

A15

POWER SUPPLY ASSEMBLY

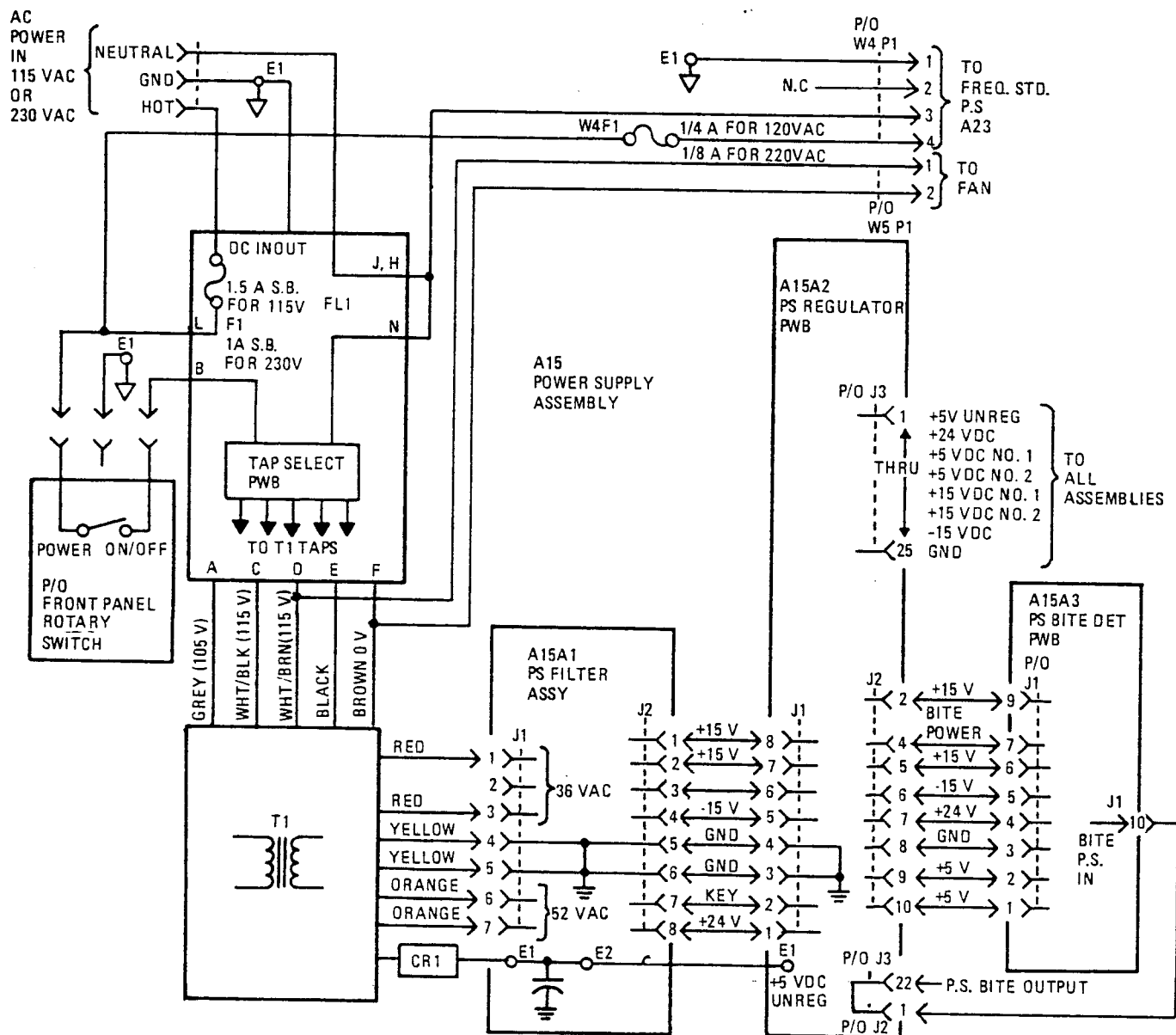


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POWER SUPPLY ASSEMBLY A15**1. GENERAL DESCRIPTION****WARNING**

Potentially hazardous high voltages are present inside the A15 assembly whenever the exciter is connected to an ac line source. Do not attempt any repair to this assembly unless the line cord is disconnected. Do not operate the exciter without the protective cover properly installed over the assembly.

Power Supply Assembly A15 converts either 100, 120, 220, or 240 Vac input line voltages into the dc voltages required to operate all RF-1310 assemblies except Frequency Standard Assembly A21. The + 24 Vdc Power Supply Assembly A23 provides power to the Frequency Standard Assembly.

Input voltage selection for the A15 assembly is made by positioning a plug-in PWB that is part of A15 Line Filter FL1. It is located next to the rear panel ac power fuse. Input voltage selection for the A23 assembly is made via switch S1 on the A23 assembly and the FL1 power select PWB. Both must be changed to affect proper line voltage selection. Refer to the Installation section of this manual for further information.

All power supply components and assemblies are housed in a single, metal housing with cover. Major components/assemblies inside this housing are listed below:

- Input Line Filter FL1
- Power Transformer T1
- Filter PWB A15A1
- Heatsink Assembly A15A2 with Regulator PWB A15A2A1
- Power Supply BITE Detector PWB A15A3

The position of these assemblies is shown in figure 1.

FL1 provides EMI protection and A15 input voltage selection. T1 converts the ac line voltage into the required lower ac voltage levels needed to run the regulators. Filter PWB A15A1 converts the T1 ac outputs into unregulated dc voltage levels. The A15A2 assembly contains the three terminal voltage regulators which convert the unregulated dc levels into regulated dc output voltages. The voltage regulators VR1 through VR6 are mounted on Heatsink Assembly A15A2, while the remaining circuitry is on Regulator PWB Assembly A15A2A1. A15A2A1 delivers + 5 Vdc, + 15 Vdc, -15 Vdc, and + 24 Vdc to other assemblies in the exciter.

Power Supply BITE PWB A15A3 monitors the output of Regulator PWB A15A2A1, and signals the Control PWB A14 microprocessor if these levels exceed certain prescribed limits. This in turn would cause a front panel fault indicator to light. All major components and assemblies in the A15 assembly are interconnected via ribbon cable with plug-in connectors.

2. INTERFACE CONNECTIONS

Table 1 details the various input/output connections and other relevant data.

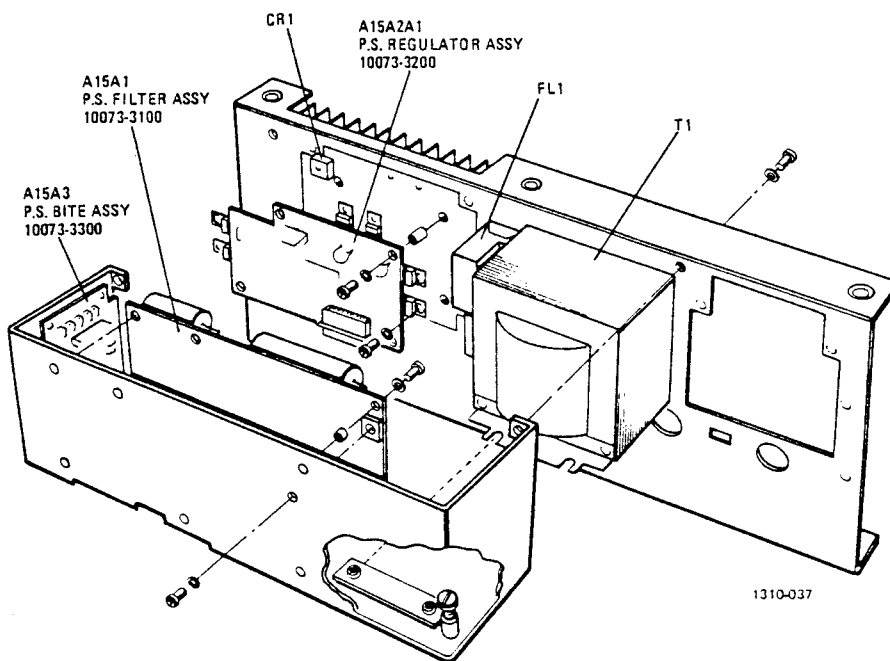


Figure 1. Power Supply Assembly A15 Location

Table 1. Power Supply Assembly A15 Interface Connectors

Connector	Function	Characteristics
A15A2A1J3-1	+ 15 V Regulated No. 1	Ground
A15A2A1J3-2	+ 24 V Regulated	
A15A2A1J3-3	Gnd	
A15A2A1J3-4	+ 5 V Unregulated	
A15A2A1J3-5, 6	+ 15 V Regulated No. 1	

Table 1. Power Supply Assembly A15 Interface Connectors (Cont.)

Connector	Function	Characteristics
A15A2A1J3-7	+ 5 V Unregulated	Ground
A15A2A1J3-8	Gnd	
A15A2A1J3-9	+ 5 V Regulated No. 2	
A15A2A1J3-10	No Connection	
A15A2A1J3-11	-15 V Regulated	Ground
A15A2A1J3-12	+ 5 V Unregulated	
A15A2A1J3-13, 14	Gnd	
A15A2A1J3-15	+ 5 V Unregulated	
A15A2A1J3-16	-15 V Regulated	0 Vdc = Failure
A15A2A1J3-17, 18	+ 24 V Regulated	
A15A2A1J3-19	-15 V Regulated	
A15A2A1J3-20	+ 15 V Regulated No. 2	
A15A2A1J3-21	+ 5 V Regulated No. 1	Ground
A15A2A1J3-22	BITE Power Supply	
A15A2A1J3-23	+ 15 V Regulated No. 1	
A15A2A1J3-24	+ 15 V Regulated No. 2	
A15A2A1J3-25	Gnd	To Front Panel ON/OFF Switch
W3P1-1	Switched Ac Hot	
W3P1-2	Gnd	
W3P1-3	Ac Hot	
W4P1-1	Ac Neutral	To + 24 V Power Supply A23
W4P1-2	Ac Hot	To + 24 V Power Supply A23
W4P1-3	Ground	To + 24 V Power Supply A23
W5P1-1	Switched Ac Hot	To fan
W5P1-2	Ac Neutral	To fan

3. A15 PARTS LISTS, COMPONENT LOCATIONS, AND SCHEMATIC DIAGRAM

Table 2 is the A15 assembly parts list. Figure 2 is the functional block diagram for Power Supply Assembly A15, figure 3 is the A15 assembly component location diagram, and figure 4 is the A15 assembly schematic diagram.

Table 2. Power Supply Assembly A15 Parts List

Ref. Desig.	Part Number	Description
A15	10121-3000-01	POWER SUPPLY
	10121-3005	PANEL, REAR
	10073-3010	BRACKET, XFMR MOUNTING
	10073-3006	CHASSIS, POWER SUPPLY
	10073-3011	PLATE, NUT
A15A1	10073-3100	PWB ASSY, FILTER
A15A2	10073-3250	HEATSINK ASSY
A15A3	10073-3300	PWB ASSY, BITE
F1	F03-0002-022	FUSE 1-1/2A SB 125V 3AG
FL1	6919-1400	LINE FILTER
W1	10073-3052	TRANSFORMER, POWER
W1	10073-7060	RIBBON CABLE, 10 COND
W2	10073-7059	RIBBON CABLE, 8 COND
W3	10073-7250	CABLE ASSY, 3 COND
W4	10121-7246	CABLE ASSY WITH FUSE
W4F1	F03-0002-010	FUSE 1/4A SB 250V 3AG
W4XF	F01-0005-000	FUSE HOLDER
W5	10121-7185	CABLE, FAN

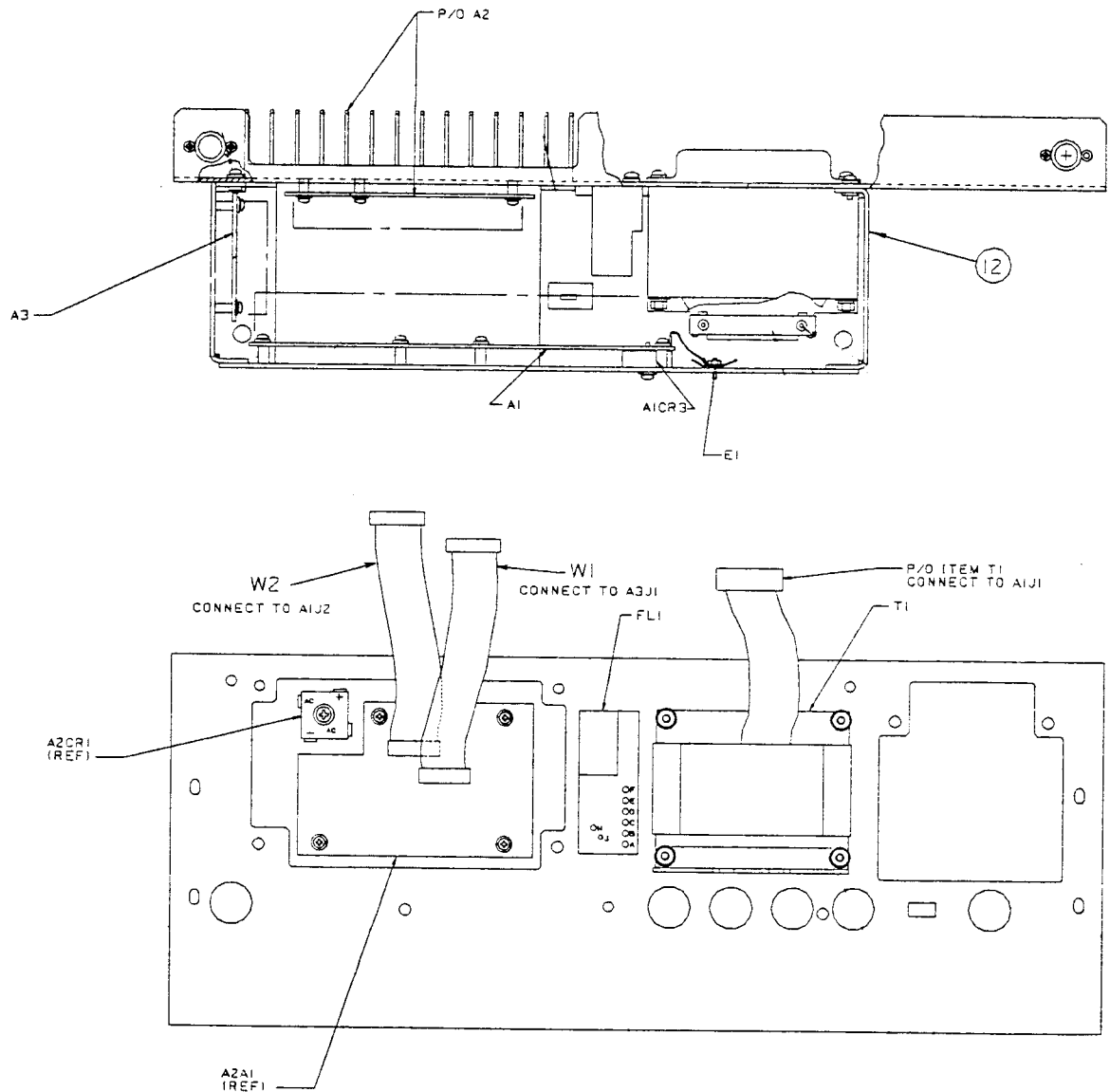


Figure 3. Power Supply Assembly A15 Component Location Diagram (10121-3000)

4. POWER SUPPLY FILTER ASSEMBLY A15A1 CIRCUIT DESCRIPTION

The A15A1 assembly contains voltage rectifiers and the large filter capacitors required to filter the input voltages from T1. The 52 Vac at J1-6 and J1-7 is full-wave rectified by CR1 and CR2 and filtered by C1 to produce an unregulated + 24 volts at J2-8.

The 36 Vac at J1-1 and J1-3 is full-wave rectified by CR3 and filtered by C2 and C3 to produce an unregulated + 15 volts at J2-1 and J2-2, and an unregulated -15 volts at J2-4. The unregulated 5 volts at E1 are heavily filtered by filter network C4-L1-C5 and made available at E2.

Table 3 is the A15A1 assembly parts list, figure 5 is the A15A1 component location diagram, and figure 6 is the A15A1 schematic diagram.

Table 3. Power Supply Filter Board Assembly A15A1 Parts List

Ref. Desig.	Part Number	Description
A15A1	10073-3100	POWER SUPPLY FILTER ASSEMBLY
	J03-0001-026	FML FASTON 3/16 22-18AWG
	J03-0004-002	LUG SOLDERLESS SLIP-ON
C1	C17-0050-282	CAP 2800UF 50V ELEC
C2	C17-0035-562	CAP 5600UF 35V ELEC
C3	C17-0035-212	CAP 2100UF 35V ELEC
C15	C17-0035-123	CAP 12000U 35V ELEC
C19	C17-0035-123	CAP 12000UF 35V ELEC
CR1	D22-0006-001	DIODE 3A 600V RECT GP
CR2	D22-0006-001	DIODE 3A 600V RECT GP
CR3	D22-5011-200	DIODE 10A 200V RECT BR
E3	MP-0372	FAST-ON .125 PCB MOUNT
J1	J42-0004-007	CONN,7 PIN
J2	J46-0032-008	CONN,8 PIN
L1	10073-3051	INDUCTOR,1MH 4 AMP

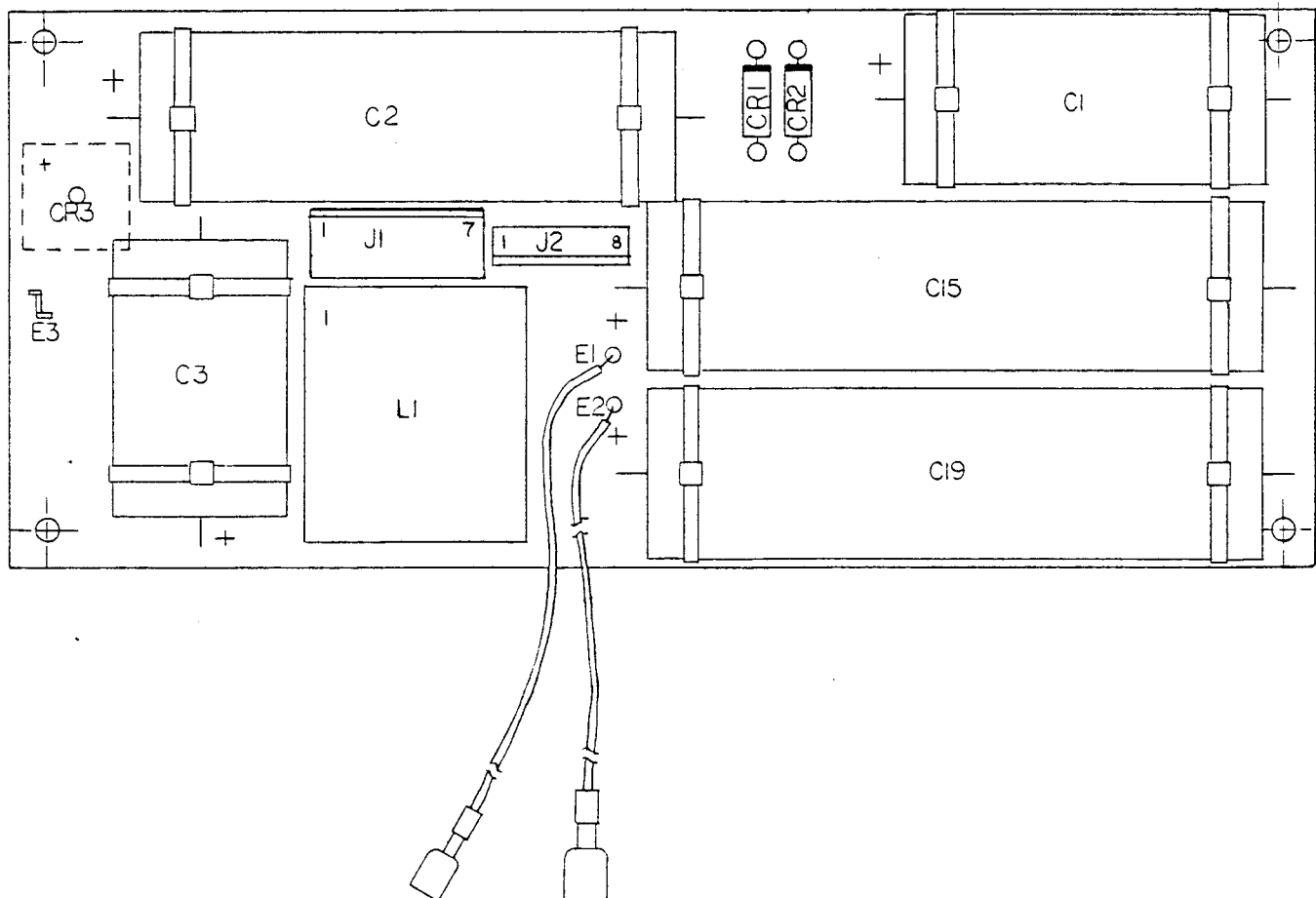


Figure 5. Power Supply Filter A15A1 Component Location Diagram (10073-3100)

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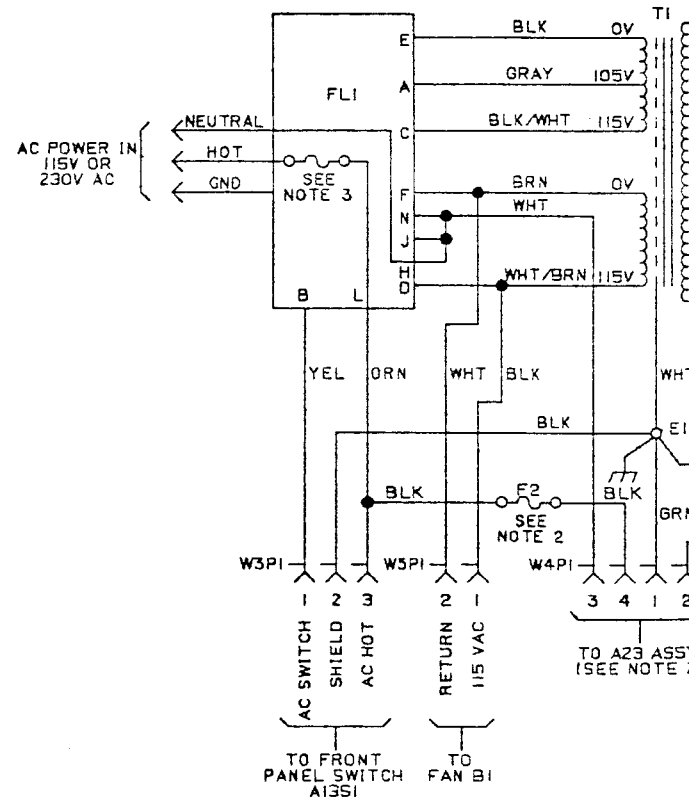
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
FOR A COMPLETE DESIGNATION, PREFIX WITH
UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.

2. A23 ASSY MAY BE EITHER:
10121-5800, FREQUENCY STANDARD +24V POWER SUPPLY OR
10121-5810, FREQUENCY STANDARD SYNCHRONIZATION DETECTOR ASSY.

W4PI CONNECTIONS AND F2 VALUE ARE CHOSEN AS SHOWN BELOW:

	10121-5800 ASSY INSTALLED	10121-5810 ASSY INSTALLED
W4PI PINOUTS		
F2 VALUE:		
AC INPUT = 110/120 VAC	1/4 AMP 'SLO-BLOW'	NOT USED
AC INPUT = 220/240 VAC	1/8 AMP 'SLO-BLOW'	NOT USED

3.	AC INPUT	
	110/120 VAC	1.5
	220/240 VAC	1.0



FLI FUSE RATING
AMP "SLOW-BLOW" FUSE
AMP "SLOW-BLOW" FUSE

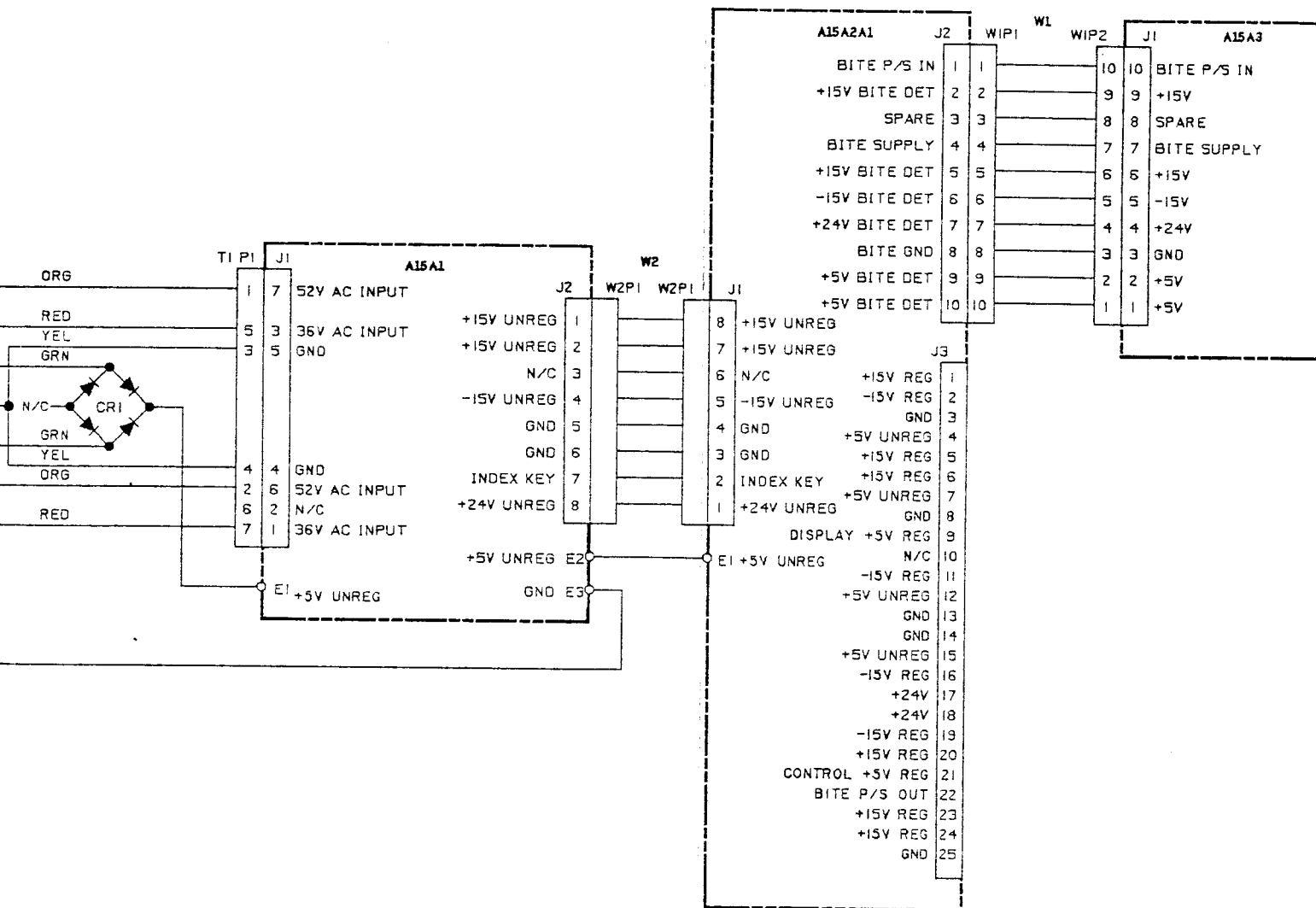
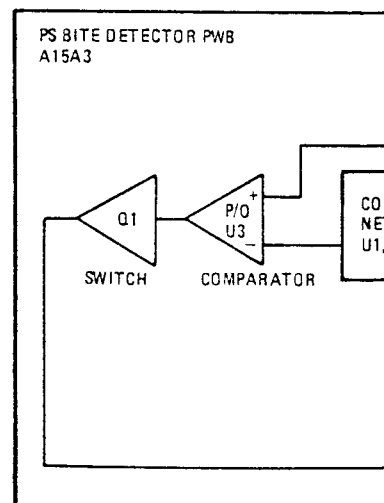
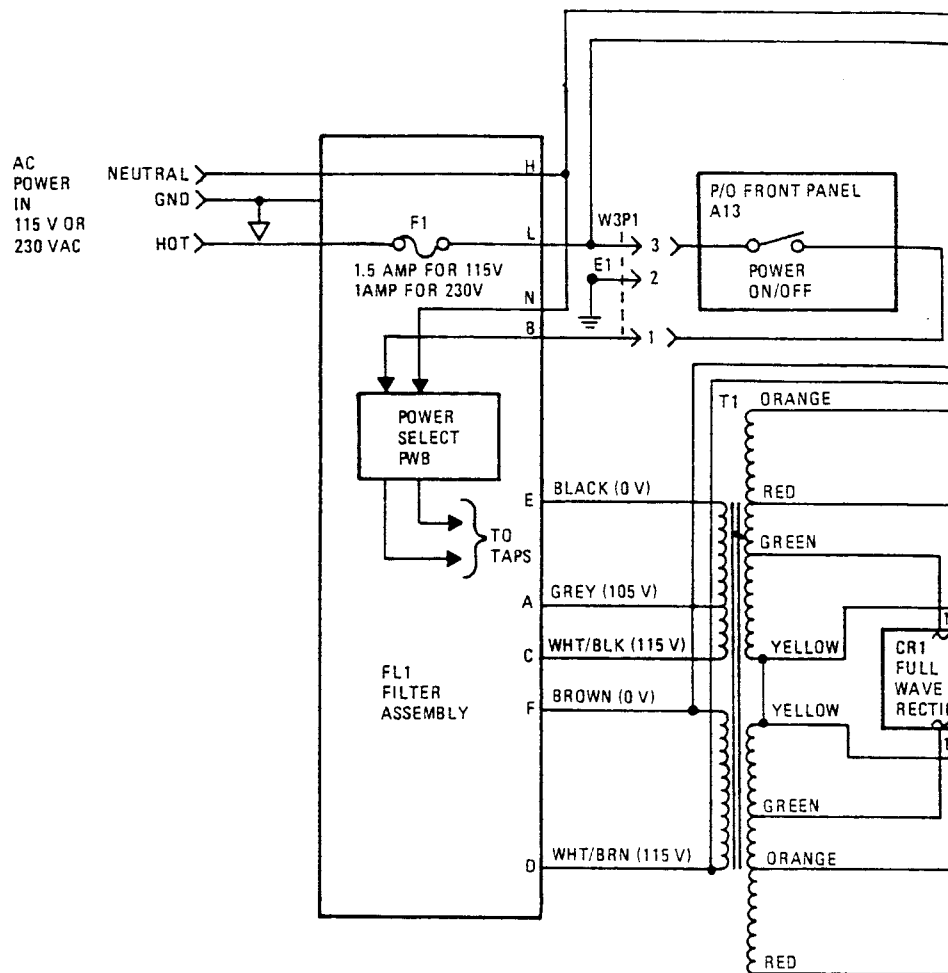
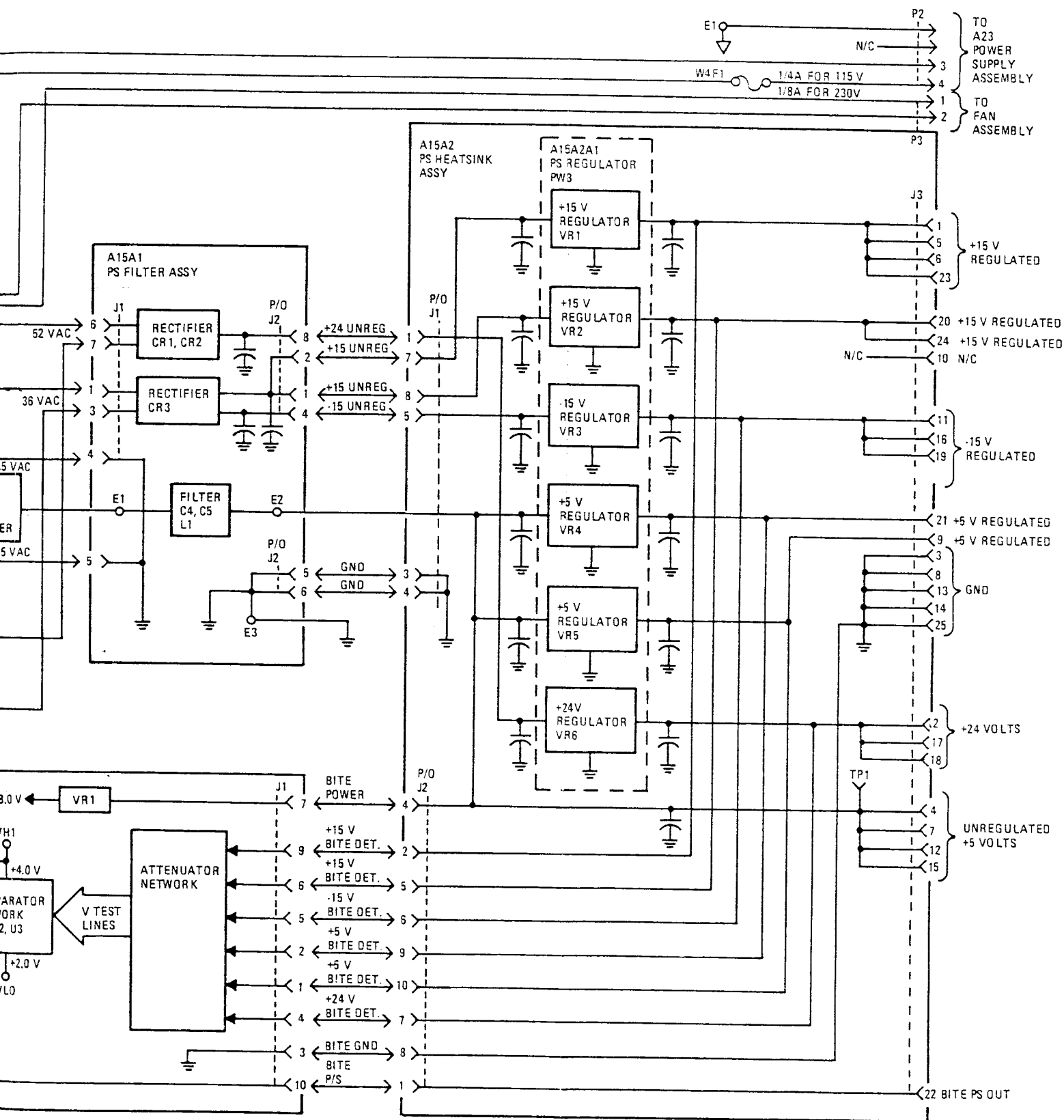


Figure 4. Power Supply Assembly A15
Schematic Diagram (10121-3001
Rev. G)





1310-038 (A1)

Figure 2. Power Supply Assembly A15 Functional Block Diagram

- NOTE: UNLESS OTHERWISE SPECIFIED:
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR A COMPLETE DESIGNATION, PREFIX WITH UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
 3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY. COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.

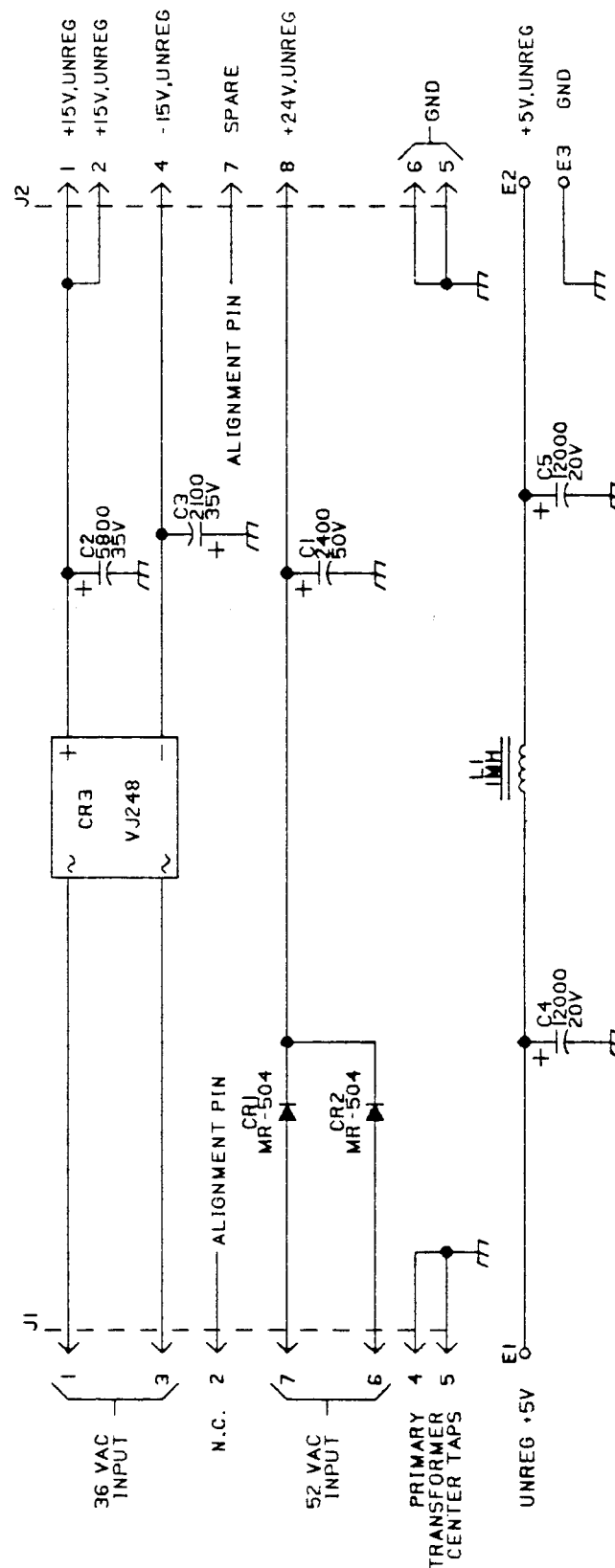


Figure 6. Power Supply Filter Assembly A15A1 Schematic Diagram (10073-3101 Rev. C)

5. POWER SUPPLY HEATSINK ASSEMBLY A15A2 CIRCUIT DESCRIPTION

Heatsink Assembly A15A2 consists of voltage regulators VR1 through VR6, CR1, and Regulator PWB A15A2A1. They are all mounted to a large heatsink bolted to the rear of the A15 assembly. Heatsink Assembly A15A2 may be removed from Power Supply Assembly A15 by removing the five mounting screws on the rear of the A15 assembly.

Regulator Assembly A15A2A1 receives the unregulated output voltages from the A15A1 assembly, and uses linear regulators mounted to Heatsink Assembly A15A2 to produce the regulated output voltages required. Table 4 lists the input voltages, the associated voltage regulator, and the output voltages.

Table 4. A15A2 Voltage Regulator Identification

Input Voltage	A15A2 Voltage Regulator	Output Voltage
+ 15 Unregulated	VR1	15 Vdc No. 1
+ 15 Unregulated	VR2	15 Vdc No. 2
-15 Unregulated	VR3	-15 Vdc
+ 5 Unregulated	VR4	+ 5 Vdc No. 1
+ 5 Unregulated	VR5	+ 5 Vdc No. 2
+ 24 Unregulated	VR6	+ 24 Vdc

All these voltages are routed through connector A15A2A1J3 (located on the bottom of the A15A2A1 PWB) for power distribution throughout the radio.

The A15A2A1 assembly also provides additional filtering to these voltages, as well as to a + 5 volt, unregulated output which does not receive any regulation. This supply voltage is regulated on the individual assemblies when used.

Table 5 is the A15A2 assembly parts list and figure 7 is the A15A2 assembly component location drawing. Table 6 is the A15A2A1 parts list and figure 8 is the A15A2A1 assembly component location drawing. Figure 9 is the A15A2 assembly and A15A2A1 assembly schematic diagram.

Table 5. Power Supply Heatsink Assembly A15A2 Parts List

Ref. Desig.	Part Number	Description
A15A2	10073-3250	POWER SUPPLY HEAT SINK ASSEMBLY
	10073-3009	HEATSINK, POWER SUPPLY
	X-0814	INSULATOR, TRANSISTOR
	M10-0006-000	WSHR SHLDR NYLON .12X.06L
	10073-7049	CLIP, RETAINING
A15A2A1	10073-3200	PWB ASSY, REGULATOR
CR1	D22-5004-001	DIODE 15A 200V RECT BR
VR1	I11-0001-006	IC VR 7815 + 15V 1.5A 4%

Table 5. Power Supply Heatsink Assembly A15A2 Parts List (Cont.)

Ref. Desig.	Part Number	Description
VR2	I11-0001-006	IC VR 7815 + 15V 1.5A 4%
VR3	I12-0002-005	IC VR 7915 -15V 1.5A 4%
VR4	I11-0001-001	IC VR 7805 + 5V 1.5A 4%
VR5	I11-0001-001	IC VR 7805 + 5V 1.5A 4%
VR6	IC-0358	IC VR 317 ADJ V 1.5A

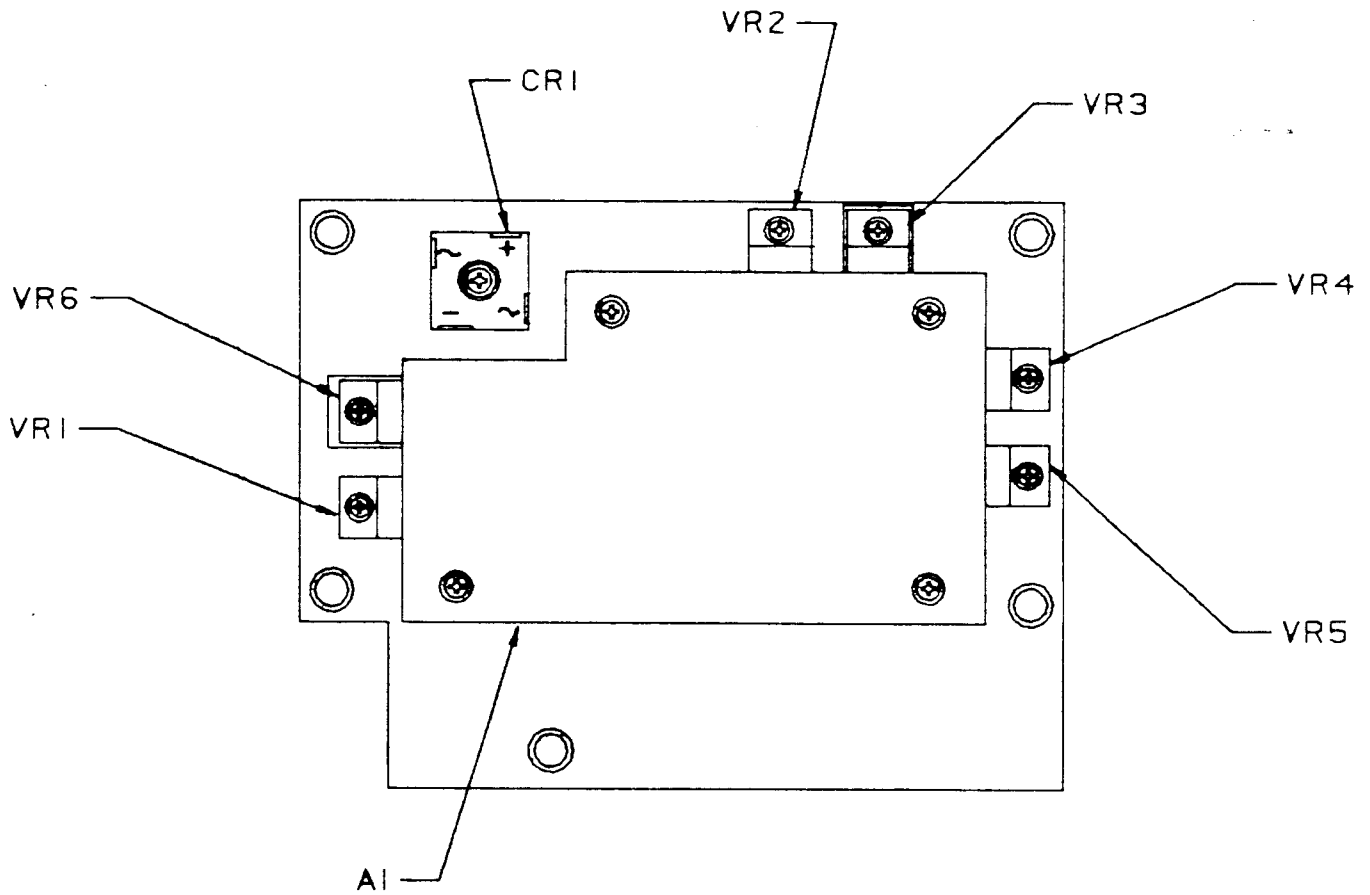


Figure 7. Power Supply Heatsink Assembly A15A2 Component Location Diagram (10073-3250)

Table 6. Power Supply Regulator Assembly A15A2A1 Parts List

Ref. Desig.	Part Number	Description
A15A2A1	10073-3200	POWER SUPPLY REGULATOR PWB ASSEMBLY
C1	C26-0050-100	CAP 10UF 20% 50V TANT
C2	M39014/02-1320	CAP .47UF 10% 50V CER-R
C3	M39014/02-1320	CAP .47UF 10% 50V CER-R
C4	C26-0025-680	CAP 68UF 20% 25V TANT
C5	M39014/02-1310	CAP .1UF 10% 100V CER-R
C6	C26-0050-100	CAP 10UF 20% 50V TANT
C7	M39014/02-1320	CAP .47UF 10% 50V CER-R
C8	M39014/02-1320	CAP .47UF 10% 50V CER-R
C9	C26-0025-680	CAP 68UF 20% 25V TANT
C10	M39014/02-1310	CAP .1UF 10% 100V CER-R
C11	C26-0050-100	CAP 10UF 20% 50V TANT
C12	M39014/02-1320	CAP .47UF 10% 50V CER-R
C13	M39014/02-1320	CAP .47UF 10% 50V CER-R
C14	C26-0025-680	CAP 68UF 20% 25V TANT
C15	M39014/02-1310	CAP .1UF 10% 100V CER-R
C16	M39014/02-1320	CAP .47UF 10% 50V CER-R
C17	M39014/02-1310	CAP .1UF 10% 100V CER-R
C18	C26-0016-150	CAP 15UF 20% 16V TANT
C19	M39014/02-1320	CAP .47UF 10% 50V CER-R
C20	M39014/02-1310	CAP .1UF 10% 100V CER-R
C21	C26-0016-150	CAP 15UF 20% 16V TANT
C22	C25-0003-015	CAP 22UF 10% 50V TANT
C23	M39014/02-1320	CAP .47UF 10% 50V CER-R
C24	M39014/02-1320	CAP .47UF 10% 50V CER-R
C25	C25-0003-015	CAP 22UF 10% 50V TANT
C26	M39014/02-1310	CAP .1UF 10% 100V CER-R
C27	C25-0003-313	CAP 100UF 10% 20V TANT
C28	M39014/02-1310	CAP .1UF 10% 100V CER-R
E1	MP-0372	FAST-ON .125 PCB MOUNT
J1	J46-0032-008	CONN ,8 PIN
J2	J46-0032-010	HEADER, 10 PIN DISCRETE
J3	J20-0009-025	CONN-D F 25 FXD RT A
R1	RN55D2430F	RES,243.0 1% 1/8W MET FLM
R2	RN55D4421F	RES,4420 1% 1/8W MET FLM
TP1	J-0392	TP PWB BRN RA SIDE ACCESS

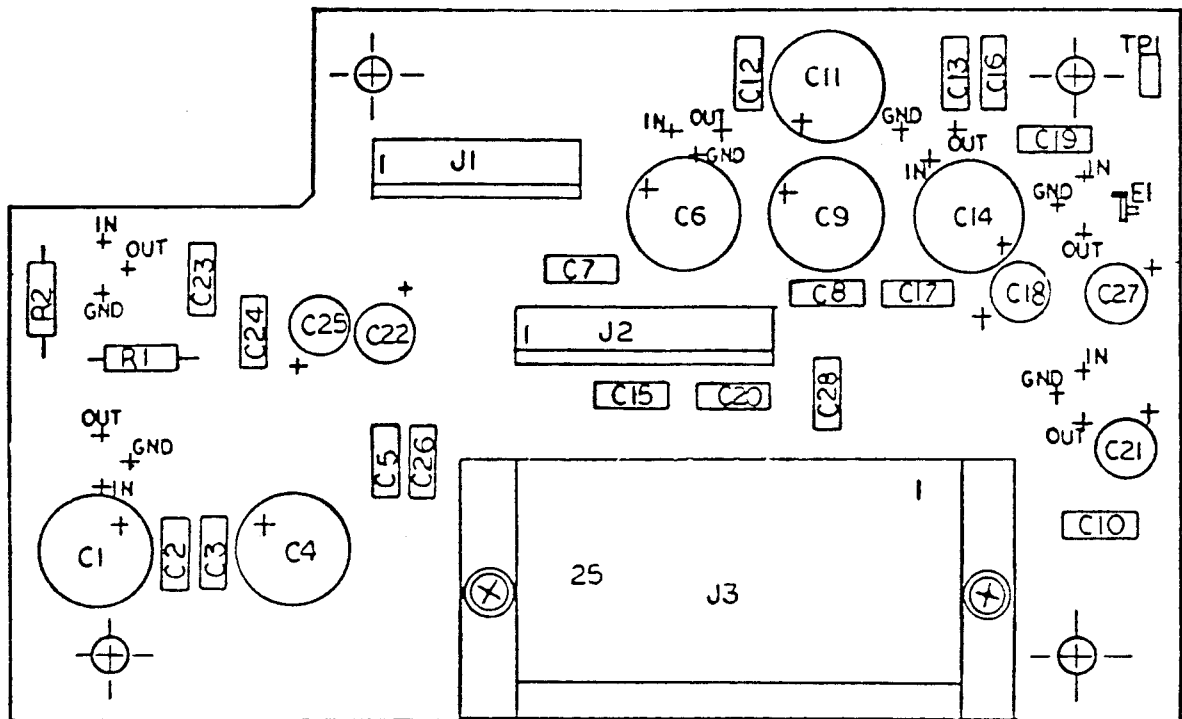
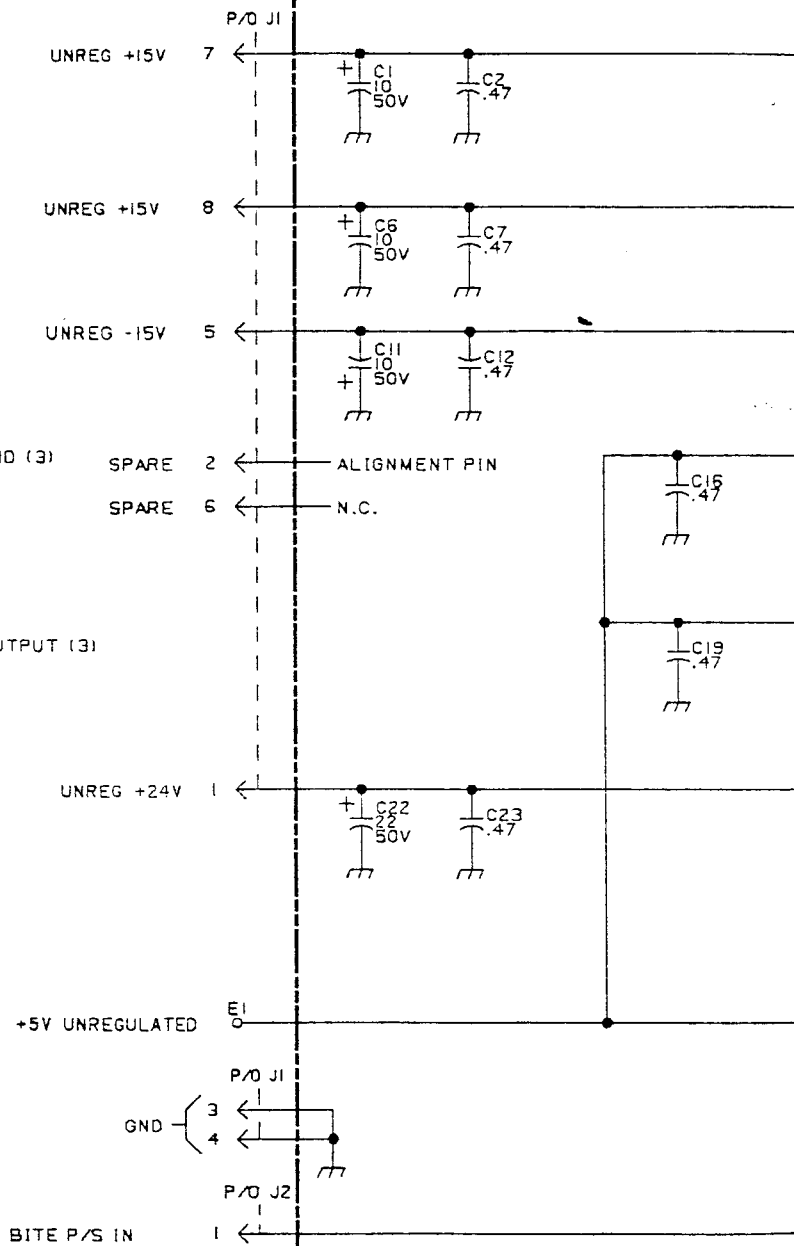
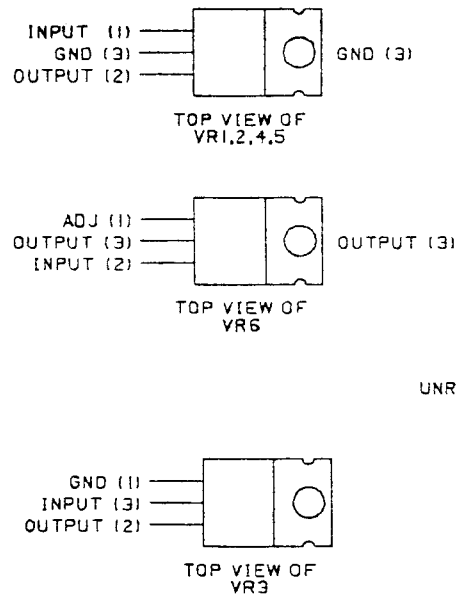


Figure 8. Power Supply Regulator Assembly A15A2A1 Component Location Diagram (10073-3200)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
FOR A COMPLETE DESIGNATION, PREFIX WITH
UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, $\pm 5\%$.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY.
COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.



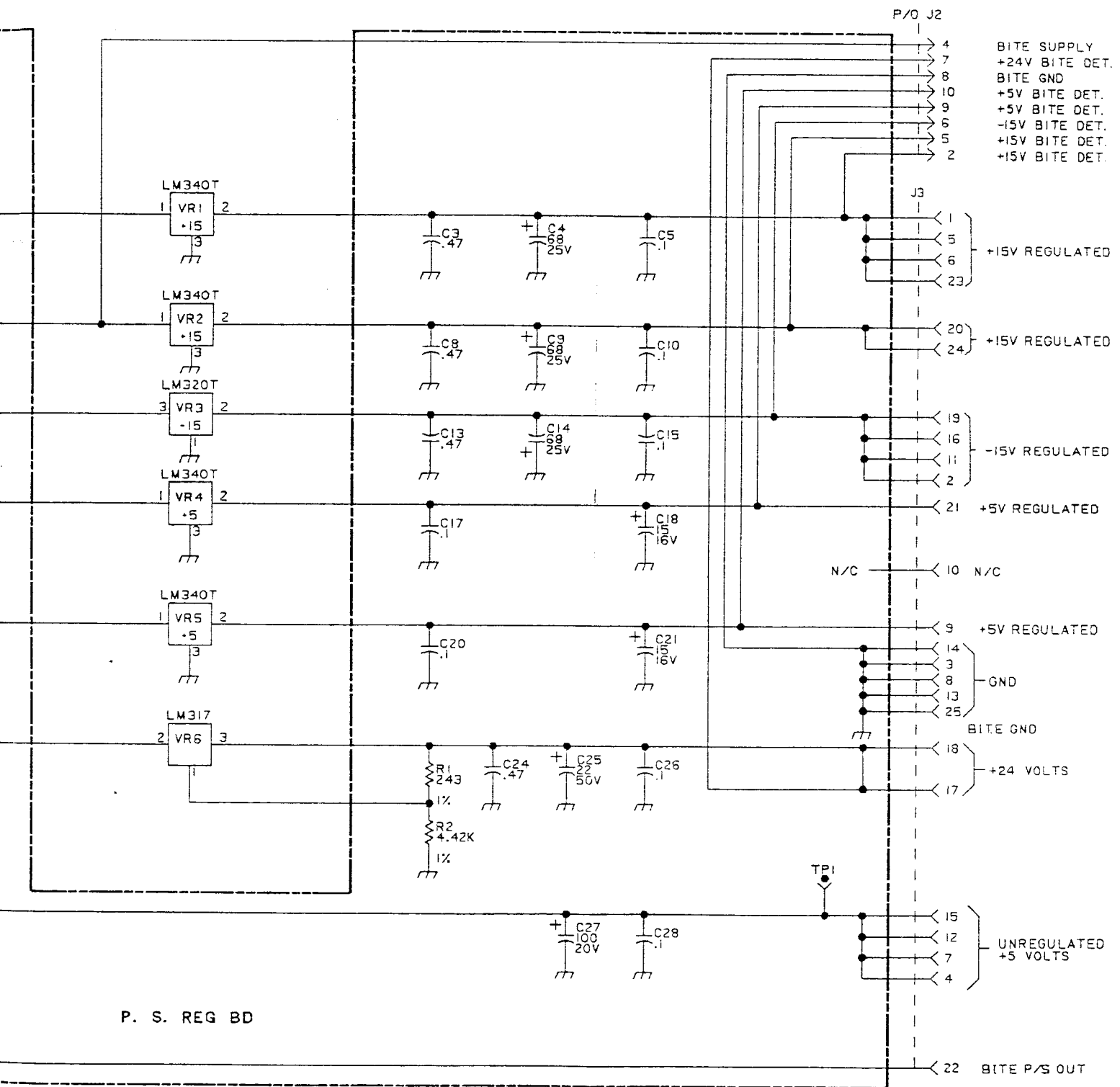


Figure 9. Power Supply Heatsink Assembly A15A2 and Power Supply Regulator Assembly A15A2A1 Schematic Diagram (10073-3201 Rev. D)

6. POWER SUPPLY BITE DETECTOR ASSEMBLY A15A3 CIRCUIT DESCRIPTION

The A15A3 assembly monitors all the regulated output voltages listed in table 4 and will issue a fault signal to Control Board Assembly A14 if any of them exceed a defined upper or lower limit. The A14 assembly will then issue a fault command and turn on the RF-1310 fault indicator on the front panel. This operation is performed continually while the exciter is operating.

The general operation scheme of the assembly is as follows, using the + 5 Vdc from the A15A2 assembly at A15A3 J1-9 as an example.

The + 5 Vdc at pin 9 is divided by resistor network R13-R14 to place a nominal 3.1 Vdc at U2D-10 (-) and U2C-9 (+). This level shall be referred to as V_{TEST} . The + 8 Vdc from VR1 is divided by R1 and R3 to place + 4 Vdc at U2D-11 (+), and by R2 and R4 to place + 2 Vdc at U2C-8 (-). The + 4 Vdc level shall be referred to as V_{HI} ; the + 2 Vdc level as V_{LO} . These two levels establish the limits that V_{TEST} must not exceed.

Under conditions where V_{LO} is less than V_{TEST} is less than V_{HI} , U2C and U2D outputs are at + 8 volts. This feeds to U3C-8 (-). Since U3C-9 (+) input is always held fixed at 4 Vdc (V_{HI}), U3C output will be low (0 Vdc), Q1 will be biased off, and the BITE output signal will be at + 8 Vdc. This notifies the BITE circuits that the + 5 Vdc level is within its limits.

Assume that V_{TEST} exceeds V_{HI} . U2D output would switch 0 Vdc, causing U3C to switch to + 8 Vdc, turning on Q1. Q1 output would drag the BITE output to 0 Vdc, and notify the BITE circuits of an error condition. The same events would occur if V_{TEST} fell below V_{LO} , except that now U2C output would affect the switching of U3C.

This concept of a comparator pair providing the lower and upper limits is used to monitor the other regulated input voltages. Since all the comparator outputs are tied together, any one of them changing states would cause Q1 to issue an error signal.

Note that there are five comparator pairs, but six input voltages. The -15 Vdc input is used as a reference (instead of ground) for the two + 15 Vdc and one + 24 Vdc inputs, thereby eliminating the need for a separate comparator pair to monitor the -15 Vdc.

The approximate range of upper and lower input limits which will not trip the comparators is given in table 7.

Table 7. A15A3 BITE Detector Trip Limits

Input Voltage Vdc	Permissible Voltage Range
+ 5 Vdc No. 1	approximately 3.0 to 6.5
+ 5 Vdc No. 2	approximately 3.0 to 6.5
+ 15 vdc No. 1	approximately 13.0 to 17.0
+ 15 Vdc No. 2	approximately 13.0 to 17.0
-15 Vdc	approximately -13.0 to -17.0
+ 24 Vdc	approximately 21 to 26

Table 8 is the A15A3 assembly parts list, figure 10 is the A15A3 assembly component location diagram, and figure 11 is the A15A3 schematic diagram.

Table 8. Power Supply BITE Assembly A15A3 Parts List

Ref. Desig.	Part Number	Description
A15A3	10073-3300	POWER SUPPLY BITE PWB ASSEMBLY
C1	M39014/02-1310	CAP .1UF 10% 100V CER-R
C2	C26-0025-100	CAP 10UF 20% 25V TANT
C3	M39014/02-1310	CAP .1UF 10% 100V CER-R
J1	J46-0032-010	HEADER, 10 PIN DISCRETE
Q1	2N2222	XSTR SS/GP NPN TO-18
R1	RN55D4021F	RES,4020 1% 1/8W MET FLM
R2	RN55D7501F	RES,7500 1% 1/8W MET FLM
R3	RN55D4021F	RES,4020 1% 1/8W MET FLM
R4	RN55D2491F	RES,2490 1% 1/8W MET FLM
R5	RN55D1212F	RES,12.1K 1% 1/8W MET FLM
R6	RN55D1822F	RES,18.2K 1% 1/8W MET FLM
R7	RN55D1212F	RES,12.1K 1% 1/8W MET FLM
R8	RN55D1822F	RES,18.2K 1% 1/8W MET FLM
R9	RN55D1822F	RES,18.2K 1% 1/8W MET FLM
R10	RN55D2102F	RES,21.0K 1% 1/8W MET FLM
R11	RN55D1821F	RES,1820 1% 1/8W MET FLM
R12	RN55D3011F	RES,3010 1% 1/8W MET FLM
R13	RN55D1821F	RES,1820 1% 1/8W MET FLM
R14	RN55D3011F	RES,3010 1% 1/8W MET FLM
R15	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R16	R65-0003-472	RES,4.7K 5% 1/4W CAR FILM
R17	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R18	R65-0003-103	RES,10K 5% 1/4W CAR FILM
R19	R65-0003-103	RES,10K 5% 1/4W CAR FILM
TP1	J-0392	TP PWB BRN RA SIDE ACCESS
TP2	J-0387	TP PWB RED RA SIDE ACCESS
TP3	J-0390	TP PWB ORN RA SIDE ACCESS
TP4	J-0391	TP PWB YEL RA SIDE ACCESS
TP5	J-0389	TP PWB GRN RA SIDE ACCESS
TP6	J-0393	TP PWB BLU RA SIDE ACCESS
U1	I20-0006-000	IC LM339 COMPARATOR PL
U2	I20-0006-000	IC LM339 COMPARATOR PL
U3	I20-0006-000	IC LM339 COMPARATOR PL
VR1	I12-0006-008	IC VR 78L08A +8V .10A 4%

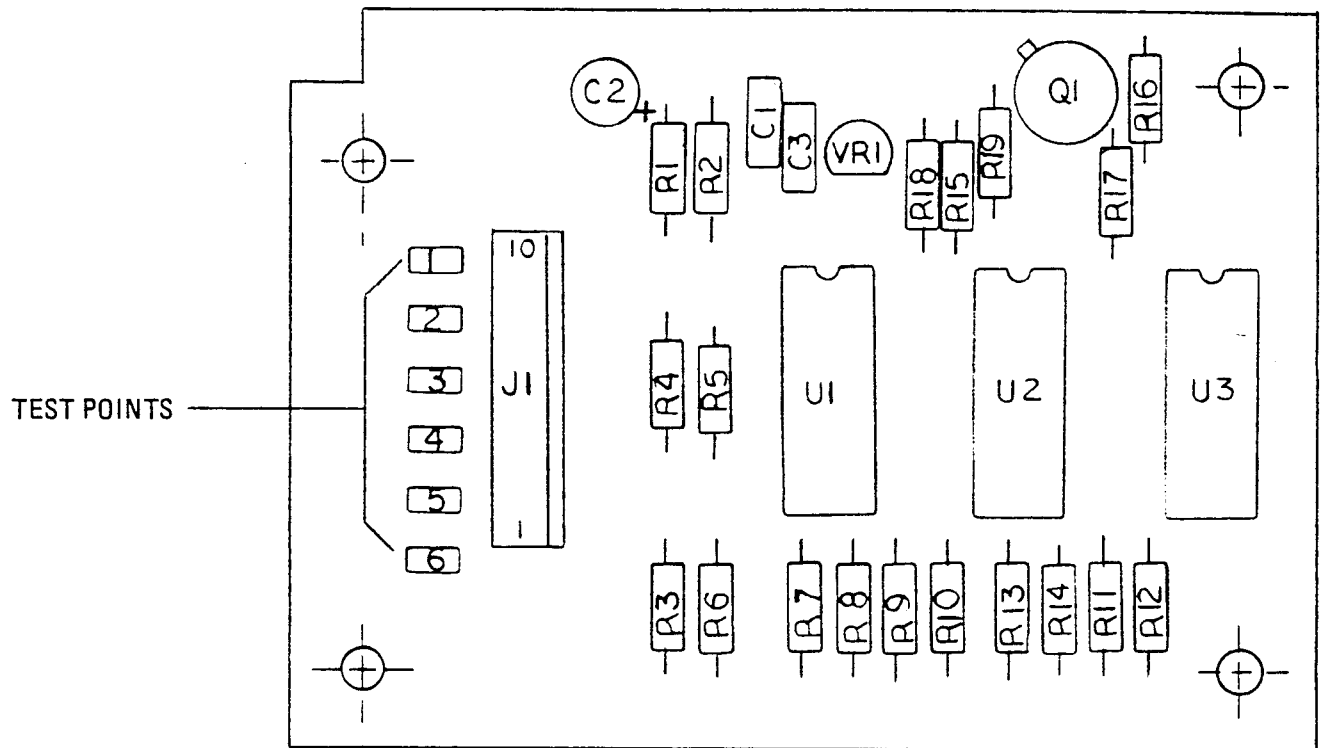
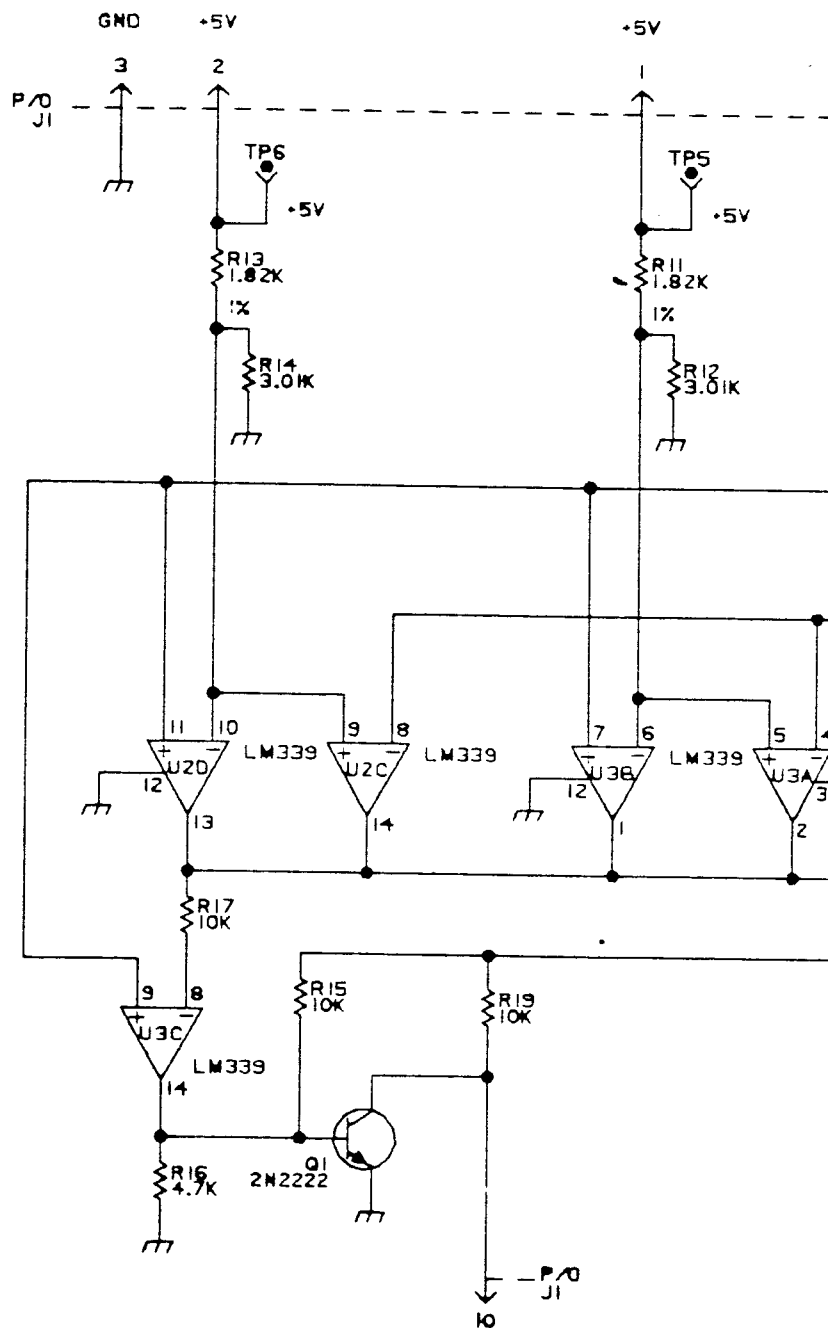
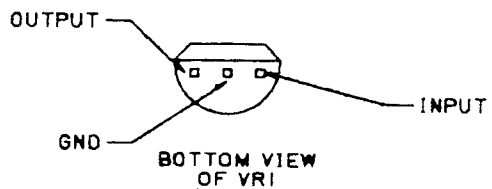


Figure 10. Power Supply BITE Assembly A15A3 Component Location Diagram (10073-3300)

NOTE: UNLESS OTHERWISE SPECIFIED:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
FOR A COMPLETE DESIGNATION, PREFIX WITH
UNIT NO. AND/OR ASSEMBLY NO. DESIGNATION.
2. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, $\pm 5\%$.
3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
4. VENDOR PART NO. CALLOUTS ARE FOR REFERENCE ONLY.
COMPONENTS ARE SUPPLIED PER PART NO. IN PARTS LIST.
5. SEE GRAPHICS BELOW.



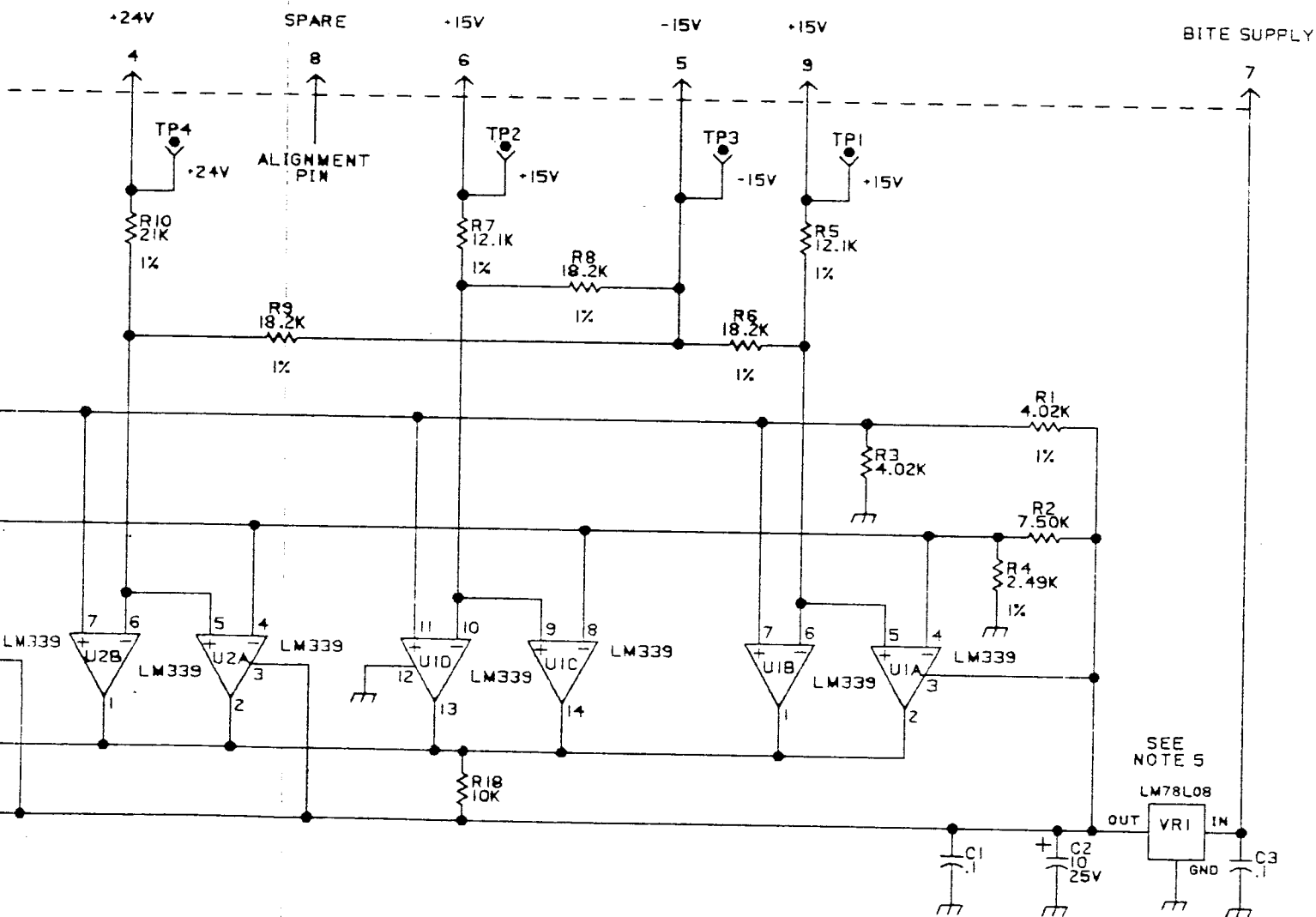


Figure 11. Power Supply BITE Assembly
A15A3 Schematic Diagram
(10073-3301 Rev. C)

7. A15 ASSEMBLY REMOVAL**WARNING**

Potentially hazardous high voltages are present inside the A15 assembly whenever the exciter is connected to an ac line source. Do not attempt any repair to this assembly unless the line cord is disconnected. Do not operate the exciter without the protective cover properly installed over the assembly.

- a. Disconnect the ac line cord.
- b. Disconnect connectors W3P1, W4P1, and W5P1 in the channel on the bottom side of the exciter (underneath the A15 assembly). These carry the switched ac power to the front panel, the A23 ac power input, and the switched ac power to the fan, respectively. Cut the typwrap for the fan cable.
- c. Remove mounting screws securing the A15 assembly cover, and remove cover.
- d. Loosen the two captive screws inside the A15 assembly securing it to the chassis.
- e. Place exciter on its side.
- f. Remove four rear panel corner screws holding rear panel to chassis.
- g. Disconnect A15J3.
- h. Carefully pull the A15 assembly away from chassis. The rear portion of the chassis will not be supported after the A15 assembly is removed.