POWER SUPPLY FOR HP 1000 "A" MODEL COMPUTERS AND EXTENDERS

(2105A, 2108A, 2109A, 2112A, 2113A 12979A, AND 12990A)

THEORY OF OPERATION

NOTE

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

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1. GENERAL INFORMATION

The Power Supplies for the 2105/2108 Processors are complex circuits which supply the necessary regulated DC voltages and coordinated logic signals for operation of the CPU, memory and I/O interface cards of the 21MX Computer Series. The required input power is from an input AC power line from 47 to 64 Hz and over a voltage range of 110 ±20% VAC or 220 ±20% VAC. Maximum input voltamperes of the 2108 are approximately 650 and the maximum input voltamperes of the 2105 are approximately 450. The overall efficiency of the power supplies range between 65% and 80%, depending upon loading.

The power supplies operate in four different modes. These are:

1. Operate
2. Line standby
3. Battery standby
4. CPU-MEM Alarm

The computer itself does not distinguish between the line standby mode and the battery standby mode, but these two states are entirely different within the power supply.

In the operate mode, all output voltages are present and current is available up to the full capacity of each output. In the two standby modes, only those voltages necessary to permit the semiconductor memory to retain its contents are present. In CPU-MEM alarm all voltages associated with respective alarm are shut down, requiring a reset to line standby mode for normal operation to resume.

As the two standby names imply, the line standby mode receives input power from the AC line power plug whereas the battery standby mode operates off of power supplied from a 12 volt storage battery.

The optional nickel cadmium battery supplied with the computer, when fully charged, provides standby power for at least two hours. Longer standby periods may be realized by the use of a larger external storage battery of voltage range 10 — 14 VDC and of approximately 3.5 amp hr capacity per 2 hours of desired standby time. It should be noted that the CPU power supply provides a constant current charge of 250 mA to the battery whenever AC line power is present.

The supply output voltage specifications and their current ratings are shown below, with an * indicating those voltages which are present only during the operate mode.

OUTPUT TERMINAL VOLTAGE	2108/2109		2105		MAXIMUM VOLTAGE DEVIATION
	OPERATE CURRENT	STANDBY CURRENT	OPERATE CURRENT	STANDBY CURRENT	
+5 volts (CPU and I/O)	35	*	25	*	±0.25V
-2 volts (CPU and I/O)	5	*	5	*	±0.40V
+12.0V (I/O)	3	*	2	*	±0.5V
-12.0V (I/O)	-3	*	-2	*	±0.5V
+5.0V (mem)	5	5	5	5	±0.25V
+12.5V (mem)	1.8	0.5	.5	.5	±0.5V
-12.5V (mem)	1.8	0.5	.5	.5	±0.5V

*Indicates that this output voltage is 0 during standby mode.

Physically the power supplies consist of two major P.C. board assemblies and five minor P.C. board assemblies.

The two major assemblies contain all circuits necessary for full operation from the AC power line. Three of the minor assemblies contain circuits which in conjunction with the two major assemblies permit standby operation from a 12 volt battery.

The remaining two minor boards serve only to interconnect the two major board assemblies.

Of the two major board assemblies, one contains all circuits associated with the isolated output voltages and control logic. This board has no voltages present greater than +28 VDC. This board (5060-8349 or 5060-8355) is located directly under the top cover of the computer, circuit side up when the supply is installed.

The other major assembly contains circuits associated with the power line input and other circuits where hazardous voltages in excess of 350 VDC are present. This board (5060-8343 or 5060-8354) is inaccessible when the supply is installed in the computer.

Transformers and optical isolators provide isolation in excess of 1500 volts between the supply outputs and the input power line. Practices necessary for UL recognition have been observed.

2. Electrical Description

The operate and line standby modes of operation employ a combination of a high voltage DC switching preregulator, two multi-output DC to DC converters and several series pass regulators.

The battery standby mode of operation employs three independent switching regulators.

All power switching in the regulators and DC to DC converters is performed at a frequency of approximately 20 kHz.

This frequency of operation results in very small size and weight of magnetic components and capacitors and produces no audible noise.

The preregulator and DC to DC converters share a common clock.

The battery powered regulators share a separate clock.

The major energy storage in the supply occurs at the line input capacitors at approximately 300 VDC. Energy storage at this high voltage, prior to the preregulator allows the computer to operate undisturbed despite line dropouts of several cycles and permits the memory to hold up for several hundred milliseconds even without a standby battery installed.

3. GENERAL OPERATION

Referring to the state transition diagram in figure 1, at initial point when all power is off to supply and AC voltage is applied the power supply moves to the line standby state, Memory lost signal will be generated due to the fact that prior to entering line standby no memory supply voltages were present — therefore, contents of memory have been lost. At approximately 70 — 75 volts AC supply will output memory voltages. A reset of power supply logic is performed by the key switch on the front panel of the computer (or via rear panel power control connector) in order to prepare power supply to enter operate state. The key switch is then turned to operate, allowing the power supply to enter the operate state if the input AC line is sufficiently high which is determined by PUUP sense circuitry. In the operate state all CPU voltages are up and in regulation and all CPU timing and control signals generated in the supply are issued. The supply can be returned to the line standby state by turning the key switch to standby position or by removing the AC input voltage. By doing so the CPU is shut down in an orderly manner such that it can be re-enabled with little problem. When returned to line standby by switch, power supply will remain in that state until switched to operate in a power down condition, unit will remain in line standby state long enough to determine if power-fail recovery option has been installed. If the option is not available the power supply will completely power down and initial power up procedure will be followed on powering supply up again.

If power fail system has been installed and battery is sufficiently charged and AC power down, the power supply enters battery standby state where memory voltages are maintained and memory overvoltage and undervoltage sense circuitry remains active. If at any time in battery standby state the battery becomes discharged the power supply will also completely power down and initial power up procedure will be followed. If battery remains charged, on AC power up, if front panel switch is in operate, power supply will enter directly into operate state.

Under the conditions of a CPU or memory overvoltage or overcurrent it enters the appropriate alarm state. In the CPU alarm state, all CPU voltages are shut off while memory voltages remain unaffected. In the memory alarm state all output voltages are shut down. Operate state may be re-entered by turning front panel switch to reset — then back to operate. If, though, the overvoltage or overcurrent still exists the supply will re-enter the alarm state. This condition will continue to exist until the overvoltage or overcurrent condition is removed.

4. POWER SUPPLY SIGNALS

The power supply provides three signals to the CPU for computer operation. These signals are 1) power up (PWU), 2) power on (PON), and 3) "not" memory lost ($\overline{\text{MLOST}}$). The following paragraphs provide a functional description of these signals.

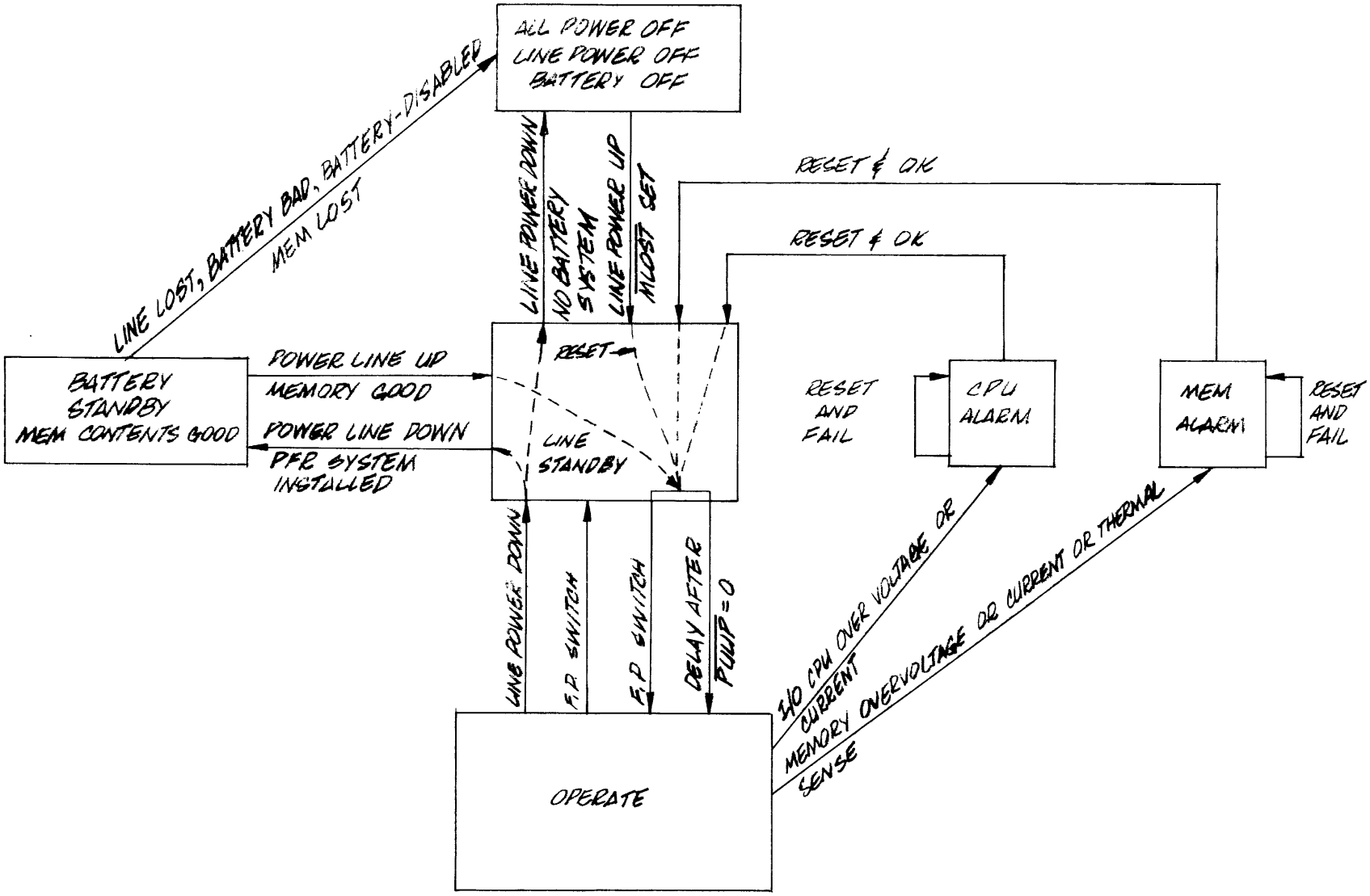


Figure 1. Power Supply State Transition Diagram

4.1 PWU

This signal is high whenever the power supply is in the operate state and the line voltage is within proper tolerances. PWU will go low immediately upon detection of a line voltage failure or alarm condition.

The function of PWU is to initiate a power fail software routine on its falling edge and an auto restart software routine on its rising edge. After PWU switches low for a line voltage failure or by rotating the key-operated switch from OPERATE to STANDBY, all output voltages will remain in regulation for a minimum of 500 μsec to permit execution of the power fail software routine. Upon restoration of power or by rotating the key-operated switch from STANDBY to OPERATE, PWU will go high within approximately one second.

4.2 PON

This signal is similar to PWU except that PON remains high for 500 μsec to 1 msec after PWU switches low. PON switches high simultaneously with PWU. The purpose of PON is to allow the CPU to access memory when the computer operating voltages are within tolerances, and to inhibit the CPU from accessing memory when computer operating voltages are low. Low operating voltages could cause the CPU to write erroneous data into memory.

4.3 $\overline{\text{MLOST}}$

This signal is low whenever there is a possibility that erroneous data may be in memory as a result of memory power supply voltages being out of tolerance, which may occur during initial power up. Automatic restart capability is inhibited whenever $\overline{\text{MLOST}}$ is low. A reset must be performed by the front panel switch or rear panel power control connector to enter the operate state when $\overline{\text{MLOST}}$ is low. Following a reset, rotate key-operated switch from STANDBY to OPERATE. $\overline{\text{MLOST}}$ will remain low for several milliseconds after PON and PWU switch to high. This will indicate to the CPU that a software routine to clear memory of any erroneous data must be performed. The conditions which will cause $\overline{\text{MLOST}}$ to be low are the following:

a. Low line and battery voltages.

b. Memory voltage out of tolerance at any time.

If the power fail recovery system is installed and operating properly, $\overline{\text{MLOST}}$ will remain high through any line voltage losses provided that the battery voltage remains above 10.5 volts. This will ensure valid memory contents and allow the auto restart capability (if enabled) to be performed.

5. LOWER BOARD OPERATION

AC line voltage is directly applied to the input bridge circuitry (see figure 2), which generates the B+ level for the preregulator circuit, and to the internal supply circuitry which generates voltages used by lower board logic. As the AC level increases the 40 kHz clock circuitry becomes enabled. This circuit generates the 20 kHz squarewave for the inverter drive circuitry and the input 20 kHz sawtooth to the pulse width modulator. At approximately 70 to 80 VAC the power up sense circuit is enabled which first generates inverter enable, preregulator enable, and pulse width modulator enable. The pulse width modulator circuit receives the input sawtooth waveform from the clock circuitry and the variable DC from the error amplifier and outputs a 20 kHz pulse train of varying duty cycle which is directly proportional to the DC level from the error amplifier. The output waveform from the pulse width modulator is fed to the preregulator level

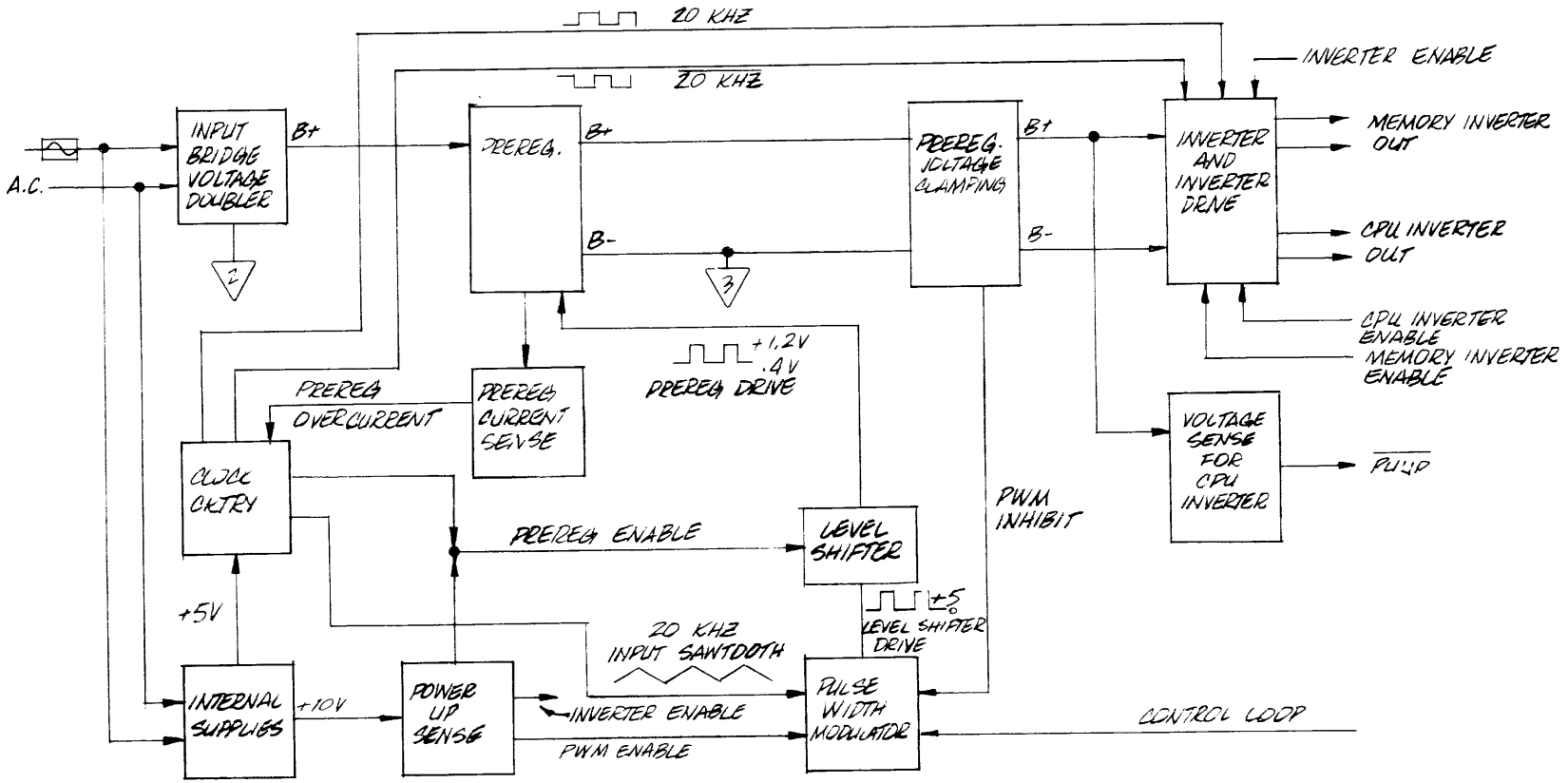


Figure 2. Lower Board Block Diagram

shifter which adjusts the waveform to conform with the biasing in the preregulator. The preregulator receives the waveform from the level shifter and converts it to a varying DC level, labeled B- or common point # 3. This DC level is proportional to the duty cycle of the input waveform so it can be seen that the error amplifier's DC level is transformed into a B- DC level by way of analog to digital and digital to analog conversion. A current sense line is taken from the preregulator and at any time excessive preregulator current is drawn a preregulator overcurrent signal is generated which shuts off the level shifter circuitry and removes the drive signal to the preregulator. B+ is also fed into the high voltage crowbar circuitry which senses if B+ exceeds 400V. If this condition occurs the crowbar circuitry is activated and B+ is shorted to ground which blows the AC input fuse. B+ is also fed to the line voltage sense circuitry. At 88 VAC (or other line voltage set by variable resistor R120) B+ has reached sufficient level to activate the sense circuitry causing $\overline{\text{PUUP}}$ to go low and allowing CPU inverters and CPU output voltages to come up. B+ and B- are finally fed to the inverter and inverter drive circuitry which is designed to generate an inverter output waveform by switching between B+ and B-. These two square waves are applied to the primaries of the CPU and memory power transformers located on the upper power supply PCA. Connected to the memory inverter output is the bootstrap supply circuitry. This circuit aids the internal supplies and bypasses surge limit resistance in the bridge circuitry for more efficient operation of the lower board circuitry.

6. INPUT RECTIFIER AND VOLTAGE DOUBLER

On initial power up, B+ is generated through CR45, CR44, CR41 and CR40 bridge circuit which is in series with R57. R57 acts as surge limit resistor for charging capacitors C1 and C2. Once line voltage has risen sufficiently to enable and maintain the memory inverters, part of the inverter signal is coupled back through T4 to the gates of CR49 and CR50 turning them on. This then creates a bypass circuit around R57, increasing efficiency under load. CR51 and CR48 are inserted in the gate circuitry to prevent reverse biasing. Since the gate signal fed from T4 is 20 kHz, the SCR's are effectively turned on all the time while the memory inverter is enabled.

The B+ level is fed to C1 and C2 which are in series. If the unit is to be operated on 110 VAC a jumper is inserted on the rear panel terminal block, connecting the neutral of the line to the junction of C1 and C2 creating a voltage doubler. In 220V operation the jumper is removed and B+ is derived directly from the bridge circuit.

7. INTERNAL SUPPLIES AND POWER UP SENSE CIRCUIT

Line voltage is applied to 60 Hz transformer T3 and power is taken from the two secondary windings. One winding supplies power to the upper board internal supplies. The other winding is applied to CR30 diode bridge to obtain +10V (Vx) and -10V (V_y). The CR29 bridge acts as a bootstrap supply. Once the memory inverters are enabled power is fed through T4 to the bridge and ±10V in order to compensate for the increased load. The +10V (Vx) supply besides being used directly, also supplies power to the +5V regulator U5 which is used as a supply for all lower board chips. C28 between pins 1 and 3 of U5 is for filtering. C13 has been added to smooth out the voltage fluctuation caused by the interval between when the load on +10V is increased by enabling memory inverters, and when T4 is capable of supplying enough power to compensate for the load increase.

In the power up sense circuit +10 is applied to the emitter of Q14 via diode CR47. At the same time the voltage at the emitter of Q14 is fed to zener CR64 via R123 and is coupled to the base of Q14 by R60. At the point where the emitter is one diode drop above the zener voltage Q14 conducts. U4A is switched on after a slight delay caused by the R77, CR55, C41 and R76 time constant in order to allow +10V to stabilize and C13 to fully charge before enabling the inverters. As U4A is turned on U4B is turned off, allow-

ing inverter enable to go high. At the same time U4C is turned off allowing preregulator enable to go high. U4D is also switched off which, after a delay determined by R63 and C34, allows the pulse width modulator to operate. This is to ensure that the inverters are operating before enabling the preregulator circuitry since preregulator control is dependent on the operation of the inverters.

Two hysteresis loops are incorporated into the power up sense circuitry. One created by R48 to compensate for slight voltage fluctuations during initial power up. The other is created by T4 which supplies the sense circuitry, once the memory power supply is activated, with a voltage which is stable over a wide range of line input voltage.

8. CLOCK AND PRE-REGULATOR ENABLE

The clock circuit consisting of U8B generates a 40 kHz, 90% duty cycle pulse train (see figure 3), that is used to derive all lower board waveforms. +5V lower board is fed to the non-inverting input of U8B by R62 and R71 divider. This causes the output of U8B to go high, which, in turn is fed back by R73. At the same time the output is also fed back to the inverting input of U8B by the R72 — C32 RC network. At the point where the level on the inverting input of U8B exceeds that of the non-inverting input, the output goes low and is held there for a predetermined period by the C32 — R64 network. The output then goes high and the oscillation repeats.

The pulse train is applied to U13A 'D' flip-flop. Both direct set and clear are disabled and the $\overline{Q}$ side is connected to the 'D' input to obtain a divide-by-2 function. The $\overline{Q}$ side is also connected to U12A which in conjunction with the pulse train from the clock circuit generates a 95% duty cycle pulse train at 20 kHz as seen in figure 3. This then drives U13B, which is the preregulator enable flip-flop. Both Q and $\overline{Q}$ sides of U13A are used as the input signals for the inverters as seen in figure 3.

The Q side of U13A is connected to the sawtooth generator for the pulse width modulator. U13B is wired such that as soon as a clock is applied it will set, turning U12B on which generates preregulator enable. The direct reset on U13B is connected to the preregulator current sense. If excessive peak current is drawn by the pre-regulator circuit then the sense line is brought low, disabling operation of the preregulator for the duration of the current 20 kHz cycle. This pre-regulator current limit is independent of the output voltage current sense circuits and serves primarily to protect preregulator transistor Q7 from excessive peak currents during transient conditions.

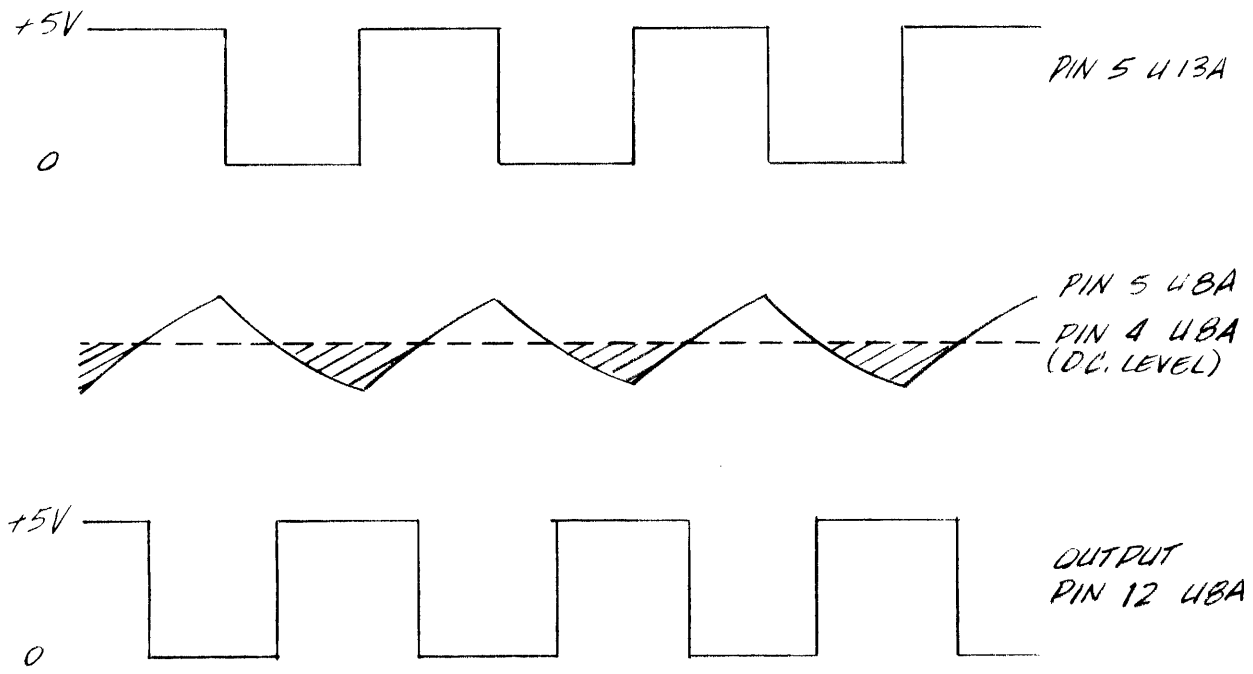


Figure 3. Lower Board Waveforms

9. PULSE WIDTH MODULATOR

The square wave output from U13A is applied to Q11 which generates a sawtooth waveform (see figure 3). This sawtooth waveform is applied to the inverting input of U8A. The non-inverting input is connected to a varying DC level generated by U11. The resulting output waveform at pin 12 is dependent on the DC level with respect to the sawtooth waveform. If the DC level is more negative than any part of the sawtooth, the output is always low. If the DC level is more positive than any part of the sawtooth, the output is always high. When the condition exists as in figure 3 where the DC level is at an intermediate level, a pulse train at pin 12 results. This is caused by the fact that whenever the DC level is more positive than the sawtooth (indicated by slashed lines) the output will be high and when the level is more negative the output will be low. As can be seen, changing the DC level with respect to the sawtooth will alter the times in which the output is high or low, thus allowing the ability to change the duty cycle of 'on' time with respect to pulse period. This is then used as a form of analog to digital converter, creating a drive waveform for the pre-regulator which, in turn acts as a high power digital to analog converter.

Diode CR46 is used by the power up sense circuitry to keep the output of the pulse width modulator at zero duty cycle and the preregulator off during initial power up.

10. PREREGULATOR LEVEL SHIFTER

The signal from the pulse width modulator enters U3 where it is gated by preregulator enable, generated by the power up sense circuitry. The open collector output transistors of U3 begin switching between a floating state and ground. R56 and R54 are used as pullup resistors to the input lines for U3.

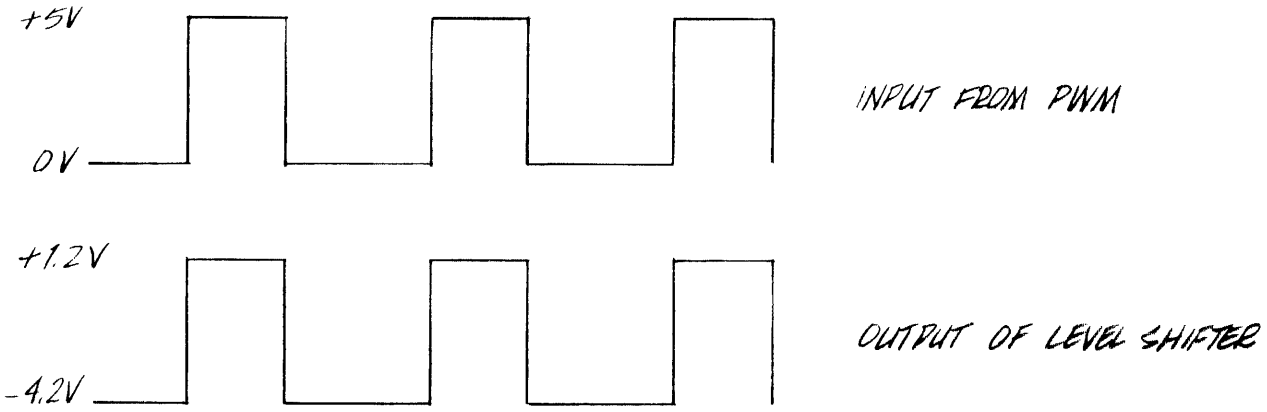
As the PWM input to U3 goes high the upper half of U3 switches Q10 on through R34. Q10 when switched on applies current from 5V through R33 — CR34 to the base of Q2 at E6. Q2 acts as a darlington driver for Q1. At the same instant the lower half of U3 turns Q12 off, which in turn removes the forward bias on Q9 turning it off.

As the pulse train goes low the upper half of U3 switches Q10 off while the lower half switches Q12 on, through R55. This creates a forward bias condition on Q9 which switches a negative current from a -4.22V source created by CR37, through R26 to E6 at the base of Q2 and through CR28 to the base of Q1.

This reverse base current on Q2 and Q1 improves the turn off time of Q1 and Q2 and is followed by reverse base emitter biasing on Q1 and Q2 in approximately 1 μsec as these transistors turn off. CR11 and CR34 serve as an anti-saturation clamp for Q1 and Q2 further improving turnoff time.

CR32 and CR33 together with R26 serve only as a protection circuit to shunt voltage away from other circuits in the event that Q1 fails with a Base-Collector short and open emitter.

As can be seen in diagram below, the resulting waveform at E6 is of the same phase as the input waveform but switches between -4.2V and +1.2V.



11. PREREGULATOR POWER STAGE

The preregulator power stage consists primarily of Q1, L1, CR5, input capacitors C1 and C2 and output capacitors C4, C11 and C12. Q1 and CR5 act as a switch controlled by the variable duty cycle of the pulse width modulator.

When Q1 is in the on state current flows from the + side of input capacitor C1 (B+) through the parallel combination of the output capacitors and the two inverter circuits to - preregulator output at inverter common. From inverter common current flows through inductor L1 and through Q1 back to the negative side of input capacitor C2 at preregulator common.

During this state a voltage appears across L1 which is equal to the difference between the input and output voltages of the preregulator. This voltage and the inductance of L1 determines the rate of change of current in L1:

$$\frac{dI_{L1}}{dt} = \frac{V_{in} - V_{out}}{L1}$$

The period of time during which Q1 is turned on determines the peak current level which builds up in L1 and consequently the level of energy stored in L1 and the average output current into the inverter circuits:

$$I_{p_{L1}} = T_{on} \frac{dI_{L1}}{dt} \quad \text{peak current}$$

$$U_{L1} = \frac{1}{2} L1 \, I^2_{p_{L1}} \quad \text{energy stored}$$

When Q1 turns off, the polarity of the voltage across L1 reverses causing CR5 to become forward biased. Current continues to flow from L1 through CR5 into the output circuit at a decreasing level as the energy stored in L1 is depleted. When the current in L1 drops to zero after a time interval determined by the value of output voltage, the inductance of L1 and the level of current in L1 at turn off of Q1

$$\left(\Delta T = \frac{V_{out}}{L} I_{p_{L1}}\right)$$

the voltage across L1 drops to zero also except for some minor ringing and CR5 is again reverse biased.

During the remaining time of the present switching period the current is supplied to the inverter circuits from the output capacitors alone.

At the beginning of the next cycle of the 20 kHz switching rate this process is repeated. The waveform at the collector of Q1 is shown in figure 4.

The complete preregulator circuit starting at the input current to photo-isolator U11 at pin J2-J on the lower board and ending at output capacitors C4, C11, C12 act as a low loss current-controlled current source translating control current levels at several milliamps and 1.5 volts to output currents of several amps at approximately 150 VDC.

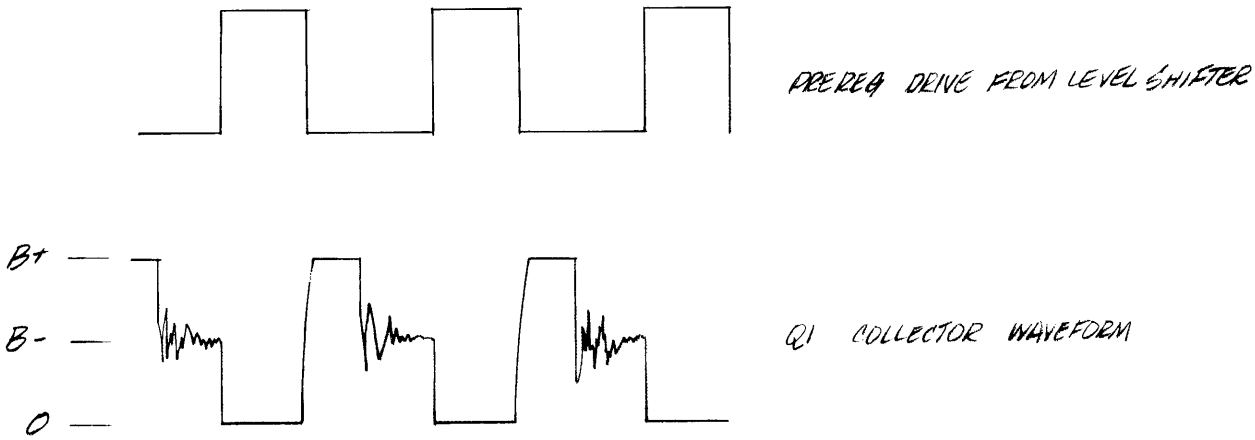


Figure 4. Q1 Collector Waveform

12. PREREGULATOR SLOW TURN-OFF

The requirement for slow turn-off is created by the basic properties of L1 in the preregulator circuit. As can be seen in figure 5, when Q1 is either fully on or fully off, very little power is consumed by it. However, a great deal of power is consumed by Q1 when making the transition from the 'on' state to the 'off' state. This is caused by the fact that as collector voltage is rising from ground to B+, current through Q1 still has the tendency to remain constant, because L1, as an inductor, opposes rapid changes in current through it. A method of minimizing this problem is achieved by creating another path for current to flow other than the transistor. This essentially describes the operation of the slow turn off circuit. The effect desired is created by current flowing through C6 and CR8 to B+. During the time Q1 is on, the side of C6 connected to CR8 is charged to 1/2 B+. As Q1 starts to switch off collector potential rises to 1/2 B+. At this point since the initial potential across C6 was 1/2 B+ and due to the fact that a capacitor opposes rapid changes in potential drop across it, the side of C6 connected to CR8 will have risen to B+ in order to maintain a 1/2 B+ potential drop across C6. At this point CR8 becomes forward biased and as Q1 collector voltage continues to rise current begins to flow through C6 which is trying to maintain its 1/2 B+ potential drop, and CR8 to B+; thus creating the second path for current needed. As can be seen in figure 5 with the

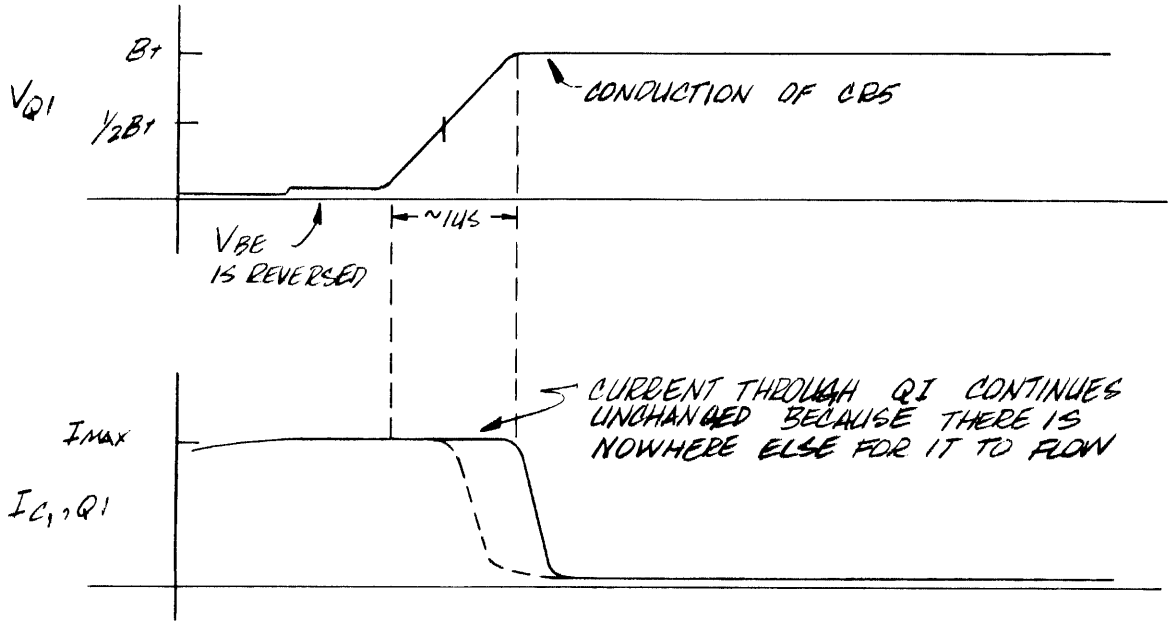


Figure 5. Q1 Power Consumption

dotted line over half of the peak power that would be dissipated in Q1 is diverted to B+. Charging of C6 is achieved in the on time of Q1 by T1 and CR7 connected to the junction of the C1 and C2 voltage doubler which acts as a supply for 1/2B+. As seen in the T1 voltage current graphs in figure 6 at the point where Q1 is about to switch on the voltage at the junction of C6 and CR8 has settled to ~ B+. As Q1 is turned on and collector potential begins to drop below B+ the potential at the junction of C6 and CR8 goes negative with respect to 1/2 B+ and current starts to flow through T1 to charge C6. This creates a back EMF in T1 which approaches -1/2 B+ as collector voltage approaches 0. As the EMF begins to break down to zero, C6 charge current through T1 reaches a maximum. EMF across T1 once again increases to 1/2 B+ until C6 is fully charged and capable of power diversion.

One problem that arises is that due to the periodic charging of C6 the potential at the junction of C1 and C2 will begin to drop, directly affecting the operation of slow turn off. This effect is compensated for by CR9, CR6 and C5. When Q1 is on the junction of CR6 and C5 is charged to ground potential. As Q1 turns off current flows to C5 and CR6 to the junction of C1 and C2 thus acting to return power lost.

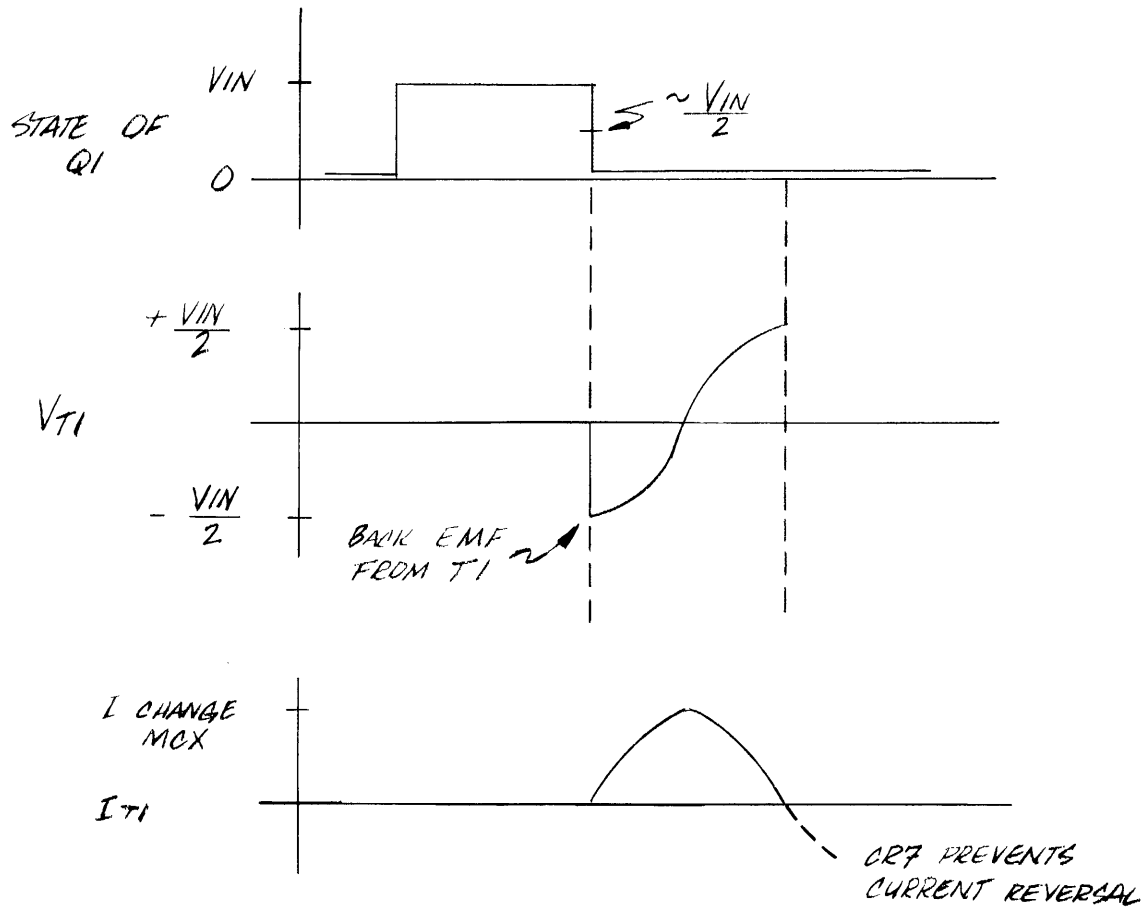


Figure 6. T1 Voltage — Current

13. HIGH VOLTAGE CROWBAR CIRCUIT

The lower board crowbar circuitry protects the power supply from excessive line voltages by shorting the input capacitors and blowing the line fuse whenever B+ exceeds 420V dc. When B+ equals 400V dc, zener diodes CR2 and CR3 begin to conduct, charging C53 through R10. When C53 is charged to approximately 20V dc, diode CR31 fires, discharging C53 into the gate of SCR4, and causing SCR4 to crowbar.

14. PREREGULATOR CURRENT SENSE

Preregulator current flowing through R1 causes a voltage drop. This voltage is passed through R15 and C20 which act as a filter circuit for current spikes. The resulting DC level is applied to Q8 via R16 and R18 divider, turning it on for excessive preregulator currents. Q8 then shorts the current sense line to ground, which clears the preregulator enable flip-flop U13B. The base of Q7 is also connected to the current sense line by R20 and C17 speed-up circuit. When the sense line goes to ground Q7 is turned off and collector voltage goes high. The high level is fed back through C16 and R17 to the base of Q8, keeping it on, and thus creating a hysteresis effect. U13B remains cleared, holding off Q1 until the end of the current 20 kHz cycle of U13A at which time U13B is cleared by a pulse from U12A.

15. LINE VOLTAGE SENSE

B+ generated by the input bridge-doubler circuit is sensed via the R36, R96, R97 and R120 divider network which is connected to a -4.2V potential created by CR55. CR56 acts as a voltage clamp, preventing the PUUP circuit from being enabled if +5V LB is low or missing and also preventing voltage at the junction of R36 — R96 from exceeding the 5V level during normal operation.

Before B+ rises to any significant level, U15A pin 4 is negative with respect to pin 5 and the output at pin 12 is consequently low. The low level at U15A results in a negative voltage appearing at U15B pin 10 via the R86 and R87 divider. This results in a high output from U15B which keeps the LED in photo-isolator U14 off. The output of U14 pin 5 is high due to a pull-up resistor on the upper board.

As B+ level increases the voltage at the junction of R96 and R97 approaches 0V. At the point where this voltage crosses above 0, the output of U15A goes high which in turn causes pin 10 of U15B to go positive, causing the output of U15B to go low. This turns on the LED in U14 causing the output at pin 5 to go low — thus resulting in the $\overline{\text{PUUP}}$ signal.

R93 connects the output of U15A to it's non-inverting input is to create hysteresis, preventing an internal oscillation. The resistor creates a large B+ voltage differential between the point where $\overline{\text{PUUP}}$ is enabled and the point where it is disabled. This is done in order to prevent the condition where the computer has a heavy load and line voltage is applied. On a soft line, line voltage level will drop significantly and if the feed back loop was not large enough to compensate for the fluctuation $\overline{\text{PUUP}}$ would be disabled, and the load would be removed — allowing the line voltage to rise and thus re-enabling $\overline{\text{PUUP}}$. This results in an oscillation condition where the CPU inverters would turn on and off approximately at 1 Hz rate.

C46 is used for slowing the switching of U14, reducing noise. R92 and C47 create a 20 ms delay before $\overline{\text{PUUP}}$ is switched low on power up but introduce no delay when line power is lost.

16. BATTERY CHARGE AND TEST LOAD

+18V rail from the memory inverter transformers is fed into the charge circuitry through R101 to R104 and CR60 which act as the positive supply for operational amplifier U16. +18V rail is also applied to R106 and R109, setting up the bias for Q15 and Q20. R101 acts as the current sense resistor for the 18V rail, limiting the output charge current to 400 mA ±50 mA. The voltage drop across R101 is applied to U16 inputs via divider network R102, R105, R108 and current source transistors Q17 and Q18. The output of U16 is connected via CR58 to the base of Q20. Q20 acts as the driver for Q15 which is the primary current pass transistor. The circuit as can be seen above, has been designed as a constant current source.

In the battery test circuitry the test signal generated on the power fail recovery boards is applied to Q19 via R112. Q19 conducts, applying power through divider R110 and R111 to Q16. Q16 conducts which connects the R91 test load from battery V+ to ground. If the battery voltage should drop below approximately 12 VDC while this load is applied, a sense circuit on the power fail recovery boards will cause the front panel battery light to flash until the battery is sufficiently charged to remain above 12 VDC during a test period.

The battery test is automatically performed for a period of about 6 seconds every six minutes.

17. CPU AND MEMORY INVERTERS

(Only operation of the memory inverters will be explained due to the fact that CPU inverter construction and operation is the same except for two differences: CPU inverters are 180° out of phase with memory inverters to more evenly distribute load on the preregulator, and the existence of T4 bootstrap connected only to memory inverter.)

Memory inverter enable, generated on the upper board, is applied to U10 pin 2 and along with inverter enable causes pin 6 to go low. This low level is used by the two NOR gates or U7 to allow the ÷2 and $\overline{\div 2}$ square waves from the clock circuitry to toggle the output transistors within it. The two outputs of U7 are connected through T2A to +Vx (approximately 10 VDC). C15 is inserted to filter spikes created by T2A. The switching action through T2A primary is induced into the secondaries to be used as base drives for Q5 and Q6. The secondary windings exhibit a degree of mutual coupling in order to compensate for slight differences in switching speed between Q5 and Q6. Due to the coupling, as long as one transistor is on there will be opposition in the secondary winding to a change in state until the transistor has been turned off.

As Q5 and Q6 change states, the output line between the transistors switches from B+ to B- (inverter common). The other output line is biased halfway between B+ and B- and is capacitively isolated to prevent saturation of the inverter output transformer.

18. CONTROL LOOP CIRCUIT

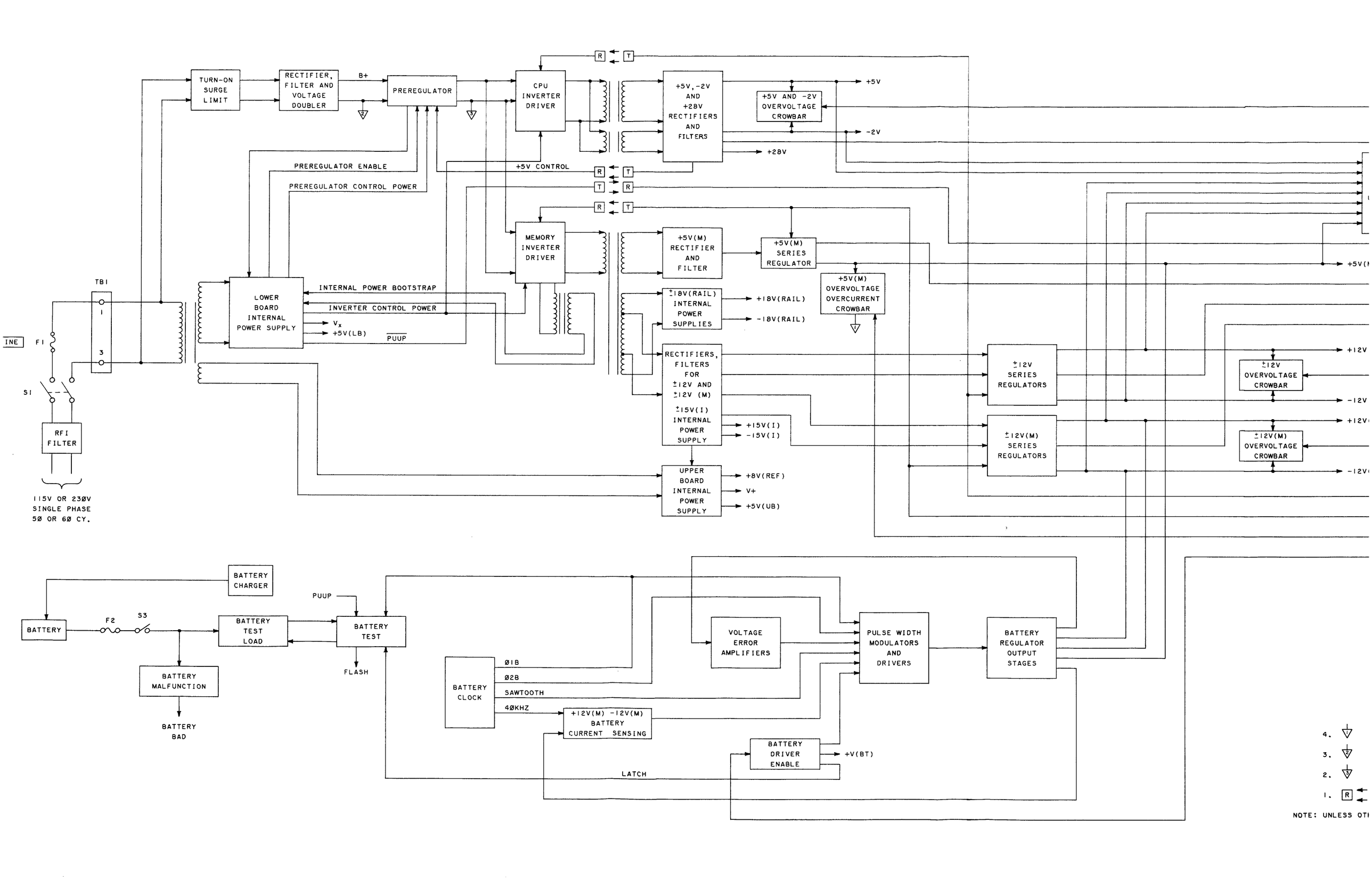
The basic preregulator control loop is designed to operate under two conditions:

1. To maintain constant preregulator control level when CPU inverters are disabled, and
2. To perform basic regulation of 5V when CPU inverters are enabled.

+18V taken from the memory inverter transformer secondary is used as an output sense for preregulator control whenever CPU inverters are not enabled. +18V is applied across R37, R38 divider and the resultant DC level is passed to collector of Q10. If CPU inverter enable is low causing Q10 to be off, the signal passes through CR22 and is applied to pin 2 of U13 via R42. +5V CPU adjust, generated from +8 reference through R116, R115, R119 and CR61 divider is applied to pin 3 of U13. The output of U13 which represents an error signal is fed to Q11 which acts as an output buffer. The output of Q11 is then fed to U11 via R45 and R80 which acts as a current source for the LED in U11. The output of U11 then acts to couple +5V error signal into the pulse width modulator for direct control of preregulator. R43, R44 and C43, coupling the output of U13 to its inverting input, act as a negative feedback loop, decreasing overall gain of unit and preventing oscillation.

At the point when CPU inverters are enabled, the inverter enable signal is coupled through R39 and R40 which turns on Q10 and shuts off the +18V control signal to U13. With CPU inverters up, +5V CPU is coupled to U13 through R36 and CR21 thus shifting preregulator control. C44 is used for maintaining a relatively even transition between control sources during the point after +18V control line is disabled and before +5V rises sufficiently. C45 is inserted primarily for noise reduction on the +5V control adjust line.

During the condition of a memory alarm where there is neither +18V or +5V CPU, U13 turns on fully driving U11 fully on which allows preregulator to turn on fully. At this point the preregulator voltage clamp circuit comes on, limiting preregulator conduction, until the memory alarm is removed.


TURN-ON SURGE LIMIT
RECTIFIER, FILTER AND VOLTAGE DOUBLER
B+
PREREGULATOR
CPU INVERTER DRIVER
+5V, -2V AND +28V RECTIFIERS AND FILTERS
+5V AND -2V OVERVOLTAGE CROWBAR
+5V
-2V
+28V
PREREGULATOR ENABLE
PREREGULATOR CONTROL POWER
+5V CONTROL
MEMORY INVERTER DRIVER
+5V(M) RECTIFIER AND FILTER
+5V(M) SERIES REGULATOR
+5V(M) OVERVOLTAGE OVERCURRENT CROWBAR
TB1
LOWER BOARD INTERNAL POWER SUPPLY
INTERNAL POWER BOOTSTRAP
INVERTER CONTROL POWER
Vx
+5V(LB)
PUUP
±18V(RAIL) INTERNAL POWER SUPPLIES
+18V(RAIL)
-18V(RAIL)
RECTIFIERS, FILTERS FOR ±12V AND ±12V (M)
±12V SERIES REGULATORS
±12V OVERVOLTAGE CROWBAR
±15V(I) INTERNAL POWER SUPPLY
+15V(I)
-15V(I)
±12V(M) SERIES REGULATORS
±12V(M) OVERVOLTAGE CROWBAR
UPPER BOARD INTERNAL POWER SUPPLY
+8V(REF)
V+
+5V(UB)
INE
F1
S1
RFI FILTER
115V OR 230V SINGLE PHASE 50 OR 60 CY.
BATTERY CHARGER
BATTERY
F2
S3
BATTERY TEST LOAD
BATTERY TEST
FLASH
BATTERY MALFUNCTION
BATTERY BAD
PUUP
BATTERY CLOCK
ØIB
Ø2B
SAWTOOTH
40KHZ
+12V(M) -12V(M) BATTERY CURRENT SENSING
VOLTAGE ERROR AMPLIFIERS
PULSE WIDTH MODULATORS AND DRIVERS
BATTERY REGULATOR OUTPUT STAGES
BATTERY DRIVER ENABLE
+V(BT)
LATCH
4.
3.
2.
1. R
NOTE: UNLESS OTH

REV	REFERENCE	SERIES /PREFIX
A	ORIG	NA

R T

+5V,-2V AND +28V RECTIFIERS AND FILTERS

+5V AND -2V OVERVOLTAGE CROWBAR

+5V

-2V

+28V

TROL

R T

T R

R T

+5V(M) RECTIFIER AND FILTER

+5V(M) SERIES REGULATOR

+5V(M) OVERVOLTAGE OVERCURRENT CROWBAR

±18V(RAIL) INTERNAL POWER SUPPLIES

+18V(RAIL)

-18V(RAIL)

RECTIFIERS, FILTERS FOR ±12V AND ±12V (M)

±15V(I) INTERNAL POWER SUPPLY

+15V(I)

-15V(I)

UPPER BOARD INTERNAL POWER SUPPLY

+8V(REF)

V+

+5V(UB)

±12V SERIES REGULATORS

±12V(M) SERIES REGULATORS

OVERVOLTAGE AND UNDERVOLTAGE SENSING

+5V(M)

+12V

±12V OVERVOLTAGE CROWBAR

-12V

+12V(M)

±12V(M) OVERVOLTAGE CROWBAR

-12V(M)

PWR UP

OVERCURRENT +5V AND -2V

OVERVOLTAGE CPU AND I/O

OVERVOLTAGE/UNDERVOLTAGE (M)

STANDBY

OVERTEMP

BATTERY • PUUP

CONTROL AND PROTECTION LOGIC

ON

RESET

POWER UP RESET

OVERCURRENT +5V(M)

OVERCURRENT ±12V

OVERCURRENT ±12V(M)

CPU AND I/O CROWBAR TRIGGER

START BATTERY TEST

PWU

PON

M LOST D

MGPD

MEMORY CROWBAR TRIGGER

MEMORY ENABLE

CPU ENABLE

VOLTAGE ERROR AMPLIFIERS

PULSE WIDTH MODULATORS AND DRIVERS

BATTERY REGULATOR OUTPUT STAGES

+12V(M) -12V(M) BATTERY CURRENT SENSING

BATTERY DRIVER ENABLE

+V(BT)

LATCH

4. ▽ SIGNAL COMMON.

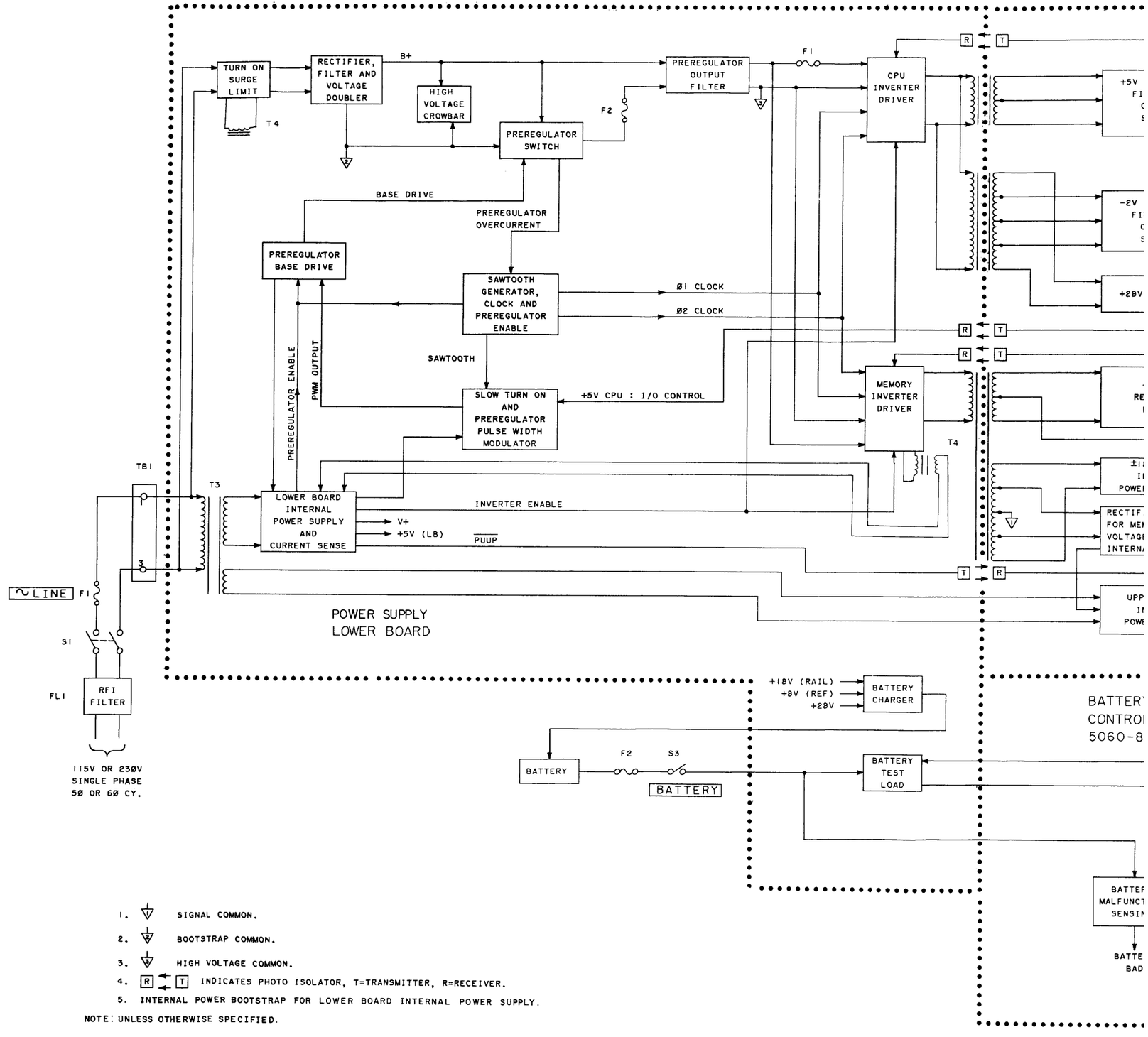
3. ▽2 BOOTSTRAP COMMON.

2. ▽3 HIGH VOLTAGE COMMON.

1. R ← → T INDICATES PHOTO ISOLATOR, T= TRANSMITTER, R= RECEIVER.

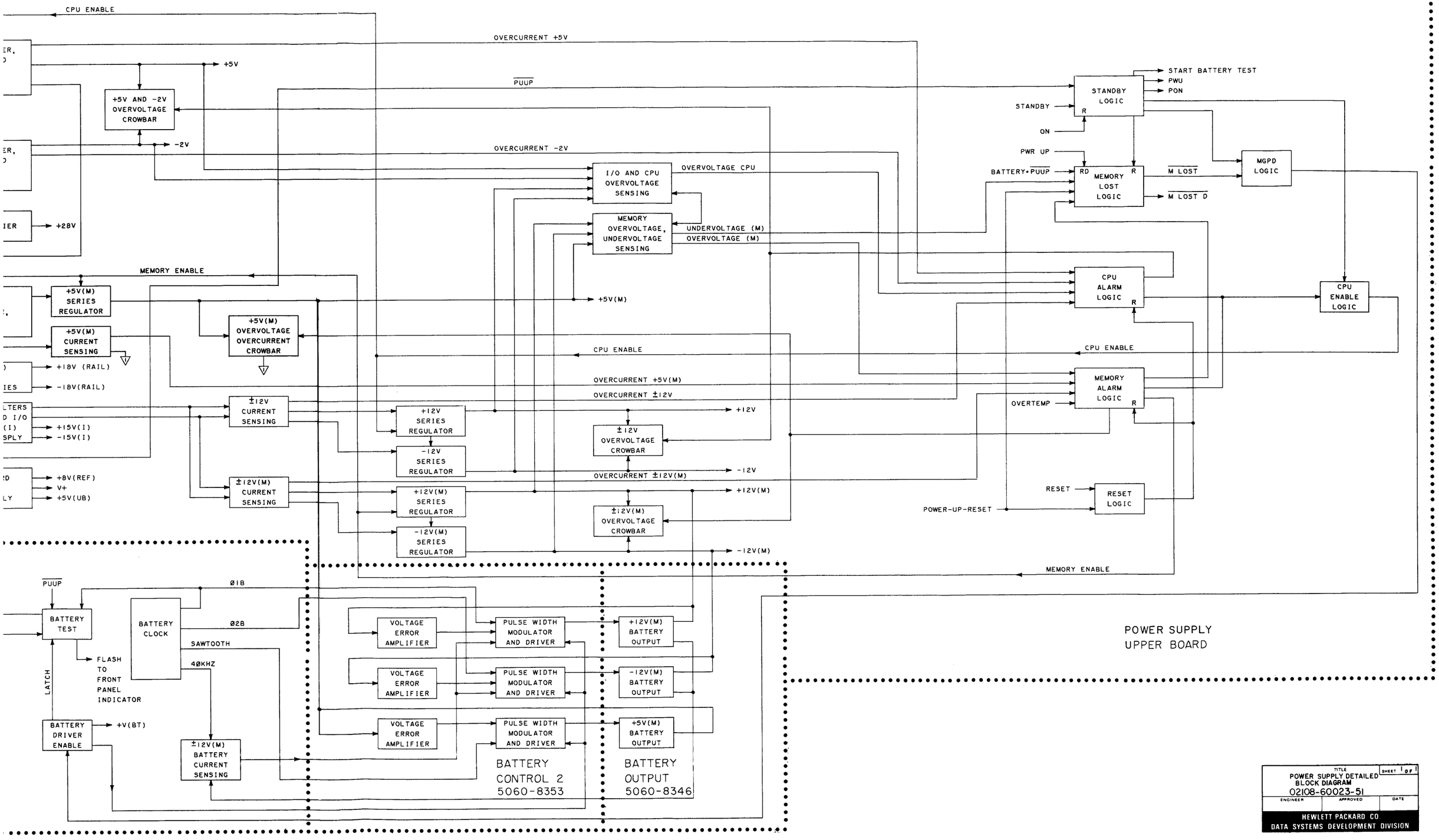
NOTE: UNLESS OTHERWISE SPECIFIED,

TITLE	SHEET 1 OF 1
POWER SUPPLY OVERALL BLOCK DIAGRAM 02108-60024-51	
ENGINEER / APPROVED / DATE	
HEWLETT-PACKARD CO. DATA SYSTEMS DEVELOPMENT DIVISION	



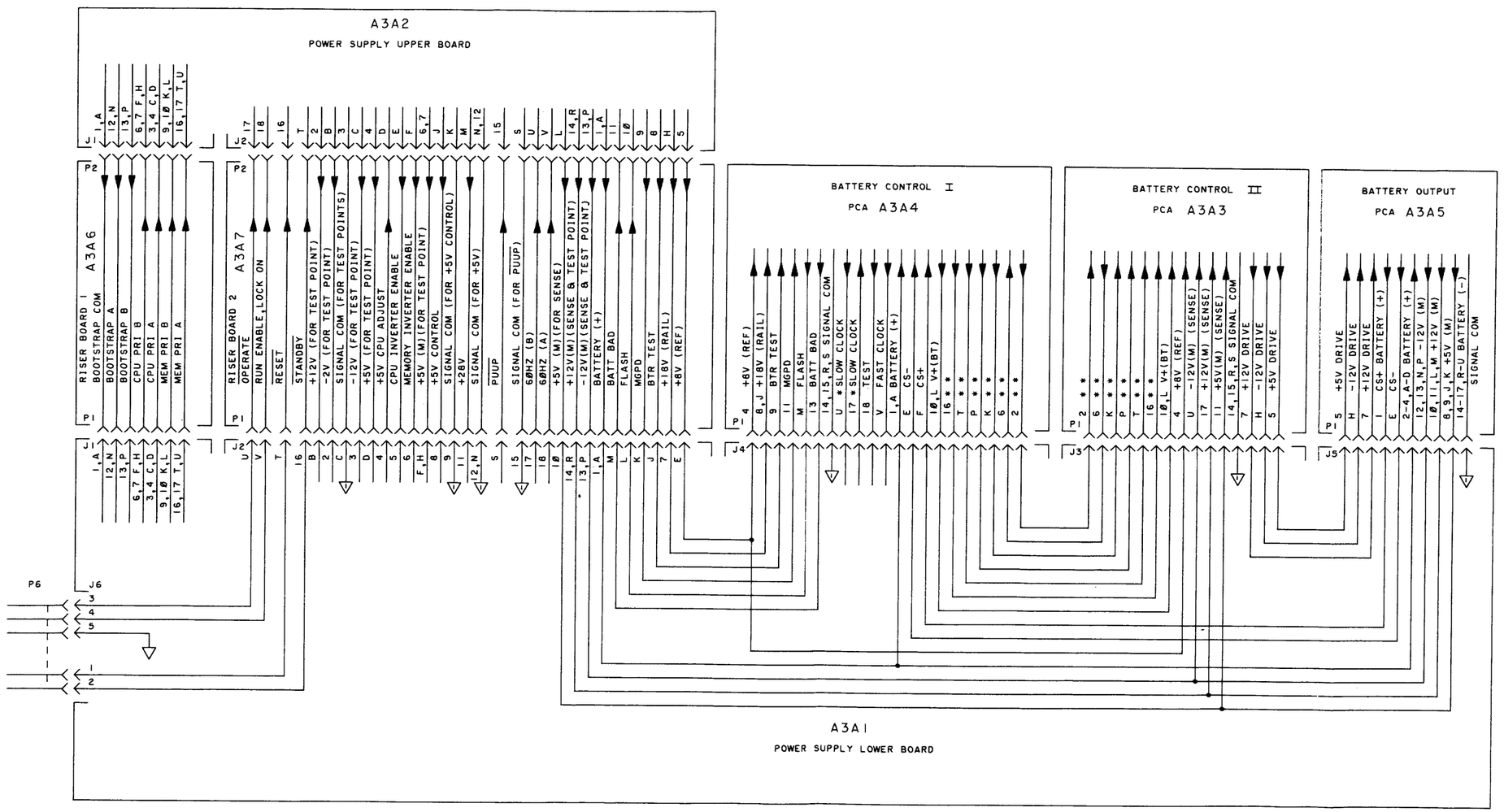
1. ▽ SIGNAL COMMON.
2. ▽ BOOTSTRAP COMMON.
3. ▽ HIGH VOLTAGE COMMON.
4. [R] ⇄ [T] INDICATES PHOTO ISOLATOR, T=TRANSMITTER, R=RECEIVER.
5. INTERNAL POWER BOOTSTRAP FOR LOWER BOARD INTERNAL POWER SUPPLY.

NOTE: UNLESS OTHERWISE SPECIFIED.



TITLE	SHEET 1 OF 1
POWER SUPPLY DETAILED BLOCK DIAGRAM 02108-60023-51	
ENGINEER / APPROVED / DATE	
HEWLETT PACKARD CO. DATA SYSTEMS DEVELOPMENT DIVISION	

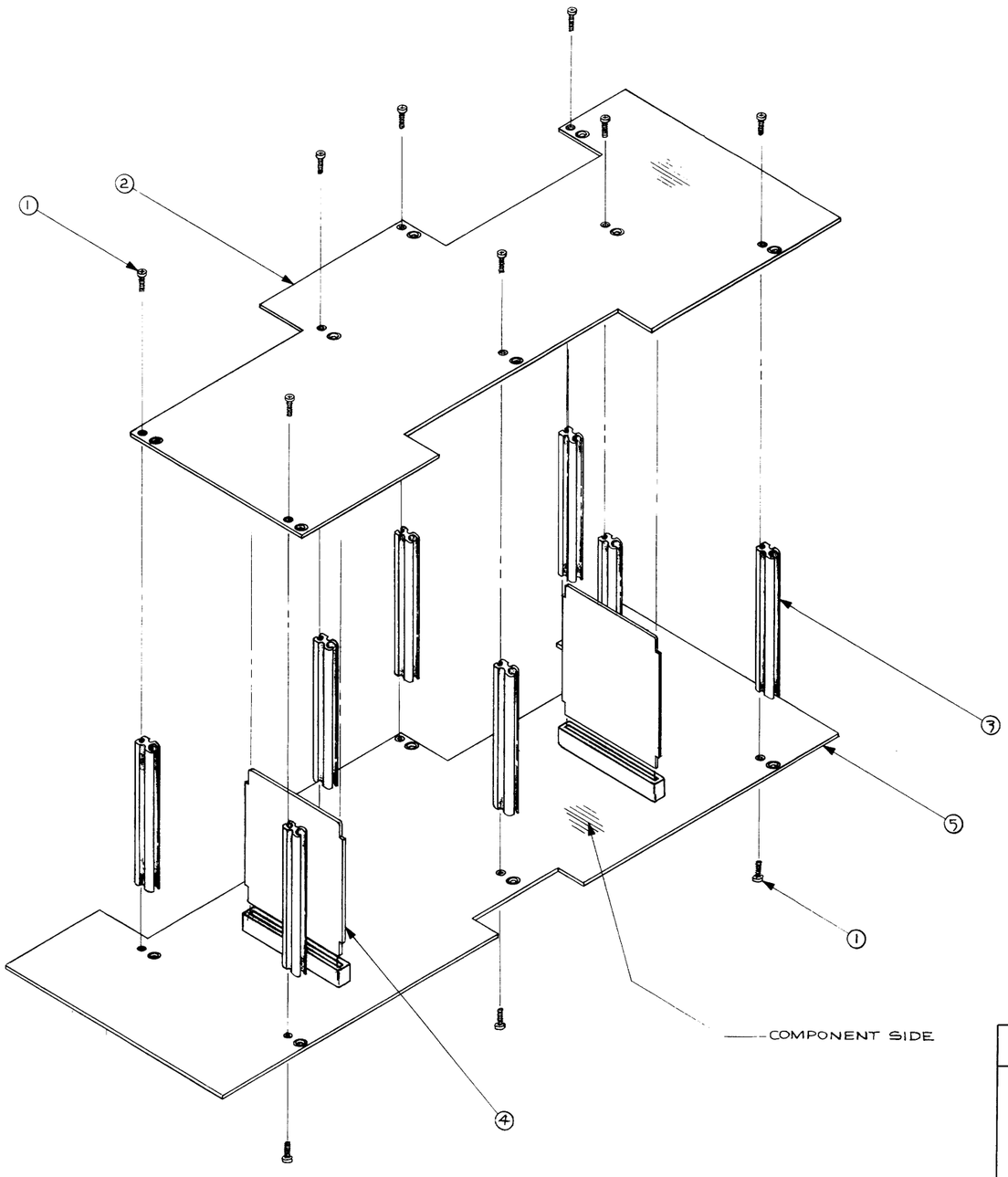
REV	REFERENCE	SERIES/PREFIX
A	ORIG	NA



1. PIN CONNECTIONS NOT SHOWN ARE IDENTICAL TO THOSE OPPOSITE.
* * THESE CONNECTIONS, AS SHOWN, ARE JUMPER WIRED BETWEEN J3 AND J4 ON PCA A3A1.
* SLOW CLOCK OUTPUT ON PIN U NORMALLY STRAPPED TO INPUT PIN 17.

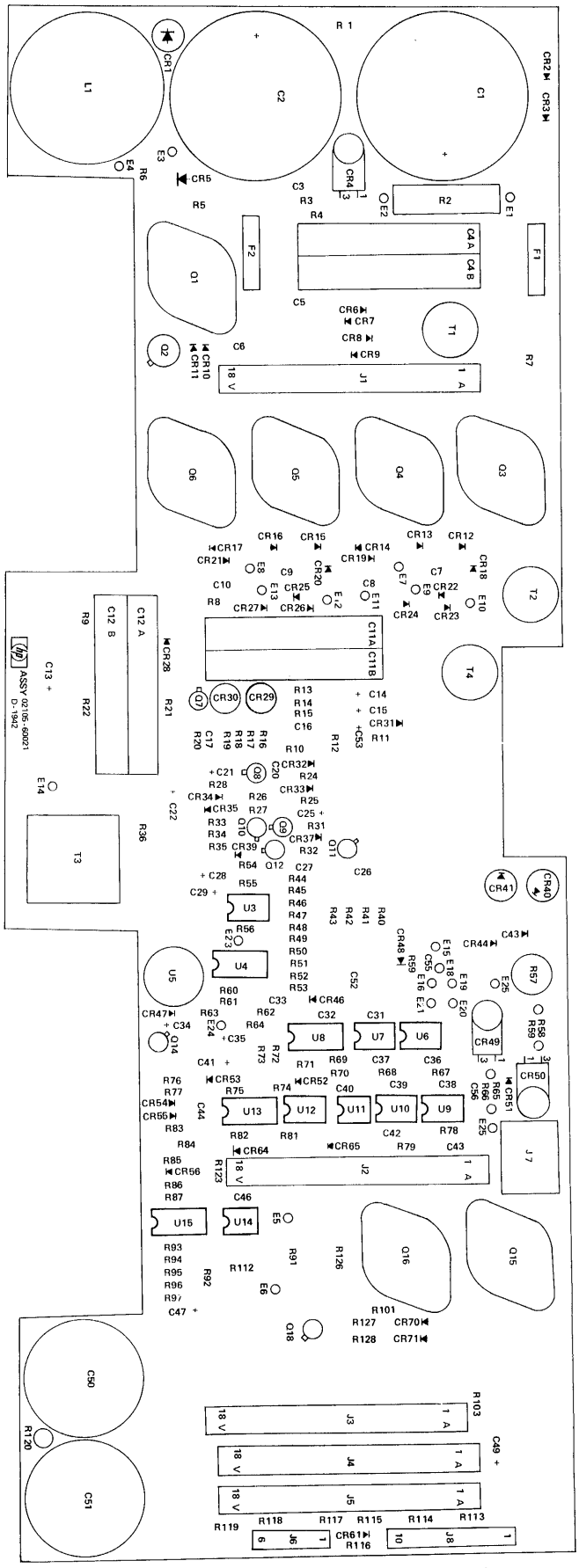
NOTE: UNLESS OTHERWISE SPECIFIED ALL CONNECTIONS TO/FROM J3, J4, AND J5 ARE TRACES ON PCA A3A1.

TITLE	SHEET 1 OF 1
POWER SUPPLY INTERCONNECTION DIAGRAM 02108-90025	
ENGINEER / APPROVED / DATE	
HEWLETT-PACKARD CO. DATA SYSTEMS DEVELOPMENT DIVISION	



	COMPUTER	2105A	2108A/2109A
	COMPLETE POWER SUPPLY ASSY.	2105-60012	2108-60023
ITEM	**QTY.**	**DESCRIPTION**	**PART NO.**	**PART NO.**
1	16	SCREW 6-20 x .625	0624-0062	0624-0062
2	1	UPPER P.S. BD. ASSY.	02105-60022	5061-1355
3	8	STANDOFF	02105-20003	02108-20001
4	2	RISER BD.	02105-80003	5080-9744
5	1	LOWER P.S. BD. ASSY.	02105-60021	5061-1354
6	1	CROSSOVER WIRING KIT	02105-60023	—
7	1	CROSSOVER BD. ASSY.	5060-8345	—

2105A/2108A/2109A Power Supply
Main Assembly



2105 Power Supply Lower Assembly
02105-60021

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	C7-10,31,33,38, 39,42,43,44	CAP 0.1UF		0150-0121		U	11	
01	C16,17	CAP .001UF 10%		0160-0153		U	2	
01	C27	CAP .47UF-20+80%		0160-0174		U	1	
01	C26	CAP .012UF 10%		0160-0301		U	1	
01	C3,36,37,55,56	CAP .01UF		0160-2055		U	5	
01	C20	CAP 5000PF		0160-2145		U	1	
01	C40,46,52	CAP 100PF 5%		0160-2204		U	3	
01	C32	CAP. 2400PF		0160-2227		U	1	
01	C5,6	CAP 3000PF		0160-2288		U	2	
01	C12	CAP FXD 2X5UF		0160-4142		U	1	
01	C4,11	CAP FXD 5UF		0160-4186		U	2	
01	C53	CAP 4.7UF 35WVDC		0180-0100		D	1	
01	C13,22,49	CAP 200UF-10+75%		0180-0104		U	3	
01	C14,15	CAP 6.8UF 10%		0180-0116		D	2	
01	C34	CAP 2.2UF 10%		0180-0197		D	1	
01	C47	CAP 22UF 10%		0180-0228		D	1	
		CAP 1UF 10%		0180-0291		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0180-0291				
01	C28							
		CAP 780UF-10+75%		0180-0432		U	2	
01	C1,2							
		CAP 6.8UF 20%		0180-1701		U	2	
01	C21,29							
		CAP 47UF 10%		0180-1704		U	1	
01	C35							
		CAP 15UF 10%		0180-1746		U	1	
01	C25							
		CAP 68UF 20%		0180-1835		U	1	
01	C41							
		CAP 4000 UF 15V		0180-2385		U	2	
01	C50,51							
		PAD-MTG TO5		0340-0164		U	6	
		STUD SOLDER		0360-0090		U	17	
01	F7-16,18-21,23-25							
		STUD SOLDER TERM		0360-0474		U	2	
		TERM STUD FKD		0360-1529		U	6	
01	F1-6							
		SPCR TAP #6X.125		0380-0383		U	17	
		CARD GUIDE		0403-0121		U	6	
		CMPOUND-NUT LOCK		0470-0231		U	0.01	BT
		ADH RTV CLEAR		0470-0251		U	0.01	TB
		RES 2.7 5% .25		0683-0275		U	3	
01	R13,14,26							
		RES 47 5% .25		0683-4705		U	1	
01	R33							
		RES 464 1%.125		0698-0082		U	1	
01	R32							
		RES 2.15K 1%.125		0698-0084		U	16	
01	R18,28,34,49,54,56,							
03	62,67,69,71,73,74,							
05	77,81,82,112							
		RES 2.37K 1%.125		0698-3150		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0698-3150				
01	R116							
		RES 3.48K 1%.125		0698-3152		U	1	
01	R119							
		RES 3.83K 1%.125		0698-3153		D	2	
01	R70,86							
		RES 4.22K 1%.125		0698-3154		D	1	
01	R52							
		RES 34.8 1% .5W		0698-3395		U	2	
01	R42,43							
		RES 46.4 1% .5W		0698-3398		U	2	
01	R40,41							
		RES 215 1% .5W		0698-3401		U	1	
01	R84							
		RES 14.7K 1% .5W		0698-3414		U	5	
01	R7-9,22,127							
		RES 21.5 1%.125		0698-3430		U	1	
01	R11							
		RES 147 1%.125		0698-3438		D	1	
01	R85							
		RES 215 1%.125		0698-3441		D	6	
01	R78,79,83,113,114,123							
		RES 422 1%.125		0698-3447		D	1	
01	R21							
		RES 215K 1%.125		0698-3454		D	1	
01	R68							
		RES 200K 1% .5W		0757-0128		U	2	
01	R36,129							
		RES 21.5K 1%.125		0757-0199		D	3	
01	R12,63,76							
		RES 1.78K 1%.125		0757-0278		D	1	
01	R61							
		RES 1K 1%.125		0757-0280		D	18	
01 03 05	R10,16,19,24,27,35, 51,58,60,64,66,75, 94-96,103,117,118							
		RES 100 1%.125		0757-0401		D	6	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	R3,15,59,65,92,126			0757-0401				
01	R55	RES 511 1%.125		0757-0416		D	1	
01	R31,45	RES 825 1%.125		0757-0421		D	2	
01	R97	RES 1.1K 1%.125		0757-0424		D	1	
01	R44,128	RES 5.11K 1%.125		0757-0438		D	2	
01	R93	RES 7.5K 1%.125		0757-0440		D	1	
01	R20	RES 8.25K 1%.125		0757-0441		D	1	
01	R17,25,46-48,50,72,87	RES 10K 1%.125		0757-0442		D	8	
01	R53	RES 82.5K 1%.125		0757-0463		D	1	
01	R5	RES 10K 1% .50		0757-0839		D	1	
01	R57	RES 5 5% 20W		0811-1654		U	1	
01	R101	RES 4.7 5% 2W		0811-1674		U	1	
01	R91	RES 10 5% 10W PW		0811-1895		U	1	
01	R1	RES .12 3% 3W		0811-2616		U	1	
01	R2	RES 2 10%		0811-3108		U	1	
01	R4,6	RES 15K 3% 3W		0812-0051		U	2	
		TBG HS BLK .250D		0890-0312		U	0.70	FT
		HT DIS TO-5		1205-0033		U	1	
		HT DIS TO-3		1205-0275		U	7	
		CONNECTOR		1251-0674		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	J8			1251-0674				
01	J1-5	CONN PC2X18.156D		1251-2026		U	5	
01	J6	PIN ASSY		1251-3412		U	1	
01	J7	CONN UTIL 6PIN M		1251-3819		U	1	
01	U13	IC SN7474N		1820-0077		U	1	
01	U5	IC LM309H		1820-0429		U	1	
01	U3	IC SN75452P		1820-0799		U	1	
01	U6,7,12	IC SN75453P		1820-1016		U	3	
01	U8,15	IC D COMPTR 8K		1826-0175		U	2	
01	Q10,12,14,18	XSTR PNP 2N2907A		1853-0281		U	4	
01	Q2	xSTR 2N3439 TO5		1854-0079		U	1	
01	Q7,8,11	XSTR 2N2222ATO18		1854-0477		U	3	
01	Q9	XSTR 2N3725 TO5		1854-0547		U	1	
01	Q15,16	XSTR 2N6055 TO3		1854-0611		U	2	
01	Q1,3-6	XSTR NPN TO3 10A		1854-0869		U	5	
01	U4	XISTOR ARRAY		1858-0009		U	1	
01	CR4	THYRISTOR SCR		1884-0233		U	1	
01	CR49,50	THYRISTOR-SCR		1884-0249		U	2	
		THYRISTOR		1884-0258		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	CR31			1884-0258				
01 03	CR14,17,21,22,25,26, 34,43,44	DIODE 1N2071		1901-0029		D	9	
01 03	CR35,39,46-48,51-54, 56,61	DIODE SIL		1901-0040		D	11	
01	CR1,40,41	DIODE 3A 600V		1901-0420		U	3	
01	CR32,33,65,70	STABISTOR STB523		1901-0460		D	4	
01 03	CR6-13,15,16,18-20, 23,24,27,28	DIODE IN4936		1901-1065		D	17	
01	CR5	RECTIFIER		1901-1087		D	1	
01	CR71	DIODE ZNR 16.2V		1902-0184		D	1	
01	CR2,3	DIODE 200V ZENER		1902-0668		D	2	
01	CR64	DIODE 3.16V		1902-3036		D	1	
01	CR37,55	DIODE ZNR 4.22V		1902-3070		D	2	
01	CR29,30	DIODE-FW BRIDGE		1906-0051		U	2	
01	U9,10	ISOLATOR		1990-0429		U	2	
01	U11,14	OPTO ISOLATOR		1990-0537		U	2	
01	R120	RES VAR 1K		2100-1986		U	1	
01	R115	RES VAR 1K 10%		2100-3352		U	1	
01	F2	FUSE 4A NB		2110-0055		U	1	
		FUSE 2.5A NB		2110-0083		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	F1			2110-0083				
		FUSE CLIP .250D		2110-0483		U	4	
		LKWSHR 10 HEL		2190-0034		U	8	
		LKWSHR 6 HEL		2190-0851		U	1	
		SCR #4-40X.312L		2200-0141		U	3	
		NUT 4-40 W/LK		2260-0009		U	4	
		SCR #6-32X2.5L		2360-0221		U	1	
		SCR 6-32X.375		2360-0359		U	21	
		NUT 6-32 .312AF		2420-0002		U	1	
		NUT 8-32 .344AF		2580-0004		U	1	
		SCR 10-32X.375		2680-0099		U	8	
		WSHR #8 BRS		3050-0001		U	1	
		WSHR #10		3050-0006		U	2	
		WSHR #4 SS		3050-0222		U	4	
		WSHR #6 SS		3050-0227		U	6	
		WSHR #10 BRS		3050-0236		U	8	
		BEADS INDIAN		4330-0145		U	4	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE 18 BLK		8150-2890		C	1	FT
01	L2-5	COIL 56UH 10%		9100-2273		U	4	
01	T2	XFORMER		9100-2951		U	1	
01	T3	XFORMER		9100-2956		U	1	
01	L1	XFORMER		9100-2959		U	1	
01	T1	XFORMER		9100-2966		U	1	
		XFORMER-POWER		9100-3803		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				9100-3803				
01	T4							
		PC CARD GUIDE		02108-00009		W	2	
		HEAT SINK		02108-00030		W	3	

ENGINEERING RESPONSIBILITY	SEMA	D-02105-60021-51

SYM	REVISIONS	APPROVED	DATE
A	AS 13501 Eb, PCO-22-5290	JWW	5-8-91

TEST POINT COMMON J2-3
TEST POINT COMMON J2-15
TEST POINT COMMON J6-4
TEST POINT COMMON J8-2

PREREGULATOR COMMON J1-1
PREREGULATOR COMMON J1-A

+12V (M) J2-14
+12V (M) J2-R
+12V (M) J3-17
+12V (M) J5-10
+12V (M) J5-11
+12V (M) J5-L
+12V (M) J5-M

+12V(M) TEST J8-9 R117 1K C51 (NOTE 2) 4000

BATTERY COMMON J2-12
BATTERY COMMON J2-N
BATTERY COMMON J3-19
J3-15
J3-R
J3-3
J4-19
J4-15
J4-R
J4-3
J5-14
J5-15
BATTERY COMMON J5-16
BATTERY COMMON J5-17
BATTERY COMMON J5-R
BATTERY COMMON J5-S
BATTERY COMMON J5-T
BATTERY COMMON J5-U
BATTERY COMMON J7-C

C50 (NOTE 2) 4000

-12V(M) TEST J8-10 R118 1K

-12V(M) J2-13
-12V(M) J2-P
-12V(M) J3-U
-12V(M) J5-12
-12V(M) J5-13
-12V(M) J5-N
-12V(M) J5-P

RESET	J6-1	J2-16	RESET
STANDBY	J6-2	J2-T	STANDBY
OPERATE	J6-3	J2-17	OPERATE
LOCK ON	J6-5	J2-18	LOCK ON

+5V(M)	J2-6	R114 215	J8-6	+5V(M) (TEST)
+5V(M)	J2-T			
+5V	J2-4	R113 215	J8-5	+5V (TEST)
-2V TEST	J2-8		J8-4	-2V (TEST)
-12V TEST	J2-C		J8-1	-12V (TEST)
+12V TEST	J2-2		J8-3	+12V (TEST)

+5V(M) J2-L
+5V(M) J3-11
+5V(M) J5-8
+5V(M) J5-9
+5V(M) J5-J
+5V(M) J5-K

V+(BT) J3-10
V+(BT) J3-L
V+(BT) J4-10
V+(BT) J4-L

BATT TEST	J2-8	J4-9	BATT TEST
MGPD	J2-9	J4-11	MGPD
FLASH	J2-10	J4-M	FLASH
BATT BAD	J2-11	J4-13	BATT BAD
+5V DRIVE	J3-5	J5-5	+5V DRIVE
+12V DRIVE	J3-T	J5-7	+12V DRIVE
-12V DRIVE	J3-M	J5-H	-12V DRIVE
SLOW CLOCK	J4-17	J4-U	SLOW CLOCK
CURRENT SENSE(-)	J4-E	J5-E	CURRENT SENSE(-)
CURRENT SENSE(+)	J4-F	J5-F	CURRENT SENSE(+)
BATTERY SIGNAL A	J3-2	J4-2	BATTERY SIGNAL A
B	J3-6	J4-6	B
C	J3-16	J4-16	C
D	J3-P	J4-K	D
E	J3-K	J4-P	E
BATTERY SIGNAL F	J3-T	J4-T	BATTERY SIGNAL F

NOTES

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE IN OHMS
   ALL CAPACITANCE IN MICROFARADS
   ALL RESISTORS ARE 1/8 WATT
2. COMPONENT LOADED IN FINAL ASSEMBLY

TEST POINT COMMON
BATTERY COMMON
PREREGULATOR COMMON
INVERTER COMMON

HIGHEST REFERENCE DESIGNATORS USED			
R128	C56	Q18	L5
U15	T4	CR71	J8

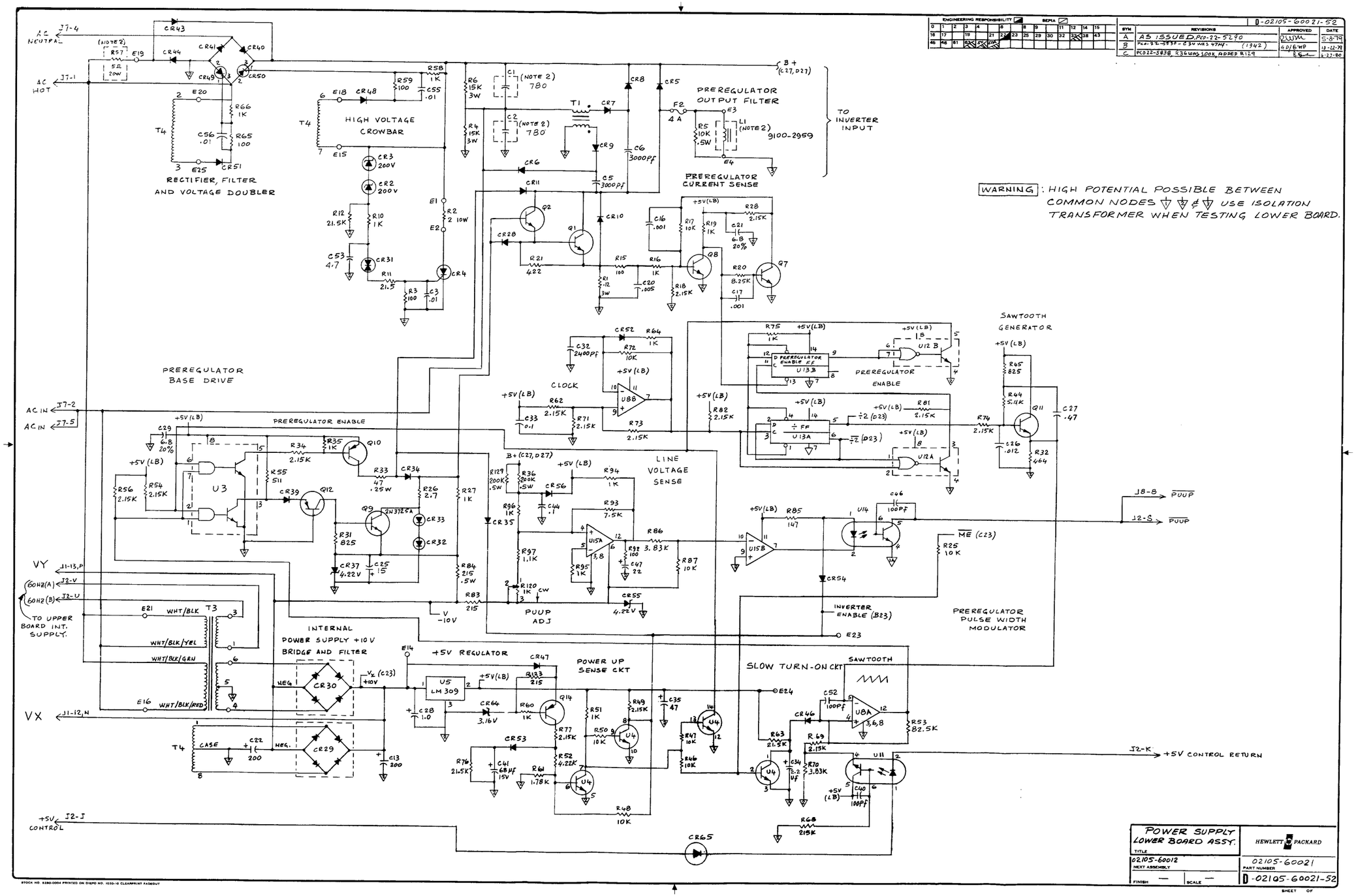
REFERENCE DESIGNATORS NOT USED	
R23,29,30,37-39,80,88-90,	
R98-100,102,104-111,121,	
R122, 124, 125	C18,19,23,
C24,30,45,48,54	Q13,17
U1,2	CR36,38,42,45,
CR 57-60, 62,63, 66-69	

REFERENCE DRAWINGS.
ASSY 02105-60021, D-1
C-2
C-3
C-4
D-5
C-6
C-7

TITLE SCHEMATIC POWER SUPPLY LOWER BD	HEWLETT PACKARD
NEXT ASSEMBLY 02105-60012 1	PART NUMBER 02105-60021
FINISH / SCALE /	D-02105-60021-51

STOCK NO 8380-0004 PRINTED ON DIEMO NO. 1030-10 CLEARPRINT PAPERCUT

SHEET OF


AC NEUTRAL
J7-4
AC HOT
J7-1
(NOTE 2)
R57
5Ω 20W
E19
CR44
CR41
CR40
CR49
CR50
CR43
RECTIFIER, FILTER AND VOLTAGE DOUBLER
T4
E20
E25
CR51
R66 1K
C56 .01
R65 100
HIGH VOLTAGE CROWBAR
E18
E15
CR48
R59 100
R58 1K
C55 .01
CR3 200V
CR2 200V
R12 21.5K
R10 1K
C53 4.7
CR31
R11 21.5
R3 100
C3 .01
E1
E2
R2 2 10W
CR4
R6 15K 3W
R4 15K 3W
C1 (NOTE 2) 780
C2 (NOTE 2) 780
T1
CR8
CR5
CR7
CR9
C6 3000pf
CR6
C5 3000pf
CR11
Q2
Q1
CR10
CR28
R21 422
R15 100
R16 1K
R1 .12 3W
C20 .005
R18 2.15K
B+ (C27, D27)
PREREGULATOR OUTPUT FILTER
F2 4A
E3
L1 (NOTE 2) 9100-2959
R5 10K .5W
E4
PREREGULATOR CURRENT SENSE
TO INVERTER INPUT
WARNING: HIGH POTENTIAL POSSIBLE BETWEEN COMMON NODES ⏚ ⏚ & ⏚ USE ISOLATION TRANSFORMER WHEN TESTING LOWER BOARD.
+5V(LB)
R28 2.15K
R17 10K
R19 1K
C21 6.8 20%
C16 .001
Q8
Q7
R20 8.25K
C17 .001
PREREGULATOR BASE DRIVE
AC IN
J7-2
AC IN
J7-5
PREREGULATOR ENABLE
C29 6.8 20%
R34 2.15K
R35 1K
Q10
R33 47 .25W
CR34
R26 2.7
R27 1K
U3
R56 2.15K
R54 2.15K
R55 511
CR39
Q12
Q9 2N3725A
CR33
CR32
R31 825
CR37 4.22V
C25 15
R84 215 .5W
R83 215
V -10V
CLOCK
C32 2400pf
CR52
R64 1K
R72 10K
U8B
R62 2.15K
C33 .1
R71 2.15K
R73 2.15K
R75 1K
U13B
PREREGULATOR ENABLE
U12B
R82 2.15K
U13A
÷2 (D23)
R81 2.15K
U12A
SAWTOOTH GENERATOR
R45 825
R44 5.11K
Q11
C27 .47
R74 2.15K
C26 .012
R32 464
B+ (C27, D27)
R129 200K .5W
R36 200K .5W
CR56
C44 .1
R96 1K
CR35
R97 1.1K
R120 1K CW
PUUP ADJ
LINE VOLTAGE SENSE
R94 1K
R93 7.5K
U15A
R95 1K
R86 3.83K
R92 100
C47 22
R87 10K
CR55 4.22V
U15B
R85 147
U14
C46 100PF
J8-8 PUUP
J2-S PUUP
ME (C23)
R25 10K
CR54
INVERTER ENABLE (B23)
E23
PREREGULATOR PULSE WIDTH MODULATOR
VY
J1-13, P
60HZ(A)
J2-V
60HZ(B)
J2-U
TO UPPER BOARD INT. SUPPLY.
T3
E21
WHT/BLK
WHT/BLK/YEL
WHT/BLK/GRN
E16
WHT/BLK/RED
VX
J1-12, N
INTERNAL POWER SUPPLY +10 V BRIDGE AND FILTER
CR30
CR29
T4
CASE
C22 200
NEG.
C13 200
+5V REGULATOR
E14
U5 LM 309
C28 1.0
CR64 3.16V
R123 215
CR47
POWER UP SENSE CKT
Q14
R60 1K
R77 2.15K
CR53
R76 21.5K
C61 68pf 15V
R61 1.78K
R52 4.22K
R51 1K
R50 10K
R49 2.15K
C35 47
U4
R47 10K
R46 10K
R48 10K
SLOW TURN-ON CKT
SAWTOOTH
E24
C52 100pf
U8A
R53 82.5K
CR46
R63 21.5K
R69 2.15K
C34 3.2 uf
R70 3.83K
U11
C40 100pf
R68 215K
J2-K +5V CONTROL RETURN
+5V CONTROL
J2-J
CR65
ENGINEERING RESPONSIBILITY
SCALE
D-02105-60021-52
REVISIONS
APPROVED
DATE
A5 ISSUED PCO-22-5290
PCO-22-5933 - C34 WAS 47MF - (1942)
PC022-5838, R36 WAS 100K, ADDED R129
STOCK NO. 5280-0004 PRINTED ON DIAMO NO. 1030-G CLEANPRINT FANFOLD
POWER SUPPLY LOWER BOARD ASSY.
TITLE
02105-60012
NEXT ASSEMBLY
FINISH
SCALE
HEWLETT PACKARD
02105-60021
PART NUMBER
D-02105-60021-52
SHEET OF

ENGINEERING RESPONSIBILITY	SEPIA
0 1 12 13 14 15 16 17 18 19 20 21 22 33 34 36 42 43 63 79 80 93	

SYM	REVISIONS	APPROVED	DATE
A	AE ISSUED - PCO-22-5290	RWM	5-8-79

D-02105-60021-53

CPU INVERTER POWER STAGE

CPU INVERTER ENABLE J2-E
(F17) INVERTER ENABLE
MEMORY INVERTER ENABLE J2-F
(F18) $\overline{ME}$
(G14) V_X
(D18) ÷2
(E18) $\overline{÷2}$
+5V(LB)
R78 215 U9 C43 0.1 C38 0.1 C36 .01 R67 2.15K
R79 215 U10 C42 0.1 C39 0.1 C37 .01 R24 1K
C31 0.1
U6

R42 34.8 .5W
R13 2.7 .25W C14 4.8 10% R43 34.8 .5W
T2B E10 E9 E7 E11 L2 L3 CR22 CR23 CR18 CR19 CR14 Q3 Q4 CR12 CR24 0.47 0.1
J1-6 J1-7 J1-F J1-H — CPU PRI B

B+ (A17, E15) F1
INVERTER INPUT FROM PREREGULATOR
R7 14.7K .5W C4 (NOTE 2) 5 UF
R8 14.7K .5W C11 (NOTE 2) 5 UF CR1
J1-3 J1-4 J1-C J1-D — CPU PRI A

PREREGULATOR OUTPUT FILTER

B+ (A17, E15)
INVERTER INPUT FROM PREREGULATOR
R9 14.7K .5W C12A 5.0 (NOTE 2)
R22 14.7K .5W C12B 5.0 (NOTE 2)
J1-16 J1-17 J1-T J1-U — MEM PRI A
T4 (PRIMARY)

R40 46.4 .5W
R14 2.7 .25W C15 4.8 10% R41 46.4 .5W
T2A E12 E13 E8 E11 L4 L5 CR25 CR26 CR20 CR21 CR16 CR17 Q5 Q6 CR15 CR27 C9 0.1 C10 0.1
J1-9 J1-10 J1-K J1-L — MEM PRI B

MEMORY INVERTER POWER STAGE

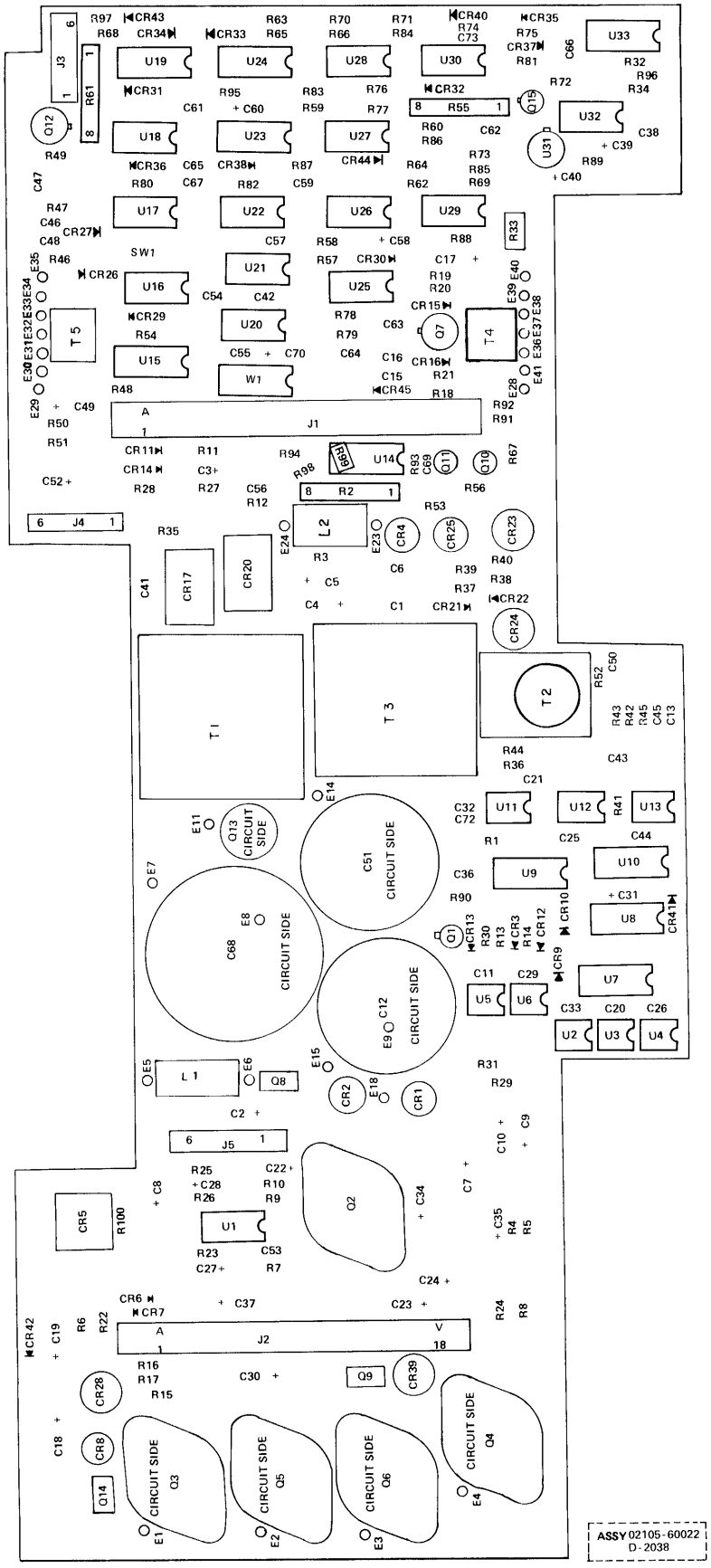
BATTERY CHARGER AND BATTERY TEST LOAD

18V (RAIL) J2-H J4-8 J4-J
TEST J4-18
+8V (REF) J2-5 J3-4 J4-4
CR70 Q18 Q15 R127 14.7K .5W R128 5.11K R101 4.7 2W R126 100 CR71 16.2V
280 MA E6 R91 10 10W E5 Q16 R112 2.15K
C49 200 UF 16V
R116 2.37 K CR61 R115 1K 1CW R119 3.48 K

R103 1K
J8-7 TEST POINT
J2-1 J2-A J3-1 J3-A J4-1 J4-A J5-2 J5-3 J5-4 J5-A J5-B J5-C J5-D J7-3 V+ BATTERY
J2-D +6V CPU ADJUST

SCHEMATIC POWER SUPPLY LOWER BOARD (TITLE)	HEWLETT PACKARD
02105-60012 (NEXT ASSEMBLY)	02105-60021 (PART NUMBER)
FINISH / SCALE	D-02105-60021-53 (SHEET OF)

STOCK NO 9280-0004 PRINTED ON DISPO NO 1030-10 CLEARPRINT FADEOUT



2105A Power Supply Upper Assembly
02105-60022

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	C1	CAP .01UF-20+80%		0150-0093		U	1	
01	C45,66,69	CAP 0.1UF		0150-0121		U	3	
01	C60,72	CAP 1.0UF 20%		0160-0127		U	2	
01	C54,55	CAP. 2.2UF		0160-0128		U	2	
01	C16,48,61	CAP .022UF 10%		0160-0162		U	3	
01	C59	CAP .033UF 10%		0160-0163		U	1	
01 03	C11,15,20,26,29, 33,47,57,63,64	CAP .01UF		0160-2055		U	10	
01	C43	CAP .33UF 20%		0160-2128		U	1	
01	C21,25,32,36	CAP 30PF 5%		0160-2199		U	4	
01	C38,65,67	CAP 100PF 5%		0160-2204		U	3	
01	C6	CAP 3000PF		0160-2288		U	1	
01	C13	CAP 470PF 5%		0160-2940		U	1	
01	C46,56	CAP 1000PF 10%		0160-3456		U	2	
01	C41,44,50	CAP .02UF 20%		0160-3459		U	3	
01	C2,37	CAP 100UF-10+50%		0180-0094		U	2	
01	C4,5,9,10	CAP 4.7UF 35WVDC		0180-0100		U	4	
		CAP 200UF-10+75%		0180-0104		U	4	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0180-0104				
01	C18,23,30,34							
		CAP 2.2UF 10%		0180-0197		D	1	
01	C70							
		CAP 22UF 10%		0180-0228		D	1	
01	C3							
		CAP 33UF 10%		0180-0229		U	2	
01	C39,40							
		CAP 1UF 10%		0180-0291		D	8	
01 03	C19,22,24, 31,35,53,58,62							
		CAP 10000UF		0180-0435		U	1	
01	C68							
		CAP 8KUF FXD		0180-0460		U	1	
01	C51							
		CAP 5KUF		0180-0464		U	1	
01	C12							
		CAP 6.8UF 20%		0180-1701		U	1	
01	C42							
		CAP 47UF 10%		0180-1704		U	1	
01	C73							
		CAP 22UF 10%		0180-1794		U	2	
01	C17,49							
		CAP 200UF-10+75%		0180-1946		U	2	
01	C7,8							
		CAP 3.3UF 10%		0180-2141		U	1	
01	C52							
		CAP-TA 3.30F		0180-2690		D	2	
01	C27,28							
		PAD-MTG TO5		0340-0164		U	3	
		STUD SOLDER		0360-0090		U	20	
01 03	E11,14,15,18,23,24 28-41							
		STUD SOLDER TERM		0360-0474		U	2	
		TERM STUD FKD		0360-1529		U	3	
01	E5,6,7							
		SPCR TAP #6X.125		0380-0383		U	17	

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	CP1,2,17,20	STANDOFF		0380-0551		U	4	
		TAPE ELECTRICAL		0460-0955		U	0.01	RL
		ADH RTV CLEAR		0470-0251		U	0.01	TU
01	R89	RES 4.7 5% .25		0683-0475		U	1	
01	R94,96	RES FXD 5.6 OHM		0683-0565		U	2	
01	R54	RES 470 5% .25		0683-4715		D	1	
01	R44,60,78	RES 2.15K 1%.125		0698-0084		D	3	
01	R15,31	RES 1.78K 1% .5		0698-0089		U	2	
01	R67	RES 2.37K 1%.125		0698-3150		D	1	
01 03	R7,9,18,23,25,47,59 63,66,70,73,83	RES 4.64K 1%.125		0698-3155		D	12	
01	R75	RES 31.6K 1%.125		0698-3160		U	1	
01	R65,80,82,97-99	RES 464K 1%.125		0698-3260		D	6	
01	R35	RES 31.5 1% .50		0698-3394		U	1	
01	R4,5	RES 14.7 1%.125		0698-3428		U	2	
01	R62,84,85	RES 147 1%.125		0698-3438		D	3	
01	R32	RES 215 1%.125		0698-3441		D	1	
01	R86	RES 348 1%.125		0698-3445		D	1	
01	R45	RES 422 1%.125		0698-3447		D	1	
		RES 28.7K 1%.125		0698-3449		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0698-3449				
01	R41							
		RES 42.2K 1%.125		0698-3450		D	2	
01	R10,26							
		RES 100 1% .50		0757-0198		D	1	
01	R72							
		RES 21.5K 1%.125		0757-0199		D	1	
01	R74							
		RES 1.21K 1%.125		0757-0274		D	2	
01	R21,49							
		RES 1.78K 1%.125		0757-0278		D	1	
01	R38							
		RES 6.19K 1%.125		0757-0290		D	2	
01	R34,37							
		RES 42.2 1%.125		0757-0316		D	4	
01	R50,51,91,92							
		RES 1.33K 1%.125		0757-0317		D	1	
01	R77							
		RES 100 1%.125		0757-0401		D	8	
01	R16,17,19,20,							
03	46,48,56,93							
		RES 511 1%.125		0757-0416		D	1	
01	R64							
		RES 681 1%.125		0757-0419		D	1	
01	R71							
		RES 750 1%.125		0757-0420		D	1	
01	R76							
		RES 10K 1%.125		0757-0442		D	16	
01	R11-14,27-30,39,40							
03	53,57,79,88,90,95							
		RES 68.1K 1%.125		0757-0461		D	1	
01	R68							
		RES 100K 1%.125		0757-0465		D	5	
01	R43,58,69,81,87							
		RES 10 1% .50		0757-0984		D	1	
01	R52							
		RES 51.1 1% .50		0757-1000		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	R3			0757-1000				
01	R1	RES 61.9 1% .50		0757-1002		U	1	
01	R36,42	RES 1.47K 1%.125		0757-1094		D	2	
01	R6,8,22,24	RES .12 3% 3W		0811-2616		U	4	
		SLEEVING FLEX.		0890-0064		U	1	FT
		TBG #20 TFE NAT		0890-0212		U	0.50	FT
		TBG HS BLK .375D		0890-0291		U	0.70	FT
01	W1	SOCKET 16 DIP LO		1200-0482		U	1	
		HT DIS PL PWR		1205-0219		U	1	
		HT DIS TO-3		1205-0275		U	5	
01	J2	CONN PC2X18.156D		1251-2026		U	1	
01	J1	CONN PC1X18.156T		1251-2346		U	1	
01	J3-5	PIN ASSY		1251-3412		U	3	
		JMPR PLUG .3"C-C		1258-0124		U	3	
01	R2,55,61	RES NET 7X4.7K		1810-0125		U	3	
01	U10	RESISTOR NETWORK		1810-0185		U	1	
01	U15	RESISTOR NETWORK		1810-0187		U	1	
01	U14	RESISTOR NETWORK		1810-0188		U	1	
01	U9	RESISTOR NETWORK		1810-0199		U	1	
01	U7	NETWORK-RESISTOR		1810-0200		U	1	
		IC LM309H		1820-0429		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	U31			1820-0429				
01	U32	IC U6E7723393		1820-0439		U	1	
01	U23	IC CD4043AY		1820-0941		U	1	
01	U18	IC CD4023AY		1820-0943		U	1	
01	U22,29	IC CD4001AY		1820-0946		U	2	
01	U17,26	IC CD4011AE		1820-0949		U	2	
01	U25	IC CD4012AE		1820-0950		U	1	
01	U19,24	IC 4049AE		1820-1145		U	2	
01	U33	IC CD4050AE		1820-1146		U	1	
01	U16,20,21	IC QUAD COMPTR		1826-0138		U	3	
01	U11-13	IC D OP AMP 20K		1826-0142		U	3	
01	Q15	XSTR PNP 2N2907A		1853-0281		U	1	
01	Q4,6	XSTR 2N6053 TO3		1853-0351		U	2	
01	Q7,12	XSTR 2N3053 TO5		1854-0039		U	2	
01	Q1,10,11	XSTR NPN SI PL5		1854-0071		U	3	
01	Q2,3,5	XSTR 2N6055 TO3		1854-0611		U	3	
01	U1,8,30	XISTOR ARRAY		1858-0008		U	3	
01	U27,28	XISTOR ARRAY		1858-0009		U	2	
		THYRISTOR 35AMPS		1884-0208		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				1884-0208				
01	Q13							
		THYRISTOR-SCR		1884-0240		U	3	
01	Q8,9,14							
		DIODE 1N2071		1901-0029		D	11	
01	CR3,6,7,9,10,12,							
03	13,41-44							
		DIODE SIL		1901-0040		D	17	
01	CR11,14-16,21,22,26							
03	27,30-34,36-38,45							
		DIODE-SI		1901-0415		U	2	
01	CR28,39							
		DIODE SILICONE		1901-0463		U	1	
01	CR40							
		DIO-PWR RECT		1901-0662		U	2	
01	CR23,24							
		DIODE-SCHUTTKY		1901-0792		U	2	
01	CR17,20							
		DIODE RECT SIL		1901-1036		U	2	
01	CR1,2							
		DIO-ZNR 6.19V 1%		1902-0588		U	1	
01	CR29							
		DIODE 4.64V		1902-3082		U	1	
01	CR35							
		DIODE-FW BRIDGE		1906-0051		U	3	
01	CR4,8,25							
		BRIDGE RECTIF		1906-0053		U	1	
01	CR5							
		COUPLER-OPTICAL		1990-0403		U	5	
01	U2-6							
		RES 5KOHM 10%		2100-3207		U	1	
01	R33							
		LKWSHR 4 HEL		2190-0003		U	4	
		LKWSHR 6 HEL		2190-0006		U	1	
		LKWSHR 10 INT		2190-0011		U	4	
		LKWSHR 1/4 HEL		2190-0032		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		LKWSHR 10 HEL		2190-0034		U	6	
		LKWSHR 6 HEL		2190-0851		U	3	
		SCR #4-40X.312L		2200-0141		U	4	
		NUT 4-40 .250AF		2260-0001		U	4	
		NUT 4-40 W/LK		2260-0009		U	1	
		SCR #6-32X.500L		2360-0201		U	1	
		SCR #6-32X.625L		2360-0203		U	2	
		SCR 6-32X.375		2360-0359		U	14	
		NUT 6-32 .312AF		2420-0002		U	1	
		SCR 10-32X.375		2680-0099		U	1	
		SCR 10-32X.438		2680-0101		U	4	
		SCR 10-32X.500		2680-0103		U	1	
		NUT 1/4-28		2950-0036		U	1	
		WSHR #4 SS		3050-0222		U	1	
		WSHR #6 SS		3050-0228		U	3	
		WSHR #4 SS		3050-0229		U	5	
		WSHR #10 BRS		3050-0236		U	7	
		WSHR .267ID BRS		3050-0284		U	1	
		WASHER FLAT		3050-0665		U	1	
01	S1	SWITCH-THERMAL		3103-0033		U	1	
		BEADS INDIAN		4330-0145		U	6	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE 14 WHITE		8150-2470		C	0.70	FT
		WIRE 18 AWG BARE		8151-0011		U	1	FT
		XFMR-POWER		9100-0444		U	1	
01	T4,5	XFORMER-CROWBAR		9100-2953		U	2	
		XFORMER-5V CPU		9100-2957		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
				9100-2957			
01	L1	CHOKE		9100-2958		U	1
01	L2	XFORMER-POWER		9100-3802		U	1
01	T1	XFORMER-POWER		9100-3805		U	1
01	T3	BOARD-ETCHED		5080-9730		W	1
		HEAT SINK		02105-00018		W	2
		STRAP-GROUND		02108-00028		W	1

D-02105-60022-51

A AS ISSUED PCO-22-5290
B PCO 22-5933 C27,28 were 1UF, 35V 10-9-80

+5V(M) RECTIFIER AND FILTER

+5V(M) CURRENT SENSING

+5V(M) SERIES REGULATOR

+5V(M), ±12V(M) CROWBAR

±18V(RAIL) INTERNAL POWER SUPPLIES

±12V AND ±12V(M) RECTIFIERS
±15V (I) INTERNAL
POWER SUPPLIES

±12V CURRENT
SENSING

+12V SERIES REGULATOR

12V SERIES REGULATOR

V+, +8V(REF) AND +5V(UB)
INTERNAL POWER SUPPLIES

±12V(M) CURRENT
SENSING

+12V(M) SERIES REGULATOR

−12V(M) SERIES REGULATOR

REFERENCE DESIGNATOR	NEAREST REFERENCE DESIGNATOR
C73	R99, L2, T5, J15
C33	CR45, L5

REFERENCE DESIGNATORS NOT USED	
C14, 71	CR18, 19

4. COMPONENT LOADED IN FINAL ASSY.
3. W1 IS AN I.C. SOCKET USED AS A CENTRAL TEST POINT.
2. Q2,4,5,7,13 ARE DARLINGTON TRANSISTORS.
1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN MICROFARADS.
NOTE: UNLESS OTHERWISE SPECIFIED.

THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG. NOS. 5060-8355-51 THRU 5060-8355-53.

POWER SUPPLY UPPER BOARD D-02105-60022-51 SHEET 1 OF 3

ENGINEER | APPROVED | DATE

HEWLETT PACKARD CO
DATA SYSTEMS DEVELOPMENT DIVISION

D-02105-60022-52

A AS ISSUED PCO-22-5295 5-1-78

+5V RECTIFIER, FILTER AND CURRENT SENSING (CPU)

-2V RECTIFIER, FILTER AND CURRENT SENSING

+5V, -2V, ±12V CROWBAR

I/O, CPU OVERVOLTAGE SENSING

MEMORY OVERVOLTAGE UNDERVOLTAGE SENSING

THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG. NOS. 5060-8355-51 THRU 5060-8355-53. SEE DWG. NO. 5060-8355-51 FOR REVISION STATUS OF ENTIRE DWG. SET.

POWER SUPPLY UPPER BOARD D-52.25-60022-52 sheet 1 of 3

ENGINEER | APPROVED | DATE

HEWLETT PACKARD CO
DATA SYSTEMS DIVISION

D-02105-60022-53

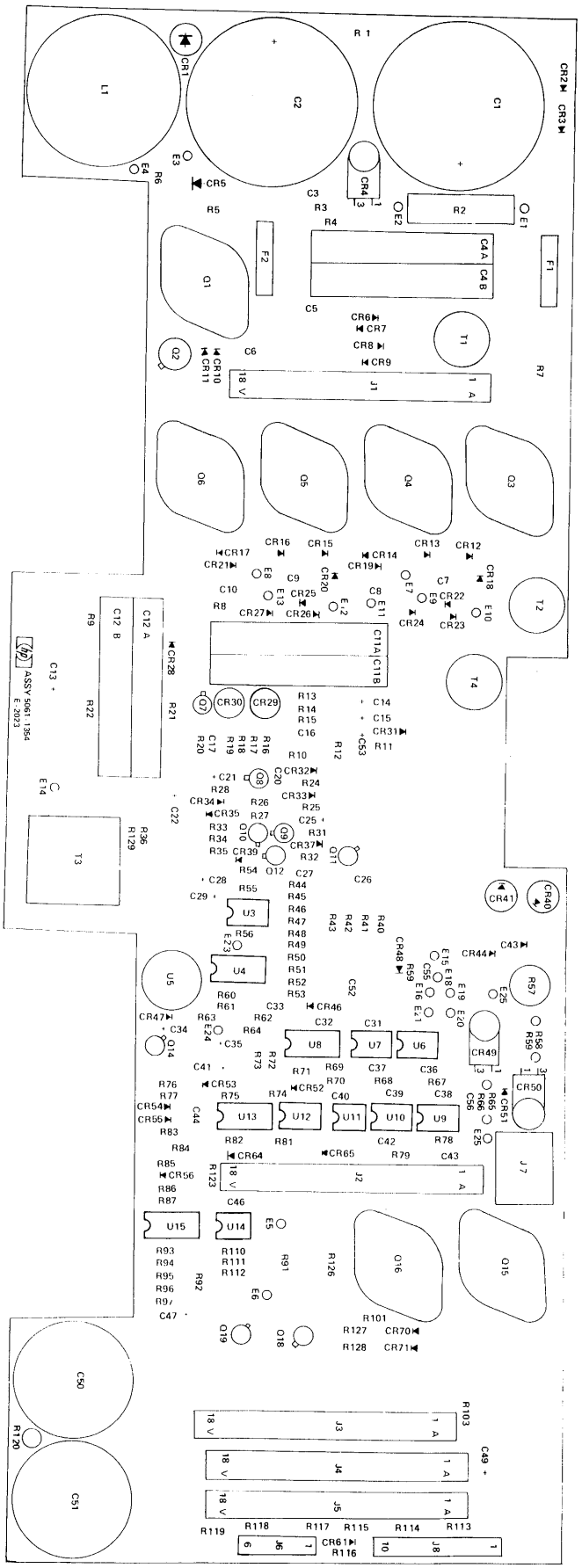
A AS ISSUED PCO-22-5290

PUUP J2-15
R2 4.7K
+5V(UB)
U29C
CR30
R58 100K
C58 1
U24B
U17C
U26A
U33E R59 4.64K
U28
R60 2.15K
V+
J2-J BATTERY TEST
U22B
U33F
U19G
U19A
R63 4.64K
U27
+8V(REF)
R62 147
J2-5 CPU INVERTER ENABLE
WI D
R64 511
(E6)
C59 .033
R87 100K
U18A
U24F
STANDBY FF U23B
+5V(UB)
R61 4.7K
CR44
+8V(REF)
STANDBY J3-2
STANDBY J2-16
OPERATE J3-3
OPERATE J2-U
LOCKON/RUN ENABLE J2-V
LOCK ON/ RUN ENABLE J4-5
PWR UP J3-5
CR43
+5V(CPU)
CR31
R65 464K
CR33
R95 10K
C60 1UF
U33B
U33A
R66 4.64K
U30
R55 4.7K
R55 4.7K
CR32
U30
J4-1 PWU
R67 2.37K
-15V(I)
+5V(MEM)
CR40
R97 464K
R96 5.6
Q15
R68 68.1K
CR34
C61 .0022
U33G
R70 4.64K
R71 681
U28
R72 100
J4-2 PON
U30
R74 21.5K
C73 47µF
R75 31.6K
CR35 4-6V
R76 750
R77 1.33K
U22A
U17A
U17D
(H18) B
MEM LOST FF U23C
WI F
WI G
R69 100K
C62 1.0
U29D
U29A
MEMORY LOST BUFFER FF
U19B
R73 4.64K
U28
R55 4.7K
J4-6 MEM LOST
J3-6
U19C
RESET J2-T
RESET J3-1
R61 4.7K
U19E
U17B
(E17) A
R78 2.15K
C63 .01
CPU ALARM U23D
+8V(REF)
U28
J2-K MGPD
R83 4.64K
U22C
OVERTEMPERATURE THERMAL SWITCH
SW1
R88 10K
U24A
U22D
R89 464K
CR36
C65 100PF
U18C
U24C
CROWBAR CPU (D14)
(H6) OVERCURRENT ±12V(M)
(B5) OVERCURRENT +5V(M)
(F19) C
U25A
R79 10K
C64 .01
MEM ALARM U23A
R81 100K
CR37
C66 0.1
R82 464K
CR38
C67 100PF
WI A
CROWBAR INHIBIT
R61 4.7K
WI H
U24G
+8V(REF)
U27
R85 147
J2-6 MEMORY INVERTER ENABLE
U33C
R84 147
U19F
U18B
CROWBAR MEMORY (B7)
R86 348
(H7) E

THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG NOS. 5060-8355-51 THRU 5060-8355-53. SEE DWG. NO. 5060-8355-51 FOR REVISION STATUS OF ENTIRE DWG. SET.

POWER SUPPLY UPPER BOARD	Sheet 1 of 3
D-02105-60022-53	
ENGINEER	APPROVED / DATE

HEWLETT PACKARD CO
DATA SYSTEMS DEVELOPMENT DIVISION



2108A/2109A Power Supply Lower Assembly
5061-1354

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01 03	C9,10,31,33,38,39,42,43,44	CAP 0.1UF		0150-0121		U	9	
01	C16,17	CAP .001UF 10%		0160-0153		U	2	
01	C7,8,27	CAP .47UF-20+80%		0160-0174		U	3	
00	C26	CAP .012UF 10%		0160-0301		U	1	
01	C3,36,37,55,56	CAP .01UF		0160-2055		U	5	
00	C20	CAP 5000PF		0160-2145		U	1	
01	C40,46,52	CAP 100PF 5%		0160-2204		U	3	
00	C32	CAP. 2400PF		0160-2227		U	1	
00	C5,6	CAP 3000PF		0160-2288		U	2	
01	C4,11,12	CAP FXD 2X5UF		0160-4142		U	3	
01	C13,22,49	CAP 200UF-10+75%		0180-0104		U	3	
01	C14,15	CAP 6.8UF 10%		0180-0116		D	2	
00	C47	CAP 22UF 10%		0180-0228		D	1	
01	C25,28,34,53	CAP 1UF 10%		0180-0291		D	4	
01	C1,2	CAP 1150UF		0180-0431		U	2	
01	C50,51	CAP 8KUF		0180-0463		U	2	
		CAP 6.8UF 20%		0180-1701		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0180-1701				
01	C21,29							
		CAP 47UF 10%		0180-1704		U	1	
00	C35							
		CAP 68UF 20%		0180-1835		D	1	
00	C41							
		PAD-MTG TO5		0340-0164		U	5	
		STUD SOLDER		0360-0090		U	17	
01	E7-16,	18-21,23-25						
		STUD SOLDER TERM		0360-0474		U	4	
		TERM STUD FKD		0360-1529		U	6	
00	E1-6							
		SPCR TAP #6X.125		0380-0383		U	17	
		CARD GUIDE		0403-0121		U	6	
		CMPOUND-NUT LOCK		0470-0231		U	0.001	RT
		ADH RTV CLEAR		0470-0251		U	0.001	TB
		RES 2.7 5% .25		0683-0275		D	2	
01	R13,14							
		RES 47 5% .25		0683-4705		U	1	
00	R33							
		RES 464 1%.125		0698-0082		D	1	
00	R32							
		RES 2.15K 1%.125		0698-0084		D	17	
01	R18,28	,34,49,54,56,						
03	62,67	,69,71,73,74,						
05	77,81	,82,110,112						
		RES 2.37K 1%.125		0698-3150		D	1	
01	R116							
		RES 3.48K 1%.125		0698-3152		U	1	
00	R119							
		RES 3.83K 1%.125		0698-3153		D	2	
01	R70,86							
		RES 4.22K 1%.125		0698-3154		D	1	
00	R52							
		RES 34.8 1% .50		0698-3395		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0698-3395				
01	R42,43							
		RES 46.4 1% .50		0698-3398		U	2	
01	R40,41							
		RES 215 1% .50		0698-3401		U	1	
00	R84							
		RES 14.7K 1% .5W		0698-3414		U	5	
01	R7,8,9,22,127							
		RES 21.5 1%.125		0698-3430		U	1	
00	R11							
		RES 147 1%.125		0698-3438		D	1	
00	R85							
		RES 215 1%.125		0698-3441		D	6	
01	R78,79,83,113							
03	114,123							
		RES 422 1%.125		0698-3447		D	1	
00	R21							
		RES 215K 1%.125		0698-3454		D	1	
00	R68							
		RES 200K 1% .5W		0757-0128		U	2	
01	R36,129							
		RES 21.5K 1%.125		0757-0199		D	3	
01	R12,63,76							
		RES 1.78K 1%.125		0757-0278		D	1	
00	R61							
		RES 1K 1%.125		0757-0280		D	19	
01	R10,16,19,24,27,35,							
03	51,58,60,64,66,75,							
05	94-96,103,111,117,							
07	118							
		RES 10 1%.125		0757-0346		D	1	
00	R26							
		RES 100 1%.125		0757-0401		D	6	
01	R3,15,59,65,92,126,							
		RES 511 1%.125		0757-0416		D	1	
00	R55							
		RES 825 1%.125		0757-0421		D	2	
01	R31,45							

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	R97	RES 1.1K 1%.125		0757-0424		D	1	
01	R44,128	RES 5.11K 1%.125		0757-0438		D	2	
00	R93	RES 7.5K 1%.125		0757-0440		D	1	
00	R20	RES 8.25K 1%.125		0757-0441		D	1	
01 03	R17,25,46-48,50,72,87	RES 10K 1%.125		0757-0442		D	8	
00	R53	RES 82.5K 1%.125		0757-0463		D	1	
01	R100	RES 68.1 1% .50		0757-0794		U	1	
00	R5	RES 10K 1% .50		0757-0839		D	1	
01	R57	RES 5 5% 20W		0811-1654		U	1	
00	R101	RES 4.7 5% 2W		0811-1674		U	1	
00	R91	RES 10 5% 10W PW		0811-1895		U	1	
00	R1	RES .12 3% 3W		0811-2616		U	1	
00	R2	RES 2 10%		0811-3108		U	1	
00	R4,6	RES 15K 3% 3W		0812-0051		U	2	
		TRG HS BLK .250D		0890-0312		U	0.35	FT
		HT DIS TO-5		1205-0033		U	1	
		HT DIS TO-3		1205-0275		U	7	
00	J8	CONNECTOR		1251-0674		U	1	
00	J1-5	CONN PC2X18.156D		1251-2026		U	5	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER
00	J6	PIN ASSY		1251-3412		U	1
01	J7	CONN UTIL 6PIN M		1251-3819		U	1
		CA TIE 3.6L		1400-0249		U	2
00	U13	IC SN7474N		1820-0077		U	1
00	U5	IC LM309H		1820-0429		U	1
00	U3	IC SN75452P		1820-0799		U	1
01	U6,7,12	IC SN75453P		1820-1016		U	3
00	U8,15	IC D COMPTR 8K		1826-0175		U	2
01	Q10,12,14,18	XSTR PNP 2N2907A		1853-0281		U	4
00	Q2	XSTR 2N3439 TO5		1854-0079		U	1
01	Q7-9,11,19	XSTR 2N2222ATO18		1854-0477		U	5
01	Q15,16	XSTR 2N6055 TO3		1854-0611		U	2
00	Q1	XSTR 2N6308 TO3		1854-0624		U	1
01	Q3-6	XSTR NPN TO3		1854-0790		U	4
00	U4	XISTOR ARRAY		1858-0009		U	1
00	CR4	THYRISTOR SCR		1884-0233		U	1
01	CR49,50	THYRISTOR-SCR		1884-0249		U	2
00	CR31	THYRISTOR		1884-0258		U	1
		DIODE 1N2071		1901-0029		D	9

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				1901-0029				
01 03	CR14,17,21,22,25,26, 34,43,44							
		DIODE SIL		1901-0040		D	11	
01 03	CR35,39,46-48,51-54, 56,61							
		DIODE 3A 600V		1901-0420		U	3	
01	CR1,40,41							
		STABISTOR STB523		1901-0460		D	4	
01	CR32,33,65,70							
		DIODE IN4936		1901-1065		D	17	
01 03	CR6-13,15,16,18,19, 20,23,24,27,28							
		RECTIFIER		1901-1087		D	1	
00	CR5							
		DIODE ZNR 5.11V		1902-0041		D	1	
00	CR64							
		DIODE ZNR 16.2V		1902-0184		D	1	
00	CR71							
		DIODE 200V ZENER		1902-0668		D	2	
00	CR2,3							
		DIODE ZNR 4.22V		1902-3070		D	2	
01	CR37,55							
		DIODE-FW BRIDGE		1906-0051		U	2	
01	CR29,30							
		ISOLATOR		1990-0429		U	2	
00	U9,10							
		OPTO ISOLATOR		1990-0537		U	2	
01	U11,14							
		RES VAR 1K		2100-1986		U	1	
00	R120							
		RES VAR 1K 10%		2100-3352		U	1	
00	R115							
		FUSE 2.5A NB		2110-0083		U	2	
00	F1,2							
		FUSE CLIP .250D		2110-0483		U	4	
		LKWSHR 10 HEL		2190-0034		U	8	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		LKWSHR 6 HEL		2190-0851		U	1	
		SCR #4-40X.375L		2200-0143		U	3	
		NUT 4-40 W/LK		2260-0009		U	4	
		SCR #6-32X.375L		2360-0197		U	4	
		SCR #6-32X2.5L		2360-0221		U	1	
		SCR 6-32X.375		2360-0359		U	21	
		NUT 6-32 .312AF		2420-0002		U	1	
		NUT 8-32 .344AF		2580-0004		U	1	
		SCR 10-32X.375		2680-0099		U	8	
		WSHR #8 BRS		3050-0001		U	1	
		WSHR #10		3050-0006		U	2	
		WSHR #4 SS		3050-0222		U	4	
		WSHR #6 SS		3050-0227		U	6	
		WSHR #10 BRS		3050-0236		U	8	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE 18 BLK		8150-2890		C	1	FT
		WIRE JUMPERS		8159-0005		D	4	
00	T2	XFORMER		9100-2951		U	1	
00	T3	XFORMER		9100-2956		U	1	
01	L1	CHOKE		9100-2960		U	1	
00	T1	XFORMER		9100-2966		U	1	
00	T4	XFORMER-POWER		9100-3803		U	1	
		PC CARD GUIDE		02108-00009		W	2	
		HEAT SINK		02108-00030		W	3	

ENGINEERING RESPONSIBILITY	SEMA

D-5061-1354-61

BTH	REVISIONS	APPROVED	DATE
A	AS 1330 ECO, PCO-82-0984 (1630C)	DJW	12-6-82

NOTES

1. UNLESS OTHERWISE SPECIFIED:
   ALL RESISTANCE IN OHMS
   ALL CAPACITANCE IN MICROFARADS
   ALL RESISTORS ARE 1/8 WATT
2. COMPONENT LOADED IN FINAL ASSEMBLY

TEST POINT COMMON
BATTERY COMMON
PREREGULATOR COMMON
INVERTER COMMON

HIGHEST REFERENCE DESIGNATORS USED			
R128	C516	Q19	
U15	T4	CR71	J8

REFERENCE DESIGNATORS NOT USED		
R23,29,30,37-39,80,88-90,		
R98-100,102,104-109,121,		
R122, 124, 125	C18,19,23,	
C24,30,45,48,54	Q13,17	
U1,2	CR36,38,42,45,	
CR57-60,62,63,66-69		

REFERENCE DRAWINGS

ASSY F-5061-1354-1
F-02105-60012-9
F-02108-60023-9

SCHEMATIC POWER SUPPLY CONTR BD	HEWLETT PACKARD
TITLE 02105-60012/02108-60038	5061-1354
NEXT ASSEMBLY	PART NUMBER D-5061-1354-61
FINISH	SCALE

ENGINEERING RESPONSIBILITY	SEPIA
0 1 2 3 4 5 6 7 8 9 11 12 14 15	
16 17 19 21 22 23 25 28 30 32 33 38 43	
45 46 61 63	

D-5061-1354-62

BYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PO-22-6938 (ECO)	J.L.W.	5-6-77
B	PCO-22-6838, R36 WAS 100K, ADD R129 200K	Greg E Frame	9-23-80

WARNING: HIGH POTENTIAL POSSIBLE BETWEEN COMMON NODES ⏚ ⏚ ≠ ⏚ USE ISOLATION TRANSFORMER WHEN TESTING LOWER BOARD.

TITLE: POWER SUPPLY LOWER BOARD ASSY.	HEWLETT PACKARD
NEXT ASSEMBLY: 02105-60012/02108-60023	PART NUMBER: 5061-1354
FINISH: — SCALE: —	D-5061-1354-62

ENGINEERING RESPONSIBILITY	SERIES	D-5061-1354 63

STM	REVISIONS	APPROVED	DATE
A	ADDED PCO-22-4984 (1630-)	[illegible]	12-6-78

CPU INVERTER POWER STAGE

CPU INVERTER ENABLE J2-E
(F17) INVERTER ENABLE
MEMORY INVERTER ENABLE J2-F
+5V(LB)
R78 215 U9 R67 2.15K C38 0.1 C36 .01 C43 0.1
R79 215 U10 R24 1K C39 0.1 C37 .01 C42 0.1
U6
R42 34.8 .5W R13 2.7 .25W C14 6.8 10% R43 34.8 .5W
T2B
E10 E9 E7 E11
CR18 CR22 CR23 Q3 CR12 C7 0.47 CR13 CR19 CR14 Q4 C8 0.47
J1-6 J1-7 J1-F J1-H
CPU PRI B
CPU PRI B
CPU PRI B
CPU PRI B

(F18) $\overline{ME}$
(G14) V_X
(D18) ÷2
(E18) $\overline{÷2}$
C31 01

INVERTER INPUT FROM PREREGULATOR
B+ (A17, E15) F1
C4 (NOTE 2) 2105A: .5UF 2108A: 2X.5UF
R7 14.7K .5W
C11 (NOTE 2) 2105A: 5UF 2108A: 2X5UF
R8 14.7K .5W
CR1
PREREGULATOR OUTPUT FILTER
J1-3 J1-4 J1-C J1-D
CPU PRI A
CPU PRI A
CPU PRI A
CPU PRI A

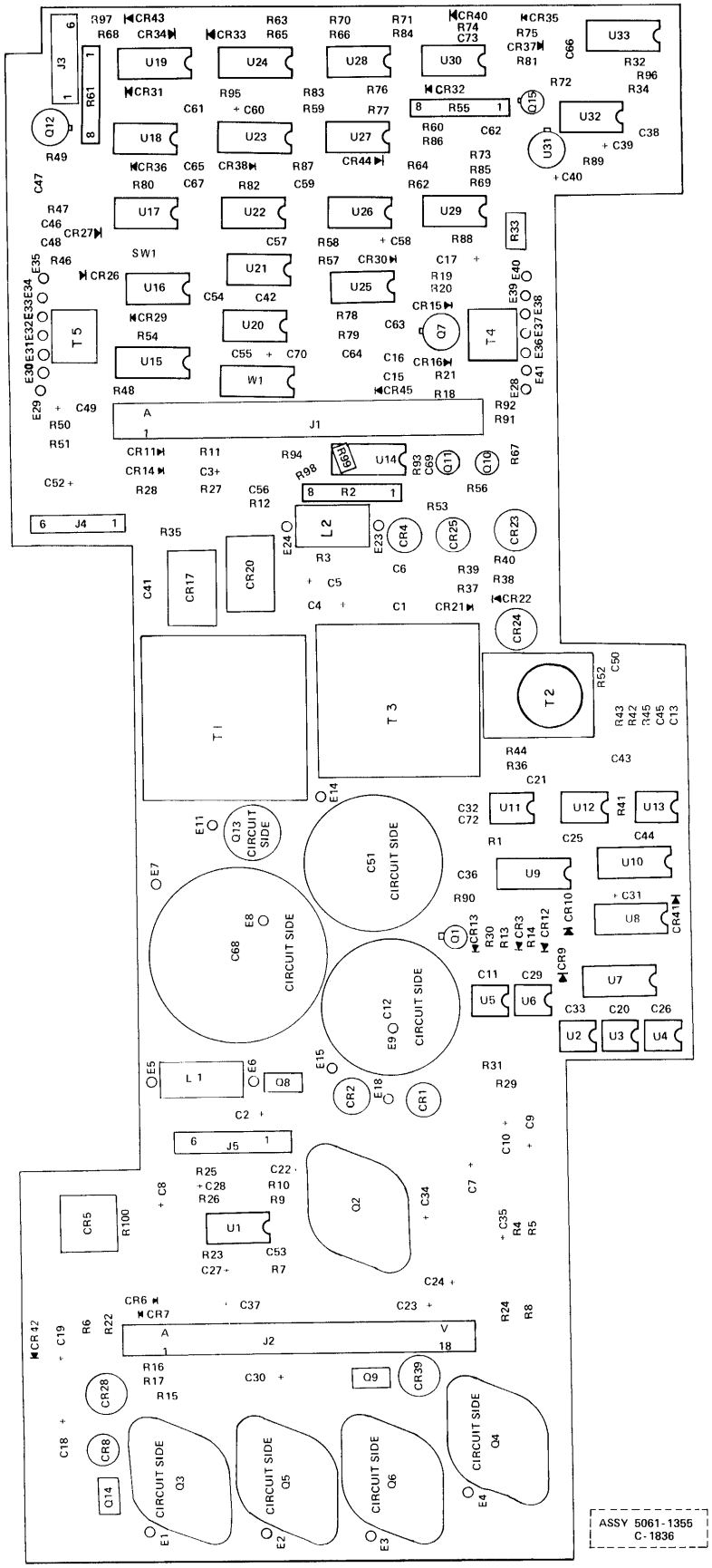
B+ (A17, E15)
R9 14.7K .5W C12A 5.0 (NOTE 2)
R22 14.7K .5W C12B 5.0 (NOTE 2)
INVERTER INPUT FROM PREREGULATOR
J1-16 J1-17 J1-T J1-U
MEM PRI A
MEM PRI A
MEM PRI A
MEM PRI A
T4 (PRIMARY)

BATTERY CHARGER AND BATTERY TEST LOAD

18V (RAIL) J2-H J4-8 J4-J
CR70 Q18 Q15 R127 14.7K .5W R101 4.7 2W R126 100 R128 5.11K CR71 14.2V
TEST J4-18
280 MA
E6 E5 R91 10 10W Q19 R112 2.15K R111 1K Q16 R110 2.15K C49 200 UF 16V
+8V (REF) J2-5 J3-4 J4-4
R116 2.37 K CR61 R115 1K CW R119 8.48 K
U7
R40 46.4 .5W R14 2.7 .25W C15 6.8 10% R41 46.4 .5W
T2A
E12 E13 E8 E11
CR20 CR25 CR26 Q5 CR15 C9 0.1 CR16 CR17 CR21 Q6 CR27 C10 0.1
J1-9 J1-10 J1-K J1-L
MEM PRI B
MEM PRI B
MEM PRI B
MEM PRI B
MEMORY INVERTER POWER STAGE

R103 1K J8-7 TEST POINT
J2-1 J2-A J3-1 J3-A J4-1 J4-A J5-2 J5-3 J5-4 J5-A J5-B J5-C J5-D J7-3 V+ BATTERY
J2-D +5V CRU ADJUST

TITLE	HEWLETT PACKARD
0E105-60012/5108-6023	
NEXT ASSEMBLY	PART NUMBER 5061-1354
FINISH / SCALE	D-5061-1354-63 SHEET OF



2108A/2109 Power Supply Upper Assembly
5061-1355

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	LOC	QUANTITY PER	UM
01	C45,66,69	CAP 0.1UF		0150-0121		U	3	
01	C60,72	CAP 1.0UF 20%		0160-0127		U	2	
01	C54,55	CAP. 2.2UF		0160-0128		U	2	
01	C16,48,61	CAP .022UF 10%		0160-0162		U	3	
00	C50	CAP .033UF 10%		0160-0163		U	1	
01 03	C11,15,20,26,29 33,47,57,63,64	CAP .01UF		0160-2055		U	10	
00	C43	CAP .33UF 20%		0160-2128		U	1	
01	C21,25,32,36	CAP 30PF 5%		0160-2199		U	4	
01	C38,65,67	CAP 100PF 5%		0160-2204		U	3	
00	C6	CAP 3000PF		0160-2288		U	1	
00	C13	CAP 470PF 5%		0160-2940		U	1	
01	C46,56	CAP 1000PF 10%		0160-3456		U	2	
01	C41,44,50	CAP .02UF 20%		0160-3459		U	3	
00	C1	CAP .05UF-20+80%		0160-3460		U	1	
00	C2,37	CAP 100UF-10+50%		0180-0094		U	2	
01	C4,5,9,10	CAP 4.7UF 35WVDC		0180-0100		D	4	
01	C18,23,30,34	CAP 200UF-10+75%		0180-0104		U	4	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	C70	CAP 2.2UF 10%		0180-0197		D	1	
00	C3	CAP 22UF 10%		0180-0226		D	1	
01	C39,40	CAP 33UF 10%		0180-0229		D	2	
01 03	C19,22,24,27,28 31,35,53,56,62	CAP 1UF 10%		0180-0291		D	10	
01	C68	CAP 24KUF		0180-0461		D	1	
		CAP 17KUF		0180-0462		D	1	
00	C42	CAP 6.8UF 20%		0180-1701		D	1	
01	C17,49	CAP 22UF 10%		0180-1794		D	2	
00	C71	CAP 68UF 20%		0180-1835		D	1	
00	C7,8	CAP 200UF-10+75%		0180-1946		D	2	
00	C52	CAP 3.3UF 10%		0180-2141		D	1	
01	C12	CAP 10 KUF		0180-2360		D	1	
		PAD-MTG TO5		0340-0164		D	3	
01 03	E11,14,15,18,23 24,28-41	STUD SOLDER		0360-0090		D	20	
01	E5,6,7	TERM STUD FKD		0360-1529		D	3	
		SPCR TAP #6X.125		0380-0383		D	17	
01	CP1,2,17,20	STANDOFF		0380-0551		D	4	
		TAPE-ELECTRICAL		0460-0042		D	0.01	PL
		TAPE ELECTRICAL		0460-0955		D	0.01	PL
		ADH RTV CLEAR		0470-0251		D	0.01	TB

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	LOC	QUANTITY PER	UM
00	R89	RES 4.7 5% .25		0683-0475		U	1	
01	R94,96	RES FXD 5.6 OHM		0683-0565		U	2	
00	R54	RES 470 5% .25		0683-4715		U	1	
01	R38,44,60,78	RES 2.15K 1%.125		0698-0084		U	4	
01	R15,31	RES 1.78K 1% .5		0698-0089		U	2	
00	R67	RES 2.37K 1%.125		0698-3150		U	1	
01 03	R7,9,18,23,25,47,59 63,66,70,73,83	RES 4.64K 1%.125		0698-3155		U	12	
00	R75	RES 31.6K 1%.125		0698-3160		U	1	
01	R65,80,82,97,98,99	RES 464K 1%.125		0698-3260		U	6	
00	R1,35	RES 31.6 1% .50		0698-3394		U	2	
00	R4,5	RES 14.7 1%.125		0698-3428		U	2	
01	R62,84,85	RES 147 1%.125		0698-3438		U	3	
00	R32	RES 215 1%.125		0698-3441		U	1	
00	R86	RES 348 1%.125		0698-3445		U	1	
00	R45	RES 422 1%.125		0698-3447		U	1	
00	R41	RES 28.7K 1%.125		0698-3449		U	1	
01	R10,26	RES 42.2K 1%.125		0698-3450		U	2	
00	R72	RES 100 1% .50		0757-0198		U	1	

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	R74	RES 21.5K 1%.125		0757-0199		D	1	
01	R21,49	RES 1.21K 1%.125		0757-0274		D	2	
01	R34,37	RES 6.19K 1%.125		0757-0290		D	2	
01	R50,51,91,92	RES 42.2 1%.125		0757-0316		D	4	
00	R77	RES 1.33K 1%.125		0757-0317		D	1	
01 03	R16,17,19,20,46,48 56,93	RES 100 1%.125		0757-0401		D	8	
00	R64	RES 511 1%.125		0757-0416		D	1	
00	R71	RES 681 1%.125		0757-0419		D	1	
00	R76	RES 750 1%.125		0757-0420		D	1	
01 03 05	R11-14,27-30,39 40,53,57,79,88 90,95	RES 1K 1%.125		0757-0442		D	16	
00	R68	RES 65.1K 1%.125		0757-0461		D	1	
01	R43,58,69,81,87	RES 100K 1%.125		0757-0465		D	5	
00	R52	RES 10 1% .50		0757-0984		D	1	
00	R3	RES 51.1 1% .50		0757-1000		D	1	
01	R36,42	RES 1.47K 1%.125		0757-1094		D	2	
01	R22,24	RES .12 3% 3W		0811-2616		D	2	
00	R6,8	RES 0.22 OHM 2W		0811-3294		D	2	
		SLEEVING FLEX.		0890-0064		D	1	FT

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		TBG HS BLK .375D		0890-0291		U	0.50	FT
00	W1	SOCKET 16 DIP LO		1200-0482		U	1	
		HT DIS PL PWR		1205-0219		U	1	
		HT DIS TO-3		1205-0275		U	5	
00	J2	CONN PC2X18.156D		1251-2026		U	1	
01	J1	CONN PC1X18.156T		1251-2346		U	1	
00	J3-5	PIN ASSY		1251-3412		U	3	
		JMPR PLUG .3"C-C		1258-0124		U	2	
01	R2,55,61	RES NET 7X4.7K		1810-0125		U	3	
00	U10	RESISTOR NETWORK		1810-0185		U	1	
00	U15	RESISTOR NETWORK		1810-0187		U	1	
00	U14	RESISTOR NETWORK		1810-0188		U	1	
00	U9	RESISTOR NETWORK		1810-0199		U	1	
00	U7	NETWORK-RESISTOR		1810-0200		U	1	
00	U31	IC LM309H		1820-0429		U	1	
00	U32	IC U6E7723393		1820-0439		U	1	
00	U23	IC CD4043AY		1820-0941		U	1	
00	U18	IC CD4023AY		1820-0943		U	1	
01	U22,29	IC CD4001AY		1820-0946		U	2	
		IC CD4011AE		1820-0949		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	U17,26			1820-0949				
00	U25	IC CD4012AE		1820-0950		U	1	
01	U19,24	IC 4049AE		1820-1145		U	2	
00	U33	IC CD4050AE		1820-1146		U	1	
01	U16,20,21	IC QUAD COMPTR		1826-0138		U	3	
01	U11-13	IC D OP AMP 20K		1826-0142		U	3	
00	Q15	XSTR PNP 2N2907A		1853-0281		U	1	
00	Q4,6	XSTR 2N6053 TO3		1853-0351		U	2	
00	Q7,12	XSTR 2N3053 TO5		1854-0039		U	2	
01	Q1,10,11	XSTR NPN SI PL5		1854-0071		U	3	
01	Q2,3,5	XSTR 2N6055 TO3		1854-0611		U	3	
01	U1,8,30	XISTOR ARRAY		1858-0008		U	3	
01	U27,28	XISTOR ARRAY		1858-0009		U	2	
		THYRISTOR 35AMPS		1884-0208		U	1	
01	Q8,9,14	THYRISTOR-SCR		1884-0240		U	3	
01 03	CR3,6,7,9,10,12,13 41-44	DIODE 1N2071		1901-0029		D	11	
01 03 05	CR11,14-16,21,22 26,27,30-34 36-38,45	DIODE SIL		1901-0040		D	17	
		DIODE-SI		1901-0415		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	CR28,39			1901-0415				
00	CR40	DIODE SILICONE		1901-0463		U	1	
01	CR23,24	DIO-PWR RECT		1901-0662		U	2	
01	CR17,20	DIODE-SCHOTTKY		1901-0792		U	2	
		DIODE RECT SIL		1901-1036		U	2	
01	CR29	DIO-ZNR 6.19V 1%		1902-0588		U	1	
00	CR35	DIODE 4.64V		1902-3082		U	1	
01	CR4,8,25	DIODE-FW BRIDGE		1906-0051		U	3	
00	CR5	BRIDGE RECTIF		1906-0053		U	1	
00	U2-6	COUPLER-OPTICAL		1990-0403		U	5	
00	R33	RES 5KOHM 10%		2100-3207		U	1	
		LKWSHR 4 HEL		2190-0003		U	4	
		LKWSHR 6 HEL		2190-0006		U	1	
		LKWSHR 10 INT		2190-0011		U	4	
		LKWSHR 1/4 HEL		2190-0032		U	1	
		LKWSHR 10 HEL		2190-0034		U	6	
		LKWSHR 6 HEL		2190-0851		U	4	
		SCR #4-40X.312L		2200-0141		U	4	
		NUT 4-40 .250AF		2260-0001		U	4	
		NUT 4-40 W/LK		2260-0009		U	1	
		SCR #6-32X.500L		2360-0201		U	1	
		SCR #6-32X.625L		2360-0203		U	2	
		SCR 6-32X.375		2360-0359		U	10	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		NUT 6-32 .312AF		2420-0002		U	1	
		SCR 10-32X.375		2680-0099		U	4	
		SCR 10-32X.438		2680-0101		U	1	
		SCR 10-32X.500		2680-0103		U	1	
		NUT 1/4-28		2950-0036		U	1	
		WSHR #6 SS		3050-0228		U	4	
		WSHR #4 SS		3050-0229		U	5	
		WSHR #10 BRS		3050-0236		U	8	
		WSHR .267ID BRS		3050-0284		U	2	
		WASHER FLAT		3050-0665		U	1	
00	S1	SWITCH-THERMAL		3103-0033		U	1	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE 14 WHITE		8150-2470		C	0.75	FT
		WIRE 18 AWG BARE		8151-0011		U	0.25	FT
00	W3	WIRE JUMPERS		8159-0005		D	1	
		XFMR-POWER		9100-0444		U	1	
00	T4,5	XFORMER-CROWBAR		9100-2953		U	2	
		XFORMER-5V CPU		9100-2957		U	1	
01	L2	CHOKE		9100-2958		U	1	
		XFORMER-POWER		9100-3802		U	1	
		XFORMER-POWER		9100-3805		U	1	
		BOARD-ETCHED		5080-9730		W	1	
		STRAP-GROUND		02108-00028		W	1	
		HEAT SINK		02108-00029		W	2	

D-5061-1355-51

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED PCO-22-4831	DWM	10-5-78
B	PCO-22-5004 CORRECTED SCHEME	DWM	12-11-78

+5V(M) RECTIFIER AND FILTER

+5V(M) SERIES REGULATOR

+5V(M), ±12V(M) CROWBAR

+5V(M) CURRENT SENSING

±18V(RAIL) INTERNAL POWER SUPPLIES

±12V AND ±12V(M) RECTIFIERS
±15V (I) INTERNAL
POWER SUPPLIES

±12V CURRENT
SENSING

+12V SERIES REGULATOR

12V SERIES REGULATOR

±12V(M) CURRENT
SENSING

+12V(M) SERIES REGULATOR

-12V(M) SERIES REGULATOR

V+,+8V(REF) AND +5V(UB)
INTERNAL POWER SUPPLIES

2105A : 5000
2108A : 10,000

4. COMPONENT LOADED IN FINAL ASSY.
3. W1 IS AN I.C. SOCKET USED AS A CENTRAL TEST POINT.
2. Q2,4,5,7,13 ARE DARLINGTON TRANSISTORS.
1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN MICROFARADS.
NOTE: UNLESS OTHERWISE SPECIFIED.

THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG. NOS. 5060-8355-51 THRU 5060-8355-53.

POWER SUPPLY UPPER BOARD D-5061-1355-51 SHEET 1 of 1

ENGINEER | APPROVED | DATE

HEWLETT PACKARD CO
DATA SYSTEMS DIVISION

ENGINEERING RESPONSIBILITY	SERIES
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 38 42 43	
83 84 90 93	

SYM	REVISIONS	APPROVED	DATE
A	2B ISSUED PCO-22-4831	DWW	10-5-78
B	PCO-22-5004: CORRECTED ERRORS	GP/DWW	12-14-78

+5V RECTIFIER, FILTER AND CURRENT SENSING (CPU)

I/O, CPU OVERVOLTAGE SENSING

+5V, -2V, ±12V CROWBAR

-2V RECTIFIER, FILTER AND CURRENT SENSING

MEMORY OVERVOLTAGE UNDERVOLTAGE SENSING

CPU PRI (A) J1-3,4,C,D

CPU PRI (B) J1-6,7,F,H

+5V CPU ADJ J2-4

(G28) CROWBAR CPU

FLASH J2-L

FLASH J4-3

BATTERY BAD J2-M

J2-8 +5V CONTROL

J2-D +5V

J2-2 -2V TEST POINT

-2V

OVERCURRENT +5V

OVERCURRENT -2V

(E6) OVERCURRENT ±12V

(A) (F24)

(C) (G23)

(B) (E23)

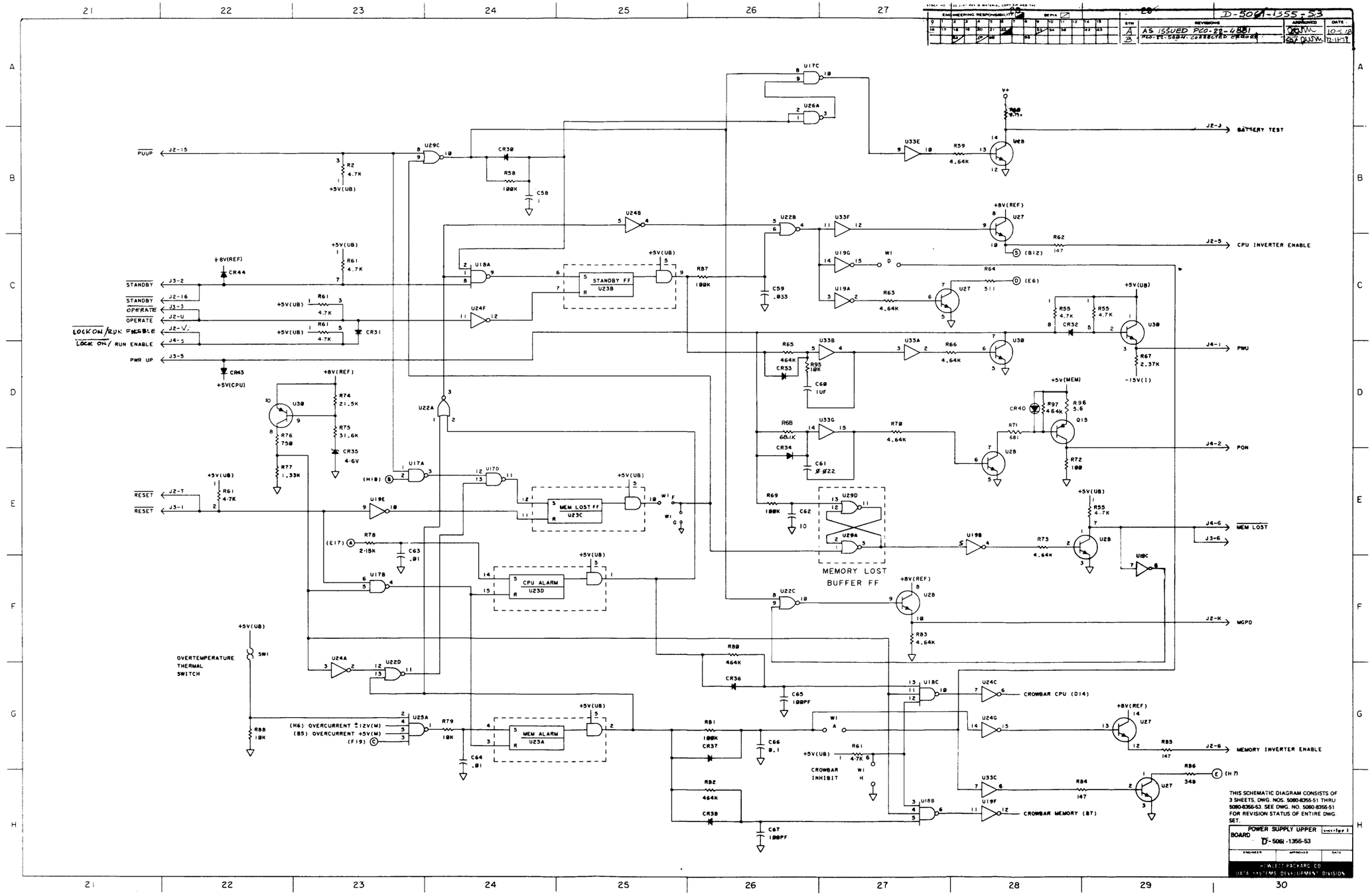
NOTE 4. 2105A: 10,000 2108A: 24,000

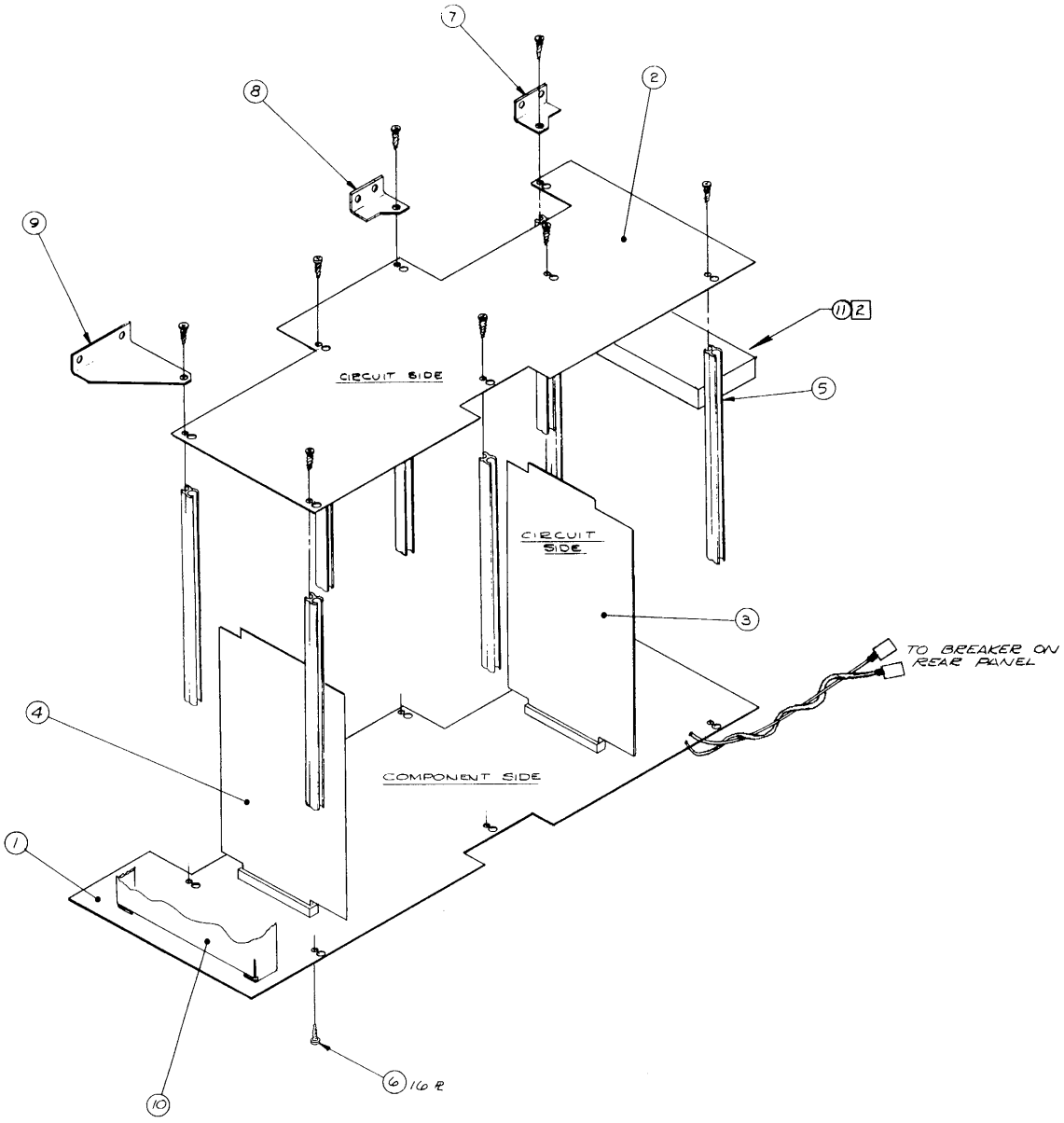
NOTE 4. 2105A: 8,000 2108A: 17,000

THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG. NOS. 5060-8355-51 THRU 5060-8355-53. SEE DWG. NO. 5060-8355-51 FOR REVISION STATUS OF ENTIRE DWG. SET.

POWER SUPPLY UPPER BOARD D-5061-1355-52	SHEET 1 of 3
ENGINEER	APPROVED / DATE

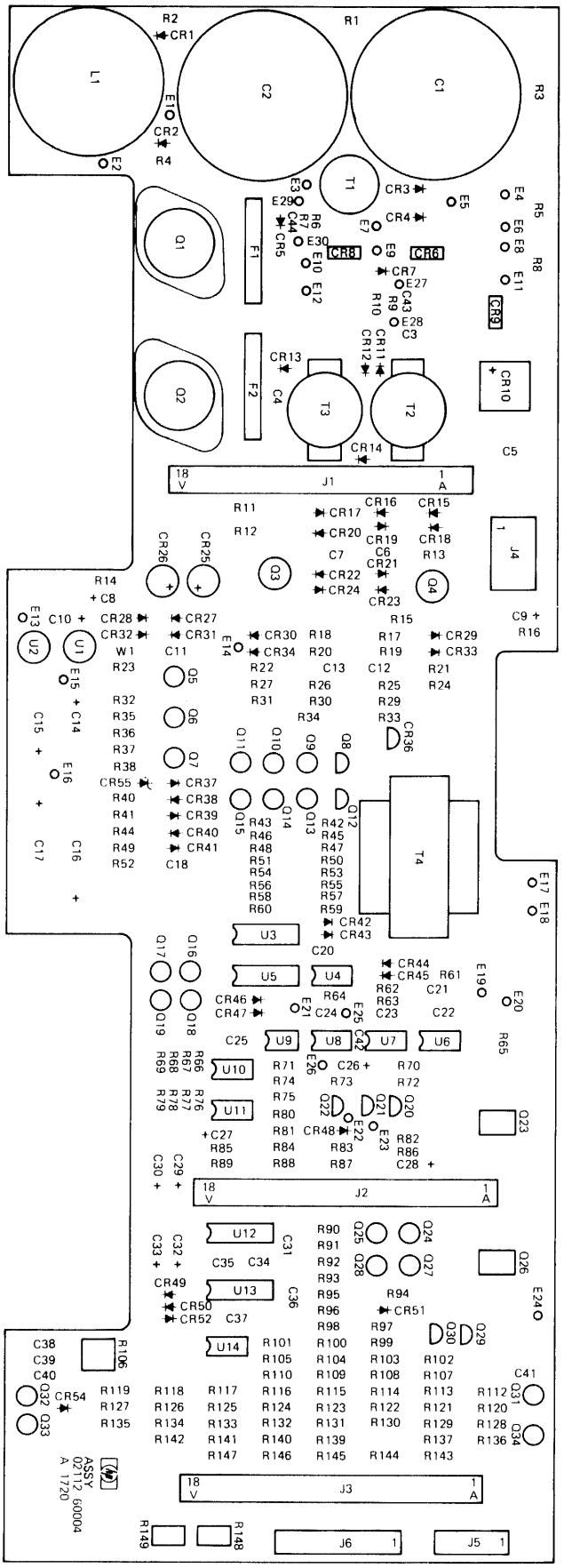
HEWLETT PACKARD CO
DATA SYSTEMS DIVISION


D-5061-1355-53
REVISIONS
A5 ISSUED PCO-22-6881
PCO-22-5424 CORRECTED ERROR
ENGINEERING RESPONSIBILITY
SHEET 1 OF 2
PUUP
J2-15
STANDBY
J3-2
STANDBY
J2-16
OPERATE
J3-3
OPERATE
J2-U
LOCK ON/RUN ENABLE
J2-V
LOCK ON/ RUN ENABLE
J4-5
PWR UP
J3-5
RESET
J2-T
RESET
J3-1
+5V(UB)
+8V(REF)
+5V(CPU)
+5V(MEM)
-15V(I)
R2 4.7K
R58 100K
C58
CR30
CR44
R61 4.7K
CR31
CR43
R74 21.5K
R75 31.6K
R76 750
R77 1.33K
CR35 4.6V
R78 2.15K
C63 .01
R87 100K
C59 .033
R64 511
R63 4.64K
R55 4.7K
CR32
R67 2.37K
R65 464K
R95 10K
CR33
C60 1UF
R66 4.64K
R68 68.1K
CR34
C61 .0022
R78 4.64K
R69 100K
C62 10
R71 681
R72 100
R97 4.64K
R96 5.6
Q15
R73 4.64K
R80 464K
CR36
C65 100PF
R81 100K
CR37
C66 0.1
R82 464K
CR38
C67 100PF
R88 10K
C64 .01
R62 147
R85 147
R86 348
R83 4.64K
C68 .01
U17C
U26A
U33E
U28
U24B
U22B
U33F
U27
U19G
U19A
U24F
U18A
U22A
U17A
U17D
U19E
U17B
U22C
U29D
U29A
U19B
U28
U19C
U18C
U24C
U24G
U27
U33B
U33A
U30
U33G
U28
U33C
U19F
U18B
U24A
U22D
U25A
U23B
U23C
U23D
U23A
U30
U27
U28
U27
U27
U28
U30
U27
U28
U27
J2-3 BATTERY TEST
J2-5 CPU INVERTER ENABLE
J4-1 PWU
J4-2 PON
J4-6 MEM LOST
J3-6
J2-K MGPD
J2-6 MEMORY INVERTER ENABLE
MEMORY LOST BUFFER FF
STANDBY FF
MEM LOST FF
CPU ALARM
MEM ALARM
OVERTEMPERATURE THERMAL SWITCH
SW1
(H6) OVERCURRENT ±12V(M)
(B5) OVERCURRENT +5V(M)
(F19)
CROWBAR INHIBIT
CROWBAR CPU (D14)
CROWBAR MEMORY (B7)
(B12)
(E6)
(H7)
(H18)
(E17)
THIS SCHEMATIC DIAGRAM CONSISTS OF 3 SHEETS, DWG. NOS. 5080-8355-51 THRU 5080-8355-53. SEE DWG. NO. 5080-8355-51 FOR REVISION STATUS OF ENTIRE DWG. SET.
POWER SUPPLY UPPER
BOARD D-5061-1356-53
HEWLETT PACKARD CO
DATA SYSTEMS DEVELOPMENT DIVISION



ITEM	QTY.	MATERIAL-DESCRIPTION	MAT'L-PART NO.
11	1	PAD - FOAM	4208-0111
10	1	BRACKET, P.C. BOARD	02112-00008
9	1	TIE BRKT, FRONT	02112-00020
8	1	TIE BRKT, CENTER	02112-00021
7	1	TIE BRKT, REAR	02112-00022
6	16	SCREW #6-20 x .625	0624-00062
5	8	STANDOFF	02112-20001
4	1	RISER BOARD	02112-80007
3	1	RISER BOARD LOADED	02112-60008
2	1	UPPER P.S. BOARD ASS'Y	02112-60005
1	1	LOWER P.S. BOARD ASS'Y	02112-60004

2112A/13A Power Supply Main Assembly
02112-60006



2112A/2113A Power Supply Lower Assembly
02112-60004

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	C11,38	CAP 0.1UF		0150-0121		U	2	
00	C5,42	CAP .01UF 20%		0150-0123		U	2	
01	C21,37	CAP 1.0UF 20%		0160-0127		U	2	
01	C36,40	CAP .0022UF 10%		0160-0154		U	2	
01	C43,44	CAP .022UF 10%		0160-0162		U	2	
00	C25	CAP .47UF-20+80%		0160-0174		U	1	
00	C39	CAP .015UF 10%		0160-0194		U	1	
01	C18,20,22-24,34,35	CAP .01UF		0160-2055		U	7	
00	C31	CAP. 2400PF		0160-2227		U	1	
01	C3,4,6,7	CAP 3000PF 5%		0160-2229		U	4	
00	C41	CAP 470PF 10%		0160-3455		U	1	
01	C12,13	CAP 5000PF 10%		0160-3458		U	2	
01	C14,15	CAP 100UF 20%		0180-0098		U	2	
01	C16,17	CAP 200UF-10+75%		0150-0104		U	2	
01	C8,9	CAP 6.8UF 10%		0180-0116		D	2	
00	C27	CAP 1UF 10%		0180-0291		D	1	
01	C26,28	CAP 6.8UF 20%		0180-1701		U	2	
		CAP 15UF 10%		0180-1746		D	6	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	LOC	QUANTITY PER	UM
				0160-1746				
01	C10,29,30,32,33,45							
		PAD-MTG TO5		0340-0164		U	2	
		STUD SOLDER		0360-0090		U	20	
		STUD SOLDER TERM		0360-0474		U	9	
		TERM STUD FKD		0360-1529		U	4	
		SPCR TAP #6x.125		0380-0383		U	7	
		RES 56 5% .25		0683-5605		U	2	
00	R7,9							
		RES 464 1%.125		0698-0082		D	6	
01	R25,26,61,63,125,64							
		RES 2.15K 1%.125		0698-0084		D	10	
01 03 05	R40,42,43,75,80, 113,114,133 145,105							
		RES 261 1%.125		0698-3132		D	1	
00	R131							
		RES 4.22K 1%.125		0698-3154		D	1	
00	R130							
		RES 4.64K 1%.125		0698-3155		D	1	
00	R41							
		RES 26.1K 1%.125		0698-3159		D	1	
00	R52							
		RES 464K 1%.125		0698-3260		D	1	
00	R81							
		RES 147 1%.125		0698-3438		D	1	
00	R146							
		RES 215 1%.125		0698-3441		D	4	
01	R 67,69,77,79							
		RES 422 1%.125		0698-3447		D	6	
01	R17,18,38,70,72,73							
		RES 28.7K 1%.125		0698-3449		D	1	
01	R115,							
		RES 1.21K 1%.125		0757-0274		D	1	
00	R118							
		RES 3.16K 1%.125		0757-0279		D	2	

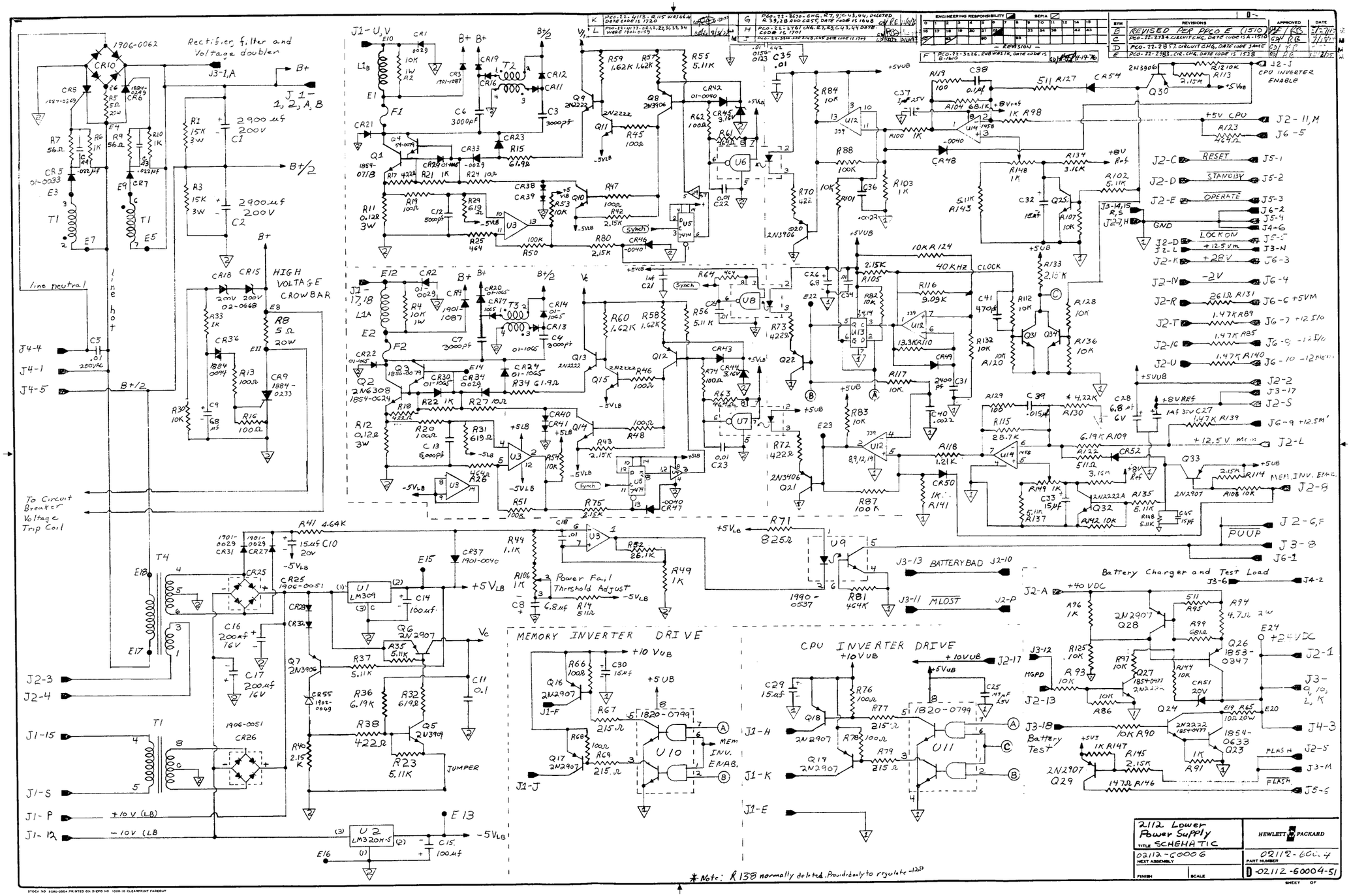
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0757-0279				
01	R134,126							
		RES 1K 1%.125		0757-0280		D	13	
01	R6,10,21,22,33,49							
03	91,96,98,100							
05	103,141,147							
		RES 9.09K 1%.125		0757-0288		D	1	
00	R116							
		RES 13.3K 1%.125		0757-0289		U	1	
00	R110							
		RES 6.19K 1%.125		0757-0290		D	2	
01	R36,109							
		RES 10 1%.125		0757-0346		D	2	
01	R24,27							
		RES 100 1%.125		0757-0401		D	16	
01	R13,16,19,20,							
03	45-48,62,66,68,74							
05	76,78,119,129							
		RES 511 1%.125		0757-0416		D	4	
01	R14,95,122,127							
		RES 619 1%.125		0757-0418		D	3	
01	R29,31,32							
		RES 681 1%.125		0757-0419		D	1	
00	R99							
		RES 825 1%.125		0757-0421		D	1	
00	R71							
		RES 1.1K 1%.125		0757-0424		D	1	
00	R44							
		RES 1.62K 1%.125		0757-0428		U	4	
01	R57-60							
		RES 5.11K 1%.125		0757-0438		D	10	
01	R23,35,37,55,56,102,							
03	135,137,143,148							
		RES 10K 1%.125		0757-0442		D	24	
01	R30,53,54,82-84,							
03	86,90,93,97,101,107							
05	108,112,117,120,							
07	121,124,125,128,132							
09	136,142,144							
		RES 68.1K 1%.125		0757-0461		D	1	

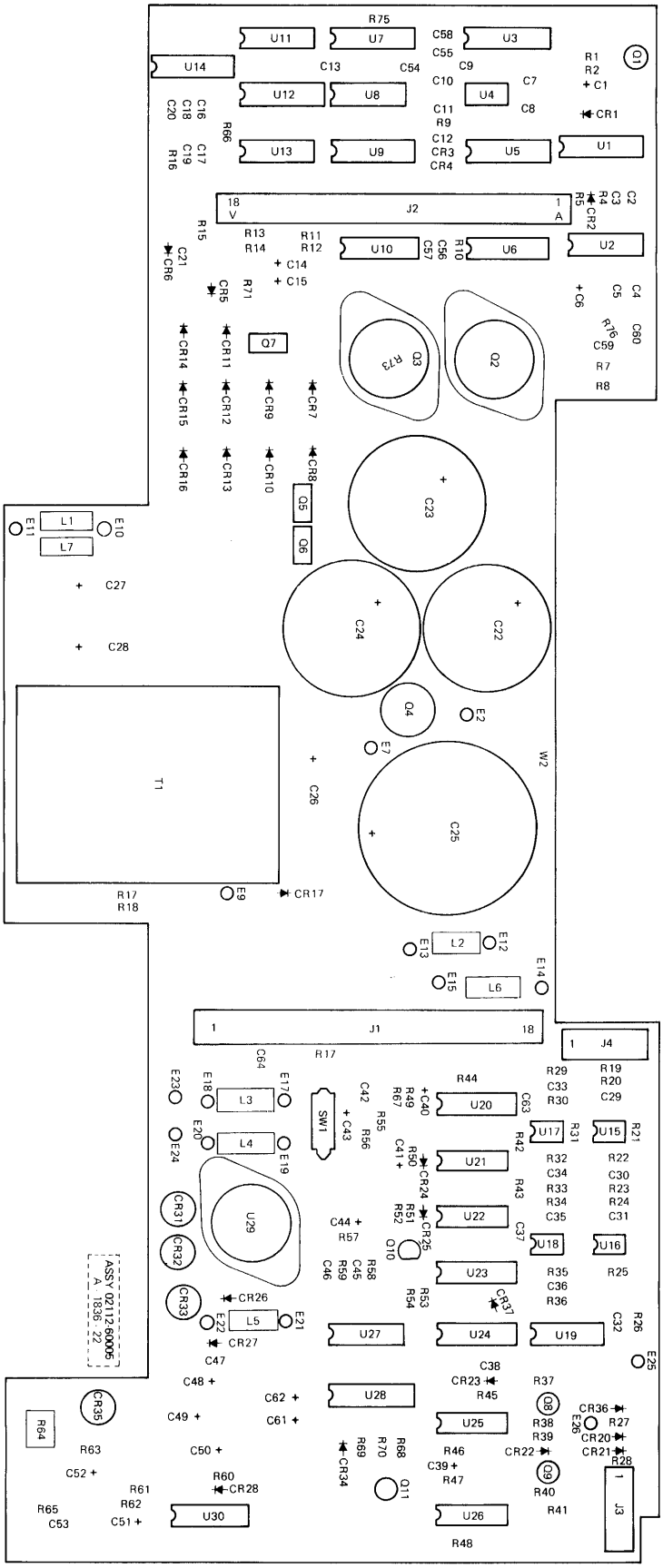
ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	LOC	QUANTITY PER	UM
00	R104			0757-0461				
01	R50,51,87,88,92	RES 100K 1%.125		0757-0465		D	5	
00	R2,4	RES 10K 1% .50		0757-0839		D	2	
01	R15,34	RES 61.9 1% .50		0757-1002		D	2	
01	R89,85,139,140	RES 1.47K 1%.125		0757-1094		D	4	
00	R94	RES 4.7 5% 2W		0811-1674		D	1	
01	R11,12	RES .12 3% 3W		0811-2616		D	2	
00	R1,3	RES 15K 3% 3W		0812-0051		D	2	
		HT DIS PL PWR		1205-0219		D	3	
		HT DIS TO-3		1205-0275		D	2	
00	U1,2	HEAT SINK TO5		1205-0315		D	2	
00	J6	CONNECTOR		1251-0674		D	1	
01	J1,2,3	CONN PC2X18.156D		1251-2026		D	3	
00	J5	PIN ASSY		1251-3412		D	1	
00	J4	CONN UTIL 6PIN M		1251-3819		D	1	
00	U5,13	IC SN7474N		1820-0077		D	2	
00	U1	IC LM309H		1820-0429		D	1	
01	U4,10,11	IC SN75452P		1820-0799		D	3	
00	U3,12	IC QUAD COMPTR		1826-0138		D	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	U14	IC D OP AMP 20K		1826-0142		U	1	
00	U2	IC V REG -5V		1826-0220		U	1	
01	Q8,12,20,21,22,29,30	XSTR 2N3906 PL18		1853-0036		U	7	
01	Q 6,7,16-19,33,28	XSTR PNP 2N2907A		1853-0281		U	8	
00	Q26	XSTR PNPSI DARL		1853-0347		U	1	
00	Q3,4	XSTR 2N3439 TO5		1854-0079		U	2	
01 03	Q5,9,10,11,13,14,15 24,25,27,31,32,34	XSTR 2N2222AT018		1854-0477		U	13	
00	Q2	XSTR 2N6308 TO3		1854-0624		U	1	
00	Q23	XSTR NPN SI DARL		1854-0633		U	1	
00	Q1	XSTR 2N6251 TO-3		1854-0718		U	1	
00	CR9	THYRISTOR SCR		1884-0233		U	1	
00	CR6,8	THYRISTOR-SCR		1884-0249		U	2	
00	CR36	THYRISTOR		1884-0258		U	1	
01	CR34,27,1,2,31,33	DIODE 1N2071		1901-0029		D	6	
01	CR5,7,28,32	RECTIFIER SIL		1901-0033		U	4	
01 03	CR37,42,43,46-50 52,54	DIODE SIL		1901-0040		D	10	
01	CR38-41	STABISTOR ST8523		1901-0460		D	4	
		DIODE IN4936		1901-1065		D	14	

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP OPTION	LOC	QUANTITY PER	UM
				1901-1065				
01	CR11-14,17,19-24,							
03	16,29,30							
		RECTIFIER		1901-1087		D	2	
00	CR3,4							
		DIODE 6.19V		1902-0049		U	1	
00	CR55							
		DIODE		1902-0556		D	1	
00	CR51							
		DIODE 200V ZENER		1902-0668		D	2	
01	CR15,18							
		DIODE 3.16V		1902-3036		D	3	
01	CR35,44,45							
		DIODE-FW BRIDGE		1906-0051		U	2	
01	CR25,26							
		RECTIFIER		1906-0080		U	1	
00	CR10							
		ISOLATOR		1990-0429		U	3	
00	U6-8							
		OPTO ISOLATOR		1990-0537		U	1	
00	U9							
		RES VAR 1K		2100-3211		U	1	
00	R106							
		RES VAR 1K 10%		2100-3352		U	2	
01	R148,149							
		FUSE 2.5A NB		2110-0083		U	2	
00	F1,2							
		FUSE CLIP .250D		2110-0483		U	4	
		LKWSHR 6 HEL		2190-0006		U	1	
		SCR #4-40X.375L		2200-0143		U	3	
		SCR #4-40X.500L		2200-0147		U	2	
		NUT 4-40 W/LK		2200-0009		U	5	
		SCR #6-32X.750L		2300-0205		U	1	
		SCR 6-32X.375		2360-0359		U	7	
		NUT 6-32 .312AF		2420-0002		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		WSHR #10		3050-0006		U	1	
		WSHR #4 SS		3050-0222		U	10	
		WSHR #6 SS		3050-0227		U	2	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
00W1		WIRE JUMPERS		8159-0005		D	1	
00T4		TRANSFORMER		9100-0665		U	1	
00T2,3		XFORMER		9100-2966		U	2	
00T1		XFORMER-POWER		9100-3803		U	1	
		HEAT SINK		02108-00030		U	3	


Rectifier, filter and Voltage doubler
1906-0062
CR10
J3-1,A
B+
J1-1, 2, A, B
2900 uf 200V C1
2900 uf 200V C2
B+/2
HIGH VOLTAGE CROWBAR
line neutral
line hot
J4-4
J4-1
J4-5
.01 250VAC C5
B+/2
To Circuit Breaker Voltage Trip Coil
T1
T4
T3
T2
J2-3
J2-4
J1-15
J1-S
J1-P
+10 V (LB)
J1-12
-10V (LB)
J1-17, 18
J1-F
J1-H
J1-K
J1-J
J1-E
J1-U, V
J2-U
J2-V
J2-R
J2-T
J2-C
J2-D
J2-E
J2-K
J2-M
J2-L
J2-P
J3-13 BATTERYBAD J2-10
J3-11 MLOST J2-P
+5V CPU
RESET
STANDBY
OPERATE
GND
LOCK ON
+12.5 V m
+28 V
-2V
+5VUB
+8V Ref
+5VLB
-5VLB
+8V REF
CPU INVERTER ENABLE
MEM INV. ENAB.
PUUP
FLAG H
FLASH
Battery Charger and Test Load
+40 VDC
J3-6
J4-2
J2-1
J3-9, 10, L, K
J4-3
J2-5
J3-M
J5-6
J3-18 Battery Test
J3-12
MGPD
J2-13
J2-17
MEMORY INVERTER DRIVE
CPU INVERTER DRIVE
Power Fail Threshold Adjust
BATTERY CHARGER
Vc
JUMPER
* Note: R138 normally deleted. Provided only to regulate -12V
2112 Lower Power Supply
SCHEMATIC
02112-60006
02112-60004
D-02112-60004-51
HEWLETT PACKARD



2112A/2113A Power Supply Upper Assembly
02112-60005

2112A/2113A Power Supply Upper Assembly (02112-60005) Sht. 1 of 6

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	C4,29,33,35,45,46 03 56,57,63	CAP 0.1UF		0150-0121		U	9	
01	C3,5,38,59	CAP 1.0UF 20%		0160-0127		U	4	
01	C2,16,18,20	CAP. 2.2UF		0160-0128		D	4	
01	C7,8,10-13,17,19 03 37,54,55,58,60	CAP .01UF		0160-2055		U	13	
00	C53	CAP 1000PF 10%		0160-3456		U	1	
00	C21	CAP .02UF 20%		0160-3459		U	1	
01	C30,31,34,36	CAP .0001UF		0160-3466		U	4	
00	C32	CAP .027UF 10%		0170-0066		U	1	
00	C47	CAP 47UF 10%		0180-0097		U	1	
00	C39,48	CAP 4.7UF 35WVDC		0180-0100		D	2	
00	C50	CAP 200UF-10+75%		0180-0104		U	1	
01	C1,61,62	CAP 6.8UF 10%		0180-0116		D	3	
00	C52	CAP 50UF -10+75%		0180-0141		U	1	
01	C40,43,51	CAP 33UF 10%		0180-0229		U	3	
		CAP 1UF 10%		0180-0291		D	3	
00	C49	CAP 5UF -10+75%		0180-0301		D	1	
01	C26-28	CAP 440UF-10+75%		0180-0595		U	3	

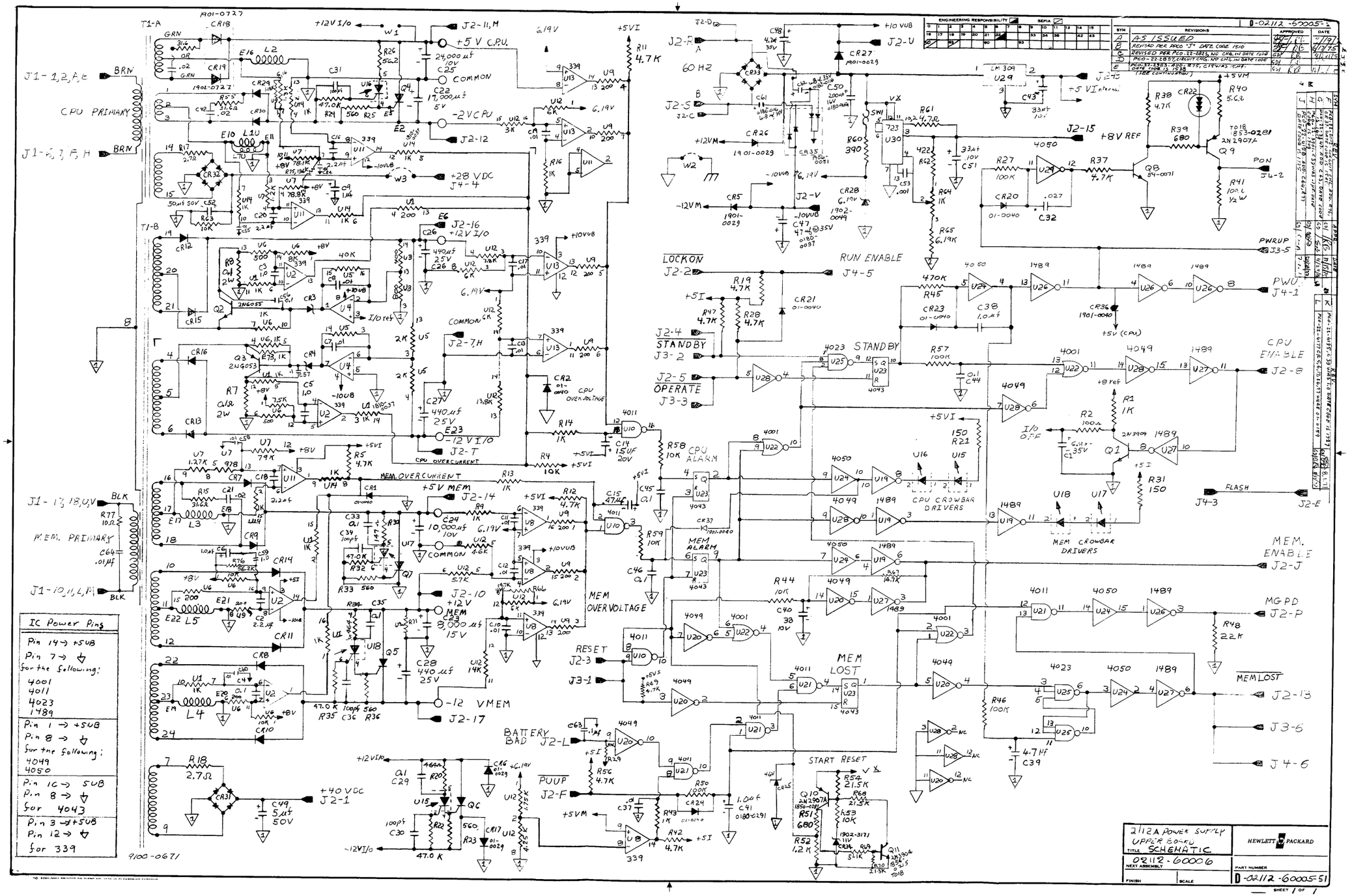
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	C15	CAP 47UF 10%		0180-1704		U	1	
00	C44	CAP .1UF 10%		0180-1743		D	1	
00	C14	CAP 15UF 10%		0180-1746		D	1	
		STUD SOLDER		0360-0090		U	5	
		STUD SOLDER TERM		0360-0474		U	3	
		TERM STUD FKD		0360-1529		U	12	
		SPCR TAP #6X.125		0380-0383		U	11	
		STANDOFF		0380-0689		U	2	
01	R17,18	RES 2.7 5% .25		0683-0275		D	2	
00	R61	RES 4.7 5% .25		0683-0475		U	1	
00	R40	RES FXD 5.6 OHM		0683-0565		U	1	
01	R9,16,43	RES 1.0K 5% .25		0683-1025		D	3	
01	R4,29,53,58,59,63	RES 10K 5% .25		0683-1035		D	6	
00	R52	RES 1200 5% .25		0683-1225		U	1	
01	R21,31	RES 150 5% .25		0683-1515		U	2	
00	R48	RES 22K 5% .25		0683-2235		U	1	
00	R60	RES 390 5% .25		0683-3915		D	1	
01 03 05	R5,10-12,19 28,37,38,42 47,49,56	RES 4700 5% .25		0683-4725		D	12	
01	R22,24,32,35	RES 47K 5% .25		0683-4735		D	4	
		RES 560 5% .25		0683-5615		U	4	

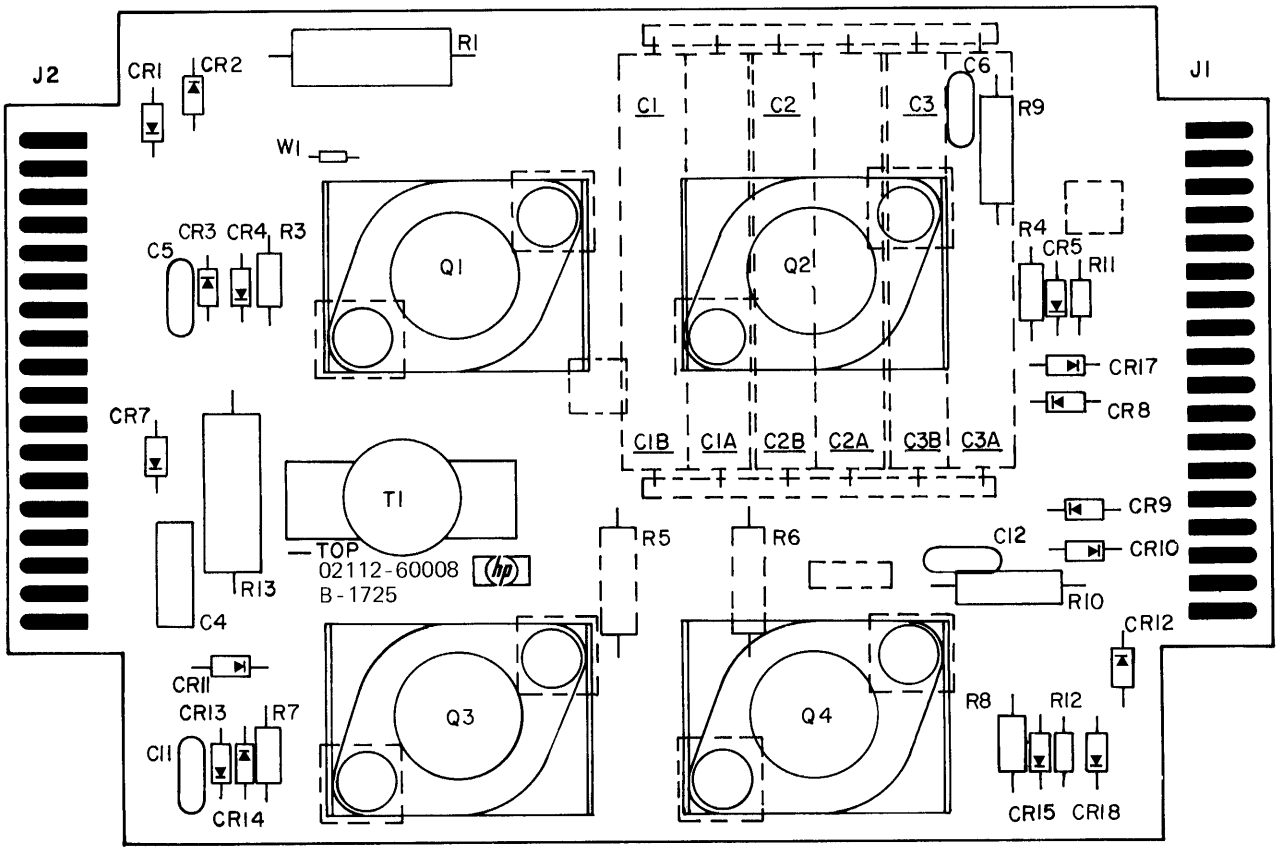
ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
				0683-5615				
01	R23,25,33,36							
		RES 680 5% .25		0683-6815		D	2	
01	R39,51							
		RES 464 1%.125		0698-0082		D	2	
01	R20,34							
		RES 14.7K 1%.125		0698-3156		D	2	
01	R66,67							
		RES 464K 1%.125		0698-3260		D	1	
00	R45							
		RES 31.6 1% .50		0698-3394		U	1	
01	R15							
		RES 147 1%.125		0698-3438		D	1	
00	R30							
		RES 422 1%.125		0698-3447		D	1	
00	R62							
		RES 196K 1%.125		0698-3453		U	1	
00	R75							
		RES 100 1% .50		0757-0198		U	1	
00	R41							
		RES 21.5K 1%.125		0757-0199		D	3	
01	R54,68,70							
		RES 1K 1%.125		0757-0280		D	4	
01	R1,13,14,73							
		RES 6.19K 1%.125		0757-0290		D	1	
00	R65							
		RES 100 1%.125		0757-0401		D	1	
00	R2							
		RES 619 1%.125		0757-0418		D	1	
00	R71							
		RES 10K 1%.125		0757-0442		D	1	
00	R44							
		RES 51.1K 1%.125		0757-0458		D	1	
00	R69							
		RES 56.2K 1%.125		0757-0459		D	1	
00	R76							
		RES 100K 1%.125		0757-0465		D	4	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	R27,46,50,57			0757-0465				
00	R26	RES 56.2 1% .75		0757-1001		U	1	
00	R7,8	RES 0.15%2W PW		0811-3290		U	2	
		TBG #20 TFE NAT		0890-0212		U	0.30	FT
		HT DIS TO-3		1205-0275		U	2	
00	J2	CONN PC2X18.156D		1251-2026		U	1	
00	J3,4	PIN ASSY		1251-3412		U	2	
00	U1,14	RES NET 8X1K DIP		1810-0037		U	2	
00	U9	RES NET 8X200DIP		1810-0124		U	1	
00	U13	RESISTOR NETWORK		1810-0185		U	1	
00	U12	RESISTOR NETWORK		1810-0187		U	1	
00	U17	RESISTOR NETWORK		1810-0188		U	1	
00	U5	RESISTOR NETWORK		1810-0199		U	1	
00	U6	NETWORK-RESISTOR		1810-0222		U	1	
00	U29	IC LM309K		1820-0430		U	1	
00	U30	IC U6E7723393		1820-0439		U	1	
00	U23	IC CD4043AY		1820-0941		U	1	
00	U25	IC CD4023AY		1820-0943		U	1	
00	U22	IC CD4001AY		1820-0946		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	U10,21	IC CD4011AE		1820-0949		U	2	
01	U19,26,27	IC MC1489AL		1820-0990		U	3	
01	U20,28	IC 4049AE		1820-1145		U	2	
00	U24	IC CD4050AE		1820-1146		U	1	
01	U2,8,11,13	IC QUAD COMPTR		1826-0138		U	4	
00	U4	IC D UP AMP 20K		1826-0142		U	1	
00	Q9,10	XSTR PNP 2N2907A		1853-0281		U	2	
00	Q3	XSTR 2N6053 TO3		1853-0351		U	1	
00	Q1,8	XSTR NPN SI PLS		1854-0071		U	2	
00	Q11	XSTR 2N5904 PLS		1854-0215		U	1	
00	Q2	XSTR 2N5055 TO3		1854-0611		U	1	
01	Q5,6,7	THYRISTOR-SCR		1884-0240		U	3	
01	CR5,6,17,26,27	DIODE 1N2071		1901-0029		D	5	
01 03	CR1,2,20,21,23,24 C36,37	DIODE SIL		1901-0040		D	8	
00	CR22	STARISTOR STB523		1901-0460		D	1	
01	CR7,9	DIO-PWR RECT		1901-0662		U	2	
01	CR8,10-16	DIODE		1901-1086		U	8	
01	CR3,4,28	DIODE 6.19V		1902-0049		U	3	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	CR25	DIODE 4.64V		1902-3082		U	1	
00	CR34	DIODE BD 11V		1902-3171		D	1	
01	CR31-33,35	DIODE-FW BRIDGE		1906-0051		U	4	
01	U15-18	ISOLATOR OPTO		1990-0431		U	4	
00	R64	RES VAR 1K		2100-3211		U	1	
		SCR 6-32x.375		2360-0359		U	6	
		NUT 6-32 W/LK		2420-0001		U	1	
		WSHR #6 BRS		3050-0100		U	1	
00	SW1	SWITCH-THERMAL		3103-0033		U	1	
		COMPOUND-THERMAL		6040-0239		U	0.001	TB
		WIRE 30AWG WHT		8150-3426		C	0.25	FT
		WIRE 22GA BARE		8151-0013		C	0.30	FT
00	W2	WIRE JUMPERS		8159-0005		D	1	
		GROUND STRAP		02112-00004		W	1	
		GROUND STRAP		02112-00005		W	1	


T1-A
T1-B
CPU PRIMARY
J1-1,2,A,E
J1-6,7,F,H
BRN
GRN
CR18
CR19
CR29
CR30
CR32
CR12
CR15
CR16
CR13
CR31
+12V I/O
J2-11,M
+5 V C.P.U.
24,000 µf 10V C25
COMMON
C22 17,000µf 5V
-2VCPU
J2-12
+28 VDC J4-4
J2-16 +12V I/O
-12 V I/O
J2-T
J2-7,H
I/O ref
CPU OVERCURRENT
MEM. OVERCURRENT
+5V MEM
J2-14
+5VM
+5VI
+10VUB
-10VUB
6.19V
+8V
+8V REF
J2-15
+12VM
-12VM
W1
W2
W3
J2-R
J2-S
J2-U
J2-V
60 HZ
VX
SW1
RUN ENABLE
LOCKON
J2-2
STANDBY
J3-2
OPERATE
J3-3
J4-5
PWRUP
J3-5
PWUP
J4-1
CPU ENABLE
J2-8
FLASH
J4-3
J2-E
MEM. ENABLE
J2-J
MGPD
J2-P
MEMLOST
J2-13
J3-6
J4-6
RESET
J2-3
J3-1
MEM LOST
BATTERY BAD
J2-L
PUUP
J2-F
START RESET
CPU ALARM
CPU CROWBAR DRIVERS
MEM CROWBAR DRIVERS
MEM ALARM
MEM OVERVOLTAGE
CPU OVERVOLTAGE
+40 VDC
J2-1
-12 VMEM
J2-17
MEM
J2-10 +12V
J2-T
J1-17,18,U,V
J1-10,11,L,P
BLK
MEM. PRIMARY
C64 .01µF
9100-0671
IC Power Pins
Pin 14 → +5VB
Pin 7 → ⏚
for the following:
4001
4011
4023
1489
Pin 1 → +5VB
Pin 8 → ⏚
for the following:
4049
4050
Pin 16 → 5VB
Pin 8 → ⏚
for 4043
Pin 3 → +5VB
Pin 12 → ⏚
for 339
D-02112-60005
REVISIONS
A AS ISSUED
B REVISED PER ECO "J" DATE CODE 1510
C PCO-22-0393, ADD R75, C154 WAS 10µF
D PCO-22-0857, CIRCUIT CHG, NO DTE, IN DATE CODE
E PCO-22-1083, ADD R76, C155 WAS 10µF; DATE CODE IS 1528
(SEE CONTINUED)
2112A POWER SUPPLY
UPPER BOARD
TITLE SCHEMATIC
D-02112-60006
NEXT ASSEMBLY
D-02112-60005-51
PART NUMBER
HEWLETT PACKARD
SHEET 1 OF 1



2112A/2113A Power Supply Riser Assembly
02112-60008

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	C5,11	CAP 0.1UF		0150-0121		U	2	
00	C4	CAP .01UF 20%		0150-0123		U	1	
00	C6,12	CAP. 2.2UF		0160-0128		D	2	
00	C1-3	CAP FXD 2X5UF		0160-4142		U	3	
00	E1-8	STUD SOLDER TERM		0360-0294		U	8	
00	F9	STUD SOLDER TERM		0360-0474		U	1	
00	F10	STUD SOLDER TERM		0360-1047		U	1	
		EYELET BRASS		0361-0534		U	1	
		SPCR TAP #6X.125		0380-0305		U	8	
		STANDOFF		0380-0886		U	2	
01	R11,12	RES 2.7 5% .25		0683-0275		D	2	
00	R13	RES 10 5% 2W		0698-3601		D	1	
00	R5,6	RES 100K 1% .50		0757-0367		U	2	
01	R3,4,7,8	RES 100 1%.125		0757-0401		D	4	
01	R1	RES 56 5% 2W		0764-0013		U	1	
00	R9,10	RES 3.3 5% 2W		0811-1672		U	2	
		TBG HS BLK .750D		0890-0301		U	0.0001	FT
		HT DIS TO-3		1205-0275		U	4	
01	Q2,4	XSTR-NPN POWER		1854-0781		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	Q1,3	XSTR NPN TO3		1854-0790		U	2	
01	CR3,4,13,14	DIODE 1N2071		1901-0029		D	4	
01 03	CR1,2,5,7-12,15,17,18	DIODE IN4936		1901-1065		D	12	
		SCR #4-40X.312L		2200-0141		U	2	
		SCR #6-32X.375L		2360-0117		U	8	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
		WIRE JUMPERS		8159-0005		D	1	
		INSULATOR RISER		02112-00024		W	1	

REVISIONS

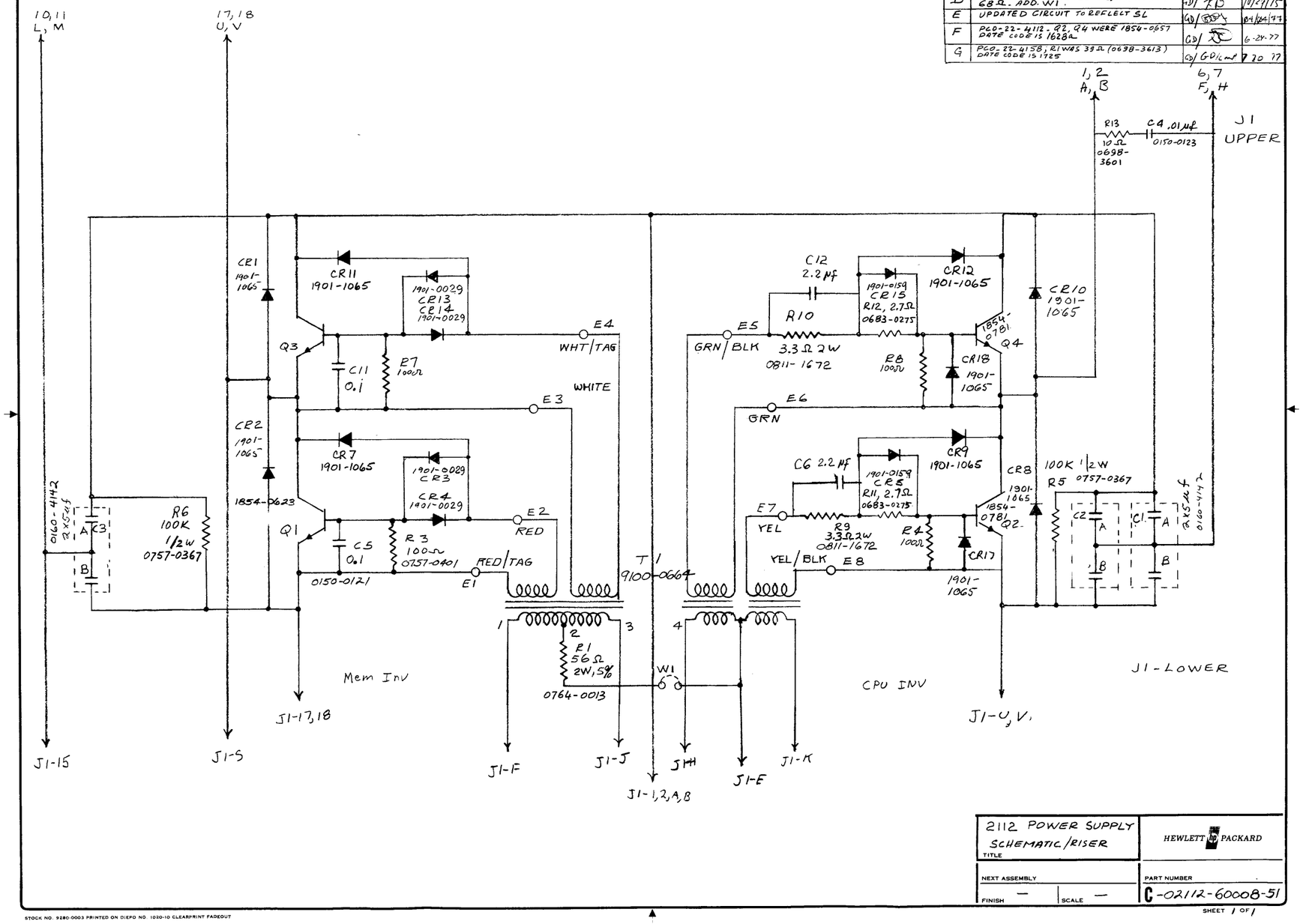
H	PCO-22-4177, CR3,4,13,14 WERE 1901-0154	CD/CW	8/1/22

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			33	34	38		42	43
50		63			90				93						

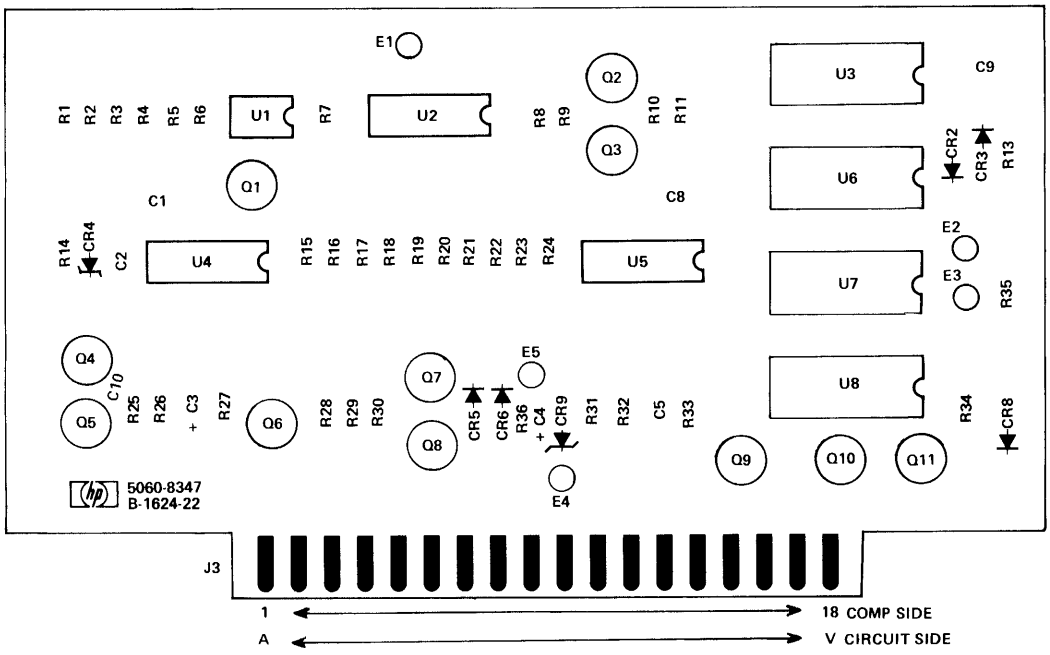
C-02112-60008-51

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED	[illegible] RB	3-15-75
B	CHANGED WIRE COLOR CALLOUT (DATE CODE 1510) PACO 'F'	[illegible] RB	5/14/75
C	PCO-22-2734- PILOT RUN MODS. DATE CODE IS 1510	GD RB	7/15/75
D	PCO-22-2880- DELETED C13, R2, R1 WAS 68Ω. ADD. W1.	GD/ RB	10/24/75
E	UPDATED CIRCUIT TO REFLECT SL	GD/ [illegible]	04/24/77
F	PCO-22-4112- R2, R4 WERE 1854-0657 DATE CODE IS 1628Q	GD/ [illegible]	6-24-77
G	PCO-22-4158; R1 WAS 39Ω (0698-3613) DATE CODE IS 1725	GD/ GD/CMP	7 20 77



2112 POWER SUPPLY SCHEMATIC/RISER (TITLE)	HEWLETT PACKARD
NEXT ASSEMBLY — FINISH — SCALE —	PART NUMBER C-02112-60008-51
	SHEET 1 OF 1

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



Battery Control I Assy
5060-8347

12944A Battery Back-up Control I Assembly Parts List (5060-8347) Sht. 1 of 3

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	C8	CAP 1.0UF 20%		0160-0127		U	1	
00	C5	CAP 1000PF 5%		0160-0938		U	1	
00	C2,10	CAP .01UF		0160-2055		U	2	
00	C9	CAP 47PF 5%		0160-2307		U	1	
00	C1	CAP 560PF 5%		0160-3535		U	1	
00	C3	CAP 2.2UF 10%		0180-0197		D	1	
00	C4	CAP 22UF 10%		0180-0228		D	1	
00	E1-3	STUD SOLDER TERM		0360-0294		U	3	
00	E4,5	STUD SOLDER TERM		0360-0474		U	2	
00	R27	RES 2.15K 1%.125		0698-0084		D	1	
01 03	R1,2,16-18,21, 22,25	RES 4.22K 1%.125		0698-3154		D	8	
00	R7	RES 23.7K 1%.125		0698-3158		D	1	
00	R36	RES 316 1% .50		0698-3402		D	1	
00	R6	RES 42.2K 1%.125		0698-3450		D	1	
00	R33	RES 21.5K 1%.125		0757-0199		D	1	
00	R24	RES 5.62K 1%.125		0757-0200		D	1	
00	R32	RES 9.09K 1%.125		0757-0288		D	1	
		RES 825 1%.125		0757-0421		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	R14			0757-0421				
01	R19,26	RES 5.11K 1%.125		0757-0438		D	2	
00	R28	RES 8.25K 1%.125		0757-0441		D	1	
01 03	R3-5,10,11,15, 20,29	RES 10K 1%.125		0757-0442		D	8	
01	R9,31,34	RES 51.1K 1%.125		0757-0458		D	3	
01	R8,13,23,35	RES 100K 1%.125		0757-0465		D	4	
00	R30	RES 1.47K 1%.125		0757-1094		D	1	
00	U1	IC LM301AN		1820-0477		U	1	
00	U6,7	IC CD4020AY		1820-0935		U	2	
00	U3,8	IC CD4027AD		1820-0938		U	2	
00	U2	IC CD4011AE		1820-0949		U	1	
00	U4,5	IC D COMPTR 8K		1826-0175		U	2	
00	Q2,9	XSTR 2N3906 PL18		1853-0036		U	2	
00	Q6	XSTR PNP 2N2907A		1853-0281		U	1	
01	Q1,3-5,7,8,10,11	XSTR 2N3904 PL5		1854-0215		U	8	
00	CR5,6	RECTIFIER SIL		1901-0033		U	2	
01	CR2,3,8	DIODE SIL		1901-0040		D	3	
00	CR9	DIODE-ZENER 13V		1902-0555		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	CR4	DIODE 4.64V		1902-3082		U	1	
		BOARD-ETCHED		5080-9738		W	1	

REV	REFERENCE	SERIES PREFIX
A	ORIG.	1553
B	22-2088	1415
C	22-2237	1417
D	22-2386	1418
E	ERRATA	NO CHANGE
F	22-3253	1616
G	22-3340	1624

40KHZ CLOCK

BATTERY DRIVER ENABLE

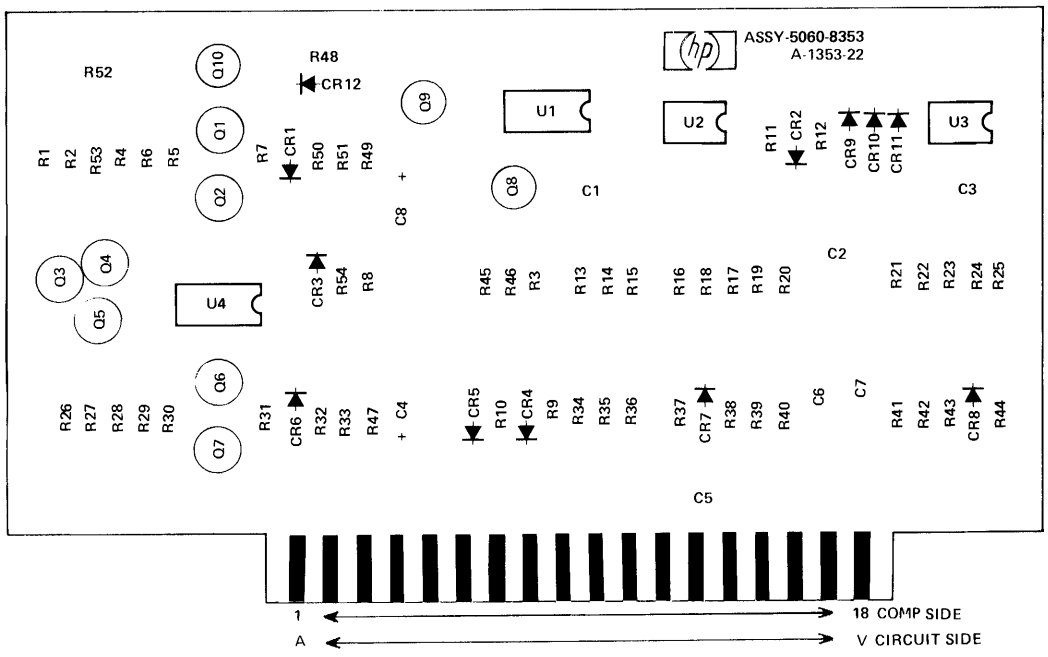
BATTERY MALFUNCTION

BATTERY TEST

±12V CURRENT SENSING

NOTE: UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN MICROFARADS.
2. SLOW CLOCK OUTPUT ON PIN 9 NORMALLY STRAPPED TO INPUT PIN 17.

TITLE: BATTERY CONTROL I
5060-8347-51

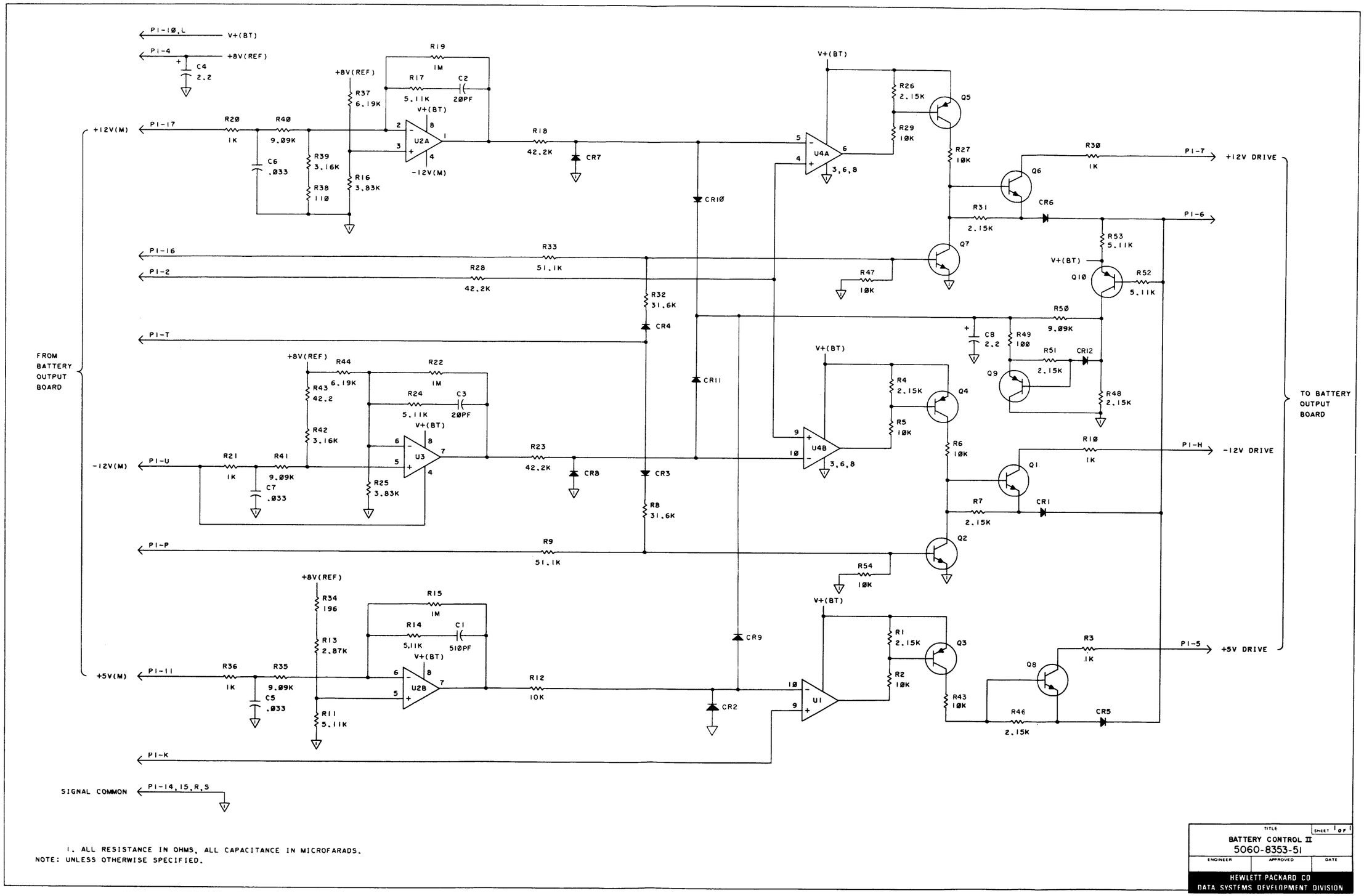


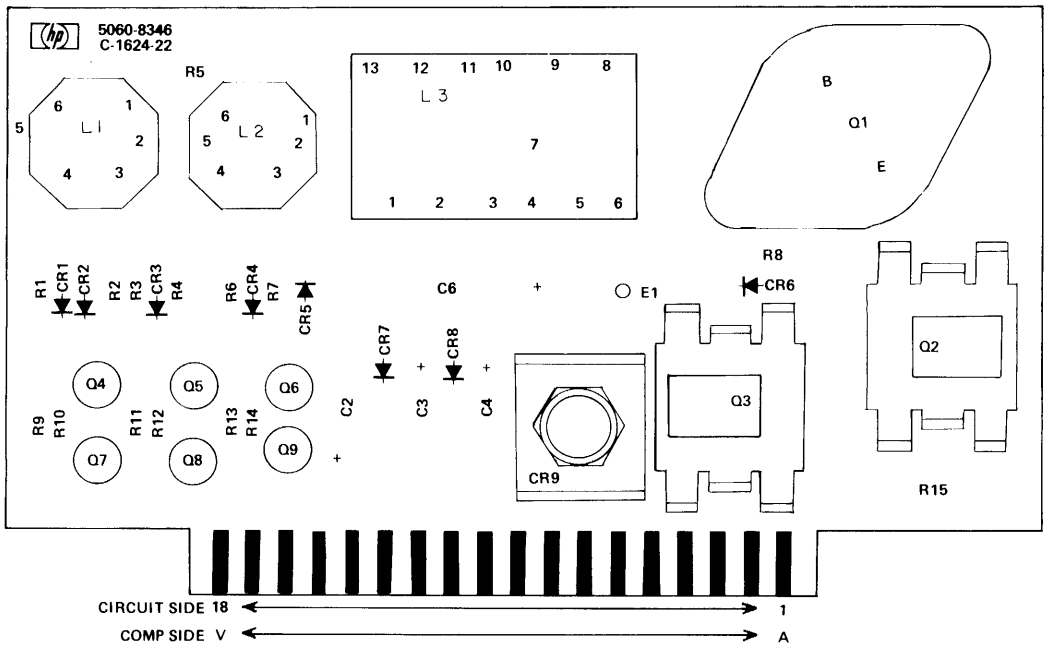
Battery Control II Assy.
5060-8353

12944A Battery Back-up Control II Assembly Parts List (5060-8353) Sht. 1 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	C5-7	CAP .033UF 10%		0160-0163		U	3	
00	C2,3	CAP 20PF 5%		0160-2198		U	2	
00	C1	CAP 510PF 10%		0160-3534		U	1	
00	C4,8	CAP 2.2UF 10%		0180-0197		D	2	
01	R15,19,22	RES 1M 5% .25		0683-1055		D	3	
01 03	R1,4,7,26,31 46,48,51	RES 2.15K 1%.125		0698-0084		D	8	
00	R13	RES 2.87K 1%.125		0698-3151		D	1	
01	R16,25	RES 3.83K 1%.125		0698-3153		D	2	
00	R8,32	RES 31.6K 1%.125		0698-3160		U	2	
00	R34	RES 196 1%.125		0698-3440		D	1	
01	R18,23,28	RES 42.2K 1%.125		0698-3450		D	3	
01	R39,42	RES 3.16K 1%.125		0757-0279		D	2	
01 03	R3,10,20,21 30,36	RES 1K 1%.125		0757-0280		D	6	
01	R35,40,41,50	RES 9.09K 1%.125		0757-0288		D	4	
01	R37,44	RES 6.19K 1%.125		0757-0290		D	2	
00	R43	RES 42.2 1%.125		0757-0316		U	1	
00	R49	RES 100 1%.125		0757-0401		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	R38	RES 110 1%.125		0757-0402		U	1	
01 03	R11,14,17,24 52,53	RES 5.11K 1%.125		0757-0438		D	6	
01 03	R2,5,6,12,27,29, 45,47,54	RES 10K 1%.125		0757-0442		D	9	
00	R9,33	RES 51.1K 1%.125		0757-0458		D	2	
00	U2,3	IC MC1458 P1		1826-0139		U	2	
00	U1,4	IC D COMPTR 8K		1826-0175		U	2	
01	Q3-5,9,10	XSTR 2N3906 PL18		1853-0036		U	5	
01	Q1,2,6-8	XSTR 2N3904 PL5		1854-0215		U	5	
01	CR1-12	DIODE SIL		1901-0040		D	12	


P1-10,L
V+(BT)
P1-4
+8V(REF)
C4
2.2
R19
1M
R17
5.11K
C2
20PF
+8V(REF)
R37
6.19K
V+(BT)
P1-17
+12V(M)
R20
1K
R40
9.09K
C6
.033
R39
3.16K
R38
110
R16
3.83K
U2A
-12V(M)
R18
42.2K
CR7
CR10
V+(BT)
R26
2.15K
Q5
R29
10K
R27
10K
U4A
3,6,8
R30
1K
P1-7
+12V DRIVE
Q6
CR6
R31
2.15K
P1-6
P1-16
R33
51.1K
P1-2
R28
42.2K
R32
31.6K
CR4
Q7
R47
10K
R53
5.11K
V+(BT)
Q10
R52
5.11K
R50
9.09K
C8
2.2
R49
100
R51
2.15K
CR12
Q9
R48
2.15K
P1-T
FROM BATTERY OUTPUT BOARD
+8V(REF)
R44
6.19K
R43
42.2
R42
3.16K
R22
1M
R24
5.11K
C3
20PF
V+(BT)
U3
R25
3.83K
-12V(M)
P1-U
R21
1K
R41
9.09K
C7
.033
R23
42.2K
CR8
CR3
R8
31.6K
CR11
V+(BT)
R4
2.15K
Q4
R5
10K
U4B
3,6,8
R6
10K
R10
1K
P1-H
-12V DRIVE
Q1
R7
2.15K
CR1
P1-P
R9
51.1K
Q2
R54
10K
TO BATTERY OUTPUT BOARD
+8V(REF)
R34
196
R13
2.87K
R15
1M
R14
5.11K
C1
510PF
V+(BT)
CR9
V+(BT)
R1
2.15K
Q3
R2
10K
R3
1K
P1-5
+5V DRIVE
Q8
+5V(M)
P1-11
R36
1K
R35
9.09K
C5
.033
U2B
R12
10K
CR2
U1
R43
10K
R46
2.15K
CR5
R11
5.11K
P1-K
SIGNAL COMMON
P1-14,15,R,S
1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN MICROFARADS.
NOTE: UNLESS OTHERWISE SPECIFIED.
TITLE
SHEET 1 OF 1
BATTERY CONTROL II
5060-8353-51
ENGINEER
APPROVED
DATE
HEWLETT PACKARD CO
DATA SYSTEMS DEVELOPMENT DIVISION



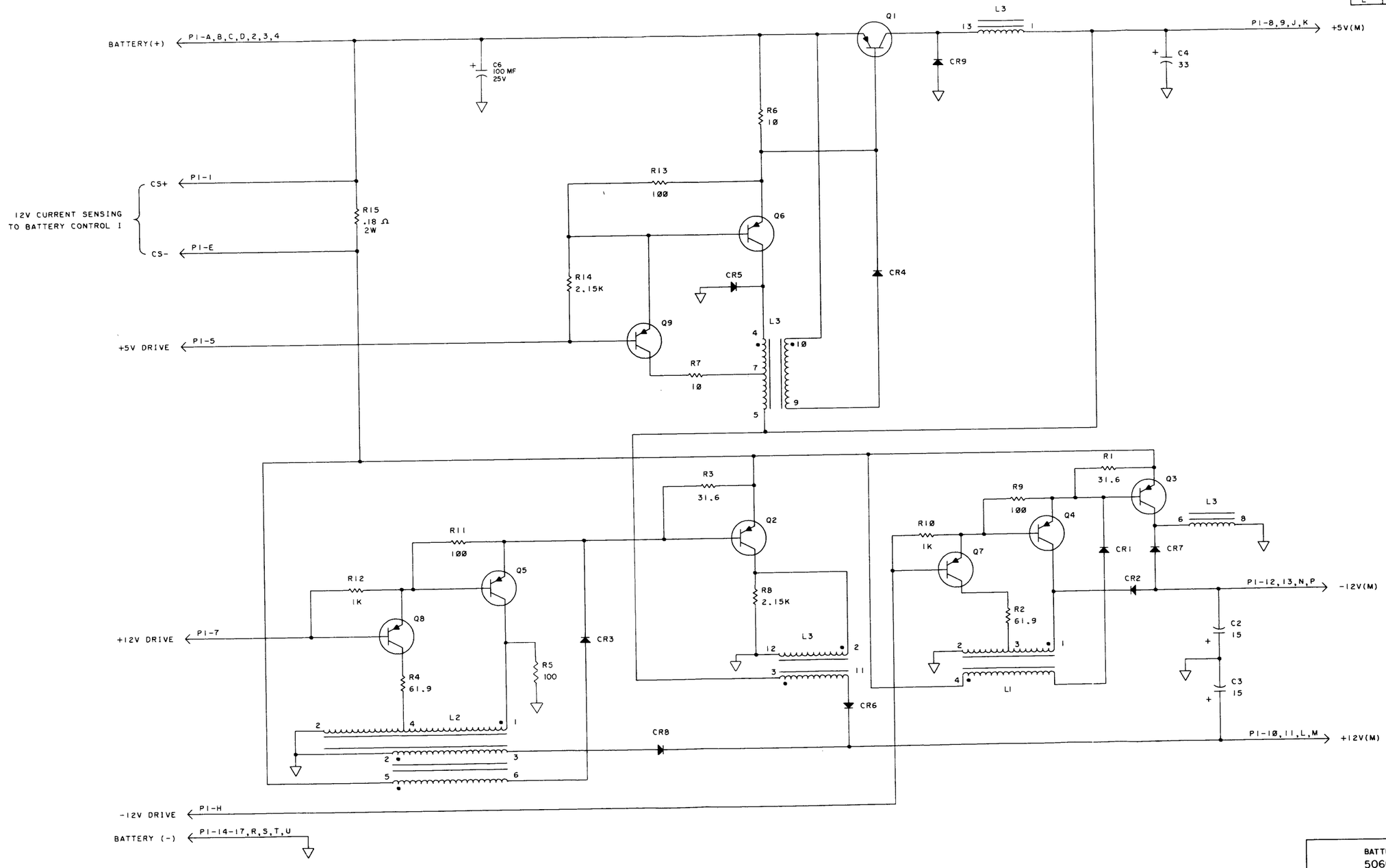
Battery Output Assy
5060-8346

12944A Battery Back-up Output Assembly Parts List (5060-8346) Sht. 1 of 2

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		0A						
00	C6	CAP 100UF-10+50%		0180-0094		U	1	
00	C4	CAP 33UF 10%		0180-0229		U	1	
00	C2,3	CAP 15UF 10%		0180-1746		D	2	
		STUD SOLDER TERM		0360-0294		U	1	
		SPCR TAP #6X.125		0380-0305		U	2	
00	F8,14	RES 2.15K 1%.125		0698-0084		D	2	
00	R1,3	RES 31.6 1%.125		0757-0180		D	2	
00	R5	RES 100 1% .50		0757-0198		U	1	
00	R2,4	RES 61.9 1%.125		0757-0276		D	2	
01	R10,12	RES 1K 1%.125		0757-0280		D	2	
00	R6,7	RES 10 1%.125		0757-0346		D	2	
01	R9,11,13	RES 100 1%.125		0757-0401		D	3	
00	R15	RES 0.18 OHM WW		0811-3293		U	1	
		SLEEVING FLEX.		0890-0064		U	0.25	FT
		HT DIS PL PWR		1205-0219		U	2	
		HT DIS TO-3		1205-0275		U	1	
01	Q7,8,9	XSTR 2N3906 PL18		1853-0036		U	3	
00	Q2,3	XSTR 2N5194 X58		1853-0212		U	2	
		XSTR 2N4236 TO5		1853-0213		U	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	Q6			1853-0213				
	Q4,5	XSTR PNP 2N2907A		1853-0281		U	2	
00	Q1	XSTR 2N4398 TO3		1853-0310		U	1	
00	CR6,7	DIODE-RECTIFIER		1901-0699		U	2	
00	CR9	DIODE		1901-1062		U	1	
01	CR1-5,8	DIODE IN4936		1901-1065		D	6	
		LKWSHR 10 HEL		2190-0034		U	1	
		LKWSHR 6 HEL		2190-0851		U	1	
		SCR #4-40X.500L		2200-0147		U	2	
		NUT 4-40 W/LK		2260-0009		U	2	
		SCR #6-32X.437L		2360-0199		U	2	
		NUT 10-32 .375AF		2740-0002		U	1	
		WSHR #4 SS		3050-0229		U	6	
		WSHR #10 BRS		3050-0236		U	1	
		COMPOUND-THERMAL		6040-0239		U	0.0012	TB
		WIRE 18 AWG BARE		8151-0011		U	2	FT
00	L2	CHOKE		9100-2962		U	1	
00	L1	CHOKE		9100-2963		U	1	
00	L3	CHOKE		9100-2964		U	1	
		BOARD-ETCHED		5060-9737		W	1	
		HEAT SINK		02108-00024		W	1	

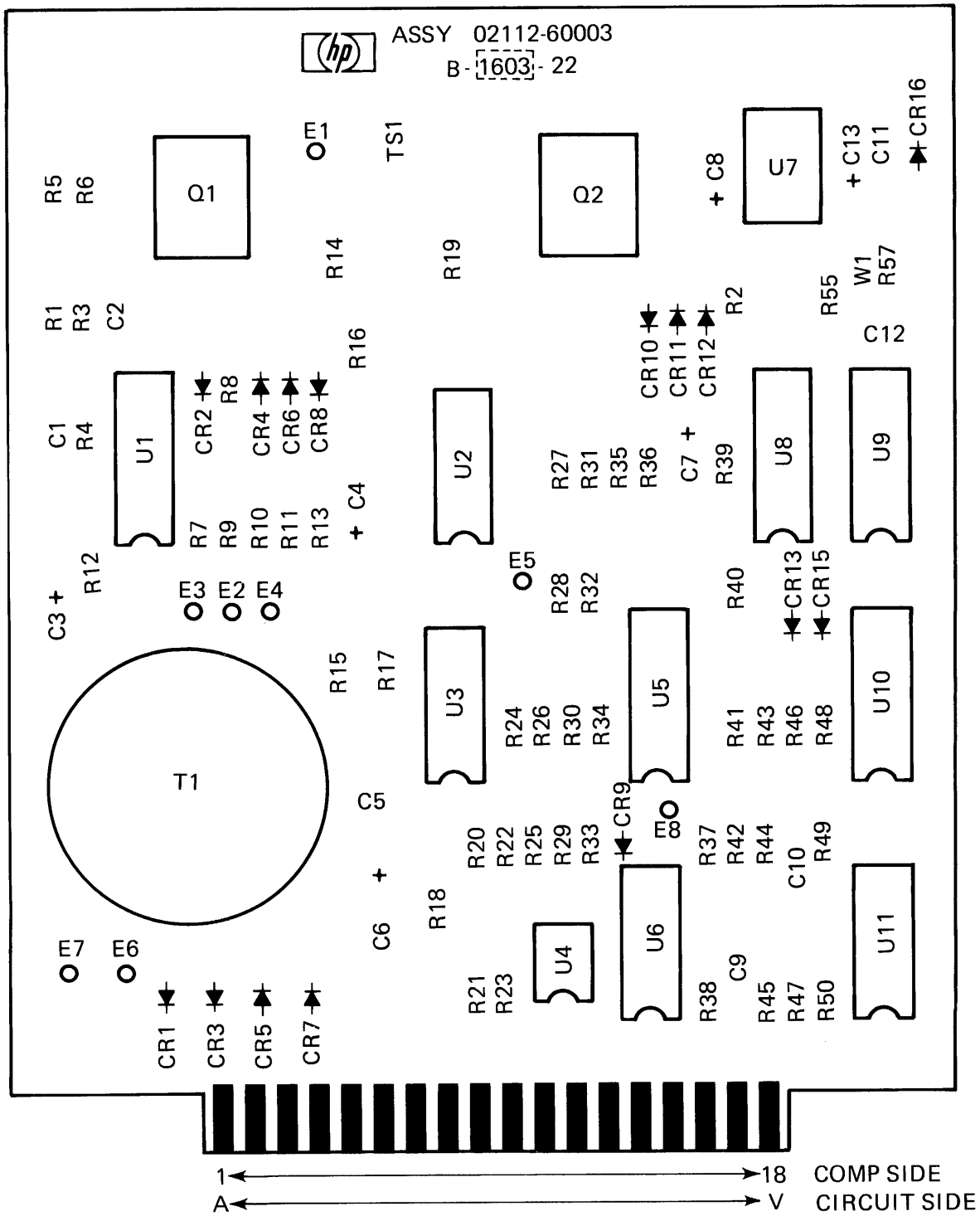
REV	REFERENCE	SERIES/PREFIX
A	ORIG.	1353
B	ERRATA	NO CHANGE
C	22-2386	1445
D	ERRATA	NO CHANGE
E	22-3312	1624



1. ALL RESISTANCE IN OHMS, ALL CAPACITANCE IN MICROFARADS.

NOTE: UNLESS OTHERWISE SPECIFIED.

TITLE	SHEET
BATTERY OUTPUT 5060-8346-51	1 of 1
ENGINEER / APPROVED / DATE	
HEWLETT-PACKARD CO. DATA SYSTEMS DEVELOPMENT DIVISION	



Battery Inverter Assembly
02112-60003

ITEM NO	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	C10,11	CAP 0.1UF		0150-0121		U	2	
00	C9	CAP 1.0UF 20%		0160-0127		U	1	
00	C12	CAP 47PF 5%		0160-2307		U	1	
00	C1,2	CAP 1000PF 10%		0160-3456		U	2	
00	C5	CAP 820PF 5%		0160-3539		U	1	
00	C6	CAP 50UF -10+75%		0180-0141		U	1	
00	C3	CAP 2.2UF 10%		0180-0197		D	1	
00	C8,13	CAP 1UF 10%		0180-0291		D	2	
00	C4,7	CAP 15UF 10%		0180-1746		D	2	
00	F1-8	STUD SOLDER TERM		0360-0294		U	8	
00	P12	RES 10K 5% .25		0683-1035		D	1	
01	R2,3,23,28,31	RES 2.15K 1%.125		0698-0084		D	5	
01	R38,44-47,49	RES 4.22K 1%.125		0698-3154		D	6	
01	R11,39	RES 4.64K 1%.125		0698-3155		D	2	
00	R57	RES 14.7K 1%.125		0698-3156		D	1	
00	R22	RES 23.7K 1%.125		0698-3158		D	1	
00	R20	RES 147 1%.125		0698-3438		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
01	R13,36	RES 215 1%.125		0698-3441		D	2	
00	R4	RES 21.5K 1%.125		0757-0199		D	1	
01	R5,26,32,34,35	RES 1K 1%.125		0757-0280		D	5	
00	R37	RES 6.19K 1%.125		0757-0290		D	1	
01	R6,16,27	RES 100 1%.125		0757-0401		D	3	
01	R14,19	RES 511 1%.125		0757-0416		D	2	
01	R10,24,30	RES 5.11K 1%.125		0757-0438		D	3	
00	R42	RES 6.81K 1%.125		0757-0439		D	1	
00	R1	RES 8.25K 1%.125		0757-0441		D	1	
01	R7-9,25,29,33,41-43	RES 10K 1%.125		0757-0442		D	8	
00	R40	RES 51.1K 1%.125		0757-0458		D	1	
01	R48,50,55	RES 100K 1%.125		0757-0465		D	3	
01	R15,17	RES 10 1% .50		0757-0984		D	2	
00	R21	RES 1.47K 1%.125		0757-1094		D	1	
00	R18	RES .12 5%2WPW		0811-3291		U	1	
		HT DIS PL PWR		1205-0284		U	2	
00	U4	IC LM301AN		1820-0477		U	1	
00	U8,9	IC CD4020AY		1820-0935		U	2	
		IC CD4027AD		1820-0938		U	2	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
00	U5,10			1820-0938				
00	U6	IC CD4011AE		1820-0949		U	1	
00	U7	IC V REG 12V		1826-0099		U	1	
00	U11	IC D COMPTR 8K		1826-0175		U	1	
00	Q1,2	XSTR NPN X58		1854-0552		U	2	
00	U3	XISTOR ARRAY		1858-0008		U	1	
00	U2	XISTOR ARRAY		1858-0009		U	1	
00	U1	XSTR ARRAY 5 NPN		1858-0021		U	1	
01	CR9,13,15,16	DIODE SIL		1901-0040		D	4	
01	CR1,3-8,10-12	DIODE IN4936		1901-1065		D	10	
00	CR2	DIODE ZNR 5.11V		1902-0041		D	1	
		LKWSHR 6 HEL		2190-0851		U	6	
		SCR #6-32X.312L		2300-0195		U	1	
		SCR #6-32X.375L		2300-0197		U	2	
		SCR #6-32X.500L		2360-0201		U	2	
		NUT 6-32 .312AF		2420-0002		U	6	
		NUT 6-32 .250AF		2420-0003		U	6	
		WSHR #6 SS		3050-0228		U	14	
00	TS1	SWITCH-THERMAL		3103-0033		U	1	
		COMPOUND-THERMAL		6040-0239		U	0.01	TB
00	W1	WIRE JUMPERS		8159-0005		D	1	

ITEM NO.	REFERENCE DESIGNATOR (FIRST SIX)	PART DESCRIPTION	PARENT OPTION	PART NUMBER	COMP. OPTION	LOC	QUANTITY PER	UM
		TRANSFORMER-PWR		9100-0666		U	1	

SYM	REVISIONS	APPROVED	DATE
A	AS ISSUED A-1510-22	[illegible]	3-17-75
B	DELETED R54 PPS A (12991A)	[illegible]	5-24-76
C	22-2775. DELETED R51, ADD. R3, R57. C3 WAS .01	GD/ RB	8/6/75
D	A-1568 22-3065. C2 WAS .1, DATE CODE 15	GD/ RB	11/4/76
E	A-1603 22-3078 R3 WAS 1K, DATE CODE 15	GD/ RB	11/4/76
F	A-1603 22-3411, NEW PCA, DATE CODE 15	GD/ RB	10/12/76

D-02112-60003-3F

THERMAL OUTPUT, MOUNT AS CLOSE TO HEATSINK AS POSSIBLE

54-0552's ARE MOUNTED ON HEATSINKS.

3622 POT CORE T1 -24V

TO H.V. RAIL

NOTE: [U2] TRANSISTOR ARRAY IS A 1858-0003 WITH HEATSINKS
[U3] TRANSISTOR ARRAY IS A 1858-0008
[U1] TRANSISTOR ARRAY IS A 1858-0021
ALL DIODES NOT LABELED ARE 1901-1065

TITLE	BATT. INV. SCHEMATIC	HEWLETT PACKARD
NEXT ASSEMBLY	12991A 12963A	PART NUMBER D-02112-60003-3F
FINISH ~	SCALE ~	SHEET 1 OF 1