

**POWER SUPPLY**  
**Part Number 5061-1356**  
**FOR HP 1000 "B" MODEL**  
**COMPUTERS AND EXTENDERS**

**(2108B, 2109B, 2111F, 2112B, 2113B,  
2117F, 12979B, AND 12990B)**

THEORY OF OPERATION

(Computer Serial Prefix Prior to 2108)

**NOTE**

This document is part of the HP 1000 M, E, and F-Series Computers Engineering and Reference Documentation and is not available separately.

## Table of Contents

	Page
1-0. INTRODUCTION	IXB-1
2-0. REFERENCE INFORMATION	IXB-3
2-1. Binary Signal Levels	IXB-4
2-2. Schematic Reading	IXB-4
2-3. Signal Names	IXB-4
2-4. Cross References	IXB-4
3-0. THEORY OF OPERATION	IXB-5
3-1. Introduction	IXB-5
3-2. Primary Input Power Circuits (sheets 1,8)	IXB-5
3-3. Preregulator A3A1 and Inverter A3A2 (sheets 2,3)	IXB-8
3-4. Inverter Stage	IXB-13
3-5. Control Board A3A5 (sheet 5)	IXB-14
3-6. Inverter Board A3A2 (sheet 3)	IXB-15
3-7. Preregulator Drive Circuitry	IXB-16
3-8. Jumper Board A3A4 (sheet 4)	IXB-19
3-9. Power Fail Recovery System (PFRS)	IXB-19
3-10. Battery Charger Board A3A3 (sheet 6)	IXB-20
3-11. Battery Backup Board A3A4 (sheet 7)	IXB-20
3-12. Battery/Status Assembly (sheet 9)	IXB-21
4-0. PROTECTION CIRCUITS	IXB-23
4-1. CPU and I/O Overcurrent Circuits	IXB-23
4-2. Memory Overcurrent Circuits	IXB-24
4-3. Overvoltage Protection Circuits	IXB-25
4-4. Overtemperature Protection Circuits	IXB-25
5-0. POWER FAILURE/AUTO RESTART CIRCUITS	IXB-27
5-1. Power Up Sequence	IXB-27
5-2. Power Down Sequence	IXB-28
5-3. Interconnection of the Power Supplies	IXB-29
APPENDIX A. POWER SUPPLY TROUBLESHOOTING	IXB-31

INTRODUCTION	SECTION I
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This document is the Theory of Operation for the 5061-1356 Power Supply and describes the operation of the various circuits and their interconnection in the power supply. The description is conducted on a functional level using block level diagrams and references to the schematic diagrams. Understanding the theory of operation is essential for performing detailed troubleshooting and repair of the power supply. Power supply schematics and parts location diagrams are included at the rear of this section.



The 5061-1356 Power Supply is covered on nine sheets of schematics and nine sheets of assembly drawings. The drawings and schematics are listed in table 2-1. The electronic design is illustrated in the schematics and the assembly drawings show the component locations. Parts lists are provided at the rear of this section with the assembly drawings and schematic diagrams.

Table 2-1. Assembly and Schematic Numbers.

Sheet No.	Ref. Desig.	Drawing No.	Title
1	A3	B-5061-1350-1	Rear Panel Assembly Drawing
		D-5061-1356-1	Power Supply Assembly Drawing
		02109-90024	Line (Mains) Power Distribution Schematic Diagram
2	A3A1	C-5061-1374-1	Pre-regulator Board Assy Dwg
		C-5061-1347-51	Pre-regulator Board Schematic
3	A3A2	D-5061-1344-1	Inverter Board Assembly Drawing
		C-5061-1344-51	Inverter Board Schematic
4	A3A4	C-5061-1351-1	Jumper Board Assembly Drawing
		B-5061-1351-51	Jumper Board Schematic
5	A3A5	D-5061-1345-2	Control Board Assembly Drawing
		C-5061-1345-51	Control Board Schematic
6	*A3A3	C-5061-1348-1	Battery Charger Board Assy Dwg
		C-5061-1348-51	Battery Charger Board Schematic
7	*A3A4	C-5061-1349-1	Battery Backup Board Assy Dwg
		C-5061-1349-51	Battery Backup Board Schematic
8	A3A6	F-5061-1371-1	Mother Board Assembly Drawing
		C-5061-1371-5	Mother Board Heatsink Assy Dwg
		C-5061-1371-51	Mother Board Assembly Schematic
9	----	02109-90024	Battery/Status Assembly Wiring Diagram
		B-12944-90004 -51	Battery/Status Assy Schematic
10	A3A6A1	C-5061-3403-1	Output Regulator Board Assy Dwg
		B-5061-3403-51	Output Regulator Board Schematic
* p/o optional PFRS (Power Fail Recovery System)			

## "B" Power Supply

### 2-1. Binary Signal Levels

Most of the logic used in the power supply is implemented with standard or Schottky TTL devices. High logic levels are approximately +2.5 to +4.5 Vdc. Low logic levels are approximately 0.0 to +0.8 Vdc. The actual values measured will vary due to the type of device, the load, and the condition of the device. When using positive logic, a high is "true" and a low is "false".

### 2-2. Schematic Reading

Logic symbols are drawn to aid in understanding the logical functions being represented. A circle or bubble at an input or output indicates an active low logic level. A circle or bubble on the clock input of a flip-flop indicates that a negative-going edge of the clock signal is used to clock the flip-flop.

### 2-3. Signal Names

Signal names are alphanumeric identifiers selected to aid in the understanding of the signal function. Not all signals are labelled, but all signals running between schematic sheets are labelled. Any signal mnemonic on the schematic may have a "not" bar over it to indicate that the signal is active low (in text, a minus sign suffix to the mnemonic will be used in place of the "not" bar). For example, the ABC- signal is low only when the ABC button is pressed. When the ABC button is not pressed, the ABC- signal is high.

### 2-4. Cross References

There are many signals that run from sheet to sheet in the schematics. The destination of signals leaving one sheet to other sheets are coded with the sheet number(s) adjacent to the signal name. For example, a signal leaving sheet 1 for sheet 7 would be coded as follows: ABC (7). A signal coming from sheet 7 to sheet 1 would be coded as follows: (7) DEF. If the signal is going to several sheets from sheet 1, it would be coded as follows: XYZ (3,4,5,7). If the signal is coming from several sheets to sheet 1, it would be coded as follows: (7,8) WXY.

### 3-1. Introduction

The overall power supply can be functionally separated into three individual units:

- a. An ac to dc supply that converts the line (mains) voltage into a +325 Vdc bus;
- b. A dc to dc supply that converts the +325 Vdc bus into +5V and -2V (CPU), +12V, -12V, and +30V (I/O), and 18Vac; and
- c. An ac supply that converts the 18Vac into +5VM, +12.5VM and -12VM.

The overall functional block diagram of the power supply is shown in Figure 3-1. The two configurations for the power supply are shown in Figures 3-2 and 3-3. Figure 3-2 illustrates a power supply with the optional Power Fail Recovery System (PFRS). It should be noted that the CPU and the I/O voltages are developed from the +325 Vdc bus via the Preregulator and Inverter circuits. The 18 Vac bus is also developed from the +325 Vdc bus via the Inverter and Preregulator circuits. This 18 Vac bus is converted into a +18 Vdc by the Battery Charger Board A3A3. The Battery Backup board A3A4 and the Battery Charger board A3A3 develop the memory voltages from either the +18 Vdc or from the external battery (+14 Vdc). If the +18 Vdc is lost, the +14 Vdc battery will maintain the memory voltages. The Battery Charger board A3A3 charges the battery while the ac power is applied.

Figure 3-3 represents a power supply without a power fail recovery system. In this mode the Jumper board A3A4 performs the function of developing the memory voltages directly from the CPU voltages. The +5VM is tied directly to the +5V (CPU). The -12VM is tied directly to the -12V (I/O). The 18 Vac bus is rectified into +18 Vdc and regulated via a series pass regulator to +12.5 VM.

### 3-2. Primary Input Power Circuits (sheets 1,8)

For the following paragraphs, schematics of the Line (Mains) Power Distribution (sheet 1) and the Mother Board A6 (sheet 8) are required.

The line (mains) power, either 115 Vac or 230 Vac, is applied to the power supply through the Line Filter FL1 to remove line induced noise, etc. and to prevent noise from leaving the power supply and going out on the ac lines (mains). The Circuit Breaker CB1 also acts as the POWER OFF/ON switch. Terminal Block TB1 is used to configure the power supply for operation from

## "B" Power Supply

either 115 Vac or 230 Vac line power. the configuration of the power supply consists of moving jumper wires on TB1 and making the appropriate connections on CB1. This sets the fans, the bias transformer, and the power supply input for operation with the proper voltage. Since it is desirable to develop the same bus voltage (B+) at 115 Vac and at 230 Vac, a voltage doubler circuit on the Mother board A3A6 is employed for 115 Vac operation. Therefore, the dc input voltage to the Inverter and Preregulator circuits is twice the peak of the ac input waveform.

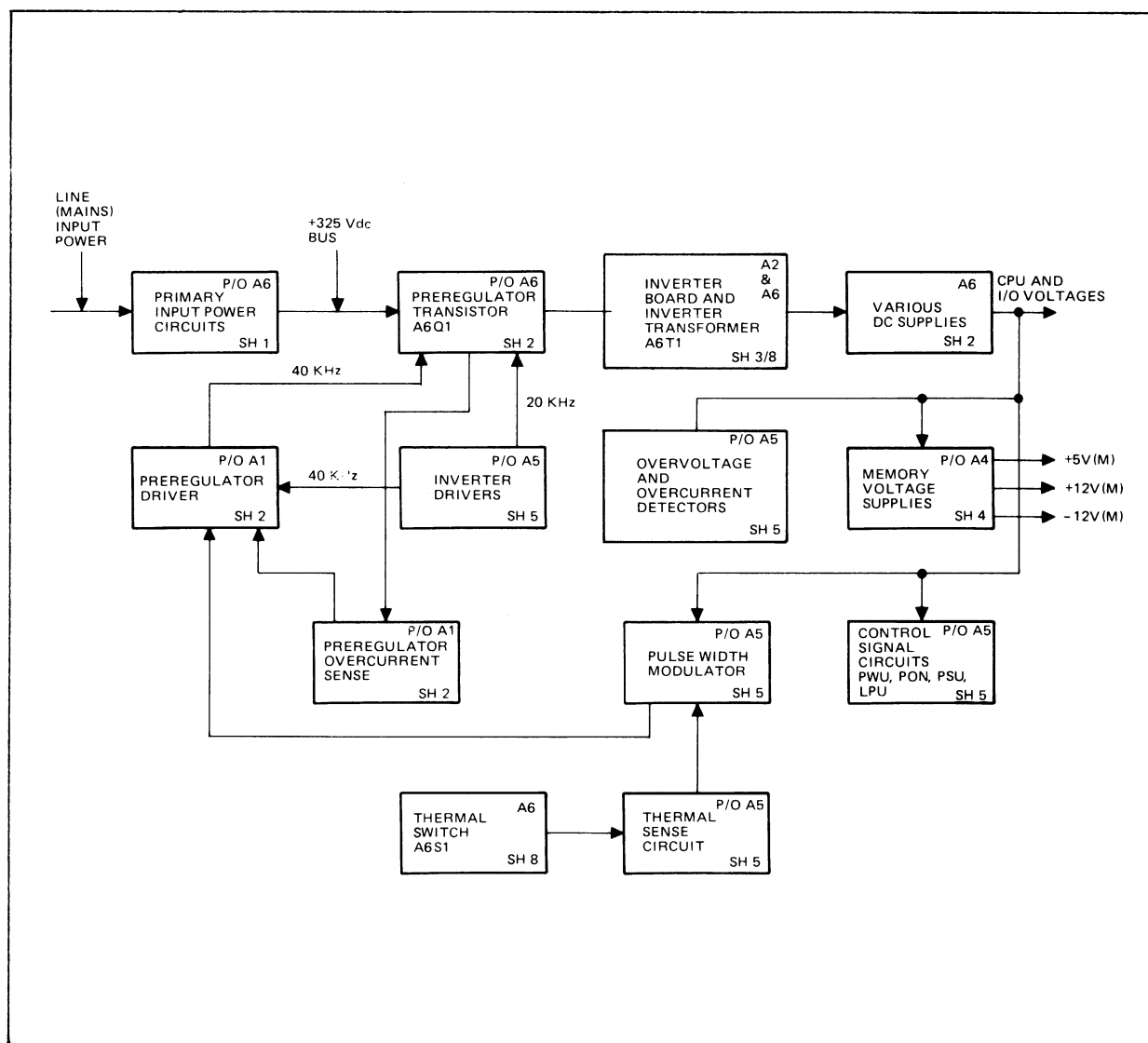


Figure 3-1. Power Supply Overall Block Diagram

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## "B" Power Supply

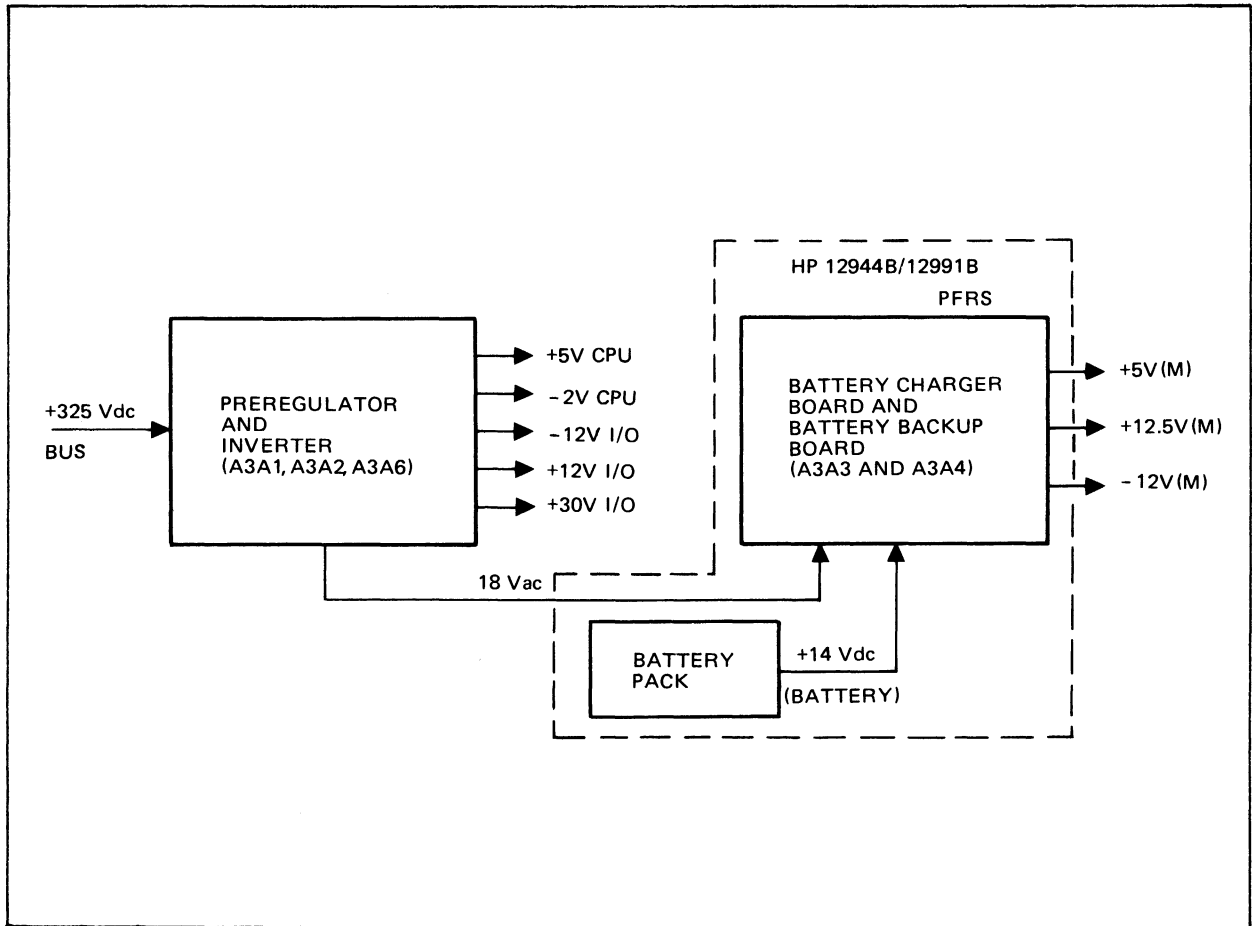


Figure 3-2. Power Supply with Optional PFRS

For example, 115 Vac develops a bus voltage of +325 Vdc as shown in the formula:  $115 \text{ Vrms} \times 1.414 \times 2 = +325 \text{ Vdc}$ .

The 230 Vac operation does not employ a voltage doubler circuit. Therefore, its bus voltage is simply equal to the peak of the 230 Vac input waveform  $\times 1.414$ .

It should be noted that the ac input waveform MUST BE a sinusoidal waveform for these formulas to be accurate.

To operate the power supply from 115 Vac, the C/T terminal must be connected to the N (neutral) terminal. This forms a voltage doubler circuit comprised of capacitors C12 and C13 and the diode bridge CR15. To change from 115 Vac operation to 230 Vac operation, the C/T terminal must be left unconnected. This allows capacitors C12 and C13 and the diode bridge CR15 to function strictly as a rectifier and filtering circuit.

## "B" Power Supply

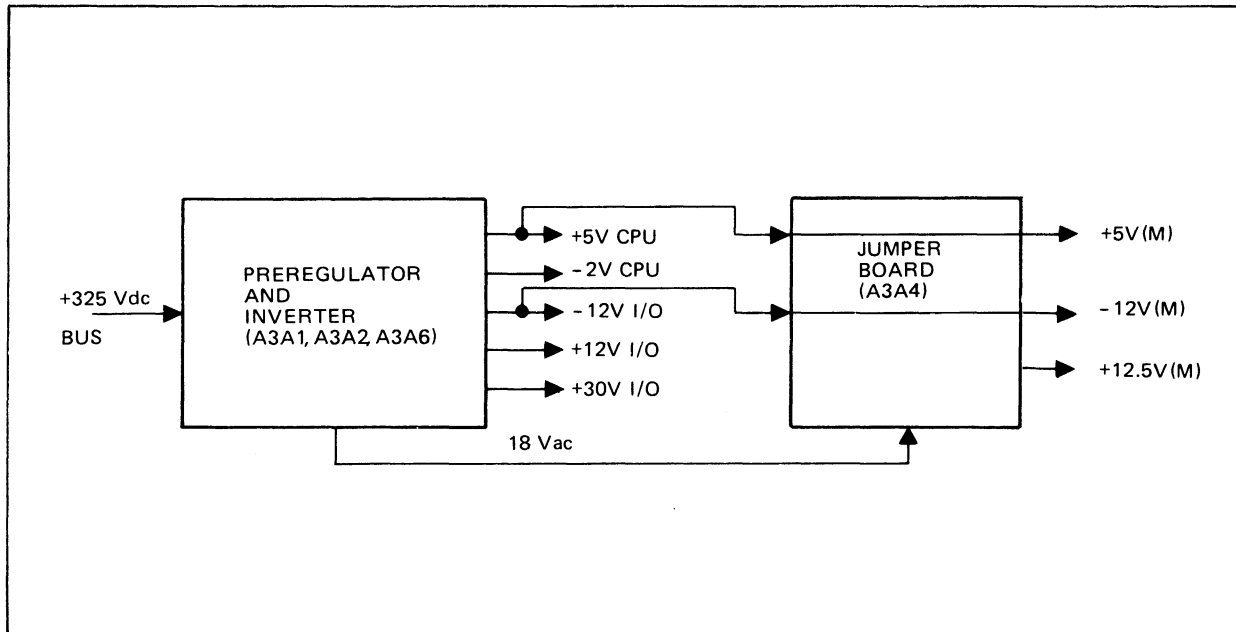


Figure 3-3. Power Supply Without PFRS

On initial power turn on, the input capacitors C12 and C13 are discharged and thermistors R5 and R6 are cold. The cold resistance of the thermistors is approximately 2.5 ohms each. The input capacitors charge through this resistance, thus limiting the input surge current. After a few cycles of the input power, the input current heats up the thermistors, allowing their resistance to decrease. Therefore, the capacitors are allowed to charge through a much lower resistance. Since the resistance of the thermistors decreases as the input current increases, the losses across the thermistors at low line voltage decrease to aid regulation.

The cooling time constant required for the thermistors to go from their hot (low resistance) to their cold (high resistance) is equal to the time required to discharge the input capacitors C12 and C13 through R10 and R11. This ensures that if the ac input power is lost the thermistors will cool down at the same rate that the capacitors C12 and C13 are discharging.

### 3.3 Preregulator A3A1 and Inverter A3A2 Boards (sheets 2,3)

The Preregulator Board A1 (sheet 2), the Inverter Board A2 (sheet 3), and the Mother Board A6 (sheet 8) schematics are required for understanding this section.

The purpose of the Preregulator and the Inverter Boards is to apply a square wave to the primary of transformer A6T1 (sheet 8). Neglecting all circuit losses, the amplitude across the primary of A6T1 should remain constant under all load conditions on the secondary of A6T1. If the primary voltage remains constant, the +5V (CPU) supply from the secondary of A6T1 is also constant. The +5V (CPU) supply is the sensed output. The -2Vdc supply has a closed loop regulation on the output regulator board consisting of op amp U1 and output

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## "B" Power Supply

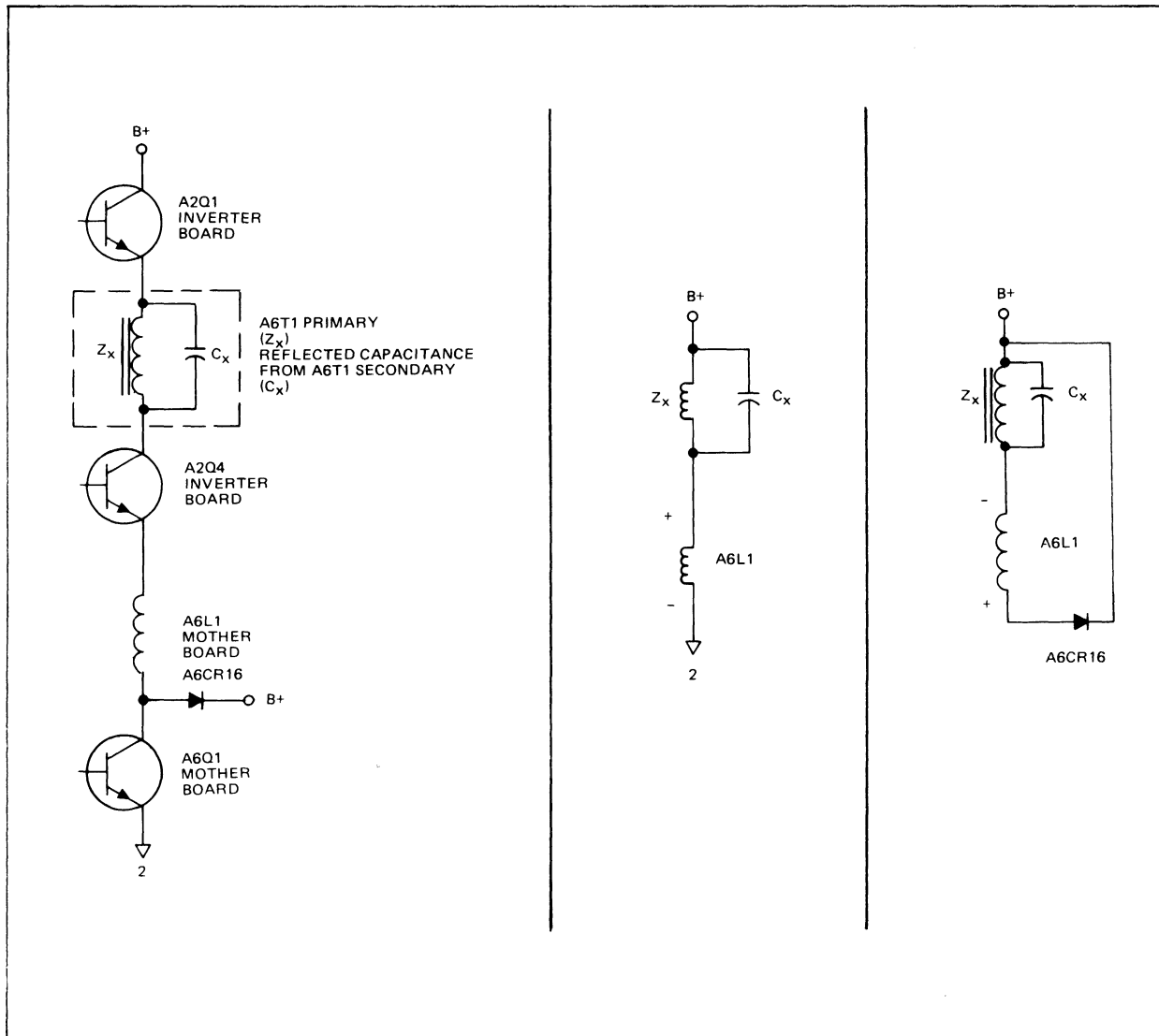
pass transistor Q3. A three terminal regulator on the output regulator board (Q2) is utilized to regulate the +12V I/O supply. The -12V I/O supply utilizes output amp U1 for feedback to a Darlington pair pass transistor Q1. The 18Vac bus is also derived from the secondary of A6T1.

To control the voltage across the primary of A6T1, the preregulator transistor A6Q1 controls the amount of current going through the the primary of A6T1 (see Figure 3-4). Figure 3-5 is a simplified diagram of Figure 3-4 when transistors A2Q1 and A2Q4 and A6Q1 are conducting. When A6Q1 starts to conduct, the impedance in series with A6Q1 is infinite due to the inductance of A6L1 and the current is zero. At a finite time later, the dc resistance of the primary of A6T1 and the inductor A6L1 reaches a minimum value and are the only impedance in series with A6Q1. Therefore, the current through A6Q1 is maximum at this time. Using these two facts, the current through A6L1 and the primary of A6T1 is a function of the inductance of A6L1 and the primary of A6T1 added together, the value of B+, and the length of time that A6Q1 conducts. Since the inductance of A6L1 and the primary of A6T1 is constant and B+ is held constant, the only variable factor that controls the current through the primary of A6T1 is the length of time that A6Q1 is allowed to conduct. Figure 3-10A represents the base drive to A6Q1. The frequency of this waveform is 40 kHz. The "on time" of A6Q1 is directly proportional to the duty cycle of this waveform.

The power supply monitors the +5V (CPU) output and determines the duty cycle from its value. Also, if the value of B+ is changed, it will effect the on time of A6Q1. If the load on the secondary of A6T1 is increased, the duty cycle will increase. This is due to the decrease in the impedance on the secondary of A6T1 being reflected back to the primary of A6T1. Since the impedance is less on the primary, the current through the primary of A6T1 must increase to maintain a constant voltage across the primary. To do this the on time of A6Q1 must increase. If the load is decreased on the +5V (CPU), the duty cycle will decrease. This is due to the impedance increasing on the secondary of A6T1. Therefore, the reflected impedance at the primary of A6T1 will increase and reduce the current through the primary of A6T1. In order to decrease the current through the primary, the on time for A6Q1 will have to decrease.

Since the preregulator transistor A6Q1 is turned on and off at a 40 kHz rate, the signal at the primary of A6T1 has a 40 kHz ripple. The current waveform through the primary of A6T1 and A6L1 is shown in Figure 3-10D. At times T1 and T3 the current through the primary of A6T1 is going through A6Q1. This may be noted in Figures 3-5 and 3-8. At times T2 and T4 the current is supplied by the collapsing field of A6L1 and the continuing current flow through the commutating diode A6CR16. This action is shown in Figures 3-6 and 3-9. Since A6Q1 and A6L1 work together to maintain a constant current through the primary of A6T1, the ripple is held to a minimum and the current through A6L1 can be considered dc current. The purpose of the Inverter Board A2 is to change the direction of this dc current flow through the primary of A6T1. Figures 3-4 and 3-7 illustrate this action (note the polarity). The dc current through A6L1 becomes the ac current of A6T1.

## "B" Power Supply



Figures 3-4, 3-5, and 3-6. Preregulator Circuit (Time T1)

The remainder of this section covers the interaction of the Inverter and the preregulator boards at four time intervals (see Figure 3-10). It also covers the Inverter and the preregulator boards in detail (duty cycle control).

### a. Time T1 (see Figure 3-10).

The preregulator transistor A6Q1 is conducting at this time and the inverter transistors A2Q1 and A2Q4 are conducting. Figure 3-4 shows the components involved and Figure 3-5 is a simplified version of Figure 3-4. From Figure 3-5 it is shown that A6Q1 is building up a field around A6L1, with the polarity of the voltage drop as indicated.  $Z_x$  represents the reflected impedance of the secondary of A6T1 to the primary of A6T1. The preregulator current is determined by the on time of A6Q1 and must be sufficient to develop the required voltage at the secondary of A6T1 for an output of +5V (rectified)

(HP 1000 M/E/F ERD)

## "B" Power Supply

### b. Time T2 (see Figure 3-10).

At this time A6Q1 turns off and A2Q1 and A2Q4 are still conducting. The field of A6L1 begins to collapse and the voltage drop across A6L1 is indicated in Figure 3-6. A6L1 tends to maintain the current constant through the primary of A6T1 during this time interval. It should be noted that during this time interval the field of A6L1 is never allowed to collapse fully before T3 occurs. The induced voltage across A6L1 due to the collapsing field is enough to cause the + end of A6L1 to go to B+ plus the forward drop of A6CR16, thus developing the current path from A6L1 through A6CR16 through the primary of A6T1 back to A6L1.

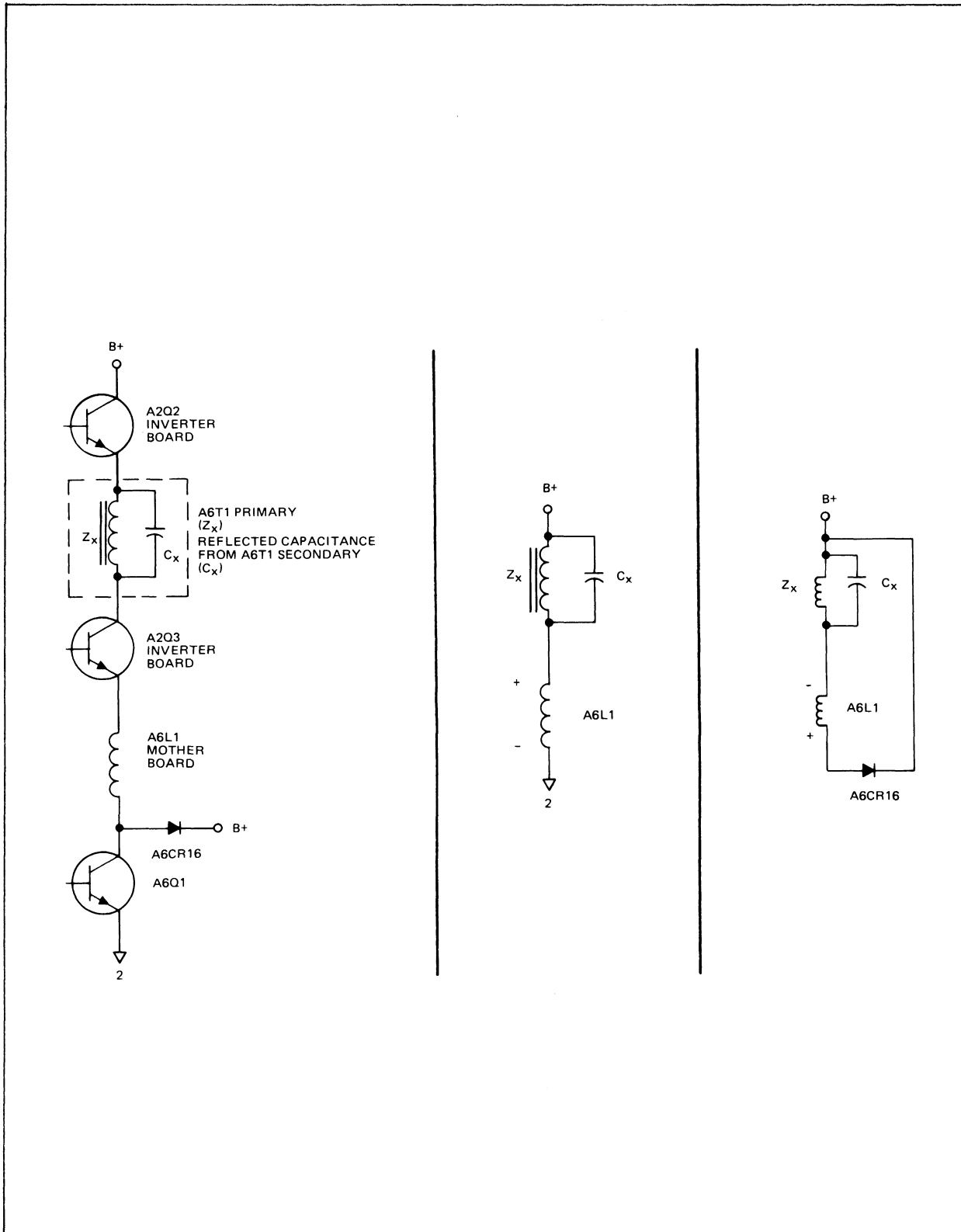
### c. Time T3 (see Figure 3-10).

At this time A6Q1 is conducting. The inverter transistors A2Q1 and A2Q4 are turned off, but A2Q2 and A2Q3 are now conducting. Figure 3-7 shows the components involved. Figure 3-8 is a simplified version of Figure 3-7. It should be noted that the voltage drop across the primary of A6T1 is reversed as indicated by the polarity. Therefore, the current through the primary of A6T1 is reversed at this time. A6Q1 builds up the field of A6L1 and develops the desired voltage across Zx. Cx represents the reflected capacitance from the secondary of A6T1. This capacitance is necessary to prevent ringing or high voltage spikes.

### d. Time T4 (see Figure 3-10).

Figure 3-9 is a simplified diagram showing the components involved during T4. During this time period the field of A6L1 begins to collapse as A6Q1 turns off inducing the indicated voltage drop across A6L1. The voltage at the + end of A6L1 reaches a value of B+ plus the forward voltage drop of A6CR16. This forward biases A6CR16 and allows the current through Zx to remain constant. The current path is from the + end of A6L1 through A6CR16 and Zx, then back to the - end of A6L1. Inverter transistors A2Q2 and A2Q4 are still conducting during this period. It should be noted that if the commutating diode A6CR16 were not in the circuit, the voltage at the + end of A6L1 would go much higher than B+ plus the forward drop of A6CR16. A6CR16 is also fundamental in providing a current path for A6L1 as it tries to maintain current in the loop of A6L1, A6CR16, and Zx when A6Q1 is off.

"B" Power Supply



Figures 3-7, 3-8, and 3-9. Preregulator Circuit (Time T3)

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## "B" Power Supply

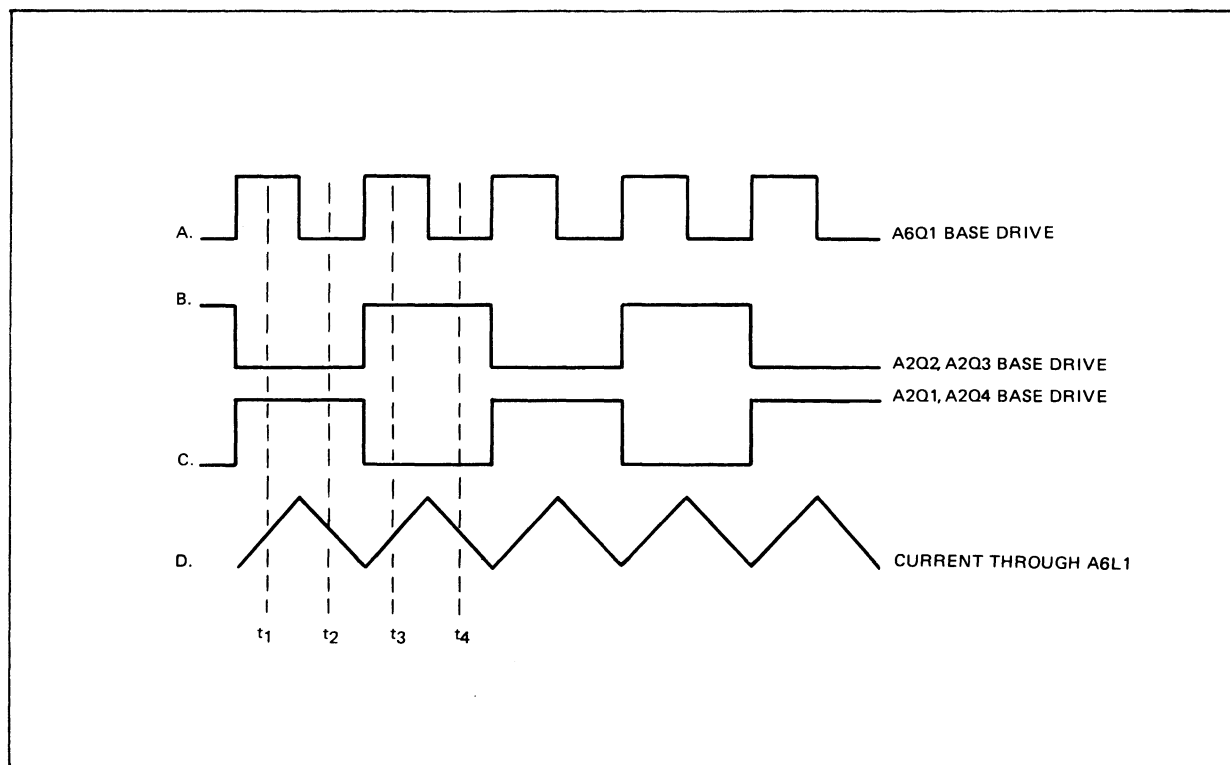


Figure 3-10. Timing Waveforms

### 3-4. Inverter Stage

The inverter transistors are arranged in an "H" configuration (see Figure 3-11) and are driven at a 20 kHz rate. As shown in Figure 3-11 the inverter transistors are driven by the 20 kHz output from the control board A5 (sheet 5) and are synchronized with the preregulator board A1 (sheet 2). The inverter transistors are driven by the inverter driver transformer A2T1 at a constant 50% duty cycle. Due to the fact that the inverter transistors are in series with A6L1, there is no need for "dead time". "Dead time" refers to the amount of time that both pairs of inverter transistors are not conducting. Since it takes longer to turn off the inverter transistor pair than to turn them on, due to storage time of the transistors, an RC time delay network is usually incorporated to delay the turn on time. This delay is used to make sure that both pairs of transistors are not conducting at the same time. This results in "dead time" because the RC turn on delay is longer than the turn off time. Since A6L1 is in series with the inverter transistors, it acts to limit current during the time that both pairs of transistors are conducting.

The inverter transformer A6T1 reflects the inductance of A6L1 from its primary to its secondary to produce the required inductance for filtering in the secondary. A6T1 also reflects the required capacitance from its secondary to its primary to produce filtering in the primary. Resistor A6R14 and capacitor A6C17 form a snubber network to shape the load so that the primary of A6T1 looks resistive.

The remainder of this section discusses the inverter drive at the component

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"B" Power Supply

level. The schematic for the control board A5 (sheet 5) will be needed along with previously listed schematics.

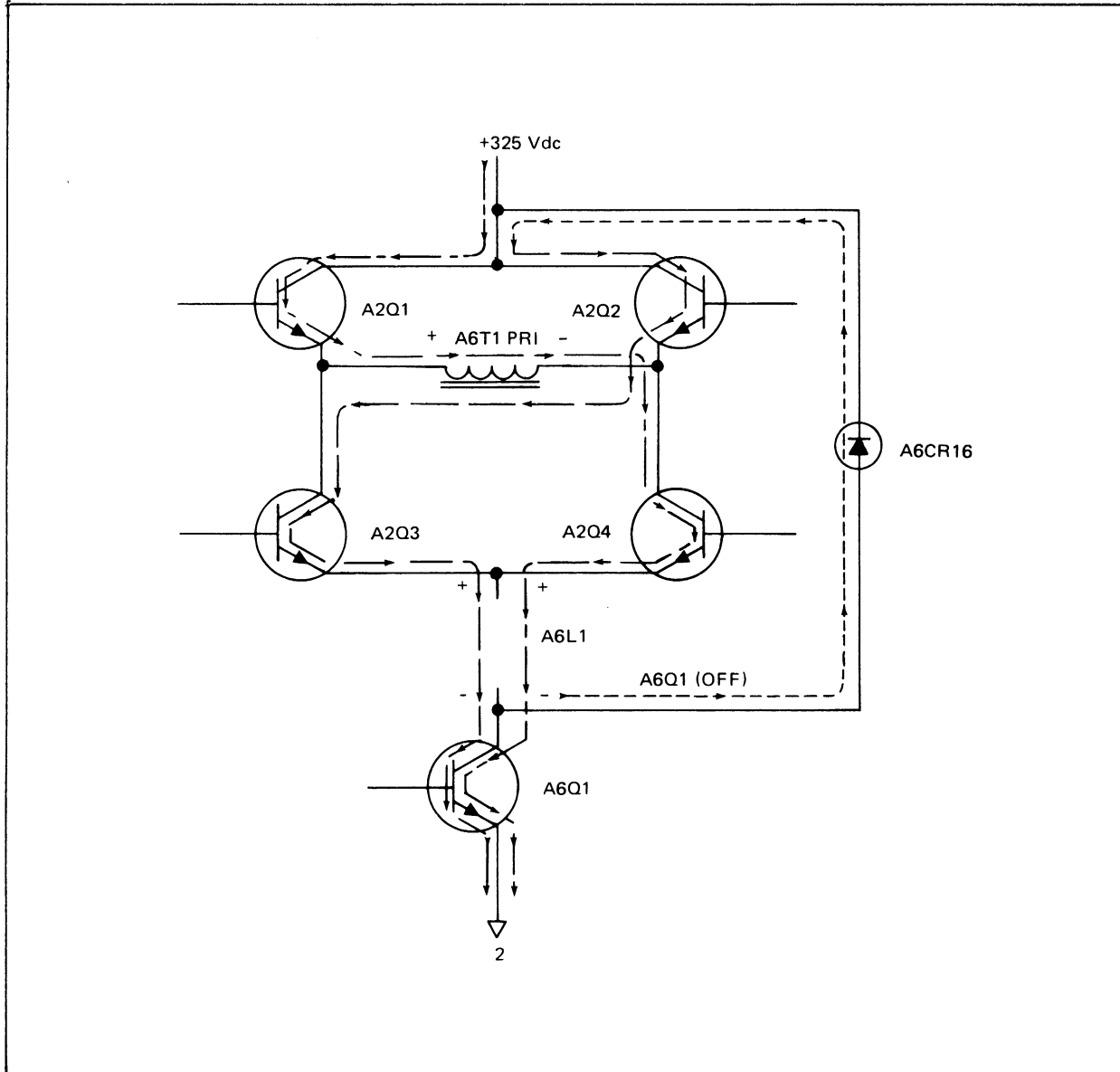


Figure 3-11. H Configuration of the Inverter Transistors

3-5. Control Board A3A5 (Sheet 5)

The comparator (U1A) and associated components form a 40 kHz oscillator. The square wave output of U1A-2 is integrated by R3 and C2. This integrated waveform (a triangle waveform) is applied U1B-6. A dc level is applied to U1B-7. The interaction of this dc level and the integrated waveform produces

(HP 1000 M/E/F ERD)



## "B" Power Supply

a square wave at the output pin 1 of U1B. This square wave output is buffered by Q4 and drives the clock input of the negative-edged triggered J-K flip-flop U2, a 74S112. The configuration of U2A and U2B is shown in figure 3-12. Since U2B is held in a constant reset state, the Q output (U2-7) is high at all times. The high at U2-7 holds the J and K inputs of U2A pins 3 and 4 high. Thus the outputs of U2A pins 5 and 6 will toggle (change state) for each clock input. This divides the clock input frequency by 2 ( $40 \text{ kHz}/2 = 20 \text{ kHz}$ ). The two outputs of U2A are 180 degrees out of phase and have a 50% duty cycle. The output at U2-5 drives Q9 which pulls the primary of A2T1A (pin 6) to ground. A2T1A (pin 4) returns to the control board through J2-S and is tied to the +8V through R48. The output at U2-6 drives Q8 which pulls the primary of A2T1B (pin 3) to ground. A2T1B pin 1 returns to the control board through J2-P and is tied to the +8V through R49. During one half of the 20 kHz cycle Q9 is conducting and Q8 is cut off. When Q9 is conducting, it drives off the inverter transistors A2Q1 and A2Q4. When Q9 is conducting, Q8 and the inductive flyback of the primary of A2T1B turn on A2Q2 and A2Q3. On the other half cycle Q9 turns off allowing the inductive flyback of the primary of A2T1A to turn on A2Q1 and A2Q4. At this time Q8 is driving off A2Q2 and A2Q3. Since the inductive flyback turns the inverter transistors on, and Q8 and Q9 turn off the inverter transistors. Therefore, the turn on energy is less than the turn off energy. At this frequency of operation the flyback action has just enough energy to keep an inverter pair turned on for a half cycle. This removes the need for anti-saturation diodes because the transistors are falling out of saturation at the end of their on time. They are about to fall out of saturation just in time to be driven off.

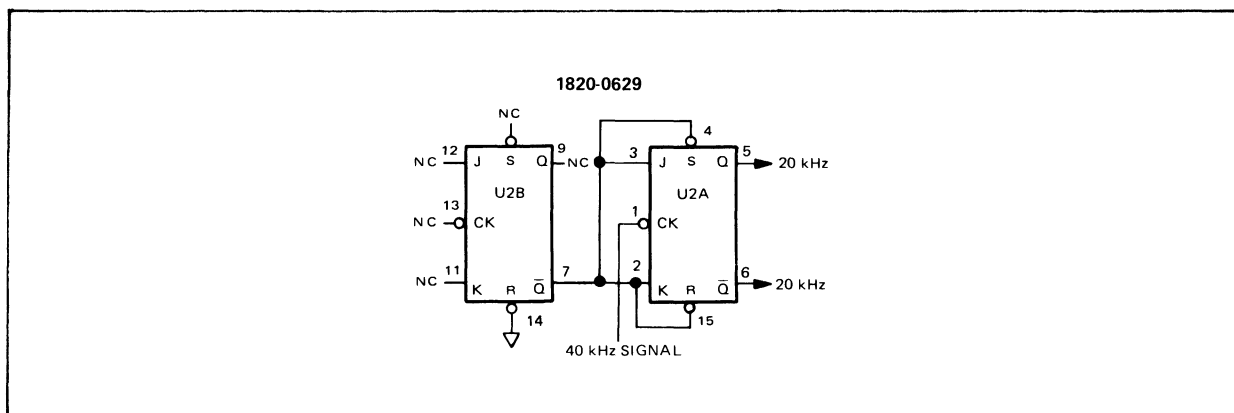


Figure 3-12. Divider Circuit

### 3-6. Inverter Board A3A2 (sheet 3)

Current sharing resistors A2R2, A2R3, A2R5, and A2R8 prevent one transistor in an inverter pair from passing all the current. When one transistor has a lower  $V_{be}$  than the other transistor the impedance of the one ohm resistor is enough added impedance to ensure that one secondary of A2T1 has enough reflected impedance into the other secondary to develop the required voltage to turn on both inverter transistors. If the resistors were not used, the base-emitter junction of the transistor with the lower  $V_{be}$ , would be the only

## "B" Power Supply

impedance reflected back to the other secondary. The result would be one transistor stealing the base drive from the other transistor of the pair.

### 3-7. Preregulator Drive Circuitry

The purpose of the preregulator drive circuitry is to monitor the +5V (CPU) and determine a corresponding duty cycle for the preregulator transistor A6Q1. The preregulator drive circuitry consists of an error amplifier (A5U3), a pulse width modulator (A5U1C), and circuitry to develop enough drive current to turn on and off A6Q1. The following schematics are required for the remainder of this discussion: control board A5 (sheet 5), preregulator board A1 (sheet 2), and mother board A6 (sheet 8).

The error amplifier is A5U3 on the control board. It is a 723 type voltage regulator and is shown in Figure 3-13. Pin 6 is the output of an internal voltage reference amplifier and has a constant 7V output. This voltage is divided down to approximately +5 volts and is applied to pin 5, the non-inverting input of an internal operational amplifier. Pin 4 is the inverting input to the same amplifier and has the +5V (CPU) applied to it. The output of this internal operational amplifier drives an emitter follower stage. The collector of the emitter follower stage is tied to pin 11 and the emitter is tied to pin 10. If the +5V (CPU) output increases, the output of the internal operational amplifier decreases. This decreases the voltage on the emitter (pin 10) of the internal emitter follower stage. This also decreases the voltage at A5U1-9, the pulse width modulator. In conclusion the error amplifier A5U3 acts as an inverting amplifier producing an output that is directly proportional to the differential between the +5V CPU and the internal voltage reference at A5U3-6.

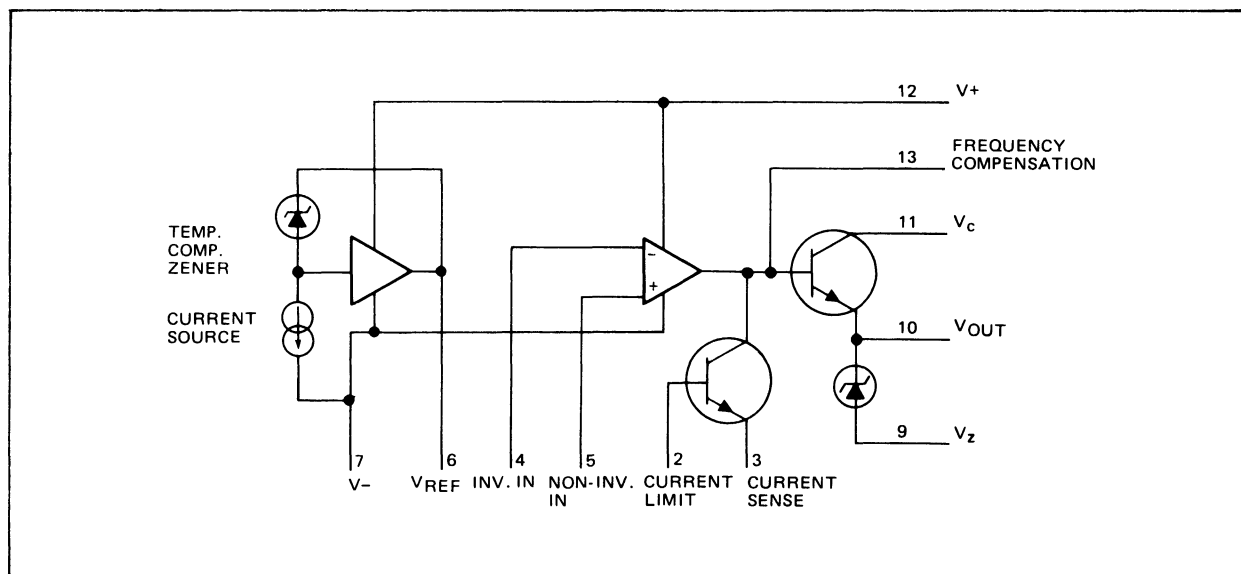
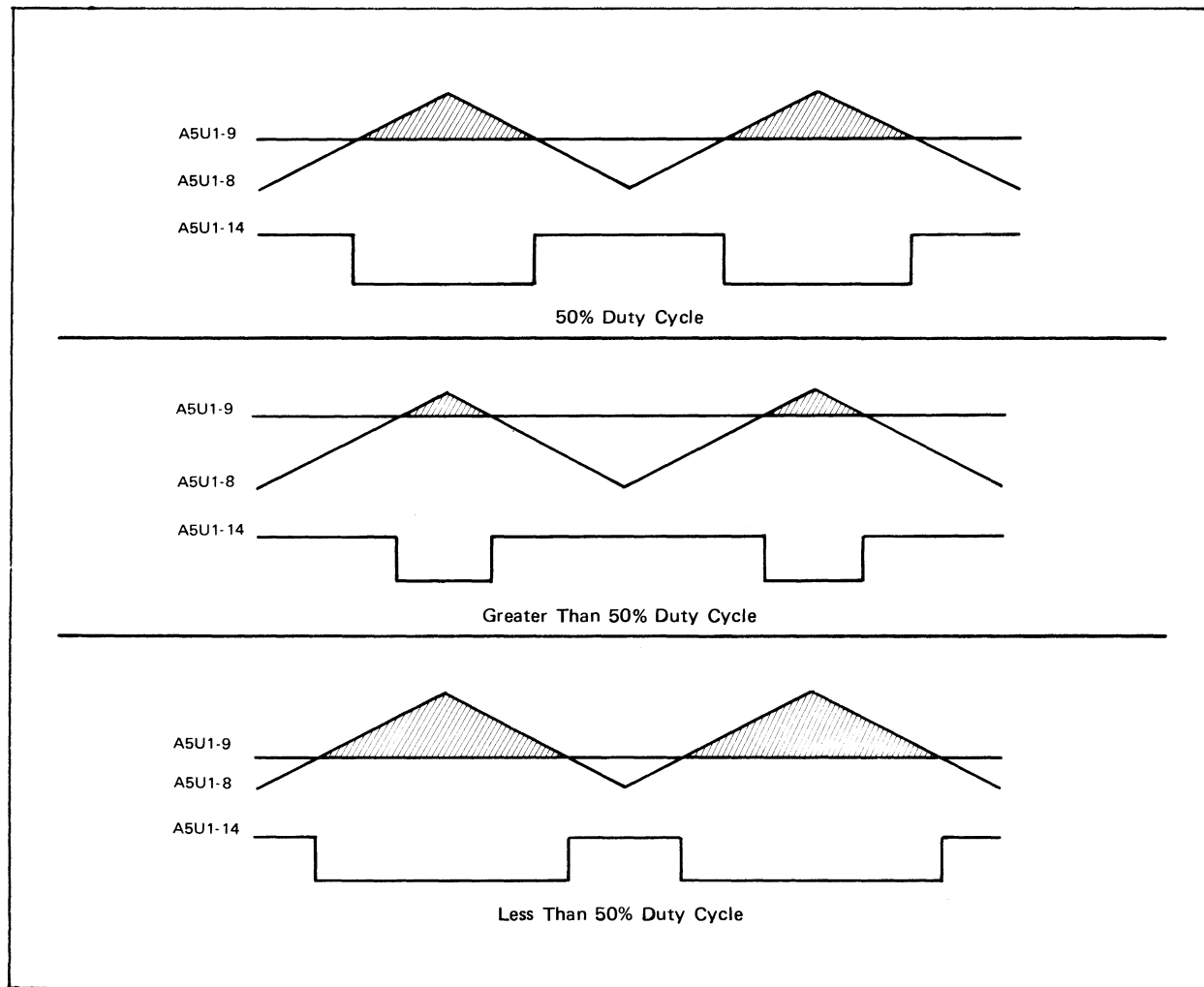


Figure 3-13. Typical 723 Voltage Regulator Functional Block Diagram

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## "B" Power Supply

The pulse width modulator (A5U1C) takes the output of the error amplifier A5U3 and compares it with an integrated waveform (triangle waveform) from the 40 kHz clock (U1-4). The dc level of the error amplifier intersects with the integrated waveform to produce an appropriate duty cycle (typically 50%) square wave at A5U1-14 under normal operating conditions. Varying the dc level changes the level of intersection with the integrated waveform, thus changing the duty cycle. The triangle waveform is applied to A5U1-8. The dc output of the error amplifier is applied to A5U1-9. A5U1-14 produces the corresponding duty cycle output. Figures 3-14 through 3-16 illustrate this action.



Figures 3-14 through 3-16. Preregulator Drive Circuit Waveforms

Combining the operation of the pulse width modulator and the error amplifier produces the following conclusion: The interaction between the +5V (CPU) and the duty cycle is inversely proportional, i.e. if the +5V (CPU) output level decreases, the duty cycle goes up. It should be noted that the duty cycle can be determined either at A5U1-14 or at the base of A6Q1 because both of these

(HP 1000 M/E/F ERD)

"B" Power Supply

signals are in phase. As a proof a detailed description of the A6Q1 base drive will now be discussed.

When A5U1-14 is high, A5Q5 turns on pulling A1U2-3 to ground (GND). A1U2-2 returns via A1R9 to +5V (L) on the mother board. This turns on U2, an OPTO-isolator, causing A1U2-6 to the pulled low to REF GND (A1U2-5). Note the change in references. REF GND is the reference for the preregulator drive and GND is the reference for the control board. The action of the OPTO-isolator allows this shift in references. The configuration for U1 and U2 are shown in Figure 3-17.

**WARNING**

DO NOT CONNECT REF COMMON 2 TO GND 1 AS THERE IS APPROXIMATELY 150 VOLTS DIFFERENCE.

**CAUTION**

Any measurements using REF COMMON must be made using test instruments with a floating input.

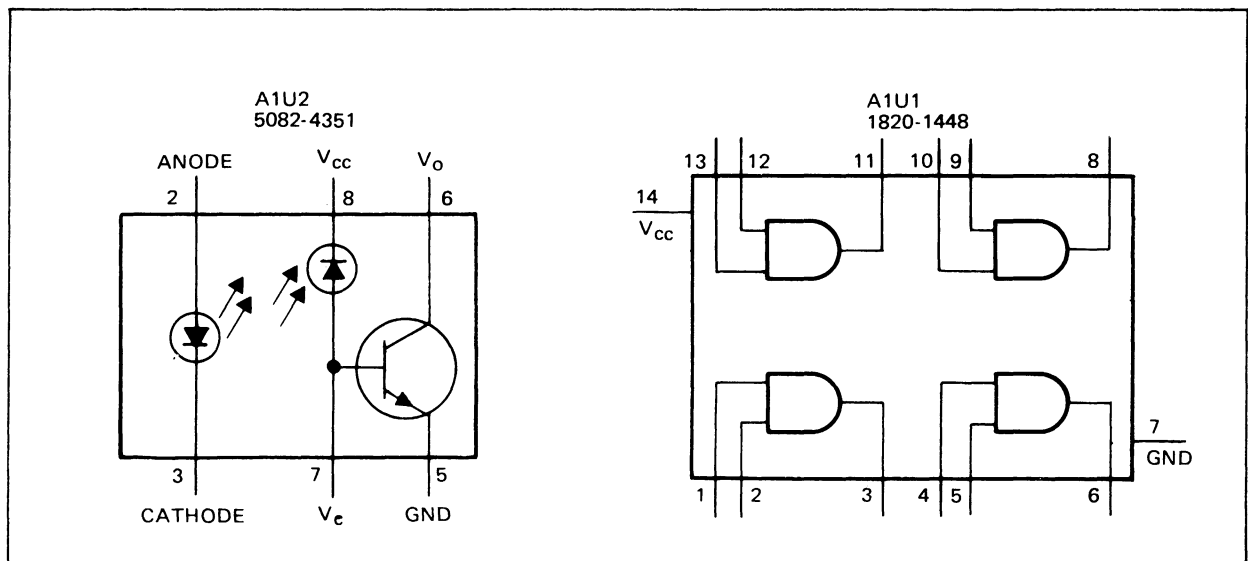


Figure 3-17. A1U1 and A1U2 Configurations

Table 3-1 shows the conditions that exist for the two states of A5U1-14.

## "B" Power Supply

Table 3-1. Preregulator Drive Conditions

A5U1-14	HIGH	LOW
A1U2-6	LOW	HIGH
A1U1-1	LOW	HIGH
A1U1-3	LOW	HIGH
A1Q7	OFF	ON
A1Q8	OFF	ON
A1Q9	ON	OFF
A1U1-10	HIGH	LOW
A1U1-8	HIGH	LOW
A1Q5	ON	OFF
A1Q6	ON	OFF
A1Q3	OFF	ON
A6Q1	ON	OFF

### 3-8. Jumper Board A3A4 (sheet 4)

The jumper board A3A4 develops the memory voltage directly from the CPU voltages. J4-F,6 the +5V M is tied directly to the +5V CPU at J4-9,10. The -12V CPU at J4-12 ties directly to the -12VM. The 18 Vac bus from the secondary of A6T1, is applied to J4-L,N. Diodes A4CR4 and A4CR5 and capacitor A6C9 (mounted on the mother board A3A6) rectify and filter the 18 Vac into +18 Vdc. A4U2, a 723 type voltage regulator, and A4Q1 form a series pass regulator for the +12.5VM. A4U2 provides voltage regulation and current protection. Overvoltage protection is provided by the circuit composed of A6CR3, A6CR4, A6R4, A6C7, and A6C8 mounted on the mother board A3A6. A4R12 adjusts the +12.5VM output at J4-P,13.

### 3-9. Power Fail Recovery System (PFRS)

The optional Power Fail Recovery System (HP 12944B for the HP 2108B/2109B or the HP 12991B for the HP2112B/2113B/2111F/2117F) consists of one battery charger board (A3A3), one battery backup board (A3A4), and the appropriate battery/status assembly. A battery load simulator plug must be connected to the BAT.INPUT connector A3J2 on the rear of the power supply, if the battery cable is not connected. The battery charger board (A3A3) and the battery backup board (A3A4) convert the 18 Vac bus into the various memory voltages. This section will discuss the operation of the battery backup and charger boards under two conditions:

- a. Line power down with a good battery.
- b. Line power up.

## "B" Power Supply

### 3-10. Battery Charger Board A3A3 (sheet 6)

Figure 3-18 is a simplified diagram of the switching network used to switch from +18 Vdc to the +14 Vdc battery. When line power is up, the inverter and preregulator stages supply +18 Vdc to point X. This voltage is regulated via a series pass regulator on the battery charger board and forward biases A3CR5 to charge the battery. A4CR10 is forward biased and goes to point Y which feeds the battery backup board which in turn develops the memory voltages. At this point A3CR4 is reversed biased. When the line power goes down, the inverter and preregulator stages cut off and the +18 Vdc goes to zero volts. The battery then forward biases A3CR4 as point Y is approximately +13.7 Vdc. This voltage powers the battery backup board A3A4 until the battery discharges down to +12.5 Vdc (80% discharged). Diodes A3CR5 and A4CR10 are reverse biased when the battery is supplying the memory voltages.

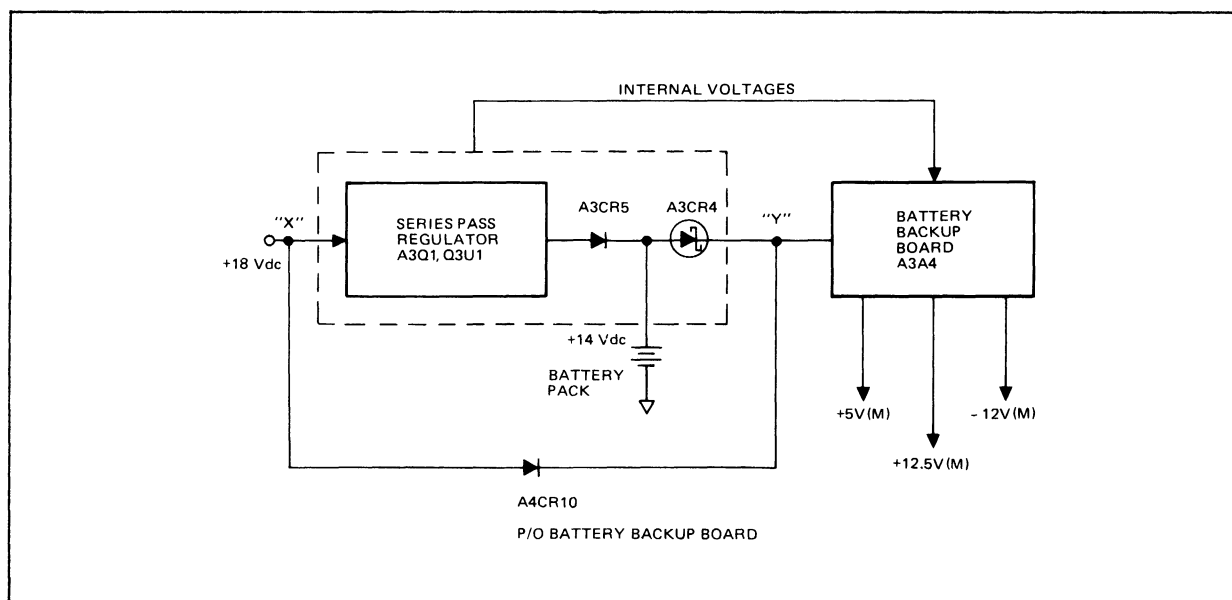


Figure 3-18. Power Fail Recovery System (PFRS) Simplified Block Diagram

### 3-11. Battery Backup Board A3A4 (Sheet 7)

The battery backup board A3A4 operation is described in the following paragraphs. The input to the battery backup board is a dc voltage at J4-D,4. Transistor A4Q5, transformer A4T1, and capacitor A6C10 form the major components for the switching supply (buck switching regulator) that produces the +5V and the -12VM outputs.

A4U2, a 723 type voltage regulator, operates as an error amplifier. A4U3A and its associated components form a 20 kHz oscillator. The output of A4U3A (pin 2) is applied to the inverting input of A4U3B (pin 6) through A4R29 and the output of A4U2 (pin 10) is applied to the non-inverting input (pin 7) of A4U3B. A4U3B forms a pulse width modulator circuit so that the output pulses at A4U3-1 vary in width inversely to the level of the +5VM output. As the

(HP 1000 M/E/F ERD)

## "B" Power Supply

+5VM decreases, the pulse width increases in width, when the +5VM increases, the pulse width decreases in width. The reason for this is apparent from the following circuit description.

A4U3-1 drives A4Q8 which in turn drives A4Q7 and A4Q5. As A4U3-1 goes high, A4Q5, and A4Q7 are turned on by A4Q8. When A4Q7 turns on, it effectively places the voltage of the primary of A4T1 across A4Q5's base-emitter junction, thus supplying more drive current than A4Q8 could supply by itself. This drive current supplied by A4Q7 is limited by A4R25 and A4Q6. If the base drive for A4Q5 is too high, A4R25 develops enough voltage to turn on A4Q6, which diverts some of the base current from A4Q7, thus decreasing the base current to A4Q5. The action of A4Q6 and A4R25 provides a constant drive to A4Q5 regardless of the voltage at J4-D,4.

The -12VM output is developed by the secondary winding of A4T1. The +12.5VM output is developed by a series pass regulator consisting of A4Q2, A4Q3, and A4U1A and B. A4Q3 is the series pass transistor. A4U1A is an error amplifier with A4Q2 providing drive for A4Q3. A4U1-3 is an adjustable reference that determines the output voltage of the series pass regulator. If the voltage output A4U1-2 decreases, this causes A4U1-1 to increase, which increases the conduction of A4Q2. This increases the base drive to A4Q3, which in turn increases the output voltage back to the correct level.

### 3-12. Battery/Status Assembly (sheet 9)

The Battery/Status Assembly operation is described in the following paragraphs. The description will be given only for the HP 12991B because the only difference between the HP 12991B and the HP 12944B is that the HP 12944B contains only one battery pack.

The two parallel battery packs, BT1 and BT2, provide +14Vdc to the BAT.INPUT connector A3J2 through the battery switch S1, and through the 6A fuse, F1. Diode CR1 provides protection against reverse voltage being applied to the power supply.

When the battery switch S1 is in the OFF position, the +14Vdc supplied by the external or internal batteries is removed from the power supply. When the battery switch S1 is in the EXT (external) position, the internal batteries are disconnected and an external dc supply is connected to the terminal block TB1. Diode CR1 and fuse F1 still provide their protection. The battery status board A1 (5061-1352) and R1, a 3 ohm 50 watt resistor form a circuit to test the condition of the batteries, external or internal.

### **CAUTION**

Do not push the battery test switch A1S1 while the computer is in the RUN mode, if switch S1 is not in the INT (internal) position, memory contents will be altered and system failures will occur.

## "B" Power Supply

When the battery test switch A1S1 is pressed, the LED A1CR3 will light and remain lit as long as A1S1 is held in the TEST position, if the batteries are fully charged. If the batteries have a low charge, the LED A1CR3 may or may not light and extinguish even though the battery test switch is still in the TEST position. Refer to the Troubleshooting Flowchart in Appendix A for further information on this problem.



PROTECTION CIRCUITS	SECTION IV
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The overcurrent, overvoltage, and overtemperature protection circuits are located on several different board assemblies in the power supply. The description of the circuits will be broken into four parts:

- a. The CPU and I/O overcurrent circuits.
- b. The memory overcurrent circuits.
- c. The overvoltage circuits.
- d. The overtemperature circuits.

The schematics for the mother board (sheet 8), the preregulator board (sheet 2), the control board (sheet 5), the battery backup board (sheet 7), and the battery/status assembly (sheet 9) are needed for this section.

#### 4-1. CPU and I/O Overcurrent Circuits

The overcurrent sense resistors for the -2V (CPU), -12V (I/O), and +12V (I/O) are located on the mother board A3A6.

When the +12V (I/O) supply draws excessive current, A6R7 develops a voltage drop greater than 0.7V causing A5Q15 to conduct. When A5Q15 conducts, there is approximately +12V on its collector. This puts a positive level on A5U4-11 and causes the output A5U4-13 to swing positive. A5R39 provides positive feedback to latch A5U4's output high. This action turns on A5Q14 which pulls A5U1-9, the non-inverting input, low causing the duty cycle to be reduced. This action removes all the CPU and I/O voltages.

When the -12V (I/O) supply draws excessive current, the voltage drop across A6R2 exceeds 0.7V causing A5Q12 to conduct. This causes A5Q2 to turn on presenting a positive level to A5U4-11. The same chain of events that occurred for the +12V (CPU) overcurrent will follow for the -12V (I/O) when it draws excessive current.

When the -2V (I/O) supply draws excessive current the voltage drop across A6R3 exceeds 0.7V, this will turn on A5Q13. This action turns on A5Q2. The collector of A5Q2 goes high presenting a positive level on A5U4-11. The remaining chain of events are the same as those for +12V (I/O) and -12V (I/O).

It should be noted here that there is not any current sense resistor in the secondary of A6T1 to sense an overcurrent condition in the +5V (CPU) supply. In order to decrease the voltage loss across a sense resistor for the +5V (CPU) supply, this resistor is placed in the primary circuit of the inverter transformer A6T1. Therefore, an overcurrent condition in the secondary on the

## "B" Power Supply

+5V (CPU) is reflected back to the primary, causing an overcurrent shutdown to occur. This type of overcurrent condition is referred to as a preregulator overcurrent, even though it is the +5V (CPU) causing the overcurrent condition. It is important to note that anything drawing too much current through A6Q1 will cause a preregulator overcurrent condition to occur. Examples of this are shorted inverter transistors or any short in the primary or the secondary of A6T1 that can draw enough current through A6Q1 to be considered an overcurrent condition.

A1L2 and A1C3 filter the 20 kHz voltage across A6R13 into a negative dc voltage with respect to REF GND 2. When the voltage across A1C3 reaches a level of -1.4 Vdc, an overcurrent condition exists in the preregulator circuit. The voltage across A1C3 forward biases A1CR1 and turns on A1Q1. A1Q1 turns on A1Q2 causing A1Q2's collector to be approximately -5V. A1CR3 and A1CR4 are three junction diodes, each with a voltage drop of about 2.1V. The -5V on the collector of A1Q2 forward biases A1CR2, A1CR3, and A1CR4. A1CR2 and A1R5 latch A1Q1 and A1Q2 on. A1CR3 and A1CR4 pull A1U2-7 low causing A1U2's internal transistor to turn off and allowing A1U2-6 to go high. Table 3-1 in Section 3 Preregulator Drive, shows that if the opto isolator (A1U2) is off, a condition similar to the internal transistor being off, the preregulator transistor A6Q1 is also off. This action removes all the CPU and I/O voltages.

Under all overcurrent conditions for the -2V (CPU), +5V (CPU), -12V (I/O), and +12V (I/O) the memory voltages remain unchanged if a power fail recovery system is being used. If a power fail recovery system is not used, the memory voltages will go down on any of the described overcurrent conditions.

### 4.2 Memory Overcurrent Circuits

The +5VM supply does not have an overcurrent shutdown circuit, but it incorporates a current limit circuit. Some of the internal components of A4U2 are shown in the dashed lines of figure 4-1. As the current through A4R20 reaches a value high enough to turn on Qx, which decreases the base drive to Qy, which in turn decreases the voltage drop across A4R23. The decrease in the voltage across A4R23 decreases the duty cycle output of the pulse width modulator A4U3B, thus decreasing the output voltage +5VM. If the load is too high, the voltage across A4R20 keeps Qx turned on, limiting the output current until the overcurrent condition is removed.

The +12.5VM supply incorporates an overcurrent shutdown circuit. A4U1B monitors the voltage across A4R5. When the current through A4R5 is large enough to be considered an overcurrent condition, the output A4U1-7 turns on A4CR12. Since A4CR12 is an SCR, it remains conducting until the bias voltages are removed from the board. A4CR12 turns off A4Q2, which turns off A4Q3. This action removes the +12.5VM.

If the +5VM current limits or if the +12.5VM latches, the CPU and I/O voltages remain at their respective levels. The +30V (I/O) and -12VM do not have any overcurrent protection.

(HP 1000 M/E/F ERD)

## "B" Power Supply

### 4-3. Overvoltage Protection Circuits

Since the action of all the overvoltage protection circuits is the same, only the +5V (CPU) overvoltage protection circuit will be explained here.

When the output level of the +5V (CPU) reaches the value to cause A6CR9, a 5.62 volt zener, to conduct plus 0.7V to turn on A6CR18, the +5V (CPU) output is tied to ground by the SCR, A6CR18. This action produces an overcurrent condition and shuts down the supply just as if an overcurrent condition had occurred.

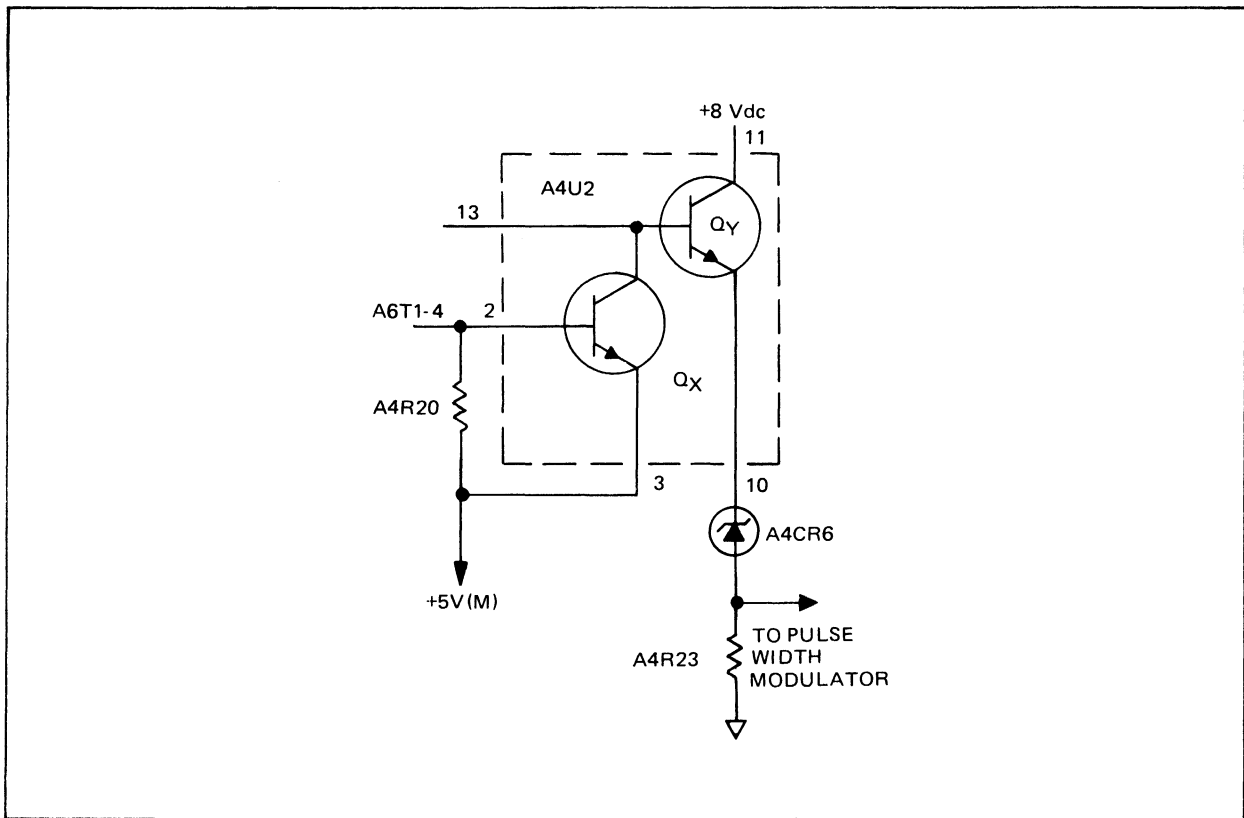


Figure 4-1. Partial Schematic of the Voltage Regulator A4U2

All voltages that have overvoltage protection convert an overvoltage condition into an overcurrent condition by shorting the output voltage to ground.

The +30V (I/O), -2V (CPU), and -12VM supplies do not have overvoltage protection circuits.

### 4-4. Overtemperature Protection Circuits

The overtemperature protection circuit consists of the Thermal Switch A6S1 on  
(HP 1000 M/E/F ERD)

## "B" Power Supply

the Mother Board. The thermal switch will open at 212 degrees F to shut down operation of the power supply. After cooling down to 162 degrees F, the switch will close and the power supply will continue operation.

When the thermal switch A6S1 opens due to an overtemperature condition, the inverting input A5U1D-10 is pulled high through R50. The noninverting input has a dc voltage of approximately +2.14 volts. Capacitor C16 acts as a noise filter, and when A5U1D-10 goes above +2.14V, the output A5U1D-13 goes low. This action applies a low level to A5U3-5 (noninverting input) causing A5U3-10 (output) to go to zero. The comparator's output A5U1-14 is forced to zero, reducing the pulse width and the duty cycle to zero, thus shutting down the power supply. When the temperature returns to normal, the thermal switch A6S1 closes and A5U1D-10 is grounded. The low level is removed from A5U3-5 when A5U1D-13 goes high as a result of A5U1D-10 being grounded, and the power supply returns to normal operation.

(HP 1000 M/E/F ERD)

The following definitions of signals are fundamental to the understanding of this section.

- PWU (Power Up) : This signal indicates that the ac line (mains) input voltage is at a level that will provide enough input energy to the power supply for it to supply all of the outputs at their maximum ratings. This signal "communicates with the CPU.
- PON (Power On) : This signal indicates that the +5V CPU and +5VM dc output voltages are operating. This signal "communicates" with the CPU.
- LPU (Line Power Up) : This is an OR tied signal that indicates the same things as the PWU signal. This is the basic signal for communicating from power supply to power supply, whereas the PWU signal communicates to the CPU.
- PSU (Power Supply Up) : This is an OR tied signal that indicates the same thing as the PON signal. This signal communicates from power supply to power supply.
- MLOST- (Memory Lost) : This signal indicates that the memory voltages are lost and not capable of sustaining the memory, therefore, memory is lost. This signal communicates with the CPU.
- MLO- (Memory Lost OR) : This is an OR tied signal that indicates the same thing as the MLOST- signal. This signal communicates from power supply to power supply.

#### 5-1. Power Up Sequence

The signals and timing involved during a power up sequence are shown in Figure 5-1. In a power up sequence the timing between PWU and PON is unimportant. PON should go high as soon as possible after all of the dc voltages are valid. When PON goes high, the CPU checks the status of the MLOST- signal. If MLOST- is high this means that the memory was not lost during a power down sequence, therefore, the CPU will not perform a clear memory routine. If MLOST- is low, the CPU will perform a clear memory routine. It is very important that MLOST- stay low for at least 50 us after PON goes high on a power up sequence (where memory was lost) so that the CPU has time to check the status of the MLOST- signal. If MLOST- went high as soon as PON went high, a clear memory routine

## "B" Power Supply

could not be initiated. The components that produce the 50 us delay for the MLOST- signal are A3C7 and A3R23 on the battery charger board. On a power up sequence with low battery voltage (below +12.5V), initially the +16.45V bus is low (below +12.5V). When the ac line (mains) power is applied the +16.45V bus goes high. The inverting input of A3U2A (pin 4) is at a lower voltage level than the noninverting input of A3U2A (pin 5). Therefore, the output of A3U2A (pin 2) is high. As A3C2 charges through A3R5 raising the voltage level at A3U2-4 to a value where A3U2-2 goes low. This action turns on A3Q5, A3Q7, and A3Q6. A3Q6 is a three terminal voltage regulator that supplies the internal bias voltages to the Battery Backup Board. Shortly after the bias voltages are applied to the Battery Backup Board, the +5VM is applied to J3-F and becomes valid. A3C7 and A3R23 provide a delay at A3U2-7. Therefore, as A3U2-7 goes high MLO- goes high, turning on A3Q10 and causing MLOST- to go high.

If a valid battery voltage had been present at the +16.45V bus, A3U2-2 would have remained low and the MLOST- and MLO- signals would have remained high. The circuitry for PON and PWU is found on the control board A3A5.

A5U4B monitors the voltage of the bias transformer T2 point "Y". A5R2 is adjusted so that A5U4-1 goes high when the ac line (mains) input voltage reaches 88 Vac. It may be noted that the voltage at point "Y" depends on the value of the ac line (mains) input voltage. When the line (mains) reaches 88 Vac, A5U4-1 goes high and turns on A5Q7. This action pulls LPU and PWU high. When PWU goes high, A5U4-14 goes high, and as soon as the +5V (CPU) tied to A5R19 at point "X" and the +5VM tied to A5R42 at J5-7 go high, then A5U4-2 goes high asserting PSU. This turns on A5Q17, A5Q18, and A5Q19, thus pulling PON high.

### 5-2. Power Down Sequence

The signals and timing involved for a power down sequence are shown in Figure 5-1. As can be seen from the figure, MLOST- is a "don't care" condition on a power down sequence. When the ac line (mains) input voltage is less than 88 Vac, that is, not high enough to maintain the power supply operation, A5U4-1 goes low. This pulls LPU and PWU low. The low PWU signal initializes a power fail routine and the CPU interrupts its operation to perform this routine. At this time it is important to notice that PWU is low and PON is high. This means that the ac line (mains) input is invalid, but that the dc voltages are still valid. As PWU goes low, A5U4-14 goes low. This pulls A5U4-5 low via a time delay developed by A5C12 and A5R22. This time delay is approximately 500 us and delays A5U4-2 from going low, causing PON and PSU to go low. The time delay of 500 us from PWU going low until PON goes low is long enough for the CPU to perform a power fail routine. The power fail routine is halted when PON goes low because about 50 us after PON goes low, the dc voltages are considered to be invalid. The reason the dc voltages can stay up as long as they do is because of the energy stored in the input capacitors, A6C12 and A6C13.

(HP 1000 M/E/F ERD)

## "B" Power Supply

### 5-3. Interconnections of the Power Supplies

When several power supplies are connected together, the LPU, PSU, and MLO- are all OR tied from power supply to power supply. Therefore, if any one of the signals goes low, it pulls the same signal low on all the power supplies (i.e., when LPU goes low on one power supply, it pulls LPU low on all the power supplies). When any of these signals go low, they in turn cause the signals in the supply that communicates with the CPU (PWU, PON, and MLOST-) to go low.

An example would be two supplies tied together and one supply lost ac line (mains) input power. If the supply that lost the ac line (mains) power was in an extender (memory or I/O), it would pull PWU low on the other supply that communicates with the CPU via LPU. This action would cause a power fail routine to be initiated.

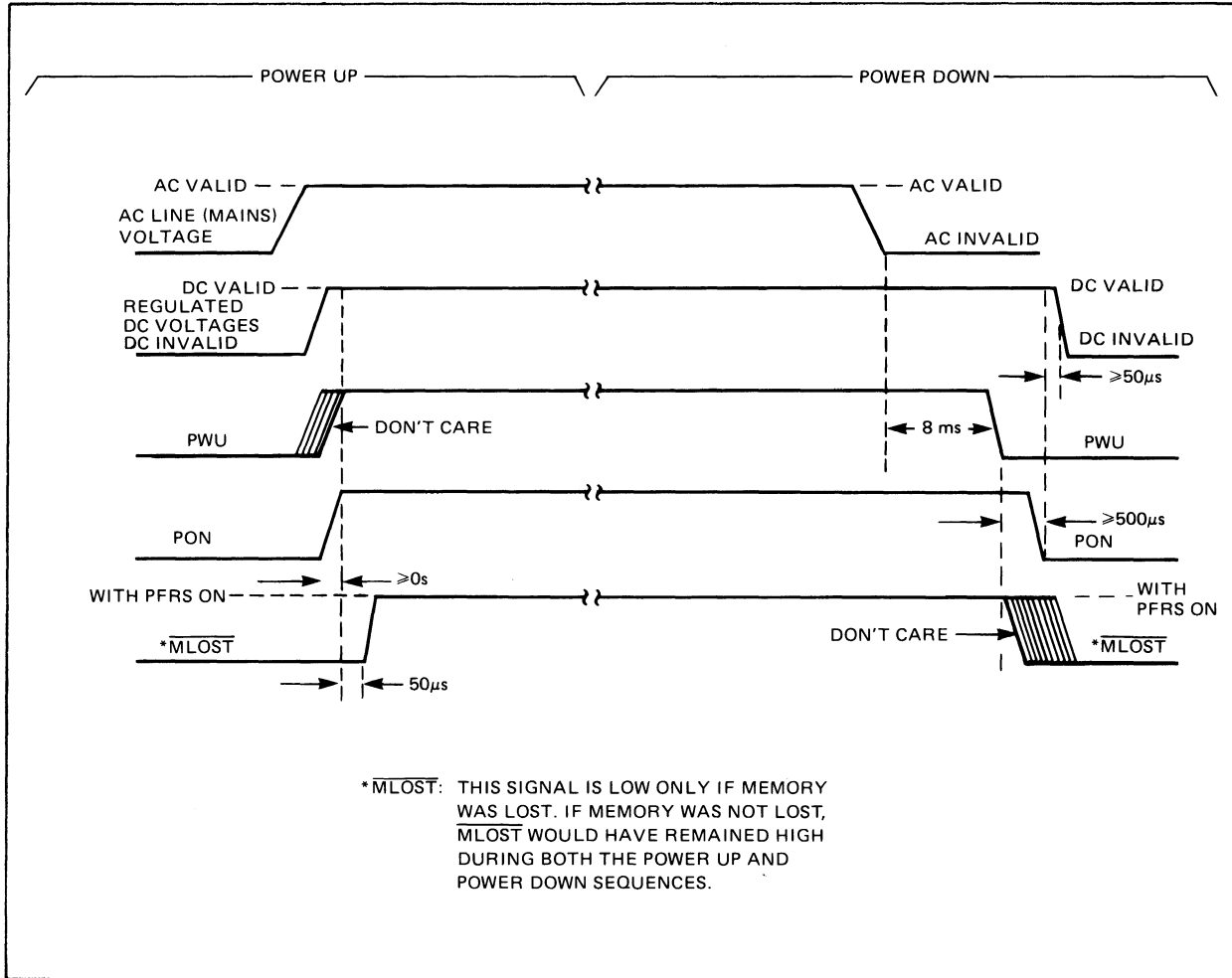


Figure 5-1. Signals and Timing Diagram for Power Up and Power Down Sequences

## "B" Power Supply

For simplification, Figure 5-2 shows the connections between a CPU power supply, a memory extender power supply, and an I/O extender power supply.

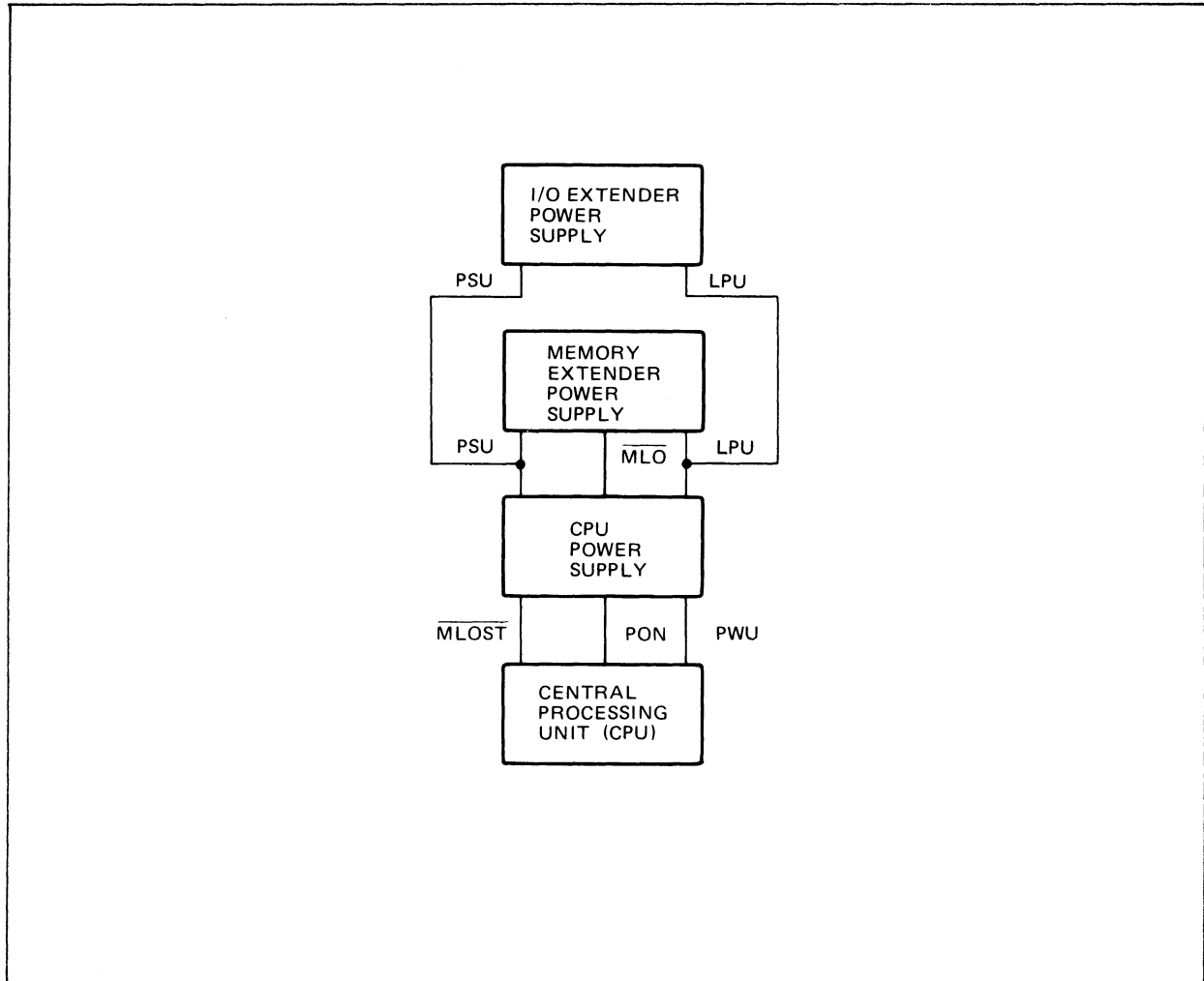


Figure 5-2. Interconnection of Power Supplies.

(HP 1000 M/E/F ERD)



POWER SUPPLY TROUBLESHOOTING	APPENDIX A
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This appendix contains the power supply trouble shooting flowchart and a parts location diagram. The flowchart can be used to isolate a failure to a particular subassembly. The parts location diagram also shows the location of the power supply adjustments.

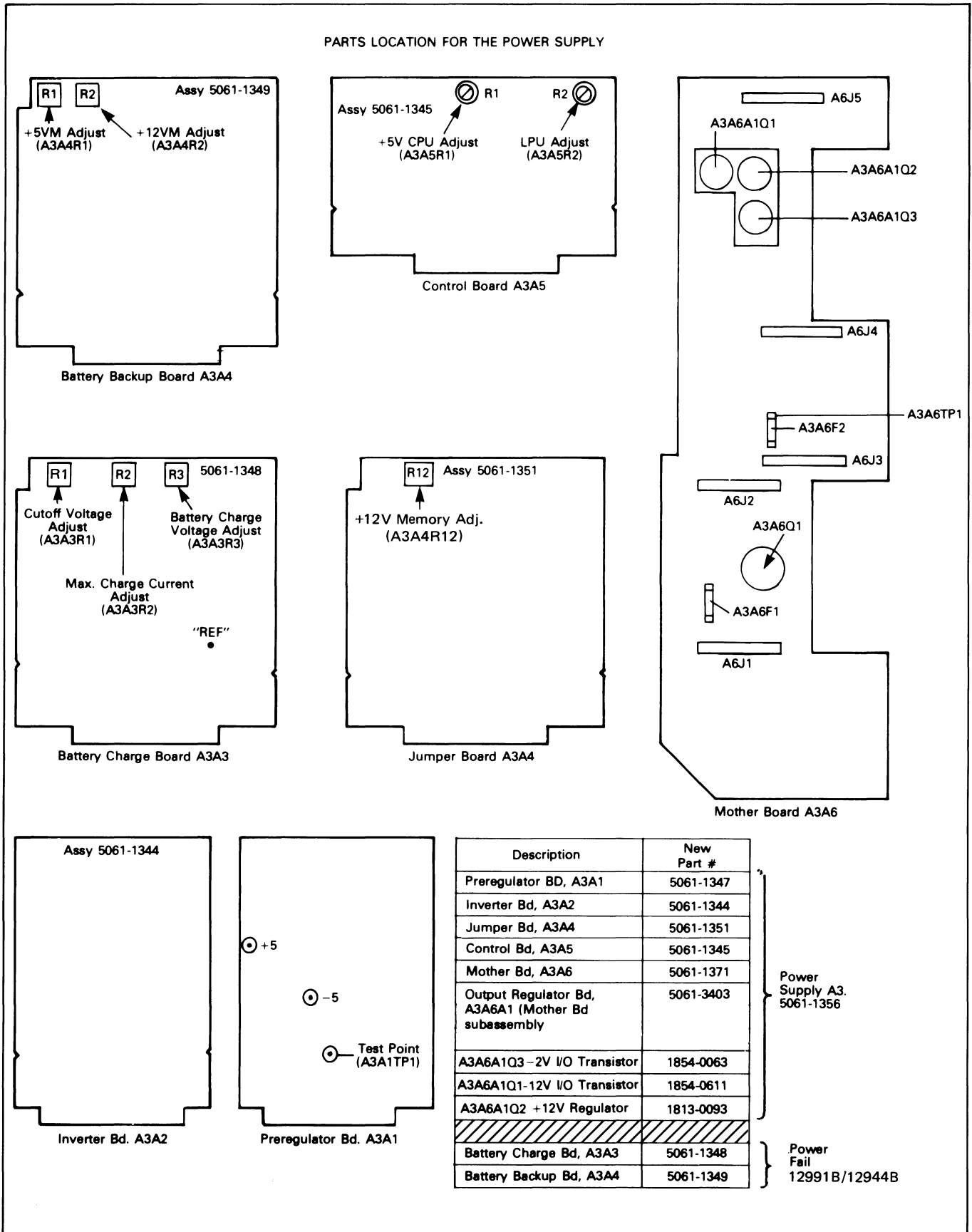
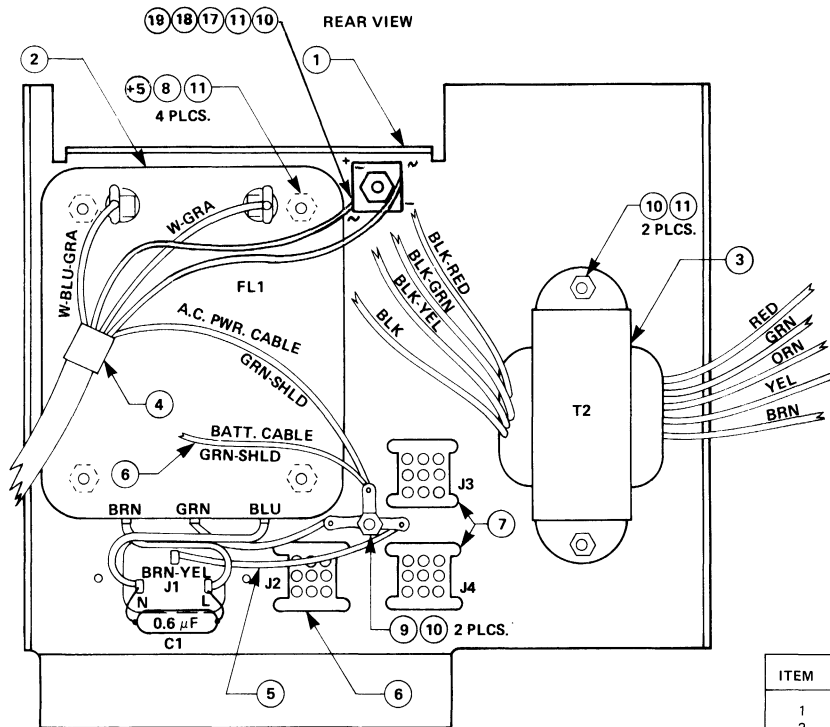


Figure A-1. Parts Location Diagram







ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	BACK PANEL	5001-2659
2	1	FILTER	9135-0097
3	1	TRANSFORMER	9100-3949
4	1	CABLE ASSY AC PWR	5061-1358
5	0.25'	WIRE - 18 GRN/YEL	8150-2919
6	1	BATT. CABLE ASSY.	5061-1357
7	1	CABLE ASSY. CONTROL	5061-1360
8	4	ACORN NUTS	0510-0110
9	2	LUG SOLDER	0360-0268
10	6	NUT HEX NO.	2420-0003
11	7	LOCKWASHER SPLIT NO. 6	2190-0851
12	1	INFO TAG	5001-2632
13	1	LABEL-WARNING	7120-4626
14	1	CAP 0.6 μF	0160-4413
15	8	WASHER FLAT # 6	3050-0228
16	1"	TUBING HEAT SHRINK	0890-1159
17	1	DIODE BRIDGE	1906-0225
18	4/R	THERMAL COMPD.	6040-0239
19	1	SCREW 6-32X.625	2360-0202

5061-1356 Power Supply Rear Panel Assembly  
5061-1350

"B" Model Power Supply Rear Panel Assembly Parts List (5061-1350)

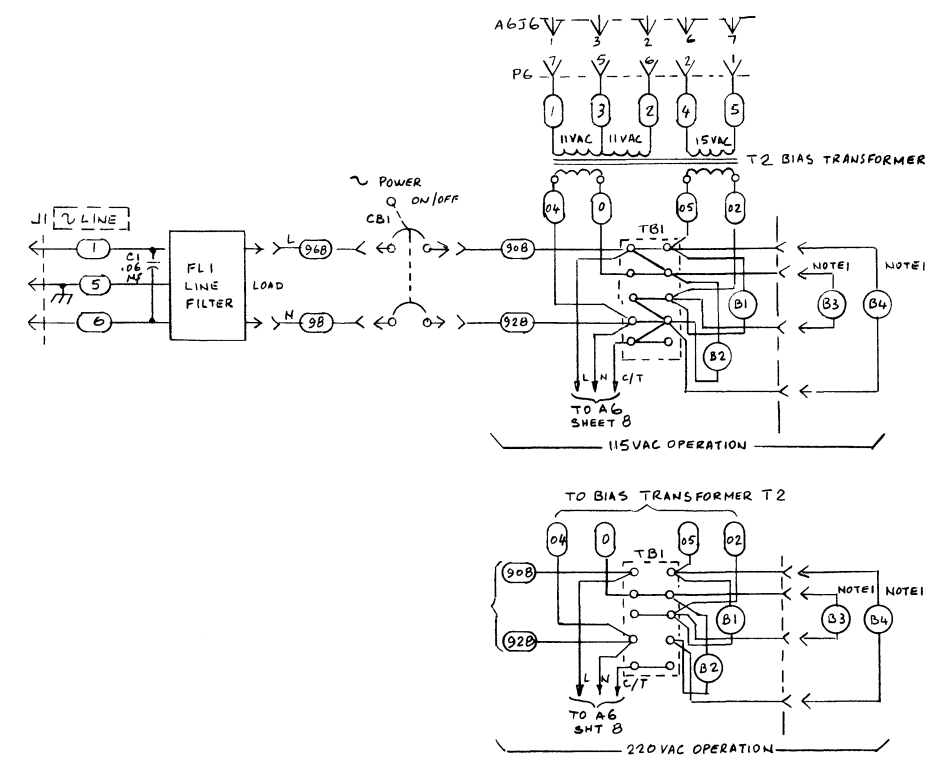
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	
01C1		CAPACITOR-FIXED		0160-4413		U	1	
		LUG SOLDER #6LKG		0360-0268		U	2	
		LUG CRP22-18RT6		0362-0321		U	4	
		NUT-CAP		0510-0110		U	4	
		TBG-HS 1.5 DIA		0890-1159		U	0.08	FT
		CONTACT FEMALE		1251-3411		U	5	
		CONN POST 7POS F		1251-4358		U	1	
		CA TIE 3.6L		1400-0249		U	5	
		DIODE BRDG 15A		1906-0225		U	1	
		LKWSHR 6 HEL		2190-0851		U	7	
		SCP #6-32X.625L		2360-0202		U	1	
		NUT 6-32 .250AF		2420-0003		U	6	
		WSHR #6 SS		3050-0228		U	8	
		PICTR-REAR PANEL		4040-1742		U	1	
		COMPOUND-THERMAL		6040-0239		U	0.01	LR
		LABEL-WARNING		7120-4626		U	1	
		LABEL-USA		7120-6830		L	1	
		WIRE 18 GRN-YEL		8150-2919		C	0.25	FT
		TRANSFORMER		9100-3949		U	1	
		FILTER-LINE		9135-0097		U	1	
		INFO TAG		5001-2632		W	1	
		PANEL-REAR,LCPS		5001-2659		W	1	
		ASSY-CABLE BATT		5061-1357		1	1	
		ASSY-CABLE AC		5061-1358		1	1	
		ASSY-CBL CONTROL		5061-1360		1	1	

REF. DWG: B-5061-1356-5 A.C. INPUT  
115/230 WIRING.

ENGINEERING RESPONSIBILITY																SEPIA	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	SYM	REVISIONS
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	A	AS ISSUED PER PLO-22-5704
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	B	ADD. NOTE 3

B-5061-1356-51

APPROVED	DATE
PPM	5/28/80



**WARNING.**  
HAZARDOUS VOLTAGES ARE PRESENT INSIDE THE POWER SUPPLY! BEFORE CHANGING FROM 110 VAC TO 220 VAC CONFIGURATION, OR VICE VERSA, SET ~ POWER AND BATTERY SWITCHES TO OFF AND DISCONNECT THE POWER CORD! FAILURE TO OBSERVE THIS PRECAUTION CAN RESULT IN SERIOUS INJURY.

**NOTES:**  
1. FANS B3 & B4 ARE REQUIRED ONLY FOR THE HP 2113 B, HP2112B, 2111F, 2117F  
2. ENCLOSED WIRE COLOR CODE ( ) CODE USED IS THE SAME AS THE RESISTOR COLOR CODE. FIRST NO. IDENTIFIES THE BASE COLOR, SECOND NO. IDENTIFIES THE WIDE STRIP AND THE THIRD NO. IDENTIFIES THE NARROW STRIP e.g. (947) DENOTES WHITE BASE, YELLOW WIDE STRIPE, AND VIOLET NARROW STRIPE.

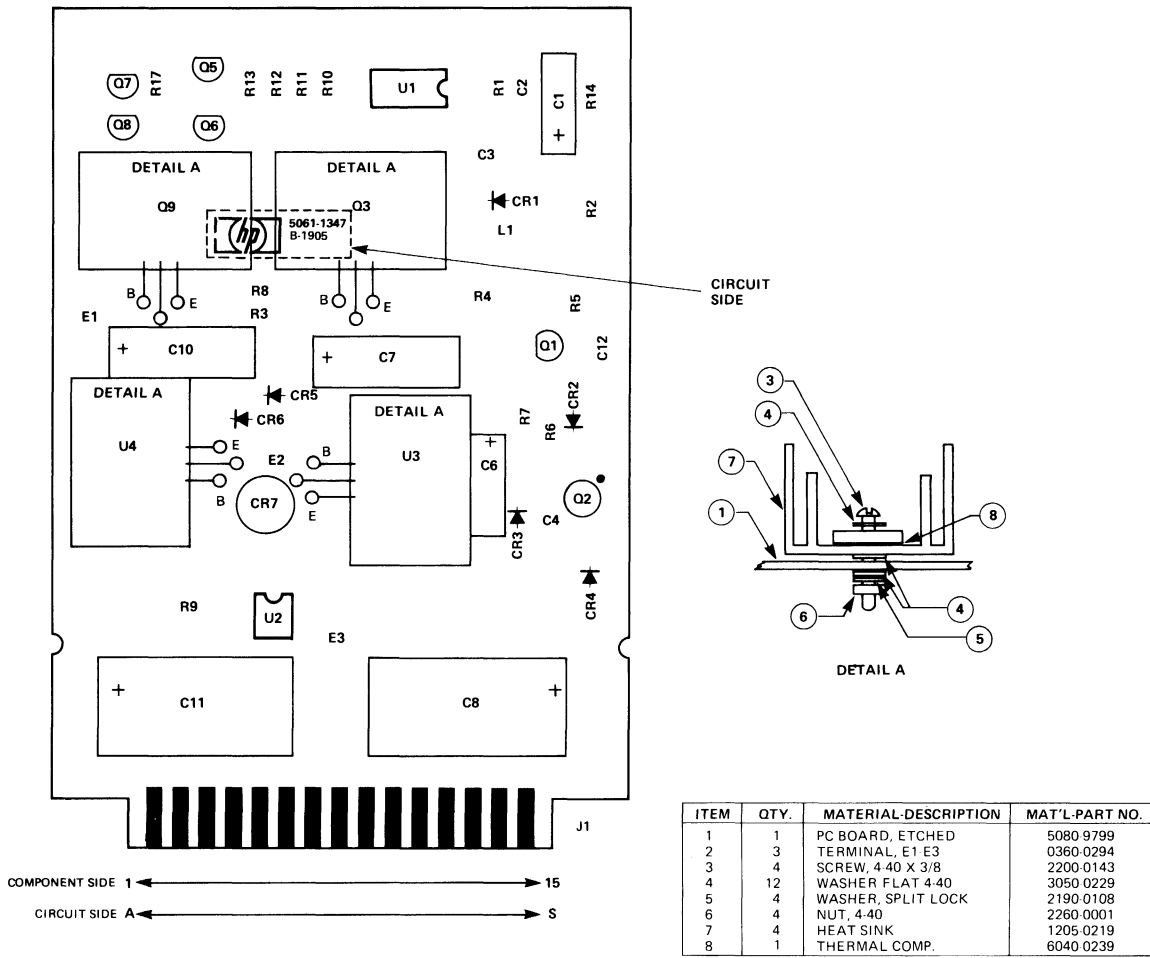
3 SEE ENGINEERING & REF. DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHEET NOS.

3 SHEET 10F10

L.C.P.S. LINE (MAINS) POWER DISTRIBUTION SCHEMATIC		HEWLETT  PACKARD	
TITLE		PART NUMBER	
NEXT ASSEMBLY		5061-1356	
FINISH		B-5061-1356-51	
SCALE		SHEET OF	







A1 Pre-regulator Assembly  
5061-1347

A1 Pre-regulator Assembly Parts List (5061-1347) Sht. 1 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
01C4		CAP .01UF		0160-2055		U	1
01C3		CAP 2.2UF 20%		0160-3901		U	1
01C2,12		CAPACITOR-FIXED		0160-5054		U	2
01C1,6		CAP 56UF 6VDC		0180-0548		U	2
00C7,10		CAP 120UF 10%		0180-2145		U	2
00C8		C-F 1500UF 16V		0180-2500		U	1
00C11		CAP 1000UF 16V		0180-2732		U	1
00E1-3		STUD SOLDER TERM		0360-0294		U	3
		ADH RTV CLEAR		0470-0251		U	0.01
01R12		RES 2.15K 1%.125		0698-0084		U	1
00R2		RES 23.7K 1%.125		0698-3158		D	1
01R13,17		RES 316 1%.125		0698-3444		D	2
00R7		RES 3.16K 1%.125		0757-0279		U	1
01R3,8,14		RES 100 1%.125		0757-0401		D	3
00R9		RES 110 1%.125		0757-0402		U	1
00R5,6		RES 511 1%.125		0757-0416		U	2
01R10,11		RES 619 1%.125		0757-0418		U	2

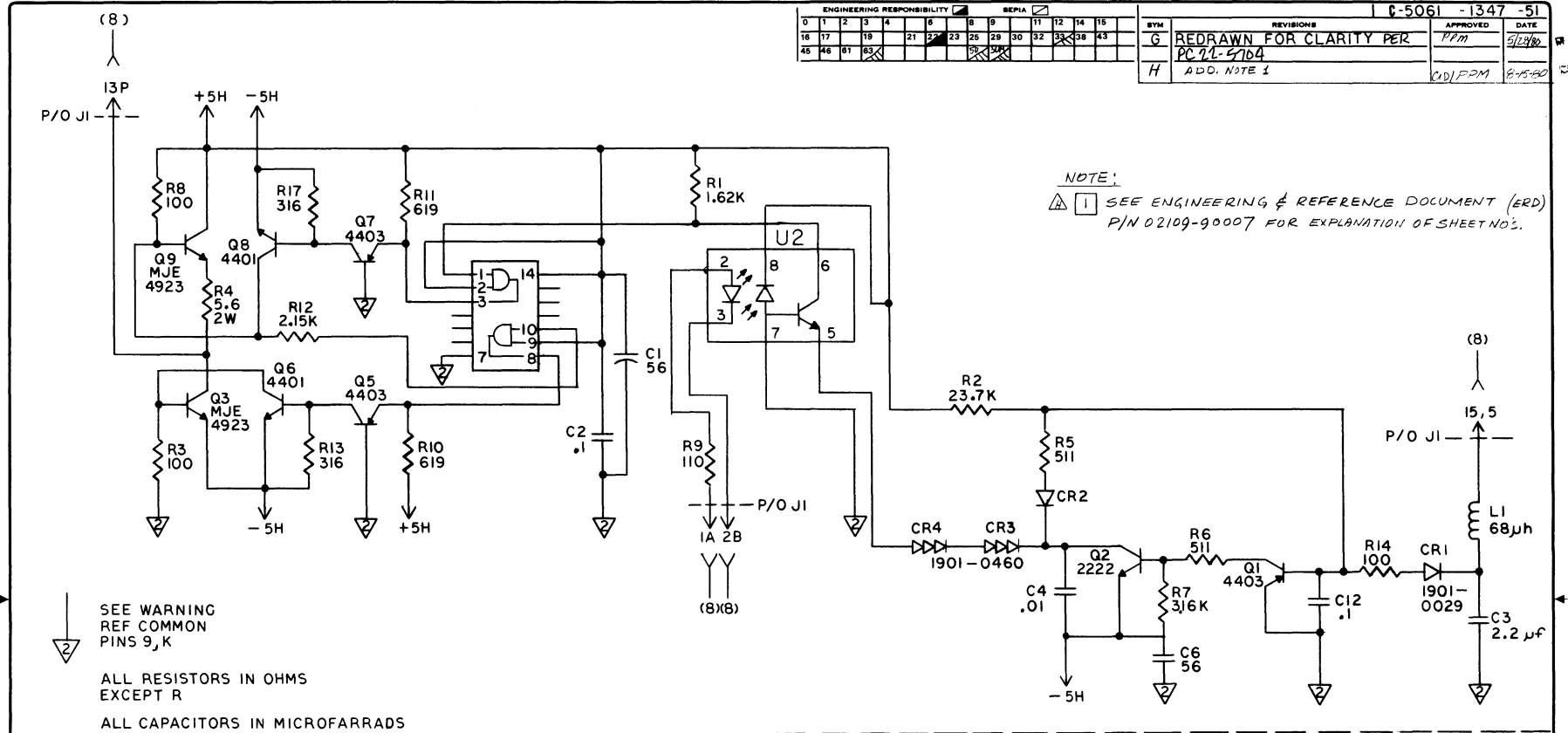
A1 Pre-regulator Assembly Parts List (5061-1347) Sht. 2 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00R1		RES 1.62K 1%.125		0757-0428		U	1
00R4		RES 5.6 5% 2W		0811-1675		U	1
		HT DIS PL PWR		1205-0219		U	4
00U1		IC SN74S 09 N		1820-1448		U	1
00U4		IC RGLTR +5V		1826-0144		U	1
00U3		IC LINEAR 5V		1826-0294		U	1
01G1,5,7		XSTR 2N4403 T092		1853-0271		U	3
00Q6,8		XSTR 2N4401 T092		1854-0467		U	2
00Q2		XSTR 2N2222AT018		1854-0477		U	1
00Q3,9		XSTR MJE4923		1854-0683		U	2
00CR1		DIODE 1N2071		1901-0029		D	1
01CR2		DIODE SIL		1901-0040		D	1
01CR3,4		STABISTOR STR523		1901-0460		D	2
00CR5		DIODE 1N4936		1901-1065		D	1
00CR6		DIODE 1N5817		1901-1080		D	1
00CR7		DIODE-FW BRIDGE		1906-0051		U	1
00U2		OPTO ISOLATOR		1990-0444		U	1
		LKWSHR 4 HEL		2190-0108		U	4
		SCR #4-40X.375L		2200-0143		U	4
		NUT 4-40 .250AF		2260-0001		U	4

A1 Pre-regulator Assembly Parts Lists List (5061-1347) Sht. 3 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	U O C	QUANTITY PER
00L1		WSHR #4 SS		3050-0229		U	12
		COMPOUND-THERMAL		6040-0239		U	0.01
		LABEL-USA		7120-6830		L	1
		COIL-FXD 68UH		9100-1633		U	1

ENGINEERING RESPONSIBILITY															REVISIONS					DATE	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	G		REDRAWN FOR CLARITY PER	PPM	5/24/80	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	H		PC 76-5704			
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	H		ADD. NOTE 1	(18) PPM	8-15-80	



NOTE:  
 [ ] SEE ENGINEERING & REFERENCE DOCUMENT (ERD)  
 P/N 02109-90007 FOR EXPLANATION OF SHEET NO'S.

SEE WARNING  
 REF COMMON  
 PINS 9, K

ALL RESISTORS IN OHMS  
 EXCEPT R

ALL CAPACITORS IN MICROFARRADS

+5H AND -5H REFERENCED TO REF COMMON

**WARNING**

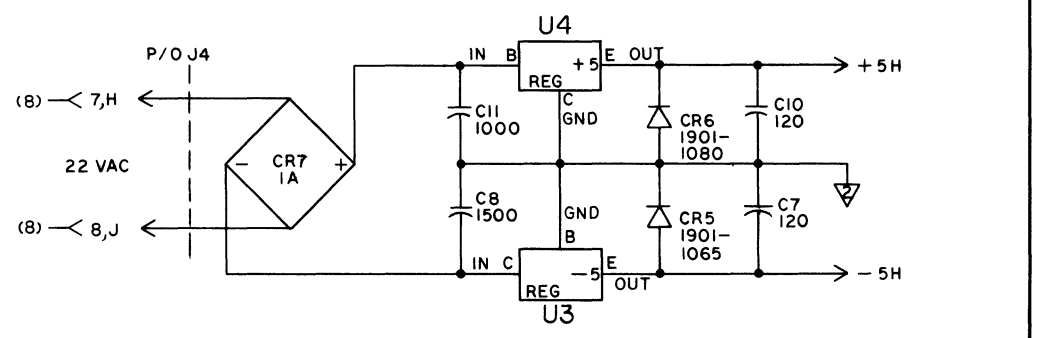
HAZARDOUS VOLTAGES ARE PRESENT INSIDE THE POWER SUPPLY BEFORE CHANGING FROM 110 VAC TO 220 VAC CONFIGURATION OR VICE VERSA. SET POWER AND BATTERY SWITCHES TO OFF AND DISCONNECT THE POWER CORD. FAILURE TO OBSERVE THIS PRECAUTION CAN RESULT IN SERIOUS INJURY.

**WARNING**

DO NOT CONNECT REF COMMON TO GROUND (GND) AS THERE IS APPROXIMATELY 150 VOLTS DIFFERENCE.

**CAUTION**

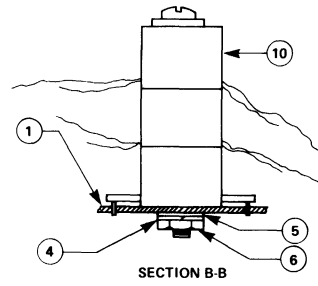
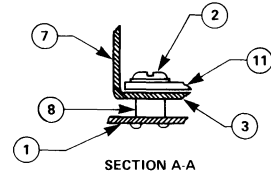
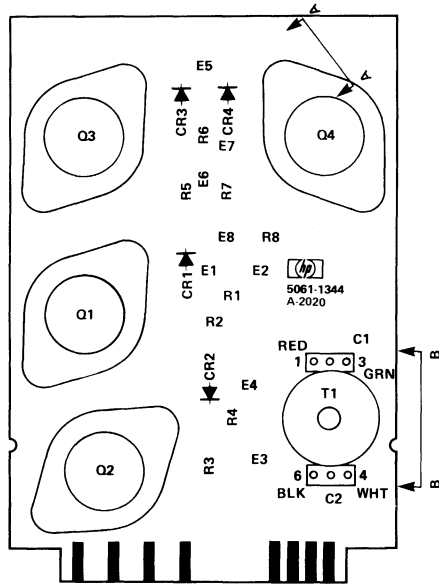
ANY MEASUREMENTS USING REF COMMON MUST BE MADE USING TEST INSTRUMENTS WITH A FLOATING INPUT.



9-27-79	PRE-REGULATOR	HEWLETT	PACKARD
DATE	BOARD POWER		
5/28/80	SUPPLY		
	LCPS		
5/8/80	5061-1356	5061-1347	
	NEXT ASSEMBLY	PART NUMBER	
76	NONE	NONE	C-5061-1347-51
	FINISH	SCALE	

STOCK NO. 9280-0003 PRINTED ON DIEPAP NO. 102010 CLEARPRINT FADEOUT





ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	P.C. BOARD, ETCHED	5080-9796
2	8	SCREW 6-32 X 3/8 WITH LK	2360-0119
3	1	COMPOUND-THERMAL	6040-0239
4	1	LOCK WASHER # 4	2190-0108
5	1	FLAT WASHER # 4	3050-0229
6	1	NUT 4-40	2260-0001
7	4	HEAT SINK TO-3	1205-0312
8	8	STAND OFF	0380-0745
9	8	TERMINAL E1-E8	0360-0294
10	1	XFORMER	9100-2951
11	4	XSTR (TO-3)	1854-0869

WIRE LIST		
RED	(LONG)	E7
RED	(SHORT)	E8
GREEN	(LONG)	E1
GREEN	(SHORT)	E2
WHITE	(LONG)	E6
WHITE	(SHORT)	E5
BLACK	(LONG)	E3
BLACK	(SHORT)	E4

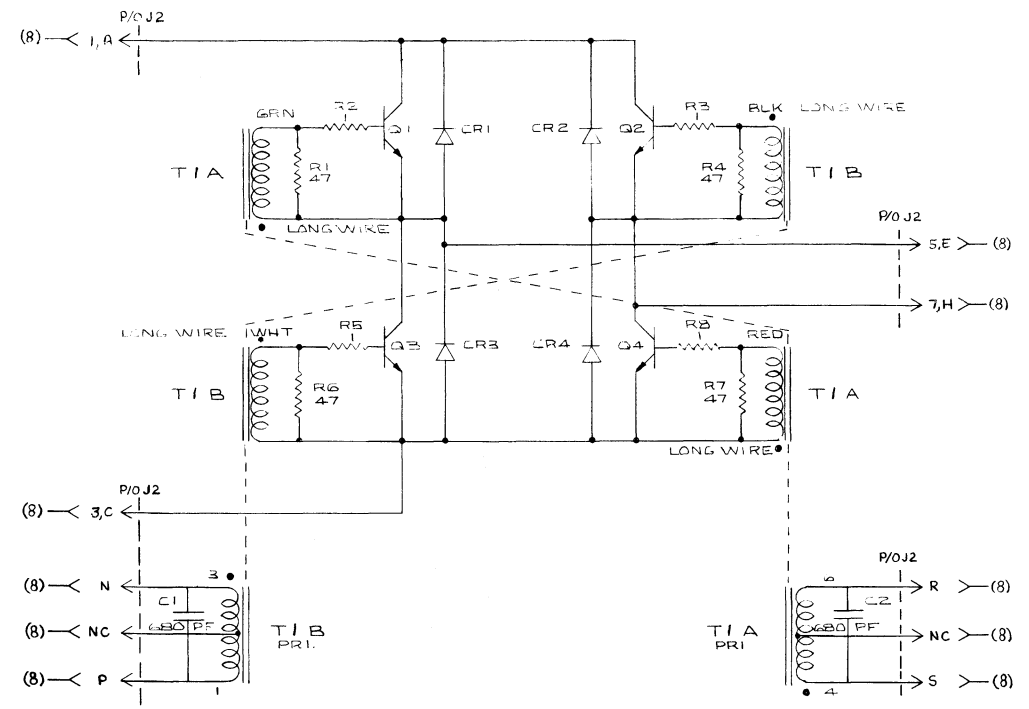
A2 Inverter Assembly Parts List (5061-1344)

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
	00C1,2	CAP 680PF 10%		0160-3573		U	2
	00F1-8	STUD SOLDER TERM		0360-0294		U	8
	00E9-16	SPCR TAP #6X.187		0380-0745		U	8
	01R1,4,6,7	RES 47 5% .25		0683-4705		U	4
	01R2,3,5,8	RES 1 10% .40W		0811-3438		U	4
		HEAT SINK		1205-0312		U	4
	01Q1-4	XSTR NPN T03 10A		1854-0869		U	4
	00CR1-4	DIODE 1N4936		1901-1065		D	4
		LKNSHR 4 HEL		2190-0108		U	1
		NUT 4-40 .250AF		2260-0001		U	1
		SCR #6-32X.437L		2360-0119		U	8
		WSHR #4 SS		3050-0229		U	1
		LABEL-USA		7120-6830		L	1
	00T1	XFORMER		9100-2951		U	1



ENGINEERING RESPONSIBILITY															SEPIA		
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

SYM	REVISIONS	APPROVED	DATE
		A	AS ISSUED
B	ADD. WIRE TO T1A	[Signature]	10/1/64
C	ADD. WIRE TO T1B	[Signature]	10/1/64
D	Q1,2,3,4 WERE 182-022 IN SERVO	[Signature]	10/1/64
E	ADD. NOTE 1	[Signature]	10/1/64



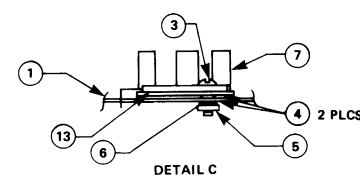
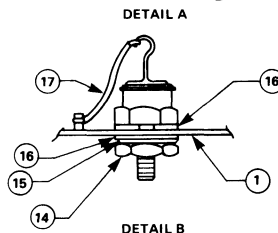
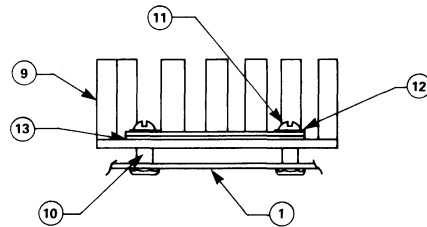
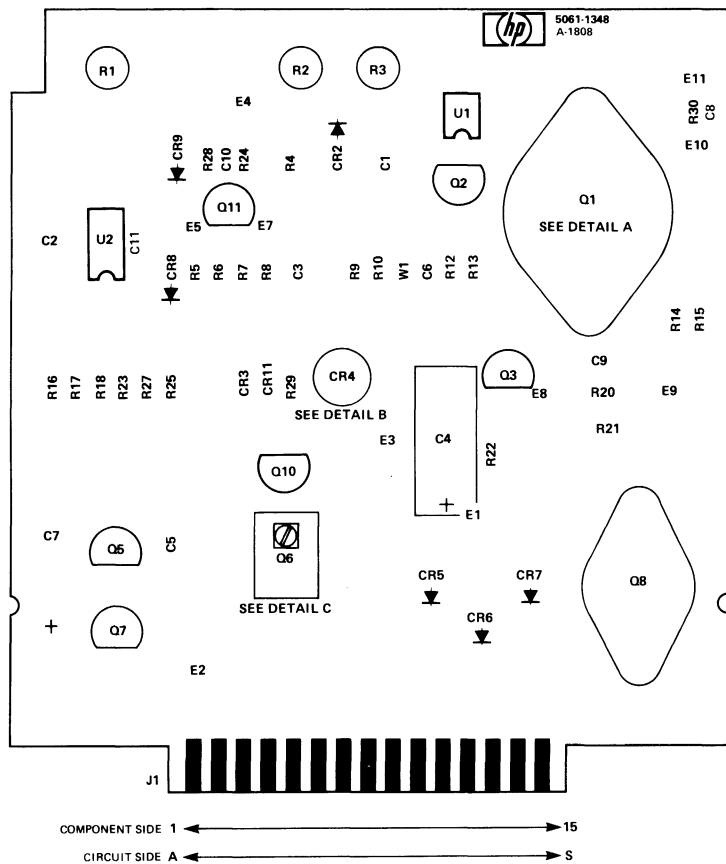
- Q1, 2, 3, 4 182-022
- CR1, 2, 3, 4 1901-1065
- R2, 3, 5, 8 0811-3438
- R1, 4, 6, 7 0683-4705
- C1, 2 0160-3573
- T1 9100-2951

**NOTE:**  
 SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHEET NO'S.

INVERTER BD.		HEWLETT PACKARD	
POWER SUPPLY		A3A2	
TITLE	A3A2	NEXT ASSEMBLY	5061-1356
PART NUMBER 5061-1344		SCALE	
C-5061-1344-51		SHEET 1 OF 1	

STOCK NO. 9280-0003 PRINTED ON DISPO NO. 102016 CLEARPRINT FABRIQUET





ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	P.C. BOARD ETCHED	5080-9800
2	3	TERMINAL, E1-3	0360-0294
3	2	# 4.40 x 3/8 SCREW	2200-0143
4	2	# 4.40 WASHER, FLAT	3050-0229
5	1	# 4.40 NUT	2260-0001
6	1	LK WASHER 4 HEL	2190-0108
7	1	HEATSINK	1205-0219
8	-	-	-
9	-	-	-
10	4	SPACER	0380-0305
11	2	SCREW	2360-0117
12	-	DELETED	-
13	.05TB	THERMAL COMPOUND	6040-0239
14	1	NUT	2740-0002
15	1	WASHER, LOCK	2190-0034
16	2	WASHER, FLAT	3050-0236
17	2.5"	WIRE 18 GA. YEL	8150-0577
18	2	SCREW 6-32 x .250 LG	2360-0113
19	1	JUMPER W1	8159-0005
20	8	STUD SOLD. TERM. E4-E11	0360-0474
21	1	EYELET	0361-1076

\* A3 Battery Charger (PFRS) Assembly  
5061-1348

A3 Battery Charger (PFRS) Assembly Parts List (5061-1348) Sht. 1 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
01							
03							
05							
07							
01C10		CAP 0.1UF		0150-0121		U	1
01C11		CAP .1UF 20% 50V		0160-0576		U	1
00C1		CAP .01UF		0160-2055		U	1
01C8,9		CAPACITOR .01MF		0160-3451		U	2
01C4		CAP 100UF 20%		0180-0098		U	1
00C2		CAP 6.8UF 10%		0180-0116		U	1
01C3,5,6		CAP 1UF 10%		0180-0291		U	3
00C7		CAP 330UF 10%		0180-1714		U	1
00F1-3		STUD SOLDER TERM		0360-0294		U	3
01F4-11		STUD SOLDER TERM		0360-0474		U	8
		EYELET		0361-1076		U	1
		SPCR TAP #6X.125		0380-0305		U	4
		ADHESIVE		0470-0409		U	0.01
00R6		RES 470K 5% .25		0683-4745		U	1
00R24		RES 2.15K 1%.125		0698-0084		U	1
00R25		RES 2.61K 1%.125		0698-0085		U	1
00R10		RES 3.83K 1%.125		0698-3153		U	1
		RES 23.7K 1%.125		0698-3158		D	1

A3 Battery Charger (PFRS) Assembly Parts List (5061-1348) Sht. 2 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
				0698-3158			
00R27							
		RES 26.1K 1%.125		0698-3159		D	1
00R18							
		RES 46.4K 1%.125		0698-3162		U	2
00P7,16							
		RES 348 1% .50		0698-3403		U	1
00R20							
		RES 287 1%.125		0698-3443		U	1
00R29							
		RES 261K 1%.125		0698-3455		U	1
00R5							
		RES 287K 1%.125		0698-3456		U	1
01R8							
		RES 1.21K 1%.125		0757-0274		U	1
00R28							
		RES 3.16K 1%.125		0757-0279		U	1
00R12							
		RES 1K 1%.125		0757-0280		U	1
00R15							
		RES 1.33K 1%.125		0757-0317		U	2
00R4,23							
		RES 100 1%.125		0757-0401		D	1
00R14							
		RES 511 1%.125		0757-0416		D	2
01R13,22							
		RES 750 1%.125		0757-0420		U	1
00R9							
		RES 10K 1%.125		0757-0442		D	1
01R17							
		RES 11K 1%.125		0757-0443		U	1
01R30							
		RES .27 5% 2W		0811-1659		U	1
00R21							
		HT DIS PL PWR		1205-0219		U	1
		HT DIS TO-3		1205-0289		U	1

A3 Battery Charger (PFRS) Assembly Parts List (5061-1348) Sht. 3 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
0006		IC 7808C		1826-0146		U	1
0002		I.C. MC 3302		1826-0174		U	1
0001		IC UA 741C		1826-0271		U	1
0103,5,11		XSTR 2N4403 T092		1853-0271		U	3
0001		XSTR 2N4398 T03		1853-0421		U	1
0008		XSTR 2N3766 T066		1854-0259		U	1
0102,7,10		XSTR 2N4401 T092		1854-0467		U	3
0108,11		DIODE SIL		1901-0040		D	2
0004		DIODE		1901-1062		U	1
0105-7		DIODE		1901-1086		U	3
0003		DIODE		1902-0064		D	1
0002		Di0-ZNR 1N827		1902-0680		D	1
0009		DIODE 2.37V 5%		1902-3002		U	1
0002		RES 5KOHM 10%		2100-3207		U	1
0003		RES VAR 500 OHM		2100-3351		U	1
0101		RES 50KOHM 10%		2100-3354		U	1
		LKWSHR 10 HEL		2190-0034		U	1
		LKWSHR 4 HEL		2190-0108		U	1
		SCR #4-40X.375L		2200-0143		U	2
		NUT 4-40 .250AF		2260-0001		U	1

A3 Battery Charger (PFRS) Assembly Parts List (5061-1348) Sht. 4 of 4

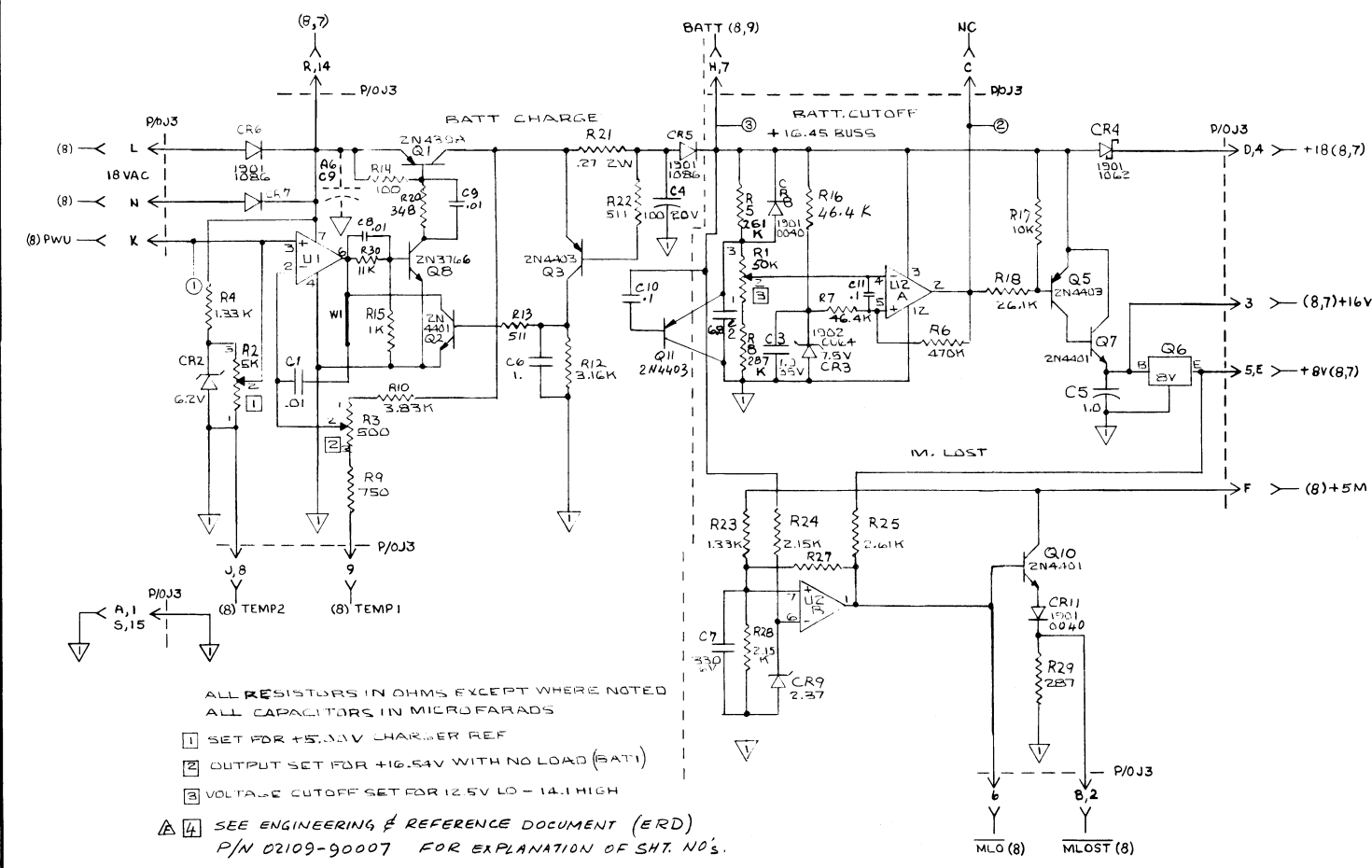
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	U O C	QUANTITY PER
		SCR #6-32X.250L		2360-0113		U	2
		SCR #6-32X.375L		2360-0117		U	2
		NUT 10-32 .375AF		2740-0002		U	1
		WSHR #4 SS		3050-0229		U	2
		WSHR #10 BRS		3050-0236		U	2
		DUPE ORN		6010-0015		U	0.001
		COMPOUND-THERMAL		6040-0239		U	0.05
		LABEL-USA		7120-6830		L	1
		WIRE 18 YEL		8150-0577		C	0.21
		WIRE JUMPERS		8159-0005		D	1
01W1							





ENGINEERING RESPONSIBILITY														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45

REV	REVISIONS	APPROVED	DATE
A	AS ISSUED	RF RB	10/30/76
B	PCO-22-5104 ADD. SHT. 6 OF 10	CP/CM3	10/19/77
C	PCO-22-4350, ADD. C8, C9, C10, R11, W1, W2, R30. DELETED CR1, R11. DATE CODE 151742	CP/CM3	11/14/77
D	PCO-22-4522, ADD. C11, DATE CODE 151800	CP/CM3	3-13-78
E	PCO-22-5104 ADD. SHT. 6 OF 10	CP/CM3	6/27/80
F	ADD. NOTE 4	CP/CM3	8-15-80



ALL RESISTORS IN OHMS EXCEPT WHERE NOTED  
 ALL CAPACITORS IN MICROFARADS

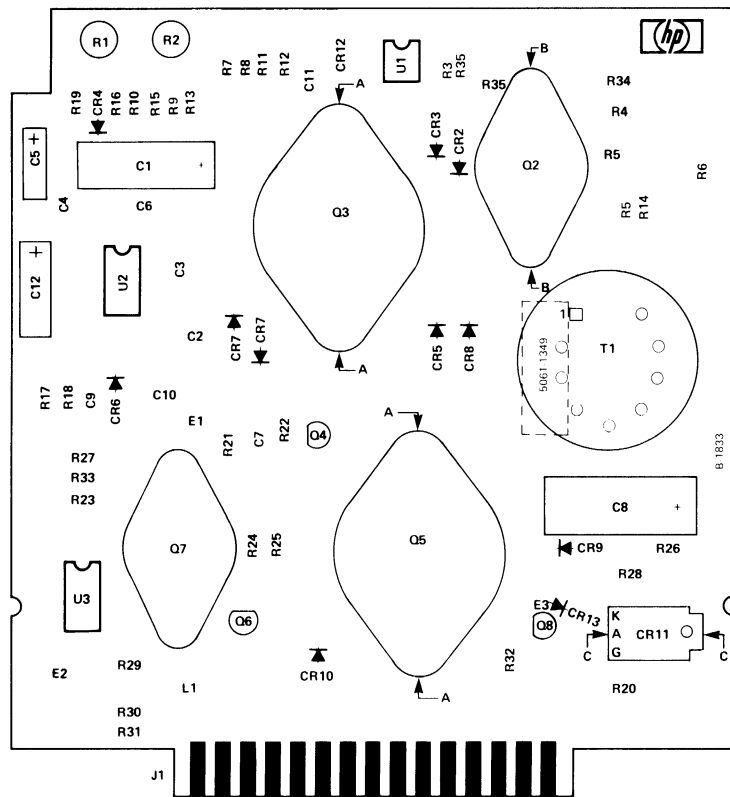
1 SET FOR +5.00V CHARGER REF  
 2 OUTPUT SET FOR +16.54V WITH NO LOAD (BAT1)  
 3 VOLTAGE CUTOFF SET FOR 12.5V LO - 14.1 HIGH

4 SEE ENGINEERING REFERENCE DOCUMENT (ERD)  
 P/N 02109-90007 FOR EXPLANATION OF SHT. NO'S.

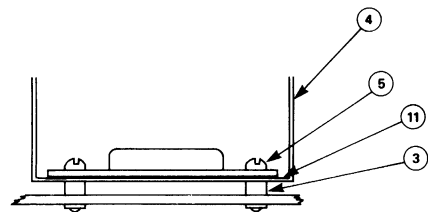
BATTERY CHARGER BOARD (PFRS)		HEWLETT-PACKARD	
TITLE 12944B 12991B		PART NUMBER 5061-134B	
NEXT ASSEMBLY		SCALE	
FINISH		C-5061-134B-51	

STOCK NO. 880-0003 PRINTED ON DIEPO NO. 1020-10 CLEARPRINT PAPER

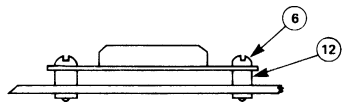




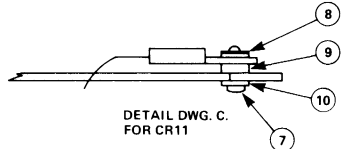
COMPONENT SIDE 1 ← → 15  
 CIRCUIT SIDE A ← → S



DETAIL DWG. A  
FOR Q3, 5



DETAIL DWG. B.  
FOR Q2, 7



DETAIL DWG. C.  
FOR CR11

ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	BOARD ETCHED	5081 2301
2	3	TERMINAL E1, E2, E3	0360 0474
3	4	SPACER	0380 0305
4	2	HEATSINK	1205 0289
5	4	SCREW 6 32 x .438	2360 0117
6	4	SCREW 4 40 x .25	2200 0103
7	1	SCREW	2200 0143
8	1	NUT	2260 0009
9	1	WASHER FLAT	3050 0229
10	1	WASHER-FIBER	3050 0080
11	05TB	THERMAL COMP.	6040 0239
12	4	SPACER	0380 0886
13		DELETED	
14	1.2"	WIRE	8150 3426
15		DELETED	

\* A4 Battery Backup Assembly  
5061-1349

A4 Battery Backup Assembly Parts List (5061-1349) Sht. 1 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00C7		CAP .0022UF 10%		0160-0154		U	1
01C4,9,11		CAP .1UF 20% 50V		0160-0576		U	3
00C3		CAP 100PF 5%		0160-2204		U	1
00C10		CAP 1500PF 5%		0160-2222		U	1
00C6		CAP 5000PF 10%		0160-3458		U	1
00C2		CAP .05UF-20+80%		0160-3460		U	1
00C1,8'		CAP 100UF 20%		0180-0098		U	2
00C5		CAP 1UF 10%		0180-0291		U	1
00C12		CAP 39UF 10%		0180-0393		D	1
01E1-3		STUD SOLDER TERM		0360-0474		U	3
		SPCR TAP #6X.125		0380-0305		U	4
		STANDOFF		0380-0886		U	4
		ADHESIVE		0470-0409		U	0.01
00R16		RES 2.15K 1%.125		0698-0084		U	1
00R9		RES 2.61K 1%.125		0698-0085		U	1
00R10		RES 3.83K 1%.125		0698-3153		U	1
00R19		RES 4.64K 1%.125		0698-3155		D	1
		RES 14.7K 1%.125		0698-3156		D	1

A4 Battery Backup Assembly Parts List (5061-1349) Sht. 2 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
00P12				0698-3156			
00P7		RES 19.6K 1%.125		0698-3157		U	1
00P28		RES 22 5% 2W		0698-3609		U	1
00R6		RES 120 5% 2W		0698-3622		U	1
00R4,34 01 3		RES 1K 1%.125		0757-0280		U	3
00P26		RES 42.2 1%.125		0757-0316		U	1
01R14,24		RES 100 1%.125		0757-0401		U	2
01R22,32		RES 511 1%.125		0757-0416		U	2
00R33		RES 5.11K 1%.125		0757-0438		U	1
01R8,17,18,21,23,27 03 30,31		RES 10K 1%.125		0757-0442		U	8
00P29		RES 20K 1%.125		0757-0449		U	1
00F13		RES 51.1K 1%.125		0757-0458		U	1
00R35		RES 100K 1%.125		0757-0465		U	1
00R15,11		RES 1.47K 1%.125		0757-1094		U	2
00R5		RES .05 10% 3W		0811-1826		U	1
01P20		RES .07 5% 5W PW		0811-3174		U	1
01R25		RES 1 10% .40W		0811-3438		U	1
		HT DIS IO-3		1205-0289		U	2

A4 Battery Backup Assembly Parts List (5061-1349) Sht. 3 of 4

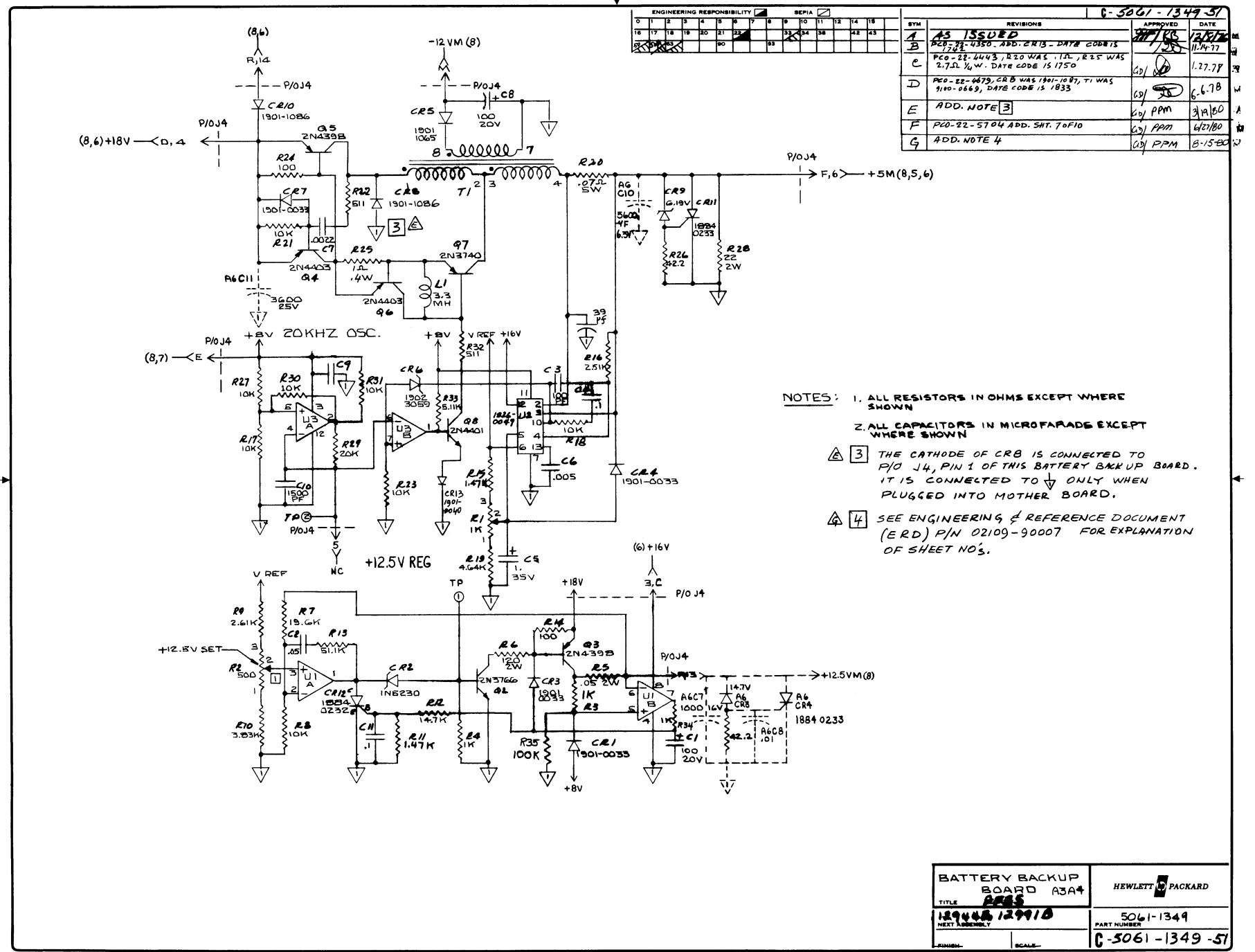
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
00U2		IC V REG		1826-0049		U	1
00U1		IC MC1458 P1		1826-0139		U	1
00U3		I.C. MC 3302		1826-0174		U	1
00G7		XSTR 2N3740 T066		1853-0052		U	1
00Q4,6		XSTR 2N4403 T092		1853-0271		U	2
00Q3,5		XSTR 2N4398 T03		1853-0421		U	2
00Q2		XSTR 2N3766 T066		1854-0259		U	1
00Q8		XSTR 2N4401 T092		1854-0467		U	1
00CR12		SCR 2N5062		1884-0232		U	1
00CR11		THYRISTOR SCR		1884-0233		U	1
01CR1,3,4,7		RECTIFIER SIL		1901-0033		U	4
01CR13		DIODE SIL		1901-0040		D	1
00CR5		DIODE IN4936		1901-1065		D	1
00CR8,10		DIODE		1901-1086		U	2
00CR9		DIODE 6.19V		1902-0049		U	1
00CR6		DIODE 3.83V		1902-3059		U	1
00CR2		DIODE 4.64V		1902-3082		U	1
00R2		RES VAR 500 OHM		2100-3351		U	1
		RES VAR 1K 10%		2100-3352		U	1

A4 Battery Backup Assembly Parts List (5061-1349) Sht. 4 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
00R1				2100-3352			
		SCR 4-40X.25		2200-0103		U	4
		SCR #4-40X.375L		2200-0143		U	1
		NUT 4-40 W/LK		2260-0009		U	1
		SCR #6-32X.375L		2360-0117		U	4
		WSHR #5		3050-0080		U	1
		WSHR #4 SS		3050-0229		U	1
		COMPOUND-THERMAL		6040-0239		U	0.01
		LABEL-USA		7120-6830		L	1
		WIRE 30AWG WHT		8150-3426		C	0.10
00L1		COIL CHK 3300UH		9100-1665		U	1
01T1		TRANSFORMER-PULS		9100-4069		U	1







ENGINEERING RESPONSIBILITY		REVISIONS		APPROVED	DATE
0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17
18	19	20	21	22	23
24	25	26	27	28	29
30	31	32	33	34	35
36	37	38	39	40	41
42	43	44	45	46	47
48	49	50	51	52	53
54	55	56	57	58	59
60	61	62	63	64	65
66	67	68	69	70	71
72	73	74	75	76	77
78	79	80	81	82	83
84	85	86	87	88	89
90	91	92	93	94	95
96	97	98	99	100	101

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED	[Signature]	11/17/77
B	PCO-22-4350 ADD. CR13 - DATA CODES IS 1751	[Signature]	11/17/77
C	PCO-22-4443, R20 WAS 1.5K, R25 WAS 2.7K 1/4W. DATE CODE IS 1750	[Signature]	1.27.78
D	PCO-22-4473, CR6 WAS 1901-1087, T1 WAS 110-0669, DATE CODE IS 1833	[Signature]	6.6.78
E	ADD. NOTE 3	[Signature]	3/18/80
F	PCO-22-5704 ADD. SMT. 70F10	[Signature]	6/27/80
G	ADD. NOTE 4	[Signature]	8-15-80

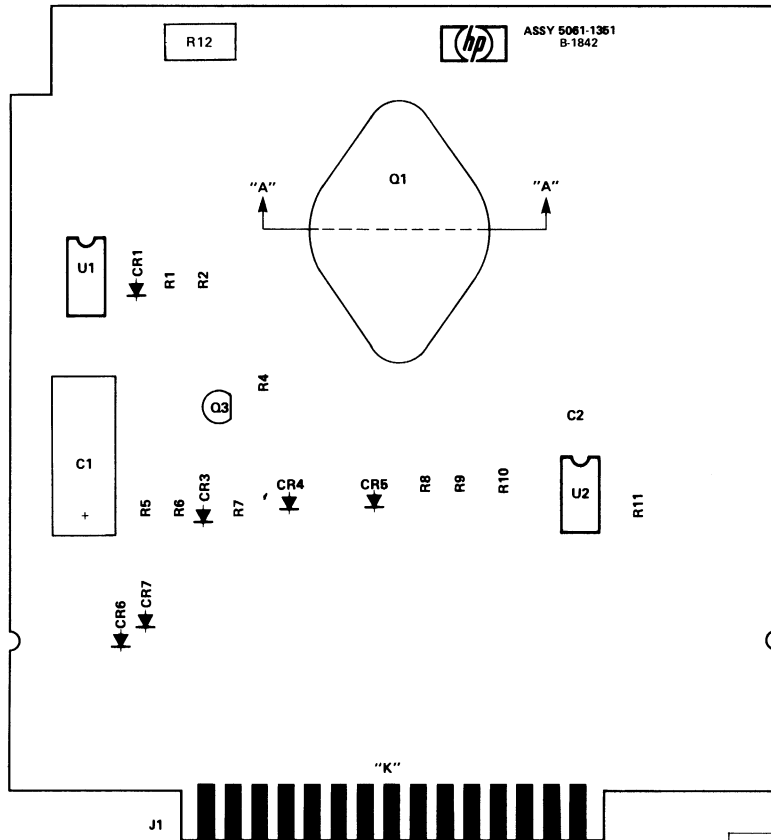
NOTES:

1. ALL RESISTORS IN OHMS EXCEPT WHERE SHOWN
2. ALL CAPACITORS IN MICROFARADES EXCEPT WHERE SHOWN
3. THE CATHODE OF CR6 IS CONNECTED TO P/O J4, PIN 1 OF THIS BATTERY BACKUP BOARD. IT IS CONNECTED TO GND ONLY WHEN PLUGGED INTO MOTHER BOARD.
4. SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHEET NO'S.

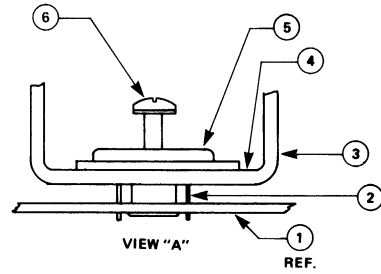
BATTERY BACKUP BOARD A3A4		HEWLETT PACKARD	
TITLE	PCO-22-4350	PART NUMBER	5061-1349
NEXT ASSEMBLY	189446 129918	SCALE	C-5061-1349-51
REVISION		SHEET	OF 64

STOCK NO. 8180-0003 PRINTED ON DIEPCO NO. 1080-10 CLEARPRINT PAPER





COMPONENT SIDE 1 ← → 15  
 CIRCUIT SIDE A ← → S



ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	PC BOARD-ETCHED	5081-2302
2	2	SPACER 6-32 x .125	0380-0342
3	1	HEAT SINK	1205-0289
4	.01TB	THERMAL COMPOUND	6040-0239
5	1	TRANSISTOR Q1	1853-0421
6	2	SCREW 6-32 x .375	2360-0117
7		DELETED	

\*\* A4 Jumper Board Assembly  
 5061-1351

A4 Jumper Board Assembly Parts List (5061-1351) Sht. 1 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00C2		CAP 100PF 5%		0160-2204		U	1
00C1		CAP 330UF 10%		0180-1714		U	1
		SPCR TAP #6X.125		0380-0342		U	2
		ADHESIVE		0470-0409		U	0.01
01P1,2,5		RES 2.15K 1%.125		0698-0084		U	3
01R4		RES 2.61K 1%.125		0698-0085		U	1
00R9		RES 3.83K 1%.125		0698-3153		U	1
00R7		RES 287 1%.125		0698-3443		U	1
00R11		RES 61.9 1%.125		0757-0276		U	1
00P6		RES 1.33K 1%.125		0757-0317		U	1
00R8		RES 5.11K 1%.125		0757-0438		U	1
00R10		RES .27 5% 2W		0811-1659		U	1
		HT DIS T0-3		1205-0289		U	1
00U2		IC V REG		1826-0049		U	1
00U1		I.C. MC 3302		1826-0174		U	1
00Q1		XSTR 2N4398 T03		1853-0421		U	1
00Q3		XSTR 2N4401 T092		1854-0467		U	1
00CR6,7		DIODE SIL		1901-0040		D	2

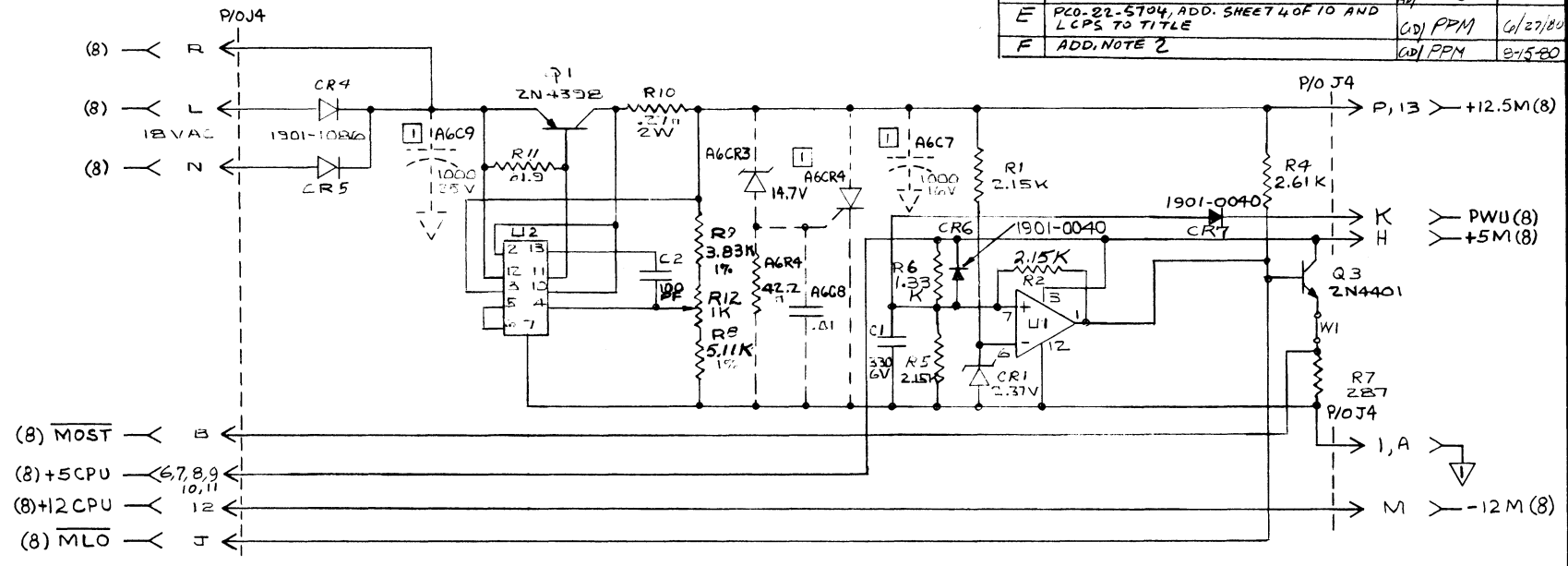
A4 Jumper Board Assembly Parts List (5061-1351) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00	CR4,5	DIODE		1901-1086		U	2
00	CR1	DIODE 2.37V 5%		1902-3002		U	1
00	R12	RES VAR 1K 10%		2100-3352		U	1
		SCR #6-32X.375L		2360-0117		U	2
		COMPOUND-THERMAL		6040-0239		U	0.01
		LABEL-USA		7120-6830		L	1
01	W1	WIRE JUMPERS		8159-0005		D	1



ENGINEERING RESPONSIBILITY															SEPIA																	
0	1	2	3	4	5	6	7	8	9	10	11	12	14	15																		
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

B-5061-1351-51			
SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED	<i>[Signature]</i>	10/30/74
B	CHANGED R2 FROM 23.7K TO 2.15K PRCR C	<i>[Signature]</i>	5/20/77
C	PCO-22-4471, REMOVED F1 DATE CODE IS 1750	<i>[Signature]</i>	1/26/78
D	PCO-22-4820, CIRCUIT CHG. DATE CODE IS 1842	<i>[Signature]</i>	9-20-78
E	PCO-22-5704, ADD. SHEET 4 OF 10 AND LCPS TO TITLE	<i>[Signature]</i>	6/27/80
F	ADD. NOTE 2	<i>[Signature]</i>	8-5-80



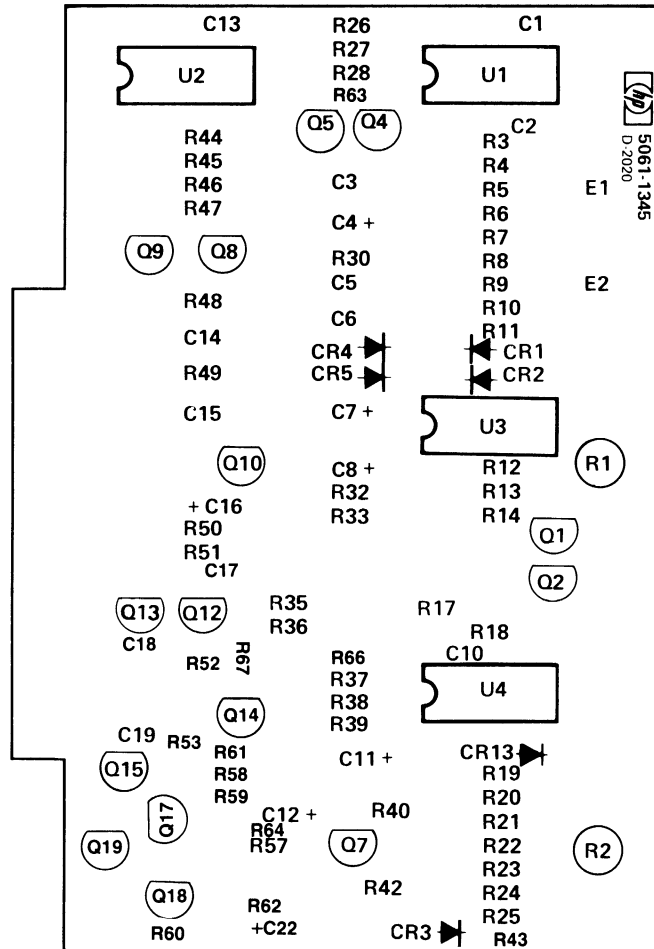
NOTES:  
 [1] COMPONENTS IN BROKEN LINE ARE LOCATED ON MOTHER BOARD.  
 [2] SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHT. NO'S.

JUMPER BOARD LCPS		HEWLETT-PACKARD	
TITLE	A3A4	PART NUMBER	5061-1351
NEXT ASSEMBLY	5061-1356	B-5061-1351-51	
FINISH	SCALE	SHEET 1 OF 1	

STOCK NO. 5280-0002 PRINTED ON DIEPRO NO. 1020-10 CLEARPRINT FADEOUT







A5 Control Board Assembly  
5061-1345

A5 Control Board Assembly Parts List (5061-1345) Sht. 1 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
01C14,15		CAP .47UF-20+80%		0160-0174		U	2
01C6		CAP .047UF 20%		0160-0575		U	1
01C5		CAP .01UF		0160-2055		U	1
00C2		CAP 2000PF 5%		0160-2225		U	1
01C1,10,13,17-19		CAPACITOR-FIXED		0160-5054		U	6
01C7		CAP 4.7UF 35WVDC		0180-0100		U	1
01C11,16		CAP 2.2UF 10%		0180-0197		D	2
01C3		CAP 22UF 10%		0180-0228		D	1
00C8		CAP .68UF 10%		0180-0373		U	1
00C22		CAP 56UF 6VDC		0180-0548		U	1
00C12		CAP 6.8UF 20%		0180-1701		U	1
00C4		CAP 120UF 10%		0180-2145		U	1
00E1,2		STUD SOLDER TERM		0360-0294		U	2
00R60		RES 220 5% .25		0683-2215		U	1
00R40		RES 47 5% .25		0683-4705		U	1
01R4-7,9,28,30,54,66		RES 2.15K 1%.125		0698-0084		U	9
		RES 2.61K 1%.125		0698-0085		U	2

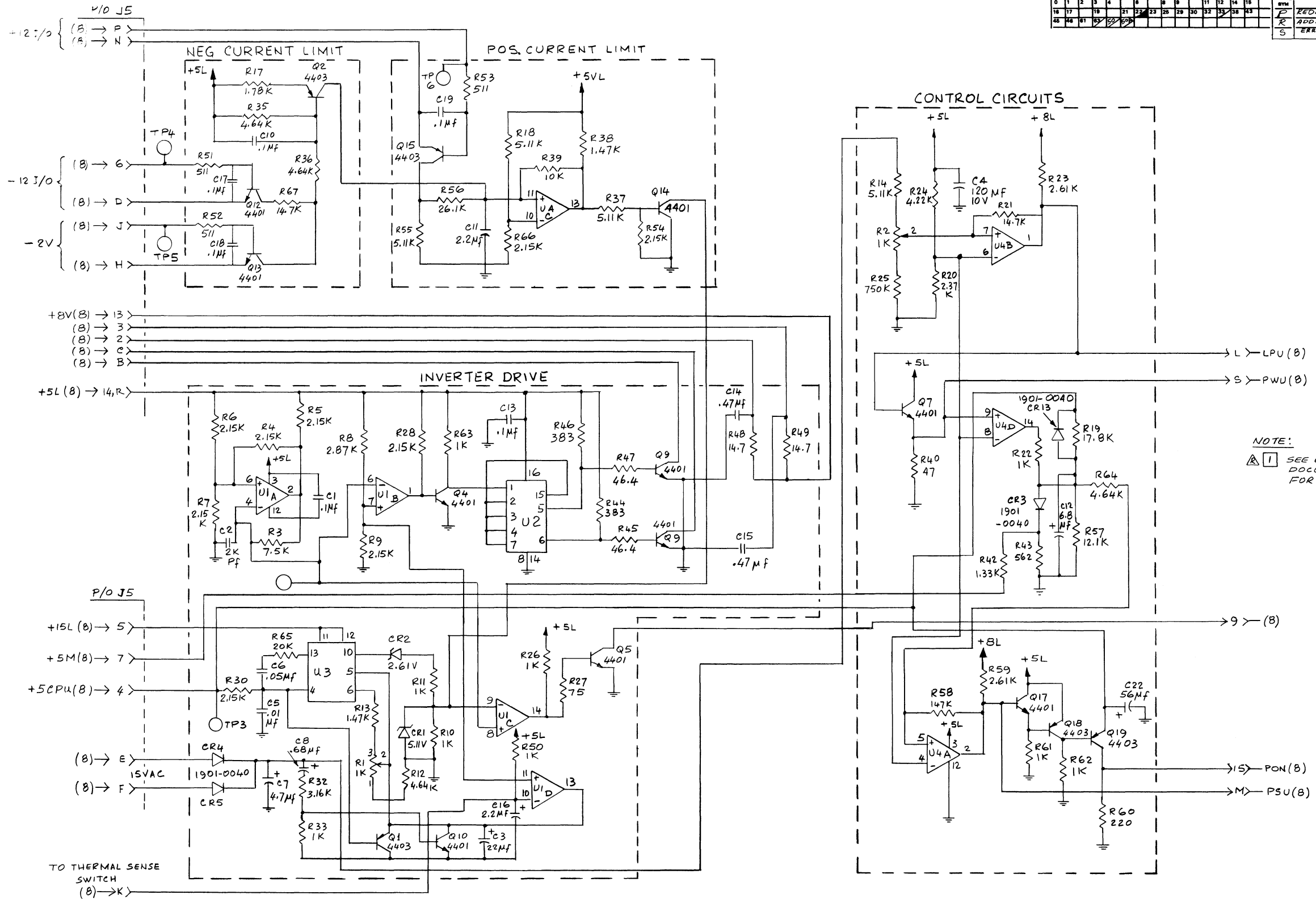
A5 Control Board Assembly Parts List (5061-1345) Sht. 2 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
01R23,59				0698-0085			
01R19		RES 17.8K 1%.125		0698-3136		U	1
01R20		RES 2.37K 1%.125		0698-3150		U	1
00R8		RES 2.87K 1%.125		0698-3151		U	1
01R24		RES 4.22K 1%.125		0698-3154		U	1
01R12,35		RES 4.64K 1%.125		0698-3155		D	4
01R21,67		RES 14.7K 1%.125		0698-3156		U	2
00R56		RES 26.1K 1%.125		0698-3159		D	1
01R48,49		RES 14.7 1% .5W		0698-3388		U	2
01R44,46		RES 383 1%.125		0698-3446		U	2
01R58		RES 147K 1%.125		0698-3452		U	1
01R45,47		RES 46.4 1%.125		0698-4037		U	2
01R17		RES 1.78K 1%.125		0757-0278		U	1
00R32		RES 3.16K 1%.125		0757-0279		U	1
01R10,11,22,26		RES 1K 1%.125		0757-0280		D	9
03 33,50,61,62,63							
00R42		RES 1.33K 1%.125		0757-0317		U	1
00R27		RES 75 1%.125		0757-0398		U	1
01R51-53		RES 511 1%.125		0757-0416		D	3

A5 Control Board Assembly Parts List (5061-1345) Sht. 3 of 3

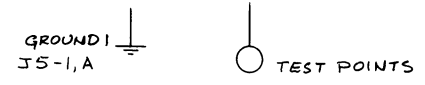
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00R43		RES 562 1%.125		0757-0417		D	1
01R25		RES 750 1%.125		0757-0420		U	1
01R14,18		RES 5.11K 1%.125 37,55		0757-0438		D	4
00R3		RES 7.5K 1%.125		0757-0440		U	1
00R39		RES 10K 1%.125		0757-0442		D	1
01R57		RES 12.1K 1%.125		0757-0444		D	1
01R65		RES 20K 1%.125		0757-0449		D	1
01R13,38		RES 1.47K 1%.125		0757-1094		D	2
		TBG #20 TFE NAT		0890-0212		U	0.09
00U2		IC SN74S112N		1820-0629		U	1
00U3		IC V REG		1826-0049		U	1
00U1,4		IC QUAD COMPTR		1826-0138		U	2
01G1,2,15,18,19		XSTR 2N4403 T092		1853-0271		U	5
01G4,5,7-10,12-14,17		XSTR 2N4401 T092		1854-0467		U	10
01CR3-5,13		DIODE S1L		1901-0040		D	4
00CR1		DIODE ZNR 5.11V		1902-0041		D	1
00CR2		DIODE 2.61V		1902-0126		U	1
00R1,2		RES VAR 1K		2100-1986		U	2
		LABEL-USA		7120-6830		L	1

ENGINEERING RESPONSIBILITY														REVISE		DATE		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	BY	REVISIONS	APPROVED	DATE
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	P	REDRAWN - CIRCUIT CHG	PPM	2-7-80
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	R	ADD. NOTE 1	GP/PPM	8-3-80
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	S	ERROR CORRECTED	GP/CRF	4-3-90



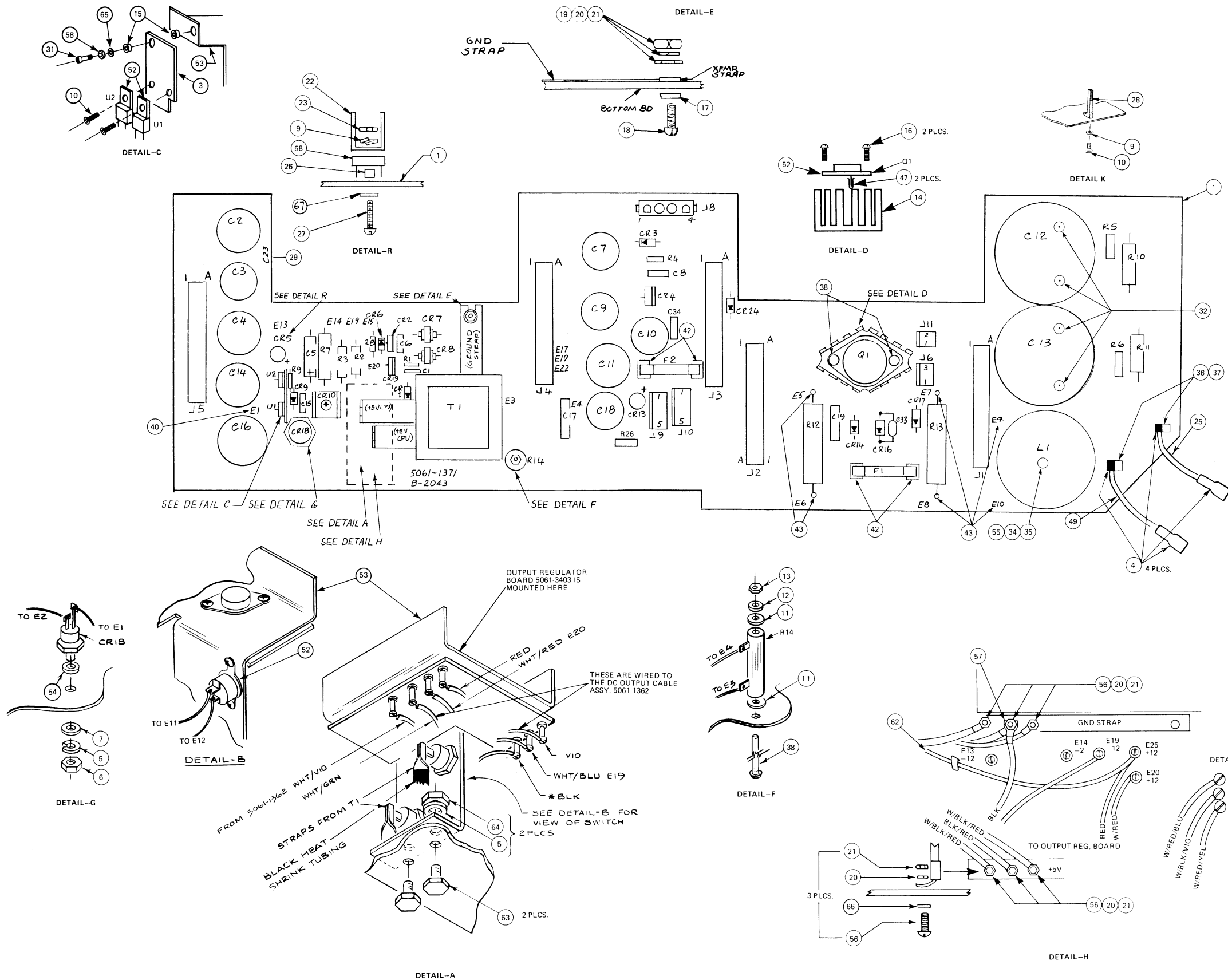
NOTE:  
 1 SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHT. NOS.

ALL CAPACITORS IN MICROFARRADS  
 ALL RESISTORS IN OHMS



CONTROL BOARD LCPS POWER SUPPLY A3A5		HEWLETT-PACKARD	
TITLE		PART NUMBER	
5061-1356		5061-1345	
NEXT ASSEMBLY		SCALE	
FINISH		D-5061-1345-51	

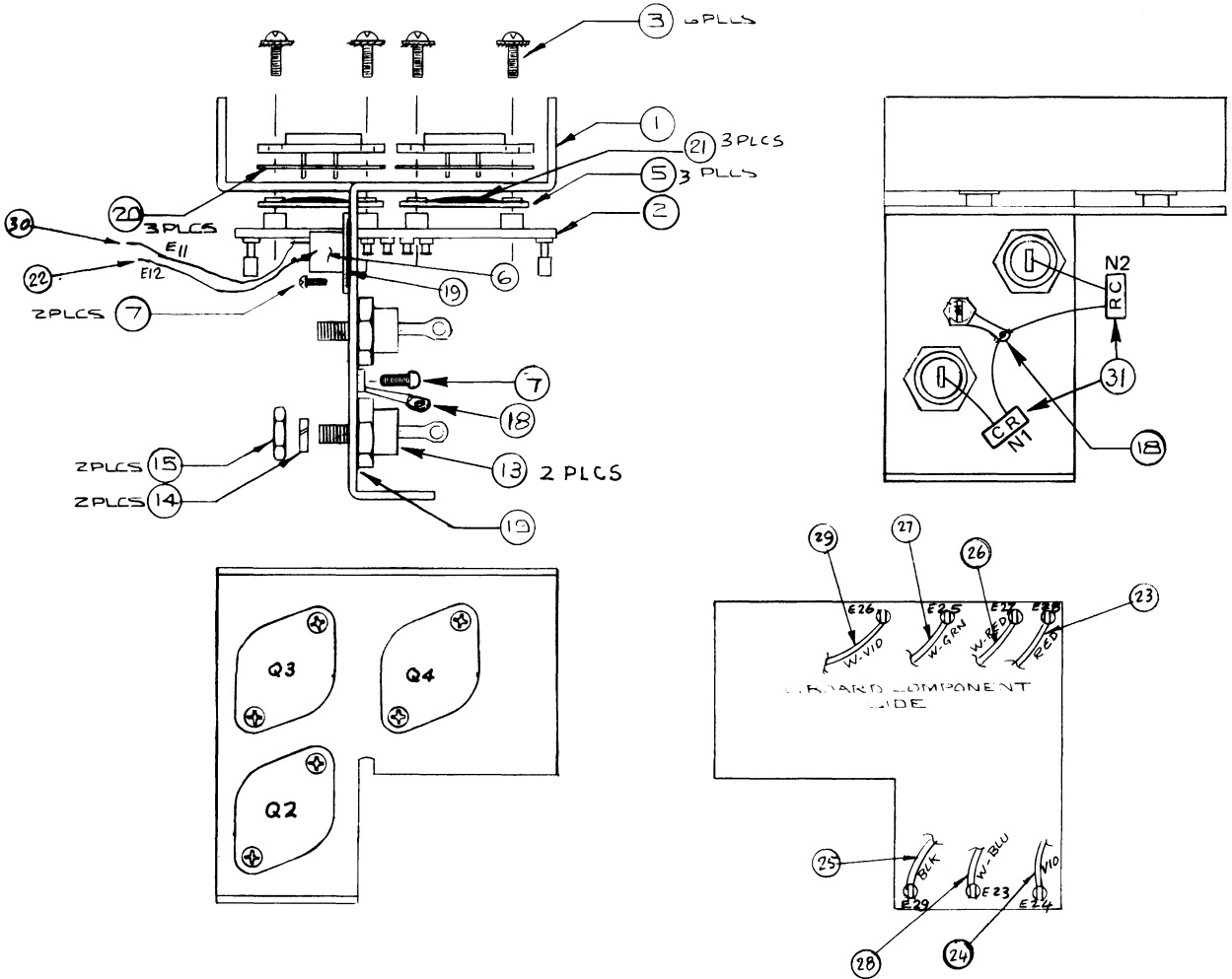




ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L PART NO.
1	1	BOARD P.C.	5080-9798
2	4	PAD-FOAM	4208-0171
3	1	VOLTAGE REGULATOR HEATSINK	5001-2680
4	4	LUG CRP 16 14	0362-0561
5	3	LOCK WASHER SPLIT	2190-0032
6	3	NUT HEX	2950-0036
7	1	WASHER FIBER	3050-0665
8	1	SCREW 6.32x2.500	2360-0221
9	10	LOCKWASHER, SPLIT 4	2190-0003
10	14	SCREW 4.40x.250	2200-0139
11	2	EXTRUDED WASHER	3050-0006
12	1	WASHER FLAT	3050-0100
13	1	NUT HEX	2420-0001
14	1	HEAT SINK	1205-0312
15	2	FIBER WASHER W/LIP	3050-0004
16	2	SCREW	2360-0117
17	1	WASHER	3050-0239
18	1	SCREW 6.32x.625 LG	2360-0203
19	1	WASHER FLAT	3050-0227
20	7	WASHER SPLIT	2190-0851
21	7	NUT HEX 6.32	2420-0003
22	1	HEAT SINK	5001-2808
23	1	NUT HEX	2260-0001
24	2	EYELET	0361-1076
25	0.67'	WIRE 16 GA RED	8150-2185
26	1	SPACER NYLON	0380-0996
27	1	SCREW 4.40x.750	2200-0151
28	10	CARD HOLDERS	5040-0170
29	1	CAP 2.2 NF C23	0160-0128
30	0.33 FT	SLEEVING FLEX	0890-0064
31	1	SCREW 4.40 x .56	2200-0091
32	4	SCREW 10.32x.375	2680-0099
33	4	LOCK WASHER SPLIT #10	2190-0034
34	5	WASHER FLAT #10	3050-0236
35	1	NUT HEX #10	2740-0002
36	3	LUG FASTON	0360-1685
37	3	RIVET	0361-1032
38	2	SPACER	0380-0383
39	3	TERMINAL	0360-0090
40	1	TERMINAL	0360-1167
41	18	EYELETS	0361-0252
42	4	FUSE CLIP	2110-0269
43	16	TERMINAL	0360-1529
44	3 1/2"	WIRE BLUE 18 GA	8150-2893
45	2.500	WIRE YEL 18 GA	8150-0577
46	2"	WIRE GRN 22 GA	8150-1645
47	2	CONNECTOR, PIN TYPE	1251-2913
48	2	LUG FASTON	0362-0480
49	0.61'	WIRE 16 GA BLACK	8150-2605
50	2	LUG CRP 22 18 GA RED	0362-0317
51	3	TY WRAP	1400-0493
52	.01 TB	THERMAL COMPOUND	6040-0239
53	1	OUTPUT REG BD HEATSINK	5001-2691
54	1	SPACER	3050-0234
55	1	LK WASHER #10 INT	2190-0011
56	6	SCREW 6.32x.375	2360-0197
57	1	LUG CRP 22 18 GA RED	0362-0321
58	1	HEX LOCK WASHER	2190-0108
59	95'	WIRE 22 GA BLUE	8150-1546
60	1	GND STRAP	5001-2622
61	1	+5V STRAP	5001-2621
62	1	ASSY WIRING	5061-1362
63	2	SCREW 1/4x20	2940-0103
64	2	NUT	2950-0004
65	1	FLAT WASHER	3050-0222
66	6	FIBER WASHER .144x.25	3050-0023
67	1	WASHER 1/4 FOR #4 SCREW	3050-0229







NOTE: THIS LAST SINK APPLICABLE TO B REVISIONS OF 5061-1371 ONLY.

ITEM	QTY.	DESCRIPTION	PART NO.
1	1	HEAT SINK	5001-2691
2	1	PC ASSY	5061-3403
3	6	SCREW 6-32 x .500 WITH LOCK-WSH.	2360-0121
4		DELETED	
5	3	INSULATOR	0340-0503
6	1	THERMO SW.	3103-0085
7	3	SCREW 4-40 x .250	2200-0103
8		DELETED	
9		DELETED	
10		DELETED	
11		DELETED	
13	2	DIODE CR 11, 12	1901-0884
14	2	LOCKWASHER .250	2190-0032
15	2	NUT HEX	2950-0036
18	1	LUG SOLDER NO. 4	0360-0272
19	A/R	THERMO COMPOUND	6040-0239
20	3	INSULATOR	1200-0043
21	A/R	SUPER BONDER 430 ADHESIVE	0470-0526
22	5.5"	BLUE 22 AWG. WIRE	8150-1546
23	4.5"	RED 18 AWG. WIRE	8150-2891
24	4.5"	VIO 18 AWG. WIRE	8150-2894
25	3.5"	BLK 18 AWG. WIRE	8150-2890
26	4.5"	W-RED 18 AWG. WIRE	8150-2649
27	5.5"	W-GRN 18 AWG. WIRE	8150-2899
28	4.5"	W-BLU 18 AWG. WIRE	8150-2900
29	5.5"	W-VIO 18 AWG. WIRE	8150-2650
30	5.5"	BLUE 22 AWG. WIRE	8150-1546
31	2	SNUBBER (N1, N2)	1810-0500

Heat Sink Assembly

A6 Mother Board Assembly Parts List (5061-1371) Sht. 1 of 6

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01034		CAP 0.10F		0150-0121			1	
01017		CAP .010F 20%		0150-0123			1	
01023		CAP. 2.20F		0160-0128			1	
01033		CAP 50PF 5% 500V		0160-2023			1	
0101,6,8,15		CAP .010F		0160-2055			4	
01019		CAP 4700PF 10%		0160-2627			1	
01012,13		CAP 1150UF		0180-0431			2	
0005		CAP 120UF 10%		0180-2145			1	
0002		CAP 9700UF 6.3V		0180-2652			1	
00018		CAP 750UF 40V		0180-2653			1	
00010		CAP 5200UF 6.3V		0180-2654			1	
0004,11,14		CAP 3300UF 25V		0180-2658			3	
00016		CAP 0.0165F 6.3V		0180-2659			1	
0103		C-F 2000UF 25V		0180-2660			1	
0107,9		C-F 900UF 25V AL		0180-2755			2	
		TRANS INSULATOR		0340-0503			3	
0102,11,12		STUD SOLDER		0360-0090			3	

A6 Mother Board Assembly Parts List (5061-1371) Sht. 2 of 6

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		TERM-SOLDER LUG		0360-0272			1	
		TERM DBL-TUP		0360-1167			1	
00E1		TERM STUD FRD		0360-1529			16	
01F3-10,		13-15,17-20,22						
		LUG SOLDER #5		0360-1685			5	
		EYLT RLU FLG		0361-0252			20	
		EYLT .1210X.200		0361-1032			5	
		LUG CRP22-18FS6		0362-0317			2	
		LUG CRP22-18RT6		0362-0321			1	
		CONN-SGL CNT		0362-0561			4	
		STDF-RVT-0K		0380-0757			2	
		SPACER #4X.125		0380-0996			1	
		ADHESIVE BONDING		0470-0526			0.01	BT
01R26		RES 2.61K 1% .5		0698-0024			1	
01F1,4,8,9		RES 42.2 1% .125		0757-0316			4	
01R10,11		RES 22K 5% 2W MD		0764-0045			2	
01F12		RES 1K 5% 10W PW		0811-1586			1	
01K3		RES .05 10% 3W		0811-1826			1	
00R7		RES .125 OHM		0811-1846			1	
00K13		RES .25 5% 10W		0811-3176			1	
00R2		RES 0.18 OHM WW		0811-3293			1	
00F14		RES 50 5% 20W PW		0819-0022			1	
		THERMISTOR		0837-0130			2	
				PART NO CONT				

A6 Mother Board Assembly Parts List (5061-1371) Sht. 3 of 6

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	U O C	QUANTITY PER	UM
00R5,6		PART NO CONT		0837-0130				
		SLEEVING FLEX.		0890-0064		U	0.33	FT
		TBG HS BLK .375D		0890-0291		U	0.17	FT
		INSL-XSTR 103 AL		1200-0043		U	3	
		HEAT SINK		1205-0312		U	1	
00E29,30		CONN-SGL CONT		1251-0600		U	2	
00J1-5		CONN PC2X15.156D		1251-2035		U	5	
		CONNECTOR; SGL		1251-2913		U	2	
00J9,10		CONN MALE 5 POST		1251-3825		U	2	
00J8		CONN UTIL 4FIN 74		1251-3837		U	1	
00J11		CONN POST 2POS 74		1251-4245		U	1	
00Jc		CONN POST 3POS 74		1251-4246		U	1	
		CA TIE 5.5L		1400-0493		U	1	
01M1,12		NETWORK-SNUBBER		1810-0500		U	2	
00D1		IC RGLTR +5V		1826-0144		U	1	
00D2		IC 7808C		1826-0146		U	1	
01N1		XSTR NPN T03 10A		1854-0869		U	1	
00E1E		THYRISTOR 35AMPS		1884-0208		U	1	
01E2,4,19		THYRISTOR SCR		1884-0233		U	3	
01E11,12		SCHOTTKY RECT		1901-0884		U	2	
		DIODE HS 30 NS		1901-0893		U	1	
		PART NO CONT						

A6 Mother Board Assembly Parts List (5061-1371) Sht. 4 of 6

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		PART NO CONT		1901-0893				
01CR16								
		DIODE IN4936		1901-1065		D	1	
01CR14								
		DIODE		1901-1086		U	2	
00CR7,8								
		RECTIFIER		1901-1087		D	1	
01CR17								
		DIODE-ZNR 14.7V 2%		1902-0078		U	3	
01CR1,3,6								
		DIODE 3.16V		1902-3036		D	1	
00CR24								
		DIODE-ZNR 5.62V 2%		1902-3105		D	1	
01CR4								
		DIODE-FW BRIDGE		1906-0051		U	2	
01CR5,13								
		RECTIFIER		1906-0079		U	1	
00CR10								
		FUSE 1A NB		2110-0001		U	2	
00F1,2								
		FUSE CLIP .2500		2110-0269		U	4	
		LKWSHR 10 IMI		2190-0011		U	1	
		LKWSHR 1/4 HEL		2190-0032		U	5	
		LKWSHR 10 HEL		2190-0034		U	4	
		LKWSHR 4 HEL		2190-0108		U	3	
		LKWSHR 6 HEL		2190-0851		U	7	
		SCREW		2200-0091		U	1	
		SCR 4-40X.25		2200-0103		U	14	
		SCR #4-40X.250L		2200-0139		U	12	
		SCR 4-40X.75		2200-0151		U	1	
		NUT 4-40 .250AF		2260-0001		U	1	
		SCR #6-32X.375L		2360-0117		U	2	
		SCR #6-32X.500L		2360-0121		U	6	

A6 Mother Board Assembly Parts List (5061-1371) Sht. 5 of 6

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		SCR #6-32X.375L		2360-0197		U	6	
		SCR #6-32X2.5L		2360-0221		U	1	
		NUT 6-32 W/LK		2420-0001		U	1	
		NUT 6-32 .312AF		2420-0002		U	1	
		NUT 6-32 .250AF		2420-0003		U	6	
		SCR 10-32X.375		2680-0099		U	4	
		NUT 10-32 .375AF		2740-0002		U	1	
		SCR 1/4-20X.500L		2940-0103		U	2	
		NUT 1/4-20		2950-0004		U	2	
		NUT 1/4-28		2950-0036		U	3	
		WASHER EXTRUDED		3050-0004		U	2	
		WSHR #10		3050-0006		U	2	
		WSHR #6		3050-0023		U	6	
		WSHR #6 BRS		3050-0100		U	1	
		WSHR #4 SS		3050-0222		U	1	
		WSHR #6 SS		3050-0227		U	1	
		WSHR #4 SS		3050-0229		U	1	
		WSHR .260ID BRS		3050-0234		U	1	
		WSHR #10 BRS		3050-0236		U	4	
		WSHR #8 FIBER		3050-0239		U	1	
		WASHER FLAT		3050-0665		U	1	
		SWITCH-THERMAL		3103-0085		U	1	
0151		FOAM-PLASTIC		4208-0171		U	4	
		WIRE 18 YEL		8150-0577		C	0.22	FT
		WIRE 22 GRN		8150-1545		C	0.17	FT
		WIRE 22 BLU		8150-1546		C	0.95	FT
		WIRE 16 RED		8150-2185		C	0.67	FT

A6 Mother Board Assembly Parts List (5061-1371) Sht. 6 of 6

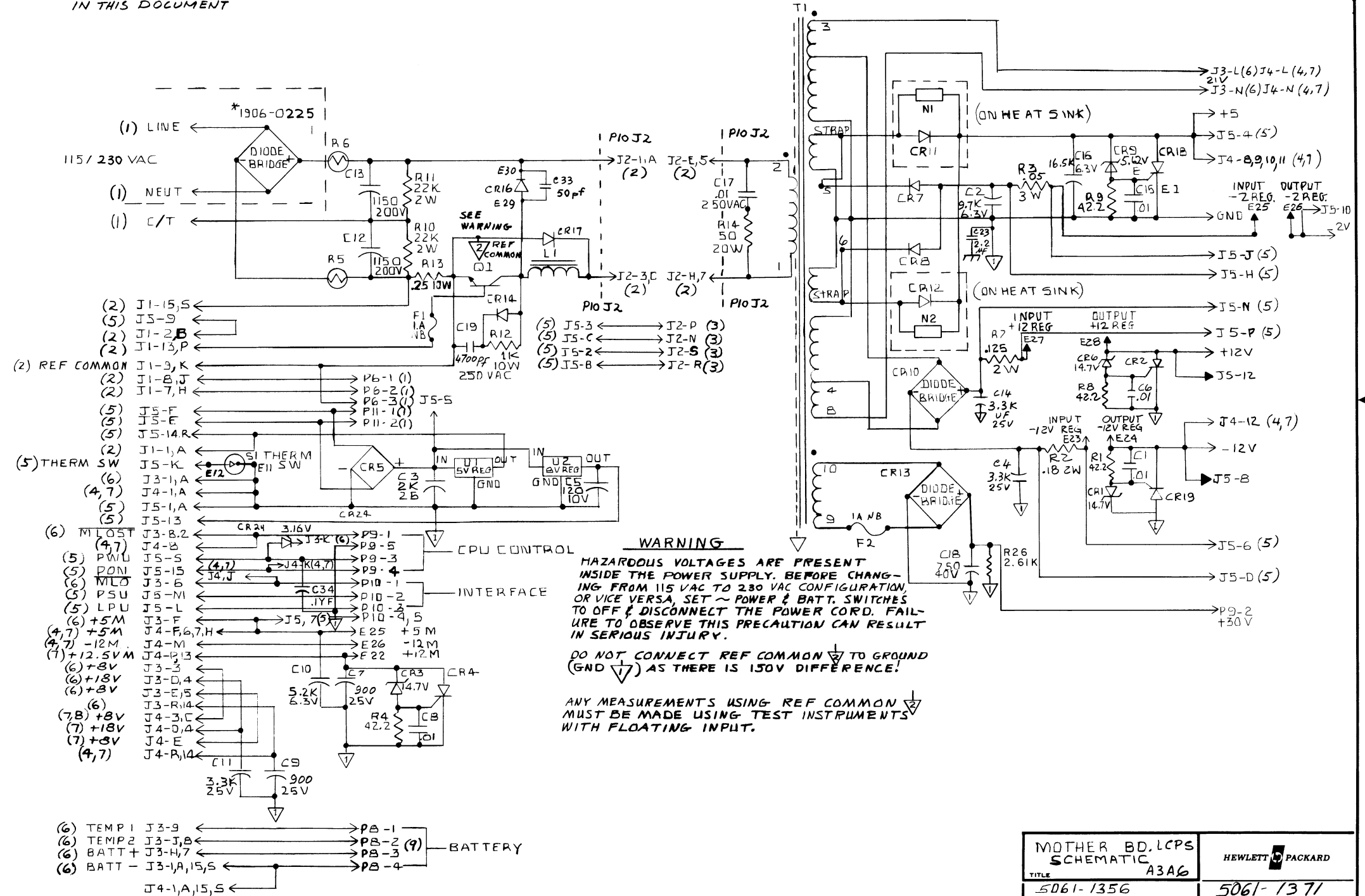
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		WIRE 16 BLACK		8150-2605		C	0.67	FT
		WIRE 18 WHT-RED		8150-2649		C	0.38	FT
		WIRE 18 WHT-VIO		8150-2650		C	0.46	FT
		WIRE 18 BLK		8150-2890		C	0.30	FT
		WIRE 18 RED		8150-2891		C	0.38	FT
		WIRE 18 BLU		8150-2893		C	0.29	FT
		WIRE 18 VIO		8150-2894		C	0.38	FT
		WIRE 18 WHT-GRN		8150-2899		C	0.46	FT
		WIRE 18 WHT-BLU		8150-2900		C	0.38	FT
		WIRE 30AWG WHT		8150-3426		C	0.33	FT
0111		CHUKE		9100-3947		U	1	
0111		XEMP-INVERTER		9100-4112		U	1	
		+5V STRAP		5001-2621		W	1	
		GROUND STRAP		5001-2622		W	1	
		VOLT REG HT SNK		5001-2680		W	1	
		OUTP1 REG HT SNK		5001-2691		W	1	
		HEAT SINK		5001-2808		W	1	
		GUIDE-PC		5040-0170		W	10	
		ASSY-CBL DC OUT		5061-1362		1	1	
		ASSY-LCPS OUTREG		5061-3403		4	1	
		BOARD-ETCHED		5080-9798		W	1	





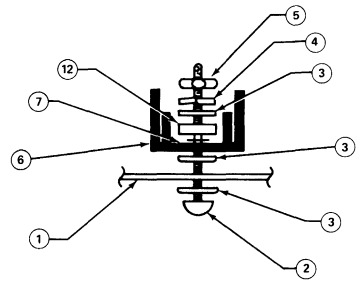
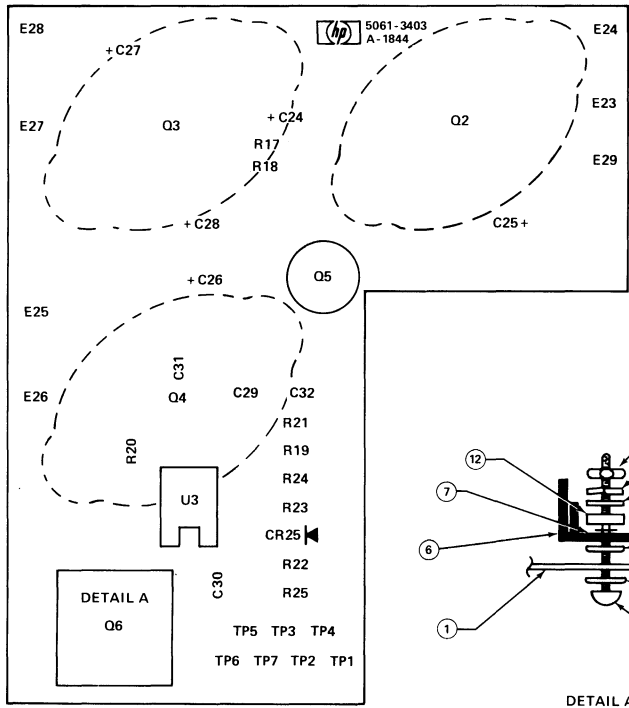
**NOTE:**

NUMBERS IN PARENTHESIS REFER TO SHEET NO'S OF SCHEMATICS IN SECTION 9 OF THE ENGINEERING REFERENCE DOCUMENT (02109-90007), EXPLANATION OF SHEET NO'S IS ALSO CONTAINED IN THIS DOCUMENT



MOTHER BD. LCPS SCHEMATIC		HEWLETT-PACKARD	
TITLE A3A6		PART NUMBER	
5061-1356		5061-1371	
NEXT ASSEMBLY		SCALE	
FINISH		C-5061-1371-51	





DETAIL A

ITEM	QTY.	DESCRIPTION	PART NO.
1	1	BOARD ETCHED	5090-0582
2	1	SCREW 4-40X.438	2200-0145
3	3	WASHER FLAT	3050-0229
4	1	WASHER SPLIT LOCK	2190-0108
5	1	NUT 4-40	2260-0001
6	1	HEAT SINK	1205-0219
7	-	THERMAL COMPOUND	6040-0239
12	1	TRANSISTOR Q6	1854-0683

A6A1 Output Regulator Board Assembly  
5061-3403

A6A1 Output Regulator Board Assembly Parts List (5061-3403) Sht. 1 of 2

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01C29,32		CAP .1UF 20% 50V		0160-0576		D	2	
01C30,31		CAP 1000PF 10%		0160-3456		U	2	
01C25,27,28		CAP 100UF 20%		0180-0098		U	3	
01C24,26		CAP 4.7UF 35WVDC		0180-0100		U	2	
		PAD-MTG T05		0340-0164		U	1	
01TF1-7		STUD SOLDER		0360-0090		U	7	
01E23-29		TERM STUD FKD		0360-1529		U	7	
		STANDOFF-RIVT-0N		0380-1137		U	6	
01R18		RES 2.37K 1%.125		0698-3150		D	1	
01R17		RES 3.48K 1%.125		0698-3152		U	1	
01R19		RES 215 1%.125		0698-3441		D	1	
01R21		RES 316 1%.125		0698-3444		D	1	
01R20,23,24		RES 1K 1%.125		0757-0280		D	3	
01R22		RES 10K 1%.125		0757-0442		D	1	
01R25		RES 100K 1%.125		0757-0465		D	1	
		HT DIS PL PWR		1205-0219		U	1	
		CONNECTOR; SGL		1251-2913		U	6	
01Q3		VOLTAGE REGLTR		1813-0093		U	1	

A6A1 Output Regulator Board Assembly Parts List (5061-3403) Sht. 2 of 2

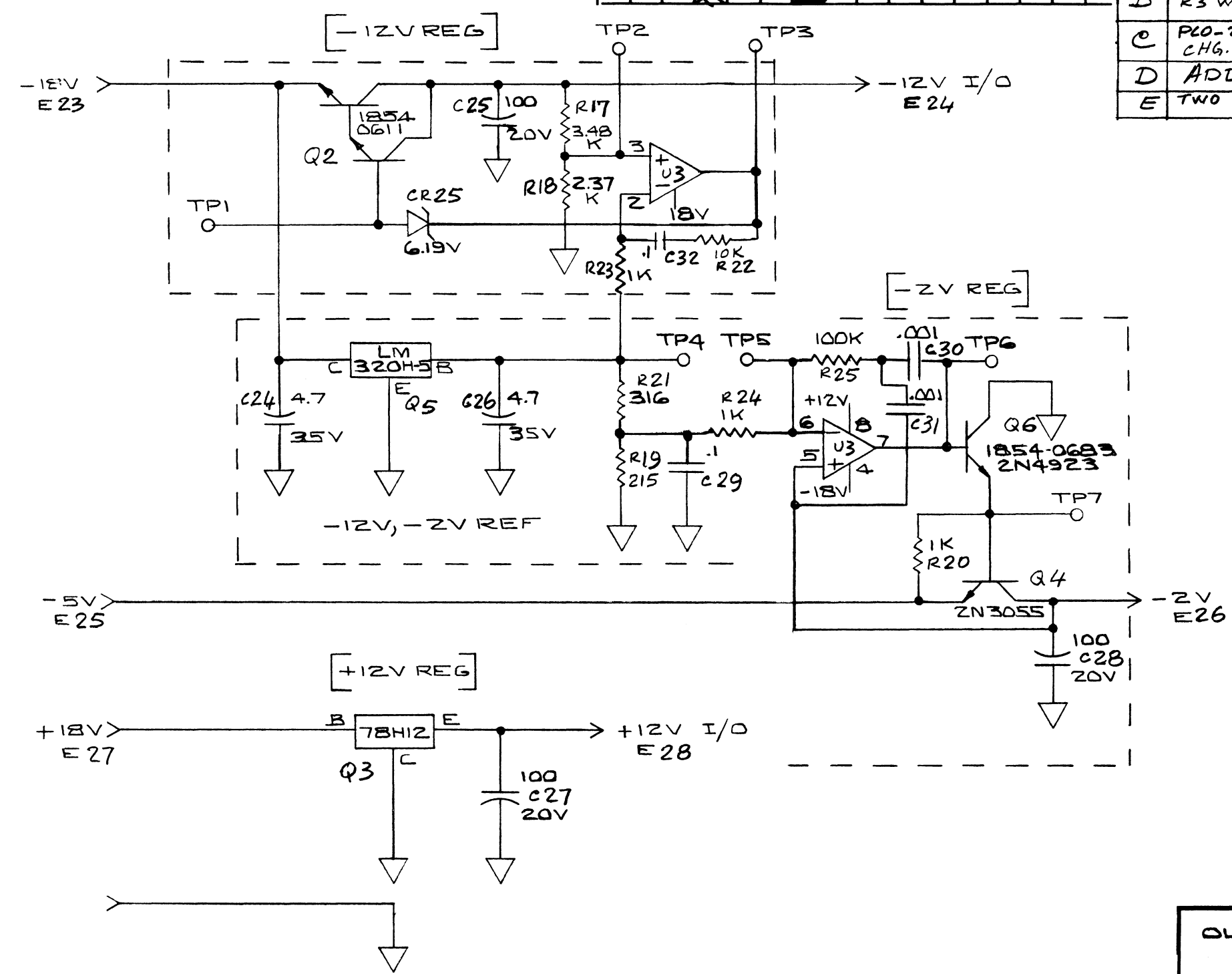
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
01U3		IC MC1458 P1		1826-0139		U	1	
01Q5		IC V REG -5V		1826-0220		U	1	
01Q4		XSTR 2N3055 T03		1854-0063		U	1	
01Q2		XSTR 2N6055 T03		1854-0611		U	1	
01Q6		XSTR NPN SI		1854-0635		U	1	
01C#25		DIODE 6.19V		1902-0049		U	1	
		LKWSHR 4 HEL		2190-0108		U	1	
		SCR 4-40X.438		2200-0145		U	1	
		NUT 4-40 .250AF		2260-0001		U	1	
		WSHR #4 SS		3050-0229		U	3	
		COMPOUND-THERMAL		6040-0239		U	0.01	TR



ENGINEERING RESPONSIBILITY													SEPIA																								
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																						
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45								
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80			

B-5061-3403-51

SYM	REVISIONS		APPROVED	DATE
	A	AS ISSUED		[Signature]
B	PCO-22-5159, ADD. MISSING REF. DESIGNATORS R3 WAS 196; R4 WAS 100		[Signature]	2-22-79
C	PCO-22-5704, ADD. SMT. 10 OF 10 CHG. DESIGNATORS NO'S.		[Signature]	6/27/80
D	ADD. NOTE 1		[Signature]	8-15-80
E	TWO R19'S IN ERROR, ONE CHG. TO R17		[Signature]	12-10-80



NOTE:  
 1 SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHEET NO'S.

OUTPUT REG. BD. LCPS		HEWLETT  PACKARD	
TITLE 5061-1371		PART NUMBER 5061-3403	
NEXT ASSEMBLY		B-5061-3403-51	
FINISH	SCALE	SHEET OF	





**POWER SUPPLY  
Part Number 5061-3476  
FOR HP 1000 "B" MODEL  
COMPUTERS AND EXTENDERS**

**(2108B, 2109B, 2111F, 2112B, 2113B,  
2117F, 12979B, AND 12990B)**

THEORY OF OPERATION

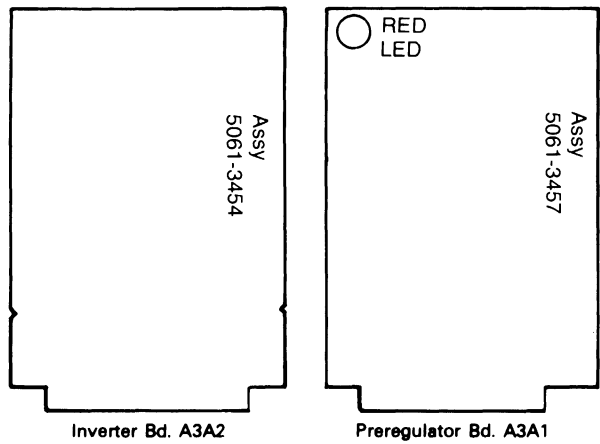
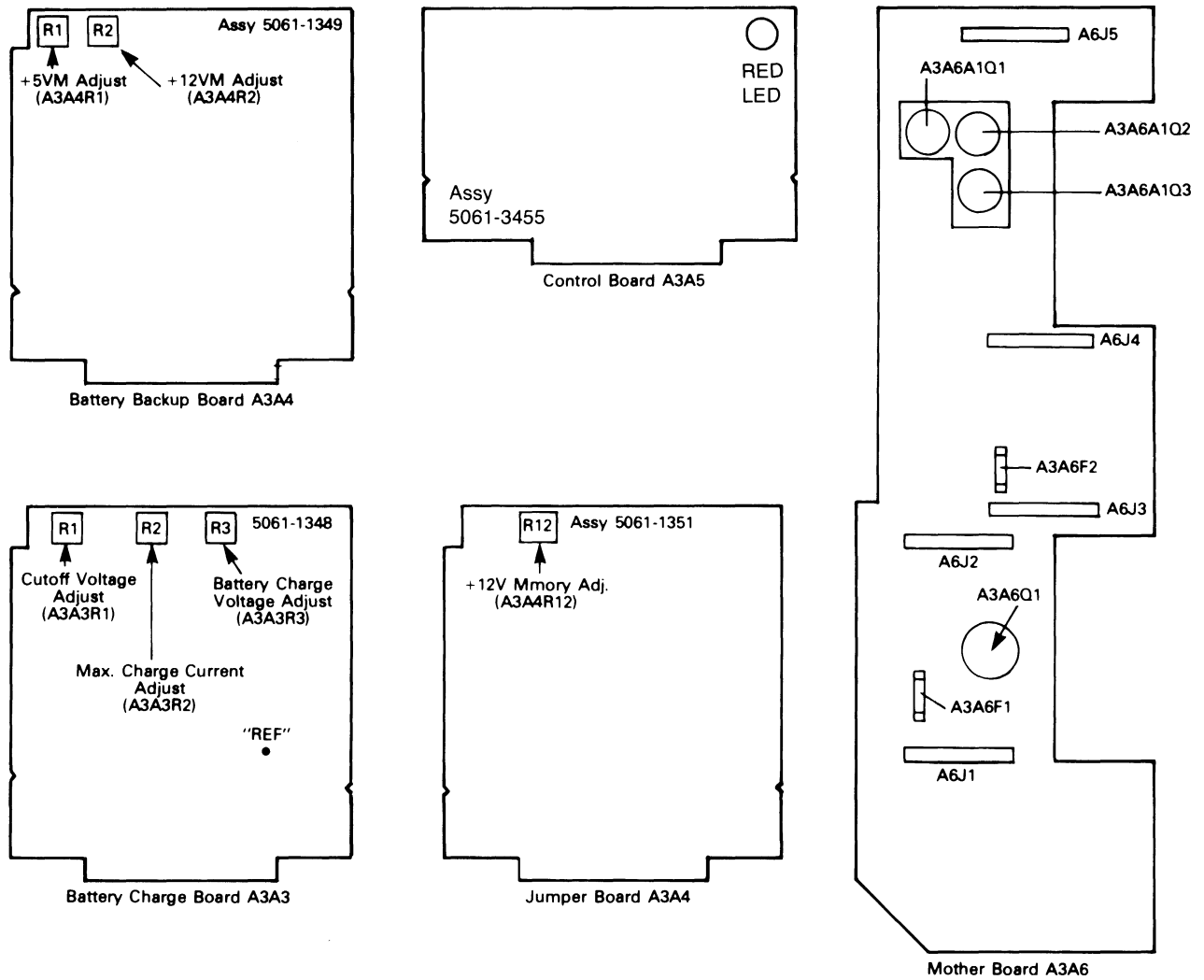
(Computer Serial Prefix 2108 or later)

**NOTE**

This document is part of the HP 1000 M, E, and F-Series Computers Engineering and Reference Documentation and is not available separately.



PARTS LOCATION FOR THE POWER SUPPLY



Description	New Part #
Preregulator Bd, A3A1	5061-3457
Inverter Bd, A3A2	5061-3454
Jumper Bd, A3A4	5061-1351
Control Bd, A3A5	5061-3455
Mother Bd, A3A6	5061-1371
Output Regulator Bd, A3A6A1 (Mother Bd subassembly)	5061-3403
A3A6A1Q3 - 2V I/O Transistor	1854-0063
A3A6A1Q1 - 12V I/O Transistor	1854-0611
A3A6A1Q2 +12V Regulator	1813-0093
Battery Charge Bd, A3A3	5061-1348
Battery Backup Bd, A3A4	5061-1349

Power Supply A3. 5061-3476

Power Fail 12991B

Figure 1. Power Supply Replaceable Assemblies



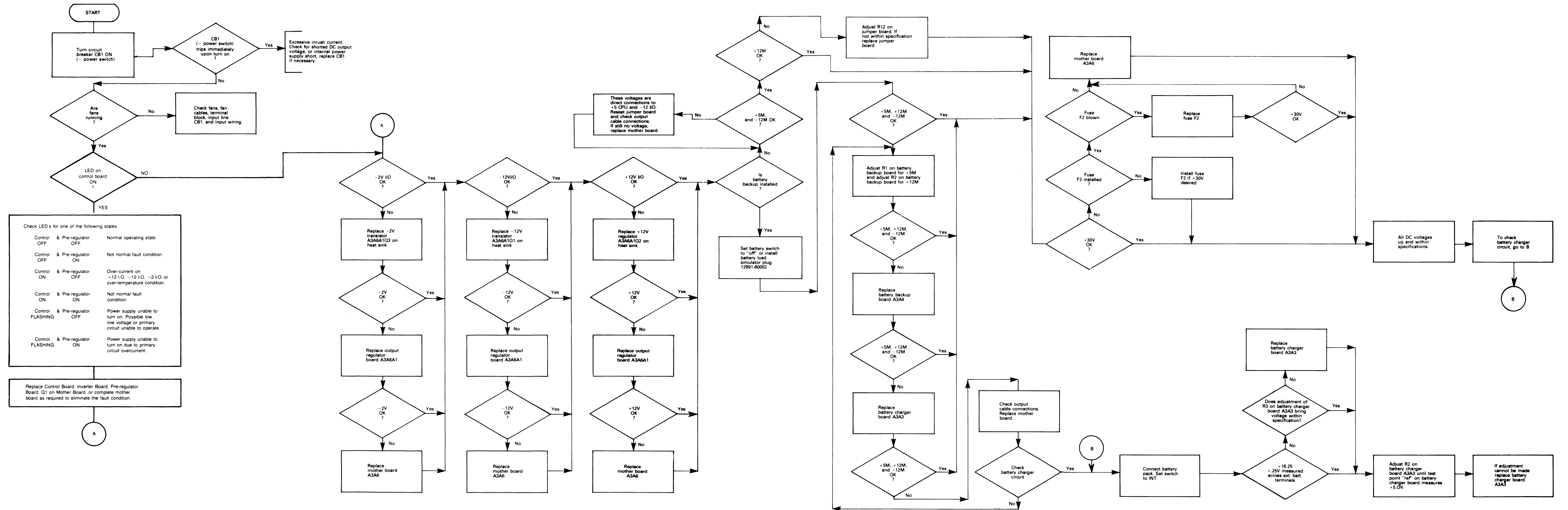


Figure 2. Power Supply Troubleshooting Flowchart



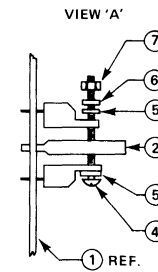
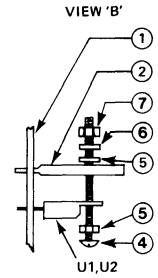
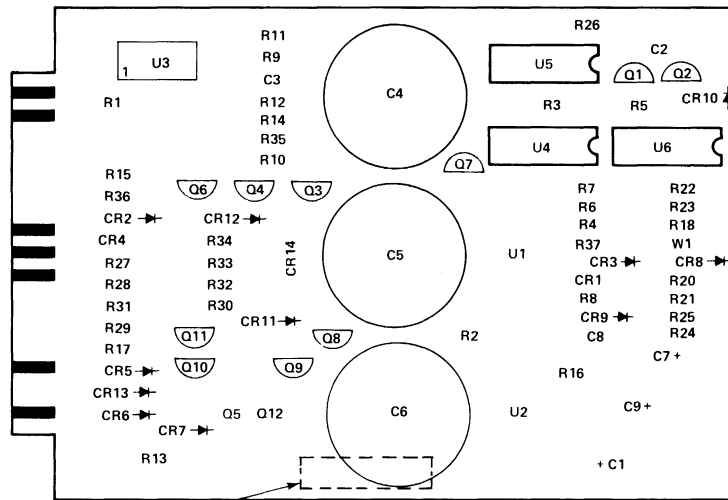
Power Supply Complete Assembly (5061-3476) Sht. 1 of 2

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	L O C	QUANTITY PER	UM
		INSULATOR		0340-0873		U	1	
		LUG SOLDER #6LKG		0360-0268		U	1	
		BLK BARR 5 TERM		0360-0624		U	1	
		MKR STRP 5X.375		0360-1309		U	1	
		TERM-BARR BLOCK		0360-1830		U	4	
		LUG CRP16-14.19F		0362-0144		U	1	
		LUG CRP26-24.19F		0362-0480		U	4	
		LUG CRP22-18.25F		0362-0482		U	1	
		GROM SNAP .375ID		0400-0056		U	1	
		NUT SHMET U 6-32		0590-0653		U	16	
		TERM-BARRBLK TAB		1251-3491		U	5	
		LKWSHR 6 HEL		2190-0851		U	24	
		SCR 4-40X.25		2200-0103		U	2	
		SCR #6-32X.312L		2360-0115		U	13	
		SCR #6-32X.250L		2360-0192		U	8	
		SCR #6-32X.250L		2360-0193		U	16	
		SCR #6-32X.500L		2360-0201		U	2	
		SCR #6-32X.750L		2360-0204		U	8	
		SCR #6-32X.750L		2360-0205		U	8	
		SCR 6-32X.375		2360-0359		U	8	
		WSHR #6 SS		3050-0227		U	18	
		WSHR #6 SS		3050-0228		U	2	
		SW SLIDE DPDT PC		3101-1338		U	1	
		CKT BRKR 2P 10A		3105-0116		U	1	
		FAN GRILLE		3160-0092		U	4	

Power Supply Complete Assembly (5061-3476) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		FAN-TBAX		3160-0341		U	2	
		FOAM-PLASTIC		4208-0172		U	2	
		FOAM-PLASTIC		4208-0205		C	1	
		LABEL SERIAL		7120-1002		U	1	
		LABEL-CAUTION		7120-3528		U	1	
		LABEL-INFO		7120-6073		U	1	
		LABEL-WARNING		7120-6317		U	1	
		WIRE 22 GRA		8150-1548		C	0.45	FT
		DECK-LCPS		5000-8088		W	1	
		LCPS-SIDE COVER		5000-8134		W	1	
		BRACKET		5001-2624		W	1	
		HOLD DWN BRACKET		5001-2625		W	1	
		COVER-PROT TB		5001-2628		W	1	
		COVER-PROT FP		5001-2630		W	1	
		COVER-FRONT, LCPS		5001-2660		W	1	
		COVER-TOP		5001-2661		W	1	
		ASSY-PS REAR PNL		5061-1350		4	1	
		ASSY-LCPS JUMPER		5061-1351		4	1	
		ASSY-CABLE FANS		5061-1359		1	1	
		ASSY-CABLE STAT		5061-1365		1	1	
		ASSY-LCPS MTHRBD		5061-1371		4	1	
		ASSY-LCPS INV 1I		5061-3454		4	1	
		ASSY-LCPS CTR 1I		5061-3455		4	1	
		ASSY-LCPS PREG 2		5061-3457		4	1	





5061-3457  
A-2108

ITEM	QTY.	DESCRIPTION	PART NO.
1	1	BOARD ETCHED	5180-0113
2	3	HEAT SINK	1205-0349
3	7	NUT, HEX	2260-0009
4	1	SCREW 4-40x3/8	2200-0143
5	4	WASHER FLAT 4x40	3050-0229
6	1	WASHER SPLIT LOCK	2190-0108
7	1	NUT 4-40	2260-0001
8	2	SCREW 4-40	0624-0077

A1 Pre-regulator Board II Assembly  
5061 - 3457

A1 Pre-regulator Board II Assembly Parts List (5061-3457) Sht. 1 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01C1,9		C-F 150UF 15V 1A		0180-0194		D	2	
01C4-e		C-F 2600UF 20V		0180-2886		D	3	
01K13		SCR TAP 4-40X.31		0624-0077		U	2	
		R F .820HM 5% 2W		0811-1665		U	1	
		HEAT SINK		1205-0349		U	3	
01U4		IC SN74LS00N		1820-1197		U	1	
01U5		IC SN74LS38N		1820-1209		U	1	
01U1		IC 7805		1826-0122		U	1	
01U6		IC QUAD COMPTR		1826-0138		U	1	
01U2		IC MC7908CT		1826-0344		U	1	
01N3,4,6,8		XSTR 2N4403 1092		1853-0271		U	4	
01N5		XSTR PNP 2N6476		1853-0406		U	1	
01N1,2,7,9-11		XSTR 2N4401 1092		1854-0467		U	6	
01N12		XSTR NPN 2N6474		1854-0727		U	1	
01CR14		DIO-FW BRDG 100V		1906-0048		U	1	
01CR10		LED-VISIBLE		1990-0627		U	1	
01U3		OPTO-ISOLATOR		1990-0664		U	1	
		LKWSHR 4 HEL		2190-0108		U	1	

A1 Pre-regulator Board II Assembly Parts List (5061-3457) Sht. 2 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		SCR 4-40X.312		2200-0166		J	2	
		NUT 4-40 .250AF		2260-0001		J	1	
		NUT 4-40 W/LK		2260-0009		J	1	
		WSHR #4 SS		3050-0229		J	4	
		LABEL-USA		7120-6830		L	1	
		BD-ETCHED		5180-0113		P	1	

A1 Pre-regulator Board II Assembly Parts List (5061-3457) Sht. 3 of 4

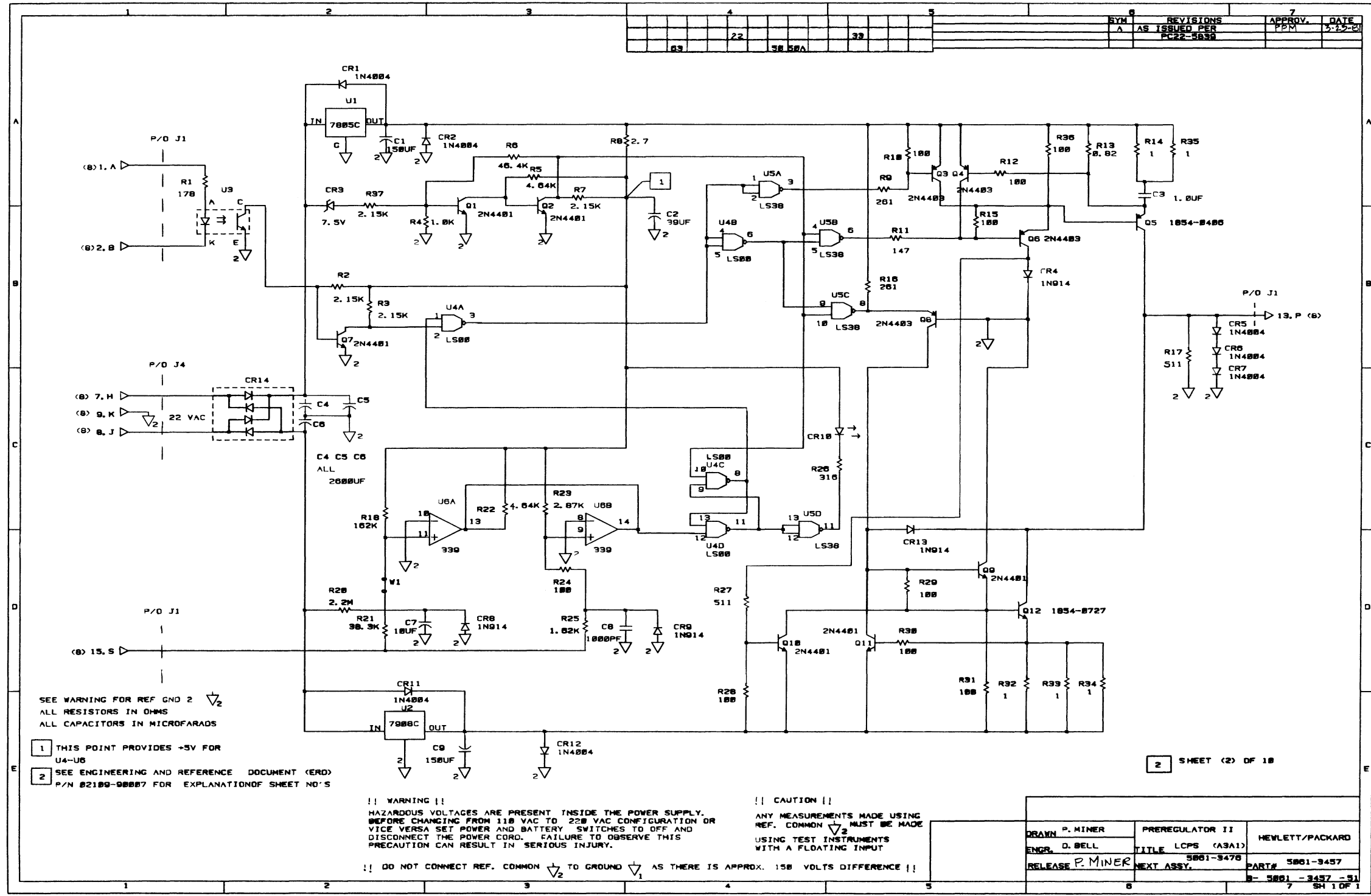
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01C8		CAP 1000PF 5%		0160-4822		D	1	
01C3		CAP 1.0UF +80-20		0160-4844		D	1	
01C7		CAP 10UF 10%		0180-0374		D	1	
01C2		CAP 39UF 10%		0180-0393		D	1	
01R8		RES 2.7 5% .25		0683-0275		D	1	
01R20		RES 2.2M 5% .25		0683-2255		D	1	
01R2,3,7,37		RES 2.15K 1%.125		0698-0084		D	4	
01R9,10		RES 261 1%.125		0698-3132		D	2	
01R23		RES 2.87K 1%.125		0698-3151		D	1	
01R5,22		RES 4.64K 1%.125		0698-3155		D	2	
01R21		RES 38.3K 1%.125		0698-3161		D	1	
01R6		RES 46.4K 1%.125		0698-3162		D	1	
01R11		RES 147 1%.125		0698-3438		D	1	
01R1		RES 178 1%.125		0698-3439		D	1	
01R26		RES 316 1%.125		0698-3444		D	1	
01R14,32-35		RES 1 5% .25W FC		0699-0208		D	5	
01R9		RES 1K 1%.125		0757-0280		D	1	
01R10,12,15,24,28-31,36		RES 100 1%.125		0757-0401		D	4	
		RES 511 1%.125		0757-0416		D	2	
				PART NO CONT				

A1 Pre-regulator Board II Assembly Parts List (5061-3457) Sht. 4 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		PART NO CONT		0757-0416				
01K	17, 27							
		RES 1.62K 1%.125		0757-0428		D	1	
01F	25							
		RES 162K 1%.125		0757-0470		D	1	
01P	18							
		DIODE-SILICON		1901-0050		D	4	
01C	4, 8, 9, 13							
		DIODE-PWR RECT		1901-0731		D	7	
01E	1, 2, 5-7, 11, 12							
		DIODE		1902-0064		D	1	
01C	3							
		WIRE JUMPERS		8159-0005		D	1	
01	1							



REV. NO.		SYMBOL		REVISIONS		APPROV.	DATE
03	22	38	50A	39		PPM	5-22-61
				AS ISSUED PER			
				PC22-5839			



SEE WARNING FOR REF GND 2  
 ALL RESISTORS IN OHMS  
 ALL CAPACITORS IN MICROFARADS

1 THIS POINT PROVIDES +5V FOR U4-U6  
 2 SEE ENGINEERING AND REFERENCE DOCUMENT (ERD) P/N 02100-98007 FOR EXPLANATION OF SHEET NO'S

!! WARNING !!  
 HAZARDOUS VOLTAGES ARE PRESENT INSIDE THE POWER SUPPLY. BEFORE CHANGING FROM 110 VAC TO 220 VAC CONFIGURATION OR VICE VERSA SET POWER AND BATTERY SWITCHES TO OFF AND DISCONNECT THE POWER CORD. FAILURE TO OBSERVE THIS PRECAUTION CAN RESULT IN SERIOUS INJURY.

!! CAUTION !!  
 ANY MEASUREMENTS MADE USING REF. COMMON MUST BE MADE USING TEST INSTRUMENTS WITH A FLOATING INPUT

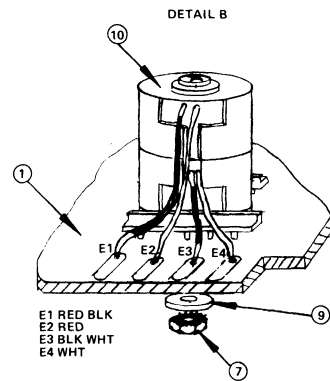
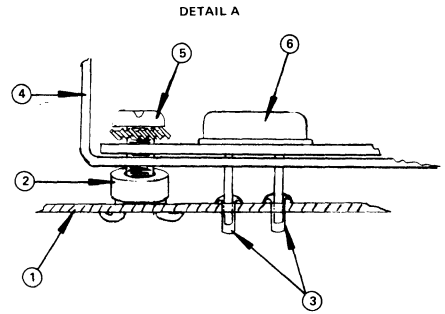
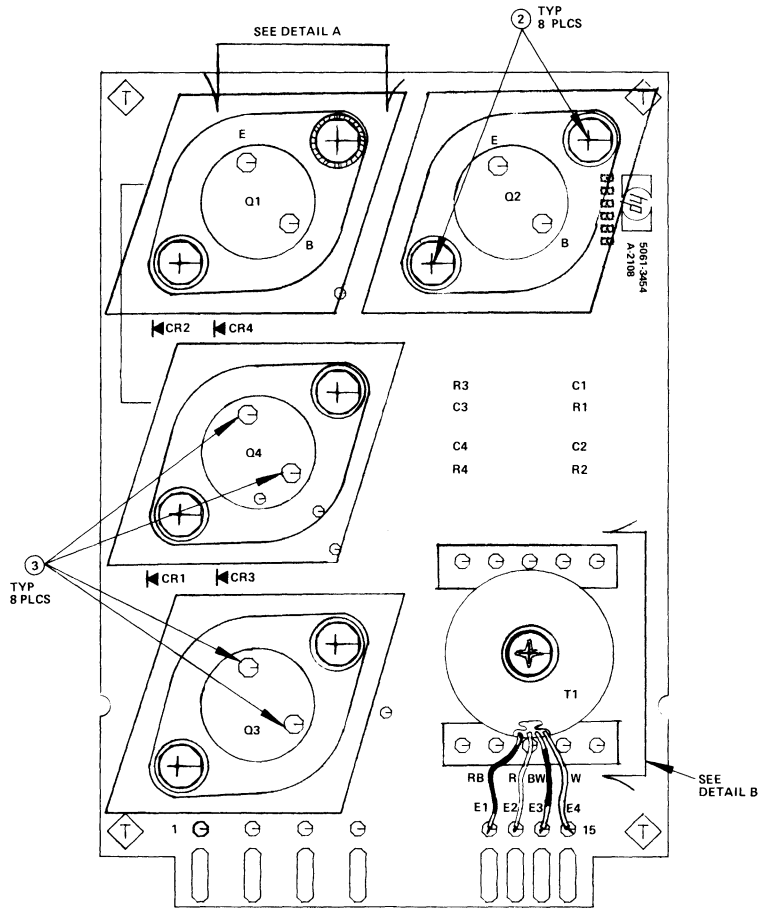
!! DO NOT CONNECT REF. COMMON TO GROUND AS THERE IS APPROX. 150 VOLTS DIFFERENCE !!

2 SHEET (2) OF 10

DRAWN P. MINER	PREREGULATOR II	HEWLETT/PACKARD
ENGR. D. BELL	TITLE LCPS (A3A1)	
RELEASE P. MINER	5061-3470	PART# 5061-3457
	NEXT ASSY.	B-5061-3457-51







ITEM	QTY.	DESCRIPTION	PART NO.
1	1	P.C. BOARD, ETCHED	5180-0111
2	8	SPCR TAP #6x.187	0380-0745
3	8	CONNECTOR, PIN	1251-2913
4	4	HEAT SINK TO-3	1205-0312
5	8	SCREW 6-32 x .438 W/LK	2360-0119
6	4	XSTR TO3 Q1-Q4	1854-0869
7	1	NUT #6	2420-0001
9	1	FLAT WASHER	3050-0228
10	1	TRANSFORMER T1	9100-4142

A2 Inverter Board II Assembly  
5061-3454

A2 Inverter Board II Assembly Parts List (5061-3454) Sht. 1 of 2

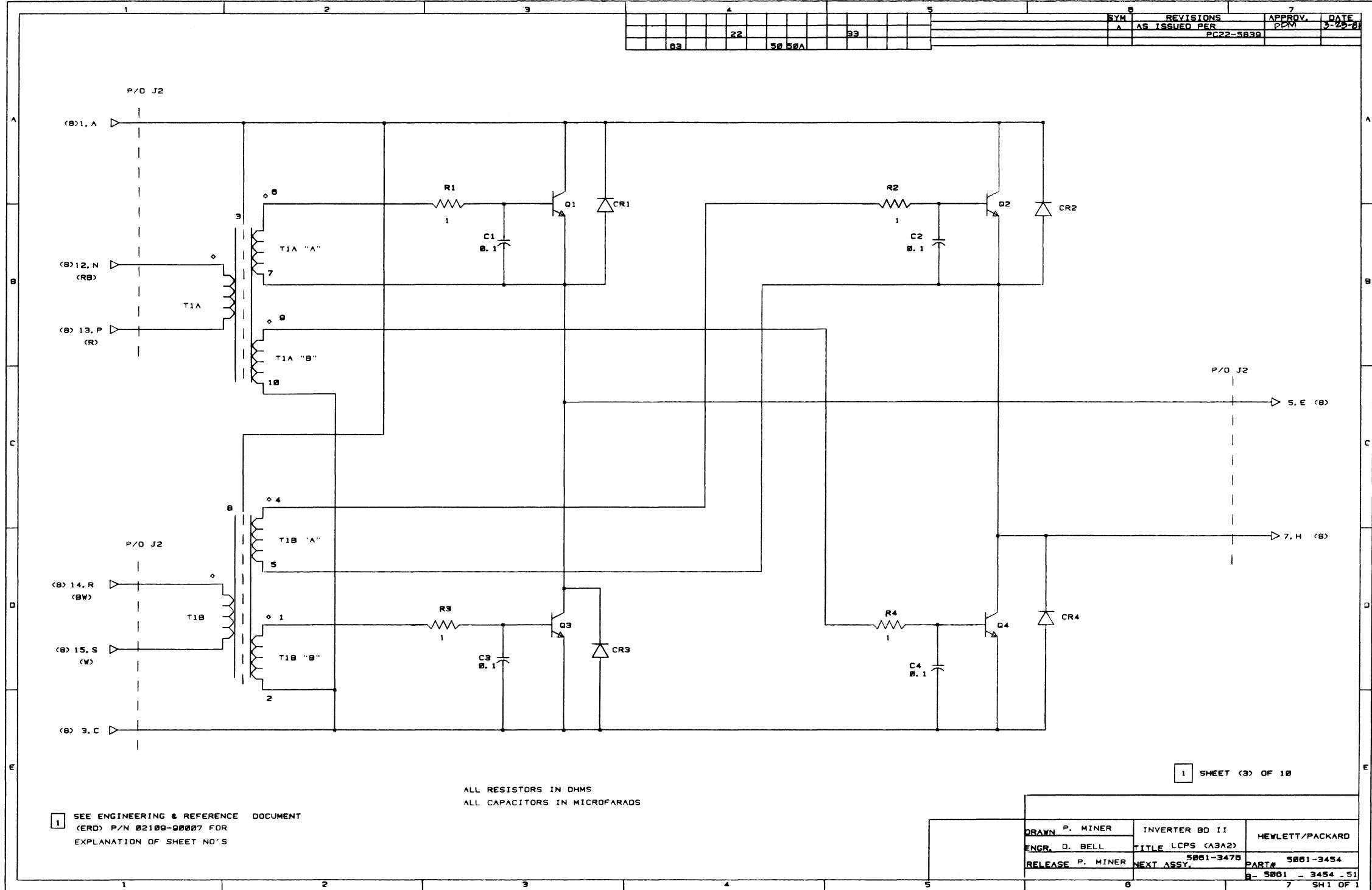
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01E1-2		SPCR TAP #6X.187		0380-0745		J	8	
		HEAT SINK		1205-0312		J	4	
01E4-16		CONNECTOR; SGL		1251-2913		J	8	
01E1-4		XSTR NPN T03 10A		1854-0869		J	4	
		SCR #6-32X.437L		2360-0119		J	8	
		NUT 6-32 W/LK		2420-0001		J	1	
		WSHR #6 SS		3050-0228		J	1	
		LABEL-USA		7120-6830		L	1	
		X-FMR-INVERTER		9100-4142		J	1	
		HD-ETCHED		5180-0111		J	1	

A2 Inverter Board II Assembly Parts List (5061-3454) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
010	C1,2,3,4	CAP .1UF +80		0160-4841		D	4	
010	R1,2,3,4	RES 1 1% .75W PW		0811-0060		D	4	
010	D1-4	DIO-1N4937		1901-0831		D	4	



22	33	SYN	REVISIONS	APPROV.	DATE
		A	AS ISSUED PER PC22-5839	PCM	3-25-61

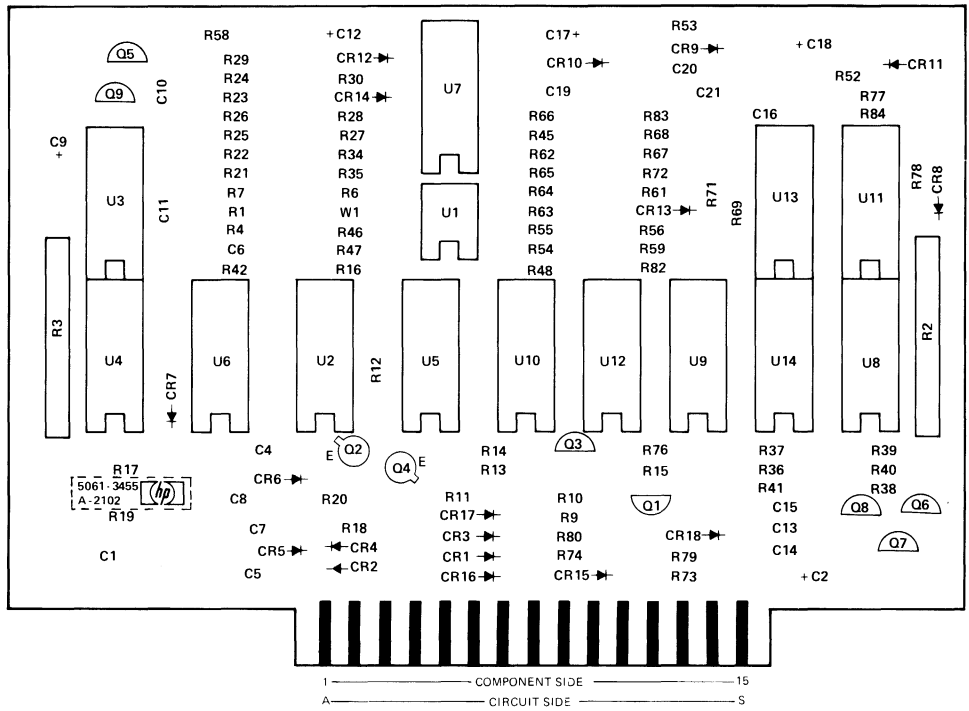


1 SHEET (3) OF 10

1 SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02100-00007 FOR EXPLANATION OF SHEET NO'S

DRAWN	P. MINER	INVERTER BD II	HEWLETT/PACKARD
ENGR.	D. BELL	TITLE LCPS (A3A2)	
RELEASE	P. MINER	5001-3470	PART# 5001-3454
		NEXT ASSY.	B-5001-3454-51





ITEM	QTY.	DESCRIPTION	PART NO.
1	1	BOARD, ETCHED	5180-0112

A5 Control Board II Assembly  
5061-3455

A5 Control Board II Assembly Parts List (5061-3455) Sht. 1 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01010		C-F 82UF 10V TA		0180-2925			1	
01017,19		RES 10 5% 2W PW		0811-1678			2	
0102,3		NTWK RES 9X4.7K		1810-0279			2	
01018		IC SN7406N		1820-0471			1	
01014		IC SN74S140N		1820-0697			1	
0104,9		IC SN74LS74N		1820-1112			2	
01012		IC SN74LS00N		1820-1197			1	
01011		IC SN74LS27N		1820-1206			1	
0105,6		IC SN74LS38N		1820-1209			2	
0107		RESISTOR ARRAY		1821-0001			1	
0102,10,13		IC QUAD COMPTR		1826-0138			3	
0103		IC QUAD OP AMP		1826-0161			1	
0101		IC 1403		1826-0544			1	
0101,3,5,6		XSTR 2N4403 T092		1853-0271			4	
0107,8		XSTR NPN SI PLS		1854-0071			2	
0109		XSTR 2N4401 T092		1854-0467			1	
		XSTR 2N2222AT018		1854-0477			2	
				PART NO CONT				



A5 Control Board II Assembly Parts List (5061-3455) Sht. 2 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
0102,4		PART NO CONT		1854-0477				
01CR11		DIODE-LIGHT EMIT		1990-0486		J	1	
		LABEL-USA		7120-6830		L	1	
		ASSY-DIP CRTL 2		5061-3495		A	1	
		HD-ETCHED		5180-0112		W	1	

A5 Control Board II Assembly Parts List (5061-3455) Sht. 3 of 4

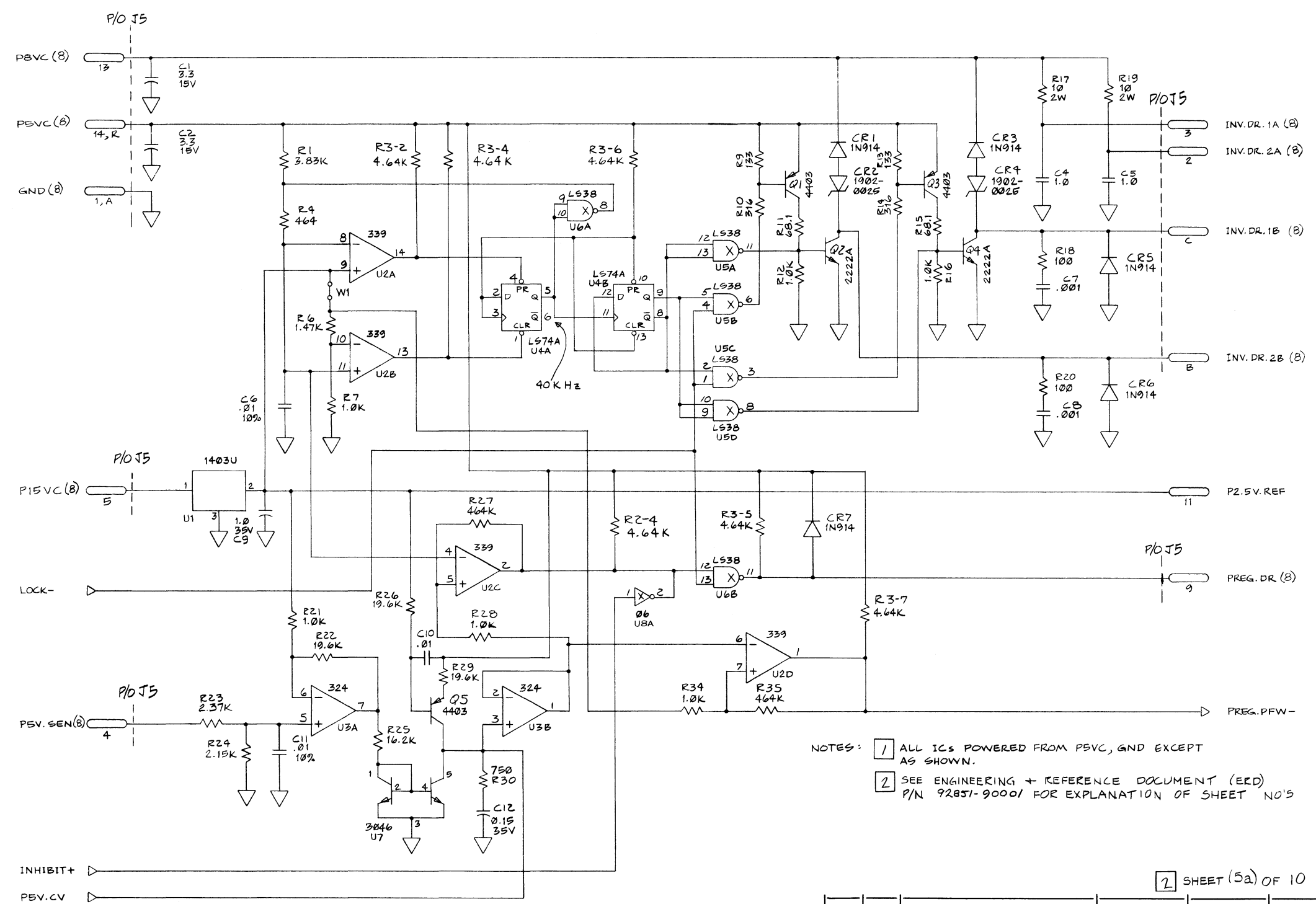
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
01C	6, 10, 11, 16, 20	CAP-FIX .01UF		0160-4832		D	5	
01C	13-15	CAP .1UF +80		0160-4841		D	3	
01C	4, 5	CAP 1.0UF +80-20		0160-4844		D	2	
01C	7, 8	CAP 1000PF 10%		0160-4847		D	2	
01C	12	CAP .15UF 10%		0180-0218		U	1	
01C	9	CAP 1UF 10%		0180-0291		D	1	
01C	1, 2, 17, 19, 21	CAP-TA 3.30F		0180-2690		D	5	
01R	4	RES 464 1%.125		0698-0082		D	1	
01R	24, 36, 37, 41	RES 2.15K 1%.125		0698-0084		D	4	
01R	47, R23	RES 2.37K 1%.125		0698-3150		D	2	
01R	65	RES 2.87K 1%.125		0698-3151		D	1	
01R	1, 74, 80	RES 3.83K 1%.125		0698-3153		D	3	
01R	59	RES 4.64K 1%.125		0698-3155		D	1	
01R	22, 26, 29	RES 19.6K 1%.125		0698-3157		D	3	
01R	62, 53	RES 46.4K 1%.125		0698-3162		D	2	
01R	27, 35, 64, 67	RES 464K 1%.125		0698-3260		D	4	
01R	9, 13	RES 133 1%.125		0698-3437		D	2	
01R	63	RES 147 1%.125		0698-3438		D	1	
		RES 215 1%.125		0698-3441		D	1	
				PART NO CONT				

A5 Control Board II Assembly Parts List (5061-3455) Sht. 4 of 4

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
01K76		PART NO CONT		0698-3441				
01K10,14		RES 316 1%.125		0698-3444			3	
01K73,79		RES 31.6 1%.125		0757-0180			2	
01K02,56		RES 1.78K 1%.125		0757-0278			2	
01K7,12,16,21,28,34,38		RES 1K 1%.125		0757-0280			15	
0339,40,48,55,61,77,82								
0583								
01K11,15		RES 68.1 1%.125		0757-0397			2	
01K18,20		RES 100 1%.125		0757-0401			2	
01R30		RES 750 1%.125		0757-0420			1	
01K50,60		RES 10K 1%.125		0757-0442			2	
01K25		RES 16.2K 1%.125		0757-0447			1	
01K60,69,71,72		RES 90.9K 1%.125		0757-0464			4	
01R05,40,54,78,84		RES 100K 1%.125		0757-0465			5	
01R6		RES 1.47K 1%.125		0757-1094			1	
01CR1,3,5-10,12,13,15-18		DIODE-SILICON		1901-0050			14	
01CR14		STABISTOR ST8523		1901-0460			1	
01CR2,4		DIODE 10V ZEN		1902-0025			2	



ENGINEERING RESPONSIBILITY															SEPIA		C-		
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	SYM	REVISIONS	APPROVED	DATE
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	A	AS ISSUED PER PC 22-5839	PPM	
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47				



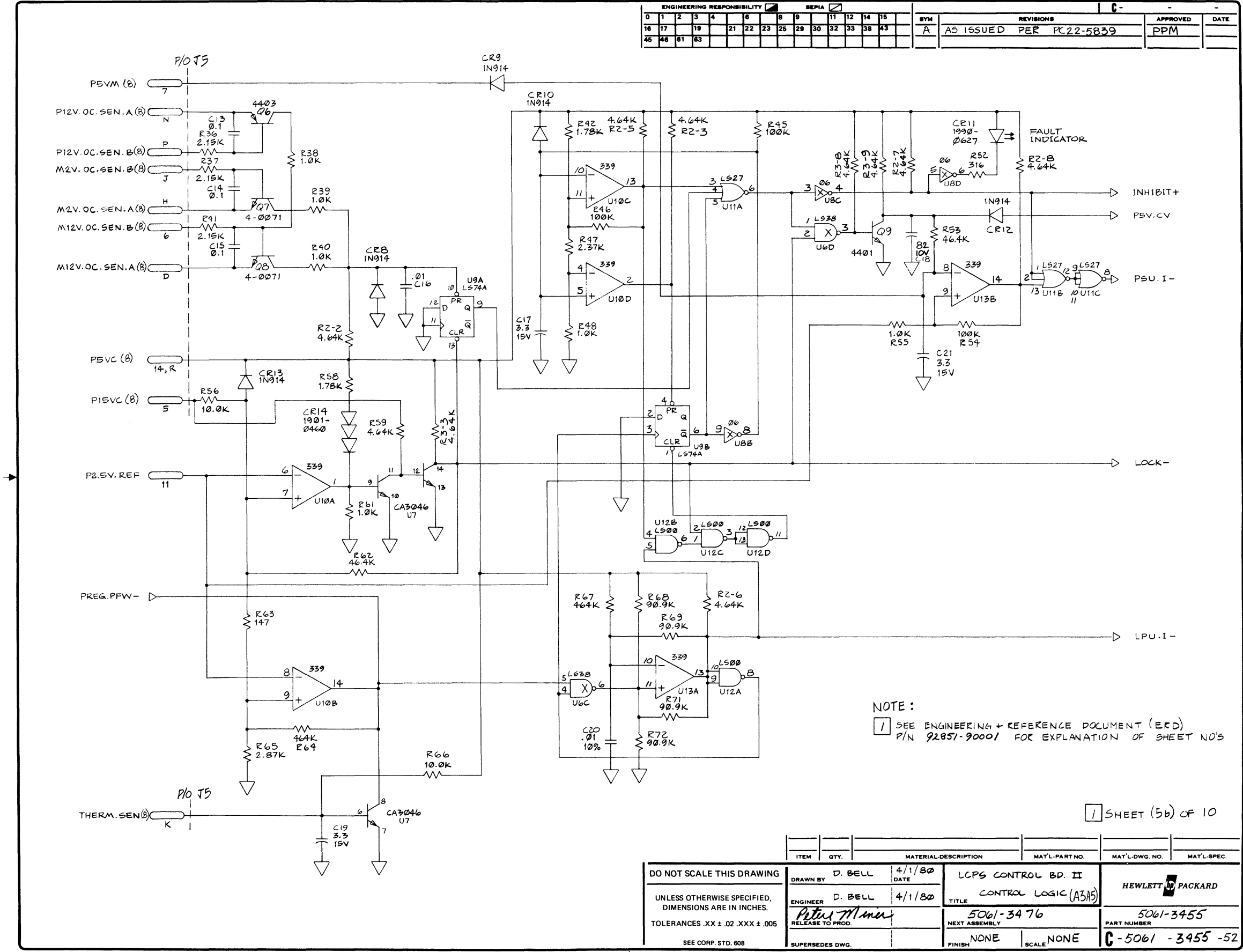
NOTES: 1 ALL ICs POWERED FROM PSVC, GND EXCEPT AS SHOWN.  
 2 SEE ENGINEERING + REFERENCE DOCUMENT (ERD) P/N 92851-90001 FOR EXPLANATION OF SHEET NO'S

2 SHEET (5a) OF 10

DO NOT SCALE THIS DRAWING	DRAWN BY D. BELL	DATE 3/17/80	TITLE LCPS CONTROL BD II	HEWLETT PACKARD
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.	ENGINEER D. BELL	DATE 3/17/80	TITLE INV/PREG DRIVE (A3A)	5061-3455
TOLERANCES .XX ± .02 .XXX ± .005	RELEASE TO PROD. Peter Miner		TITLE 5061-3476	5061-3455
SEE CORP. STD. 608	SUPERSEDES DWG.		NEXT ASSEMBLY	PART NUMBER
			FINISH NONE	SCALE NONE
				C-5061-3455-51



ENGINEERING RESPONSIBILITY															SYM		REVISIONS		APPROVED		DATE		
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A		AS ISSUED PER PC22-5839		PPM			
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31								
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47								



NOTE:  
 1 SEE ENGINEERING + REFERENCE DOCUMENT (ERD)  
 P/N 92857-90001 FOR EXPLANATION OF SHEET NO'S

1 SHEET (5b) OF 10

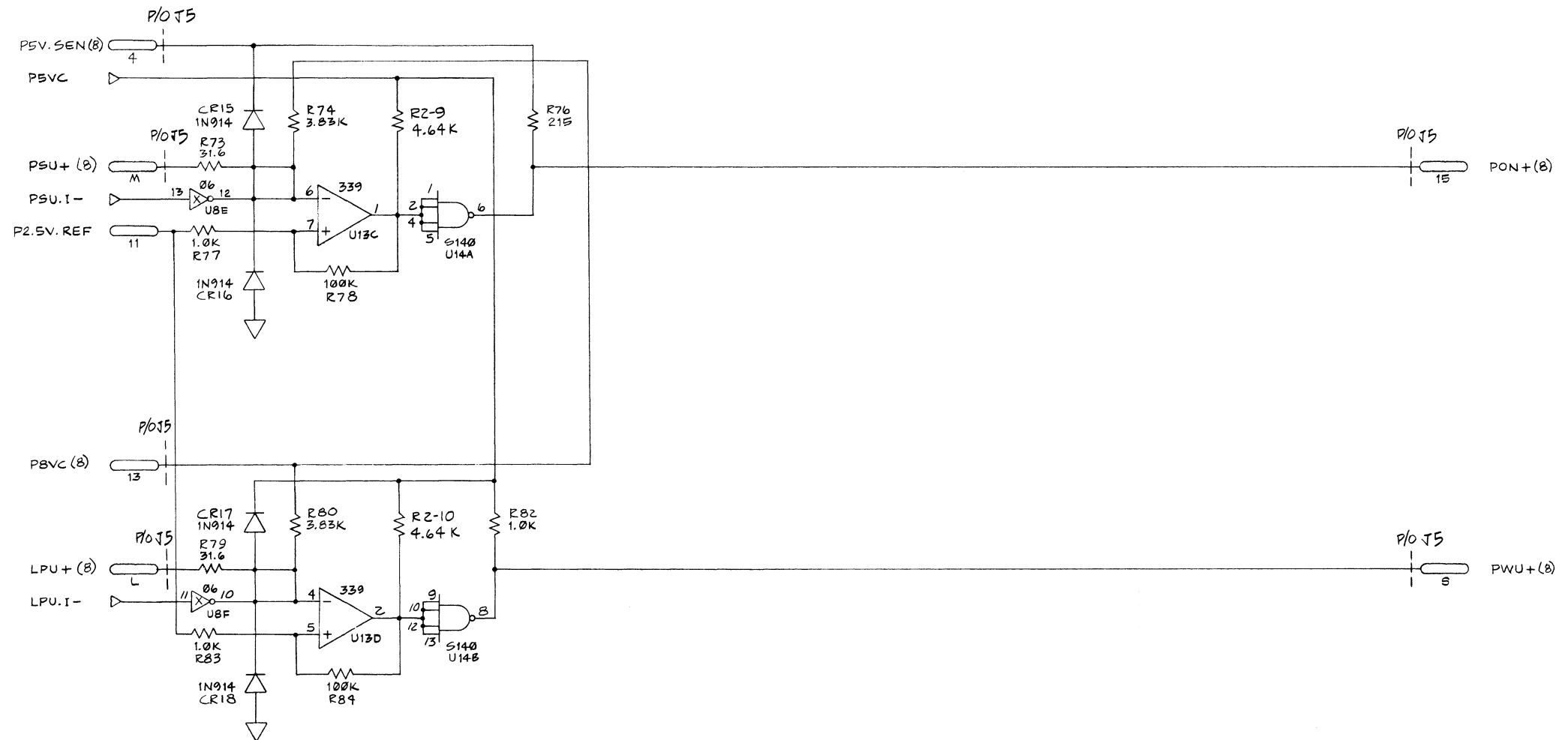
ITEM	QTY.	MATERIAL DESCRIPTION	MAT'L PART NO.	MAT'L DWG. NO.	MAT'L SPEC.
DO NOT SCALE THIS DRAWING					
DRAWN BY D. BELL		DATE 4/1/80		LCPS CONTROL BD. II	
ENGINEER D. BELL		DATE 4/1/80		CONTROL LOGIC (A3A5)	
TOLERANCES .XX ± .02 .XXX ± .005		5061-3476		HEWLETT PACKARD	
SEE CORP. STD. 608		NEXT ASSEMBLY		PART NUMBER	
SUPERSEDES DWG.		FINISH NONE		5061-3455	
		SCALE NONE		C-5061-3455-52	

STOCK NO. 9280-0003 PRINTED ON DIEPO NO. 1020-10 CLEARPRINT FADEOUT





ENGINEERING RESPONSIBILITY															SEPIA															C-																									
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	SYM	REVISIONS		APPROVED	DATE
																																A	AS ISSUED PER PC22-5839		PPM																				



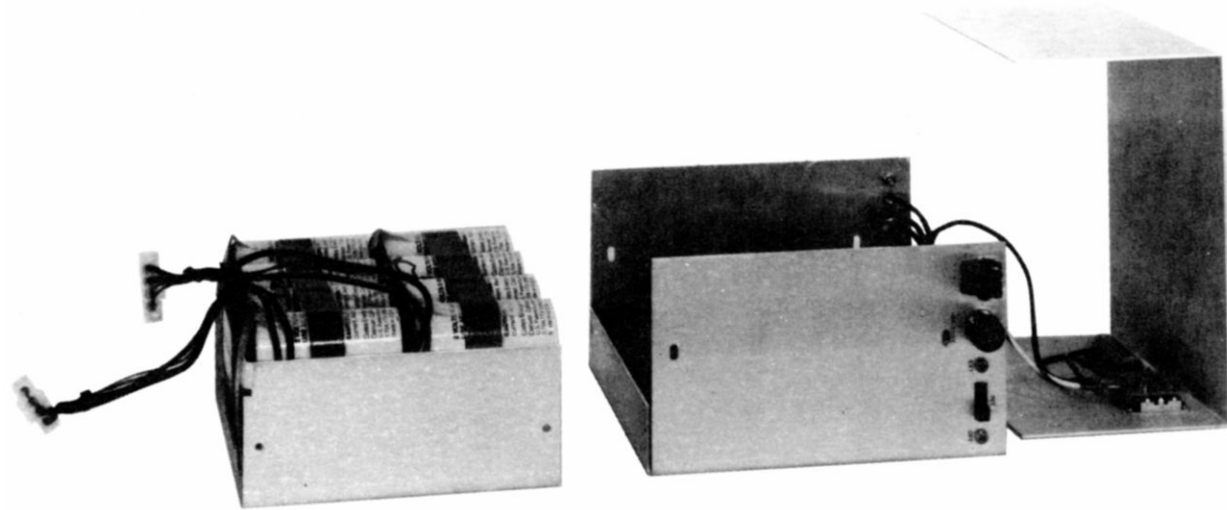
NOTE:  
 [1] SEE ENGINEERING + REFERENCE DOCUMENT (ERD)  
 P/N 92851-90001 FOR EXPLANATION OF SHEET NO'S

[1] SHEET (5c) OF 10

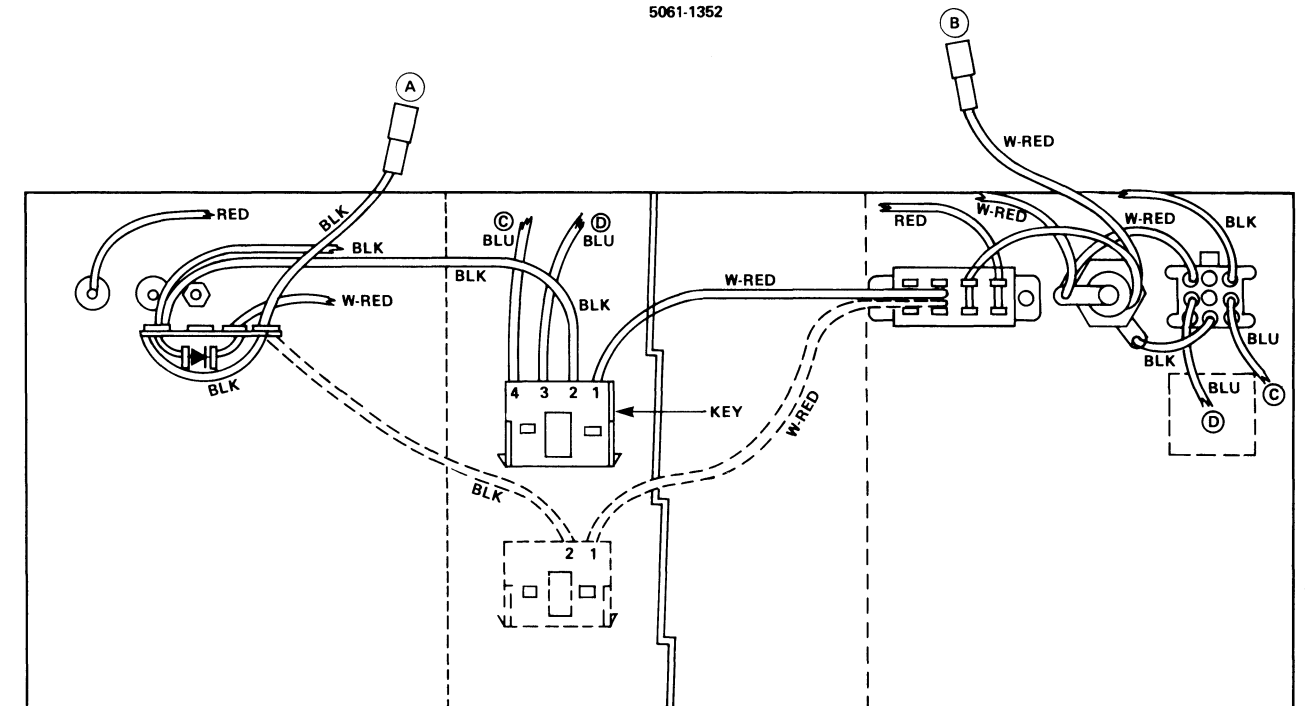
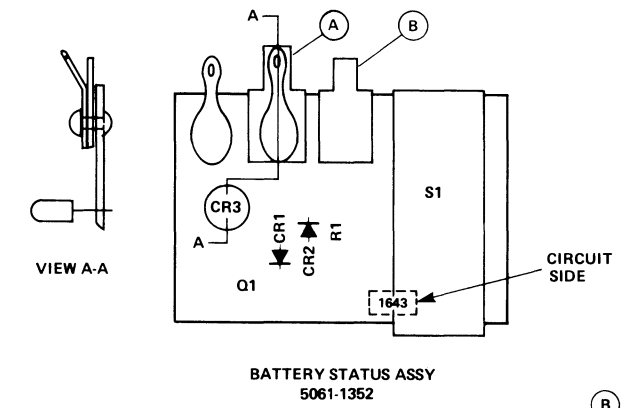
ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.	MAT'L-DWG. NO.	MAT'L-SPEC.
DO NOT SCALE THIS DRAWING					
DRAWN BY D. BELL		DATE 4/2/80	LCPS CONTROL BD. II		HEWLETT  PACKARD
ENGINEER D. BELL		DATE 4/2/80	INTERFACE LOGIC (A3A5)		
TOLERANCES .XX ± .02 .XXX ± .005		SEE CORP. STD. 608	NEXT ASSEMBLY 5061-3476		PART NUMBER 5061-3455
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.		RELEASE TO PROD. <i>Peter Miner</i>	FINISH NONE		SCALE NONE
SUPERSEDES DWG.		C-5061 - 3455 -53		SHEET 3 OF 3	

STOCK NO. 9280-0003 PRINTED ON DIEPO NO. 1020-10 CLEARPRINT FADEOUT





\*The 12944B Battery Status Assembly supplied with single battery set.



NOTE:  
MATERIAL IN BROKEN LINES USED IN 12991-60001 ONLY.  
BATTERY BOX WIRING



12944B Battery Box Assembly Parts List (12944-60001) Sht. 1 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
		BARRIER BLOCK		0360-0643		U	1
		TERM-SOLDER LUG		0360-1158		U	1
		TERMINAL STRIP		0360-1607		U	1
		RES 3 1/2 50W		0811-2966		U	1
		SLEEVEING FLEX.		0890-0064		U	0.15
		BATTERY ASSY		0950-1596		U	1
		WASHER NEOPRENE		1400-0090		U	1
		DIODE		1901-1086		U	1
		FUSE 6A NB		2110-0056		U	1
		CAP-FUSEHOLDER		2110-0465		U	1
		FUSEHOLDER-BODY		2110-0470		U	1
		LKWSHR 1/2 INT		2190-0068		U	1
		LKWSHR 4 HEL		2190-0108		U	4
		LKWSHR 6 HEL		2190-0851		U	2
		SCR 4-40X.25		2200-0103		U	2
		SCR #4-40X.375L		2200-0143		U	2
		NUT		2260-0002		U	2
		SCR #6-32X.250L		2360-0113		U	10
		SCR #6-32X.625L		2360-0203		U	2
		NUT 6-32 .250AF		2420-0003		U	2
		NUT 1/2-28		2950-0054		U	1
		SW SLIDE OP3T PC		3101-2151		U	1
		FOAM-PLASTIC		4208-0173		U	1
		WIRE 18 BLK		8150-2890		C	0.63
		WIRE 18 RED		8150-2891		C	0.25
		WIRE 18 AWG BARE		8151-0011		U	0.19

12944B Battery Box Assembly Parts List (12944-60001) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
		PAD-FOAM		9220-2070		C	1
		BOX-BATTERY		5000-8095		W	1
		COVER-BATTERY		5000-8096		W	1
		HOLD DWN BATTERY		5000-8097		W	1
		ASSY-LCPS STATUS		5061-1352		4	1
		ASSY-BAT. CBL		12944-60005		1	1

12944B Battery Box Subassembly Parts List (5061-1352)

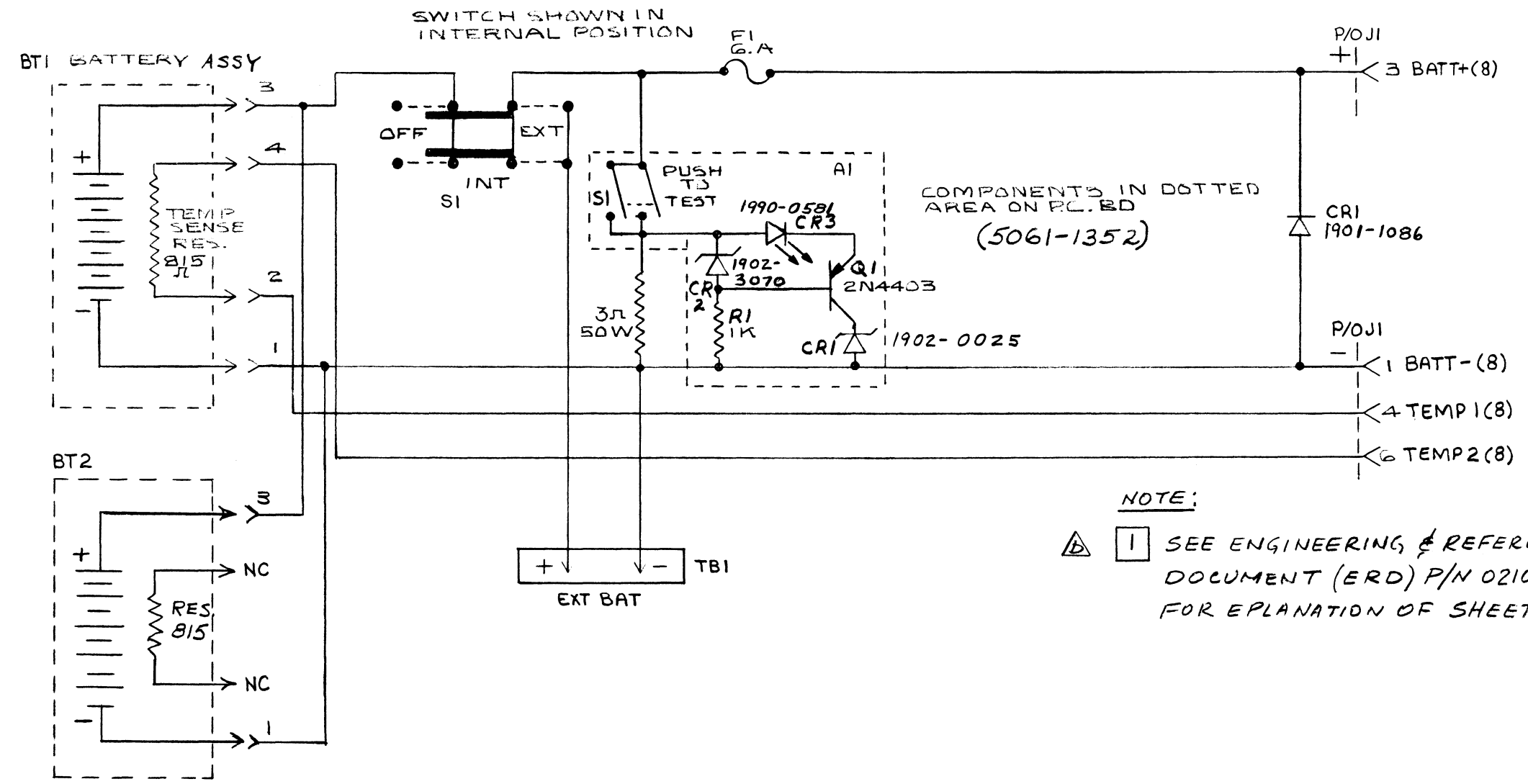
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		TERM-SOLDER LUG		0360-0272		U	2	
		TERM-BARR BLOCK		0360-1824		U	2	
		EYLT .121DX.200		0361-1032		U	3	
00R1		RES 1K 1%.125		0757-0280		D	1	
00Q1		XSTR 2N4403 T092		1853-0271		U	1	
00CR1		DIODE 10V ZEN		1902-0025		D	1	
00CR2		DIODE ZNR 4.22V		1902-3070		D	1	
00CR3		LED-V SEN		1990-0581		U	1	
00S1		SW SLIDE MOM		3101-2153		U	1	
		LABEL-USA		7120-6830		L	1	





ENGINEERING RESPONSIBILITY															SEPIA																																			
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

B-12944-90004		APPROVED	DATE
SYM	REVISIONS		
A	AS ISSUED	JFF/RB	10/29/76
B	PCO-22-4230 - BATTERY ASSY. WAS 12944-60004	AD/SV	8/24/77
C	PCO-22-5704, ADD. SHT. 9 OF 10	AD/PPM	6/27/80
D	ADD. NOTE 1	AD/PPM	8-15-80



COMPONENTS IN DOTTED AREA ON P.C.B.D (5061-1352)

NOTE:  
 1 SEE ENGINEERING & REFERENCE DOCUMENT (ERD) P/N 02109-90007 FOR EXPLANATION OF SHEET NOS.

ADDITIONAL BATTERY FOR 12991-60001 ASSY

BATTERY/STATUS SCHEMATIC (PFRS)		HEWLETT  PACKARD	
TITLE LCPS			
12944B / 12991B /		5061-1352	
NEXT ASSEMBLY 13303J		12944-60001	
		PART NUMBER 12991-60001	
FINISH	SCALE	B-12944-90004-51	

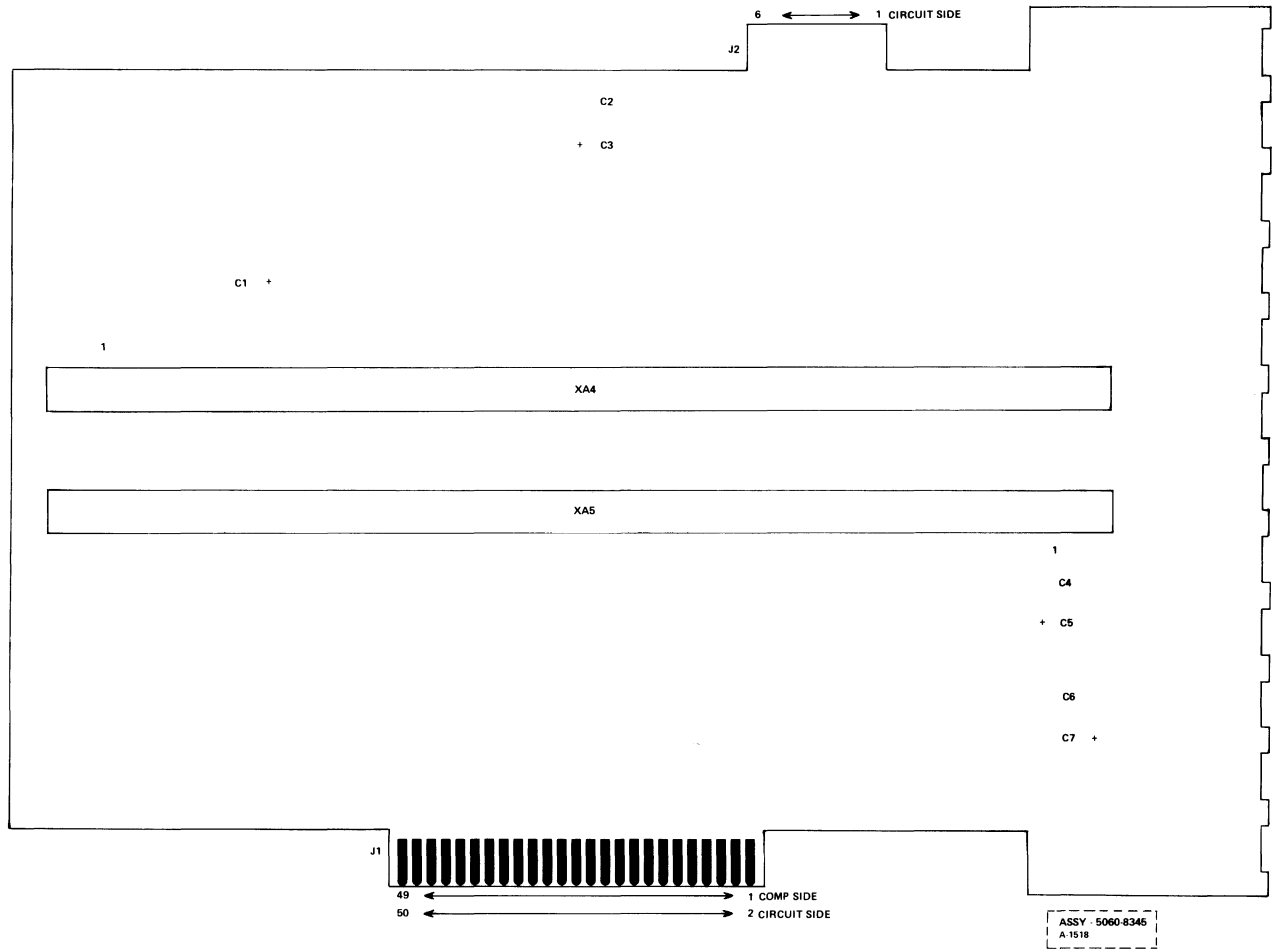


12991B Battery Box Assembly Parts List (12991-60001) Sht. 1 of 2)

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		BARRIER BLOCK		0360-0643		U	1	
		TERM-SOLDER LUG		0360-1158		U	1	
		TERMINAL STRIP		0360-1607		U	1	
		RES 3 1/2 50W		0811-2966		U	1	
		SLEEVING FLEX.		0890-0064		U	0.15	FT
		BATTERY ASSY		0950-1596		U	2	
		CONN UTIL 4PIN		1251-4623		U	1	
		CONTACT-CONN		1251-4747		U	2	
		WASHER NEOPRENE		1400-0090		U	1	
		DIODE		1901-1086		U	1	
		FUSE 6A NR		2110-0056		U	1	
		CAP-FUSEHOLDER		2110-0465		U	1	
		FUSEHOLDER-BODY		2110-0470		U	1	
		LKWSHR 1/2 INT		2190-0068		U	1	
		LKWSHR 4 HEL		2190-0108		U	4	
		LKWSHR 6 HEL		2190-0851		U	2	
		SCR 4-40X.25		2200-0103		U	2	
		SCR #4-40X.375L		2200-0143		U	2	
		NUT		2260-0002		U	2	
		SCR #6-32X.250L		2360-0113		U	10	
		SCR #6-32X.625L		2360-0203		U	2	
		NUT 6-32 .2504F		2420-0003		U	2	
		NUT 1/2-28		2950-0054		U	1	
		SW SLIDE GP3T PC		3101-2151		U	1	
		FOAM-PLASTIC		4208-0173		U	1	
		WIRE 18 WHT-RED		8150-2649		C	0.50	FT

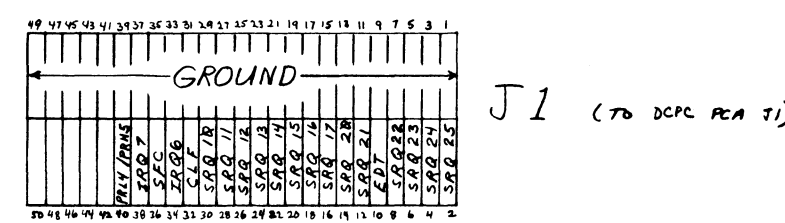
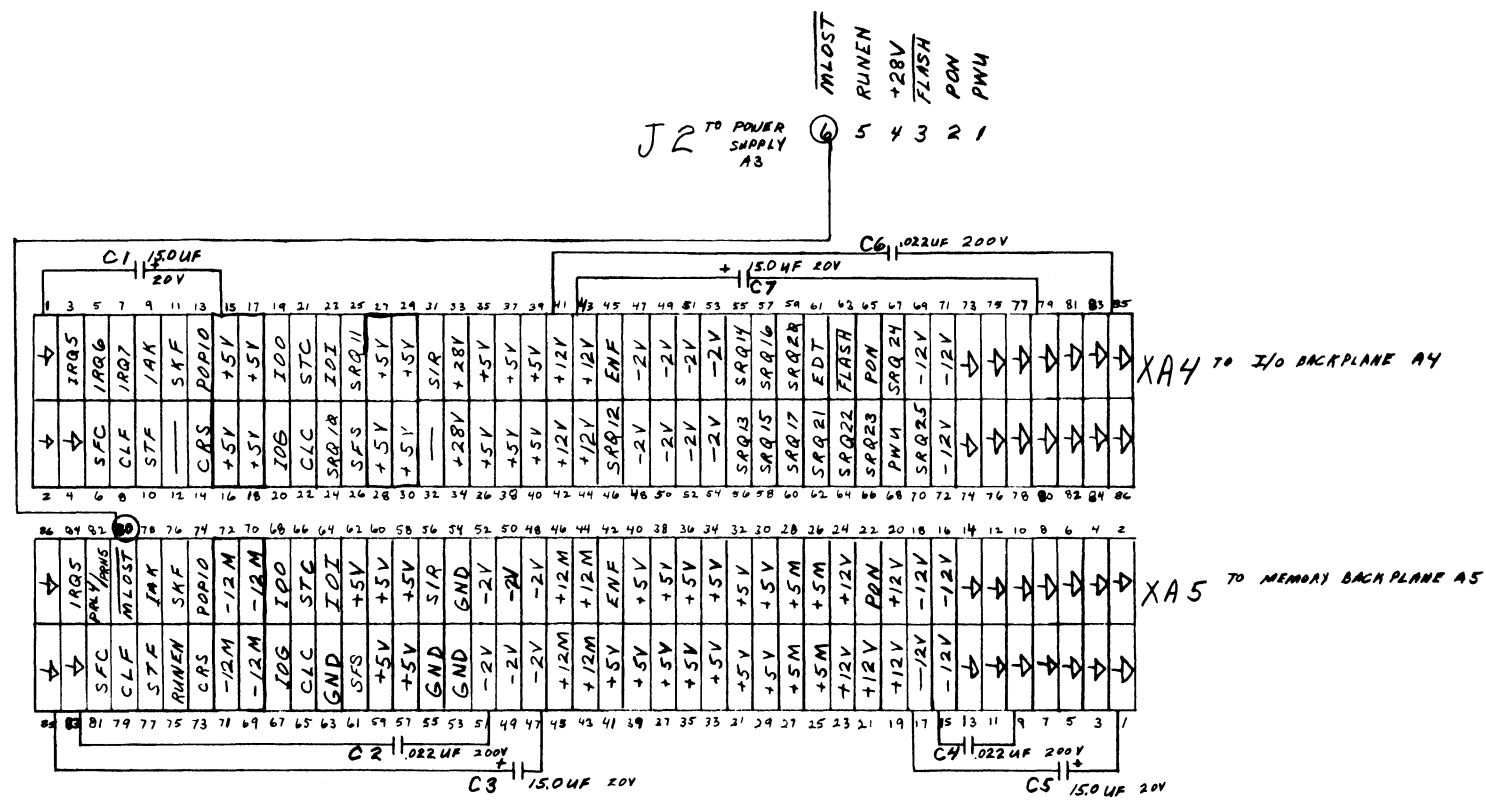
12991B Battery Box Assembly Parts List (12991-60001) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		WIRE 18 BLK		8150-2890		C	1.13	FT
		WIRE 18 RED		8150-2891		C	0.25	FT
		WIRE 18 AWG BARE		8151-0011		U	0.19	FT
		PAD-FOAM		9220-2070		C	2	
		ASSY-LCPS STATUS		5061-1352		4	1	
		ASSY-BAT. CBL		12944-60005		1	1	
		HOLD DWN BATTERY		12991-00001		W	1	
		COVER-DOUBLE		12991-00002		W	1	
		BOX-BATTERY		12991-00003		W	1	



2105A/08A/09A/12A/13A Crossover Board Assembly  
5060-8345

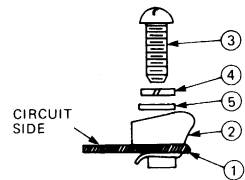
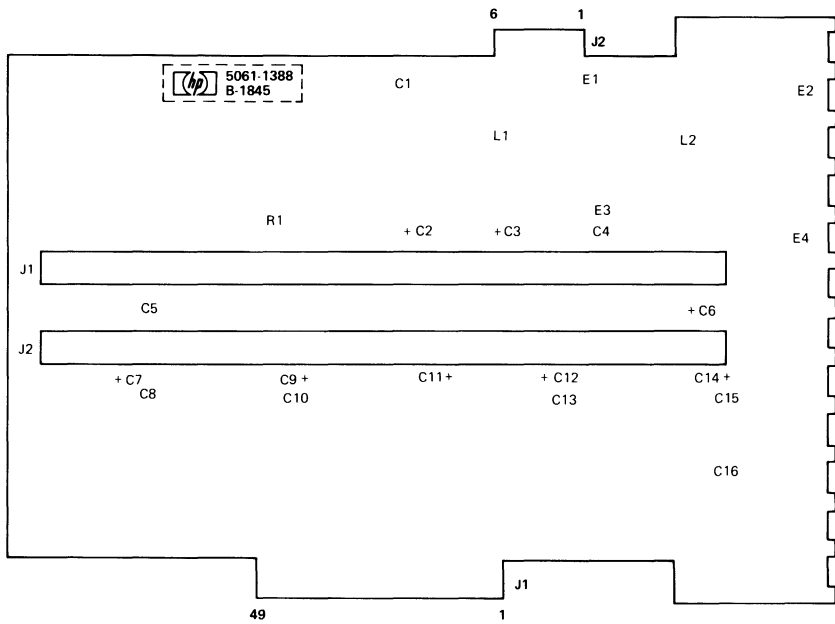




NOTE:  
1. ALL CAPACITORS ARE ±10%







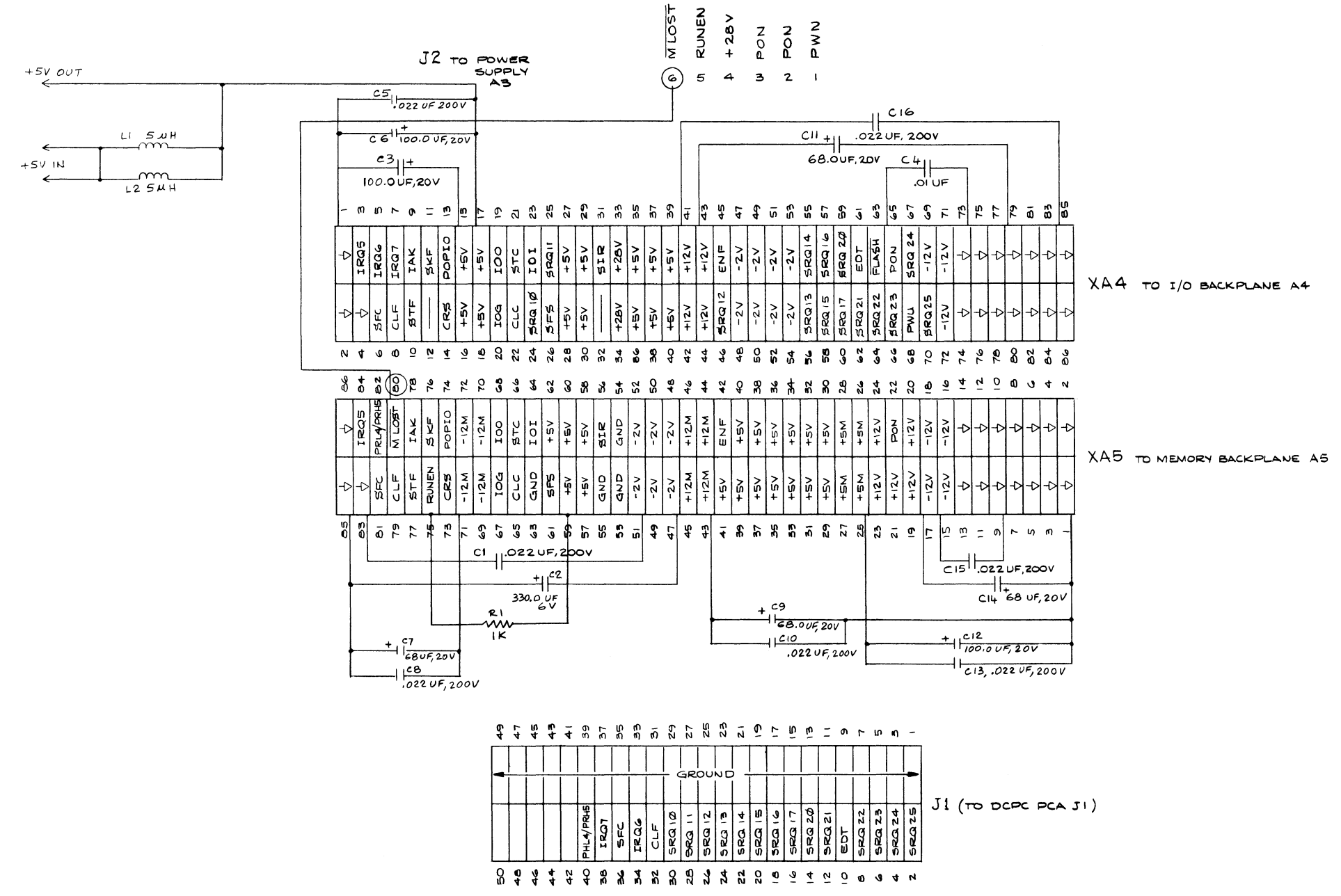
ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
1	1	BOARD ETCHED	5090-1601
2	12	CLIP	0360-0589
3	12	SCREW, 6-32 x .437 LG.	2360-0199
4	12	WASHER SPLIT LOCK	2190-0851
5	12	WASHER FLAT	3050-0228
6	3"	WIRE MAGNET 20 AWG	8180-2220
7	4	E1-E4	0360-1529
8	2	L1, L2	9100-2957

2108B/09B/11F/12B/13B/17F Crossover Board Assembly  
5061-1388



ENGINEERING RESPONSIBILITY																REVISIONS																											
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
																DATE																											
																APPROVED																											
																DATE																											

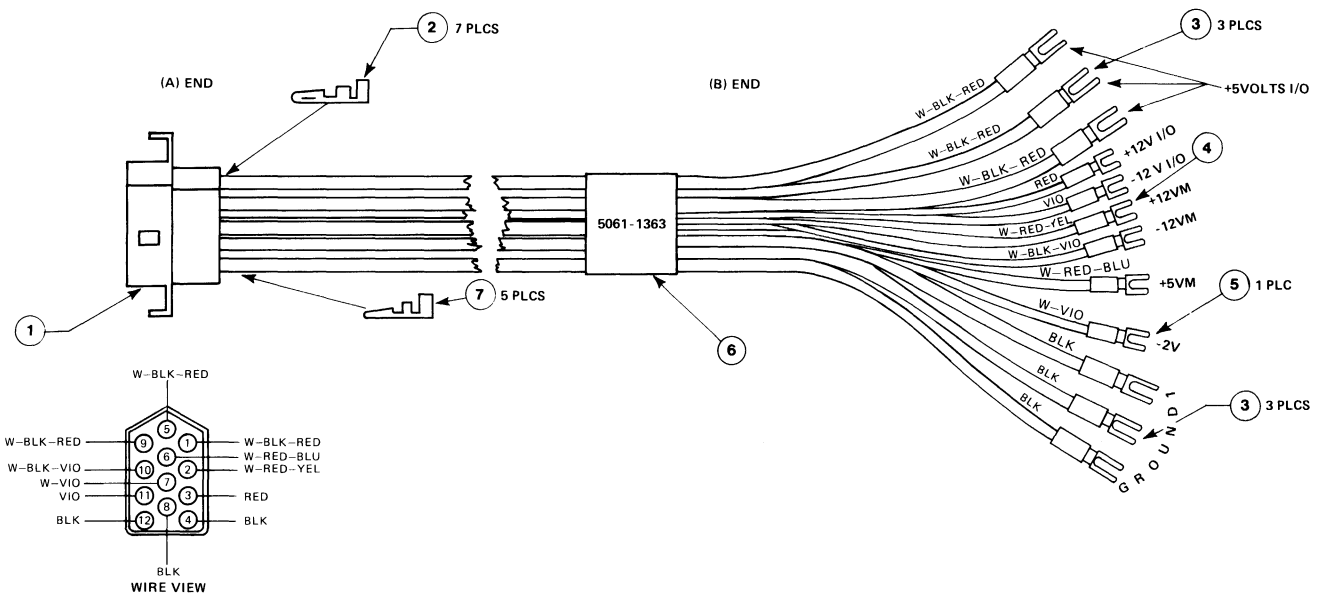
REV	DESCRIPTION	APPROVED	DATE
A	AS ISSUED		5-18-77
B	PCO-22-4832, APP. K1(1K) DATE CODE 15171E	GJ	9-5-77
C	PCO-22-4832, CIRCUIT CHG. DATE CODE 151837	GJ	9-15-78
D	PCO-22-5159, C2 WAS 100UF EDV. DATE CODE 161865	GJ	2-21-79



NOTE:  
1. ALL CAPACITORS ARE ±10%

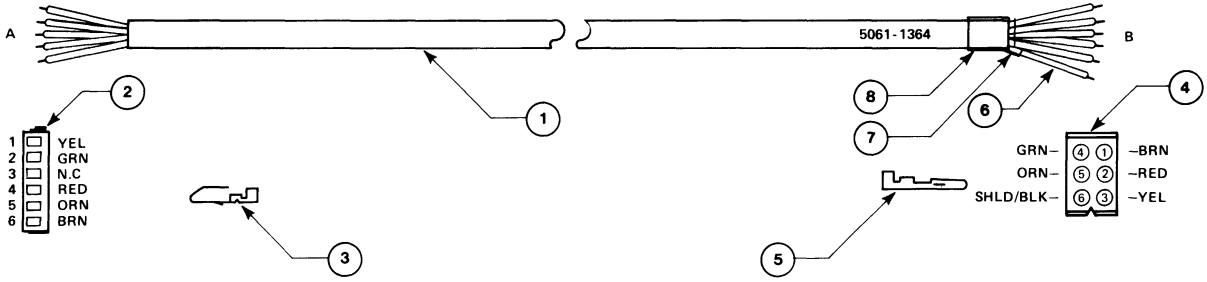
CROSS-OVER PCA		HEWLETT-PACKARD	
SCHEMATIC			
NEXT ASSEMBLY	SCALE	PART NUMBER	
		D-5061-1388-51	





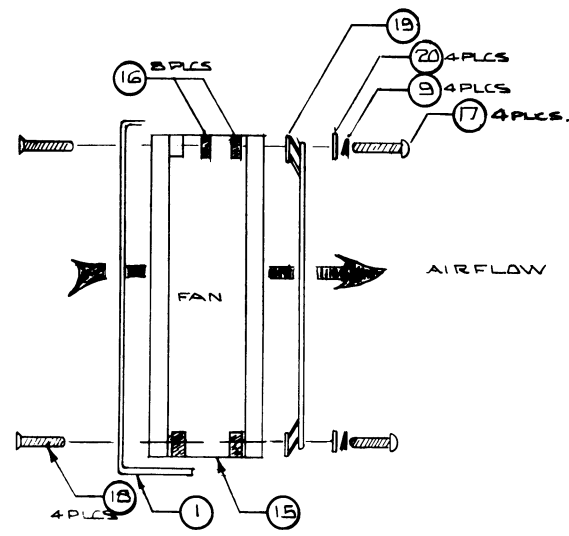
ITEM	QTY.	DESCRIPTION	PART NO.
1	1	HOUSING	1251-4638
2	7	CONTACT MALE	1251-4592
3	6	LUG CRIMP (YEL)	0362-0305
4	5	LUG CRIMP (RED)	0362-0317
5	1	LUG CRIMP (BLU)	0362-0318
6	0.15 FT	SHRINK TUBING	0890-0301
7	5	CONTACT MALE	1251-4537

"B" Model Crossover Cable Assembly  
5061-1363

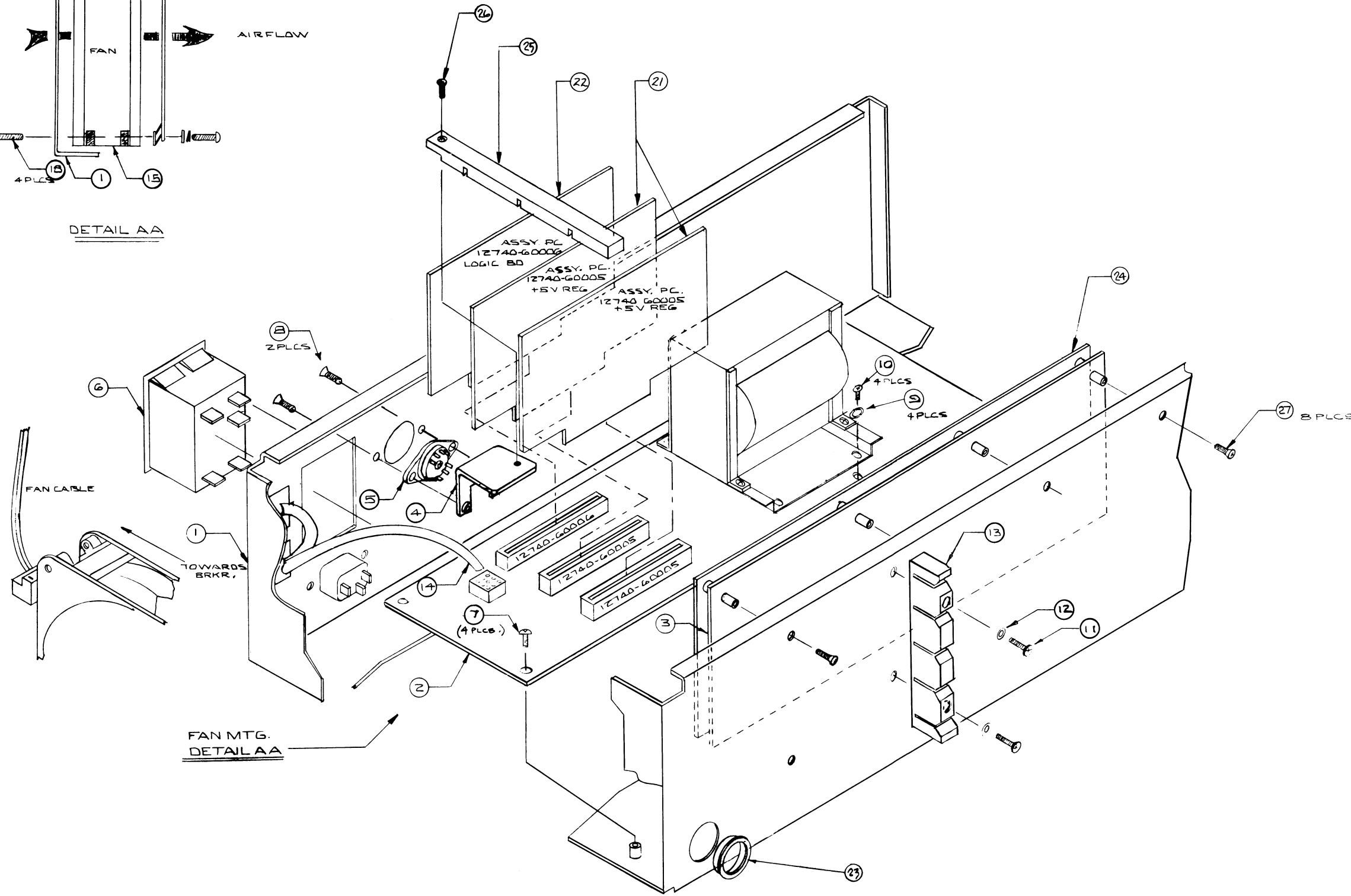


ITEM	QTY.	DESCRIPTION	PART NO.
1	25.00	CABLE 5 COND & SHLD	8120-1856
2	1	HOUSING MOLEX	1251-2546
3	5	CONTACT MALE	1251-2754
4	1	HOUSING MOLEX	1251-2507
5	6	CONTACT MALE	1251-2599
6	2.00	BLK 22 GA WIRE	8150-1540
7	.500	SHRINK TUBING	0890-0311
8	1.500	SHRINK TUBING	0890-0201

"B" Model Crossover Status Cable Assembly  
5061-1364



DETAIL AA



ITEM	QTY.	DESCRIPTION	PART NO.
1	1	BOX PWR SPLY	12740-00004
2	1	ASSY M. BD	12740-60003
3	1	ASSY BACK PLANE	12740-60004
4	1	COVER SWITCH	12740-00012
5	1	SWITCH	3100-3450
6	1	BREAKER	3105-0147
7	4	6-32 SCREW	2360-0113
8	2	4-40 X .375 SCREW	2200-0167
9	8	LOCKWASHER SPLIT	2190-0006
10	4	6-32 X .437 SCREW	2360-0199
11	2	6-32 X .750 SCREW	2360-0125
12	2	WASHER FLAT	3050-0228
13	1	GUIDE PC	13037-20003
14	1	ASSY CABLE	12740-60010
15	1	FAN	3160-0341
16	8	NUT TINNEMAN	0590-0653
17	4	SCREW	2360-0205
18	4	SCREW 6-32 X .625 FHD	2360-0202
19	1	GRILLE WIRE	3160-0092
20	4	WASHER FLAT	3050-0227
21	2	ASSY PC +5V REG	12740-60005
22	1	ASSY PC LOGIC	12740-60006
23	1	GROMMET	0400-0085
24	1	SHIELD-BACKPLANE	12740-00019
25	1	BOARD RETAINER	12740-20003
26	1	SCREW ~ FH 6-32 X .500	2360-0200
27	8	SCREW 6-32 X .875 FH	2360-0206

FPP Power Supply Assembly (12740-60007)



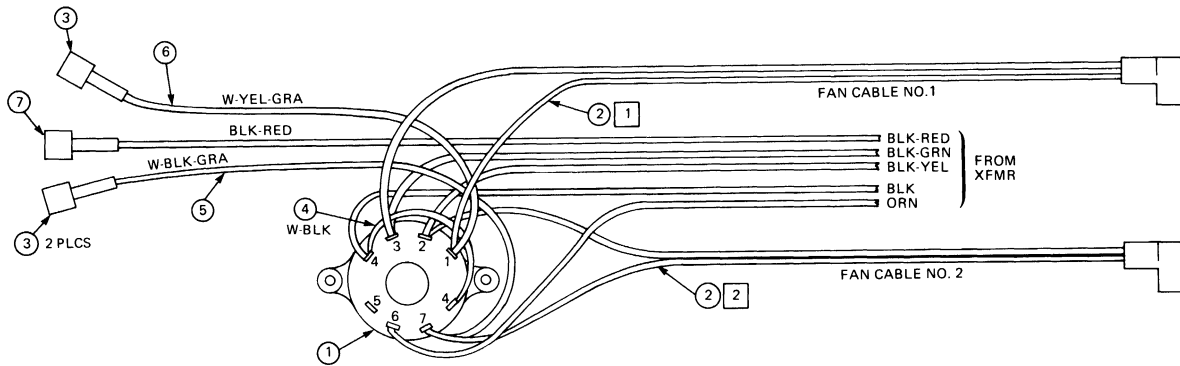
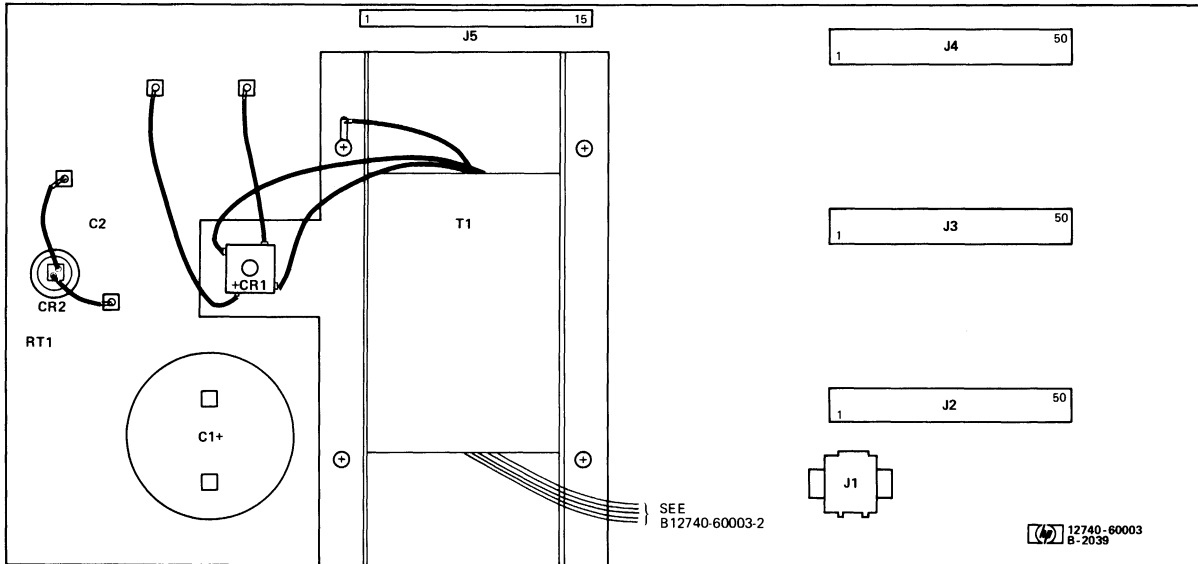


FPP Power Supply Assembly Parts List (12740-60007) Sht. 1 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		CAP .22UF 10%		0160-4259		U	1	
		LUG SOLDER #6LKG		0360-0268		U	1	
		CONN-SGL CONT		0362-0561		U	2	
		GROM SNAP .875ID		0400-0085		U	1	
		NUT SHMET U 6-32		0590-0653		U	8	
		SLEEVING FLEX.		0890-0064		U	0.09	FT
		TBG HS BLK .375D		0890-0291		U	0.17	FT
		TBG HS BLK .750D		0890-0301		U	0.09	FT
		LKWSHR 6 MEL		2190-0006		U	6	
		SCR #4-40X.375L		2200-0167		U	2	
		SCR #6-32X.250L		2360-0113		U	8	
		SCR 6-32X.75		2360-0125		U	2	
		SCR #6-32X.437L		2360-0199		U	4	
		SCR #6-32X.500L		2360-0200		U	1	
		SCR #6-32X.625L		2360-0202		U	4	
		SCR #6-32X.750L		2360-0205		U	4	
		SCR #6-32X.875L		2360-0206		U	8	
		NUT 6-32 .250AF		2420-0003		U	1	
		WSHR #6 SS		3050-0227		U	4	
		WSHR #6 SS		3050-0228		U	2	
		CIRCUIT BREAKER		3105-0147		U	1	
		FAN GRILLE		3160-0092		U	1	
		FAN-TBAX		3160-0341		U	1	
		LABEL INFO		7120-3738		U	1	
		LABEL-WARNING		7120-4567		U	1	
		WIRE 22 BLK		8150-1540		C	0.25	FT

FPP Power Supply Assembly Parts List (12740-60007) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER	UM
		WIRE 18 W-BN-GRA		8150-2651		C	0.30	FT
		WIRE 18 W-O-GRA		8150-2916		C	0.30	FT
		WIRE 18 GRN-YEL		8150-2919		C	0.21	FT
		BOX-P.S.		12740-00004		W	1	
		COVER-SWITCH		12740-00012		W	1	
		TAG-INFO 100/220		12740-00013		W	1	
		TAG-INFO 120/240		12740-00014		W	1	
		SHIELD		12740-00019		W	1	
		BRACE		12740-20003		W	1	
		ASSY-FPP MOTHER		12740-60003		4	1	
		ASSY-FPP BK PLN		12740-60004		4	1	
		ASSY- +5V REG		12740-60005		4	2	
		ASSY-LOGIC		12740-60006		4	1	
		ASSY-CBL CTPL		12740-60010		1	1	
		GUIDE PC BD REAR		13037-20003		W	1	



NOTES:

- 1 FAN CABLE NO.1 CUT TO 10" LG STRIP WIRE ENDS .250
- 2 FAN CABLE NO.2 CUT TO 19" LG STRIP WIRE ENDS .250

7	1	LUG CRIMP FASTOM	0362-0467
6	0.50'	WHT-YEL-GRA 18GA	8150-0581
5	0.63'	WHT-BLK-GRA-18GA	8150-2920
4	0.25	WHT BLK 18GA	8150-2895
3	2	LUG CRIMP FASTOM	0362-0561
2	2	FAN CABLE	8120-1478
1	1	SWITCH	3100-314

FPP Power Supply Mother Board Assembly  
12740-60003

FPP Power Supply Mother Board Assembly Parts List (12740-60003) Sht. 1 of 2

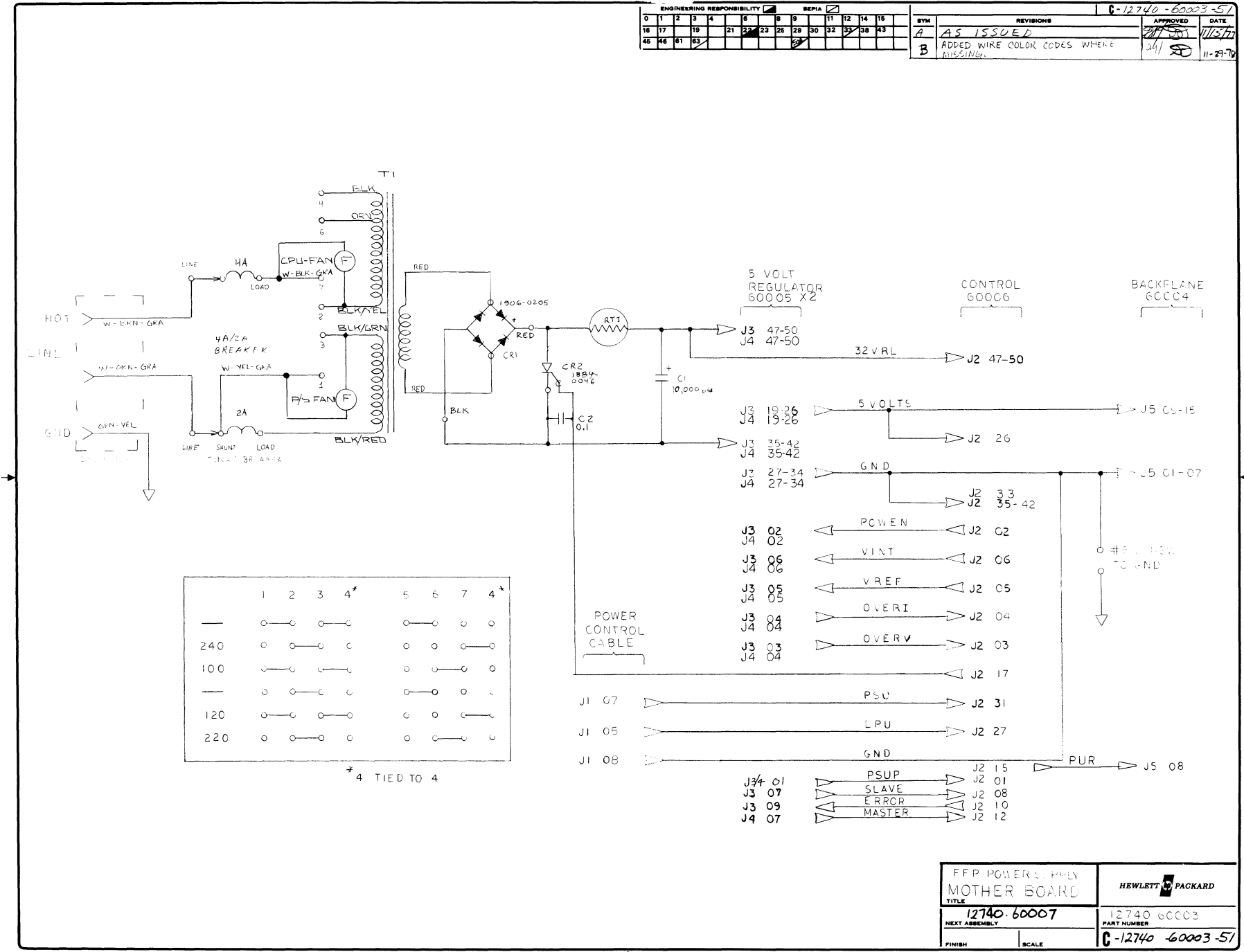
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
01C2		CAP .1UF 20% 50V		0160-0576		D	1
01C1		CAPACITOR-FIXED		0180-2830		U	1
		LUG SOLDER #6LKG		0360-0268		U	1
		LUG CRP22-16.25F		0362-0467		U	1
		CONN-SGL CONT		0362-0561		U	2
		SPACER-CERAMIC		0380-1288		U	2
01R11		THERMISTOR		0837-0214		U	1
00J1		HDR UTIL 9PIN M		1251-4002		U	1
00J2,3,4		CONN PC2X25 .100		1251-4573		U	3
01J5		CONN-15 POS		1251-5093		U	1
01CR2		RECTIFIER		1884-0046		U	1
01CR1		DIO-FW HRDG 200V		1906-0205		U	1
		LKWSHR 1/4 INT		2190-0027		U	1
		LKWSHR 10 HEL		2190-0034		U	2
		SCR 4-40X.312		2200-0105		U	6
		SCR #6-32X.500L		2360-0201		U	1
		SCR 6-32X.375		2360-0359		U	6
		SCR 10-32X.375		2680-0099		U	2
		NUT 1/4-28		2950-0036		U	1
		WSHR #10 SS		3050-0226		U	2
		WSHR #6 SS		3050-0228		U	7
		WSHR .260ID 8RS		3050-0234		U	2

FPP Power Supply Mother Board Assembly Parts List (12740-60003) Sht. 2 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	L O C	QUANTITY PER
01S1		SW RTRY 6POS AC		3100-3450		U	1
		COMPOUND-THERMAL		6040-0239		U	0.01
		CDSET FAN UL		8120-1478		U	2
01F1		WIRE 18 W-Y-GRA		8150-0581		C	0.50
		WIRE 22 Y		8150-1544		C	0.17
		WIRE 16 RED		8150-2185		C	0.38
		WIRE 16 BLACK		8150-2605		C	0.49
		WIRE 18 WHT-BLK		8150-2895		C	0.25
		WIRE 18 W-BK-GRA		8150-2920		C	0.63
01T1		TRANSFORMER-PWR		9100-4070		U	1
		GUIDE-PC		5040-0170		W	6
		PLATE-XFMR		12740-00009		W	1



ENGINEERING RESPONSIBILITY																6-12740-60003-51			
BYM																REVISIONS		APPROVED	DATE
A AS ISSUED																		<i>[Signature]</i>	11/27/70
B ADDED WIRE COLOR CODES WHERE MISSING.																		<i>[Signature]</i>	11-29-70



	1	2	3	4*	5	6	7	4*
—	○	○	○	○	○	○	○	○
240	○	○	○	○	○	○	○	○
100	○	○	○	○	○	○	○	○
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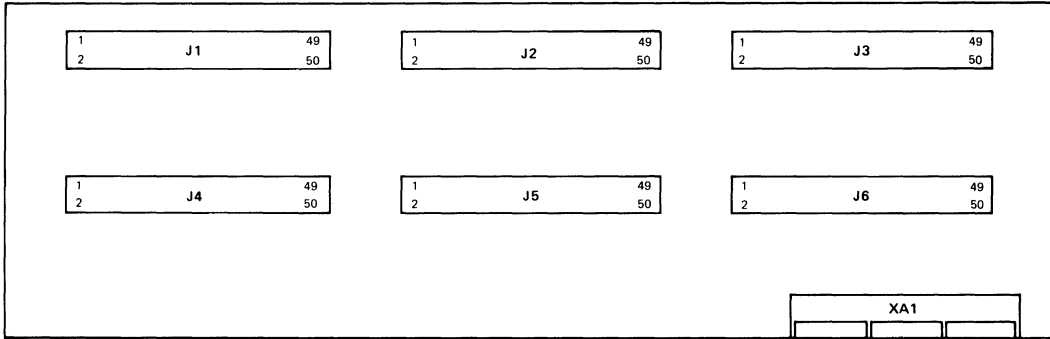
\* 4 TIED TO 4

FFP POWER SUPPLY		HEWLETT PACKARD	
MOTHER BOARD			
TITLE	12740-60007	PART NUMBER	12740-60003
NEXT ASSEMBLY		FINISH	C-12740-60003-51
SCALE		SHEET	1 OF 1





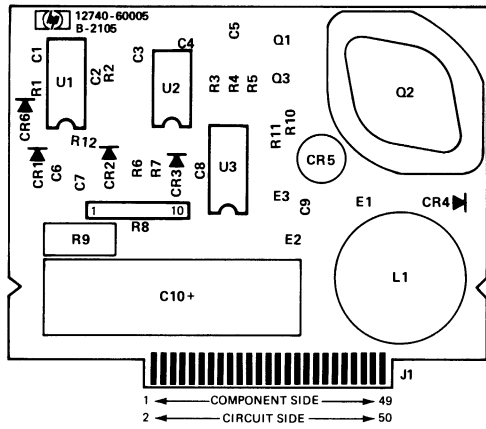
12740-60004  
B-1815



(LOGIC LOCATED  
ON CIRCUIT SIDE)

ITEM	QTY.	DESCRIPTION	PART NO.
4	8	STANDOFF	0380-0076
3	6	PC CONNECTOR 50 PIN	1251-4573
2	1	MOLEX CONN. 15 PIN	1251-5578
1	1	PC BOARD ETCHED	12740-80004

F-Series FPP Backplane Assembly 12740-60004



FPP Power Supply 5V Regulator Assembly-12740-60005

12740A FPP Power Supply 5V Regular Assembly Parts List (Sht 1 of 3)  
(12740-60005)

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01C4,		CAP 1.0UF 20%		0160-0127		U	1	
00C2		CAP .0022UF 10%		0160-0154		U	1	
01C8		CAP .47UF-20+80%		0160-0174		U	1	
01C9,		CAP .1UF 20% 50V		0160-0576		D	1	
01C1,3,5,7,		CAP .01UF 20%		0160-3879		U	4	
00C6		CAP 15UF 10%		0180-1746		D	1	
01C10,		CAPACITOR-FIXED		0180-2829		U	1	
		PAD-MTG T05		0340-0164		U	1	
		STUD SOLDER TERM		0360-0474		U	2	
01E1-3		TERM-SLDR STUD		0360-1819		U	3	
		SPCR TAP #6X.125		0380-0305		U	2	
		STDF-RND .250-IN		0380-1145		U	1	
00R7		RES 2.15K 1%.125		0698-0084		D	1	
01R3		RES 464K 1%.125		0698-3260		D	1	
01R4,5		RES 215 1%.125		0698-3441		D	2	
01R11		RES 196K 1%.125		0698-3453		U	1	
00R1		RES 21.5K 1%.125		0757-0199		D	1	
01R10		RES 10 1%.125		0757-0346		D	1	
		RES 562 1%.125		0757-0417		D	1	

12740A FPP Power Supply 5V Regular Assembly Parts List (Sht 2 of 3)  
(12740-60005)

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01R12				0757-0417				
00R2,6		RES 10K 1%.125		0757-0442		D	2	
01R9		RESISTOR-FIXED		0811-3511		U	1	
		HT DIS T0-3		1205-0289		U	1	
00R8		NTWK RES 9X10K		1810-0280		U	1	
01U3,		RESISTOR-ARRAY		1810-0316		U	1	
00U2		IC QUAD COMPTR		1826-0138		U	1	
01U1		IC SG3524		1826-0428		U	1	
01Q3		TRANSISTOR		1853-0045		U	1	
00Q1		XSTR 2N2222A T018		1854-0477		U	1	
01Q2		PWR TRANSISTOR		1854-0746		U	1	
01CR3,6		STABISTOR ST8523		1901-0460		D	2	
00CR4		DIODE IN4936		1901-1065		D	1	
01CR5		DIO-SCHOTTKY		1901-1100		U	1	
01CR1		DIODE IN5908		1902-0939		D	1	
00CR2		DIO-ZNR 5.62V 2%		1902-3105		D	1	
		LKWSHR 10 HEL		2190-0034		U	1	
		LKWSHR 6 HEL		2190-0851		U	1	
		SCR 6-32X.375		2360-0359		U	2	
		NUT 6-32 .312AF		2420-0002		U	1	

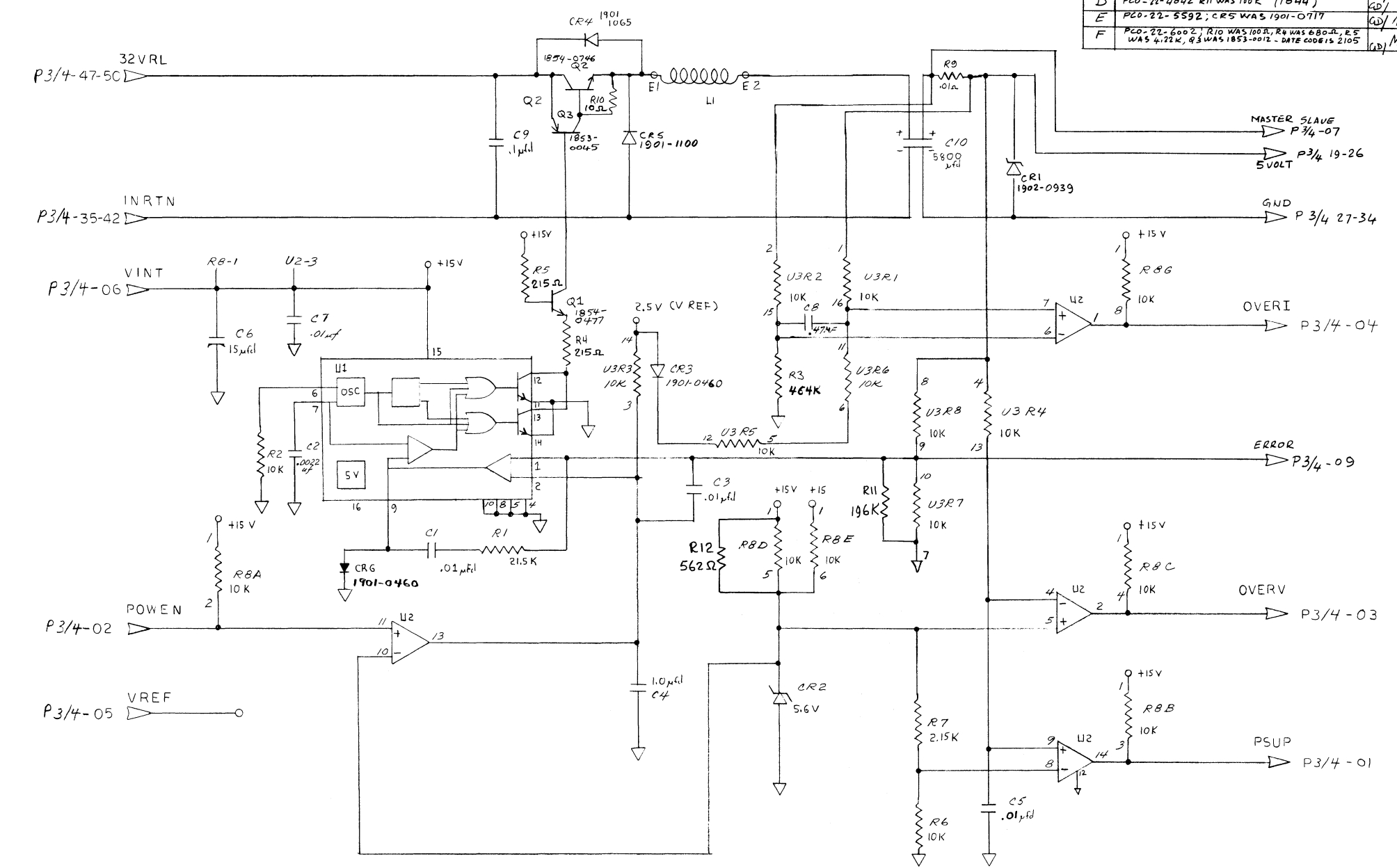
12740A FPP Power Supply 5V Regular Assembly Parts List (Sht 3 of 3)  
 (12740-60005)

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01L1		WSHR #6 SS		3050-0228		U	2	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE 18 BLU		8150-2893		C	0.15	FT
		CHOKE		9140-0307		U	1	



ENGINEERING RESPONSIBILITY															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

REVISIONS		APPROVED	DATE
A	AS ISSUED	[Signature]	11/27/77
B	COMPLIANT CHANGES PER FRCA #0	[Signature]	11/20/78
C	PCO-22-4754 - ADD. R12, DATE CODE 15 1830	[Signature]	8/27/79
D	PCO-22-4842 R11 WAS 100K (1844)	[Signature]	9/27/79
E	PCO-22-5592; CR5 WAS 1901-0717	[Signature]	11/15/80
F	PCO-22-6002; R10 WAS 100K, R8 WAS 680K, R5 WAS 4.72K, Q3 WAS 1853-0012 - DATE CODE IS 2105	[Signature]	11/27/81

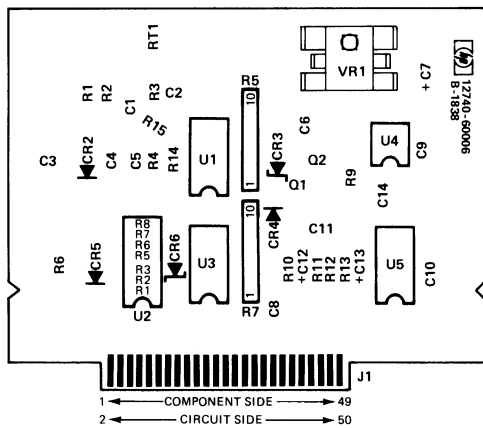


FPP POWER SUPPLY 5VOLT REGULATOR		HEWLETT  PACKARD	
TITLE	12740-60007	PART NUMBER	12740-60005
NEXT ASSEMBLY		SCALE	C-12740-60005-51
FINISH		SCALE	

STOCK NO. 9280-0003 PRINTED ON DIEPO NO. 1020-10 CLEARPRINT FADEOUT







FPP Power Supply Logic Board - 12740 - 60006

12740A FPP Power Supply Logic Board Assembly Parts List (Sht 1 of 2)  
(12740-60006)

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
01C4,14		CAP 1.0UF 20%		0160-0127		U	2
01C10		CAP .47UF-20+80%		0160-0174		U	1
01C3,9		CAP .1UF 20% 50V		0160-0576		U	2
01C6		CAPACITOR-CERAMI		0160-3490		U	1
01C5		CF CE 10P 100V		0160-3567		U	1
00C1,2,8,11		CAP .01UF 20%		0160-3879		U	4
00C7		CAP 100UF-10+75%		0180-0061		U	1
01C12,13		CAP .1UF 10%		0180-1743		U	2
		STUD SOLDER TERM		0360-0474		U	2
01R2		RES 23.7K 1%.125		0698-3158		D	1
01R1		RES 26.1K 1%.125		0698-3159		D	1
01R10		RES 422K 1%.125		0698-3460		U	1
01R12		RES 34.8K 1%.125		0757-0123		U	1
00P6		RES 21.5K 1%.125		0757-0199		D	1
01R4,11,13		RES 750 1%.125		0757-0420		U	3
01R15		RES 10K 1%.125		0757-0442		D	1
00R3		RES 61.9K 1%.125		0757-0460		U	1
		RES 90.9K 1%.125		0757-0464		U	1

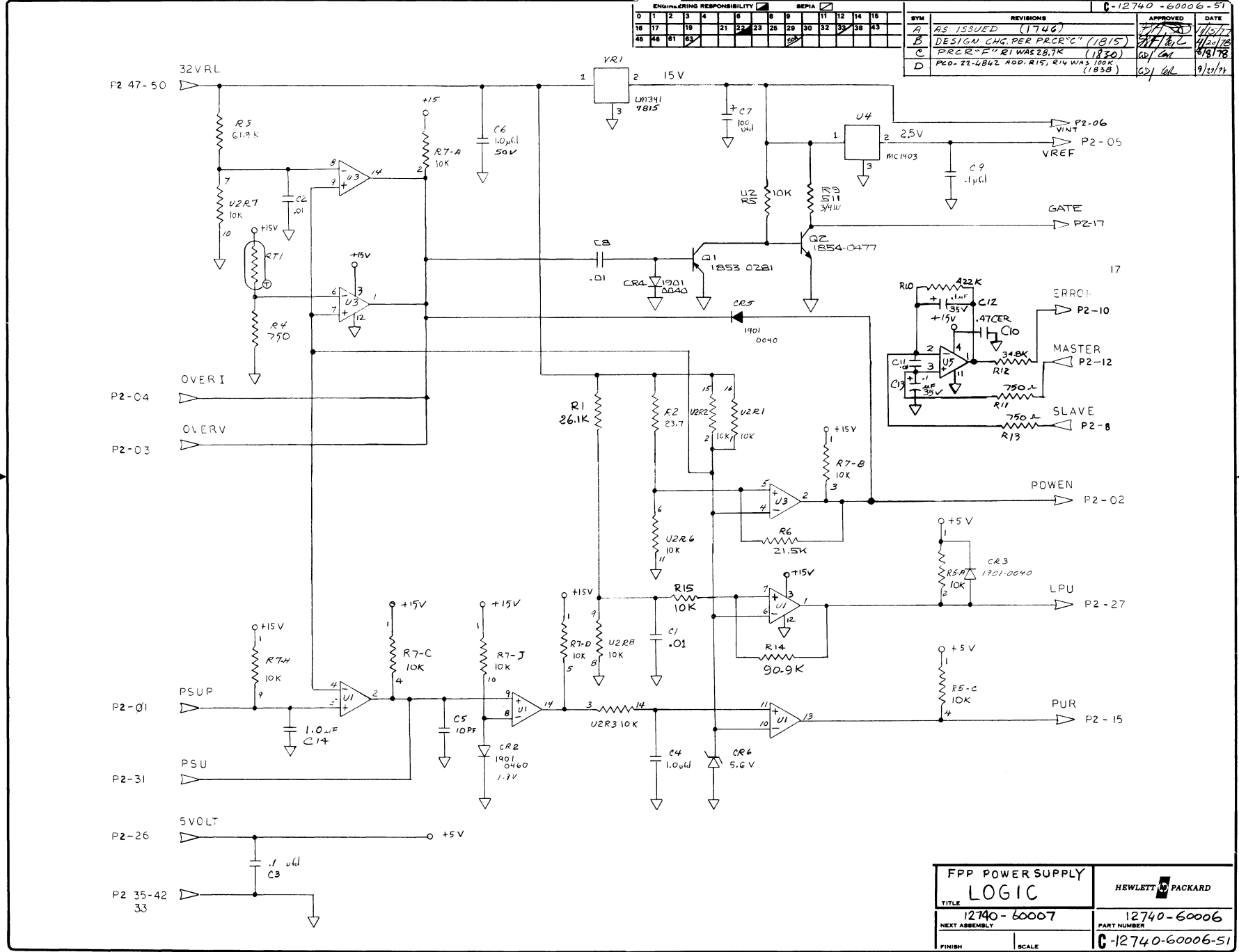
12740A FPP Power Supply Logic Board Assembly Parts List (Sht 2 of 2)  
(12740-60006)

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
		PART NO CONT		0757-0464			
01R14							
		RES 511 1% .50		0757-0814		U	1
01R9							
		THERMISTOR DISC		0837-0040		U	1
01RT1							
		HT DIS PL PWR		1205-0219		U	1
		NTWK RES 9X10K		1810-0280		U	2
01R5,7							
		RESISTOR-ARRAY		1810-0316		U	1
00U2							
		IC QUAD OP AMP		1826-0161		U	1
01U5							
		I.C. MC 3302		1826-0174		U	2
00U1,3							
		IC 7815 V RGLTR		1826-0396		U	1
01VR1							
		IC V REF 2.5V		1826-0467		U	1
01U4							
		XSTR PNP 2N2907A		1853-0281		U	1
00Q1							
		XSTR 2N2222AT018		1854-0477		U	1
01Q2							
		DIODE SIL		1901-0040		D	3
00CR3,4,5							
		STABISTOR STB523		1901-0460		D	1
00CR2							
		DIO-ZNR 5.62V 2%		1902-3105		D	1
00CR6							
		SCR #4-40X.375L		2200-0143		U	1
		NUT 4-40 W/LK		2260-0009		U	1
		COMPOUND-THERMAL		6040-0239		U	0.01
		BOARD-ETCHED		12740-80006		W	1



ENGINEERING RESPONSIBILITY																
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

REVISIONS		APPROVED	DATE
A	AS ISSUED (1746)	[Signature]	4/15/75
B	DESIGN CHG PER PRCR-C" (1815)	[Signature]	4/15/75
C	PRCR-E" R1 WAS 28.7K (1820)	[Signature]	8/5/78
D	PRC-21-4842 ADD R15, R14 WAS 100K (1838)	[Signature]	9/22/78



FPP POWER SUPPLY		HEWLETT PACKARD	
TITLE LOGIC		PART NUMBER 12740-60006	
NEXT ASSEMBLY 12740-60007		SCALE C-12740-60006-51	
FINISH	SCALE	SHEET 1 OF 1	

STOCK NO. 9280-0003 PRINTED ON DIEP NO. 1022-10 CLEARPRINT FADEOUT



# **HP 2108MK AND 2109EK BOARD COMPUTERS**

## **NOTE**

This document is part of the HP 1000 M, E, and F-Series Computers Engineering and Reference Documentation and is not available separately.





HP 2108MK AND HP 2109EK BOARD COMPUTERS	SECTION X
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POWER, VENTILATION, AND ASSEMBLY

Board computer customers will need to provide voltage, current, and ventilation as specified in the following paragraphs. Assembly drawing are provided at the rear of this section.

POWER SUPPLY SPECIFICATIONS. The K-Series microprogrammable processor requires the voltages and tolerances listed in the following table. If memory is to be sustained during power failure the "M" (memory) voltages must be isolated from the CPU and I/O voltages. If this feature is not desired, the +5M and -12M may be common with the +5V and -12V respectively. The +12M should be derived from a separate source since it requires closer regulation than the +12V.

REQUIRED VOLTAGES AND REGULATION

VOLTAGE	REGULATION*
+5V	5%
-2V	10%
+12V	5%
-12V	5%
+5VM	5%
-12VM	10%
+12.5VM**	3%

\*Regulation includes line, load, and ripple  
 \*\*Labeled +12VM

CURRENT REQUIREMENTS. The current required for your CPU, front panel, memory, and accessories can be calculated using the electrical specifications contained in the HP 1000 Computers Hardware Data Book. The current edition of the data book can be obtained from your local Hewlett-Packard Sales and Service Office.

Note: The current requirements for planned additions to your computer should be taken into consideration when designing your power supply.

VENTILATION. Air intake may be from either the left or right side of the card cage. Air must flow parallel to the CPU board. Vents are provided in the the deck for this purpose. See the appropriate assembly drawing located at the rear of this section.

Air flow requirements in cubic feet per minute (cfm) are derived as follows:

cfm required = Watts x 0.22

To derive Watts for dc power use  $P=EI$

0.22 is a constant to provide the total cfm required so that the temperature rise should not exceed 10 degrees Celsius from ambient. Where ambient = 55 degrees Celsius maximum.

CARD CAGE AND BACKPLANE ASSEMBLY. The procedure for assembling the card cage and backplanes to the deck is provided on the drawings at the end of this section. There are three assembly and mounting drawings for the 2108MK and three for the 2109EK.

#### REPAIR INFORMATION

The HP 1000 K-Series Board Computer service plan is based on returning defective boards to the Computer Service Division, K-Series Repair Facility in Cupertino, California for cutomers in the United States. Customers located outside the United States should contact the local Hewlett-Packard Sales and Service Office for the address of their appropriate repair center.

The original shipping container is the recommended package for returning boards and should have been retained for this purpose. All repairs will be performed in the shortest time possible and a two week maximum turn-around time can usually be expected.

Repaired boards will not be updated to the latest service note change revision unless specific instructions are included requesting updates.

You can help expedite repairs by:

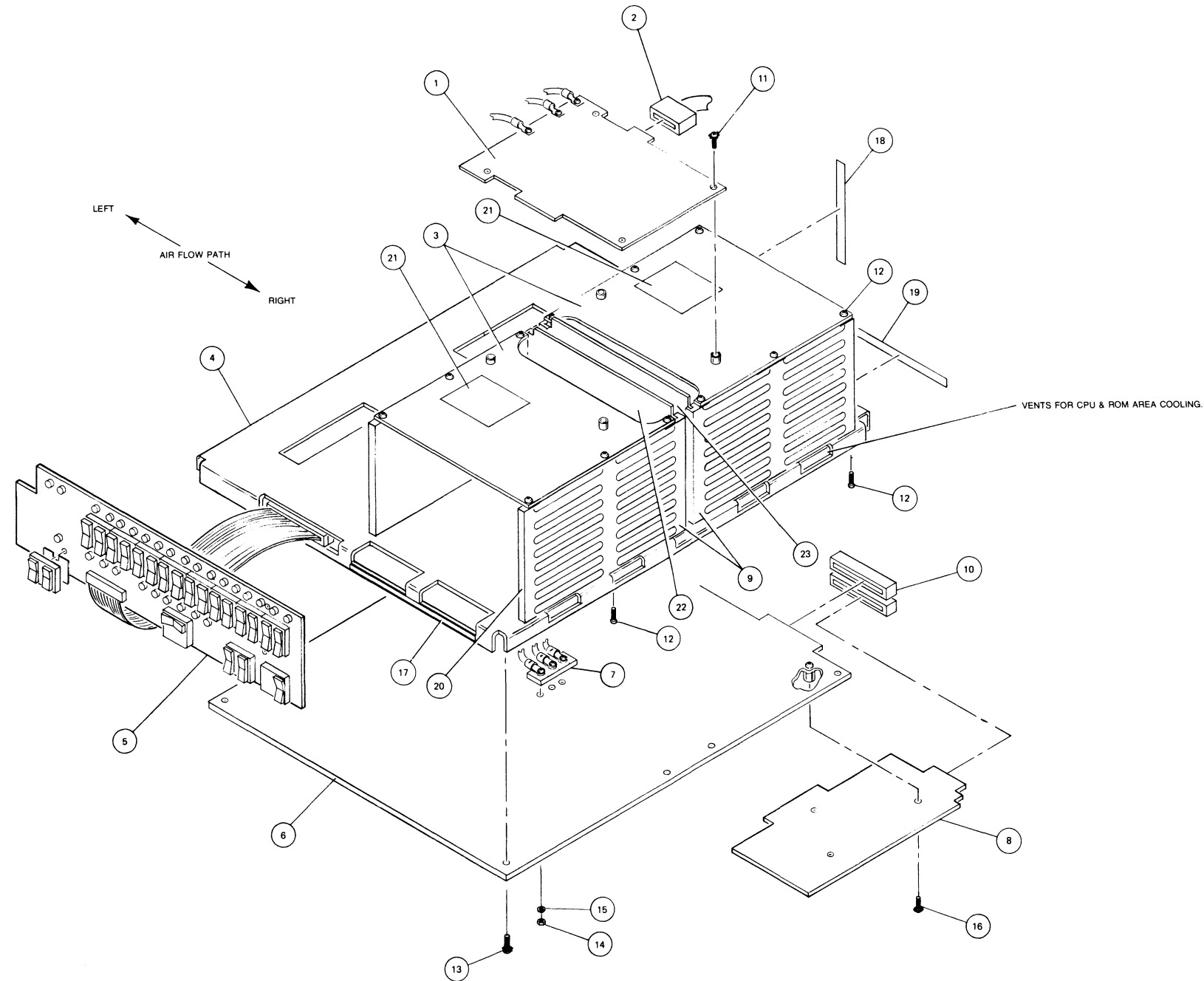
1. Packaging board in original container.
2. Include details describing the failure.
3. Ship packaged boards prepaid to:

Computer Service Division  
K-Series Repair  
19310 Pruneridge Avenue  
Cupertino, California 95014

(HP 1000 M/E/F-SERIES ERD)

ASSEMBLY PROCEDURE

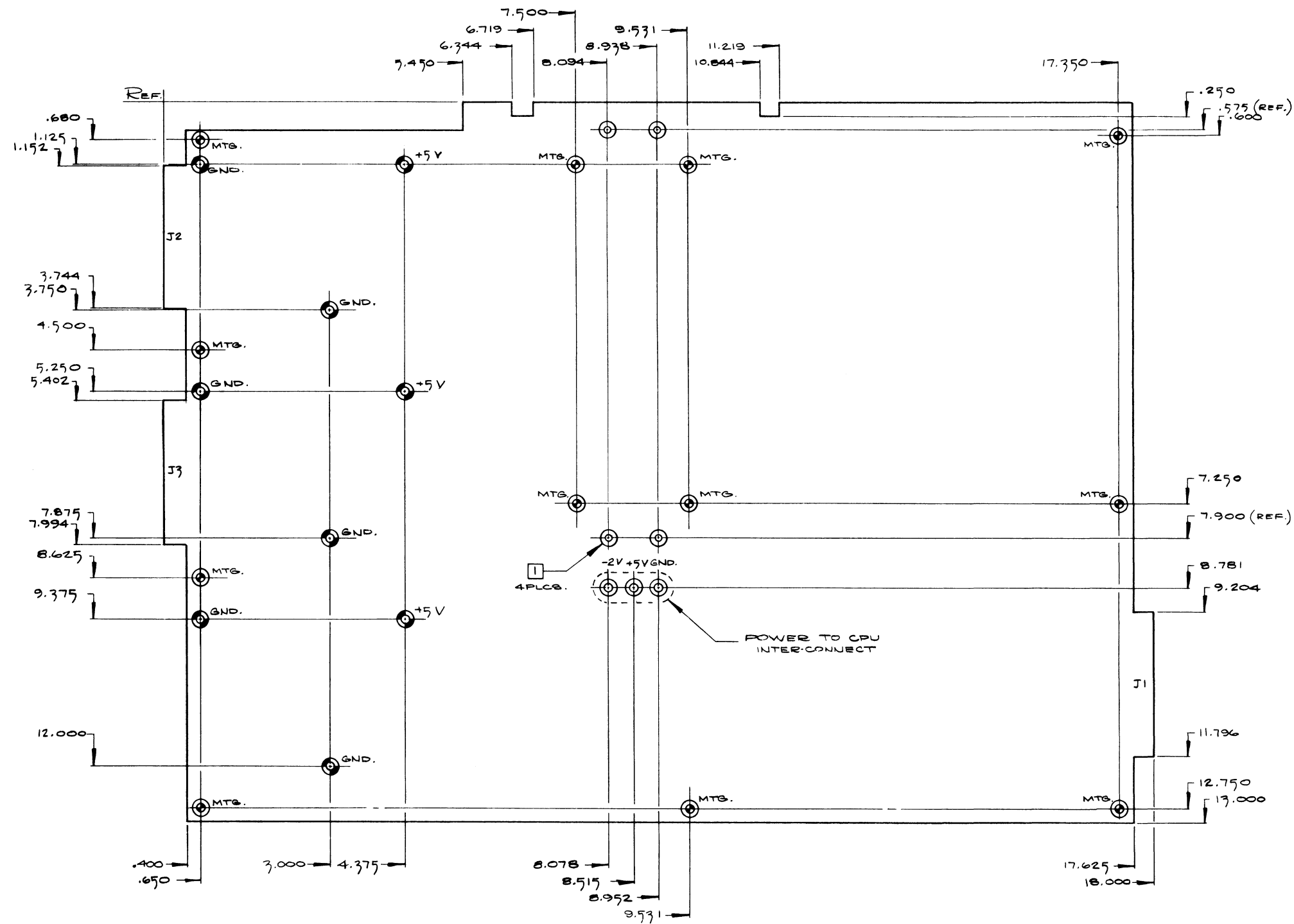
1. ATTACH FRONT AND BACK CARD GUIDES (9) (4 EACH) TO THE DECK (4) USING TWELVE 6-19 X .375 SELF-TAPPING SCREWS (13) TORQUE TO 2 LB/IN. NOTE PROPER LOCATION OF LABELED CARD GUIDES.
2. ATTACH CARD CAGE TOP COVERS (3) (2 EACH) USING TWELVE 6-19 X .375 SELF-TAPPING SCREWS (13) TORQUE TO 2 LB/IN.
3. ATTACH POWER WIRING ASSEMBLY (7) (02108-60039) TO PROCESSOR BOARD (6) (5060-8352) USING NUTS AND LOCKWASHERS INCLUDED WITH THE ASSEMBLY. BLACK WIRE GOES TO GROUND CONNECTION.
4. INSERT POWER WIRING ASSEMBLY THRU HOLE IN DECK AND ATTACH PROCESSOR BOARD TO BOTTOM OF DECK USING TWELVE 6-32 X .375 SCREWS (14)
5. INSERT I/O BACKPLANE BOARD (23) (02105-60002 OR 02108-60007) INTO REAR CARD CAGE AND PROCESSOR BOARD. BE SURE TO INSTALL ACCORDING TO LABELS.
6. INSERT MEMORY BACKPLANE BOARD (22) (02105-60005 OR 02108-60021) INTO FRONT CARD CAGE AND PROCESSOR BOARD. BE SURE TO INSTALL ACCORDING TO LABELS.
7. ATTACH CROSSOVER BOARD (1) (5060-8345) TO I/O AND MEMORY BACKPLANE BOARDS USING FOUR 6-32 X .375 SCREWS (11)
8. ATTACH THE THREE WIRES OF THE POWER WIRING ASSEMBLY TO CROSSOVER BOARD. BLACK TO GROUND; WHITE-BLACK-RED TO +5V AND WHITE-VIOLET TO -2V.
9. CONNECT CABLE ASSEMBLY (2) (02108-60034) TO CROSSOVER BOARD.
10. ATTACH ROM CONTROL STORE BOARD (8) (5061-1367) TO PROCESSOR BOARD USING THREE 6-32 X .250 SCREWS (16) AND CONNECT THE TWO BOARDS TOGETHER WITH CABLE ASSEMBLY (10) (5061-1336).
11. ATTACH FLAT RIBBON CABLE OF FRONT PANEL ASSEMBLY (5) (5060-8343) TO PROCESSOR BOARD (NOTE CONNECTOR ORIENTATION).



23	1	ASSY - I/O BACKPLANE			
22	1	ASSY - MEMORY BACKPLANE			
21	2	LABEL - WARNING			
20	1	LABEL - MEMORY (BLACK & WHITE)			
19	1	LABEL - COMPONENT SIDE UP			
18	1	LABEL - I/O			
17	1	LABEL COMPONENT SIDE UP			
16	3	SCREW 6-32 X .250	2360-0113		
15	3	WASHER - LOCK	2190-0006		
14	3	NUT	2420-0002		
13	12	SCREW - 6-32 X .375	2360-0359		
12	24	SCREW - 6-19 X .375 TAPPING	0624-0309		
11	4	SCREW - 6-32 X .375	2360-0359		
10	1	ASSY - CABLE	5061-1336		
9	4	GUIDE - PC 5-SLOT OR 9-SL'			
8	1	ASSY - ROM	5061-1367		
7	1	ASSY - POWER WIRING	02108-60039		
6	1	ASSY - CPU	5060-8352		
5	1	ASSY - FRONT PANEL PCA	5060-8343		
4	1	DECK	02108-00004		
3	2	COVER - CARD CAGE	02108-00012		
2	1	ASSY - P.S. CABLE	02108-60034		
1	1	ASSY - X-OVER	5060-8345		
ITEM	QTY	MATERIAL DESCRIPTION	MAT'L PART NO.	MAT'L DWG. NO.	MAT'L SPEC.

2108MK AND ACCESSORIES ASSEMBLY



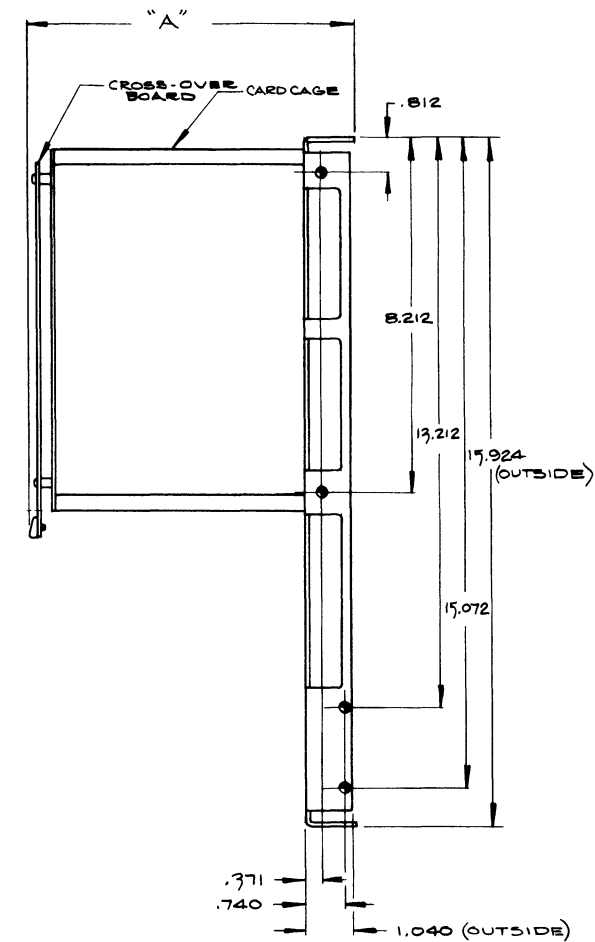
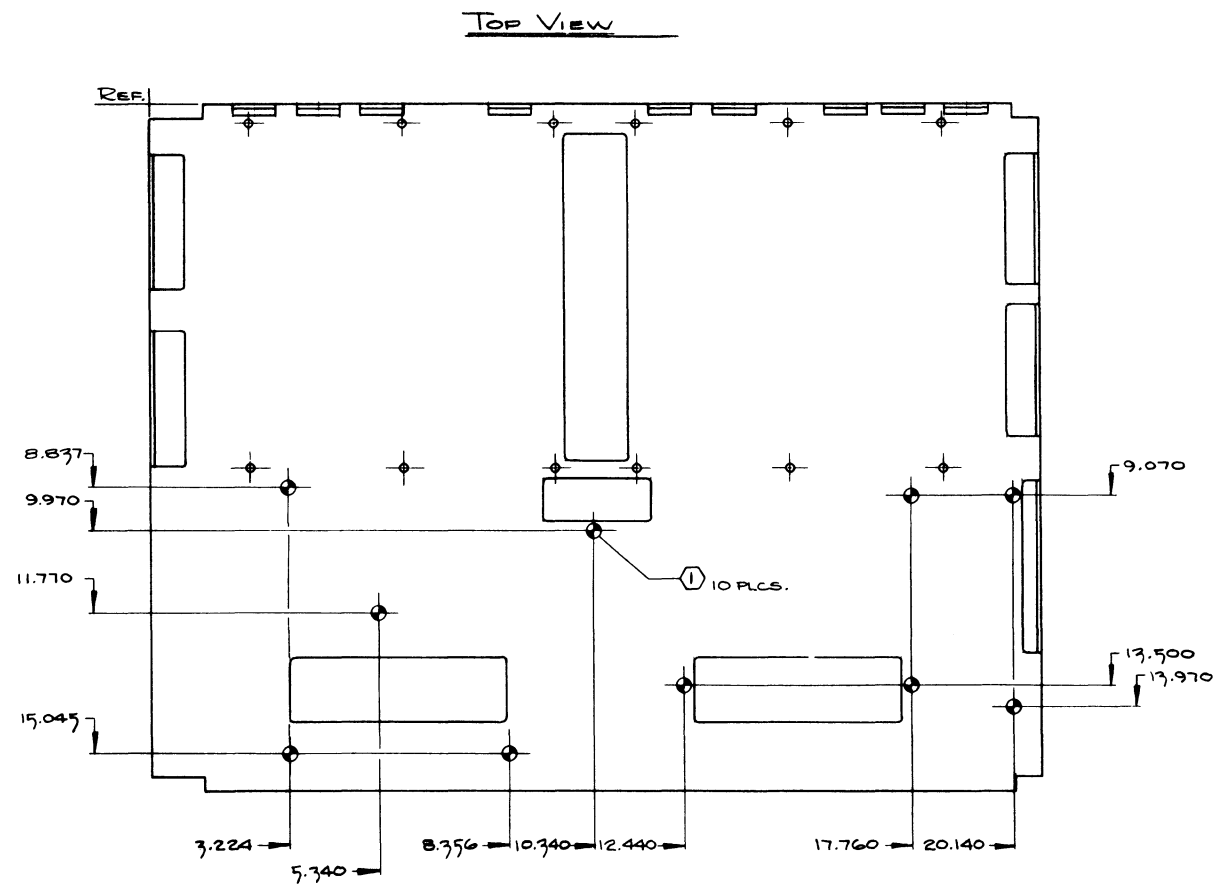


- NOTES:**
1. MTG. HOLES FOR 43/86 CONNECTORS WITH BARS. (NOT USED)
  2. CPU TO DECK MTG. HOLES. (12 PLCS.)
  3. ROM MTG. HOLES (VALUES ABOVE). (9 PLCS.)

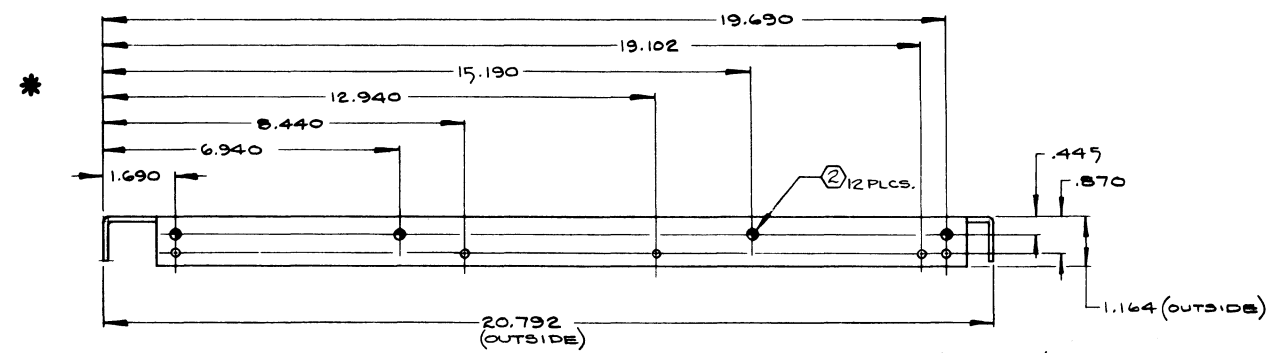
COMPONENT SIDE

2108MK CPU ASSEMBLY  
MOUNTING DIMENSIONS





MODEL NO.	DIMENSION "A"
12728A	4.400 ± .042
12728B	7.600 ± .042



\* ALL DIMENSIONS ON THIS VIEW ARE THE SAME OPPOSITE SIDE.

- ① \* 8-32 x .460 LG. (FROM TOP OF DECK) STANDOFFS. 10 EA.
- ② \* 6-32 CLINCH NUTS (INSTALLED REVERSE SIDE). 12 EA.

2108MK DECK ASSEMBLY MOUNTING DIAGRAM



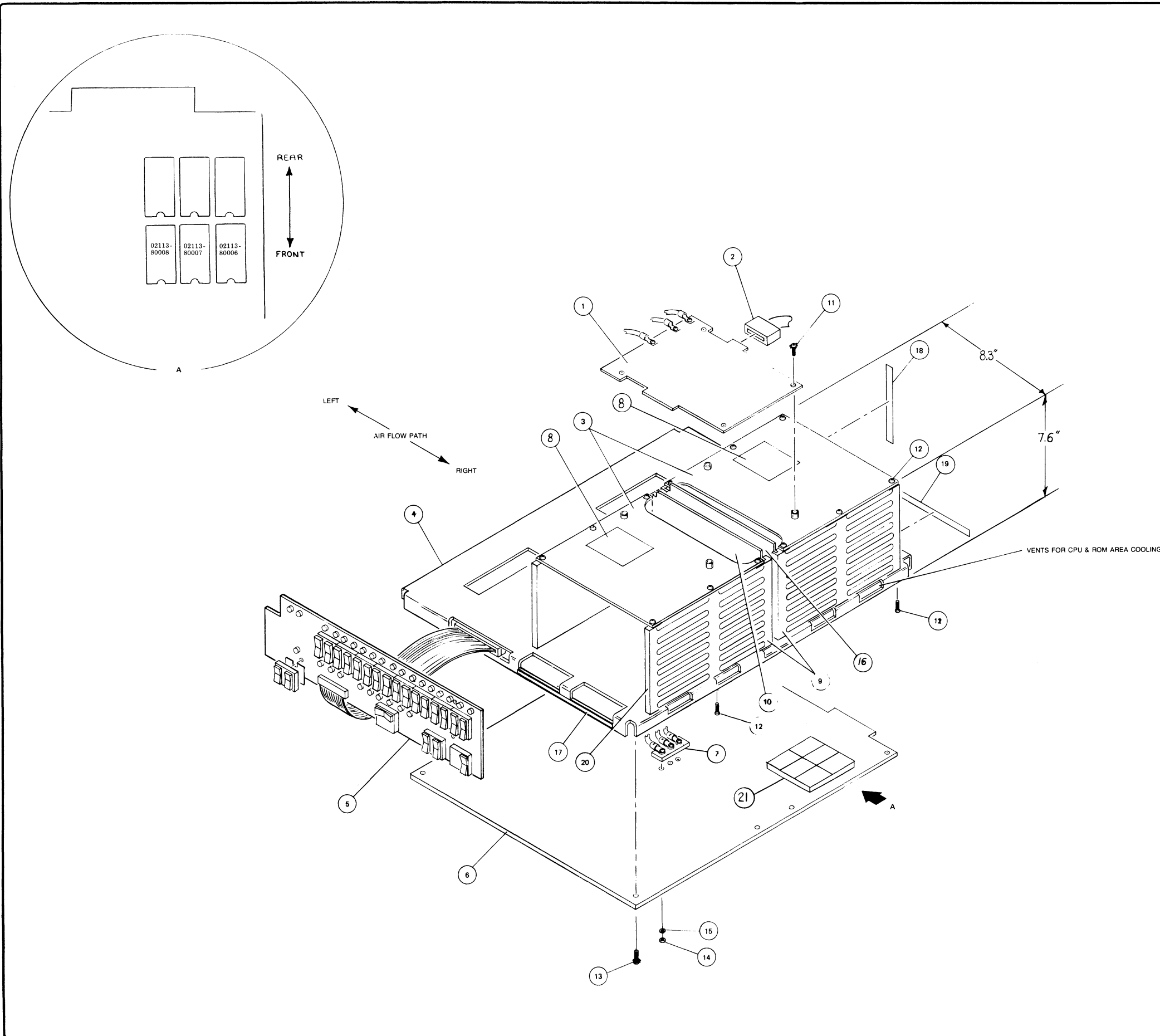


ASSEMBLY PROCEDURE

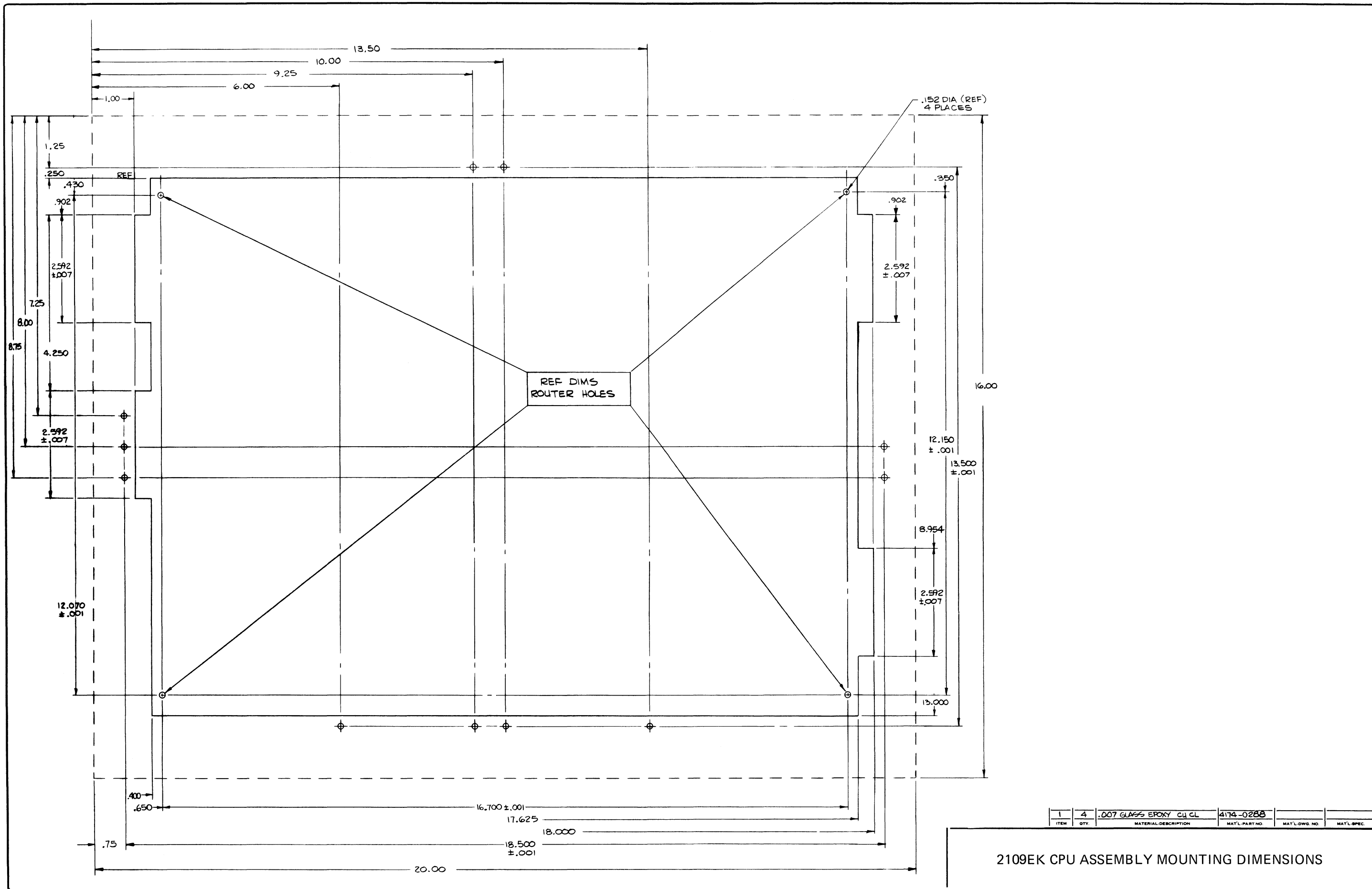
- 1 ATTACH FRONT AND BACK CARD GUIDES (9) (4 EACH) TO THE DECK (4) USING TWELVE 6-19 X .375 SELF-TAPPING SCREWS (12) TORQUE TO 2 LB-IN. NOTE PROPER LOCATION OF LABELED CARD GUIDES.
- 2 ATTACH CARD CAGE TOP COVERS (3) (2 EACH) USING TWELVE 6-19 X .375 SELF-TAPPING SCREWS (12) TORQUE TO 2 LB-IN.
- 3 ATTACH POWER WIRING ASSEMBLY (7) (02108-60039) TO PROCESSOR BOARD (6) (5061-1400) USING NUTS AND LOCKWASHERS INCLUDED WITH THE ASSEMBLY. BLACK WIRE GOES TO GROUND CONNECTION.
- 4 INSERT POWER WIRING ASSEMBLY THRU HOLE IN DECK AND ATTACH PROCESSOR BOARD TO BOTTOM OF DECK USING TWELVE 6-32 X .375 SCREWS (14)
- 5 INSERT I/O BACKPLANE BOARD (16) (02108-60007) INTO REAR CARD CAGE AND PROCESSOR BOARD. BE SURE TO INSTALL ACCORDING TO LABELS.
- 6 INSERT MEMORY BACKPLANE BOARD (10) (5061-1382) INTO FRONT CARD CAGE AND PROCESSOR BOARD. BE SURE TO INSTALL ACCORDING TO LABELS.
- 7 ATTACH CROSSOVER BOARD (1) (5061-1388) TO I/O AND MEMORY BACKPLANE BOARDS USING FOUR 6-32 X .375 SCREWS (11)
- 8 ATTACH THE THREE WIRES OF THE POWER WIRING ASSEMBLY TO CROSSOVER BOARD. BLACK TO GROUND, WHITE-BLACK-RED TO +5V AND WHITE-VIOLET TO -2V.
9. CONNECT CABLE ASSEMBLY (2) (5061-1364) TO CROSSOVER BOARD.
10. INSTALL THE INSTRUCTION ROMS (21) AS ILLUSTRATED.
11. ATTACH FLAT RIBBON CABLE OF FRONT PANEL ASSEMBLY (5) (5061-1343) TO PROCESSOR BOARD (NOTE CONNECTOR ORIENTATION).

21	1	SET OF INSTRUCTION ROMS	12728H		
20	1	LABEL — MEMORY (BLACK & WHITE)	7120-3861		
19	1	LABEL — COMPONENT SIDE UP			
18	1	LABEL — I/O	7120-3859		
17	1	LABEL COMPONENT SIDE UP			
16	1	ASSY- I/O BACKPLANE	02108-60007		
15	3	WASHER — LOCK	2190-0006		
14	3	NUT	2420-0002		
13	16	SCREW — 6-32 X .375	2360-0359		
12	24	SCREW — 6-19 X .375 TAPPING	0624-0309		
11	4	SCREW — 6-32 X .375	2360-0359		
10	1	ASSY- MEMORY BACKPLANE	5061-1382		
9	4	GUIDE — PC 4-SLOT OR 9-SLOT	02108-40001		
8	2	LABEL- WARNING	7120-2598		
7	1	ASSY — POWER WIRING	02108-60039		
6	1	ASSY — CPU	5061-1400		
5	1	ASSY — FRONT PANEL PCA	5061-1343		
4	1	DECK	5000-9087 4		
3	2	COVER — CARD CAGE	02108-00012		
2	1	ASSY — P S CABLE	5061-1364 4		
1	1	ASSY — X OVER	5061-1388		
ITEM	QTY	MATERIAL-DESCRIPTION	MAT'L PART NO.	MAT'L DWG. NO.	MAT'L SPEC.

2109EK AND ACCESSORIES ASSEMBLY



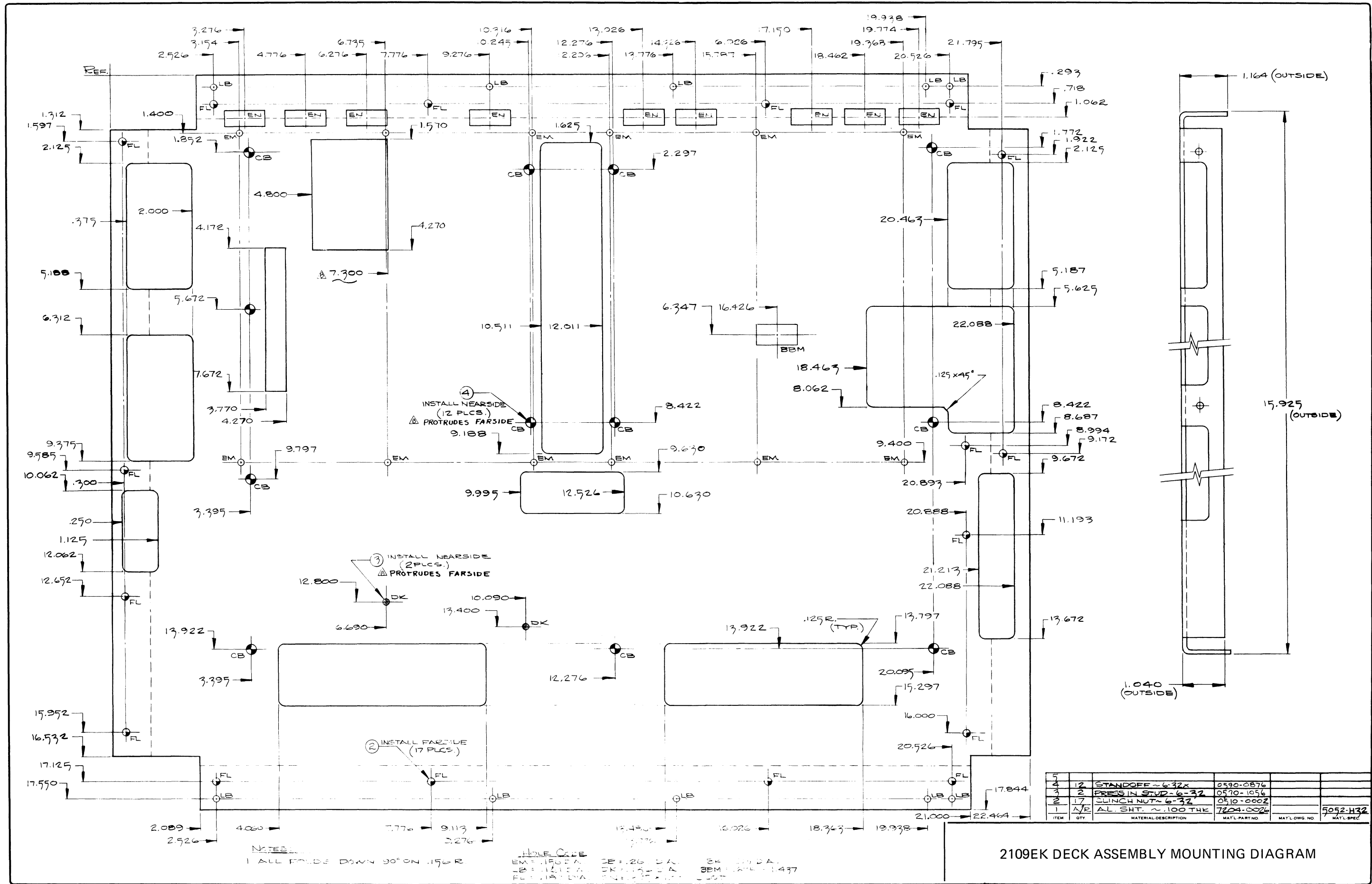




1	4	.007 GLASS EPOXY CU CL	4174-0268		
ITEM	QTY	MATERIAL-DESCRIPTION	MAT'L PART NO.	MAT'L DWG. NO.	MAT'L SPEC.

2109EK CPU ASSEMBLY MOUNTING DIMENSIONS





ITEM	QTY	MATERIAL DESCRIPTION	MATL PART NO	MATL DWG NO	MATL SPEC
5	12	STANDOFF - 6-32x	0590-0876		
4	2	PRESS IN STUD - 6-32	0510-1056		
3	17	CLINCH NUT - 6-32	0510-0002		
2	1	AL. SHT. ~.100 THK	7204-0002		
1					5092-H32

2109EK DECK ASSEMBLY MOUNTING DIAGRAM

