TANDY®
Service Manual

DAISY WHEEL PRINTER
DWP 220

Catalog Number: 26-1278
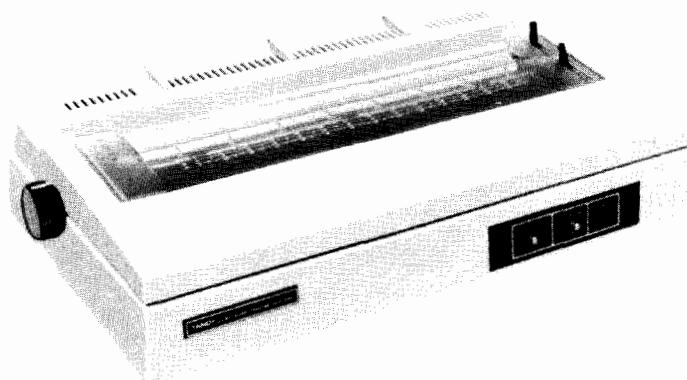
CONTENTS

I. INTRODUCTION

The Daisy Wheel Printer DWP-220 is a serial impact printer consisting of electronic circuitry and mechanical parts.

The electronic circuitry includes several microprocessors which control the printing operations. The mechanical section includes various motors and the print wheel hammer. Each mechanism is driven by an individual motor or magnet.

Because the DWP-220 uses a high ratio of electronic circuitry for printing control, the various mechanisms have been simplified, resulting in a reduced number of adjustments and easy maintenance.

II. CONFIGURATION

1. Outline

[Configuration]

Line Feed Motor

Power Supply Unit

Control Board

Platen Assembly

Carriage Assembly

Space Motor
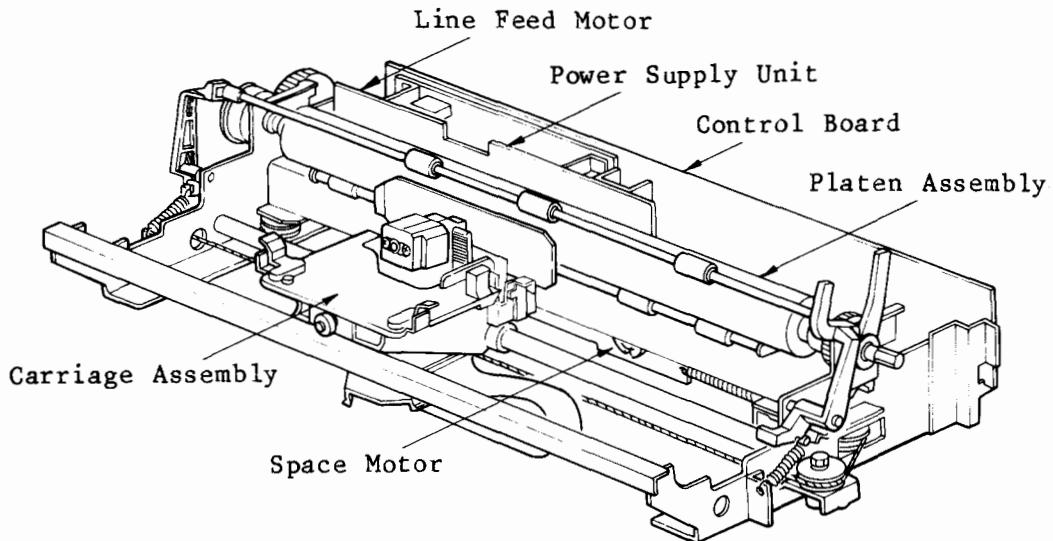
Figure 1

1-1. Mechanical Section

The mechanical section is responsible for all the Printer's mechanical operations. Each mechanism has an individual drive motor or magnet.

Mechanical Section		
	Character Selection	Selection Motor
	Printing	Hammer Magnets
	Carriage Movement Assembly	Space Motor
	Paper Feeding	Line Feed Motor
	Ribbon Feeding	Ribbon Feed Motor
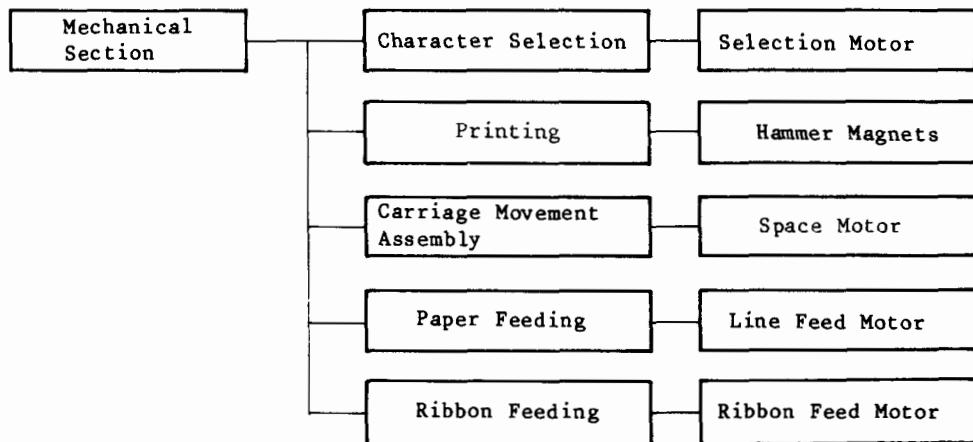
Figure 2

1-2. Electronic Circuitry

The electronic circuitry includes two microprocessors which control the mechanics and the printer interface.
The electronic circuitry basically consists of analog circuits to control the motors and magnets and digital circuits to control the printer interface logic.

```
Electronic ──── Digital ──── CPU Group
Circuitry       Circuits
                         ──── Interface ◄──► External Devices

                Analog ──── Selection Drive ──► Selection Motor
                Circuits
                         ──── Hammer Drive ──► Hammer Magnet

                         ──── Space Drive ──► Space Motor

                         ──── Line Feed Drive ──► Line Feed Motor

                         ──── Ribbon Feed Drive ──► Ribbon Feed Motor
```
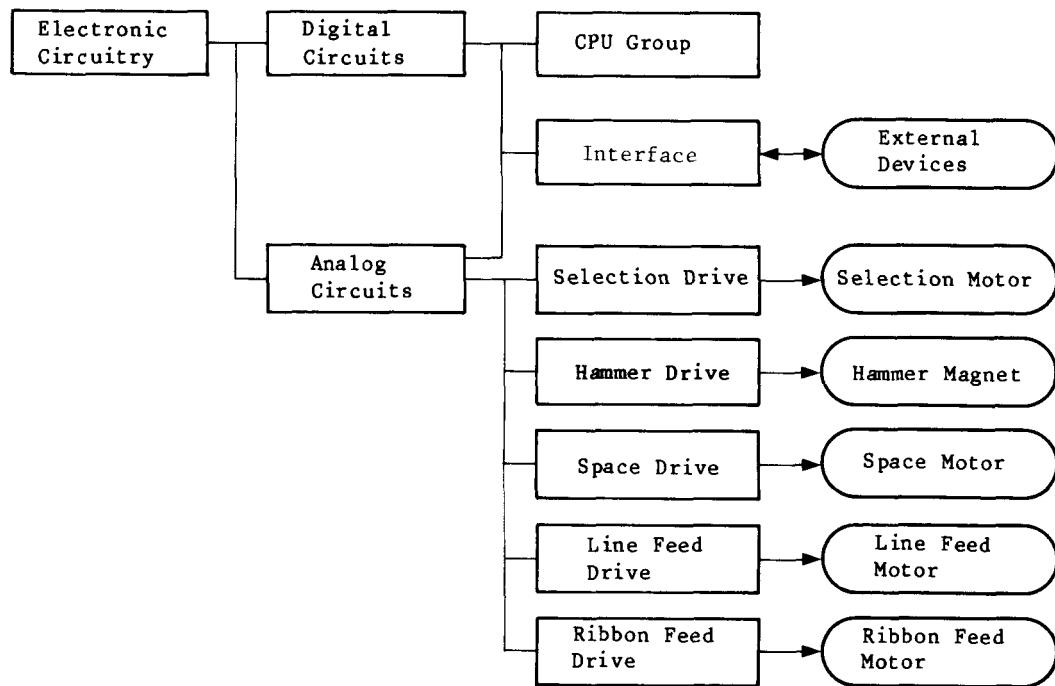
Figure 3

- 3 -

1-3. Specifications

Printing Speed.............. 20 characters per second (typical)
Carriage Return Speed....... 1200 ms per 13.6 inches
Line Feed Speed............. 1 inch per second
Printing Pitch.............. 1/10 inch, 1/12 inch, Proportional spacing
Line Feed Pitch............. 1/6 inch, 1/8 inch, 1/12 inch
Font........................ 100 character positions on a Single Daisy
                         Print Wheel
Wheel....................... Courier 10 (Cat. No. 26-1230)
                         Letter Gothic 12 (Cat. No. 26-1231)
                         Venezia P.S. (Cat. No. 26-1232)
Characters per Line......... 136 characters in 10 pitch mode
                         163 characters in 12 pitch mode
Print Wheel Life............ 10 million characters (V-shaped mono-mold
                         print wheel)
Ribbon Life................. Nominal 340,000 characters; may vary
                         according to the text printed
                         (Multi-strike, carbon ribbon)

Interfaces
    Interfaces.............. Parallel/Serial
    Code.................... Modified ASCII
Parallel Interface
    Data.................... 8 parallel data and 1 strobe
Serial Interface
    Data Format............. Start bit: 1 bit
                           Data bit: 8 bits
                           Stop bit: 1 or 2 bits

Temperature Ranges
    Operating............... +41 to + 95°F (+ 5 to +35°C)
    Storage................. -40 to +158°F (-40 to +70°C)
Relative Humidity
    Operating............... 20 - 90% RH (Non-condensing)
    Storage................. 5 - 95% RH (Non-condensing)
Paper
    Weight.................. Total weight: 26 pound/ft^2 max.
                           (127.8 grams/m^2 max.)
                           One ply: 8 pounds/ft^2 max.
                           (40 grams/m^2 max.)
    Size.................... Width: 16.5 inches max. (420 mm max.)
                           Length: 3.33 inches min. (84.7 mm min.)
Ribbon...................... Multi-strike, carbon ribbon (Cat. No.26-1299)
Size........................ 6.65" x 24.37" x 13.35"
                         169 mm x 619 mm x 339 mm (HWD)
Power Requirements.......... 120 VAC, 50/60 Hz, 60 W typical

Optional bidirectional tractor is available (Cat. No. 26-1444).

2. Mechanical Section

The mechanical section performs a variety of mechanical functions.

2-1. Carriage Assembly

The carriage assembly consists of the character selection, printing, and ribbon feed mechanisms.

(1) Character selection mechanism

The character selection mechanism uses a selection motor to turn the print wheel.

To select a character on the print wheel, the current print wheel position is compared with that of the next character to be printed. The print wheel rotation direction and the number of steps required are determined; then, the selection motor is started.

The print wheel rotates to take the shortest path and consequently never rotates more than 180°.

An example of the print wheel operation is given below.

Example: Printing characters Q and O alternately.
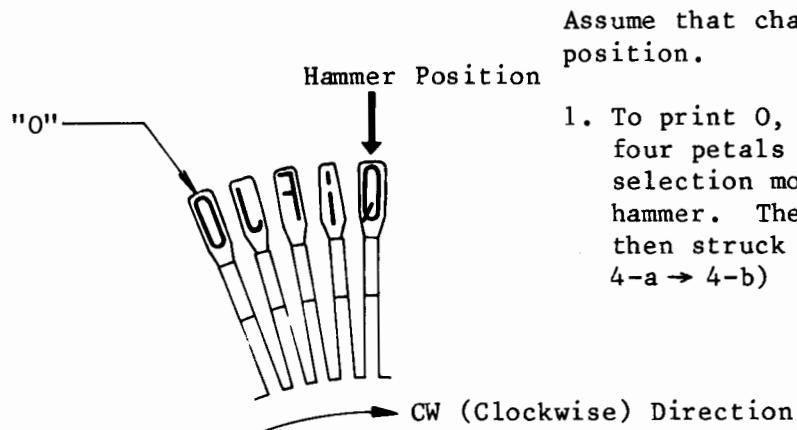
Assume that character Q is at the hammer position.

1. To print O, the print wheel is turned four petals clockwise by the selection motor, to place O under the hammer. The character element O is then struck by the hammer. (Figure 4-a → 4-b)

Hammer Position

"O"

CW (Clockwise) Direction
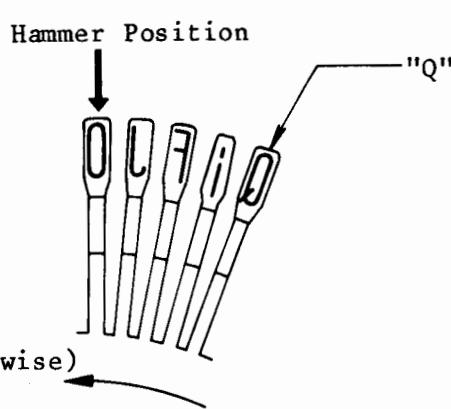
Figure 4-a

2. To print Q next, the print wheel is turned four petals counterclockwise by the selection motor, to place Q under the hammer. The character element Q is then struck by the hammer. (Figure 4-b → 4-a)

Hammer Position

"Q"

CCW (Counterclockwise) Direction

Figure 4-b

(2) Printing mechanism

The printing mechanism prints the characters on the print wheel by impacting them against the ink ribbon with a hammer.

To print a character, the character selection mechanism places the print wheel at the desired character position. Next, the hammer magnet is energized, which propels the hammer toward the platen. After printing, the hammer is returned to its original position by a return spring and stopped by the return damper.
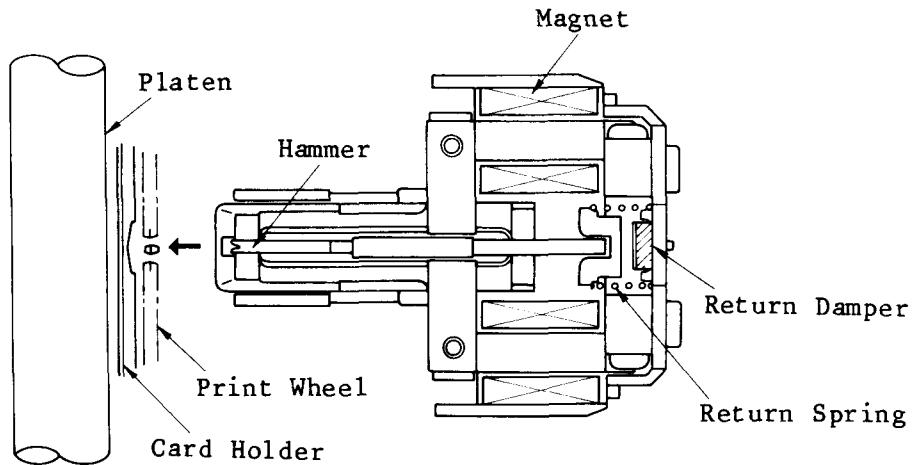
Figure 5

(3) Ribbon feed mechanism

The ribbon feed mechanism, which is driven by the ribbon feed motor, feeds the ribbon within the ribbon cartridge via idle and drive gears.

A spring located on the bottom side of the feed plate engages the ribbon cartridge feed gear against the feed plate.

The ribbon feed motor turns counterclockwise.
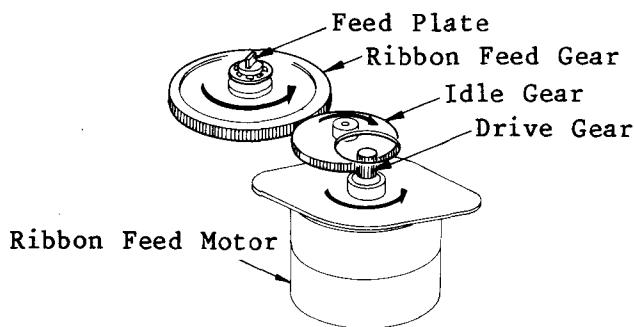
Figure 6

2-2. Frame

The frame supports the carriage assembly movement and paper feed mechanisms.

(1) Carriage assembly movement mechanism

The carriage assembly movement mechanism is driven by the space motor and moves the carriage assembly horizontally.

The space motor rotation torque is transferred to the carriage assembly by the space wire.

Space Shaft

Space Motor

Support Plate

Carriage Assembly

Space Wire

Side Pulleys

Spring, Tension Cam
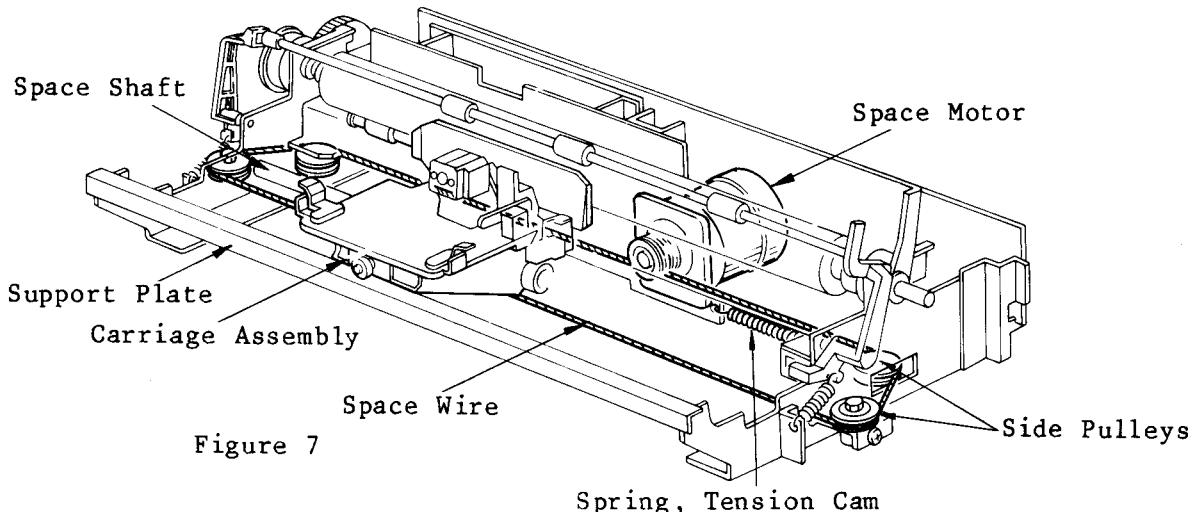
Figure 7

The wire converts the space motor rotation to a horizontal movement.
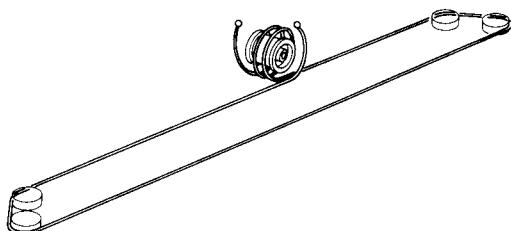
Figure 8

The side pulley is held under tension by a spring and cam to hold the space wire taut.

Spring, Tension Cam

Space Wire

Side Pulley

Tension Cam
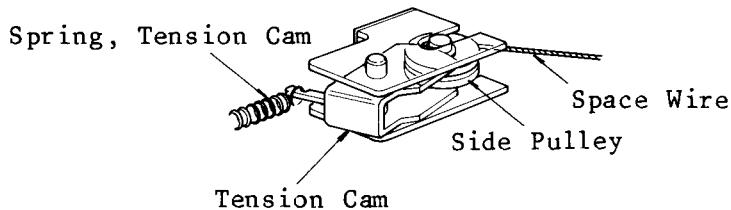
Figure 9

(2) Paper feed mechanism

Platen Assembly
Platen Pulley

Line Feed Belt
Idle Gear
Line Feed Motor
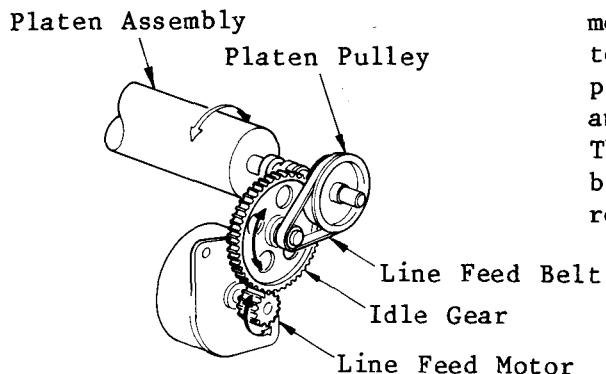
The paper feed mechanism is driven by the line feed motor. Torque from the motor gear, which is directly connected to the motor, is transferred to the platen pulley via an idle gear and belt, and then to the platen.
The paper can be fed either forward or backward by controlling the motor rotation direction.

Figure 10

3. Drive Components

The DWP-220 has four motors and three magnets which constitute the drive components.

3-1. Motors

Motor	Selection	Stepper motor (rotates clockwise or counterclockwise)
	Space	Stepper motor (rotates clockwise or counterclockwise)
	Line Feed	Stepper motor (rotates clockwise or counterclockwise)
	Ribbon Feed	Stepper motor (rotates counterclockwise)
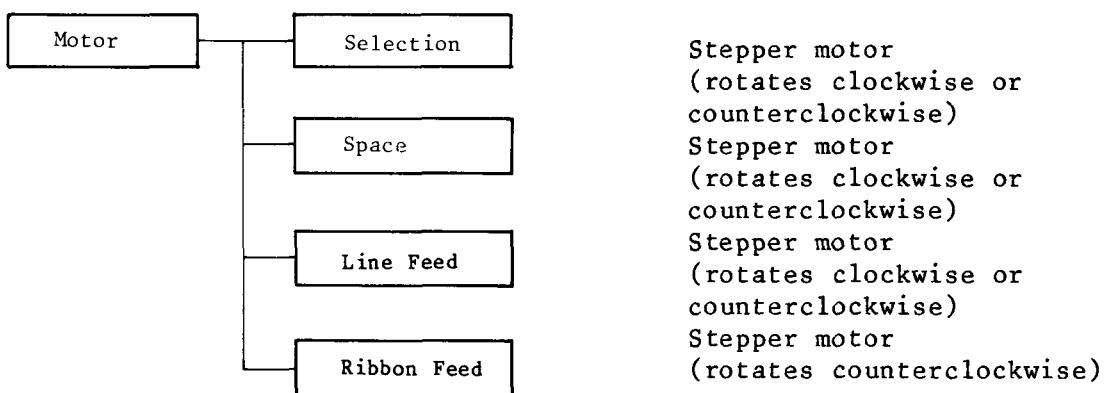
Figure 11

These stepper motors are driven by single/double phase or double phase excitation.

(1) Selection and space motors

The selection and space motors are driven by single/double phase excitation.


```
SEL A
(SP)

SEL B
(SP)

SEL C
(SP)

SEL D
(SP)

Energized
phase

        A·D     A     A·B     B     B·C     C     C·D     D     A·D     A
```
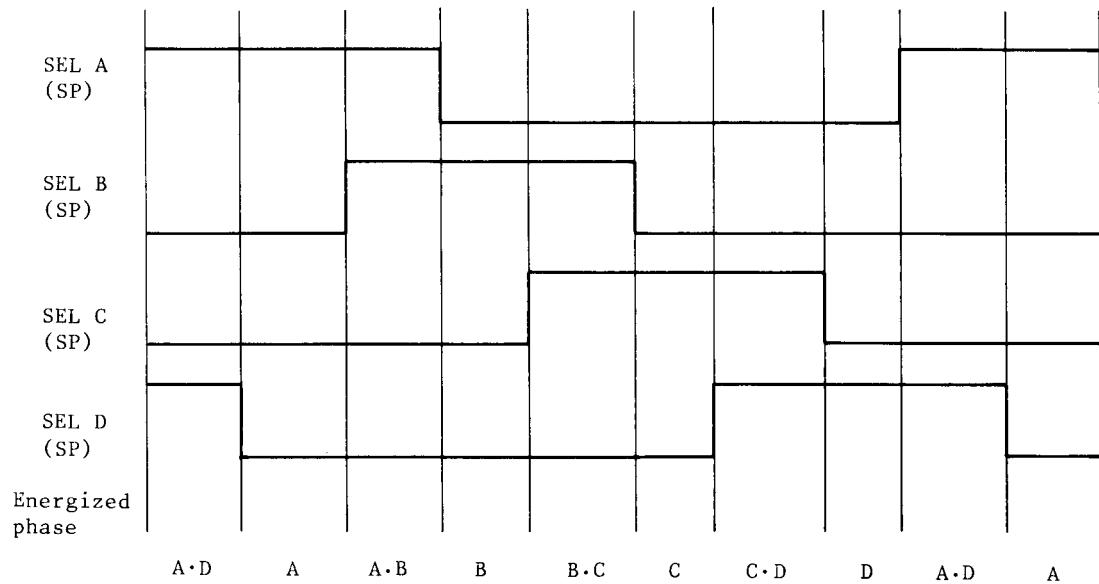
Figure 12

The selection and space motors can rotate either clockwise or counterclockwise. The direction of rotation can be selected by the SEL(SP)A to SEL(SP)D pulses, while the motor rotation speed can be controlled by changing the pulse widths of SEL(SP)A to SEL(SP)D.
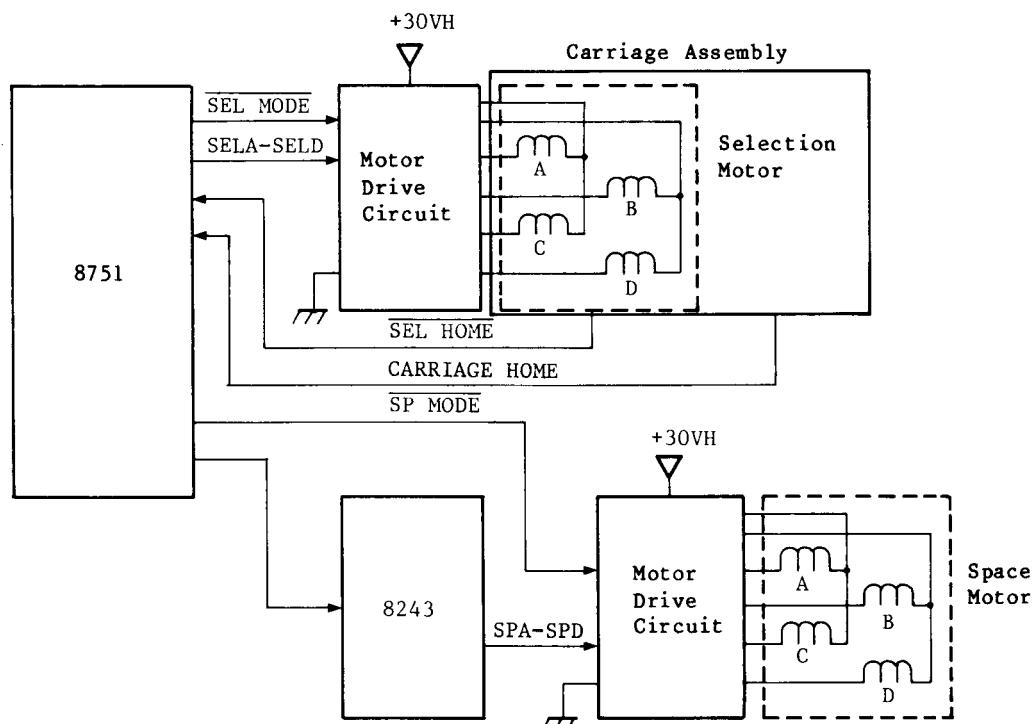
Figure 13

(2) Line feed and ribbon feed motors

The line feed and ribbon feed motors are driven by double phase excitation.
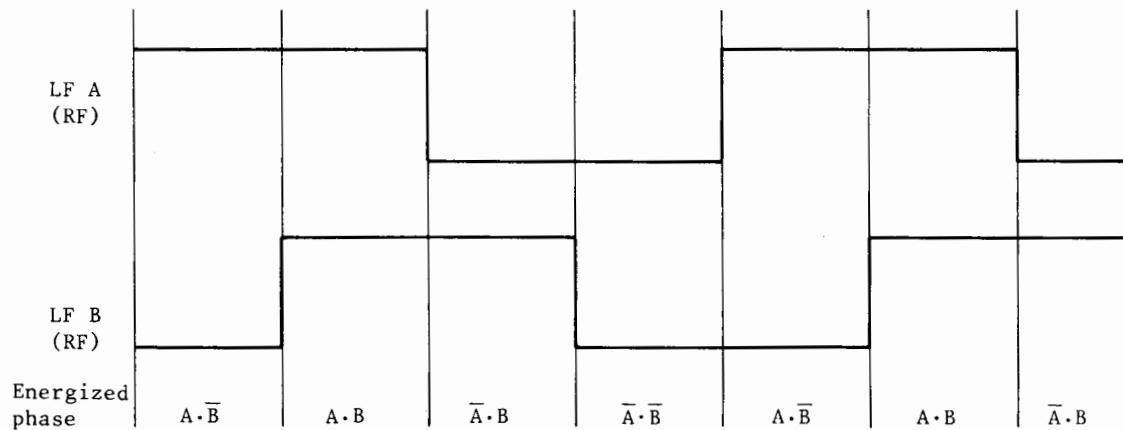
Figure 14

The line feed motor can rotate either clockwise or counterclockwise and the direction of rotation can be selected by the LFA and LFB pulses.

The ribbon feed motor only rotates counterclockwise.
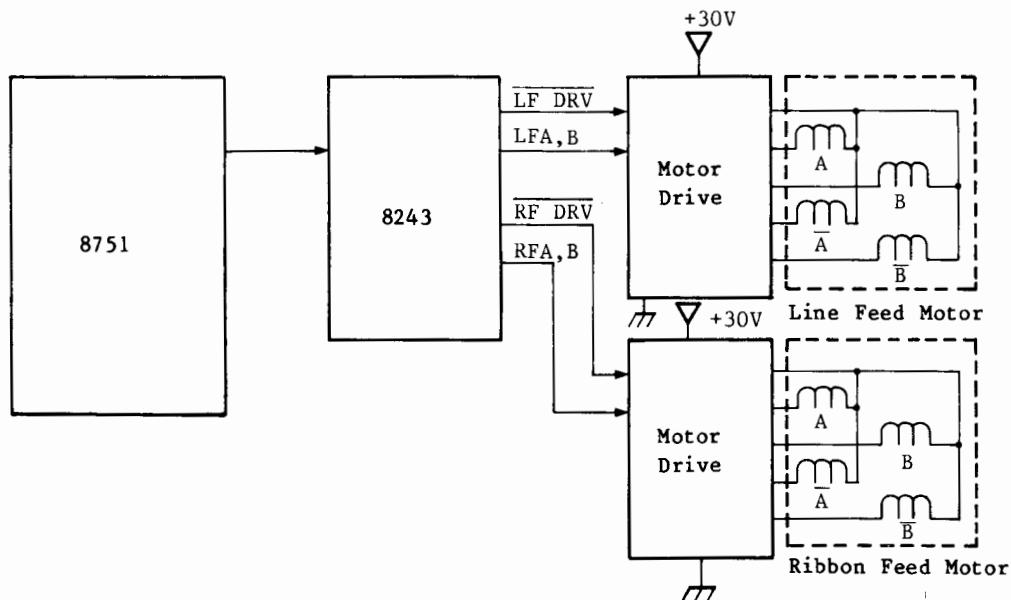
Figure 15

3-2. Magnets
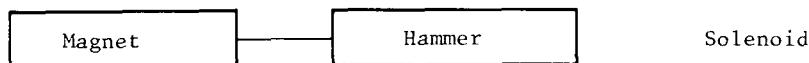
Figure 16

The solenoid magnets perform printing operations.

(1) Hammer drive

The hammer magnet can be driven in 7 stages according to the print wheel character.
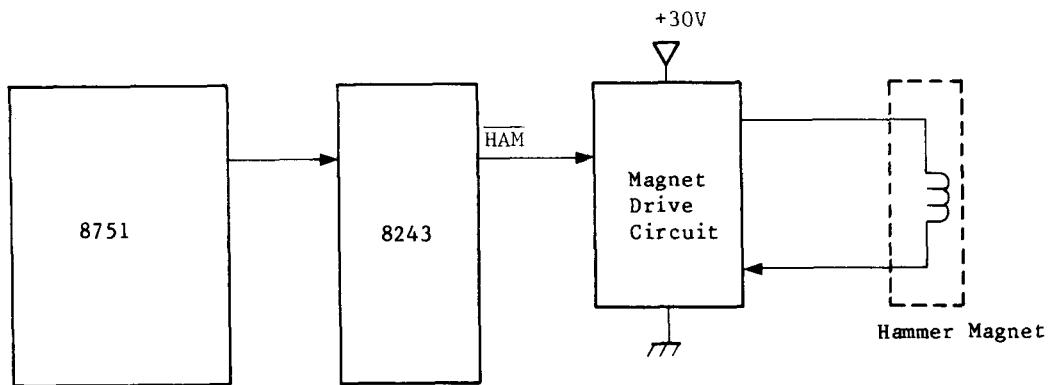
Figure 17

4. Power Supply and Power Supply Monitoring

The DWP-220 DC voltages are supplied by the power supply unit. This power supply unit is monitored by a power monitor circuit when the Printer is powered on, when it is printing, and when power failures occur.

4-1. Power Specifications

DC voltage	Tolerance	Destination
+5V	$+10$ % -5 %	Digital circuits
+5VH	+50%	Motor hold circuits
+12V	±10%	Analog circuits and magnet hold circuits
-12V	±10%	Analog circuits
+30V	± 5%	Motor and magnet drive circuits
+30VH	$+30$ % -10 %	Motor drive circuits

Table 1

4-2. Power Supply Monitoring
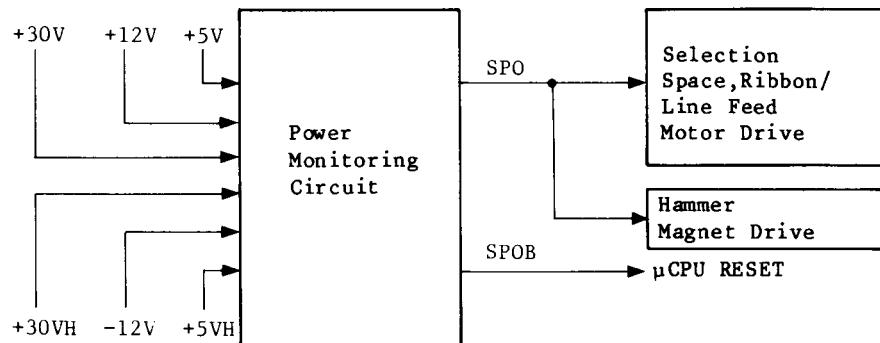
Figure 18

The microprocessor is reset when the DC power is applied. When an error occurs in the DC power supply, the selection and space motor drivers are disabled.

III. CIRCUIT DESCRIPTION

1. General

The printer circuitry is separated into three blocks, as shown below.
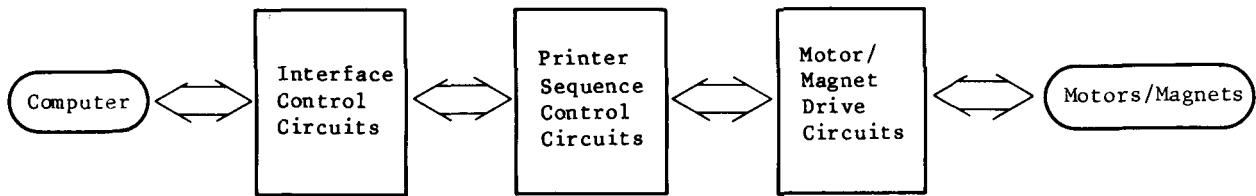
Figure 19

A. Interface control
The interface control circuits control signal transfers to and from an external device and, at the same time, transmit data to the printer sequence control circuits.

B. Printer sequence control
The printer sequence control circuits control the operation of motors and magnets as specified by the data received from the interface control circuits.

C. Motor/Magnet drive
The motor/magnet circuits activate and drive the motors and magnets as directed by the printer sequence control circuits.

2. Interface Descriptions

The DWP-220 is provided with parallel and serial interfaces which are selected by means of DIP Switch No. 1 located on the left-hand side at the rear of the printer.
The DIP Switches are **OFF** when set to **"OPEN"**.

SW NO.	ON	OFF
1	SERIAL INTERFACE	PARALLEL INTERFACE
4	AUTO NL INVALID	AUTO NL VALID
5	SELF TEST VALID	SELF TEST INVALID
6	BIDIRECTIONAL MODE INVALID	BIDIRECTIONAL MODE VALID

SW NO.	BAUD RATE			
	600	1200	2400	4800
2	ON	OFF	ON	OFF
3	ON	ON	OFF	OFF
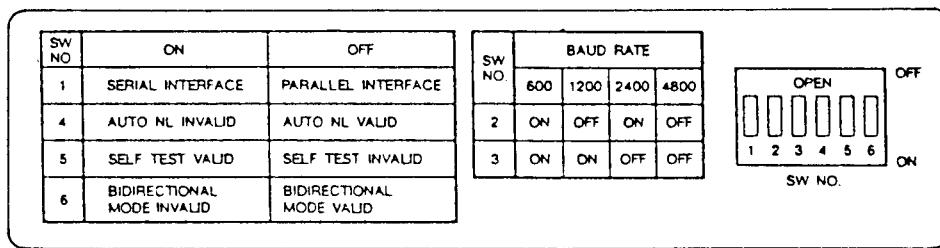
Figure 20

[Function of the DIP Switches]

Interface Select: No. 1
This switch selects the interface to be used. When set to **OFF**, the **Parallel** interface is selected. When **ON**, the **Serial** interface is selected.

Serial Baud Rate: No. 2 and No. 3
These switches select the Serial Baud Rate. For baud rates of 600, 1200, 2400, or 4800, set both switches to the appropriate positions, as indicated in Table 2.

Baud Rate	No. 2	No. 3
4800	OFF	OFF
2400	ON	OFF
1200	OFF	ON
600	ON	ON

Table 2

Note: When you first unpack your DWP-220, both switches (No. 2 and 3) are set to the **ON** position.

New Line: No. 4
When the Printer receives a control code 13 (the Carriage Return code), this switch selects either Carriage Return with Line Feed or Carriage Return only. Normally, you'll leave this switch in the **OFF** position (CR + LF)® For some applications (e.g., when you are using the Printer with an IBM PC, TANDY 1200, or TANDY 1000, which automatically sends LF along with CR), set it to **ON** (CR only).
You can also select **CR + LF** or **CR** only via software (27 21/27 22 code sequence). However, once you change this function via software, you must turn the Printer power **OFF** to use this DIP Switch.

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Self-Test: No. 5
Switch No.5 is used to check the Printer functions and is effective only when the Printer is **OFF-LINE**. Set the switch to **ON**, after making sure the front cover is closed, and the self-test operation will begin. If the front cover is opened during the operation, the self-test stops. When set to **OFF**, the Printer is initialized in **OFF-LINE** mode.

The following functions will be tested:
' Selection (print wheel position selection).
' Spacing (one line of H's is printed).
' The revision number of built-in ROM is printed.
' All characters are printed.

Print Direction: No. 6
This switch selects the print direction. When this switch is set to **OFF**, bidirectional printing is selected. When set to **ON**, unidirectional printing is selected. Precise vertical alignment for tables, charts, etc., is achieved via unidirectional printing. However, if you want faster printing, select bidirectional printing.

2-1. Parallel Interface

2-1-1. Input Signal System Diagram


```
                         DATA 1
                         DATA 2
                         DATA 3
                         DATA 4
   PRINTER               DATA 5               COMPUTER
                         DATA 6
                         DATA 7
                         DATA 8

                         ‾‾‾‾‾‾‾
                         STROBE
```
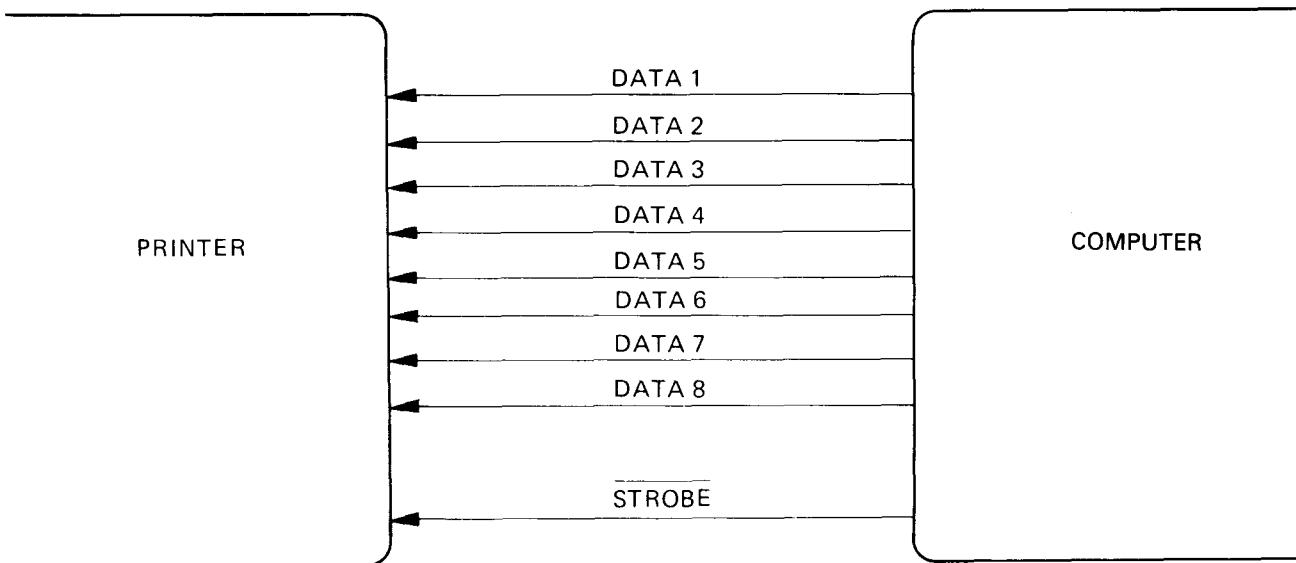
Figure 21

Note: Ground not shown.

[Description of Each Input Signal]

(1) **DATA LINES (DATA 1 - DATA 8)**
    8 inputs provide information for printing. The Printer will ignore any invalid code sent from the computer.
    STROBE* is a sampling signal for data lines, providing instruction signals for printing.

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2-1-2. Output Signal System Diagram
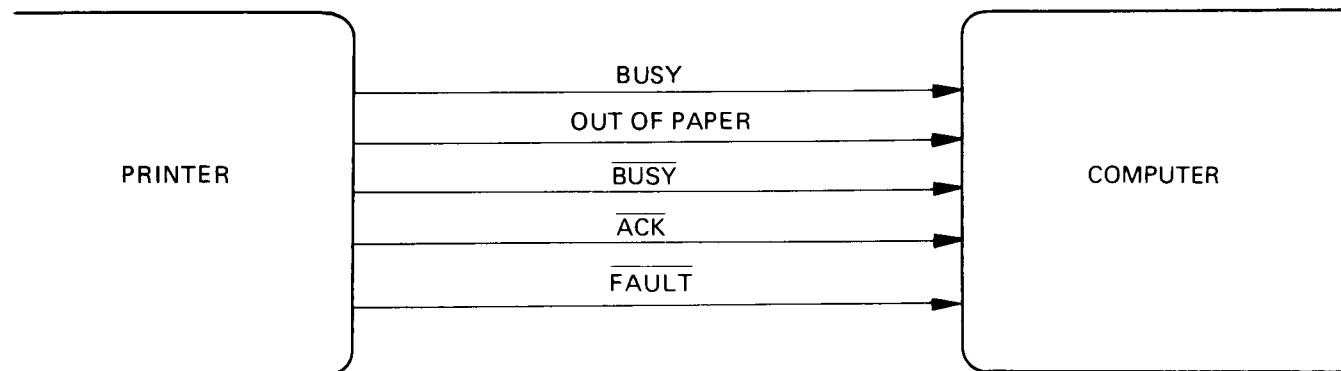
Figure 22

Note: Ground not shown.

[Description of Each Output Signal]

(1) BUSY
    Busy Condition: Data is in buffer
                           Initial state
                           Off-line mode
                           Error state
                           Ribbon fault state
                           Cover open state
    Ready condition: States other than the six above

(2) OUT OF PAPER
    No function. This line is always a "0" signal.

(3) BUSY*
    This signal is the logical inverse of BUSY.

(4) ACK*
    This signal indicates the Printer is no longer busy.

(5) FAULT*
    This signal indicates the Printer is in an error condition, in a ribbon fault state, in a cover open state, or in an off-line condition.

2-1-3. Interface Signal Pin Assignments
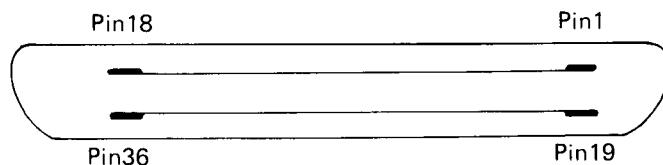
Figure 23

Pin	Signal Name	Pin	Signal Name
1	$\overline{\text{STROBE}}$	19	GND
2	DATA 1	20	GND
3	DATA 2	21	GND
4	DATA 3	22	GND
5	DATA 4	23	GND
6	DATA 5	24	GND
7	DATA 6	25	GND
8	DATA 7	26	GND
9	DATA 8	27	GND
10	$\overline{\text{ACK}}$	28	GND
11	BUSY	29	GND
12	OUT OF PAPER	30	GND
13	$\overline{\text{BUSY}}$	31	N.C
14	GND	32	$\overline{\text{FAULT}}$
15	GND	33	GND
16	GND	34	N.C.
17	GND	35	N.C.
18	+5 VDC	36	N.C.

Table 3

Notes: 1) N.C. pins are pulled up to +5 VDC through a 10kohm resistor.
2) Pin 18 provides +5 VDC to the host computer (less than 80mA of current).

2-1-4. Input/Output Interface Timing Consideration

Figure 24

T_1: 0 µs MIN.
T_2: 1.5 µs $\pm$ 0.5 µs
T_3: 0 < 1 µs
T_4: 0 µs MIN.
T_5: 3µs
T_6: 5µs
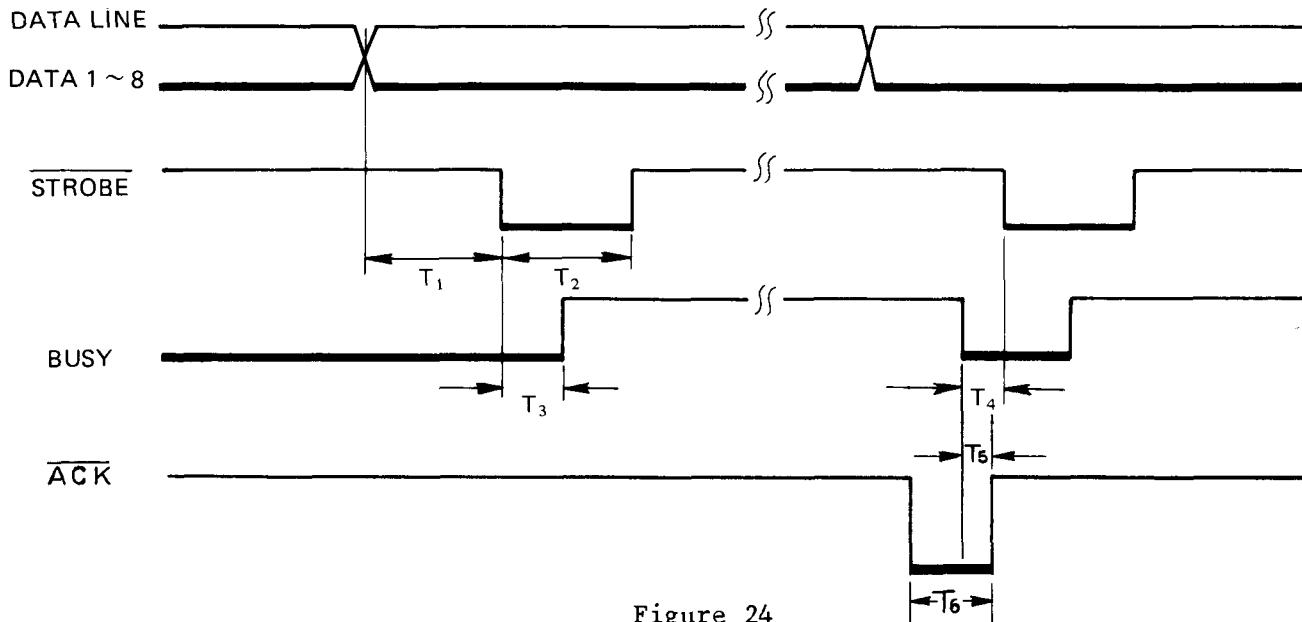
Note: It takes BUSY a maximum of 5 seconds to raise to the "Low" level after Power On. (The Carriage is at the right edge.)

2-2. Serial Interface

2-2-1. Input Signal System Diagram
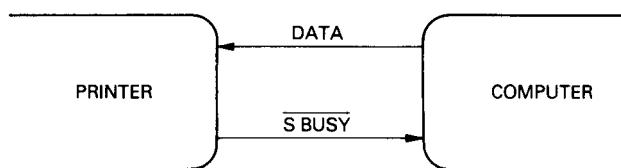
Note: Ground not shown.

Figure 25

[Description of Each Signal]

(1) The Data signal for actuating the Printer is sent from the computer in the format shown below:
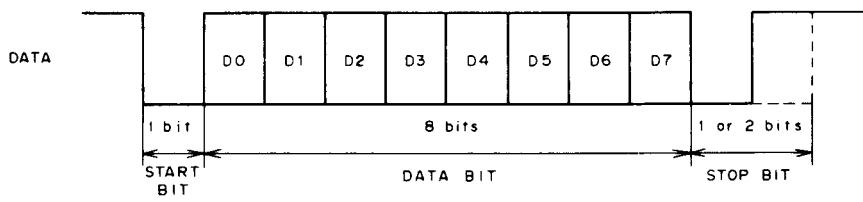
Figure 26

(2) SBUSY
This signal is the same as BUSY used in the parallel interface. Refer to parallel interface, under output signal.

2-2-2. Interface Signal Pin Assignments
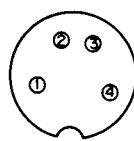
Figure 27

Pin	Signal Name
1	N.C
2	S̄ BUSY
3	SG
4	DATA

SG: Signal ground

Table 4

3. Interface Control
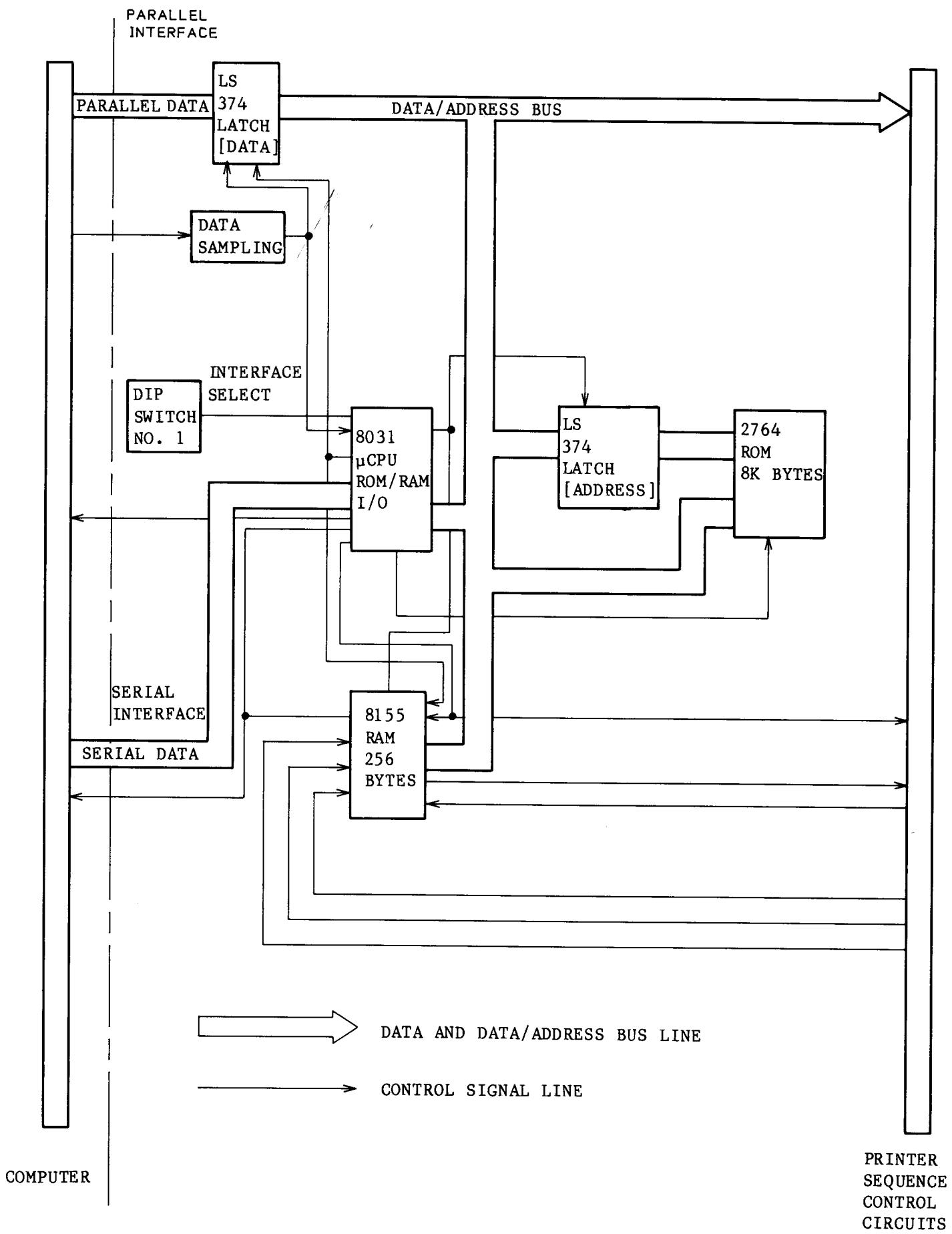
Figure 28. INTERFACE CONTROL CIRCUITS BLOCK DIAGRAM

3-1. Descriptions of Each Circuit Function

(1) LS374 Latch (Data)
Takes in parallel data from the computer.

(2) Data Sampling
This is a timing circuit for taking in of parallel data by LS374. Also, when data has been taken in by LS374, this circuit lets the 8031 (μCPU) know about it.

(3) 8031 μCPU
Reads in parallel and serial data, and controls transfer to the printer sequence control circuits. At this time, depending on the type of data, it set the timer of the 8155 (RAM).

(4) LS374 Latch (Address)
Extracts address data only from the data/address bus line and indicates the address in the 2764 (ROM).

(5) 2764 ROM
Firmware

(6) 8155 RAM
Memory for firmwares' use and for printer sequence control circuits status information.
Also applies interrupt process to the printer control sequence circuits 8751 (μCPU) according to direction from the 8031 (μCPU).

3-2. Interface Control Operation

Depending on input of data from the computer, the interface control carries out the following processing.
(1) Taking parallel data into the LS374. (Parallel Interface)
(2) Transfer of parallel or serial data to the printer sequence control circuits.

3-2-1. Data Latch (Parallel Interface)
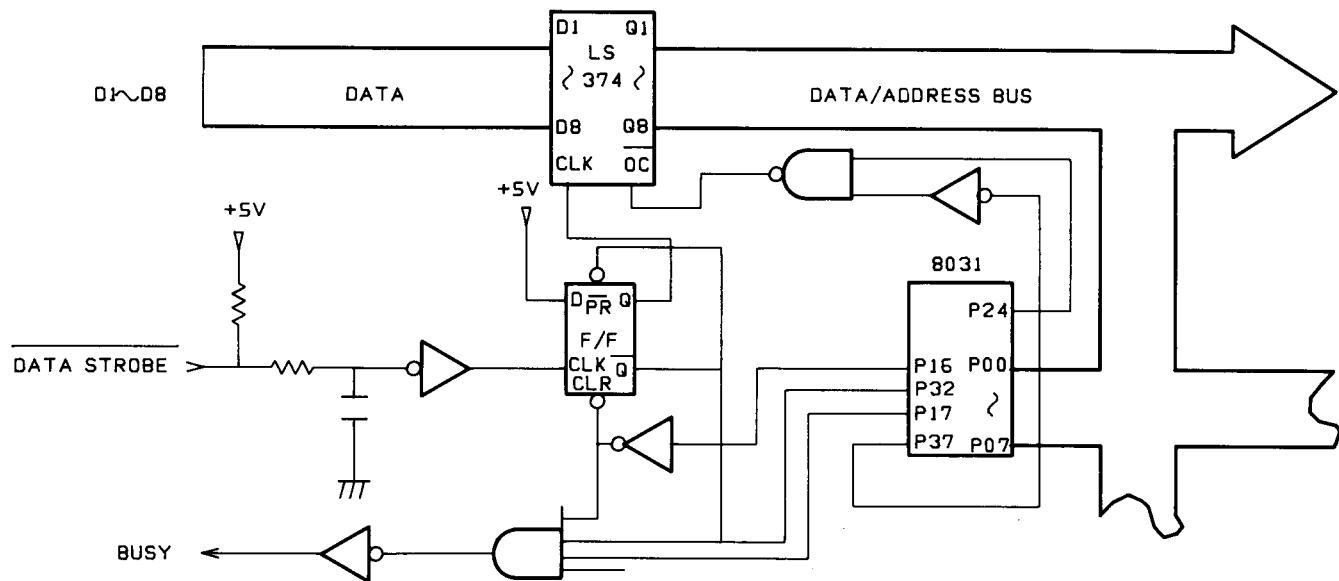
Figure 29
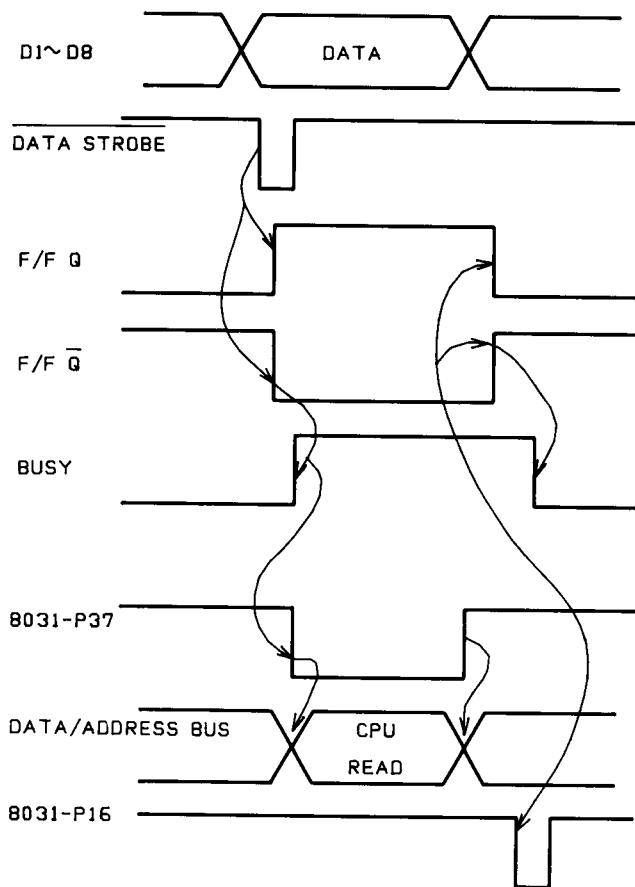
When DATA STROBE* becomes "Low", the gate of LS374 opens and data is taken in.
At this time, a "High" BUSY signal is output to the computer. Also, as 8031-P17 is "Low", the 8031 (μCPU) is informed that data has been taken in by LS374.

Figure 30

3-2-2. Data Transfer

INTERFACE CONTROL CIRCUITS | PRINTER SEQUENCE CONTROL CIRCUITS
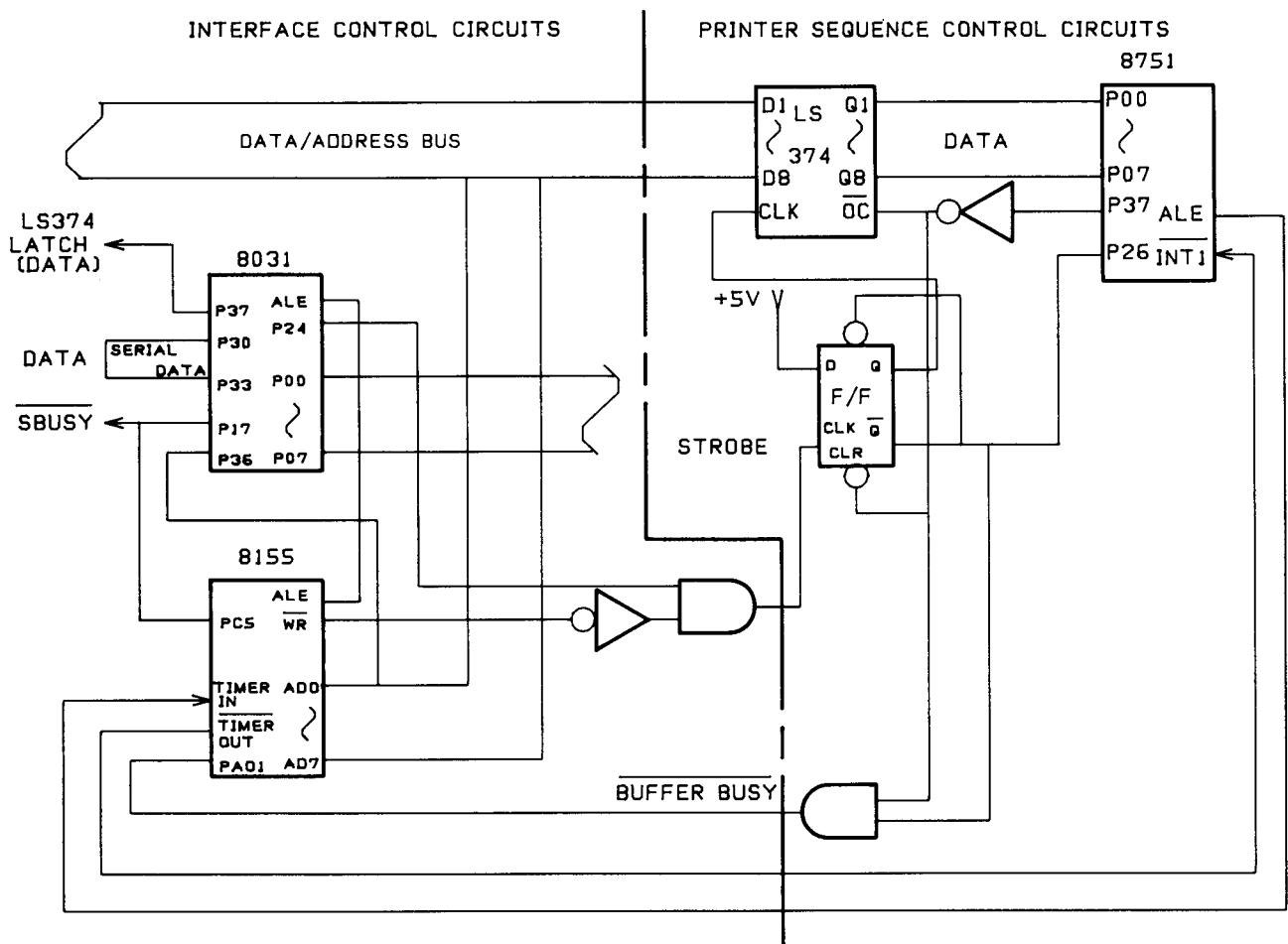
Figure 31

Figure 32
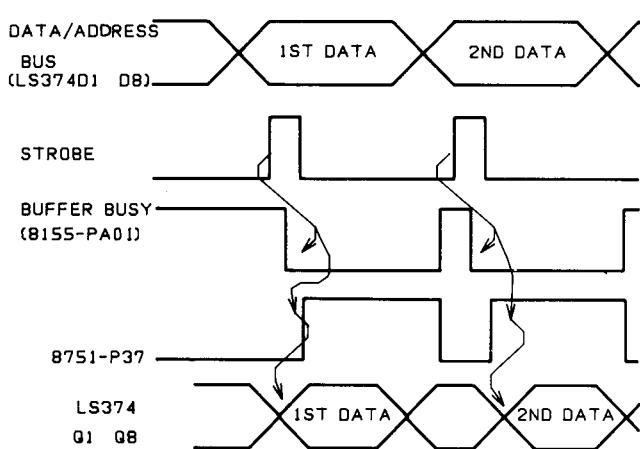
(1) Parallel Interface

The 8031 (μCPU) confirms that BUFFER BUSY* is "High" and, with 8031-P37 "Low", outputs the data taken in by LS374 into the data/address bus. Next, by making 8031-P36 "Low", STROBE "High" is output and printer sequence control LS374 takes in data.

(2) Serial Interface

The 8031 (μCPU) confirms that BUFFER BUSY is "High" and reads in serial data from the data line. At this time, the 8031 (μCPU) makes 8031-P17 "Low" and outputs SBUSY* "Low" to the computer.

When the 8031 (μCPU) reads in serial data, it converts it to parallel data and outputs it to the data/address bus line. Following this, the processing for data taken in by LS374 is the same as for the parallel interface.

4. Printer Sequence Control
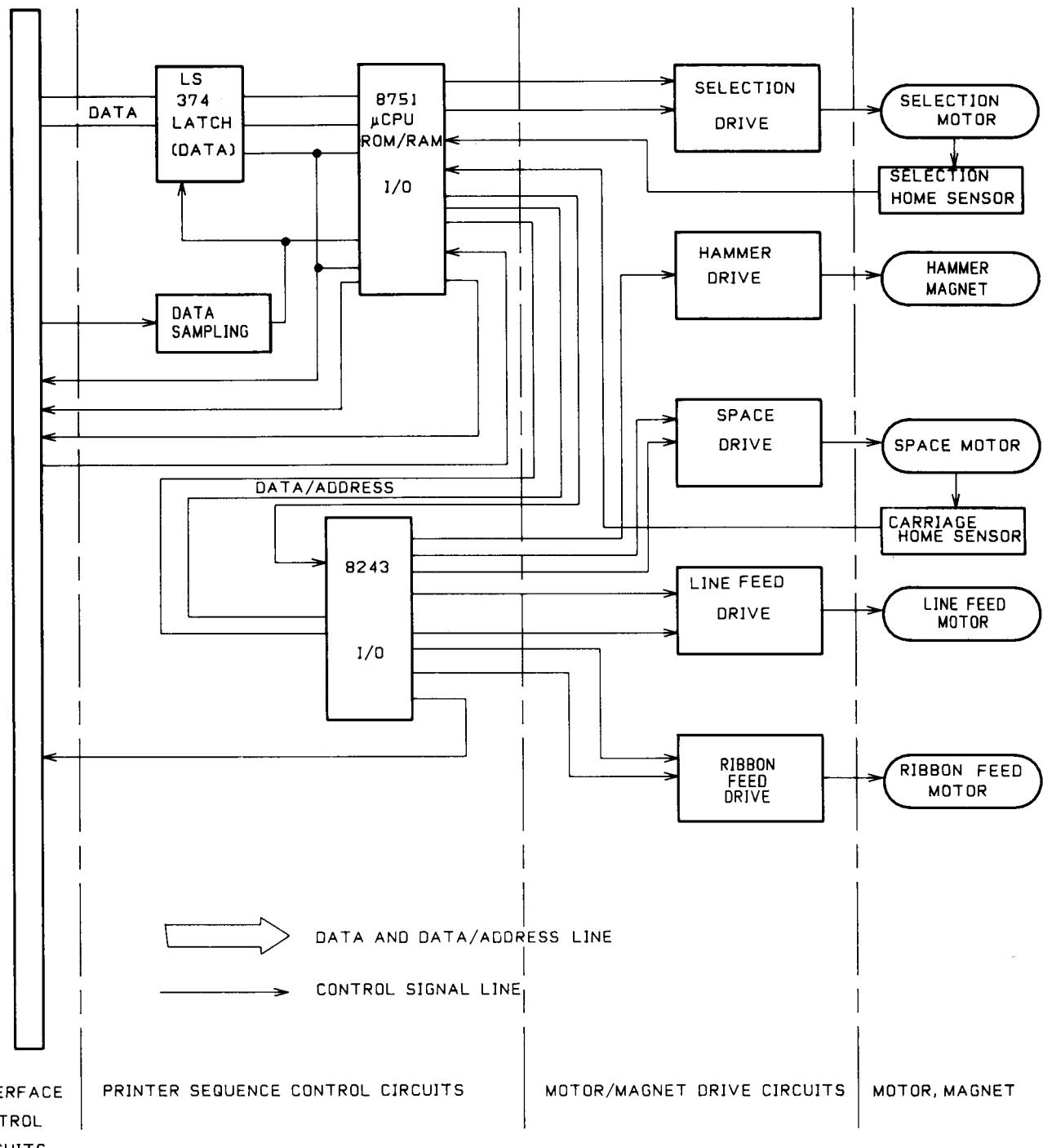
Figure 33. BLOCK DIAGRAM

4-1. Description of Each Circuit Function

(1) LS374 Latch (Data)
Takes in data from interface control.

(2) Data Sampling
Timing circuit for taking in of data by LS374. Also, when data is taken in by LS374, this circuit lets the 8751 (μ CPU) know about it.

(3) 8751 μ CPU
Outputs data from LS374 and, depending on the type of data, exerts I/O control over 8243 and 8751 itself.

(4) 8243 I/O
Directs action for hammer, space, line feed and ribbon feed.

4-2. Printer Sequence Control Operation
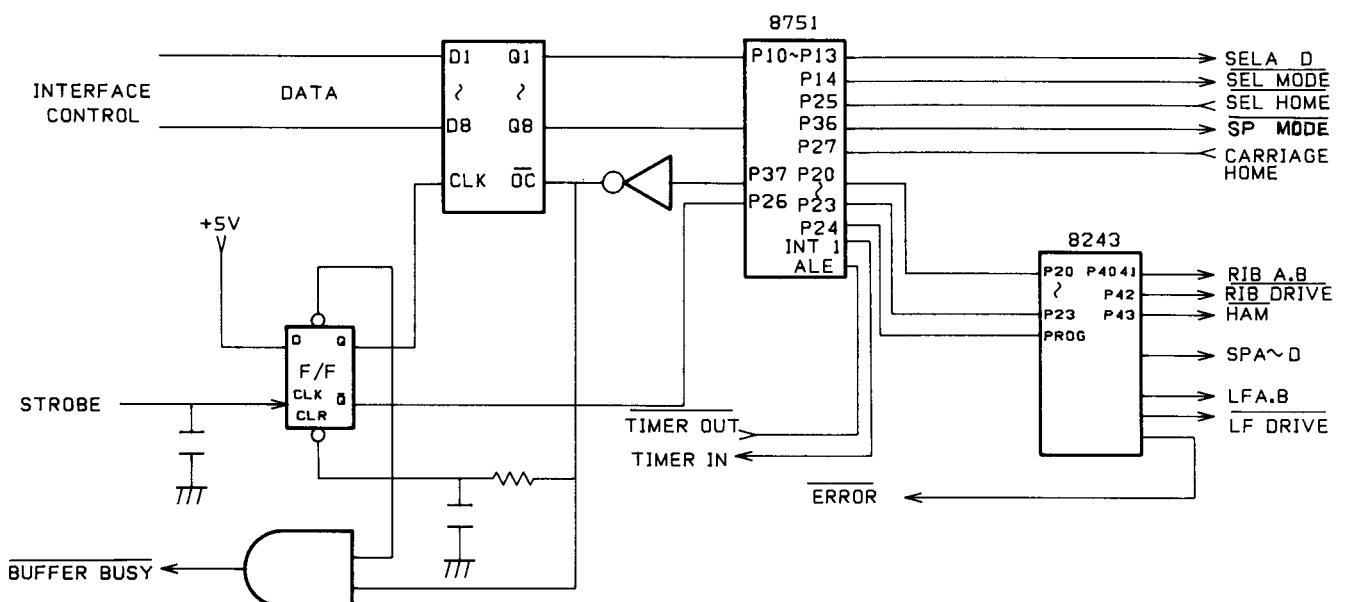
Figure 34

The printer interface control carries out the following processing according to the reception of data and STROBE from the interface control.

(1) Takes in data from LS374.

(2) Outputs BUFFER BUSY* "Low" to the interface control.
At this time it also makes 8751-P26 "Low".

(3) Outputs "High" from 8751-P37, and causes LS374 data to be output to the data line.

(4) **The 8751 (μCPU) reads in data** and, directs the appropriate action
depending on the data content .

Example 1. The case of printable character data.

1) Directs the action for the selection received from the I/O port of the
8751 (μCPU) itself.

2) 8751-P24 goes "Low", causing the hammer port address to be set to 8243
(I/O) P20 - P23. Next 8751-P25 goes "High", causing the hammer data to
be set to 8243 (I/O) P20 - P23.

3) Carries out the direction from the 8243 I/O port for hammer action.

Example 2. The case of line feed data.

1) 8751-P24 goes "Low", causing the line feed port address to be set to
8243 (I/O) P20 - P23. Next 8751-P24 goes "High", causing the line feed
data to be set to 8243 (I/O) P20 - P23. At this time the interface
control 8031 (μCPU) sets the timer of the 8155 (RAM) and applies an
interrupt process so as to make INT1 of the 8751 (μCPU) effective.

2) Carries out the direction from the 8243 I/O port for line feed action.

4-3. Selection Motor

The selection motor operation is controlled by the SELA-SELD and SEL MODE* signals. The selection motor control timing diagram is as follows:
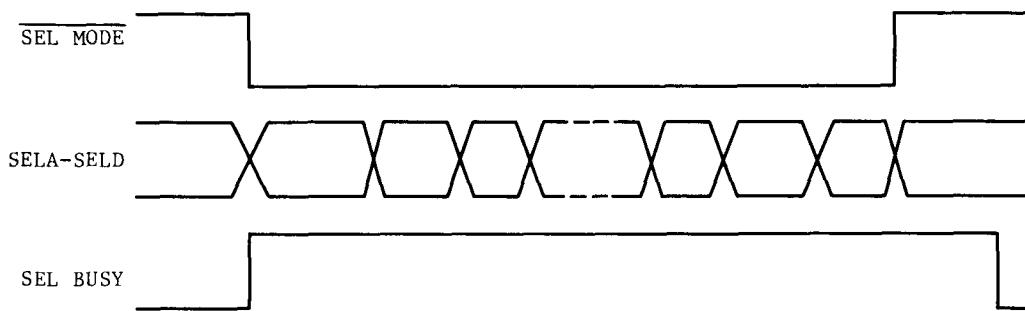
Figure 35

[Signal description]

(1) SEL MODE*

Selection motor drive signal.
High ⟶ Motor hold
Low ⟶ Motor drive

(2) SELA-SELD

The SELA-SELD signals specify the direction of rotation and the number of steps travelled for the selection motor. These signals control the velocity of the selection motor by controlling the acceleration, the constant speed, and the deceleration, depending on the number of steps specified.
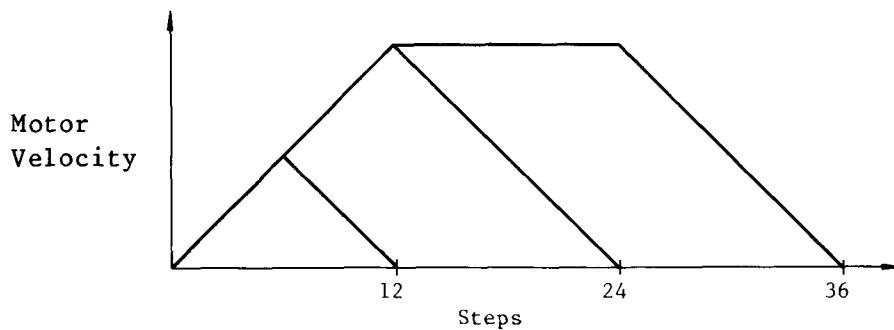
Figure 36

The selection motor travels four steps to print one character.

(3) SEL HOME*

This signal is used to detect the space pitch, the style of the print wheel installed, and the home position.

(4) ERROR*

This signal notifies the interface control of any printer errors.

4-3-1. Normal Operation
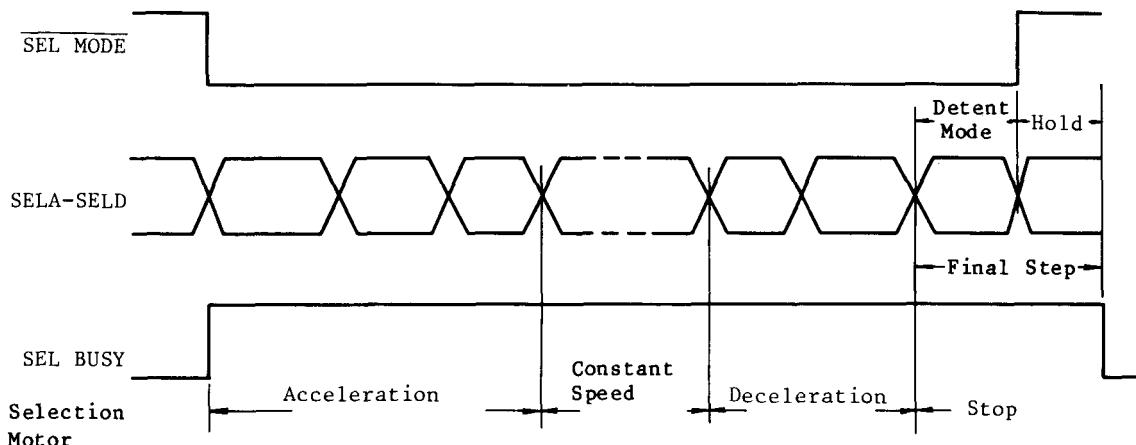
Figure 37

(1) The μCPU compares the current print wheel position with the print wheel position specified by the next print code, and calculates the direction of rotation and the number of steps required to determine the shortest path for the selection motor to turn the print wheel and line up the next print position.

(2) The selection motor is actuated by SELA-SELD and SEL MODE*, and proceeds through the successive stages of velocity, from acceleration to movement at constant speed, then to deceleration.

(3) The selection motor is held at the position specified on the final transition of SELA-SELD, and stops completely as SEL MODE* goes from low to high.

4-3-2. Restore Operation
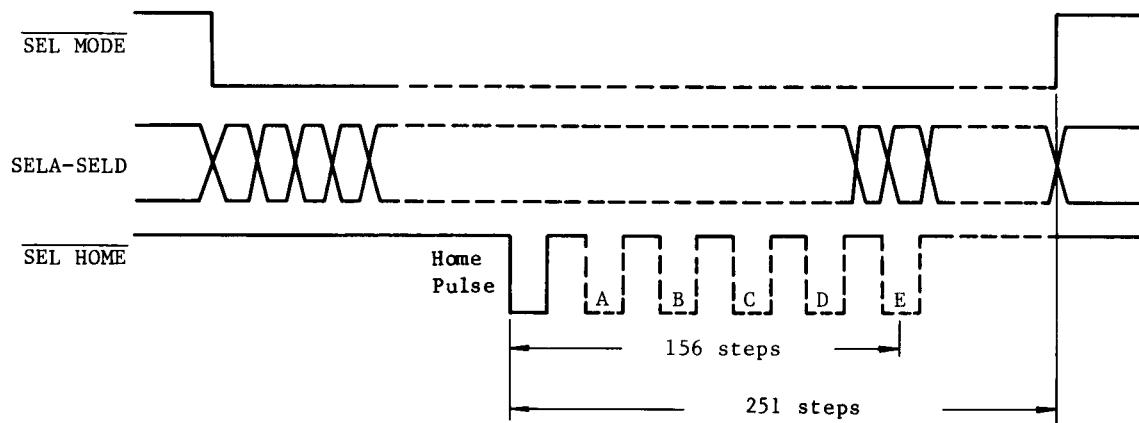
Figure 38

(1) The selection motor is directed by SELA-SELD to rotate clockwise. The motor is actuated as SEL MODE* goes low. (The print wheel rotates clockwise when viewed from the front of the Printer.)

(2) The selection motor rotates at minimum speed. The control circuit stops the motor 251 steps after detecting SEL HOME*.

(3) The restore operation is completed, and the position where the motor stops becomes the home position for the print wheel.

Note: The space pitches are detected 156 steps after SEL HOME* is detected.

4-3-3. Restore Errors
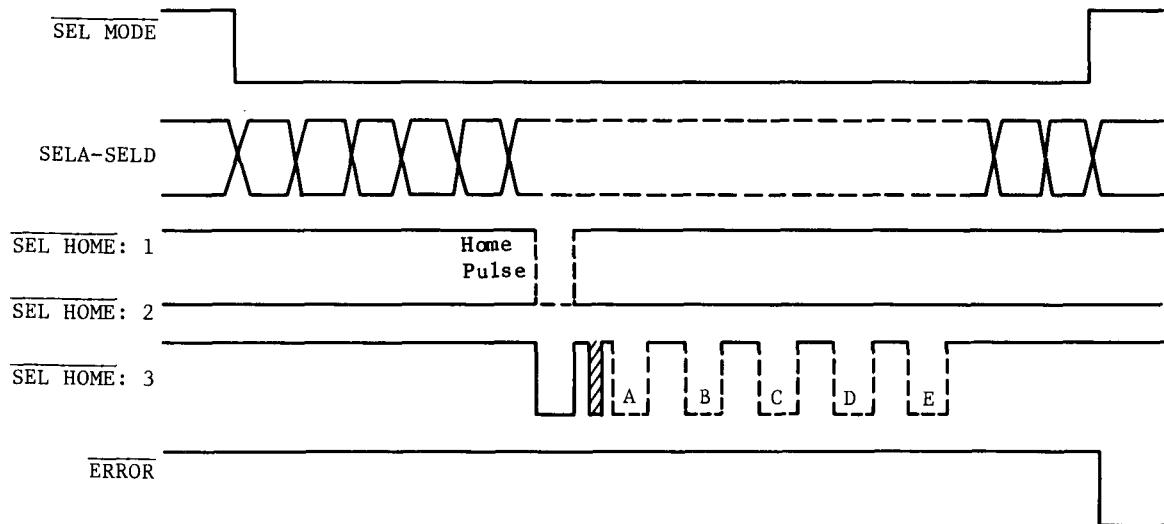
Figure 39

(1) SEL HOME*:1 Selection home not detected.
(2) SEL HOME*:2 Selection home detected continuously.
(3) SEL HOME*:3 Pulses other than to E were generated during detection
of the space pitch and print wheel style.

A restore error is generated if any one of the above conditions is
detected. An ERROR* low signal is then output to notify the interface
control of the error.

4-4. Space Motor

The space motor operation is controlled by the SPA-SPD and SP MODE*
signals. The space motor control timing diagram is as follows:
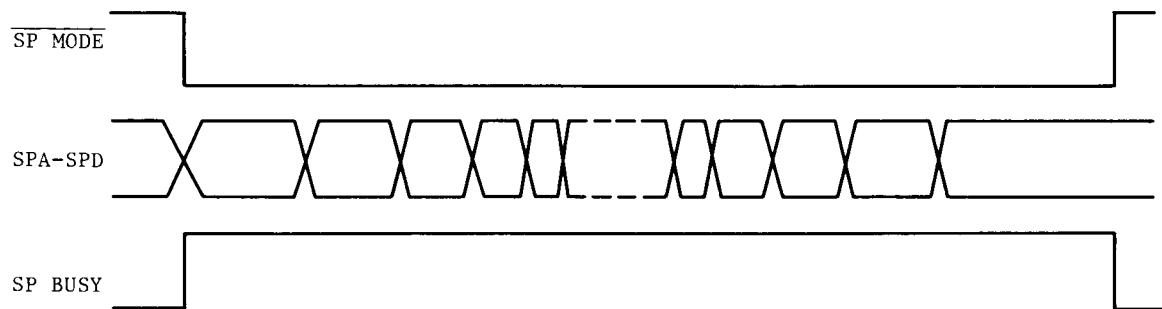
Figure 40

[Signal description]

(1) SP MODE*

Space motor drive signal.
High $\longrightarrow$ Motor hold
Low $\longrightarrow$ Motor drive

(2) SPA-SPD

SPA-SPD specify the direction of rotation of the space motor and the
number of steps it must move. These signals control the velocity of
the space motor from acceleration to deceleration, or from
acceleration to movement at constant speed, then to deceleration,
depending on the number of steps specified.
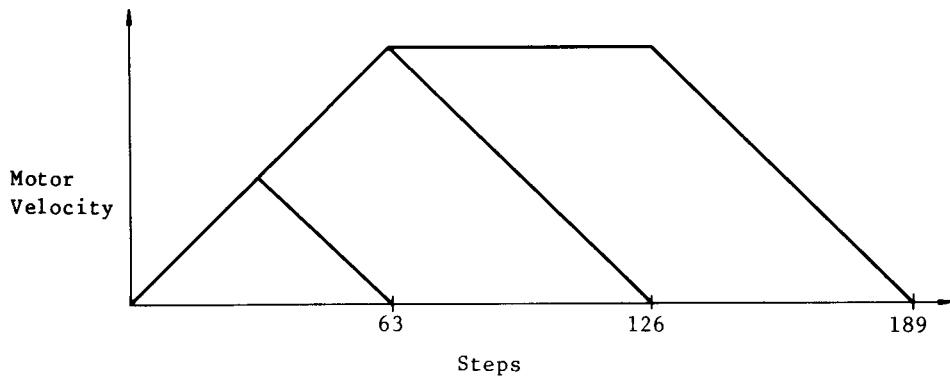
Figure 41

The space motor moves 1/120" per step.

(3) CARRIAGE HOME

This signal is used to detect the home position of the carriage.

4-4-1. Normal Operation
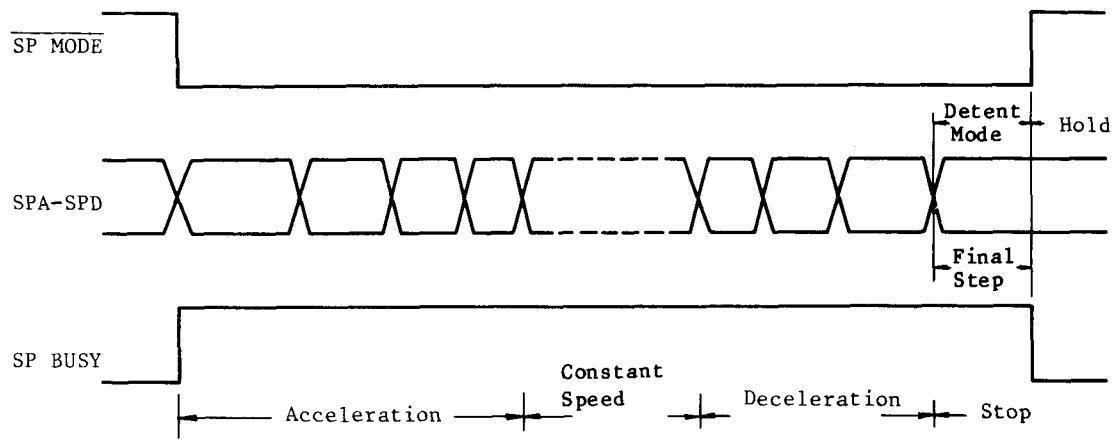
Figure 42

(1) The μCPU controls the direction of rotation of the space motor and the number of steps it must move through commands executed via the I/O. The μCPU directly controls the space motor movement.

(2) The space motor is actuated by the signals SPA-SPD and SP MODE*, and proceeds through successive stages of velocity from acceleration to movement at constant speed, then to deceleration.

(3) The space motor is held at the position specified on the final transition of SPA-SPD, and stops completely as SP MODE* goes from low to high.

4-4-2. Restore Operation 1
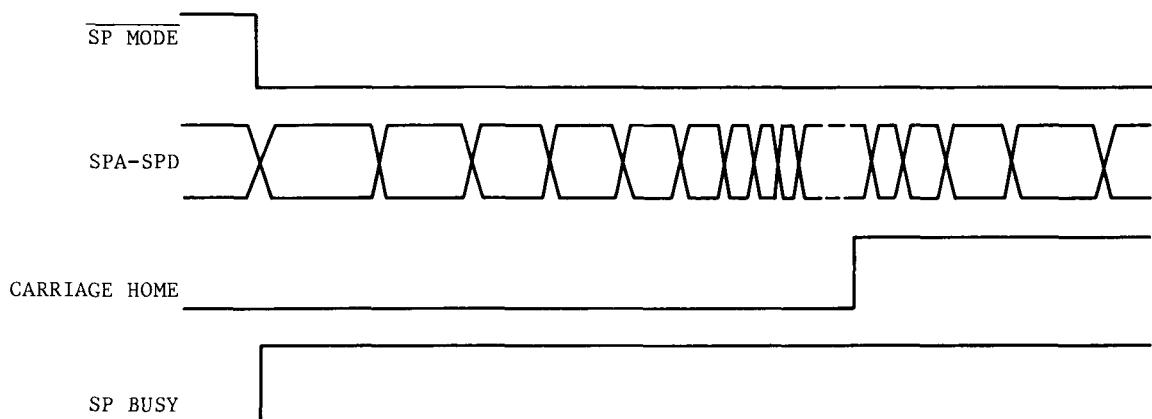
Figure 43

(1) The space motor is directed by SPA-SPD to rotate counterclockwise. The motor is actuated as SP MODE* goes low. (The carriage moves in the CR direction.)

(2) The space motor accelerates for 20 steps, then maintains a constant speed until CARRIAGE HOME goes from low to high.

(3) As CARRIAGE HOME goes high, the space motor decelerates for 20 steps.

Note: If CARRIAGE HOME goes high before the space motor has accelerated 20 steps, the motor decelerates by the same number of steps it accelerated.

4-4-3. Restore Operation 2

```
SP MODE _____|‾‾‾‾‾‾

                                              Detent  |   Hold
                                           |← Mode →|←→

SPA-SPD  ___╳‾╳‾‾╳‾‾‾╳‾‾‾╳‾‾‾‾‾╳‾‾╳_____

CARRIAGE _____|
HOME                                         |_____

SP  BUSY ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾|
                                             |_____|‾‾‾‾‾‾‾‾
```
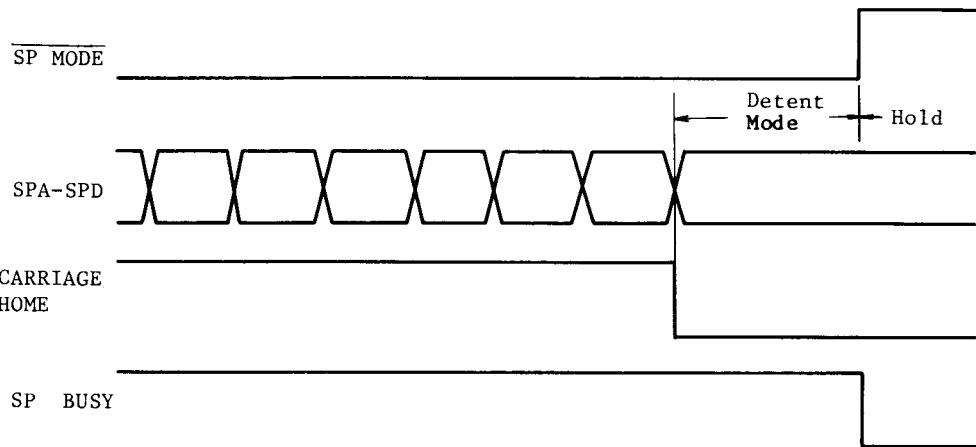
Figure 44

(1) After deceleration is completed, pulses SPA-SPD are switched to allow the space motor to rotate clockwise. (The carriage moves in the TAB direction.)

(2) The space motor rotates one step at a time until CARRIAGE HOME drops from high to low.

(3) The space motor is held at the position specified by the final transition of SPA-SPD, and stops completely as SP MODE* goes from low to high.

(4) The restore operation is completed, and the position where the motor has stopped becomes the home position for the carriage.

Note: When CARRIAGE HOME is initially high at the start of the restore operation, restore operation 2 can be initiated by bypassing restore operation 1.

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4-4-4. Restore Errors
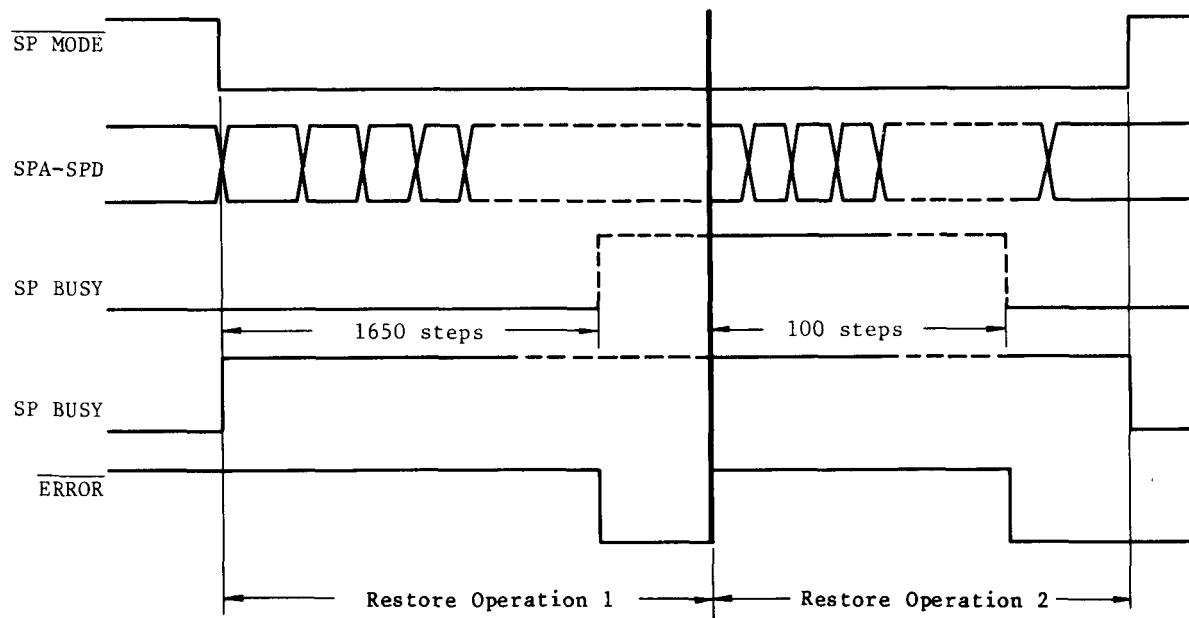
Figure 45

(1) A restore error is generated if CARRIAGE HOME fails to go high within 1,650 steps during restore operation 1.

(2) A restore error is also generated if CARRIAGE HOME fails to go low within 100 steps during restore operation 2.

An ERROR* low signal is then output to the interface control to denote the error.

4-5. Line Feed Motor

The line feed motor operation is controlled by the LFA, LFB, and LF DRV*
signals. The motor can be rotated in both directions by changing the
phasing between the LFA and LFB pulses.
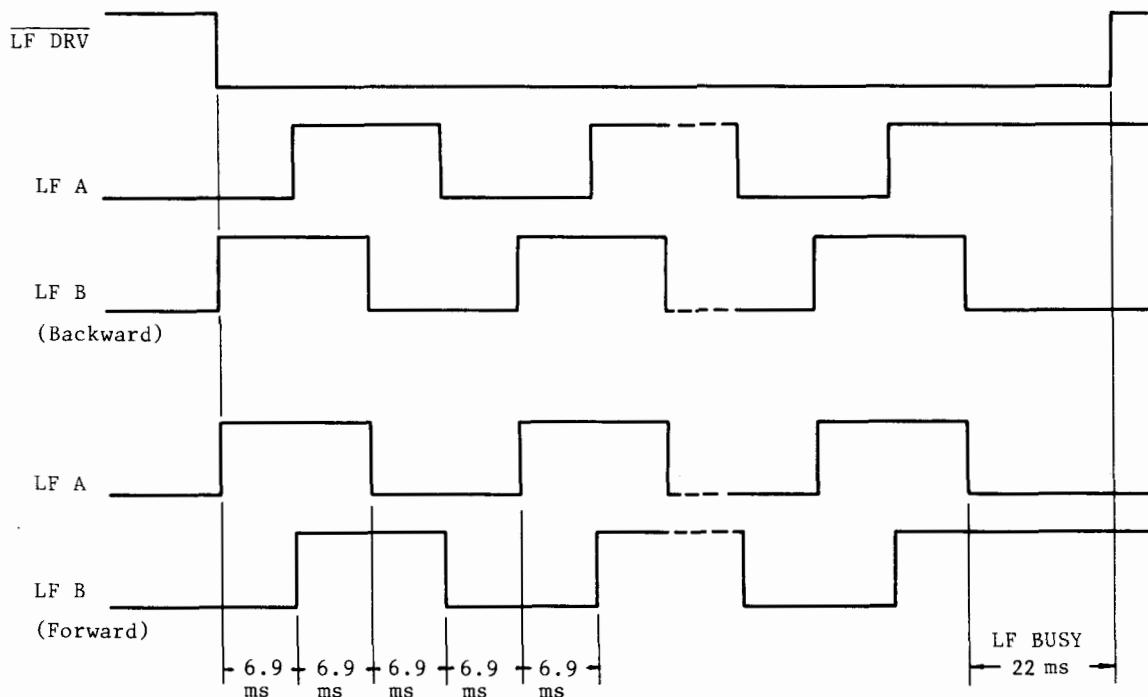
Figure 46

4-6. Ribbon Feed Motor

The ribbon feed motor operation is controlled by the RFA, RFB, and RF
DRV* signals. The ribbon feed motor only rotates counterclockwise. It
normally travels two steps when printing a character and eight steps while
underlining.
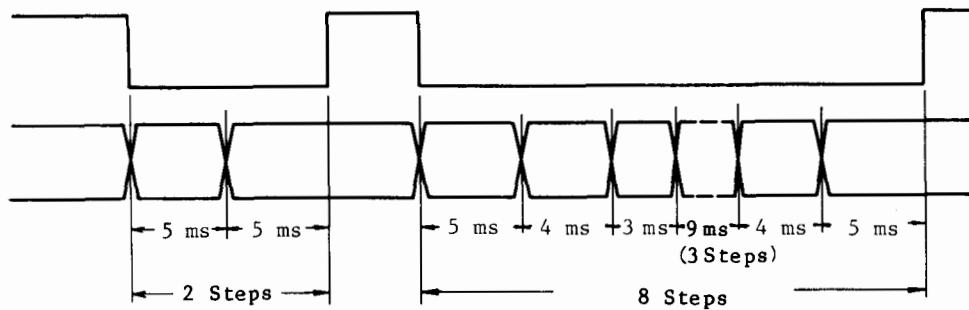
Figure 47

The velocity of the ribbon feed motor is controlled from acceleration to
deceleration, or from acceleration to movement at constant speed, then to
deceleration, depending on the number of steps specified.

4-7. Hammer Magnet

The hammer magnet operation is controlled by the HAM* signal.
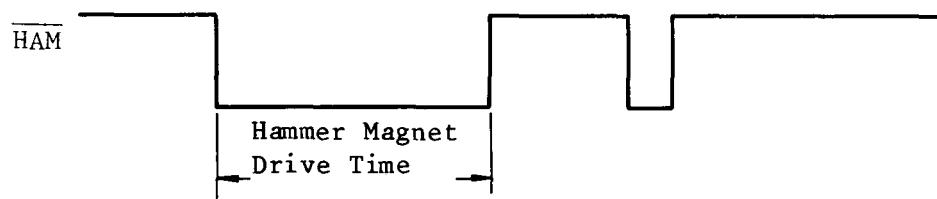
Figure 48

The velocity at which the hammer magnet is driven depends on the impression level selected, and the type of character being printed. When printing in the External Program Mode, this velocity is selected by the programmer. Refer to the owner's manual for further information.

4-8. Ribbon End Detection
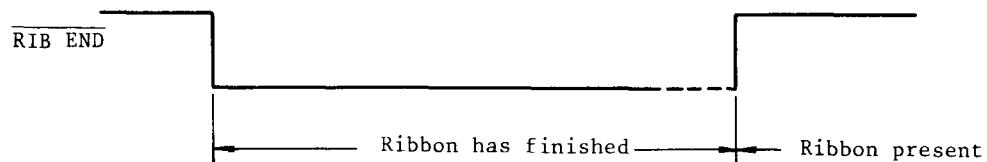
Figure 49

5. Motor/Magnet Drive Circuits

This section describes the analog circuits that drive the motors and magnets.
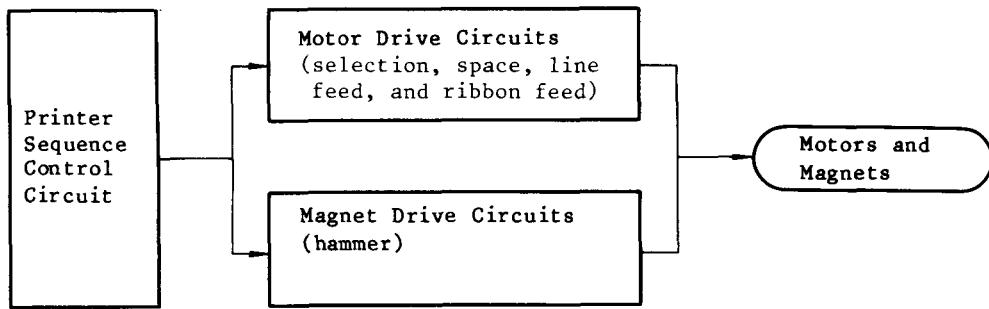
Figure 50

A. Motor drives

The motor drive circuits actuate the selection, space, line feed, and ribbon feed motors as directed by the printer sequence control.

B. Magnet drives

The magnet drive circuits actuate the hammer magnet as directed by the printer sequence control.

5-1. Motor Drive Circuits (Selection and Space)

The selection and space motor drive circuits are similar in circuit design; therefore, the description for the selection motor drive circuit also applies to the space motor drive circuit.
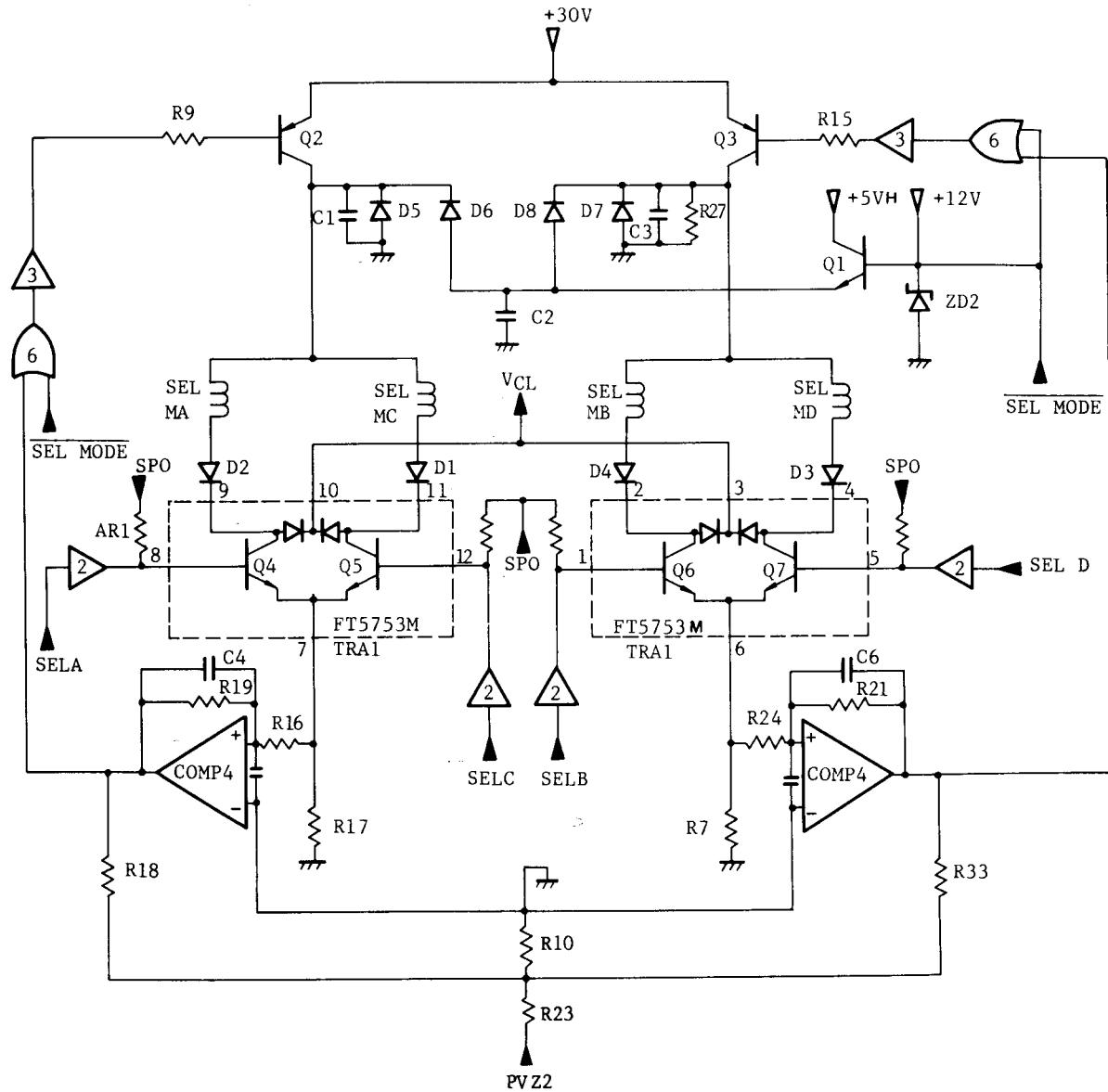
Figure 51

The selection motor drive circuit operation is controlled by the SEL MODE* signal. As SEL MODE* goes low, transistors Q2 and Q3 are turned on to start drive current flow through the selection motor coils SELMA-SELMD (motor drive). When SEL MODE* goes high, transistor Q2 only turns on to introduce a holding current flow through selection motor coils SELMA-SELMD (motor stop).

The circuit operation to energize motor coil SELMA is explained below.
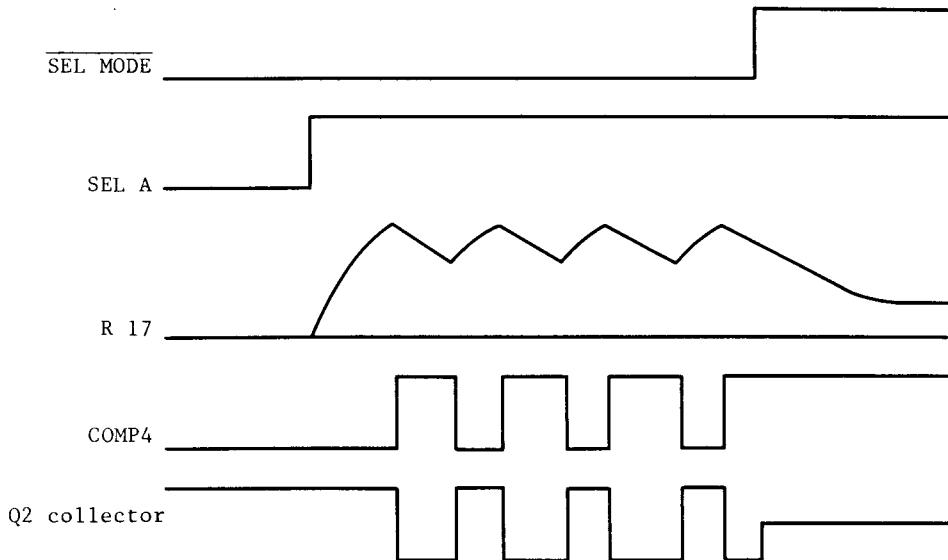
Figure 52

As the SELA pulse goes high, transistor Q4 turns on and drive current flows
through components SELMA, D2, Q4, R17, to GND, to energize motor coil
SELMA. The drive current is sampled at the non-inverting terminal of COMP4
as it flows through R17. As the current eventually reaches the threshold
level specified for COMP4, the COMP4 output pin goes high to turn off
transistor Q2. As a result, the drive current flow stops.
As the drive current declines, transistor Q4 remains on, maintaining
current flow in motor coil SELMA, though at a declining rate. When this
current falls below the specified threshold level for COMP4, COMP4 output
goes low to turn transistor Q2 on again, resuming the drive current flow
and thus reenergizing motor coil SELMA (chopper drive).
Motor coils SELMB-SELMD follow a similar operation sequence. Switching
SELA-SELD pulses in a phased sequence energizes SELMA-SELMD and causes the
selection motor to rotate.

5-2. Motor Drive Circuits (Line Feed and Ribbon Feed)

The line feed and ribbon feed motor drive circuits are similar in circuit design; therefore, the description for the line feed motor drive circuit also applies to the ribbon feed motor drive circuit.

RF DRIVE Pulse		Q1	Q2	Q3	Q4
LF A	High	ON	–	OFF	–
	Low	OFF	–	ON	–
LF B	High	–	ON	–	OFF
	Low	–	OFF	–	ON

Table 5
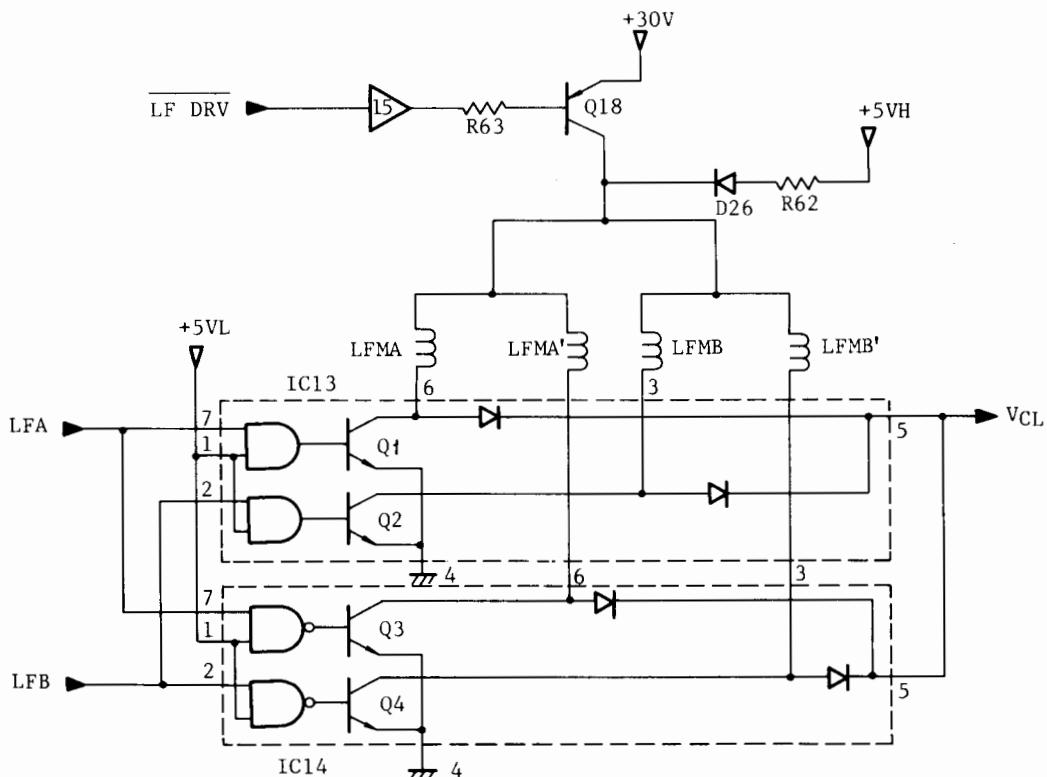
Figure 53

The line feed motor drive circuit operation is controlled by the LF DRV* signal. As LF DRV* goes low, transistor Q18 turns on to start drive current flow through line feed motor coils LFMA, LFA', LFB, and LFB' (motor drive). When LF DRV* goes high, a holding current flow is supplied to LFA, LFA', LFB, and LFB' from the +5VH rail via R62 and D26 (motor stop). Switching the LFA and LFB pulses causes transistors Q1 to Q4 to be switched, as shown in Table 5. As a result, the drive current flows through the motor coil, the transistors, then to GND, thereby energizing the motor coil (unipolar drive).
The LFA and LFB pulses are switched in the following order: LFA, B = high → LFA = low, LFB = high → LFA, B' = low → LFA = high, LFB = low. Correspondingly, the motor coils are energized in the order: LFMA, B → LFMA', B → LFMA', B' → LFMA, B', causing the line feed motor to rotate.
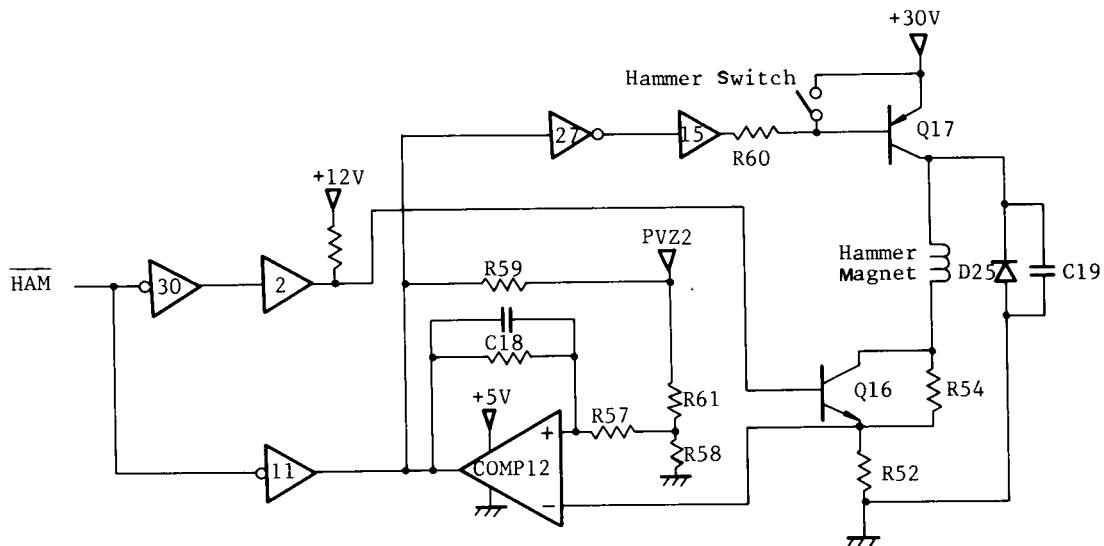
Figure 54

The operation hammer magnet drive circuit is controlled by the HAM*
signal. During a hammer magnet drive period, HAM* goes low to turn on
transistor Q17, starting drive current flow through the hammer magnet and
energizing it.
The drive current is sampled at the inverting terminal on COMP12 as current
flows through R52. As the COMP12 output pin goes low, transistor Q17 turns
off, thereby controlling the drive current flow.
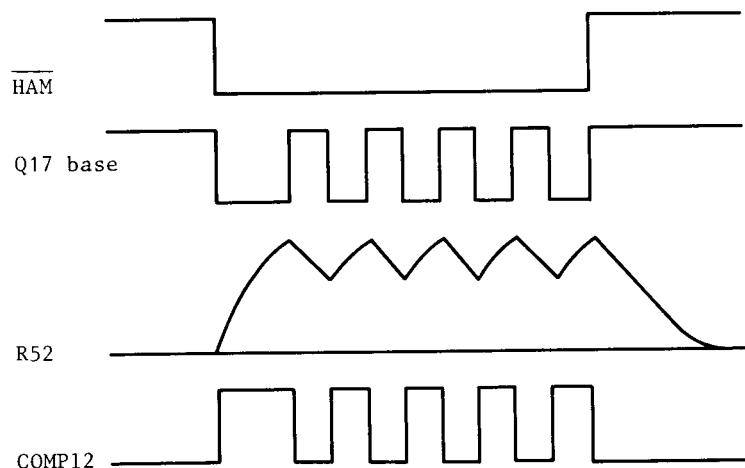
Figure 55

5-4. Voltage Monitoring
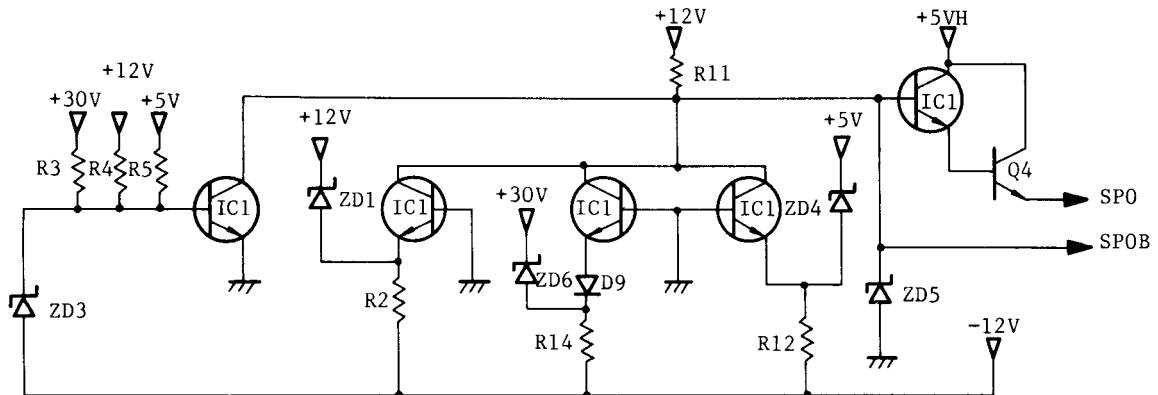
Figure 56

Signals SPO and SPOB go high when all the DC voltages have risen to the correct levels. SPO is input to the selection and space motor drive circuits to enable or disable the motor drives, while SPOB resets the µCPU to initialize it.

Both SPO and SPOB go low when any of the DC voltages deviates from its specified value. As a result, the selection and space motors are deactivated and any µCPU activity is stopped.

IV. POWER SUPPLY UNIT

This power supply is a compact, lightweight, switching DC-regulated power supply, designed to drive the DWP-220 Printer.

1. Specifications

Power source Specifications	+5V	+5VH	+12V	-12V	+30V	+30VH
Use	For digital circuits	For motor hold voltage	For analog circuit magnet hold voltage	For analog circuits	For motor and magnet drive circuits	For motor drive circuits
Output voltage	5V$^{+10\%}_{-5\%}$	5V+50%	12V±10%	-12V±10%	30V±5%	30V+10%
Output current	0.5-1.5A	0.6-1.15A	0.43-0.85A	0.05-0.1A	0.01-1.1A	0-0.3A
Load range fluctuations	-	-	-	-	1-4.9A	-
Ripple voltage (p-p)	50mV	1V	150mV	150mV	200mV	1V
Voltage spikes	200mV	2V	500mV	500mV	500mV	2V

Table 6

2. Output Pin Arrangement

. CN1 (power connector)

Pin No.	1	2	3	4	5	6	7	8
Output voltage	PG	PG	+12V	+5VH	+30VH	+30V	+30V	+30V

. CN2 (logic connector)

Pin No.	1	2	3	4	5	6	7	8	9	10
Output voltage	LG	LG	LG	LG	LG	+5V	+5V	+5V	+12V	-12V

Table 7

3. Voltage Output Sequence
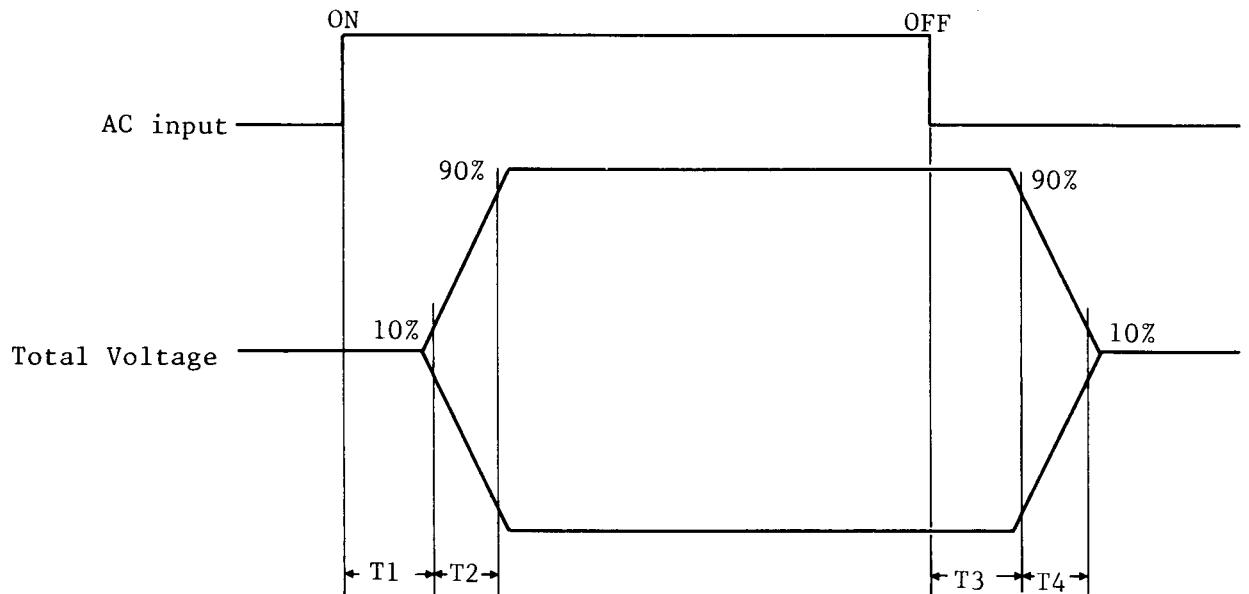
T1 = 0 - 100 ms
T2 = 0 - 200 ms
T3 = 0 - 100 ms
T4 = 5 - 200 ms

Figure 57

4. Circuit Operation Description
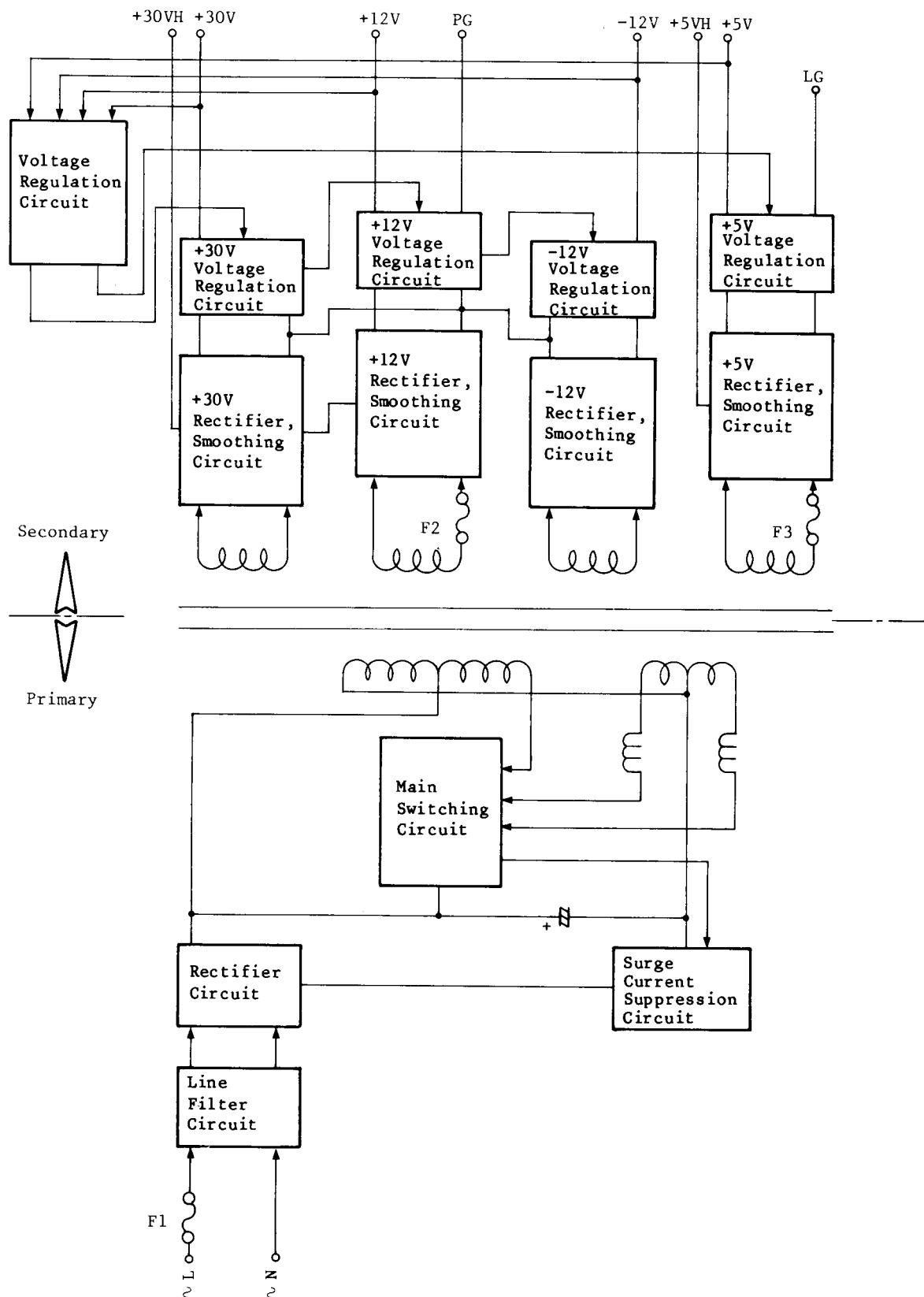
Figure 58. POWER SUPPLY BLOCK DIAGRAM

4-1. Line Filter Circuit
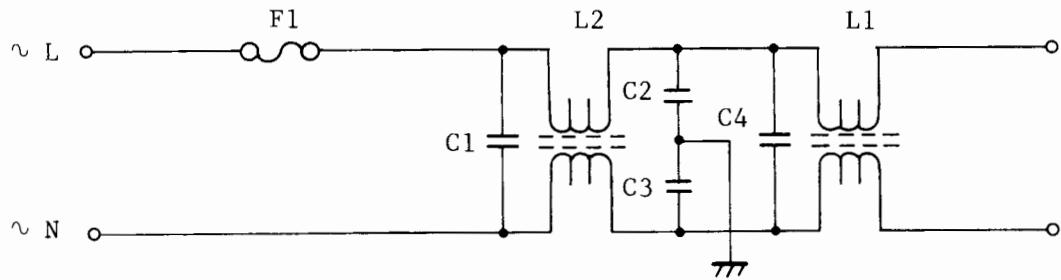
Figure 59. 100V Series

This circuit suppresses and absorbs normal mode noise flowing through the AC line, and common mode noise which occurs between the AC line and ground.

4-2. Rectifier, Smoothing Circuit On Primary Side
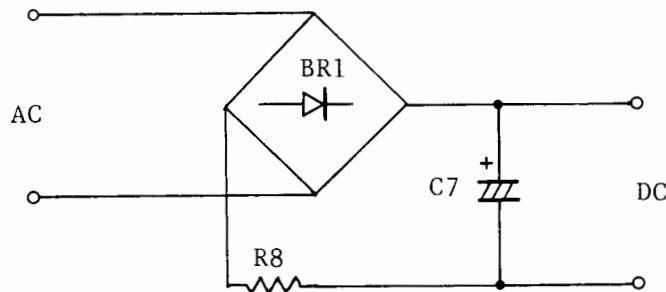
Figure 60

After rectifying the AC input with bridge diode BR1, this circuit smooths the rectified AC by using capacitor C7, and produces a DC output.

4-3. Surge Current Suppression Circuit
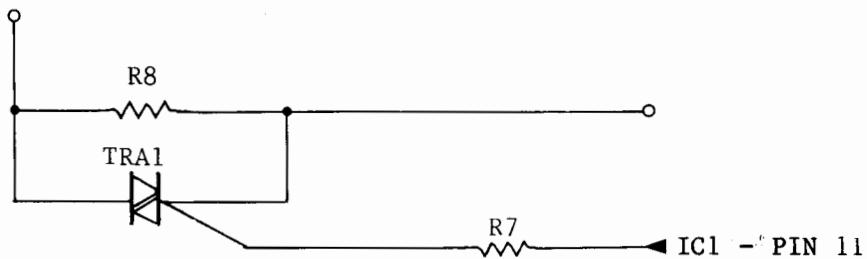
Figure 61

This circuit limits surge current flow, which occurs when the power is applied, to less than 35A (standard value) by using R8. R8 is eventually bypassed when TRA1 is turned ON by an output voltage from IC-1, pin 11.

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4-4. Main Switching Circuit
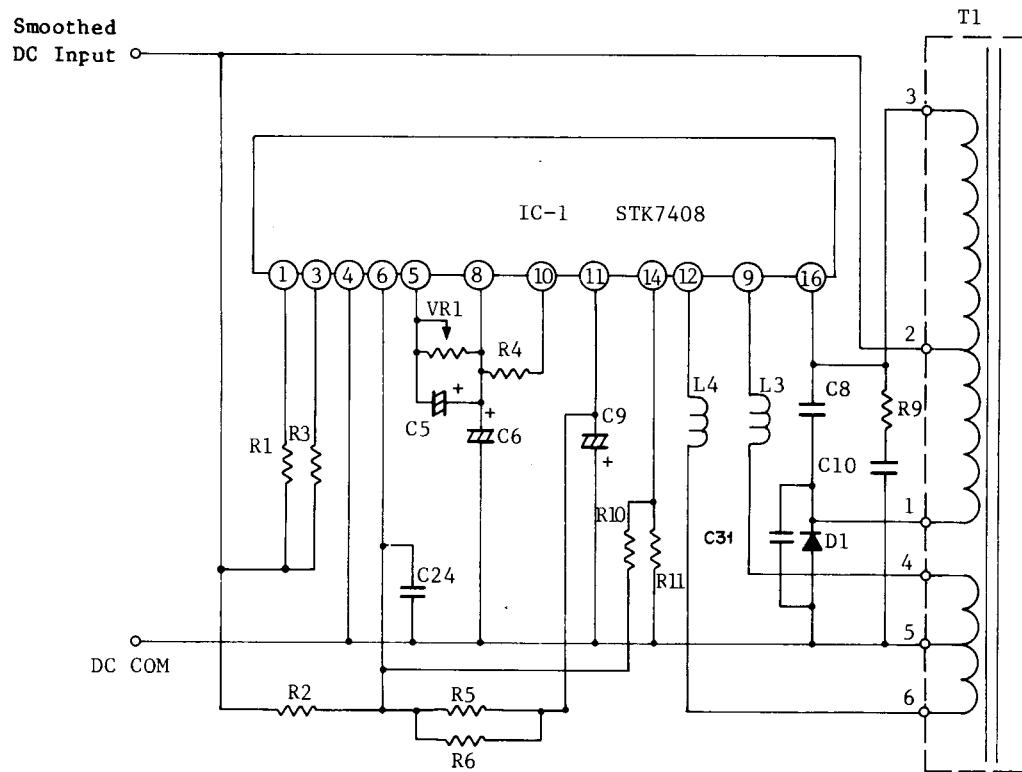
Figure 62

The main switching circuit is controlled by switching regulator STK7408.
The STK7408 consists of a start circuit, oscillator, differential
amplifier, drive circuit, switching circuit and bias power supply circuit.
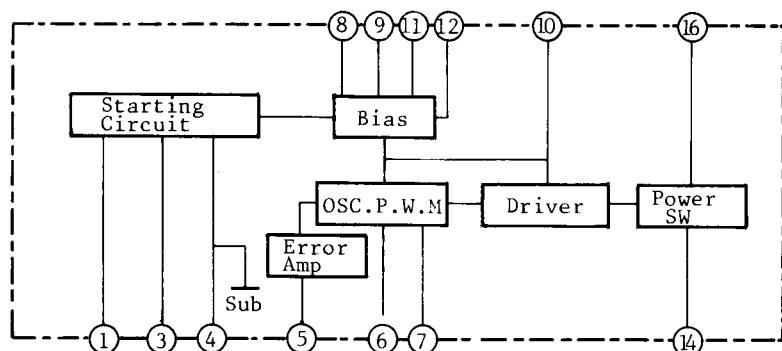
Figure 63

The smoothed DC is input to IC-1, pins 1 and 3 (the start circuit), via R1 and R3. When the voltage potential of the smoothed DC becomes high enough, the start circuit operates. Voltage is supplied to the start circuit from IC-1, pin 8 (bias power supply circuit), and the oscillator circuit begins oscillating. Once oscillation begins, the switching circuit's main transistor starts switching, and switching current flows from IC-1, pin 16, to IC-1, pin 14, then to R11, and to DC COM. Voltage is developed across the main transformer T1, pins 4 and 6, and is input to IC-1, pins 9 and 12 (bias power supply circuit), via L3 and L4 to provide positive VCC and negative VCC to the IC. At that time, voltage supply from the start circuit stops.

The switching current is sensed at R11, potentially divided by R2, R5, R6 and R10, then input to IC-1, pin 6 (differential amplifier). The differential amplifier controls the output to the primary circuit.

4-5. Rectifier, Smoothing Circuit On Secondary Side (+30, +12 and +5V)
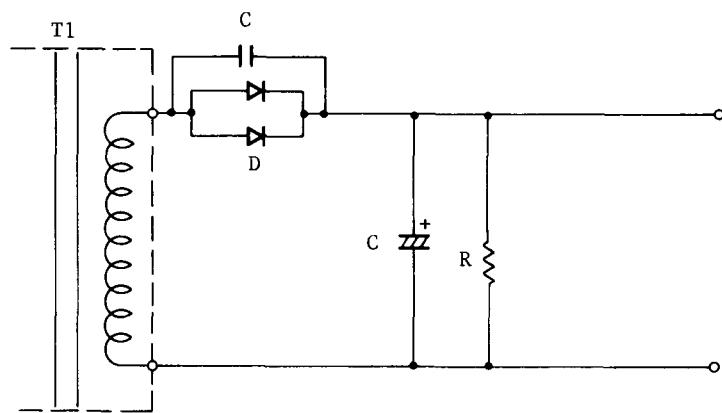
Figure 64

The high-frequency voltages which are generated by the main switching circuit are stepped down by main transformer T1, rectified by diodes, then smoothed by the RC circuits.

4-6. Voltage Regulation Circuits (+30 and +5V)
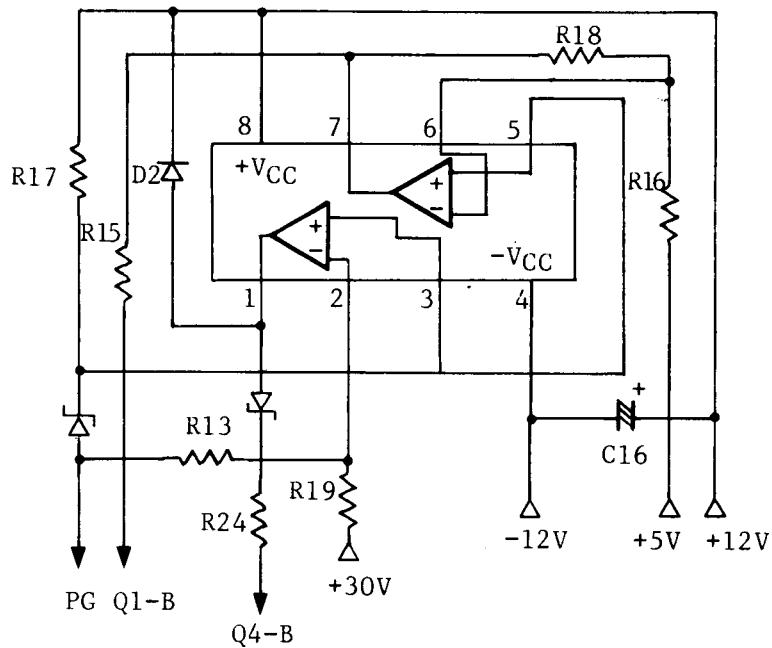
Figure 65

IC-2 is a dual operational amplifier which regulates the +30V and +5V DC output voltages to a constant level.

V. PARTS REMOVAL/REPLACEMENT PROCEDURES

1. Tools

General Tools	Special Tools	
(+) Screwdriver: Large (+) Screwdriver: Small (-) Screwdriver: Medium (-) Torquedriver: 6kg Thickness gauge: 0.05 mm. Tension gauge: 2kg	Tool A: Tool B: Tool C:	Platen gap/Carriage home adjustment tool Platen gap sub/card holder gap adjustment tool LF belt tension adjustment tool

Table 8

1-1. Special Tools

Tool A
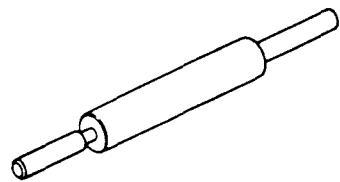
Tool B

Platen gap/carriage home
adjustment tool: No. 87789906
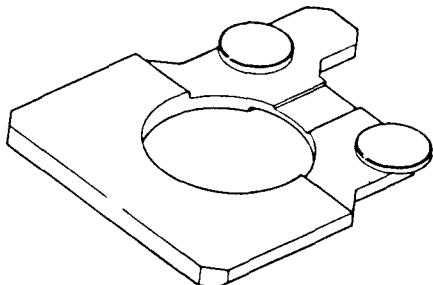
Platen gap sub/card holder gap
adjustment tool: No. 87789916

Tool C
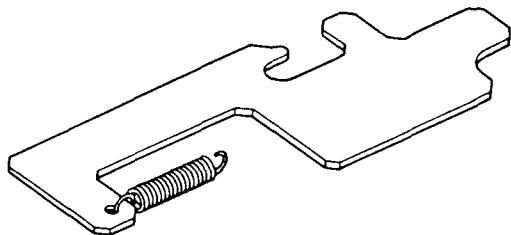
LF belt tension adjustment tool: No. 87789911

Figure 66

2. Top Cover Removal

(1) Remove the right and left platen knobs.

(2) Loosen the cover screws on the right and left sides of the rear side of the Printer.

Platen Knob

Top Cover Assembly

Platen Knob

Screws

Figure 67

Front Cover

Silencer

Screws

Operator Panel

Notch

Bottom Cover Assembly

Figure 68

(3) Open the front cover and remove the silencer.

(4) Remove the screws from the front of the right and left sides of the top cover.

(5) Disengage the notch on the front left side of the top cover; then, remove the top cover.

(Top Cover Assembly)

Control Cover
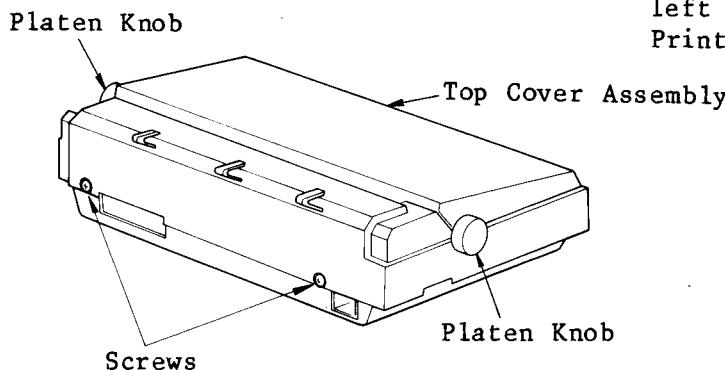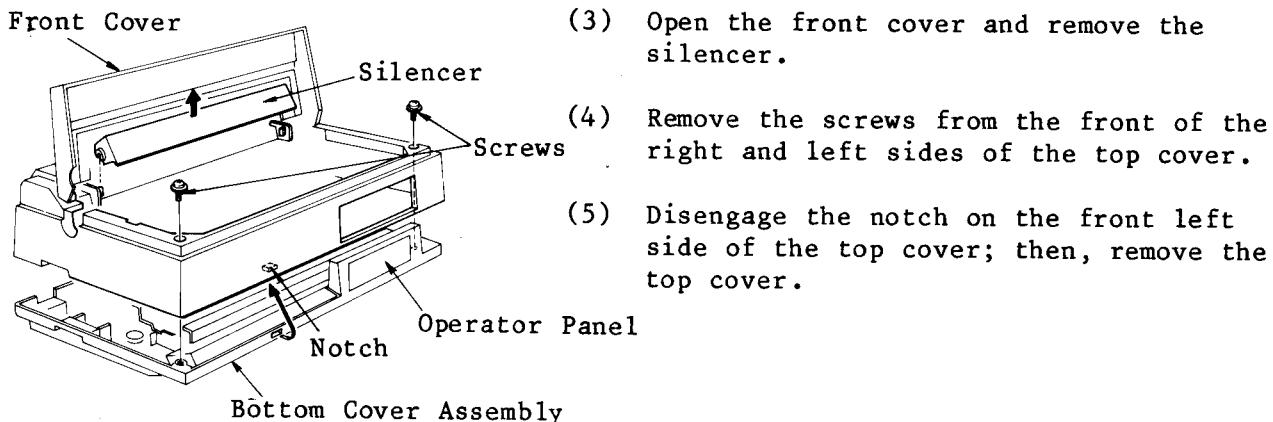
Cover Open Switch

Cable Connector

Figure 69

(6) Disconnect the cover open switch cable connector from the control board.
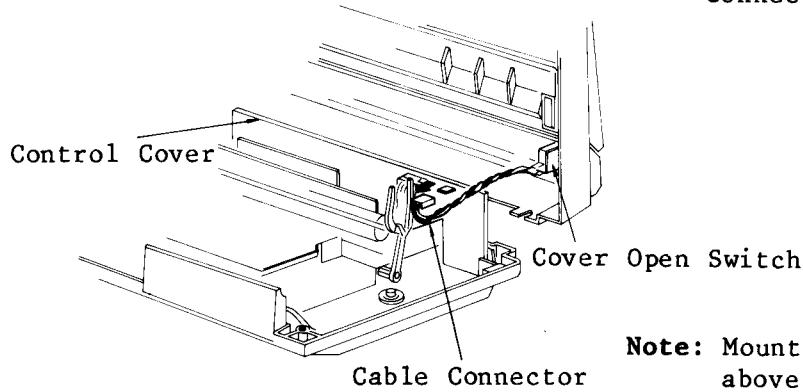
Note: Mount the top cover by performing the above procedure in reverse.

3. Bottom Cover Removal

(1) Remove the operator panel cable connector from the control board. (Remove the operator panel.)

Control Board

Operator Panel   Cable Connector
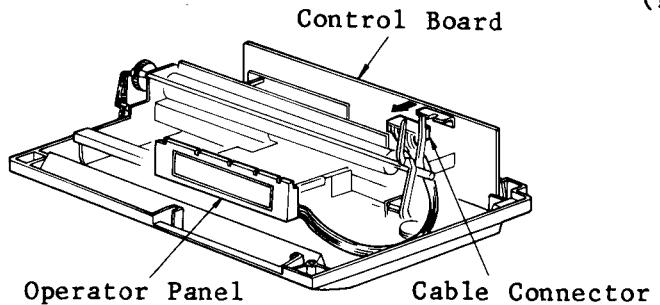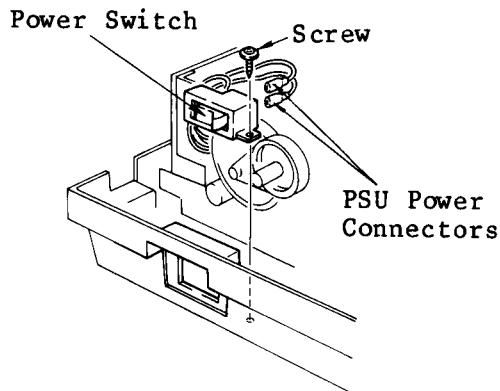
Figure 70

(2) Remove the screw holding the AC switch gaurd.

(3) Remove the two PSU power connectors (white and black) from the power switch.
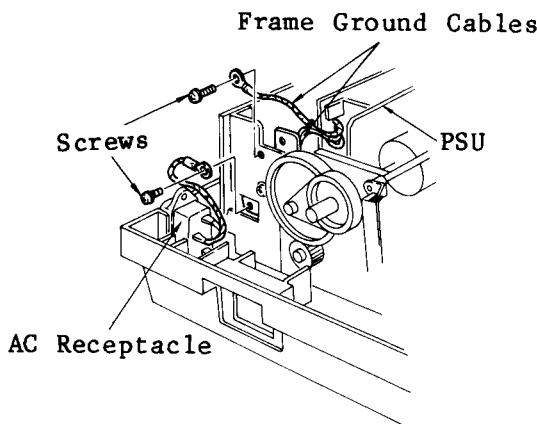
Power Switch   Screw

PSU Power Connectors

Figure 71

(4) Remove the AC receptacle and PSU frame ground cable from the printer frame.

Frame Ground Cables

Screws   PSU

AC Receptacle

Figure 72

(5) Remove the flat cable clamp from the bottom cover.

Cable Clamp   Carriage Assembly

Flat Cable
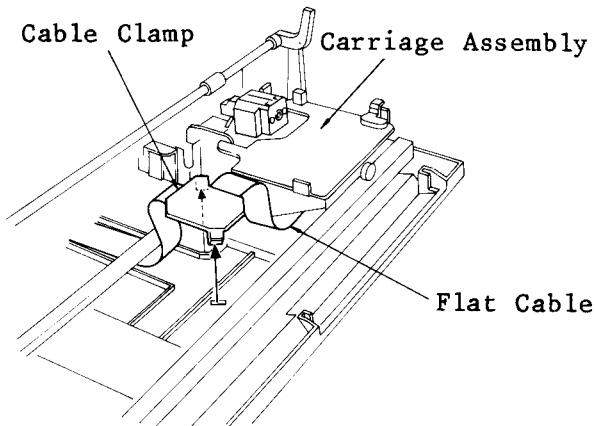
Figure 73

(6) Remove the right and left screws holding the printer frame.

(7) Remove the bottom cover.

Screws

Note: Mount the bottom cover by performing the above procedure in reverse.

Bottom Cover Assembly
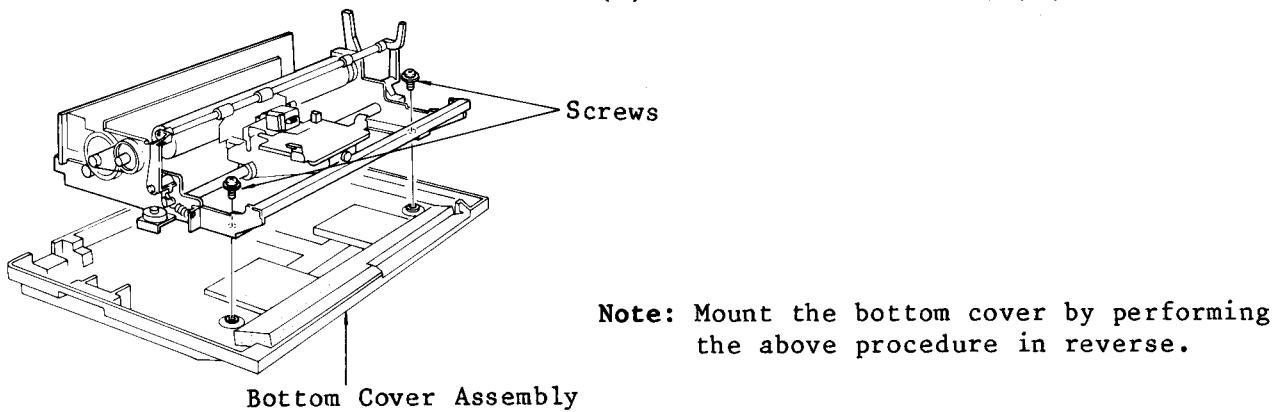
Figure 74

4. Control Board Replacement

4-1. Control Board Removal

(1) Remove the right and left screws holding the control board.
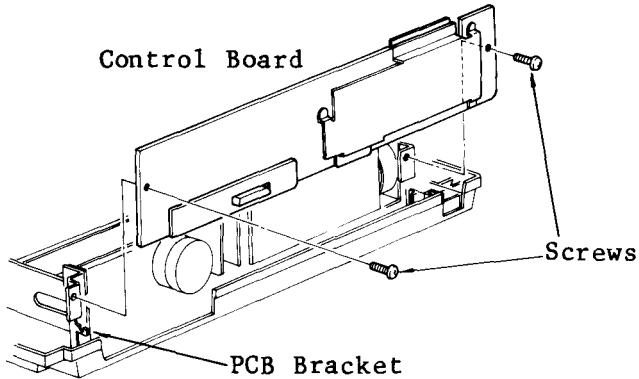
Figure 75

(2) Remove the cable connectors from the control board.

Note: Unlock the cable connector before disconnecting the flat cable.
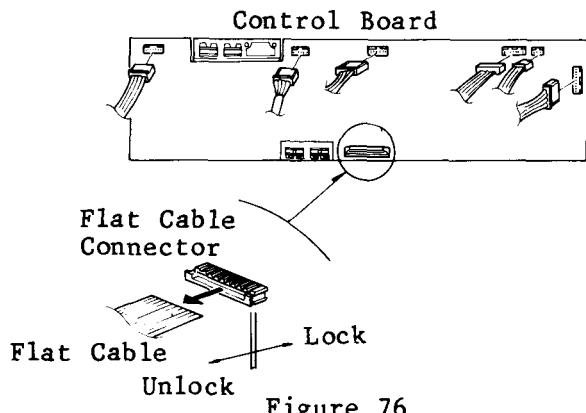
Figure 76

4-2. Control Board Installation

(1) Plug the cable connectors onto the control board; then, install the control board on the PCB bracket.

Note: Remember to lock the connector before reconnecting the flat cable.

(2) Secure the control board with two retainer screws.

5. PSU Replacement

5-1. PSU Removal

(1) Disconnect the power cable from the Printer.

(2) Remove the control board. (See item 4, "Control Board Replacement".)

(3) Remove the screw holding the AC switch guard.

(4) Remove the two PSU power connectors (white and black) from the power switch.

Power Switch   Screw

PSU Power Connectors
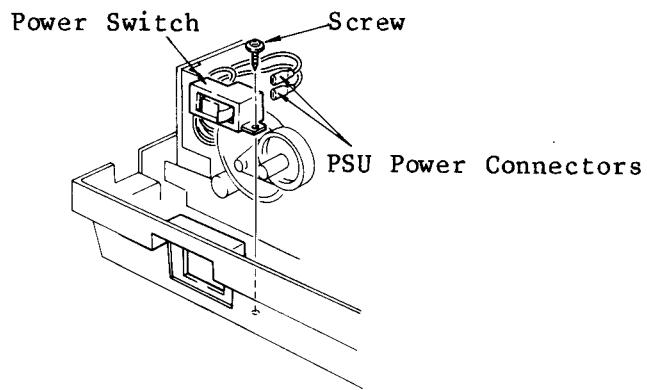
Figure 77

(5) Remove the AC receptacle and PSU frame ground cable from the printer frame.

Frame Ground Cables

Screws
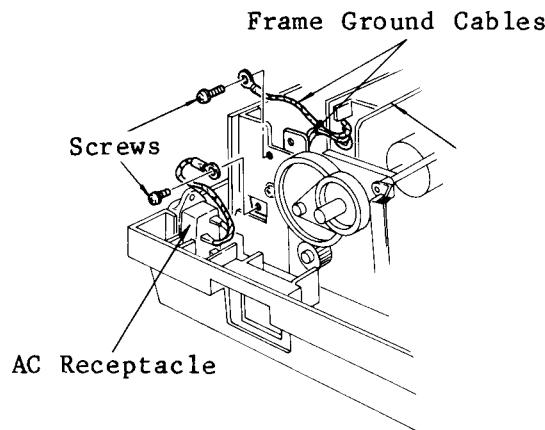
AC Receptacle

Figure 78

(6) Remove the right and left screws holding the PSU.

PSU Bracket

PSU
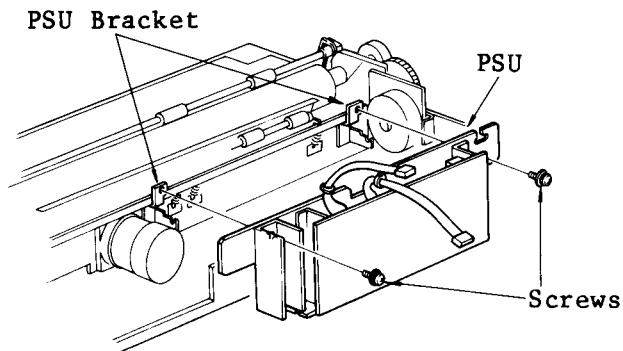
Screws

Figure 79

5-2. PSU Installation
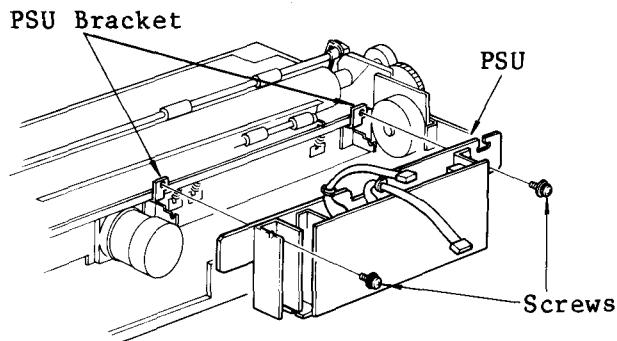
(1) Install the PSU in the PSU bracket and secure it with two retainer screws.

PSU Bracket

PSU

Screws

Figure 80

Frame Ground Cables
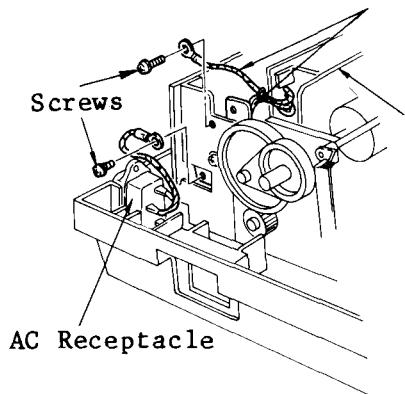
(2) Mount the AC receptacle and reattach the PSU frame ground to the printer frame.

Screws

AC Receptacle

Figure 81
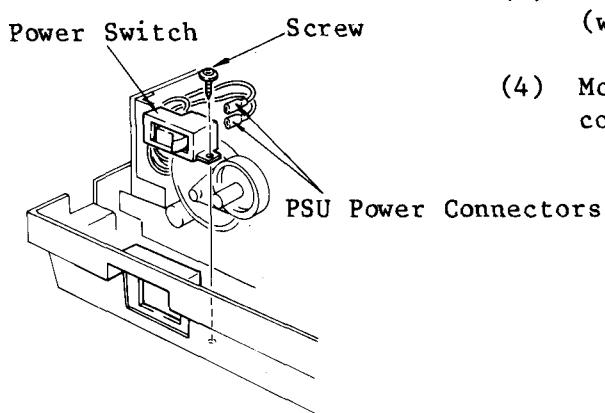
Power Switch   Screw

(3) Reattach the two PSU power connectors (white and black) to the power switch.

(4) Mount the AC switch guard on the bottom cover.

PSU Power Connectors

Figure 82

(5) Install the control board. (See item 4, "Control Board Replacement".)

(6) Reconnect the power cable to the Printer.

6. Carriage Assembly Replacement

6-1. Carriage Assembly Removal

(1) Remove the bottom cover. (See item 3, "Bottom Cover Removal".)

(2) Turn the Printer so the control board is facing downward; then, disconnect the flat cable from the control board.

Flat Cable

Flat Cable Connector

Control Board
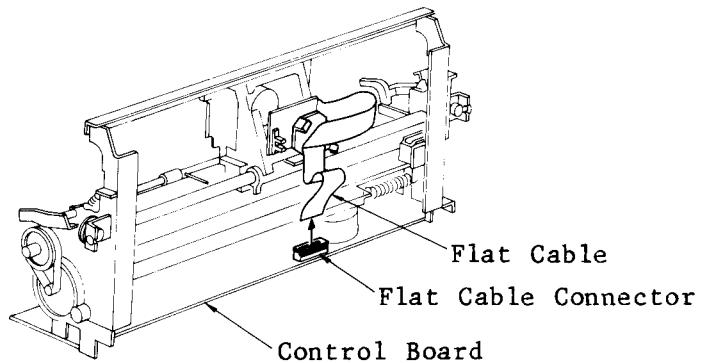
Figure 83

(3) Remove the wire clamp holding the space wire to the carriage frame.

Carriage Assembly

Screw

Wire Clamp
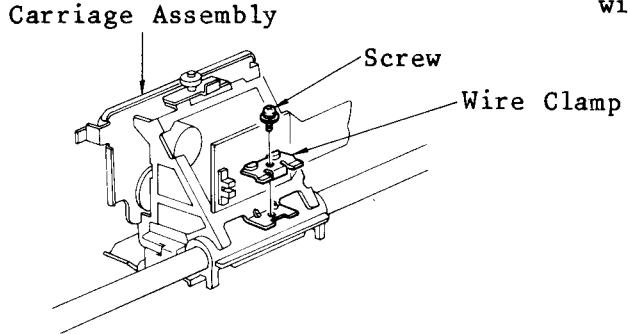
Figure 84

(4) Return the Printer to its normal upright position.

(5) Remove the right and left screws holding the support plate; then, remove the support plate.

Screws

Nut

Support Plate

Nut
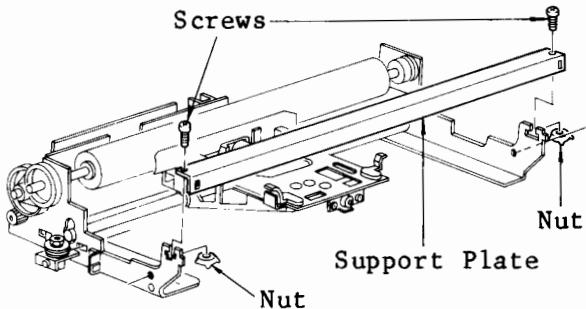
Figure 85

(6) Remove the right and left spring plate screws holding the space shaft; then, remove the spring shaft.

Screw

Spring plate

Screw

Carriage Assembly

Spring Plate
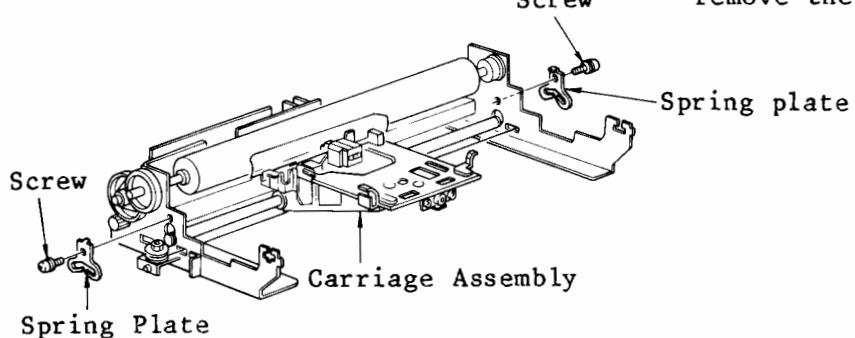
Figure 86

(7) Remove the carriage assembly and space shaft together as one unit from the printer frame.

(8) Remove the space shaft from the carriage assembly.

Space Shaft
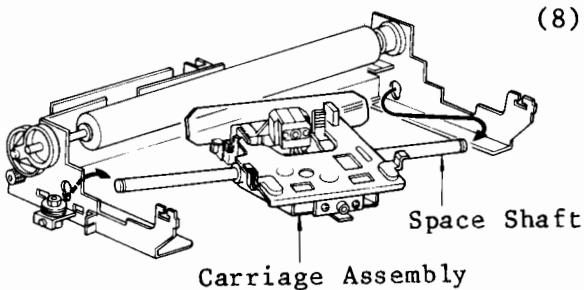
Carriage Assembly

Figure 87

6-2. Carriage Assembly Installation

(1) Insert the space shaft into the carriage assembly bearing hole.

Note: Wipe off any dust on the space shaft; then, coat the shaft lightly with oil. (Use Toshiba silicon oil TSF-100.)
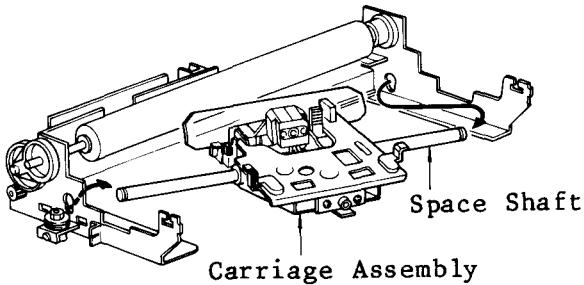
(2) Hold the carriage assembly with both hands; then, mount it together with the space shaft onto the printer frame.

Space Shaft

Carriage Assembly
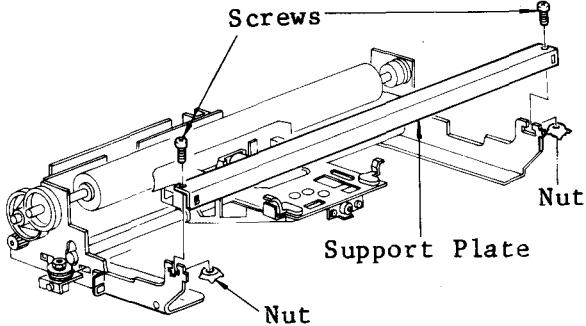
Figure 88

(3) Mount the support plate on the printer frame; then, secure the support frame with the retainer screws and nuts.

Screws

Nut

Support Plate

Nut
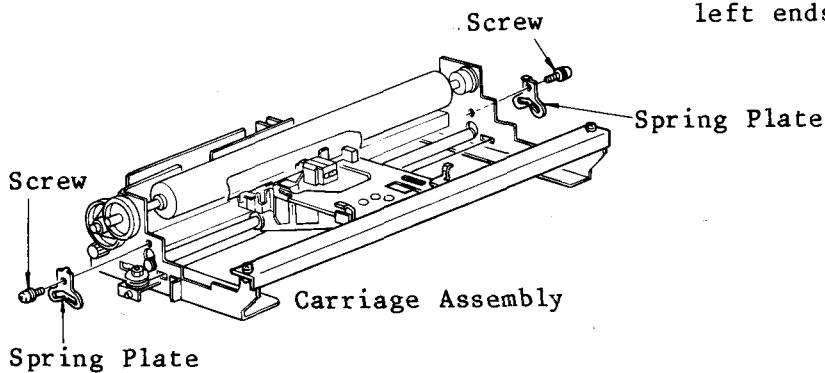
Figure 89

(4) Place the spring plate along the space shaft channel; then, secure it with the retainer screws. (Secure the right and left ends of the space shaft.)

Screw

Spring Plate

Screw

Carriage Assembly

Spring Plate

Figure 90

(5) Position the Printer so the control board is facing downward.

(6) Wind the space wire (inside the space motor pulley) onto the space motor pulley for 1.25 turns.
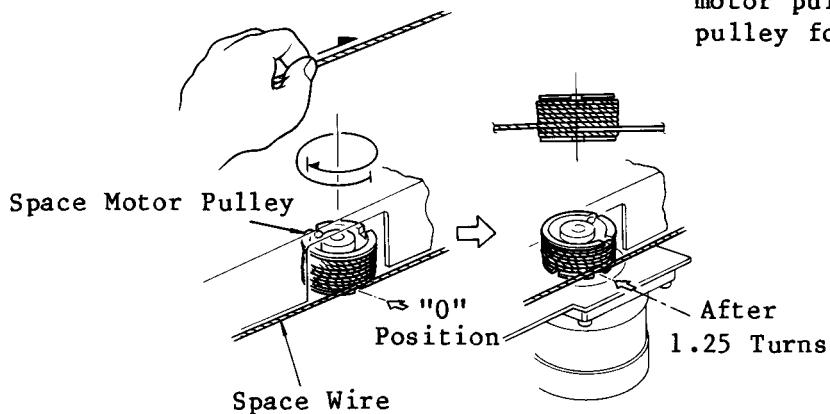
Figure 91

(7) Press the carriage assembly against the left frame; then, secure the space wire by mounting the wire clamp on the carriage frame.

Note: When mounting the wire clamp, tighten the screw with a torque of 6 kg.
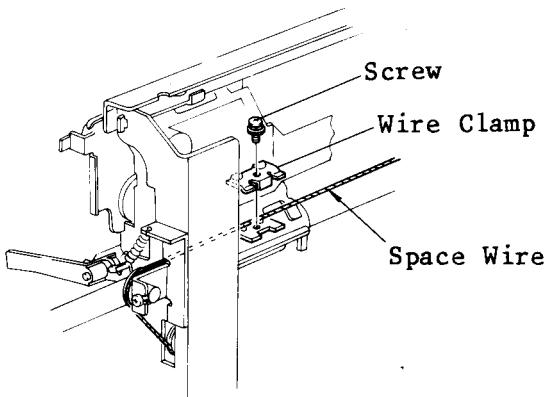
Figure 92

(8) Reconnect the flat cable to the control board.
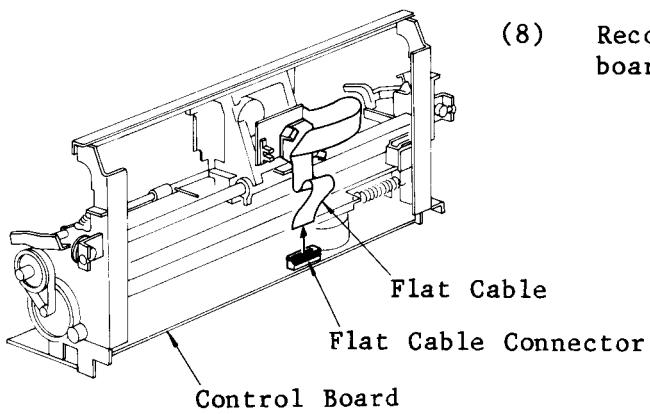
Figure 93

(9) Reinstall the Printer top and bottom covers.

6-3. Checks and Adjustments after Replacement

Upon exchanging a carriage assembly, check and adjust the platen gap and carriage's home position with the tools as shown in Figure 94.
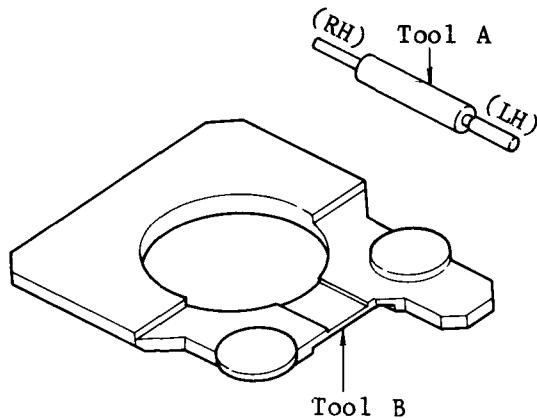
Tool A: Platen gap/Carriage home
       position adjusting tool

Tool B: Platen gap sub/Card
       holder gap adjustment
       tool

Figure 94

Figure 95

(1) Checking and adjusting the platen gap

1) Position the carriage assembly at the center of the Printer and attach Tool B to the front carrier.
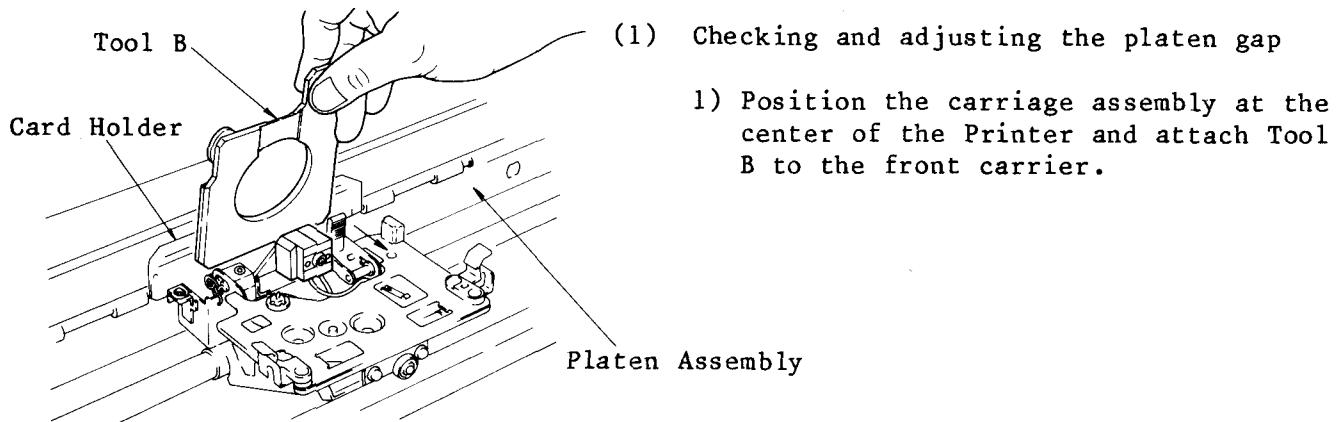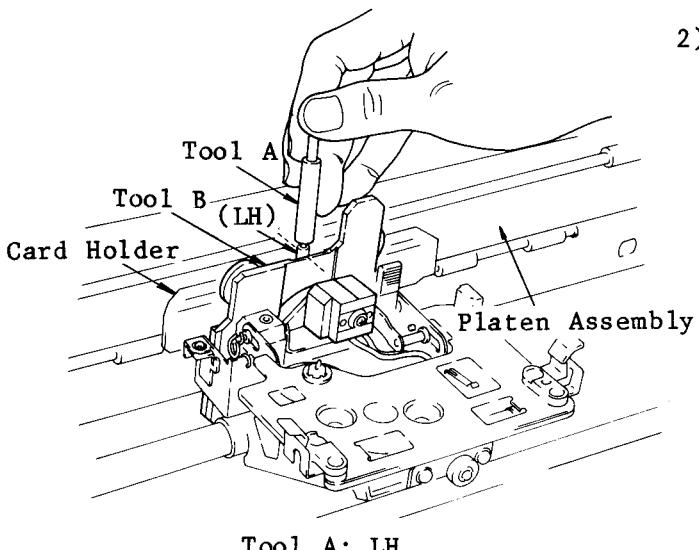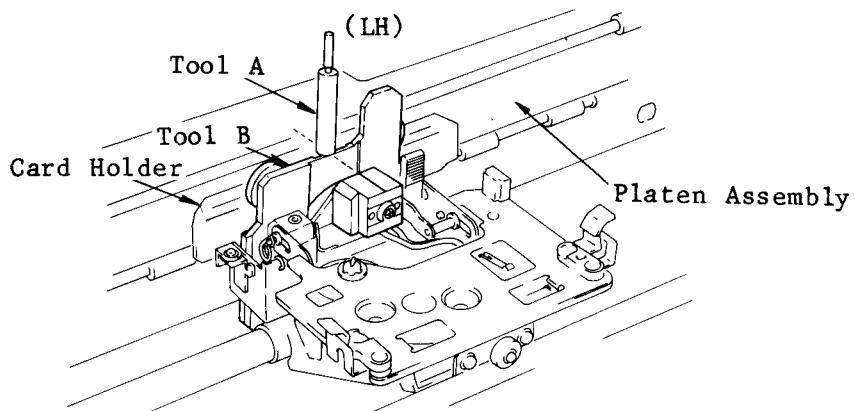
2) Check the platen gap on both the left-hand and right-hand sides of Tool A.

- Tool A: LH (marked in red) must not pass between the platen and Tool B.
- Tool A: RH must pass between the platen and Tool B.

Adjust if either requirement is not satisfied.

Tool A: LH

Figure 96

Tool A: RH
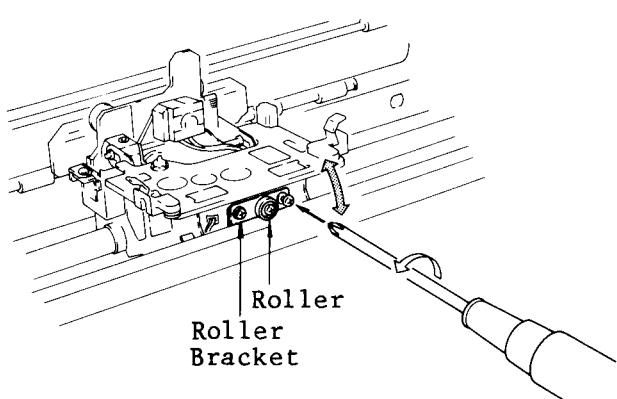
Figure 97

3) Loosen the screws securing the roller bracket.

4) Move the right-hand side of the roller bracket up and down to adjust the platen gap.

Figure 98

- 63 -

(2) Card holder gap check and adjustment

1) Check the gap between the card holder and both spacers of tool B, with a thickness gauge.

The 0.05 mm thickness gauge must pass between the spacers and the card holder.
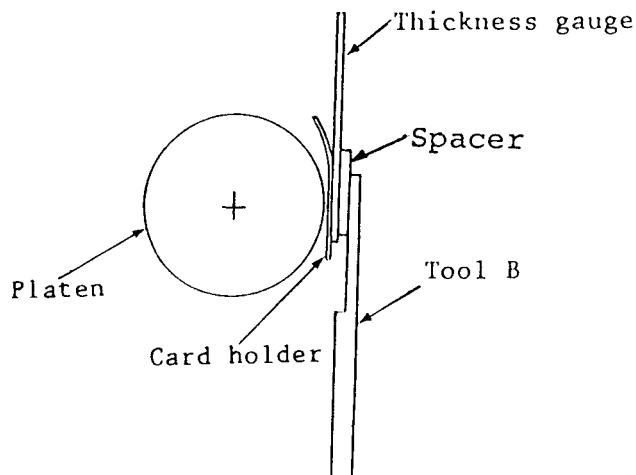
Figure 99

2) Loosen the screw retaining the card holder bracket.

3) Adjust the card holder gap by moving the card holder bracket forwards and backwards.

4 After adjustment, load a paper onto the platen, and confirm that there is a gap between the card holder and the platen.
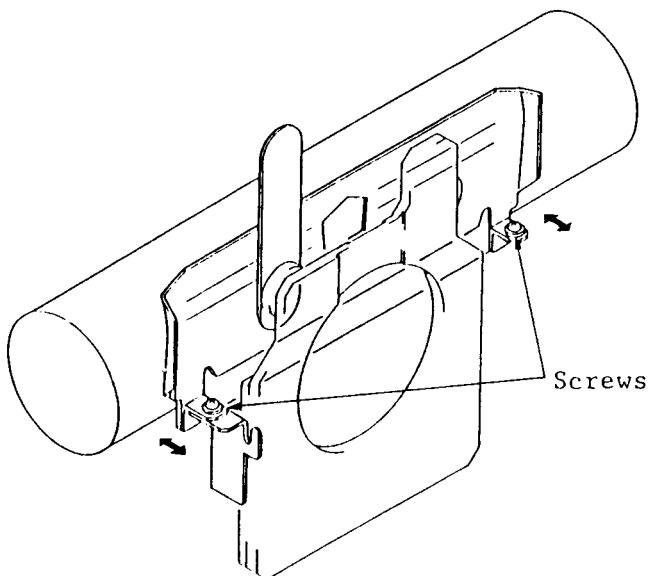
Figure 100

(3) Checking and adjusting the carriage's home position

1) Press the carriage assembly against the left frame and turn ON the power supply.

2) Tool A: press LH against the carriage frame. Check the carriage's home position against the grooved part of the tool.

  ● The frame edge must be inside the groove.

  Adjust if this is not the case.

Figure 101

Tool A

Tool A

Carriage Frame

Printer Frame
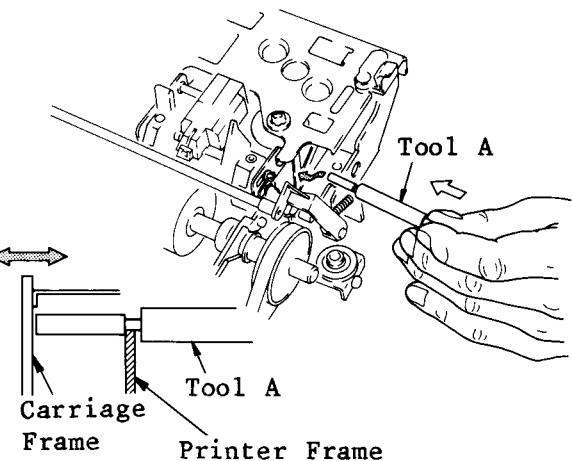
3) Loosen the screw securing the shutter.

4) Adjust the carriage's home position by moving the shutter either to the right or left.

Shutter, Home Sensor
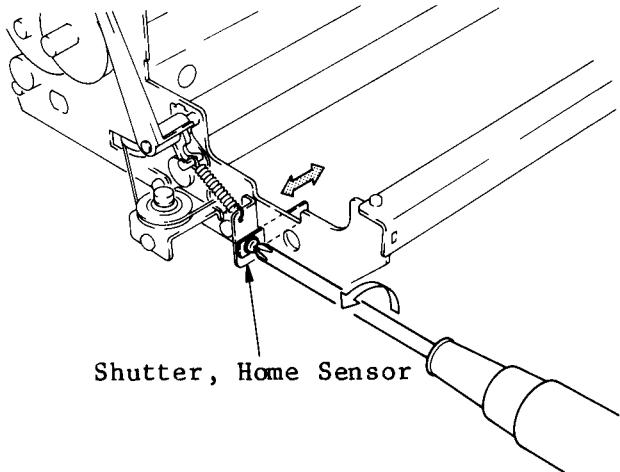
Figure 102

7. Space Wire Replacement

7-1. Space Wire Removal

(1) Remove the bottom cover. (See item 3, "Bottom Cover Removal".)

(2) Remove the flat cable and space wire clamp. (See item 6, "Carriage Assembly Replacement".)

(3) Remove the spring from the tension cam.

Tension Cam

Spring, Tension Cam
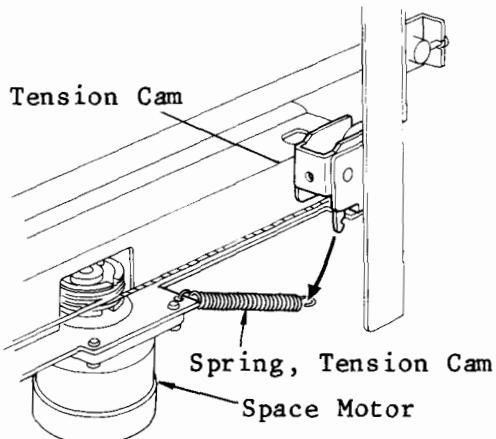
Space Motor

Figure 103

(4) Loosen the hexagonal nuts holding the right and left side pulleys.

(5) Loosen the right and left side pulley post adjusting screws.

Hexagonal Nut

Side Pulley

Adjusting Screw
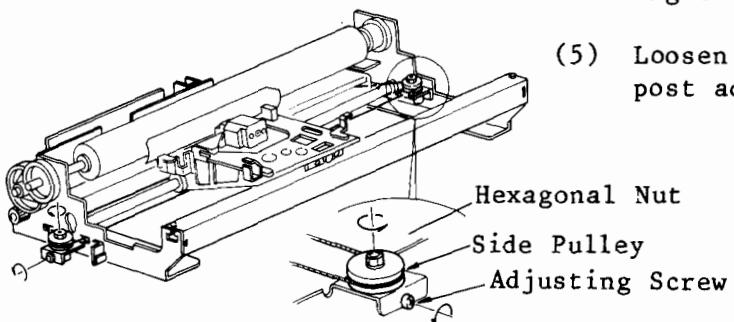
Figure 104

Figure 105

(6) Remove the space wire from the space motor pulley.

(7) Remove the space wire from the Printer.
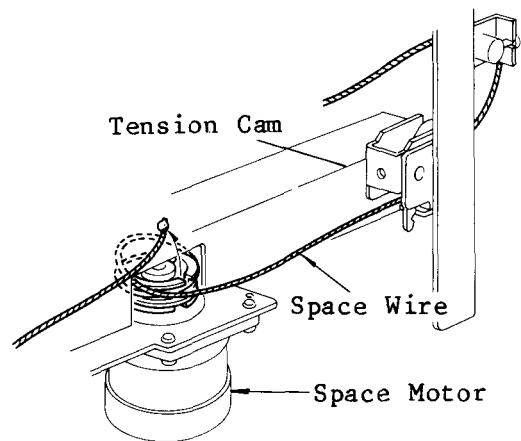
7-2. Space Wire Installation
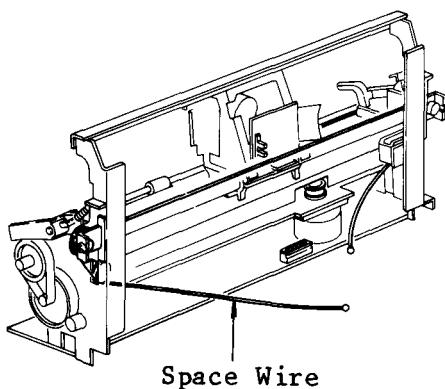
(1) Thread the space wire through the wire holes on the right and left sides of the printer frame.

Note: Do not damage the space wire coating.

Space Wire
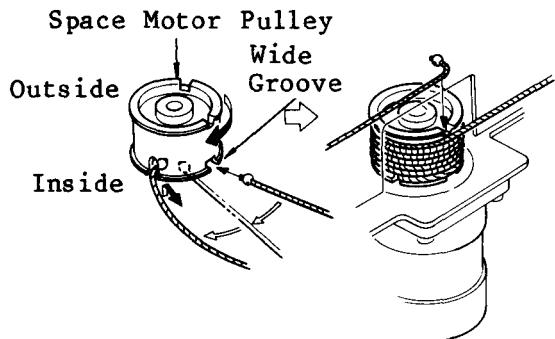
Figure 106

(2) Thread the right end of the space wire along the wide channel inside the space motor pulley; then, hook it onto the narrow notch.

Space Motor Pulley

Wide Groove

Outside

Inside

Figure 107
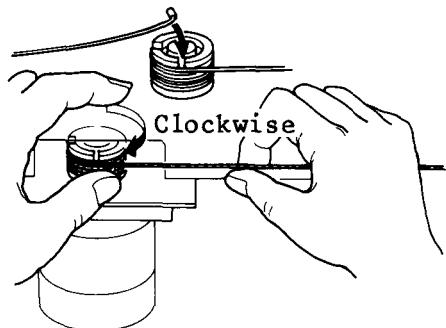
(3) Hold the space wire with the right hand; then, turn the space motor pulley clockwise with the left thumb to wind the space wire onto the space motor pulley.

(4) Hook the left end of the space wire onto the narrow notch outside the space motor pulley.

Clockwise

Figure 108

Screw Edge

Side Pulley Post

Adjusting Screw
Side Pulley
Hexagonal Nut

(5) Turn the left side pulley post adjusting screw until the tip appears above the side pulley post surface.

(6) Tighten the hexagonal nuts to secure the side pulleys.

Figure 109

Space Motor Pulley

"0" Position

Space Wire

After 1.25 Turns
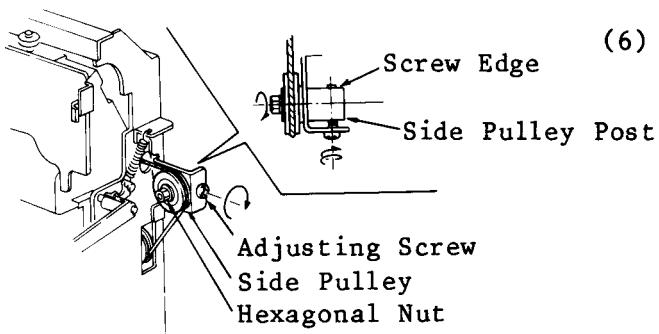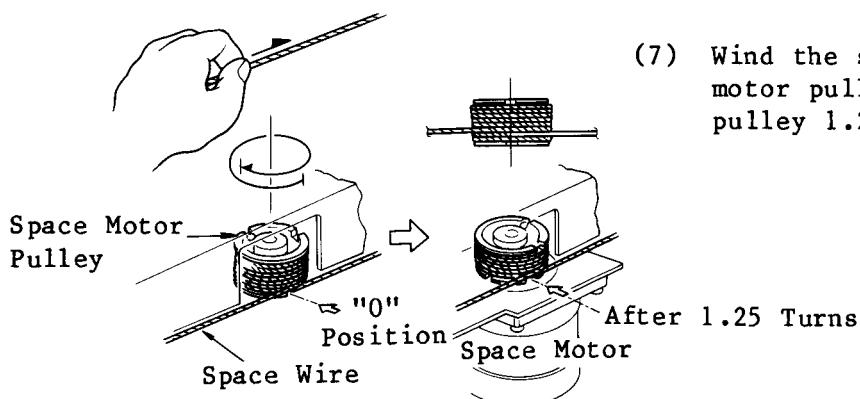
Space Motor

(7) Wind the space wire (inside the space motor pulley) onto the space motor pulley 1.25 turns.

Figure 110

Screw

Wire Clamp

Space Wire

(8) Press the carriage assembly against the left frame; then, secure the space wire by mounting the wire clamp onto the carriage frame.

Note: When mounting the wire clamp, the screw must be tightened with a torque of 6 kg. Do not overtighten the screw.
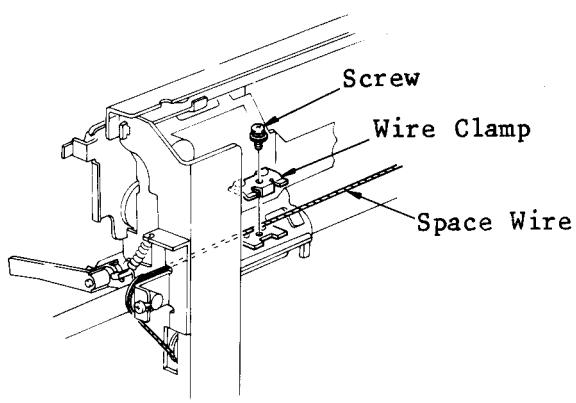
Figure 111
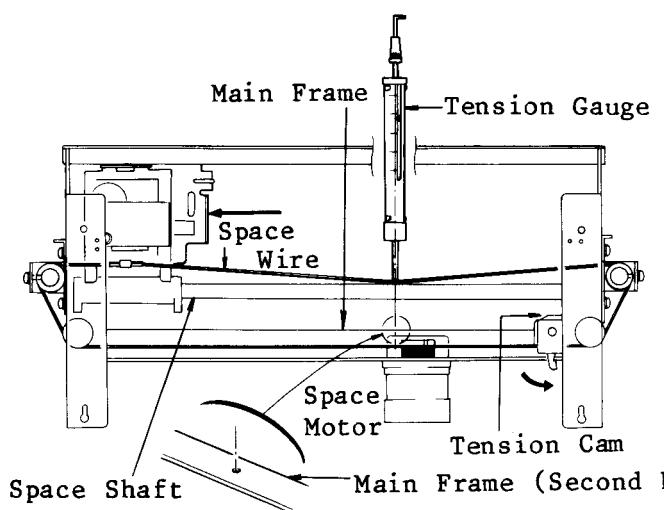
Figure 112

(9) Check the space wire tension at the second hole position along the main frame.
Press the space wire with a tension gauge and check that the tension is 1.3 to 1.5 kg when the space wire and space shaft surface are on the same plane.

Note: Free the tension cam on the right frame.
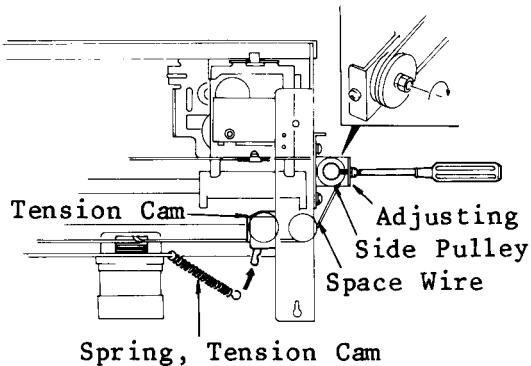
Figure 113

(10) Adjust the space wire tension with the adjusting screw of the right side pulley post. After adjusting the tension, check the tension by moving the carriage assembly horizontally several times.

(11) After adjustment, tighten the hexagonal nuts to secure the side pulleys.

(12) Mount the spring on the tension cam.

(13) Return the pulley to its original position; then, reattach the bottom cover.

8. Line Feed Motor Replacement

8-1. Line Feed Motor Removal
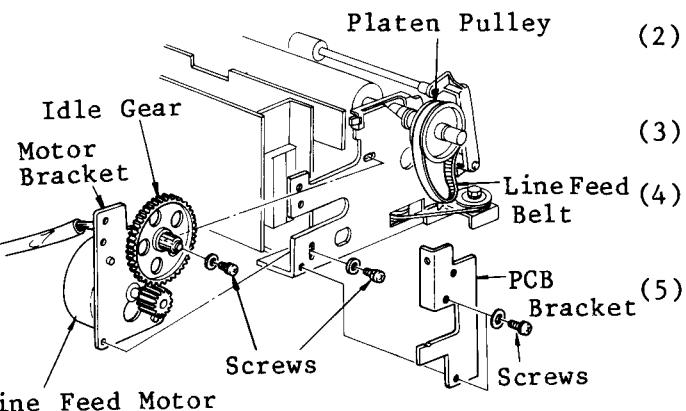
(1) Remove the bottom cover. (See item 3, "Bottom Cover Removal".)

(2) Remove the control board. (See item 4, "Control Board Replacement".)

(3) Remove the left PCB bracket.

(4) Remove the screw holding the motor bracket.

(5) Remove the motor bracket from the Printer.

Figure 114

(6) Remove the screws holding the line feed motor.
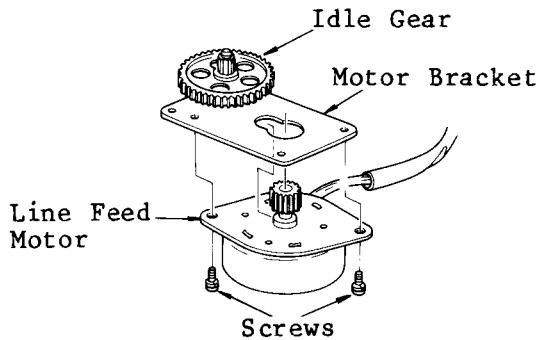
Figure 115

8-2. Line Feed Motor Installation

(1) Press the line feed motor bearing part against the motor bracket channel; then, secure the line feed motor with the retainer screws.

Idle Gear

Motor Bracket
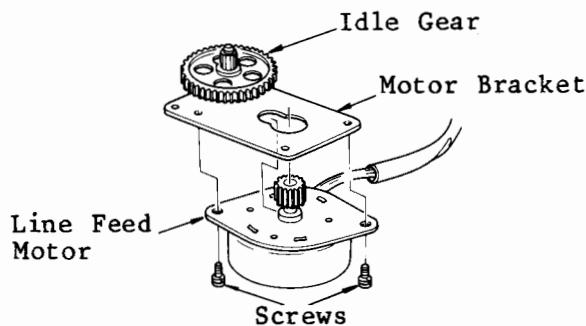
Line Feed Motor
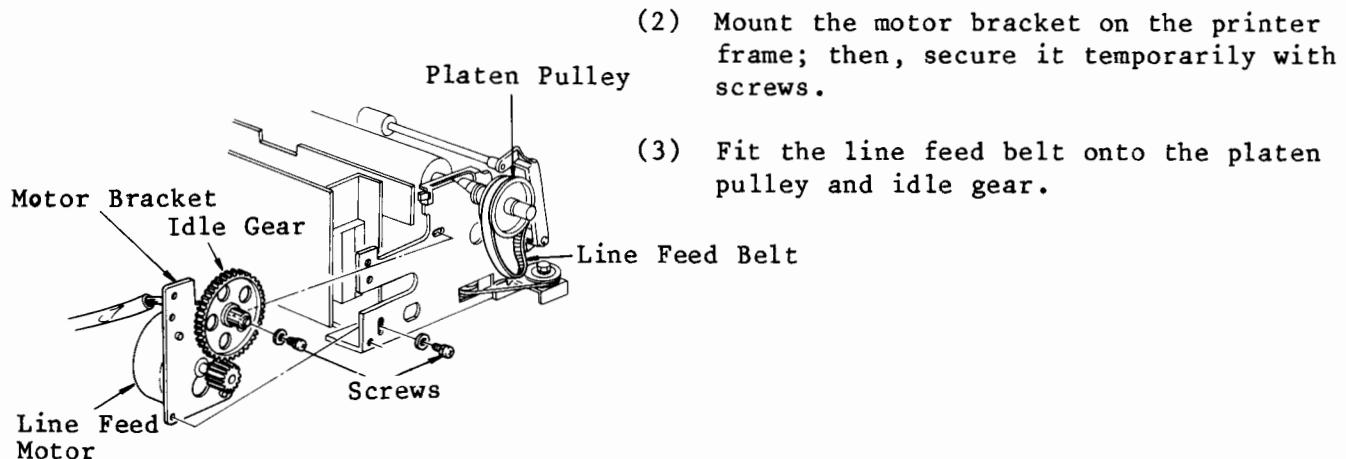
Screws

Figure 116

(2) Mount the motor bracket on the printer frame; then, secure it temporarily with screws.

(3) Fit the line feed belt onto the platen pulley and idle gear.

Platen Pulley

Motor Bracket
Idle Gear

Line Feed Belt

Screws

Line Feed Motor

Figure 117

(4) Mount the belt tension adjusting tool (Tool C) as shown in Figure 118.

(5) Loosen the screws holding the motor bracket; then, tighten them again.

(6) Install the PCB bracket.

Tool C
Belt Tension
Adjustment Tool

Motor Bracket
Line Feed Motor

Screws
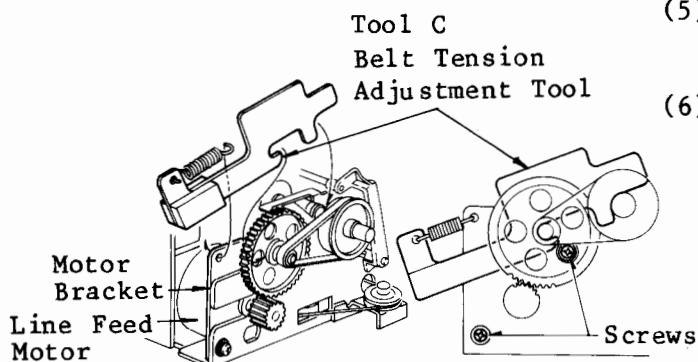
Figure 118

Note: When adjusting the belt tension using a tension gauge, put the tension gauge on the idle gear shaft, then place a strain of 2.5 ± 0.5 kg in the direction indicated by the arrow. At this tension, secure the motor bracket with the retainer screws.

Motor Bracket

Tension Gage

Line Feed Motor
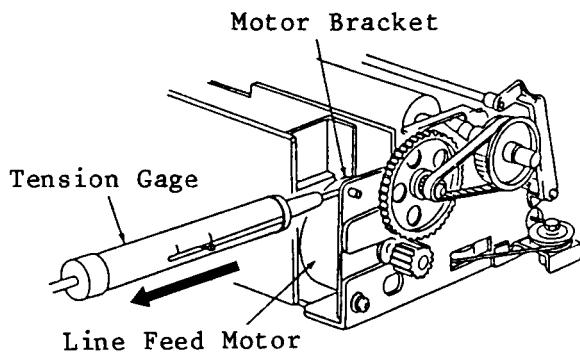
Figure 119

(7) Slot in the control board. (See item 4, "Control Board Replacement".)

(8) Reattach the bottom cover.

9. Platen Assembly Replacement

9-1. Platen Assembly Removal

(1) Remove the line feed belt.
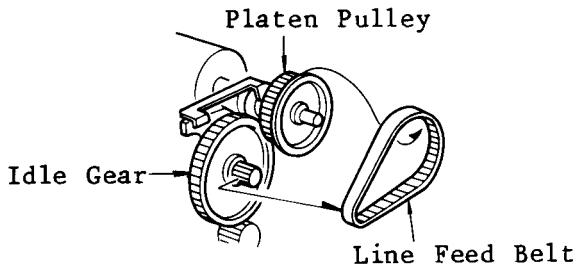
Figure 120

(2) Press both the right and left platen latch levers down and out toward the sides of the printer frame.
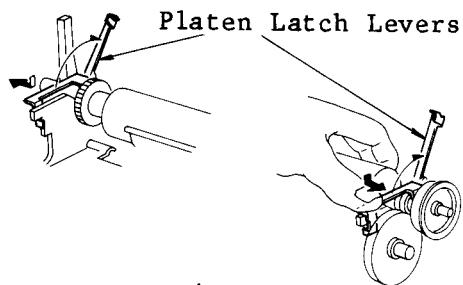
Figure 121

(3) Remove the platen assembly.
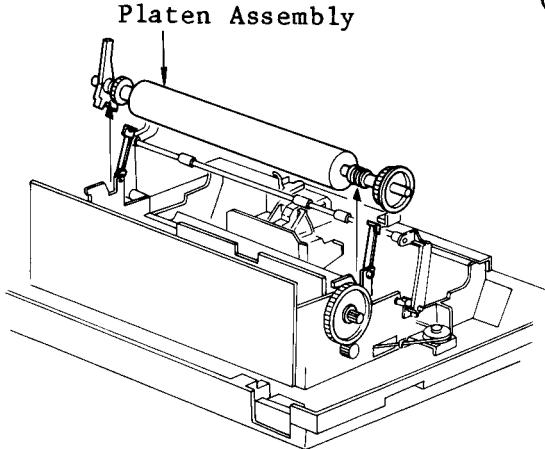
Figure 122

9-2. Platen Assembly Installation
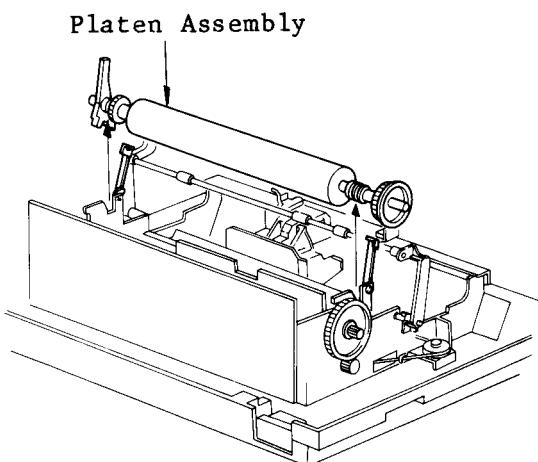
Platen Assembly

Figure 123

(1) Mount the platen assembly on the printer frame.

Note: Check the channel position under the right bearing.

Platen Latch Levers
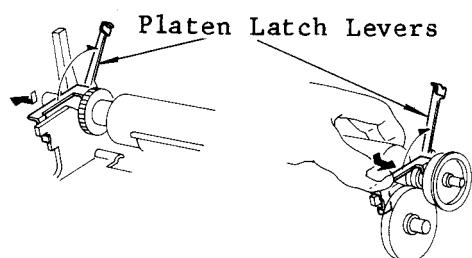
Figure 124

(2) Press the right and left platen latch levers down and in toward the middle of the printer frame.

(3) Install the line feed belt.

Platen Pulley

Idle Gear

Line Feed Belt

Figure 125

VI. TROUBLESHOOTING

```
                    ┌─────────────┐                    ┌──────────────┐
                    │  Power on   │                    │   Printing   │
                    └──────┬──────┘                    │  operation   │
                           │                           └──────┬───────┘
          No        ╱──────┴──────╲                           │
        ┌──────────╱ Power lamp    ╲              No     ╱─────┴─────╲
        │          ╲ light?        ╱          ┌─────────╱  Prints?    ╲
   ┌────┴────┐      ╲──────┬──────╱           │         ╲             ╱
   │1. Power │          Yes │                 │          ╲───┬───────╱
   │ Supply  │              │                 │           Yes │
   │ error   │       ╱──────┴──────╲          │               │
   └─────────┘  No  ╱ Space restore ╲   ┌─────┴──────┐  ╱──────┴───────╲     No
        ┌─────────╱  performed?     ╲   │4. Hammer   │ ╱ Printing       ╲ ┌──────────
        │         ╲────────┬────────╱   │  error     │ ╲ normally?      ╱ │
   ┌────┴────┐         Yes │           └────────────┘  ╲──────┬───────╱  │
   │2. Space │              │                              Yes │         ┌────┴──────┐
   │  error  │       ╱──────┴──────╲                          │         │5. Low density│
   └─────────┘  No  ╱ Selection     ╲                   ┌──────┴──────┐ └────┬──────┘
        ┌─────────╱  restore        ╲                   │  Printing   │      │
        │         ╲  performed?     ╱                   │  operation  │ ┌────┴──────┐
   ┌────┴────┐     ╲───────┬───────╱                    │  normal.    │ │6. Overlap-│
   │3.Selection│        Yes │                           └─────────────┘ │ ping char-│
   │  error   │             │                                           │ acters    │
   └─────────┘        ┌──────┴──────┐                                   └────┬──────┘
                      │ Initialization│                                      │
                      │ terminated.  │                                  ┌────┴──────┐
                      └─────────────┘                                   │7. Misprinting│
                                                                        └────┬──────┘
                                                                             │
                                                                        ┌────┴──────┐
                                                                        │8. Skipped │
                                                                        │ characters│
                                                                        └───────────┘
```

1. Power Supply Error

```
                    ╭─────────────╮
                    │ Power lamp  │
                    │ does not    │
                    │ light.      │
                    ╰──────┬──────╯
                           │
                    ╱──────┴──────╲
                   ╱   AC input    ╲      No
                   ╲ voltage OK?   ╱──────────────────────────┐
                    ╲──────┬──────╱                           │
                           │ Yes                       ╱──────┴──────╲
                           │                          ╱ Power supply  ╲   No
                    ╱──────┴──────╲     No            ╲  cable OK?    ╱──────────┐
                   ╱  AC receptacle ╲─────────┐        ╲──────┬──────╱          │
                   ╲    OK?        ╱          │               │ Yes            │
                    ╲──────┬──────╱     ┌─────┴─────┐   ┌──────┴──────┐  ┌──────┴──────┐
                           │ Yes        │ Replace the│   │ Check the wall│  │ Replace the │
                           │            │ AC receptacle.│ │ receptacle.  │  │ AC cable.   │
                    ╱──────┴──────╲      └───────────┘   └─────────────┘  └─────────────┘
                   ╱   Internal   ╲   No
                   ╲ cables OK?   ╱──────────┐
                    ╲──────┬──────╱          │
                           │ Yes       ┌─────┴─────┐
                           │           │ Check the in-│
                           │           │ ternal cables.│
                    ╱──────┴──────╲     ├───────────┤
                   ╱  AC input to  ╲ No │ Reconnect or│     Note: Note down the connecting points
                   ╲ the PSU OK?   ╱────┤ replace      │            and cable colors when
                    ╲──────┬──────╱     │ the cables.  │            reconnecting the AC cables.
                           │ Yes        └───────────┘
                           │           ┌───────────┐
                           │           │ Check the  │
                    ╱──────┴──────╲     │ PSU cables.│
                   ╱ Output volt-  ╲ No ├───────────┤
                   ╲ age from the  ╱────│ Reconnect or│
                   ╲  PSU OK?     ╱     │ replace      │
                    ╲──────┬──────╱     │ the cables.  │
                           │ Yes        └───────────┘
                           │                              ╱──────┴──────╲
                           │                             ╱    Fuse       ╲   No
                    ╱──────┴──────╲                      ╲    open        ╱──────────┐
                   ╱ Power supply  ╲  No                  ╲  circuit?    ╱           │
                   ╲ to the control ╱─────────┐            ╲──────┬──────╱           │
                   ╲  PSU OK?     ╱           │                   │ Yes             │
                    ╲──────┬──────╱     ┌─────┴─────┐      ┌──────┴──────┐  ┌──────┴──────┐
                           │ Yes        │ Check the  │      │ Replace      │  │ Replace      │
                           │            │ PSU cables.│      │ the fuse.    │  │ the PSU.     │
                           │            ├───────────┤      └─────────────┘  └─────────────┘
                    ╱──────┴──────╲      │ Reconnect or│
                   ╱  Operator     ╲ No  │ replace      │
                   ╲ panel cable con-╱───│ the cables.  │
                   ╲  nection       ╱    └───────────┘
                   ╲   OK?        ╱
                    ╲──────┬──────╱     ┌───────────┐
                           │ Yes        │ Check       │
                           │            │ the cables. │
                    ┌──────┴──────┐     └───────────┘
                    │ Replace the  │
                    │ operator panel│
                    │ LED.          │
                    └─────────────┘
```

2. Space Error

```
                    ╭─────────────╮
                    │   Space     │
                    │ restoration │
                    ╰─────────────╯
                           │
                  ◇────────────────◇        No
                  │ Carriage moves │──────────────┐
                  │ to the left side? │           │
                  ◇────────────────◇              │
                           │ Yes                  ▼
                           │            ◇──────────────◇        No
                           │            │ Carriage moves │───────────────────────┐
                           │            │ to the right?  │                        │
                           │            ◇──────────────◇                          │
                           │                    │ Yes                             ▼
                           │                    │              ◇──────────────◇  Yes
                           │           ◇─────────────────◇     │ Side pulley  │──────────┐
                           │           │ Carriage moves  │ No  │  damaged?    │          │
                           │           │ sensor dirty or │─────┐ ◇──────────◇            ▼
                           │           │    dusty?       │     │   │ No          ┌──────────────┐
                           │           ◇─────────────────◇     │   │             │ Replace the  │
                           │                    │ Yes          │ ◇──────────◇ No │ side pulley. │
                           │            ┌──────────────┐       │ │ Space wire │────┐ └──────────┘
                           │            │ Clean the sensor. │  │ │   OK?      │    │
                           │            └──────────────┘      │ ◇──────────◇     ▼
                           ▼                                  │   │ Yes   ┌──────────────┐
```

(Flowchart: Space Error troubleshooting)

- **Space restoration**
- Carriage moves to the left side? — No → Carriage moves to the right?
  - Carriage moves to the right? — No → Side pulley damaged?
  - Carriage moves to the right? — Yes → Carriage moves sensor dirty or dusty?
- Carriage moves sensor dirty or dusty?
  - Yes → Clean the sensor.
  - No → (Carriage stops at the left side.)
- Carriage next moves to the right?
  - No → Carriage stops at the left side.
    - No → (to Side pulley check path)
    - Yes → Replace the carriage assembly.
  - Yes → Carriage stops at the home position?
- Carriage stops at the home position?
  - No → Carriage moves to the right past the normal home position?
    - Yes → (to Carriage home sensor path)
    - No → Adjust the carriage home position.
  - Yes → **Restoring normal operation**
- Side pulley damaged?
  - Yes → Replace the side pulley.
  - No → Space wire OK?
- Space wire OK?
  - No → Replace the space wire.
  - Yes → Space shaft dirty or dusty?
- Space shaft dirty or dusty?
  - Yes → Clean the space shaft, then lubricate.
    - **Note:** Use TOSHIBA silicon oil TSF100.
  - No → CN4 (on the control board) connection OK?
- CN4 (on the control board) connection OK?
  - No → Check the connections. / Reconnect
  - Yes → CN1/CN10 (on the control board) connection OK?
- CN1/CN10 (on the control board) connection OK?
  - No → Check the connections. / Reconnect
  - Yes → Output voltage from the PSU OK?
- Output voltage from the PSU OK?
  - No → Replace the PSU.
  - Yes → Replace the control board.
- Carriage home sensor and the cable OK?
  - No → Replace the carriage assembly
  - Yes → Flat cable connection OK?
- Flat cable connection OK?
  - No → Check connector CN3 on the control board. / Reconnect or replace the flat cable.
  - Yes → Replace the control board.

3. Selection Error

```
                    ┌─────────────┐
                    │  Selection  │
                    │ restoration │
                    └─────────────┘
                           │
                    ╱ Print ╲           No
                  ╱ wheel rotates? ╲──────────────────────────┐
                    ╲           ╱                              │
                     ╲ Yes ╱                                   │
```

Note: The print wheel rotates clockwise when viewed from the front of the machine.

╱ Print wheel ╲ No
╱ rotation normal? ╲

╱ Underline Character stops at the printing position? ╲ No → Print wheel cartridge removal

Restoring operation normal.

╱ Print wheel sense mark dirty or dusty? ╲ Yes → Clean the sense mark.

No

╱ Selection home sensor dirty or dusty? ╲ Yes → Clean the sensor.

No

╱ Selection home sensor and the cable OK? ╲ No → Replace the carriage assembly.

Yes

╱ Flat cable connection OK? ╲ No → Check connector CN3 on the control board / Reconnect the flat cable.

Yes → Replace the control board.

╱ Print wheel cartridge installation OK? ╲ No → Reinstall the print wheel cartridge.

Yes

╱ Ribbon twisted around the print wheel. ╲ Yes → Remove the ribbon cartridge. / Check the ribbon and ribbon installation.

No

╱ Hammer returns? ╲ No → ╱ Hammer energized? ╲ No

Yes

╱ Hammer energized? ╲ Yes → Replace the control board. → Replace the carriage assembly.

╱ Selection motor rotation OK? ╲ Yes → Replace the carriage assembly.

No

╱ Selection motor cable connection OK? ╲ No

Yes

╱ Flat cable connection OK? ╲ No → Check the connector CN3 on the control board. / Reconnect the flat cable.

Yes

╱ Connections CN1/CN10 on the control board OK? ╲ No → Check the connectors. / Reconnect.

Yes

╱ Output voltage from the PSU OK? ╲ No → Replace the PSU.

Yes → Replace the control board.

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4. Hammer Error

```
                    ┌──────────────┐
                    │  No printing │
                    └──────────────┘
                           │
                           ▼
                      ╱─────────╲                    No
                     ╱  Hammer   ╲───────────────────────────────────┐
                     ╲ operating?╱                                   │
                      ╲─────────╱                                    ▼
                           │ Yes                               ╱──────────────╲        No
                           ▼                                  ╱    Hammer       ╲──────────────┐
                      ╱──────────╲                            ╲ cable connection ╱             │
                     ╱ Ribbon lift ╲          No              ╲      OK?        ╱              ▼
                    ╱  solenoid     ╲──────────────┐           ╲──────────────╱          ┌──────────┐
                    ╲ operation OK? ╱              │                  │ Yes            │ Replace the│
                     ╲──────────────╱             ▼                  ▼                │ carriage   │
                           │ Yes           ╱────────────╲            ╱──────────────╲  │ assembly.  │
                           │              ╱  Solenoid     ╲   No     ╱  Flat cable    ╲  No  └──────────┘
                           │             ╱ cable connection╲────────╱ connection OK    ╲──────────────┐
                           │             ╲    OK?          ╱   │    ╲       ?          ╱              │
                           │              ╲──────────────╱    ▼     ╲──────────────╱               ▼
                           │                    │ Yes    ┌──────────┐      │ Yes            ┌──────────────┐
                           │                    ▼        │Replace the│      │                │Check connector│
                           │              ╱────────────╲ │ carriage  │      │                │CN3 on the     │
                           │             ╱  Flat cable   ╲│ assembly. │      │                │control board. │
                           │            ╱ connection OK    ╲ No └────────┘      │                └──────────────┘
                           │            ╲       ?         ╱──────┐             │                ┌──────────────┐
                           │             ╲──────────────╱       ▼             │                │Reconnect the │
                           │                    │ Yes   ┌──────────────┐      │                │flat cable.   │
                           │                    ▼       │Check connector│      │                └──────────────┘
                           │              ┌──────────┐  │CN3 on the con-│      │
                           │              │Replace the│  │trol board.    │      │
                           │              │control    │  └──────────────┘      │
                           │              │board.     │  ┌──────────────┐      │
                           │              └──────────┘  │Reconnect the │      │
                           │                            │flat cable.   │      ▼
                           │                            └──────────────┘  ╱──────────────╲    No
                           ▼                                              ╱ Hammer switch  ╲──────────────┐
                      ╱──────────────╲                                   ╱(on the control   ╲             │
                     ╱  Print wheel    ╲       No                        ╲ board) ON?      ╱              ▼
                    ╱ cartridge instal- ╲──────────────┐                  ╲──────────────╱          ┌──────────┐
                    ╲ lation OK?        ╱              ▼                         │ Yes            │ Turn the │
                     ╲──────────────╱          ┌──────────────┐                 ▼                │ switch ON.│
                           │ Yes               │Reinstall the │           ┌──────────────┐       └──────────┘
                           ▼                   │print wheel   │           │Replace the   │
                      ╱──────────────╲          │cartridge.    │           │control board.│
                     ╱   Ribbon        ╲   No   └──────────────┘           └──────────────┘
                    ╱ cartridge instal- ╲──────────────┐
                    ╲ lation OK?        ╱              ▼
                     ╲──────────────╱          ┌──────────────┐
                           │ Yes               │Reinstall the │
                           ▼                   │ribbon cartridge.│
                      ╱──────────────╲          └──────────────┘
                     ╱   Ribbon        ╲   No
                    ╱  feeding OK       ╲──────────────┐
                    ╲       ?          ╱              ▼
                     ╲──────────────╱          ┌──────────────┐
                           │ Yes               │Adjust the ribbon│
                           ▼                   │feed mechanism.  │
                      ┌──────────┐             └──────────────┘
                      │Adjust the│
                      │platen gap.│
                      └──────────┘
```

5. Low Density

```
                    ┌─────────────┐
                    │ Low density │
                    │ printing    │
                    └──────┬──────┘
                           │
                           ▼
                        ╱─────╲              ┌──────────────────┐
                       ╱ Ribbon ╲     No     │ Ribbon cartridge │
                      ╱ cartridge OK╲────────▶│ removal          │
                       ╲    ?    ╱            └────────┬─────────┘
                        ╲─────╱                        │
                           │                           ▼
                          Yes                       ╱──────╲
                           │              ╱─────────────────────╲    No    ┌──────────────┐
                           │             ╱      Ribbon            ╲────────▶│ Replace the  │
                           │            ╱ feeds when the manual    ╲        │ ribbon.      │
                           │            ╲   knob is turned          ╱       └──────────────┘
                           │             ╲        ?                ╱
                           │              ╲─────────────────────╱
                           │                        │
                           │                       Yes
                           │                        │
                           │                        ▼
                           │             ┌──────────────────┐
                           │             │ Ribbon cartridge │
                           │             │ installation     │
                           │             └────────┬─────────┘
                           │◀──────────────────────┘
                           ▼
                        ╱─────╲
                       ╱ Ribbon ╲         No    ┌──────────────┐
                      ╱ cartridge instal-╲──────▶│ Reinstall the│
                      ╲ lation OK?       ╱       │ ribbon       │
                       ╲─────╱                   │ cartridge.   │
                           │                     └──────────────┘
                          Yes
                           ▼
                        ╱─────╲
                       ╱ Ribbon ╲         No    ┌──────────────┐
                      ╱ feeding OK╲──────────────▶│ Adjust the   │
                      ╲    ?     ╱               │ ribbon feed  │
                       ╲─────╱                   │ mechanism.   │
                           │                     └──────────────┘
                          Yes
                           ▼
                        ╱─────╲
                       ╱ Overall ╲        No    ┌──────────────┐
                      ╱ low density╲────────────▶│ Adjust the   │
                      ╲ printing  ╱              │ platen gap.  │
                       ╲    ?    ╱               └──────────────┘
                        ╲─────╱
                           │
                          Yes
                           ▼
                        ╱─────╲
                       ╱ Hammer ╲         No    ┌──────────────┐
                      ╱ cable connection╲───────▶│ Replace the  │
                      ╲    OK?    ╱              │ carriage     │
                       ╲─────╱                   │ assembly.    │
                           │                     └──────────────┘
                          Yes
                           ▼
                        ╱─────╲
                       ╱Flat cable╲       No    ┌──────────────┐
                      ╱ connection OK╲──────────▶│ Check connector│
                      ╲    ?     ╱              │ CN3 on the   │
                       ╲─────╱                   │ control board.│
                           │                     └──────┬───────┘
                          Yes                           │
                           ▼                            ▼
                  ┌──────────────┐            ┌──────────────┐
                  │ Replace the  │            │ Reconnect the│
                  │ control board.│           │ flat cable.  │
                  └──────────────┘            └──────────────┘
```

6. Overlapping Characters

Characters overlapping horizontally

```
( Characters overlapping horizontally )
            |
    < Space shaft dirty or dusty ? > --- Yes ---> [ Clean the space shaft. ]
            |                                      Note: Use TOSHIBA silicon
            No                                           oil TSF100.
            |
    < Side pulley ? > --- No ---> [ .Check whether the side pulley is damaged or not. ]
            |                     [ Replace the side pulley. ]
            Yes
            |
    < Space wire OK? > --- No ---> [ Check whether the space wire is damaged or not. ]
            |                      [ Check the space wire tension. ]
            Yes                    [ Replace the space wire. ]
            |
    < Space motor cable connection OK? > --- No ---> [ Check the cable connector. ]
            |                                        [ Reconnect the cable connector. ]
            Yes
            |
    [ Replace the control board. ]
```

Characters overlapping vertically

```
( Characters overlapping vertically. )
            |
    < Paper release/ bail lever setting OK? > --- No ---> [ Check the lever. ]
            |                                             [ Reset the lever. ]
            Yes
            |
    < Line feed belt OK ? > --- No ---> [ Check whether the line feed belt is damaged or not. ]
            |                           [ Check the line feed belt tension. ]
            Yes                         [ Replace the line feed belt. ]
            |
    < Line feed motor cable connection OK? > --- No ---> [ Check the cable connector. ]
            |                                            [ Reconnect the cable connector. ]
            Yes
            |
    [ Replace the control board. ]
```

7. **Misprinting**

```
                    ┌──────────────┐
                    │  Misprinting │
                    └──────┬───────┘
                           │
                    ╱──────┴──────╲          No
                   ╱  Print wheel  ╲──────────────────────────┐
                   ╲ home position ╱                          │
                    ╲    OK?      ╱                            │
                     ╲─────┬─────╱                      ╱──────┴──────╲
                       Yes │                           ╱  Print wheel  ╲        Yes
                           │                          ╱  sense mark dirty or ╲──────────────┐
                    ╱──────┴──────╲        No         ╲     dusty?    ╱                     │
                   ╱ Cable connection╲──────────┐      ╲─────┬─────╱               ┌────────┴────────┐
                   ╲     OK?      ╱             │          No │                   │  Clean the       │
                    ╲─────┬─────╱        ┌──────┴──────┐      │                   │  sense mark.     │
                     Yes │              │ Check the cable│    │                   └──────────────────┘
                         │              │ connector.    │ ╱──┴──────────╲       Yes
         ┌───────────────┤              └──────┬──────┘ ╱   Selection    ╲──────────────┐
         │               │                     │       ╲  home sensor dirty╱             │
         │        ┌──────┴──────┐       ┌──────┴──────┐ ╲   or dusty?  ╱       ┌─────────┴────────┐
         │        │ Replace the │       │ Reconnect the│  ╲────┬─────╱         │  Clean the       │
         │        │ control board│      │ cable connector│    No│             │  sensor.         │
         │        └─────────────┘       └─────────────┘        │             └─────────┬────────┘
         │                                            ╱─────────┴────╲                 │
         │                                           ╱   Selection     ╲      No ┌─────┴────────────┐
         │                                          ╱ motor cable connec-╲───────│ Replace the      │
         │                                          ╲   tion OK?    ╱            │ carriage         │
         │                                           ╲─────┬──────╱             │ assembly.        │
         │                                            Yes  │                    └──────────────────┘
         │                                          ╱──────┴──────╲       No
         │                                         ╱  Flat cable   ╲────────────┐
         │                                         ╲ connection OK?╱            │
         │                                          ╲─────┬──────╱      ┌───────┴──────────┐
         │                                            Yes │            │ Check connector   │
         └────────────────────────────────────────────────┘           │ CN3 on the       │
                                                                       │ control board.    │
                                                                       └───────┬──────────┘
                                                                       ┌───────┴──────────┐
                                                                       │ Reconnect the    │
                                                                       │ flat cable.      │
                                                                       └──────────────────┘
```

8. **Skipped Characters**

```
                 ┌──────────────┐
                 │  Skipped     │
                 │  characters  │
                 └──────┬───────┘
                        │
                 ╱──────┴──────╲         Yes
                ╱    Only        ╲──────────────────────────────────┐
                ╲ skipping certain╱                                  │
                ╲  characters? ╱                                     │
                 ╲─────┬─────╱                               ╱───────┴──────╲      No
                    No │                                    ╱   Print         ╲──────────┐
                       │                                    ╲  wheel OK       ╱          │
                ╱──────┴──────╲       Yes                    ╲     ?      ╱      ┌────────┴────────┐
               ╱   Skipping     ╲──────────────┐              ╲────┬─────╱       │ Replace the     │
               ╲  at random?  ╱               │              Yes  │            │ print wheel     │
                ╲─────┬─────╱                 │                    │            │ cartridge.      │
                   No │              ╱─────────┴────╲              │            └─────────────────┘
                      │             ╱  Interface      ╲    No       │
               ┌──────┴──────┐     ╲ cable connection OK╱───────────┤
               │ Check the space│   ╲      ?      ╱            ┌─────┴──────────┐
               │ mechanism.   │     ╲────┬──────╱             │ Check the cable │
               └─────────────┘       Yes │                   │ connector.      │
                                         │                   └─────┬──────────┘
                                  ┌──────┴──────┐            ┌──────┴──────────┐
                                  │ Replace the │            │ Reconnect the   │
                                  │ control board│           │ cable connector.│
                                  └─────────────┘            └─────────────────┘
```

VII. PRINTED CIRCUIT BOARD

1. Interface Control Board

— Top View —

— Bottom View —

- Top View -

- Bottom View -

PWB NO.8022604A
E46669-707V

3. Power Supply Unit (200 Volt Series)

- Top View -

PWB NO.8022605B

VIII. WIRING DIAGRAM

PARALLEL I/F CONNECTOR

SERIAL I/F CONNECTOR

I/F CONTROL BOARD

CN1 CN4 CN2 CN8 CN7 CN10

CN3 CN6 CN9

AC POWER RECEPTACLE

PSU

FG
W
B

CN1 CN2

AC POWER SWITCH

LINE FEED MOTOR

SPACE MOTOR

COVER OPEN SWITCH

SIGNAL LINE

AC LINE

OPERATIONAL PANEL

CN1 Power Supply Unit (CN1)
CN2 Line Feed Motor
CN3 Carriage Assembly
CN4 Space Motor
CN6 Parallel I/F
CN7 Cover Open Switch
CN8 Operational Panel
CN9 Serial I/F
CN10 Power Supply Unit (CN2)

IX. EXPLODED VIEWS & PARTS LIST

- MAIN FRAME & SPACE MECHANISM
- PAPER FEED MECHANISM
- CARRIAGE ASSEMBLY
- PCB ASSEMBLY, I/F CONTROL
- POWER SUPPLY UNIT, 100V SERIES
- POWER SUPPLY UNIT, 200V SERIES

MAIN FRAME & SPACE MECHANISM
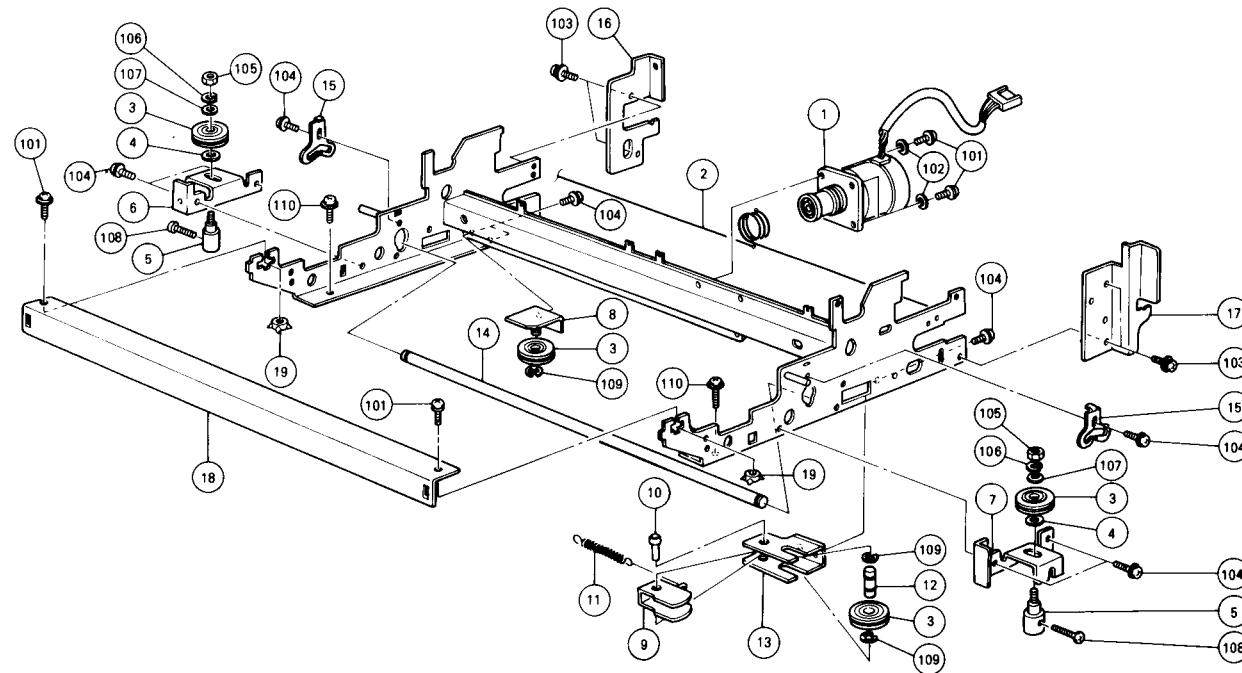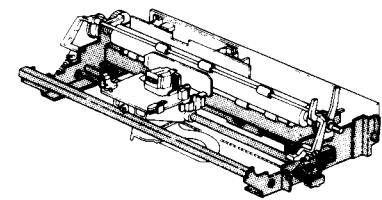
MAIN FRAME & SPACE MECHANISM

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.	REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	MOTOR WITH GEAR, SPACE	AM-4756	87781158	110	SCREW WITH FLAT WASHER, MACHINE, PAN HEAD, M4 X 8	AHD-2385	09514008B
002	WIRE, SPACE	AW-3283	87781113				
003	PULLEY, SIDE	ARA-0592	87781103				
004	WASHER, SIDE PULLEY, SPECIAL	AHD-8888	87781117				
005	POST, SIDE PULLEY	ART-5600	87781116				
006	BRACKET, SIDE PULLEY, LH	ART-5601	87781115				
007	BRACKET, SIDE PULLEY, RH	ART-5602	87781114				
008	BRACKET, POST	N/S	87781104				
009	CAM, TENSION	ART-5603	87781108				
010	SHAFT, TENSION CAM	ART-5604	87781109				
011	SPRING, TENSION CAM	ARB-7768	87781111				
012	SHAFT, SIDE PULLEY	ART-5605	87781110				
013	HOLDER, SIDE PULLEY	ART-5606	87781107				
014	SHAFT, SPACE	ART-5607	87781100				
015	SPRING, SPACE SHAFT	ARB-7769	87781102				
016	BRACKET, PCB STAY, LH	ART-5608	87781156				
017	BRACKET, PCB STAY, RH	ART-5609	87781155				
018	PLATE, SUPPORT	N/S	87781101				
019	NUT, SUPPORT PLATE, SPECIAL	AHD-7329	87781119				
101	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M4 X 10	AHD-2965	09504010B				
102	WASHER, FLAT, M4	AHD-8889	07000040B				
103	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M4 X 6	AHD-2966	08011212				
104	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M4 X 6	AHD-2852	09504006B				
105	NUT, HEXAGON, M5	AHD-7313	07100050B				
106	WASHER, SPRING, M5	AHD-8869	07030050B				
107	WASHER, FLAT, M4		07010050B				
108	SCREW, MACHINE, PAN HEAD, M4 X 16	AHD-2967	03140160B				
109	RETAINING RING, TYPE-E, M6	AHD-7264	07200060E				
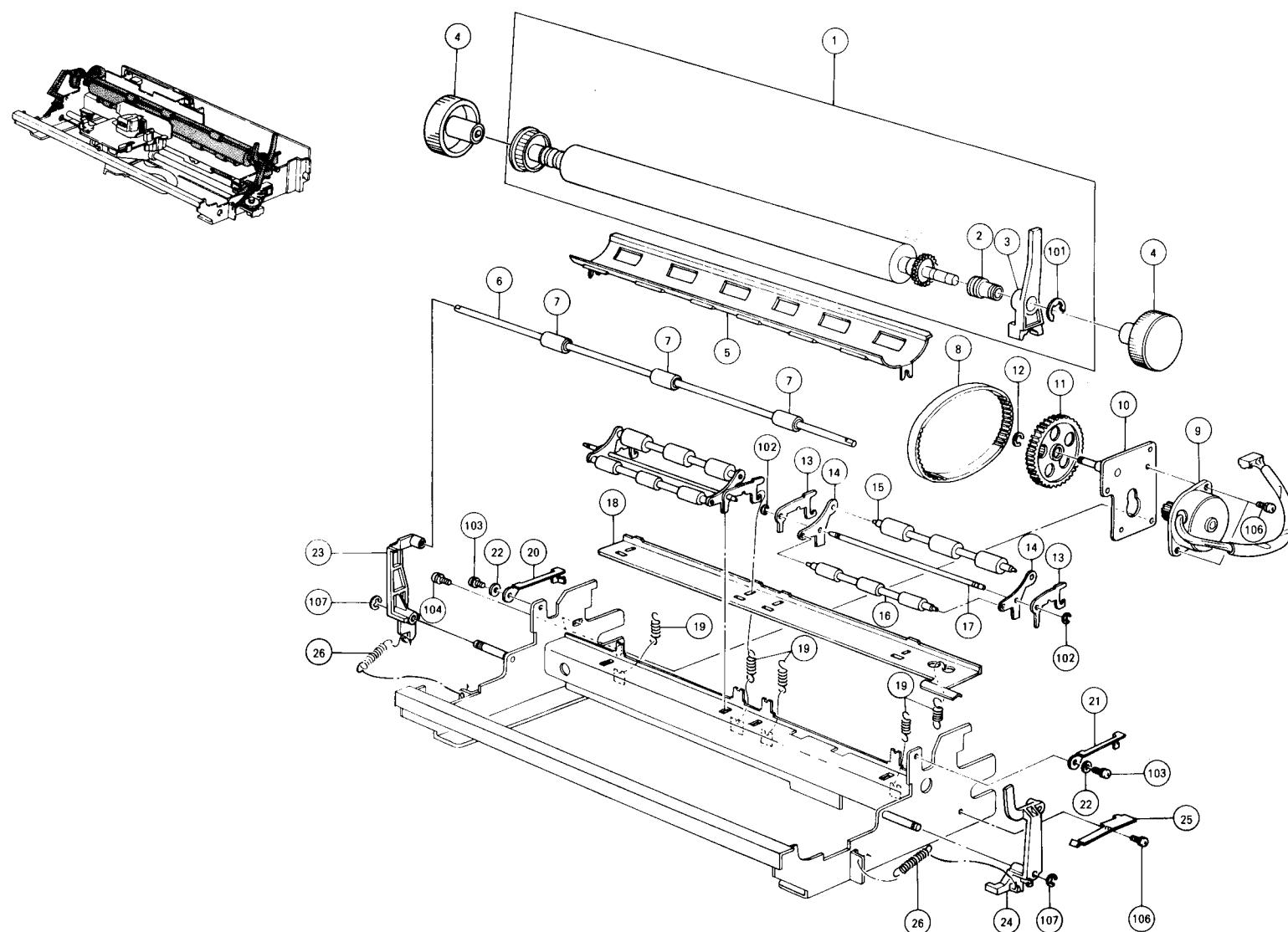
PAPER FEED MECHANISM

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	PLATEN ASSEMBLY	ART-5610	87783003
002	SUPPORT, PLATEN, RH	N/S	87783037
003	LEVER, PAPER RELEASE	ART-5611	87783058
101	RETAINING RING, TYPE-E, M12		07200120E
	END OF PLATEN ASSEMBLY		
004	KNOB, PLATEN	AK-2960	87783098
005	DEFLECTOR	ART-5612	87783020
006	SHAFT, PAPER BAIL	N/S	87783113
007	ROLLER, PAPER BAIL	ARA-0593	87783012
008	BELT, LINE FEED	AB-6572	87783050
009	MOTOR WITH GEAR, LINE FEED	AM-4757	87783060
010	BRACKET, LINE FEED	ART-5613	87783054
011	GEAR, IDLER	ARA-0594	87783051
012	RETAINING RING, TYPE-C, SPECIAL	AHC-3158	87783057
013	ARM, PRESSURE ROLLER	ART-5614	87783029
014	BRACKET, PRESSURE ROLLER	N/S	87783028
015	ROLLER, PRESSURE, REAR	ARA-0595	87783023
016	ROLLER, PRESSURE, FRONT	ARA-0596	87783022
017	SHAFT, PRESSURE ROLLER	N/S	87783045
018	LEVER, PRESSURE ROLLER	ART-5615	87783025
019	SPRING, PRESSURE ROLLER	ARB-7770	87783026
020	LEVER, LATCH, LH	ART-5616	87783043
021	LEVER, LATCH, RH	ART-5617	87783044
022	COLLAR, LATCH LEVER	AHC-3159	87503035
023	LEVER, PAPER BAIL, LH	ART-5618	87783120
024	LEVER, PAPER BAIL, RH	ART-5619	87783121
025	SPRING PLATE, PAPER BAIL	ARB-7771	87783116
026	SPRING, PAPER BAIL	ARB-7772	87783082
102	RETAINING RING, TYPE-E, M2	AHE-0101	07200020E
103	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 5	AHD-2968	08011225

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
104	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M4 X 8	AHD-2969	08011193
106	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M4 X 6	AHD-2852	09504006B
107	RETAINING RING, TYPE-E, M4	AHE-0099	07200040E

CARRIAGE ASSEMBLY

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	CARRIAGE ASSEMBLY	N/S	87782000
002	RIBBON MECHANISM ASSEMBLY	N/S	87782200
003	TAB, CARTRIDGE, LH	AHC-1792	87472200
004	TAB, CARTRIDGE, RH	AHC-1793	87472201
005	GEAR, RIBBON FEED	ARA-0589	87782215
006	PLATE, RIBBON FEED	N/S	87782216
007	SPRING, RIBBON FEED	ARB-7764	87782217
008	RETAINING RING, TYPE-CR, SPECIAL	AHC-3153	87502223
009	RETAINING RING, TYPE-CE, SPECIAL	AHC-3154	08050079
010	DAMPER, RIBBON CARTRIDGE	AHC-3155	87782219
012	SENSOR, RIBBON END	ART-5594	87786502
013	CAP, RIBBON END SENSOR	AHC-3156	87782223
014	GEAR, IDLER	ARA-0590	87782218
015	MOTOR WITH GEAR, RIBBON FEED	AM-4755	87782240
101	SCREW, MACHINE, PAN HEAD, M3 X 6	HD-2055	03130060B
102	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2524	08011166
104	RETAINING RING, TYPE-E, M2 ***END OF RIBBON MECHANISM ASSEMBLY***	AHE-0101	07200020E
016	HAMMER ASSEMBLY (NON-REPAIRABLE ASS'Y) HAMMER SUBASSEMBLY HAMMER SUPPORT, HAMMER DAMPER, RETURN STOPPER, HAMMER COVER, HAMMER SPRING, RETURN SCREW, MACHINE, PAN HEAD, M2 X 6	ART-5595	87782600

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	SCREW, MACHINE, PAN HEAD, M2.5 X 4 ***END OF HAMMER ASSEMBLY***		
017	COLLAR, PIVOT PIN	AHC-3157	87782050
018	SET SPRING, FRONT CARRIER	ARB-7765	87782053
019	SPRING, MOTOR BRACKET	ARB-7766	87782054
020	BRACKET, FLAT CABLE	N/S	87782062
021	TIE-WRAP, 100MM	AHC-0623	11050042
022	BRACKET, ROLLER	ART-5596	87782041
023	ROLLER, CARRIAGE	ARA-0591	87782045
024	CLAMP, SPACE WIRE	N/S	87782055
025	FLAT CABLE ASSEMBLY	AW-3282	87786505
026	CABLE, FLAT	--	87786506
027	SENSOR, CARRIAGE HOME ***END OF FLAT CABLE ASSEMBLY***	ART-5597	14030256
028	CARD HOLDER	ART-5598	87782047
029	BRACKET, FRONT	N/S	87782035
030	SPRING, WHEEL CASSETTE	ARB-7767	87782044
031	SENSOR, SELECTION HOME	ART-5599	87786501
032	DAMPER, CARRIER FRAME		87782064
033	BRUSH, CARRIER FRAME		87782350
034	BRACKET, CARD HOLDER		87782036
035	STAY, CARD HOLDER, LH		87782037
036	STAY, CARD HOLDER, RH		87782038
102	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2524	08011166
104	RETAINING RING, TYPE-E, M2	AHE-0101	07200020E
105	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M2.5 X 6	AHD-2523	08011190
106	RETAINING RING, TYPE-E, M3	AHE-0035	07200030E

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.	REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
107	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 8	AHD-2526	08011167				
108	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M3 X 4	AHD-2964	08011126				
109	SCREW WITH WASHER ASS'Y, MACHINE, ROUND HEAD, M3 X 6		08011188				
	END OF CARRIAGE ASSEMBLY						
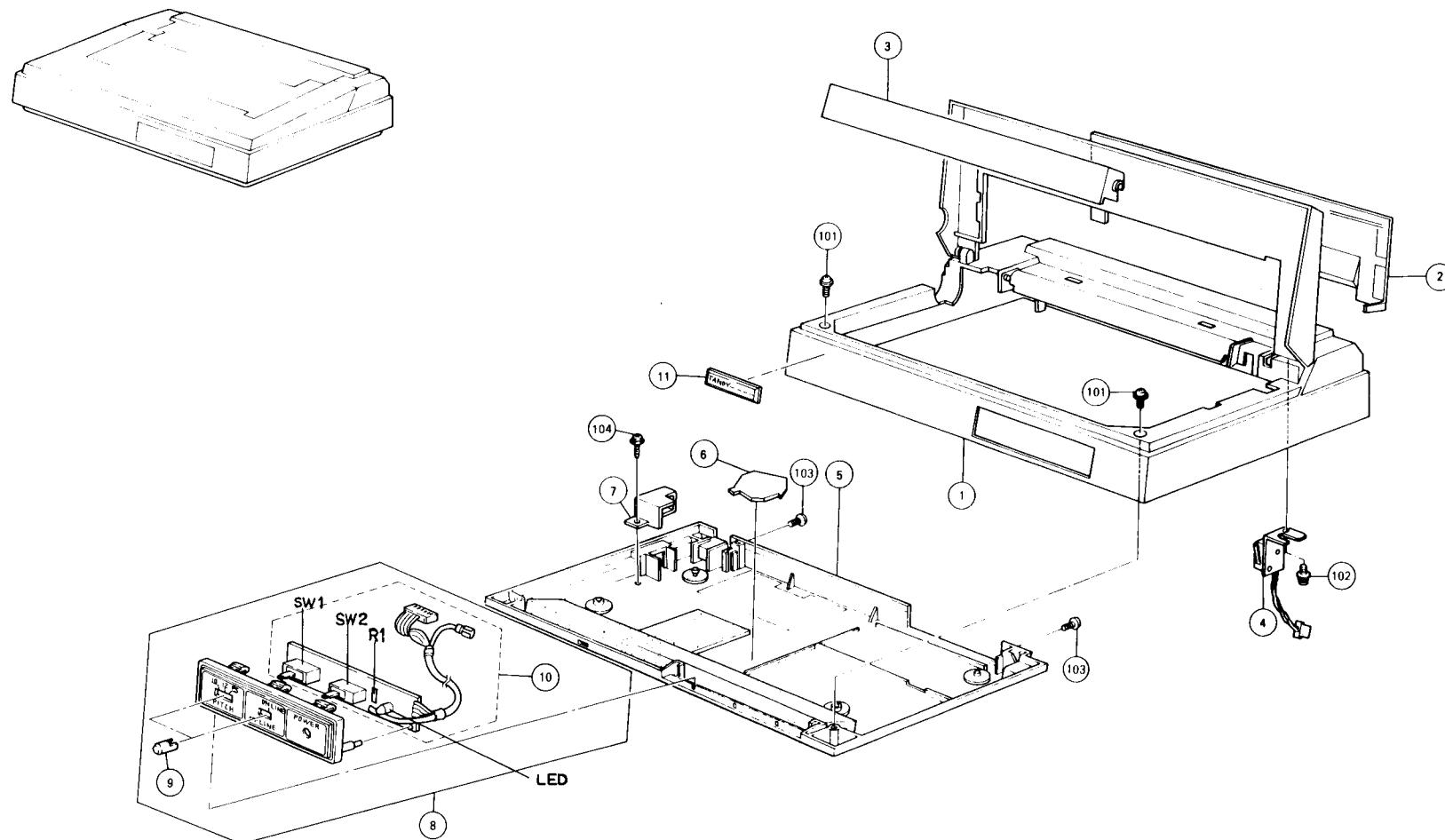
COVER ASSEMBLY

COVER ASSEMBLY

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	COVER, TOP	AZ-7211	87784000
002	COVER, FRONT VIEW	AZ-7212	87784002
003	SILENCER		87784003
004	SWITCH & BRACKET ASSEMBLY, COVER OPEN SWITCH ASSEMBLY, COVER OPEN BRACKET, SWITCH ASSEMBLY ***END OF SWITCH & BRACKET ASSEMBLY***	AS-7580	87786507
005	COVER, BOTTOM	AZ-7213	87784081
006	CLAMP, FLAT CABLE	AHC-3160	87784026
007	GUARD, AC SWITCH	AHC-3161	87784027
008	OPERATIONAL PANEL ASSEMBLY	AZ-7214	87784601
009	TAB, SWITCH (ON/OFF LINE, PITCH)	AS-2816	87474039
010	PCB ASSEMBLY, OPERATIONAL PANEL	N/S	87787021
	RESISTORS		
R1	RES., CARBON FILM, 150 OHM +-5% 1/4W	N0142EEC	16114151
	MISCELLANEOUS		
SW1	SWITCH, PITCH, SLIDE	AS-2818	87476876
SW2	SWITCH, ON/OFF LINE, SLIDE	AS-2817	87476877
LED1	LED, POWER, BR5534S	AL-1290	14030156

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	END OF PCB ASSEMBLY, OPERATIONAL PANEL		
	END OF OPERATIONAL PANEL ASSEMBLY		
011	PLATE, LOGO		87784080
102	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2524	08011166
104	SCREW WITH FLAT WASHER, MACHINE, PAN HEAD, M4 X 8	AHD-2385	09514008B

HARDWARE KIT

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	HARDWARE KIT	AHW-2601278	87789000
101	SCREW, MACHINE, TRUSS HEAD, M4 X 16		08011213B
103	SCREW, MACHINE, TRUSS HEAD, M4 X 8		03440080D

PCB ASSEMBLY
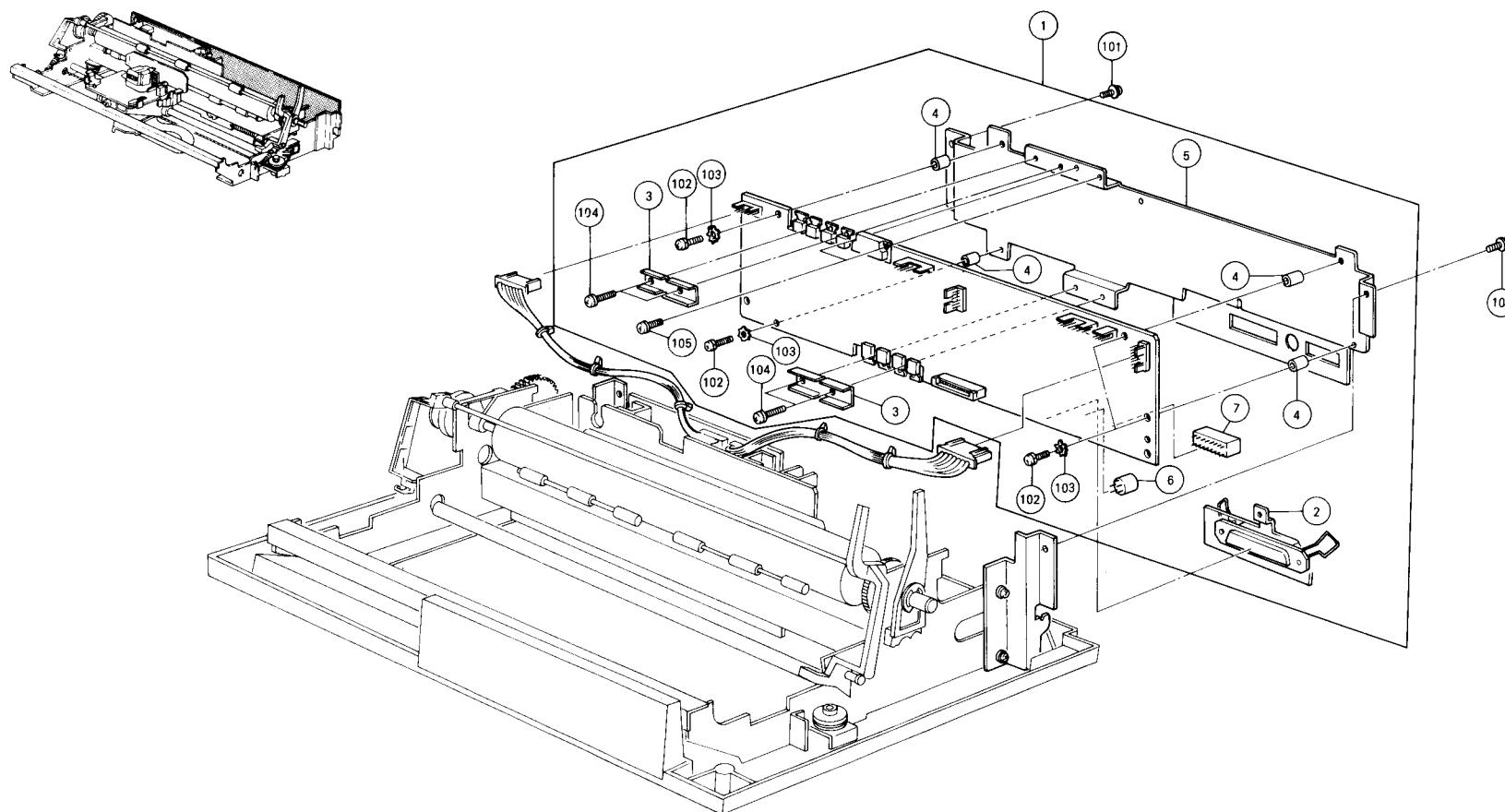
PCB ASSEMBLY, I/F CONTROL

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	PCB ASSEMBLY, V9/T I/F CONTROL	AX-9519	87787020
	RESISTORS		
R1	RES., CARBON FILM, 1 kOHM +-5% 1/2W	N0196EFC	16116102
R49	RES., METAL FILM, 5.1 OHM +-5% 1W	N0048EGE	16000337
R23	RES., METAL OXIDE FILM, 24 OHM +-5% 2W	N-0079EHD	16000590
R38,40, 43	RES., WINDING, 0.5 OHM +-1% 2W	N-0010BHH	16000912
R11,14	RES., METAL FILM, 1.62 OHM +-1% 1/4W		16011311
R45	RES., METAL FILM, 2.61 kOHM +-1% 1/8W	N0662BBE	16012813
R42	RES., THERMISTOR, 10 kOHM +-2% 1/8W	AT-1245	16013879
R52	RES., CARBON FILM, 100 OHM +-5% 1/4W	N0132EEC	16114101
R10,17 51,70, (R14,17)	RES., CARBON FILM, 1 kOHM +-5% 1/4W	N0196EEC	16114102
R2,36, 60,69	RES., CARBON FILM, 10 kOHM +-5% 1/4W	N0281EEC	16114103
R66,67, 68,71,	RES., CARBON FILM, 150 OHM +-5% 1/4W	N0142EEC	16114151
R27	RES., CARBON FILM, 1.5 kOHM +-5% 1/4W	N0629EEC	16114152
R64	RES., CARBON FILM, 180 OHM +-5% 1/4W	N0387EEC	16114181
R4,6,7, 8,30,37 50,53	RES., CARBON FILM, 2.7 kOHM +-5% 1/4W	N0224EEC	16114272
R3,9,20 21,22, 24,25, 28,44, 54,55	RES., CARBON FILM, 4.7 kOHM +-5% 1/4W	N0247EEC	16114472
R5	RES., CARBON FILM, 82 OHM +-5% 1/2W	N0187EFC	16116820
R35,56 63	RES., METAL FILM, 1 kOHM +-1% 1/4W	N0196EEC	16221001
R46	RES., METAL FILM, 1.1 kOHM +-1% 1/4W	N0198BEE	16221101
R47	RES., METAL FILM, 1.5 kOHM +-1% 1/4W	N0206BEE	16221501
R57	RES., METAL FILM, 1.62 kOHM +-1% 1/4W	N0207BEE	16221621
R41	RES., METAL FILM, 2.43 kOHM +-1% 1/4W	N0663BEE	16222431
R19,34 (R13)	RES., METAL FILM, 2 kOHM +-1% 1/4W	N0213BEE	16222001
R18,32 33,39	RES., METAL FILM, 232 OHM +-1% 1/4W	N0532BEE	16222320
R59,65	RES., METAL FILM, 316 OHM +-1% 1/4W	N0533BEE	16223160
R12,15, 31	RES., METAL FILM, 475 OHM +-1% 1/4W	N0627BEE	16224750
R13,16, 26,29, 48	RES., METAL FILM, 47.5 kOHM +-1% 1/4W	N0100BEE	16224752
R58	RES., METAL FILM, 6.19 kOHM +-1% 1/4W	N0596BEE	16226191

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
R61	RES., CARBON FILM, 18 kOHM +-5% 1/4W	N0568BEE	16114183
R62	RES., METAL FILM, 1.43 kOHM +-1% 1/4W	N0572BEE	16221431
AR6,7,8	RES., ARRAY, 10 KOHM +-10% 1/8W ,8 ELEMENTS	ARX-0201	16013540
AR1,2	RES., ARRAY, 1 kOHM +-10% 1/8W, 4 ELEMENTS	ARX-0432	16022613
AR3	RES., ARRAY, 2.2 kOHM +-10% 1/8W, 4 ELEMENTS	ARX-0204	16022615
AR4,5,9	RES., ARRAY, 4.7 kOHM +-10% 1/8W, 8 ELEMENTS	ARX-0199	16012502
AR10	RES., ARRAY, 10 kOHM +-10% 1/8W ,4 ELEMENTS	ARX-0207	16020326
AR11	RES., ARRAY, 1k-150 OHM +-10% 1/8W	ARX-0308	87476702
	CAPACITORS		
C57,58	CAP., ALUMINUM ELECTROLYTIC, 22µF +-20% 25V	CC226MFAP	16041114
C33,37, 47,49, 55,61, 62,63	CAP., ALUMINUM ELECTROLYTIC, 10µF +-20% 16V	CC106MDAP	16041098
C18,52 53 (C14,16)	CAP., ALUMINUM ELECTROLYTIC, 10µF +-20% 50V	CC106MJAP	16041161
C2,3,4, 7,13, 15,21, 66	CAP., CERAMIC, 1000pF +-10% 50V	CC102KJCP	16060874

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
C5,8	CAP., CERAMIC, 0.1µF +80 -20% 25V	CC104ZFCP	16060876
C1,9,14, 17,19, 20, 22, 23, 26, 27, 28, 29, 32, 34, 35, 38, 41, 43, 44, 45, 46, 48, 50, 54, 56, 59, 60, IC29; 35 P-GND IC29; 36 P-GND	CAP., CERAMIC, 0.01µF +80 -20% 50V	CC103ZJCP	16060879
C30	CAP., CERAMIC, 2200pF +-10% 50V	CC222KJCP	16060882
C6	CAP., POLYESTER FILM, 0.1µF +-10% 50V	CC104KJGP	16061081
C40	CAP., CERAMIC, 5pF +-5% 50V	CC050JJCP	16061112
C10,11 12,16	CAP., POLYESTER FILM, 1000pF +-10% 50V		16061082
C24,25, 31	CAP., CERAMIC, 470pF +-5% 50V	CC471JJCP	16061093
C65	CAP., CERAMIC, 8200pF +-20% 50V	CC822MJCP	16060872
C39	CAP., CERAMIC, 10pF +-10% 50V	CC100KJCP	16060995
	TRANSISTORS		
Q7,8,13	TRANSISTOR, SILICON, 2SB605, PNP	2SB-605	14000212

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
Q1,6	TRANSISTOR, SILICON, 2SD571, NPN	2SD-571	14000213
Q4,5 11,12	TRANSISTOR, SILICON, 2SB677, PNP	2SB-677	14010299
Q2,3, 9,10	TRANSISTOR, SILICON, 2SD687, NPN	2SD-687	14010300
TRA1,2	TRANSISTOR, ARRAY, FT5753M	MX-6555	14010286
	IC'S		
IC19	IC, SOFT ASSEMBLY, V9/R ETW	MP-0040	87786728
IC33	IC, SOFT ASSEMBLY, V9/T INTERFACE	MP-0041	87786716
IC1	IC, TD62507P, TRANSISTOR ARRAY	MX-6556	14010301
IC28	IC, TTL, SN7404N, HEX INVERTERS	MX-6557	14070098
IC11	IC, TTL, SN7405N, HEX INVERTERS	MX-6558	14070173
IC2,9	IC, TTL, SN7417N, HEX BUFFERS/DRIVERS	MX-6559	14070344
IC27	IC, TTL, SN74LS21, DUAL 4-AND GATES	MX-6560	14070740
IC5	IC, IR-2C03, DRIVER STUCK	MX-6561	14071324
IC14,16	IC, UDN-5711M, 2-NAND GATES/DRIVERS	MX-6562	14071328
IC6,8	IC, AN6552, DUAL OP. AMP	MX-6333	14080343
IC4,7, 12,18	IC, NJM2903D, COMPARATOR	MX-6563	14080356
IC30	IC, 8031 µCPU or 8051 µCPU	MX-6564	14071253
IC21,25	IC, TTL, SN74LS04, HEX INVERTERS	AMX-3552	14070539
IC23	IC, TTL, SN74LS00, QUADRUPLE 2-NAND GATES	MX-3479	14070542

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
IC3	IC, TTL, SN74LS32N, QUADRUPLE 2-OR GATES	AMX-5193	14070610
IC22	IC, TTL, SN74LS74N, DUAL D-TYPE EDGE TRIGGERED F/F	MX-3808	14070614
IC24	IC, TTL, SN74LS08N, QUADRUPLE 2-AND GATES	AMX-3698	14070621
IC10	IC, TTL, SN74LS54N, 4 WIDE AND-OR INVERT GATES	MX-5729	14070753
IC15,36	IC, TTL, SN74LS14N, HEX SCHMITT-TRIGGER INVERTERS	AMX-4526	14070760
IC26,31 32	IC, TTL, SN74LS374, OCTAL D-TYPE EDGE TRIGGERED F/F	AMX-3928	14070796
IC29	IC, MOS, TMP8155P, I/O PORTS AND TIMER	MX-5773	14070947
IC20	IC, N-MOS, µPD8243C, QUAD. EXPANDER	AMX-5214	14070988
IC34	IC, TTL, SN75188N, QUAD. LINE DRIVER	AMX-3867	14070824
IC13,17	IC, UDN-5712M, 2 AND-GATES/DRIVERS		14071192
IC35	IC, TTL, SN75189N, QUAD. LINE RECEIVER	AMX-4509	14070825
	DIODES		
D5,14, 19,21	DIODE, SILICON, IS2075K	DX-1118	14010631
ZD2,6, 9,10 (ZD1)	DIODE, ZENER, HZ5C1	ADX-1451	14020299
ZD8	DIODE, ZENER, HZ7B1	DX-2618	14020301
D6,7,8, 9,10,11 12,13, 20	DIODE, SILICON, RGP10A	ADX-1455	14020306
ZD5	DIODE, ZENER, HZ7A2	DX-1176	14020374
ZD1,4	DIODE, ZENER, HZ11A-3	DX-1316	14020392

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
ZD3,7 11(ZD3)	DIODE, ZENER, HZ 24-3	DX-2619	14020443
D1,2,3, 4,15,16 17,18	DIODE, SILICON, W03C, 200V 1A	DX-2620	14020388
	CONNECTORS & SOCKETS		
CN7	CONNECTOR, MALE-4P	AJ-7204	11020903
CN2,4,8	CONNECTOR, MALE-6P	AJ-5016	11020907
CN1	CONNECTOR, MALE-8P	AJ-5017	11020911
CN10	CONNECTOR, MALE-10P	AJ-5018	11020915
CN3	CONNECTOR, FEMALE, ZC-024	AJ-5019	87786700
	INDUCTORS		
L3	SN COIL, 30µH +-10%	ACA-8346	12010039
L1,2	COIL, 82µH +-10%	ACA-8379	16070061
	MISCELLANEOUS		
HAM	SWITCH, HAMMER, SLIDE	AS-1467	12040882
	POWER BUS, PCB, CONTROL	N/S	88510596
XTL2	RESONATOR, CERAMIC, 7.37MHz	AC-0997	87476705
C51			
XTL1	RESONATOR, CRYSTAL PX1, 8MHz	MX-1173	87786701
002(CN6)	CONNECTOR, FEMALE-36PIN, PARALLEL INTERFACE	AJ-5015	87786721
003	CLAMP, TRANSISTOR	N/S	87471054
004	SPACER, HEAT SINK	N/S	87781502
005	HEAT SINK	N/S	87781501
006(CN9)	SOCKET, FEMALE-5PIN, SERIAL INTERFACE	AJ-7675	11040341
007	DIP SWITCH(6 SWITCHES)(SW1)	AS-2918	12041331

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
102	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M3 X 14	AHD-2970	09503014B
103	WASHER, OUTER TOOTH, M3	AHD-8874	07050030B
104	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M3 X 10	AHD-2476	09503010B
105	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M3 X 6 ***END OF PCB ASSEMBLY, V9/T I/F CONTROL***	AHD-2475	09503006B
101	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2526	08011167

POWER SUPPLY UNIT , 100V SERIES

CN1

CN2
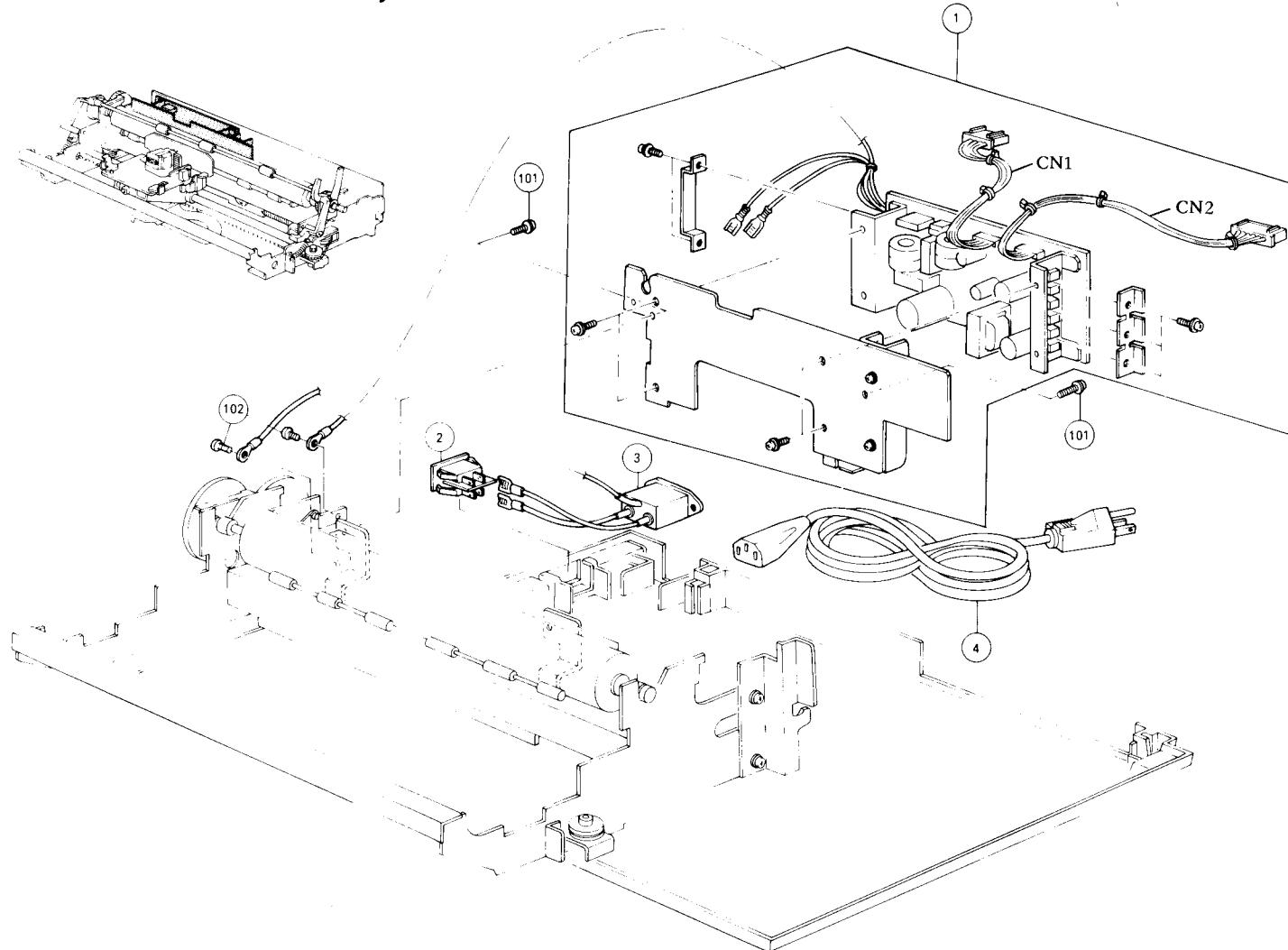
POWER SUPPLY UNIT, 100V SERIES

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	POWER SUPPLY UNIT	ATA-1067	80220064
	RESISTORS		
R8	RES., CEMENT, 10 OHM +-10% 5W	N0063FKF	16000560
R18	RES., CARBON FILM, 27 kOHM +-5% 1/4W	N0316EEC	16114273
R7,15, 24	RES., CARBON FILM, 200 OHM +-5% 1/4W	N0146EEC	16114201
R1	RES., CEMENT, 3.3 kOHM +-10% 5W	N0230FKF	16000566
R3	RES., METAL OXIDE FILM, 100 kOHM +-10% 2W	N0132FHD	16000405
R4	RES., METAL OXIDE FILM, 15 OHM +-10% 1W	N0074FGE	16000565
R2	RES., CARBON FILM, 1.5 mOHM +-5% 1/4W	N0450EEC	16114155
R11	RES., METAL OXIDE FILM, 0.47 OHM +-5% 2W	N0008EHE	16000400
R10,22, 16 (R4,6,7 8,30,37 50,53)	RES., CARBON FILM, 2.7 kOHM +-5% 1/4W	N0224EEC	16114272
R9	RES., METAL OXIDE FILM, 100 OHM +-5% 2W	N0132EHD	16011765
R6	RES., METAL FILM, 100 kOHM +-1% 1/4W	N0371BED	16221003
R25	RES., CARBON FILM, 2 kOHM +-5% 1/2W	N0213EFC	16116202
R26	RES., METAL OXIDE FILM, 2.7 kOHM +-10% 2W	N0224FHD	16000503
R20,23	RES., METAL OXIDE FILM, 2.7 kOHM +-5% 1W	N0224EGD	16012717
R21	RES., CARBON FILM, 1.8 kOHM +-5% 1/4W	N0210EEC	16114182
R12	RES., METAL OXIDE FILM, 470 OHM +5% 1W	N0169EGD	16011762
R14,17 (R10,17 51,57)	RES., CARBON FILM, 1 kOHM +-5% 1/4W	N0196EEC	16114102
R13 (R19,34)	RES., METAL FILM, 2 kOHM +-1% 1/4W	N0213BGE	16222001
R19	RES., METAL FILM, 10 kOHM +-1% 1/4W	N0281BGE	16221002
R5	RES., METAL FILM, 27 kOHM +-1% 1/4W	N0316BEE	16222702
VR1	POT, 1 kOHM +-20% 1/2W, VOLUME	AP-7430	16018052
	CAPACITORS		
C2,3	CAP., METALIZED PAPER, 4700pF +-20% 250V		16050083
C1,4	CAP., METALIZED PAPER FILM, 0.1µF 250V		16061125
C7	CAP., ALUMINUM ELECTROLYTIC, 390µF +-20% 200V	CC397MPAP	16041233
C6,9	CAP., ALUMINUM ELECTROLYTIC, 220µF +-20% 16V	CC227MDAP	16041323
C8	CAP., CERAMIC, 150pF +80 -20% 3.2KV	CC151ZACP	16061183
C22	CAP., ALUMINUM ELECTROLYTIC, 1500µF +-20% 50V	CC158MJAP	16041324
C14,16, 17,18 (C52,53)	CAP., ALUMINUM ELECTROLYTIC, 10µF +-20% 50V	CC106MJAP	16041161

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
C19	CAP., ALUMINUM ELECTROLYTIC, 470µF +-20% 35V	CC477MGAP	16041325
C12	CAP., ALUMINUM ELECTROLYTIC, 470µF +-20% 35V	CC477MGAP	16041012
C13,21	CAP., ALUMINUM ELECTROLYTIC, 100µF +-20% 25V	CC107MFAP	16041284
C20	CAP., ALUMINUM ELECTROLYTIC, 1000µF +-20% 35V	CC108MGAP	16041234
C15	CAP., ALUMINUM ELECTROLYTIC, 3300µF +-20% 10V	CC338MCAP	16041429
C11	CAP., ALUMINUM ELECTROLYTIC, 220µF +-20% 10V		16041464
C5	CAP., ALUMINUM ELECTROLYTIC, 2.2µF +-20% 50V	CC225MJAP	16041282
C10,31	CAP., CERAMIC, 220pF +-10% 3.2KV	CC221KACP	16061114
C23	CAP., CERAMIC, 0.1µF +80 -20% 50V		16060658
C24	CAP., CERAMIC, 220pF +-5% 50V	CC221JJCP	16060692
C27,28 29,30	CAP., CERAMIC, 1000pF +-10% 1KV		16060469
	TRANSISTORS		
Q1,2,4	TRANSISTOR, SILICON, 2SD687, NPN	2SD-687	14010300
Q3	TRANSISTOR, SILICON, 2SC2001, PNP	2SC-2001	14000280

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	IC'S		
IC1	IC, HYBRID, STK7408	MX-6565	14080341
IC2	IC, µPC4558C, DUAL OP. AMP	MX-6459	14080144
	DIODES		
D1	DIODE, SILICON, RUIC, FIRST RECOVERY	ADX-1693	14010796
D3,4,6	DIODE, SILICON, S5KC20, FIRST RECOVERY	ADX-1526	14020385
D5	DIODE, SILICON, IS1834	ADX-1524	14010780
D2	DIODE, SILICON, IS1588	ADX-1304	14010611
ZD1 (ZD2,6, 9,10)	DIODE, ZENER, HZ5C-1		14020299
ZD2	DIODE, ZENER, HZ12B-3	DX-2621	14020483
ZD4	DIODE, ZENER, HZ12B-1	DX-2622	14020482
ZD3 (ZD3,7 11)	DIODE, ZENER, HZ24-3	DX-2623	14020443
	INDUCTORS		
L1,2	CHOKING COIL, 2MH 2A	ACB-2554	88510845
L3,4	CHOKING COIL, 4.7µH 620MA	ACB-2555	12010081
	MISCELLANEOUS		
BR1	BRIDGE RECTIFIER, S4VB40	DX-2624	14020427
T1	TRANSFORMER, V9PSU, 100V	ATB-0506	88510826
TRA1	TRYAC, AC08DIM, 400V 8A	ADX-1700	14050118
F.C	CLIP, FUSE	N/S	11040260
F1	FUSE, MT4-2A	AHF-0101	11070350
F2	FUSE, GGS-3A	AHF-0102	11070413
F3	FUSE, GGS-5A	AHF-0103	11070415
CN1	CABLE ASSEMBLY, POWER		80225166
CN2	CABLE ASSEMBLY, LOGIC		80225167

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	END OF POWER SUPPLY UNIT		
002	SWITCH, POWER, 250V 16A, ROCKER	AS-3067	87506810
003	RECEPTACLE, AC POWER	AJ-5020	87786512
004	CABLE, AC POWER, 125V 10A	AW-2887	88510676
101	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2524	08011166
102	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M4 X 6	AHD-2852	09504006B

POWER SUPPLY UNIT , 200V SERIES

CN1

CN2

(101)

(101)

(102)

2

3

1

4

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
001	POWER SUPPLY UNIT	ATA-1067	80220036
	RESISTORS		
R8	RES., CEMENT, 20 OHM +-10% 5W		16000672
R18	RES., CARBON FILM, 27 kOHM +-5% 1/4W	N0316EEC	16114273
R7,15, 24	RES., CARBON FILM, 200 OHM +-5% 1/4W	N0146EEC	16114201
R1	RES., CEMENT, 3.3 kOHM +-10% 5W		16000671
R3	RES., METAL OXIDE FILM, 200 kOHM +-5% 2W		16000670
R4	RES., METAL OXIDE FILM, 15 OHM +-10% 1W	N0074FGE	16000565
R2	RES., CARBON FILM, 1.5 MOHM +-5% 1/4W	N0450EEC	16114155
R11	RES., METAL OXIDE FILM, 0.47 OHM +-5% 2W	N0008EHE	16000400
R10,22, 16 (R4,6,7 8,30,37 50,53)	RES., CARBON FILM, 2.7 kOHM +-5% 1/4W	N0224EEC	16114272
R9	RES., METAL OXIDE FILM, 100 OHM +-5% 2W	N0132EHD	16011765
R25	RES., CARBON FILM, 2 kOHM +-5% 1/2W	N0213EFC	16116202
R26	RES., METAL OXIDE FILM, 2.7 kOHM +-10% 2W	N0224FHD	16000503
R20,23	RES., METAL OXIDE FILM, 2.7 kOHM +-5% 1W	N0224EGD	16012717
R21	RES., CARBON FILM, 1.8 kOHM +-5% 1/4W	N0210EEC	16114182

| REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
R12	RES., METAL OXIDE FILM, 470 OHM +5% 1W	N0169EGD	16011762
R14,17 (R10,17 51,57)	RES., CARBON FILM, 1 kOHM +-5% 1/4W	N0196EEC	16114102
R13 (R19,34)	RES., METAL FILM, 2 kOHM +-1% 1/4W	N0213BGE	16222001
R19	RES., METAL FILM, 10 kOHM +-1% 1/4W	N0281BGE	16221002
R5	RES., METAL FILM, 47 kOHM +-1% 1/4W	N0316BEE	16224702
VR1	POT, 1 kOHM +-20% 1/2W, VOLUME	AP-7430	16018052
	CAPACITORS		
C3	CAP., X: 0.1µF, Y: 4700pF x2		80225244
C7	CAP., ALUMINUM ELECTROLYTIC, 100µF +-20% 400V		16041498
C6,9	CAP., ALUMINUM ELECTROLYTIC, 220µF +-20% 16V	CC227MDAP	16041323
C10	CAP., CERAMIC, 150pF +80 -20% 3.2KV	CC151ZACP	16061183
C22	CAP., ALUMINUM ELECTROLYTIC, 1500µF +-20% 50V	CC158MJAP	16041324
C14,16, 17,18 (C52,53)	CAP., ALUMINUM ELECTROLYTIC, 10µF +-20% 50V		16041216

| REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
C12,19	CAP., ALUMINUM ELECTROLYTIC, 470µF +-20% 35V	CC477MGAP	16041325
C13,21	CAP., ALUMINUM ELECTROLYTIC, 100µF +-20% 25V		16041477
C20	CAP., ALUMINUM ELECTROLYTIC, 1000µF +-20% 35V	CC108MGAP	16041234
C15	CAP., ALUMINUM ELECTROLYTIC, 3300µF +-20% 10V	CC338MCAP	16041429
C11	CAP., ALUMINUM ELECTROLYTIC, 220µF +-20% 10V		16041499
C5	CAP., ALUMINUM ELECTROLYTIC, 2.2µF +-20% 50V		16041473
C1, 2	CAP., METALIZED PAPER FILM, 0.15µF AC250V +-20%		16061479
C23	CAP., CERAMIC, 0.1µF +80 -20% 50V		16060658
C24	CAP., CERAMIC, 220pF +-5% 50V	CC221JJCP	16060692
C27,28 29,30	CAP., CERAMIC, 2200pF +80 -20% 1KV	CC222ZACP	16060782
	TRANSISTORS		
Q1,2,4	TRANSISTOR, SILICON, 2SD687, NPN	2SD-687	14010300
Q3	TRANSISTOR, SILICON, 2SC2001, PNP	2SC-2001	14000280

REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	IC'S		
IC1	IC, HYBRID, STK7408	MX-6565	14080341
IC2	IC, µPC4558C, DUAL OP. AMP	MX-6459	14080144
	DIODES		
D1	DIODE, SILICON, RUIC, FIRST RECOVERY	ADX-1693	14010796
D3,4,6	DIODE, SILICON, S5KC20, FIRST RECOVERY	ADX-1526	14020385
D5	DIODE, SILICON, IS1834	ADX-1524	14010780
D2	DIODE, SILICON, IS1588	ADX-1304	14010611
ZD1 (ZD2,6, 9,10)	DIODE, ZENER, HZ5C-1		14020299
ZD2	DIODE, ZENER, HZ12B-3	DX-2621	14020483
ZD4	DIODE, ZENER, HZ12B-1	DX-2622	14020482
ZD3 (ZD3,7 11)	DIODE, ZENER, HZ24-3	DX-2623	14020443
	INDUCTORS		
L1,5	CHOKING COIL, 900µH 1A	ACB-2554	80224512
L3,4	CHOKING COIL, 4.7µH 620MA	ACB-2555	12010081
L2	CHOKING COIL, 16µH 1A		80224513
	MISCELLANEOUS		
BR1	BRIDGE RECTIFIER, S4VB40	DX-2624	14020427
T1	TRANSFORMER, V9PSU, 200V		80224542
TRA1	TRYAC, AC08DIM, 400V 8A	ADX-1700	14050118
F.C	CLIP, FUSE		11040260
F1	FUSE, MT4-2A	AHF-0101	11070350
F2	FUSE, GGS-3A	AHF-0102	11070413
F3	FUSE, GGS-5A	AHF-0103	11070415
CN1	CABLE ASSEMBLY, POWER		80225166
CN2	CABLE ASSEMBLY, LOGIC		80225167

| REF. NO.	DESCRIPTION	RS PART NO.	MANUFACTURER PART NO.
	END OF POWER SUPPLY UNIT		
002	SWITCH, POWER, 250V 16A, ROCKER	AS-3067	87506810
003	RECEPTACLE, AC POWER	AJ-5020	87786519
004	CABLE, AC POWER	AW-2887	87456830
101	SCREW WITH WASHER ASS'Y, MACHINE, PAN HEAD, M3 X 6	AHD-2524	08011166
102	SCREW WITH SPRING WASHER, MACHINE, PAN HEAD, M4 X 6	AHD-2852	09504006B

X. SCHEMATIC DIAGRAMS

- I/F CONTROL BOARD LOGIC
- POWER SUPPLY UNIT LOGIC (100VOLT SERIES)
- POWER SUPPLY UNIT LOGIC (200VOLT SERIES)

CN 1

| Pin	Signal
8	+30 V
7	+30 V
6	+30 V
5	+30 VH
4	+5 VH
3	+12 VH
2	P G
1	P G

CN 4

Pin	Signal
6	SP M6
5	SP M5
4	SP M4
3	SP M3
2	SP M2
1	SP M1

CN 2

Pin	Signal
1	LF M1
2	LF M2
3	LF M3
4	LF M4
5	LF M5
6	LF M6

CN 8

Pin	Signal
6	N C
5	+5V
4	ON LINE
3	PS SPACE
2	I/IO SPACE
1	GND

CN 7

Pin	Signal
4	N C
3	GND
2	GND
1	COVER OPEN

CN 10

Pin	Signal
10	- 12 V
9	+ 12 V
8	+ 5 V
7	+ 5 V
6	+ 5 V
5	L G
4	L G
3	L G
2	L G
1	L G

DIP SW 1

Sw	Function
6	PRINT DIRECTION
5	SELF TEST
4	NEW LINE
3	BAUD RATE 2
2	BAUD RATE 1
1	INTERFACE SELECT

CN 9

Pin	Signal
4	DATA
3	SG
2	SBUSY
1	N C

CN 3

Pin	Signal
24	RF M5
23	RF M4
22	RF M3
21	RF M2
20	RF M1
19	RIB LC
18	RIB END
17	GND
16	P. GND
15	P. GND
14	P. GND
13	CARRIAGE HOME
12	SP LC
11	+5V L
10	SEL HOME
9	SEL LC
8	SEL M6
7	SEL M5
6	SEL M4
5	SEL M3
4	SEL M2
3	SEL M1
2	HAM 2
1	HAM 1

CN 6

Pin	Signal
36	N C
35	N C
34	N C
33	N C
32	$\overline{\text{FAULT}}$
31	N C
30	GND
29	GND
28	GND
27	GND
26	GND
25	GND
24	GND
23	GND
22	GND
21	GND
20	GND
19	GND
18	+5V
17	F G
16	GND
15	N C
14	GND
13	$\overline{\text{BUSY}}$
12	P. END
11	BUSY
10	$\overline{\text{ACKNLG}}$
9	DATA 8
8	DATA 7
7	DATA 6
6	DATA 5
5	DATA 4
4	DATA 3
3	DATA 2
2	DATA 1
1	$\overline{\text{DATA STROB}}$

Primary | Secondary

~L F 12A L2 2mH L1 2mH BR1 S4VB40

85V ~138V

~N

C1 0.1μF C2 4700 pF C3 4700 pF C4 0.1μF

FG (Frame GND)

C7 390μF

IC 1
STK 7408

(1)(3)(4)(6)(5) (8) (10) (11) (14)(12) (9) (16)

VR1 1K R4 15Ω C5 2.2μF C6 220μF C9 220μF

R1 3.3K R3 100K

C24 220pF

R8 10Ω R2 1.5MΩ R5 27K
TRA1 R7 200Ω R6 100K

L4 4.7μH L3 4.7μH C8 150pF R9 100Ω
R10 27K C31 220pF C10 220pF
R11 0.47Ω D1

T1

R15 200Ω R17 1K D2 R18 27K
B IC 2 R16 2.7K
8 7 6 5 / 1 2 3 4
ZD1 HZ5C-1 R13 2K ZD3 HZ24-3 R19 10K C16 10μF C D

C30 2200pF D6 Q4 R24 200Ω
R25 2K Q2
C28 2200pF D4 R22 2.7K
R26 2.7K C23 0.1μF C20 1000μF R20 2.7K C12 470μF C13 100μF
C22 1500μF ZD2 HZ12B-3 C17 10μF
F2 3A

C29 2200pF Q3 R21 1.8K R14 1K
D5 R23 2.7K C21 100μF B C D
C19 470μF C18 10μF ZD4 HZ12 B-1

C27 2200pF Q1
D3 R12 470Ω
C15 3300μF C14 10μF C11 220μF
F3 5A

CN1
1 PG
2 PG
3 +12
4 +5H
5 +30H
6 +30
7 +30
8 +30

CN2
1 LG
2 LG
3 LG
4 LG
5 LG
6 +5
7 +5
8 +5
9 +12
10 -12

DWP-220 Control Codes

Codes (Dec)		(Hex)	Function
08n		08n	Backspace n/120" (1<n<255)
10		0A	Line Feed*
13		0D	Carriage Return with Line Feed**
14		0E	End Underline
15		0F	Start Underline
27	01	1B 01	1/120" Space
27	02	1B 02	2/120" Space
27	03	1B 03	3/120" Space
27	04	1B 04	4/120" Space
27	05	1B 05	5/120" Space
27	06	1B 06	6/120" Space
27	07	1B 07	7/120" Space
27	08	1B 08	8/120" Space
27	09	1B 09	9/120" Space
27	10	1B 0A	Reverse Line Feed*
27	14	1B 0E	12 Pitch Select
27	15	1B 0F	10 Pitch Select
27	17	1B 11	Proportional Space Select
27	21	1B 15	Start Carriage Return Only**
27	22	1B 16	End Carriage Return Only**
27	24	1B 18	Enters External Program Mode***
27	25	1B 19	Exits External Program Mode***
27	26	1B 1A	1/48" Line Feed
27	28	1B 1C	Half Line Feed
27	30	1B 1E	Reverse Half Line Feed
27	31	1B 1F	Bold Print On
27	32	1B 20	Bold Print Off
27	56	1B 38	1/38" Line Feed

*   Line Feeds may be sent from machine-language programs, but not from BASIC's **LPRINT** statement. See the technical Information section of your Tandy Computer owner's manual for details on sending Line Feeds.

** Normally, **CHR$(13)** causes a Carriage Return plus a Line Feed. However, after a CHR$(27); CHR$(21) is sent, a CHR$(13) causes a Carriage Return only; **CHR$(27); CHR$(22)** causes a return to normal.

*** See **External Program Mode** later in this manual.

Examples of Code program Lines

```
LPRINT CHR$(8); CHR$(1)
     Backspaces 1/120".
LPRINT CHR$(13)
     Returns carriage with Line Feed.
LPRINT CHR$(27); CHR$(3)
     Moves 3/120" space.
LPRINT CHR$(27); CHR$(14)
     All subsequent characters will be printed in 12 pitch.
LPRINT CHR$(27); CHR$(17)
     All subsequent characters will be printed in Proportional Spacing.
```

ASCII Character Codes

Printable Characters

The DWP-220 can produce all modified ASCII characters. Here's what they look like:

DEC.	HEX.	OCT.	Char	DEC.	HEX.	OCT.	Char	DEC.	HEX.	OCT.	Char	DEC.	HEX.	OCT.	Char
32	20	040	SP	62	3E	076	>	92	5C	134	\	122	7A	172	z
33	21	041	!	63	3F	077	?	93	5D	135	]	123	7B	173	{
34	22	042	"	64	40	100	@	94	5E	136	^	124	7C	174	|
35	23	043	#	65	41	101	A	95	5F	137	_	125	7D	175	}
36	24	044	$	66	42	102	B	96	60	140	`	126	7E	176	~
37	25	045	%	67	43	103	C	97	61	141	a	163	A3	243	£
38	26	046	&	68	44	104	D	98	62	142	b	174	AE	256	1/2
39	27	047	'	69	45	105	E	99	63	143	c	184	B8	270	—
40	28	050	(	70	46	106	F	100	64	144	d	185	B9	271	‰
41	29	051	)	71	47	107	G	101	65	145	e	186	BA	272	¦
42	2A	052	*	72	48	110	H	102	66	146	f	222	DE	336	¢
43	2B	053	+	73	49	111	I	103	67	147	g				
44	2C	054	,	74	4A	112	J	104	68	150	h				
45	2D	055	-	75	4B	113	K	105	69	151	i				
46	2E	056	.	76	4C	114	L	106	6A	152	j				
47	2F	057	/	77	4D	115	M	107	6B	153	k				
48	30	060	0	78	4E	116	N	108	6C	154	l				
49	31	061	1	79	4F	117	O	109	6D	155	m				
50	32	062	2	80	50	120	P	110	6E	156	n				
51	33	063	3	81	51	121	Q	111	6F	157	o				
52	34	064	4	82	52	122	R	112	70	160	p				
53	35	065	5	83	53	123	S	113	71	161	q				
54	36	066	6	84	54	124	T	114	72	162	r				
55	37	067	7	85	55	125	U	115	73	163	s				
56	38	070	8	86	56	126	V	116	74	164	t				
57	39	071	9	87	57	127	W	117	75	165	u				
58	3A	072	:	88	58	130	X	118	76	166	v				
59	3B	073	;	89	59	131	Y	119	77	167	w				
60	3C	074	<	90	5A	132	Z	120	78	170	x				
61	3D	075	=	91	5B	133	[	121	79	171	y				

—MEMO—

—MEMO—