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SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

Radio Receiving Set AN/WRR-3A (see figure 1-1) is a dual conversion superheterodyne receiver for surface craft and submarine installation. It receives A1 (CW), A2 (MCW) and F1 (FSK) signals. The receiver has a frequency range of 14 to 600 KC in five bands

The receiver consists of two stages of RF amplifica- tion, a mixer, a local oscillator, a single stage of I amplification (which is, essentially, a second converte used on Bands I and IV only), three stages of IF ampli-

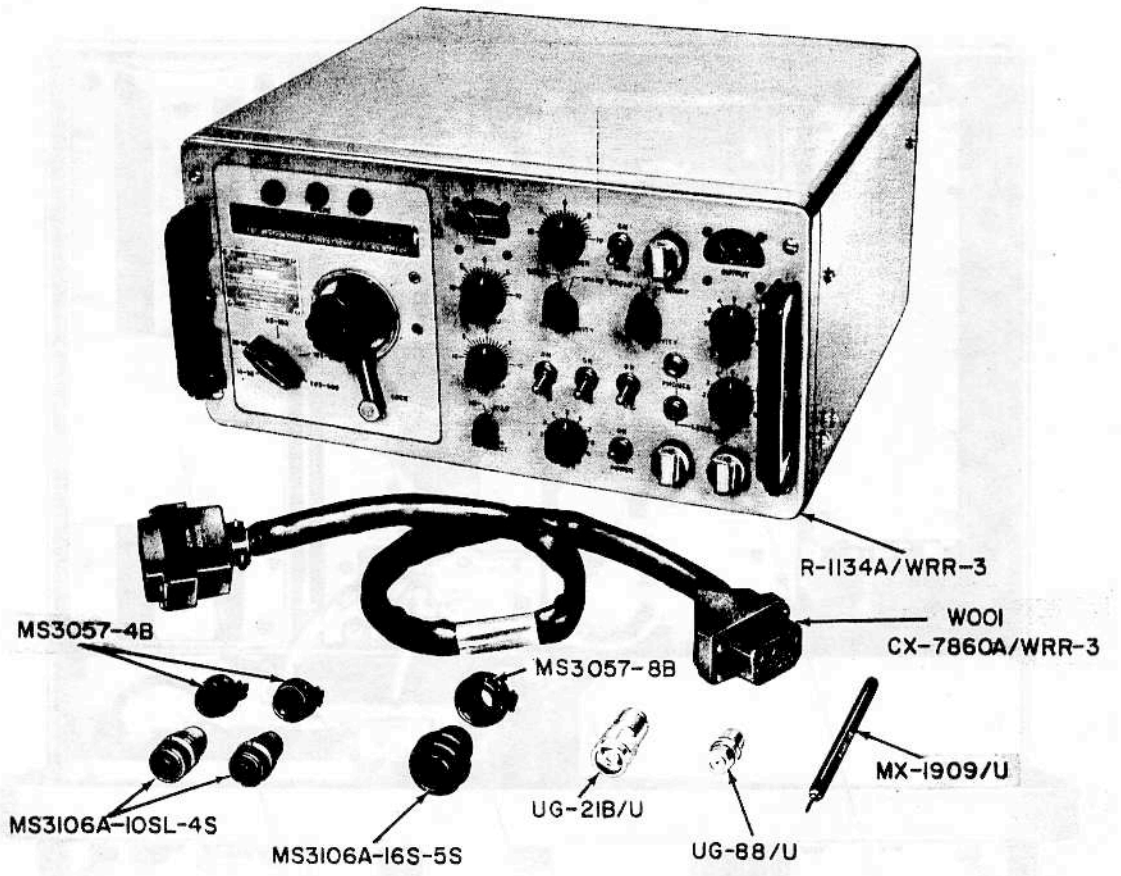

Figure 1-1. Radio Receiving Set AN/WRR-3A

fication, a cathode follower stage, a beat frequency oscillator stage, a BFO mixer, an audio detector, a noise limiter, an output limiter and three stages of audio amplification. A crystal calibrator consisting of a 50 KC crystal oscillator and a 10 KC multivibrator is provided as a reference for setting and calibrating the tuning dial.

Audio outputs are provided at two jacks on the front panel (for headphone use) and at two receptacles at the rear of the equipment (for connection to balanced audio distribution lines). The outputs on the front panel are independent of the outputs on the rear of the equipment. The power supply of the AN/WRR-3A may be connected to operate from 105, 115 or 125 VAC, 50 to 60 CPS or 400 CPS.

The receiver chassis is mounted on slides in a metal case and can be either completely removed from the case or partially removed and tilted for servicing. Once the receiver is withdrawn, however, all electrical connections made at the rear of the case are broken. Thus, when servicing the equipment, the jumper cable provided with the equipment must be used.

Many components are mounted on printed circuit boards which fit into assemblies. Figures 1-2 and 1-3 show assemblies that are accessible from the top and bottom of the main chassis. Each assembly is physically independent of the other. A faulty assembly can be quickly replaced with a spare one. Electrical connections between each assembly and the remaining circuits are made through coaxial and multi-pin connectors. Thus, when an assembly is removed from the chassis, all electrical connections to and from that assembly are broken.

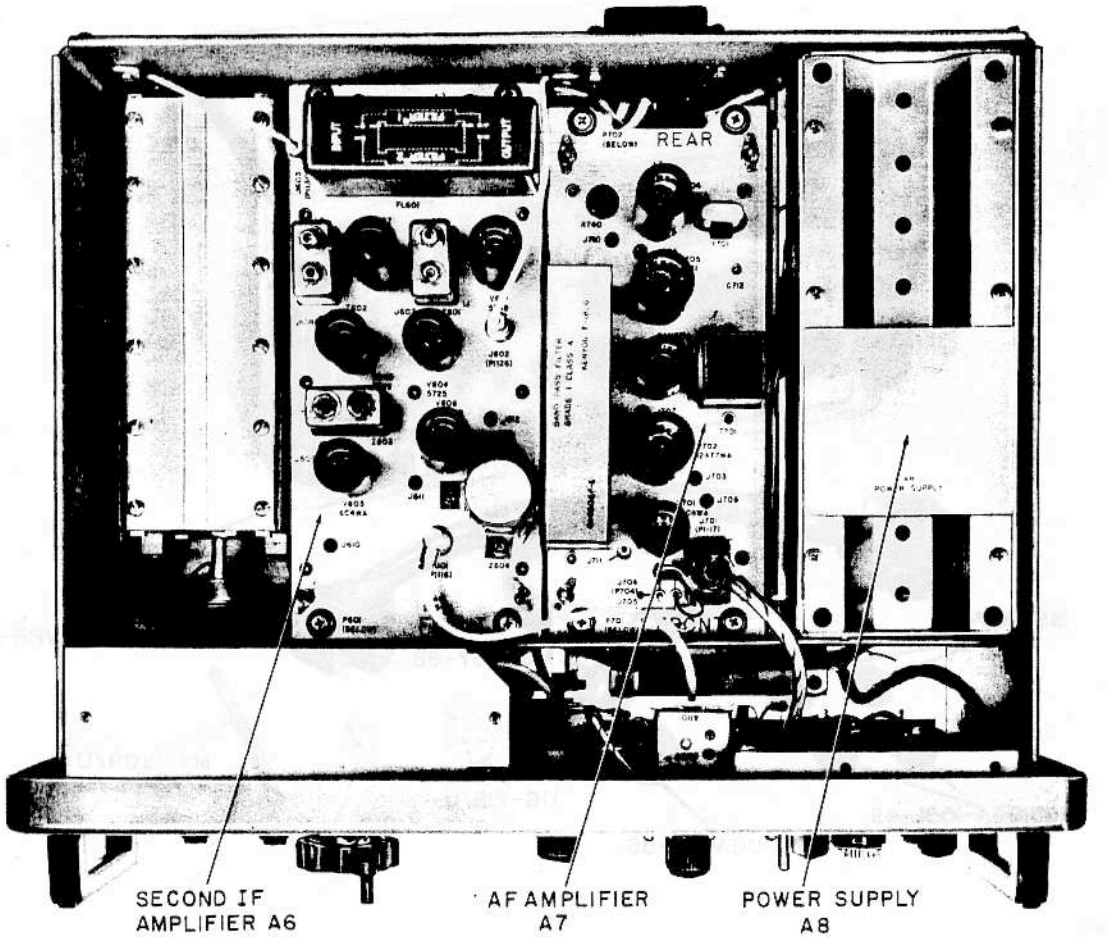

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Figure 1-2. Assemblies Accessible from Top of Chassis

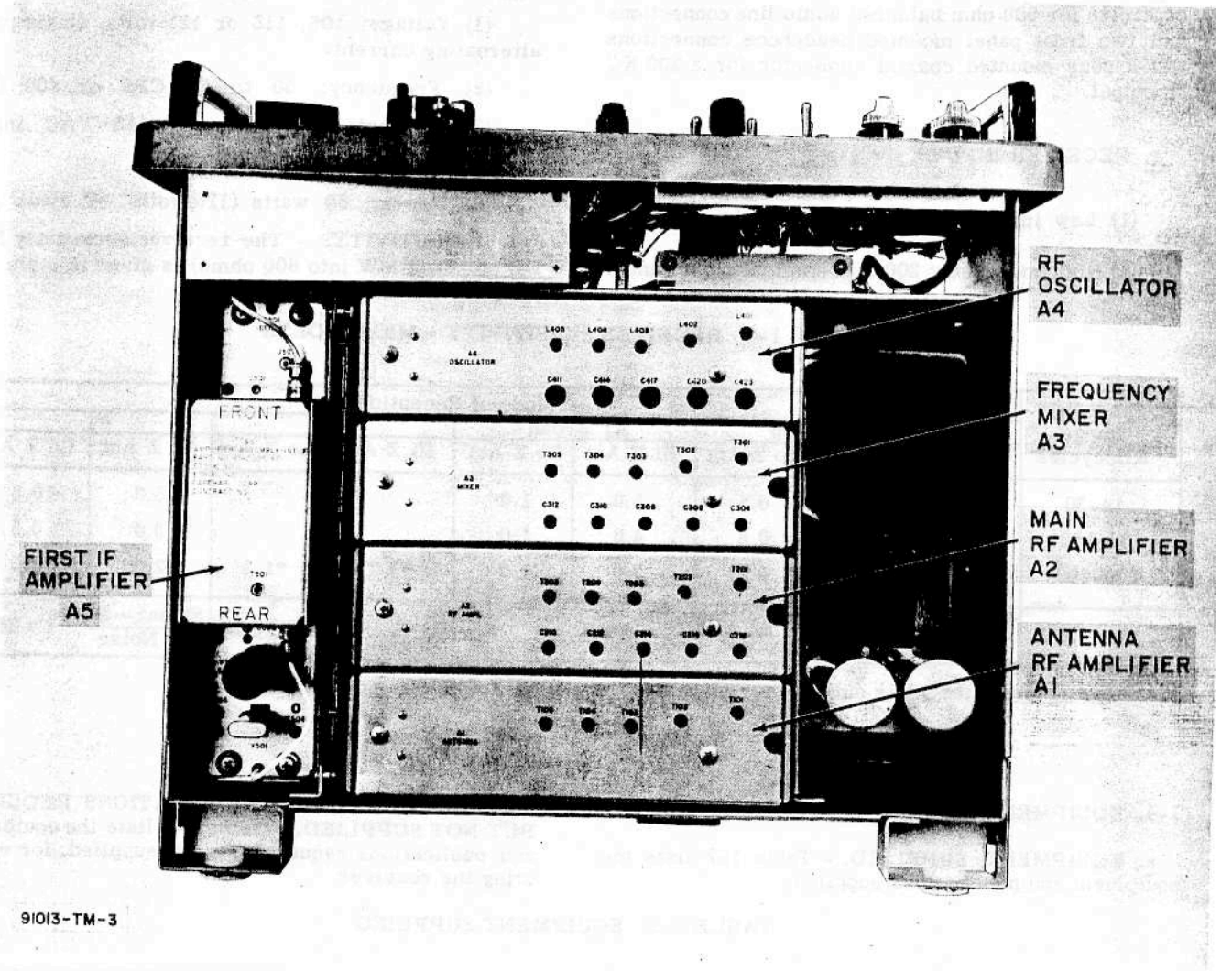

Figure 1-3. Assemblies Accessible from Bottom of Chassis

1-2. FACTORY OR FIELD CHANGES.

No factory or field changes have been made.

1-3. QUICK REFERENCE DATA.

a. FREQUENCY BAND RANGES:

(1) Band I: 14 to 30 KC.

(2) Band II: 30 to 63 KC.

(3) Band III: 63 to 133 KC.

(4) Band IV: 133 to 283 KC.

(5) Band V: 283 to 600 KC.

b. RECEIVER TYPE. - Dual conversion superheterodyne on Bands I and IV and single conversion superheterodyne on Bands II, III and V.

c. INTERMEDIATE FREQUENCIES.

(1) On Bands II, III, and V: 200 KC.

(2) On Bands I and IV the first IF is 60 KC and the second IF is 200 KC.

d. OSCILLATOR FREQUENCIES.

(1) The first conversion oscillator operates above the received signal frequency on all bands.

(2) The second conversion oscillator (Bands I and IV only) operates at 140 KC, controlled by a type CR-18/U crystal.

(3) The calibrator oscillator operates at 50 KC, controlled by a type CR-18/U crystal.

(4) The calibrator multivibrator operates at 10 KC, controlled by the calibrator oscillator.

(5) The beat frequency oscillator operates at 200 KC.

e. RECEPTION. - A1 (CW), A2 (MCW), and F1 (FSK).

f. RECEIVER OUTPUTS. - Two rear mounted receptacles for 600 ohm balanced audio line connections and two front panel mounted headphone connections and a rear mounted coaxial connector for a 200 KC IF output.

g. RECEIVER INPUTS.

(1) Low impedance: 50 ohm nominal impedance.

(2) High impedance: 200 UUF nominal capacitance.

h. POWER REQUIREMENTS.

(1) Voltage: 105, 115 or 125 volts, single phase alternating current.

(2) Frequency: 50 to 60 CPS or 400 CPS.

(3) Current: 0.58 ampere (115 VAC input).

(4) Power factor: 0.90

(5) Power: 60 watts (115 volts, 60 cycle AC).

i. SENSITIVITY. - The receiver sensitivity for 0 DB output (6 MW into 600 ohms) is given in table 1-1.

TABLE 1-1. RECEIVER SENSITIVITY - MICROVOLTS

Frequency Range Kilocycles	Mode of Reception							
	A1 Sharp		A1 Broad		A2		F1	
	Hi Z Ant	Lo Z Ant	Hi Z Ant	Lo Z Ant	Hi Z Ant	Lo Z Ant	Hi Z Ant	Lo Z Ant
14-30	4.0	0.5	5.0	1.0			5.0	0.5
30-150	3.0	0.5	4.0	1.0			3.0	0.5
150-600	2.0	0.5	3.0	1.0	*3.0	*1.5	2.0	0.5
	$\frac{\text{Signal + Noise}}{\text{Noise}}$ = 20 DB				$\frac{\text{Signal + Noise}}{\text{Noise}}$ = 10 DB		$\frac{\text{Signal + Noise}}{\text{Noise}}$ = 20 DB	

*These sensitivities apply only to the frequency range from 250 to 600 KC.

1-4. EQUIPMENT LISTS.

a. EQUIPMENT SUPPLIED. - Table 1-2 lists the equipment and publications supplied.

b. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED. - Table 1-3 lists the equipment and publications required, but not supplied, for operating the receiver.

TABLE 1-2. EQUIPMENT SUPPLIED

Quant. per Equip.	Nomenclature		Overall Dimensions			Volume	Weight
	Name	Designation	Height inches	Width inches	Depth inches	cu ft	lbs
1	Radio Receiver: Tubes semi-conductors, and crystals in place.	R-1134A/WRR-3	8.75	17.25	16.75	1.5	69.5
1	Connector	MS3106A-16S-5S					
2	Connectors	MS3106A-10SL-4S					
1	Connectors	UG-88/U					
1	Connectors	UG-21B/U					
2	Clamps	MS3057-4B					
1	Clamp	MS3057-8B					
1	Test cable assembly	CX-7860A/WRR-3					
1	Test prod	MX-1909/U					
2	Technical manuals	NAVSHIPS 0967-035-1010					
1	Maintenance standard book	NAVSHIPS 0967-035-1030					

TABLE 1-3. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

Qty per Equipment	Nomenclature		Required Use	Required Characteristics
	Name	Designation		
1 or 2 as required	Headset	49507 or equivalent	Operator monitoring	600 ohm impedance or greater
1 or 2 as required	AF Amplifier	AM-215/U or equivalent	Optional for remote use	600 ohm input impedance per device
1	FSK Converter	AN/URA-17 or equivalent	Teletype for frequency shift	
1	Antenna system	AN/SRA-17, AT-317/BRR or equivalent		50 ohm or high impedance

c. SHIPPING DATA. - All equipment and publications are in one shipping container 32-5/8 in. long, 19-5/8 in. wide and 11-1/4 in. deep (4.168 cu ft). The weight of the container and contents is 123.0 pounds.

d. ELECTRON TUBE AND SEMICONDUCTOR COMPLEMENT. - Table 1-4 lists the electron tubes and semiconductors used in the receiver.

TABLE 1-4. ELECTRON TUBE AND SEMICONDUCTOR COMPLEMENT

Unit	Number of Tubes and Semiconductors of Type Indicated										
	6AN5WA	6AU6WB	6C4WA	12AT7WA	5725/6AS6W	5749/6BA6W	5751	1N485B	1N547	1N3004B	1N2042-2
Antenna RF Amplifier						1					
Main RF Amplifier						1					
Frequency Mixer					1						
RF Oscillator			1								
1st IF Amplifier					1						
2nd IF Amplifier		1	1		1	3		2			
AF Amplifier	1		2	1			1	2			
Power Supply									2	1	2
Total number of each Type	1	1	4	1	3	5	1	4	2	1	2

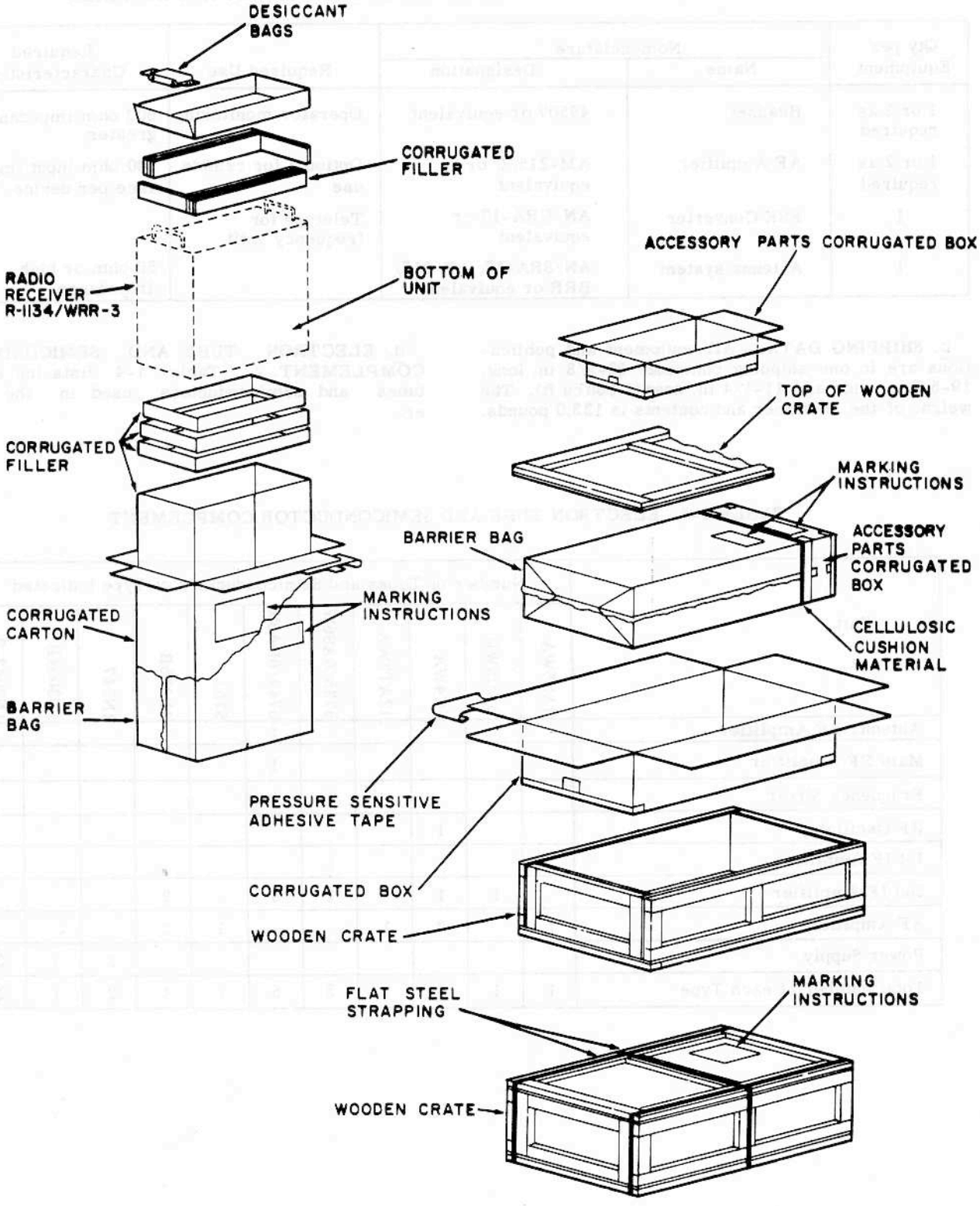

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Figure 2-1. Packaging Diagram

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Radio Receiving Set AN/WRR-3A is shipped with the chassis mounted in its cabinet and all electron tubes and semiconductors in place. To unpack the receiver, refer to figure 2-1. Check all items in the shipping container against table 1-2. Inspect each item and report any damage.

2-2. SITE LOCATION.

When selecting a site for the receiver, the following considerations should be made:

a. Enough space must be left at the rear of the chassis for cable connections.

b. All front panel controls and indicators must be easily accessible to the operator.

c. Enough clearance must be provided to the front for ease of maintenance when the chassis is extended and tilted.

2-3. POWER REQUIREMENTS AND DISTRIBUTION.

The receiver requires an AC power source supplying one of three voltages: 105, 115, or 125 volts, at a frequency of 50 to 60 CPS or 400 CPS. Determine the voltage and the frequency of the AC power source available at the receiver installation. Then connect the primary power to the receiver as set forth in paragraph 2-5a.

2-4. INSTALLATION REQUIREMENTS.

The receiver is intended for shipboard operation and is designed for table top installation without the use of shock mounts. The following paragraphs describe the procedures used to install the receiver in position and connect all signal and power cables. Procedures for cable fabrication are also included.

NOTE

The Receiving Set must be mounted so that the flange of the front panel will not scrape the mounting surface when chassis is removed from or inserted into cabinet. Allow a slight overhang of the front edge or use spacers at the bolting points to raise the set slightly above the table top. If a spacer is used it should extend the full width of the cabinet in order to provide a large bearing surface and prevent deforming of the cabinet bottom.

a. INSTALLATION PROCEDURES. - Install the receiver as follows:

(1) Remove the receiver from its cabinet (see figure 2-2) as follows: press down the lock bar release on each handle and pull down the lock bars into the horizontal position. Pull the receiver chassis straight out to the first lock position, supporting the receiver chassis while pulling it from the cabinet. Press in the chassis release button on each track and pull the receiver chassis past the second lock position; continue to pull out the receiver chassis until it is free of the tracks extended from the cabinet.

(2) Drill four 7/16 inch holes through the mounting surface according to figure 2-5. Allow at least three inches behind the cabinet for cable clearance.

(3) Secure the receiver cabinet to the mounting surface with bolts, lockwashers and flatwashers as shown in figure 2-5.

(4) Connect a grounding braid to one of the mounting bolts as directed by the particular installation plan.

NOTE

If the receiver is to be mounted with the back of the receiver cabinet close to a bulkhead, connect all cables to the receptacles on the rear of the cabinet before securing it to the mounting surface. Leave a minimum clearance of two inches around the receiver for ventilation.

(5) Return the receiver chassis to its cabinet.

b. CABLING. - Route the cables to their respective receptacles at the rear of the receiver to complete the installation (see figures 2-3 and 2-5). The required connectors and clamps are provided in a paper container packed with the receiver.

(1) ANTENNA CABLE. - The antenna cable requires a UG-21B/U plug and a length of RG-12/U coaxial cable, or equivalent (see figure 2-3).

(2) POWER CABLE. - The power cable requires an MS3106A-16S-5S plug, an MS3057-8B clamp and a length of MC0S-2 cable, or equivalent (see figure 2-3). Connect the power line to pins A and C. (Pin B is grounded inside the receiver and is used for external grounding.)

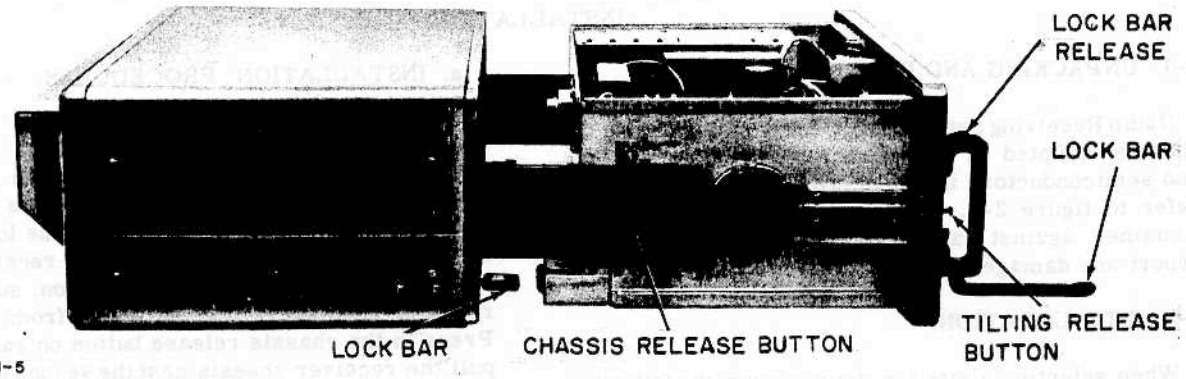


Figure 2-2. Removing Chassis from Cabinet

(3) AUDIO CABLE. - Each audio cable for the balanced audio output requires an MS3106A-10SL-4S plug, an MS3057-4B clamp and a length of RG-22B/U cable, or equivalent.

c. TEST PROD. - Test prod MX-1909/U is provided to allow access to test points where clearance is a problem. A special test lead may be fabricated from the test prod using any connectors desired. See figure 2-4 for fabrication procedure.

2-5. INSPECTION AND ADJUSTMENTS.

To inspect or perform adjustments on the receiver, pull the receiver chassis from its cabinet into the servicing position until it reaches the safety stops. Pull the latch buttons on the front panel and tilt the chassis up or down, 45 or 90 degrees.

CAUTION

The positioning mechanism must lock in place before releasing the handles.

a. POWER TRANSFORMER PRIMARY TAP SETTINGS. - The receiver is shipped with the power transformer primary connected for operation from a 115 VAC, 50-60 CPS source. If the voltage used in the installation differs from 115 VAC by more than five volts, the connections to the primary circuit of the power transformer must be changed to a position corresponding to the input voltage closest to that available at the installation (see figures 5-5 and 6-15). If the receiver is to be operated from a 400 CPS supply, unsolder and remove the lead connected to terminal 1 of T801 and connect it to terminal 6.

b. COMMON ANTENNA CONNECTION. - Radio Receiver AN/WRR-3A may be operated in combination with other receivers from a common antenna. However, the performance while so connected will be degraded.

c. OPERATING TEST IN SERVICE POSITION. - With the receiver chassis in servicing position, connect test cable assembly CX-7860A/WRR-3 between receptacle at the back of the receiver chassis and receptacle on the inside back wall of the receiver cabinet. With the test cable connected as described, all circuits are connected and the receiver can be operated in this position for servicing.

WARNING

Connect the test cable to the chassis receptacle first, before connecting it to the cabinet receptacle.

d. PERFORMANCE CHECK. - After the installation is completed, check the performance of the receiver to insure the correctness of the installation and to determine that the receiver is in proper operating condition. Perform the operating procedures described in Section 3. Note any discrepancies in performance and report them to the proper authorities.

2-6. INTERFERENCE REDUCTION.

Filters have been incorporated within the receiver to keep inter-equipment interference at a minimum. At VLF and LF, power line wiring can induce appreciable noise into antenna cables. Make sure that antenna cables are installed as far as possible from any power cables. Mechanical vibration can produce

electrical interference. All bolts, screws and other fasteners used in the installation of the receiver must be provided with lockwashers and fasteners must be tightly secured. Electrical interference can be caused by signals generated by electrical equipment such as radio or radar transmitters in close proximity to the receiver or its antenna. All ground connections between the receiver, antenna and other equipment must be clean and tight. Coaxial cable fittings must be carefully checked for proper grounding of coaxial cable shields.

2-7. PREPARATION FOR RESHIPMENT.

To prepare the receiver for reshipment, proceed as follows:

a. Place POWER switch to "OFF."

b. Remove all cables from the rear of the receiver.

c. Remove the receiver chassis from its cabinet (see figure 2-2).

d. Remove the nuts, bolts, washers and grounding braid securing the cabinet to the mounting surface.

e. Remove the cabinet and place it on a bench.

f. Fully extend the two tracks on the inside walls of the cabinet.

g. Hold the cabinet firmly on the bench and insert the receiver chassis into position so that the rails at the sides of the chassis engage the tracks extended from the cabinet.

h. Push the receiver chassis into the cabinet until the chassis release lever clicks into position. Continue to push the chassis all the way into the cabinet. Two lock positions must be passed.

i. Check that the hooks on the lower ends of the handles are engaged in the fork assemblies. Then raise the lock bars to secure the receiver in the cabinet. Push the lock bars against the handles until they snap into the locked position.

j. Place all items listed in table 1-2 in a corrugated carton (see figure 2-1). Use paper filler as necessary.

k. Seal and pack the corrugated carton in the reverse order shown in figure 2-1.

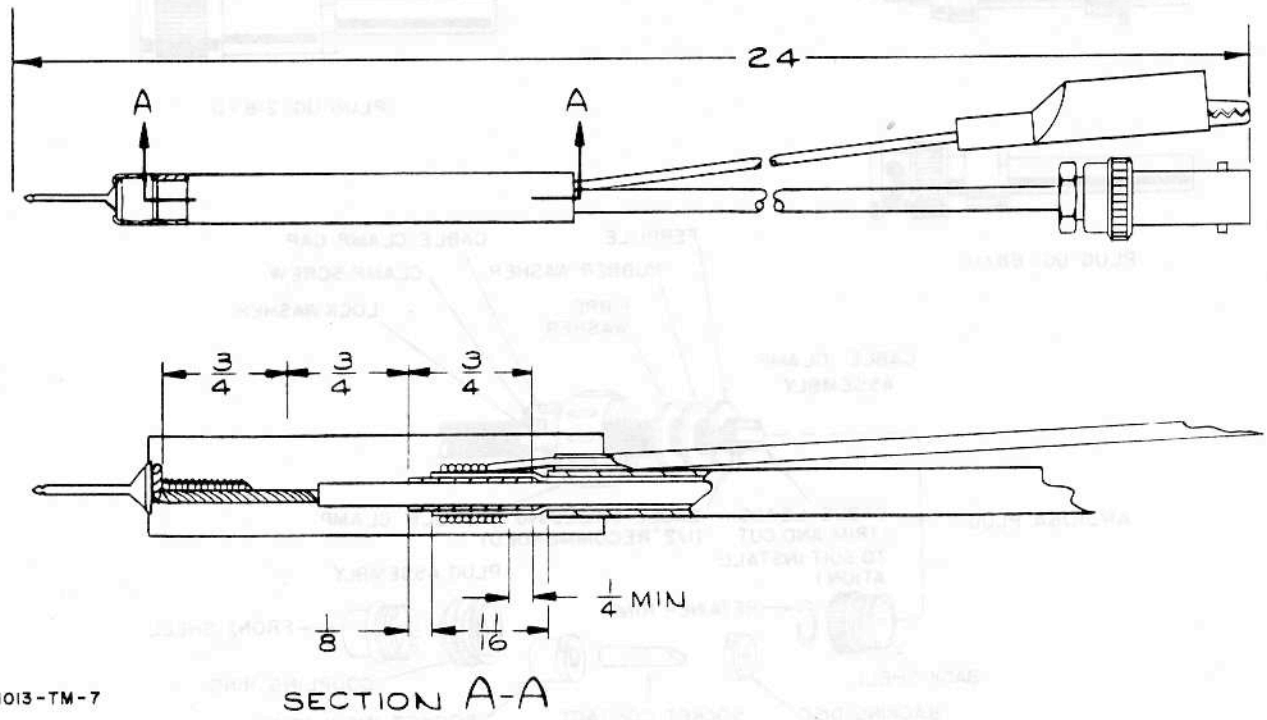


Figure 2-4. Special Test Lead Fabrication

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

Radio Receiving Set AN/WRR-3A receives three types of signals, A1 (CW), A2 (MCW) and F1 (FSK) in the frequency range of 14 KC to 600 KC. The overall frequency range of the receiver is divided into five bands. Each band has its own set of digital drum type dials. The band in use is indicated directly by the exposed set of dials. The audio output may be monitored by headphones at the receiver installation or by a remote speaker.

The AN/WRR-3A operates as a dual conversion superheterodyne receiver on Bands I and IV and as a single conversion superheterodyne receiver on Bands II, III and V. For optimum sensitivity, selectivity and image rejection, two RF amplifiers are used. On Bands I and IV signals from the RF amplifiers pass through a frequency converter, the first IF filter, a second frequency converter, and three IF amplifier stages before being demodulated. On Bands II, III and V, signals from the RF amplifiers bypass the first IF filter and second frequency converter stage used in Bands I and IV. During A1 reception, CW signals are heterodyned with the output from a beat frequency oscillator (B.F.O.) to produce the audio output. During A2 reception, the signals are demodulated by an audio detector to produce the audio output. Interference from signals near the desired signal frequencies is minimized by the use of an intermediate frequency filter and an audio frequency filter. Noise is reduced by a noise peak limiter for improved intelligibility of received signals. A crystal-controlled calibration circuit provides accurate calibration at each 10 KC point throughout the tuning range.

3-2. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. - All operating controls, meters and indicators necessary for the operation of the receiver are on the front panel (see figure 3-1). The controls, meters and indicators are listed in their functions in table 3-1.

b. SEQUENCE OF OPERATION. - The sequence of operation of the receiver is as follows: Preset the controls, calibrate at nearest 10 KC calibration point; select A1, A2, or F1 operation; regulate the output; and return all controls to their preset positions when radio communication is terminated.

(1) CONTROL PRESET POSITIONS. - Before operating the receiver, preset the controls as follows:

(a) CAL TO "OFF."

(b) N.L. to "OFF."

(c) O.L. to "ON."

(d) CAL ADJ to "0."

(e) ANT. COMP to "0."

(f) FREQ VERNIER to "6."

(g) I.F. SELECTIVITY to "BROAD."

(h) A.F. SELECTIVITY to "BROAD."

(i) GAIN to "6."

(j) ANTENNA IMPEDANCE to "HI" or "LO," depending on the type of antenna in use.

(k) OUTPUT to "10."

(l) LEVEL to "10."

(m) B.F.O. to "OFF."

(2) CALIBRATION. - Calibrate the receiver as follows:

(a) Place the POWER switch to "ON," and allow a 15 minute warmup period.

(b) Plug headphones similar to Navy type 49507 into one of the PHONES jacks.

(c) Select the frequency band containing the desired receiver operating frequency with the Band Selector switch.

(d) Tune the receiver to the 10 KC calibration point nearest the desired frequency as indicated on the counter dial.

(e) Place the CAL switch to "ON".

(f) Adjust the CAL ADJ control for a zero beat in the headset and for a zero beat indication on the TUNING meter. If more than one zero beat is attainable with CAL ADJ control, adjust for zero beat indication for nearest zero on panel.

(g) Place the CAL switch to "OFF" and set the Tuning Control to the desired frequency.

(3) A2 (MCW) OPERATION. - Operate the receiver for A2 reception as follows:

(a) Perform the calibration procedures given in subparagraph (2) above.

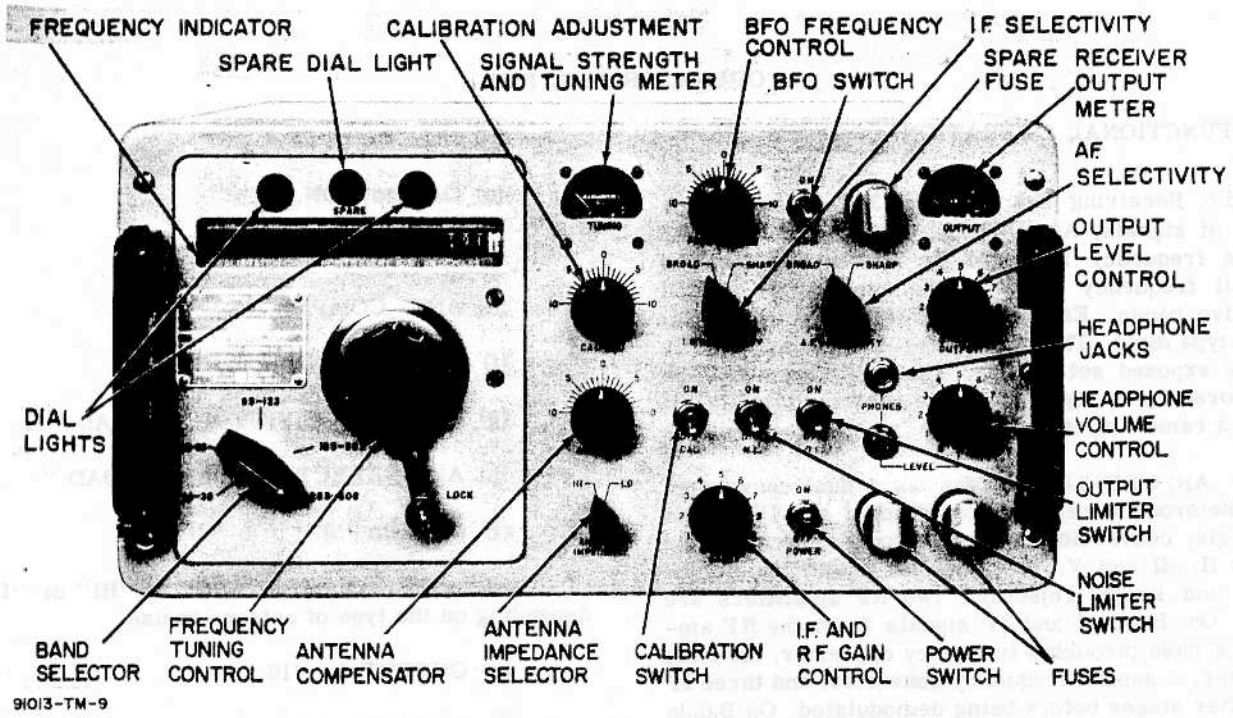


Figure 3-1. Operating Controls and Indicators

(b) Adjust the Tuning Control and ANT. COMP control for a maximum indication on the TUNING meter.

(c) Adjust the GAIN control for a barely perceptible indication (approximately one division) on the TUNING meter.

(d) Adjust the OUTPUT control for approximately a +8 DB indication on the OUTPUT meter.

(e) Adjust the LEVEL control for a comfortable volume in the headset.

(4) A1 (CW) OPERATION. - Operate the receiver for A1 reception as follows:

(a) Perform the calibration procedures given in subparagraph (2) above.

(b) Place the B.F.O. switch to "ON."

(c) Adjust the Tuning Control and ANT. COMP control for a maximum indication on the TUNING meter.

(d) Adjust the GAIN control for a barely perceptible indication (approximately one division) on the TUNING meter.

(e) Set A.F. SELECTIVITY switch to "SHARP."

(f) Adjust the FREQ VERNIER control for the most distinct tone in the headset, then return the A.F. SELECTIVITY switch to "BROAD."

(g) Adjust the OUTPUT control for a +8 DB indication on the OUTPUT meter.

(h) Adjust the LEVEL control for a comfortable volume in the headset.

(5) F1 (FSK) OPERATION. - Operate the receiver for F1 reception as follows:

(a) Perform the calibration procedures given in subparagraph (2) above.

(b) Adjust the ANT. COMP control for a maximum indication on the TUNING meter.

(c) When Frequency Shift Converter CV-89A/URA-8A (or similar audio input type) is used with the AN/WRR-3, set the B.F.O. switch to "ON" and adjust the FREQ VERNIER and OUTPUT controls as required.

(d) When Facsimile Frequency Shift Converter CV-172/U (or similar audio input type) is used with the AN/WRR-3, set the B.F.O. switch to "ON" and adjust the FREQ VERNIER and OUTPUT controls as required.

(6) SEVERE RECEIVING CONDITIONS. - Under severe receiving conditions, use the additional procedures below:

(a) If an adjacent signal interferes during A2 reception, place the A.F. SELECTIVITY switch to "SHARP" and adjust the Tuning Control for the most distinct tone in the headset.

(b) If an adjacent signal interferes during A1 reception, place the I.F. SELECTIVITY switch to "SHARP" and adjust the Tuning Control for the most

TABLE 3-1. RADIO RECEIVING SET AN/WRR-3A, OPERATING CONTROLS AND INDICATORS

Control or Indicator	Ref. Des.	Function
Band Selector	S101, S201, S501, S502, S401, S301	Selects one of five tuning bands of the receiver through mechanical linkage and changes the receiver to single or double conversion operation as required.
Tuning Control	C1103	Tunes receiver to desired frequency within a selected band.
CAL ADJ	C1102	Adjusts frequency of local oscillator to correct the dial frequency at each 10 KC calibration point.
ANT. COMP	C103	Fine tunes antenna circuit.
ANTENNA IMPEDANCE	S1103	Selects either high impedance or low impedance for the antenna in use.
FREQ VERNIER	C1101	Adjusts output frequency of beat frequency oscillator to produce a tone for A1 signal reception.
I.F. SELECTIVITY	S601	"BROAD" position: normal setting for reception of A1 and A2 signals.
		"SHARP" position: narrows IF bandwidth of receiver for use in A1 and F1 signal reception.
B.F.O.	S1102	In "ON" position provides for reception of A1 signals. (Inoperative when CAL switch is in the "ON" position.)
A.F. SELECTIVITY	S1106	"BROAD" position: normal for reception of A1 and A2 signals.
		"SHARP" position: reduces audio response of receiver to emphasize a 1000 CPS tone at the receiver output to reduce the effects of interference.
CAL	S1104	In the "ON" position provides frequency check points at each 10 KC interval throughout the tuning range of the receiver.
N.L. (noise limiter)	S1105	In the "ON" position adds noise limiter to reduce static noise interference. (Inoperative when BPO switch is in the "ON" position.)
O.L. (output limiter)	S1107	In "ON" position adds output limiter to limit receiver audio output.
GAIN	R1101	Controls gain of RF and IF amplifiers.
POWER	S1108	In "ON" position, primary power is applied to receiver.
OUTPUT	R1102	Acts as a conventional volume control when the O.L. switch is in the "OFF" position. Adjusts the limiting levels of an audio limiter when the O.L. switch is in the "ON" position.
LEVEL	R1106	Controls volume in headphones.
TUNING meter	M1101	Indicates signal strength and is used to indicate exact tuning of receiver.
OUTPUT meter	M1102	Indicates output level of receiver with 0 DB reference level of 1 milliwatt.

distinct tone in the headset. If the signal continues to interfere, place the A.F. SELECTIVITY switch to "SHARP" and adjust the FREQ VERNIER control for the most distinct tone.

(c) If there is considerable static noise during A2 reception, place the N.L. switch to "ON" and set the GAIN control and the OUTPUT control for the best intelligibility.

(d) If the signal fluctuates greatly in strength, place the O.L. switch to "ON" and adjust the GAIN control for a maximum reading of full scale on the TUNING meter, then adjust the OUTPUT control for a +8 DB indication on the OUTPUT meter.

(7) SECURING THE RECEIVER. - After use, secure the receiver by returning the POWER switch to "OFF."

NOTE

In an emergency, the receiver can be immediately turned off by placing the POWER switch to "OFF."

3-3. SUMMARY OF OPERATING PROCEDURES.

The operating procedures of the receiver are summarized as follows:

a. Place POWER switch to "ON."

b. Calibrate the receiver at the 10 KC calibration point nearest the frequency at which the receiver is to be operated (refer to paragraph 3-2b(2)).

c. For A1 or F1 reception, place the B.F.O. switch to "ON," and for A2 reception, place the B.F.O. switch to "OFF."

d. Maintain an output level of +8 DB as indicated on the OUTPUT meter, using the OUTPUT control.

3-4. EMERGENCY OPERATION.

a. JAMMING. - Should jamming occur, immediately begin the procedures given in paragraph 3-2b(6).

b. CIRCUIT FAILURE. - Should reception fail while operating on Band I or IV, switch to Band II, III, or V and check if signals can be received on these bands. If so, locate a frequency that is free for use and try to establish communications on this frequency. If the receiver will not operate on any band, secure the receiver and report its condition and symptoms to the supervisor.

3-5. OPERATOR'S MAINTENANCE.

a. ROUTINE CHECK. - Table 3-2 lists the routine checks to be performed by the operator to reduce the down time of the receiver. Perform these checks each time the receiver is placed in operation. If the receiver is in continuous use, perform these checks daily. If trouble or substandard performance is revealed by the routine check procedures, the receiver requires maintenance by an authorized technician. Report the condition immediately to the supervisor.

b. EMERGENCY MAINTENANCE. - Emergency maintenance procedures consist of replacing defective fuses. Although these procedures are normally performed by a technician, an operator may replace these parts during an emergency condition. Table 3-2 lists some of the visual checks that can be made to determine whether any of the parts are defective. The following paragraph outlines the procedure for replacing a defective fuse.

(1) FUSE REPLACEMENT. - To replace a defective fuse, press in fuse cap and twist it a quarter turn counterclockwise and pull out. Replace the defective fuse with the SPARE fuse located on the front panel (see figure 3-1).

CAUTION

Never replace a fuse with one of a higher rating unless continual operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not insert a second fuse until the fault has been corrected.

TABLE 3-2. ROUTINE CHECK CHART

What to Check	How to Check	Remarks
Fuses	Apply power to receiver. Fuse cap lights if fuse is blown. NOTE: If both fuses are blown, neither cap will light.	If fuse cap lights, replace with spare fuse. If fuse caps do not light and equipment is inoperative, check both fuses and primary power.
Dial-lamp assemblies	Dial lamps should light when power is applied.	If dial lamp assembly does not light, replace with spare dial lamp assembly.
Receiver Operation	Plug headphones into either PHONES jack. Tune receiver to a signal on Band I. An indication should be seen on the OUTPUT and TUNING meters and a received signal should be heard in the headphones; repeat for Bands II, III, IV and V.	If there is no meter indications and/or a signal is not heard in the headphones, report condition to supervisor.
Frequency Calibration	Set Band Selector to Band IV (133-283). Set CAL switch to "ON." Rotate Tuning Control through Band IV. A beat note is heard at each 10 KC point and a zero beat is obtained at any 10 KC point by adjusting CAL ADJ control.	If either zero beat or beat note cannot be obtained report condition to supervisor.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL.

This section is divided into two main parts: an overall functional description that essentially shows block diagram relationship of the assemblies and a circuit description that treats circuitry within each of the assemblies. In the overall description the signal is traced from antenna input to audio output. At points where signal path depends on switch positions or other conditions, first one path is described and then the rest. Discussion of the calibration condition and power requirements is reserved until last. Make frequent use of figure 4-1 in connection with the overall description. In the detail circuit description, the text is supplemented by simplified schematics as well as the overall schematic diagram.

The AN/WRR-3 is a dual conversion superheterodyne receiver on Bands I and IV and a single conversion superheterodyne receiver on Bands II, III and V. On Bands I and IV, signals pass through two RF amplifiers, a frequency converter, the first IF amplifier, a second frequency converter, and three IF amplifier stages before being demodulated. On Bands II, III and V, signals from the mixer bypass the first IF filter and second frequency converter stage. During A1 reception, CW signals are heterodyned with the output from a B.F.O. to produce the audio output. During A2 reception, the signals are demodulated by an audio detector to produce the audio output. Interference from signals near the desired frequency is minimized by using an intermediate-frequency filter and an audio-frequency filter. Noise is reduced by a noise peak limiter, and a crystal-controlled calibration circuit provides accurate calibration at each 10 KC point throughout the tuning range.

4-2. OVERALL FUNCTIONAL DESCRIPTION.

Relay K1001 switches between two taps on the antenna input transformer to provide a means to approximate an impedance match to various types of receiving antennas. When the ANTENNA IMPEDANCE switch is in the "HI" position, the coil circuit of K1001 closes to energize the relay. When energized, K1001 connects the antenna to V101 through a high-impedance tap on the antenna input transformer and opens the low impedance circuit. When the ANTENNA IMPEDANCE switch is in the "LO" position, the signal passes through lowpass filter FL1001, thermal circuit breaker CB1001, and is connected to V101 through a low-impedance tap on the antenna input transformer. Signals from the antenna are amplified by two RF amplifiers, V101 and V201 (connected in cascade), before being heterodyned in V301 to produce the intermediate frequency. On Bands I (14-30 KC) and IV (133-283 KC), S501 (mechanically ganged to the Band Selector) connects the output from V301 to bandpass filter FL501. On Bands II (30-63 KC), III (63-133 KC) and V (283-600 KC), local oscillator V401 operates 200 KC above the signal frequency and the output from V301 is connected directly to bandpass filter FL601 through S501, S502 and T501.

On Bands I and IV, local oscillator V401 operates at 60 KC above the signal frequency. Bandpass filter FL501 passes only the 60 KC difference frequency from V301. The 60 KC output from FL501 is applied to converter V501, a combination mixer and oscillator tube. The oscillator section of V501 is a crystal controlled oscillator operating at 140 KC. Switches S502 and S501 connect B voltage to the plate and screen grid of V501 on Bands I and IV. The output from V501 is connected to IF SELECTIVITY filter FL601 through S502, T501, and S601.

With IF SELECTIVITY switch in the "SHARP" position, the output from V301 or V501 is connected to V601 through the narrow response section of FL601 having a one KC bandwidth centered about 200 KC. With the IF SELECTIVITY switch in the "BROAD" position, the output from V301 or V501 is connected to V601 through the wide response section of FL601 having a three KC bandwidth centered about 200 KC. The 200 KC output from FL601 is then amplified by the three IF amplifiers, V601, V602 and V603. Further skirt selectivity is provided by tuned interstage networks Z601, Z602, and Z603. The output from V602 is connected to IF cathode follower V605. The output of V603 is connected to B.F.O. mixer V604 and MCW detector CR601.

During the reception of A2 signals, the output from B.F.O. mixer V604 is disconnected and beat frequency oscillator V606 is disabled. When N.L. (noise limiter) switch S1105 is in the "ON" position, the noise limiter diode CR602 is connected across the output from CR601. When N.L. switch S1105 is in the "OFF" position, the output from CR601 is connected to first audio amplifier V701. The output from CR601 is amplified by V701 before being applied to audio bandpass filter FL701. When AF SELECTIVITY switch S1106 is in the "SHARP" position, the audio output from V701 passes through audio bandpass filter FL701, which passes only those frequencies between 825 CPS and 1175 CPS. When the AF SELECTIVITY switch is in the "BROAD" position, the output from V701 is connected directly to the second audio amplifier V702A. With O.L. (output limiter) switch S1107 in the "ON" position, a bias voltage is applied to

output limiter diodes CR702 and CR703 which in turn limit the positive and negative peak amplitude of the output from V702A. In this case the output of the receiver is controlled by the action of CR702 and CR703. When O.L. (output limiter) switch S1107 is in the "OFF" position, the bias voltage on CR702 and CR703 is changed so that the diodes have no effect upon the output from V702A. The output from CR702 and CR703 is applied to V702B to drive the output amplifier V703. Output transformer T701 couples the output from V703 to the two PHONES jacks on the front of the receiver and through lowpass filter FL1004 to the balanced audio lines at the rear of the receiver.

During the reception of A1 and F1 signals, B.F.O. switch S1102 is in the "ON" position. B is connected to the plate and screen grid of beat frequency oscillator V606 through S1102A and the output from B.F.O. mixer V604 is connected directly to first audio amplifier V701. The output from AM detector CR601 is now disconnected from V701 by S1102B.

During the calibration of the receiver, CAL switch S1104 is in the "ON" position. B+ is connected to crystal oscillator V704 and multivibrator V705 through S1104A, and removed from first RF amplifier V101 and beat frequency oscillator V606. Crystal oscillator V704 synchronizes multivibrator V705 at a stable fundamental frequency output of 10 KC. The output from V705 is applied to V201 which amplifies the harmonic frequency contained in the output from V705 that corresponds to the frequency at which the receiver is tuned. Local oscillator V401, mixer V301 and converter V501 function the same as during normal reception. The fourth harmonic from V704 (200 KC) is heterodyned with the 200 KC output from V601. To produce a zero beat, which indicates the exact tuning of the receiver to a 10 KC calibration point, the frequency of operation of V401 is varied with CAL ADJ control. The audio beat frequency is detected and amplified as during reception of signals.

The power supply provides a regulated filament voltage of 5.6 VAC and a regulated plate voltage of 91 VDC to V401. To all other tubes it supplies 6.3 VAC for the filaments and 140 VDC for the plates and screen grids.

4-3. CIRCUIT DESCRIPTION.

The circuits in Radio Receiving Set AN/WRR-3A are described for operation on Band V. The operation of the receiver on Bands I through IV is similar except where specified otherwise.

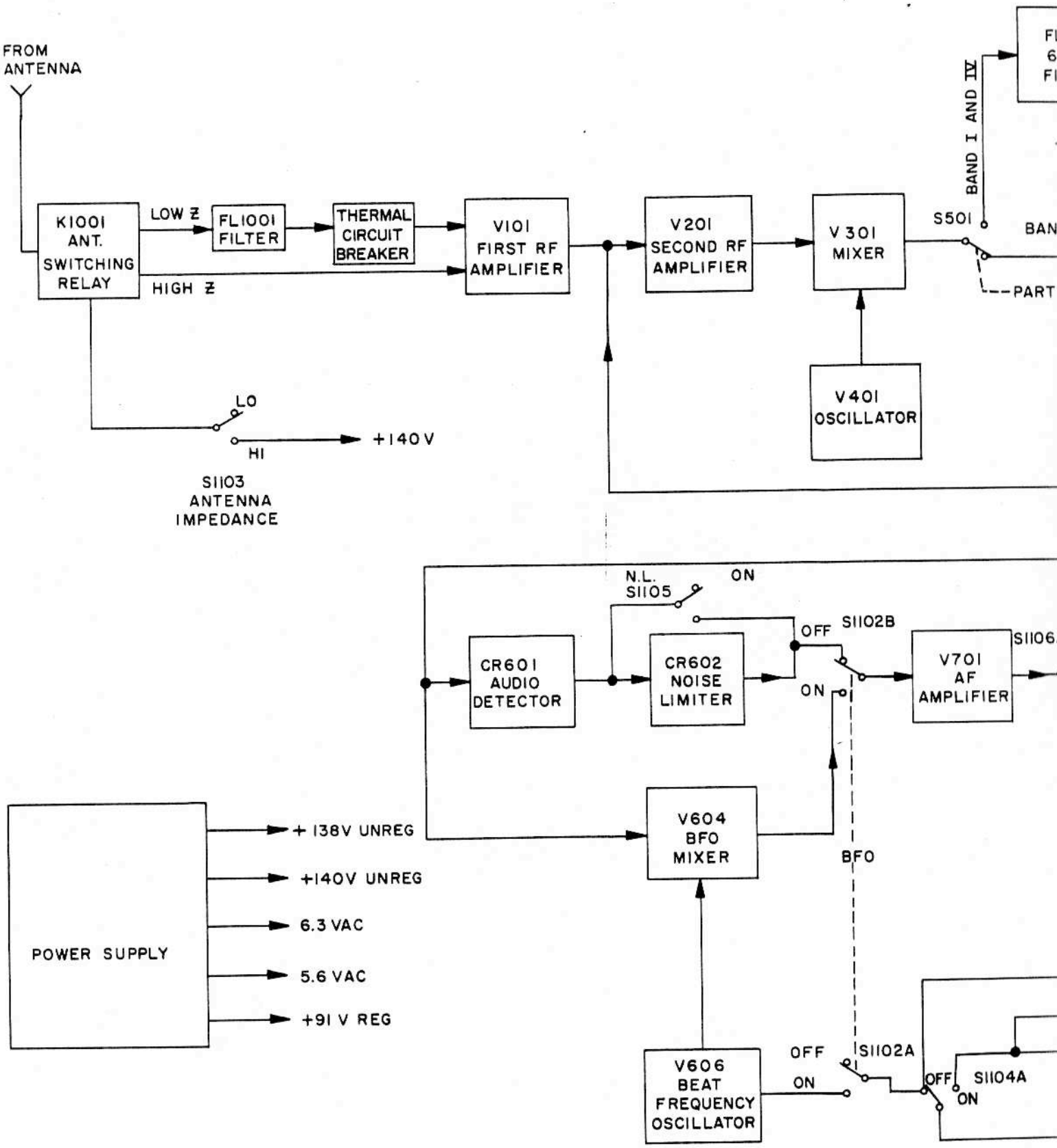
a. ANTENNA AMPLIFIER CIRCUIT (see figure 4-2). - The antenna input is coupled to first RF amplifier V101 by K1001 to facilitate matching either a low or high impedance type of antenna. With ANTENNA IMPEDANCE switch S1103 in the "HI" position, relay K1001 is energized; thus connecting the antenna, through capacitor C102 and resistor R107, to the tap on the secondary winding of T105. The secondary winding of T105 then acts as an autotransformer to couple the input to the control grid of V101.

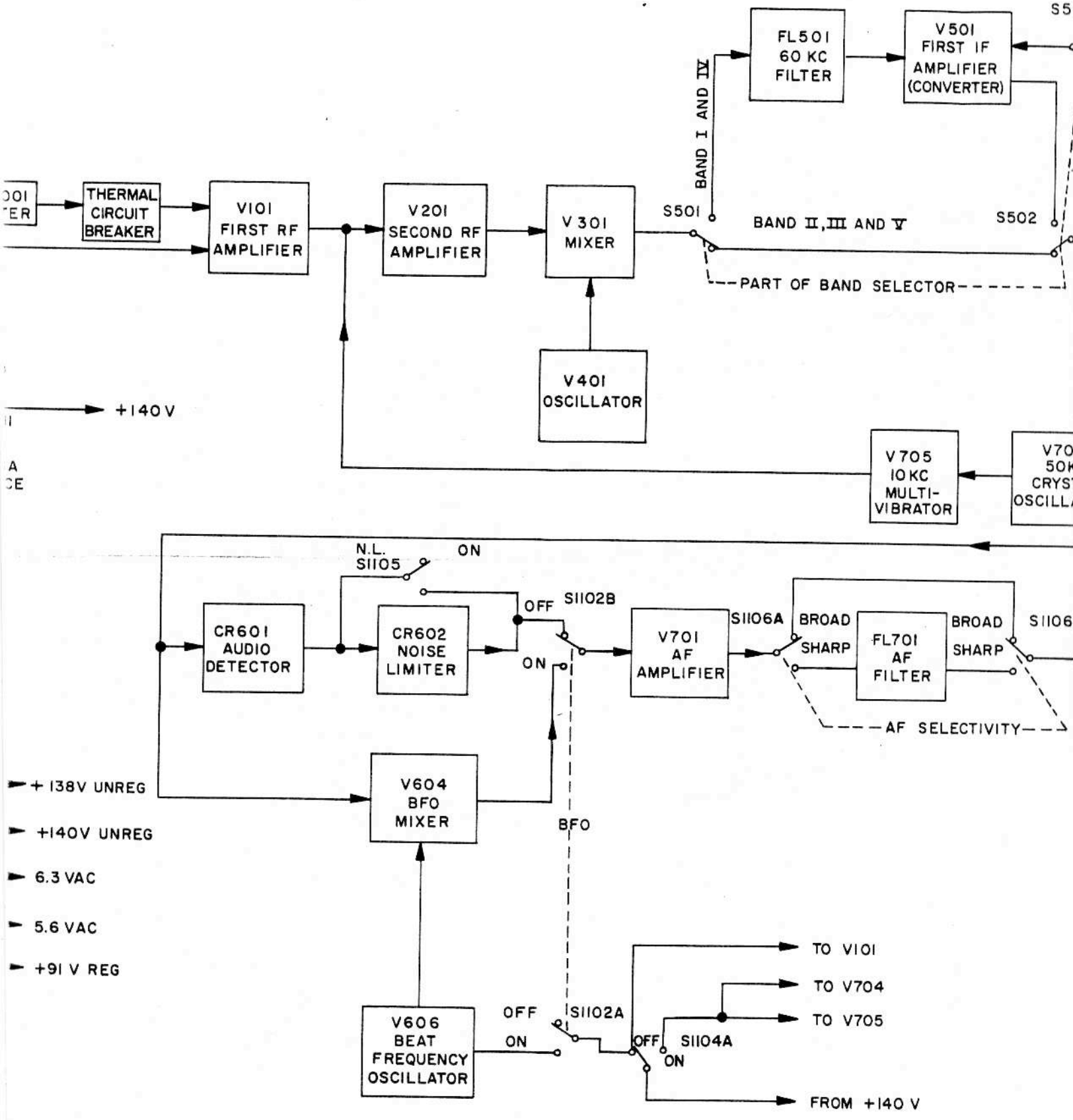
With ANTENNA IMPEDANCE switch S1103 in the "LO" position, relay K1001 is de-energized; putting the antenna in series with lowpass filter FL1001 and thermal circuit breaker CB1001 before connecting to the primary of T105. FL1001 attenuates signals above 800 KC and CB1001 opens when RF currents over approximately one ampere are induced by nearby transmitters. Relay K1001 now also puts C1002 in series with C102 and R107 to the tap of T105. C1002 thus provides a circuit capacitance to T105 that is roughly equivalent to the circuit capacitance presented by the high impedance condition. With circuit capacitance approximately equal for either high impedance or low impedance conditions, switching from one to the other will not appreciably affect circuit tuning.

The secondary winding of T105 is tuned to the desired signal frequency by trimmer capacitor C103 and tuning capacitor C1103D. When high-level input signals produce an RMS voltage of approximately 65 volts at V101 grid, the neon tube VR101 will conduct and prevent excessive signal voltages from damaging tube V101. The gain of amplifier V101 is controlled by cathode bias resistors R108 and GAIN control R1101A. The GAIN control R1101A varies the bias voltage; however, a minimum protective bias is provided by R108.

Capacitor C105 and R109 decouple the RF output of V101 from the 140 V line. RF transformer T205 couples the output from V101 to RF amplifier V201. Capacitor C204 and the primary winding of T205 form a tuned circuit which is resonant at a frequency below the lower limit of the tuning band. This increases the plate load impedance for V101 at the low frequency end of the tuning band in order to provide more uniform gain across the band. Plate and screen grid voltage for V101 is supplied through contacts on the CAL switch so that this stage is disabled when the crystal calibrator is in use.

b. RF AMPLIFIER CIRCUIT (see figure 4-3). - The secondary winding of T205 is tuned to the incoming signal frequency by trimmer capacitor C210, temperature compensating capacitor C209 and tuning capacitor C1103C. Capacitor C203 completes the RF circuit to ground. R206 is an isolating resistor to return the grid to the biasing voltage divider. A positive control grid voltage is taken from the junction of R204 and R205. Cathode bias voltage is taken from the junction of R202 and R204. Resistors R204, R202, R205 and GAIN control R1101A form a DC voltage divider network connected between the 140 V line and ground. The gain of V201 is controlled by varying the cathode bias voltage and the control grid voltage with GAIN control R1101A. This arrangement provides a linear relationship between the position of the GAIN control and the gain of V201. Capacitor C201 and R203 decouple the RF output of V201 from the 140 V line. RF transformer T305 couples the output from V201 to mixer V301. The distributed capacitance of the primary winding of T305 forms a parallel tuned circuit resonant at a frequency above the upper limit of the tuning band. Therefore the plate


FROM ANTENNA
K1001 ANT. SWITCHING RELAY
LOW Z
HIGH Z
FL1001 FILTER
THERMAL CIRCUIT BREAKER
V101 FIRST RF AMPLIFIER
V201 SECOND RF AMPLIFIER
V301 MIXER
V401 OSCILLATOR
BAND I AND IV
S501
PART
LO
HI
+140V
S1103 ANTENNA IMPEDANCE
N.L. S1105
ON
OFF
S1102B
CR601 AUDIO DETECTOR
CR602 NOISE LIMITER
V701 AF AMPLIFIER
S1106
POWER SUPPLY
+138V UNREG
+140V UNREG
6.3 VAC
5.6 VAC
+91 V REG
V604 BFO MIXER
BFO
V606 BEAT FREQUENCY OSCILLATOR
S1102A
S1104A


FL501
60 KC
FILTER
V501
FIRST IF
AMPLIFIER
(CONVERTER)
BAND I AND IV
THERMAL
CIRCUIT
BREAKER
V101
FIRST RF
AMPLIFIER
V201
SECOND RF
AMPLIFIER
V301
MIXER
S501
BAND II, III AND V
S502
PART OF BAND SELECTOR
V401
OSCILLATOR
+140V
V705
10 KC
MULTI-
VIBRATOR
N.L.
S1105
ON
OFF
S1102B
ON
CR601
AUDIO
DETECTOR
CR602
NOISE
LIMITER
V701
AF
AMPLIFIER
S1106A
BROAD
SHARP
FL701
AF
FILTER
BROAD
SHARP
AF SELECTIVITY
+138V UNREG
+140V UNREG
6.3 VAC
5.6 VAC
+91 V REG
V604
BFO
MIXER
BFO
V606
BEAT
FREQUENCY
OSCILLATOR
OFF
ON
S1102A
OFF
ON
S1104A
TO V101
TO V704
TO V705
FROM +140 V

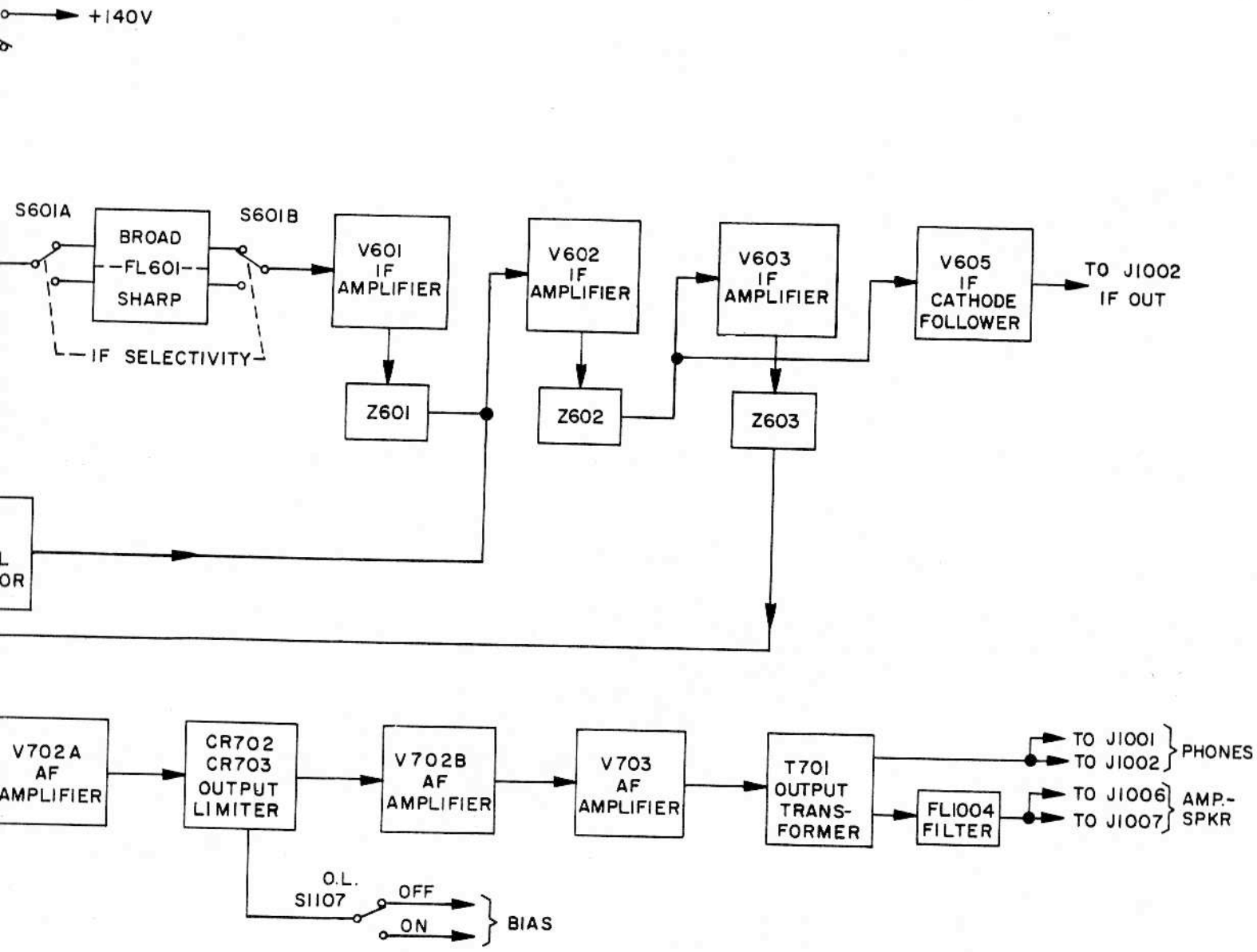


Figure 4-1. Radio Receiver R-1134A/WRR-3A,
Functional Block Diagram

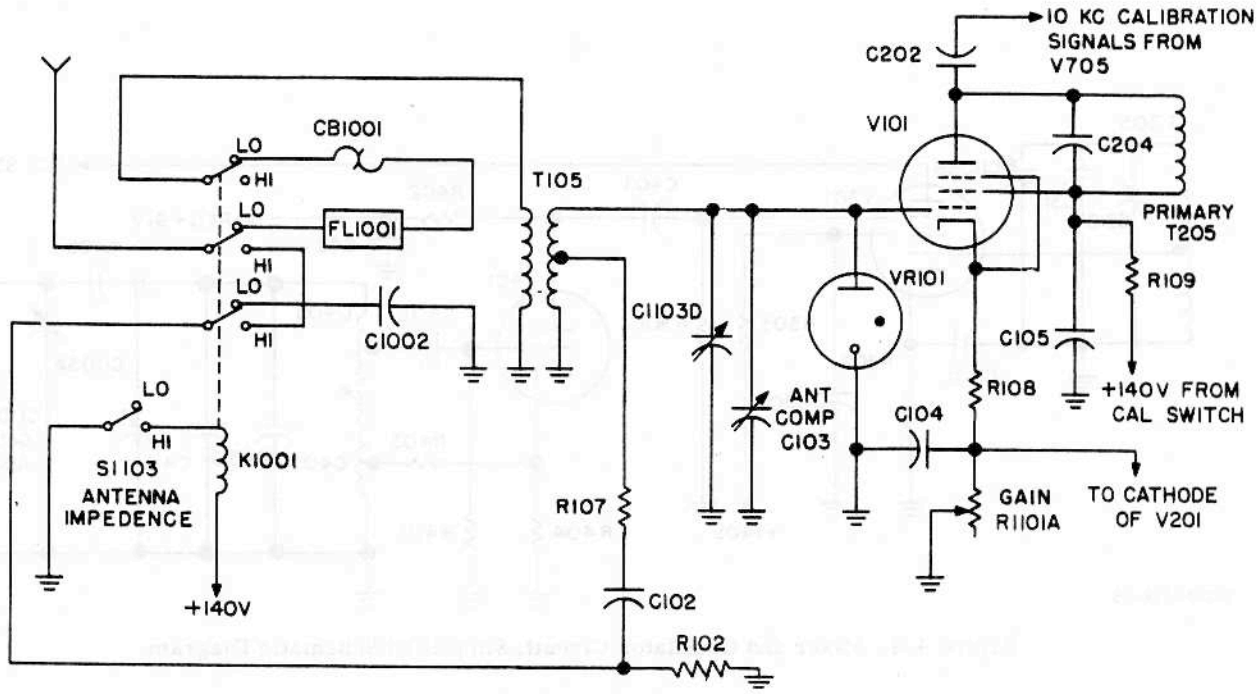


Figure 4-2. Antenna Amplifier Circuit, Simplified Schematic Diagram

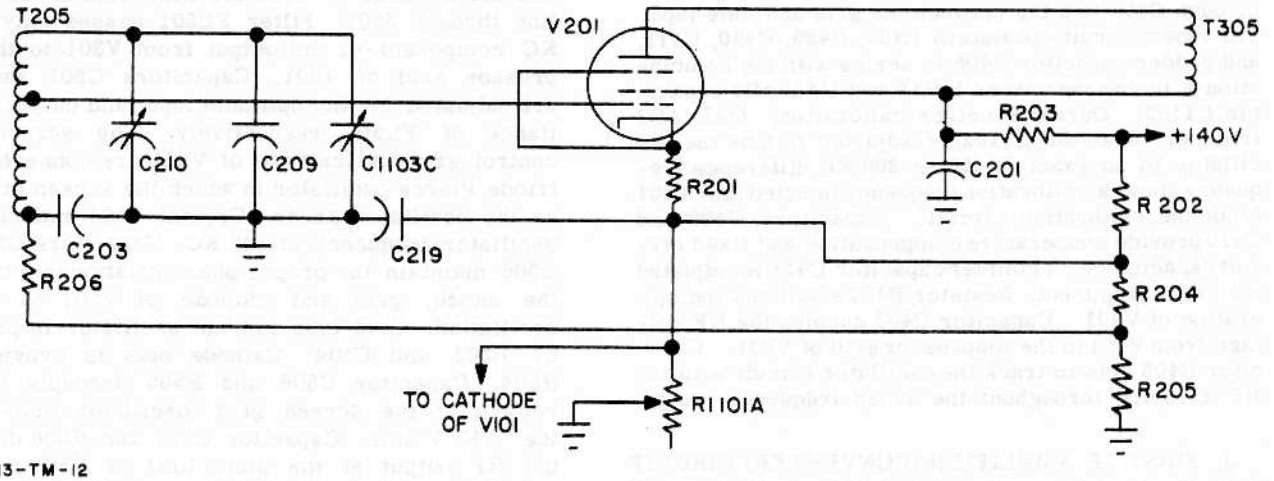


Figure 4-3. RF Amplifier Circuit, Simplified Schematic Diagram

load impedance and gain of V201 increases with the frequency. Thus the overall gain of V101 and V201 together is nearly constant throughout the tuning band.

c. MIXER AND OSCILLATOR CIRCUIT (see figure 4-4). - The secondary winding of T305 is tuned to the output frequency of V201 by trimmer capacitor C312, temperature compensating capacitor C311 and tuning capacitor C1103B. Part of the RF voltage across the secondary winding of T305 is tapped directly to the control grid of V301. Cathode bias is provided by R302. Capacitor C302 and R303 decouple the RF voltage on the screen grid of V301 from the 140 V line. Resistor R301 provides a DC return path from the suppressor grid and is part of the output load for oscillator V401.

Oscillator V401 is a modified Hartley circuit, operating 60 KC above the incoming signal frequency on Bands I and IV and 200 KC above the incoming

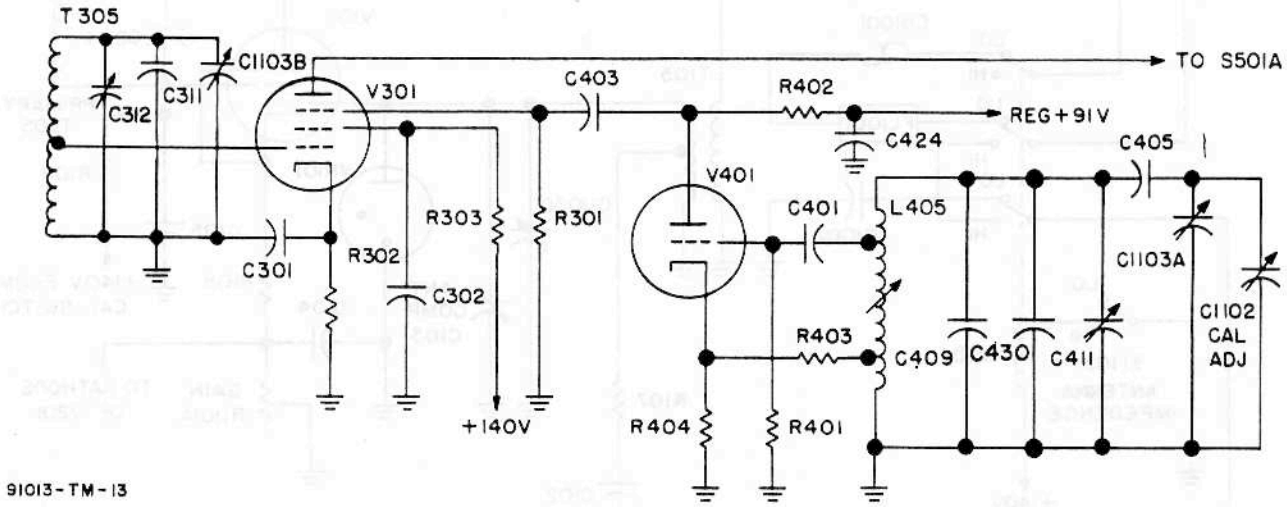


Figure 4-4. Mixer and Oscillator Circuit, Simplified Schematic Diagram

frequency on Bands II, III and V. Grid bias is provided by grid leak resistor R401. V401 is a Hartley oscillator circuit in which oscillations are supported by feedback through the plate load R402 and capacitor C424 to the grid through L405 and C401. The necessary 180 degree phase shift is attained by connecting the cathode through C409 to a tap between the grid and plate taps. The tuned circuit consists of L405, C409, C430, C411, and padder capacitor C405 in series with the combination of tuning capacitor C1103A and CAL ADJ capacitor C1102. During receiver calibration, CAL ADJ trimmer capacitor C1102 is adjusted to tune the oscillator to an exact 60 KC or 200 KC difference frequency above a calibration frequency injected into V201 from the calibration circuit. Capacitors C409 and C430 provide temperature compensation and fixed circuit capacitance. Trimmer capacitor C411 is adjusted for exact alignment. Resistor R403 stabilizes the operation of V401. Capacitor C403 cpuples the RF voltage from V401 to the suppressor grid of V301. Capacitor C405 acts to track the oscillator circuit with the RF circuits throughout the tuned frequency range.

d. FIRST IF AMPLIFIER (CONVERTER) CIRCUIT (see figure 4-5). - Converter V501 is the first IF stage on Bands I and IV. Switches S501 and S502, ganged with the Band Selector, disable V501 on Bands II, III and V. On Bands II, III and V the DC path from the plate of V301 to the 140 V supply is through S501A, S502A, the primary winding of T501, and R506. Resistor R506 and C511 decouple RF voltage from the 140 V line. RF transformer T501 couples the output from V301 to I.F. SELECTIVITY switch S601A. Capacitor C510, the distributed capacitance of the coaxial cable connecting V301 to T501, and the inductance of T501 form a tuned circuit which is resonant at 200 KC.

During operation on Bands I and IV, 140 volts is connected to the plate of V301 through R501, FL501, and S501A. The output from V301 is connected to FL501 through S501. Capacitor C502 and R501 decouple RF voltage from the 140 V line. The plate and screen grid of V501 are connected to the 140 V line through S502. Filter FL501 passes only the 60 KC component of the output from V301 to the suppressor grid of V501. Capacitors C501 and C503 are adjusted for the optimum input and output capacitance of FL501 respectively. The screen grid, control grid and cathode of V501 are connected as a triode Pierce oscillator in which the screen grid acts as the oscillator anode. Crystal Y501 maintains the oscillator frequency at 140 KC. Capacitors C504 and C506 maintain the proper phase relationship between the anode, grid and cathode of V501 to sustain oscillation. Grid bias for the oscillator is provided by R503 and C504. Cathode bias is provided by R504. Capacitor C506 and R505 decouple the RF voltage at the screen grid (oscillator plate) from the 140 V line. Capacitor C511 and R506 decouple the RF output at the plate load of V501 from the 140 V line. The 60 KC output from FL501 heterodynes with the 140 KC output of the oscillator section of V501 to produce the sum frequency of 200 KC. The output from V501 is connected to T501 through S502. Capacitor C509, trimmer capacitor C508, capacitor C510, and the inductance of T501 form a tuned circuit which is resonant at 200 KC.

e. IF AMPLIFIER CIRCUIT (see figures 4-6 and 4-7). - I.F. SELECTIVITY switch S601A connects the output from T501 to IF filter FL601 and S601B connects the output from FL601 to IF amplifier V601 (see figure 4-6). Filter FL601 is a two-section,

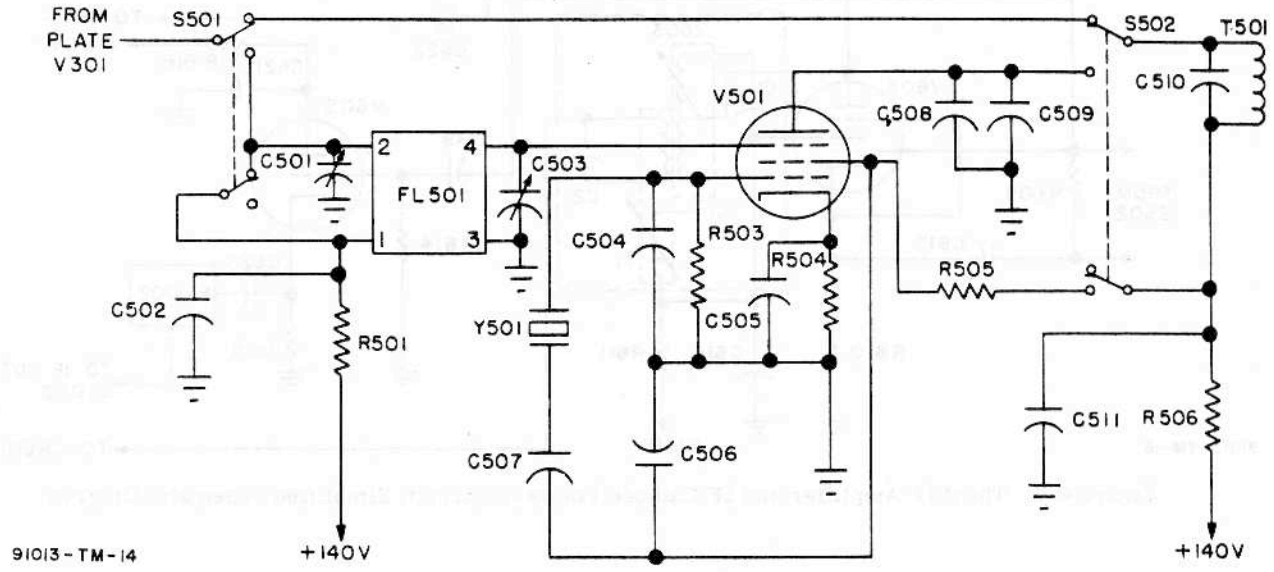


Figure 4-5. First IF Amplifier (Converter), Simplified Schematic Diagram

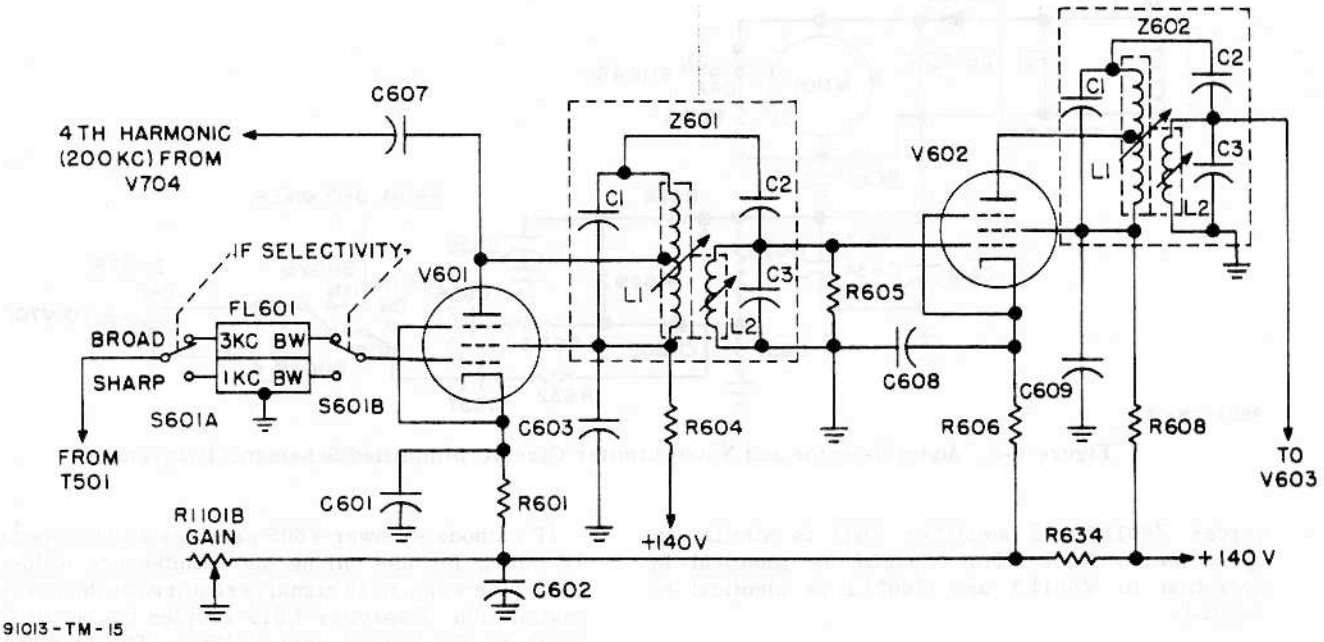


Figure 4-6. First and Second IF Amplifier Circuit, Simplified Schematic Diagram

mechanical filter which passes only the 200 KC component from T501. One section of the filter has a bandwidth of three KC and the other section has a bandwidth of one KC.

GAIN control R1101B controls the gain of V601 and V602 by varying the cathode bias on the tubes. GAIN control R1101B and resistor R634 form a DC voltage divider connected between the 140 V line and ground. Capacitor C602 and R634 decouple IF voltage from the bias line while capacitor C603 and R604 decouple IF voltage from the 140 V Line. Cathode resistor R601 provides a minimum bias for V601. The output from V601 is capacitively coupled by Z601 to V602. Z601L1 and Z601L2 are separated by magnetic shielding; thus, there is no inductive coupling between them. Coupling is attained through capacitor Z601C2. Both Z601L1 and Z601L2 are tuned to 200 KC by Z601C1 and Z601C3 respectively while resistor R605 provides a shunt impedance

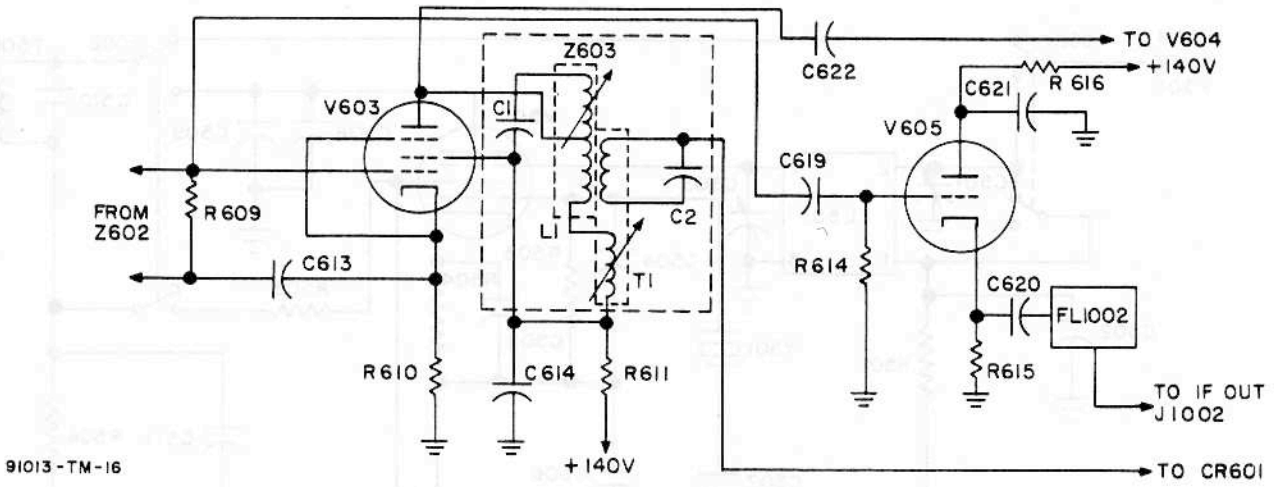


Figure 4-7. Third IF Amplifier and IF Cathode Follower Circuit, Simplified Schematic Diagram

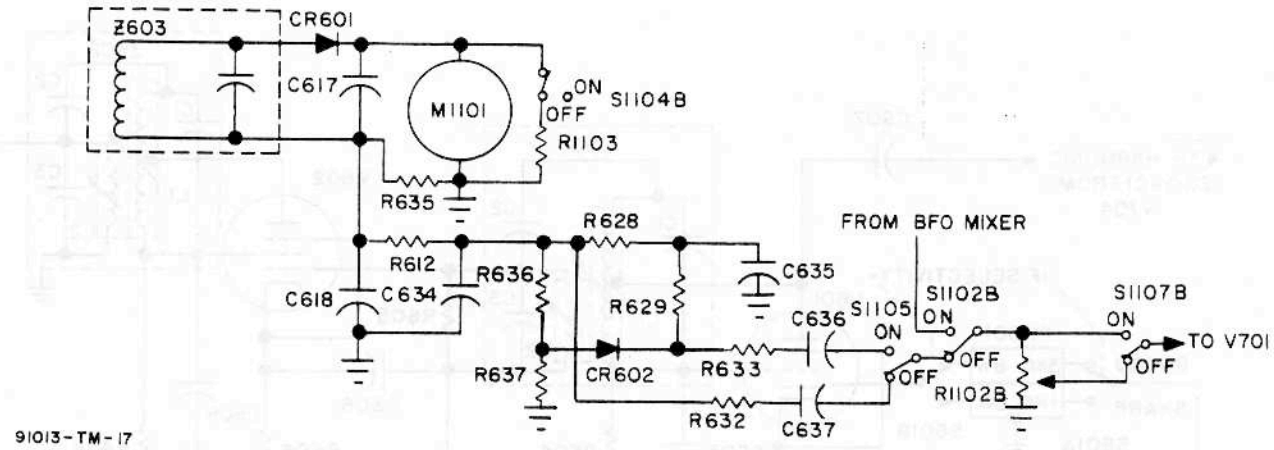


Figure 4-8. Audio Detector and Noise Limiter Circuit, Simplified Schematic Diagram

across Z601L2. IF amplifier V602 is similar in operation to V601. Coil Z602L2 is identical in operation to Z601L2 and Z602L1 is identical to Z601L1.

IF amplifier V603 has two outputs. One output capacitively couples the signal at the plate of V603 to B.F.O. mixer V604 (see figure 4-7). The second output transformer couples the signal at the plate of V603 by means of Z603 to audio detector CR601. The signal present at the grid of V603 is also capacitively coupled by C619 to the grid of cathode follower V605. Cathode resistor R610 provides cathode bias for V603. Capacitor C614 and R611 decouple the IF voltage at the output of V603 and the 140 V line.

IF cathode follower V605 provides a low impedance IF output for use during the maintenance of the receiver or when an IF signal is required at the receiver installation. Capacitor C619 couples the output from Z602 to the control grid of V605. The IF signal at the plate is grounded by C621. Capacitor C620 couples the output from the cathode of V605 to IF filter FL1002. The output of FL1002 is connected to J1102 on the rear of the receiver.

f. AUDIO DETECTOR AND NOISE LIMITER CIRCUIT (see figure 4-8). - Intermediate frequency signal from Z603 is applied to diode CR601 in series with capacitor C617. This intermediate frequency signal is rectified by diode CR601, producing a

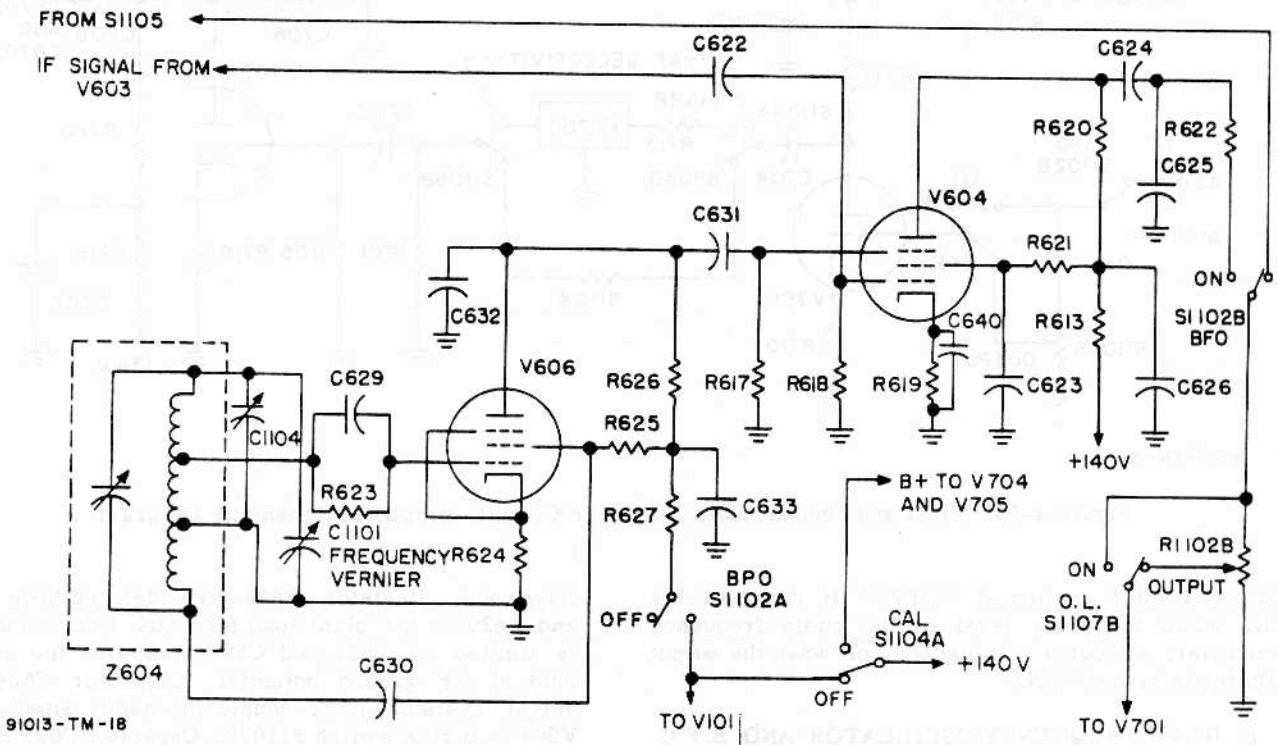


Figure 4-9. Beat Frequency Oscillator and B.F.O. Mixer Circuit, Simplified Schematic Diagram

direct current which varies at the modulation rate, if the signal is modulated. The direct current path is through meter M1101, the diode load resistance and the output winding of Z603. The diode load resistance consists of resistor R635 in parallel with the series combination of R612, R636, and R637. Meter M1101 therefore indicates the relative amplitude of the intermediate frequency signal applied to the detector circuit. Meter shunt resistor R1103 is removed from the circuit by the calibrate switch S1104B to provide a greater meter deflection during the calibration process.

Resistor R612 and capacitors C618 and C634 form a lowpass filter which passes the direct current and its audio frequency component, and filters the intermediate frequency signals out of the audio frequency circuits.

Resistors R636 and R637 form a voltage divider which provides operating bias voltage for diode CR602. The voltage across the diode load resistance is negative with respect to ground, because of the rectified current flowing through the resistance, and is proportional to the amplitude of signal applied to the detector circuit. Since the anode of diode CR602 is connected to the junction of R636 and R637, and the cathode is connected through R629 and R628 to the junction of R636 and R628, the cathode of CR602 will be negative with respect to its anode by the amount of voltage drop across resistor R636. This voltage will be proportional to the amplitude of signal being received, and permits audio frequency signals of lesser voltage to pass through diode CR602. The resistance values of resistors R636 and R637 have been chosen to make this operating voltage approximately equivalent to 60 percent modulation of the intermediate frequency signal. Resistor R628 with capacitor C635 provides a long time constant so that the voltage on the cathode of CR602 cannot change at an audio frequency rate. Any audio frequency voltage greater than that corresponding to approximately 60 percent modulation (such as impulse type interference) will bias CR602 to cutoff and will not be applied to the audio frequency amplifier.

Audio frequency signal from the junction of CR602 and R629 is connected through R633, C636, S1105 and S1102 to the audio frequency amplifier.

When the noise limiter switch S1105 is in the "OFF" position, audio frequency signal from the junction of R636 and R628 is connected through R632, C637, S1105 and S1102 to the audio frequency amplifier.

Switch S1102B connects the output level control R1102B to the detector, noise limiter circuit when the B.F.O. is turned "OFF." It connects the output level control to the output of the B.F.O. mixer circuit when the B.F.O. is turned "ON."

Switch S1107B connects the input of the audio frequency amplifier to output level control R1102B, to act as a conventional volume control, when the

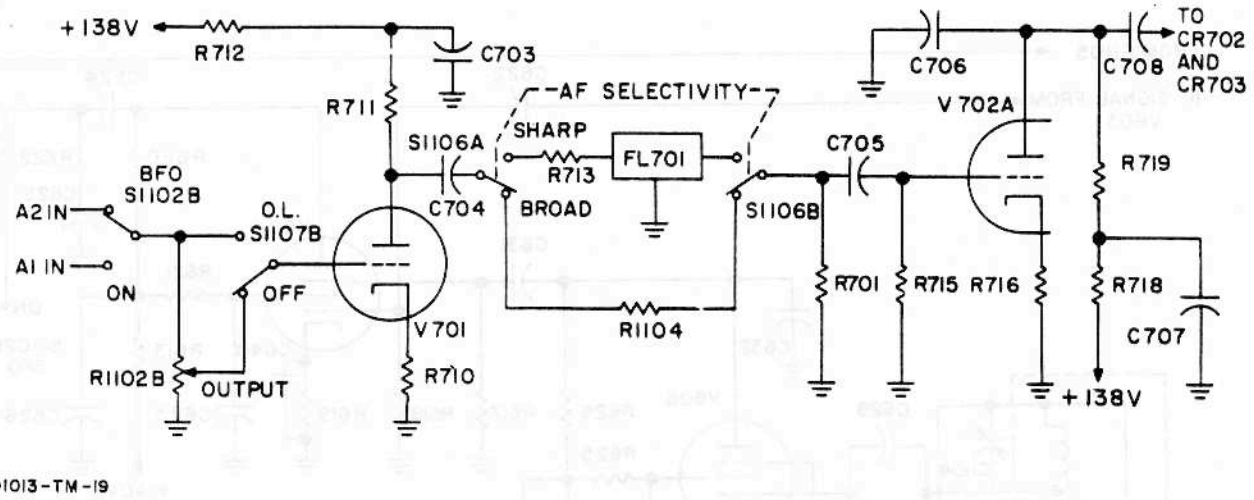


Figure 4-10. First and Second Audio Amplifier Circuit, Simplified Schematic Diagram

output limiter is turned "OFF." It connects the full audio frequency level to the audio frequency amplifier, without a volume control, when the output limiter is turned "ON."

g. BEAT FREQUENCY OSCILLATOR AND B.F.O. MIXER CIRCUIT (figure 4-9). - Beat frequency oscillator V606 is an electron coupled Hartley oscillator. It functions only when B.F.O. switch S1102 is in the "ON" position and CAL switch S1104 in the "OFF" position. In the "ON" position, B.F.O. switch S1102A connects 140 V to the plate and screen grid of V606. CAL switch S1104 is in series with S1102A and must be in the "OFF" position to continue the DC circuit from the plate and screen grid of V606 to the 140 V supply. This is to avoid the possibility of mistaking a B.F.O. zero beat for a calibration zero beat. The oscillator tuned circuit consists of Z604, trimmer capacitor C1104 and FREQ VERNIER capacitor C1101. Grid bias is obtained from C629 and R623 and additional bias is provided by cathode resistor R624. Positive feedback is coupled from the screen grid (oscillator plate) by capacitor C630 and oscillator coil assembly Z604 to the control grid of V606. Harmonics of the oscillator frequency are bypassed to ground at the plate of V606 by C632, and RF voltage is decoupled from the 140 V line by C633 and R627. The output frequency of V606 is 200 KC when FREQ VERNIER capacitor C1101 is in its "0" position.

The output from V606 is coupled by C631 to the suppressor grid of B.F.O. mixer V604. Resistor R617 provides a DC return path from the suppressor grid of V604 to ground and is the output load from B.F.O. V606. The 200 KC IF output from V603 is coupled to the control grid by C622. Resistor R618 provides a DC return path from the control grid of V604 to ground and forms part of the output load for IF amplifier V603. The outputs from V603 and V606 are heterodyned in V604 to produce an audio beat frequency. Resistor R619 provides cathode bias and R620 is the plate load for V604. Screen current is limited by R621 and C623 maintains the screen grid at RF ground potential. Capacitor C624 and series resistor R622 couple the audio output from V604 to B.F.O. switch S1102B. Capacitor C625 shunts to ground the very high audio frequencies and RF frequencies in the output from V604. The RF voltage at the output of V604 is decoupled from the 140 V line by C626 and R613. With B.F.O. switch S1102V in the "ON" position, the audio output from V604 is connected to the first audio amplifier V701, through S1107B.

h. AUDIO AMPLIFIER CIRCUIT (see figures 4-10 and 4-11). - The input to the audio amplifiers is selected by B.F.O. switch S1102B. When the O.L. switch is in the "ON" position, O.L. (output limiter) switch S1107B connects the entire audio input voltage directly to the control grid of first audio amplifier V701 (see figure 4-10). With the O.L. switch in the "OFF" position, the input level of V701 is controlled by OUTPUT control R1102B. Audio voltage from V701 is decoupled from the 138 V line by R712 and C703. Capacitor C704 couples the output from V701 to A.F. SELECTIVITY switch S1106. When the A.F. SELECTIVITY switch is in the "SHARP" position, the output from V701 is connected to audio bandpass filter FL701 which passes only the frequencies between 825 and 1175 CPS. Series resistor R713 increases the input impedance of FL701 as seen by V701, thereby establishing the proper load impedance for V701. When the A.F. SELECTIVITY switch is in the "BROAD" position, the audio output path from V701 is through S1106, series resistor R1104, and S1106 to the control grid circuit of V702A. The purpose of R1104 is to compensate for the loss of gain in FL701 so that the overall gain is approximately equal in both "SHARP" and "BROAD" positions. Resistor R701 provides the terminating impedance of FL701.

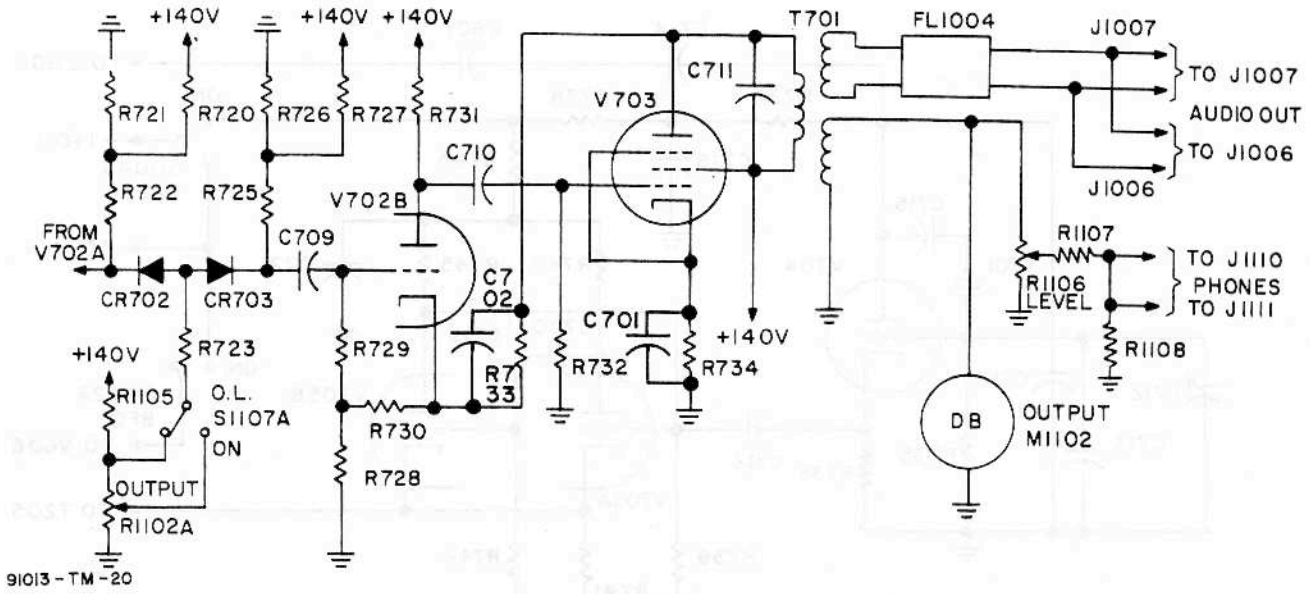


Figure 4-11. Output Limiter, Third Audio Amplifier and Output Amplifier Circuit, Simplified Schematic

The output from FL701, or directly from V701, is coupled by C705 to the control grid of V702A. The audio input voltage to V702A is developed across grid return resistor R715. Cathode bias is provided by R716, and R719 is the plate load for V702A. Capacitor C706 attenuates the high frequency response of V702A. Capacitor C707 and R718 decouple the audio output of V702A from the 138 V line. The output from V702A is coupled by C708 to output limiter diodes CR702 and CR703. When O.L. switch S1107A is in the "ON" position, the OUTPUT control R1102A determines the maximum output level of the receiver.

i. OUTPUT LIMITER. - A voltage divider consisting of resistors R720, R721 provides a positive voltage to the cathode of CR702. An identical voltage divider consisting of resistors R727, R726 provides the same positive voltage to the cathode of CR703. The anode voltage for both diodes is provided from a voltage divider consisting of resistors R1105, R1102A. When the output limiter (O.L.) switch is "OFF," the anode voltage is supplied from the junction of resistors R1105, R1102A, making the anodes positive with respect to the cathodes, and both diodes conduct, offering a low impedance path for the audio signals, without limiting. When the O.L. switch is "ON," the anode voltage can be varied by means of R1102A. The value of the anode voltage with respect to its cathode voltage determines the maximum amplitude of audio peak voltages that will be passed by CR702 and CR703, one diode clipping on the positive half cycle and the other clipping on the negative half cycle. Resistors R722 and R725 are cathode isolating resistors and R723 is the anode load resistor to isolate the audio signals from the DC control

The output from the output limiter is coupled by C709 to the control grid of third AF amplifier V702B. Cathode bias is obtained from R730 in series with R728. Control grid bias voltage is obtained from the junction of R728 and R730. The output from V702B is coupled to the control grid of output amplifier V703 by C710. Cathode bias for V703 is provided by R734 and C701. Capacitor C711 attenuates high frequencies across the primary winding of output transformer T701. Negative feedback is applied from the plate of C703 through R733 and C702 to the cathode of V702B. Capacitor C702 and resistors R733, R730, R728 form a voltage divider to apply part of the output from V703 as negative feedback to the cathode of V702B. The purpose of the negative feedback is to reduce the distortion and to increase the stability of the audio amplifiers under varying loads connected to the output of T701.

Transformer T701 couples the output from V703 to the remote audio line connected at the rear of the receiver and to the two PHONES jacks on the front panel of the receiver. Filter FL1004, in series with the remote audio lines, reduces signal and noise frequencies outside the desired audio frequency range. Two parallel balanced audio lines are connected to the output of FL1004. The PHONES output is taken from LEVEL control potentiometer R1106 at the voltage divider junction of R1107 and R1108.

j. CALIBRATOR CIRCUIT (see figure 4-12). - Pierce oscillator V704, operating at 50 KC, synchronizes multivibrator V705 to an accurate 10 KC fundamental output. Crystal V701 is connected as a high Q resonator in a Colpitts circuit. Capacitors C713 and C717 maintain the proper phase relationship between the plate, cathode and grid to sustain

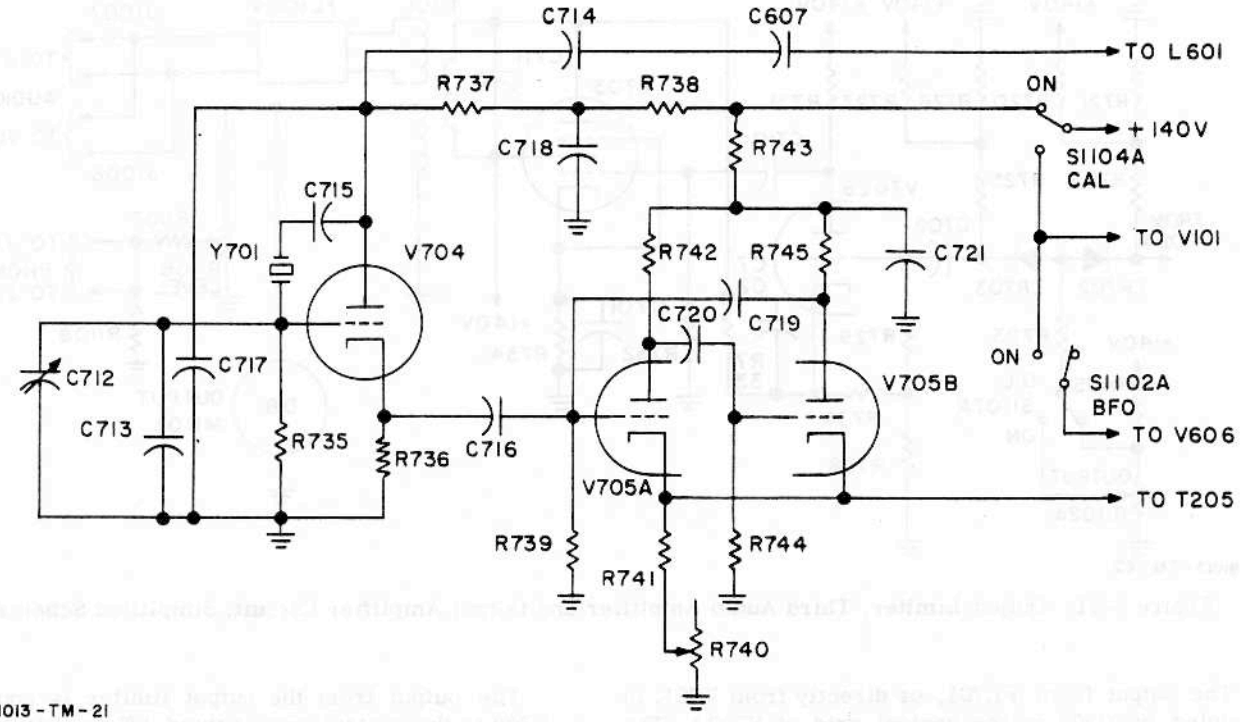


Figure 4-12. Calibrator Circuit, Simplified Schematic Diagram

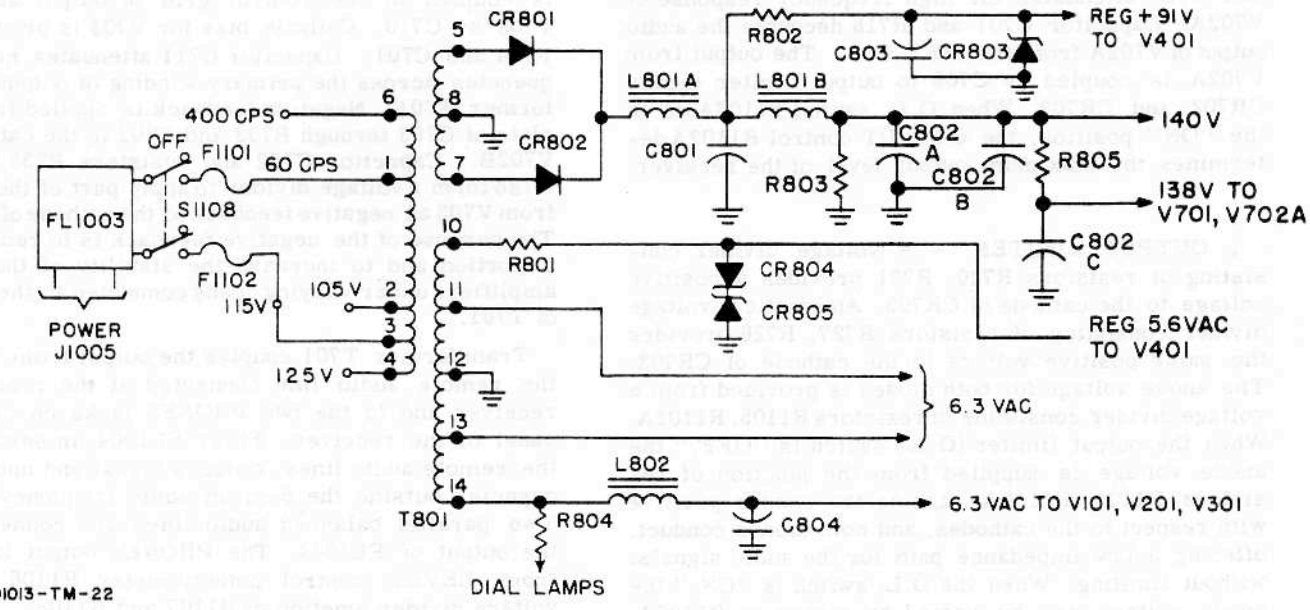


Figure 4-13. Power Supply, Simplified Schematic Diagram

oscillation. Grid leak bias is provided by C712, C713 and R735. Capacitor C712 is adjusted for a frequency of exactly 50 KC. The output voltage at the plate is developed across R737. Resistor R738 and C718 decouple the RF output of V704 from the 140 V line. Capacitor C714, in series with C607, couples the plate output from V704 to IF coil Z601L1. The fourth harmonic of the output from V704 heterodynes with the signal present at V601 plate produced by V705 (discussed in the following paragraph) and a zero beat frequency is obtained for the calibration of the receiver. Capacitor C716 couples the cathode output from V704 to the control grid of V705A to synchronize the fundamental output frequency of V705 at 10 KC.

Multivibrator V705 produces a square wave output, rich in harmonics, at the fundamental frequency of 10 KC. The approximate output frequency is determined by the time constant of C720 and R744 and the time constant of C719 and R739. Stabilization is provided by resistor R740. Capacitor C721 and R743 decouple the 10 KC output and its harmonics from the 140 V line. Resistors R742 and R745 are the plate loads for V705A and V705B respectively. Resistor R741, in series with R740 provides cathode bias for both sections of V705 and together with R740 is the cathode load. Resistor R740 is adjusted for proper synchronization with the 50 KC oscillator. The cathode output from V705B is coupled to the primary winding of RF coupling transformer T205 by C202 (see figure 4-2). Because the multivibrator output is rich in harmonics, calibration check points are produced at 10 KC intervals throughout the tuning range of the receiver.

The calibrator circuit is energized when CAL switch S1104 is in the "ON" position. Switch S1104A connects 140 V to both V704 and V705 and opens the 140 V line to first RF amplifier V101 and to beat frequency oscillator V606 to disable the two stages. Thus it is impossible for incoming signals or the beat frequency oscillator to interfere during receiver calibration.

k. POWER SUPPLY CIRCUIT (figure 4-13). - AC power is connected through line filter FL1003, POWER switch S1108 and fuses F1101 and F1102. For 60 cycle operation, one AC line is connected to terminal 1 of power transformer T801, and for 400 cycle operation, it is connected to terminal 6 of T801. The full wave rectifier, CR801 and CR802, provides all the plate and screen grid voltage for the receiver. Bleeder resistor R803 discharges filter capacitors C801 and C802 when the receiver is turned off, provides stabilization of the output voltage when the receiver is operating, and limits surge voltages during receiver warmup. Resistor R802 is a voltage dropping resistor which, in conjunction with diode CR803 regulates the output voltage to 91 volts for the plate of the first oscillator V401. Diode CR803 has a Zener breakdown voltage of 91 volts. Whenever the applied voltage exceeds this value, CR803 will conduct, drawing sufficient current through resistor R802 to drop the voltage to 91 volts. The voltage drop across CR803 remains at 91 volts, regardless of the amount of current it passes, when operated in the Zener mode. Capacitor C803 provides additional filtering of the regulated 91 VDC line. Resistor R805 and capacitor C802C provide additional filtering of the unregulated 138V line for operation of the first and second audio amplifier circuits.

The filament winding of T801 has five terminals, connected as three pairs, to which the tube filaments are connected. Terminals 11 and 13 provide 6.3 VAC with a grounded center tap to the electron tubes in the IF and AF amplifiers. Terminals 12 and 14 provide 6.3 VAC with one side grounded for the RF amplifier tubes and dial lamps. Choke L802 and capacitor C804 form an RF filter to keep RF interference from being coupled between the power supply and the RF amplifiers. Terminals 10 and 12 provide 14 VAC which is dropped to 5.6 VAC due to current through R801. Diodes CR804 and CR805 are connected to operate in the Zener mode. The Zener breakdown voltage is 5.6 volts. When conducting is the forward direction as a normal diode, the voltage drop is negligible. Thus the two diodes in series with opposite polarities will provide full wave regulation of the AC by drawing sufficient current to maintain the 5.6 volts for the heater of the first oscillator V401. The purpose of regulating the oscillator filament voltage is to stabilize the operating frequency of the receiver against fluctuations of power input voltage and to prolong the life of the tube.

SECTION 5

TROUBLE-SHOOTING

5-1. GENERAL.

This section contains complete trouble-shooting procedures which will aid in isolating a trouble to a particular assembly or component. Three types of tables are employed. The first type is a preliminary trouble-shooting chart using front panel indicators (table 5-2). This table is used to isolate a trouble to a particular assembly or component by using front panel indications. The second type is the system trouble-shooting chart (table 5-3). This table is used to isolate a trouble to a particular assembly by using signal injection and voltage measurements. The third type is the functional trouble-shooting charts (tables 5-4 through 5-10). These tables are used to isolate a trouble to a particular component within an assembly by using signal injection and performing voltage and resistance measurements.

The front panel indicators and the crystal calibrator provide a convenient means of isolating trouble to a particular assembly or part. For example, the tuning meter indicates diode detector current and can be used to determine if the signal is getting through the IF amplifier. The calibration oscillator injects a 200 KC signal into the first stage of the IF amplifier. It is only necessary to turn the CAL switch to "ON" and observe the tuning meter to determine if the IF assembly is functioning. Refer to table 5-2 to perform this type of fault analysis.

Each trouble-shooting chart refers to test points which identify the signal injection points and the voltage and resistance measurement points. Major test points are used to determine the assembly of the receiver containing the trouble. They are identified by a star enclosed Arabic number and are referenced in the text as ★1. Secondary test points are used to determine the stage or subassembly within an assembly containing the trouble. They are identified by an encircled capital letter and are referenced in the text as ●A. Minor test points are used to determine the defective part within a stage or subassembly. They are identified by an encircled capital letter with a subscript Arabic number and are referenced in the text as ●A1.

When a failure of any type occurs in the receiver, perform the preliminary inspection as given in paragraph 5-3a before using the trouble-shooting tables. The preliminary inspection may pinpoint the trouble immediately. If the preliminary inspection fails to reveal the trouble, use the system trouble-shooting chart to determine the defective assembly. Then use the referenced functional chart to determine the defective component within the assembly.

The trouble-shooting charts are based on the following assumptions:

a. All external equipment is in good operating order.

b. All fuses and lamps are good (refer to paragraph 3-5).

TABLE 5-1. TEST EQUIPMENT REQUIRED FOR TROUBLE-SHOOTING

NAME	NOMENCLATURE	ALTERNATE
Electronic Multimeter	AN/USM-116	ME-25/U
Electronic Multimeter	ME-6E/U	ME-74/U
RF Signal Generator Set	AN/URM-25 Series	
Electron Tube Test Set	TV-7D/U	
Audio Oscillator	TS-382/U Series	
Test Adapter Set	AN/USM-119	MX-1258/U
Frequency Meter Set	AN/USM-26 Series	

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

Table 5-1 lists the test equipment required to trouble-shoot the receiver. The special tools required are a seven pin miniature tube socket adapter, a nine pin miniature tube socket adapter, test cable CX-7860A/WRR-3 and the special test lead. The tube socket adapters are included in the AN/USM-119. Test cable CX-7860A/WRR-3 is provided with each AN/WRR-3 equipment. The special test lead is made from test prod MX-1909/U which is supplied with each AN/WRR-3A equipment (see paragraph 2-4c).

5-3. OVERALL TROUBLE-SHOOTING.

a. PRELIMINARY CHECK. - Perform the following preliminary checks on the receiver before actual trouble-shooting:

(1) Turn POWER switch to "ON" and observe all front panel indications (refer to table 5-2).

(2) Withdraw the chassis from the cabinet as shown in figure 2-5 and inspect the receiver for any visible signs of damage or corrosion.

(3) Check all switches for positive action. Check that the controls do not scrape or bind and are attached firmly to their shafts.

(4) Connect test cable adapter CX-7860A/WRR-3 between receptacle at the back of the receiver chassis and receptacle on the inside back wall of the receiver cabinet. With the test cable connected as described, all circuits are connected and the receiver can be operated in this position for servicing.

WARNING

Connect the test cable to the chassis receptacle first, before connecting it to the cabinet receptacle.

b. CONTROL SETTINGS. - Preset the controls as indicated below and set POWER switch S1108 to "ON." After the completion of each step, return the controls to their preset position. Throughout the procedures controls are assumed to be in their preset position at the start of each step.

NOTE

All controls are located on the front panel.

CONTROL	SETTING
CAL (S1104)	OFF
N.L. (S1105)	OFF
O.L. (S1107)	ON
CAL ADJ (C1102)	0
B.F.O. (S1102)	ON
ANT. COMP (C103)	0
FREQ VERNIER (C1101)	6
I.F. SELECTIVITY (S601)	BROAD
A.F. SELECTIVITY (S1106)	BROAD
GAIN (R1101)	6
ANTENNA IMPEDANCE (S1103)	LO
OUTPUT (R1102)	10
LEVEL (R1106)	10

c. SYSTEM TROUBLE-SHOOTING CHART (see table 5-3). - Use the system trouble-shooting chart to determine the defective assembly. The voltage outputs of the power supply are measured first and then signal injections are made at the major test points. Work back from the audio amplifier assembly to the antenna amplifier assembly. When a defective subassembly is located refer to the applicable functional trouble-shooting chart (tables 5-4 to 5-10). In using the system trouble-shooting chart, refer to the functional block diagram (figure 4-1) and the schematic diagram (figure 6-38). Figures 5-1, 5-2 and 5-3 show the physical location of test points. In addition, see figure 5-5 for primary power distribution.

5-4. FUNCTIONAL TROUBLE-SHOOTING.

a. PRELIMINARY CHECK. - The preliminary checks to be performed before trouble-shooting the receiver are the same as those listed in paragraph 5-3a.

b. CONTROL SETTINGS. - Preset the controls according to paragraph 5-3b except where specified otherwise in the functional trouble-shooting charts. At the completion of each step return the controls to their preset positions.

c. FUNCTIONAL TROUBLE-SHOOTING CHARTS. - Use the functional trouble-shooting charts, tables 5-4 through 5-10, to isolate a fault to a particular part within an assembly. The procedures to be followed are listed in sequence in each chart. The initial approach is to use signal injection at the secondary test points, working back from the output stage to the input stage in each assembly to isolate the defective stage. When the defective stage is located, check the tube. If the tube is good, insert it with a tube socket adapter, back into the socket. Take voltage and resistance measurements according to the associated voltage and resistance diagrams to isolate the defective part within the stage. The voltage and resistance diagrams show the relative locations of the tube sockets in each assembly as viewed from the top (tube side). The overall schematic diagram, figure 6-38, gives the electrical location of the test points and serves as an aid to identifying the defective part. Figure references in the "Test Point" column of the charts give the physical locations of the test points.

NOTE

All signal injection, voltage and resistance measurements are made without removing the assemblies from the receiver by using the seven and nine pin miniature tube socket adapters. The antenna and main RF amplifiers, frequency mixer, RF oscillator, and power supply have covers which must be removed to perform voltage and resistance checks (see figures 5-1 and 5-2).

5-5 LOCATION OF PARTS.

Figures 6-14 through 6-37 show the physical location of all component parts in each assembly and on the main receiver chassis. If a reference designation of a part is known, the part can be located by referring to the "LOCATING FUNCTION" column of the Maintenance Parts List, table 7-2.

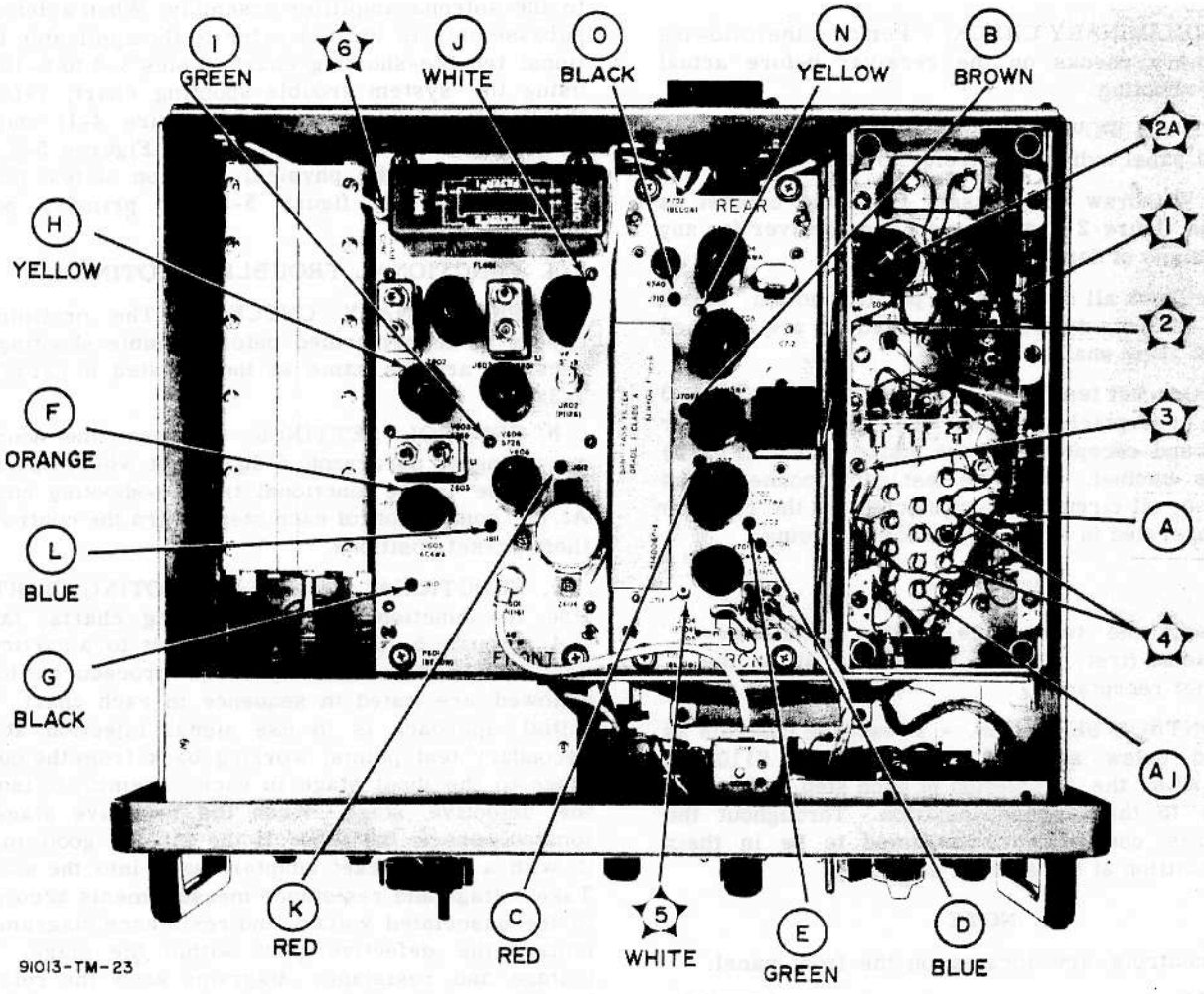


Figure 5-1. Top View, Test Point Location

TABLE 5-2. PRELIMINARY TROUBLE-SHOOTING USING FRONT PANEL INDICATORS

Step	Front Panel Indication	Probable Trouble
1	Dial lamps do not light. OUTPUT and TUNING meters do not indicate with GAIN control set at "10"	Indicates that power supply is not providing power. Check the fuses and ascertain that the power line is connected and energized. Refer to table 5-4 to check power supply.
2	TUNING meter indicates, but OUTPUT meter does not indicate and no signal is audible in headphones inserted in the PHONES jack.	AF amplifier defective. Refer to table 5-5.
3	With A. F. SELECTIVITY switch in "BROAD" position, the set operates properly, but with A. F. SELECTIVITY switch in "SHARP" position and FREQ VERNIER adjusted for maximum indication on the output meter, the set does not operate.	Filter FL701 or A. F. SELECTIVITY switch S1106 defective.

TABLE 5-2. PRELIMINARY TROUBLE-SHOOTING USING FRONT PANEL INDICATORS (Continued)

Step	Front Panel Indication	Probable Trouble
4	TUNING meter does not indicate. With CAL switch "ON," TUNING meter still does not indicate.	Second IF amplifier defective. Refer to table 5-6.
5	With I.F. SELECTIVITY switch in one position, the set operates properly. With I.F. SELECTIVITY switch in the other position, the set does not operate.	Filter FL601 or switch S601 defective.
6	TUNING meter does not indicate. With CAL switch "ON," TUNING meter provides a steady indication which does not change as the Tuning Control is rotated through several calibration check points.	RF oscillator , frequency mixer, or main RF amplifier defective. Refer to table 5-3.
7	Set operates properly on Bands II, III, and V. Set does not operate on Bands I and IV.	First I.F. amplifier defective. Refer to table 5-7.
8	TUNING meter does not indicate. With CAL switch "ON," TUNING meter indicates and calibration beat notes are audible in headphones and indicated on tuning meter.	Antenna or antenna RF amplifier defective. Refer to table 5-3.
9	Set does not operate on one band. Operation is satisfactory on all other bands.	RF oscillator, frequency mixer, main RF amplifier, or antenna RF amplifier, band switch or coil associated with inoperative band is defective. Refer to table 5-3.

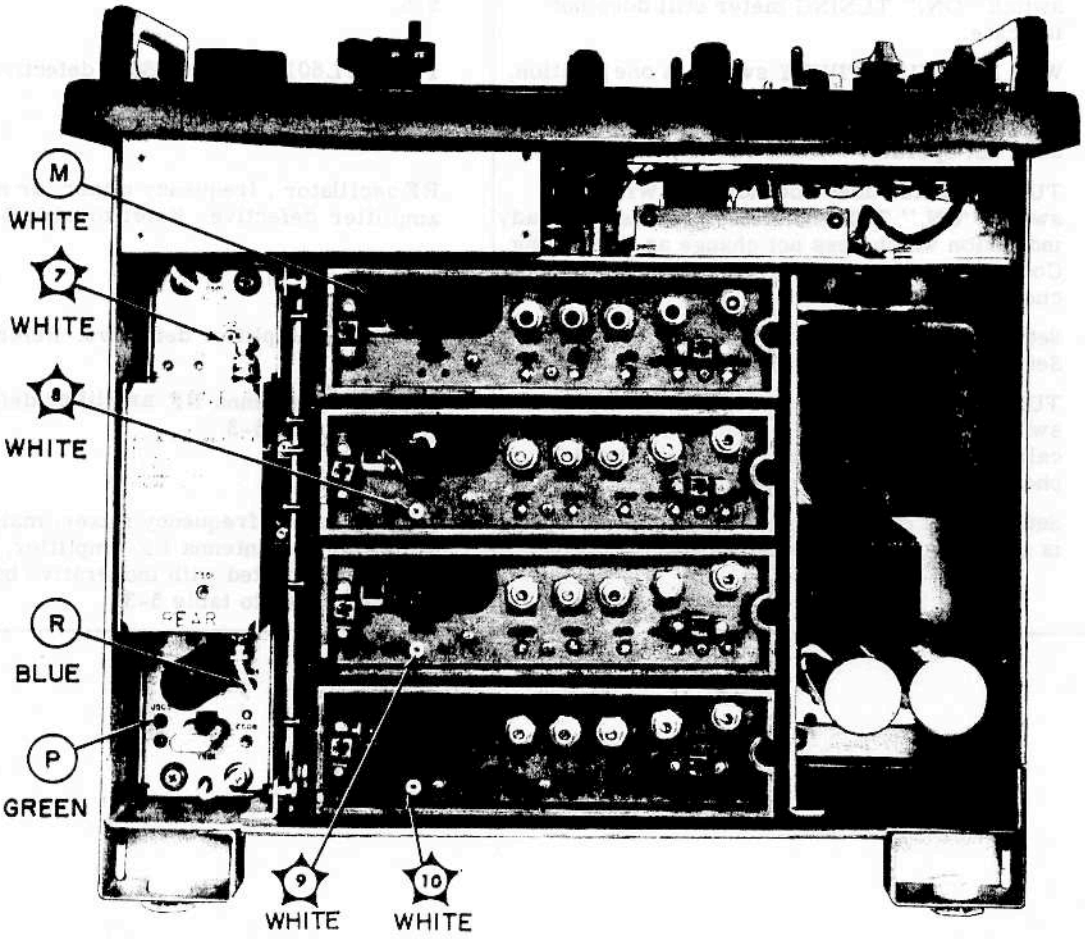


Figure 5-2. Bottom View, Test Point Location

TABLE 5-3. SYSTEM TROUBLE-SHOOTING CHART

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Check output voltages of power supply at test points ★1, ★2, ★2A, ★3, and ★4 (see figure 5-1) with electronic multimeter (AN/USM-116).	+91 (±4.6) VDC at ★1 +140 (±14) VDC at ★2 +138 (±14) VDC at ★2A 5.6 (±0.3) VAC at ★3 6.3 (±0.63) VAC at ★4	If voltages are normal, proceed to step 2. If not, proceed to step 1 of table 5-4.
2	Set the output of the audio oscillator to 1000 CPS at 0.008 VRMS.		

TABLE 5-3. SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	a. Apply the audio oscillator output to test point ★ 5 (see figure 5-1).	a. Tone is heard in headphones and OUTPUT meter M1102 indicates a minimum of +8 DB.	a. If indications are normal proceed to b. If not, proceed to step 1 of table 5-5.
	b. Set A. F. SELECTIVITY switch S1106 to "SHARP".	b. Little or no change in OUTPUT meter M1102 indication.	b. If indications are normal proceed to step 3. If not, check S1106 and audio bandpass filter FL701.
3	Set the B. F. O. switch to "OFF." Adjust the signal generator for a 200 KC output at 1600 UV, modulated 30 percent with 1000 CPS. Apply the signal generator output to test point ● J and connect the electronic multimeter (AN/USM-116) to test point ● G (see figure 5-1).	Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB and the electronic multimeter indicates a minimum of -1.0 volts.	If indications are normal, proceed to step 4. If not, proceed to step 1 of table 5-6.
4	Set the B. F. O. switch to "OFF." Adjust the signal generator for a 60 KC output at 27 millivolts, modulated 30 percent with 1000 CPS and apply the signal generator output to test point ★ 7 (see figure 5-2).		
	a. Set the Band Selector switch to Band I (14-30).	a. Tone heard in headphones and OUTPUT meter M1102 indicates a minimum of +8 DB.	a. If indications are normal, proceed to b. If not, check V501, S501 and S502 then refer to step 1 of table 5-7.
	b. Set the Band Selector switch to Band IV (133-283).	b. Same as a.	b. If indications are normal, proceed to step 5. If not, check V501, S501 and S502, then refer to step 1 of table 5-7.
5	a. Connect electronic multimeter (AN/USM-116) to test point ● M (see figure 5-2).	a. -1.0 VDC to -6.0 VDC.	a. If indication is normal, proceed to b. If not, refer to step 2 of table 5-8.
	b. Repeat a. with the Band Selector switch in each of the following positions: Band I (14-30), Band II (30-63), Band III (63-133), Band V (283-600).	b. Same as a, except -0.5 VDC minimum is allowable at low end of Band V.	b. If indications are normal, proceed to step 6. If not, refer to step 2 of table 5-8.
6	Set the B. F. O. switch to "ON." a. Set the Band Selector switch to Band I (14-30) and tune the receiver to any frequency within the band. Set the signal generator to the receiver frequency and adjust the signal generator output for a 200 UV, unmodulated signal. Apply the signal generator output to test point ★ 8 and adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	a. Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB and TUNING meter M1101 indicates a minimum of 5.	a. If indications are normal, proceed to b. If not, refer to step 1 of table 5-8.

TABLE 5-3. SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	b. Repeat a. with the Band Selector switch in each of the following positions: Band II.(30-63), Band III (63-133), Band IV (133-283), and Band V (283-600).	b. Same as a.	b. If indications are normal, proceed to step 7, if not, refer to step 1 of table 5-8.
7	Adjust the signal generator output level to 50 UV. Apply the signal generator output to test point ★ 9 (see figure 5-2) and repeat the procedure in step 6.	Tone heard in headphones, OUTPUT meter M1102 indicates a minimum of +8 DB and TUNING meter M1101 indicates a minimum of 5.	If indications are normal, proceed to step 8, if not, refer to step 1 of table 5-9.
8	Adjust signal generator output level to 25 UV. Apply the signal generator output to test point ★ 10 (see figure 5-2) and repeat the procedure in step 6.	Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB and TUNING meter M1101 indicates a minimum of 5.	If indications are normal, proceed to step 9. If not, refer to step 1 of table 5-10.
9	a. Adjust the signal generator output level to 1.5 UV. Apply the signal generator output to test point ★ 11 (see figure 5-3) and repeat the procedure in step 6 for one band only.	a. Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB and TUNING meter M1101 indicates a minimum of 5.	a. If indications are normal, proceed to b. If not, check FL1001 and all connections between connector J1003 and test point ★ 10.
	b. Set the ANTENNA IMPEDANCE switch S1103 to "HI" and adjust the signal generator output level to 3 UV. Apply the signal generator output through a high impedance dummy antenna (see figure 5-4) to test point ★ 11 (see figure 5-3) and repeat the procedure in step 6.	b. Same as a.	b. If indications are not normal, check relay K1001 and switch S1103.

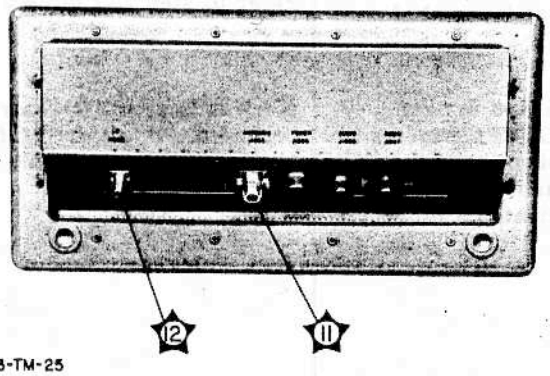


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Figure 5-3. Rear View, Test Point Location

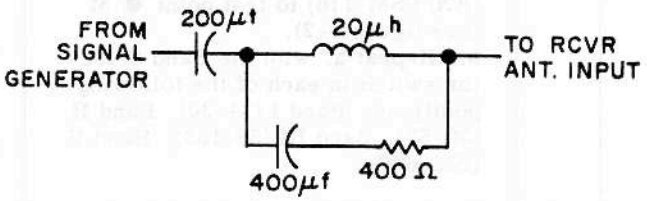

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Figure 5-4. High Impedance Dummy Antenna

TABLE 5-4. POWER SUPPLY, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	T801 Terminals 1 and 3	Measure AC voltage.	113 VAC	If indication is not normal, check primary power source, FL1003, fuse holders, and S1108. If indication is normal proceed to step 2.
2	(A) Figure 5-1	Connect electronic multimeter (AN/USM-116) between test point and ground.	+180 VDC	If indication is normal, check L801A, C801, R805, C802 and R803. If not, proceed to step 3.
3	(A1) Figure 5-1	Same as step 2.	195 VAC	If indication is normal, check CR801 and CR802. If not, check T801 and primary power circuit (see figure 5-5).

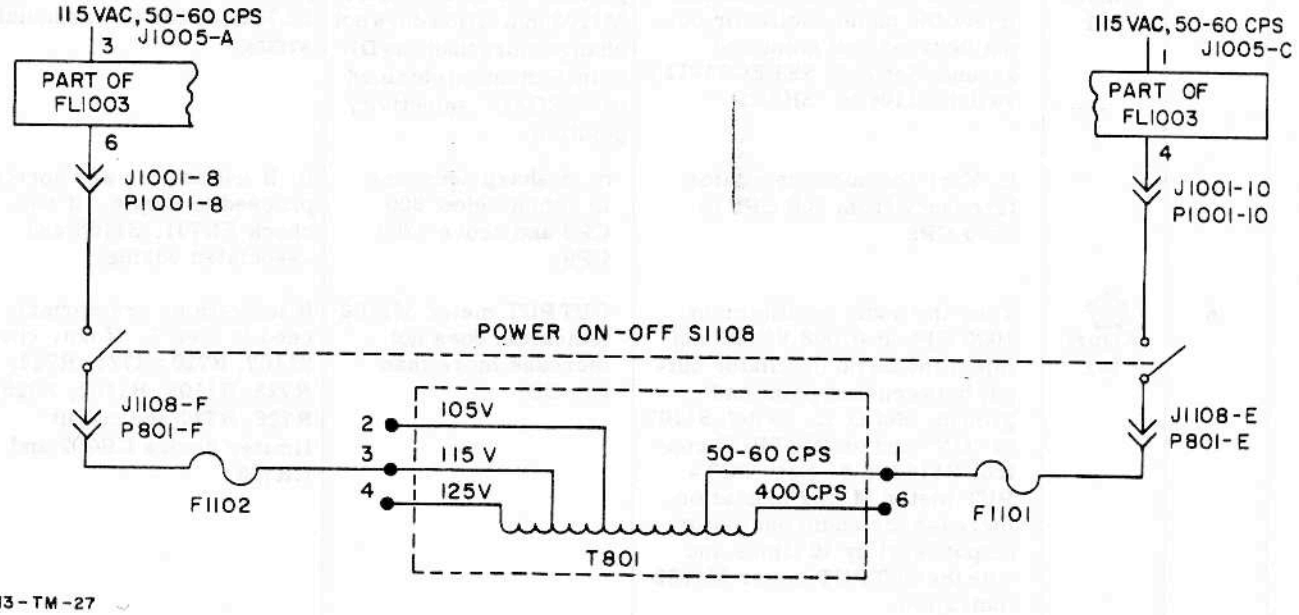


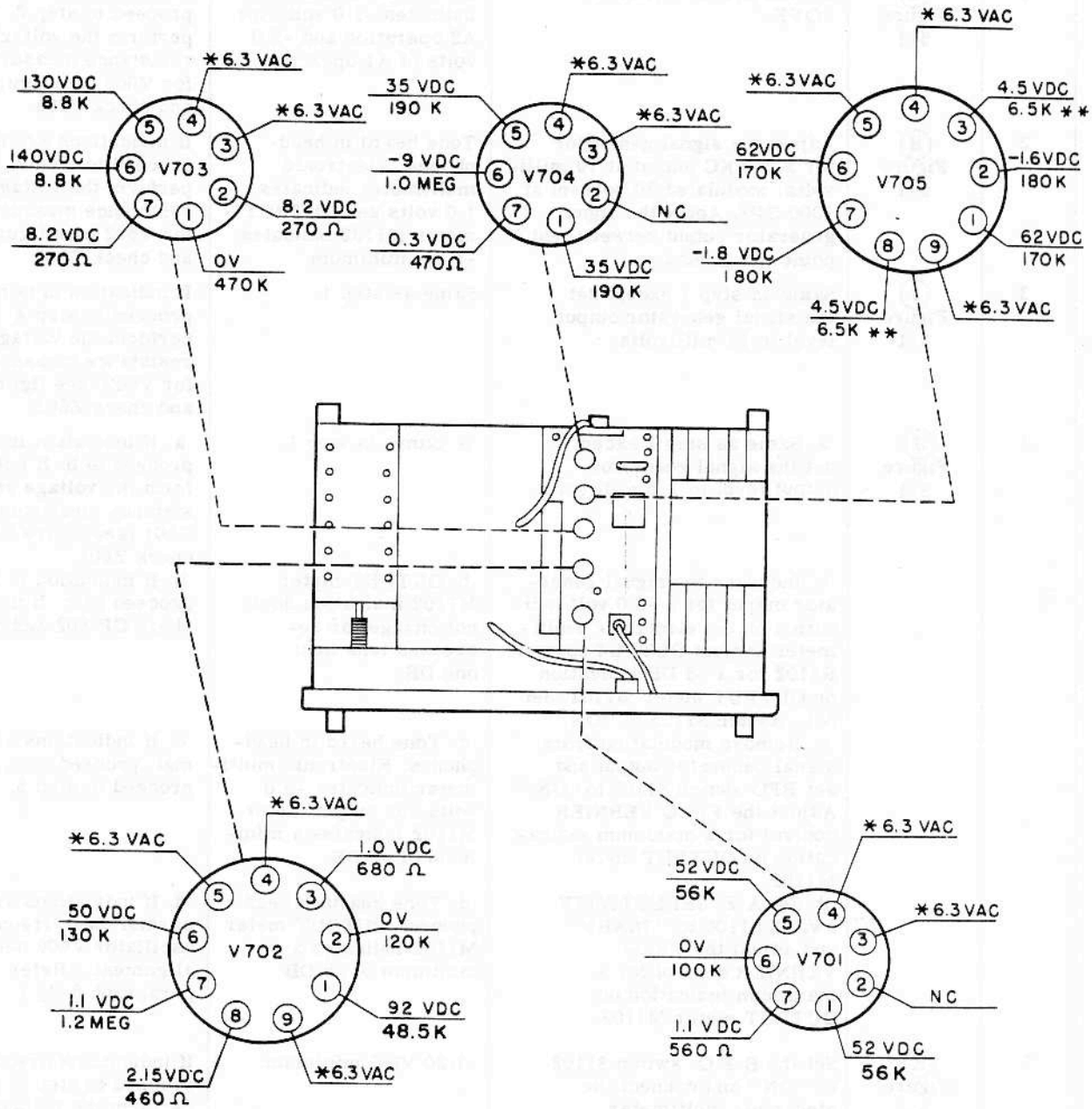
Figure 5-5. Primary Power Distribution Diagram

TABLE 5-5. AF AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(B) Figure 5-1	Tune the audio oscillator to 1000 CPS at 2.0 VRMS and inject the audio oscillator output between test point and ground.	Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB.	If indications are normal, proceed to step 2. If not, perform the voltage and resistance measurements for V703 (see figure 5-6).

TABLE 5-5. AF AMPLIFIER, TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	(C) Figure 5-1	Tune the audio oscillator to 1000 CPS at 0.26 VRMS and inject the audio oscillator output between test point and ground.	Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB.	If indications are normal, proceed to step 3. If not, perform the voltage and resistance measurements for V702 (see figure 5-6).
3	(D) Figure 5-1	Tune the audio oscillator to 1000 CPS at 0.28 VRMS and inject the audio oscillator output between test point and ground.	Tone heard in headphones. OUTPUT meter M1102 indicates +8 DB, minimum.	If indications are normal, proceed to step 4. If not, check S1107, CR702 and CR703, R723, R1102 and R1105.
4	(E) Figure 5-1	Tune the audio oscillator to 1000 CPS at 0.023 VRMS and inject the audio oscillator output between test point and ground.	Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB.	If indication is normal, proceed to step 5. If not, perform the voltage and resistance measurements for V702 (see figure 5-6).
5	(5) Figure 5-1	a. Tune the audio oscillator to 1000 CPS at 0.008 VRMS and inject the audio oscillator output between test point and ground. Set A.F. SELECTIVITY switch S1106 to "SHARP."	a. Tone heard in headphones. OUTPUT meter M1102 indication does not change more than one DB from indication obtained in "BROAD" selectivity position.	a. If indications are normal, proceed to b. If not, check FL701, S1106 and associated wiring.
		b. Vary the audio oscillator frequency from 500 CPS to 1500 CPS.	b. A sharp decrease in output below 800 CPS and above 1200 CPS.	b. If indications are normal, proceed to step 6. If not, check FL701, S1106 and associated wiring.
6	(5) Figure 5-1	Tune the audio oscillator to 1000 CPS at 0.008 VRMS and inject the audio oscillator output between test point and ground. Set O. L. switch S1107 to "ON" and set OUTPUT control R1102 to 6. Note OUTPUT meter M1102 indication. Increase the audio oscillator output level by 10 times and note the OUTPUT meter M1102 indication.	OUTPUT meter M1102 indication does not increase more than two DB.	If indications are normal, proceed to step 7. If not, check S1107, R720, R721, R722, R723, R1105, R1102, R725, R726, R727 and output limiter diodes CR702 and CR703.
7	(N) Figure 5-1	Connect electronic multimeter between test point and ground and set CAL switch S1104 to "ON."	-9.5 VDC	If indication is normal, proceed to step 8. If not, perform the voltage and resistance measurements for V704 (see figure 5-6) and check S1104.
8	(O) Figure 5-1	Same as step 7.	+4.25 VDC 6500 ohms	If indication is not normal, perform the voltage and resistance measurements for V705 (see figure 5-6).



NOTES:

Measure between pins marked *. Measure voltage and resistance of V704 and V705 with CAL switch in "ON" position.
** Resistance will vary with setting of R740. Unless otherwise specified all voltage and resistance measurements are made to ground.
Voltage and resistance measurements are made with electronic multimeter (AN/USM-116).

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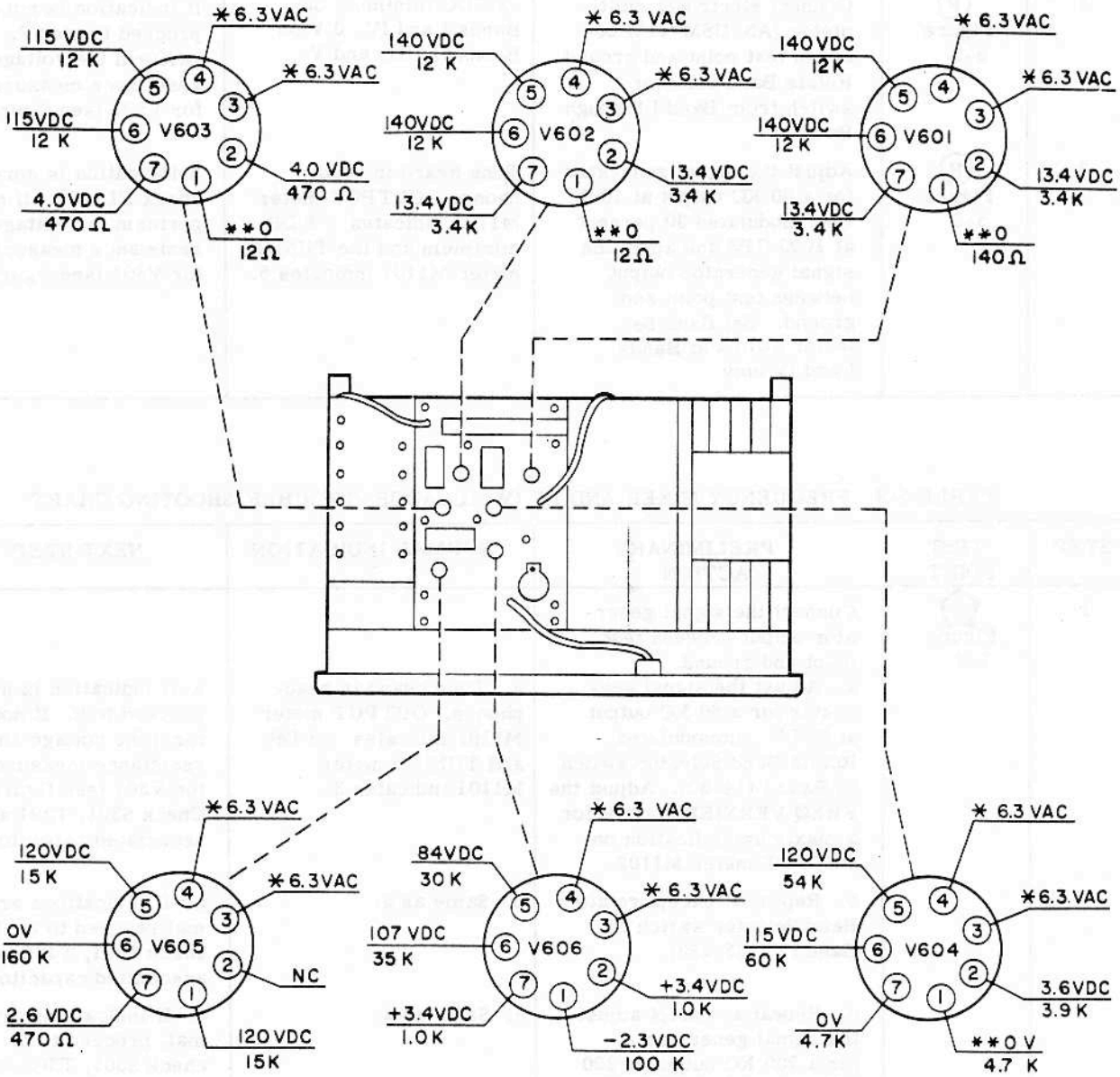
Figure 5-6. AF Amplifier, Typical Voltage and Resistance Measurements

TABLE 5-6. SECOND IF AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(G) Figure 5-1	Set the B.F.O. switch to "OFF."	Electronic multimeter indicates -1.0 volts for A2 operation and -3.0 volts of A1 operation.	If indications are normal, proceed to step 2. If not, perform the voltage and resistance measurement for V603 (see figure 5-7) and check Z603.
2	(H) Figure 5-1	Adjust the signal generator for a 200 KC output at 70 millivolts, modulated 30 percent at 1000 CPS. Apply the signal generator output between test point and ground.	Tone heard in headphones. Electronic multimeter indicates 1.0 volts and OUTPUT meter M1102 indicates +8 DB minimum.	If indications are normal, proceed to step 3. If not, perform the voltage and resistance measurements for V603 (see figure 5-7) and check Z603.
3	(I) Figure 5-1	Same as step 1 except set the signal generator output level to 11 millivolts.	Same as step 1.	If indication is normal, proceed to step 4. If not, perform the voltage and resistance measurements for V602 (see figure 5-7) and check Z602.
4	(J) Figure 5-1	a. Same as step 1 except set the signal generator output level to 1.5 millivolts.	a. Same as step 1.	a. If indication is normal, proceed to b. If not, perform the voltage and resistance measurements of V601 (see figure 5-7) and check Z601.
		b. Increase the signal generator output for a -3.0 volt indication on the electronic multimeter. Adjust OUTPUT control R1102 for a +8 DB indication on OUTPUT meter M1102. Set N.L. switch S1105 to "ON."	b. OUTPUT meter M1102 indication does not change, or decreases less than one DB.	b. If indication is normal, proceed to c. If not, check CR 602 and S1105.
		c. Remove modulation from signal generator output and set BFO switch S1102 to "ON." Adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	c. Tone heard in headphones. Electronic multimeter indicates -3.0 volts and output meter M1102 indicates a minimum of +8 DB.	c. If indications are normal, proceed to d. If not, proceed to step 5.
		d. Set A.F. SELECTIVITY switch S1106 to "SHARP" and adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	d. Tone heard in headphones. OUTPUT meter M1102 indicates a minimum of +8 DB.	d. If indications are not normal, beat frequency oscillator V606 needs alignment. (Refer to paragraph 6-2g.)
5	(K) Figure 5-1	Set the B.F.O. switch S1102 to "ON" and connect the electronic multimeter (AN/USM-116) between test point and ground.	-1.20 VDC minimum.	If indications are normal, proceed to step 6. If not, perform the voltage and resistance measurements for V606 (see figure 507) and check S1102A.
6	(L) Figure 5-1	Tune the audio oscillator to 1000 CPS at 0.32 VRMS and inject the audio oscillator output between test point and ground.	Tone heard in headphones. OUTPUT meter M1102 indicates minimum of +8 DB.	If indications are normal, perform the voltage and resistance measurements for V604 (see figure 5-7). If not, check S1102B and continuity to P705.



NOTES:

* measure between pins. ** do not measure. Measure all voltage and resistance with GAIN control at 6. Voltage and resistance measurements on V606 are made with B.F.O. switch in "ON" position. Unless otherwise specified all voltage and resistance measurements are made to ground. Voltage and resistance measurements are made with electronic multimeter (AN/USM-116).

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Figure 5-7. Second IF Amplifier, Typical Voltage and Resistance Measurements

TABLE 5-7. FIRST IF AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(P) Figure 5-2	Connect electronic multimeter (AN/USM-116) between test point and ground. Rotate Band Selector switch from Band I through Band V.	-8 VDC minimum on Bands I and IV, 0 V on Bands II, III, and V.	If indication is normal, proceed to step 2. If not, perform the voltage and resistance measurements for V501 (see figure 5-8).
2	(R) Figure 5-2	Adjust the signal generator for a 60 KC output at 1000 UV, modulated 30 percent at 1000 CPS and apply the signal generator output between test point and ground. Set Band Selector switch at Bands I and IV only.	Tone heard in headphones. OUTPUT meter M1102 indicates + 8 DB minimum and the TUNING meter M1101 indicates 5.	If indication is normal, check FL-501. If not, perform the voltage and resistance measurements for V501 (see figure 5-8).

TABLE 5-8. FREQUENCY MIXER AND RF OSCILLATOR, TROUBLE-SHOOTING CHART

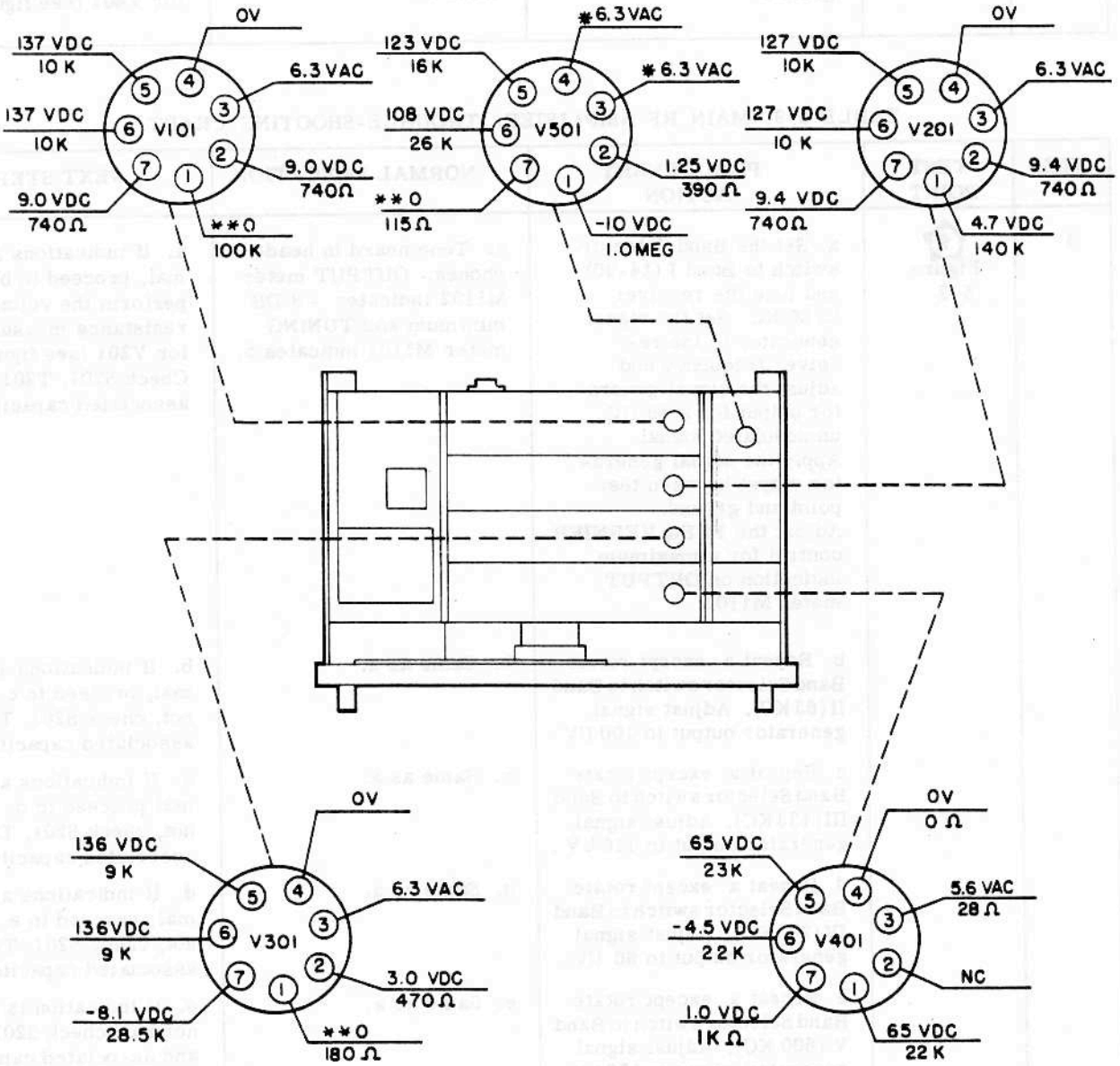
STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(8) Figure 5-2	Connect the signal generator output between test point and ground.		
		a. Adjust the signal generator for a 60 KC output at 90 UV, unmodulated. Rotate Band Selector switch to Band I (14-30). Adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	a. Tone heard in headphones. OUTPUT meter M1102 indicates + 8 DB and TUNING meter M1101 indicates 3.	a. If indication is normal, proceed to b. If not, perform the voltage and resistance measurements for V301 (see figure 5-8). Check S301, T301 and associated capacitors.
		b. Repeat a. except rotate Band Selector switch to Band IV (133-283).	b. Same as a.	b. If indications are normal proceed to c. If not, check S301, T304 and associated capacitors.
		c. Repeat a. except adjust the signal generator for a 200 KC output at 200 UV and rotate the Band selector switch to Band II (30-63).	c. Same as a.	c. If indications are normal, proceed to d. If not, check S301, T302 and associated capacitors.
		d. Repeat a. except adjust the signal generator for a 200 KC output at 200 UV and rotate the Band Selector switch to Band III (63-133).	d. Same as a.	d. If indications are normal, proceed to e. If not, check S301, T303 and associated capacitors.
		e. Repeat a. except adjust the signal generator for a 200 KC output at 200 UV and rotate the Band Selector switch to Band V (283-600).	e. Same as a.	e. If indications are not normal check S301, T305 and associated capacitors.

TABLE 5-8. FREQUENCY MIXER AND RF OSCILLATOR, TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	(M) Figure 5-2	Connect electronic multimeter (AN/USM-116) between test point and ground.	-1.0 VDC minimum on all bands, except -0.5 VDC minimum at low end of Band V.	If indication is not normal, perform the voltage and resistance measurements for V401 (see figure 5-8).

TABLE 5-9. MAIN RF AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(9) Figure 5-2	a. Set the Band Selector switch to Band I (14-30) and tune the receiver to 30 KC. Set the signal generator to the receiver frequency and adjust the signal generator output for a 45 UV, unmodulated signal. Apply the signal generator output between test point and ground. Adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	a. Tone heard in headphones. OUTPUT meter M1102 indicates +8 DB minimum and TUNING meter M1101 indicates 5.	a. If indications are normal, proceed to b. If not, perform the voltage and resistance measurements for V201 (see figure 5-8). Check S201, T201 and associated capacitors.
		b. Repeat a. except rotate Band Selector switch to Band II (63 KC). Adjust signal generator output to 100 UV.	b. Same as a.	b. If indications are normal, proceed to c. If not, check S201, T202 and associated capacitors.
		c. Repeat a. except rotate Band Selector switch to Band III (133 KC). Adjust signal generator output to 110 UV.	c. Same as a.	c. If indications are normal proceed to d. If not, check S201, T203 and associated capacitors.
		d. Repeat a. except rotate Band Selector switch to Band IV (283 KC). Adjust signal generator output to 60 UV.	d. Same as a.	d. If indications are normal, proceed to e. If not, check S201, T204 and associated capacitors.
		e. Repeat a. except rotate Band Selector switch to Band V (600 KC). Adjust signal generator output to 160 UV.	e. Same as a.	e. If indication is not normal, check S201, T205 and associated capacitors.



NOTES:

* measured between pins. ** do not measure. Measure all voltage and resistance with GAIN control at 6 and Band Selector switch to Band I (14-30). Unless otherwise specified all voltage and resistance measurements are made to ground. Voltage and resistance measurements made with electronic multimeter (AN/USM-116).

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Figure 5-8. First IF Amplifier, Oscillator, Frequency Mixer, Main RF Amplifier and Antenna RF Amplifier, Typical Voltage and Resistance Measurements

TABLE 5-10. ANTENNA RF AMPLIFIER TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(10) Figure 5-2	a. Set the Band Selector switch to Band I (14-30) and tune the receiver to 30 KC. Set the signal generator to the receiver frequency and adjust the signal generator for a 15 UV, unmodulated signal. Apply the signal generator output between test point and ground and adjust the FREQ VERNIER control for a maximum indication on OUTPUT meter M1102.	a. Tone heard in headphones. OUTPUT meter M1102 indicates +8 DB minimum and TUNING meter M1101 indicates 5.	a. If indications are normal, proceed to b. If not, perform the voltage and resistance measurements for V101 (see figure 5-8). Check S101, T101 and associated capacitors.
		b. Repeat a. except set Band Selector switch to Band II (63 KC). Adjust signal generator for 14 UV	b. Same as a.	b. If indications are normal, proceed to c. If not, check S101, T102 and associated capacitors.
		c. Repeat a. except set Band Selector switch to Band III (133 KC). Adjust signal generator for 22 UV.	c. Same as a.	c. If indications are normal, proceed to d. If not, check S101, T103 and associated capacitors.
		d. Repeat a. except set Band Selector switch to Band IV (283 KC). Adjust signal generator for 10 UV	d. Same as a.	d. If indications are normal, proceed to e. If not, check S101, T104 and associated capacitors.
		e. Repeat a. except set Band Selector switch to Band V (600 KC). Adjust signal generator for 50 UV	e. Same as a.	e. If indications are not normal, check S101, T105 and associated capacitors.

SECTION 6

REPAIR

6-1. FAILURE, AND PERFORMANCE AND OPERATION REPORTS.

NOTE

The Bureau of Ships no longer requires the submission of failure reports for all equipment. Reports are to be accomplished for designated equipments to the extent required by existing directives. All failures shall be reported for those equipments requiring Failure Reports.

6-2. ALIGNMENT AND ADJUSTMENT.

a. TEST EQUIPMENT AND SPECIAL TOOLS. - The test equipment required to align and adjust the receiver are listed below. The special tools required are test cable CX-7860A/WRR-3 and the special test lead. Test cable CX-7860A/WRR-3 is provided with each AN/WRR-3A equipment. The special test lead is made from test prod MX-1909/U which is provided with each AN/WRR-3A equipment (see paragraph 2-4c).

(1) Electronic Multimeter AN/USM-116.

(2) Electronic Multimeter ME-6E/U.

(3) RF Signal Generator AN/URM-25 series.

(4) Frequency Meter Set AN/USM-26 series.

(5) A 680 UUF Capacitor.

(6) 600 ohm non-inductive resistor.

b. CONTROL SETTINGS. - Before starting an alignment procedure, front panel controls are to be in the preset positions indicated below. POWER switch S1108 is in the "ON" position. Any change in control setting from the preset position will be indicated in the alignment procedure.

CONTROL	SETTING
CAL (S1104)	OFF
N.L. (S1105)	OFF
O.L. (S1107)	ON
CAL ADJ (C1102)	0
B.F.O. (S1102)	ON
ANT. COMP (C103)	0
FREQ VERNIER (C1101)	6
I.F. SELECTIVITY (S601)	BROAD
A.F. SELECTIVITY (S1106)	BROAD
GAIN (R1101)	6
ANTENNA IMPEDANCE (S1103)	LO
OUTPUT (R1102)	10
LEVEL (R1106)	10

c. TEST SET-UP. - The signal injection points and signal generator settings are given in each step. Additional receiver control settings are given where necessary with each step. The location of each alignment control on the receiver is shown in figures 6-1 and 6-2. The location of signal injection points are shown in figures 5-1, 5-2 and 5-3.

d. CONNECTIONS. - Connect electronic multimeter AN/USM-116 to test point ● G where it is to remain throughout the alignment procedure. The remainder of the connections are given in the particular alignment procedure being performed.

NOTE

Do not exceed a -1.5 volt indication on the electronic multimeter at any time during alignment. Reduce the signal generator output level accordingly as the alignment procedures progress.

e. SECOND IF AMPLIFIER ALIGNMENT. - To align the second IF amplifier proceed as follows:

(1) Connect the 680 UUF capacitor between test point ● F (see figure 5-1) and ground.

(2) Tune the signal generator for a 200 KC, unmodulated signal and connect the signal generator output to test point ● H (see figure 5-1).

(3) Adjust the signal generator output level to produce a -1.0 volt indication on the electronic multimeter.

(4) Adjust Z603L1 (see figure 6-1) for a maximum indication on the electronic multimeter.

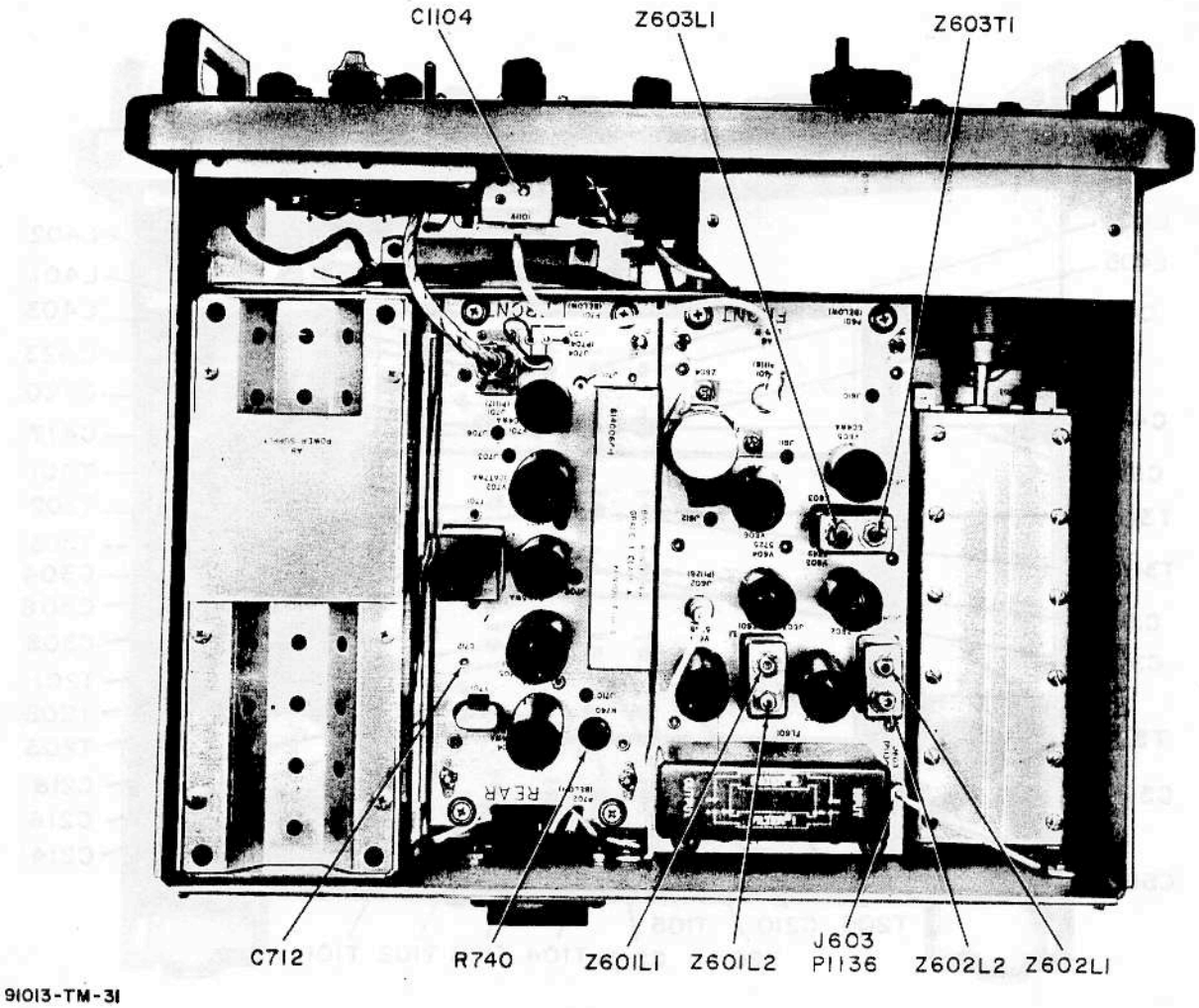

Figure 6-1. Alignment Controls, Top View

(5) Remove the 680 UUF capacitor and adjust Z603T1 (see figure 6-1) for a maximum indication on the electronic multimeter.

(6) Connect the signal generator output to test point ● I (see figure 5-1) and connect the 680 UUF capacitor between test point ● H and ground (see figure 5-1).

(7) Adjust Z601L1 (see figure 6-1) for a maximum indication on the electronic multimeter.

(8) Remove the 680 UUF capacitor and adjust Z601L2 for a maximum indication on the electronic multimeter.

(9) Connect the signal generator output to test point ● J (see figure 5-1) and connect the 680 UUF capacitor between test point ● I and ground (see figure 5-1).

(10) Adjust Z602L1 (see figure 6-1) for a maximum indication on the electronic multimeter.

(11) Remove the 680 UUF capacitor and adjust Z602L2 (see figure 6-1) for a maximum indication on the electronic multimeter.

f. FIRST IF AMPLIFIER ALIGNMENT. - To align the first IF amplifier proceed as follows:

(1) Connect the frequency meter set to the signal generator.

(2) Tune the signal generator to 200 KC, unmodulated, as read on the frequency meter set.

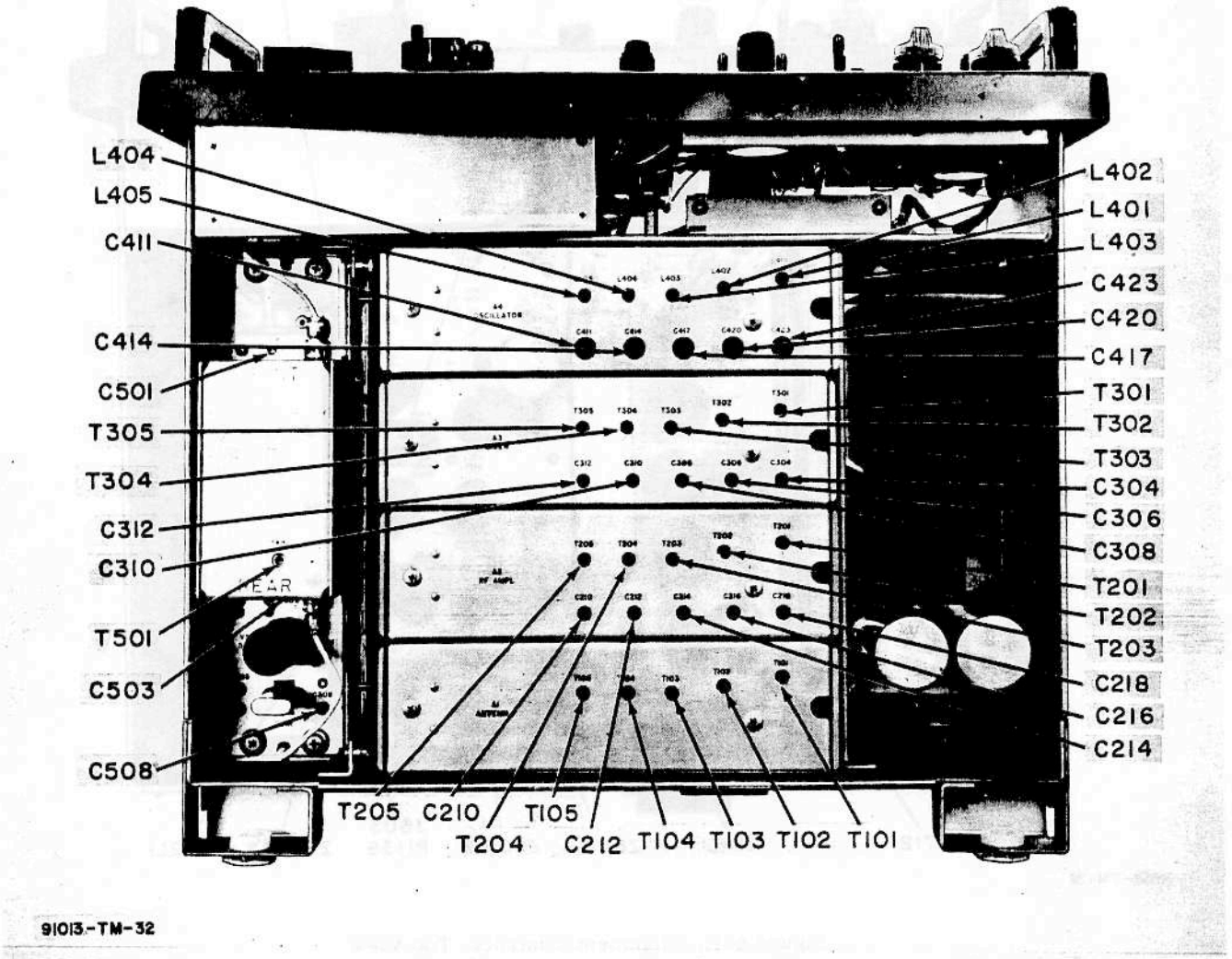

Figure 6-2. Alignment Controls, Bottom View

(3) Set the Band Selector switch to Band V (283-600) and connect the signal generator to test point ★8 (see figure 5-2).

(4) Adjust T501 (see figure 6-2) for a maximum indication on the electronic multimeter.

(5) Connect the signal generator output to the frequency meter set.

(6) Tune the signal generator to 60 KC, unmodulated, as read on the frequency meter set.

(7) Set the Band Selector switch to Band IV (133-283) and connect the signal generator output to test point ★8 (see figure 5-2).

(8) Adjust C508 (see figure 6-2) for maximum indication on the electronic multimeter.

(9) Adjust C501 and C503 (see figure 6-2) for a

maximum indication on the electronic multimeter.

NOTE

Do not readjust T501 while Band Selector switch is on Band IV.

g. BFO ALIGNMENT. - To align the best frequency oscillator proceed as follows:

(1) Connect the frequency meter to test point ● L.

(2) Disconnect P1136 from J603 (see figure 6-1).

(3) Set FREQ VERNIER to 0.

(4) Adjust C1104 for a 200.000 KC indication on the frequency meter (see figure 6-1).

h. CALIBRATOR ADJUSTMENT. - To adjust the crystal-controlled calibrator proceed as follows:

(1) Connect the frequency meter to test point ★12 (see figure 5-3).

(2) Disconnect P1136 from J603 (see figure 6-1).

(3) Set CAL switch to ON.

(4) Adjust C712 (see figure 6-1) for a 200.000 KC indication on the frequency meter set.

(5) Connect the frequency meter set to test point ● O (see figure 5-1).

(6) Adjust R740 (see figure 6-1) for a 20.000 KC indication on the frequency meter set.

(7) Readjust R740 until the frequency meter indicates a change in frequency. Note the position of the slot on R740.

(8) Readjust R740 in the opposite direction from step (7) until the frequency meter set indicates a change in frequency from 20 KC. Note the position of the slot on R740.

(9) Set R740 midway between the positions noted in steps (7) and (8).

i. RF SECTION ALIGNMENT. - To completely align the RF section, the antenna RF amplifier, main RF amplifier, frequency mixer and RF oscillator must be aligned on each band. In addition, each band must be aligned at the upper and lower alignment frequencies of the band.

Table 6-1 lists the steps necessary to align the RF section, the control or reference symbol of the part to be adjusted, the assembly where the adjustment is located and the position of the Band Selector switch.

The complete alignment procedure for Band I is given below. To align the RF section on the remaining bands, repeat the procedures using the frequencies and adjusting the parts listed in table 6-1.

NOTE

The oscillator alignment on Band I is completed and checked before aligning the oscillator on Band II, or before aligning the other stages of Band I.

(1) Preset the controls according to paragraph 6-2b.

(2) Connect a set of headphones in one of the receiver PHONES jack.

(3) Connect the electronic multimeter to test point ● G (see figure 5-1).

(4) Connect the signal generator output to test point ★ 8 (see figure 5-2) and the HIGH RF OUTPUT of the signal generator to the frequency meter set.

(5) Set the Band Selector to Band I and tune the receiver to 14.30 KC.

NOTE

In setting the tuning control to the alignment frequency, always approach the frequency from the low end.

(6) Tune the signal generator to 14.300 KC as read on the frequency meter.

(7) Connect the frequency meter to IF OUTPUT jack, J1002 (test point ★12, figure 5-3) on the rear of the receiver cabinet.

(8) Adjust L401 (see figure 6-2) for a 200,00 KC output frequency as read on the frequency meter set.

(9) Tune the receiver to 28.9 KC.

(10) Tune signal generator for a 200.000 KC output as read on the frequency meter.

(11) Again connect the frequency meter to the HI RF OUTPUT of the signal generator and note the frequency.

(12) If the signal generator frequency differs greatly from the correct value of 28.9 KC, set the signal generator to the opposite side of 28.9 KC by 2.5 times the frequency error.

Example: The 200.000 KC output occurs at the generator setting of 28.1 KC, 28.9 KC - 28.1 KC = 0.8 KC; 2.5 times 0.8 KC = 2.0 KC. Therefore, set the signal generator to 30.9 KC.

The multiplication factor on the remaining bands is as follows: Band II, 3.0 times the alignment error;

Band III, 1.5 times the alignment error; Bands IV and V, 0.5 times the alignment error.

(13) Again connect the frequency meter to the receiver IF OUTPUT jack.

(14) Adjust C423 (see figure 6-2) for a 200,00 KC output as read on the frequency meter.

(15) Repeat items (4) through (14) until alignment error is less than 20 CPS on Band I. The allowable error on the remaining bands is as follows: Band II, less than 30 CPS; Band III, less than 40 CPS; Band IV, less than 50 CPS; Band V, less than 75 CPS.

(16) Repeat items (4) through (15) for the remaining bands using the frequencies and adjusting the parts listed in steps 2 through 5 of table 6-1 (see figure 6-2).

(17) Connect the signal generator output to test point ★11 (see figure 5-3).

(18) With the receiver dial set at 14.30 KC and the signal generator tuned to 14.300 KC, adjust T301, T201 and T101 (see figure 6-2) in that order, for a maximum indication on the electronic multimeter.

(19) Connect the HIGH RF OUTPUT of the signal generator to the frequency meter and tune the signal generator to 28.900 KC as read on the frequency meter.

(20) Tune the receiver to 28.90 KC.

(21) Adjust C304, C218 (see figure 6-2) and ANT. COMP, (see figure 3-1) in that order, for a maximum indication on the electronic multimeter.

(22) Repeat items (18) through (21) until there is no further change in the electronic multimeter indication.

TABLE 6-1. RF SECTION ALIGNMENT PROCEDURE

STEP	SIGNAL GENERATOR AND RECEIVER FREQUENCY (KC)	ADJUST	STAGE	BAND SELECTOR SWITCH POSITION
1	14.3	L401	RF Oscillator	14-30
	28.9	C423	RF Oscillator	
2	30.7	L402	RF Oscillator	30-63
	60.8	C420	RF Oscillator	
3	64.5	L403	RF Oscillator	63-133
	128.3	C417	RF Oscillator	
4	136.3	L404	RF Oscillator	133-283
	272.9	C414	RF Oscillator	
5	290.0	L405	RF Oscillator	283-600
	579.0	C411	RF Oscillator	
6	14.3	T301	Frequency Mixer	14-30
		T201	Main RF Amplifier	
		T101	Antenna RF Amplifier	
7	28.9	C304	Frequency Mixer	14-30
		C204	Main RF Amplifier	
		ANT COMP	Antenna RF Assembly	
8	30.7	T302	Frequency Mixer	30-63
		T202	Main RF Amplifier	
		T102	Antenna RF Assembly	
9	60.8	C306	Frequency Mixer	30-63
		C216	Main RF Amplifier	
		ANT COMP	Antenna RF Assembly	
10	64.5	T303	Frequency Mixer	63-133
		T203	Main RF Amplifier	
		T103	Antenna RF Amplifier	
11	128.3	C308	Frequency Mixer	63-133
		C214	Main RF Amplifier	
		ANT COMP	Antenna RF Amplifier	
12	136.3	T304	Frequency Mixer	133-283
		T204	Main RF Amplifier	
		T104	Antenna RF Amplifier	
13	272.9	C310	Frequency Mixer	133-283
		C212	Main RF Amplifier	
		ANT COMP	Antenna RF Amplifier	
14	290.0	T305	Frequency Mixer	283-600
		T205	Main RF Amplifier	
		T105	Antenna RF Amplifier	
15	579.0	C312	Frequency Mixer	283-600
		C210	Main RF Amplifier	
		ANT COMP	Antenna RF Amplifier	

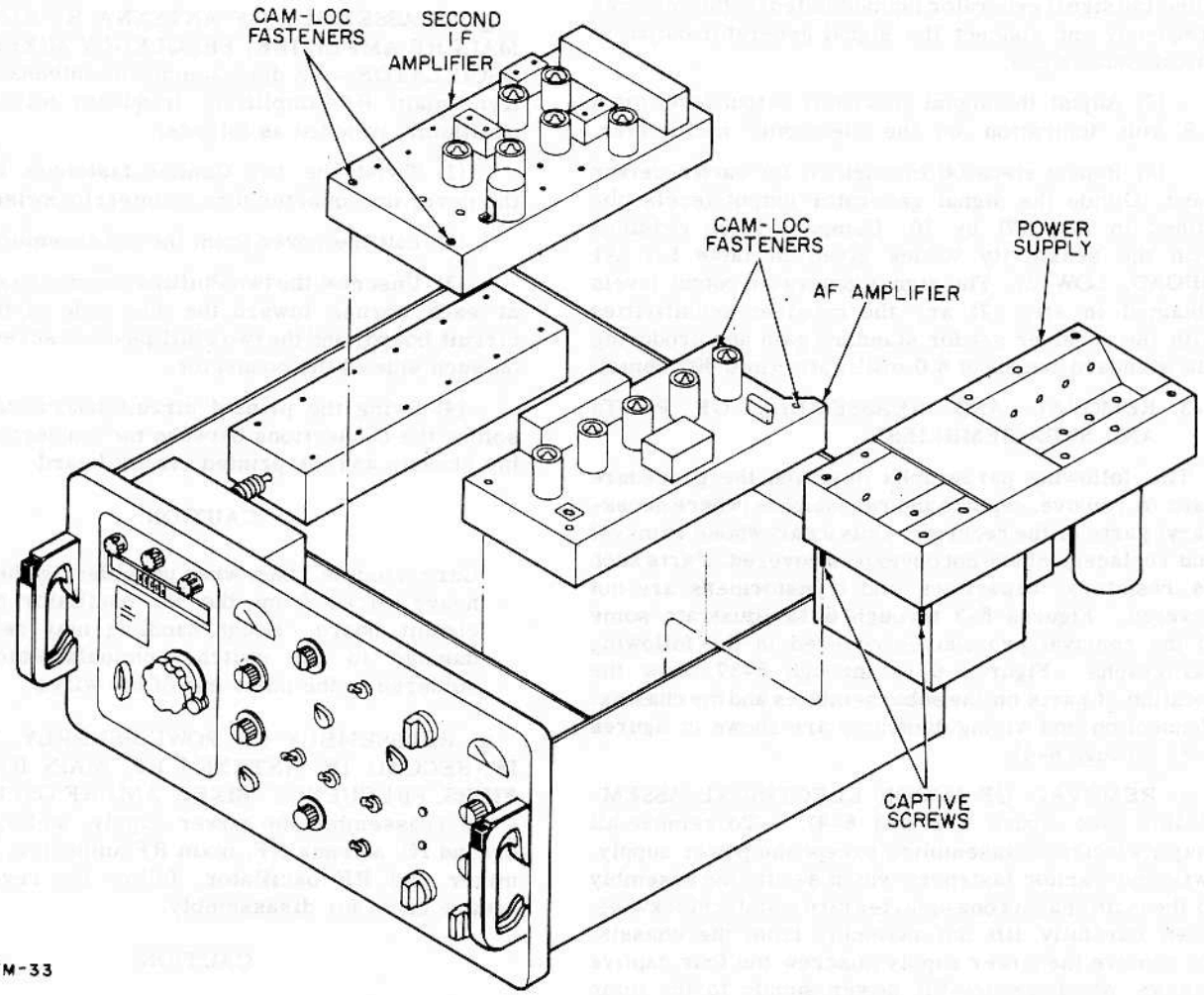

Figure 6-3. Removal of Assemblies from Top of Chassis

(23) Repeat items (18) through (22) for the remaining bands, using the frequencies and adjusting the parts listed in steps 8 through 15 of table 6-1 (see figures 3-1 and 6-2).

j. FINAL CHECK. - After the alignment of the receiver is completed, check the receiver A1 sensitivity against the values in table 1-1, using the procedures below. If the receiver sensitivity is not satisfactory on any one band, realign the receiver on that band, then check again. If the receiver sensitivity is not satisfactory on any band, check the tubes in the RF section.

(1) Connect the attenuator pad (CN-36/URM-25) to Antenna Input jack J1003.

(2) Connect a 600 ohm, non-inductive resistor across audio output connector, J1006 or J1007. Then connect an electronic multimeter (ME-6E/U) across the resistor.

(3) Preset the receiver controls according to paragraph 6-2(b) and set the POWER switch to "ON."

(4) Tune the receiver to any frequency within Band I.

(5) Short the input of the attenuator pad and adjust the receiver GAIN control for 0.19 volt indication on the electronic multimeter.

(6) Remove the short from the attenuator pad. Tune the signal generator (unmodulated) to the receiver frequency and connect the signal generator output to the attenuator pad.

(7) Adjust the signal generator output level for a 1.9 volt indication on the electronic multimeter.

(8) Repeat steps (4) through (7) for each receiver band. Divide the signal generator output levels obtained in step (7) by 10. Compare these readings with the sensitivity values given in table 1-1 (A1 BROAD, LOW Z). The signal generator output levels obtained in step (7) are the receiver sensitivities with the receiver set for standard gain and producing the standard output of 6.0 milliwatts (into 600 ohms).

6-3. REMOVAL AND REASSEMBLY OF PARTS AND SUBASSEMBLIES.

The following paragraphs describe the procedure used to remove, replace and reassemble (where necessary) parts of the receiver. Only a part whose removal and replacement are not obvious is covered. Parts such as resistors, capacitors and transformers are not covered. Figures 6-3 through 6-13 illustrate some of the removal procedures covered in the following paragraphs. Figures 6-14 through 6-37 show the location of parts on the subassemblies and the chassis. Connection and wiring diagrams are shown in figures 6-38 through 6-41.

a. REMOVAL OF MAJOR ELECTRICAL ASSEMBLIES (see figure 6-3 and 6-4). - To remove all major electrical assemblies except the power supply, twist the Camloc fasteners which secure the assembly to the main chassis one-quarter turn counterclockwise. Then carefully lift the assembly from the chassis. To remove the power supply unscrew the four captive screws which secure the power supply to the main chassis. Then lift the power supply from the chassis.

b. DISASSEMBLY OF THE POWER SUPPLY. - To disassemble the power supply twist the six Camloc fasteners located on the cover of the power supply one-quarter turn counterclockwise and lift the cover from the power supply.

c. DISASSEMBLY OF AF, FIRST IF AND SECOND IF AMPLIFIERS. - To disassemble the AF, first IF and second IF amplifiers, proceed as follows:

(1) Twist the Camloc fasteners, located on the cover of the assembly, one-quarter turn counterclockwise.

(2) Lift off the cover of the assembly.

(3) Unplug P704 and P705 on the AF amplifier. Disconnect wires from S601 to J604 and J605 on the second IF assembly. Release clamp securing Z604 to the second IF amplifier.

(4) Unscrew the red Phillips-head screws on the printed circuit board. The remaining Phillips-head screws (uncolored) attach the heavy components to the printed circuit board itself.

(5) Carefully remove the printed cirucuit board assembly from the chassis.

d. DISASSEMBLY OF ANTENNA RF AMPLIFIER, MAIN RF AMPLIFIER, FREQUENCY MIXER AND RF OSCILLATOR. - To disassemble the antenna RF amplifier, main RF amplifier, frequency mixer and RF oscillator, proceed as follows:

(1) Twist the two Camloc fasteners located on the cover one-quarter turn counterclockwise.

(2) Lift the cover from the subassembly.

(3) Unscrew the two Phillips-head screws, located at each corner toward the tube side of the printed circuit board, and the two Phillips-head screws located on each side of the connector.

(4) Swing the printed circuit board out and unsolder the connections between the connector, assembly chassis and the printed circuit board.

CAUTION

Care must be taken when unsoldering the three heavy wires from the RF oscillator printed circuit board. Rough handling may result in damage to the switch terminals which are soldered to the other end of the wires.

e. REASSEMBLY OF POWER SUPPLY, AF FIRST IF, SECOND IF, ANTENNA RF, MAIN RF AMPLIFIERS, FREQUENCY MIXER AND RF OSCILLATOR. - To reassemble the power supply, audio, first IF, second IF, antenna RF, main RF amplifier, frequency mixer and RF oscillator, follow the reverse procedure given for disassembly.

CAUTION

When replacing any subassembly, make certain, by careful inspection, that all mechanical connections between the subassembly and the main chassis are aligned. Do not try to force an assembly into place as damage to the equipment may result.

f. REMOVAL OF TUNING DRIVE ASSEMBLY (see figure 6-5). - To remove the tuning drive assembly from the main chassis, proceed as follows:

NOTE

The tuning drive assembly is a delicate and precision instrument and should not be removed unless absolutely necessary.

(1) Loosen the two Allen-head screws which connect the dial shaft bellows coupling to the main tuning capacitor shaft.

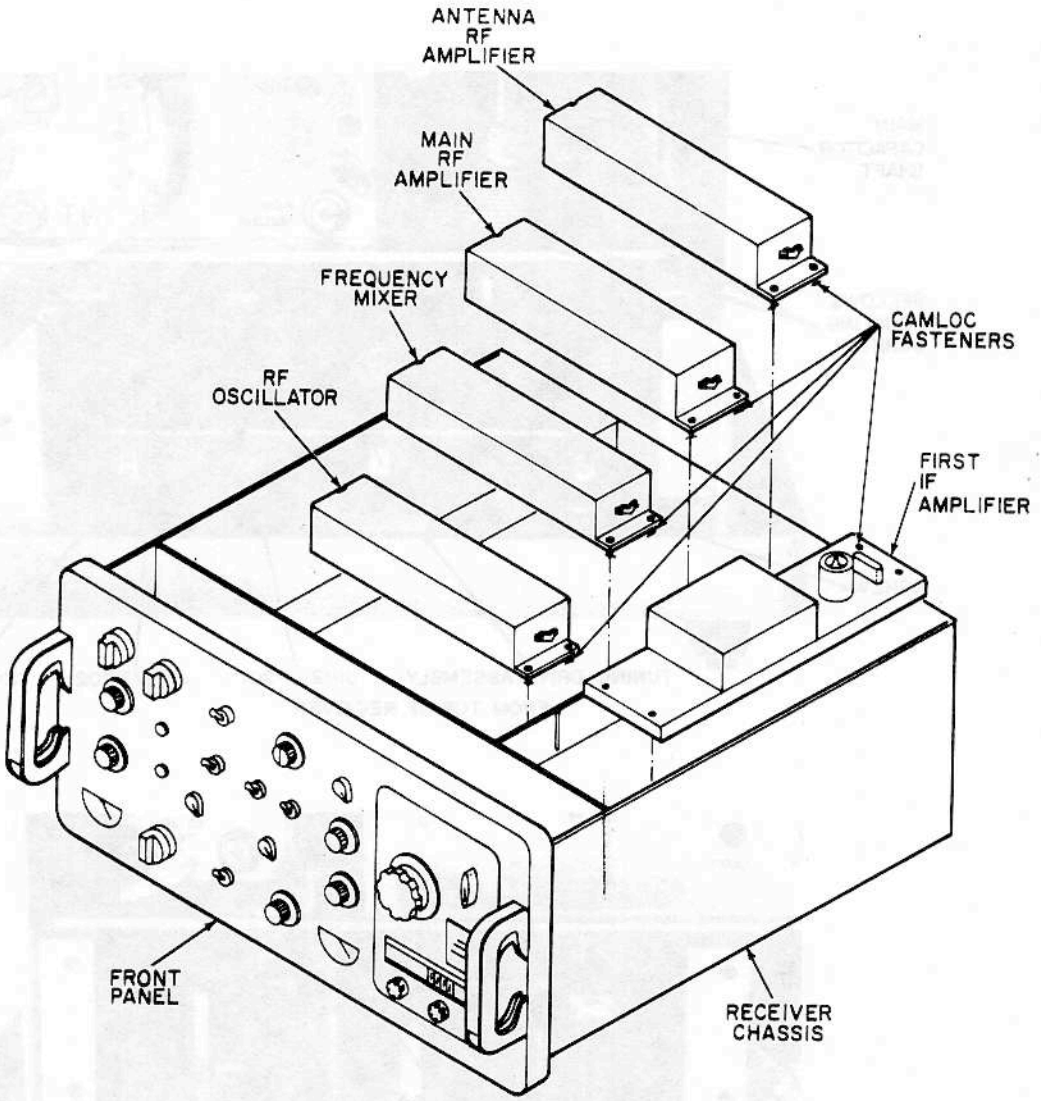

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Figure 6-4. Removal of Assemblies from Bottom of Chassis

(2) Unplug the two dial lamp plugs, P1112 and P1113.

(3) Unscrew the four Allen-head screws which secure the dial assembly to the front panel.

(4) Remove the front rack screw and loosen the rear rack screw.

(5) Carefully remove the dial assembly from the front panel.

g. DISASSEMBLY OF TUNING DRIVE ASSEMBLY (see figure 6-6).- To disassemble the tuning drive assembly, proceed as follows:

(1) Remove the tuning drive assembly from the main receiver chassis (see paragraph 6-3f).

(2) Remove screws (1), lockwashers (2) and nameplate (3).

(3) Loosen setscrews (4) and remove hex nut (5), washer (6), lockwasher (7), dial knob lock (8) and tuning control knob (9).

NOTE

The setscrews (4, 10) removed in steps (3) and (4) are staked with glypstal. This must be removed with a solvent prior to removal of the setscrews.

(4) Loosen setscrews (10) and remove Band Selector knob (11).

(5) Remove wires and grommet (12) from recess in tuning drive subassembly (13).

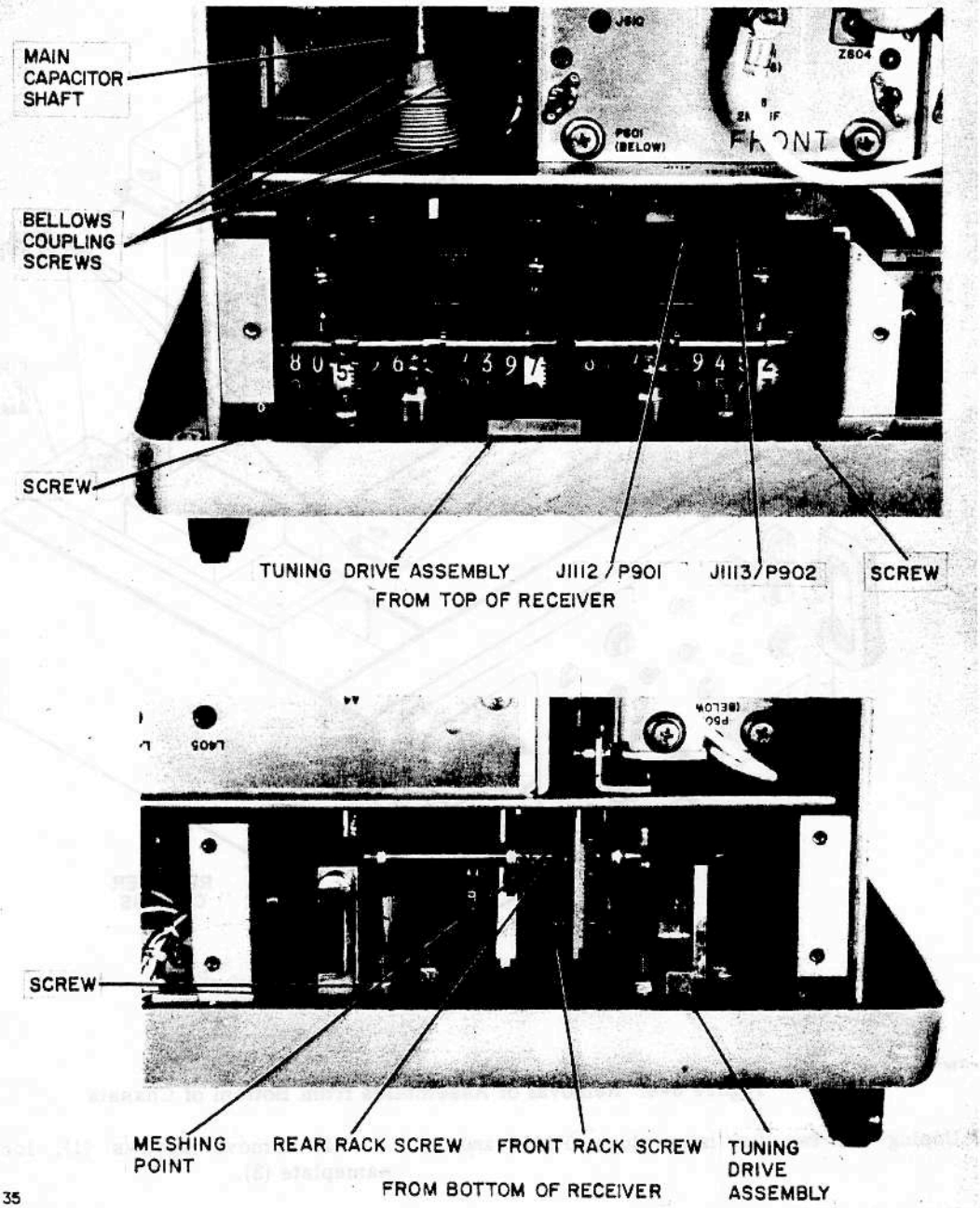


Figure 6-5. Removal of Tuning Drive Assembly

(6) Remove screws (14), spacers (15) and carefully remove the tuning drive subassembly. (See paragraph 6-3i for disassembly of the tuning drive subassembly.)

CAUTION

Avoid contact between the control dials of the tuning drive subassembly and any hard or abrasive object because the control dials are easily damaged.

(7) Remove lamp and lens assemblies (44) from front of panel. Unsolder wires from lamp holders (16) and remove hex nuts (17), washers (43) and indicator lights.

(8) Remove hex nuts (18), washers (19), clamp-assembly plate (20) and light distributor (23).

(9) Remove screws (21) while holding mask retainer (22) in place, and remove front panel (46) from tuning drive assembly.

(10) Remove mask retainer (22) carefully, as dial masks (24, 25, 26) are spring loaded and tend to jump out.

(11) Remove dial window clip (28), dial window (45), dial masks (24, 25, 26) and coil springs (27).

(12) Remove screws (29), lockwashers (30), dial light reflector (31) and spacers (32).

(13) Remove hex nuts (33) and washers (34).

(14) Remove setscrew (35), retaining ring (36), shaft (37), and cam lift arms (47).

(15) Remove screw (38), lockwasher (39), spring (40), ball bearing (41) and band selector switch assembly (42).

h. REASSEMBLY OF TUNING DRIVE ASSEMBLY. - To reassemble the tuning drive assembly follow the reverse procedure for disassembly.

NOTE

The setscrews (4, 10) must be staked with glyptal when replaced.

i. DISASSEMBLY OF TUNING DRIVE SUBASSEMBLY (see figure 6-7). - The following is a step-by-step procedure for the disassembly of the tuning drive subassembly. Refer to steps (1) through (8) for the removal of Bands IV and V control dials, steps (9) through (15) for the removal of Bands I, II and III control dials and steps (16) through (25) for the disassembly of the low speed drive assembly.

(1) Remove the tuning drive subassembly using procedures of paragraph 6-3g., steps (1) through (6).

NOTE

Before proceeding with disassembly, align control dials as in figure 6-8.

(2) Remove pins (1), screws (2) and washers (3) while holding bracket (4) in place

(3) Hold the gear and shaft assemblies (5, 6, 7) and the dial and gear assembly No. 5 (8) toward the center of the assembly and carefully remove bracket (4) from the assembly.

(4) Hold the dial and gear assembly No. 5 (8) and the gear and shaft assemblies (6, 7) in place and remove gear and shaft assembly (5).

(5) Hold the gear and shaft assemblies (6, 7) and the dial and gear assembly No. 4 (15) in place and remove dial and gear assembly No. 5 (8), spacers (9) and control dials (11, 12, 13) and three gear indexes (19).

(6) Hold gear and shaft assembly (7) in place and slide gear and shaft assembly (6) and shaft (14) away from bracket (10) sufficiently to allow shaft (14) to clear bracket (10). Then remove shaft (14) together with dial and gear assembly No. 4 (15), spacers (9), control dials (16, 17, 18) and three gear indexes (19).

NOTE

Band I, II and III shall be in position as in figure 6-8.

(7) Remove gear and shaft assemblies (6, 7).

(8) Remove ball bearings (20) from brackets (4, 10).

NOTE

At this point the following items may be removed and replaced: gear and shaft assemblies (5, 6, 7); dial and gear assemblies (8, 15); control dials (11, 12, 13, 16, 17, 18); shaft (14) (refer to paragraph 6-3j, steps 29 through 54 for reassembly).

(9) Remove pins (21).

CAUTION

Before proceeding with the disassembly, cover spur gear (22) of ground shaft assembly (59) in some manner so as to protect the control dial from damage during handling.

(10) Remove screws (23) and washers (24) while holding bracket (25) in place.

(11) Hold the gear and shaft assemblies (6, 26) and the control dial (27) toward the center of the assembly and carefully remove bracket (25) and spacer (28).

(12) Hold gear and shaft assembly (26) in place and carefully remove control dials (27, 29), spacers (9), dial and gear assembly No. 1 (30) and two gear indexes (19).

(13) Hold control dial (34) in place and carefully remove control dials (31, 32), spacers (9), dial and gear assembly No. 2 (33), gear and shaft assembly (26) and two gear indexes (19).

(14) Remove control dials (34, 35, 36), dial and gear assembly No. 3 (37), spacers (9), shaft (38) and three gear indexes (19).

(15) Remove ball bearings (20) from brackets (10, 25) and remove spacers (28).

NOTE

At this point the following items may be removed and replaced: gear and shaft assembly (26); control dials (27, 29, 31, 32, 34, 35, 36); dial and gear assemblies (30,. 33, 37); shaft (38) (refer to paragraph 6-3j, steps 14 through 28, for reassembly).

(16) Remove pins (39).

(17) Remove screws (40), washers (41), finger stop

(42), spacer (43) and spring (44).

(18) Remove Allen-head screw (45), lockwasher (46), cam (47), spacer (48), retaining ring (79) and spacers (80, 81).

NOTE

If gear and shaft assembly (61) is to be replaced, remove pin (49), stop dog (50) and spacer (51).

(19) Remove retaining ring (52), spacer (53), retaining ring (54) and spacer (55).

(20) Remove screws (56), lockwashers (57) and washers (58).

(21) Hold gear and shaft assemblies (59, 60, 61) in place and carefully remove rear plate (62), ball bearings (63, 65) and bearing (64).

(22) Remove gear and shaft assemblies (59, 60, 61), ball bearing (66) and spacers (67, 68).

(23) Remove screws (69) and washers (70). Remove bearing (71) freeing subassembly panel (76).

(24) Remove pins (72), screws(73) and spacers (74) from front plate (75).

NOTE

Rear plate (62), spacers (74) and front plate (75) are machined after assembly and must be maintained as a matched set. Subassembly panel (76) and brackets (4, 10, 25) are also a matched set.

(25) Remove setscrew (77) and shaft (78).

j. REASSEMBLY OF TUNING DRIVE SUBASSEMBLY (see figure 6-7). - The following is a step-by-step procedure for the reassembly of the tuning drive subassembly. Refer to steps 1 through 13 for the reassembly of the low speed drive assembly; steps 14 through 28 for the reassembly of Bands I, II and III control dials; and steps 29 through 54 for the reassembly of Bands IV and V control dials.

(1) Install spacers (74) on front plate (75) using pins (72) and screws (73).

(2) Align front plate (75) and subassembly panel (76), then press bearing (71) in place. Secure the assembly using screws (69) and washers (70).

(3) Place spacers (67, 68) on gear and shaft assembly (60), and install in proper location on subassembly panel (76). Secure the gear and shaft assembly (60) using spacers (80, 81) and retaining ring (79).

(4) Install gear and shaft assemblies (59, 61) in proper location on subassembly panel (76).

(5) Install bearings (63, 64, 65) in place on rear plate (62) and position rear plate on assembly.

(6) Load anti-backlash gear of gear and shaft assembly (60) and secure rear plate (62) to assembly using screws (56), lockwashers (57) and washers (58).

(7) Install spacers (53) and retaining ring (52) on gear and shaft assembly (59).

(8) Install spacer (48) and cam (47) using Allen-head screw (45) and lockwasher (46).

NOTE

Endplay of gear and shaft assembly (59) should not exceed 0.005 in.

1	Screw
2	Lockwasher
3	Nameplate
4	Setscrew
5	Hex Nut
6	Washer
7	Lockwasher
8	Dial Knob Lock
9	Tuning Control Knob
10	Setscrew
11	Band Selector Knob
12	Grommet
13	Tuning Drive Subassembly
14	Screw
15	Spacer
16	Lampholder
17	Hex Nut
18	Hex Nut
19	Washer
20	Clamp - Assembly Plate
21	Screw
22	Mask Retainer
23	Light Distr
24	Dial Mask
25	Dial Mask
26	Dial Mask
27	Coil Spring
28	Window Cli
29	Screw
30	Lockwasher
31	Dial Light
32	Spacer
33	Hex Nut
34	Washer
35	Setscrew
36	Retaining R
37	Shaft
38	Screw
39	Lockwasher
40	Spring
41	Ball Bearin
42	Band Select
43	Washers
44	Lamp and L
45	Dial Window
46	Front Panel
47	Cam Lift Ar

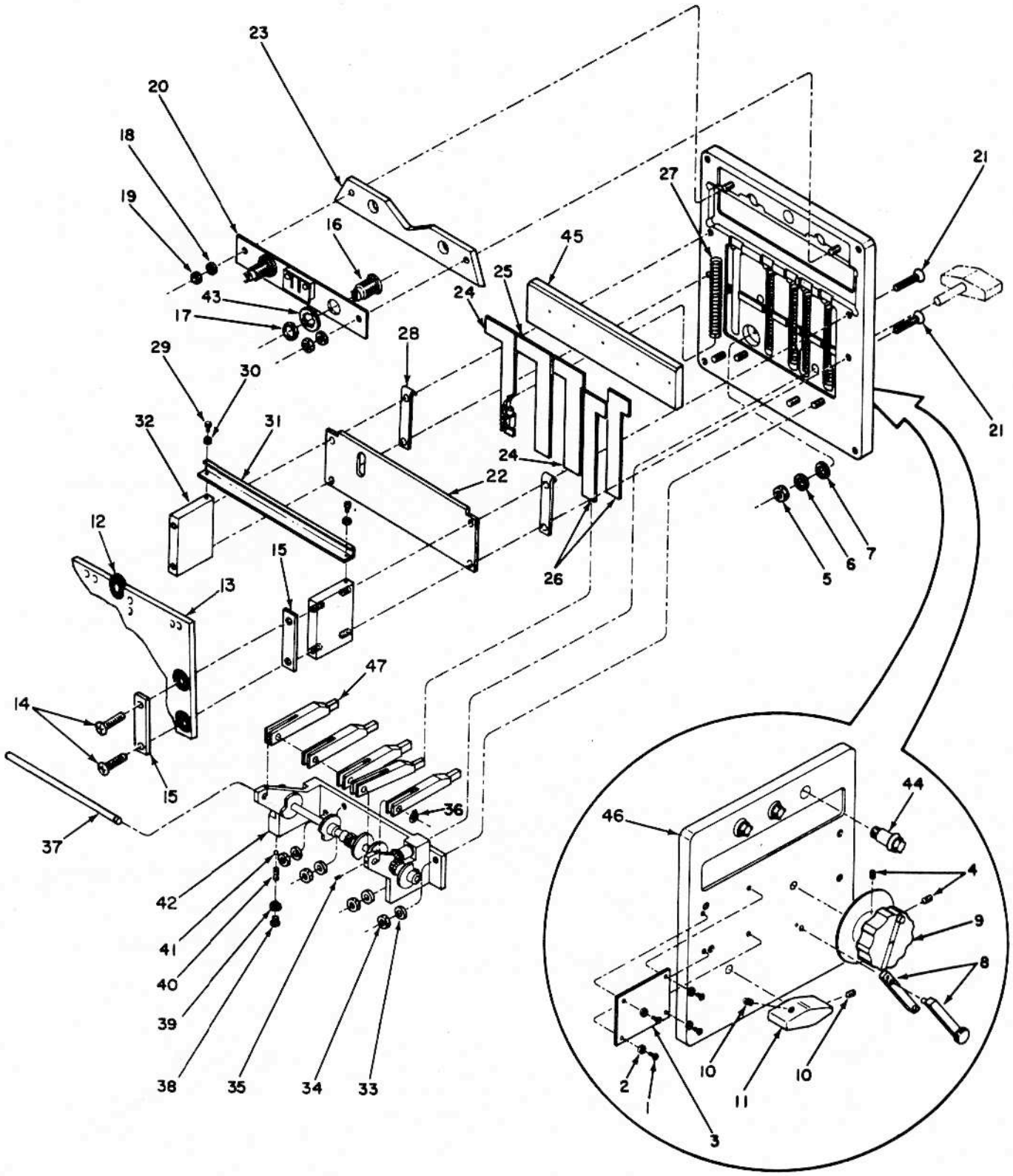


Figure 6-6. Tuning Drive Assembly, Exploded View

(9) Load anti-backlash gear of gear and shaft assembly (59) and mesh with pinion gear of gear and shaft assembly (60).

(10) Install ball bearing (66), spacers (51, 55) and retaining ring (54).

(11) Install stop dog (50) using a 4-40 setscrew if removed per note following paragraph 6-3i(18).

NOTE

Endplay of gear and shaft assembly (61) should not exceed 0.005 in.

(12) Install spring (44), spacer (43) and finger stop (42) using screw (40) and washer (41).

(13) Loosen screws (69). Turn lower gear assembly away from high speed gear section and secure screws (69).

(14) Select the control dials (27, 29) and the dial and gear assembly No. 1 (30). Stack the three dials and measure their combined height. Add a sufficient quantity of spacers (9) to increase the combined height to 0.870 (± 0.005 in.).

(15) Repeat step (14) using the control dials (31, 32) and the dial and gear assembly No. 2 (33) measuring for a combined height of 0.945 (± 0.005).

(16) Repeat step (14) using the control dials (34, 35, 36) and the dial and gear assembly No. 3 (37), measuring for a combined height of 1.120 (±0.005) in.

(17) Install two of bearings (20) in bracket (10) and place one of spacer (28) on shaft (38). Install shaft (38) in bracket (10).

(18) Install shaft (78) using setscrew (77) and place a small amount of special lubricant on shafts (78, 38).

(19) Slide dial and gear assembly No. 3 (37) in position as in figure 6-8 and place approximately one-fourth of the spacers (9), acquired in step (14), on shaft (38).

(20) Slide one of gear indexes (19) on shaft (78) with the short teeth away from bracket (10) and position indexing gear so that short tooth slides under smooth black ring of dial and gear assembly No. 3 (37).

(21) Place a small amount of special lubricant on shaft (38) and position control dial (36) on shaft (38) as shown in figure 6-8. Mesh control dial (36) with gear index.

(22) Place approximately one-fourth of the spacers (9), acquired in step (14), on shaft (38) and place a small amount of lubricant on shaft (78). Slide one of gear indexes (19) into position on shaft (78) so that short tooth is against smooth ring of control dial (36).

(23) Repeat step (21) through (22) using control dial (35).

(24) Repeat step (20) using control dial (34) and place the remainder of the spacers (9), required in step (14), on shaft (38).

(25) Repeat steps (19) through (22) using the control dials (31, 32) and the dial and gear assembly No. 2 (33). Spacers (9), acquired in step (15), shall be divided into three groups and placed between the control dials (31, 32) and between the control dial (32) and the dial and gear assembly No. 2 (33). The remainder of the spacers shall be placed in front of control dial (31).

(26) Repeat steps (19) through (22) using the control dials (7, 29) and the dial and gear assembly No. 1 (30). Spacers (9), acquired in step (14), shall be divided into two groups, and placed between control dials (27, 29) and between the control dial (29) and the dial and gear assembly No. 1 (30).

NOTE

Before proceeding make certain that the control dials are aligned as in figure 6-8.

(27) Place gear and shaft assembly (26) into position in bracket (10).

(28) Place spacer (28) on shaft (38). Install bearing (20) in bracket (25) and, while supporting shafts (26, 38), carefully slide bracket (25) into position. Secure bracket (25) using screws (23) and washers (24).

(29) Repeat step (14) using the control dials (16, 17, 18) and the dial and gear assembly No. 4 (15), measuring for a combined height of 1.200 (± 0.005) in.

(30) Repeat step (14) using the control dials (11, 12, 13) and the dial and gear assembly No. 5 (8), measuring for a combined height of 1.120 (± 0.005 in).

(31) Place spacer (28) on shaft (14) and install shaft (14) into position in bracket (10).

(32) Place a small amount of special lubricant on shaft (14) and slide control dial (18) in position as shown in figure 6-8. Place approximately one-third of the spacers (9), acquired in step (29), on shaft (14).

(33) Place a small amount of special lubricant on shaft (78). Slide one of indexing gears (19) on shaft (14) with the short teeth away from bracket (10) and engage teeth of control dial (18).

(34) With control dial (18) in position as in figure 6-8, the short tooth of indexing gear must face shaft (14). If it does not, disengage indexing gear, turn indexing gear one-eighth (one tooth) and re-engage.

(35) Repeat step (32) and (34) using control dial (17) and control dial (16).

(36) Place gear and shaft assembly (5) in bracket (10) and place gear and shaft assembly (6) in bracket (25).

(37) Place approximately one-fourth of the spacers (9), acquired in step (30), on shaft (14) and slide control dial (13) in position as shown in figure 6-8.

(38) Repeat steps (33) and (34) using control dial (13).

(39) Slide control dial (12) in position as shown in figure 6-8 and place approximately one-fourth of the spacers (9), acquired in step (30), on shaft (14).

(40) Repeat steps (33) and (34) using control dial (12).

(41) Slide control dial (12) in position as shown in figure 6-8 and place approximately one-fourth of the spacers (9), acquired in step (30), on shaft (14).

(42) Repeat steps (33) and (34) using control dial (12).

(43) Lubricate shaft (14) with a small amount of special lubricant and place the dial and gear assembly No. 5 (8) on shaft (14).

(44) Install gear and shaft assembly (5) in position on bracket (10).

(45) Place bearings (20) in bracket (4) and place spacer (28) on shaft (14). While holding gear and shaft assemblies (5, 6, 7) and shaft (14) in position, carefully slide bracket (4) into position. Secure bracket (4) using screws (2) and washers (3).

NOTE

At this point all control dials must be aligned as in figure 6-8.

(46) Loosen screws (2, 23), replace pins (1, 21) and secure screws (2, 23).

(47) Check gear and shaft assemblies (5, 6, 7, 26) and shafts (14, 38) for endplay.

NOTE

Endplay shall not exceed 0.007 in. (0.004 in. on gear and shaft assembly (7). If endplay does exceed limits, place spacers (28) on end of shaft(s) which exceed limit.

(48) Loosen screws (69) and move lower gear assembly toward gear and shaft assembly (7) until helical gears completely engage. Secure screws (69).

(49) Gently rotate gear and shaft assembly (7) and check for backlash of helical gears.

NOTE

If noticeable backlash or binding is present, repeat step (48).

(50) Rotate gear and shaft assembly (61) counterclockwise until 276.56 appears on Band V control dials.

(51) Adjust cam (47) and stop dog (50) in position as shown in figure 6-9. Tighten Allen-head screw (45) and setscrew.

(52) Rotate gear and shaft assembly (61) approximately 1-1/2 turn clockwise and counterclockwise, noting stop action of stop finger (42).

NOTE

If stop finger (42) does not fall at proper time, readjust cam (47) until stop action is corrected.

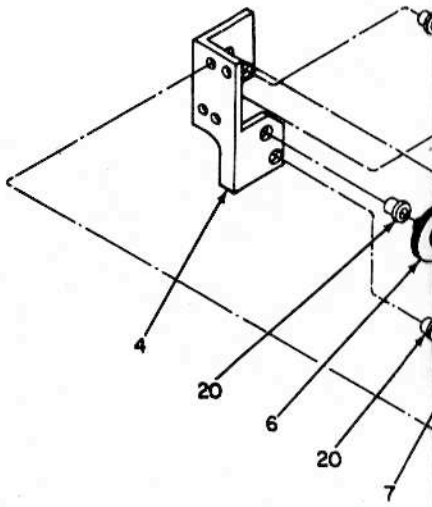
(53) Rotate gear and shaft assembly (61) to the extreme counterclockwise position. If 276.56 KC is indicated on Band V control dials, drill and pin stop dog (50).

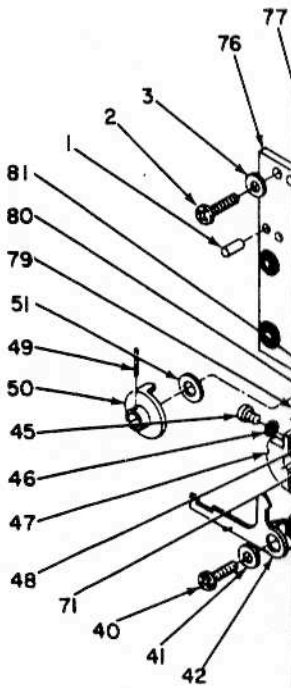
1 Pin
2 Screw
3 Washer
4 Bracket
5 Gear and Shaft Assembly
6 Gear and Shaft Assembly
7 Gear and Shaft Assembly
8 Dial and Gear Assembly No. 5
9 Spacer
10 Bracket
11 Control Dial
12 Control Dial
13 Control Dial
14 Shaft
15 Dial and Gear Assembly No. 4
16 Control Dial
17 Control Dial
18 Control Dial
19 Gear Indexes
20 Ball Bearings
21 Pin
22 Spur Gear
23 Screw
24 Washer
25 Bracket
26 Gear and Shaft Assembly
27 Control Dial
28 Spacer
29 Control Dial
30 Dial and Gear Assembly No. 1
31 Control Dial
32 Control Dial
33 Dial and Gear Assembly No. 2
34 Control Dial
35 Control Dial
36 Control Dial
37 Dial and Gear Assembly No. 3
38 Shaft
39 Pin
40 Screw
41 Washer
42 Finger Stop
43 Spacer
44 Spring
45 Allen-head Screw
46 Lockwasher
47 Cam
48 Spacer
49 Pin
50 Stop Dog
51 Spacer
52 Retaining Ring
53 Spacer
54 Retaining Ring
55 Spacer
56 Screw
57 Lockwasher
58 Washer
59 Gear and Shaft Assembly
60 Gear and Shaft Assembly
61 Gear and Shaft Assembly
62 Rear Plate
63 Ball Bearing
64 Bearing
65 Ball Bearing
66 Ball Bearing
67 Spacer
68 Spacer
69 Screw
70 Washer
71 Bearing
72 Pin
73 Screw
74 Spacer
75 Front Plate
76 Subassembly Panel
77 Setscrew
78 Shaft
79 Retaining Ring
80 Spacer
81 Spacer

in
crew
asher
racket
ear and Shaft Assembly
ear and Shaft Assembly
ear and Shaft Assembly
ial and Gear Assembly No. 5
pacer
racket
ontrol Dial
ontrol Dial
ontrol Dial
haft
ial and Gear Assembly No. 4
ontrol Dial
ontrol Dial
ontrol Dial
ear Indexes
all Bearings
in
ur Gear
crew
asher
racket
ear and Shaft Assembly
ontrol Dial
pacer

29 Control Dial
30 Dial and Gear Assembly No. 1
31 Control Dial
32 Control Dial
33 Dial and Gear Assembly No. 2
34 Control Dial
35 Control Dial
36 Control Dial
37 Dial and Gear Assembly No. 3
38 Shaft
39 Pin
40 Screw
41 Washer
42 Finger Stop
43 Spacer
44 Spring
45 Allen-head Screw
46 Lockwasher
47 Cam
48 Spacer
49 Pin
50 Stop Dog
51 Spacer
52 Retaining Ring
53 Spacer
54 Retaining Ring
55 Spacer
56 Screw

57 Lockwasher
58 Washer
59 Gear and Shaft Assembly
60 Gear and Shaft Assembly
61 Gear and Shaft Assembly
62 Rear Plate
63 Ball Bearing
64 Bearing
65 Ball Bearing
66 Ball Bearing
67 Spacer
68 Spacer
69 Screw
70 Washer
71 Bearing
72 Pin
73 Screw
74 Spacer
75 Front Plate
76 Subassembly Panel
77 Setscrew
78 Shaft
79 Retaining Ring
80 Spacer
81 Spacer





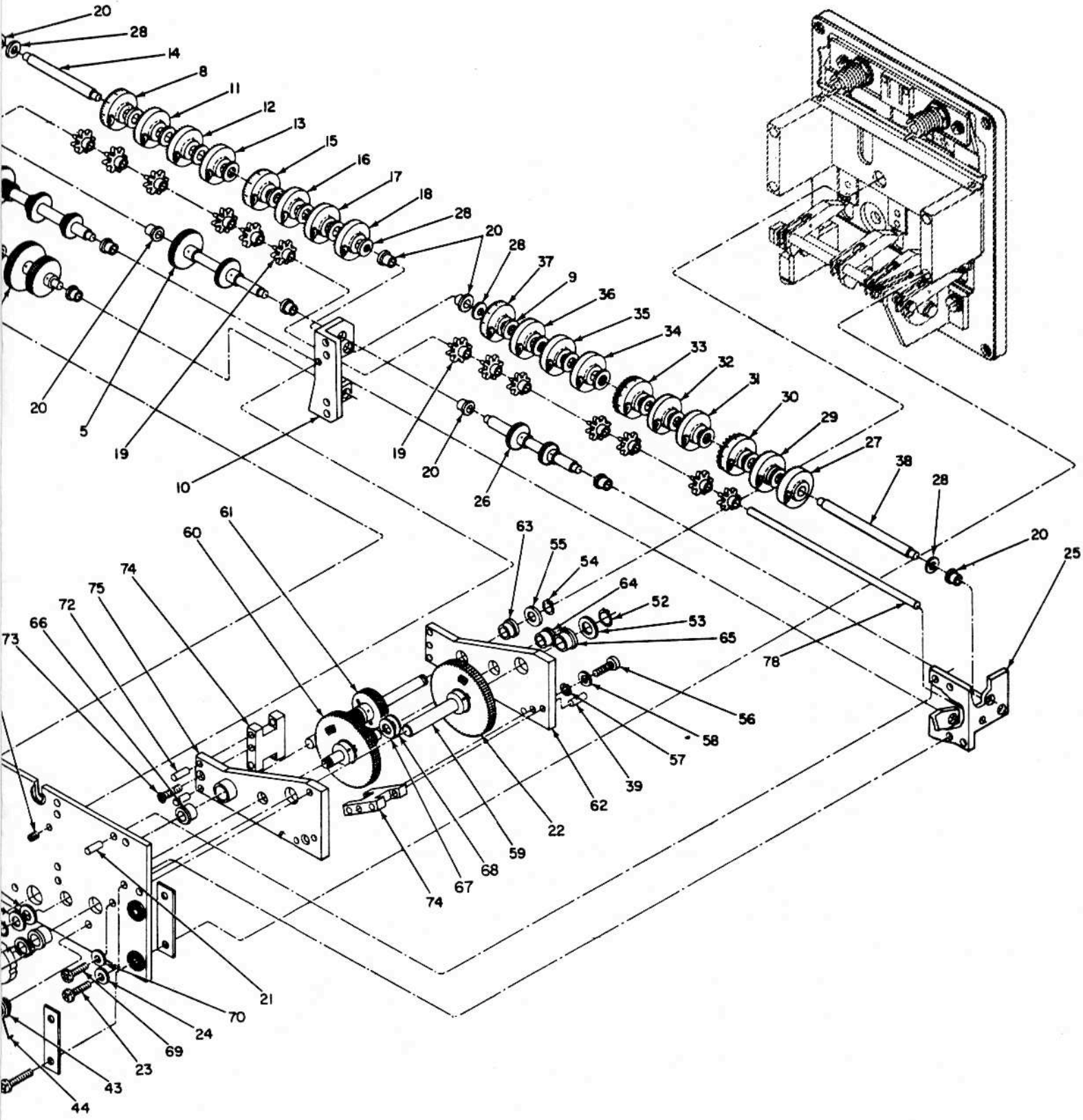


Figure 6-7. Tuning Drive Subassembly, Exploded View

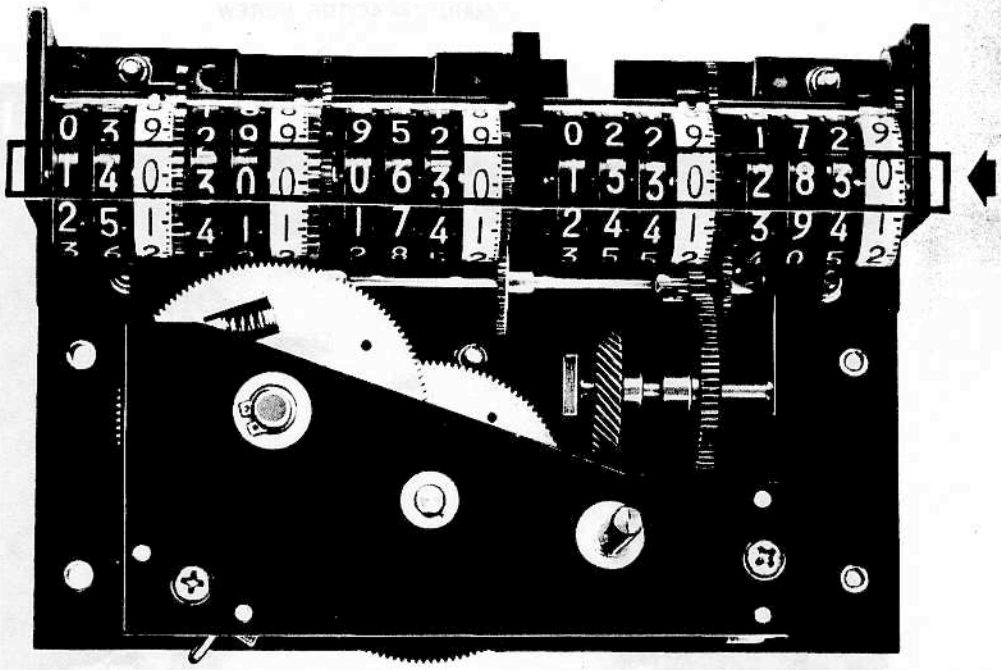


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Figure 6-8. Tuning Drive Subassembly, Control Dial Alignment

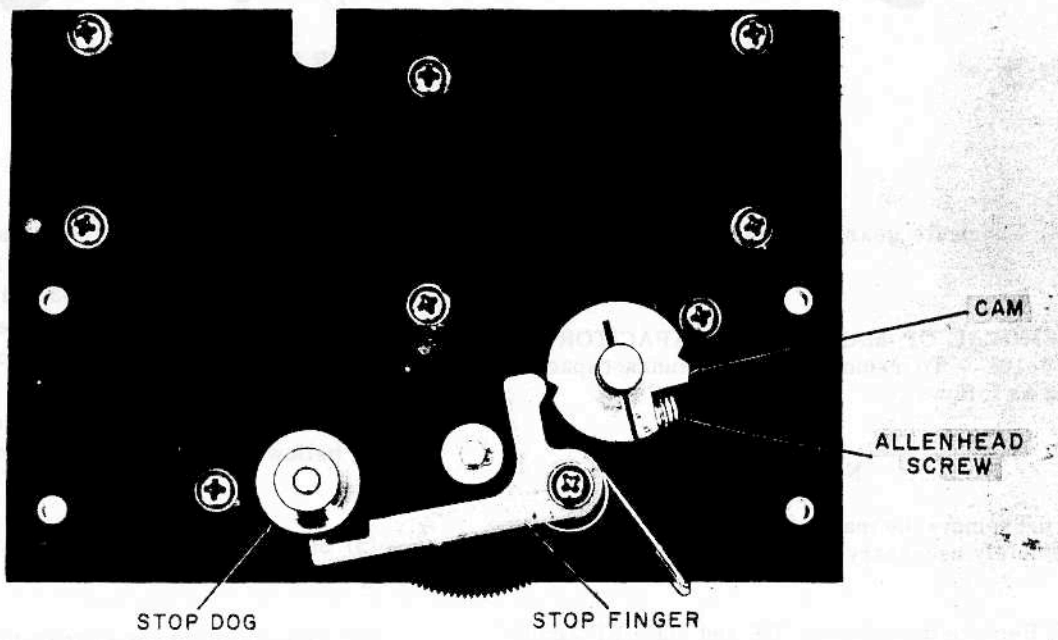

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Figure 6-9. Tuning Drive Subassembly, Cam and Stop Dog Alignment

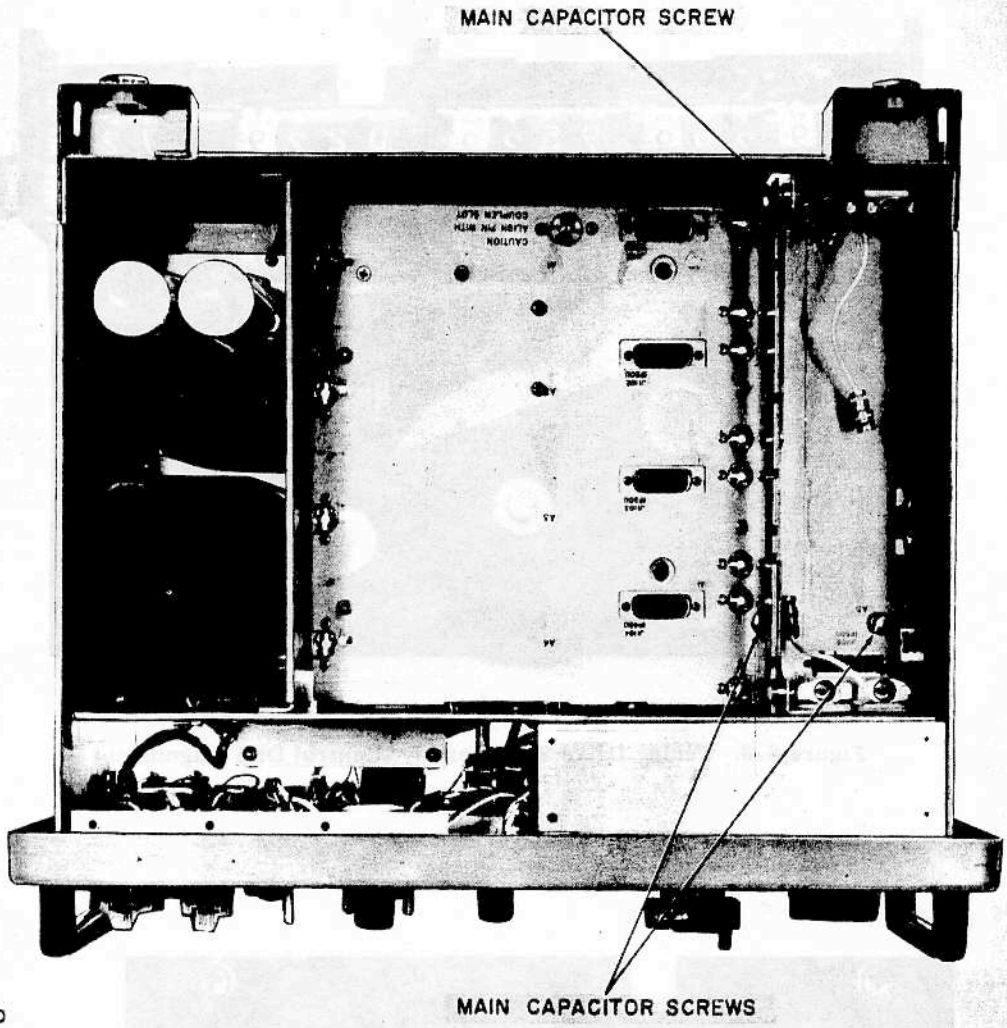

Figure 6-10. Removal of Main Tuning Capacitor

(54) Lubricate gears, sparingly, using MIL-G-3278.

k. REMOVAL OF MAIN TUNING CAPACITOR (see figure 6-10). - To remove the main tuning capacitor proceed as follows:

NOTE

Do not remove the main tuning capacitor unless absolutely necessary.

(1) Remove the antenna RF and main RF amplifiers, mixer, RF oscillator and the first and second IF amplifiers (see paragraph 6-3a.).

(2) Remove the cover from the wiring trough (located under the second IF amplifier).

(3) Remove the coaxial inserts from J1101-A1, J1102-A1, J1103-A1 and J1104-A1 by pushing the hollow end of the tool (CA-58037) firmly over the inserts, then push down gently on the plunger until the insert is released from the connector.

(4) Loosen the two Allen-head setscrews securing the bellows coupling to the main tuning capacitor shaft.

(5) Slide the bellows coupling clear of the drive tuning assembly shaft.

(6) Remove the three screws that secure the tuning capacitor to the main chassis.

(7) Carefully lift the tuning capacitor from the main chassis.

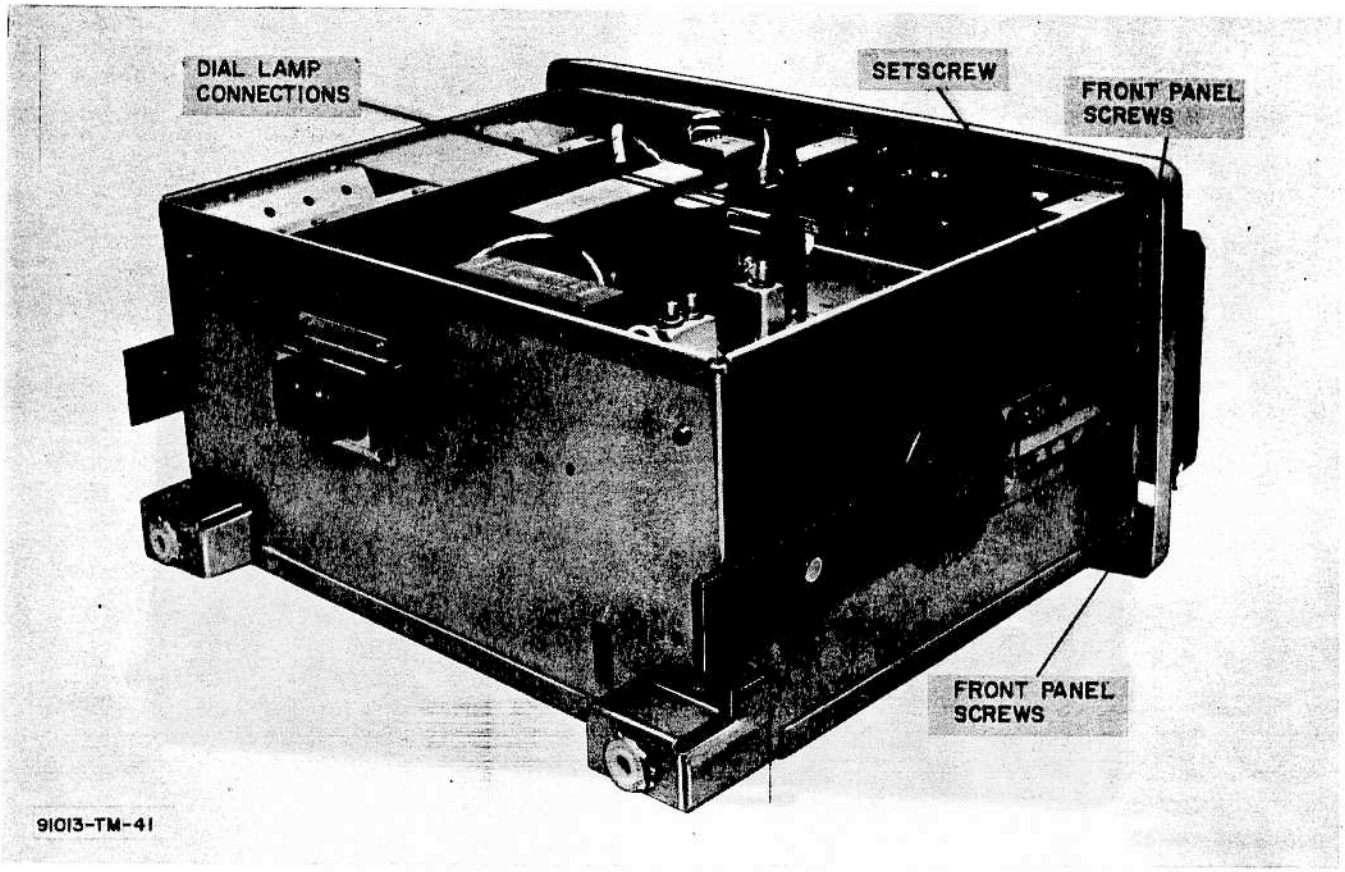

Figure 6-11. Removal of Front Panel

l. REPLACEMENT AND ALIGNMENT OF MAIN TUNING CAPACITOR (see figure 6-10). - To replace and align the main tuning capacitor, proceed as follows:

(1) Install the tuning capacitor in the receiver chassis.

(2) Mechanically align the capacitor shaft and the tuning assembly shaft using shims between mounting feet of capacitor and main chassis as needed.

(3) Rotate the tuning capacitor shaft completely counterclockwise.

(4) Set the Band Selector switch to Band V and rotate Tuning Control completely counterclockwise.

(5) Release the finger stop, located on the rear of the drive tuning assembly, and slowly rotate the Tuning Control counterclockwise to a frequency of 272.88.

CAUTION

Do not rotate the Tuning Control beyond 272.88.

(6) Align bellows coupling between capacitor shaft and the dial assembly shaft and tighten the four Allen-head screws located on the bellows coupling. Be sure the tuning capacitor shaft is against its stop (completely counterclockwise) before screws are tightened.

(7) Rotate the Tuning Control clockwise until the finger stop is back in its original position.

(8) Replace the coaxial inserts in J1101-A1, J1102-A1, J1103-A1 and J1104-A1.

(9) Replace the wiring trough cover and the assemblies.

(10) Align the receiver (see paragraph 6-2). RF section may be the only section requiring alignment.

m. REMOVAL OF FRONT PANEL (see figure 6-11). - Unless extensive damage has been done to the front panel itself, it does not need to be removed. All components mounted on the front panel may be removed and replaced without removing the front panel. To remove the front panel, proceed as follows:

(1) Remove the receiver from its cabinet.

(2) Remove the tuning drive assembly (refer to paragraph 6-3f)

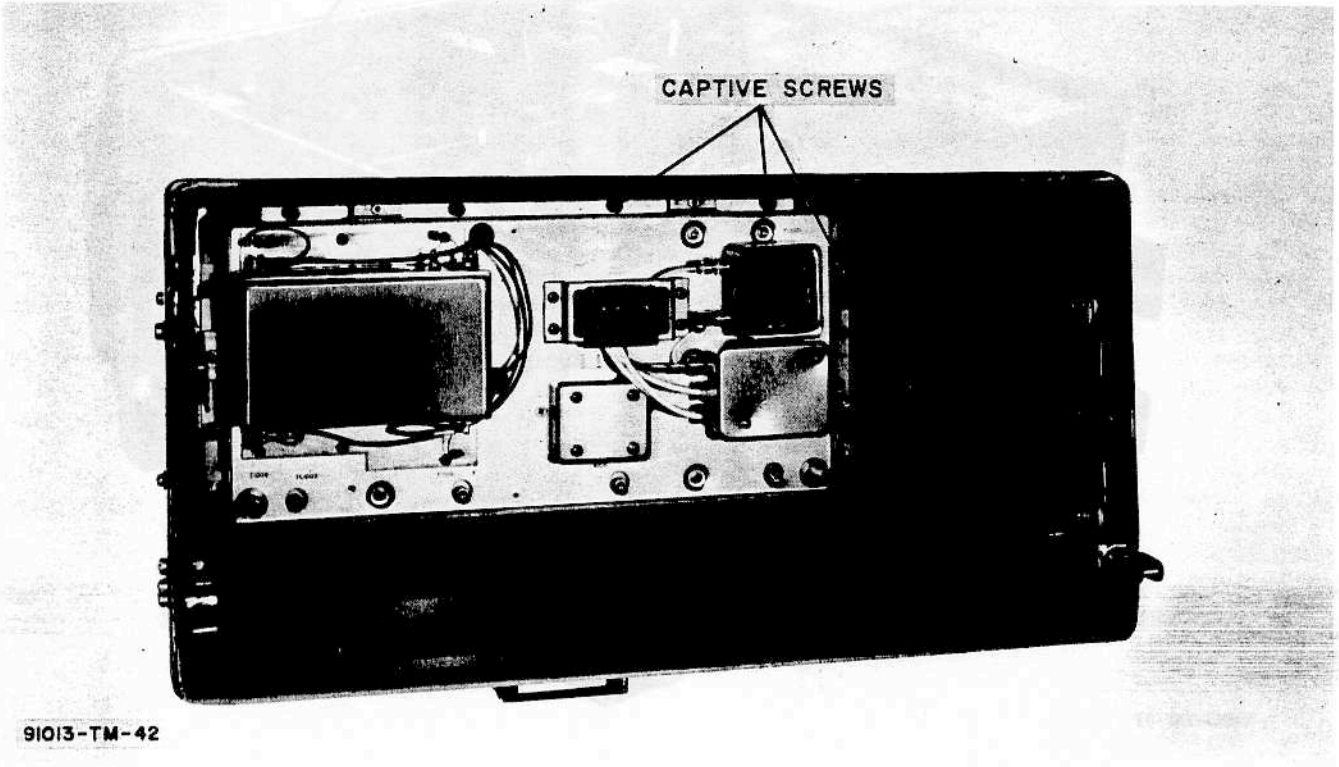

Figure 6-12. Removal of Radio Interference Filter

(3) Disconnect P1117 from J701 and P1116 from J601.

(4) Loosen the Allen-head setscrews which connect the pull wire to S601.

(5) Loosen the Allen-head setscrews which connect the ANT COMP control shaft to the miter gear.

(6) Unscrew the Phillips-head screws which secure the handles to the front panel.

(7) Unscrew six screws, washers and nuts which secure front panel to main chassis.

(8) Remove tilt mechanism handles.

(9) Swing the front panel out at about 45 degrees.

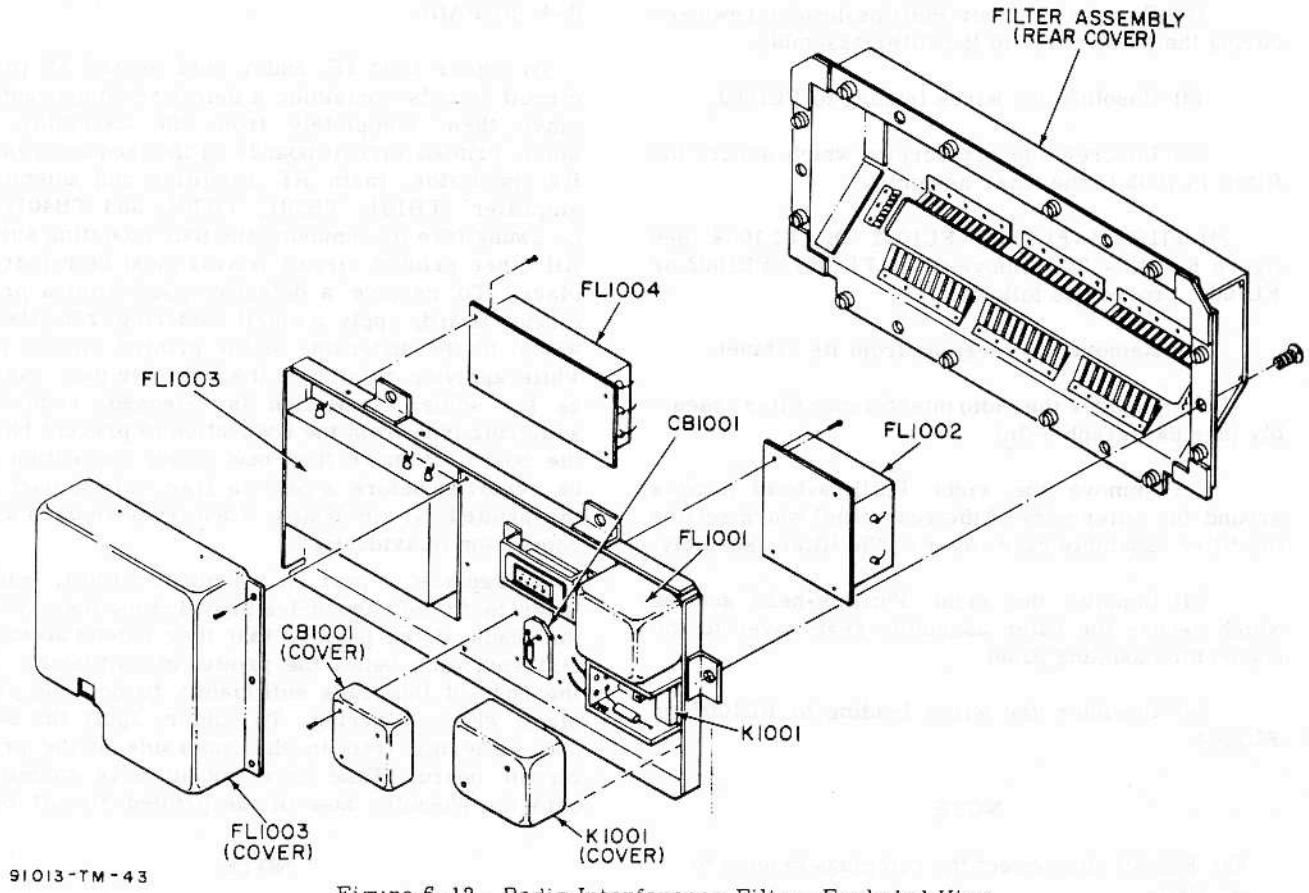

Figure 6-13. Radio Interference Filter, Exploded View

n. REMOVAL OF RADIO INTERFERENCE FILTER (see figure 6-12). - To remove the radio interference filter proceed as follows:

(1) Remove the receiver from its cabinet.

(2) Disconnect the cables at the rear of the receiver cabinet.

(3) Loosen the 12 captive screws, located on the inside of the cabinet, which secure the filter assembly to the receiver cabinet.

o. REMOVAL OF REAR PANEL COMPONENTS.

(1) THERMAL CIRCUIT BREAKER CB1001 (see figure 6-13). - To remove thermal circuit breaker CB1001, proceed as follows:

(a) Remove the receiver from its cabinet.

(b) Remove, from inside the receiver cabinet, the two screws which secure the thermal circuit breaker cover to the rear filter assembly and lift off the cover.

(c) Unsolder the two leads and carefully pull the circuit breaker from its holder.

(2) RELAY K1001 (see figure 6-13). - To remove relay K1001, proceed as follows:

(a) Remove the receiver from its cabinet.

(b) Remove the radio interference filter (see paragraph 6-3n).

(c) Unsolder the leads from the relay, noting their exact position.

(d) Remove the four screws which secure the relay to the mounting and carefully remove the relay.

(3) FILTER FL1003 (see figure 6-13). - To remove filter FL1003, proceed as follows:

(a) Remove the receiver from its cabinet.

(b) Remove the radio interference filter (see paragraph 6-3n).

(c) Remove the four Phillips-head screws securing the filter cover to the filter assembly.

(d) Unsolder the wires leading to FL1003.

(e) Unscrew the six screws which secure the filter FL1003 to the filter assembly.

(4) FILTER FL1001, FL1002 OR FL1004 (see figure 6-13). - To remove filter FL1001, FL1002 or FL1004, proceed as follows:

(a) Remove the receiver from its cabinet.

(b) Remove the radio interference filter assembly (see paragraph 6-3n).

(c) Remove the eight Phillips-head screws around the outer edge of the rear panel which secure the filter assembly rear cover to the filter assembly.

(d) Remove the eight Phillips-head screws which secure the filter assembly rear cover to the connector mounting panel.

(e) Unsolder the wires leading to FL1002 or FL1004.

NOTE

On FL1001 disconnect the two plugs leading to FL1001.

(f) Remove the four Phillips-head screws which secure the filter to the panel.

NOTE

The screws which secure FL1001 to the filter assembly are located on the rear of the filter assembly.

6-4. REPAIR.

To repair first IF, audio, and second IF printed circuit boards containing a defective component, remove them completely from the assembly. The small printed circuit boards on the frequency mixer, RF oscillator, main RF amplifier and antenna RF amplifier (TB101, TB201, TB301, and TB401) may be swung free by removing the four mounting screws. All other printed circuit boards must be repaired in place. To remove a defective part from a printed circuit board, apply a small soldering iron (about 35 watts) to the underside of the printed circuit board while applying tension on the defective part. As soon as the solder connection is released, remove the soldering iron from the connection to prevent burning the board. If more than one solder connection must be removed before a part is free, cut the part from the printed circuit board. Then, remove each solder connection individually.

To replace a part on a printed circuit, bend the leads to fit into the holes provided for the part. Cut the leads of the part so that they extend about one-sixteenth inch below the printed circuit board. Bend the ends of the leads sufficiently to hold the part in place while soldering. To solder, apply the solder and soldering iron to the underside of the printed circuit board. Take care not to have solder flow onto the phenolic base of the printed circuit board.

NOTE

Avoid applying more heat than absolutely necessary during soldering otherwise circuits may lift from printed circuit board.

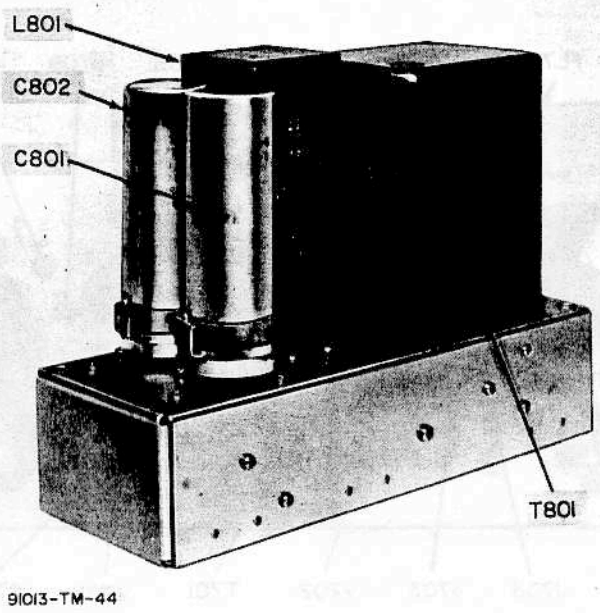

Figure 6-14. Power Supply, Side View

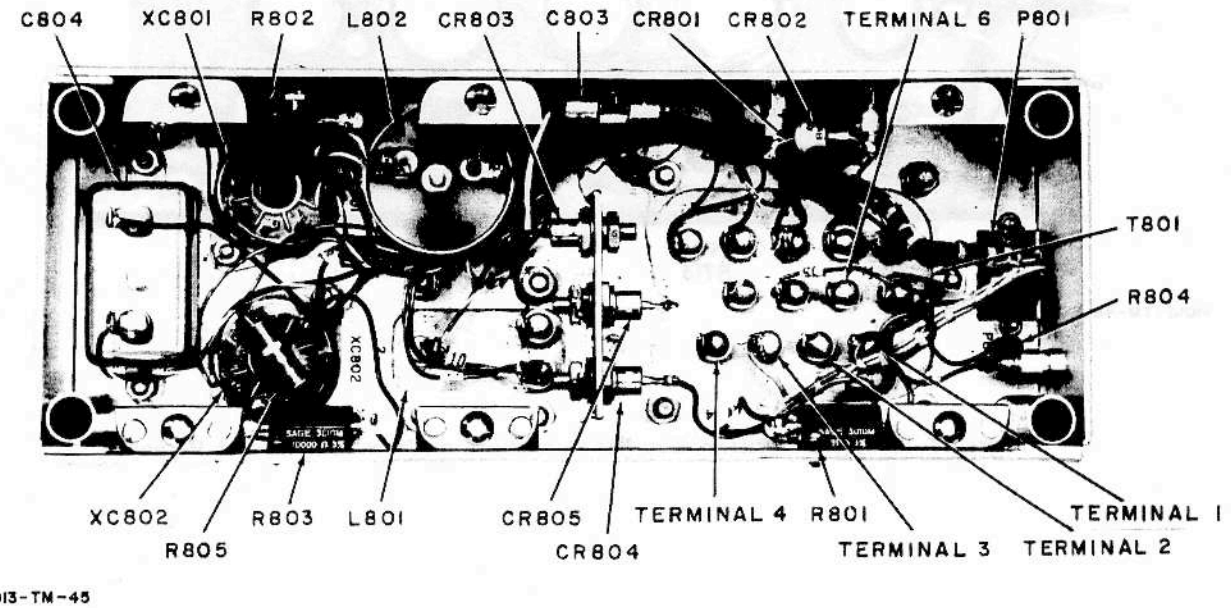

Figure 6-15. Power Supply, Bottom View with Cover Removed

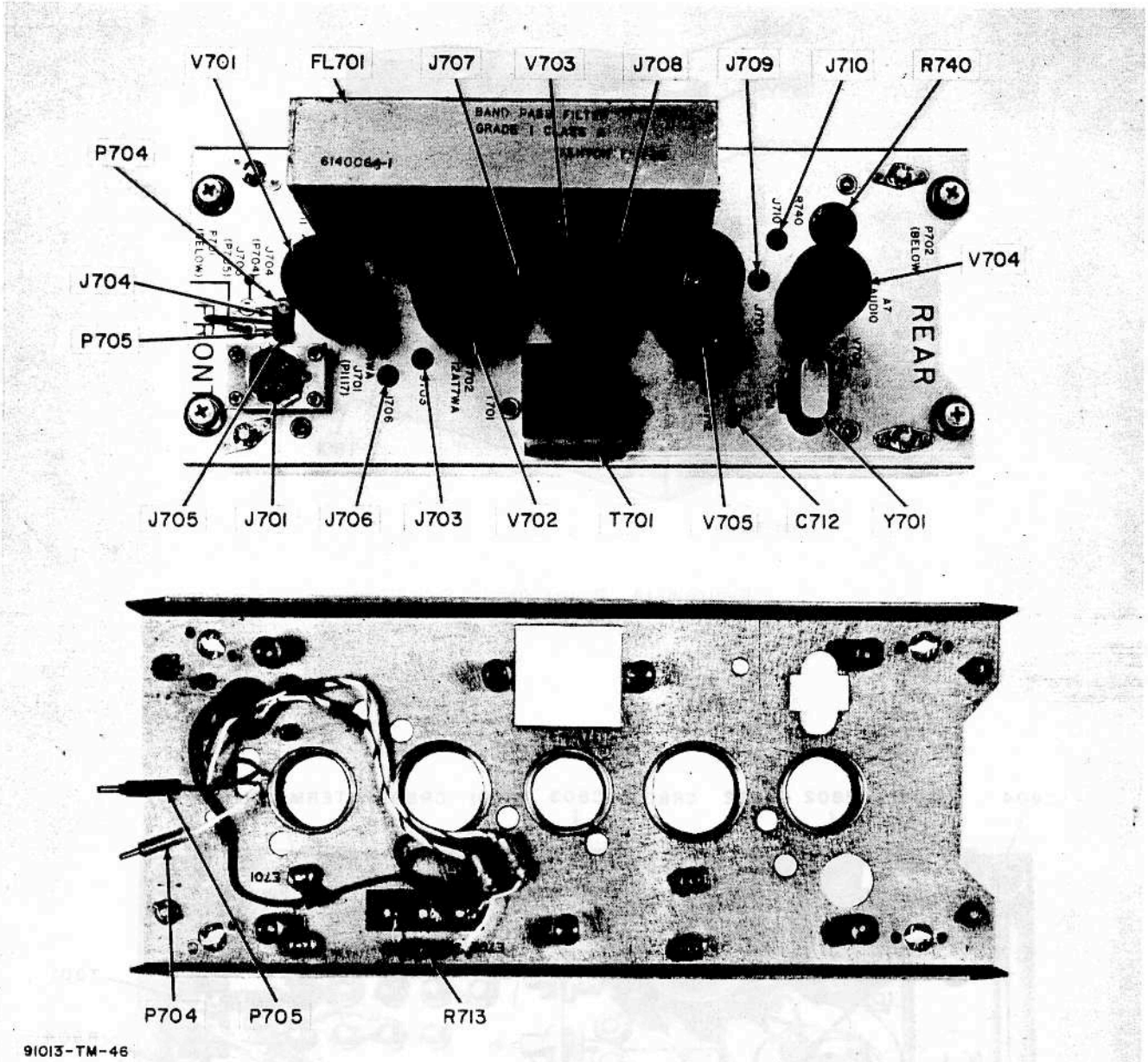

Figure 6-16. AF Amplifier, Top View and Bottom View with TB 701 Removed

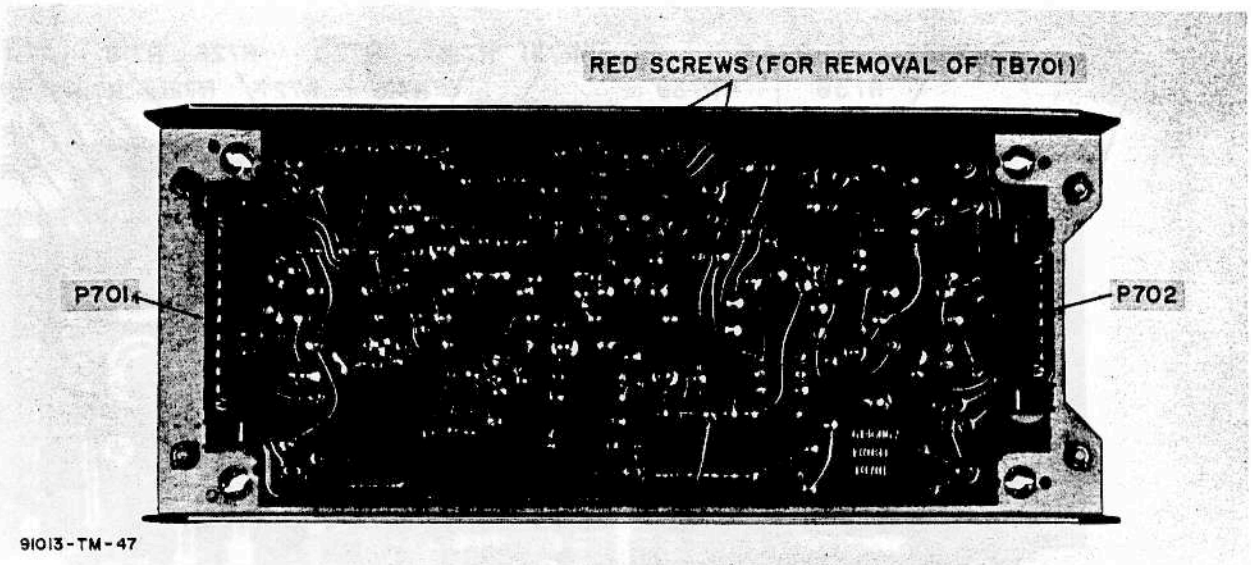

Figure 6-17. AF Amplifier, Bottom View with Cover Removed

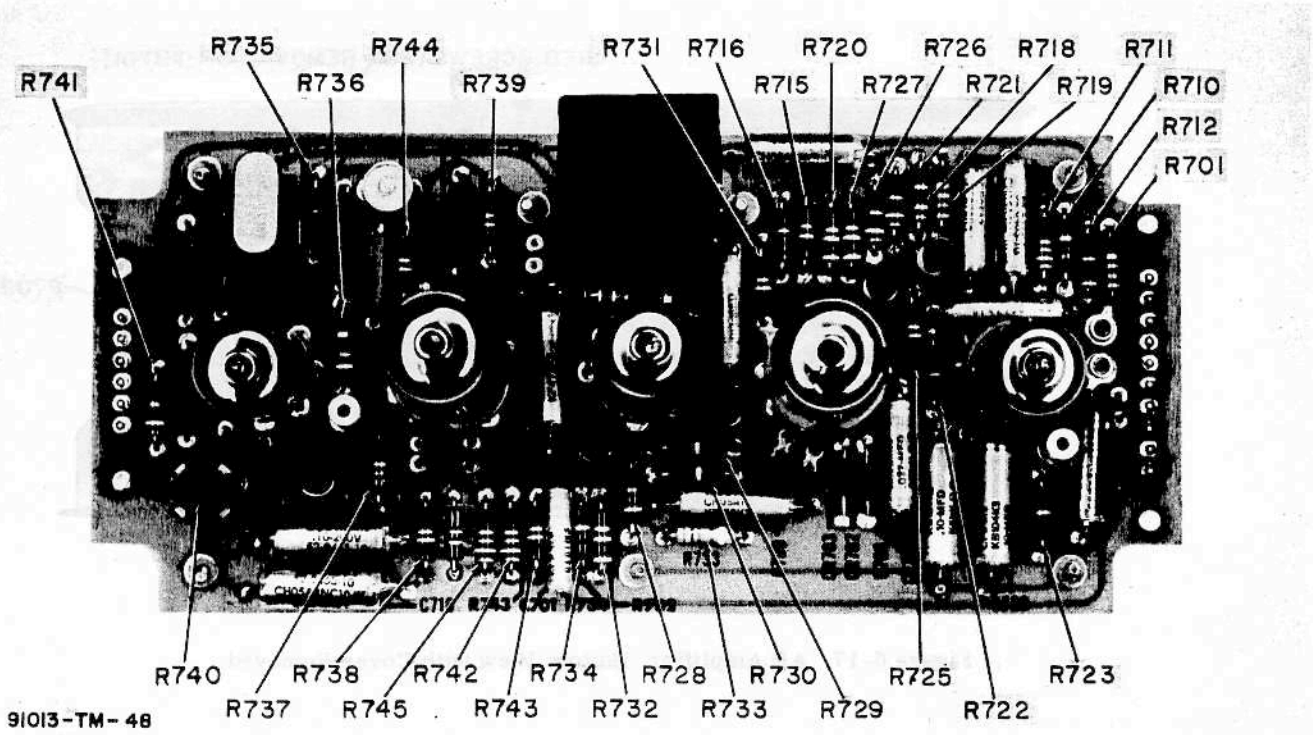

Figure 6-18. AF Amplifier, Resistor Location on TB 701

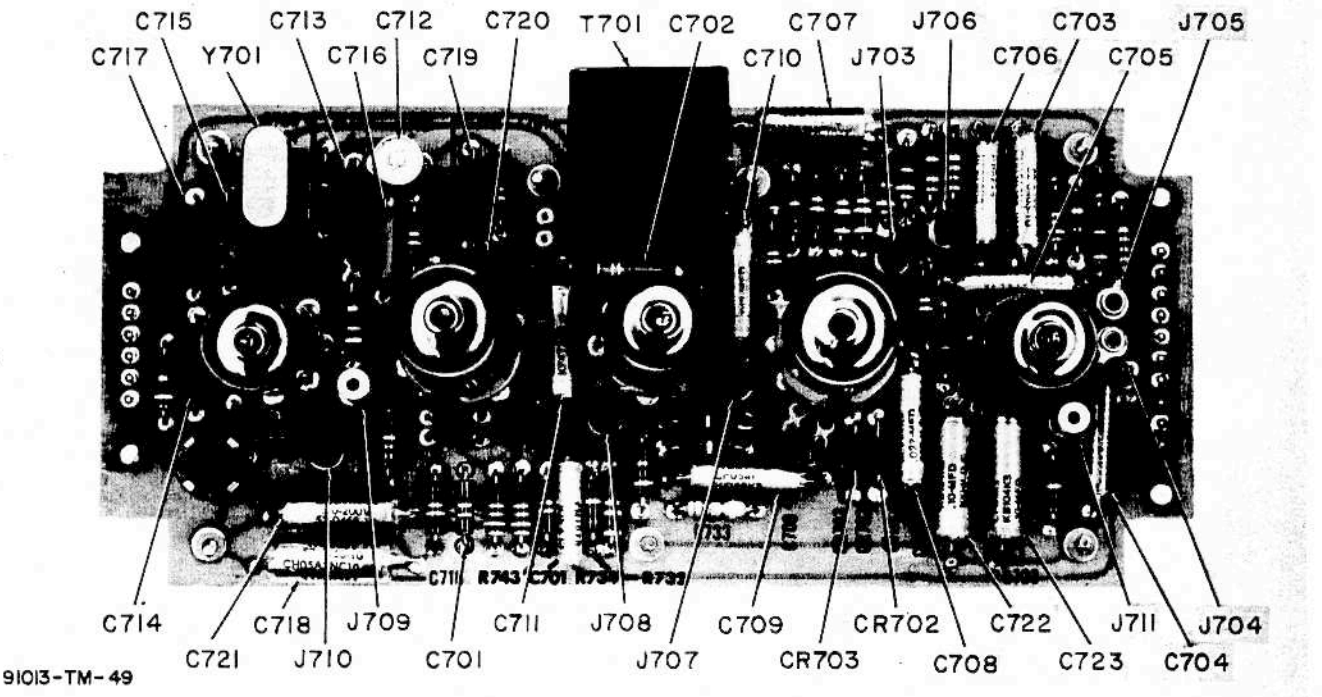

Figure 6-19. AF Amplifier, Component Location except Resistors on TB 701

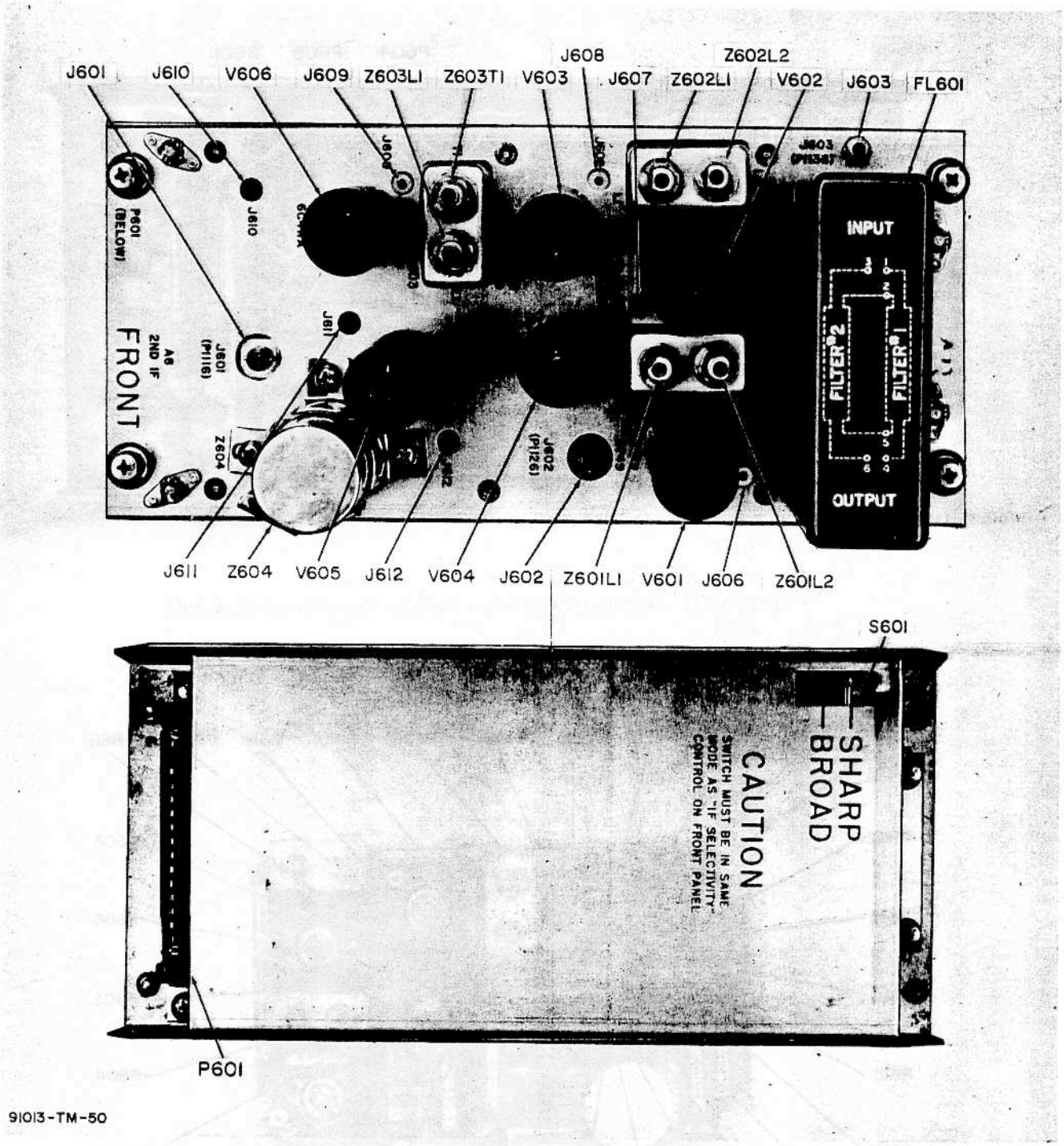

Figure 6-20. Second IF Amplifier, Top and Bottom View

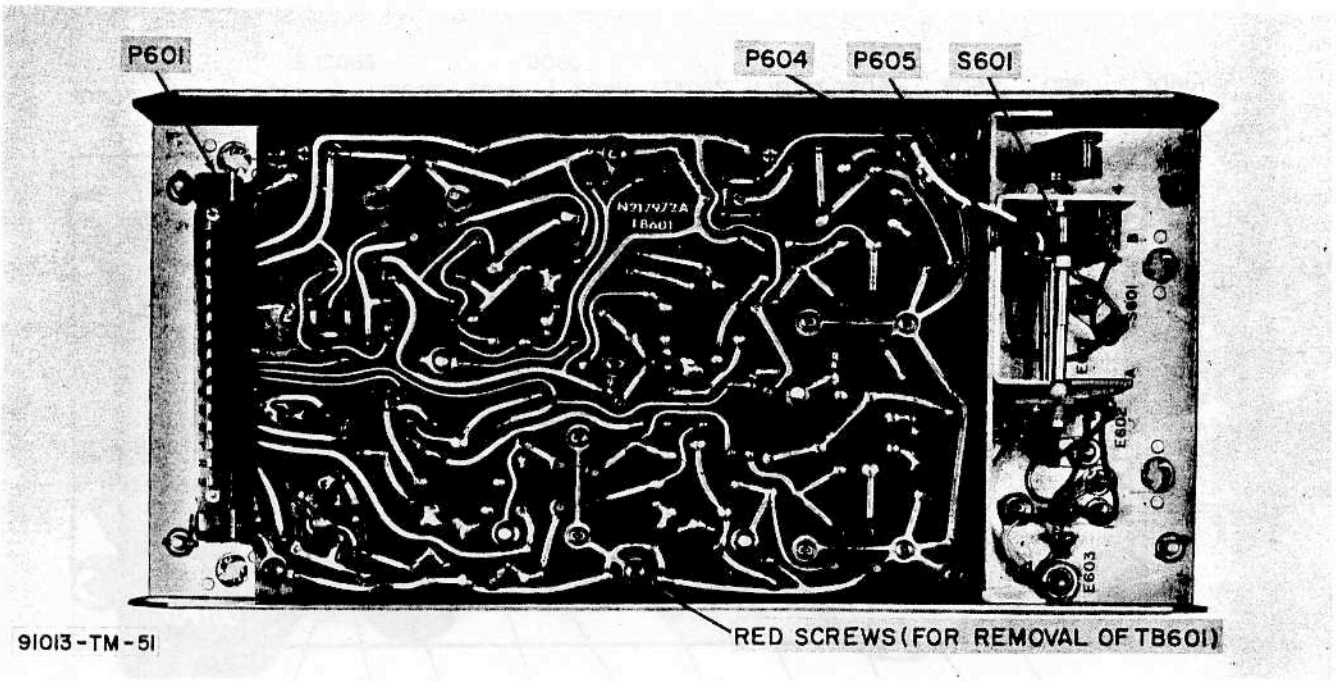

Figure 6-21. Second IF Amplifier, Bottom View, Cover Removed

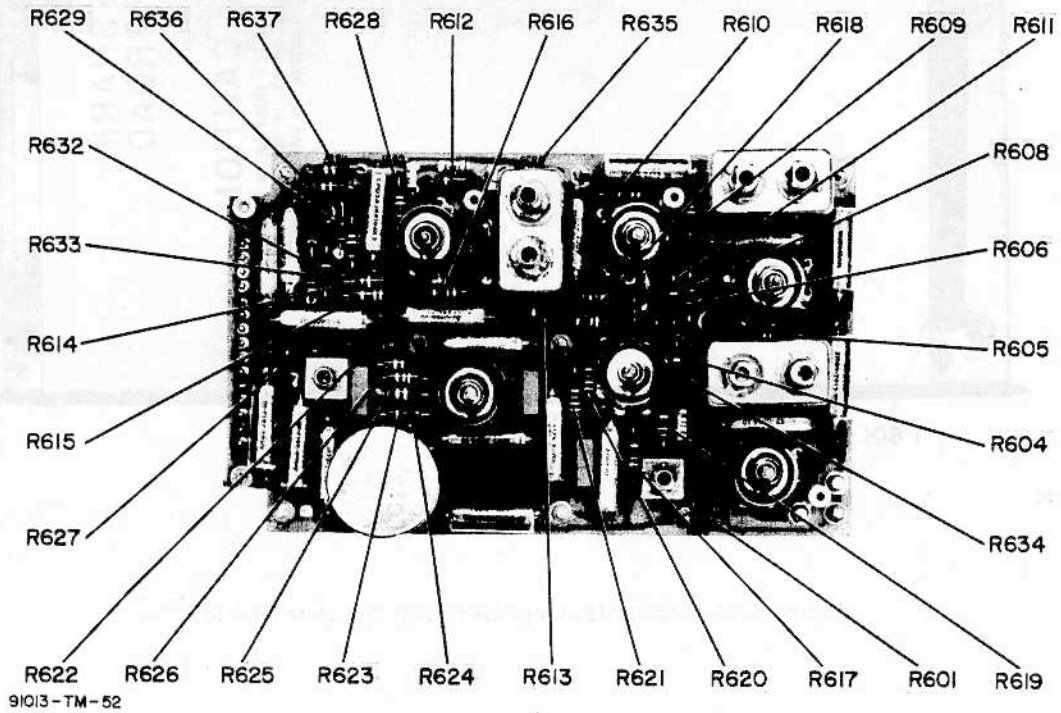

Figure 6-22. Second IF Amplifier, Resistor Location on TB 601

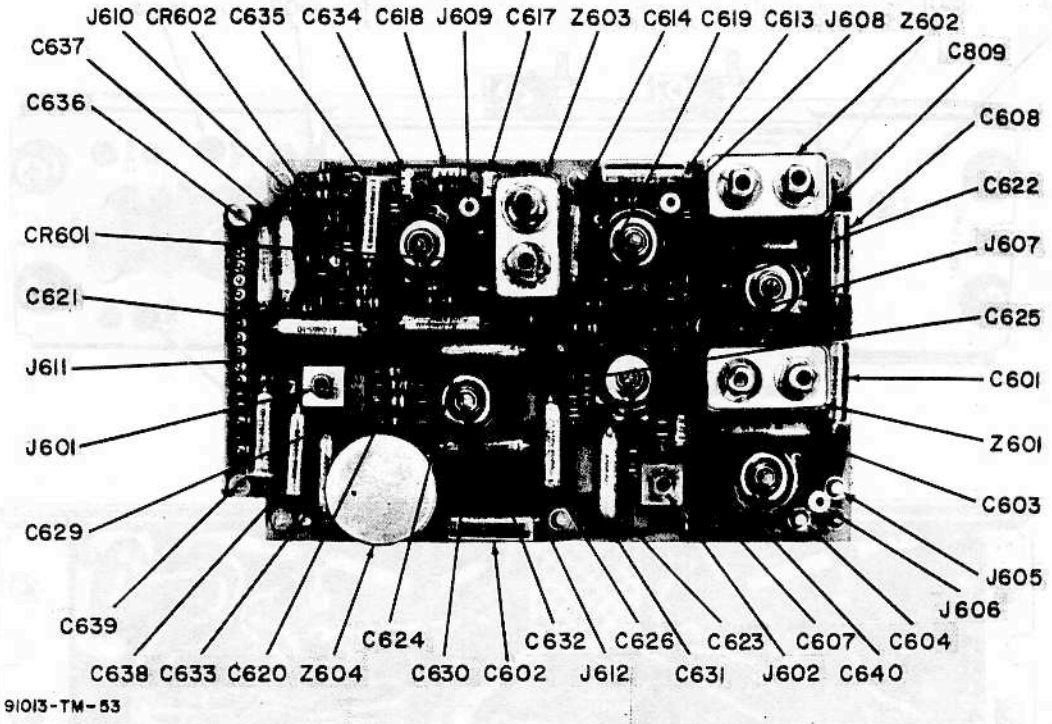

Figure 6-23. Second IF Amplifier, Component Location Except Resistors on TB 601

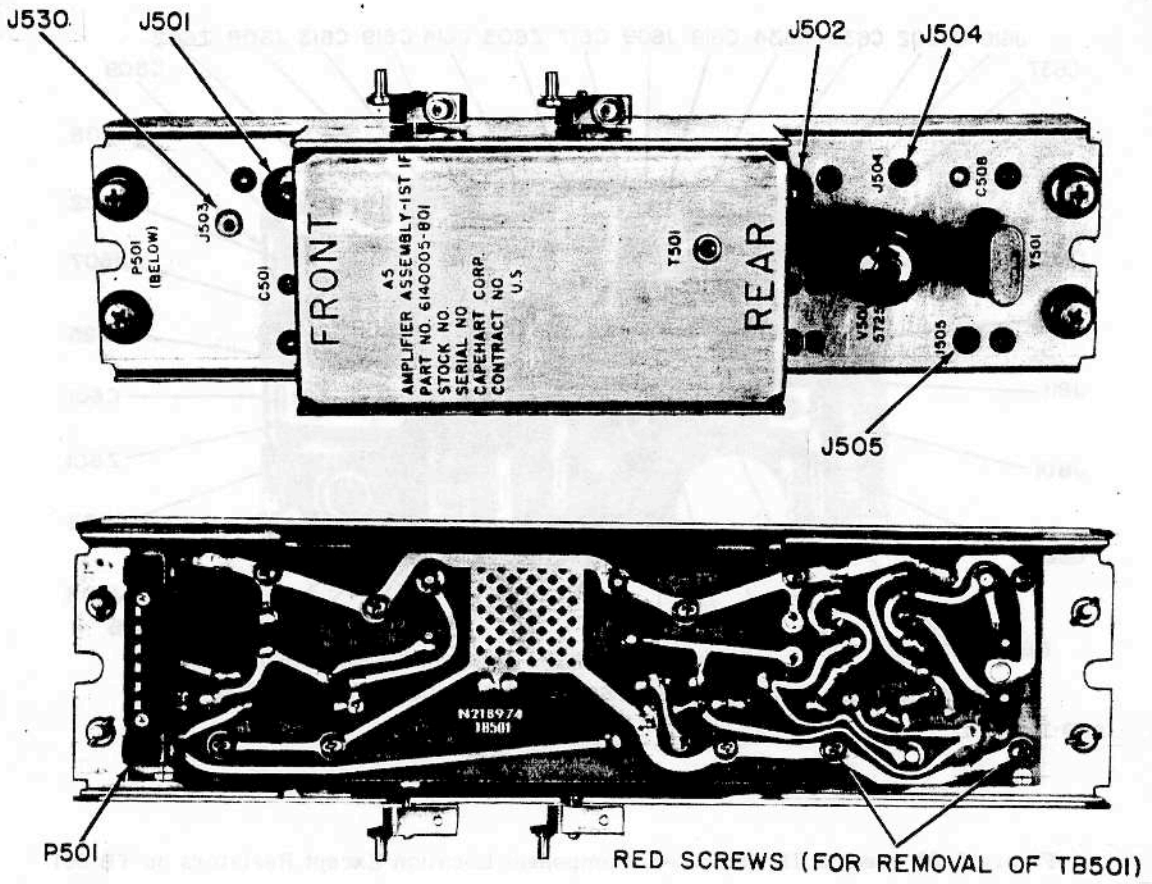

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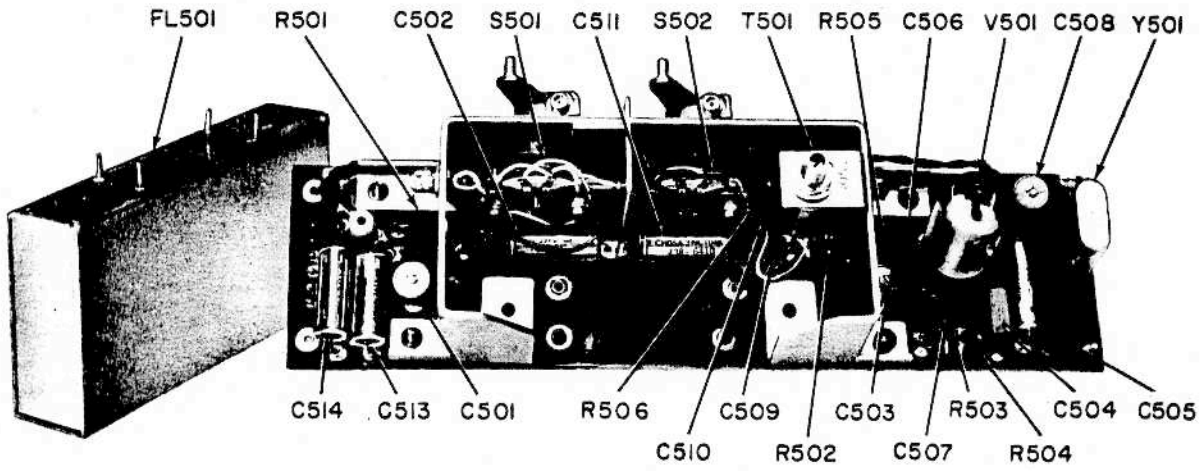
Figure 6-24. First IF Amplifier, Top and Bottom Views



91013-TM-55

Figure 6-25. First IF Amplifier, Cover Removed

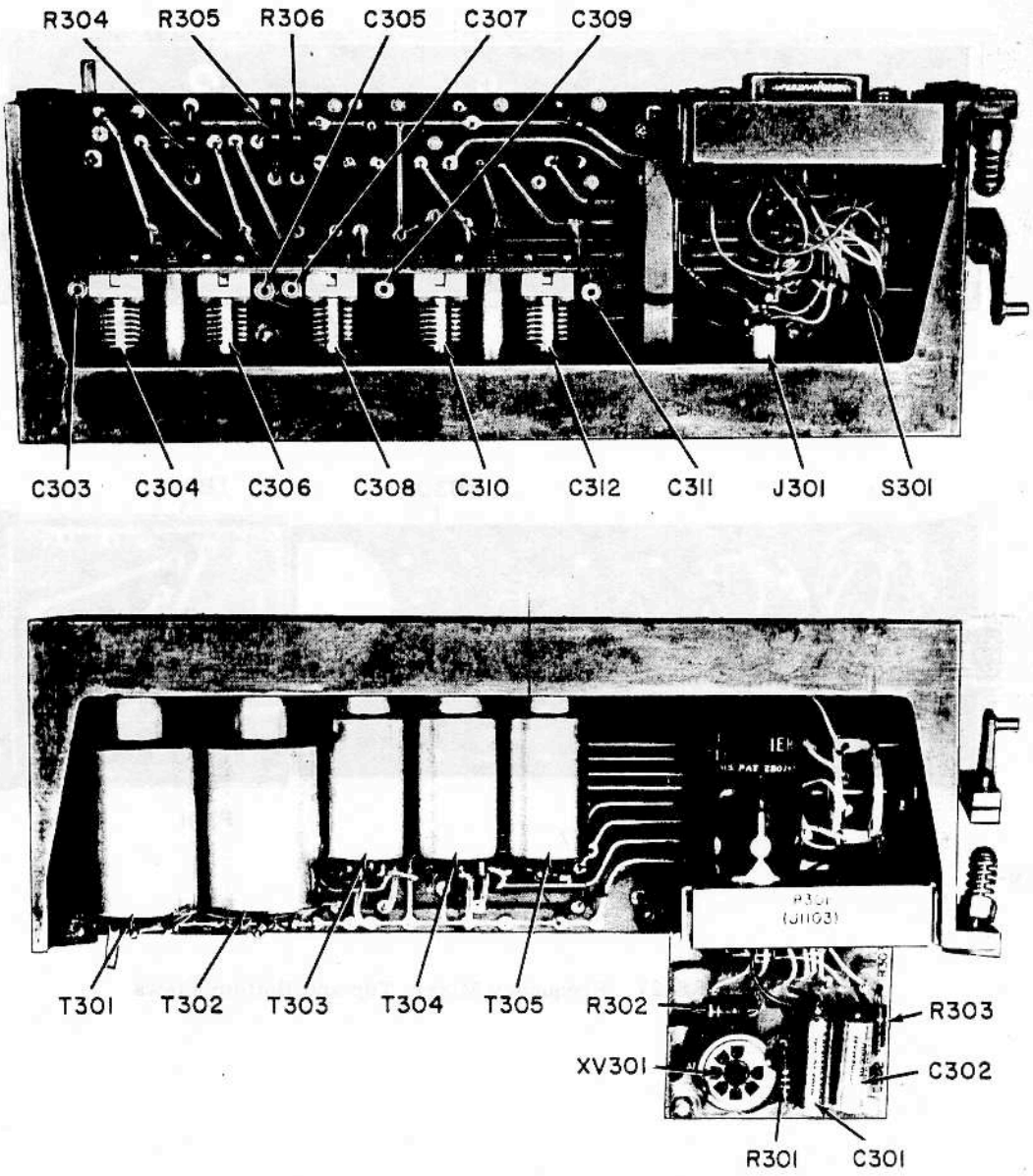


Figure 6-26. Frequency Mixer, Side Views

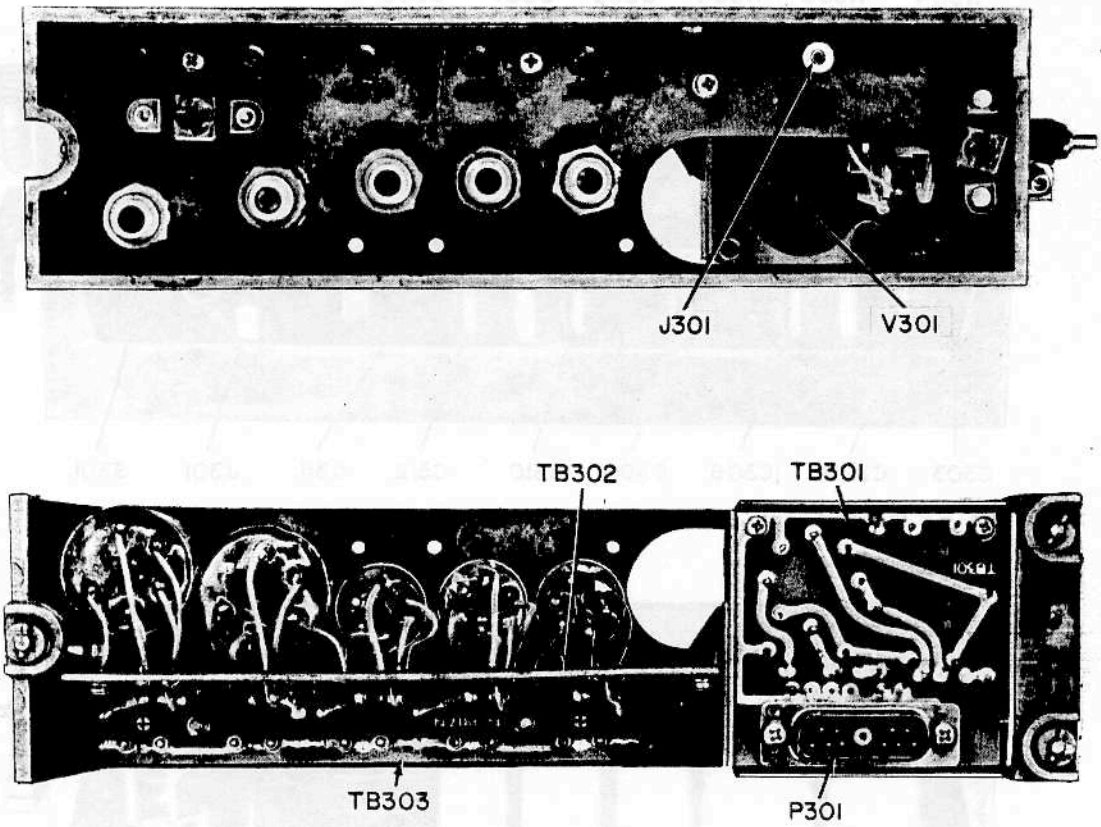


Figure 6-27. Frequency Mixer, Top and Bottom Views

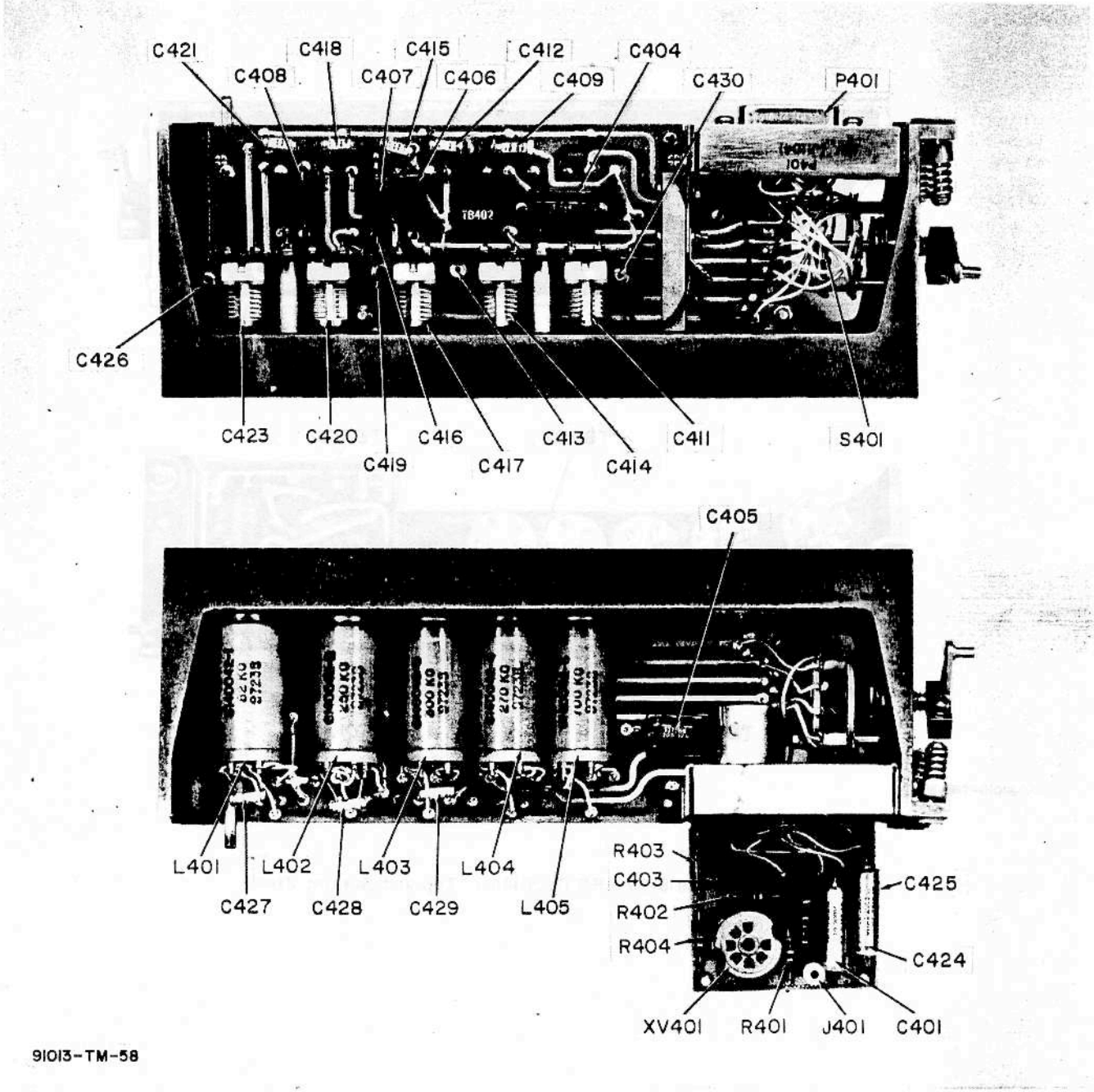


Figure 6-28. RF Oscillator, Side Views

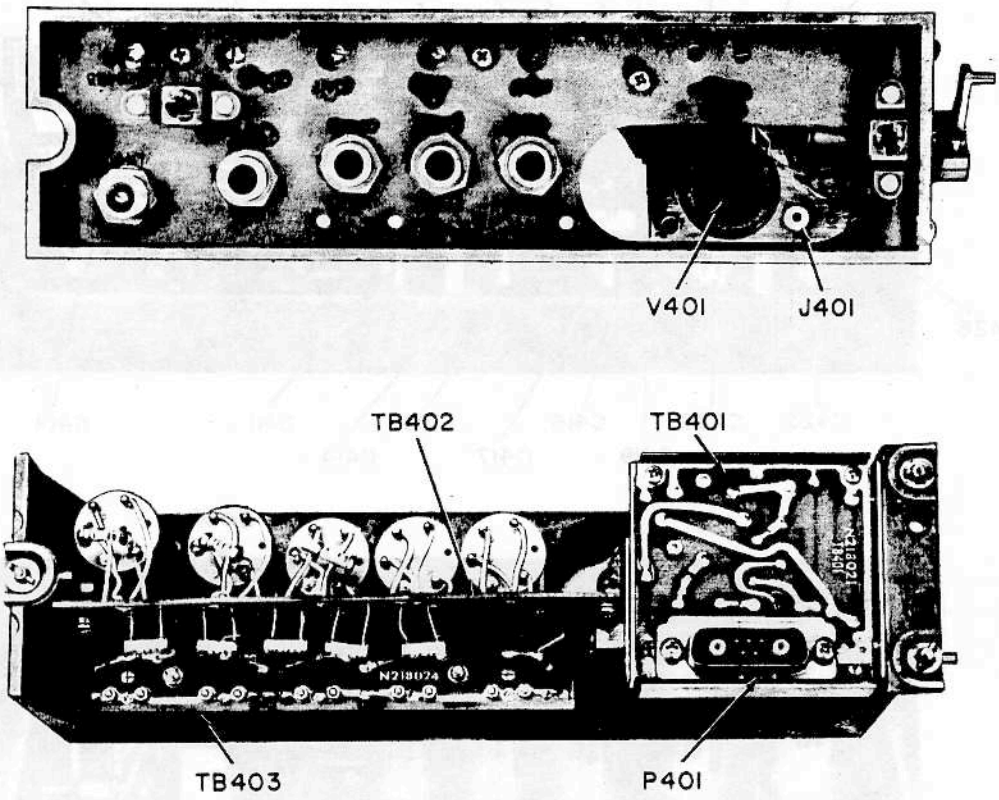


Figure 6-29. RF Oscillator, Top and Bottom Views

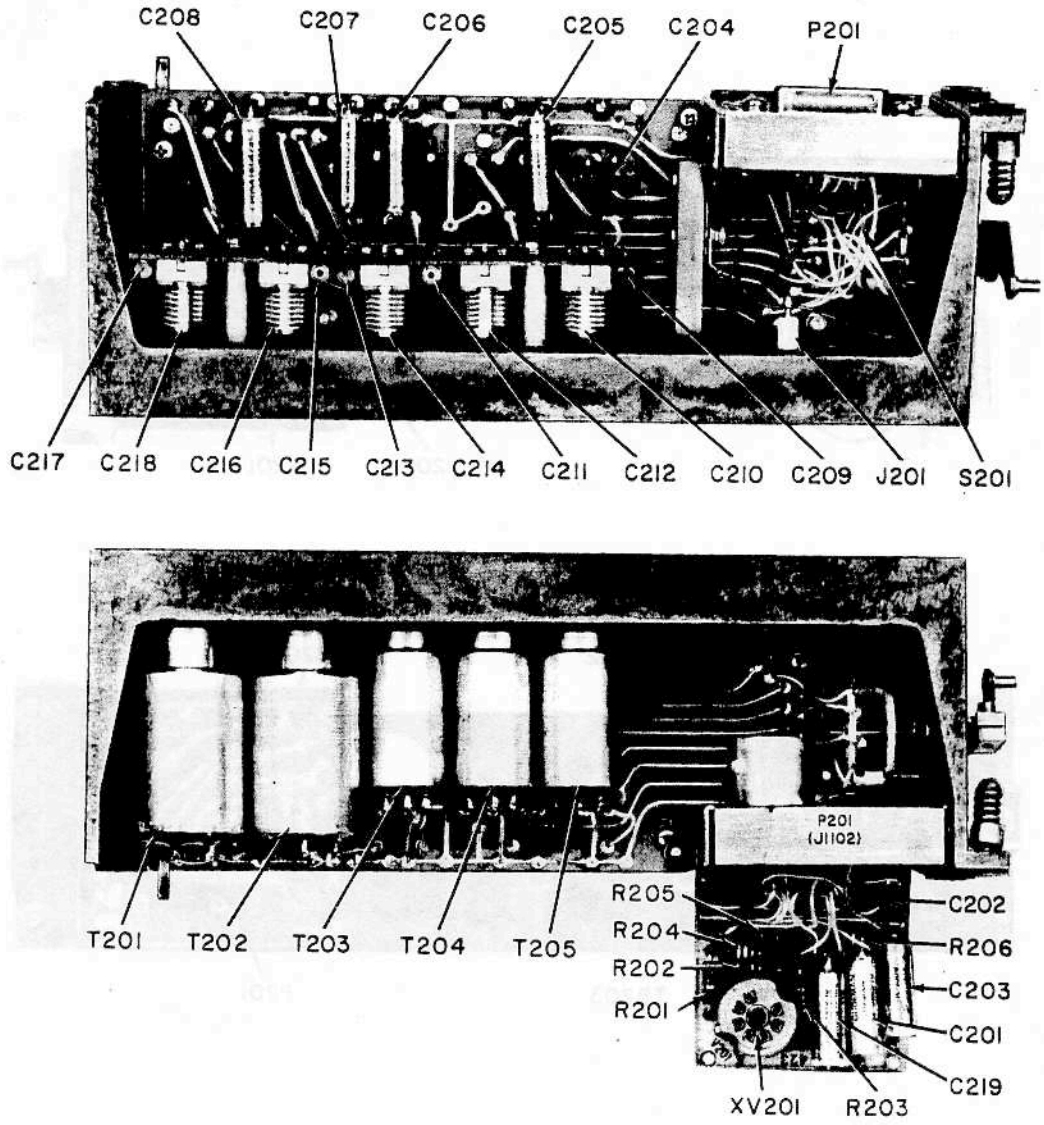


Figure 6-30. Main RF Amplifier, Side Views

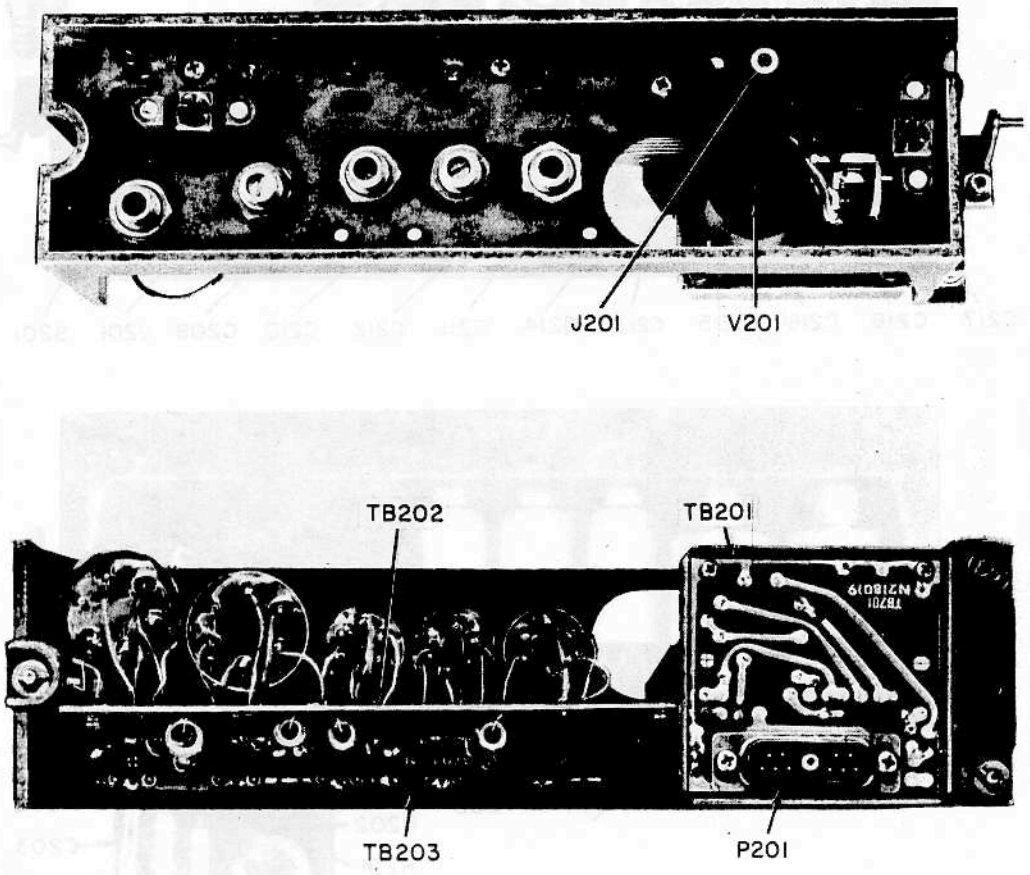


Figure 6-31. Main RF Amplifier. Top and Bottom Views

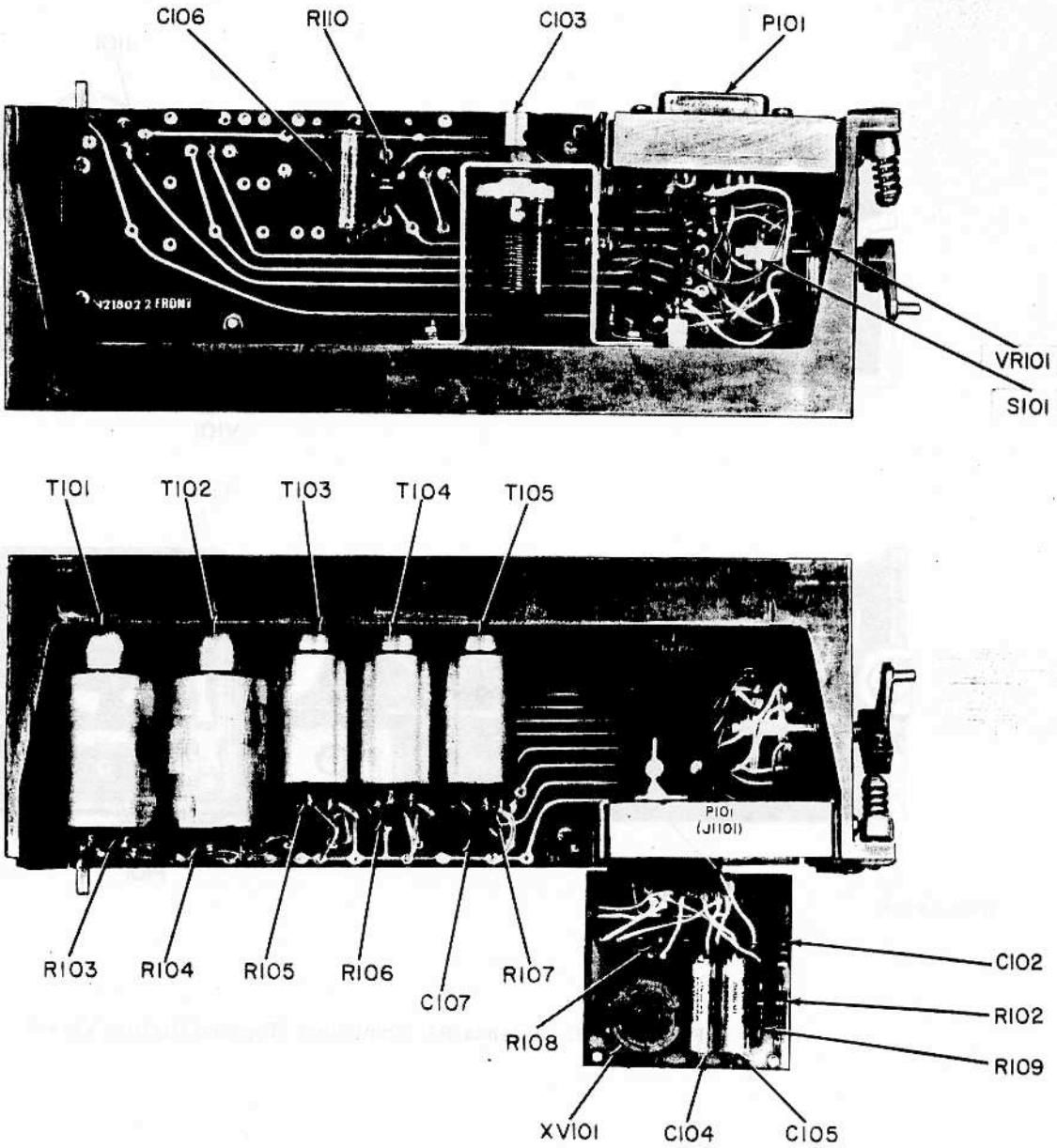


Figure 6-32. Antenna RF Amplifier, Side Views

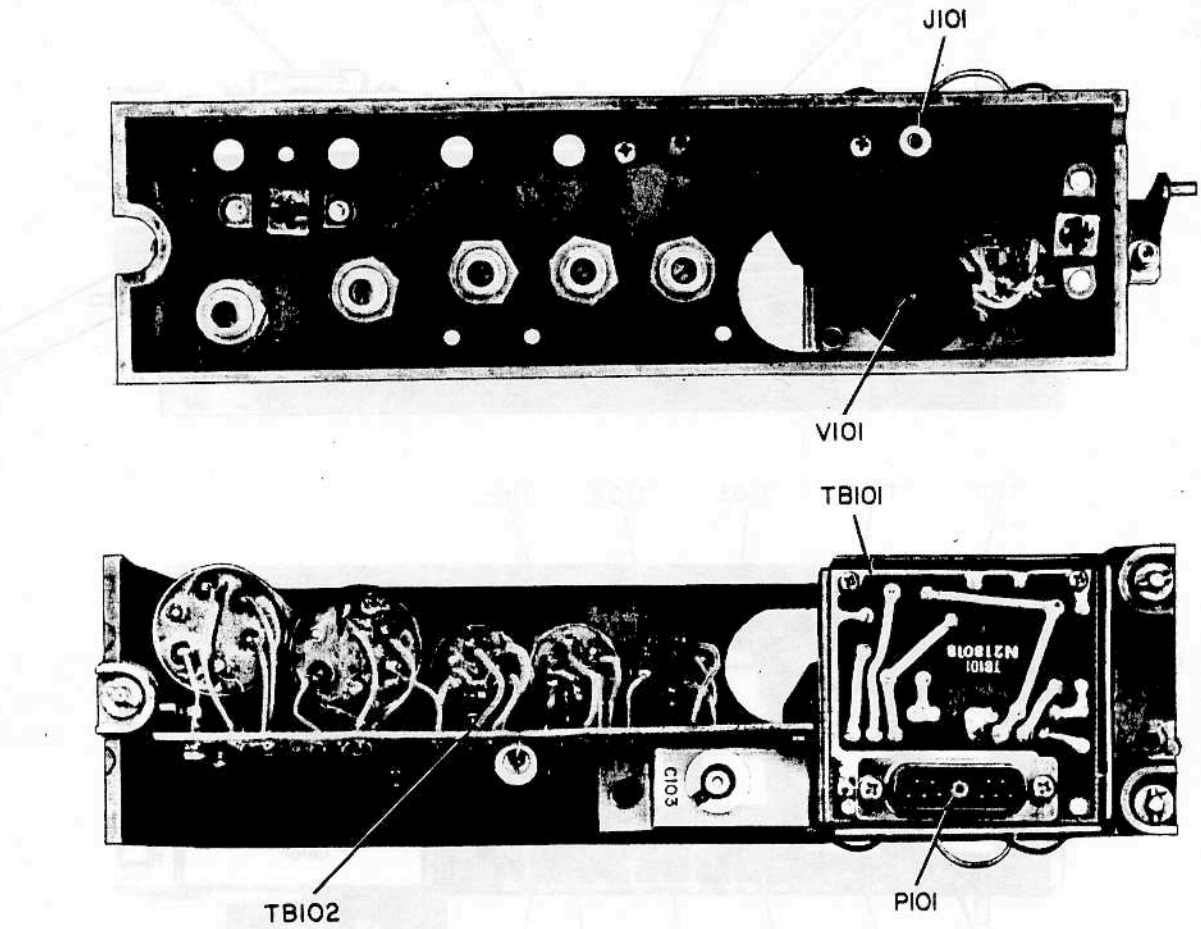


Figure 6-33. Antenna RF Amplifier, Top and Bottom Views

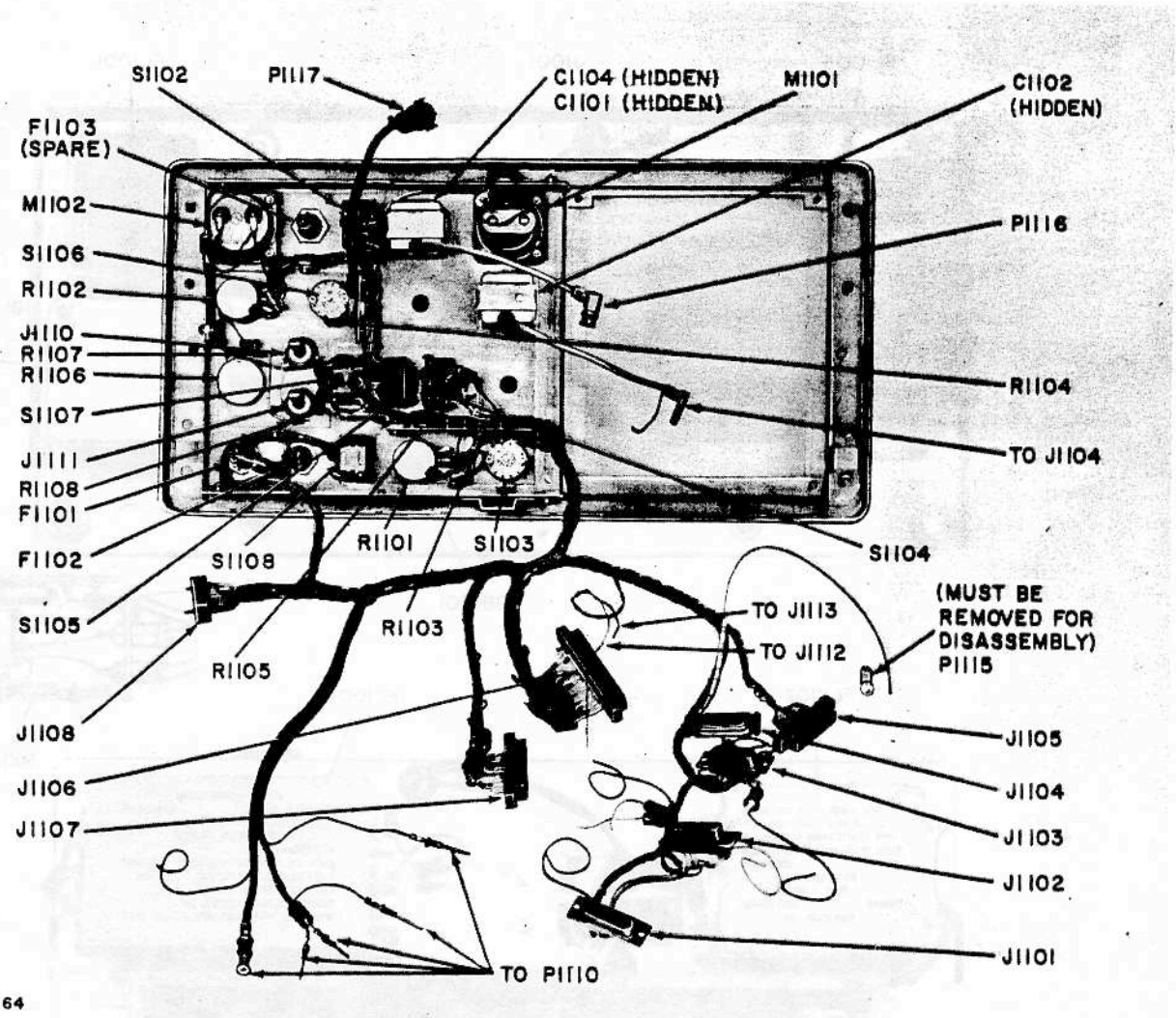


Figure 6-34. Front Panel and Wiring Harness

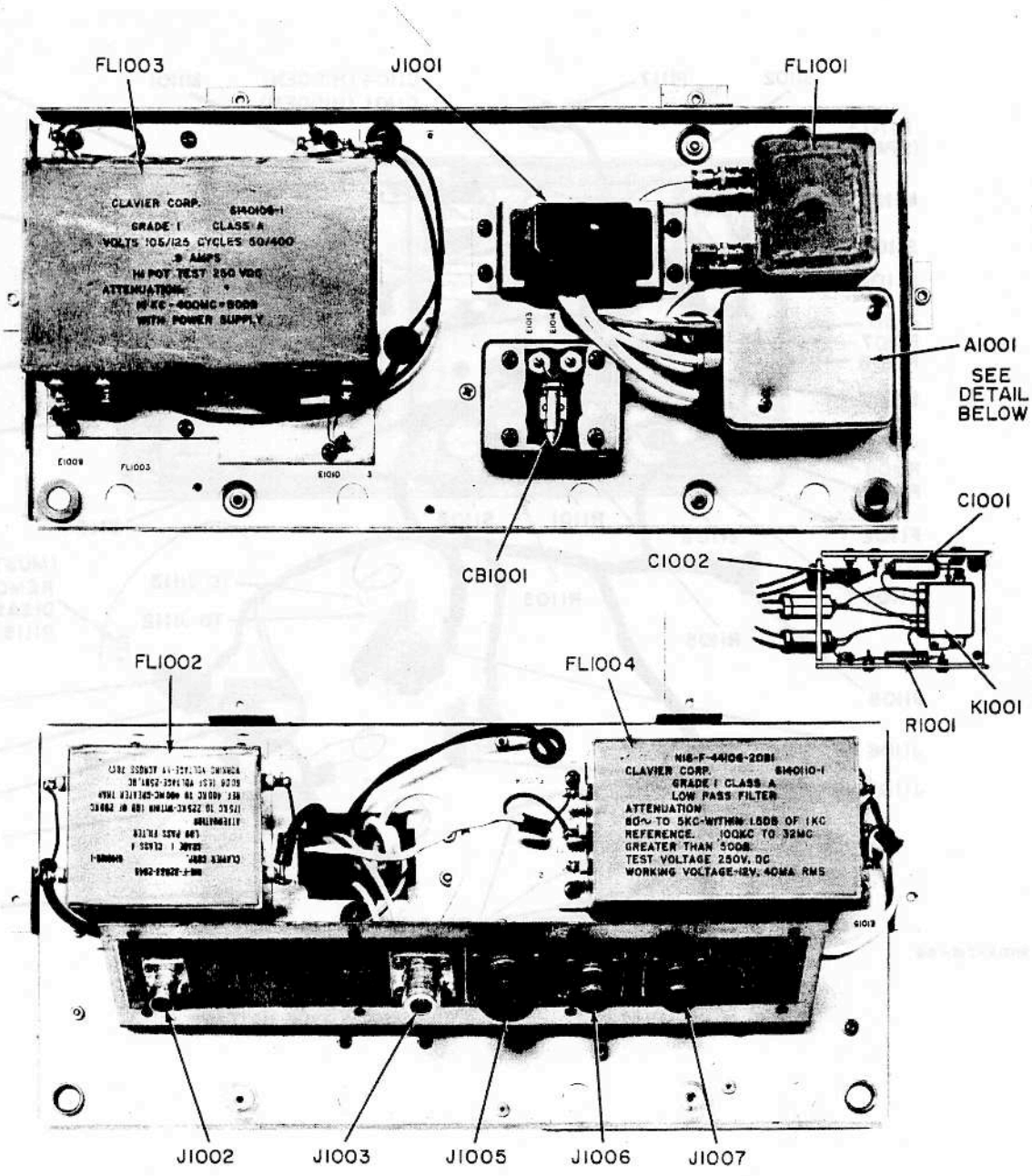


Figure 6-35. Radio Interference Filter

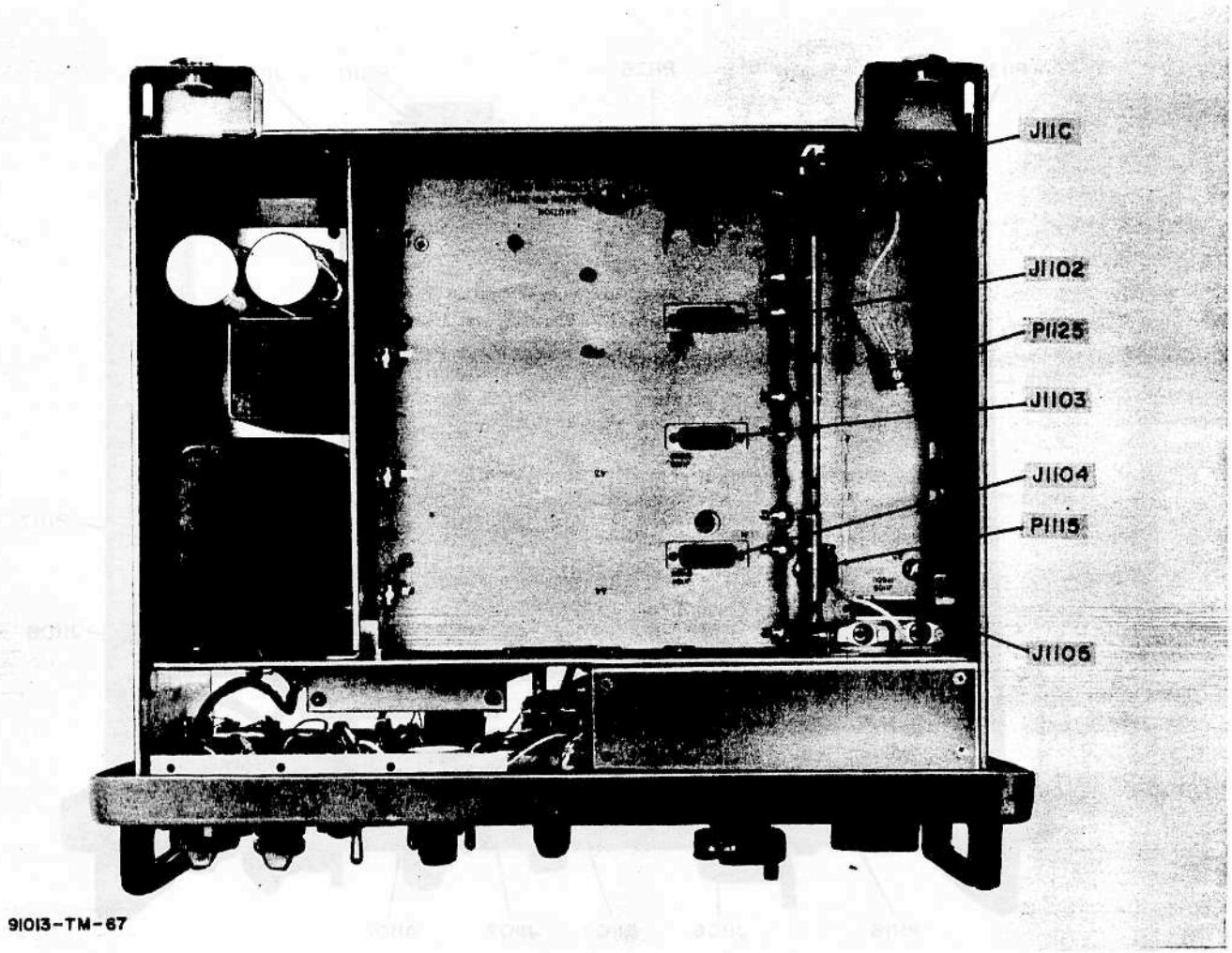
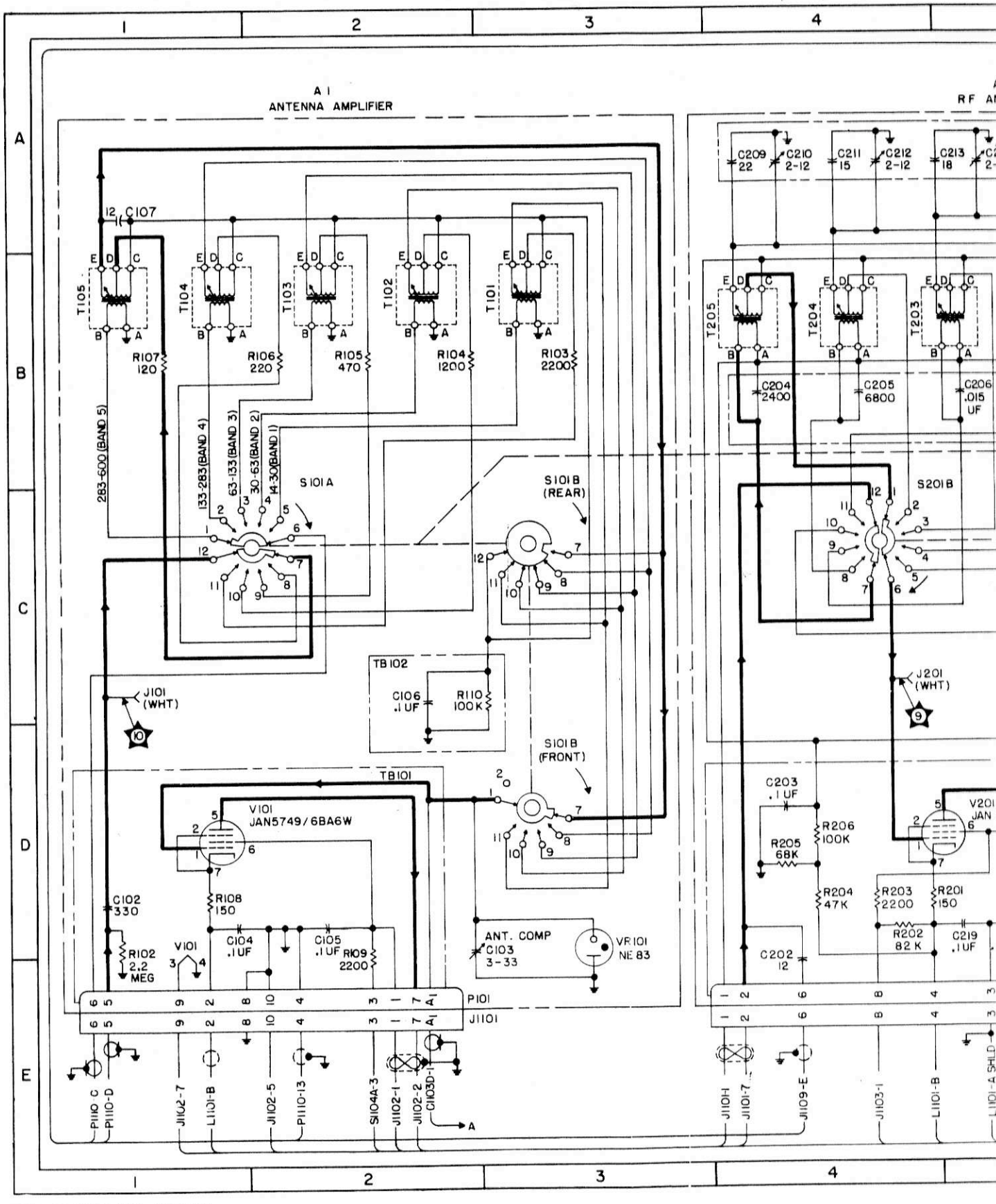
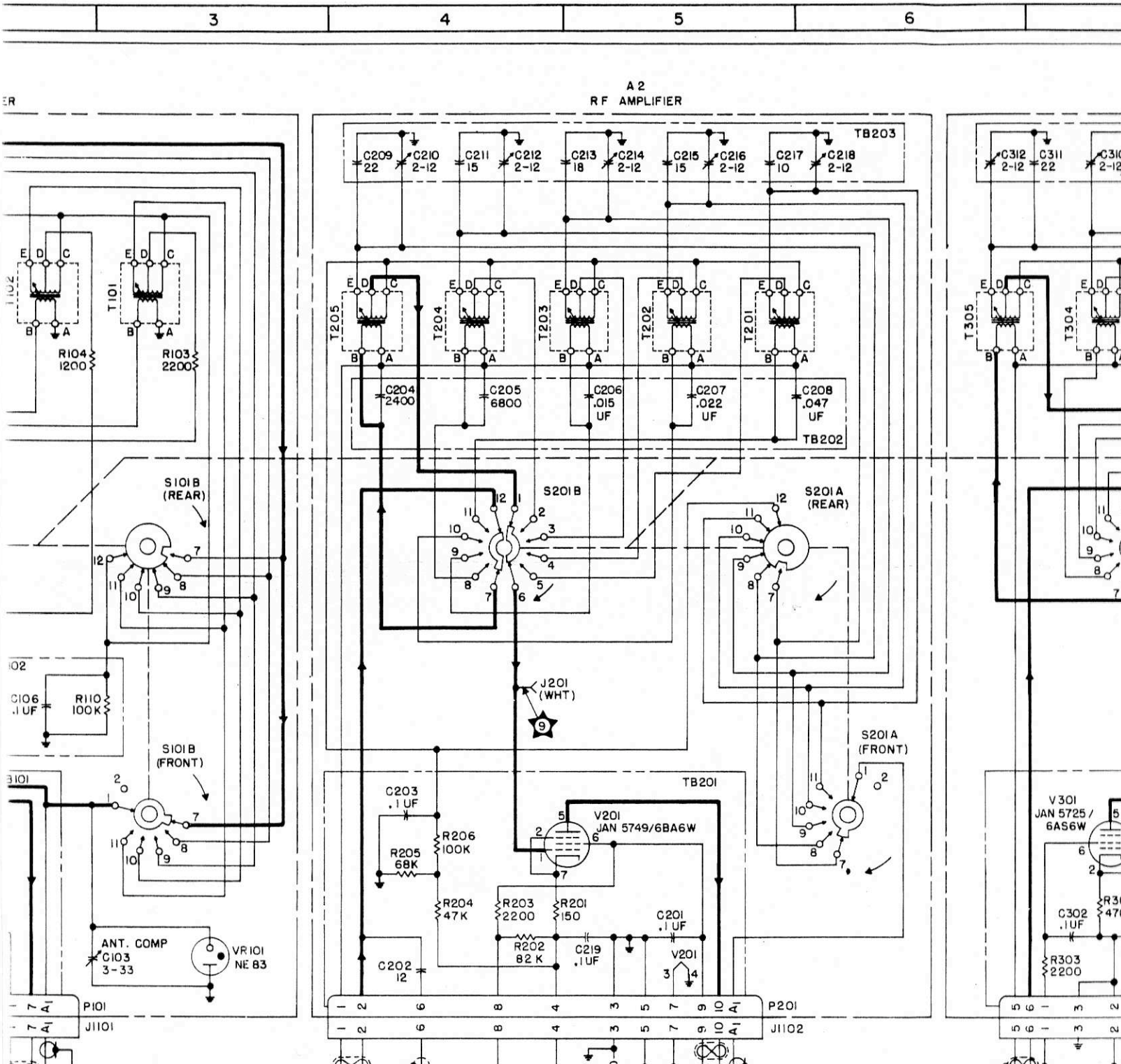


Figure 6-37. Main Chassis, Bottom View, Plug-In Assemblies Removed



REF. CLAVIER DWG. 6143000
91013-TM-68


3
4
5
6
A2
RF AMPLIFIER
TB203
C209 22
C210 2-12
C211 15
C212 2-12
C213 18
C214 2-12
C215 15
C216 2-12
C217 10
C218 2-12
T205
T204
T203
T202
T201
C204 2400
C205 6800
C206 .015 UF
C207 .022 UF
C208 .047 UF
TB202
R104 1200
R103 2200
S101B (REAR)
S201B
S201A (REAR)
J201 (WHT)
C106 .1 UF
R110 100K
S101B (FRONT)
S201A (FRONT)
TB201
C203 .1 UF
R206 100K
R205 68K
V201 JAN 5749/6BA6W
R204 47K
R203 2200
R201 150
C201 .1 UF
R202 82 K
C219 .1 UF
C202 12
ANT. COMP C103 3-33
VR101 NE 83
P101
J1101
P201
J1102
J1101-1
J1101-7
J1109-E
J1103-1
L1101-B
L1101-A SHLD
J1101-10
J1103-2
J1101-9
J1103-9
J1103-5
J1103-6
C1030-1
B
J1102-2
C1030-1
A
T305
T304
C312 2-12
C311 22
V301 JAN 5725/ 6AS6W
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J1102-8
J1108-T
J1102-5
J1104-3

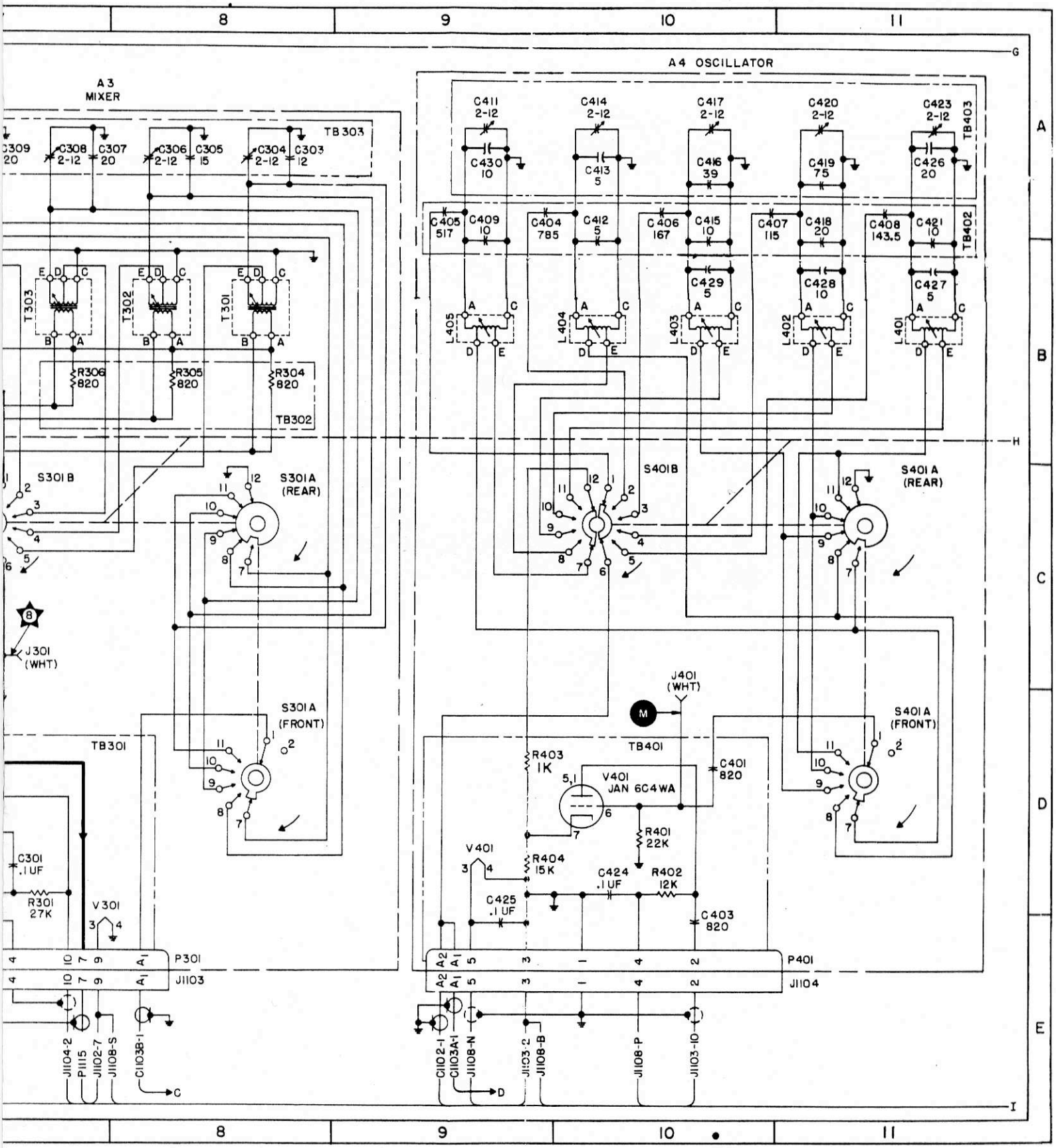

Figure 6-38. Schematic Diagram

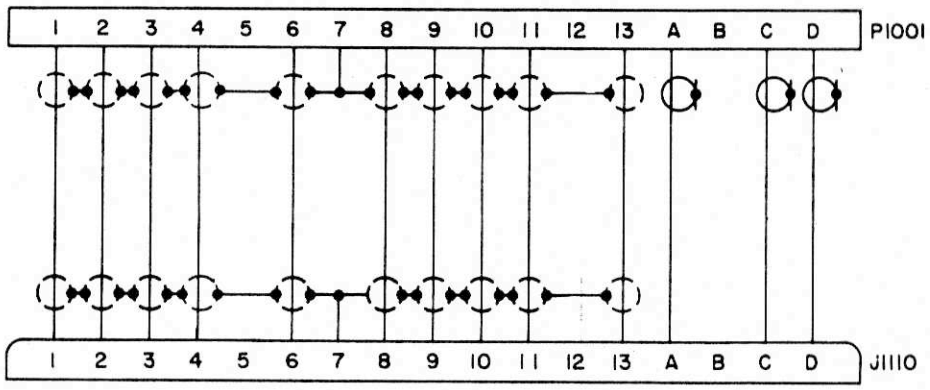

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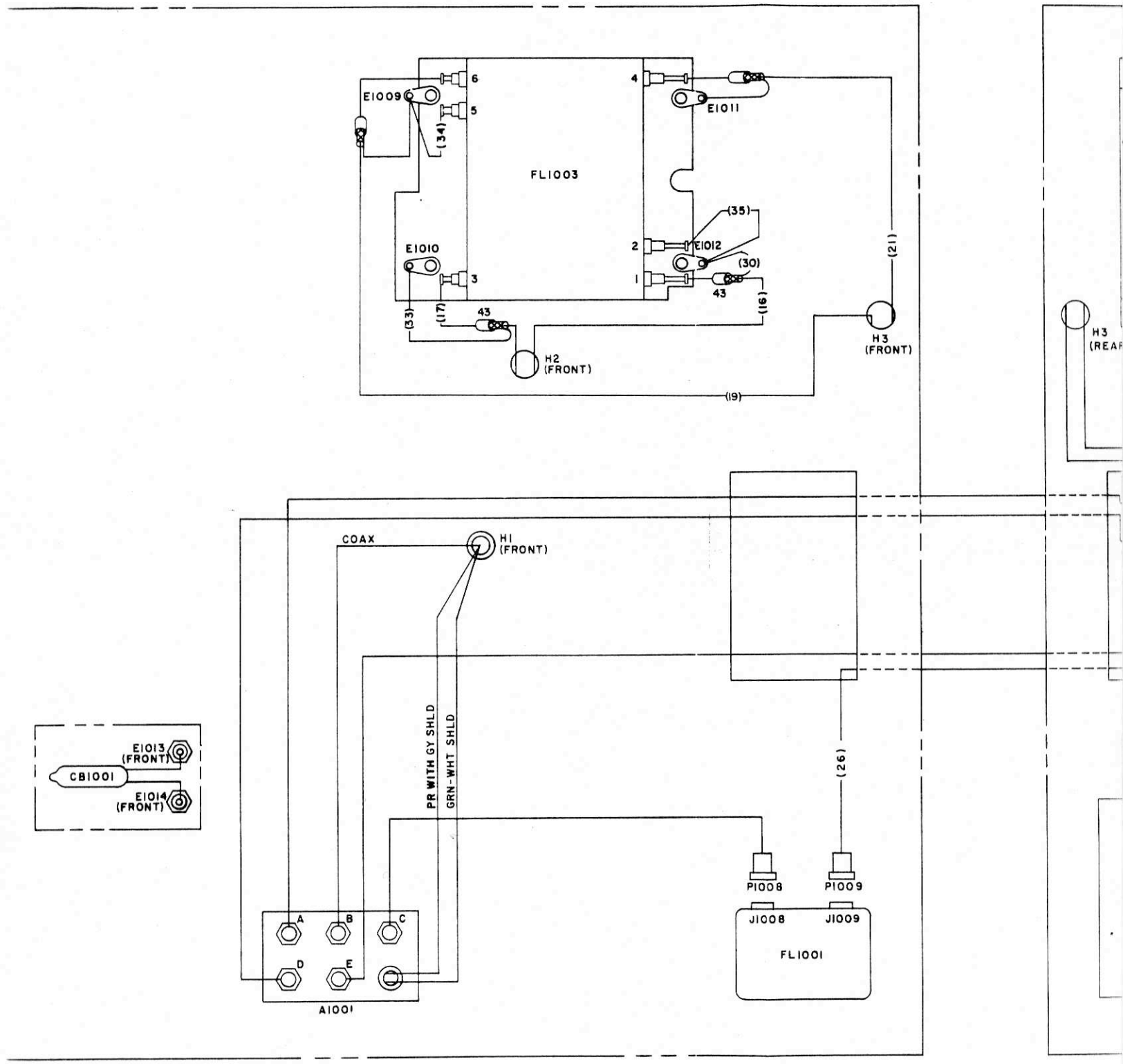
Figure 6-41. Test Cable CX-7860A/WRR-3, Schematic Diagram



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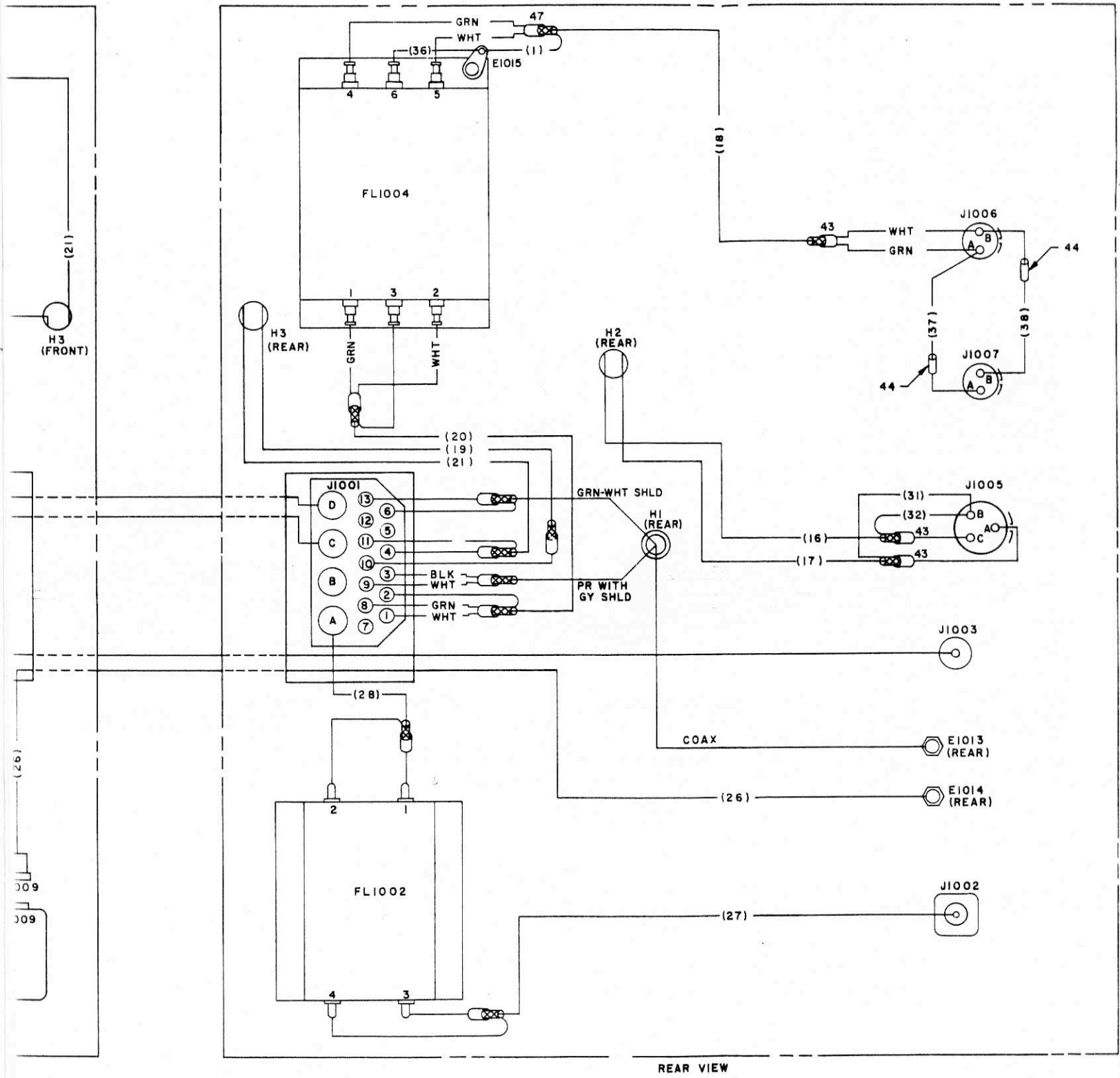
FRONT VIEW
(REF WIRING DIAGRAM 61463012)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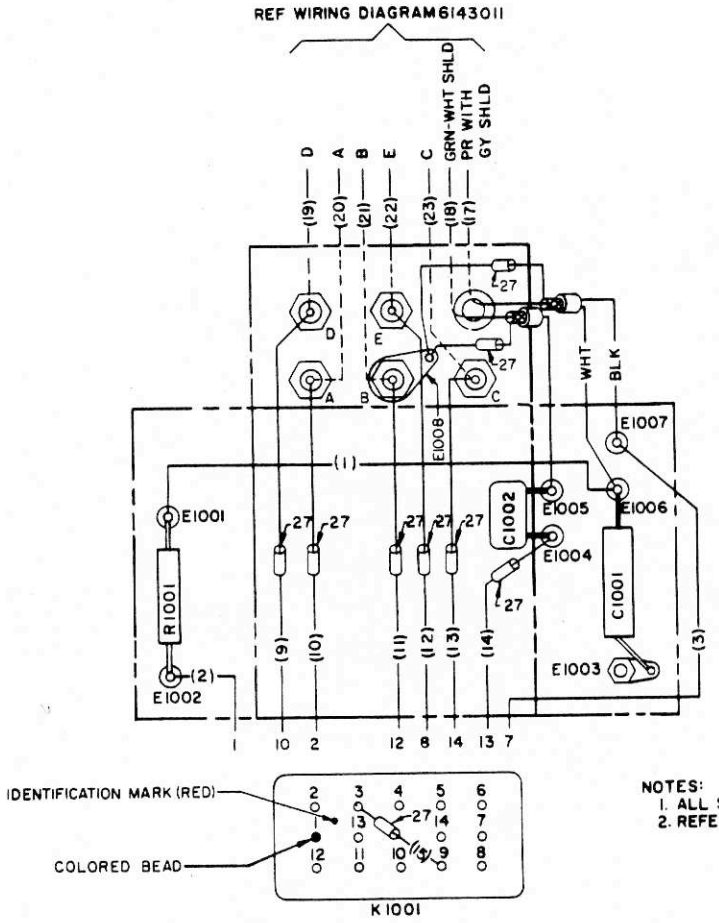
47
WHT
(36)
(1)
E1015
4
6
5
FL1004
1
3
2
(18)
J1006
43
WHT
GRN
B
A
44
(37)
(38)
J1007
44
H3
(FRONT)
(21)
H3
(REAR)
GRN
WHT
H2
(REAR)
(20)
(19)
(21)
J1001
D
C
B
A
13
12
11
10
9
8
6
5
4
3
2
1
7
GRN-WHT SHLD
H1
(REAR)
BLK
WHT
GRN
WHT
PR WITH
GY SHLD
J1005
(31)
(32)
43
43
B
A
C
(16)
(17)
J1003
(28)
COAX
E1013
(REAR)
(26)
E1014
(REAR)
2
1
FL1002
4
3
(27)
J1002
REAR VIEW

WIRE LEGEND			
NO.	DRAWING NO	GA	DESCR
1	6142204-50	24	BLK
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16	6142205-31	20	SHLD
17	6142205-31	↓	↓
18	6142210-16		
19	6140115-801	↓	↓
20	6140114-801	20	SHLD
21	6140115-802	20	SHLD
22			
23			
24			
25			
26	6140113-801	—	COAX
27	6140112-801	—	COAX
28	6140116-801	—	COAX
29			
30	6142207-20	20	BUS
31	↓	↓	↓
32			
33	↓	↓	↓
34	6142207-20	20	BUS
35	↓	↓	↓
36			
37	↓	↓	↓
38	6142207-20	20	BUS
39			
40			
41			
42			
43	6142203-9	9	SLV
44	6142189-527	20	SLV
45			
46			
47	MS25311-130		FERRULE
48			

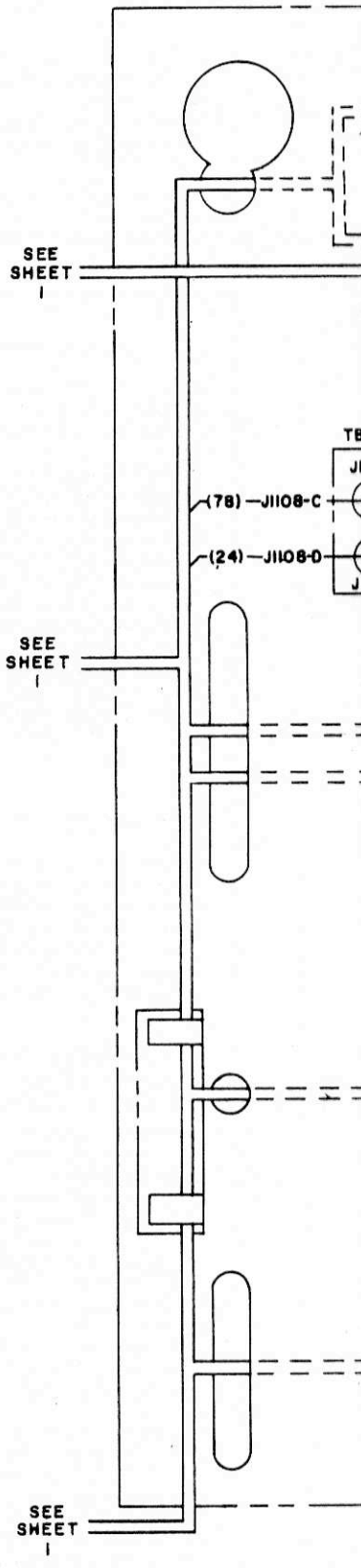
NOTES:
1. ALL SOLDERING TO BE PER MIL-S-6872.
2. REFERENCE SCHEMATIC NO. 6143000



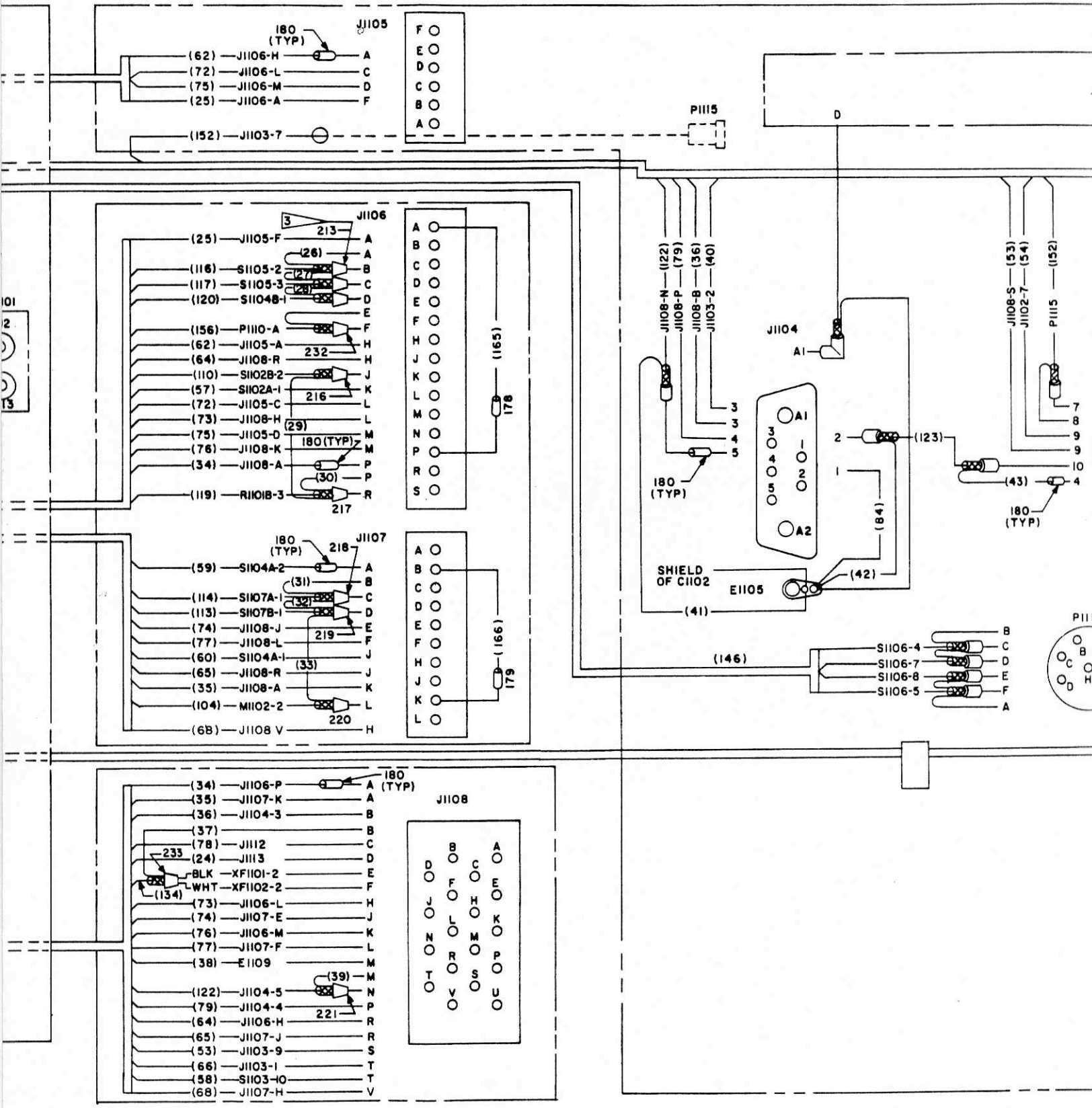
WIRE LEGEND			
NO.	DRAWING NO.	GA	DESCR
1	6142204-52	24	RED
2	6142204-52	24	RED
3	6142204-50	24	BLK
4			
5			
6			
7			
8			
9	6142207-24	24	BUS
10	↑	↑	↑
11			
12			
13			
14	↓	↓	↓
15	6142207-24	24	BUS
16			
17	6140106-801	20	SHLD
18	6140106-803	20	SHLD
19	6140102-801		COAX
20	6140102-801		↑
21	6140104-801		
22	6140111-801		↓
23	6140105-801		COAX
24			
25			
26			
27	6142189-9029	24	SLV
28			

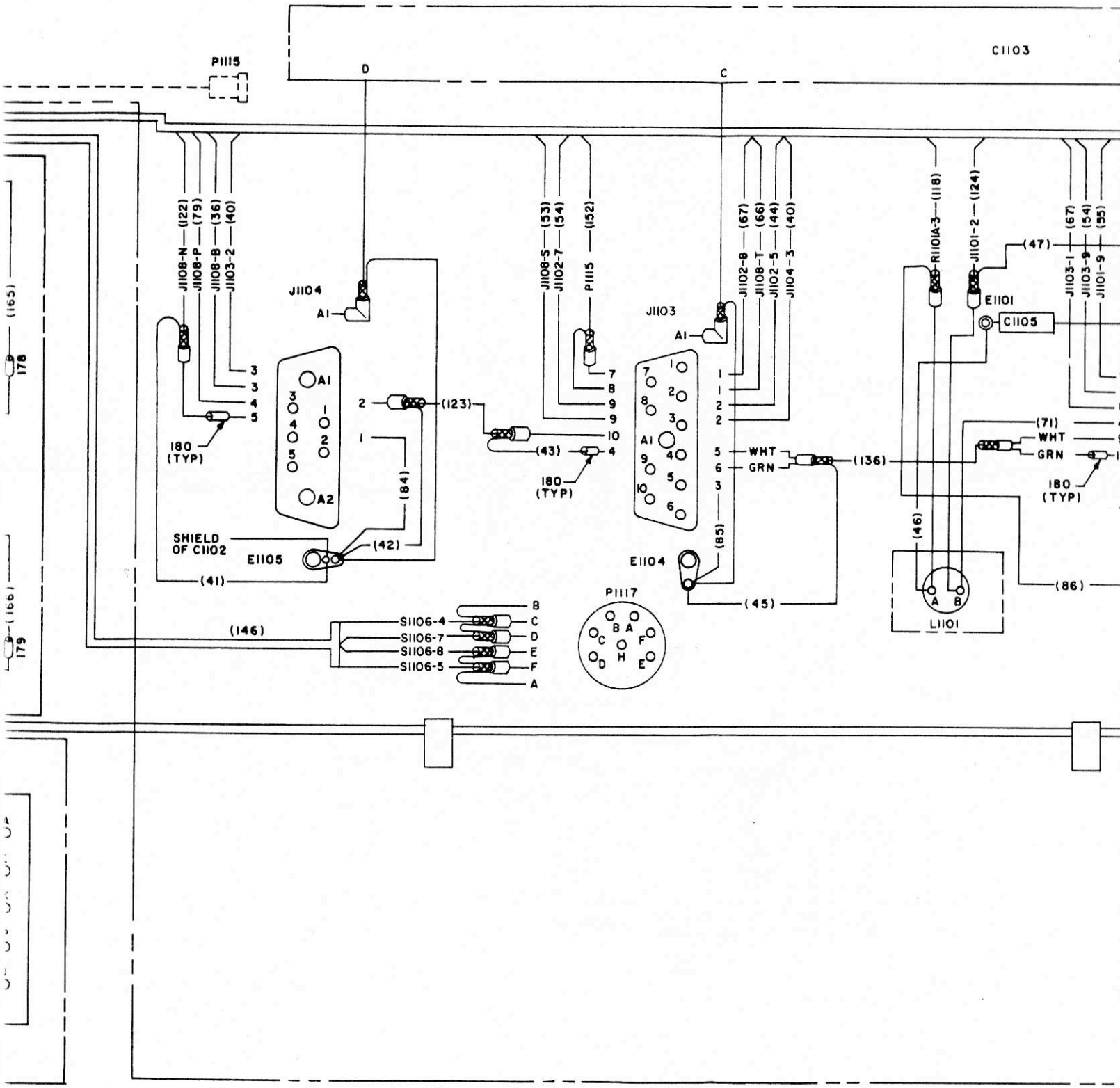
NOTES:
1. ALL SOLDERING TO BE PER MIL-S-6872
2. REFERENCE SCHEMATIC NO. 6143000

Figure 6-40. Wiring Diagram,
Radio Interference Filter



91013-TM-69


J1105
180 (TYP)
(62) J1106-H A
(72) J1106-L C
(75) J1106-M D
(25) J1106-A F
(152) J1103-7
P1115
D
J1106
3
213
(25) J1105-F A
(26) A
(116) S1105-2 B
(27)
(117) S1105-3 C
(28)
(120) S1104B-1 D
E
(156) P1110-A F
(62) J1105-A H
232
(64) J1108-R H
(110) S1102B-2 J
(57) S1102A-1 K
216
(72) J1105-C L
(73) J1108-H L
(29)
(75) J1105-D M
180 (TYP) M
(76) J1108-K M
(34) J1108-A P
(30) P
(119) R1101B-3 R
217
(165)
178
J1107
180 (TYP)
218
(59) S1104A-2 A
(31) B
(114) S1107A-1 C
(32)
(113) S1107B-1 D
(74) J1108-J E
219
(77) J1108-L F
(60) S1104A-1 J
(33)
(65) J1108-R J
(35) J1108-A K
(104) M1102-2 L
220
(68) J1108 V H
(166)
179
J1108
180 (TYP)
(34) J1106-P A
(35) J1107-K A
(36) J1104-3 B
(37) B
(78) J1112 C
233
(24) J1113 D
BLK XF1101-2 E
(134)
WHT XF1102-2 F
(73) J1106-L H
(74) J1107-E J
(76) J1106-M K
(77) J1107-F L
(38) E1109 M
(39) M
(122) J1104-5 N
(79) J1104-4 P
221
(64) J1106-H R
(65) J1107-J R
(53) J1103-9 S
(66) J1103-1 T
(58) S1103-10 T
(68) J1107-H V
J1108-N (122)
J1108-P (79)
J1108-B (36)
J1103-2 (40)
J1104
A1
3
3
4
5
180 (TYP)
A1
A2
2
1
(123)
(84)
SHIELD OF C1102
E1105
(42)
(41)
J1108-S (53)
J1102-7 (54)
P1115 (152)
7
8
9
9
10
(43)
4
180 (TYP)
(146)
S1106-4 B
S1106-7 C
S1106-8 D
S1106-5 E
F
A
P11


P1115
C1103
D
C
J1104
A1
J1103
A1
J1108-N (122)
J1108-P (79)
J1108-B (36)
J1103-2 (40)
J1108-S (53)
J1102-7 (54)
P1115 (152)
J1102-8 (67)
J1108-T (66)
J1102-5 (44)
J1104-3 (40)
R1101A-3 (118)
J1101-2 (124)
J1103-1 (67)
J1103-9 (54)
J1101-9 (55)
(47)
E1101
C1105
(71)
WHT
GRN
(136)
WHT
GRN
180 (TYP)
180 (TYP)
180 (TYP)
(123)
(43)
(84)
(42)
(41)
SHIELD OF C1102
E1105
E1104
(85)
(45)
(46)
(86)
L1101
A
B
(146)
S1106-4
S1106-7
S1106-8
S1106-5
B
C
D
E
F
A
P1117
(165)
178
(166)
179

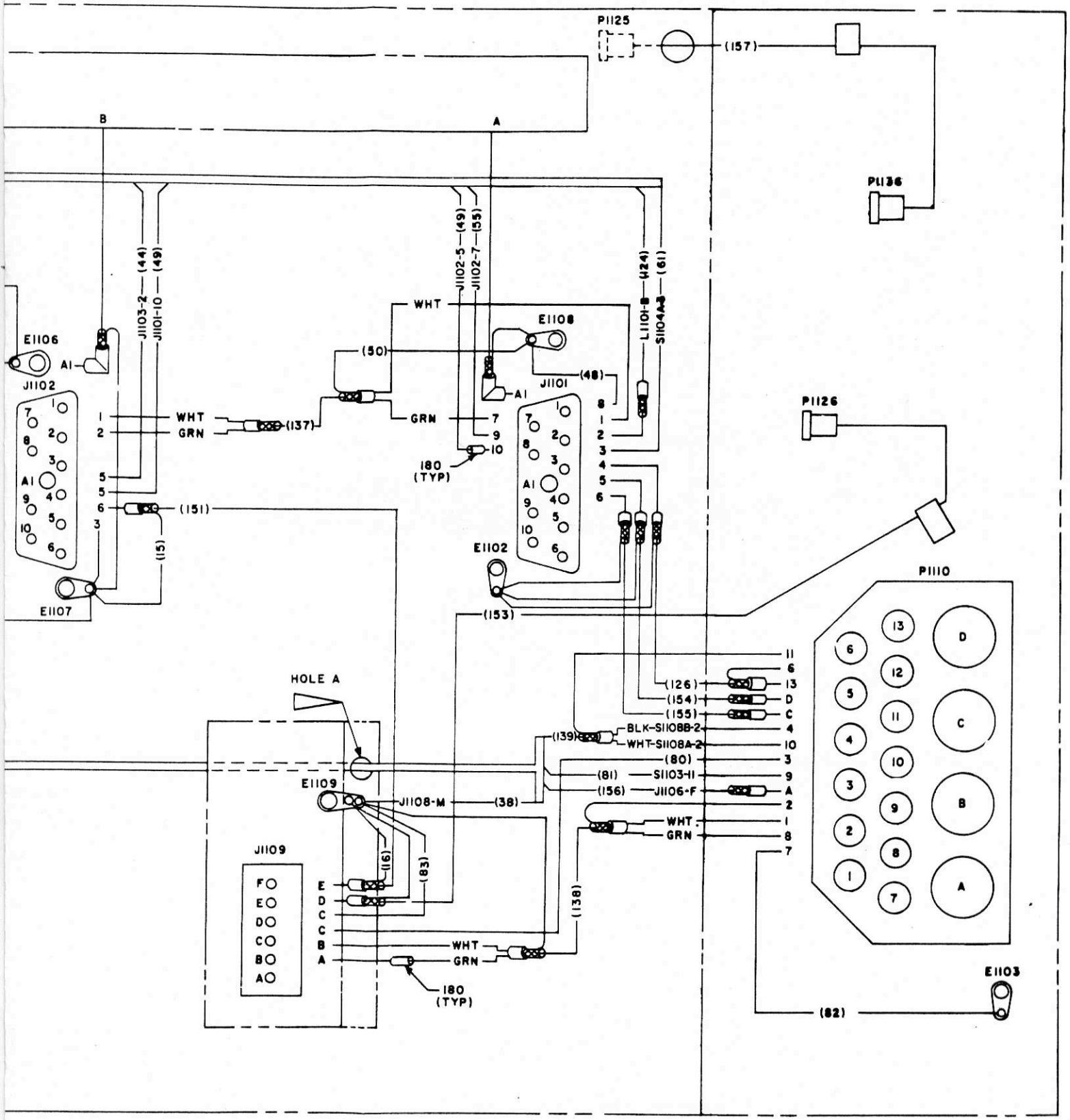
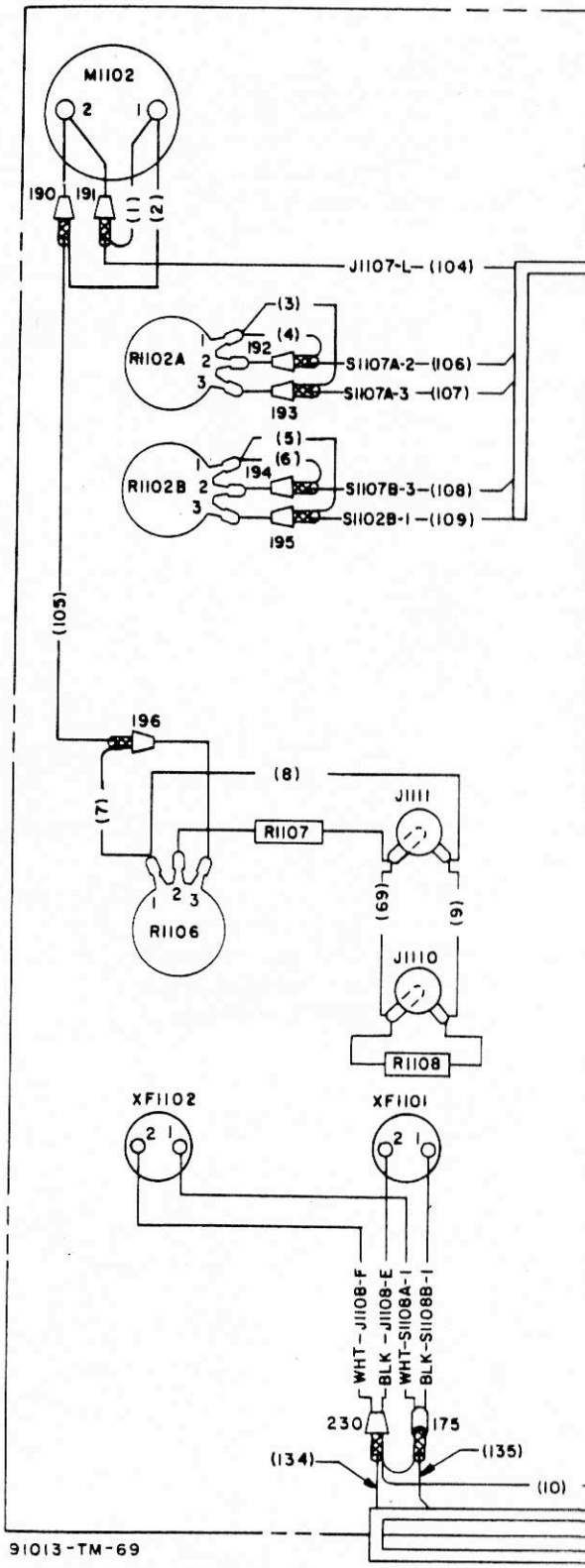


Figure 6-39. Wiring Diagram, Front Panel (Sheet 2 of 2)


M1102
2
1
190
191
(1)
(2)
J1107-L-(104)
(3)
(4)
192
R1102A
2
3
S1107A-2-(106)
S1107A-3-(107)
193
(5)
(6)
194
R1102B
2
3
S1107B-3-(108)
S1102B-1-(109)
195
(105)
196
(8)
(7)
J1111
R1107
1
2
3
R1106
(69)
(9)
J1110
R1108
XF1102
XF1101
2
1
WHT-J1108-F
BLK-J1108-E
WHT-S1108A-1
BLK-S1108B-1
230
175
(134)
(135)
(10)
91013-TM-69

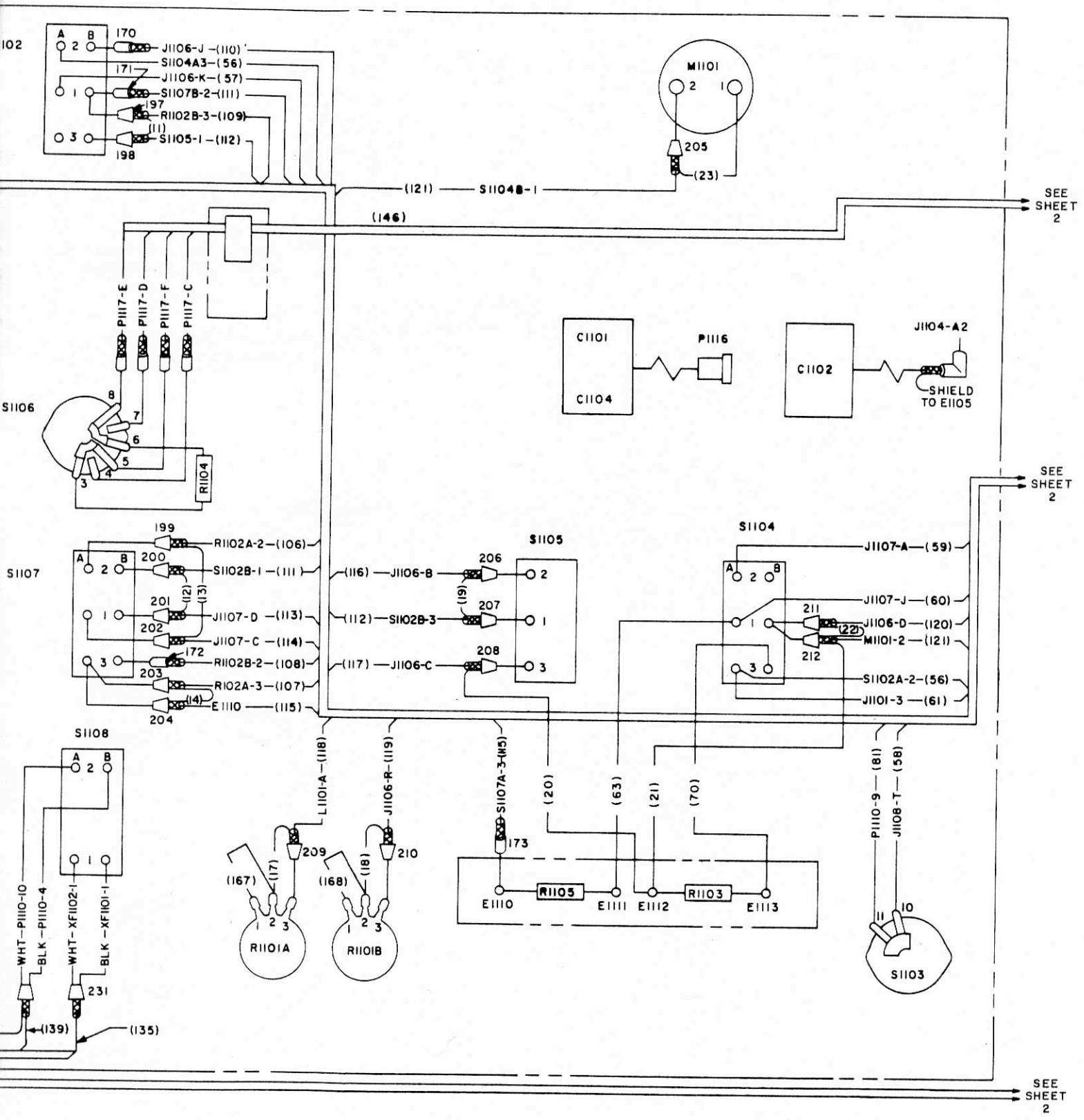
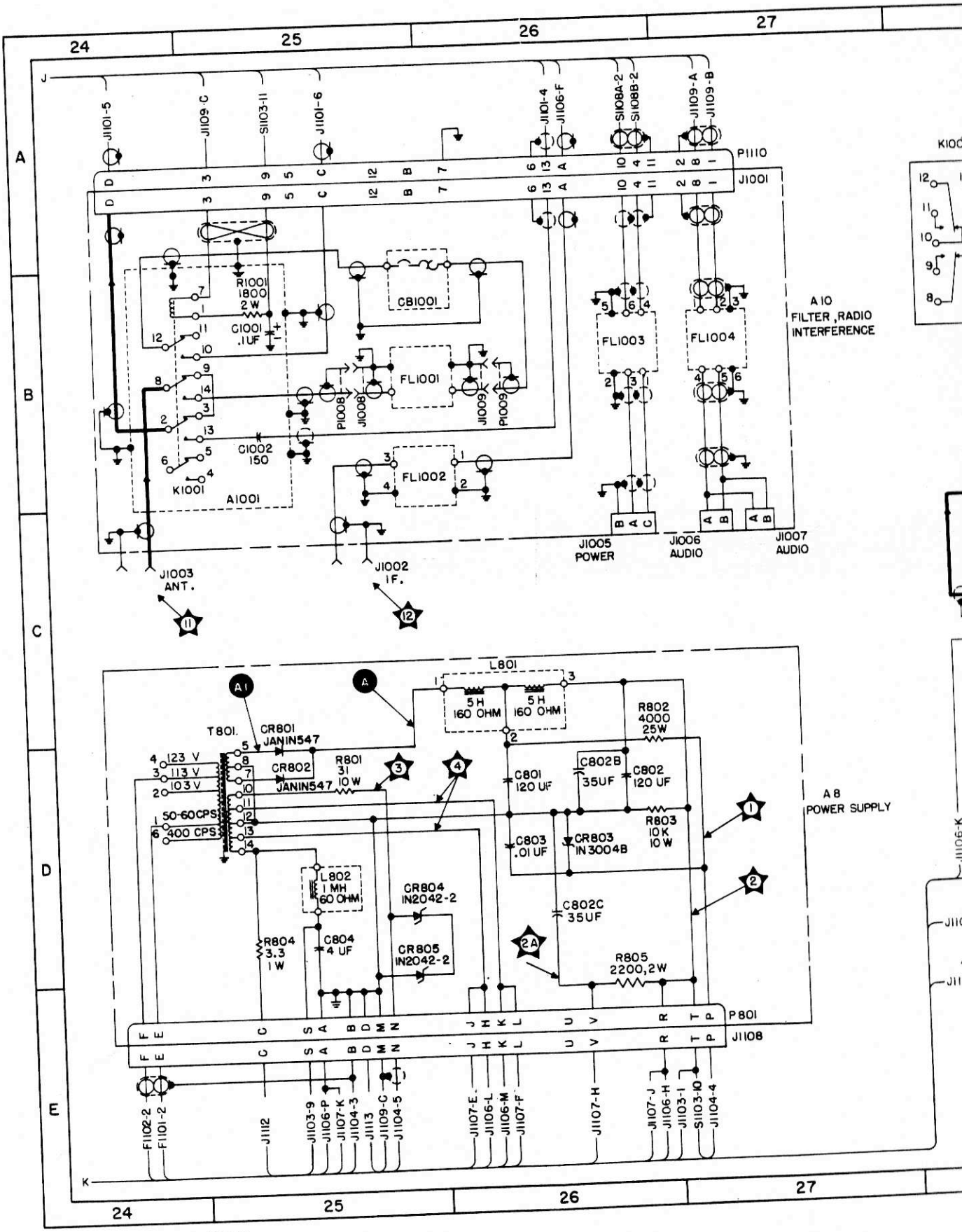
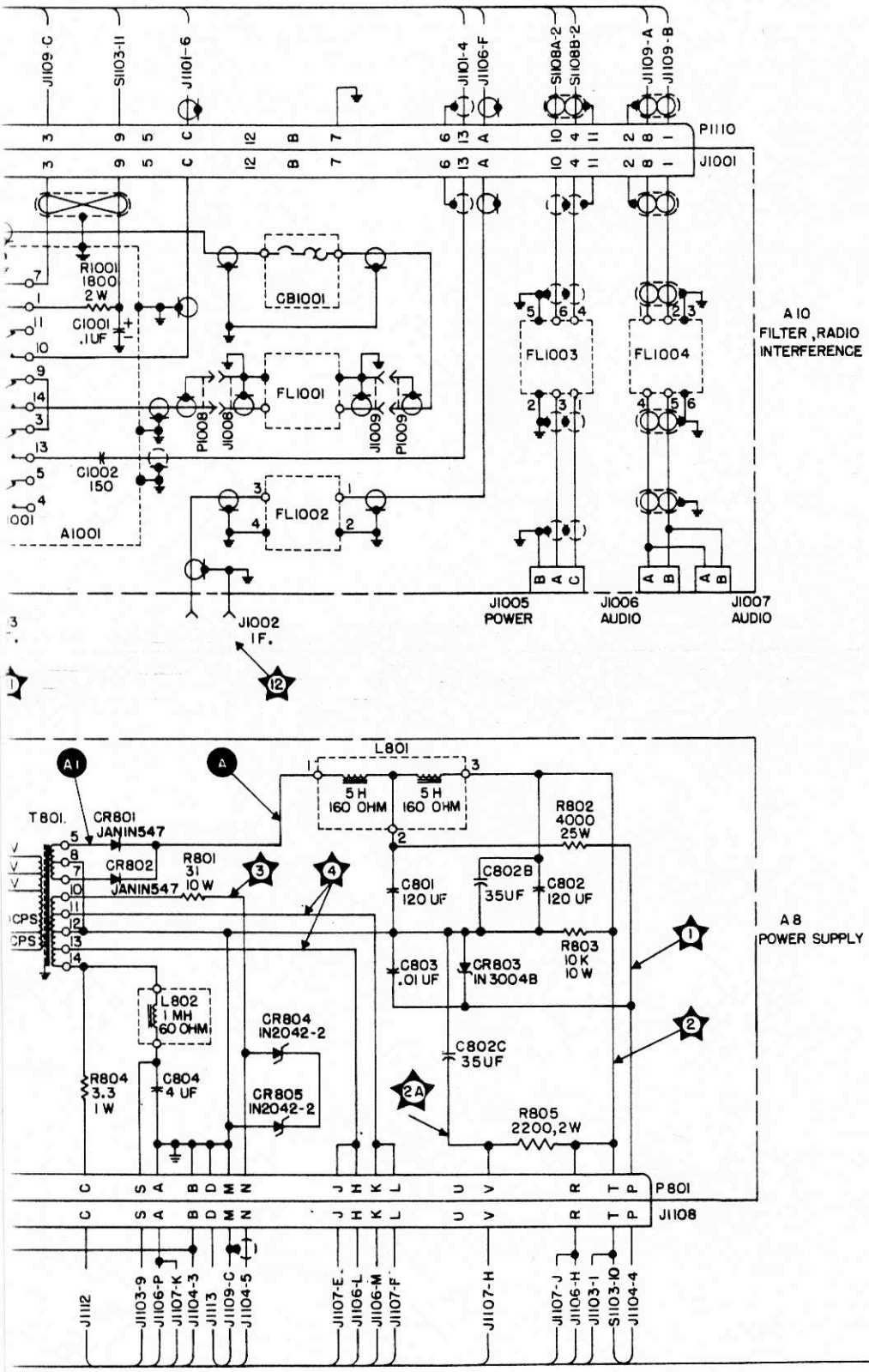


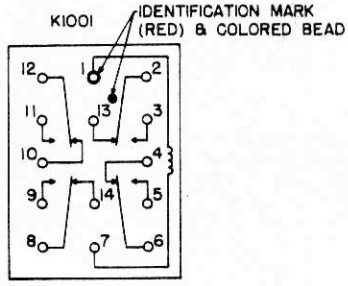
Figure 6-39. Wiring Diagram, Front Panel (Sheet 1 of 2)



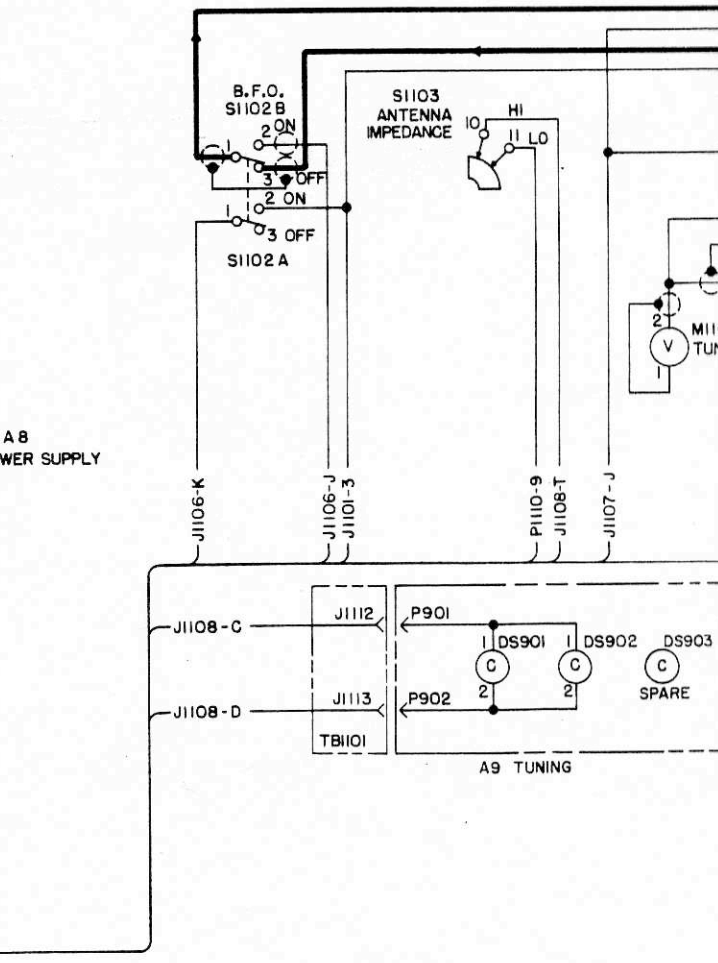
REF: CLAVIER DWG. 6143000

91013-TM-68





NOTES :
1. UNLESS O
ALL RESIS
ALL CAPA
2. K INDICATI
3. MEG INDIC
4. W INDICAT
5. UF INDICA
6. H INDICAT
7. MH INDICA
8. KC INDICA
9. ALL WAFE
ACTUATOR
POSITION
SHOWN IN
10. INDI
11. INDI



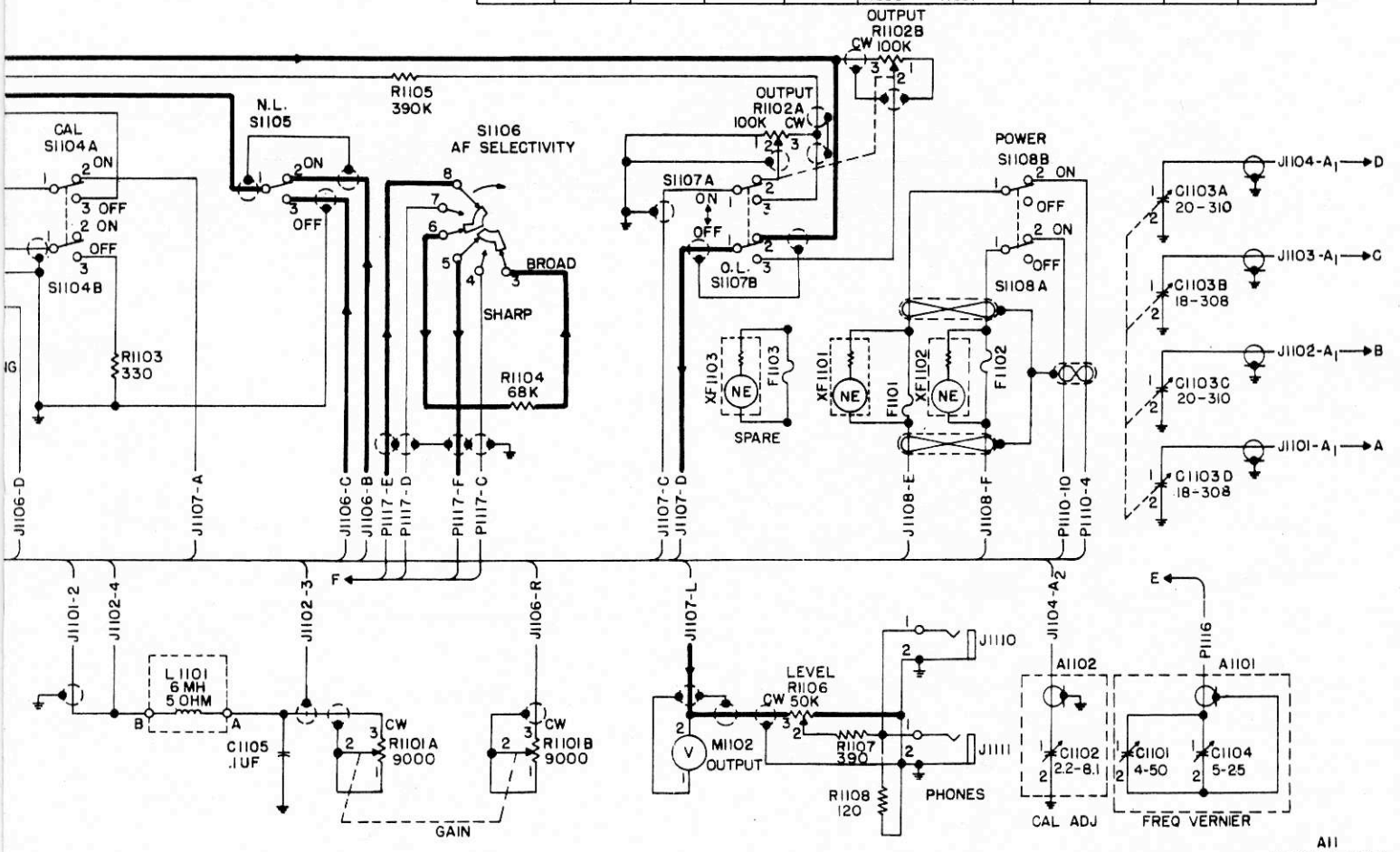
	30	31	32	33	34	

HERWISE SPECIFIED :
TANCE VALUES ARE IN OHMS .
ITANCE VALUES ARE IN MICROMICROFARADS .
S THOUSANDS OF OHMS .
TES MILLIONS OF OHMS .
S WATTS .
ES MICROFARADS .
S HENRIES .
ES MILLIHENRIES .
ES KILOCYCLE .
SWITCH SECTIONS ARE VIEWED FROM
END WITH SWITCH IN COUNTERCLOCKWISE
XCEPT SWITCHES S501, S502 & S601
CLOCKWISE POSITION .

ATES MAJOR TEST POINT .

ATES MINOR TEST POINT .

ANT.	R F AMPL	MIXER	O S C	1 ST I.F.	2 ND I.F.	AUDIO	PWR SUPPLY	TUNING	FILTER	FRAME & PANEL
LAST NUMBERS USED:										
C107 J101 P101 R110 S101 T105 V101 TB102 VR101	C219 J201 P201 R206 S201 T205 V201 TB203	C312 J301 P301 R306 S301 T305 V301 TB303	C430 J401 L405 P401 R404 S401 V401 TB403	C514 J505 P501 R506 S502 T501 V501 Y501 FL501 TB501	C640 J612 P605 R637 S601 V606 Z604 CR602 FL601 TB601	C723 J711 P705 R745 T701 V705 Y701 FL701 CR703	C804 L802 P801 R805 T801 CR805	P902 DS903	C1002 J1009 K1001 P1009 R1001 CB1001 FL1004 A1001	C1105 F1103 J1113 L1101 M1102 R1108 S1108 TB1101 P1136 A1102
NUMBERS NOT USED:										
C101 R101			C402 C410 C422	C512	C604 C605 C606 C610 C611 C612 C615 C616 C628 C627 P602 P603 R602 R603 R607 R630	J702 P703 R702 THRU R709 R714 R717 R724 CR701 R631			J1004 P1001 THRU P1007	S1101 P1101 THRU P1109 P1118 THRU P1124 P1127 THRU P1135 P1111 THRU P1114



	30	31	32	33	34	

Figure 6-38. Schematic Diagram

Ref. Desig.	Coordinates	R
A1	1A to 3D	
A2	4A to 6D	
A3	6A to 8D	
A4	9A to 11D	
A5	12A to 13D	
A6	14A to 19D	
A7	19A to 23D	
A8	24C to 27D	
A9	28D	
A10	24A to 27B	
A11	1A thru 34E	
A1001	25B	
A1101	33E	
A1102	33E	
C101	not used	
C102	1D	
C103	3D	
C104	2D	
C105	2D	
C106	2C	
C107	1A	
C201	5D	
C202	4D	
C203	4D	
C204	4B	
C205	4B	
C206	5B	
C207	5B	
C208	6B	
C209	4A	
C210	4A	
C211	4A	
C212	4A	
C213	5A	
C214	5A	
C215	5A	
C216	5A	
C217	5A	
C218	6A	
C219	5D	
C301	7D	
C302	7D	
C303	8A	
C304	8A	
C305	8A	
C306	8A	
C307	7A	
C308	7A	
C309	7A	
C310	7A	
C311	7A	
C312	6A	
C401	10D	
C402	not used	
C403	10D	

f. Desig.	Coordinates
C404	7B
C405	9B
C406	10B
C407	10B
C408	11B
C409	9B
C410	not used
C411	9A
C412	10B
C413	10A
C414	10A
C415	10B
C416	10B
C417	10A
C418	11B
C419	11A
C420	11A
C421	11B
C422	not used
C423	11A
C424	10D
C425	9D
C426	11A
C427	11B
C428	11B
C429	10B
C430	9A
C501	13D
C502	13C
C503	13B
C504	12C
C505	12C
C506	12C
C507	13B
C508	13B
C509	12B
C510	12C
C511	not used
C512	13D
C513	12D
C514	15B
C601	15C
C602	15B
C603	not used
C604	not used
C605	not used
C606	15B
C607	16B
C608	17C
C609	not used
C610	not used
C611	not used
C612	17C
C613	18B
C614	not used
C615	not used
C616	19B
C617	18B
C618	
C619	

Ref. Desig.	Coordinates
C620	15D
C621	14D
C622	17C
C623	17D
C624	18C
C625	18D
C626	18D
C627	not used
C628	not used
C629	16C
C630	16D
C631	17C
C632	17D
C633	17D
C634	18C
C635	18D
C636	19D
C637	18D
C638	16D
C639	17D
C640	17D
C701	23C
C702	22B
C703	20D
C704	19C
C705	19B
C706	20C
C707	20C
C708	20B
C709	21B
C710	22B
C711	23B
C712	20D
C713	20D
C714	21C
C715	21C
C716	21D
C717	21C
C718	21C
C719	21C
C720	22C
C721	23D
C722	21D
C723	21D
C801	26D
C802	26D
C803	26D
C804	25D
C1001	25B
C1002	25B
C1101	33E
C1102	33E
C1103	33D
C1104	33E
C1105	30E

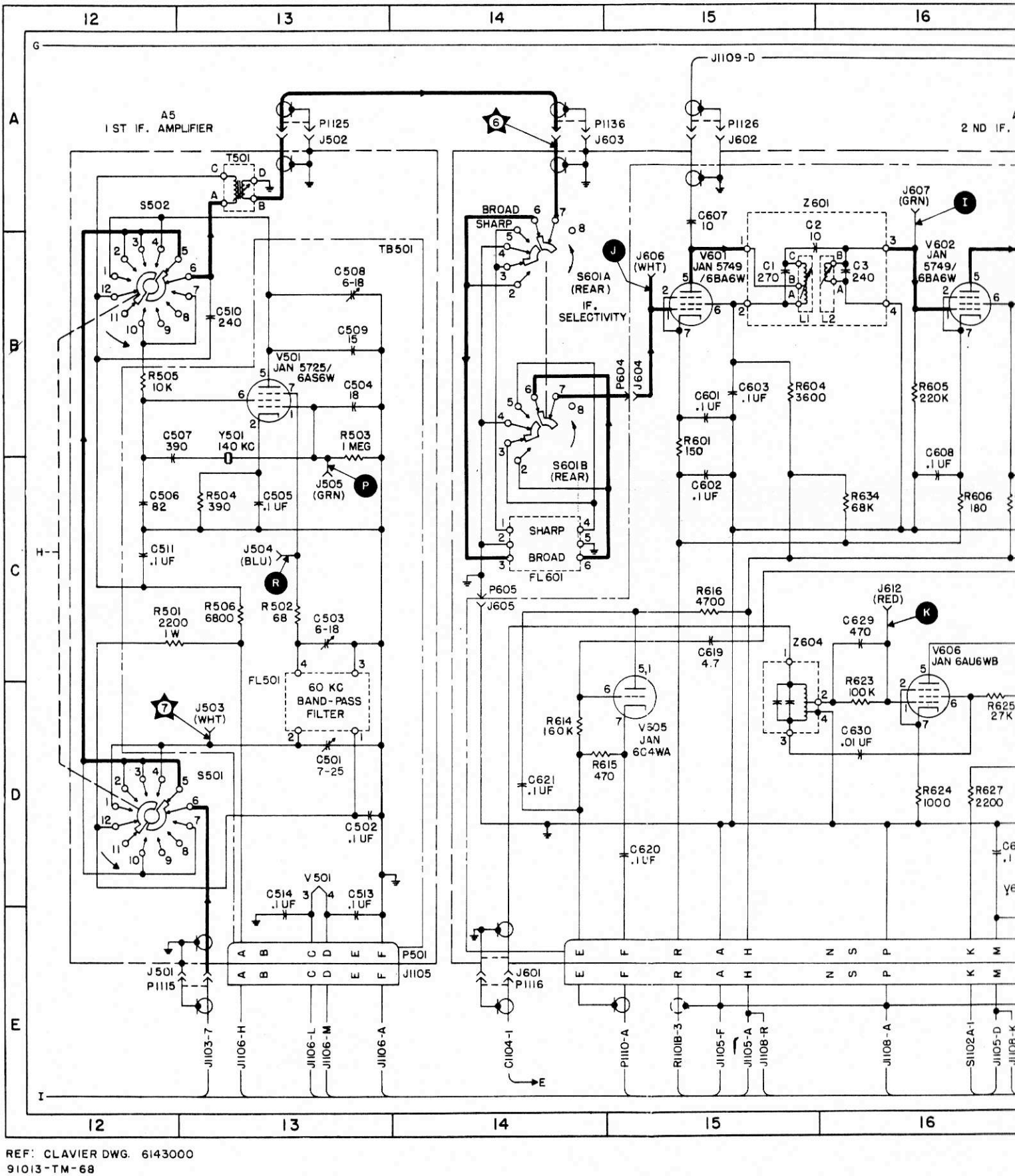
Ref. Desig.	Coordinates
CB1001	26B
CR601	19B
CR602	19D
CR701	not used
CR702	21B
CR703	21B
CR801	25D
CR802	25D
CR803	26D
CR804	25D
CR805	25E
DS901	29E
DS902	29E
DS903	29E
F1101	32D
F1102	33D
F1103	32D
FL501	13D
FL601	14C
FL701	19B
FL1001	26B
FL1002	26C
FL1003	26B
FL1004	27B
J101 ★ 10	1C
J201 ★ 9	4C
J301 ★ 8	7C
J401 ● M	10C
J501	12E
J502	13B
J503 ★ 7	12D
J504 ● R	12C
J505 ● P	13C
J601	14E
J602	15A
J603 ★ 6	14A
J604	15B
J605	14C
J606 ● J	15B
J607 ● I	16B
J608 ● H	17B
J609 ● F	18B
J610 ● G	18C
J611 ● L	18D
J612 ● K	16C
J701	19E
J702	not used
J703 E	20B
J704	20D
J705	19C
J706 ● D	20B
J707 ● C	22B
J708 ● B	22B
J709 ● N	20D
J710 ● O	23D

Ref. Desig.	Coordin
J711 ★ 5	20D
J1001	26A
J1002 ★ 12	25C
J1003 ★ 11	24C
J1004	not use
J1005	26C
J1006	27C
J1007	27C
J1008	25B
J1009	26B
J1101	2E
J1102	5E
J1103	7E
J1104	10E
J1105	13E
J1106	17E
J1107	21E
J1108	26E
J1109	23A
J1110	32D
J1111	32E
J1112	28D
J1113	28E
K1001	24B
L401	11B
L402	11B
L403	10B
L404	10B
L405	9B
L801	26C
L802	25D
L1101	30E
M1101	29D
M1102	32E
P101	2E
P201	5E
P301	7E
P401	10E
P501	12E
P601	17E
P602	not us
P603	not us
P604	18B
P605	14C
P701	21E
P702	23A
P703	not us
P704	19D
P705	19C
P801	26E
P901	28D
P902	28E
P1001	not u
P1002	not u
P1003	not u

nates	Ref. Desig.	Coordinates	Ref. Desig.	Coordinates	Ref. Desig.	Coordinates	Ref. Desig.
	CB1001	26B	J711 ★ 5	20D	P1004	not used	R204
	CR601	19B	J1001	26A	P1005	not used	R205
	CR602	19D	J1002 ★ 12	25C	P1006	not used	R206
	CR701	not used	J1003 ★ 11	24C	P1007	not used	R301
	CR702	21B	J1004	not used	P1008	25B	R302
	CR703	21B	J1005	26C	P1009	26B	R303
	CR801	25D	J1006	27C	P1101	not used	R304
ed	CR802	25D	J1007	27C	P1102	not used	R305
ed	CR803	26D	J1008	25B	P1103	not used	R306
	CR804	25D	J1009	26B	P1104	not used	R401
	CR805	25E	J1101	2E	P1105	not used	R402
	DS901	29E	J1102	5E	P1106	not used	R403
	DS902	29E	J1103	7E	P1107	not used	R404
	DS903	29E	J1104	10E	P1108	not used	R501
	F1101	32D	J1105	13E	P1109	not used	R502
	F1102	33D	J1106	17E	P1110	26A	R503
	F1103	32D	J1107	21E	P1111	not used	R504
	FL501	13D	J1108	26E	P1112	not used	R505
	FL601	14C	J1109	23A	P1113	not used	R506
	FL701	19B	J1110	32D	P1114	not used	R601
	FL1001	26B	J1111	32E	P1115	12E	R602
	FL1002	26C	J1112	28D	P1116	14E	R603
	FL1003	26B	J1113	28E	P1117	19E	R604
	FL1004	27B	K1001	24B	P1118	not used	R605
	J101 ★ 10	1C	L401	11B	P1119	not used	R606
	J201 ★ 9	4C	L402	11B	P1120	not used	R607
	J301 ★ 8	7C	L403	10B	P1121	not used	R608
	J401 ● M	10C	L404	10B	P1122	not used	R609
	J501	12E	L405	9B	P1123	not used	R610
	J502	13B	L801	26C	P1124	not used	R611
	J503 ★ 7	12D	L802	25D	P1125	13A	R612
	J504 ● R	12C	L1101	30E	P1126	15A	R613
	J505 ● P	13C	M1101	29D	P1127	not used	R614
	J601	14E	M1102	32E	P1128	not used	R615
	J602	15A	P101	2E	P1129	not used	R616
	J603 ★ 6	14A	P201	5E	P1130	not used	R617
	J604	15B	P301	7E	P1131	not used	R618
	J605	14C	P401	10E	P1132	not used	R619
	J606 ● J	15B	P501	12E	P1133	not used	R620
	J607 ● I	16B	P601	17E	P1134	not used	R621
	J608 ● H	17B	P602	not used	P1135	not used	R622
	J609 ● F	18B	P603	not used	P1136	14A	R623
	J610 ● G	18C	P604	18B	R101	not used	R624
	J611 ● L	18D	P605	14C	R102	1D	R625
	J612 ● K	16C	P701	21E	R103	3B	R626
	J701	19E	P702	23A	R104	2B	R627
	J702	not used	P703	not used	R105	2B	R628
	J703 E	20B	P704	19D	R106	2B	R629
	J704	20D	P705	19C	R107	1B	R630
	J705	19C	P801	26E	R108	1D	R631
	J706 ● D	20B	P901	28D	R109	2D	R632
	J707 ● C	22B	P902	28E	R110	2C	R633
	J708 ● B	22B	P1001	not used	R201	4D	R634
	J709 ● N	20D	P1002	not used	R202	4D	R635
	J710 ● O	23D	P1003	not used	R203	4D	R636

Coordinates	Ref. Desig.	Coordinates	Ref. Desig.	Coordinates	Ref. Desig.	Coordinates
4D	R637	18C	R1105	31C	V501	12B
4D	R701	19C	R1106	32E	V601	15B
4D	R702	not used	R1107	32E	V602	16B
7D	R703	not used	R1108	32E	V603	18B
7D	R704	not used	S101	3C & 3D	V604	17D
7D	R705	not used	S201	5C & 5D	V605	15D
8B	R706	not used	S301	8C & 8D	V606	16D
8B	R707	not used	S401	11C & 11D	V701	20D
7B	R708	not used	S501	12D	V702	20B & 22B
10D	R709	not used	S502	12B	V703	23B
10D	R710	19D	S601	14A & 14B	V704	21D
9D	R711	20C	S1101	not used	V705	22D
9D	R712	20C	S1102	28C	VR101	3D
12C	R713	19C	S1103	28C	XF1101	32D
13C	R714	not used	S1104	29C	XF1102	32D
13C	R715	20C	S1105	30C	XF1103	32D
12C	R716	20C	S1106	31C	Y501	12C
12B	R717	not used	S1107	32C	Y701	20C
12C	R718	20B	S1108	33C	Z601	16B
15B	R719	20B	T101	3B	Z601C1	15B
not used	R720	21B	T102	2B	Z601C2	16B
not used	R721	21C	T103	2B	Z601C3	16B
15B	R722	21B	T104	1B	Z601L1	15B
16B	R723	21C	T105	2B	Z601L2	16B
16C	R724	not used	T201	5B	Z602	17B
not used	R725	21B	T202	5B	Z602C1	17B
16C	R726	21C	T203	5B	Z602C2	17B
17B	R727	21B	T204	4B	Z602C3	17B
17C	R728	22C	T205	4B	Z602L1	17B
18C	R729	22B	T301	8B	Z602L2	17B
18B	R730	22B	T302	8B	Z603	18B
18C	R731	22C	T303	7B	Z603C1	18B
14D	R732	22C	T304	7B	Z603C2	18B
14D	R733	22B	T305	6B	Z603L1	18B
15C	R734	22C	T501	12A	Z603T1	18B
17D	R735	21D	T701	23B	Z604	15D
17D	R736	21D	T801	24D		
17D	R737	21C	TB101	2D		
17C	R738	21C	TB102	2C		
17D	R739	21D	TB201	5D		
18D	R740	22D	TB202	5B		
16D	R741	22D	TB203	5A		
16D	R742	22C	TB301	7D		
16D	R743	23C	TB302	8B		
16C	R744	22D	TB303	8A		
16D	R745	22C	TB401	10D		
18C	R801	25D	TB402	10B		
18D	R802	26D	TB403	10A		
not used	R803	26D	TB501	12C		
not used	R804	25E	TB601	15A thru 18D		
18D	R805★2A	26E	TB1101	28E		
19D		25B	V101	2D		
16C	R1001	31E	V201	5D		
18B	R1101	32C	V301	7D		
18C	R1102	30D	V401	10D		
	R1103	31D				
	R1104					

Figure 6-38. Schematic Diagram (Sheet 1 of 4)



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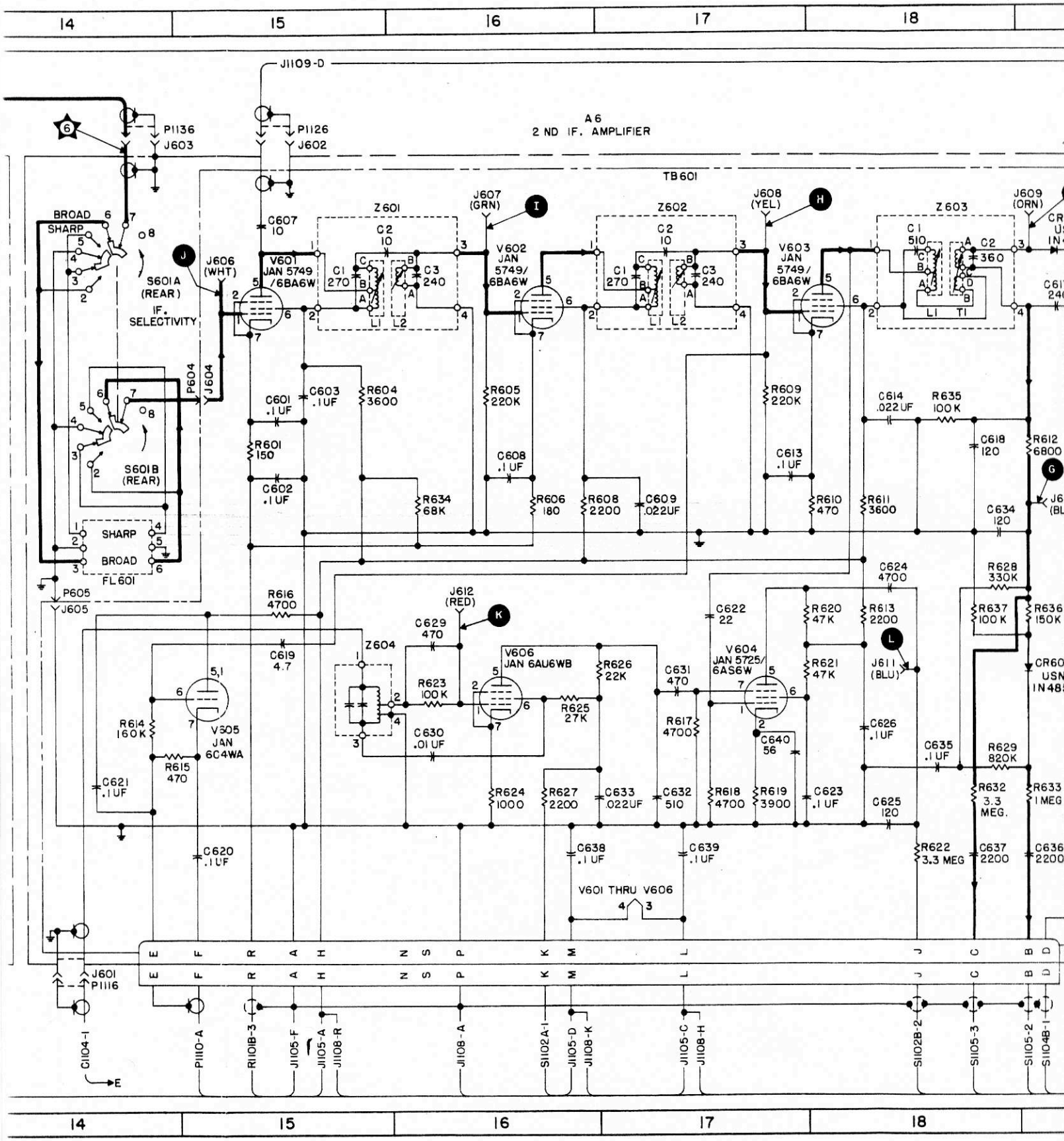
91013-TM-68


14
15
16
17
18
A6
2 ND IF. AMPLIFIER
J1109-D
P1136
J603
P1126
J602
TB601
BROAD
SHARP
S601A
(REAR)
IF.
SELECTIVITY
S601B
(REAR)
FL601
SHARP
BROAD
P604
J604
P605
J605
J606
(WHT)
J607
(GRN)
J608
(YEL)
J609
(ORN)
J611
(BLU)
J612
(RED)
J601
P1116
V601
JAN 5749
/6BA6W
V602
JAN
5749/
6BA6W
V603
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V604
JAN 5725/
6AS6W
V605
JAN
6C4WA
V606
JAN 6AU6WB
V601 THRU V606
Z601
Z602
Z603
Z604
C601 .1 UF
C602 .1 UF
C603 .1 UF
C607 10
C608 .1 UF
C609 .022UF
C613 .1 UF
C614 .022 UF
C618 120
C619 4.7
C620 .1 UF
C621 .1 UF
C622 22
C623 .1 UF
C624 4700
C625 120
C626 .1 UF
C629 470
C630 .01 UF
C631 470
C632 510
C633 .022UF
C634 120
C635 .1 UF
C637 2200
C638 .1 UF
C639 .1 UF
C640 56
R601 150
R604 3600
R605 220K
R606 180
R608 2200
R609 220K
R610 470
R611 3600
R612 6800
R613 2200
R614 160K
R615 470
R616 4700
R617 4700
R618 4700
R619 3900
R620 47K
R621 47K
R622 3.3 MEG
R623 100K
R624 1000
R625 27K
R626 22K
R627 2200
R628 330K
R629 820K
R632 3.3 MEG.
R633 1 MEG
R634 68K
R635 100K
R636 150K
R637 100K
C1104-1
P1110-A
R1101B-3
J1105-F
J1105-A
J1108-R
J1108-A
S1102A-1
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S1104B-1

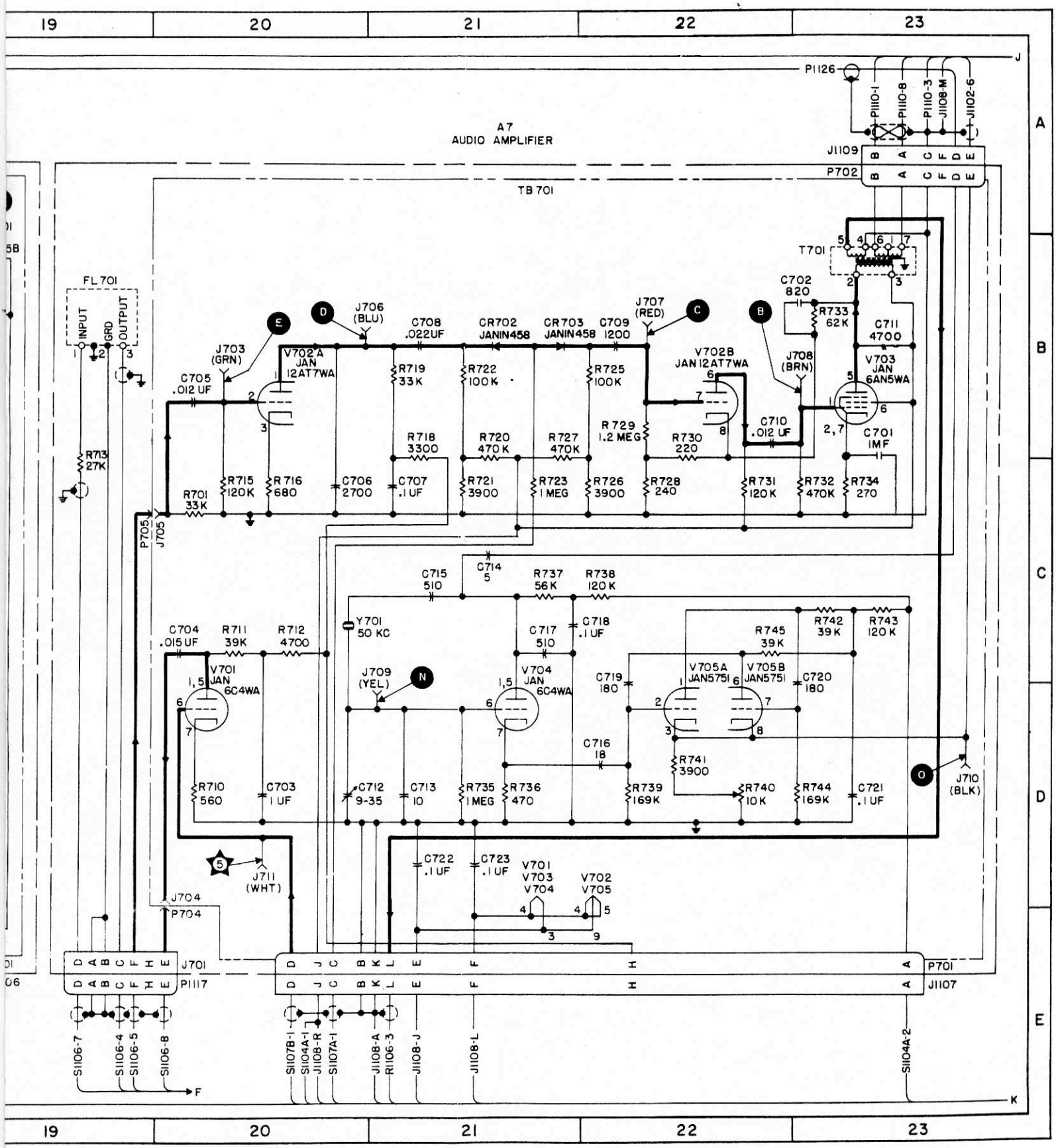

Figure 6-38. Schematic Diagram