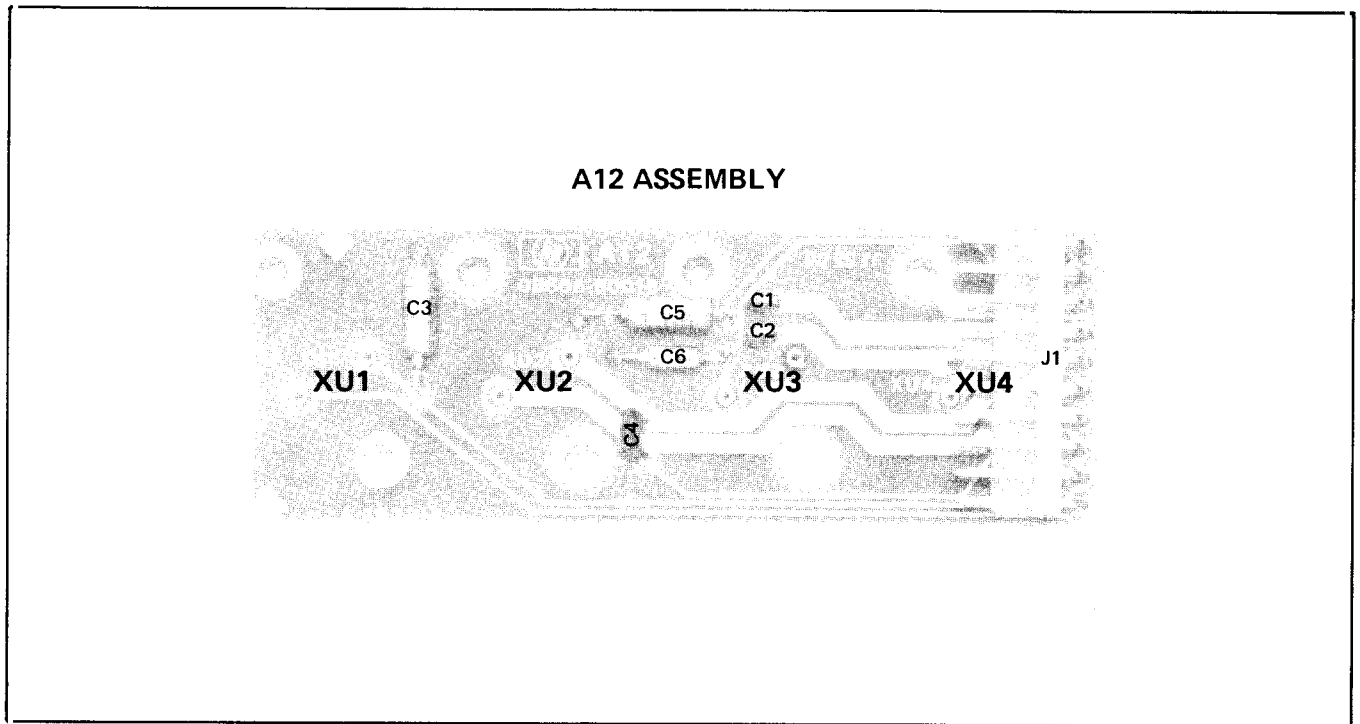
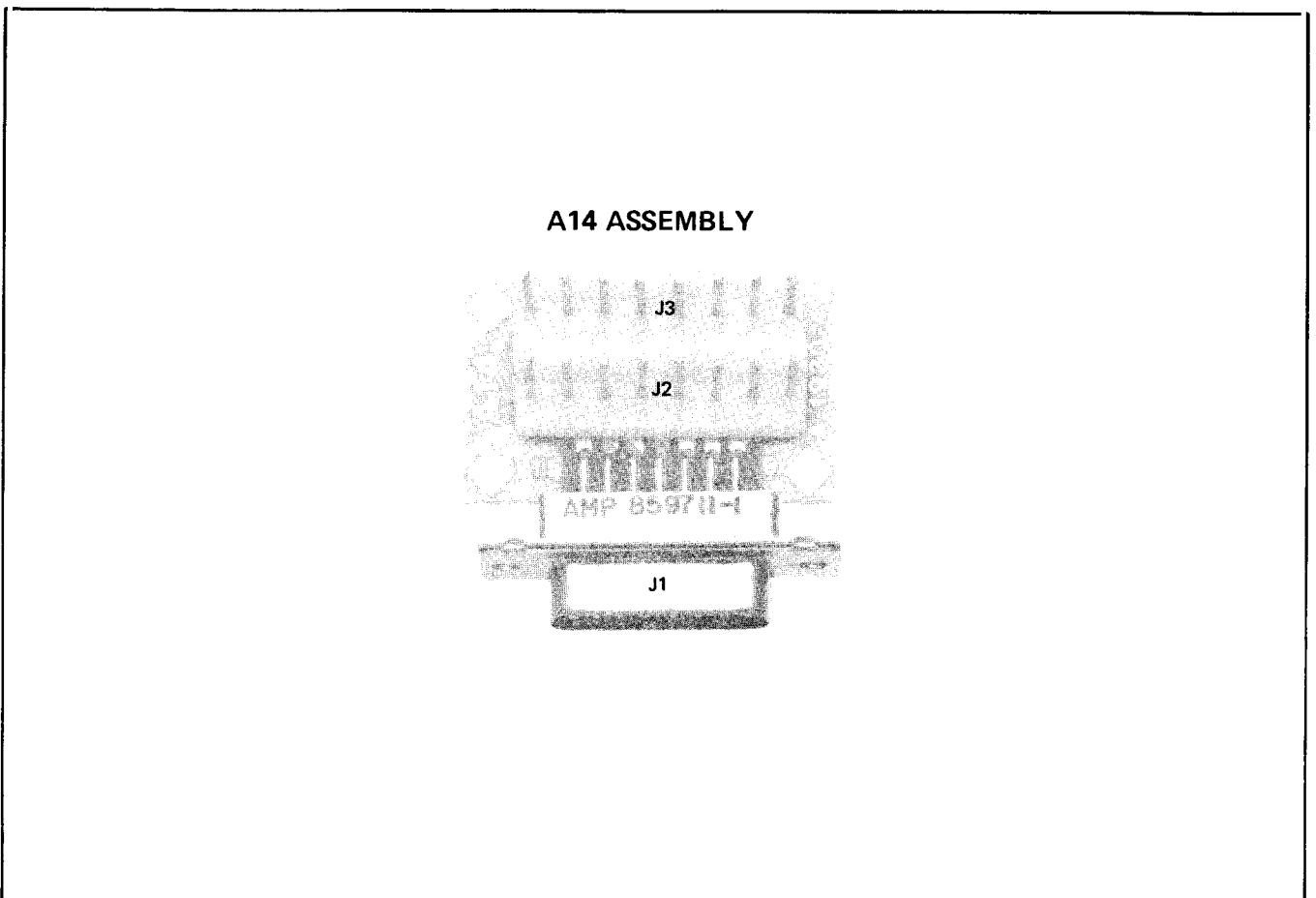


Figure 8-109. Amplitude, Modulation and Annunciator Displays Schematic Diagram



**Figure 8-110. Voltage Regulator Component Locations**



**Figure 8-111. Filter Bank Component Locations**

## SERVICE SHEET 22 (Cont'd)

keeps the regulators from being reverse biased if an output is connected to a higher voltage.

The overvoltage protection circuit at the input of the +15 and -15V power supplies (VR5, R65, C21 and Q12) protects the supplies from excess line voltage. The unregulated voltages for the +15 and -15 Vdc supplies are about +25 and -25 Vdc. The 68.1 volt zener diode VR5 and its accompanying components is connected between the two supplies. The normal voltage across the zener diode is approximately 50 Vdc. When the voltage exceeds the threshold of 68.1 volts, the zener will turn on. Current is drawn through R65 which charges C21 until Q12 fires. Then the line fuse blows.

The +5 Vdc supply's crowbar (overvoltage protection) circuit consists of VR6, R80, R81 and Q3. The circuit protects the +5 volt supply if it is shorted to the +15 Vdc supply or other positive voltage greater than the threshold voltage of VR6 (+8.25 volts). In this situation, VR6 will turn on and draw enough current through R80 to fire Q3. This blows the +5 volt supply fuse.

LEDs DS1,2 and 3 are lit when the power supplies are providing an output voltage. Resistors R82, 83 and 84 set the current through the LEDs. Inductors L1, 2 and 3 and capacitors C17, 18, 19, 23, 24, 25, 26, 27 and 28 isolate and filter the associated supplies.

## TROUBLESHOOTING

Procedures for checking the circuits shown on Service Sheet 22 are given below. The area or points to check are marked on the schematic by a hexagon with a check mark and a number inside, e.g.  $\sqrt{3}$ . Fixed voltages are shown on the schematic inside a hexagon, e.g.  $2V \pm 0.2V$ . Transistor bias voltages are shown without tolerances.

### Test Equipment

Digital Multimeter ..... HP 3465A  
Oscilloscope ..... HP 1222A

$\sqrt{1}$  Verify that the voltages shown in Table 1 are correct.

Table 1. Power Supply Measurements

Volts	On test point J6-Pin:					
	11	13	9	3	10	2
Vdc	+25	+17 to +13	+11	+5.6 to +5.2	-25	-13 to -17
Vp-p	1.0	0.01	1.5	0.01	1.0	0.01

**SERVICE SHEET 22**  
**P/O A10 AUDIO/POWER SUPPLY ASSEMBLY**  
**P/O A12 VOLTAGE REGULATOR ASSEMBLY**  
**P/O A14 FILTER BANK ASSEMBLY**  
**A15 LINE POWER MODULE**  
**P/O A16 10 MHz REFERENCE OSCILLATOR ASSEMBLY**

**TROUBLESHOOTING HELP**

Service Sheet BD1

Table 4-1. Abbreviated Performance Tests

Table 5-2. Post-Repair Adjustments

**PRINCIPLES OF OPERATION**

**General**

The four dc power supplies are +24 Vdc unregulated, +15 Vdc regulated, +5 Vdc regulated and -15 Vdc regulated. The Attenuator Current Protection circuit protects against continuing current flow through the A9 Attenuator Assembly's latching relay coils. The switching time is about 60 ms. There are two types of overvoltage protection circuits. The first limits the unregulated voltage input to the  $\pm 15$  volt supplies. The second type limits the voltage out of the +5 volt supply to the Signal Generator's circuits.

**+24V Unregulated Supply and Attenuator Current Protection**

The unregulated +24 volts switches the Step Attenuator, the Heterodyne frequency band and supplies current to the crystal oven's heater when the high stability time base, Option 001 is installed. The Attenuator Current Protection circuit will short +24V to ground through Q1 which blows F1. This occurs when attenuator and or heterodyne band switching current is drawn for more than 2.2 seconds.

The comparator, U2's reference voltage is set by the +24 voltage divided by R73 and R74. The step attenuator and heterodyne band switching coils draw current only during the time the switching takes place (about 60 ms). The resulting voltage drop across R75 will cause the voltage at the inverting input to go more negative. This causes the output of U2 to try to switch positive. Capacitor C22 keeps the output from switching immediately. The capacitor charges through R72 which is connected to the +5V supply. When the voltage on C22 nears +1.4 volts, Q2 will conduct enough current to trigger SCR Q1. This shorts the +24 volt supply to ground which blows fuse F1.

**Regulated +15, +5, and -15 Volt Supplies**

The ac voltages from the secondary of the power transformer are rectified by diodes CR6,7,8 and 9 for the +15 and -15 Vdc unregulated voltages. The +5 volts dc supply's unregulated voltage is from rectifiers located within the rear panel.

Diodes CR12, 13 and 14 protect the series regulators, U1, U2 and U3. If the output voltage of the series regulators goes more positive than the unregulated input voltage the diodes will be turned on. This

### P/O A10 ASSEMBLY

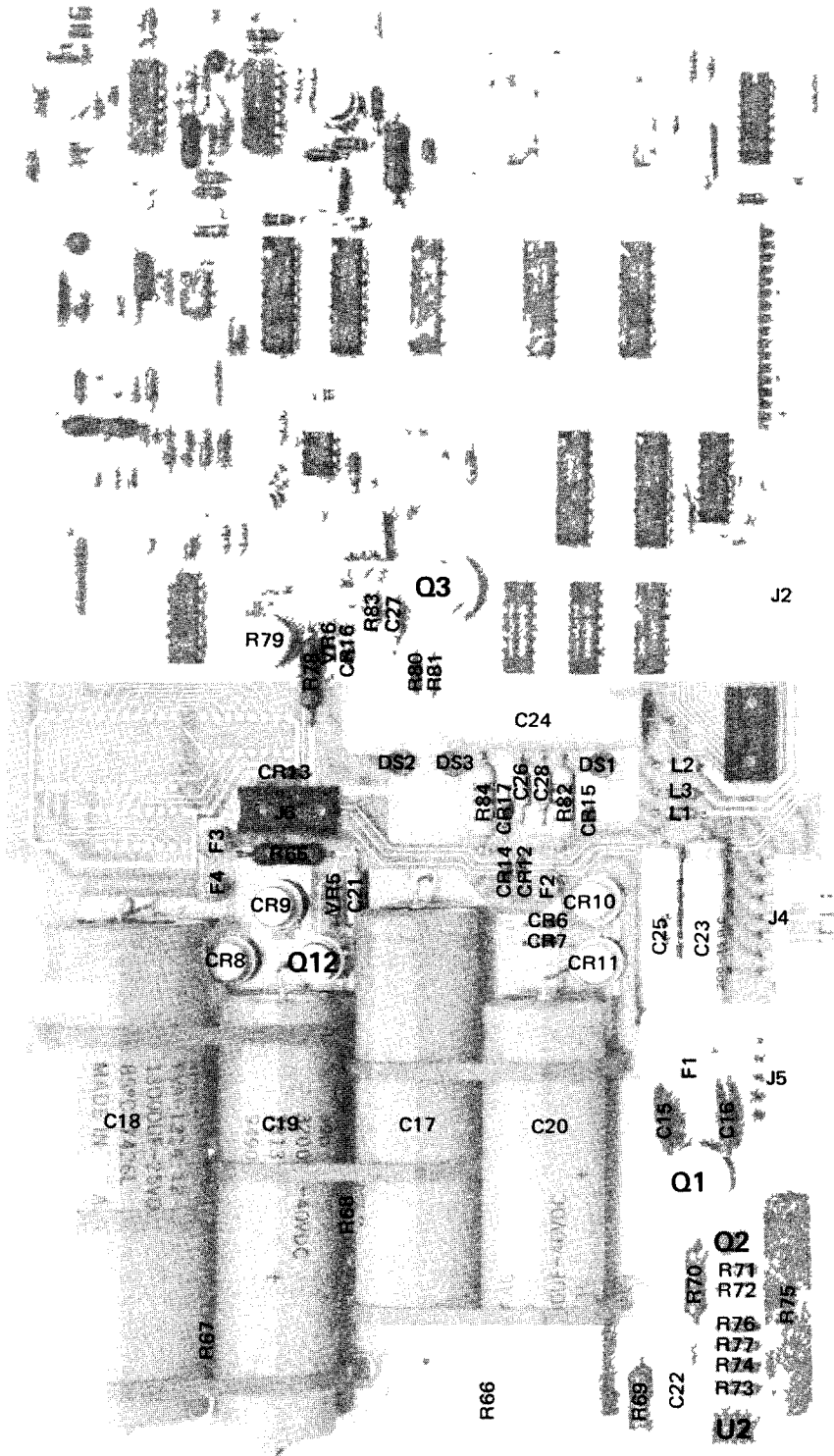
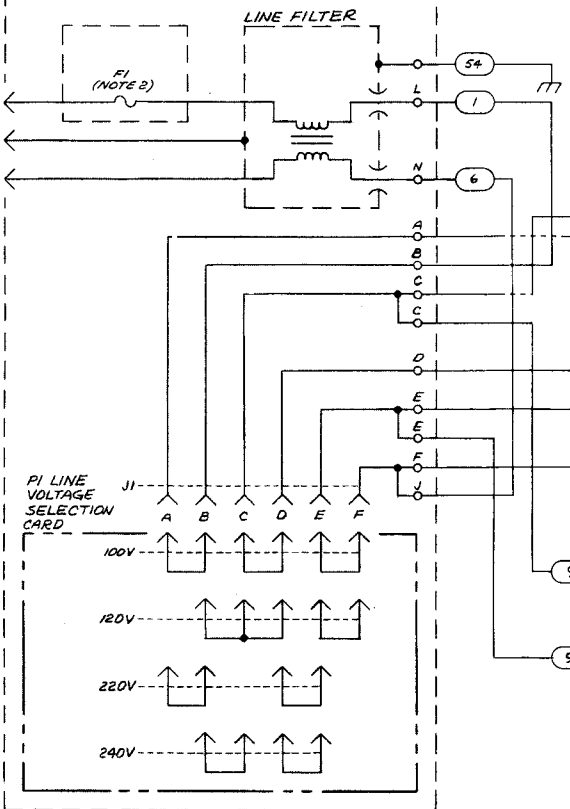


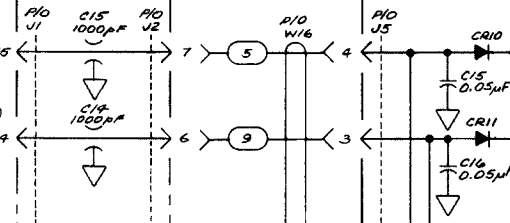
Figure 8-112. Power Supply (A10 Assembly) Component Locations

**A15 LINE POWER MODULE (0960-0443)**

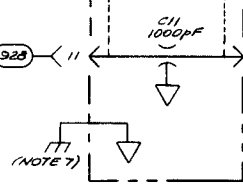
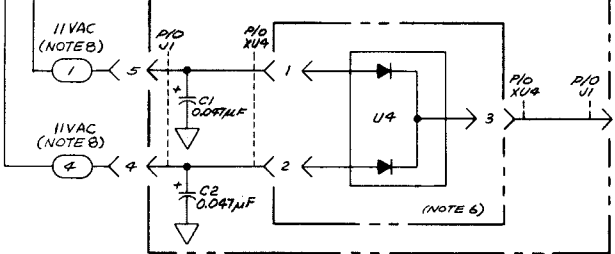
LINE VOLTAGE  
100, 120, 220  
240 VAC  
+5% -10%,  
48-66Hz



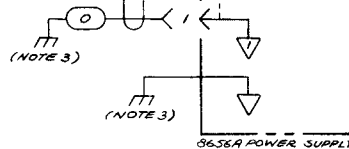
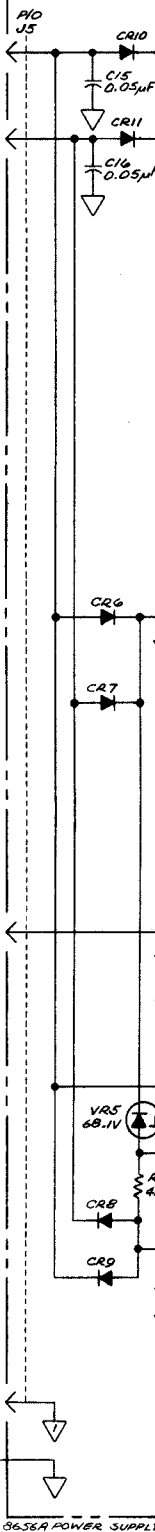
**P10 A14 FILTER BANK ASSEMBLY (08656-60078)**



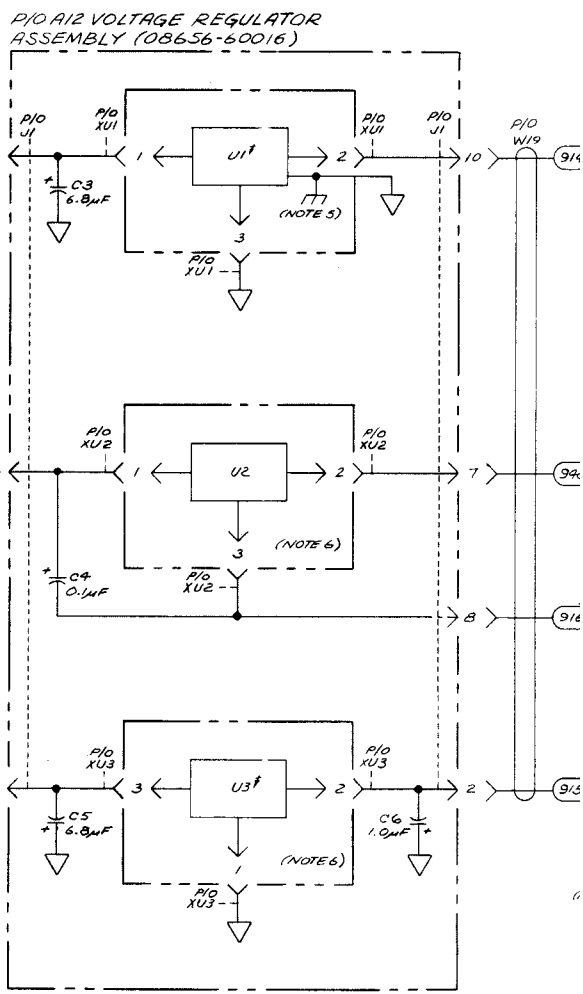
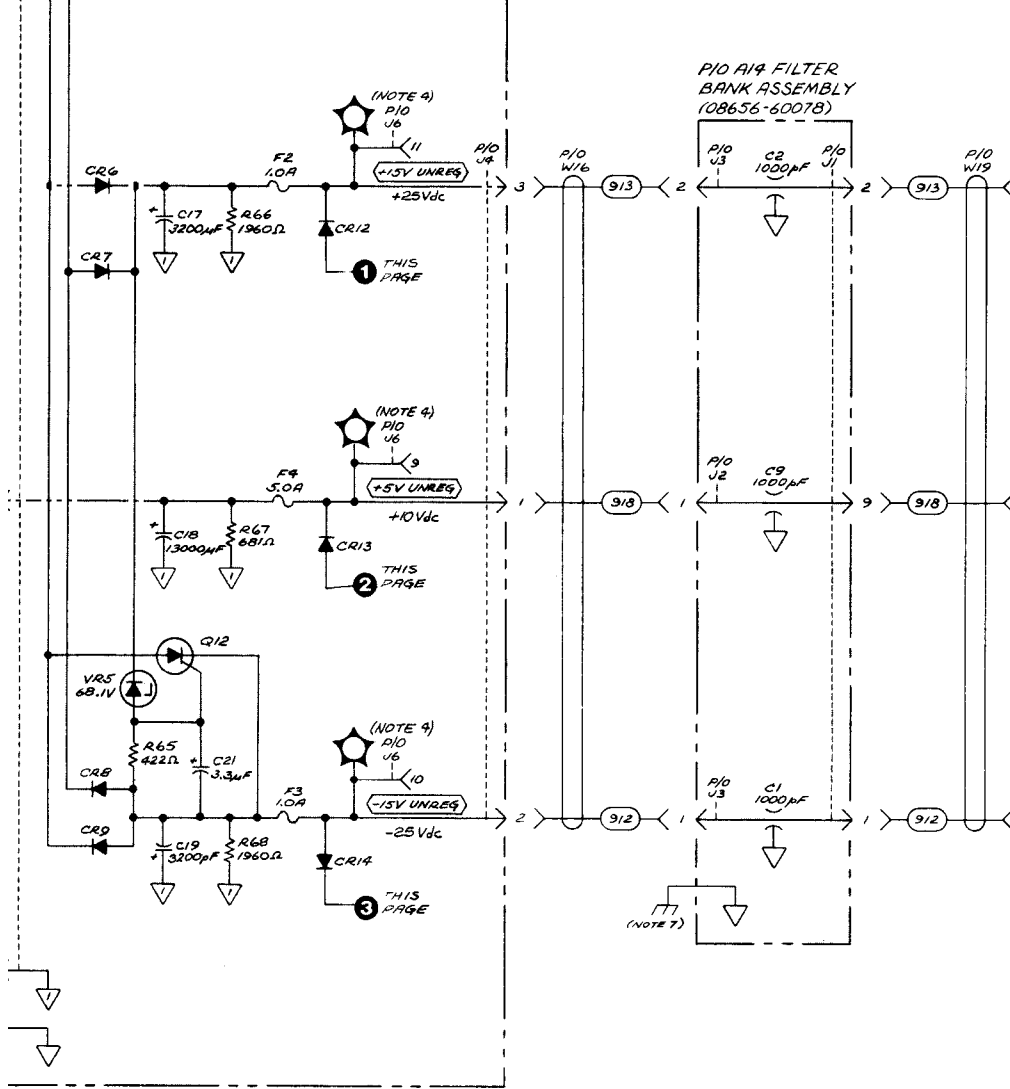
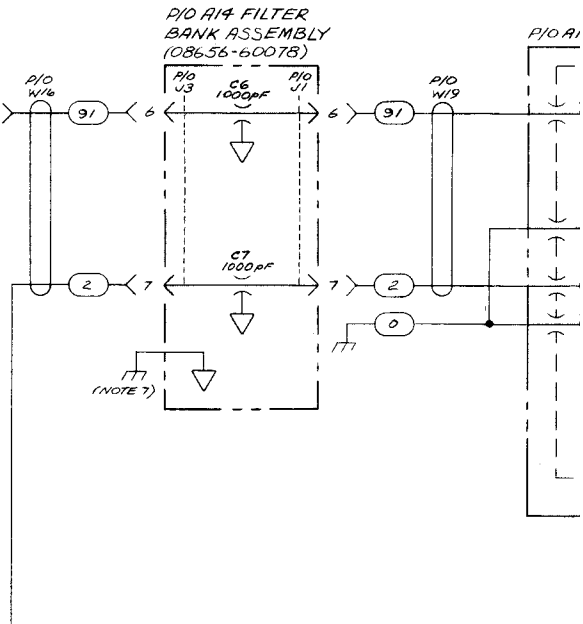
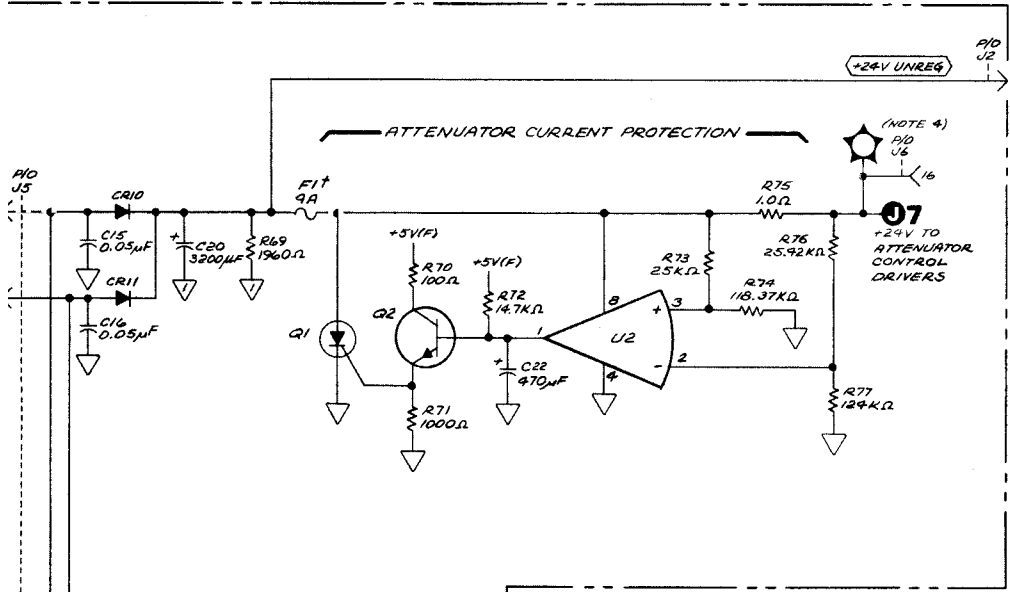
**P10 A12 VOLTAGE REGULATOR ASSEMBLY (08656-60016)**



**P10 A10 AUDIO**



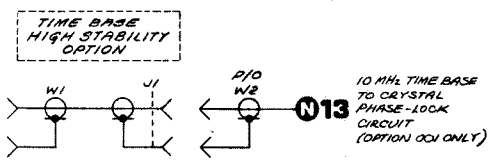
P10 A10 AUDIO/POWER SUPPLY ASSEMBLY (08656-60006)







FOR ASSEMBLY (OPTION 001 ONLY)



**WARNING**

THIS INSTRUMENT DOES NOT HAVE A PRIMARY POWER SWITCH. THE FOLLOWING VOLTAGES ARE ALWAYS PRESENT WHENEVER THE INSTRUMENT IS CONNECTED TO AN AC OUTLET:

- A. LINE VOLTAGE
- B. PRIMARY AND SECONDARY AC VOLTAGES.
- C. UNREGULATED DC VOLTAGES (+24V, +15V, +5V AND -15V).
- D. REGULATED DC VOLTAGES (+15V, +5V, AND -15V).

**CAUTION**

DO NOT CONNECT OR DISCONNECT THE AUDIO/POWER SUPPLY BOARD (A10) OR VOLTAGE REGULATOR BOARD (A12) WITH THE AC POWER CORD CONNECTED, OTHERWISE DAMAGE TO THE INSTRUMENT MAY RESULT.

NOTES

1. SEE TABLE 8-3 FOR SCHEMATIC DIAGRAM NOTES.
  2. VALUE OF F1 IS 1.25A SLO-BLO FOR 100/180 VAC, AND 0.6A SLO-BLO FOR 220/240VAC.
  3. A10 CHASSIS GROUND IS ACHIEVED THROUGH A10J5-1 AND 3 CONNECTIONS AND MECHANICAL CONTACT WITH FASTENERS HOLDING PC BOARD TO FRAME.
  4. SERVICE TEST POINT. PIN OF DUAL IN-LINE TEST SOCKET J6.
  5. A12 CHASSIS GROUND IS ACHIEVED THROUGH MECHANICAL CONTACT WITH FASTENERS HOLDING U1 TO FRAME.
  6. CASES OF U2, U3, AND U4 ARE INSULATED FROM CHASSIS GROUND.
  7. A14 CHASSIS GROUND IS ACHIEVED THROUGH MECHANICAL CONTACT WITH FASTENERS HOLDING ASSEMBLY TO FRAME.
  8. THIS AC VOLTAGE MEASUREMENT IS TO CHASSIS GROUND.
- † INDICATES CIRCUIT CHANGE. SEE SECTION VII.

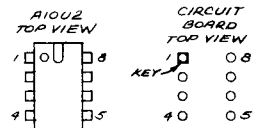
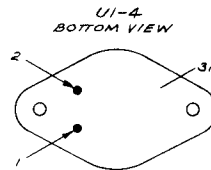
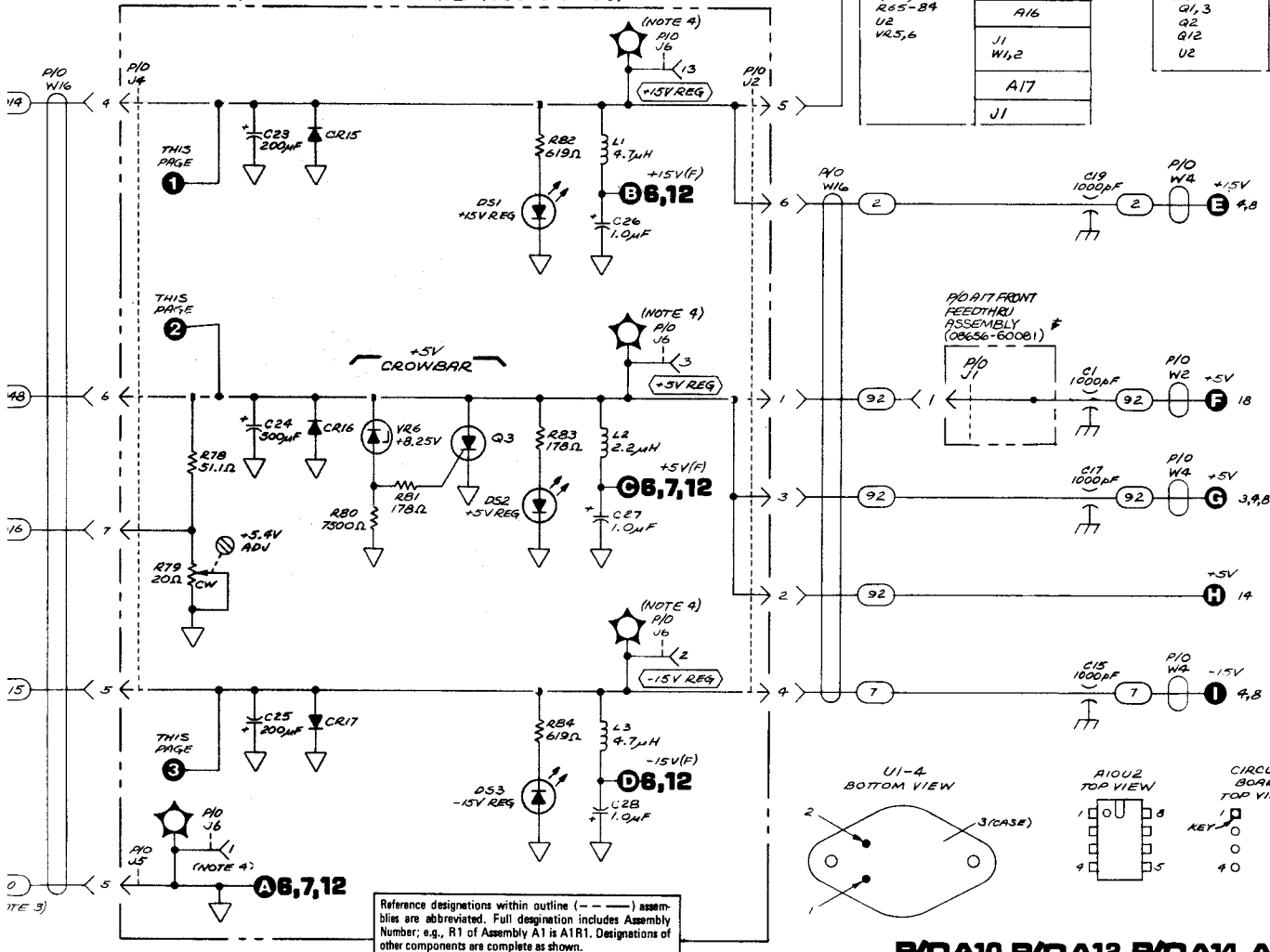
REFERENCE DESIGNATIONS

NO PREFIX	A12
B1	C1-6
C1,15,17,19	J1
F1	XU1-4
T1	
U1-4	A14
W2,4,16,19,20	
A10	C1-7,9,11,13-15
C15-28	J1-3
CR6-17	
DS1-3	A15
PT-9	
U2,9-6	J1
L1-3	PI
Q1-3,12	
R65-84	A16
U2	
VR5,6	J1
	A17
	J1

TRANSISTOR AND INTEGRATED CIRCUIT PART NUMBERS

REFERENCE DESIGNATIONS	PART NUMBERS
NO PREFIX	
U1	1826-0819
U2	1826-0513
U3	1826-0820
U4	1906-0231
A10	
Q1,3	1884-0012
Q2	1854-0810
Q12	1884-0018
U2	1826-0412

P10 A10 AUDIO/POWER SUPPLY ASSEMBLY (08656-60006)



P/OA10, P/OA12, P/OA14, A15, P/OA16

Figure 8-113. Power Supply Schematic Diagram