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**MODEL H80, H136
SERVICE MANUAL**

37401800-9A00

REV. A

MAY 1984

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SECTION 1

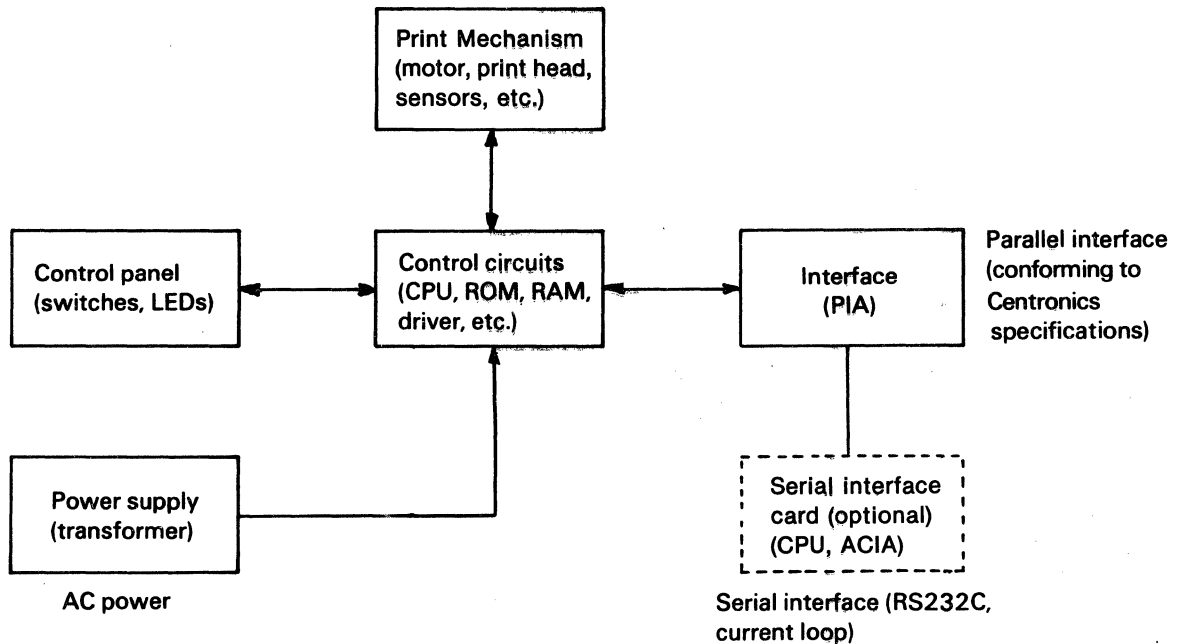
INTERFACE & SPECIFICATIONS

1.1 COVERAGE OF THIS MANUAL

This service manual contains technical data, procedures, prints and schematics for the maintenance of Model H80 and H136 printers. The Model H80 is an 80 column printer. The Model H136 is a 156 column printer. Look for differences in configurations and parts descriptions due to wider platen, longer line length, etc. Most other functions are identical.

1.2 OVERVIEW

The printer consists of the print mechanism, control circuits, power supply, control panel and enclosure. The serial interface is an option.



BASIC BLOCK DIAGRAM

1.3 SPECIFICATIONS; H80, H136

	H80	H136
Print head		
(a) Wire diameter	0.25 mm (.010")	0.25 mm (.010")
(b) Wire pitch	0.353 mm (0.014") (arranged vertically)	0.353 mm (0.014") (arranged vertically)
(c) Number of wires	9	9
(d) Response frequency	960 Hz	960 Hz
Printing speed	160 characters/sec (at 10 characters/inch)	160 characters/sec (at 10 characters/inch)
Feed speed	9.1 lines/sec (at 6 lines/inch)	9.1 lines/sec (at 6 lines/inch)
Feed method	Pin feed (feed force: 2 kg or more)	Pin feed (feed force: 2 kg or more)
	Friction feed (feed force: 1 kg or more)	Friction feed (feed force: 400 g or more)
Print forms		
(a) Fan-folded forms	127-254 mm wide (5-10")	127-431.8 mm wide (5-17")
(b) Cut-sheet forms	127-254 mm wide (5-10") (A4 standard)	127-431.8 mm wide (5-17") (A3 standard)
(c) Rolled forms	216 mm (8.5") wide; roll outside diameter 70 mm, inside diameter 20 mm or less	Not possible
(d) Paper thickness	With copies	0.13 mm or less (.005")
	Without copies	0.25 mm or less (.010")
Duplicating capability	Up to 3 sheets including original (with 34-kg carbon-backed paper or non-carbon paper)	Up to 4 sheets including original (with 34-kg carbon-backed paper or non-carbon paper)
End-of-paper detection	Approx. 65 mm from print position to detecting position (End-of-paper detection can be disabled with a switch.)	Approx. 65 mm from print position to detecting position (End-of-paper detection is disabled when levers are set at FRICTION FEED and PAPER SET.)
Paper cutter	1 inch or less from print position	1 inch or less from print position
Dot pitch (vertical)		
Normal pitch	0.353 ± 0.2 mm (1/72")	0.353 ± 0.2 mm (1/72")
½ pitch	0.118 ± 0.1 mm (1/216")	0.118 ± 0.1 mm (1/216")
Character pitches		
Pica normal standard characters	10 characters/inch (80 characters/line)	10 characters/inch (156 characters/line)
Pica NLQ standard characters	10 characters/inch (80 characters/line)	10 characters/inch (156 characters/line)
Pica normal enlarged characters	5 characters/inch (40 characters/line)	5 characters/inch (78 characters/line)

1.3 SPECIFICATIONS; H80, H136 (cont.)

	H80	H136
Character pitches (cont.) Pica NLQ enlarged characters Pica normal reduced characters Pica normal reduced and enlarged characters Elite normal standard characters Elite normal enlarged characters	5 characters/inch (40 characters/line) 17.14 characters/inch (132 characters/line) 8.57 characters/inch (66 characters/line) 12 characters/inch (96 characters/line) 6 characters/inch (48 characters/line)	5 characters/inch (78 characters/line) 17.14 characters/inch (267 characters/line) 8.57 characters/inch (133 characters/line) 12 characters/inch (187 characters/line) 6 characters/inch (93 characters/line)
Graphic dot number 8, 9 8 8 8 8, 9, 16 8	60 dots/inch (480 dots/line) 72 dots/inch (576 dots/line) 80 dots/inch (640 dots/line) 90 dots/inch (720 dots/line) 120 dots/inch (960 dots/line) 240 dots/inch (1,920 dots/line) Adjacent horizontal dots cannot be printed in 240 dots/inch mode. 120 dots/inch mode is divided into high speed mode in which adjacent dots cannot be printed and normal mode in which all dots can be printed.	60 dots/inch (936 dots/line) 72 dots/inch (1,123 dots/line) 80 dots/inch (1,248 dots/line) 90 dots/inch (1,404 dots/line) 120 dots/inch (1,872 dots/line) 240 dots/inch (3,744 dots/line) Adjacent horizontal dots cannot be printed in 240 dots/inch mode. 120 dots/inch mode is divided into high speed mode in which adjacent dots cannot be printed and normal mode in which all dots can be printed.
Line spacing	1/6 inch (4.23 mm) 1/8 inch (3.18 mm) 7/72 inch (2.47 mm) n/72 inch n/216 inch (Programmable in units of 1/216")	1/6 inch (4.23 mm) 1/8 inch (3.18 mm) 7/72 inch (2.47 mm) n/72 inch n/216 inch (Programmable in units of 1/216")
Ink ribbon (a) Type (b) Specifications (c) Color (d) Service life (e) Storage life	Cassette (ink roller built in) Nylon, 13 mm wide × 6.5 m, endless loop Black Approx. 3 million characters (pica standard) at normal temperature and humidity 1 year in fixed package at room temperature	Cassette (ink roller built in) Nylon, 13 mm wide × 6.5 m, endless loop Black Approx. 3 million characters (pica standard) at normal temperature and humidity 1 year in fixed package at room temperature
Supply voltage/power consumption	Supply voltage	Power consumption
UL/CSA (USA) Europe	60 Hz 120V + 10% - 15% 50 Hz 230V ± 15%	Max. 1.3 A Max. 120 W

1.3 SPECIFICATIONS; H80, H136 (cont.)

	H80	H136
Reliability/durability (a) MTBF (b) Unit service life (excluding print head) (c) Print head life	2,000 operating hours (under operating conditions of 35% page density and 25% or less duty cycle) 12,000 operating hours or 5 years (under operating conditions of 35% page density and 25% or less duty cycle) 100 million characters (16 dots/character and duty cycle of wire 35% or less)	2,000 operating hours (under operating conditions of 35% page density and 25% or less duty cycle) 12,000 operating hours or 5 years (under operating conditions of 35% page density and 25% or less duty cycle) 100 million characters (16 dots/character and duty cycle of wire 35% or less)
Printing operation 1-pass characters 2-pass characters Graphic Note: Passes 1 and 2 of the same character are printed in the same direction.	Bidirectional logical seeking Same as above (See note.) Unidirectional (left to right)	Bidirectional logical seeking Same as above (See note.) Unidirectional (left to right)
Safety regulations	Passes UL/CSA/GS regulations	Passes UL/CSA/GS regulations
Electrical characteristics (a) Resistance to line noise	The unit operates properly with impulse of 500 V or less (800 ns square wave).	The unit operates properly with impulse of 500 V or less (800 ns square wave).
Environmental conditions (a) Temperature Operating Storage (b) Humidity Operating Storage (c) Vibration Operating Storage (d) Shock Operating Storage	5° to 40° C - 30° to 60° C 20% -90% r.h. (no condensation) 10% - 90% r.h. (no condensation) 0.25 G max. 0.5 G max.	5° to 40° C - 30° to 60° C 20% -90% r.h. (no condensation) 10% - 90% r.h. (no condensation) 0.25 G max. 0.5 G max.
Physical Characteristics (a) External dimensions Width Depth Height (b) Weight	400 mm (15.75") (excluding paper feed knob) 320 mm (12.6") 110 mm (4.3") (excluding paper cover) Approx. 8 kg (17.5 lb.)	598 mm (23.5") (excluding paper feed knob) 350 mm (13.8") 130 mm (5.1") (excluding paper cover) Approx. 12 kg (26.4 lb.)

1.4 INTERFACE SPECIFICATIONS

1.4.1 Data Transfer

8-bit parallel interface (conforming to Centronics interface specifications)

1.4.2 Input/Output Signal Levels

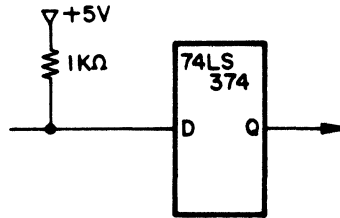
Signal levels

“L” : +0.0 V to +0.4 V

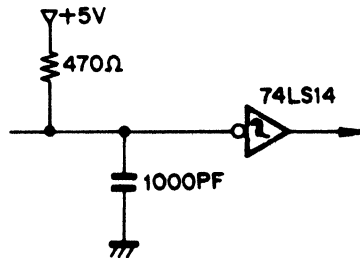
“H” : +2.4 V to +5.25 V

Input/output conditions

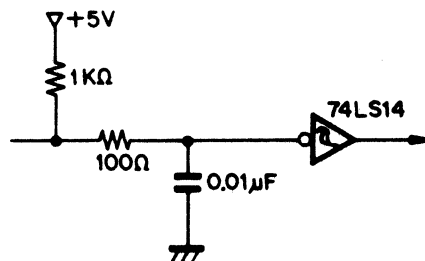
a) DATA 1 – 8 Connected to +5 V via 1K ohms.



b) $\overline{\text{STB}}$ Connected to +5 V via 470 ohms and to GND via 1,000 pF.

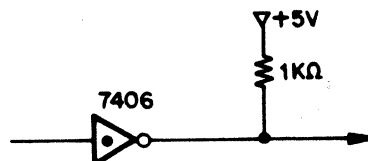


c) $\overline{\text{INPRM}}$ Connected to +5 V via 1K ohms and, across 100 ohms, to GND via 0.01 μF.



d) $\overline{\text{ACKNLG}}$, $\overline{\text{FAULT}}$, $\overline{\text{SLCT}}$, $\overline{\text{BUSY}}$, $\overline{\text{PE}}$

Output of an open-collector gate is connected to +5 V via 1K ohms.



1.4.3 Cable Specifications

Wire AWG 28 or larger size

Cable length twisted pair cable: 1.5 m or less

1.4.4 Parallel Interface Connector Pin Assignments

Pin no.	Signal name	In/out	Pin no.	Signal name	In/out
1	$\overline{\text{STB}}$	In	19	STB-RET	
2	DATA 1	In	20	DATA 1-RET	
3	DATA 2	In	21	DATA 2-RET	
4	DATA 3	In	22	DATA 3-RET	
5	DATA 4	In	23	DATA 4-RET	
6	DATA 5	In	24	DATA 5-RET	
7	DATA 6	In	25	DATA 6-RET	
8	DATA 7	In	26	DATA 7-RET	
9	DATA 8	In	27	DATA 8-RET	
10	$\overline{\text{ACKNLG}}$	Out	28	ACKNLG-RET	
11	BUSY	Out	29	BUSY-RET	
12	PE	Out	30	PE-RET	
13	SLCT	Out	31	$\overline{\text{INPRM}}$	In
14	$\overline{\text{AUTO LINE FEED}}$	In	32	$\overline{\text{FAULT}}$	Out
15	NC		33	GND	
16	GND (OV)		34	NC	Out
17	FG		35	+5 V (Note 2)	
18	NC		36	$\overline{\text{SLCT-IN}}$	In

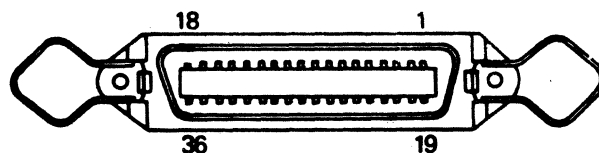
Note 1: All signals signified by—RET are connected to GND (pins 20–30)

Note 2: Pulled up to +5 V via 3.3 kohms.

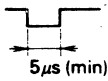
1.4.5 Parallel Interface Connector

Printer side: Amphenol 57—40360 or equivalent

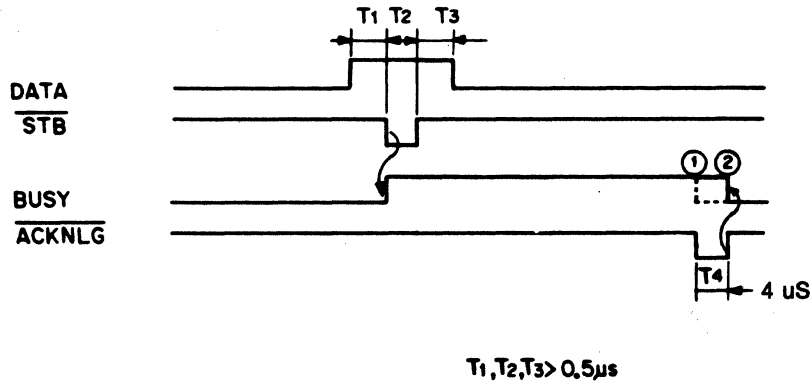
Cable side: Amphenol 57—30360 or equivalent



1.4.6 Description of Input Signals

(a) DATA 1 ~ 8	<ul style="list-style-type: none"> ○ Bits 1 ~ 8 of character code and image data ○ Read into the printer strobed by \overline{STB}. ○ DATA 1 ~ 8 should not vary while $\overline{STB} = L$.
(b) \overline{STB}	<ul style="list-style-type: none"> ○ Strobe signal to read DATA 1 ~ 8 ○ \overline{STB} is effective when $BUSY = L$. ○ The next \overline{STB} should not be output before \overline{ACKNLG} appears.
(c) \overline{INPRM}	<ul style="list-style-type: none"> ○ Signal to initialize the printer ○ If \overline{INPRM} appears when the printer is operating, it stops immediately. Initialization is executed at the rise of \overline{INPRM} from "L" to "H". ○ \overline{INPRM} 
(d) \overline{ACKNLG}	<ul style="list-style-type: none"> ○ Acknowledge signal responding to \overline{STB} ○ The next \overline{STB} should not be output before \overline{ACKNLG} returns. ○ \overline{ACKNLG} is output independently of \overline{STB} under the following conditions. <ul style="list-style-type: none"> a) \overline{INPRM} has appeared after power-on to put the unit in ON-LINE mode. b) OFF-LINE mode has changed to ON-LINE.
(e) $BUSY$	<ul style="list-style-type: none"> ○ When $BUSY$ is H, the unit is busy. ○ When $BUSY$ is L, the unit is ready. \overline{ACKNLG} is output when $BUSY$ decays to L. ○ $BUSY$ is H in OFF-LINE mode.
(f) PE	<ul style="list-style-type: none"> ○ PE rises to H when paper runs out. * Except when the paper sensor switch of the 80-characters/line printer is set to CUT SHEET, or when the paper release lever of the 156-characters/line printer is set to a position other than PIN FEED.
(g) SLCT	<ul style="list-style-type: none"> ○ When SLCT is H, the unit is selected.
(h) \overline{FAULT}	<ul style="list-style-type: none"> ○ \overline{FAULT} is L in the following conditions. <ul style="list-style-type: none"> a) When paper is out. b) In off-line mode
(i) $\overline{AUTO LINE FEED}$	<ul style="list-style-type: none"> ○ When $\overline{AUTO LINE FEED}$ is L, one linefeed is executed following execution of CR.
(j) $\overline{SLCT-IN}$	<ul style="list-style-type: none"> ○ When $\overline{SLCT-IN}$ is L, the unit is selected.

1.4.7 Timing Diagram (Parallel Interface)



T1	0.5	μs (min)
T2	0.5	μs (min)
T3	0.5	μs (min)
T4	4.0	μs (min)

Note: The timing of ① can be selected with jumper J5 of the 80-characters/line printer or J3 of the 156-characters/line printer. When the machine leaves the factory, the timing is set to ②.

1.4.8 Optional Interface

Serial interface (RS-232C or current loop) can be incorporated by installing an option card.

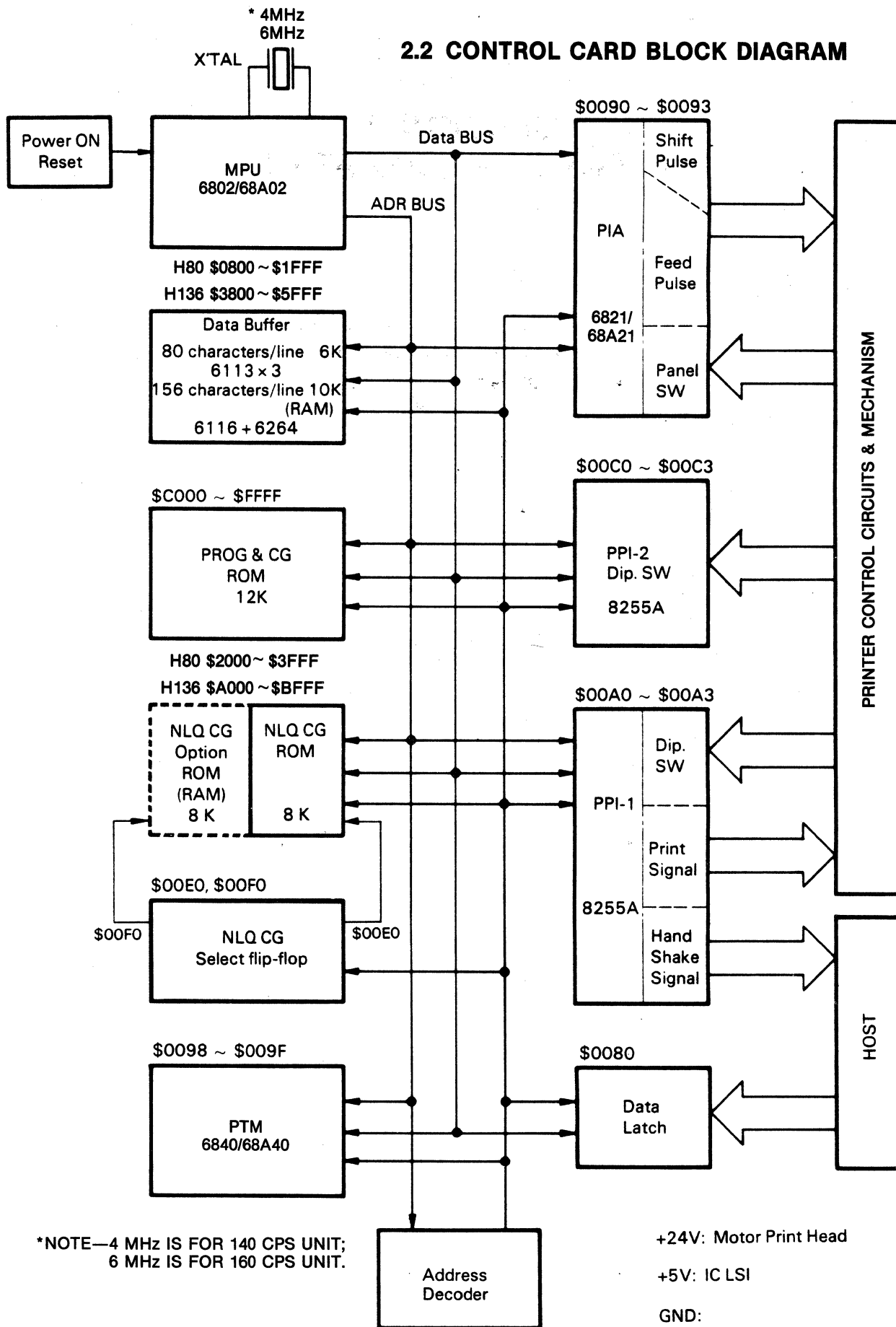
SECTION 2

THEORY OF OPERATION

2.1 GENERAL

This section contains block diagrams, timing diagrams, flow charts, electronic circuits and descriptions of the functions of this printer. Differences between the 80-column and 156-column units are included.

2.2 CONTROL CARD BLOCK DIAGRAM



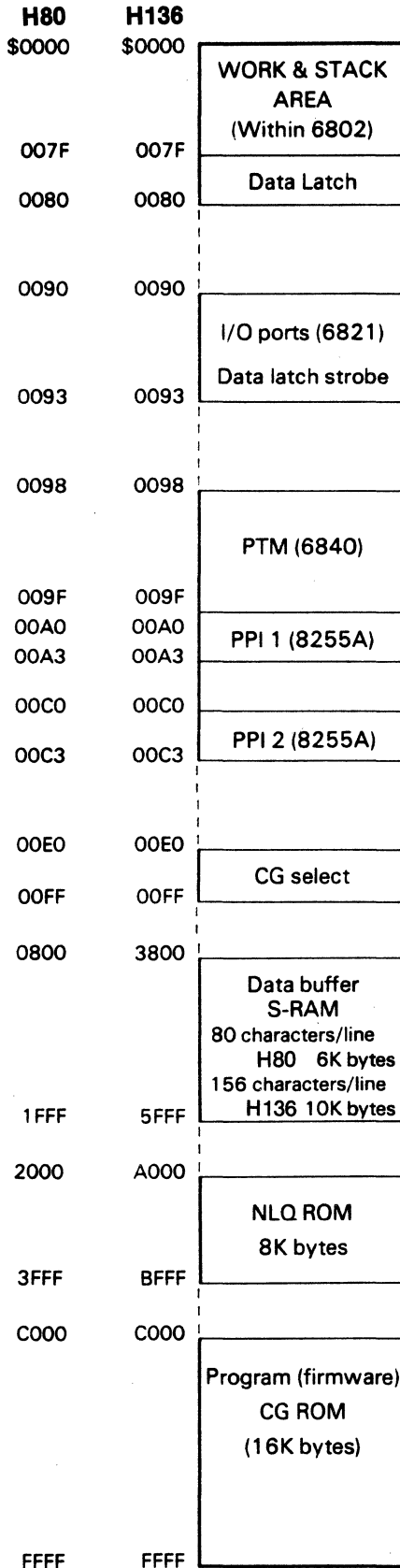
*NOTE—4 MHz IS FOR 140 CPS UNIT;
6 MHz IS FOR 160 CPS UNIT.

+24V: Motor Print Head

+5V: IC LSI

GND:

2.3 MEMORY MAP

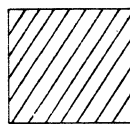


I/O ports

Bits Address	D7	D6	D5	D4	D3	D2	D1	D0	Remarks
\$0080 (R)	DATA 8	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	8-bit parallel data in
\$0090 (R)	ON LINE LED	ALARM LED	ON LINE SWITCH	LF SWITCH	FF SWITCH		PAPER EMPTY	HOME POSITION	Control panel inputs
\$0092 (W)	F ϕ 4	F ϕ 3	F ϕ 2	F ϕ 1	S ϕ 4	S ϕ 3	S ϕ 2	S ϕ 1	Stepping motor outputs
\$00A0 (R)	SW1-8	SW1-7	SW1-6	SW1-5	SW1-4	SW1-3	SW1-2	SW1-1	DIP switch inputs for character set
\$00A1 (W)	N ϕ 8	N ϕ 7	N ϕ 6	N ϕ 5	N ϕ 4	N ϕ 3	N ϕ 2	N ϕ 1	Wire dot pin outputs
\$00A2 (W)	FAULT	SLCT	BUSY	ACKNLG	PE			N9	Interface signals Auto-under-line signal
\$00CD (R)	SW2-8	SW2-7	SW2-6	SW2-5	SW2-4	SW2-3	SW2-2	SW2-1	DIP switch for setting print mode
\$00C1 (R)	SW4-8	SW4-7	SW4-6	SW4-5	SW4-4	SW4-3	SW4-2	SW4-1	Not equipped
\$00C2 (R)					SW3-4	SW3-3	SW3-2	SW3-1	DIP switch for setting page length

(R) READ mode
(W) WRITE mode

* F ϕ 1 ~ 4: Paper feed motor pulse
S ϕ 1 ~ 4: Carriage motor pulse

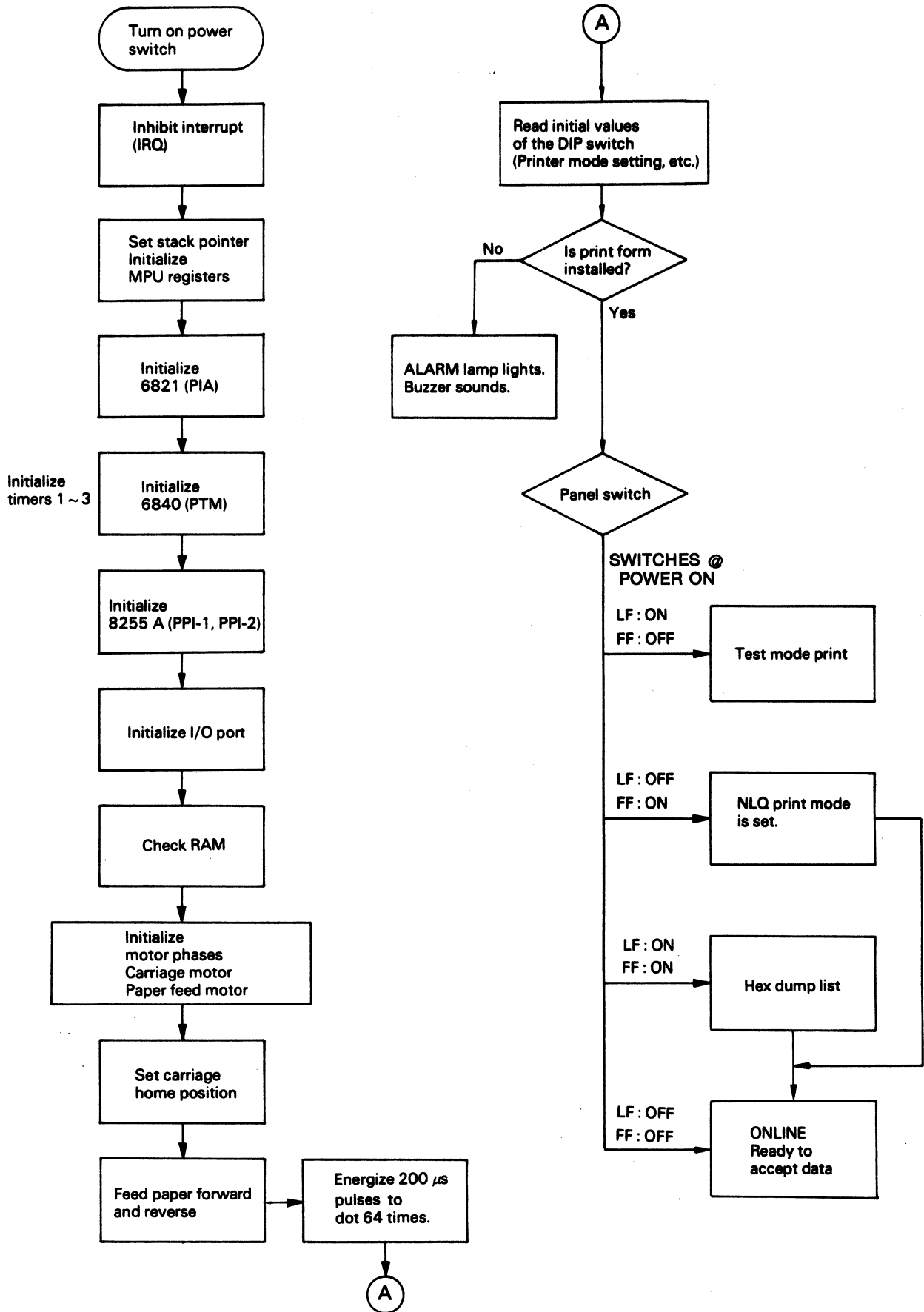


Option NLQ CG

6802 reset vector address table

Vector		Contents
MS	LS	
FFFF	FFFF	Restart (RES)
FFFC	FFFD	NMI
FFFA	FFFB	SWI
FFF8	FFF9	IRQ

2.4 INITIALIZATION ROUTINE



2.5 CONTROL CARD CIRCUITS

1. Power-on-reset circuit
2. MPU (68A02)
3. ROM, RAM
4. PTM (68A40)
5. PIA (68A21)
6. PPI-1 (8255A)
7. PPI-2 (8255A)
8. Head driver
9. Power supply

The printer incorporates a 68A02 8-bit microprocessor (MPU). A clock signal of 1 MHz is generated from 6 MHz generated by a quartz crystal, to time data transfer operations.

The printer consists of ROM which stores software, data buffer RAM, printer unit, control panel, buzzer and LSIs (PIA, PTM, PPI) which control interface ports. Each device is controlled by the timing signal output from MPU.

2.5.1 Power-On-Reset Circuit

The power-on-reset circuit initializes the MPU and resets the head to the home position.

Power-on-reset initializes the MPU, PIA, PTM, and PPI on one hand, and prevents the printer from printing something at the moment of power-on on the other hand.

At the moment of power-on, waveforms are as shown in Figure 2-1.

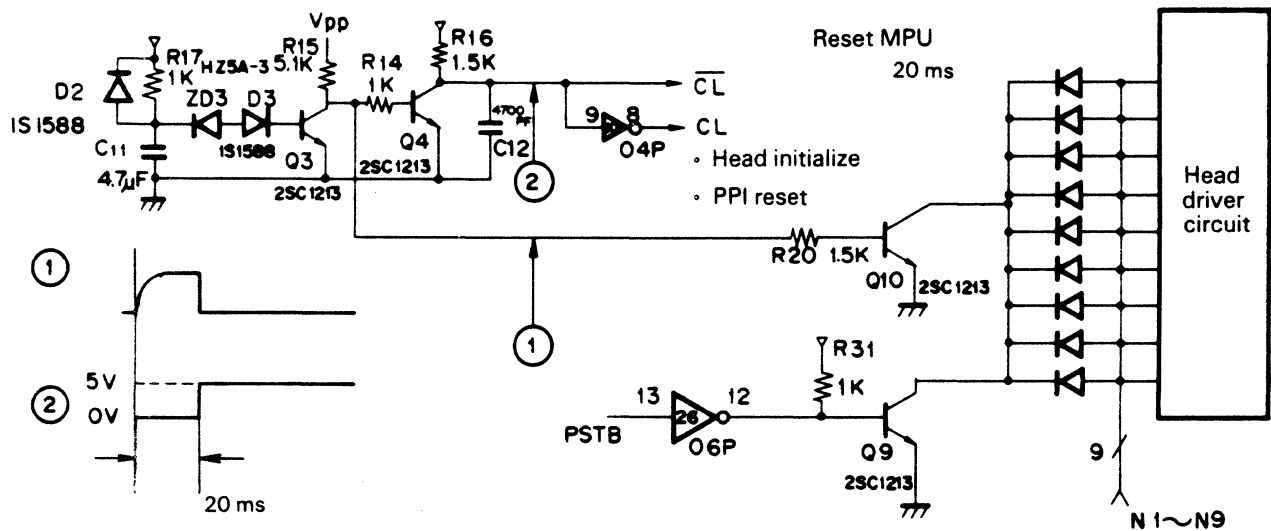


Figure 2-1 Power-On-Reset Circuit

2.5.2 Microprocessor Unit (MPU)

The 68A02 MPU generates the basic clock of 1 MHz (1 μ s) from a 6 MHz quartz oscillator.

The basic clock signal (E) is used to time data transfer operations between the MPU and peripheral LSIs.

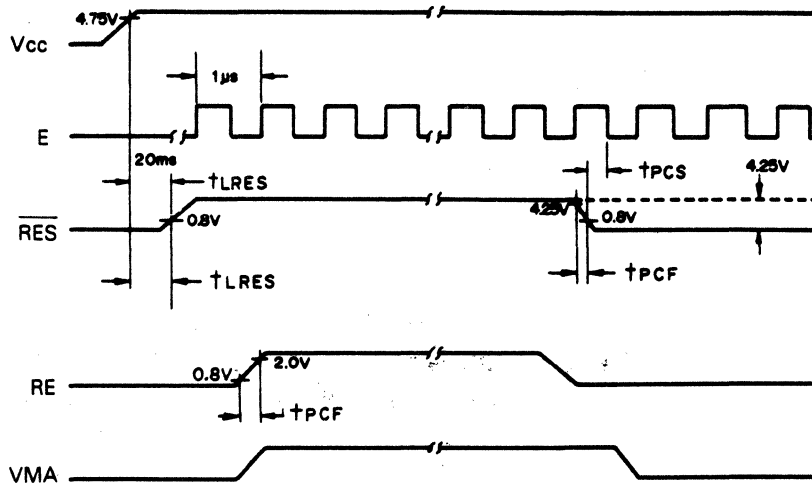


Figure 2-2 Reset Timing

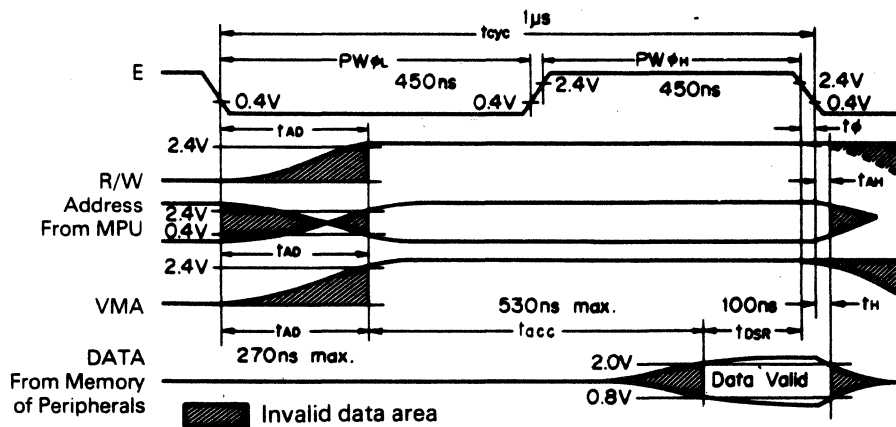


Figure 2-3 Read Operation Sequence

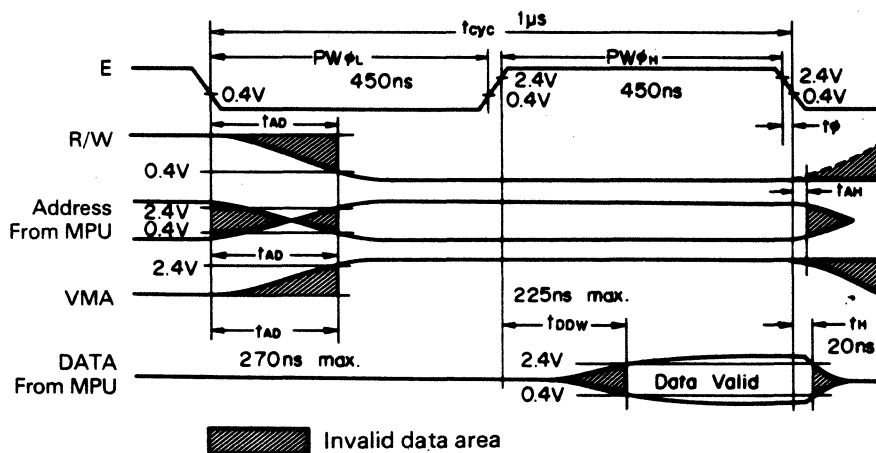


Figure 2-4 Write Operation Sequence

2.5.3 ROM, RAM

The two types of printer incorporate P-ROM and S-RAM which assign the following addresses.

		H80	H136
P-ROM	For firmware	\$E000 ~ \$FFFF 8K BYTES (IC1)	\$E000 ~ \$FFFF 8K BYTES (IC1)
	Part of firmware for CG	\$C000 ~ \$DFFF 8K BYTES (IC4)	\$C000 ~ \$DFFF 8K BYTES (IC4)
	For NLQ	\$2000 ~ \$3FFF 8K BYTES (IC2)	\$A000 ~ \$BFFF 8K BYTES (IC2)
S-RAM	6116	\$0800 ~ \$1FFF 6K BYTES (IC11, 12, 13)	\$3800 ~ \$3FFF 2K BYTES (IC3)
	6264	None	\$4000 ~ \$5FFF 8K BYTES (IC11)

2.5.4 Programmable Timer

The 6840 (PTM) incorporates three programmable timers which are used as follows under the control of the firmware.

- Timer 1: Generates signal PSTB which determines the pulse width of 460 μ s supplied to the print head.
- Timer 2: Determines the period to supply power to the print head and outputs a pulse of 595 μ s.
- Timer 3: Determines the step rate of the stepping motor and outputs a pulse of 1190 μ s.

2.5.5 Peripheral Interface Adaptor (PIA)

The 6821 (PIA) port outputs signals indicating what carriage and paper feed motor phases to excite and receives signals from control panel switches, home position and paper sensing switch.

Table 1 PIA Functions

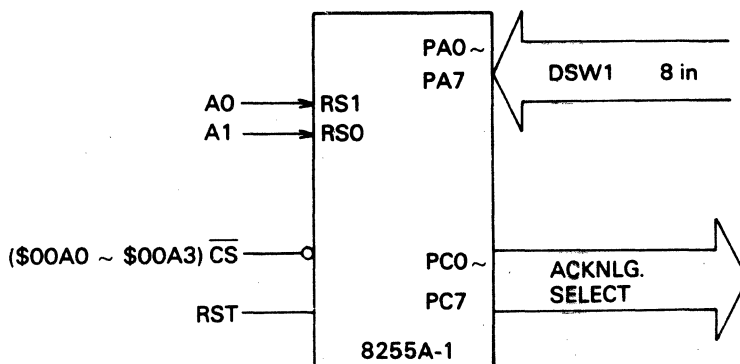
Pin No.	Signal Name	Function	In/Out	
2	PA0	Home position sense	"H": detected	←
3	PA1	Paper sense	"H": detected	←
4	PA2			
5	PA3	FF switch status in	"H": ON	←
6	PA4	LF switch status in	"H": ON	←
7	PA5	ON LINE switch status in	"H": ON	←
8	PA6	ALARM lamp status	"H": ON	→
9	PA7	ON LINE lamp status	"H": ON	→
10	PB0	Carriage motor phase $\phi 1$		→
11	PB1	Carriage motor phase $\phi 2$		→
12	PB2	Carriage motor phase $\phi 3$		→
13	PB3	Carriage motor phase $\phi 4$		→
14	PB4	Paper feed motor phase $\phi 1$		→
15	PB5	Paper feed motor phase $\phi 2$		→
16	PB6	Paper feed motor phase $\phi 3$		→
17	PB7	Paper feed motor phase $\phi 4$		→
18	CB1	Data strobe from host computer	∇ : IN	←
19	CB2	Paper feed motor power	"H": ON	→
20	VCC	+ 5V		←
21	R/W	Read/write signal		←
22	CS0	+ 5V		←
23	$\overline{CS2}$	Chip select		←
24	CS1	Chip select		←
25	E	System clock (1 μ s)		←
26	D7	Data		←
	\sim			\sim
33	$\overline{D0}$	Data		←
34	\overline{RES}	Reset		←
35	A1	Register select		←
36	A0	Register select		←
37	IRQB	Interrupt request		→
38	IRQA	Interrupt request		→
39				
40	CA1	Print strobe		←

2.5.6 Programmable Peripheral Interface (PPI-1)

The programmable peripheral interface (PPI) generates head drive signals N1-N9 and parallel interface control signals. The firmware controls the interface. DIP switch SW1 permits selection of international character set.

Table 2 PPI-1 Functions

Pin No.	Signal Name	Function	In/Out
1	PA3	DIP switch SW1-4 in	↑
2	PA2	DIP switch SW1-3 in	↑
3	PA1	DIP switch SW1-2 in	↑
4	PA0	DIP switch SW1-1 in	↑
5	RE	Read signal	↑
6	\overline{CS}	Chip select signal	↑
7	GND	OV	
8	RS1	Register select signal A1 in	↑
9	RS0	Register select signal A0 in	↑
10	PC7	FAULT output signal	→
11	PC6	SELECT output signal	→
12	PC5		
13	PC4	\overline{ACKNLG} output signal	→
14	PC0	Head pin output signal	→
15	PC1	Head pin output signal	→
16	PC2	Buzzer	→
17	PC3	PE output signal	→
18	PB0	Head pin output signal	→
2	2		
25	PB7		
26			
27	D7	Data	→
2	2		
34	D0	Data	→
35	RST	Reset in	↑
36	WE	Write enable signal	↑
37	PA7	DIP switch SW1-8 in	↑
38	PA6	DIP switch SW1-7 in	↑
39	PA5	DIP switch SW1-6 in	↑
40	PA4	DIP switch SW1-5 in	↑

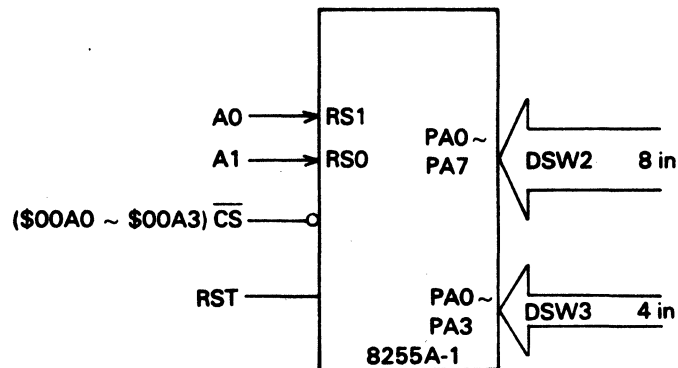


2.5.7 Programmable Peripheral Interface (PPI-2)

The programmable peripheral interface (PPI) is used as input ports for switches DSW2 and DSW3 which specify print mode and printer operation mode.

Table 3 PPI-2 Functions

Pin No.	Signal Name	Function	In/Out
1	PA3	DIP switch SW2-4 in	←
2	PA2	DIP switch SW2-3 in	←
3	PA1	DIP switch SW2-2 in	←
4	PA0	DIP switch SW2-1 in	←
5	\overline{RD}	Read signal	←
6	\overline{CS}	Chip select signal	←
7	GND	0V	
8	RS1	Internal register select signal A1 in	←
9	RS0	Internal register select signal A0 in	←
10	PC7		
11	PC6		
12	PC5		
13	PC4		
14	PC0	DIP switch SW3-1 in	←
15	PC1	DIP switch SW3-2 in	←
16	PC2	DIP switch SW3-3 in	←
17	PC3	DIP switch SW3-4 in	←
18	PB0		
2	?		
25	PB7		
26	Vcc	+5V	
27	D7	Data	↔
2	?		
34	D0	Data	↔
35	RST	Reset in "H": reset	←
36	\overline{WD}	Write enable signal	←
37	PA7	DIP switch SW2-8 in	←
38	PA6	DIP switch SW2-7 in	←
39	PA5	DIP switch SW2-6 in	←
40	PA4	DIP switch SW2-5 in	←



2.5.8 Print Head Driver Circuit

When power is turned "ON", PRS (Power Reset) clamps the diodes for 20 ms, preventing undesirable pin fire caused by unstable voltage during power-up. When printing is desired, PSTB (Print Strobe) unclamps the diodes through Q9, allowing lines from IC9 containing true data (H) to fire those pins for the duration of PSTB (460 us). Q11, Q12, Q13 deliver the Print Strobe to the solenoids to fire the pins.

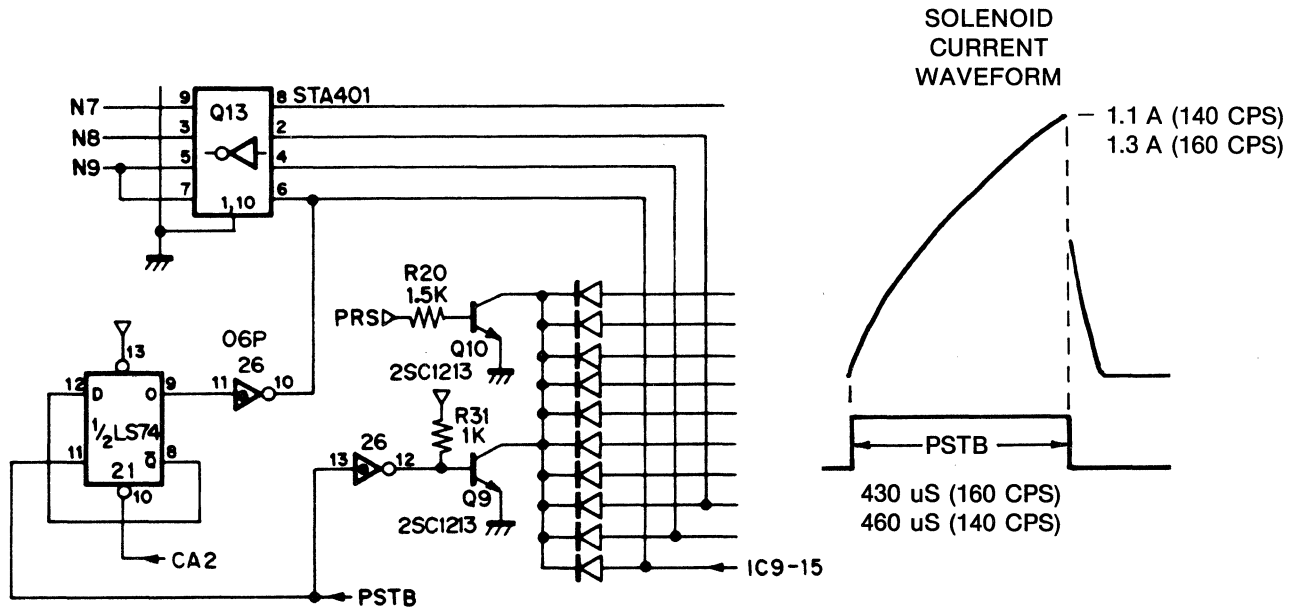


Figure 2-5 Print Head Driver Circuit



2.5.9 Power Supply

The power supply voltages are as follows:

Vcc:	+ 5 V DC	Logic Supply
Vpp:	+24 V DC	Motor and Solenoid Supply

2.6 JUMPER SETTINGS

Table 4 Jumper Settings

H80	H136	Short		Open	Initial State
J1	J1	CN10-34 & 31 pin		CN10-34 pin NC	Open
J2	J2	CN10-33 & GND		CN10-33 pin NC	Shorted
J3	-	1-2	8K BYTES		1-2
		2-3	16K BYTES		
J5	J3	1-3	Decaying edge of BUSY is  of ACKNLG.	/	1-3
		2-3	Decaying edge of BUSY is  of ACKNLG		
J6	J4	Connects Vpp (+24V) to circuits.		Removes Vpp (+24V) from circuits.	Shorted
J7	J5	/		/	Open
J8	J6	Connects Vcc (+5V) to circuits.		Removes Vcc (+5V) from circuits.	Shorted
J12	J7	Vpp (+24V) -0.5V		Vpp (+24V) +0.5V	Shorted
J13	-	1-2	Addresses each device regardless of A15.	/	1-2
		2-3	Addresses each device only when A15 is "L".		
-	J8	1-2	IC11 8K RAM	/	1-2
		2-3	IC11 2K RAM		
-	J9	1-2	IC11 8K RAM corresponding address	/	1-2
		2-3	IC11 2K RAM corresponding address		
-	J10	1-2	IC1 8K RAM corresponding address	/	1-2
		2-3	IC1 16K RAM corresponding address		
-	J11	1-2	IC4 8K RAM corresponding address	/	1-2
		2-3	IC4 16K RAM corresponding address		

2.7 DIP SWITCH SETTINGS

Table 5 DIP Switch SW1

No.	DIP switch	OFF	ON	At the time of shipment
SW1-1 SW1-2 SW1-3 SW1-4	International character set	As shown in separate Table		
SW1-5	NLQ options equipped?	Not equipped	Equipped	OFF
SW1-6	Zero character format	"0"	" ϕ "	OFF
SW1-7	Italic character set	Invalid	Valid	ON
SW1-8	Option reservation			OFF

Table 6 International Characters (SW1-1 to 4)

Name of country	International code	SW1-1	SW1-2	SW1-3	SW1-4
U.S.A.	0	OFF	OFF	OFF	OFF
France	1	ON	OFF	OFF	OFF
German	2	OFF	ON	OFF	OFF
U.K.	3	ON	ON	OFF	OFF
Denmark	4	OFF	OFF	ON	OFF
Sweden	5	ON	OFF	ON	OFF
Italy	6	OFF	ON	ON	OFF
Spain	7	ON	ON	ON	OFF
Japan	8	OFF	OFF	OFF	ON

Table 7 DIP Switch SW2

No.	DIP switch	OFF	ON	At the time of shipment
SW2-1	Paper-end detector	Enable	Disable	OFF
SW2-2	Buzzer	Enable	Disable	OFF
SW2-3	3K input buffer	Invalid	Valid	OFF
SW2-4	Print mode selection	See separate Table		OFF
SW2-5				OFF
SW2-6				OFF
SW2-7				OFF
SW2-8	H80 Right margin	80 characters per line	64 characters per line	OFF
SW2-8	H136 Right margin	156 characters per line	136 characters per line	ON

Table 8 Power-up Print Mode and Right Margin (SW2-4 to 7)

Print mode	SW2-4	SW2-5	SW2-6	SW2-7	H80 Right margin		H136 Right margin	
					SW2-8		SW2-8	
					OFF	ON	OFF	ON
Pica normal characters	OFF	OFF	OFF	OFF	80 columns	64 columns	156 columns	136 columns
Pica normal enlarged characters	OFF	OFF	OFF	ON	40 columns	32 columns	78 columns	68 columns
Pica condensed characters	ON	OFF	OFF	OFF	132 columns	109 columns	267 columns	233 columns
Pica condensed enlarged characters	ON	OFF	OFF	ON	66 columns	54 columns	133 columns	116 columns
Pica emphasized characters	OFF	ON	OFF	OFF	80 columns	64 columns	156 columns	136 columns
Pica emphasized enlarged characters	OFF	ON	OFF	ON	40 columns	32 columns	78 columns	68 columns
Pica NLQ characters	ON	ON	OFF	OFF	80 columns	64 columns	156 columns	136 columns
Pica enlarged NLQ characters	ON	ON	OFF	ON	40 columns	32 columns	78 columns	68 columns
Elite normal characters	OFF	OFF	ON	OFF	96 columns	76 columns	187 columns	163 columns
Elite normal enlarged characters	OFF	OFF	ON	ON	48 columns	38 columns	93 columns	81 columns

Table 9 DIP Switch SW3

No.	DIP switch	OFF	ON	At the time of shipment
SW3-1	<u>SLCT-IN</u>	Not internally fixed	ON	
SW3-2	Page length	11 inches	12 inches	OFF *
SW3-3	Skip-over perforation	Invalid	Valid	OFF
SW3-4	<u>AUTO LINE FEED</u>	Invalid	Valid	OFF

SECTION 3

PREVENTIVE MAINTENANCE

3.1 DESCRIPTION

Preventive maintenance consists of cleaning the exterior and interior of the printer and lubrication of moving parts and surfaces, if needed.

WARNING

Remove power plug from outlet before disassembling printer or performing preventive maintenance, otherwise a shock hazard could exist.

3.2 CLEANING

Instructions for cleaning the exterior surfaces and platen are contained in the Users Manual, Section 4. Observe the caution not to use solvents or caustic cleaners which may damage the surfaces.

Internal Dust Etc.—If paper bits, dust, etc. have accumulated inside the printer so that performance may be impaired, carefully vacuum the areas affected. A soft brush attachment is recommended.

3.3 LUBRICATION

After extended use of printer or during repair, it is recommended that the assemblies shown in Figure 3-1 be lubricated. Moving parts, gears, etc. may be lubricated using #90 turbine oil as required.

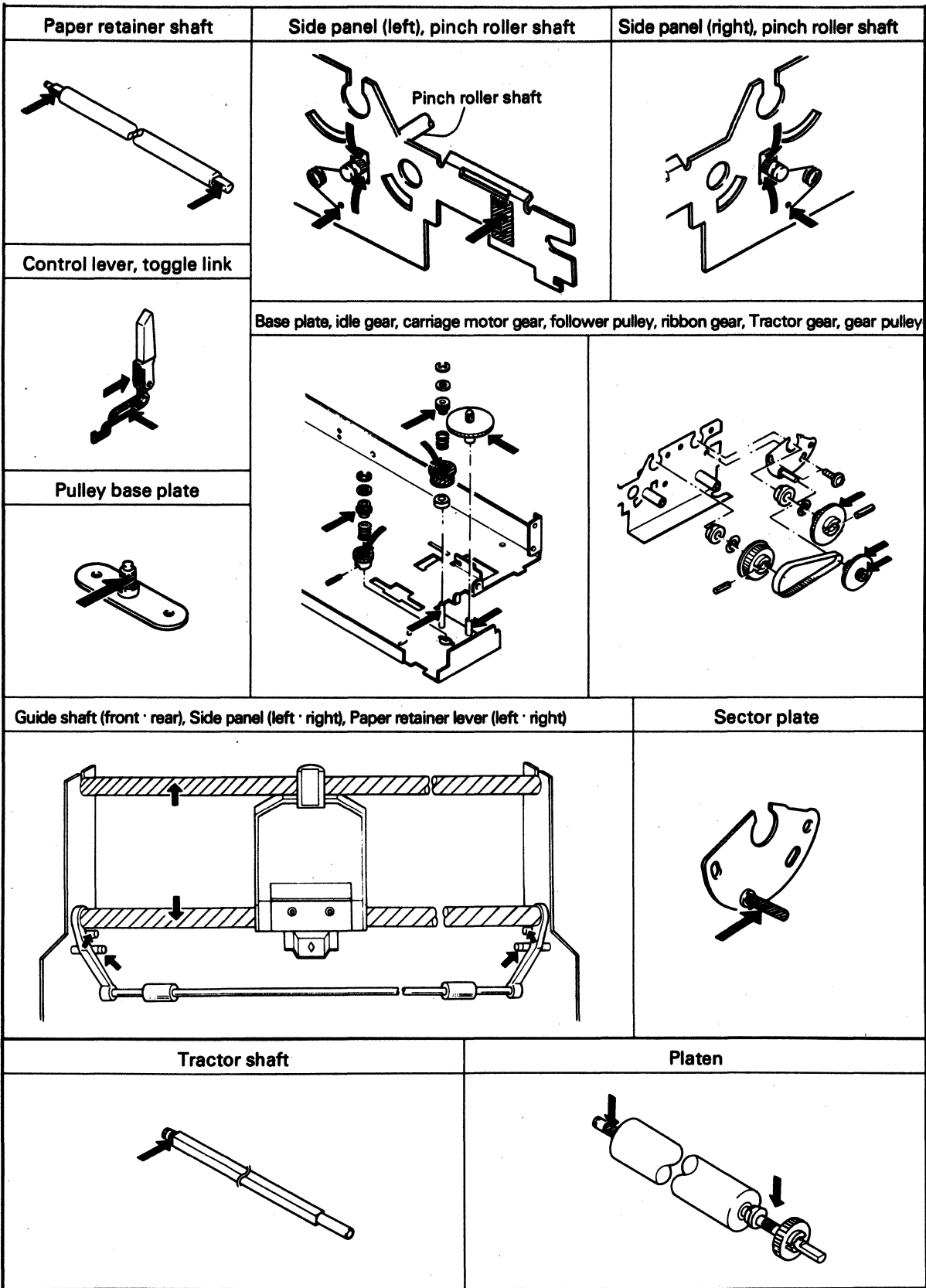


Figure 3-1 Lubrication

SECTION 4 REPLACEMENT PROCEDURES

4.1 PURPOSE

This section contains procedures to aid in the replacement of assemblies, subassemblies or parts in the printer. These procedures are intended for qualified service personnel only. Procedures for both H80 and H136 are included here.

NOTE

In those cases where a disassembly procedure disturbs a calibrated position, the procedure defines which adjustment is required to restore normal settings.

4.2 PRINT HEAD REPLACEMENT

The print head can be replaced by any handy person. This procedure is contained in the Users Manual.

4.3 REMOVAL OF COVERS

Refer to Figures 4-1 and 4-2 for the procedures for cover removal (H80 and H136).

Item	Procedure
Removal	1. Open the front cover, remove the ink ribbon cassette and remove front screw.
	2. Remove the paper feed knob.
	3. Loosen two screws at the rear of the printer (next to the connectors of the power cord and interface).
	4. Disengage two latching tabs through the square holes provided on the bottom cover, and remove the top cover.
Installation	1. Reverse removal procedure.

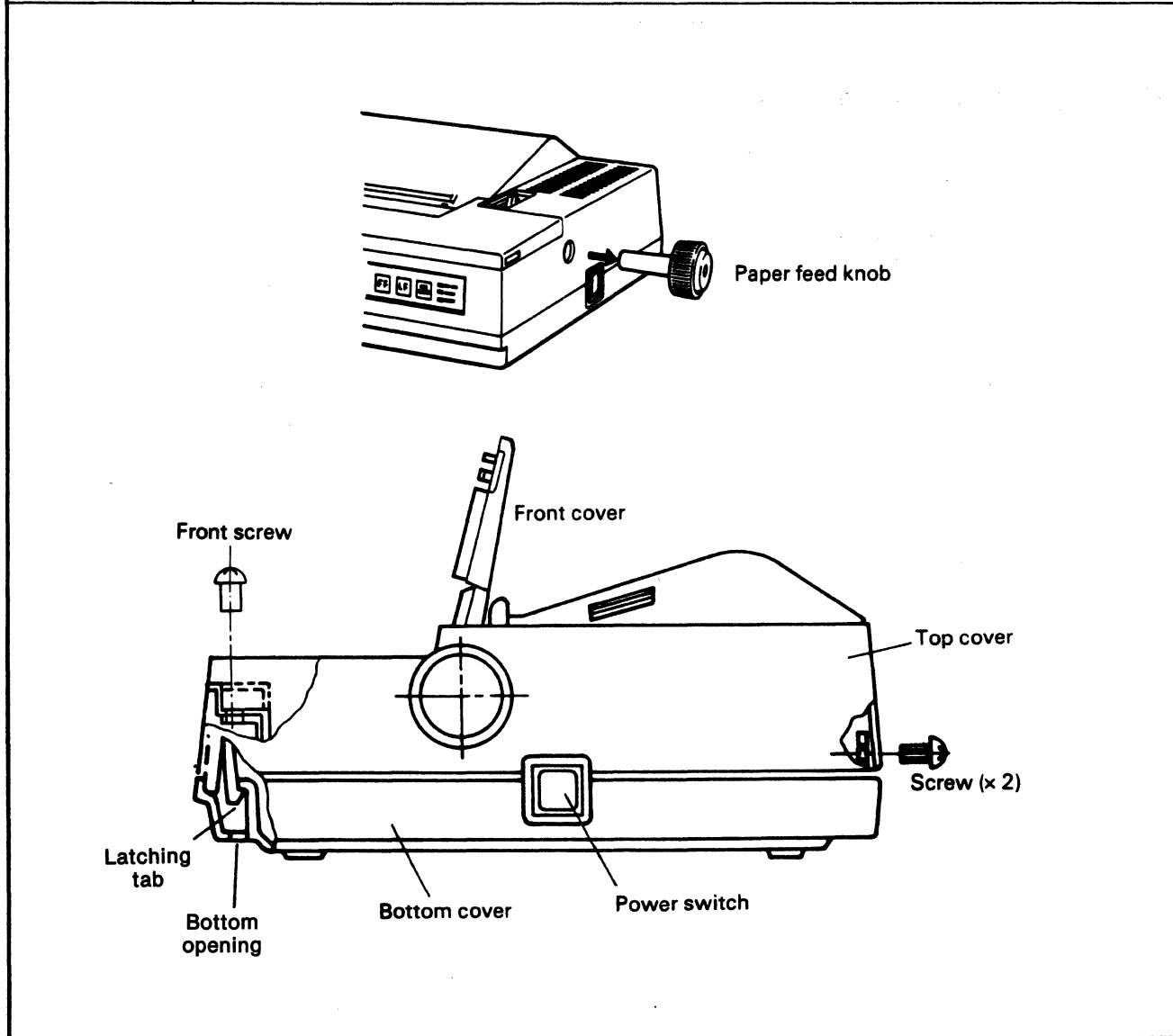


Figure 4-1 H80 Cover Removal

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Open the front cover, and remove the ink ribbon cassette. 2. Remove the paper feed knob. 3. Loosen three screws at the rear of the printer (next to the connectors of the power cord and interface). 4. Disengage two latching tabs through the square holes provided on the bottom cover, and remove the top cover.
Installation	<ol style="list-style-type: none"> 1. Reverse removal procedure.

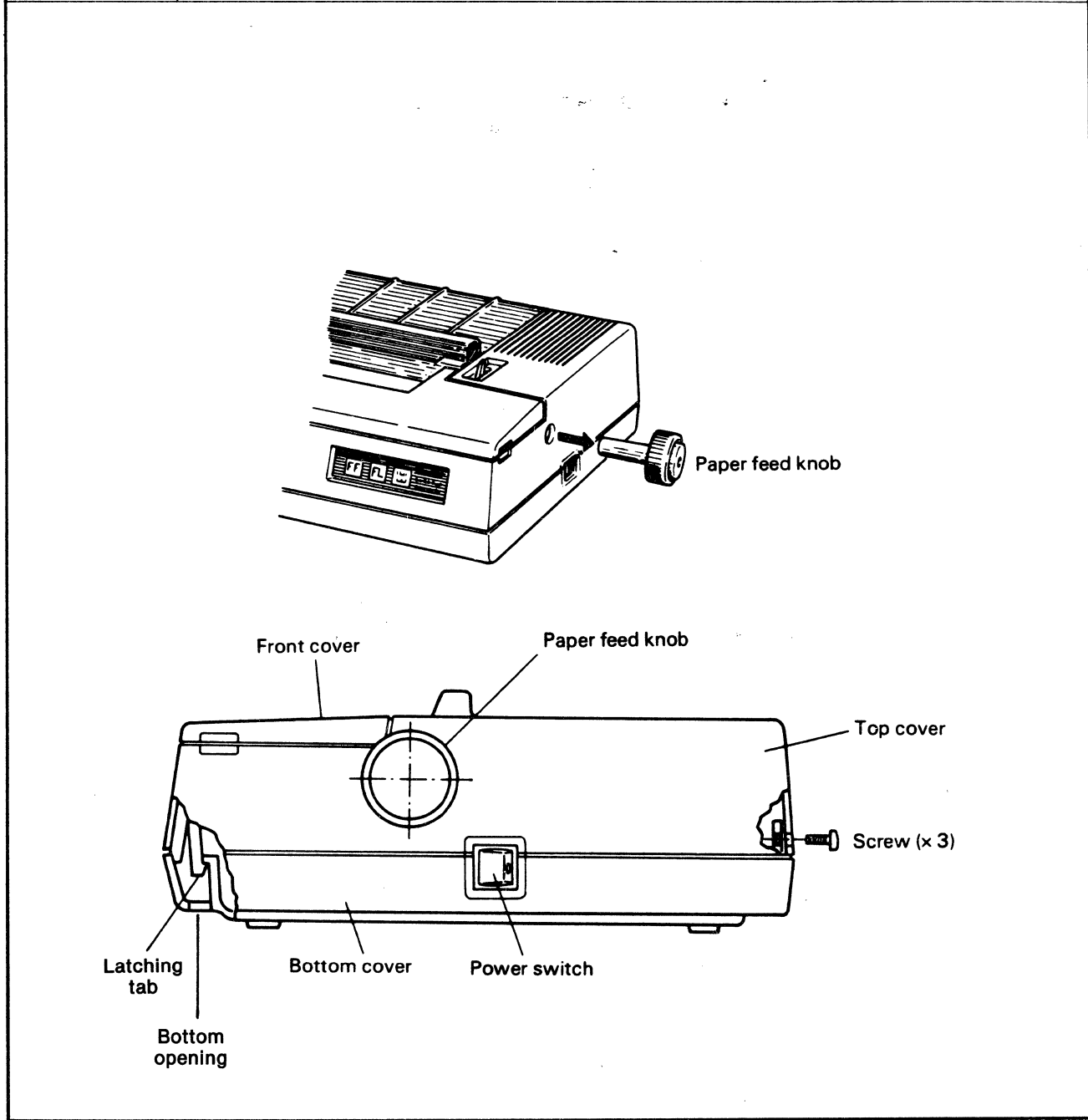


Figure 4-2 H136 Cover Removal

4.4 PRINT MECHANISM REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none">1. Remove the top cover.2. Remove screw ② securing the frame ground lead.3. Unplug connector CN2 using one hand while holding the control card with the other hand.4. Remove the two screws ③. (Make sure the clamping screws installed for shipment are removed.)5. Pull the print mechanism toward the transformer and remove it from the guide grooves of the bottom cover.6. Unplug connectors; CN7, paper sensing switch; CN6, photosensor; CN3, print head; CN4, carriage motor; and CN5, paper feed motor (hold the control card with the other hand).
Installation	<ol style="list-style-type: none">1. Reverse removal procedure.

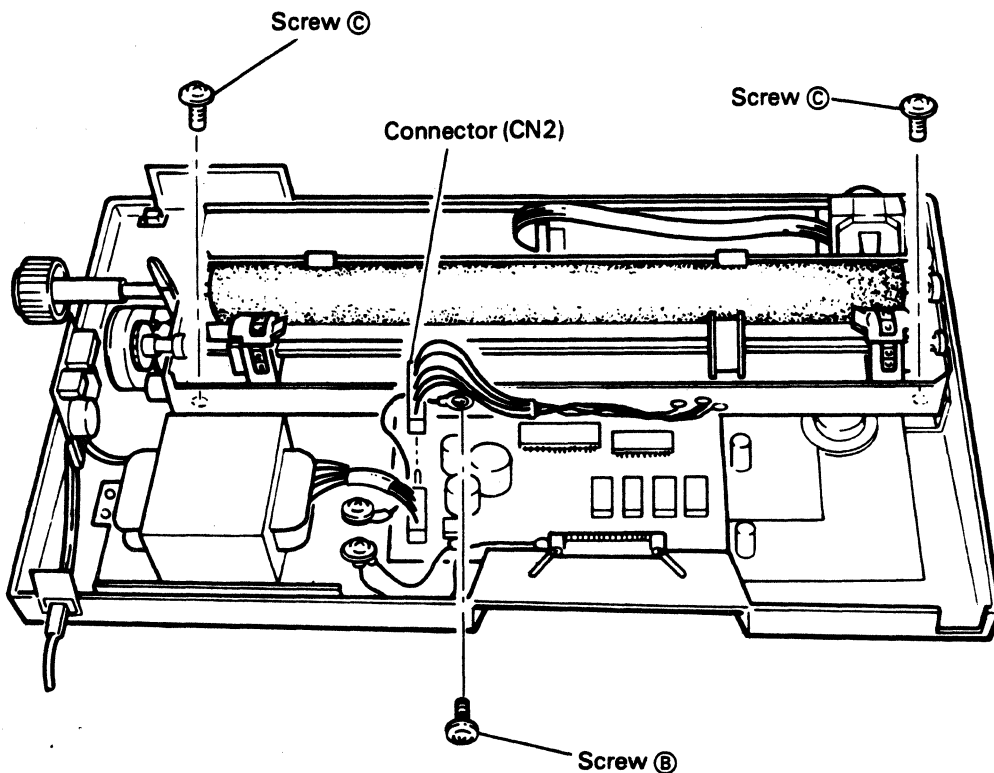
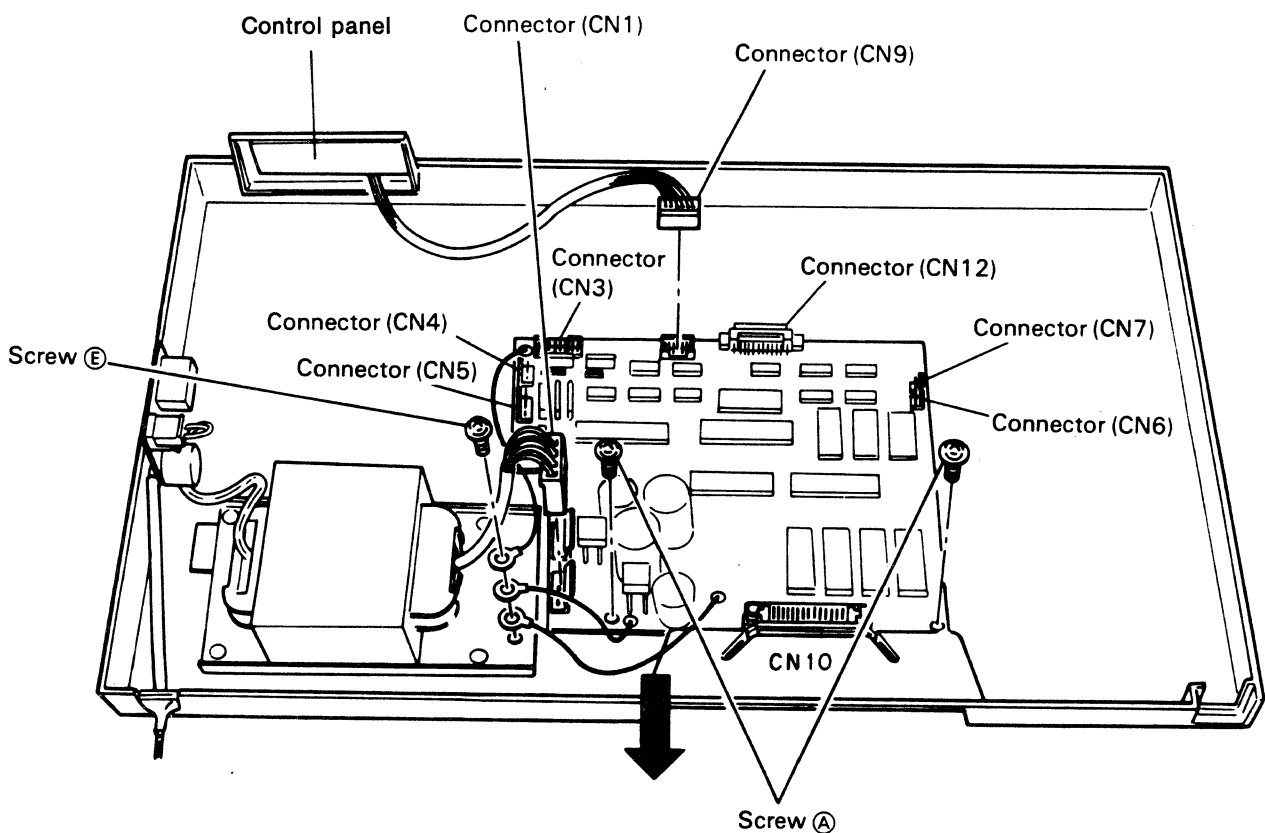


Figure 4-3 Print Mechanism Removal

4.5 CONTROL CARD REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove the print mechanism (page 4-4). 3. Remove screw ⑤ securing three ground leads soldered to the main card.* 4. Unplug connector CN1 of the transformer secondary circuit (hold the control card with the other hand). 5. Unplug connector CN9 of the keyboard from the control card (hold the control card with the other hand). (See the connector layout diagram.) 6. Remove two screws ④ securing the control card. 7. Remove the control card (be careful not to bend the spring clamps of Centronics connector CN10).
Installation	1. Reverse removal procedure.



* It may be necessary to first remove the power transformer mounting screws to allow access to the ground screw ⑤.

Figure 4-4 Control Card Removal

4.6 POWER SUPPLY REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove the receptacle and the filter card unit from the bottom cover. 3. Remove screw ⑥ securing three ground leads of the control card and screw ⑥ securing a frame ground lead. 4. Unplug connector CN1 of the transformer secondary circuit (hold the control card with the other hand). 5. Unplug connector CNP2 of the power transformer from the filter card. 6. Remove four screws ④ retaining power transformer and two toothed washers. 7. Remove the transformer from its base plate.
Installation	<ol style="list-style-type: none"> 1. Reverse removal procedure.

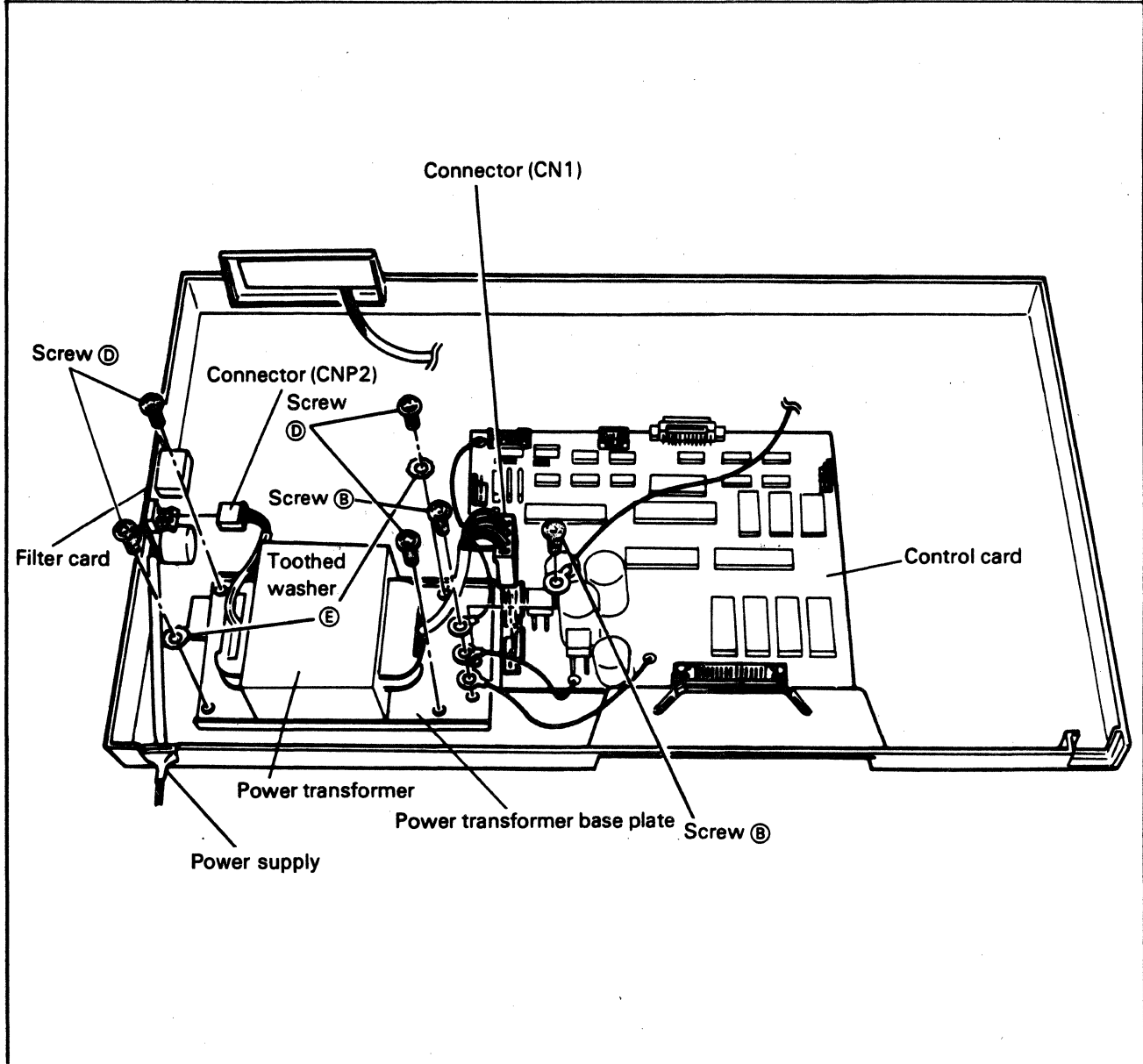


Figure 4-5 Power Supply Removal

4.7 PLATEN REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove the filter card unit and put it beside the transformer. 3. Tilt the control lever toward the tractor (in the ← direction). 4. Move the paper retainer shaft toward the print head. 5. Loosen the screws (two) securing the sector plate two turns. 6. Remove the timing belt from the platen pulley. 7. Remove the E-retaining ring. 8. Remove the left-side bearing from the platen. 9. Remove the right-side bearing from the side plate. 10. Remove the platen by lifting it upward. 11. Remove the spring pin, then the platen pulley, spring washer, and bearing (right side).
Installation	1. Reverse removal procedure.
Adjustment	Adjust timing belt tension (see Section 5).

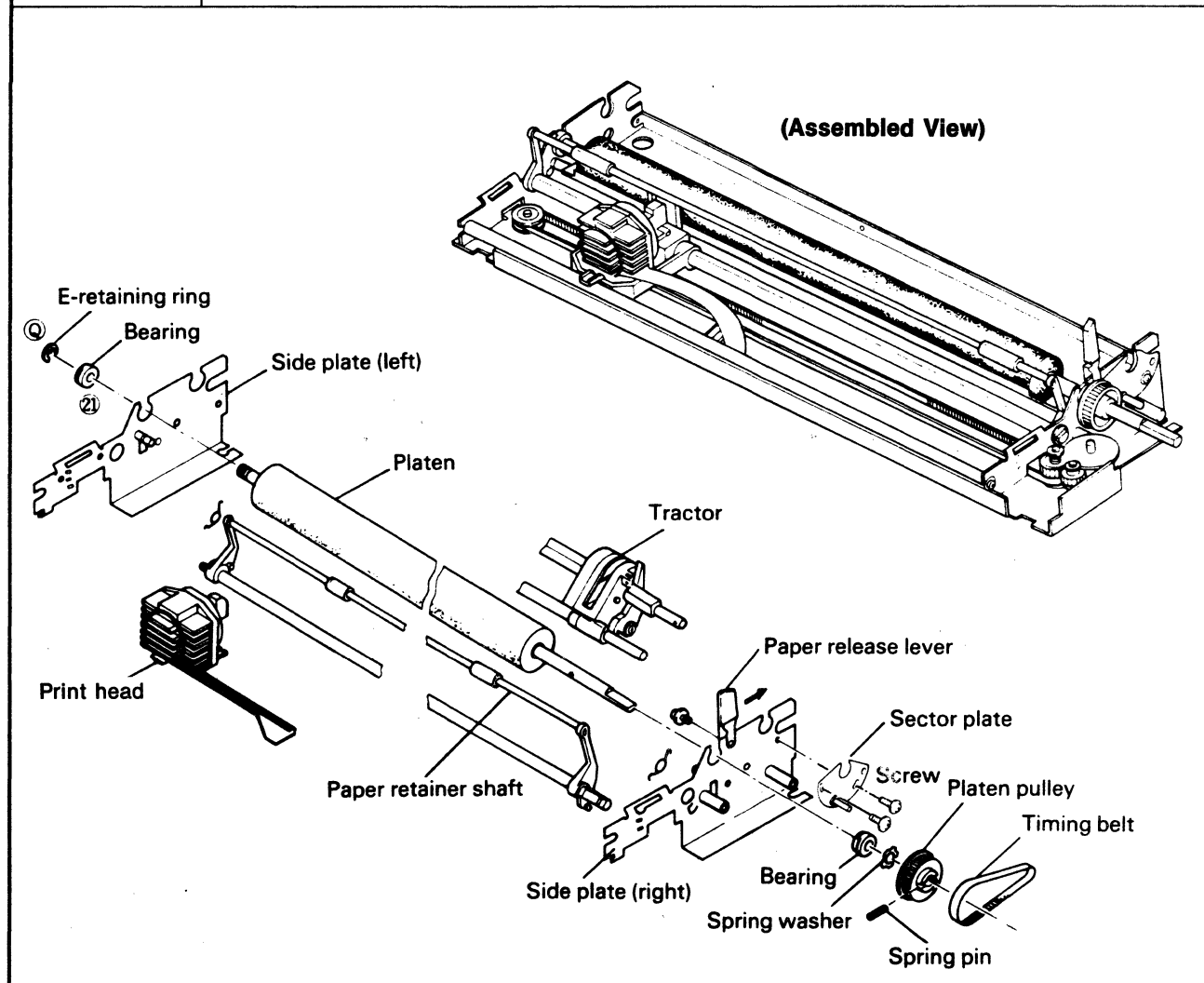


Figure 4-6 Platen Removal

4.8 H80 TRACTOR REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover 2. Unsolder and remove the leads (two) of the paper sensing switch fitted to the tractor unit from the slide switch terminals. 3. Tilt the lock lever backward to unlock the tractor (in the → direction). 4. Remove the E-retaining rings (two) of the tractor guide shaft. 5. Remove the tractor guide shaft from the side plate (left). 6. Remove the E-retaining ring of the tractor shaft. 7. Move the right tractor to the paper guide roller. 8. Remove the left and right bearings from side plate. 9. Remove the tractor unit, paper guide roller, and tractor (right) from the tractor shaft.
Installation	<ol style="list-style-type: none"> 1. Reverse removal procedure. <p>Notes:</p> <ol style="list-style-type: none"> a. Installation of pin wheels requires alignment (see Section 5). b. Position the tractor unit and the E-retaining ring of the tractor guide shaft (see Figure 4-7 below).

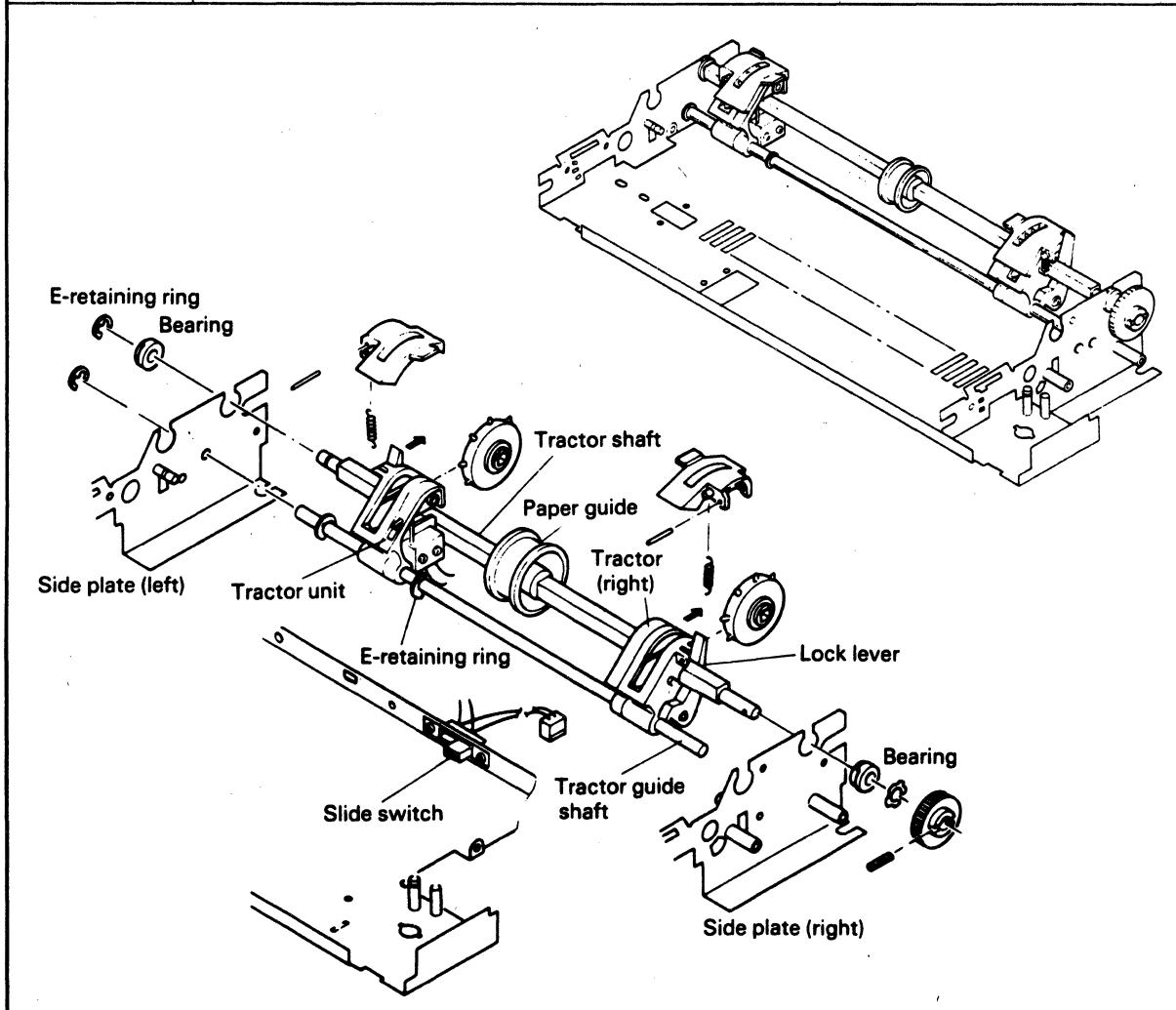


Figure 4-7 Tractor Removal (H80)

4.9 H136 TRACTOR REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Unsolder and remove the leads (two) of the papersensing switch fitted to the tractor unit from the slide switch terminals. 3. Tilt the lock lever backward to unlock the tractor (in the → direction). 4. Remove the E-retaining rings (two) of the tractor guide shaft. 5. Remove the tractor guide shaft from the side plate (left). 6. Remove the E-retaining ring of the tractor shaft. 7. Move the right tractor to the paper guide roller. 8. Remove the left and right bearings from side plate. 9. Remove the tractor unit, paper guide rollers (two), and tractor (right) from the tractor shaft.
Installation	<ol style="list-style-type: none"> 1. Reverse removal procedure. <p>Note:</p> <ol style="list-style-type: none"> a. Installation of pin wheels requires alignment (see Section 5). b. Position the tractor unit and the E-retaining ring of the tractor guide shaft (see Figure 4-8 below).

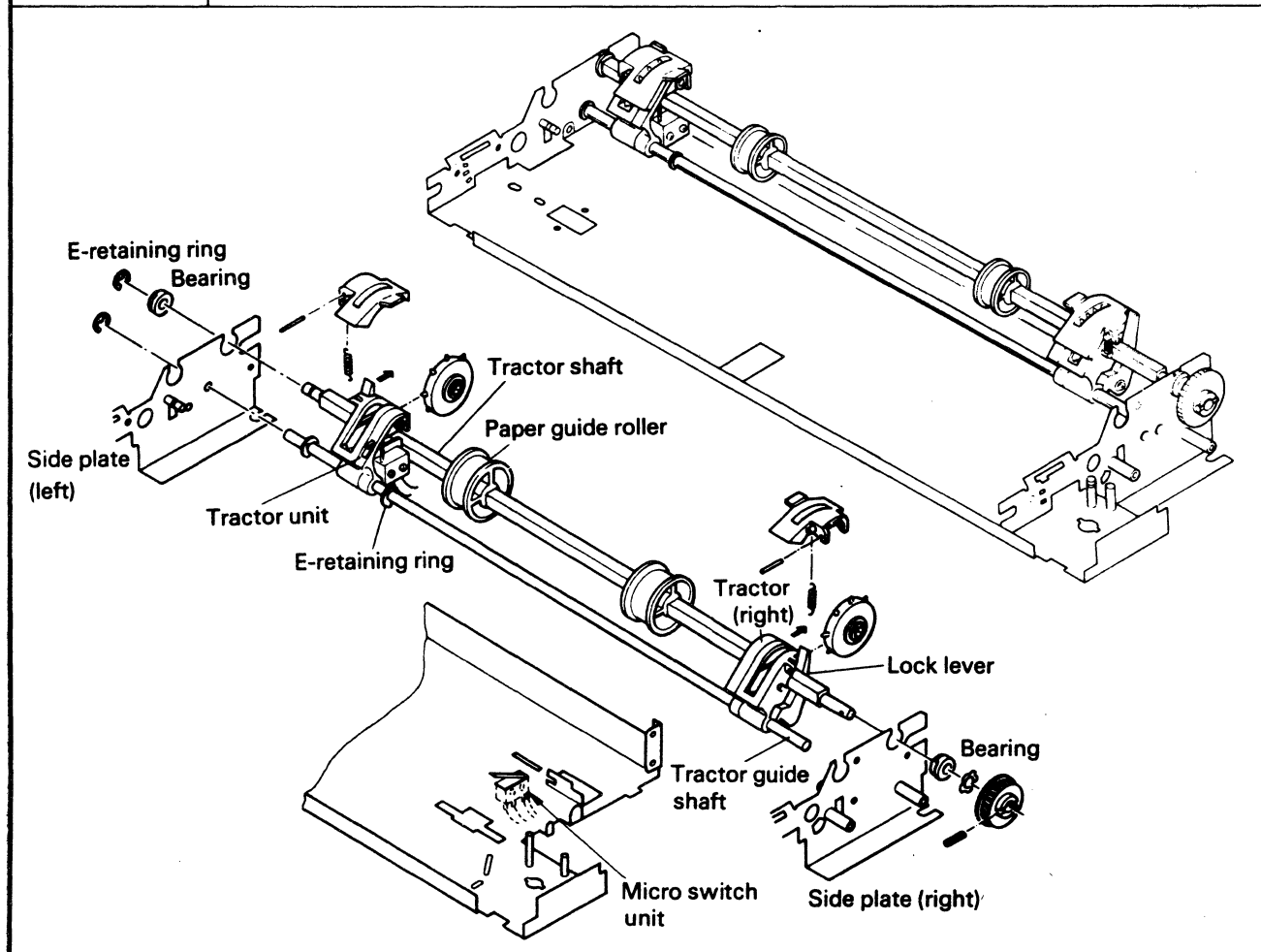


Figure 4-8 Tractor Removal (H136)

4.10 H80 CARRIAGE TIMING BELT REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the print mechanism from the bottom cover (see Figure 4-3). 2. Loosen the screw securing the idler pulley base plate. 3. Remove E-retaining rings (two) from the carrier motor shaft and the follower pulley shaft. 4. Remove idle gears (two) 5. Remove the ribbon gear. 6. Remove the follower pulley. 7. Remove the carriage guide shaft from the printer base plate (perform 2-6 of Step 8, replacing the carriage guide shaft). 8. Remove the carriage timing belt from the carriage (use tweezers).
Installation	1. Reverse removal procedure.
Adjustments	Adjust: Carriage timing belt tension (Section 5) Print Head clearance (Section 5) Carriage home position (Section 5) Idle gear axial play (Section 5)

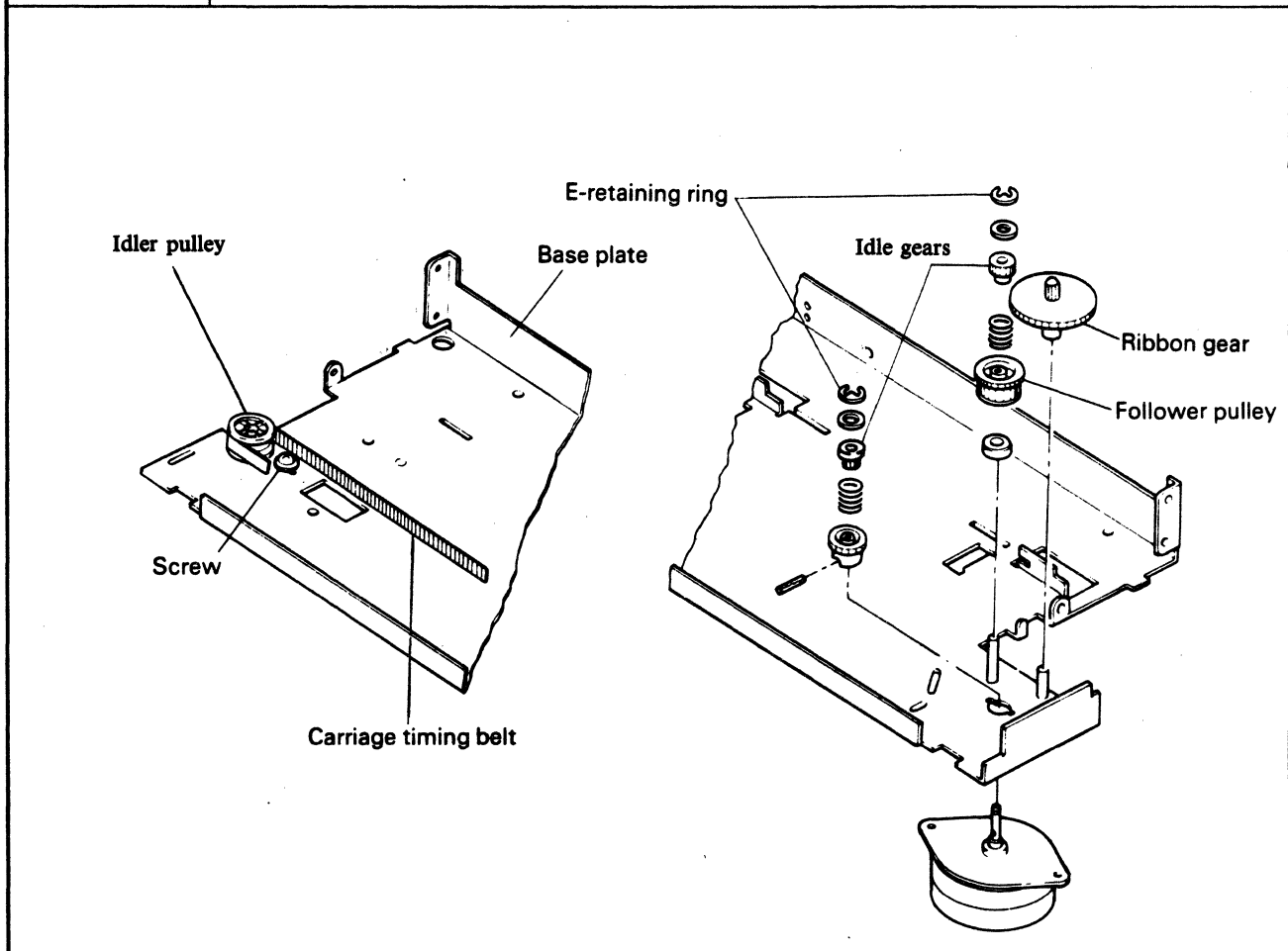


Figure 4-9 Carriage Timing Belt Removal (H80)

4.11 H136 CARRIAGE TIMING BELT REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the print mechanism from the bottom cover (see Figure 4-3). 2. Move the carriage to the right over to the hole provided to facilitate belt replacement. 3. Loosen the screw securing the idler pulley base plate. 4. Set the printing unit on its side and remove the carriage timing belt from the carriage on the bottom side of the base plate (use tweezers). 5. Remove E-retaining rings (two) from the carrier motor shaft and the follower pulley shaft. 6. Remove the idle gear. 7. Remove the ribbon gear. 8. Remove the clutch gear. 9. Remove the follower pulley. 10. Remove the carriage timing belt.
Installation	<ol style="list-style-type: none"> 1. Reverse removal procedure.
Adjustments	Adjust: Carriage timing belt tension (Section 5) Print Head clearance (Section 5) Carriage home position (Section 5) Idle gear axial play (Section 5)

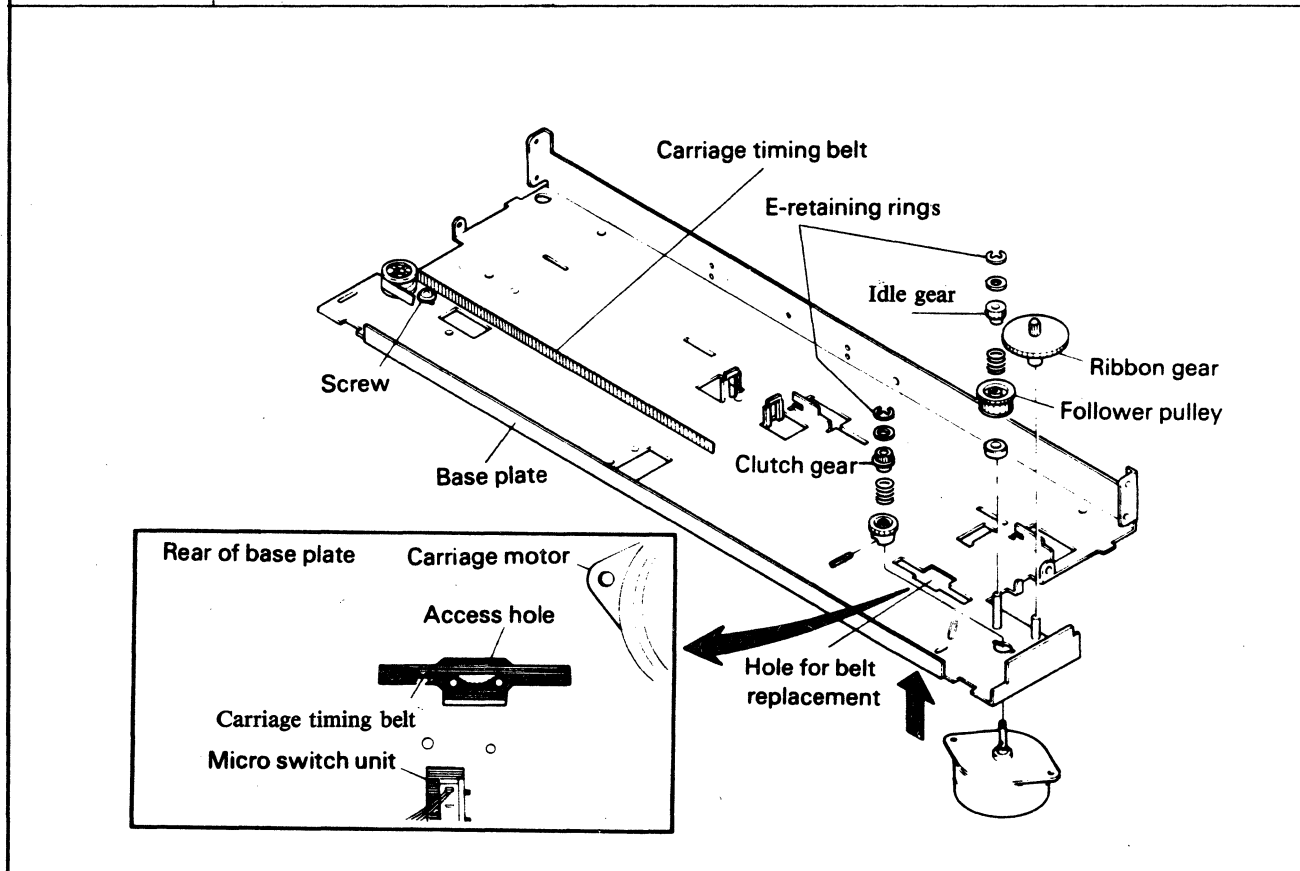


Figure 4-10 Carriage Timing Belt Removal (H136)

4.12 PAPER RETAINER & CARRIAGE GUIDE SHAFT REMOVAL

Paper Retainer Removal

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove paper retainer level springs (two) from the paper retainer levers. 3. Remove nut from the left end of the guide shaft, then remove spring washer, eccentric lever, and bearing. 4. Remove the E-retaining ring on the right side of the guide shaft rear, then the bearing. 5. Turn the guide shaft 90° by hand and pull off the paper retainer levers. 6. Remove the paper retainer shaft and paper retainer.
Installation	1. Reverse removal procedure.
Adjustment	Adjust print head clearance (Section 5).

Carriage Guide Shaft Removal

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Continuing from above, replace the paper retainer. 2. Pull off the guide shaft toward the left side plate.
Installation	1. Reverse removal procedure.
Adjustment	Adjust print head clearance (Section 5).

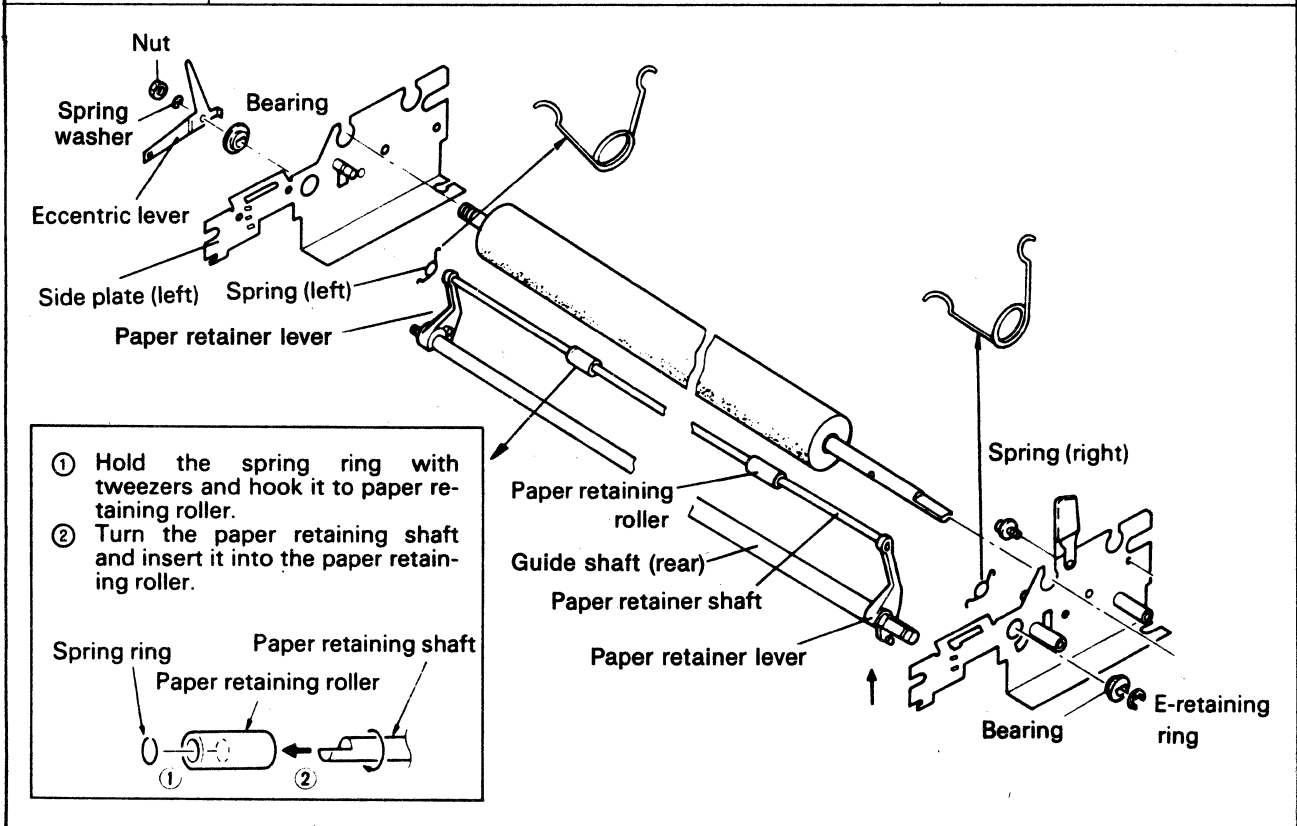


Figure 4-11 Paper Retainer and Carriage Guide Shaft Removal

4.13 PINCH ROLLER REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove the platen and tractor. 3. Tilt the paper release lever toward A. 4. Remove the pinch roller spring (left) from the pinch roller shaft. 5. Raising the paper pan slightly at side A, move it to the left or right and remove. 6. Tilt the paper release lever toward B. 7. Remove the screw securing the pinch roller link plate, then move the link plate to the left and remove. 8. Remove pinch roller intermediate springs (two) and pinch roller spring (right) from the pinch roller shafts (two), then remove the pinch roller shafts.
Installation	1. Reverse removal procedure.

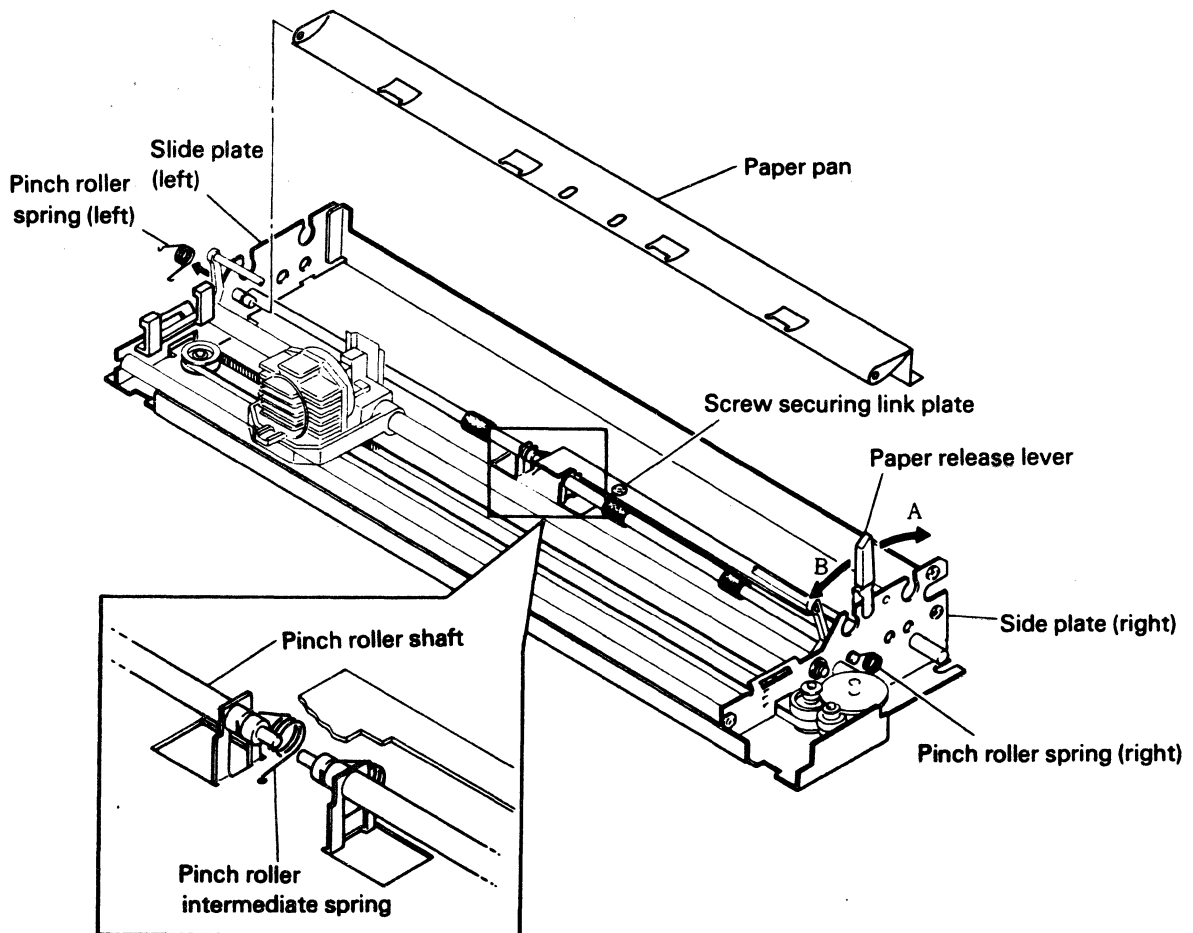


Figure 4-12 Pinch Roller Removal (H136 only)

4.14 CARRIAGE DRIVE MOTOR REMOVAL

Item	Procedure
Removal	<ol style="list-style-type: none"> 1. Remove the top cover. 2. Remove the print mechanism. 3. H-80 — Remove two E-retaining rings, two washers, two idle gears, ribbon gear, two clutch springs, carriage motor gear and spring pin, in that order. H-136—Remove two E-retaining rings, two washers, idle gear, ribbon gear, clutch gear, clutch spring, clutch gear spring, carriage motor gear and spring pin, in that order. 4. Remove the screws from the carriage motor.
Installation	1. Reverse removal procedure.
Adjustment	Adjust carriage home position (see Section 5).

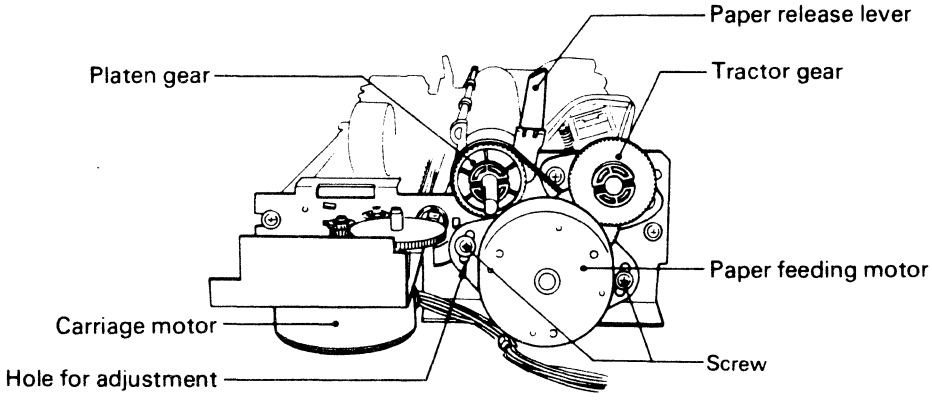
Exploded view diagram of the carriage drive motor assembly. Labels include: E-retaining ring, Washer, Idle gear, Ribbon gear, Clutch spring, Idle gear (H80), Clutch gear (H136), Clutch spring (H80), Clutch gear spring (H136), and Carriage motor gear.

Diagram showing the carriage motor being removed from the carriage assembly. Labels include: Screw and Carriage motor.

Figure 4-13 Carriage Drive Motor Removal

4.15 PAPER FEED DRIVE MOTOR REMOVAL

Item	Procedure
Removal	1. Remove the top cover. 2. Remove the print mechanism. 3. Remove two screws from the paper feed motor.
Installation	1. Reverse removal procedure.
Adjustment	When replacing the paper feed motor, secure it temporarily with two screws and fit the paper feed knob to the platen to ensure that the gears mesh and operate smoothly.



The diagram shows a detailed view of the paper feed drive mechanism. It features a central paper feeding motor connected to a tractor gear, which in turn meshes with a platen gear. A paper release lever is positioned above the tractor gear. A carriage motor is located to the left of the platen gear. A hole for adjustment is indicated on the platen gear housing. Two screws are shown securing the paper feeding motor to the frame.

Figure 4-14 Paper Feed Drive Motor Removal

SECTION 5 ADJUSTMENTS

5.1 PURPOSE

This section contains procedures for adjusting mechanical parts of the printer. These adjustments ensure that the printer will perform properly and within specifications.

5.2 SUMMARY OF ADJUSTMENTS

The following adjustments or alignments are contained in this section:

5.3 CARRIAGE TIMING BELT TENSION

5.4 PAPER FEED BELT TENSION

5.5 PRINT HEAD CLEARANCE

5.6 CARRIAGE HOME POSITION

5.7 TRACTOR PIN WHEEL ALIGNMENT

5.8 IDLE GEAR AXIAL PLAY

5.3 CARRIAGE TIMING BELT TENSION

Item	Procedure
Adjustment	Tighten the carriage timing belt with a force of 1.0 kg (2.2 lb). Note that H136 should be 2.5 kg (5.5 lb).
Adjusting Procedure	<ol style="list-style-type: none"> 1. Loosen the screw securing the pulley base plate. 2. Hook a tension gauge (0 – 3 kg) at the working hole of the pulley base plate. 3. Pull the tension gauge with a force of X kg in the direction of P. 4. Hold that force while tightening the screw.

PRINTER	FORCE
H80	1 kg
H136	2-3 kg

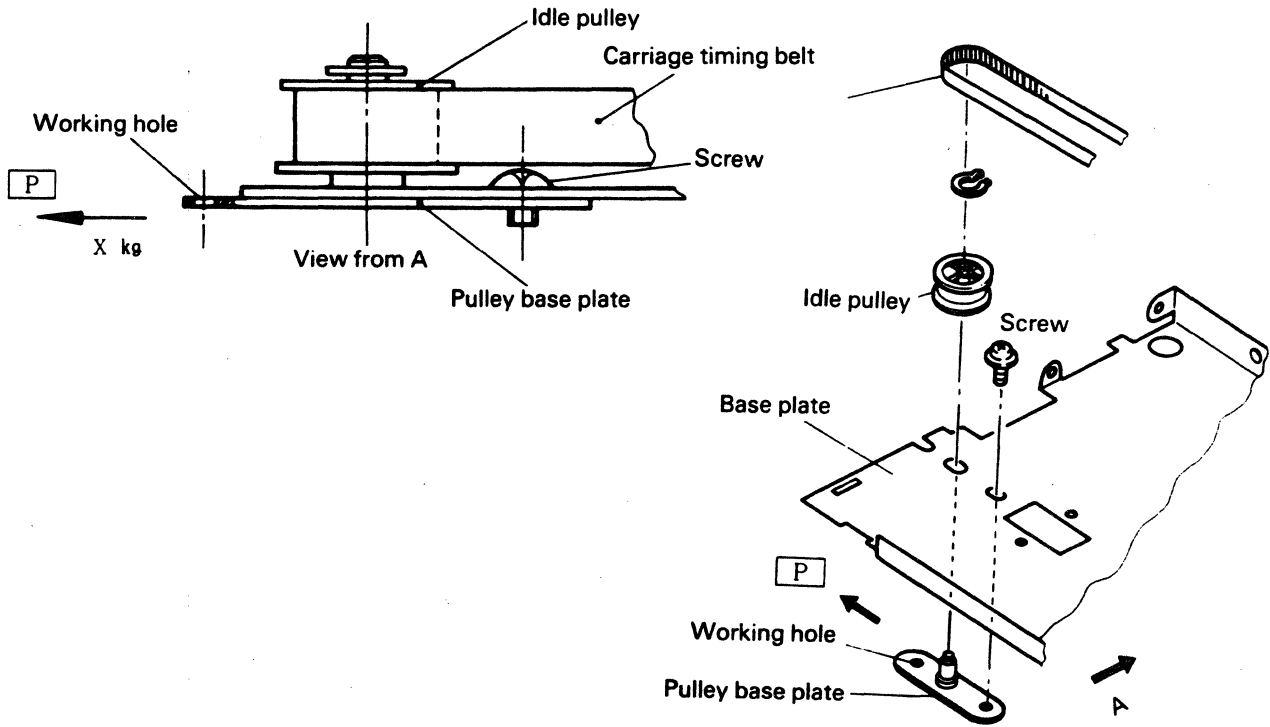


Figure 5-1 Carriage Timing Belt Tension

5.4 PAPER FEED BELT TENSION

Item	Procedure
Adjustment	Tighten the paper feed belt with a force of 1.5 kg (3.3 lb).
Adjusting Procedure	<ol style="list-style-type: none"> 1. Loosen the screws (two) securing the sector plate. 2. Hook a tension gauge (0 – 3 kg) at the working hole of the sector plate. 3. Pull the tension gauge with a force of 1.5 kg in the direction of P. 4. Hold that force while tightening the screw.

The diagram illustrates the adjustment of paper feed belt tension. The upper portion, labeled 'View from A', shows a cross-section of the mechanism. A timing belt is looped around a gear pulley and a tractor gear. A sector plate is positioned above the tractor gear, secured by a screw. A working hole is located on the sector plate. A force of 1.5 kg is applied to this hole in the direction of 'P'. The lower portion is an exploded view of the components: the side plate (right), sector plate, working hole, screw, tractor gear, gear pulley, and timing belt. An arrow 'A' points to the sector plate, and 'P' indicates the direction of the tensioning force.

Figure 5-2 Paper Feed Belt Tension

5.5 PRINT HEAD CLEARANCE

Item	Procedure
Adjustment	Adjust the position of the guide shaft to establish proper print head to platen gap.
Adjusting Procedure	<ol style="list-style-type: none"> 1. Tilt the eccentric lever fully toward the platen (in the direction of A). 2. Loosen nut (M4) of the eccentric lever until the guide shaft becomes movable. 3. Adjust clearance between the print head and the platen to 0.2 ± 0.05 mm by turning the guide shaft when the carriage is brought to the left end, middle, and right end of the platen (move the carriage by hand). Do not install print form or ink ribbon for this adjustment. (Let the D-cut face upward before making adjustment.) 4. Tighten the nut of the eccentric lever to secure the guide shaft (hold the D-cut at the right end of the guide shaft with pliers).

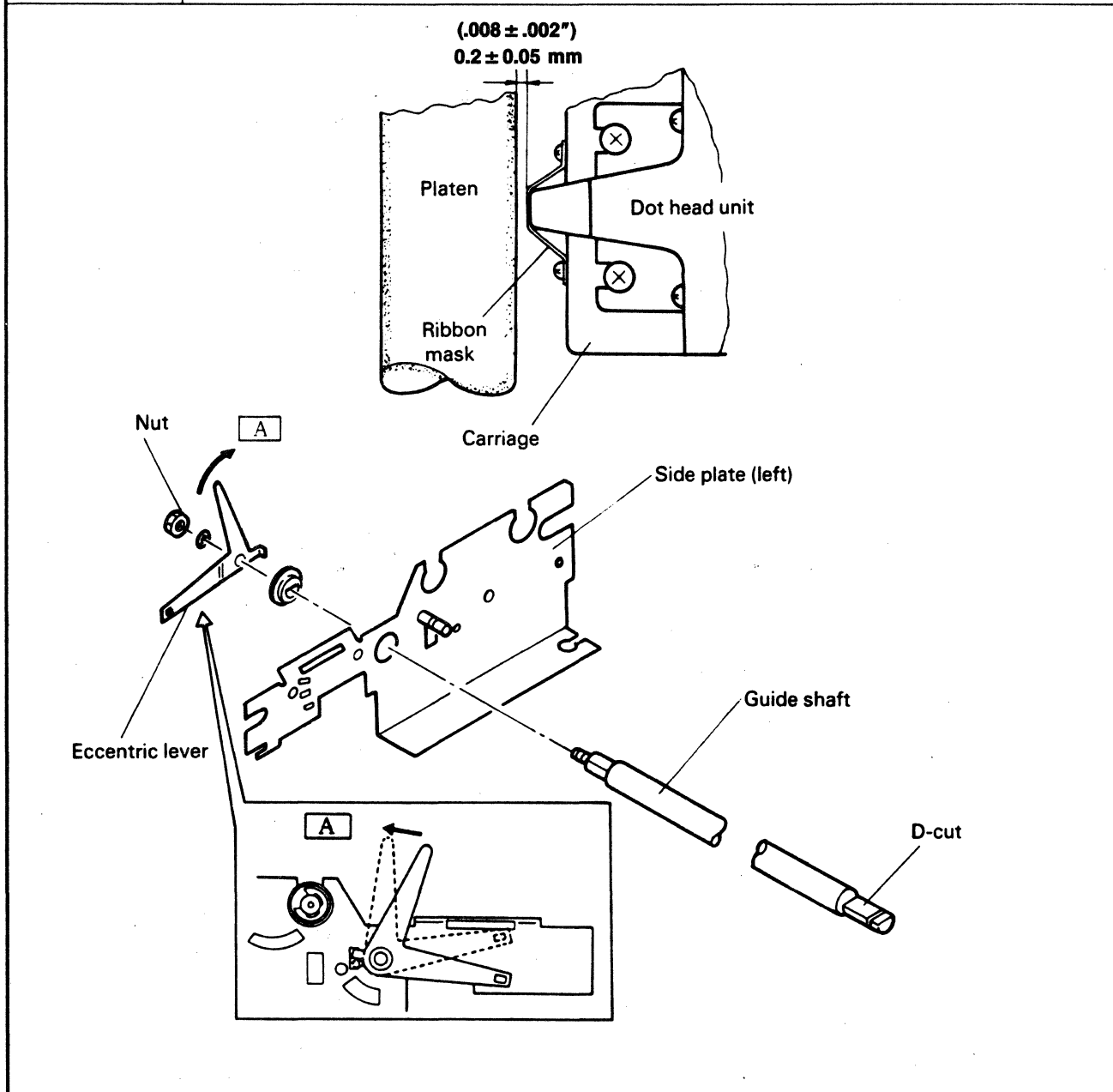


Figure 5-3 Print Head Clearance

5.6 CARRIAGE HOME POSITION

Item	Procedure
Adjustment	Adjust the indexing of the carriage drive motor gear so that there is a 2.1 mm (.083") gap at the left of the carriage (home position).
Adjusting Procedure	<ol style="list-style-type: none"> 1. Remove the top cover so that the carriage motor mounting screws are visible. 2. Loosen the (2) motor mounting screws 4-5 turns and unmesh the motor gear from the follower pulley gear. 3. Turn the power ON to the printer. The motor will jog in two directions and come to a resting position. 4. Without disturbing the position of the motor gear, move the carriage out from the left end stop to form a gap of 2.1 ± 0.3 mm ($.083 \pm .012$"). 5. Mesh the motor gear with the follower gear pulley and tighten the mounting screws. 6. Check the home position gap by turning power OFF, then ON. Make certain the gears mesh with very little play.

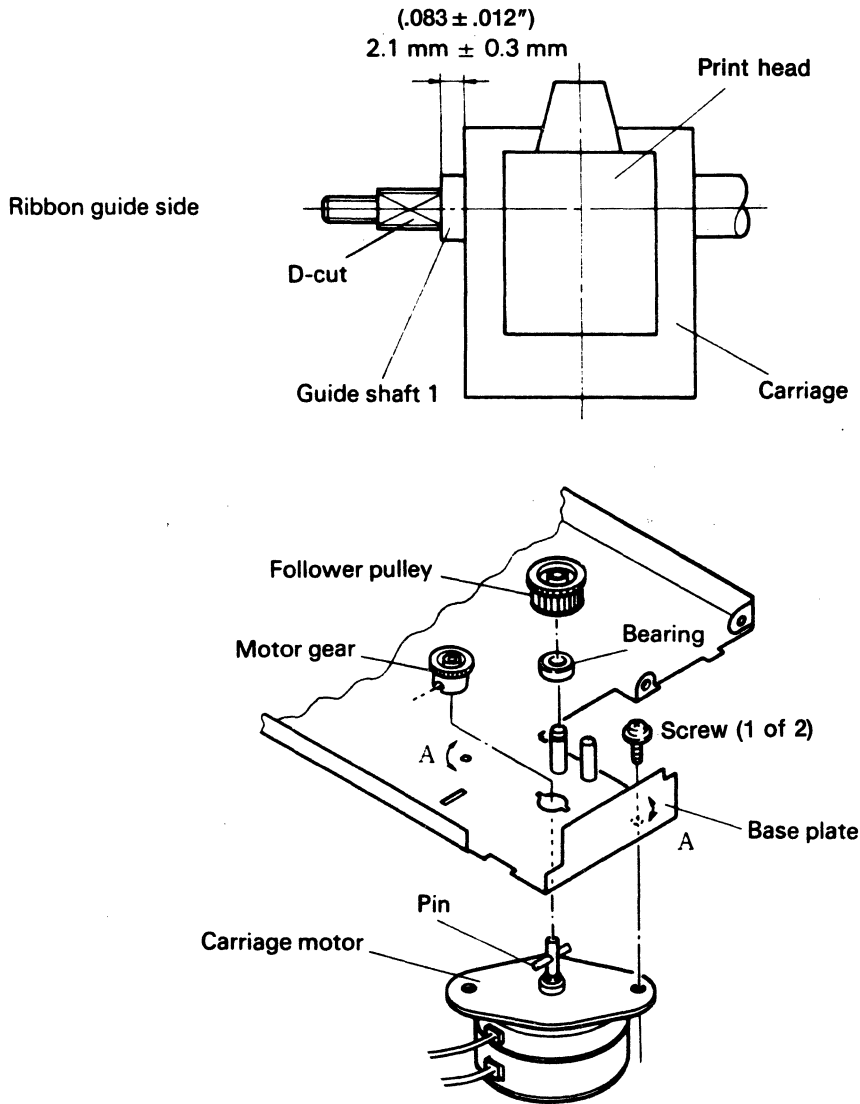


Figure 5-4 Carriage Home Position

5.7 TRACTOR PIN WHEEL ALIGNMENT

Align the right pin wheel with the left and index them with the tractor shaft.

Caution: The print form will not feed properly if the pins of the left and right tractors are not aligned.

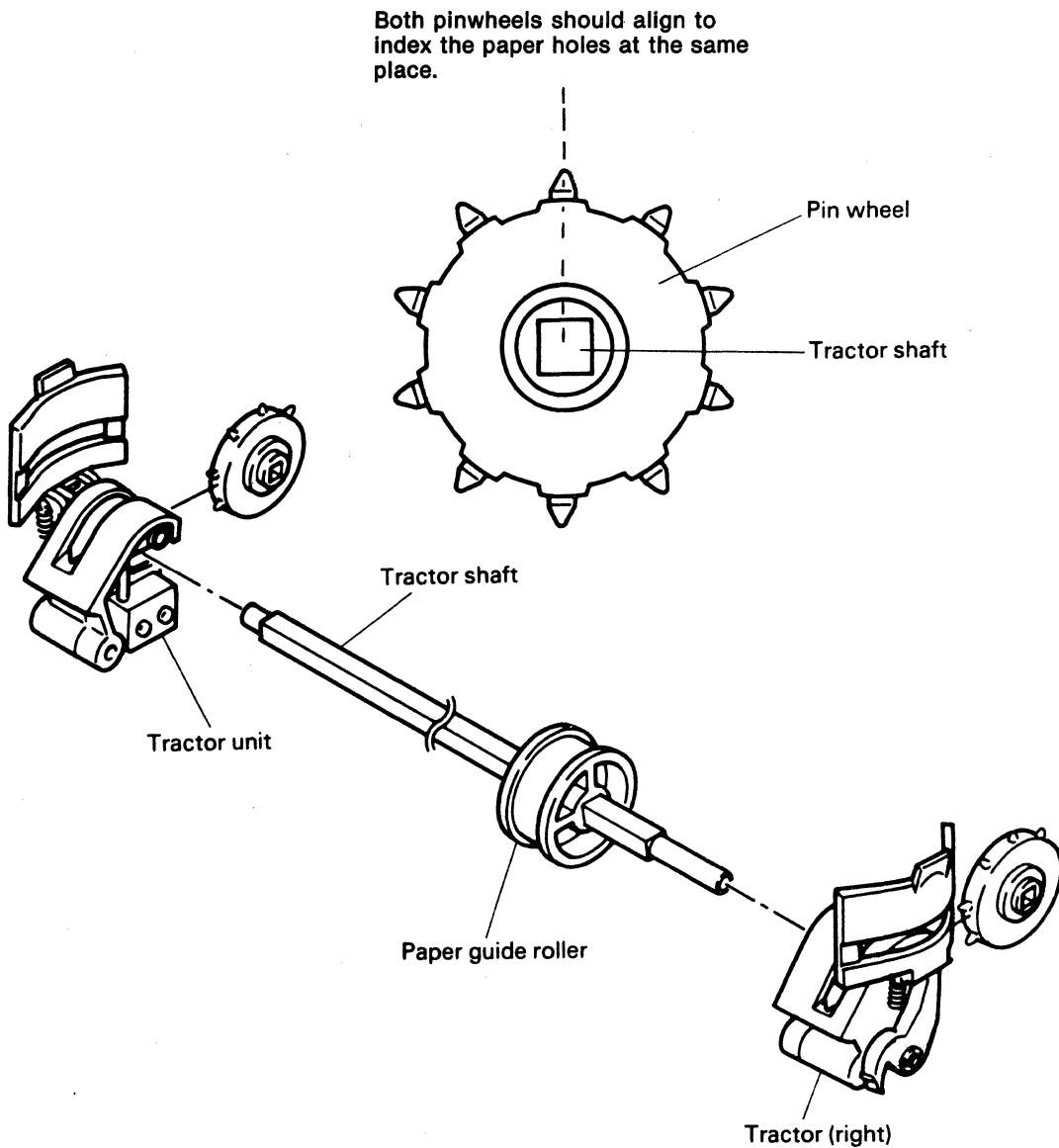


Figure 5-5 Tractor Pin Wheel Alignment

5.8 IDLE GEAR AXIAL PLAY

Adjust axial play of the idle gear (on the carriage motor shaft) to 0.03-0.1 mm (.001-.004"). Use thickness gauge and shim washers as needed.

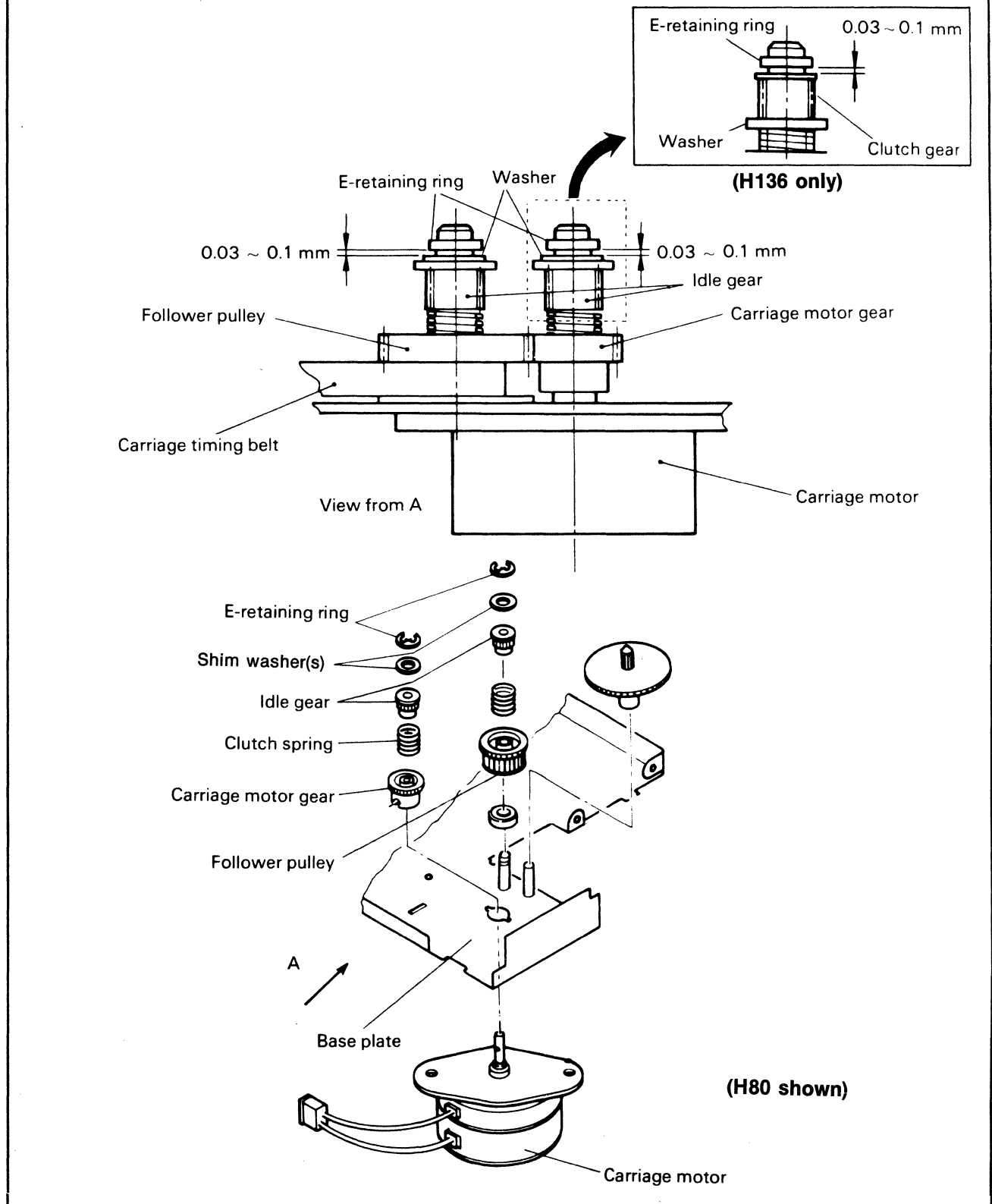


Figure 5-6 Idle Gear Axial Play

SECTION 6

TROUBLESHOOTING CHARTS

6.1 PURPOSE

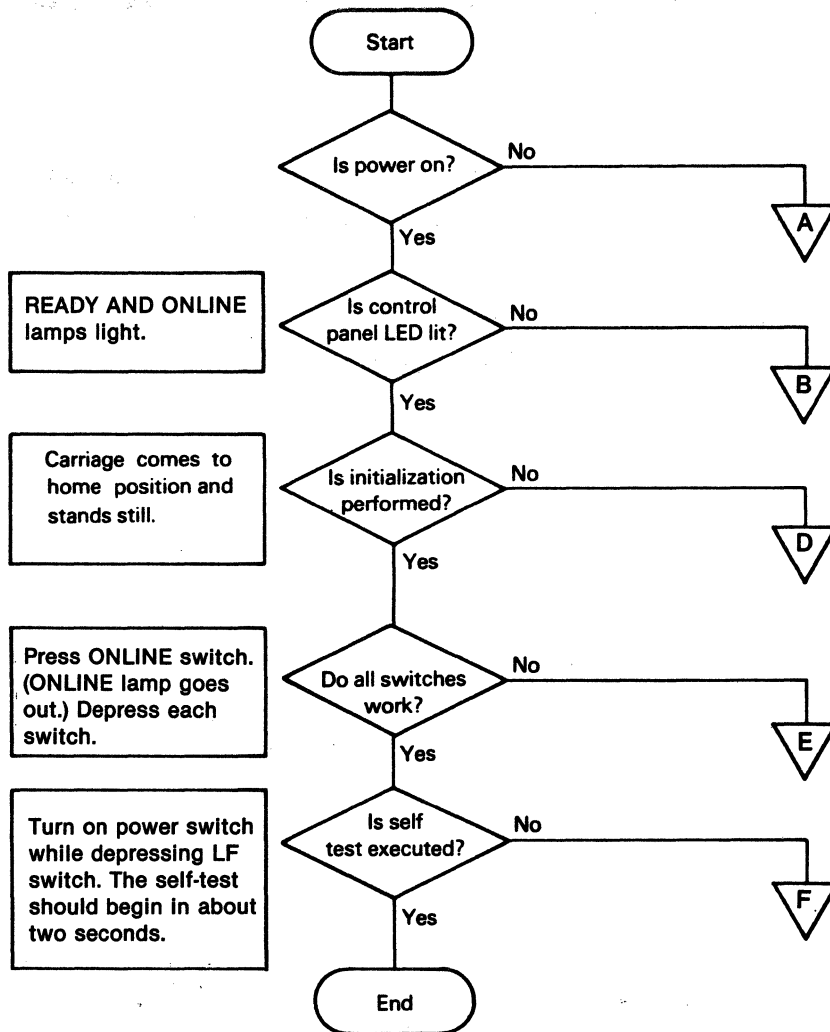
The troubleshooting charts are included to help the service person to determine the trouble source. Troubleshooting must be performed by a qualified service person, observing the safety precautions associated with electrical circuits.

6.2 PREPARING TO TROUBLESHOOT

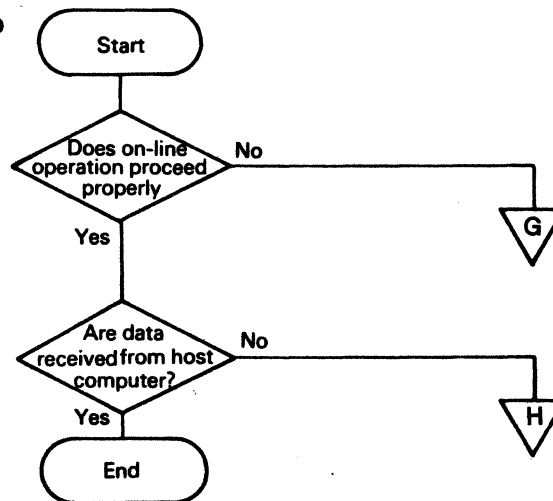
Check the following items before proceeding to troubleshooting.

1. Disconnect the interface cable from the host computer.
2. Install paper in the printer.

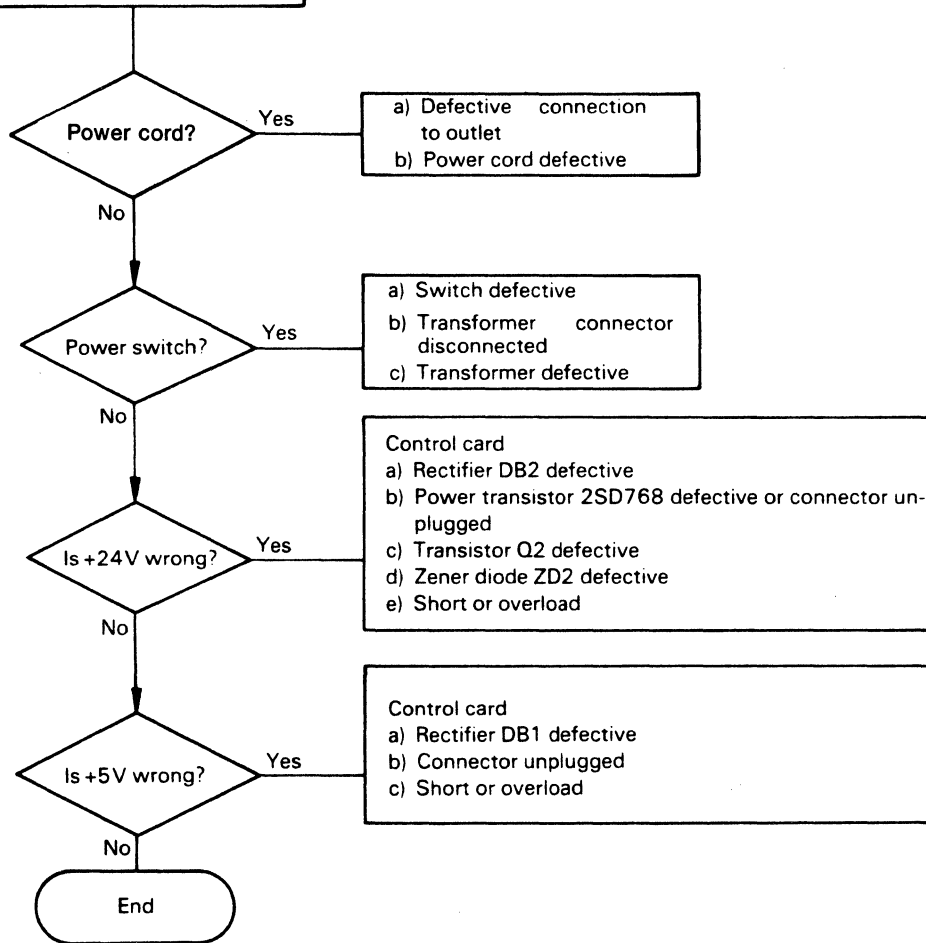
6.3 TROUBLESHOOTING FLOWCHARTS



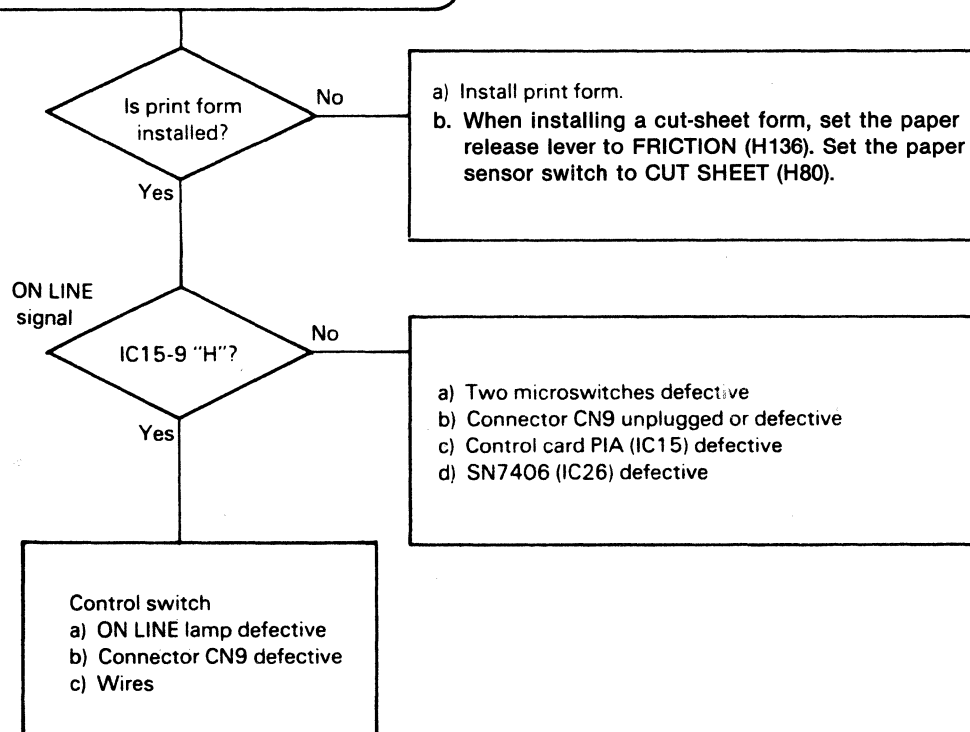
Printer connected to the host computer.

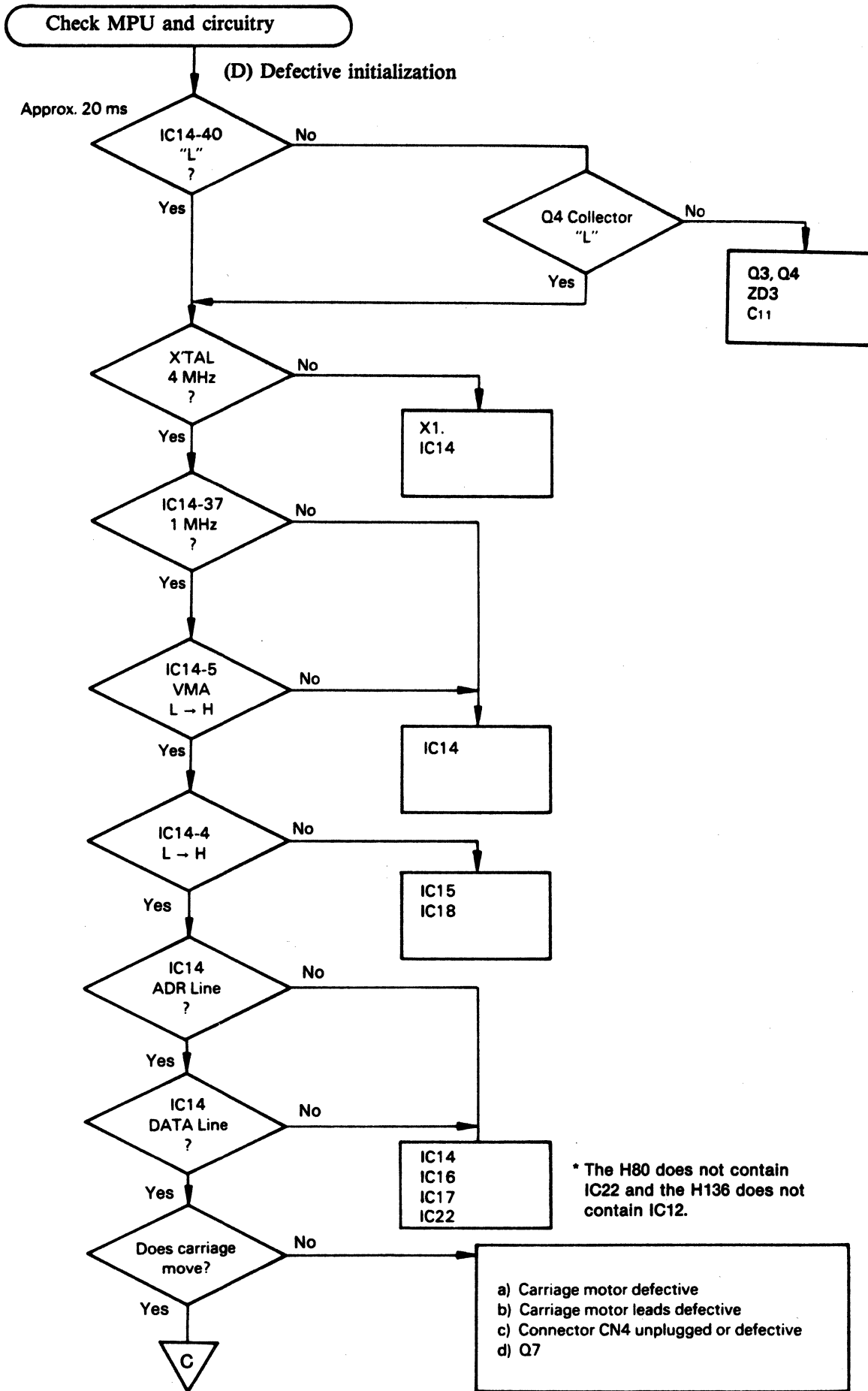


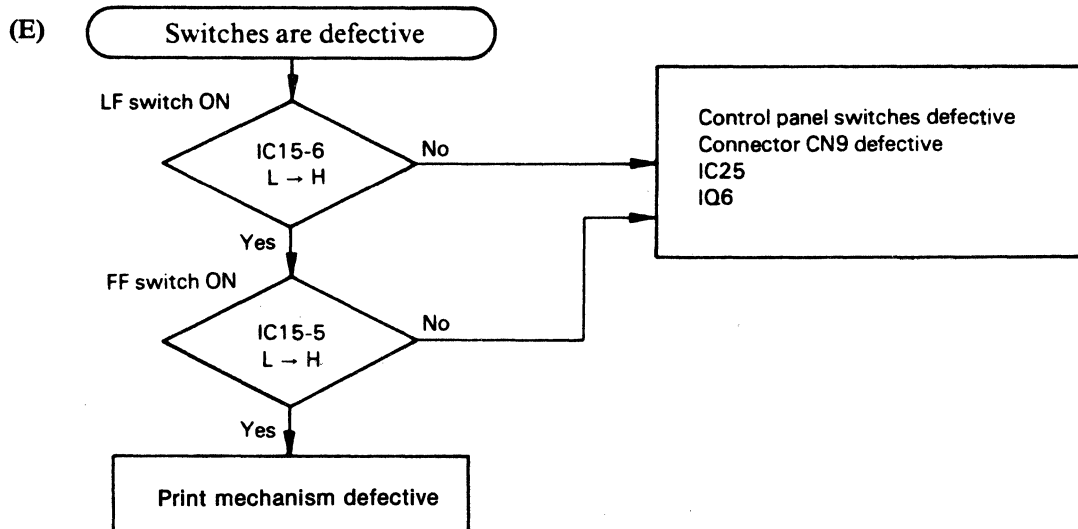
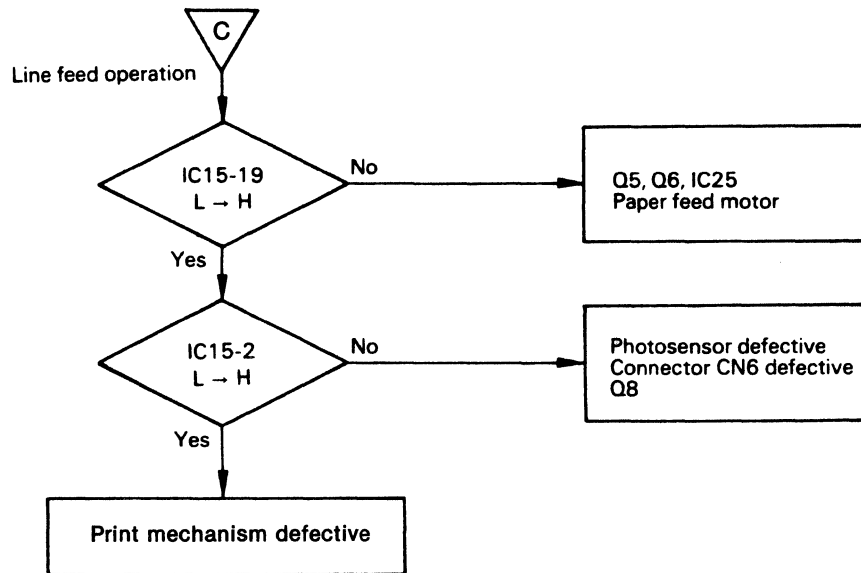
(A) Improper DC voltages after power-on (Including blown fuse)

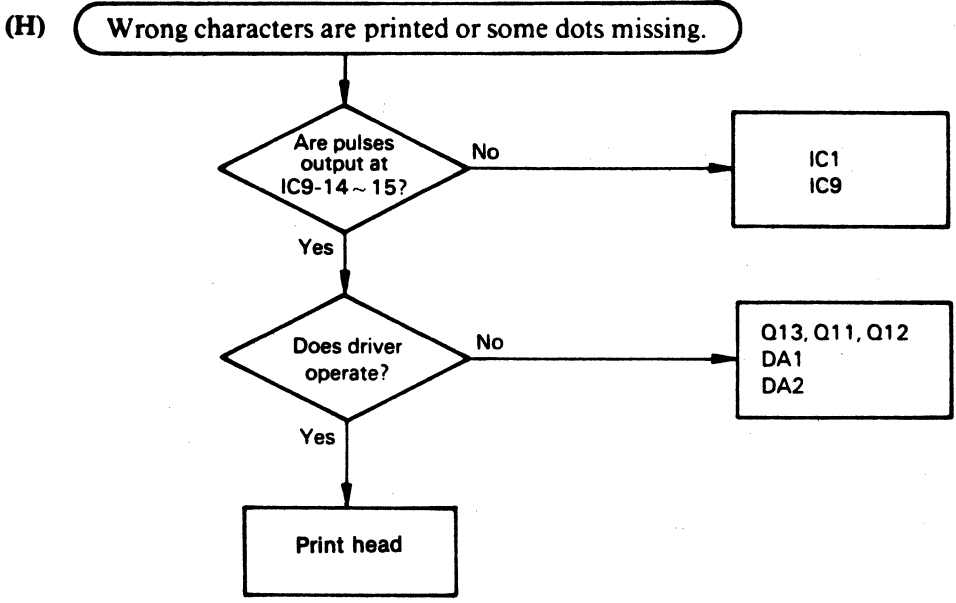
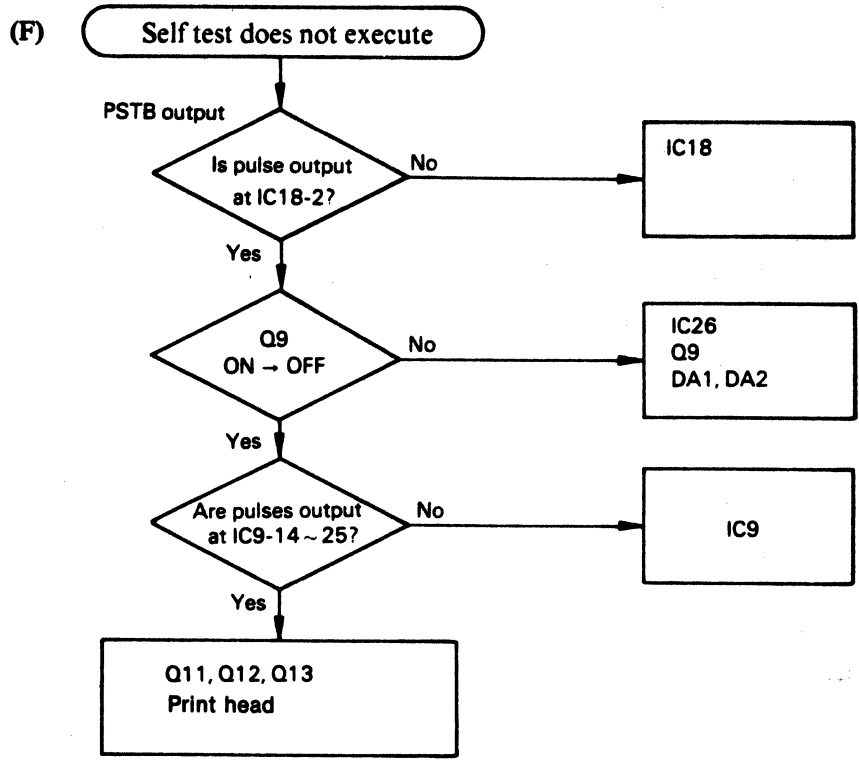


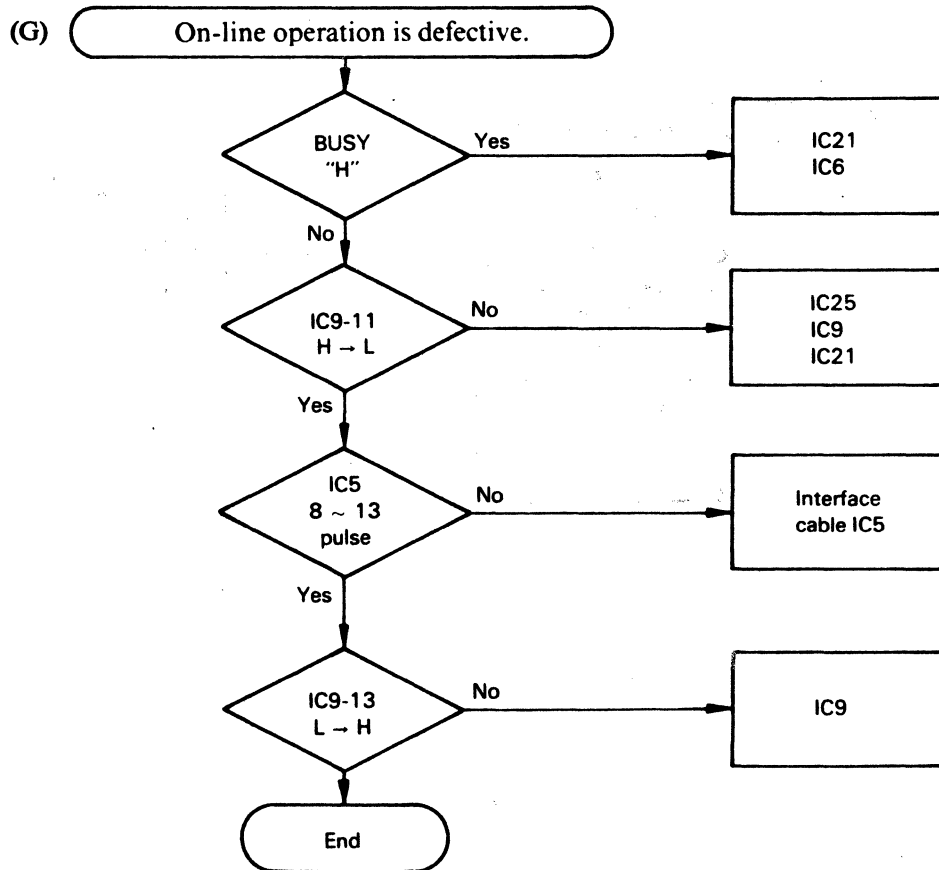
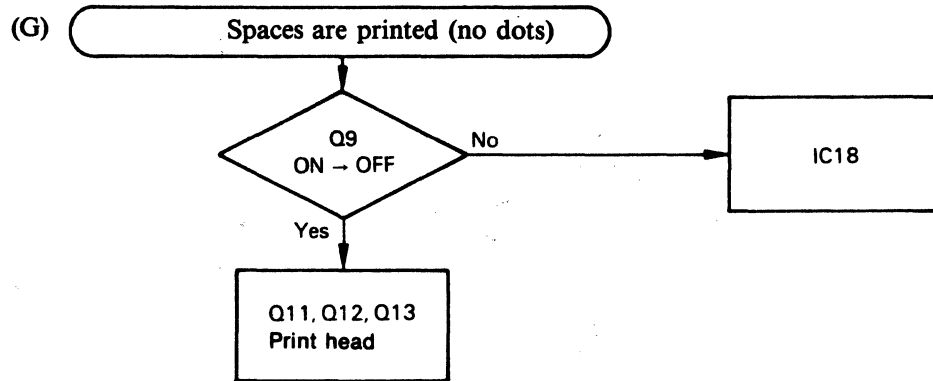
(B) LED indications on the control panel

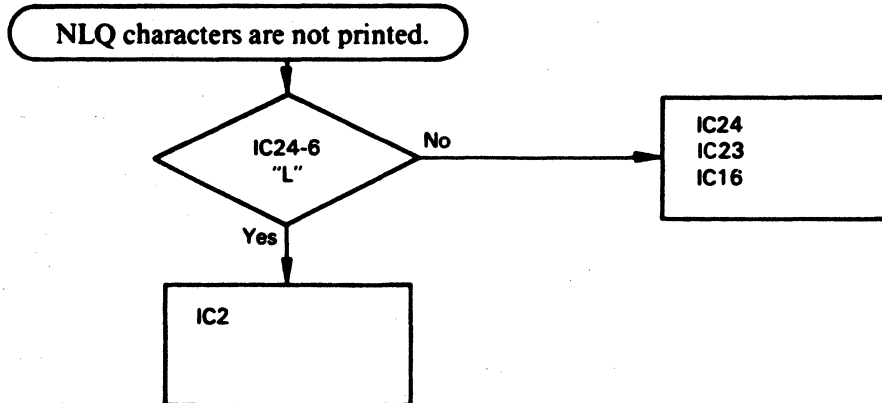
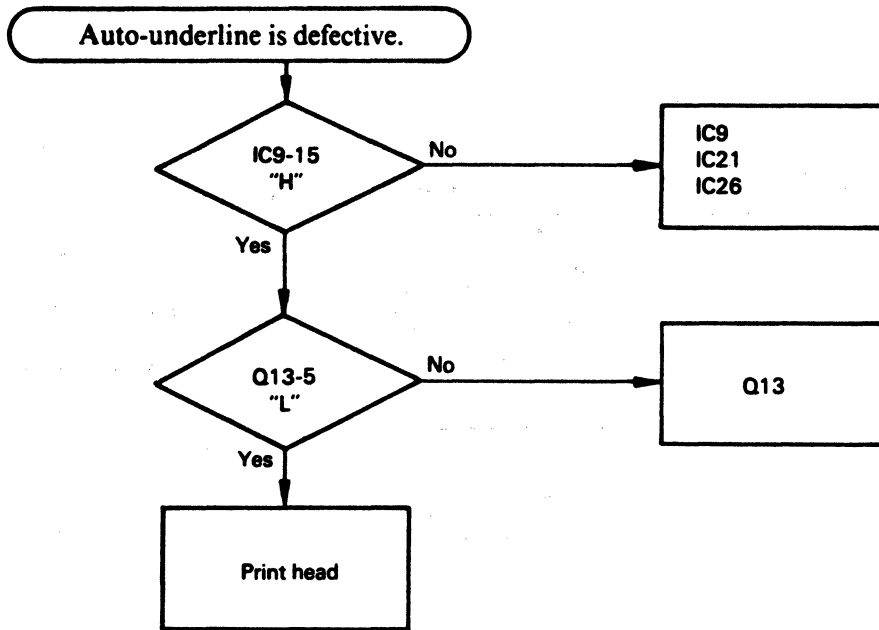




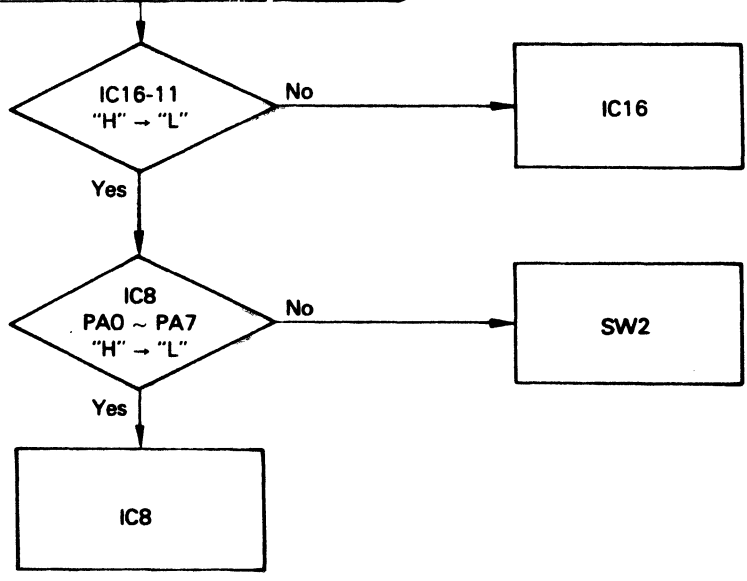




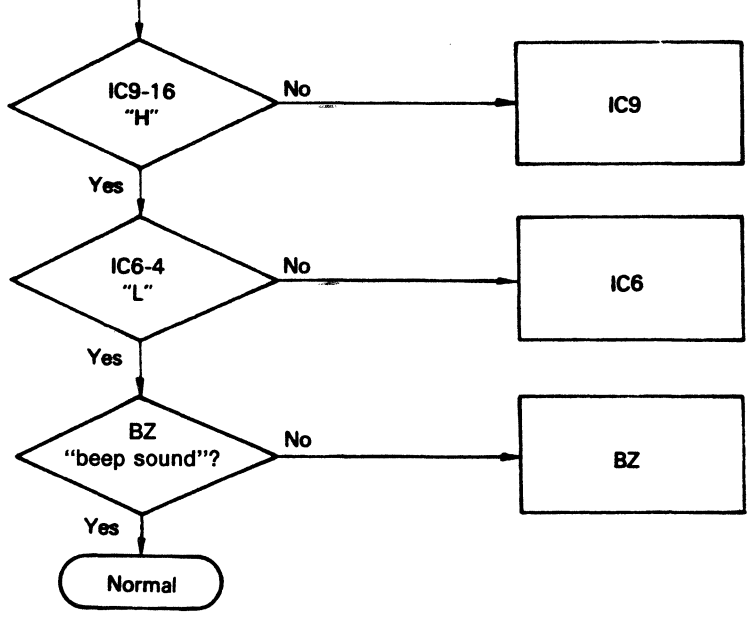




(11) Print mode and print function do not operate.



Buzzer does not sound. (Ensure that SW2-2 is OFF)



6.4 MECHANICAL FAULT CHART

Symptom	Cause	Check Point
1. Paper feed defective	<ul style="list-style-type: none"> ● Control lever at wrong position ● Motor gear engaging defectively 	Paper release lever setting Gear engagement
2. Form does not enter	<ul style="list-style-type: none"> ● Passage between paper pan and platen clogged 	
3. Prints no characters	<ul style="list-style-type: none"> ● ALARM switch is on (form is installed). ● Signals are good. 	ALARM switch (out-of-paper switch) Head or driver
4. Paper does not feed.	<ul style="list-style-type: none"> ● Paper feed motor driver defective 	Motor driver
5. Characters smeared	<ul style="list-style-type: none"> ● Head-platen clearance wrong ● Ink ribbon out of track 	Platen-carriage clearance Check ink ribbon.
6. Operation wrong after carriage return	<ul style="list-style-type: none"> ● Home position incorrectly adjusted 	Adjust home position
7. Carriage movement defective	<ul style="list-style-type: none"> ● Carriage dragging (resistance more than 500 g) ● Clutch spring sticky 	Carriage parts defective Axial play incorrectly adjusted.
8. Noisy and operation defective	<ul style="list-style-type: none"> ● Carriage timing belt loose 	Carriage timing tension Gear teeth missing
9. Ribbon feed defective	<ul style="list-style-type: none"> ● Clutch spring defective ● Ribbon cassette defective 	Clutch spring Ribbon cassette
10. Short life of carriage timing belt/paper feed timing belt	<ul style="list-style-type: none"> ● Carriage timing belt tension ● Paper feed belt tension 	Carriage timing belt Adjust paper feed belt

SECTION 7 CIRCUIT DIAGRAMS

7.1 PURPOSE

This section contains wiring, interconnection and circuit schematic diagrams for all models of the H80, H136 series.

7.2 PRIMARY POWER CIRCUIT & LINE FILTER

The schematic diagrams of the line circuit for 120 V and 230 V models are shown in Figures 7-1 and 7-2.

7.3 LOGIC DIAGRAMS

The logic schematic diagrams for the H80 and H136 are shown in Figures 7-3, 7-4 and 7-5.

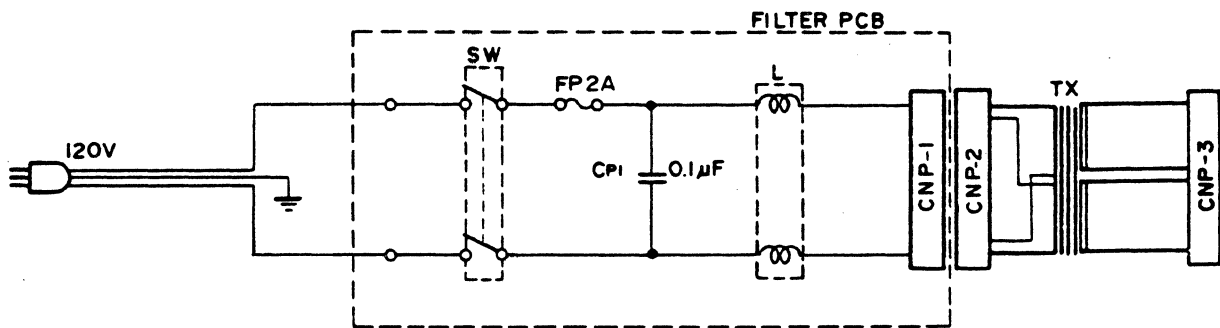
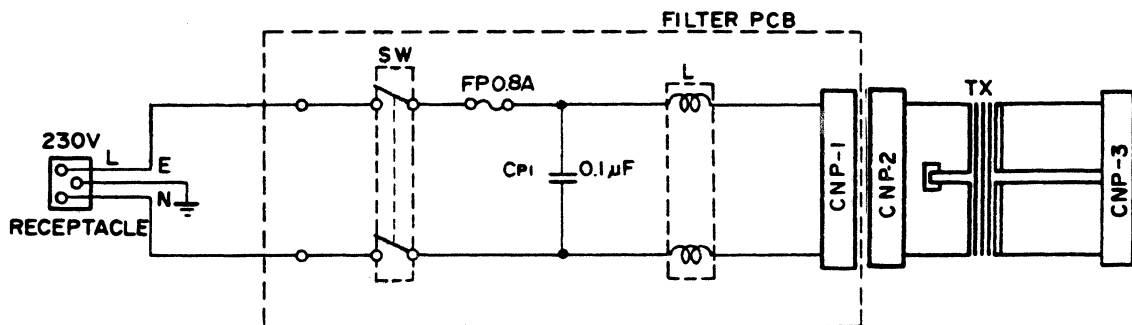


Figure 7-1 120 V Primary Circuit Diagram



Tx: TRANSFORMER

Figure 7-2 230V Primary Circuit Diagram

1800-9A00

7-2

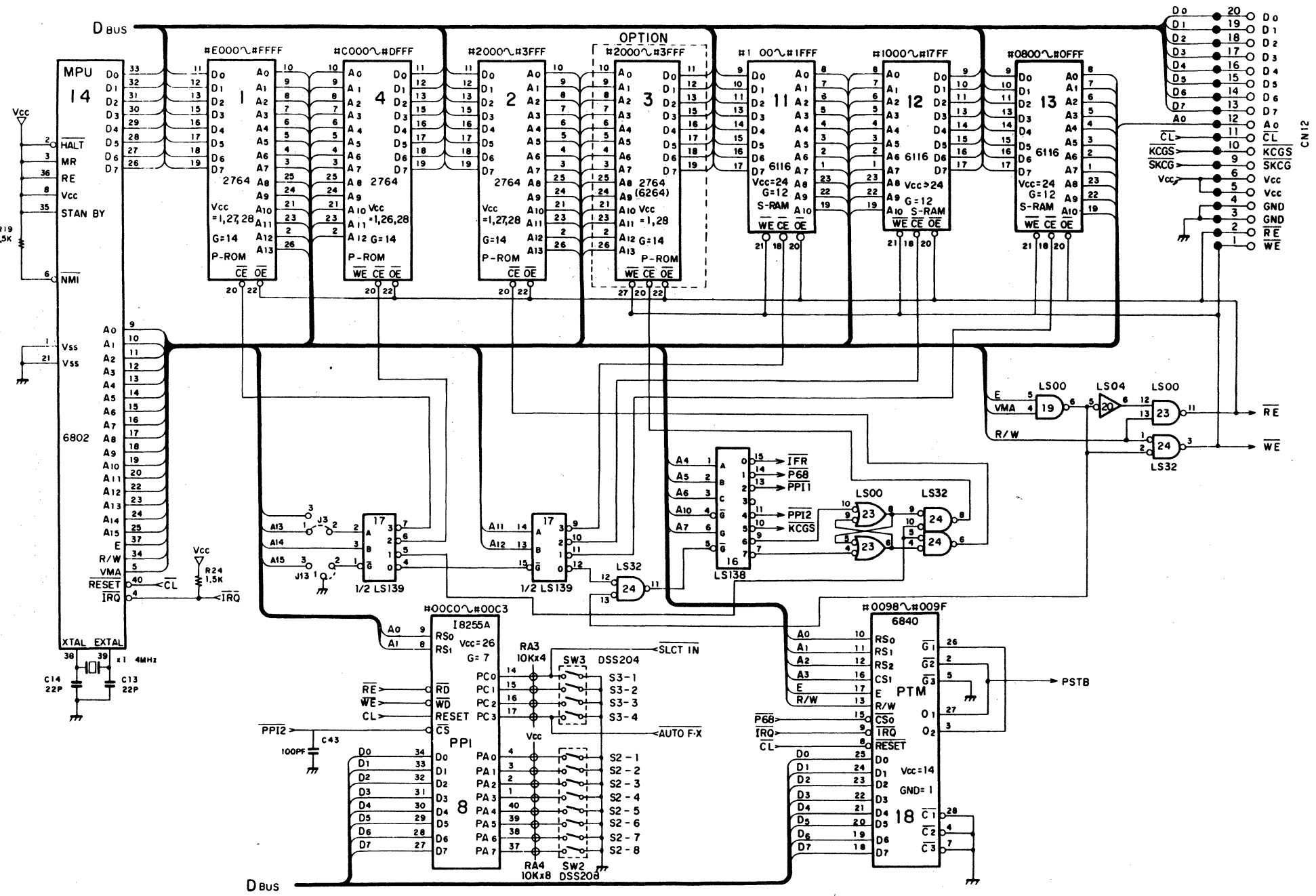


Figure 7-3A H80 Logic Diagram (SH 1)

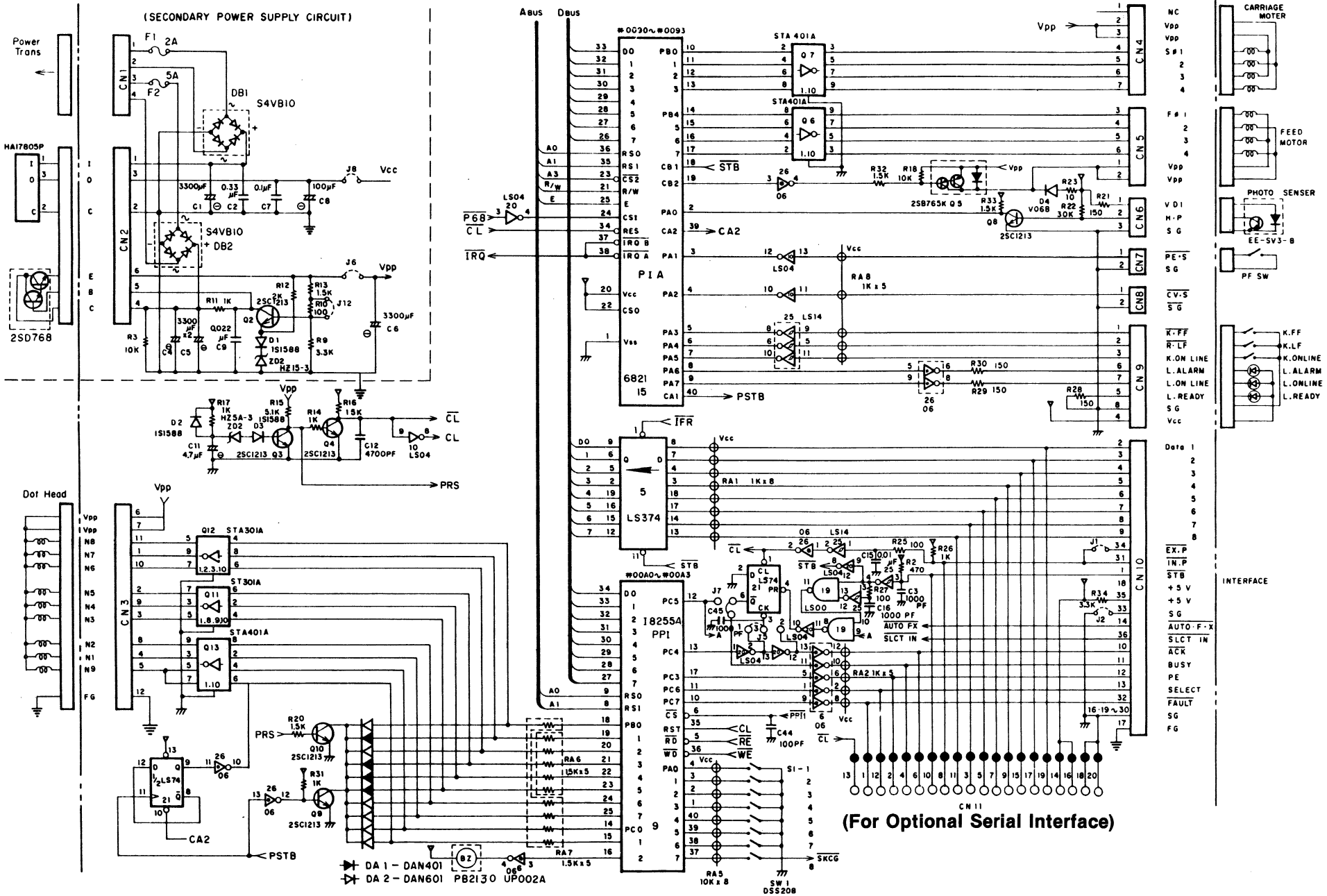


Figure 7-3B H80 Logic Diagram (SH 2)

1800-9A00

7-4

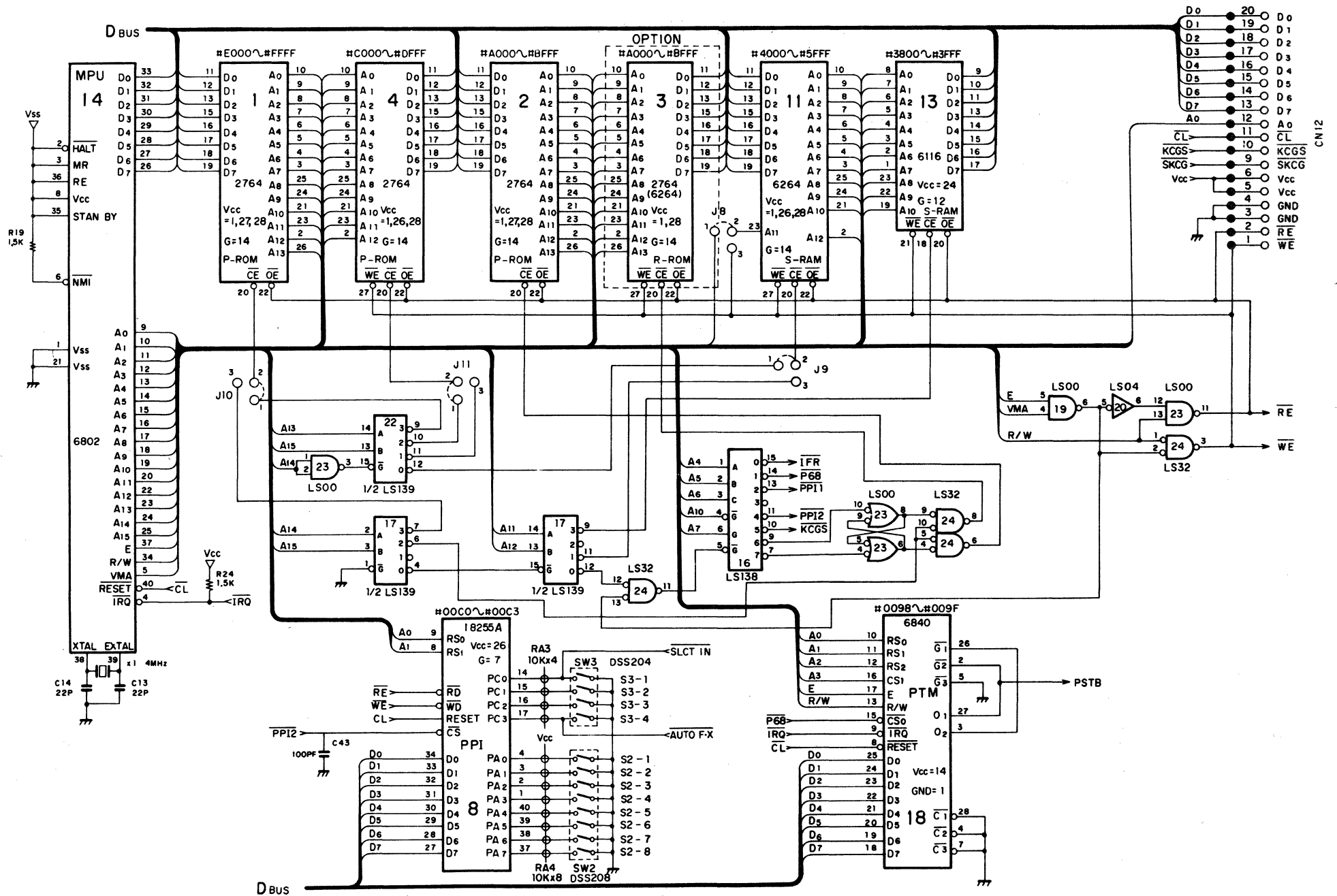


Figure 7-4A H136 Logic Diagram (SH 1)

1800-9B00

7-5

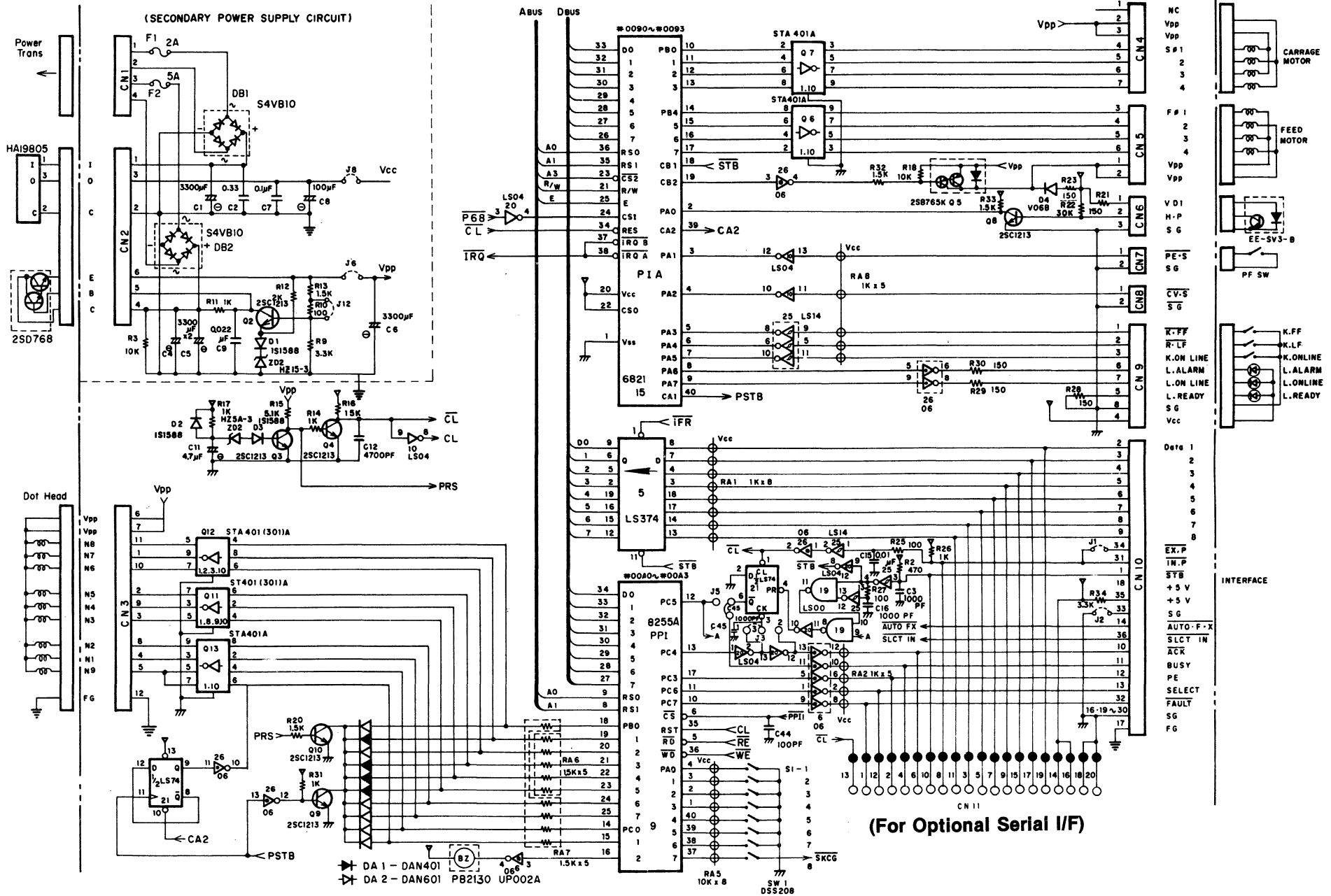


Figure 7-4B H136 Logic Diagram (SH 2)

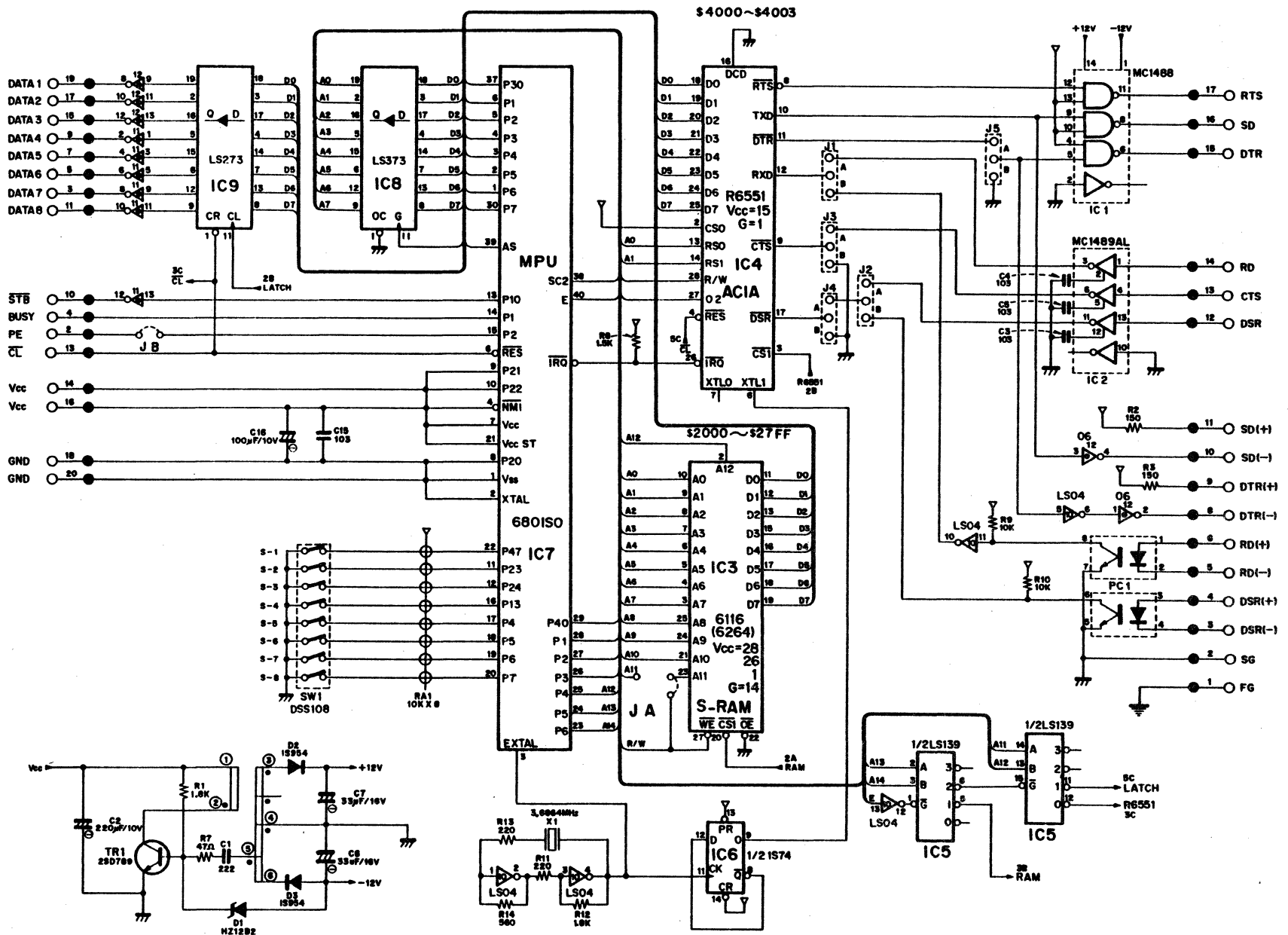
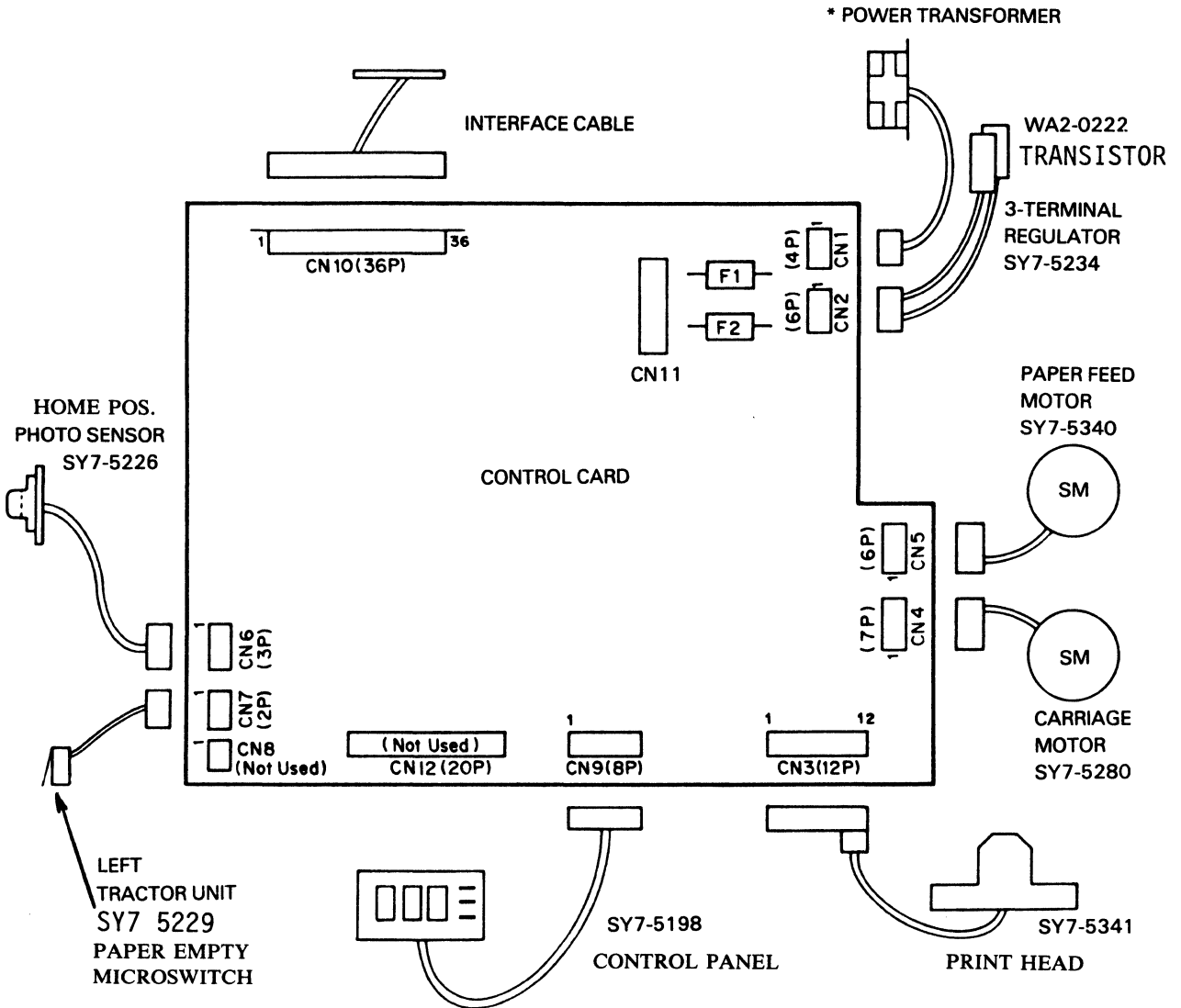


Figure 7-5 Serial Interface Diagram (Option)

7.4 CONNECTOR LAYOUT DIAGRAM



7.5 CONNECTOR PIN ASSIGNMENTS

CN1 (SECONDARY POWER SUPPLY INPUT)

Pin No.	Signal	Description
1	AC for + 5V	
2	AC for + 5V	Input for 2nd side
3	AC for + 24V	
4	AC for + 24V	

CN2 (VOLTAGE REGULATOR)

Pin No.	Signal	Description
1	Input	
2	Common	+5V Regulator
3	Output	
4	Collector	
5	Base	+24V
6	Emitter	

CN3 (DOT DATA)

Pin No.	Signal	Description
1	N2	7th Dot
2	N4	5th Dot
3	N6	3rd Dot
4	N8	1st Dot
5	N9	9th Dot
6	VP	+24V
7	VP	+24V
8	N7	2nd Dot
9	N5	4th Dot
10	N3	6th Dot
11	N1	8th Dot
12	FG	Frame Ground

CN4 (CARRIAGE MOTOR SIGNAL)

Pin No.	Signal	Description
1	NC	No Connection
2	VP	+24V
3	VP	+24V
4	S ϕ 1	Shift Pulse ϕ 1
5	S ϕ 2	Shift Pulse ϕ 2
6	S ϕ 3	Shift Pulse ϕ 3
7	S ϕ 4	Shift Pulse ϕ 4

CN5 (FEED MOTOR SIGNAL)

Pin No.	Signal	Description
1	VP	+24 V
2	VP	+24 V
3	F ϕ 1	Feed Pulse ϕ 1
4	F ϕ 2	Feed Pulse ϕ 2
5	F ϕ 3	Feed Pulse ϕ 3
6	F ϕ 4	Feed Pulse ϕ 4

CN6 (PHOTO SENSOR)

Pin No.	Signal	Description
1	VD1	+5V
2	H.P	Home Position
3	SG	Signal Ground

CN7 (PAPER EMPTY SWITCH)

Pin No.	Signal	Description
1	PE.SW	Paper Empty Switch
2	SG	Signal Ground

CN9 (PANEL SWITCH)

Pin No.	Signal	Description
1	K. FF	Form Feed Key
2	K. LF	Line Feed Key
3	K. ON LINE	ON LINE Key
4	Vcc	+5V
5	L. READY	READY Lamp
6	L. ALARM	ALARM Lamp
7	L. ON LINE	ON LINE Lamp
8	SG	Signal Ground

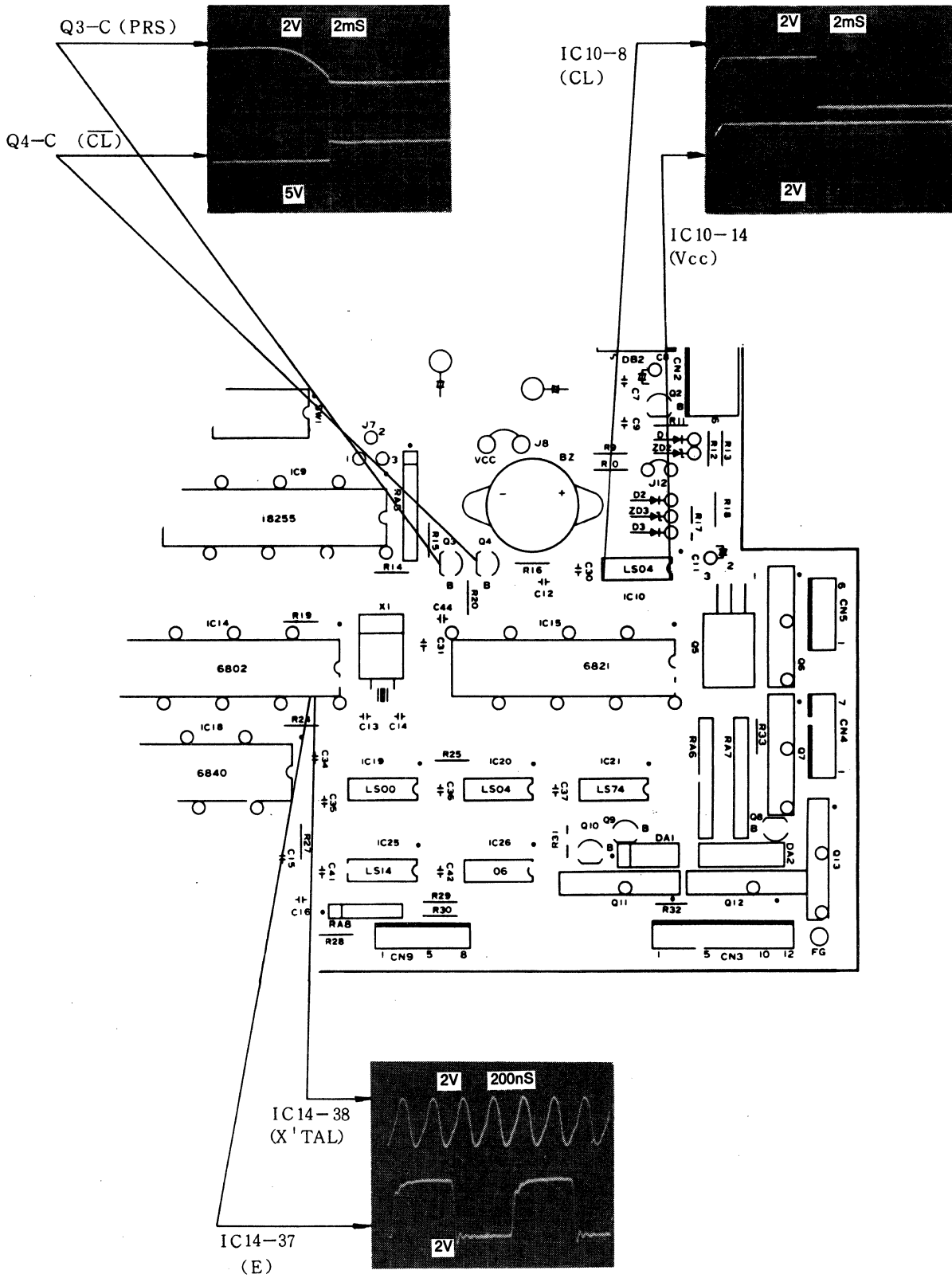
CN10 (INTERFACE SIGNAL)

Pin No.	Signal	Description
1	STB	Strobe
2	DATA 1	DATA 1
3	2	
4	3	
5	4	
6	5	
7	6	
8	7	
9	8	
10	ACKNLG	Acknowledge
11	Busy	
12	PE	Paper Empty
13	Select	Select
14	AUTO LINE FEED	
16	SG	Signal Ground
17	FG	Frame Ground
18	+5V	
19 ~ 30	SG	Signal Ground
31	IN PRIME	
32	FAULT	
33	SG	Signal Ground
34	EXPRIME	
35	+5V	
36	SLCTIN	

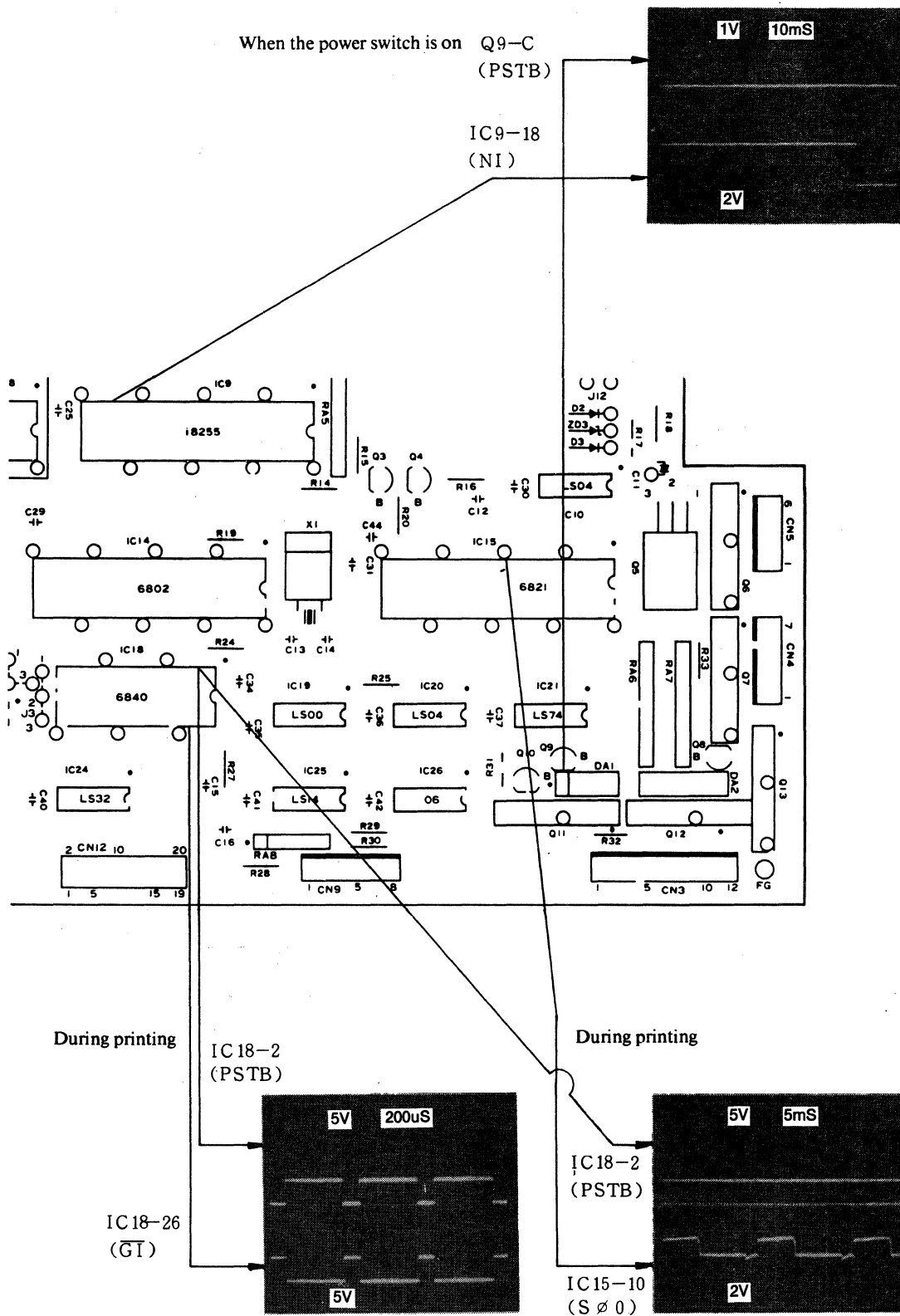
CN11 (RS232C/Current loop interface)

Function	Signal	Pin No.	Signal	Function	
Fault Signal	FAULT	1	2	PE	Paper Empty Signal
		3	4	BUSY	Busy Signal
		5	6	ACKNLG	Acknowledge Signal
Data Signal	DATA 7	7	8	IN. PRIM	Input Prime Signal
		9	10	STB	Data Strobe Signal
		11	12	SELECT	SELECT
RESET Signal	CL	13	14	+5V	
Data Signal	DATA 3	15	16	+5V	
		17	18	SG	Signal Ground
		19	20	SG	Signal Ground

7.6 WAVE FORMS

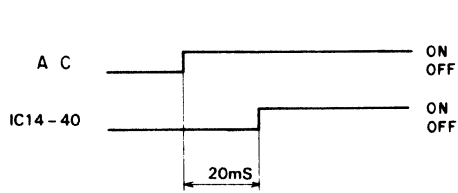


Waveforms (cont.)

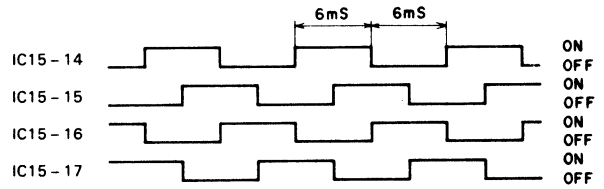


Waveforms (cont.)

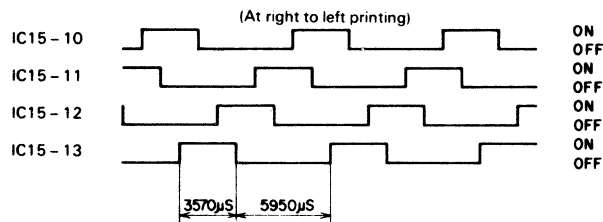
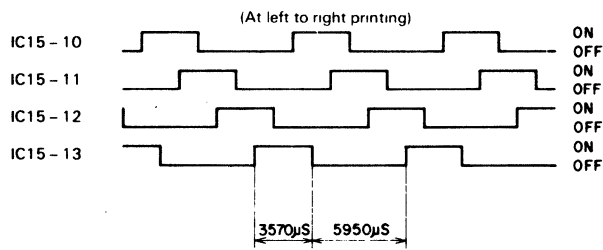
Reset (Power ON)



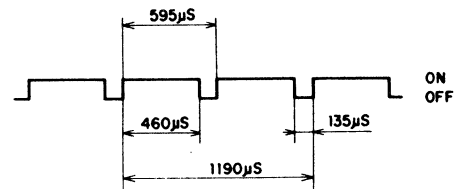
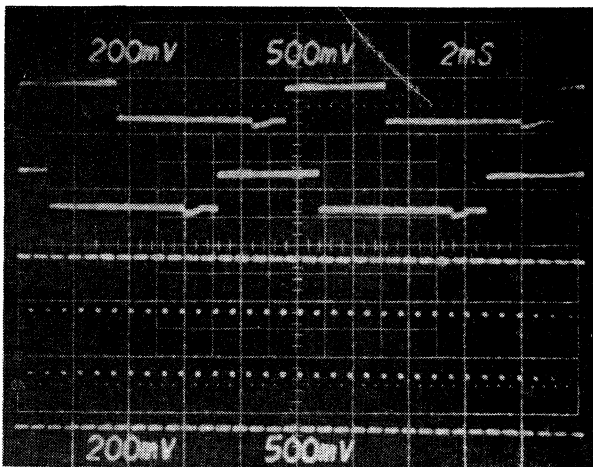
Paper Feed



Carriage motor



Relationship between carriage motor and timer 1 IC18-27



IC15-14

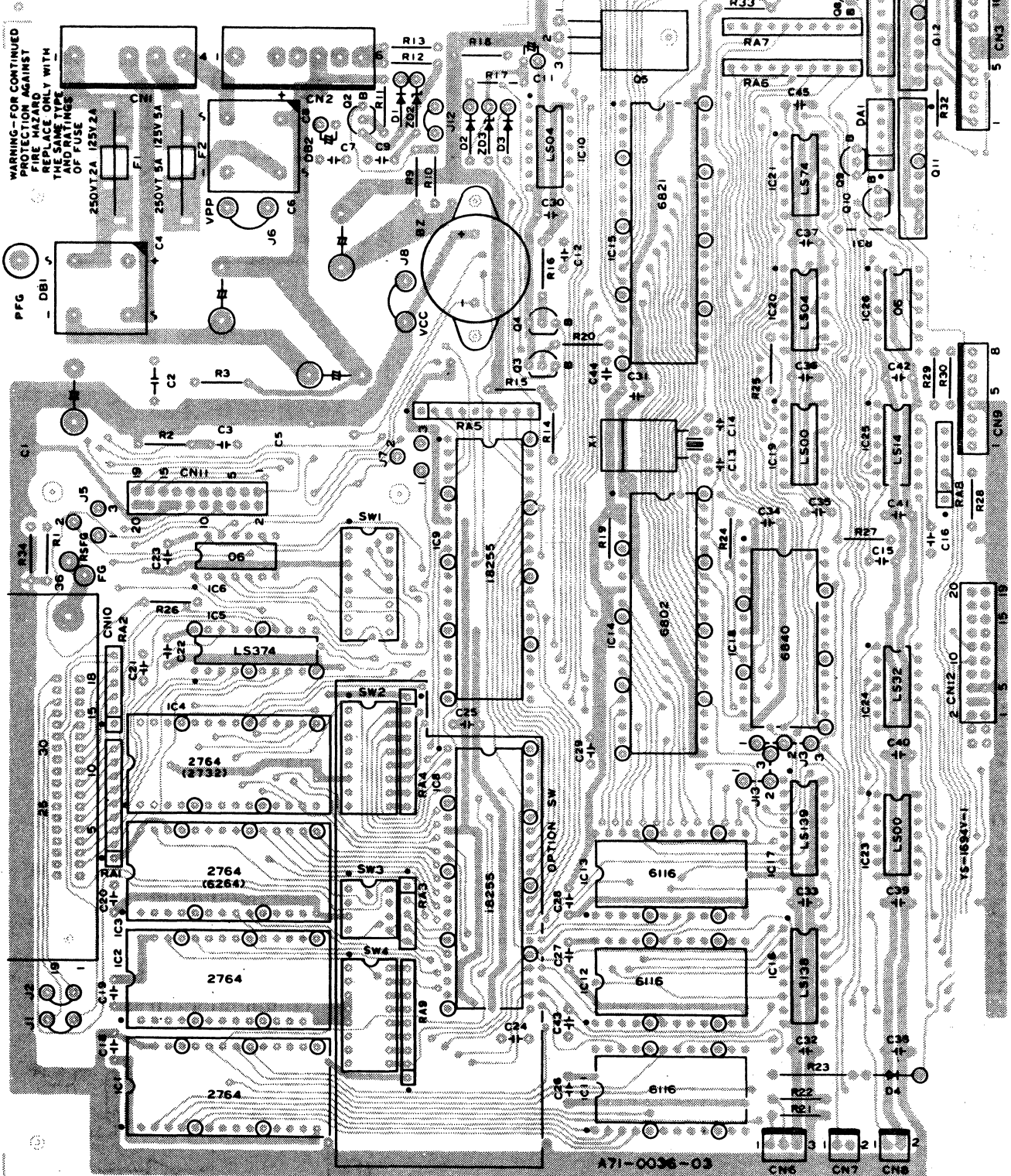
IC15-15

IC18-27

IC18-26

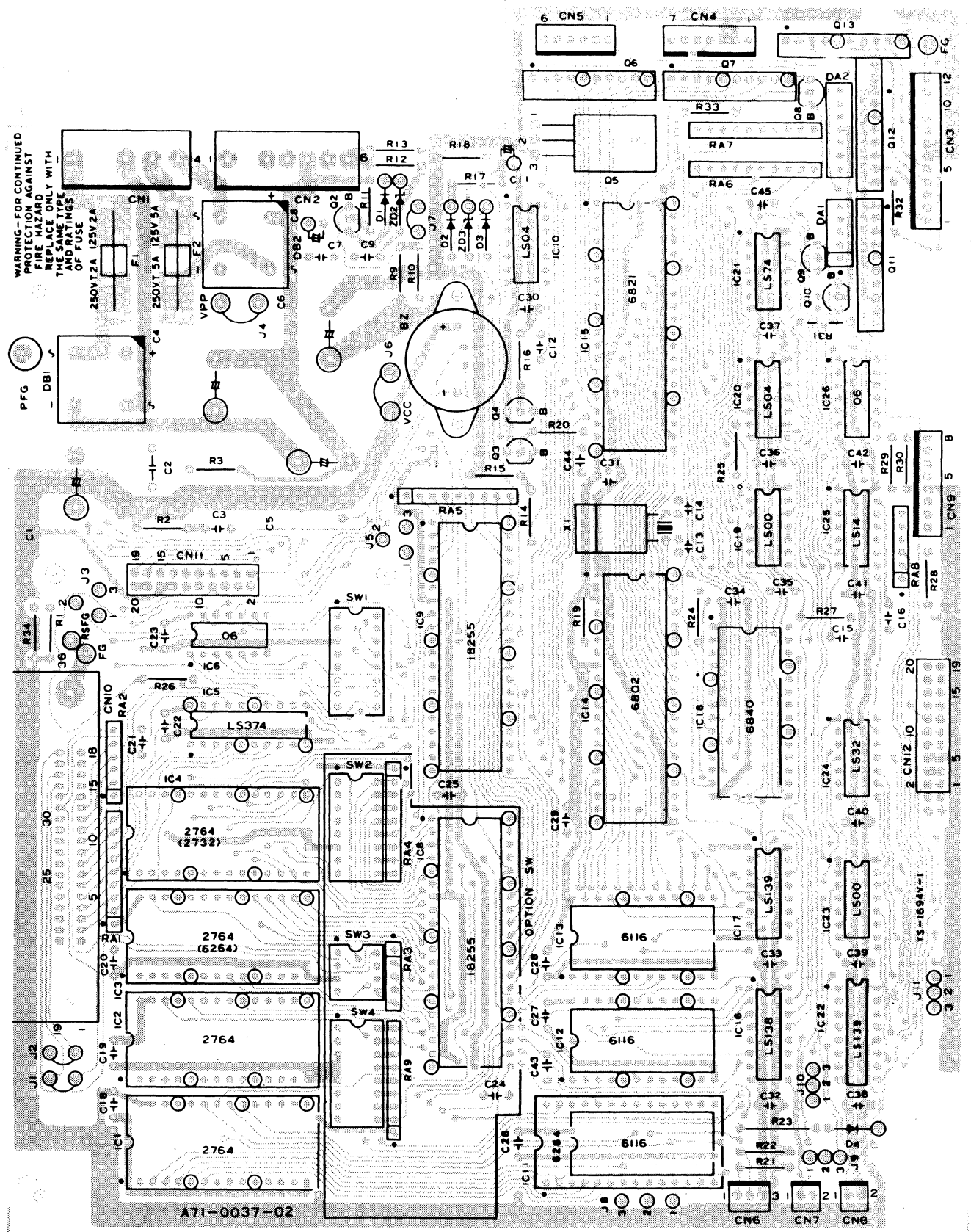
7.7 PCB LAYOUT

A71-0036-03

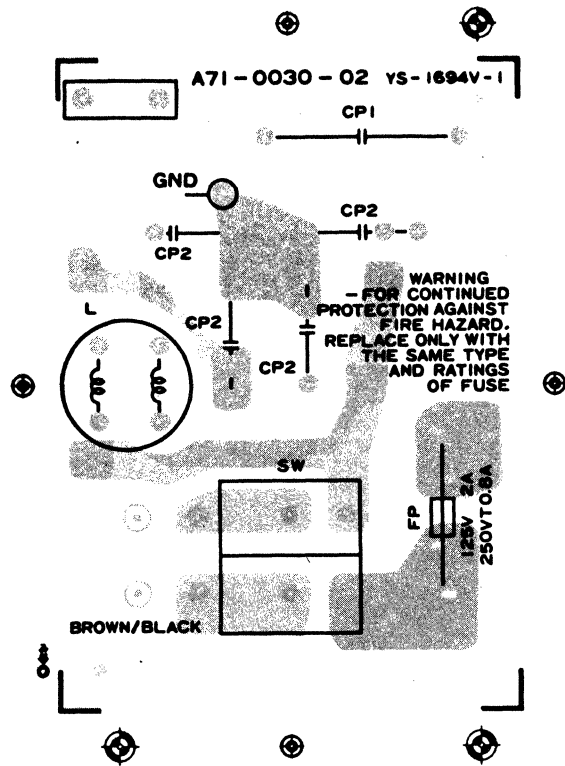


H80 Control Board

WARNING—FOR CONTINUED
 PROTECTION AGAINST
 FIRE HAZARD,
 REPLACE ONLY WITH
 THE SAME TYPE
 AND RATINGS
 OF FUSE

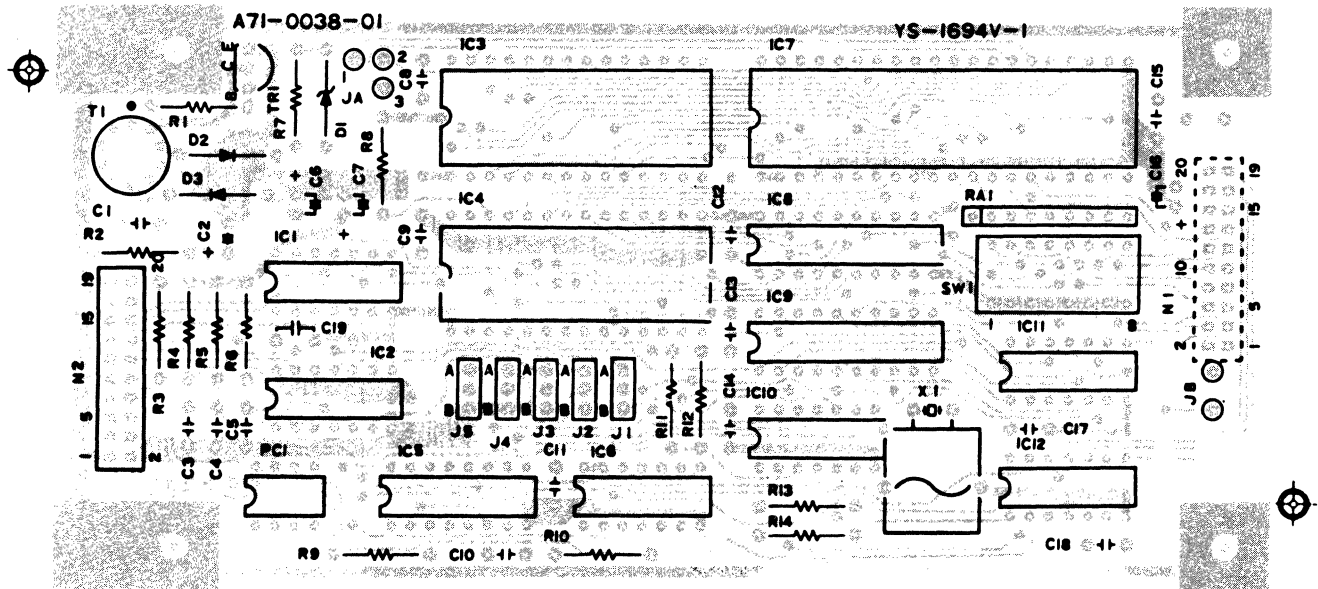


H136 Control Board



AC Power Filter Card

Serial Interface Card Unit



Serial Interface Card

SECTION 8 ILLUSTRATED PARTS

8.1 COVERAGE

This section contains parts information for the H80 and H136 printers. The information for each is separated for convenience. The Model H80 is covered first.

8.2 MINOR HARDWARE

Minor hardware such as screws, nuts, washers, and springs are commonly designated by alphabetical characters (A, B, C etc.).

8.3 ILLUSTRATED PARTS SUMMARY

The illustrated parts are summarized below.

- H80 Enclosure (Cover sets, power supply, etc.) 8-2
- H80 Print Mechanism 8-4
- H80 Control Card Layout 8-7
- H80 Enclosure (Cover sets, power supply, etc.) 8-11
- H136 Print Mechanism 8-13
- H136 Control Card Layout 8-17
- H80, H136 Filter Card Layout 8-21
- Serial Interface Layout 8-23

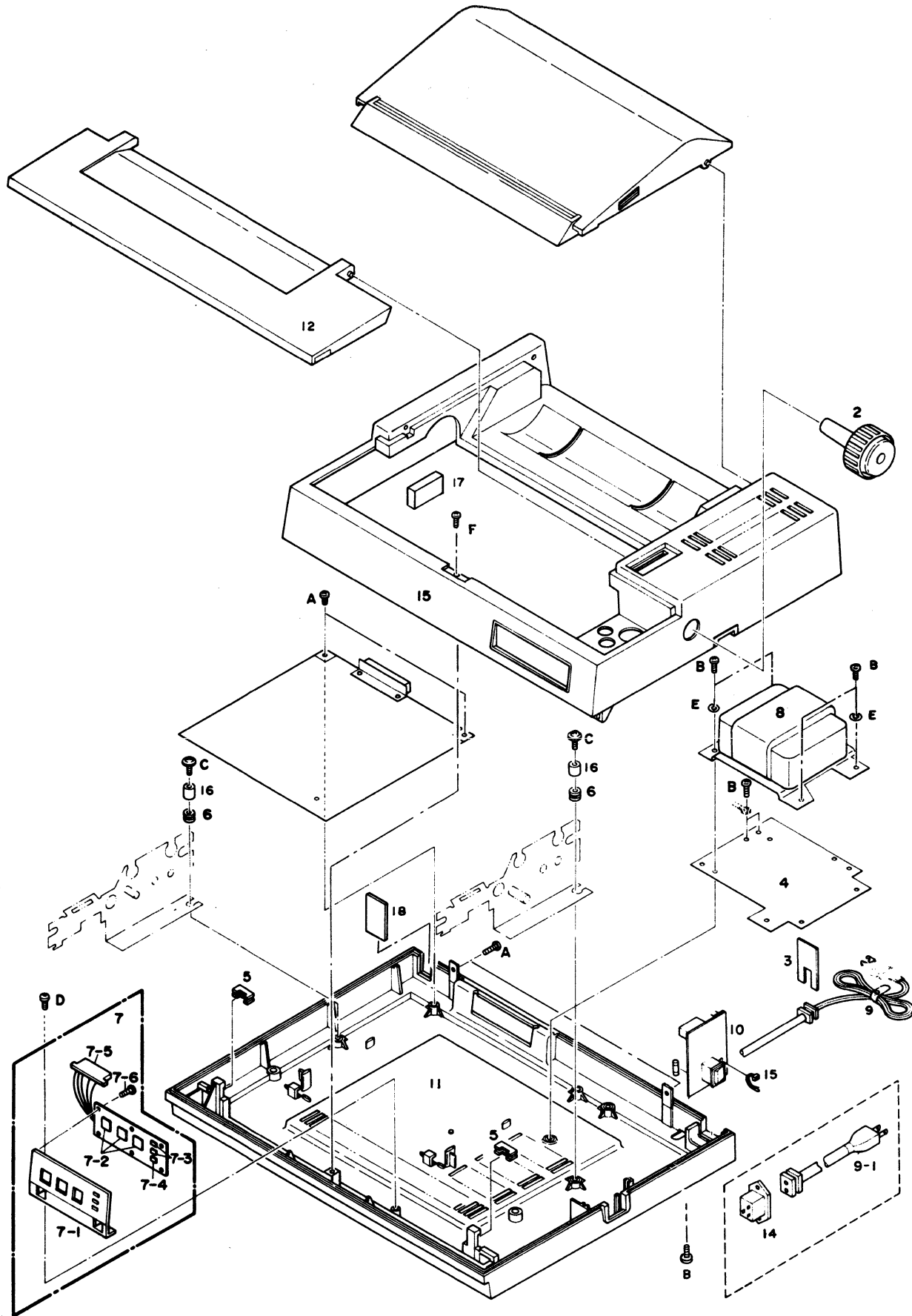


Figure 8-1 H80 Enclosure

Table 8-1 H80 Enclosure Parts

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
1	SY7-5151-000	1	COVER, ROLL PAPER	
2	SY7-5166-000	1	KNOB, PLATEN	
3	SY7-5170-000	1	COVER, POWER SUPPLY	
4	SY7-5175-000	1	MOUNTING PLATE, TRANSFORMER	
5	SY7-5193-000	2	RUBBER, PAD FRONT	
6	SY7-5194-000	2	RUBBER, PAD REAR	
7	SY7-5198-000	1	FLAT KEYBOARD	
7-1	SY7-5262-000	1	MOUNTING PLATE	
7-2	SY7-5263-000	3	MT SWITCH	
7-3	SY7-5266-000	2	LED TLY211 (YELLOW)	
7-4	SY7-5265-000	1	LED TLG211 (GREEN)	
7-5	SY7-5264-000	1	CONNECTOR 8P, FEMALE	
7-6	X16-2605-000	6	SCREW, TAPPING PH2.6x5	
8				
	SY7-5336-000	1	TRANSFORMER 120V 150VA	120V
	SY7-5337-000	1	TRANSFORMER 230V 150VA	230
9				
	SY7-5205-000	1	POWER SUPPLY CORD, 120V	120V
	SY7-5206-000	1	POWER SUPPLY CORD, 230V	230V
10				
	SY7-5208-000	1	FILTER CARD UNIT.....	120V
	SY7-5209-000	1	FILTER CARD UNIT.....	230
11	SY7-5327-000	1	BASE COVER	
12	SY7-5222-000	1	FRONT COVER	
13	SY7-5326-000	1	UPPER COVER	
14	SY7-5239-000	1	RECEPTACLE.....	230
15	X66-6615-000	1	BAND, TIE	
16	XZ1-1400-655	2	SPACER	
17	SY7-5329-000	1	PAD, RUBBER	
18	SY7-5307-000	1	COVER, RS CONNECTOR	
A	XB6-7300-607	4	SCREW, TP, PH3x6	
B	XB6-7400-805	7	SCREW, TP, PH4x8	
C	XB6-7401-205	2	SCREW, TP, PH4x12	
D	SY7-5233-000	2	SCREW, TAPPING, PH3x8	
E	XD1-4100-402	2	WASHER, TOOTHED 4MM	
F	XB6-7300-805	1	SCREW, TP, PH3x8	

Note: Two types of power transformers are available thus, either one may be installed in the unit.

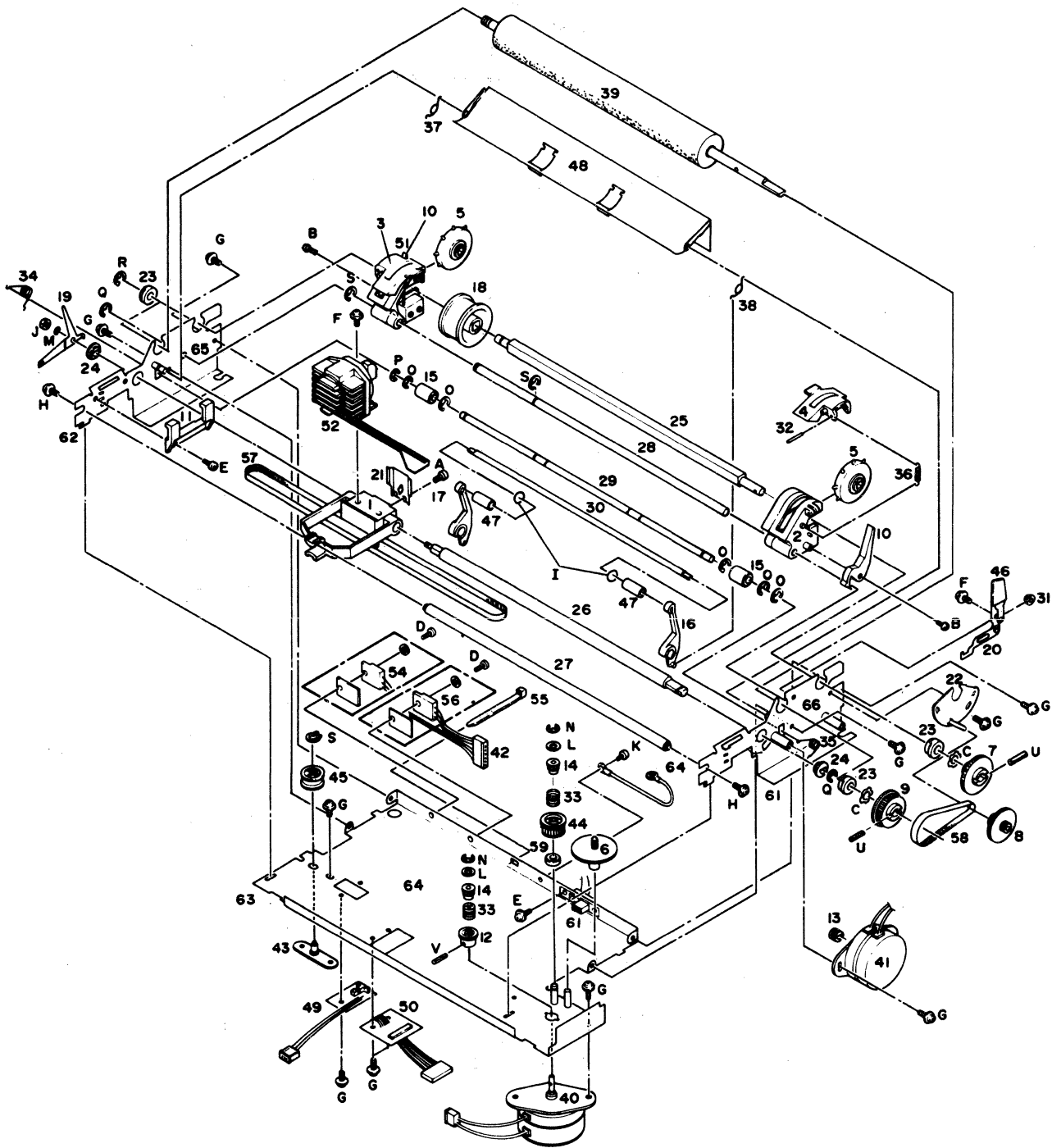


Figure 8-2 H80 Print Mechanism

Table 8-2 H80 Print Mechanism Parts

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
1	SY7-5152-000	1	CARRIAGE	
2	SY7-5153-000	1	TRACTOR (RIGHT)	
3	SY7-5403-000	1	COVER, TRACTOR (LEFT)	
4	SY7-5155-000	1	COVER, TRACTOR (RIGHT)	
5	SY7-5156-000	2	WHEEL, PINFEED	
6	SY7-5157-000	1	GEAR, RIBBON	
7	SY7-5158-000	1	GEAR, TRACTOR	
8	SY7-5378-000	1	GEAR, PULLEY	
9	SY7-5160-000	1	PULLEY, PLATEN	
10	SY7-5161-000	2	LEVER, PAPER LOCK	
11	SY7-5162-000	1	PLATE, RIBBON GUIDE	
12	SY7-5163-000	1	GEAR, CARRIAGE MOTOR	
13	SY7-5339-000	1	GEAR, PAPER FEED MOTOR	
14	SY7-5165-000	2	GEAR, IDLER	
15	SY7-5167-000	2	ROLLER, PINCH	
16	SY7-5168-000	1	LEVER, PAPER HOLDER (RIGHT)	
17	SY7-5169-000	1	LEVER, PAPER HOLDER (LEFT)	
18	SY7-5171-000	1	ROLLER, GUIDE	
19	SY7-5172-000	1	LEVER, ECCENTRIC	
20	SY7-5173-000	1	TOGGLE LINK	
21	SY7-5174-000	1	RIBBON MASK	
22	SY7-5297-000	1	BRACKET, CRECENT	
23	SY7-5177-000	4	BUSHING	
24	SY7-5178-000	2	BUSHING, ECCENTRIC	
25	SY7-5179-000	1	SHFT, TRACTOR	
26	SY7-5180-000	1	SHAFT, GUIDE REAR	
27	SY7-5181-000	1	SHAFT, GUIDE FRONT	
28	SY7-5182-000	1	SHAFT, TRACTOR GUIDE	
29	SY7-5183-000	1	SHAFT, PINCH ROLLER	
30	SY7-5184-000	1	SHAFT, PAPER HOLDER	
31	SY7-5185-000	1	COLLAR	
32	XD3-4200-402	2	PIN, PARALLEL	
33	SY7-5187-000	2	SPRING, CLUTCH	
34	SY7-5188-000	1	SPRING, PINCH ROLLER (LEFT)	
35	SY7-5189-000	1	SPRING, PINCH ROLLER (RIGHT)	
36	SY7-5190-000	2	SPRING, TRACTOR	
37	SY7-5191-000	1	SPRING, PAPER HOLDER (LEFT)	
38	SY7-5192-000	1	SPRING, PAPER HOLDER (RIGHT)	
39	SY7-5195-000	1	PLATEN	
40	SY7-5196-000	1	MOTOR, CARRIAGE	
41	SY7-5340-000	1	MOTOR, PAPER FEED	
42	SY7-5210-000	1	CONNECTOR WITH WIRE 6P, FEMALE	
43	SY7-5287-000	1	SUPPORT, IDLE PULLEY	
44	SY7-5211-000	1	PULLEY, FORE	
45	SY7-5212-000	1	PULLEY, IDLER	

(continued)

Table 8-2 - H80 Print Mechanism Parts (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
46	SY7-5214-000	1	LEVER, PAPER RELEASE	
47	SY7-5216-000	1	ROLLER, PAPER HOLDER	
48	SY7-5220-000	1	PAPER DEFLECTOR	
49	SY7-5226-000	1	PCB UNIT, PHOTO SENSER	
50	SY7-5227-000	1	PCB UNIT, DOT HEAD W/CONNECTOR	
51	SY7-5229-000	1	TRACTOR UNIT (LEFT)	
52	SY7-5341-000	1	DOT HEAD UNIT	
54	SY7-5234-000	1	IC HA17805P (POWER IC)	
55	X66-6615-000	1	BAND, TIE	
56	WA2-0222-000	1	TRANSISTOR 2SD768	
57	SY7-5259-000	1	TIMING BELT, CARRIAGE	
58	SY7-5260-000	1	TIMING BELT, PAPER FEED	
59	XG2-4012-403	1	BALL BEARING	
60	SY7-5199-000	1	SLIDE SWITCH ASS'Y	
61	SY7-5328-000	1	PLATE, RIGHT	
62	SY7-5332-000	1	PLATE, LEFT	
63	SY7-5333-000	1	PLATE, BASE	
64	SY7-5283-000	1	GROUND WIRE	
A	SY7-5231-000	2	SCREW, TAPPING PH2x4	
B	SY7-5232-000	2	SCREW, TAPPING PH3x6	
C	SY7-5261-000	2	WASHER, SPRING	
D	XB1-2260-505	2	SCREW, BH2.6x5	
E	XB1-2300-405	4	SCREW, BH3x4	
F	XB6-7300-807	3	SCREW, TP, PH3x8	
G	XB6-7300-607	14	SCREW, TP, PH3x6	
H	XB6-7400-805	5	SCREW, TP, PH4x8	
I	SY7-5330-000	2	RING, RETAINING	
J	XB7-2100-405	1	NUT M4	
K	XB1-2400-505	1	SCREW, BH4x5	
L	XD1-1104-121	2	WASHER, SHIM 4.1MM	
M	XD1-4200-402	1	WASHER, TOOTHED, OUTER 4.1MM	
N	XD2-1100-322	2	WASHER, RETAINING 3.2MM	
O	XD2-1100-422	5	WASHER, RETAINING 4.2MM	
P	XD2-1100-502	2	WAHSER, RETAINING 5.0MM	
Q	XD2-1100-582	3	WASHER, RETAINING 5.8MM	
R	XD2-1100-642	2	WASHER, RETAINING 6.4MM	
S	XD2-2100-302	1	PIN, GRIP 3.0MM	
T	XD3-1120-122	1	PIN, SPRING 1.2MM	
U	XD3-1200-162	2	PIN, SPRING 2.0MM	

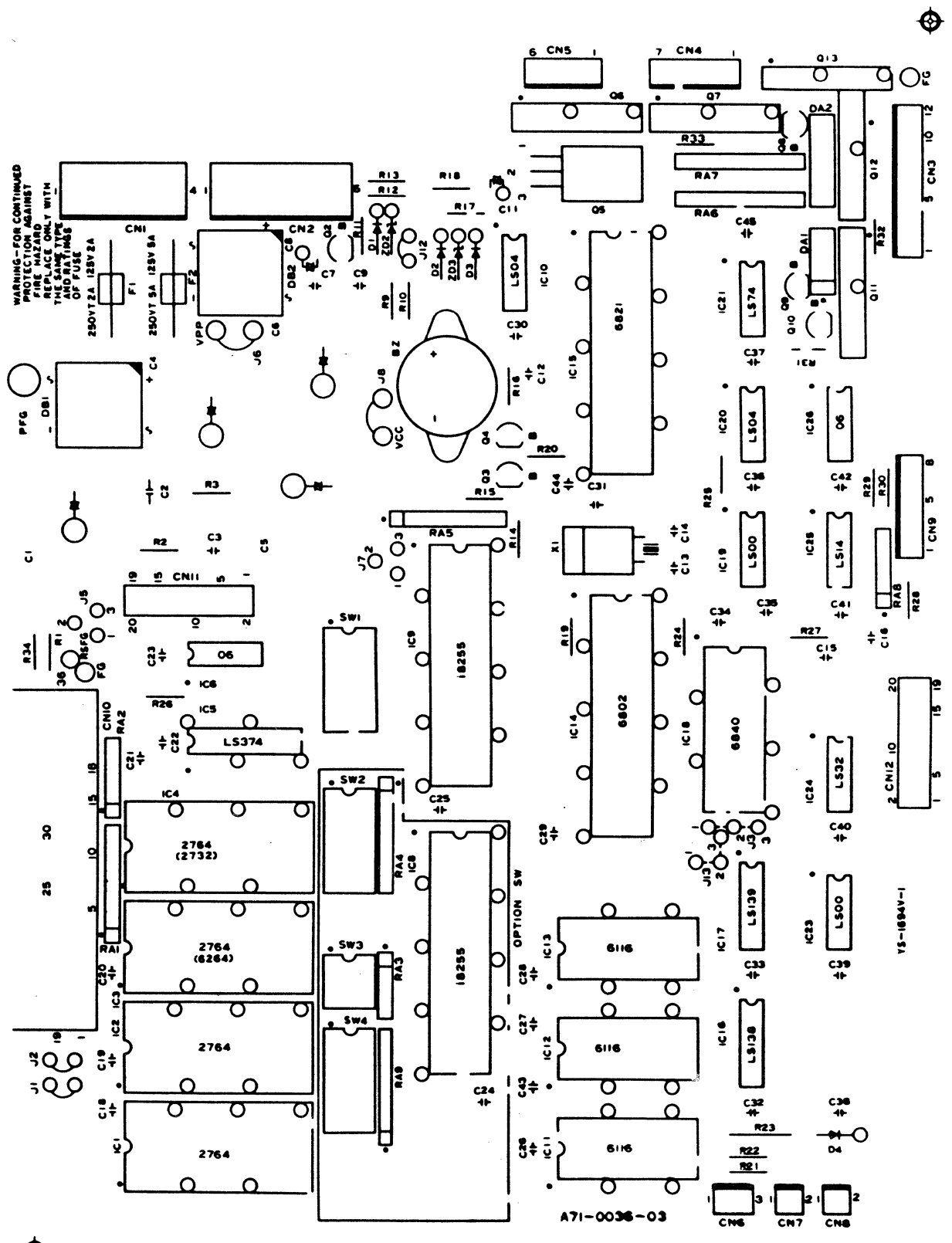


Figure 8-3 H80 Control Card Layout

Table 8-3 H80 Control Card Components

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
ICS, LSIS				
IC1	SY7-5346-000	1	EP-ROM, HN482764G-4 (CONTROL)	
IC2	SY7-5347-000	1	EP-ROM, (NLQ)	
IC4	SY7-5348-000	1	EP-ROM, (CG)	
IC5	WA3-0281-000	1	IC, SN74LS374P, TTL	
IC6/26	X65-7160-000	2	IC, SN7406P, TTL	
IC8/9	WA3-0944-000	2	MOS LSI, I8255A-5, PPI	
IC10/20	X65-7467-000	2	IC, SN74LS04P, TTL	
IC11/12/ 13	WA3-0665-000	3	LSI, HM6116P-3, STATIC RAM	
IC14	SY7-5342-000	1	MOS LSI, HD468A02P, CPU	
IC15	WA3-0299-000	1	MOS LSI, HD468A21P, PIA	
IC16	WA3-0110-000	1	IC, SN74LS138P, TTL	
IC17	WA3-0200-000	1	IC, SN74LS139P, TTL	
IC18	WA3-0302-000	1	MOS LSI, MC68A40P, PTM	
IC19/23	WA3-0132-000	2	IC, SN74LS00P, TTL	
IC21	WA3-0281-000	1	IC, SN74LS74AP, TTL	
IC24	WA3-0135-000	1	IC, SN74LS32P, TTL	
IC25	WA3-0002-000	1	IC, SN74LS14P, TTL	
TRANSISTORS				
Q2/3/4	X65-6174-000	3	TRANSISTOR, 2SC1213, NPN	
Q5	SY7-5315-000	1	TRANSISTOR, 2SB765K, PNP	
Q6/7	SY7-5257-000	2	TRANSISTOR ARRAY, STA401A	
Q8/9/10	X65-6174-000	3	TRANSISTOR, 2SC1213, NPN	
Q11/12	SY7-5316-000	2	TRANSISTOR ARRAY, STA301A	
Q13	SY7-5257-000	1	TRANSISTOR ARRAY, STA401A	
DIODES				
D1/2/3/4	X65-5032-000	4	DIODE, 1S1588, SILICON	
ZD2	SY7-5317-000	1	DIODE, ZENER, HZ15-3 (15V)	
ZD3	SY7-5318-000	1	DIODE, ZENER, HZ5A-3 (5V)	
DA1	WA1-0023-000	1	DIODE ARRAY, DAN401	
DA2	WA1-0035-000	1	DIODE ARRAY, DAN601	
DB1/2	WA1-0059-000	2	DIODE STACK, S4VB10	
CONNECTORS				
CN1	SY7-5240-000	1	CONNECTOR, 4P, MALE	
CN2	SY7-5319-000	1	CONNECTOR, 6P, MALE	
CN3	WS3-0169-000	1	CONNECTOR, 12P, MALE	
CN4	SY7-5243-000	1	CONNECTOR, 7P, MALE	
CN5	WS3-0206-000	1	CONNECTOR, 6P, MALE	

(continued)

Table 8-3 H80 Control Card Components (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
CONNECTORS				
CN6	WS3-0274-000	1	CONNECTOR, 3P, MALE	
CN7	WS3-0209-000	1	CONNECTOR, 2P, MALE	
CN9	SY7-5244-000	1	CONNECTOR, 8P, MALE	
CN10	SY7-5238-000	1	CONNECTOR, 36P, FEMALE	
CN11	SY7-5371-000	1	CONNECTOR, 20P, FEMALE	
RSFG	SY7-5343-000	1	CONNECTOR, 2P, MALE	
IC SOCKETS				
S-IC1/2/ 3/4	WA9-0058-000	4	SOCKET, IC (28PINS)	
IC14	WA9-0059-000	1	SOCKET, LSI (40PINS)	
RESISTORS				
RA1	VR9-0838-000	1	RESISTOR ARRAY, 1K ohm x 8, 1/8W	
RA2/8	VR9-0911-000	2	RESISTOR ARRAY, 1K ohm x 5, 1/8W	
RA3	VR9-0200-000	1	RESISTOR ARRAY, 10K ohm x 4, 1/8W	
RA4/5	VR9-0948-000	2	RESISTOR ARRAY, 10K ohm x 8, 1/4W	
RA6/7	SY7-5310-000	2	RESISTOR ARRAY, 1.5K ohm x 5, 1/4W	
R1/9/34	VR1-8143-332	3	RESISTOR COMPOSITION, 3.3K ohm, 1/4W	
R2	VR1-8143-471	1	RESISTOR COMPOSITION, 470 ohm, 1/4W	
R3/18	VR1-8143-103	2	RESISTOR COMPOSITION, 10K ohm, 1/4W	
R10/25/ 27	VR1-8143-101	3	RESISTOR COMPOSITION, 100 ohm, 1/4W	
R11/14/ 17/26/ 31	VR1-8143-102	5	RESISTOR COMPOSITION, 1K ohm, 1/4W	
R12	VR1-8143-202	1	RESISTOR COMPOSITION, 2K ohm, 1/4W	
R13/16/ 19/20/ 24/32/ 33	VR1-8143-152	7	RESISTOR COMPOSITION, 1.5K ohm, 1/4W	
R15	VR1-8143-512	1	RESISTOR COMPOSITION, 5.1K ohm, 1/4W	
R21/28/ 29/30	VR1-8143-151	4	RESISTOR COMPOSITION, 150 ohm, 1/4W	
R22	VR1-8143-303	1	RESISTOR COMPOSITION, 30K ohm, 1/4W	
R23	VR1-8143-151	1	RESISTOR COMPOSITION, 150 ohm, 1/4W	

(continued)

Table 8-3 H80 Control Card Components (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
CAPACITORS				
C1	SY7-5253-000	1	CAPACITOR, ELECTROLYTIC, 16V, 3300uF	
C2	VC3-2501-334	1	CAPACITOR, FILM, 50V, 0.33uF	
C3	VC4-2502-102	1	CAPACITOR, CERAMIC, 50V, 1000pF	
C4	SY7-5252-000	2	CAPACITOR, ELECTROLYTIC, 50V, 3300uF	
C6	SY7-5254-000	1	CAPACITOR, ELECTROLYTIC, 35V, 3300uF	
C7	VC3-2501-104	1	CAPACITOR, FILM, 50V 0.1uF	
C8	SY7-5308-000	1	CAPACITOR, ELECTROLYTIC, 10V, 100uF	
C9	VC3-2501-223	1	CAPACITOR, FILM, 50V, 0.022uF	
C11	SY7-5309-000	1	CAPACITOR, ELECTROLYTIC, 25V, 4.7uF	
C12	VC4-2502-472	1	CAPACITOR, CERAMIC, 50V, 4700pF	
C13/14	VC4-2502-220	2	CAPACITOR, CERAMIC, 50V, 22pF ± 10%	
C15	VC4-4504-103	1	CAPACITOR, CERAMIC, 50V, 10000pF	
C16	VC4-2502-102	1	CAPACITOR, CERAMIC, 50V, 1000pF	
C18 ~42	VC4-4504-103	25	CAPACITOR, CERAMIC, 50V, 10000pF	
C43/44	VC4-2502-471	2	CAPACITOR, CERAMIC, 50V, 470pF	
MISCELLANEOUS				
F1	WD1-0081-000	1	FUSE, 2A (5MT-2A), SLOWBLOW	120V
	WD1-0061-000	1	FUSE, 2A (19195-2A), SLOWBLOW	230V
F2	WD1-0074-00	1	FUSE, 5A (5MT-5A), SLOWBLOW	120V
	WD1-0047-000	1	FUSE, 5A (19195-5A), SLOWBLOW	230V
FH	X62-6982-000	4	HOLDER, FUSE S-N5053	
SW1	SY7-5230-000	1	DIP SWITCH (8PINS)	
X1	SY7-5344-000	1	CRYSTAL OSCILLATOR, 4.5 MHz (140 CPS)	
	WK2-0044-000	1	CRYSTAL OSCILLATOR, 6.1 MHz (160 CPS)	
BZ	SY7-5345-000	1	BUZZER PB2130 up002A	

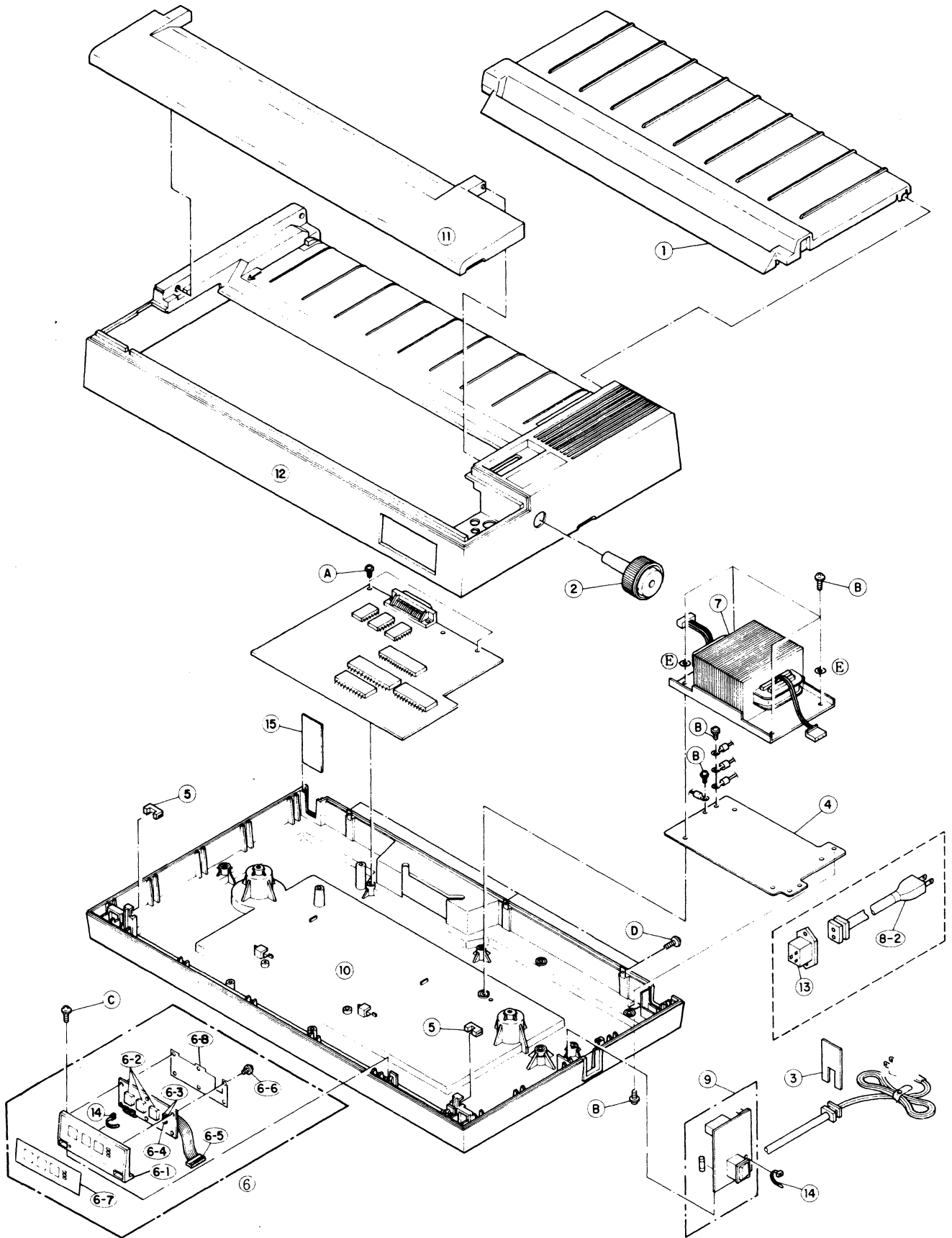


Figure 8-4 H136 Enclosure

Table 8-4 H136 Enclosure Parts

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
1	SY7-5298-000	1	COVER, PAPER	
2	SY7-5166-000	1	KNOB, PLATEN	
3	SY7-5170-000	1	COVER, POWER SUPPLY	
4	SY7-5299-000	1	MOUNTING PLATE, TRANSFORMER	
5	SY7-5194-000	2	PAD, RUBBER, FRONT	
6	SY7-5198-000	1	FLAT KEYBOARD ASS'Y	
6-1	SY7-5262-000	1	MOUNTING PLATE	
6-2	SY7-5263-000	3	SWITCH, MT	
6-3	SY7-5266-000	2	LED, TLY211 (YELLOW)	
6-4	SY7-5265-000	1	LED, TLG211 (GREEN)	
6-5	SY7-5264-000	1	CONNECTOR, 8P, FEMALE	
6-6	X16-2605-070	6	SCREW, TAPPING PH2.6x5	
6-7	SY7-3647-000	1	SHEET CHARACTER	
6-8	SY7-3649-000	1	COVER, SHEET	
7				
	SY7-5336-000	1	TRANSFORMER, 150VA.....	120V
	SY7-5337-000	1	TRANSFORMER, 150VA.....	230V
8-2	SY7-5205-000	1	CORD, POWER SUPPLY.....	120V
	SY7-5206-000	1	CORD, POWER SUPPLY.....	230V
9				
	SY7-5208-000	1	FILTER CARD UNIT.....	120V
	SY7-5209-000	1	FILTER CARD UNIT.....	230V
10	SY7-5352-000	1	COVER, BASE W/DAMPER	
11	SY7-5305-000	1	COVER, FRONT	
12	SY7-5353-000	1	COVER, UPPER W/DAMPER	
13	SY7-5239-000	1	RECEPTACLE.....	230V
14	X66-6615-000	1	BAND, TIE	
15	SY7-5307-000	1	COVER, RS CONNECTOR	
A	X86-7300-607	2	SCREW, TP, PH3x6	
B	X86-7400-805	7	SCREW, TP, PH4x8	
C	SY7-5233-000	2	SCREW, TAPPING, PH3x8	
D	X86-7300-807	3	SCREW, TP, PH3x8	
E	XD1-4100-402	2	WASHER, TOOTHED 4M	

Note: Two types of power transformers are available thus, either one may be installed in the unit.

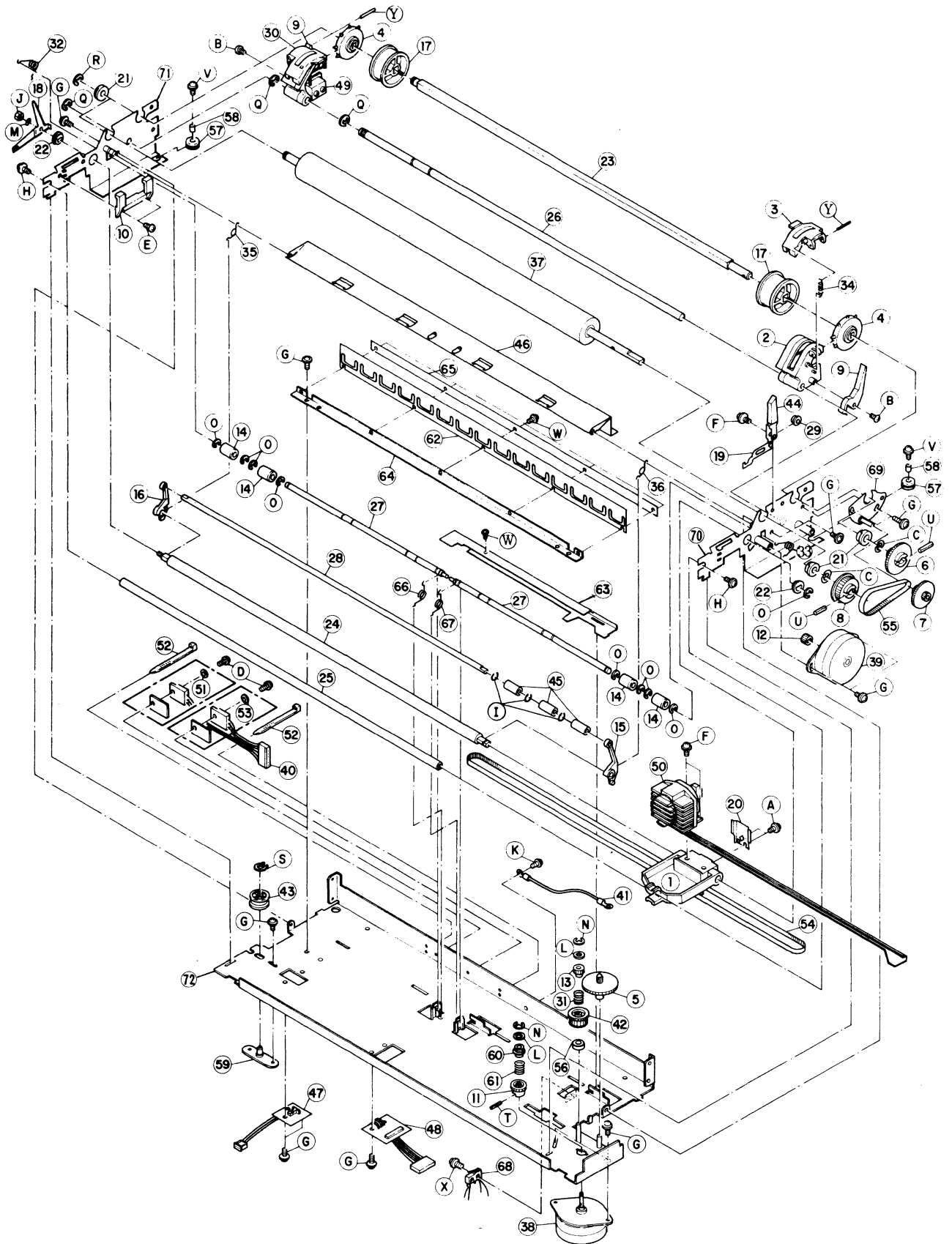


Figure 8-5 H136 Print Mechanism

Table 8-5 H136 Print Mechanism Parts

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
1	SY7-5152-000	1	CARRIAGE	
2	SY7-5153-000	1	TRACTOR, RIGHT	
3	SY7-5155-000	1	COVER, TRACTOR RIGHT	
4	SY7-5156-000	2	WHEEL, PINFEED	
5	SY7-5157-000	1	GEAR, RIBBON	
6	SY7-5158-000	1	GEAR, TRACTOR	
7	SY7-5378-000	1	GEAR, PULLEY	
8	SY7-5160-000	1	PULLEY, PLATEN	
9	SY7-5161-000	2	LEVER, PAPER LOCK	
10	SY7-5162-000	1	PLATE, RIBBON GUIDE	
11	SY7-5163-000	1	GEAR, CARRIAGE MOTOR	
12	SY7-5339-000	1	GEAR, PAPER FEED MOTOR	
13	SY7-5165-000	1	GEAR, IDLER	
14	SY7-5167-000	4	ROLLER, PINCH	
15	SY7-5168-000	1	LEVER, PAPER HOLDER RIGHT	
16	SY7-5169-000	1	LEVER, PAPER HOLDER LEFT	
17	SY7-5171-000	2	ROLLER, GUIDE	
18	SY7-5172-000	1	LEVER, ECCENTRIC	
19	SY7-5173-000	1	TOGGLE LINK	
20	SY7-5174-000	1	RIBBON MASK	
21	SY7-5177-000	4	BUSHING	
22	SY7-5178-000	2	BUSHING, ECCENTRIC	
23	SY7-5271-000	1	SHAFT, TRACTOR	
24	SY7-5272-000	1	SHAFT, REAR	
25	SY7-5273-000	1	SHAFT, FRONT	
26	SY7-5274-000	1	SHAFT, TRACTOR GUIDE	
27	SY7-5275-000	2	SHAFT, PINCH ROLLER	
28	SY7-5276-000	1	SHAFT, PAPER HOLDER	
29	SY7-5185-000	1	COLLAR	
30	SY7-5186-000	2	PIN, PARALLEL	
31	SY7-5187-000	1	SPING, CLUTCH	
32	SY7-5277-000	1	SPRING, PINCH ROLLER (LEFT)	
33	SY7-5278-000	1	SPRING, PINCH ROLLER (RIGHT)	
34	SY7-5190-000	2	SPRING, TRACTOR	
35	SY7-5191-000	1	SPRING, PAPER HOLDER, LEFT	
36	SY7-5192-000	1	SPRING, PAPER HOLDER, RIGHT	
37	SY7-5279-000	1	PLATEN	
38	SY7-5280-000	1	MOTOR, CARRIAGE, W/CONNECTOR	
39	SY7-5340-000	1	MOTOR, PAPER FEED, W/CONNECTOR	
40	SY7-5282-000	1	CONNECTOR W/WIRE 6P. FEMALE	
41	SY7-5283-000	1	GROUND CABLE	
42	SY7-5211-000	1	PULLEY, FORE	
43	SY7-5212-000	1	PULLEY, IDLER	
44	SY7-5214-000	1	LEVER, PAPER RELEASE	
45	SY7-5216-000	3	COLLAR, PAPER HOLDER	
46	SY7-5284-000	1	DEFLECTOR, PAPER	
47	SY7-5226-000	1	PCB UNIT, PHTO SENSOR W/CONNECTOR	
48	SY7-5227-000	1	PCB UNIT, DOT HEAD W/CONNECTOR	
49	SY7-5229-000	1	TRACTOR UNIT, W/MICRO SW LEFT	
50	SY7-5354-000	1	DOT HEAD UNIT	
51	SY7-5234-000	1	IC, HA17805P (POWER IC)	
52	X66-6615-000	1	BAND, TIE	
52	WA2-0222-000	1	TRANSISTOR, 250768	
54	SY7-5286-000	1	TIMING BELT, CARRIAGE	
55	SY7-5260-000	1	TIMING BELT, PAPER FEED	
56	XG2-4012-403	1	BALL BEARING, CRZ-44	

Table 8-5 H136 Print Mechanism Parts (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
57	SY7-5193-000	2	PAO, RUBBER, REAR	
58	XZ1-1400-655	2	SPACER	
59	SY7-5287-000	1	SUPPORT, IDLE PULLEY	
60	SY7-5288-000	1	GEAR, CLUTCH	
61	SY7-5289-000	1	SPRING, CLUTCH GEAR	
62	SY7-5290-000	1	HOLDER, PAPER	
63	SY7-5291-000	1	SUPPORT, PINCH ROLLER	
64	SY7-5292-000	1	SUPPORT, PAPER HOLDER	
65	SY7-5293-000	1	PLATE, PAPER HOLDER	
66	SY7-5294-000	1	SPRING, PINCH ROLLER, LEFT	
67	SY7-5295-000	1	SPRING, PINCH ROLLER, RIGHT	
68	SY7-5296-000	1	MICRO SW UNIT, PE	
69	SY7-5297-000	1	BRACKET, CRESCENT	
70	SY7-5328-000	1	PLATE, RIGHT	
71	SY7-5332-000	1	PLATE, LEFT	
72	SY7-5334-000	1	PLATE, BASE	
A	SY7-5231-000	2	SCREW, TAPPING, PH2x4	
B	SY7-5232-000	2	SCREW, TAPPING, PH3x6	
C	SY7-5261-000	2	WASHER, SPRING	
D	XB1-2260-505	2	SCREW, BH2.6x5	
E	XB1-2300-405	2	SCREW, BH3x4	
F	XB6-7300-807	3	SCREW, TP, PH3x8	
G	XB6-7300-607	15	SCREW, TP, PH3x6	
H	XB6-7300-805	2	SCREW, TP, PH4x8	
I	SY7-5330-000	3	RING, RETAINING	
J	XB7-2100-405	1	NUT M4	
K	XB1-2400-505	1	SCREW, BH4x5	
L	XD1-1104-121	2	WASHER, SHIM 4.1MM	
M	XD1-4200-402	1	WASHER, TOOTHED, OUTER 4.1MM	
N	XD2-1100-322	2	WASHER, RETAINING 3.2MM	
O	XD2-1100-422	1	WASHER, RETAINING 4.2MM	
P	XD2-1100-502	10	WASHER, RETAINING 5MM	
Q	XD2-1100-582	3	WASHER, RETAINING 5.8MM	
R	XD2-1100-642	2	WASHER, RETAINING 6.4MM	
S	XD2-2100-302	1	WASHER, RETAINING GRIP 3MM	
T	XD3-1120-122	1	PIN, SPRING 1.2MM	
U	XD3-1200-162	2	PIN, SPRING 1.6MM	
V	XB6-7401-205	2	SCREW, TP, PH4x12	
W	XB6-7200-405	6	SCREW, TP, PH2x4	
X	XA3-1200-807	2	SCREW, TAPPING, PH2x8	
Y	XD3-4200-402	2	PIN, PARALLEL	

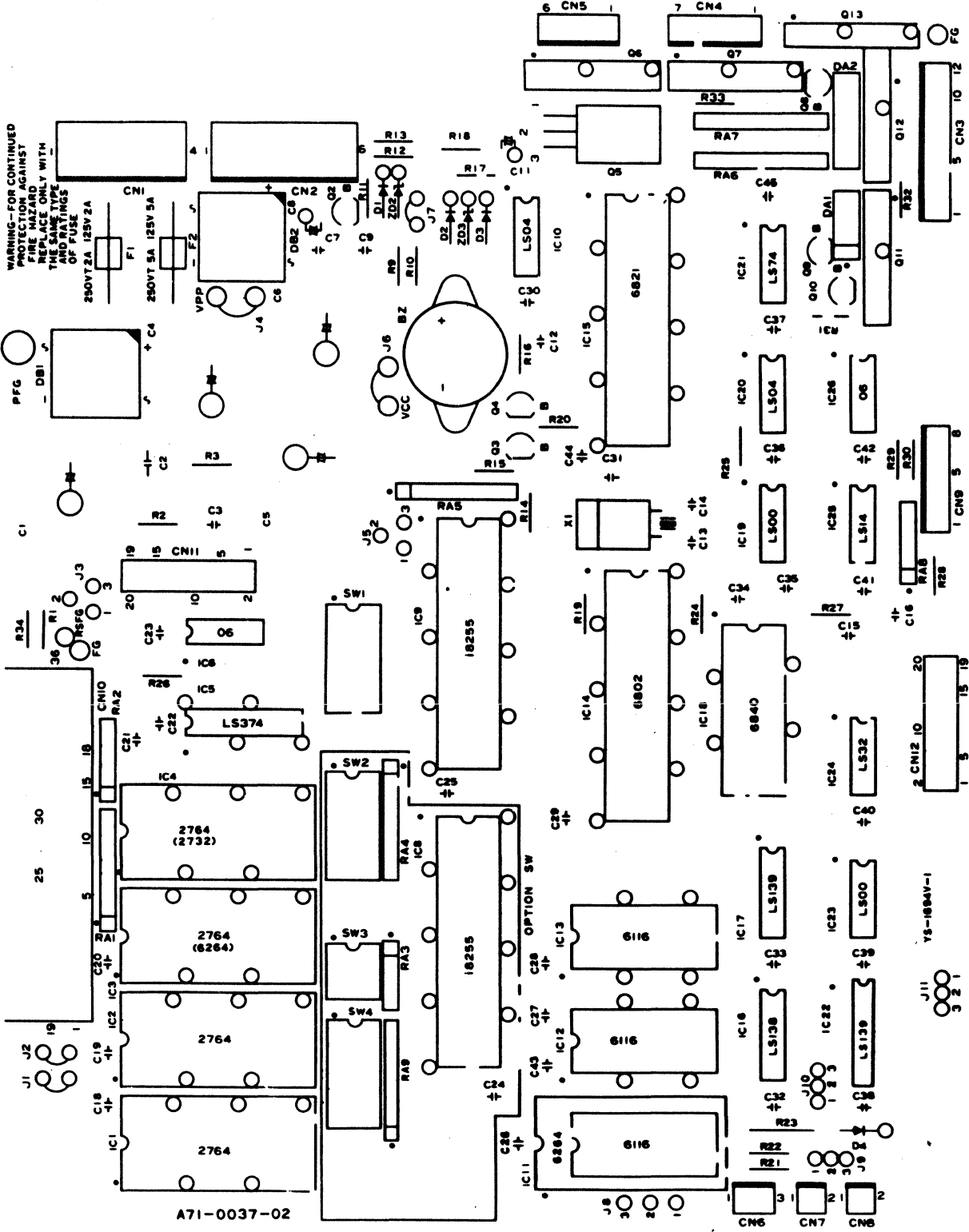


Figure 8-6 H136 Control Card Layout

Table 8-6 H136 Control Card Components

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
I C S. L S I S				
IC1	SY7-5357-000	1	EP-ROM, HN482764G-4 (CONTROL)	
IC2	SY7-5347-000	1	EP-ROM, (NLQ)	
IC4	SY7-5358-000	1	EP-ROM, (CG)	
IC5	WA3-0281-000	1	IC, SN74LS374P, TTL	
IC6/26	X65-7160-000	2	IC, SN7406P, TTL	
IC8/9	WA3-0944-000	1	MOS LSI, I8255A-5, PPI	
IC10/20	X65-7467-000	2	IC, SN74LS04P, TTL	
IC11	SY7-5355-000	1	LSI, HM6264P-3, STATIC RAM (8K)	
IC13	WA3-0665-000	1	LSI, HM6116P-3, STATIC RAM (2K)	
IC14	SY7-5342-000	1	MOS LSI, HD468A02P, CPU	
IC15	WA3-0299-000	1	MOS LSI, HD468A21P, PIA	
IC16/22	WA3-0110-000	2	IC, SN74LS138P, TTL	
IC17	WA3-0200-000	1	IC, SN74LS139P, TTL	
IC18	WA3-0302-000	1	MOS LSI, MC68A40P, PTM	
IC19/23	WA3-0132-000	2	IC, SN74LS00P, TTL	
IC21	WA3-0281-000	1	IC, SN74LS74AP, TTL	
IC24	WA3-0135-000	1	IC, SN74LS32P, TTL	
IC25	WA3-0002-000	1	IC, SN74LS14P, TTL	
T R A N S I S T O R S				
Q2/3/4	X65-6174-000	3	TRANSISTOR, 2SC1213, NPN	
Q5	SY7-5315-000	1	TRANSISTOR, 2SB765K, PNP	
Q6/7	SY7-5257-000	2	TRANSISTOR ARRAY, STA401A	
Q8/9/10	X65-6174-000	3	TRANSISTOR, 2SC1213, NPN	
Q11/12	SY7-5316-000	2	TRANSISTOR ARRAY, STA301A	
Q13	SY7-5257-000	1	TRANSISTOR ARRAY, STA401A	
D I O D E S				
D1/2/3/4	X65-5032-000	4	DIODE, 1S1588, SILICON	
Z02	SY7-5317-000	1	DIODE, ZENER, HZ15-3 (15V)	
Z03	SY7-5318-000	1	DIODE, ZENER, HZ5A-3 (5V)	
DA1	WA1-0023-000	1	DIODE ARRAY, DAN401	
DA2	WA1-0035-000	1	DIODE ARRAY, DAN601	
DB1/2	WA1-0059-000	2	DIODE STACK, S4VB10	
C O N N E C T O R S				
CN1	SY7-5240-000	1	CONNECTOR, 4P, MALE	
CN2	SY7-5319-000	1	CONNECTOR, 6P, MALE	
CN3	WS3-0169-000	1	CONNECTOR, 12P, MALE	
CN4	SY7-5243-000	1	CONNECTOR, 7P, MALE	
CN5	WS3-0206-000	1	CONNECTOR, 6P, MALE	

(continued)

Table 8-6 H136 Control Card Components (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
CONNECTORS				
CN6	WS3-0274-000	1	CONNECTOR, 3P, MALE	
CN7	WS3-0209-000	1	CONNECTOR, 2P, MALE	
CN9	SY7-5244-000	1	CONNECTOR, 8P, MALE	
CN10	SY7-5238-000	1	CONNECTOR, 36P, FEMALE	
CN11	SY7-5371-000	1	CONNECTOR, 20P, FEMALE	
RSFG	SY7-5343-000	1	CONNECTOR, 2P, MALE	
IC SOCKETS				
S-IC1/2/ 3/4	WA9-0058-000	4	SOCKET, IC (28PINS)	
IC14	WA9-0059-000	1	SOCKET, LSI (40PINS)	
RESISTORS				
RA1	VR9-0838-000	1	RESISTOR ARRAY, 1K ohm x 8, 1/8W	
RA2/8	VR9-0911-000	2	RESISTOR ARRAY, 1K ohm x 5, 1/8W	
RA3	VR9-0200-000	1	RESISTOR ARRAY, 10K ohm x 4, 1/8W	
RA4/5	VR9-0948-000	2	RESISTOR ARRAY, 10K ohm x 8, 1/4W	
RA6/7	SY7-5310-000	2	RESISTOR ARRAY, 1.5K ohm x 5, 1/4W	
R1/9/34	VR1-8143-332	3	RESISTOR COMPOSITION, 3.3K ohm, 1/4W	
R2	VR1-8143-471	1	RESISTOR COMPOSITION, 470 ohm, 1/4W	
R3/18	VR1-8143-103	2	RESISTOR COMPOSITION, 10K ohm, 1/4W	
R10/25/ 27	VR1-8143-101	3	RESISTOR COMPOSITION, 100 ohm, 1/4W	
R11/14/ 17/26/ 31	VR1-8143-102	5	RESISTOR COMPOSITION, 1K ohm, 1/4W	
R12	VR1-8143-202	1	RESISTOR COMPOSITION, 2K ohm, 1/4W	
R13/16/ 19/20/ 24/32/ 33	VR1-8143-152	7	RESISTOR COMPOSITION, 1.5K ohm, 1/4W	
R15	VR1-8143-512	1	RESISTOR COMPOSITION, 5.1K ohm, 1/4W	
R21/28/ 29/30	VR1-8143-151	4	RESISTOR COMPOSITION, 150 ohm, 1/4W	
R22	VR1-8143-303	1	RESISTOR COMPOSITION, 30K ohm, 1/4W	
R23	VR1-8143-151	1	RESISTOR COMPOSITION, 150 ohm, 1/4W	

(continued)

Table 8-6 H136 Control Card Components (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
CAPACITORS				
C1	SY7-5253-000	1	CAPACITOR, ELECTROLYTIC, 16V, 3300uF	
C2	VC3-2501-334	1	CAPACITOR, FILM, 50V, 0.33uF	
C3	VC4-2502-102	1	CAPACITOR, CERAMIC, 50V, 1000pF	
C4	SY7-5252-000	2	CAPACITOR, ELECTROLYTIC, 50V, 3300uF	
C6	SY7-5254-000	1	CAPACITOR, ELECTROLYTIC, 35V, 3300uF	
C7	VC3-2501-104	1	CAPACITOR, FILM, 50V 0.1uF	
C8	SY7-5308-000	1	CAPACITOR, ELECTROLYTIC, 10V, 100uF	
C9	VC3-2501-223	1	CAPACITOR, FILM, 50V, 0.022uF	
C11	SY7-5309-000	1	CAPACITOR, ELECTROLYTIC, 25V, 4.7uF	
C12	VC4-2502-472	1	CAPACITOR, CERAMIC, 50V, 4700pF	
C13/14	VC4-2502-220	2	CAPACITOR, CERAMIC, 50V, 22pF ± 10%	
C15	VC4-4504-103	1	CAPACITOR, CERAMIC, 50V, 10000pF	
C16	VC4-2502-102	1	CAPACITOR, CERAMIC, 50V, 1000pF	
C18 ~42	VC4-4504-103	25	CAPACITOR, CERAMIC, 50V, 10000pF	
C43/44	VC4-2502-471	2	CAPACITOR, CERAMIC, 50V, 470pF	
MISCELLANEOUS				
F1	WD1-0081-000	1	FUSE, 2A (5MT-2A), SLOWBLOW	120V
	WD1-0061-000	1	FUSE, 2A (19195-2A), SLOWBLOW	230V
F2	WD1-0074-00	1	FUSE, 5A (5MT-5A), SLOWBLOW	120V
	WD1-0047-000	1	FUSE, 5A (19195-5A), SLOWBLOW	230V
FH	X62-6982-000	4	HOLDER, FUSE S-N5053	
SW1	SY7-5230-000	1	DIP SWITCH (8PINS)	
X1	SY7-5344-000	1	CRYSTAL OSCILLATOR, 4.5 MHz (140 CPS)	
	WK2-0044-000	1	CRYSTAL OSCILLATOR, 6.1 MHz (160 CPS)	
BZ	SY7-5345-000	1	BUZZER PB2130 up002A	

Table 8-7 Filter Card Components

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
CP1	SY7-5249-000	1	FILM CAPACITOR 250V 0.1uF	
CP2	SY7-5217-000	4	FILM CAPACITOR 250V 2200pF.....	230
FP	WD1-0081-000	1	SLOW BLOW FUSE 2A 125V.....	120V
FP	WD1-0077-000	1	SLOW BLOW FUSE 0.8A 250V.....	230
FH	X62-6982-000	2	FUSE HOLDER S-N5054	
L	X62-1525-000	1	LINE CHOKE COIL NF1403a	
SW	SY7-5237-000	1	SEESAW SWITCH (1802 2102)	
	SY7-5242-000	1	CONNECTOR 2P, MALE	

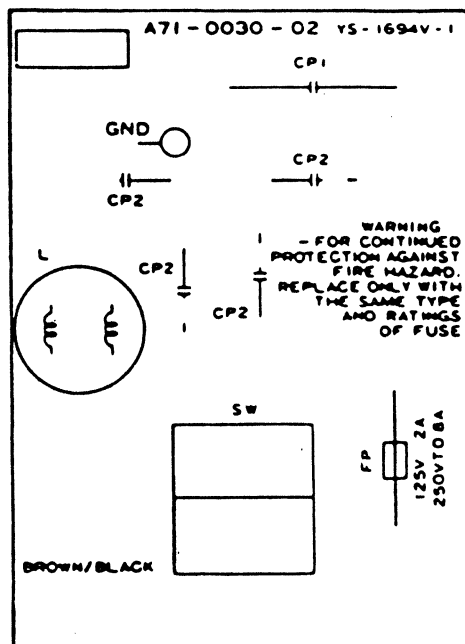


Figure 8-7 H80, H136 Filter Card Layout

Table 8-8 Serial Interface Components

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
SOCKETS				
S-IC3	WA9-0058-000	1	SOCET, IC, 28P	
S-IC7	WA9-0059-000	1	SOCKET, LSI, 40P	
CONNECTORS				
J1~5	SY7-5366-000	5	CONNECTOR, 3P, MALE	
N1	SY7-5367-000	1	CONNECTOR, 20P, MALE	
MISCELLANEOUS				
T1	SY7-5368-000	1	DC-DC CONVERTER (TB-1)	
PC1	SY7-5369-000	1	PHOTO COUPLER, EE-CM2	
X1	WK2-0054-000	1	CRYSTAL, 3.6864MHZ, HC-43/V	
SW1	SY7-5370-000	1	SWITCH, DIP (8PINS), DSS108	
P-J1~5	SY7-5372-000	5	PLUG, JUMPER, 2P	
	SY7-5373-000	2	LOCKING SUPPORT	
	SY7-5233-000	2	SCREW, TAPPING, PH3x8	
	SY7-5374-000	1	CONNECTOR W/WIRE 25P	
	SY7-5375-000	1	BRACKET, CONNECTOR	
	SY7-5376-000	1	GROUND WIRE	
	SY7-5377-000	2	SCREW, LOCKING CONNECTOR	

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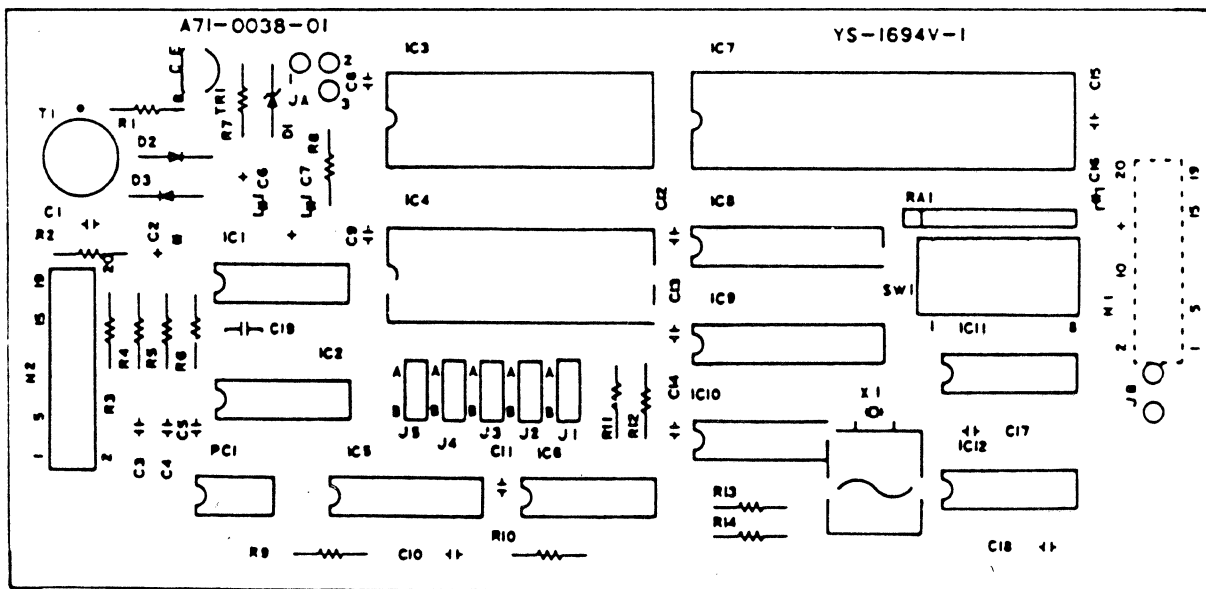


Figure 8-8 Serial I/F Layout

Table 8-8 Serial Interface Components (cont.)

KEY NO.	PART NO.	Q'TY	DESCRIPTION	REMARKS
IC, LSI				
IC1	SY7-5362-000	1	LINE DRIVER, MC1488	
IC2	SY7-5363-000	1	LINE DRIVER, MC1489AL	
IC3	WA3-0665-000	1	LSI, HM6116P-3, SRAM	
IC4	WA3-0701-000	1	MOS LSI, R6551AP, ACIA	
IC5	WA3-0200-000	1	TTL IC, SN74LS139N	
IC6	WA3-0137-000	1	TTL IC, SN74LS74AN	
IC7	SY7-5364-000	1	MOS LSI, HD68P01V0-29B,MCU	
IC8	WA3-0428-000	1	TTL IC, SN74LS373N	
IC9	WA3-0279-000	1	TTL IC, SN74LS273N	
IC10	X65-7467-000	1	TTL IC, SN74LS04N	
IC11/12	X65-7160-000	2	TTL IC, SN7406N	
RESISTORS				
RA1	VR9-0948-000	1	RESISTOR ARRAY, 10K ohm x 8, 1/4W	
R1/12	VR1-8143-182	2	RESISTOR CARBON, 1.8K ohm, 1/4W	
R2/3	VR1-8143-151	2	RESISTOR CARBON, 150 ohm, 1/4W	
R4/5/6/9 10	VR1-8143-103	5	RESISTOR CARBON, 10K ohm, 1/4W	
R7	VR1-8143-470	1	RESISTOR CARBON, 470 ohm, 1/4W	
R8	VR1-8143-152	1	RESISTOR CARBON, 1.5K ohm, 1/4W	
R11/13	VR1-8143-221	2	RESISTOR CARBON, 220 ohm, 1/4W	
R14	VR1-8143-561	1	RESISTOR CARBON, 560 ohm, 1/4W	
CAPACITORS				
C1	VC4-3503-222	1	CAPACITOR, CERAMIC, 50V, 2200pF	
C2	VC1-2101-228	1	CAPACITOR, ELECTROLYTIC, 10V, 2200uF	
C3~5/ 8~15/ 17~19	VC4-4504-103	14	CAPACITOR, CERAMIC, 50V, 10000pF	
C6/7	VC1-2161-336	2	CAPACITOR, ELECTROLYTIC, 16V, 33uF	
C16	VC1-2101-107	1	CAPACITOR, ELECTROLYTIC, 10V, 100uF	
DIODES				
D1	SY7-5365-000	1	DIODE, ZENER, HZ-1282	
D2/3	WA1-0204-000	2	DIODE, 1S954	
TRANSISTORS				
TR1	WA1-0091-000	1	TRANSISTOR, 2SD789, NPN	

APPENDIX A

SERIAL INTERFACE (OPTION)

A.1 DESCRIPTION

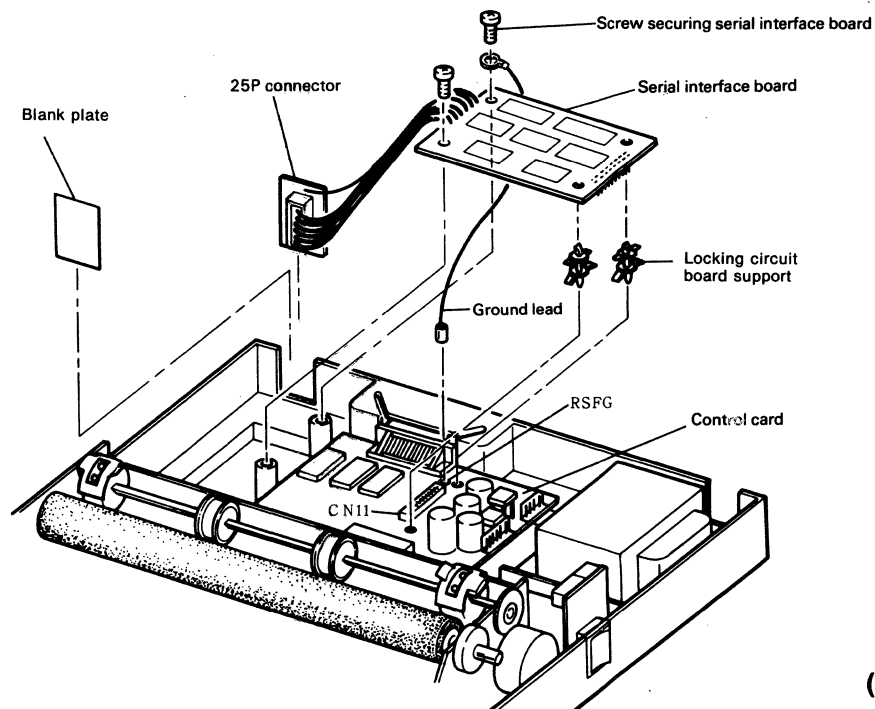
The serial interface is contained on a circuit board which is simple to install (2 screws plus ground lead). This interface provides RS-232C and 20 mA current loop. When this interface is installed, the printer can operate as a parallel or serial printer as long as only one interface connector is used at a time (unplug unused interface).

A.2 PREPARATION

Prepare the interface PCB by setting the baud rate switches for RS-232C or install jumpers for current loop operation as appropriate. Consult the tables which follow for the operating parameters.

A.3 INSTALLATION

1. Remove the top cover, the the blank plate.
2. Install locking circuit board supports (two) into the holes beside CN11 of the control card.
3. Connect the ground lead RSFG of the control card.
4. Insert the serial interface board into CN11 and locking circuit board supports.
5. Install serial interface board retaining screws (two). Secure the terminal lug from the ground lead under one screw, as shown.
6. Insert the serial interface 25P connector in the place previously covered by the blank plate.
7. Replace the top cover.



(H136 shown)

Figure A-1 Installing the Serial I/F Card

A.4 USER SELECTABLE FUNCTIONS

Dip Switch Settings

(1) Baud rate

* In the current loop, operation cannot be assured if the baud rate is over 2400 bps.

SW No. B.P.S.	1	2	3
110	ON	ON	ON
300	OFF	ON	ON
600	ON	OFF	ON
1200	OFF	OFF	ON
2400	ON	ON	OFF
4800	OFF	ON	OFF
9600	ON	OFF	OFF
19200	OFF	OFF	OFF

(2) Parity

SW No.	4	5
Content		
EVEN	ON	ON
ODD	ON	OFF
No-Parity	OFF	ON
	OFF	OFF

(3) Data word length (4) Stop bit length

SW No.	6
Length	
8	ON
7	OFF

SW No.	7
Length	
1	ON
2	OFF

(5) Protocol

SW No.	8
Content	
RDY/BSY	ON
XON/XOFF	OFF

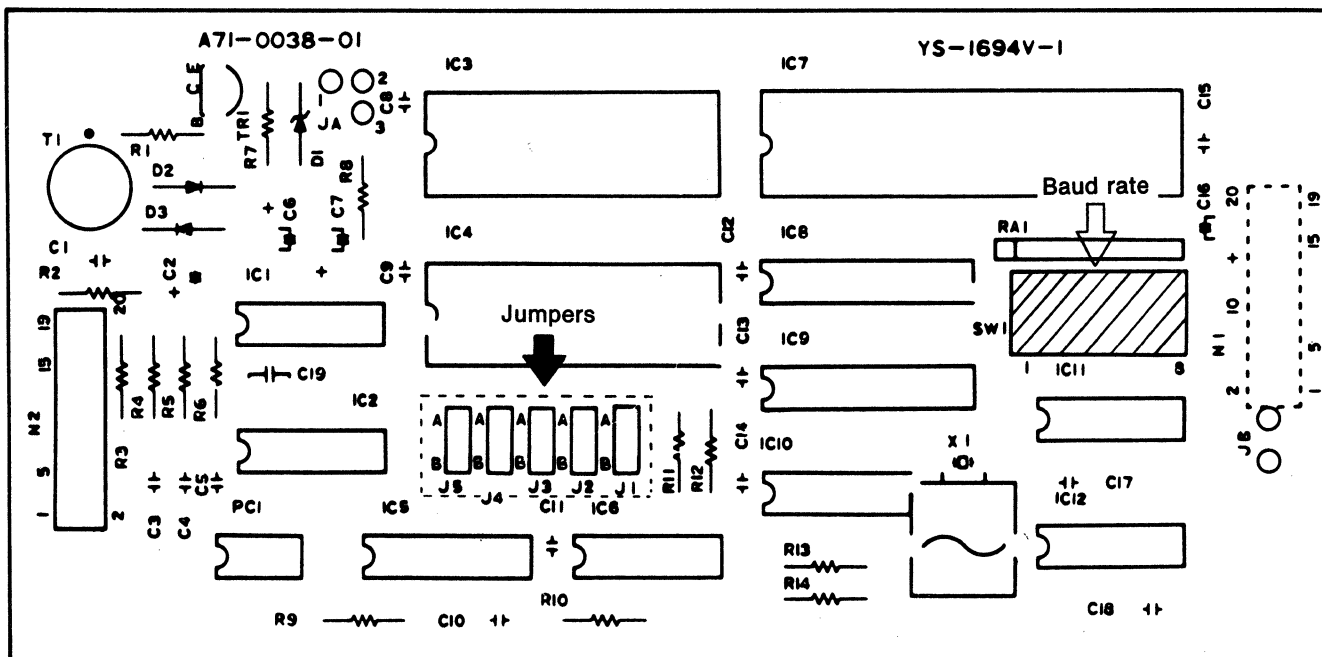
- Notes:
1. All dip switches are factory set to OFF.
 2. After setting the switch, re-supply the power (reset).
 3. The dip switches are SW1 indicated with ↓ in the figure below.

Jumper Plug Configuration

No.	Function	Side A	Side B
J1	Interface	RS-232-C	Current Loop
J2	Interface	RS-232-C	Current Loop
J3	CTS	Valid	Invalid or Current Loop
J4	DSR	Valid	Invalid
J5	DTR	Valid	Always "SPACE" condition

- * All Jumper plugs are factory set to side A.
- ** The Jumper plugs are indicated with ↓ in the figure below.

Serial Interface PCB



A.5 CONNECTOR PIN ASSIGNMENTS

RS-232C

Pin No.	Symbol	Signal name	Direction Printer/Host Machine	Ready /Busy	X-ON X-OFF
1	FG	Protective Ground	-	Used	Used
2	SD	Send Data (TD)	→	Not used	Used
3	RD	Received Data	←	Used	Used
4	RTS	Request To Send	→	Used	Used
5	CTS	Clear To Send	←	Not used	Used
6	DSR	Data Set Ready	←	Not used	Used
7	SG	Signal Ground	-	Used	Used
20	DTR	Data Terminal	→	Used	Used

20 mA Current Loop

Pin No.	Symbol	Signal name	Direction Printer/Host Machine	Ready /Busy	X-ON X-OFF
1	FG	Protective Ground	-	Used	Used
14	SD (+)	Send Data (+)	→	Used	Used
15	SD (-)	Send Data (-)	→	Not used	Used
12	RD (+)	Received Data (+)	←	Used	Used
13	RD (-)	Received Data (-)	←	Used	Used

A.6 SERIAL INTERFACE CONNECTOR

Printer DB-25 P (Female)
Cable DB-25 SA-J 4 (male)

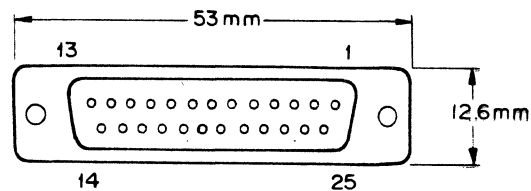


Figure A-2 25-Pin Female Input Connector

A.7 SIGNAL DESCRIPTION

1. FG Protective Ground
Ground for protection, connected to the printer chassis.
 2. SD Send Data
A transmission line which sends serial data from the printer to the host machine. While nothing is being transmitted, this is in MARK state (low).
 3. RD Received Data
A transmission line which sends serial data from the host machine to the printer. While nothing is being transmitted, this is in MARK state (low).
 4. RTS Request to Send
Printer output signal. When the printer is ready to received, this is in SPACE state (high).
 5. CTS Clear to Send
Printer input signal. This should be high so the printer transmits data.
 6. DSR Data Set Ready
Printer input signal. This should be high so the printer receives data.
 7. SG Signal Ground
- 12, 13. RD (+ -) Received Data
A transmission line which sends serial data from the host CPU to the printer. While nothing is being transmitted, this should be in MARK state.
- 14, 15. SD (+ -) Send Data
A transmission line which sends serial data from the printer to the host CPU. While nothing is being transmitted, this is in MARK state
20. DTR Data Terminal Ready
Printer output signal. When the printer is ready to receive, this is in SPACE state (high).

Note: DSR and CTS can be ignored by switching jumpers..

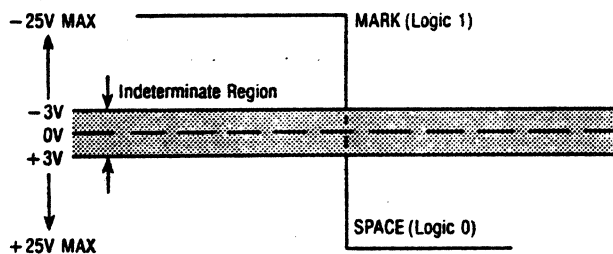




Figure A-3 RS-232C Signal Levels



Figure A-4 Logic Diagram, Serial Word Format

A.8 INPUT/OUTPUT CIRCUIT CONFIGURATIONS

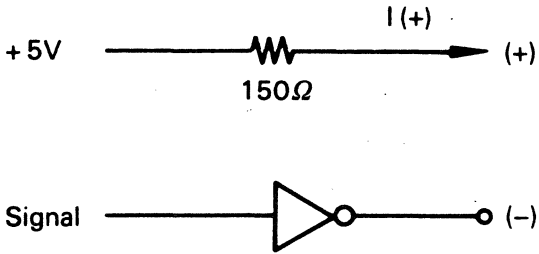
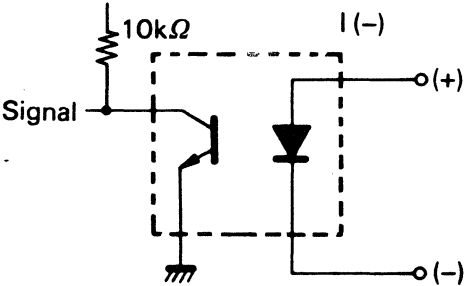
RS-232C

	Signal	Circuit
Output	SD RTS DTR	 <p>MC1488's equivalent</p>
Input	RD CTS DSR	 <p>MC1489AL's equivalent</p>

(1) Output level $\pm 8V$ TYP

(2) Input level $\pm 15V$ max $\pm 5V$ min

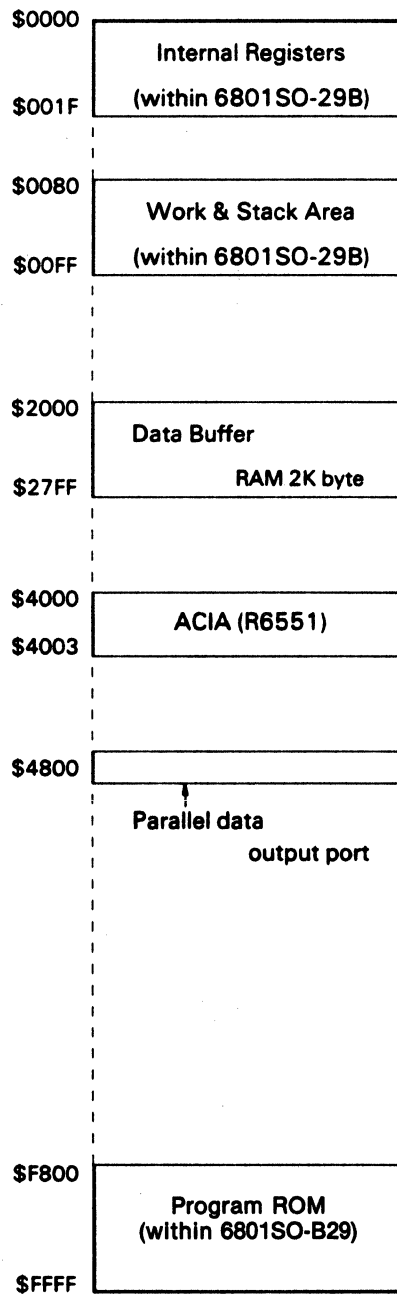
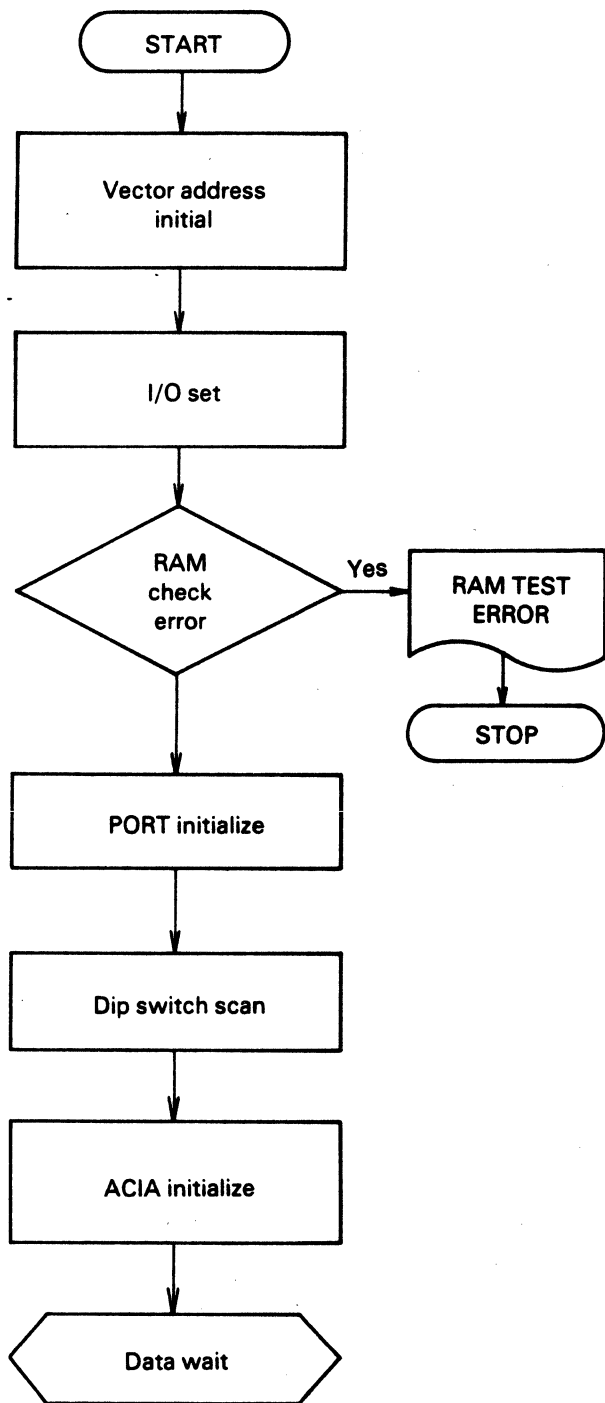
Current Loop

	Signal	Circuit
Output	SD (+) SD (-)	 <p>SN7406's equivalent</p>
Input	RD (+) RD (+)	

(1) Output level $I(+)$ 20 mA (2) Input level $I(-)$ 20 mA

* Voltage Max 30V, Current Max 30 mA

A.9 SERIAL INTERFACE INITIAL FLOW AND MEMORY MAP



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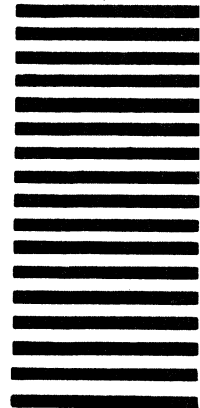
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