R-1230

CONFIDENTIAL

NAVSHIPS 94581 *(Non-Registered)*

Technical Manual

for

ON-LINE RECEIVER

of

COUNTERMEASURES RECEIVING SET AN/FLR-11(V)

and

DIRECTION FINDER GROUP AN/FRA-54(V) (U)

Radio Corporation of America
Defense Electronic Products
Surface Communications Division
Camden, New Jersey

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

UNCLASSIFIED

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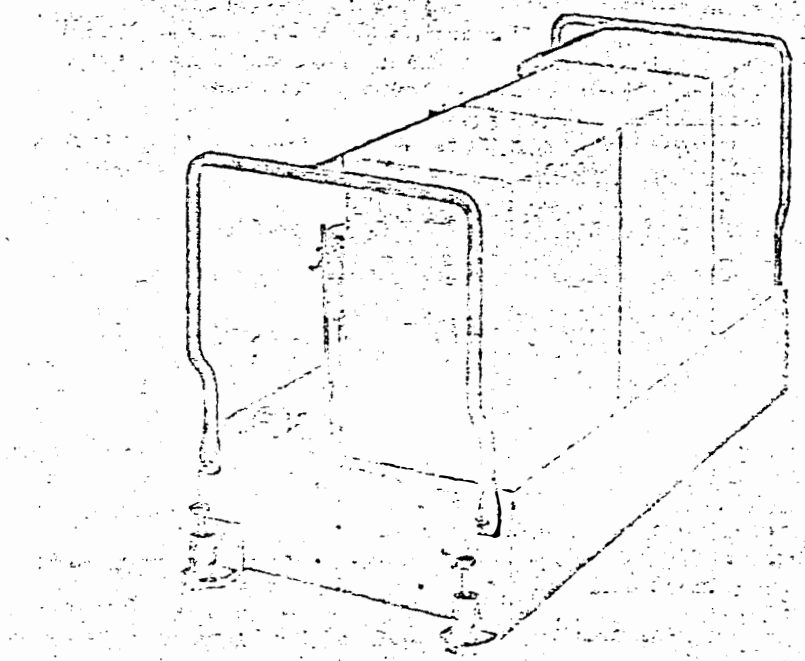
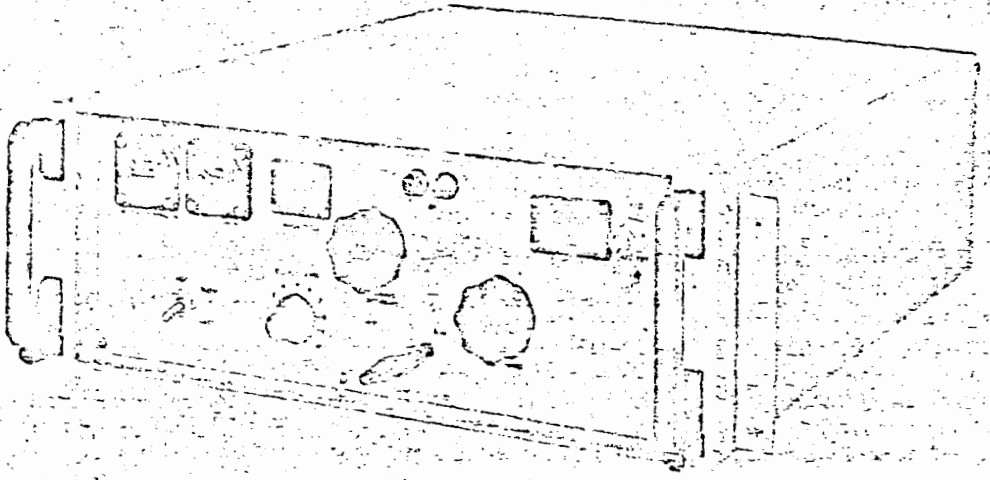
Contract: NObsr 87308 *Approved by BuShips: 11 April 1963*



OSCILLATOR-POWER SUPPLY
O-928/FLR



COUNTERMEASURES RECEIVER
R-1125/FLR

Figure 1-1. On-Line Receiver of Countermeasures Receiving Set AN/FLR-11(V) and Direction Finder Group AN/FRA-54(V)

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

The On-Line Receiver of Countermeasures Receiving Set AN/FLR-11(V) and Direction Finder Group AN/FRA-54(V) (figure 1-1) consists of Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR. Countermeasures Receiver R-1125/FLR is a triple-conversion, superheterodyne receiver covering the frequency range of 2 mc to 32 mc in four bands. The receiver output is the third conversion frequency of 65 kc, and the bandwidth is 60 kc. Two direct reading counters show the frequency to which the receiver is tuned as the sum of both counter readings. The O-928/FLR provides the operating power required by the R-1125/FLR, and a crystal-controlled, 100-kc reference signal which permits adjustment of the MEGACYCLE counter in precise 100-kc increments throughout the tuning range of the R-1125/FLR. An internal interpolation-oscillator (in the R-1125/FLR) provides continuous tuning of each 100-kc increment. Combined counter readings indicate the center-frequency of receiver tuning with an accuracy of 3-cps per megacycle ±50 cps: the MEGACYCLE counter indicates 100-kc steps and the KILOCYCLE counter indicates frequencies between each step.

1-2. FACTORY OR FIELD CHANGES.

No factory or field changes have been made to this equipment.

1-3. QUICK REFERENCE DATA.

a. GENERAL

(1) NOMENCLATURE.

(a) Countermeasures Receiver R-1125/FLR.
(b) Oscillator-Power Supply O-928/FLR.

(2) CONTRACT NUMBER: NObsr 87308.

(3) AMBIENT TEMPERATURE LIMITATIONS: Equipment will operate within limits of 0°C (+32°F) to -50°C (-122°F) after nonoperating exposure to temperatures from -62°C (-79°F) to +75°C (+185°F).

b. ELECTRICAL CHARACTERISTICS.

(1) FREQUENCY RANGE: Nominal, 2 mc to 32 mc inclusive.

(2) TUNING BANDS AND BAND RANGES: Four bands — 2-4 mc, 4-8 mc, 8-16 mc, and 16-32 mc.

(3) TYPE OF FREQUENCY CONTROL: Crystal oscillator control of 300 100-kc increments; lesser increments continuously tuned using L-C oscillator.

(4) TYPES OF RECEPTION: Receiver output is an intermediate frequency from 35 kc to 95 kc, centered at 65 kc, retaining all modulation of the received signal or signals with fidelity.

(5) MAXIMUM RECEIVER OUTPUT: 64 milliwatts into a 250-ohm resistive load. (60 KC wide)

(6) FREQUENCY-CONTROL CRYSTAL (Oscillator-Power Supply O-928/FLR).

(a) Government designation: CR-42/U.

(b) Oscillation frequency: 100 kc.

(c) Crystal operating temperature: 75°C (167°F) ±1°C.

(d) Frequency accuracy over operating range: 3 parts per million at 75°C (167°F).

(7) FREQUENCY-CONTROL CRYSTAL (Countermeasures Receiver R-1125/FLR).

(a) Government designation: CR-46/U.

(b) Oscillation frequency: 285 kc.

(c) Crystal operating temperature: -40°C (-40°F) to +85°C (+185°F) ±3°C.

(d) Frequency accuracy over operating range: ±0.01% from -40°C (-40°F) to +85°C (+185°F).

(8) FREQUENCY STABILITY AND ACCURACY DATA.

(a) Continuous tuning: 3 parts per million ±50 cycles.

(b) Environmental changes: 3 cycles per megacycle ±150 cycles, frequency change from °C (-32°F) to 50°C (122°F).

Change	Frequency Variation
Line voltage, from 103.5 vac to 126.5 vac	50 cycles, maximum
Temperature from 0°C (32°F) to 50°C (122°F)	3 cycles per megacycle ±150 cycles

(9) RECEIVER SENSITIVITY: The maximum input voltage required to produce a 10-db signal-plus-noise to noise ratio at the output is 3.5 μv.

(10) ELECTRICAL CHARACTERISTICS OF RECOMMENDED ANTENNA: For optimum performance, an antenna having a 70-ohm terminal impedance is recommended.

(11) PRIMARY POWER REQUIREMENTS.

(a) Voltage: 105/115/125 volts, 60 cycles ±5%, single phase, ac.

(b) Current (nominal): One receiver and one oscillator-power supply, 1.25 amperes ac (crystal oven off); 1.4 amperes ac (crystal oven on), at 115 volts.

(c) Power (nominal): One receiver and one oscillator-power supply, 145 watts (crystal oven off); 160 watts (crystal oven on).

(d) Additional receivers: Each additional receiver operated from the common oscillator-power supply increases the primary power requirement by approximately 100 watts, ac.

(e) Five receivers: Total primary requirement for five receivers and one oscillator-power supply is approximately 545 watts (crystal oven off); 560 watts (crystal oven on).

NOTE

Crystal oven A1001 in the O-928/FLR is thermostatically controlled and when operating, adds approximately 15 watts to the primary power requirement.

(12) HETERODYNE FREQUENCY RANGE.

(a) High-frequency oscillator: 3.725 mc to 33.725 mc.

(b) Interpolation oscillator: 680 kc to 580 kc.

(13) I-F FREQUENCIES DEVELOPED.

(a) First conversion: 1625 kc to 1725 kc (tuned).

(b) Second conversion: 220 kc.

(c) Third conversion: 65 kc.

1-4. EQUIPMENT LISTS.

a. EQUIPMENT SUPPLIED. - Table 1-1 lists the names, quantities, dimensions, and weights of all equipment supplied.

b. EQUIPMENT REQUIRED BUT NOT SUPPLIED. - Table 1-2 lists the equipment required for operation, but not supplied.

c. SHIPPING DATA. - Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR are shipped as integral parts of Countermeasures Receiving Set AN/FLR-11(V) and Direction Finder Group AN/FRA-54(V). Refer to NAVSHIPS 94557 and NAVSHIPS 94565 for pertinent shipping data.

d. TUBE AND SEMICONDUCTOR COMPLEMENT. - Table 1-3 lists all tubes by types, showing the number of each type installed in an R-1125/FLR and an O-928/FLR. Semiconductors which function as vacuum tubes are also included.

TABLE 1-1. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), EQUIPMENT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		OVERALL DIMENSIONS (IN.)			VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Countermeasures Receiver	R-1125/FLR	6-3/32	19	24-1/2	1.2	65
1	Oscillator-Power Supply	O-928/FLR	9-13/16	8-1/2	20-3/4	0.8	75
1	Mounting Plate		2	17-5/8	20-5/8	0.43	10
1 set	Miscellaneous Cable Connectors						
1 set	Mounting Plate Hardware						
2	Technical Manual	NAVSHIPS 94581					

TABLE 1-2. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), EQUIPMENT REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP.	NOMENCLATURE		USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	Antenna		Intercepts r-f signals	70 ohms impedance
1	Cable, Coaxial	RG59/U	Antenna transmission line to receiver	70 ohms impedance
1	Cable, Coaxial	RG59/U	Receiver output line	70 ohms impedance
1	Cable, Coaxial	RG59/U	100-kc reference	70 ohms impedance

TABLE 1-2. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), EQUIPMENT REQUIRED BUT NOT SUPPLIED (Continued)

QTY PER EQUIP.	NOMENCLATURE NAME	NOMENCLATURE DESIGNATION	USE	REQUIRED CHARACTERISTICS
1	Cable, Power	THFA, or equivalent	Supplies primary power to equipment	
1	Cable, Supply		Supplies plate and filament voltage to receiver from power supply	
1	Cable, DF Indicator	THFA, or equivalent	Supplies external power for DF indicator	

TABLE 1-3. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), TUBE AND SEMICONDUCTOR COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPES INDICATED						NUMBER OF SEMICONDUCTORS OF TYPES INDICATED										
	5654	5670	5749	5750	6005	7586	TOTAL NO. OF TUBES PER UNIT	1N198	1N251	1N457	1N485B	1N1126A	1N1590	1N1591	1N3005B	1N3011B	1N3028B	TOTAL NO. OF SEMI-CONDUCTORS PER UNIT
R-1125/FLR	6	1	3	4	1	13	28	1	4		4		1	1		1	1	13
O-928/FLR						3	3			2		4			1			7
Total Number of Each Type	6	1	3	4	1	16		1	4	2	4	4	1	1	1	1	1	

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

The On-Line Receiver of Countermeasures Receiving Set AN/FLR-11(V) and Direction Finder Group AN/FRA-54(V) is shipped and installed as an integral part of Countermeasures Receiving Set AN/FLR-11(V) and Direction Finder Group AN/FRA-54(V). Refer to NAVSHIPS 94557 and NAVSHIPS 94565 for pertinent data concerning unpacking and handling. Outline drawings of the R-1125/FLR and O-928/FLR are shown in figures 2-1 and 2-4, respectively.

2-2. MECHANICAL INSPECTION.

Make a complete mechanical inspection of the equipment for damage which may have occurred during shipment. Check the following items:

a. Check for nuts, washers, or foreign particles which may be lodged where they can cause a short-circuit or affect the operation of mechanical devices.

b. Tighten any screws or nuts which may have worked loose.

c. Look for broken wires or loose electrical connections.

d. Check the operation of all mechanical panel controls through the range of travel, and in both directions, to detect bent shafts or other evidence of damage.

e. Check that all tubes are seated in their sockets and that the crystal-oscillator oven (A1001) is properly seated in socket XA1001 in the oscillator-power supply.

f. Check fuses F951 through F955 located on the R-1125/FLR rear-panel and make sure they are in the holders.

g. Check fuses F1051, F1052, and F1053 located on the O-928/FLR chassis and make sure they are in the holders.

2-3. POWER DISTRIBUTION AND REQUIREMENTS.

a. REQUIREMENTS. - The O-928/FLR requires a single-phase a-c power source of 105 to 125 volts at 60 cps ±5%. Voltage variations should not exceed 10 percent of the nominal value.

b. PRIMARY CONNECTION. - To apply primary a-c power to the O-928/FLR, a female connector must be attached to power cabling of the correct rating. This connector mates with a male fitting, designated J1051, on the chassis. (See figure 2-7.) Fuse F1051 protects the supply in the event of current overload, and a power ON-OFF switch (S1051) mounted on the supply chassis applies or removes power to the equipment.

c. DISTRIBUTION. - Figure 5-1 shows the distribution of primary power within the O-928/FLR. Primary power is not applied to the R-1125/FLR.

2-4. INSTALLATION LAYOUT.

Countermeasures Receiver R-1125/FLR is designed for mounting in a standard 19-inch relay rack. Oscillator-Power Supply O-928/FLR is designed for mounting on the mounting plate supplied. The mounting plate will support two O-928/FLR and is designed to mount in a standard 19-inch relay rack. Each O-928/FLR provides operating power and a 100-kc reference signal for one to five R-1125/FLR; two O-928/FLR will accommodate up to ten R-1125/FLR.

a. POWER SOURCE. - The power source described in paragraph 2-3a should be readily available.

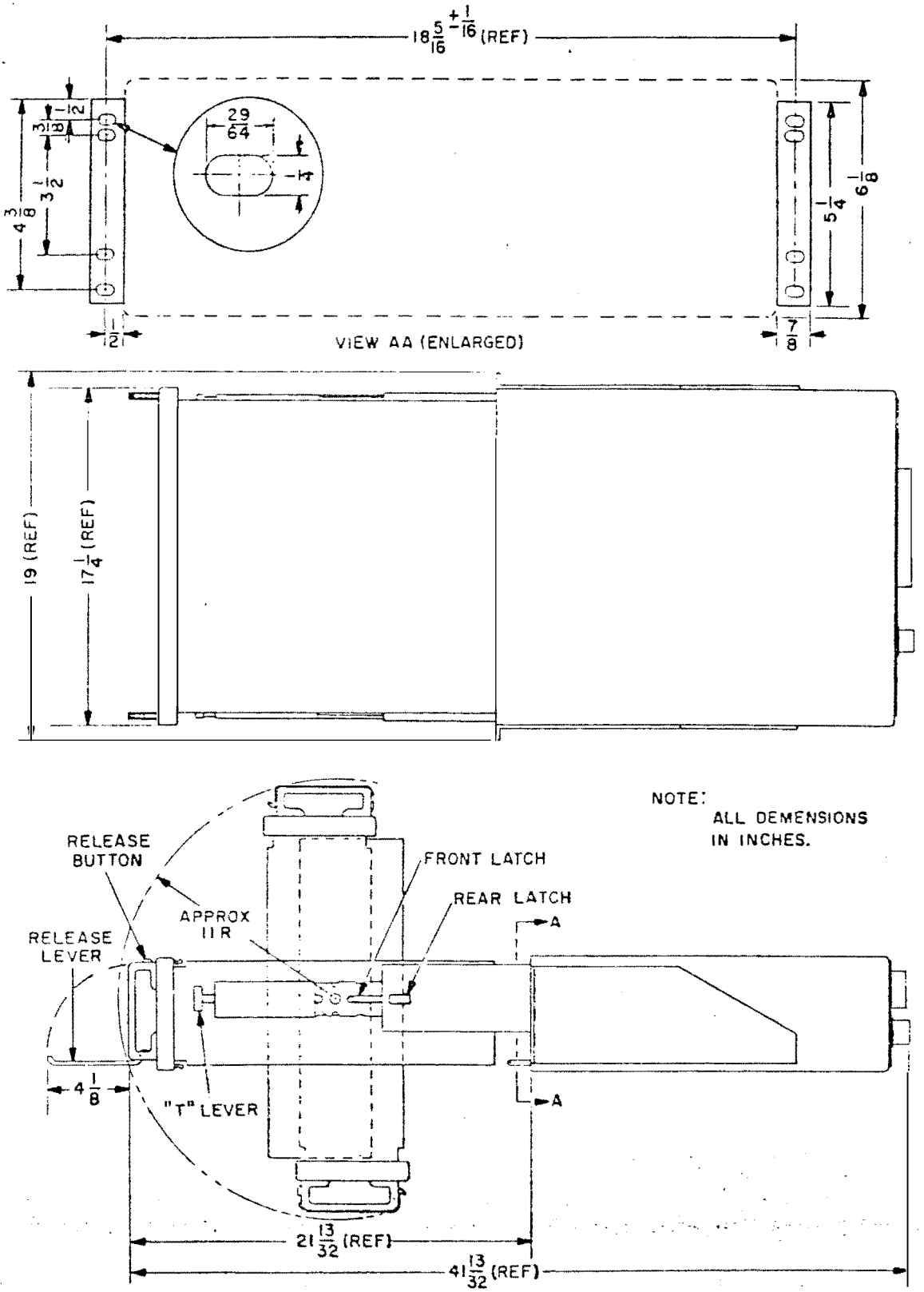


Figure 2-1. Countermeasures Receiver R-1125/FLR, Outline Drawing

b. CABLE LENGTHS. - The length of the a-c power cable is not critical, but the length of the antenna transmission line should be kept as short as possible. The length of the 100-kc reference signal cable and the DF indicator cable is not critical.

CAUTION

The length of the plate and filament supply cable is critical and should not be less than 7 feet nor more than 12 feet. This cable provides a predetermined voltage drop in the filament supply circuit to the R-1125/FLR.

c. SERVICE ACCESS. (See figures 2-1 and 2-6.) - Service access to the equipment is obtained in the following manner.

(1) COUNTERMEASURES RECEIVER R-1125/FLR. - The R-1125/FLR is designed so that most of the servicing operations can be done from the front. A slide and tilt mechanism allows the drawer to be pulled out and tilted at various angles. The operation of this mechanism is described in detail in paragraph 2-5a(1). To permit the drawer to be raised and indexed vertically, there must be a clearance of at least 22 inches in front and at least 19 inches directly above the R-1125/FLR. A clearance of at least 3 inches at the rear of the enclosure is necessary for the passage of external cables.

(2) OSCILLATOR-POWER SUPPLY O-928/FLR. - The O-928/FLR may be removed for servicing by removing a blank panel. The mounting plate provides for the installation of two O-928/FLR, side by side, each unit removable from the front. A clearance of at least 20 inches is required to remove an O-928/FLR from the rack.

d. INTERACTION WITH OTHER EQUIPMENT. - One of the features of the equipment is its ability to operate normally in an environment close to transmitting equipment. Internal shielding and filtering effectively reduce the danger of interaction between equipments.

2-5. INSTALLATION REQUIREMENTS.

Installation consists of mounting the R-1125/FLR in the rack, installing the mounting plate, and mounting the O-928/FLR on the mounting plate. The necessary internal and external cables are then connected to complete the installation.

a. REMOVAL AND REPLACEMENT OF THE R-1125/FLR DRAWER. - Perform the following steps to open, index, remove, and replace the drawer.

(1) OPENING AND INDEXING THE DRAWER. (See figure 2-2.)

Step 1. To unlock the drawer, press the button on top of the handles and lower the handle levers.

Step 2. Grasp the handles and pull the drawer out on the slides. The drawer will lock in a fully extended position.

Step 3. To raise the drawer, pull out the T-shaped release latch on both slides and lift the drawer to a vertical position. Release the latches to lock the drawer at a 90° angle.

Step 4. To lower the drawer, pull out the T-shaped latches and lower the drawer to a level position. Release the latches to lock the drawer in this position.

Step 5. To close the drawer, simultaneously press the front latches on each slide and push the drawer in by the handles. With the drawer closed, raise both levers to lock the drawer. Secure the handle levers by pressing against the handles.

(2) REMOVING AND REPLACING THE DRAWER.

Step 1. Open the drawer to the extended position.

Step 2. Remove cable clamp.

Step 3. Reach in and disconnect the cable at P901, and guide the cable retracting mechanism to a closed position.

WARNING

Be sure that the equipment is deenergized before disconnecting plug P901. The voltage and current present can be hazardous to equipment and personnel.

Step 4. Simultaneously press the rear latch on both slides and pull the drawer forward, supporting the drawer as it leaves the slides.

Step 5. To replace the drawer, lift it into place on the slides. Push the drawer in until it locks in the extended position. Connect the cable.

Step 6. Simultaneously press the front latch on both slides and push the drawer in by the handles.

Step 7. With the drawer closed, raise both handle levers to lock the drawer. Secure the levers by pressing against the handles.

CAUTION

If several receivers are installed in one rack, check that the rack is firmly secured to the floor. The weight of a number of extended drawers will tip the rack if insufficient support is provided.

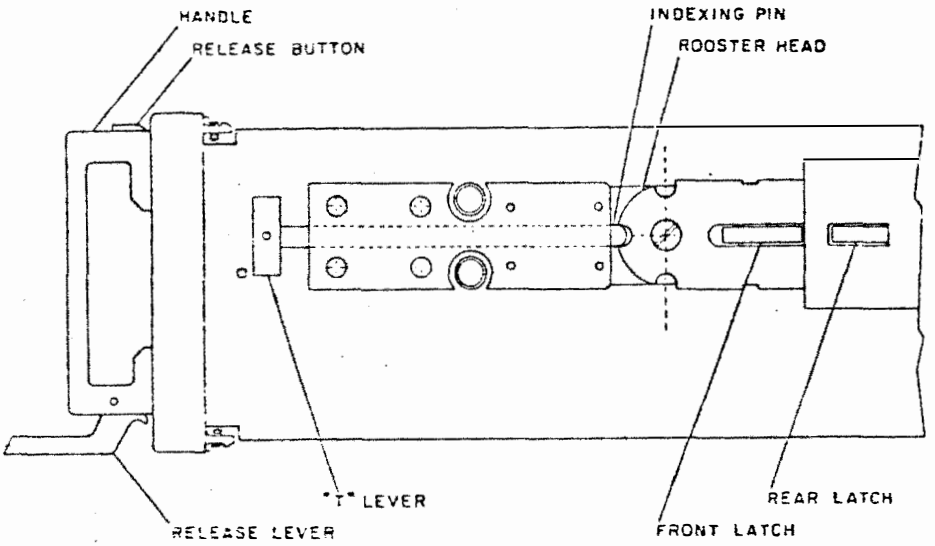


Figure 2-2. Drawer Operating Mechanism

b. REMOVAL AND REPLACEMENT OF SIDE BRACES. - As shown in figure 2-3, each of the two side braces is fastened to the cabinet by five Phillips roundhead screws. Remove these screws to detach the side brace (each screw threads into either the slide or the locking latch). To replace the side braces, hold the brace in position against the cabinet and replace the screws. Tighten each screw firmly to secure the brace.

c. MOUNTING PLATE FOR O-923/FLR. (See figure 2-5.) - The mounting plate consists of a flat baseplate equipped with side brackets for permanent installation in the equipment rack. The mounting plate is fastened to the rack using eight 10/32 oval-head screws, lockwashers, and nuts. Slotted screw holes in the mounting brackets provide for a lateral adjustment of plate position.

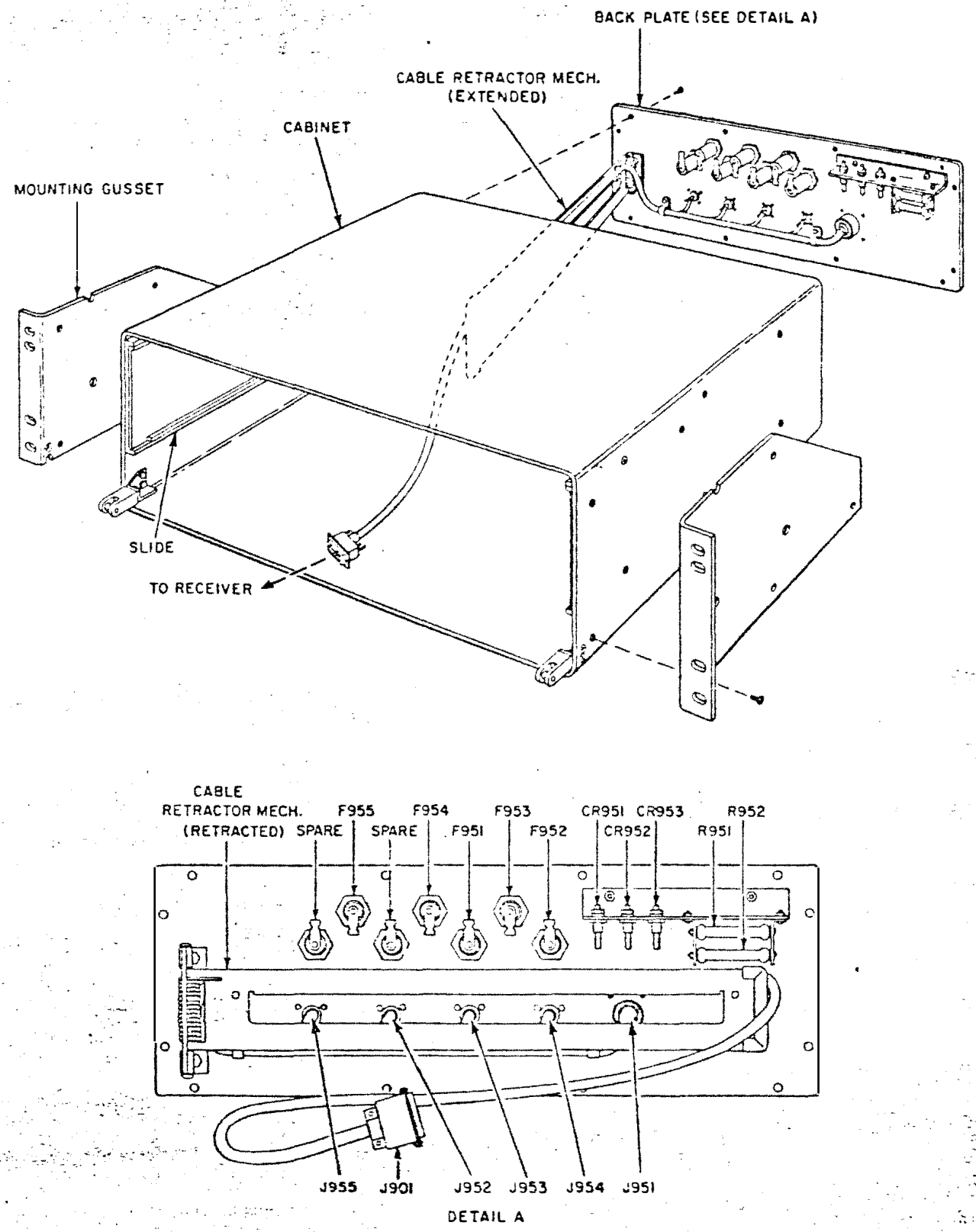


Figure 2-3. Cabinet Mounting Details

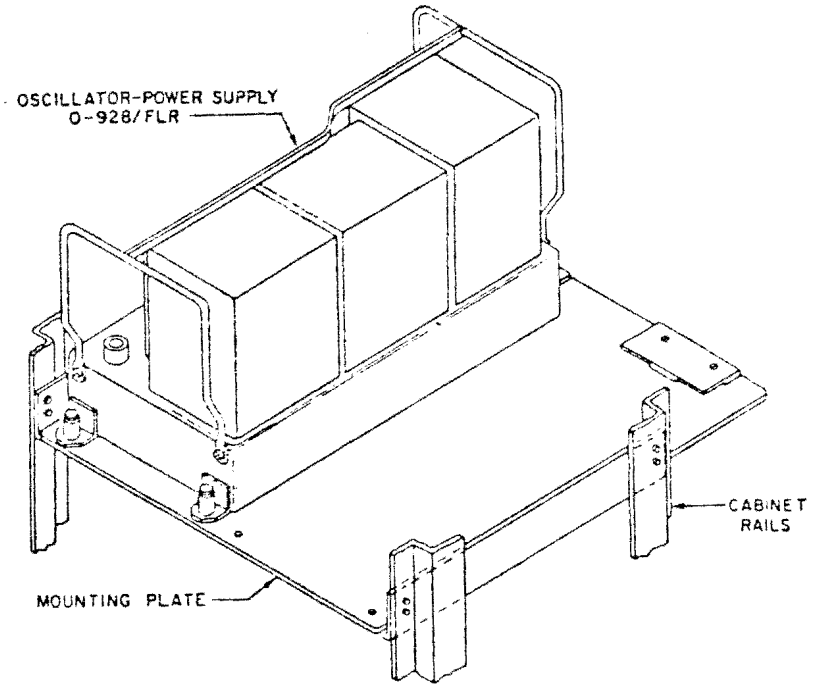


Figure 2-6. Mounting Plate, Installation Details

e. CABLE CONNECTIONS. - All units are shipped installed in their respective cabinets and external cables are provided; however, if replacements are unavailable replacement cables can be fabricated from the following information. Refer to NAVSHIPS 94557 and 94565 for external cable connections and other pertinent cabling information. External cable receptacles are located on the R-1125/FLR rear panel and on the O-928/FLR chassis, as shown in figure 2-7. Table 2-1 contains a summary of the types and functions of all external plugs and their mating receptacles.

(1) ASSEMBLY OF EXTERNAL CABLING. - Figure 2-8 illustrates the method of assembling the JAN type UG260/B and type UG290/A plug to RG59/U coaxial cable to construct the antenna, output, and 100-kc reference cables. Figure 2-9 shows the method of assembling type MS3106B14S7S plugs to appropriate cabling to make up the a-c power cable. The type MS3108B10SL3S plug for assembling the DF indicator cable is similar to the a-c power plug shown in figure 2-9. Figure 2-10 shows the method of assembling type MS3108B16S1P and type MS3108B16S1S plugs to appropriate cable to make up the plate and filament supply cable. Detailed instructions for the assembly of electrical connectors is contained in NAVSHIPS 900171, Chapter 5. Chapter 6 of the same publication provides complete cabling instructions.

Cable lengths are determined by measuring the routing distance from the R-1125/FLR or the O-928/FLR to the cable destination. In multiple receiver installations, corresponding cables will necessarily have different lengths.

CAUTION

Length of the plate and filament supply cable must be not less than 7 feet nor more than 12 feet. A predetermined voltage drop in the filament-supply conductors provides proper filament voltage the the R-1125/FLR.

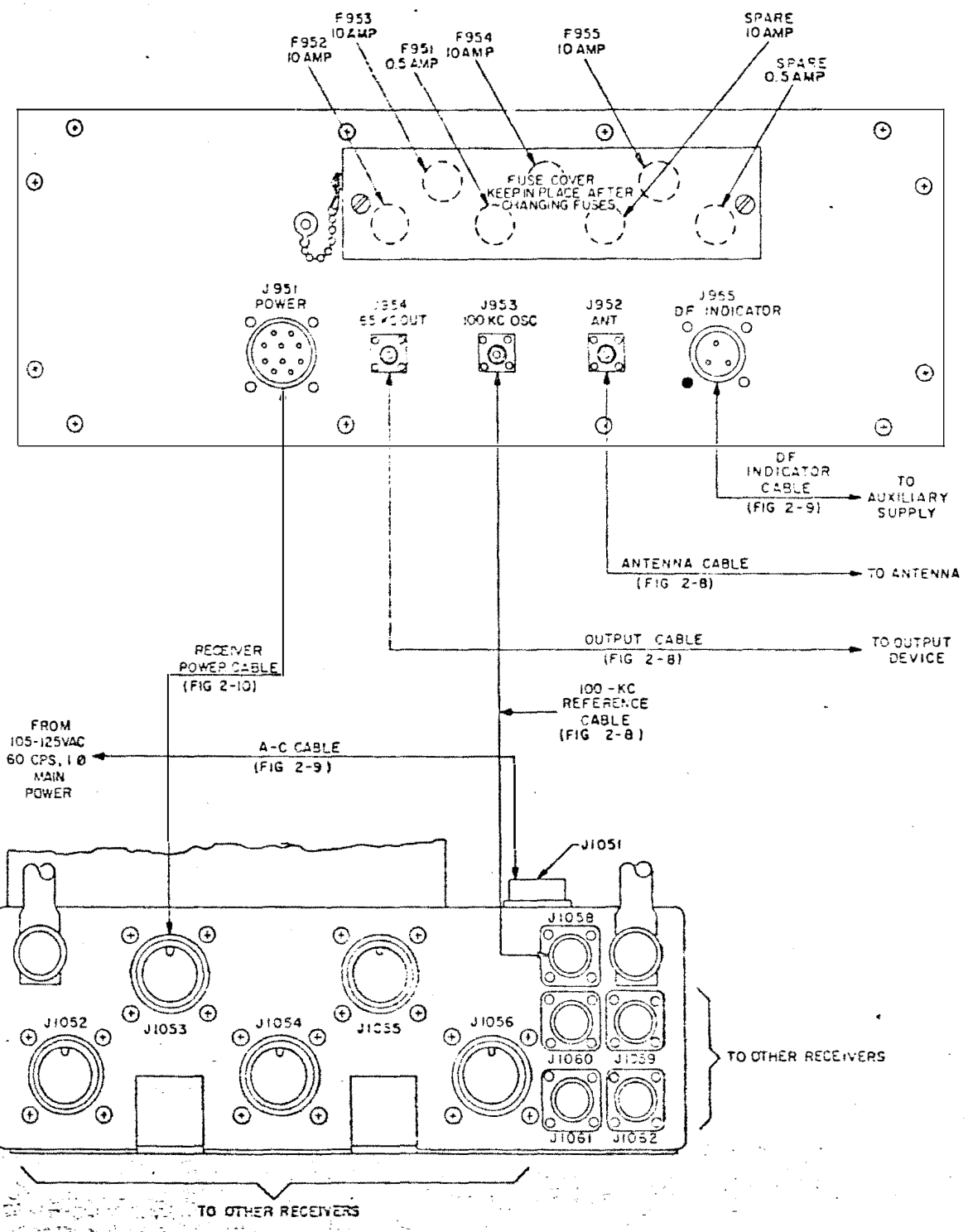


Figure 2-7. External Cable Connections

TABLE 2-1. CONNECTORS (PLUGS) AND CABLES REQUIRED FOR MAKING EXTERNAL CONNECTIONS

CIRCUIT SYMBOL AND TYPE OF PLUG	CIRCUIT WHERE USED	TYPE CABLE	CIRCUIT SYMBOL AND TYPE OF MATING RECEPTACLE
P1051	105-125-volt, a-c power	THFA or equivalent	J1051 MS3102A14S7P
P952 UG260B/U	Antenna input	RG59/U coaxial	J952 UG290A/U
P954 UG260B/U	Receiver output	RG59/U coaxial	J954 UG290A/U
P951 MS3108B16S1P	Plate and filament supply		J951 MS3102A16S1P
P953 UG260B/U	100-kc reference signal to receiver	RG59/U coaxial	J953 UG290A/U
P1058 to P1062 UG260B/U	100-kc reference signal to receiver	RG59/U coaxial	J1058 to J1062 UG290A/U
P1052 to P1056 MS3108B16S1P	Plate and filament supply to receiver		J1052 to J1056 MS3102A16S1S
P955	DF indicator, external supply	THFA or equivalent	J955 MS3102A10SL3P

Plug P1501 which is provided for the a-c power cable has three contacts. Contacts A and C connect the a-c line, and contact B to ground. The coaxial cable connectors have a single contact for the inner cable conductor; the connector shell serves as the shield contact. Plug P951 which is provided for the plate and filament supply cable has seven contacts, one of which is not used. All mating connectors on the O-928/FLR chassis, P1052 through P1056, have a similar contact arrangement.

(2) INTERNAL CONNECTIONS. - Figure 2-7 shows all internal connections as well as external connections between the R-1125/FLR and O-928/FLR. To complete these connections, proceed as follows:

(a) Connect the 100-kc reference cable to the R-1125/FLR by mating plug P953 with receptacle J953 (100 KC OSC) at the center of the rear panel. Connect the other end of the cable to the O-928/FLR by mating plug P1058 with receptacle J1058 on the chassis end.

NOTE

Connectors J1058 through J1062 are connected in parallel and serve from one to five receivers. Connections may be made without regard for numerical sequence.

(b) Connect the plate and filament supply-cable to the R-1125/FLR by mating plug P951 with receptacle J951 (POWER) on the left side of the rear panel. Connect the other end of the cable to the O-928/FLR by mating plug P1052 with receptacle J1052 on the chassis end.

NOTE

Connectors J1052 through J1056 are connected in parallel and serve from one to five receivers. Connections may be made without regard for numerical sequence.

(3) EXTERNAL CONNECTIONS. - External connecting cables are installed as shown in figure 2-7. To complete these connections, perform the following:

(a) Connect the antenna transmission line to the R-1125/FLR by mating plug P952 with receptacle J952 (ANT) on the left side of the rear panel. Connect the other end of the line as shown in NAVSHIPS 94557 and NAVSHIPS 94565.

(b) Connect the R-1125/FLR output cable by mating plug P954 with receptacle J954 (65 KC OUT) on the left side of the rear panel. Connect the other end of the cable as shown in NAVSHIPS 94557 and NAVSHIPS 94565.

(c) Connect the DF indicator cable to the R-1125/FLR by mating plug P955 with receptacle J955 (DF INDICATOR) on the right side of the rear panel. Connect the other end of the cable to an external power source. (See figure 4-23.)

(d) Connect the a-c primary power cable to the O-928/FLR by mating plug P1051 with receptacle J1051 on the chassis. Connect the other end of the cable to the source of primary power.

NOTE

External primary power source line switches should be off at this time.

(4) TRANSFORMER POWER TAPS. - Before operating the equipment, measure the average line voltage of the primary power source with a multimeter. The primary winding of power transformer T1051 in the O-928/FLR is tapped to permit operation of the equipment from a 57-63-cps power source of 105, 115, or 125 volts. The transformer taps for these voltages are connected to terminal board TB1051. (See figure 4-26.) Transformer connections to TB1051 are: terminal 1, common; terminal 2, 105 vac; terminal 3, 115 vac; and terminal 4, 125 vac. The equipment is shipped with connections made for operation from a 115 vac source. If the average value of the primary power source falls between two of the voltages mentioned, connections for the higher value should be made. A tag showing the voltage used should be attached to connector J1051 on the O-928/FLR when the connection is made.

2-6. INSPECTION AND ADJUSTMENTS.

a. GENERAL. - After the equipment is installed, and before it is turned over to operating personnel, observe the equipment performance in detail and make all necessary adjustments. Because of environmental differences between the factory and the installation site, and due to equipment handling during transit and installation, some adjustments may be required to obtain optimum equipment performance. These adjustments should be minor. All aspects and features of operation must be checked correct any condition which would lead to subnormal performance.

b. INITIAL ENERGIZING OF EQUIPMENT. - Energize the equipment for the first time as follows:

NOTE

The location of each control is shown in figure 3-1. Table 3-1 gives a brief description of each control.

Step 1. Make sure that all external connections are tight.

Step 2. Check that primary connections to power transformer T1051 are compatible with the average line voltage, as described in paragraph 2-5d(4).

Step 3. Set the controls as specified in table 3-2.

Step 4. Place the switch that controls the external primary power source to on.

CAUTION

Before energizing the equipment, SELECTOR switch S1052 at the O-928/FLR must be set to a position corresponding to the number of receivers to be operated.

Step 5. Place the power ON-OFF switch at the O-928/FLR in the ON position. The R-1125/FLR frequency counter lamps will light.

NOTE

Equipment will be operable within 30 seconds, but a warmup period of one hour is required for maximum frequency stability.

Step 6. Connect the associated equipment to the receiver output at J954 (65 KC OUT).

Step 7. Adjust the OUTPUT LEVEL control to obtain an indication of receiver noise at the associated equipment.

c. TUNING PERFORMANCE. - To test the performance of the tuning circuits, use a compatible signal generator such as the AN/URM-25D to produce the test signal. Because the frequency accuracy of the R-1125/FLR exceeds that of most signal generators, calibrate the generator using the R-1125/FLR as a reference before beginning the test, or use a primary frequency standard to set the generator. An alternate method involves tuning the generator for maximum receiver output at each frequency checked. At least one frequency within each tuning band should be observed. Frequencies selected should be at or near the high or low end of each tuning band. If necessary, actual transmitted signals may be used for the test, keeping in mind that the carrier frequency of the received signal may vary considerably from its nominal value. The frequency of the transmitted signal should be measured accurately before apparent discrepancies in the counter readings are attributed to defective tuning circuits or incorrectly set counters.

(1) TUNING THE R-1125/FLR. - The incremental tuning feature of the R-1125/FLR is described in Section 3. The main points of this procedure are incorporated in the following performance check:

Step 1. With the BAND switch in the 2-4 position, the MEGACYCLE counter will initially read 02.0. The KILOCYCLE counter should read 00.0.

Step 2. Adjust the signal generator for a 2.0-mc (unmodulated) signal with a level of 500 μv.

Step 3. Adjust the TUNING (Mc) control for a dip (minimum indication) on the 100 KC TUNING meter.

Step 4. Adjust the TUNING (Kc) control for a maximum indication on the SIGNAL STRENGTH meter.

Step 5. Adjust the OUTPUT LEVEL control for the desired output level.

Step 6. Repeat steps 2 through 5 for each of the three remaining BAND switch positions. Set the signal generator to the proper frequency for the low end of each band.

Step 7. When a transmitted signal is used to check tuning performance, remember that the TUNING (Mc) control tunes the R-1125/FLR in 100-kc increments only. A dip on the 100 KC TUNING meter is used to precisely set each increment. Use the TUNING (Kc) control for continuous tuning between increments.

d. OPERATION OF SPECIAL CIRCUITS. - Devices such as the automatic gain control (agc) circuit and the DF indicator (lamp) circuit, although not essential to basic receiver operation, nevertheless have a special function to improve operating efficiency. Conduct initial performance checks on these circuits by manipulating controls and observing the degree to which the desired function is performed.

(1) AUTOMATIC GAIN CONTROL. - Agc voltage is applied to the two r-f amplifiers in the preselector, and to four stages in the first i-f and injection amplifier. The effect is regulation of receiver gain in inverse proportion to the strength of the received signal. Two agc time constants, suitable for use with various received signals, are provided: SLOW and FAST.

Check the agc action by tuning the receiver to several signals having different magnitudes. (When checking receiver performance using a signal generator, this effect may be obtained by changing the

level of output signal from the generator.) The indication on the SIGNAL STRENGTH meter should decrease for a weak signal and increase for a strong signal, but the receiver output level should remain essentially constant. If extreme variations in receiver output are encountered during this check, refer to the troubleshooting information in Section 5.

CAUTION

The RESERVE GAIN, THRESHOLD AGC, and I-F AGC controls are screwdriver adjustments located on the bottom of the chassis. They are adjusted at the factory and should not be reset during performance checks. Section 6, Repair, contains instructions for adjustment of these controls in the event that the equipment is repaired.

(2) DF INDICATOR LAMPS. - Two indicator lamps on the R-1125/FLR panel, LOW (green) and HIGH (amber), light to show the relative frequency range being used at the receiver. The operator selects one of two antenna systems to obtain optimum reception by the use of the BAND switch. Check the DF indicator circuit operation as follows:

Step 1. Place the BAND switch in the 2-4 position. Adjust the TUNING (Mc) control over the tuning range. The LOW indicator should light over the complete range.

Step 2. Place the BAND switch in the 4-8 position. Tune over the complete range. The LOW indicator should light over most of the range and the HIGH indicator should light as 8 mc is approached. (The transition point is adjustable; refer to Section 6, Repair.)

Step 3. Place the BAND switch in the 8-16 position. Tune over the complete range. The LOW indicator should light near the 8-mc region and the HIGH indicator should light over the remaining range. (The transition point is adjustable; refer to Section 6, Repair.)

Step 4. Place the BAND switch in the 16-32 position. Tune over the complete range. The HIGH indicator should light over the entire tuning range.

e. OPERATION WITH OTHER EQUIPMENT. - The efficiency of the R-1125/FLR and O-928/FLR, when used with other equipment, should be tested by actual operation. The following considerations will help in making the test meaningful:

(1) Make sure the other equipment is in good operating condition before the test.

(2) Condition the R-1125/FLR and O-928/FLR by making the control settings in accordance with table 3-2.

(3) When adjusting and connecting the terminal equipment, follow the instructions contained in the instruction manual for that equipment.

(4) Allow ample warmup time; operate the connected equipments long enough for each to stabilize.

2-7. PREPARATION FOR RESHIPMENT.

a. EQUIPMENT DISASSEMBLY. - The degree to which the equipment must be disassembled for reshipment will depend on whether the complete equipment or only part of it is to be reshipped, and the type and number of shipping containers to be used. The following steps will serve as a guide for either partial or complete disassembly of the equipment.

(1) Remove all primary power from the equipment by opening external primary power source switches and placing the power switch on the O-928/FLR to OFF.

(2) Discharge all plate-supply capacitors with a grounding probe.

(3) Disconnect all cabling, including that between the R-1125/FLR and O-928/FLR.

(4) Check that outstanding field changes or required repairs have been recorded on the Equipment History Card or other pertinent record.

(5) Remove the O-928/FLR from the mounting plate.

(6) Remove the R-1125/FLR.

(7) Inspect the equipment for mechanical defects listed in paragraph 2-2.

(8) Collect all reusable mounting hardware, interconnecting cable assemblies, connectors for external cabling, and the technical manuals. Spare parts to be turned in with the equipment should be inventoried and replaced in the original container. Provision should be made for the replacement of missing or damaged items prior to shipment.

b. REPACKAGING. - For instructions and requirements for packaging and repacking the equipment, refer to MIL-E-17555, "Preservation, Packaging, and Marking of Electronic Equipment and Associated Maintenance Parts." Also observe the following:

(1) Mark the box containing the technical manuals "TECHNICAL MANUALS INSIDE."

(2) Do not remove the tubes for reshipment.

(3) Coaxial cables, when coiled, should not have loops less than 25 or 30 inches in diameter.

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

Countermeasures Receiver R-1125/FLR is a high-frequency, superheterodyne receiver employing triple frequency-conversion for the reception of signals in the frequency range from 2.0 mc to 32.0 mc. It is intended for use in special operating categories and provides a 65-kc output signal having a 60-kc bandwidth. Receiver operation is characterized by extreme frequency stability, permitting long periods of unattended operation. A high level of performance can be expected despite adverse conditions. Initial tuning is obtained in 100-kc increments with an interpolation oscillator (in the receiver) which provides continuous tuning between increments. The frequency range is covered in four bands with counter-type tuning dials which permit accurate presetting to a desired frequency. A special drift-cancelling circuit contributes to the receiver's high performance by cancelling any frequency error as the result of frequency drift in the high-frequency oscillator. Drift in the interpolation oscillator circuit is minimal at the low frequency used.

Oscillator-Power Supply O-928/FLR supplies operating power from one to five R-1125/FLR, and includes a 100-kc crystal oscillator which provides a standard reference signal (for incremental tuning) to each receiver.

Within the specified frequency range, the R-1125/FLR output is an intermediate frequency band from 35.0 to 95.0 kc which retains all modulation of the received signals with a high degree of fidelity.

3-2. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. - All controls required for normal operation of the equipment are located on the receiver front panel. Controls accessible to the operator, but not required for normal operation, are located on the R-1125/FLR chassis and on the O-928/FLR chassis, and are described in paragraph 3-2d. Table 3-1 contains a description of all operating controls, and figure 3-1 shows the location of each control.

b. SEQUENCE OF OPERATION. (Refer to table 3-1.)

NOTE

Before attempting to use the equipment, make sure that all interconnections have been made in accordance with Section 2, Installation.

(1) STARTING.

(a) Place the power switch located on the O-928/FLR in the ON position and note that the R-1125/FLR counter lamps light.

(b) Set the OUTPUT LEVEL control to the maximum clockwise position.

(c) Place the AGC switch in the SLOW position.

(2) TUNING. - Assume that the desired frequency is 4.235 mc.

(a) Set the BAND switch to the 4-8 position.

(b) Adjust the TUNING (Mc) control to obtain an 04.2 reading on the MEGACYCLE counter.

(c) Adjust the TUNING (Mc) control slightly for a dip (minimum reading) on the 100 KC TUNING meter.

(d) Use the TUNING (Kc) control to set the KILOCYCLE counter to read 35.0.

(3) OTHER OPERATING ADJUSTMENTS.

(a) USE OF OUTPUT LEVEL CONTROL. - The OUTPUT LEVEL control adjusts the level of the 65-kc receiver output signal applied to the associated terminal equipment. Adjustment of this control is dependent on reception and the signal level required for operation of terminal equipment.

(b) USE OF AGC SLOW-FAST SWITCH. - For normal signal reception, the AGC SLOW-FAST switch is placed in the SLOW position to select a normal agc time constant. The FAST position provides a much shorter agc time constant.

(4) STANDBY OPERATION. - There are no provisions for standby operation of the equipment. Between or after periods of actual reception, the equipment may be allowed to remain energized without risk of damage. The following steps are indicated for good operating practice:

(a) Adjust the OUTPUT LEVEL control to a medium or low setting.

(b) If practical, place the associated terminal equipment in a standby condition.

(c) Log any abnormal performance or indication noted during the period of operation.

(5) STOPPING.

(a) Turn the OUTPUT LEVEL control fully counterclockwise.

(b) Place the power ON-OFF switch located on the O-928/FLR in the OFF position.

TABLE 3-1. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), CONTROL FUNCTIONS

CONTROL NAME	TYPE OF CONTROL	FUNCTION
ON-OFF	Switch	Controls primary power to power supply
POWER ON	Indicator lamp	Lights when primary power is applied to power supply
TUNING (Mc)	Variable tuning capacitor	Tunes receiver in 100-kc steps
MEGACYCLE	Three-digit counter	Shows setting of TUNING (Mc) control in megacycles; i.e., 04.2 = 4.2 mc
TUNING (Kc)	Variable tuning capacitor	Continuous tuning of receiver through 100-kc steps selected by TUNING (Mc) control
KILOCYCLE	Three-digit counter	Shows setting of TUNING (Kc) control in kilocycles and tenths of kilocycles; i.e., 40.7 = 40.7 kc
BAND	Switch	Selects frequency band and positions MEGACYCLE counter drums to register frequencies covered.
OUTPUT LEVEL	Potentiometer	Controls receiver output
SIGNAL STRENGTH	Panel meter	Indicates carrier level of received signal
100 KC TUNING	Panel meter	Indicates 100-kc tuning steps
AGC SLOW-FAST	Switch	Selects response of agc action
DF LOW-HIGH	Indicator lamps	Indicate antenna to be selected for optimum reception

3-3. SUMMARY OF OPERATION.

A brief summary of the procedures for operation of the equipment in proper sequence is given in table 3-2.

TABLE 3-2. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), SUMMARY OF OPERATION

STEP	PROCEDURE
	STARTING
1	Place the power switch on the O-928/FLR in the ON position.
2	Set the OUTPUT LEVEL control to near maximum (clockwise) position.
3	Place the AGC switch in the SLOW position.
	TUNING
4	Set BAND switch to position covering desired frequency.
5	Rotate TUNING (Mc) control until first three digits of desired frequency appear on MEGACYCLE counter. (First digit will be zero if frequency is less than 10 megacycles.)
6	Readjust TUNING (Mc) control for a dip (minimum reading) on the 100 KC TUNING meter.
7	Rotate TUNING (Kc) control until last three digits of desired frequency appear on KILOCYCLE counter.
8	Note DF indicating lamps. If LOW lamp is lit low-frequency antenna has been selected, and if HIGH lamp is lit high-frequency antenna has been selected.
	STOPPING
9	Turn the OUTPUT LEVEL control fully counterclockwise.
10	Place the power switch on the O-928/FLR in the OFF position.

3-4. EMERGENCY OPERATION.

a. PARTIAL FAILURE. - Normally, good maintenance procedure requires that electronic equipment be shut down for repairs as soon as any significant defect develops. In an emergency situation, however, loss of the services of the equipment for any length of time may not be acceptable, and a substitute method of operation must be found. This method will, in most cases, involve a reduction in equipment capability. Once the emergency has passed, steps should be taken promptly to restore the equipment to normal operation. Because of the relative complexity and intended function of this equipment, only a limited selection of emergency operating procedures are applicable. Subject to the foregoing, the following emergency operating procedures are suggested.

(1) LOSS OF AGC VOLTAGE. - Failure of the agc circuits within the receiver will not usually interrupt the signal flow; the set will remain operative but subject to strong signal overloading.

(2) DEFECTIVE TUNING INDICATORS. - In the event that the 100 KC TUNING meter should become defective, incremental tuning can be continued by noting the presence of a signal at the system terminal equipment. Carefully adjust the TUNING (Mc) control to obtain a receiver output signal. If the SIGNAL STRENGTH meter becomes defective, a similar technique may be employed while adjusting the TUNING (Kc) control.

c. INDICATOR PRESENTATIONS.

(1) TUNING INDICATORS. - The principal indicators of interest to the operator are the 100 KC TUNING meter and the MEGACYCLE and KILOCYCLE frequency counters. The general function of these and their associated controls are described in table 3-1. Paragraph 3-2b(2) outlines the tuning procedure to be followed, using a frequency of 4.235 mc as an example. For a more detailed description of the tuning indicators and their operation, assume a signal frequency of 16.2524 mc. The BAND switch is placed in the 16-32 position (16.0 mc to 32.0 mc).

(a) Rotate the TUNING (Mc) control until the digits 1, 6, and 2 appear in sequence from left to right on the three drums of the MEGACYCLE counter.

(b) Observe the 100 KC TUNING meter. A correct setting of the TUNING (Mc) control will be indicated by a deflection of the pointer towards the left or zero position; slight readjustment may be necessary to obtain a minimum meter reading or dip.

(c) Rotate the TUNING (Kc) control until the digits +, 5, 2, and 4 appear on the counter drums of the KILOCYCLE counter. The extreme left drum indicates a plus (+) over the normal tuning range, and a minus (-) when the range is exceeded.

(d) Figure 3-2 shows the correct setting of the counters for the above frequency and illustrates the proper indication of the SIGNAL STRENGTH and 100 KC TUNING meters.

NOTE

The third (left to right) drum of the MEGACYCLE counter indicates "hundreds" of kilocycles. Incremental tuning (in 100-kc steps) provides a dip in the 100 KC TUNING meter reading each time a digit appears on this drum, whether or not a signal is received.

(2) EXTERNAL INDICATOR. - A coaxial cable connector (VFO OUTPUT) on the front panel provides for connection of an external frequency counter to measure the frequency of the interpolation oscillator. A measurement of this frequency together with the computation shown below will precisely indicate the frequency to which the receiver is tuned. To determine the frequency of the received signal with greater accuracy than that displayed by the MEGACYCLE and KILOCYCLE counters, perform the following calculation:

$$F_{sig} = MC + (0.680 - F_{osc})$$

Where: F_{sig} = frequency of received signal in megacycles

MC = MEGACYCLE counter reading (in megacycles)

F_{osc} = frequency counter (external) reading in megacycles

Example: Assuming that MC = 2.5 mc, and F_{osc} = 0.638022 mc

$$F_{sig} = 2.5 + (0.680 - 0.638022)$$

$$F_{sig} = 2.5 + 0.041978$$

$$F_{sig} = 2.541978 \text{ mc}$$

(3) DF LOW-HIGH INDICATORS. - A green (LOW), and amber (HIGH), lamp on the front panel indicate the relative frequency range and tuning area in use at the receiver so the operator may select one of two antenna systems for optimum reception. The LOW indicator lamp will light when the BAND switch is in the 2-4 (mc) position; the HIGH lamp will light when the BAND switch is in the 16-32 (mc)

position. An overlapping area occurs with the BAND switch in the 4-8 (mc) or 8-16 (mc) positions, since operation in an area centered at 8.0 mc is acceptable using either antenna. Refer to paragraph 4-2a(15) for a detailed description of the DF indicator circuit. The following list shows the DF indications obtained on each band, and gives the antenna system which should be used for each combination of BAND switch positions and DF lamp indications. (Refer also to paragraph 6-4i for adjustment information.)

BAND	INDICATOR	ANTENNA
2-4	LOW (green)	Low frequency
4-8	LOW (green)	Low frequency
4-8	HIGH (amber)	High frequency
OR		
8-16	LOW (green)	Low frequency
8-16	HIGH (amber)	High frequency
16-32	HIGH (amber)	High frequency

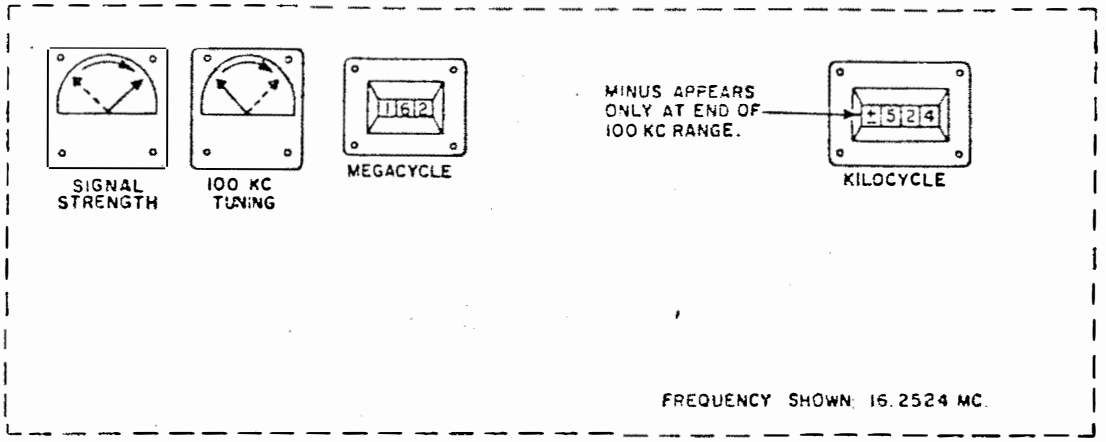


Figure 3-2. Frequency Counter and Meter Presentations

d. NONOPERATING CONTROLS. - The following controls, although accessible to the operator, are primarily intended for use by technicians in adjusting and calibrating the R-1125/FLR. Normally, the settings of these controls should not be changed except by a qualified technician.

(1) RESERVE GAIN. - This is a screwdriver adjustment on the receiver chassis. It adjusts the maximum receiver output level available when the OUTPUT LEVEL control is in the fully clockwise position.

(2) AGC THRESHOLD. - This is a screwdriver adjustment located on the receiver chassis. It adjusts the agc voltage applied to all controlled stages by setting the signal level at the agc amplifier input.

(3) I-F AGC. - This is a screwdriver adjustment located on the receiver chassis. It sets the ratio of agc voltage applied to the 220-kc i-f amplifier stages with respect to that voltage applied to the preselector r-f stages.

(4) SELECTOR. - The SELECTOR switch is located on the O-928/FLR chassis. It compensates for the change in power supply loading when less than five receivers are operated from a common O-928/FLR.

CAUTION

The SELECTOR switch (S1052) must be set to a position corresponding to the number of receivers operated from the power supply before the equipment is energized.

(3) DEFECTIVE DF LOW-HIGH INDICATORS. - If the DF indicating circuit becomes defective, the proper antenna choice may be made by selecting the antenna which gives the highest reading on the SIGNAL STRENGTH meter.

(4) POWER FAILURE. - Interruption of the primary a-c power supply to the equipment can be remedied only by an alternate power source. Most shipboard power-distribution systems, and occasionally shore installations, have emergency power systems consisting of an independent generator, distribution switchboard, and emergency transmission lines. The operator should be familiar with the installation site and be able to shift quickly to alternate or emergency sources having the same electrical rating.

b. OPERATION IN THE PRESENCE OF JAMMING. - Operating procedures in the presence of signal jamming are not applicable to the intended purpose of this equipment.

3-5. OPERATOR'S MAINTENANCE.

a. GENERAL. - Electronic technicians are generally responsible for the maintenance and repair of this equipment. In order to lighten the work load of the technician group, routine items of preventive maintenance which do not require elaborate or precision-type test equipment are normally assigned to the operator. Troubleshooting and repair of minor defects may also be required of operating personnel from time to time. In order to meet this responsibility, a thorough knowledge of the equipment, including complete familiarity with the function of all controls and the procedures governing their use, is mandatory. A general knowledge of circuit theory should also be acquired, so that the existence, location, and probable cause of any electrical or mechanical fault can be promptly determined. In this manner, minor troubles can often be corrected before they become serious. Under normal operating conditions, however, major repairs or precise adjustments should not be attempted by other than qualified technicians.

b. OPERATING CHECKS AND ADJUSTMENTS. - The equipment is designed to operate for long periods without requiring extensive adjustments other than those involved in shifting frequency or adjusting signal level.

(1) SHIFTING FREQUENCY. - Repeat all steps in the tuning procedure listed in table 3-2.

(2) PERIODIC CHECKS. - At least once daily, make the following check for resonance: the 100 KC TUNING meter should remain in a "dip" once the receiver is tuned. If it becomes necessary to make frequent or large adjustments of the TUNING (Mc) control, accompanied by pronounced signal fading, ask for technician service.

c. EMERGENCY MAINTENANCE. - Operating personnel must expect the possibility of failure when technician services are not immediately available. When it is of the utmost importance to keep the equipment in operation, the operator must be able to locate the source of trouble, determine its nature, and make repairs. It is not practical to attempt a discussion of every type of failure which may possibly occur. Instead, a general outline of troubleshooting techniques will be presented to aid the operator in developing a systematic approach to emergency maintenance.

d. ISOLATING TROUBLE. - The equipment consists of a series of functional sections, each performing a specific task. Component failure in one section may have adverse effects on associated sections. Depending on the function of a defective part, the result may range from reduced receiver sensitivity to complete breakdown of the equipment. A haphazard search through the parts in all sections is not likely to accomplish a great deal, except possibly by accident. A more efficient approach involves deduction of the faulty section using the symptom evidenced by faulty operation, followed by a detailed examination of the suspected section to locate the defective component. Once these steps have been taken, the repair problem becomes simplified. Make the following checks before attempting an involved analysis of the trouble:

(1) Check the position of all controls to ensure that they have not been accidently moved from operating position.

CAUTION

Controls and switches should move easily from one setting to another. If a control or switch does not respond to ordinary finger pressure, consider it mechanically defective and consult a technician. Do not attempt to force the movement of a control; expensive damage is almost certain to occur.

(2) If the equipment is dead (no dial illumination, meter indications, or output signal), check the power switch on the O-928/FLR and at the primary power source. Check fuses F951 through F955 on the rear panel of the R-1125/FLR, and fuses F1051 through F1053 on the O-928/FLR chassis. (See figures 5-3 and 5-78.)

(3) If the antenna is connected through a switch or distribution panel, make sure the connection is properly made.

(4) Check that all connections between the R-1125/FLR and O-928/FLR are secure.

(5) Make a general inspection of all installation wiring for broken leads or short-circuited connections.

(6) Inspect all tubes, noting that they are firmly seated in the sockets. If it is a glass-enclosed tube, note that the filament is lighted. If metal encased, note that the casing is warm indicating a lighted filament.

e. TROUBLESHOOTING GUIDE. - Table 3-3 will help the operator to find and correct minor troubles. In the case of a major failure, the guide will help to determine which section or sections are at fault.

f. TUBE AND FUSE LOCATIONS. - Illustrations in Section 5 show the location of all tubes and fuses.

TABLE 3-3. OPERATOR'S TROUBLESHOOTING GUIDE

INDICATION	PROBABLE CAUSE	REMEDIAL ACTION
Equipment dead; lamps do not light	a. Power switch set to OFF	a. Check switch setting. Place at ON
	b. Primary power source turned off	b. Verify. Have power restored
	c. A-c power fuse F1051 defective	c. Check fuse F1051. Inform technician if new fuse blows
	d. Faulty external power connection	d. Check a-c power connection at J1051 in O-928/FLR
Lamps light but no receiver output	Faulty antenna connection	Check antenna connection at J952
All signals weak	RESERVE GAIN adjustment incorrect	Check control setting

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVERALL FUNCTIONAL DESCRIPTION.

a. GENERAL. - Countermeasures Receiver R-1125/FLR is a triple-conversion, superheterodyne receiver which operates in the frequency range of 2.0 mc to 32.0 mc. Receiver output is an undemodulated i-f frequency of 65 kc having a fixed bandwidth of 60 kc. Continuous tuning over the frequency range is provided in four bands. An accurate 100-kc reference signal supplied by the companion O-928/FLR provides a synthesized frequency which is used for drift-cancelled tuning in 100-kc steps. The frequency of the continuous-tuning circuit can be monitored externally to obtain extremely accurate tuning of each 100-kc step. The frequency range is covered in the following four bands: (1) 2.0 mc to 4.0 mc, (2) 4.0 mc to 8.0 mc, (3) 8.0 mc to 16.0 mc, and (4) 16.0 mc to 32.0 mc.

Oscillator-Power Supply O-928/FLR supplies plate and filament voltages for the operation of one to five receivers. It also supplies an accurate and stable 100-kc reference signal to the receiver(s). Plate and filament supply voltages for the receiver oscillators are regulated by Zener-diode circuits in the receiver(s). The O-928/FLR provides the following voltages for receiver operation: (1) 100-kc crystal-controlled reference signal, (2) 175 volts dc, plate voltage, (3) 6.3 volts ac, filament voltage, (4) 18.0 volts ac, filament voltage (to regulating circuit), (5) 5.0 volts ac, indicator lamp voltage, and (6) 115 volts ac, crystal-oven voltage (to 100-kc crystal oscillator).

b. BASIC FUNCTIONAL DIAGRAM. - Figure 4-1 is a basic functional diagram of the R-1125/FLR and O-928/FLR. It shows the functional relationship between the sections. Only one R-1125/FLR is shown, but up to five can be operated simultaneously from one O-928/FLR. Individual cable connectors supply a 100-kc reference signal, and plate and filament voltages to each receiver.

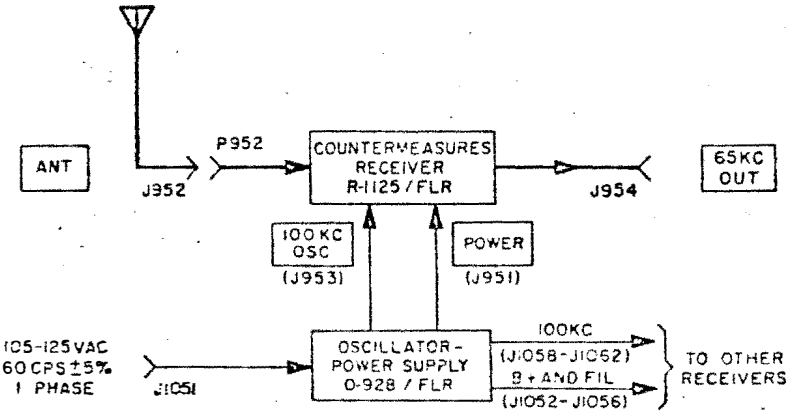


Figure 4-1. Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR, Basic Functional Diagram

c. FUNCTIONAL OPERATION. - Figure 4-2 is a functional block diagram of the R-1125/FLR and O-928/FLR. The main signal path through the assemblies is indicated by a heavy line with arrowheads showing the direction of signal flow. Arrowheads on light lines show the direction of signal flow for secondary signal paths.

(1) COUNTERMEASURES RECEIVER R-1125/FLR. - An r-f signal at the antenna is selected and amplified by the r-f amplifier, and applied to the first mixer. Here it is combined with a locally generated r-f signal from the high-frequency oscillator (HFO) to produce the first i-f frequency between 1625 kc and 1725 kc. A 60-kc signal bandwidth is selected by the tunable i-f filter and applied to the second mixer to obtain the second i-f frequency of 220 kc. After amplification, the signal is applied to

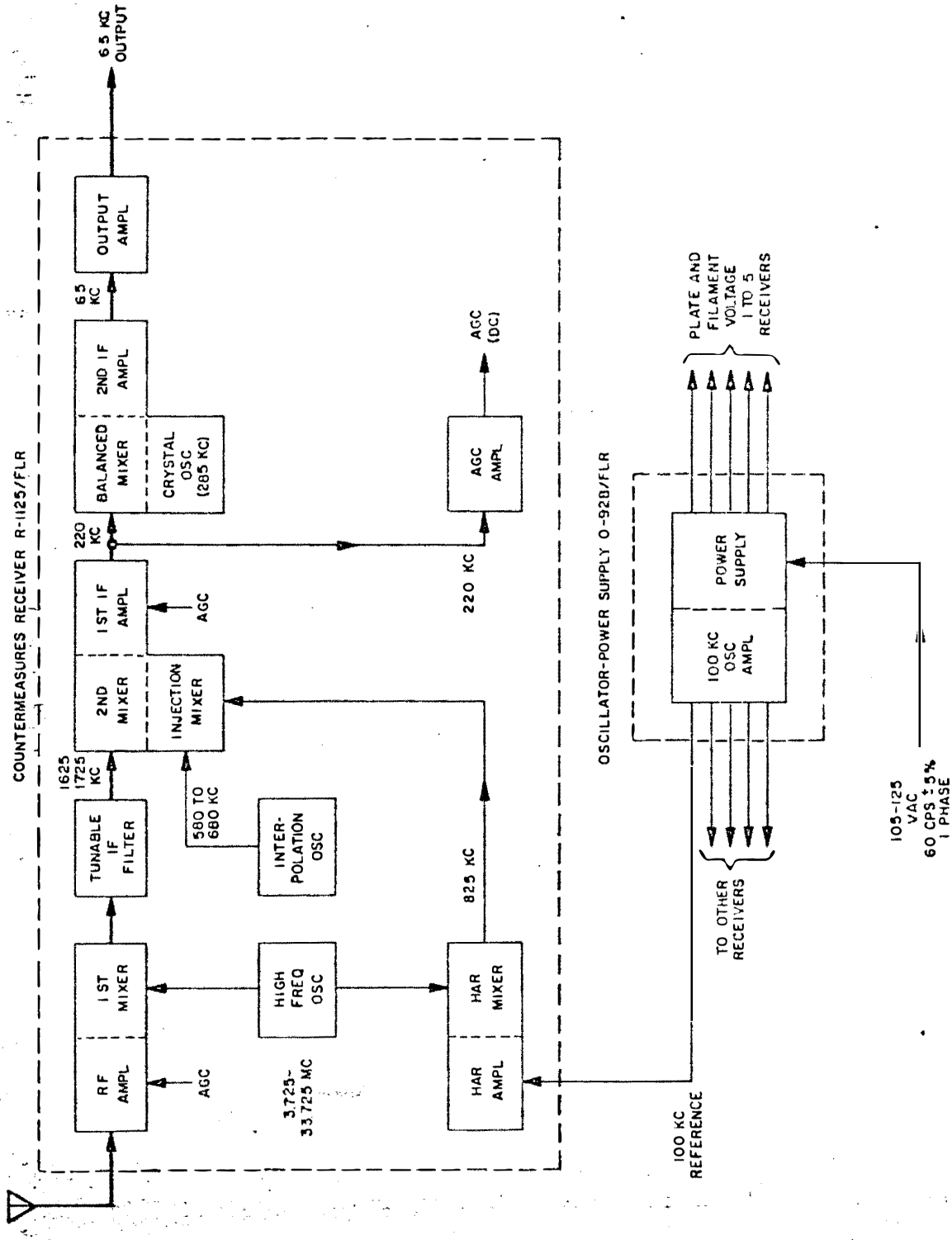


Figure 4-2. Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR, Functional Block Diagram

the balanced mixer where it is combined with a locally generated 285-kc signal to obtain the third i-f frequency (output frequency) of 65 kc. This signal is amplified by the output amplifier to obtain a required signal level at the receiver output.

(a) AGC AMPLIFIER. - The agc amplifier receives a 220-kc i-f frequency from the first i-f amplifier. After amplification and rectification, the resultant d-c voltage is applied to the receiver r-f and i-f stages. Because the magnitude of the agc voltage is proportional to the carrier strength of signals present in the first i-f amplifier, the gain of r-f and i-f stages is controlled to provide a relatively constant receiver output for a wide range of received signals.

(b) HARMONIC AMPLIFIER. - A 100-kc reference signal from the O-928/FLR is applied to the harmonic amplifier. A diode circuit generates 100-kc harmonics which are selected, amplified, and applied to the harmonic mixer. Here the selected harmonic is combined with a locally generated signal from the HFO to produce the 825-kc injection frequency. This frequency is combined with a 580- to 680-kc signal from the interpolation oscillator at the injection mixer to produce a 1405- to 1505-kc signal. In turn, this signal is combined with a 1625- to 1725-kc signal from the tunable i-f filter at the second mixer to obtain a 220-kc i-f frequency.

(2) OSCILLATOR-POWER SUPPLY O-928/FLR. - This unit consists of a 100-kc oscillator-amplifier and a d-c power supply. It is designed for operation from a 105-125 volt a-c primary power source, and supplies plate and filament voltages for the simultaneous operation of one to five receivers.

(a) 100-KC OSCILLATOR-AMPLIFIER. - This assembly consists of a plug-in temperature-controlled crystal oven with a 100-kc crystal which is plugged into the chassis. The crystal oscillator is followed by a two-stage 100-kc amplifier to provide an extremely accurate 100-kc reference frequency for one to five receivers. Individual cable connectors on the common chassis permit receiver connections.

(b) POWER SUPPLY. - The power supply consists of a power transformer, diode bridge-rectifier, and a two-section LC filter. It supplies filament and plate voltage for operation of the crystal oscillator-amplifier, and filament and plate voltages for the simultaneous operation of one to five receivers. Individual cable connectors on the chassis provide for receiver connections. A selector switch on the chassis has five positions (to accommodate from one to five receivers). When placed in the proper position, compensating resistors are selected to insure that the normal value of plate voltage is supplied for any number of receivers between one and five.

d. TRIPLE FREQUENCY CONVERSION. - Figure 4-3 is a block diagram showing the development of the three i-f frequencies in the receiver. The preselector r-f amplifiers select an operating frequency between 2.0 and 32.0 mc and apply the signal, after amplification, to the first mixer. The mixer combines the received signal with the first injection frequency of 3.725 to 33.725 mc supplied by the high-frequency oscillator, to produce the first i-f frequency of 1625 to 1725 kc. The tunable i-f filter selects the difference frequency from the combined signals. A description of the receiver tuning system is given in paragraph 4-1e.

The tunable i-f filter output signal is amplified and applied to the second mixer where it is combined with the second injection frequency of 1405 to 1505 kc. The second mixer output contains the second i-f frequency of 220 kc, which is selected and amplified by the first i-f amplifier and applied to the balanced mixer.

The balanced mixer provides the third and final conversion frequency of 65 kc by combining the 220-kc i-f frequency with a locally generated 285-kc frequency from a crystal oscillator. The 65-kc difference frequency is then amplified to obtain the receiver output signal.

e. TUNING SYSTEM. - Figure 4-4 is a block diagram showing the receiver tuning system, the stages which are jointly tuned, and the functional relationship between the two tuning controls (TUNING (Mc) and TUNING (Kc)). To serve as an example, the frequency of 2.105 mc has been arbitrarily selected as the frequency to which the receiver is tuned. All signal and injection frequencies noted in figure 4-4 are present when the receiver is tuned to this frequency.

(1) MEGACYCLE COUNTER. - When the receiver is tuned to 2.105 mc the MEGACYCLE counter will read 02.1, and the preselector will be tuned to accept a 160-kc wide signal-band between 2.07 and 2.23 mc (see detail A in figure 4-4). Because the high-frequency oscillator (HFO) is jointly tuned with the preselector, setting the MEGACYCLE counter to 02.1 also tunes the HFO to a frequency of 3.825 mc. The received signal of 2.105 mc is combined with the 3.625 mc oscillator signal in the

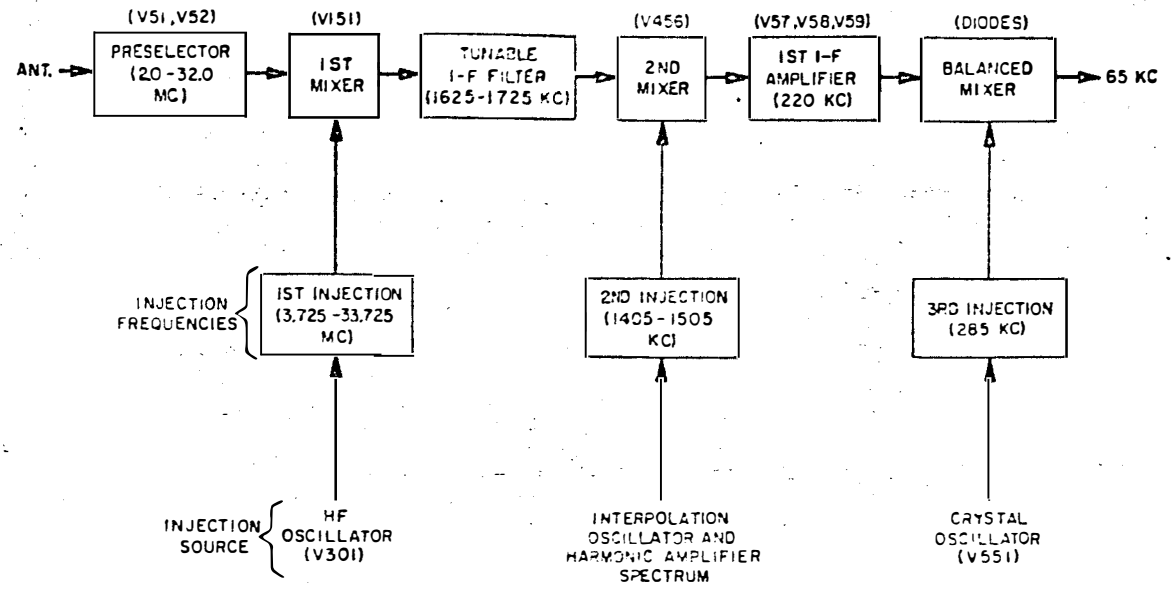


Figure 4-3. Countermeasures Receiver R-1125/FLR, Frequency Conversion Diagram

first mixer (V151) to produce the first i-f frequency of 1720 kc (3825 minus 2105 = 1720). The 3.825-mc signal from the HFO will also combine with other signals present in the preselector between 2.1 mc and 2.2 mc.

The harmonic amplifier is jointly tuned with the preselector and HFO to select the 3.0-mc harmonic of the 100-kc reference signal (see detail D in figure 4-4). This harmonic (the 30th is combined with the 3.825-mc HFO signal in the harmonic mixer (V251) to obtain the 825-kc injection signal which is applied to the first injection amplifier stage (3.825 minus 3.0 = 0.825). After amplification, the 825-kc injection signal is applied to the injection mixer (V453) where it is combined with a signal from the interpolation oscillator.

(2) KILOCYCLE COUNTER. - When the receiver is tuned to a signal frequency of 2.105 mc the KILOCYCLE counter will read 05.0, and the tunable i-f filter is tuned to accept all signals (within a 60-kc band) centered at 1720 (see detail B in figure 4-4). The interpolation oscillator is jointly tuned with the tunable i-f filter, and the oscillator output is a 675-kc signal which is applied to the injection mixer (V453). The mixer combines the 675-kc signal with the 825-kc signal from the injection amplifier to obtain a 1500-kc signal (675 plug 825 = 1500), which is amplified by the third injection amplifier stage and applied to the second mixer (V456). The second mixer combines the 1500-kc injection signal with the 1720-kc signal from the tunable i-f filter to produce a 220-kc i-f frequency for the first i-f amplifier (1720 minus 1500 = 220), (see detail C, figure 4-4).

f. DRIFT CANCELLATION. - Figure 4-4 also shows the drift cancellation circuit for the HFO. Frequency drift occurring in the HFO (V301) is cancelled and does not appear at the second mixer output (V456). The second mixer receives two input signals; one at 1720 kc from the tunable i-f filter, and one at 1500 kc from the third injection-amplifier stage. Since both signals are derived from the HFO output, frequency drift in the HFO will have equal effect on each signal. The 220-kc difference frequency from the 2nd mixer (V456) will not change as a result of HFO drift. A detailed explanation of the drift-cancelling process is given in paragraph 4-2a(4).

4-2. FUNCTIONAL SECTIONS.

In figure 4-5, the detailed block diagram, all functional sections are enclosed by broken lines. A detailed theory of operation of these assemblies is given in the following paragraphs.

a. COUNTERMEASURES RECEIVER R-1125/FLR. - The receiver consists of the following major assemblies: preselector, tunable i-f filter, first i-f and injection amplifier, mixer and second i-f amplifier, output amplifier, high-frequency oscillator, interpolation oscillator, and agc amplifier. As shown in figure 4-5, more than one functional section may be located on a common major assembly.

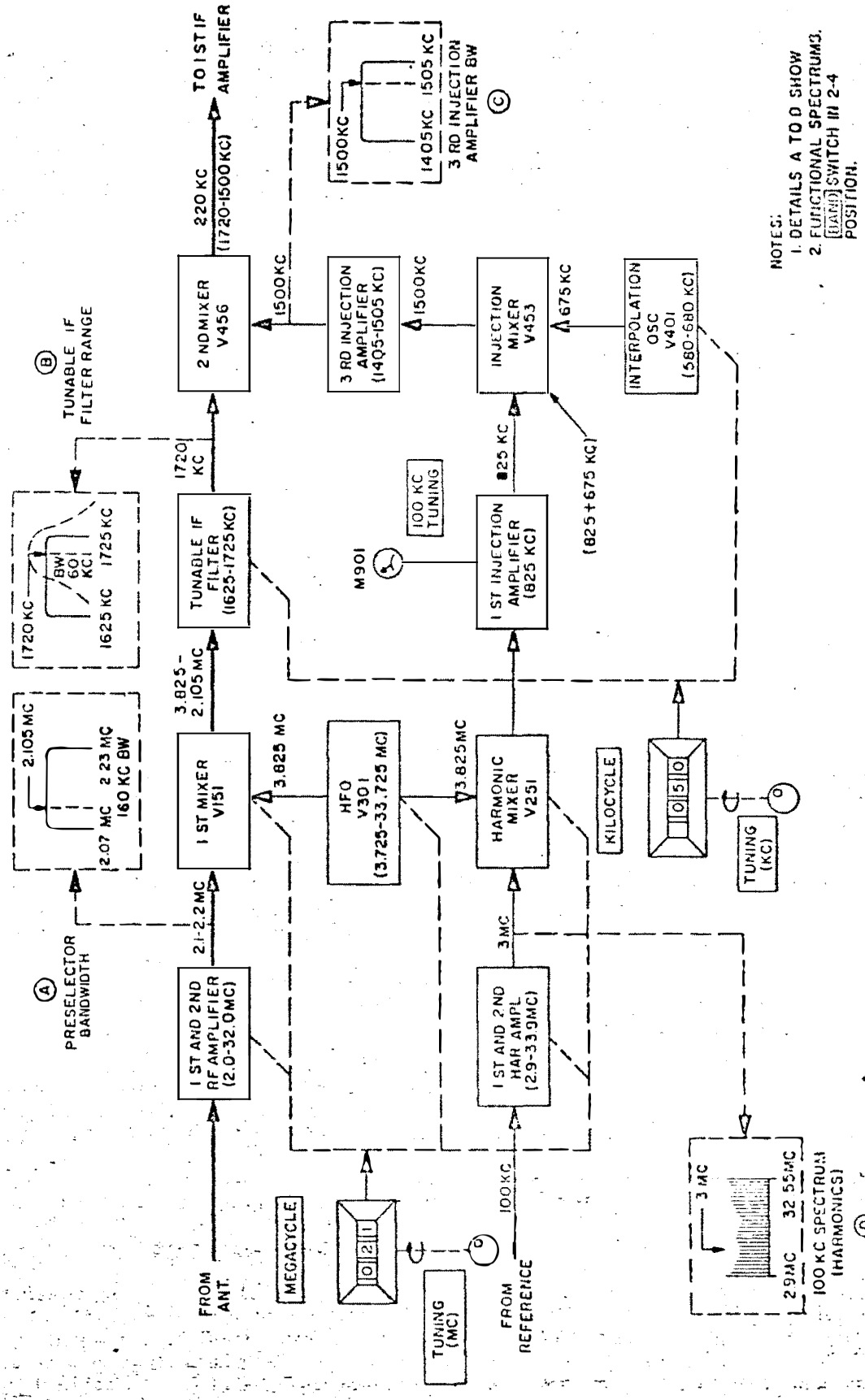


Figure 4-4. Countermeasures Receiver R-1125/FLR, Basic Tuning Diagram

For example, the 100-kc buffer (V605) is located on the agc amplifier assembly; this relationship is indicated by the circled letter B in both blocks. Figure 4-5 was arranged in this manner to permit rapid analysis and tracing of the main signal path.

(1) PRESELECTOR. (See figures 4-6 and 4-7.) - The preselector consists of r-f amplifiers (V51 and V52) and the first mixer (V151). The function of the preselector is to select and amplify the tuned signal(s) and combine it (them) with a locally generated signal from the high-frequency oscillator (V301). Figure 4-6 shows the r-f amplifiers operating in band 1 (2-4) position. An r-f signal from the antenna is applied to the preselector at input connector J51. A tuned circuit consisting of r-f coil L51, tuning capacitor C801A, and trimmer capacitor C51, selects the desired operating frequency. Variable capacitor C801A is one section of a three-section tuning capacitor adjusted by the front panel TUNING (Mc) control. The signal is coupled to the control grid of first r-f amplifier V51 through coupling capacitor C57. The output signal from V51 is developed across r-f coil L55 and applied to the grid of the second r-f amplifier V52 through coupling capacitor C72. R-f coil L55 is tuned by variable capacitor C801B which is jointly tuned with variable capacitor C801A. The output of V52 is developed across r-f coil L151 (see figure 4-7) and applied to first mixer V151. Mixer V151 receives signals from the HFO at J153 and from the second r-f amplifier at J151. Mixer V151 heterodynes these inputs to produce the first i-f frequency (1625 to 1725 kc) across i-f coil L351 in the tunable i-f filter (see figure 4-8).

Agc voltage from the agc amplifier is applied to r-f amplifier V51 and V52 through resistors R55 and R64, respectively. Test points (TP)J52, (TP)J55, and (TP)J152 permit signal testing at the control grids of each rf amplifier, and the mixer.

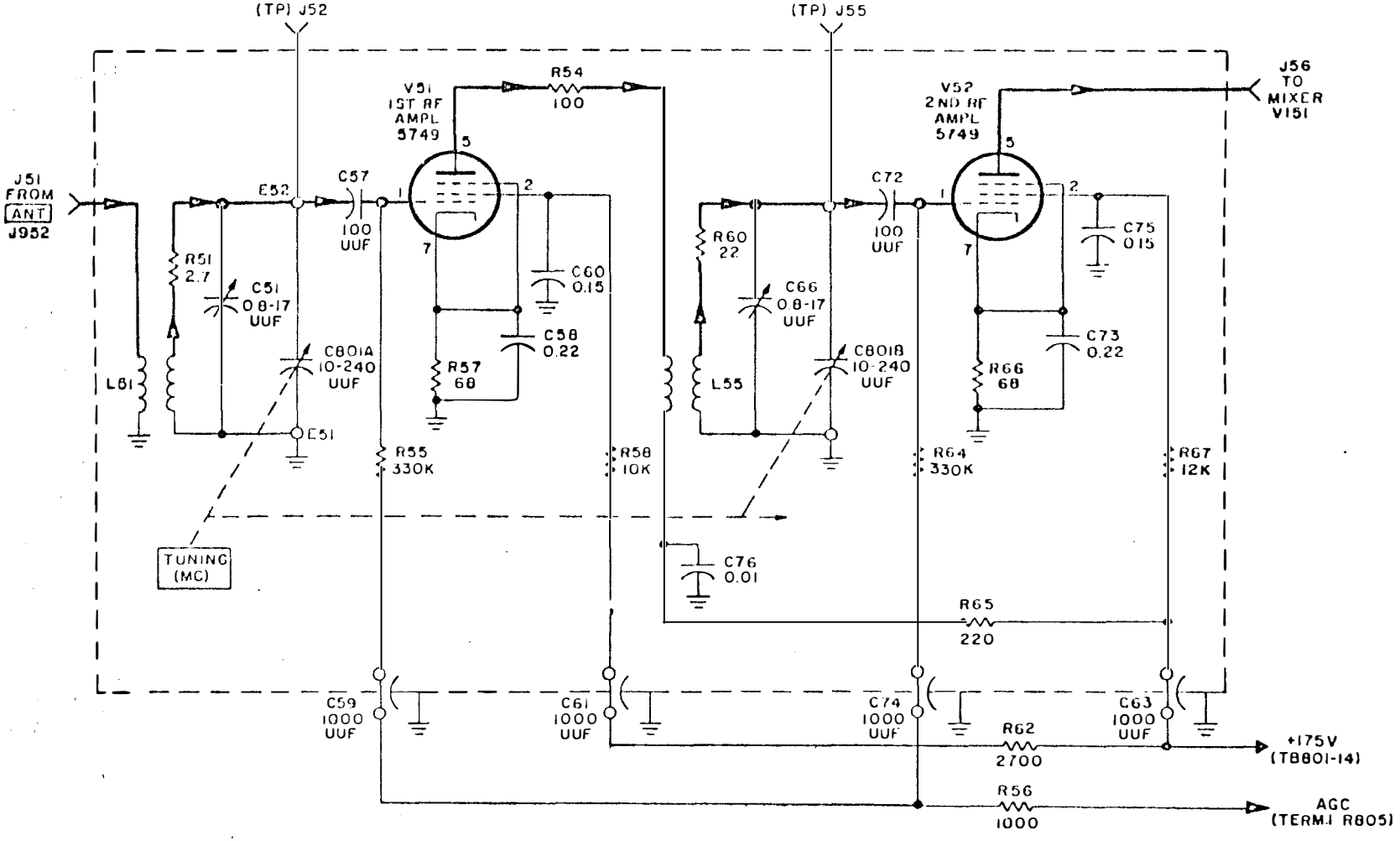
(2) TUNABLE I-F FILTER. (See figure 4-8.) - The tunable i-f filter is a continuously tuned four-section band pass filter which follows the preselector mixer. Actually, the first section of the filter (L351 and C351A) contains the plate load for the preselector mixer (at J154). The output signal from the mixer is developed in this section. The four filter sections are jointly tuned by a four-section variable capacitor (C351). This capacitor is ganged to the interpolation oscillator tuning capacitor (C407), both of which are adjusted by the front panel TUNING (Kc) control. The tunable i-f filter selects the first conversion frequency (or frequencies) from the output of the preselector mixer.

Figure 4-8 shows the arrangement of the resonant circuits of the filter. Each filter section has a parallel resonant circuit which is shielded to prevent coupling between coils. Coils L351 and L352 are coupled by coil L353 which is common to the return circuit of both coils. The tuned circuits of coil L352 and coil L354 are coupled through capacitors C353, C355, and common coupling capacitor C354. The relatively small value of capacitors C353 and C355 as compared to the value of C354, acts to isolate the two tuned circuits. Common coupling coil L356 provides sectional coupling for the remaining filter sections, L354 and L355. The tunable i-f filter output, at connector P456, is applied to the first i-f and injection amplifier assembly which follows.

(3) FIRST I-F AND INJECTION AMPLIFIER. (See figure 4-9.) - The i-f and injection amplifier contains three functional sections. These are: the first i-f amplifier, consisting of V455 through V459; the injection amplifier, consisting of V451, V452, V453, and V454; and the output amplifier (refer to paragraph 4-2a(7)). The drift-cancelling circuit for the high-frequency oscillator is formed by the circuit arrangement of the i-f amplifier and injection stages. Figure 4-9 is a block diagram of the first i-f and injection amplifier showing the relationship of these circuits. The following paragraphs describe the operation of each functional section.

(a) FIRST I-F AMPLIFIER. - Figure 4-10 is a simplified schematic diagram of the first i-f amplifier. This section receives the 1625- to 1725-kc signals from the tunable i-f filter, converts this i-f frequency to 220 kc, amplifies the signal, and applies it to the mixer and second i-f amplifier which follows. A signal from the tunable i-f filter (at connector J456) is applied to the control grid of V455 through coupling capacitor C483. The output signal is developed across a resonant circuit composed of capacitor C477 and i-f coil L452, and applied to second mixer V456 through coupling capacitor C478. The output signal is combined in the second mixer with a 1405- to 1505-kc injection signal from the injection amplifier (from V454). The resultant difference frequency of 220 kc (1625 to 1725 kc minus 1405 to 1505 kc) is applied to i-f filter FL453. The filter trimming capacitors are C498 and C499.

Amplifier tube V457 receives the 220-kc signal from FL453 through coupling capacitor C486. The output signal is coupled to amplifier tube V458 through coupling capacitor C484. The interstage coupling circuit between V458 and V459 consists of coupling capacitor C488, resistor R808, front panel OUTPUT LEVEL control R901, and coupling capacitor C492. Cable connections to the i-f amplifiers are made at connectors J458 and J459. Resistor R808 and OUTPUT LEVEL control R901 form an attenuator circuit with R901 serving as the adjustable shunt-arm. The i-f signal level applied to



NOTES:
1. ALL VALUES IN OHMS AND MICROFARADS, UNLESS OTHERWISE SPECIFIED.
2. CIRCUIT SHOWN WITH BAND SWITCH IN POSITION 2-4

Figure 4-6. Preselector R-F Amplifiers, Simplified Schematic Diagram

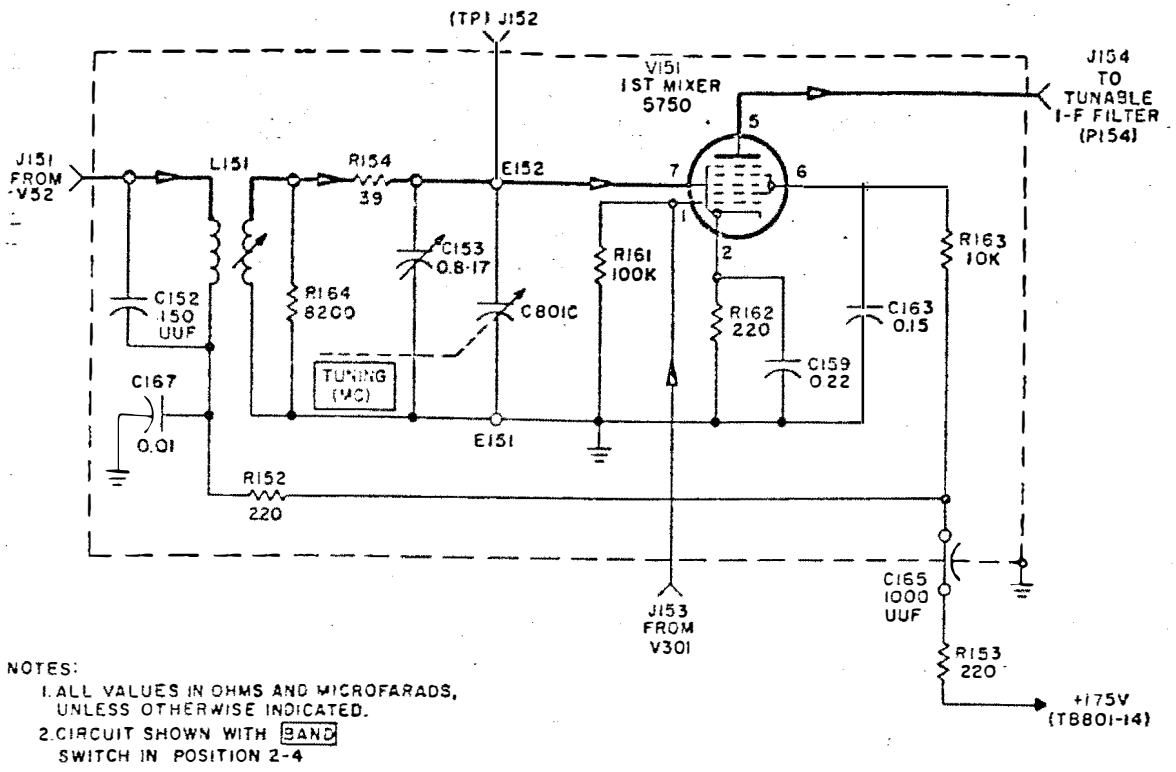


Figure 4-7. Preselector Mixer, Simplified Schematic Diagram

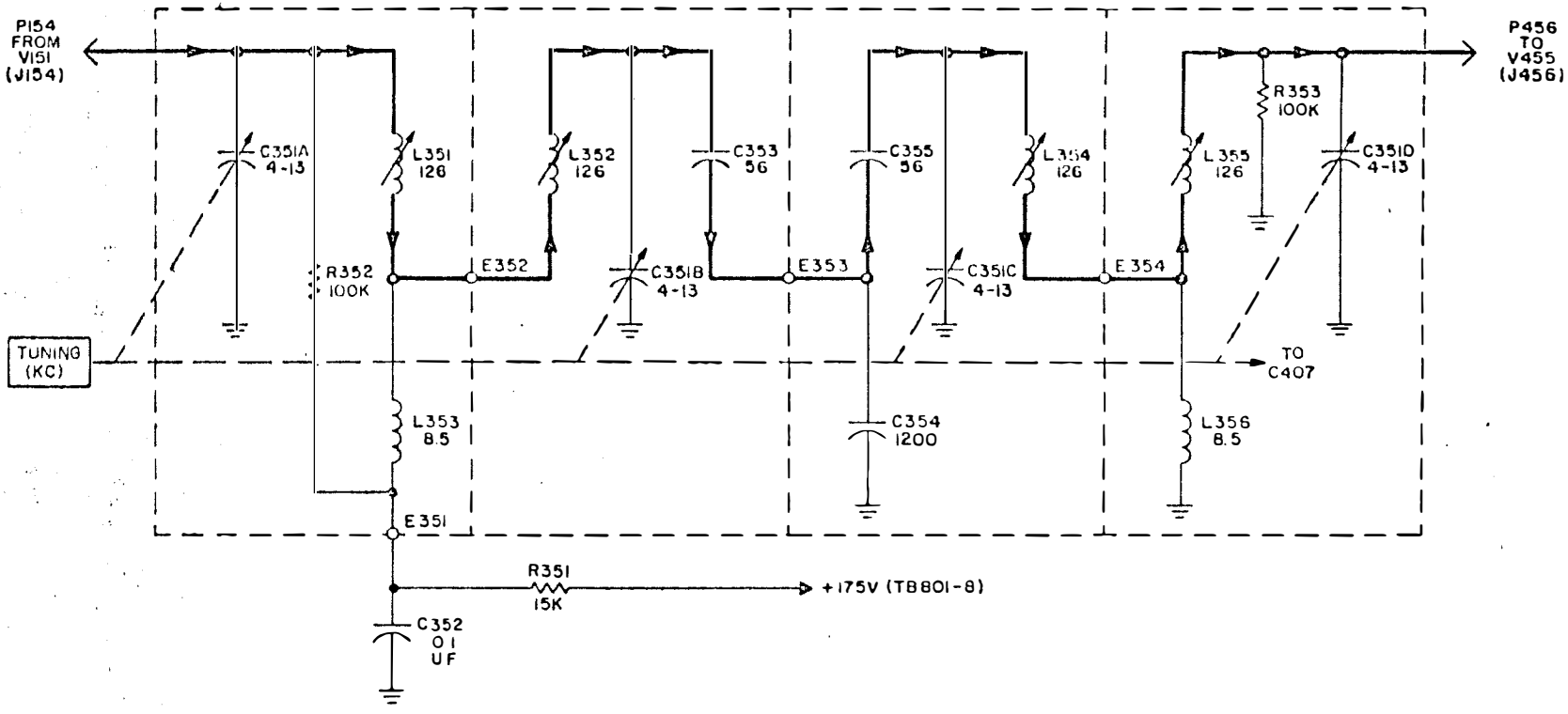
amplifier V459 is adjusted by R901. The 220-kc output signal from V459 is coupled to the balanced mixer stage which follows by capacitor C493 through connector J460.

Agc voltage from the agc amplifier is applied to i-f amplifier tubes V455, V457, V458, and V459 through resistors R474, R482, R483, and R505, respectively. Amplifier tubes V457, V458, and V459 are RC coupled stages with i-f selectivity determined by bandpass filter FL453.

(b) INJECTION AMPLIFIER. - Figure 4-11 is a simplified diagram of the injection amplifier circuit. This section receives the 825-kc signal from the harmonic mixer (V251) and combines it with a 680- to 580-kc signal from the interpolation oscillator (V401) to obtain the 1405- to 1505-kc signal which is applied to the second mixer (V456) in the first i-f amplifier. An 825-kc signal at J451 is applied to first injection amplifier tube V451 through coupling capacitor C482. A resonant circuit consisting of capacitor C457 and i-f coil L455 is tuned to accept the 825-kc signal. The output signal is coupled to second injection cathode follower V452 through i-f filter FL451 which is tuned by trimmer capacitors C459 and C460.

The 100 KC TUNING meter (M901) is a d-c microammeter which functions as a voltmeter to measure the d-c voltage developed across the cathode resistor (R452) of first injection amplifier tube V451. Resistor R470 is the meter multiplier and capacitor C451 bypasses the signal components. Meter M901 provides a minimum reading (dip) when an 825-kc signal is applied to V451, and functions as a signal tuning indicator for 100-kc increment receiver tuning. A separate agc circuit (not to be confused with the receiver agc circuit) stabilizes injection amplifier gain and indirectly operates the 100-kc tuning meter.

The output signal from second injection cathode follower V452 is applied to the injection grid of injection mixer V452 through coupling capacitor C462. Injection mixer V452 combines the 825-kc signal with the 580- to 680-kc interpolation oscillator signal (from V452). Mixer output is the sum frequency of 1405 to 1505 kc (825 plus 580 to 680 = 1405 to 1505). Filter FL452 couples the mixer output to third injection amplifier V454; trimmer capacitors C463 and C468 tune the filter. The output signal from V454 is coupled to the signal grid of second mixer V456 (in the first i-f amplifier) by capacitor C472. A resonant circuit consisting of i-f coil L451 and series capacitors C471 and C472 is tuned to the 1405- to 1505-kc injection frequency. (See figure 4-10.)



NOTE:

ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.

Figure 4-8. Tunable I-F Filter, Simplified Schematic Diagram

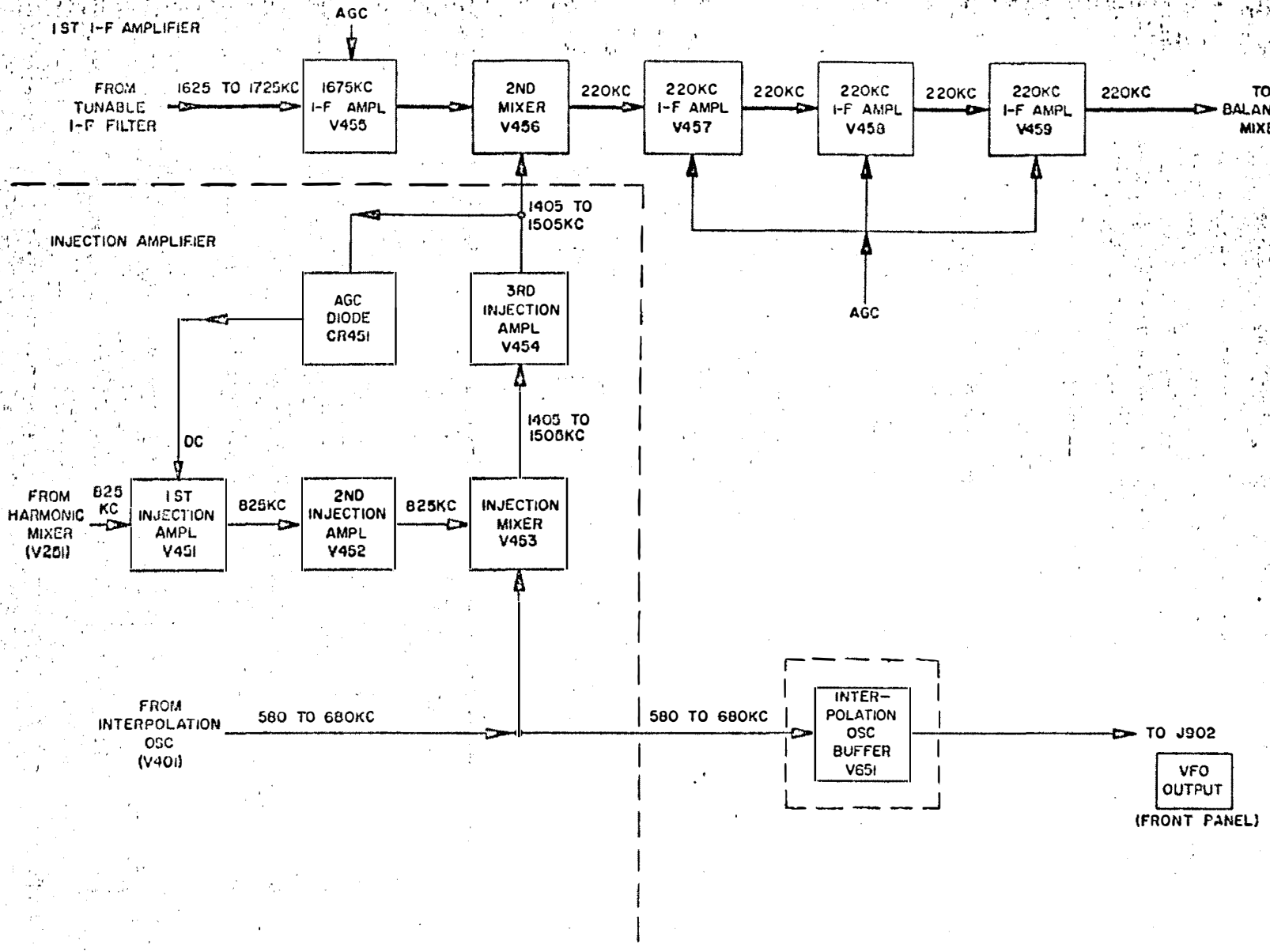
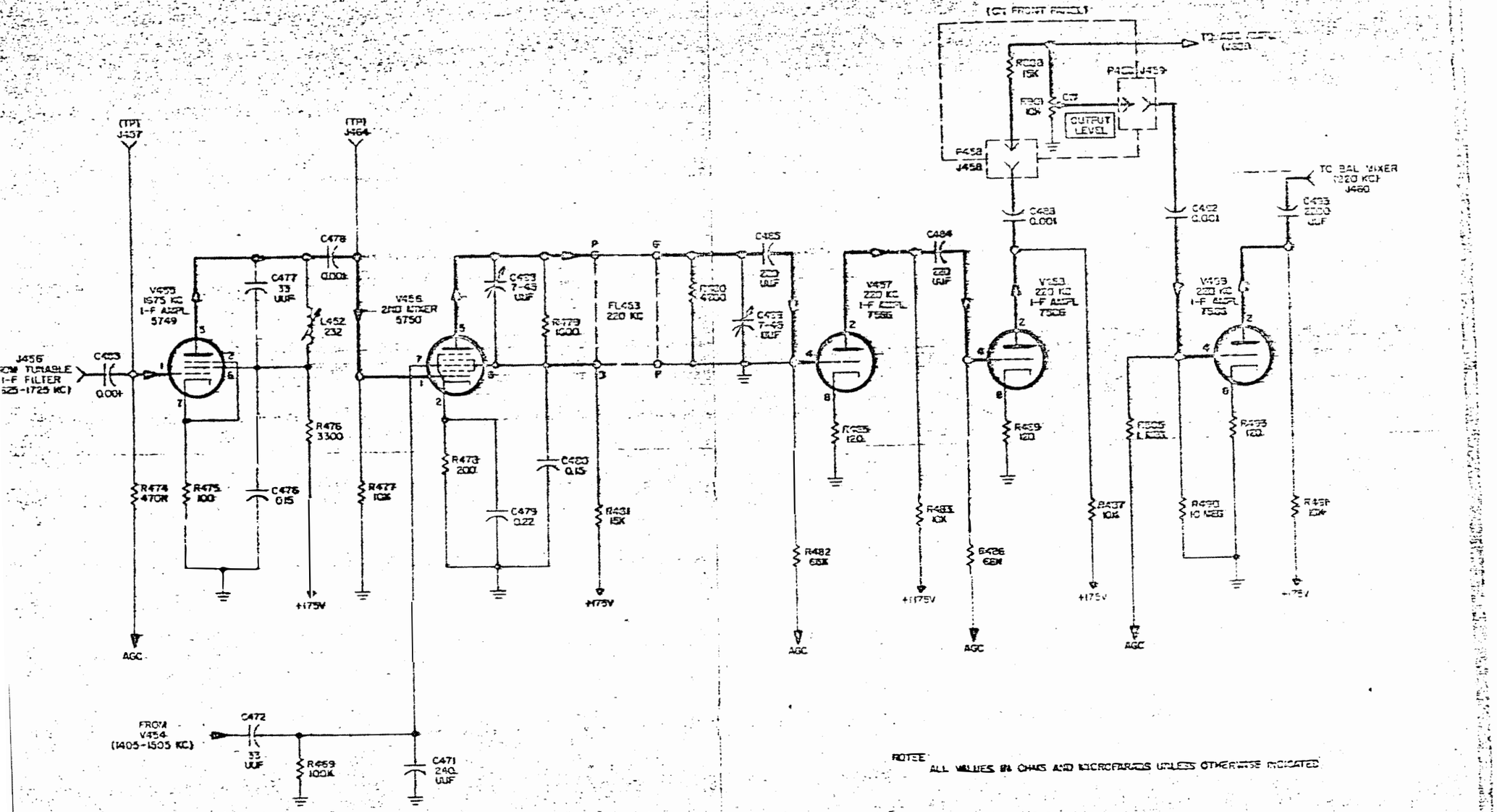
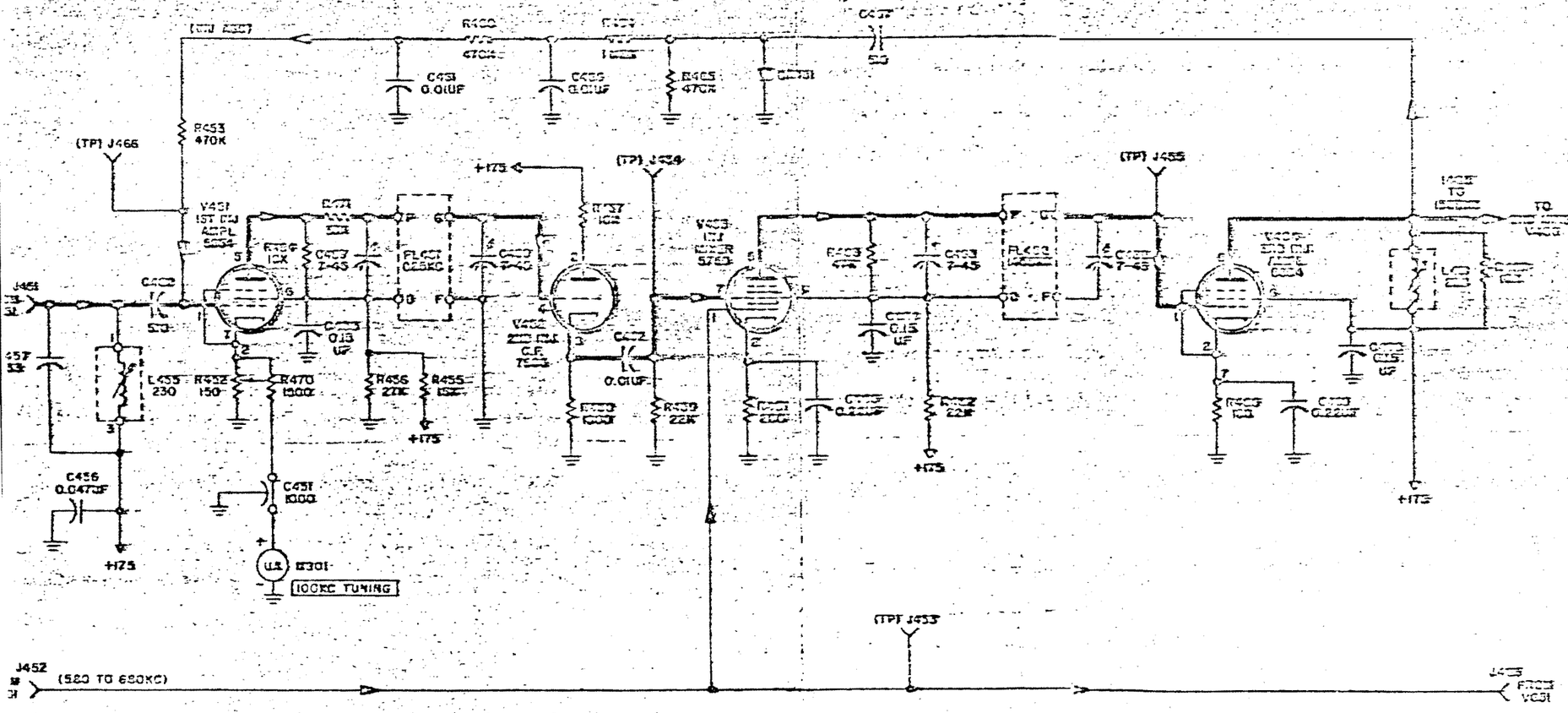


Figure 4-9. First I-F and Injection Amplifier, Block Diagram



NOTES:
ALL VALUES IN OHMS AND MICROFARADS UNLESS OTHERWISE INDICATED

Figure 4-10. First I-F Amplifier, Simplified Schematic Diagram



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Connector J463 applies the interpolation oscillator signal to interpolation oscillator buffer V651, (see paragraph 4-2a(5) and figure 4-13). Test jacks (TP)J466, (TP)J454, and (TP)J455 permit signal testing at the control grids of V451, V453, and V454, respectively.

The age circuit (not to be confused with the receiver age circuit), stabilizes the gain of the injection amplifier and indirectly operates the 100 KC TUNING meter M901. The 1405- to 1505-kc output signal from injection amplifier V454 is applied to age rectifier CR451 through coupling capacitor C467. The diode rectifies the signal to produce a d-c voltage which is proportional to signal strength across age lead resistor R465. A low-pass RC filter composed of resistors R460 and R464, and capacitors C461 and C466, removes the i-f component from the rectified signal. This age voltage is applied to injection amplifier V451 through resistor R453. Meter M901 (in the absence of a signal) indicates the plate current of V451 as a function of the voltage drop across cathode resistor R452. With an 825-kc signal present, the age voltage developed increases the grid bias which causes a drop in plate current. This drop produces a minimum reading (dip) at meter M901. Since the 825-kc signal is present only at precise 100-kc tuning intervals, the meter reading provides an accurate indication of receiver tuning in 100-kc increments.

(4) FREQUENCY DRIFT CANCELLATION. (See figure 4-12.) - A drift-cancelling loop for the high-frequency oscillator (V301) is formed by injection-amplifier stages V451, V452, V453, and V454. Figure 4-12 shows a basic block diagram of a drift-cancelling circuit which is similar to that used in the receiver. The following description explains the operation of the basic circuit. Notations at each block relate that block to a similar stage in the receiver.

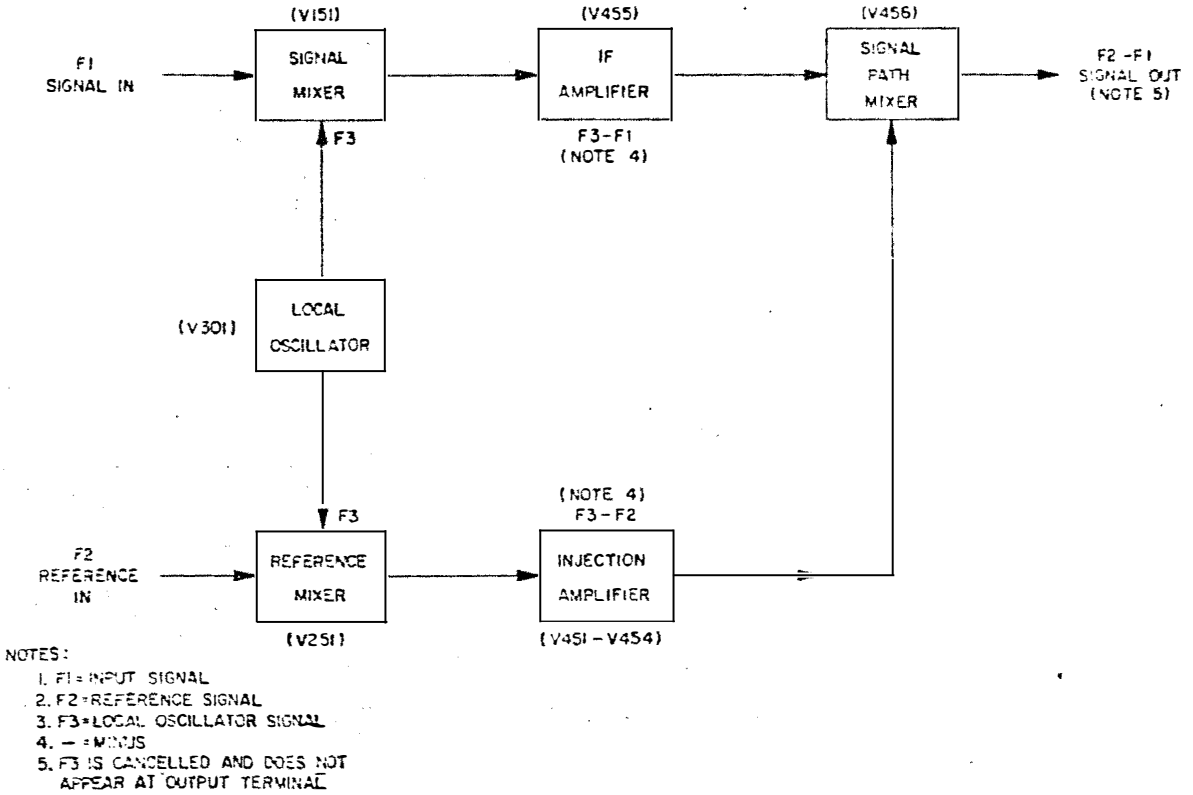


Figure 4-12. Basic Drift-Cancelling Loop, Block Diagram

When the signal from a local oscillator is applied simultaneously to two mixers (V151 and V251), the two conversion frequencies obtained will exhibit identical frequency changes as a result of local-oscillator drift. When the mixer outputs are amplified and combined in a third mixer (V456), the conversion process eliminates the effects of local-oscillator drift. Cancellation is not obtained for any frequency drift due to either signal or reference inputs.

With reference to figure 4-12, signal frequency F1 is applied to the signal mixer (V151), and reference frequency F2 to the reference mixer (V251). Local oscillator signal F3 is applied to both

mixers. Output from the signal mixer is a difference frequency, F3 minus F1, which is amplified by V455 and applied to one input of signal-path mixer V456. Output from the reference mixer is a difference frequency, F3 minus F2, which is amplified by V451 through V454 and applied to the other input of signal-path mixer V456. The difference frequency from V456 is F2 minus F1. The local oscillator term F3 has been eliminated and, consequently, frequency drift originating at the local oscillator.

The interpolation oscillator (V401) is omitted from figure 4-12 because it is not related to the drift-cancelling circuit. Frequency drift originating in the interpolation oscillator is not drift-cancelled. It is reduced to a minimum because of the low operating frequency used and through circuit design.

(5) INTERPOLATION OSCILLATOR BUFFER. (See figure 4-13.) - The interpolation oscillator buffer (V651) is an r-f amplifier. It amplifies the output signal from the interpolation oscillator and applies it to a monitor connection on the front panel (VFO OUTPUT, J902). In addition, it provides circuit isolation between interpolation oscillator V401 and the measuring equipment connected to J902. A 580- to 680-kc signal from the interpolation oscillator is applied to the control grid of buffer V651 through coupling capacitor C651. The buffer output is coupled to the VFO OUTPUT connector (J902) through r-f transformer T651.

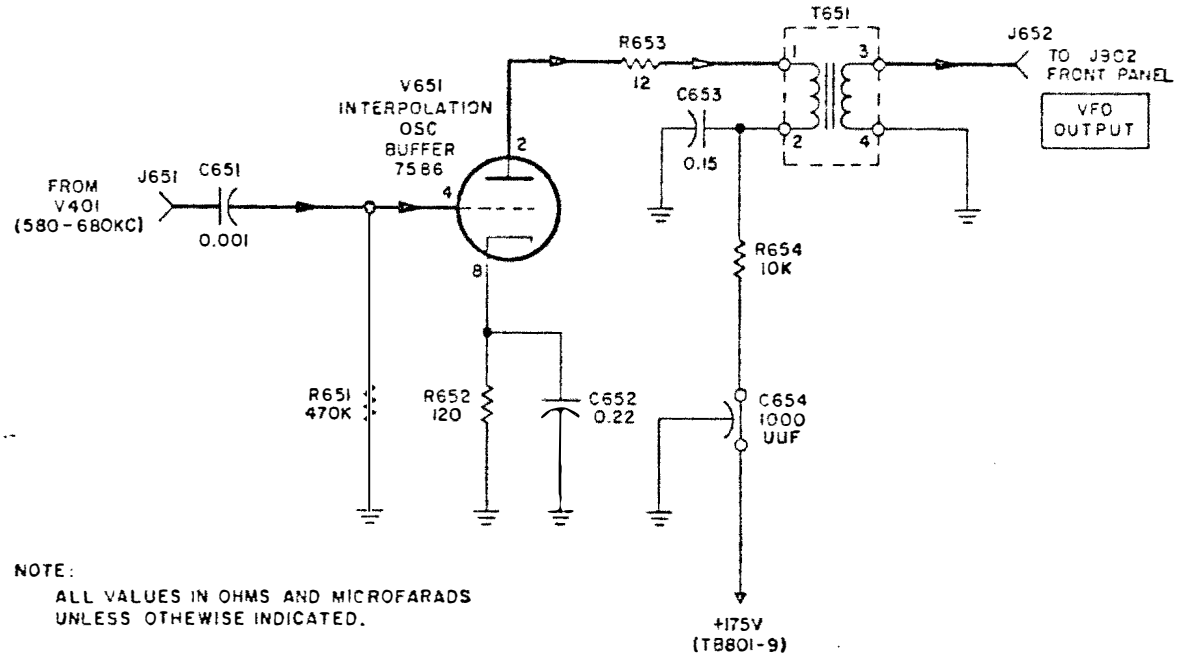
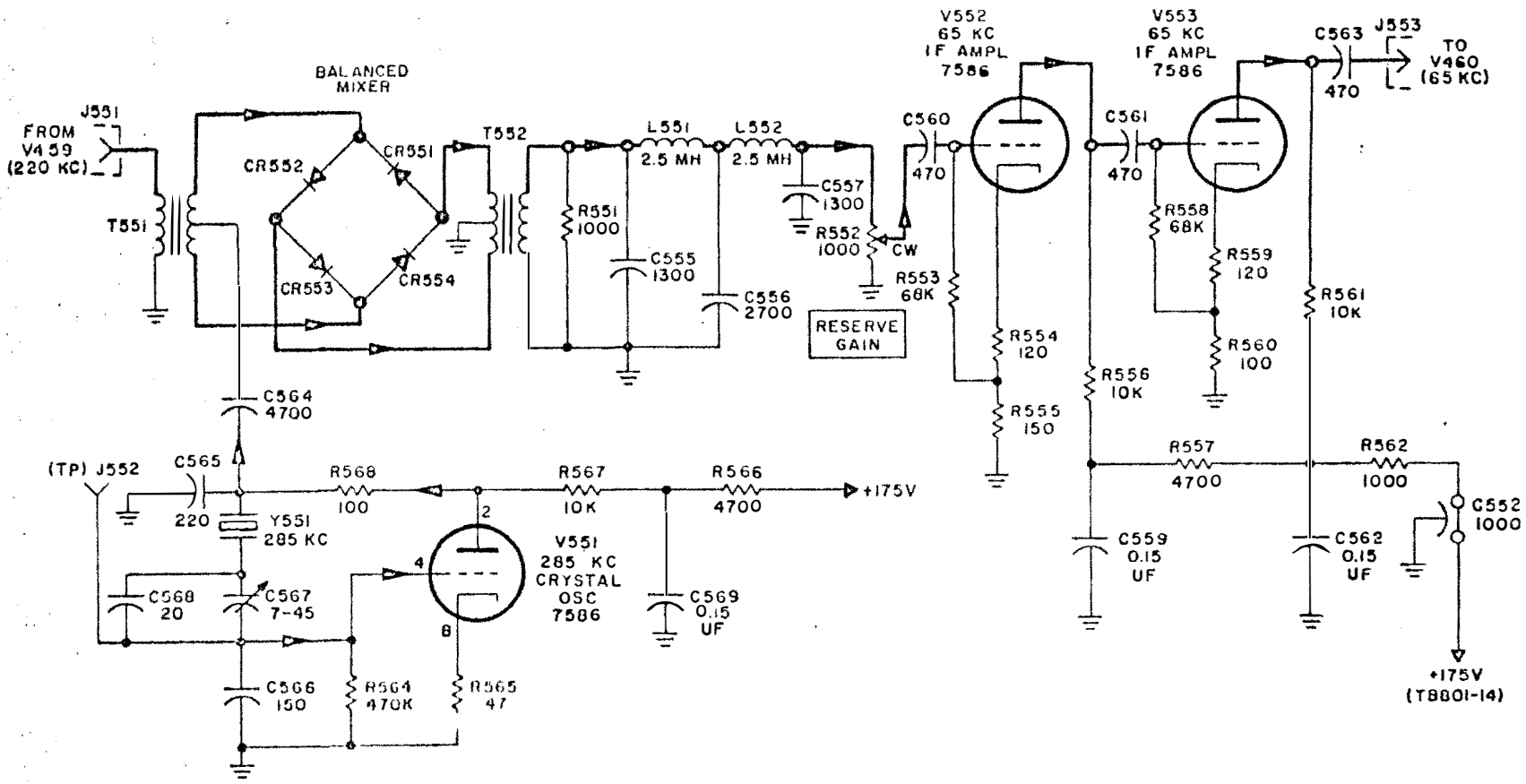


Figure 4-13. Interpolation Oscillator Buffer, Simplified Schematic Diagram

(6) MIXER AND SECOND I-F AMPLIFIER. (See figure 4-14.) - The mixer and second i-f amplifier consists of a balanced mixer (CR551 through CR554), a 285-kc crystal oscillator (V551), and the second i-f amplifier tubes (V552 and V553). The following paragraphs describe the operation of these functional sections.

(a) BALANCED MIXER. - The balanced mixer (balanced r-f demodulator) consists of input transformer T551, bridge-circuit diodes CR551, CR552, CR553, and CR554, and output transformer T552. The function of this circuit is to develop the receiver third-conversion frequency of 65 kc. A 220-kc signal from the first i-f amplifier is coupled to the diode mixer through transformer T551. A locally generated 285-kc signal from crystal oscillator V551 is applied to the center-tapped secondary of T551 through coupling capacitor C564. The difference frequency of 65 kc (285 minus 220 = 65) is obtained at output transformer T552. The balanced mixer effectively cancels the 285-kc signal from the crystal oscillator. A two-section low-pass filter consisting of L551 and L552, with C555, C556, and C557 prevents passage of the sum frequencies in the mixer output, but allows the 65-kc difference frequency to be applied to the RESERVE GAIN control (R553) for amplification by the second i-f amplifier which follows.

(b) 285-KC CRYSTAL OSCILLATOR. - This is the third conversion oscillator which



NOTE:
ALL VALUES IN MICROMICROFARADS AND OHMS UNLESS OTHERWISE INDICATED.

Figure 4-14. Mixer and Second I-F Amplifier, Simplified Schematic Diagram

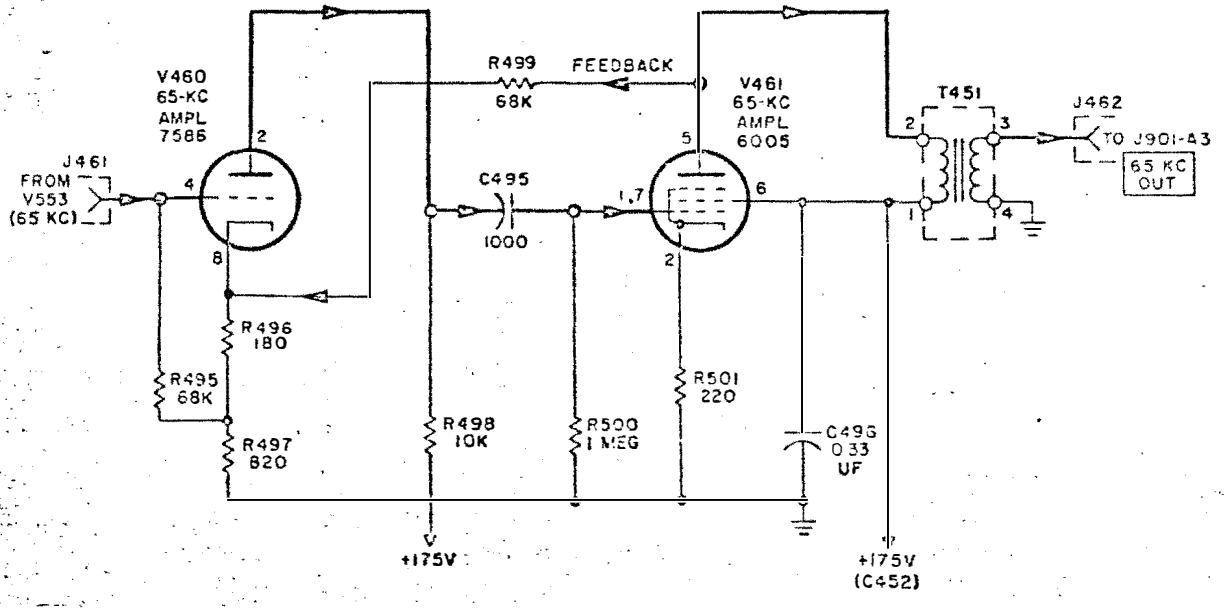
consists of V551 and 285-kc crystal Y551. The oscillator output is applied to the balanced mixer to develop the final i-f frequency of 65 kc. The circuit arrangement is a modified Pierce oscillator. Trimmer capacitor C567 allows minor adjustment of the oscillator frequency for calibration purposes. Test jack (TP)J552 permits the oscillator output to be monitored for test purposes.

(c) SECOND I-F AMPLIFIER. - The second i-f amplifier consists of amplifiers V552 and V553. This circuit amplifies the 65-kc i-f signal prior to amplification by the output amplifier which follows. Potentiometer R553 (RESERVE GAIN) sets the 65-kc signal level which is applied to amplifier tube V552 through coupling capacitor C560. The output is coupled to amplifier V553 through capacitor C561. After amplification to a suitable level, the 65-kc signal is applied to the output amplifier through coupling capacitor C563.

(7) OUTPUT AMPLIFIER. (See figure 4-15.) - The output amplifier which consists of 65-kc amplifiers V460 and V461, amplifies the signal from the second i-f amplifier to the level required for receiver output. The 65-kc signal at connector J461 is applied to the control grid of V460, amplified, and applied to the control grid of V461 through coupling capacitor C495. The output from V461 is applied to 65 KC OUT connector J954 located on the rear panel, through output transformer T451 and connector J462. A negative (voltage) feedback circuit consisting of R499 provides signal degeneration from the plate of V461 to the cathode of V460. This feedback stabilizes the gain of the output amplifier.

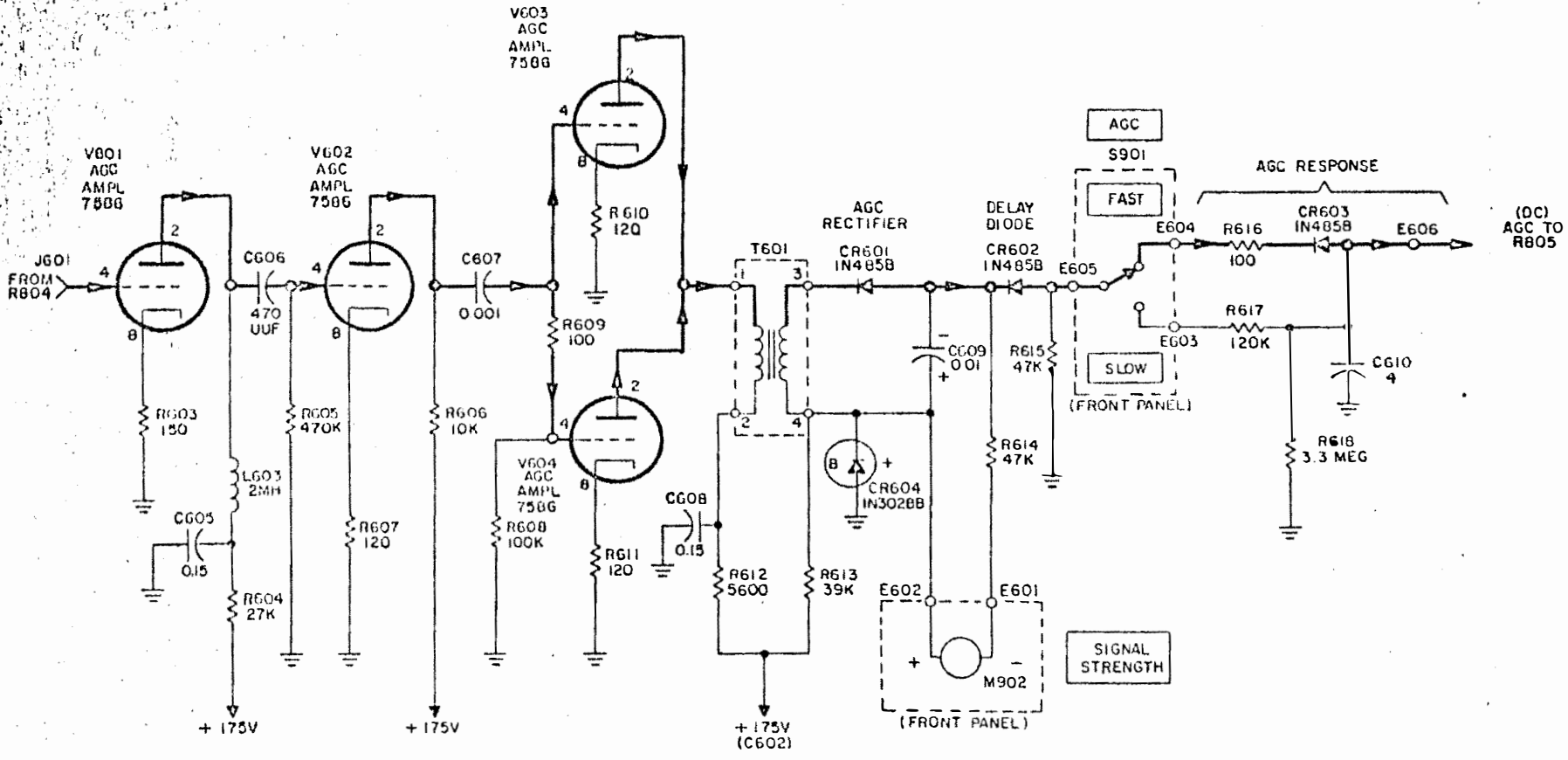
(8) AGC AMPLIFIER. (See figure 4-16.) - The agc amplifier assembly consists of agc amplifiers V601 through V604, and agc delay and timing circuits. The function of this assembly is to develop a d-c agc voltage which is applied to r-f amplifiers in the preselector, and to i-f amplifiers in the first i-f and injection amplifier, for automatic control of receiver gain in proportion to the strength of the received signal(s). In addition, an agc delay circuit prevents the development of an agc voltage when a weak signal is being received, and an agc timing circuit provides a quick-reaction slow-decay response. The SIGNAL STRENGTH meter (M902) on the front panel operates from the agc circuit.

(a) AMPLIFIER. - A 220-kc i-f signal from the first i-f amplifier (see figure 4-10), is applied to the control grid of V601 through connector J601. The output is applied to V602 through coupling capacitor C606; coil L603 acts as an untuned load impedance for the plate of V601. The output from V602 is applied to the parallel-connected control grids of V603 and V604 through C607. The plates of V603 and V604 are also parallel-connected and the output signal is coupled directly to transformer T601. Tubes V603 and V604 are operated in parallel to provide a low impedance signal source for the agc circuit which follows.



NOTE:
ALL VALUES IN OHMS AND MICROMICROFARADS
UNLESS OTHERWISE INDICATED.

Figure 4-15. Output Amplifier, Simplified Schematic Diagram



NOTE:
ALL VALUES IN OHMS AND MICROFARADS
UNLESS OTHERWISE SPECIFIED

Figure 4-16. AGC Amplifier, Simplified Schematic Diagram

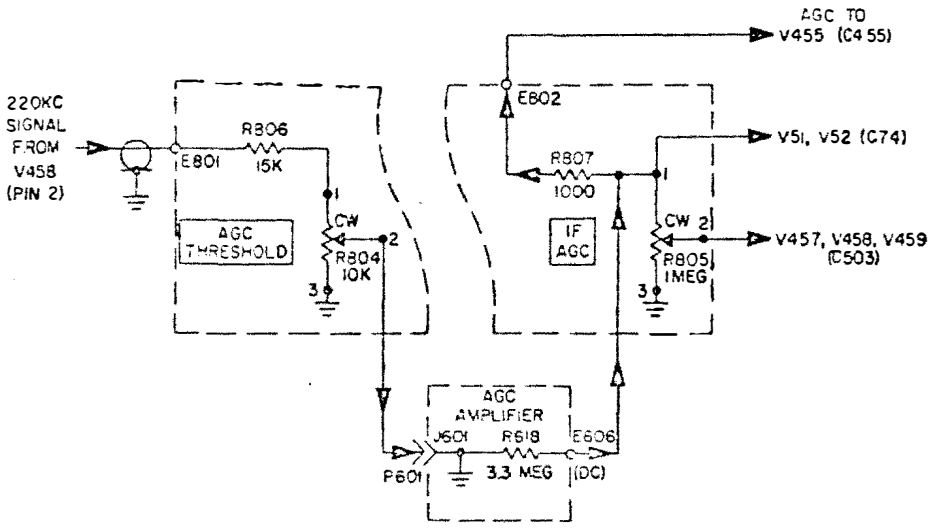
(b) DELAY CIRCUIT. - The 220-kc output signal from the secondary of transformer T601 is applied to agc rectifier CR601, delay diode CR602, and load resistor R615. Zener diode CR604 regulates the d-c voltage applied from dropping resistor R613. This voltage reverse-biases diode CR602 and prevents diode conduction except in the presence of a strong signal from transformer T601. Weak signals that cannot overcome the reverse bias do not produce an agc voltage. Assuming that Zener diode CR604 is maintaining a 22-volt bias, then the signal from T601 must have a peak value of 23 volts (16 volts rms) to cause diode CR602 to conduct and supply approximately 1-volt of agc voltage across load resistor R615. Agc voltage, when developed, is applied to the agc circuit which follows through the AGC FAST-SLOW switch (S901).

SIGNAL STRENGTH meter M902 is a d-c microammeter which functions as a voltmeter to measure the agc voltage developed (which is proportional to the carrier level of the received signal). Resistor R614 is the meter multiplier and capacitor C609 bypasses the signal component of the agc voltage. Agc delay diode CR602 accepts the negative agc voltage but blocks the (discharge) circuit from C610.

(c) AGC TIMING. - When an agc voltage is developed, it is applied to the delay circuit through the AGC FAST-SLOW switch S901. With S901 in the FAST position, the negative agc voltage causes diode CR603 to conduct and agc is available for distribution at terminal E606. Capacitor C610 will become charged, and will discharge through resistor R618; however, the polarity of diode CR602 prevents the discharge current from flowing through resistors R616 and R615 and changing the RC time constant of the circuit.

NOTE

The I-F AGC control R805 is connected in parallel with resistor R618. (See figure 4-17.)



NOTE:
ALL VALUES IN OHMS
UNLESS OTHERWISE SPECIFIED

Figure 4-17. AGC Distribution Circuit, Simplified Schematic Diagram

When switch S901 is in the SLOW position, agc voltage is applied at terminal E606 through resistor R617, and charges capacitor C610. The charge time-constant, determined by resistor R617, is approximately 0.5 second (for a capacitor charge to 73 percent of maximum voltage) which applies slow-response agc voltage to the controlled stages. Capacitor C610 discharges through resistor R618 and I-F AGC control R805 (in parallel), providing a slow-decay characteristic of approximately 3 seconds. When switch S901 is in the FAST position, agc voltage is applied at terminal E606 through resistor R616 and diode CR603. The charge time for capacitor C610 is now determined by resistor R616 and is approximately 400 microseconds; this applies quick-reaction agc voltage to the controlled stages. Capacitor C610 again discharges through R618 and the I-F AGC control R805 (in parallel). The reverse

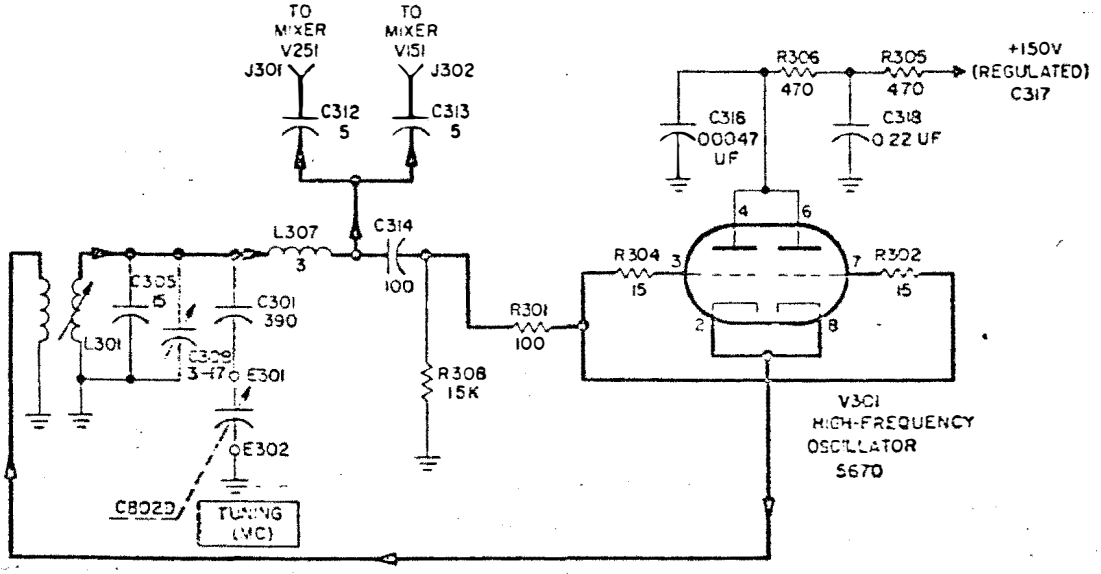
polarity of diode CR603 prevents discharge through R616 and R615, and the slow-decay agc characteristic is maintained.

The quick-reaction characteristic when the AGC switch S901 is in the FAST position assures immediate application of agc voltage to the controlled stages when a signal is received; the slow decay holds the gain of the receiver constant in the event that the signal strength is fluctuating.

(9) AGC DISTRIBUTION CIRCUIT. (See figure 4-17.) - The agc distribution circuit consists of two screwdriver-adjust controls (AGC THRESHOLD R804 and I-F AGC R805) located on the receiver chassis. The AGC THRESHOLD control (R804) sets the level of the 220-kc signal applied to the agc amplifier input at connector J601; the I-F AGC control (R805) adjusts the value of agc voltage applied to three stages in the first i-f amplifier. A 220-kc i-f signal from the plate of i-f amplifier tube V458 (see figure 4-10) is applied to the threshold control circuit at terminal E801. The setting of the AGC THRESHOLD control (R804) determines the weak-signal threshold level, below which an agc voltage is not produced in the agc amplifier.

Agc voltage from the agc amplifier output at terminal E606 is fed to the junction of resistor R807 and the I-F AGC control (R805). The voltage is applied directly to r-f amplifiers V51 and V52 in the preselector (see figure 4-6), and through resistor R807 to V455 in the first i-f and injection amplifier (see figure 4-10). The setting of I-F AGC control R805 determines the value of agc voltage applied to 220-kc i-f amplifier tubes V457, V458, and V459 (see figure 4-10). With this arrangement, the AGC THRESHOLD control (R804) may be set to the desired weak-signal level, and then the I-F AGC control (R805) adjusted to obtain the required agc level for control of the 220-kc i-f amplifiers.

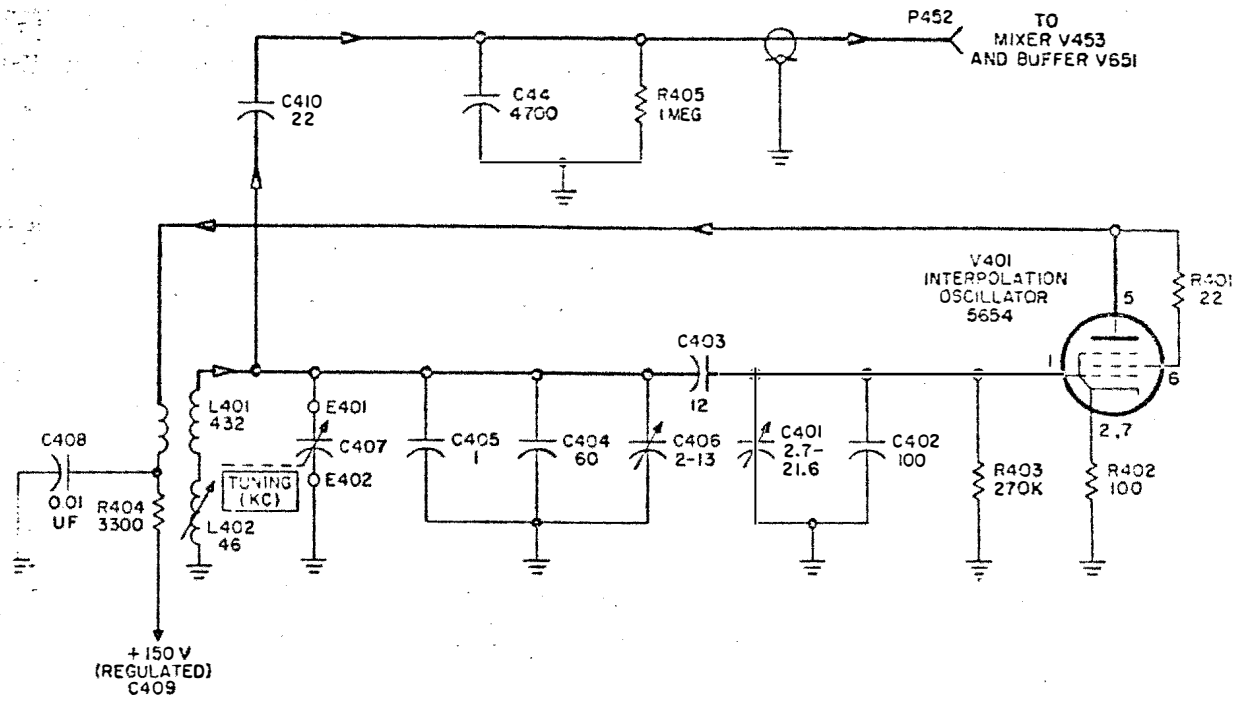
(10) HIGH-FREQUENCY OSCILLATOR. (See figure 4-18.) - High-frequency oscillator (HFO) V301 covers the frequency range of 3.725- to 33.725-mc in four bands. The locally-generated signal from the HFO is applied simultaneously to the preselector mixer (V151) to obtain the receiver first-conversion frequency, and to the harmonic-amplifier mixer (V251) to obtain the 825-kc injection signal. Figure 4-18 shows the HFO circuit as it appears in band 1 operation (for 2.0 to 4.0-mc receiver operation). The HFO is a modified grid-tuned Armstrong circuit with cathode feedback. Coil L301 includes both the tuned-grid and feedback windings. Connector J301 provides an output to the harmonic mixer (V251) through connector J252, and connector J302 provides an output to the preselector mixer (V151) through connector J302. Oscillator frequency drift is cancelled by a drift-cancelling loop which is described in paragraph 4-2a(4).



NOTES:
1. ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.
2. CIRCUIT SHOWN WITH BAND SWITCH IN POSITION 2-4.

Figure 4-18. High-Frequency Oscillator, Simplified Schematic Diagram

(11) INTERPOLATION OSCILLATOR. (See figure 4-19.) - Interpolation oscillator V401 covers a frequency range from 580 kc to 680 kc, regardless of the BAND switch position. The locally generated signal is applied to the injection mixer (V453) in the first i-f and injection amplifier and provides continuous receiver tuning through the 100-kc incrementally tuned steps. Oscillator tube V401 is triode-connected and operates in a grid-tuned Armstrong circuit. Feedback is obtained from the plate circuit by a primary winding on coil L401. Winding L402 is a part of coil L401 but is not inductively coupled to the grid coil.



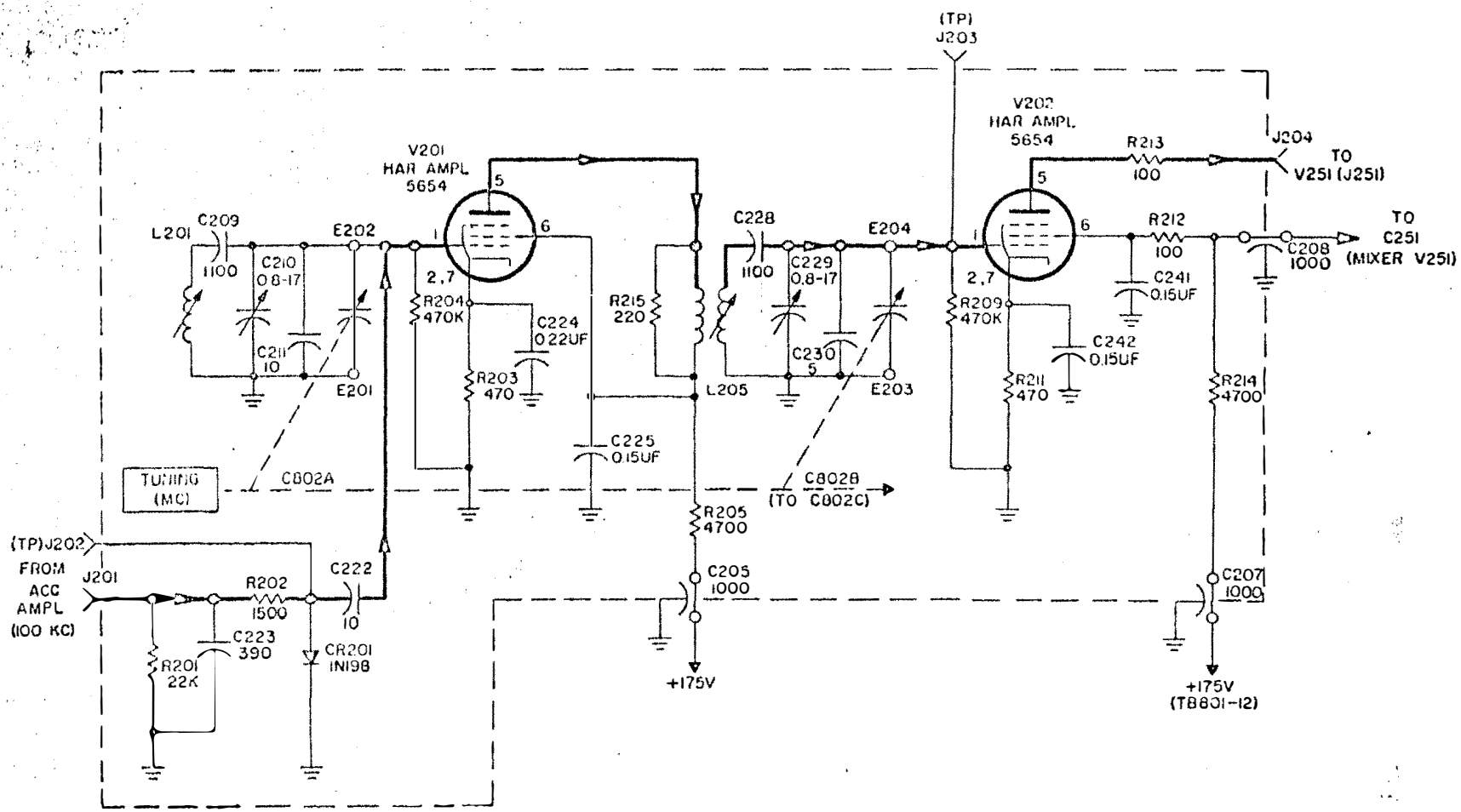
NOTE:
ALL VALUES ARE IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

Figure 4-19. Interpolation Oscillator, Simplified Schematic Diagram

Output connector P452 provides an output to injection mixer V453 through connector J452 (see figure 4-9). Output is also applied to the interpolation oscillator buffer (V651). Resistor R405 is the grid lead for injection mixer V453. Coupling capacitor C410 and capacitor C411 form a signal divider which reduces the interpolation oscillator signal applied to V453 in direct ratio to the reactance of the two capacitors. The interpolation oscillator is not drift-cancelled, but the circuit design and the low operating frequency insure stable operation.

(12) HARMONIC AMPLIFIER. (See figure 4-20.) - The harmonic amplifier consists of two tuned r-f amplifiers, V201 and V202, and harmonic-generating diode CR201. This section produces a frequency spectrum containing 100-kc harmonics from the 100-kc reference signal from Oscillator-Power Supply O-928/FLR. The harmonic amplifier tuning capacitors, C802A and C802B, are ganged to preselector and high-frequency oscillator tuning capacitors, all of which are tuned by the TUNING (Mc) control. The harmonic amplifier covers the frequency range from 2.9 mc to 32.9 mc in four bands as selected by the receiver BAND switch. Figure 4-20 shows the circuit with the BAND switch in the 2-4 position.

A 100-kc signal from the reference crystal oscillator (in the O-928/FLR) is applied to harmonic-generating diode CR201 at connector J201. The clipping action of CR201 provides the control grid of V201 with a wide range of 100-kc harmonics through coupling capacitor C222. (Harmonics to the 329th order are generated by diode CR201.) The required harmonic is selected by a resonant circuit consisting of coil L201 tuned by variable capacitor C802A, (see paragraph 4-1e for a description of the frequency relation between the selected harmonic and the receiver incremental tuning). The output of V201 is tuned by resonant circuit L205 and C802B, and applied to the control grid of amplifier V202 for additional amplification. The output from the plate of V202 is applied to a resonant circuit in



NOTES:
1. ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.
2. CIRCUIT SHOWN WITH BAND SWITCH IN POSITION 2-4.

Figure 4-20. Harmonic Amplifiers, Simplified Schematic Diagram

harmonic mixer V251 through connector J204. Test point (TP)J203 allows signal testing at the input of amplifier V202.

(13) HARMONIC MIXER. (See figure 4-21.) - The harmonic mixer consists of harmonic mixer V251 and a resonant circuit comprising coil L251 tuned by variable capacitor C802C. The harmonic mixer covers the frequency range of 2.9 mc to 32.9 mc in four bands; figure 4-21 shows only the components for band 1 operation. Variable capacitor section C802C is jointly tuned with sections C802A and C802B in the harmonic amplifier. The harmonic mixer (V251) combines a signal from the high-frequency oscillator at connector J252, with 100-kc harmonic selected by the harmonic amplifier. The primary of coil L251 is the plate load for harmonic amplifier V202 in the preceding circuit-section, and the selected 100-kc harmonic is applied to the signal grid of V251. The mixer plate load is a resonant circuit formed by coil L455 and capacitor C457 in the injection amplifier circuit (see figure 4-11). Refer to paragraph 4-1e for a description of receiver tuning related to operation of the harmonic mixer.

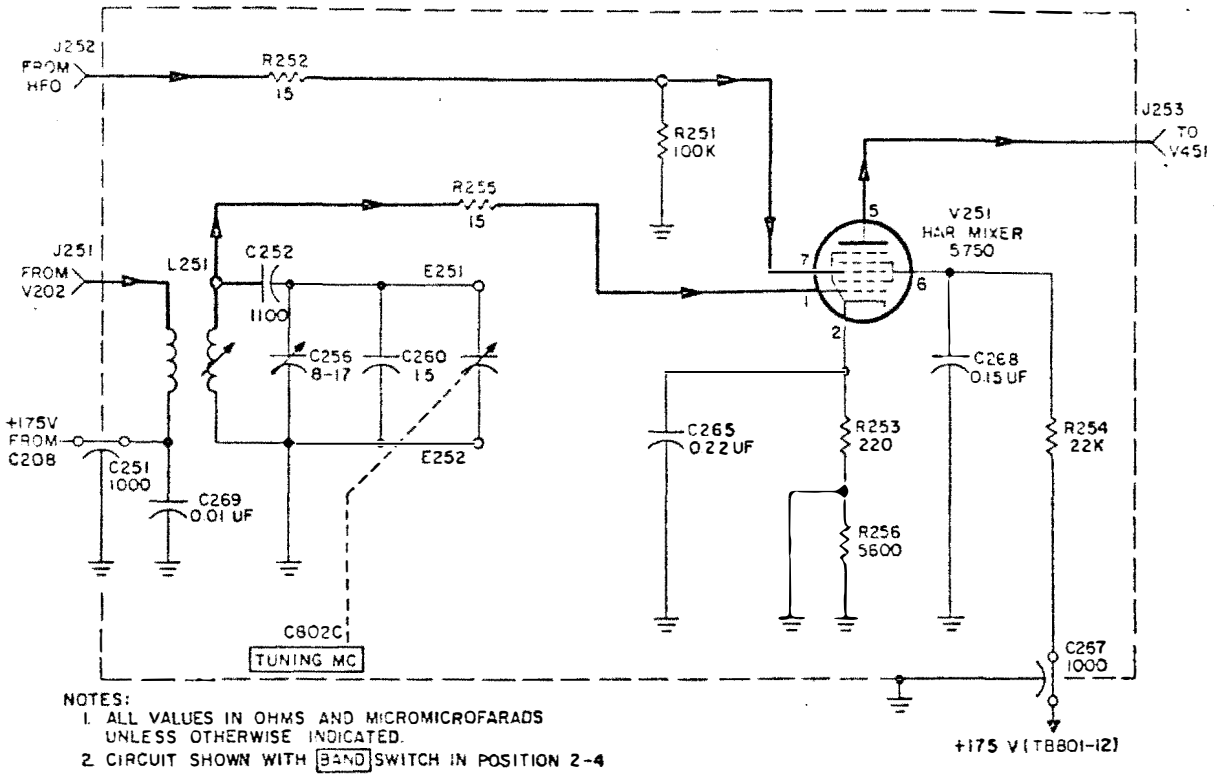


Figure 4-21. Harmonic Mixer, Simplified Schematic Diagram

Section S251A of the receiver BAND switch short-circuits cathode resistor R256 when in the 16-32 band position only. The resultant decrease in the cathode resistance reduces the grid bias and increases the mixer output. This increase in signal output compensates for the decrease in amplitude of the 100-kc harmonics over the 16-32 band frequency range.

(14) 100-KC BUFFER AMPLIFIER. (See figure 4-22.) - The 100-kc buffer amplifier consists of V605 and i-f coils L602 and L601. The buffer amplifier is used to increase the level of the 100-kc reference signal from Oscillator-Power Supply O-928/FLR. In addition, the buffer provides circuit isolation to prevent interaction between receivers when more than one receiver is operated from a common oscillator-power supply. The 100-kc reference signal is applied to the tap connection of coil L602 through J602. Coil L602 is a resonant circuit tuned by capacitor C611. The tap permits an impedance match to the relatively low impedance of the 100-kc reference source in the oscillator-power supply. The signal is applied to the control grid of V605, and appears across the output circuit consisting of i-f coil L601. This coil is a resonant circuit tuned by capacitor C223 in the harmonic amplifier (see figure 4-20) in series with coupling capacitor C613. The amplified 100-kc reference signal is applied to the harmonic amplifier input via connector P201. Test jack (TP)J603 permits signal tests to be made at the grid of V605.

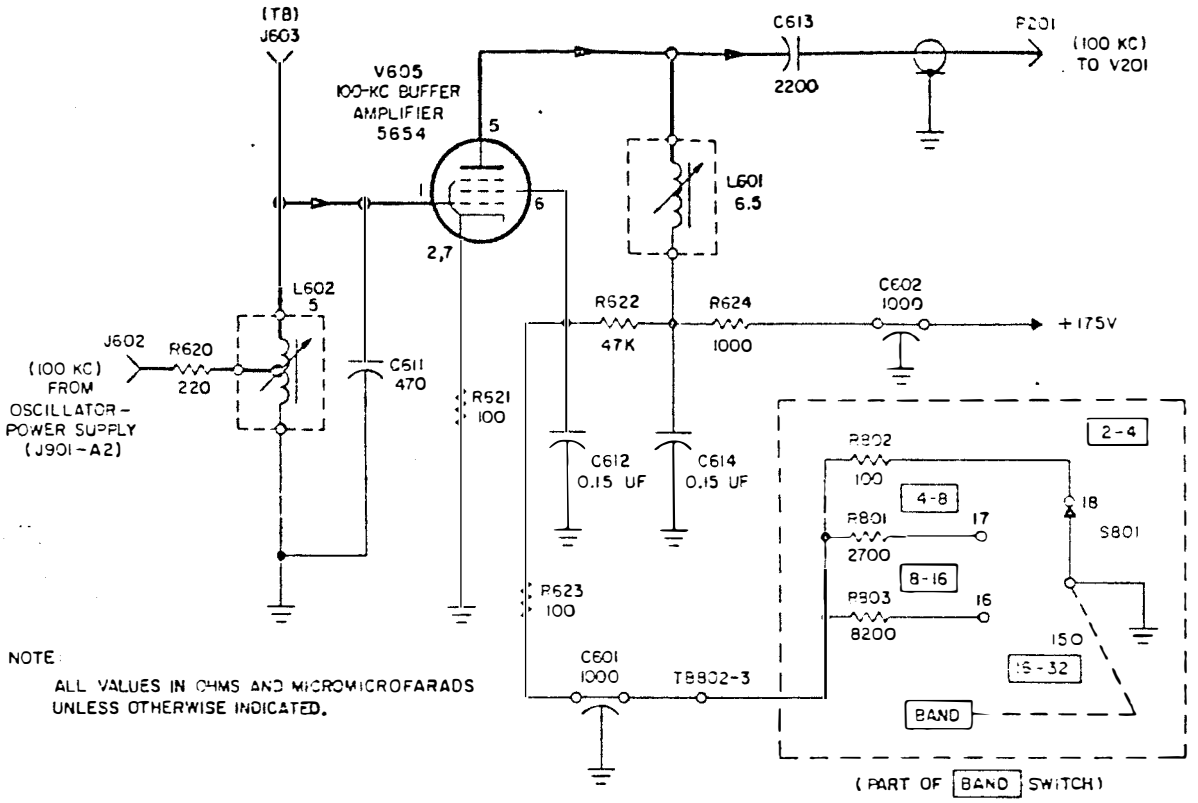


Figure 4-22. 100-Kc Buffer Amplifier, Simplified Schematic Diagram

Rotary switch S801 is ganged to the receiver BAND switch, and adjusts the gain of V605 by changing the screen voltage. It increases the voltage progressively for BAND switch positions 2, 3, and 4, corresponding to frequency ranges of 4-8, 8-16, and 16-32 mc, respectively. Since the amplitude of the 100-kc harmonics (generated by CR201 in the harmonic amplifier) decreases progressively with the increase in harmonic number, the switch arrangement compensates for this decrease and assures the generation of harmonics with the required amplitudes.

Screen voltage for V605 is obtained from the common +175-volt supply through a voltage divider formed by series resistors R622 and R644, and shunt resistor R623 in series with a resistor selected by switch S801. In the 2-4 position of the BAND switch, resistor R802 is selected to add 100 ohms to the shunt arm. The screen voltage present is determined by the ratio of the series and shunt divider sections with some reduction because of the voltage drop occurring in resistors R622 and R624 as the result of screen current. In the 4-8 and 8-16 positions of switch S801, the divider shunt-arm resistance is increased which provides a corresponding increase in screen voltage. In the 16-32 position, the shunt arm is open-circuited and maximum screen voltage is applied.

(15) DF INDICATOR CIRCUIT. (See figure 4-23.) - The DF indicator circuit consists of DF LOW-HIGH panel lamps DS901 and DS902, a section of rotary switch S801 which is ganged to the receiver BAND switch, and cam-operated switches S802 and S803 attached to the three-section variable capacitor C801 and operated by the capacitor tuning shaft. The purpose of the indicator circuit is to inform operating personnel of the general frequency range in use at the receiver so that the proper antenna system may be selected for optimum receiver operation. As shown in figure 4-23, when the BAND switch is in the 2-4 position (2-4 mc) the LOW indicator lights, and in the 16-32 position (16-32 mc) the HIGH indicator lights. In the other two BAND switch positions, either lamp will light depending on the adjustment of cams S802 and S803. The switch cams are adjustable to permit selection of the required sequence of DF indications. The final cam adjustments are determined by the system operating frequency and antennas involved. See paragraph 3-2c(3) for a description of DF indicator operation.

Connector J955 (DF INDICATOR) on the receiver rear-panel provides a connection for an external voltage source to operate the DF indicating lamps.

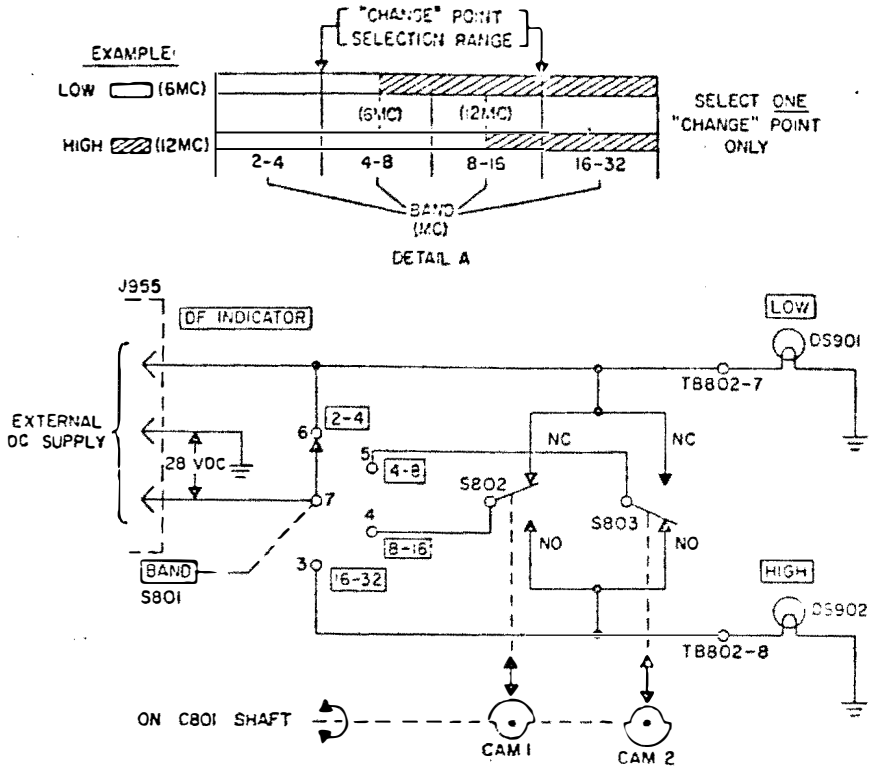


Figure 4-23. DF Indicator Circuit, Simplified Schematic Diagram

(16) VOLTAGE REGULATORS. (See figure 4-24.) - Two voltage-regulating circuits are used in the receiver to regulate critical supply voltages. These are: (1) a 6.3-volt a-c filament-supply regulator for high-frequency oscillator V301, and (2) a 150-volt d-c supply regulator for the plates of V301 and interpolation oscillator V401. These circuits are described in the following paragraphs.

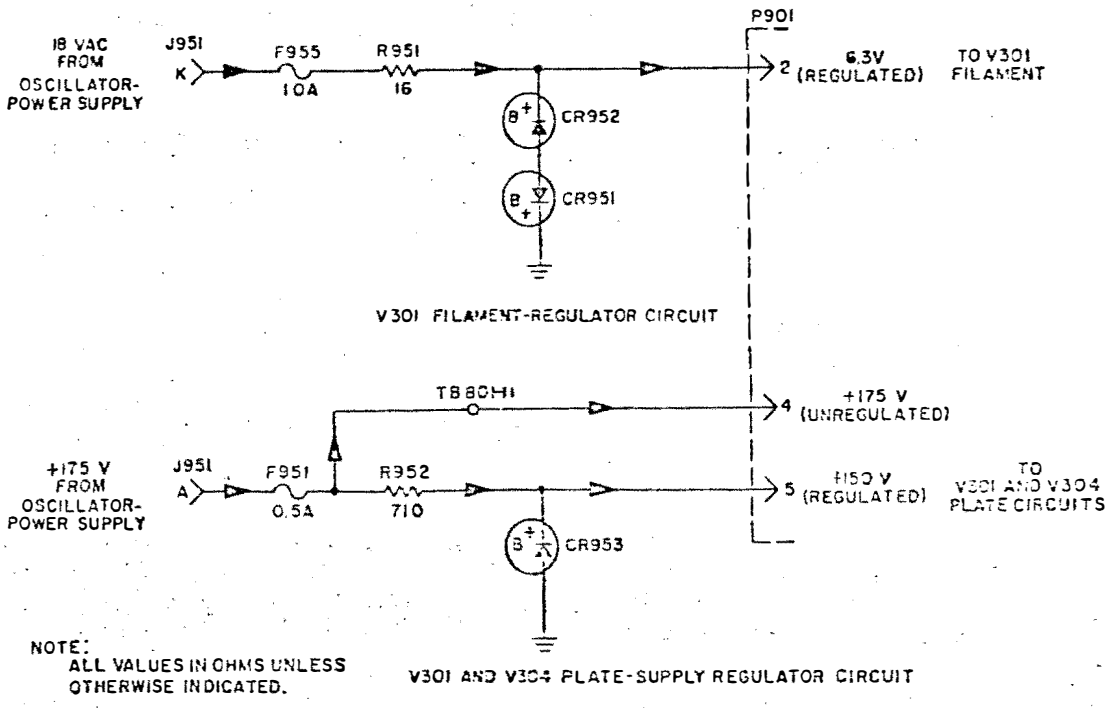


Figure 4-24. Countermeasures Receiver R-1125/FLR Voltage-Regulator Circuits, Simplified Schematic Diagram

(a) 6.3-VOLT REGULATOR. - The filament supply for high-frequency oscillator V301 is regulated by two Zener diodes (CR951 and CR952). This insures frequency stability and minimizes the effects of power fluctuations. The diodes are series-connected across the 18-volt a-c supply with opposing polarity. Each diode conducts in turn during each a-c alternation, and the non-conducting diode clamps the filament supply voltage at approximately 6.3 volts. Series resistor R951 carries both the filament and diode current and the diodes perform as a shunt voltage regulator. Fuse F955 protects the filament circuit in the event of abnormal current.

(b) 150-VOLT REGULATOR. - Plate supply voltage for high-frequency oscillator V301 and interpolation oscillator V401 is regulated by Zener diode CR953. The diode shunts the 175-volt d-c supply source and is connected with opposing polarity. Resistor R952 carries both the plate supply current and the diode current and the diode clamps the supply voltage at 150 volts. A bypass circuit through terminal TB201-11 provides unregulated plate voltage to the receiver. Fuse F951 protects the plate-supply circuit in the event of abnormal current.

b. OSCILLATOR-POWER SUPPLY O-928/FLR. - The oscillator-power supply consists of two major assemblies: a 100-kc crystal oscillator-amplifier and a receiver power-supply. The crystal oscillator-amplifier is a plug-in unit to facilitate servicing and replacement. The following paragraphs describe the operation of these assemblies.

(1) 100-KC OSCILLATOR-AMPLIFIER. (See figure 4-25.) - The 100-kc oscillator-amplifier consists of crystal oscillator V1001, buffer amplifier V1002, and amplifier V1003. A plug-in oven (A1001) contains the 100-kc crystal (Y1001) and includes a thermostatic temperature-control element to maintain constant operating temperature for the crystal. In addition, an amplitude controlling feedback-loop consisting of diodes CR1002 and CR1003 maintains the amplitude of the 100-kc output at a constant level.

(a) OSCILLATOR-AMPLIFIER. - Oscillator V1001 and the 100-kc crystal Y1001 are arranged in a Pierce circuit with variable capacitor C1003 to adjust the oscillator frequency for calibration purposes. The output of the oscillator is applied to the control grid of buffer V1002 through coupling capacitor C1006. The output from buffer V1002 is developed across a divider consisting of resistors R1010 and R1009. The reduced signal level from the divider is applied to the control grid of amplifier V1003 through coupling capacitor C1010. Output transformer T1001 couples the plate of V1003 to the oscillator-amplifier output connector P1063, and then to the five connectors (J1058 through J1062) which supply from one to five receivers with the 100-kc reference signal.

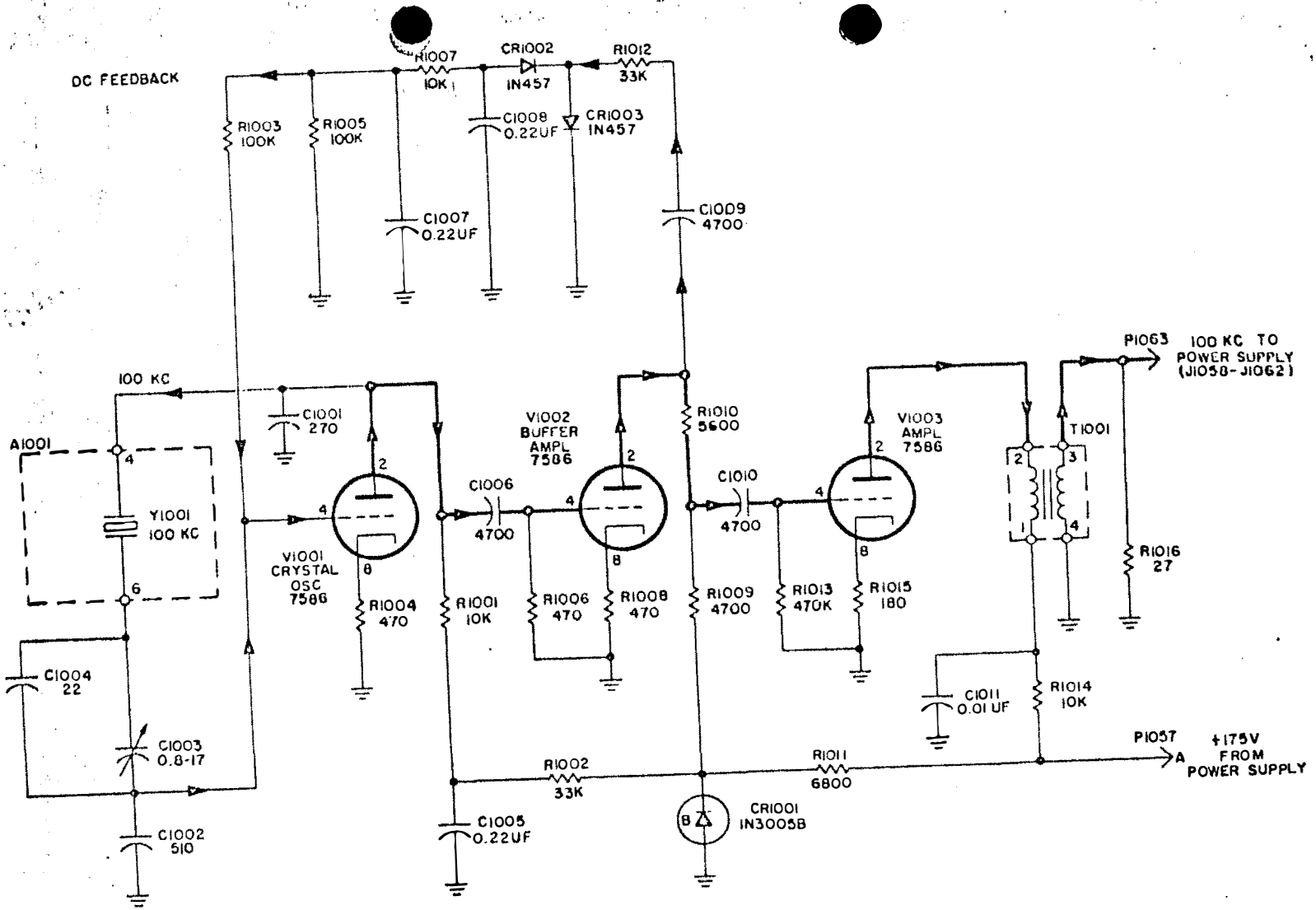
A Zener diode, CR1001, provides plate supply regulation for the oscillator (V1001) and buffer (V1002). Amplifier V1003 receives unregulated supply voltage from the common +175-volt supply circuit at connector P1057.

(b) AMPLITUDE CONTROL LOOP. - A negative d-c bias proportional to the amplitude of the 100-kc signal is applied to the control grid of oscillator V1001 through resistor R1003. A portion of the 100-kc signal at the plate of buffer V1002 is applied to a half-wave voltage doubler circuit composed of diodes CR1002 and CR1003 through coupling capacitor C1009. Resistor R1012 provides circuit isolation to prevent the diodes from affecting the operation of V1002. The d-c voltage across load resistor R1005 is negative with respect to ground and proportional to the signal magnitude at the plate of V1002. A low-pass filter formed by resistor R1007 and capacitors C1007 and C1008 effectively removes the signal component from the bias voltage.

Amplitude control of the 100-kc output signal is obtained in the following manner: An increase in signal level at the plate of V1002 increases the negative bias applied to V1001 through resistor R1003. This additional grid bias reduces the signal output from V1001 and also from V1002. A corresponding decrease in signal level at V1002 decreases, in turn, the bias obtained from the control-loop circuit and produces an increase in signal level. Actually, equalibrium is reached during operation and the control loop maintains a relatively constant output level from the 100-kc oscillator-amplifier.

(2) POWER SUPPLY. (See figure 4-26.) - The power supply provides plate and filament voltages for the operation of one to five receivers. The supply consists of a power transformer (T1051), an a-c line-filter (FL1051), a bridge rectifier (CR1051 through CR1054), and a two-section LC low-pass filter (L1051, L1052, C1051, and C1052). A SELECTOR switch (S1051) provides lead compensation for the supply when fewer than five receivers are operated from the common supply.

(a) POWER TRANSFORMER. - Primary a-c power is applied to the primary of power transformer T1051 from connector J1051. Filter FL1051 is a low-pass r-f filter which prevents



NOTE:

ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.

Figure 4-25. 100-Kc Oscillator-Amplifier, Simplified Schematic Diagram

spurious r-f signals from entering or leaving the power supply. Fuses F1051 and F1054 protect the supply, and ON-OFF switch S1051 controls the application of primary power to the supply. POWER indicator lamp DS1051 lights when primary power is applied.

Transformer T1051 has a tapped primary winding; terminals 2, 3, and 4 permit operation from a 105, 115, or 125-volt primary power source. Terminals 5 and 6 supply 213 volts ac to the bridge rectifier. Terminals 7 and 8 provide 6.3 volts ac for the filaments of V1001, V1002, and V1003 in the 100-kc oscillator-amplifier. Terminals 7 and 9 (terminal 7 is common), provide 18 volts ac to the regulator circuit for high-frequency oscillator V301 filament (see figure 4-24). Terminals 11 and 12 supply 7.3 volts ac to the filaments of the remaining tubes in the receiver(s). A predetermined voltage drop in the supply cables assures a normal 6.3 volts ac at the receiver(s). Terminals 7 and 10 (terminal 7 is common) supply 5 volts ac for the operation of counter lamps DS901, DS902, DS903, and DS904.

Terminals E and F of connector J1057 are connected to the power source at the primary of transformer T1051 and supply even-heater voltage to the crystal-oscillator even (plug-in assembly A1001). All supply connections to operate the 100-kc oscillator-amplifier are provided at connector J1057, and all connections for the operation of one to five receivers are made at connectors J1052 through J1056. Refer to figure 6-16 in Section 6 for a complete schematic diagram of the power supply.

(b) RECTIFIER AND FILTER. - A full-wave bridge rectifier consisting of diodes CR1051, CR1052, CR1053, and CR1054 rectifies the a-c voltage from power transformer terminals 5 and 6. The rectified voltage is applied to a two-section LC filter through SELECTOR switch S1052. Filter choke L1051 and capacitor C1051 form the first filter section, and filter choke L1052 with capacitor C1052 form the final filter section. Capacitors C1051 and C1052 are both plug-in components which facilitate servicing and replacement. Resistor R1055 acts as the supply bleeder. Fuse F1052 is in series with the +175-volt circuit which supplies plate voltage through connector J1057-A for the 100-kc oscillator-amplifier tubes. The fuse protects the power supply in the event of abnormal current.

(c) SELECTOR SWITCH S1052. - Before the equipment is energized, SELECTOR switch S1052 must be set to the position corresponding to the number of receivers to be operated from the common oscillator-power supply. The first four positions of this switch insert four different compensating resistors in series with the bridge-rectifier output circuit. Resistors R1051, R1052, R1053, and R1054 respectively reduce the oscillator-power supply output voltage to the nominal level for operation of one, two, three, or four receivers. The fifth position applies the output of the bridge-rectifier circuit directly to the five receivers, since no compensation is required for operating five receivers.

Each series element in the supply (filter chokes, rectifiers, and the like), produces a voltage drop proportional to the supply load current. A single receiver draws load current of approximately 0.3 ampere (dc) and five receivers require a total load current of 1.5 amperes. Without compensation, the supply voltage would change depending on the number of receivers operated.

SECTION 5

TROUBLESHOOTING

5-1. GENERAL.

Effective troubleshooting of electronic equipment consists of identifying the nature of the trouble, determining the assembly or circuit section at fault, and locating the defective part. Repairs and adjustments are then made to return the equipment to normal operating condition. A systematic procedure is required.

The first step when troubleshooting defective equipment is to identify the type of fault present. Faulty operation symptoms can range from intermittent minor defects to complete failure of the equipment. The second step is to sectionalize the fault by identifying the assembly or circuit section responsible. Special attention should be given to easily overlooked troubles such as incorrectly positioned controls, loose connections, or blown fuses. Obvious faults such as burned-out parts, arcing, or shorted components can often be located by visual or aural observation. Once the trouble has been located in a particular assembly, appropriate voltage, resistance, or continuity measurements can be used to locate the defective part. Signal tracing is an especially effective troubleshooting method; the absence or abnormality of a received signal at a particular circuit point can indicate the faulty equipment section.

It is often possible to relate the trouble to a particular circuit section by noting abnormality of meter readings or substandard response to control adjustments. Refer to the information in NAVSHIPS 91282 for a complete description of troubleshooting and testing methods.

Troubleshooting Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR will usually include the following steps in the order listed:

Step 1. Determine the major assembly at fault.

Step 2. Localize the trouble to a particular circuit section.

Step 3. Troubleshoot the circuit to determine the defective part.

Step 4. Remove the assembly for repair.

Step 5. Replace the repaired assembly.

Step 6. Test the equipment to verify that the fault has been corrected.

5-2. TEST EQUIPMENT, SPECIAL TOOLS, AND REFERENCE DESIGNATIONS.

a. TEST EQUIPMENT. - A list of test equipment required to perform the troubleshooting procedures in this section is given below. Equivalent test equipment may be substituted.

(1) Multimeter AN/PSM-4C.
(2) Vacuum-Tube Voltmeter ME-30/U.
(3) Vacuum-Tube Voltmeter ME-6D/U.
(4) Signal Generator AN/URM-25D.
(5) Oscilloscope OS-8C/U.
(6) Electron Tube Test Set TV-7D/U.

b. SPECIAL TOOLS. - No special tools are required to troubleshoot the equipment.

c. REFERENCE DESIGNATIONS. - Reference designations for all parts in a particular assembly are grouped numerically. The series of number groups assigned to subassemblies in the R-1125/FLR and the O-928/FLR are given in table 5-1.

TABLE 5-1. EQUIPMENT REFERENCE DESIGNATION NUMBERS AND SUBASSEMBLY LOCATIONS

REFERENCE NUMBERS	SUBASSEMBLY	SUBASSEMBLY LOCATION
51 - 99	Preselector, first and second r-f amplifiers	R-1125/FLR
101 - 149	Not used	
151 - 199	Preselector mixer	R-1125/FLR
201 - 249	Harmonic amplifier	R-1125/FLR
251 - 299	Harmonic mixer	R-1125/FLR
301 - 349	High-frequency oscillator	R-1125/FLR
351 - 399	Tunable i-f filter	R-1125/FLR
401 - 449	Interpolation oscillator	R-1125/FLR
451 - 549	First i-f and injection amplifier	R-1125/FLR
551 - 599	Mixer and second i-f amplifier	R-1125/FLR
601 - 649	Agc amplifier	R-1125/FLR
651 - 699	Interpolation oscillator buffer	R-1125/FLR
701 - 799	Not used	
801 - 899	Chassis	R-1125/FLR
901 - 949	Front panel	R-1125/FLR
951 - 999	Rear panel	R-1125/FLR
1001 - 1049	100-kc oscillator-amplifier	O-928/FLR
1051 - 1099	Power supply	O-928/FLR

3. OVERALL TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Before following the detailed troubleshooting procedure provided for each assembly, check the front panel controls for proper setting, inspect the equipment for blown fuses and faulty cable connections, and look for indications of damage such as broken wires or charred insulation. Refer to the checking procedures given in NAVSHIPS 91828, particularly paragraph 3-3, "Testing Techniques and Practices."

b. CONTROL SETTINGS. - A list of front panel control settings for the equipment is given in table 5-2. These preliminary settings are made in preparation for troubleshooting the R-1125/FLR and the O-928/FLR. Individual controls are readjusted as required when troubleshooting specific sections of the equipment.

TABLE 5-2. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), PRELIMINARY CONTROL SETTINGS

CONTROL	LOCATION	SETTING
BAND	R-1125/FLR	2-4
TUNING (Mc)	R-1125/FLR	02.0
TUNING	R-1125/FLR	00.0
OUTPUT LEVEL	R-1125/FLR	midrange
AGC SLOW-FAST	R-1125/FLR	SLOW
SELECTOR	O-928/FLR	(see CAUTION below)
ON-OFF	O-928/FLR	ON

CAUTION

Before energizing the equipment, SELECTOR switch S1052 on the O-928/FLR must be set to a position corresponding to the number of receivers operated.

c. OVERALL TROUBLESHOOTING CHART. - Table 5-3, the overall troubleshooting chart, describes a step-by-step procedure for localizing the trouble to a particular circuit section. By a process of elimination, the particular assembly or circuit section at fault may often be determined.

TABLE 5-3. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), OVERALL TROUBLESHOOTING CHART

STEP	ACTION	NORMAL INDICATION	PROBABLE FAULT LOCATION
1	Set Oscillator-Power Supply O-928/FLR ON-OFF switch to ON	MEGACYCLE and KILO-CYCLE counter lamps light	Fuses F954, F1051, and F1054
2	Adjust TUNING (Mc) control for dip on 100 KC TUNING meter.	100 KC TUNING meter dips	Refer to paragraph 5-10, first i-f and injection amplifier
3	Tune signal using both TUNING controls	SIGNAL STRENGTH meter shows signal present	Refer to paragraph 5-13, agc amplifier
4	Adjust OUTPUT LEVEL control for indication on associated receiver output load	Receiver output signal present	Refer to paragraph 5-10, first i-f and injection amplifier
5	Place BAND switch in 16-32 position	DF HIGH indicator on front panel lights	Refer to paragraph 5-17, DF indicator

5-4. FUNCTIONAL SECTION TROUBLESHOOTING.

a. GENERAL. - The paragraphs which follow in this section provide individual instructions for troubleshooting each subassembly in the equipment. Included are troubleshooting charts, functional schematic diagrams, and photographs showing the location of parts and test points. A voltage and resistance diagram is also included for each assembly.

b. TEST POINT SYMBOLS. - For the purpose of rapid identification of circuit test points, symbols are provided in troubleshooting tables and schematic diagrams. The symbols have the following significance:

Indicates a major test point for checking circuit functions and localizing troubles, or a major measuring point for signal or power supply voltages.

Indicates a secondary test point for isolating faults within a major section, and also indicates adjustments.

Indicates a minor test point within a secondary test point section.

WARNING

Dangerous potentials are present in the O-928/FLR.

5-5. PRIMARY POWER SECTION.

a. GENERAL. - Figure 5-1 is a power distribution diagram of Oscillator-Power Supply O-928/FLR. When tracing the power circuit, make sure that the main power is present.

b. TEST EQUIPMENT. - Use multimeter AN/PSM-4C or equivalent to troubleshoot the primary power circuit.

c. CONTROL SETTINGS. - Set the front panel controls as described in table 5-2. With the ON-OFF power switch on the O-928/FLR in the ON position POWER indicator DS1051 should light.

d. PRIMARY POWER TROUBLESHOOTING CHART. - Table 5-4 is a troubleshooting chart for the primary power circuit. Perform the steps in the order shown. Compare the results with those listed in the NORMAL INDICATION column. If an indication is normal, proceed to the next step; if an indication is abnormal, follow instructions given in the NEXT STEP column. To facilitate measurements

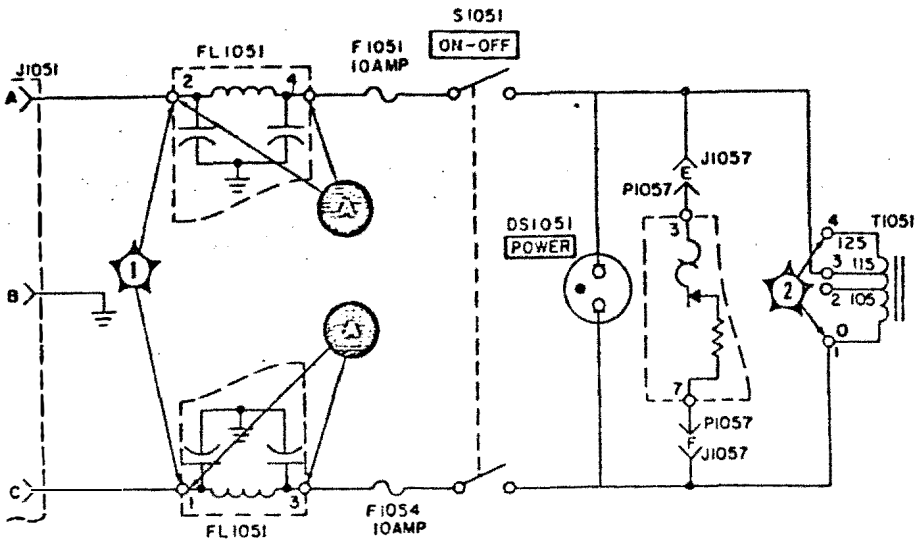


Figure 5-1. Primary Power Distribution, Schematic Diagram

and circuit checking, remove the O-928/FLR from the mounting plate. Invert the chassis, resting it on the handles, and remove the bottom plate.

TABLE 5-4. OSCILLATOR-POWER SUPPLY O-928/FLR, PRIMARY POWER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Figure 5-3	Place ON-OFF switch S1051 in ON position.	POWER indicator DS1051 lights	If indicator does not light check fuses F1051 and F1054. If indicator still does not light, check DS1051.
2	(1) Figures 5-1 and 5-5	Connect multimeter between terminals 1 and 2 of filter FL1051.	105 to 125 vac	If normal reading not obtained, check primary power source. Check cable to connector J1051.
3	(A) Figures 5-1 and 5-5	WARNING Disconnect primary power before making this measurement. Using multimeter, check for continuity between terminals 2 and 4, and 1 and 3 of FL1051.	Less than one ohm, each section of filter FL1051	Replace filter FL1051.
4	(2) Figures 5-1 and 5-5	Connect multimeter across primary of T1051 (terminal 1 to 2, 3, or 4).	105 to 125 vac	If normal reading not obtained, check switch S1051. WARNING Disconnect primary power before checking S1051.

5-6. POWER SUPPLY.

a. GENERAL. - The power supply section of the O-928/FLR provides plate and filament voltage for the operation of one to five receivers (R-1125/FLR). It also supplies plate and filament power to the 100-kc oscillator-amplifier section in the O-928/FLR. Faulty operation of the power supply will cause erratic receiver operation or disable the receiver entirely. Figure 5-2 is a functional schematic diagram of the power supply; figures 5-3 and 5-4 show the location of parts.

b. PRELIMINARY CHECK. - Before performing the troubleshooting steps in table 5-5, carefully inspect the power supply, especially the following:

(1) Cable connections at J1051 and J1057, and connectors J1052 through J1056.
(2) Fuses F1051 and F1054.
(3) Clamps for plug-in capacitors C1051 and C1052.

WARNING

Dangerous potentials are present in the power supply circuits.

c. TEST EQUIPMENT. - Use multimeter AN/PSM-4C or equivalent to troubleshoot the power supply.

d. CONTROL SETTINGS. - Set the controls to the positions indicated in table 5-2.

e. POWER SUPPLY TROUBLESHOOTING CHART. - Table 5-5 is the troubleshooting chart for the power supply. Perform the steps in the order shown and compare the results with those given in the NORMAL INDICATION column. Figure 5-5 shows the location of test points.

TABLE 5-5. OSCILLATOR-POWER SUPPLY O-928/FLR, POWER SUPPLY, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Figure 5-3	Place ON-OFF switch in ON position.	POWER indicator DS1051 lights	If indication abnormal, perform steps in table 5-4.
2	(3) Figures 5-2, 5-4 and 5-5	Connect multimeter from pin 5 of XC1052 to chassis. Select 300 vdc range.	+175 vdc ±20%	If reading is normal, proceed to step 6. If reading is abnormal, proceed to step 3.
3	Figure 5-3	Replace plug-in capacitors C1051 and C1052 and repeat step 2.	+175 vdc ±20%	If reading is normal, proceed to step 6. If reading is abnormal, proceed to step 4.
4	(5) Figures 5-2, 5-3, and 5-5	Connect multimeter from terminal 1 of choke L1051 to chassis.	+190 vdc ±20%	If reading is normal, check chokes L1051 and L1052 for continuity. Replace if faulty. If abnormal, proceed to step 5.

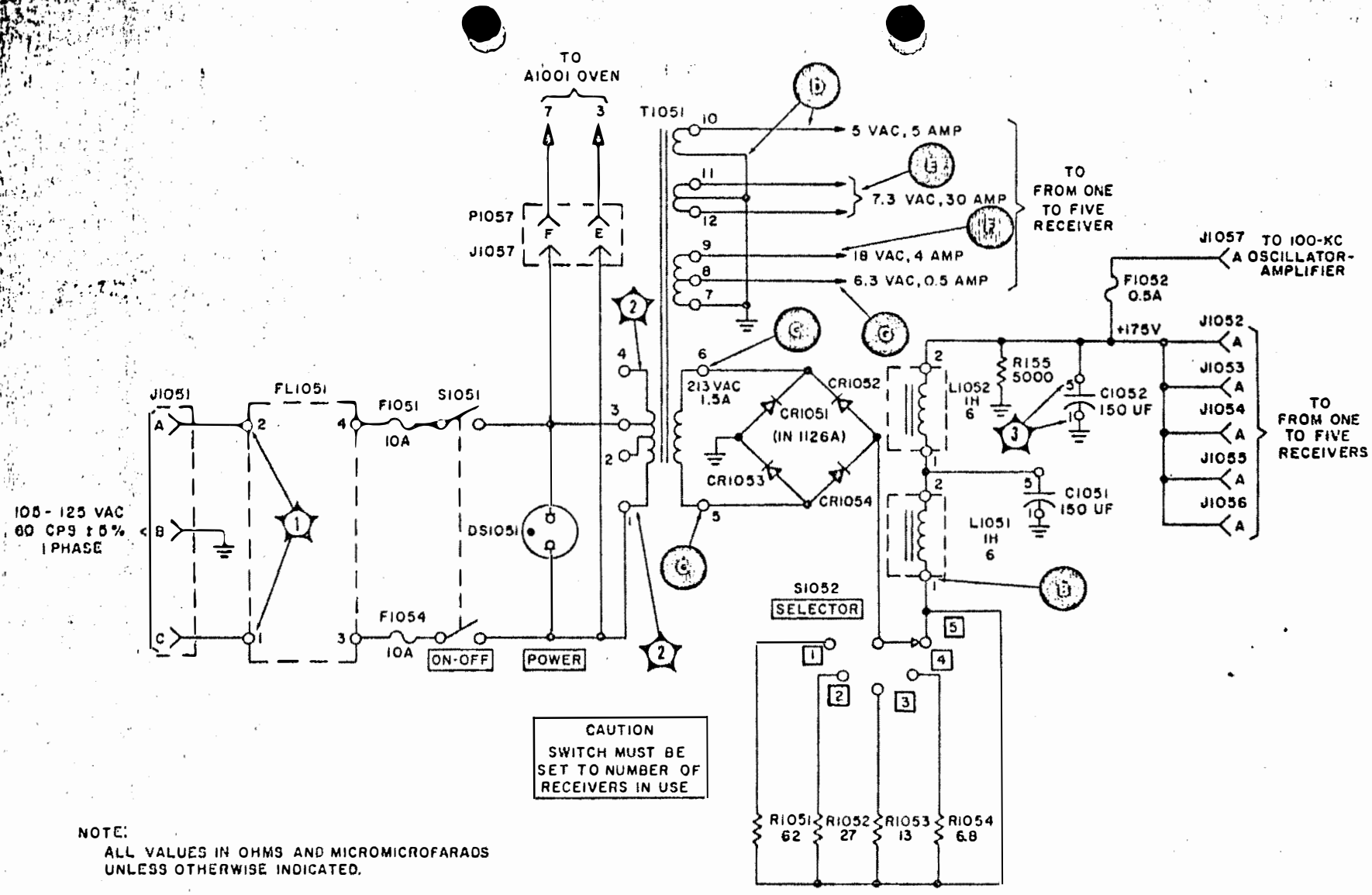


Figure 5-2. Power Supply, Functional Schematic Diagram

TABLE 5-5. OSCILLATOR-POWER SUPPLY O-928/FLR, POWER SUPPLY, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	Ⓒ Figures 5-2, 5-3, and 5-5	Connect multimeter from terminal 6 to terminal 5 of transformer T1051. Select the 300 vac range.	213 vac ±20%	If reading abnormal, disconnect rectifiers CR1051 through CR1054. If still abnormal, check transformer T1051. Repeat steps in table 5-4. If reading is normal, replace rectifiers CR1051 through CR1054. Check SELECTOR switch S1051, and resistors R1051 through R1054.
6	Ⓓ Figures 5-2, 5-3, and 5-5	Connect multimeter to terminal 10 of transformer T1051 and chassis. Select 10 vac range.	5 vac ±20%	If reading is low accompanied by heating of circuit wiring, check for short circuit in DS903 through DS906 wiring. If reading normal, proceed to step 7.
7	Ⓔ Figures 5-2, 5-3, and 5-5	Connect multimeter from terminal 11 to terminal 12 of transformer T1051.	7.3 vac ±20%	If reading and indication similar to step 6, check for short circuit in receiver filament wiring.
8	Ⓕ Figures 5-2 and 5-5	Connect multimeter from terminal 9 of T1051 to chassis. Select 30 vac range.	18 vac ±20%	If reading abnormal, check V301 filament-regulator circuit. (Refer to table 5-17.)
9	Ⓖ Figures 5-2 and 5-5	Connect multimeter from terminal 8 of T1051 to chassis. Select 10 vac range.	6.3 vac ±20%	If reading low and indication similar to step 6, check for short circuit in 100 kc oscillator-amplifier filament wiring.

5-7. 100-KC OSCILLATOR-AMPLIFIER.

a. GENERAL. - The 100-kc oscillator-amplifier section of Oscillator-Power Supply O-928/FLR is mounted on top of the common power supply chassis. An accurate 100-kc reference signal is supplied by this subassembly for the operation of one to five receivers. Faulty operation of the 100-kc oscillator-amplifier can affect the accuracy of receiver calibration or disable the receiver completely. Figure 5-6 is a functional schematic diagram; figures 5-7 and 5-8 show the location of parts, and figure 5-9 shows the location of test points.

b. ACCESS. - For access to the 100-kc oscillator-amplifier test points, remove the four screws which mount the subassembly to the chassis and rotate the subassembly to expose the tube sockets and parts. The power supply cable at connector J1057 should remain connected to provide plate and filament voltage to the subassembly.

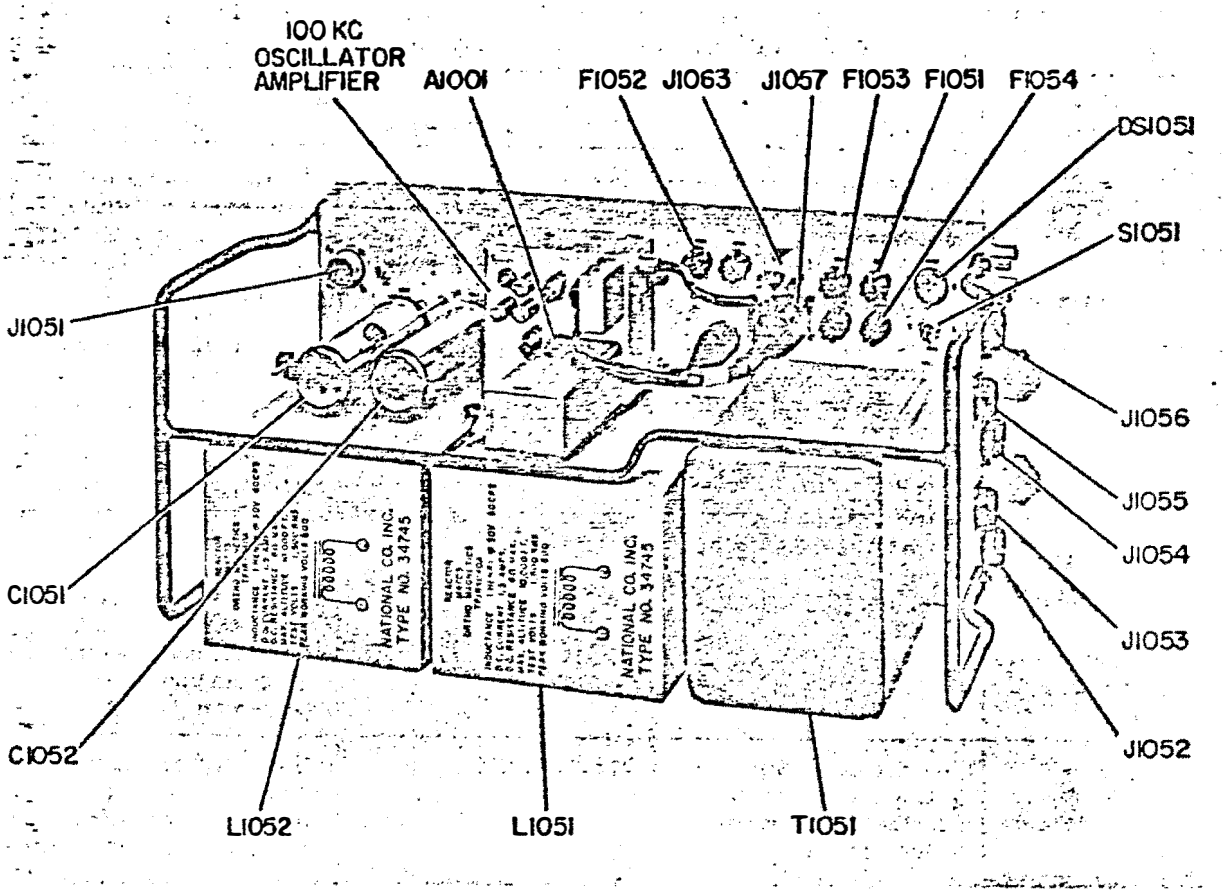


Figure 5-3. Oscillator-Power Supply O-928/FLR, Top View, Location of Parts

c. PRELIMINARY CHECK. - Before troubleshooting the 100-kc oscillator-amplifier, check the following:

(1) Seating of V1001, V1002, and V1003 in their sockets.
(2) Cable connections at J1057 and J1063.
(3) Seating of crystal-oven assembly A1001 in its socket.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U and ME-6D/U, oscilloscope OS-8C/U, and electron tube test set TV-7D/U, or their equivalent.

e. CONTROL SETTINGS. - Set controls to the positions given in table 5-2. Place the ON-OFF power switch on the O-928/FLR chassis in the ON position. Allow at least 30 seconds for warmup.

f. 100-KC OSCILLATOR-AMPLIFIER TROUBLESHOOTING CHART. - Table 5-6 is a troubleshooting chart for the 100-kc oscillator-amplifier subassembly. It provides for measurements of the d-c plate voltage distribution and stage-by-stage signal tracing. Perform the steps in the order listed. Compare the results of each step with information in the NORMAL INDICATION column, and follow the instructions in the NEXT STEP column. Figure 5-10 is a diagram of voltage and resistance measurements for the oscillator-amplifier assembly.

NOTE

To check the output frequency of the 100-kc oscillator-amplifier, refer to paragraph 6-3a in Section 6, Repair.

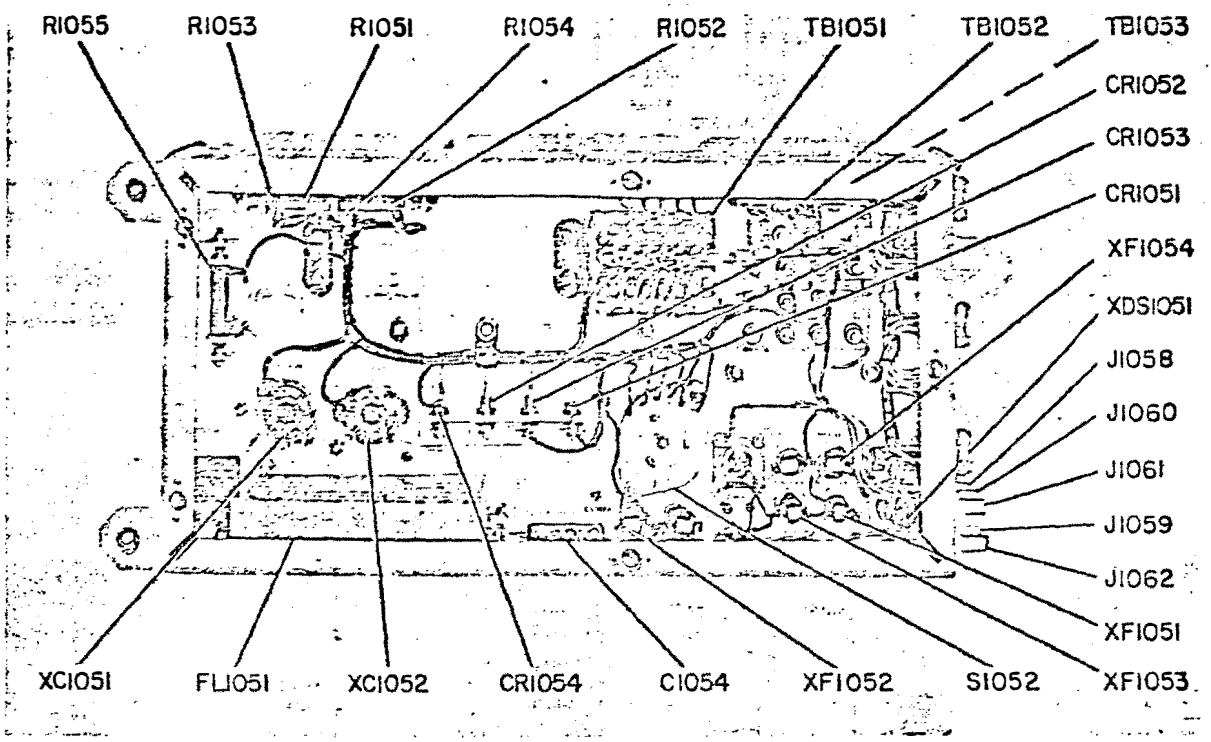


Figure 5-4. Oscillator-Power Supply O-928/FLR, Bottom View, Location of Parts

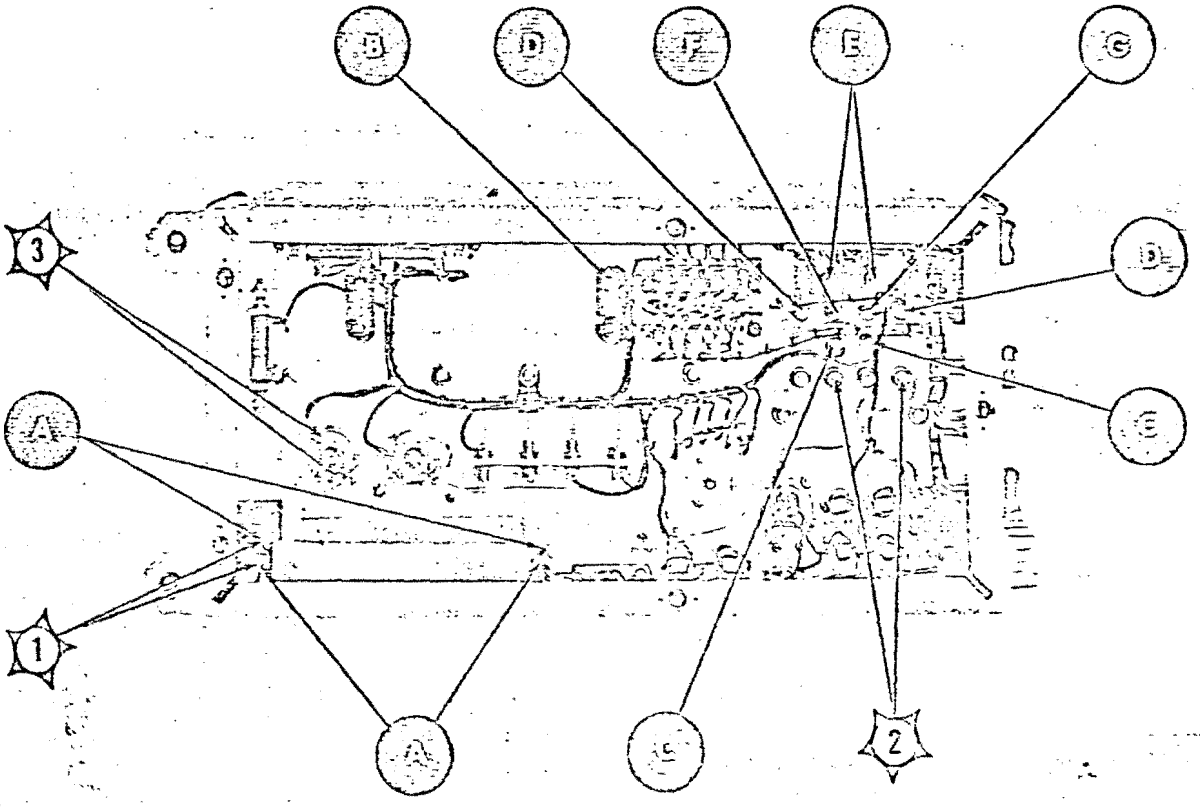
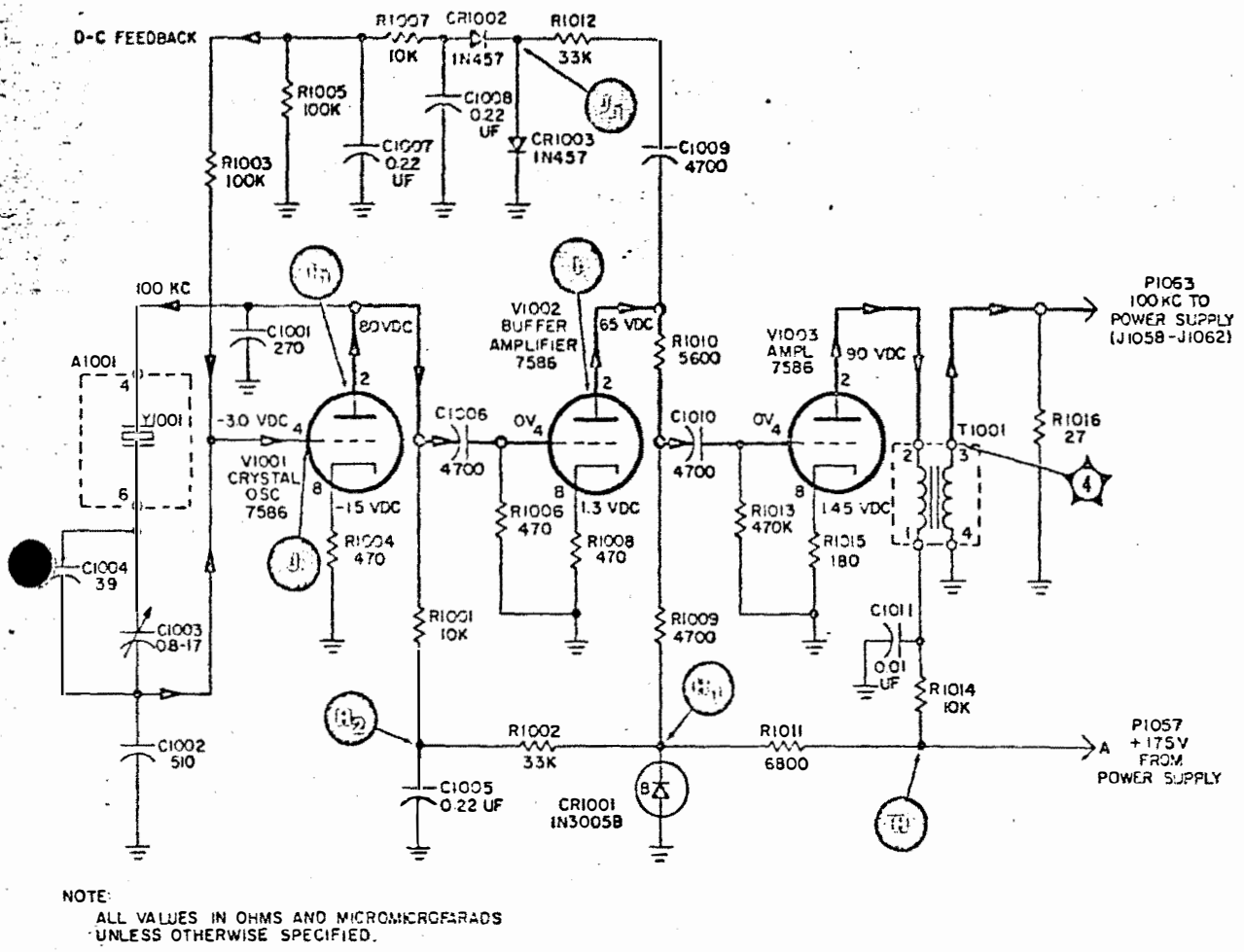


Figure 5-5. Oscillator-Power Supply O-923/FLR, Location of Test Points



NOTE:
ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

Figure 5-6. 100-Kc Oscillator-Amplifier, Functional Schematic Diagram

TABLE 5-6. OSCILLATOR-POWER SUPPLY O-928/FLR, 100-KC OSCILLATOR-AMPLIFIER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(H) Figures 5-6, 5-8, and 5-9	Connect multimeter from junction of R1011 and R1014 to chassis. Select 300 vdc range.	+175 vdc ±20%	If reading abnormal, perform steps in table 5-5. If normal, proceed to next step.
2	(H_1) Figures 5-6, 5-8, and 5-9	Connect multimeter from junction of R1011 and CR1001 to chassis.	+100 vdc ±20%	If reading abnormal, check R1011 and CR1001. If normal, proceed to next step.
3	(H_2) Figures 5-6, 5-8, and 5-9	Connect multimeter from junction of R1002 and C1005 to chassis.	+85 vdc ±20%	If reading abnormal, check R1002 and C1005. If normal, proceed to next step.

TABLE 5-6. OSCILLATOR-POWER SUPPLY O-928/FLR, 100-KC OSCILLATOR-AMPLIFIER, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	 Figures 5-6, 5-7, and 5-9	Connect vtvm ME-30/U and oscilloscope OS-8C/U from terminal 3 of T1001 to chassis. Note 100-kc waveform on scope.	Vtvm: 1.5v rms Scope: undistorted sine waveform	If reading and waveform normal, proceed to step 8. If abnormal, proceed to next step.
5	 Figures 5-6, 5-8, and 5-9	Using step 4 test equipment, check signal at pin 2 of V1002.	Vtvm: 5v rms Scope: undistorted sine waveform	If indications abnormal, proceed to next step. If normal, check V1003, T1001, and C1010.
6	 Figures 5-6, 5-8, and 5-9	Using step 4 test equipment, check signal at pin 2 of V1001.	Vtvm: 0.5v rms Scope: undistorted sine waveform	If indications abnormal, proceed to next step. If normal, check V1002 and C1006.
7	 Figures 5-6, 5-7, and 5-9	Replace V1001 and repeat step 6.	See step 6	If indications abnormal, check C1001 and C1002. Replace crystal oven assembly A1001. If vtvm reading too high, proceed to next step.
8	 Figures 5-6, 5-8, and 5-9	Measure d-c feedback voltage at pin 4 of V1001 using vtvm ME-6D/U.	-2.8 vdc ±10%	If reading abnormal, proceed to next step. If normal, recheck step 7.
9	 Figures 5-6, 5-8, and 5-9	Measure 100-kc signal at junction of CR1002 and CR1003 using vtvm ME-30/U.	2v rms ±10%	If reading normal, replace diodes CR1002 and CR1003 repeat step 8. If step 8 reading abnormal, check C1007, C1008, R1007, R1005, and R1003. Replace faulty part and repeat step 4.

5-8. PRESELECTOR.

a. GENERAL. - The preselector consists of the first and second r-f stages and the first conversion mixer. Faulty operation of the preselector can reduce the strength of received signals or prevent reception. Figure 5-11 is a functional schematic diagram of the preselector. Figures 12 through 5-17 show the location of parts, and figures 5-18 through 5-21 show the location of test points.

b. ACCESS. - The preselector is located at the rear of the chassis. To obtain access to the test points, pull out the receiver drawer and raise it vertically. Test points are available on both the top and the bottom of the chassis.

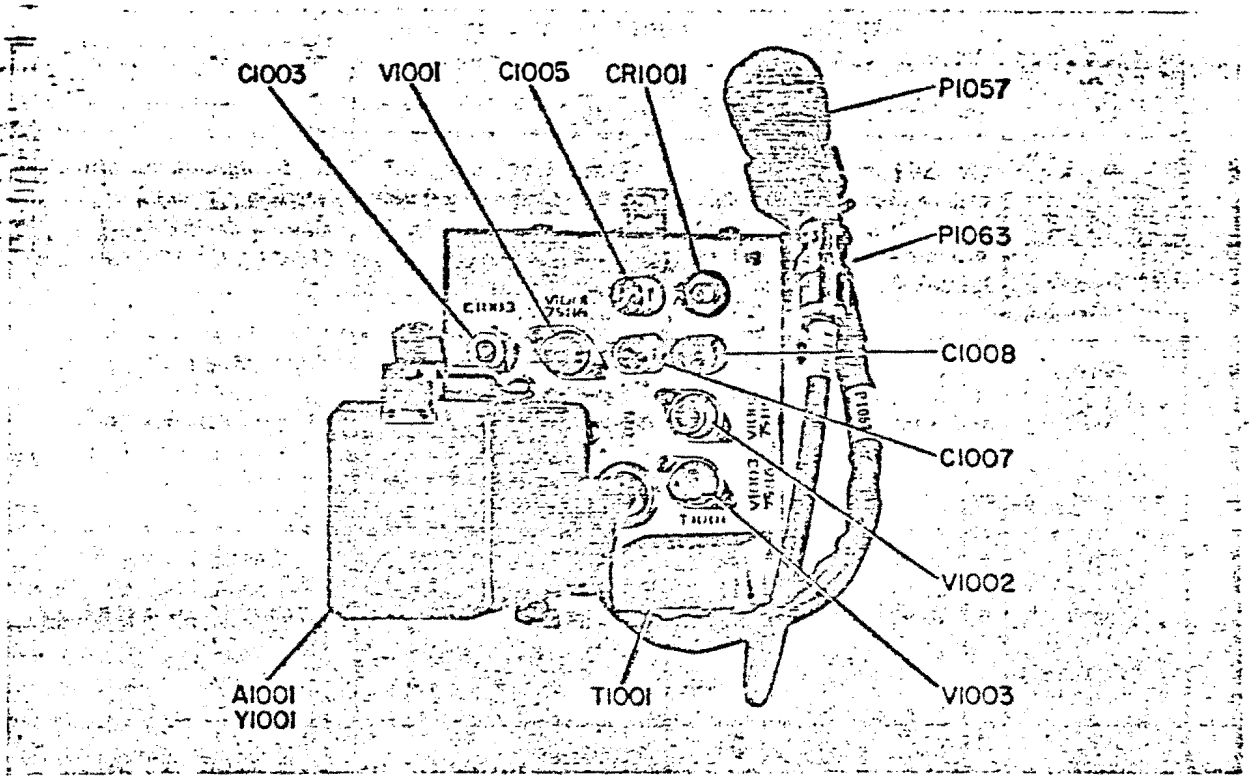


Figure 5-7. 100-Kc Oscillator-Amplifier, Top View, Location of Parts

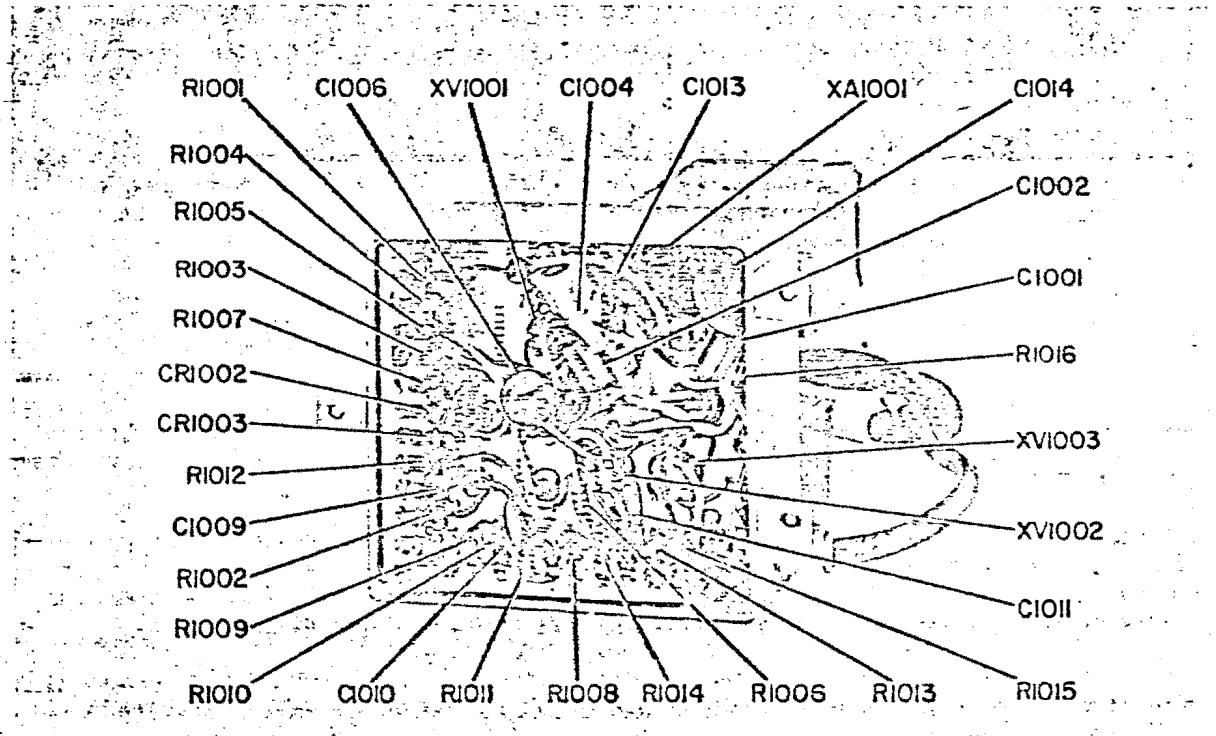


Figure 5-8. 100-Kc Oscillator-Amplifier, Bottom View, Location of Parts

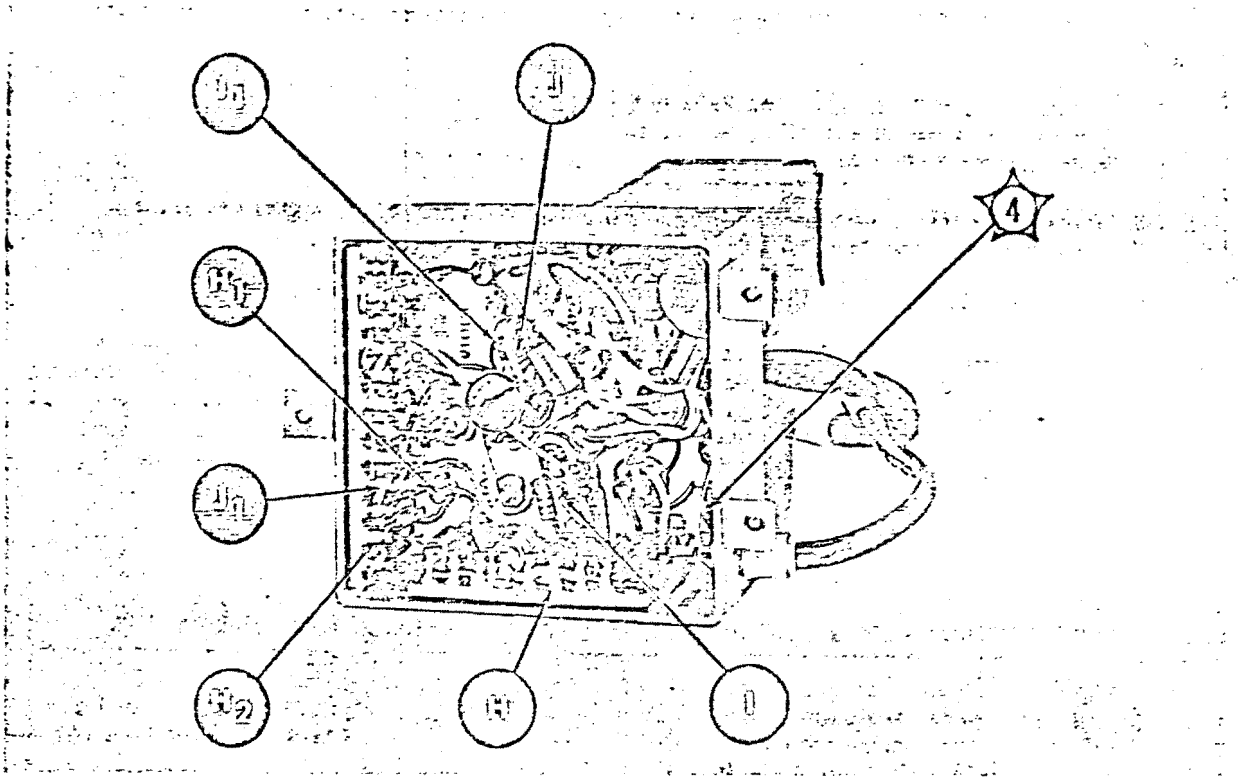


Figure 5-9. 100-Kc Oscillator-Amplifier, Location of Test Points

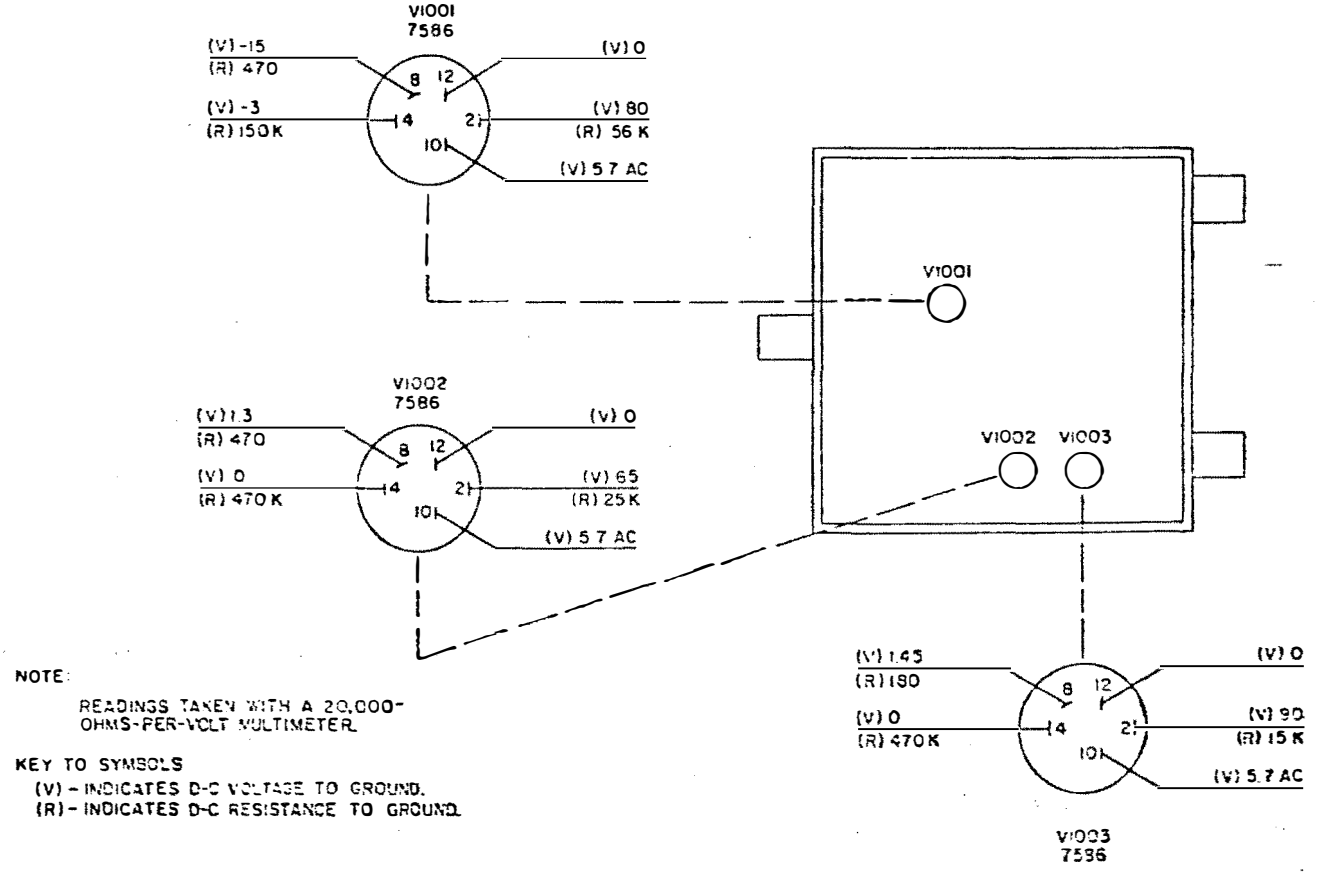


Figure 5-10. 100-Kc Oscillator-Amplifier, Voltage and Resistance Diagram

c. PRELIMINARY CHECK. - Before troubleshooting the preselector subassembly, check the following:

(1) Seating of tubes V51, V52, and V151 in their sockets.
(2) Cable connections at J51, J56, and J154.
(3) Soldered connections at chassis feedthrough terminals.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, signal generator AN/URM-25D, and electron tube test set TV-7D/U, or their equivalents.

e. CONTROL SETTINGS. - Set the controls to the positions given in table 5-2.

f. PRESELECTOR TROUBLESHOOTING CHART. - Troubleshooting the preselector consists of measuring the supply voltages and tracing signals through the circuits. Table 5-7 is the troubleshooting chart for the preselector. Perform the steps in the order listed. Compare the results of each step with information in the NORMAL INDICATION column, and follow instructions in the NEXT STEP column. Figure 5-22 is a diagram of voltage and resistance measurements for the preselector assembly.

TABLE 5-7. COUNTERMEASURES RECEIVER R-1125/FLR, PRESELECTOR, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(K) (K1) (K2) Figures 5-11, 5-13, 5-16, 5-19, and 5-21	In turn, connect multimeter from chassis feedthrough capacitors C63, C61, and C165 to chassis. Select 300 vdc range.	C63: +175 vdc ±20% C61: +160 vdc ±20% C165: +175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check capacitor C63. If reading abnormal, check R62 and C61. If reading abnormal, check C165 and R153.
2	(L) Figures 5-11, 5-13, and 5-19	Connect multimeter from chassis feedthrough capacitors C78 and C79 to chassis. Select 10 vac range.	C78: 3.15 vac ±5% C79: 315 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check capacitor C78. If reading abnormal, perform step 7 in table 5-5. Check C79.
3	5 (M) Figures 5-11, 5-13, 5-14, 5-15, 5-16, 5-18, and 5-20	Connect vtvm ME-30/U from (TP)J152 to chassis. Select 100-mv range. Connect signal generator to (TP)J55, adjust for 13-mv output at 2.0 mc.	Vtvm: 100 mv rms (nominal)	If reading abnormal, check V52. Check C72 and L151.

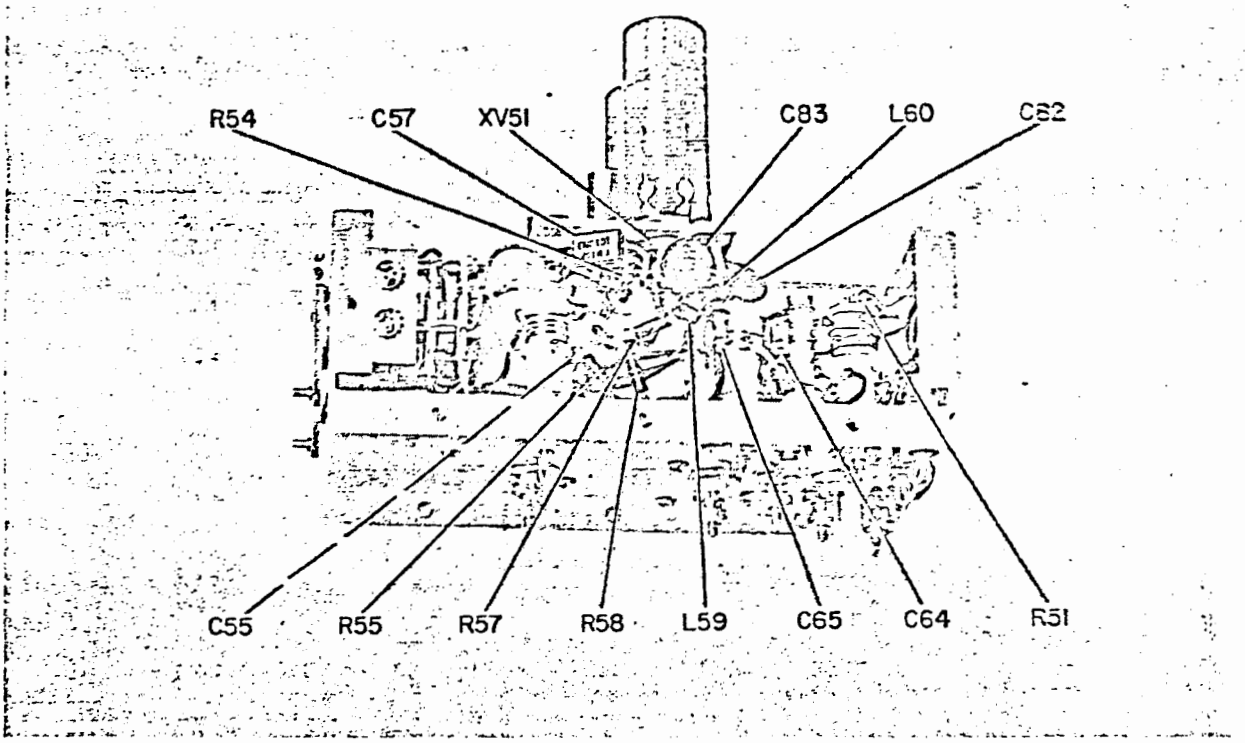


Figure 5-12. Preselector (R-F Subassembly), Side View, Location of Parts

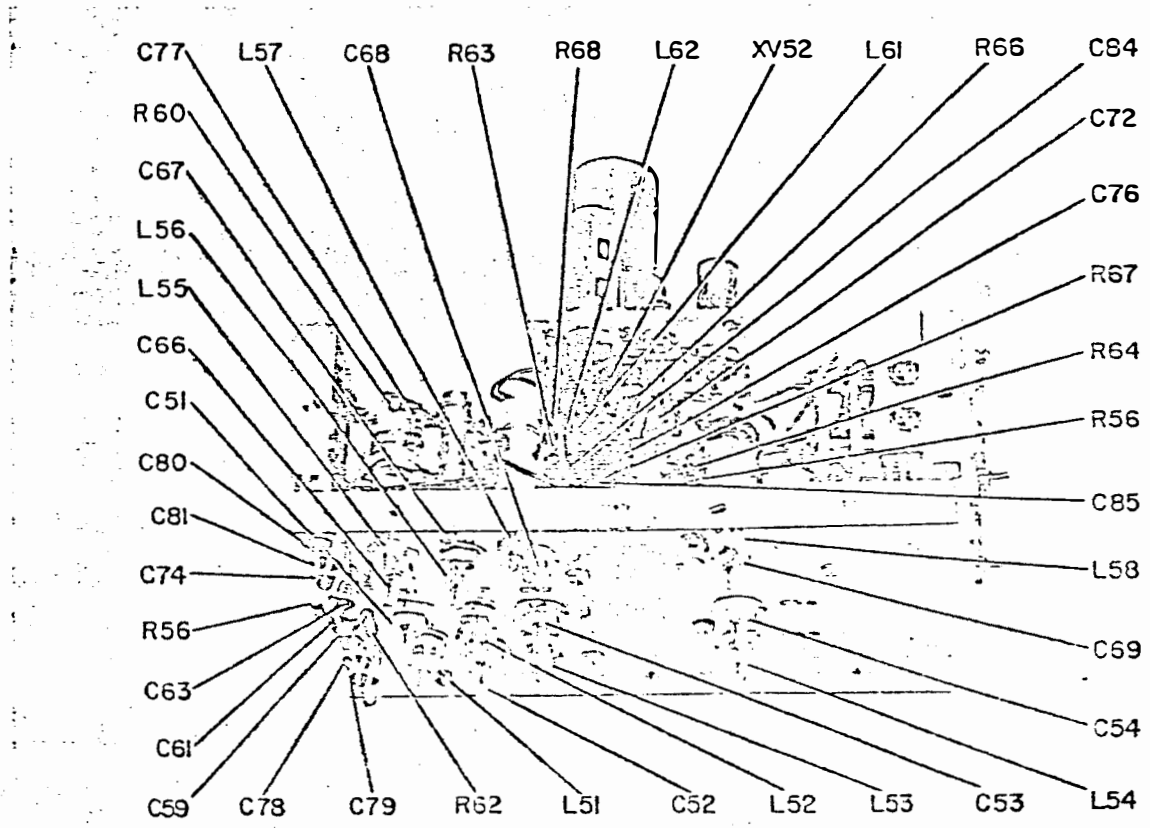


Figure 5-13. Preselector (R-F Subassembly), Bottom View, Location of Parts

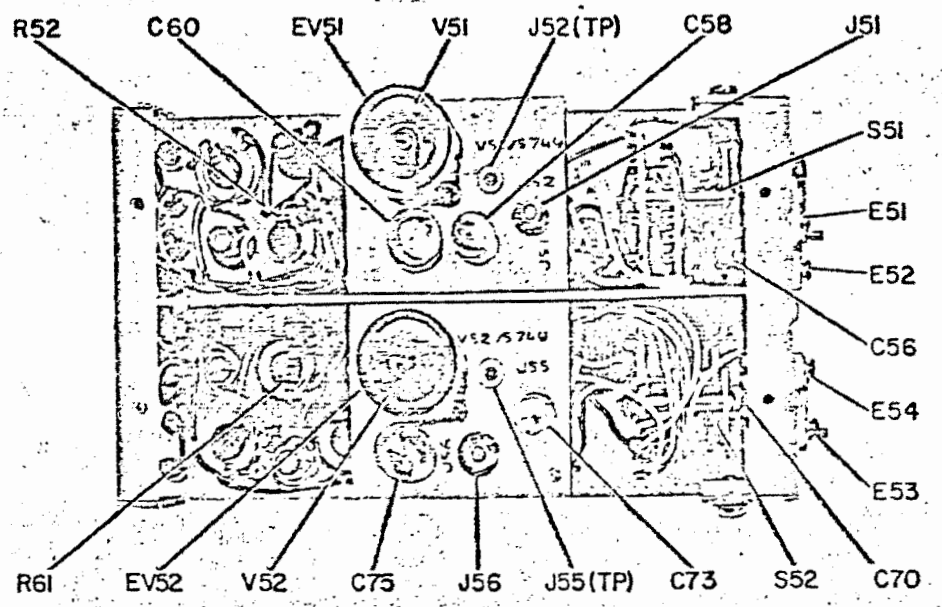


Figure 5-14. Preselector (R-F Subassembly), Top View, Location of Parts

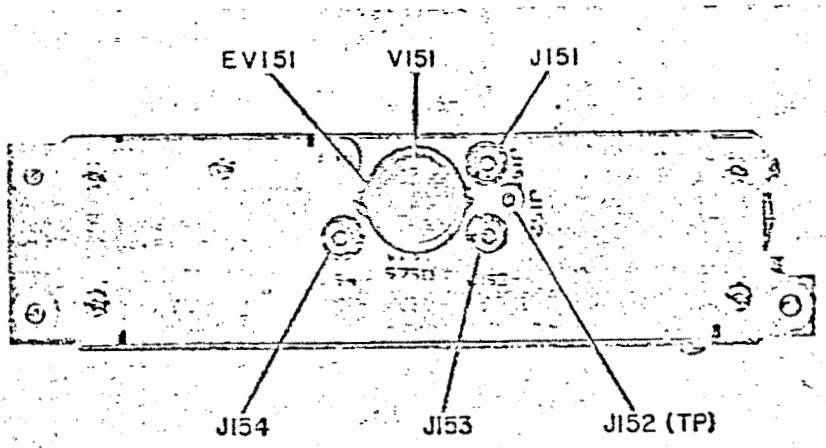


Figure 5-15. Preselector (Mixer Subassembly), Top View, Location of Parts

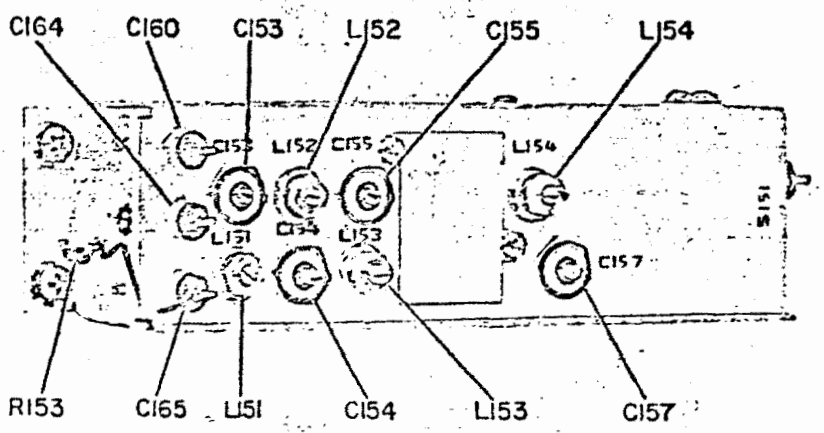


Figure 5-16. Preselector (Mixer Subassembly), Bottom View, Location of Parts

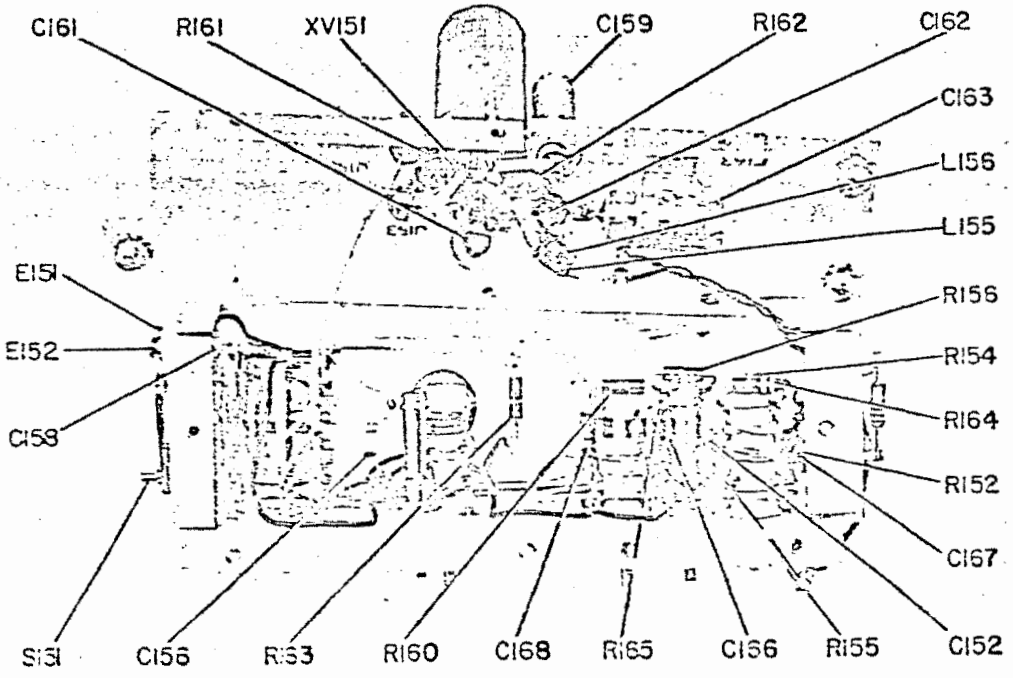


Figure 5-17. Preselector (Mixer Subassembly), Interior View, Location of Parts

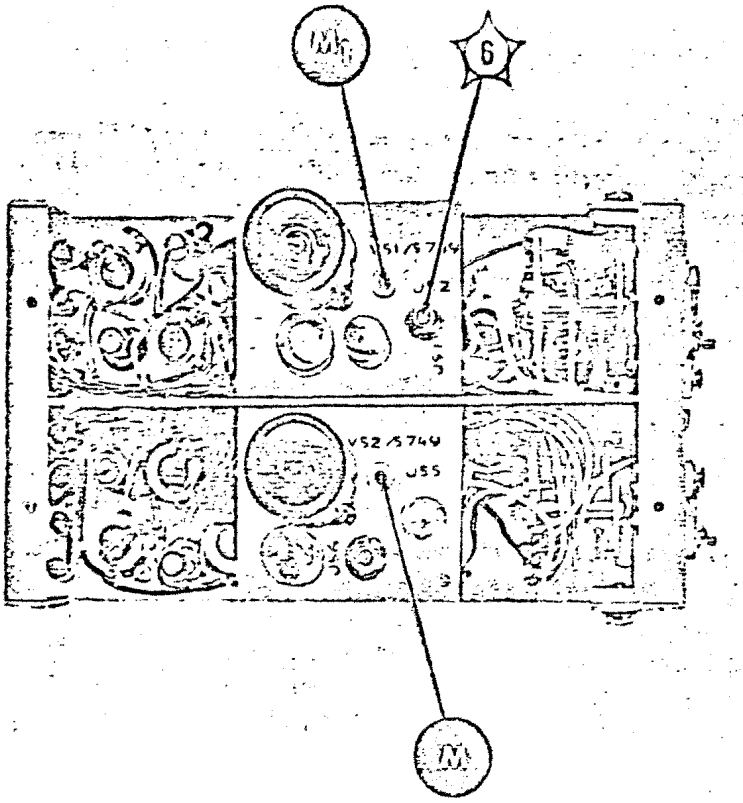


Figure 5-18. Preselector (R-F Subassembly), Top View, Location of Test Points

TABLE 5-7. COUNTERMEASURES RECEIVER R-1125/FLR, PRESELECTOR, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	(M) Figures 5-11, 5-12, 5-13, 5-14, and 5-18	Connect generator to (TP)J52 and reduce output to 5 mv.	Vtvm: 100 mv rms (nominal)	If reading abnormal, check V51. Check C57 and L55.
5	6 Figures 5-11, 5-14, and 5-18	Connect generator to J51 (at J952 ANT). Reduce output to 1 mv.	Vtvm: 100 mv rms (nominal)	If reading abnormal, check R51 and L51.

5-9. TUNABLE I-F FILTER.

a. DIAGRAMS. - Figure 5-23 is a functional schematic diagram of the tunable i-f filter. Refer also to figure 5-11, the functional schematic diagram of the preselector, because the plate-lead circuit for V151 (the preselector mixer) is part of the tunable i-f filter circuit. Figures 5-24 and 5-25 show the location of parts of the tunable i-f filter and figure 5-26 shows the location of test points.

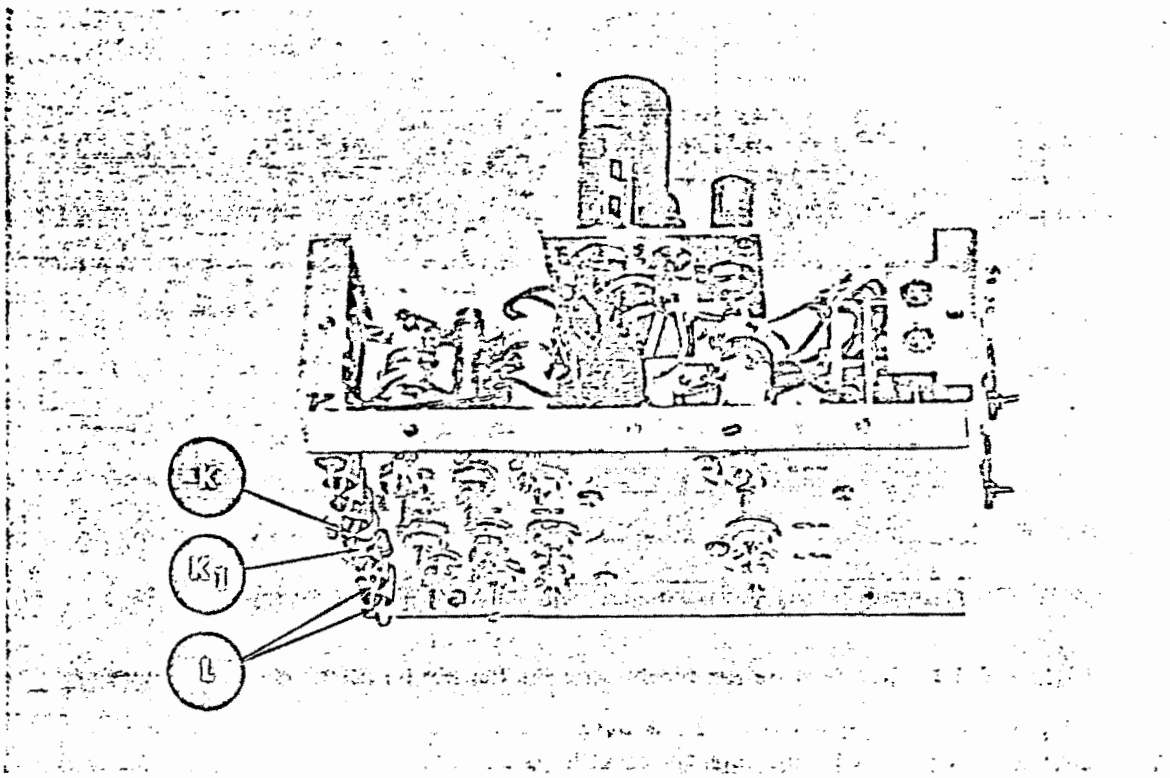


Figure 5-19. Preselector (R-F Subassembly), Bottom View, Location of Test Points

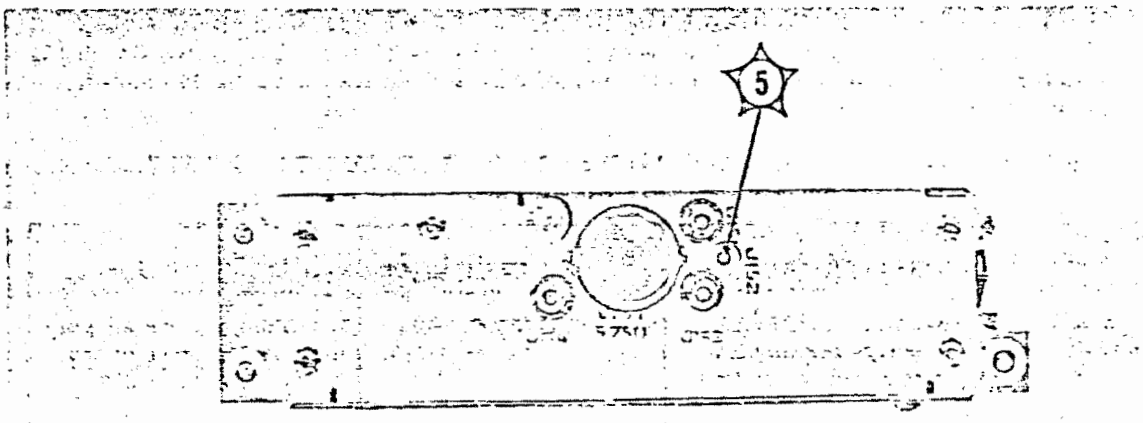


Figure 5-20. Preselector (Mixer Subassembly), Top View, Location of Test Points

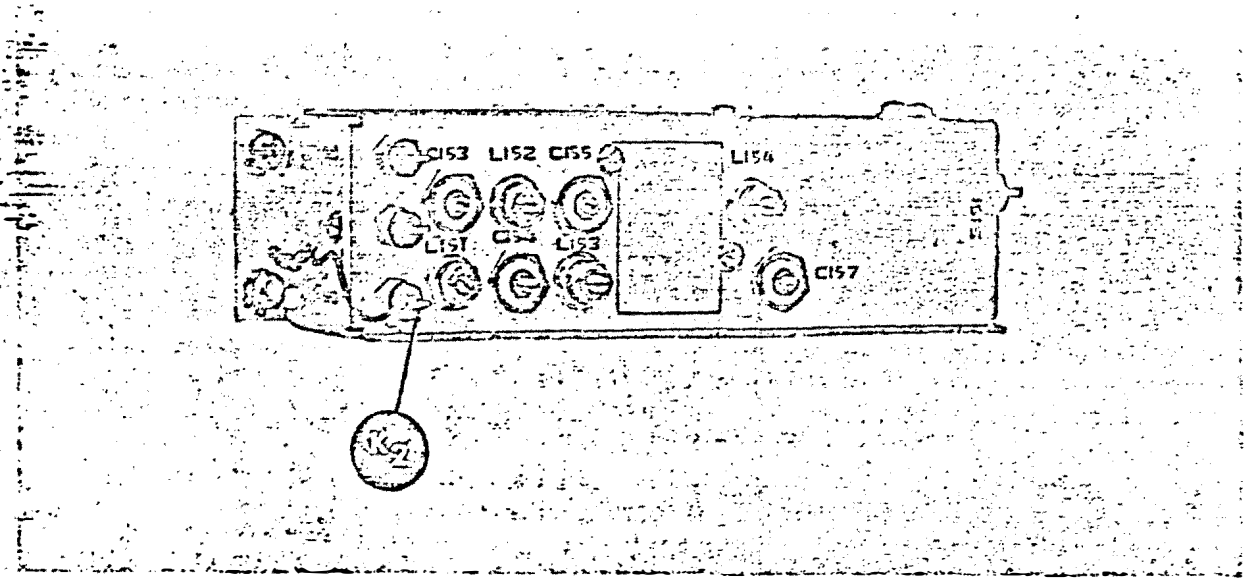


Figure 5-21. Preselector (Mixer Subassembly), Bottom View, Location of Test Points

b. PRELIMINARY CHECK. - Before troubleshooting the tunable i-f filter, check the following:

(1) Input and output connectors at P154 and P456.
(2) Soldered connection at feedthrough terminal E351.

c. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, and signal generator AN/URM-25D, or their equivalents.

d. CONTROL SETTINGS. - Set the controls to the positions given in table 5-2. Reposition BAND switch to 16-32 and tune receiver to 32.000 mc.

NOTE

Before troubleshooting the preselector, attach a clip lead from C74 to ground to remove the agc voltage.

e. TUNABLE I-F FILTER TROUBLESHOOTING CHART. - Table 5-8 is the troubleshooting chart for the tunable i-f filter. Troubleshooting the tunable i-f filter consists of measuring the supply voltage applied at chassis terminal E251, and testing the circuit operation with an externally applied signal. Electron tubes are not used in this assembly.

TABLE 5-8. COUNTERMEASURES RECEIVER R-1125/FLR, TUNABLE I-F FILTER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(N) Figures 5-23, 5-24, and 5-26	Connect multimeter from feedthrough terminal E351 to chassis. Select 300 vdc range.	E351: +125 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check R351 and C352.

TABLE 5-8. COUNTERMEASURES RECEIVER R-1125/FLR, TUNABLE I-F FILTER, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	(7) (5) Figures 5-23, 5-26, and 5-20	Disconnect output cable at J456. Connect vtvm ME-30/U to P456. Connect signal generator to (TP)J152 and adjust for 1675-kc unmodulated output of 500 mv. Set KILOCYCLE counter to +50.0.	Vtvm: 320 mv rms (nominal)	If reading abnormal, remove tunable i-f filter assembly and check circuits. Refer to paragraph 6-4f for removal instructions.

5-10. FIRST I-F AND INJECTION AMPLIFIER.

a. DIAGRAMS. - The first i-f and injection amplifier assembly contains three functional circuits. The following functional schematic diagrams are provided for these circuits:

Figure	Title
5-27	First I-F Amplifier
5-28	Injection I-F Amplifier
5-29	Output Amplifier

Figures 5-30 and 5-31 show the location of parts, and figures 5-32 and 5-33 show the location of test points.

b. ACCESS. - The first i-f and injection amplifier is located at the right rear of the chassis; pull out the receiver and raise it vertically to expose the test points.

c. PRELIMINARY CHECK. - Before troubleshooting the first i-f and injection amplifier (including the output amplifier), make a preliminary inspection with emphasis on the following:

(1) Seating of tubes V451 to V461, inclusive, in their sockets.
(2) Cable connections at J456, J460, J451, J452, J461, and J462.
(3) All soldered connections at chassis feedthrough terminals.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-6D/U, vtvm ME-30/U, signal generator AN/URM-25D, and electron tube test set TV-7D/U, or their equivalents.

WARNING

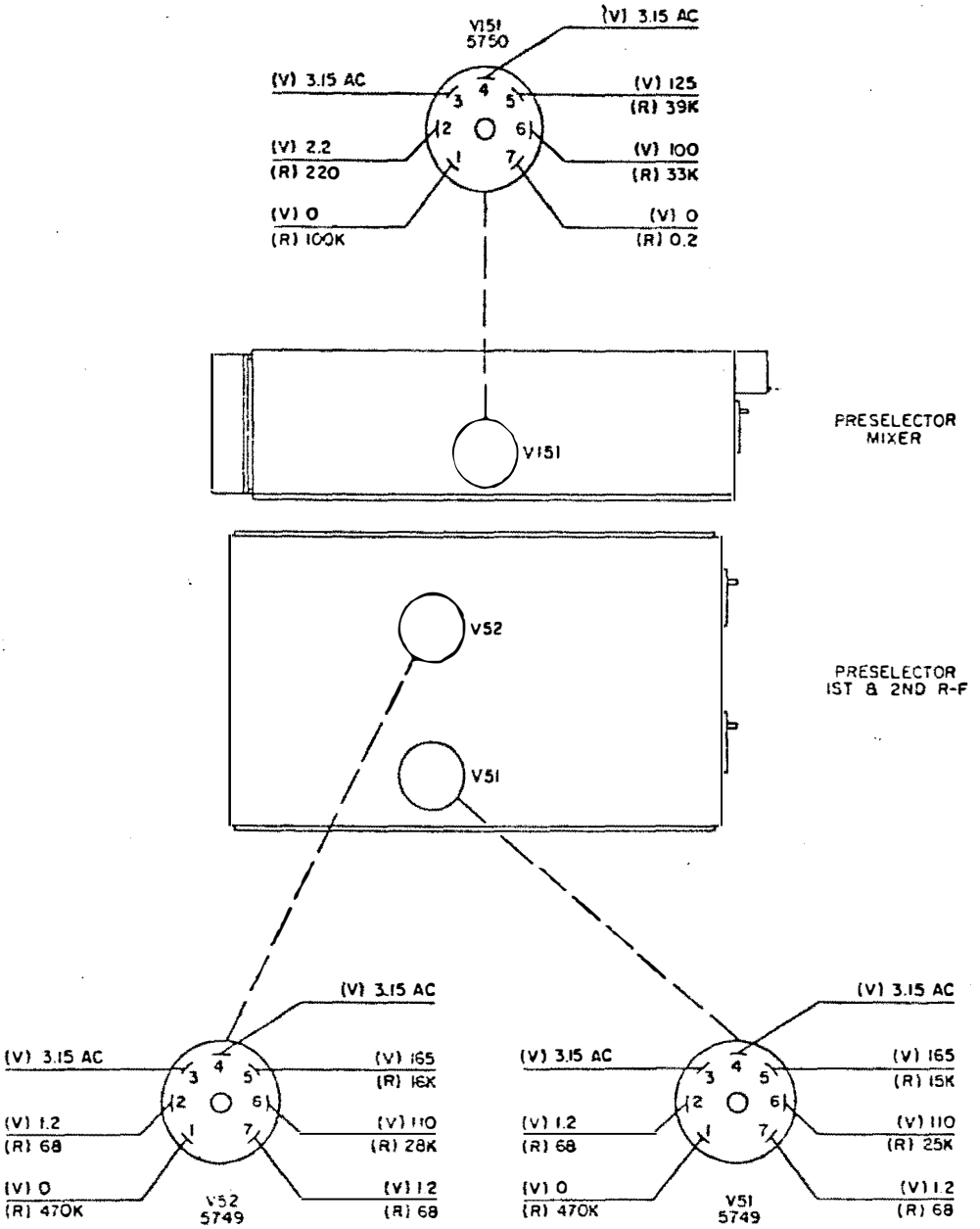
Dangerous potentials are present in these circuits.

e. CONTROL SETTINGS. - Place the controls in the positions listed in table 5-2. Exceptions will be made for certain steps in the troubleshooting procedure.

f. FIRST I-F AND INJECTION AMPLIFIER TROUBLESHOOTING CHART. - Table 5-9 is the troubleshooting chart for the three functional sections in this assembly. Perform the steps in the order listed and compare the results with those given in the NORMAL INDICATION column. Then, follow the instructions in the NEXT STEP column. Figure 5-34 is a voltage and resistance diagram.

NOTE

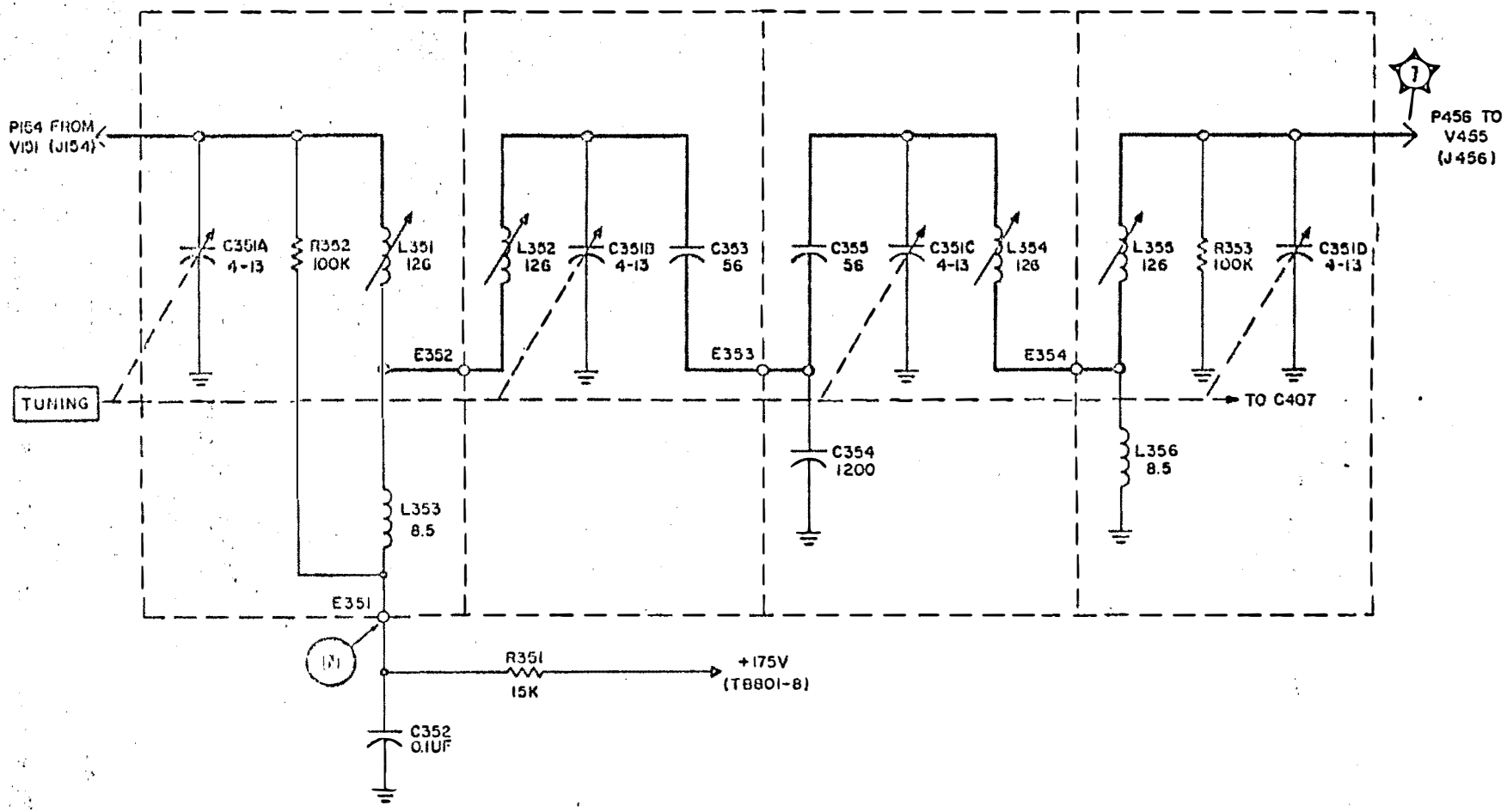
Before troubleshooting the first i-f and injection amplifier, attach a clip lead from C303 to chassis to remove the age voltage.



NOTE:
READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.

KEY TO SYMBOLS
(V)- INDICATES D-C VOLTAGE TO GROUND.
(R)- INDICATES D-C RESISTANCE TO GROUND.

Figure 5-22. Preselector, Voltage and Resistance Diagram



NOTE
ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.

Figure 5-23. Tunable I-F Filter, Functional Schematic Diagram

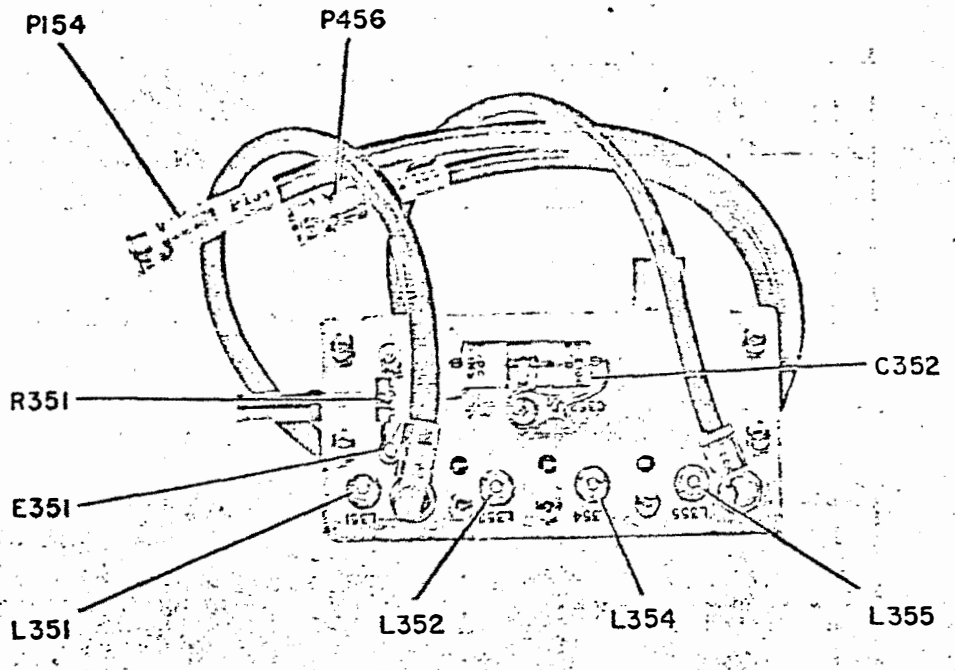


Figure 5-24. Tunable I-F Filter, Top View, Location of Parts

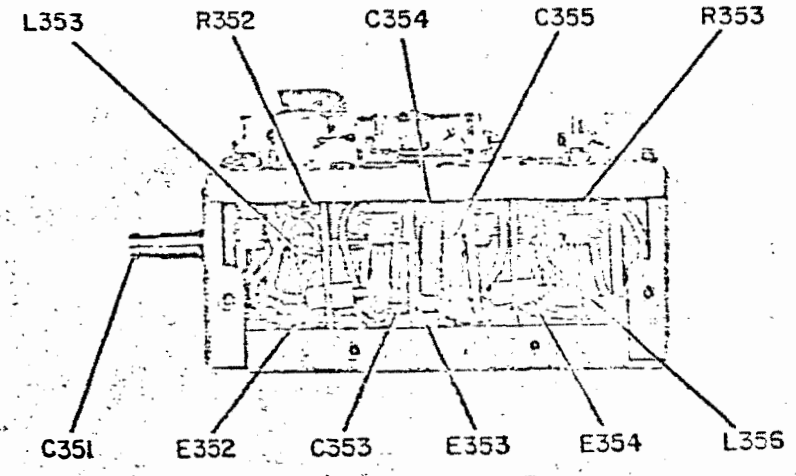


Figure 5-25. Tunable I-F Filter, Side View, Location of Parts

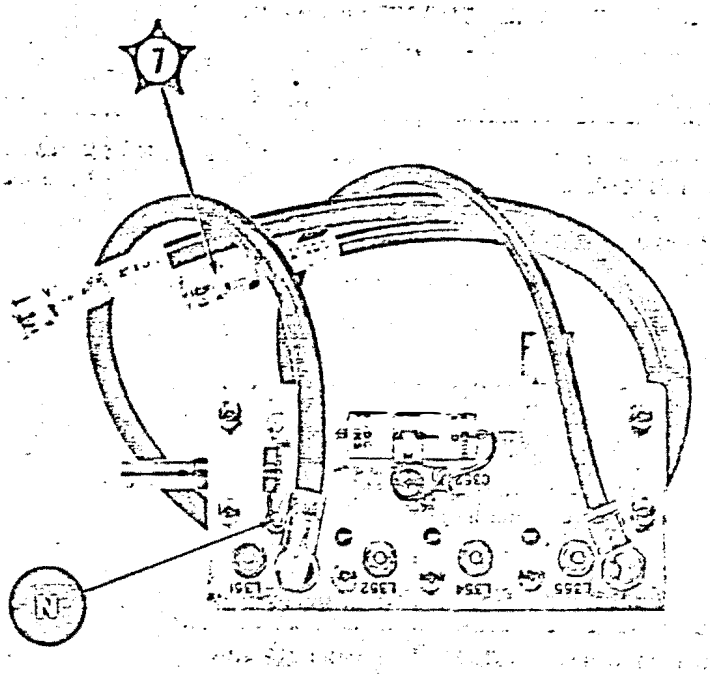


Figure 5-26. Tunable I-F Filter, Location of Test Points

TABLE 5-9. COUNTERMEASURES RECEIVER R-1125/FLR, FIRST I-F AND INJECTION AMPLIFIER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Figures 5-27 through 5-33	Connect multimeter from chassis feedthrough capacitor C452 to chassis. Select 300 vdc range.	C452: +175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check capacitor C452.
2	Figures 5-27 through 5-33	Connect multimeter from feedthrough capacitors C453 and C454 to chassis. Select 10 vac range.	C453: 3.15 vac ±5% C454: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check C453. If reading abnormal, perform step 7 in table 5-5. Check C454.
3	8 9 Figures 5-27 through 5-33	Connect vtvm ME-30/U to J460 (disconnect cable W806). Turn OUTPUT LEVEL control fully cw. Disconnect cable at J451. Connect signal generator to (TP)J464, adjust for 150 uv output at 220 kc.	Vtvm: 0.1v rms (±10%)	If reading abnormal, check tubes V456, V457, V458, and V459. Check OUTPUT LEVEL control R901, and R808.

TABLE 5-9. COUNTERMEASURES RECEIVER R-1125/FLR, FIRST I-F AND INJECTION AMPLIFIER, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	Q, 9 Figures 5-27 through 5-33	Connect vtvm ME-30/U to (TP)J464, and signal generator to (TP)J457. Adjust generator for 0.02v output at 1675 kc.	Vtvm: 0.1v rms (±10%)	If reading abnormal, check V455 and C478.
5	R, R1 Figures 5-27 through 5-33	Connect vtvm ME-30/U (TP)J455, and signal generator to (TP)J454. Adjust generator for 0.05v output at 1455 kc.	Vtvm: 0.1v rms (±10%)	If reading abnormal, check V453.
6	S1 Figures 5-27 through 5-33	Connect vtvm ME-6D/U to (TP)J466. (Leave signal generator as adjusted in step 5.) Select vdc range.	Vtvm: -10 vdc (±10%)	If reading abnormal, remove bottom plate from assembly and perform next step.
7	S Figures 5-27 through 5-33	Connect vtvm ME-6D/U at junction of C467 and CR451.	Vtvm: -10 vdc (±10%)	If reading abnormal, check C467. If reading normal, check R453, R460, R464, and R465. Check C461 and C466. Repair and repeat step 6.
8	R1, 10 Figures 5-27 through 5-33	Connect vtvm ME-30/U to (TP)J454, and the signal generator to J451. Adjust generator for 0.02v output at 825 kc.	Vtvm: 0.1v rms (±10%)	If reading abnormal, check V451, V452, and C482.
9	11, 12 Figures 5-27 through 5-33	Connect vtvm ME-30/U to J462 (disconnect cable), and signal generator to J461 (disconnect cable). Adjust generator for 0.1v output at 65 kc.	Vtvm: 1.0v rms (±10%)	If reading abnormal, check V460, V461, and C495.

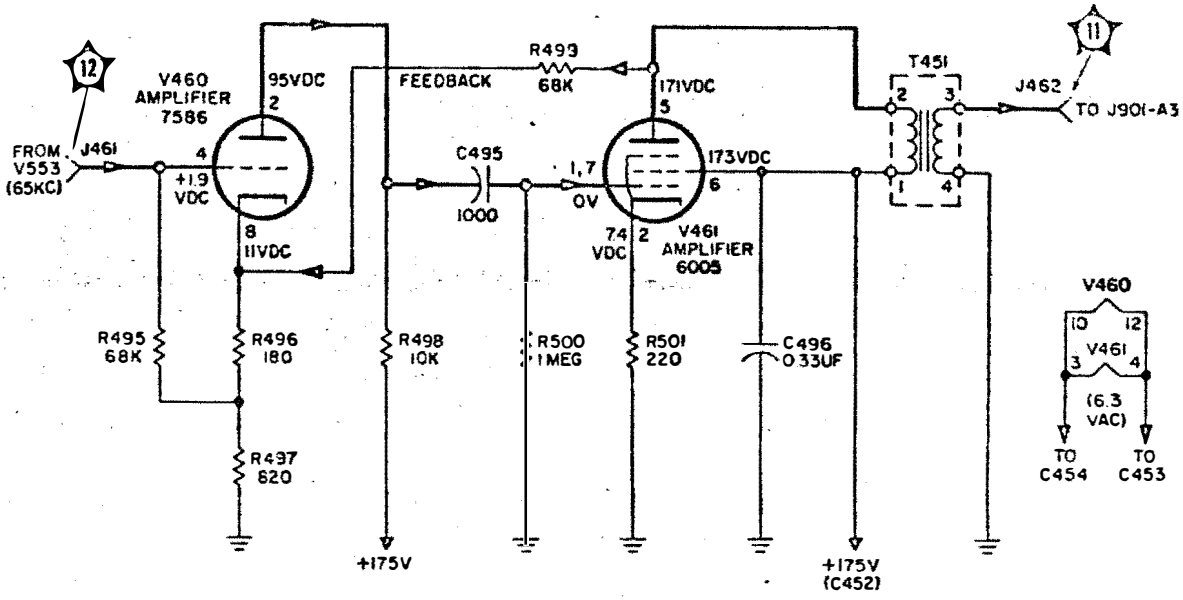


Figure 5-29. Output Amplifier, Functional Schematic Diagram

5-11. INTERPOLATION OSCILLATOR BUFFER.

a. GENERAL. - The interpolation oscillator buffer provides a 580- to 680-kc signal from the interpolation oscillator (V401) to the VFO OUTPUT connector (J902) on the receiver front panel. The buffer (V651) provides signal amplification and circuit isolation to prevent signal-monitoring instruments connected to J902 from affecting oscillator operation. Figure 5-35 is a functional schematic diagram of the interpolation oscillator buffer, figures 5-36 and 5-37 show the location of parts, and figure 5-38 shows the location of test points.

b. ACCESS. - The interpolation oscillator buffer assembly is centrally located near the rear of the chassis. Pull out the receiver and raise it vertically to expose the connectors and the test points.

c. PRELIMINARY CHECK. - Before troubleshooting the interpolation oscillator buffer, make a preliminary inspection with emphasis on the following:

(1) Input and output connectors at J651 and J652.
(2) Seating of tube V651 in its socket.
(3) Soldered connections at chassis feedthrough terminals.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, signal generator AN/URM-25D, and electron tube test set TV-TD/U, or equivalent test instruments.

e. CONTROL SETTINGS. - Set the front panel controls to the positions given in table 5-2.

f. INTERPOLATION OSCILLATOR BUFFER TROUBLESHOOTING CHART. - Troubleshooting the interpolation buffer consists of measuring the supply voltage applied and testing circuit operation with an externally applied signal. Perform the steps listed in the interpolation oscillator buffer troubleshooting chart, table 5-10, in the order given and compare the results with those listed in the NORMAL INDICATION column. Then follow the instructions in the NEXT STEP column. Figure 5-39 is a voltage and resistance diagram.

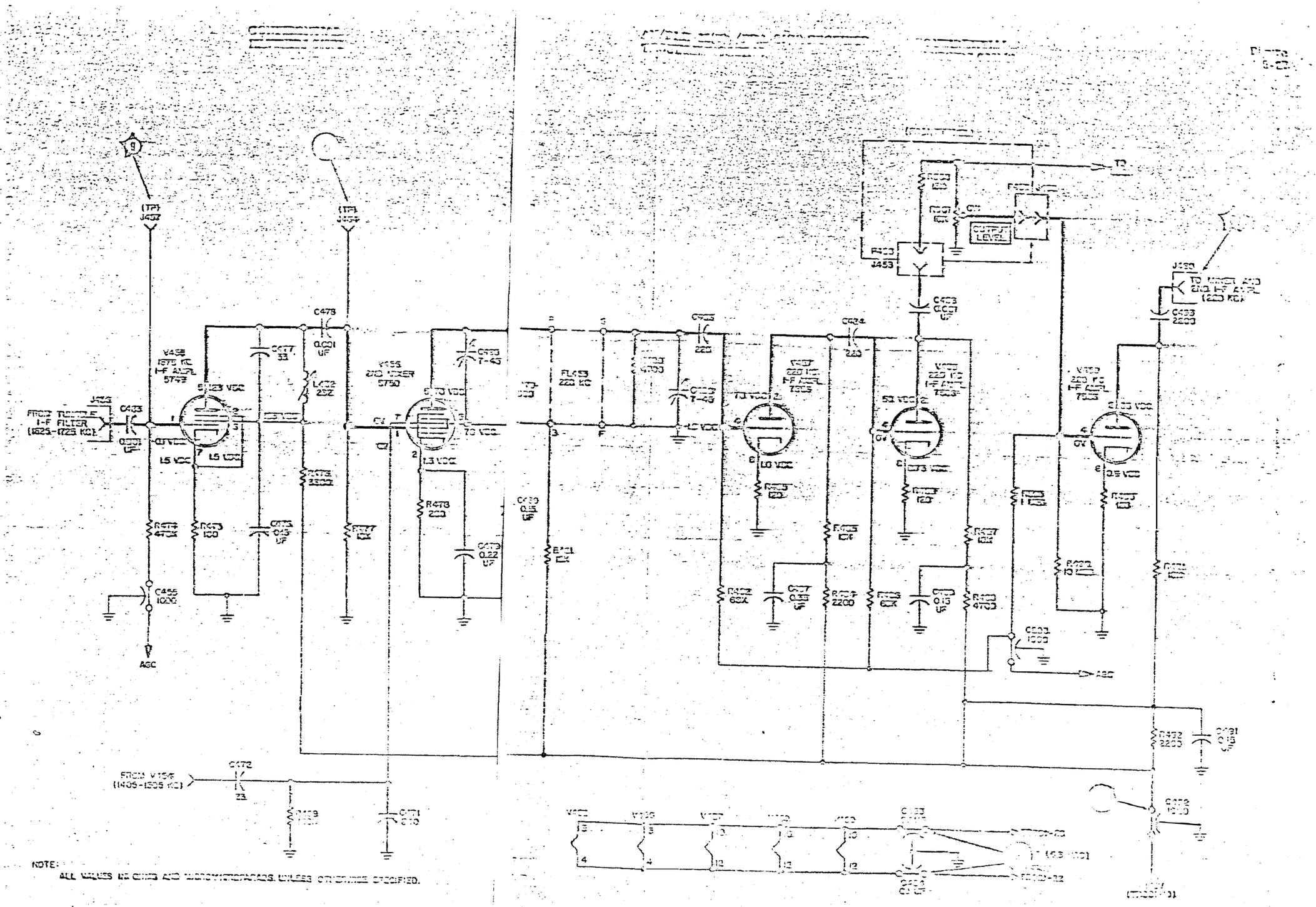
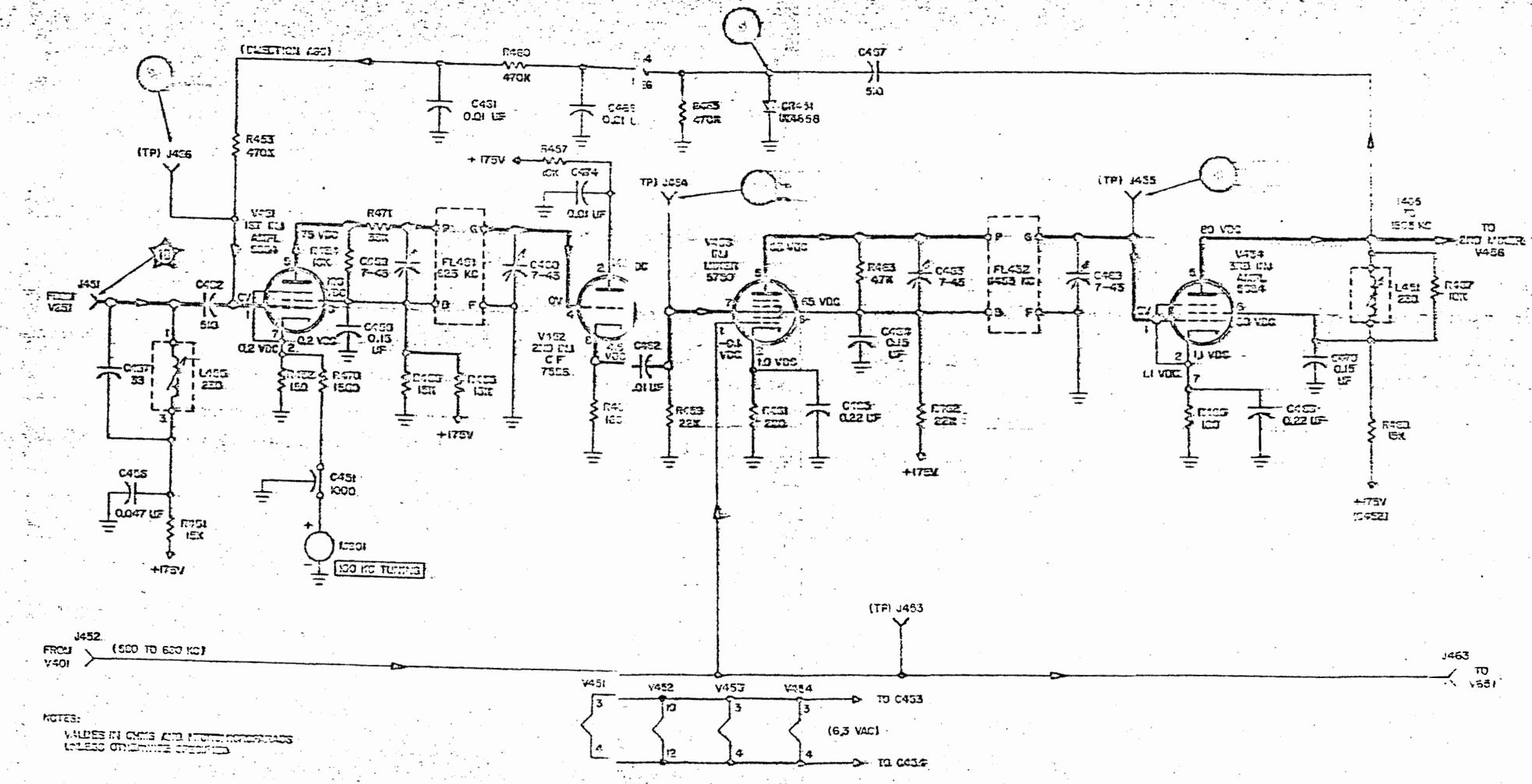


Figure 5-17. Block 1-F Amplifier, Functional Schematic Diagram



NOTES:
VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE SPECIFIED

Figure 5-22. Injection I-F Amplifier, Functional Schematic Diagram

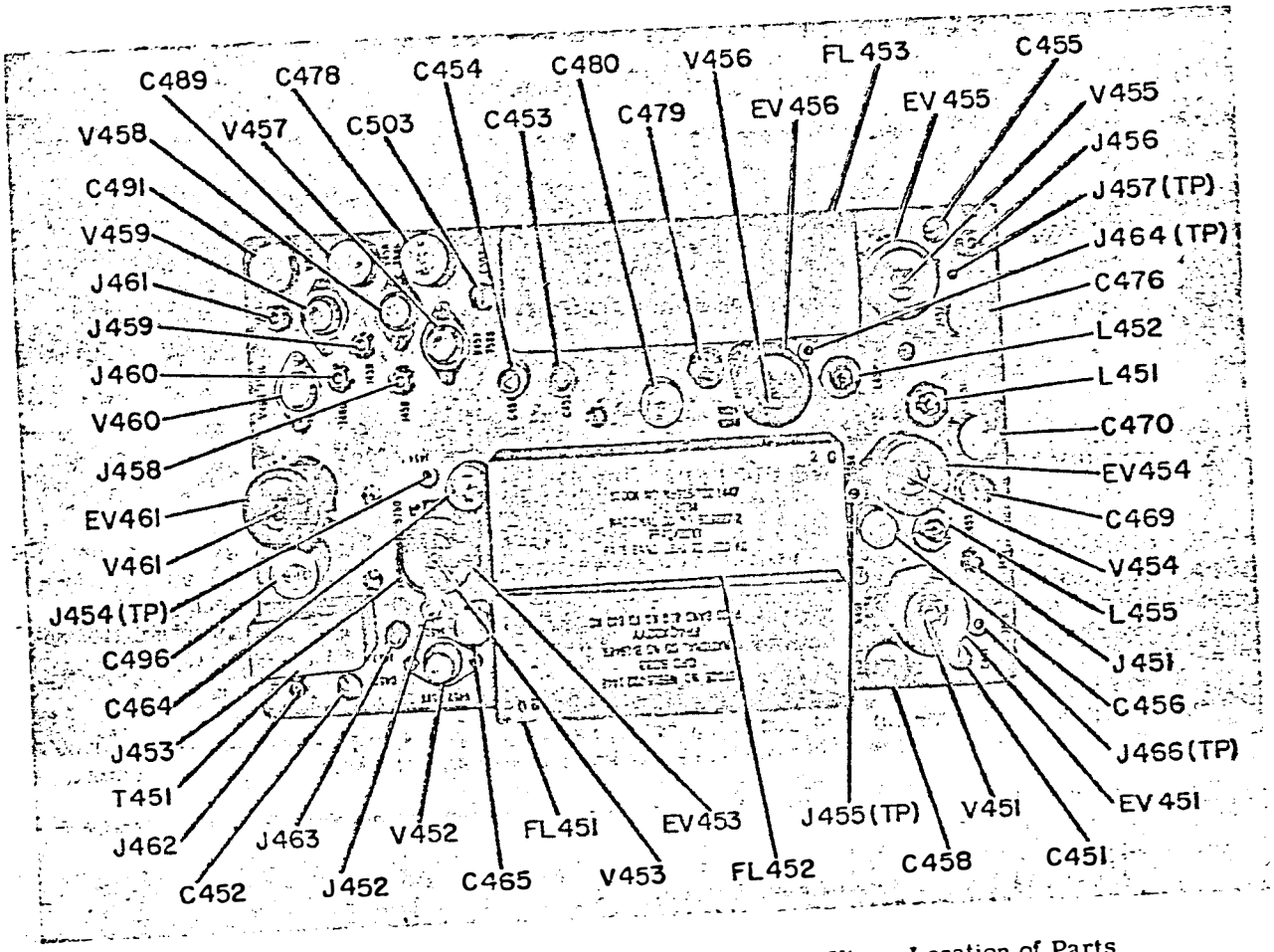
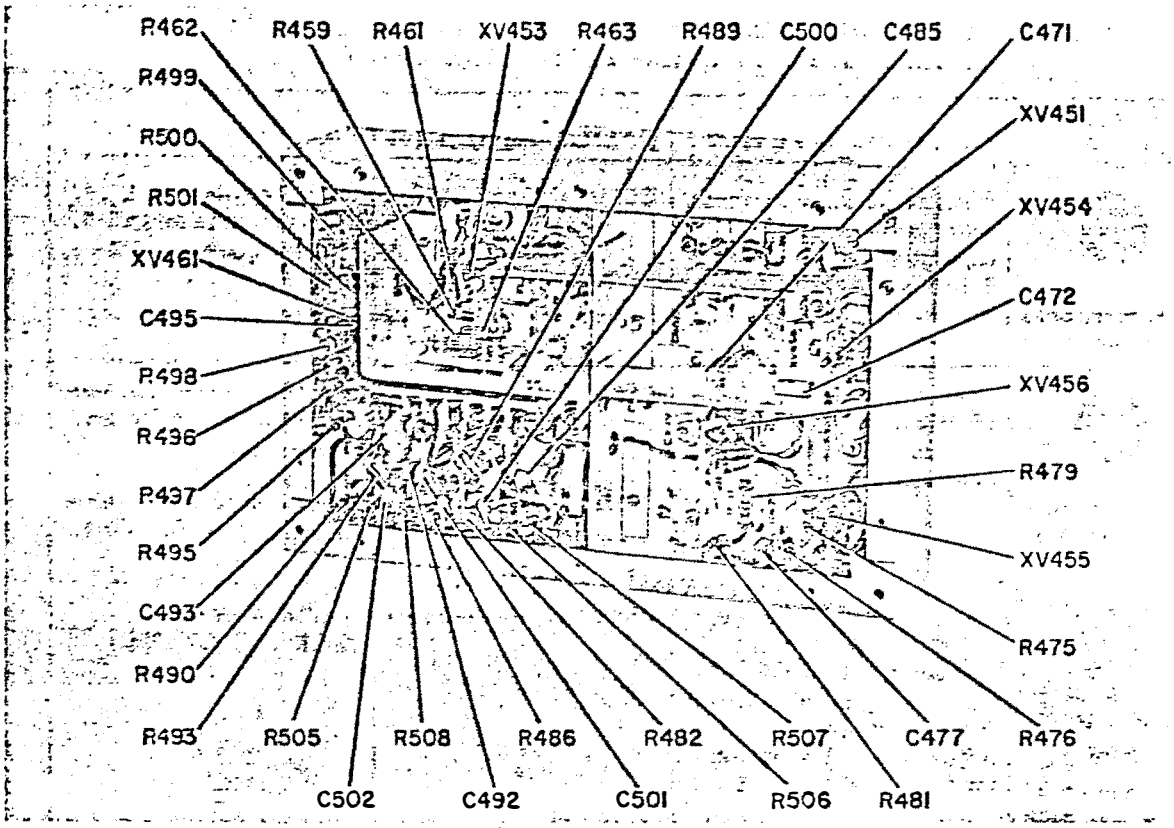


Figure 5-30. First I-F and Injection Amplifier, Top View, Location of Parts



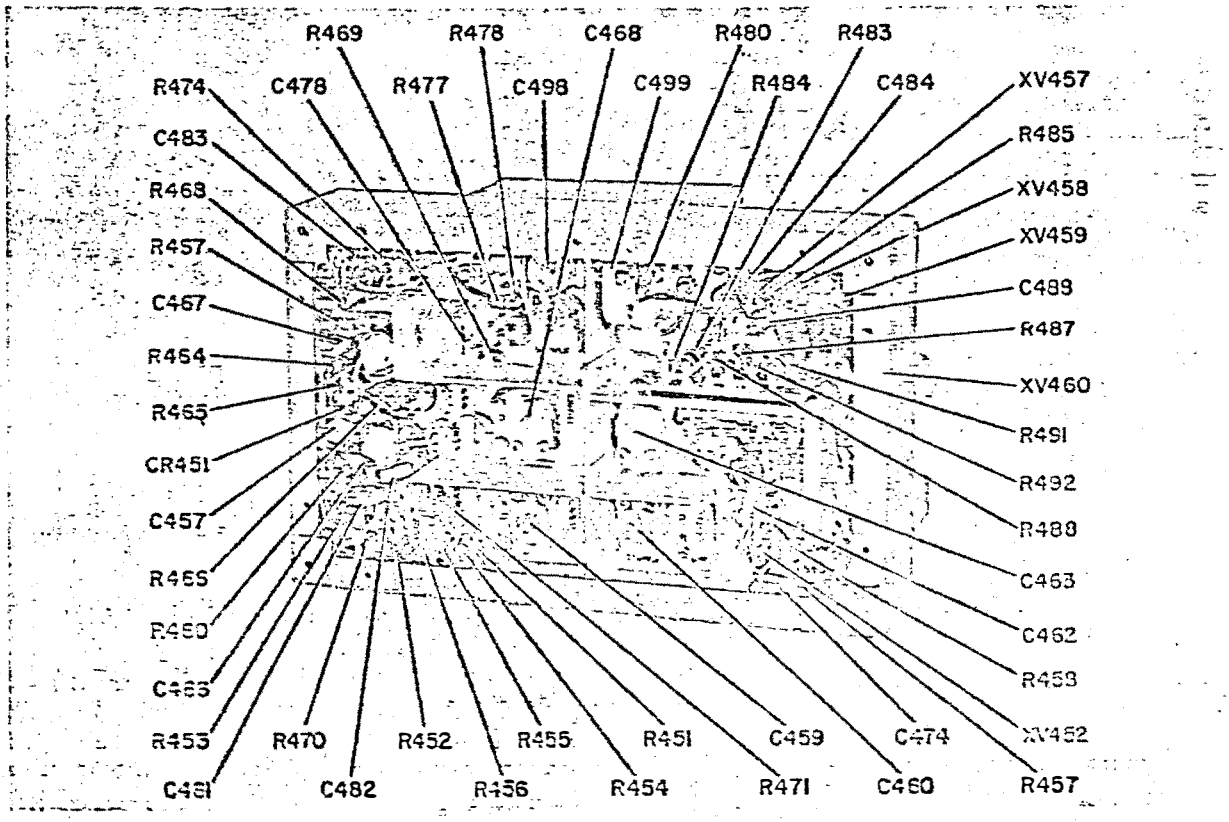


Figure 5-31. First I-F and Injection Amplifier, Bottom Views, Location of Parts

TABLE 5-10. COUNTERMEASURES RECEIVER R-1125/FLR, INTERPOLATION OSCILLATOR BUFFER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(11) Figures 5-35 through 5-38	Connect multimeter from chassis feedthrough capacitor C654 to chassis. Select 300 vdc range.	C654: +175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check capacitor C654.
2	(10) Figures 5-35 through 5-38	Connect multimeter from feedthrough capacitors C655 and C656 to chassis. Select 10 vac range.	C655: 3.15 vac ±5% C656: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check C655. If reading abnormal, perform step 7 in table 5-5. Check C656.
3	(13) (14) Figures 5-35 through 5-38	Connect vtvm ME-30/U to J902 VFO OUTPUT (on panel). Connect signal generator to J651 (remove cable W808). Adjust generator output for 0.3v at 630 kc.	Vtvm: 2v rms ±10%	If reading abnormal, check V651 and C651.

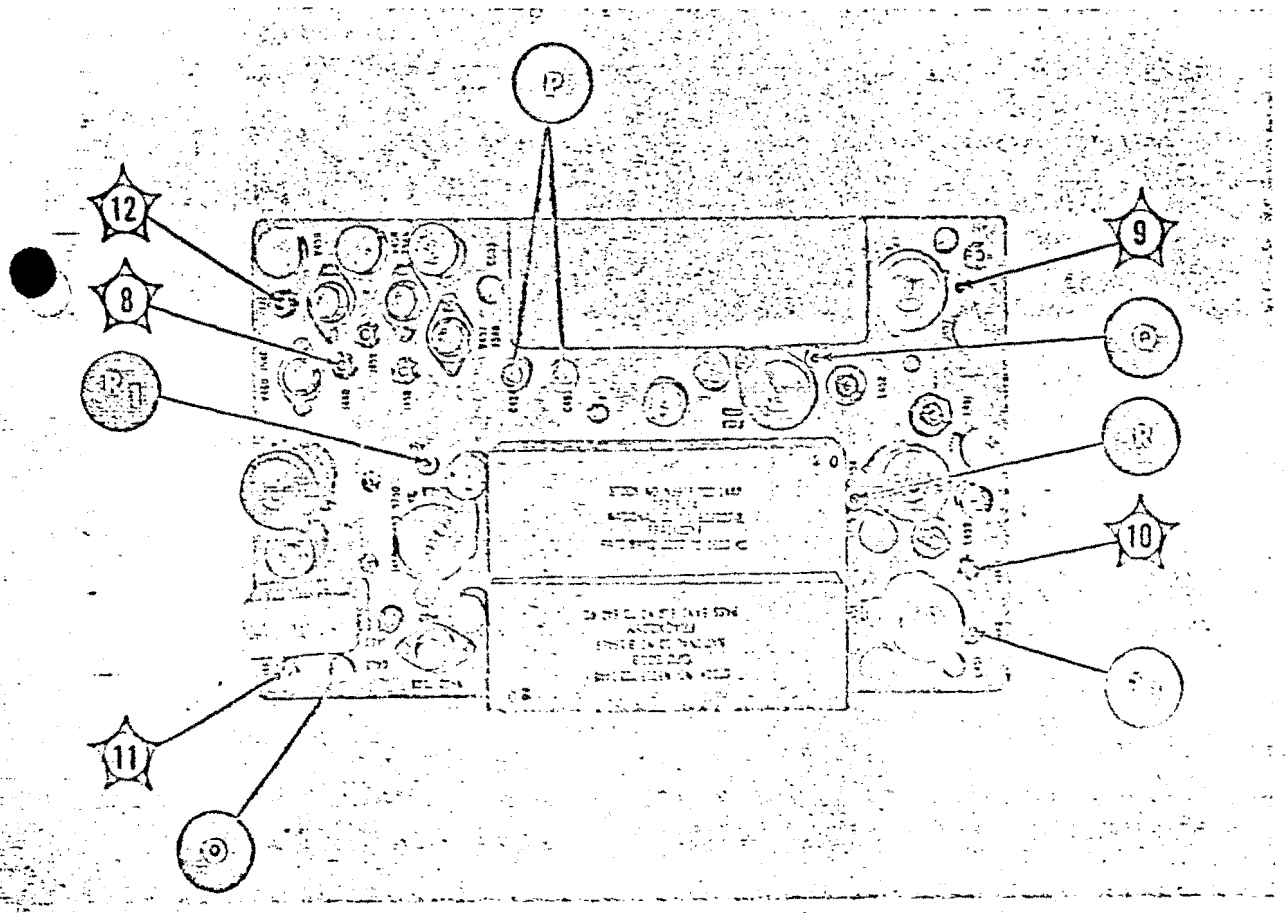


Figure 5-32. First I-F and Injection Amplifier, Top View, Location of Test Points

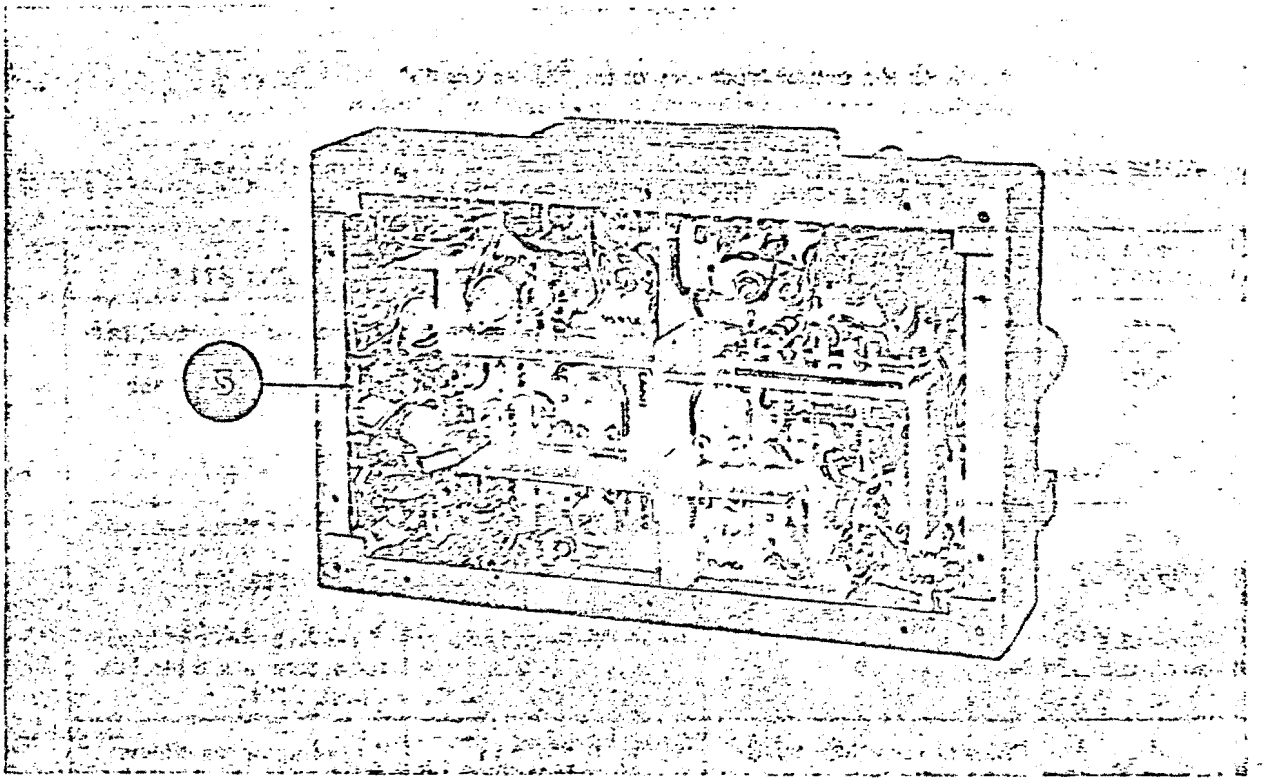


Figure 5-33. First I-F and Injection Amplifier, Bottom View, Location of Test Points

5-12. MIXER AND SECOND I-F AMPLIFIER.

a. GENERAL. - The mixer and second i-f amplifier consists of three circuit sections: a balanced mixer (the third conversion mixer), a two-stage 65-kc i-f amplifier, and a 285-kc crystal oscillator. Faulty operation of this assembly can reduce the strength of received signals, or prevent reception. Figure 5-40 is a functional schematic diagram of the mixer and second i-f amplifier, figures 5-41 and 5-42 show the location of parts, and figure 5-43 shows the location of test points.

b. ACCESS. - The mixer and second i-f amplifier is centrally located on the left side of the chassis. Pull out and lower the receiver. All connections and test points are exposed on the top of the chassis.

c. PRELIMINARY CHECK. - Before troubleshooting the mixer and second i-f amplifier, perform the preliminary inspections given below:

(1) Seating of tubes V551, V552, and V553 in their sockets.
(2) Cable connections at J551 and J553.
(3) Soldered connections at chassis feedthrough terminals.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, signal generator AN/URM-25D, oscilloscope CS-8C/U, and electron tube test set TV-7D/U, or equivalent test instruments.

e. CONTROL SETTINGS. - Set the front panel controls to the positions given in table 5-2. Exceptions will be made for certain steps during the troubleshooting procedure.

f. MIXER AND SECOND I-F AMPLIFIER TROUBLESHOOTING CHART. - Table 5-11 is a troubleshooting chart for the mixer and second i-f amplifier. It provides for measurements of the supply voltage, output of the 285-kc crystal oscillator, and signal levels at test points. Figure 5-44 is a diagram of voltage and resistance measurements for this assembly.

NOTE

To check the output frequency of the 285-kc crystal oscillator, refer to paragraph 6-4g in Section 6, Repair.

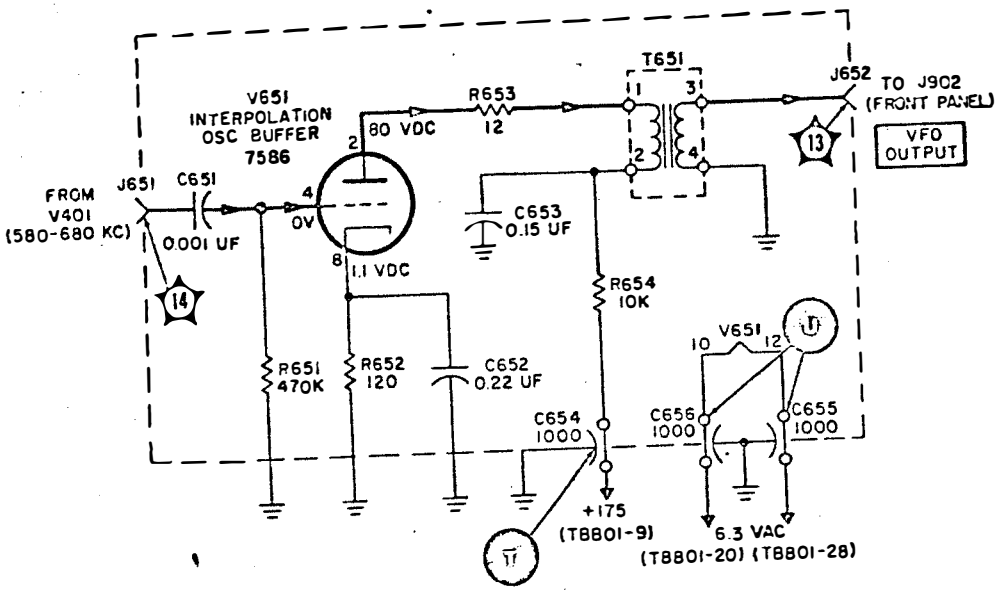
TABLE 5-11. COUNTERMEASURES RECEIVER R-1125/FLR, MIXER AND SECOND I-F AMPLIFIER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(V) Figures 5-40 through 5-43	Connect multimeter from chassis feedthrough capacitor C552 to chassis. Select 300 vdc range.	C552: 175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check capacitor C552.
2	(W) Figures 5-40 through 5-43	Connect multimeter from feedthrough capacitors C553 and C554 to chassis. Select 10 vac range.	C553: 3.15 vac ±5% C554: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check C553. If reading abnormal, perform step 7 in table 5-5. Check C554.
3	15 Figures 5-40 through 5-43	Connect vtvm ME-30/U and oscilloscope from (TP)J552 to chassis. Monitor 285-kc waveform on scope.	Vtvm: 0.65v rms Scope: Undistorted sine waveform	If reading or waveform abnormal, check V551, R564, and C566. Replace crystal Y551.
4	16 17 Figures 5-40 through 5-43	Connect vtvm ME-30/U to J553 (disconnect cable W807). Connect signal generator to J551. (Disconnect cable W806). Adjust generator for 0.035-volt output at 200 kc.	Vtvm: 0.1v rms (Adjust generator frequency for a maximum reading on vtvm)	If reading abnormal, check C564. Check also V552, V553, and C563. Refer to paragraph 6-4g for RESERVE GAIN control adjustment.
5	16 Figures 5-40 through 5-43	Connect oscilloscope to J553 and note waveform.	Scope: Undistorted sine wave	If waveform distorted, or both 220-kc and 285-kc signals present, check transformers T551 and T552, and diodes CR551 through CR554.

5-13. AGC AMPLIFIER.

a. GENERAL. - The agc amplifier provides an agc voltage for automatic gain control (agc) of the preselector r-f amplifiers, and four stages in the first i-f amplifier. The agc amplifier assembly also contains the 100-kc buffer-amplifier stage. This circuit amplifies the 100-kc reference signal from the O-928/FLR prior to harmonic generation in the harmonic amplifier circuit. Figure 5-45 is a functional schematic diagram of the agc amplifier and the 100-kc buffer-amplifier. Figures 5-46 and 5-47 show the location of parts, and figure 5-48 shows the location of test points.

b. ACCESS. - The agc amplifier assembly is located on top of the chassis near the front panel. Pull out the receiver and tilt it downward to expose the test points.



NOTE:
ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.

Figure 5-35. Interpolation Oscillator Buffer, Functional Schematic Diagram

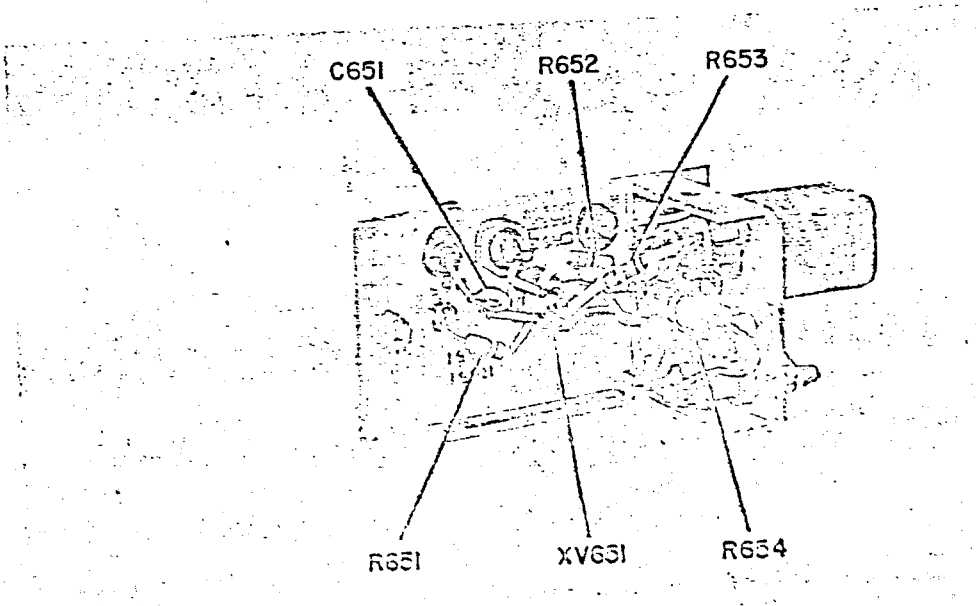


Figure 5-36. Interpolation Oscillator Buffer, Bottom View, Location of Parts

c. PRELIMINARY CHECK. - Before troubleshooting the agc amplifier assembly (and the 100-kc buffer-amplifier), make a preliminary inspection with emphasis on the following:

(1) Seating of tubes V601 through V605 in their sockets.
(2) Cable connections at J601 and J602 (and P201 at the harmonic amplifier).
(3) Soldered connections at the chassis feedthrough terminals.

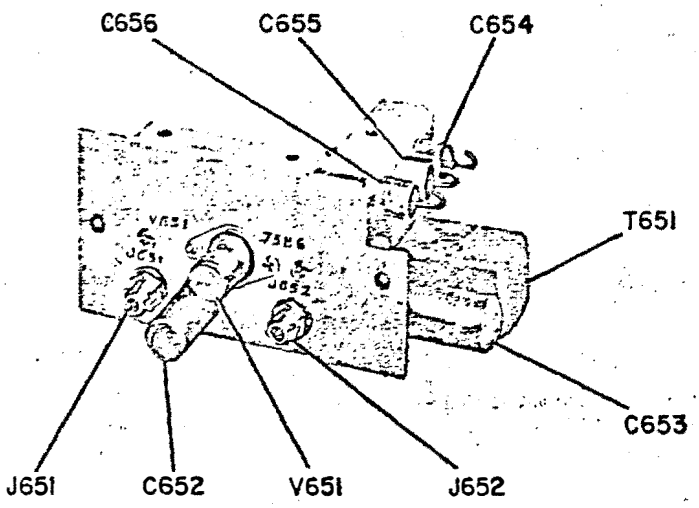


Figure 5-37. Interpolation Oscillator Buffer, Top View, Location of Parts

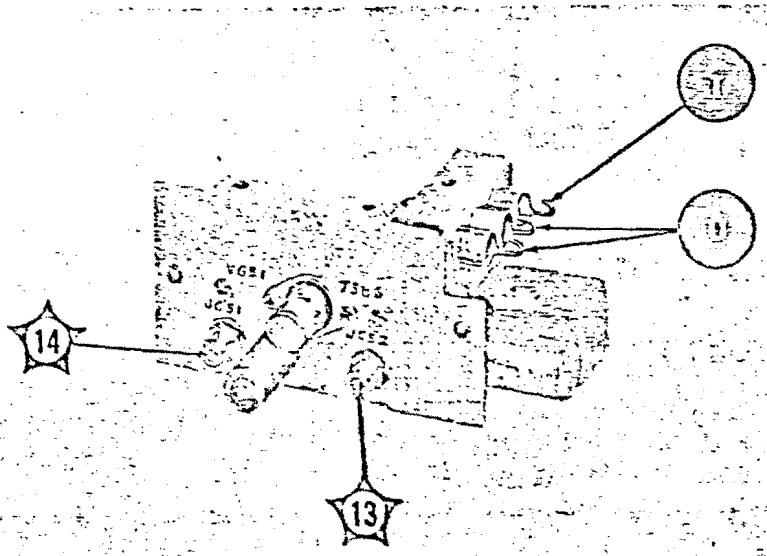


Figure 5-38. Interpolation Oscillator Buffer, Location of Test Points

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-6D/U, vtvm ME-30/U, signal generator AN/URM-25D, and electron tube test set TV-7D/U, or their equivalents.

e. CONTROL SETTINGS. - Set the front panel controls to the positions given in table 5-2. Exceptions will be made for certain steps during the troubleshooting procedure.

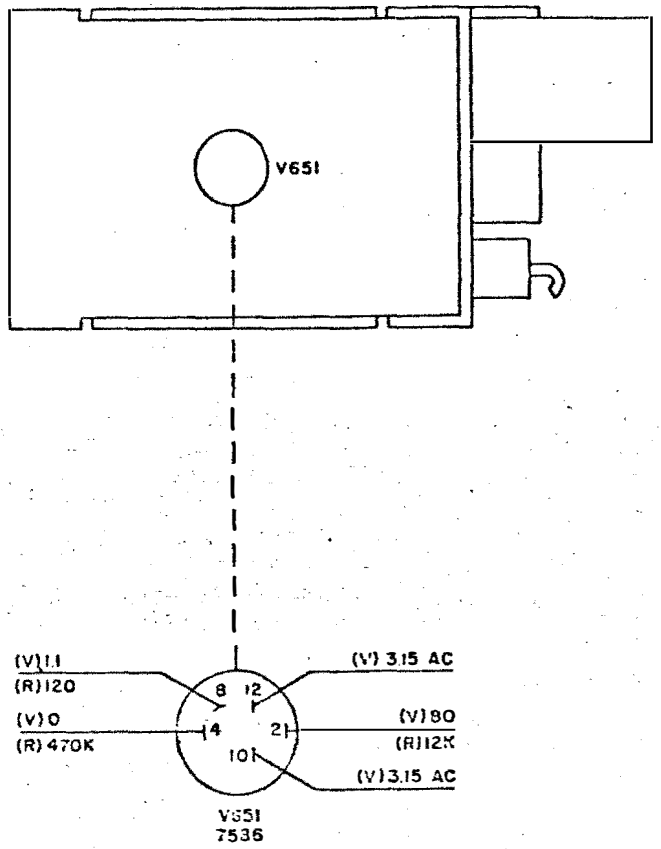
f. AGC AMPLIFIER TROUBLESHOOTING CHART. - Table 5-12 is a troubleshooting chart for the agc amplifier. It provides for the measurement of supply voltage and signal levels at circuit test points. Figure 5-49 is a diagram of voltage and resistance measurements for this assembly.

TABLE 5-12. COUNTERMEASURES RECEIVER R-1125/FLR, AGC AMPLIFIER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	X Figures 5-45 through 5-48	Connect multimeter from chassis feedthrough capacitor C602 to chassis. Select 300 vdc range.	C602: +175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check capacitor C602.
2	Y Figures 5-45 through 5-48	Connect multimeter from chassis feedthrough capacitors C603 and C604 to chassis. Select 10 vac range.	C603: 3.15 vac ±5% C604: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check C603. If reading abnormal, perform step 7 in table 5-5. Check C604.
3	18 19 Figures 5-45 through 5-48	Connect vtvm ME-6D/U from terminal E606 to chassis. Connect signal generator from J601 to chassis (remove cable). Adjust generator for 0.015v output at 220 kc.	Vtvm: -10 vdc ±10%	If reading abnormal, perform next step.
4	Z Figures 5-45 through 5-48	Connect vtvm ME-6D/U to terminal E605 (leave generator as in step 3).	Vtvm: -11.5 vdc ±10%	If reading normal, check S901 (AGC SLOW-FAST). Check CR603. If reading abnormal, perform next step.
5	ZA Figures 5-45 through 5-48	Connect vtvm ME-6D/U to terminal E602 (leave generator as in step 3).	Vtvm: +21 vdc ±10%	If reading normal, perform step 6; if abnormal, check R613 and CR604. Check also tubes V601 through V604.
6	AA Figures 5-45 through 5-48	Disconnect other test instruments and connect multimeter from chassis feedthrough capacitor C601 to chassis. Note reading for all BAND positions.	Vtvm reading: 2-4: 6.5 vdc ±20% 4-8: 14 vdc ±20% 8-16: 27 vdc ±20% 16-32: 60 vdc ±20%	If readings abnormal, check C601, R622, and R624. Also R801, R802, and R803 for each BAND switch position.

TABLE 5-12. COUNTERMEASURES RECEIVER R-1125/FLR, AGC AMPLIFIER, TROUBLESHOOTING CHART (Continued)

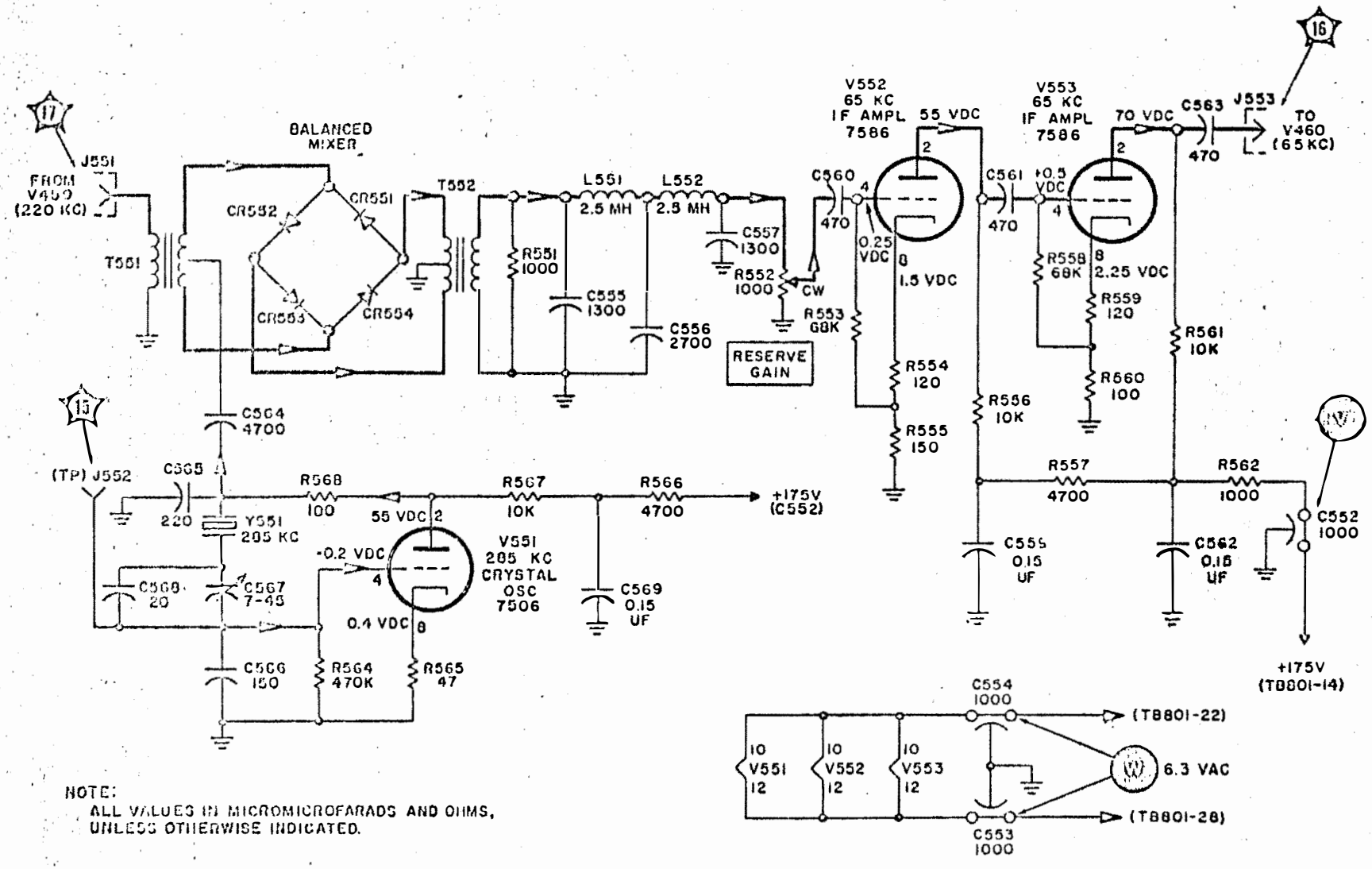
STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
7	20 AB Figures 5-45 through 5-48	Place BAND switch in position 4. Connect vtvm ME-30/U from connector P201 to chassis (remove P201 from J201). Connect signal generator from (TP)J603 to chassis. Adjust generator for 0.008v output at 100 kc.	Vtvm: 0.1v rms ±10%	If reading abnormal, check V605 and C613. If normal, perform next step.
8	21 Figures 5-45 through 5-48	Connect signal generator to J602. Adjust for 0.008v output at 100 kc. (BAND switch in position 4.)	Vtvm: 1.0v rms ±10%	If reading abnormal, check L602 and C611.



NOTE:
READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.

KEY TO SYMBOLS
(V)-INDICATES D-C VOLTAGE TO GROUND.
(R)-INDICATES D-C RESISTANCE TO GROUND.

Figure 5-39. Interpolation Oscillator Buffer, Voltage and Resistance Diagram



NOTE:
ALL VALUES IN MICROMICROFARADS AND OHMS, UNLESS OTHERWISE INDICATED.

Figure 5-40. Mixer and Second I-F Amplifier, Functional Schematic Diagram

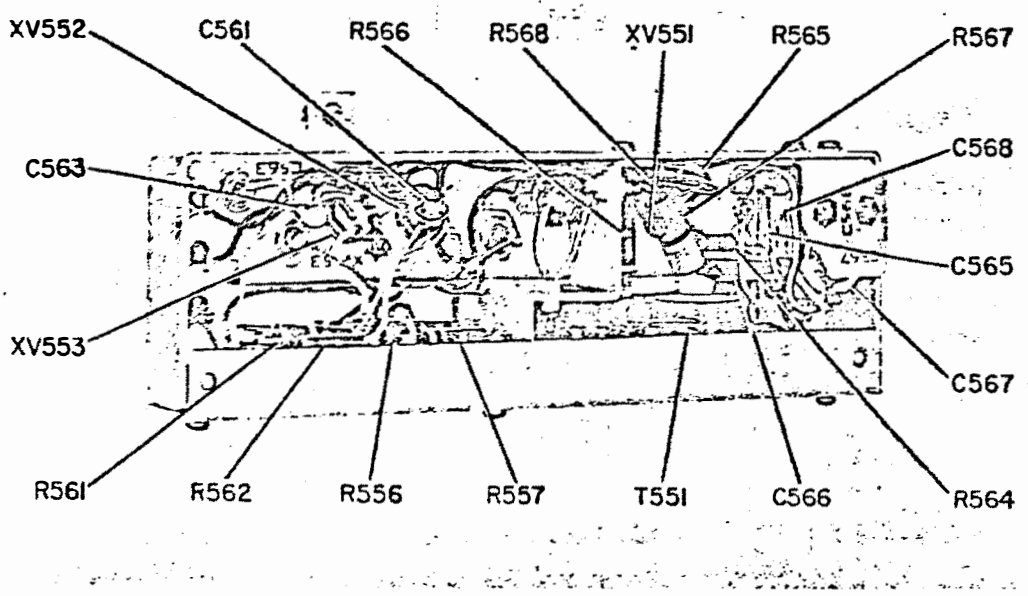


Figure 5-41. Mixer and Second I-F Amplifier, Bottom View, Location of Parts

5-14. HIGH-FREQUENCY OSCILLATOR (HFO).

a. GENERAL. - The high-frequency oscillator (HFO) V301 generates a local r-f signal which is applied to the preselector mixer (V151) and also to the harmonic amplifier mixer (V251). The HFO provides an injection signal for the first frequency-conversion to 1625-1725 kc, and also develops the 825-kc signal for incremental tuning of the receiver. Figure 5-50 is a functional schematic diagram of the HFO. Figures 5-51, 5-52, and 5-53 show the location of parts, and figure 5-54 shows the location of test points.

b. ACCESS. - The HFO assembly is centrally located on the receiver chassis. To obtain access to the test points, pull out the receiver and raise it vertically. Test points are located on both the top and bottom of the assembly.

c. PRELIMINARY CHECK. - Before troubleshooting the high-frequency oscillator, make a preliminary inspection with emphasis on the following:

(1) Seating of tube V301 in its socket.
(2) Cable connections at J301 and J302.
(3) All soldered connections at chassis feedthrough capacitors.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, vtvm ME-6D/U, oscilloscope OS-8C/U, and electron tube test set TV-7D/U, or equivalent test equipment.

WARNING

Dangerous potentials are present in these circuits.

e. CONTROL SETTINGS. - Place the front panel controls in positions listed in table 5-2.

f. HIGH-FREQUENCY OSCILLATOR TROUBLESHOOTING CHART. - Table 5-13 is the troubleshooting chart for the HFO. Perform the steps in the order listed and compare results with those given in the NORMAL INDICATION column. Then follow instructions in the NEXT STEP column. Figure 5-55 is a voltage and resistance diagram.

NOTE

To check the output frequency of the HFO, refer to paragraph 6-4d in Section 6, Repair.

TABLE 5-13. COUNTERMEASURES RECEIVER R-1125/FLR, HIGH-FREQUENCY OSCILLATOR, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	AC Figures 5-50 through 5-54	Connect multimeter from chassis feedthrough capacitor C317 to chassis. Select 300 vdc range.	C317: +150 vdc ±3%	If reading abnormal, perform step 4 in table 5-17. Check C317.
2	AD Figures 5-50 through 5-54	Connect multimeter from chassis feedthrough capacitor C315 to chassis. Select 10 vac range.	C315: 6.3 vac ±3%	If reading abnormal, perform step 2 in table 5-17. Check C315.
3	22 Figures 5-50 through 5-54	Connect vtvm ME-30/U to connector J301 and then J302. (Remove cables W802 and W803). Connect oscilloscope to same points.	Vtvm: 8v rms ±10% Scope: Undistorted sine waveform	If reading abnormal, check C312 and C313; perform next step.
4	AE Figures 5-50 through 5-54	Connect vtvm ME-60/U to (TP)J303.	Vtvm: -15 vdc ±10%	If reading abnormal, check V301 and R308.

5-15. INTERPOLATION OSCILLATOR.

a. GENERAL. - The interpolation oscillator V401 generates an r-f signal from 680 to 580 kc which is applied to the injection mixer (V443), and also the interpolation oscillator buffer (V651). Faulty operation of the interpolation oscillator can degrade reception or disable the receiver. Figure 5-56 is a functional schematic diagram of the interpolation oscillator. Figures 5-57 and 5-58 show the location of parts, and figures 5-59 and 5-60 show the location of test points.

b. ACCESS. - The interpolation oscillator is located on the right side of the receiver chassis near the front panel. To obtain access to the interpolation oscillator test points, pull out the receiver and raise it.

c. PRELIMINARY CHECK. - Before troubleshooting the interpolation oscillator, make a preliminary inspection with emphasis on the following:

(1) Seating of tube V401 in its socket.
(2) Cable connector P452.
(3) All soldered connections at chassis feedthrough capacitors.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, oscilloscope OS-8C/U, and electron tube test set TV-7D/U, or equivalent test equipment.

e. CONTROL SETTINGS. - Place the panel controls in positions listed in table 5-2.

TABLE 5-14. COUNTERMEASURES RECEIVER 1125/FLR, INTERPOLATION OSCILLATOR, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	AF Figures 5-56 through 5-60	Connect multimeter from chassis feedthrough capacitor C409 to chassis. Select 300 vdc range.	C409: +150 vdc ±5%	If reading abnormal, perform step 4 in table 5-17. Check C409.
2	AG Figures 5-56 through 5-60	Connect multimeter from feedthrough capacitor C412 and C413 to chassis. Select 10 vac range.	C412: 3.15 vac ±5% C413: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check C412. If reading abnormal, perform step 7 in table 5-5. Check C413.
3	23 Figures 5-56 through 5-60	Connect vtvm ME-30/U and oscilloscope from P452 to chassis. (Remove P452 from J452.)	Vtvm: 0.35 v rms (±10%) Scope: Undistorted sine waveform.	If reading or waveform are abnormal, check V401 and C410.

f. INTERPOLATION OSCILLATOR TROUBLESHOOTING CHART. - Table 5-14 is the troubleshooting chart for the interpolation oscillator. Perform the steps in the order given and compare results with those listed in the NORMAL INDICATION column. Then follow instructions in the NEXT STEP column. Figure 5-61 is a voltage and resistance diagram.

NOTE

To check the output frequency of the interpolation oscillator, refer to paragraph 6-4a in Section 6, Repair.

5-16. HARMONIC AMPLIFIER.

a. GENERAL. - The harmonic amplifier produces and selects the proper 100-kc harmonic for operation of the receiver incremental tuning circuits.

When combined with a signal from the high-frequency oscillator, the injection amplifier 825-kc signal is obtained. Faulty operation of the harmonic amplifier can degrade reception or disable the receiver. Figure 5-62 is a functional schematic diagram of the harmonic amplifier. Figures 5-63 through 5-67 show the location of parts, and figures 5-68 through 5-71 show the location of test points.

b. ACCESS. - The harmonic amplifier assembly consists of two shielded coil subassemblies. One subassembly contains the two harmonic amplifiers (V201 and V202), and the other contains the harmonic mixer (V251). Both subassemblies are located centrally on the left side of the receiver chassis. To expose the test points, withdraw the receiver and raise it.

c. PRELIMINARY CHECK. - Before troubleshooting the harmonic amplifier, make a preliminary inspection with emphasis on the following:

(1) Seating of tubes V201, V202, and V251 in their sockets.
(2) Cable connections at J201, J204, J251, J252, and J253.
(3) All soldered connections at chassis feedthrough capacitors.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C, vtvm ME-30/U, signal generator AN/URM-25D, and electron tube test set TV-7D/U, or equivalent test equipment.

e. CONTROL SETTINGS. - Place the front panel controls in positions listed in table 5-2.

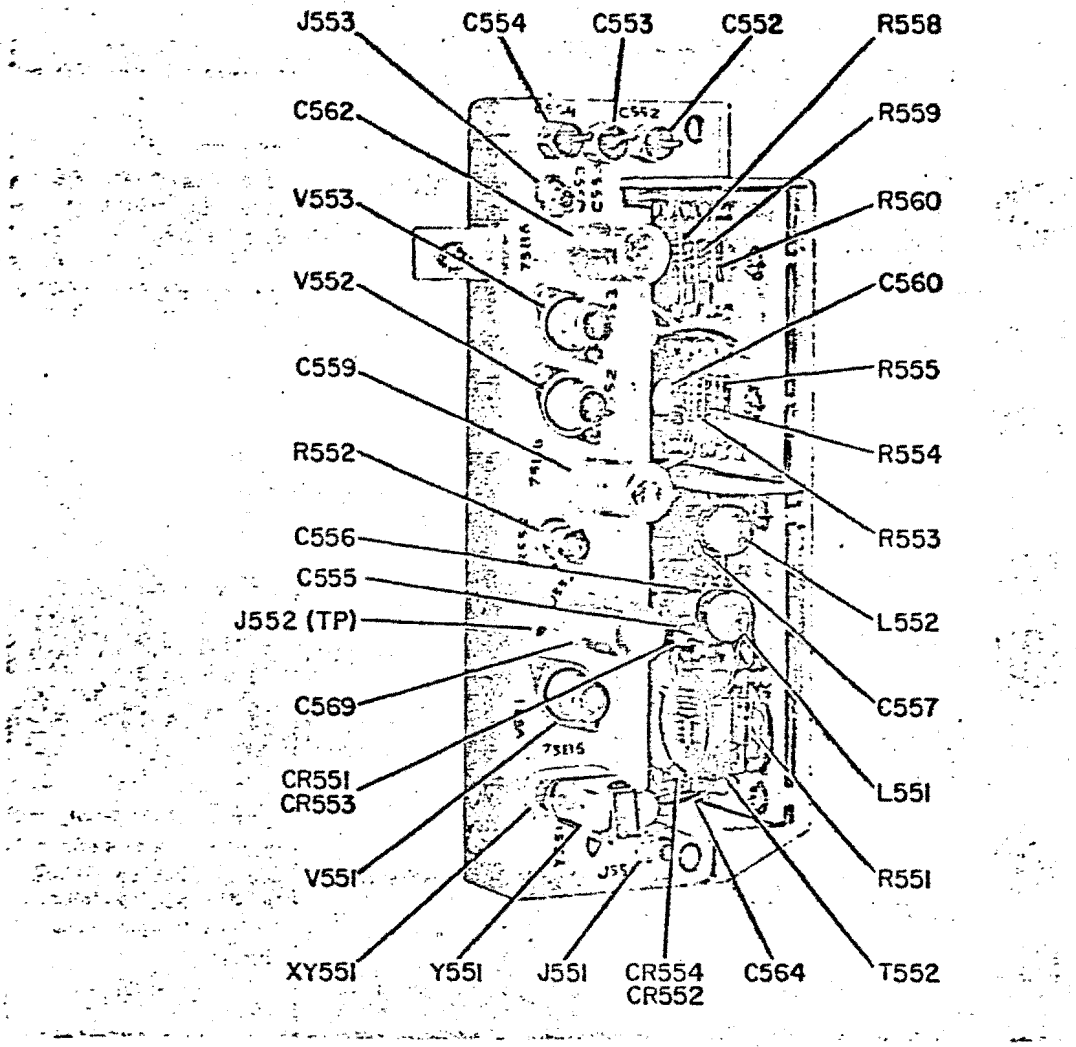


Figure 5-42. Mixer and Second I-F Amplifier, Top View, Location of Parts

f. HARMONIC AMPLIFIER TROUBLESHOOTING CHART. - Table 5-15 is the troubleshooting chart for the harmonic amplifier. Perform the steps in the order given and compare results with those listed in the NORMAL INDICATION column. Then follow the instructions in the NEXT STEP column. Figure 5-72 is a voltage and resistance diagram.

5-17. DF INDICATOR CIRCUIT.

a. GENERAL. - The DF indicator circuit uses indicator lamps DS901 (LOW) and DS902 (HIGH) located on the receiver front panel. The LOW lamp, when lighted, informs the operator that the receiver tuning range in use requires a low-frequency antenna system for optimum reception; when the HIGH lamp is lighted, a high-frequency antenna system should be used. Lamp selection is determined by the BAND switch position and also the frequency range being used. Refer to paragraph 6-4i in Section 6, Repair, for information relative to adjusting the lamp operating sequence. Figure 5-73 is a functional schematic diagram of the DF indicator circuit. Figures 5-74 and 5-75 show the location of parts, and figure 5-76 shows the location of test points.

b. ACCESS. - Cam operated switches S902 and S903 are located inside the frame of variable capacitor C902, near the preselector assembly. Switch section S901 and terminal board TB902 are located beneath the chassis at the rear. To expose the test points, open the receiver and raise it.

TABLE 5-15. COUNTERMEASURES RECEIVER R-1125/FLR, HARMONIC AMPLIFIER, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	AH, AH, AI, AH, AH Figures 5-62 through 5-71	In turn, connect multimeter from feedthrough through capacitors C205, C207, C267, C208 and C251 to chassis. Select 300 vdc range.	C205: +175 vdc ±20% C207: +175 vdc ±20% C267: +175 vdc ±20% C208: +160 vdc ±20% C251: +160 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check C205, C207, and C267. Check connecting lead from C208 to C251. Check C208 and C251.
2	AJ, AJ, AK Figures 5-62 through 5-71	In turn, connect multimeter from chassis feedthrough capacitors C201, C202, C203, C204, C264, and C266 to chassis. Select 10 vac range.	C201: 3.15 vac ±5% C202: 3.15 vac ±5% C203: 3.15 vac ±5% C204: 3.15 vac ±5% C264: 3.15 vac ±5% C266: 3.15 vac ±5%	If reading abnormal, perform step 7 in table 5-5. Check filament circuit feedthrough capacitors. Check filament circuit wiring.
3	24, AL, AL Figures 5-62 through 5-71	Remove cable at J201. Connect vtvm ME-30/U to (TP)J203. Connect signal generator to (TP) J202, adjust for 0.004 v output at 2.9 mc. (Adjust TUNING (Mc) control for dip on 100 KC TUNING meter at 2.0 mc.)	Vtvm: 0.02 v rms (minimum)	If reading abnormal, check V201 and C222.

TABLE 5-15. COUNTERMEASURES RECEIVER R-1125/FLR, HARMONIC AMPLIFIER, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	A12 Figures 5-62 through 5-71	Connect vtvm ME-30/U to (TP)J254. (Leave generator as in step 3.)	Vtvm: 0.04 v rms (minimum)	If reading abnormal, check V202 and cable W804.
5	A1 24 Figures 5-62 through 5-71	Connect oscilloscope to (TP)J202 (adjust internal sweep for 20 kc/sec). Connect signal generator to J201 and adjust for 1.0 v 100-kc output. (Insert 0.01 uf capacitor and 10-kilohm resistor in series with generator output.)	Scope: Pattern shows distortion.	If scope pattern abnormal, check CR201 and C223.

c. PRELIMINARY CHECK. - Before troubleshooting the DF indicating circuit, make a preliminary inspection with emphasis on the following:

(1) Seating of lamps DS901 and DS902 in their sockets.
(2) Cable connection at J955.
(3) Soldered connections on terminal board TB802.

d. TEST EQUIPMENT. - Use the ohmmeter range of multimeter AN/PSM-4C for all measurements.

e. CONTROL SETTINGS. - The front panel control settings given in table 5-2 are not required when troubleshooting the DF indicator circuit. BAND switch positions and adjustment of the TUNING (Mc) control for individual test steps are given in the DF indicator circuit Troubleshooting chart, table 5-16.

CAUTION

Remove primary power from the equipment before troubleshooting the DF indicator circuit. A wrong test connection at terminal board TB802 can damage the multimeter (ohmmeter range) if d-c voltage is present.

f. DF INDICATOR CIRCUIT TROUBLESHOOTING CHART. - Table 5-16 is the troubleshooting chart for the DF indicator circuit. Perform the steps in the order given and compare results with those listed in the NORMAL INDICATION column. Then follow the instructions in the NEXT STEP column.

CAUTION

Before troubleshooting the DF indicator circuit, remove the external supply-cable at connector J955 (if present). All tests are made using the multimeter ohmmeter range, and circuit voltage is not required.

TABLE 5-16. COUNTERMEASURES RECEIVER R-1125/FLR, DF INDICATOR CIRCUIT TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	 Figures 5-73 through 5-76 and 5-79	Connect multimeter from J955-C to TB802-7. Select low ohms range. Place BAND switch in 2-4 position.	Ohms: 0	If reading abnormal, check connectors P901 and J901.
2	 Figures 5-73 through 5-76 and 5-79	Connect multimeter from J955-A to TB802-8.	Ohms: 0	If reading abnormal, check connectors P901 and J901.
3	 Figures 5-73 through 5-76 and 5-79	Connect multimeter from J955-B to chassis.	Ohms: 0	If reading abnormal, check connection from J955-B to chassis.
4	 Figures 5-73 through 5-76 and 5-79	Connect multimeter from J955-C to chassis.	Ohms: 100	If reading abnormal, check DS901.
5		Connect multimeter from J955-A to chassis.	Ohms: 100	If reading abnormal, check DS902.

TABLE 5-16. COUNTERMEASURES RECEIVER R-1125/FLR, DF INDICATOR CIRCUIT, TROUBLESHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	Figures 5-73 through 5-76 and 5-79			
6	(AN)	a. Connect multimeter from J955-C to J955-A. (Leave ohmmeter connected.)	a. Ohms: 100	a. If reading abnormal, check switch section S801.
	(AN) Figure 5-79	b. Place BAND switch in 4-8 position. Set MEGACYCLE counter to read 4.0 mc, and then 8.0 mc. Remove DS902.	b. (4.0 mc) Ohms: 100 (8.0 mc) Ohms: infinity	b. If readings abnormal, check S801 and S803.
		c. Place BAND switch in 8-16 position. Set MEGACYCLE counter to read 8.0, and then 16.0 mc. (DS902 out)	c. (8.0 mc) Ohms: 100 (16.0 mc) Ohms: infinity	c. If readings abnormal, check S801 and S802.
		d. Place BAND switch in 16-32 position. Set MEGACYCLE counter to read 16.0, and then 32.0 mc. Replace DS902.	d. (16.0 mc) Ohms: 0 (32.0 mc) Ohms: 0	d. If readings abnormal, check S801.

5-18. VOLTAGE REGULATOR CIRCUITS.

a. GENERAL. - Two voltage-regulator circuits are incorporated in the receiver. One regulates the filament voltage for high-frequency oscillator V301, and the other regulates the plate supply for V301 and V401 (the interpolation oscillator). Faulty operation of either regulator can adversely affect the receiver frequency calibration and stability or prevent operation entirely. Figure 5-77 is a functional schematic diagram showing the individual regulator circuits. Figure 5-78 shows the location of parts, and figure 5-79 shows the location of test points.

b. ACCESS. - The regulating circuits are located on the receiver rear panel. To obtain access to the test points, refer to figure 2-3 in Section 2, Installation, and remove the rear panel screws. The cable retractor mechanism will allow the rear panel to be positioned for the performance of troubleshooting steps.

c. PRELIMINARY CHECK. - Before troubleshooting the regulator circuits, make a preliminary inspection with emphasis on the following:

(1) Fuses F953 and F951.
(2) Cable connections at J951 and J901.
(3) Soldered connections on rear panel.

d. TEST EQUIPMENT. - Use multimeter AN/PSM-4C.

e. CONTROL SETTINGS. - Place the front panel controls in positions listed in table 5-2.

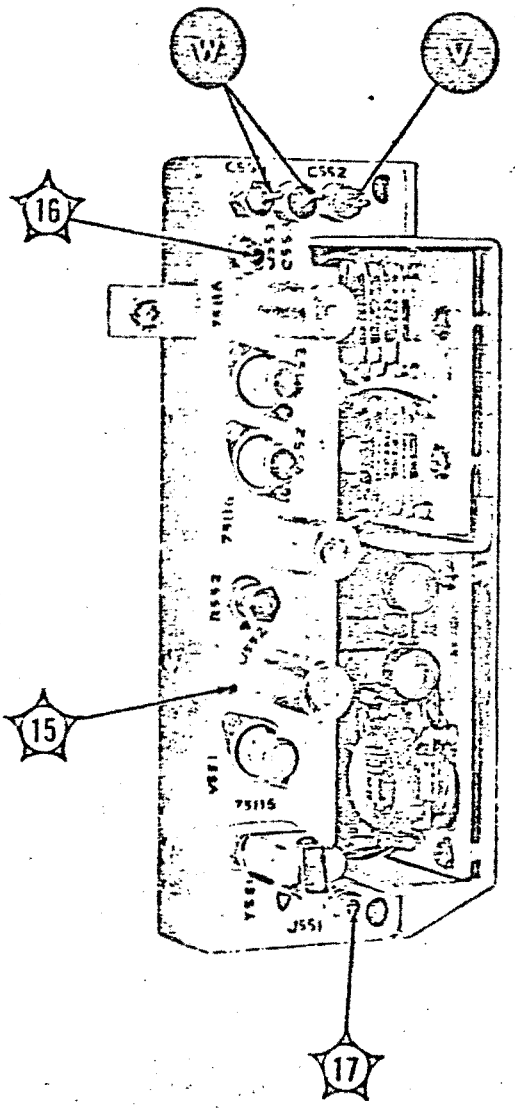
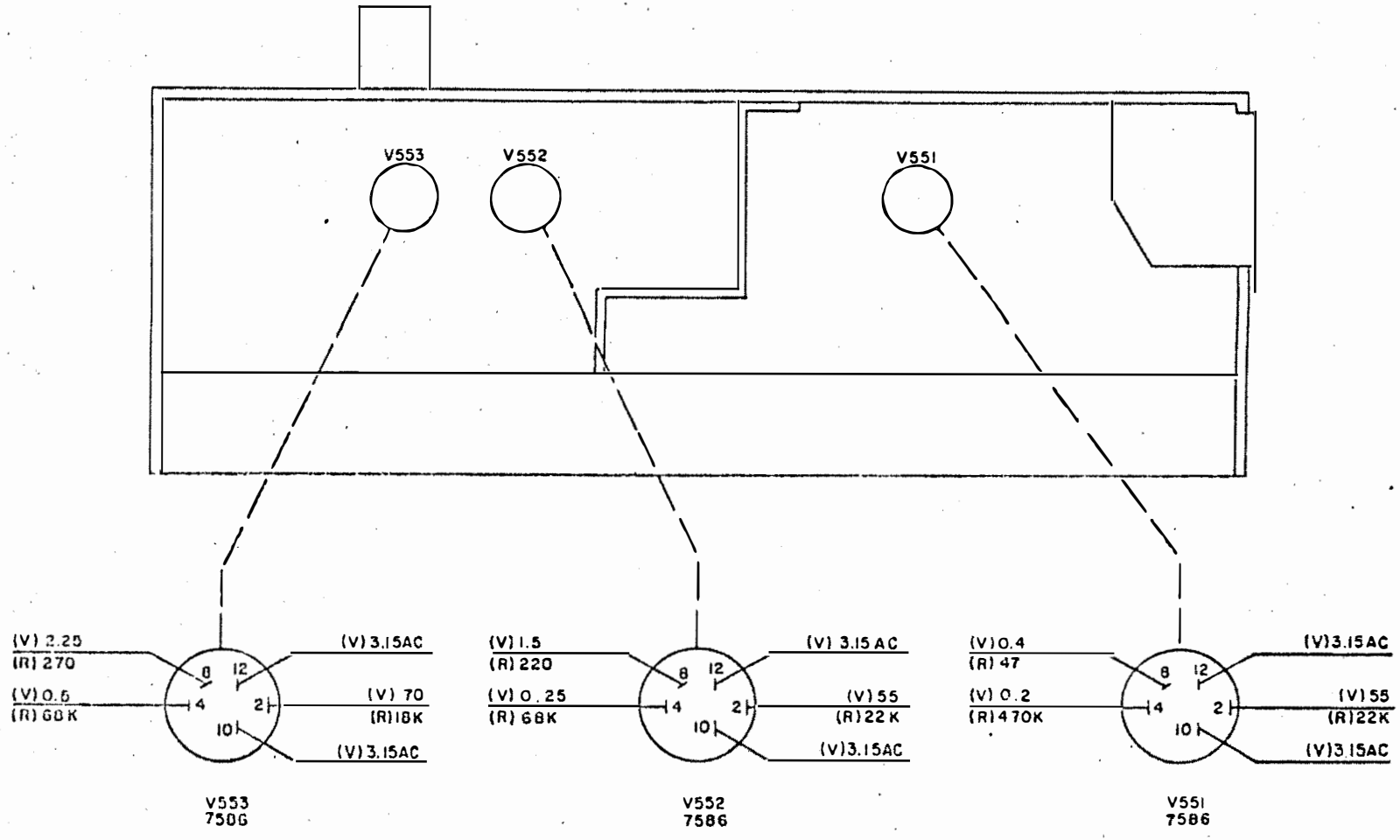


Figure 5-43. Mixer and Second I-F Amplifier, Location of Test Points

f. VOLTAGE-REGULATOR CIRCUITS TROUBLESHOOTING CHART. - Table 5-17 is the troubleshooting chart for the voltage-regulator circuits. Perform the steps in the order given and compare the results with those listed in the NORMAL INDICATION column. Then follow instructions in the NEXT STEP column.

5-19. TYPICAL TROUBLES.

Table 5-18 lists typical troubles which may occur during operation of the equipment. The troubles, listed in the order of their likelihood of occurrence, are subject to additional information based on eventual field experience. Figure 5-80 is a block diagram showing the circuit location of test points at test point (TP) jacks and at connectors. Other test points are not included. Signal paths through the suspected assemblies may be selected and measurements made at adjacent test points to verify circuit operation. All signal levels shown are normally present for a preset output level of 1.0 volt rms at connector J954 (65 KC OUT) with a 250-ohm load attached. All signal levels given are subject to a tolerance of ±10%. When a faulty circuit section has been located, refer to the troubleshooting chart for that section for further troubleshooting information.



NOTE:

READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER

KEY TO SYMBOLS

(V)–INDICATES D-C VOLTAGE TO GROUND
(R)–INDICATES D-C RESISTANCE TO GROUND

Figure 5-44. Mixer and Second I-F Amplifier, Voltage and Resistance Diagram

TABLE 5-17. COUNTERMEASURES RECEIVER R-1125/FLR, VOLTAGE-REGULATOR CIRCUITS, TROUBLESHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	AP Figures 5-77, 5-78, and 5-79	Connect multimeter from fuse F955 to chassis. Select 30 vac range.	F955: 18 vac ±10%	If reading abnormal, perform step 8 in table 5-5. Check F955.
2	AP1 Figures 5-77, 5-78, and 5-79	Connect multimeter from junction of R951 and CR952 to chassis. Select 10 vac range.	R951 and CR952: 6.3 vac ±5%	If reading abnormal, check R951 and Zener diodes CR952 and CR951. Make sure that V301 is seated properly in socket. Check V301.
3	AQ Figures 5-77, 5-78, and 5-79	Connect multimeter from fuse F951 to chassis. Select 300 vdc range.	F951: +175 vdc ±20%	If reading abnormal, perform step 2 in table 5-5. Check F951.
4	AQ1 Figures 5-77, 5-78, and 5-79	Connect multimeter from junction of R952 and CR953 to chassis.	R952 and CR953: +150 vdc ±5%	If reading abnormal, check R952, and Zener diode CR953. Make sure that tubes V301 and V401 are properly seated in their sockets. Check V301 and V401.

5-20. NUVISTOR ELECTRON TUBES.

Figure 5-81 shows the basing diagram for the type 7586 Nuvistor. Both the R-1125/FLR and the O-928/FLR use a number of Nuvistor (electron tubes) type 7586. The tube is a miniaturized metal-ceramic triode exhibiting high reliability and shock resistance. Although the type 7586 Nuvistor pin arrangement is numbered from 1 to 12 inclusive, six of the pins are internally connected and do not make contact with the socket. Indexing is provided by two base-lugs of unequal width. To insert a Nuvistor in its socket, engage the lugs in the socket slot and rotate the Nuvistor into position. Press firmly on the top of the metal case to seat the Nuvistor in the socket.

TABLE 5-18. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), TYPICAL TROUBLES

SYMPTOM	PROBABLE CAUSE	REMEDY
Equipment inoperative, frequency counters not lighted.	a. No primary power.	a. Check main power.
	b. Blown primary fuse.	b. Replace fuses F1051 or F1054. (Refer to table 5-5.)
Equipment inoperative, frequency counters lighted.	a. Blown fuse in +175 volt circuit.	a. Replace fuse F951. (Refer to table 5-5.)
	b. Blown fuse in tube filament circuit.	b. Replace fuse F952 or F953. (Refer to table 5-5.)

TABLE 5-18. ON-LINE RECEIVER OF COUNTERMEASURES RECEIVING SET AN/FLR-11(V) AND DIRECTION FINDER GROUP AN/FRA-54(V), TYPICAL TROUBLES (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
Noise at R-1125/FLR output, but no signal.	a. Blown fuse in HFO (V301) filament line.	a. Replace fuse F955. (Refer to table 5-17.)
	b. No 100-kc reference signal, blown fuse in O-928/FLR oscillator-amplifier supply circuits.	b. Replace fuses F1052 and F1053. (Refer to table 5-6.)
	c. MEGACYCLE counter not set at 100-kc interval.	c. Adjust TUNING (Mc) control for dip on 100 KC TUNING meter.
R-1125/FLR output present, but all signals weak.	a. Faulty antenna system or connections.	a. Check antenna system, check cable connections at J592 (ANT) and J51.
	b. Weak tube in signal path circuit.	b. Check tubes. (See figure 5-80.)
	c. RESERVE GAIN control R552 imporperly adjusted.	c. Readjust RESERVE GAIN control. (Refer to table 5-11.)

NOTE

Before replacing a blown fuse always try to determine the reason why the fuse has blown. Check the circuit wiring and cable connection in the fused circuit.

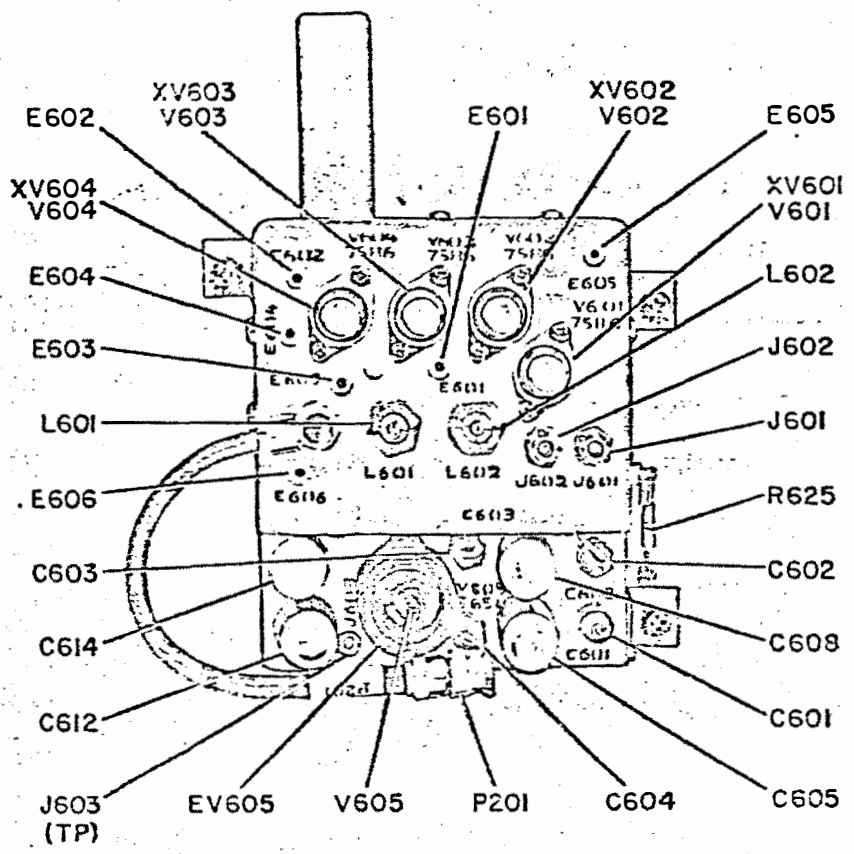


Figure 5-46. AGC Amplifier and 100-Kc Buffer Amplifier, Top View, Location of Parts

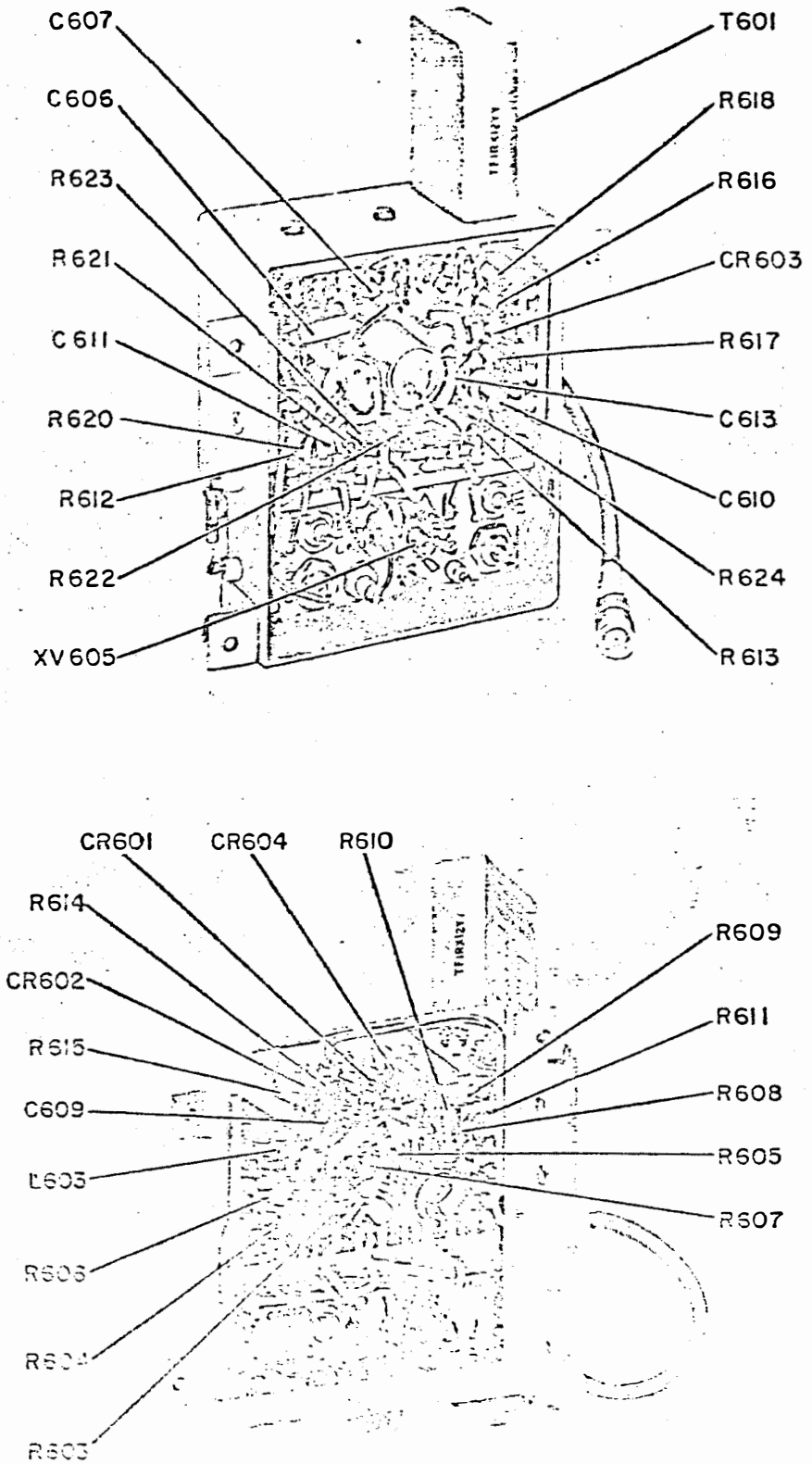


Figure 5-47. AGC Amplifier and 100-Kc Buffer Amplifier, Bottom Views, Location of Parts

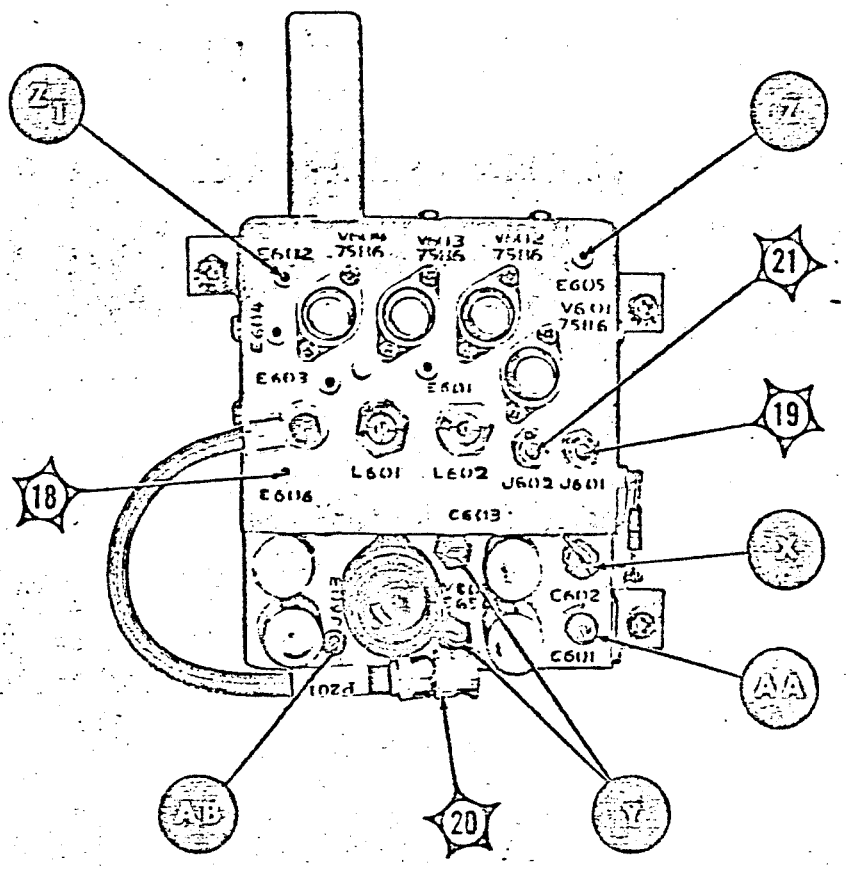
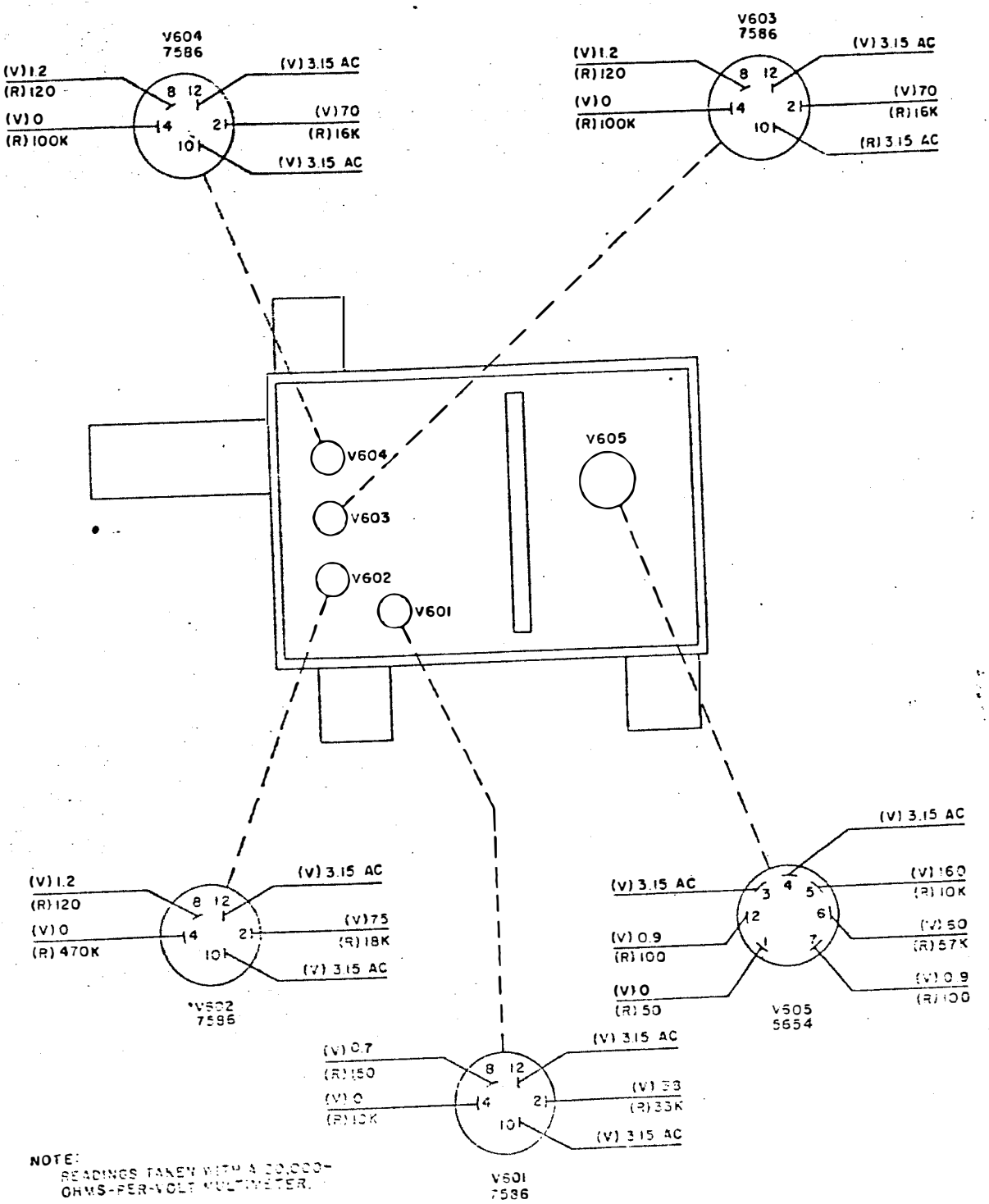


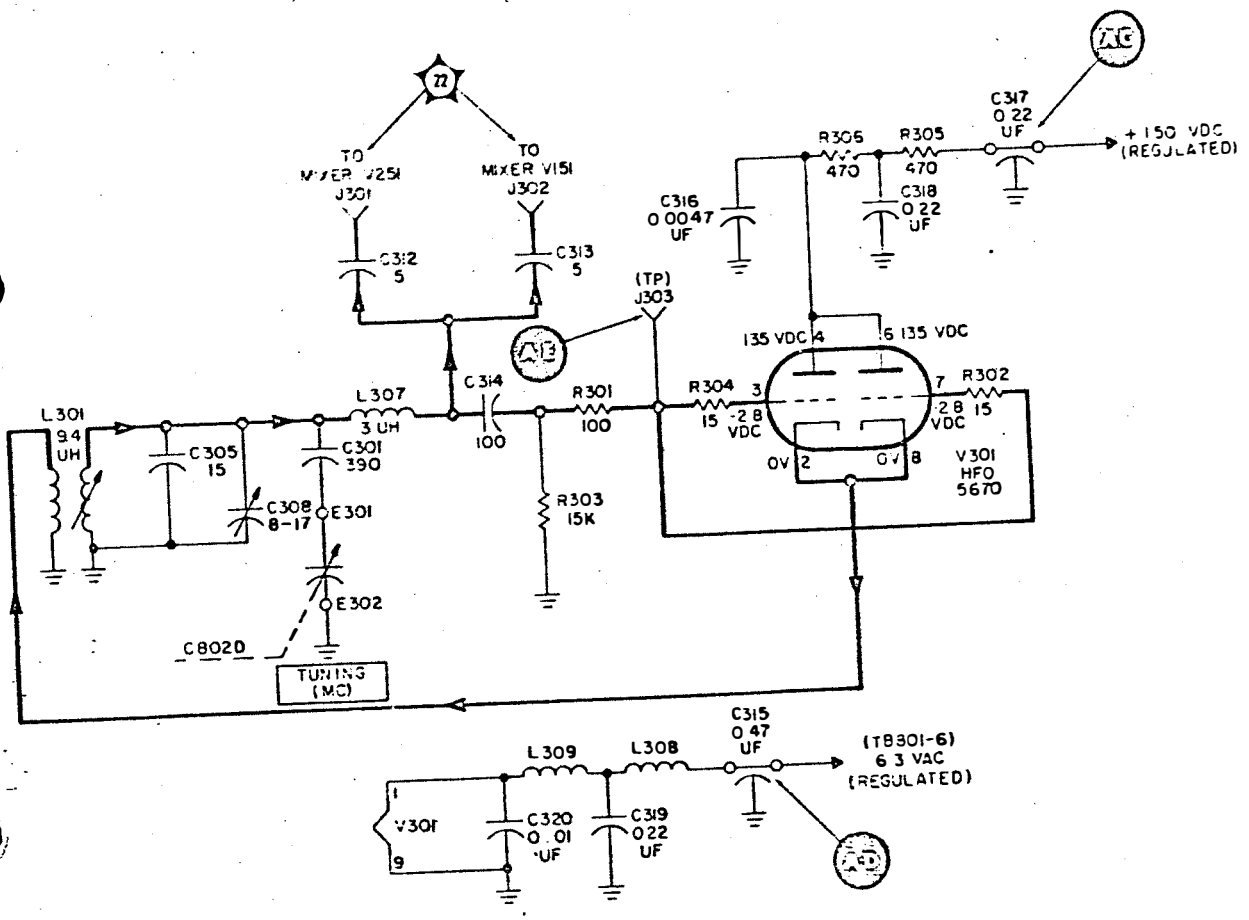
Figure 5-48. AGC Amplifier and 100-Kc Buffer Amplifier, Location of Test Points



NOTE:
READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.

KEY TO SYMBOLS
(V)-INDICATES D-C VOLTAGE TO GROUND.
(R)-INDICATES D-C RESISTANCE TO GROUND.

Figure 5-49. AGC Amplifier, Voltage and Resistance Diagram



NOTE
ALL VALUES IN OHMS AND MICROMICROFARADS
UNLESS OTHERWISE INDICATED

Figure 5-50. High-Frequency Oscillator, Functional Schematic Diagram

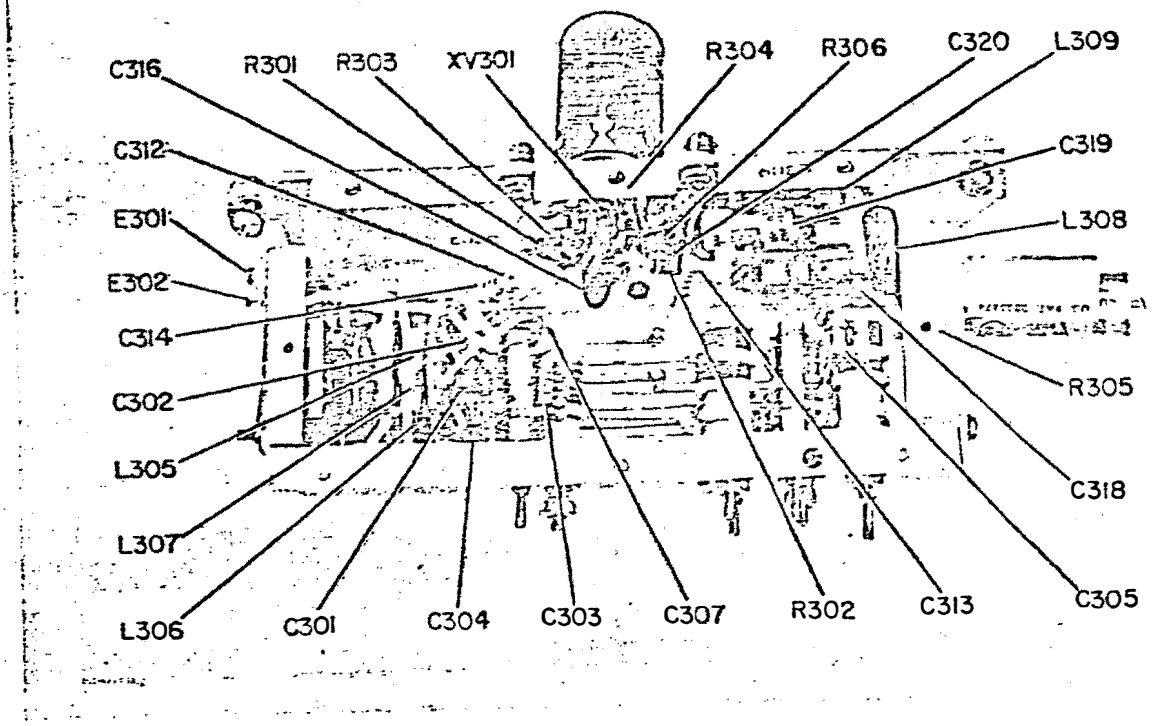


Figure 5-51. High-Frequency Oscillator, Bottom View, Location of Parts

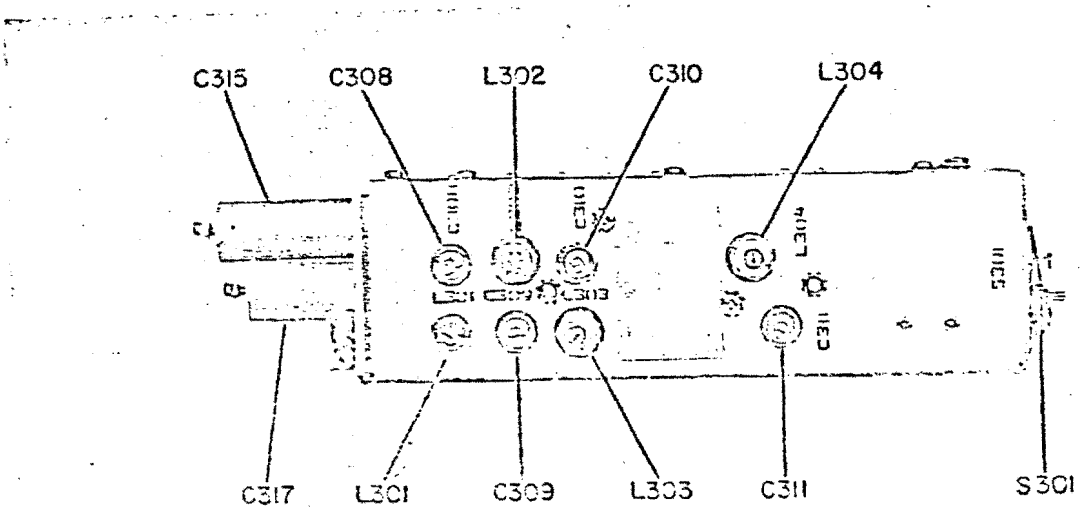


Figure 5-52. High-Frequency Oscillator, Left Side View, Location of Parts

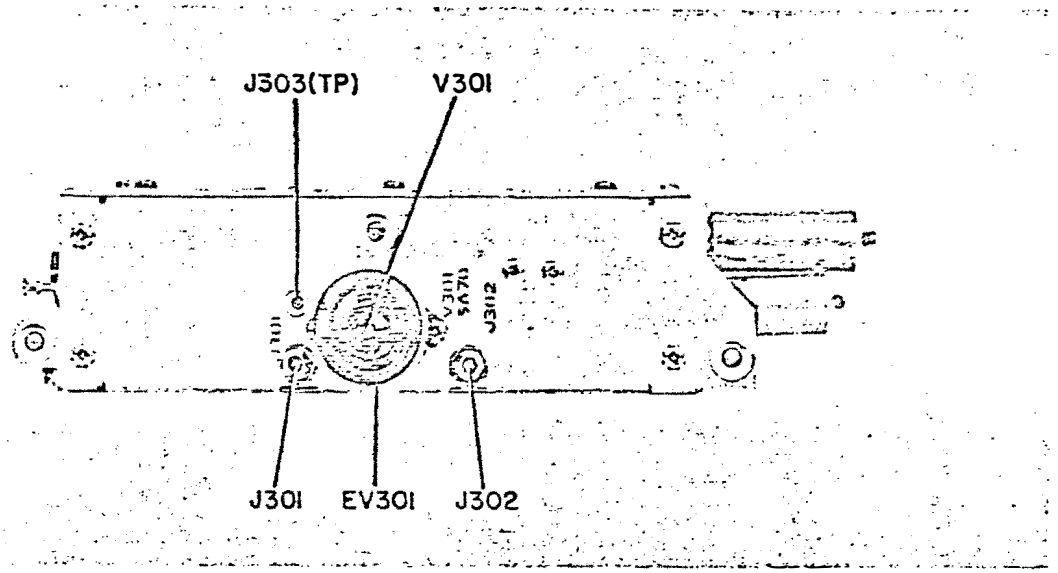


Figure 5-53. High-Frequency Oscillator, Right Side View, Location of Parts

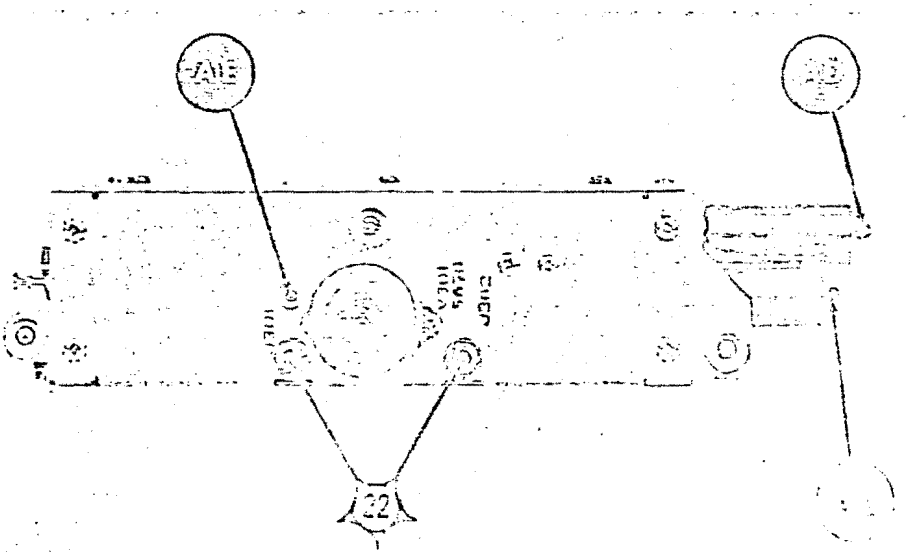
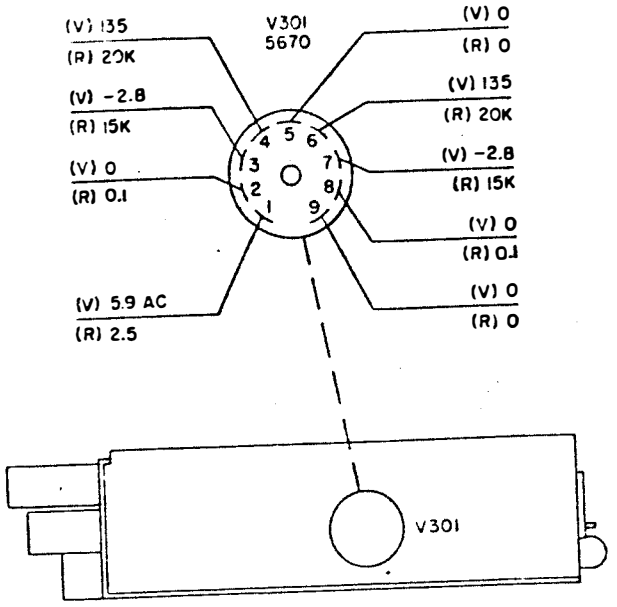


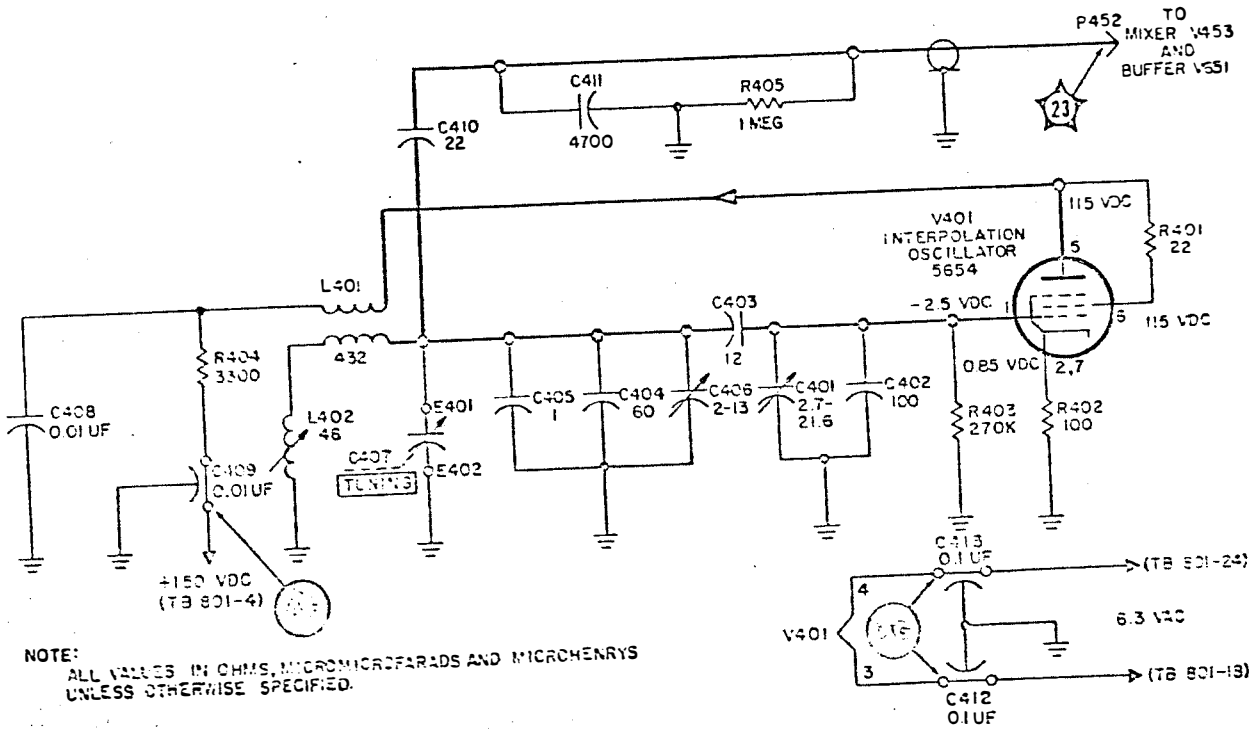
Figure 5-54. High-Frequency Oscillator, Location of Test Points



NOTE:
READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.

KEY TO SYMBOLS
(V)-INDICATES D-C VOLTAGE TO GROUND.
(R)-INDICATES D-C RESISTANCE TO GROUND.

Figure 5-55. High-Frequency Oscillator, Voltage and Resistance Diagram



NOTE:
ALL VALUES IN OHMS, MICROMICROFARADS AND MICROHENRYS UNLESS OTHERWISE SPECIFIED.

Figure 5-56. Interpolation Oscillator, Functional Schematic Diagram

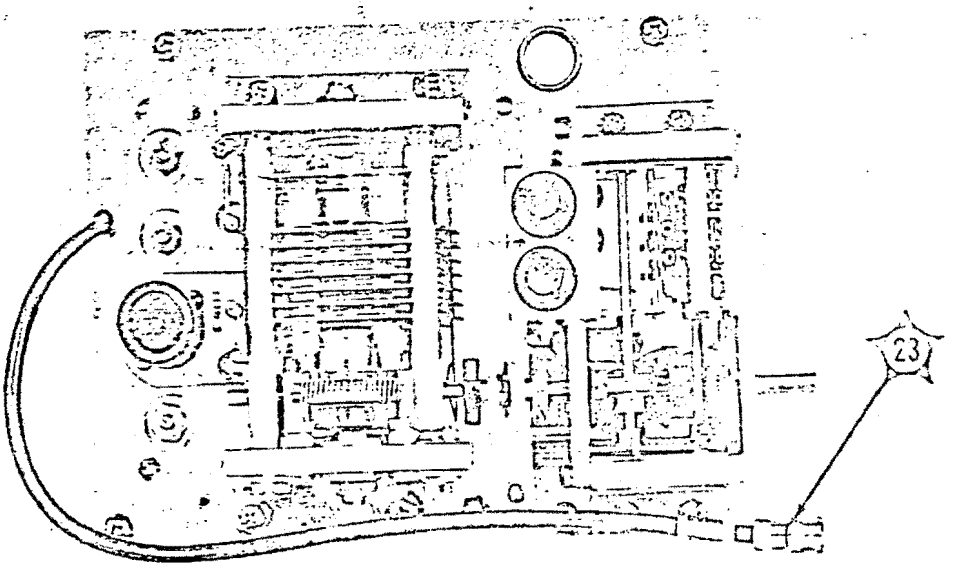


Figure 5-59. Interpolation Oscillator, Top View, Location of Test Points

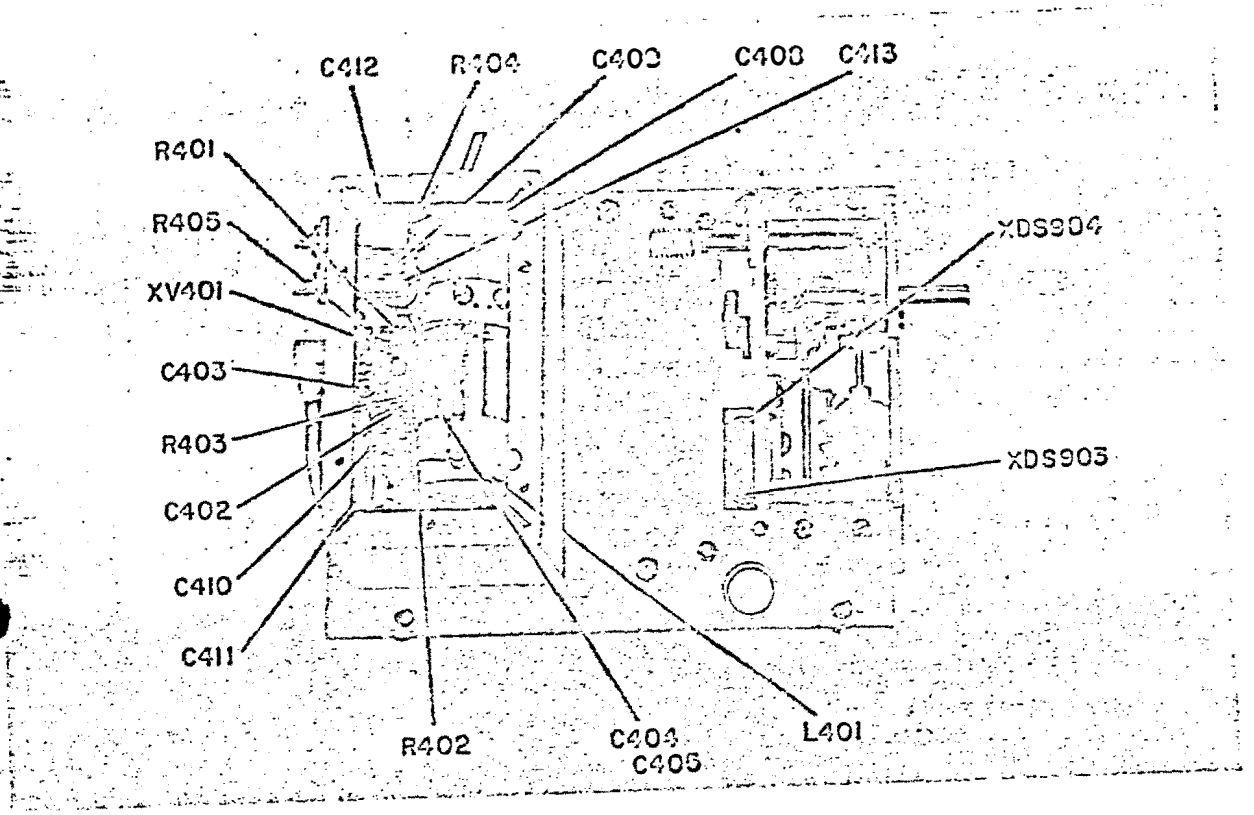


Figure 5-57. Interpolation Oscillator, Bottom View, Location of Parts

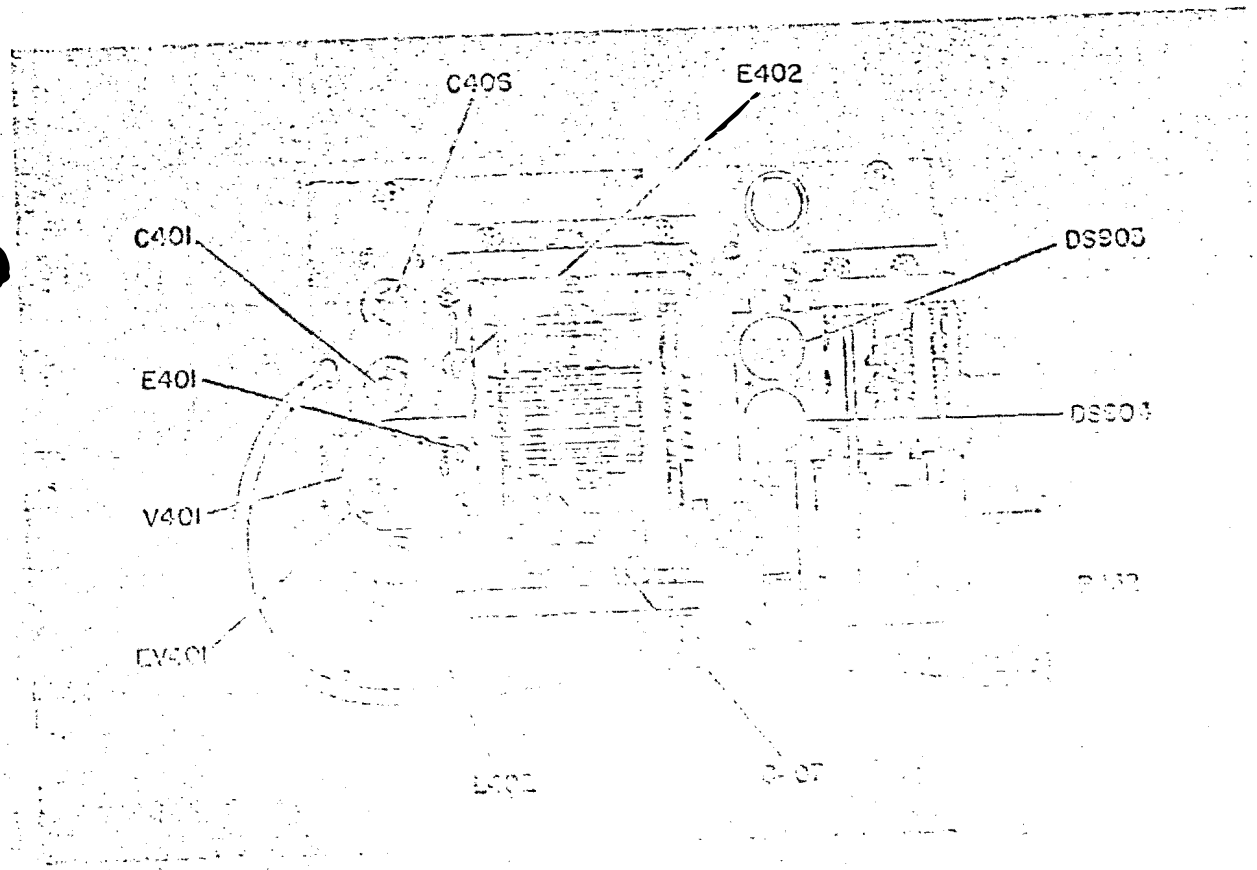


Figure 5-58. Interpolation Oscillator, Top View, Location of Parts

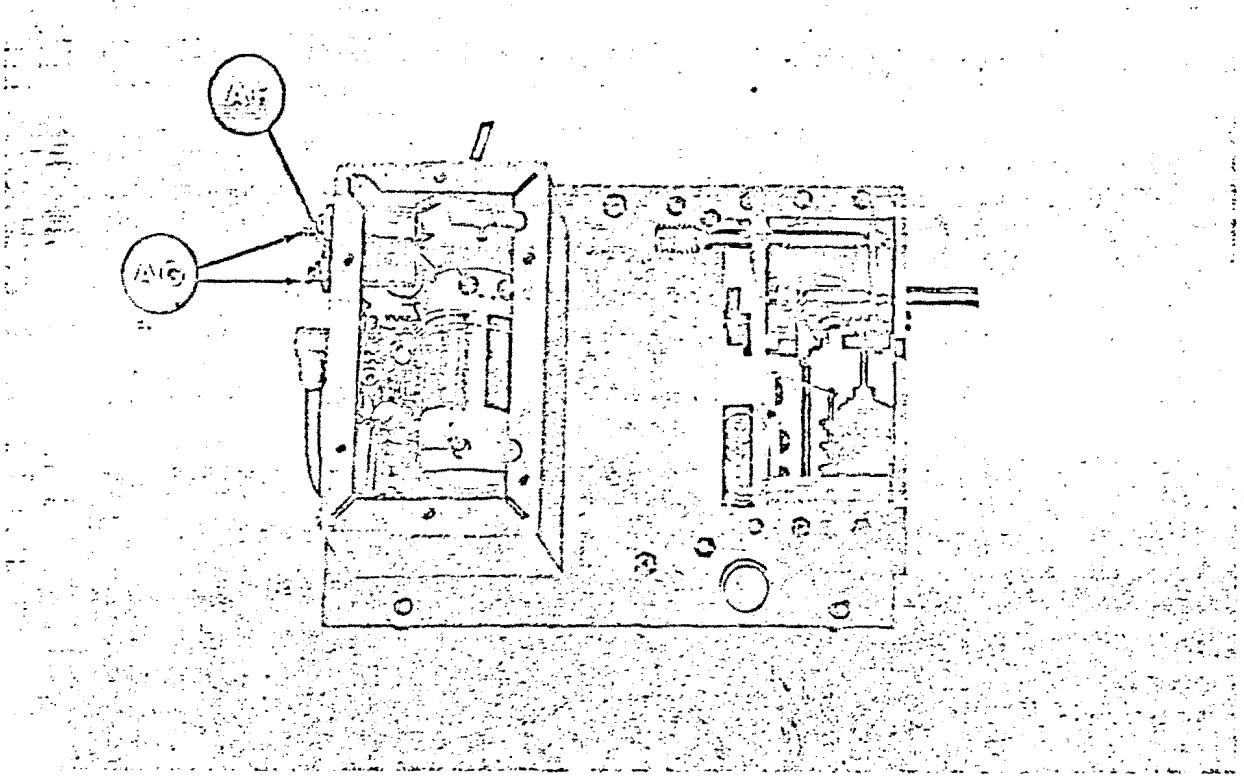
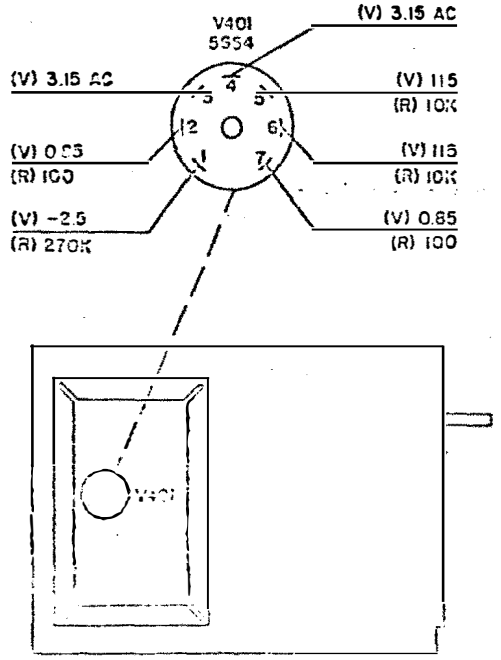
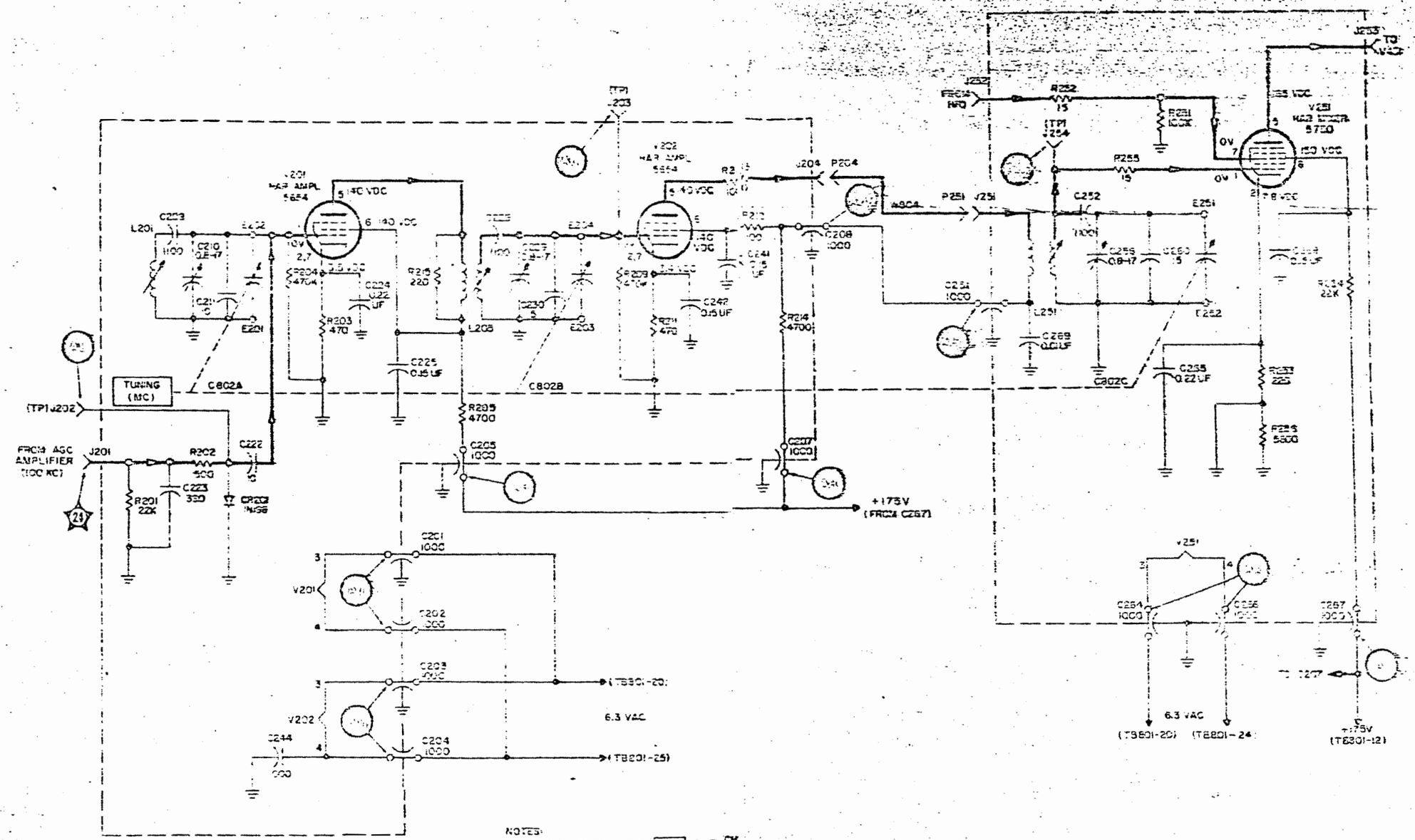


Figure 5-60. Interpolation Oscillator, Bottom View, Location of Test Points



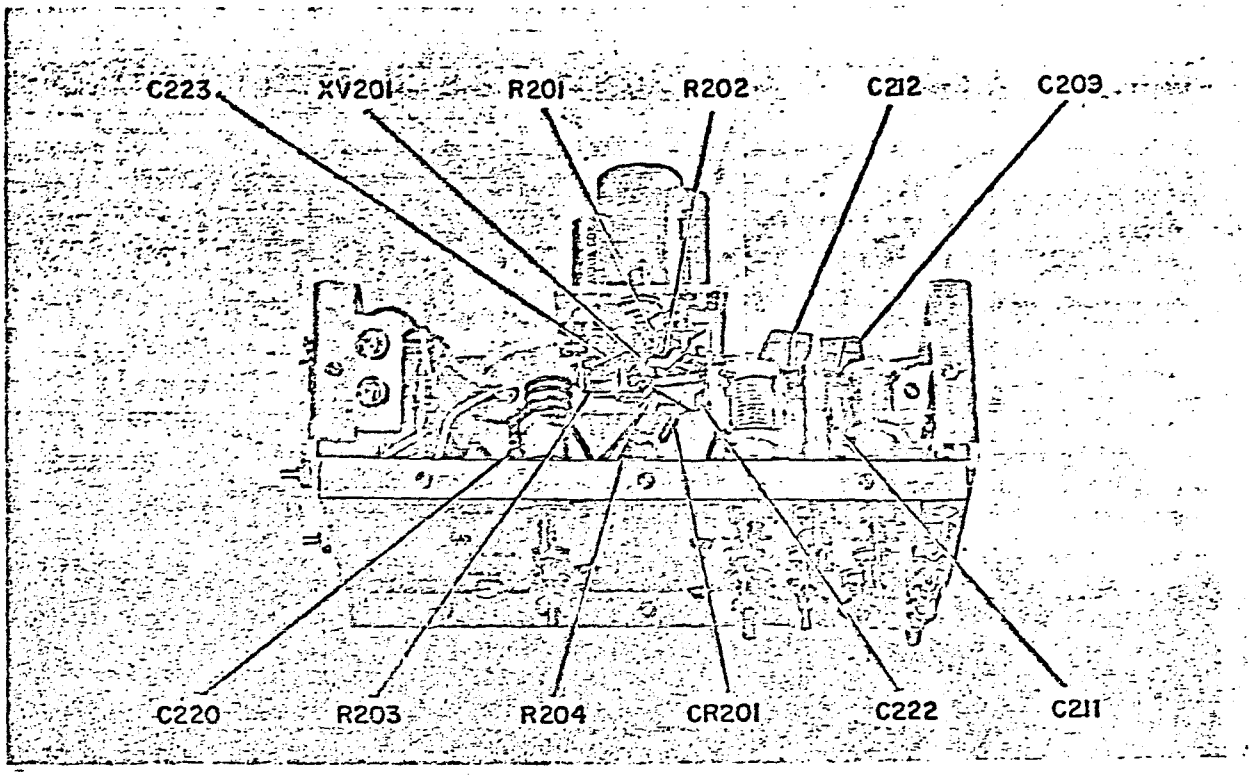
NOTE:
READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.
KEYS TO SYMBOLS
(V)-INDICATES D-C VOLTAGE TO GROUND.
(R)-INDICATES D-C RESISTANCE TO GROUND.

Figure 5-61. Interpolation Oscillator, Voltage and Resistance Diagram

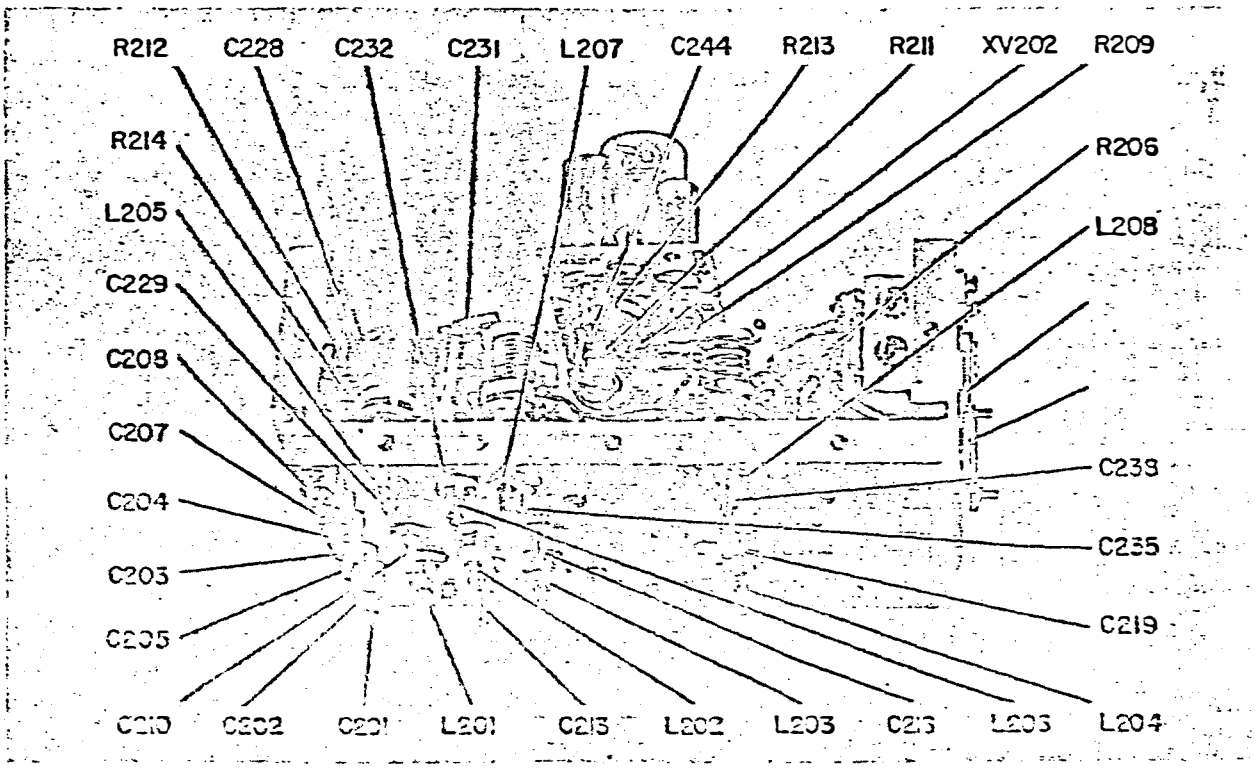


NOTES:
1. CIRCUIT SHOWN WITH BAND SWITCH IN POSITION 2-4.
2. ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.

Figure 5-62. Harmonic Amplifiers and Mixer, Functional Schematic Diagram



Right Side



Left Side

Figure 5-63. Harmonic Amplifier (R-F Subassembly), Side View, Location of Parts

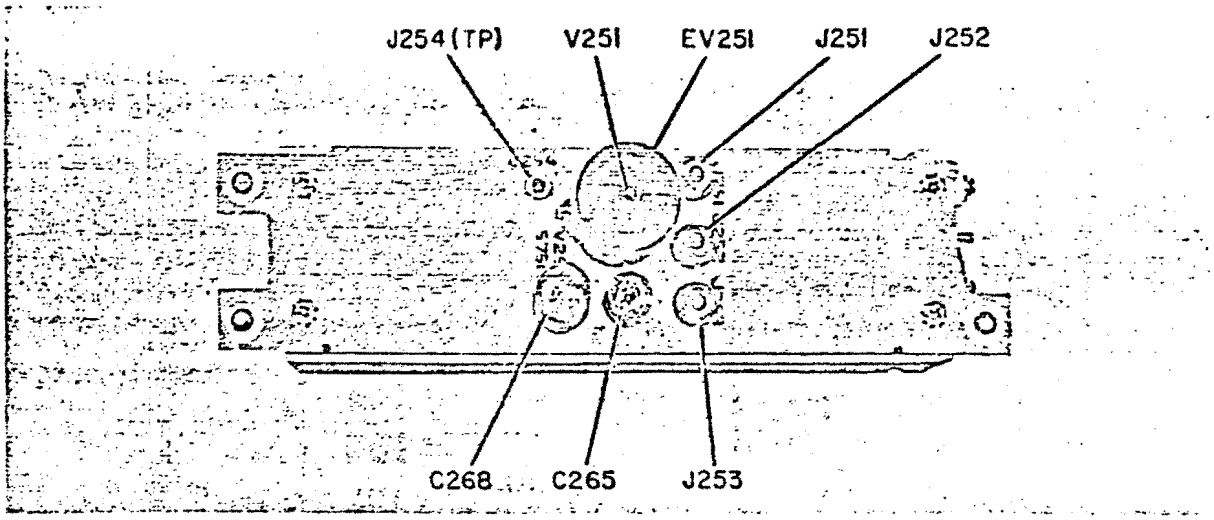


Figure 5-66. Harmonic Amplifier (Mixer Subassembly), Top View, Location of Parts

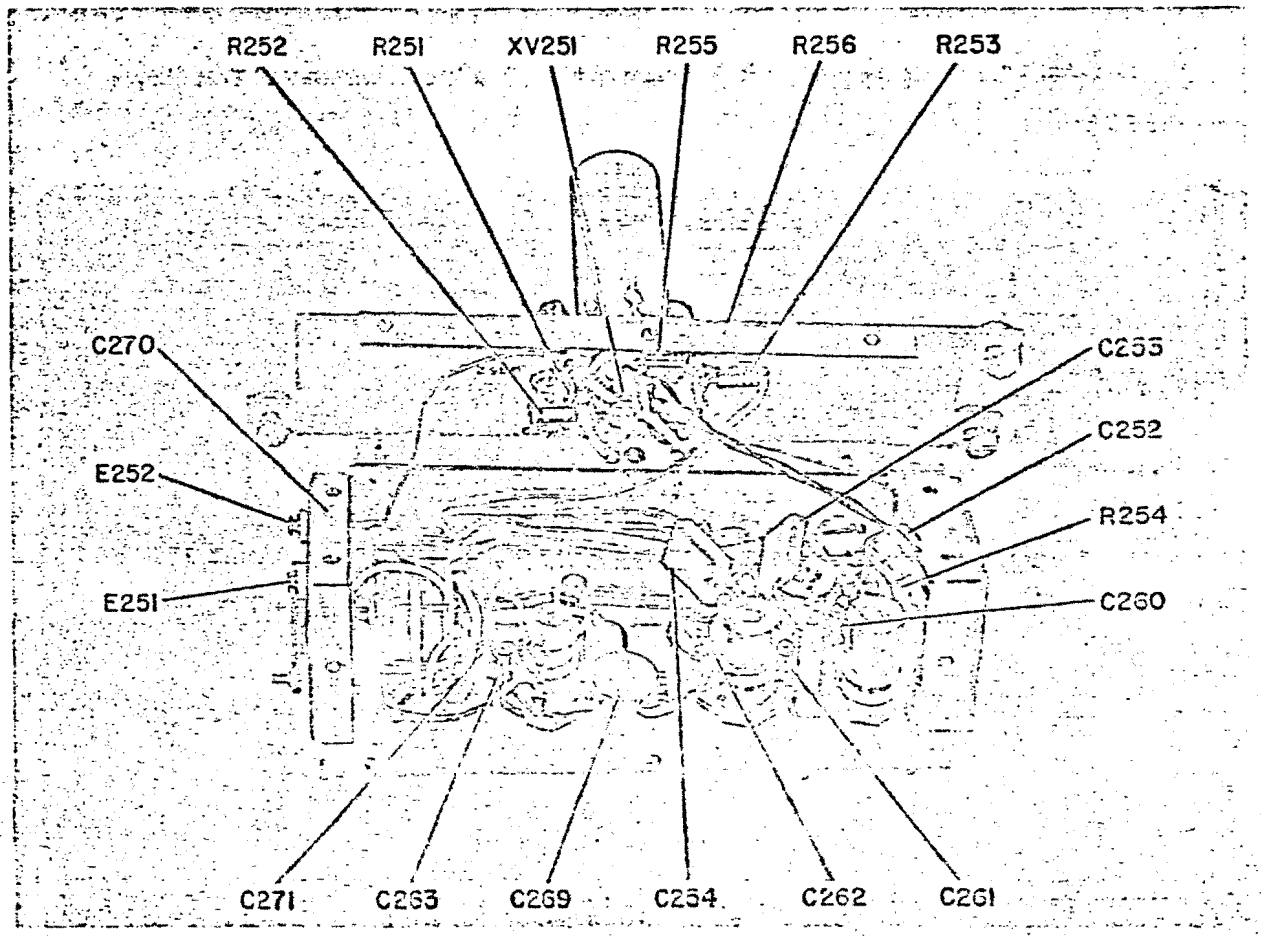


Figure 5-67. Harmonic Amplifier (Mixer Subassembly), Interior View, Location of Parts

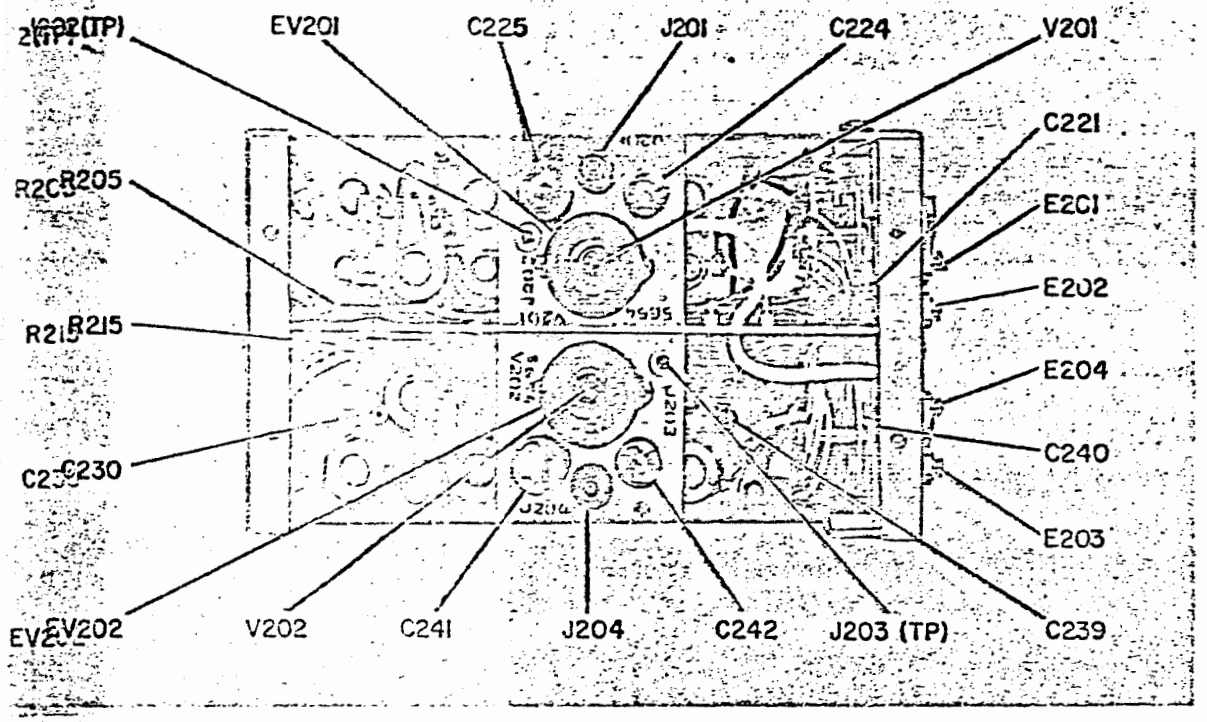


Figure 5-64. Harmonic Amplifier (R-F Subassembly), Top View, Location of Parts

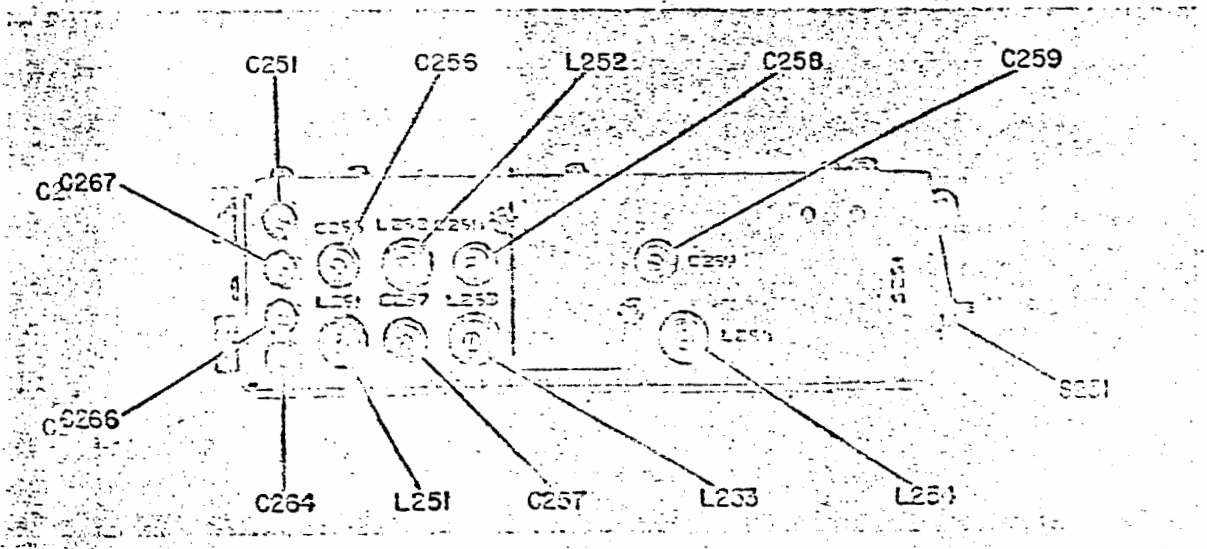


Figure 5-65. Harmonic Amplifier (Mixer Subassembly), Bottom View, Location of Parts

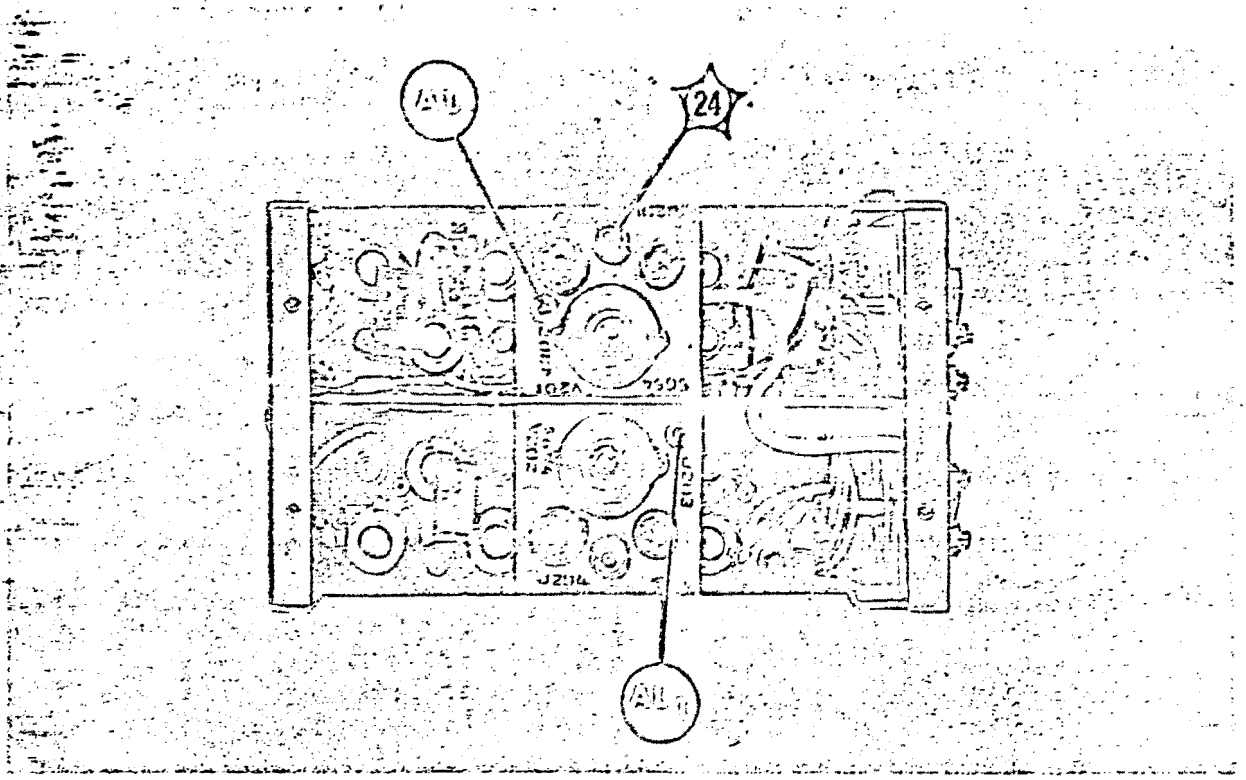


Figure 5-68. Harmonic Amplifier (R-F Subassembly), Top View, Location of Test Points

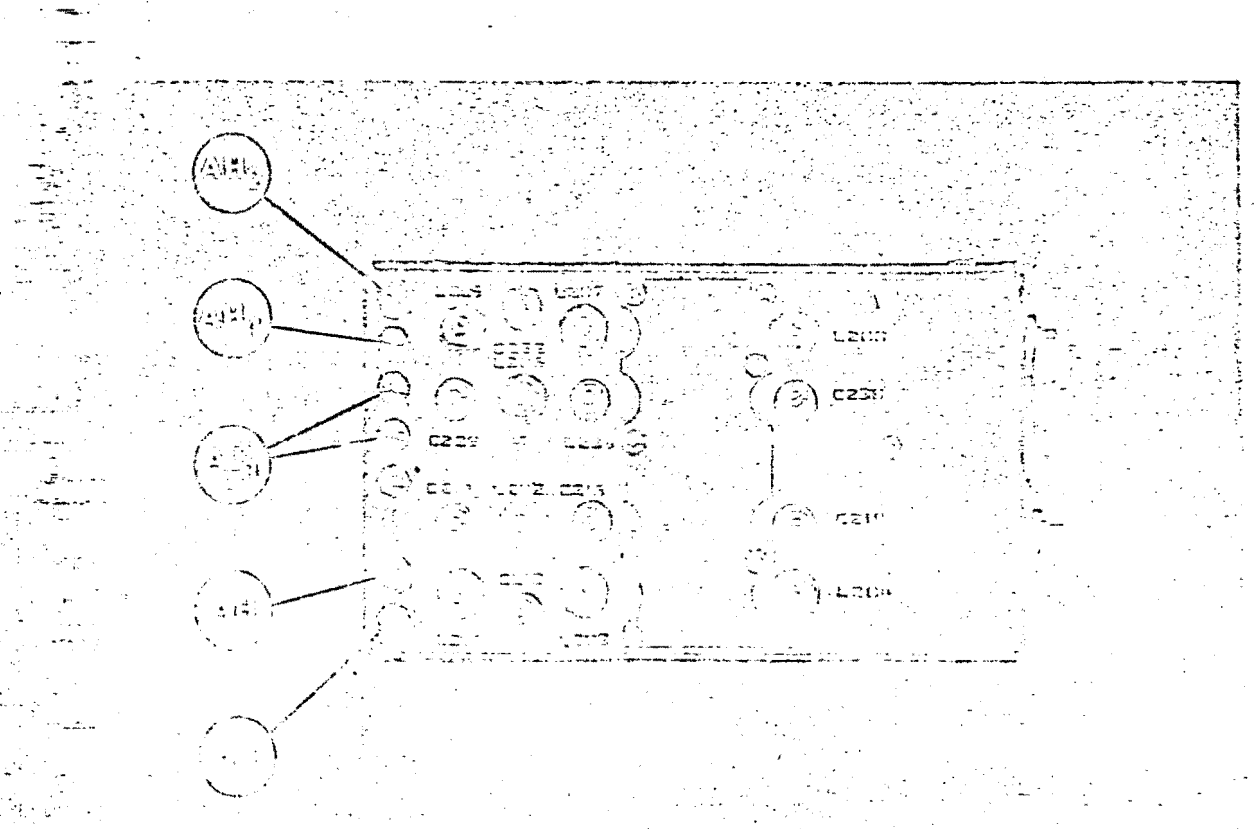


Figure 5-69. Harmonic Amplifier (R-F Subassembly), Bottom View, Location of Test Points

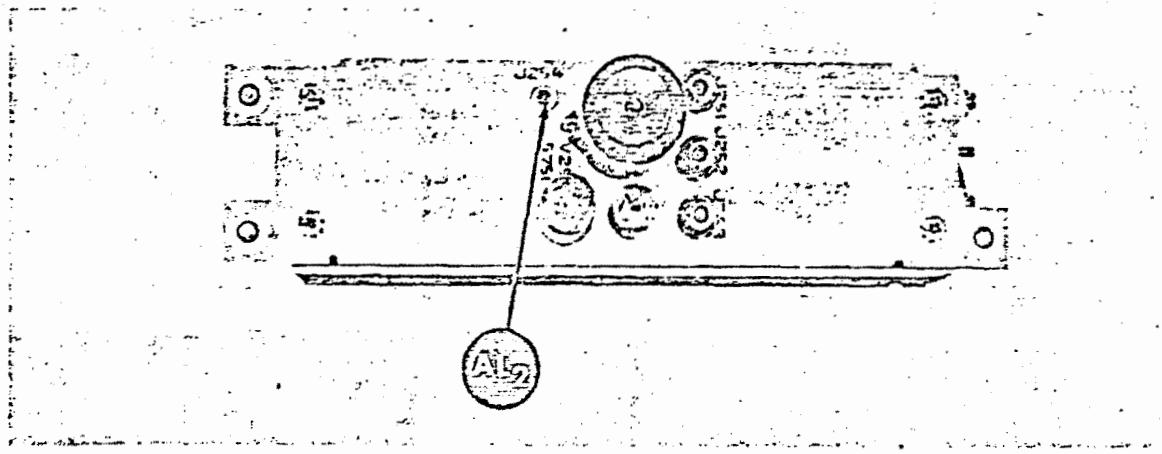


Figure 5-70. Harmonic Amplifier (Mixer Subassembly), Top View, Location of Test Points

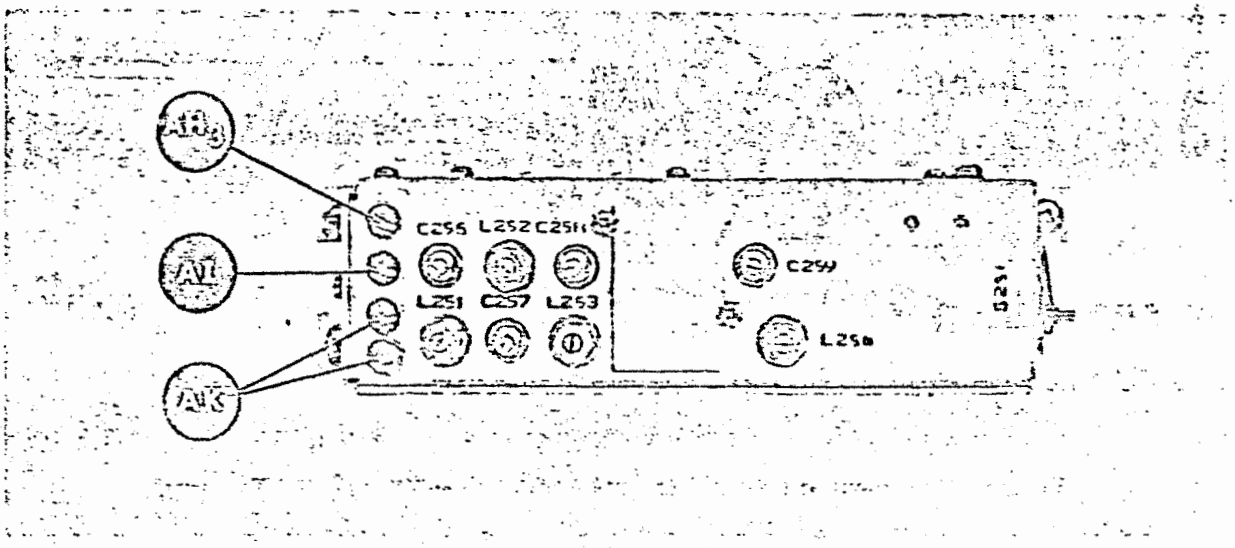


Figure 5-71. Harmonic Amplifier (Mixer Subassembly), Bottom View, Location of Test Points

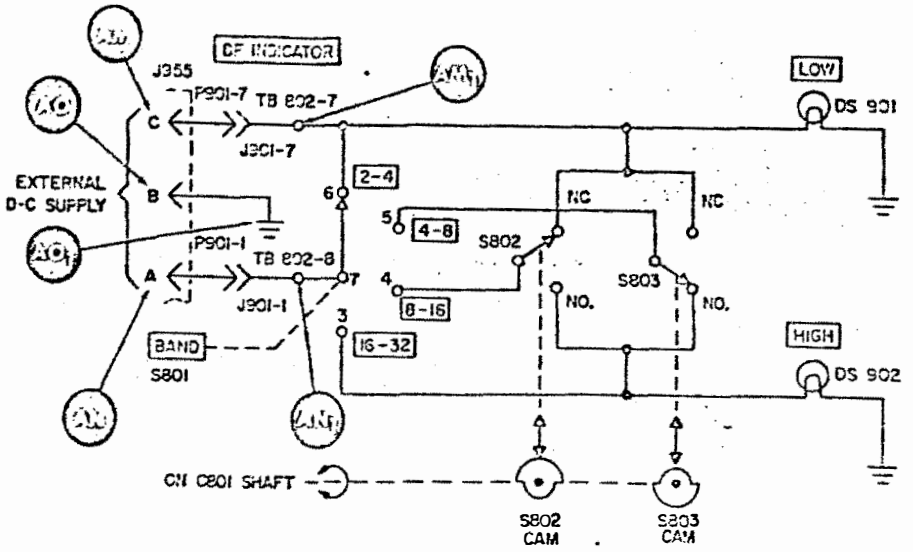


Figure 5-73. DF Indicator Circuit, Functional Schematic Diagram

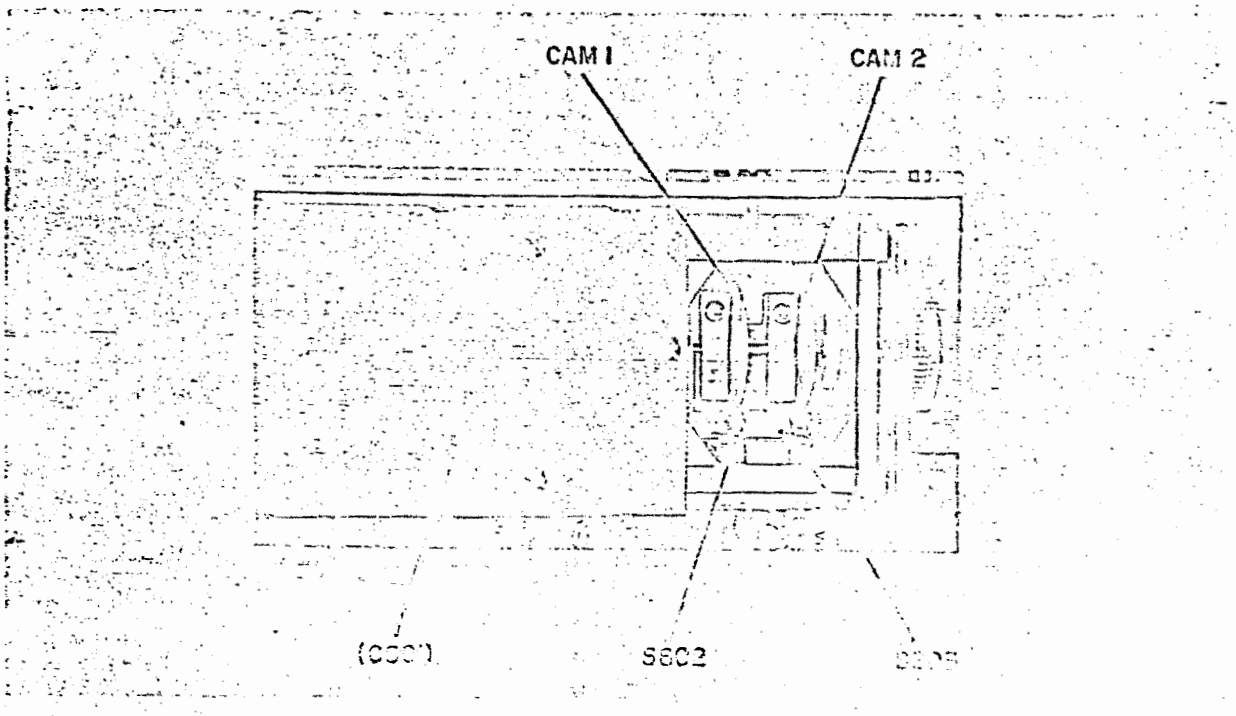
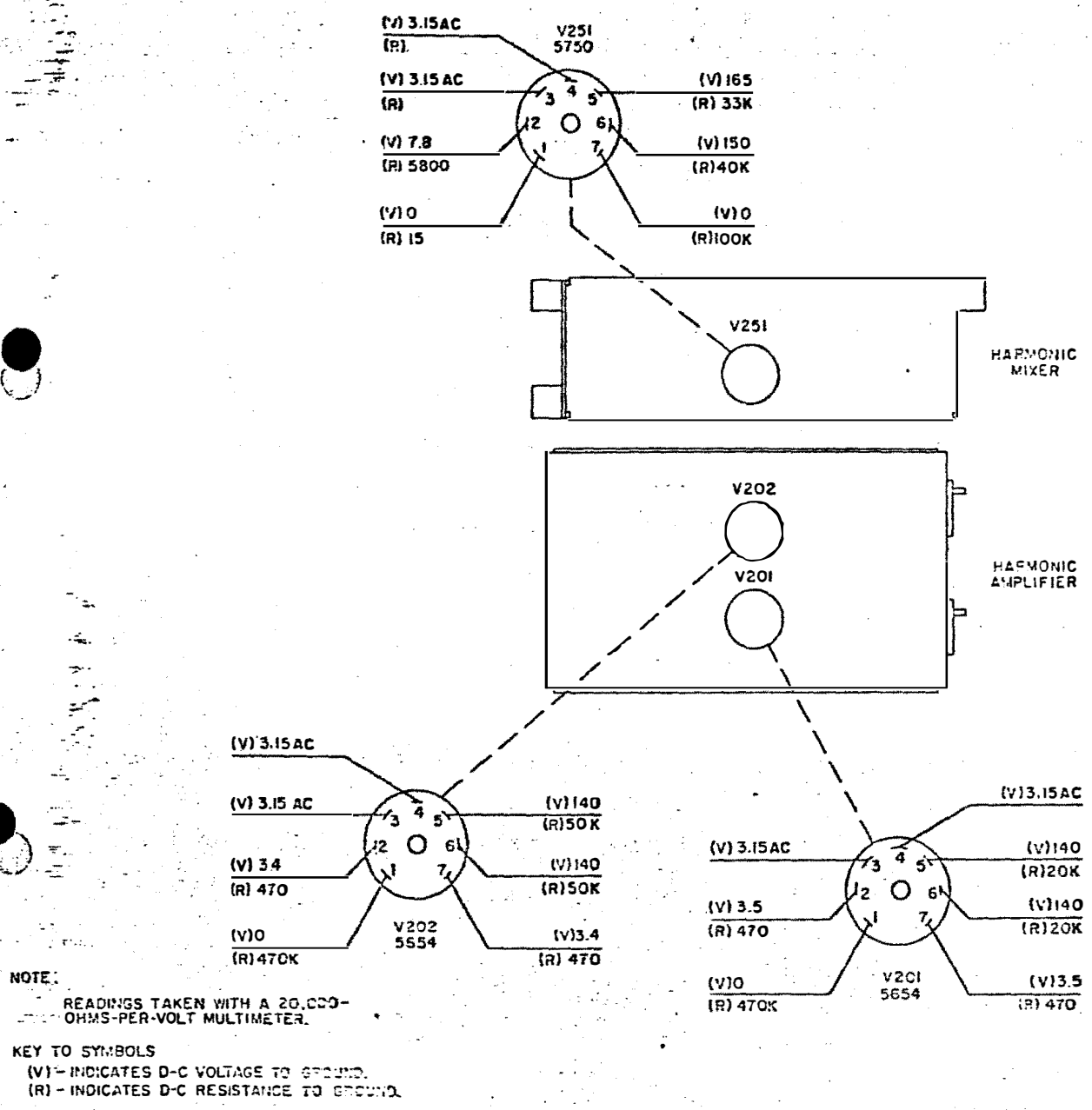


Figure 5-74. DF Indicator Circuit, Top View, Location of Parts



NOTE:

READINGS TAKEN WITH A 20,000-OHMS-PER-VOLT MULTIMETER.

KEY TO SYMBOLS

(V) – INDICATES D-C VOLTAGE TO GROUND.
(R) – INDICATES D-C RESISTANCE TO GROUND.

Figure 5-72. Harmonic Amplifier, Voltage and Resistance Diagram

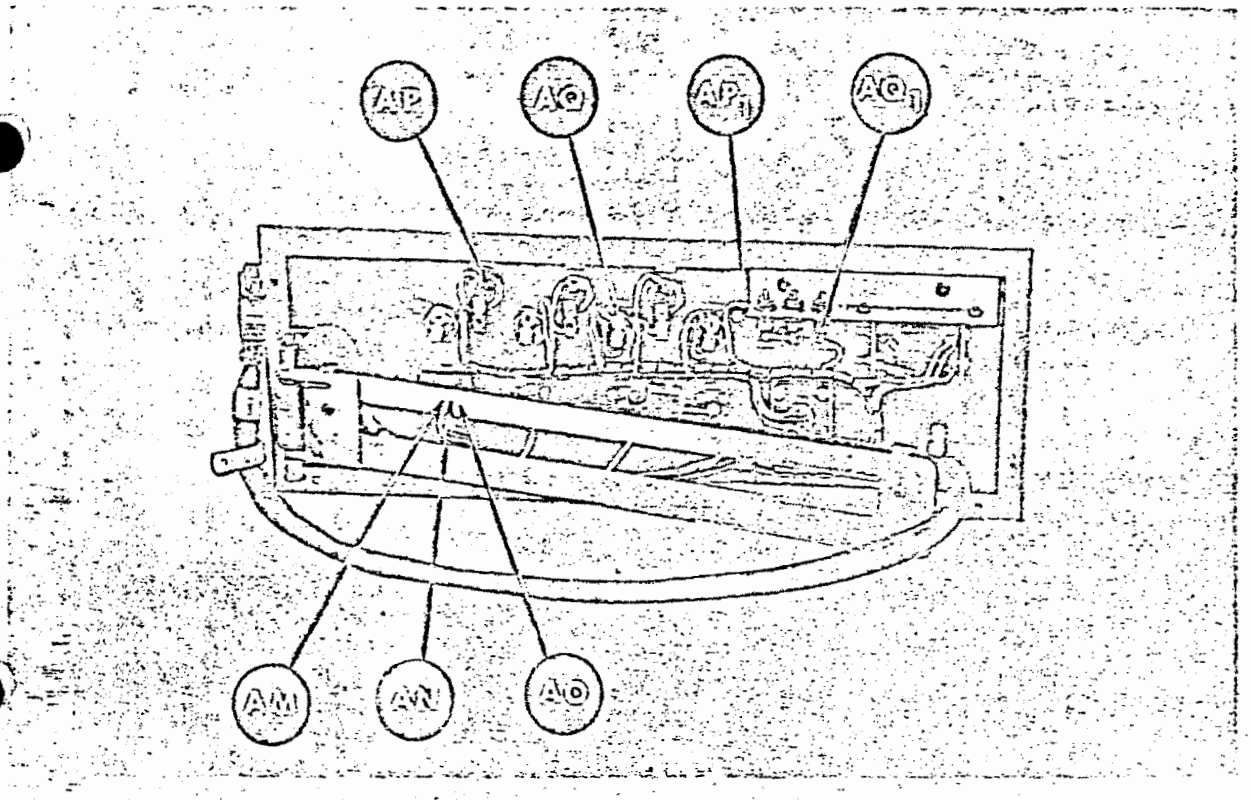


Figure 5-79. Countermeasures Receiver R-1125/FLR, Voltage-Regulator Circuits, Location of Test Points

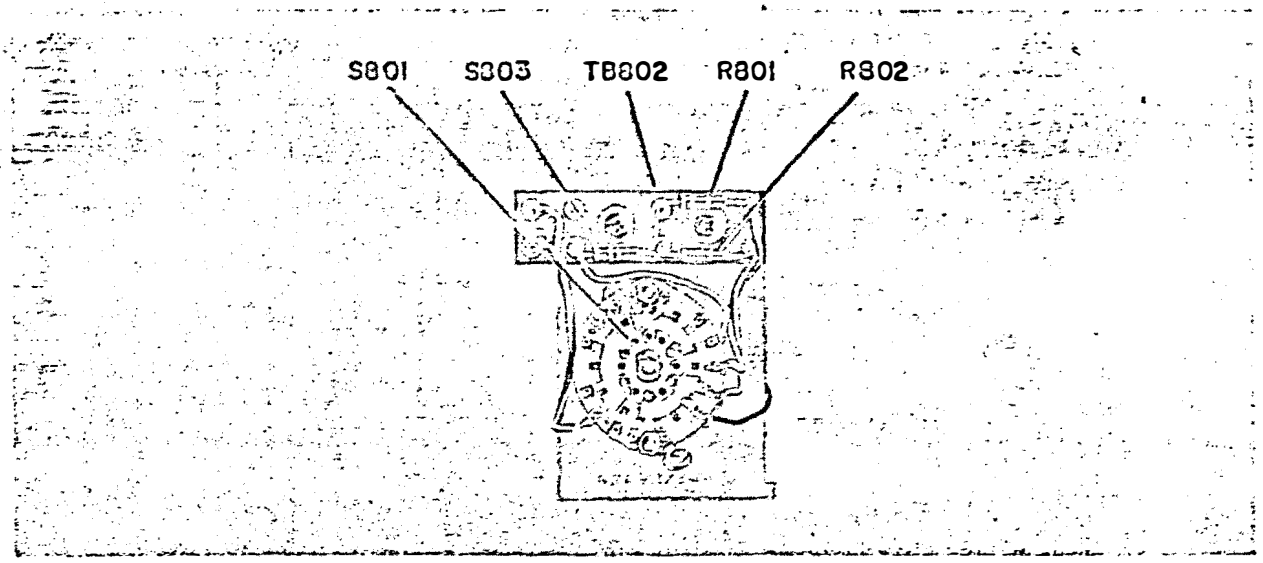


Figure 5-75. DF Indicator Circuit, Bottom View, Location of Parts

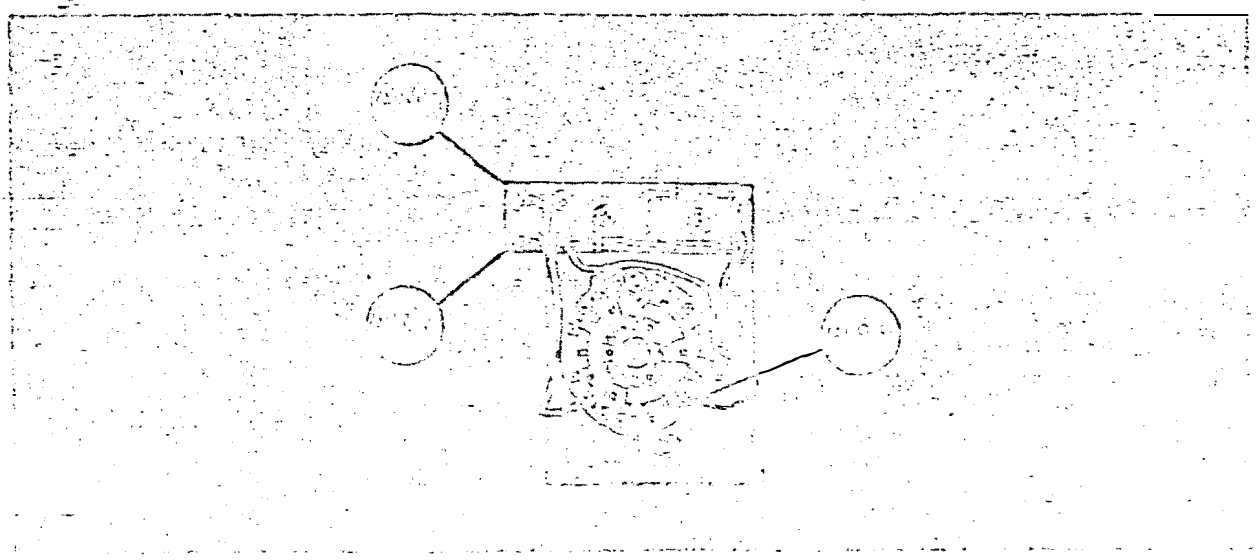


Figure 5-76. DF Indicator Circuit, Location of Test Points

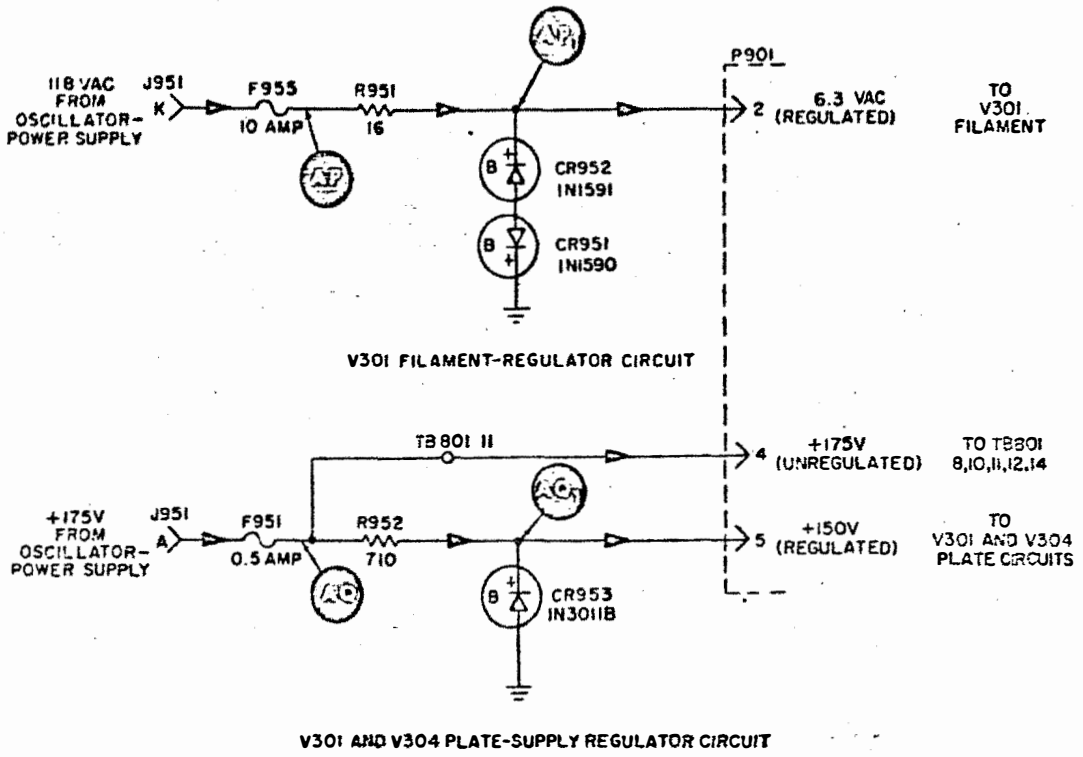


Figure 5-77. Countermeasures Receiver R-1125/FLR, Voltage-Regulator Circuits, Functional Schematic Diagram

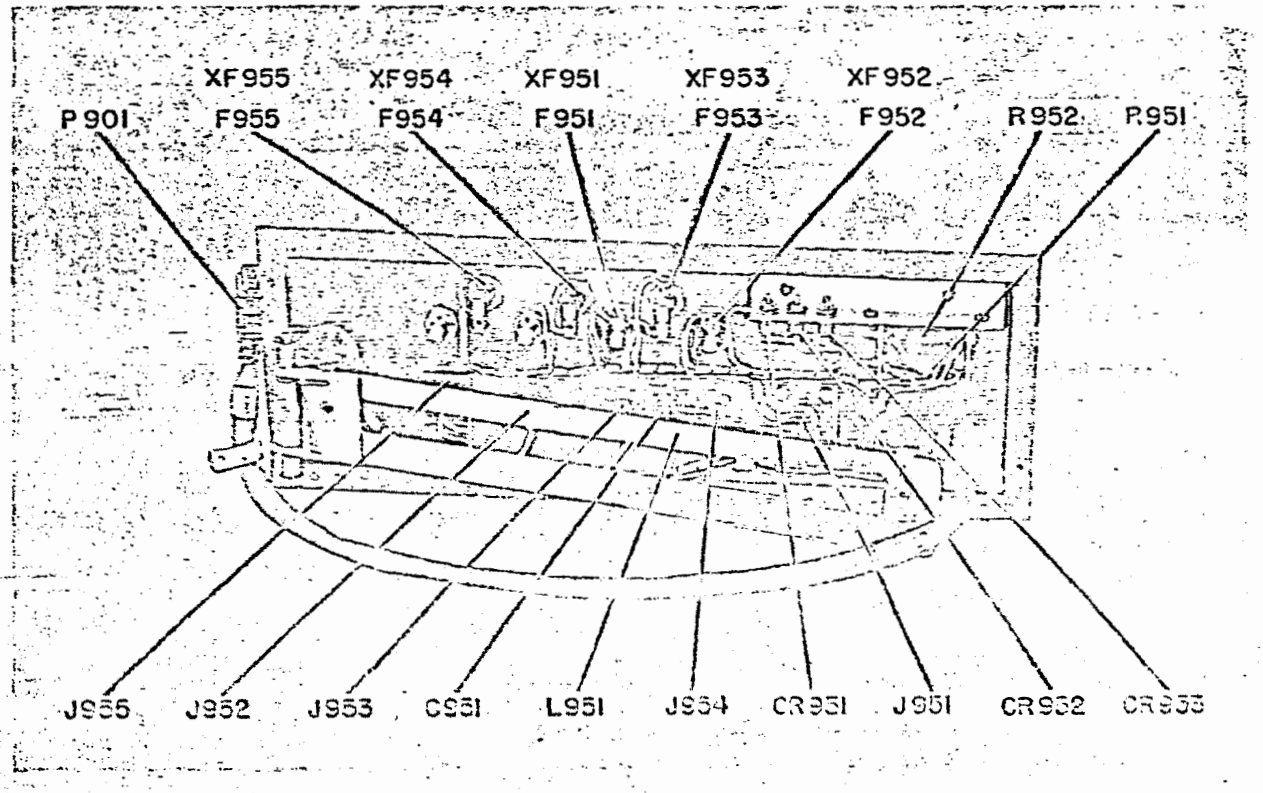
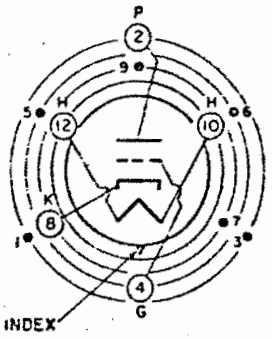


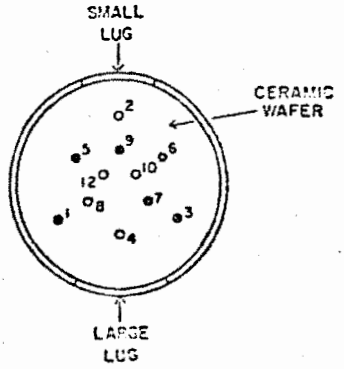
Figure 5-78. Countermeasures Receiver R-1125/FLR, Voltage-Regulator Circuits, Location of Parts

BASING DIAGRAM (Bottom View)



INDEX = LARGE LUG
● = PIN CUT OFF

TUBE BASE



▲ PIN HAS INTERNAL CONNECTION AND IS CUT OFF CLOSE TO CERAMIC WAFER – DO NOT USE.

PIN 1: ▲	PIN 5: ▲	PIN 9: ▲
PIN 2: PLATE	PIN 6: ▲	PIN 10: HEATER
PIN 3: ▲	PIN 7: ▲	PIN 11: OMITTED
PIN 4: GRID	PIN 8: CATHODE	PIN 12: HEATER

Figure 5-81. Type 7586 Nuvistor, Basing Diagram

SECTION 6

REPAIR

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

NOTE

The Bureau of Ships no longer requires the submission of failure reports for all equipments. Failure Reports and Performance and Operational Reports are to be accomplished for designated equipments (refer to EIB 565 and 571) to the extent required by existing directives. All failures shall be reported for those equipments requiring the use of Failure Reports.

6-2. TUNING AND ADJUSTMENT.

a. GENERAL. - The following paragraphs contain information on tuning and adjustment procedures for Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR. In addition, information is included relative to the required test equipment, special tools, control settings, test setups, connections, and performance standards. Procedures for tuning and adjusting the 100-kc oscillator-amplifier in the O-928/FLR are discussed first, followed by those for the R-1125/FLR.

b. ADJUSTMENTS. - Proper alignment of the tuned circuits in the R-1125/FLR and the O-923/FLR depends on careful adjustment of the variable (trimmer) capacitors and the slug-tuned coils. This requires a high-quality signal generator calibrated accurately with an external frequency standard. In general, the strength of the test signal from the generator is determined by test conditions. Circuits requiring only small adjustments will indicate proper responses with only nominal signal levels; those appreciably out of adjustment will require correspondingly larger signal levels. The following alignment instructions are based on the assumption that the circuits have not been misaligned, and only nominal signal levels are required for optimum adjustment. Figure 6-1 shows the adjustment limits of a typical ceramic trimmer capacitor.

c. REQUIREMENTS. - Certain other assumptions must also be made in connection with alignment adjustments. These are:

(1) The equipment is connected to a proper source of primary power.

(2) The equipment has been warmed up for at least an hour to assure optimum stability of the frequency determining circuits.

(3) Except for misalignments under test, the equipment is working properly.

(4) The output of Signal Generator AN/URM-25D (see table 6-1) is properly terminated with a 50-ohm load. This ensures that the voltage output from the generator is consistent with the front panel meter reading on the generator's self-contained meter.

(5) All indications at the receiver output (J954, 65 KC OUT), are obtained with a 230-ohm load termination.

Figure 6-1. Ceramic Trimmers, Adjustment Limits

d. TEST EQUIPMENT AND SPECIAL TOOLS. - Table 6-1 lists the test equipment needed for most tests and alignment adjustments. The following special tool is required to align the slug-tuned coils in the tunable i-f filter assembly: Alignment Tool, Cambion 2033; FSN5120-540-1898.

e. PRELIMINARY CONTROL SETTINGS. - Table 6-2 lists the front panel control settings for the R-1125/FLR and O-928/FLR. Any exceptions to these settings are noted where applicable.

TABLE 6-1. TEST EQUIPMENT FOR TUNING AND ADJUSTMENT

NOMENCLATURE	CHARACTERISTICS	APPLICATION
Signal Generator AN/URM-25D	10 kc to 50 mc; output 0.1 uv to 0.1 v; modulated 400 or 1000 cps	Test signal source
Electronic Multimeter AN/USM-116		Signal measurements
Oscilloscope OS-8C/U (if desired)	Sensitivity 0.1 v rms per inch; response ±3 db from 5 cps to 2 mc	Waveshape analysis
External Frequency Standard AN/URQ-9	Accuracy: 1 part in 10^7, or greater	Checking accuracy of signal generator and electronic counter
Electronic Counter AN/USM-26		Frequency measurements

TABLE 6-2. PRELIMINARY CONTROL SETTINGS

CONTROL	LOCATION	SETTING
BAND switch	Receiver front panel	2-4 position
TUNING (Mc) control	Receiver front panel	Adjust for 02.0 reading on MEGACYCLE counter
TUNING (Kc) control	Receiver front panel	Adjust for 00.0 reading on KILOCYCLE counter
OUTPUT LEVEL control	Receiver front panel	Fully cw
AGC SLOW-FAST switch	Receiver front panel	SLOW
AGC THRESHOLD (R804) (Screwdriver adjustment)	Under receiver chassis	2/3 cw (approx)
I-F AGC (R805) (Screwdriver adjustment)	Under receiver chassis	2/3 cw (approx)
ON-OFF power switch	Oscillator-power supply	ON

6-3. 100-KC OSCILLATOR-AMPLIFIER OF OSCILLATOR-POWER SUPPLY O-928/FLR, TUNING AND ADJUSTMENTS.

The following paragraphs contain instructions for the adjustment and alignment of the 100-kc oscillator-amplifier assembly. These procedures are performed with the assembly in place on the O-928/FLR chassis.

CAUTION

SELECTOR switch S1052 must be set to a position

corresponding to the number of receivers in use before the equipment is energized.

a. TEST EQUIPMENT. - Use electronic multimeter AN/USM-116, electronic (frequency) counter AN/USM-26, and external frequency standard AN/URQ-9, or equivalent test equipment.

b. TEST SETUP. - Alignment and adjustment of the 100-kc oscillator-amplifier, for practical reasons, also includes adjustment of the tuned circuits in the 100-kc buffer-amplifier (located in the R-1125/FLR on the age amplifier assembly). Prior to alignment, check the accuracy of the electronic counter at 100 kc, using the external frequency standard. Pull out the receiver and raise it to expose test point (TP)J603 located on the top of the age amplifier assembly.

c. CONNECTIONS. (See figures 5-46, 5-47, and 5-48.)

(1) Connect the frequency counter to (TP)J603.

(2) Connect the electronic multimeter to (TP)J603.

d. PROCEDURE. (See figures 5-7 and 5-8.)

Step 1. Adjust variable capacitor C1003 to obtain a reading of 100.000 kc ($\pm 1 \times 10^{-6}$) on the frequency counter.

Step 2. Adjust the slug of coil L602 (100-kc buffer-amplifier) for a maximum reading on the multimeter.

Step 3. Connect the multimeter to (TP)J202 (harmonic amplifier, see figure 5-8).

Step 4. Adjust the slug of coil L601 (100-kc buffer-amplifier) for a maximum reading on the multimeter.

Step 5. Disconnect test equipment.

6-4. COUNTERMEASURES RECEIVER R-1125/FLR, TUNING AND ADJUSTMENTS.

The following paragraphs contain instructions for the adjustment and alignment of the receiver assemblies. These procedures are performed with all assemblies in place in the receiver. Pull out and rotate the receiver chassis to expose the test points and components to be adjusted.

a. INTERPOLATION OSCILLATOR.

(1) TEST EQUIPMENT. - Use frequency counter AN/USM-26 or equivalent.

(2) TEST SETUP. - Alignment and tracking of the interpolation oscillator with the KILOCYCLE counter readings is obtained by careful adjustment of variable capacitors C401 (fine adjustment), C408 (coarse adjustment), and slug-tuned coil L402. Pull out the receiver and raise it to expose the interpolation oscillator adjustments.

(3) CONNECTIONS. (See figures 5-57 and 5-58.) - Connect the frequency counter to panel connector J902 (VFO OUTPUT). This connection measures the interpolation oscillator output frequency through interpolation oscillator buffer V651.

(4) CONTROL SETTINGS. - Adjust the TUNING (kc) control to set the kilocycle counter to +00.0. Preset variable capacitors C401 and C406 to a midrange value (See figure 6-1)

(5) PROCEDURE. (See figures 5-51 and 5-58.)

Step 1. Adjust slug-tuned coil L402 for a frequency counter reading of 580 kc.

Step 2. Reset the KILOCYCLE to read 00.0 AND NOTE the frequency COUNTER INDICATION If the counter reads 680 kc, interpolation oscillator alignment is complete; IF NOT Go to Step 3.

Step 3. Adjust capacitor C406 (coarse) for a frequency counter reading of approximately 680 kc; complete the adjustment using capacitor C401 (fine)

NOTE

When the adjustment of C406 produces a frequency counter reading within 100 cycles of 680 kc, C401 should be used to make a final adjustment.

Step 4. Return the KILOCYCLE counter to +00. 0 and adjust L402 for a frequency counter reading of 580 kc.

Step 5. Reset the KILOCYCLE counter to 00. 0. If the frequency counter now reads 680 kc, all adjustments are correct. If not, repeat steps 3 through 5 until the frequency counter reads 680 kc at a KILOCYCLE counter setting of 00. 0, and 580 kc at a KILOCYCLE counter setting of +00. 0 without additional adjustment.

Step 6. Disconnect test equipment.

b. FIRST I-F AND INJECTION AMPLIFIER. - Three circuit sections of this assembly require adjustment. These are: the first i-f amplifier, the 825-kc injection amplifier, and the 1455-kc injection amplifier (no adjustments are provided for the output amplifier which is also located on this assembly). Each circuit section requires individual adjustment as described in the following paragraphs.

(1) TEST EQUIPMENT. - Use electronic multimeter AN/USM-116, signal generator AN/URM-25D, and frequency counter AN/USM-26, or equivalents.

(2) TEST SETUP. - The first i-f and injection amplifier circuits are aligned by applying a test signal from the signal generator, measuring the signal level at selected circuit points, and adjusting the variable capacitors or slug-tuned coils involved. Pull out the receiver and raise it to expose the test points.

(3) PROCEDURE FOR FIRST I-F AMPLIFIER. (See figures 5-27, 5-30, and 5-33.)

Step 1. Remove P456 and J456 at input to amplifier stage V455.

Step 2. Connect signal generator to test point (TP)J457, and adjust generator for 100-millivolt output at 1675 kc.

Step 3. Connect electronic multimeter to test point (TP)J464.

Step 4. Adjust slug-tuned coil L452 for a maximum indication on the electronic multimeter.

NOTE

Response of this stage is essentially flat from 1625 to 1725 kc. Check also the electronic multimeter indications with the signal generator frequency set first at 1600 kc and then at 1750 kc, with the generator supplying a 100-millivolt test signal. The electronic multimeter should indicate approximately 70 percent of the voltage obtained at 1675 kc.

Step 5. Disconnect test equipment.

Step 6. Remove cable W805 from connector J451 at the input to amplifier stage V451, and cable W806 from connector J460 at output of amplifier stage V459.

Step 7. Connect signal generator to test point (TP)J464, and adjust generator for 100-millivolt output at 220 kc.

Step 8. Connect electronic multimeter to J460.

Step 9. Adjust capacitors C498 and C499 for a maximum indication on the electronic multimeter. (These capacitors tune filter FL453 to 220 kc.)

Step 10. Disconnect test equipment. Replace cable W805 at J451.

(4) PROCEDURE FOR INJECTION I-F AMPLIFIER. (See figures 5-28, 5-30, and 5-33.)

Step 1. Connect signal generator to (TP)J254 of the harmonic mixer (figure 5-66) and adjust generator for 100-millivolt output at 825 kc.

Step 2. Connect electronic multimeter to (TP)J454. (Remove tube V454 to disable the age voltage at tube V451.)

Step 3. Adjust slug-tuned coil L455, and capacitors C459 and C460 for a maximum indication on the multimeter. (Capacitors C459 and C460 tune filter FL451 to 825 kc.)

Step 4. Replace tube V454 and disconnect test equipment.

Step 5. Remove connector P452 from J452. Connect signal generator to (TP)J454 and adjust for 100-millivolt output at 1455 kc.

Step 6. Connect electronic multimeter to (TP)J455.

Step 7. Adjust capacitors C463 and C468 for a maximum indication on multimeter. (Capacitors C463 and C468 tune filter FL452 to 1455 kc.)

Step 8. Remove electronic multimeter from (TP)J455 and connect to (TP)J466. Select applicable d-c range.

Step 9. Adjust slug-tuned coil L451 for a maximum indication on multimeter (polarity at (TP)J466 is negative dc).

Step 10. Disconnect test equipment and replace remaining cable connections previously removed.

NOTE

There are no adjustments in the output amplifier section of the first i-f and injection amplifier assembly.

c. HARMONIC AMPLIFIER.

(1) TEST EQUIPMENT. - Use electronic multimeter AN/USM-116, signal generator AN/URM-25D, and frequency counter AN/USM-26, or equivalents.

(2) TEST SETUP. - The harmonic amplifier and mixer is aligned by applying a test signal from the signal generator, adjusting the receiver TUNING (Mc) control for a specified MEGACYCLE counter reading, and adjusting the slug-tuned coils and capacitors in the harmonic amplifier (for each position of the BAND switch) to obtain a maximum indication on the electronic multimeter. Table 6-3 lists the test signal frequency, the MEGACYCLE counter reading, and identifies the adjustments for each position of the BAND switch. Pull out the receiver and raise it to expose the test points and components to be adjusted.

TABLE 6-3. ALIGNMENT CHART, HARMONIC AMPLIFIER

SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	MEGACYCLE COUNTER SETTING	ADJUSTMENTS		
			1	2	3
2900 kc 4900 kc	2-4	02.0 04.0	L201 C210	L205 C229	L251 C256
4900 kc 8900 kc	4-8	04.0 08.0	L202 C213	L206 C232	L252 C257
8900 kc 16900 kc	8-16	08.0 16.0	L203 C216	L207 C235	L253 C258
16900 kc 32300 kc	16-32	16.0 32.0	L204 C219	L208 C238	L254 C259

TABLE 6-4. ALIGNMENT CHART, HIGH-FREQUENCY OSCILLATOR

BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	MEGACYCLE COUNTER SETTING	ADJUST
16-32	16.000 mc 32.000 mc	16.05 32.05	L304 C311
8-16	8.000 mc 16.000 mc	08.05 16.05	L303 C310
4-8	4.000 mc 8.000 mc	04.05 08.05	L302 C309
2-4	2.000 mc 4.000 mc	02.05 04.05	L301 C308

Step 1. Connect the signal generator and the frequency counter to the receiver input at J952 (ANT). (Check all generator frequencies using the frequency standard.)

Step 2. Connect the electronic multimeter to the receiver output at J954 (65 KC OUT).

Step 3. Place the BAND switch in the 16-32 position.

Step 4. Remove the MEGACYCLE counter bezel (four screws) to expose the counter forth digit (see figure 6-5).

Step 5. Adjust the signal generator for an output of 100 uv at precisely 16.000 mc.

NOTE

If necessary, the signal generator output level can be increased to a maximum value of 1000 uv and then reduced during adjustment. Reducing the signal level will produce more accurate meter indications.

Step 6. Set the MEGACYCLE counter to ready 16.05. (The last digit, 5, is normally covered by the counter bezel.) Check that the KILOCYCLE counter reads 00.0.

Step 7. Adjust slug-tuned coil L304 for a reading on the electronic multimeter. (If high-frequency oscillator adjustments are incorrect no reading is obtained.)

Step 8. Note the 100 KC TUNING meter indications during adjustment and carefully adjust L304 for a minimum reading (maximum 100 KC TUNING meter dip).

Step 9. Adjust the signal generator for an output of 100 uv at precisely 32.000 mc.

Step 10. Set the MEGACYCLE counter to read 32.05.

Step 11. Adjust capacitor C311 for a reading on the electronic multimeter.

Step 12. Note the 100 KC TUNING meter indication and carefully adjust C311 for a minimum reading (maximum 100 KC TUNING meter dip).

Step 13. Repeat steps 5 through 12 to verify correct adjustment of L304 and C311.

Step 14. Place the BAND switch, in turn, in positions 8-16, 4-8, and 2-4. Set the MEGACYCLE counter and adjust the signal generator output to the values listed in table 6-4. First adjust the slug-tuned coil and then the capacitor, following the procedure described in steps 5 through 13, for each band.

Step 15. Disconnect test equipment and replace the MEGACYCLE counter bezel.

(3) CONNECTIONS. (See figures 5-62 through 5-69.)

(a) Remove connector P201 from J201 at the input of amplifier V201.

(b) Connect signal generator to J201 and adjust for a 100-millivolt output signal. (Frequency is selected from table 6-3.)

(c) Connect electronic multimeter to (TP)J466 on the first i-f and injection amplifier assembly.

(d) Connect frequency counter to generator output and monitor the generator frequency.

(4) CONTROL SETTINGS. - Table 5-2 lists control settings for the equipment; table 6-3 gives the MEGACYCLE counter setting for the adjustments which follow.

(5) PROCEDURE. (See figures 5-63 through 5-67, and refer to table 6-3.)

Step 1. Check that BAND switch is in the 2-4 position and set the MEGACYCLE counter to read 02. 0.

Step 2. Adjust signal generator for 100-millivolt, 2900-kc output signal (refer to table 6-3). Check the generator frequency using the frequency counter.

Step 3. Adjust slug-tuned coils L201, L205, and L251 for a maximum indication on the electronic multimeter (columns 1, 2, and 3 in table 6-3).

Step 4. Set MEGACYCLE counter to read 04. 0 and adjust generator for 4900-kc output frequency. (Use counter to check frequency.)

Step 5. Adjust capacitors C210, C229, and C256 for maximum indication on the electronic multimeter.

Step 6. Repeat steps 1 through 5 to correct minor changes in alignment because of interaction between the coil and capacitor adjustments.

Step 7. In turn, place the BAND switch in positions 4-8, 8-16, and 16-32; set the MEGACYCLE counter and signal generator as shown in table 6-3; make the adjustments listed in columns 1, 2, and 3 of table 6-3 for each MEGACYCLE counter setting. Follow the general procedure described in steps 1 through 6.

Step 8. Disconnect test equipment and replace the cable at connector J201.

d. HIGH-FREQUENCY OSCILLATOR. - Adjustments of the high-frequency oscillator slug-tuned coils and capacitors are performed by applying a test signal to the receiver input, monitoring the receiver output and noting the indications on the 100 KC TUNING meter. Accuracy of the test signal frequency must be compatible with the accuracy given in Section 1, paragraph 1-4 (Quick Reference Data). If available, standard frequency transmissions from station WWV (or equivalent) may be used to check the test signal frequency. The high-frequency oscillator adjustment procedure described in the following paragraphs must be performed in the order presented.

(1) TEST EQUIPMENT. - Use frequency counter AN/USM-26, signal generator AN/URM-25D, electronic multimeter AN/USM-116, and external frequency standard AN/URQ-9, or equivalent.

(2) TEST SETUP. - To adjust the high-frequency oscillator, set the MEGACYCLE counter to a specified reading and adjust the associated slug-tuned coil and capacitor for each position of the BAND switch starting with the 16-32 position. Table 6-4 lists the MEGACYCLE counter readings and test frequencies, and identifies the adjustments. Pull out the receiver and raise it to expose the components to be adjusted.

(3) CONTROL SETTINGS. - Table 5-2 lists the initial control settings for the equipment; table 6-4 lists additional control settings required during adjustments.

(4) PROCEDURES. (See figures 5-51 through 5-54, and refer to table 6-4.)

e. PRESELECTOR.

(1) TEST EQUIPMENT. - Use electronic multimeter AN/USM-116, signal generator AN/URM-25D, and frequency counter AN/USM-26, or equivalents.

(2) TEST SETUP. - The preselector circuits are aligned by applying a test signal from the signal generator, adjusting the receiver TUNING (Mc) control for a specified MEGACYCLE counter reading, and adjusting the slug-tuned coils and capacitors to obtain a maximum indication on the multimeter. Table 6-5 lists the test signal frequency and the MEGACYCLE counter reading, and identifies the adjustments for each position of the BAND switch. Pull out the receiver and raise it to expose the test points and components to be adjusted on the preselector assembly. Disable the agc circuit by removing the coaxial cable (P601) at J601 (agc amplifier assembly).

TABLE 6-5. ALIGNMENT CHART, PRESELECTOR

SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	MEGACYCLE COUNTER SETTING	ADJUSTMENTS		
			1	2	3
2.0 mc 4.0 mc	2-4	02.0 04.0	L51 C51	L55 C66	L151 C153
4.0 mc 8.0 mc	4-8	04.0 08.0	L52 C52	L56 C67	L152 C154
8.0 mc 16.0 mc	8-16	08.0 16.0	L53 C53	L57 C68	L153 C155
16.0 mc 32.0 mc	16-32	16.0 32.0	L54 C54	L58 C69	C154 C157

(3) CONNECTIONS. (See figures 5-12 through 5-17, and refer to table 6-5.)

(a) Connect signal generator and frequency counter to the receiver input at J952 (ANT).

(b) Connect the multimeter to test point (TP)J457 on the first i-f and injection amplifier assembly.

(4) CONTROL SETTINGS. - Table 5-2 lists the control settings for the equipment. Refer to table 6-5 for the MEGACYCLE counter settings when performing the following adjustments.

(5) PROCEDURE. (See figures 5-12 through 5-17, and refer to table 6-5.)

Step 1. Place the BAND switch in the 2-4 position.

Step 2. Adjust the signal generator for an output signal of 3 uv at 2.0 mc (monitor the generator output with the frequency counter).

Step 3. Set the MEGACYCLE counter to read 02.0 mc.

Step 4. Adjust slug-tuned coils L51, L55, and L151 for a maximum indication on the multimeter (columns 1, 2, and 3 of table 6-5).

Step 5. Set the MEGACYCLE counter to 04.0 mc.

Step 6. Adjust the signal generator for an output of 3 uv at 4.0 mc. (Check the generator output using the frequency counter.)

Step 7. Adjust capacitors C51, C66, and C153 for a maximum indication on the multimeter.

Step 8. Repeat steps 3 through 7 to correct minor changes in alignment because of interaction between the coil and capacitor adjustments.

Step 9. Place the BAND switch, in turn, to positions 4-8, 8-16, and 16-32. Set the

MEGACYCLE counter and the signal generator to the values indicated in table 6-5. Make the indicated coil and capacitor adjustments for each test frequency to obtain a maximum indication on the multimeter. Follow the general procedure described in steps 1 through 7.

Step 10. Disconnect test equipment.

f. TUNABLE I-F FILTER.

(1) TEST EQUIPMENT AND SPECIAL TOOLS. - Use electronic multimeter AN/USM-116, signal generator AN/URM-25D, and frequency counter AN/USM-26, or equivalents. Use special alignment tool, Cambion 2033 (FSN 5120-540-1898) to adjust the slug-tuned coils in the filter.

(2) TEST SETUP. - The four circuits in the tunable i-f filter are aligned by applying a test signal from the signal generator and adjusting the slug-tuned coils (using the special tool) to obtain a maximum signal on the multimeter. Pull out the receiver and raise it to expose the test points and components to be adjusted on the tunable i-f filter assembly.

(3) CONNECTIONS. (See figures 5-24 and 5-25.)

(a) Connect the signal generator to test point (TP)J152 on the preselector assembly (see figure 5-15).

(b) Connect the multimeter to test point (TP)J464 on the first i-f and injection amplifier assembly (see figure 5-30).

(c) Connect the frequency counter to monitor the generator output frequency.

(4) CONTROL SETTINGS. - Table 5-2 lists the control settings for the equipment. In addition, set the KILOCYCLE counter to read 50.0 by adjusting the TUNING (Kc) control.

(5) PROCEDURE. (See figures 5-24 and 5-25.)

Step 1. Adjust the signal generator for an output of 50 millivolts at 1675 kc (check the frequency using the frequency counter).

Step 2. Adjust slug-tuned coils L351, L353, L354, and L356 (in turn) for a maximum indication on the multimeter.

Step 3. Check circuit alignment by adjusting the signal generator first to 1505 kc and then to 1845 kc. Note the indication on the multimeter. The multimeter indication should drop at least 40 db at each frequency. Readjust the four coils, if necessary, to obtain a flat response from 1625 kc to 1725 kc.

Step 4. Disconnect test equipment.

g. MIXER AND SECOND I-F AMPLIFIER. - Two adjustments are required in the mixer and second i-f amplifier assembly: the 285-kc oscillator frequency adjustment C567, and the RESERVE GAIN control (R553, a screwdriver adjustment). These adjustments serve unrelated circuit functions and will be described in subsequent individual paragraphs.

(1) TEST EQUIPMENT. - Use electronic multimeter AN/USM-116 and frequency counter AN/USM-26, or equivalents.

(2) TEST SETUP. - The frequency of 285-kc crystal oscillator V551 is monitored at test point (TP)J552 using the frequency counter, and capacitor C567 is adjusted to correct the oscillator frequency. RESERVE GAIN control R553 is adjusted to obtain a specified level of noise at the receiver output without a receiver input signal.

(3) CONTROL SETTINGS. - Table 5-2 lists the control settings for the equipment. Additional control settings for specific adjustments are given where applicable.

(4) PROCEDURE FOR 285-KC OSCILLATOR. (See figures 5-41 and 5-42.)

Step 1. Allow the equipment to warm up for at least one-half hour before adjusting the

tuned to 32.0 mc, and the generator set at 32.0 mc.

Step 3. Tune the receiver for a MEGACYCLE counter reading determined in step 4 of paragraph 6-4g(5); see note above.

Step 4. Connect the multimeter to terminal E606 on the agc amplifier assembly (see figure 5-46). Select the d-c volts range.

Step 5. Adjust AGC THRESHOLD control R804 (screwdriver adjustment; see figure 6-3) for an indication of from 0.1 to 0.4 volt (negative) on the multimeter.

Step 6. Disconnect only the multimeter. Leave the signal generator connected as in step 2.

(5) PROCEDURE FOR I-F AGC CONTROL R805. (See figures 5-47 and 5-48.)

Step 1. Place the BAND switch in the 16-32 position and set the MEGACYCLE counter to the minimum-gain frequency as determined in step 4 of paragraph 6-4g(5).

Step 2. Adjust the signal generator for an output of 100 millivolts at the minimum-gain frequency.

NOTE

If there is doubt as to the minimum-gain frequency, perform the following adjustments with the receiver and generator tuned to 32.0 mc.

Step 3. Connect the multimeter to terminal E606 on the agc amplifier assembly (see figure 5-46). Select the d-c volts range and note the measured agc voltage (approximately -15 to -20 volts).

Step 4. Connect the multimeter to feedthrough capacitor C503 on the first i-f and injection amplifier assembly (see figure 5-31).

Step 5. Adjust I-F AGC control R805 (screwdriver adjustment, see figure 6-3) for a multimeter reading which is one-third of the reading noted in step 3.

Step 6. Reconnect the multimeter to terminal E606. Check that the measured agc voltage is the same value as when measured in step 3. If it is not, adjust R804 to obtain the noted value, then repeat steps 4 through 6.

i. DF INDICATOR ADJUSTMENTS. - The operating sequence of the two DF indicator lamps on the front panel (DS901 LOW and DS902 HIGH) is adjusted by positioning two cams which operate switches S802 and S803 (see figure 4-23). The cams and switches are located in the end section of variable capacitor C801 at the preselector assembly (see figure 6-2). Each cam is adjustable and can be positioned on the capacitor shaft so as to light either the LOW or the HIGH lamp at a predetermined setting of the MEGACYCLE counter, but subject to the position of the BAND switch (see figure 5-73). As shown in detail A of figure 5-73, a DF indicator "change" point can be selected on either the 4-8-mc or the 8-16-mc frequency range (but not both). Selection is determined by the characteristics of the antenna systems employed. For example: if a low-frequency antenna is operable from 2.0 to 12.0 mc, the "change" point would be at 12.0 mc; or, if the high-frequency antenna operates from 6.0 to 32.0 mc, the "change" point would be at 6.0 mc.

(1) TEST EQUIPMENT AND SPECIAL TOOLS. - No test equipment or special tools are required.

(2) ADJUSTMENT METHOD. - The two cams which actuate DF indicator switches S802 and S803 are secured to the shaft of variable capacitor C801 with individual clamps. To adjust the cams, loosen the clamps (using an Allen wrench) just enough to permit cam movement. Note the raised section of the cam edge which catuates the switch. After adjustment, the cam is secured in position by tightening the clamp. Refer to paragraphs 3-2c(3) and 4-2a(15) for a description of DF indicator operation and circuit arrangement.

(3) CONTROL SETTINGS. - The equipment need not be energized when adjusting the DF indicator switches (S802 and S803) because the indicator lamp supply voltage is obtained externally at

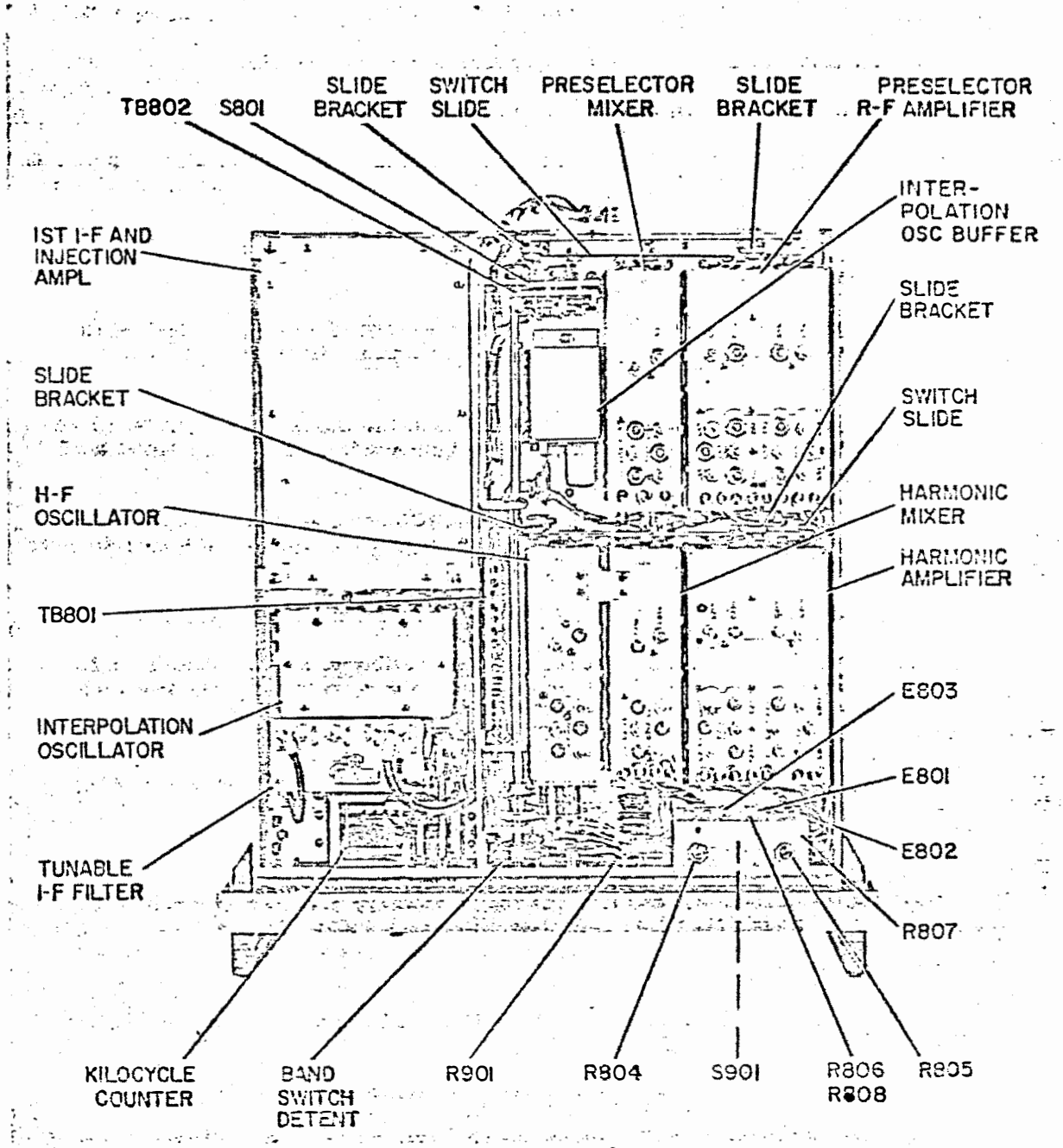


Figure 6-3. Countermeasures Receiver R-1125/FLR, Bottom View, Location of Assemblies and Parts

Step 5. Determine the "change" frequency (between 4.0 and 8.0 mc); i.e., the frequency at which the LOW lamp should light and the HIGH lamp should extinguish. Set the MEGACYCLE counter to this frequency.

Step 6. Loosen the clamp and adjust the cam of S803 so that the LOW lamp will be lighted from 4.0 mc to the "change" point frequency, and will be extinguished from the "change" point to 8.0 mc. Tighten the clamp.

Step 7. Check the adjustment by setting the MEGACYCLE counter first to 4.0 mc and then to 8.0 mc. The LOW lamp should light from 2.0 mc to the "change" point and the HIGH lamp from the "change" point to 8.0 mc.

(5) PROCEDURE FOR "CHANGE" POINT BETWEEN 8.0 AND 16.0 MC. (See figure 4-23.)

Step 1. Check that external indicator-supply voltage is present at J955.

Step 2. Place the BAND switch in the 4-8 position.

Step 3. Loosen the clamp and adjust the cam of S803 so that the LOW indicator lamp (DS903) lights for all positions of the shaft of capacitor C801. Tighten the clamp. Check by setting the MEGACYCLE counter first to 4.0 mc and then to 8.0 mc; the LOW lamp should remain lighted throughout the frequency range.

Step 4. Place the BAND switch in the 8-16 position.

Step 5. Determine the "change" frequency (between 8.0 and 16.0 mc); i.e., the frequency at which the HIGH lamp should light and the LOW lamp should extinguish. Set the MEGACYCLE counter to this frequency.

Step 6. Loosen the clamp and adjust the cam of S802 so that the LOW lamp will be lighted from 8.0 mc to the "change" point (frequency), and will be extinguished from the "change" point to 16.0 mc. Tighten the clamp.

Step 7. Check the adjustment by setting the MEGACYCLE counter first to 8.0 mc and then to 16.0 mc. The LOW lamp should light from 8.0 mc to the "change" point, and the HIGH lamp from the "change" point to 16.0 mc.

6-5. REMOVAL, ADJUSTMENT, REPAIR AND REASSEMBLY OF PARTS AND ASSEMBLIES.

a. GENERAL. - This section describes the removal of assemblies or subassemblies from the R-1125/FLR and the O-928/FLR, removal of parts from the assemblies, repair of parts when applicable, reassembly of parts in the assembly, and reinstallation of the assembly. It also includes lubrication directions, the specific lubricant to use, and the frequency of application. Illustrations included in this section or referenced in other sections show the location of assemblies and parts in the equipment to facilitate removal and reinstallation. Figures 6-2 and 6-3 show parts and assemblies of the R-1125/FLR. (See figures 5-3 and 5-4 for parts and assemblies of the O-928/FLR.)

b. OSCILLATOR-POWER SUPPLY O-928/FLR.

(1) 100-KC OSCILLATOR-AMPLIFIER. - The 100-kc oscillator-amplifier assembly is located on the O-928/FLR chassis. It contains 100-kc crystal-oven assembly A1001. Both the oven assembly and the 100-kc oscillator-amplifier can be removed from the O-928/FLR chassis without removing the O-928/FLR from the equipment rack.

(a) REMOVAL OF 100-KC OSCILLATOR-AMPLIFIER ASSEMBLY. (See figures 5-3 and 5-4.)

Step 1. Remove the cable plugs from chassis connectors J1057 and J1063.

Step 2. Loosen the three captive screws which secure the assembly to the power supply chassis. Lift the assembly from the chassis.

(b) ADJUSTMENT AND REPAIR OF 100-KC OSCILLATOR-AMPLIFIER ASSEMBLY. - The 100-kc oscillator-amplifier assembly is constructed so that a minimum of effort is required to remove parts for repair or replacement. No mechanical adjustments are involved in this assembly. Removal of parts for replacement requires only routine procedures such as unsoldering leads and removing mounting screws or nuts. If terminal boards must be loosened temporarily for access to components, the only requirement is the removal of the terminal board mounting screws.

(c) REMOVAL OF PARTS. (See figures 5-7 and 5-8.)

1. To remove the crystal oven assembly A1001, release the spring clip from the

retainer post and release the oven clamp. Unplug the oven assembly from the chassis socket.

2. To remove transformer T1001, unsolder the terminal leads noting the lead color and location for replacement purposes. Remove the two mounting nuts and washers, and lift the transformer from the chassis.

(d) REPLACEMENT OF PARTS. (See figures 5-7 and 5-8.)

1. To replace crystal oven assembly A1001, plug the assembly into the chassis socket. Position the assembly clamp, adjusting the spring clip on the retainer post to secure the oven in the socket.

2. To replace transformer T1001, insert the mounting screws into the chassis holes, noting that the transformer terminal marking corresponds with the chassis marking. Mount the transformer with the two nuts and washers, and resolder the terminal leads in the order noted during removal.

(e) REPLACEMENT OF 100-KC OSCILLATOR-AMPLIFIER ASSEMBLY. (See figures 5-3 and 5-4.)

Step 1. Install the assembly in place on the power-supply chassis, positioning the three mounting brackets over the chassis nuts. Secure the assembly with the three captive screws.

Step 2. Reconnect cable plugs to chassis connectors J1057 and J1063.

(2) POWER SUPPLY. - The power supply chassis, which also contains the 100-kc oscillator-amplifier assembly, is installed on a mounting plate that is secured to the equipment rack. The mounting plate will support two O-928/FLR units side-by-side, but the following instructions are concerned with a single unit only. To expose the power supply, remove the rack panel adjustment to the supply by removing the four screws and cup washers.

(a) REMOVAL OF OSCILLATOR-POWER SUPPLY O-928/FLR. (See figure 2-6.)

Step 1. Remove the power cable plug f om chassis connector J1051.

Step 2. Remove all power supply cables at chassis connectors J1052 and J1056.

Step 3. Remove all 100-kc reference coaxial cables at chassis connectors J1058 through J1062.

Step 4. Loosen the two captive screws which secure the chassis brackets to the mounting plate.

Step 5. Withdraw the chassis from the mounting plate using the two support handles provided.

(b) ADJUSTMENT AND REPAIR OF POWER SUPPLY ASSEMBLY. - The power supply assembly is conventional in construction and does not require mechanical adjustments. All parts are readily removed and replaced by unsoldering leads and removing the securing nuts or screws. Fuses are accessible on top of the chassis, including spare fuses of proper replacement ratings. Usually, the power supply assembly can be repaired without removing the 100-kc oscillator-amplifier assembly. In the event this assembly must be removed, follow the removal instructions in paragraph 6-5b(1)(b).

(c) REMOVAL OF PARTS. (See figures 5-3 and 5-4.)

1. To remove transformer T1051, unsolder the terminal leads noting the color and location for replacement purposes. Remove the two nuts and washers from terminals 11 and 12. Remove the four mounting nuts and washers, noting the lead with a ground lug from terminal 7, and raise the chassis to remove the transformer.

2. To remove choke L1051 or choke L1052, unsolder the leads at the choke terminals. Remove the four mounting nuts and washers. Raise the ch ssis to remove the choke.

3. To remove diodes CR1051 through CR1054, unsolder the diode leads, noting color

and location for replacement purposes. Remove the mounting nut and washer, noting the locations of the bushing and the two insulating washers, and remove the diode from the mounting bracket. Note the diode polarity for replacement purposes. Note also the position of the insulating bushing on the diode body.

CAUTION

To protect the diode when soldering or unsoldering, clamp the diode terminal (between the soldering iron and the diode body) with long-nose pliers. The pliers function as a heat sink and reduces diode temperature during the soldering process.

4. To remove switch S1052, unsolder the leads and code them for replacement purposes. Loosen the two setscrews and remove the knob. Note the knob position in relation to the switch position and the chassis marking. Remove the mounting nut and washer and remove the switch.

5. To remove plug-in capacitor C1051 or C1052, release the spring clip at the retainer post and remove the clamp. Unplug the capacitor from the socket.

(d) REPLACEMENT OF PARTS. (See figures 5-3 and 5-4.)

1. To replace transformer T1051, insert the mounting screws into the chassis holes, nd guide the two strap leads onto screw terminals 11 and 12. Secure the transformer with the four nuts nd washers, and attach the ground lug from terminal 7. Secure the strap leads at terminals 11 and 12 ith the two nuts and washers, and resolder the remaining leads to the terminals in the order noted during removal.

2. To replace filter choke L1051 or L1052, insert the mounting screws into the chassis holes and secure the choke with the four nuts and washers. Solder the leads to the two terminals.

3. To replace diode CR1051 through CR1054, assemble one insulating washer and the insulating bushing on the diode body, and insert the diode in the mounting bracket hole (observe the polarity noted during removel). Install the second insulating washer and secure the diode with the nut and washer. Solder the leads, observing the polarity noted during removal. Observe the CAUTION in paragraph 6-5b(2)(c)3.

4. To replace switch S1052, insert the bushing into the chassis hole and rotate the switch to engage the indexing lug. Secure the switch with the nut and washer. Install the knob and secure it by tightening the two setscrews. (Rotate the knob through the switch positions, checking that the knob pointer corresponds with the chassis marking.) Solder the leads to the switch, following the order and coding noted during removal.

5. To replace plug in capacitor C1051 and C1052, insert the capacitor into the chassis socket and seat it securely. Replace the clamp and adjust the spring clip on the retainer post to secure the capacitor.

(e) REPLACEMENT OF OSCILLATOR-POWER SUPPLY O-928/FLR. (See figure 2-6.)

Step 1. Install the chassis on the mounting plate, and recess the two chassis cleats in the mounting plate brackets.

Step 2. Position the two captive screws (on the brackets) over the mounting plate nuts and secure the chassis to the plate.

Step 3. Connect all 100-kc reference cables which were disconnected during chassis removal to chassis connectors J1053 through J1062.

Step 4. Connect all power supply cables which were disconnected during chassis removal to chassis connectors J1052 through J1056.

Step 5. Connect the power cable plug to chassis connector J1051.

c. COUNTERMEASURES RECEIVER R-1125/FLR.

(1) PRESELECTOR. - The preselector consists of two subassemblies: the r-f amplifier and the mixer. They are located at the rear of the receiver chassis and can be removed individually for repair and adjustment. **Pull out the receiver and raise it to expose the two subassemblies.**

(a) REMOVAL OF PRESELECTOR R-F AMPLIFIER SUBASSEMBLY. **(See figures 6-2 and 6-3, and 5-12, 5-13, and 5-14.)**

Step 1. Remove the coaxial cables at connectors J51 and J56.

Step 2. Unsolder leads from feedthrough capacitors C59, C61, C63, C74, C78, C79, C80, and C81, noting lead color and location for replacement purposes.

Step 3. Place the BAND switch in the 2-4 position. Remove the two bracket guides and switch slide located back of preselector subassemblies.

Step 4. Unsolder leads to feedthrough terminals E51, E52, E53, and E54, noting lead location for replacement purposes.

Step 5. Loosen the three captive mounting screws and remove the subassembly from the receiver chassis.

(b) ADJUSTMENT AND REPAIR OF PRESELECTOR R-F AMPLIFIER SUBASSEMBLY. - Cover plates on the preselector r-f amplifier subassembly can be removed for access to all parts and wiring (see figures 5-12, 5-13, and 5-14). In addition, a rectangular cover on the bottom of the subassembly can be removed to expose the tube sockets for voltage and resistance measurements. All parts are readily removed and replaced by unsoldering leads and removing the securing nuts or screws.

(c) REMOVAL OF PARTS. (See figures 5-12, 5-13, and 5-14.) - To remove switch S51 or S52, unsolder all leads and code them for replacement purposes. Remove the switch lever (two screws) and note its position for replacement purposes. Remove the switch and mounting bracket (two screws). Remove the bushing nut and washer to separate switch from bracket.

(d) REPLACEMENT OF PARTS. (See figures 5-12, 5-13, and 5-14.) - To replace switch S51 or S52, install the switch on the mounting bracket and engage the index lug in the bracket hole. Secure the switch with the bushing nut and washer. Install the switch with bracket in the subassembly (two screws). Install the switch lever and position it as noted during removal. Solder all leads to switch contacts following the order and coding noted during the removal process.

(e) REPLACEMENT OF PRESELECTOR R-F AMPLIFIER SUBASSEMBLY. **(See figures 6-2 and 6-3, and 5-12, 5-13, and 5-14.)**

Step 1. Replace all cover plates removed during adjustment and repair.

Step 2. Place the subassembly in position on the receiver chassis and secure it with the three captive mounting screws.

Step 3. Solder leads to feedthrough terminals E51, E52, E53, and E54.

Step 4. Place the BAND switch in the 2-4 position. Install the two bracket guides and switch slide, and engage the lever pins of both preselector subassemblies.

Step 5. Solder leads to feedthrough capacitors C59, C61, C63, C74, C78, C79, C80, and C81 in the order noted during removal.

Step 6. Connect the coaxial cables to connectors J51 and J56.

(f) REMOVAL OF PRESELECTOR MIXER SUBASSEMBLY. (See figures 6-3, 5-15, 5-16, and 5-17.)

Step 1. Remove coaxial cables W801 and W802 at connectors J151 and J152, respectively. Remove coaxial cable at connector J154.

Step 2. Unsolder leads from feedthrough capacitors C160, C164, and C165.

Step 2. [illegible] switch in the 2-4 position. Remove the two bracket guides and switch slide located back of the preselector subassemblies.

Step 4. Unsolder leads to feedthrough terminals E151 and E152.

Step 5. Loosen the three captive mounting screws and remove the subassembly from the receiver chassis.

(c) ADJUSTMENT AND REPAIR OF PRESELECTOR MIXER SUBASSEMBLY. - Cover plates on the mixer subassembly can be removed for access to all parts and wiring (see figures 5-15, 5-16, and 5-17). In addition, a rectangular cover on the bottom of the subassembly can be removed to expose the tuning slugs for alignment and resistance measurements. All internal parts are readily removed and replaced by unsoldering leads and removing retaining nuts or screws.

(h) REMOVAL OF PARTS. (See figures 5-15, 5-16, and 5-17.) - To remove switch S151, unsolder all leads and note them for replacement purposes. Remove the switch lever (two screws) and note its position for replacement purposes. Remove the switch and mounting bracket (two screws). Remove the bushing nut and washer to separate the switch from bracket.

(i) REPLACEMENT OF PARTS. (See figures 5-15, 5-16, and 5-17.) - To replace switch S151, install the switch on the mounting bracket and engage the index lug in the [illegible] hole. Secure the switch to the bracket with bushing nut and washer. Install the switch with bracket in the subassembly (two screws). Install the switch lever and position it as noted during removal. Solder all leads to switch contacts following the order noted during removal.

(j) REPLACEMENT OF PRESELECTOR MIXER SUBASSEMBLY. (See figures 6-3, 5-15, 5-16, and 5-17.)

Step 1. Replace all cover plates removed during adjustment and repair.

Step 2. Place the assembly in position on the receiver chassis and secure it with the three captive mounting screws.

Step 3. Solder the leads to feedthrough capacitors E151 and E152.

Step 4. Place the BAND switch in the 2-4 position. Install the two guide brackets and switch slide, engaging the lever pins of both preselector subassemblies.

Step 5. Solder leads to feedthrough capacitors C160, C164, and C165, in the order noted during removal.

Step 6. Connect coaxial cables W801 and W802 to connectors J151 and J152, respectively. Connect coaxial cable P154 to connector J154.

(2) TUNABLE I-F FILTER. - The tunable i-f filter assembly is located on the interpolation oscillator assembly mounting plate, on the bottom of the receiver chassis near the front panel. It can be removed without removing the interpolation oscillator assembly. Pull out the receiver and raise it to expose the tunable i-f filter assembly.

(a) REMOVAL OF TUNABLE I-F FILTER ASSEMBLY. (See figures 6-3, 5-24, and 5-25.)

Step 1. Remove the coaxial cable P154 from connector J154 (preselector mixer subassembly), and remove coaxial cable P456 from connector J456 (first i-f and injection amplifier assembly).

Step 2. Unsolder lead to feedthrough terminal E351.

Step 3. Remove the two mounting screws and remove the tunable i-f filter from the interpolation oscillator mounting plate.

(b) ADJUSTMENT AND REPAIR OF THE TUNABLE I-F FILTER ASSEMBLY. (See figures 5-24 and 5-25.) - The assembly has a removable cover plate which permits inspection of internal parts, and most repairs. Removal of parts for repair or replacement is conventional in all cases except for the four-section variable capacitor C351. Removing this capacitor requires the removal of nearly all

the parts inside the assembly case and the removal of the three inner partitions. Because the variable capacitor is well-constructed with wide plate spacing, there is little chance that removal will be necessary.

(c) REPLACEMENT OF TUNABLE I-F FILTER ASSEMBLY. (See figures 6-3, 5-24, and 5-25.)

Step 1. Rotate the spur gear on the tuning shaft of capacitor C351 so as to place the colored dot on the shaft directly opposite the colored dot on the shaft bushing. (This adjustment completely meshes the capacitor plates.)

Step 2. Set the KILOCYCLE counter to read +08. 0.

Step 3. Place the assembly in position on the interpolation oscillator mounting plate being careful not to disturb the tuning shaft position, and mesh the spur gear with the KILOCYCLE counter pinion gear. Secure the assembly with the two mounting screws.

Step 4. Solder the lead to feedthrough terminal E351.

Step 5. Connect coaxial cable P154 to connector J154 (preselector mixer assembly), and connect coaxial cable P456 to connector J456 (first i-f and injection amplifier assembly).

(3) FIRST I-F AND INJECTION AMPLIFIER. - The first i-f and injection amplifier assembly is located on the receiver chassis at the rear. It contains three major circuit-sections: the first i-f amplifier, the injection amplifier, and the output amplifier. Pull out the receiver and raise it to expose the assembly.

(a) REMOVAL OF FIRST I-F AND INJECTION AMPLIFIER ASSEMBLY. (See figures 6-2, 6-3, 5-30, and 5-36.)

Step 1. Remove the nine coaxial cables at connectors J451, J452, J456, J458, J459, J460, J461, J462, and J463.

Step 2. Unsolder leads from feedthrough capacitors C451, C452, C455, and C503. Note the color and location for replacement purposes.

Step 3. Remove the four screws from the mounting brackets (on the bottom of the receiver chassis), and remove the assembly, lifting it from the top of the receiver chassis.

(b) ADJUSTMENT AND REPAIR OF FIRST I-F AND INJECTION AMPLIFIER ASSEMBLY. - A bottom plate on the first i-f and injection amplifier can be removed for access to all parts and wiring (see figure 5-31). All parts are readily removed by unsoldering leads or removing mounting screws or nuts. No mechanical adjustments are required at this assembly. If terminal boards are loosened temporarily for access to components or parts, the only requirement is the removal of the terminal-board mounting screws.

(c) REMOVAL OF PARTS. (See figures 5-30 and 5-31.)

1. To remove r-f coils L451, L452, and L455, unsolder the leads and note the color and location for replacement purposes. Remove the coil mounting nut and washer, and remove the coil.

2. To remove filters FL451, FL452, and FL453, unsolder the leads and note the color and location for replacement purposes. Remove the four nuts and washers and remove the filter, noting terminal locations on chassis.

3. To remove transformer T451, unsolder the leads and note the lead color and location. Remove the two nuts and washers and remove the transformer, noting the terminal locations with respect to the chassis parts.

(d) REPLACEMENT OF PARTS. (See figures 5-30 and 5-31.)

1. To replace r-f coils L451, L452, and L455, insert the threaded bushing in the chassis hole and secure it with the nut and washer. Solder the leads following the order noted during removal.

2. To replace filters FL451, FL452, and FL453, insert the [illegible] chassis holes, locating the terminals as noted during removal. Secure the filter with the four nuts and washers. Solder the leads following the order noted during the removal.

3. To replace transformer T451, insert the mounting screws into the chassis holes, locating the terminals as noted during removal. Secure the transformer with the two nuts and washers. Solder the leads following the order noted during the removal.

NOTE

When replacing filters or r-f coils with new parts, complete the alignment and adjustment procedure given in paragraph 6-4b before returning the receiver to service.

(c) REPLACEMENT OF FIRST I-F AND INJECTION AMPLIFIER ASSEMBLY. (See figures 6-2, 6-3, 5-30, and 5-31.)

Step 1. Replace the bottom plate on the assembly.

Step 2. Place the assembly in position on top of the receiver chassis and secure it to the mounting brackets (from the bottom of the receiver chassis) using the four screws and washers. (T451 should be at the rear of the receiver.)

Step 3. Solder the leads to feedthrough capacitors C451, C452, C455, and C500, following the order noted during removal.

Step 4. Reconnect the coaxial cables to connectors J451, J452, J456, J458, J459, J460, J461, J462, and J463.

(4) INTERPOLATION OSCILLATOR BUFFER. - The interpolation oscillator buffer assembly is located on the bottom of the receiver chassis in a central position at the rear. Pull out the receiver and raise it to expose the assembly.

(a) REMOVAL OF INTERPOLATION OSCILLATOR BUFFER ASSEMBLY. (See figures 6-3, 5-36, and 5-37.)

Step 1. Remove coaxial cables at connectors J651 and J652.

Step 2. Unsolder leads from feedthrough capacitors C654, C655, and C656. Note color and location for replacement purposes.

Step 3. Remove the two captive screws which secure the assembly; remove the assembly.

(b) ADJUSTMENT AND REPAIR OF INTERPOLATION OSCILLATOR BUFFER ASSEMBLY. - A wrap-around case can be removed for access to all parts and wiring (seven screws and washers). All parts are readily accessible for repair or replacement. No mechanical adjustments are required for this assembly.

(c) REMOVAL OF PARTS. (See figures 5-36 and 5-37.) - To remove transformer T651, unsolder the leads and note the color and location for replacement purposes. Remove the two nuts and washers and remove the transformer. Note the terminal locations on the chassis.

(d) REPLACEMENT OF PARTS. (See figures 5-36 and 5-37.) - To replace transformer T651, insert the mounting screws in the chassis holes, locating the terminals as noted during removal. Secure the transformer with the two nuts and washers. Solder the leads following the order noted during removal.

(e) REPLACEMENT OF INTERPOLATION OSCILLATOR BUFFER ASSEMBLY. (See figures 6-3, 5-36, and 5-37.)

Step 1. Replace the wrap-around case (six screws and washers).

Step 2. Position the assembly on the chassis and secure it with the two captive nuts.

Step 3. Solder leads to feedthrough capacitors C654, C655, and C656, following the order noted during removal.

Step 4. Replace the coaxial cables at connectors J651 and J652.

(5) MIXER AND SECOND I-F AMPLIFIER. - The mixer and second i-f amplifier assembly is located on top of the receiver chassis near the preselector assembly. Pull out the receiver and raise it to expose the assembly.

(a) REMOVAL OF MIXER AND SECOND I-F AMPLIFIER ASSEMBLY. (See figures 6-2, 5-41, and 5-42.)

Step 1. Remove coaxial cables W806 and W807 at connectors J551 and J553, respectively.

Step 2. Unsolder leads to feedthrough capacitors C552, C553, and C554. Note the order and lead color for replacement purposes.

Step 3. Loosen two of the captive mounting screws by inserting a Phillips screwdriver through the assembly holes provided. Loosen the remaining captive mounting screw (on the bracket) from the bottom of the receiver chassis.

Step 4. Remove the assembly from the receiver chassis.

(b) ADJUSTMENT AND REPAIR OF MIXER AND SECOND I-F AMPLIFIER ASSEMBLY. - A shield cover on top of the assembly can be removed for access to parts and wiring not available from the bottom of the assembly. Remove Nuvistors (electron tubes) V511 and V512 to facilitate removal of the two cover screws and washers. All parts are conveniently located for repair or replacement and may be removed by unsoldering leads or removing mounting screws or nuts. If terminal boards are to be loosened or removed for access to parts, the terminal-board mounting screws must be removed and external leads unsoldered. No mechanical adjustments are required for this assembly.

(c) REMOVAL OF PARTS. (See figures 5-41 and 5-42.)

1. To remove transformers T551 and T552, unsolder all external leads to terminal board TB551 (note the color and lead location for replacement purposes) and remove the four mounting screws and the terminal board. Unsolder the transformer leads and code them for replacement purposes. Remove the single nut and washer securing the transformer to the terminal board and remove the transformer.

2. To remove the balanced-mixer diodes (CR551 through CR554), unsolder all external leads to terminal board TB551 (note the color and lead location for replacement purposes), and remove the four mounting screws and the terminal board. Unsolder the diode leads, noting diode polarity for replacement purposes.

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diodes on TB501 terminal posts, noting diode polarity. Replace terminal board TB501 and secure with four screws and washers. Resolder terminal board leads following the order noted during removal. Observe the CAUTION following paragraph 6-5c(5)(c)2.

3. To replace crystal Y551, plug the crystal into the socket and replace the spring clip.

NOTE

When replacing crystal Y551 with a new part, complete the alignment and adjustment procedure given in paragraph 6-4g(4) before returning the receiver to service.

(e) REPLACEMENT OF MIXER AND SECOND I-F AMPLIFIER ASSEMBLY. (See figures 6-2, 5-41, and 5-42.)

Step 1. Replace the shield cover on top of the assembly (two screws and washers), and replace Nuvistors (electron tubes) V551 and V552 which were originally removed for access to the screws.

Step 2. Position the assembly on the receiver chassis and secure it by tightening the captive screw on the bracket, and the two captive screws accessible through the assembly holes.

Step 3. Solder the leads to feedthrough capacitors C552, C553, and C554, in the order noted during removal.

Step 4. Reconnect coaxial cables W806 and W807 to connectors J551 and J553, respectively.

(6) AGC AMPLIFIER. - The agc amplifier is located on top of the receiver chassis near the front panel. It consists of two major circuit-sections: the agc amplifier and the 100-kc buffer-amplifier. Pull out the receiver and raise it to expose the assembly.

(a) REMOVAL OF AGC AMPLIFIER ASSEMBLY. (See figures 6-2, 5-46, and 5-47.)

Step 1. Remove coaxial cables at connector J201 (harmonic amplifier assembly), and connectors J601 and J602 (agc amplifier assembly).

Step 2. Unsolder leads to feedthrough capacitors C601, C602, C604, and C605. Note the color and lead location for replacement purposes.

Step 3. Unsolder leads to feedthrough terminals E601, E602, E603, E604, E605, and E606. Note color and lead location for replacement purposes.

Step 4. Loosen three captive screws on the assembly brackets and remove the assembly.

(b) ADJUSTMENT AND REPAIR OF AGC AMPLIFIER ASSEMBLY. - All parts are readily removed by unsoldering leads or removing mounting screws or nuts. No mechanical adjustments are required for this assembly. If terminal boards are to be loosened or removed for access to parts, mounting screws must be removed and external leads unsoldered.

(c) REMOVAL OF PARTS. (See figures 5-46 and 5-47.)

1. To remove transformer T601, unsolder the leads. Note the color and location for replacement purposes. Remove the two mounting nuts and washers and remove the transformer.

2. To remove diodes CR601 through CR604, unsolder diode leads from terminal board, noting polarity and position for replacement purposes. If necessary, terminal board TB601 (diodes CR601, CR602, and CR603), and terminal board TB603 (diode CR603), can be removed for access to the diodes. To remove either terminal board, unsolder all external leads, noting the color and location for replacement purposes. Remove the board mounting screws and the board. Observe CAUTION following paragraph 6-5c(6)(c)2.

3. Remove r-f coils L601 and L602 (100-kc buffer amplifier) by unsoldering leads. Note

the color and location for replacement purposes. Remove mounting nut and washer and remove the transformer.

(d) REPLACEMENT OF PARTS. (See figures 5-46 and 5-47.)

1. To replace transformer T601, insert the mounting screws into the chassis holes, noting that the terminal location corresponds with the chassis marking, and secure the transformer with the two nuts and washers. Solder the leads following the order noted during removal.

2. To replace diodes CR601 through CR604, install the diode on the terminal board noting the polarity and position required. Solder the diode leads, observing the CAUTION note which follows. If the terminal boards were removed, replace the boards and secure it with the mounting screws. Resolder all external leads in the order noted during removal.

CAUTION

To protect the diode when soldering or unsoldering, clamp the diode lead (between the soldering iron and the diode body) with long-nose pliers. The pliers functions as a heat sink and reduces diode temperature during the soldering process.

3. To replace r-f coils L601 and L602, insert the threaded stud into the chassis hole and secure it with the mounting nut and washer. Solder the leads following the order noted during removal.

(e) REPLACEMENT OF AGC AMPLIFIER ASSEMBLY. (See figures 6-2, 5-46, and 5-47.)

Step 1. Position the assembly on the receiver chassis and secure it with the three captive screws on the mounting brackets.

Step 2. Solder the leads to feedthrough terminals E601, E602, E603, E604, E605, and E606, following the order noted during removal.

Step 3. Solder the leads to feedthrough capacitors C601, C602, C603, C604, and C605, in the order noted during removal.

Step 4. Reconnect coaxial cables at connector J201 (harmonic amplifier assembly), and connectors J601 and J602 (agc amplifier assembly).

(7) HIGH-FREQUENCY OSCILLATOR MAINTENANCE. - The high-frequency oscillator is located centrally on the receiver chassis. Pull out the receiver and raise it to expose the assembly. The assembly is removed from the bottom of the receiver chassis.

(a) REMOVAL OF HIGH-FREQUENCY OSCILLATOR ASSEMBLY. (See figures 6-2, 6-3, 5-51, 5-52, and 5-53.)

Step 1. Remove coaxial cables W303 and W302 at connectors J301 and J302, respectively.

Step 2. Unsolder leads at feedthrough capacitors C315 and C317, noting lead location for replacement purposes.

Step 3. Set the BAND switch to position 2-4 and remove the two bracket-guides and switch slide located at the [illegible] end of the assembly. (This also opens the harmonic amplifier [illegible] by interlock.)

Step 4. Unsolder leads to [illegible] feedthrough terminals E301 and E302.

Step 5. [illegible] mounting screws and remove the assembly from the [illegible].

(b) [illegible] OF HIGH-FREQUENCY OSCILLATOR ASSEMBLY. - A [illegible] high-frequency oscillator assembly can be removed for access to all parts and wiring. (See figures 5-51, 5-52, and 5-53.) In addition, a rectangular cover plate on the bottom of the

assembly can be removed to expose the tube socket for voltage and resistance measurements. All parts are readily removed and replaced by unsoldering the leads and by removing the securing nuts or screws.

(c) REMOVAL OF PARTS. (See figures 5-51, 5-52, and 5-53.) - To remove switch S301, unsolder all leads and code them for replacement purposes. Remove the switch lever (two screws), and note the position for replacement purposes. Remove the switch with mounting bracket (two screws). Remove the bushing nut and washer to separate the switch from the bracket.

(d) REPLACEMENT OF PARTS. (See figures 5-51, 5-52, and 5-53.) - To replace switch S301, install the switch on the mounting bracket and engage the index lug in the bracket hole. Secure the switch with the bushing nut and washer. Install the switch with bracket in the assembly (two screws). Install the switch lever and position as noted during removal. Solder all leads to the switch contacts following the order and coding noted during switch removal.

(e) REPLACEMENT OF HIGH-FREQUENCY OSCILLATOR ASSEMBLY. (See figures 6-2, 6-3, 5-51, 5-52, and 5-53.)

Step 1. Replace all cover plates removed during adjustment and repair.

Step 2. Place the assembly on the receiver chassis and secure it to the chassis with the two captive screws.

Step 3. Solder the leads to feedthrough terminals E301 and E302.

Step 4. Place the BAND switch in the 2-4 position. Install the two guide brackets and the switch slide, engaging the switch levers of the high-frequency oscillator and the harmonic amplifier assemblies.

Step 5. Solder the leads to feedthrough capacitors C315 and C217 in the order noted during removal.

Step 6. Replace coaxial cables W803 and W802 at connectors J301 and J302, respectively.

(8) INTERPOLATION OSCILLATOR. - The interpolation oscillator is located on the receiver chassis near the front panel. It consists of an assembly plate containing the tunable i-f filter, the interpolation oscillator, and the KILOCYCLE counter. The counter is coupled to variable capacitor C407 (interpolation oscillator) and variable capacitor C351 (tunable i-f filter). See paragraph 6-5c(2) for maintenance information on the tunable i-f filter.

(a) REMOVAL OF INTERPOLATION OSCILLATOR ASSEMBLY. (See figures 6-2, 5-57, and 5-58.)

Step 1. Remove the first i-f and injection amplifier assembly to make room for removal of the interpolation oscillator (see paragraph 6-5c(3)(a)).

Step 2. Remove coaxial cable at connector J154 (preselector).

Step 3. Unsolder leads at feedthrough capacitors C409, C412, and C413 (interpolation oscillator), and the lead at terminal E351 (tunable i-f filter). Note the color and location for replacement purposes.

Step 4. Unsolder the lead at KILOCYCLE counter lamps DS903 and DS904.

Step 5. Loosen the two Allen setscrews and remove TUNING (Kc) knob from the front panel of the receiver.

Step 6. Loosen the four captive screws on the assembly plate and remove the assembly from the receiver, withdrawing the KILOCYCLE counter shaft from the panel hole.

(b) ADJUSTMENT AND REPAIR OF INTERPOLATION OSCILLATOR ASSEMBLY. - A cover plate on the interpolation oscillator coil assembly can be removed for access to the tube socket (for voltage and resistance measurements) and for access to the parts and wiring. All parts are easily removed by unsoldering leads and removing the securing nuts and screws. The shield-can, covering variable capacitor C407, can be removed to inspect the capacitor and the tuning shaft coupling.

(c) REMOVAL OF PARTS. (See figures 5-24, 5-57, and 5-58.)

1. To remove the interpolation oscillator coil assembly, first remove the shield-cam on variable capacitor C407, then unsolder the leads to feedthrough terminals E401 and E402. Remove the four mounting screws, accessible inside the coil box, and remove the coil assembly.

2. To remove the KILOCYCLE counter mechanism, use an Allen wrench to loosen the shaft-coupling clamp and remove the four screws which secure the counter. Remove the counter, sliding the shaft free of the coupling.

NOTE

Removal of variable capacitor C407 is not recommended as a field maintenance measure. Compensating plate-segments on the capacitor have been factory adjusted to track with the KILOCYCLE counter settings. In the event of malfunction it is suggested that the complete interpolation oscillator assembly (less the tunable i-f filter and counter) be replaced. Removal and replacement instructions for the variable capacitor are included in this section as an emergency repair measure only.

3. To remove variable capacitor C407, remove the shield-cam (four screws) and unsolder the leads to feedthrough terminals E401 and E402. Loosen the shaft coupling clamp, using an Allen wrench. Remove the four mounting screws and remove the capacitor, sliding the shaft free of the coupling.

(d) DISASSEMBLY OF KILOCYCLE COUNTER. - The following instructions refer to the steps applicable to the removal of specific parts of the counter (see figure 6-4).

1. To remove the drive gears and stop ring assembly from the gear housing, perform steps 1 through 5.

2. To remove the counter shaft and number wheel assembly, perform step 6.

3. To remove the pinion shaft and the three pinion gears, perform step 7.

4. To disassemble the kilocycle counter completely, perform all the following steps.

Step 1. To remove the spur and helical gears from the tuning shaft, remove the locking ring at the back end of the tuning shaft. Loosen the setscrews on the two gears. Slide the shaft forward through both gears, and through the ball bearing in the front of the gear housing.

Step 2. To remove the spur gear from the output shaft, remove the locking ring at the back end of the output shaft. Loosen the setscrews on the spur gear and slide the output shaft out through the rear of the gear housing.

Step 3. Remove the helical idler gear by removing one machine screw and nut.

Step 4. To remove the driver helical gear and stop ring assembly, loosen the setscrews in the stop collar and helical driver gear. Slide the stop collar and all the stop rings to the back end of the transfer shaft, exposing the locking ring. Remove the locking ring and slide the shaft through all the parts and out through the front of the gear housing.

Step 5. To remove the driver shaft, driven helical gear, and idler gear, remove the pins from both gears. Remove the retaining ring and loosen the setscrews in both gears. Slide the driver shaft through both gears and out through the ball bearing in the side of the gear housing.

Step 6. To remove the counter shaft and number wheel assembly, loosen the setscrew in the pinion gear on the counter shaft. Slide the pinion gear, spacer washer, and ball bearing along the shaft toward the number wheels. Move the shaft into the hole from which the bearing was removed so that the right-hand end of the shaft can be removed from its bearing and the assembly can be tilted up and removed.

NOTE

Do not remove the pinion shaft unless there are worn or damaged parts to be replaced, because the locking rings used to secure the pinion shaft are damaged during the removal. If it becomes necessary to remove the pinion shaft, remove the locking rings and slide the shaft out through the supporting bracket.

(c) ASSEMBLY OF THE KILOCYCLE COUNTER. - The following instructions refer to the steps applicable to assembling specific parts of the counter:

1. If the counter shaft number wheel assembly has been removed, perform steps 1 through 6.

2. If the pinion shaft has been removed, perform steps 7 and 8.

3. If the drive gears and locking ring assembly have been removed, perform steps 9 through 27 (see figure 6-4).

NOTE

Lubricate all shafts and bearings with watch oil and all other friction points with grease during assembly.

Step 1. Assemble the three number wheels to the left of the units wheel on the counter shaft.

Step 2. Position the stop collar on the counter shaft and allow 0.014 to 0.018 inch clearance between the last number wheel and the stop collar. Tighten the setscrews.

Step 3. Slide the pinion gear, washer, and ball bearing to the center of the shaft. Place a ball bearing on the opposite end of the shaft.

Step 4. Insert the left-hand end of the shaft into the appropriate hole in the left side of the gear housing; then move the whole assembly to the right, seating the ball bearing in the hole provided in the right-hand side of the gear housing.

Step 5. Slide the left-hand ball bearing along the shaft until it seats in the hole provided in the gear housing.

Step 6. Slide the spacer washer and pinion gear to the left and tighten the setscrews in the pinion gear, allowing for 0.003 inch maximum end play.

Step 7. Insert the end of the pinion shaft through the hole in the supporting bracket, and while sliding the shaft to the right, assemble the pinion gears in place on the shaft (be sure that the pinions mesh with the number wheels).

Step 8. Install a locking ring on each end of the pinion shaft.

Step 9. Insert two ball bearings in the holes for the driver shaft, and slide the driver shaft through the right-hand bearing.

Step 10. Slide the driver helical gear, the driver gear, and the spacer washer onto the shaft, and insert the shaft into the left-hand ball bearing.

Step 11. Place a locking ring in the groove on the right-hand end of the shaft, and adjust the drive gear for zero end play. Tighten the setscrews in the drive gear. (The setscrews in the driver helical gear are tightened later.)

Step 12. Install the two ball bearings for the transfer shaft and slide the cut-down end of the shaft through the front bearing.

Step 13. Place the following items on the shaft: 1 No. one locking ring, 12 No. two

locking rings, 1 No. three locking ring, the stop collar, the driver helical gear, and the shaft collar.

Step 14. Slide the shaft in until it seats in the rear bearing.

Step 15. Slide all the parts on the shaft to the rear to make room for the locking ring.

Step 16. Install the locking ring in the groove provided on the shaft.

Step 17. Slide all the parts on the shaft to the front, and adjust and secure the shaft collar so that there is no end play. Check that the shaft turns freely.

Step 18. Insert the tab on No. one locking ring into the hole above the shaft; then adjust and secure the stop collar so that the locking rings are close but not tight.

Step 19. Install the helical idler gear assembly, using the machine screw, lockwasher, and flat washer on the inside and a lockwasher and nut on the outside of the rear panel.

Step 20. Install the two ball bearings for the tuning shaft, and insert the grooved end of the shaft through the front bearing.

Step 21. Place the spur gear and the helical gear on the shaft. Install the locking ring in the groove near the end of the shaft, and insert the end of the shaft into the rear bearing.

Step 22. Slide the spur gear forward and secure it with the setscrews so that the shaft has no end play, but it still turns freely.

Step 23. Install the two bearings for the output shaft and insert the cut-down end of the shaft through the front bearing.

Step 24. Place the washer, spur gear, and locking ring on the shaft, and slide the shaft through the rear bearing until it stops.

Step 25. Adjust the spur gear so that it meshes properly with the spur gear on the tuning shaft, and secure it with the setscrews.

Step 26. Adjust the position of all helical gears so that they mesh properly; then install the drive pins where they are required.

Step 27. With the tuning shaft in the fully counterclockwise position (against the stop), set the counter to read -850.

(f) REPLACEMENT OF PARTS. (See figures 5-57 and 5-58.)

1. To replace the interpolation oscillator coil assembly, position the assembly on the assembly plate and secure with the four screws which are installed inside the coil box. Solder leads to feedthrough terminals E401 and E402, and replace the shield-can on variable capacitor C407.

2. To replace the KILOCYCLE counter, place it in position and slide the shaft into the capacitor coupling. Secure the counter with four screws. Carefully set the counter to read approximately +06. 0, and mesh the rotor plates of capacitor C407 flush with the stator plates (fully meshed). Tighten the shaft clamp.

3. To replace capacitor C407, place it in position and slide the shaft coupling onto the KILOCYCLE counter shaft. Secure the capacitor with the mounting screws and resolder leads to feedthrough capacitors E401 and E402. Carefully set the counter to read approximately +06. 0, and mesh the capacitor rotor plates flush with the stator plates (fully meshed). Tighten the shaft coupling. Replace the capacitor shield-can.

(g) REPLACEMENT OF INTERPOLATION OSCILLATOR ASSEMBLY. (See figures 6-2, 5-57, and 5-58.)

Step 1. Position the interpolation oscillator assembly plate on the receiver chassis, inserting the KILOCYCLE counter shaft through the panel hole. Secure the assembly with the four captive screws.

Step 2. Replace the TUNING (Kc) knob and tighten the two setscrews.

Step 3. Resolder the lead to KILOCYCLE counter lamps DS903 and DS904.

Step 4. Resolder the leads to feedthrough capacitors C409, C412, and C413 (interpolation oscillator), and the lead to terminal E351 (tunable i-f filter) in the order noted during removal.

Step 5. Replace the coaxial cable at connector J154 (preselector).

Step 6. Replace the first i-f and injection amplifier assembly (see paragraph 6-5c(3)(e)).

(9) HARMONIC AMPLIFIER. - The harmonic amplifier consists of two subassemblies: the r-f amplifiers and the harmonic mixer. They are centrally located on the receiver chassis and can be removed individually for repair or adjustments. Pull out the receiver and raise it to expose the two subassemblies.

(a) REMOVAL OF HARMONIC AMPLIFIER R-F SUBASSEMBLY. (See figures 6-2, 6-3, 5-63, and 5-64.)

Step 1. Remove the coaxial cable at connector J201, and cable W804 at connector J204.

Step 2. Unsolder leads from feedthrough capacitors C201, C202, C203, C204, C205, C207, and C208. Note the color and location for replacement purposes.

Step 3. Place the BAND switch in the 2-4 position. Remove the two guide brackets and the switch slide located back of the harmonic amplifier subassemblies.

Step 4. Unsolder the leads from feedthrough terminals E201, E202, E203, and E204. Note the color and location for replacement purposes.

Step 5. Loosen the three captive mounting screws and remove the subassembly from the receiver chassis.

(b) ADJUSTMENT AND REPAIR OF HARMONIC AMPLIFIER R-F SUBASSEMBLY. - Cover plates on the subassembly can be removed for access to all parts and wiring. In addition, a rectangular plate on the bottom of the subassembly can be removed to expose the tube sockets for voltage and resistance measurements. All parts are readily removed by unsoldering leads and removing securing nuts or screws.

(c) REMOVAL OF PARTS. (See figures 5-63 and 5-64.)

1. To remove switch S201 or S202, unsolder all leads and code them for replacement purposes. Remove the switch lever (two screws) and note the switch position for replacement purposes. Remove the switch and mounting bracket (two screws). Remove the bushing nut and washer and separate the switch from the bracket.

2. To remove diode CR201, unsolder the diode leads (note diode polarity for replacement purposes).

CAUTION

To protect the diode when soldering or unsoldering, clamp the diode lead (between the soldering iron and the diode body) with long-nose pliers. The pliers functions as a heat sink and reduces the diode temperature during the soldering process.

(d) REPLACEMENT OF PARTS. (See figures 5-63 and 5-64.)

1. To replace switch S201 or S202, install the switch on the mounting bracket and engage the index lug in the bracket hole. Secure the switch with the bushing nut and washer. Install the switch and bracket in the subassembly (two screws). Install the switch lever and position it as noted during removal. Solder all leads to switch contacts following the order and coding noted during removal.

2. To replace diode CR201, install the diode (noting the proper polarity) and solder the leads. Observe the CAUTION note following paragraph 6-5c(9)(c).

(e) REPLACEMENT OF HARMONIC AMPLIFIER R-F SUBASSEMBLY. (See figures 6-2, 6-3, 5-63, and 5-64.)

Step 1. Replace all cover plates removed during adjustment and repair.

Step 2. Place the subassembly in position on the receiver chassis and secure it with the captive screws.

Step 3. Solder the leads to feedthrough terminals E201, E202, E203, and E204, in the order noted during removal.

Step 4. Place the BAND switch in the 2-4 position. Install the two bracket guides and the switch slide, engaging the lever pins of both subassemblies.

Step 5. Solder leads to the feedthrough capacitors C201, C202, C203, C204, C205, C207, and C208, following the order noted during removal.

Step 6. Reconnect the coaxial cable at connector J201, and cable W804 at connector J204.

(f) REMOVAL OF HARMONIC AMPLIFIER MIXER SUBASSEMBLY. (See figures 6-2, 6-3, and 5-65 through 5-67.)

Step 1. Remove the coaxial cables W804, W803, and W805 from connectors J251, J252, and J253, respectively.

Step 2. Unsolder the leads to feedthrough capacitors C251, C264, C266, and C267. Note the color and lead location for replacement purposes.

Step 3. Place the BAND switch in the 2-4 position. Remove the two guide brackets and the switch slide located back of the harmonic amplifier subassemblies.

Step 4. Unsolder the leads from feedthrough terminals E251 and E252, noting the location for replacement purposes.

Step 5. Remove the ground strap connecting the high-frequency oscillator assembly with the harmonic mixer subassembly (four screws, on the bottom of the assemblies).

Step 6. Loosen the three captive screws and remove the subassembly from the receiver chassis.

(g) ADJUSTMENT AND REPAIR OF HARMONIC AMPLIFIER MIXER SUBASSEMBLY. - A cover plate on the subassembly can be removed for access to all parts and wiring (see figures 5-65, 5-66, and 5-67). In addition, a rectangular plate on the bottom of the subassembly can be removed to expose the tube socket for voltage and resistance measurements. All parts are easily removed by unsoldering leads and removing the securing nuts or screws.

(h) REMOVAL OF PARTS. (See figures 5-65, 5-66, and 5-67.) - To remove switch S251, unsolder the leads and code them for replacement purposes. Remove the switch lever (two screws) and note the switch position for replacement purposes. Remove the switch and mounting bracket (two screws). Remove the bushing nut and washer and separate the switch from the bracket.

(i) REPLACEMENT OF PARTS. (See figures 5-65, 5-66, and 5-67.) - To replace switch S251, install the switch on the mounting bracket and engage the index lug in the bracket hole. Secure the switch with the bushing nut and washer. Install the switch and bracket in the subassembly (two screws). Install the switch lever and position as noted during removal. Solder all leads to switch contacts following the order noted during removal.

(j) REPLACEMENT OF HARMONIC AMPLIFIER MIXER SUBASSEMBLY. (See figures 6-2, 6-3, and 5-65 through 5-67.)

Step 1. Replace all cover plates removed during adjustment and repair.

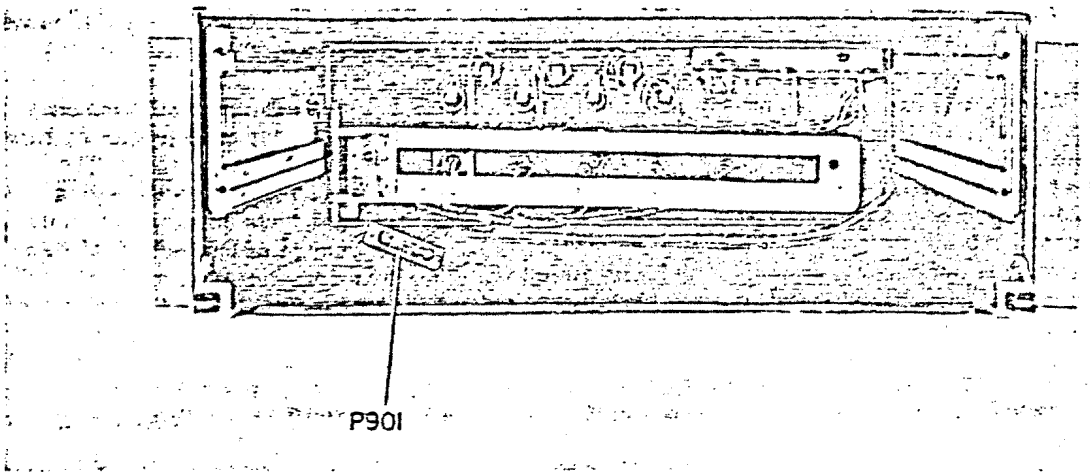


Figure 6-5. Cabinet of Countermeasures Receiver R-1125/FLR

(b) REMOVAL OF REAR PANEL. (See figure 2-3.)

Step 1. Pull out the receiver and lower it to expose connector P901 on the rear of the chassis. Disconnect the cable at J901 and remove the cable clamp (one screw). Push the receiver into its cabinet.

Step 2. Remove the cabinet rear panel mounting screws (twelve), and remove the rear panel from the cabinet.

(c) REMOVAL OF PARTS. (See figure 5-78.)

1. To remove Zener diodes CR951, CR952, and CR953, unsolder the leads; note the color and location for replacement purposes. Remove the mounting nut and washer, noting the insulating bushing and washers, and remove the diode. Observe the CAUTION below during soldering operati

2. To remove the receiver cable and retractor mechanism, remove the screws and nut (two) securing the hinge to the rear panel. Unsolder the leads to connectors J951 through J955 and c each lead for replacement purposes. Remove the clamps holding the cable to the rear panel.

(d) REPLACEMENT OF PARTS. (See figure 5-78.)

1. To replace Zener diodes CR951, CR952, and CR953, assemble the insulating washe and the insulating bushing on the diode body, and insert the diode in the mounting bracket hole (obse the polarity noted during removal). Install the second insulating washer and secure the diode with the mounting nut and washer. Solder the leads following the order noted during removal.

CAUTION

To protect the diode when soldering or unsoldering, clamp the diode terminal (between the soldering iron and the diode body) with long-nose pliers. The pliers acts as a heat sink and reduces diode temperature during the soldering process.

2. To replace the receiver cable and retractor mechanism, solder the leads to connec tors J951 through J955 following the order noted during removal. Secure the cable to the rear panel with the clamps. Place the hinge of the retractor mechanism in position and secure it to the rear pa with the two screws and nuts.

(e) REPLACEMENT OF REAR PANEL. (See figure 6-4.)

Step 2. Place the subassembly in position on the receiver chassis and secure it with the three captive screws.

Step 3. Install the ground strap between the harmonic mixer and the high-frequency oscillator assembly (four screws).

Step 4. Solder the leads to feedthrough terminals E251 and E252, following the order noted during removal.

Step 5. Place the BAND switch in the 2-4 position. Install the two bracket guides and the switch slide, engaging the lever pins of both assemblies.

Step 6. Solder the leads to feedthrough capacitors C251, C264, C266, and C267, following the order noted during removal.

Step 7. Reconnect cables W804, W803, and W805 to connectors J251, J252, and J253, respectively.

(10) DF INDICATOR CIRCUIT. - The DF indicator circuit consists of front panel lamps DS901 (LOW) and DS902 (HIGH) (see figure 3-1); rotary switch S801, operated by the BAND switch lever (see figures 5-74 and 5-75); and two cam-operated momentary switches S802 and S803, located in the end section of preselector variable-capacitor C801 (see figures 5-74 and 5-75). Pull out the receiver and raise it to expose the parts.

(a) ADJUSTMENT AND REPAIR OF DF INDICATING CIRCUIT PARTS. - All parts in the DF indicating circuit are easily removed by unsoldering leads and removing the securing nuts or screws. An exception is switch S801, the coupling hub of which is pinned (in addition to a setscrew). If terminal board TB802 is to be loosened temporarily for access to the parts, the mounting screws must be removed.

(b) REMOVAL OF PARTS. (See figures 5-74 and 5-75.)

1. To remove switch S801, place the BAND switch in 2-4 position. Remove the switch lever coupling-hub using a pin punch. Remove the switch bracket from the chassis (two screws), noting the ground lead connection, and disengage the switch lever from the switch slide. Position the switch and bracket to expose the switch contacts and unsolder all switch leads, noting their locations for replacement purposes. Remove the switch lever (two screws) and the coupling-hub (one setscrew). Remove the bushing nut and washer to separate switch from bracket.

2. To remove switches S802 and S803, remove the switch mounting bracket from capacitor C801 frame (two screws). U solder all leads and code them for replacement purposes. Remove each switch (two screws), noting the position for replacement purposes.

(c) REPLACEMENT OF PARTS. (See figures 5-74 and 5-75.)

1. To replace switch S801, mount it on the bracket in the position shown in figure 5-55, and secure it with the bushing nut and washer. Install the coupling hub and switch lever (do not install the hub pin at this time), and solder all leads in the order noted during removal. Position the switch bracket on the chassis and engage the switch lever in the switch slide. Secure the bracket (two screws) and the ground lead connection. Place the BAND switch in the 16-32 position and install the coupling-hub pin.

2. To replace switch S802 and S803, position the switch on the mounting bracket (as noted during removal) and secure to the bracket (two screws). Install the bracket on the frame of capacitor C801 (two screws) and resolder all switch leads following the order noted during removal.

(11) REAR PANEL MAINTENANCE. - The receiver cabinet rear-panel contains the voltage regulating circuits, fuses, and the connectors for external cabling. A cable retracting mechanism for the receiver drawer is located on the rear of the panel (see figure 6-5).

(a) ADJUSTMENT AND REPAIR OF REAR-PANEL PARTS. - All parts on the receiver cabinet rear-panel are readily removed for repair and replacement by unsoldering leads and removing the securing nuts or screws. A fuse-cover on the panel can be removed for access to the receiver fuses.

Step 1. Position rear panel on the receiver cabinet and secure it with the mounting screws (12).

Step 2. Pull out the receiver and lower it to expose connector P901 on the chassis rear. Connect cableand plug to J901, and secure the cable to the chassis with the cable clamp (one screw).

(12) MEGACYCLE COUNTER. - The MEGACYCLE counter indicates the nominal frequency (in megacycles) to which the receiver is tuned. Four drum-type counters, one for each frequency band, provide a direct reading in megacycles and are driven by gears from the TUNING (Mc) shaft. The counter selector mechanism containing the four counters is operated by the BAND switch through a steel drive cable to position the proper counter in the panel window. The complete counter assembly and the drive cable can be replaced in the event of malfunction, but replacement of the individual number drums or gears is not recommended. The lucite illuminating element containing lamps DS803 and DS804 can be separately replaced. Pull out the receiver to expose the counter assembly and raise the chassis to locate the drive cable and pulleys.

(a) REMOVAL OF MEGACYCLE COUNTER. (See figures 6-6, 6-7, and 6-8.) - Before removing the counter, first remove the selector wheel drive cable by performing the following steps in the order given.

NOTE

If only the drive cable is to be removed and replaced, ignore the counter removal instructions and perform the steps given in paragraphs 6-5c(12)(a)1 and 6-5c(12)(b)2.

1. REMOVAL OF DRIVE CABLE.

Step 1. Place the BAND switch in the 2-4 position.

Step 2. Loosen the clamp screw D1 on pulley D and remove drive cable from pulley.

Step 3. Place the BAND switch in the 8-16 position.

Step 4. Loosen the clamp screw D2 on pulley D and remove the drive cable.

Step 5. Manually rotate the selector wheel so as to place the counter with the largest gear at the panel window.

Step 6. Loosen the clamp screw on pulley A and remove the loop of drive cable. Completely remove cable by pulling ends through chassis holes Y and Z.

2. COUNTER REMOVAL. - Before removing the counter assembly, unsolder the wire connection to lamp sockets XDS803 and XDS804. (See figure 6-2.)

Step 1. Loosen the two Allen setscrews on the TUNING (Mc) knob and remove knob from the tuning shaft.

Step 2. Remove the four mounting screws securing the counter to the chassis (three from the top and one from the bottom of the chassis). Note that two screws are long and two are short.

Step 3. Tilt the counter to separate the shaft coupling (5, figure 6-8), and remove the counter by withdrawing the shaft through the panel hole.

Step 4. Loosen the two Allen screws on the flexible coupling (7, figure 6-8) and remove the coupling.

Step 5. Remove the two screws attaching the lucite element to the counter frame and remove the element.

(b) DISASSEMBLY OF MEGACYCLE COUNTER. - The following is the procedure for disassembling the megacycle counter (see figure 6-8). It will be unnecessary in all instances to disassemble the unit completely, so the following instructions refer to the steps applicable to the part that needs replacement.

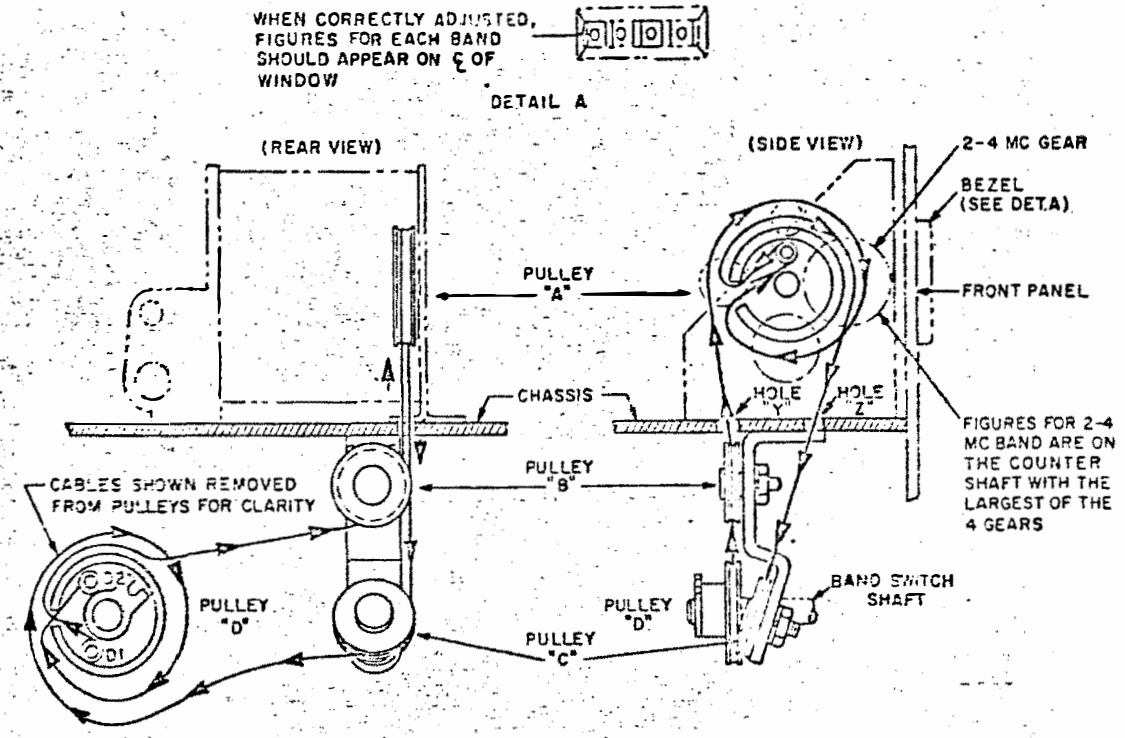


Figure 6-6. Megacycle Counter, Drive Cable Installation

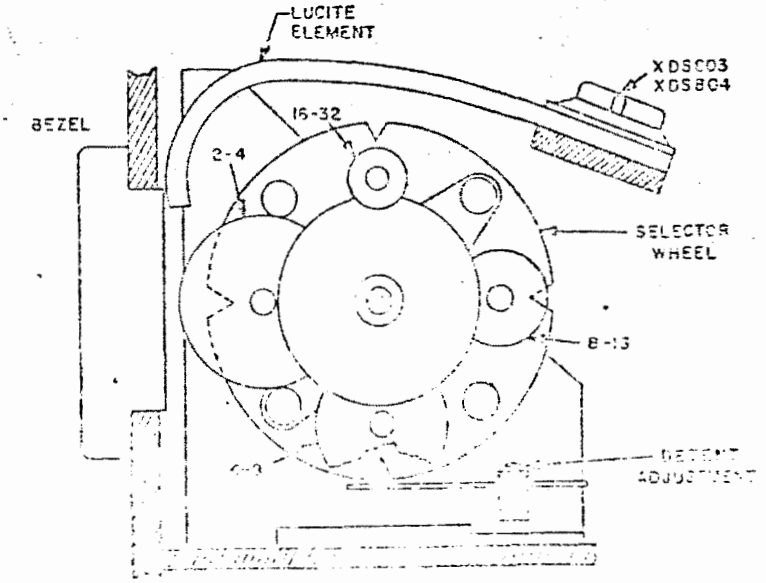


Figure 6-7. Megacycle Counter, Selector Wheel and Detent

1. If only the counter drum assembly is to be removed, perform steps 1 through 3.

2. If an individual counter is to be removed from the counter drum assembly, perform steps 1 through 4.

3. To disassemble a counter, perform step 6.

4. To remove only the cluster gear assembly, perform steps 1 through 3, and 6.

5. To remove the megacycle (MC) tuning shaft and stop ring assembly, perform step 7.

6. To disassemble the megacycle counter completely, complete all the following steps:

Step 1. Remove the three 4-40 screws from the left-hand counter mounting bracket. Slide the bracket off the center shaft.

Step 2. Remove the three 4-40 screws from the right-hand counter mounting bracket, and the three counter bracket spacers. Be careful when removing the rear spacer; it contains the counter detent spring.

Step 3. Slide the counter drum assembly (containing four counters) off the center shaft.

Step 4. If an individual counter from the counter drum assembly needs replacement, remove the pinion gear from the end of the counter shaft, and the four screws from the pulley subassembly. Now remove the pulley subassembly and the four counter pinion shafts (each has three pinion gears), and slide the counter shaft (from which the pinion gear was removed) from the counter drum assembly.

Step 5. If the counter needs complete disassembly, slide the three number wheels off the counter shaft. The fourth or units wheel is pinned on the counter shaft; to remove the units wheel drive the pin out carefully, using a drive punch of the correct size.

Step 6. To remove the cluster gear subassembly from the right-hand counter mounting bracket, remove the pin from the helical gear at the end of the center shaft. Loosen the setscrew and remove the helical gear. Remove one locking ring and slide the shaft out of the oilite bearing in the right-hand counter mounting bracket.

Step 7. To remove the megacycle (MC) tuning shaft and stop ring assembly, carefully drive the pin from the helical drive gear and loosen the setscrew. Remove the drive pin and loosen the setscrew on the stop collar. Slide the helical drive gear, stop collar, stop rings, and spur gear forward on the megacycle (MC) tuning shaft, exposing a locking ring. Remove the locking ring and slide the shaft out the back of the right-hand counter mounting bracket.

(c) ASSEMBLY OF MEGACYCLE COUNTER. - The following instructions refer to the step applicable to assembling specific parts (see figure 6-9).

1. To assemble the counter drum assembly, perform steps 16 through 18.

2. If an individual counter has been disassembled, perform steps 1 through 18.

3. If the cluster gear assembly has been removed, perform steps 12 through 18.

4. If the megacycle (MC) tuning shaft and stop ring assembly has been removed, perform steps 19 through 27.

5. If either counter mounting bracket is new, assemble the right-hand and left-hand counter mounting brackets on a flat surface. Line-ream the bushings to 0.1565 (+0.0005, -0.0000) inch. Reassemble the megacycle counter as follows:

Step 1. Assemble each counter with a shaft of different length. Place one spacer washer over the small end of the counter shaft (where it fits between the units wheel and the end plate of the counter drum assembly).

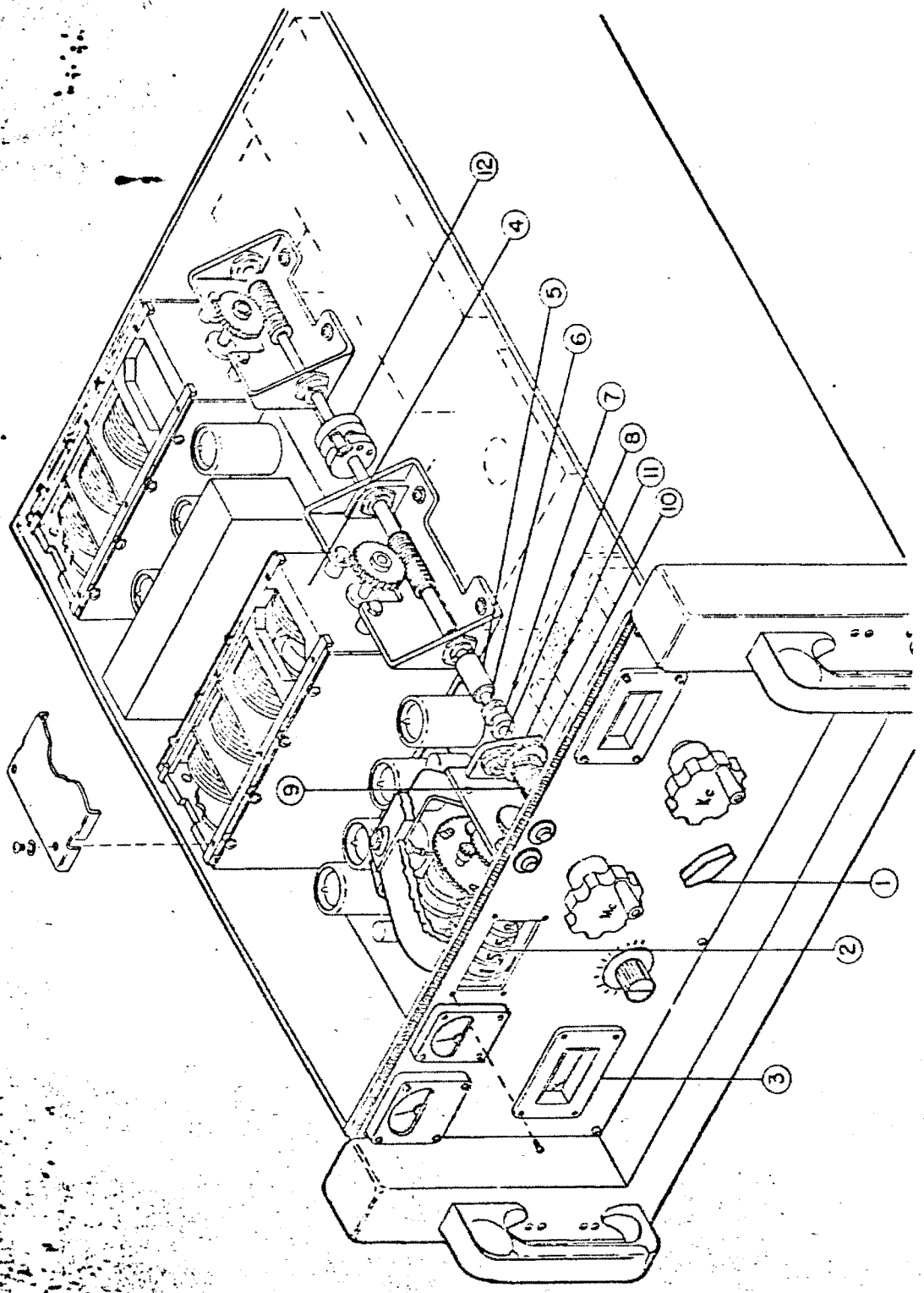


Figure 6-8. Countermeasures Receiver R-1125/FLR, Main Tuning Mechanism

Step 2. Hold the end plate assembly with the two shaft retainers on one side and four counter spacers extending from the other side. Insert the shortest counter shaft through one of the four holes nearest the outside edge of the end plate. Lubricate the ends of the counter shafts with watch oil during assembly. Lubricate all other surfaces where friction occurs with grease. Place the largest (2-4) pinion gear on the end of the counter shaft and tighten the setscrews lightly (there will be a further adjustment).

Step 3. Insert the next larger counter shaft (with washer) through the next hole clockwise (looking at the counter end). Place the next smaller (4-8) pinion gear on the end of the counter shaft and tighten the setscrews lightly.

Step 4. Continue the procedure described in steps 2 and 3 until all four counter shafts have been installed.

Step 5. Holding the end plate in one hand with the gears down, insert the ends of four counter pinion shafts into the four holes nearest the center of the end plate.

Step 6. Place one pinion gear on each of the pinion gear shafts. (Notice that half of the teeth have been cut down on one side. This side is placed toward the end plate.)

Step 7. Place one number wheel over each counter shaft followed by one pinion gear over each pinion shaft. Mesh the pinion gears with the number wheels.

Step 8. Continue the procedure described in step 7 until the three number wheels and three pinion gears have been added to each counter. Starting with the 2-4 counter, set the wheels to read approximately 0200, 0400, 0800, and 1600, respectively.

Step 9. Place the three spacer washers on the end of each counter shaft.

Step 10. Fit the pulley subassembly over the ends of all counter and pinion shafts. Position the cable slot 180° from the counter shaft having the largest pinion gear.

Step 11. Insert four screws with lockwashers through the pulley subassembly into the counter spacers. Check for 0.010 to 0.015 inch end play for each number wheel group. If necessary, add or subtract spacer washers to obtain correct end play. Set aside the counter drum assembly.

CAUTION

If it is necessary to replace any gear, units wheel, or stop collar that is pinned to a shaft, also replace the shaft. When drilling the new part for the pin, the part may be damaged in attempting to use the existing hole in the old shaft.

Step 12. To replace the cluster gear assembly, place the locking ring in the groove nearest the gear cluster on the center shaft. Place the flat washer over the end of the shaft, and insert the shaft through the bushing in the right-hand counter mounting bracket.

Step 13. Place the flat washer and then the spring washer over the end of the shaft.

Step 14. Place the locking ring in the groove on the shaft, compressing the spring washer as required.

Step 15. Place the driven helical gear on the end of the shaft, and lightly tighten the setscrew.

Step 16. Slide the counter drum assembly on the center shaft meshing the four pinion gears with the cluster gears.

Step 17. Attach the three counter bracket spacers to the right-hand counter mounting bracket, using the three 4-40 screws and three lockwashers. Install the rear spacer that contains the detent spring carefully.

Step 18. Insert the end of the center shaft into the bushing in the left-hand counter

mounting bracket, using a sufficient number of spacer washers to limit the end play of the counter drum assembly to 0.006 to 0.011 inch. Secure the left-hand counter mounting brackets with the three 4-40 screws and three lock washers.

Step 19. To replace the stop ring and MC tuning shaft assembly, place the locking ring in the groove nearest the end of the shaft. Add to the shaft (over the end with only one flat) one spring washer and one flat washer.

Step 20. Insert the end of the MC tuning shaft with only one flat through the cilite bushing at the rear of the right-hand counter mounting bracket. Do not insert the end of the shaft through the front hole as yet.

Step 21. Slide the following items over end of shaft in the order listed: one flat washer, one spur gear with pin facing forward, one stop ring with straight tab, 29 stop rings with single bent tab pointed to rear, one stop ring with two bent tabs (long one to front), one stop collar, and one helical drive gear.

Step 22. Slide the MC tuning shaft through the front hole.

Step 23. Slide all parts on the shaft to the front, except for the one flat washer to allow room to install the locking ring.

Step 24. Push the shaft forward to compress the spring washer, and install the locking ring with the flat washer between the locking ring and the surface of the mounting bracket. The shaft is now held captive.

Step 25. Slide the stop collar toward the rear of the MC tuning shaft, and secure it with the setscrew.

Step 26. Align the two helical gears before pinning. If the tolerance buildup of the stop rings plus a 0.005-inch gap prevents the proper installation of the helical gears, selective assembly of stop rings will be necessary.

Step 27. Pin the stop collar and helical gears when their positions are satisfactory.

(d) REPLACEMENT OF MEGACYCLE COUNTER. (See figures 6-6, 6-7, and 6-8.) - To replace the MEGACYCLE counter and drive cable, perform the following steps in the order given:

1. COUNTER REPLACEMENT.

Step 1. Install the lucite illuminating element; secure the bracket to the counter frame with the two screws previously removed.

Step 2. Install the flexible coupling (7, figure 6-8) on the tuning shaft. Tighten the two Allen setscrews lightly; a later adjustment is required.

Step 3. Slide the tuning shaft through the panel hole and position the counter over the chassis mounting holes. Install the four mounting screws but do not tighten at this time. (The two long screws are for the cast portion of the counter frame, and the short screws are for the sheet metal portion.)

Step 4. Install the TUNING (Mc) knob on the tuning shaft and secure it with the Allen setscrews.

Step 5. Carefully mate the two halves of the flexible coupling (7, figure 6-8). Hold the counter in place and crank the TUNING (Mc) knob several times slowly in each direction, and note any misalignment between the counter shaft and the variable capacitor shaft. Correct the position of the counter on the chassis until the two shafts are concentric.

Step 6. Tighten the counter mounting screws. Apply a small amount of Glyptol (or equivalent) cement to the edge of each screw. Do not fill the screw slot with cement. Apply Glyptol (or equivalent) to the lucite element mounting screws.

detent (figure 6-7) for proper indexing.

Step 16. Apply a small amount of Glyptol (or equivalent) cement to the edge of all mounting screws and pulley clamp screws. Do not fill the screw slots with cement.

3. COUNTER ADJUSTMENTS. - When carefully performed, the following adjustments will provide original frequency accuracy of the MEGACYCLE counter. If there is any doubt as to the calibration of the counter, refer to paragraphs 6-4c and 6-4d and check the alignment of the frequency determining circuits.

Step 1. Place the BAND switch in the 16-32 position.

Step 2. Remove the bezel from the MEGACYCLE counter window (4 screws).

Step 3. Loosen the hexagonal screw locking the small stop gear (8, figure 6-8) and adjust the TUNING (Mc) knob for a counter reading of 1482.

Step 4. Loosen the two setscrews at the counter shaft end of the flexible coupling (7, figure 6-8). Mate the coupling halves and tighten the setscrews.

NOTE

The counter and the variable capacitor tuning shaft "flats" will be flush if properly mated. Completely remove the flexible coupling (7, figure 6-8) and check, if necessary.

Step 5. Turn the TUNING (Mc) knob counterclockwise to locate the shaft stop point in variable capacitor C802. This point is identified by noting the split gear on the shaft of capacitor C802. At the stop, the right-hand section of the gear will continue to move slightly, but the left-hand section will remain stationary. Do not force the tuning shaft past this point.

Step 6. Check the MEGACYCLE counter reading; it should be 1482. If not, loosen the setscrews on the shaft coupling (5, figure 6-8) and adjust to obtain this reading. Tighten the setscrews.

Step 7. Adjust the TUNING (Mc) knob for a counter reading of 1558.

Step 8. Rotate all stop rings (9, figure 6-8) in a counterclockwise direction on the tuning shaft, and adjust the large spur gear so that the stop pin contacts the dog on the rear stop ring. Tighten the hexagonal screw on the small stop gear (8, figure 6-8).

Step 9. Set the MEGACYCLE counter to read 1600. Place the BAND switch, in turn, in the positions listed below, and note the counter reading at each position.

Band	Counter Reading
2-4	0200
4-8	0400
8-16	0800

Step 10. If the counter readings do not correspond with those listed, loosen the Allen setscrew on the counter pinion gear and adjust the drums. Tighten the setscrew. Allow 1/32-inch clearance between the pinion gear and the drive gear to prevent binding.

Step 11. Replace the MEGACYCLE counter bezel.

Step 12. Apply a small amount of Glyptol (or equivalent) cement to the edge of all setscrews. Do not fill in the screw slot.

d. VARIABLE CAPACITOR GANGING, C801 AND C802, TO MEGACYCLE COUNTER.

(1) GENERAL. - The following instructions describe the coupling and adjustment of variable-capacitor tuning shafts to the MEGACYCLE counter assembly and drive mechanism; specifically, the

Step 7. Resolder the wire connection to sockets XDS803 and XDS804 on the lucite element.

2. DRIVE CABLE REPLACEMENT. - Approximately 3-1/2 feet of seven strand steel cable (Natco A33832A) is required to replace the drive cable. Perform the following steps in the order given:

Step 1. Manually rotate the counter selector wheel to place the counter with the largest gear at the panel window.

Step 2. Double the cable, placing the two ends together, and form a small loop at the center.

Step 3. Place the cable loop under the washers of the clamp screw on pulley A. Lead the doubled cable through the slot in the rim and tighten the clamp screw.

Step 4. Check that the BAND switch is in the 2-4 position.

Step 5. Loosen the mounting screws on pulleys B and C and slide both pulleys close to the chassis in the bracket slots. Tighten the mounting screws.

Step 6. Select one cable end and wind it in a clockwise direction over the top of pulley A and through chassis hole Z. Keep the cable under tension to prevent it from slipping out of the pulley groove.

Step 7. Temporarily secure the cable to the bottom of the panel frame with a small piece of adhesive tape.

Step 8. Take the remaining cable end and wind it in a counterclockwise direction around pulley A and through chassis hole Y. Keep tension on the cable to prevent slippage from the pulley groove.

Step 9. Temporarily secure the cable to the bottom of the panel frame with a small piece of adhesive tape.

Step 10. Select the first cable end at chassis hole Z. Keep the cable taut and pass it over pulley C, over the top of pulley D, and through the slot in the rim. Loop the cable around clamp screw D1 (under the washer), pull it tightly, and tighten the clamp screw.

Step 11. Take up the remaining cable at chassis hole Y. Keep it taut and slowly place the BAND switch in the 8-16 position, releasing the cable smoothly during switch rotation to prevent it from slipping out of the pulley grooves.

Step 12. Pass the cable over pulley B, under pulley D, and through the slot in the rim. Loop the cable around clamp screw D2 (under the washer), pull it tightly, and tighten the clamp screw.

Step 13. Loosen the mounting screw at pulley B and slide the pulley in the bracket slot to apply cable tension. Tighten the mounting screw.

Step 14. Loosen the mounting screw at pulley C, and slide the pulley in the bracket slot to apply cable tension. Tighten the mounting screw.

NOTE

When adjusting pulleys B and C, do not overtighten the drive cable. Only sufficient tension is required to prevent the cable from leaving the pulley grooves during operation. Normal adjustment will provide a 1/4-inch cable movement between pulley D and either pulley B or C when the cable is pressed between these pulleys.

Step 15. Place the BAND switch, in turn, in all switch positions several times, noting that the selector wheel indexes properly in each position. If required, adjust the selector wheel

coupling and adjustment of C802 (harmonic amplifier capacitor gang) and C801 (preselector capacitor gang). Figure 6-8 illustrates the coupling mechanism. Numerals in parentheses (in the following instructions) identify the parts of the coupling mechanism.

(2) COUPLING ADJUSTMENTS, CAPACITOR C802. (See figure 6-8.)

Step 1. Place the BAND switch (1) in the 16-32 position.

Step 2. Rotate the MEGACYCLE counter assembly (2) until the 16-32 counter drums appear in the bezel aperture (3). (The 16-32 counter is the one with the smallest pinion gear.)

Step 3. Remove the bezel (3) so that all four digits of the counter are visible. (The fourth digit is used for calibration purposes and is normally masked by the counter bezel.)

Step 4. Couple the harmonic amplifier capacitor, C802, (4) to the MEGACYCLE counter assembly (2) by means of the shaft coupling (5), the intermediate shaft (6), and the flexible coupling (7).

Step 5. Perform the MEGACYCLE counter adjustments described in paragraph 6-5c(12)(d)3.

(3) COUPLING ADJUSTMENTS, CAPACITOR C801. (See figure 6-8.)

NOTE

The coupling adjustments described in paragraph 6-5d(2) for the harmonic amplifier capacitor (C802) must be completed before attempting coupling adjustments for the preselector capacitor (C801) which follow.

Step 1. Place the BAND switch in the 16-32 position.

Step 2. Rotate the TUNING (MC) control fully counterclockwise. The MEGACYCLE counter should read 1558.

Step 3. Loosen the two Allen setscrews on coupling (12) of capacitor C801 drive mechanism.

Step 4. Rotate the capacitor gang (C801) counterclockwise until the mechanical stop prevents further rotation.

Step 5. Tighten the Allen setscrews on the coupling.

NOTE

The flats on the drive shafts of capacitor gangs C801 and C802 should mate at the coupling (12).

Step 6. Replace the bezel at the MEGACYCLE counter.

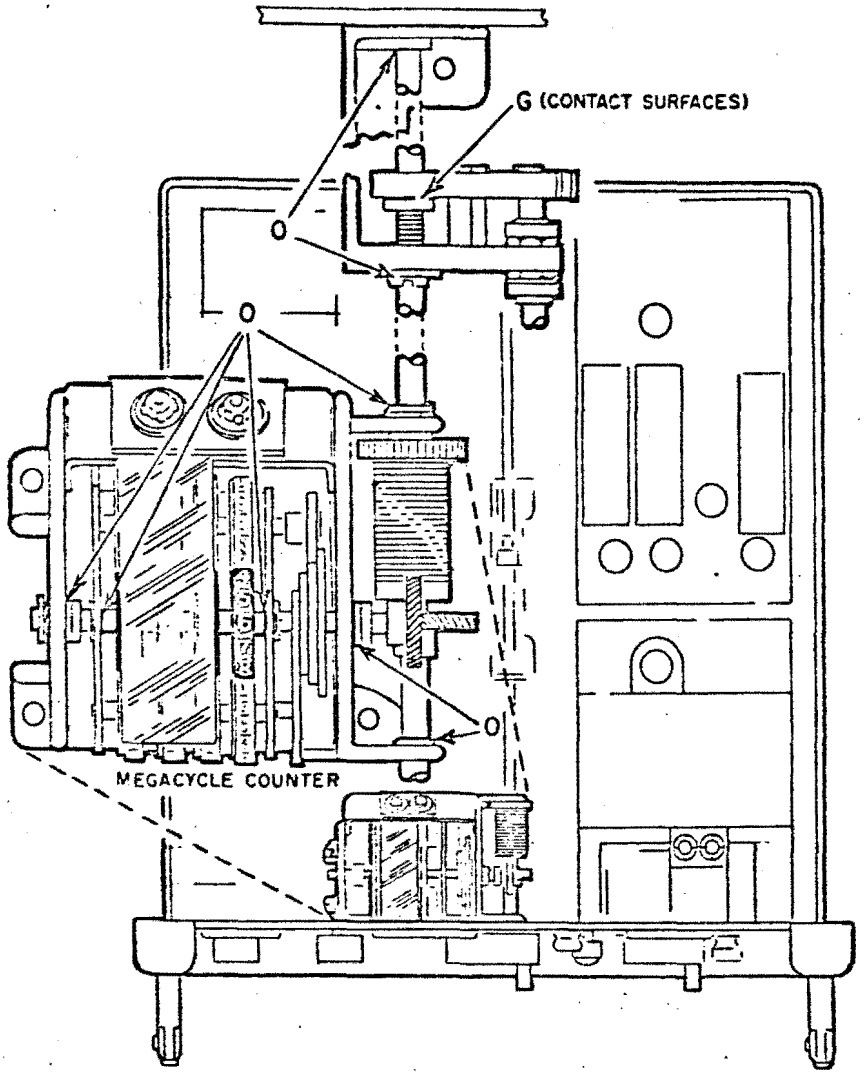
e. LUBRICATION.

(1) GENERAL. - The lubricating procedure in the following paragraphs is performed semiannually.

(2) TUNING MECHANISM AND COUNTERS. (See figure 6-10.)

(a) Pull out the receiver to expose the tuning mechanism.

(b) Lubricate the MEGACYCLE counter sleeve bearings as shown in figure 6-10. Lubricate the shaft bearings and the four counter-drum shafts (only one counter drum is shown in figure 6-10). Lubricate the KILOCYCLE counter shaft bearings and mechanism. Grease the worm gears and tuning-shaft pinion gears.



O - OIL: MIL-L-6085 (1-2 DROPS)
G - GREASE: MIL-G-16908 (VERY LIGHT COAT)

Figure 6-10. Lubrication Points, Receiver Counter Mechanism

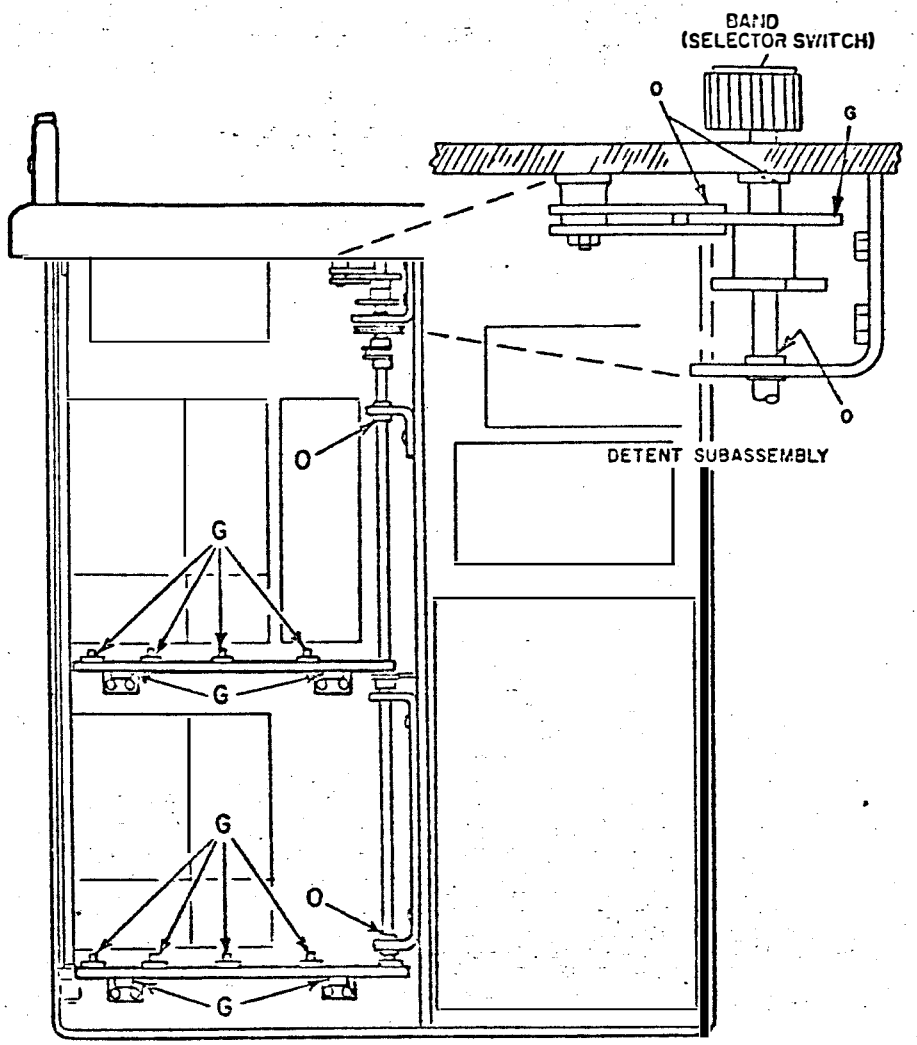
(3) BAND SELECTOR SWITCH. (See figure 6-11.)

(a) Pull out the receiver and raise it to expose the receiver chassis.

(b) Lubricate the BAND switch detent mechanism. Rotate the switch through all positions to distribute the grease. Lubricate all sleeve bearings and grease the switch slides at each switch lever location.

(4) DRAWER SLIDES. (See figure 6-12.) - Pull out the receiver and lubricate all points shown in figure 6-12 including the T-shaped lever, handle release lever, and the front and rear latches. Work the mechanism to distribute the lubricant. Grease the slide mechanism lightly at the points indicated, and operate the slide several times to distribute the grease.

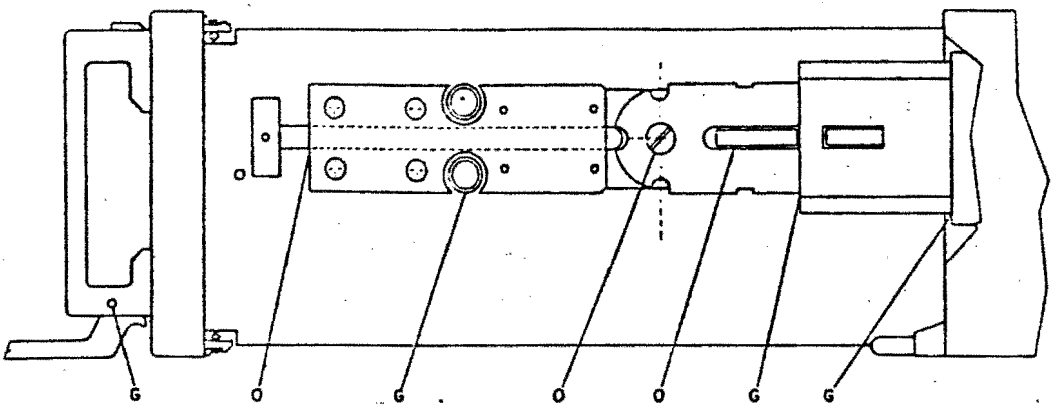
f. LAMPS. - The R-1125/FLR is equipped with six lamps; two on the front panel (DF indicator lamps, see figure 3-1) and two at each counter mechanism (MEGACYCLE and KILOCYCLE counter, see figure 6-2). The C-928/FLR is equipped with a single lamp on the chassis (POWER indicator, see figure 5-4). The DF indicator lamps are accessible from the front; the counter lamps are accessible by pulling out the receiver. To remove a receiver lamp, unscrew the cap; the lamp is an integral part



R-1125/FLR CHASSIS
(BOTTOM VIEW)

O-OIL: MIL-L-6085, (1-2 DROPS)
G-GREASE: MIL-G-16908 (VERY LIGHT COAT)

Figure 6-11. Lubrication Points, Receiver Bandswitching Mechanism



LEGEND

O = OIL MIL-L-6085 (1-2 DROPS)
G = GREASE: MIL-G-16908 (VERY LIGHT COAT)

Figure 6-12. Lubrication Points, Receiver Slide Mechanism

of the cap. To remove the POWER lamp, unscrew the cap to expose the lamp and then unscrew the lamp. Lamp replacement procedure is the reverse of removal.

6-6. OVERALL SCHEMATIC AND WIRING DIAGRAMS.

This section contains complete schematic and wiring diagrams of all functional sections in the R-1125/FLR and the O-928/FLR. Diagram arrangement is in a logical sequence and follows the receiver main signal path, where applicable. Figures 6-13 to 6-16 are overall schematic diagrams of subassemblies in the R-1125/FLR, and figures 6-17 and 6-18 are overall schematic diagrams of the O-928/FLR. Figure 6-19 is an interconnecting cable diagram showing all internal cable connections between subassemblies in the R-1125/FLR. Figures 6-20 through 6-34 are wiring diagrams of the R-1125/FLR subassemblies, and figure 6-35 is the interconnecting cable diagram for the O-928/FLR.

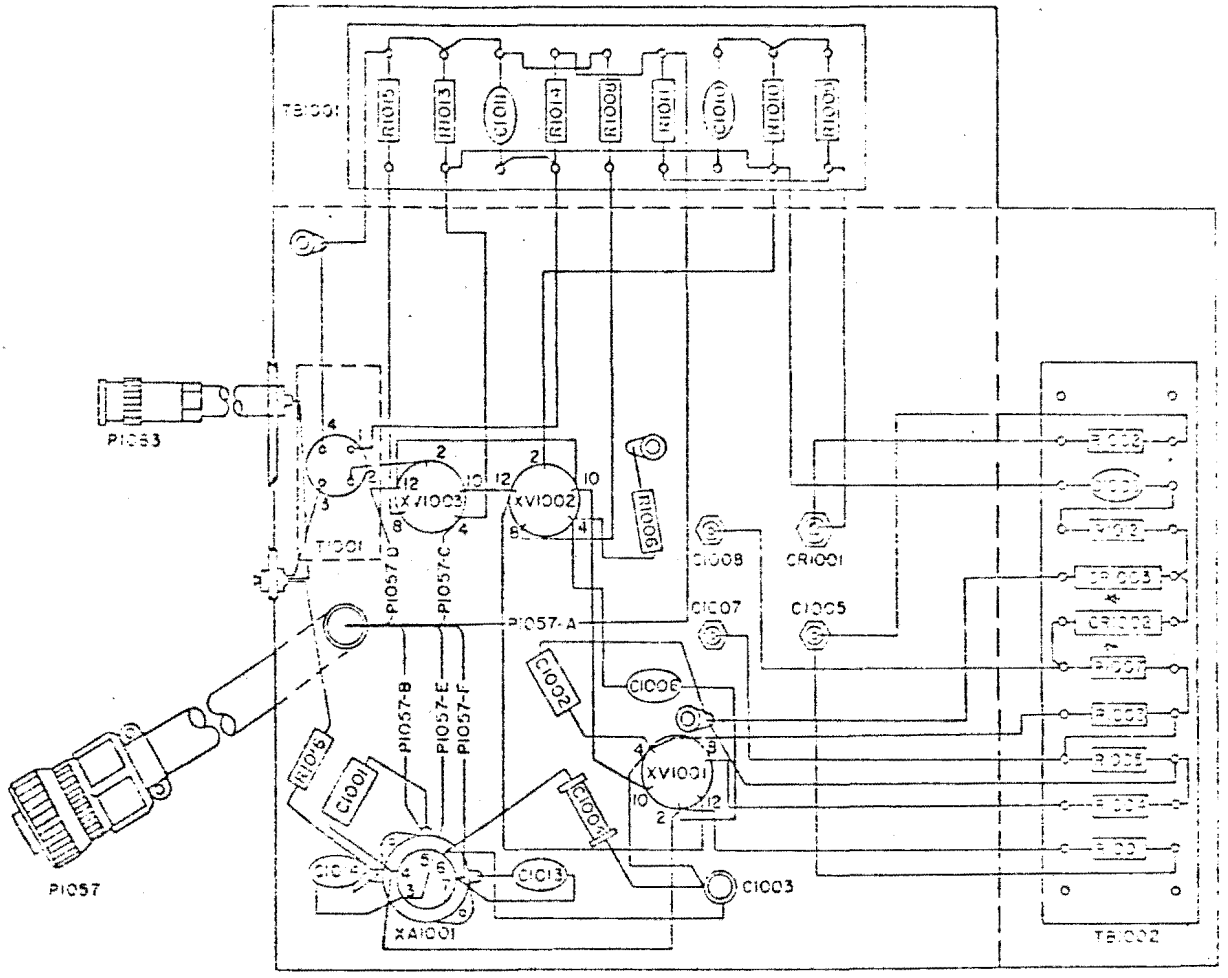


Figure 6-20. 100-Kc Oscillator-Amplifier, Wiring Diagram

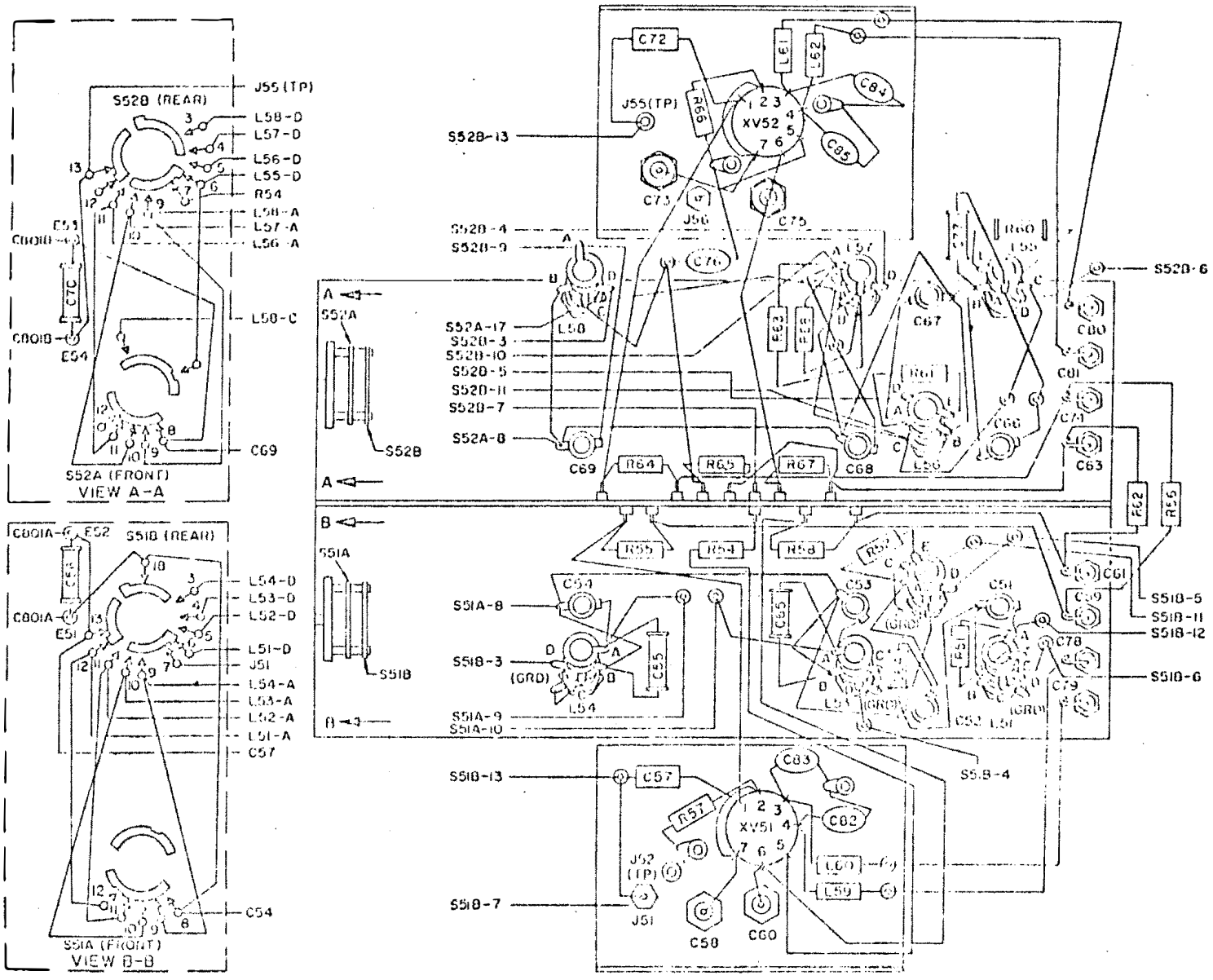
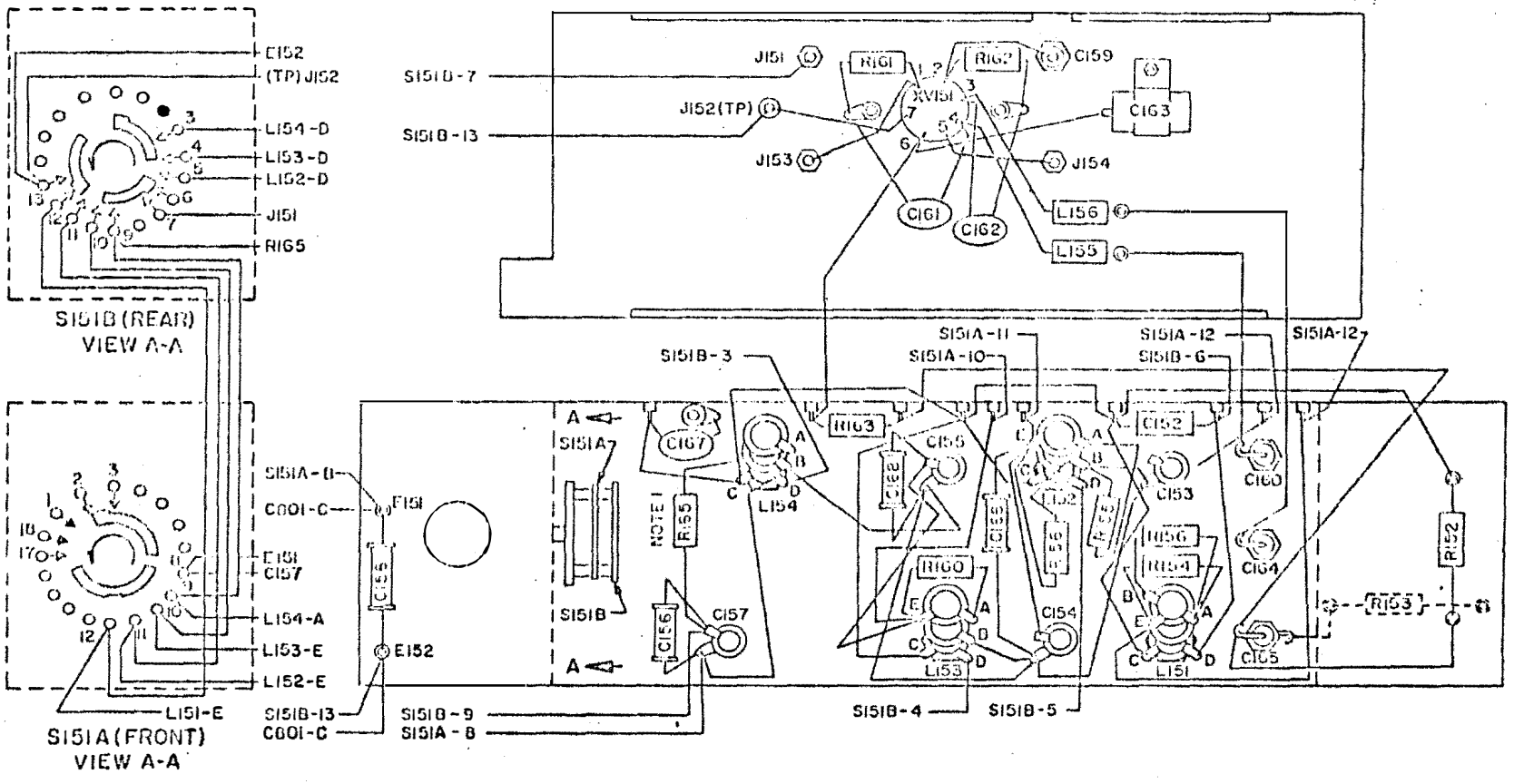


Figure 6-22. Preselector R-F Amplifiers, Wiring Diagram



NOTE:

1. R165 IS .208 FEET (2-1/2") OF RESISTANCE WIRE, HATCO DWG. A35902-1

Figure 6-23. Preselector Mixer, Wiring Diagram

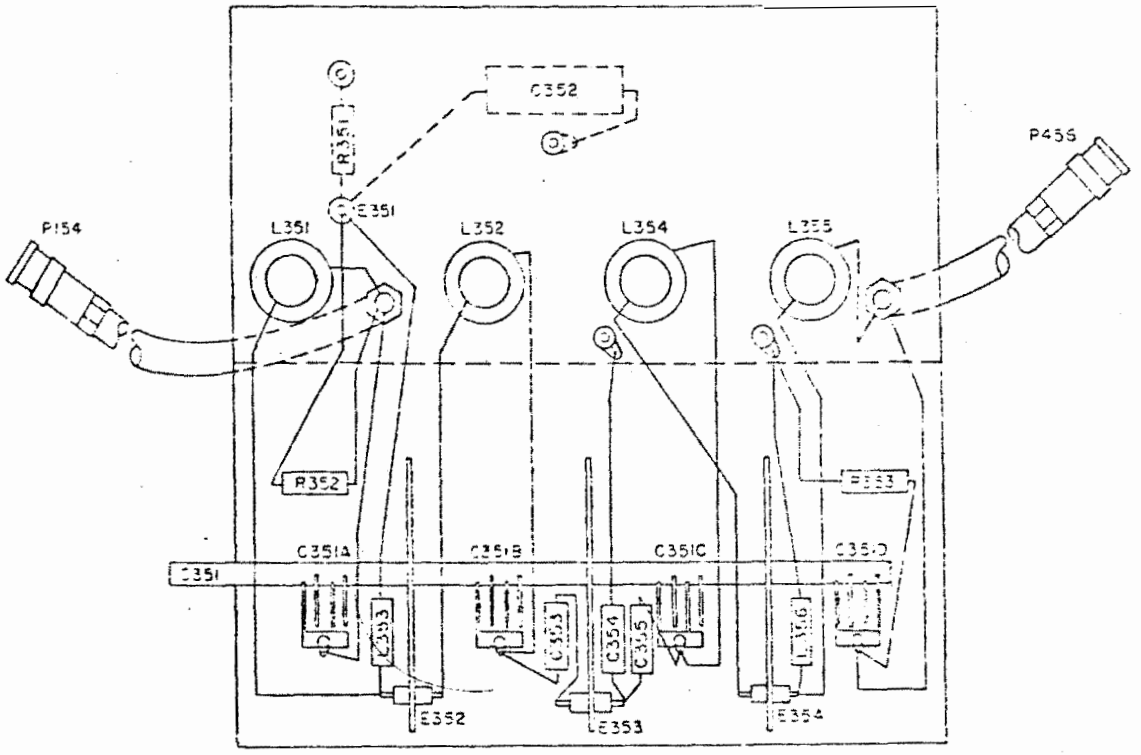


Figure 6-24. Tunable I-F Filter, Wiring Diagram

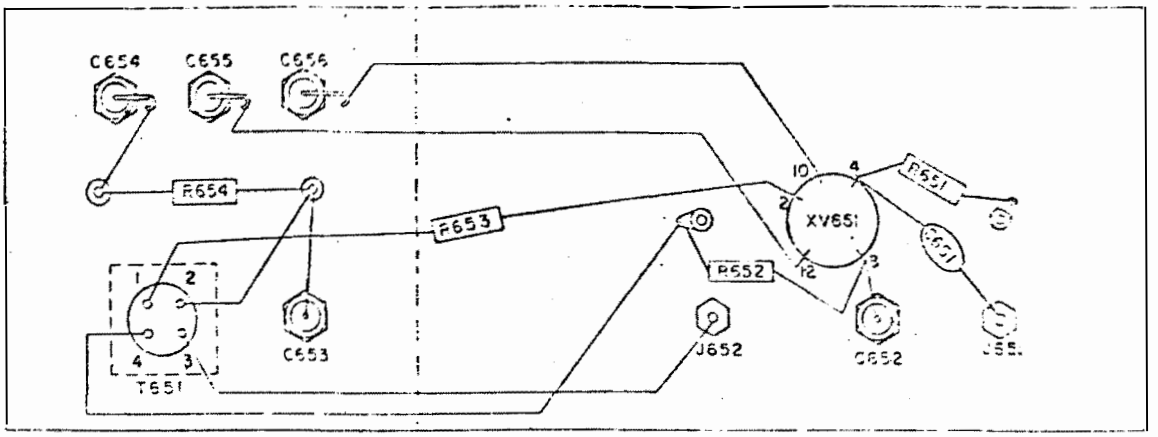


Figure 6-26. Interpolation Oscillator Buffer, Wiring Diagram

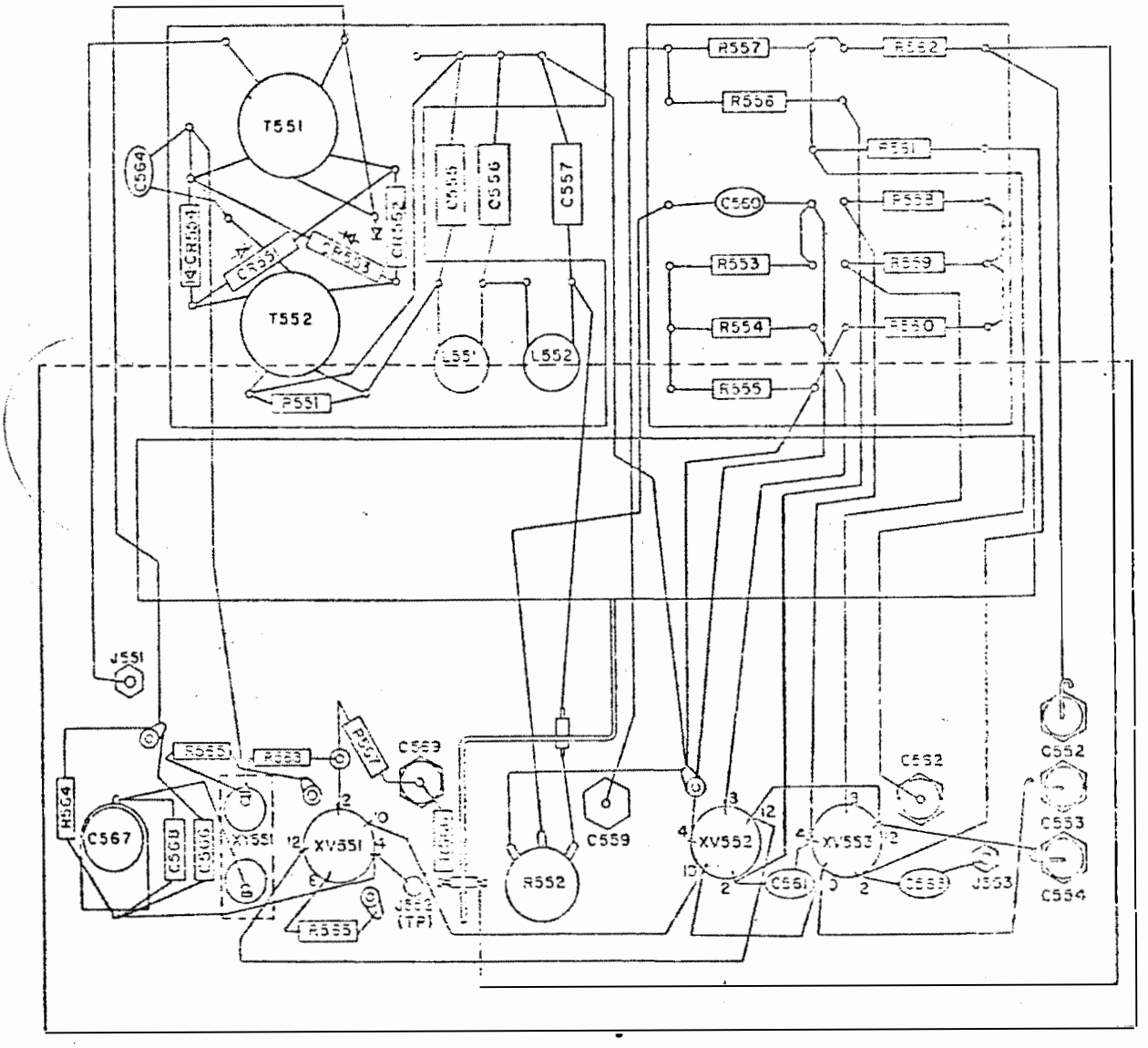


Figure 6-27. Mixer and Second I-F Amplifier, Wiring Diagram

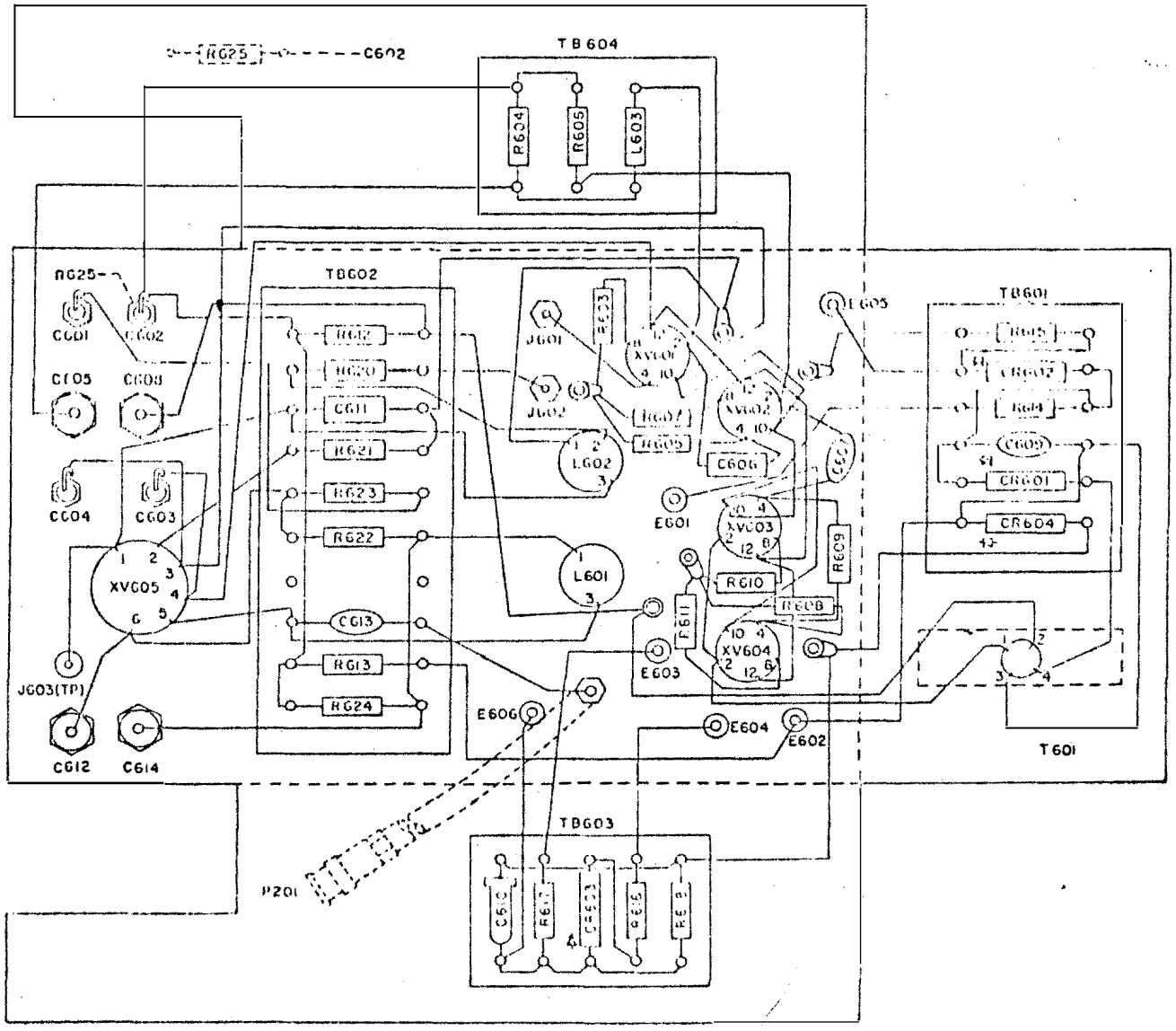


Figure 6-28. AGC Amplifier, Wiring Diagram

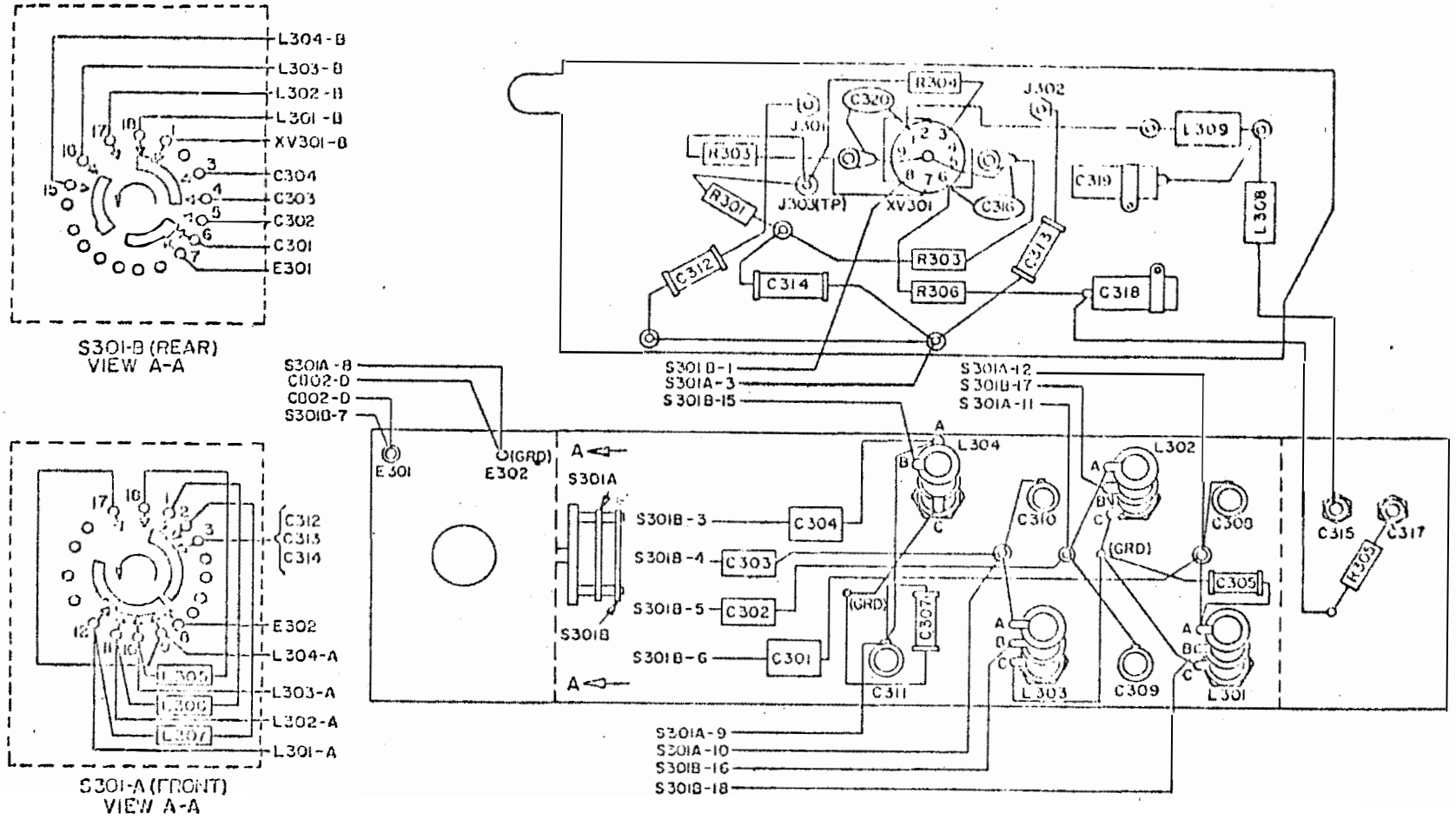


Figure 6-29. High-Frequency Oscillator, Wiring Diagram

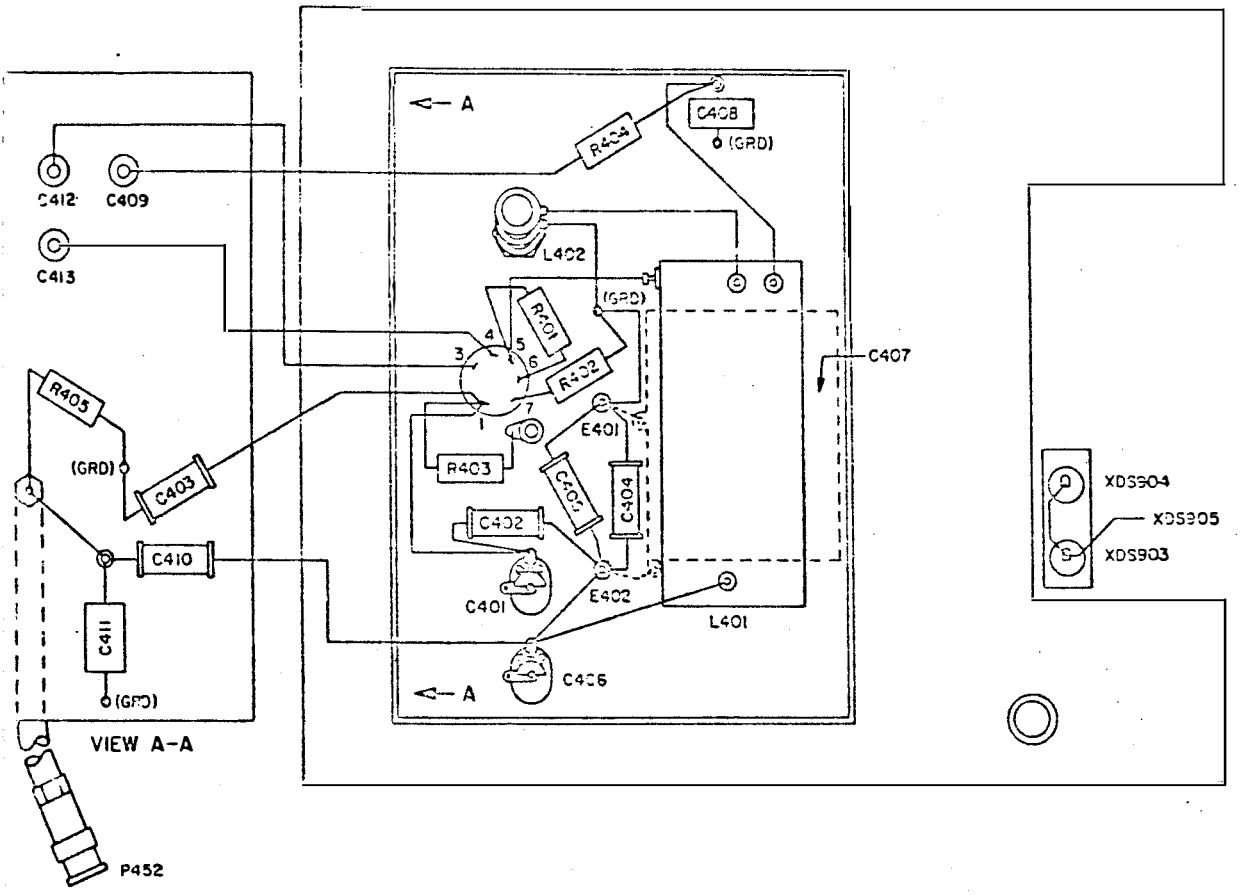


Figure 6-30. Interpolation Oscillator, Wiring Diagram

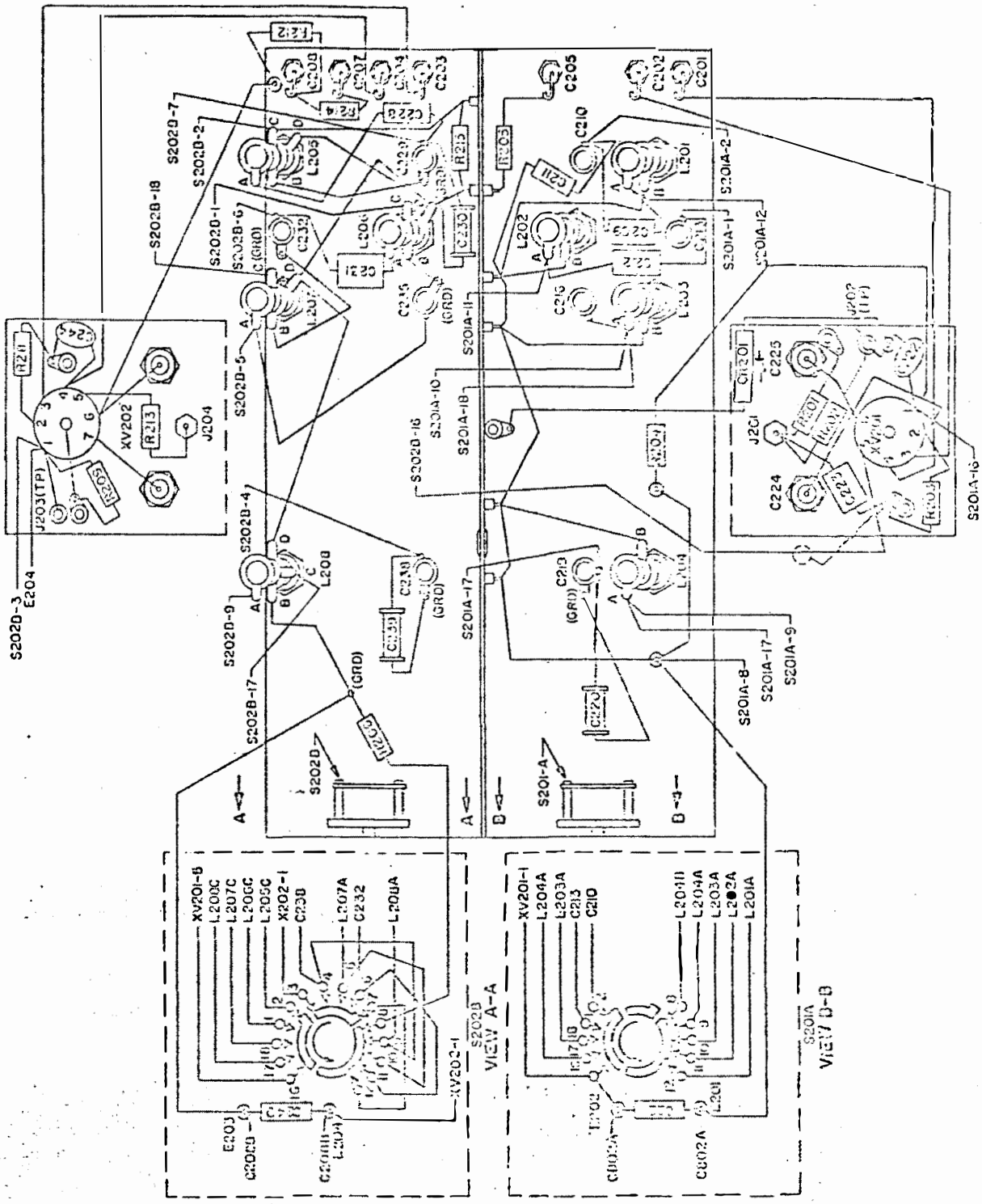


Figure 6-31. Harmonic Amplifiers, Wiring Diagram

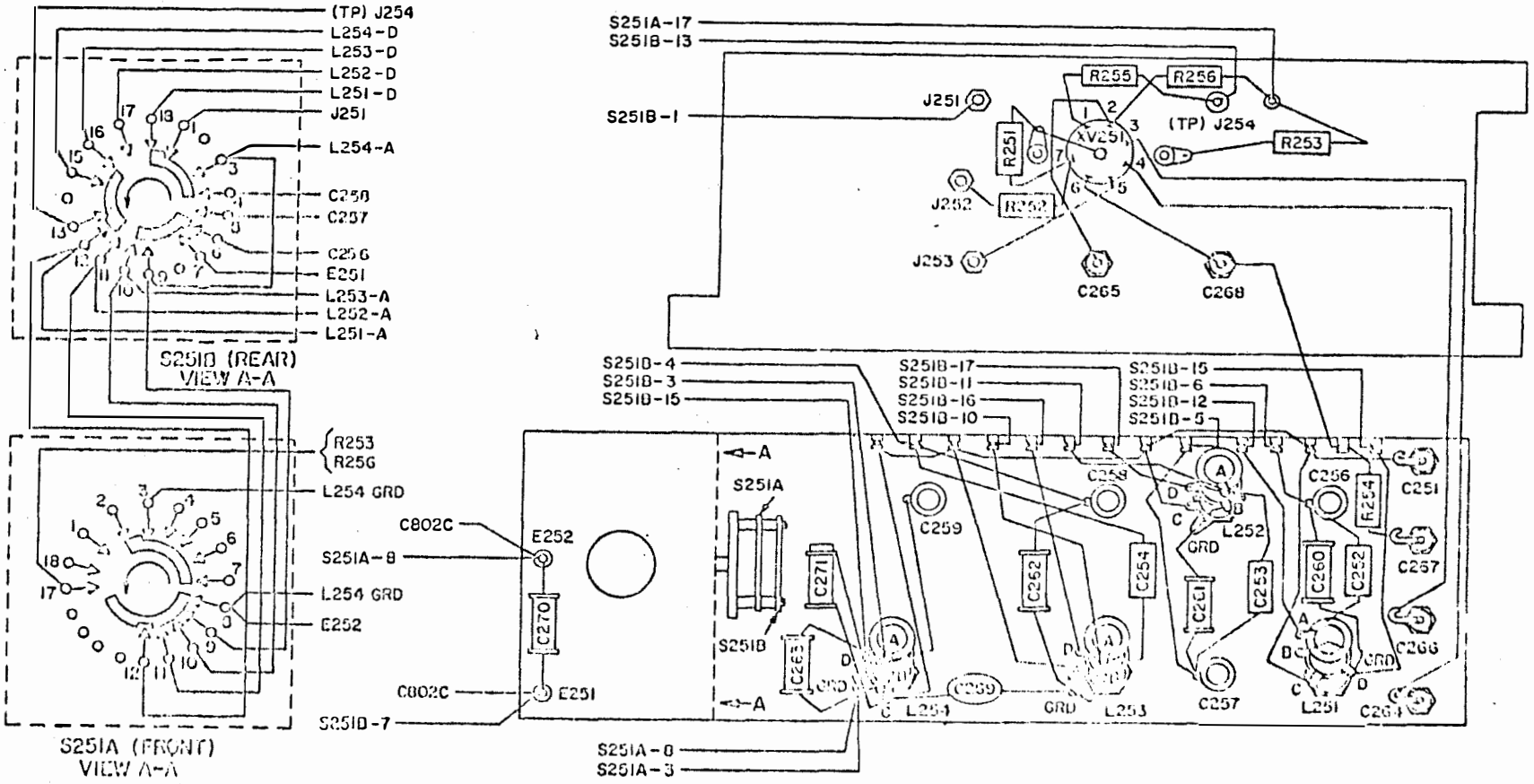


Figure 6-32. Harmonic Mixer, Wiring Diagram

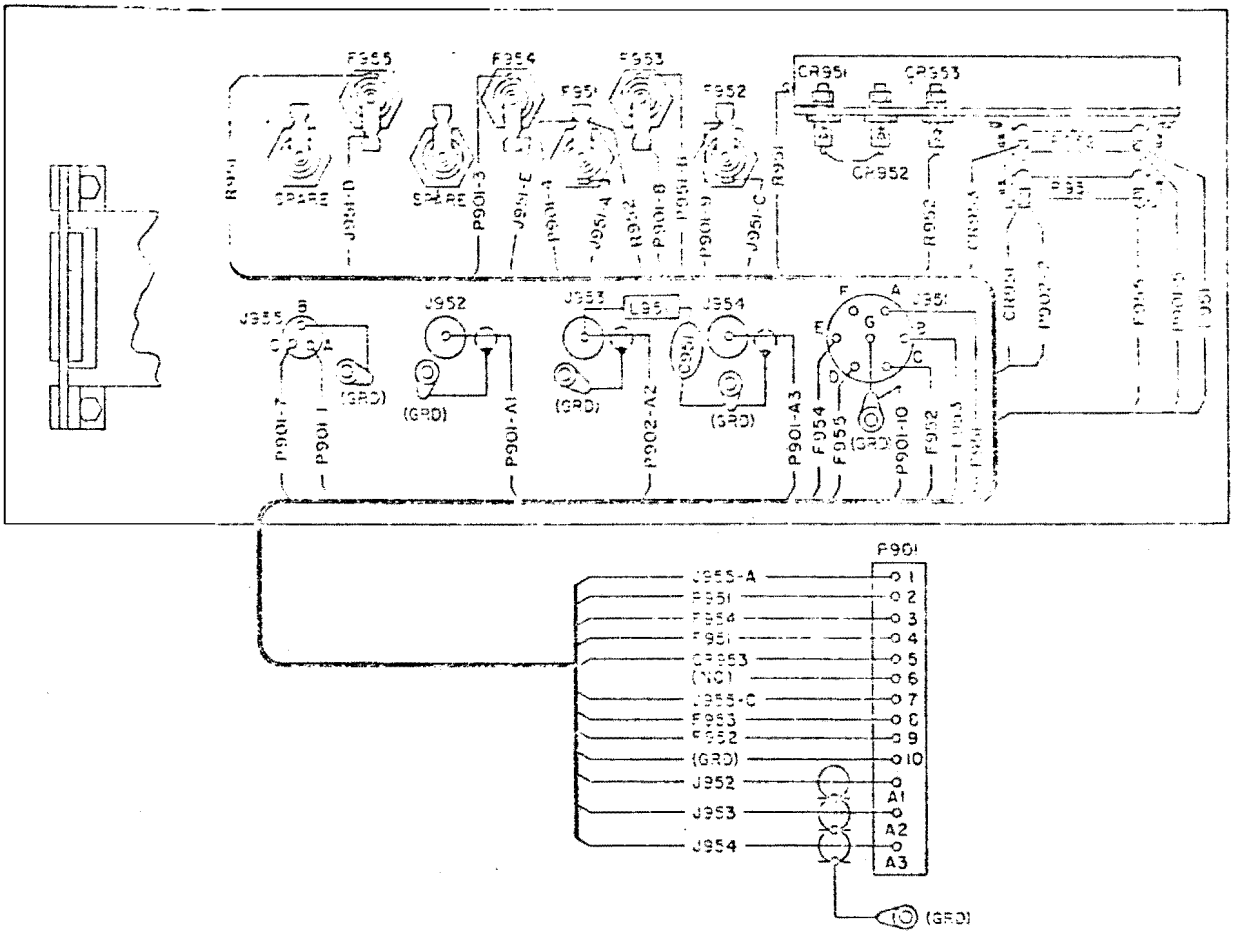
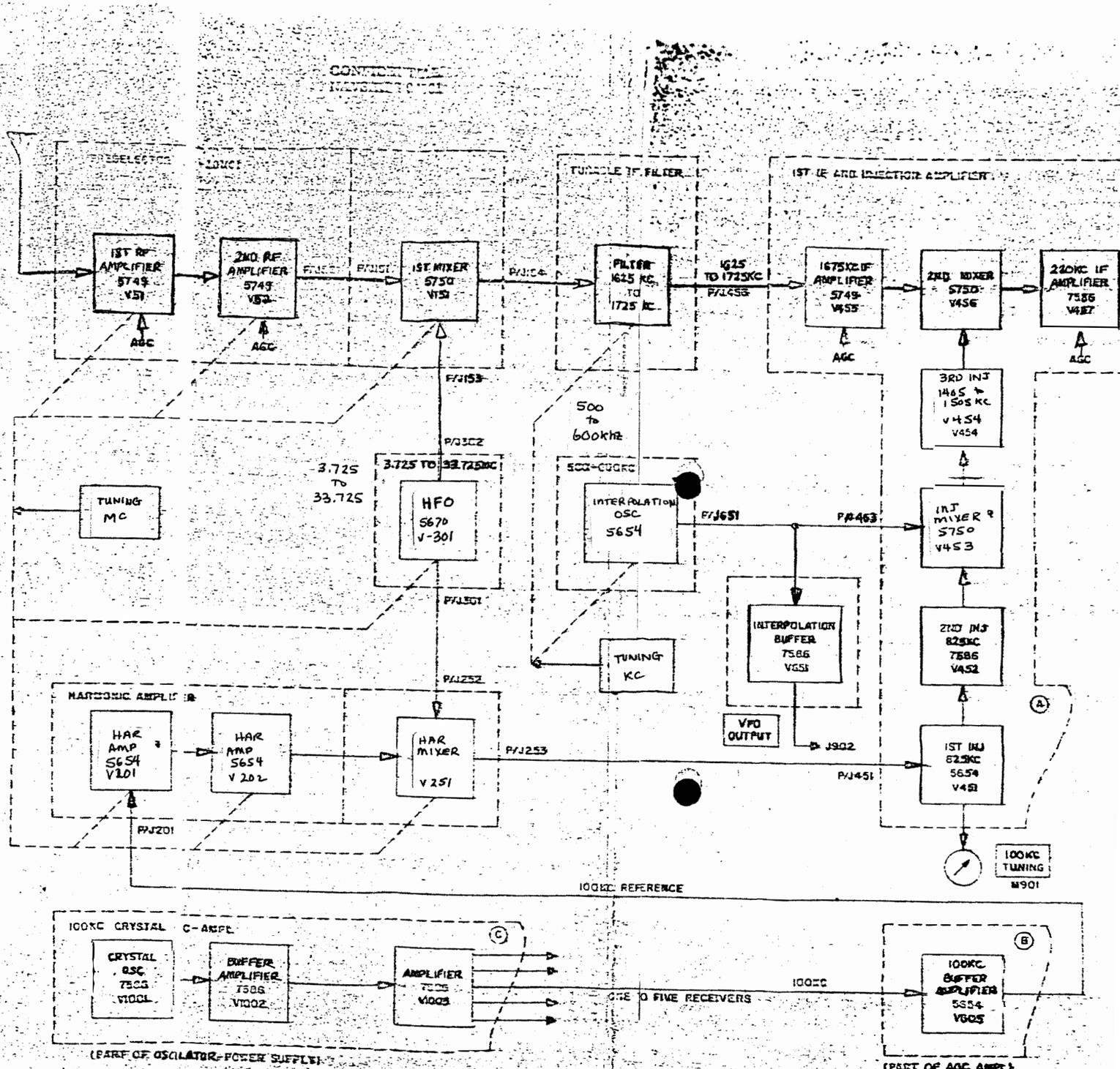


Figure 6-34. Countermeasures Receiver R-1125/FLR, Rear Panel, Wiring Diagram


PRESELECTOR
LOUC
TUNABLE IF FILTER
1ST IF AND INJECTION AMPLIFIER
1ST RF AMPLIFIER 5749 V51
2ND RF AMPLIFIER 5749 V52
1ST MIXER 5750 V151
FILTER 1625 KC TO 1725 KC
1625 TO 1725KC
1675KC IF AMPLIFIER 5749 V455
2ND MIXER 5750 V456
220KC IF AMPLIFIER 7586 V457
AGC
P/J153
P/J154
P/J455
3RD INJ 1465 to 1505 KC V454 V454
500 to 600kHz
P/J302
3.725 TO 33.725MC
3.725 To 33.725
HFO 5670 V-301
500-600KC
INTERPOLATION OSC 5654
P/J651
P/J463
INJ MIXER 5750 V453
TUNING MC
INTERPOLATION BUFFER 7586 V651
2ND INJ 82.5KC 7586 V452
TUNING KC
VFO OUTPUT
J902
P/J252
HARMONIC AMPLIFIER
HAR AMP 5654 V201
HAR AMP 5654 V202
HAR MIXER V251
P/J253
P/J451
1ST INJ 82.5KC 5654 V451
P/J201
100KC TUNING M901
100KC REFERENCE
100KC CRYSTAL C-AMPL
CRYSTAL OSC 7586 V1001
BUFFER AMPLIFIER 7586 V1002
AMPLIFIER 7586 V1003
ONE TO FIVE RECEIVERS
100KC
100KC BUFFER AMPLIFIER 5654 V605
(PART OF OSCILLATOR-POWER SUPPLY)
(PART OF AGC AMPL)

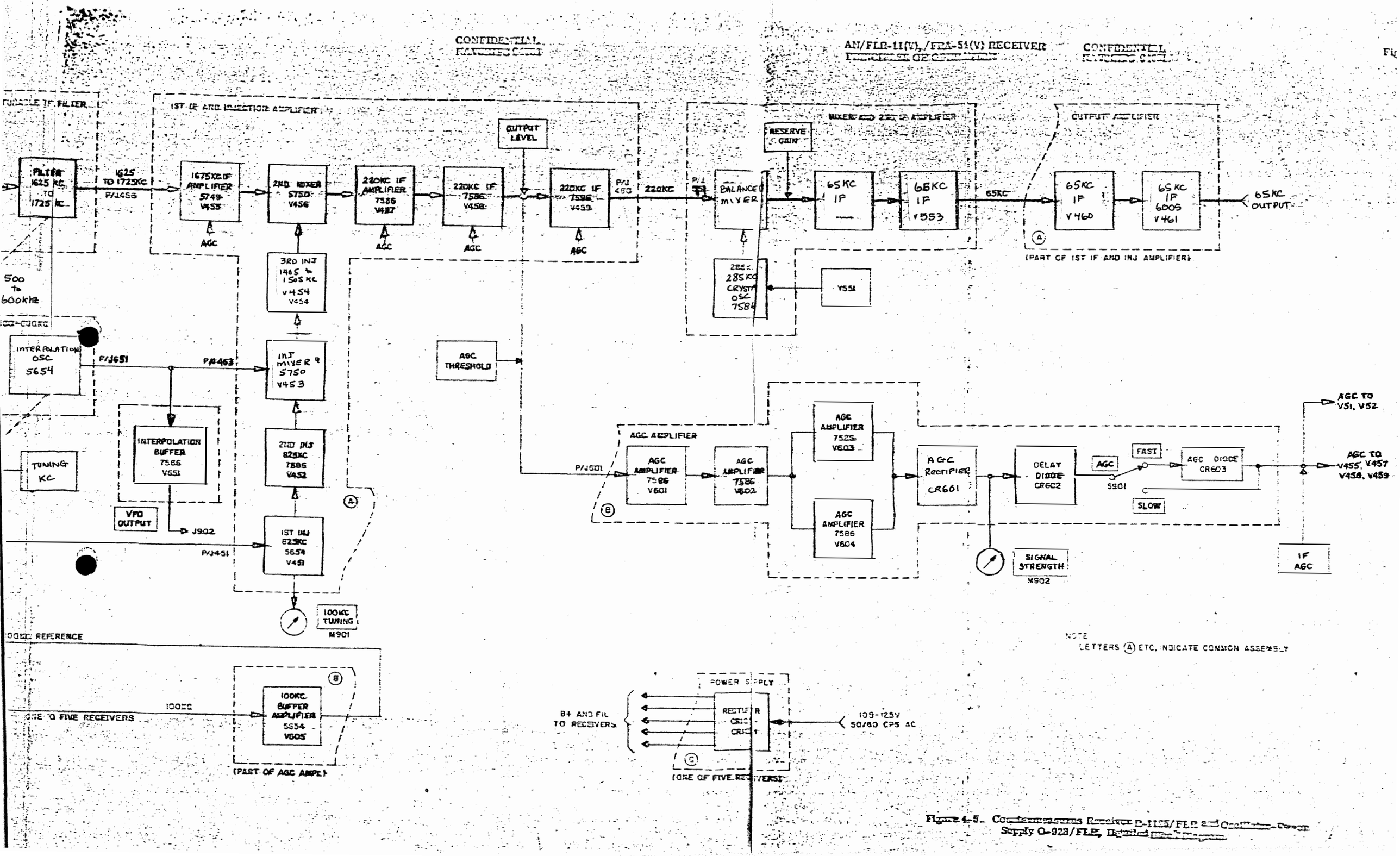
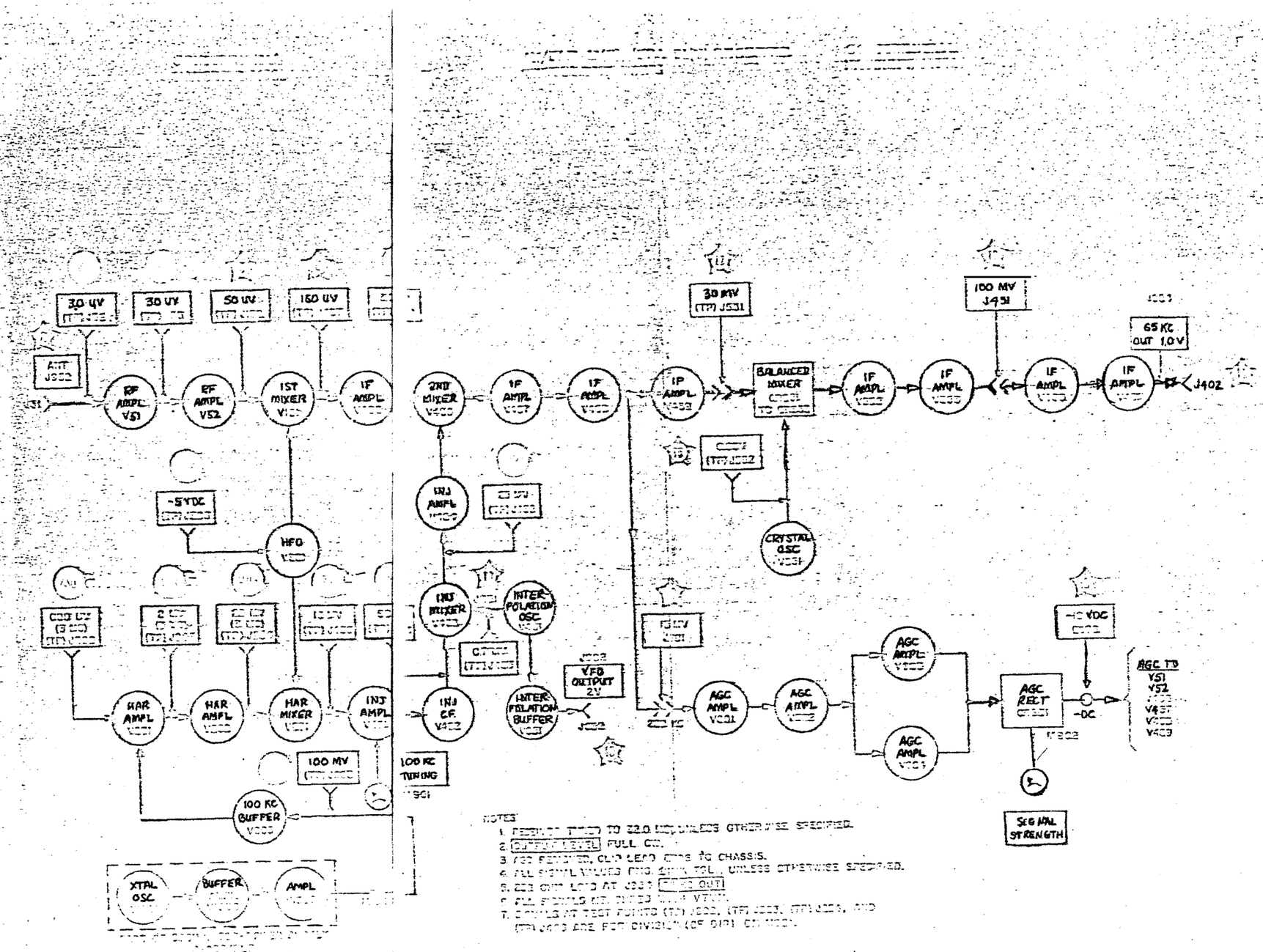


Figure 4-5. Communications Receiver R-1155/FLR and Control-Power Supply O-923/FLR, Detailed Block Diagram



NOTES:

1. RESISTOR VALUES TO 22.0 MEGOHMS UNLESS OTHERWISE SPECIFIED.
2. OUTPUT LEVEL FULL CO.
3. ALL RESISTOR, CLIP LEAD ARE TO CHASSIS.
4. ALL SIGNAL VALUES RMS WITH TOL., UNLESS OTHERWISE SPECIFIED.
5. ALL OUTPUT LOAD AT J003 OHMS OUT.
6. ALL RESISTOR VALUES ARE IN OHMS, K=1000, M=1000000.
7. SIGNALS AT TEST POINTS (TP) J002, (TP) J003, (TP) J004, AND (TP) J005 ARE POST DIVISION (OF DIAL CAL VOLT.

Figure 5-83. Test Jack and Connector Locations and Signal Level Test Diagram

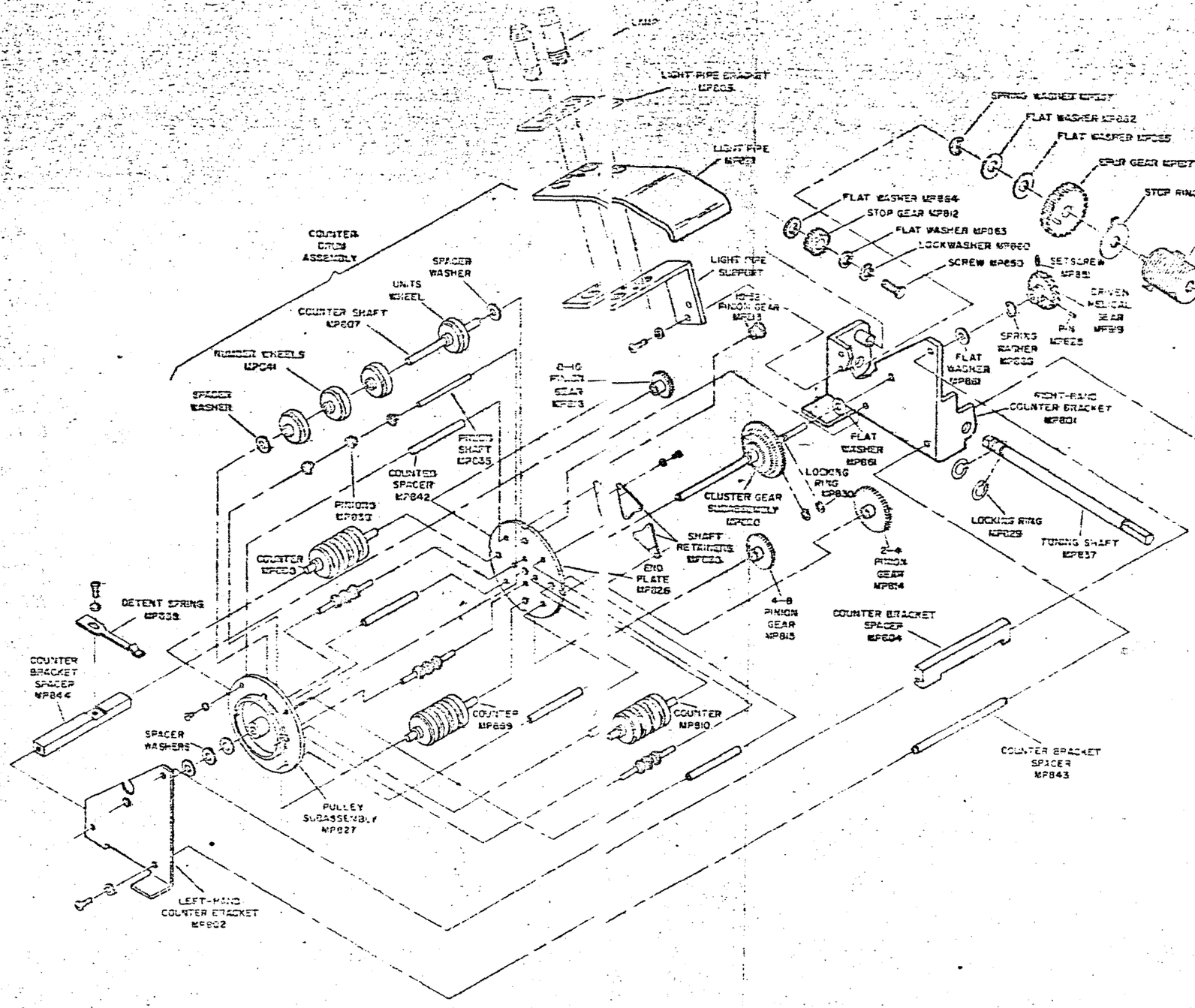
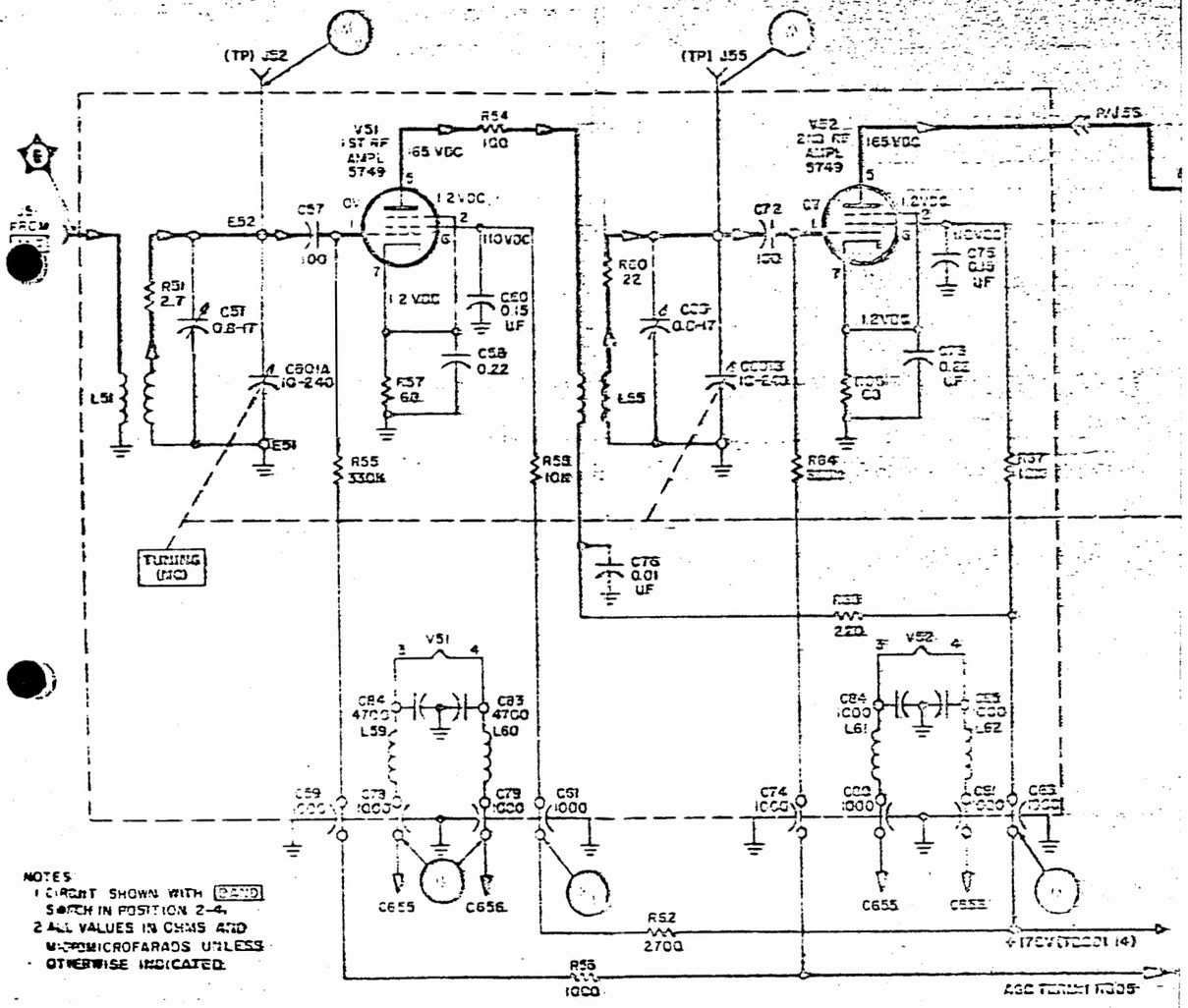


Figure 6-8. Megacycle Counter, Exploded View



NOTES:
1. CIRCUIT SHOWN WITH BAND SWITCH IN POSITION 2-4.
2. ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.

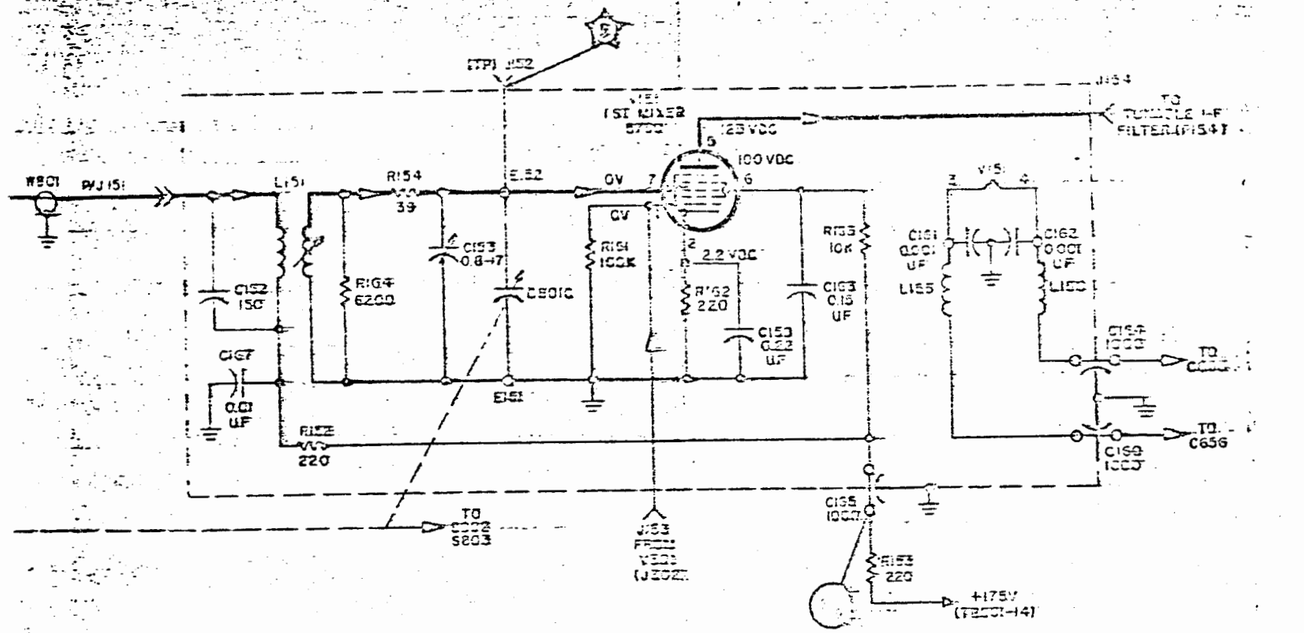


Figure 5-12. Receiver, Electrical Schematic Diagram

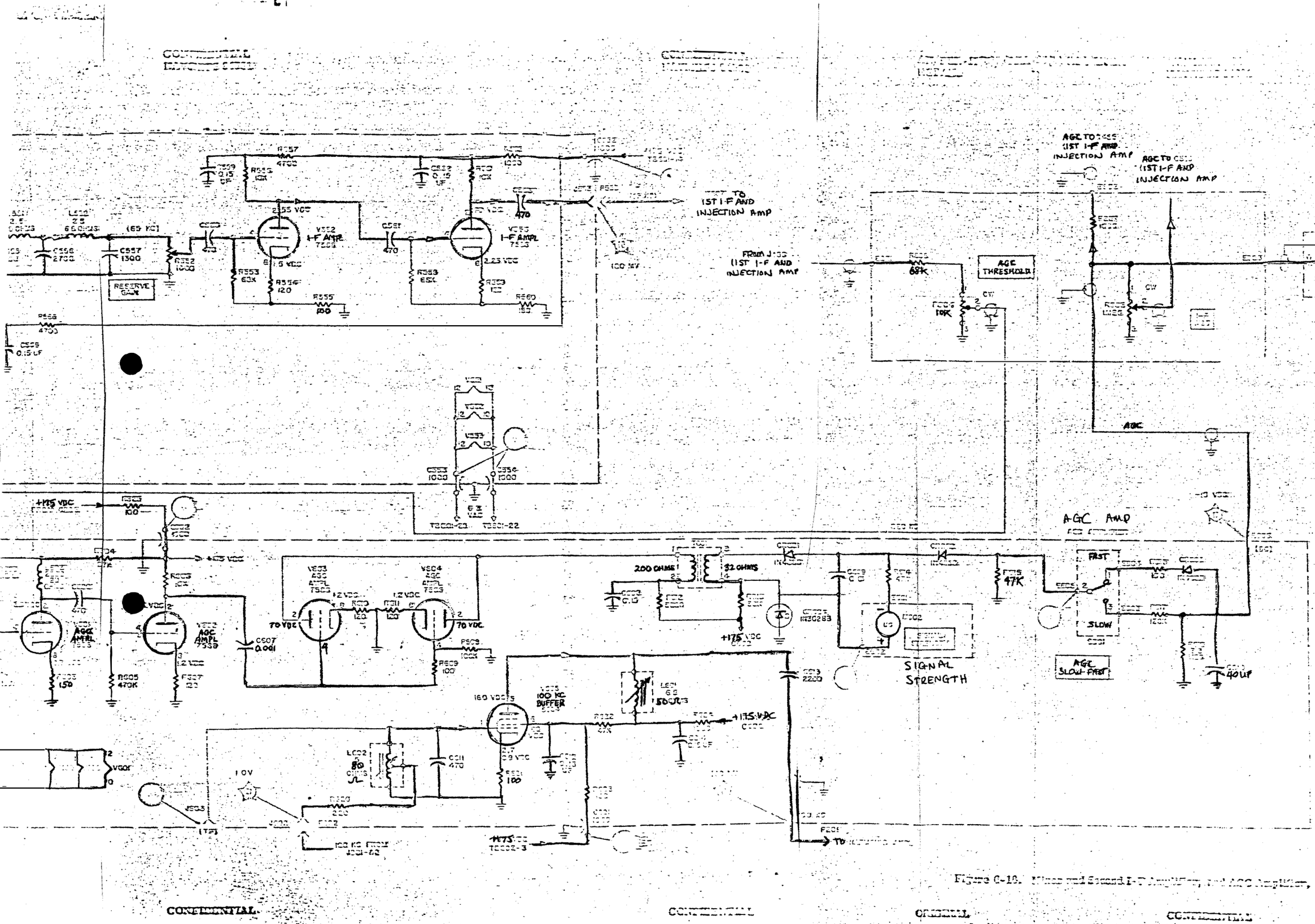
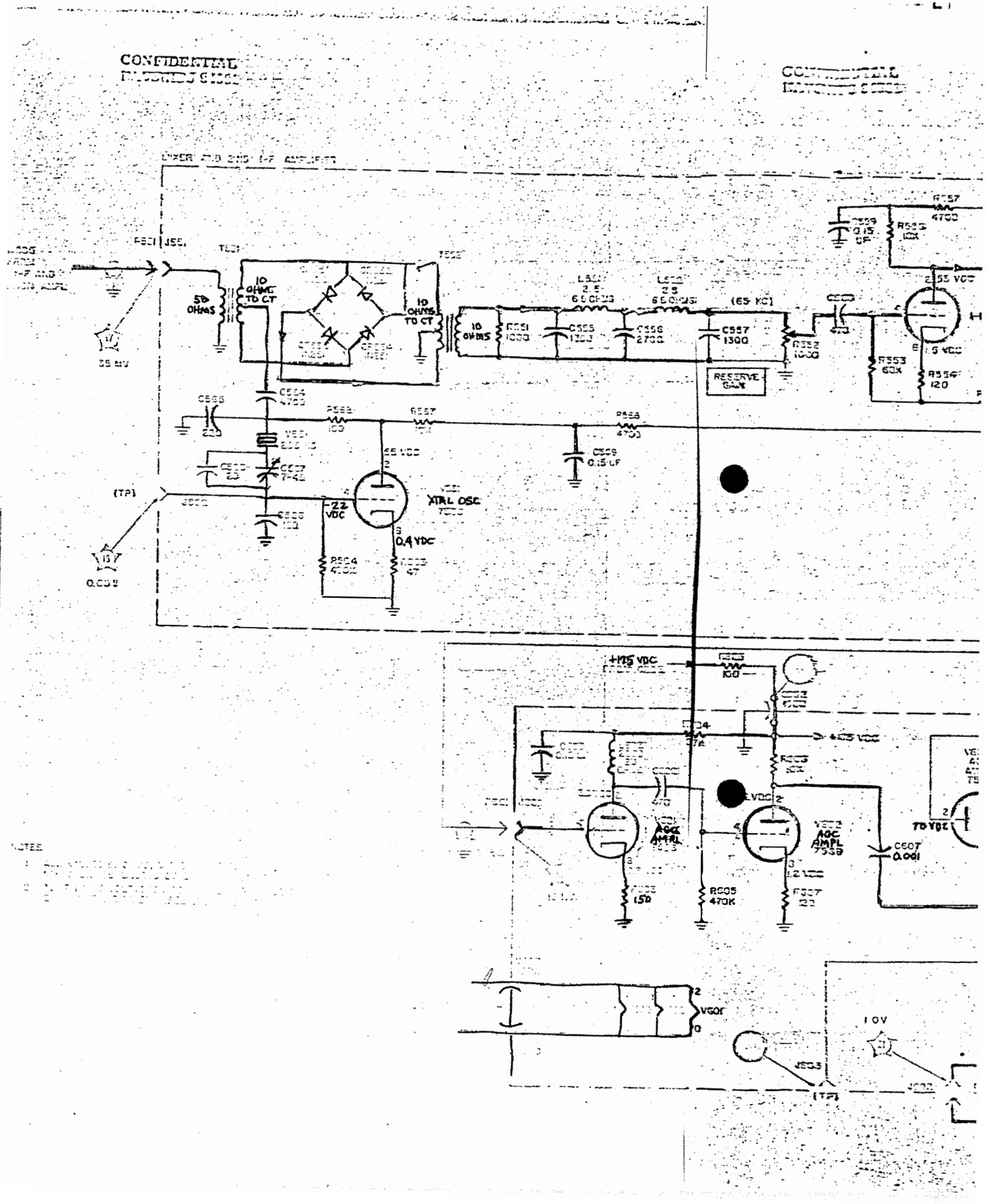
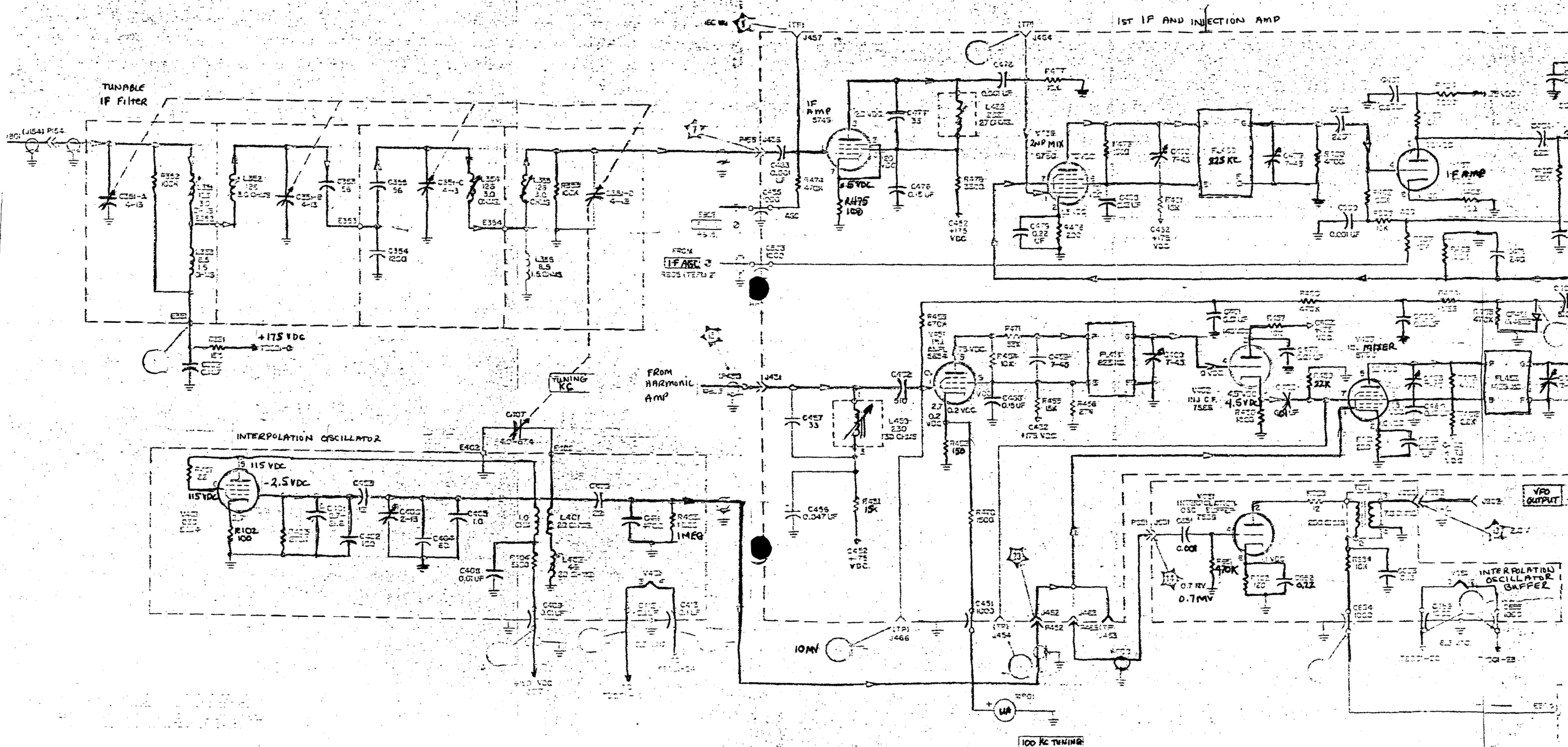


Figure C-18. Mixer and Second I-F Amplifier, and AGC Amplifier, Control Chassis



NOTES


TUNABLE IF FILTER
1ST IF AND INJECTION AMP
IF AMP 5749
2ND MIX 5749
1ST MIXER 5749
IF AMP
225 KC
+175 VDC
TUNING KC
INTERPOLATION OSCILLATOR
115 VDC
-2.5 VDC
FROM HARMONIC AMP
FROM IF AGC
4.5 VDC
0.7 MV
10 MV
100 KC TUNING
VFO OUTPUT
INTERPOLATION OSCILLATOR BUFFER

1ST IF AND INJECTION AMP

IF AMP 5749

2ND MIX 5763

IF AMP

V433 IF AMP 7CM6

IF AMP 7CM6

OUTPUT LEVEL

FROM IF AGC

FROM MIXER AND 2ND IF AMP

OUT PUT AMPLIFIER

MIXER

INJ C.F. 7586

INTERPOLATION OSC BUFFER

VFO OUTPUT

Feed BACK

4mc

100 KC TUNING

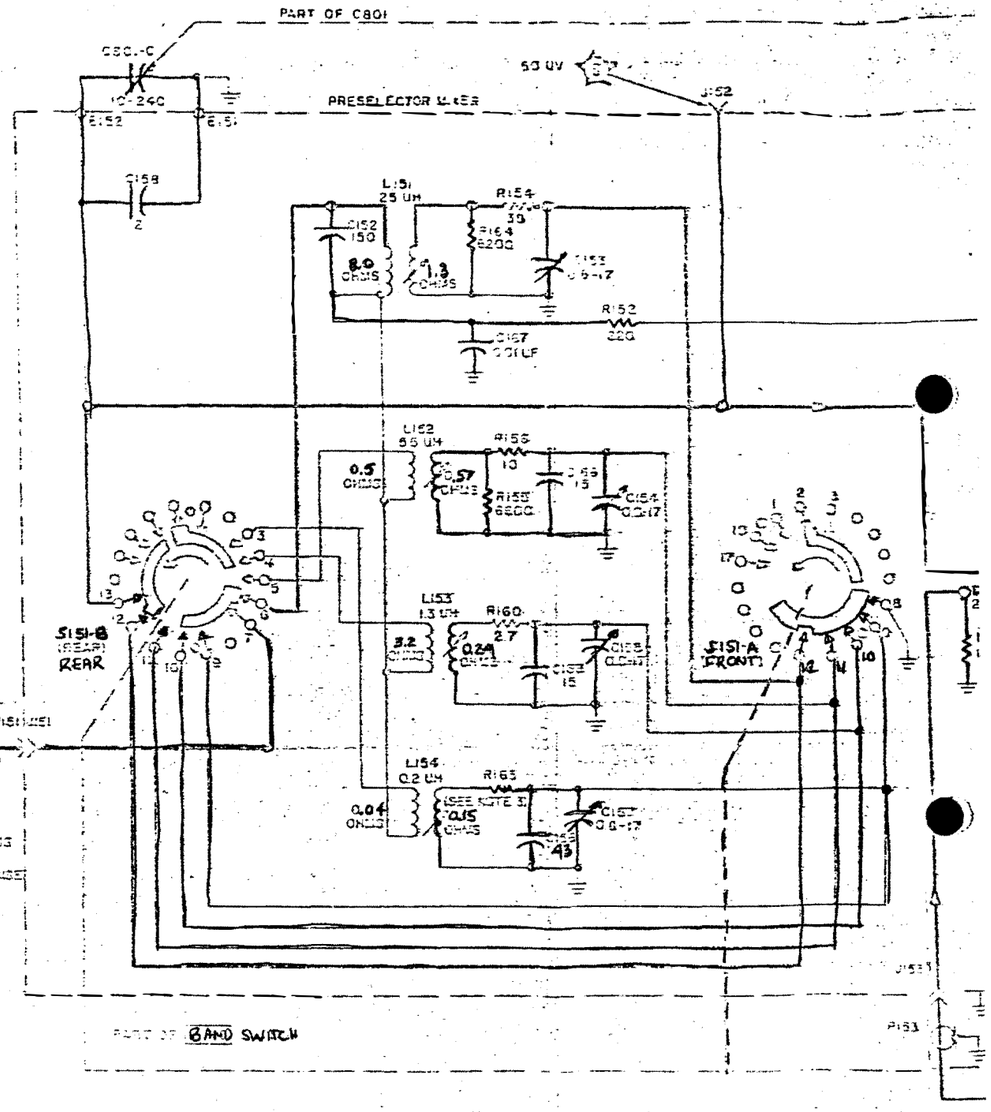
10MV

0.7MV

6.3VAC

Figure 6-10. Receiver 1st IF Amp, Interpolation Oscillator, First IF Deamplification Amplifier, and Interpolation Oscillator Buffer, Circuit Schematic Diagram

CONFIDENTIAL
NAVSHIPS 94501



EST
ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.
SWITCHES ARE SHOWN IN EXTREME CLOCKWISE POSITION. (BAND POSITION 2-4)
RIGS CONSISTS OF 0.203"(2.5") OF RESISTANCE WIRE NATCO DWG A50033-1
TEST POINT VOLTAGES ARE DVM, UNLESS OTHERWISE INDICATED. (SEE FIGURE 6-200)

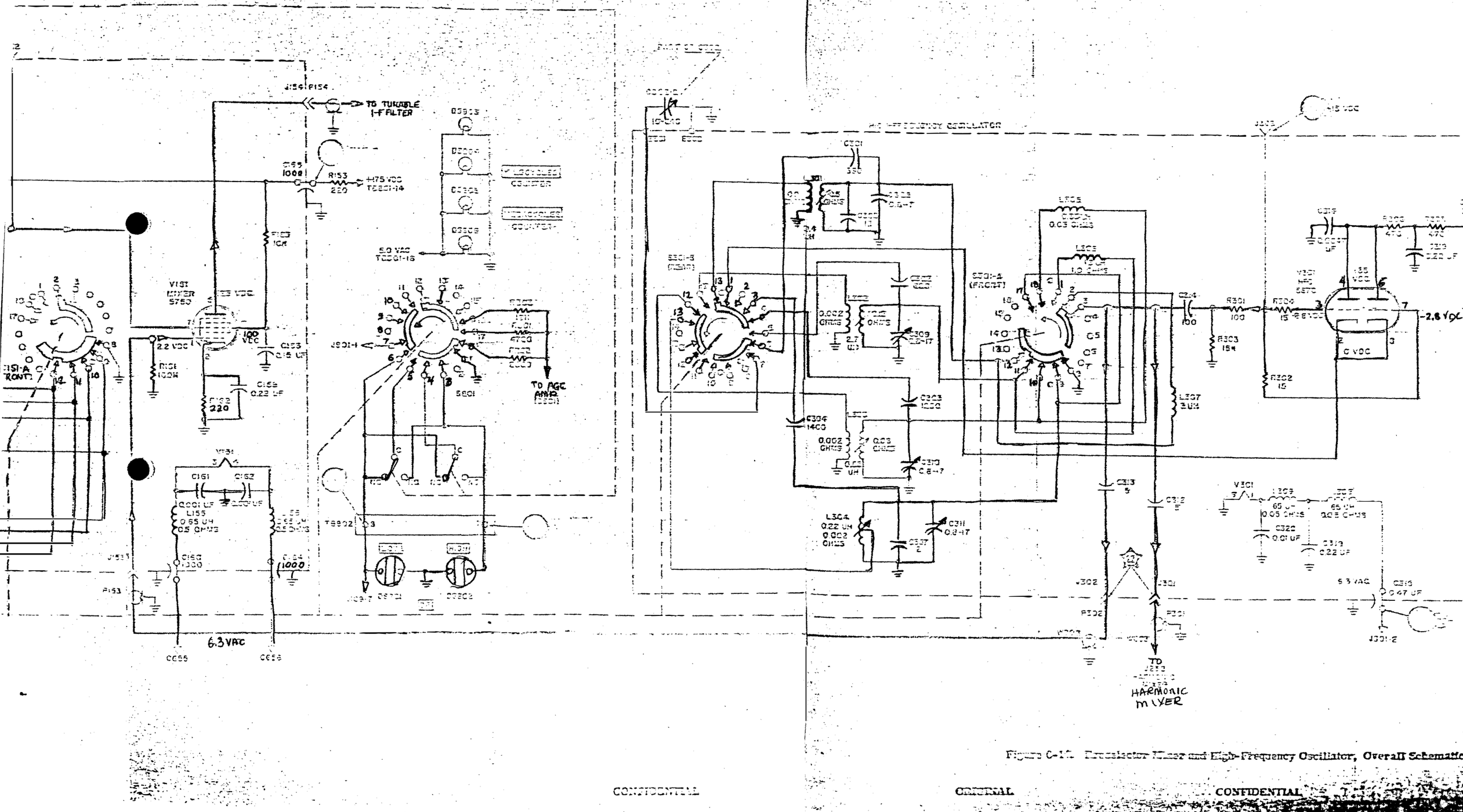


Figure 6-10. Turret-Selector Mixer and High-Frequency Oscillator, Overall Schematic D

J502 ANT

L51 12 UH 2.4 MC

.002 OHMS

0.04 Ω

R51 2.7

C51 0.3-17

L52 4.1 UH 4-8 MC

0.3 OHMS

1.30 Ω

R52 4.7

C52 12

C53 0.3-17

L53 1.2 UH 7-13 MC

C54 12

C55 0.3-17

L54 0.1 UH 13-30 MC

0.1 OHMS

C55 60

C56 0.3-17

TUNING (MC)

16-32

8-16

4-8

1-4

S2-A (FRONT)

S2-B (REAR)

S2-C (FRONT)

S2-D (REAR)

C57 100

V21 1ST RF AMP 5749

165 VDC

R54 100

R53 10K

170 VDC

1.2 VDC

C53 0.12

C58 0.22

R57 68

R55 330K

V51

C62 4700

C63 4700

L59 0.05 OHMS 0.65 UH

L60 0.05 OHMS 0.65 UH

C59 1000

C78 1000

C73 1000

6.3 VAC

6.3 VAC

TO C655

TO C655

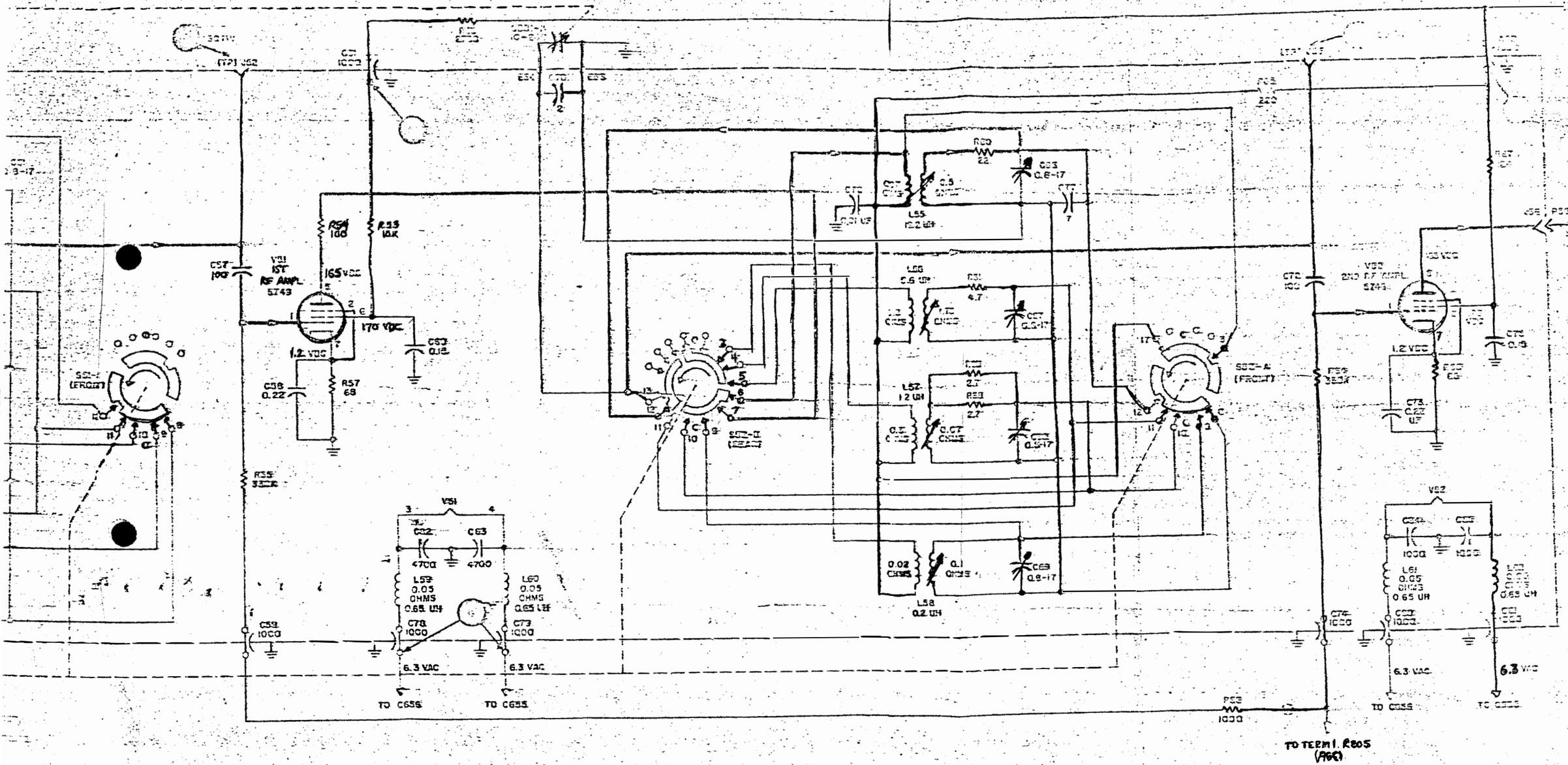
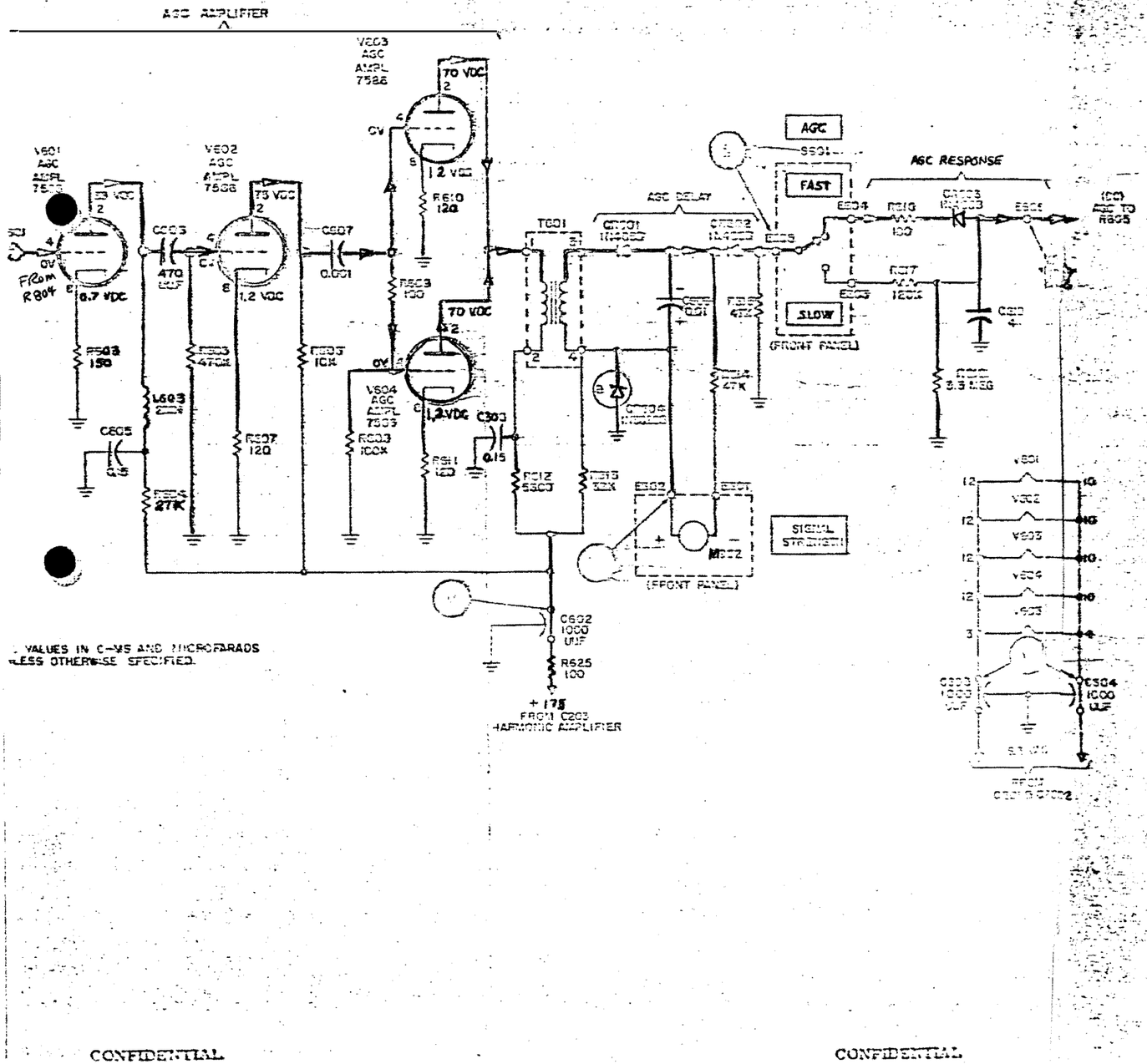


Figure C-3. Preselector Amplifier and Converter Assembly, Schematic Diagram (Sheet 1 of 2)



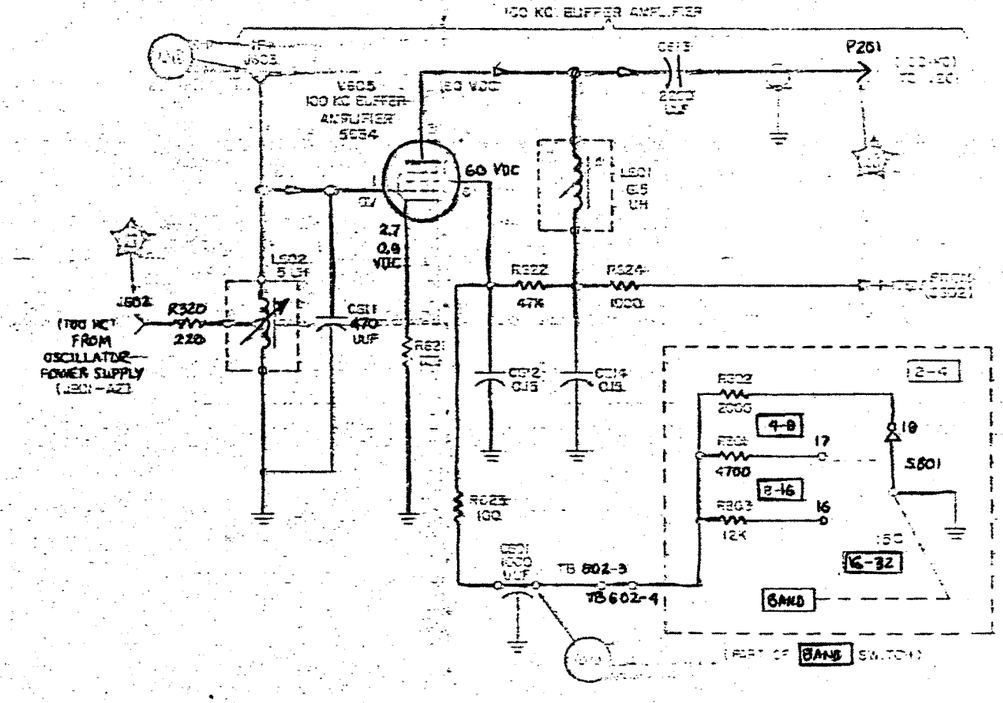


Figure 5-13. 100 Kc Buffer and VFO Cathode Follower Schematic Diagram

CONFIDENTIAL
SECURITY INFORMATION

FROM TUNING (MC)

FROM SHEET 1

C202-A
10-200

HARMONIC AMPLIFIER 1ST AND 2ND PP

E201

E202

600 Ω

(TP) J202

C221
15

C209
1100

L201
0.9
OHMS
13 UH

C210
0.8-17

C211
10

C212
1600

L202
0.95
OHMS
3.9 UH

C215
0.8-17

1ST HAR

C222
10

CR201
1N180

L203
0.37
OHMS
1 UH

C213
0.8-17

S201-A
(FRONT)

L204
0.1
OHMS
0.2 UH

C223
0.8-17

C220
5

R202
1500

R2
47

FROM
AGC AMPL
100KC BUFFER
(V605)

P201

J201

R201
22K

C223
390

FROM AGC
AMP
100 KHz Buffer
V605

CONFIDENTIAL

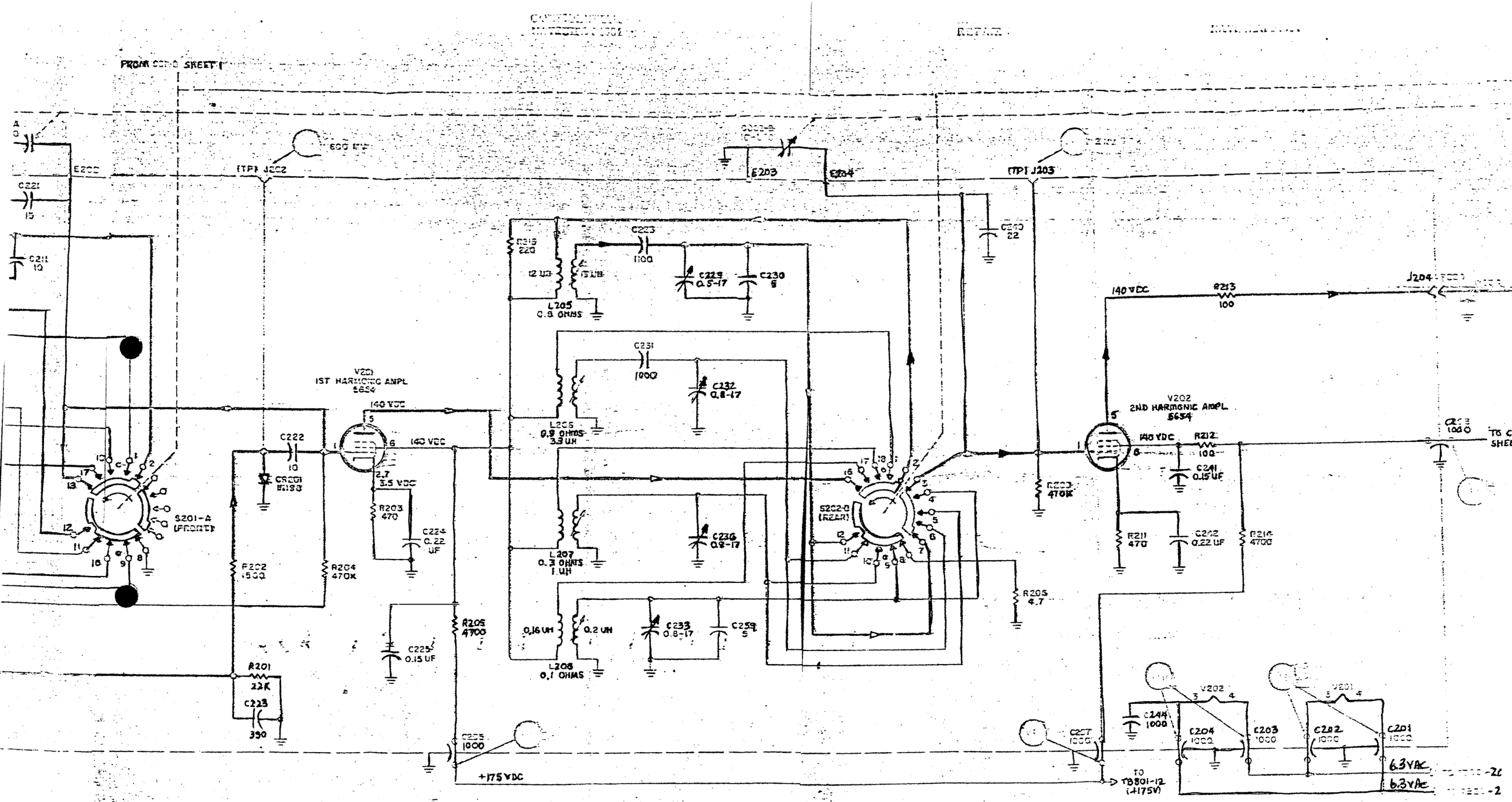


Figure C-13. Preselector Amplifiers and Harmonic Amplifiers, Overall Schematic Dia (Sheet 2 of 2)

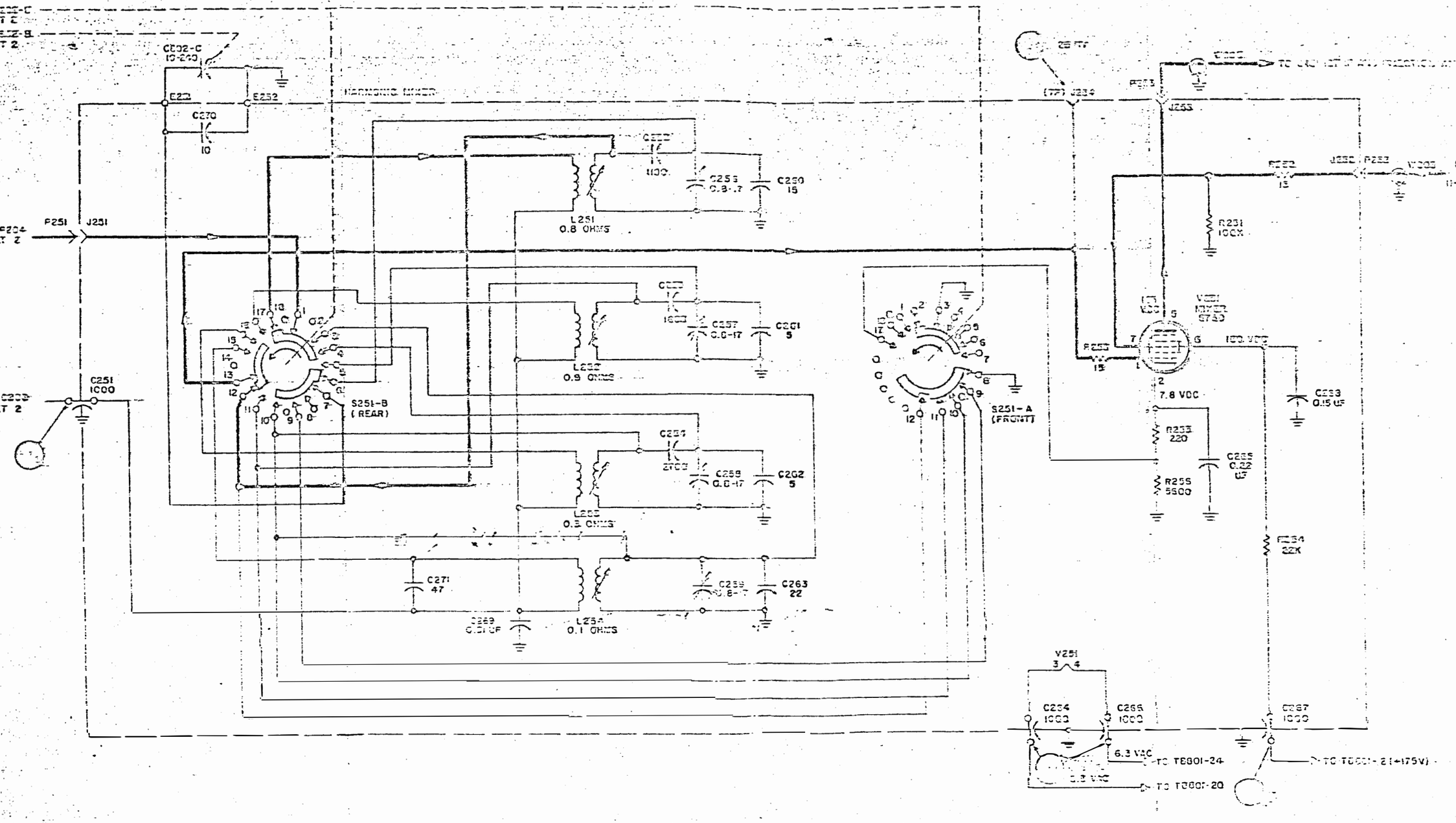


Figure 6-12. Preselector Amplifiers and Harmonic Amplifier, Overall Schematic Diagram (Sheet 3 of 3)

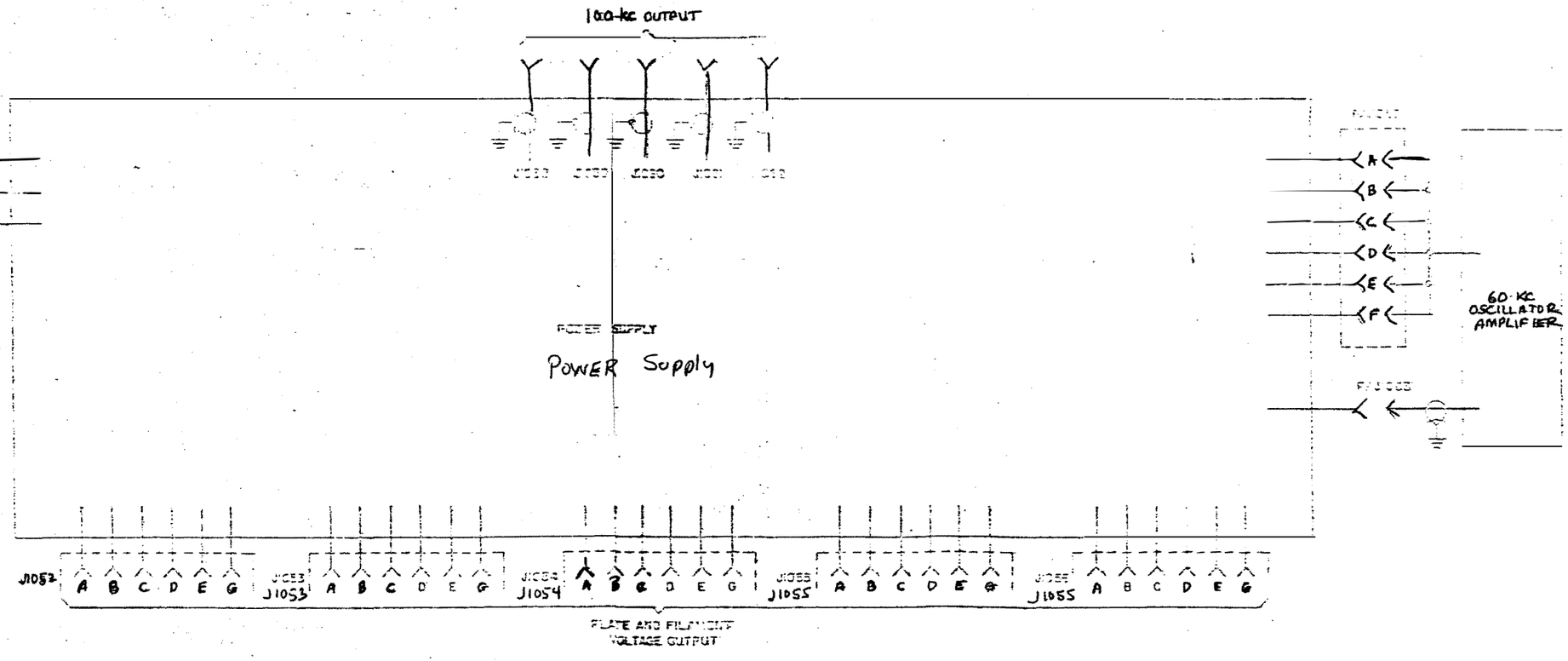
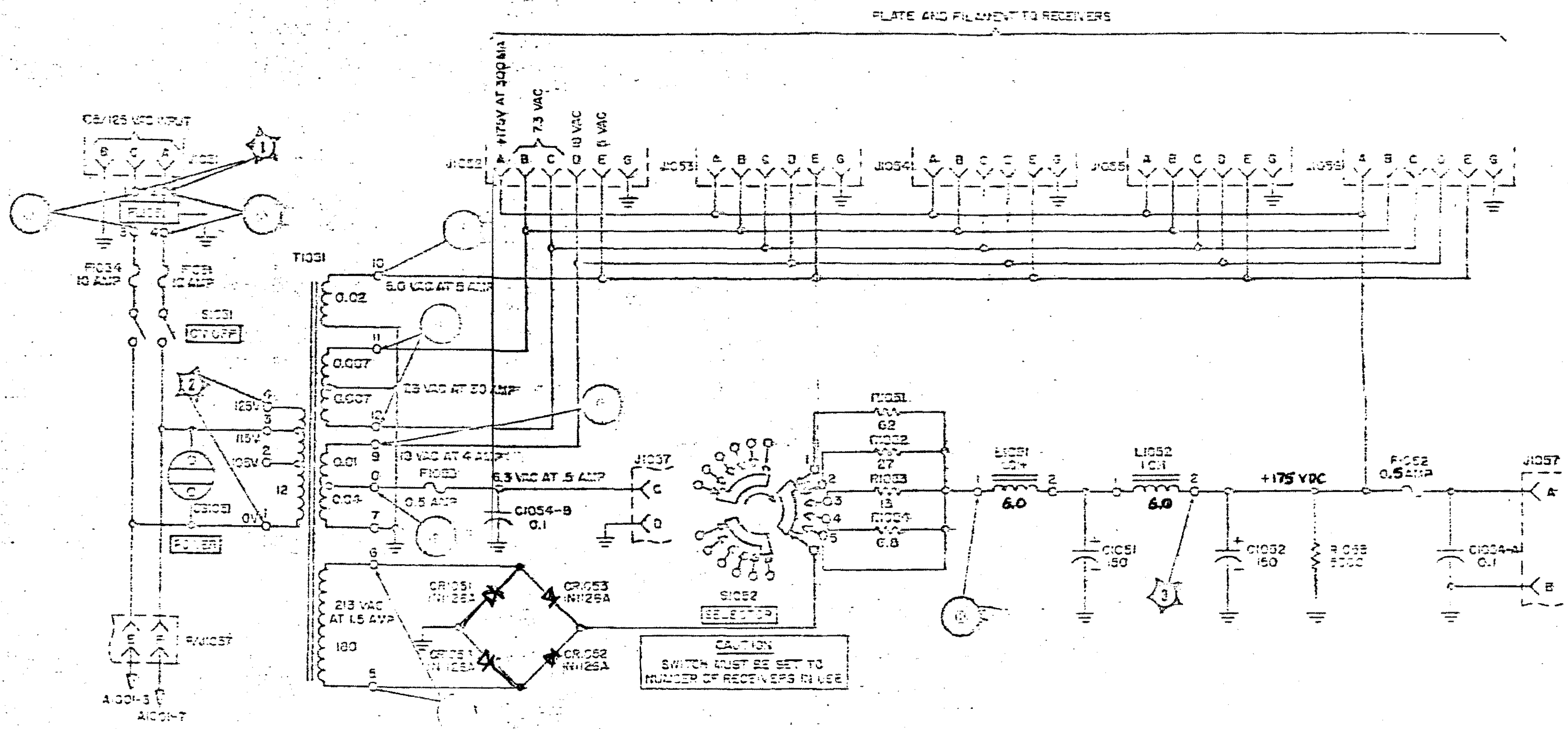


Figure 6-37. Interconnecting Cables, Oscillator-Power Supply C-823/FLR

Figure 6-19. Receiver Assemblies, Interconnecting Cable Diagram



NOTES

1. ALL VALUES ARE IN OHMS AND MICROFARADS UNLESS OTHERWISE SHOWN.
2. [illegible]

Figure 6-13. Power Supply, Overall Schematic Diagram

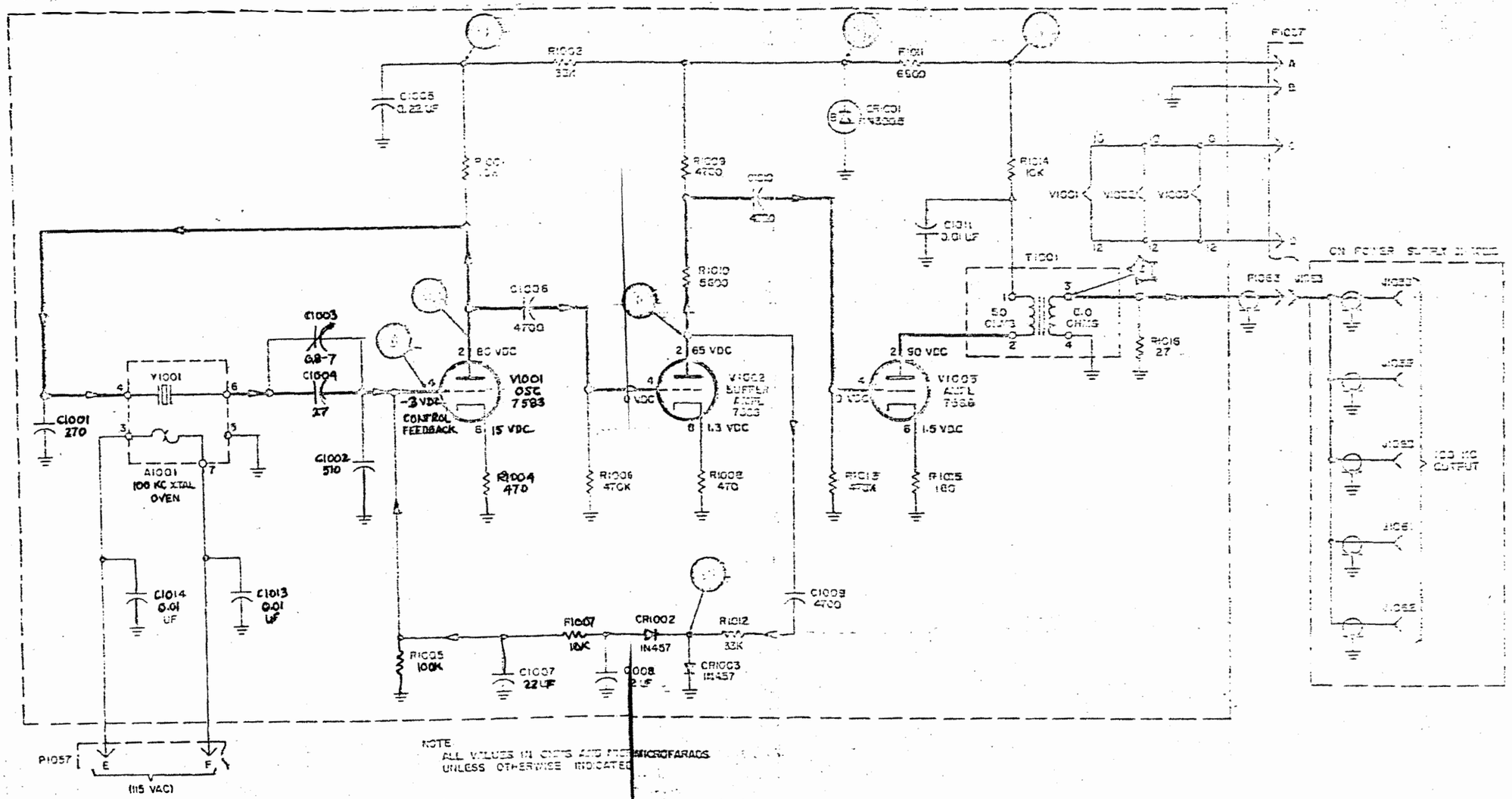
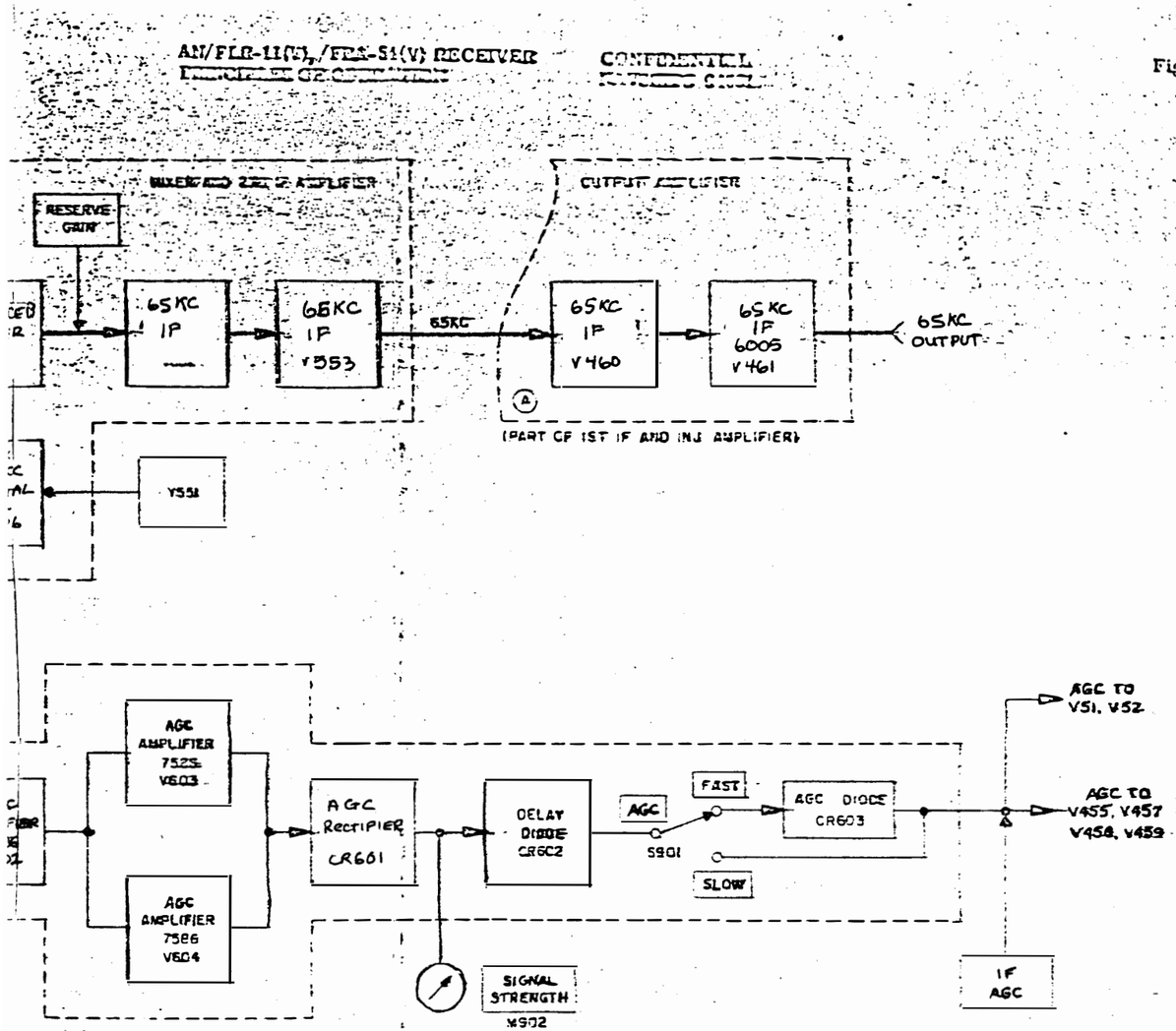


Figure 6-17. 100-kc Oscillator Amplifier, Overall Schematic Diagram

100 kc OSCILLATOR Amplifier

Figure 4-5



NOTE
LETTERS (A) ETC. INDICATE COMMON ASSEMBLY

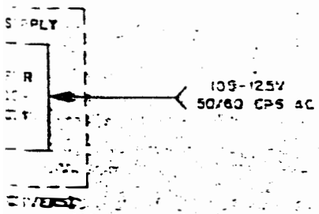


Figure 4-5. Communications Receiver R-1105/FLR and Control-Power Supply C-923/FLR, Detailed Block Diagram

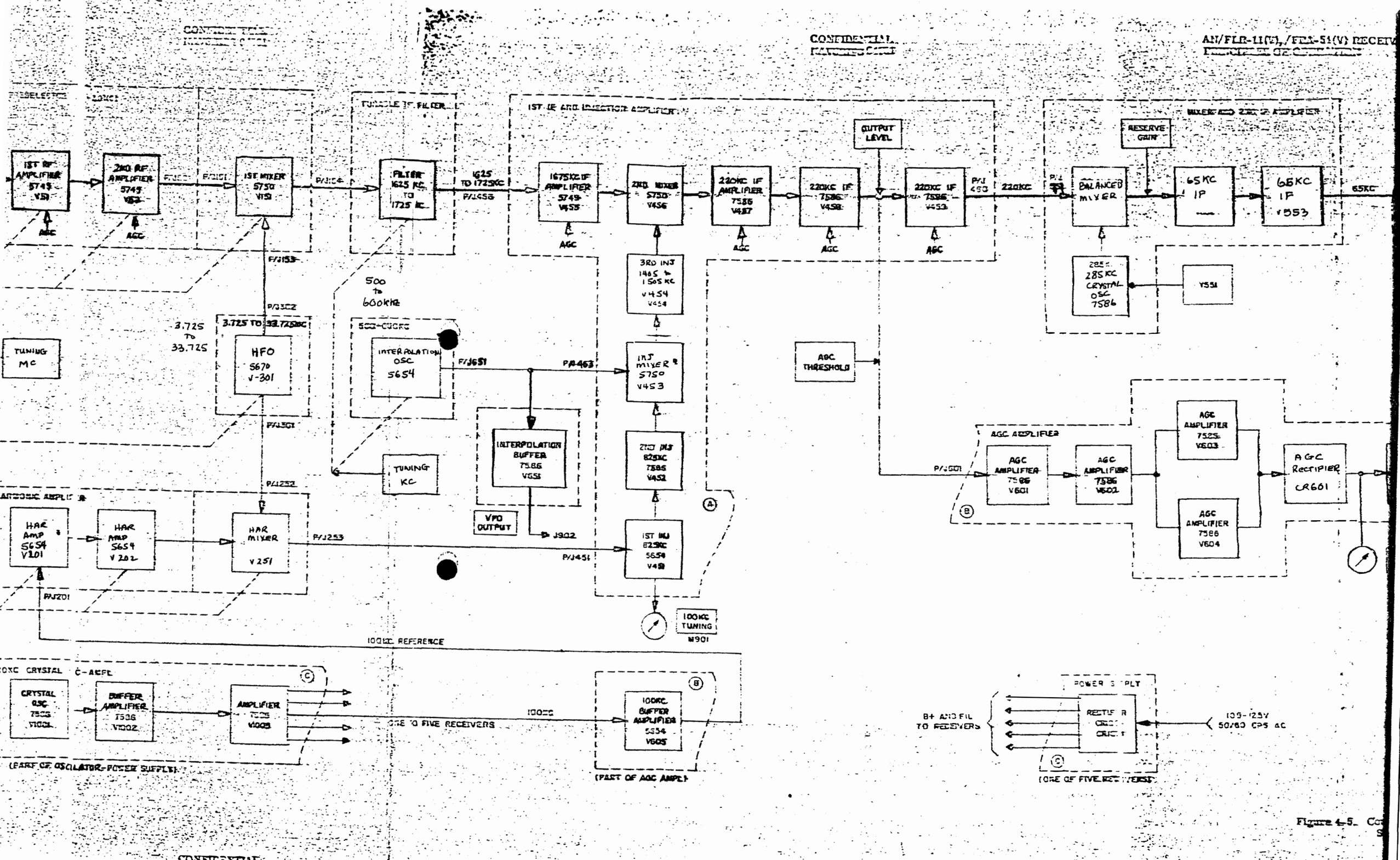


Figure 4-5. Co
S

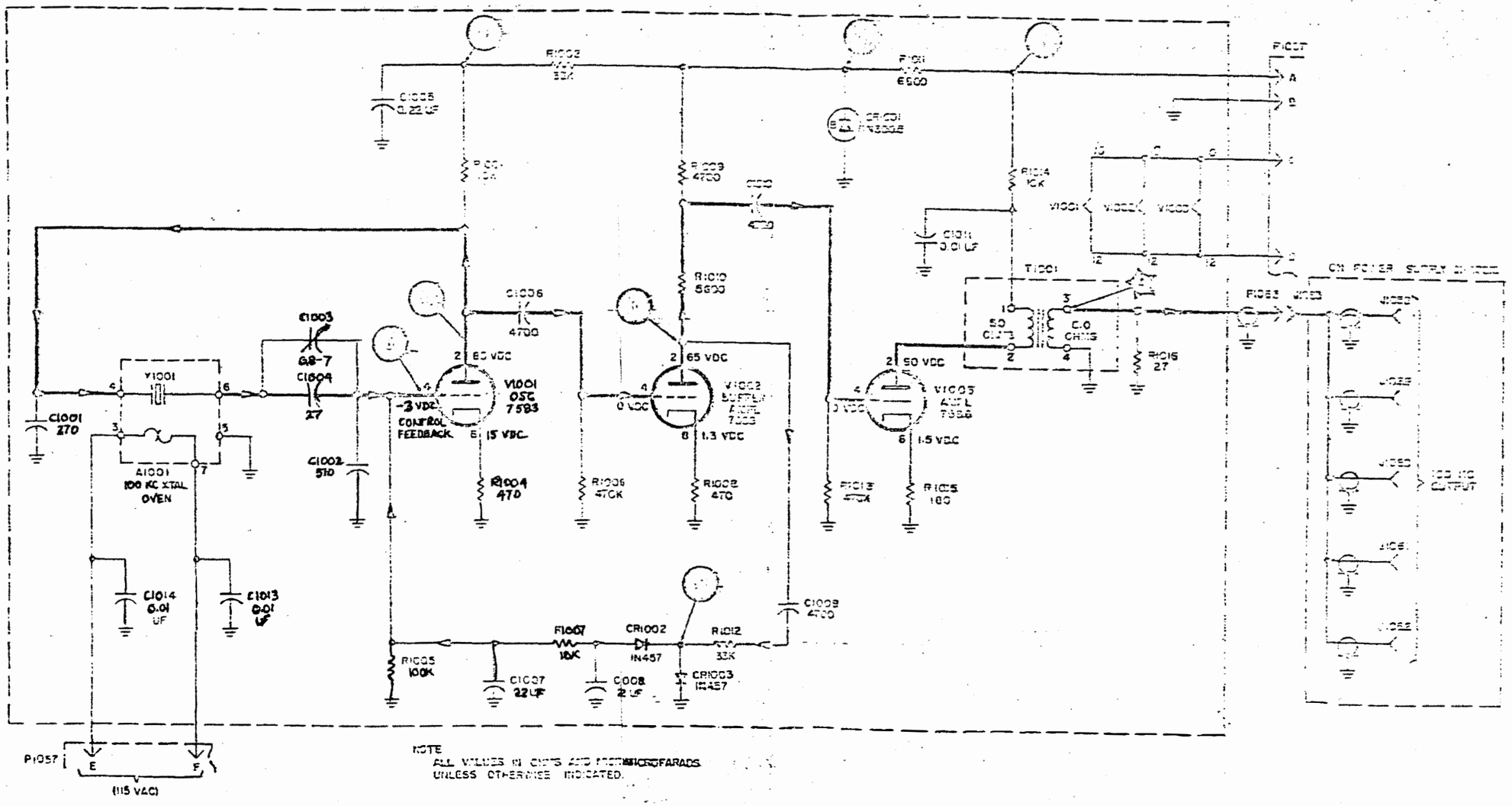


Figure C-17. 100-kc Oscillator-Amplifier, Circuit Schematic Diagram
100 kc OSCILLATOR Amplifier

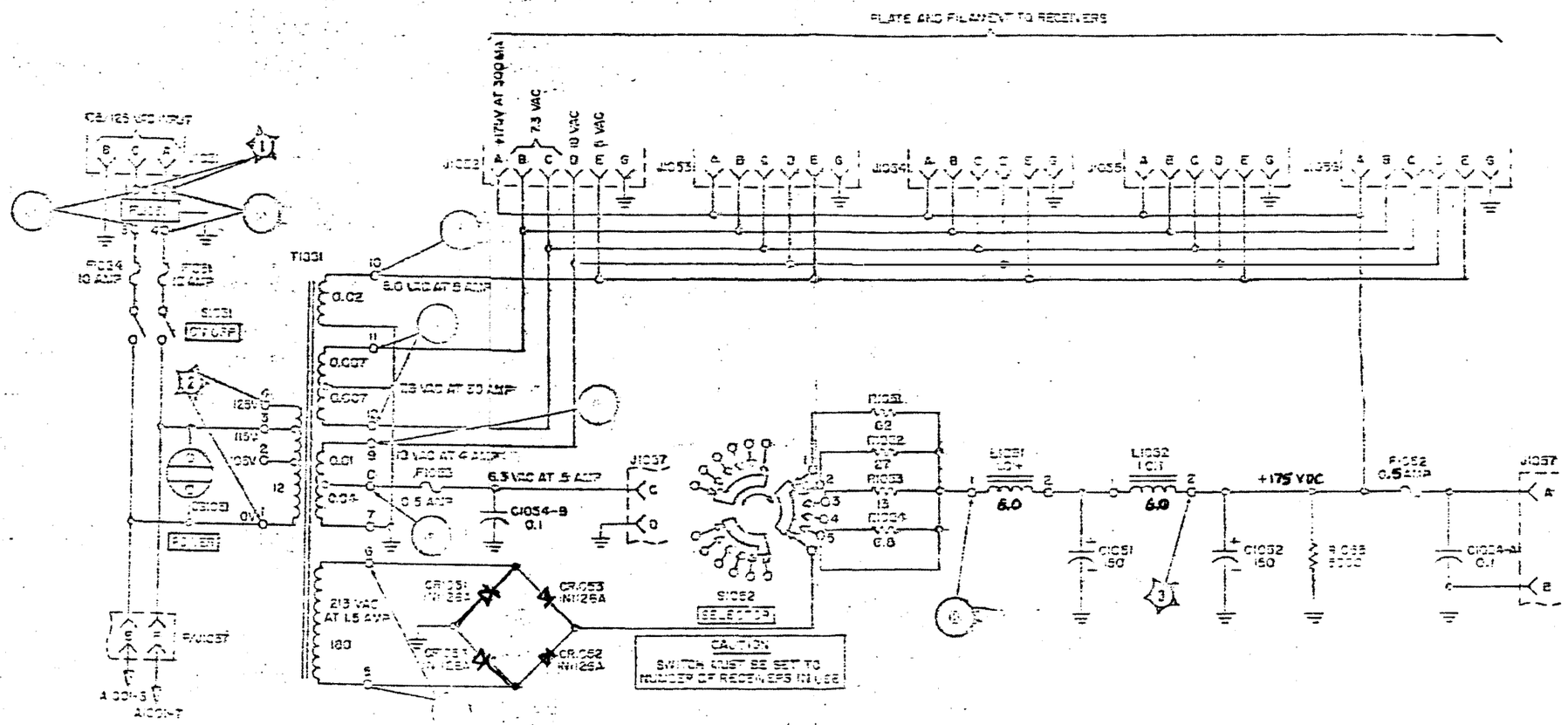


Figure C-13. Power Supply, Overall Schematic Diagram

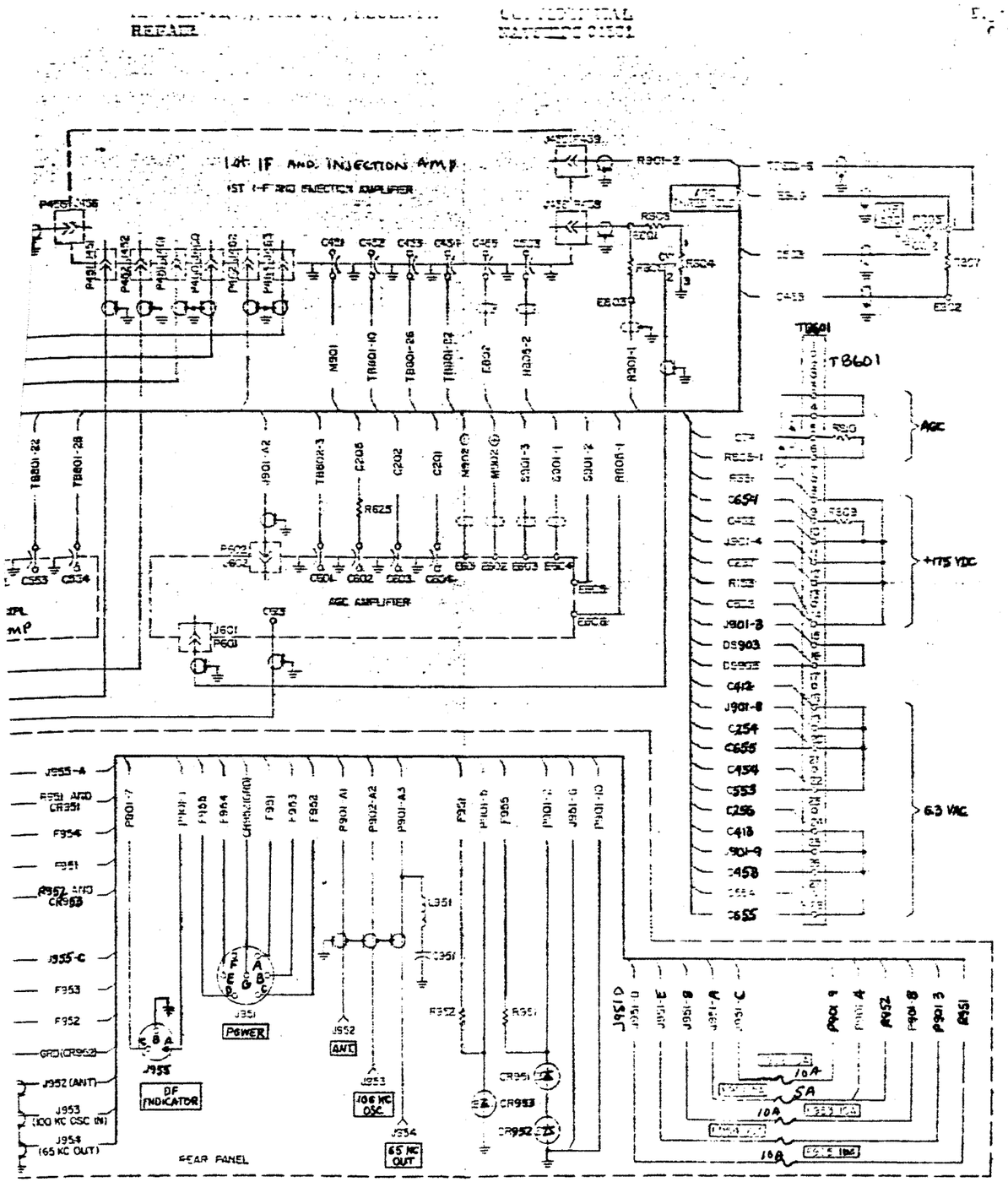


Figure 6-19. Receiver Assemblies, Interconnecting Cable Diagram

Figure 6-19. Receiver Assemblies, Interconnecting Cable Diagram

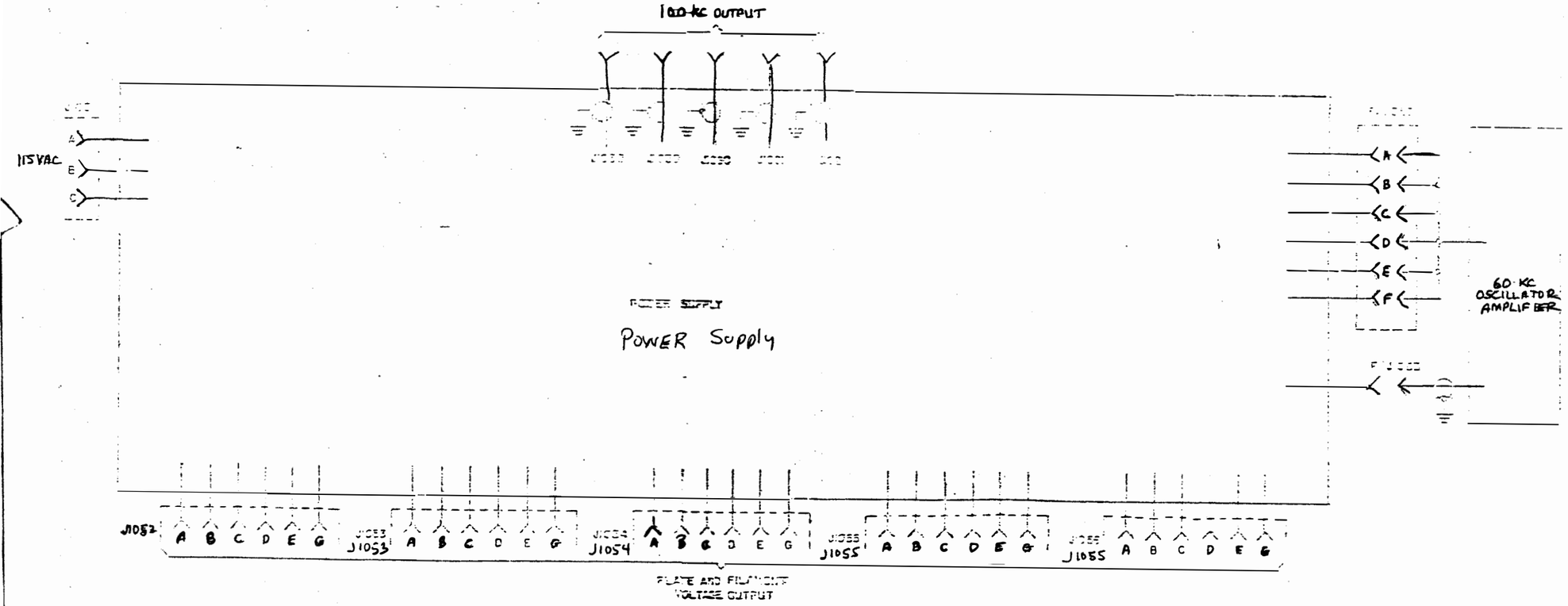


Figure C-25. Interconnecting Cables, Oscillator-Power Supply C-823/FLR

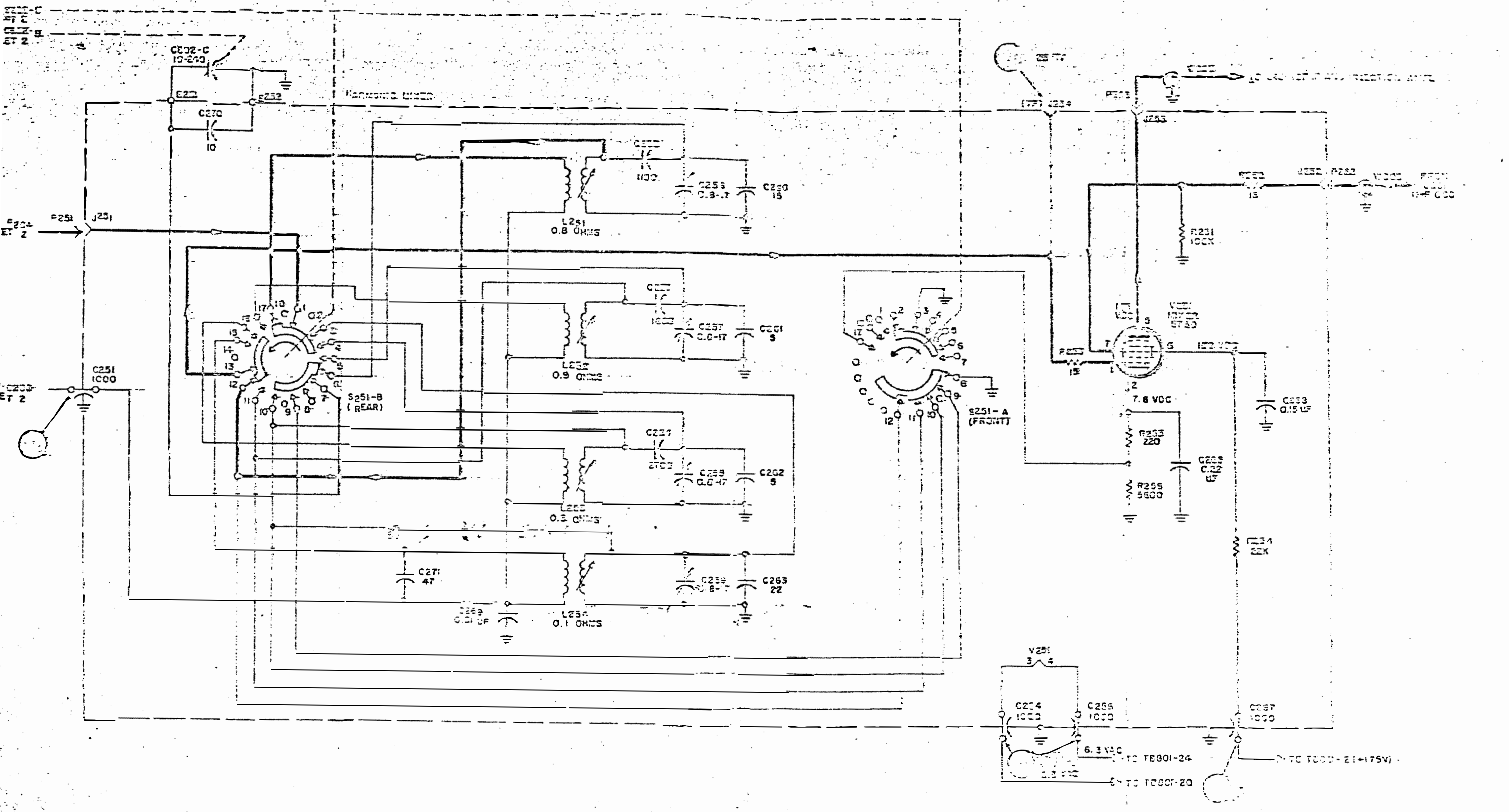


Figure 6-12. Deviation Amplifiers and Harmonic Amplifier, Overall Schematic Diagram (Sheet 3 of 3)

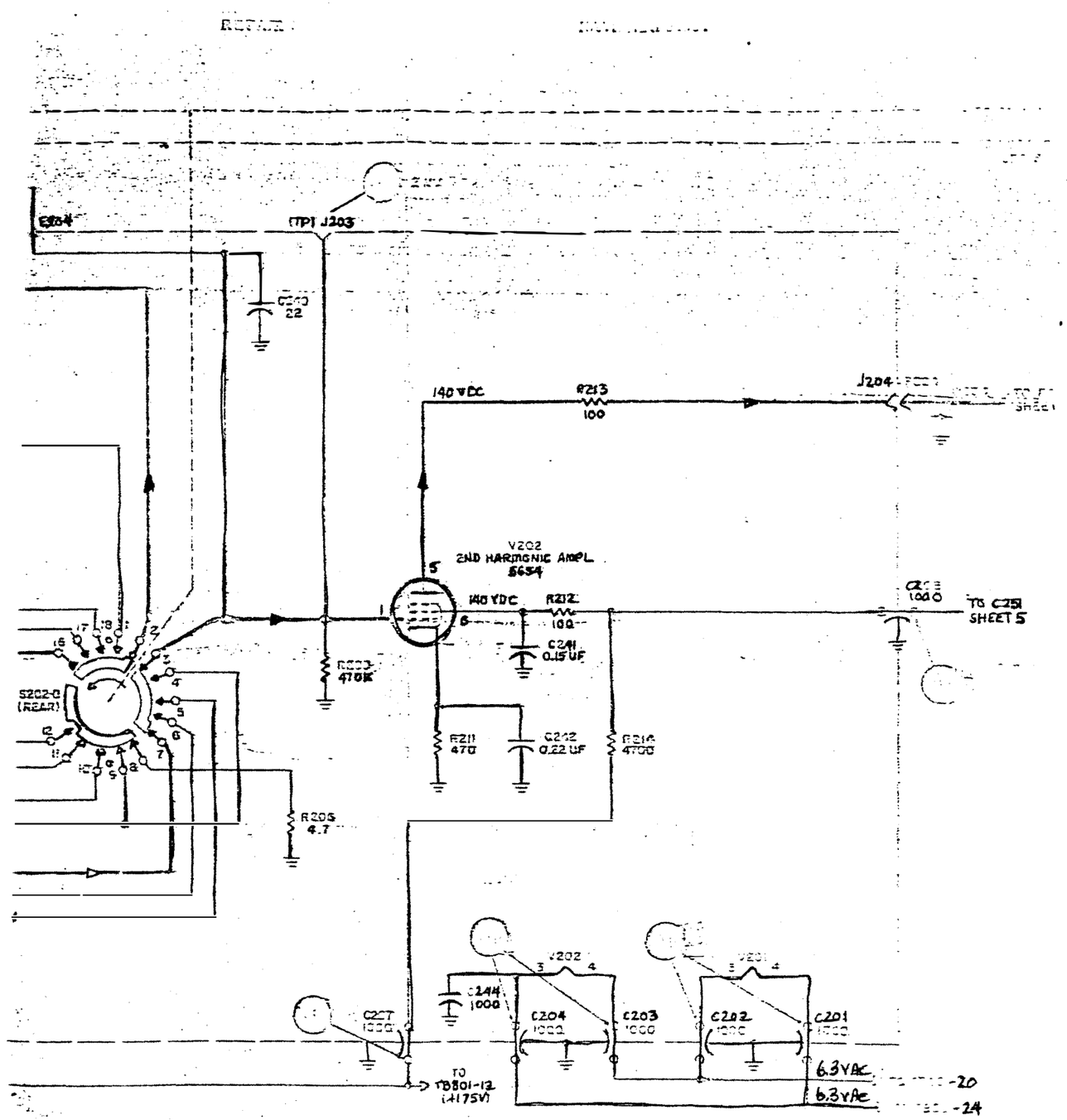


Figure C-13. Preselector Amplifiers and Harmonic Amplifier, Overall Schematic Diagram (Sheet 2 of 2)

FROM TUNING UNIT

HARMONIC AMPLIFIER 1ST AND 2ND PF

C202-A 10-240

E201

E202

C221 15

C209 1100

L201 0.9 OHMS 13 UH

C210 0.8-17

C211 10

C212 1600

L202 0.35 OHMS 3.9 UH

C213 0.8-17

L203 0.37 OHMS 1 UH

C217 0.8-17

L204 0.1 OHMS 0.2 UH

C218 0.8-17

C220 5

S201-A (FRONT)

600 MFD

(TP) J202

V201 1ST HARMONIC AMPL 6BC4

140 VDC

C222 10

CR201 IN198

R202 1500

R204 470K

R203 470

C224 0.22 UF

2.7

3.5 VDC

C225 0.15 UF

R201 22K

C223 390

P201

J201

R205 4700

C226 1000

+175 VDC

E203

E204

C223 1100

C219 220

12 UH

L205 0.9 OHMS

C228 0.5-17

C230 5

C231 1000

C232 0.8-17

L205 0.9 OHMS 3.3 UH

L207 0.3 OHMS 1 UH

C236 0.8-17

S202-B (REAR)

R206 4.7

0.16 UH

0.2 UH

C233 0.8-17

C234 5

L208 0.1 OHMS

(TP) J203

C210 22

R203 470K

C227 1000

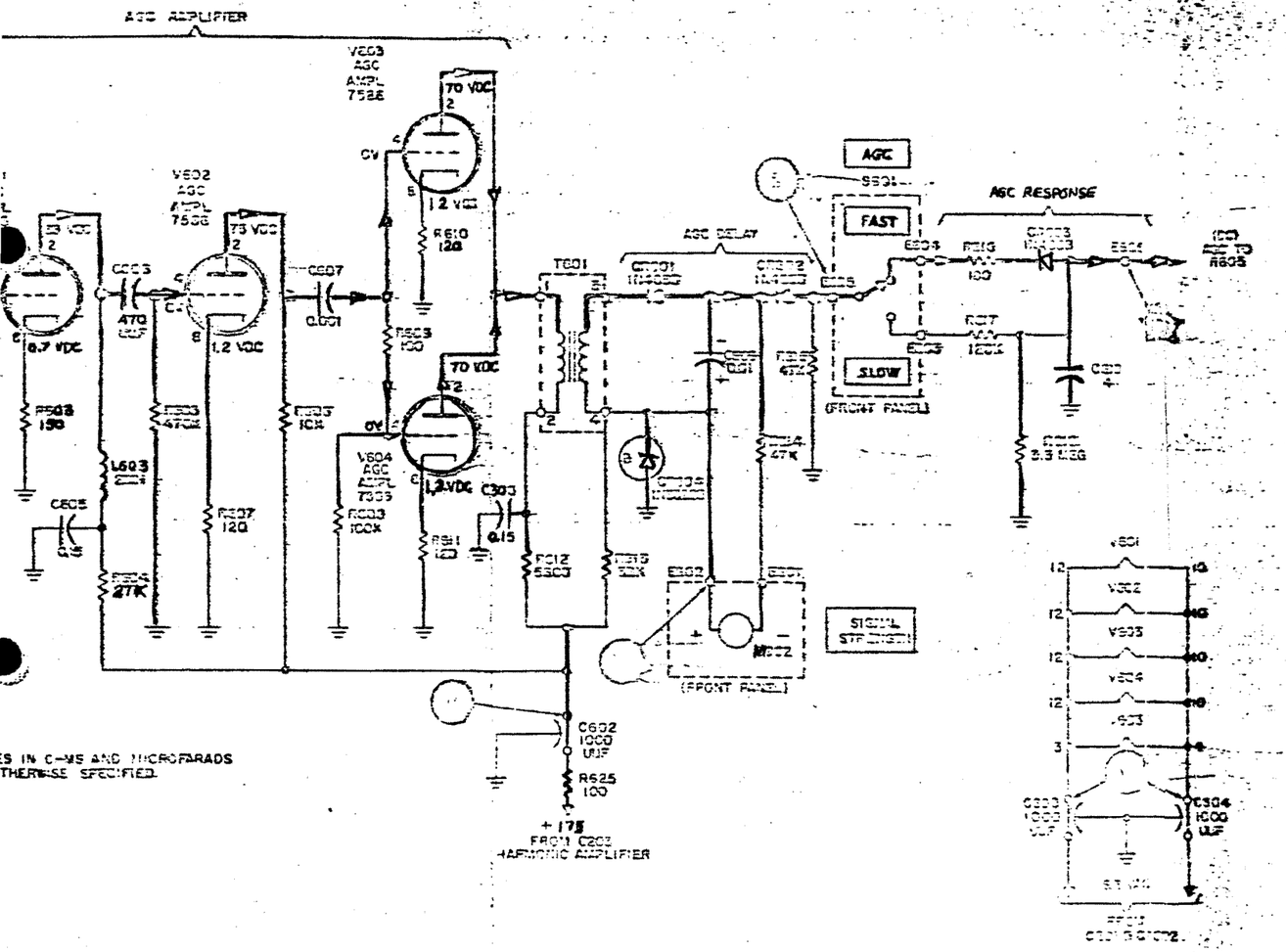
DM AGC

MP

0-KHz Buffer

605

Figure C-13.



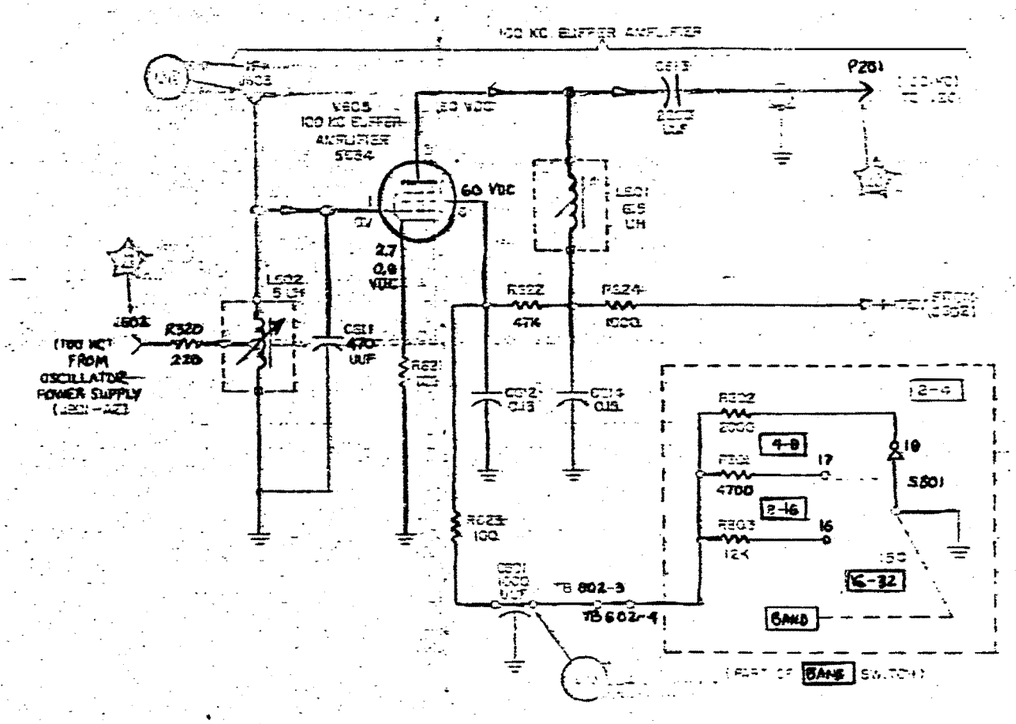


Figure 5-13. 100 [illegible] Schematic Diagram

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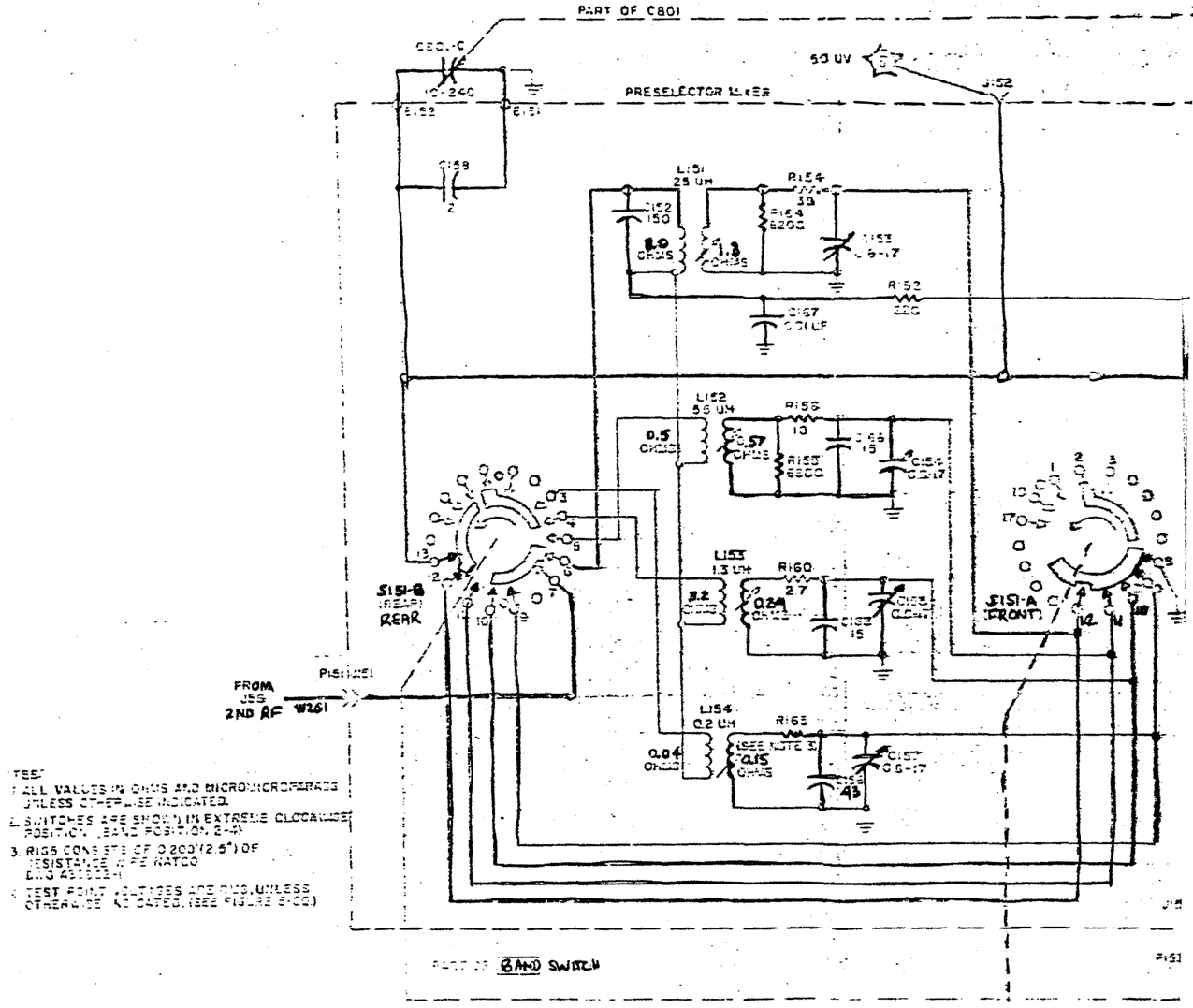


TEST

1. ALL VALUES IN OHMS AND MICROMICROFARADS UNLESS OTHERWISE INDICATED.
2. SWITCHES ARE SHOWN IN EXTREME CLOCKWISE POSITION (BAND POSITION 8-4).
3. R165 CONSISTS OF 0.200"(2.5") OF RESISTANCE WIRE MATCO DWG 4813024-1.
4. TEST POINT VOLTAGES ARE DVD, UNLESS OTHERWISE INDICATED. (SEE FIGURE 8-100)

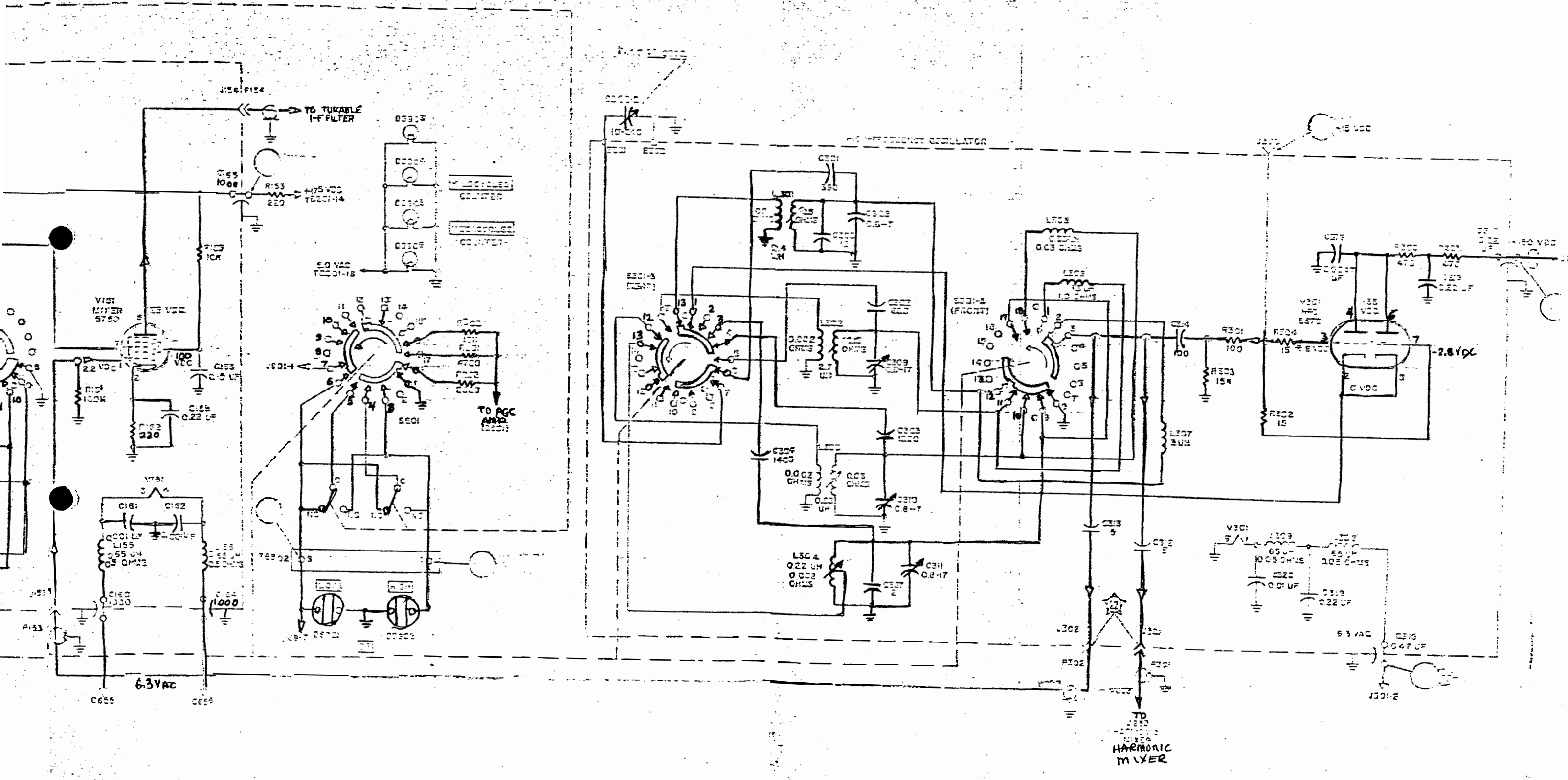


Figure C-10. Receiver Mixer and High-Frequency Oscillator, Overall Schematic Diagram

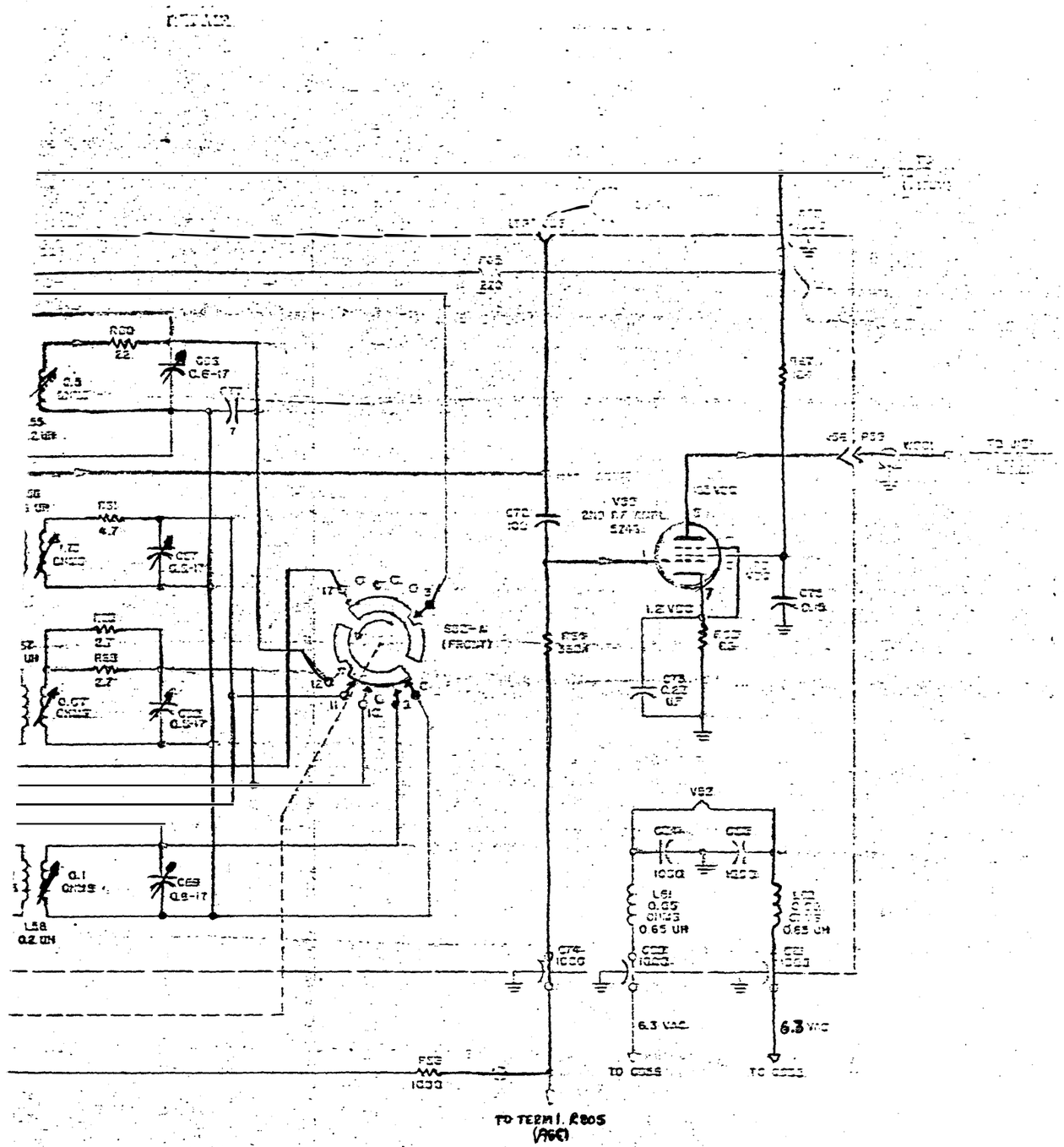
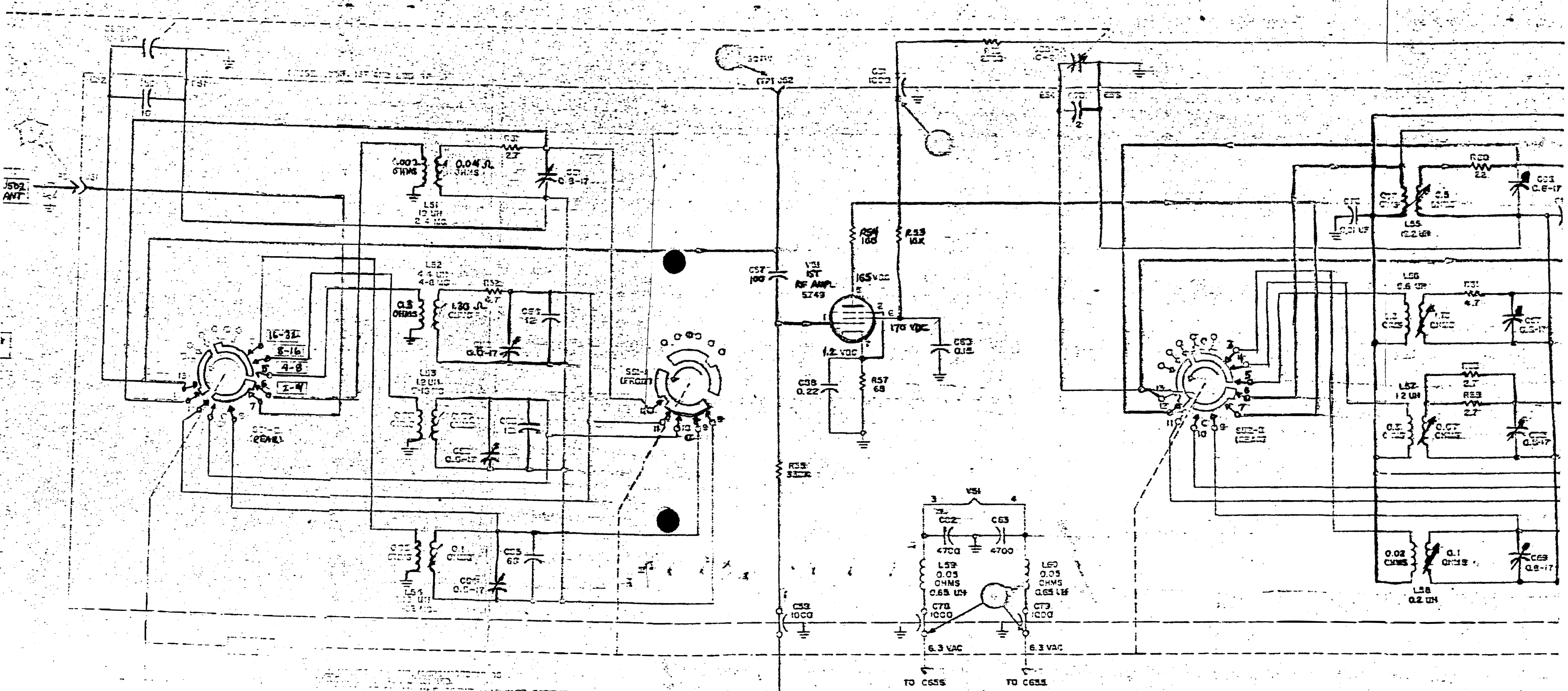


Figure C-13. Preselector Amplifier and Converter Amplifier, Schematic Diagram (Sheet 1 of 2)


J502 ANT
L51 12 UH
0.04 Ω OHMS
16-32
8-16
4-8
2-4
L52
L53
C57 100
V51 1ST RF AMPL. 5749
165 VDC
170 VDC
1.2 VDC
C58 0.22
R57 68
R54 100
R53 10K
R55 330K
C53 1000
V51
C62 4700
C63 4700
L59 0.05 OHMS 0.65 UH
L60 0.05 OHMS 0.65 UH
C78 1000
C79 1000
6.3 VAC
6.3 VAC
TO C655
TO C655
R60 22
L55 12.2 UH
L56 5.6 UH
R61 4.7
L57 12 UH
R63 2.7
0.02 OHMS
L58 0.2 UH

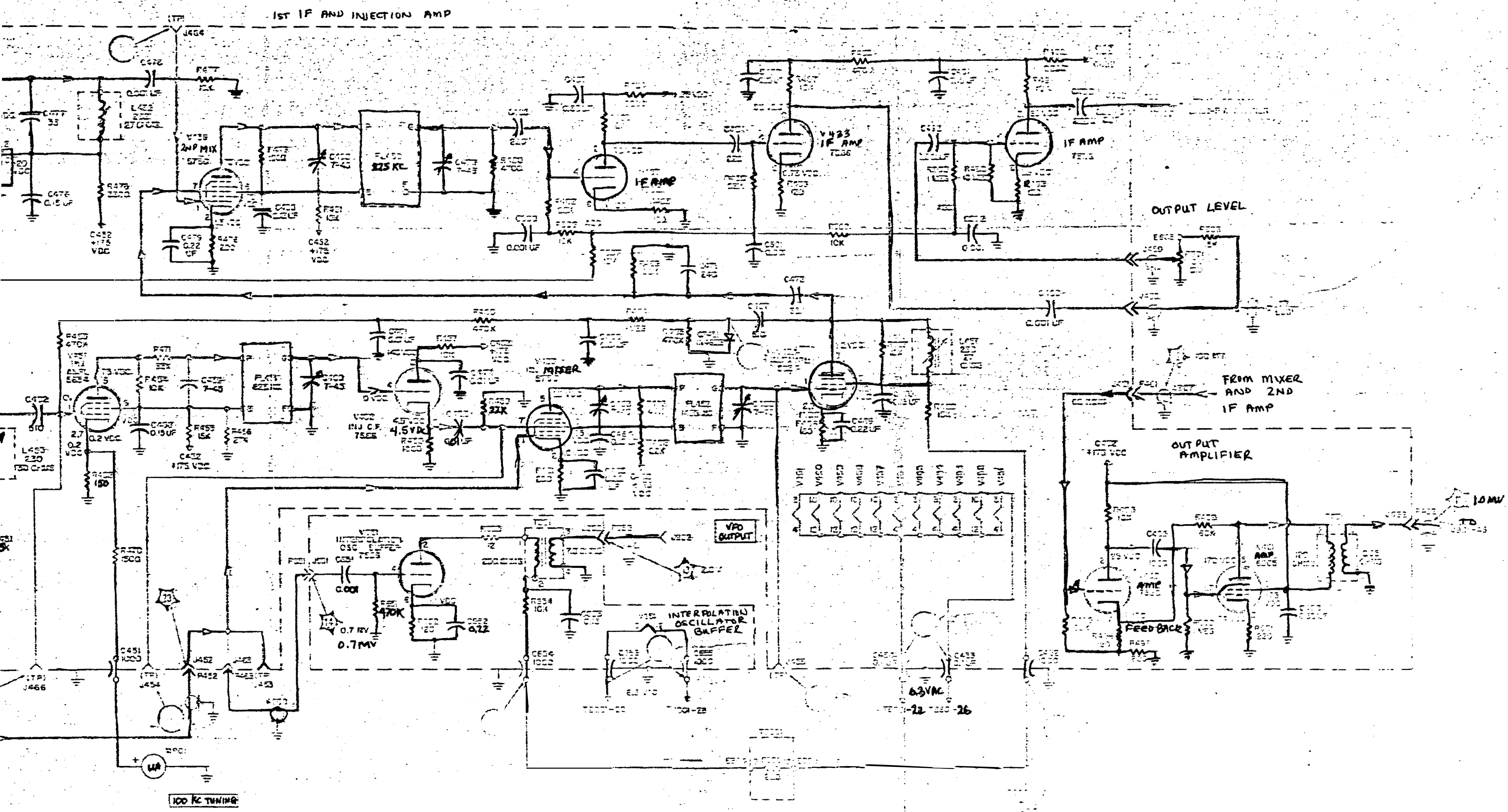
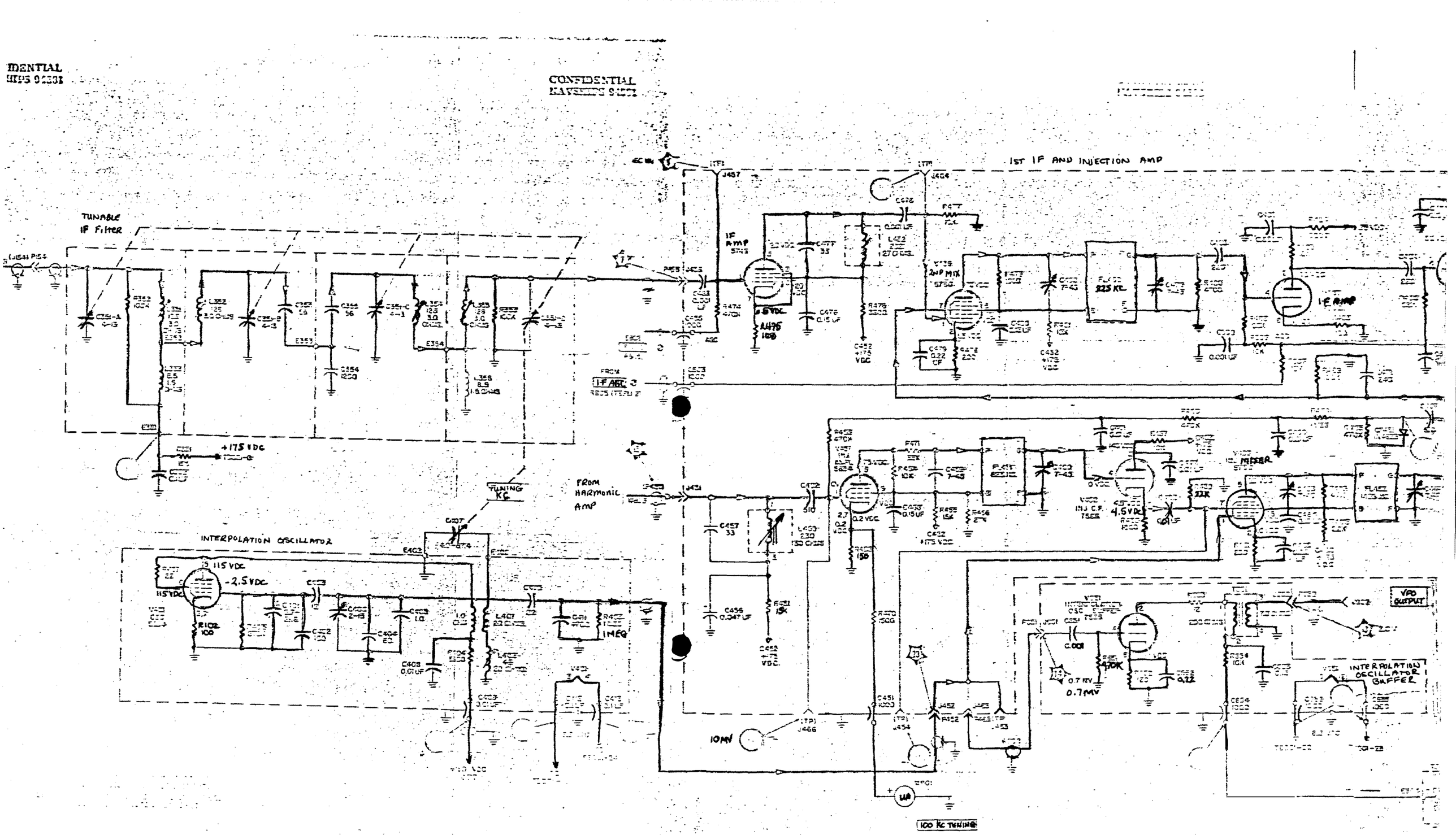


Figure 5-[illegible]. [illegible] Oscillator, First IF and Injection Amplifier, [illegible] Schematic Diagram


1ST IF AND INJECTION AMP
TUNABLE IF FILTER
IF AMP 5749
2ND MIX 5749
225 KC
IF AMP
+175 VDC
TUNING KC
INTERPOLATION OSCILLATOR
115 VDC
-2.5 VDC
FROM HARMONIC AMP
FROM IF AGC
10MV
0.7 RV
0.7MV
4.5 VRMS
INJ C.F. 7565
MIXER
VFO OUTPUT
INTERPOLATION OSCILLATOR BUFFER
100 KC TUNING

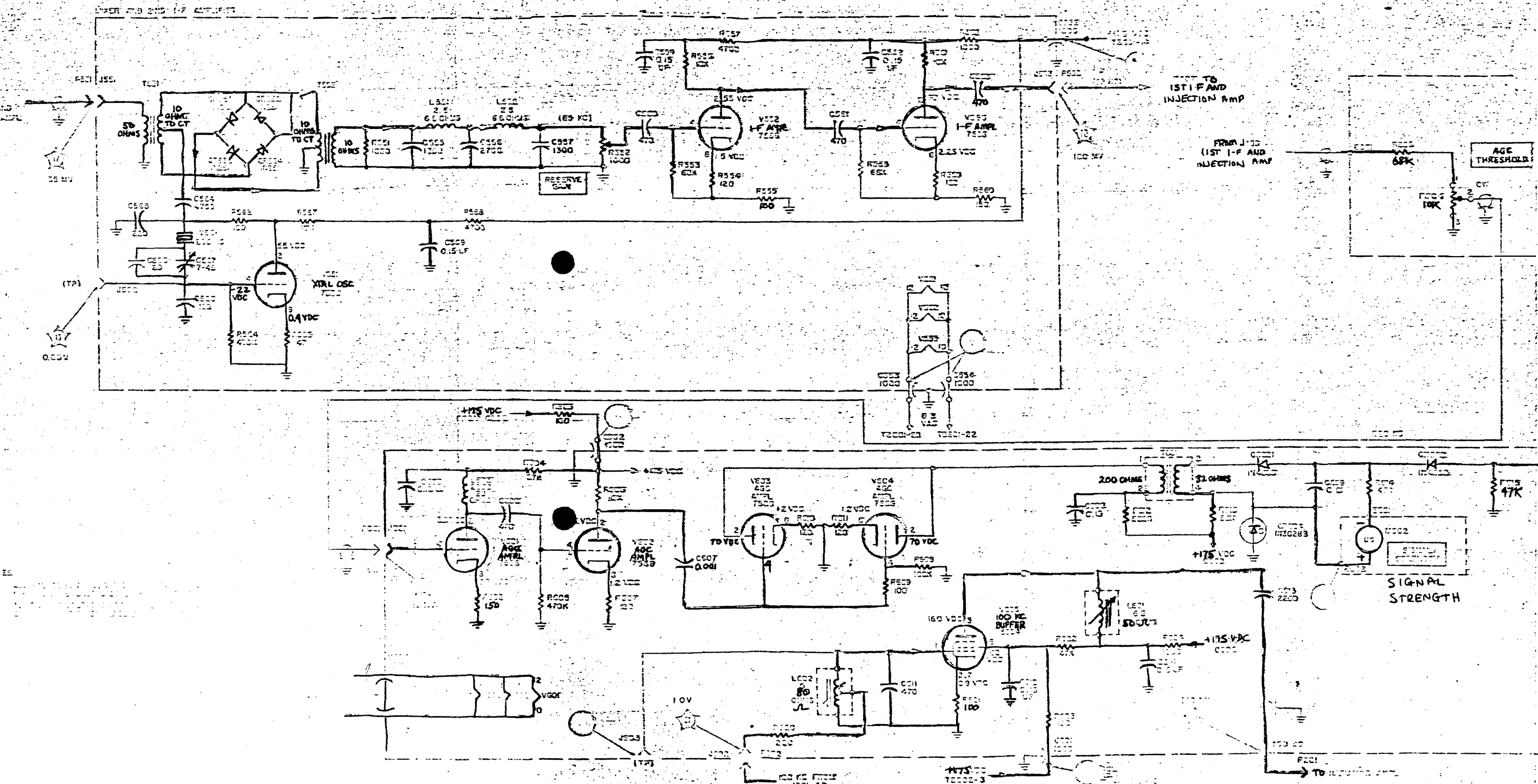

TO 1ST I-F AND INJECTION AMP
AGC THRESHOLD
68K
10K
I-F AMPL
XTAL OSC
RESERVE GAIN
AGC AMPL
100 KC BUFFER
SIGNAL STRENGTH
47K
200 OHMS
32 OHMS
+175 VDC
0.4 VDC
0.15 UF
0.001
470K
150

Figure C-10.

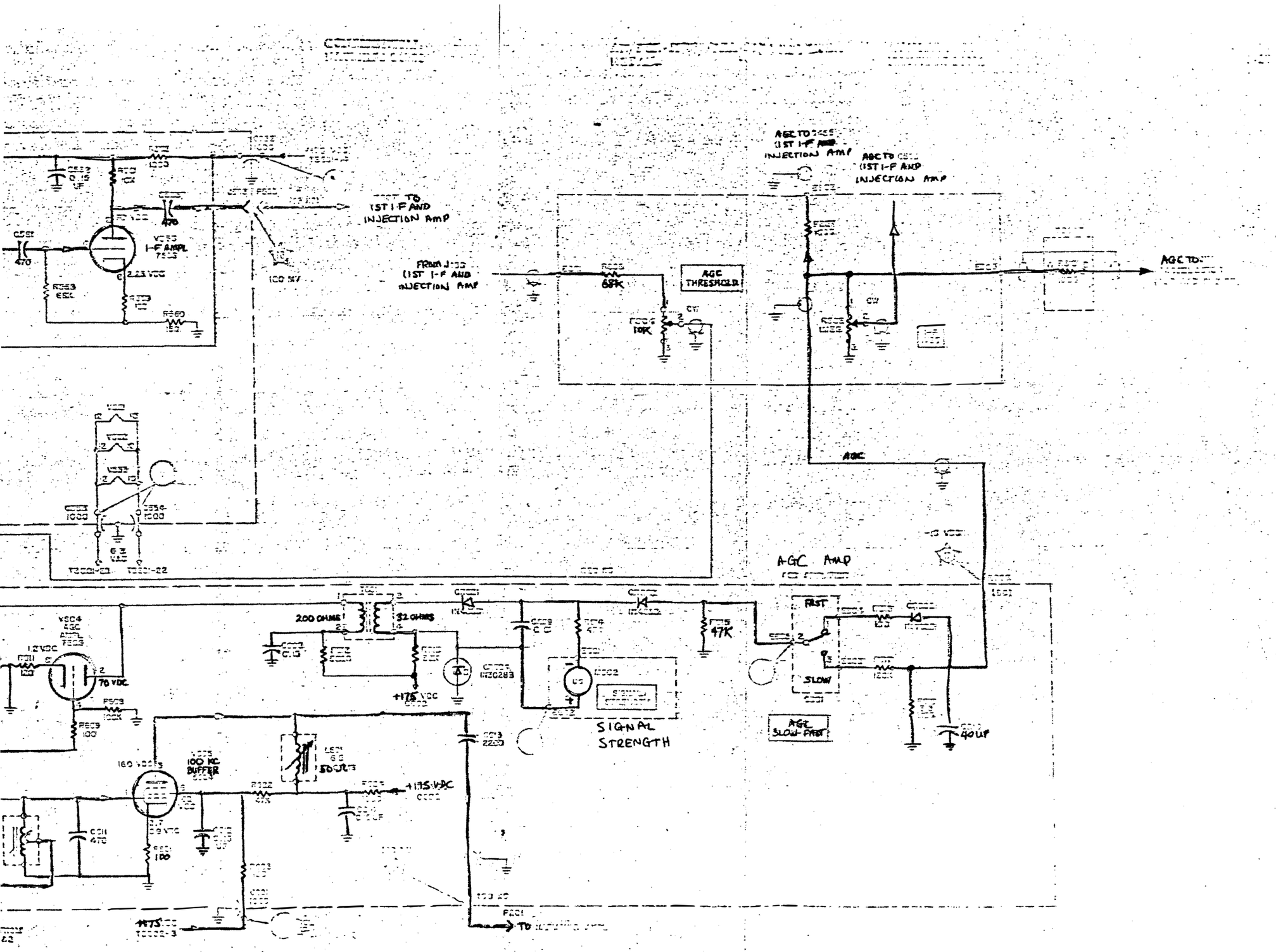
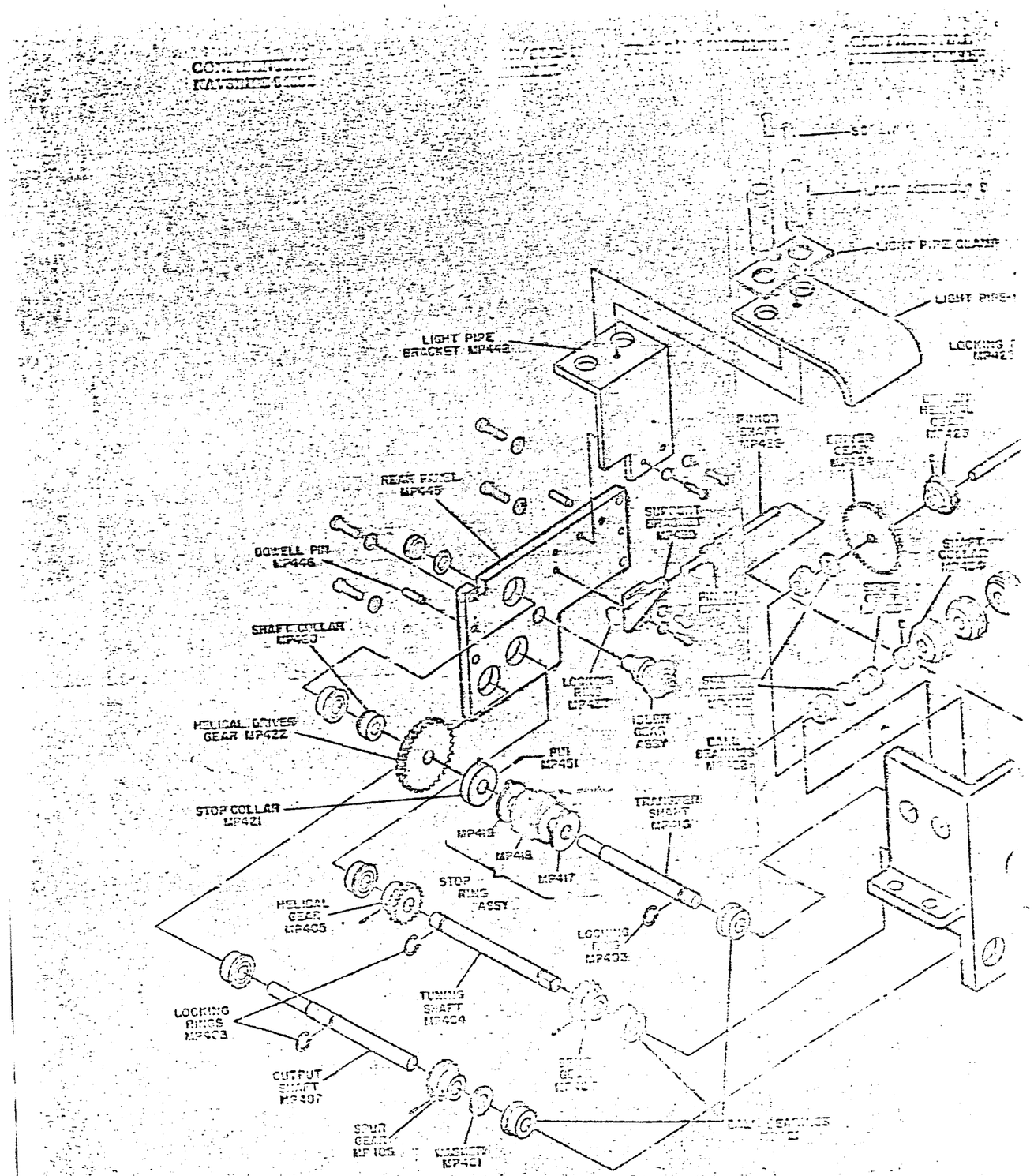


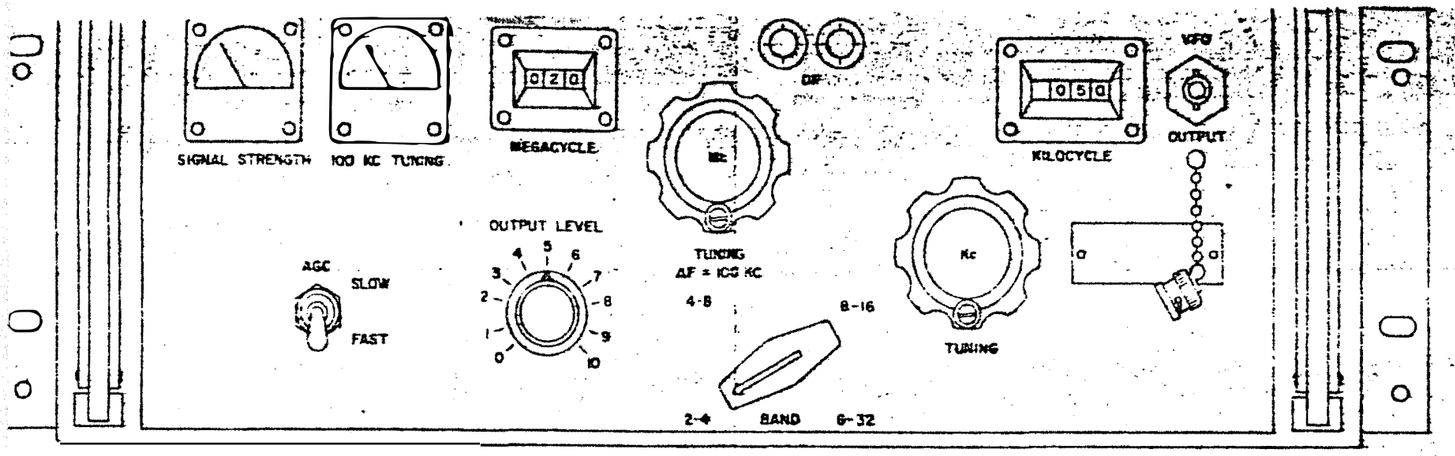
Figure C-18. [illegible] and Second I-F Amplifier, and AGC Amplifier, Overall Schematic



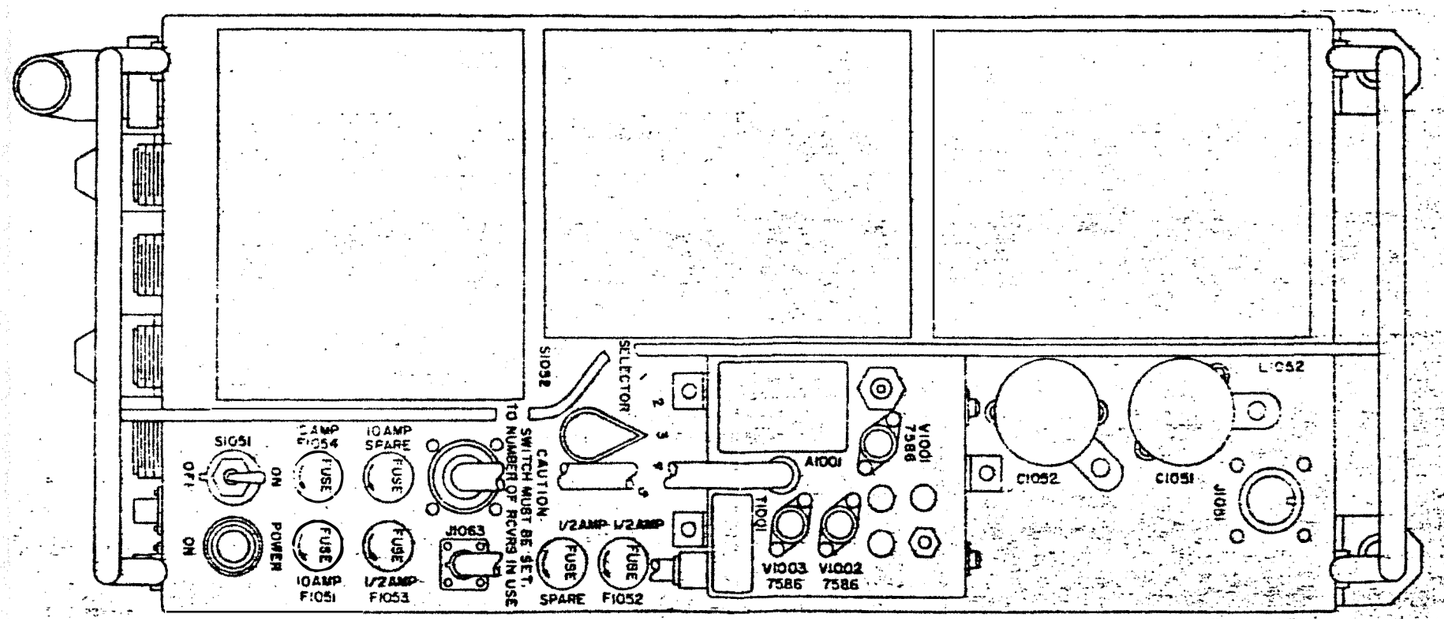
CONFIDENTIAL

ORIGINAL

CONFIDENTIAL



COUNTERMEASURES RECEIVER R-1125/FLR



OSCILLATOR-POWER SUPPLY O-928/FLR

Figure 3-1. Countermeasures Receiver R-1125/FLR and Oscillator-Power Supply O-928/FLR Control Locations

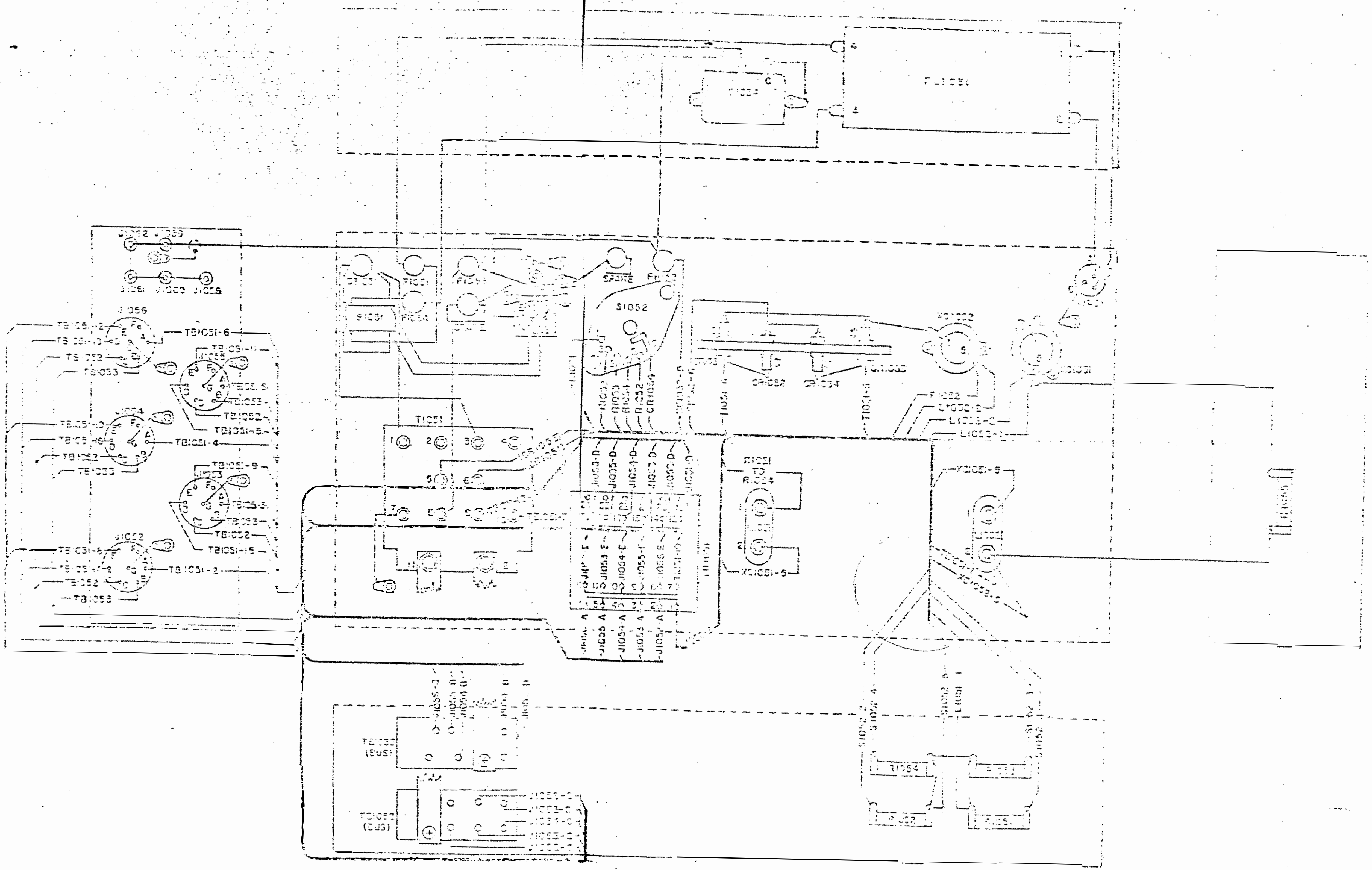


Figure C-21. Power Supply, Wiring Diagram

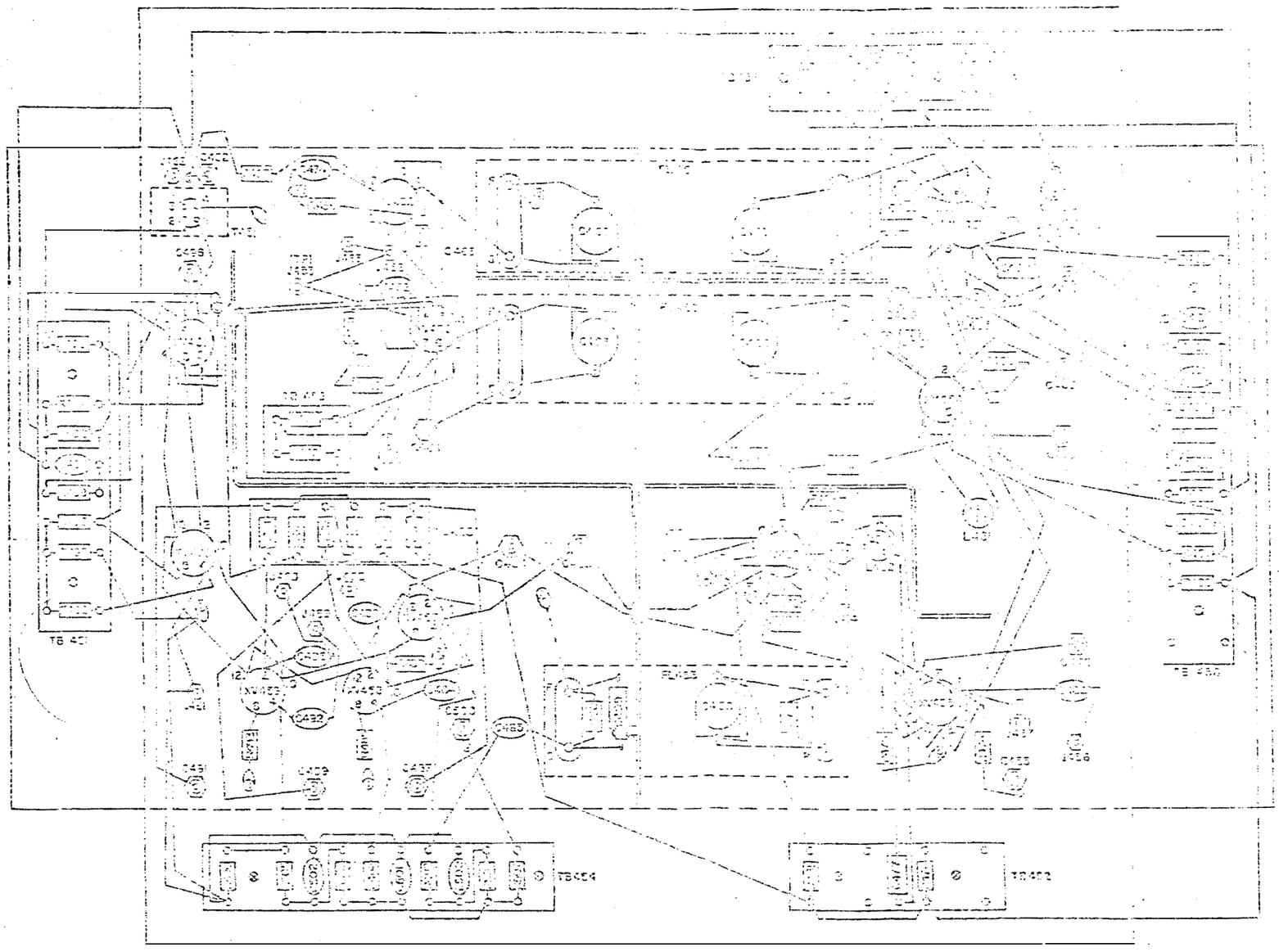


Figure 6-43. First I-F and Detector Amplifier, Wiring Diagram

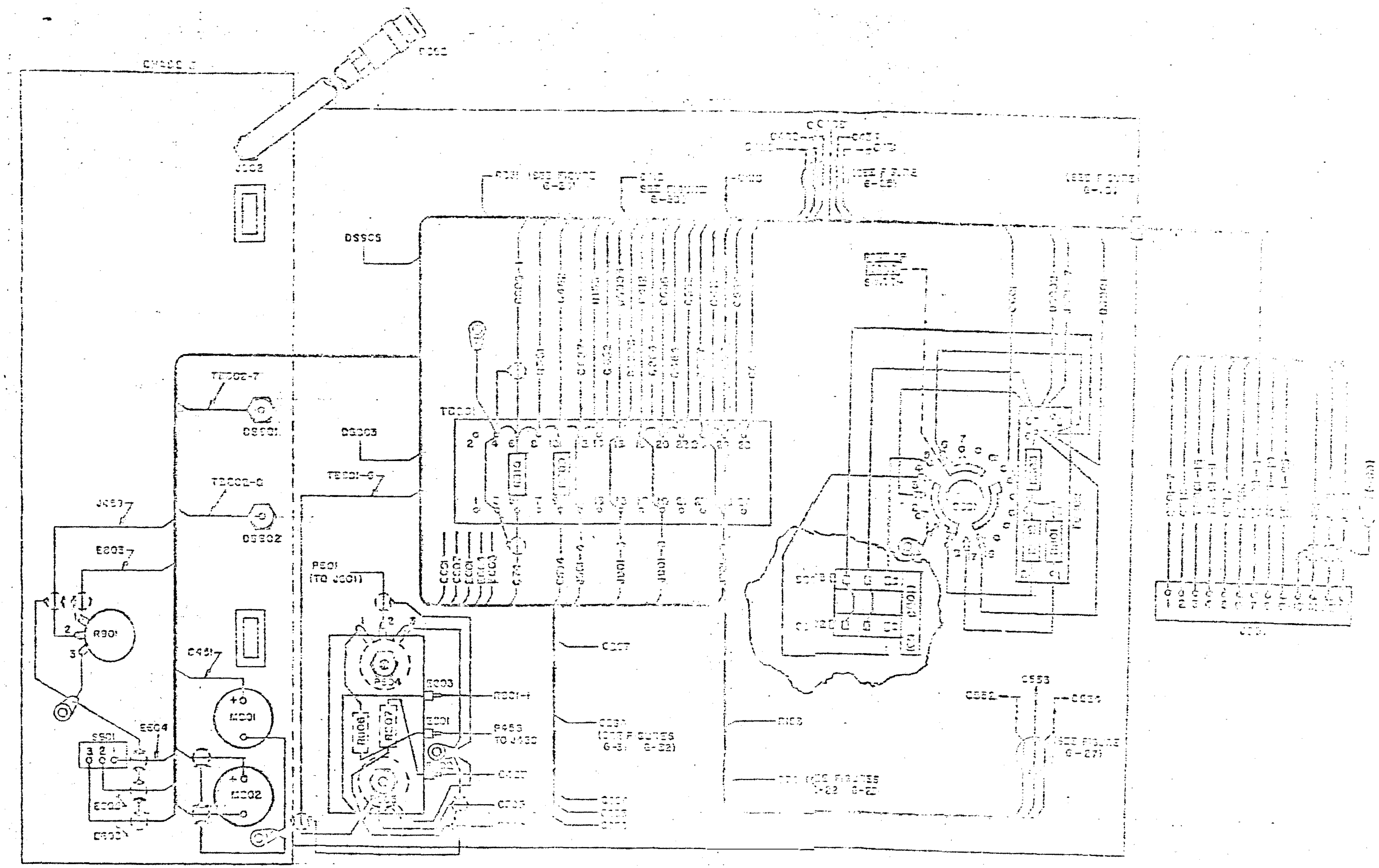

DS505
DS503
DS501
DS502
TB501
R501
R503
MD01
MD02
P501
(TO J501)
J102
C451
E504
S501

Figure C-[illegible]. [illegible]