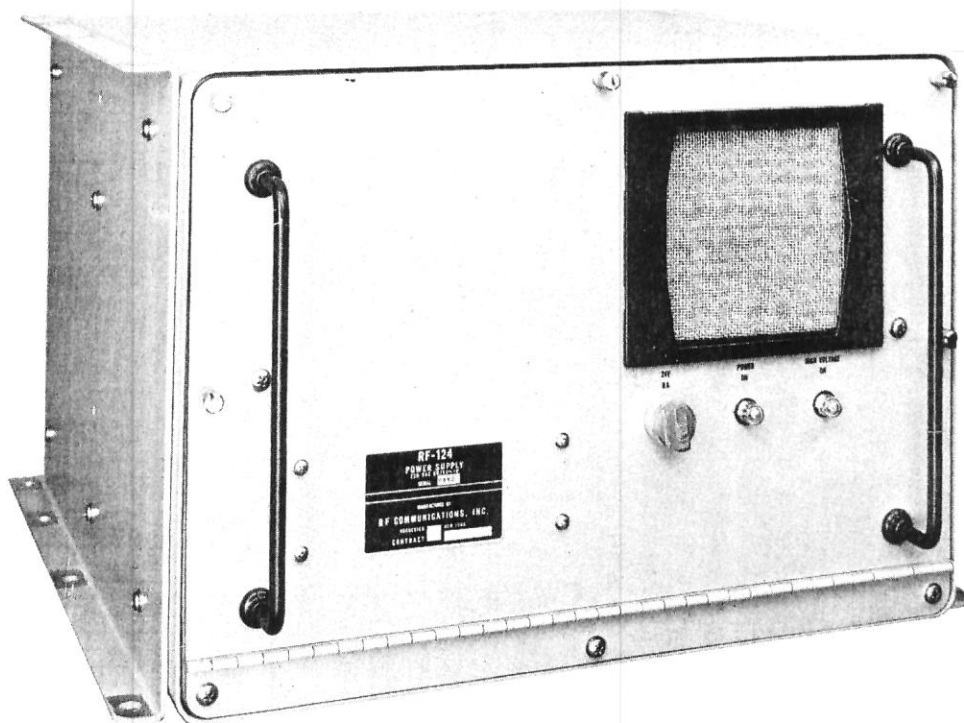


**HARRIS**

COMMUNICATION AND  
INFORMATION PROCESSING

# RF-124 POWER SUPPLY

## INSTRUCTION MANUAL

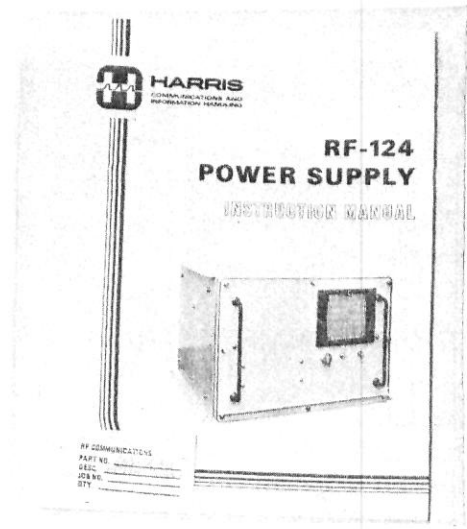
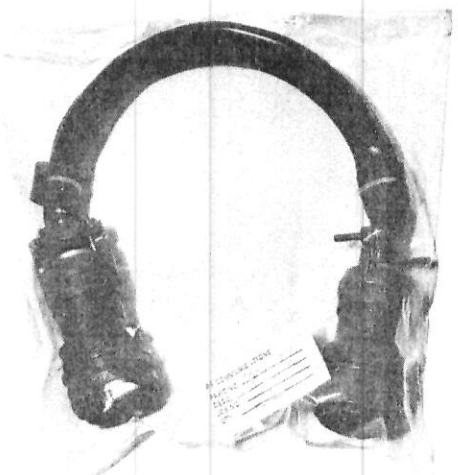
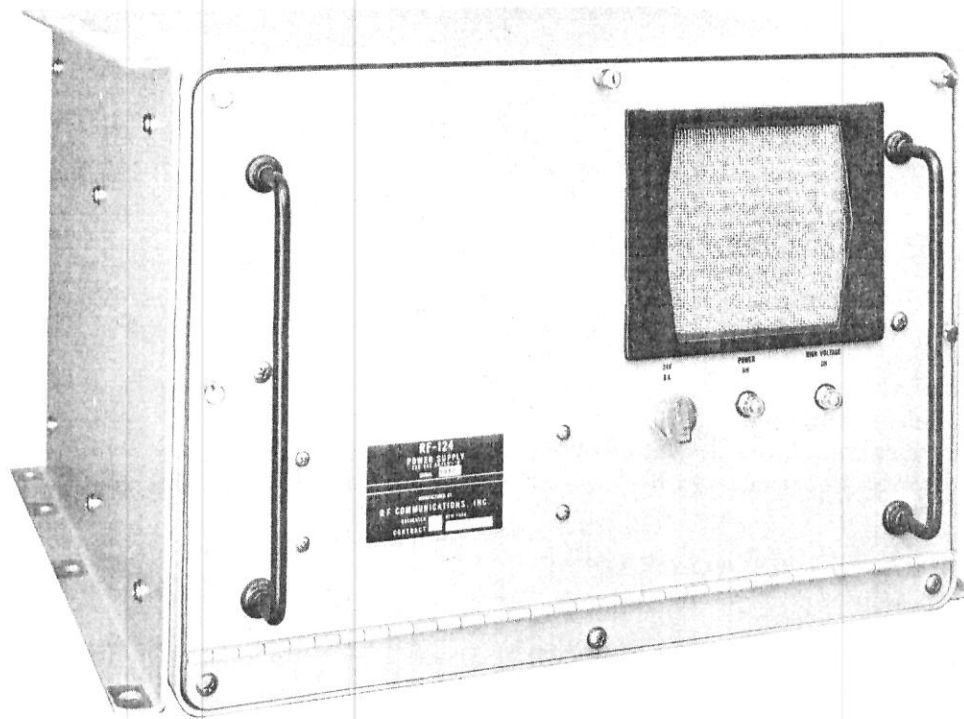


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NOTE:  
THIS FIGURE IS FOR REFERENCE ONLY.  
FOR DETAILED PARTS LIST, SEE PARAGRAPH  
1.5.

Figure 1-1. Equipment and Accessories Supplied

## SECTION I GENERAL INFORMATION

### 1.1 SCOPE

This manual describes and contains information necessary for the installation, operation and maintenance of Power Supply RF-124, which is shown with its accessories in Figure 1-1.

### 1.2 2250 OR 1600V OUTPUT

The RF-124 may be used with several different transmitters, some of which require a final plate voltage of +2250 Vdc while others require +1600 Vdc. Commencing with serial number 0650, RF-124's can be wired to produce either output. Therefore it is imperative that the unit be checked to ensure that it is properly wired to provide the correct voltage to the transmitter (paragraph 2.6). Transmitter final plate voltage requirements are as follows:

- RF-130, 1000W - use 2250V connection.
- RF-130, 400W/1000W - for RF-130's with the 400W/1000W option, use 1600V or 2250V, as appropriate, and make the related resistor change in the Exciter Up-Converter Module (see the RF-130 system Instruction Manual and Addenda); otherwise, excessive power will result.
- RF-140D - use 1600V connection.

The RF-124 is a single unit consisting of a case which houses the power transformers, inductors, capacitors, etc., and the rear connectors. The front panel is hinged and may be swung out from the case for access to the unit interior. In early models all electrical connections between components mounted on the front panel and components mounted in the case are brought through a terminal strip mounted on the front panel. All wires may be disconnected at that terminal strip to facilitate rapid and convenient removal of the entire front panel assembly. On later models, the front panel assembly is connected directly to the chassis assembly, without a terminal board between.

### 1.3 SPECIFICATIONS

#### Input Power

230 volts ( $\pm 10\%$ ), 4500 watts, 50/60 Hz ( $\pm 5\%$ ), single phase, 20 amperes, 0.85 minimum power factor at full load.

#### Output Power

- a. 115 volts, 60 Hz, single phase, 185 watts.
- b. 115 volts, 400 Hz, single phase, square wave, 70 watts.
- c. 500 Vdc at 0.9 amperes.

### Output Power (con't)

- d. 2250 Vdc at 1.2 amperes. For Serial Number 0650 and higher, either 2250 Vdc at 1.2 amperes or 1600 Vdc at 0.85 amperes, selected by tap connection on the power transformer.

**Size:** 17-3/8 inches wide, 19 inches deep, 12-1/4 inches high.

**Weight:** 200 pounds

**Temperature Limitations:** 0 to 50°C

**Shock:** 10 g's maximum for 1 millisecond

### 1.4 ELECTRICAL DESCRIPTION

The RF-124 provides dc plate and screen and ac voltages as required by the RF-110A Power Amplifier. The final plate voltage (+2250 Vdc for units with Serial Numbers below 0650; +2250 Vdc or +1600 Vdc for units with Serial Numbers 0650 and higher) and the driver plate voltage (+500 Vdc) are derived from a dual secondary transformer. Final screen voltages are derived from the +500 Vdc source by regulator circuitry located in the RF-110A. Fan power (115 Vac, 400 Hz) is derived from an inverter. In addition, an isolated 115 Vac, 60 Hz, single phase output is provided for the RF-110A and as primary power (if applicable) for the exciter and antenna coupler equipment.

#### Note

Portions of this manual do not apply to the RF-110 Power Amplifier, an early version of the RF-110A.

### 1.5 EQUIPMENT SUPPLIED

The following items are included in an RF-124 shipment. See Figure 1-1.

<u>Item</u>	<u>Part Number</u>
Power Supply RF-124 with stack mounting brackets installed.	8913 - 0001
RF-124 Instruction Manual	8913 - 0003
Interconnection Cable (W3 of Transmitting System)	399 - 0027
1.5 ampere fuse (5 supplied)	HVB - 1.5A - 2500V
Ground Strap (13.0 inches)	391 - 0021 - 3
Ground Strap Hardware (screw, flat and lock washer)	MS51958 - 63 MS15795 - 808 MS35337 - 81
25 Amp Fuse	F02832V8AS

## **1.6 EQUIPMENT REQUIRED BUT NOT SUPPLIED**

For miscellaneous installation hardware, see RF-110A/112A Instruction Manual 1932-0005.

## **1.7 DIFFERENCES IN PRODUCTION RUNS**

Product improvement is a continuing effort at Harris. Accordingly, your unit may have incorporated in it certain changes introduced during production. Verify the serial number of your unit before servicing and ordering parts. Detailed information regarding these changes may be found on the schematic, in the parts list and in the text.

## **SECTION II INSTALLATION**

### **2.1 GENERAL**

No special procedures need be performed on the RF-124 for its installation. The equipment is ready for use as shipped from the factory. However, modifications to the primary power input jumpering and fusing of the associated RF-110A may be necessary unless the RF-124 is shipped as a part of a specific system.

#### **Note**

Before proceeding with the installation, operation or maintenance of the RF-124, personnel should refer to the RF-110A/112A Instruction Manual to familiarize themselves with the equipment with which the RF-124 is used.

### **2.2 INSTALLATION SITE**

The installation site will be determined by the requirements of the transmitting system in which the RF-124 is used.

### **2.3 UNPACKING AND INSPECTION**

The RF-124 is shipped in one carton; the shipping weight is nearly 250 pounds. Carefully open the carton and check the contents against the packing list. If no packing list is available, paragraph 1.5 contains a complete list of equipment supplied. Carefully inspect the contents for signs of damage. If any damage exists, save the packing material to substantiate any claims with the transportation agency.

### **2.4 MOUNTING**

The RF-124 mounts in the equipment stack in place of the RF-112A Power Supply. However, the increased height of the RF-124 requires that additional vertical space be available and that the sway brace mounting be changed. In addition, the shock absorbing characteristics of the system will be reduced (paragraph 1.3). For detailed instruction, refer to Figure 2-2 and paragraph 2.2 of the RF-110A/112A Instruction Manual.

### **2.5 POWER REQUIREMENTS**

The RF-124 equipment requires 4500 watts nominal, with the RF-110A at full RF output. Line voltage requirements are 230 Vac ( $\pm 10\%$ ), single phase, 50/60 Hz. Transformers A2T1 and A2T2 in the RF-124 are provided with taps for line voltage variations. Measure the line voltage and change taps as required using the information in paragraph 4.5.

## 2.6 CONNECTIONS

The following primary power jumpering and fusing must be performed on the RF-110A equipment to which the RF-124 supplies power:

### Note

When performing steps a. through d., refer to the RF-110A/112A Instruction Manual for locations of components and connections.

- a. Disconnect (at source) the primary power from the system in which the RF-124 is to be installed.

### WARNING

Failure to perform step a. will cause unswitched primary power to be present on exposed terminals.

- b. If system was previously equipped with RF-112A power supply equipment, disconnect and remove that equipment.
- c. Primary Power Tie-in: To A2P5 (mating connector to A2J5, located on the back of the RF-110A equipment) connect:
  1. 230 Vac, single phase, 50/60 Hz, hot side of power source, black wire, to Pin A.
  2. 230 Vac, single phase, 50/60 Hz common line of power source, white wire, or other hot line of power source, red wire, to Pin B.
  3. Primary power source ground line to case of 1A2P5.
  4. No connections are to be made to Pin C of 1A2P5.
- d. Primary power jumper connections and fuses: Refer to the following chart and make the necessary fusing and jumpering changes to the RF-110A.

RF-110A Terminal Board or Fuseholder	Mating Plug or Fuse
A1TB1	None
A1TB2	Install A1P5 Jumper Strip (supplied with RF-110A)
A1TB4	Jumper TB4 per Figure 5-20, Note 11, in RF-110A/112A manual for 115 Vac.
Primary Fuses (3 each)	Install Primary Power Fuses; 25 amp, Type 5AB-25A or F60C500V25AS.



- e. Connect J1 of the RF-124 to J1 of the RF-110A, using cable W3 supplied with the RF-124.
- f. For standard RF-130 applications using 2250 Vdc final plate voltage, CR1-2 in the RF-124 are connected to terminal X1 on A2T1. On units bearing Serial Number 0650 and higher, connect the wire from CR1-2 to X1 if a final plate voltage of 2250 Vdc is required or to tap X5 if a final plate voltage of 1600 Vdc is required.

## 2.7 GROUNDING (See Figure 2-1.)

A 10-32 threaded hole labeled GND is provided on the back of the case of the RF-124 for attaching a ground strap. The RF-124 should be connected by ground strap to the system ground bus in addition to a good "physical" ground (ships hull or ground stake). Ensure that a solid, clean, metal-to-metal bond exists between all equipments and ground.

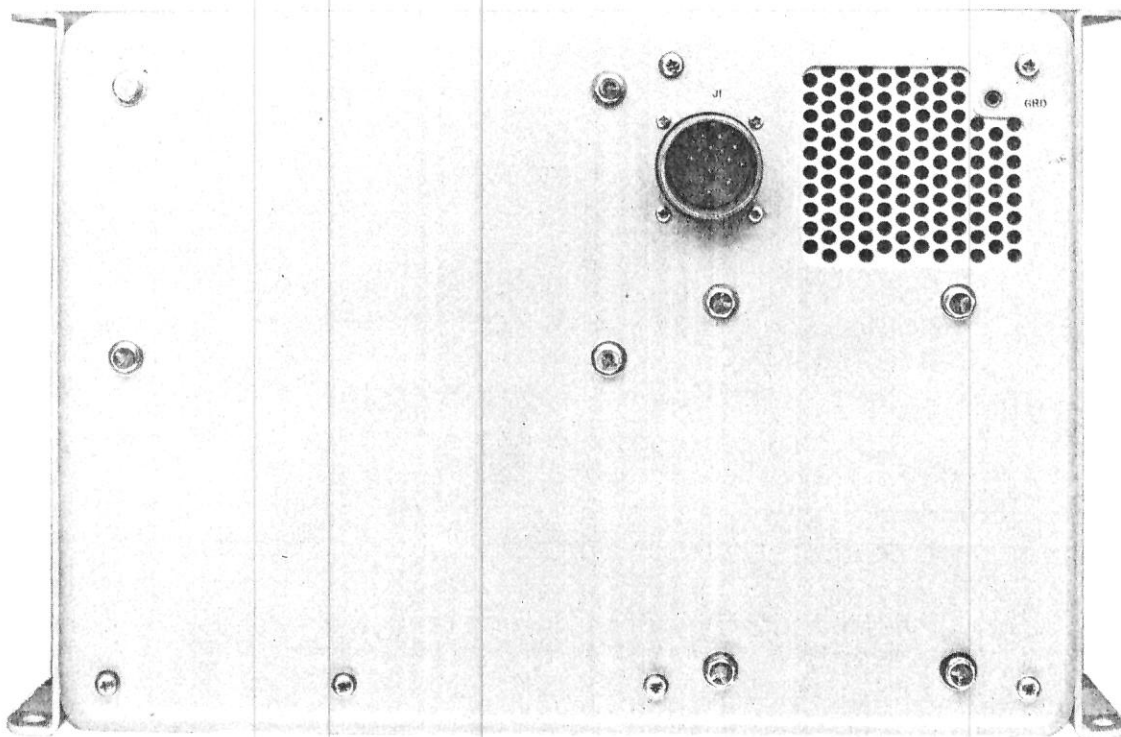


Figure 2-1. RF-124 Power Supply, Rear View

## SECTION III OPERATION

### 3.1 GENERAL

The RF-124 has no operating controls of its own. All functions are controlled from other equipments in the system using the RF-124.

### 3.2 CONTROLS AND INDICATORS

There are no operating controls located on the RF-124. There are two indicating type fuse holders and an indicator lamp on equipments, with SN-0340 or under (see Figure 3-1). The two fuses, 24 volt, 8 amp, and 500 volt, 1.5 amp, protect the fan power and the 500 Vdc supplies, respectively. The indicator in the fuse holder lights when its fuse opens. The POWER ON indicator lights to indicate that the RF-124 inverter has been energized. On equipment with SN-0341 or over (see Figure 3-2) a HIGH VOLTAGE ON indicator has been substituted for the 500V, 1.5A fuse.

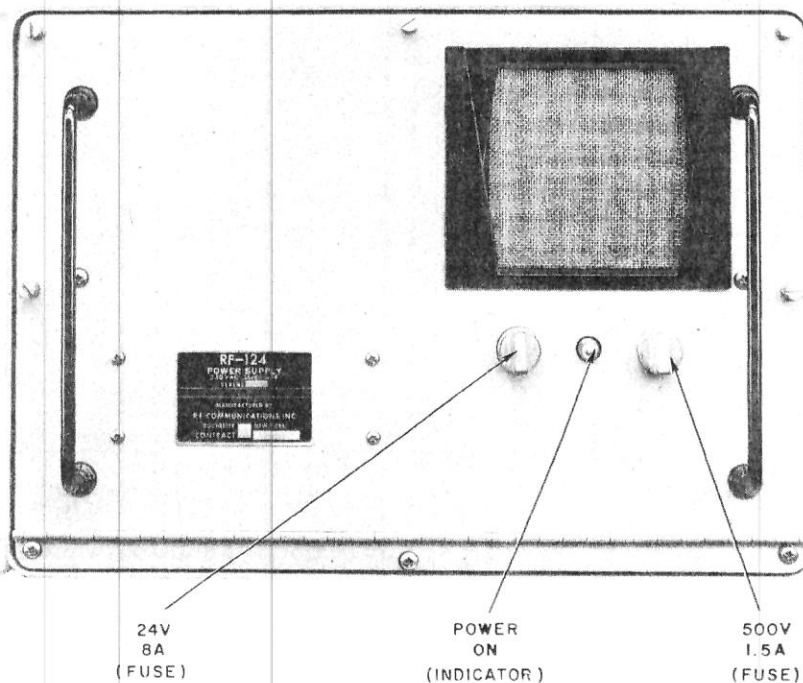


Figure 3-1. Front Panel View (Units with SN-0340 and under)

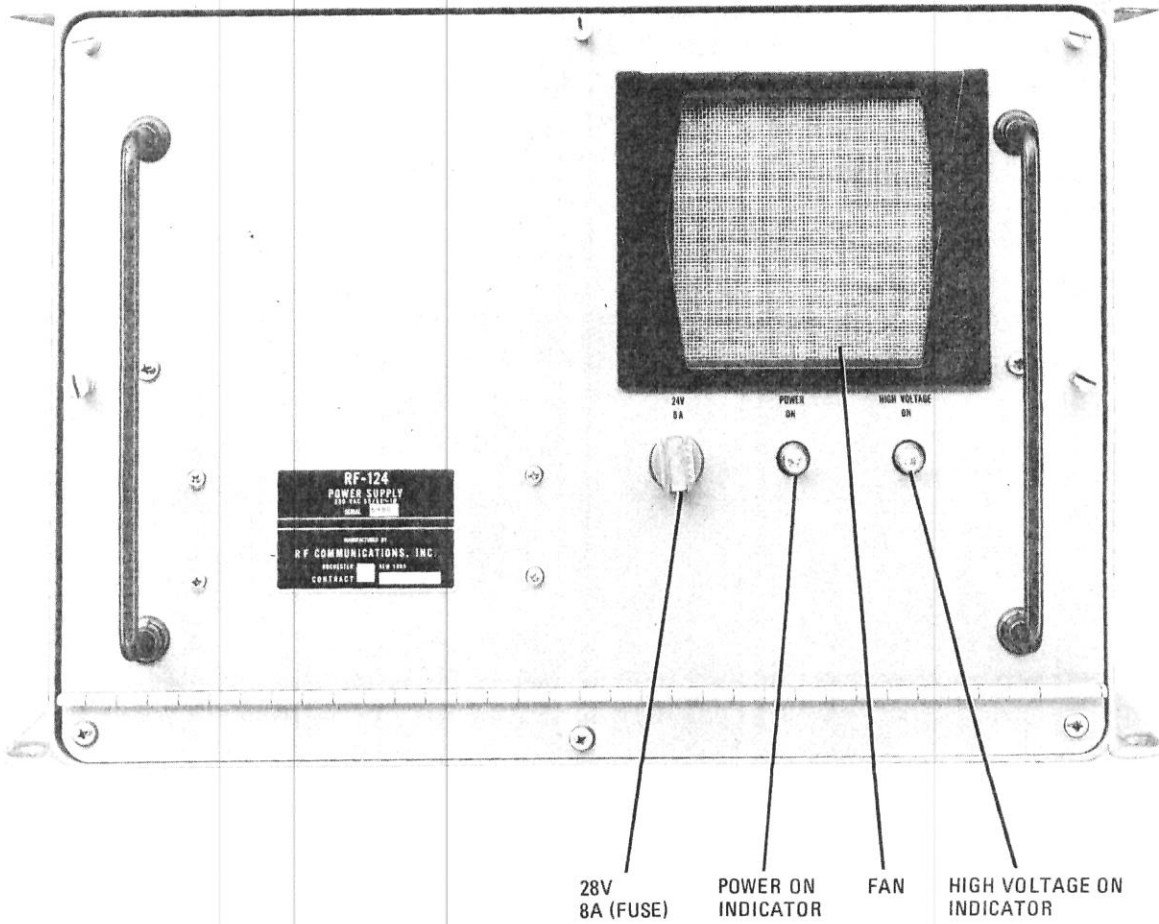


Figure 3-2. Front Panel View (Units with SN-0341 and over)

## SECTION IV CIRCUIT DESCRIPTION

### 4.1 GENERAL

Setting the RF-110A Primary Power Switch at ON applies switched 230 Vac power to Pins D and E of A2J1 on the RF-124 (Figure 5-5). The switched 230 Vac is then routed through interlock switches S2 and S3, to the primary winding of A2T2. Transformer T2 develops 115 Vac and 24 Vac on its secondaries. The 115 Vac is distributed to the rest of the system (RF-110A, exciter, antenna coupler, etc.) via Pins F and G of A2J1. The 24 Vac winding powers the 115 Vac, 400 cycle inverter. The inverter input circuit is completed by jumpering Pins J and H of A2J1.

In early models, blower B1 is across the primary of A2T2, and energized when Switched 230 Vac is applied. In models with Serial No. 0341 and over, the blower is across the primary of A2T1, and energized when Delayed 230 Vac is applied.

Upon first application of Switched 230 Vac to the system, an initial delay of 3 minutes will be encountered for RF-110A warm-up. Following this period, the delayed 230 Vac will be present when the RF-110A is put in an operate mode providing the following conditions are satisfied:

- a. RF-110A fan is operating (airvane interlock in the RF-110A).
- b. The temperature of the chassis of the RF-124 does not exceed 85°C.
- c. The high voltage interlock in the RF-110A is closed.

The two secondaries of A2T1 develop voltages which are full wave rectified and filtered, supplying +2250 Vdc (on units having Serial Numbers 0650 and higher, +1600 Vdc can also be supplied by appropriate power transformer tap connection) to Pin R of A2J1 and +500 Vdc to Pin M of A2J1.

### 4.2 PLATE HIGH VOLTAGE SUPPLY

The plate high voltage supply utilizes a full wave rectifier with a choke input filter. Choke A2L2 is a swinging choke which improves the power supply voltage regulation over the current range.

### 4.3 SCREEN VOLTAGE SUPPLY

The RF-110A final amplifier screen voltage and driver amplifier plate voltage is obtained from an auxiliary winding on A2T1 and is also full wave rectified.

#### 4.4 115 VAC, 400 Hz INVERTER

The 400 Hz source is utilized by an RF-110A cooling fan. Fan speed and source frequency are directly proportional; hence, a 400 Hz source allows a 6.6-fold increase in RPM over a 60 Hz source and an 8-fold increase in RPM over a 50 Hz source. Accordingly, fan effectiveness is superior at 400 Hz operation.

When the RF-110A Primary Power switch is positioned to ON, pins J and H of 2A2J1 are electrically connected through the RF-110A standby relay, thereby applying 24 Vac through fuse 2A1F1 to the full wave bridge rectifiers consisting of CR4 through CR7. This rectified voltage is filtered by C1 and C2, and applied to the center top of the primary winding of transformer T1.

Oscillations in the primary circuit of T1 begin as resistor R9 allows transistor Q1 to start to conduct. This allows current to flow through T1-3, 4 (from T1-3, through T1, out T1-4, through Q1, to ground). The inductance of T1 causes a current to also flow through T1-5, 4 (from T1-5, through T1, out T1-4, through Q1, and return through R3-R5), turning Q1 on more. (A similar but reversed current through T1-2, 1 is blocked by, and holds off, Q2.) The positive feedback to Q1 allows the current through T1-3, 4 to continue to increase (for about 1.25 ms) until T1 saturates. As T1 becomes saturated, the inductively caused current through T1-5, 4 (and Q1-E, B) is greatly reduced, and Q1 starts to turn off. This reduces the current through T1-3, 4; which causes, through inductance, the current through T1-5, 4 to try to reverse. This causes Q1 to be turned off. As Q1 is turning off, inductance also causes current to flow at T1-1, 2. Q2 will start to turn on, allowing current to flow through T1-3, 2. Positive feedback holds Q2 on (and Q1 off) and allows current to increase through T1-3, 2 (again for about 1.25 ms) until T1 again saturates, causing the current to again reverse. This turns Q2 off and Q1 on, for the start of another cycle. The switching action continues at a rate of about 400 Hz, as determined mainly by the characteristics of T1, and the value of the supply voltage.

Resistors R3-R5, R6-R8 limit the base current in Q1 and Q2 to the correct value.

R1, R2, and C3 reduce transient voltage spikes, to protect Q1 and Q2.

The peak voltage from the emitter of either transistor to ground is approximately twice the supply voltage, or 50 volts.

The oscillations generated in the primary circuit of T1 are coupled by transformer action to the T1 secondary, to supply 115 Vac, 400 Hz through 2A2J1-L, K to the RF-110A.

In units with serial numbers less than 0650, the circuit operation is similar, with diodes CR8 and CR9 serving the function of transient protection for the transistors.

#### 4.5 TROUBLESHOOTING

When troubleshooting, use a systematic approach to isolate the malfunction to a faulty circuit. Carefully check operating procedures to eliminate the possibility of operator error, and read paragraphs 4.1 through 4.4 of this manual to develop an understanding of circuit functions.

When all output voltages of the RF-124 are low, or if all are high, check the input line voltage (230 Vac nominal) to the equipment. Three taps are provided on the primary windings of A2T1 and A2T2 for primary line voltage of 218 Vac, 230 Vac and 241 Vac (Figure 5-7). The RF-124 is shipped with A2T1 and A2T2 230 Vac primary taps connected. Measure the primary power supply line voltage, and, if necessary, connect the appropriate taps by the following procedure:

- a. If the primary power supply line voltage is less than 225 Vac, transfer spade lug terminated wire from A2TB1 terminal 2 to A2TB1 terminal 1. Transfer terminal 12 to 11.
- b. If the primary power supply line voltage is more than 235 Vac, transfer spade lug terminated wire from A2TB1 terminal 2 to A2TB1 terminal 3. Transfer terminal 12 to 13.

## SECTION V MAINTENANCE

### 5.1 GENERAL

Periodic cleaning and checking of output voltages (depending upon usage and operating conditions) is all that is required in maintaining the RF-124. Output voltages varying more than  $\pm 10\%$  of the nominal value would indicate impending component failure. Locating and replacing the faulty component before total failure constitutes electrical preventative maintenance. Any accumulation of dirt or corrosion should be removed as often as the RF-124 is opened. Any signs of excessive heat buildup in any part of the RF-124 should immediately be investigated to find and eliminate the cause. Use water and a small amount of soap or liquid detergent to clean the air filter. Dry thoroughly before replacing.

#### Note

Use only rosin-core solder: never use acid core solder or paste flux.

#### WARNING

Lethal voltages are present within the RF-124 during operation. When performing any maintenance of the equipment, ensure that primary power is turned off and secured at the source.

### 5.2 DISASSEMBLY

To swing down the front panel, loosen five screws located around the top and side edges of the front panel. The front panel will then swing out on its hinge. Removal of the front panel requires detaching the wires of the cable coming up from the case mounted equipment. Then remove the three screws located along the bottom of the front panel.

To remove the chassis cover on the front panel, loosen three screws, slide the cover out and set aside.

#### Note

When removing any component, carefully set aside the hardware in the order of removal to avoid confusion during replacement.

### 5.3 PARTS IDENTIFICATION

Figures 5-1 through 5-6 illustrate component locations on the front panel assembly (designated A1) and case assembly (designated A2). Determine the serial number of your unit and select the appropriate figures.

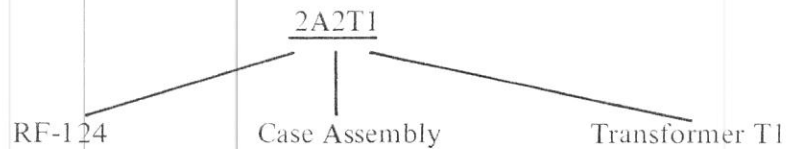
The Maintenance Parts List (which follows Figure 5-5) is organized with the major assembly designation followed by the part designation.

Example:



In those cases where the RF-124 is part of a system, such as the RF-130 system, the RF-124 is identified as equipment 2. This number appears first in the parts description thereby allowing system identification of all parts.

Example:



When ordering parts from the factory, include Unit Type, Serial Number, Part Designation, Part Number and Description as presented in the Parts List.

Example: To order 2A2T1

























Unit:	RF-124
Serial Number:	0123
Part Designation:	A2T1
Part Number:	1975 - 0056
Description:	Transformer, Power: 230 volt primary, dual secondary 2500 volts and 575 volts.

#### 5.4 SCHEMATIC DIAGRAM


















Figure 5-7 is a schematic diagram of the Power Supply RF-124.



## 5.5 MAINTENANCE PARTS LIST

Ref. Desig.	Description	Part No.
A1	Front Panel Assembly	8913-0010
A1B1	Fan, Muffin: 230 Vac, 60 Hz, 14W, Rotron Mfg. Co., Type "Sentinel 756"	756 Muffin
A1C1	Capacitor, fixed, electrolytic: 1400 uF, 50 WVDC	CE71C142G
A1C2	Same as A1C1	
A1C3 	Capacitor, fixed, electrolytic: 0.4 uF, 20%, 100 WVDC	CL33BN0R4MNE
A1CR1	Rectifier Block: 1 $\phi$ . full wave, Solitron	SPF-90
A1CR2	Same as A1CR1	
A1CR3	Rectifier Block: 1 $\phi$ . full wave, Solitron	SPF-30
A1CR4 	Diode: 6A, 100V-PIV, Motorola MR-751	7573-0011
A1CR5	Same as A1CR4	
A1CR6	Same as A1CR4	
A1CR7	Same as A1CR4	
A1CR8  	Diode: 1A, 200V-PIV, Type 1N4003	1N4003
A1CR9	Same as A1CR8	
A1CR10	Same as A1CR8	
A1CR11	Same as A1CR8	
A1DS1	Lamp, Neon: NE2D	MS25252-NE2D
A1DS2 	Same as A1DS1	
A1F1 	Fuse, cartridge: 8A, 32V, Slo-Blo, Littlefuse Co.	313008
A1F2 	Fuse, cartridge: 1.5A, 250V	F02A250V1.5AS
A1Q1 	Transistor, PNP, GE, 2N2079	2N2079
A1Q1 	Transistor, PNP, 2N5884	2N5884
A1Q2	Same as A1Q1	
A1R1 	Resistor, fixed, composition: 10 ohm, 2W, 10%	RC42GF100K
A1R1 	Resistor, fixed, composition: 33 ohm, 2W, 10%	RC42GF330K
A1R2	Same as A1R1	
A1R3 	Resistor, fixed, composition: 6.8K ohms, 1/2W, 10%	RC20GF682K
A1R3 	Resistor, fixed, composition: 10 ohm, 2W, 10%	RC42GF100K
A1R4	Same as A1R3	
A1R5 	Same as A1R1	
A1R5 	Same as A1R3	
A1R6 	Same as A1R1	
A1R6 	Same as A1R3	
A1R7 	Same as A1R3	
A1R8 	Same as A1R3	
A1R9 	Resistor, fixed, composition: 120 ohm, 15W, 1%	RER50F1200M
A1S1	Switch, Thermal	S70-0002-000
A1S2 	Switch, Interlock	MS16106-4
A1S3 	Same as A1S2	
A1S4 	Same as A1S2	
A1T1	Transformer, Saturable	391-8405
A1TB1 	Terminal Board	37TB24

5.5 MAINTENANCE PARTS LIST (Con't)

Ref. Desig.	Description	Part No.
A1XDS1	Socket, Lamp	LH74/LC13CN
A1XDS2 	Same as A1XDS1	
A1XF1	Fuse Holder	J50-0004-002
A1XF2 	Same as A1XF1	
A2	Case Assembly	8913-0020
A2C1	Capacitor, fixed, plastic: 25 uF, 4 KV	8913-0052
A2C2	Capacitor, fixed, plastic: 30 uF, 1 KV	8913-0051
A2F1 	Fuse, cartridge, 1.5A, Buss P/N HVB-1.5	HVB-1.5A-2500V
A2J1	Connector, Mil Type MS3102R28-17P	MS3102R28-17P
A2L1 	Choke, 2H	8913-0053
A2L2 	Choke, .35 to 45H	1975-0055
A2L3	Choke, 1H	8913-0054
A2R1	Resistor, fixed, wirewound: 100K, 100W, Ohmite	0625
A2R2	Resistor, fixed, wirewound: 25K, 40W, Ohmite	F-431
A2R3	Resistor, fixed, composition: 100K, 2W, 10%	RC42GF104K
A2R4 	Same as A2R1	
A2S1	Not Used	
A2S2 	Same as A1S2	
A2S3 	Same as A1S2	
A2S4 	Same as A1S2	
A2T1 	Transformer, power: 230 Vac primary, dual secondary 2500 Vac and 575 Vac	1975-0056
A2T2	Transformer, power: 230 Vac primary, dual secondary 115 Vac and 24 Vac	8913-0057
A2TB1	Terminal Board	37TB13
A2XF1 	Fuse Holder, Buss P/N 4529	
A2MP1	Shield, H.V.	8913-0023
	Improved Device	
	Equipments SN0001 - SN-0340	
	Equipments SN0341 - up	
	Equipments SN0001 - SN-0649	
	Equipments SN0650 - up	
	Equipments SN0850 - up	

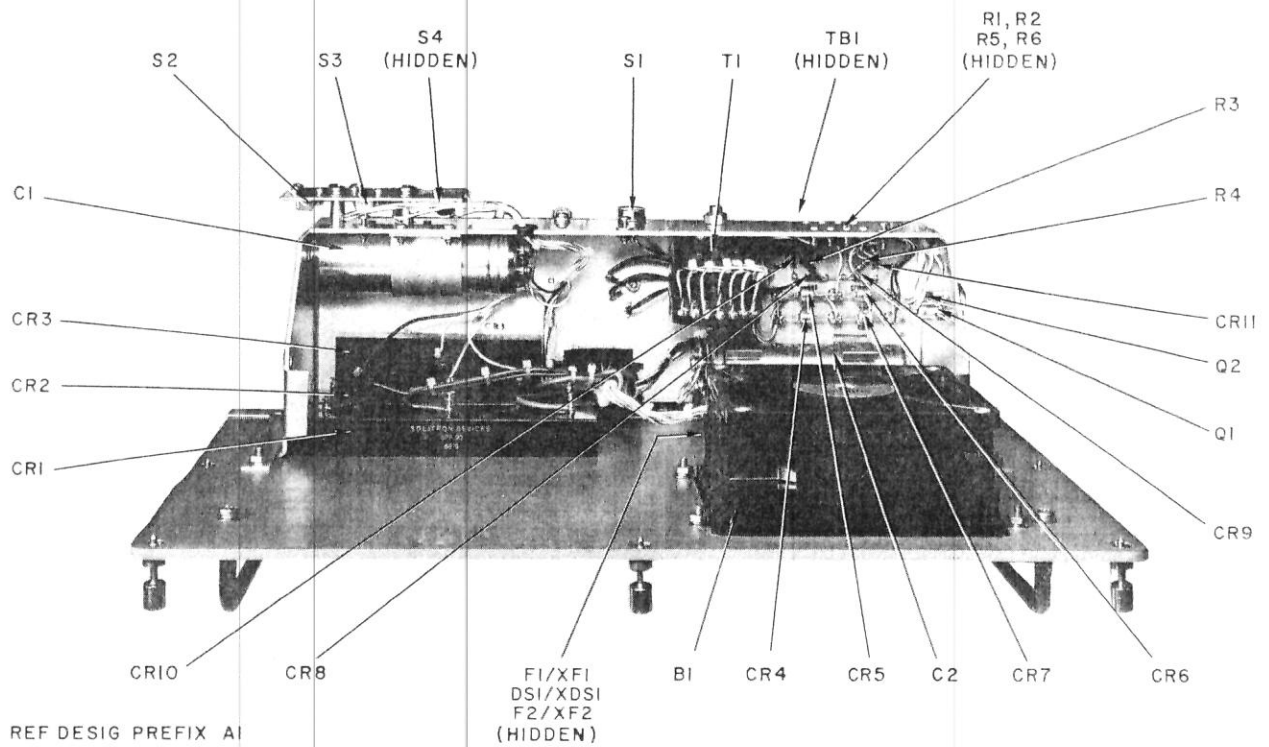


Figure 5-1. Front Panel Assembly A1, Component Locations (Units with SN-0340 or Under)

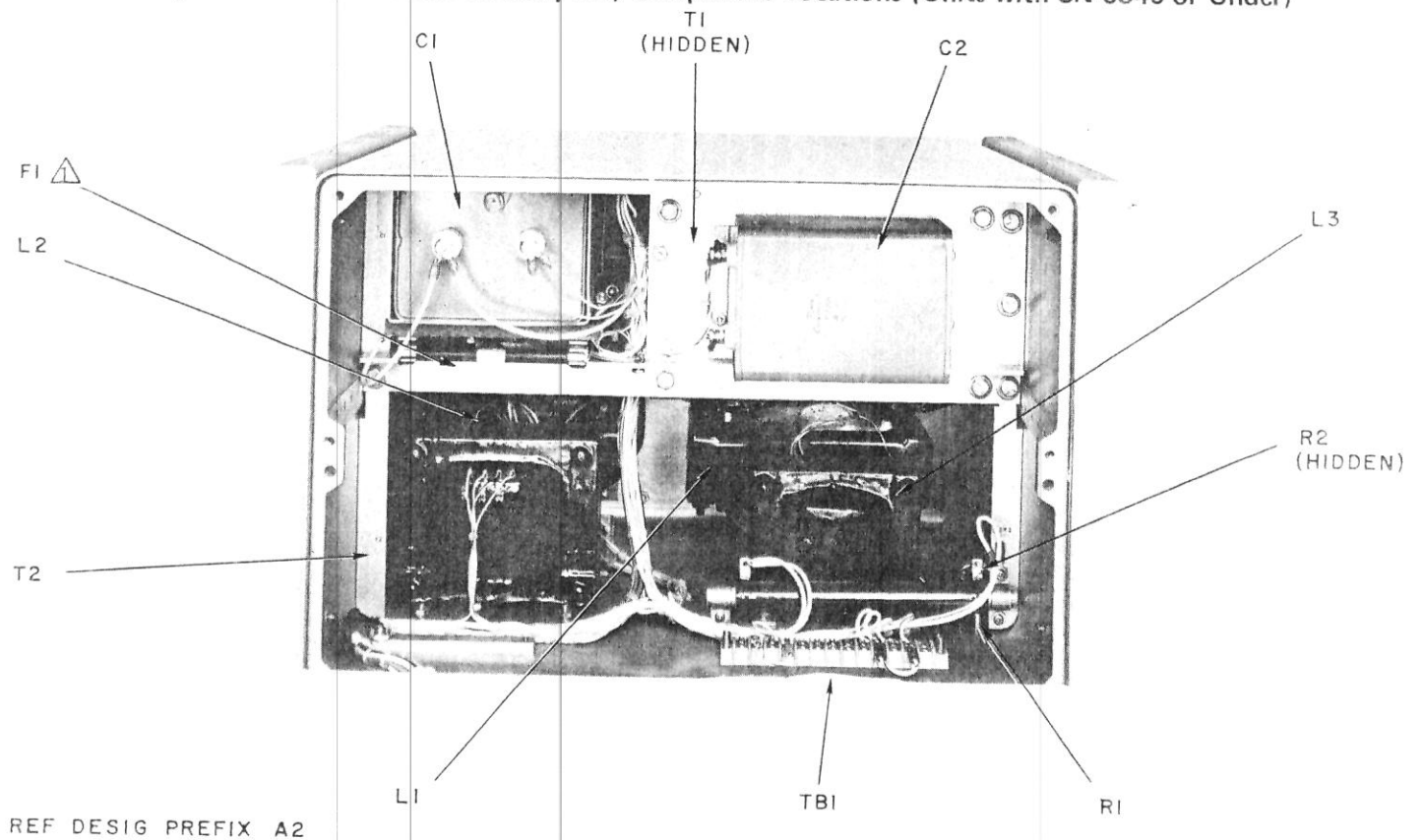


Figure 5-2. Case Assembly A2, Component Locations (Units with SN-0340 or Under)

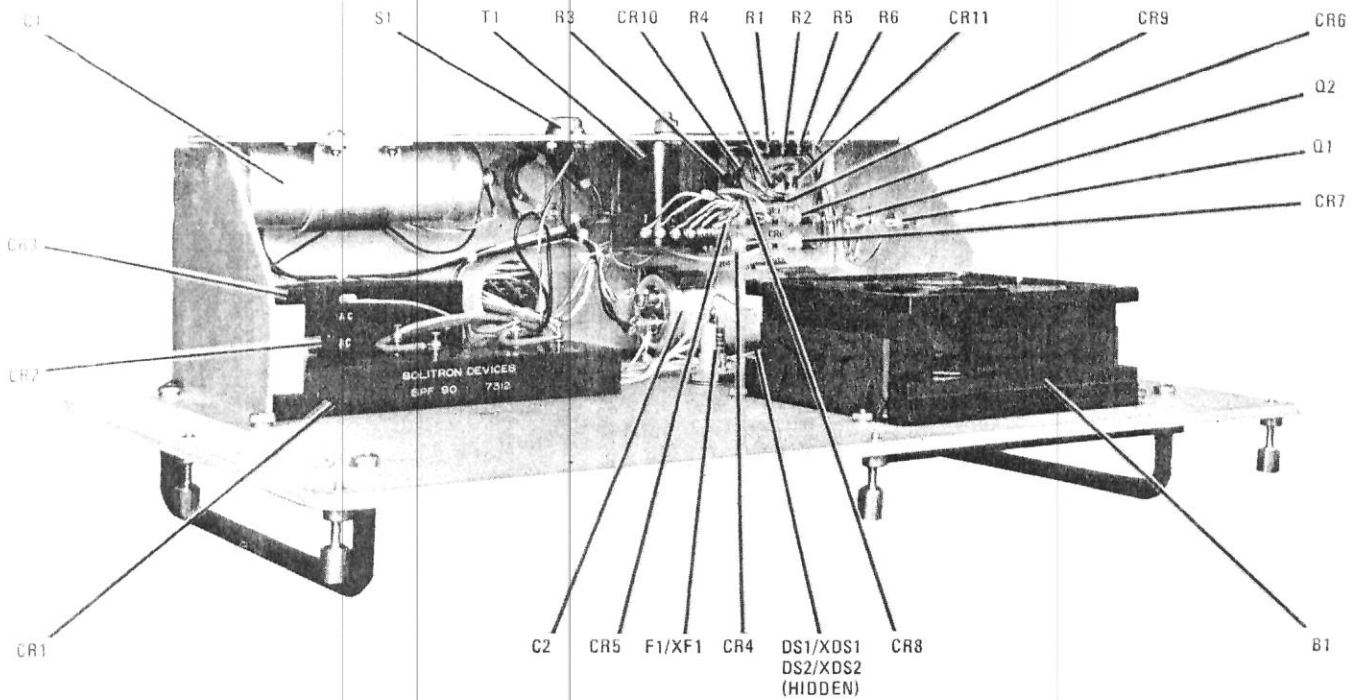


Figure 5-3. Front Panel Assembly A1, Component Locations (Units with SN-0341 to SN-0649)

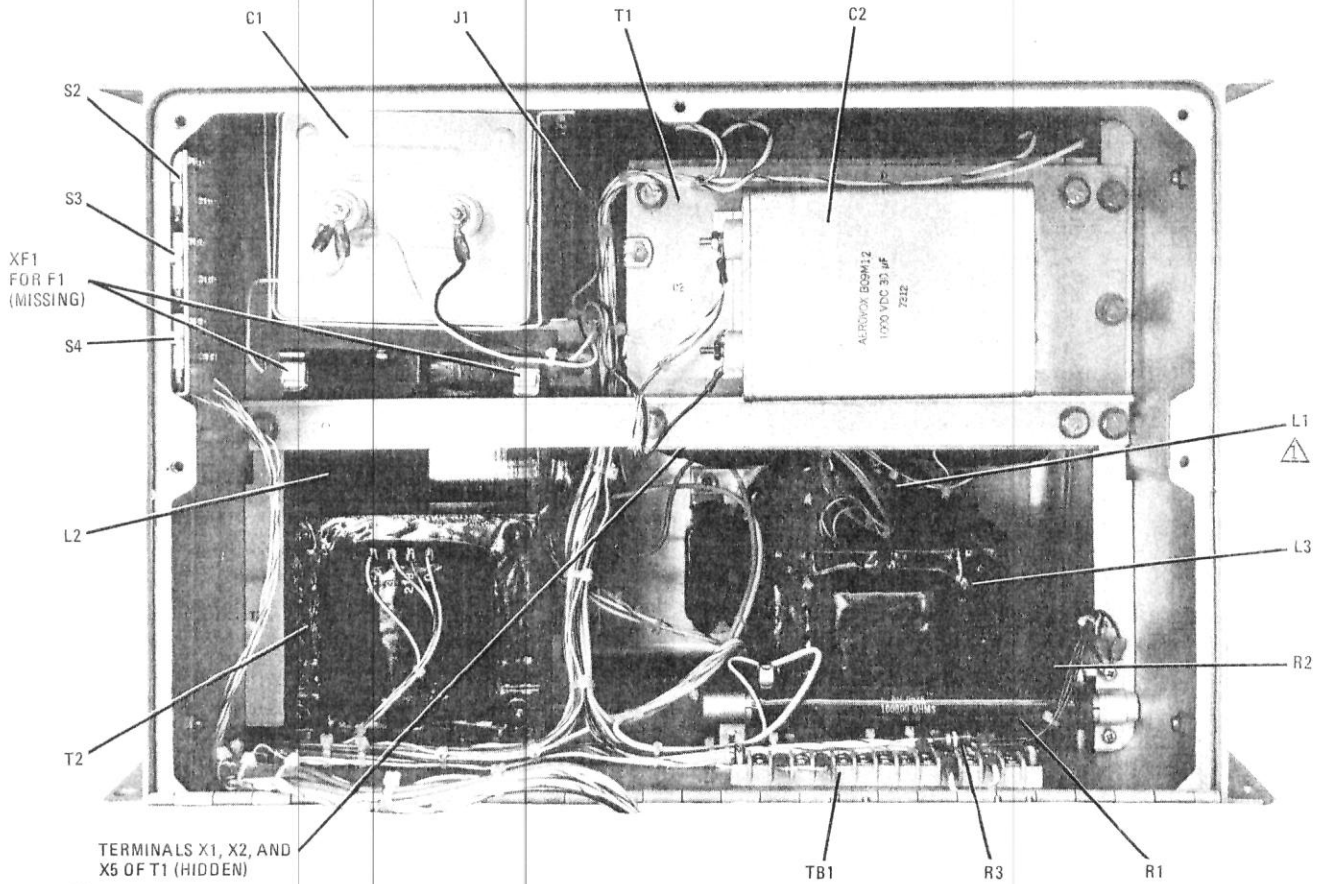


Figure 5-4. Case Assembly A2, Component Locations (Units with SN-0341 to SN-0649)

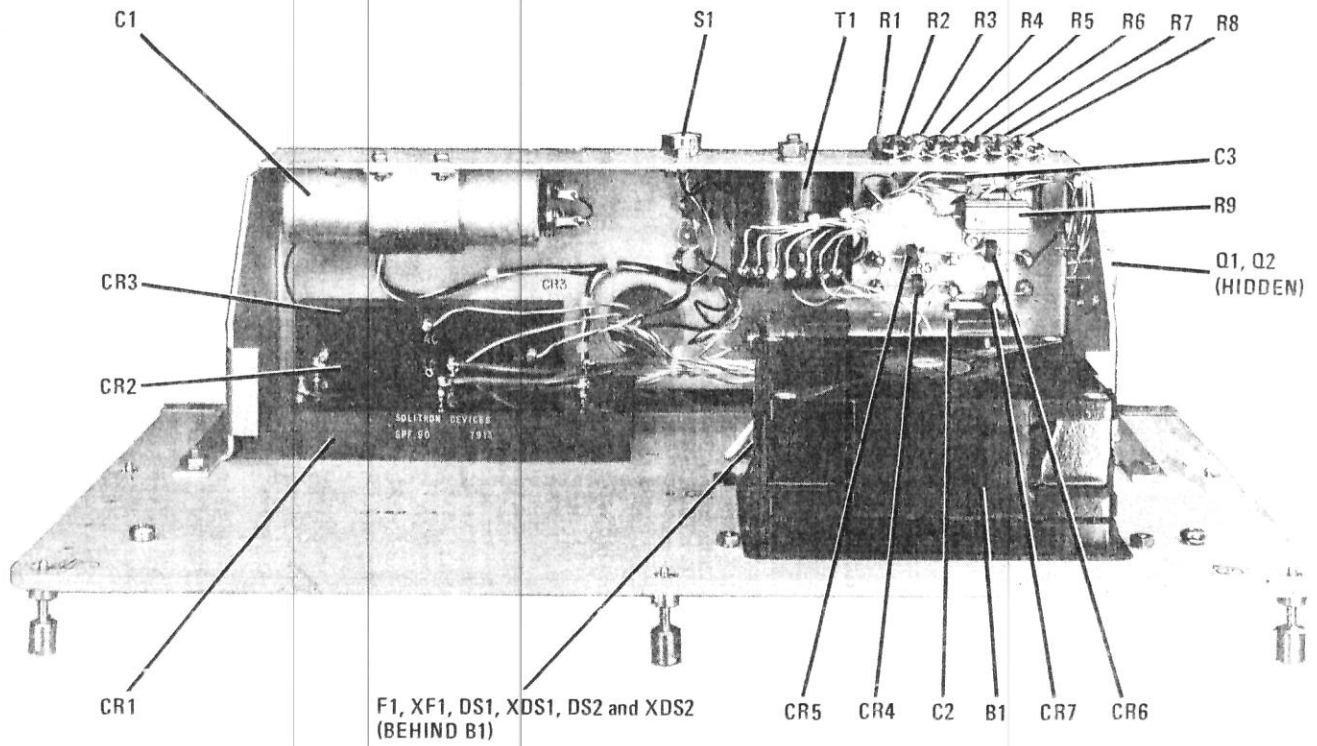


Figure 5-5. Front Panel Assembly, Component Locations (Units with SN-0650 or Over)

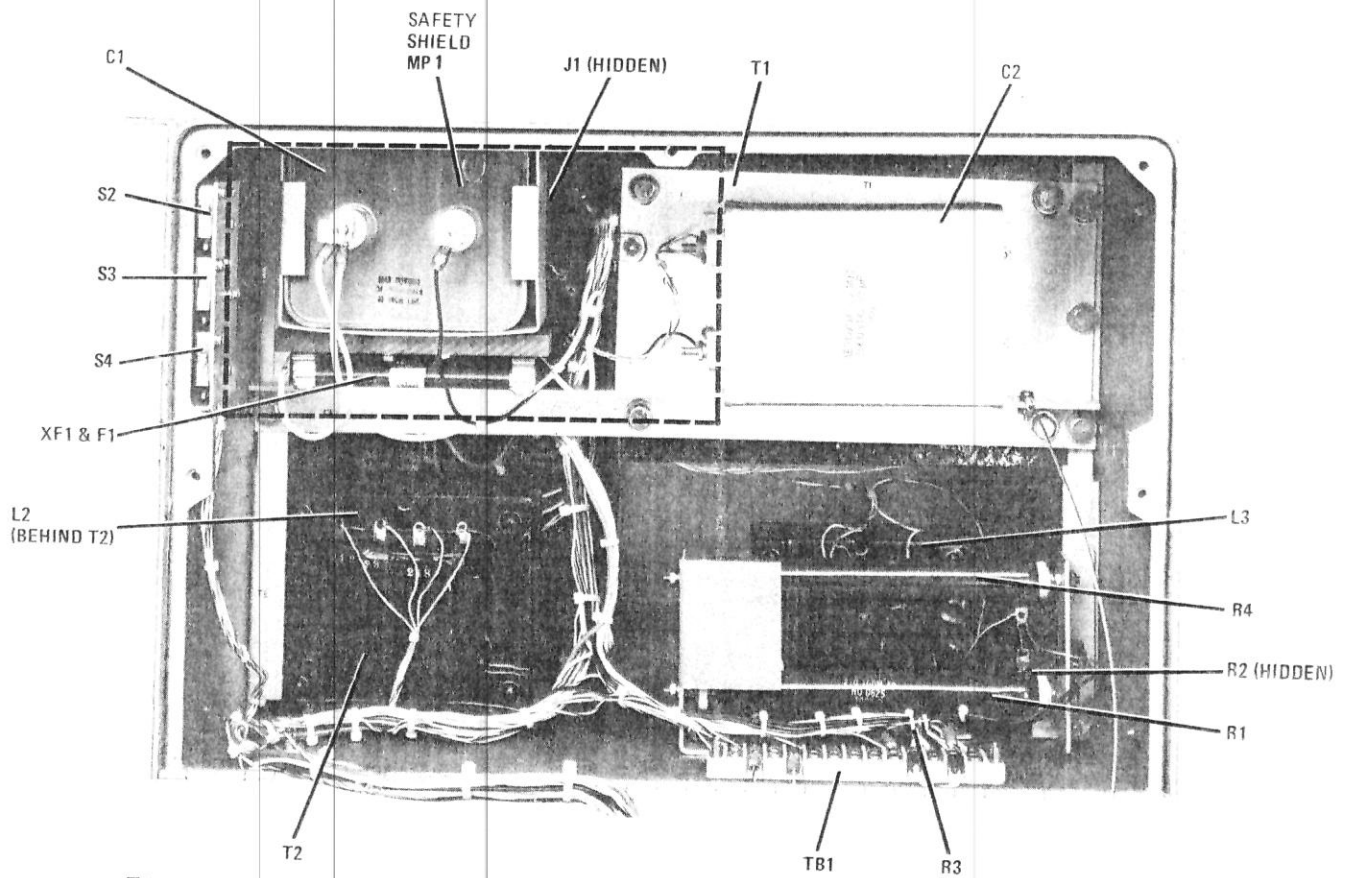


Figure 5-6. Case Assembly, Component Locations (Units with SN-0650 or Over)

