

**WANG**

3305

## **DAISY PRINTER**

### **Models:**

**DW/OS-20**

**DW/22-20**

**PC-PM011**

**Customer Engineering  
Product Maintenance Manual**

**729-1054-A**

## PREFACE

This document is the Standard Maintenance (STD) Manual for the Daisy Printer models DW/OS-20, DW/22-20, and PC-PM011. It is organized in accordance with the approved STD outline established at the Field/Home Office Publications meetings conducted on September 14th and 15th, 1982. The scope of this manual reflects the type of maintenance philosophy selected for this product (swap unit, printed circuit assembly, chip level or any combination thereof).

The purpose of this manual is to provide the Wang-trained Customer Engineer (CE) with instructions to operate, troubleshoot and repair the Daisy Printer. It will be updated on a regular schedule.

Second Edition (October 1983)

This edition of the Daisy Printer STD manual obsoletes document(s) no. 729-1054. The material in this document may only be used for the purpose stated in the Preface. Updates and/or changes to this document will be published as Product Service Notices (PSN's) or subsequent editions.

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WARNING

\*\*\*\*\*  
\* DO NOT OPEN THE SWITCHING POWER SUPPLY UNDER ANY \*  
\* CIRCUMSTANCE. EXTREMELY DANGEROUS VOLTAGE AND \*  
\* CURRENT LEVELS (IN EXCESS OF 300 VOLTS DC AND UN- \*  
\* LIMITED CURRENT) ARE PRESENT WITHIN THE POWER SUPPLY. \*  
\* DO NOT ATTEMPT TO REPAIR THE SWITCHING POWER \*  
\* SUPPLY; IT IS FIELD REPLACEABLE ONLY. \*  
\* AFTER POWERING THE UNIT DOWN AND DISCONNECTING THE AC \*  
\* POWER PLUG FROM THE WALL OUTLET, ALLOW ONE MINUTE \*  
\* BEFORE REMOVING THE POWER SUPPLY TO PROVIDE ADEQUATE \*  
\* TIME FOR ANY RESIDUAL VOLTAGE TO DRAIN THROUGH THE \*  
\* BLEEDER RESISTORS. \*  
\*\*\*\*\*

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**CHAPTER**

**1**

**INTRO-  
DUCTION**

## CHAPTER 1

## INTRODUCTION

The Product Maintenance Manual provides installation, theory of operation, installation and check-out procedures, corrective and preventive maintenance, removal and replacement procedures, and troubleshooting information for the WANG Daisy Printer models DW/OS-20, DW/22-20, PC-PM011 in the field. An IPB (illustrated parts breakdown) is provided to aid in locating and identifying all the PC's major components.

The level of coverage in the Product Maintenance documentation is directed toward an Associate Field Engineering Technician (AFET) with a minimum of six months field experience who has received qualified PC training either directly from a Wang course instructor or indirectly via Wang video tape.

### 1.1 INTRODUCTION

The WANG 20 CPS Bi-Directional Series Daisy Printers (hereafter referred to as the printer) provides low-cost, letter-quality output for all models of Wang Office Information Systems (OIS), 2200, Professional, and Virtual Storage Computer Systems with combined data processing/word processing mode option.

The printer is bidirectional and uses interchangeable plastic daisy wheels containing 96 characters to print uppercase and lowercase letters, numerals, and special symbols and characters. Additional characters can be obtained by overstriking, a print feature described in both the OIS and VS operators guides. The operator control features are shown in figure 1-1.

The printers can produce a 132-character line (10-pitch), a 158-character line (12-pitch), a 198-character line (15-pitch) with OIS only or a 13-inch line (proportionally spaced characters) at an average rate of 20 printed characters per second (cps). Up to 6-part paper can be used with the printers. Standard features include a print wheel that can be removed without taking off the ribbon cartridge, a Test pushbutton to check on printer operation, and Low and High print impression pushbuttons.

The printer can be mounted on any desk or table top. For Model DW/OS-20, the printer can be located up to 25 feet (7.6 m), with the cable supplied, or up to 2000 feet (609.6 m), with a special order cable, from the master CPU unit. For models DW/22-20 and PC-PM011, the printer can be located up to 12 feet (3.7 m), with the cable supplied from the master CPU unit. Printer options include a Twin-Sheet Feeder for single sheets, Monodirectional and Bidirectional Forms Tractors, and an Envelope Feeder for standard business-size envelopes.

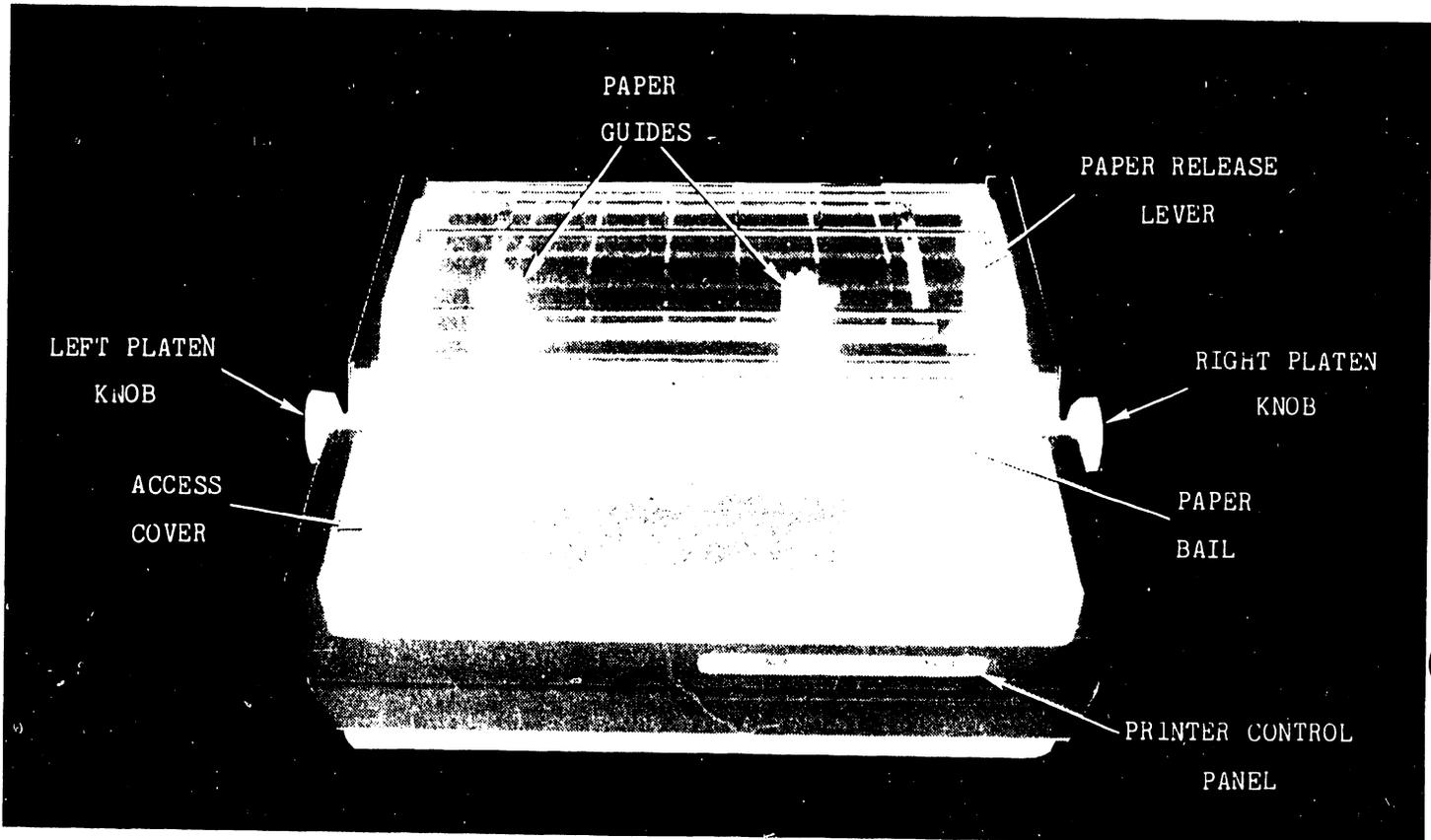


Figure 1-1. Wang 20 CPS Bi-Directional Daisy Printer

1.2 RELATED DOCUMENTATION

To be supplied.

1.3 HARDWARE AND SOFTWARE REVISION LEVELS

To be supplied.

## 1.4 PRINTER SPECIFICATIONS

The following listing provides a summary of the printer capabilities and operational characteristics.

### Printer Size

Height.....9.0 in. (22.9 cm)  
 Height with Forms Tractor.....12.5 in. (31.7 cm)  
 Depth.....19.5 in. (48.5 cm)  
 Width.....25.0 in. (63.5 cm)

### Approximate Net Weight

43.0 lb (19.5 kg)

### Speed

20 characters per second average, bidirectional

### Pitch/Line Length

10-pitch -- 132 characters  
 12-pitch -- 158 characters  
 15-pitch -- 198 characters (OIS only)  
 Proportional spacing -- 13 in. (33 cm)

### Paper Specifications

Minimum Width .....3.5 in. (8.9 cm)  
 Maximum Width .....13.0 in. (33.0 cm)

### Paper Thickness

0.027 in. (0.069 cm) (5 copies, plus original)

### Print Wheels (Plastic Only)

DW/OS Only

<u>10-Pitch</u>	<u>12- Pitch</u>	<u>15-Pitch</u>
<u>Proportional Spacing</u>		
Courier	Courier	Cubic
Theme		
Delegate	Elite	Letter Gothic
Narrator	Letter Gothic	
OCR A	Prestige Elite	
OCR B	Scientific Gothic	
Prestige Pica		
Symbol		

Character Set

96 Characters, plus additional characters created by overstriking

Switches

Top of Page, Select, Test, Low and High Impression  
Test five-section DIP

Indicators

Power, Malfunction, Change Daisy, Test,  
Change Ribbon, Change Paper, Select, Low, High LED's  
Error Code seven segment indicator

Ribbon Cartridges

Carbon (single or multi-strike) or fabric

Cabling

12 ft (3.4 m) - printer to CPU, 18 twisted pair cable. (Parallel I/O)  
50 ft (15.2 m) - printer to CPU, maximum special order, 18 twisted pair  
cable. (Parallel I/O)  
25 ft (7.6 m) - printer to CPU - Twin Coax cable. (Serial I/O)  
2000 ft (609.6 m) maximum special order, Twin Coax cable.

Power Requirements

115 or 230 VAC  $\pm$  10%  
50 or 60 Hz  $\pm$  1 Hz  
1.2 amps at 115V  
0.6 amps at 230 V  
125 watts (427 Btu/hr)

Operating Environment

50°F to 90°F (10°C to 32°C)  
20 % to 80% relative humidity, noncondensing

**CHAPTER**

**2**

**THEORY**

**OF**

**OPERA-**

**TION**

## CHAPTER 2

## THEORY OF OPERATION

2.1 GENERAL DESCRIPTION

The printer is a Z80A Microprocessor controlled device which responds to print commands received from a master CPU via an I/O interface consisting of a Single Board Data Link (SIBLINK) or parallel I/O interface PCO. When the Z80A Microprocessor receives a print command, it directs carriage, print wheel, paper, ribbon, and print hammer movements to carry out the command. The Z80A Microprocessor coupled with a Programmable Read Only Memory (PROM) and a Random Access Memory (RAM) becomes a complete Central Processing Unit (CPU). The Z80A has an 8-bit bidirectional data bus for transferring data, a 16-bit unidirectional bus for addressing the various memories, I/O ports, and 5 control signal lines.

The Z80A obtains its instructions by addressing the PROMS. While performing these instructions; the microprocessor also addresses the RAM (reading and writing), input ports (to obtain current printer information and receive data from the interface), and output ports (to control the stepper motors, keyboard lights, error display information and to pass data to the interface). In order to perform the required printing the Z80A must process and control the data for five major functions as follows: Carriage Movement, Paper feed, Print Wheel Position, Ribbon Advance, and Hammer energy.

The Z80A CPU processes input data from the interface (SIBLINK) which instructs the printer which motor to activate and how many steps and the direction to rotate the motor. The motors used are all stepper motors. The carriage motor moves in steps of 1/120 inch. The daisy wheel motor requires four steps for a one pedal movement. Each step of the paper feed motor moves the paper 1/48 inch. The ribbon advance stepper motor moves the ribbon 0.017 inch per step.

Once a character is specified by the interface, the Z80A determines the shortest distance and the direction for print wheel movement to bring the selected character to a position in front of the print hammer as fast as possible. The Z80A controls the print wheel motor through output port 50.

The Z80A controls the carriage motor through output port 51 to position the carriage assembly (which houses the daisy motor and the print wheel) at the desired position where the character is to be printed.

Ribbon feed is commanded to advance by the Z80A through output port 53. Ribbon feed occurs after the hammer has printed the character.

The Z80A controls the hammer force by outputting the appropriate code for the character being printed to output port 57. All stepper motors must be stopped when the hammer strikes the character to be printed.

## 2.2 DETAILED DESCRIPTION

In the following text, negative (active) signal mnemonics are not barred over the signal mnemonics as shown in the logic diagrams but instead have an asterisk located just after the mnemonic as shown in example below:

e.g. XYZ (barred signal) = XYZ\* (asterisked signal)

### 2.2.1 POWER ON SEQUENCE

When power is applied to the printer, one shot L32-9 (2F4,7886) generates a positive pulse which is inverted by L31 (2F3,7886) to become the MASTER RESET\* pulse. This MASTER RESET\* pulse clears D type FF's L41 (2F7,7886), L46 (2G2,7886), L43 (2F2,7886), L42 (2E2,7886), L45 (2C2,7886), L19 (3C11,7886), L44 (3B11,7886), L50 (2B5,7886); and S-R FF's L33-6 (2D3,7886) and L33-13 (2B2,7886). Also, MASTER RESET\* sets L33-9 (2A10,7886) and L33-4 (2C7,7886) and applies the required initialization pulse to the Z80A CTC L11-17 (1F5,7886). The MASTER RESET\* pulse is anded with XRST\* to generate ZRST\* which sets the Z80A L3-26 (1E3, 7886) program counter to 00,00 HEX (the starting address of Program Memory).

Also, a RESET M\* signal from the interface or either a WR\* or an I/O 40 signal will cause a pulse (MASTER RESET\*) that is of shorter duration to be generated by L32-5 and inverted by L31 that will have the same effect as the pulse generated during the power on sequence.

### 2.2.2 SIBLINK

The Sibling (see logic diagram WL # 210-8038, data link block diagram figure 2-2, and Sibling block diagram figure 2-1) is a single board data link interface which allows data and status to be transferred between a master CPU and the Printer by transferring data at high speed between the master main memory (or disk) and the main memory of the printer. The function of the Sibling can be divided into the three separate sections described below and shown in figure 2-1 and described below:

1. Data-Link Section      The section of the Sibling board or parallel I/O that communicates with the Master (refer to paragraph 2.2.2.1).
2. Memory Section      The section which contains the memory, DMA control, and the CPU (refer to paragraph 2.2.2.2).
3. I/O Section      The section which contains the Input/Output structure, Input/Output signals, and Input/Output commands (refer to paragraph 2.2.2.3).

### 2.2.2.1 Data Link

The Data Link is the portion of the Sibling that communicates with the Master CPU. The master uses this serial link for transferring asynchronous bidirectional data at high speeds between its main memory (or disk) and the main memory of the printer. All transfers of data are performed using Direct Memory Access (DMA) operation at a rate of 4.275 MHz. Serial data to or from the printer is reformatted to parallel bytes when processed internally in the master or the printer. For a general understanding of its operation, the data link portion of the Sibling is discussed from the block diagram level as shown in figure 2-2.

#### a. COMMAND TRANSFERS

The printer can perform the following command transfers:

1. RESTART (Hex code A8)
2. STATUS (Hex code B0)
3. 1-BYTE WRITE (Hex code A3)
4. 256-BYTE WRITE (Hex code A5)
5. 1-BYTE READ (Hex code A2)
6. 256-BYTE READ (Hex code A4)

#### b. HEADER/INSTRUCTION BYTE

Any one of the above listed software transfer commands can be issued to a printer after its status has been checked. Each command received has its own Header/Instruction byte with the exception of STATUS and RESTART commands which only contains the command byte. The four remaining commands involve data transfers and the Header/Instruction byte is the messenger of what type of operation will occur. Hex codes for each command are listed above with the command transfers.

All four data transfer (read and write) commands require an address for each byte of data. Each address consists of two bytes for sixteen bit addressing and these two address bytes precede the data byte.

All Header/Instruction, Address and Data, bytes are configured to eleven bit bytes for serial transmission as shown in table 2-1. Because the commands are transmitted asynchronously, three extra bits are required for detection (start), parity error, and termination (stop) for each transmitted byte. The start bit, the first bit, is used for detection and synchronization with the printer clock pulse. The parity bit, the tenth bit, is used for error detection of lost bits. The stop bit, the eleventh bit, is used for detecting the end of each byte.

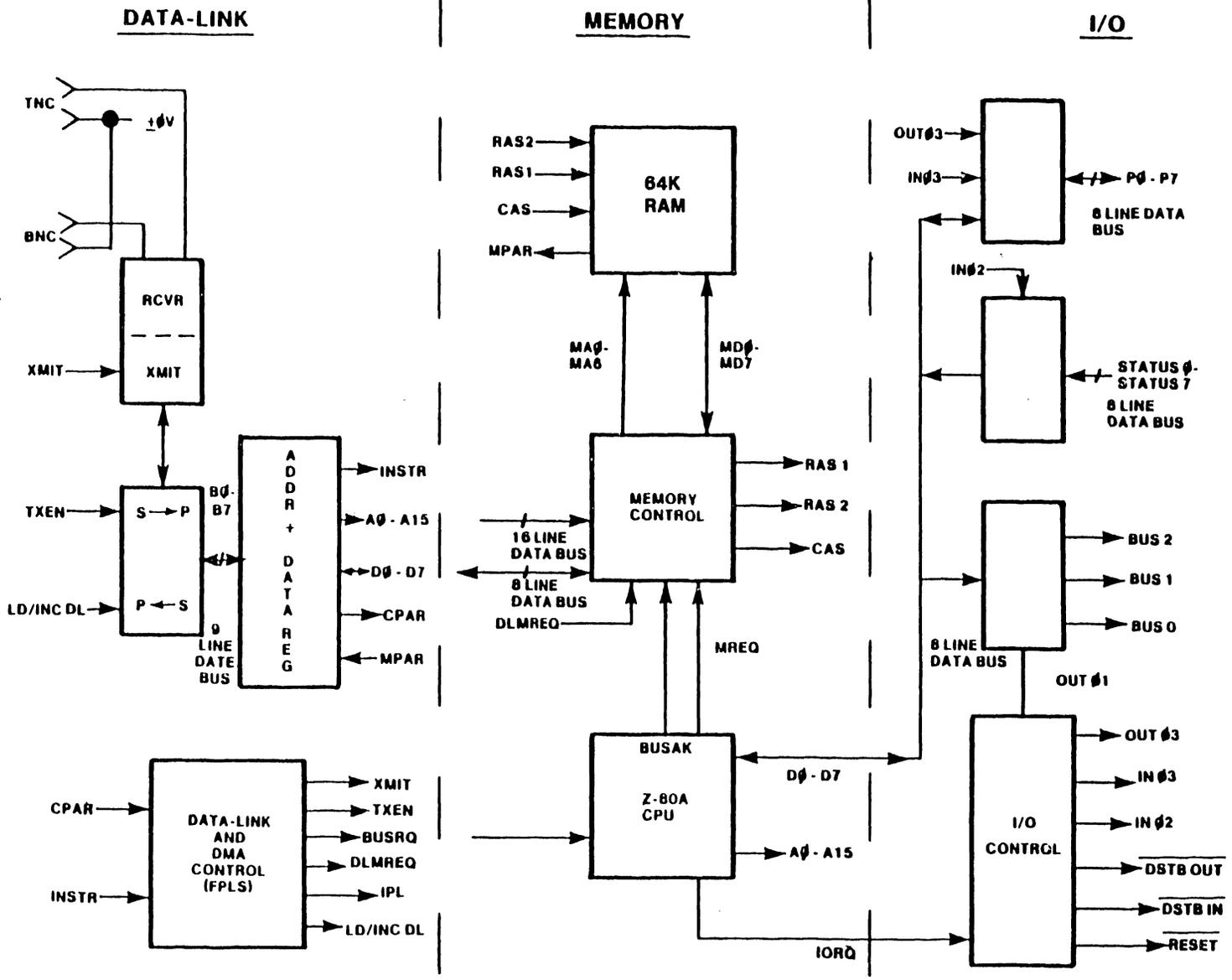


Figure 2-1 Siblink Block Diagram

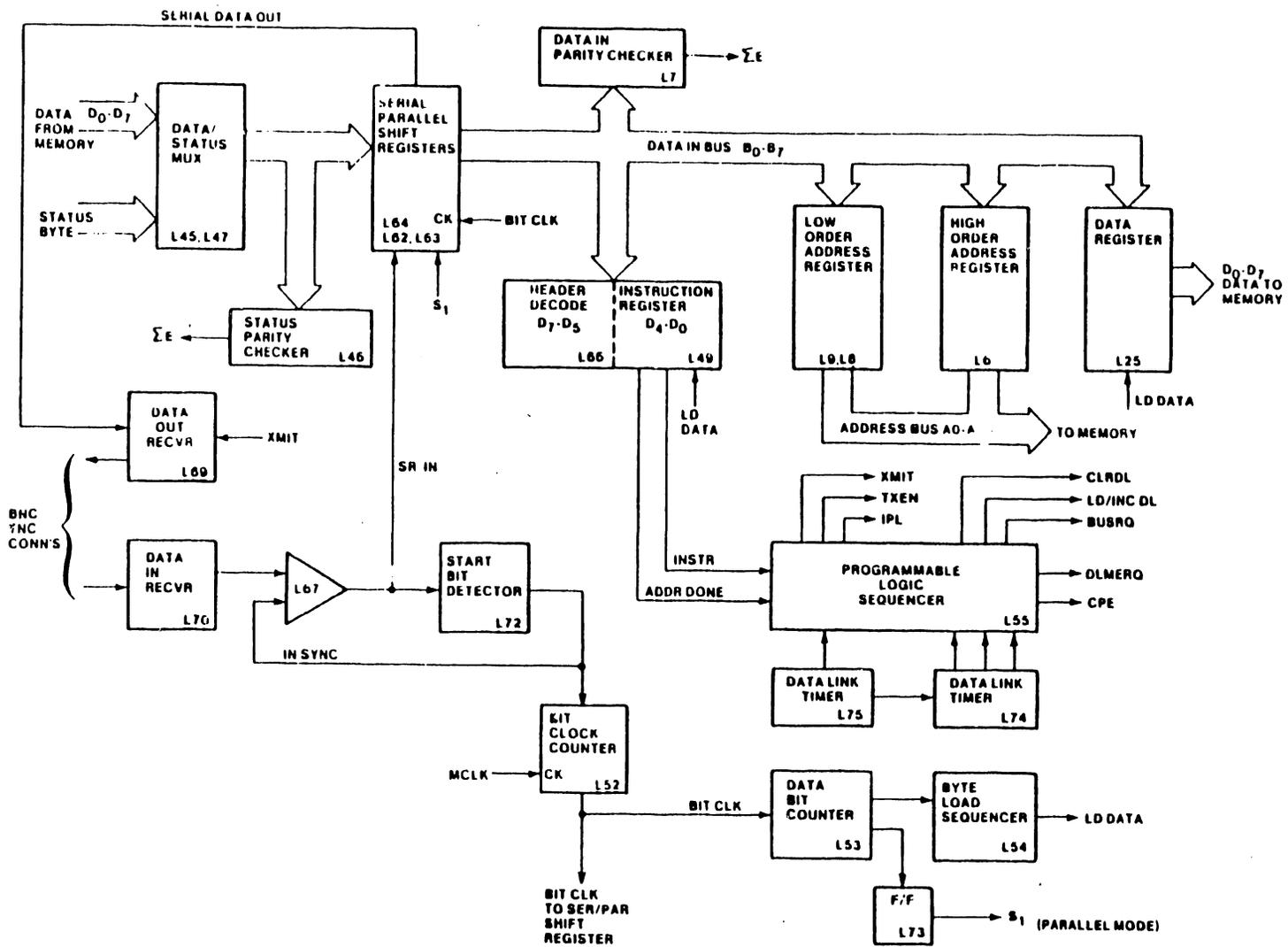


Figure 2-2 Data Link Block Diagram

Header/Instruction bytes, which precede all data transfers, have to be detected and decoded for initiating the proper operation internally in the data link. A header code of 101 (consists of the MSB's D<sub>7</sub> and D<sub>5</sub>) is detected internally to set up the instruction bits (D<sub>4</sub>-D<sub>0</sub>) as shown in table 2-1.

Table 2-1

## TYPICAL HEADER/INSTRUCTION BYTE

TIME 0	MSB*								LSB		
BITS	1	2	3	4	5	6	7	8	9	10	11
	START	D7	D6	D5	D4	D3	D2	D1	D0	PAR	STOP
	1	1	0	1	X	X	X	X	X	X	0
	(SYNC BIT)*										

Each Command Header/Instruction byte is shown in the table 2-2 below.

Table 2-2

## COMMAND HEADER/INSTRUCTION BYTES

TIME 0	HEADER				INSTRUCTION					
	<u>D7</u>	<u>D6</u>	<u>D5</u>	<u>D4</u>	<u>D3</u>	<u>D2</u>	<u>D1</u>	<u>D0</u>	<u>PAR</u>	<u>COMMAND</u>
	1	0	1	1	0	0	0	1	0	STATUS
	1	0	1	0	1	0	0	0	1	RESTART
	1	0	1	0	0	1	0	0	1	256-BYTE RD
	1	0	1	0	0	1	0	1	0	256-BYTE WR
	1	0	1	0	0	0	1	0	1	1-BYTE READ
	1	0	1	0	0	0	1	1	0	1-BYTE WRITE

The Header/Instruction bytes in table 2-2 are decoded in the data link portion of the Siblink and processed as described in the following paragraphs.

### c. TIMING CLOCKS

The master clock (MCLK) for the SIBLINK PCB is a XTAL oscillator Y1 (1G11) which is cut for 21.375 MHz. The master clock (MCLK) is divided by two by D type FF L60 (1G9) to provide the 10.687 MHz SYS CLK which is used for timing in the data link circuitry. The bit clock counter L52 (3A6) divides the master clock by five to derive the 4.275 MHz BIT CLK.

### d. RECEIVE MODE

The Master CPU initiates all data transfers. Data transmitted from the Master CPU to the printer requires the device to be in the receive (REC) mode. The two transfer operations used in this mode are the 1-Byte and 256-Byte WRITE commands. The datalink section of the Sibling remains in the receive (REC) mode during all WRITE transmissions. The printer data link will not accept a READ command until a turn around delay of 8.5 us (REC to XMIT) has timed out to allow the transmitted reflections on the coaxial lines to subside. The datalink section of the Sibling will always be in the receive mode prior to the Master CPU initiating a command.

### e. TRANSMIT MODE

It should be noted that a transmit (XMIT)-to-receive (REC) mode delay in the printer datalink requires 7.5 us. Two commands, 1-BYTE READ and 256-BYTE READ, require accessing the memory on the Sibling PCB (L11-L19 and L29-L37 sheet 3 of 8038) one location at a time and then transmitting the data (D0-D7) via multiplexer L45 (2C9), L/R shift registers L62 (2C7), and transmitter L69 (3B10) to the Master CPU serially and sequentially. STATUS command is a one (1) byte command which accesses the Sibling status register and serially transmits the status byte to the Master CPU prior to a Read or Write command. If the STATUS is in error the operation will be aborted.

### f. HEADER/INSTRUCTION BYTE AND START BIT DETECTION

With the data link in REC mode, every Header/Instruction byte is received serially into the data link by a receiver L70 (3B10) and gated through NAND gate L67 by XMIT signal (low) as Serial In (SR IN) data. The Start Bit Detector and In-Sync FF's L72 (3B8) detect and synchronize the Start Bit which is always a one (1). The Start bit when detected and synchronized sets a latch-up condition during the input of the next 10 bits of each byte.

The In-Sync FF also enables the Bit Counter L52 (3B7) to count. The bit counter L52 produces bit clocks (BIT CLK) at a 4.275 MHz rate which clock the serial data bits into the shift right serial registers L62, L63 and L64 (2E7). Each bit clock (BIT CLK) is generated from five MCLKs. MCLK counts and clears counter L53 (3B6) for each bit of each byte (9). Each serially transmitted byte is delayed (separated) from the previous byte by approximately 11 us. Counter L53 is clocked by BIT CLKs producing a Ripple Carry Out which enables L53 F/F to set, producing a S1 signal at the Q output of D type FF L73 (3A5). Signal S1 gates the serial loaded Header/Instruction byte (and all data bytes) onto the B<sub>0</sub>-B<sub>7</sub> parallel data bus. The header portion 101 (B5, B6, and B7) of Header/Instruction byte is then decoded by L67, L48 and L68 gates (2G5) and loaded into the Instruction Decode register L49 (2G4). If the header code is in error the operation will be aborted.

The HEADER decode produces signal INSTR at the output of L49-15 (2G4) which clocks the five instruction bits into register L66 (2F6). The instruction decodes into one of the six commands. L7 (2E6) is the parity checker for every byte of data received and transmitted by the data link.

#### g. PROGRAMMABLE LOGIC SEQUENCER

L55 (2B4) is a programmable matrix logic sequencer. Once the instruction byte is decoded, the programmed sequencer and the data link timers L74 and L75 (2B6) produce the controls for performing each of the six Header/Instruction commands. Once the Header/Instruction byte is decoded as discussed above, the procedure for completing each instruction is as follows:

##### 1. Restart

This command is decoded in the same manner as all other Header/Instruction bytes, producing a Clear Data Link (CLR DL) signal. This signal clears the data link and any parity error that might exist and also resets the IPL bit. The device is now ready for another IPL and continuation of a Read or Write operation.

##### 2. Status

The STATUS Header/Instruction byte is loaded in the same manner as described for a Header/Instruction byte. The decode starts the data link timers, inhibits any received data and sets the data link to the XMIT mode. The status byte is loaded into MUX registers L45 and L47 (2D10). The status byte is then parallel loaded into the serial/parallel registers L62, L63 and L64 (2D7). The transmit enable (TXEN) signal starts the bit clock counter which shifts the status byte out of the serial register to the L47 multiplexer (2E9) and then via the coaxial cable to the master data link. The STATUS of the printer (slave) data link will always be checked prior to receiving data.

##### 3. 1-Byte Read

This command will decode by setting up a high order address and low order address which consist of two bytes that are each serially loaded into the shift left serial/parallel registers and parallel loaded into address registers. The first byte is the high order address which is loaded into L6 register (2D2) and the low address is loaded into registers L8 and L9 (2E2). The two address bytes access one byte from memory which is loaded into the Quad 2-input mux registers L45 and L47 (2D10). This byte of data is parallel loaded into the parallel/serial registers L62, L63 and L64 (2D7) prior to shifting out the byte serially to the Master. L7 (2E6) checks the parity of the 1-byte read.

##### 4. 256-Byte Read

This command will decode by setting up a high order starting address and a low order address which starts at Hex 00 and is incremented through Hex FF. This method permits a maximum of of 256 bytes per DMA. Each byte of data accessed from memory is loaded into mux registers L45 and L47 (2D10). Each byte is loaded into the parallel load and serial out registers until 256 bytes are read from memory.

### 5. 1-Byte Write

This Header/Instruction command is decoded which provides for two address bytes with a byte of data to be stored in the 64K of memory provided on the sibilink board. The address bytes always precede the data byte. The address bytes are loaded serially and loaded into the address registers in parallel. The data byte which follows is loaded by signal LD DATA into the data register L25 (2B2) and stored in memory at the specified address.

### 6. 256-Byte Write

This command is decoded providing the starting address for 256 bytes of data. The Low Order address is Hex 00 which is always the starting address for a block of data. The low order registers are incremented by the LD/INC DL signal generated at L55-15 (2B4) for each data byte address. Each byte of data following an address is clocked into the temporary data storage register L25 (2B2) by signal LD DATA.

#### 2.2.2.2 Memory

Row Address Select (RAS) and Column Address Select (CAS) logic is employed to address the main memory (64K x 8 RAM, with Parity). The main memory is accessed by a 14-bit address through 7 address lines. This is accomplished by alternating a 14-bit address between RAS and CAS over the 7 address lines (A<sub>0</sub> thru A<sub>6</sub>). Memory is accessible to the CPU and the Data Link via a DMA path.

RAS/CAS cycles are required any time main memory is addressed. Main memory is addressed during these operations:

- CPU instruction fetch/refresh cycle
- CPU data read
- CPU data write
- DMA transfer

A CPU instruction fetch is requested for as long as the CPU indicates that an instruction address is on the address bus. This request is delayed by one CPU clock time.

The function of the Z80 CPU L5 (1D7) is to obtain instructions from the memory section of the Sibilink and perform the required operation. It requires a single +5V power source and a single clock frequency of 3.5625 MHz. The chip uses a 16-bit unidirectional address bus (A<sub>0</sub>-A<sub>15</sub>) and an 8-bit bidirectional data bus (D<sub>0</sub>-D<sub>7</sub>). A reset line initializes the chip and three major status output lines. These lines (MREQ, IORQ, and BUSAK) inform the associated circuitry what function the CPU is about to perform. The MREQ (Memory Request) signal is active when memory is being accessed to fetch either an instruction or data. The IORQ (Input/Output Request) signal goes active to indicate an input or output to the printer or during the previously mentioned interrupt acknowledge cycle. The BUSAK (Bus Acknowledge) is used to indicate to the printer that the CPU address bus, data bus and bus signals have been set to a high impedance so that an external device can now control these signals.

In addition, the Z80 CPU receives a BUSRQ (Bus-Request) input, which requests the CPU to switch its address, data, and status bus lines into the high impedance state so that an outside device may use these buses. The associated BUSAK output goes active when the CPU has complied with this request.

### 2.2.2.3 Input/Output Structure

The three basic parts of the Sibling I/O structure are an eight-bit bidirectional data bus, an eight-bit input status port, and three strobe lines. The three strobe lines are used for:

1. Reading the data bus (RD\*).
2. Writing the data bus (WR\*).
3. Resetting printer/peripheral hardware (PWR ON).

In addition to the three strobe lines the I/O contains three bus select control lines for:

1. Multiplexing the data bus (BUS 0,1,2).
2. Multiplexing the status port (INO2\*).
3. Multiplexing the strobe lines.

The Sibling selects the port with which it wishes to communicate. If fully decoded, this bus is capable of selecting up to 8 different devices. Only that device that is selected will respond to the data strobe signals generated. The selected device will place the appropriate status signals on the shared status lines.

### 2.2.3 CPU PCB

There are three versions of the CPU PCB (210-7886), each of which accommodates the three models of the Daisy Printer. The basic differences between the three CPU PCB's are the PROM loading arrangement and the jumper configuration. The PROM loading chart is contained in table 2-3 and the jumper configuration is contained in table 2-4 and location is shown in figure 2-3.

Table 2-3

#### PROM LOADING CHART

<u>Model</u>	<u>CPU Board Number</u>	<u>L5</u>	<u>L6</u>	<u>L7</u>	<u>L8</u>
DW/OS-20	210-7886-A	378-7001	378-7000	378-7013	Spare
DW/22-20	210-7886-1A	378-7010	378-7009	378-7011	Spare
PC/PM011	210-7886-1B	378-7001	378-7000	378-7013	Spare

Table 2-4

CPU PCB JUMPER CONFIGURATION

JUMPERS	5	6	7	8	
210-7886-A	*N/C	JOIN	JOIN	N/C	*N/C = no connection
210-7886-1A	JOIN	N/C	N/C	JOIN	
210-7886-1B	JOIN	N/C	N/C	JOIN	

BOTTOM LEFT-HAND CORNER

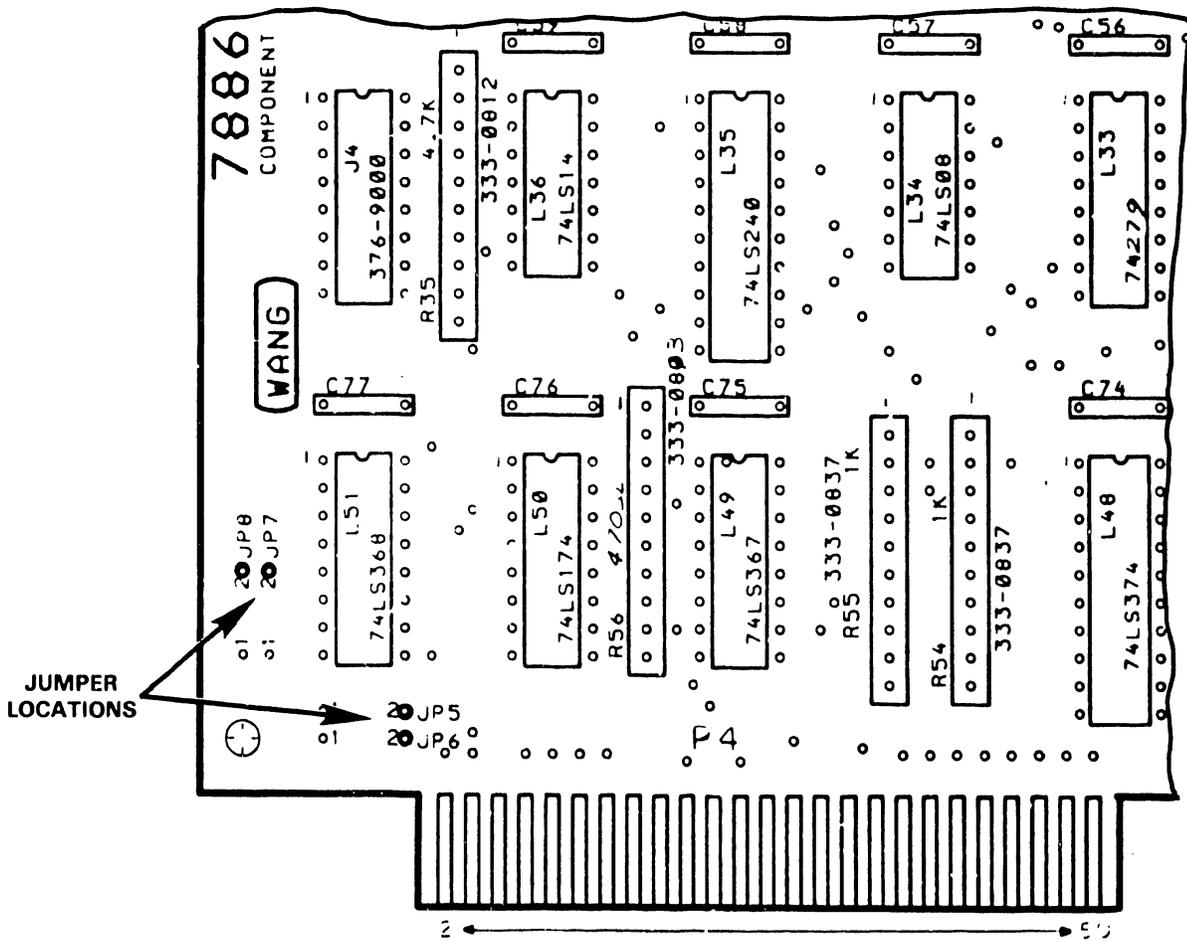


Figure 2-3 CPU PCB Jumper Configuration

The Z80A CPU structure (see figure 2-4 and schematic WL# 7686) for the printer consists of seven major functions.

- 1) L3 Z80A CPU (1F3)
- 2) L2 clock generator (1C3)
- 3) L24 Control Signals Driver (1F2).
- 4) L27 Data Bus Output Driver (1D9)
- 5) L4 and L12 Address Bus Driver (1E2).
- 6) L9 RAM memory (1F7).
- 7) L5, L6, and L7 PROM memory (1D7).

#### 2.2.3.1 Memory Accessing

The printer memory is a combination of PROM and RAM Memory. The PROM memory consists of L5, L6, and L7 (1B,D7) which are 4K by 8 chips. RAM memory L7 (1F7) is a 2K by 8 chip.

The 3 line to 8 line decoder L16 (1F5) is used to select PROM or RAM memory by decoding address lines BA12, BA13 and BA14 and using BA15 as an enable signal. Address line BA15 must be low to select memory causing the memory selected to be in the lower 32K of the 64K address space. Enable signal BA15 low along with signal IORQ\* high and the anded output of signals M1\* and MREQ\* at L15-8 (1G1), either being low, sets the G2A input of L16-4 (1F5) low. This causes the selection of either PROM or RAM memory in 4K blocks. The PROMs occupy the first 16K of memory space at memory locations 0000H through 3FFFH. RAM L9 (1F7) occupys the 4K space 4000H through 4FFFH. Address lines BA0 through BA11 select the locations within PROM (1B,D7). Address lines BA0 through BA10 select the locations in RAM L9 (1F7).

#### 2.2.3.2 Memory Read

When RD\* signal L24-3 (1F2)) goes low it indicates a read operation is in process. If M1\* at L24-9 (1G2) or MREQ\* at L24-11 (1G2) are low a memory read is indicated, and the data from the memory location selected by the address lines and the memory decoder L16 (1F6) is put on the data bus and read by the Z80A L3 (1F3). This sequence is used by the Z80A to fetch its instructions and to obtain data for processing during one of it's machine cycles.

#### 2.2.3.3 Memory Write

Signal WR\* at L24-7 (1F2) going low indicates a write operation is in process. If MREQ\* at L24-11 (1F2) is low a memory write operation is indicated and data from the CPU L3 (1F3) can written into the memory locations selected by the address lines in the 4K memory space of 4000H to 4FFFH of L9 (1F7).

#### 2.2.3.4 I/O Port Command Decoding

##### a Output Command

An output command is generated when signal WR\* at L24-7 (1F1) goes low along with signal IORQ\* at L24-5 (1G1) low. The output port enabled is determined by decoding the lower 8 address lines from L4 (1E2) by L30 (1B7) and L28 (1D5). table 2-5 lists the output ports and their functions.

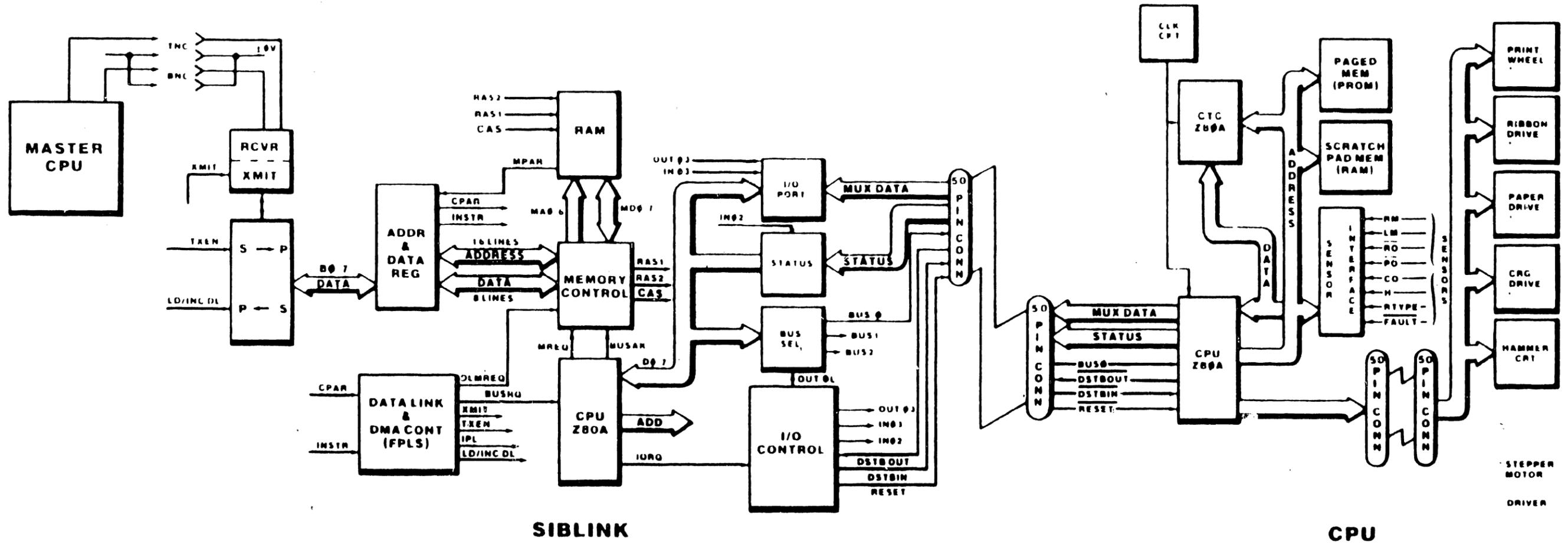


Figure 2-4 Printer Functional Block Diagram

Table 2-5

## OUTPUT PORTS

PORT	FUNCTION
OUT (00)	Out data port to the interface.
OUT (01)	Output for status signals to the interface.
OUT (02)	Sets busy status signal.
OUT (03)	Resets the Data Available status signal.
OUT (04)	Not Defined.
OUT (05)	Hammer strike counter enable line.
OUT (06)	Not Defined.
OUT (07)	Twin sheet feeder/Envelope Feeder control interface.
OUT (20)	CTC Channel 0 control.
OUT (21)	CTC Channel 1 control.
OUT (22)	CTC Channel 2 control.
OUT (23)	CTC Channel 3 control.
OUT (50)	Daisy Motor control.
OUT (51)	Carriage Motor control.
OUT (52)	Paper Feed Motor control.
OUT (53)	Ribbon Motor control.
OUT (54)	Keyboard LED control.
OUT (55)	Alarm and Keyboard switch reset.
OUT (56)	Seven segment display control.
OUT (57)	Hammer Impression control.

## b. Input Commands

An input command is generated when RD\* L24-3 (1F1) goes low along with IORQ\* L24-5 (1G1) low. The enabled input port is determined by decoding the lower 8 address lines from L4 (1E2) at L14 (1E5) and L29 (1B5). Table 2-6 lists the input ports and their functions.

Table 2-6

## INPUT PORTS

PORT	FUNCTION
IN (00)	Input from interface
IN (01)	Sensor Status
IN (02)	Status of keyboard and interface signals.
IN (03)	Dip switch and Arabic control switch status.
IN (04)	Twin sheet feeder/Envelope feeder Interface status.
IN (05)	Hammer strike counter disable line.
IN (06)	Resets busy status signal.
IN (07)	Interface data port test.

## 2.2.4 PRINTER DRIVER PCB

The printer driver PCB is shown in figure 2-3 and in schematic/logic diagram WL# 7868. The printer contains four stepper motors: daisy motor, carriage motor, paper feed motor and ribbon drive motor along with a hammer coil. Each stepper motor is controlled by four phase signals and a hold line. CTC channels 0, 1, 2 and 3 are used in the timer mode for timing the stepper motor phase changes and the hammer on time. When the printer is first powered up all phases will be held low, all motors will be in hold mode, and the hammer stays inactive. Power to the motors and hammer is controlled by the motor enable bit from L-42-10 (2D1,7886). To move a stepper motor the motor enable bit must be high, the phase sequence of 19, 1B, 1C, 14, 16, 12, 13 and 11 or a portion thereof applied the the motor circuitry to move the motor in one direction. To move the motor in the other direction the phase sequence is the opposite of that shown above (note that the ribbon motor can only move forward, it must not be reversed).

A write to the motor ports that turns on phases 1 and 3 or 2 and 4 together (i.e. 15, 17, 1A, 1B, 1D, 1E, and 1F) will turn on the fault circuit consisting of L13 and L23 on the 7868 PCB and will disable power to the motors while the condition exists.

### 2.2.4.1 Motor Drive Circuits

The daisy motor, the carriage motor and the paper feed motor use a constant current drive. This drive has two current levels, the lower of which is selected by the hold bit of the motor port being low. The upper current is selected when the hold bit is high.

Since the three motor circuits are identical except for the components that determine current levels, only the daisy motor circuit will be described. Schematic WL# 7868, page 3, (sections designated by coordinates D -G and 7-11) contain the current drive circuit for one winding of the daisy motor.

Outputting a code of 01H writes a high to D00. Signal D00 high through buffer/driver L12-6 (3F10) turns on Q38. Since the hold bit D HOLD\* is low, buffer/driver output L12-10 (3E9) is low reducing the reference voltage obtained at L20-2 (3E9). Initially there is no current flowing through resistor R120 (3E9) causing L20-3 (3E9) to be at 0 Volts and L20-7 (3E8) to be high. This high is applied to L21-2 and L21-7 (3G11). Since signal D00 is also high, L21-5 (3F10) will be low, turning on transistor Q36 through resistor R87. This causes current to flow through Q36 and out through jack 63 (DPIA) into the motor winding. The current through the motor winding returns through jack 73 (3A7), diode D30 (3F9), transistor Q38 (3F9) and resistor R120 (3E9) to the return line. The current will ramp up until the voltage at L20-3 (3E9) is equal to the voltage at L20-2. At this time L20-7 will go low, reducing the voltage at L20-2 through the voltage divider action of resistors R82, R83, and R84. Transistor Q36 (3G8) will turn off when L21-5 (3G11) turns off. Current now flows into jack 63 (3A7) from the 36 Volt return line through diode D28 (3G7) until the current ramps down sufficiently so that the voltage at L20-3 (3E9) is equal to the voltage at L20 - 2. At this point L20-7 goes high, the voltage on L20-2 goes to the higher level, and the cycle repeats until signal D00 (3E11) goes low.

When the hold bit is high the action described above is valid, except that the reference voltage on L20-2 (3E9) is higher, and thus the current levels are higher.

Inputting a code of 04 or 14 into the daisy motor port will cause the same action as a code of 01 or 11, except that the current will now flow into the motor winding at jack 73 (3A7) from the 36 Volt line through transistor Q37 (3G9) or from the 36 Volt return through diode D29 (3G9), and out of the motor winding at jack 63 (3A7) through diode D27 (3F7), transistor Q35 (3F8), and resistor R120 (3E9) to 36 Volt return.

When signals D00 and D02 are both high, all four transistors (Q35, Q36, Q37 and Q38) will be on causing a short on the 36 Volt line. L23-3 (3F10) goes low if both signals D00 and D02 are high, driving L8-10 (1F6) low, which is inverted by differential amplifier L8-13 (1E6), thus turning off transistor Q34 (1F4) which provides the drive current for transistors Q35 and Q38 (3F8,9) from the +5V line. This removes the current path from + 36 Volts to 36 Volt return.

The ribbon motor is also a stepper motor; but uses a constant current drive of a different type from that of the carriage, daisy and paper feed motors. The ribbon drive circuit is bounded by the coordinates A-D, 7-11 of schematic WL# 7868, sheet 3. The ribbon motor has one end of each winding connected to +18 V and the other end connected to a pin of jack J3. In this description the other end is connected to jack 13 (3A8) and to the collectors of transistors Q32 and Q33 (3B,C8). If the ribbon hold bit is low (R HOLD\*) the ribbon motor is off. When the R HOLD\* bit is high with signals R02 low and R00 high, transistor Q23 is turned on which turns on transistor Q33 pulling the collector of Q33 up to the +36 volt line level. Current then flows from the +36 Volts through resistor R118, transistor Q33 and the winding of the motor to +18 V. When the voltage across resistor R118 reaches the Vbe of transistor Q21 (approximately 0.6 volts) Q21 limits the base of Q33 at a level sufficient to keep the current constant. When signal R HOLD\* is high with signals R00 low and R02 high, L22-6 (3B10) turns transistor Q32 on, pulling its collector down to 0 V. Current thus flows from the +18V through the motor winding, transistor Q32 and resistor R121 to 0V. When the voltage across resistor R121 reaches the Vbe of transistor Q22 the current is limited through transistor Q32 as described above. If both R00 and R02 are high, L23 - 6 will go low and shut off the drive from transistor Q34 as described above in the daisy drive description.

#### 2.2.4.2 Hammer Drive Circuit

The hammer circuit uses current drive controlled by D - A converter L26 (1C10). The value of the six bit word written into the D - A latch L44 (3B10, 7886) determines the current through the hammer. A code of 00 will provide no current, and a code of 3F will provide maximum current. In operation resistor R135 (1C9) sets up a current into the D-A converter of -1.5 milliamperes. The portion of this current that corresponds to the value of the digital word at the D-A converter inputs is pulled through resistor R111 and inverted by L19 (1B8) providing a positive voltage at L19-4. This voltage is the reference voltage and L19 turns on transistor Q2 which drives transistor Q13 (1A5) until the current reaches the level so that the voltage across resistor R11 (1A5) equals the voltage at L19-4, then L19 holds transistor Q2 on at the correct level to maintain the current set by the D-A converter. The CPU turns off the data to the D-A converter at the end of the hammer on time (typically 2 milliseconds). If the hammer data is not set to 00 within a certain length of time (typically 6 milliseconds) the circuit consisting of L25 (1D10), L27 (1D9) and L8-2 (1F7) will turn transistor Q34 off, which turns L8-1 (1D5) off, removing the +15V from the hammer drive circuitry, preventing the hammer circuitry from being kept on continuously if the data is not removed from the D-A converter input.

### 2.2.5 PARALLEL INPUT/OUTPUT INTERFACE PCB (7885)

The parallel I/O Interface PCB is shown in figure 2-5 and in logic diagram WL# 210-7885. The Parallel I/O Interface PCB is a data link interface which allows data and status to be transferred between a master CPU (Professional Computer or a 2200 System) and the Printer by transferring data at high speed between the master main memory (or disk) and the main memory of the printer. It is used in conjunction with either Daisy Printer Model PC-PM011 when interfaced with the Professional Computer or Daisy Printer Model DW/22-20 when interfaced with the 2200 System. In these two models the Parallel I/O Interface PCB replaces the serial Sibling PCB. Its primary function is to convert the Wang's 50-pin standard printer interface to a 36-pin configuration used by either the Professional Computer or the 2200 System.

The 2200 System's version of the card, 7885-1 has the jumper at SP1 and SP2, on the card, cut. The signals from the 50-pin connector are fed through buffers and inverters to the appropriate pin on the 36-pin connector.

The Professional Computer's version of the card, 7885, has the jumper as SP1 and SP2, on the card, joined. The signals from the 50-pin connector, Data and Status, are multiplexed through the Data lines of the 36-pin connector by use of the USRO line of the connector; with USRO high, Status appear on the Data lines of the 36-pin connector and with USRO low, Data is on the Data lines.

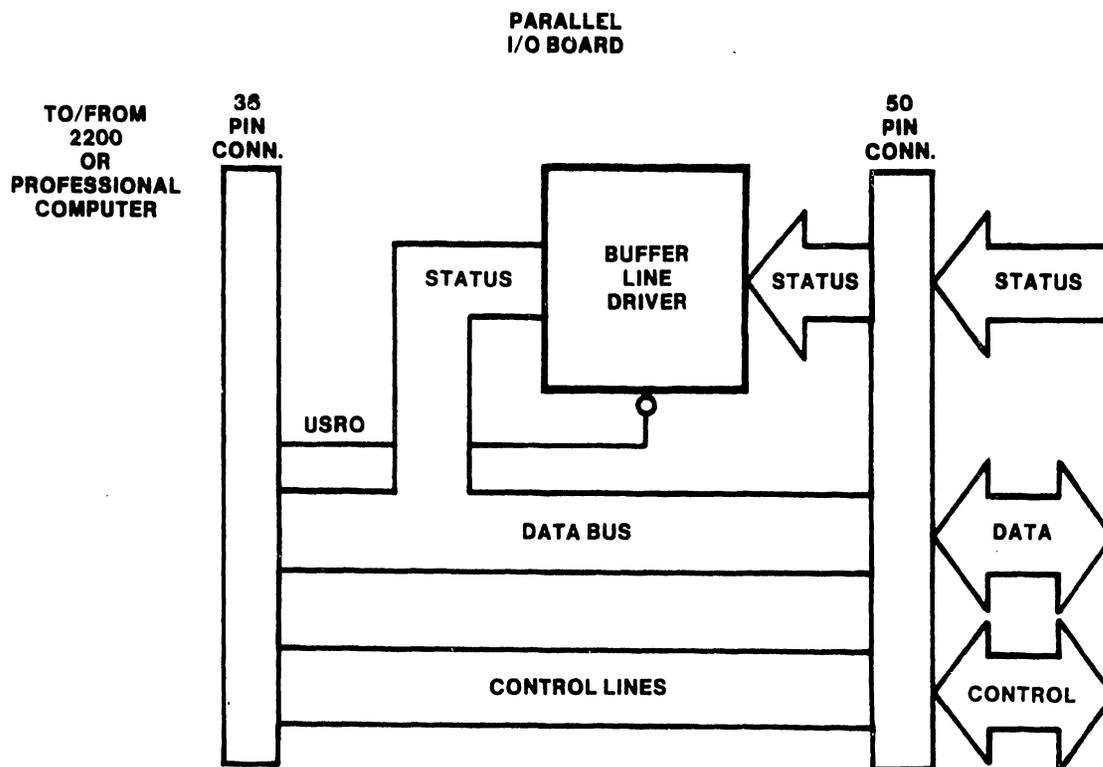


Figure 2-5 Parallel Input/Output Interface PCB Block Diagram

**CHAPTER**

**3**

**OPERA-**

**TION**

## CHAPTER 3 OPERATION

### 3.1 CONTROLS AND INDICATORS

#### 3.1.1 ON/OFF SWITCH

The printer on/off switch is located at the left end of the rear panel (refer to figure 3-1). To turn the printer on, press 1. To turn the printer off, press 0. When the printer is off, the Power lamp on the control panel is extinguished.

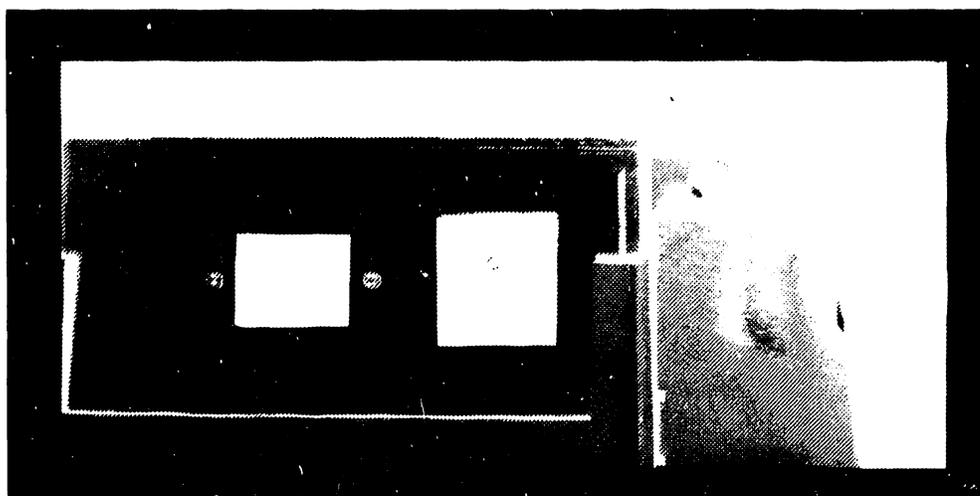


Figure 3-1. Printer Power Switch

#### 3.1.2 CONTROL PANEL

The control panel on the front of the printer (refer to figure 3-2) contains buttons and indicators for controlling printer operation. The indicators provide the operator with a visual cue of printer status. Whenever a Stop condition (Malfunction, Change Daisy, Change Ribbon, or Change Paper) is encountered, the printer stops printing and deselects (the Select lamp extinguishes). In addition, an audible tone sounds and an indicator displays the action required before printing can be resumed. Detailed descriptions of the pushbuttons and indicators follow, together with the operator actions required. After the appropriate action has been performed, the printer must be reselected by pressing the Select switch.



Figure 3-2. Printer Control Panel

#### Select Button

Press the Select button to initially activate the printer or to restart it after it has been deselected. The button lights to indicate that the printer is selected. When the printer is selected, the Low, High, and Test buttons are inactive. Before turning off power to the printer, deselect the printer by pressing the Select button.

#### Top of Page Button

The Top of Page button positions continuous-form paper to the top of the page; it can also be used to reprint an entire page if a problem is noticed during the printing. To reprint the current page, deselect the printer and press the Top of Page button. The printer advances to the top of the next page. Select the printer, and the entire page reprints from the beginning. This button can be used only if the printer is first deselected. It cannot be used to reprint the current page if the last line on the page has been printed, or if the printer is automatically deselected by a malfunction.

#### NOTE

The distance from the top edge of continuous-form paper to the line where printing begins is set by the operator during paper insertion. Refer to DW/20 DAISY PRINTER USER MANUAL (paragraphs 3.5 and 3.6) for instructions on how to set this distance.

The Top of Page button is also used with the optional Twin-Sheet Feeder to eject a sheet of paper from the printer.

### Change Daisy Indicator

Anytime a Stop condition is encountered in the text being printed, the Change Daisy lamp illuminates, an audible tone sounds, and the printer automatically deselected. When this occurs, change the print wheel using the procedure contained in the DW/20 DAISY PRINTER USER MANUAL (paragraph 3.4) then press Select to continue printing.

The Change Daisy lamp also illuminates if the pitch or character set of the current printout is different from the pitch or character set used for the last printout. Press Select to continue printing.

### Change Paper Indicator

When the printer nears the end of the last sheet of paper, the Change paper lamp illuminates, a tone sounds, and the printer automatically deselected. To continue printing one or more lines on the last sheet, press Select once for each line to be added. Use the platen knob to remove the remaining paper from the printer. Insert additional paper into the printer using the procedures contained in the DW/20 DAISY PRINTER USER MANUAL (paragraphs 3.5 and 3.6) and then press Select to continue printing.

### Change Ribbon Indicator

When the printer ribbon cartridge requires changing, the Change Ribbon lamp illuminates, the printer automatically deselected, and a tone sounds. Change the ribbon cartridge using the procedures contained in the DW/20 DAISY PRINTER USER MANUAL (paragraphs 3.2 and 3.3) and then press Select to continue printing.

### Low/High Impression Buttons

The impression control buttons adjust the print intensity. To set these controls, first deselect the printer; then press the Low button for printing single sheets of paper, or press the High button for printing multiple forms. The Low and High indicators show which impression setting is in use.

### Test Button

The Test button prints the nine lines of text shown in figure 3-3 to verify the printer is operational. This button also checks the quality of the printing. Each line is 13.2 inches (33.5 centimeters) in length, and contains all 96 characters on the print wheel. With the printer deselected, insert paper wider than 13.2 inches (33.5 centimeters), press the Test button and then press Select to begin the test printout. Press the Test button a second time to stop the test. If one or more characters do not print uniformly, perform the print wheel cleaning procedure described in the DW/20 DAISY PRINTER USER MANUAL (paragraph 3.7) or replace the print wheel if necessary.



The printer error codes, plus the possible causes for each error and corrective actions to clear the malfunctions, are listed in table 3-1.

Table 3-1. Error Code Descriptions and Corrective Actions

Error Code	Error Location	Description and Corrective Action
0	COVER OPEN	If the printer top cover is raised, the printer stops functioning. This feature is included as a safety measure to protect the operator. The remedy is to close the cover and reselect the printer.
1	CPU	This error is due to a malfunction in the central processor unit (CPU board) in the printer.
2	DATA LINK OR SYSTEM	This error is indicated when there is a fault related to the OIS master or interconnecting cable. It can also be due to a malfunction within the printer. Check that the system power is on and the system is connected.
3	DRIVER CARD	This error is indicated if there is a malfunction in the printer.
4	DAISY HOME	This error is indicated if there is a malfunction in the printer.
5	CARRIAGE SENSOR	This lamp illuminates if the carriage is unable to move because of either a paper jam, an obstruction, or because of a faulty carriage sensor. Try to remove the jammed piece of paper using the Top of Page switch. If paper can not be removed by this method, switch off printer power. If there is an obstruction in the carriage, such as a foreign object or piece of paper, remove it. Turn on the printer and then press Select switch. If the same error is indicated, further troubleshooting is required.
6	FEEDER	If a Twin-Sheet Feeder and an Envelope Feeder are both connected to the printer at the same time, this number will be displayed. To correct this indication, switch off the power, disconnect one of the feeders from the printer, switch the power on and press the Select switch.
7	MIDDLE EAST MODE	This number is illuminated whenever the Middle East Mode switch is in the On position (up).

#### 3.1.4 MIDDLE EAST MODE SWITCH

The Middle East Mode switch is located on a panel below the printer top cover, and is shown in figure 3-4. This switch is normally set to the off position, toward the front of the printer. When using an Arabic language print wheel, this switch should be set to on to cause the printer to print so that the text reads from right to left. When this switch is on, the error code indicator displays the numeral 7. If a malfunction occurs, another error code is displayed.

#### 3.1.5 TEST SWITCHES

A group of five test switches, located under the printer cover and shown in figure 3-4, are intended for use by the customer service engineer. These switches should all be set to the Off position for normal printer operation. These switches provide the software control for the diagnostic tests contained in chapter 4.

**CHAPTER**

**4**

**INSTAL-  
LATION**

## CHAPTER 4

### INSTALLATION

The installation instructions contained herein cover operational site requirements and preparation of the equipment through initial operational checkout.

#### 4.1 SITE PREPARATION

- a. Ensure that the correct ac power outlet is available at the site connected to either 115 Vac (+10, -15%) at 60Hz or 230Vac (+10, -15%) at 50Hz power .
- b. The main power cable requires a grounded three prong receptacle.
- c. The printer must be located within 6.5 ft. of the a.c. power receptacle.
- d. The printer is a desk-top (table) model. Choose an adequate piece of furniture (see specification in Chapter 1).

#### 4.2 ENVIRONMENTAL CONSIDERATIONS

The recommended ambient temperature for the printer is 15°C to 28°C (60°F to 80°F). Temperature control is an important factor because the printer is cooled by the surrounding room air. If the system is situated in direct sunlight, there should be a shading device available to eliminate excessive heat.

The recommended ambient relative humidity should be maintained between 40%-60%.

Normal precautions should be taken to keep dust, dirt, and other foreign matter out of the printer. The amount of contamination typically found in the air in a normal business environment will not interfere with the operation of the equipment.

Static electricity can interfere with operation of the printer. It can be minimized or eliminated either by not installing printer in a carpeted area, removing the carpeting from the area the printer is to be installed in or by treatment of the carpet with an anti-static spray. Additionally, for new installations select furniture with anti-static upholstery and metal wheels, and maintain room humidity at about 40% (particularly during winter months) to control static electricity.

### 4.3 UNPACKING

The printer is packaged in a cardboard container containing the following items:

- a. Two ribbon cartridges
- b. Two daisy print wheels
- c. Printer ac power cord
- d. Installation and instruction manual
- e. One 25 ft. (7.6m) dual coax cable (Printer to Master CPU) (Serial I/O).

One 12 ft. (3.4m) 18 twisted pair cable (Printer to Master CPU)  
(Parallel I/O).

The printer unit is shipped on a two-piece wood pallet with a cardboard box strapped over it (see figure 4-1). Styrofoam protection is provided at the top and bottom of the box. The unit is removed by cutting the packing straps, lifting the top cover of the box with the styrofoam protection from the top of the printer and then lifting the printer from the cardboard box/pallet.

### 4.4 SYSTEM INTERCONNECTIONS

After unpacking the printer, place it in the planned location and complete the following interconnection.

- a. Connect the 6.5 ft. ac power cable from the ac power input receptacle at rear of the printer to the designated grounded three-prong power output receptacle.

### 4.5 INITIAL TURN ON AND POWER UP DIAGNOSTIC TESTS

- a. Turn the printer on (do not connect to master CPU unit) and wait until the Malfunction LED (see paragraph 3.1.2) illuminates. The seven segment Error Code display (see paragraph 3.1.3 and figure 3-4) should display a 2.

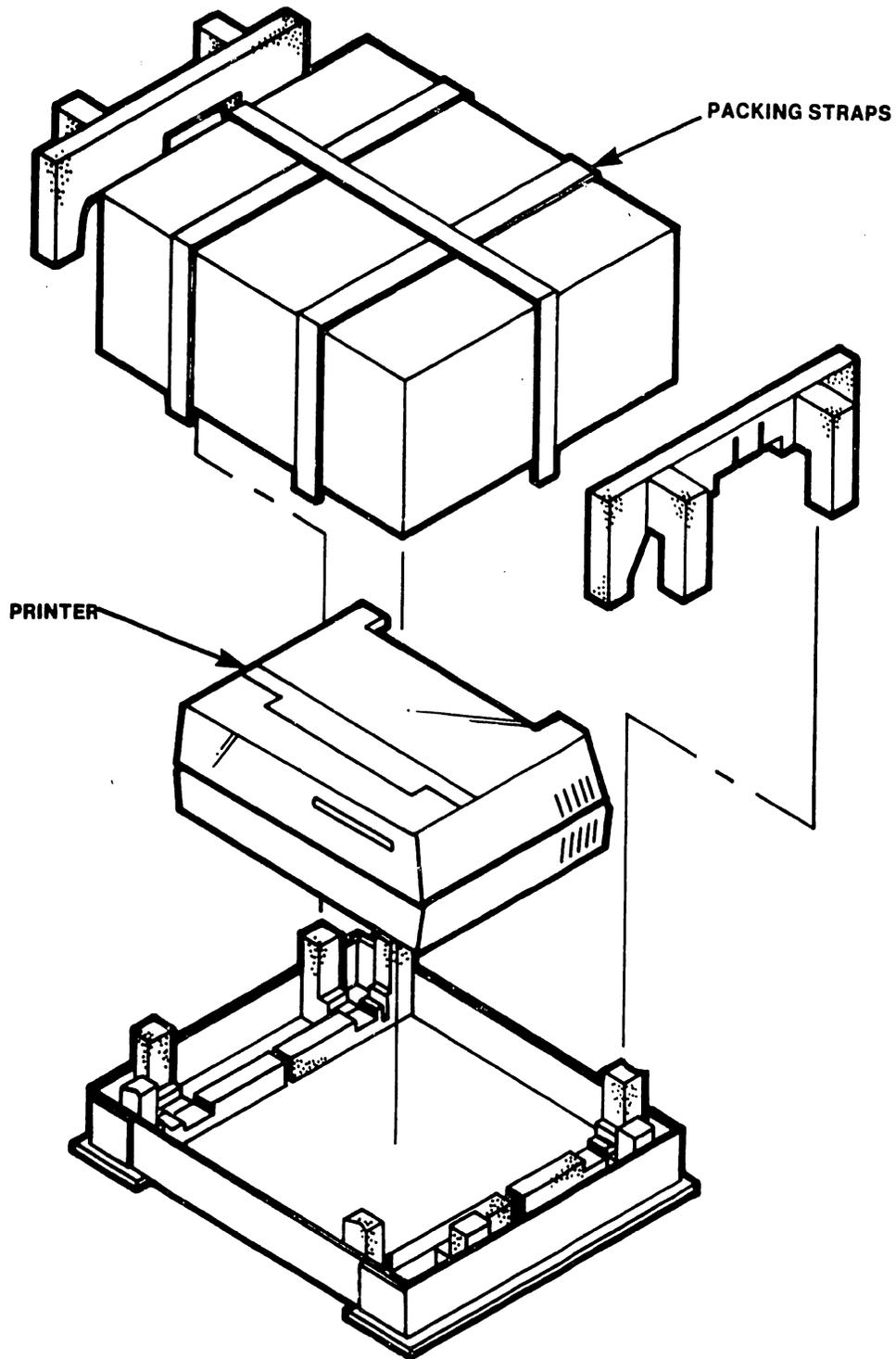


Figure 4-1 Printer Unpacking

## WARNING

```

*****
*
* DO NOT OPEN THE SWITCHING POWER SUPPLY UNDER ANY
* CIRCUMSTANCE. EXTREMELY DANGEROUS VOLTAGE AND
* CURRENT LEVELS (IN EXCESS OF 300 VOLTS DC AND UN-
* LIMITED CURRENT) ARE PRESENT WITHIN THE POWER SUPPLY.
*
* DO NOT ATTEMPT TO REPAIR THE SWITCHING POWER
* SUPPLY; IT IS FIELD REPLACEABLE ONLY.
*
* AFTER POWERING THE UNIT DOWN AND DISCONNECTING THE AC
* POWER PLUG FROM THE WALL OUTLET, ALLOW ONE MINUTE
* BEFORE REMOVING THE POWER SUPPLY TO PROVIDE ADEQUATE
* TIME FOR ANY RESIDUAL VOLTAGE TO DRAIN THROUGH THE
* BLEEDER RESISTORS.
*
*****

```

## NOTE

In order to measure the following voltages the printer must have at least one PCB installed to load the power supply.

## WARNING

DO NOT ATTEMPT TO ADJUST EITHER THE +5 VDC OR +40 VDC POWER SUPPLIES UNLESS THERE ARE ACCESS HOLES SPECIFICALLY CUT IN THE POWER SUPPLY CAGE TO PERFORM THESE ADJUSTMENTS

- b. Using the digital voltmeter, measure the -5, +5, +12, -15, +15, +20, and +40 Vdc power supply voltages at the cables as listed below. Refer to the printed circuit board schematics listed below for test point locations. If the +5 Vdc supply is out of tolerance, adjust resistor R 31 (through the hole in the switching power supply cage). If the +40 Vdc supply is out of tolerance, adjust resistor R5 (through the hole in the switching power supply cage). If either the the +5 Vdc or the +40 Vdc supply can not be adjusted to within tolerance replace the switching power supply.

## NOTE

IT IS POSSIBLE TO ISOLATE A PCB MALFUNCTION THAT OVERLOADS A POWER SUPPLY OUTPUT BY INSERTING ONE PCB AT A TIME UNTIL THE MALFUNCTION IS FOUND.

VOLTAGE	TOLERANCE	LOCATION	WIRE COLOR	ADJUSTABLE
-5 Vdc	-4.8 to -5.2 Vdc	7886 & 7868	WHITE	NO
+5 Vdc	+4.9 to +5.10 Vdc	7886 & 7868	VIOLET	YES
+12 Vdc	+11.6 to +12.4 Vdc	7886 & 7868	YELLOW	NO
-15 Vdc	-14.5 to -15.5 Vdc	7886 & 7868	GREEN	NO
+15 Vdc	+14.5 to +15.5 Vdc	7886 & 7868	BLUE	NO
+20 Vdc	+19.0 to +21.0 Vdc	7868	ORANGE	NO
+40 Vdc	+38 0 to +42.0 Vdc	7868	RED	YES
0 Vdc		7868	BLACK/BROWN	NO

- c. Set the printer up as required for the specific test to be run by setting the five section dip switch (see figure 3-4) to the setting required for the desired test (see table 4-1).
- d. On the printer front panel, first press the Test switch and then the Select switch. Note that the selected test begins immediately.
- e. If the Malfunction LED illuminates check the Error Code Indicator (figure 3-4) and refer to field service Error Code descriptions and corrective action (paragraph 4-6) for information as to printer fault. Note that some of the tests use the front panel LED's (including the Malfunction LED) and then the seven segment display (see figure 3-4) as a final readout. Do not test output with an error code generated by an actual fault.

Table 4-1  
TEST SWITCH SETTINGS

TEST NAME	DIP SWITCH NO.				
	1	2	3	4	5
BURN IN	ON	OFF	ON	OFF	ON
SELF TEST/MECHANISM VERIFICATION TEST	OFF	OFF	OFF	OFF	OFF
SENSOR TEST	OFF	OFF	OFF	OFF	ON
SWITCH TEST	OFF	OFF	OFF	ON	OFF
PRINT QUALITY ADJUSTMENT TEST	OFF	OFF	OFF	ON	ON
DAISY HOME ADJUSTMENT TEST	OFF	OFF	ON	OFF	ON
SEVEN SEGMENT DISPLAY TEST	OFF	ON	OFF	OFF	ON
POWER UP DIAGNOSTIC TEST	OFF	ON	ON	OFF	OFF
TWIN SHEET FEEDER FEED TEST	ON	ON	ON	OFF	OFF
TWIN SHEET FEEDER EJECT TEST	ON	ON	ON	OFF	ON
ENVELOPE FEEDER FEED TEST	ON	ON	ON	ON	OFF
ENVELOPE FEEDER EJECT TEST	ON	ON	ON	ON	ON

#### 4.6 THE FIELD SERVICE ERROR CODES

The field service error codes will appear only when the Burn In and the Power Up Loop diagnostic tests are being run. The error codes displayed are more detailed than the customer error codes described in chapter 3. While the customer error codes will only display the first error code encountered, all the error codes that occurred during a Burn In run will be flashed on the seven segment display at two second intervals. The codes are as follows:

- P - Segments A,B,E,F, & G  
     PROM Error  
         The PROM checksum failed; replace the PROMs L5, L6 and L7 on 210-7886.
- A - Segments A,B,C,E,F & G  
     RAM Error  
         The RAM failed its read/write test; replace the RAM L9 on 210-7886.
- c - Segments E,D, & G  
     CTC Error  
         The CTC failed to generate an interrupt; replace the CTC L11 on 210-7886.
- b - Segments C,D,E,F & G  
     Bi-directional port error  
         Latches to data link have failed; replace latches
- d - Segments B,C,D,E & G  
     Driver card missing  
         Insert driver card into printer
- o - Segments C,D,E & G  
     Driver card communication lines have failed  
         Insert driver card into printer and measure -15 Vdc level

Decimal point means that a chopper drive phase has failed.

To find which motor has failed:

- Segment F indicates carriage
- Segment A indicates paper feed
- Segment C indicates daisy wheel

To find which phase has failed:

- Segment E indicates phase 1
- Segment G indicates phase 2
- Segment C indicates phase 3
- Segment D indicates phase 4

An example is when the decimal point, Segment A, and Segment C illuminate indicating that the paper feed phase 3 circuitry has failed. Because the chopper drive uses a bridge circuit, two phases usually fail together (phases 1 and 3 or phases 2 and 4). If only one phase has failed it usually means that there is a loose connection between the motor and the motor/driver card.

## Segments A,C,D,E,F &amp; G

## Twin Sheet/Envelope Feeder error

Both the Twin Sheet and Envelope feeders are connected to printer, disconnect one of the feeders.

## NOTE

The following four error codes (segments F, B, E, and C) may appear in combination with each other:

## Segment F

Left margin sensor held on. This error is displayed if the left margin sensor does not turn off during carriage home.

## Segment B

Left margin sensor held off. If the left margin sensor does not turn on after the carriage has moved to the left margin, this error will be displayed. Sometimes this error is caused if the right margin sensor is wired into the connector for the left margin on the sensor harness.

## Segment E

Right margin sensor held on. If the left margin is malfunctioning, the home routine will check the state of the right margin sensor to detect whether the carriage is jammed.

## Segment C

Right margin sensor held off. If left margin sensor has failed, the right will be tested to attempt to sense problems with the carriage.

## Upside down u - Segments A,B,C,E, and F

Carriage is jammed. If during the carriage home routine neither margin can be made to turn on after several attempted moves, the program assumes that the carriage is jammed in the middle of the platen.

## Segment A

Daisy home sensor remains on. This error will appear if the daisy home sensor can not be turned off by stepping the print wheel off of home several times.

## Segment D

Daisy home sensor remains off. This error will appear if the print wheel is stepped through twice without the home sensor turning on.

Other observable malfunctions that can occur to the printer are as follows:

1. Carriage assembly does not move. Check the -15 Vdc supply output as described in paragraph 4.5 b.
2. Carriage assembly moves, but printer does not print. Check the +15 Vdc supply output as described in paragraph 4.5 b.
3. If none of the printer functions operate, change the Z80A CPU chip L3 on the CPU board 210-7867.

#### 4.7 BURN IN

##### 4.7.1 GENERAL

Burn In is the customer engineering procedure used to test the printer's electronics and print mechanism's without connecting them to a system. Burn In performs print tests interspersed with long period of internal hardware checks. Each cycle of printing and testing will be labeled to assist in determining the length of time spent in Burn In. The first error encountered in Burn In will halt the test and display the error code on the seven segment display.

Burn In contains the following sequence of tests:

- One loop through the power up diagnostics.
- The printing of the first pass number.
- One cycle of the print quality adjustment test.
- The running of the mechanism verification test.
- Cycling through the power up diagnostics for approximately 24 minutes.

The power up diagnostics portion of the Burn In sequence consists of the following tests:

- PROM test
- RAM test
- CTC test
- Driver board presence test
- Driver board communication test
- Chopper drive circuitry test (not implemented)

The next pass number is printed followed by repetition of the Burn In sequence of print and power up tests as described in paragraph 4.7.2:

##### 4.7.2 BURN IN TEST PROCEDURE:

- a. Ensure that the printer is disconnected from the system.
- b. Set the five test dip switches to the setting for Burn In.
- c. Load 13.0 inch paper into the printer.
- d. Turn the printer on.
- e. The Test, Select, and Low Impression LED's will illuminate and printer will start the first pass if all hardware is operating correctly.
- f. If there is a hardware error, the Malfunction LED will light and the Error Code seven segment display will display the customer engineering error code for the particular fault. Refer to paragraph 4-6 for a complete description of the customer engineering fault error code displays.
- g. Burn In will halt and restart exactly where halted if the printer is deselected during Burn In.

- h. If a print error such as paper out, ribbon out, or cover open occurs during printing; the Burn In test halts when the printer deselects.
- i. When the print error is cleared and the printer is reselected, Burn In will restart where it was interrupted.
- j. If a hardware fault is encountered during testing the Malfunction LED will illuminate. Then the Error Code seven segment display will cycle through and display each error code generated by the fault for two seconds (refer to the customer engineering error codes contained in paragraph 4-6).
- k. If the Test Switch is pressed during printing the Burn In test will stop and all LEDs will be extinguished. The printer can then be restarted only by turning the printer off and then on again.
- l. The printer switches are only monitored during printing. If one of the switches is pressed during the Power Up Diagnostic test, it will not affect the test.

#### 4.8 SELF TEST AND MECHANISM VERIFICATION TEST

##### 4.8.1 GENERAL

The mechanism verification test doubles as the customer initiated self-test. The test consists of printing nine-132 character lines (see figure 3-3) at ten pitch (giving a 13.0 inch line or full platen width). Each of the nine lines begins with a "T" to test vertical alignment. The first eight lines simply step the wheel petal-by-petal to check the print quality of each character. The ninth line of characters tests horizontal registration. It begins with a "T" which is followed by the alpha/numeric sequence "ErZ2mE" repeated to complete the remaining spaces of the ninth line to end the test.

The test starts using a low hammer force but can be changed to high hammer force by pressing the high hammer force switch (depressing the switch may cause a delay in printing as long as the switch is held down). The ribbon type, paper out, ribbon out, and cover open switches operate normally.

##### 4.8.2 SELF TEST AND MECHANISM VERIFICATION TEST PROCEDURE:

- a. Set the five test dip switches to the setting for the self test.
- b. Place a supply of 13.0 inch paper into the platen.
- c. Press the Test and then the Select switch.
- d. If the printer hardware operates correctly the Test and Low LED's will light and the Malfunction LED will be extinguished.
- e. If the Malfunction LED illuminates check the Error Code seven segment display. It will display one of the customer display Error codes (see Table 3-1) detailing the fault that prevents the test from being run.

- f. Press the Select switch. The printer should start printing. If it does not one of the front panel LED's will light indicating either a ribbon out, paper out, cover open, or malfunction stopped the test. Clear (correct) the error condition and write down the fault code on the Error Code display and press Select again to reselect the printer.
- g. The printer will start printing the nine lines. It will stop printing and deselect if:

Paper out occurs  
 Ribbon out occurs  
 Cover is opened  
 Select is pressed while printing

Printing will resume at exactly the same point when the error condition is cleared and the Test is re-selected by pressing the Select switch.

- h. Pressing the Test switch will stop the test before completion and return the printer to the system operation (master CPU) if test was running while system was connected to printer. Otherwise the printer will wait for the initiation of another test.
- i. When all nine lines have been printed, the printer will reset switches and wait for either another test command or system commands.

#### 4.9 SENSOR TEST

##### 4.9.1 GENERAL

The sensor test shuts off power to all the printer motors to allow them to be moved freely and displays the status of certain printer sensors on the Error Code seven segment display as well as the front panel LED's.

##### 4.9.2 SENSOR TEST PROCEDURE

- a. Set the five test dip switches as shown in table 4-1 for the sensor test, press Test switch and observe that the Test LED illuminates. Manually move the printer mechanism's through the sensors limits described below and observe that the Error Code indicator segments illuminate and extinguish as described below.

The Error Code display has seven segments along with the decimal point used to describe the sensor status which are labeled as follows:

	<u>Segment A</u>	
<u>Segment F</u>		<u>Segment B</u>
	<u>Segment G</u>	
<u>Segment E</u>		<u>Segment C</u>
Decimal Point	<u>Segment D</u>	

Segment A reflects the state of daisy home sensor. If the daisy wheel is at home position, segment A will light, if daisy is not at home position segment A will be extinguished. Rotating the daisy wheel should activate the sensor causing segment A to blink on then off as the daisy wheel passes home position.

Segment B reflects the state of the right margin sensor. When the carriage is at the right margin sensor segment B will light. Pushing the carriage to the extreme right activates the right margin sensor

Segment C as well as the Change paper LED on the front panel reflect the state of the paper out sensor. If there is no paper in the platen both segment C and the Change paper LED will light.

Segment D as well as the Malfunction LED reflect the state of the cover open switch. If the cover is open both segment D and the Malfunction LED will light.

Segment E as well as the Change ribbon LED on the front panel reflect the state of the ribbon out sensor. If a change ribbon condition exists (the reflective surface has moved in front of ribbon out sensor) both segment E and the Change ribbon LED will light.

Segment F reflects the state of the left margin sensor. If the carriage is at the left margin, segment F will light (pushing the carriage to the extreme left energizes the left margin sensor).

Segment G reflects the state of the ribbon type switch. If a single-strike ribbon is installed (tab at bottom of cartridge is broken) segment G will light.

The Decimal Point reflects the state of the reverse print switch (located next to the Test- five section dip switch). The decimal point will light when the reverse print switch is energized.

- b. Pressing the Test switch again stops the sensor test and resets the printer.

#### 4.10 SWITCH TEST

##### 4.10.1 GENERAL

The switch test checks the functioning of the Select and Impression membrane switches on the control panel. The Test switch can not be checked but must be working in order to initiate any of the tests.

##### 4.10.2 SWITCH TEST PROCEDURE

- a. Set the five test dip switches for the switch test as shown in table 4-1.

- b. Press the Test switch and observe that the Malfunction, Change Paper, Change Daisy, Change Ribbon control panel LED's illuminate while the Low, High, and Select LED's remain extinguished.

NOTE

Only the first switch pressed during the following test sequence will initiate a switch test. When this switch is released the next switch can be pressed to initiate the next switch test.

- c. Press the Select switch and observe that the Select LED and segment A of the test panel seven segment indicator illuminate.
- d. Press the control panel Low Impression switch and observe that both its Low LED and segment F of the test panel indicator illuminate.
- e. Press the control panel High Impression switch and observe that both its High LED and segment B of the test panel indicator illuminate.
- f. Press the control panel Test switch again to end the test. This resets the control panel LED's and the error code display.

#### 4.11 PRINT QUALITY ADJUSTMENT TEST

##### 4.11.1 GENERAL

The print quality adjustment test provides a uniform method for judging the mechanical alignment of the daisy head and the hammer. The test continuously prints out three full platen width lines of text. The printer prints first a full platen line of underscores, then a line of cents signs and finally a line of capital H's (the H's are all printed on virgin ribbon no matter what type ribbon is installed in the printer). The ribbon type switch operates normally for all lines of text other than capital H's. The Burn In test uses this test but stops it after three lines; whereas, during this test it runs until the Test switch is pressed.

##### 4.11.2 PRINT QUALITY ADJUSTMENT TEST PROCEDURE

- a. Set the five test dip switches for the print quality adjustment test as listed in table 4-1.
- b. Load full-platen width paper into the printer.
- c. Press the Test switch.
- d. If the printer is operating normally, both the Test and Low LED's will illuminate and the Malfunction LED will extinguish.
- e. If the Malfunction LED illuminates, check the Error Code seven segment display to identify the malfunction.

- f. Press the Select switch and observe that the printer starts printing.
- g. The printer will stop printing and deselect if either paper out occurs, ribbon out occurs, cover opens, or the Select switch is pressed.
- h. Press the Select switch to cause the printer to resume printing at the interrupted character.
- i. Press the Test switch to end the test.

#### 4.12 DAISY HOME ADJUSTMENT TEST

##### 4.12.1 GENERAL

The daisy home adjustment test provides the procedure for setting the daisy wheel home position. When the daisy wheel is instructed to find home position, it first clears the home sensor by moving the wheel ten petals clockwise from the home sensor (if the home sensor does not turn off after several tries the sensor is assumed to be stuck on). The wheel is then stepped one petal at a time counterclockwise until the home sensor turns on.

After the sensor is energized, the printer checks the current daisy motor phase. If it is not the home phase ( phase eight or HEX FC ) the wheel is moved phase by phase until the home phase is reached. The problem that arises when adjusting the daisy wheel for home position is that the sensor is two petals wide and each petal is four phases wide which makes it advisable to fine tune the daisy motor so that the first phase that turns it provides a daisy home between phases 3 and 6.

##### 4.12.2 DAISY HOME ADJUSTMENT TEST PROCEDURE

- a. Set the five test DIP switch for the Daisy Home Adjustment test as listed in table 4-1.
- b. Press the Test switch.
- c. The seven segment error code display will clear.
- d. Press the Select switch .
- f. The daisy wheel will drive to home position. If the daisy does not home because of a hardware failure the Malfunction LED will illuminate and the seven segment error code display will display the error.
- g. After the daisy wheel successfully drives to home position, it will step off the home sensor then move toward home one phase at a time with a very long time delay to find the first phase that turn the home sensor on.

- h. The wheel will continue moving to the home petal and the phase which turned the sensor on will be displayed on the seven segment display. The phases are displayed as regular numbers from one to eight. If the sensor never turns on, the decimal point in the display will turn on.
- i. After the test is completed the alarm will sound and the printer will deselect. Power will remain applied to the daisy wheel. Press the Test switch to terminate the test.

#### 4.13 SEVEN SEGMENT DISPLAY TEST

##### 4.13.1 GENERAL

The Display test provides a method to check the integrity of the seven segment test display. The validity of error codes can be assured once the test has been run and all segments are operating correctly.

##### 4.13.2 SEVEN SEGMENT DISPLAY TEST PROCEDURE

- a. Set the five test dip switches as shown in table 4-1 for the Display test.
- b. Press the Test switch.
- c. Observe that all the segments of the seven segment test display extinguish and then the display will then blink on and off at two second intervals.
- d. Pressing the Test switch again will terminate the Display test.

#### 4.14 POWER UP DIAGNOSTIC TEST

##### 4.14.1 GENERAL

The power up diagnostics are the same as those used in the Burn In test (paragraph 4.7)

##### 4.14.2 POWER UP DIAGNOSTIC TEST PROCEDURE

- a. Set the five test dip switches to the settings shown in the Burn In test as described in paragraph 4-7.
- b. Press the Test Switch.
- c. The power up diagnostics will run in a loop for the same amount of time that is described in Burn In. The first error encountered will halt the test (The Test LED will extinguish and the Malfunction LED will light). The seven segment display will flash the Field Engineering Error Codes that were generated by the fault. This code will flash on and off at two second intervals. The test can not be halted except by turning the printer off. After the power up diagnostic test has run for the specified time for the Burn In test, control is returned to test mode for the completion of the tests contained in the Burn In test sequence.

#### 4.15 TWIN SHEET FEEDER FEED TEST

##### 4.15.1 GENERAL

The Twin Sheet Feeder (TSF) checks the hardware used by the TSF.

##### 4.15.2 TWIN SHEET FEEDER FEED TEST PROCEDURE

- a. Set the five-test dip switches to the setting for the TSF Feed test as listed in table 4-1.
- b. Attach the Twin Sheet Feeder to the printer.
- c. Place paper into both bins of the Feeder
- e. Turn the printer on.
- f. Press the Test switch and observe that the following operations occur:

The carriage and daisy will home, then the carriage will move 4.5 inches from home to guide the paper into the printer. If there is an error in homing the carriage; the routine will stop and set the seven segment display to the applicable error code.

If there is a sheet of paper in the printer, it will be ejected into the TSF pickup bin. Then a new sheet will be fed from bin one.

If the TSF driver circuitry is working correctly, a sheet of paper will be fed into the printer.

The test will automatically terminate when the sheet has been fed.

#### 4.16 TWIN SHEET FEEDER EJECT TEST

##### 4.16.1 GENERAL

The TSF eject test checks that the TSF will eject a sheet of paper from the printer.

##### 4.16.2 TWIN SHEET FEEDER EJECT TEST PROCEDURE

- a. Follow the instructions for TSF feed test to feed a sheet of paper into the printer.
- b. Set the five test dip switches for the TSF Eject test as listed in table 4-1 .
- c. Press the Test switch.
- d. If there is a sheet of paper in the platen area, it will be ejected into the TSF pickup bin.
- e. The test will automatically terminate when the sheet of paper has been ejected.

#### 4.17 ENVELOPE FEEDER FEED TEST

##### 4.17.1 GENERAL

This test checks the operation of the envelope feeder driver and sensor circuitry on the CPU card.

##### 4.17.2 ENVELOPE FEEDER FEED TEST PROCEDURE

- a. Set the five test dip switches to the setting for the EF Feed test as listed in Table 4-1.
- b. Attach the Envelope feeder to the printer.
- c. Fill the Envelope feeder with envelopes.
- d. Turn the Envelope feeder on.
- e. Press the Test switch and observe the following operations:.

If there are no other hardware errors, the carriage and daisy will home. The carriage will move to the center of the envelope to assist in guiding the envelope into the platen.

If all feeder circuitry is working an envelope will be fed.

The process will repeat with the ejection of an envelope in the platen and the feeding of another envelope.

The test will continue until an envelope misfeed or when the test switch is pressed leaving the last envelope fed in the printer platen.

#### 4.18 ENVELOPE FEEDER EJECT TEST

##### 4.18.1 GENERAL

The envelope feeder eject test checks to ensure that the feeder ejects an envelope from the printer to its stacker tray.

##### 4.18.2 ENVELOPE FEEDER EJECT TEST PROCEDURE

- a. Refer to the instructions for the Envelope Feeder Feed test (paragraph 4.17) to insert an envelope into the printer platen.
- b. Set the five test dip switch to the setting for the Envelope Feeder Eject test as listed in Table 4-1.
- c. Press the Test switch.
- d. The carriage will home and move to the center of the envelope.
- e. If there are no hardware errors the envelope will be placed into the feeders pickup bin.

- f. After the envelope has been ejected into the stacker tray the test will automatically stop.

#### 4.19 INSTALLATION OF OPTIONAL EQUIPMENT

##### NOTE

THE CPU BOARD (210-7886) CONTAINS ALL THE ELECTRONICS REQUIRED FOR THE OPERATION OF BOTH THE TWIN SHEET FEEDER AND THE ENVELOPE FEEDER.

##### 4.19.1 INSTALLATION OF THE TWIN SHEET AND ENVELOPE FEEDER KIT UJ 206-1196

The twin sheet feeder and envelope feeder kit contains a mounting plate with two self threading screw holes, a six pin keyed threaded connector, a 15 pin DIP connector, a ribbon cable with DIP connectors, and a six wire cable hard wired to the six pin keyed threaded connector with its remaining end terminated with a DIP connector.

- a. Remove the Siblinc protective cover plate.
- b. Remove the Siblinc PCB and disconnect the connector from jack J1.
- c. Remove the two #4 pan head screws and the blank cover plate from the rear panel of the printer.
- d. Secure the mounting plate to the printer rear panel with the two #4 pan head screws removed in step c. above.
- e. Insert the 16 pin DIP connector into jack J4 on the CPU board.
- f. Insert the eight pin keyed connector into jack J3 on the CPU board.
- g. For the standard application, set the Siblinc board (WL# 210-8038-1A) switches for an address of 404 (see figure 4-2) as follows:
  - SW 1 - bits 1, 2, 3, 4, 5, 7, 8 OFF and bit 6 ON
  - SW 2 - bits 1 through 8 OFF
  - SW 3 - bits 1, 3, 4 ON and bit 2 OFF
- h. For the nonstandard three line down application using the TSF, set the Siblinc (WL# 210-8038-1A) board switches for an address of 414 (see figure 4-2) as follows:
  - SW 1 - bits 1, 2, 3, 5, 7, 8 OFF and bits 4 and 6 ON
  - SW 2 - bits 1 through 8 OFF
  - SW 3 - bits 1, 3, 4 ON and bit 2 OFF
- i. Insert the Siblinc board into the printer and reconnect its cable connector to jack J1.
- j. Install the Siblinc protective cover in position behind the Siblinc board.

DEVICE TYPE = 0404FF

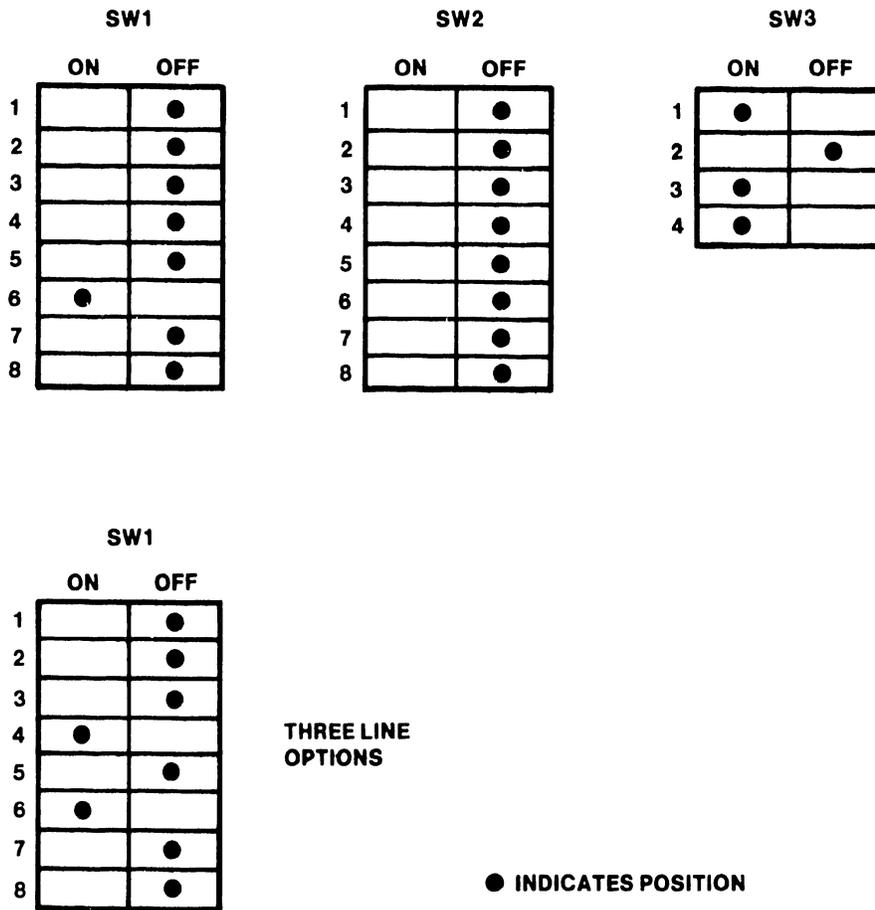


Figure 4-2 Siblink (PCB 8038-1A) Switch Settings

# **CHAPTER**

## **5**

# **PREVENTIVE AND CORRECTIVE MAINTENANCE**

## CHAPTER 5

## PREVENTIVE AND CORRECTIVE MAINTENANCE

This chapter contains:

- Preventive Maintenance: The periodic inspection and lubrication of the system to reduce rate of failures.
- Corrective Maintenance: The adjustment, calibration, and replacement of components as required to restore the system to proper working order.

### 5.1 PREVENTIVE MAINTENANCE

Preventive maintenance is the normal cleaning and inspection which is done either every six months, every 500 hours of operation, or at each service call; whichever occurs first. The printer needs cleaning and minimal lubrication, followed by visual inspection of the print quality. The time required for these procedures is about 15 minutes.

#### 5.1.1 CLEANING AND INSPECTION

1. Remove power from printer, and open or remove covers.
2. Inspect the printer, including the carriage drive cable system, for signs of wear and loose or broken hardware. Check the platen and carriage system for looseness or wobble and for foreign materials.
3. Remove the platen, paper cradle, ribbon cartridge and printwheel and inspect for signs of wear.

4. Clean the printer. Remove paper residue, ink, dust, etc., with alcohol-saturated cleaning pads and wipers. Check particularly the carriage rails and pulley grooves.
5. Clean the platen, platen pressure rollers, and paper bail rollers with Fredron Platen Cleaner, or equivalent. Do not use alcohol on these items.
6. Clean the hammer actuator with a cloth or brush.

#### 5.1.2 LUBRICATION

Lubricate the printer as follows: DO NOT EXCEED THE RECOMMENDED AMOUNTS.

1. Carriage rail bearing: put 4 or 5 drops of #10 weight oil on either side of the carriage, and move carriage back and forth.
2. Remove the two caps from the hammer armature pivots, and apply IBM #23 grease on pivot pin. Do not oil the parts. To locate the lubrication points, refer to figure 5-1.

#### 5.1.3 VISUAL INSPECTION (figure 5-2)

Printing characteristics to check are:

1. Character Spacing: A row of uppercase "H"'s shows any spacing problems present in the machine.
2. Print Consistency: Type a sentence such as "The quick brown fox...", which uses all the alphabet in a random order.
3. Condition of the Print Wheel (Worst Case): Check I, E, H, X
4. Evenness: Type a line of under-scores.
5. Line Spacing: Six line feeds equals one inch.

- ① APPLY IN SMALL AMOUNTS-USE OIL SYRINGE
- ② APPLY IN SMALL AMOUNTS-USE GREASE SYRINGE
- ③ APPLY THIN FILM TO SHOCK MOUNT SURFACES
- ④ USE LIGHT MACHINE OIL FOR CARRIAGE GUIDE SHAFTS

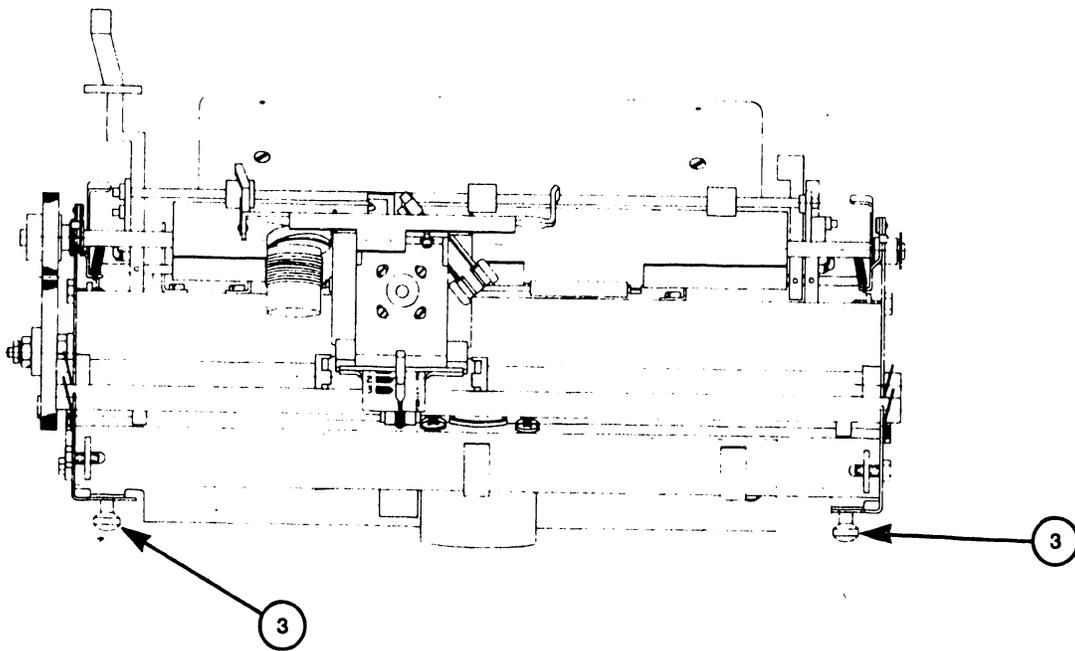
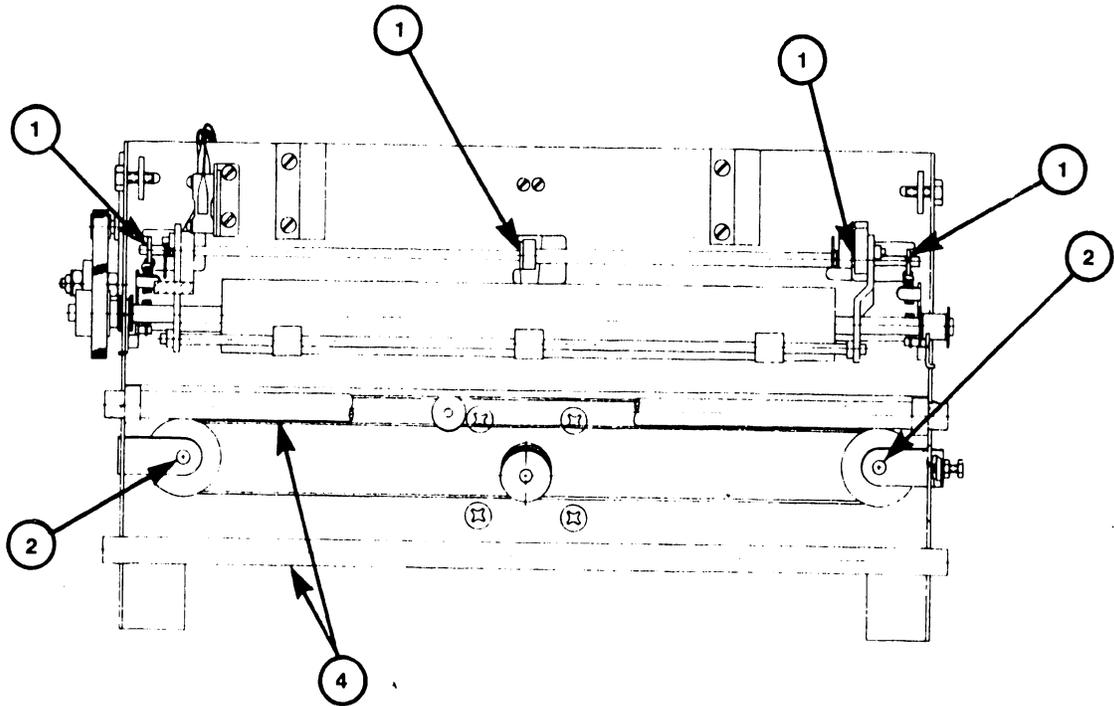


Figure 5-1 Lubrication Points





## 5.2 CORRECTIVE MAINTENANCE

Corrective maintenance comprises checks and adjustments, and components replacement, possibly indicated as necessary by diagnostic test results. Paragraph 5.2.1 describes component checks and appropriate adjustments; paragraph 5.2.2 describes component replacement.

### 5.2.1 CHECKS AND ADJUSTMENTS

This paragraph describes checks and adjustments for the Printer Assembly.

All apparently faulty mechanical assemblies and components should be checked for proper adjustment before removal or replacement. If the check shows them as out-of-tolerance, correct the adjustment. Only if proper adjustment fails to correct the problem, should components be removed or replaced. Always go through the adjustment and/or alignment procedures after replacing a mechanical part or assembly.

Some adjustment procedures require removal of the covers of the printer. To remove the covers see the instructions in paragraph 5.2.2.

The following tools and equipment may be needed for adjustment and/or alignment.

Alignment Disk (printer)	WL 580-0152
Knob	WL 655-0274
Hammer Gauge/Cable	
Alignment/Tension Tool (PRT)	WL 580-0225
Feeler Gauge .028"/.032"	
Pin Gauge .030"/.060"	WL 726-9726
Allen-wrench set	
Digital Voltmeter	

#### 5.2.1.1 Printer Assembly

Printer assembly aspects checked/adjusted are:

- Print-wheel-to-platen gap
- Hammer-to-platen gap
- Print hammer angle
- Print wheel home position
- Print solenoid arm and lamination
- Cord tension
- Backlash
- Card guide
- Left margin home position

- End-of-ribbon sensor
- Ribbon drive
- Daisy wheel damper
- Ribbon height

#### 5.2.1.1.1 Print Wheel to Platen Check

This check determines whether the characters on the printer Daisy wheel are positioned at the proper distance from the printer's platen. The check is made by replacement of the Daisy wheel with an alignment disk and use of the alignment tool to gauge the print-wheel-to-platen gap. The alignment is correct if possible to insert the alignment tool between the two with little effort and if there is a very slight drag on the alignment tool when it is worked back and forth between the two.

Do the print wheel to platen adjustment (para 5.2.1.1.2) only if the gap is incorrect. Check the print-wheel-to-platen gap as follows:

1. With system power off, remove the print wheel from the carriage motor assembly.

#### NOTE

Be certain to support assembly by grasping Hammer Housing assembly with one hand during step 2.

2. Insert print wheel alignment disk (WL #580-0152) in place of the Print Wheel (alignment disk's raised side should be positioned toward the hub). (See figure 5-3.) Hold alignment disk in place by a knob (WL #655-0274).
3. Lift bail roller assembly away from platen.
4. Return daisy motor assembly to its normal operating position (holding by hammer housing assembly). Be certain that the daisy motor assembly is properly seated.
5. Set small end of the hammer gauge (WL #580-0225) forward on the platen in line with the alignment disk (figure 5-4).
6. With the alignment disk and alignment tool in position and the copy control lever in position 1 indent, remove/insert alignment tool. The alignment tool should just lightly contact the disk.

#### NOTE

Under these circumstances, the gap between the platen and print wheel is within 0.095 and 0.105 inch (0.240 and 0.270 cm). (See figure 5-5.)

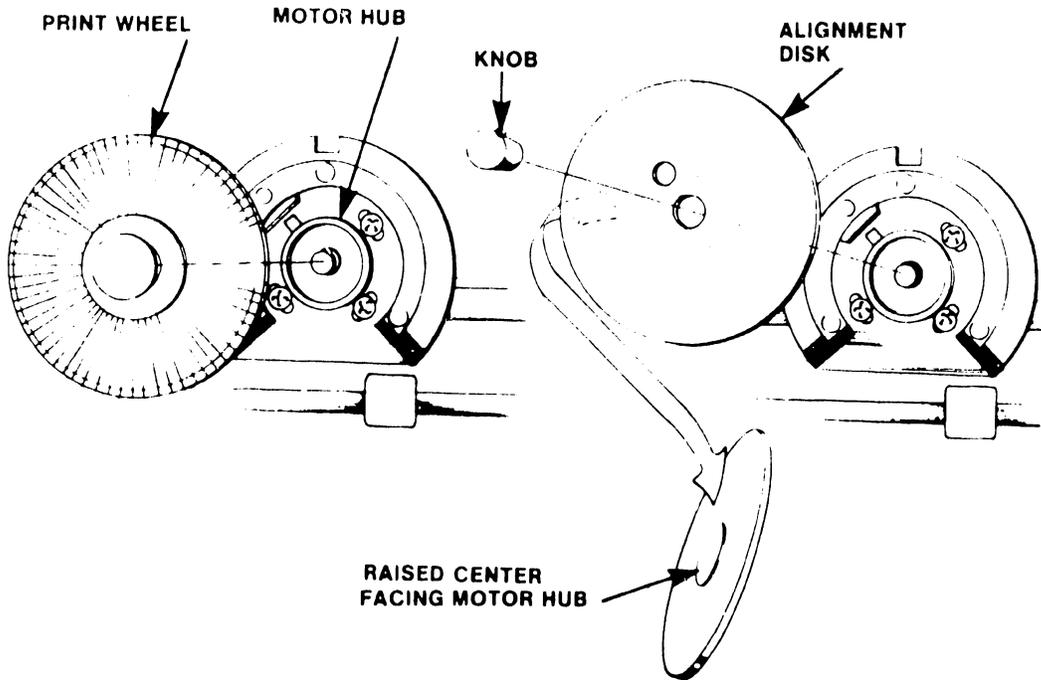


Figure 5-3 Print Wheel and Alignment Disks

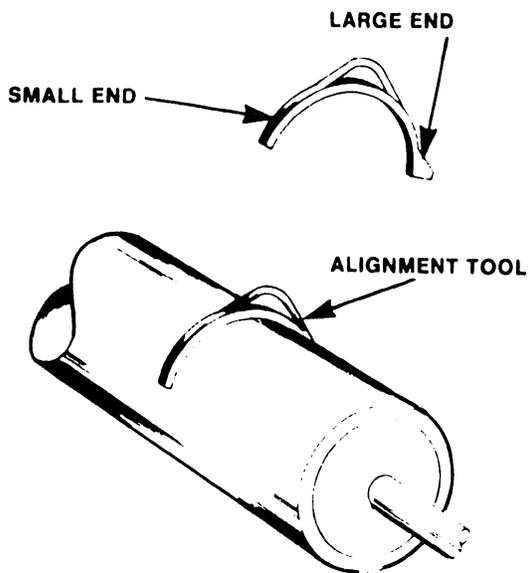


Figure 5-4 Alignment Tool Using Small End

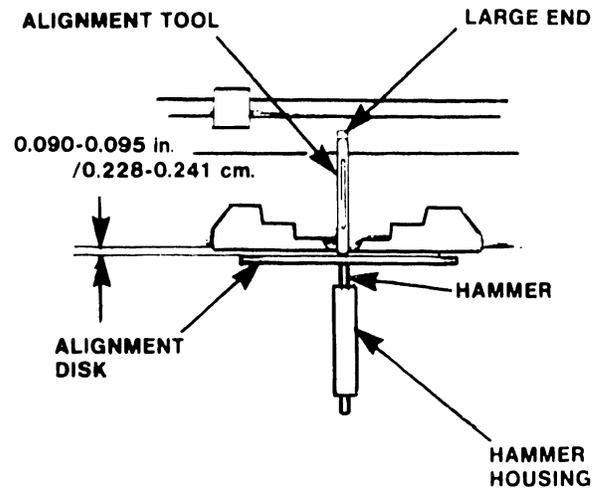


Figure 5-5 Print Wheel-to-Platen Spacing

7. Rotate print wheel approximately 180 degrees and ensure a happy medium at both positions.
8. Remove alignment tool, knob, and alignment disk (by grasping the alignment disk perimeter).
9. Replace print wheel. Put carriage assembly in its normal operating position. Replace ribbon.

#### 5.2.1.1.2 Print Wheel to Platen Adjustment

1. With the power off, remove the print wheel from the carriage assembly.
2. Remove print wheel by grasping and pulling hub firmly to release.

#### NOTE

Be certain to support assembly by grasping Hammer Housing assembly with one hand while performing step 3.

3. Insert alignment disk (WL #580-0152) in place of the Print Wheel (alignment disk's raised side should be positioned toward the hub). (See figure 5-3.) Alignment disk is held in place by a knob (WL #655-0274).
4. Lift bail roller assembly away from platen.
5. Return carriage assembly to its normal operating position (holding by hammer housing assembly). Be certain the daisy assembly is properly seated.
6. Set the small end of the alignment tool (WL #580-0225) forward on the platen in line with the alignment disk (figure 5-3).
7. Loosen four Phillips head screws on the carriage assembly (figure 5-6) and then tighten them so they are only slightly snug.
8. Snap the daisy motor assembly into its normal operating position (grasp by hammer housing).
9. Set the small end of the alignment tool (WL #580-0225) forward on the platen in line with the alignment disk (figure 5-4).
10. Adjust the carriage assembly so that the alignment tool fits loosely between the alignment disk and the platen and the carriage assembly is parallel with both the platen and the carriage base plate (the assembly on which it is mounted). See figure 5-6.
11. Tighten the four phillips head screws and repeat the check as a final adjustment.

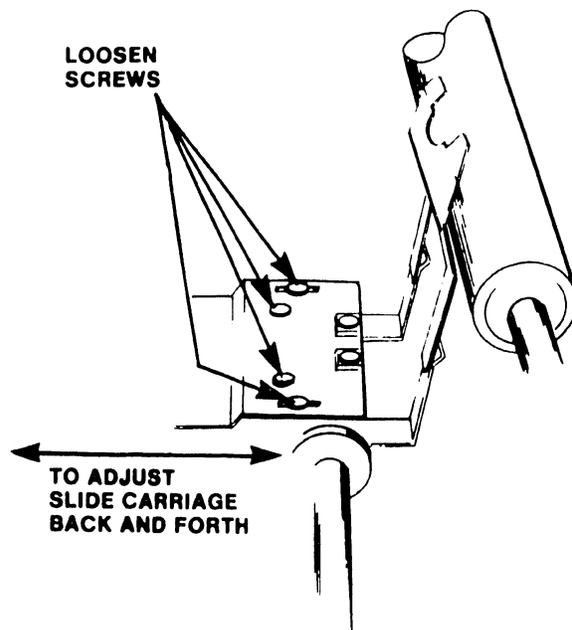


Figure 5-6 Print-Wheel-to-Platen Adjustment

12. Remove alignment tool and alignment disk; replace print wheel and ribbon.
13. Return printer to normal operating condition and print a test document which contains lines of all capital letters.
14. Check printout for even printing of all characters and repeat portions of this procedure as necessary to achieve normal printing.

#### 5.2.1.1.3 Hammer-to-Platen Check

1. Remove print wheel; close daisy assembly and make sure it is seated in the latch.
2. Set large part of the alignment tool (WL #580-0225) forward on the platen in line with print hammer (see figures 5-7 and 5-8). With the print wheel removed and the copy-control lever in position 1, the large end of the alignment tool should just touch the hammer.

#### NOTE

Under these conditions, the gap between the platen and hammer will be within 0.242 to 0.248 inch (0.610 to 0.630 cm).

3. Perform the adjustment procedure if necessary. Otherwise, return the printer to normal operating conditions.

#### 5.2.1.1.4 Hammer-to-Platen Adjustment

To adjust for the proper clearance between the hammer and the platen, perform the following procedure.

1. With the large end of the alignment tool on the platen in line with the hammer, loosen the two screws that mount the yoke assembly to the motor (see figure 5-9).
2. Move yoke assembly until the hammer just touches the large end of the alignment tool.
3. Tighten the two screws and return the printer to normal operating conditions.

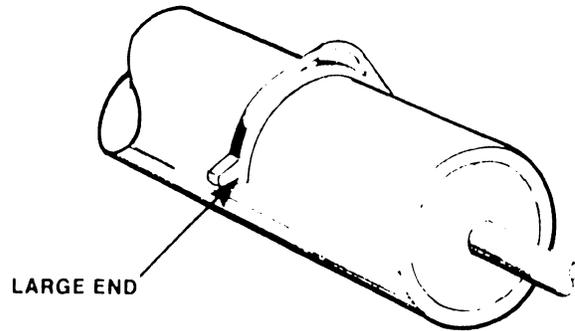


Figure 5-7 Alignment Tool using Large End

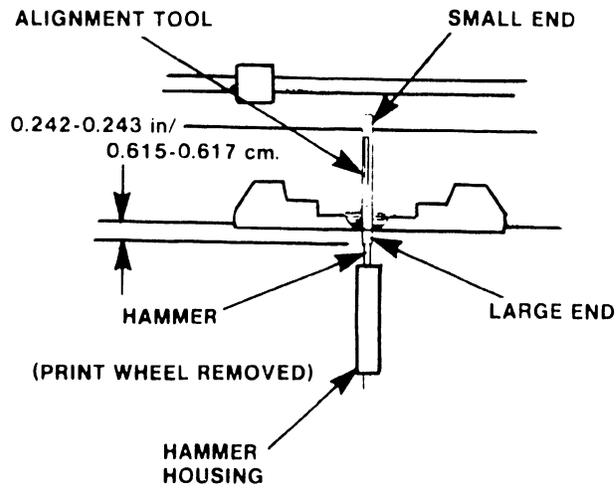


Figure 5-8 Hammer-to-Platen Check

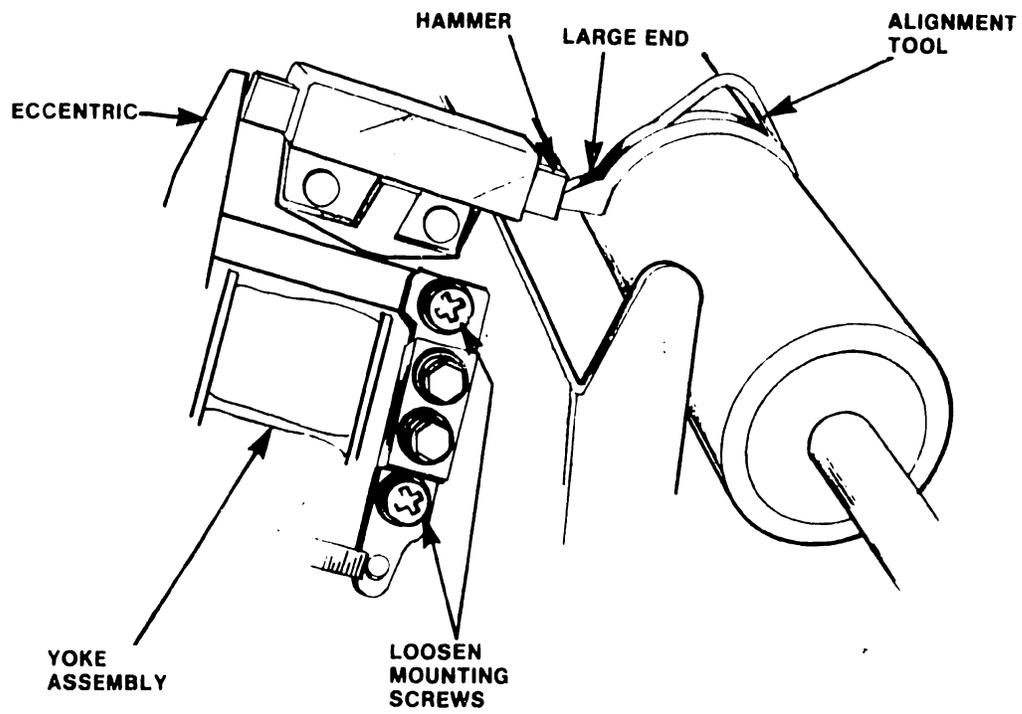


Figure 5-9 Hammer-to-Platen Adjustment

#### 5.2.1.1.5 Print Hammer Angle Check

1. Print a test document with lines of capital letters (especially M's and H's).
2. Perform the print hammer angle adjustment (para. 5.2.1.1.6) if characters do not print with the same density at both the top and bottom of each character.

#### 5.2.1.1.6 Print Hammer Angle Adjustment

1. Loosen the two hammer housing mounting/adjusting screws (figure 5-10).
2. Shift angle of the hammer and hammer housing so that even pressure is on the characters during printing; tighten screws.
3. Print test document with lines of capital letters (especially M's and H's).
4. If characters do not print with the same density at the top and bottom of each character, repeat this adjustment. If adjustment does not enable top-of-character printing, refer to printer trouble analysis, Chapter 8.

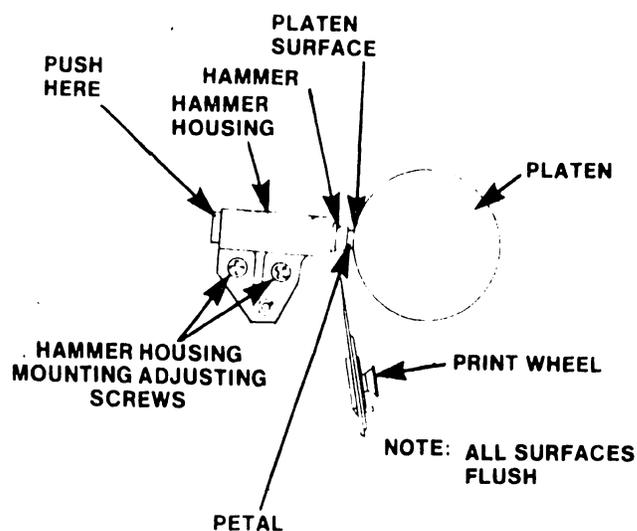


Figure 5-10 Hammer Check and Adjustment

## 5.2.1.1.7 Print Wheel Home Position Check

## NOTE

See Diagnostics, Chapter 8 (Printer - Mechanical Test) for alternate method of checking print wheel home position. The diagnostic test is preferred for accurate alignment.

1. Turn power ON
2. Load system disk.
3. Remove ribbon.
4. Select printer.
5. Pull carriage assembly back.
6. Check to see if the print wheel home position (lower case letter o) is in normal position in line with the hammer as shown in figure 5-11. If not in alignment, note how far off the lower case o is from normal position.
7. Perform the home position character adjustment below.

## 5.2.1.1.8 Print Wheel Home Position Adjustment

If the home character position is out of adjustment, adjust photo sensor with the steps below.

1. De-select printer.
2. Pull carriage assembly back to service position.
3. Remove print wheel.
4. Loosen 2 mounting nuts (see figure 5-12).
5. Move sensor to right if lower case o is to the left of home position and vice versa. Tighten nuts.
6. Put print wheel on.

## CAUTION

Never leave carriage in service position when selecting printer.

7. Select printer.
8. Pull carriage assembly back.
9. Observe home position alignment.

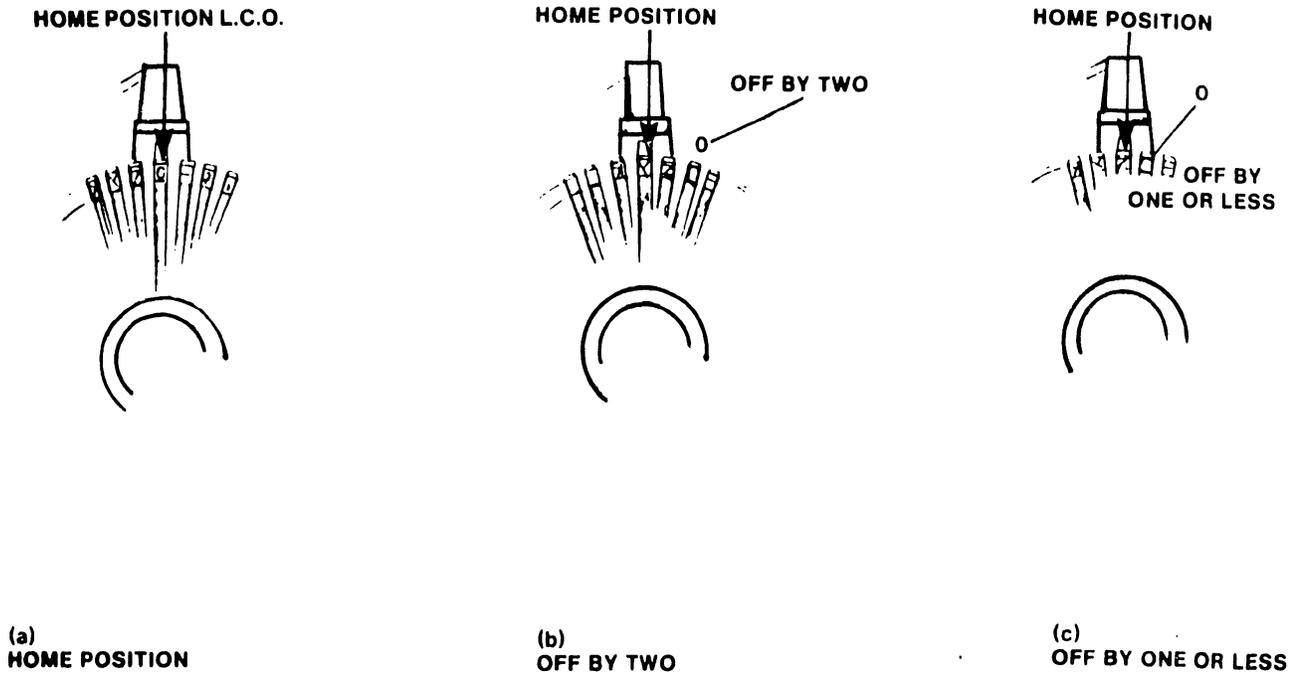


Figure 5-11 Print Wheel Positions

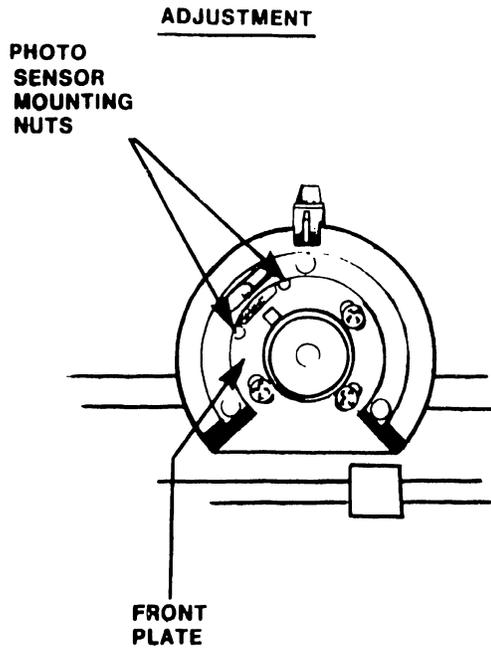


Figure 5-12 Home Position Adjustments

#### 5.2.1.1.9 Print Solenoid Arm and Lamination Check and Adjustment

To check:

1. Remove ribbon cartridge and print wheel.
2. Push print solenoid arm all the way forward towards the platen.
3. Inspect the alignment of the print solenoid arm with respect to the face of the coil laminations; be sure that both surfaces are touching and parallel (see figure 5-13). If alignment is incorrect, adjust as follows.

To adjust:

1. To adjust the print solenoid arm with respect to the face of the lamination, loosen coil assembly mounting screws (figure 5-13).
2. Push print solenoid arm forward (toward platen) as far as possible and hold.
3. Move coil assembly until its lamination is touching and parallel with the print solenoid arm surface.
4. Tighten mounting screws while holding coil in place.

#### 5.2.1.1.10 Print Solenoid Arm-to-Lamination Gap Check

The gap between the print solenoid arm and the (bottom corner of the top) core of the coil laminations is 0.030 inch (0.0762 cm). See figure 5-14. Use the .030/.060 pin gauge (WL #726-9726) to measure the gap.

#### 5.2.1.1.11 Print Solenoid Arm-To-Lamination Gap Adjustment

1. Loosen lock nut on the print solenoid arm stop eccentric (figure 5-14).
2. Adjust eccentric stop until the correct dimension is obtained (0.030 inch, 0.0762 cm).
3. Tighten lock nut.
4. Recheck hammer-to-platen check.

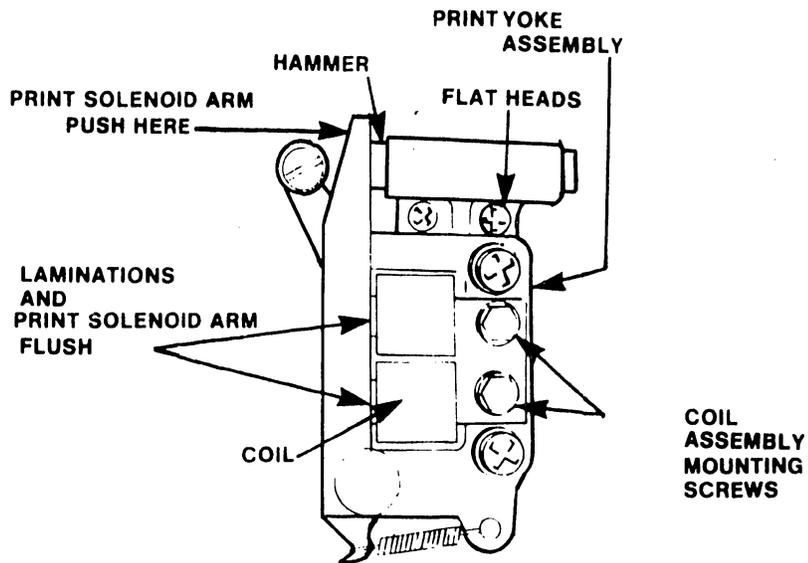


Figure 5-13 Print Solenoid Arm and Lamination Adj

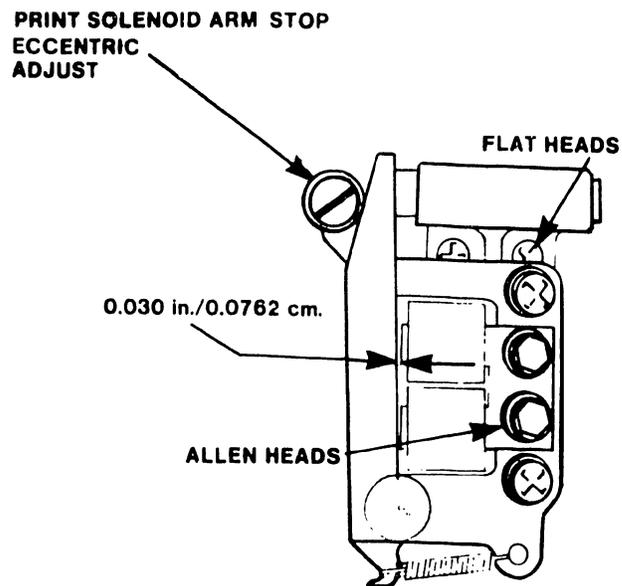


Figure 5-14 Print Solenoid Arm-to-Lamination Gap

#### 5.2.1.1.12 Cord Tension Check

The Hammer Gauge/Cable Tension Adjustment Tool (WL 580-0225) is needed to check the cord tension.

1. Position carriage at extreme left position.
2. Insert adjustment tool through the right-hand hole adjacent to the motor in the printer assembly base (see figure 5-15), and engage carriage cord in the notch on the tool upper surface. The bottom surface of the tool must be flat against the printer chassis.
3. Check that the cord has sufficient tension to close the tension-measuring gap on the tool (tension should not be greater than is necessary to close the gap)
4. Position carriage at extreme right and repeat the cord tension measurement through the left-hand hole position adjacent to the motor. If either measurement shows a need for adjustment, go to the next paragraph.

#### 5.2.1.1.13 Cord Tension Adjustment

1. Move carriage to the extreme left side of the printer.
2. Loosen lock nut on the right side of the printer frame (figure 5-16).
3. Adjust tension of cord by turning the tension screw on the right side of the printer (see figure 5-16).
4. Adjust the screw for correct tension when the carriage is on the left side of unit, as described in paragraph 5.2.1.1.12. Tighten lock nut.

#### 5.2.1.1.14 Backlash Check

1. Turn power on.
2. Load system software.
3. Select printer.
4. Check backlash by rotating platen gear back and forth.
5. Deselect and rotate platen 90 degrees.
6. Select printer, and check for backlash again.
7. Repeat steps 5 and 6 until full 360-degree revolution is checked.

#### NOTE

Only a small amount of movement is acceptable. If movement is excessive, adjust backlash as described below. Ensure that platen gear mounting screw is tight before the adjustment procedure is performed.

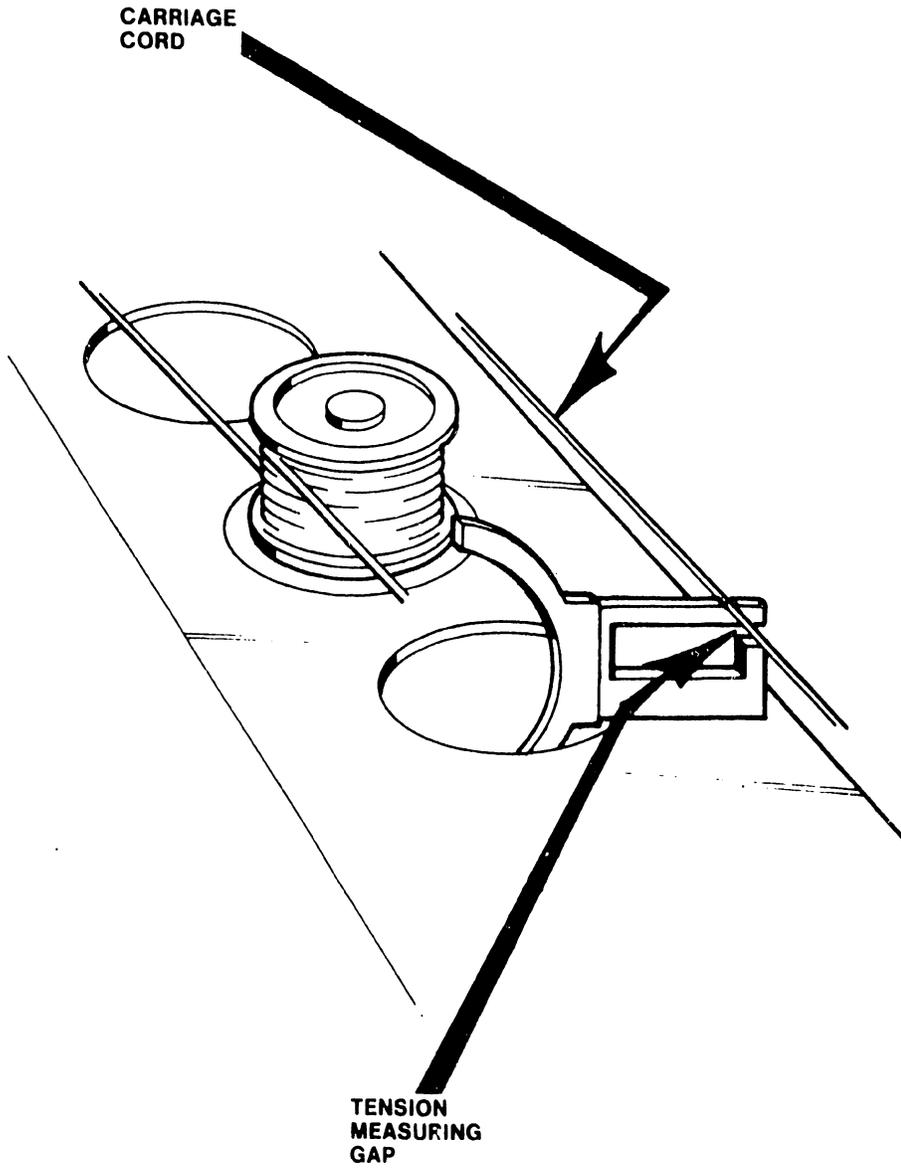


Figure 5-15 Cord Tension Check

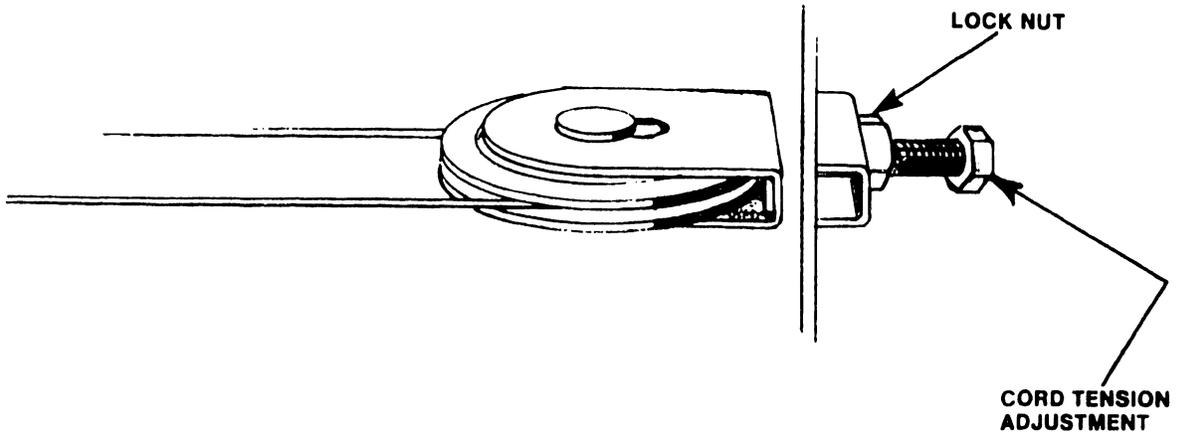


Figure 5-16 Cord Tension Adjustment

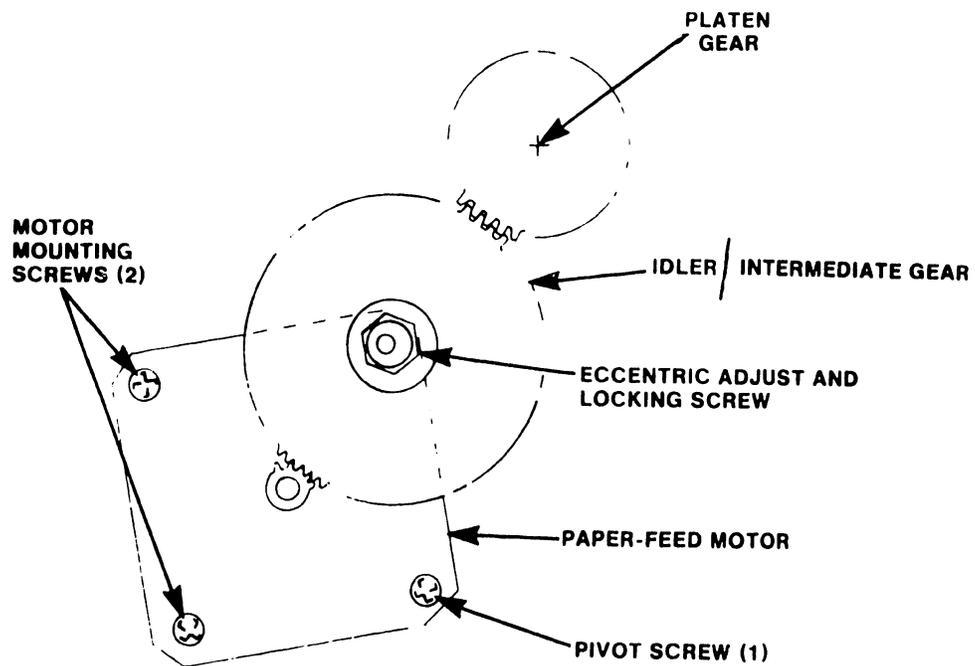


Figure 5-17 Backlash Check and Alignment

## 5.2.1.1.15 Backlash Adjustment

1. Remove disk and turn off power.
2. Remove printer (see paragraph 5.2.2).
3. Loosen idler gear locking screw and adjust eccentric screw so that the backlash between the drive gear and idler gear is minimum (see figure 5-17).

## NOTE

Moving gears closer together reduces backlash. However, if the gears are too close the gear train binds. Check each adjustment for binding before continuing with procedures. Turn gears through 360 degrees while checking.

4. Tighten gear nut while holding eccentric nut in place.
5. Loosen the two motor mounting screws and the pivot screw on plate and adjust the backlash between the idler gear and the platen gear (see figure 5-17).
6. Tighten the two motor mounting screws and the pivot screw while holding plate.
7. Install printer.
8. Perform backlash check again to determine the amount of backlash after adjustment.

## 5.2.1.1.16 Card Guide Check

1. Turn power on.
2. Load operating system (OS) software.
3. Remove OS software diskette (single-disk-drive system).
4. Load document for printing from archive diskette.
5. Select Print Document.
6. Name document.
7. Execute.
8. Select printing parameters.
9. Execute.

10. Insert paper.
11. Select Printer.
12. Print two lines, at least.
13. Check that the printing is horizontally aligned with the horizontal segment of the card guide as shown in figure 5-18. Either the roll-up or the roll-down switch may be used to position the line of characters.
14. If alignment is incorrect, adjust as described below.

#### 5.2.1.1.17 Card Guide Adjustment

1. Loosen the two card-guide mounting screws (see figure 5-18).
2. Move card guide so that the horizontal segment of the card guide is parallel to the previously printed material.
3. Hold guide stationary and tighten screws.

#### 5.2.1.1.18 Left Margin Home Position Check

1. Turn power on and load OS software.
2. Remove OS software diskette (on single-disk system), and load document (archive) disk.
3. Select Print Document on menu.
4. Name document.
5. Execute.
6. Select printing parameters, left margin at 00.
7. Execute.
8. Insert paper and Select Printer.
9. Print several lines.
10. Check that the left-margin home position is  $0.55 \pm 0.016$  inch ( $1.4 \pm 0.0$  cm) from the left side of the paper when the margin is set at 00 on the print menu.

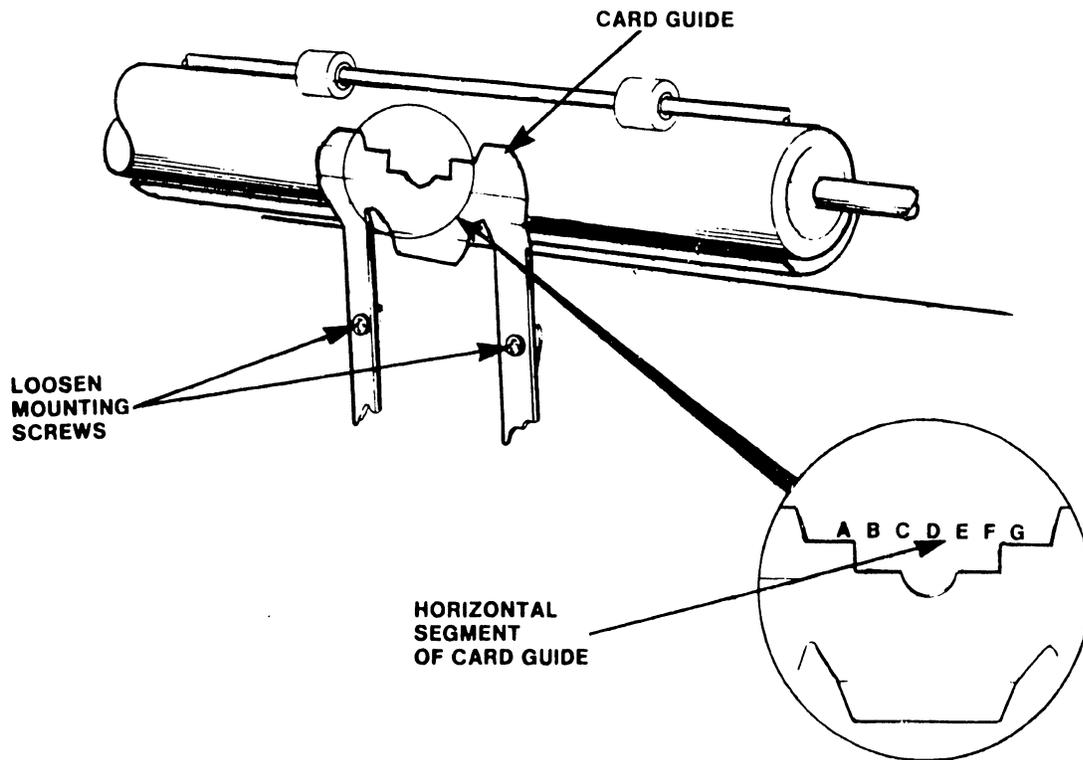


Figure 5-18 Card Guide Check and Adjustment

#### 5.2.1.1.19 Left Margin Home Position Adjustment

1. Loosen screw that holds the photo flag (see figure 5-19). Moving the photo flag towards the left increases the left margin width. Moving it right decreases margin width.
2. Slide the photo flag from side-to-side until left margin is  $0.55 \pm 0.016$  inch (1.4 cm) from left side. It may be necessary to repeatedly re-cue the document and re-adjust the flag until the left margin is correct. Fine adjustments can be made by loosening the four carriage motor mounting screws and turning the motor slightly.

#### NOTE

The Printer diagnostic (figure 8-8) can be used for alignment check (Chapter 8).

#### 5.2.1.1.20 End of Ribbon Check

1. Use a test ribbon cartridge. To make a test cartridge, cut the ribbon on a used cartridge so that the metal spring in the sensor pocket reflects the LED light.
2. Insert test cartridge in system.
3. Turn on system and load OS software.
4. Observe that the "Change Ribbon" LED on the printer control keyboard is illuminated. If the LED is not illuminated, adjust sensor.

#### NOTE

A method of checking that the sensor is good; use any light reflecting flat metal tool, such as feeler gauge or screwdriver tip, in front of the sensor to activate the change-ribbon light. This may be used in conjunction with the diagnostic - Display and Keyboard - Chapter 8.

#### 5.2.1.1.21 End-of-Ribbon Adjustment

1. Loosen mounting screws on sensor.

#### NOTE

Move carriage over hole in cross frame so that a screw driver can be used to loosen the screws on bottom of sensor.

2. Adjust sensor so that its active side is parallel to the pocket in the ribbon.
3. Repeat check to be sure change-ribbon panel LED illuminates.

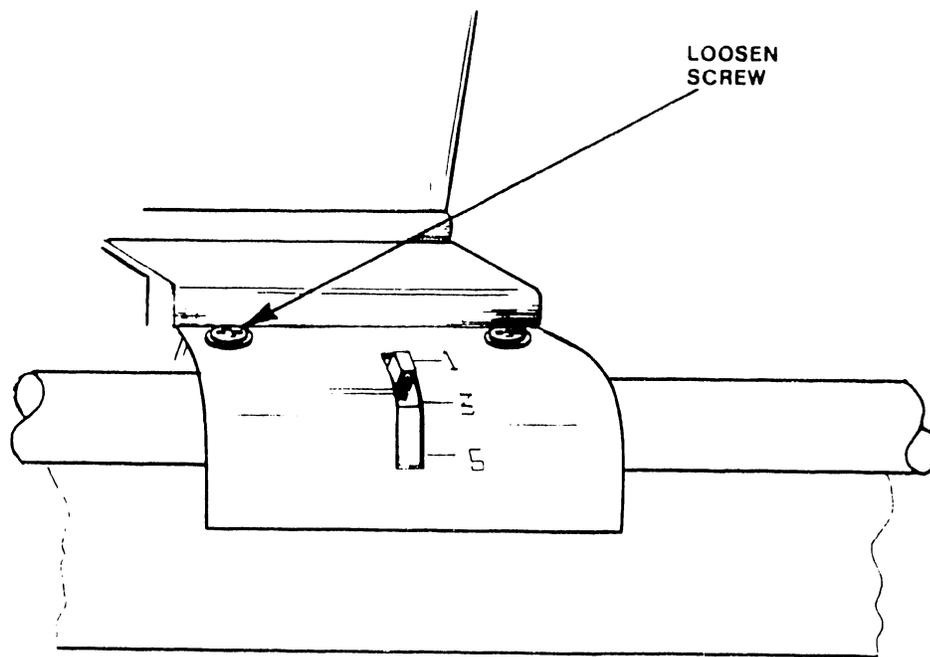


Figure 5-19 Left Margin Home Position Adjustment

## 5.2.1.1.22 Ribbon Drive Check

1. Remove ribbon cartridge.
2. Check that the ribbon drive has 8 to 12 ounces (224 to 336 grams) of spring tension (measure with gram gauge WL #726-4417 at the base of the spike driver). Push at base of spike driver as shown in figure 5-20.

## NOTE

Take reading when spike driver begins to move from the pressure applied by the gram meter.

## 5.2.1.1.23 Ribbon Drive Adjustment

1. Open grip ring and rotate it around motor (see figure 5-21).

## NOTE

From a top view rotate grip ring clockwise to increase tension and counter-clockwise to decrease tension.

2. Adjust for 8 to 12 ounces (224 to 336 grams).

## 5.2.1.1.24 Daisy Wheel Damper Check (figure 5-22)

A misadjusted damper assembly may contribute to character spacing problems. To check the adjustment:

1. Tilt print head back.
2. Remove Ribbon.
3. Remove daisy wheel.
4. Place ruler edge across dampening bracket and daisy wheel hub (with ruler surface against the daisy wheel spindle). Verify that dampening bracket is set from 0.010" to 0.020" higher than the hub (a 0.010" feeler gauge should be insertable under the straight edge; a 0.020" feeler gauge should not be insertable).

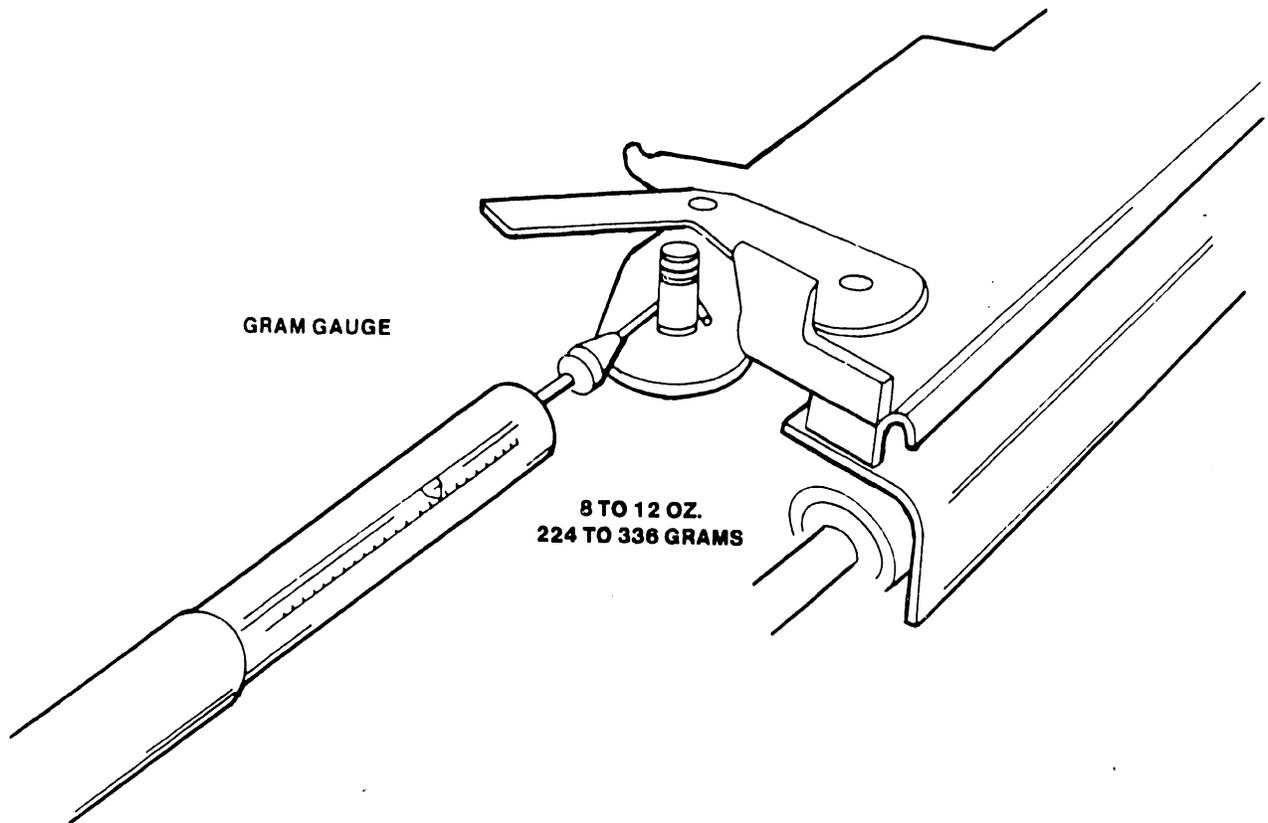


Figure 5-20 Ribbon Drive Spring Tension Check

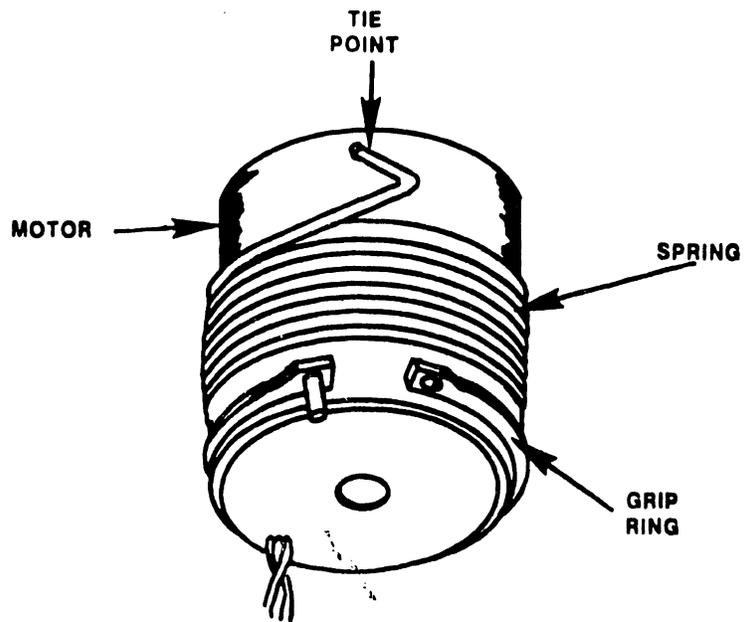


Figure 5-21 Ribbon Drive Motor

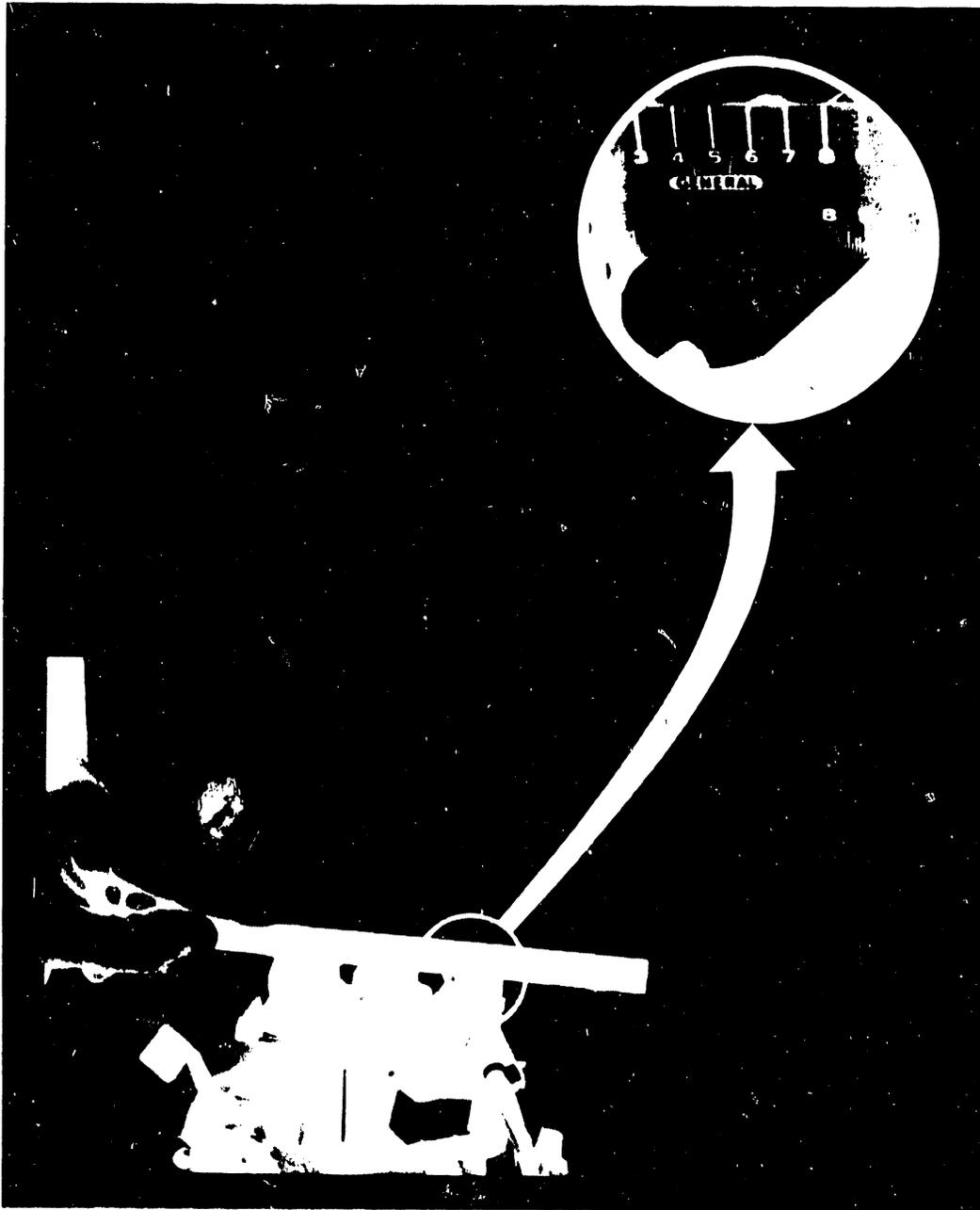


Figure 5-22 Daisy Wheel Damper Check

#### 5.2.1.1.25 Daisy Wheel Damper Adjustment

1. Remove the three Phillips Head screws to remove the dampening bracket. If the bracket is too low, go to step 2; if the bracket is too high, go to step 3:
2. Install shim washers WLI 653-0107 (0.005" thickness) as required (one or two) under each mounting post in addition to any existing shims. Go to step 4.
3. Remove shim washers Go to step 4.
4. Reinstall bracket, and verify adjustment per paragraph 5.2.1.1.24.

#### 5.2.1.1.26 Ribbon-Height Check and Adjustment

The system diagnostics (Chapter 8) provides the means of verifying that printing is vertically centered on the ribbon. Test selection comprises the following menu sequence:

Main Diagnostic Menu

Printer

Mechanical

Ribbon Adjust

Should the test indicate a requirement for vertical ribbon adjustment, perform the following.

1. Remove ribbon.
2. Tilt print head back.
3. Use channel-lock pliers to grip ribbon platform (see figure 5-23), and bend height tab either up or down, as required.



Figure 5-23 Ribbon-Height Check and Adjustment

#### 5.2.1.1.27 Paper Out Switch Check

The paper out switch is set to operate between 0.050 in. and 0.080 in. when the paper release lever is forward. To check, first place a 0.050 in. feeler gauge between the switch actuator and the paper-out detecting bracket, the switch should not operate. Replace the 0.050 in. gauge with a 0.080 in. feeler gauge and the switch should now activate.

#### 5.2.1.1.28 Paper Out Switch Adjustment

To adjust the paper out switch, set the paper release lever to the forward or released position. Then loosen the two paper out switch adjusting screws shown in figure 5-24. Adjust the paper out switch so a standard sheet of paper activates the switch causing the change paper indicator to extinguish. When the paper is removed the indicator should illuminate.

#### NOTE

When the paper release lever is in the forward position, the paper-out sensors should extend into the deflector. When the lever is back, the sensor should be even with or just below the deflector.

#### 5.2.1.1.29 Pressure Rollers Check

The clearance between the rollers assembly shaft and the paper guide is set to operate at 0.015 in. as shown in figure 5-24. To check, first place a 0.015 in. feeler gauge between the rollers assembly shaft and the paper guide. It is important that the clearance for all roller assembly shafts be equal so as to provide even paper to platen pressure. This clearance should not be so great that the shaft and rollers can fall out of the holding tabs.

#### 5.2.1.1.30 Pressure Rollers Adjustment

To adjust the clearance between the rollers assembly shaft and the paper guide, the tabs at the ends of the rollers assembly shaft (see figure 5-25) must be adjusted with a long nose pliers. While adjusting the tabs, place a 0.015 in. feeler gauge between the rollers assembly shaft and the paper guide and align the clearance between the rollers assembly shaft and the paper guide to measure 0.015 in.

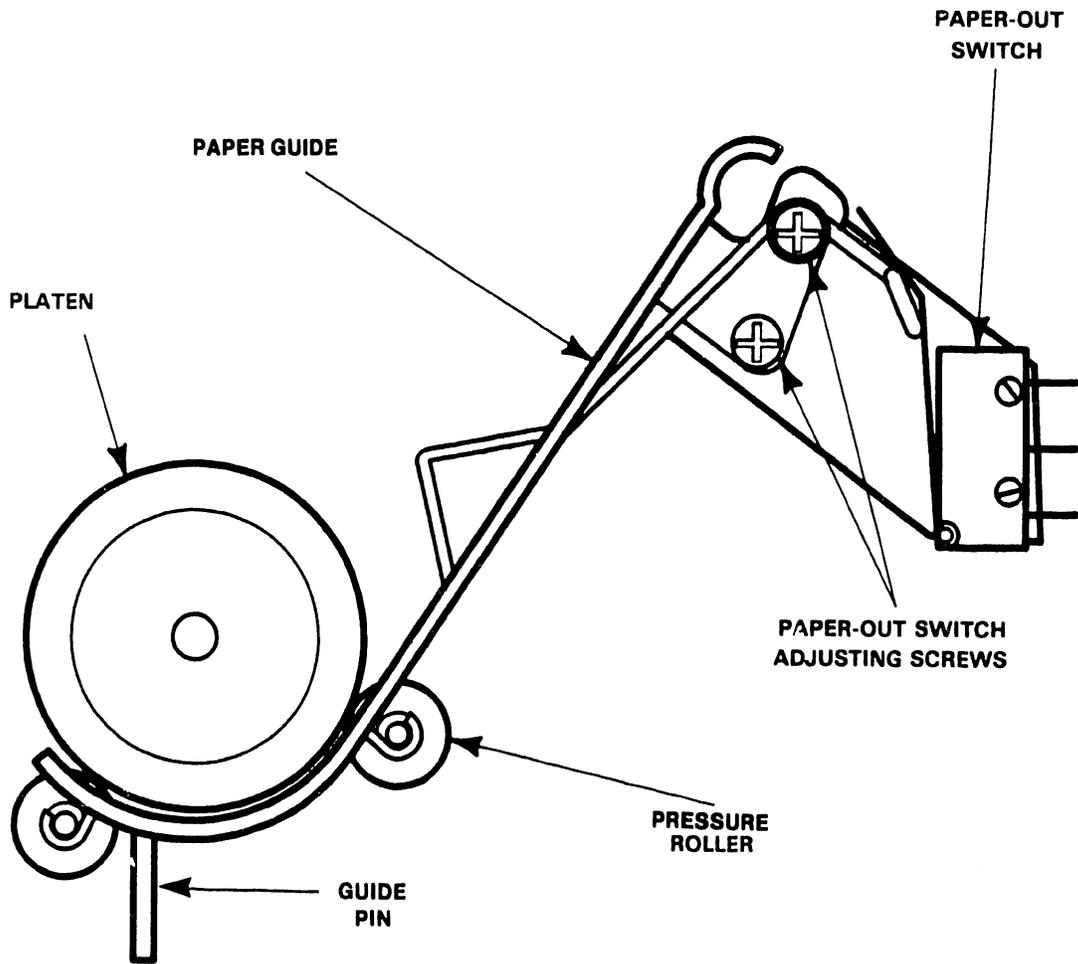


Figure 5-24 Paper Out Switch Check and Adjustment

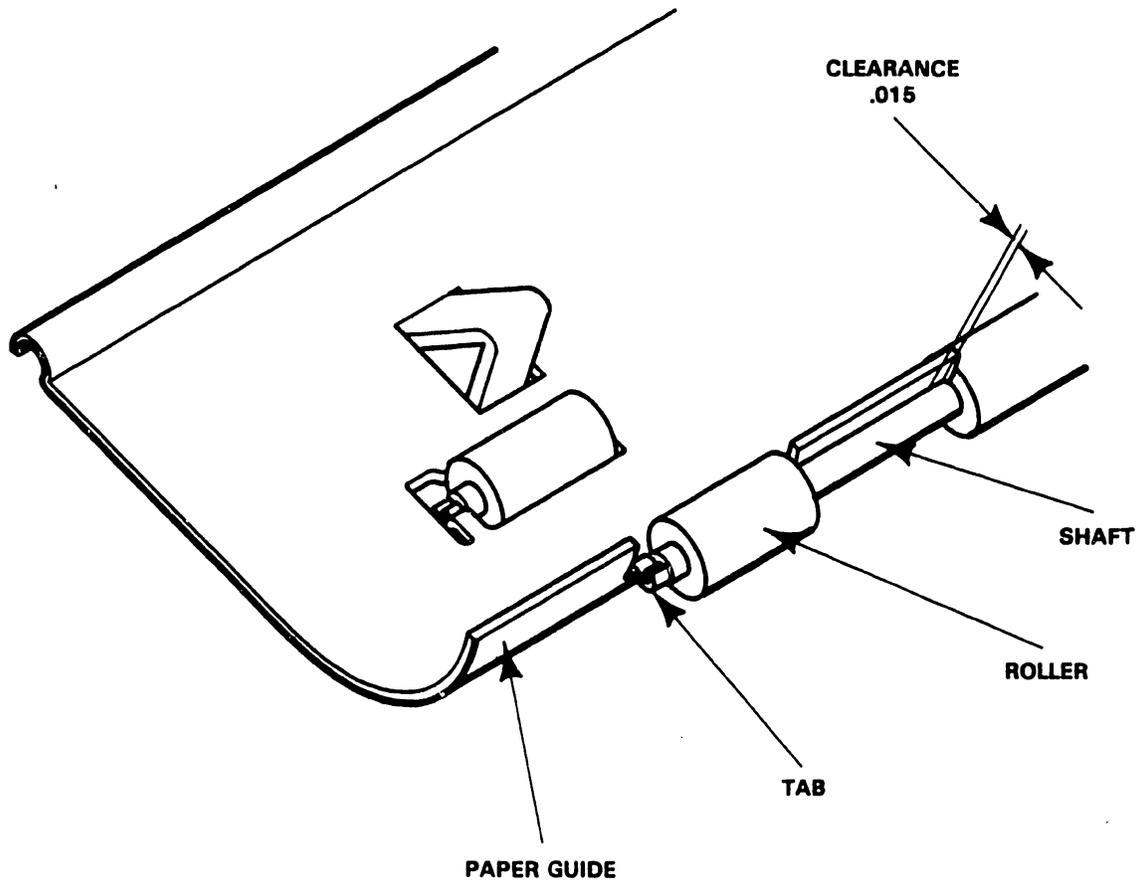


Figure 5-25 Pressure Rollers Check and Adjustment

## 5.2.2 REMOVAL AND REPLACEMENT

This paragraph contains procedures and illustrations for removal and replacement of equipment.

### 5.2.2.1 Cabinet and Cover Removal

1. Remove both snap-in covers at each end of the platen.
2. Remove the two (2) recess phillips heads screws at the rear side of the access cover.
3. Remove cover by raising the rear of the cover and sliding it forward and up.

### 5.2.2.2 Access Cover Removal

1. Remove platen by releasing latches on each side and then lifting the platen up and out.
2. Disconnect the three (3) keyboard & fault display panel cabinet cables.
3. Remove the two (2) inside front corner hold down screws.
4. Remove the two (2) rear outside screws.

### 5.2.2.3 Printer Unit Removal

1. Disconnect the 12 pin AMP connector from the error display panel.
2. Disconnect print head ribbon cable from controller and CPU PC boards.
3. Disconnect the four (4) pin paper drive and sensor cables connectors from the controller PC board.
4. Release the four (4) printer legs from their shock mount by pulling up on each end of the printer unit one at a time.

CAUTION: DO NOT PULL ON CARRIAGE RAILS.

5. Lift printer unit from the mounting brackets.

### 5.2.2.4 Print Head Assembly

1. Disconnect the print head cable from the flex cable by removing the two (2) phillips heads connector mounting screws.
2. Release spring holding carriage base plate to front shaft bearing at copy control lever cutout.
3. Pull print head assembly forward and remove four 4 screws holding the assembly to the rear shaft bearing assembly.
4. Lift head assembly from the printer unit.

#### 5.2.2.5 Power Supply

1. Remove AC power cord.
2. Disconnect the three connectors from the power supply harness to PC boards.
3. Disconnect the fan cable.
4. Release the four (4) captive screws at each corner of the power supply.
5. Lift power supply from the chassis.

#### 5.2.2.6 Carriage Removal

1. Printer has to be removed from chassis per previous step.
2. Loosen and remove carriage cords.
3. Remove the carriage rods hold downs by removing the screws that hold them to the side frame.
4. Remove the flex cable by removing the two (2) screws on the end of the cable that mounts to the carriage. (Not to be performed if a new carriage has flex cable attached).

#### 5.2.2.7 Cord Replacement

1. Remove the printer unit.
2. Loosen the cord tension by removing the screw, (1) of figure 5-26.
3. Put the ball end of the cord in the bottom hole of the carriage hub, (2).

#### NOTE

A spring hook is helpful in handling the cords.

5. With the loop end of the cord, feed the cord around the right-hand pulley (3).
6. Push the loop end of the cord through the hole in the right-hand side frame, and fasten the end with the holding pin (4).
7. With the spring hook, loop the cord around the top groove of carriage pulley. Position the carriage about two inches from the left-side frame (5).

8. Turn the hub clockwise to get a couple of loops on the hub. Hold the hub tight, and pull the cord out at the point between the hub and the pulley. Slide the carriage to the right side of the printer (within about an inch of the right side). This allows room to wind up the rest of the cord without interference from the carriage (6).
9. Put the ball end of the second cord in the top hole of the hub. Wrap the cord clockwise around the hub two full turns with the cord coming off the front of the hub (7).
10. Take the loop end of the cord and feed it around the left pulley (8).
11. Loop the cord, with the spring hook, around the bottom groove of the carriage pulley (9).
12. Put the loop end of the cord through the left-side frame and insert the holding pin (10).
13. Adjust the cord tension. Alternately turn both right and left tension-adjusting screws to divide the slack evenly.
14. Replace printer.

#### 5.2.2.8 Photo Sensor

Unscrew the 2 photo sensors from the printer, and remove their leads from the connectors. Right and left carriage sensor leads may be cut under the printer base, and the soldered to reconnect.

#### 5.2.2.9 Paper Guide and Roller Assembly Removal

The paper guide and roller assembly is removed from the printer after the removal of the platen. Disconnect the paper out switch wires. Lift the paper guide clear of the chassis.

#### 5.2.2.10 Platen Assembly Removal

Release the latches on each side of the platen assembly and lift the platen up and out.

#### 5.2.2.11 Card Guide Removal

The card guide is removed by removing the two screws on the mounting bracket.

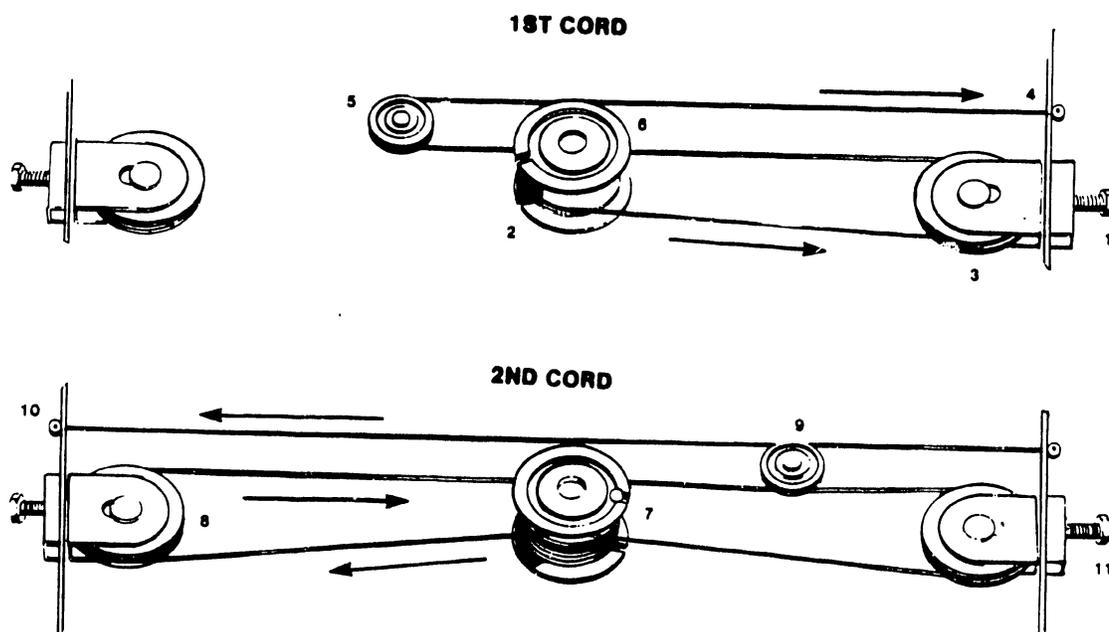


Figure 5-26 Cord Replacement

5.2.2.12 Hammer Removal

CAUTION

The hammer is spring loaded and can pop out unexpectedly.

To remove the hammer, remove one of the two hammer bracket mounting screws; loosen the other, and tip up one end of the bracket. Once this is done, the hammer slides out of the housing.

5.2.2.13 Print Wheel Removal

Print wheel removal is done by tilting the ribbon platform back. This lifts the ribbon automatically. Now pull on the print wheel hub. It lifts off easily.

**CHAPTER**

**6**

**SCHE-**

**MATICS**

THE SCHEMATICS, WHEN AVAILABLE, ARE ON THE LAST FICHE IN THIS SET.

**CHAPTER**

**7**

**ILLUSTRATED**

**PARTS**

**BREAKDOWN**

## CHAPTER 7

## ILLUSTRATED PARTS BREAKDOWN

7.1 SCOPE

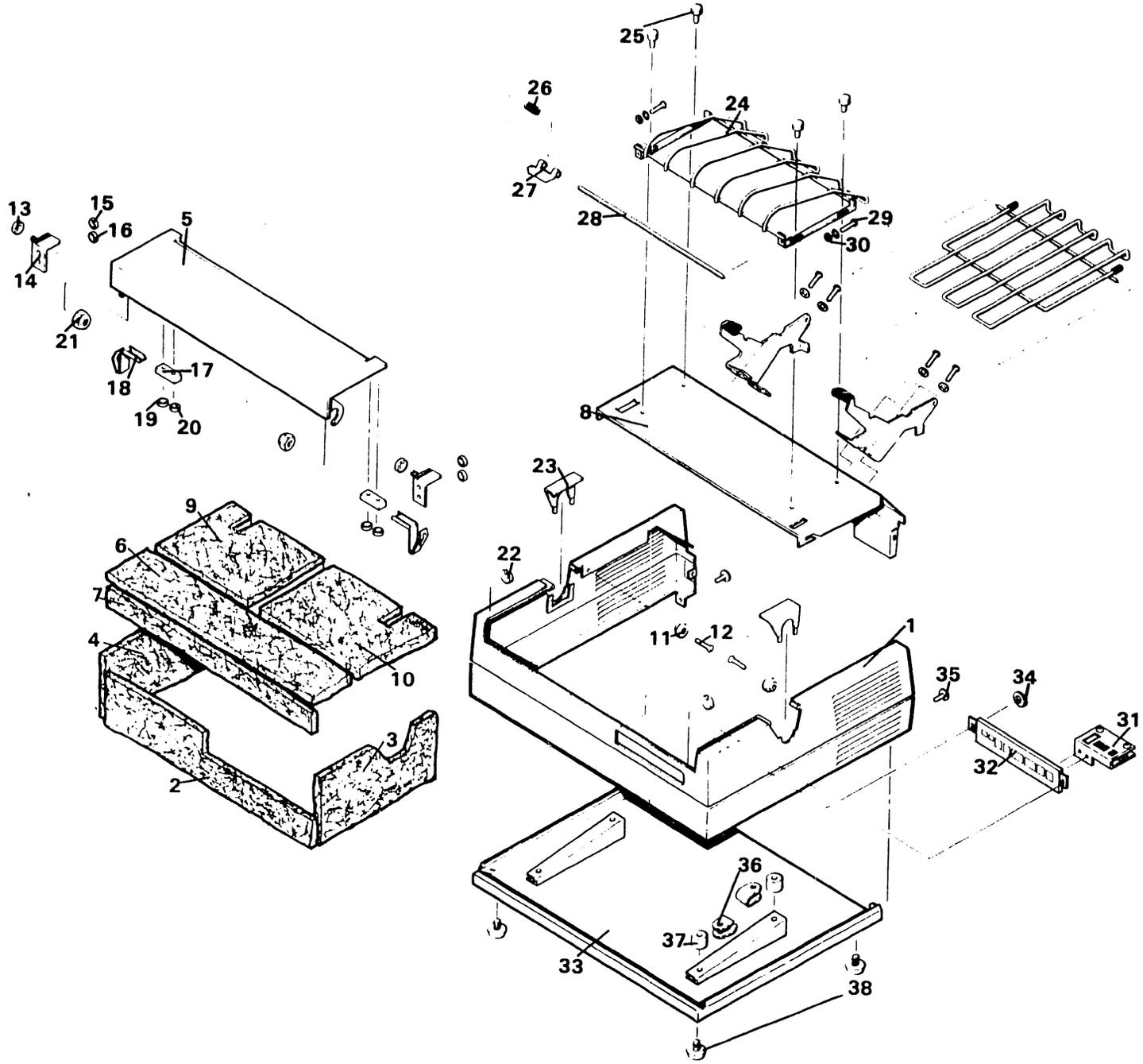
The following Illustrated Parts Breakdowns (IPB) provide reference to assemblies that are identified for maintenance procedures. IPB's included in this manual are:

- Figure 7-1 Covers and Base Pan 729-5246
- Figure 7-2 Common Mechanical Assembly 279-5271
- Figure 7-3 Platen Assembly 279-5191
- Figure 7-4 Carriage Assembly 279-5273
- Figure 7-5 Electronics Assembly - Serial Model (Sheet 1 of 2)
- Figure 7-5 Electronics Assembly - Parallel Model (Sheet 2 of 2)

## COVERS AND BASE PAN 729-5246

ITEM #	DESCRIPTION	PART NO.
1.	Cover, Top Weld	451-2949
2.	Damping Pad	660-0673
3.	Damping Pad LH	660-0670
4.	Damping Pad RH	660-0671
5.	FRNT Top Weld Cover	451-2947
6.	Top FRNT DMPG Pad	660-0798
7.	FRNT Cover DMPG Pad Screw,	660-0797
8.	Center Wrap	458-0578
9.	Top LH Dpng Pad	660-0676
10.	Top RH Dpng Pad	660-0677
11.	Pin Clip	478-0430
12.	Scr 6-32x1/2 FLT	650-3161
13.	8-32 KEPS Locknut	652-0029
14.	Cover Hinge BRKT	451-4702
15.	Flatwasher, #6	653-3000
16.	6-32 KEPS Locknut	652-0032
17.	CLIP Bar Spacer	449-0616
18.	Access Cover Catch	651-0240
19.	Flatwasher, #4	653-2001
20.	4-40 KEPS Locknut	652-2005
21.	8-32 Locknut	652-0046
22.	Rubber Bumper	655-0231
23.	Roll Cover	449-0215
24.	Cover Rack	458-0474
25.	6-32x1/2 Thumbscrew	650-3174
26.	Edge Guide Spring	465-1669
27.	Edge Guide	452-4057
28.	Edge Guide Rod	461-3348
29.	Scr 4-40x3/8 P.H. SEMS	650-3161
30.	Flat Washer, #4	653-2000
31.	Sub Panel Assy	279-5299
32.	Membrane Sw Panel Assy	325-2469
33.	Base Pan Assy	279-5303
34.	Nut Thumb #4-40	652-3008
35.	8-32x3/8 Truss Hd	650-4123
36.	Strap Ground	458-0603
37.	Shock Mount	449-0456
38.	Bumper, White	655-0205

Figure 7-1 Covers and Base Pan 729-5246



## COMMON MECHANICAL ASSEMBLY 279-5271

ITEM #	DESCRIPTION	PART NO.
1.	Screw, Stop	478-0790
2.	Arm, Paper Release	449-0523
3.	Bracket, Paper Scale RH	451-2625
4.	Bracket, Paper Scale LH	451-2626
5.	Screw Taptite, 6-32 x 1/4	650-4091
6.	Spring, Tension	458-0600
7.	Screw, SEMS 4-40 x 1/4	650-2087
8.	Washer, #4	653-2002
9.	Locknut, 4-40	652-2005
10.	Bracket, MTNG LH	451-4729
11.	Bracket, MTNG RH	451-4730
12.	Rod, Cam	461-3315
13.	Retaining Ring, CRES	651-1727
14.	"O" Ring	653-3006
15.	Lockwasher, #2	653-0990
16.	Screw, SEMS 2-56 x 1/4 PH	650-0083
17.	Hexnut 2-56	652-0990
18.	Paper Scale	458-0458
19.	Paper Guide & Switch Assy.	279-5301
20.	Roller Shaft, Plat Pres	461-3277
21.	Washer, NYL 3/4" OD	653-0056
22.	Spring, Detent	465-1730
23.	Shaft, Paper Release	461-3533
24.	Locknut, 10-32	652-6002
25.	Flat Washer, #10	653-6000
26.	Eccentric, Idler Gear	461-3310
27.	Gear, Idler	461-2023
28.	Stud Idler Gear	461-3306
29.	Screw, Taptite, 8-32 x 1/4	650-4089
30.	Flat Washer, #8	653-4000
31.	Paper Motor and Plug Assy	279-5277
32.	Arm, Paper Bail L.H.	449-0525
33.	Arm, Paper Bail R.H.	449-0524
34.	Latch, Platen L.H.	458-0903
35.	Latch, Platen R.H.	458-0904
36.	Rtnr. Ring	651-1712
37.	Rtnr. Ring	651-1745
38.	Stud, Cable Pulley	461-3514
39.	Spacer, Washer	449-0601
40.	Nut Plate, Pulley Brkt.	461-0139
41.	Bracket, Pulley Mnt.	451-5004
42.	Locknut 6-32	652-0032
43.	Screw, Soc. HD. 6-32 x 3/4	650-3242
44.	Pulley, Cable	478-1110

## COMMON MECHANICAL ASSEMBLY 279-5271 (Continued)

ITEM #	DESCRIPTION	PART NO.
45.	Side Frame Assy L.H.	279-5274
46.	Side Frame Assy R.H.	279-5275
47.	Screw, Teuss HD. 10-32 3/8	650-6121
48.	Spring, Ppr. Tens.	458-1077
49.	Spring, Ppr. Tens. (GOLD)	465-1781
50.	Crossmember, Main	458-1061
51.	Crossmember, Motor	458-1060
52.	Sensor	375-2120
53.	Screw, F.H. 2-56 x 1/4	650-0081
54.	Bumper, Carriage	655-0276
55.	Shaft, Carriage Guide	461-3532
56.	Rod, Paper Bail	461-3534
57.	Roller, Bale Assy	279-5156
58.	Anchor, Cable	458-0897
59.	Cable, Carriage Drive	420-2018
60.	Carriage Drive Motor Assy	279-5276
61.	Switch, Sub. Min.	325-2325-1
62.	Nut Plate	452-0268
63.	Lever, Paper Sensor	449-0615
64.	Screw, Truss Hd. 4-40 x 3/8	650-2127
65.	Spring Extension Latch	465-1741
66.	Screw, Self T. Hex #8 x 1/2	651-0039
67.	Flatwasher #8	653-4000
68.	Edge Nut	458-0868
69.	Spring Bail Return	465-1720
70.	Retainer, Shaft	458-0866
71.	Screw, Taptite 4-40 x 3/8	650-4090

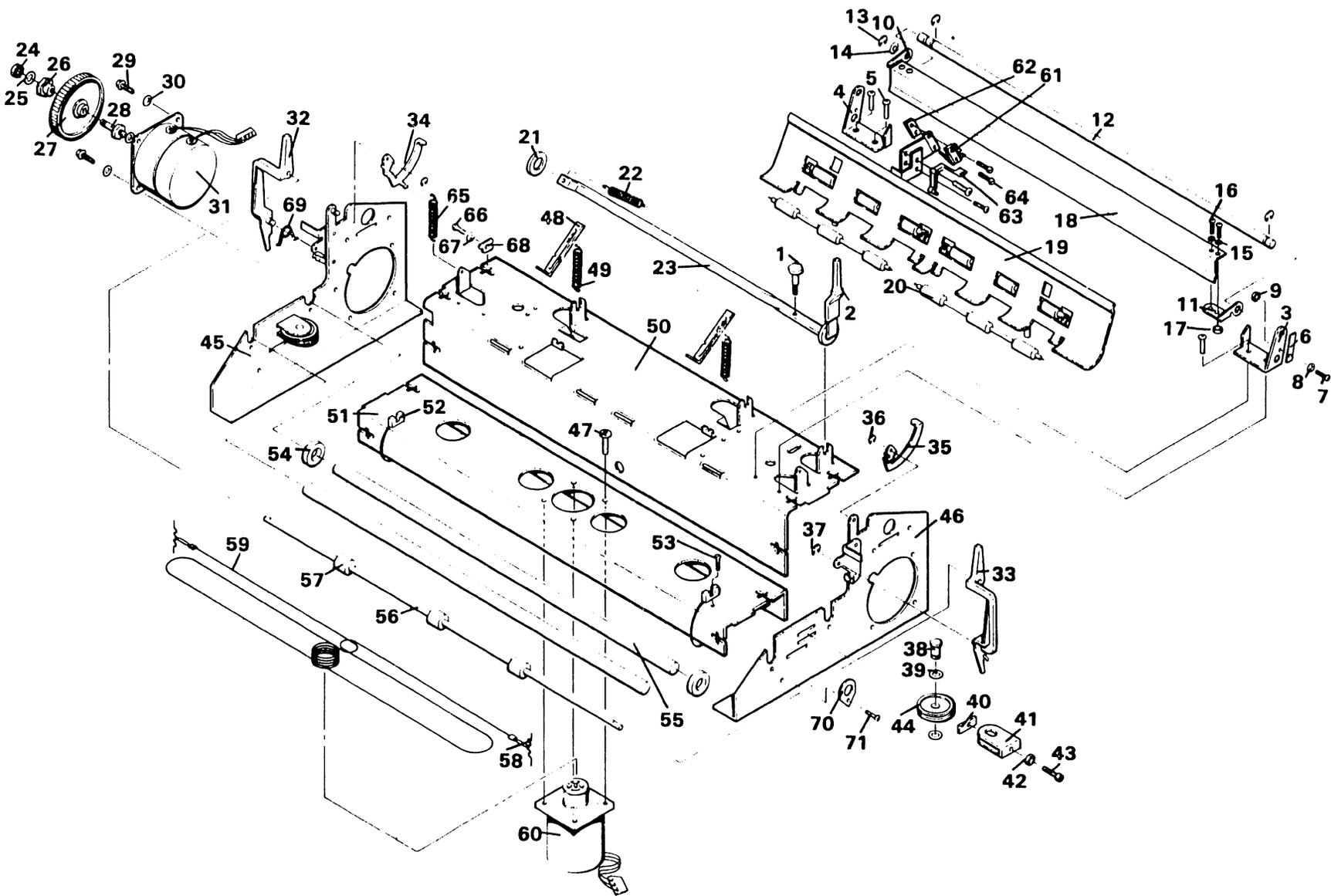


Figure 7-2 Common Mechanical Assembly 279-5271

PLATEN ASSEMBLY  
279-5191

ITEM #	DESCRIPTION	PART NO.
1.	Dress Knob Disk	615-0266
2.	10-24 x 5/16 Socket Set Screw	650-5100
3.	Platen Knob	449-0665
4.	Tractor Feed Gear	461-2046
5.	Needle Bearing	465-0262
6.	Platen	478-1116
7.	Platen Locator Bushing	465-0733
8.	Bearing	465-0311
9.	Vernier Washer	653-0041
10.	Platen Vernier Washer	653-0046
11.	Vernier Clutch Spring	465-1648
12.	Vernier Gear	461-2022
13.	10-32x 3/16 Socket Set Nylok Screw	650-6061
14.	Vernier Cone	449-0157
15.	Platen Vernier Knob	449-0219
16.	Retainer Ring	651-1744

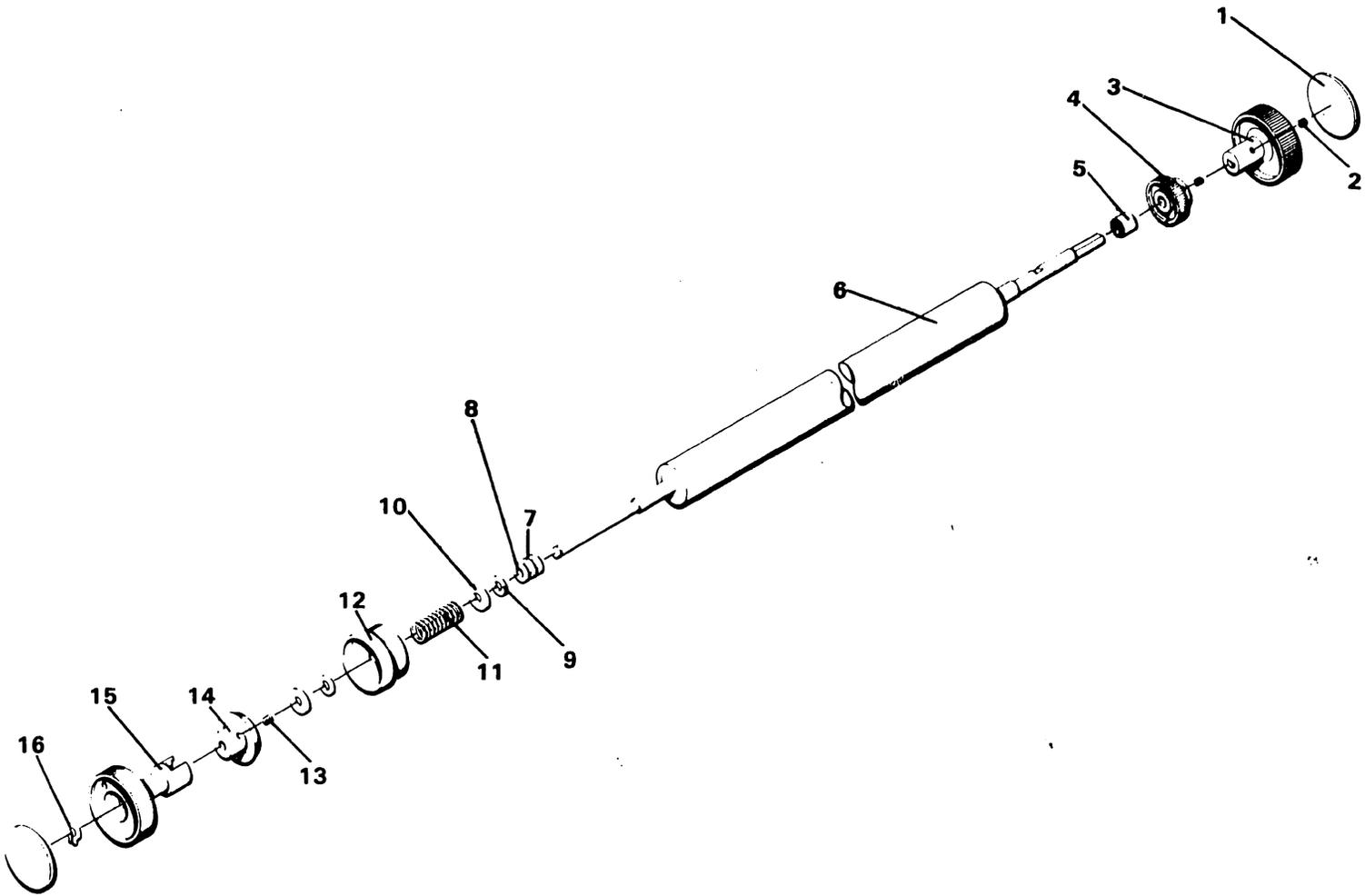


Figure 7-3 Platen Assembly 279-5191

7-8

## CARRIAGE ASSEMBLY

ITEM #	DESCRIPTION	PART NO.
1.	Printwheel Hub Molded	449-0617
2.	Roll Pin	651-1504
3.	4-40 x 1/2" Flt Hd Screw	650-2401
4.	Daisy Wheel damper	449-0418
5.	Nut Plate	452-0224
6.	#4 Flat Washer	653-2000
7.	4-40 x 5/16 Screw	650-2100
8.	2-56 Hex Nut	650-0061
9.	#2 Lockwasher	653-0990
10.	#2 Flat Washer	653-0991
11.	1-64 x 3/8 Screw	650-0008
12.	Head Sensor	375-2110-4
13.	Home Sw. Mount	449-0453
14.	Damper Bracket	279-9000-16
15.	6-32 x 3/8 Sems Screw	650-3120
16.	#6 Flat Washer	653-3000
17.	Hammer Housing Brkt.	449-0454
18.	Print Hammer Housing	449-0415
19.	Print Hammer	478-0708-M
20.	Hammer Spring	465-1757
21.	3 x 48 x 1/2 Slot Screw	650-1160
22.	#3 Lockwasher	653-1000
23.	#3 Flat Washer	653-1001
24.	Extrusion Spring	465-1733
25.	Motor	400-0056
26.	Print Yoke Assy.	279-5302
27.	Card Guide	452-4137
28.	Card Guide and Cable Mt	452-4130
29.	Head Cable Assy	420-1103
30.	Conn Hsg 24 Pos 2 Row	654-2128
31.	4-40 x 3/16 Screw	650-2060
32.	4-40 x 1/4 Screw	650-2087
33.	4-40 x 5/16 Screw	650-2100
34.	#4 Flat Washer	653-2000
35.	4-40 x 3/16 Screw	650-2060
36.	Shim Carriage Brckt .005 Thk	458-0927
37.	Retainer	449-0168
38.	Wiper	478-1063
39.	Wiper	656-0106
40.	Pulley Carriage	478-1127
41.	Screw Shoulder	478-1102
42.	Carrg Bearing Hsng	461-3552
43.	Solenoid Mount	450-0145
44.	4-40 x 5/8 Screw	650-2200
45.	#4 Flat Washer	653-2001

## CARRIAGE ASSEMBLY (Continued)

ITEM #	DESCRIPTION	PART NO.
46.	4-40 x 1/4 Screw	650-2087
47.	#4 Flat Washer	653-2001
48.	Motor Clip	449-0417
49.	Spring Copy Cntl	465-1737
50.	Copy Control Brng	449-0433
51.	Flag Margin Switch	458-0926
52.	Carriage	451-2332
53.	Screw 6-32 x 3/4 Soc Cap	650-1160
54.	6-32 Lock Nut KEPS	652-0032
55.	Pivot Shaft	478-1061
56.	Snap Ring	651-1701
57.	#4 Flat Washer	653-2000
58.	4-40 x 5/16 Screw	650-2100
59.	Pivot Block	449-0419
60.	#6 Lock Washer	653-3001
61.	#6 Flat Washer	653-3000
62.	6-32 x 3/8 Screw	650-3134
63.	Motor Pivot	478-0580
64.	Pusher Cartridge	
65.	Ribbon Drive Lever	458-0862
66.	4-40 x 3/8 Flat Hd Screw	650-2063
67.	Cartridge Clip	449-0409
68.	4-40 x 3/16 Screw	650-2060
69.	Cartridge Load Button	449-0497
70.	Ribbon Plat <sup>c</sup> orm	458-0861
71.	#2 x 3/8 Self-Tap screw	651-0178
72.	Sensor	375-2110-4
73.	Spacer End of Ribbon	449-0414
74.	#2 Flat Washer	653-0991
75.	#2 x 5/16 Self Tap Screw	651-0178
76.	2-56 x 1/2 Screw	650-0160
77.	#2 Lockwasher	653-0990
78.	#2 Flat Washer	653-0991
79.	Switch, ribbon FD	325-2309-M2
80.	Nut Plate	461-0063
81.	E Ring	651-1762
82.	Spike Driver Assy	279-9000-42
83.	Ribbon Drive Assy Pad (5.0-7)	458-0863
84.	Ribbon Drive Catch (5.0-1)	449-0588
85.	Ribbon Motor (+1)	279-5280
86.	Ribbon Mtg Spring (4.1-16)	465-1652
87.	Retainer Ring (4.1-15)	651-1756

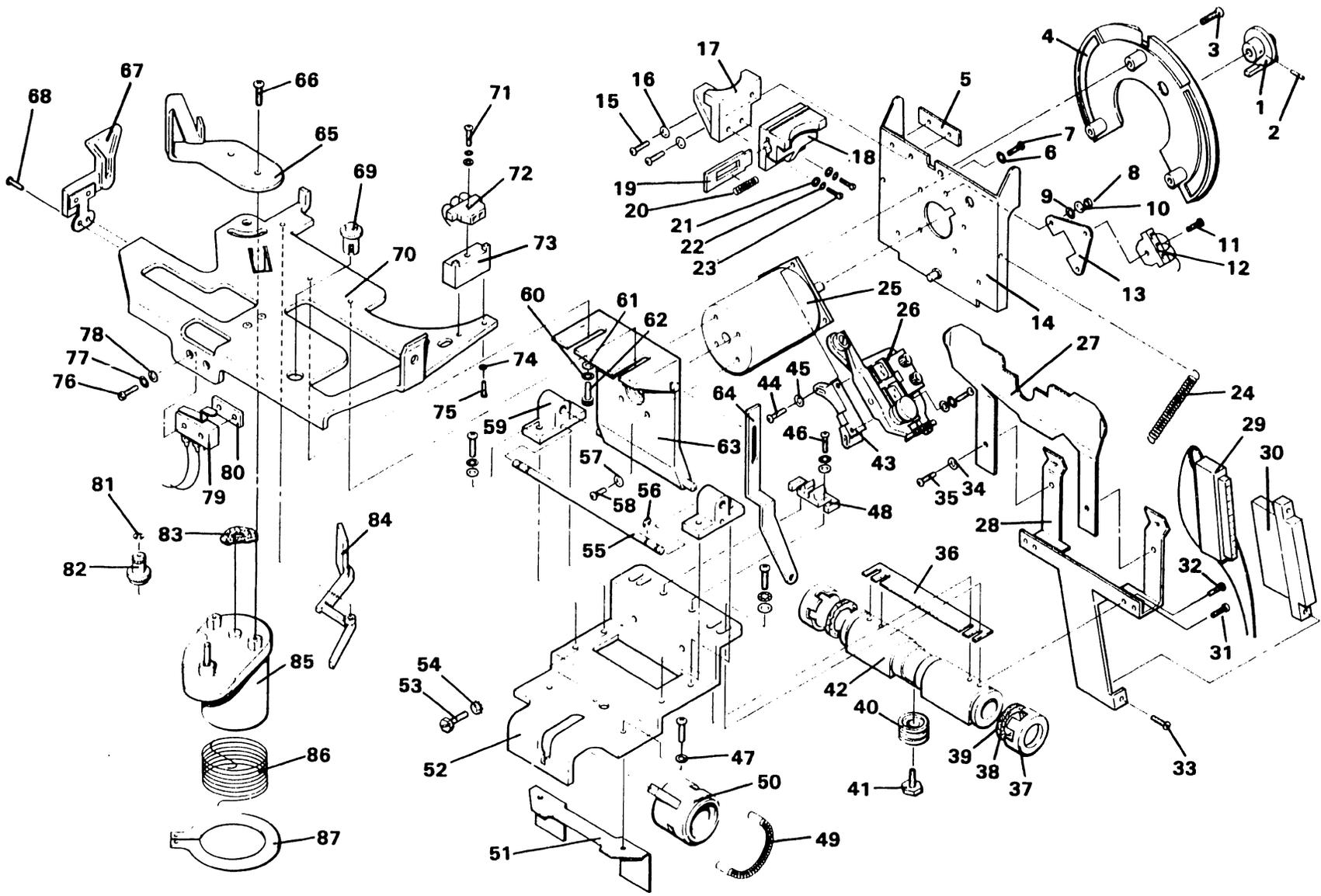


Figure 7-4 Carriage Assembly

7-11

## ELECTRONICS ASSEMBLY

ITEM #	DESCRIPTION	PART NO.
1.	Cover, PS	451-2632
2.	Cover	
3.	Base, PS	458-3020
4.	Brace, PS	
5.	Switch DPST, Rocker	325-0059
6.	Power Cord	420-2019
7.	Spacer	462-0172
8.	Fan Cable	220-1759
9.	Power Harness	270-3237
10.	Bracket, Interface	451-4922
11.	CPU to PWR DVR Cable	220-3187
12.	CPU to Kbd Cable	220-3184
13.	CPU to SUB PNL Cable	220-3186
14.	I/O INTRFC Cable (Serial)	220-1751
	I/O INTRFC Cable (Parallel)	220-3221
15.	Siblink PCB (Serial)	210-8038-1A
16.	I/O INTRFC PCB (Parallel)	210-7885
17.	Fan. 50 CFM	400-1001
18.	Brkt, Fan Spt	451-2627
19.	Brkt, PCB Spt LH	451-4910
20.	Guide PCB NYL 4"	452-4042
21.	CPU PCB	210-7886-A
22.	Driver PCB	210-7868
23.	Brkt, PCB Spt. RH	451-4909
24.	Strap PCB Spt	458-1067
25.	Shield/Hold Down Brkt	452-3588
26.	Btn PCB Gde Two Grve	449-0597
27.	Guide, PCB 8" NYL	465-1237
28.	Plunger, Nylatch	651-0213
29.	Shield, Front	452-3587
30.	Plate, Blank	452-0234
31.	BNC-TNC Cable Assy	220-1751
32.	PL MTG, TNC/BNC	452-0235
33.	Wire & Lug Assy	220-1486
34.	UJ-1196 TSF/EF Option	206-1196
35.	EF Cable Assy	220-3121
36.	TSF Cable Assy	220-1785

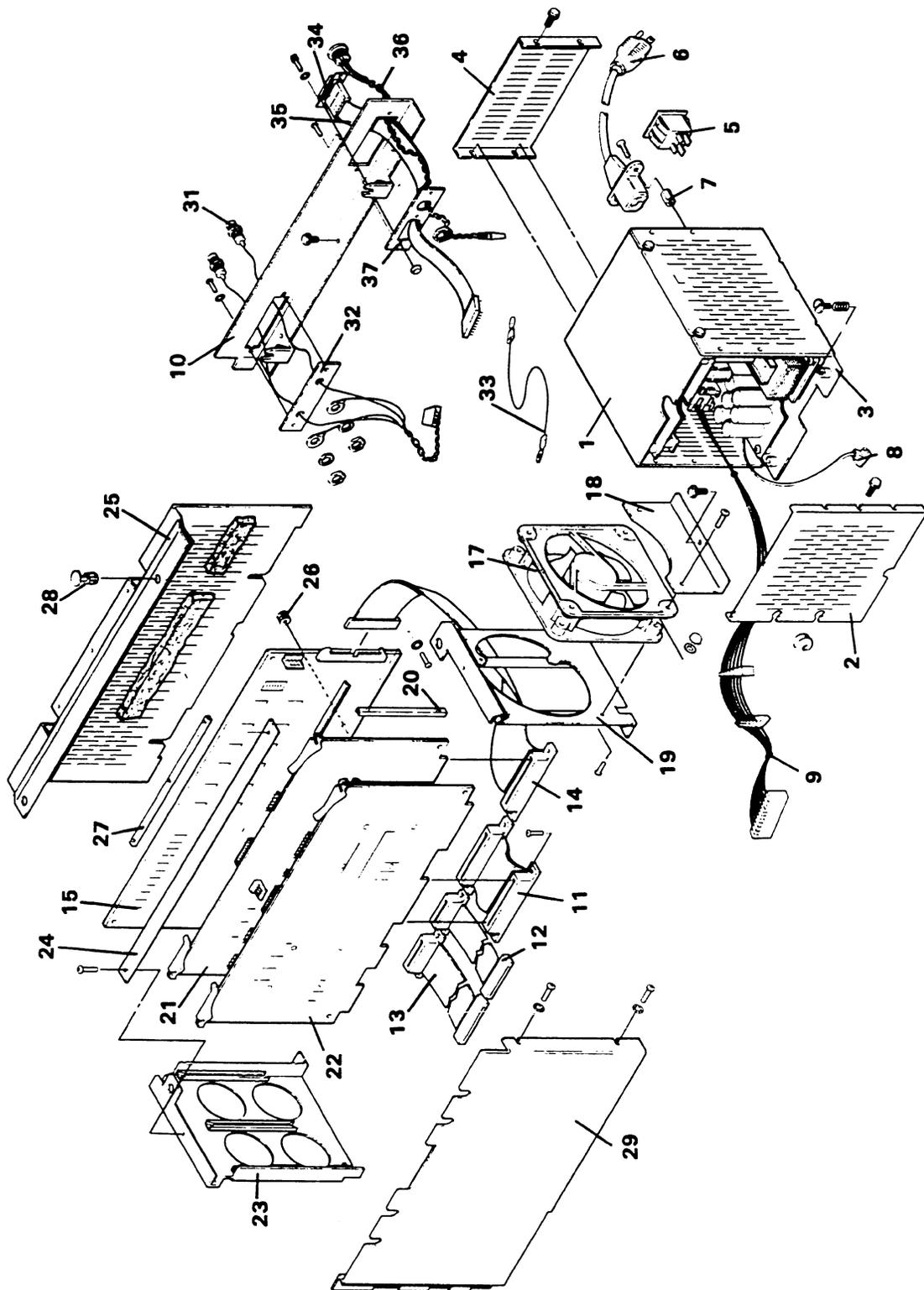


Figure 7-5 Electronics Assembly - Serial Model (Sheet 1 of 2)

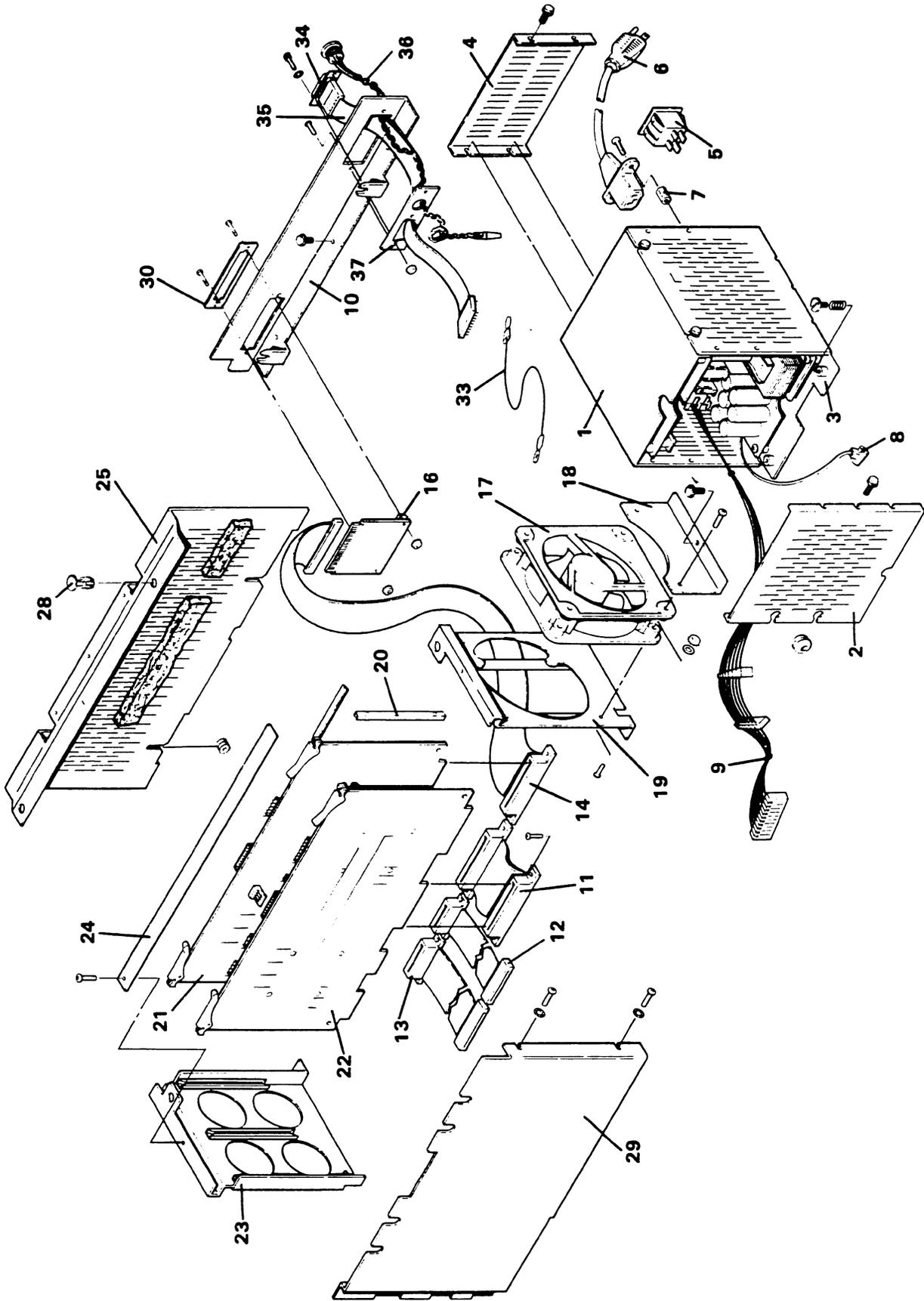


Figure 7-5 Electronics Assembly - Parallel Model (Sheet 2 of 2)

**CHAPTER**

**8**

**TROUBLE-  
SHOOTING**



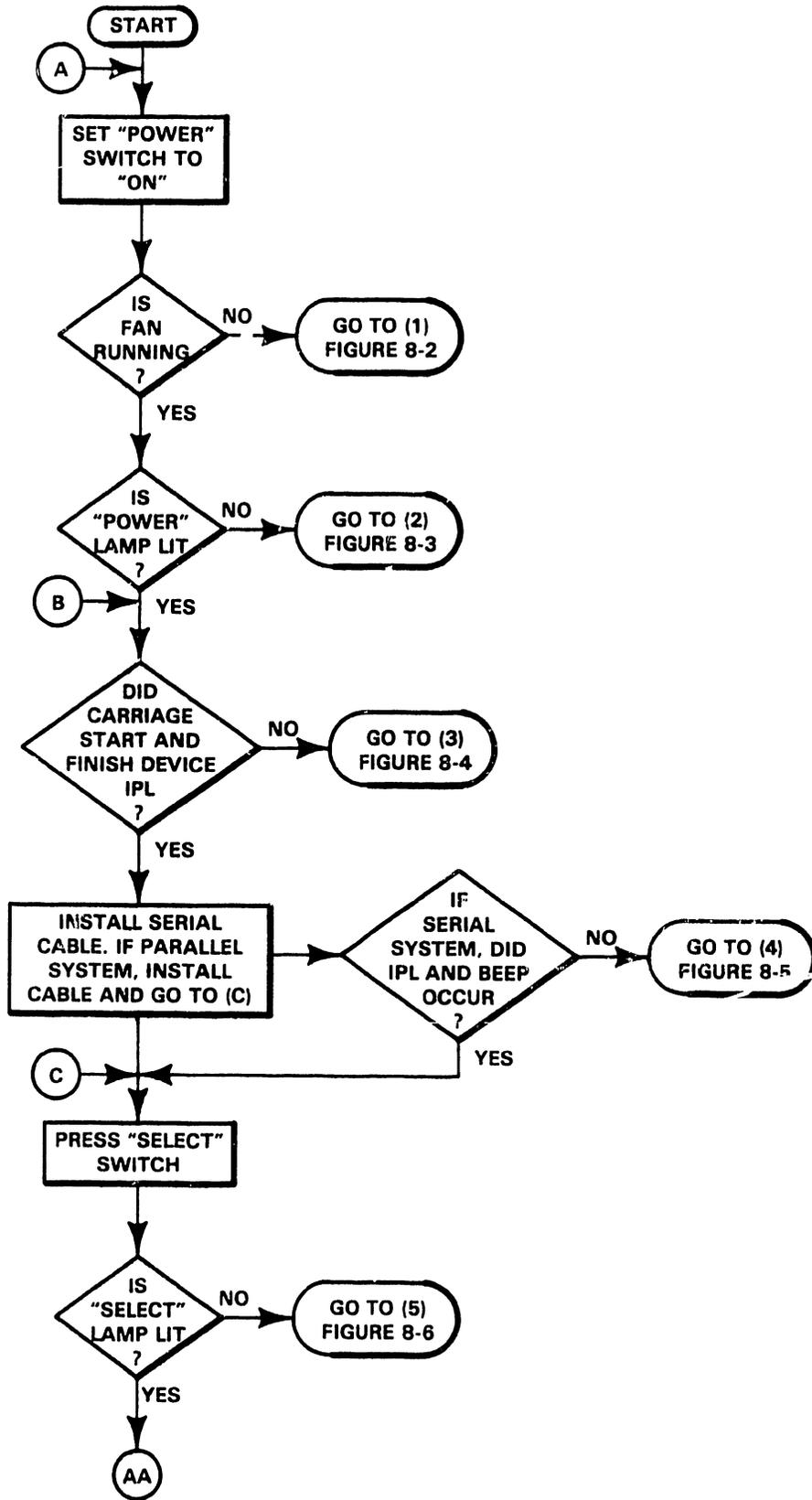


Figure 8-1 Overall Printer Troubleshooting Flowchart (Sheet 1 of 2)

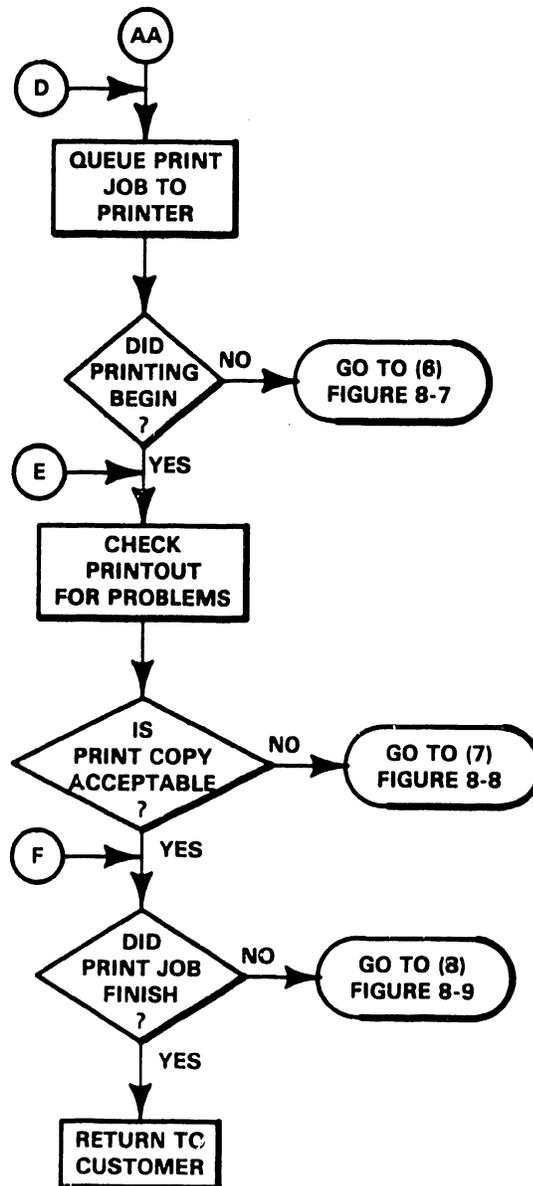


Figure 8-1 Overall Printer Troubleshooting Flowchart (Sheet 2 of 2)

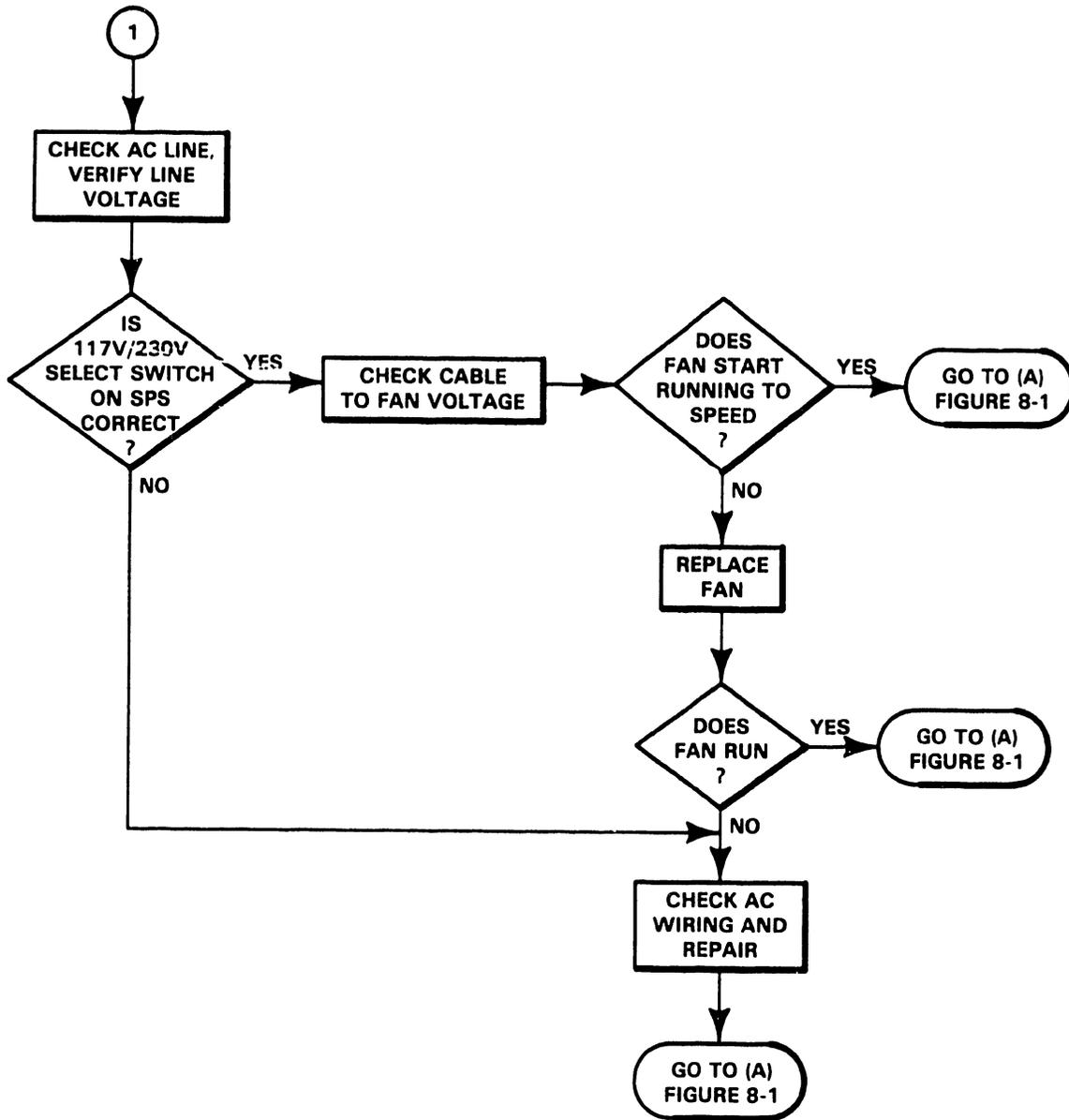


Figure 8-2 External Power Malfunctions

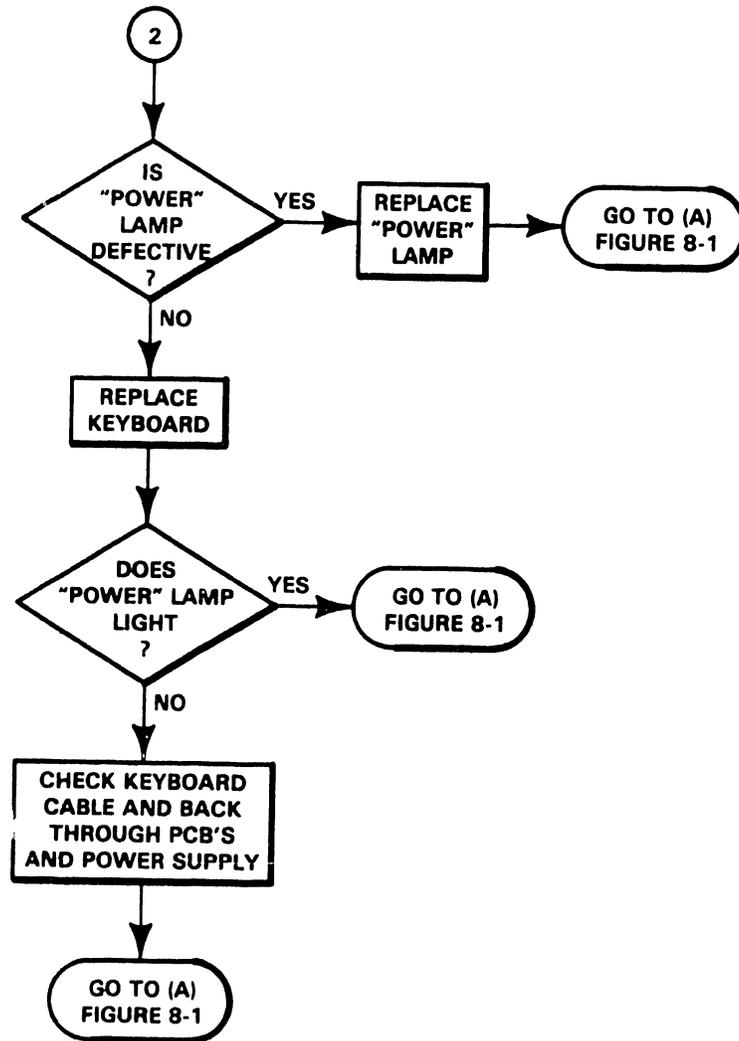


Figure 8-3 Internal Power Malfunctions

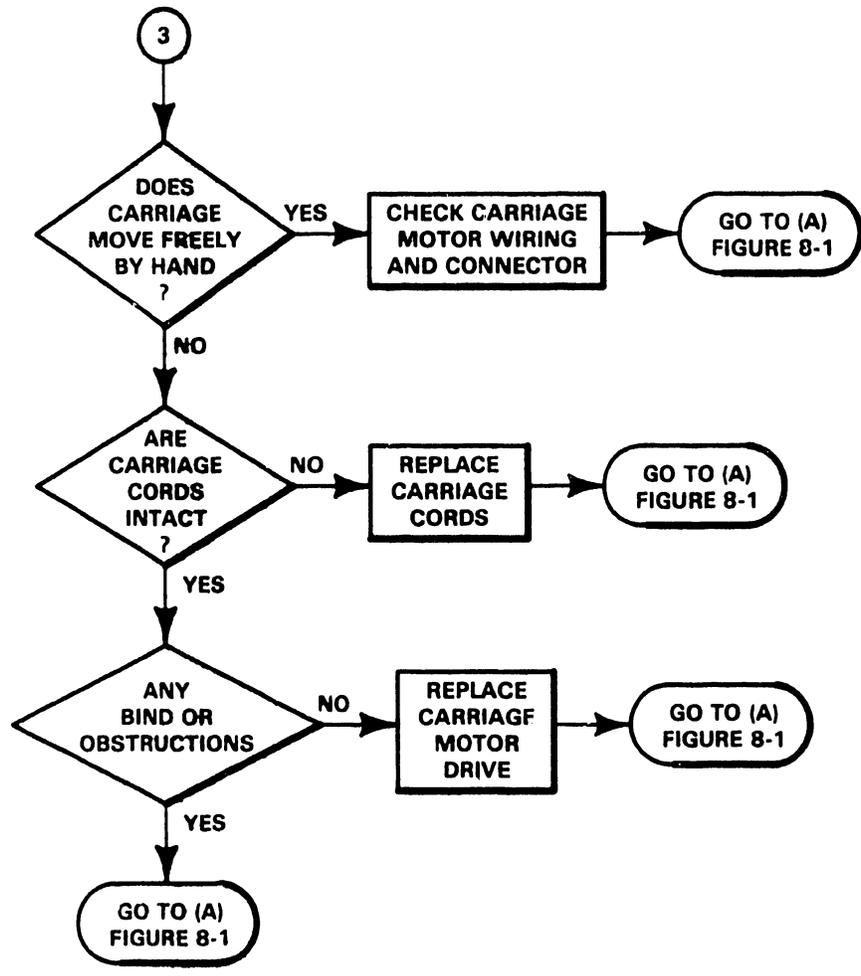


Figure 8-4 Device IPL Malfunctions

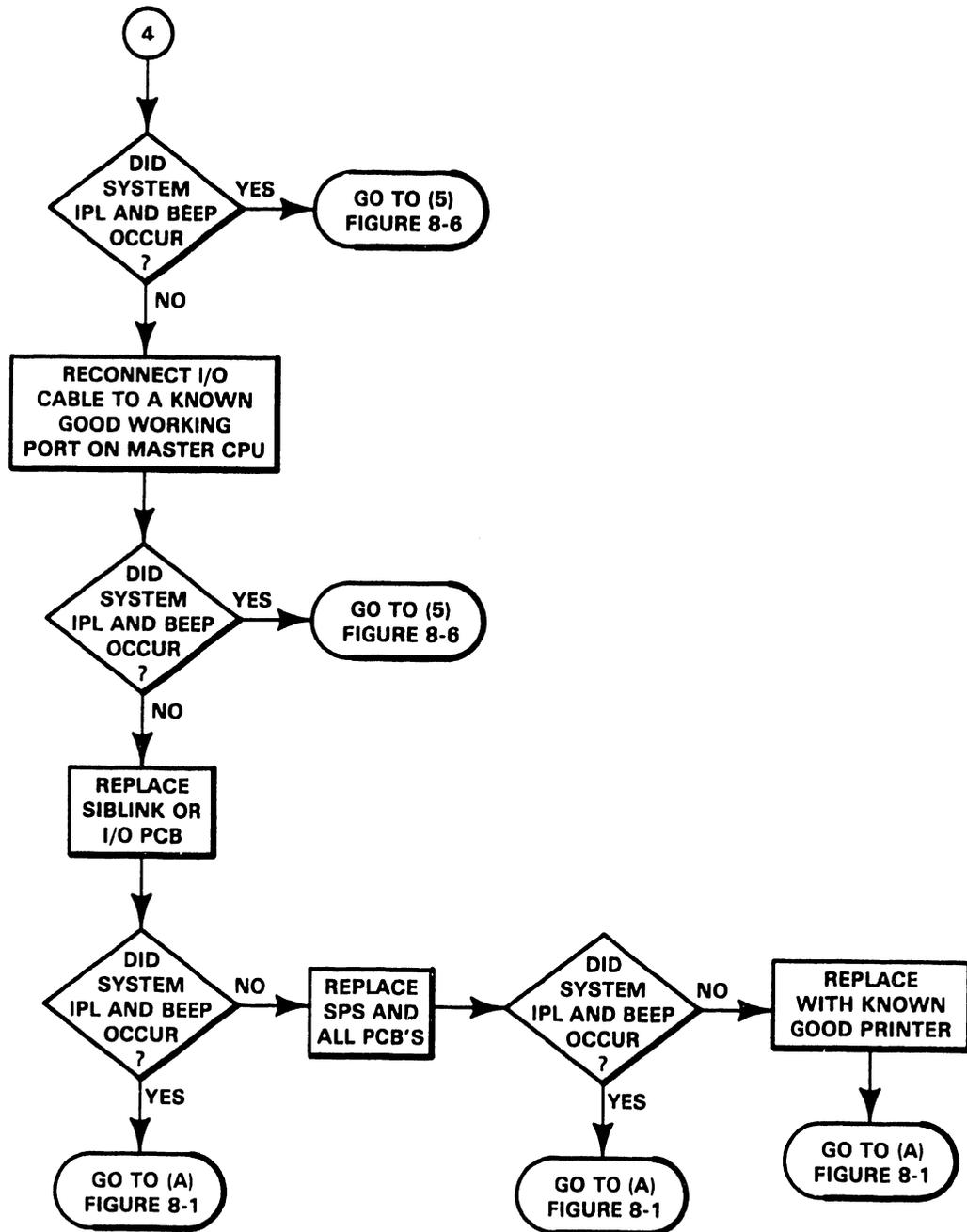


Figure 8-5 System IPL Malfunctions

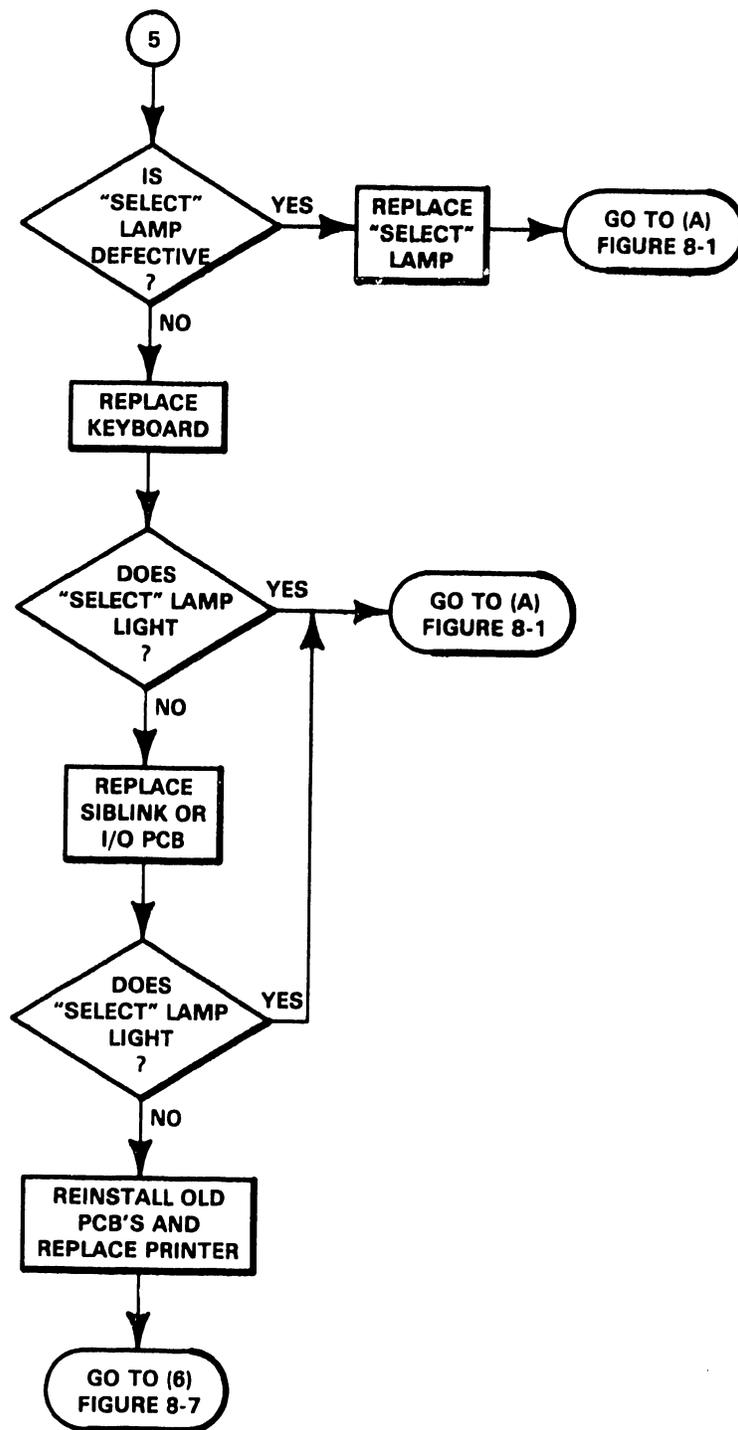


Figure 8-6 I/O Selection Malfunctions

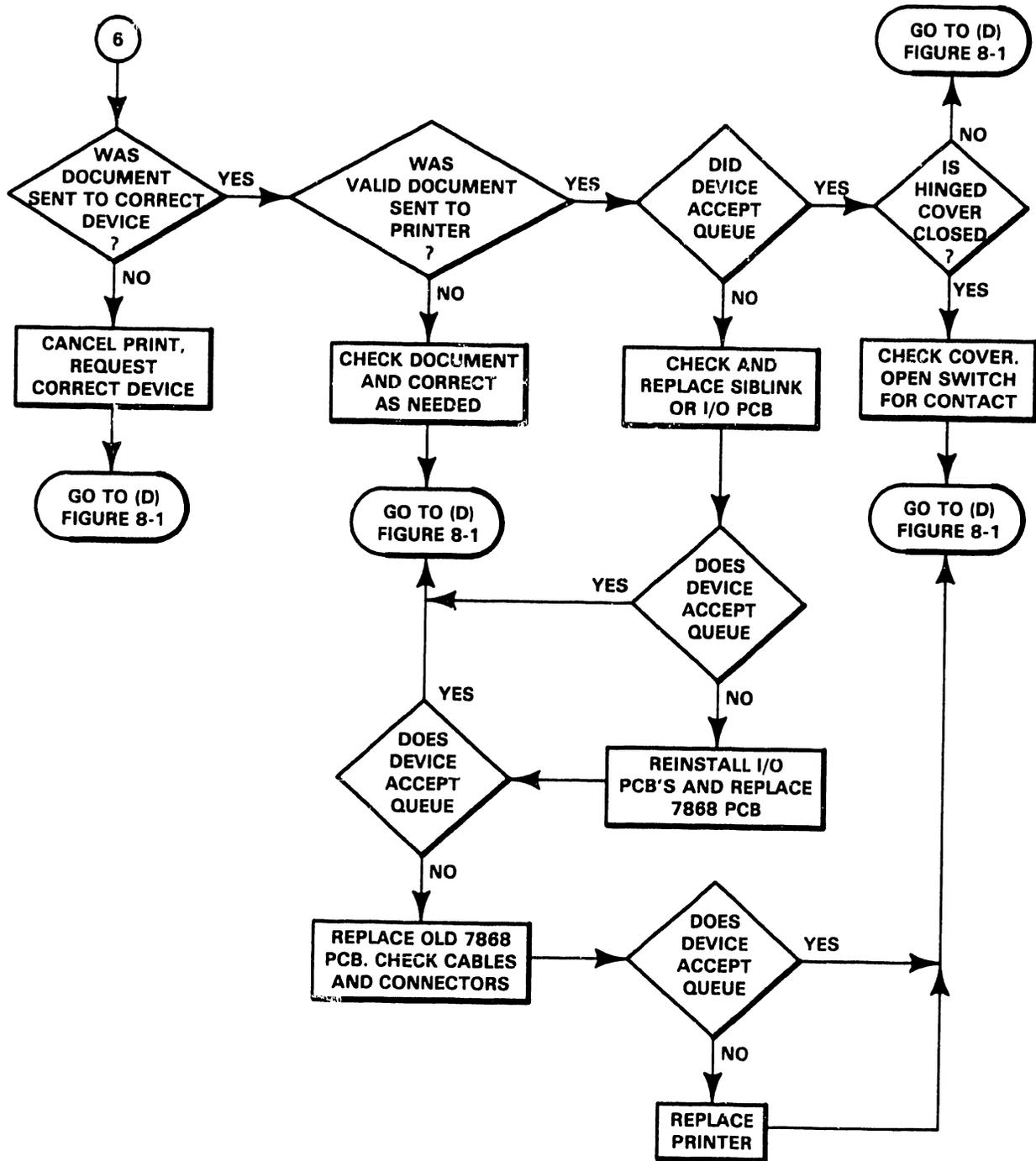


Figure 8-7 Print Start Malfunctions

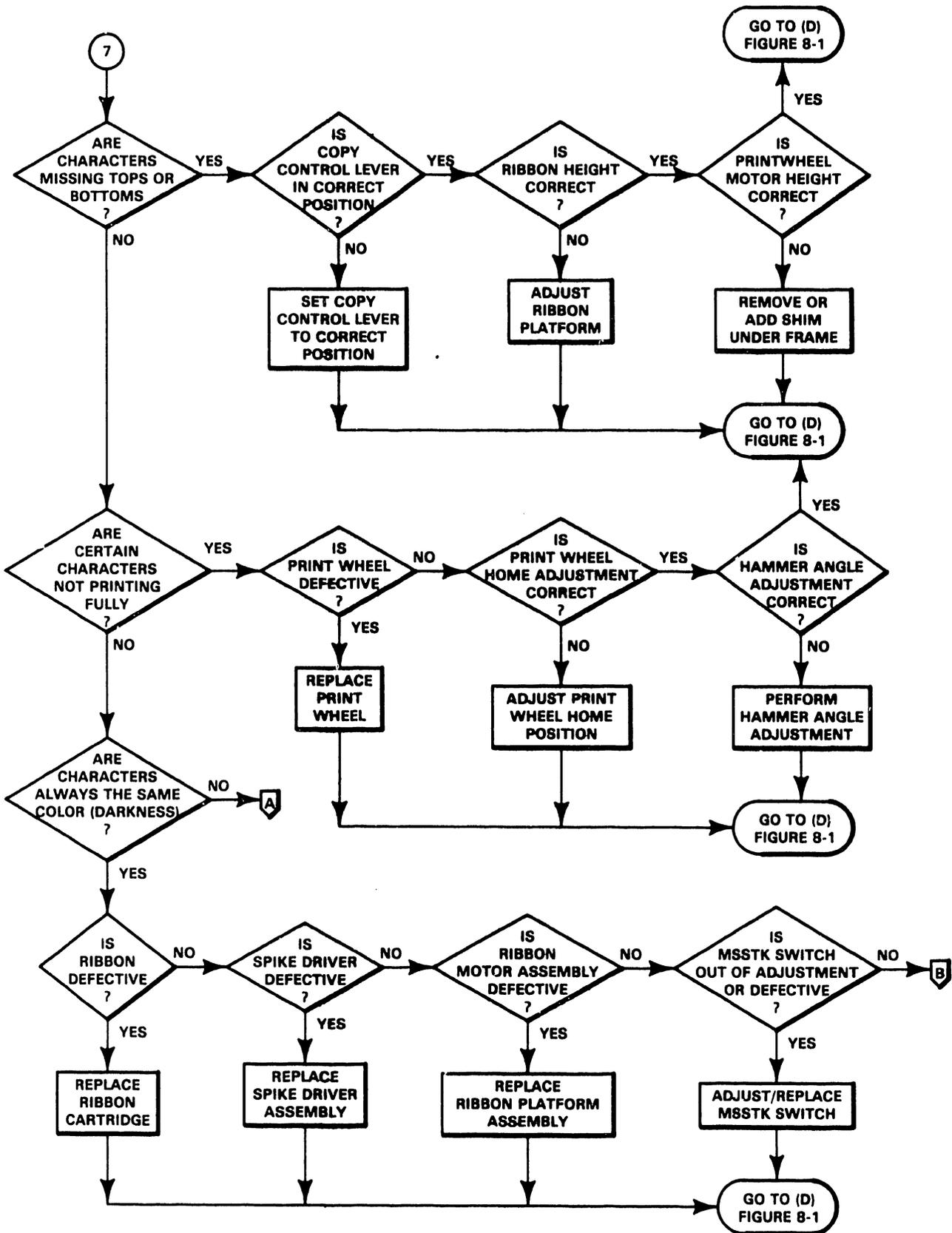


Figure 8-8 Print Quality Malfunctions (Sheet 1 of 3)

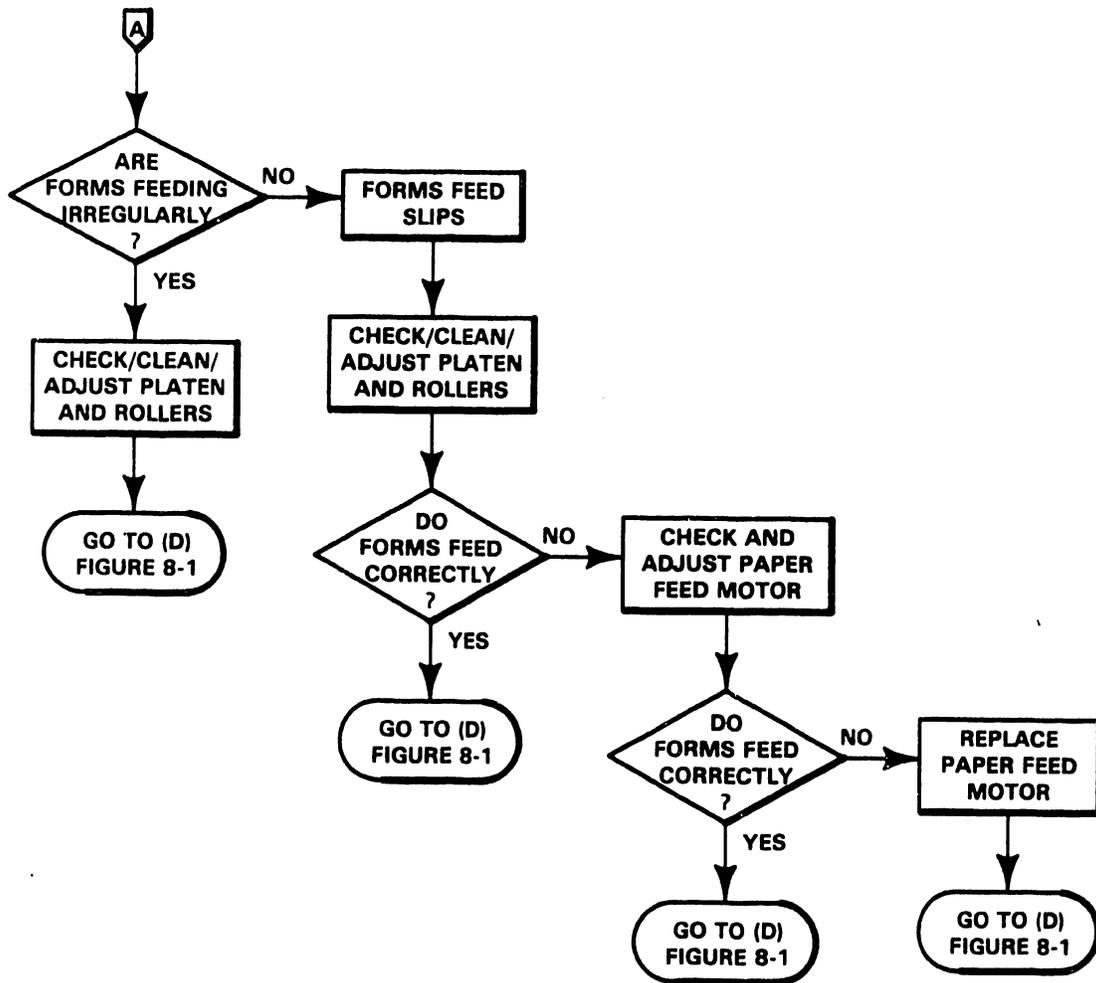


Figure 8-8 Print Quality Malfunctions (Sheet 2 of 3)

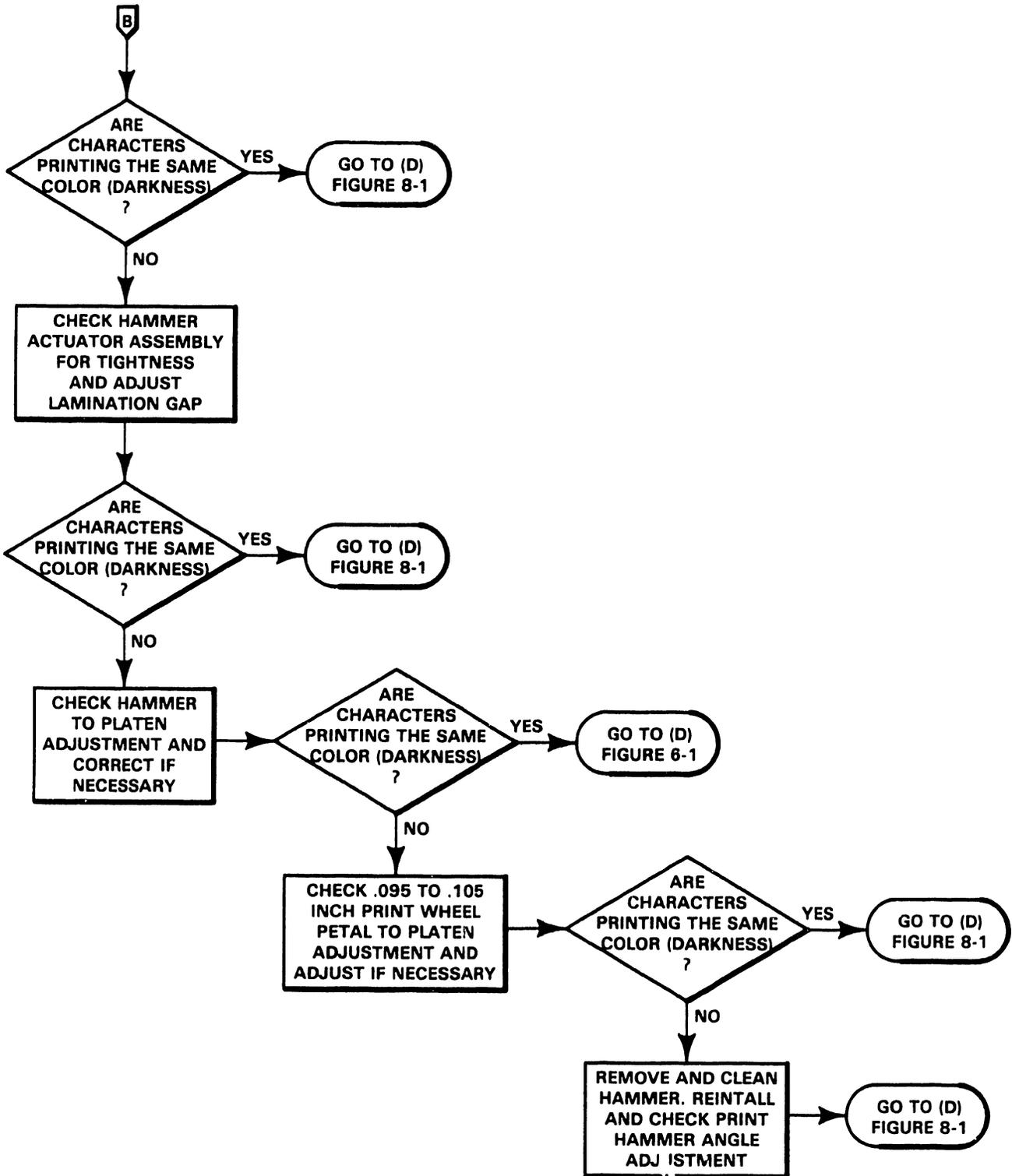


Figure 8-8 Print Quality Malfunctions (Sheet 3 of 3)

**CHAPTER**

**6**

**SCHE-**

**MATICS**

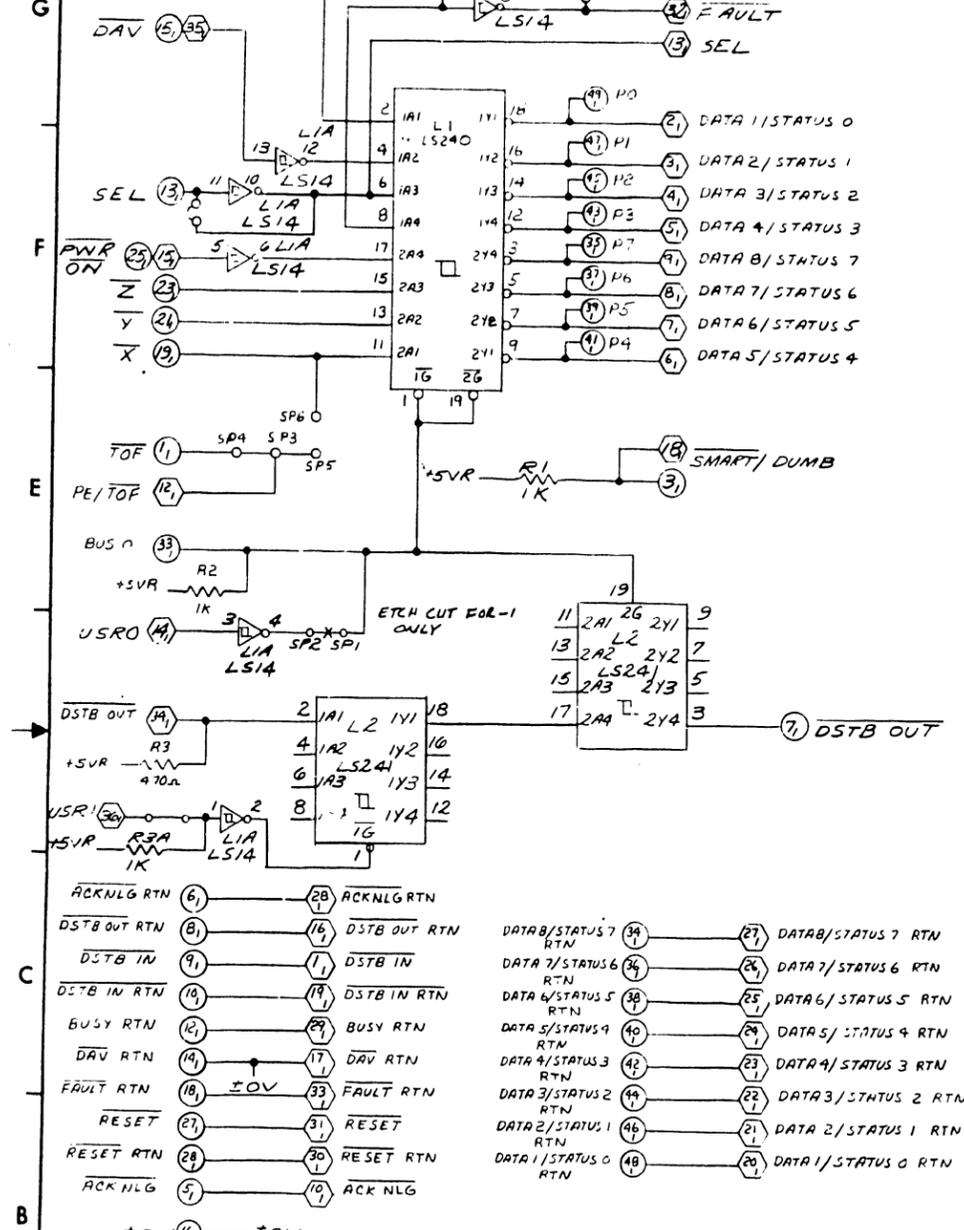
CHAPTER 6  
SCHEMATICS

TABLE OF CONTENTS

<u>WLI No.</u>	<u>TITLE</u>	
210-7885	50 to 36 Pin Interface Board	1 Sheet
210-8038	64K Single Board Data Link	5 Sheets
210-7886	CPU Board	5 Sheets
210-7868	Printer Driver Board	5 Sheets
210-7877	Test Panel Board	1 Sheet

The schematics in this manual are the latest revisions available at the time this document was sent to print.

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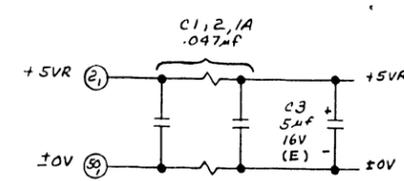
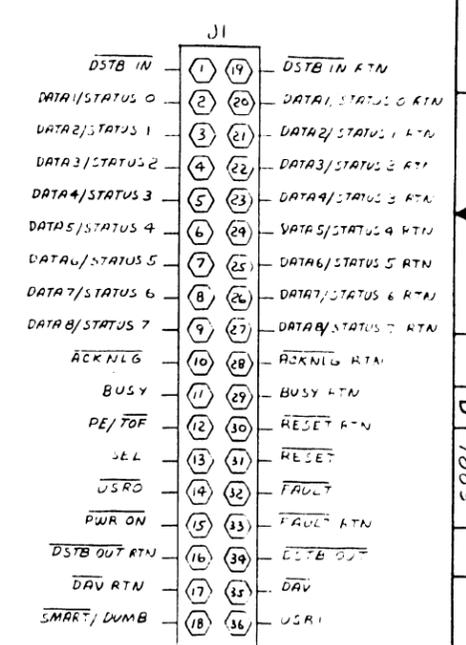
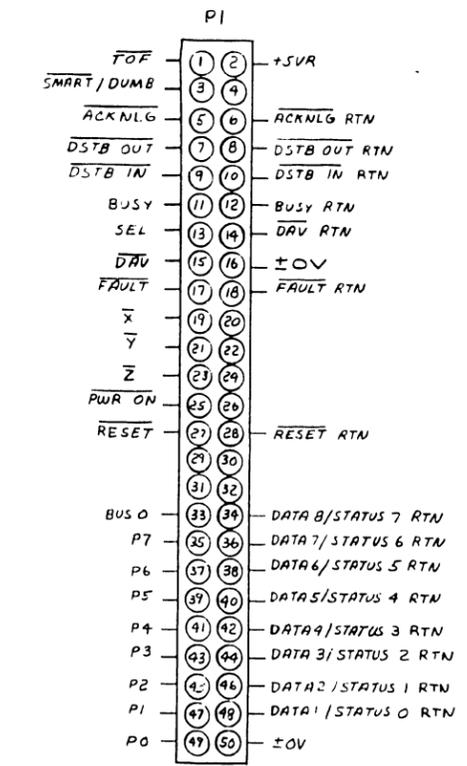
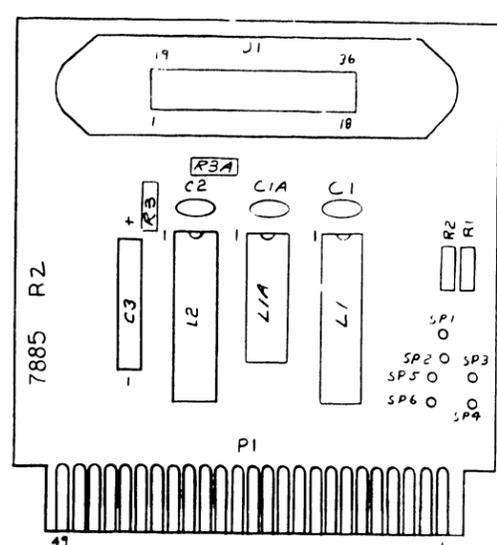
MNEMONICS	COORD
ACK NLG	1B11, 1B10
ACK NLG RTN	1C11, 1C10
BUSY	1G10
BUSY RTN	1C11, 1C10
BUS 0	1E11
DATA1/STATUS 0	1F9
DATA2/STATUS 1	
DATA3/STATUS 2	
DATA4/STATUS 3	
DATA5/STATUS 4	
DATA6/STATUS 5	
DATA7/STATUS 6	
DATA8/STATUS 7	
DATA1/STATUS 0 RTN	1C9, 1C8
DATA2/STATUS 1 RTN	
DATA3/STATUS 2 RTN	
DATA4/STATUS 3 RTN	
DATA5/STATUS 4 RTN	
DATA6/STATUS 5 RTN	
DATA7/STATUS 6 RTN	
DATA8/STATUS 7 RTN	
DAV	1G11
DAV RTN	1C11, 1C10
DSTB OUT	1D8, 1D11
DSTB IN RTN	1C11, 1C10
DSTB OUT RTN	1C11, 1C10
DSTB IN	1C11, 1C10
FAULT	1G9
FAULT RTN	1G10
PO-P7	1G9
PE/TOF	1E11
PWR ON	1F11
TOF	1E11

MNEMONICS	COORD
RESET	1B11, 1B10
RESET RTN	1B11, 1B10
SEL	1F11
SEL RTN	1G9
SMART/DUMB	1E9
USAI	1D11
USRO	1D11
X	1F11
Y	1F11
Z	1F11
±OV	1B11

I.C. LOCATION	TYPE	WL PART NO
L1	74LS244	316-0288
L2	74LS241	376-028A
L1A	74LS14	376-0322

TYPE	LOCATION	SPARES
74LS241	L2	1

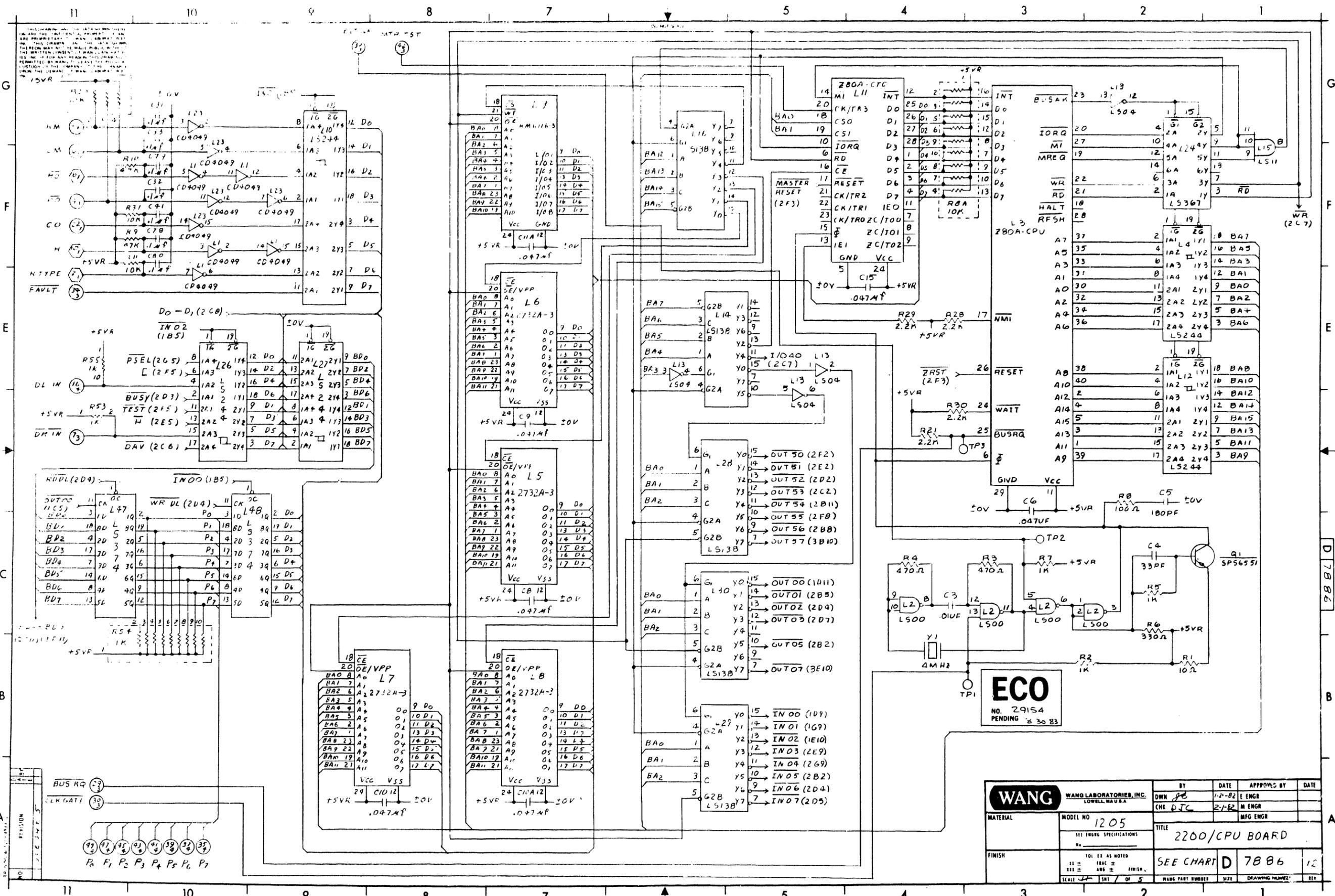
COMPONENT	TYPE	WL PART NO.
R1, 2, 3A	1K 1/4W 5%	330-3011
R3	470Ω 1/4W 5%	330-2048
C1, 2, 1A	.047µF 50V	300-1766
C3	5µF 16V (E)	300-3004
J1	36 PIN CONN	350-0085M



REV	DATE	BY	CHKD	APP'D	REVISION
1	3-29-82	5-10-82	6-28-82	10/21/82	7-22-83
2					
3					
4					
5					
6					
7					
8					
9					
10					

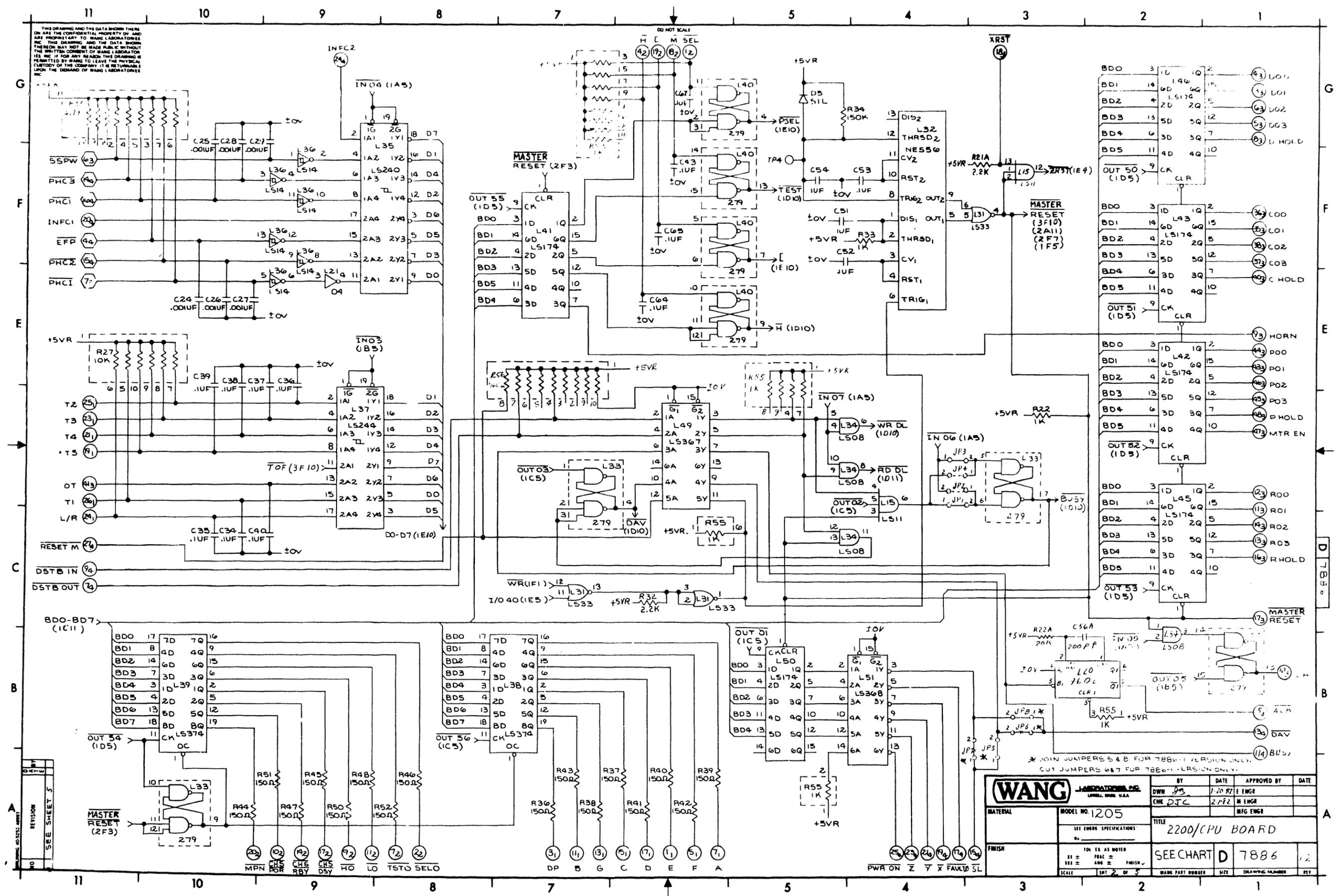
NOTE  
1. ALL RES ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.

WANG WANG LABORATORIES, INC. LOWELL, MA USA		BY	DATE	APPROVED BY	DATE
MATERIAL	MODEL NO 1205	DOWN A Bentley	7-29-82	E ENGR	
FINISH	SEE ENGR SPECIFICATIONS	CHR 3/1/82	4/13/82	M ENGR	
TITLE 50 TO 36 PIN INTERFACE BOARD					
SCALE	TOL EX AS NOTED	210-7885	D	7885	4
	FRAC ±				
	ANG ±				
	FINISH				
	SHT / OF 1				
	WANG PART NUMBER				
	SIZE				
	DRAWING NUMBER				
	REV				



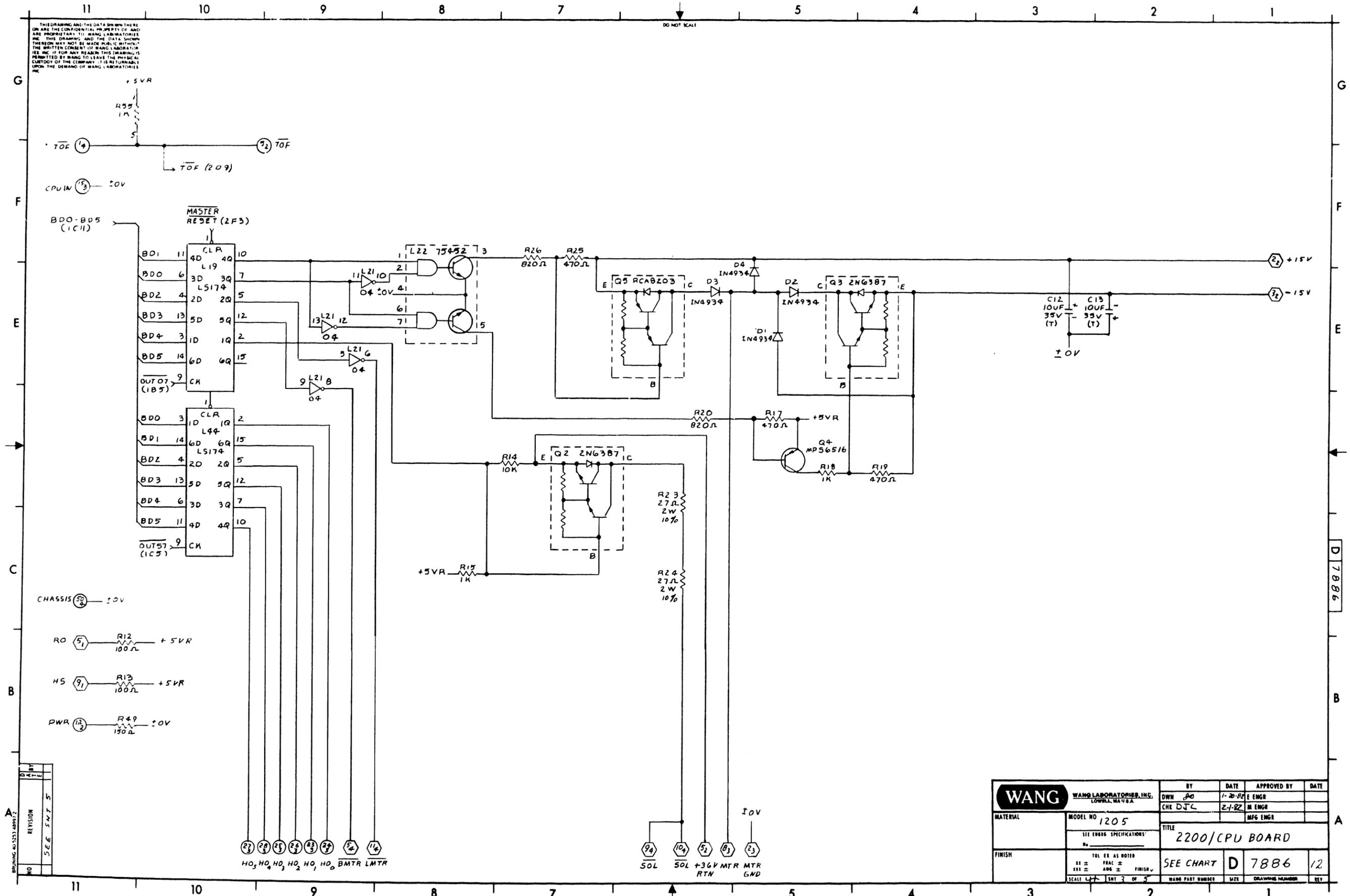
<b>WANG</b> WANG LABORATORIES, INC. LOWELL, MA 01854		BY DWN JTC	DATE 1-2-82	APPROVED BY E ENGR	DATE
MATERIAL	MODEL NO 1205	TITLE 2200/CPU BOARD			
FINISH		SEE CHART D 7886		12	
SCALE 1/8" = 1"		WANG PART NUMBER		DRAWING NUMBER	

THIS DRAWING AND THE DATA SHOWN THEREON ARE THE CONFIDENTIAL PROPERTY OF WANG AND ARE PROPRIETARY TO WANG LABORATORIES, INC. THIS DRAWING AND THE DATA SHOWN THEREON MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES, INC. IF FOR ANY REASON THIS DRAWING IS PERMITTED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY IT IS HEREBY RELEASED UPON THE DEMAND OF WANG LABORATORIES, INC.



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DO NOT SCALE



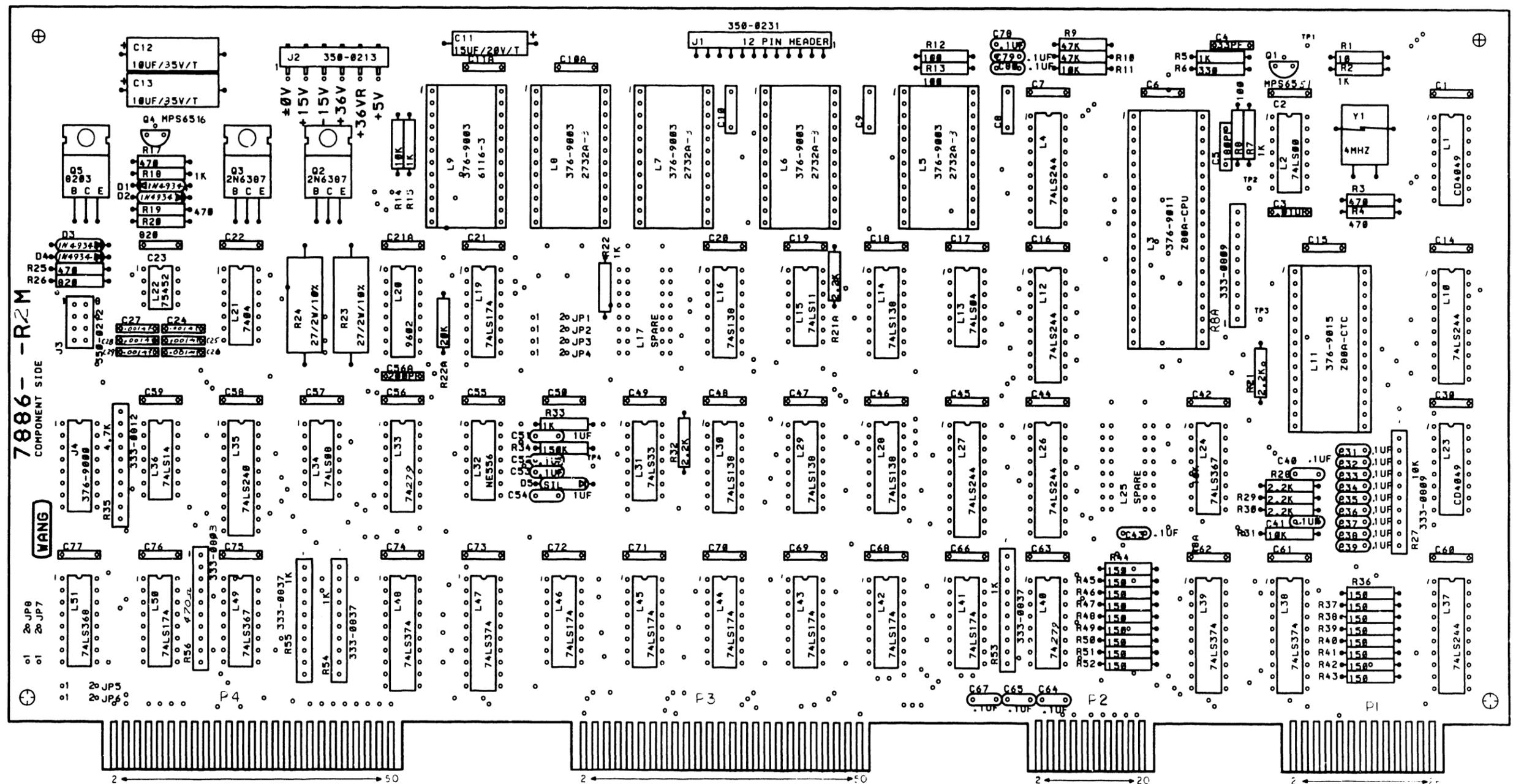
NO	REVISION	DATE	BY
1	SEE SMT 5		

<b>WANG</b> WANG LABORATORIES, INC. LOWELL, MASSA.		BY	DATE	APPROVED BY	DATE
MODEL NO 1205		DWN	1-20-82	E ENGR	
SEE ENGR SPECIFICATIONS		CHK	2-1-82	M ENGR	
TITLE		2200/CPU BOARD			
FINISH		SEE CHART	D	7886	12
SCALE 1/4" = 1"		WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

D 7886

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DO NOT SCALE



7886-R2M  
COMPONENT SIDE

WANG

REV	DATE	BY	APP'D
1			

NO. 11

<b>WANG</b> LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY DWN	DATE 1/21/82	APPROVED BY M ENGR	DATE
MATERIAL	MODEL NO. 1205	TITLE 2200/CPU BOARD			
FINISH	SEE ENGR SPECIFICATIONS	SEE CHART D		7886	1
SCALE: 1" = 1"		WANG PART NUMBER		SIZE	DRAWING NUMBER

G  
F  
E  
C  
B  
A

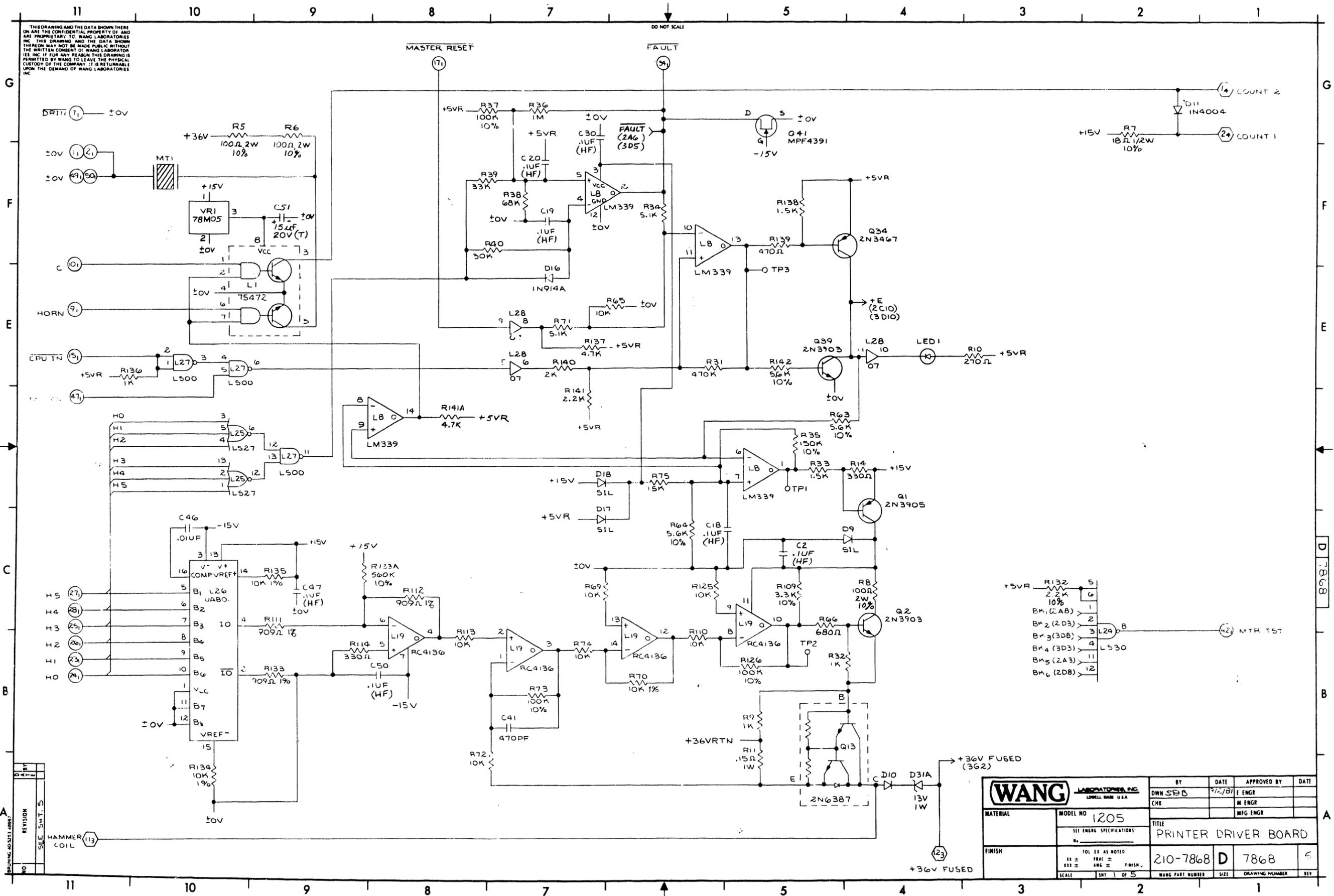
G  
F  
E  
C  
B  
A

11 10 9 8 7 5 4 3 2 1

11 10 9 8 7 5 4 3 2 1



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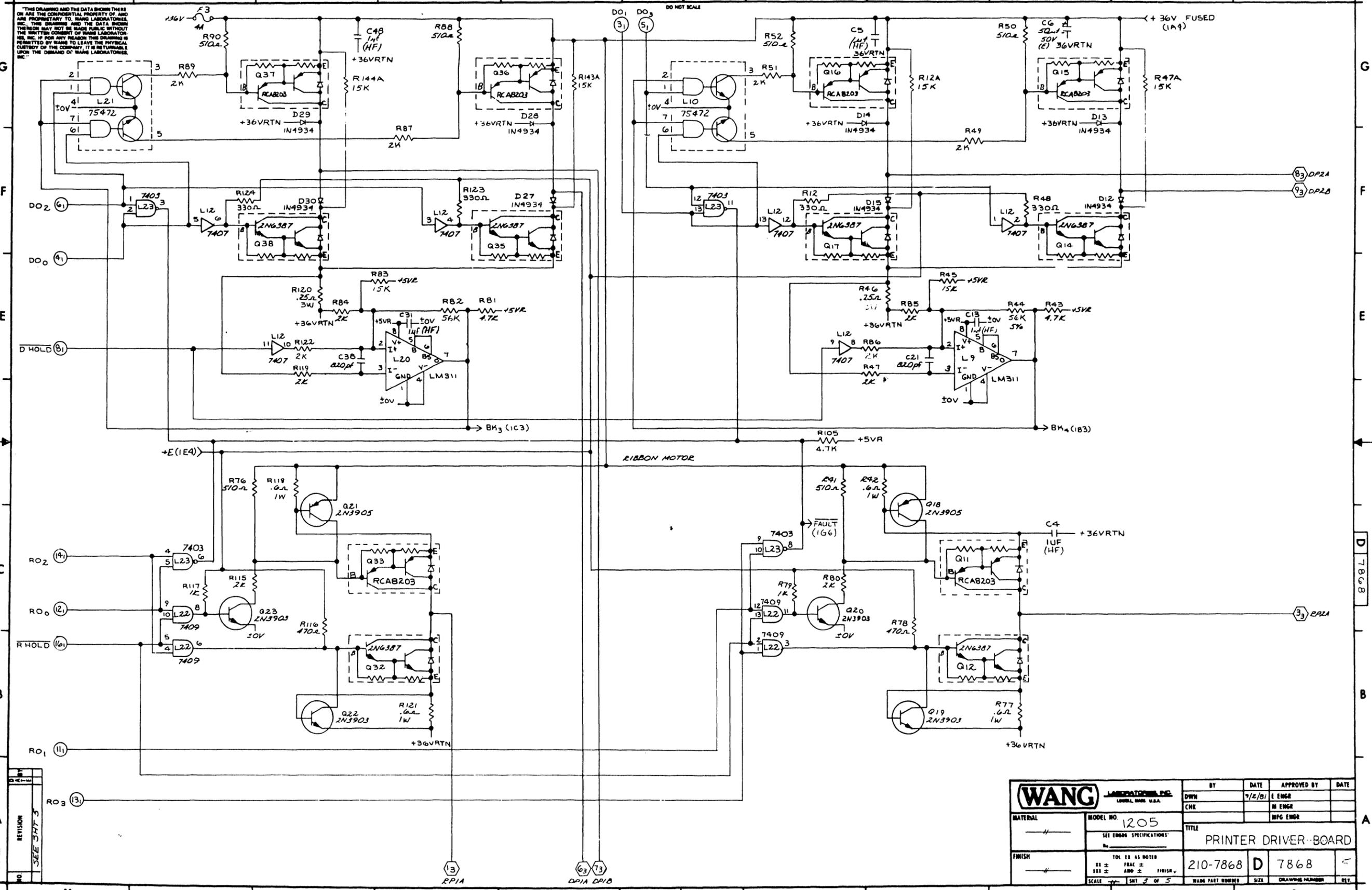


REV	DATE	BY	APP
1			

REVISION  
SEE SHT. 5  
HAMMER COIL (13)

<b>WANG</b> LABORATORIES INC. LOWELL, MASS. U.S.A.		BY DWN SBB	DATE 9/2/81	APPROVED BY E ENGR	DATE
MATERIAL	MODEL NO 1205	CHK		MFG ENGR	
SEE ENGR SPECIFICATIONS		TITLE PRINTER DRIVER BOARD			
FINISH	TOL EX AS NOTED	210-7868		D	7868
SCALE	INT 1 OF 5	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV





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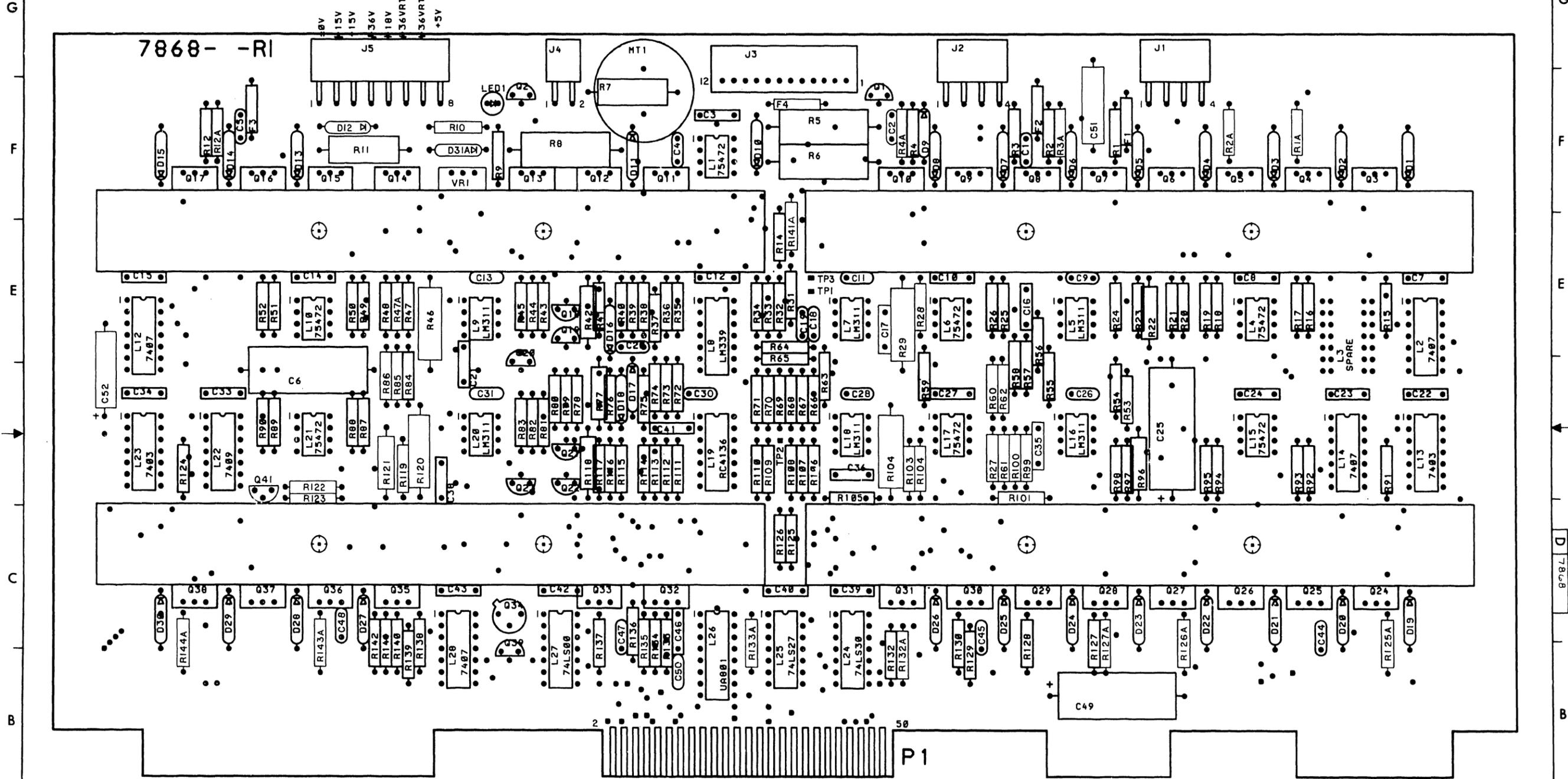
REV	DESCRIPTION
1	ISSUED
2	REVISED
3	REVISED

SEE SHEET 3

<b>WANG</b> LABORATORIES, INC. LOCAL MADE U.S.A.		BY	DATE	APPROVED BY	DATE
MATERIAL	MODEL NO. 1205	DWH	7/2/61	E ENGR	
FINISH	SEE ENGR SPECIFICATIONS	CHK		M ENGR	
				MFG ENGR	
TITLE		210-7868 D 7868			
SCALE		SHEET 3 OF 5			
DRAWING NUMBER		210-7868 D 7868			

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DO NOT SCALE



NO	REVISION	DATE	BY

<b>WANG</b> LABORATORIES INC. LOWELL, MASS. U.S.A.		BY DWN S.D.B.	DATE 9/2/81	APPROVED BY E ENGR	DATE
MATERIAL	MODEL NO 1205	TITLE PRINTER DRIVER BOARD			
FINISH	SEE ENG'G SPECIFICATIONS	210-7868 D 7868 5			
SCALE	1:1	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

REVISION

11 10 9 8 7 5 4 3 2 1

G F E C B A

D 7868

THIS DRAWING AND THE DATA SHOWN THEREON ARE THE CONFIDENTIAL PROPERTY OF WANG LABORATORIES, INC. THE DRAWING AND THE DATA SHOWN THEREON MAY NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES, INC. IF FOR ANY REASON THIS DRAWING IS PERMITTED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY, IT IS RETURNABLE UPON THE DEMAND OF WANG LABORATORIES, INC.

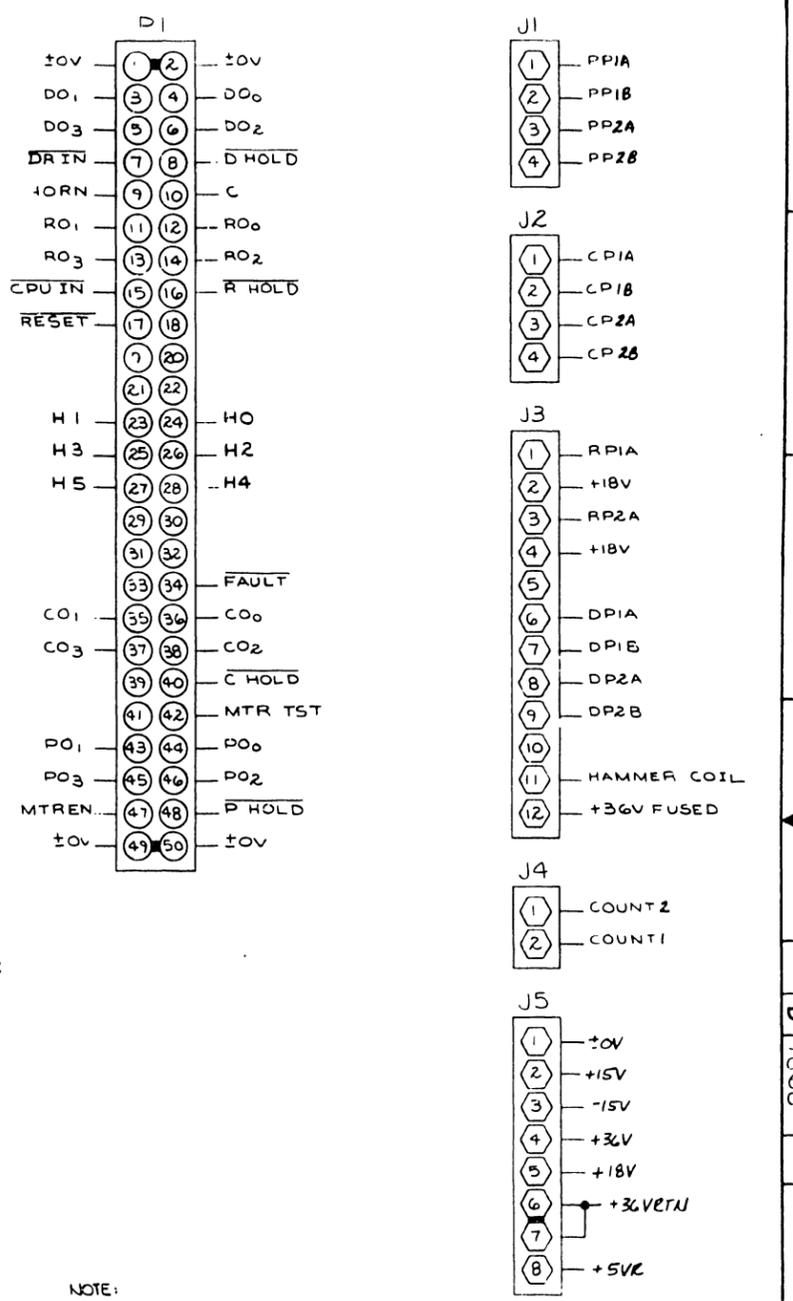
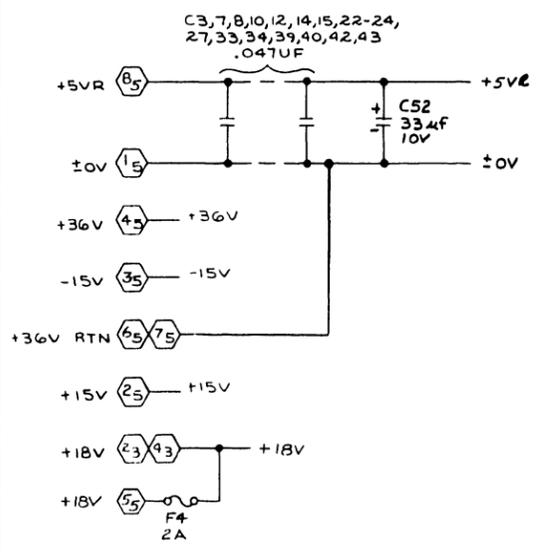
COMPONENT	TYPE	W.L. PART NO.
R1, 4, 15, 20, 78, 91, 97, 116, 127, 129, 139	470Ω 5% 1/4W	330-2048
R2, 3, 17, 19, 41, 50, 52, 76, 88, 90, 92, 95, 128, 130	510Ω 5% 1/4W	330-2052
R5, 6, 8	100Ω 10% 2W	337-2010
R7	18Ω 10% 1/2W	331-1018
R9, 32, 79, 117, 136	1K 5% 1/4W	330-3011
R10	270Ω 5% 1/4W	330-2028
R11	.15Ω 5% 1W	334-0053
R12, 48, 114, 123, 124	330Ω 5% 1/4W	330-2034
R14		
R56, 57, 61, 86, 106, 122, 116, 18, 21, 23, 25, 26, 28, 47, 49, 51, 53, 62, 80, 84, 85, 87, 89, 93, 94, 98, 101-103, 107, 115, 119, 140	2K 5% 1/4W	330-3021
R29, 104	.3Ω 5% 3W	334-0018
R24, 27, 43, 67	4.7K 5% 1/4W	330-3048
B1, 100, 105, 137, 141A		
R31	470K 5% 1/4W	330-5048
R33, 138	1.5K 5% 1/4W	330-3016
R34, 71	5.1K 5% 1/4W	330-3052
R35	150K 10% 1/4W	330-5016
R36	1M 5% 1/4W	330-6011
R37, 73, 126	100K 10% 1/4W	330-5011
R38	68K 5% 1/4W	330-4069
R39	33K 5% 1/4W	330-4034
R40	30K 5% 1/4W	330-4031
R42, 77, 22, 118, 121, 124	.6Ω 5% 1W	334-0054
R41, 54, 50, 82, 99, 108	56K 5% 1/4W	330-4057
R45, 55, 58, 83, 1A, 2A, 3A, 4A, 12A, 125A, 126A, 127A, 132A, 143A, 144A, 47A, 75	15K 5% 1/4W	330-4016
R66	680Ω 5% 1/4W	330-2069
R59, 68	18K 5% 1/4W	330-4019
R63, 64, 142	5.6K 10% 1/4W	330-3057
R65, 69, 72, 74, 110, 113, 125	10K 5% 1/4W	330-4011
R107	3.3K 10% 1/4W	330-3034
R111, 112, 133	909Ω 1% 1/8W	333-0059
R46, 120	.25Ω 5% 3W	334-0017
R132, 141	2.2K 5% 1/4W	330-3023
R133A	560K 10% 1/4W	330-5057

COMPONENT	TYPE	W.L. PART NO.
R134, 135, 70	10K 1% 1/8W	333-0017
C1, 4, 5, 9, 11, 13, 26, 28, 31, 44, 45, 48	1UUF 50V (H.F.)	300-1931
C2, 18, 19, 20, 30, 47, 50	.1UUF 50V (H.F.)	300-1930
C3, 7, 8, 10, 12, 14, 15, 22-24, 27, 33, 34, 39, 40, 42, 43	.047UUF 50V	300-1966
C6, 25, 49	50UUF 50V (E)	300-3010
C16, 17, 21, 35, 36, 38	820PF 500V	300-1820
C41	470PF 500V	300-1470
C46	.01UUF 25V	300-1903
C51	15UUF 20V (T)	300-4022
C52	33UUF 10V (T)	300-4024
D1-8, 12-15, 19-30	1N4934	380-4011
D9, 17, 18	SILICON	380-1001
D10, 11	1N4004	380-4000
D16	1N914A	380-1012
D31A	13V, 1W ZENER	380-2113
41, 18, 21	2N3905	375-1069
Q2, 19, 20, 22, 23, 39	2N3903	375-1068
Q3, 6, 7, 10, 12-14, 17, 24, 27, 28, 31, 32, 35, 38	2N6387	375-1052
Q4, 5, 8, 9, 11, 15, 16, 25, 26, 29, 30, 33, 36, 37	RCAB203	375-1053
Q34	2N3467	375-1026
Q41	MPF4391	375-1070
J1, 2	4 PIN HEADERS	350-0209
J3	12 PIN HEADER	350-0231
J4	2 PIN MOLEX	350-0236
J5	8 PIN HEADERS	350-0210
L1, D1	LAMP, RED	370-0026
F1, F4	2A, 125V PICCO FUSE	360-1155
F3	4A, 125V PICCO FUSE	360-1156
F2	2.5A, 125V PICCO FUSE	360-1153
MT1	AT-20 AUDIO TRANSDUCER	320-0303
VRI	78M05 REG.	374-0016

MNEMONICS	COORD
L	1F11
C HOLD	2A11
COUNT 1	1G1
COUNT 2	1G1
CO0	2D11
CO1	2G7
CO2	2B11
CO3	2G7
CPU IN	1E11
CP1A	2A7
CP1B	2A7
CP2A	2C1
CP2B	2C1
D HOLD	3E11
DO0	3E11
DO1	3G6
DO2	3F11
DO3	3G6
DP1A	3A7
DP1B	3A7
DP2A	3F1
DP2B	3F1
DRIN	1G11
FAULT	1G6
HAMMER COIL	1A11
HORN	1E11
HO-H5	1B11
MTR TST	1D11
MTR TST	1C1
P HOLD	2E11
PO0	2F11
PO1	2G6
PO2	2F11
PO3	2G6
PP1A	2F1
PP1B	2A7
PP2A	2F1
PP2B	2F1
RESET	1G8
R HOLD	3B11
RO0	3C11
RO1	3B11
RO2	3C11
RO3	3A11
RP1A	3A8
RP2A	3C1
+36V FUSED	1A4
+36V RTN	5B5

I.C. LOCATION	TYPE	W.L. PART NO.
L1, 4, 6, 10, 15, 17, 21	75472	36-0499
L2, 12, 14, 28	7407	376-0056
L3, 11	3FARE	
L5, 7, 9, 16, 18, 20	LM311	376-0474
L8	LM339	376-0740
L13, 23	7403	376-0028
L19	RC4136	376-0425
L22	7409	376-0085
L24	74LS30	376-0249
L25	74LS27	376-0245
L26	UA801	376-0290
L27	74LS00	376-0207

TYPE	I.C. LOC.	SPARES
74LS00	L27	
7407	L28	3
74LS27	L25	1



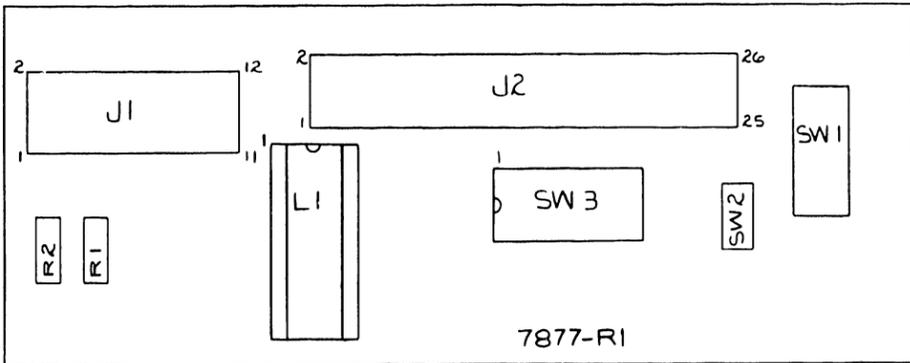
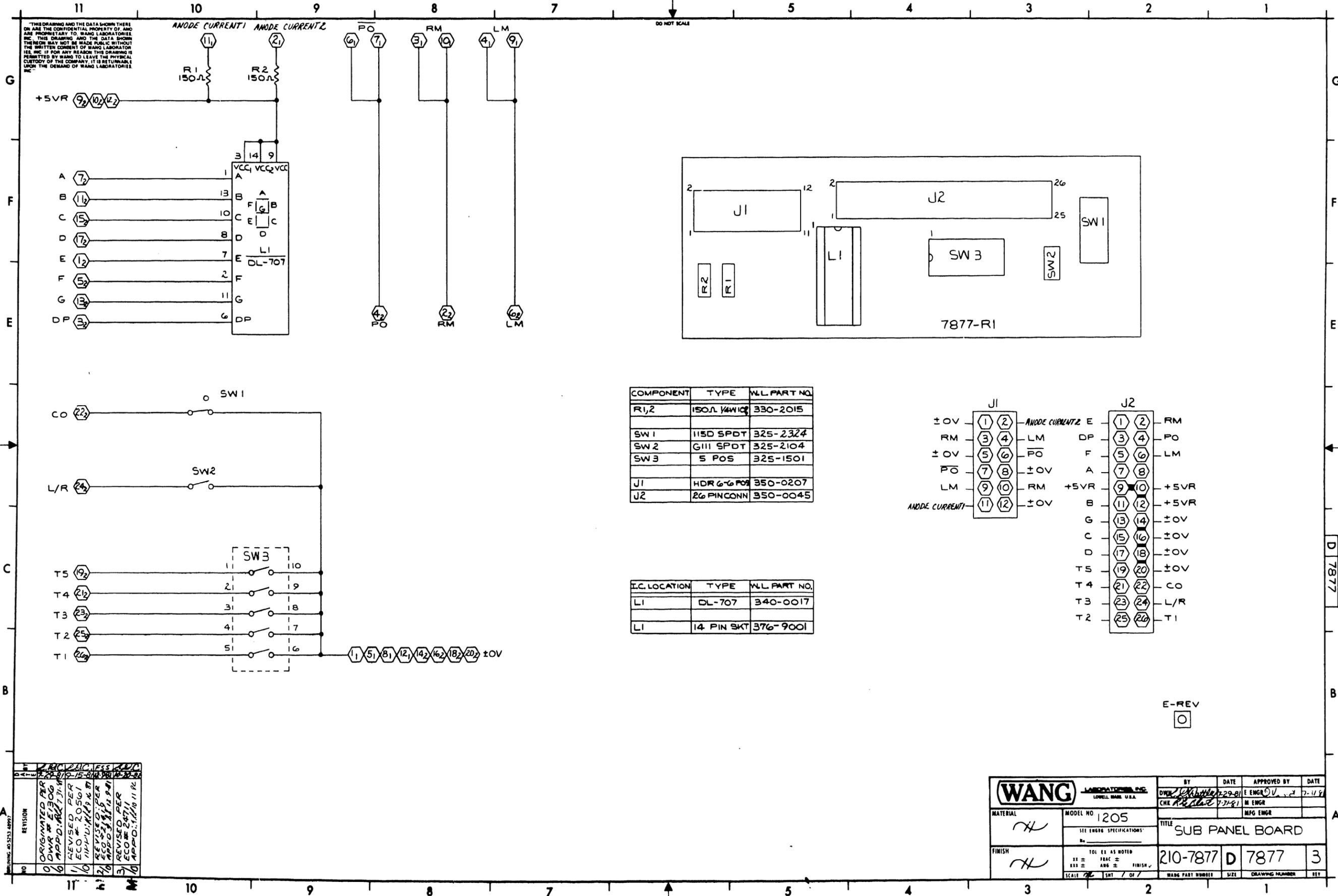
NOTE:  
1. ALL RES ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.

E-REV.  
3

REVISION	DATE	BY	REASON
1	12-22-78	DBB	ORIGINATED PER DWG # 210-7868
2	12-22-78	KTH	REVISED PER ECO # 20778
3	12-22-78	KTH	REVISED PER ECO # 20953
4	12-22-78	KTH	REVISED PER ECO # 21317
5	12-22-78	KTH	REVISED PER ECO # 21491
6	12-22-78	KTH	REVISED PER ECO # 21957
7	12-22-78	KTH	REVISED PER ECO # 21957

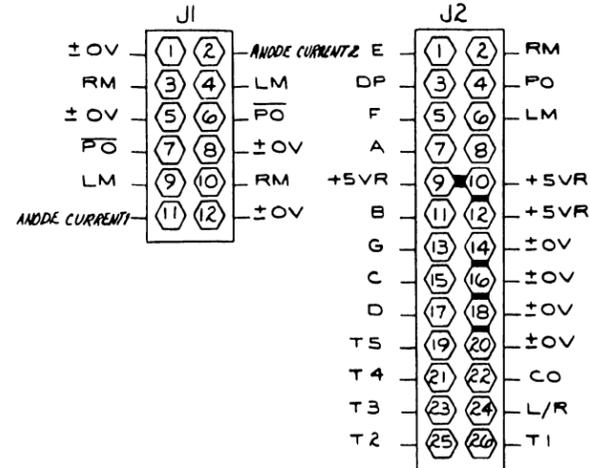
<b>WANG</b> LABORATORIES, INC. LITTLE ROCK, ARK. U.S.A.		BY: DWN SBB	DATE: 7/2/81	APPROVED BY: E ENGR D.V.	DATE: 7/2/81
MATERIAL: SEE ENGR SPECIFICATIONS		CHK: MZL	DATE: 7/2/81	APPROVED BY: M ENGR	DATE:
MODEL NO: 1205		TITLE: PRINTER DRIVER BOARD			
FINISH: 101 IN AS NOTED	SCALE: 1:1	210-7868	D	7868	5
WANG PART NUMBER		SIZE	DRAWING NUMBER		REV

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COMPONENT	TYPE	W.L. PART NO.
R1,2	150Ω 1/4WIC	330-2015
SW 1	11SD SPDT	325-2324
SW 2	6111 SPDT	325-2104
SW 3	5 POS	325-1501
J1	HDR 6-6 POS	350-0207
J2	26 PINCONN	350-0045

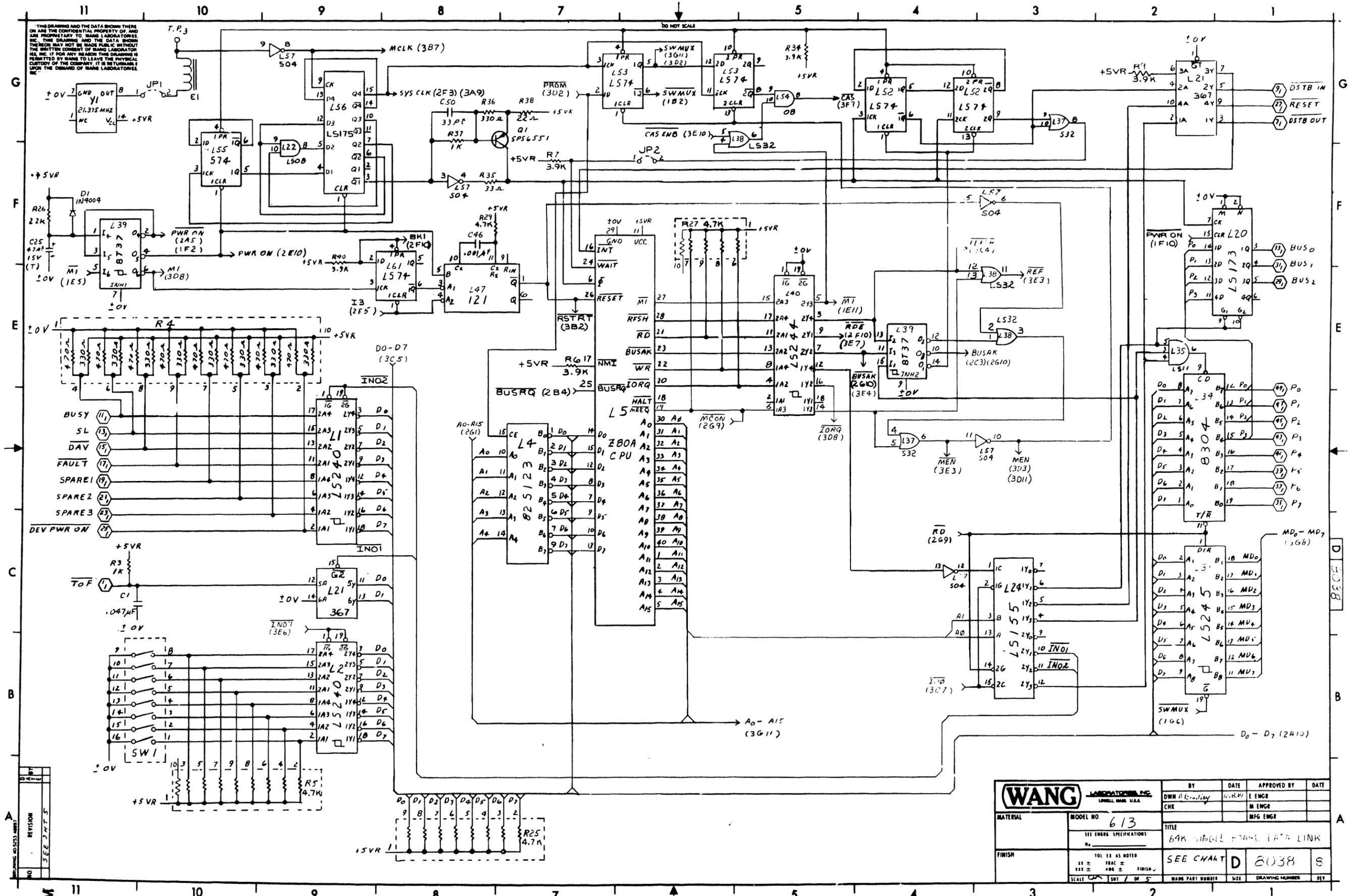
I.C. LOCATION	TYPE	W.L. PART NO.
L1	DL-707	340-0017
L1	14 PIN SKT	376-9001



REV	DATE	BY	CHK	APP'D.	DESCRIPTION
0	10-15-68	DWR			ORIGINATED PER DWR # E306
1	11-10-68				REVISOR PER ECO # 20501
2	11-11-68				REVISOR PER ECO # 20501
3	11-11-68				REVISOR PER ECO # 24711
4	11-11-68				REVISOR PER ECO # 24711

<b>WANG</b> LABORATORIES INC. LOWELL MASS. U.S.A.		BY: <i>[Signature]</i>	DATE: 7-11-68	APPROVED BY: <i>[Signature]</i>	DATE: 7-11-68
MATERIAL: <i>[Handwritten]</i>	MODEL NO: 1205	TITLE: SUB PANEL BOARD			
FINISH: <i>[Handwritten]</i>	TOL. EX. AS NOTED	210-7877	D 7877	3	
	SCALE: 1/8" = 1"	WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

THIS DRAWING AND THE DATA SHOWN THERE ON ARE THE CONFIDENTIAL PROPERTY OF AND ARE PROPRIETARY TO WANG LABORATORIES, INC. THE DRAWING AND THE DATA SHOWN THEREON MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES, INC. IF FOR ANY REASON THIS DRAWING IS REPRODUCED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY, IT IS RETURNABLE UPON THE DEMAND OF WANG LABORATORIES, INC.

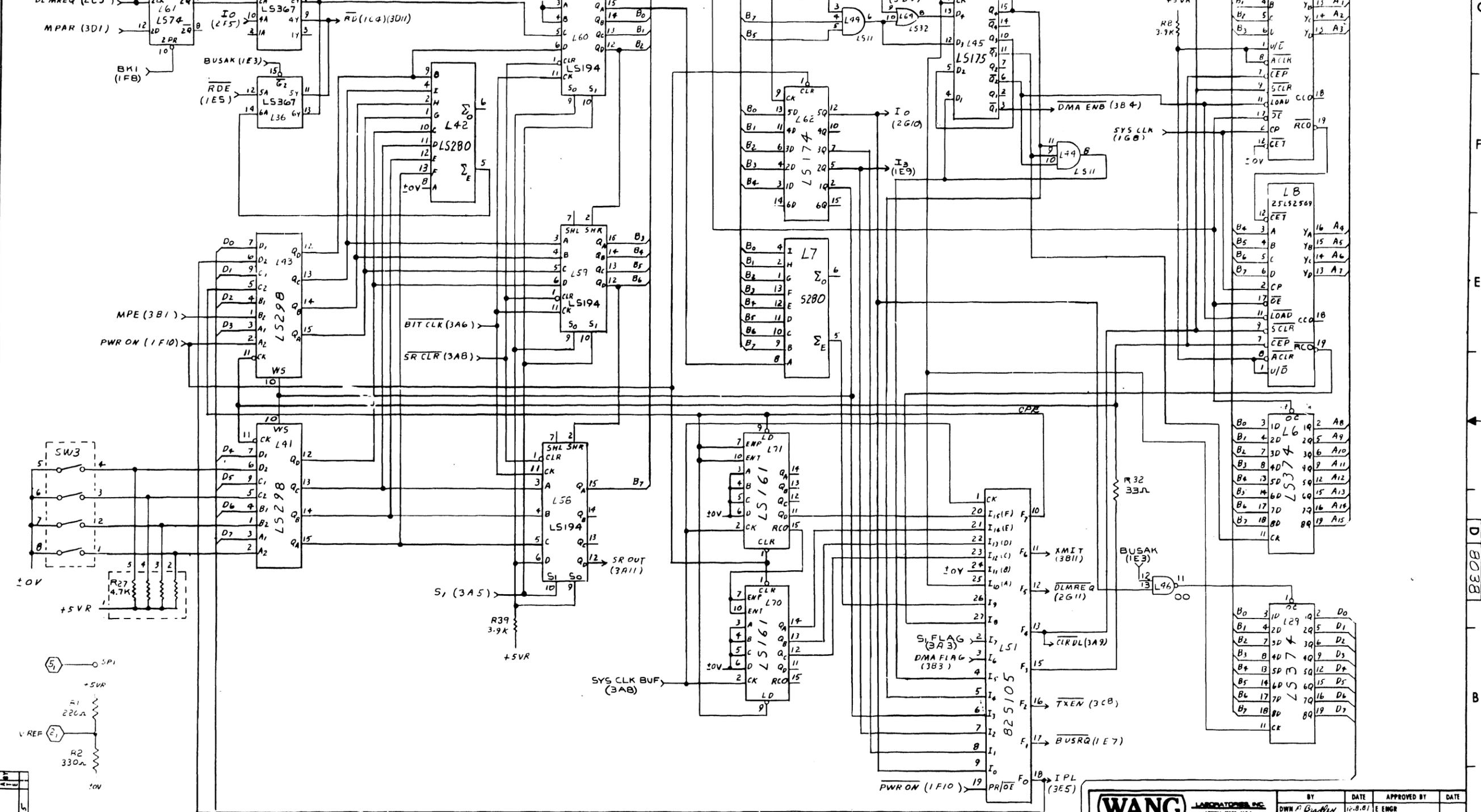


REV	REVISION
1	3 E E 3 M T S

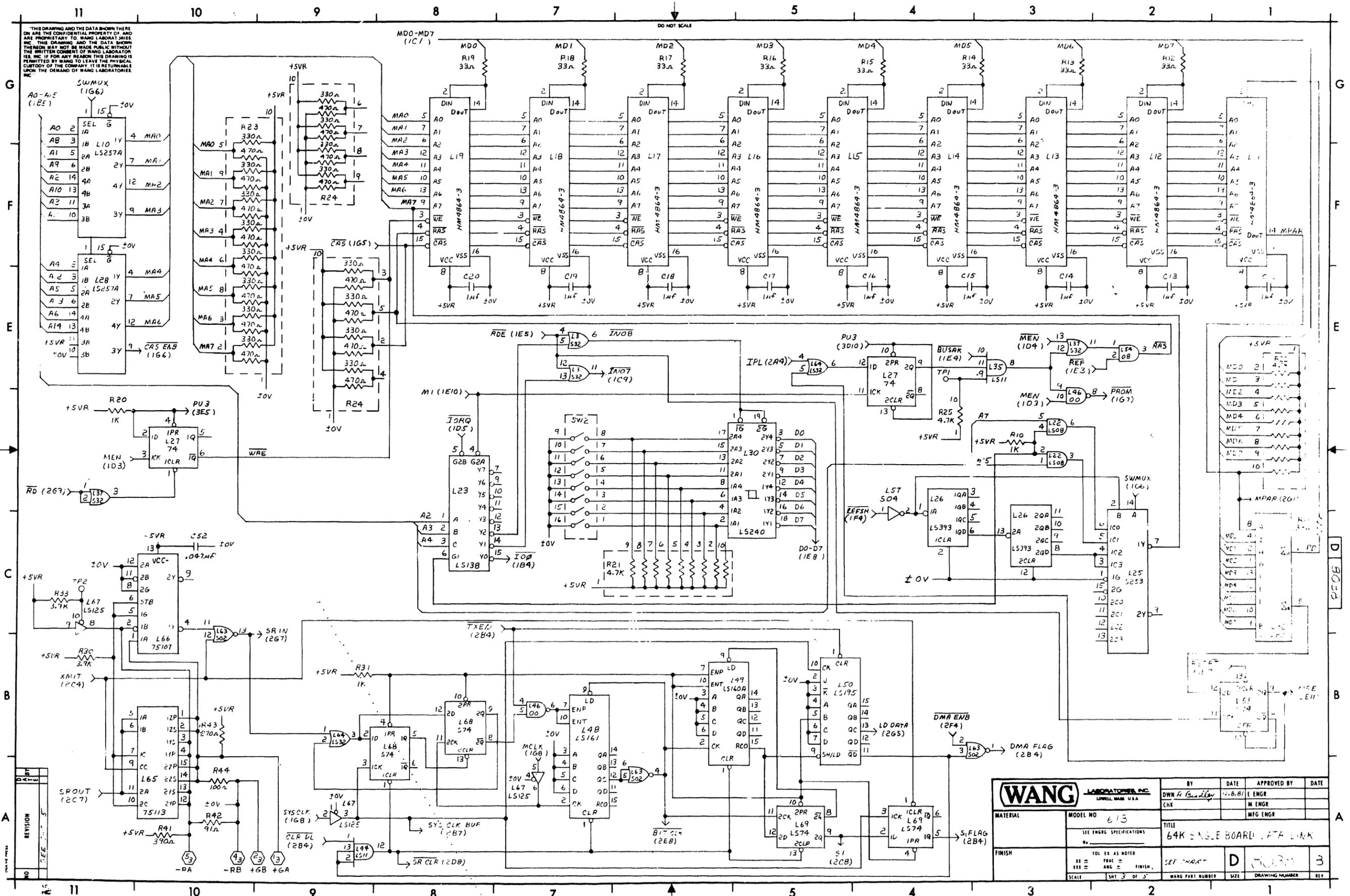
<b>WANG</b> LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY DWN	DATE 11/11/77	APPROVED BY E ENGR	DATE
MATERIAL	MODEL NO. 613	CHK		M ENGR	
SEE ENGR SPECIFICATIONS		TITLE 64K SINGLE ENDED DATA LINK		MFG ENGR	
FINISH	TOL. IS AS NOTED	SEE CHART	D 8038	S	
SCALE 1/8" = 1"		SHEET 1 OF 5	WANG PART NUMBER	SIZE	DRAWING NUMBER

11 10 9 8 7 5 4 3 2 1

"THE DRAWING AND THE DATA SHOWN THERE ON ARE THE CONFIDENTIAL PROPERTY OF AND ARE PROPRIETARY TO WANG LABORATORIES INC. THIS DRAWING AND THE DATA SHOWN THEREIN MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES INC. IF FOR ANY REASON IT IS PERMITTED BY WANG TO LEAVE THE PROPERTY OF THE COMPANY IT IS TO BE DESTROYED OR REPRODUCED ONLY UPON THE DEMAND OF WANG LABORATORIES INC."



THIS DRAWING AND THE DATA SHOWN THERE ON ARE THE CONFIDENTIAL PROPERTY OF, AND ARE PROPRIETARY TO WANG LABORATORY, INC. THIS DRAWING AND THE DATA SHOWN THEREON MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORY, INC. IF FOR ANY REASON THIS DRAWING IS PERMITTED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY, IT IS RETURNABLE UPON THE DEMAND OF WANG LABORATORY, INC.



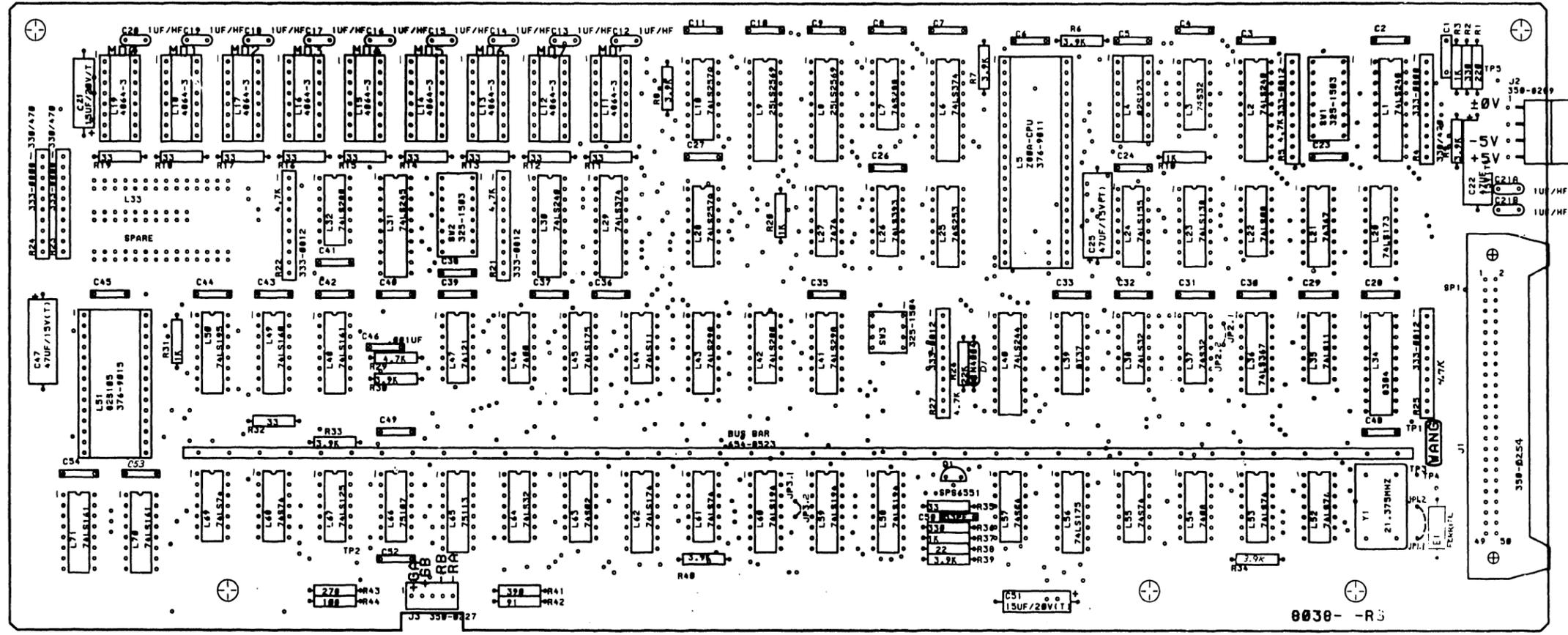
REV	DESCRIPTION
1	ISSUED FOR FAB

<b>WANG</b> LABORATORY, INC. LOWELL, MASS. U.S.A.		BY DWN A. GARDNER	DATE 12-8-81	APPROVED BY E ENGR	DATE
MATERIAL	MODEL NO 613	CHK		M ENGR	
SEE ENGR SPECIFICATIONS		TITLE 64K SINGLE BOARD DATA LINK		MFG ENGR	
FINISH		SCALE 1/8" = 1" AS NOTED		SEE PART	D 5030 3
NO. OF SHEETS 1		SHEET NO. 3		WANG PART NUMBER	SIZE DRAWING NUMBER

11 10 9 8 7 5 4 3 2 1

DO NOT SCALE

THIS DRAWING AND THE DATA SHOWN THEREON ARE THE CONFIDENTIAL PROPERTY OF AND ARE PROPRIETARY TO WANG LABORATORIES, INC. THIS DRAWING AND THE DATA SHOWN THEREON MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES, INC. IF FOR ANY REASON THIS DRAWING IS PERMITTED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY, IT IS RETURNABLE UPON THE DEMAND OF WANG LABORATORIES, INC.



<b>WANG</b> LABORATORIES, INC. LOWELL, MASS. U.S.A.		BY	DATE	APPROVED BY	DATE
		DWN R. Ch... CHK	12.10.81	E ENGR	
MATERIAL	MODEL NO	TITLE			
	613	64K SINGLE BOARD DATA LINK			
FINISH	SEE ENGR SPECIFICATIONS	101 EX AS NOTED	SEE CHART	D	8038
	101 EX AS NOTED	101 EX AS NOTED	SEE CHART	D	8038
	SCALE	1/4" = 1"	WANG PART NUMBER	SIZE	DRAWING NUMBER

NO	REVISION
1	ISSUED

11 10 9 8 7 5 4 3 2 1

THIS DRAWING AND THE DATA SHOWN THERE ON ARE THE CONFIDENTIAL PROPERTY OF AND ARE PROPRIETARY TO WANG LABORATORIES INC. THIS DRAWING AND THE DATA SHOWN THEREON MAY NOT BE MADE PUBLIC WITHOUT THE WRITTEN CONSENT OF WANG LABORATORIES INC. IF FOR ANY REASON THIS DRAWING IS PERMITTED BY WANG TO LEAVE THE PHYSICAL CUSTODY OF THE COMPANY, IT IS RETURNABLE UPON THE DEMAND OF WANG LABORATORIES INC.

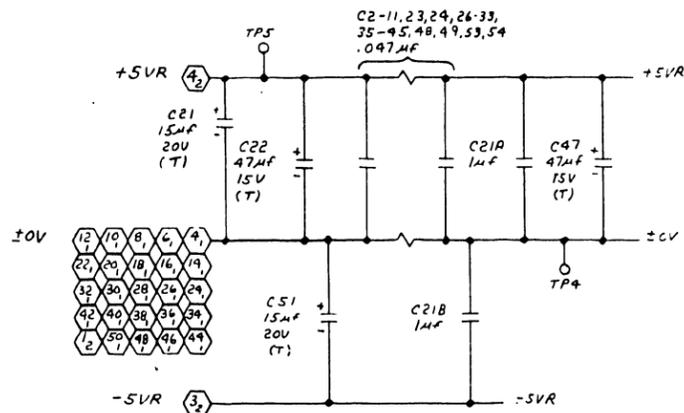
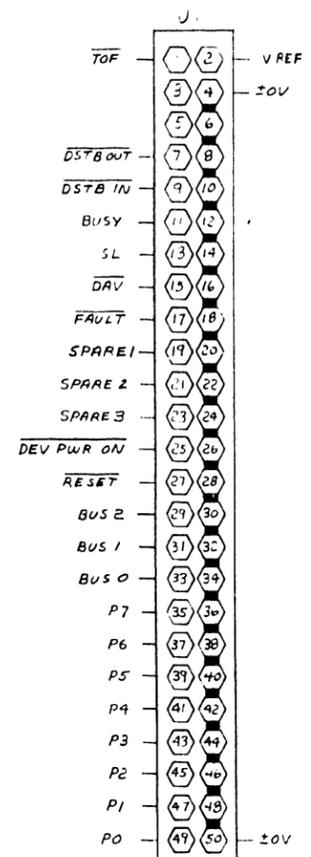
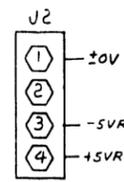
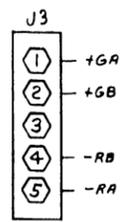
I.C. COMPONENT	TYPE	W.L. PART NO.
11, 30	74LS240	376-0297
13, 37	74532	376-0205
14	825123	SEE CHART
15	Z80A CPU	SEE CHART
16, 19	74LS374	376-0286
17	745280	376-0246
18, 19	74LS569	376-0498
20, 28	74LS257A	376-0204
21, 19	74LS164-3	SEE CHART
22	74LS173	376-0289
23	74367	376-0176
24	74LS08	376-0153
25	74LS138	376-0294
26	74LS155	376-0158
27	74LS253	376-0337
28	74LS393	376-0307
29	7474	376-0006
30	74LS245	376-0285
31, 32, 42	74LS280	376-0242
33	SPARE	
34	74LS175	376-0160
35, 44	74LS11	376-0225
36	74LS367	376-0172
38, 49	74LS32	376-0211
39	8737	376-0289
40	74LS244	376-0288
41, 43	74LS298	376-0232
45, 56	74LS175	376-0160
46	7400	376-0002
47	74121	376-0051
48, 70, 71	74LS161	376-0233
49	74LS160A	376-0466
50	74LS195	376-0248
51	825105	SEE CHART
52, 53, 61, 69	74LS74	376-0155
54	7408	376-0081
55, 68	74LS74	376-0202
57	74504	376-0197
58, 59, 60	74LS194	376-0416
61	74LS174	376-0159
62	74LS04	376-0199
63	75113	376-0256
64	75107	376-0146
65	74LS125	376-0486
66, 67, 68	SKT, 16 PIN	376-9002
69	SKT, 40 PIN	376-9011
70	SKT, 28 PIN	376-9015

COMPONENT	TYPE	W.L. PART NO.
R1	220Ω 1/4W 5%	330-2023
R2, 36	330Ω 1/4W 5%	330-2034
R3, 10, 20, 31, 37	1K 1/4W 5%	330-3011
R4, 23, 24	330Ω/470Ω SIP	333-0808
R5, 21, 22, 25, 27	4.7K SIP	333-0812
R6-9, 30, 33, 34, 39, 40	3.9K 1/4W 5%	330-3040
R11-19, 32, 35	33Ω 1/4W 5%	330-1034
R26	22K 1/4W 5%	330-4023
R29	4.7K 1/4W 5%	330-3048
R38	22Ω 1/4W 5%	330-1023
R41	390Ω 1/4W 5%	330-2040
R42	91Ω 1/4W 5%	330-1092
R43	270Ω 1/4W 5%	330-2028
R44	100Ω 1/4W 5%	330-2011
C1-11, 23, 24, 26-33, 48, 49, 52-54	.047μF 50V	300-1966
C12-20, 21A, 21B	1μF 50V	300-1931
C21, 51	15μF 20V (T)	300-4022
C22, 25, 47	47μF 15V (T)	300-9020
C46	.001μF 500V	300-1906
C50	33PF 500V	300-1033
D1	1N4004	380-4000
Y1	21.375 MHz	321-0049
J1	50 PIN CONN	350-0254
J2	4 POS HDR	SEE CHART
J3	5 POS HDR	350-0227
Q1	SPS 6551	375-1050
E1	FERRITE BEAD	410-1016
SW1, 2	SPST 8 POS	325-1503
SW3	SPST 4 POS	325-1504

MNEMONICS	COORD.
BUS 0	1F1
BUS 1	1F1
BUS 2	1E1
BUS Y	1D11
DAV	1D11
DEV PWR ON	1C11
DSTB IN	1G1
DSTB OUT	1G1
FAULT	1D11
+GB	3A9
+GA	3A9
-RA	3A10
-RB	3A10
RESET	1G1
SL	1D11
SPARE 1	1D11
SPARE 2	1D11
SPARE 3	1C11
TOF	1C11
VREF	2B11

I.C. TYPE	LOCATION	SPARES
7400	L46	1
7408	L54	2
74LS08	L22	1
74LS11	L35	1
74S32	L3	2
74LS32	L38	1
74LS125	L67	1

DO NOT SCALE



210 = 209 + 377 OR 378

210	209	L4	L5	L11-19	L51	J2
8038-A	8038	377-0419	377-0368	377-0415	377-0406	350-0209
8038-1A	8038-1	377-0419	377-0368	377-0415	377-0406	350-0230

NOTE: ALL RESISTOR ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.

8038 8038-1  
E REV 5-82  
3 2

NO	REVISION	DATE	BY	CHK'D	APP'D	REVISED PER	ECO#	REVISED PER	ECO#	REVISED PER	ECO#
1	REVISED PER ECO# 27803	11/18/82	JWS								
2	REVISED PER ECO# 27803	11/18/82	JWS								
3	REVISED PER ECO# 27803	11/18/82	JWS								
4	REVISED PER ECO# 27803	11/18/82	JWS								
5	REVISED PER ECO# 27803	11/18/82	JWS								
6	REVISED PER ECO# 27803	11/18/82	JWS								
7	REVISED PER ECO# 27803	11/18/82	JWS								
8	REVISED PER ECO# 27803	11/18/82	JWS								
9	REVISED PER ECO# 27803	11/18/82	JWS								
10	REVISED PER ECO# 27803	11/18/82	JWS								
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49	REVISED PER ECO# 27803	11/18/82	JWS								
50	REVISED PER ECO# 27803	11/18/82	JWS								

<b>WANG LABORATORIES INC.</b> LOWELL, MASS. USA		BY DWN A. CROSBY	DATE 12/21/82	APPROVED BY E ENGR L. COLE	DATE 12/21/82
MATERIAL	MODEL NO 613	CHK'D DWN	MFG ENGR	TITLE 64K SINGLE BOARD DATA LINK	
FINISH	SEE CHART	SCALE 3 OF 3	SIZE D	DRAWING NUMBER 8038	REV 3

**END**