COLECO INDUSTRIES INC.

PRINTER LOGIC BOARD

REPAIR GUIDE

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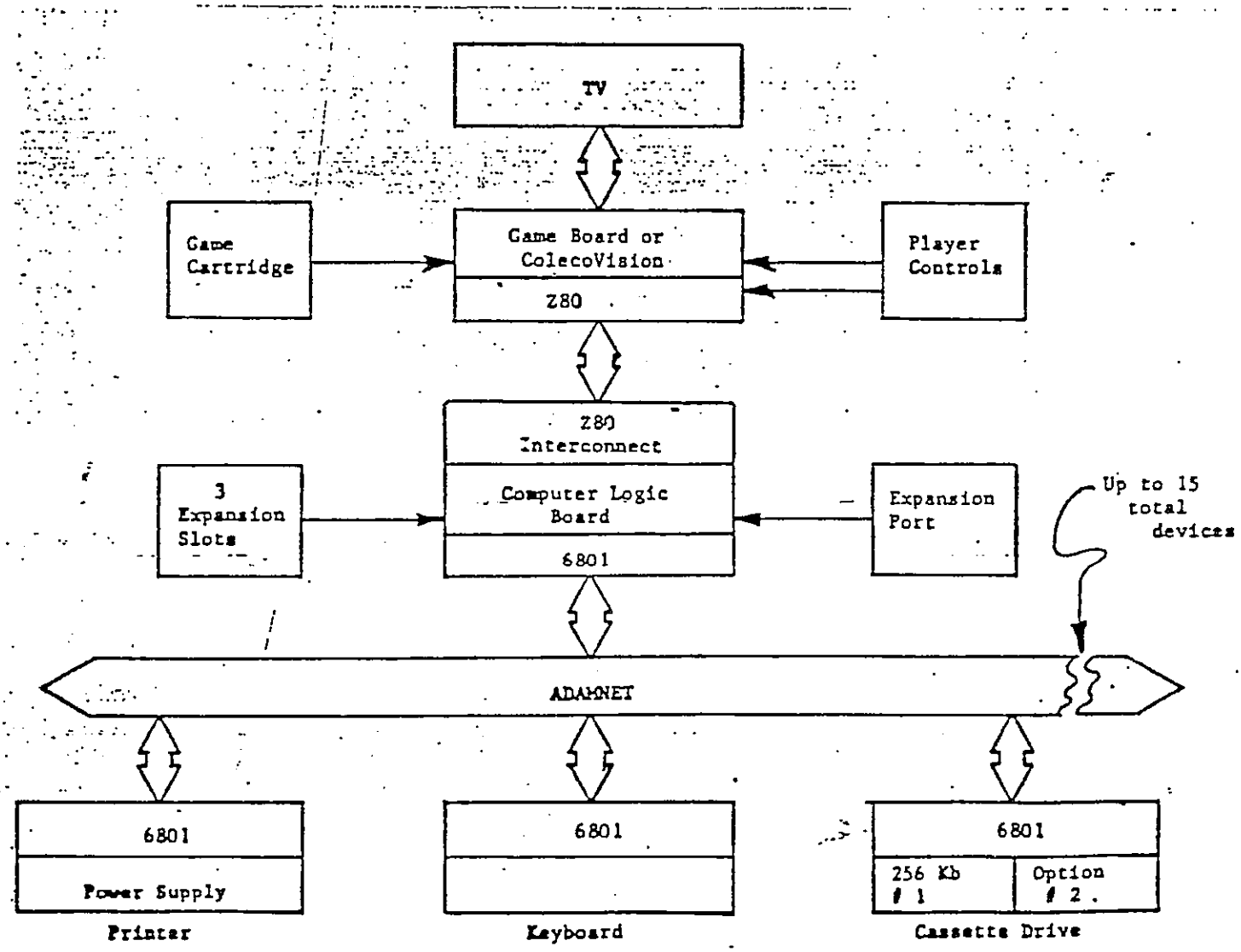
CHAPTER 1. ADAM COMPUTER SYSTEM BLOCK DIAGRAMS

A. Complete System.

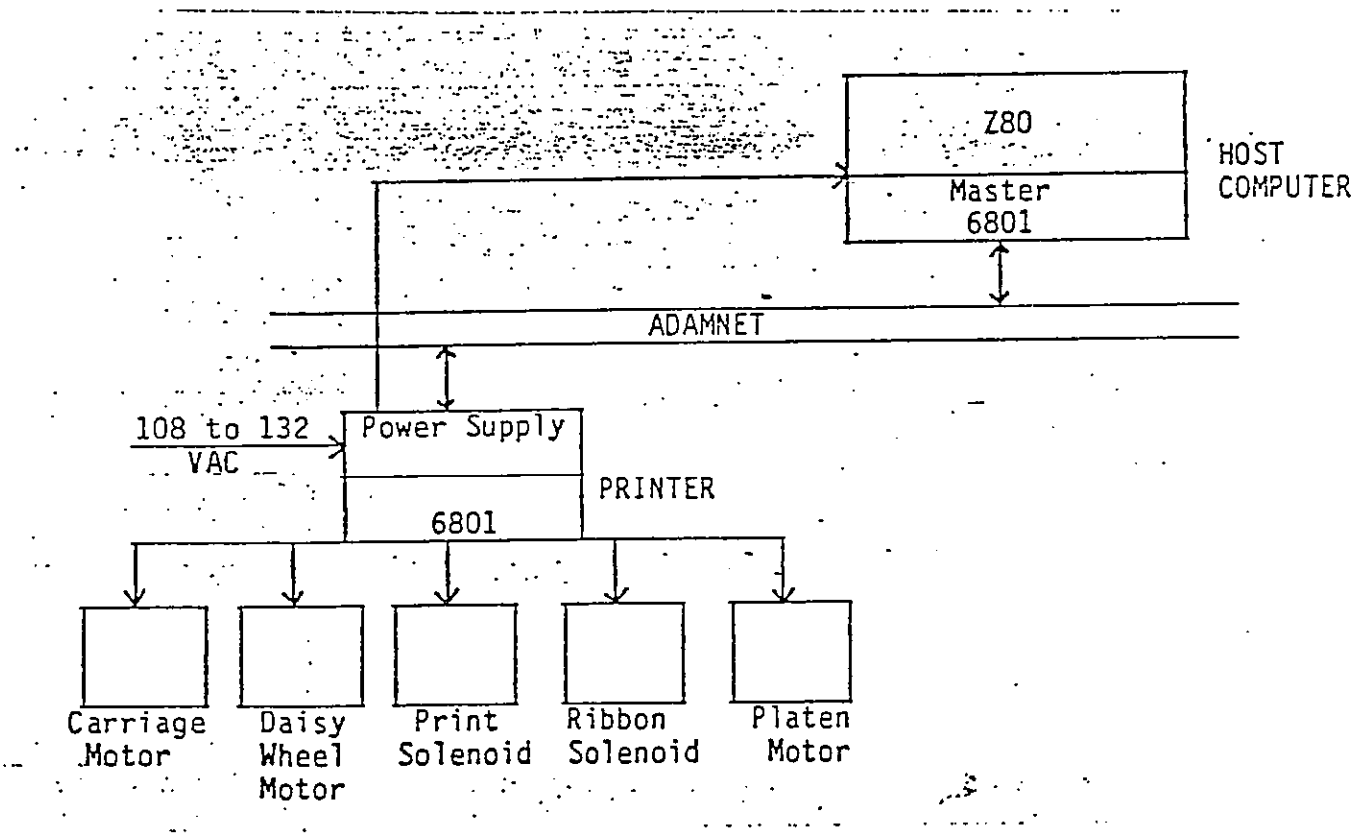
The SmartWriter printer, combined with a Computer Logic Board and a Delta Game Board or ColecoVision and the AdamNet Communications Network make up the main computer system for the Adam Computer. The SmartWriter Printer provides the system power supply as well as printed output. The Computer Logic Board provides the operating system for word processing and the DRAM used for programming operations. The Game Board contains the Z80 CPU game operating system, and interfaces for game cartridge ROMs and hand controllers. (See Figure 1, below)



B. Printer Power Supply & Logic Board.

The Power Supply is located within the printer assembly. A 108 to 132 VAC power line provides power to the printer/power supply, which provides power to the Delta Memory Console or Expansion Module #3 and the Keyboard. Incoming line voltage is converted to four low-level regulated DC voltages, and one 18V unregulated voltage required for the printer. The printer is also connected to the Memory Console or Expansion Module #3 via a 62500-baud, 3-line communications interface, AdamNet (See Figure 2, below)

A PCB, fully shielded to FCC part 15 requirements, consists of three major systems: a 6801 microprocessor, an AdamNet serial interface, and parallel drivers that control the electro-mechanical devices. A crystal oscillator provides the 4.0 MHz clock for the printer. (See Figure, Appendix B)



CHAPTER 2. HOW TO USE THIS GUIDE

A. Confirm / Verify Problems Described.

1. Inspect for physical damage as most probable cause of failures.
   a. Check all connectors, wiring, and components for good connection.
   b. Clean edge fingers and other contact points.

2. Check revision level of pc assembly.
   (Reference Assembly Drawings)
   a. 41240 - Printer Power Supply
   b. 41033 - Printer Logic Board

B. Cautions.

1. Handle assemblies and components with care appropriate to avoid damage to static sensitive devices.

   a. Testing must be performed at an ESD protected work station.

      1. Conductive mat/work surface.

      2. Properly grounded operator.

      3. No plastic tools e.g. desoldering tools.

C. Equipment necessary to perform tests herein described or referenced.

1. System Final Tester
2. Known Good Adam Card Set
3. Final Test Cartridge

D. Using Customer description of problem and/or previous test results (see Ch 4: Quick Overall Check), use Symptom Index as diagnostic pointer to probable defects and cause.

CHAPTER 3. SYMPTOM INDEX

Symptoms below are listed in descending order of probability within three major categories.

1. Electronic Problems.

2. Electro-Mechanical Component Problems.

3. Mechanical Adjustment Problems.

SYMPTOM	CAUSE
1) Ghosting:	
(Comma, accent, period)	3. Improper Hammer Adjustment 3. Improper Daisy Wheel Motor Alignment. 2. Defective Daisy Wheel. 3. Improper Platen Adjustment.
(Characters)	3. Improper Daisy Wheel Motor Alignment. 3. Improper Hammer Alignment. 3. Improper Platen Adjustment. 2. Defective Daisy Wheel.
(Underline)	3. Improper Hammer Angle. 3. Improper Motor Alignment. 2. Bent Daisy Wheel Petal. 3. Improper Daisy Wheel Boss Height. 3. Boss Rubs on Opto-Coupler.
2) Incomplete Characters	3. Improper Hammer Angle. 3. Improper Daisy Wheel Motor Alignment. 2. Gouge In Platen. 2. Defective Daisy Wheel. 3. Improper Platen Alignment. 2. Unground Platen has "Low Spot". 3. Missing Carriage Rail Skids. 2. Defective Hammer.

3) Rattle In Printer	3.	Loose Screw in Printer.
	3.	Loose P Clip.
	3.	Loose Ribbon Shield Retaining Nut.
	3.	Loose Heat Sink.
	3.	Extra Ribbon Shield Spring.
4) No Print/ Stops Printing	2.	Bound Ribbon Cassette.
	2.	Broken Ribbon Cassette.
	3.	Ribbon Index Cruciform Not Fully Inserted.
	3.	Ribbon Shield hits Daisy Wheel.
	2.	Wrong Detent In Geartrain.
	1.	Defective U2, Ptr Logic Board.
	2.	Right Platen End Cap Binding.
	1.	C4 Bad In Printer Logic Board.
	1.	Defective J2.
	1.	Cold Solder F3/Power Supply.
	2.	Bad Geartrain Mounting Stud.
	3.	Loose Print Terminal.
	1.	Broken Solder connection.
	1.	Defective Power Supply transformer.
	3.	Loose Screw Shorting Power Supply.
5) Overlapping Characters	3.	Ribbon Shield/Platen Interference.
	3.	Interference between Carriage Head and Limit Switch.
	3.	Loose Carriage Head Limit Switch.
	2.	Broken Capstan on Carriage Motor.
	3.	Daisy Wheel Hitting Ribbon Shield.
	3.	Motor Alignment.
	1.	Defective CR26 on Printer Logic Board.
	3.	Glue on Carriage Wheel.
6) Character Spacing	2.	Daisy Wheel Stepping Motor.
	2.	Bent Daisy Wheel Petal(s).
	3.	Daisy Wheel Hits Ribbon Shield.
	3.	Ribbon Shield Hits Platen.
	2.	Bottom Shield Assembly Warped.
	3.	Carriage Skid Not Fully Inserted.
	2.	Defective Daisy Wheel Boss.
	2.	Defective Daisy Wheel.
	1.	Bad CR26 on Printer Logic Board.
	2.	Defective Limit Switch.

7) Up/Down Char, Left Margin	3.	Interference Between Carriage Head and Limit Switch.
	3.	Limit Switch Misadjusted.
	2.	Clampcord.
	2.	Defective Geartrain Switch.
	2.	Defective Daisy Wheel Boss.
	2.	Defective Carriage Rail.
	2.	No Hub on Rail.
	2.	Defective Platen.
	3.	Loose Bottom Shell Capstan.
	3.	Ribbon Shield Hits Platen.
8) Erratic Line Spacing	3.	Excessive Geartrain Switch Bounce.
	3.	Lead Switch Misadjusted.
	1.	Q7 Cold Solder on Printer Logic Board.
	2.	Geartrain Lead Switch Intermittent Closure.
9) Bad/Missing Characters	2.	Broken Daisy Wheel Petal.
	2.	Defective Daisy Wheel.
	2.	Defective Hammer.
	2.	Defective Ribbon Cassette.
10) Erratic Left Margin	3.	No Silicon on Carriage Rails.
	1.	Broken Solder Joint F3.
	3.	Hot Melt On Carriage Rails.
	1.	Wires Not Soldered to Switch.
	2.	Defective Limit Switch.
	2.	Defective Platen.
	3.	Platen Alignment.
	2.	No Hub On Carriage Rail.
11) No/Improper Reset	1.	Broken solder connection on Printer Limit Switch.
	1.	Cold Solder F1/Printer Logic AdamNet Cable.
	1.	Component Leads Shorting to Chassis/Printer Logic Bd.
	1.	Cold Solder E3/Printer Logic Bd.
	1.	Open Wire E3/Printer Logic Bd.

12) Leaning Characters	3.	Improper Daisy Wheel Motor Alignment.
	2.	Bent Daisy Wheel Petal(s).
13) Incorrect Characters	1.	U4 Not Soldered In Logic Board.
	3.	Daisy Wheel Hits Ribbon Shield.
	1.	Defective U2 in Logic Board.
	2.	Defective Daisy Wheel.
	3.	Defective Optical Sensor in Carriage Head.
	2.	Defective Daisy Wheel Boss.
	3.	Daisy Wheel Hits Transformer Shield.
14) Improper Paper Feed	3.	Improper Platen Adjustment.
	2.	Defective Paper Shield.
	3.	Incorrect Bail Tension.
15) Paper Jammed	3.	Paper Guide Loc-Tited to Transporter.
16) Bad Video	1.	12VL & 12VI Shorted.
	1.	Cold Solder C4/Power Supply PCB.
	1.	Broken Solder Connection/Printer Power Supply E12.
	3.	Loose Transformer.
	1.	C15/Power Supply Not Soldered.
17) No Video	1.	Broken Solder C2/Power Supply.
	2.	Broken Power Supply Cord.
18) Interference When Geartrain Advances	1.	Broken Leg C9/ Power Supply.
19) Scrambled Graphics	1.	Broken Solder Joint E12.
	1.	Cold Solder Joint F3.
	1.	Defective U2 Printer Logic.
20) Intermittent Ribbon Advance	2.	Burr on Capstan Wheel of Ribbon Cassette.
	3.	Two Rubber Buffers in Ribbon Advance Solenoid.
	1.	Cold Solder Connection.
	2.	Defective J Spring.
	2.	Defective Ribbon Cassette.

21) Won't Load Tapes	1.	C2 Not Soldered to Printer Logic Bd.
	3.	Corrosion on U2/Printer Logic Bd.
	1.	Bad Solder Connection E5/Printer.
	1.	Broken Trace C3/Printer Logic.
	1.	C17 Broken Trace/Printer Logic.
	2.	Defective Ribbon Shield.
22) Printer Goes Into Self Test	1.	Solder Ball Shorting U2 to Gnd.
23) Geartrain Problems	1.	U7 Pin #20 Gamma Logic Floating.
	3.	Connector Not Inserted at PCB.
	1.	E4 Shorted to E3/Power Supply PCB.
24) Spinning Daisy Wheel	2.	Defective Opto-Coupler Switch.
	2.	R67 Wrong Value. (Should be 6.7K)
	2.	Defective Opto-Sensor.
25) Frozen Bail Lever	2.	Defective Bail Wire.
	3.	Improper Platen Position.
26) Missing Underline/ Descenders	2.	Defective Ribbon Cassette.
27) Cannot Store Files	1.	Defective Printer Power Supply Secondary #3 & #4 Shorting.
28) System Locks Up @5 Minutes	1.	Defective C4/Printer Logic
	3.	U4 Not Inserted.
29) Stepping Motor Stops @15 Minutes	1.	Defective U2/Power Supply.
30) Vibrating Daisy Wheel.	3.	Daisy Wheel Motor Screw Touching Boss.
31) Static In Audio	1.	Cold Solder E12.
32) Erratic Function of Carriage Motor	1.	CR6 Open/Printer Logic Bd.

CHAPTER 4. QUICK OVERALL CHECK

A. Check all system interconnections for integrity.

B. Check power supply voltages at all PC Assemblies.

C. Use System Final Test to highlight functional problems. See Set-up Drawing T-1800 and reference procedure: Printer (System) Cartridge Test (Log# 107.4, Appendix A). Failures are detected by observing mechanical operation of the printer and checking the printout for errors.

D. Printer self-test may be run by shorting pin #22 of the Printer 6801 to ground on power-up. The resident print routine prints the following two-line message:

"Your new ADAM Family Computer System is now ready to make your life easier, more organized and more fun than ever."

CHAPTER 5. TEST FIXTURES

A. System Final Test Documentation.

1. T-1638 Rev A: System Final Test Assembly.
2. T-1132 Rev A: System Test Hardware Sub-Assembly.
3. T-1132 Rev A: System Test Hardware Schematic.
4. Log #107.4: Printer (System Cartridge) Test Procedure.
5. T-1614 Rev B: System Test Interface Harness.
6. T-1619 Rev 0: Interface Harness Wire List.
7. System Test Cartridge Rev 3.1.
8. T-1800 Test Set-Up Drawing.

CHAPTER 6. SCHEMATIC AND ASSEMBLY DOCUMENTATION

A. Printer Chassis

1. Power Supply Assembly: 41240
2. Linear Power Supply Schematic: 41234
3. Compuwriter PC Board Assembly: 41033
4. Logic Schematic: 41218

B. Additional Drawings

1. Gamma/Delta Schematic: 41843
2. Delta Game Schematic: 41844

APPENDIX B: FUNCTIONAL BLOCK SUBSECTIONS

Note: Reference Board Assemblies and Schematics for Component Identification.

6801 MICROPROCESSOR - "U2"

Printer control logic consists of a hardware/firmwave system centered about a 6801 microprocessor. The 6801 executes microprograms for handling the printer interfacing, print functions, and paper control. When power is turned on, the printer 6801 waits for a system-ready signal from the Master 6801 CPU (located on the logic board) and then resets. Data is sent to the printer via the Master CPU and the serial communications link, AdamNet.

Three seperate functions of the printer - lateral carriage motion, the rotation of the daisy wheel, and stepping of the platen to move paper - can be activated simultaneously by the 6801. The 6801 provides 2048 bytes of ROM and 128 bytes of RAM. It operates in two modes; "think" and "action". Outputs of the 6801 are high (+5V) during think mode and low (0V) during action mode. After a reset, the 6801 goes into a think mode, then it switches after into an action mode, 1200 times per second. It remains in action mode for as long as necessary to complete any pending actions (usually less then 1/2400 second).

Most external actions, such as motor stepping, serial data sampling, and solenoid firing are done during the action mode. Other calculations that the 6801 does, such as carriage motion optimization, are done during the think mode. Exceptions are motor stepping during the homing process, power down and power up sequences, and enabling of the data flow signal, which all occur during the think mode.

2. CARRIAGE (STEPPER) MOTOR DRIVERS - "U4 & Q15 - 18"

The four carriage motor windings are driven directly from the 6801 port 1, pins 13, 14, 15 and 16 through individual gates of U4 and associated transistor switches. The lateral motion of the carriage is carefully controlled bythe 6801 increase printing speed. The carriage moves to a column only when there is a character to be printed. Blank character spaces are accumulated and these are passed over very quickly. For example, with a tabulated report, the printer moves directly to the column where there is a printed character, skipping over blank spaces; or with an indented left margin, the carriage returns to where printed characters begin. This feature is not active, however, if the data is being received at a very slow rate.

3. DAISY WHEEL MOTOR DRIVERS - "U4 & Q11 - 14"

The four daisy wheel motor windings are driven directly from the 6801 port 1 pin 17, 18, 19 and 20 through individual gates of U4 and associated transistor switches. The operation of the daisy wheel returns to the home position. As the wheel rotates to print the characters input from the buffer, the 6801 calculates the direction of the wheel and turns it to minimize the amount of rotation required. This function is associated with the 6801 P20 datum sensor. The 96-petal wheel has grouped together the upper case, lower case letters, and numerals; the other characters are distributed over the rest of the wheel.

4. PRINT SOLENOID - "U3 & Q2"

Once the daisy wheel rotates to the character selected, the print solenoid activates the hammer to impact the print. The strength of the blow delivered by the print hammer varies depending on the surface area of the character being printed. Small characters, such as period, are struck more lightly than large characters, such as W. This ensures that the periods don't perforate the paper, and that the W's will be the same darkness as the smaller characters.

5. RIBBON SOLENOID - "U3 & Q3"

As every other character is printed, the ribbon advances to the next position (1/5 of a character width) in anticipation of the next print impact. The ribbon is an interchangeable multi-stroke unit with an expected life of 120,000 characters.

6. PLATEN MOTOR - "U3, Q6, Q7, Q10"

Two line-feed signals from the 6801 will advance the platen to the next print line. The end of platen travel function is associated with 6801 Pin 24.

7. PARALLEL POWER SUPPLY - "U1, U2, U3, U4"

The printer provides power to the host computer (Delta or Expansion Module #3) as well as the Printer Logic. Voltages are derived from seperate secondary windings of transformer T1 and converted to to DC via bridge rectifier arrays. The DC voltages are then regulated and filtered with the exception of an unregulated 18V DC used in the printer ribbon solenoid circuitry. (See Figure 3. below)

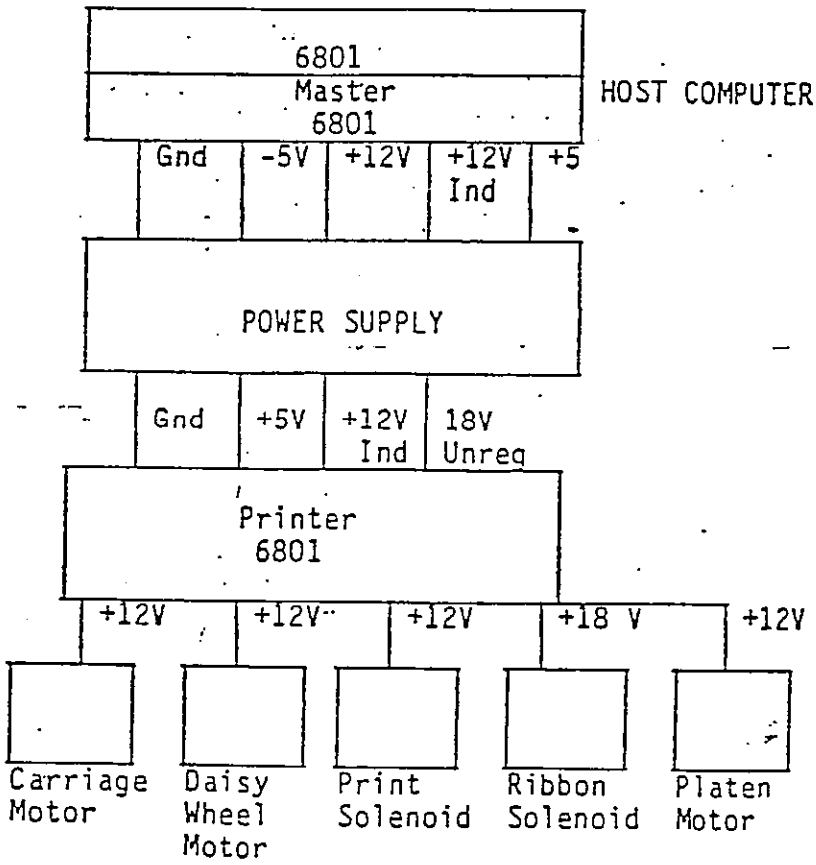
In addition to a GROUND (GND) reference, voltages are:

+5V (+6/-3%)

+12IV (+5/-5%) Inductive Voltage

+12LV (+5/-5%) Logic Voltage

-5V (-7/+5%)



APPENDIX C: ANNOTATED SCHEMATIC

Reference logic schematic 41218 Rev. K.

Circuit Node	Comment
A +5V	
B +12V Inductive	
C +16/18V Unregulated	
D. $\overline{\text{RESET}}$	Active low power on, or AdamNet reset.
E. U2 - 40	External clock, should be 1.0 MHz.
F. U2 - 13,14,15,16 H. U2 - 17,18,19,20	Active low (0-5V) Motor pulses.
G. J1 - 13,14,15,16 I. J1 - 19,20,21,22	Active low (0-12V) Motor pulses.