opposite end.	AC Line Cord	TMC CA-103 COR 1628	
XF100	5CB/464	HOLDER: fuse, extractor post type, for single AGC fuse.		TMC FH-100-2 BUS HKP-M	
XI100	5L/1641	LIGHT: indicator, with red frosted lens, for miniature bayonet base lamp.	Pilot Light	TMC TS-106-1 DLC 87410-111	

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RECEIVING SET, RADIO AN/FRR-502			RECEIVER SUB-ASSEMBLY R-5007/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
XV100	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V100	TS102P01	JAN-S-28A
XV101	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V101	TS102P01	JAN-S-28A
XV102	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V102	TS102P01	JAN-S-28A
XV103	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V103	TS102P01	JAN-S-28A
XV104	10EC/29468	SOCKET: tube, 9 pin miniature	Socket V104	TS103P01	JAN-S-28A
XV105	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V105	TS102P01	JAN-S-28A
XV106	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V106	TS102P01	JAN-S-28A
XV107	10EC/29469	SOCKET: tube, 7 pin miniature	Socket V107	TS102P01	JAN-S-28A
XV108	10EC/28274	SOCKET: tube, octal	Socket V108	TS101P01	JAN-S-28A
XV109	10EC/29469	SOCKET: tube, 7 pin miniature	Socket 109	TS102P01	JAN-S-28A
XY100	10EC/38616	SOCKET: crystal, ceramic, .487 in. spacing for .050 in. pins	Crystal Holder	TMC TS-104-1 EBY 8879	
Y100	10X/455/CR-25/U	CRYSTAL UNIT: quartz, 455 kc, .01%. (not supplied with receiver)	IF Alignment	CR-25/U	MIL-C-3098A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Refer nc Number	Name & Description	Function	Manufactur r & D signation or JAN Type	Contractor or Gov rnment Drawing or Specification
C500	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C501	10EC/40568	CAPACITOR: variable, air dielectric, four sect., 10-135 uuf ea. sect., 500 vdcw.	Frequency Tuning	TMC CB-101 RCC800284	
C502	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11A120	JAN-C-81
C503	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM 5S1 (CCK05W103Z)	JCNAAF-C-26
C504	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw. disc type.	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C505	(10EC/37224)	CAPACITOR: fixed, ceramic, 150 uuf, ± 10%, 500 vdcw.	Plate Tank	TMC CC-101-2 ERE GP2K151K (CCK22W151Z)	JCNAAF-C-26
C506		NOT USED			
C507	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C508	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor r Governm nt Drawing or Specification
C509	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11A120	JAN-C-81
C510	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C511	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	RF Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C512	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C513	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11A120	JAN-C-81
C514	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C515	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C516	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C517	10EC/37187	CAPACITOR: fix d, mica, 620 uuf, ± 2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Nam & Description	Function	Manufacturer & D signation or JAN Type	Contractor or Gov rnment Drawing or Specification
C518	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2%, char. D, 500 vdcw.	Part of IF Tank	CM20D621G	MIL-C-5A
C519	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type.	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C520	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C521	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Reactance Tube Grid	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C522	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C523	10EC/29223	CAPACITOR: variable, ceramic, 7-45 uuf, 500 vdcw.	Reactance Tube Balance Control	CV11C450	JAN-C-81
C524	10EC/26186	CAPACITOR: fixed, ceramic, 47 uuf, ± 5%, 500 vdcw	Reactance Tube Screen Bypass	CC21UJ470J	JAN-C-20A
C525A		CAPACITOR: fixed, ceramic, 15 uuf, ± 10%, 500 vdcw.	Reactance Tube Coupling	CC21SL150K	JAN-C-20A
C525B		CAPACITOR: fixed, Same as C525A			
C526	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Governm nt Drawing or Specification
C527	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw.	Oscillator Trimmer	CV11C300	JAN-C-81
C528	10EC/26186	CAPACITOR: fixed, ceramic, 47 uuf, ± 10%, 500 vdcw.	Oscillator Grid	CC21UJ470J	JAN-C-20A
C529	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C530	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C531	(10EC/37238	CAPACITOR: fixed, ceramic, 120 uuf, ± 10%, 500 vdcw.	RF Bypass	TMC CC-101-4 EREGP2K121K (CCK04X121K)	JCNAAF-C-26
C532	10EC/39845	CAPACITOR: variable, air dielectric 3.2-50 uuf, 500 vdcw.	Crystal Tuning	TMC CT-104-1 HAM MAPC50B	
C533	10EC/35709	CAPACITOR: fixed, ceramic, 10 uuf, ± .5 uuf, 500 vdcw.	HFO Output	CC21SH100D	JAN-C-20A
C534	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Oscillator Plate Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C535	10EC/37239	CAPACITOR: fix d, c ramic, 1 uuf, ± .25 uuf, 500 vdcw.	Oscillator Inj ction	CC20SK010C	JAN-C-20A
C536	10EC/37240	CAPACITOR: fixed, mica, 1000 uuf, ± 2%, char. E, 500 vdcw.	Oscillator Padd r	CM30E102G	MIL-C-5A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C537	(10EC/37224	CAPACITOR: fixed, ceramic, 150 uuf, ±10%, 500 vdcw.	Plate Tank	TMC CC-101-2 ERE GP2K151K (CCK22W151Z)	JCNAAF-C-26
C538	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ±20%, 500 vdcw, disc type	RF Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C539		CAPACITOR: fixed, ceramic, 25 uuf, ±10%, 500 vdcw.	Reactance Tube Linearity	CC21SL250K	JAN-C-20A
I500	5L/777	LAMP: incandescent, 6-8 v, 250 ma dc, bayonet base.	Pilot Light	GEC 44	TMC BI-101-44
L501		NOT USED			
L502	10EC/39846	COIL: radio frequency, 2 sect.: 30 uh, Q of 40 at 2.5 mc, and 2.6 uh, Q of 30 at 7.9 mc.	Oscillator Tank	TMC A-313	
P500	10EC/39541	CONNECTOR: receptacle, 4 coaxial contacts, and 8 non-coaxial contacts.	RF Head Connector	TMC PL-109 CAN DPD-12C4-33S	
R500	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ±10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R501	10EC/35233	RESISTOR: fixed, composition, 10 ohms ±10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R502	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ±10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A

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RECEIVING SET, RADIO AN/FRR-502 — RADIO FREQUENCY TUNER TN-5010/FRR-502

Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R503	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R504	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A
R505	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R506	10EC/36630	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 2 watts	Plate Decoupling	RC42GF273K	MIL-R-11A
R507	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R508	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R509	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R510	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R511	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A
R512	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt.	P/O Screen Voltag Divid r	RC20GF104K	MIL-R-11A
R513	10EC/36630	RESISTOR: fix d, composition, 27,000 hms, ± 10%, 2 watts	Plat D coupling	RC42GF273K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufactur r & Designation or JAN Type	Contractor or Gov rnm nt Drawing or Specification
R514	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R515	10EC/32845	RESISTOR: fixed, composition, 820 ohms ± 10%, 1/2 watt	Mixer Cathode Bias	RC20GF821K	MIL-R-11A
R516	10EC/35244	RESISTOR: fixed, composition, 47,000 ohms ± 10%, 1 watt	Plate Decoupling	RC30GF473K	MIL-R-11A
R517	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	Reactance Tube Grid Resistor	RC20GF474K	MIL-R-11A
R518	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	P/O Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R519	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	P/O Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R520	10EC/34699	RESISTOR: fixed, composition, 2700 ohms, ± 5%, 1/2 watt	Reactance Tube Cathode Bias	RC20GF272J	MIL-R-11A
R521	10EC/32784	RESISTOR: fixed, composition, 47,000 ohms, ± 10%, 1/2 watt	Reactance Tube Screen Resistor	RC20GF473K	MIL-R-11A
R522		NOT USED			
R523	10EC/37234	RESISTOR: fixed, composition, 22 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF220K	MIL-R-11A
R524	10EC/32780	RESISTOR: fixed, composition, 22,000 ohms, ± 10%, 1/2 watt	Oscillator Grid Resistor	RC20GF223K	MIL-R-11A

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R525	10EC/37232	RESISTOR: fixed, composition, 120 ohms ±10%, 1/2 watt	Oscillator Cathode Bias	RC20GF121K	MIL-R-11A
R526	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ±10%, 1/2 watt	Oscillator Screen Resistor	RC20GF393K	MIL-R-11A
R527	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ±10%, 1/2 watt.	Oscillator Plate Resistor	RC20GF393K	MIL-R-11A
R528	10EC/36120	RESISTOR: fixed, composition, 3,300 ohms, ±5%, 1/2 watt	Reactance Tube Plate Load	RC20GF332J	MIL-R-11A
S500	10EC/39540	SWITCH: rotary, non-shorting, mycalex insulation, two pole, three position	Slave, Master Xtal Operational Switch	TMC SW-100 OAK 53340FIX	
T500	10EC/39847	TRANSFORMER: r-f, 2-4 mc, pri. 2.8 uh, secdy. 35 uh.	Antenna Transformer	TMC A-314	
T501	10EC/39848	TRANSFORMER: r-f, 2-4 mc, pri. 200 uh, secdy. 42 uh.	Interstage Transformer	TMC A-312	
T502	10EC/39849	TRANSFORMER: r-f, 2-4 mc, pri. 200 uh, secdy. 42 uh.	Mixer Transformer	TMC A-315	
T503	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
V500	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	1st RF	6AG5 (JAN 6AG5)	JCNAAF-T-1
V501	10EC/18141 (10EC/21430)	TUBE: 1 ctron, 6AG5, miniatur 7 pin	2nd RF	6AG5 (JAN 6AG5)	JCNAAF-T-1

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5010/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
V502	10EC/27511 (10EC/35258)	TUBE: electron, 6AU6, miniature 7 pin.	Mixer	6AU6 (JAN 6AU6WA)	JCNAAF-T-1
V503	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin	Reactance Tube	6AG5 (JAN 6AG5)	JCNAAF-T-1
V504	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	HF Oscillator	6AG5 (JAN 6AG5)	JCNAAF-T-1
X1500	5L/1642	SOCKET: miniature bayonet base, T-3-1/4 bulb, right angle, down turned, short, hole size 5/32 in., 1-3/8 in. lg, 7/16 wd OA.	Lamp Socket	TMC TS-109 DLC 708	
XV500	10EC/29469	SOCKET: tube, 7 pin miniature	V500 Socket	TS102P01	JAN-S-28A
XV501	10EC/29469	SOCKET: tube, 7 pin miniature	V501 Socket	TS102P01	JAN-S-28A
XV502	10EC/29469	SOCKET: tube, 7 pin miniature	V502 Socket	TS102P01	JAN-S-28A
XV503	10EC/29469	SOCKET: tube, 7 pin miniature	V503 Socket	TS102P01	JAN-S-28A
XV504	10EC/29469	SOCKET: tube, 7 pin miniature	V504 Socket	TS102P01	JAN-S-28A
XY500	10EC/38616	SOCKET: crystal, ceramic, .487 in. spacing for .050 in. pins.	Xtal Socket	TMC TS-104-1 EBY 8879	
Y500	10X/* /CR-18/U * (Reference number dictated by frequency requir d).	CRYSTAL UNIT: quartz (frequency as required) (not supplied with r-f tuner)	HFO Control	CR-18/U	MIL-C-3098A.

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RECEIVING SET, RADIO AN/FRR-502 — RADIO FREQUENCY TUNER TN-5011/FRR-502

Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C600	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C601	10EC/40568	CAPACITOR: variable, air dielectric, four sect., 10-135 uuf, ea. sect., 500 vdcw.	Frequency Tuning	TMC CB-101 RCC 800284	
C602	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11A120	JAN-C-81
C603	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C604	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C605	10EC/32097	CAPACITOR: fixed, ceramic, 100 uuf, ± 10%, 500 vdcw.	Plate Tank	CC26UJ101J	JAN-C-20A
C606		NOT USED			
C607	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C608	10EC/39956 (10EC/36578)	CAPACITOR: fix d, c ramic, .01 uf, ± 20% 500 vdcw, disc typ	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

RECEIVING SET, RADIO AN/FRR-502 — RADIO FREQUENCY TUNER TN-5011/FRR-502

Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C609	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw	High Frequency Band Adjustment	CV11A120	JAN-C-81
C610	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C611	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type.	HF Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C612	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C613	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11A120	JAN-C-81
C614	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C615	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C616	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C617	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2% char. D, 500 vdcw.	P/O IF Tank	CM20D621G	MIL-C-5A

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5011/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C618	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2% char. D, 500 vdcw.	P/O IF Tank	CM20D621G	MIL-C-5A
C619	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C620	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C621	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20% 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C622	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C623	10EC/29223	CAPACITOR: variable, ceramic, 7-45 uuf, 500 vdcw.	Reactance Tube Balance Control	CV11C450	JAN-C-81
C624	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ± 10%, 500 vdcw	Reactance Tube Screen Bypass	CC21UJ470J	JAN-C-20A
C625	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ± 10%, 500 vdcw.	Reactance Tube Coupling	CC21UJ470J	JAN-C-20A
C626	10EC/39956 (10EC/36578)	CAPACITOR: fix d, ceramic, .01 uf, ± 20%, 500 vdcw, disc typ	Plat D coupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

RECEIVING SET, RADIO AN/FRR-502		RADIO FREQUENCY TUNER TN-5011/FRR-502			
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C627	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw.	Oscillator Trimmer	CV11C300	JAN-C-81
C628	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ±10%, 500 vdcw	Osc. Grid Coupling	CC21UJ470J	JAN-C-20A
C629	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ±20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C630	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ±20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C631	(10EC/37238)	CAPACITOR: fixed, ceramic, 120 uuf, ±10%, 500 vdcw	RF Bypass	TMC CC-101-4 ERE GP2K121K (CCK04X121K)	JCNAAF-C-26
C632	10EC/39845	CAPACITOR: variable, air dielectric, 3.2-50 uuf, 500 vdcw.	Crystal Tuning	TMC CT-104-1 HAM MAPC50B	
C633	10EC/35709	CAPACITOR: fixed, ceramic, 10 uuf, ±.5 uuf, 500 vdcw.	HFO Output	CC21SH100D	JAN-C-20A
C634	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ±20%, 500 vdcw, disc type	Osc. Plate Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C635	10EC/35689	CAPACITOR: fixed, ceramic, 1.5 uuf, ±.25 uuf, 500 vdcw.	Oscillator Injection.	CC21SK1R5C	JAN-C-20A
C636	10EC/37246	CAPACITOR: fixed, mica, 1500 uuf, ± 2%, char. E, 500 vdcw	Oscillator Padder	CM30E152G	MIL-C-5A

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Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C637	10EC/32097	CAPACITOR: fixed, ceramic, 100 uuf, ±10%, 500 vdcw.	Plate Tank	CC26UJ101J	JAN-C-20A
C638	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, ± 20%, 500 vdcw, disc type	RF Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
I600	5L/777	LAMP: incandescent, 6-8 v, 250 ma dc, bayonet base.	Pilot Light	TMC BI-101-44 GEC 44	
L601		NOT USED			
L602	10EC/39851	COIL ASSEMBLY: radio frequency, 3 sect.; sect. No. 1: L of 7.7 uh, Q of 78 at 7.9 mc sect. No. 2: L of 1.7 uh, Q of 44 at 7.9 mc sect. No. 3: L of 4.2 uh, Q of 57 at 7.9 mc	Oscillator Tank	TMC A-297	
P600	10EC/39541	CONNECTOR: receptacle, 4 coaxial contacts, and 8 non-coaxial contacts	RF Head Connector	TMC PL-109 CAN DPD-12C4-33S	
R600	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ±10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R601	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ±10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R602	10EC/32816	RESISTOR: fix d, composition, 220 ohms ±10%, 1/2 watt	Cathod Bias	RC20GF221K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5011/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R603	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R604	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A
R605	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R606	10EC/36630	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 2 watts.	Plate Decoupling	RC42GF273K	MIL-R-11A
R607	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms ± 10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R608	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R609	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R610	10EC/35233	RESISTOR: fixed, composition 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R611	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A
R612	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R613	10EC/36630	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 2 watts	Plate Decoupling	RC42GF273K	MIL-R-11A

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5011/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing r Specification
R614	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ±10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R615	10EC/32845	RESISTOR: fixed, composition, 820 ohms, ±10%, 1/2 watt	Mixer Cathode Bias	RC20GF821K	MIL-R-11A
R616	10EC/35244	RESISTOR: fixed, composition, 47,000 ohms, ±10%, 1 watt	Plate Decoupling	RC30GF473K	MIL-R-11A
R617	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms ±10%, 1/2 watt	Reactance Tube Grid Resistor	RC20GF474K	MIL-R-11A
R618	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ±10%, 1/2 watt	P/O Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R619	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms ±10%, 1/2 watt	P/O Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R620	10EC/36126	RESISTOR: fixed, composition, 2200 ohms ±5%, 1/2 watt	Reactance Tube Cathode Bias	RC20GF222J	MIL-R-11A
R621	10EC/32784	RESISTOR: fixed, composition, 47,000 ohms, ±10%, 1/2 watt	Reactance Tube Screen Resistor	RC20GF473K	MIL-R-11A
R622		NOT USED			
R623	10EC/37234	RESISTOR: fixed, composition, 22 ohms ±10%, 1/2 watt	Parasitic Suppressor	RC20GF220K	MIL-R-11A
R624	10EC/32780	RESISTOR: fix d, composition, 22,000 ohms, ±10%, 1/2 watt	Osc. Grid R sistor	RC20GF223K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5011/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R625	10EC/37232	RESISTOR: fixed, composition, 120 ohms, ±10%, 1/2 watt	Osc. Cathode Bias	RC20GF121K	MIL-R-11A
R626	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ±10%, 1/2 watt	Osc. Screen Resistor	RC20GF393K	MIL-R-11A
R627	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ±10%, 1/2 watt	Osc. Plate Resistor	RC20GF393K	MIL-R-11A
R628	10EC/36126	RESISTOR: fixed, composition, 2200 ohms ±5%, 1/2 watt	Reactance Tube Plate Load	RC20GF222J	MIL-R-11A
S600	10EC/39540	SWITCH: rotary, non-shorting, mycalex insulation, two pole, 3 position	Slave, Master, Xtal Operational Switch	TMC SW-100 OAK 53340F1X	
T600	10EC/39852	TRANSFORMER: r-f, 4-8 mc, pri, L of 3.2 uh, Q of 75 at 7.9 mc; secdy, L of 10.5 uh, Q of 58 at 7.9 mc	Antenna Transformer	TMC A-298	
T601	10EC/39861	TRANSFORMER: r-f, 4-8 mc, pri, L of 50 uh, Q of 40 at 2.5 mc; secdy, L of 10.5 uh, Q of 58 at 7.9 mc	Interstage RF Transformer	TMC A-296	
T602	10EC/39862	TRANSFORMER: r-f, 4-8 mc, pri, L of 50 uh, Q of 40 at 2.5 mc; secdy, L of 10.5 uh, Q of 58 at 7.9 mc	Mixer Transformer	TMC A-299	
T603	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
V600	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin	1st RF	6AG5 (JAN 6AG5)	JCNAAF-T-1

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5011/FRR-502		
Circuit Ref rence Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Governm nt Drawing or Specification
V601	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	2nd RF	6AG5 (JAN 6AG5)	JCNAAF-T-1
V602	10EC/27511 (10EC/35258)	TUBE: electron, 6AU6, miniature 7 pin	Mixer	6AU6 (JAN 6AU6WA)	JCNAAF-T-1
V603	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin	Reactance Tube	6AG5 (JAN 6AG5)	JCNAAF-T-1
V604	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	HF Oscillator	6AG5 (JAN 6AG5)	JCNAAF-T-1
XI600	5L/1642	SOCKET: miniature bayonet base, T-3-1/4 bulb, right angle, down turned, short, hole size 5/32 in., 1-3/8 in. lg x 7/16 in. wd OA.	Lamp Socket	TMC TS-109 DLC 708	
XV600	10EC/29469	SOCKET: tube, 7 pin miniature.	V600 Socket	TS102P01	JAN-S-28A
XV601	10EC/29469	SOCKET: tube, 7 pin miniature	V601 Socket	TS102P01	JAN-S-28A
XV602	10EC/29469	SOCKET: tube, 7 pin miniature.	V602 Socket	TS102P01	JAN-S-28A
XV603	10EC/29469	SOCKET: tube, 7 pin miniature.	V603 Socket	TS102P01	JAN-S-28A
XV604	10EC/29469	SOCKET: tube, 7 pin miniature.	V604 Socket	TS102P01	JAN-S-28A
XY600	10EC/38616	SOCKET: crystal, ceramic, .487 in. spacing for .050 in. pins.	Xtal Socket	TMC TS-104-1 EBY 8879	
XY600	10X/ /CR-18/U * (R f r nc numb r indicated by frequ ncy r quir d.)	CRYSTAL UNIT: quartz (frequ ncy as r - quir d) (not suppli d with r-f tun r)	HFO Control	CR-18/U	MIL-C-3098A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C700	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C701	10EC/40568	CAPACITOR: variable, air dielectric, four sect., 10-135 uuf ea. sect., 500 vdcw.	Frequency Tuning	TMC CB-101 RCC 800284	
C702	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw.	High Frequency Band Adjustment	CV11C300	JAN-C-81
C703	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C704	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C705	10EC/37250	CAPACITOR: fixed, ceramic, 22 uf, ±5%, 500 vdcw.	Plate Tank	CC21SH220J	JAN-C-20A
C706		NOT USED			
C707	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C708	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	AVC Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C709	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw	High Frequency Band Adjustment	CV11C300	JAN-C-81
C710	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C711	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C712	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C713	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw	High Frequency Band Adjustment	CV11C300	JAN-C-81
C714	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C715	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C716	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type	Filament Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C717	10EC/37187	CAPACITOR: fix d, mica, 620 uuf, ± 2%, char. D, 500 vdcw	P/O IF Tank	CM20D621G	MIL-C-5A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Ref rence Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Gov rnment Drawing or Specification
C718	10EC/37187	CAPACITOR: fixed, mica, 620 uuf, ± 2%, char. D, 500 vdcw	P/O IF Tank	CM20D621G	MIL-C-5A
C719	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C720	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C721	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C722	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type	Reactance Tube Grid Filter	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C723	10EC/34692	CAPACITOR: variable, ceramic, 3-12 uuf, 500 vdcw.	Reactance Tube Balance Control	CV11A120	JAN-C-81
C724	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ± 5%, 500 vdcw	Screen Bypass	CC21UJ470J	JAN-C-20A
C725	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ± 5%, 500 vdcw.	Reactance Tube Coupling	CC21UJ470J	JAN-C-20A
C726	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	Plate Decoupling	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26

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RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
C727	10EC/29449	CAPACITOR: variable, ceramic, 4-30 uuf, 500 vdcw	Oscillator Trimmer	CV11C300	JAN-C-81
C728	10EC/28030	CAPACITOR: fixed, ceramic, 47 uuf, ±5%, 500 vdcw.	Osc. Grid Coupling	CC21UJ470J	JAN-C-20A
C729	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Cathode Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C730	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type.	Screen Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C731	10EC/37238	CAPACITOR: fixed, ceramic, 120 uuf, ±10%, 500 vdcw.	HFO Output	TMC CC-101-4 ERE GP2K121K (CCK04X121K)	JCNAAF-C-26
C732	10EC/39845	CAPACITOR: variable, air dielectric, 3.2-50 uuf, 500 vdcw	Crystal Tuning	TMC CT-104-1 HAM MAPC50B	
C733	10EC/35709	CAPACITOR: fixed, ceramic, 10 uuf, ±.5 uuf, 500 vdcw.	HFO Output	CC21SH100D	JAN-C-20A
C734	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ±20%, 500 vdcw, disc type	Osc. Plate Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
C735	10EC/37251	CAPACITOR: fixed, ceramic, 1 uuf, ±.25 uuf, 500 vdcw.	Oscillator Injection	CC21SL010C	JAN-C-20A
C736	10EC/37253	CAPACITOR: fixed, mica, 2200 uuf, ± 2%, char. E, 500 vdcw.	Oscillator Padder	CM30E222G	MIL-C-5A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Nam & Description	Function	Manufacturer & D signation or JAN Type	Contractor or Government Drawing or Specification
C737	10EC/37250	CAPACITOR: fixed, ceramic, 22 uf, ± 5%, 500 vdcw.	Plate Tank	CC21SH220J	JAN-C-20A
C738	10EC/39956 (10EC/36578)	CAPACITOR: fixed, ceramic, .01 uf, (GMC), ± 20%, 500 vdcw, disc type.	RF Bypass	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	JCNAAF-C-26
I700	5L/777	LAMP: incandescent, 6-8 v, 250 ma dc, bayonet base.	Pilot Light	TMC BI-101-44, GEC 44	
L702	10EC/39863	COIL: r-f, 3 sect: sect. No. 1: L of .352 uh, Q of 86 at 25 mc; sect. No. 2: L of 1.14 uh, Q of 114 at 25 mc; sect. No. 3: L of 2.1 uh, Q of 114 at 7.9 mc.	Oscillator Tank	TMC A-305	
P700	10EC/39541	CONNECTOR: receptacle, 4 coaxial and 8 non-coaxial contacts	RF Head Connector	TMC PL-109 CAN DPD-12C4-33S	
R700	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R701	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R702	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt.	Cathode Bias	RC20GF221K	MIL-R-11A
R703	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R704	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A

PART 12 TABLE OF PARTS

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Ref rence Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R705	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R706	10EC/36630	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 2 watts.	Plate Decoupling	RC42GF273K	MIL-R-11A
R707	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	AVC Filter	RC20GF104K	MIL-R-11A
R708	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF100K	MIL-R-11A
R709	10EC/32816	RESISTOR: fixed, composition, 220 ohms, ± 10%, 1/2 watt	Cathode Bias	RC20GF221K	MIL-R-11A
R710	10EC/35233	RESISTOR: fixed, composition, 10 ohms, ± 10%, 1/2 watt	Screen Parasitic Suppressor	RC20GF100K	MIL-R-11A
R711	10EC/33056	RESISTOR: fixed, composition, 220,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF224K	MIL-R-11A
R712	10EC/32734	RESISTOR: fixed, composition, 100,000 ohms, ± 10%, 1/2 watt	P/O Screen Voltage Divider	RC20GF104K	MIL-R-11A
R713	10EC/36630	RESISTOR: fixed, composition, 27,000 ohms, ± 10%, 2 watts	Plate Decoupling	RC42GF273K	MIL-R-11A
R714		NOT USED			
R715	10EC/32845	RESISTOR: fix d, composition, 820 ohms, ± 10%, 1/2 watt.	Mix r Cathod Bias	RC20GF821K	MIL-R-11A
R716	10EC/35244	RESISTOR: fix d, composition, 47,000 ohms, ± 10%, 1 watt	Plat D coupling	RC30GF473K	MIL-R-11A

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit R ferenc Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R717	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms ± 10%, 1/2 watt	Reactance Tube Grid Resistor	RC20GF474K	MIL-R-11A
R718	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt	Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R719	10EC/32787	RESISTOR: fixed, composition, 470,000 ohms, ± 10%, 1/2 watt.	P/O Reactance Tube Grid Filter	RC20GF474K	MIL-R-11A
R720	10EC/36120	RESISTOR: fixed, composition, 3300 ohms, ± 5%, 1/2 watt	Reactance Tube Cathode Bias	RC20GF332J	MIL-R-11A
R721	10EC/32784	RESISTOR: fixed, composition, 47,000 ohms, ± 10%, 1/2 watt	Reactance Tube Screen Resistor	RC20GF473K	MIL-R-11A
R722	10EC/32758	RESISTOR: fixed, composition, 6800 ohms, ± 5%, 1/2 watt	Reactance Tube Plate Load	RC20GF682J	MIL-R-11A
R723	10EC/37234	RESISTOR: fixed, composition, 22 ohms ± 10%, 1/2 watt	Parasitic Suppressor	RC20GF220K	MIL-R-11A
R724	10EC/32780	RESISTOR: fixed, composition, 22000 ohms, ± 10%, 1/2 watt.	Oscillator Grid Leak	RC20GF223K	MIL-R-11A
R725	10EC/37232	RESISTOR: fixed, composition, 120 ohms, ± 10%, 1/2 watt	Osc. Cathode Bias	RC20GF121K	MIL-R-11A
R726	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ± 10%, 1/2 watt	Osc. Screen Resistor	RC20GF393K	MIL-R-11A
R727	10EC/37241	RESISTOR: fixed, composition, 39,000 ohms, ± 10%, 1/2 watt.	Osc. Plate Resistor	RC20GF393K	MIL-R-11A

PART 12 TABLE OF PARTS

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
R728	10EC/32838	RESISTOR: fixed, composition, 130 ohms, ± 5%, 1/2 watt	Mixer Cathode Resistor	RC20GF131J	MIL-R-11A
S700	10EC/39540	SWITCH: rotary, non-shorting, mycalex insulation, 2 pole, 3 position.	Slave, Master Xtal Operational Switch	TMC SW-100 OAK 53340F1X	
T700	10EC/39864	TRANSFORMER: r-f, 8-16 mc, pri. .53 uh, secdy. 2.1 uh	Antenna Transformer	TMC A-306	
T701	10EC/39865	TRANSFORMER: r-f, 8-16 mc, pri. 52.5 uh, secdy. 2.4 uh.	Interstage RF Transformer	TMC A-304	
T702	10EC/39866	TRANSFORMER: r-f, 8-16 mc, pri. 52.5 uh, secdy. 2.4 uh.	Mixer Transformer	TMC A-307	
T703	10EC/40565	TRANSFORMER: i-f, 455 kc, plate coupling.	IF Transformer	TMC A-157	
V700	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	1st RF	6AG5 (JAN 6AG5)	JCNAAF-T-1
V701	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	2nd RF	6AG5 (JAN 6AG5)	JCNAAF-T-1
V702	10EC/27511 (10EC/35258)	TUBE: electron, 6AU6, miniature 7 pin.	Mixer	6AU6 (JAN 6AU6WA)	JCNAAF-T-1
V703	10EC/18141 (10EC/21430)	TUBE: electron, 6AG5, miniature 7 pin.	Reactance Tube	6AG5 (JAN 6AG5)	JCNAAF-T-1
V704	10EC/18141 (10EC/21430)	TUBE: lectron, 6AG5, miniatur 7 pin.	HF Oscillator	6AG5 (JAN 6AG5)	JCNAAF-T-1

RECEIVING SET, RADIO AN/FRR-502			RADIO FREQUENCY TUNER TN-5012/FRR-502		
Circuit Reference Symbol	RCAF Reference Number	Name & Description	Function	Manufacturer & Designation or JAN Type	Contractor or Government Drawing or Specification
XI700	5L/1642	SOCKET: miniature bayonet base, T-3-1/4 bulb, right angle, down turned, short, hole size 5/32 in., 1-3/8 in. lg x 7/16 in. wd OA.	Lamp Socket	TMC TS-109 DLC 708	
XV700	10EC/29469	SOCKET: tube, 7 pin miniature.	V700 Socket	TS102P01	JAN-S-28A
XV701	10EC/29469	SOCKET: tube, 7 pin miniature.	V701 Socket	TS102P01	JAN-S-28A
XV702	10EC/29469	SOCKET: tube, 7 pin miniature.	V702 Socket	TS102P01	JAN-S-28A
XV703	10EC/29469	SOCKET: tube, 7 pin miniature	V703 Socket	TS102P01	JAN-S-28A
XV704	10EC/29469	SOCKET: tube, 7 pin miniature.	V704 Socket	TS102P01	JAN-S-28A
XY700	10EC/38616	SOCKET: crystal, ceramic, .487 in. spacing for .050 in. pins.	Xtal Socket	TMC TS-104-1 EBY 8879	
Y700	10X/* /CR-18/U * (Reference number dictated by frequency required.)	CRYSTAL UNIT: quartz (frequency as required). (not supplied with r-f tuner)	HFO Control	CR-18/U	MIL-C-3098A

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ROYAL CANADIAN AIR FORCE

EO 35BG-5FRR502-6B/1
10 Sept 56

MODIFICATION

RECEIVING SET, RADIO AN/FRR-502

(SQUELCH MODIFICATION)

EQUIPMENT AFFECTED:	10EA/34592 - Receiver Subassembly, R-5007/FRR-502
BY WHOM WORK WILL BE PERFORMED:	Contractor
WHEN WORK WILL BE PERFORMED:	Prior to delivery
RCAF FORM ENTRIES:	E133
MODIFICATION OF SPARES IN STOCK:	Nil

PURPOSE

1 This modification provides for automatic muting of the audio output until the receiver is tuned to an RF signal of pre-determined amplitude.

MODIFICATION DATA

2 The following outlines the modification data for one receiver:

Mechanical

(a) Due to the complexity of the modification, this work will be performed only by the contractor.

Electrical

(b) An electrical description of the modification follows:

Theory of Operation

(1) A control tube is introduced into the first audio frequency amplifier grid circuit to control the bias of this stage. The control tube is operated by the amplitude of the negative DC voltage developed across the second detector load resistance. With signals below a pre-determined and adjustable level, the first audio tube is maintained in a current "cut off" condition, and in consequence, there is no audio output from the receiver. With signal levels in excess of the pre-determined level, the excess bias is removed from the first audio amplifier, which then operates in a normal manner.

Circuit Description

(2) Reference should be made to Figures 4, 5, and 7. The Squelch control tube, V110, introduced by this modification, is controlled by the rectified voltage appearing across the second detector load resistance R118. This negative voltage is filtered by R157, C161 to remove the audio frequency components of the signal, and applied then to the grid of V110, a 6AB4 tube.

(3) With applied signal of amplitude less than threshold, V110 is in a conducting condition as the cathode voltage is negative with respect to the grid, and the plate current causes a voltage drop across the plate load resistor, R153. This causes the grid of V104 to fall below its cathode voltage sufficiently to cut the tube off.

(4) As the input signal level is increased, the negative voltage applied to the grid of the control tube increases, and the plate current decreases allowing the grid of V104 to approach normal operating condition.

(5) With V110 in the "cut off" condition, the plate voltage rises to its maximum at which point the diode section of V104 limits and prevents its grid from being driven positive. V104 operating bias voltage is developed in the grid circuit resistors R160 and R158.

(6) In operation, the rate of change of bias of V104 is such that a 3 db change in signal level is sufficient to change the audio output level from -30 dbm to +25 dbm -- its full rated power.

(7) To maintain the overall fidelity of the audio frequency section of the receiver, after incorporation of this modification the following changes are made:

(i) V104 plate load resistor, R124, is changed in value.
(ii) C125 audio coupling capacitor is changed in value.
(iii) C126, V105 cathode resistor bypass capacitor is deleted.
(iv) C127, high frequency bypass, is deleted.

PARTS REQUIRED

3 The following parts are required to complete the modification of one receiver:

RCAF REF	PART	DESCRIPTION	QUANTITY
(10EC/37191)	TMC CC-100-15 CDC TM5D5 (CCK04W472Z)	CAPACITOR: fixed, ceramic, 0.005 uf, C125	ea 1
10EC/39956 (10EC/35246)	TMC CC-100-16 CDC TM5S1 (CCK05W103Z)	CAPACITOR: fixed, ceramic, 0.01 uf, C159, C161	ea 2
	Titania Electric Corp.	CAPACITOR: fixed, titanium dioxide, 0.1 uf, ±20%, 150 vdcw, rectangular, C160	ea 1
10EC/37230	RC20GF124K	RESISTOR: fixed, composition, R124	ea 1
10EC/35548	RC30GF274K	RESISTOR: fixed, composition, R151	ea 1
10EC/36134	RC30GF103J	RESISTOR: fixed, composition, R152	ea 1
10EC/36252	RC20GF225K	RESISTOR: fixed, composition, R153, R160	ea 2
10EC/37231	RV4ATSA252A	RESISTOR: variable, R155	ea 1
10EC/33017	RC30GF102K	RESISTOR: fixed, composition, R156	ea 1
10EC/32790	RC20GF105K	RESISTOR: fixed, composition, R157	ea 1
10EC/32787	RC20GF474K	RESISTOR: fixed, composition, R158	ea 1
	RC30GF683K	RESISTOR: fixed, composition, 68,000 ohms, R159	ea 1

PARTS REQUIRED (cont)

RCAF REF	PART	DESCRIPTION	QUANTITY
(10EC/37237)	CMC 6AB4 (JAN 6AB4)	TUBE: electron, V110	ea 1
10EC/29469	TS102P01	SOCKET: tube, XV110	ea 1

PARTS RENDERED SURPLUS OR OBSOLETE

4 The following parts are rendered surplus or obsolete by this modification:

RCAF REF	PART	DESCRIPTION	QUANTITY
10EC/39320	TMC CE-100 AVX E26E1934	CAPACITOR: fixed, electrolytic, C126	ea 1
(10EC/37191)	TMC CC-100-15 CDC TM5D5 (CCK04W472Z)	CAPACITOR: fixed, ceramic, C127	ea 1
10EC/32991	RC20GF333K	RESISTOR: fixed, composition, R124	ea 1

ADDITIONAL DATA

6 The following information pertains to the modification of one receiver:

Test Procedure

(a) The test procedure for one receiver follows:

Test Equipment

(1) Signal Generator, Measurements Corp. Model 82
AC Voltmeter, -40 to +30 db range
600 ohm, 2 watt carbon resistor
VTVM, Hewlett-Packard Model 410B

Conditions

(2) For test, the receiver controls are to be set as follows:

AC line voltage	110 V AC
AVC switch	ON
BFO switch	OFF
Noise limiter	OFF
RF Gain control	Maximum
AF Gain control	As detailed in paragraph (4) (ii) following

DC Check

(3) With receiver "ON", RF Gain at maximum, V110 and V104 removed, measure voltages between points specified below and ground using the vacuum tube voltmeter.

(i)	pin 1, V110	voltage to be 11.5 V DC ±20%
(ii)	pin 1, V104	voltage to be 11.5 V DC ±20%
(iii)	pin 7, V104	voltage to be 6.0 V DC ±20%

Insert V104 in socket and recheck voltages at

(iv) pin 1, V104 voltage to be 7.5 V DC ±20%
(v) pin 7, V104 voltage to be 8.2 V DC ±20%

NOTE

Under no circumstance should voltage in (iv) be more positive than that in (v).

(vi) Junction of R155, R156 negative voltage to be not less than -27 V DC

(4) (i) Set signal generator to suitable frequency, output level to 6 UV modulated 30% at 1000 cps. (Allowance is to be made for the 6 db pad.)
(ii) Turn squelch control fully counter-clockwise and tune receiver. Adjust audio gain control to give 1.8 watts output (+24.8 dbm).
(iii) Turn squelch control until AF audio output falls not more than 1 db.
(iv) Set signal generator to output level 3 db lower than in (i) above.
(v) Audio output to be not more than -30 dbm.

(5) With receiver and signal generator set as above but with signal levels as listed in test sheet, repeat test procedure above. Record results on test sheet.

List of Illustrations

(b) The illustrations accompanying this modification are as follows:

Figure 1 Test Equipment Connections
Figure 2 Front View, R-5007/FRR-502 with TN-5010/FRR-502
Figure 3 Top View, R-5007/FRR-502
Figure 4 Bottom View, R-5007/FRR-502
Figure 5 Simplified Schematic Diagram (with Squelch), Limiter-Audio Circuit, R-5007/FRR-502
Figure 6 Pictorial Wiring Diagram (with Squelch), R-5007/FRR-502
Figure 7 Schematic Diagram (with Squelch), R-5007/FRR-502 with TN-5010/FRR-502
Figure 8 Schematic Diagram, TN-5011/FRR-502
Figure 9 Schematic Diagram, TN-5012/FRR-502

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

Prepared By:
T.M.C. (Canada) Limited

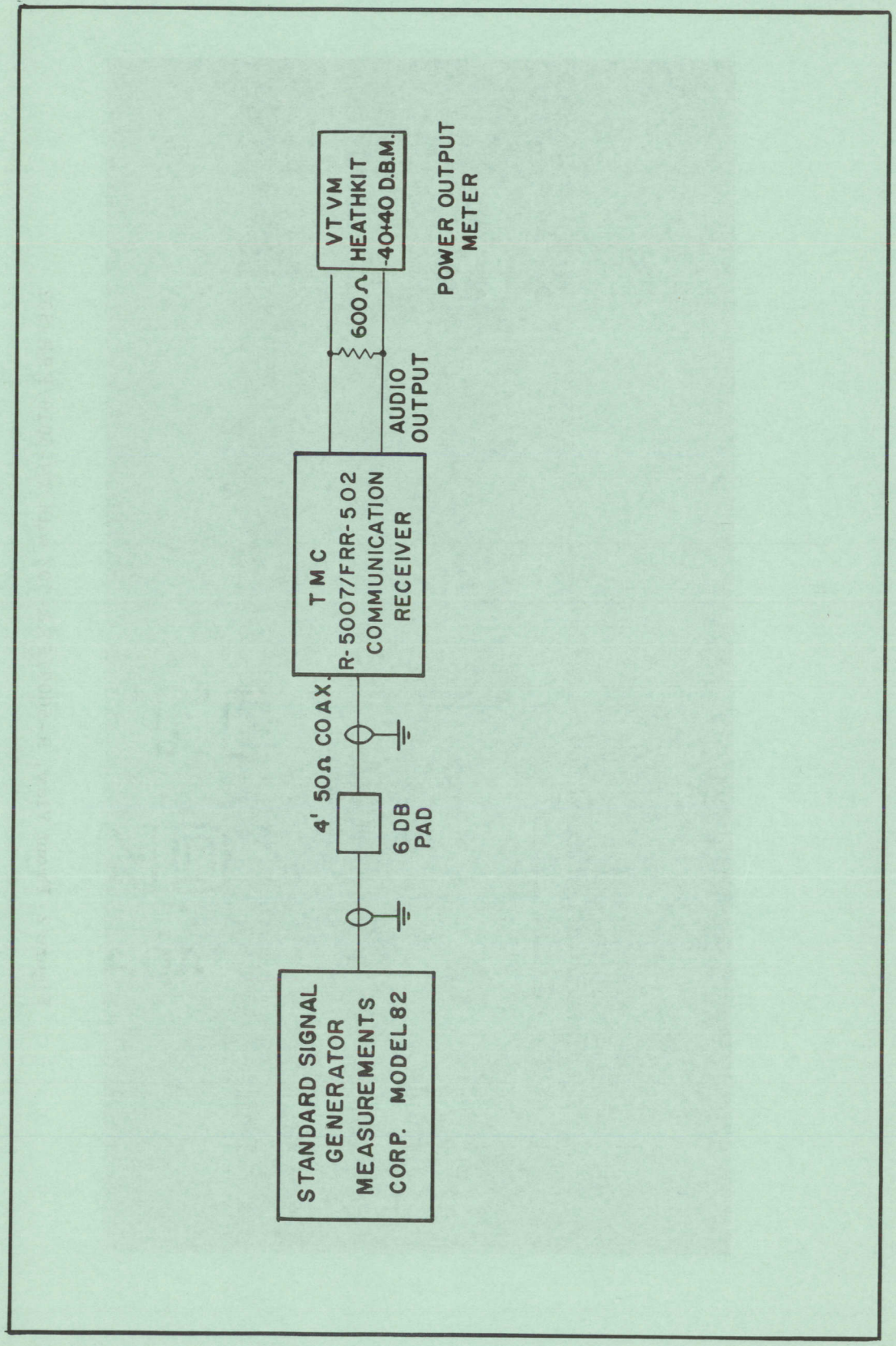

Figure 1 Test Equipment Connections

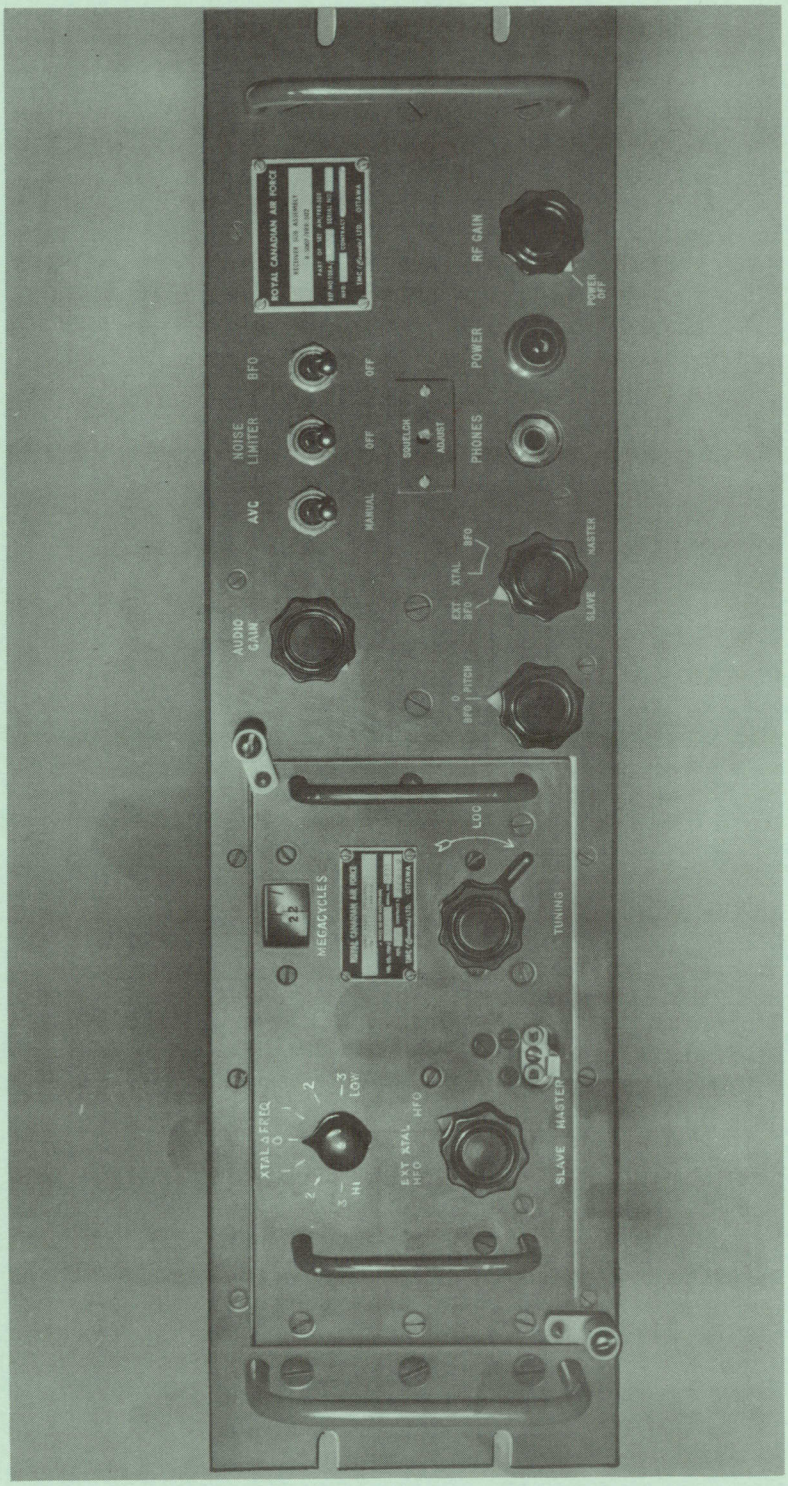

Figure 2 Front View, R-5007/FRR-502 with TN-5010/FRR-502

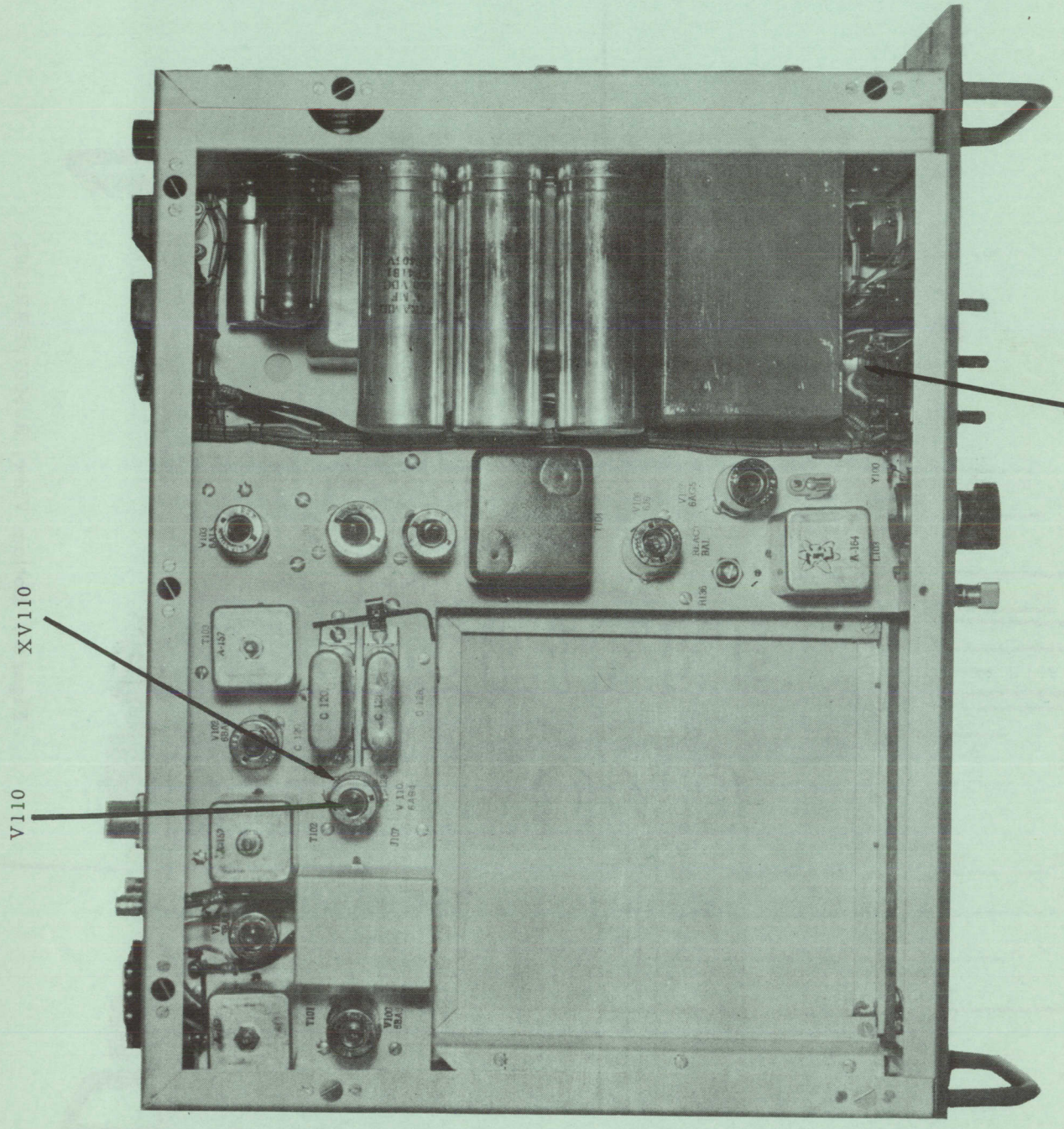

Figure 3 Top View, R-5007/FRR-502

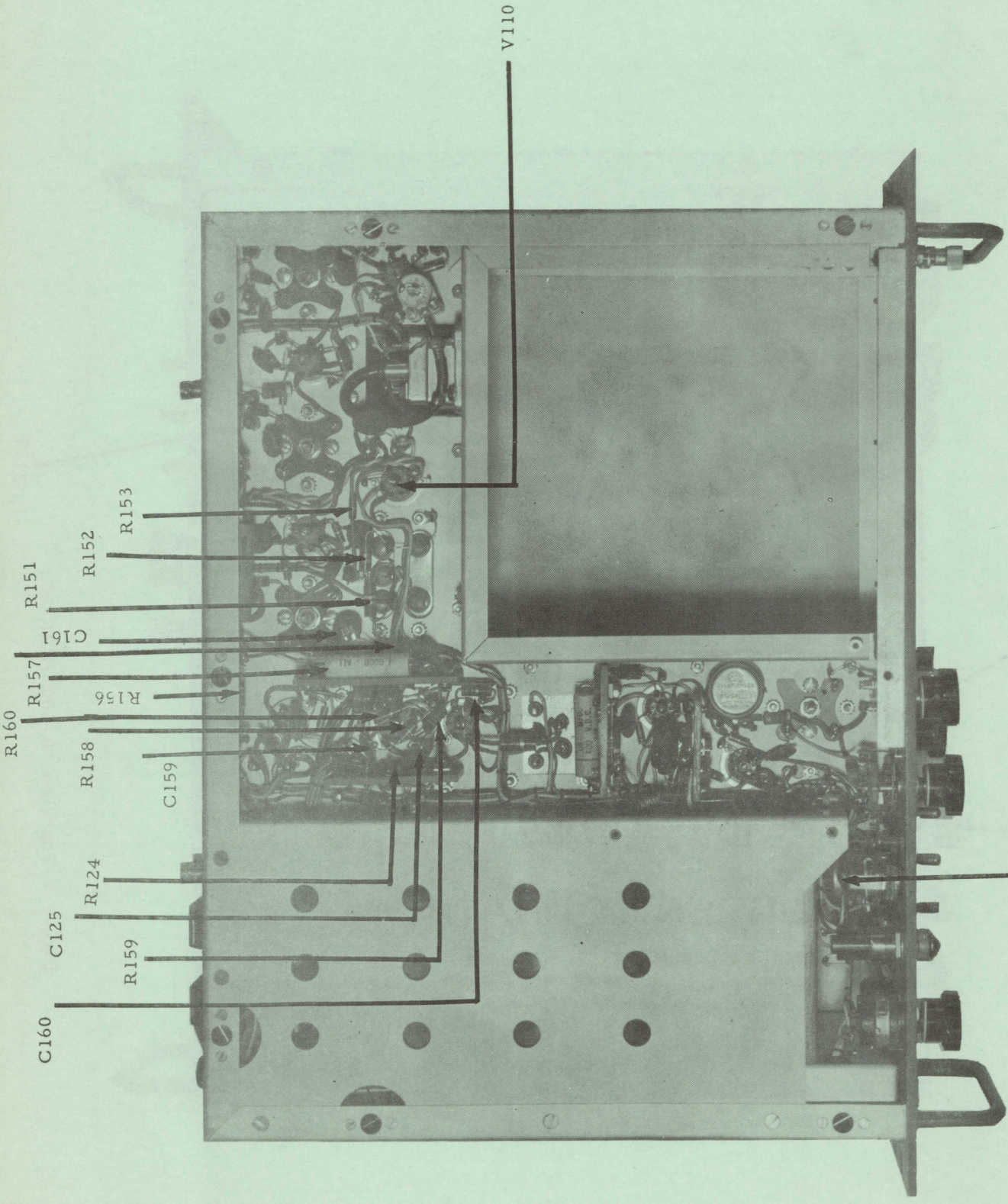

Figure 4 Bottom View, R-5007/FRR-502

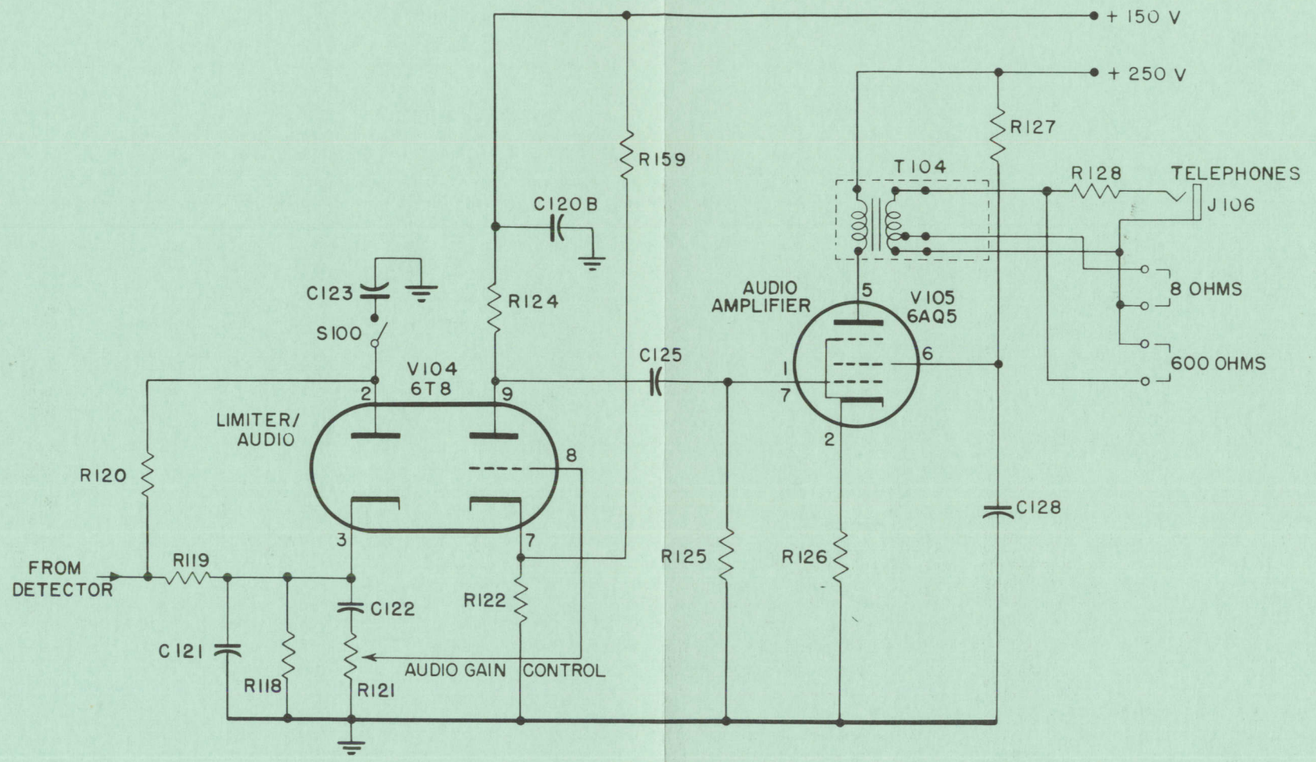

Figure 5 Simplified Schematic Diagram (with Squelch), Limiter-Audio Circuit, R-5007/FRR-502

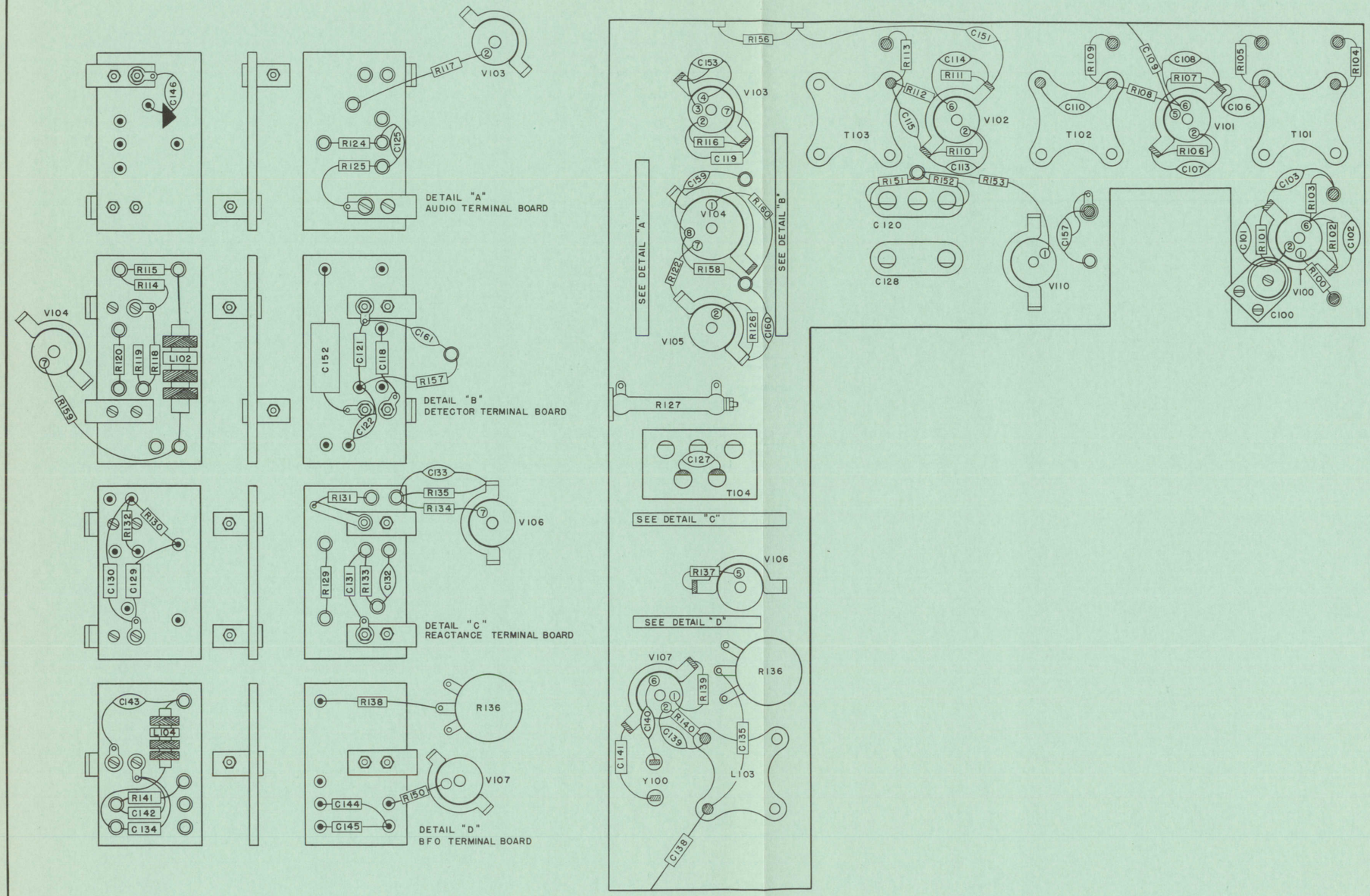

Figure 6 Pictorial Wiring Diagram (with Squelch), R-5007/FRR-502

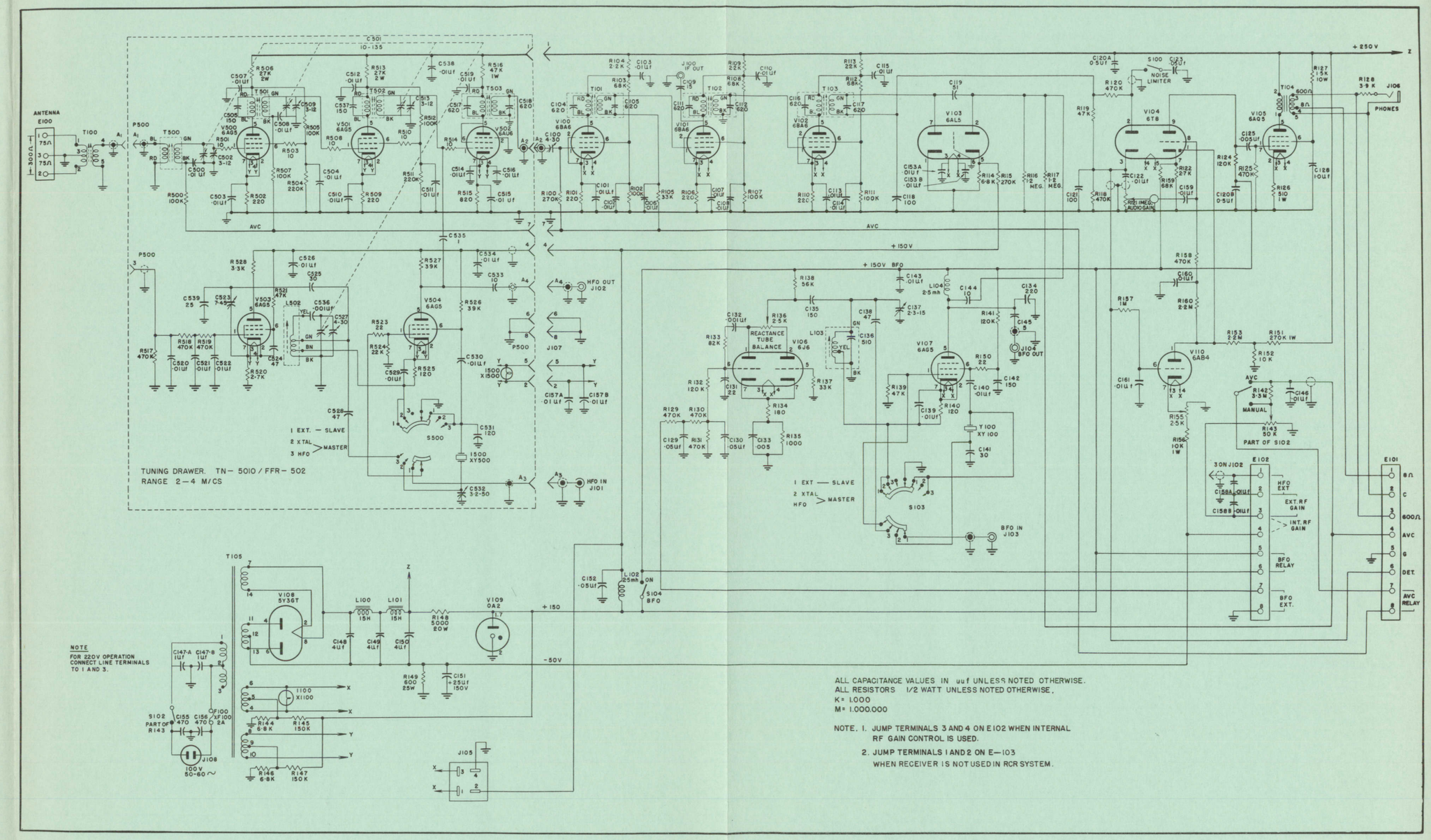

Figure 7 Schematic Diagram (with Squelch), R-5007/FRR-502 with TN-5010/FRR-502

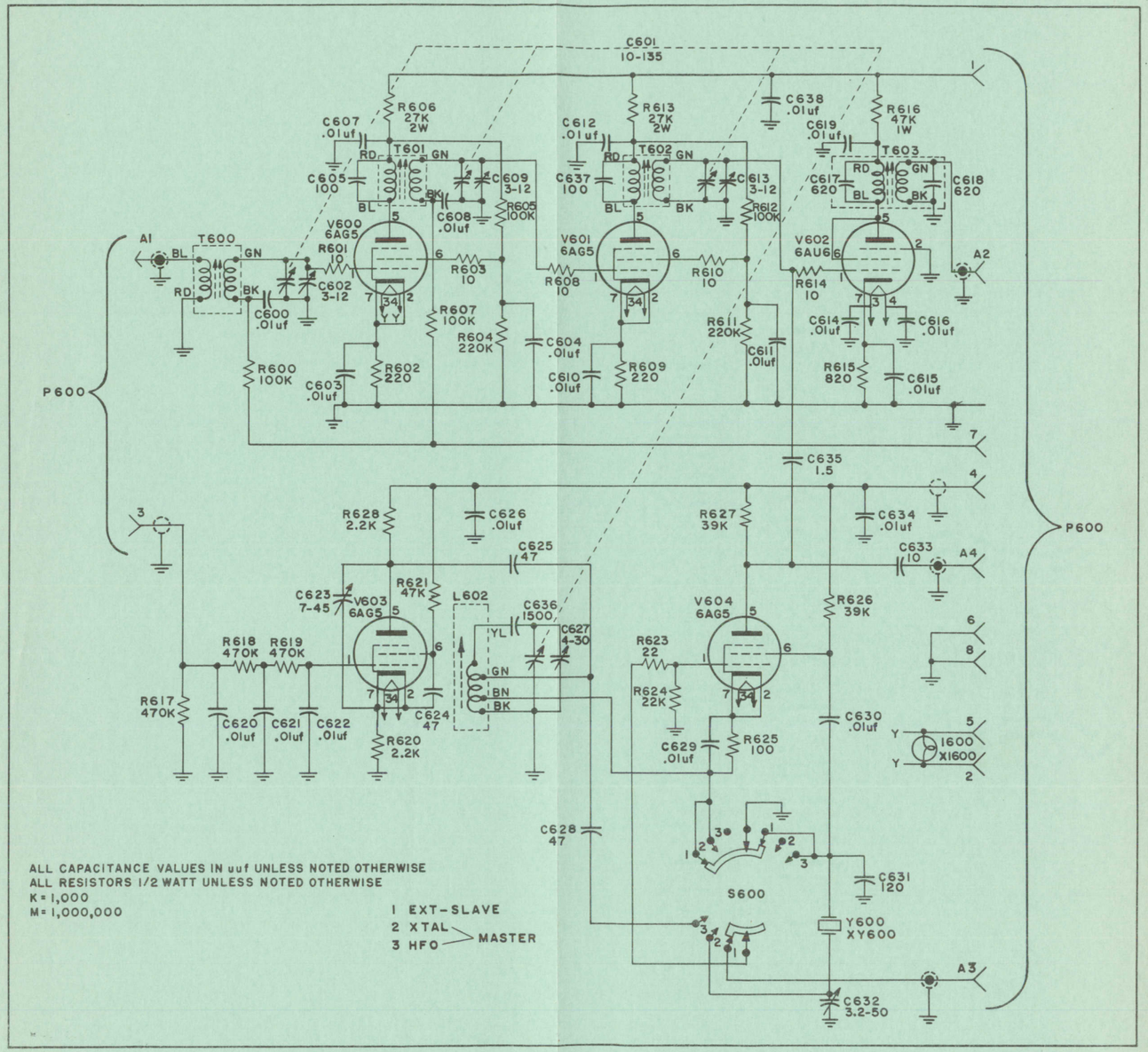

Figure 8 Schematic Diagram, TN-5011/FRR-502

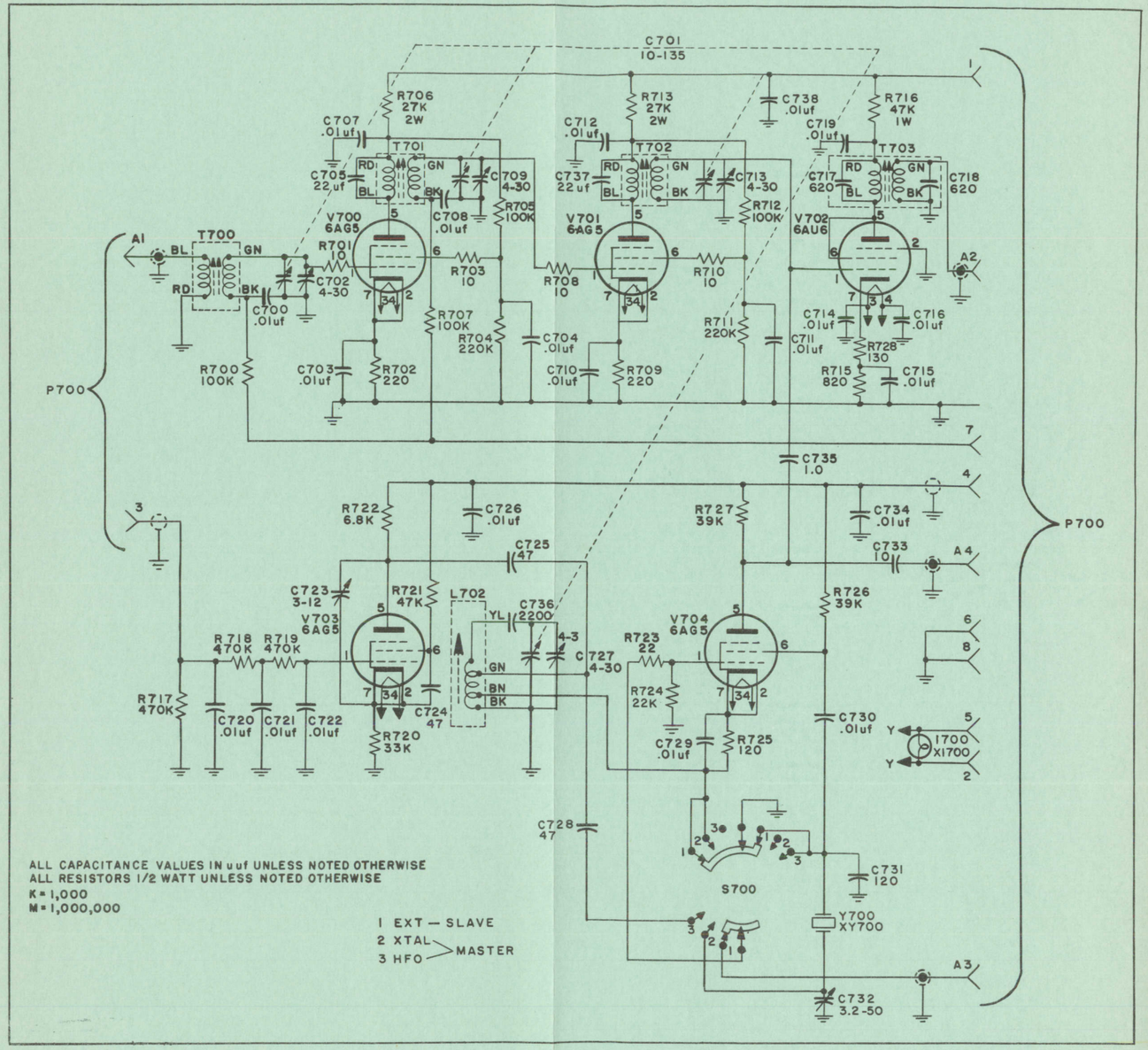

Figure 9 Schematic Diagram, TN-5012/FRR-502