

9868A
I/O EXPANDER
SERVICE MANUAL

HEWLETT  PACKARD



9868A I/O EXPANDER
SERVICE MANUAL
for 9800 Series Calculators

09868-90001

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SCHEMATICS

AC Input and Mother Board (A1) Connections

+5V Power Supply

±12V Power Supplies

The Model 9868A I/O Expander is intended for use with all 9800 Series Calculators. All peripheral operations that are referred to in this manual assume that the peripheral has been properly installed, an appropriate plug-in ROM Block is installed, and the correct operating procedures are being used.

SCOPE OF THE MANUAL

This manual provides the information necessary to provide on-site service of the 9868A I/O Expander. This manual assumes that the Field Service Engineer is familiar with all normal calculator and peripheral operation.

SERVICE CONCEPT

The 9868A I/O Expander is maintained by component or assembly replacement. The +5V Power Supply Assembly (A81) may be exchanged on the -hp- Blue Stripe program or serviced by component repair. This service concept offers the Customer Service Office and the customer a policy whereby a defective Expander may be repaired with minimum cost and instrument 'down' time.

MANUAL CONTENT

This manual contains sections on Installation, Theory of Operation, Troubleshooting and Repair, and schematics of the electrical assemblies. Thus, sufficient information is provided so that all required maintenance, troubleshooting and repair can be performed.

NOTE

The assemblies not on the Blue Stipe Program are available from Customer Service Center (CSC) as replacement parts. Complete assembly replacement should be used when component level repair cannot be accomplished at the customers location and bench repair is not acceptable.

POWER REQUIREMENTS

The I/O Expander will operate within the voltage ranges of either 90 to 126 volts ac or 198 to 252 volts ac. The line frequency must be within 48 to 440 Hz. The I/O Expander requires a maximum of 120 voltamps.

NOTE

The I/O Expander requires a maximum of 200 voltamps when it is operated on 220V or 240V ac at frequencies in excess of 66 Hz.

The line voltage selector (see Figure 1), located in the power module on the front of the Expander, selects a nominal operating voltage range of either 100V, 120V, 220V or 240V. A different fuse is required for operation in either the 100-120V or 220-240V ranges. Information on how to set the line voltage selector and how to change fuses is presented in the following pages.

CAUTION

DO NOT APPLY AC POWER TO THE I/O EXPANDER UNLESS THE LINE VOLTAGE SELECTOR IS SET FOR THE PROPER VOLTAGE AND THE CORRECT FUSE IS INSTALLED. DAMAGE TO THE I/O EXPANDER CAN RESULT IF THIS PRECAUTION IS NOT OBSERVED.

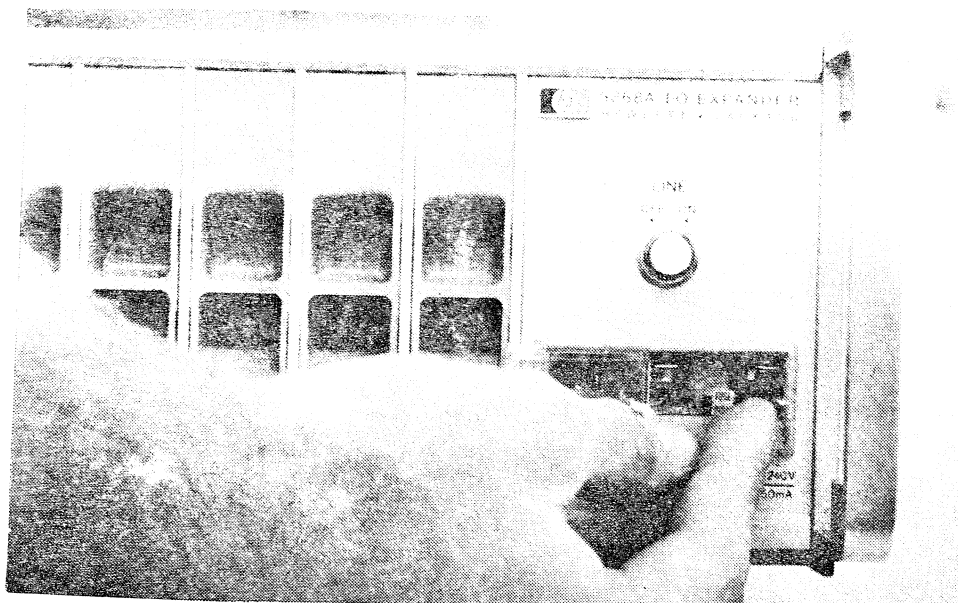
GROUNDING REQUIREMENTS

To protect operating personnel, the NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION (NEMA) recommends that the I/O Expander cabinet be grounded. The I/O Expander is equipped with a three-conductor power cable which, when connected to an appropriate receptacle, grounds the cabinet of the I/O Expander. The center pin of the power cable connector is the ground connection and must be used to ground the expander chassis.

SETTING THE LINE VOLTAGE SELECTOR

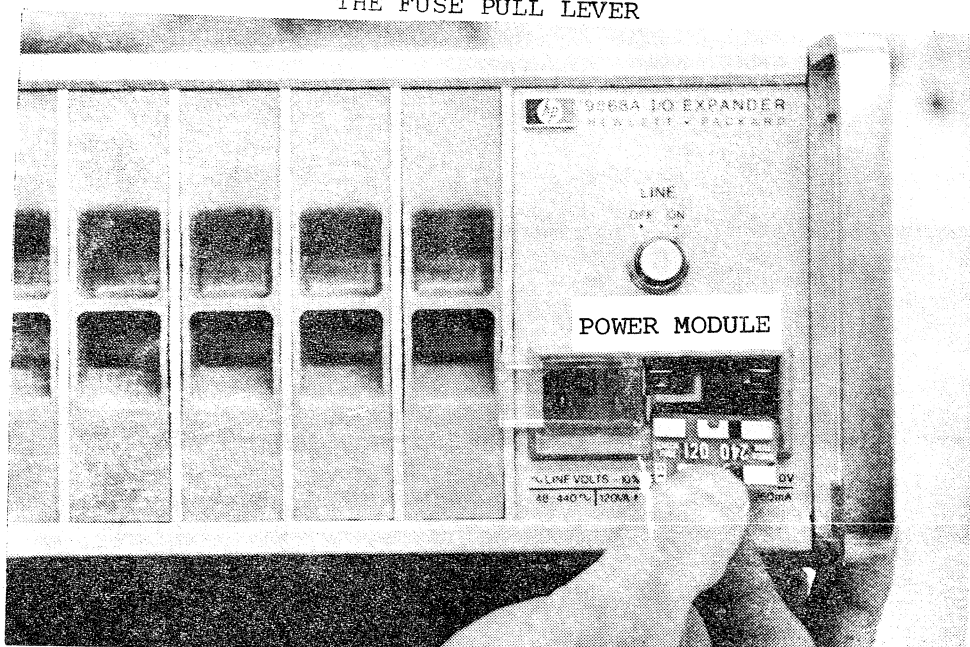
A packet containing two 1.5 amp fuses, two 0.75 amp fuses, and the line voltage selector card is provided with each Expander.

FIGURE 1.



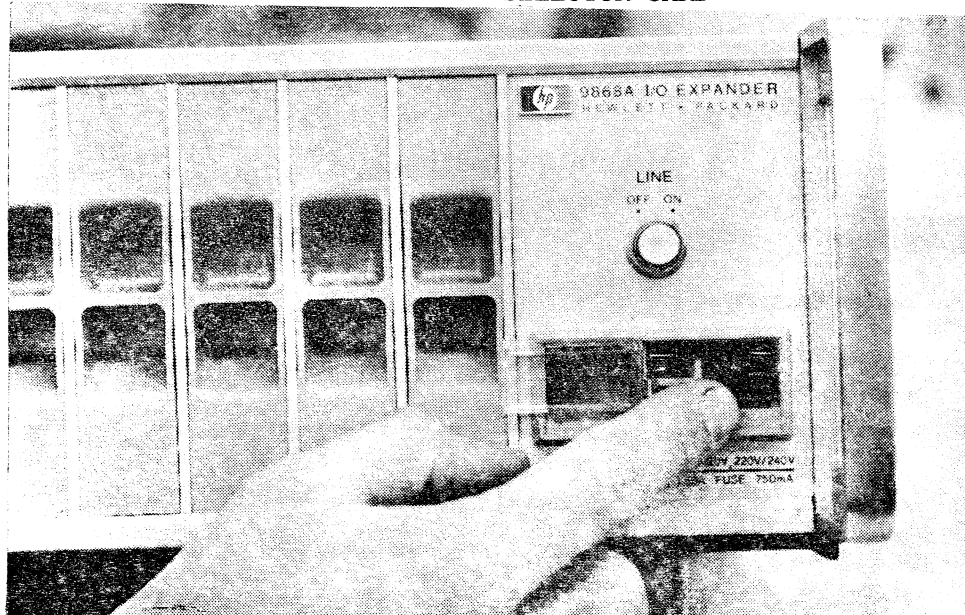
Slide the plastic window to the left and move the FUSE PULL lever to the left (removing the fuse).

THE FUSE PULL LEVER



Hold the card so that the line voltage to be set is positioned to the left. (Card shown in 120V position.)

THE LINE VOLTAGE SELECTOR CARD



Push the voltage selector card into the power module, insert the proper fuse, and slide the plastic window to the right

To install the line voltage selector, perform the following procedure (refer to Figure 1):

1. Slide the clear plastic window on the power module to the left.
2. Pull the FUSE PULL lever out until it is against the left side of the power module. (The fuse and line voltage selector card are not installed at the factory.)
3. Hold the line voltage selector card such that only the number which indicates the required voltage setting will be visible when the card is inserted into the power module. Insert the card into the slot in the bottom of the power module.
4. Return the FUSE PULL lever to its original position.
5. Install the appropriate fuse (see Table 1) by firmly pressing it into the fuse clip.
6. Slide the clear plastic window to the right.

To change the setting of the line voltage selector or to change fuses, perform the above procedure, but remove the fuse after the FUSE PULL lever is pulled. Then remove the card with a sharp-pointed object such as a ball-point pen.

Table 1

Fuse Requirements:

Voltage	Fuse	-hp- Part Number
100V	1.5 amp	2110-0033
120V	1.5 amp	2110-0033
220V	0.75 amp	2110-0043
240V	0.75 amp	2110-0043

CALCULATOR/EXPANDER INTERCONNECTIONS

The calculator end of the interface cable (see Figure 2) is marked '9868A I/O EXPANDER INTERFACE' and must be plugged into any unused calculator I/O connector. The Expander end of the interface cable is marked 'SIGNAL CABLE' and must be plugged into one of the I/O Expander I/O connectors. The inter-instrument power

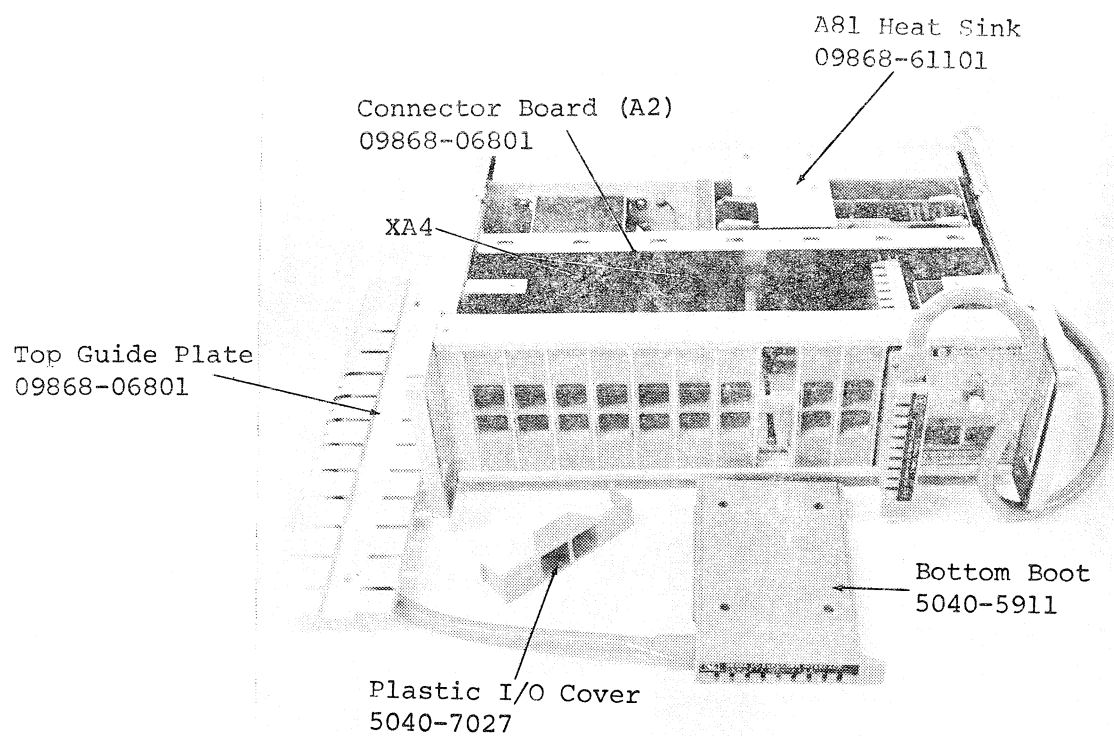


FIGURE 2. THE 9868A I/O EXPANDER

cord can be plugged into any unused calculator power receptacle; if all receptacles are in use, utilize the inter-instrument cable to plug the I/O Expander into one of the eight convenience outlets located on the back of the I/O Expander. Then use the other power cable to connect the convenience outlets to an ac power source. Do Not use a calculator convenience outlet for this purpose, as the calculator does not provide enough power for the Expander convenience outlets.

IMPORTANT NOTE

The I/O Expander ON-OFF power switch does not control the ac power to the convenience outlets. Power to the convenience outlets must be removed by disconnecting rear ac power cord.

PERIPHERAL INTERCONNECTIONS

Connect each peripheral device to one of the I/O connectors on the Expander. (Refer to the appropriate peripheral manual for the peripheral's installation procedure.) The convenience outlets on the back of the I/O Expander provides ac power for eight peripherals.

NOTE

The total current provided by the convenience outlets cannot exceed 6 amps.

CONVENIENCE OUTLETS

Eight convenience outlets are provided on the back panel of the Expander (see Figure 3) and can be used to provide power for eight peripherals. The convenience outlets and the Expander power receptacle are electrically isolated from each other. The convenience outlets are fused with a 6 amp fuse, thus limiting the total current used by all of the peripherals to 6 amps.

NOTE

A calculator convenience outlet should not be used to provide power to the Expander convenience outlets, as the calculator does not provide enough power for the Expander convenience outlets.

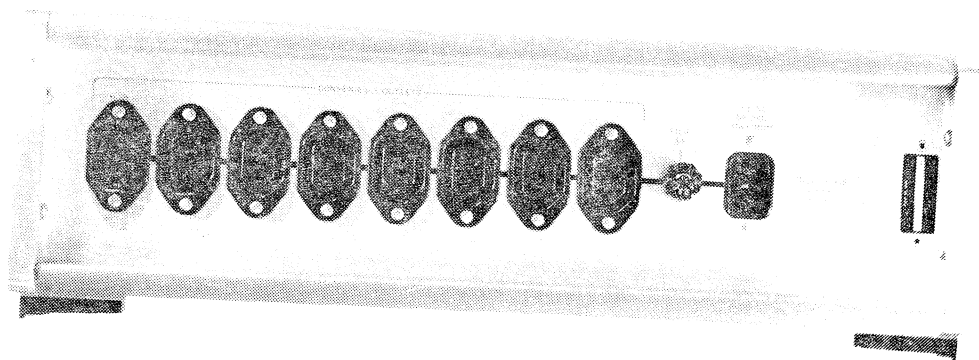


FIGURE 3. 9868A CONVENIENCE OUTLETS

WARNING

BEFORE SERVICING AN I/O EXPANDER ENSURE THAT POWER IS REMOVED FROM BOTH THE EXPANDER POWER MODULE AND THE CONVENIENCE OUTLETS. FAILURE TO OBSERVE THIS WARNING CAN RESULT IN ELECTRICAL SHOCK WHILE THE INSTRUMENT IS BEING SERVICED.

Refer to the +5V Schematic, Figure 4, a simplified drawing of the +5V power supply, and Figure 5, a representation of the significant power supply waveforms, during the following presentation.

The +5V power supply utilizes a switching regulator technique to provide maximum output current with minimum heat dissipation by the series pass transistor. Since Q2 only draws current when saturated, power dissipation in Q2 is minimized.

CAUTION

THE +5V POWER SUPPLY MAY BE DAMAGED IF THE SUPPLY
IS OPERATED WITHOUT BEING PROPERLY HEAT SUNK.

Q2 is switched by a small voltage difference between U1 pin 2 and U1 pin 3 (inputs to the IC operational amplifier). A +5V reference is established on the amplifier non-inverting input (pin 3) by voltage divider R1 and R2. C2 ensures that the +5V reference does not appear on U1 pin 3 before the +5V sense voltage (E out) appears on U1 pin 2. If the +5V reference should appear first, Q5 switches ON and disables the supply. (An example of this is when a 9800 Calculator is switched OFF then ON very quickly.) When the supply output is less than the reference voltage, U1 switches Q2 ON. The +19V Q2 collector voltage, divided by R3 and R4, establishes a higher reference voltage (See Figure 5). When the supply output increases to the higher reference voltage, U1 switches Q2 OFF and the previous reference decreases to the level originally established by R1 and R2. Q2 is switched ON when the voltage output is again equal to the reference voltage.

FUNCTIONAL DESCRIPTION

The Q2 output is a 20V square wave, which is filtered by L1, C4, and C5. The output of the filter (+5V) is the average of the Q2 collector signal. CR3 provides a continuous path for inductor (L1) current when Q2 is OFF. L2 isolates the capacitance of C4 and C5 from external filter capacitance, couples the ripple voltage to the +5V sense line, and provides additional +5V filtering.

+5V PROTECTION

The +5V supply is short-circuit protected by Q5. Q5 is switched ON if either of two conditions occur:

1. If the +5V reference appears on U1 pin 3 before the sense voltage is +5V.
2. If the sense voltage is more than .6V below the reference voltage (+5V output shorted to ground or a negative supply).

Q5 switching on clamps the operational amplifier output to the sense voltage (e.g., ground), thus Q2 is switched OFF.

Over-voltage protection is provided by Q4, CR4 and Q5. (An over-voltage condition will occur if either Q2 is shorted or the +5V supply should become shorted to a more positive supply.) When the +5V supply exceeds approximately 5.2V, CR4 begins conducting and switches Q4 ON. Q4, then, clamps the +5V Bus to ground, which switches Q5 ON, thus switching the supply OFF. (Q4 remains conducting until the instrument power is switched OFF.)

CAUTION

THE +5V POWER SUPPLY IS NOT CURRENT LIMITED. A FAILURE WHICH RESULTS IN EXCESSIVE +5V CURRENT MAY CAUSE DAMAGE TO THE INSTRUMENT.

POWER ON PRESET (NPOP)

The one-shot (U2) is triggered as the +5V supply output is rising from 0 to +5V. The one-shot Q output switches Q3 ON, thus generating the (low) 'power on preset' (NPOP) pulse.

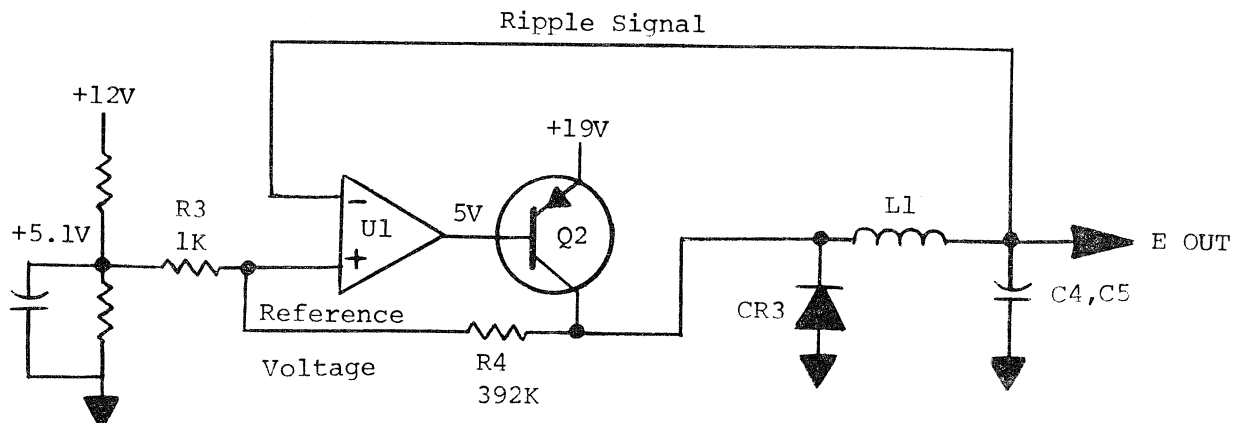
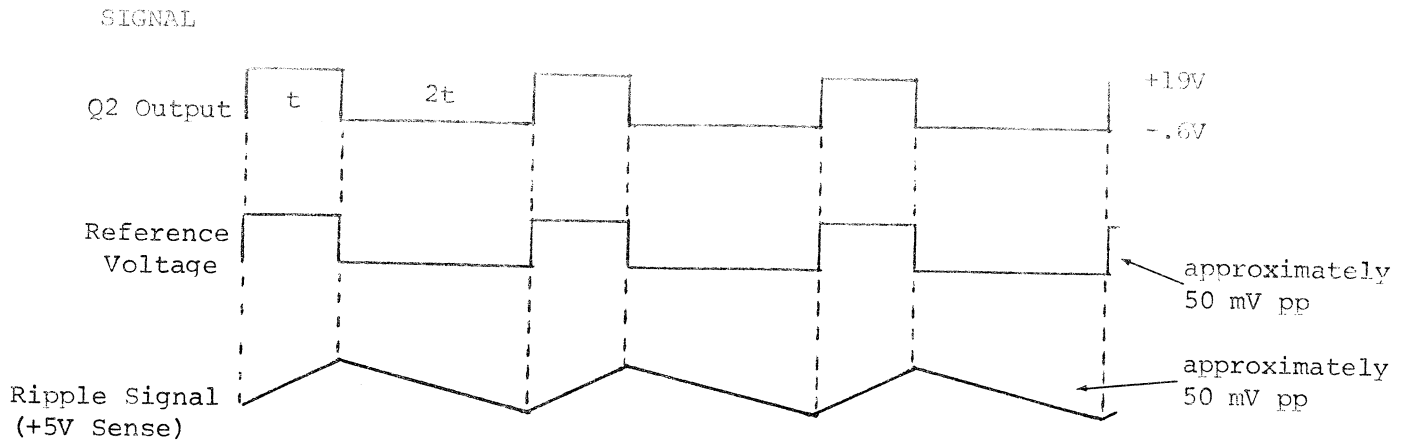


FIGURE 4. +5V SIMPLIFIED SCHEMATIC
P-9868-3- (10)



NOTE: When the reference voltage and the ripple signal are approximately equal, Q2 switches conduction states.

Figure 5. Power Supply Waveforms

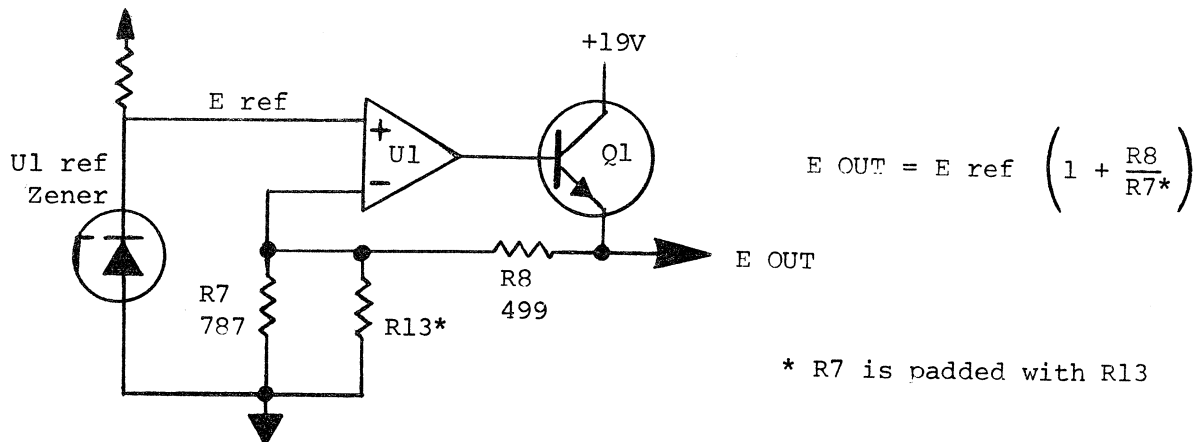


Figure 6. +12V Power Supply

+12V POWER SUPPLY

Figure 6 is a simplified drawing of the +12V power supply and should be referred to during the following presentation.

The U1 internal reference zener diode provides a +7.15V reference for the (U1) operation amplifier. The +12V supply functions as a non-inverting amplifier which amplifies the zener reference voltage. The gain of the amplifier is determined by the ratio of R8 to R7. Since the feedback through R8 and R7 regulates the supply output, varying R7 (by changing R13) varies the supply output.

+12V PROTECTION

R4 (in conjunction with U1) provides current limiting for Q1.

Q4 and CR9 provide 'over-voltage' protection. When the supply output increases to +13V, CR9 begins conducting and switches Q4 ON. Q4, then, clamps the supply output to ground.

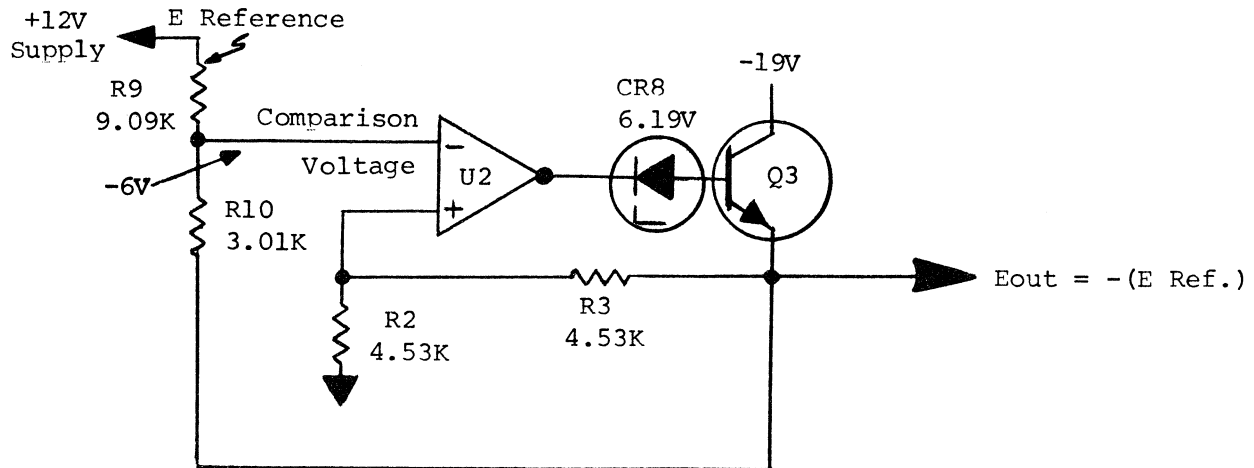


Figure 7. -12V Simplified Schematic

-12V POWER SUPPLY

Figure 7 is a simplified drawing of the -12V power supply, and should be referred to during the following presentation.

The -12V power supply reference voltage is determined by the +12V and -12V outputs through R9 and R10. If the +12V supply increases, U2 senses the +12V increase and increases the Q3 output an equal amount. When the -12V supply is of equal magnitude to the +12V supply, the reference voltage will, again be -6V. In this manner, the -12V supply is forced to precisely 'track' the +12V supply. Thus, changing the value of R13* changes the output of both the +12V and -12V power supplies.

R2 and R3 provide feedback to stabilize the -12V supply and, in conjunction with R9 and R10, determines the supply output. (See the +12V supply presentation.)

CR8 shifts the level of the U2 output by 6.19V to provide proper biasing for Q3.

-12V PROTECTION

R6 (with U2) provides current limiting for Q3.

Q5 and CR10 protects 'downstream' devices should the -12V supply become more negative than -13V.

INTERCONNECT CARDS

The Expander I/O cards provide the following:

1. Signal buffering for calculator input and output signals.
2. Impedance matching of the I/O cards to the Expander cables to minimize signal loss.
3. Logic for calculator and Expander +5V 'power up' detection.
4. +12V and -12V power is provided (from the Expander power supplies) for peripheral devices that require these voltage levels.

The I/O card 'power up' logic circuits prevents calculator/peripheral operations unless the Expander and calculator +5V power supplies are over +4.5V (see Figure).

+5V POWER SUPPLY

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CAUTION

THE A81 ASSEMBLY MAY BE DAMAGED IF IT IS OPERATED CONTINUOUSLY FOR MORE THAN ONE MINUTE WITHOUT BEING PROPERLY HEAT SUNK.

NOTE

The A81 assembly may be operated for longer periods of time if the thermal plate is connected to the heat sink and the assembly is placed on extender boards. If this procedure is used, the heat sink should be periodically checked to ensure that it is not overheating .

The switching frequency of Q2 should be between 18 KHz (period = 55.6 μ S) and 30 KHz (period = 33.3 μ S) and is controlled by the value of R4. The only recommended values are listed below; if one of these three resistors does not bring the switching frequency within the specifications indicated above, there is probably a component failure on the A81 assembly.

R4	-hp- Part Number	Effect
475K	0757-0481	increases frequency
392K	0698-4535	nominal
324K	0757-0479	lowers frequency

It may be necessary to remove Q5 to troubleshoot the +5V supply as most failures will cause Q5 to be switched ON. Removing Q5 may, however, cause R6 to open. Therefore, it is recommended that a spare R6 (22 ohm -hp- Part Number 0684-2201) be available when servicing the Expander.

Common +5V power supply failures are, a defective regulator IC (U1) or the case (collector) of Q2 becoming shorted to the heat sink (ground).

+5V SPECIFICATION:

+5V $\pm 2\%$

$\pm 12V$ SUPPLIES

The most common failures on the A83 assembly are the two IC regulators U1 or U2. However, if U1 is changed the reference zener may be slightly different, necessitating a change in the value of R13. ($E_{out} = 12V \pm 2\%$)

To determine the correct value of R13 perform the following procedure:

1. Switch the Expander OFF and remove the A83 assembly.
2. Remove R13.
3. Connect a 10-turn 100K pot in parallel with R7. (Adjust the pot for 100K)
4. Install the A83 assembly and switch the Expander ON.
5. Slowly decrease the pot to give +12.1V output at TP1.
6. Remove the pot and measure the value of the resistance used in step 5.
7. Use the padding list (below) to select the resistor nearest the resistance measured in step 6. Install the selected resistor.
8. Check TP1 and TP2 for $\pm 12V \pm 2\%$.

Table 2. R13 Padding List

Value	-hp- Part No.	Value	-hp- Part No.	Value	-hp- Part No.
221K	0757-0473	8.87K	0698-4202	4.32K	0757-0436
56.2K	0757-0459	7.87K	0698-3259	4.12K	0698-3493
32.4K	0698-4492	6.98K	0698-4470	3.83K	0698-3153
22.6K	0757-0349	6.34K	0698-3516	3.65K	0757-0434
17.4K	0698-4482	5.90K	0698-3515	3.40K	0698-4440
14.0K	0698-4479	5.36K	0698-3258	3.24K	0698-4439
11.5K	0698-3268	4.99K	0698-3279	3.09K	0698-4438
10.0K	0757-0442	4.64K	0698-3155		

I/O EXPANDER INTERFACE CABLE

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The I/O Expander Interface Cable (including the A3 and A4 assemblies) may be troubleshot by performing the following procedure:

1. Switch the calculator and Expander OFF.
2. Remove all of the peripheral I/O connectors.
3. Remove the Expander top cover and the I/O card cover plate.
4. Disconnect the calculator-end of the I/O cable.
5. Using table 3, test the calculator to peripheral signals by alternately shorting each input pin on P1 to ground and +5V. Use a logic probe to check the I/O cable output (on one of the 10 I/O connectors) for the same signal. (The input pin numbers and output pin numbers are the same.) Table 4 shows the components and wiring used on each data line.

CAUTION

DAMAGE TO THE LOGIC PROBE WILL OCCUR IF I/O CONNECTOR PINS 3 AND C (-12V) OR 5 AND E (+12V) ARE CHECKED DURING THIS PROCEDURE. A VOLTMETER SHOULD BE USED TO CHECK THESE SUPPLIES.

NOTE

The signal NCEO is enabled by the calculator +5V supply and pins 2 and B must, therefore, be jumpered to the Expander +5V to check that data line (P1 pin 21).

6. Perform step 5 using tables 4 and 5; alternately ground or apply +5V to the I/O connector and checking the calculator end (P1) of the I/O cable with a logic probe.

When performing step 6, the Expander +5V should be used. If a long test probe is not available, bend a paper clip to look like the one shown below and use it to jumper the +5V to the I/O connector pins.



NOTE

The I/O Expander Interface Cable may contain an unused twisted pair of wires which may be used to replace a defective pair. Always replace a complete pair and not just a single wire.

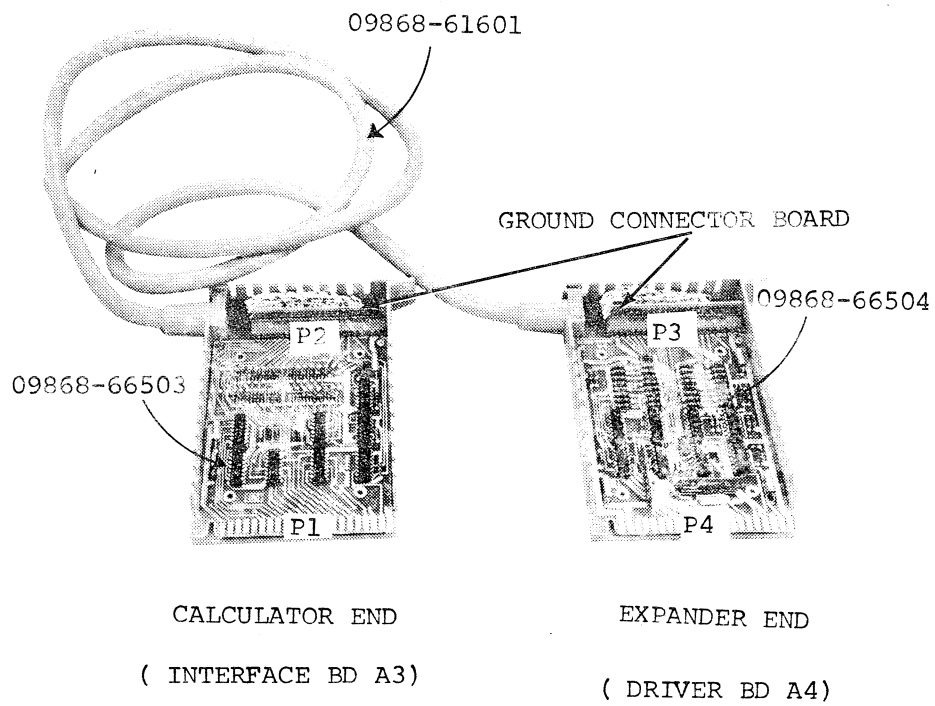


FIGURE 8. EXPANDER INTERFACE CABLE

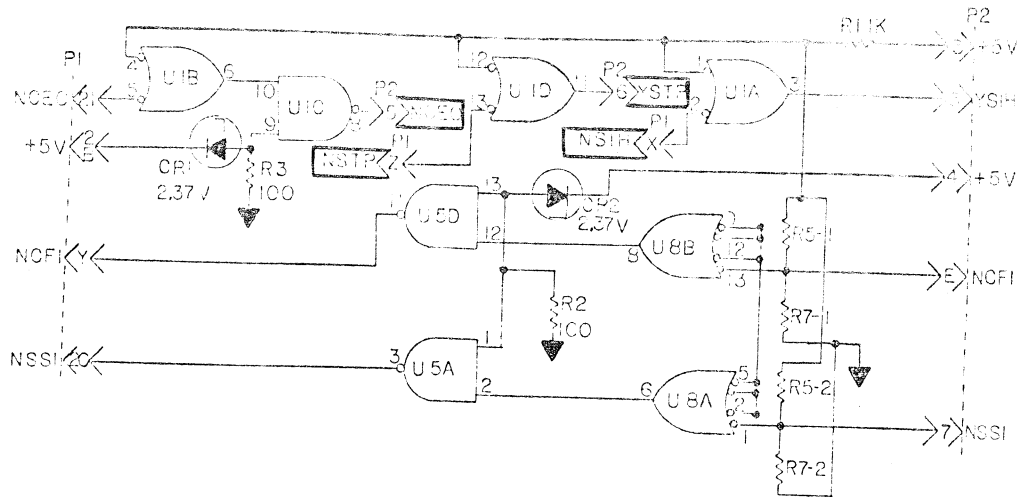
Table 3. Calculator Outputs

P1 Pin No.	Mnemonic	P1 Pin No.	Mnemonic	P1 Pin No.	Mnemonic
7	DO-1	16	SO-2	H	DO-2
10	DO-4	17	SO-3	J	DO-3
11	DO-5	18	CO-Ø	V	CO-1
12	DO-6	19	CO-2	W	CO-3
13	DO-7	21	NCEO	X	NSIH
14	SO-Ø	F	DO-Ø	Z	NSTP
15	SO-1				

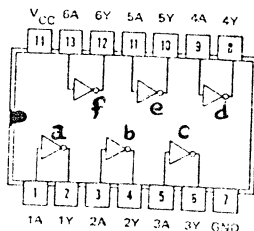
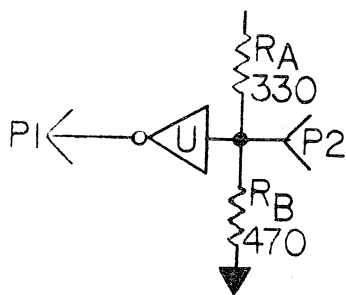
Tables 4-A3 and 4-A4 are shown on page pages 17 and 18.

Table 5. Calculator Inputs

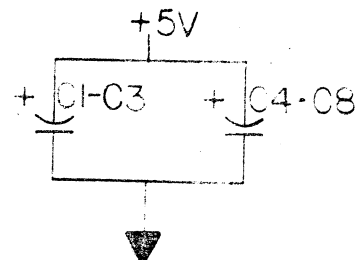
P4 Pin No.	Mnemonic	P4 Pin No.	Mnemonic	P4 Pin No.	Mnemonic
6	DI-Ø	K	DI-1	R	SI-Ø
8	DI-3	L	DI-4	S	SI-1
9	DI-2	M	DI-5	T	SI-2
20	NSSI	N	DI-6	U	SI-3
		P	DI-7	Y	NCFI

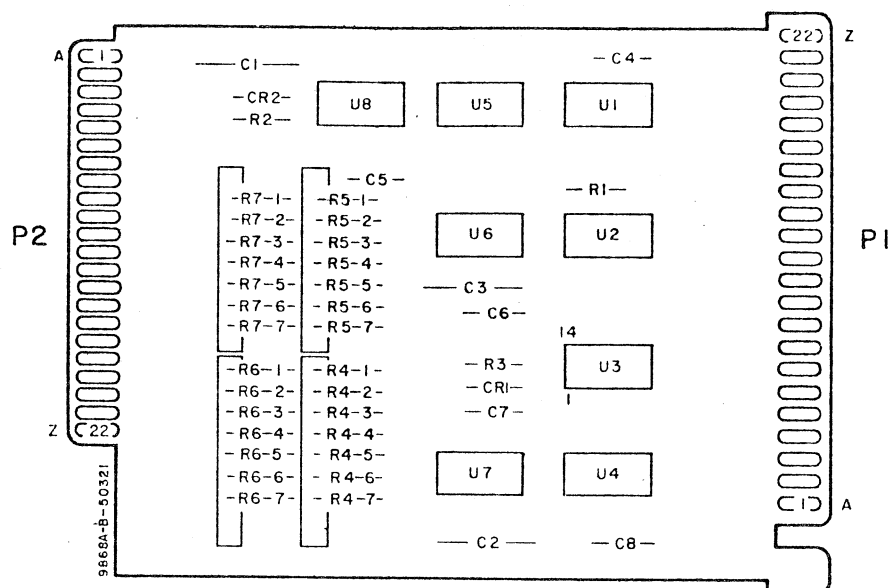


P1 Pin	Mnem	U	Ra	Rb	P2 Pin	Cable Color	P1 Pin	Mnem	U	Ra	Rb	P2 Pin	Cable Color
1					1,2	9/2/8	A					A,B	9/3/4
2	+5				3,4	9/2/5	B	+5				C,D	9/8
3							C						
4							D	10/20	U4C	R8		Y	0
5							E						
6	DI-0	U7A	R4-7	R6-7	X	1	F	DO-0	U4A			21	9/0/1
7	DO-1	U4D			20	9/0/5	H	DO-2	U4E			14	9/0/3
8	DI-3	U7B	R4-4	R6-4	U	4	J	DO-3	U4F			18	9/0/4
9	DI-2	U7C	R4-5	R6-5	V	3	K	DI-1	U7D	R4-6	R6-6	W	2
10	DO-4	U3C			17	9/0/5	L	DI-4	U7E	R4-3	R6-3	T	5
11	DO-5	U3B			16	9/0/6	M	DI-5	U7F	R4-2	R6-2	S	6
12	DO-6	U3A			15	9/0/7	N	DI-6	U6A	R4-1	R6-1	R	7
13	DO-7	U3D			14	9/0/8	P	DI-7	U6B	R5-7	R7-7	P	8
14	SO-0	U2E			13	9/1/2	R	SI-0	U6C	R5-6	R7-6	N	9/0
15	SO-1	U3F			12	9/1/3	S	SI-1	U6F	R5-5	R7-5	M	9/1
16	SO-2	U2A			11	9/1/4	T	SI-2	U6E	R5-4	R7-4	L	9/2
17	SO-3	U2B			10	9/1/5	U	SI-3	U6D	R5-3	R7-3	K	9/3
18	CO-0	U2C			9	9/1/6	V	CO-1	U2E			J	9/4
19	CO-2	U2F			8	9/1/7	W	CO-3	U2D			H	9/5
20	NSSI	See 'power up'			7	9/1/8	X	NSIH	See 'power up'			F	9/6
21	NCEO	schematic			5	9/2/4	Y		Schematic			E	9/7
22					22,Z		Z	NSTP				6	9/2/3

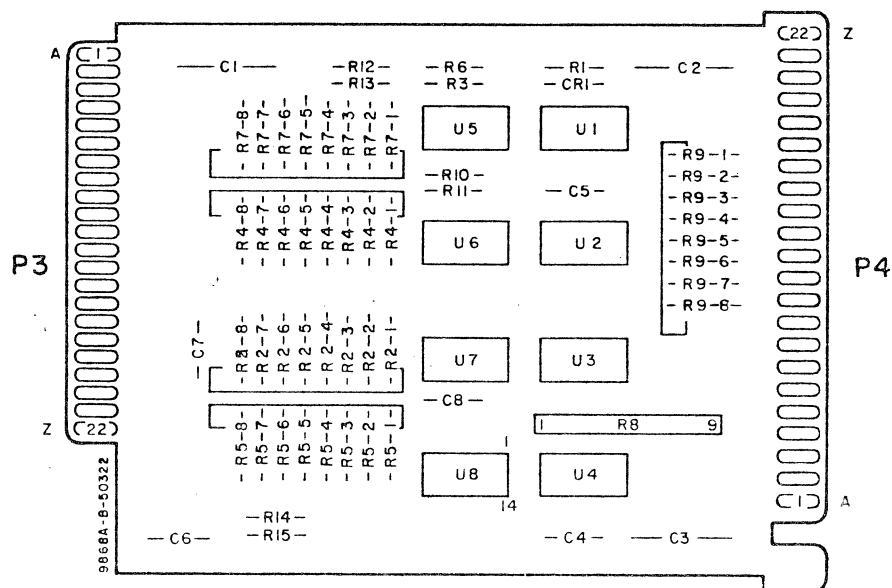


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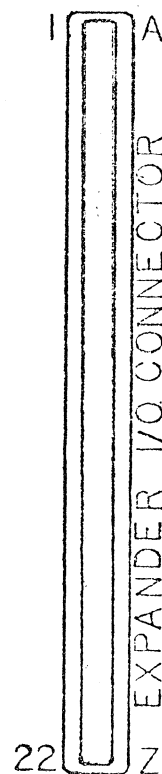




A3
 hp Part No 09868-66503
 REV A



A4
 hp Part No 09868-66504
 REV A



REFERENCE DESIGNATOR	hp- PART NO.	TQ	DESCRIPTION		
A1	R1	09868-66501	1	PC ASS'Y, MOTHER	
		0698-3624	1	R-Fxd; 150 ohm,	
		1251-1962	2	Connector - PC; 2X10	
		1251-2917	2	Connector - PC; 2X12	
A2	XA1 XA4	09868-66502	1	PC ASS'Y, CONNECTOR	
		1251-0158	1	Connector - PC; 1X6	
		1251-1365	11	Connector - PC; 2X22	
A3	C1-C3 C4-C8 CR1,CR2	09868-66503	1	PC ASS'Y, CALCULATOR INTERFACE	
		0180-0229	3	C-Fxd; 33 uF 10V	
		0160-3847	5	C-Fxd; .01 uF 25V	
		1902-3002	2	Diode-BKDN; 2.37V	
	R1	0684-1021	1	R-Fxd; 1000 ohm, 10%	
	R2,3	0684-1011	2	R-Fxd; 100 ohm, 10%	
	R4,5	1810-0141	2	R-Network; 330 ohm	
	R6,7	1810-0142	2	R-Network; 470 ohm	
	R8	0684-4721	1	R-Fxd; 4.7K 10%	
	U1	1820-0370	1	IC-SN74H00N	
	U2-U4	1820-0424	3	IC-SN74H04N	
	U5	1820-0269	1	IC-SN7403N	
	U6,7	1820-0175	2	IC-SN7405N	
	U8	1820-0537	1	IC-SN7413N	
A4	C1-C3 C4-C8 CR1	09868-66504	1	PC ASS'Y, DRIVER	
		0180-0229	3	C-Fxd; 33 uF 10V	
		0160-3847	5	C-Fxd; .01 uF 25V	
		1902-3002	1	Diode-BKDN; 2.37V	
	R1	0684-1011	1	R-Fxd; 100 ohm, 10%	
	R2, R4	1810-0141	2	R-Network; 330 ohm	
	R3	0683-3315	1	R-Fxd; 330 ohm, 5%	
	R5, R7	1810-0142	2	R-Network; 470 ohm	
	R6	0683-4715	1	R-Fxd; 470 ohm, 5%	
	R8,R9	1810-0121	2	R-Network; 1000 ohm	
	R10,13,14	0683-4715	3	R-Fxd; 470 ohm, 5%	
	R11,12,15	0683-3315	3	R-Fxd; 330 ohm, 5%	
	U1	1820-0370	1	IC-SN74H00N	
	U2-U4	1820-0424	3	IC-SN74H04N	
	U5	1820-0537	1	IC-SN7413N	
	U6-U8	1820-0424	3	IC-SN74h04N	
		11200-04101	1	Cover, I/O	
		11200-04102	1	Cover, keyed plate	
		5040-5911	2	Boot, bottom	
		7120-2932	1	Plate, ID	
		7120-2933	1	Plate, ID	

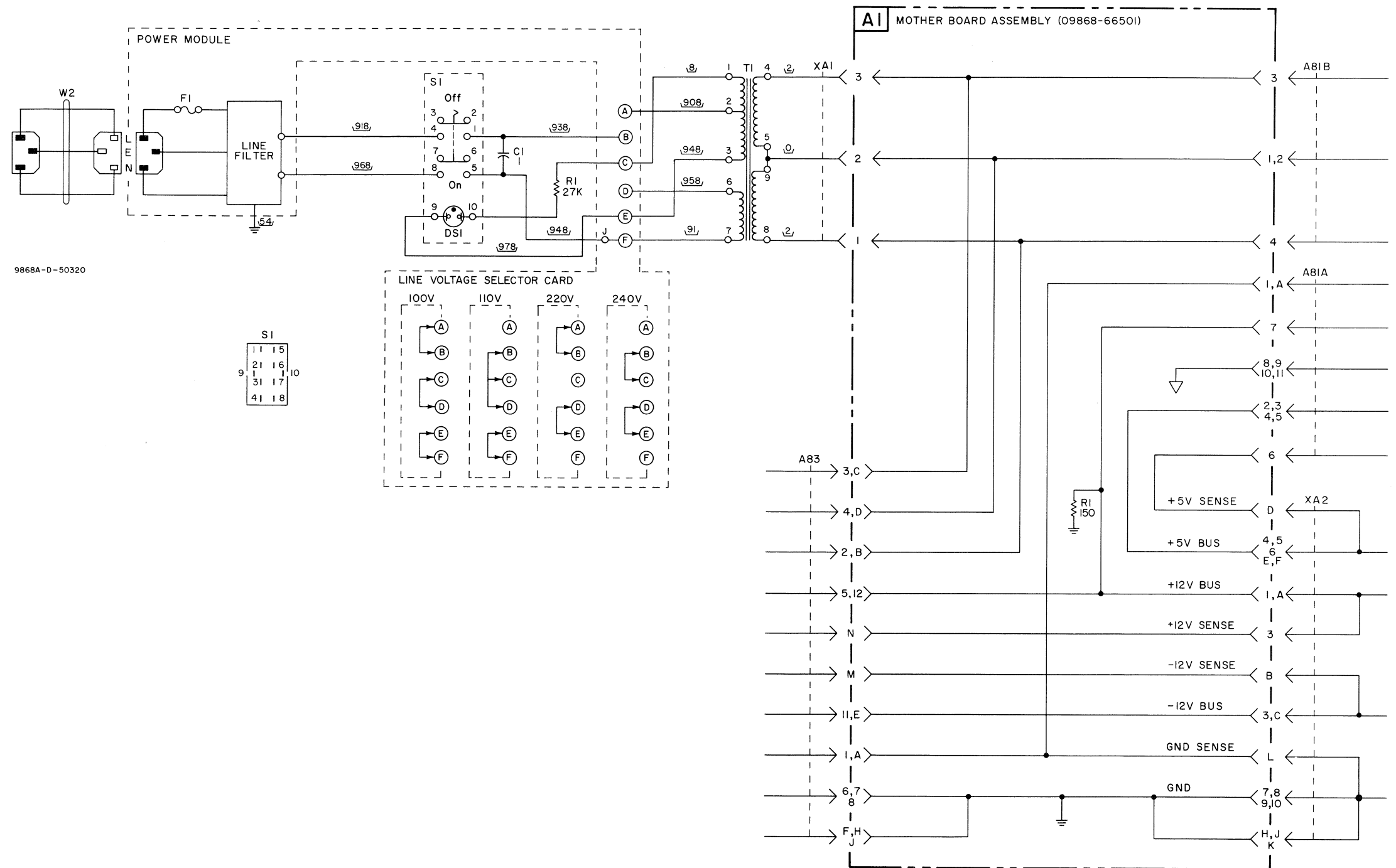
† Numbers in this column identify parts shown in Figure

P-9868-3-(21)

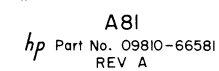
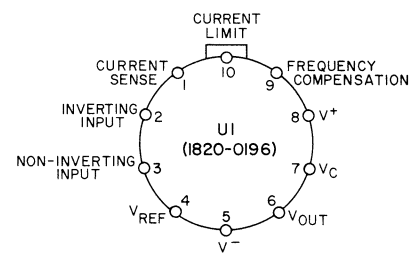
REFERENCE DESIGNATOR	hp- PART NO.	TQ	DESCRIPTION		
A5	09868-61601	1	CABLE ASS'Y		
	09868-26505	2	PC BD - Ground Connector		
A81	09810-69581	1	PC ASS'Y, +5 VOLT		
C1	0180-2405	1	C-Fxd; 6400 uF 25V		
C2	0180-1701	1	C-Fxd; 6.8 uF 6V		
C3	0150-0073	1	C-Fxd; 100 pF 1KV		
C4-C9	0180-1714	6	C-Fxd; 330 uF 6V		
C10,C11	0180-1701	2	C-Fxd; 6.8 uF 6V		
CR1, CR2	1901-0200	2	Dio-Si; 3A, 100V		
CR3	1901-0511	1	Dio-Si; 1N3889R		
CR4	1902-3094	1	Dio-BKDN; 5.11V		
Q1	1853-0052	1	XSTR; 2N3740		
Q2	1853-0311	1	XSTR; 2N3792		
Q3	1854-0354	1	XSTR; NPN		
Q4	1884-0068	1	Thyristor		
Q5	1854-0354	1	XSTR; NPN		
L1	9100-3231	1	Choke; 180 uH		
L2	9100-3232	1	Choke; 40 uH		
R1	0698-4461	1	R-Fxd,MF; 698 ohm 1%		
R2	0757-0416	1	R-Fxd,MF; 511 ohm 1%		
R3	0757-0280	1	R-Fxd,MF; 1000 ohm 1%		
R4*	0757-0479	1	R-Fxd,MF; 392K 1%		
			*SEE PADDING LIST IN TEST PROC.		
R5	0684-2211	1	R-Fxd; 220 ohm, 10%		
R6	0684-2201	1	R-Fxd; 22 ohm, 10%		
R7	0811-3069	1	R-Fxd; 1 ohm		
R8	0684-1001	1	R-Fxd; 10 ohm, 10%		
R9	0684-1011	1	R-Fxd; 100 ohm, 10%		
R10	0684-2731	1	R-Fxd; 27K, 10%		
R11	0684-3321	1	R-Fxd; 3.3K, 10%		
R12	0684-3311	1	R-Fxd; 330 ohm, 10%		
	0340-0155	1	Insulator-Xstr		
	1200-0080	1	Insulator-diode		
	1205-0033	2	Heat Sink, semincon.		
	09868-61101	1	Heat Sink, A81 Ass'y		
	1400-0493	2	Strap-cable (C1)		
A83	09810-66583	1	PC ASS'Y, + & - 12 VOLT		
C1,C2	0180-2407	2	C-Fxd; 1000 uF 25V		
C3	0180-0291	1	C-Fxd; 1 uF 35V		
C4	0150-0071	1	C-Fxd; 400 pF 500V		
C5	0150-0073	1	C-Fxd; 100 pF 1KV		
C6,C7	0180-0387	2	C-Fxd; 47 uF 20V		
C8	0180-1779	1	C-Fxd; 18 uF 35V		

REFERENCE DESIGNATOR	hp PART NO.	TO	DESCRIPTION		
A83 (cont'd)					
CR1-CR7	1901-0045	7	Dio-Si; .75A, 100V		
CR8	1902-0049	1	Dio-BKDN; 6.19V		
CR9, CR10	1902-3191	2	Dio-BKDN; 13V		
HS1	1205-0021	2	Head Dissipator		
Q1	1854-0063	1	XSTR; 2N3055		
Q2	1853-0010	1	XSTR; PNP		
Q3	1853-0063	1	XSTR; PNP		
Q4,Q5	1884-0068	2	Thyristor		
R1	0757-0409	1	R-Fxd,MF; 274 ohm 1%		
R2,R3	0698-4443	2	R-Fxd,MF; 5430 ohm 1%		
R4	0811-3069	1	R-Fxd; 1 ohm		
R5	0684-3911	1	R-Fxd; 390 ohm 10%		
R6	0811-3069	1	R-Fxd; 1 ohm		
R7	0698-4014	1	R-Fxd,MF; 787 ohm 1%		
R8	0698-4123	1	R-Fxd,MF; 499 ohm 1%		
R9	0757-0228	1	R-Fxd,MF; 9090 ohm 1%		
R10	0757-0273	1	R-Fxd,MF; 3010 ohm 1%		
R11,R12	0684-1011	2	R-Fxd; 100 ohm		
	1400-0493	2	Strap, capacitor		
CHASSIS ASS'Y					
T1	9100-3280	1	Power Transformer		
S1	3101-1394	1	Power Switch		
	2140-0244	1	Lamp-neon; ALH		
	5060-9409	1	Power Module		
	5020-8122	1	Line Voltage Selector Card		
F1	2110-0033	1	Fuse; .75 Amp NB (220-240V)		
F1	2110-0043	1	Fuse; 1.5 Amp NB (110-120V)		
F2	2110-0056	1	Fuse; 6 Amp NB		
	0160-3999	1	C-Fxd; 1 uF 270V		
	09868-00201	1	Panel, left front		
	09868-00202	1	Panel, right front		
	09868-00601	1	Shield, safty		
	09868-01201	1	Support Bracket		
	09868-01204	1	Retainer Bracket		
	09868-01206	1	Bracket, front panel		
	09868-06801	1	Guide-top		
	09868-06802	1	Guide-bottom		
	09868-20201	1	Panel, extruded		
	09868-22001	2	Side frame		
	09868-60101	1	Main deck		
	09868-60203	1	Panel Ass'y; rear		
	09868-00203	1	Rear panel		
	1251-2357	1	Connector; AC Power		

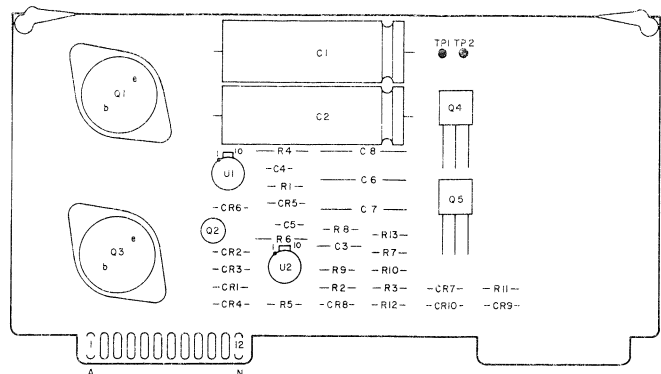
REFERENCE DESIGNATOR	-hp- PART NO.	TQ	DESCRIPTION		
	CHASSIS (cont'd)				
	2151-2995	8	Connector; convenience		
	1400-0084	1	Fuse Holder		
	09868-61101	1	Heat Sink (A81)		
	09868-61202	1	Bracket; PC BD (A2)		
	0403-0164	13	PC BD Guide; Black		
	5000-0051	2	Plate, Fluted		
	5000-8597	2	Cover; rear side		
	5000-8599	2	Cover; front side		
	5040-7027	11	Cover; plastic		
	5040-7028	12	Spacer; plastic		
	5060-0222	2	Handle Ass'y		
	5060-0767	5	Foot ass'y		
	5060-8587	1	Top cover ass'y		
	5060-8711	1	Bottom cover ass'y		
	5060-8737	2	Retainer; handle Ass'y		
	7120-1254	1	Ident Plate		
	8120-1521	1	Cable Ass'y; AC Power		
	8120-1575	1	Cable Ass'y; Inter Inst		
	5060-0091		10 pin Extender BD		
	5060-9160		12 pin Extender BD		
	09868-90000		Manual; peripheral		
	09868-90001		Manual; service		



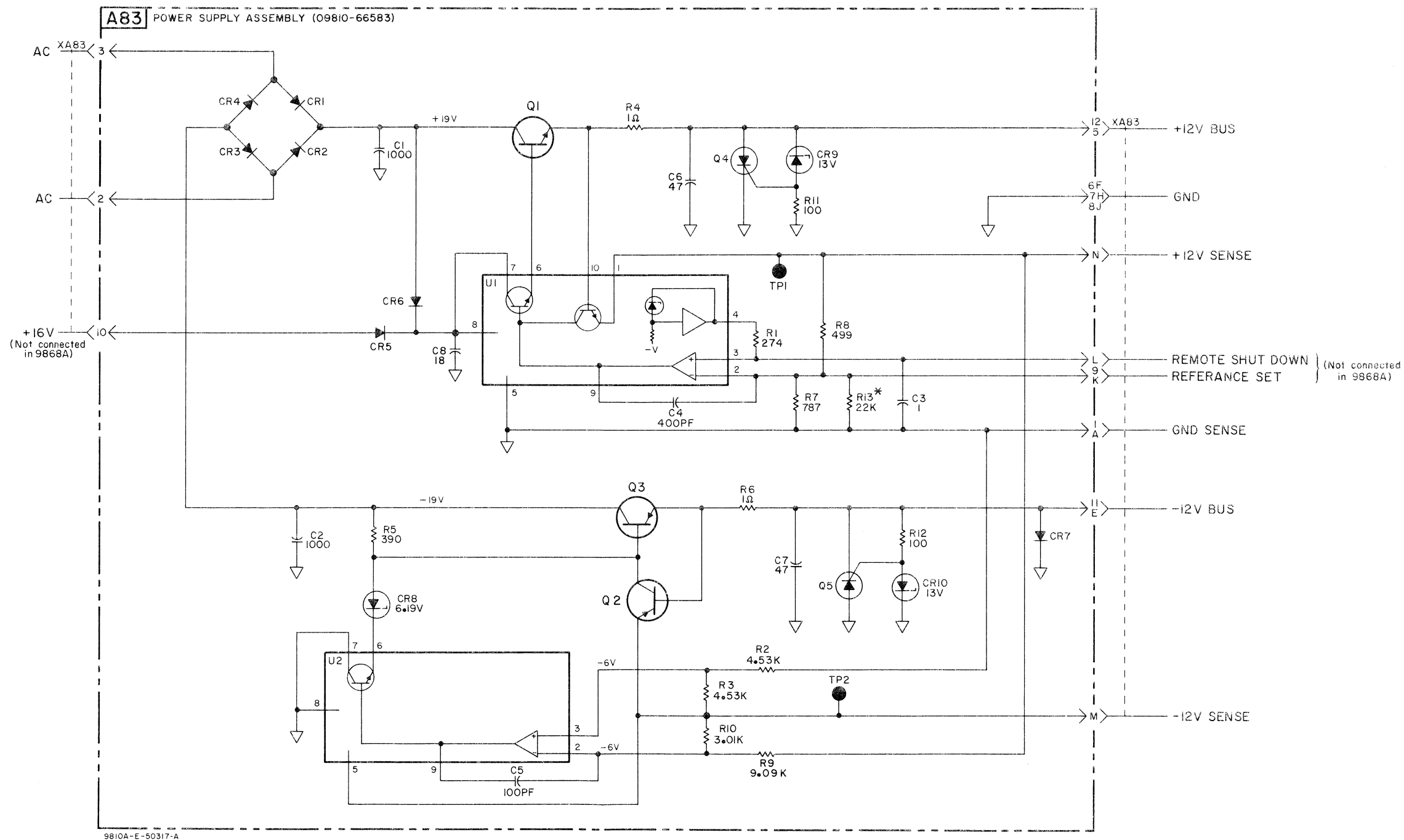
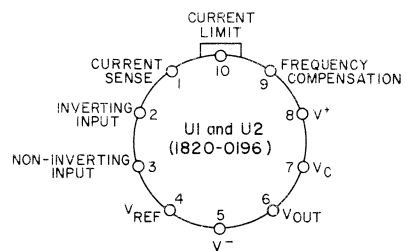
AC Input Circuits and Mother Board Interconnections



9868A +5V Power Supply Assembly A81



A83
hp Part No 09810-66583
REV A



9810A-E-50317-A

PART NO. 09868-90001

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