

**TANDY®**

# Service Manual

(REVISED VERSION)

26-2818

## DOT MATRIX PRINTER DMP 300

Catalog Number: 26-2818


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#### **PRODUCT SAFETY NOTICE**

Many electrical and mechanical parts in this chassis have special characteristics. These characteristics often pass unnoticed and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts that have these special safety characteristics are identified in this manual and its supplements; electrical components having such features are identified by a  in the schematic diagram and the parts list.

Before replacing these components, read the parts list in this manual carefully. The use of substitute replacement parts that do not have the same safety characteristics as specified in the parts list may create shock, fire, or other hazards.

# Specifications

## Physical/Environmental Specifications

Dimensions	4.57 (H) × 15.67 (W) × 13.58 (D) inches (116 mm × 398 mm × 345 mm)
Weight	Approximately 18.5 lbs (8.4 kg)
Temperature	55°F to 85°F (13°C to 30°C), during operation –40°F to 158°F (–40°C to 70°C), storage
Humidity	40 ~ 80%, during operation 20 ~ 90%, storage
Power Supply	120 VAC ± 12.5%, 220/240 VAC ± 12.5%, 50/60 Hz ± 2%
Power Consumption	110 VA (Self-test printing) 40 VA (Stand-by)

## Printing Specifications

Print Method	Impact, Dot Matrix (Bidirectional Short-line-seeking)
Print Head	24 pin
Print Speed	225 cps (10CPI, Draft)
Paper Feed Method	Friction method Tractor method
Line Feed Pitch	Minimum of 1/216 inch
Line Feed Time	80 ms (6 lines/inch), 60 ms (8 lines/inch) (during continuous line feed)
Printing Forms	Paper width 3 - 10 inches Ream weight 12 - 24 lbs (45 g/m <sup>2</sup> - 90 g/m <sup>2</sup> )
Multiple Copies	Original, plus 3 Total thickness, less than 0.014 inch (0.356 mm)
Ribbon	Cassette style, single color (Black)

**Note:** Nominal specs represent the design specs; all units should be able to approximate these—some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit perform to less than within any limit spec.

## **Power Supply Precautions**

Do not operate the printer with voltages higher or lower than the rated value. The printer operating voltages are specified as 105 V through 135 V for the USA version. However, continuous operation near the upper voltage limits is not desirable since the internal temperature could rise. Operation near the lower limit voltage may result in interference from external line-voltage “noise.” If the power supply voltage is unstable, use a CVR (Constant Voltage Regulator).

This printer has a fuse on the AC power line and +5 V power line. If the fuse should blow, be sure to replace it with a fuse that is of the same type and rating.

## **Installation Location Precautions**

The printer must be installed according to the following instructions:

- 1) Avoid the following conditions:
  - Direct sunlight (This could cause cover deformation and excessive internal heating.)
  - Large fluctuations in temperature
  - Windy areas (outdoors)
  - Dust
  - Open doors leading outside (Do not set the printer adjacent to an open door.)
  - Air conditioner vents
  - Heating apparatus (stoves, hot air vents, and so on)
  - Excessive vibration
- 2) Do not smoke in the room where the printer is installed.
- 3) Do not operate the printer in an explosive environment.
- 4) Operate the printer as far as possible from radios, TVs, and communication devices to avoid the possibility of external interference.
- 5) Keep the conditions of the room where the printer is installed as specified below:
  - Temperature: 55 to 85°F (13 to 30°C)
  - Humidity: 40 to 80% RH

6) Position the printer and continuous-form paper as follows:

a) Table or stand

The printer must be mounted on a table or stand approximately 28 inches (71 cm) high. (The table or stand must be leveled and even, and sturdy enough to prevent excessive vibration during printing. The four rubber printer feet must be in the same plane.)

b) Paper alignment

Place the paper with the sides parallel to the paper feeding direction. The paper must be fed to the printer at a right angle to the printer. The printer must be placed in the correct position. Horizontal shift of the position must be within 1 inch (2.5 cm), measured on the floor. (See Figure 1.)

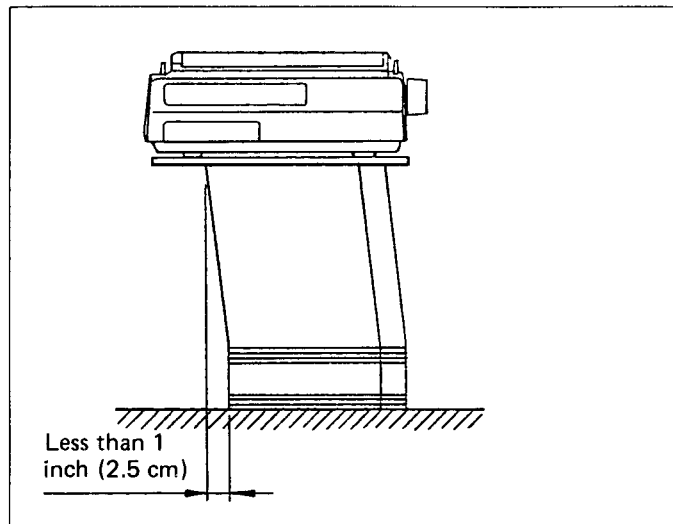


Figure 1

c) Printer position

The rear side of the printer must be directly above the table edge. To secure clearance for paper output, place the printer 24 inches (60 cm) or more from the wall.

d) Fed and ejected paper

To prevent entangling of fed and ejected paper forms, place the end of the first ejected page 4 to 6 inches (10 to 15 cm) away from the table feet. Entangling of paper might cause a paper jam.

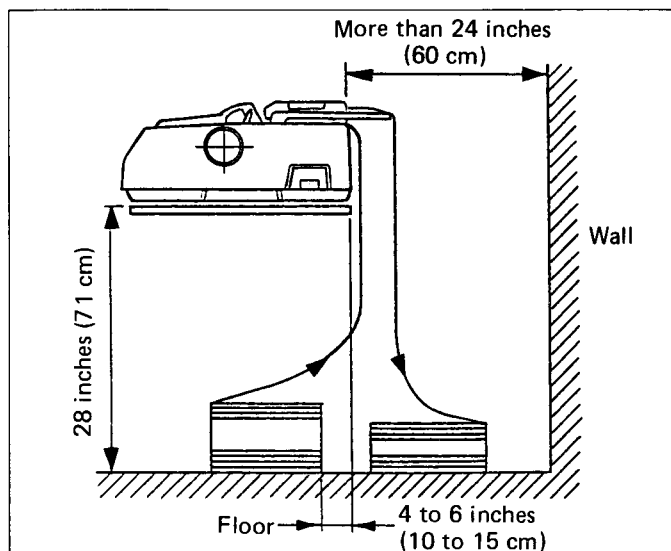


Figure 2

## Print Function Switches

The functions of the switches on the operation panel depend on the state of the printer:

- During operation
- In menu mode
- In other modes

### Switch Functions

<div> <div>Mode</div> <div>Switch to be pressed</div> </div>	Power ON time	Normal & Hex dump mode		Self-test mode	Menu mode
		On-line mode	Off-line mode		
ON/OFF LINE Switch (ENTER/EXIT)	Prints the list of current settings and enters the menu mode.	Enters the off-line mode.  (*3)	Enters the on-line mode.  (*3)	Exits the self-test mode, and enters the on-line mode.	Exits the menu mode, and enters the on-line mode.
LINE/FORM Switch (GROUP)	Enters the self-test mode.	Performs line feed. Pressing for 1 second or more causes the page to turn.	Performs line feed. Pressing for 1 second or more causes the page to turn.	—	Increments the menu groups.
QUIET/PARK Switch (ITEM)	—	Switches the quiet mode to the resident mode, and vice versa.	Performs form saving. (Parks pin-feed paper.)	—	Increments the menu items.
LQ/DP PITCH Switch (SET)	Enters the hex-dump mode.	Switches the LQ and utility mode alt.	Switches the CPI in the order of 10, 12, 17, and PROP.	—	Updates menu setting values.
ON/OFF LINE & LINE/FORM Switch (*1)	—	Enters the menu mode.  (*4)	—	—	—
ON/OFF LINE & LQ/DP PITCH Switch (*2)	Performs menu factory setting.	—	—	—	—

\*1 : In the on-line mode, press the LINE/FORM switch while the ON/OFF LINE switch is pressed.

\*2 : Effective when both the ON/OFF LINE and the LQ/DP PITCH switches are pressed at power-on, regardless of which has been pressed earlier.

\*3 : Effective even when the mechanism is working.

\*4 : Effective only when the receiving buffer is empty and the mechanism is not working.

—: Invalid.

## Special Switch Operations

### 1) Hex-Dump mode

- a) Enter Hex-Dump mode by pressing the LQ/DP PITCH switch during power up.
- b) Exit Hex-Dump mode by powering down the printer.
- c) All other primary function switches operate the same as when in the normal print mode (ON/OFF LINE, LINE/FORM, QUIET/PARK).

### 2) Self-Test mode

- a) Enter Self-Test Mode by pressing the LINE/FORM switch during power up.
- b) Exit Self-Test Mode by pressing the ON/OFF LINE switch.

## Menu Selection

### 1) Overview:

Access “global” type printer features/functions as directly as possible. Features selected in Menu mode become the default features for the printer each time it is powered on. The Menu function allows features to be activated without the use of a software command. Software commands will override Menu settings.

### 2) Key Functions:

<u>Key Name</u>	<u>Function</u>
GROUP	General categorization of functions/features. Selects next Group title; once through the entire list, loops back to the first Group.
ITEM	Direct name of functions/features. Selects next Item title; once through the entire list, loops back to the first Item in the current Group.
SET	Value (setting) of the Item. Selects next Setting value; once through the entire list, loops back to the beginning of the list.

### 3) Operation

- a) To enter Menu mode, press the ON/OFF LINE switch during power up or press the LINE/FORM FEED switch. When this is done, the mode enters the Menu after printing the list of current settings.
  - i) The current setting is printed.
  - ii) Printer=deselected state. ON/OFF LINE LED=off
  - iii) Press GROUP switch to print first Menu item.

**Note:** Menu mode can be set also by pressing the ON/OFF LINE switch and LINE/FORM FEED switch.
- b) Upon entering Menu mode, the first GROUP—ITEM—SET is printed.
- c) See Key functions above for description of operation.
- d) To exit Menu mode, press the ON/OFF LINE switch.
- e) If conflicting functions are set in Menu mode, the printer treats these functions according to the priority table.
- f) The TOF position is not affected by Menu mode.



- g) Pressing the ON/OFF LINE, LQ/DP PITCH switches simultaneously on power up resets the Menu back to its factory settings. (See Table of All Menu Choices for further details.)

**Note 1:** When entering/exiting Menu mode, the user is not prompted.

**2:** DLL data will not be lost after exiting the menu except when Emulation mode is changed.

#### 4) Table of All Menu Choices

Factory settings are printed in bold.

Group	Item	Choice
Font	Type Face (Tandy Mode)	<b>LQ Courier</b> , LQ Prestige, DLL No.4 DLL No.5, Draft
	Type Face (IBM Mode)	<b>LQ Courier</b> , LQ Prestige, DLL, Draft
	Pitch	<b>10 CPI</b> , 12 CPI, 17.1 CPI. Proportional
	Attributes	<b>None</b> , Italics, Elongated, Bold, Enhanced, Double Height
General Control	Emulation Mode	Tandy, <b>IBM</b>
	Tandy Processing (Tandy Mode)	<b>Data</b> , Word
	IBM Processing (IBM Mode)	<b>PPR</b> , AGM
	Unidirectional	<b>No</b> , Yes
	Offset	-5, -4, -3, -2, -1, <b>0</b> , +1, +2, +3, +4, +5
	Left End	<b>1 Column</b> , 2 Column, 3 Column, 4 Column, 5 Column, 6 Column, 7 Column, 8 Column, 9 Column, 10 Column, 11 Column, 12 Column, 13 Column, 14 Column, 15 Column, 16 Column, 17 Column, 18 Column, 19 Column, 20 Column, 21 Column
Vertical Control	Auto CR	<b>Yes</b> , No
	Line Spacing	<b>6 LPI</b> , 8 LPI
	Form Tear-Off	<b>On</b> , Off
	Skip Over Perforation	<b>No</b> , Yes
	CR Code	CR & LF, <b>CR Only</b>
	LF Code	LF & CR, <b>LF Only</b>
	Page Length	3", 3.5", 4", 5", 5.5", 6", 7", 8", 8.5", 11", 11-2/3", 12", 14", 18"
Symbol Sets	Top Margin	<b>1 Line</b> , 2 Line, 3 Line, 4 Line, 5 Line, 6 Line, 7 Line, 8 Line, 9 Line, 10 Line
	Character Set (Tandy Mode)	<b>Tandy</b> , IBM
	Character Set (IBM Mode)	<b>IBM Set 1</b> , IBM Set 2
	Language Set (Tandy Mode)	<b>USA</b> , German, French, Norwegian, Swedish, Danish, Finnish, Italian, Spanish, English, Belgium, Dutch
	Zero Character (IBM Mode)	<b>Slashed</b> , Unslashed
	5BH-5EH (Tandy Mode)	Tandy, <b>ASCII</b>

## Errors

When an error occurs, the ON/OFF LINE indicator and the QUIET indicator blink, and the LED corresponding to the error is turned on.

### Error indication list

Alarm name		LED indication						Description of the alarm
Alarm classification	Subclassification	ON/ OFF LINE	QUIET	LQ	12	17	PS	
CPU alarms	Internal RAM	o	o				●	This alarm occurs when an error results from a read/write check of internal RAM of CPU (80C154), which is performed just after power-on.
ROM alarms	Program ROM	o	o		●			This alarm occurs when an error results from the hash total check of a program, performed just after power-on.
	EEPROM	o	o		●		●	This alarm occurs when an error results from the read/write check, performed after an unsuccessful EEPROM hash total check.
	Resident ROM	o	o		●	●		This alarm occurs when an error results from the resident CG ROM matching data check, performed just after power-on.
RAM alarm	External RAM	o	o		●	●	●	This alarm occurs when an error results from the external RAM read/write check, performed just after power-on.
Mechanism alarms	Head homing	o	o	●				This alarm occurs when a head homing execution alarm has been detected, just after power-on, or during INPUT PRIMR-N receiving.
	Spacing	o	o	●			●	This alarm occurs when spacing type alarm has been detected during printing or skipping.
	Print overrun	o	o	●		●		This alarm occurs when excessive dots have been printed during printing.
	AP JAM	o						This alarm occurs when paper is jammed during auto park operation.
	Overheated HEAD	o						This alarm occurs when the print head becomes overheated.
	Overheated LF/space motor	o						This alarm occurs when the LF/space motor becomes overheated.
Control alarms	Print End Response	o	o	●		●	●	This alarm occurs when the number of the print end response from the mechanism controller exceeds the number of the print lines.
	Cell Put	o	o	●	●			This alarm occurs when the contents of an image buffer cell is taken out twice in succession.
	Cell Get	o	o	●	●		●	This alarm occurs when the contents of an image buffer cell is taken out twice in succession.
	HPC/LPC FIFO	o	o	●	●	●		This alarm occurs when an invalid command has been issued from the decoder to the mechanism controller.
Paper alarm	PAPER END	o						This alarm occurs when the printing paper is running short. The ON/OFF LINE indicator blinks.

( • : On    o : Blink    Space: Off)

## Print Head Protection

A thermistor is built into the print head to protect it from overheating caused by long-lasting continuous bidirectional printing or heavy duty printing. When the coil temperature goes up, the control circuit detects the thermistor signal and stops printing (including one-way printing and stepping printing), until the coil temperature goes down to within the limits.

The ON/OFF LINE indicator flickers during the printing stop.

# Interface

## Parallel Interface

### Pin Configuration

PIN	SIGNAL	IN/OUT	DESCRIPTION
1	STROBE-N	IN	Samples input data when changing from low level to high level. Input data: High level indicates "1" and low level "0".
2	DATA BIT1	IN	
3	DATA BIT2	IN	
4	DATA BIT3	IN	
5	DATA BIT4	IN	
6	DATA BIT5	IN	
7	DATA BIT6	IN	
8	DATA BIT7	IN	
9	DATA BIT8	IN	
10	ACKNOWLEDGE	OUT	Indicates character input completion, or function operation end, at low level.
11	BUSY	OUT	Indicates data cannot be received at high level. Data can be input at low level.
12	PAPER END	OUT	High level indicates paper end.
13	BUSY	OUT	Indicates data cannot be received at low level. Data can be input at high level.
	(SELECT)	(OUT)	High level indicates select (online) condition.
14	AUTO FEED	IN	(Note 3)
15	NC		
16	SG		Signal ground
17	FG		Frame ground
18	+5V		+ 5 V supply (50 mA maximum)
	(NC)		
19~30	SG		Twisted pair return (for pin No. 1 to 11)
31	NC		
	(INPUT PRIME)	IN	When this signal goes to the low level, printer controller is initialized. The low level should be held for more than 0.5 ms. (Note 5)
32	FAULT	OUT	This signal goes from high to low level when paper runs out. (Possible to indicate error and off-line state.)
33	INITIAL (OV)	IN	(Note 5)
34	NC		
35	NC		
	(PULLED-HIGH)		Fixed to High (Connected to + 5 V through 3.3K)
36	SELECT IN	IN	(Note 4)

**Note 1:** Signals in the parentheses are used on IBM mode.

**2:** The jumping wire settings are as follows:

	SP1			SP2					SP3		SP4	
	A	B	C	A	B	C	D	E	A	B	A	B
TANDY Mode		○		○				○			○	
IBM Mode	○		○	○			○					○

\*Factory setting is Tandy mode.

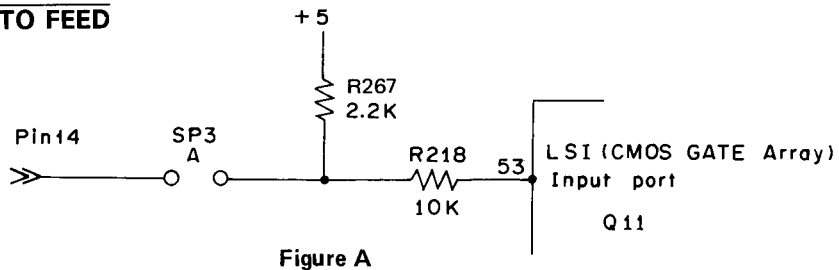
**3:** When the jumping wire is set in the SP3 A, the AUTO FEED (pin 14) is effective. Refer to Figure A below.

**4:** When the jumping wire is removed from the SP2 A and it is set in the SP2 B, the SELECT IN (pin 36) is effective. Refer to Figure B below.

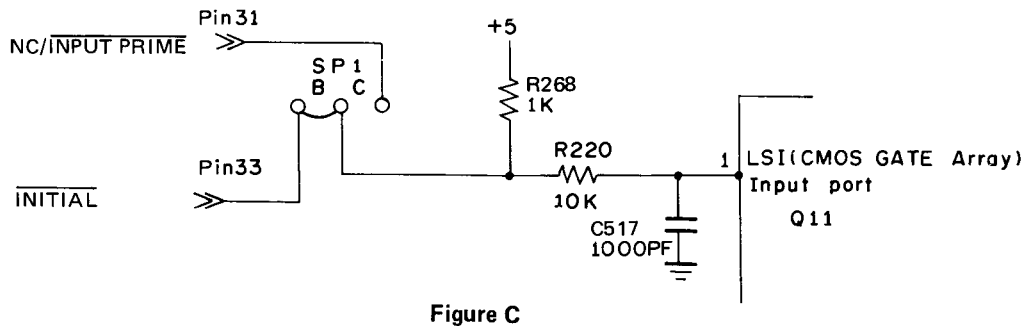
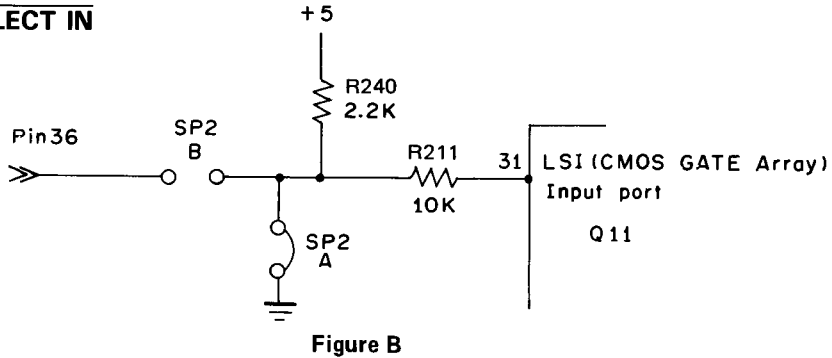
## 5: Reset Signal

Two types of reset signals are provided for Tandy and IBM mode. INITIAL is used Tandy mode, INPUT PRIME is used in IBM mode. When INITIAL or INPUT PRIME signal level reaches low level, the Q8 (80C154) detects it, and if data is in the interface buffer, the Q8 prints out all the data and performs the same initialization as the power on. If no data is in the interface buffer, it performs the same initialization as the power on. Refer to Figure C below.

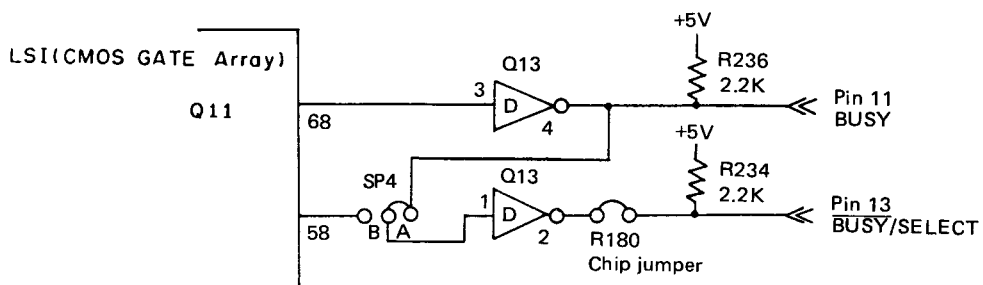
### Pin 14 AUTO FEED



### Pin 36 SELECT IN



### Pin 11 BUSY Pin 13 BUSY/SELECT



## ACKNOWLEDGE , STROBE , and BUSY Signals (See Figure 5)

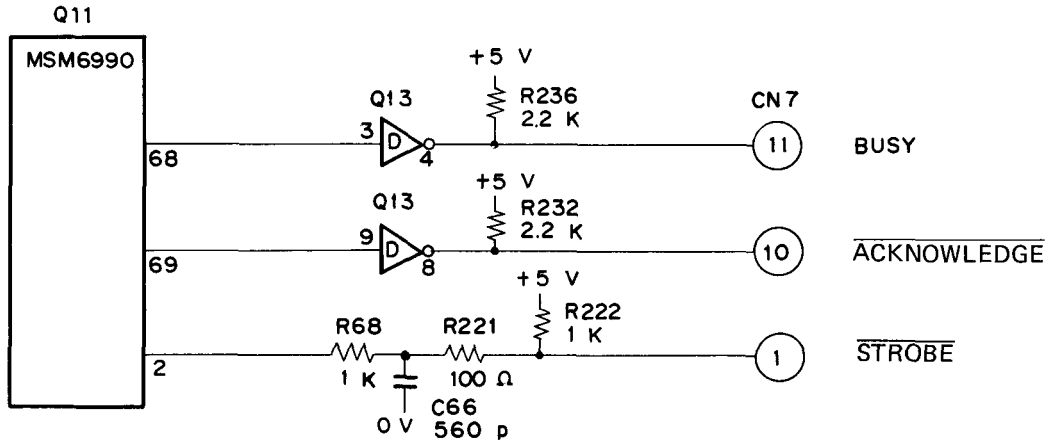


Figure 3

Signals BUSY, ACKNOWLEDGE , and STROBE are connected to the LSI Q11 (MSM6990) separately. The BUSY and ACKNOWLEDGE signals are output from the LSI when the control program sets data in the internal register of Q11. The STROBE signal is input to the LSI, and the data received is processed by Q11.

## FAULT Signal

This signal is output from Q11 (MSM6990).

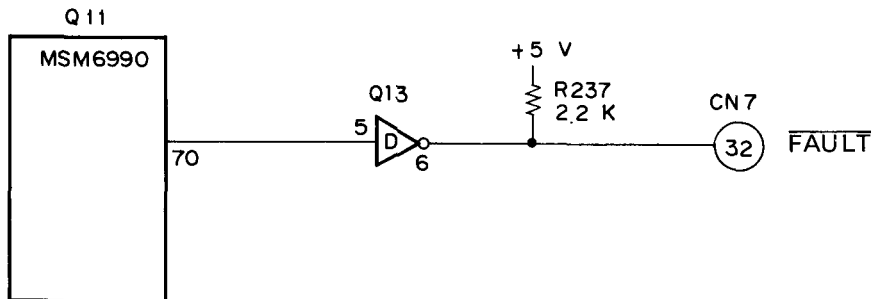


Figure 4

When printer alarm status is detected, a FAULT signal is output from CN7/32 via Q11/70 (MSM6990) and Q13.

This signal goes LOW to show that the printer is in an error state.

The following conditions will cause errors.

- 1) If a RAM error is detected during the initialization process.
- 2) If the home position is not detected during the home detection process.
- 3) If a spacing error is detected.
- 4) If a paper out is detected.

When the ON/OFF LINE and QUIET indicator is blinking due to an ERROR state caused by 1), 2) or 3), turn the switch off and then on again, or input the INITIAL signal in order to terminate the error state. The FAULT signal immediately goes HIGH if paper is inserted during the PAPER OUT condition.

### Parallel interface timing chart

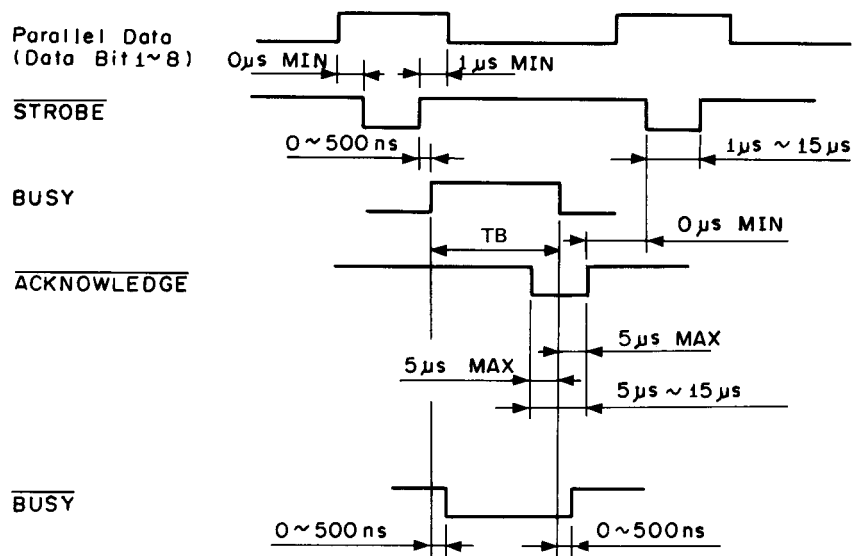


Figure 5

**Note:** The minimum value of TB (busy-on time) is  $20\mu s$ , and the maximum value is the time spent for printing, carriage return, and line feed.

## Performing a Self Test

The DMP 300 has a built-in self-test feature to check the print quality and general printer operation.

Before running the self test, be sure to load paper that is 8.5 to 11 inches wide.

**Caution:** Printing on the platen can shorten the life of the platen and the print head.

To run the self test:

1. Press and hold the LINE/FORM switch.
2. Set the POWER switch to ON. The DMP 300 will print the ASCII 96 characters in various fonts.
3. Press this ON/OFF LINE switch. The printer will finish printing the current line before stopping and returning to its default state.

# Block Diagram

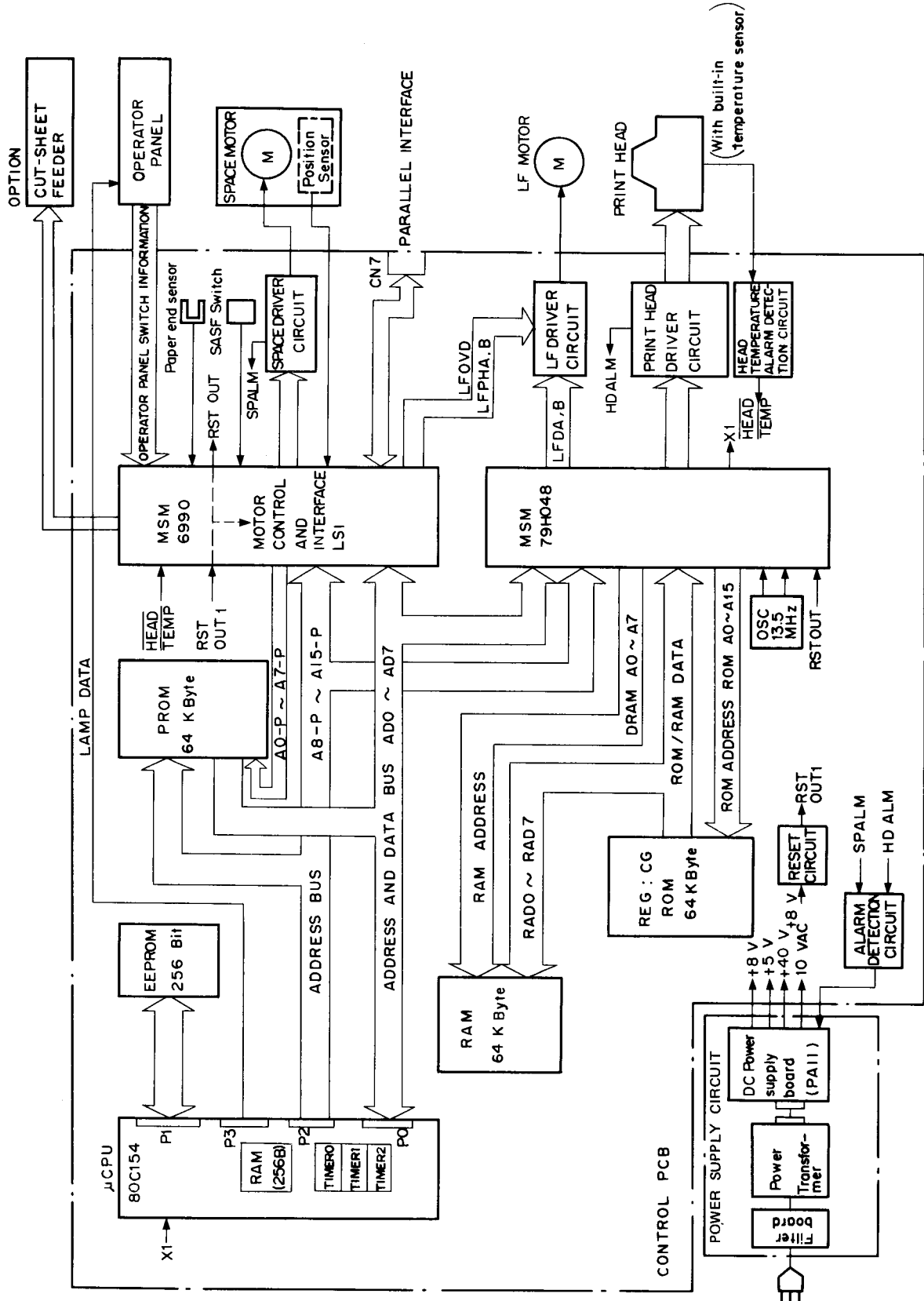


Figure 6



# Power Supply Unit

The power supply unit consists of a filter board, a power transformer, and the secondary power PCB (PAII PCB). For each part location, see the Power Supply Unit Waveform.

## Filter PCB

An inlet, an AC switch, an AC fuse, and noise filter circuitry are incorporated in a single mold PCB.

## Power Transformer

Secondary outputs are: Motors and head drive power (46 VAC), logical circuit power (9.6 VAC), and interface power (10 VAC).

## Secondary Power PCB

### 1) Motors and head drive power (40 V)

This power is regulated to 40 V output by the separate excitation chopper method.

The output from the transformer is rectified by the rectifier stack (D1), and smoothed by C1. The feedback voltage, that is, the output voltage divided by R10 and R11, is then input to IC2 (M5291), to cause alteration in the electric potential, which turns Q1 on and off repeatedly. The result is pulse voltage output to the Q1 collector. This pulse output is smoothed by L1 and C5, to provide a 40 V stabilized output. The 40 V output voltage may drop depending on the AC input voltage or printing duty. This power unit features an overvoltage and overcurrent detection circuit, as protection.

At a printer alarm, a thyristor (D2) in this protection circuit turns on to blow the AC fuse on the primary side.

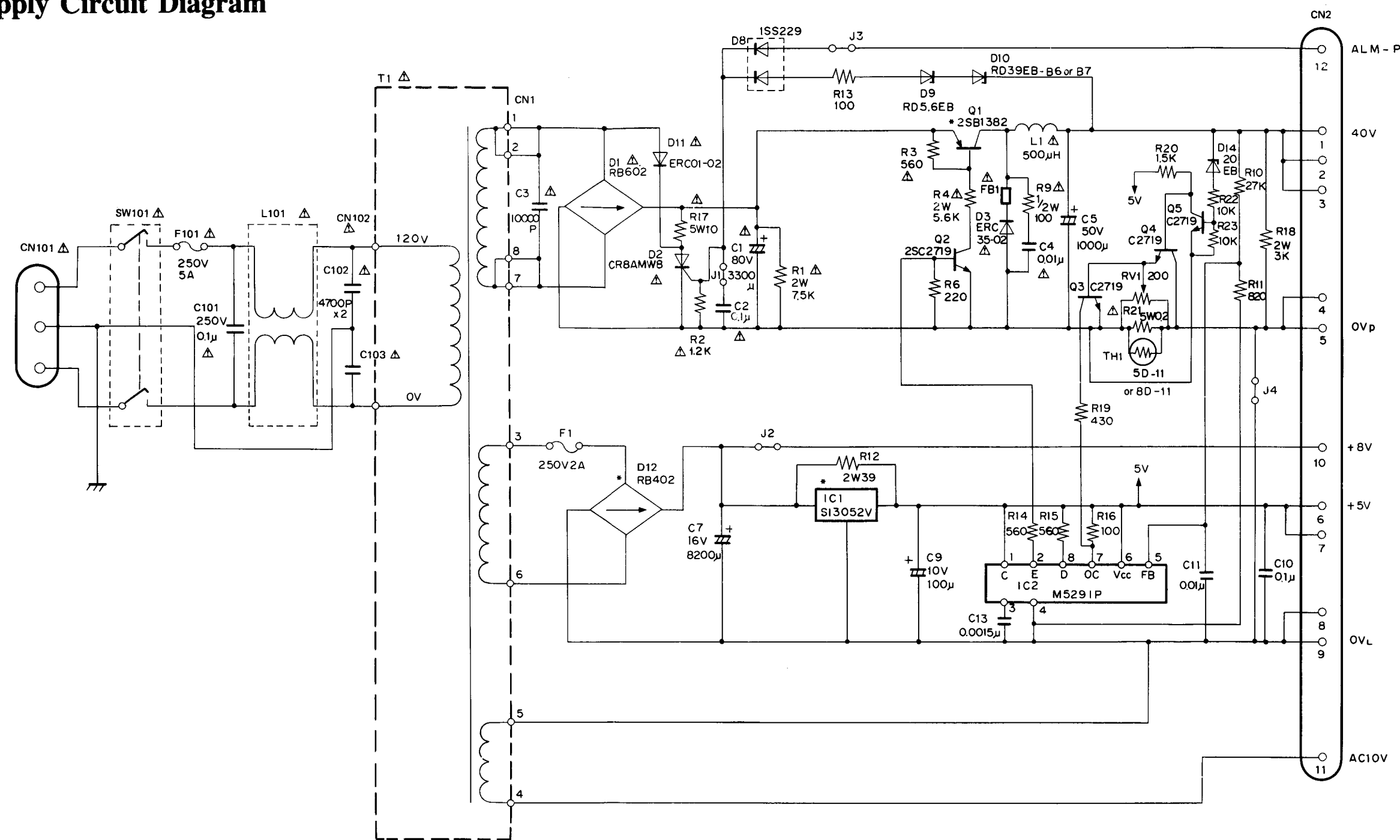
### 2) Logic system power

The output from the transformer is rectified by the rectifier stack (D12), and is smoothed by C7. This power is divided, and one is output as an 8 V free running power supply, while the other is regulated by IC1 (SI3052V) and is output as a 5 V steady power supply.

A fuse (F1) serves as a protection against overcurrent.



Power Supply Circuit Diagram

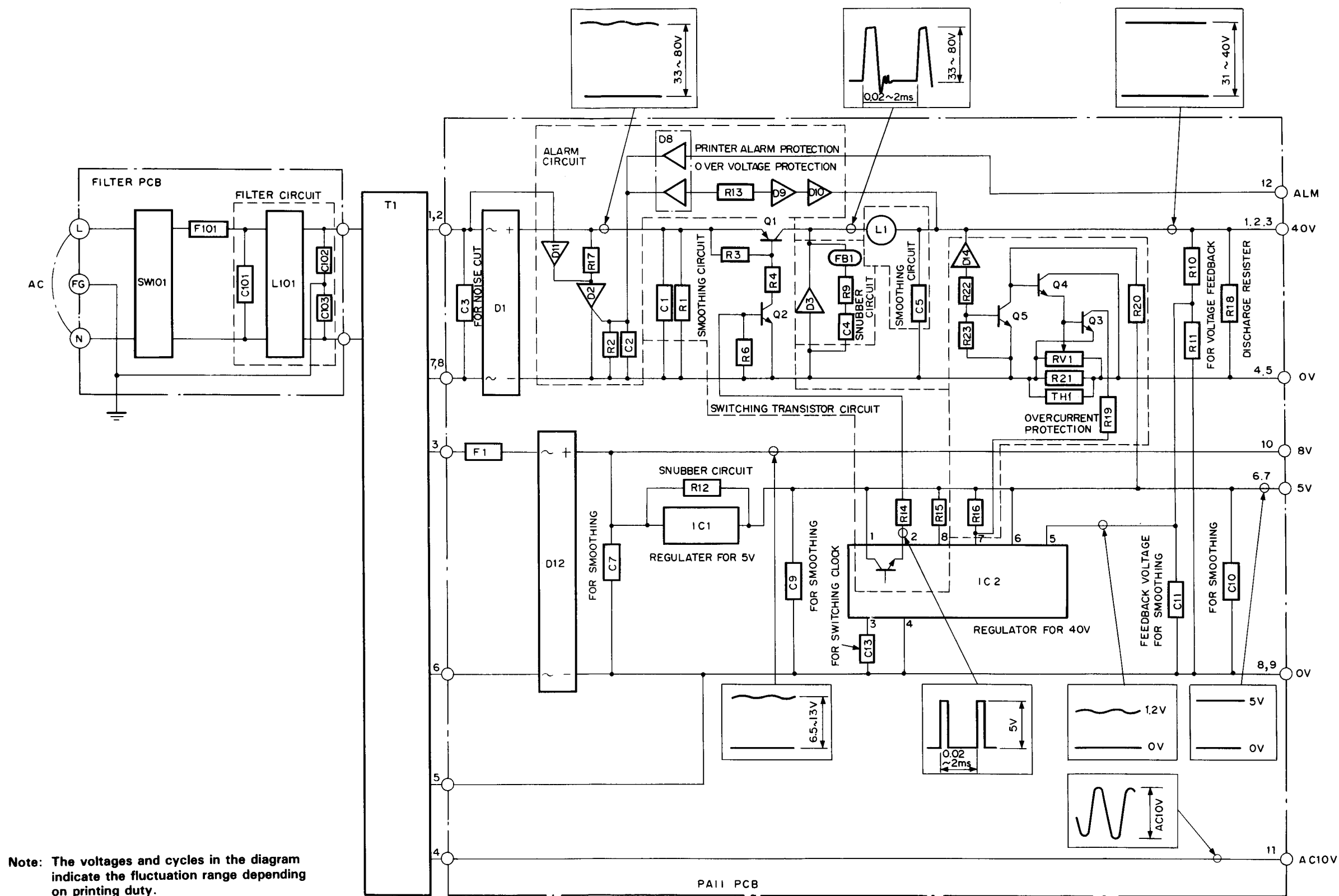


NOTE: RESISTOR VALUES ARE IN [Ω] UNLESS OTHERWISE SPECIFIED.  
CAPACITOR VALUES ARE IN [μF] UNLESS OTHERWISE SPECIFIED.  
\* WITH HEAT SINK.

Figure 7



Power Supply Unit Waveform



Note: The voltages and cycles in the diagram indicate the fluctuation range depending on printing duty.

Figure 8



# Control PCB

## Control Circuit

### Pin driving signals

MOTS-PCB CN11

CN11 pin No.	Head pin No.	CN11 pin No.	Head pin No.
2	# 1	19	# 2
3	# 3	18	# 4
22	# 5	35	# 6
23	# 7	34	# 8
4	# 9	17	# 10
5	# 11	16	# 12
24	# 13	33	# 14
25	# 15	32	# 16
8	# 17	13	# 18
9	# 19	12	# 20
10	# 21	11	# 22
28	# 23	19	# 24

### Description of the circuit

This circuit implements printing by driving the head coils corresponding to the head data 1 to 24 (head pin number), according to  $\overline{\text{HDDV}}$  and  $\overline{\text{EN}}$  signals.

When the  $\overline{\text{HDDV}}$  signal is at low level, the head drive time is determined by the  $\overline{\text{HDDV}}$  signal pulse width and CR integrating circuit. The  $\overline{\text{HDDV}}$  signal pulse width is automatically determined and changed by Q6 (MSM79H048), depending on the number of head drive pins.

Since the drive voltage changes according to the number of head pins to be driven, the drive time is modified by the CR integrating circuit. Specifically, when many pins are to be driven, the drive time is extended to compensate for the voltage drop, while the time is shortened when fewer pins are to be driven.

## Head drive timing chart

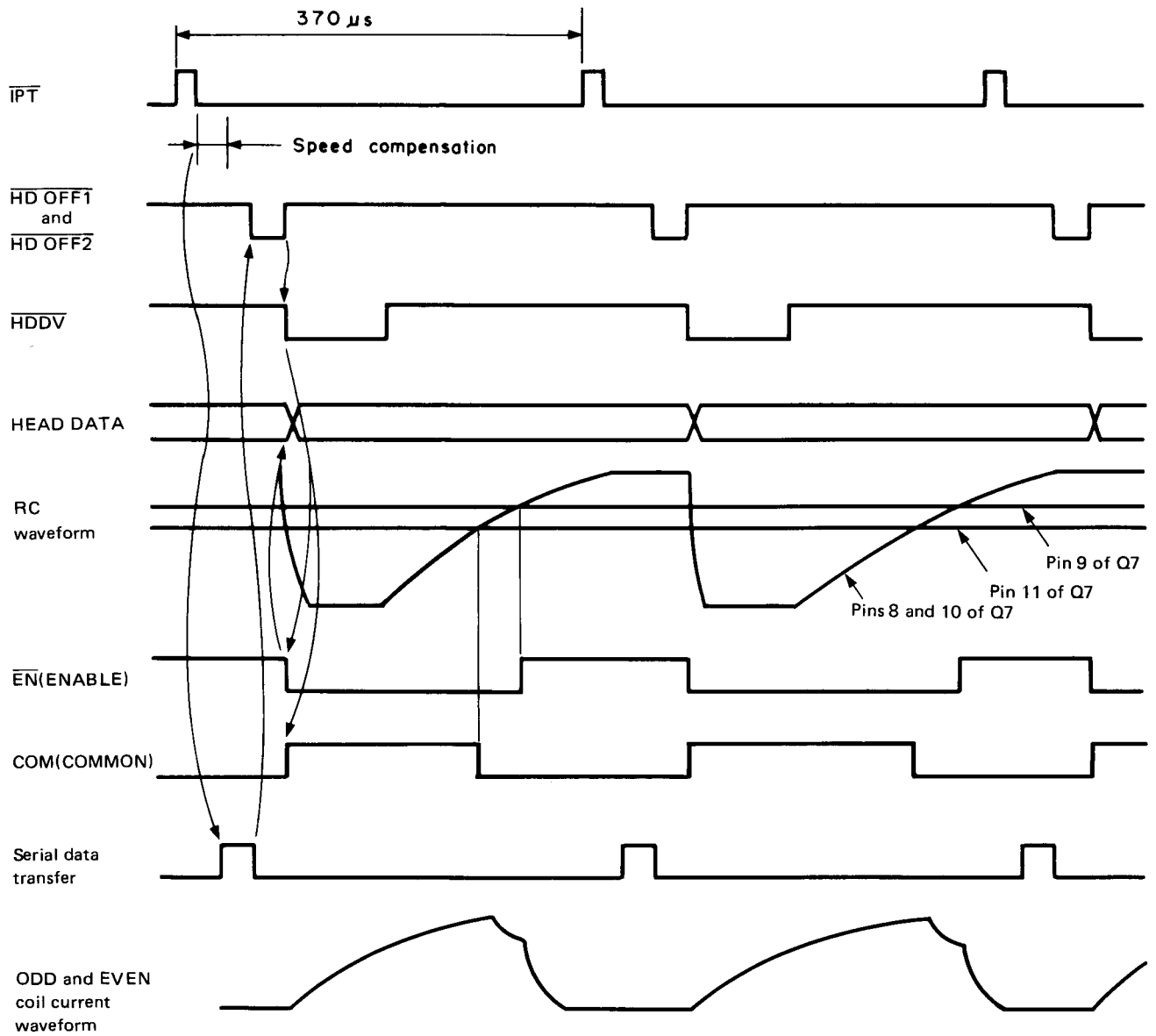


Figure 9



## Head carrier driving signals

### 1) Space motor control

The motor control LSI (Q11: MSM6990) outputs the space motor phase signals (SP-U, SP-V, and SP-W) in accordance with the spacing command from the microprocessor, and at the same time outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal whose pulse width is controllable by the program, and is used to control the motor drive time.

The SP ON/OFF signal is output for acceleration and deceleration requiring a larger torque.

The motor driver (MTDV) drives the space motor in accordance with these signals. Pins 9 and 11 of the MTDV are for the protective circuits against overvoltage and overcurrent, respectively.

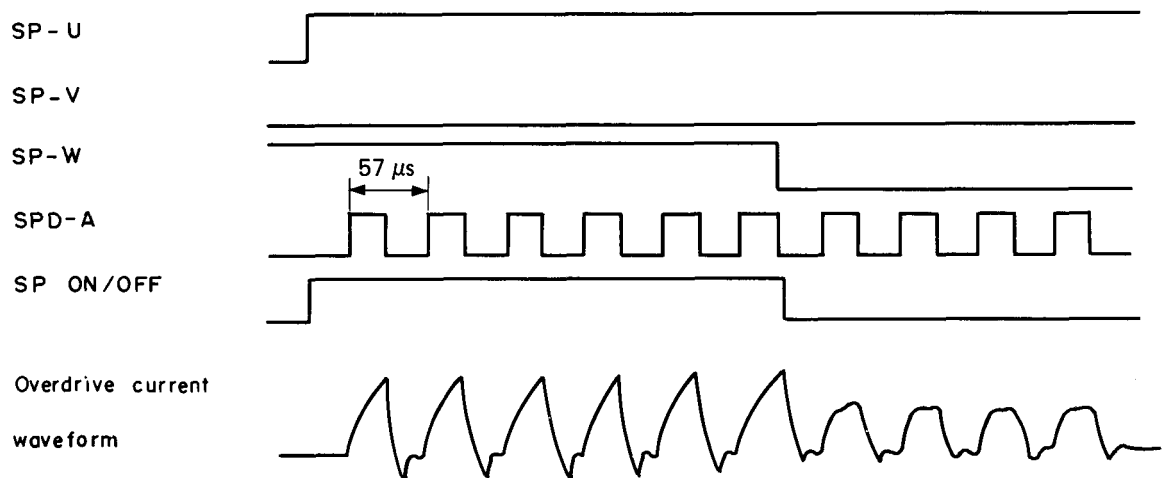


Figure 10

## 2) Slit encoder

With operation of the space motor, the PHASE-A and PHASE-B signals are generated by the photosensor and disk slit.

The motor control LSI (Q11: MSM6990) frequency divides these edge pulse signals in accordance with the print pitch, and outputs the IPT signal to provide dot-on timing and carriage position detection timing.

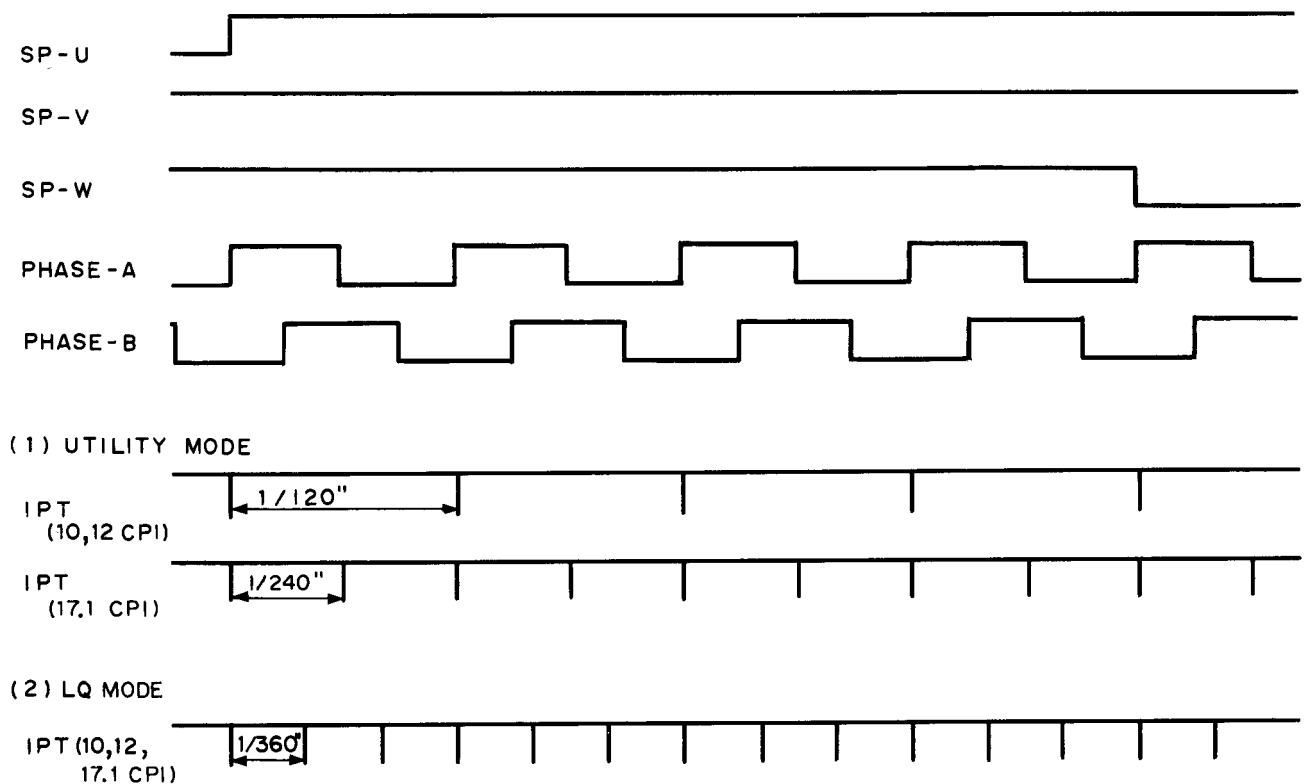


Figure 11

## Line feed signals

The line feed motor is locked with the LF HOLD signal (minute current: approx.25mA) while it is at a stop.

During line feed operation, the line feed motor is driven by a large current supplied in accordance with LF OVD signal.

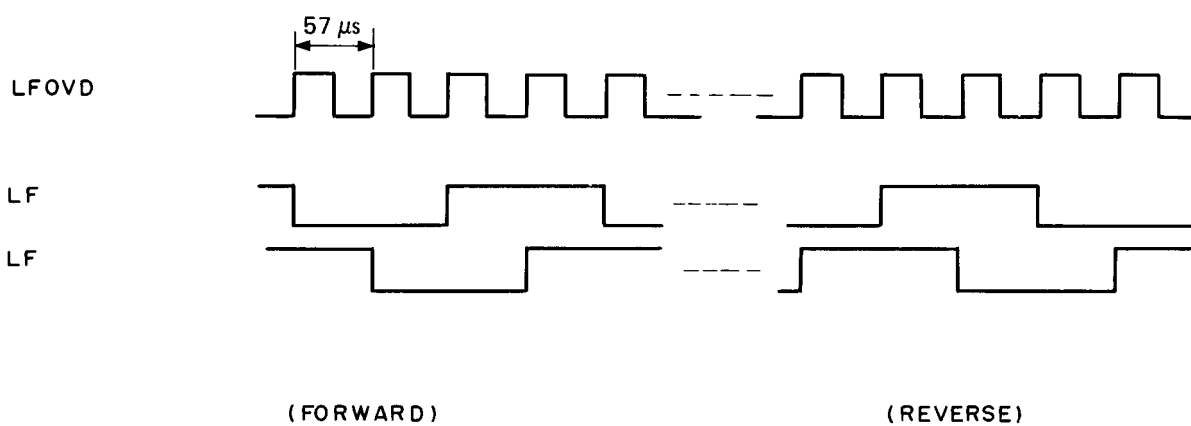


Figure 12

## Reset circuit

The reset circuit features a Q7 (NJM2901) comparator. When the printer is reset, an RST OUT 1 signal is input to pin 67 of Q11 (MSM6990) from pin 1 of Q7, to reset Q11, and the signal is posted from pin 88 of Q11 to Q8 (80C154) and Q6 (MSM79H048), to reset them. When Q11, Q8, and Q6 are all reset, the +5 VD transistor TR129 is turned on and supplies +5 VD power to each block.

Power on, power off timing chart

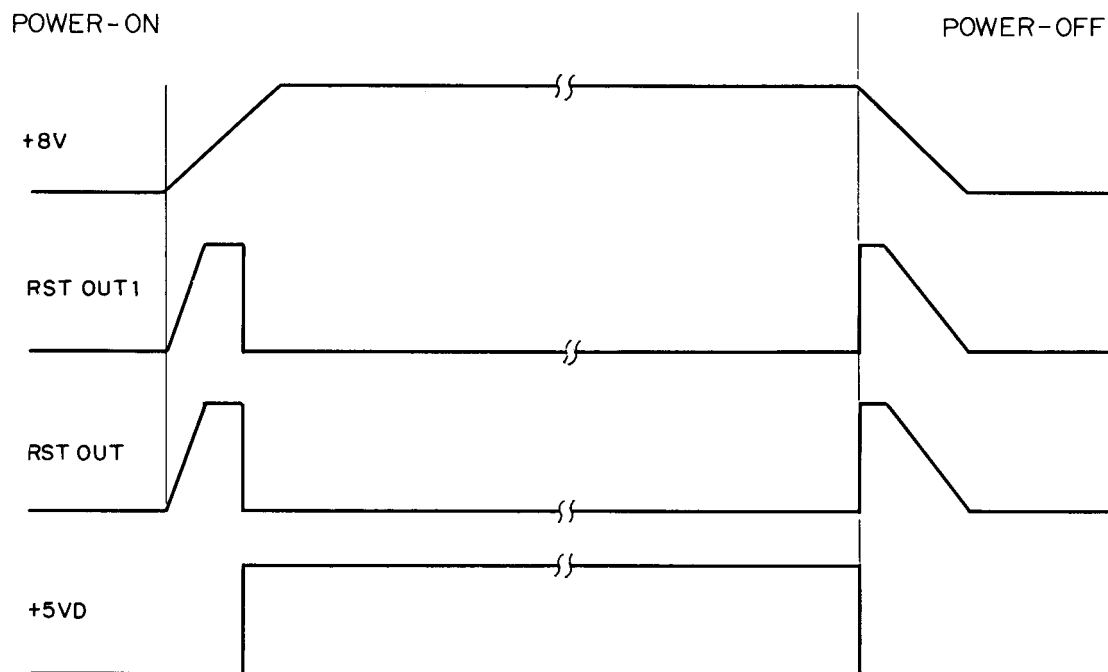


Figure 13

### Space motor alarm timing chart



**Figure 15**

## PAPER END Signal

This printer features a sensor to detect when the paper nears the end. When the end of the paper is approached, the Paper End signal level on the interface becomes high.

### Circuit diagram

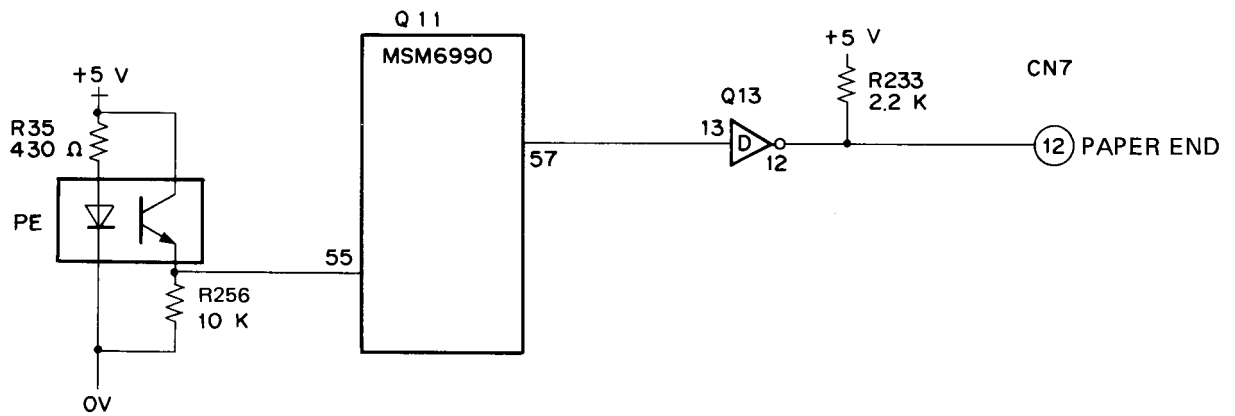


Figure 16

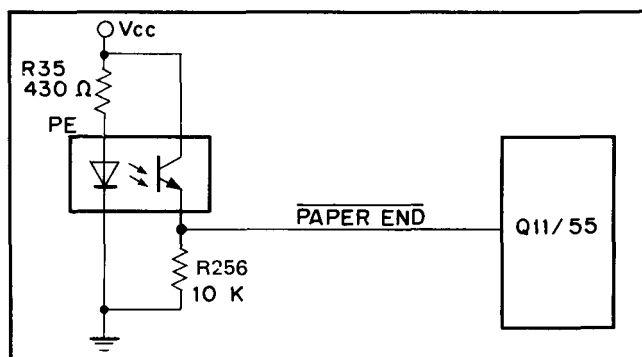
## Lamps and Switches

There are 7 LED lamps and 4 push switches on the front panel of the printer.

	Function	Signal Flow
ON/OFF LINE indicator	Lights when the printer enters the on-line state and starts flickering when the printer enters the print-suppress mode or when a malfunction is off line. Blinks for an alarm.	CN1/4 → Q8/2
QUIET indicator	Two-pass printing.	CN1/5 → Q11/72
LQ indicator	Letter-quality mode selected.	CN1/6 → Q8/1
12 indicator	12 CPI character pitch selected.	CN1/7 → Q8/44
17 indicator	17 CPI character pitch selected.	CN1/8 → Q8/5
PS indicator	Proportional mode selected.	CN1/9 → Q8/7
POWER indicator	Lights when power is turned on.	5 V
ON/OFF LINE switch	Changes the printer to on line/off line state.	CN1/12 → Q11/41
LINE/FORM switch	Feeds paper one line. Feeds paper to the next TOF position when this switch is kept pressed for a short time.	CN1/13 → Q11/42
QUIET/PARK switch	On Line: Switches the printing mode from usual printing to quiet printing, and vice versa. Off Line: Reverse feeds paper out of the platen-local paper path, but not out of the push tractor.	CN1/14 → Q11/43
LQ/DP PITCH switch	On Line: Changes the Print Quality Letter Quality/Utility mode. Off Line: Selects the print character pitches 10 CPI, 12 CPI, 17 CPI or proportional mode.	CN1/15 → Q11/44

## Detecting Circuit

### Paper End Sensor



$\overline{\text{PAPER END}} \leq 0.8 \text{ V} : \text{paper loaded}$

$\overline{\text{PAPER END}} \geq 2.2 \text{ V} : \text{paper empty}$

Figure 17. Paper Empty Detecting Circuit

When the paper runs out, the photosensor (PE) on the control board is turned off, and as a result, the  $\overline{\text{PAPER END}}$  signal becomes 0. This signal is fed to pin 55 of the motor control LSI (Q11), causing the printing operation to be stopped and the ON/OFF LINE indicator to blink.

### Semi-Automatic Sheet Feeding (SASF) Switch

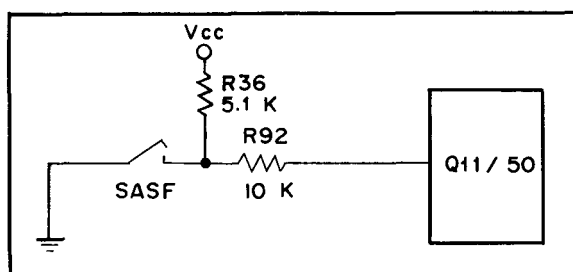


Figure 18. Semi-Automatic Sheet Feeding Switch Circuit

This function enables automatic paper setting to print at the starting position, for cut-form or continuous-form paper.

To use cut-form paper, press the PARK switch on the operating panel. Continuous-form paper already set is automatically saved in the position, where the top of the paper is aligned with the push tractor.



## Pin Overheat Detector

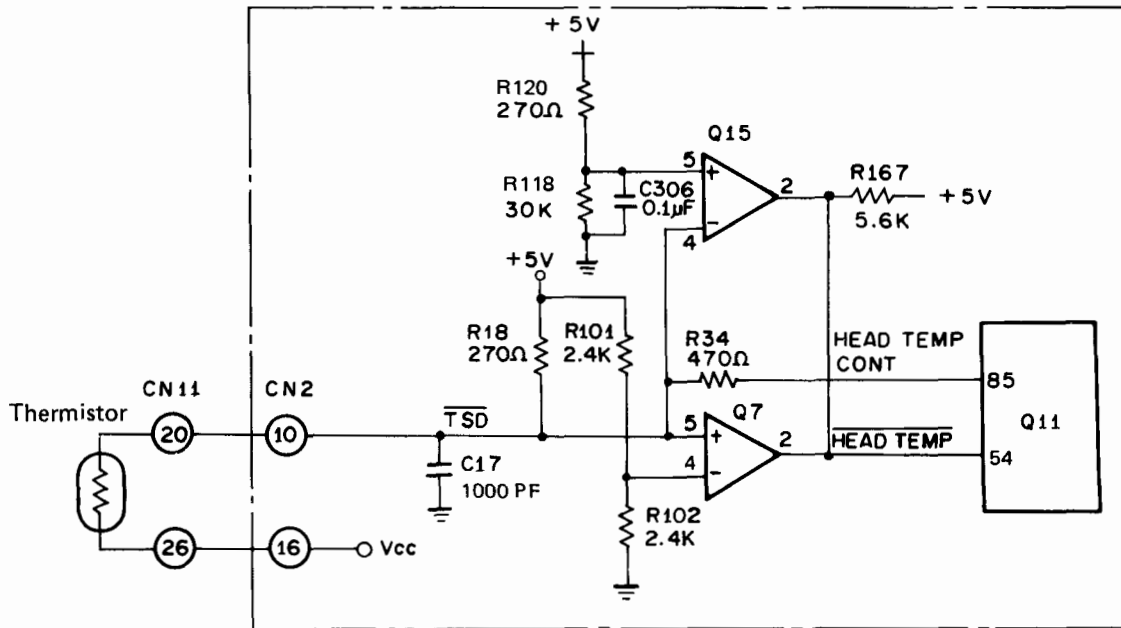


Figure 19. Pin Overheat Detecting Circuit

In order to protect the head coils, this circuit monitors the head temperature using the built-in thermistor of the print head.

If heavy-duty printing is performed continuously for a long time, the print head temperature rises. When the head temperature reaches a certain value, a head overheat alarm is detected.

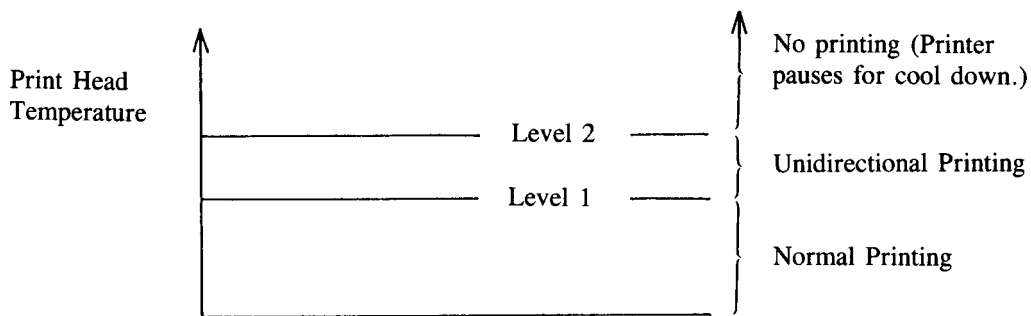
When the alarm is detected, the printing operation is halted to wait for the head temperature to lower. When the head temperature returns below the alarm detection temperature, the printing operation is restarted.

This overheat detection circuit operates in two stages. At the first temperature trip point, the printer begins unidirectional printing. At the second trip point, the printer pauses for cool-down.

The first temperature trip is brought on at level 1 of the temperature in the print head, and the second trip point is at level 2 of the temperature as listed in the logic table below:

Q11, Pin 85 HEAD TEMP CONT	Q7, Pin 5 DC Voltage	Q7, Pin 11 DC Voltage	Q15, Pin 5 DC Voltage	Q7, Pin 2 HEAD TEMP DC Voltage	Print Head Temperature	Printing Operation
0 V	2.5 ~ 4.95 V	2.5 V Constant	4.95 V Constant	+ 5 V	< Level 1	Normal
	0 ~ 2.5 V			0 V	> Level 1	Unidirectional
Open	2.5 ~ 4.95 V	2.5 V Constant	4.95 V Constant	+ 5 V	< Level 2	Unidirectional
	0 ~ 2.5 V			0 V	> Level 2	Paused
	4.95 ~ 5 V			0 V	> Level 2	Paused

Printing Operation



The alarm detection is performed as follows. (Refer to Figure 19 and the logic table above.)

The head temp cont signal comes out from pin 85 of Q11 each time prior to the printer printing each line. This is to sense whether the HEAD TEMP signal is + 5 V or 0 V, corresponding with each state of the 0 V or open at pin 85 of Q11.

If the HEAD TEMP signal receives the 0 V state from either Pin 2 of Q15 or Pin 2 of Q7, the HEAD TEMP signal becomes 0 V because both comparator transistors Q7 and Q15 are of open collector output.

When the temperature in the print head rises, the resistance of the thermistor lowers. The potential of the comparator (Q7) positive input (pin 5) lowers to invert the comparator output from + 5 V to 0 V. This causes the HEAD TEMP signal to be output to the printer motor control circuit of Q11. This forces the printer to begin unidirectional printing when the print head temperature reaches level 1, and to pause for cool-down when level 2 is reached.

When the thermistor circuit is disconnected due to a broken thermistor or an equivalent condition such as poor connector contact, etc., the HEAD TEMP signal becomes 0 V and the print head temperature goes up to level 2. The Q15 negative input pin 4 is between 4.95 V and 5 V which is higher than the positive input pin 5, and the output pin 2 is 0 V, causing the HEAD TEMP to be 0 V. This makes the print head temperature become level 2, causing the printing operation to pause for cool-down.

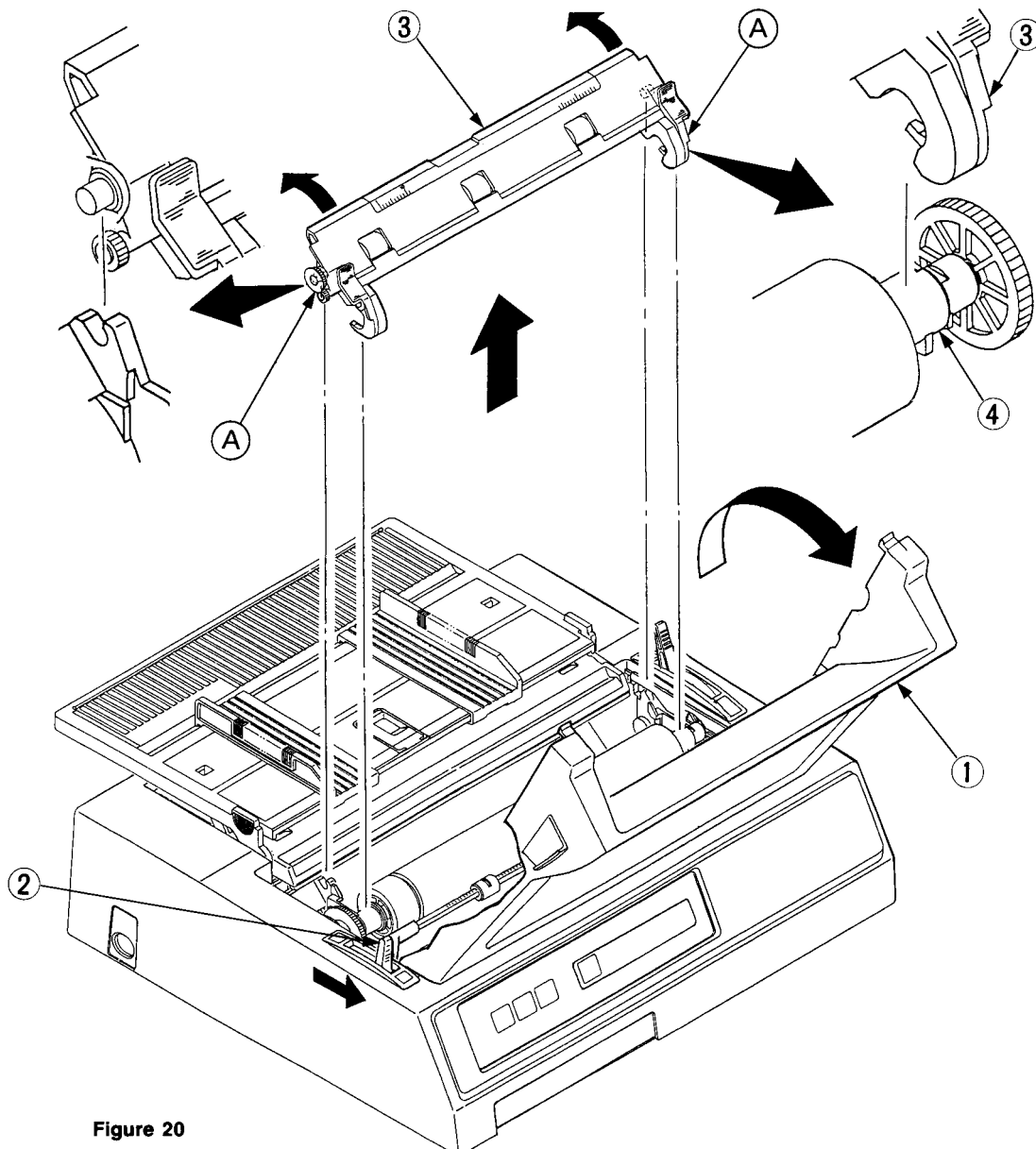
## Replacement and Adjustment

Refer to the exploded view and the parts list for identification of the reference numbers.

The procedures explained apply to removing the assemblies. Reverse the procedures, when reinstalling the assemblies.

## Separator Assembly

- 1) Open access cover ①.
- 2) Move bail lever forward.
- 3) Tilt separator assembly ③ backward by lock lever ④A to release it from the platen assembly shaft ④.



**Figure 20**

## **Print Head**

- 1) Open the access cover ①.
- 2) Remove the ribbon cassette ②.
- 3) Move the head clamp ③ 90° to the left to unlock the print head ④.
- 4) Remove the print head ④ from the carriage frame ⑤.

### **Notes on installation:**

- 1) Push the print head ④ down into the connector ⑥ while guiding it into the carriage frame ⑤.
- 2) Position the head clamp ③ securely between the print head ④ and the carriage frame ⑤.

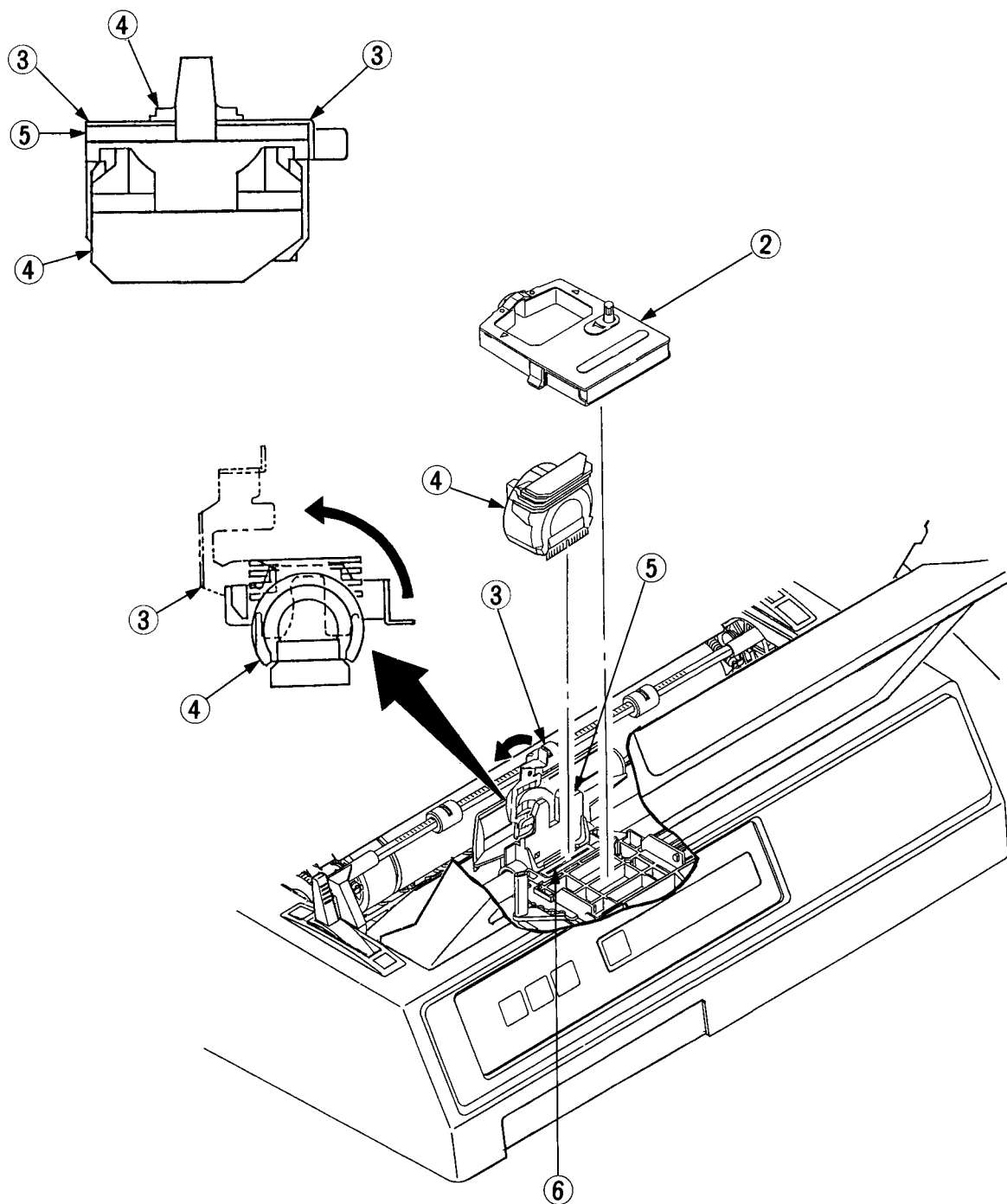


Figure 21

## **Upper Cover Assembly**

- 1) Remove the platen knob ①.
- 2) Insert a flat-blade screwdriver through slots ② in the main frame and disengage the claw ③ of the upper cover.
- 3) Lift the front of the upper cover assembly ④ and detach it by pushing backward and pulling up.
- 4) Open and take out the access cover ⑤ from the middle cover ⑥.
- 5) Remove the sheet separator ⑧ from the rear cover ⑦.
- 6) Remove the rear cover ⑦ from the middle cover ⑥.

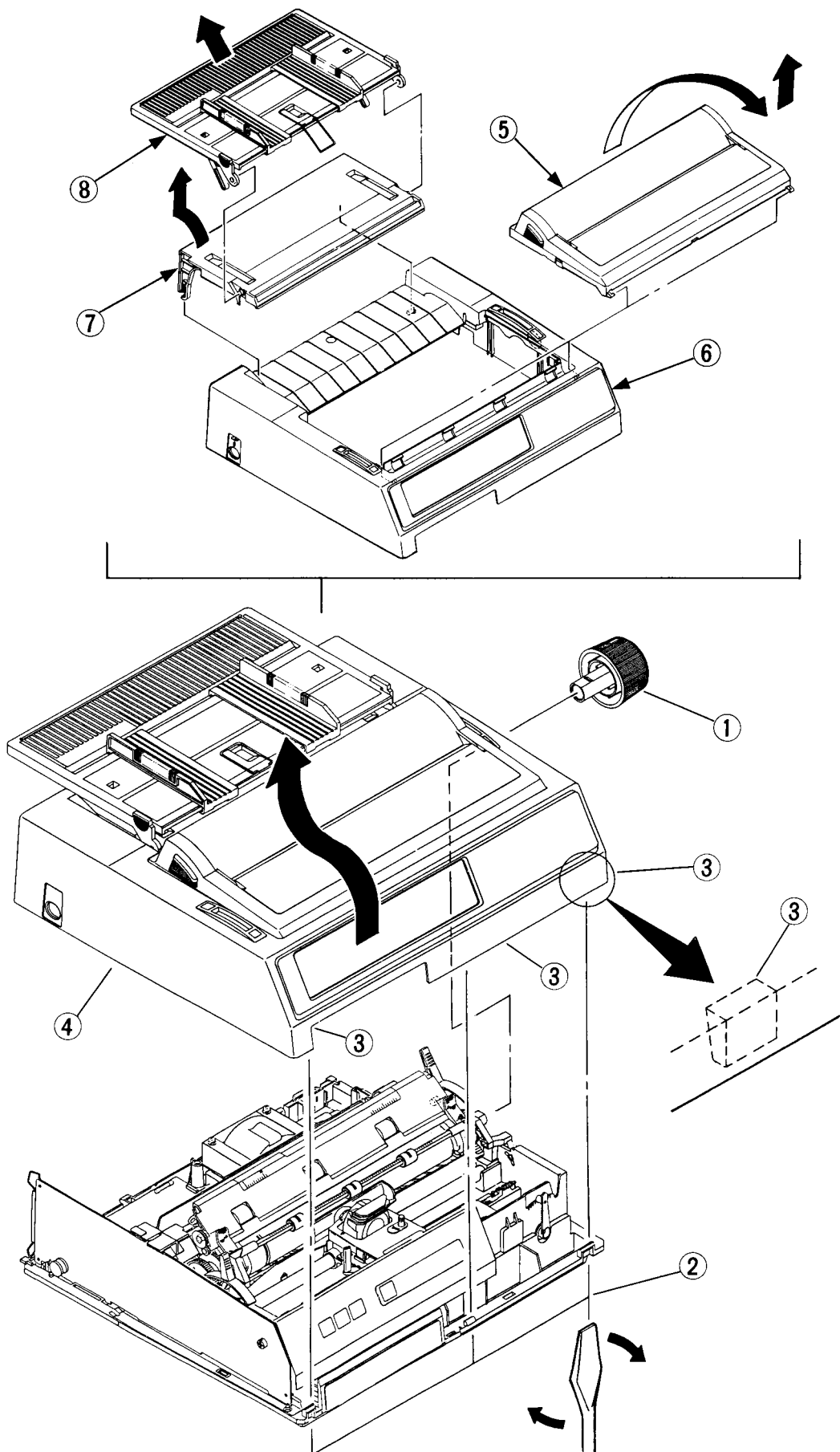


Figure 22

## Ribbon Drive Gear Assembly

- 1) Remove the upper cover assembly. (See page 38.)
- 2) Remove the ribbon cassette ①.
- 3) Detach two front claws ② and two rear claws ③ by pushing the claws outward with a flat-blade screwdriver inserted through the hole ④.
- 4) Pull upward to remove the ribbon drive gear assembly ⑤.
- 5) Remove the head cable ⑥, and rubber pressure contact ⑦ from the drive assembly.

### Notes on installation:

- 1) Do not touch the exposed terminals (crimp terminals) ⑧ on the carriage cable ⑥ and space motor assembly ⑧. Protect these terminals from dirt and dust.
- 2) Do not bend the head cable ⑥ at acute angles or creasing of the cable could occur.

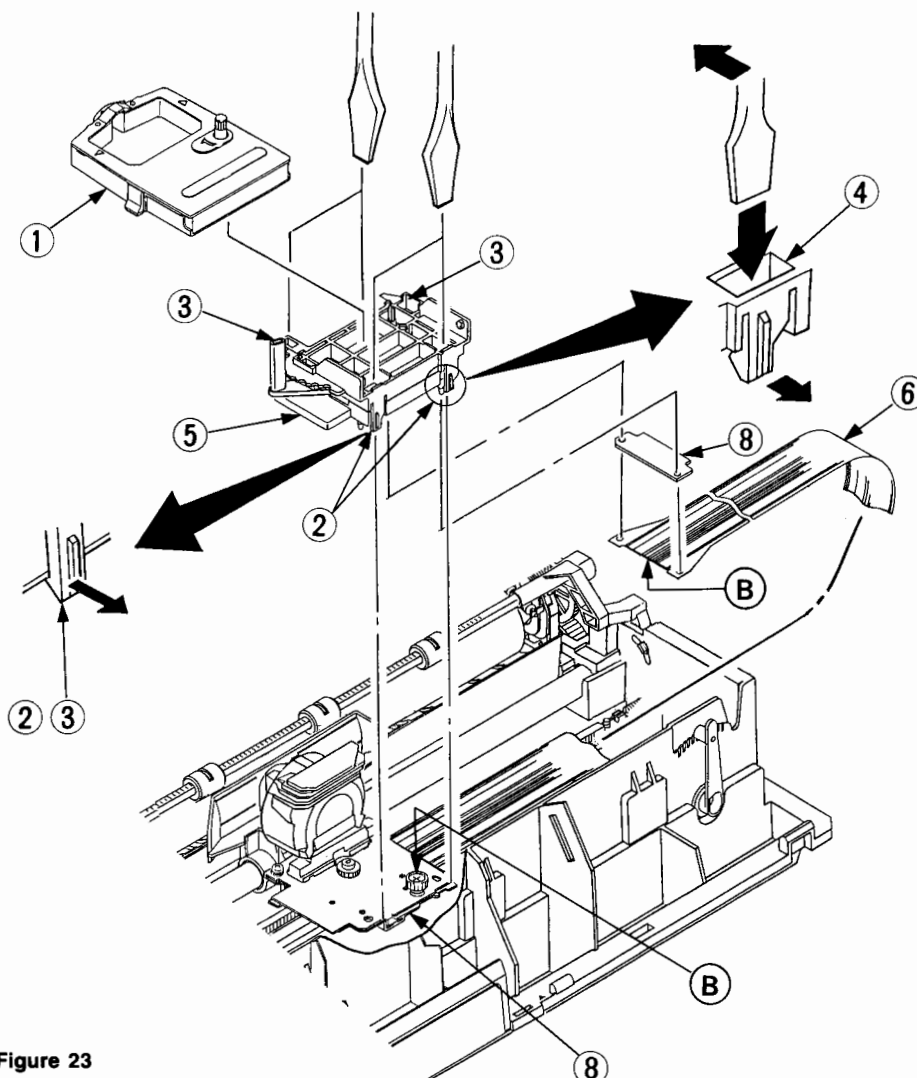


Figure 23



## Space Motor Assembly

- 1) Remove the ribbon drive gear assembly. (See page 40.)
- 2) Remove the connector ① noting the position indentation in its surface.
- 3) Remove the three screws ②.
- 4) Remove the space motor assembly ③. Be careful not to lose the slider ⑤.

### Notes on installation:

- 1) Do not touch the exposed terminals (crimp terminals) ① on the space motor assembly ③. Protect such terminals from dirt and dust.
- 2) Install the space motor assembly ③ by fitting portion ③ to the carriage frame ④ and aligning the surface ③ with the corresponding carriage frame surface.
- 3) Install the slider ⑤ by fitting the portions ⑤ and ⑤ to the space motor assembly. Make sure the groove of the slider is positioned over the lip of the guide rail.
- 4) After installing the ribbon drive gear assembly, check and adjust the gap between the platen and print head. (See page 51.)

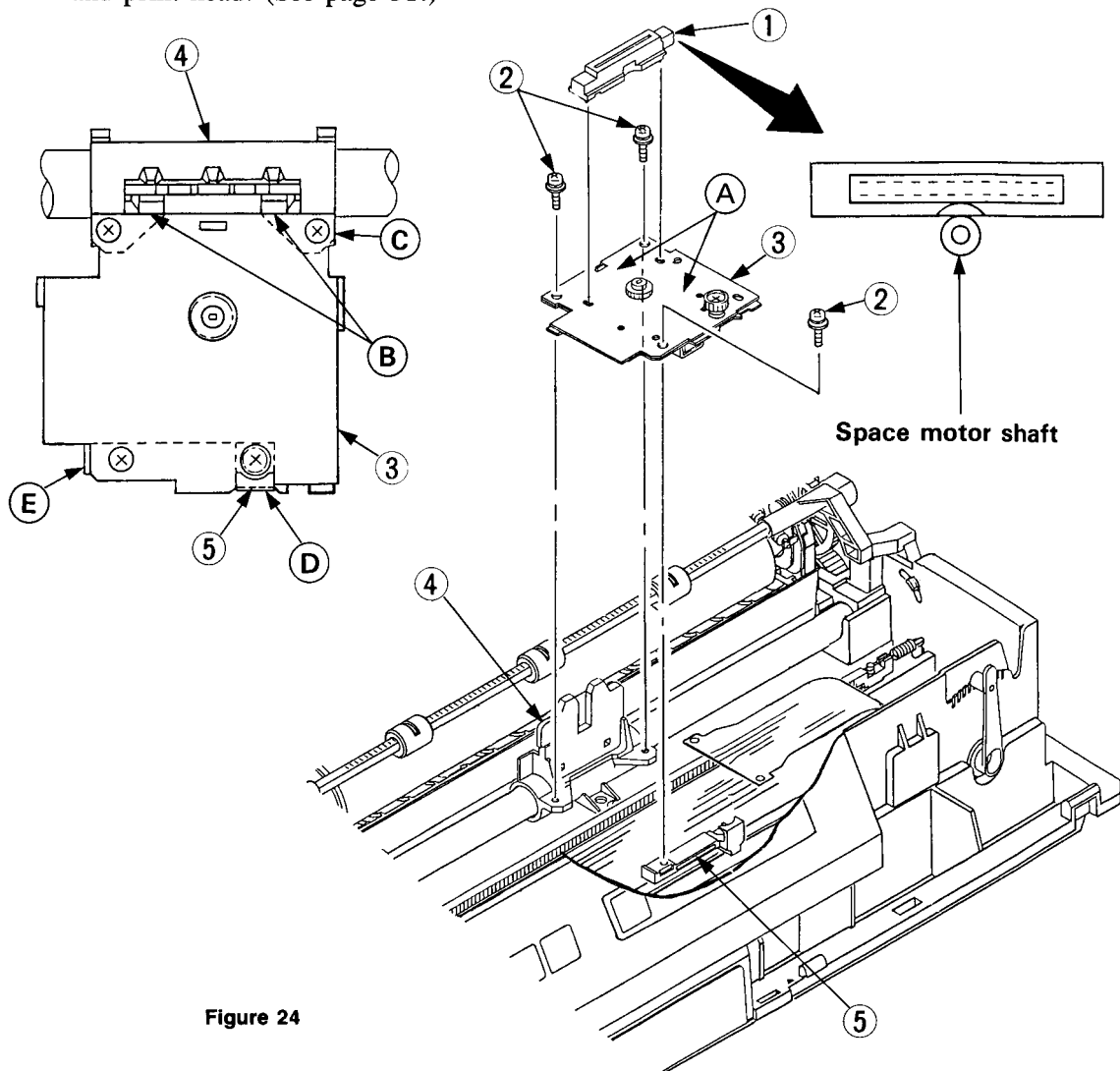


Figure 24

## Carriage Frame

- 1) Remove the space motor assembly. (See page 41.)
- 2) Remove the head clamp ①.
- 3) Remove the ribbon protector ②. (See page 50.)
- 4) Push the shaft clamp ③ to the left on the main frame and lift the left end of the carriage shaft ④. Then, pull the right end of the shaft out from the guide hole ⑤, removing it together with the carriage frame ⑥.
- 5) Pull out the carriage shaft ④ from the carriage frame ⑥.

### Notes on installation:

- 1) After installing the carriage frame, adjust the gap between the platen and print head. (See page 51.)

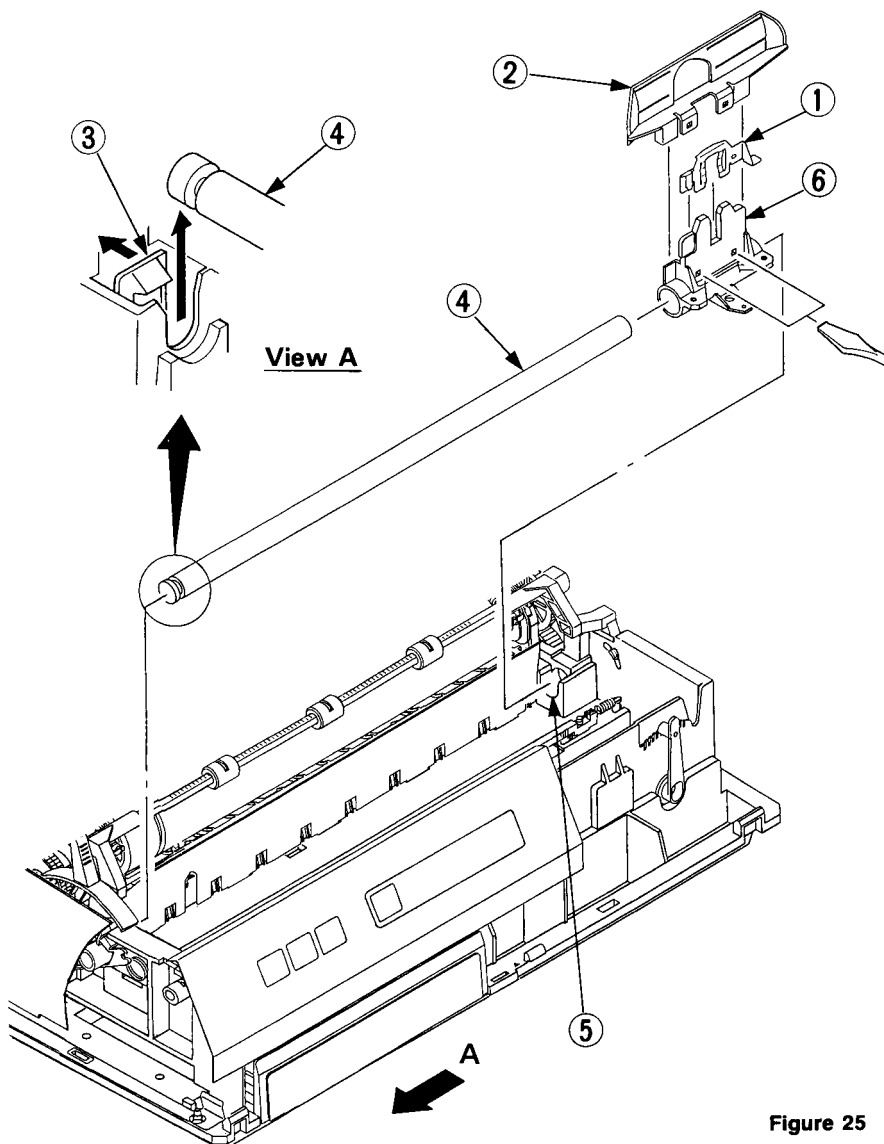


Figure 25

## Space Rack

- 1) Remove the space motor assembly. (See page 41.)
- 2) Remove the spring ①.
- 3) Pull the space rack ④ upward while disengaging the claw ③ from the insertion hole ② in the main frame. Remove the space rack.

### Notes on installation:

- 1) When installing the spring ①, twist its right end 90° counterclockwise.
- 2) Install the rack so that it connects into the two guide holes ⑤ and ⑥.
- 3) After installing the space motor assembly, check and adjust the gap between the platen and print head assembly. (See page 51.)

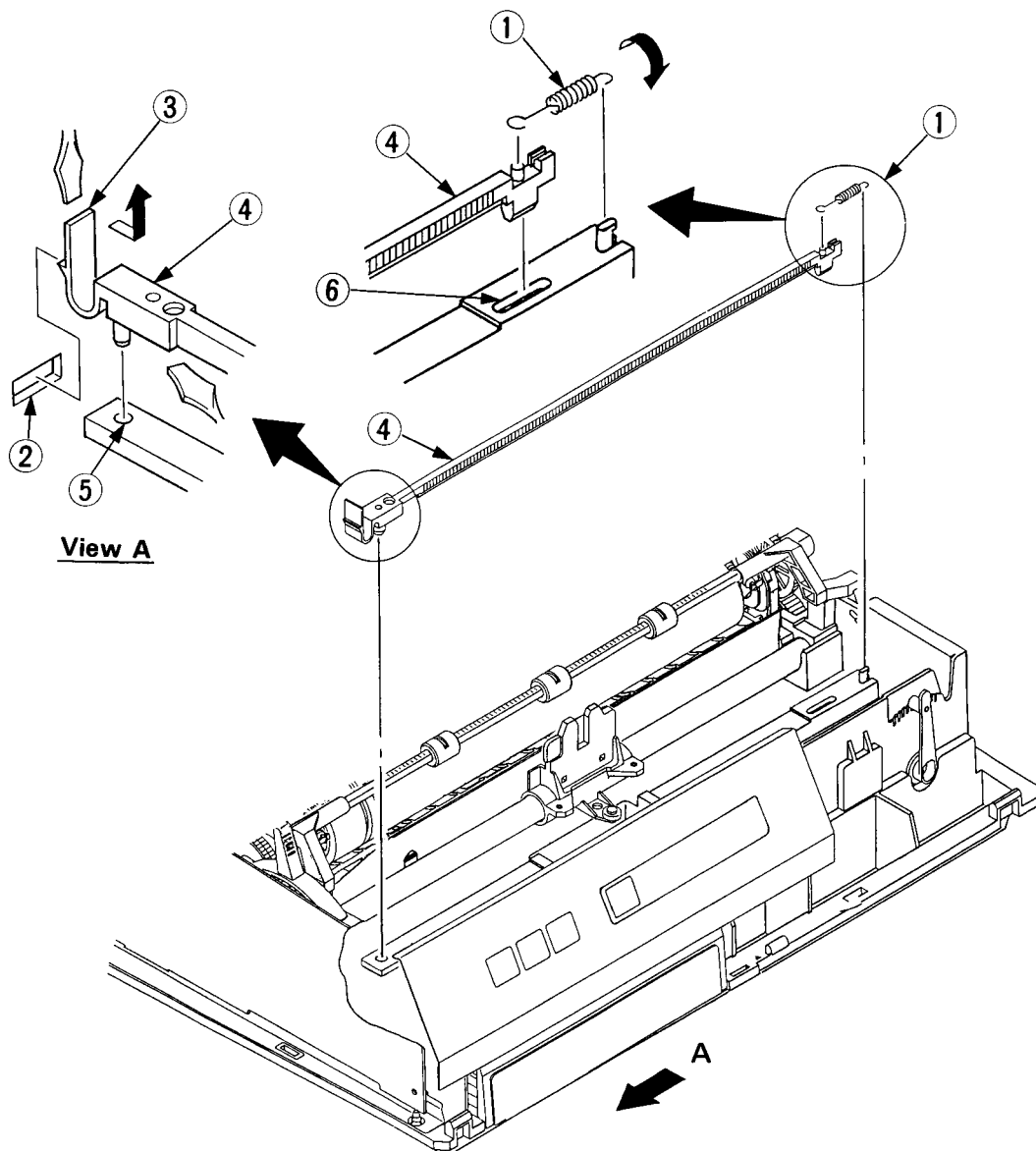


Figure 26

## Guide Rail

- 1) Remove the space motor assembly. (See page 41.)
- 2) Remove the adjusting cam ① as follows:
  - a) Pull portion ④ of the adjusting cam ① outward and turn it clockwise until it is in a horizontal position.
  - b) Remove the cam by pulling it outward through the guide ③ in the main frame ②.
- 3) Push the claw ④ outward and disengage it from the left end of the guide rail ⑤.
- 4) Remove the right end of the guide rail ⑤ by pulling it from the guide ⑥ in the main frame and lifting it out.

### Notes on installation:

- 1) Install the guide rail so that it seats over the two guide pins ⑦ and ⑧.
- 2) After installing the guide rail, adjust the gap between the platen and print head. (See page 51.)

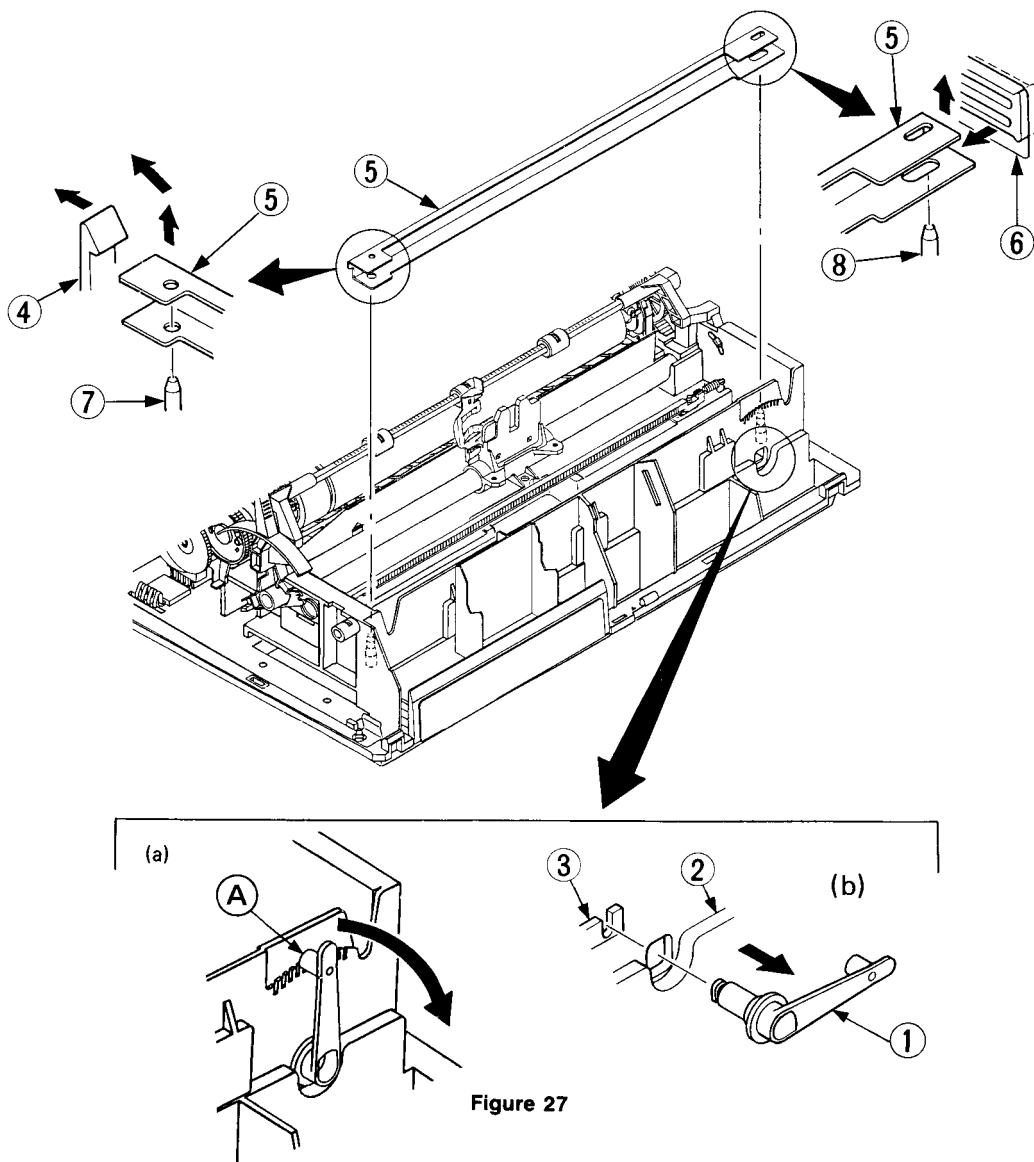


Figure 27

## Operator PCB

- 1) Remove the upper cover. (See page 38.)
- 2) Turn the hooks ① and ② outward and remove the operation panel ④ from the main frame ③ and the connector ⑥ of the control PCB ⑤.
- 3) Turn the six hooks ⑦ outward and remove the operator PCB ⑧ from the panel frame ⑨.

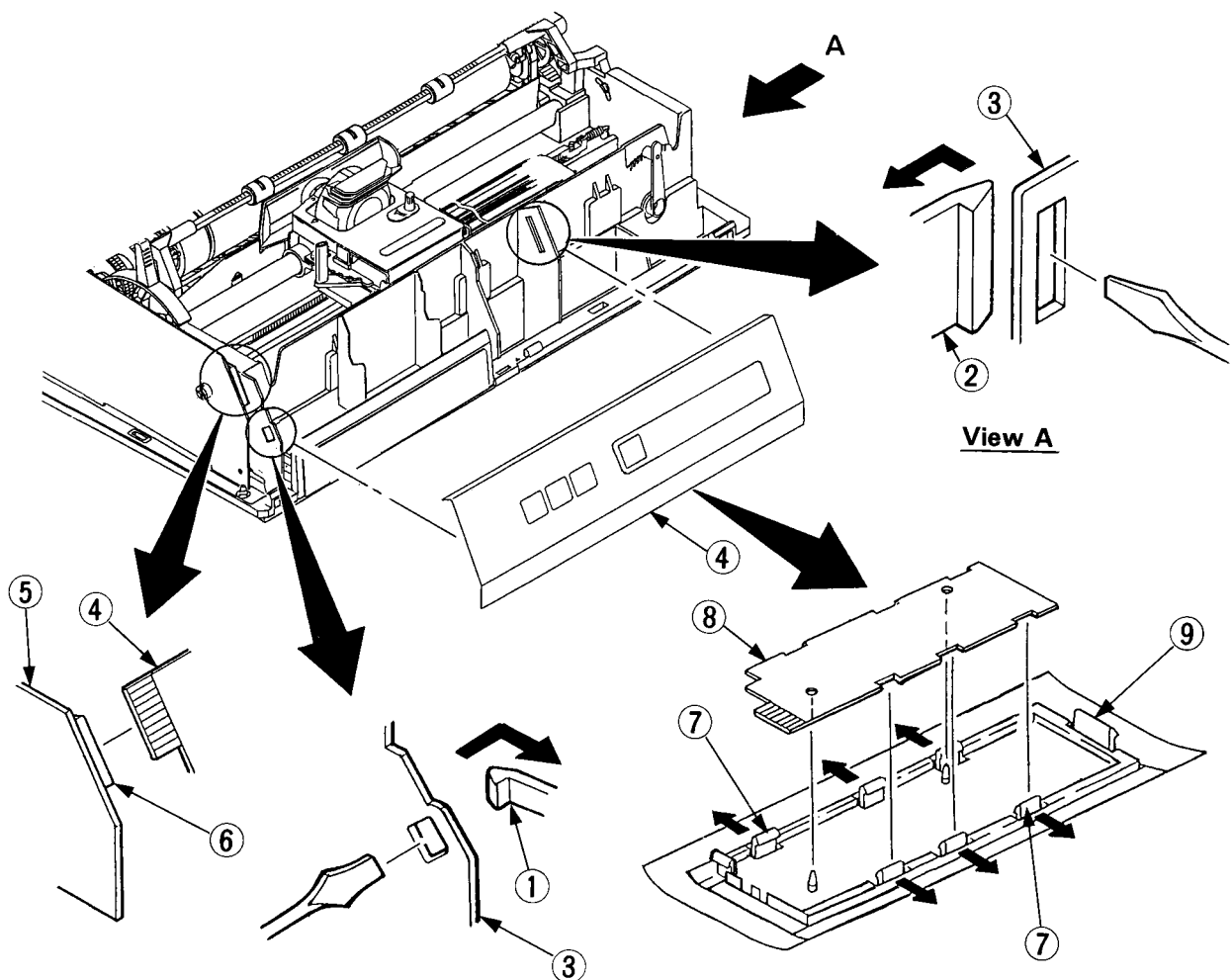


Figure 28

## Control PCB

- 1) Remove the operation panel. (See page 45.)
- 2) Turn the locking post ① clockwise at 90° to unlock.
- 3) Press the board clamp ② upward, and pull the control PCB ③ to the left.
- 4) Incline the control PCB ③ by 45° and then pull it slanted in the upper direction.
- 5) Remove the head cable ⑤ from the connector ④.

### Notes on installation:

- 1) The bare terminal ① (pressure-welded block) must be free from dust, chips, and must not be directly touched.
- 2) The following parts must be firmly engaged: guide ② , power contact ③ , connection plate ④ , guide ⑤ , and sensor lever ⑥ .
- 3) To prevent the sensor lever ⑥ from butting against the paper end sensor, install the control PCB while paper is under the platen, and the sensor lever ⑥ is depressed.

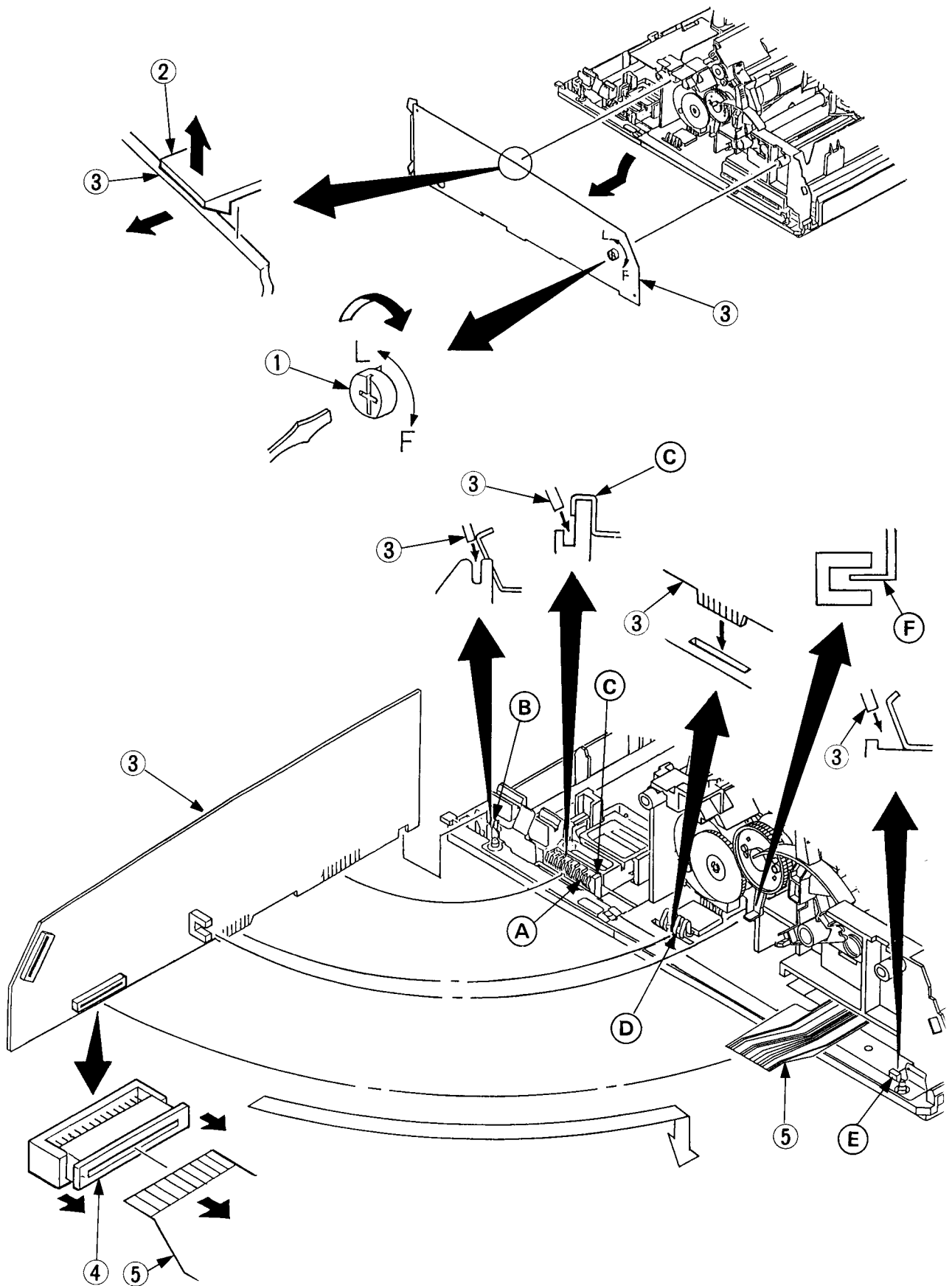


Figure 29

## Head Cable

- 1) Remove the control PCB. (See page 46.)
- 2) Remove the ribbon feed gear assembly. (See page 40.)
- 3) Position the carriage ① at the left end, and remove the head cable ② from the connector ③.

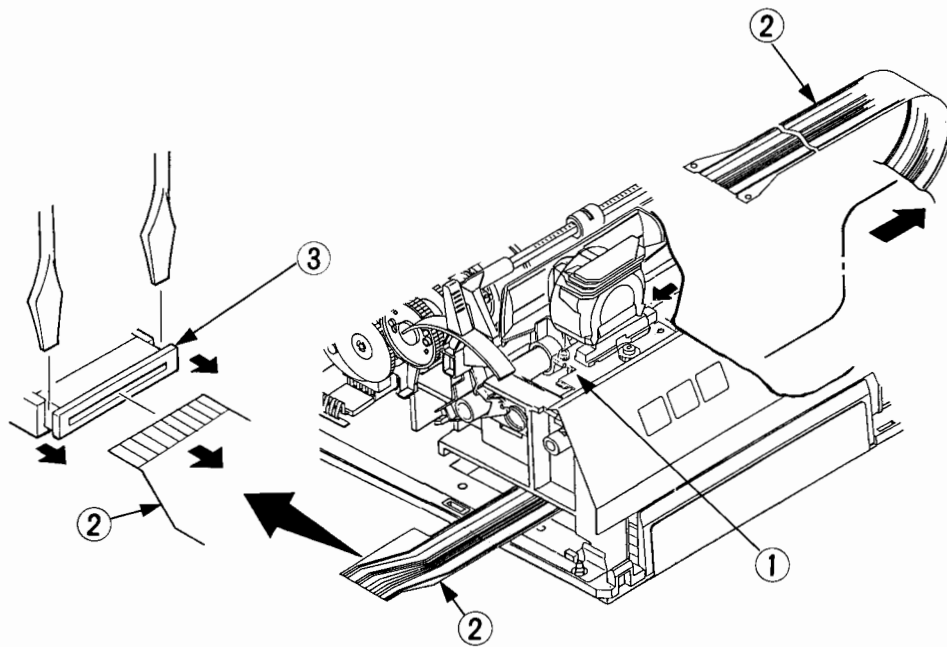


Figure 30



## Platen Assembly

- 1) Remove the upper cover. (See page 38.)
- 2) Remove the separator assembly ① from the platen ② by tilting it backward.
- 3) Move the bail arm toward the front of the printer (open position).
- 4) Push the release lever ⑦ to its rear position.
- 5) Pull the lock levers ③ and ④ in the direction of the arrow (a) and move them 90° upward, as indicated by arrow (b). This releases the platen assembly ② from the main frame ⑤.
- 6) Slide the carriage frame ⑥ to the right end of the carriage shaft. Lift the left end of the platen assembly ② from the main frame, and return the carriage frame to the left end of the carriage shaft.
- 7) Remove the platen assembly ② from the main frame by lifting its right end.

### Notes on installation:

- 1) When assembling the platen assembly, move the bias gear ⑪ to the platen gear ⑩ as indicated by the arrow then engage them at portion C. (The bias gear ⑪ is differentiated by half of a tooth with respect to the tooth of platen gear ⑩.) After installing the platen assembly, verify that the gears engage securely at A and B, and the platen turns smoothly.
- 2) Lock the platen assembly after setting the release lever ⑦ to the open (forward) position, and confirming that the paper chute positioning hole ⑧ is properly engaged in the main frame groove ⑨.

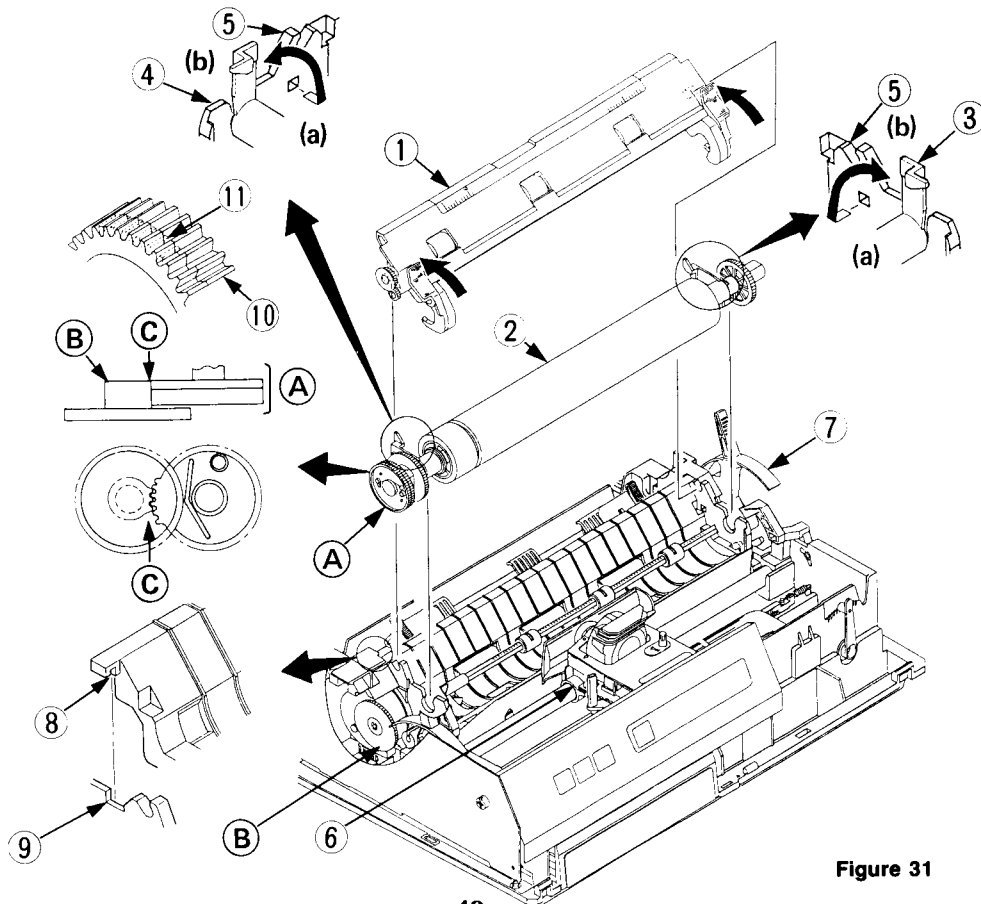


Figure 31

## Ribbon Protector

- 1) Remove the print head. (See page 36.)
- 2) Remove the platen assembly. (See page 49.)
- 3) Push the supporting point ④ outward to remove the head clamp ①.
- 4) Pull the bail lever ② toward the front of the printer.
- 5) Remove the ribbon protector ④ from the carriage frame ③ by lifting it with a flat-blade screwdriver through a slot ⑤ in the carriage frame.

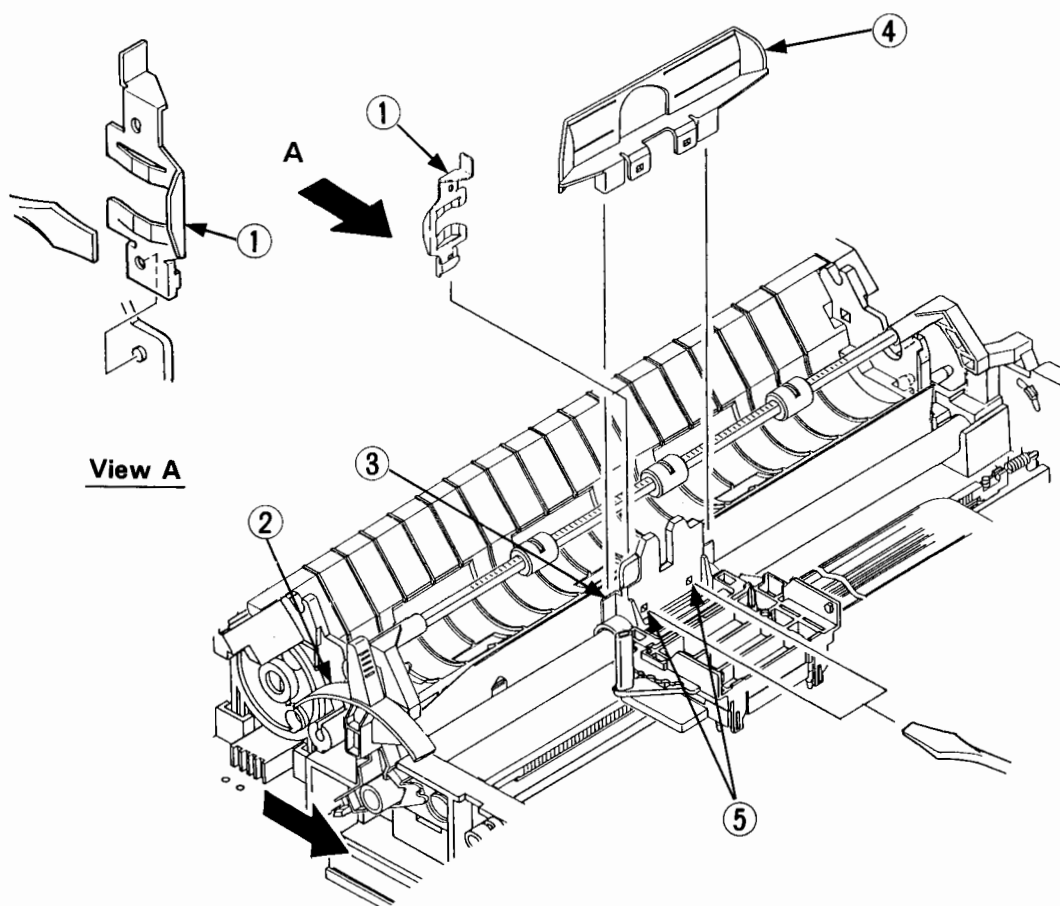


Figure 32

## **Adjustment for Parallel Between Platen and Print Head**

- 1) The gap must be adjusted to:  $0.016 \pm 0.002$  inch ( $0.41 \pm 0.05$  mm).
- 2) The left end, center, and right end of the platen must be adjusted.
- 3) Adjustment method:
  - a) Turn the release lever to open.
  - b) To compensate for the difference in gap between the right and left sides of the platen, turn the adjusting cam clockwise or counterclockwise to adjust gap.
  - c) Set the adjusting lever to Range 1, and press down the adjusting gear in the direction of A to disengage the adjusting lever and the adjusting gear.
  - d) Modify the gap to  $0.016 \pm 0.002$  inch ( $0.41 \pm 0.05$  mm) by turning the adjusting screw in the direction of B or C while the adjusting lever and the adjusting gear are disengaged.
  - e) Modify the gap between the right and left sides of the platen by turning the adjusting cam to the left or to the right.
  - f) Make sure that the gap is  $0.028 \pm 0.002$  inch ( $0.71 \pm 0.05$  mm) when the adjusting lever is set to Range 5.

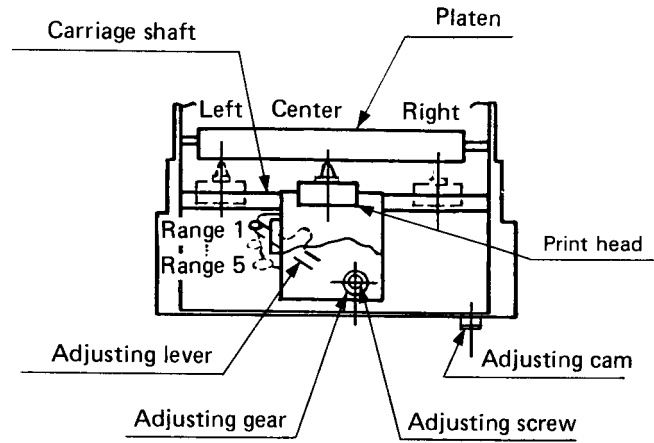


Figure 33

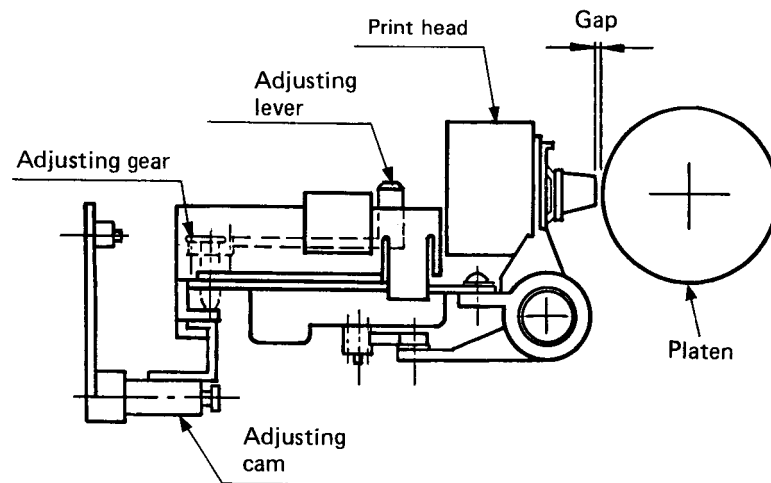


Figure 34

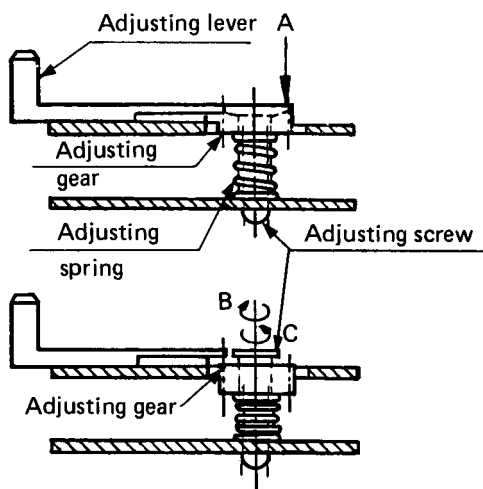


Figure 35

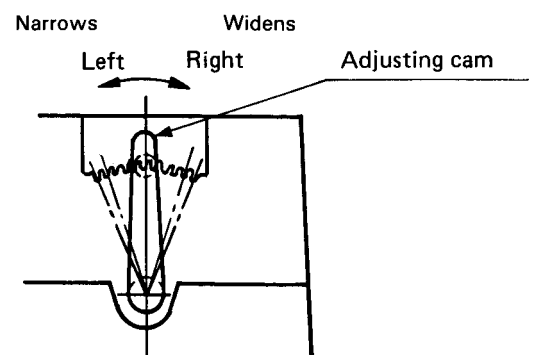


Figure 36

# Notes and Techniques

## General

If repair is requested by a user, check whether the printer can be repaired by the Care and Maintenance procedure described in the Owner's Manual.

If possible, ask the user under what conditions the trouble occurred, and record the answer.

Before troubleshooting, let the printer operate under the same conditions as were present when trouble occurred. Is the trouble reproducible? If not, let the printer perform test printing and then proceed to troubleshooting.

## Lamp Display

### 1) Printer mode display

Print mode		ON/OFF LINE	QUIET	Contents	Remarks
Operation mode	ON LINE	ON	OFF	Indicates the printer is ready for receiving.	
	HEX DUMP			Indicates the printer is in the hex-dump mode.	
	Self Test	OFF	OFF	Indicates that the printer is in the Self-Test mode.	
	MENU			Indicates that the printer is in the menu mode.	
Operator alarm	Paper end	BLINK	OFF	Form end, single sheet end, or bottom paper end.	
	Paper jam			SASF paper jam	
	CSF paper jam			Paper jam or paper end when CSF is installed.	
Fault alarm		BLINK	BLINK		

## 2) Fault alarm display

When an alarm state is detected, the corresponding LED goes on.

(The POWER, ON/OFF LINE, and QUIET LEDs are on regardless of the other mode LEDs.) For details, see the section on Errors.

Error Category	Lighted LED other than POWER, ON/OFF LINE LED, and QUIET LED.	Contents
Memory error	PS	CPU internal RAM error
	12	Program ROM error
	12, PS	EEPROM error
	12, 17, PS	External RAM error
	12, 17	Resident CG error
Spacing error	LQ	Head homing error
	LQ, PS	Spacing error

# Parts Layout

## Control PCB

Components side

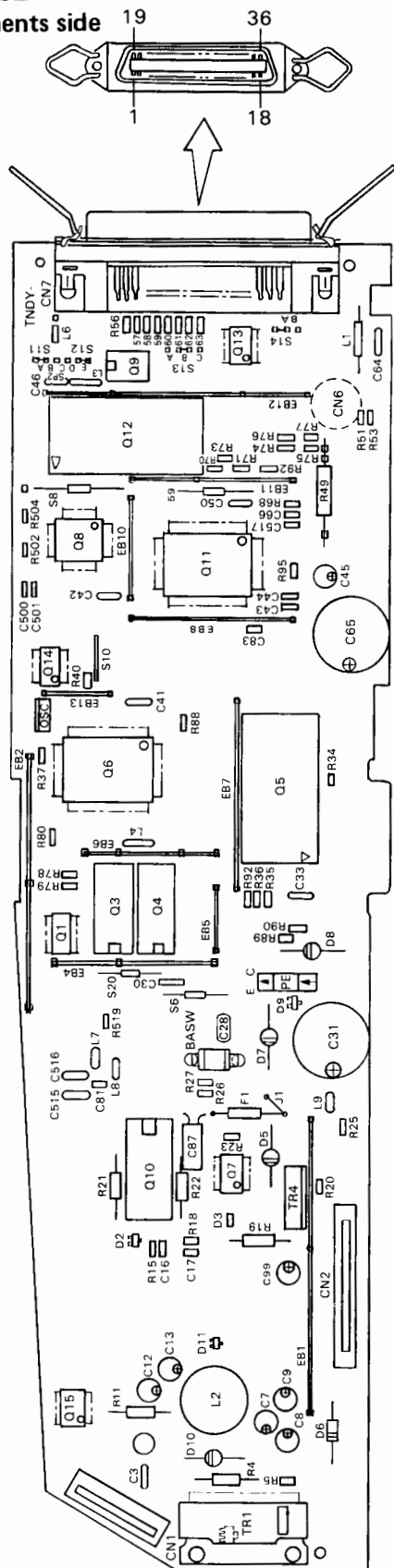


Figure 37

Solder side

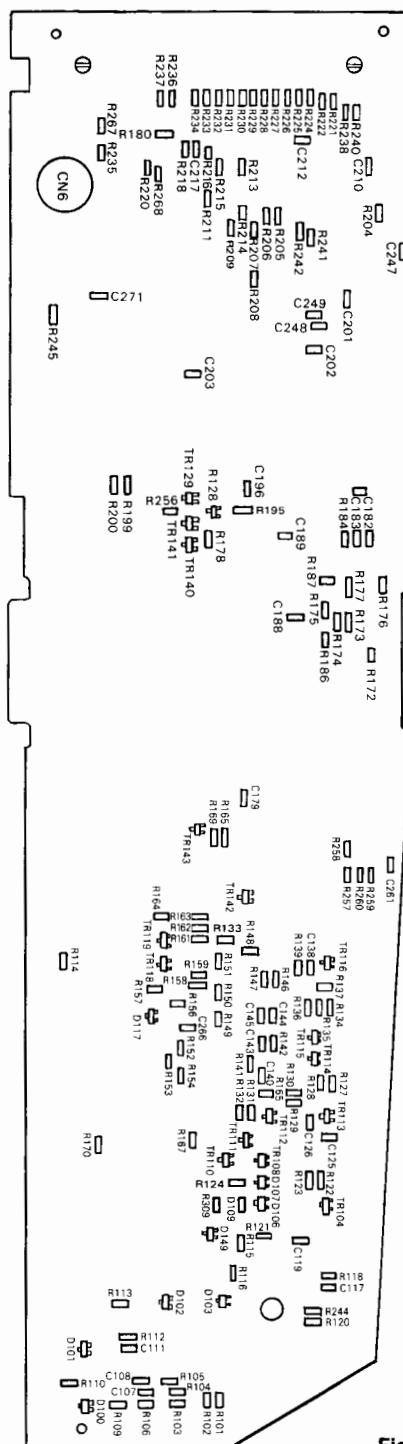


Figure 38

**Note:** Short wire setting

TANDY mode

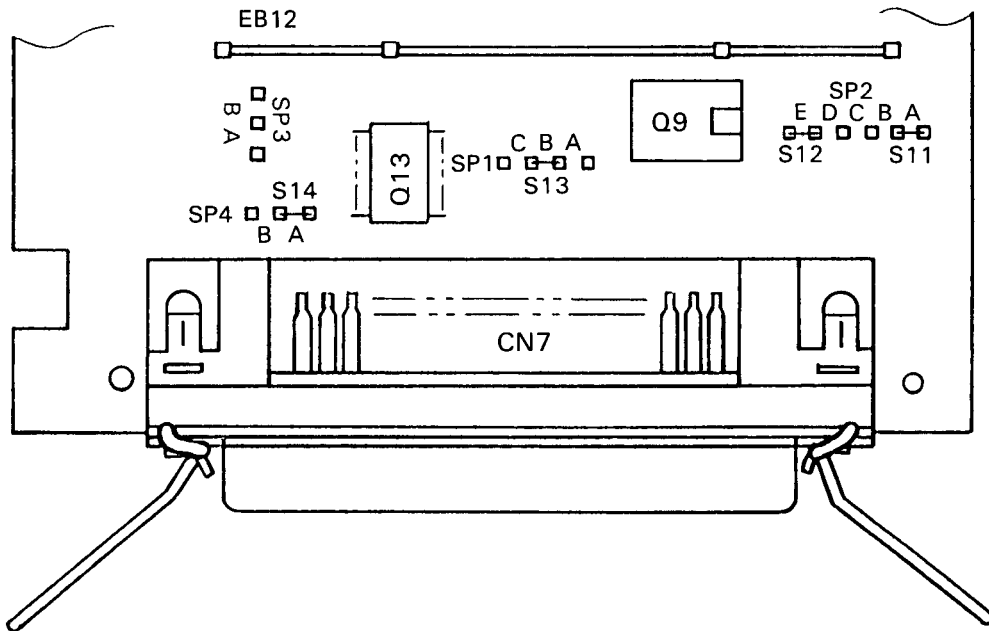


Figure 39

IBM mode

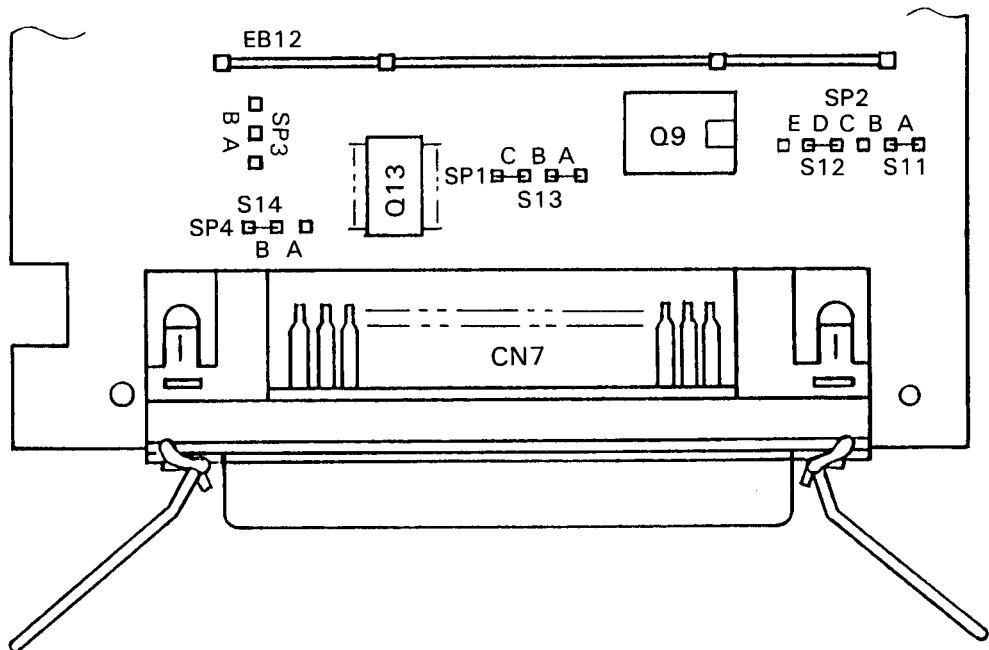


Figure 40



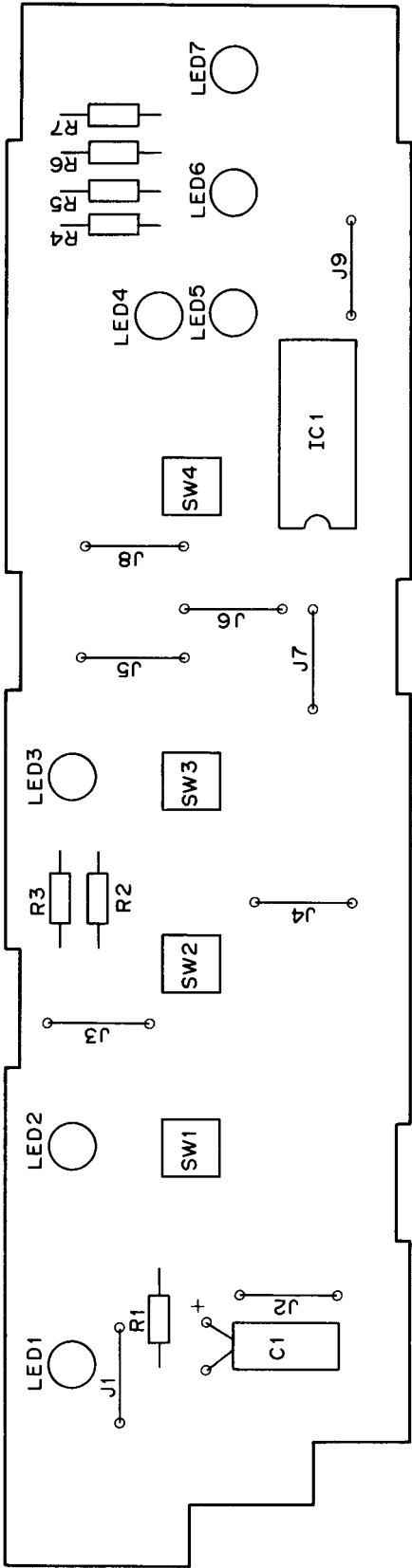


Figure 41

Connector Location and Pin Numbers

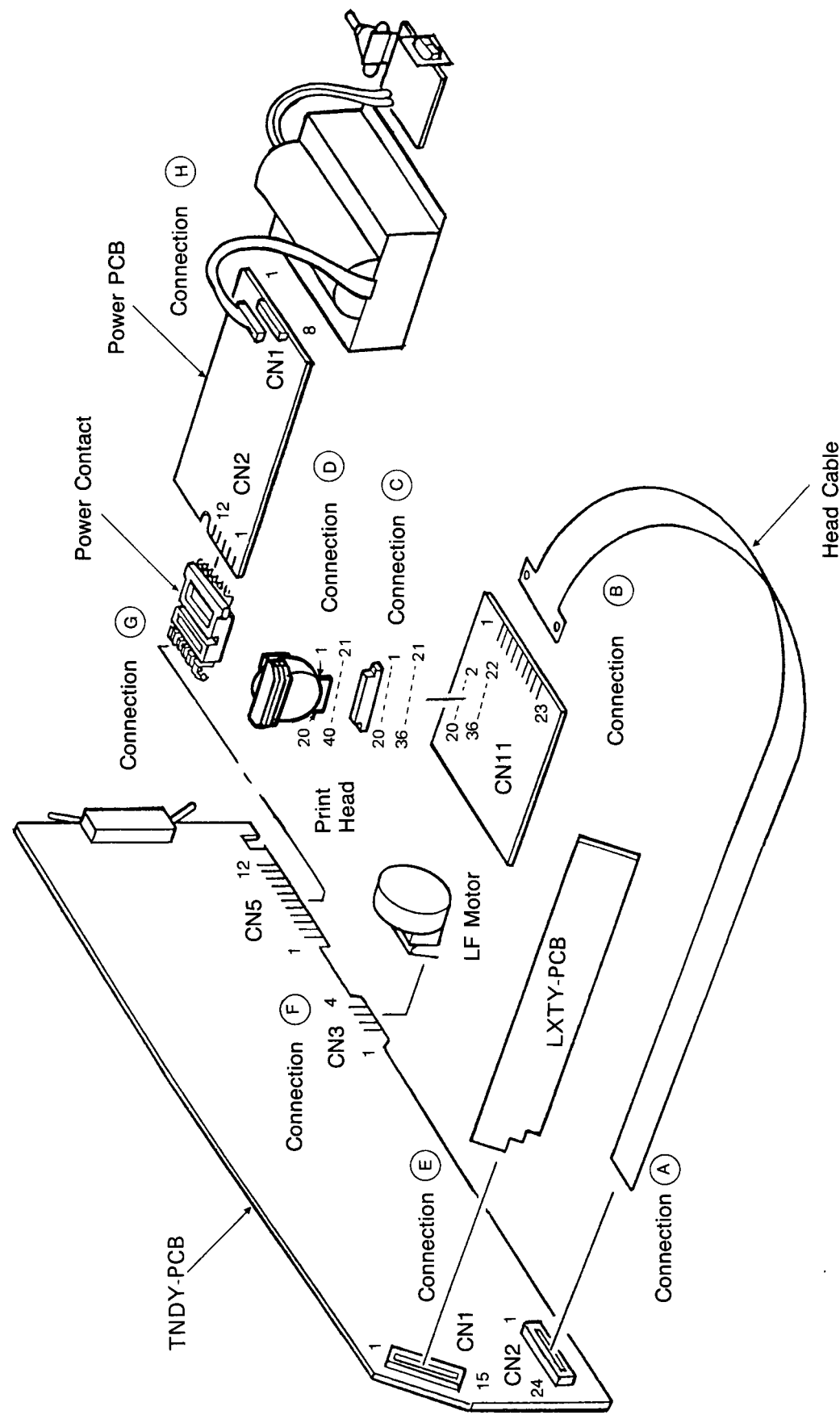
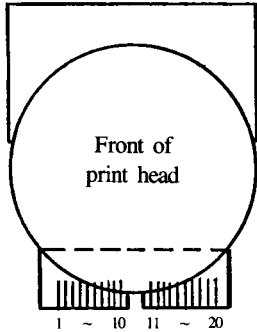
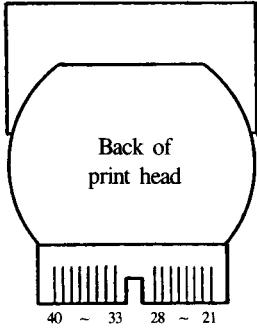
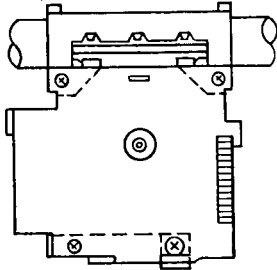
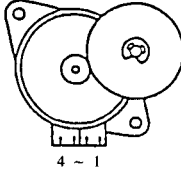


Figure 42

**Pin Number and Signal Names (1)**

Name	Signal Name	Connection								Coil Resistance	Figure
		A	B	C	D	E	F	G	H		
<b>PRINT HEAD</b>	ODD EN	13,15	13							Approx. 18.3 Ω	<p align="center">Pins on print head</p> 
	EVEN EN		15								
	HEAD GAP	2	2								
	ODD COM	3~6	5,6	6,7 26,27							
	EVEN COM		3,4	14,15 30,31							
	TSD	10	10	20							
	S CLOCK	11	11								
	S DATA	14	14								
	+ 40 V FB	23	22								
	0 V	12	12								
	+5 V	16	16								
	EP	19~22	19~22								
	# 1			2	2						
	# 2			19	19						
	# 3			3	3						
	# 4			18	18						
	# 5			22	22						
	# 6			35	39						<p align="center">Back of print head</p> 
	# 7			23	23						
	# 8			34	38						
	# 9			4	4						
	#10			17	17						
	#11			5	5						
	#12			16	16						
	#13			24	24						
	#14			33	37						
	#15			25	25						
	#16			32	36						
	#17			8	8						
	#18			13	13						
	#19			9	9						
	#20			12	12						
	#21			10	10						
	#22			11	11						
	#23			28	28						
	#24			29	33						

## Pin Number and Signal Names (2)

Name	Signal Name	Connection								Coil Resistance	Figure
		A	B	C	D	E	F	G	H		
SP MOTOR	SPMV	7	7							Approx. 21 $\Omega$	Pins on SP motor 
	SPMU	8	8								
	SPMW	9	10								
	PHASE-A	18	18								
	PHASE-B	17	17								
OPERATION PANEL	ON/OFF LINE					12					
	LINE/FORM					13					
	QUIET/PARK					14					
	LQ/DP PITCH					15					
	ON/OFF LINE LED					4					
	QUIET LED					5					
	LQ LED					6					
	12 LED					7					
	17 LED					8					
	PS LED					9					
	5 VD2					3					
	+5 V					1, 2					
	0 V					10,11					
LF MOTOR	MA1						2			Approx. 6.8 $\Omega$	Pins on LF motor 
	MB1						1				
	MA2						3				
	MB2						4				
CN5	+40 V							1 ~ 3			
	EP							4,5			
	+5 V							6,7			
	0 V							8, 9			
	+8 V							10			
	AC 10 V							11			
	ALM-P							12			

# Troubleshooting

First verify the trouble condition, then locate the trouble in accordance with the detailed procedure given for each item in the table.

Status	Details	Troubleshooting No.
Trouble upon power on	<ul style="list-style-type: none"> <li>Power is not supplied.</li> <li>Only the power LEDs on.</li> <li>Printer alarm occurred.</li> </ul>	① ② ③
Trouble during printing	<ul style="list-style-type: none"> <li>Erroneous printing or omission in printing.</li> <li>Line feed malfunction.</li> <li>Operation switch malfunction.</li> <li>Data is not received.</li> </ul>	④ ⑤ ⑥ ⑦

Refer to the exploded view/PCB views and the parts list for identification of the reference numbers.

**SYMPTOM 1.** The power fails to turn on.

	POSSIBLE CAUSE	SOLUTION
1	Fuse blown	Replace with a fuse of the same rating.
2	Transformer malfunction	Check the output voltage. Replace the transformer.
3	Power circuit malfunction	Check the power voltage. Replace the power unit.

**SYMPTOM 2.** The power indicator goes on but the printer does not work.

	POSSIBLE CAUSE	SOLUTION
	Control PCB is defective.	Replace the Control PCB.

**SYMPTOM 3.** Printer alarm occurs (The ON/OFF LINE and the QUIET indicators flicker.)

A. The PS indicator goes on.

	POSSIBLE CAUSE	SOLUTION
	Internal RAM error in the CPU.	Replace the CPU (Q8).

B. The 12 indicator goes on.

	POSSIBLE CAUSE	SOLUTION
	Program ROM error	Replace the program ROM (Q12).

C. Both the 12 and the PS indicators go on.

	POSSIBLE CAUSE	SOLUTION
1	EEPROM error	Replace the EEPROM (Q9).
2	CPU malfunction	Replace the CPU (Q8).

D. Both 12 and 17 indicators go on.

	POSSIBLE CAUSE	SOLUTION
1	Resident ROM malfunction	Replace the Resident ROM (Q5).
2	79H048 malfunction	Replace the 79H048 (Q6).

E. 12, 17, and PS indicators go on.

	POSSIBLE CAUSE	SOLUTION
1	External RAM malfunction	Replace the RAM (Q3, Q4).
2	79H048 malfunction	Replace the 79H048 (Q6).

F. LQ indicator goes on.

Head homing malfunction

	POSSIBLE CAUSE	SOLUTION
1	Carriage unit connection fault	Connect the carriage cable properly.
2	6990 malfunction	Replace Q11 (6990).
3	Space motor driver malfunction	Replace the Space Motor Driver (MTDV).
4	Carriage unit malfunction	Replace the carriage unit.

G. LQ indicator and the PS indicator go on.

Spacing error

	POSSIBLE CAUSE	SOLUTION
1	An obstacle on the carriage unit driving surface	Remove the obstacle.
2	F 1 ~ 4	F 1 ~ 4

SYMPTOM 4. Erroneous printing or omission in printing.

	POSSIBLE CAUSE	SOLUTION
1	Carriage unit connection fault	Connect the carriage cable properly.
2	Control PCB is defective.	Check the output signals for the pin. Replace a defective part.

**SYMPTOM 5. Line feed error**

	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
1	LF motor is defective	Check motor for mechanical problems. Repair or replace defective components.
2	Connection plate pin break.	Replace the connection plate.
3	Platen gear is broken.	Replace.
4	Control PCB is defective.	Check pulses from CPU to drivers. Replace defective components or PCB.

**SYMPTOM 6. The printer fails to work after an operation switch is pressed.**

	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
1	Operation panel connection fault.	Connect the operation panel properly.
2	Control PCB is defective.	Check signals from each operation switch. Replace a defective part.
3	Operation panel defective.	Replace the operation panel.

**SYMPTOM 7. Data receiving disabled.**

**A. Parallel interface data receiving disabled.**

	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
	Control PCB defective.	IF DATA, $\overline{\text{STROBE}}$ , $\overline{\text{ACKNOWLEDGE}}$ , BUSY check. Replace a defective part.

**B. Print data omitted or the printer fails to work when data is received by the parallel interface.**

	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
1	SYMPTOM 4	SYMPTOM 4
2	SYMPTOM 7-A	SYMPTOM 7-A

# Lubrication

## 1) Lubricants

GEP : Alvania grease #2EP (or equivalent)

PM : Pan motor oil (or equivalent)

## 2) Amount of lubricants

Ⓐ = ordinary ..... approximately 3 to 4 drops oil or 0.008 inch (0.2 mm) thick grease.

Ⓑ = small amount ..... approximately one drop of oil.

## 3) Period of lubrication

This equipment is designed to be maintenance-free and oiling is unnecessary during operation. However, when reassembly or cleaning of oiled parts occurs, lubrication is required.

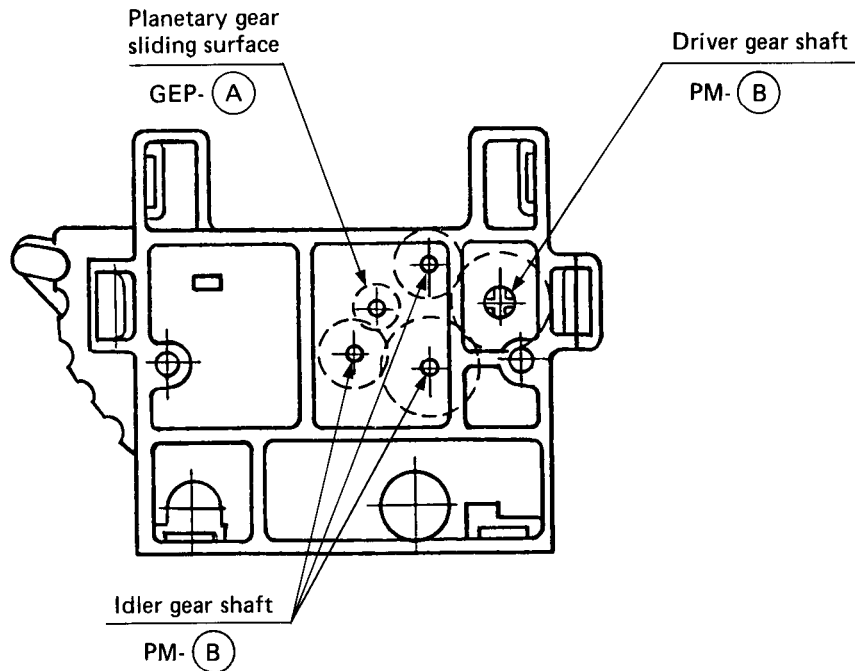
## 4) Areas to avoid contact with lubricant.

Item No.	Areas to avoid lubricant	Reason	Remarks
1	Platen surface	To prevent stained paper	
2	Pressure roller surface	To prevent stained paper and poor paper feeding	The roller surface should be free of oil because grease is applied to the pivotal part of the pressure roller.
3	Pressure roller for a bail bar	To prevent stained paper and poor paper feeding	
4	Ink ribbon	To prevent poor printing	
5	Pin tractor	To prevent stained paper	
6	Flexible head cable	To prevent poor electrical contact and cable cracking	
7	Space motor board	To prevent poor electrical contact	



## 5) Lubrication points

### a) Ribbon drive gear assembly



**Figure 43**

**Note:** The upper and lower ends of the gear shaft should be oiled.

b) Space rack

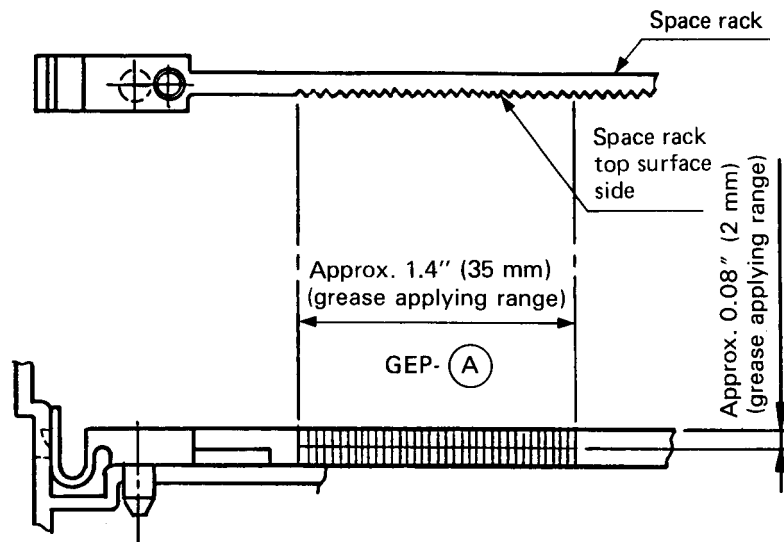


Figure 44

**Note:** Grease should be applied to an area of approx. 1.4" (35 mm) from the left end of the tooth part (shaded portion) covering the edge approx. 0.08" (2 mm) from the space rack top surface.

c) Platen assembly

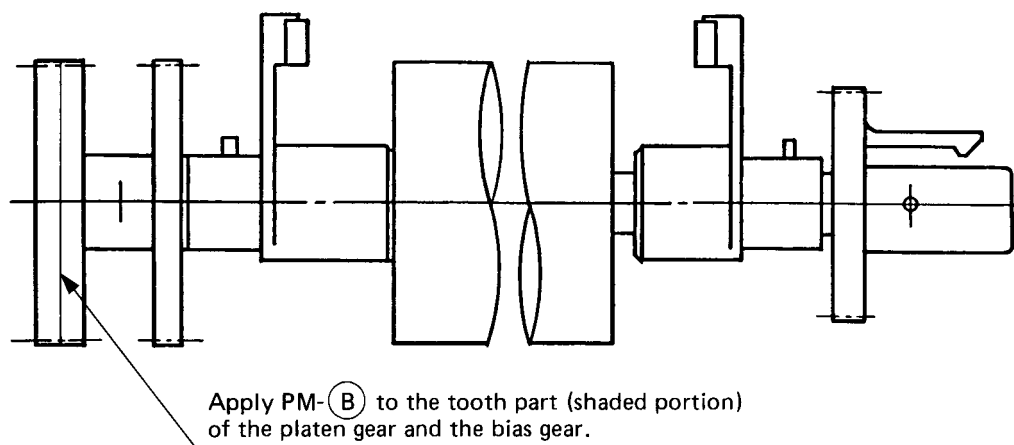


Figure 45

d) Tractor driving system

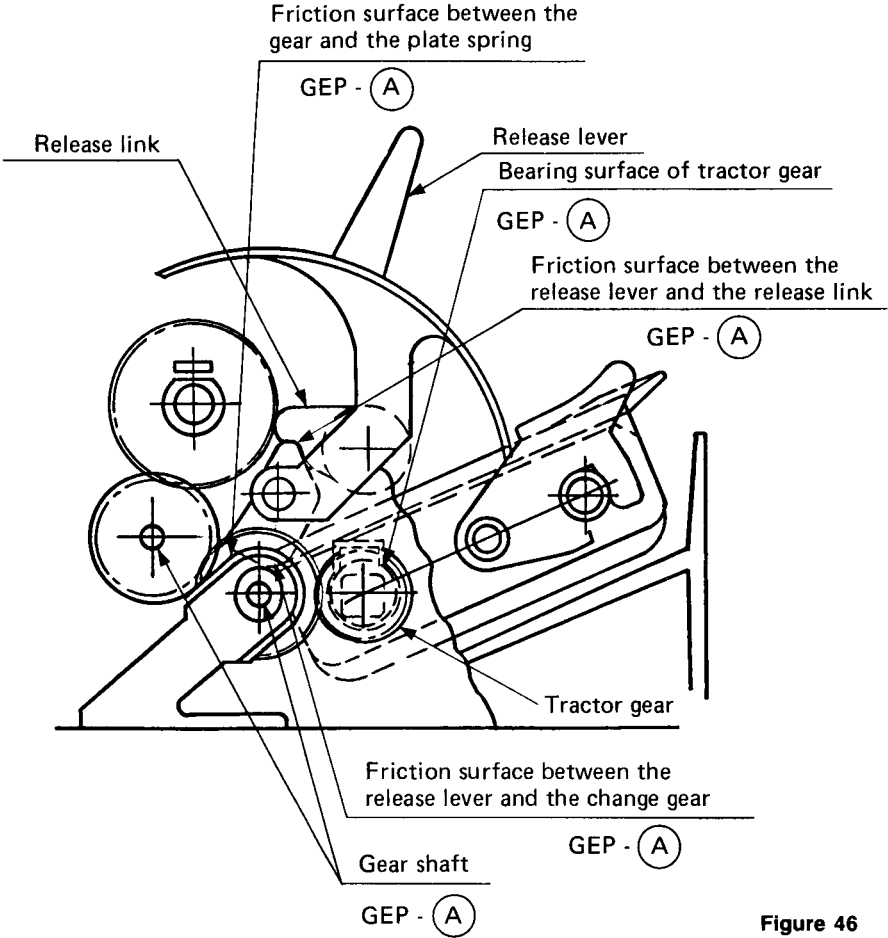


Figure 46

e) Tractor drive shaft

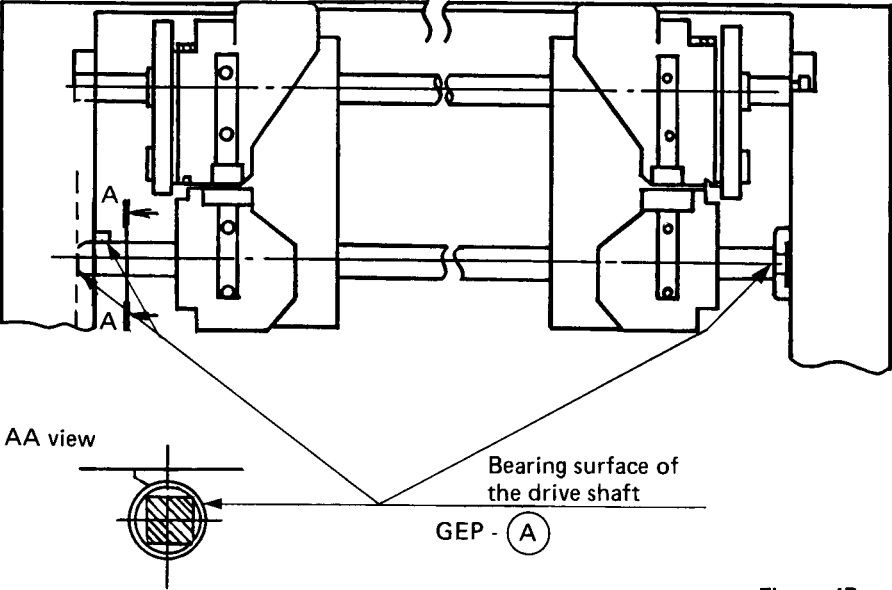


Figure 47

# Wiring Diagram

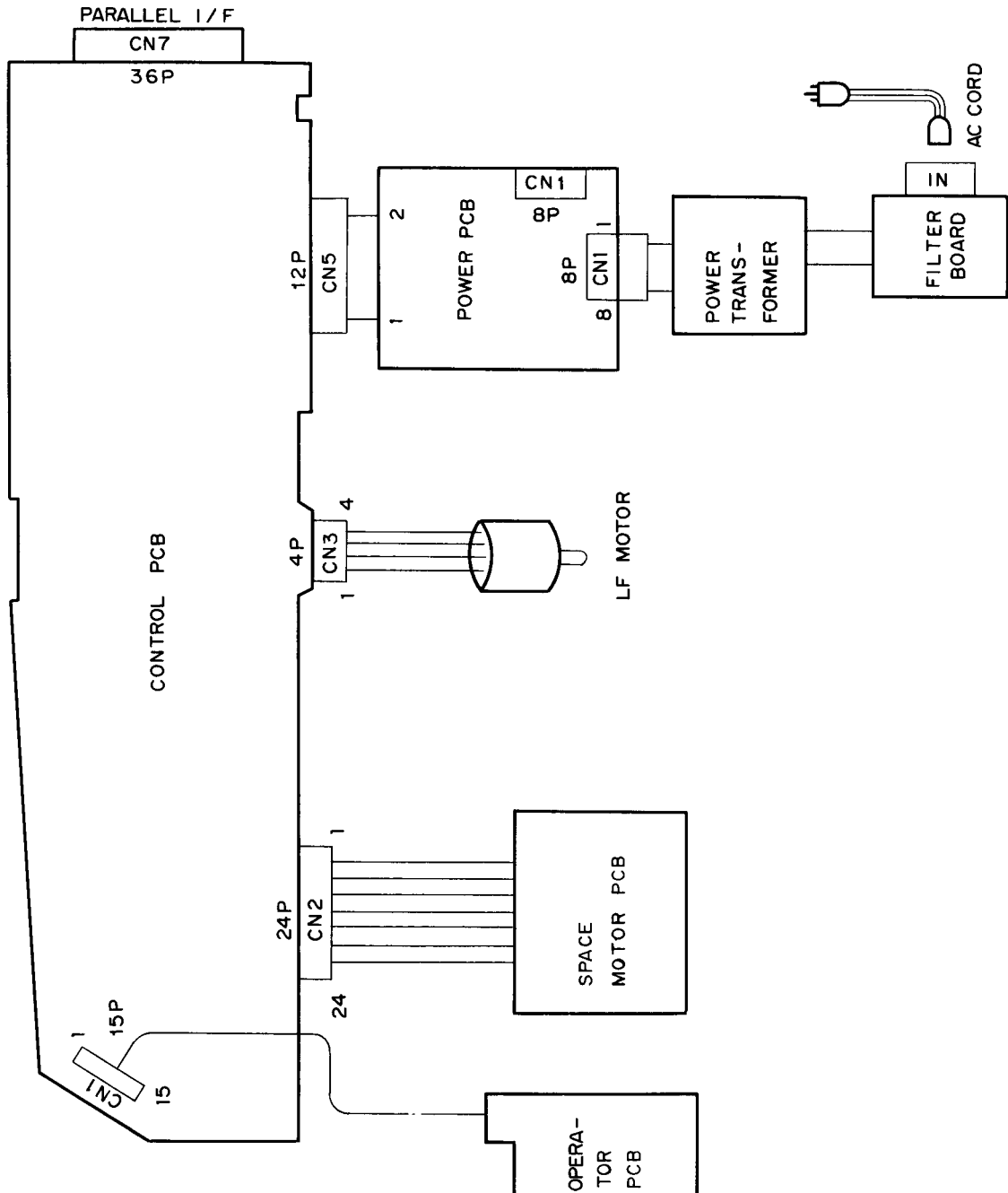


Figure 48

# Printed Circuit Board Views

## Filter Board

Top View (Components Side)

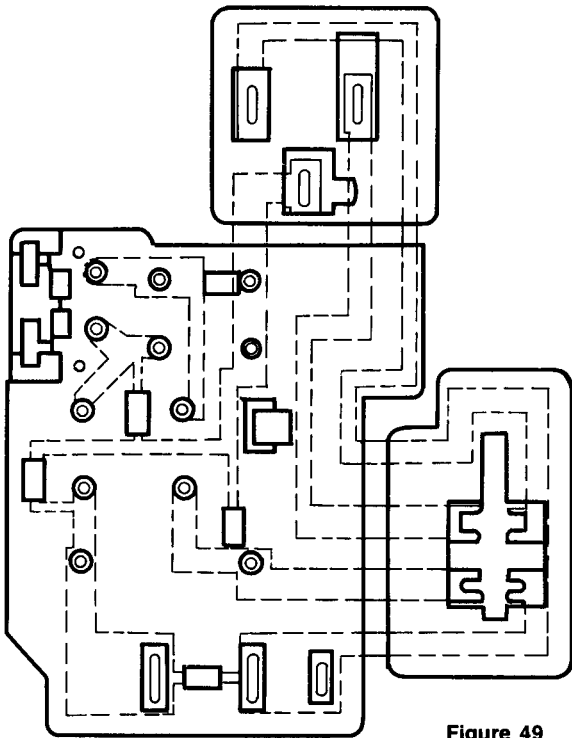


Figure 49

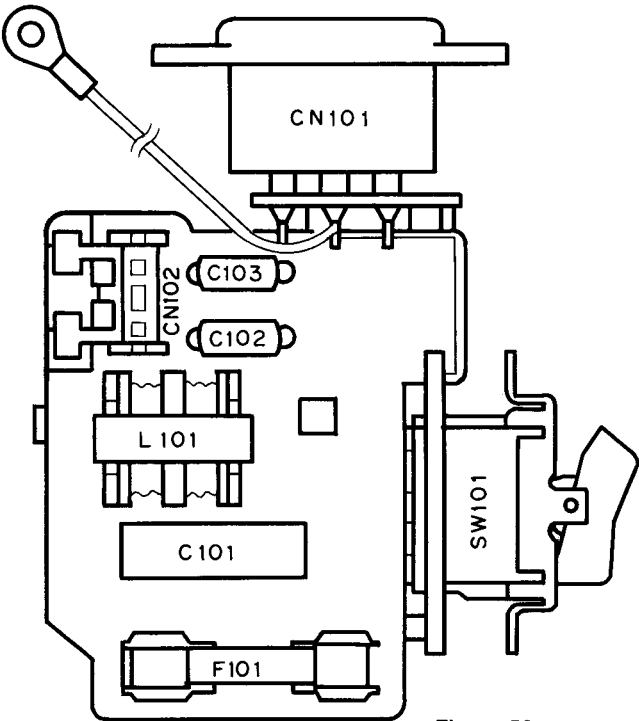


Figure 50

Bottom View (Solder Side)

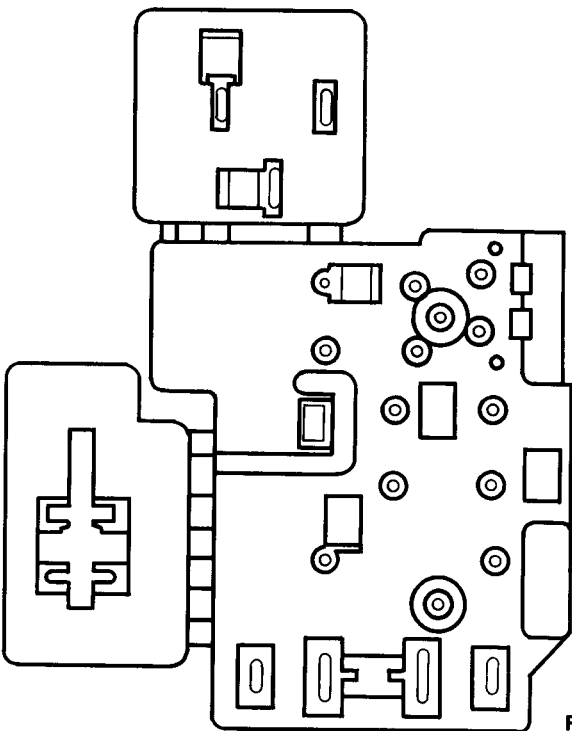


Figure 51

Right Side View (CN102 Connection)  
(USA, Canada Version Only)

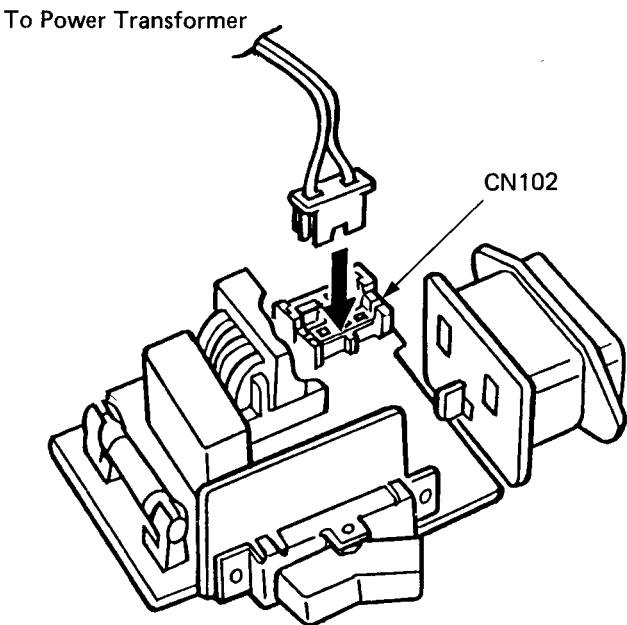


Figure 52

Power PCB

Top View (Screen and Components Side)

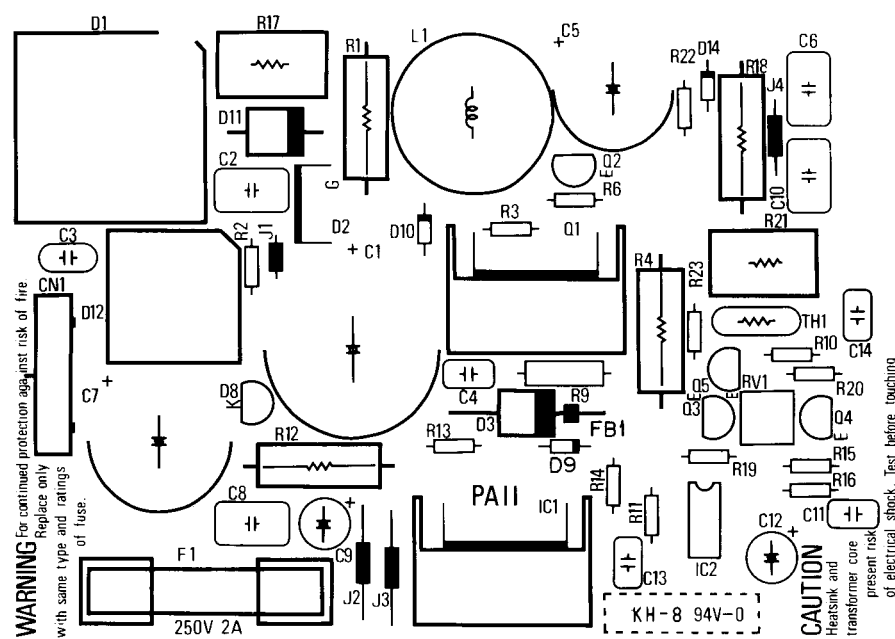


Figure 53

Bottom View (Solder Side)

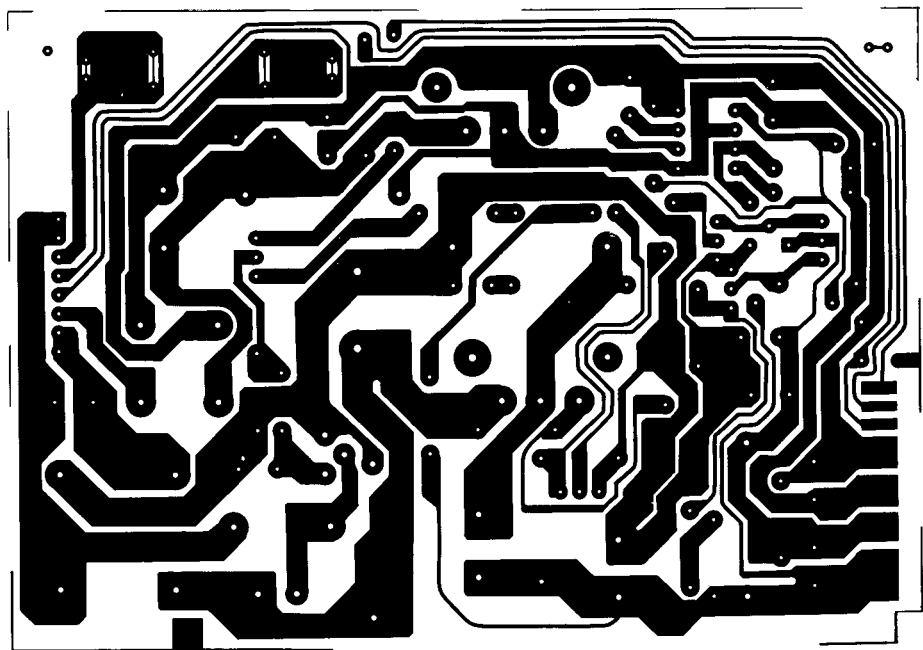


Figure 54

Control PCB  
Solder Side

Screen drawing

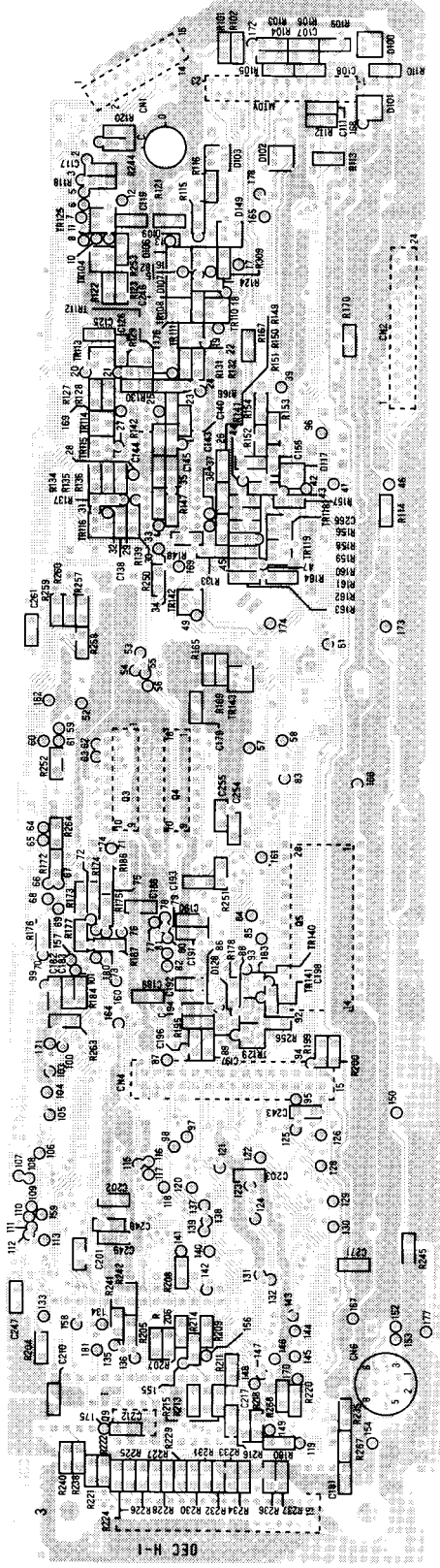


Figure 55

Pattern drawing

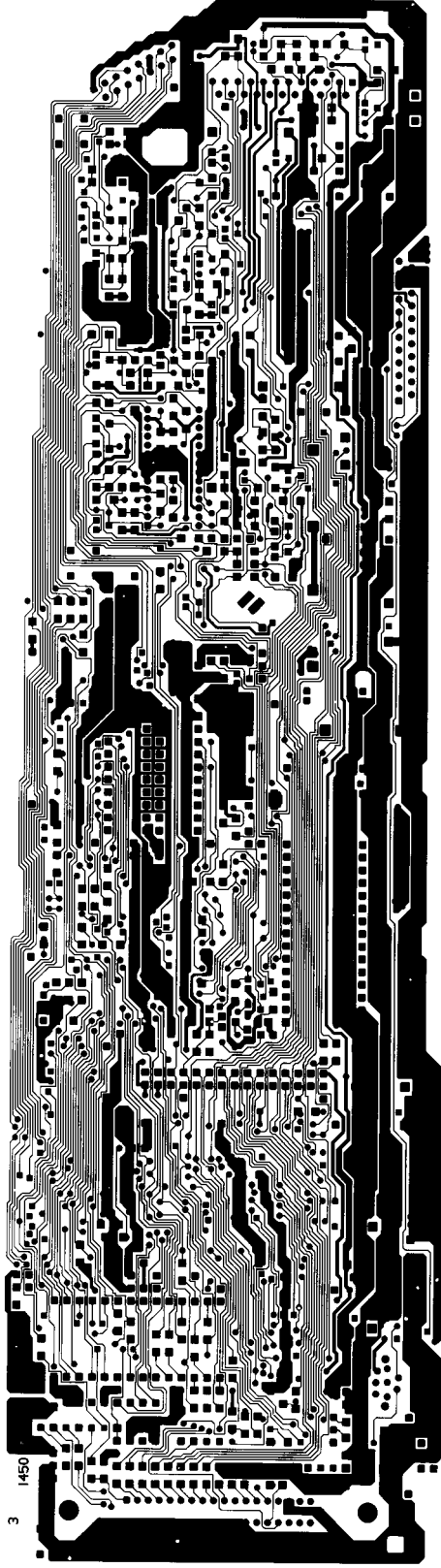


Figure 56

# Components Side

## Screen drawing

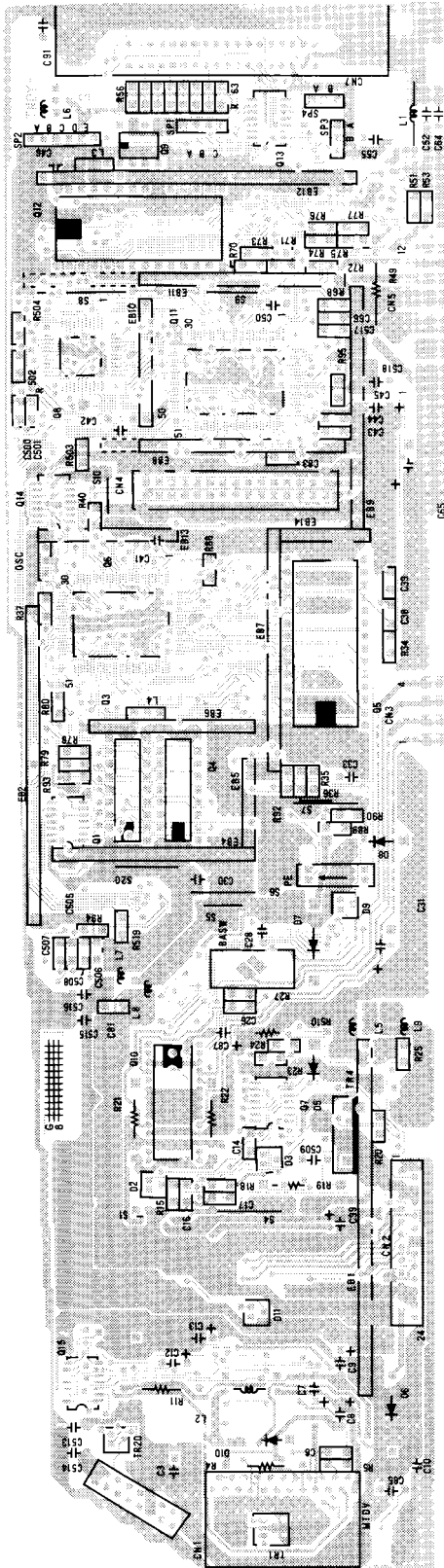


Figure 57

## Pattern drawing

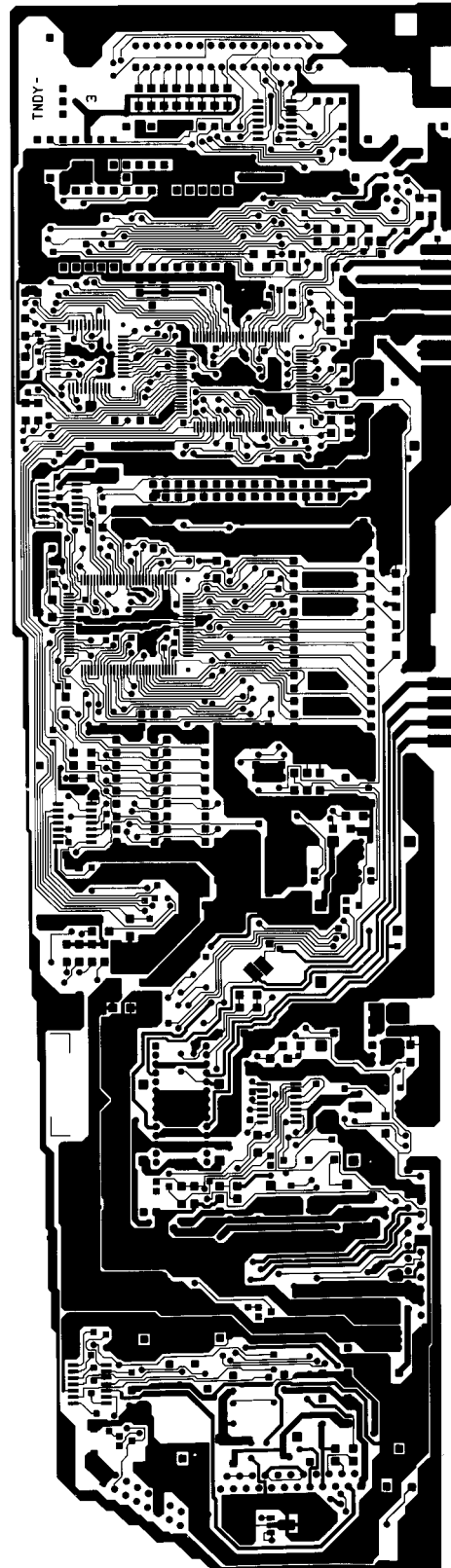


Figure 58



# Operator PCB

Top View  
(Screen and Components Side)

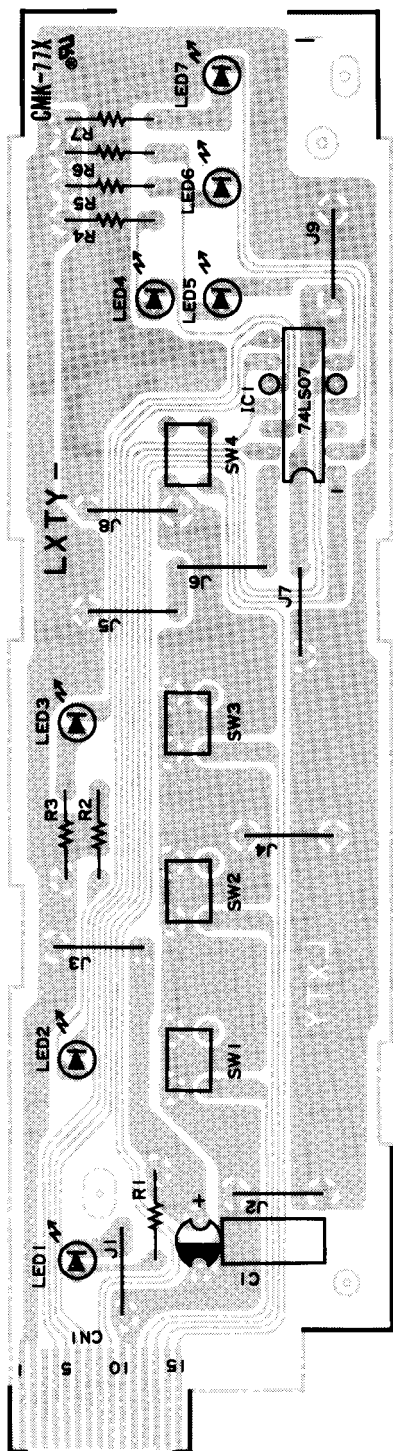


Figure 59

Bottom View  
(Solder Side)

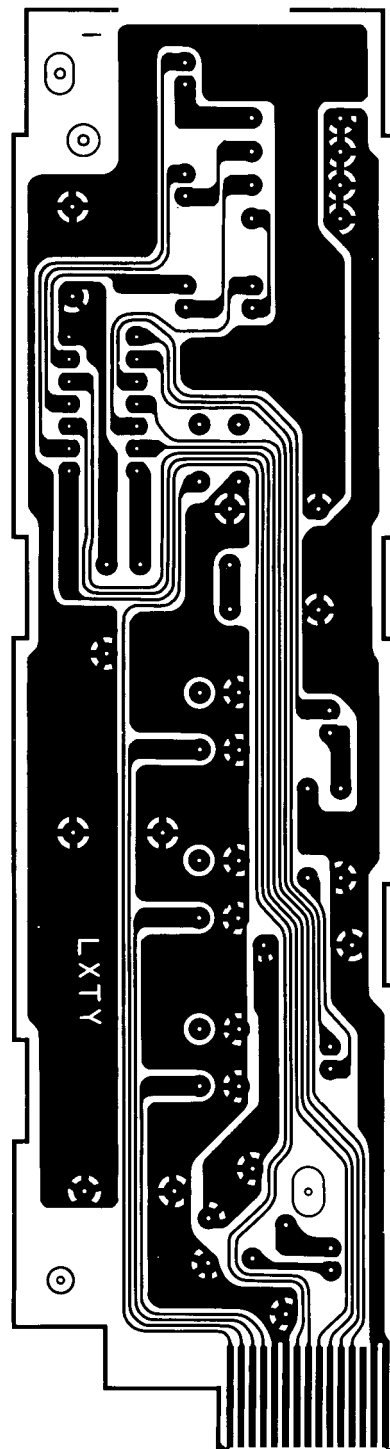


Figure 60

Space Motor PCB

Top View

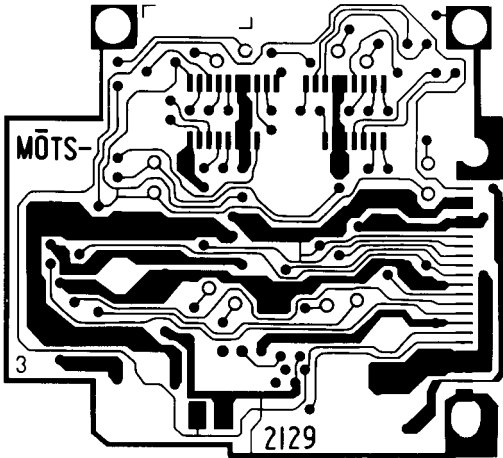


Figure 61

Bottom View  
(Components Side)

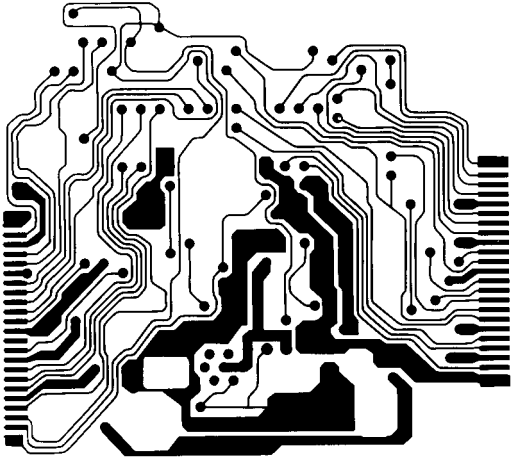
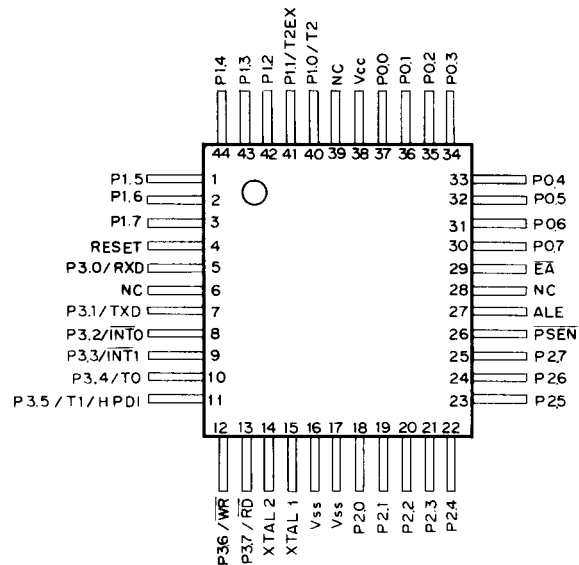


Figure 62

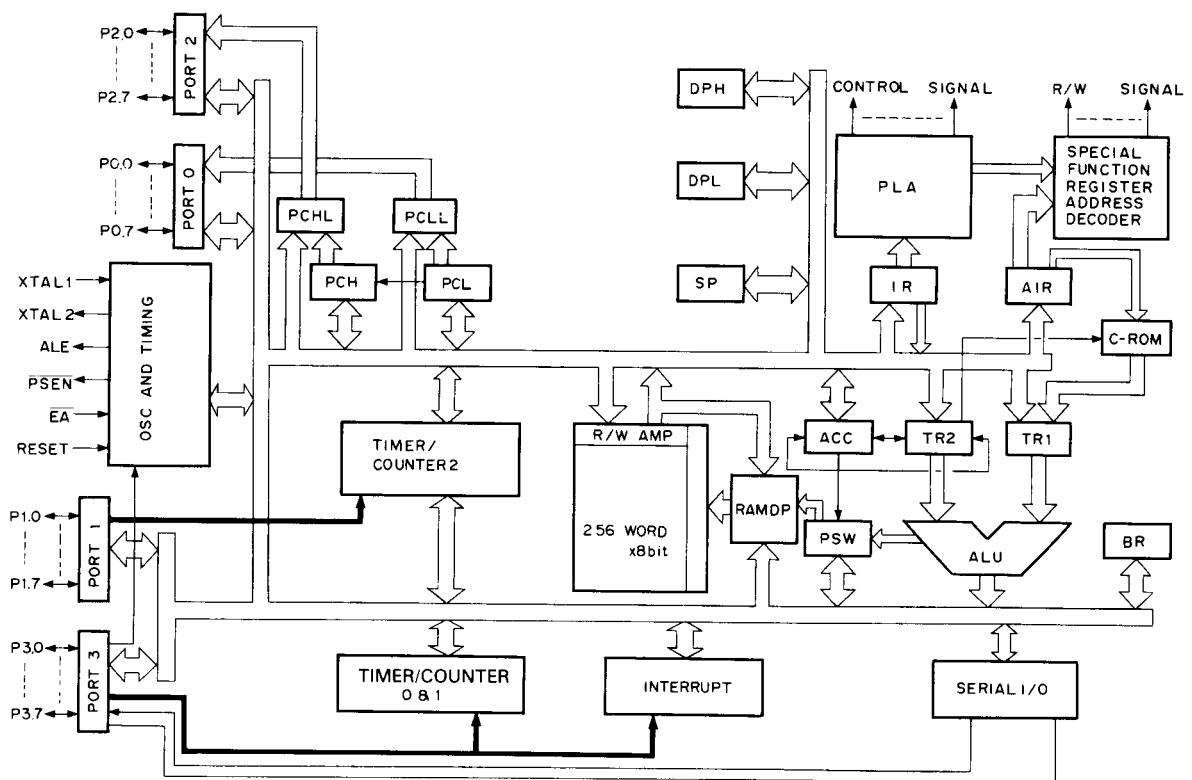
# IC and Transistor Lead Identification

## CPU (MSM80C154)

### Q8



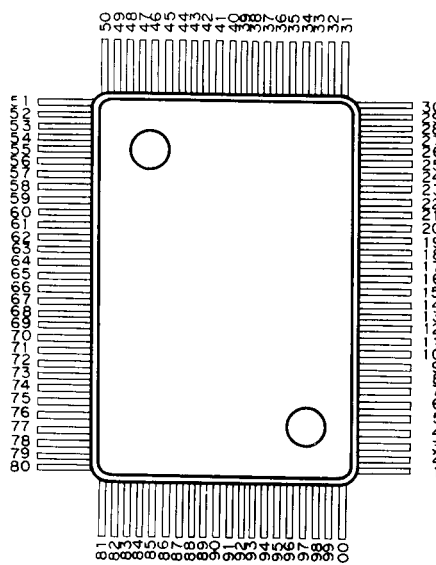
### Q8 Block Diagram



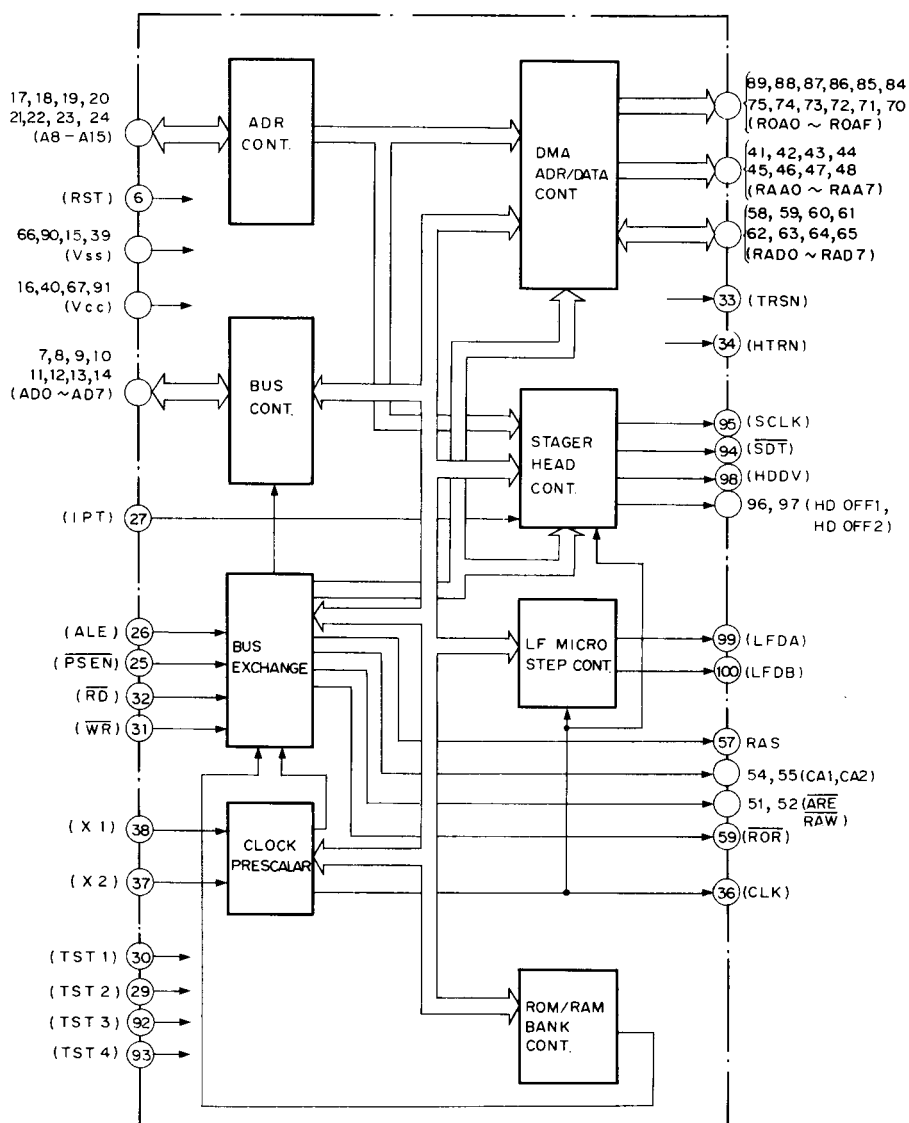
# Gate Array (MSM79H048)

Q6

Top View



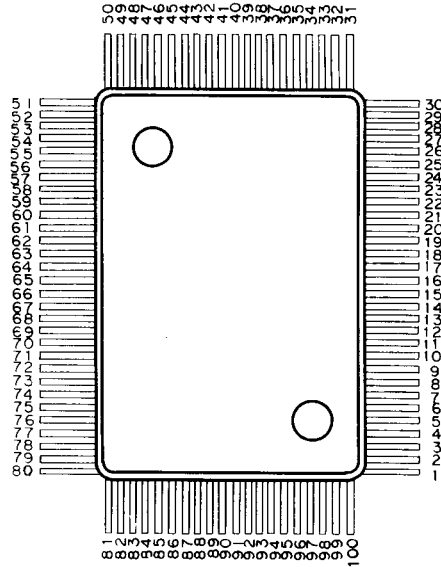
## Q6 Block Diagram



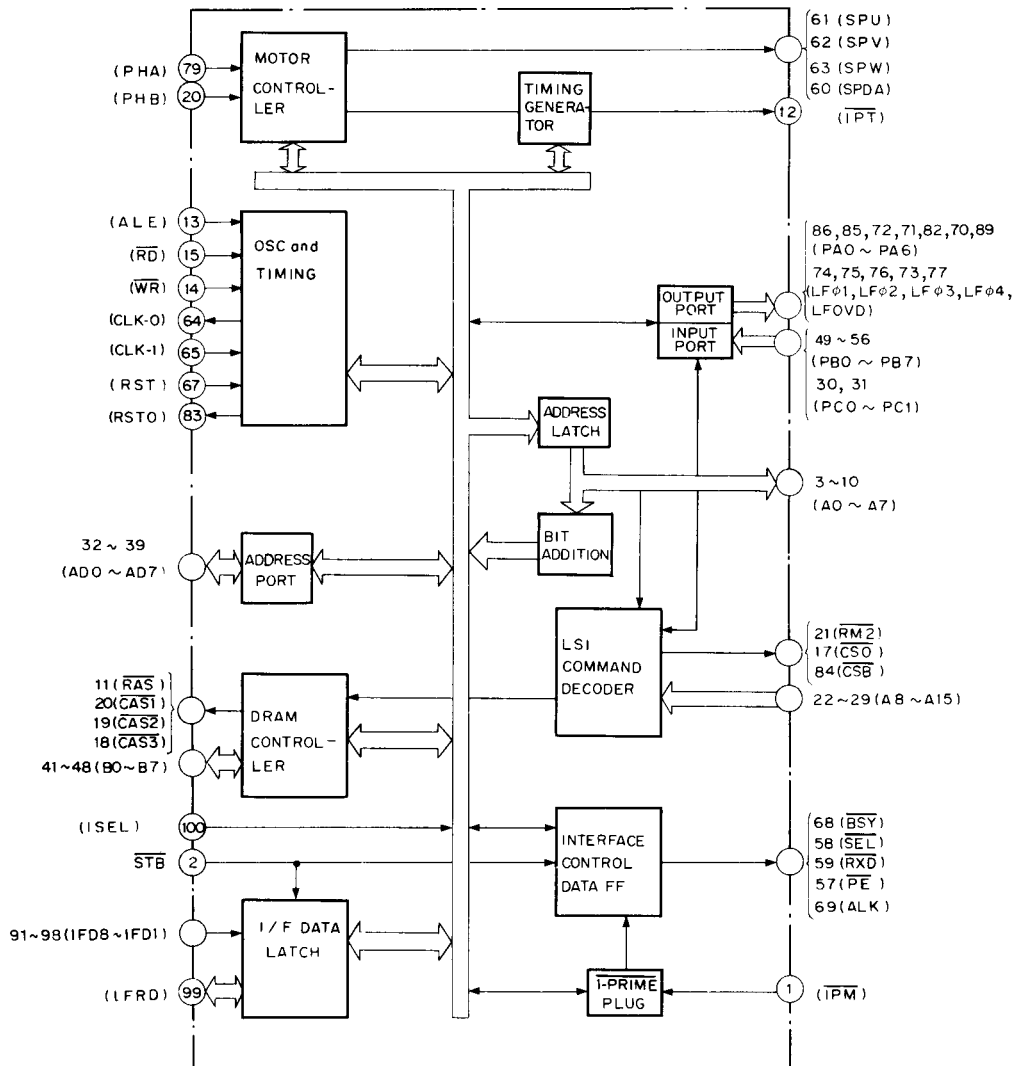
# Gate Array (MSM6990)

## Q11

### Top View



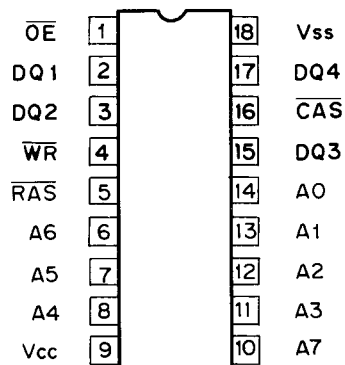
### Q11 Block Diagram



## RAM (M5M4464P-12)

Q3, Q4

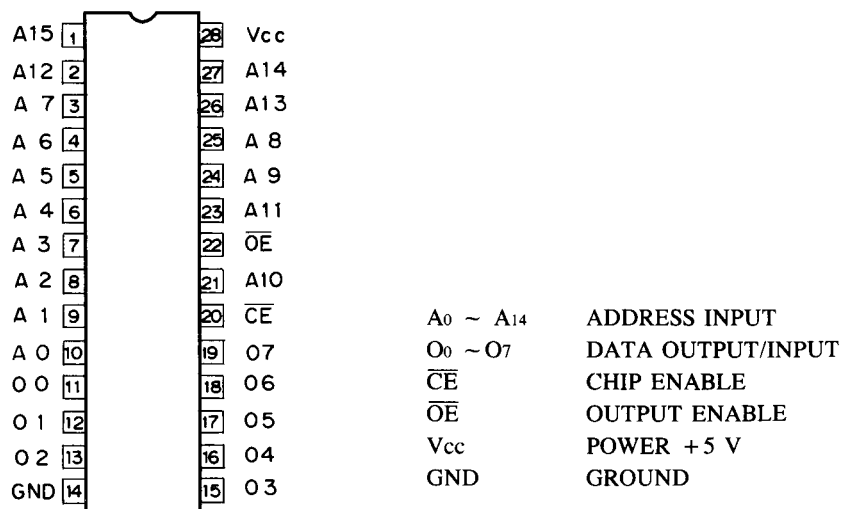
Top View



## ROM (27512-17)

Q5, Q12

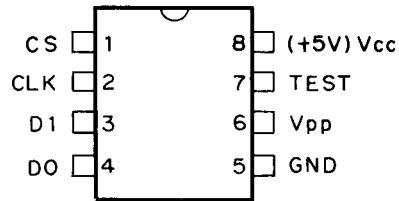
Top View



## EEPROM (ER59256)

**Q9**

**Top View**

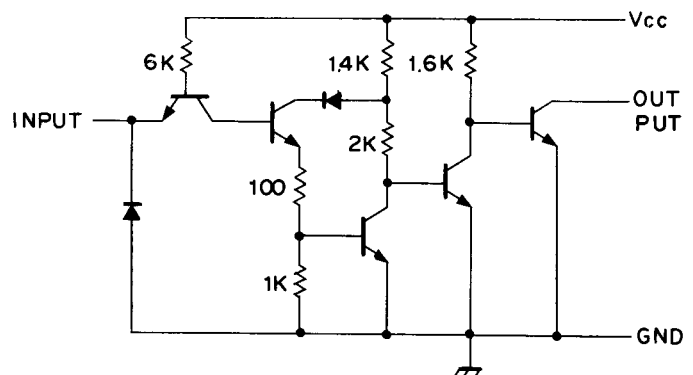
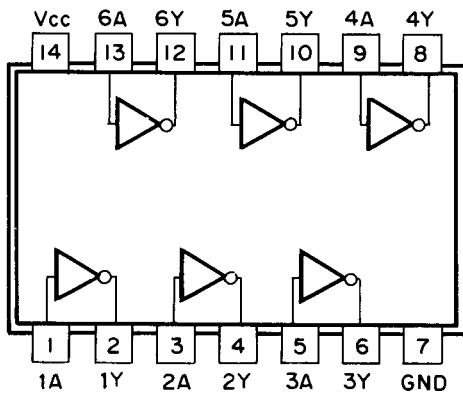


CS      Chip Select  
 CLK    Clock Input  
 DI      Serial Data Input  
 DO      Serial Data Output  
 Vcc     +5 V Power Supply  
 GND    Ground

**IC**

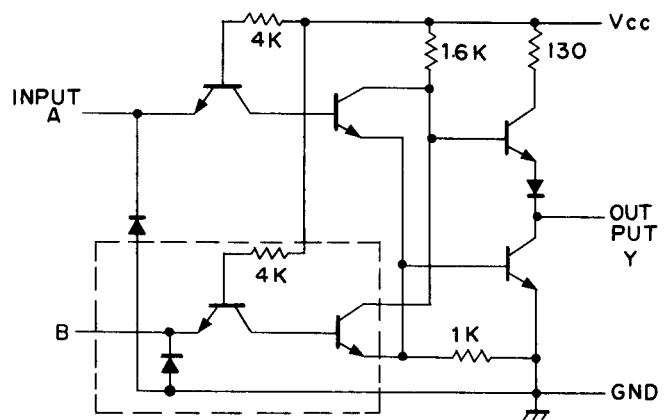
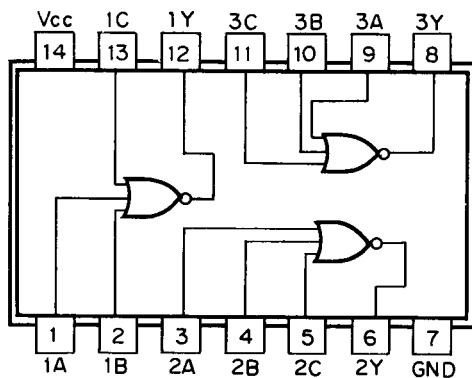
**1) 74LS06**

**Q13**

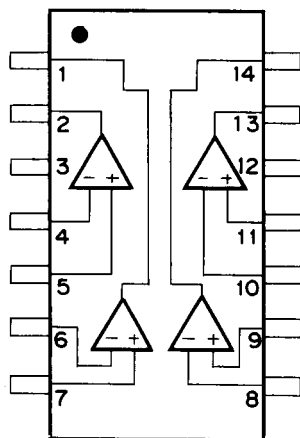


**2) 74LS27**

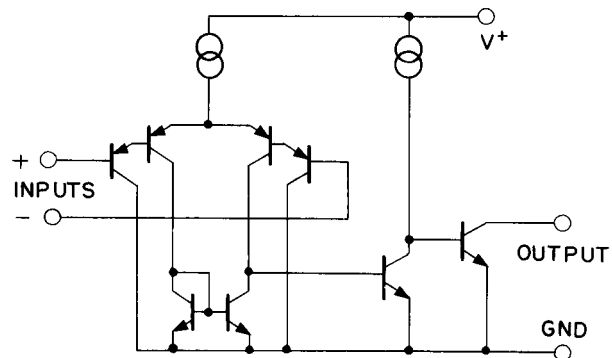
**Q14**



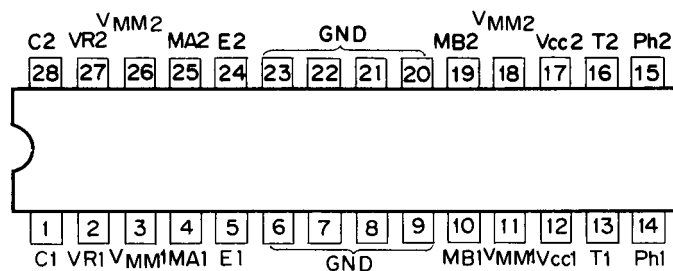
### 3) IC Comparator (NJM2901M) Q7, Q15



1. OUTPUT2
2. OUTPUT1
3. V+
4. - INPUT1
5. + INPUT1
6. - INPUT2
7. + INPUT2
8. - INPUT3
9. + INPUT3
10. - INPUT4
11. + INPUT4
12. GROUND
13. OUTPUT4
14. OUTPUT3



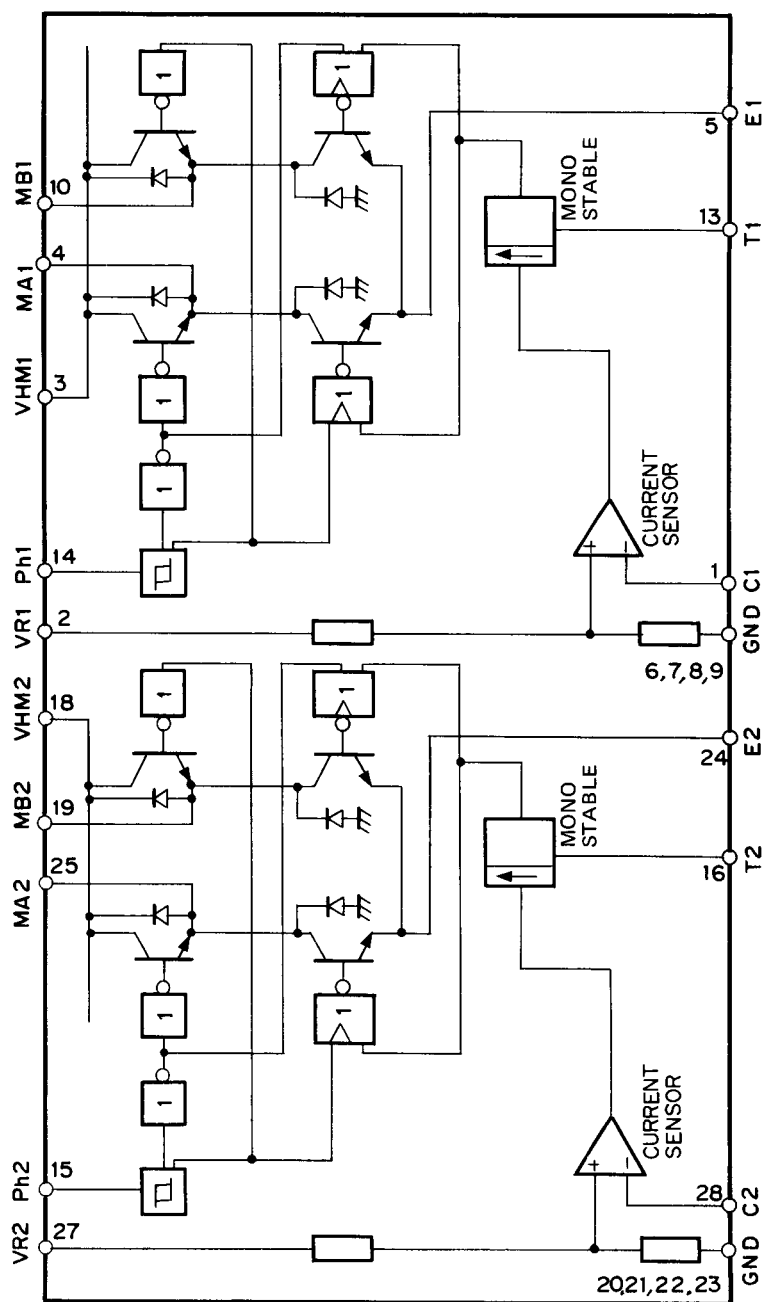
### Linear IC (M54646P) Q10



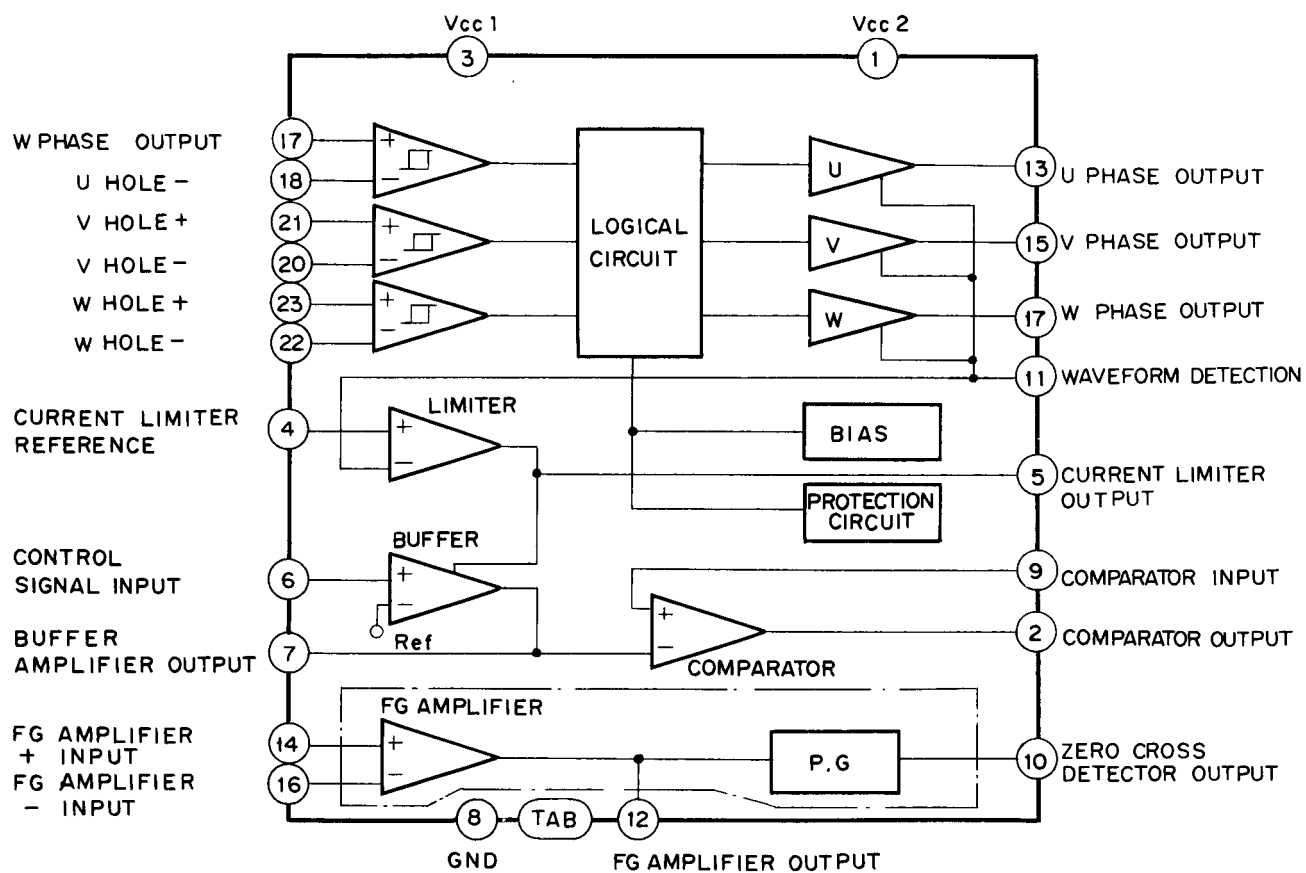
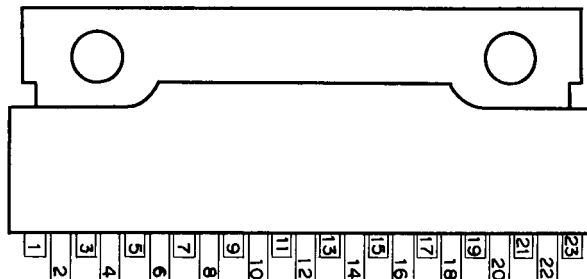
Number	Symbol	Function	Number	Symbol	Function
1	C1	Comparator input (1)	15	Ph2	Output current direction switch
2	VR1	Comparator reference input (1)	16	T2	One-shot multi time constant
3	VMM1	Output power supply (1)	17	Vcc2	Circuit current (2)
4	MA1	Output pin (1)	18	VMM2	Output power supply (2)
5	E1	Current sensor (1)	19	MB2	Output pin (2)
6	GND	Ground	20	GND	Ground
7	GND	Ground	21	GND	Ground
8	GND	Ground	22	GND	Ground
9	GND	Ground	23	GND	Ground
10	MB1	Output pin (1)	24	E2	Current sensor (2)
11	VMM1	Output power supply (1)	25	MA2	Output pin (2)
12	Vcc1	Circuit current (1)	26	VMM2	Output power supply (2)
13	T1	One-shot multi time constant	27	VR2	Comparator reference input (2)
14	Ph1	Output current direction switch	28	C2	Comparator input (2)



### Q10 Block Diagram

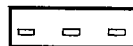
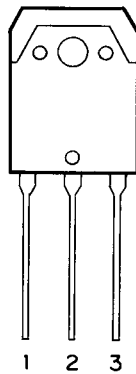


# **Linear IC (HA13412)** **MTDV**



## Transistor

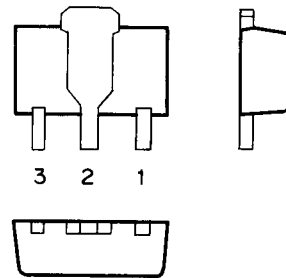
### 1) Transistor 2SB883 Tr4



1 : BASE  
2 : COLLECTOR  
3 : EMITTER

### 2) Transistor 2SB1123 Tr1

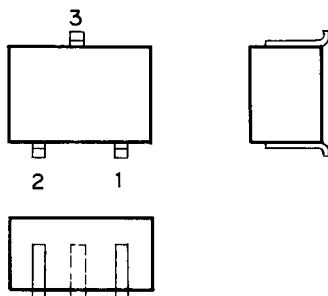
#### Bottom View



1 : BASE  
2 : COLLECTOR  
3 : EMITTER

### 3) Transistor 2SA1344/UN2111/DAT114K Tr111, Tr113, Tr114, Tr116, Tr129

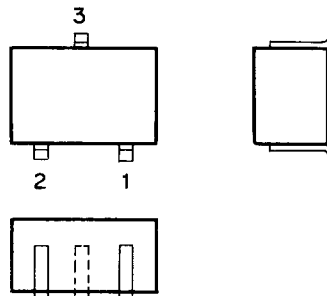
#### Top View



1 : EMITTER  
2 : BASE  
3 : COLLECTOR

### 4) Transistor 2SC3361/2SC2412K Tr104, Tr108, Tr110, Tr112, Tr115, Tr118, Tr119, Tr140, Tr141, Tr142, Tr143

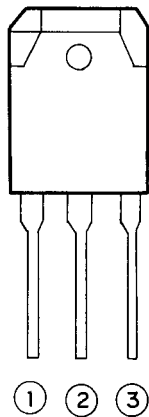
#### Top View



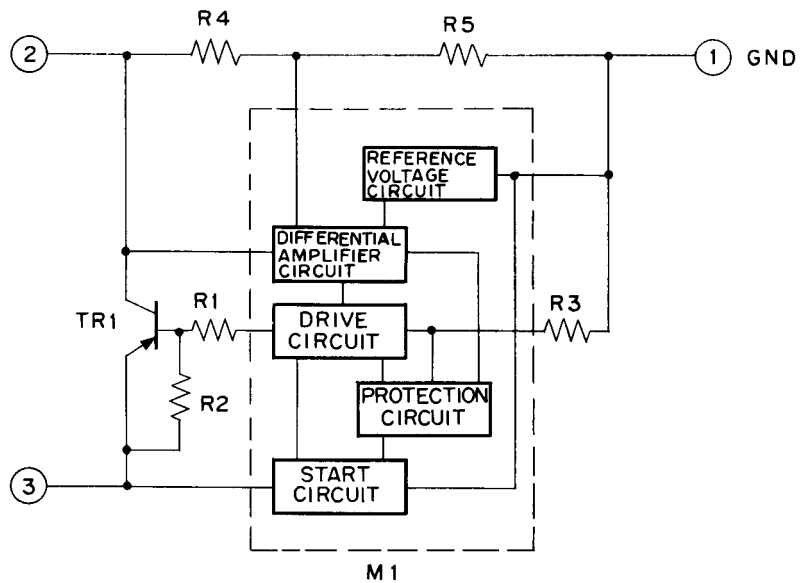
1 : EMITTER  
2 : BASE  
3 : COLLECTOR

## Triode Regulator (SI3052V)

### IC1 (POWER PCB)

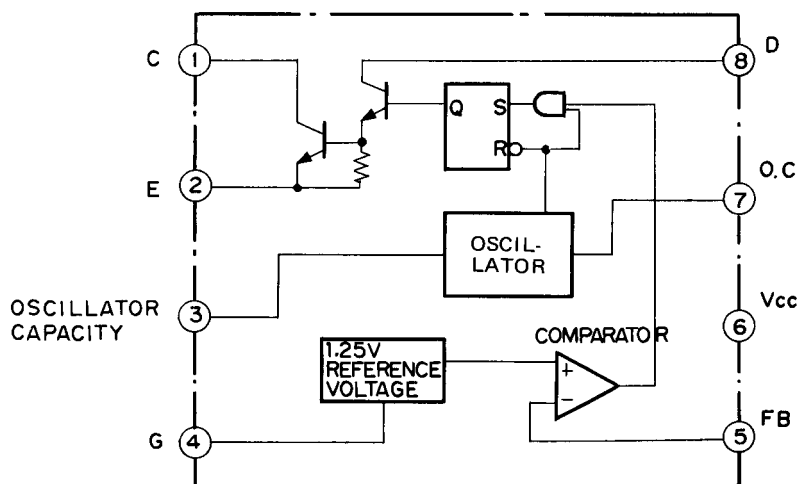
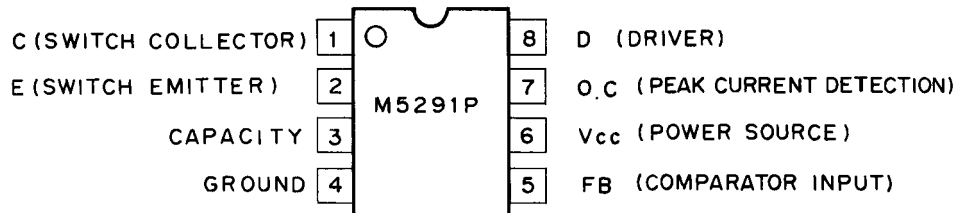


1: GND  
2: OUTPUT  
3: INPUT




## Switching Regulator Controller (M5291P)

### IC2 (POWER PCB)














# Parts List

## Electrical Parts

**Product Safety Note:** Products marked with a  have special characteristics important to safety. Before replacing any of these components, read carefully the product safety notice of this service manual. Don't degrade the safety of the product through improper servicing.

### Filter Circuit Board Assembly and Power Transformer

Ref.No.	Description	RS Part No.	Mfr. Part No.	
	Assembly, Circuit Board, Filter consists of the following:		4YX4056-3477G1	
C101 	0.1 $\mu$ F, 250 V, $\pm 20\%$		306A2217M5104	
C102 	4700 pF, 400 V, + 80/ – 20%		302A4035Z6472	
C103 	4700 pF, 400 V, + 80/ – 20%		302A4035Z6472	
CN101 	Inlet, NC174		4LP-7144	
CN102 	Connector, 2-173270-2		4FP-12940-2	
F101 	Fuse, MGC-5, 250 V, 5A		540A2052M2502	
FG1	FG Line		4YS4058-1505G2	
FH1 	Fuse Holder, UF-0017		242A3060P0001	
L101 	Filter Coil, 602Y1R0		4FP-21514-5	
SW101 	Switch, EST-15747V		200A3113P2000	
T1 	Power Transformer		4YB4056-8354P1	

## Power PCB Assembly

Ref.No.	Description	RS Part No.	Mfr. Part No.	
△	Assembly, PCB, Power consists of the following:		3YU5057-3219G1	
Capacitors				
C1	△ 3300 $\mu$ F, 80 V, $\pm$ 20%		4FP-23139	
C2	△ 0.1 $\mu$ F, 100 V, $\pm$ 10%		4FP-23044-47	
C3	△ 10000 pF, 250 V, + 80/– 20%		302A4027Z5103	
C4	△ 0.001 $\mu$ F, 100 V, $\pm$ 10%		4FP-23044-35	
C5	1000 $\mu$ F, 50 V, $\pm$ 20%		4FP-23140	
C6	Not used			
C7	8200 $\mu$ F, 16 V, $\pm$ 20%		4FP-23141	
C8	Not used			
C9	100 $\mu$ F, 10 V, + 50/– 10%		4FP-23012-12	
C10	0.1 $\mu$ F, 100 V, $\pm$ 10%		4FP-23044-47	
C11	0.01 $\mu$ F, 100 V, $\pm$ 10%		4FP-23044-41	
C12	Not used			
C13	0.0015 $\mu$ F, 100 V, $\pm$ 10%		4FP-23044-36	
Diodes				
D1	△ Rectifier Diode, RB602		4FP-24374-2	
D2	△ Thyristor, CR8AMW8		4FP-24388	
D3	△ Diode, ERC35-02		4FP-24383	
D4	Not used			
D5	Not used			
D6	Not used			
D7	Not used			
D8	Diode, 1SS229		4FP-24173	
D9	Diode, RD5.6E-B		4FP-24005-3	
D10	Diode, RD39E-B6 or B7		4FP-24005-55	
D11	△ Diode, ERC01-02		4FP-24377	
D12	Rectifier Diode, RB402		4FP-24374	
D13	Not used			
D14	Diode, RD20EB		4FP-24005-16	
ICs				
IC1	Regulator, SI3052V		4FP-25074-1	
IC2	Regulator Controller, M5291P		4FP-25129	
Transistors				
Q1	△ Transistor, PNP, 2SB1382		4FP-24378	
Q2	△ Transistor, NPN, 2SC2719		4LP-44335	
Q3	Transistor, NPN, 2SC2719		4LP-44335	
Q4	Transistor, NPN, 2SC2719		4LP-44335	
Q5	Transistor, NPN, 2SC2719		4LP-44335	

Ref.No.		Description	RS Part No.	Mfr. Part No.	
Resistors					
R1	△	7500 Ω, 2 W, ± 5%		4FP-22075-752	
R2	△	1200 Ω, 1/4 W, ± 5%		4LP-8446-122	
R3	△	560 Ω, 1/4 W, ± 5%		4LP-8446-561	
R4	△	5600 Ω, 2 W, ± 5%		4FP-22075-562	
R5		Not used			
R6		220 Ω, 1/4 W, ± 5%		4LP-8446-221	
R7		Not used			
R8		Not used			
R9	△	100 Ω, 1/2 W, ± 5%		4LP-8447-101	
R10		27 kΩ, 1/4 W, ± 1%		323A1222F0273	
R11		820 Ω, 1/4 W, ± 1%		323A1222F0821	
R12		39 Ω, 2 W, ± 5%		4FP-22075-390	
R13		100 Ω, 1/4 W, ± 5%		4LP-8446-101	
R14		560 Ω, 1/4 W, ± 5%		4LP-8446-561	
R15		560 Ω, 1/4 W, ± 5%		4LP-8446-561	
R16		100 Ω, 1/4 W, ± 5%		4LP-8446-101	
R17	△	10 Ω, 5 W, ± 5%		4FP-22091-100	
R18		3 kΩ, 2 W, ± 5%		4FP-22075-302	
R19		430 Ω, 1/4 W, ± 5%		4LP-8446-431	
R20		1500 Ω, 1/4 W, ± 5%		4LP-8446-152	
R21	△	0.2 Ω, 5 W, ± 10%		4FP-22091-8	
R22		10 kΩ, 1/4 W, ± 5%		4LP-8446-103	
R23		10 kΩ, 1/4 W, ± 5%		4LP-8446-103	
RV1		200 Ω, 1/2 W		4FP-22087-201	
Miscellaneous					
CN1		Connector, 172681-8		4FP-12836-8	
FB1	△	Beads, B-20L-48B		4FP-21542-6	
FH2		Fuse Holder, TS-01-P-SN		4FP-21069	
F1		Fuse, MGC-2, 250 V, 2 A		540A2052M2202	
H1		Heat Sink		4FP-14110-5	
H2		Heat Sink		4FP-14110-4	
H3		Heat Sink		4FP-14133	
J1		Jumper Wire		4FP-22079-2	(25 mm)
J2		Jumper Wire		4FP-22079-5	(15 mm)
J3		Jumper Wire		4FP-22079-5	(15 mm)
J4		Jumper Wire		4FP-22079-3	(10 mm)
L1	△	Coil, SK-21P-060-550		4FP-21566-2	
TH1		Thermistor, 5D-11 or 8D-11		4FP-14512-8	

## Control PCB Assembly

Ref.No.	Description	RS Part No.	Mfr. Part No.	
	Assembly, PCB, Control consists of the following:		4YA4042-1433G100	
Capacitors				
C1	Not used			
C2	Not used			
C3	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C4	Not used			
C5	Not used			
C6	Not used			
C7	3.3 $\mu$ F, 100 V, $\pm$ 20%		304A1041A2339	
C8	10 $\mu$ F, 50 V, $\pm$ 20%		304A1041H1100	
C9	10 $\mu$ F, 50 V, $\pm$ 20%		304A1041H1100	
C10	Not used			
C11	Not used			
C12	3.3 $\mu$ F, 100 V, $\pm$ 20%		304A1041A2339	
C13	10 $\mu$ F, 50 V, $\pm$ 20%		304A1041H1100	
C14	Not used			
C15	Not used			
C16	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C17	1000 pF, 50V, $\pm$ 10%		303A6009K3102	
C18	Not used			
⋮	⋮			
C25	Not used			
C26	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C27	Not used			
C28	0.022 $\mu$ F, 100 V, $\pm$ 2%		306A4100G2223	
C29	Not used			
C30	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C31	680 $\mu$ F, 50 V, $\pm$ 20%		304A1035H1681	
C32	Not used			
C33	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C34	Not used			
⋮	⋮			
C40	Not used			
C41	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C42	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C43	100 pF, 50 V, $\pm$ 5%		303A3008K0101	
C44	100 pF, 50 V, $\pm$ 5%		303A3008K0101	
C45	100 $\mu$ F, 10 V, $\pm$ 20%		304A1041A1101	
C46	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C47	Not used			
C48	Not used			
C49	Not used			
C50	1 $\mu$ F, 25 V, +80/–20%		303A4117Z2105	
C51	Not used			
⋮	⋮			
C63	Not used			



Ref.No.	Description	RS Part No.	Mfr. Part No.	
Capacitors				
C64	10000 pF, 250 V, +80/–20%		302A4027Z5103	
C65	680 $\mu$ F, 50 V, $\pm$ 20%		304A1035H1681	
C66	560 pF, 50 V $\pm$ 5%		303A3008K0561	
C67	Not used			
⋮	⋮			
C80	Not used			
C81	0.1 $\mu$ F, 50V, +80/–20%		303A6009Z3104	
C82	Not used			
C83	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C84	Not used			
C85	Not used			
C86	Not used			
C87	10 $\mu$ F, 63 V, $\pm$ 20%		304A1041J1100	
C88	Not used			
⋮	⋮			
C98	Not used			
C99	3.3 $\mu$ F, 100 V, $\pm$ 20%		304A1041A2339	
C100	Not used			
⋮	⋮			
C106	Not used			
C107	10 pF, 50 V, $\pm$ 5%		303A3008K0100	
C108	1000 pF, 50 V, $\pm$ 10%		303A6009K3102	
C109	Not used			
C110	Not used			
C111	10000 pF, 50 V, $\pm$ 10%		303A6009K3103	
C112	Not used			
⋮	⋮			
C116	Not used			
C117	0.1 $\mu$ F, 50V, +80/–20%		303A6009Z3104	
C118	Not used			
C119	1000 pF, 50 V $\pm$ 10%		303A6009K3102	
C120	Not used			
⋮	⋮			
C124	Not used			
C125	10000 pF, 50 V, $\pm$ 10%		303A6009K3103	
C126	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C127	Not used			
⋮	⋮			
C137	Not used			
C138	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C139	Not used			
C140	820 pF, 50 V, $\pm$ 5%		303A3008K0821	
C141	Not used			
C142	Not used			
C143	820 pF, 50 V, $\pm$ 5%		303A3008K0821	
C144	820 pF, 50 V $\pm$ 5%		303A3008K0821	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Capacitors				
C145	820 pF, 50V, $\pm 5\%$		303A3008K0821	
C146	Not used			
⋮	⋮			
C178	Not used			
C179	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C180	Not used			
C181	Not used			
C182	10 pF, 50 V, $\pm 5\%$		303A3008K0100	
C183	10 pF, 50 V, $\pm 5\%$		303A3008K0100	
C184	Not used			
⋮	⋮			
C187	Not used			
C188	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C189	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C190	Not used			
⋮	⋮			
C195	Not used			
C196	22000 pF, 50V, $\pm 10\%$		303A6009K3223	
C197	Not used			
⋮	⋮			
C200	Not used			
C201	22000 pF, 50V, $\pm 10\%$		303A6009K3223	
C202	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C203	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C204	Not used			
⋮	⋮			
C209	Not used			
C210	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C211	Not used			
C212	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C213	Not used			
⋮	⋮			
C216	Not used			
C217	470 pF, 50 V, $\pm 5\%$		303A3008K0471	
C218	Not used			
⋮	⋮			
C246	Not used			
C247	1000 pF, 50V, $\pm 10\%$		303A6009K3102	
C248	1000 pF, 50V, $\pm 10\%$		303A6009K3102	
C249	1000 pF, 50V, $\pm 10\%$		303A6009K3102	
C250	Not used			
⋮	⋮			
C260	Not used			
C261	1000 pF, 50V, $\pm 10\%$		303A6009K3102	
C262	Not used			
⋮	⋮			

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Capacitors				
C265	Not used			
C266	0.1 $\mu$ F, 50V, +80/–20%		303A6009Z3104	
C267	Not used			
⋮	⋮			
C270	Not used			
C271	0.1 $\mu$ F, 50 V, +80/–20%		303A6009Z3104	
C272	Not used			
⋮	⋮			
C499	Not used			
C500	1000 pF, 50V, $\pm$ 10%		303A6009K3102	
C501	1000 pF, 50V, $\pm$ 10%		303A6009K3102	
C502	Not used			
⋮	⋮			
C514	Not used			
C515	10000 pF, 250V, +80/–20%		302A4027Z5103	
C516	10000 pF, 250V, +80/–20%		302A4027Z5103	
C517	1000 pF, 50V, $\pm$ 10%		303A6009K3102	
Connectors				
CN1	Connector, AK-127S15D		224A1156P0150	
CN2	Connector, Z-355S		224A3198P0240	
CN3	Not used			
CN4	Not used			
CN5	Not used			
CN6	Connector, TCS7688-01-201		221A1622P0081	
CN7	Connector, 57LE-40360-7300 (D53)		220A1423P0361	
Diodes				
D1	Not used			
D2	Diode, MA151WK or DAN202K		611A0003N0003	
D3	Diode, MA3047-H		613A0291M0102H	
D4	Not used			
D5	Diode, DSA3A1		610A0021L0092	
D6	Diode, EM1Z or SM-1A-02 or DSA1A2		610A0003M0001	
D7	Diode, DSA3A1		610A0021L0092	
D8	Diode, DSA3A1		610A0021L0092	
D9	Diode, MA151WK or DAN202K		611A0003N0003	
D10	Diode, DFA1A1		610A0221L0021	
D11	Diode, MA3075-M		613A0291M0152M	
D100	Diode, MA151WK or DAN202K		611A0003N0003	
D101	Diode, MA3300 or RD30M-B		613A0103M0292	
D102	Diode, MA3300 or RD30M-B		613A0103M0292	
D103	Diode, MA151WK or DAN202K		611A0003N0003	
D104	Not used			

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Diodes				
D105	Not used			
D106	Diode, MA152WA		611A0029M0002	
D107	Diode, MA3120		613A0291M0202	
D108	Not used			
D109	Diode, MA3047-H		613A0291M0102H	
D110	Not used			
⋮	⋮			
D116	Not used			
D117	Diode, MA3056-M		613A0291M0122M	
D118	Not used			
⋮	⋮			
D127	Not used			
D128	Diode, RD2.7M-B1		613A0233M0042A	
D129	Not used			
⋮	⋮			
D148	Not used			
D149	Diode, MA151WK or DAN202K		611A0003N0003	
ICs				
Q1	Digital IC, SN74LS08NS		700A0550N0008	
Q2	Not used			
Q3	Dynamic RAM, MOS, 464P-12		802A2003M8302	
Q4	Dynamic RAM, MOS, 464P-12		802A2003M8302	
Q5	CG ROM		4YR4077-1182G1	
Q6	Digital IC, MOS, MSM79H048GS-V1K		702A4824N9016	
Q7	Linear IC, NJM2901M		720A0528N0002	
Q8	Micro CPU, 8 bits, MSM80C154GC-V1K		851A0124N0013	
Q9	EEPROM, MOS, ER59256-NW		816A8020M0000	
Q10	Linear IC, M54646P		720A1822M0002	
Q11	Digital IC, MOS, MSM6990GS-V1K		702A2024N0003	
Q12	Program ROM		4YR4077-1181G1	
Q13	Digital IC, 74LS06		700A0503N0006	
Q14	Digital IC, SN74LS27NS		700A0550N0027	
Q15	Linear IC, NJM2901M		720A0528N0002	
MTDV	Linear IC, HA13412		720A4021E0004	
Sockets				
Q5	Socket, IC, DL2-28A-05		245A1155P0280	
Q12	Socket, IC, DL2-28A-05		245A1155P0280	
Resistors				
R1	Not used			
R2	Not used			
R3	Not used			
R4	0.51 $\Omega$ , 1/2 W, $\pm 5\%$		324A1001J0518	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R5	220 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0224	
R6	Not used			
⋮	⋮			
R10	Not used			
R11	2k $\Omega$ , 1/2 W, $\pm 5\%$		321A1431J0202	
R12	Not used			
R13	Not used			
R14	Not used			
R15	120 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0124	
R16	Not used			
R17	Not used			
R18	270 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0271	
R19	1200 $\Omega$ , 1/2 W, $\pm 5\%$		321A1431J0122	
R20	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R21	0.51 $\Omega$ , 1/2 W, $\pm 5\%$		324A1001J0518	
R22	0.51 $\Omega$ , 1/2 W, $\pm 5\%$		324A1001J0518	
R23	3300 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0332	
R24	Not used			
R25	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R26	Not used			
R27	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R28	Not used			
⋮	⋮			
R33	Not used			
R34	470 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0471	
R35	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R36	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R37	1 M $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0105	
R38	Not used			
R39	Not used			
R40	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R41	Not used			
⋮	⋮			
R48	Not used			
R49	1.8 $\Omega$ , 1 W, $\pm 5\%$		327A1002J0189	
R50	Not used			
R51	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R52	Not used			
R53	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R54	Not used			
R55	Not used			
R56	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R57	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R58	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R59	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R60	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R61	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R62	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R63	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R64	Not used			
R65	Not used			
R66	Not used			
R67	Not used			
R68	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R69	Not used			
R70	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R71	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R72	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R73	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R74	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R75	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R76	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R77	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R78	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R79	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R80	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R81	Not used			
⋮	⋮			
R87	Not used			
R88	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R89	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R90	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R91	Not used			
R92	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R93	Not used			
R94	Not used			
R95	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R96	Not used			
⋮	⋮			
R100	Not used			
R101	2400 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0242	
R102	2400 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0242	
R103	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R104	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R105	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R106	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R107	Not used			
R108	Not used			
R109	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R110	2000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0202	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R111	Not used			
R112	20 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0203	
R113	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R114	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R115	100 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0104	
R116	100 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0104	
R117	Not used			
R118	30 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0303	
R119	Not used			
R120	270 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0271	
R121	5100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0512	
R122	30 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0303	
R123	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R124	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R125	Not used			
R126	Not used			
R127	2000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0202	
R128	2000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0202	
R129	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R130	2000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0202	
R131	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R132	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R133	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R134	150 k $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0154	
R135	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R136	36 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0363	
R137	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R138	Not used			
R139	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R140	Not used			
R141	47 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0473	
R142	47 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0473	
R143	Not used			
R144	Not used			
R145	Not used			
R146	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R147	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R148	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R149	150 k $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0154	
R150	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R151	36 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0363	
R152	68 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0683	
R153	6800 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0682	
R154	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R155	Not used			

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R156	2400 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0242	
R157	6800 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0682	
R158	3 k $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0302	
R159	2400 $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0242	
R160	Not used			
R161	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R162	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R163	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R164	120 k $\Omega$ , 1/8 W, $\pm 1\%$		323A5015F0124	
R165	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R166	510 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0511	
R167	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R168	Not used			
R169	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R170	1200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0122	
R171	Not used			
R172	510 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0511	
R173	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R174	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R175	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R176	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R177	680 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0681	
R178	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R179	Not used			
R180	0 $\Omega$ , chip jumper		323A5011P0001	
R181	Not used			
R182	Not used			
R183	Not used			
R184	1200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0122	
R185	Not used			
R186	510 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0511	
R187	1200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0122	
R188	Not used			
⋮	⋮			
R194	Not used			
R195	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R196	Not used			
R197	Not used			
R198	Not used			
R199	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R200	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
R201	Not used			
R202	Not used			
R203	Not used			
R204	1800 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0182	



Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R205	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R206	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R207	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R208	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R209	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R210	Not used			
R211	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R212	Not used			
R213	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R214	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R215	330 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0331	
R216	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R217	Not used			
R218	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R219	Not used			
R220	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R221	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R222	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R223	Not used			
R224	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R225	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R226	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R227	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R228	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R229	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R230	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R231	10k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	
R232	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R233	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R234	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R235	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R236	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R237	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R238	3300 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0332	
R239	Not used			
R240	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R241	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R242	430 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0431	
R243	Not used			
R244	0 $\Omega$ , chip jumper		323A5011P0001	
R245	0 $\Omega$ , chip jumper		323A5011P0001	
R246	Not used			
⋮	⋮			
R255	Not used			
R256	10 k $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0103	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Resistors				
R257	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R258	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R259	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R260	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R261	Not used			
R262	Not used			
R263	Not used			
R264	Not used			
R265	Not used			
R266	Not used			
R267	2200 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0222	
R268	1000 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0102	
R269	Not used			
⋮	⋮			
R308	Not used			
R309	100 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0101	
R310	Not used			
⋮	⋮			
R501	Not used			
R502	510 $\Omega$ , 1/8W, $\pm 5\%$		323A5015J0511	
R503	Not used			
R504	510 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0511	
R505	Not used			
⋮	⋮			
R518	Not used			
R519	5600 $\Omega$ , 1/8 W, $\pm 5\%$		323A5015J0562	
Transistors				
TR1	Transistor, PNP, 2SB1123		601A1032N0002	
TR2	Not used			
TR3	Not used			
TR4	Transistor, PNP, 2SB883		601A1232M0001	
TR104	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR105	Not used			
TR106	Not used			
TR107	Not used			
TR108	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR109	Not used			
TR110	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR111	Transistor, PNP, 2SA1344 or UN2111 or DTA114K		600A1003N0003	
TR112	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR113	Transistor, PNP, 2SA1344 or UN2111 or DTA114K		600A1003N0003	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Transistors				
TR114	Transistor, PNP, 2SA1344 or UN2111 or DTA114K		600A1003N0003	
TR115	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR116	Transistor, PNP, 2SA1344 or UN2111 or DTA114K		600A1003N0003	
TR117	Not used			
TR118	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR119	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR120	Not used			
⋮	⋮			
TR128	Not used			
TR129	Transistor, PNP, 2SA1344 or UN2111 or DTA114K		600A1003N0003	
TR130	Not used			
⋮	⋮			
TR139	Not used			
TR140	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR141	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR142	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
TR143	Transistor, NPN, 2SC3361 or 2SC2412K		602A1003N0002	
Miscellaneous				
BASW	Leaf Switch, MSW-1731CVC		218A7050P0001	
F1	Fuse, MC1, 125 V, 1 A		540A2115S1102	
J1	Jumper Wire		LY-6507-1-GN	
L1	Beads Core, FBA04HA 900KF-00		105A1222C1001	
L2	Coil, OL1614-102KR70		353A3002K0102	
L3	EMI Filter, DST306-55F103Z		342A1004P2103	
L4	EMI Filter, DST306-55F103Z		342A1004P2103	
L6	Beads Filter, ZBF253D-01		377A1115P1309	
L7	Beads Filter, ZBF253D-01		377A1115P1309	
L8	Beads Filter, ZBF253D-01		377A1115P1309	
L9	Beads Filter, ZBF253D-01		377A1115P1309	
OSC	Oscillator, FAR-C4SB13500000M02A		381A2001B0006	
PE	Photocoupler, EE-SX1042		652A0127M0012	
S6	Jumper Wire		321A1520P0001	
S7	Jumper Wire		5KH-31036-150	
S8	Jumper Wire		321A1520P0001	
S9	Jumper Wire		321A1520P0001	
S10	Jumper Wire		5KH-31036-100	
S11	Jumper Wire		5KH-31036-25	
S12	Jumper Wire		5KH-31036-25	
S13	Jumper Wire		5KH-31036-25	
S14	Jumper Wire		5KH-31036-25	
S20	Jumper Wire		321A1520P0001	

Ref.No.	Description	RS Part No.	Mfr. Part No.	
Miscellaneous				
EB1	Ground Bar		3LH-31313-159	
EB2	Ground Bar		3LH-31313-96	
EB3	Not used			
EB4	Ground Bar		3LH-31313-133	
EB5	Ground Bar		3LH-31313-13	
EB6	Ground Bar		3LH-31313-158	
EB7	Ground Bar		3LH-31313-85	
EB8	Ground Bar		3LH-31313-163	
EB9	Not used			
EB10	Ground Bar		3LH-31313-15	
EB11	Ground Bar		3LH-31313-163	
EB12	Ground Bar		3LH-31313-97	
EB13	Ground Bar		3LH-31313-13	

### Operator PCB Assembly

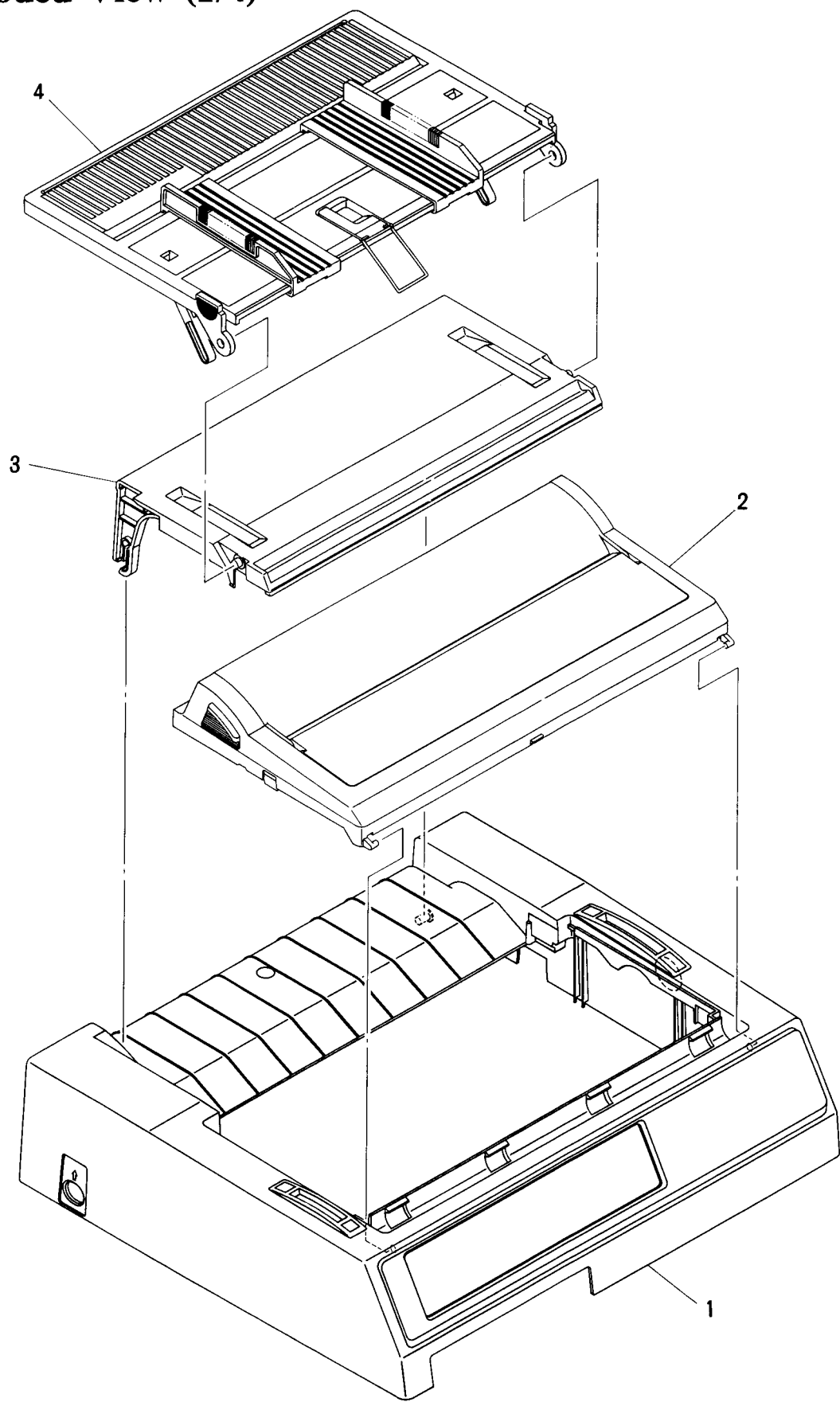
Ref.No.	Description	RS Part No.	Mfr. Part No.	
	Assembly, PCB, Operator consists of the following:		4YB4042-1436P1	
C1	10 $\mu$ F, 50 V, $\pm$ 20%		304A1041H1100	
IC1	IC, 74LS07		700A0503M0007	
LED1	LED, POWER, LT3H477W		650A0228M0007	
LED2	LED, ON/OFF LINE, LT3H477W		650A0228M0007	
LED3	LED, QUIET, LT3H477W		650A0228M0007	
LED4	LED, LQ, LT3H477W		650A0228M0007	
LED5	LED, 12, LT3H477W		650A0228M0007	
LED6	LED, 17, LT3H477W		650A0228M0007	
LED7	LED, PS, LT3H477W		650A0228M0007	
R1	150 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0151	
R2	150 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0151	
R3	150 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0151	
R4	110 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0111	
R5	110 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0111	
R6	110 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0111	
R7	110 $\Omega$ , 1/4 W, $\pm$ 5%		321A1421J0111	
SW1	Key Switch, ON/OFF LINE, B3F1000S		205A1179P1000	
SW2	Key Switch, LINE FORM, B3F1000S		205A1179P1000	
SW3	Key Switch, QUIET/PARK, B3F1000S		205A1179P1000	
SW4	Key Switch, LQ/DP/PITCH, B3F1000S		205A1179P1000	

## Mechanical Parts

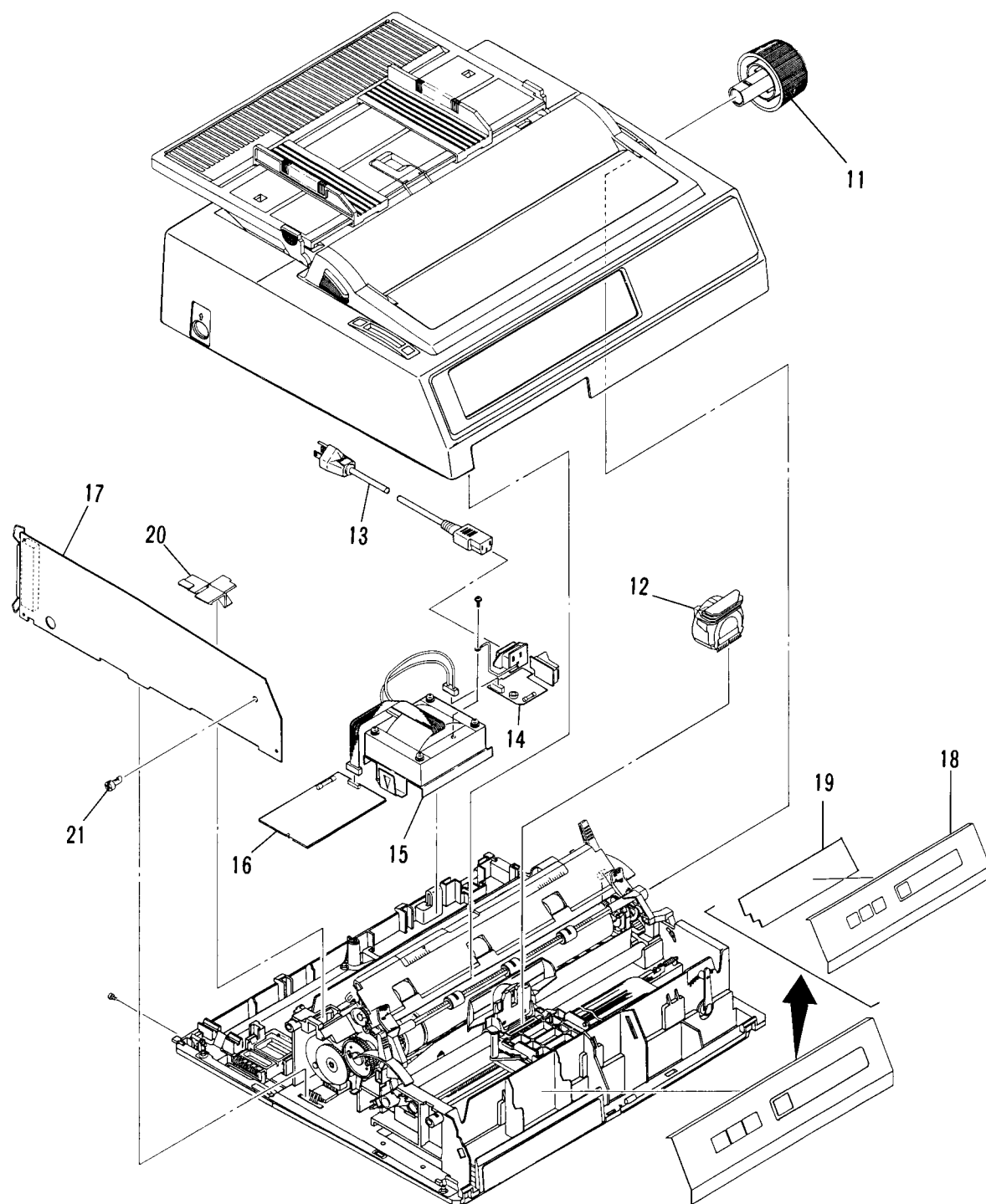
Ref.No.	Description	RS Part No.	Mfr. Part No.	Remarks
1	Cover, Middle		1PP4016-6557P6	(without ROM)
2	Cover, Access		2PA4016-6559G3	
3	Cover, Rear		1PP4016-6567P3	
4	Separator, Sheet		1PA4016-6569G3	
11	Knob, Platen		3PP4025-2871P3	
12	Print Head		4YA4023-2011G1	
13	Cord, AC		3YS4011-1026P1	
14	Assembly, Filter		4YX4056-3477G1	
15	Power Transformer		4YB4056-8354P1	
16	Assembly, PCB, Power		3YU5057-3219G1	
17	Assembly, PCB, Control		4YA4042-1433G100	
17	Assembly, PCB, Control		4YA4042-1433G103	
18	Assembly, Operator		3PP4025-3114G4	
19	Assembly, PCB, Operator		4YB4042-1436P1	
20	Pressure, Board		3PP4025-2896P3	
21	Post, Board Locking		4PP4025-2870P1	
31	Panel, IC Card		2PP4025-2952P4	
32	Cover, Pressure, Board		3PA4025-2806G3	
33	Frame, Main		3PA4025-2802G3	
34	Assembly, Separator		3PA4025-2963G3	
35	Assembly, Platen		3PA4025-2811G3	
36	Assembly, Chute, Paper		3PA4025-2853G3	
37	Assembly, Roller, Pressure		3PA4025-2846G1	
38	Shaft, Carriage		4PP4025-2837P1	
39	Rail, Guide		3PP4025-2809P1	
40	Rack, Space		3PP4025-2845P1	
41	Spring, Tension		4PB4025-2873P1	
42	Spring, Leaf		3PP4025-2819P1	
43	Lever, Sensor		3PP4025-2826P1	
44	Lever, Paper End		3PP4025-2825P1	
45	Cover, Sensor		3PP4025-2827P3	
46	Contact, Power		3PB4025-2911P1	
47	Plate, Connection		3PP4025-2874P1	
48	Bar, Bail, Paper		4PA4025-2838G1	
49	Arm, Bail, Left		2PP4025-2841P3	
50	Arm, Bail, Right		3PP4025-2840P3	
51	Spring, Arm, Left		4PB4025-2843P1	
52	Spring, Arm, Right		4PB4025-2842P1	
53	Motor, LF		3PB4025-2844P1	
54	Lever, Release		3PP4025-2852P3	
55	Link, Release		4PP4025-2881P1	
56	Gear, Drive, Tractor		4PP4025-2869P1	
57	Spring, Reset		4PP4025-2867P1	
58	Gear, Idler		4PP4025-2868P1	
59	Gear, Change		4PP4025-2866P1	

Ref.No.	Description	RS Part No.	Mfr. Part No.	Remarks
60	Cam, Adjusting		4PP4025-2810P1	
71	Assembly, Gear, Ribbon Feed		4PA4025-2832G1	
72	Cable, Head		2PU4007-1095P5	
73	Protector, Ribbon		3PP4025-2836P1	
74	Clamp, Head		4PP4025-1048P1	
75	Frame, Carriage		4PB4025-2829G1	
76	Connector, Head		3PB4025-1241P1	
77	Contact, Pressure		4PP4025-2960P1	
78	Assembly, Motor, Space		4YX4025-2052G4	
79	Slider		4PB4025-1088P1	
81	Guide, Sheet		3PP4025-2927P1	
82	Shaft, Lock		4PP4025-2831P1	
83	Shaft, Drive		4PP4025-2864P1	
84	Assembly, Frame, Tractor, Left		4PA4025-2861G1	
85	Assembly, Frame, Tractor, Right		4PA4025-2855G1	

# Exploded View (1/4)

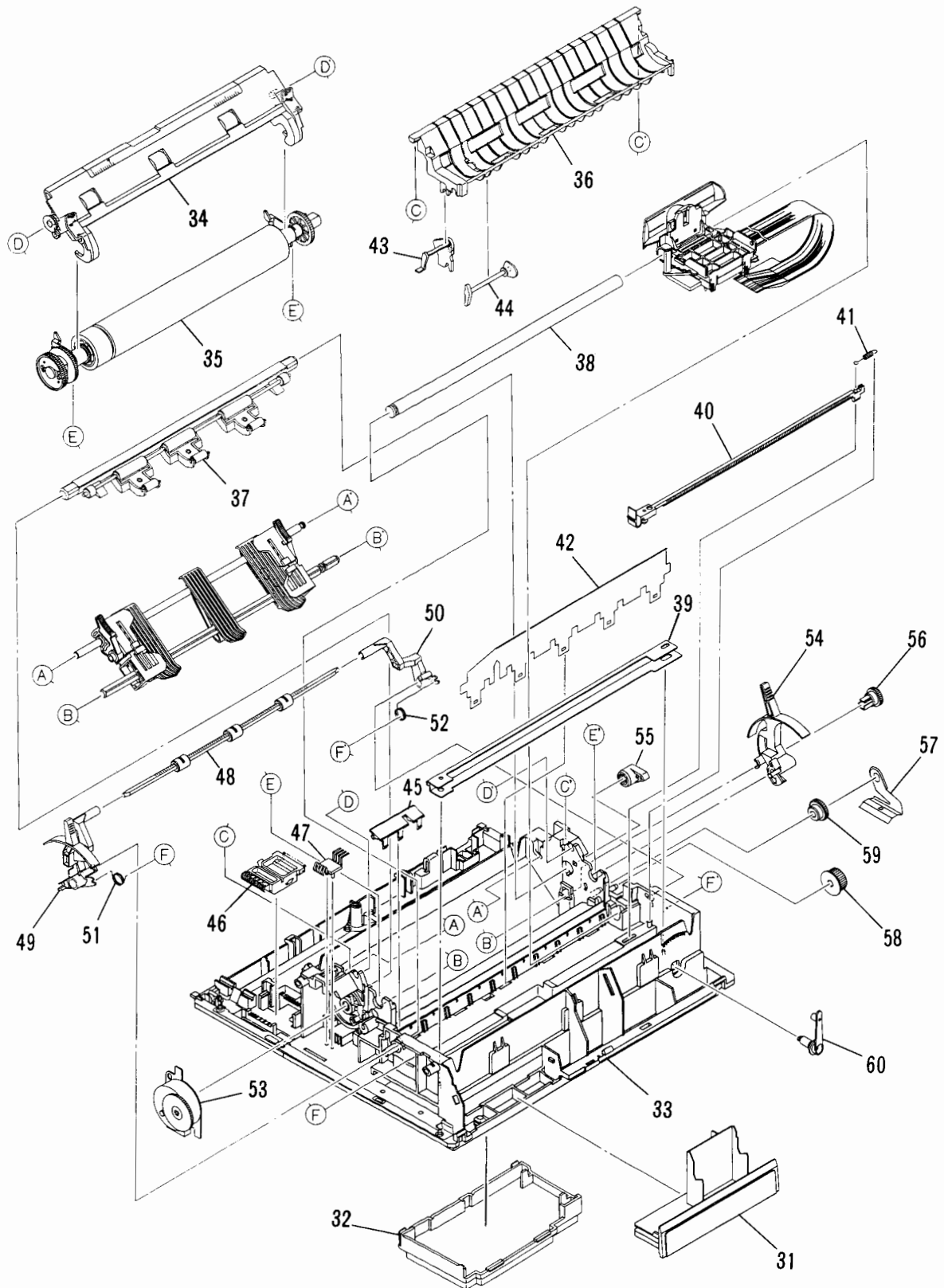


## Exploded View (2/4)

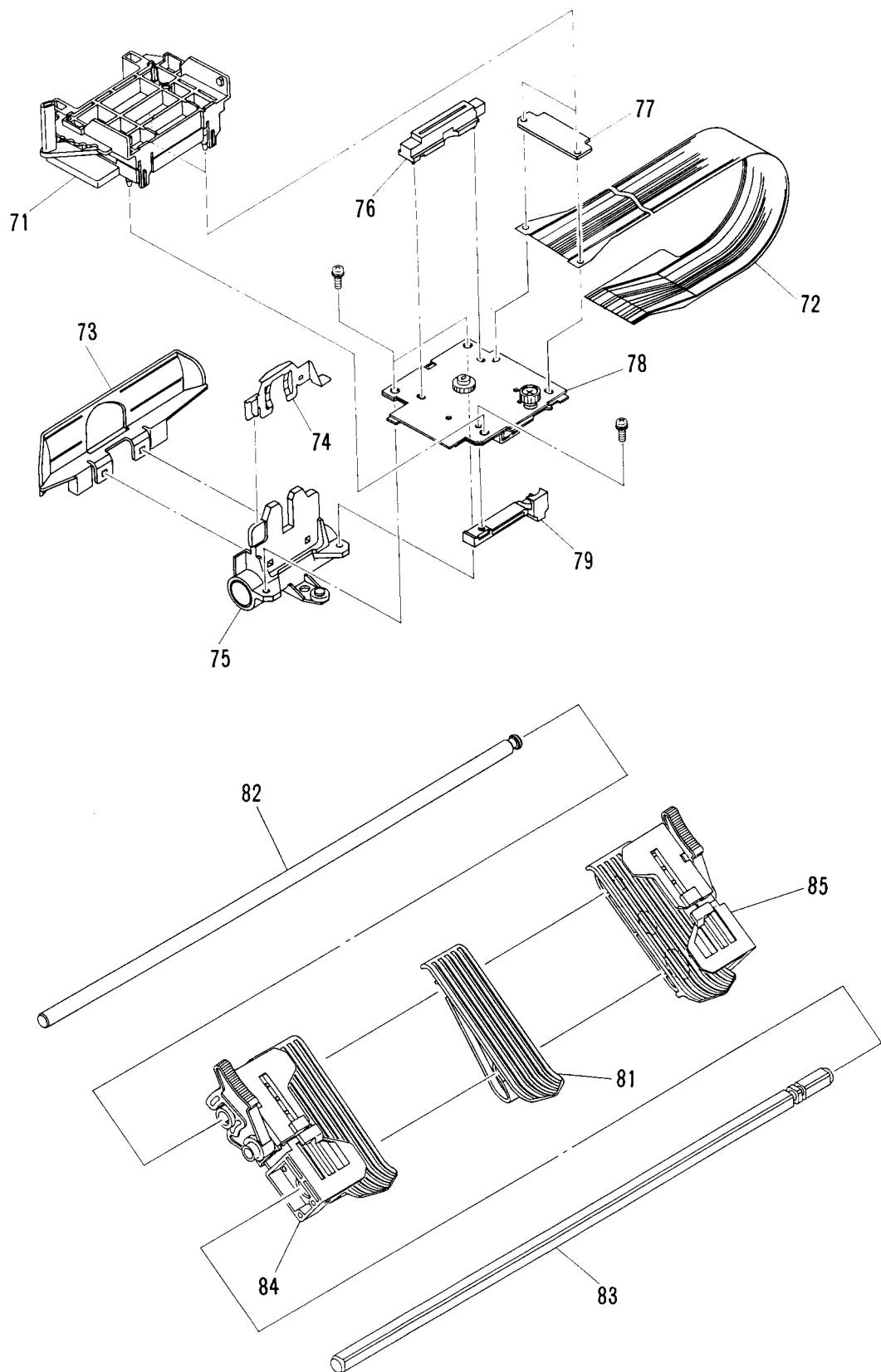


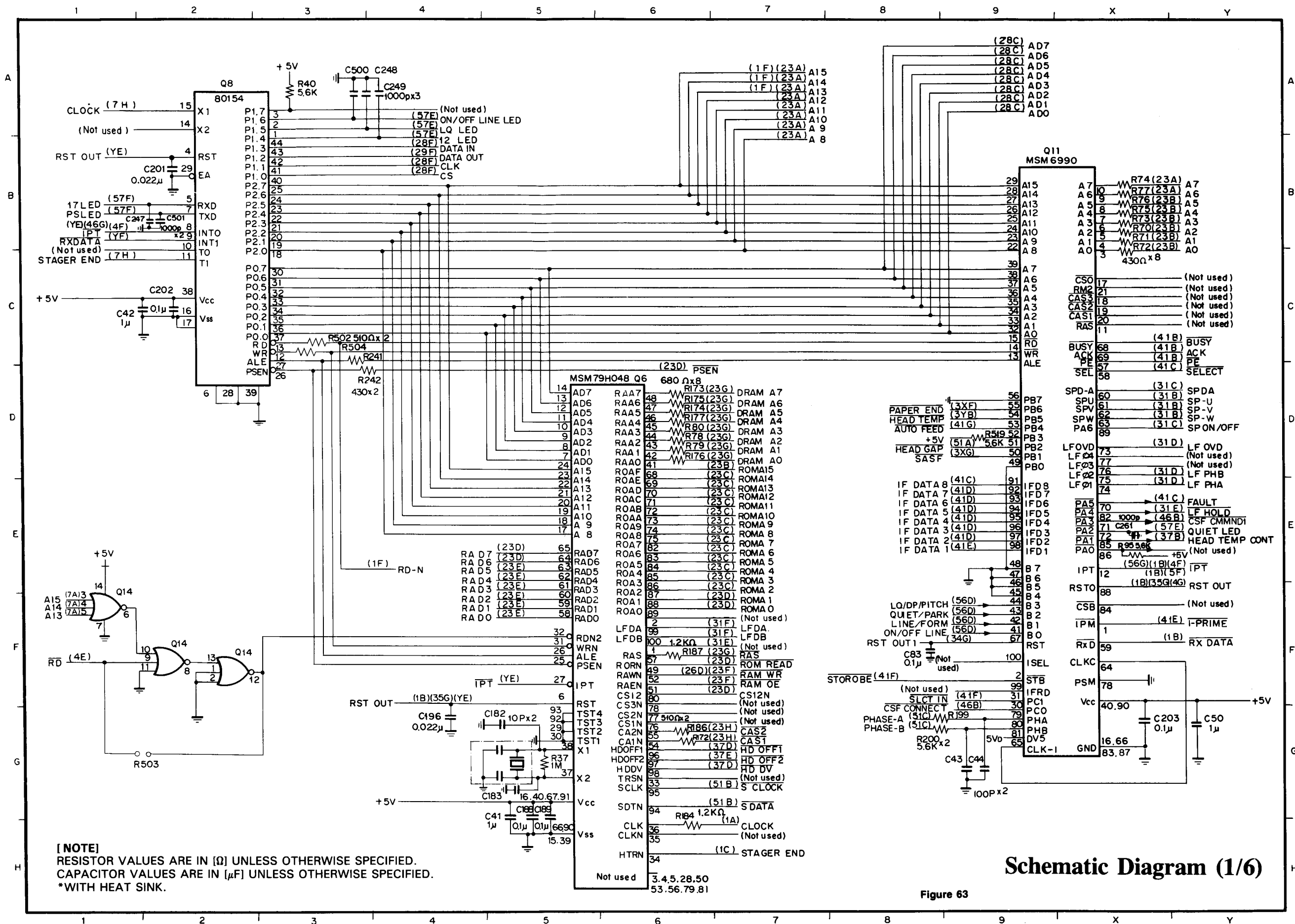


## Exploded View (3/4)



## Exploded View (4/4)

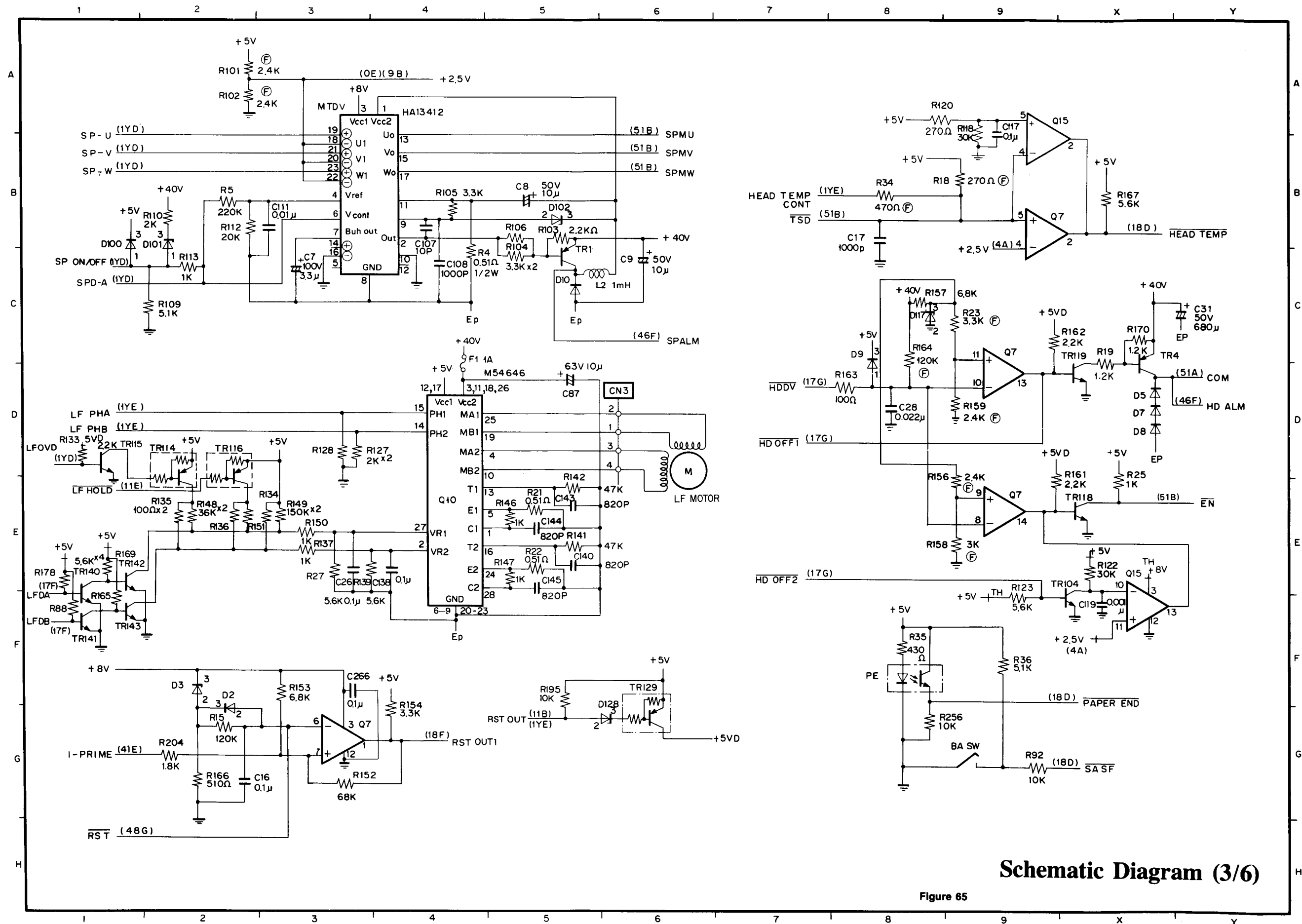






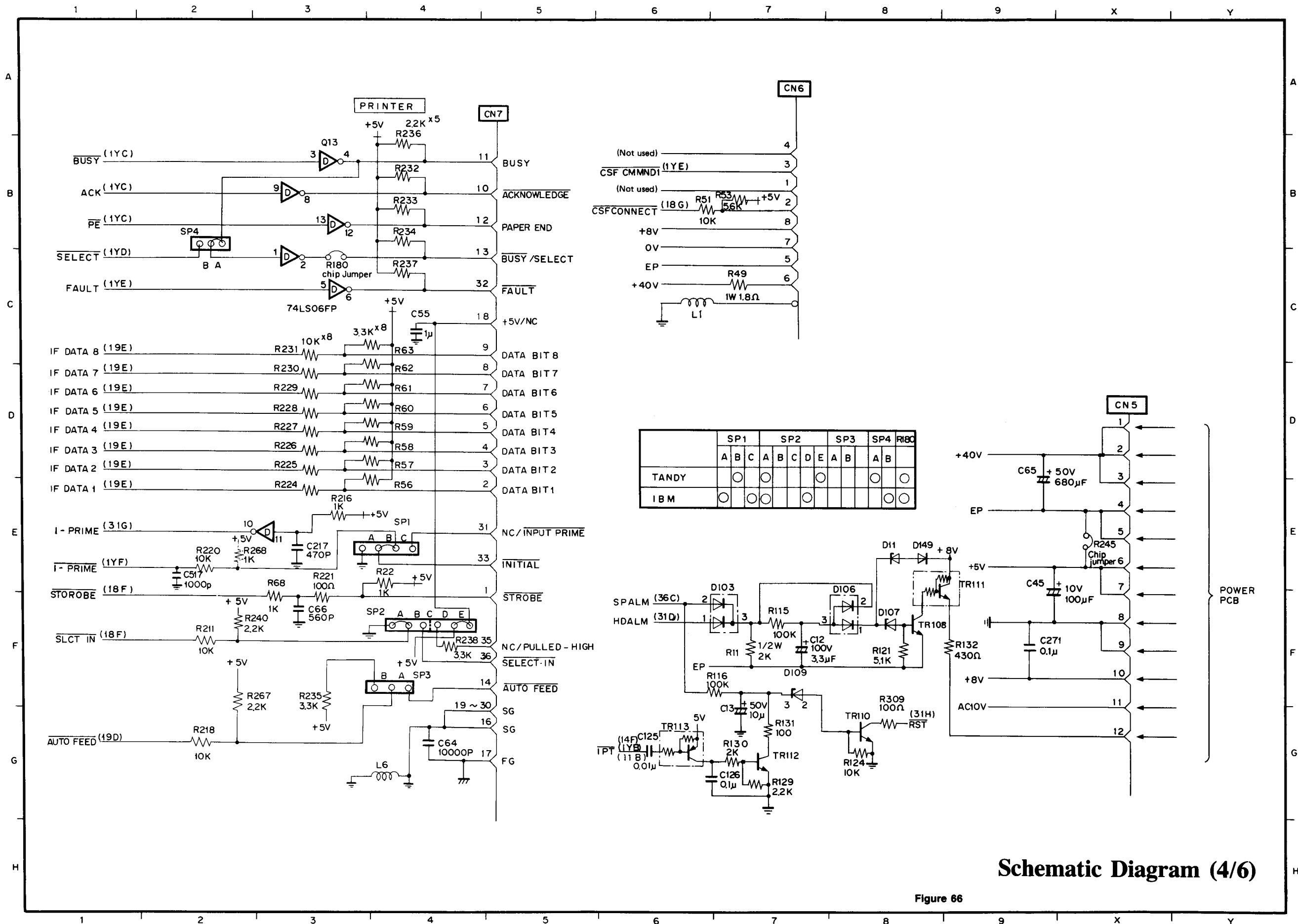












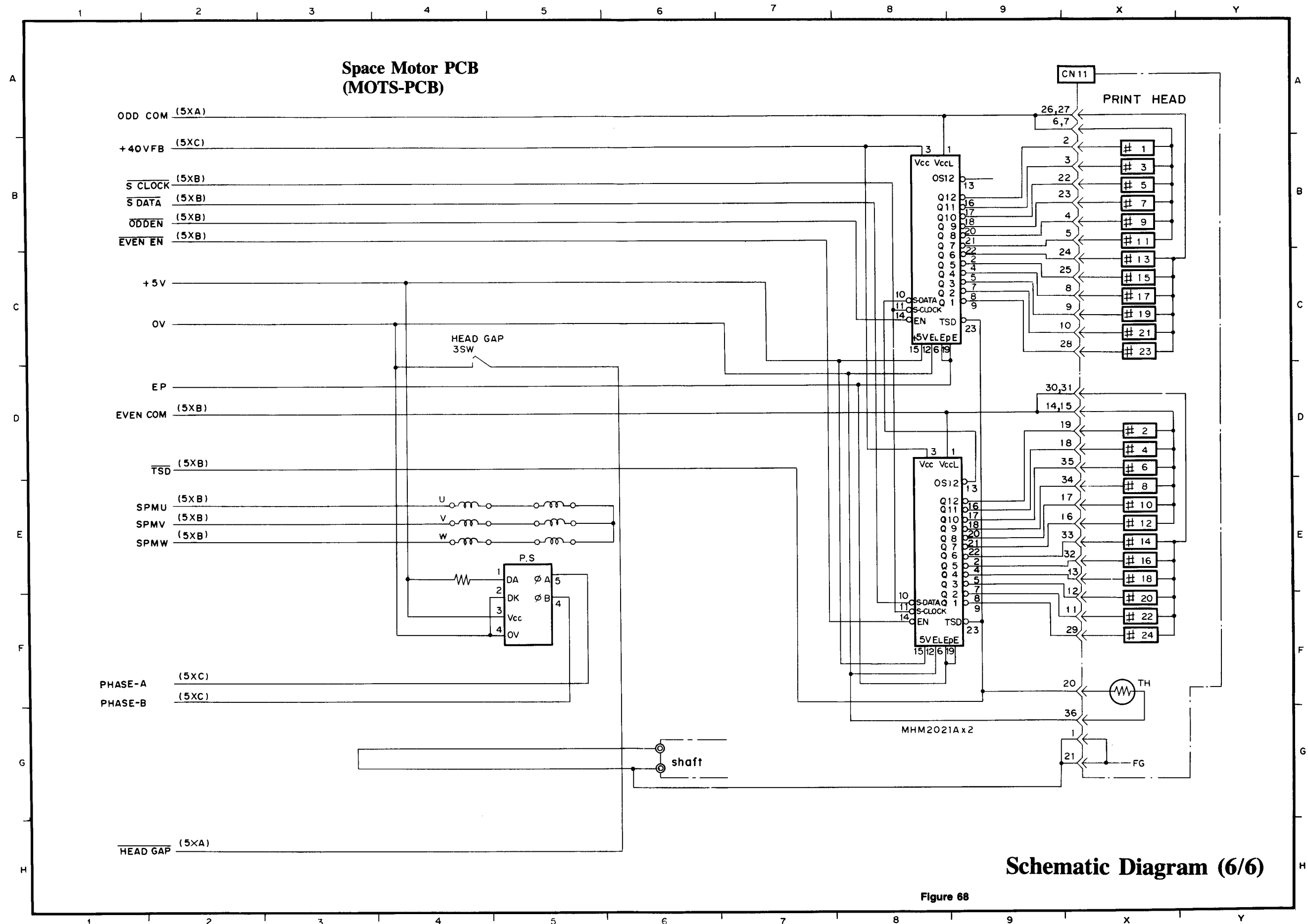
Schematic Diagram (4/6)

Figure 66









**Schematic Diagram (6/6)**

**Figure 68**



# Appendices

## Tandy Control Codes

Code Dec.	Hex	Symbol	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
8 n	(08) n	BS n	Backspace (n=Binary) n:BS Point NO.	Backspace (n=Binary) n:BS Point NO.	_____	
10	(0A)	LF	Line Feed	Line Feed (Full LF)	Line Feed (7/60 inch LF)	
12	(0C)	FF	Form Feed	Form Feed	Form Feed	
13	(0D)	CR	Carriage Return (Latched Data)	Carriage Return (1/6 inch)	Carriage Return (7/60 inch)	
14	(0E)	SO	End Underline	End Underline	_____	
15	(0F)	SI	Start Underline	Start Underline	_____	
18	(12)	DC2	Select Graphics Mode	Select Graphics Mode	_____	
19	(13)	DC3	_____	Select Data Processing Mode	_____	
19	(13)	DC3	Select Word Processing Mode	_____	_____	
27 49 57	(1B) (31) ⋮ (39)	ESC 01 ⋮ 09	Proportional Spacing	Proportional Spacing	_____	
27 10	(1B) (0A)	ESC LF	Full Reverse Line Feed (Set)	Full Reverse Line Feed (Executive)	_____	
27 14	(1B) (0E)	ESC SO	Start Elongation	Start Elongation	Start Elongation	
27 15	(1B) (0F)	ESC SI	End Elongation	End Elongation	End Elongation	
27 16 n1 n2	(1B) (10) n1 n2	ESC DLE n1 n2	Positioning (2 pitches are available) (n:Binary)	Positioning (2 pitches are available) (n:Binary)	Positioning (2 pitches are available) (n:Binary)	
27 17	(1B) (11)	ESC DC1	Select Proportional Character	Select Proportional Character	_____	
27 18	(1B) (12)	ESC DC2	Select Correspondence-10 Character	Select Correspondence-10 Character	_____	
27 19	(1B) (13)	ESC DC3	Select Standard-10 Character	Select Standard-10 Character	_____	
27 20	(1B) (14)	ESC DC4	Select Condensed Character	Select Condensed Character	_____	

Code Dec.	Hex	Symbol	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
27 21	(1B) (15)	ESC NAK	Select CR Only	Select CR Only	Select CR Only	
27 22	(1B) (16)	ESC SYN	Select CR = NL (LF)	Select CR = NL (LF)	Select CR = NL (LF)	
27 23	(1B) (17)	ESC ETB	Select Standard-12 Character	Select Standard-12 Character	_____	
27 28	(1B) (1C)	FSC FS	Half Forward Line Feed (Set)	Half Forward Line Feed (Executive)	_____	
27 29	(1B) (1D)	ESC GS	Select Correspondence-12 Character	Select Correspondence-12 Character	_____	
27 30	(1B) (1E)	ESC RS	Half Reverse Line Feed (Set)	Half Reverse Line Feed (Executive)	_____	
27 31	(1B) (1F)	ESC US	Start Bold	Start Bold	_____	
27 32	(1B) (20)	ESC SP	End Bold	End Bold	_____	
27 33	(1B) (21)	ESC !	Enter IBM Emulation Mode	Enter IBM Emulation Mode	Enter IBM Emulation Mode	
27 49	(1B) (31)	ESC 1	1/20 Forward Line Feed	1/20 Forward Line Feed	1/20 Forward Line Feed	
27 38	(1B) (26)	ESC &	Load User Font	Load User Font	_____	
27 52 n	(1B) (34) n	ESC 4 n	Form Length Set	Form Length Set	Form Length Set	
27 54	(1B) (36)	ESC 6	Set Full Forward Line Feed (No motion)	_____	_____	
27 56	(1B) (38)	ESC 8	3/4 Forward Line Feed (Set)	3/4 Forward Line Feed (Executive)	_____	
27 58	(1B) (3A)	ESC :	Select IBM Character Set 1	Select IBM Character Set 1	_____	
27 59	(1B) (3B)	ESC ;	Select Tandy Character Set	Select Tandy Character Set	_____	
27 61 n	(1B) (3D) n	ESC = n	Font Assign Correspondence-10 Character	Font Assign Correspondence-10 Character	_____	
27 62 n	(1B) (3E) n	ESC > n	Font Assign Correspondence-12 Character	Font Assign Correspondence-12 Character	_____	



Code Dec.	Hex	Symbol	Data Processing Mode	Word Processing Mode	Graphics Mode	Remarks
27 63 n	(1B) (3F) n	ESC ? n	Font Assign Proportional Character	Font Assign Proportional Character	_____	
27 66 48	(1B) (42) (30)	ESC B O	End Italic Character	End Italic Character	_____	
27 66 49	(1B) (42) (31)	ESC B 1	Select Italic Character	Select Italic Character	_____	
27 71	(1B) (47)	ESC G	4/5 Forward Line Feed (Executive)	4/5 Forward Line Feed (Executive)	4/5 Forward Line Feed (Executive)	
27 72 n	(1B) (48) n	ESC H n	Perforation Skip Set	Perforation Skip Set	_____	
27 73 n1 n2 d1 ⋮ dk	(1B) (49)      dk	ESC I n1 n2 d1 ⋮ dk	High-Resolution Graphics (n1 n2: Column length) (d1 ~ dk: Image data) (k = 3 (n1·n2))	High-Resolution Graphics (n1 n2: Column length) (d1 ~ dk: Image data) (k = 3 (n1·n2))	High-Resolution Graphics (n1 n2: Column length) (d1 ~ dk: Image data) (k = 3 (n1·n2))	
27 75	(1B) (4B)	ESC K	Insert New Paper from Hopper 1	Insert New Paper from Hopper 1	Insert New Paper from Hopper 1	
27 77	(1B) (4D)	ESC M	Select Microfont	Select Microfont	_____	
27 81 n	(1B) (51) n	ESC Q n	Set Left Margin	Set Left Margin	_____	
27 82 n	(1B) (52) n	ESC R n	Set Right Margin	Set Right Margin	_____	
27 83 n	(1B) (53) n	ESC S n	Select Super/Subscript Character (n = 0: Superscript) (n = 1: Subscript)	Select Super/Subscript Character (n = 0: Superscript) (n = 1: Subscript)	_____	
27 85 n	(1B) (55) n	ESC U n	Select Bi/Unidirectional Printing (n = 0: Bidirectional) (n = 1: Unidirectional)	Select Bi/Unidirectional Printing (n = 0: Bidirectional) (n = 1: Unidirectional)	Select Bi/Unidirectional Printing (n = 0: Bidirectional) (n = 1: Unidirectional)	

<b>Code Dec.</b>	<b>Code Hex</b>	<b>Symbol</b>	<b>Data Processing Mode</b>	<b>Word Processing Mode</b>	<b>Graphics Mode</b>	<b>Remarks</b>
27 87	(1B) (57)	ESC W	Select Double-Height Character	Select Double-Height Character	_____	
27 88	(1B) (58)	ESC X	End Super/Subscript Character	End Super/Subscript Character	_____	
27 89 n	(1B) (59) n	ESC Y n	International Character Set	International Character Set	_____	
27 90	(1B) (5A)	ESC Z	Double Strike	Double Strike	_____	
28 n1	(1C) n2	FS n1 n2	Repeat Printable Character	Repeat Printable Character	Repeat Printable Character	
30	(1E)	RS	End Graphics Mode	End Graphics Mode	End Graphics Mode	

## IBM Control Codes

### IBM X24 Proprinter emulation, with exceptions

Code Dec.	Hex	Symbol	Function	
			PPR	AGM
13	(0D)	CR	Carriage Return	Carriage Return
27	(1B)	ESC	Set 1/8" Line Spacing	Set 1/8" Line Spacing
48	(30)	0		
27	(1B)	ESC	Set 7/72" Line Spacing	Set 7/72" Line Spacing
49	(31)	1		
27	(1B)	ESC	Set 1/6" Line Spacing	Set 1/6" Line Spacing
50	(32)	2		
27	(1B)	ESC	Set Line Spacing	
50	(32)	2		
27	(1B)	ESC	Set n/180" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
51	(33)	3		
n		n		
27	(1B)	ESC	Set n/216" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
51	(33)	3		
n		n		
27	(1B)	ESC	Set n/60" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
65	(41)	A		
n		n		
27	(1B)	ESC	Set n/72" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
65	(41)	A		
n		n		
10	(0A)	LF	Line Feed	Line Feed
12	(0C)	FF	Form Feed	Form Feed
27	(1B)	ESC	n/180" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
74	(4A)	J		
n		n		
27	(1B)	ESC	n/216" Line Spacing (n: Binary, $1 \leq n \leq 255$ )	
74	(4A)	J		
n		n		
27	(1B)	ESC	Reverse Feed	Reverse Feed
93	(5D)	I		
11	(0B)	VT	Vertical Tab	Vertical Tab
27	(1B)	ESC	Set Form Length (Line) (n: Binary)	Set Form Length (Line) (n: Binary)
67	(43)	C		
n		n		
27	(1B)	ESC	Set Form Length (Inch) (n: Binary)	Set Form Length (Inch) (n: Binary)
67	(43)	C		
48	(30)	0		
n		n		
27	(1B)	ESC	Set Top of Form	Set Top of Form
52	(34)	4		

Code Dec.	Hex	Symbol	Function	
			PPR	AGM
27 78 n	(1B) (4E)	ESC N n	Set Auto Perforation	Set Auto Perforation
27 79	(1B) (4F)	ESC O	Reset Auto Perforation	Reset Auto Perforation
27 66 n1 n2	(1B) (42)	ESC B n1 n2	Set Vertical Tab	Set Vertical Tab
27 82	(1B) (52)	ESC R	Set Default Tab	Set Default Tab
27 91 92	(1B) (5B) (5C)	ESC [ \	Select ASCII/AGM	Select ASCII/AGM
27 53 n	(1B) (35)	ESC 5 n	Set/Reset Auto LF (n = 1: Set, n = 0: Reset)	Set/Reset Auto LF (n = 1: Set, n = 0: Reset)
27 68 n1 ⋮ nk	(1B) (44)	ESC D n1 ⋮ nk	Set Horizontal Tab (n: TAB Position, $1 \leq K \leq 28$ )	Set Horizontal Tab (n: TAB Position, $1 \leq K \leq 28$ )
9	(09)	HT	Horizontal Tab	Horizontal Tab
27 88 n1 n2	(1B) (58)	ESC X n1 n2	Set Left/Right Margin (Character) (n: Binary)	Set Left/Right Margin (Character) (n: Binary)
8	(08)	BS	Backspace	Backspace
27 100	(1B) (64)	ESC d n1 n2	Move Print Position (1/120") (n: Binary)	Move Print Position (1/120") (n: Binary)
18	(12)	DC2	Set 10 CPI	Set 10 CPI
27 58	(1B) (3A)	ESC : :	Set 12 CPI	Set 12 CPI
15	(0F)	SI	Set Condensed Print	Set Condensed Print
27 80 n	(1B) (50)	ESC P n	Proportional Spacing (n = 1: Set, n = 0: Reset)	Proportional Spacing (n = 1: Set, n = 0: Reset)
14	(0E)	SO	Double Wide by Line	Double Wide by Line
20	(14)	DC4	Cancel Double Wide	Cancel Double Wide
27 87 n	(1B) (57)	ESC W n	Set Double Wide (n = 1: Set, n = 0: Reset)	Set Double Wide (n = 1: Set, n = 0: Reset)
27 91 64	(1B) (5B) (40)	ESC [ @	Set Double High	Set Double High

Code		Symbol	Function	
Dec.	Hex		PPR	AGM
27 69	(1B) (45)	ESC E	Set Emphasized Print	Set Emphasized Print
27 70	(1B) (46)	ESC F	Reset Emphasized Print	Reset Emphasized Print
27 71	(1B) (47)	ESC G	Set Enhanced Print	Set Enhanced Print
27 72	(1B) (48)	ESC H	Reset Enhanced Print	Reset Enhanced Print
27 83 n	(1B) (53)	ESC S n	Set Super/Subscript (n = 1: Set superscript)	Set Super/Subscript (n = 1: Set superscript)
27 84	(1B) (54)	ESC T	Reset Super/Subscript	Reset Super/Subscript
27 45 n	(1B) (2D)	ESC – n	Set/Reset Underline (n = 1: Set, n = 0: Reset)	Set/Reset Underline (n = 1: Set, n = 0: Reset)
27 95 n	(1B) (5F)	ESC – n	Set/Reset Overline (n = 1: Set, n = 0: Reset)	Set/Reset Overline (n = 1: Set, n = 0: Reset)
27 73 n	(1B) (49)	ESC I n	Select Print Mode	Select Print Mode
27 54	(1B) (36)	ESC 6	Select Character Set2	Select Character Set2
27 55	(1B) (37)	ESC 7	Select Character Set1	Select Character Set1
27 61	(1B) (3D)	ESC =	Down Line Loading	Down Line Loading
27 42 m n1 n2	(1B) (2A)	ESC * m n1 n2		Select Graphics Mode (m: Graphics mode) (n1 n2 Column length)
27 91 103	(1B) (5B) (67)	ESC [ g	Select Graphics Mode	Select Graphics Mode
27 75 n1 n2	(1B) (4B)	ESC K n1 n2	Single Density Graphic	Single Density Graphic
27 76 n1 n2	(1B) (4C)	ESC L n1 n2	Double Density Graphic	Double Density Graphic

Code Dec.	Hex	Symbol	Function	
			PPR	AGM
27	(1B)	ESC	Double Density Graphic	Double Density Graphic
89	(59)	Y		
n1		n1		
n2		n2		
27	(1B)	ESC	Quadruple Density Graphic	Quadruple Density Graphic
90	(5A)	Z		
n1		n1		
n2		n2		
24	(18)	CAN	Cancel Data	Cancel Data
27	(1B)	ESC	Print Suppress	Print Suppress
81	(51)	Q		
36		\$		
27	(1B)	ESC	Stop Printing	Stop Printing
106	(6A)	J		
17	(11)	DC1	Select Printer	Select Printer
27	(1B)	ESC	Unidirectional Print (n = 1: Set, n = 0: Reset)	Unidirectional Print (n = 1: Set, n = 0: Reset)
85	(55)	U		
n		n		
27	(1B)	ESC	All Character Chart	All Character Chart
94	(5E)	^		
27	(1B)	ESC	All Character Chart (n: Character length)	All Character Chart (n: Character length)
92	(5C)	\		
n1		n1		
n2		n2		
27	(1B)	ESC	Return to Tandy Mode	Return to Tandy Mode
33	(21)	!		



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