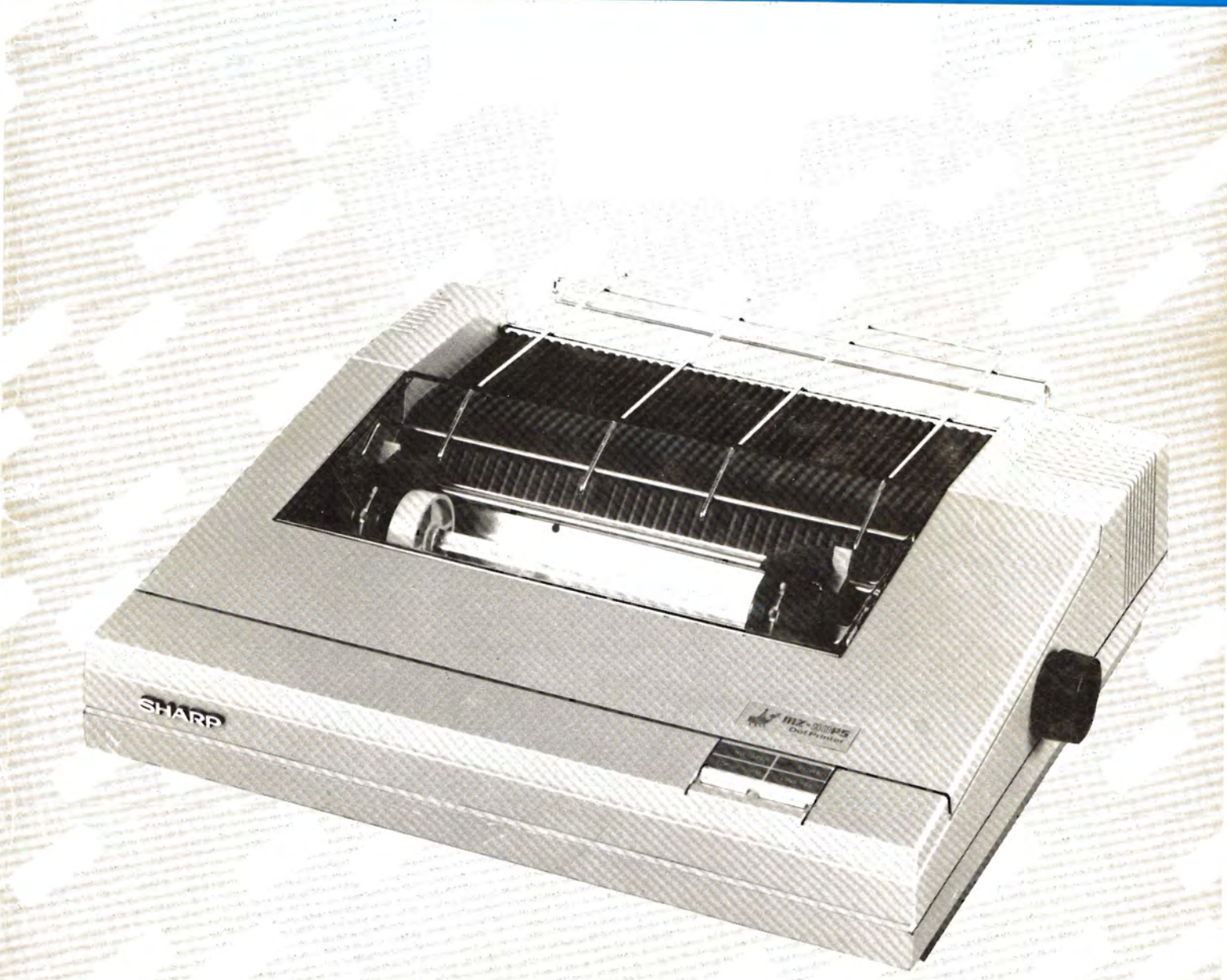
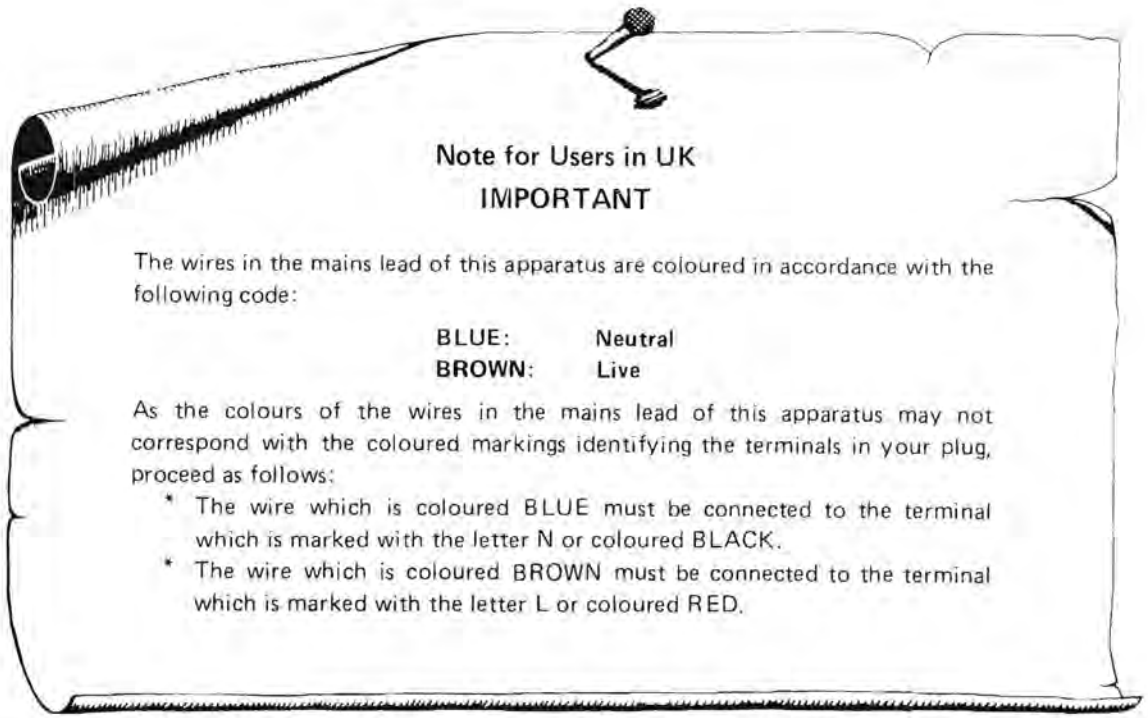
SHARP

DOT PRINTER

MZ-80P5

INSTRUCTION MANUAL





Note for Users in UK

IMPORTANT

The wires in the mains lead of this apparatus are coloured in accordance with the following code:

BLUE: **Neutral**
BROWN: **Live**

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

* The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK.
* The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

INTRODUCTION

Thank you very much for purchasing the Sharp Dot Printer MZ-80P5. This unit is designed as a terminal dot matrix impact printer for use with Sharp's personal computer MZ-80B. It has many features and can be used in a wide variety of fields. Read this Instruction Manual before using the MZ-80P5 so that you can use it correctly.

Table of Contents

Features

• Printing paper	Can use fanfold paper 4–10 inches wide.
• Character printing	Four character sizes are possible.
• Bit image printing	Printing is possible with dot units.
• Paging	Number of lines printed on 1 page can be determined.
• Tabulation	Both vertical and horizontal tabulation control is possible.
• Feed	Switch for line by line paper feed and paper feed in page units. Control is also possible through software.
• Copies	Simultaneous copies, up to 3 pages including the original, are possible.
• Alarm bell	Alarm bell sounds to warn the user of mechanical trouble, lack of printing paper, etc.
• Bi-directional printing	Along with bi-directional printing, there is very effective printing thanks to the use of logical seeking. (Only 80 characters/line, 40 characters/line)
• Printing ribbon	It can be easily put in and taken out without getting ones hands dirty because a special cartridge ribbon is used.
• Interface	An extension of Centronics system or RS-232C interface is possible.

Cautions during Use

1. Installation

- Do not install the unit in the following places.
  Where there is lots of moisture.
  Where it is hit by direct sunlight.
  Where there is lots of dust.
  Where the temperature is very high or low.
  Where there is lots of vibration.
- Install the unit as level as possible.
- Do not install the unit near machines that generate lots of noise. Also, use a power source different from that used by such machines.
- Use the power source voltage shown on the rating plate on the back of the unit.

2. Cautions during Operation

- Do not touch the printing head with your hand during operation because it becomes very hot.
- Immediately pull out the power cord if water or liquid or metal objects such as a wire or pin gets inside the unit by mistake. Then completely remove these foreign objects.
- Always be sure the braided wire, etc. are completely connected when operating this machine. (Refer to page 4.)

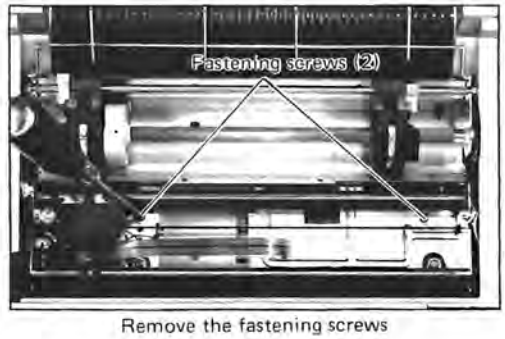
3. Screws to Fasten Printing Mechanism

The printing mechanism is fastened to the chassis with two screws to prevent it from being damaged by vibration during transit. Remove these two screws before using the unit. When transporting it again, refasten the mechanism with these screws. Keep the screws that you remove for that purpose.

STEP 1. Stand the printer cover up vertically.

STEP 2. Remove the screws holding the mechanism. When the printing head is all the way to the left, there is one screw in the chassis between the belt to the right side of it and another fastening screw in the right end in the horizontal direction.

STEP 3. Put the printer cover back. Keep the fastening screws that you removed.

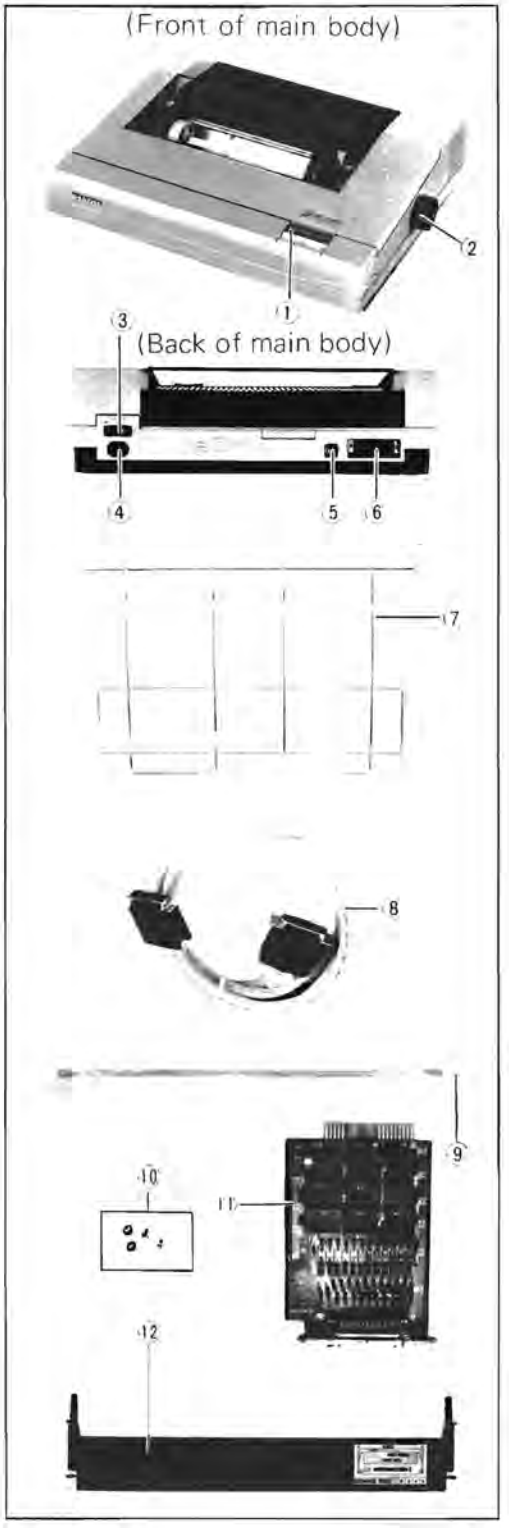


Remove the fastening screws

Dot Printer MZ-80P5

The main body, assistant guide, signal cable, braided wire, screws, I/O card, cartridge ribbon and power cord come with the MZ-80P5.

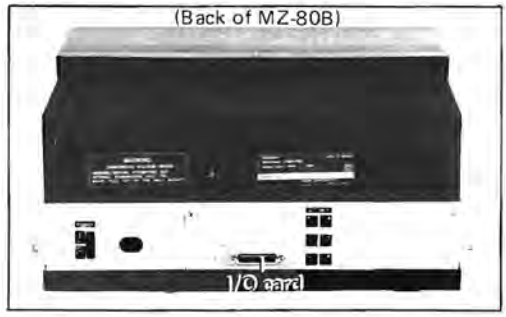
① **Control panel**
Holds paper feed switches and indicators.
② **Manual feed knob**
③ **Power switch**
④ **Appliance inlet**
Connect the power cord connector of an accessory here.
⑤ **FG (Frame ground) terminal**
Terminal for connecting braided wire between the MZ-80P5 and MZ-80B.
⑥ **Signal terminal (I/O PORT 1)**
Connect the signal cable connector here.
⑦ **Assistant guide**
Attach to the main body for smooth feed of printing paper.
⑧ **Signal cable**
Connect the printer I/O card and the MZ-80P5 with this cable.
⑨ **Braided wire**
Connect to the FG terminals of the MZ-80B and MZ-80P5.
⑩ **Screws (4)**
Use these screws to fasten the connectors of the signal cable.
⑪ **I/O card**
Interface card for connecting the MZ-80B and printer.
Insert this card in the extension unit MZ-80EU (option) built into MZ-80B.
⑫ **Special cartridge ribbon**



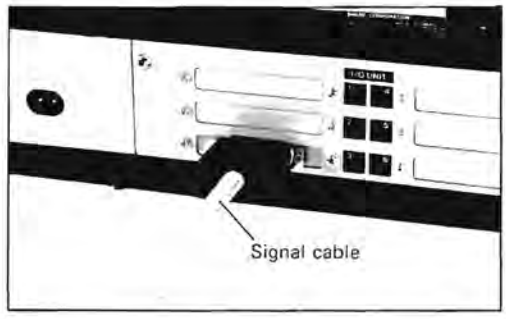
Connecting MZ-80B and MZ-80P5

Correctly observe the following steps when connecting the MZ-80P5 to host computer MZ-80B.

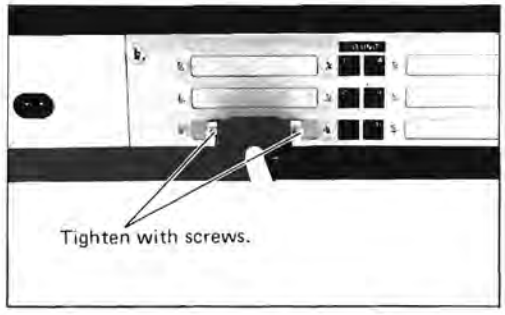
STEP 1. Insert the supplied I/O card in the lower left connector (No.3) of the extension unit MZ-80EU (option) built into the back of the MZ-80B. The Fig. on the right shows the I/O card inserted. Refer to the Instruction Manual for the MZ-80B regarding the method of inserting the card, and connect it correctly. Also replace all the screws removed before the card was inserted.



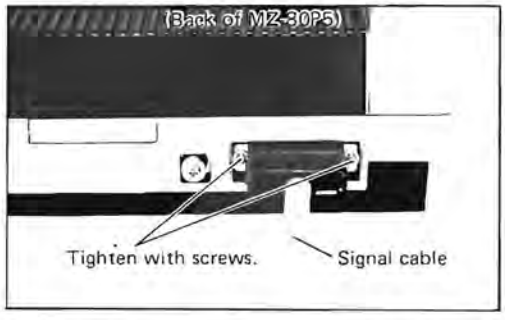
STEP 2. Connect the supplied signal cable to the signal terminal for the I/O card. You can use either the right or left cable connector, but pay attention to the direction when connecting. They are non-reversible connectors.



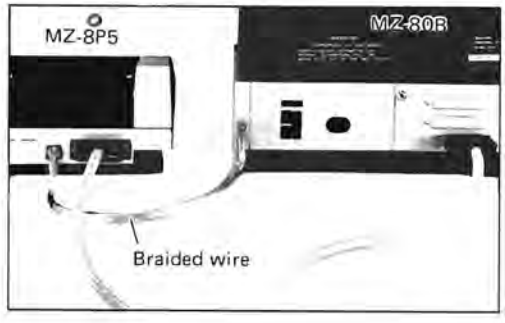
STEP 3. Pass the supplied screws through the holes in the right and left of this connector, and fasten the connector by tightening these screws. Be sure to tighten these screws. (Tighten screws in 2 places)



STEP 4. Connect the other end of the signal cable to the signal terminal (I/O PORT 1) in the back of printer MZ-80P5. As in STEP 3, use the supplied screws, and fasten both sides of this connector by tightening the screws. (Tighten screws in 2 places.)



STEP 5. Finally, connect the FG terminals of the MZ-80B and MZ-80P5 with the supplied braided wire (Fig. on the right). The lug terminal on one side of the braided wire is "U" shaped, and the other end is round shaped. Connect the "U" shaped lug terminal to the FG terminal of the MZ-80B, and the round shaped lug terminal to the FG terminal of the MZ-80P5. When connecting to the FG terminal of the MZ-80P5, tighten the lug terminal of the braided wire with the screw of FG. This connection of the braided wire must be done.

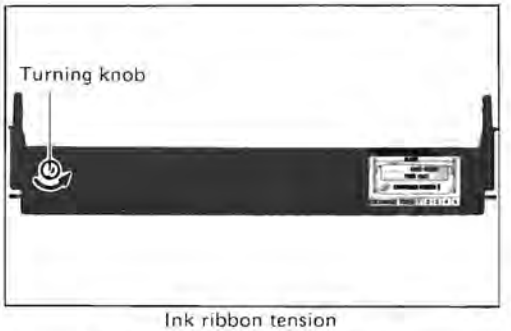


Cartridge Ribbon Setting

The cartridge ribbon for the MZ-80P5 is a long-lasting, endless type and easy to set and remove. You won't get your hands dirty when handling it. Follow the procedure explained below when setting the cartridge ribbon.

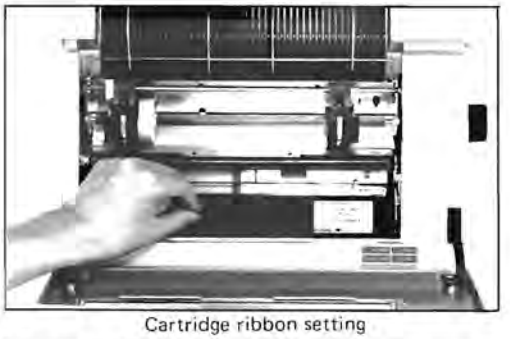
STEP 1. Stand up the printer cover and check that the scale touches (Leans against the back) the platen.

STEP 2. Turn the cartridge ribbon turning knob in the direction of the arrow and check that the ribbon isn't loose or twisted.

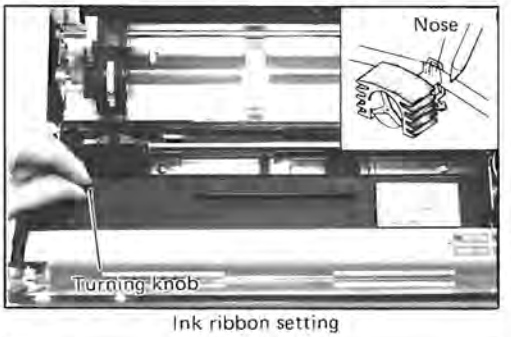


Ink ribbon tension

STEP 3. Take the cartridge ribbon by the handle and set it in by suspending the ribbon in the head nose guide and pushing the cartridge ribbon to the printer mechanism. At this time, check that the cartridge ribbon is in the support grooves on the right and left of the mechanism.


Cartridge ribbon setting

STEP 4. While pushing the ribbon down with a pencil or similar instrument, turn the cartridge ribbon turning knob in the direction of the arrow and set the ink ribbon correctly between the head nose and ribbon mask.

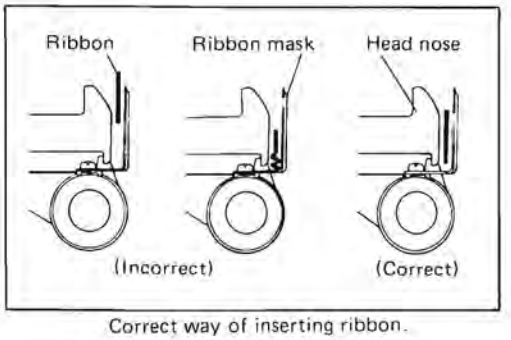


Ink ribbon setting

STEP 5. Finally, check that the ink ribbon isn't twisted or loose and take up the ribbon tension.

(Note 1) Be careful that the ink ribbon is put in correctly. If it isn't, there is danger that the ribbon may come out, there may be mis-printing or that the head needle may be damaged.

(Note 2) This cartridge ribbon can be replaced only with an ink ribbon. However, replacement of the ink ribbon of the same cartridge ribbon can be done only 4 times. After that, use a new cartridge ribbon.

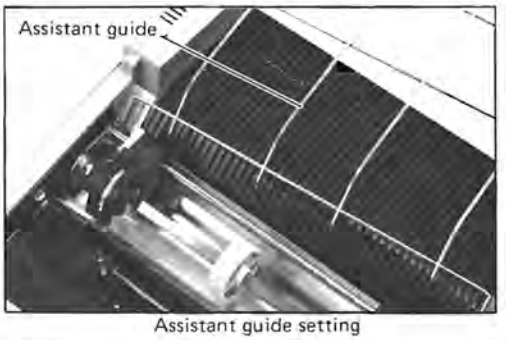


Correct way of inserting ribbon.

Printing Paper Setting

This unit can use fanfold paper from 4 inches to 10 inches wide. The printing paper is set according to the following procedure.

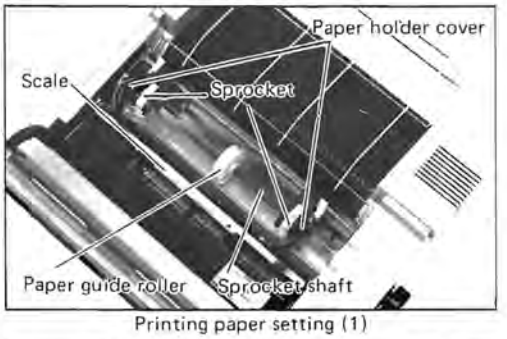
STEP 1. Attach the supplied assistant guide for smooth printing paper flow. For this purpose, insert the tips of this assistant guide in the right and left holes on the back of the paper feed mechanism.



Assistant guide setting

STEP 2. Incline the scale toward yourself and remove it from the platen.

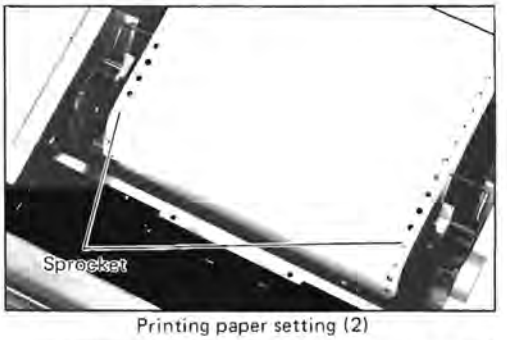
STEP 3. Check that the paper guide roller is in the center of the sprocket shaft and open the right and left covers holding the paper.



Printing paper setting (1)

STEP 4. Insert the fanfold paper between the assitant guide roller and the frame, and put it in between the paper guide on the back of the printer mechanism.

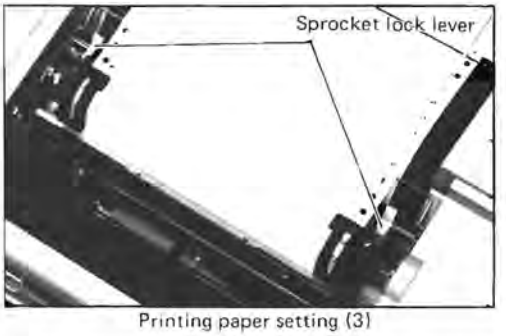
STEP 5. When the printing paper comes out toward you, insert the sprocket pin in the printing paper transport hole. At this time check that the printing paper is parallel to the sprocket pin.



Printing paper setting (2)

STEP 6. Return the paper holder cover and scale to their original positions, loosen and raise the sprocket lock levers on both sides toward yourself and adjust the right/left tension and position of the printing paper. Then return the sprocket lock levers to their original positions and lock them.

(Note) The scale graduation indicates printing position from the 1st digit to the 80th digit on a line. (For normal printing)



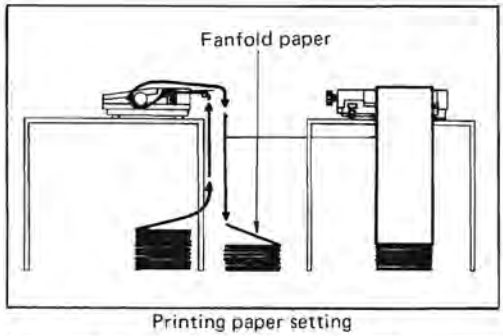
Printing paper setting (3)

STEP 7. Replace the printer cover and setting of the printing paper is finished.

Printing Paper Adjustment

1. Printing paper placement

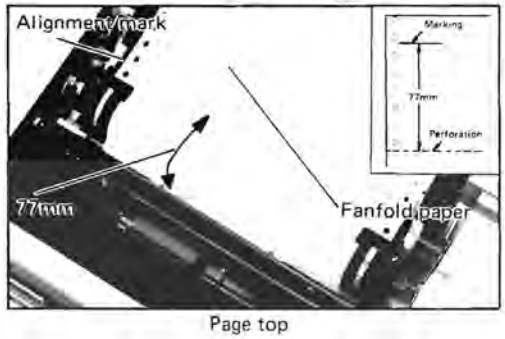
Place the top of the printing paper so it is located lower than the surface of the MZ-80P5's assistant guide. Also place the printing paper so it is parallel to the MZ-80P5 and parallel to the printing section. If this isn't done, proper paper feed is not possible and the paper may jam.



Printing paper setting

2. Page top

Make a mark 77mm above perforations of the fanfold paper and align this mark and the alignment mark (straight line projection part) of the sprocket frame. Then printing will start from the first line (topmost line) of the paper being used.
Under these conditions, this position will become the initial printing line of each page when the power is turned on. (When the fanfold paper used agrees with the set page mode on the printer)



Page top

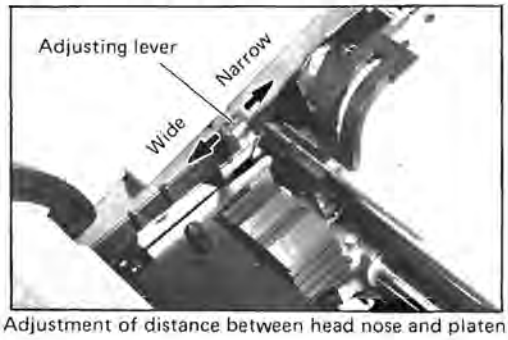
3. Adjustment for different types of printing paper

With the MZ-80P5, the space between the print head nose and the platen can be adjusted. Adjust it in the following cases.

- Adjust it according to the thickness of the printing paper being used such as for copy paper, etc.
- Adjust printing pressure when changing the shading (light/dark) of the printed characters, etc.

Method of adjustment
Adjust the distance with the adjusting lever on the left side of the printer mechanism.

- The space between the printer head nose and the platen widens when the lever is pulled toward yourself.
- The space narrows when the lever is pushed backwards.

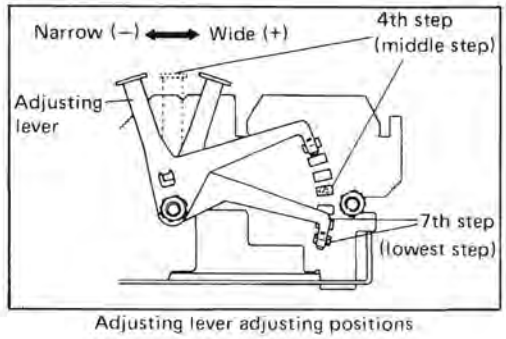


Adjustment of distance between head nose and platen

Recommended position for adjusting lever
The adjusting lever has 7 positions. However, for ordinary printing, set it at the following positions.

- 1 sheet of printing paper used: Step 4 (middle step)
- Copy paper (2–3 sheets): Step 7 (lowest step)

(Note) If printing becomes light when using the printer for a long time, set the adjusting lever one step back (–) and use it that way.



Adjusting lever adjusting positions

Printing Head Change

Printing head life is approximately 50 million characters (when printing 14-dot characters). When there is printing head wear due to long use and damage to the printing head pin, replace with a new printing head in the following way.

STEP 1. If the printer is being used, turn off the power and wait until the head cools off. Never touch the head.

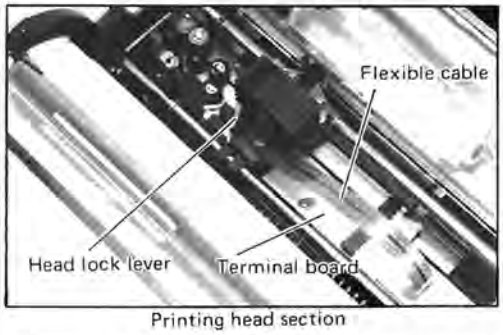
STEP 2. Stand up the printer cover and remove the cartridge ribbon.

STEP 3. While pushing the connector on the terminal board, pull out the flexible cable connected to the head horizontally.

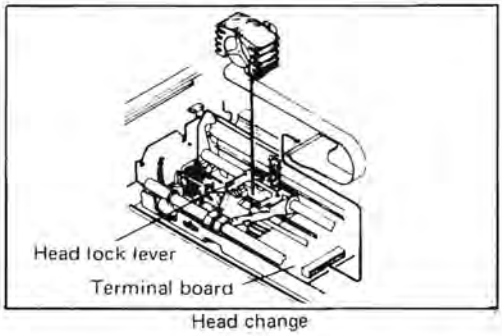
STEP 4. Turn the head lock lever to the right and pull the printing head upwards.

STEP 5. Attach a new head, return the head lock lever to its position and lock the head.

STEP 6. Firmly insert the flexible cable into the connector on the terminal board.



Printing head section

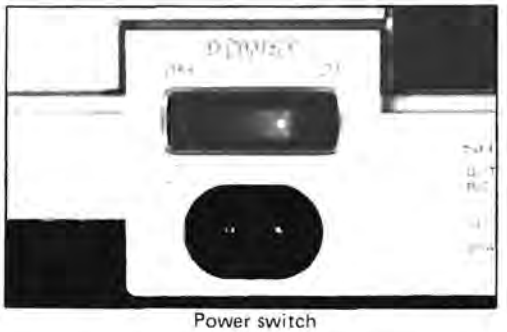


Head change

Operation

1. Switch

The POWER switch is on the back of the MZ-80P5 and the LINE FEED and TOP OF FORM switches are on the front control panel.

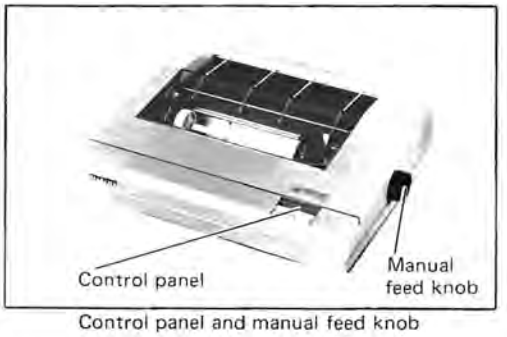


Power switch

POWER: It turns power ON/OFF. Power is turned on when the switch is pushed to ON or to the side marked "**I**".

LINE FEED: Printing paper is fed through while this switch is depressed. If it is lightly pushed consecutively, line by line paper feed is possible.

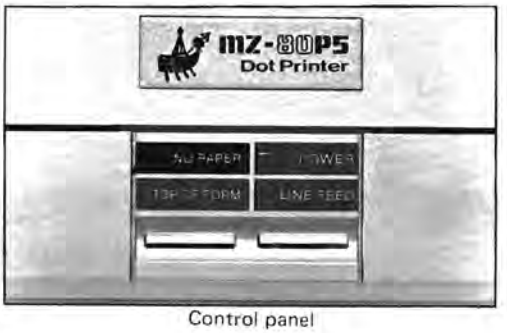
(Note) Paper feed pitch for single line feed is performed by the pitch setting (explained later) through software. When not set, it is 1/6 inch pitch.



Control panel and manual feed knob

TOP OF FORM: When this switch is pushed, printing paper is fed to the top line of the next page. Top line of the page means the printing line when the power is turned on.

(Note) The number of lines printed on one page can be changed with software. When the power is turned on, it is 66 lines per page. However, when the number of lines is changed midway, the position of the top line of the page changes.



Control panel

2. Indicators

There are two indicators (LED), POWER and NO PAPER, on the control panel of the MZ-80P5.

POWER: Lights up when the power is turned on. This indicator blinks when something irregular happens to the printer mechanism. It is to warn the user.

NO PAPER: Lights up when there is no paper.

3. Alarm bell

There is an alarm bell built into the MZ-80P5 and it sounds under the following circumstances.

- Something irregular happens to the printer mechanism.
- When there is no printing paper.
- When the printer receives the BEL code, and if you yourself make an error in software when it is set in the (ESC + 05H) mode (explained later).

4. Manual feed knob

There is a manual feed knob on the right side of the MZ-80P5. Use it to align printing paper position (top) etc. when the power is OFF. Be careful because the printing paper will become loose when the knob is turned toward you. Refer to the item "2. Page top" on the page 7.

5. Abnormalities in the printing mechanism

When there are some abnormalities in the operation of the printing head of the printer, the power lamp blinks and the alarm bell sounds. The printer controls itself to prevent any printer trouble. When this happens, the only thing to do is turn off the power. Before turning on the power once again, check that there is no external cause such as paper jamming, etc. If the extraordinary condition does not disappear after turning off the power, see your dealer.

6. Self Check Test

There is a self check for the MZ-80P5. Because of this feature the following tests are possible.

- Check of printing head and printing quality.
- Check of paper feed and ink ribbon feed.

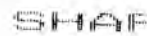
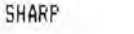
[Method] Set the printing paper correctly and, while pressing the LINE FEED switch, turn on the power. If all is right, the printer will continuously print correctly the characters it has. Turn off the power to stop the operation.

[Example of character printing]

Printer Control Code

The MZ-80P5 is a terminal printer capable of software control by the host machine and performs a variety of functions through reception of the following control codes.

Control code	Function
CR [0DH] (Carriage return)	Data in the printer buffer are printed when the CR code is input. • Printing data (full digits) including spaces are continuously input, and data in the buffer are automatically printed when the subsequent effective data are printing data. • When there are no printing data preceding the CR code or when there are all spaces, the head does not move. • If ESC+0AH (explained later) is previously determined, the paper is fed one line after printing.
LF [0AH] (Line feed)	Data in the buffer are printed and the paper advances one line when the LF code is input. • When there are no printing data preceding the LF code or when there are all spaces, the paper is fed only one line when the LF code is input.
VT [0BH] (Vertical tabulation)	Data in the buffer are printed and vertical tabulation carried out according to a previously determined program (explained later) when the VT code is input.
FF [0CH] (Form feed)	Data in the buffer are printed and form feed (feed to the initial printing position of the following page) carried out according to a previously determined program (explained later) when the FF code is input.
HT [09H] (Horizontal tabulation)	Horizontal tabulation is carried out according to a previously determined program (explained later) when the HT code is input. • The HT code is ignored if the positions of the horizontal tabulation were not previously set.
SO [0EH] (Shift out)	Printing, after the SO code is input, is double size (9x 16 dot). It performs double size printing of the normal printing mode or reduced printing mode (SI code). • The SO code can be input in any position in a line. • If double size characters and normal size characters are mixed in the same line, the 79th character is the final position when changing double size characters to normal size characters. • That function is cancelled by a new line or the DC4 code (explained later).

Control code	Function
	(Example) 1) [SO] + "SHARP" + [CR] + [LF]  2) "SHARP" + [SO] + "COMPUTER" + [DC4] + "SYSTEM" + [CR] + [LF] 
SI [0FH] (Shift out)	Printing after input of the SI code is reduced printing mode for normal size. • There are 136 characters/line when the SI code proceeds. • It becomes the double size character mode when the SO code is input in the SI mode. • The SI mode is cancelled by input of the DC2 (explained later) code. • In the SI mode, the SO mode is cancelled by the DC4 code or the next line. (Example) 1) [SI] + "SHARP" + [CR] + [LF]  2) [SI] + "SHARP" + [SO] + "COMPUTER" + [DC4] + "SYSTEM" + [CR] + [LF] 
DC4 [14H] (Device control 4)	The SO mode (double size character) is cancelled by input of the DC4 code.
DC2 [12H] (Device control 2)	The SI mode (reduced character) is cancelled by input of the DC2 code.
CAN [18H] (Cancel)	All data input before the CAN code on the same line are invalid when the CAN code is input.

Control code	Function
BEL [07H] (Bell)	The alarm bell built into the printer sounds for approximately 3 seconds when the BEL code is input. • The alarm bell sounds when there is no printing paper and when there is trouble with the printing mechanism.
ESC (1BH) + 00H (Escape)	Paper feed pitch after input of the (ESC + 00H) code is 1/9 inch. • Paper feed pitch becomes 1/6 inch, when the (ESC + 02H) code is input, when reset with the initial reset signal (IRT) or when the power is resupplied. However, immediately after that, correct the paper feed pitch to adjust the page.
ESC + 02H	Paper feed pitch after input of the (ESC + 02H) code is 1/6 inch. • 1/6 inch paper feed is automatically set after power is turned on or after resetting.
ESC + 03H	Checks existence of printing paper and responds with status signal ($\overline{\text{STATUS}}$) when the (ESC + 03H) code is input. $\overline{\text{STATUS}}$ is low level: no printing paper is high level: no trouble
ESC + 04H	Checks mechanical condition of the printer and responds with status signal ($\overline{\text{STATUS}}$) when (ESC + 04H) code is input. $\overline{\text{STATUS}}$ is low level: mechanical trouble is high level: no trouble
ESC + 05H	The alarm bell sounds for approximately 2 seconds if there is an error in the input command and parameter after the (ESC + 05H) code is input.
ESC + 06H	It cancels the (ESC + 05H) mode. • It is set to the (ESC + 06H) mode when the power is turned on.
ESC + 08H	No-paper signal from the printing paper check is ignored when the (ESC + 08H) code is input.
ESC + 09H	It cancels the (ESC + 08H) mode. • It is set to the (ESC + 09H) when the power is turned on.
ESC + 0AH	The mode for performing paper feed by input of the CR code is set after input of the (ESC + 0AH) code.
ESC + 0BH	Cancels the (ESC + 0AH) mode. • It is set to the (ESC + 0BH) mode when the power is turned on.

Control code	Function
ESC + 10H + n	It depends on (n) which is determined by values 01H – FFH and makes the one line paper feed pitch n/48H. • It is valid in this mode only when using the (ESC + 02H) mode. • Paper feed pitch is 1/6 inch when not set in this mode.
ESC + 11H + n_1 + n_2 + ... + n_k + NUL	Positions (lines) for vertical tabulation are set with n_1, n_2, ... n_k. NUL as NULL code (00H) is considered the end mark. • Set positions (k) are within 255. • Paper feed pitch of one line is determined by (ESC + 10H + n). • Positions for vertical tabulation should not exceed the length of one page (number of lines). • Paper feed is by single line when the VT code is input, if no vertical tabulation is set. • This mode is completely cancelled when the bit image mode (explained later) is used.
ESC + 12H + n	Number of lines printed on each page is determined by n. • n must be within 255. • Paper feed pitch of one line is determined by (ESC + 10H + n). • There are 66 lines per one page when this mode is not set.
ESC + 13H + n_1 + n_2 + ... + n_k + NUL	Horizontal tabulation positions (characters) are set for k positions with n_1, n_2, ... n_k. NUL is considered end mark with NUL code (00H). • Set positions (k) are within 122. • In the normal size printing mode, that command is ignored when trying to set the tabulation for more than 80 characters. • In the reduced size printing mode, that command is ignored when trying to set the tabulation for more than 136 characters. • It ignores the HT code when the horizontal tabulation positions are not set. • It ignores the HT code when in the double size printing mode. • All these tabulation positions are cancelled when the bit image mode (explained later) is used.
ESC + 14H	Density of printing (stress printing) is controlled after (ESC + 14H) is input. The same characters on the same line are struck twice. • (ESC + 14H) can be input in any position in a line.
ESC + 15H	It cancels stress printing mode (ESC + 14H).

Control code	Function
ESC + 16H	Stress printing is performed after the (ESC + 16H) is input. The difference with stress character printing due to the (ESC+14H) is that paper is fed 1/216 inch when characters are struck the second time in (ESC + 16H). • The (ESC + 16H) code can be input in any position in a line.
ESC + 17H	It cancels the stress printing mode due to (ESC + 16H).
ESC + 18H + (DATA SIZE) + n_1 + n_2 + ... + n_k	It prints in order according to each bit pattern of the data n_1, n_2, ... n_k of the numbers determined by the (DATA SIZE). It is called bit image printing. • (DATA SIZE) is determined by 2 bytes and must be input in the order of lower 8 bits and upper 8 bits. • It makes data $n_1 \sim n_k$ 8-bit data. • It makes data size a maximum of 480 when in the normal size printing mode. • It makes data size a maximum of 816 when in the reduced size printing mode (SI mode). • This bit image printing mode is cancelled after one line is printed. • Vertical and horizontal tabulation are cancelled if they were set before the bit image printing mode is determined. • (ESC+14H) or (ESC+16H) mode is cancelled if it was set previously before the bit image printing mode.
ESC + 19H + (LENGTH)	It makes the word length determined by (LENGTH) the maximum number of characters that can be printed on one line. • (LENGTH) is within 80 in the normal size printing mode. • (LENGTH) is within 136 in the reduced size printing mode (SI mode). • The above mentioned word length determination is cancelled by changing the printing size mode (SI or DC2). • It is set for a word length of 80 characters when the power is turned on.

(Note) Codes, data, parameter, etc. sent to the printer are binary values.

Examples of character printing with the MZ-80P5

- 80 characters/line

```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```

- 40 characters/line

```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```

- 136 characters/line

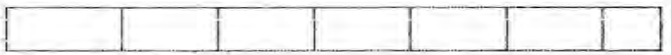
```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```

- 68 characters/line

```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```

- Non-line space mode

```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```



- Line space mode

```
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
MZ-80P5 is a most powerful printer.
```

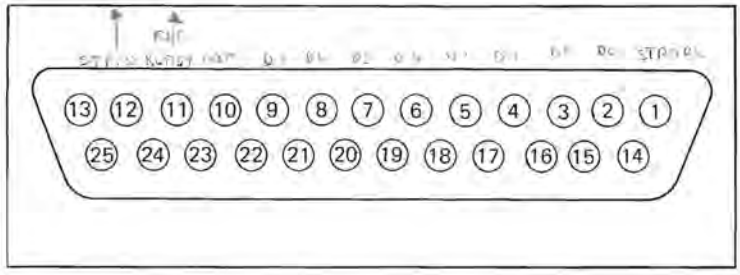
- Bit image printing

Interface

Parallel interface card (built into the MZ-80B) comes as standard for the MZ-80P5. The following is an explanation of this parallel interface.

1. Signal terminal

Pin arrangement of the signal terminal for the interface card which is connected to the printer is as shown in the Fig. on the right.



2. Signal arrangement and explanation

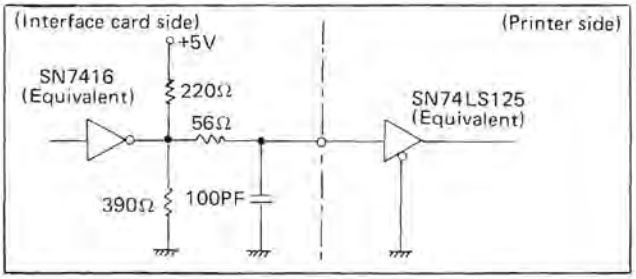
Pin No.	Signal	Direction	Explanation
1	RDP	Input	• This is the strobe signal for data (RD1~RD8) read-in. Data is read in after the signal reaches a high level. • Positive logic
2	RD1	Input	• It shows 8-bit parallel data from the 1st bit to 8th bit. RD1, RD8 match LSB, MSB respectively.
3	RD2	Input	
4	RD3	Input	
5	RD4	Input	
6	RD5	Input	
7	RD6	Input	
8	RD7	Input	
9	RD8	Input	
10	IRT	Input	• It is the initial reset signal and forcedly returns the printer to READY. (Same conditions when turning power on)
11	$\overline{\text{RDA}}$	Output	• It is a signal to indicate whether printing is possible or not (Data can be entered or not). • It is negative logic and data can be entered with the signal at a low level.

Pin No.	Signal	Direction	Explanation
12	$\overline{\text{STATUS}}$	Output	• It responds with this signal, checking whether there is printing paper or not and checking the condition of the printer mechanism in response to status demands from the host machine. • *It is negative logic and this signal is at a high level during correct conditions. • *This signal is at a low level when there is no printing paper or when trouble with the mechanism is caused.
13–25	GND	—	• Logic GND level

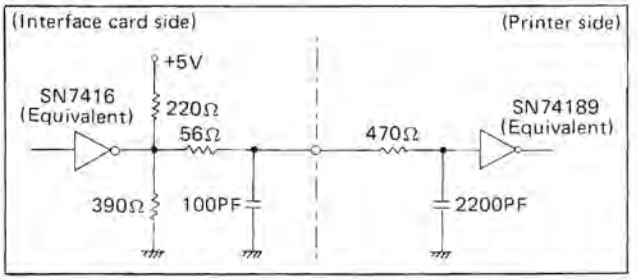
(Note) Signals are all at TTL level.
*(Note) These specifications may be different from former ones.

3. Interface circuit

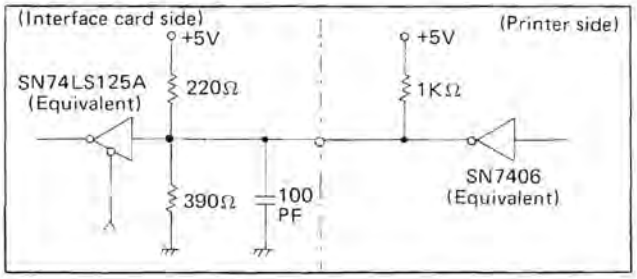
a) RD1–RD8 line



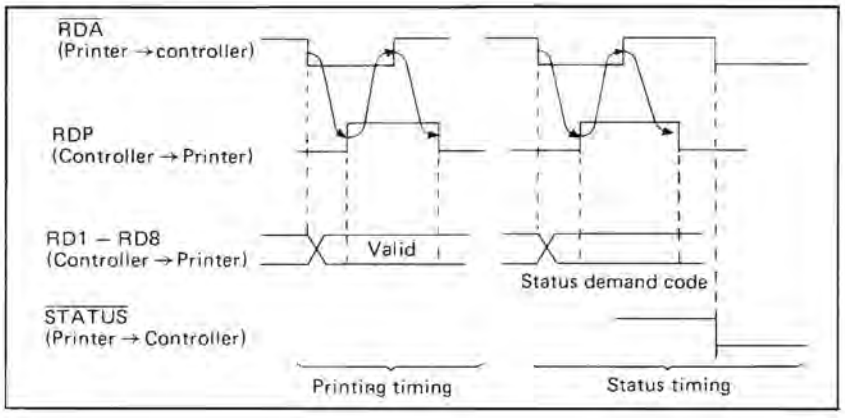
b) IRT, RDP line



c) $\overline{\text{RDA}}$, $\overline{\text{STATUS}}$ line



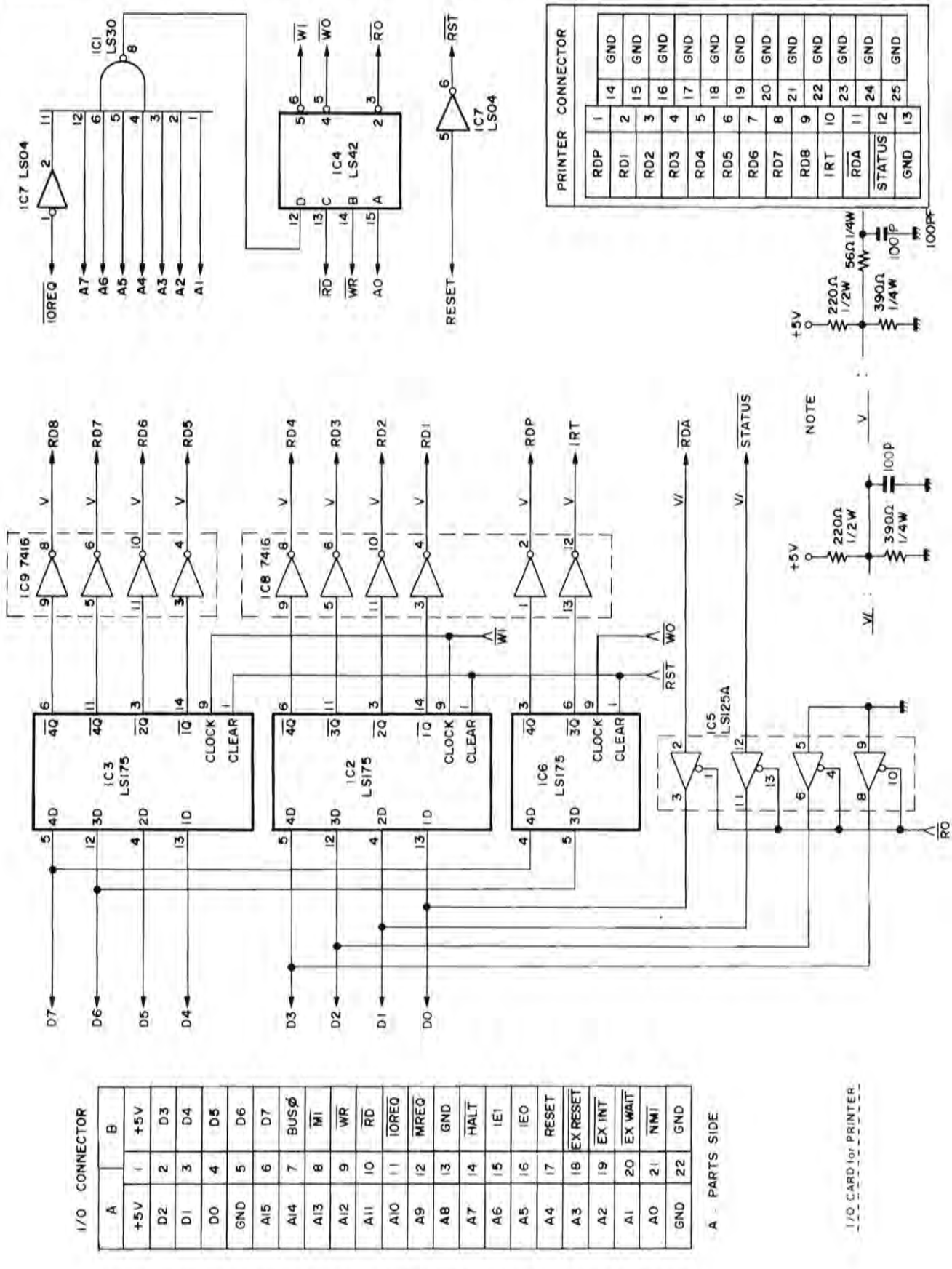
4. Timing chart



5. Port address

The port address for the MZ-80P5's standard interface is as follows.
Input port: FFH
Output port: FEH

Circuit Diagram for Standard Interface Card



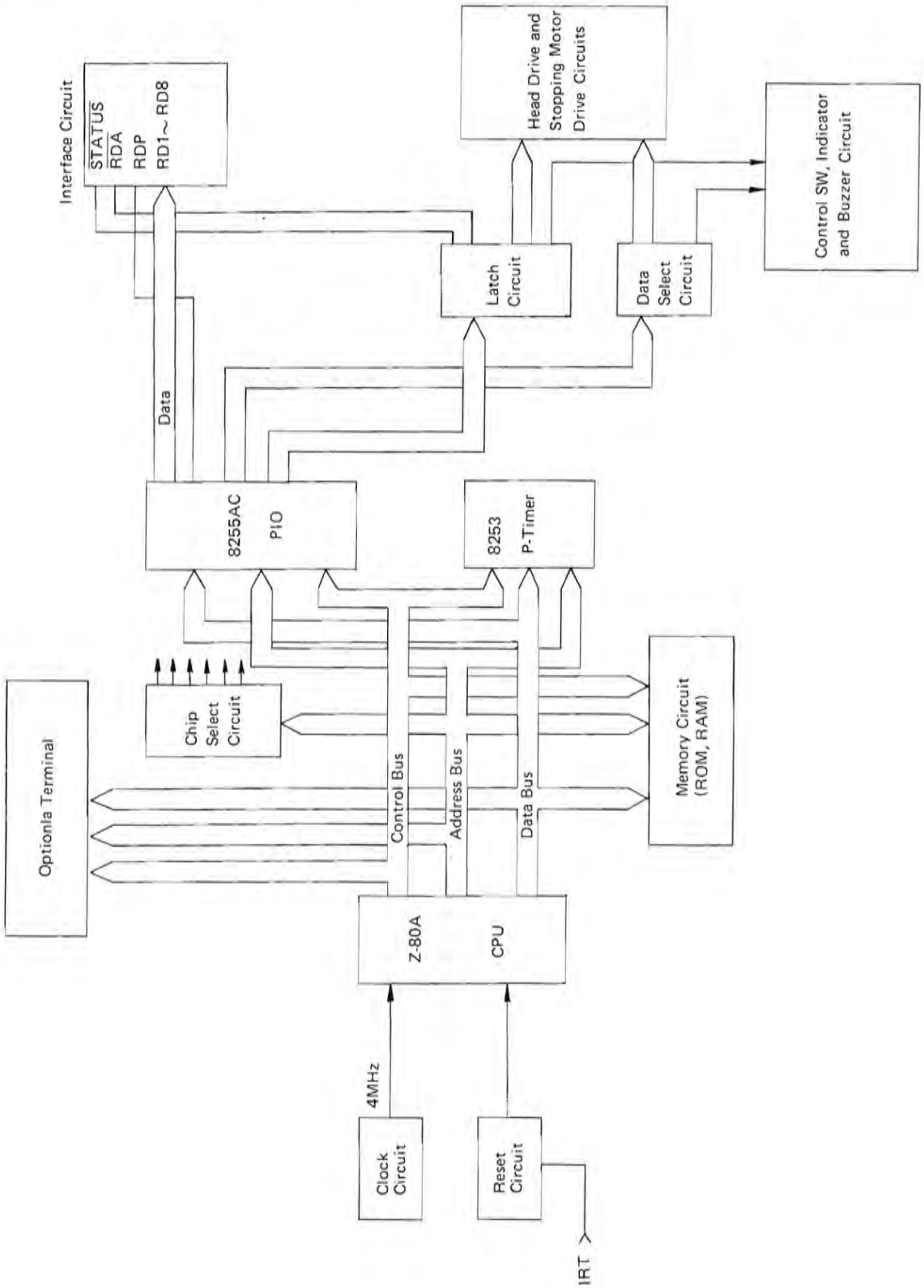
I/O CONNECTOR

A		B
+5V	1	+5V
D2	2	D3
D1	3	D4
D0	4	D5
GND	5	D6
A15	6	D7
A14	7	BUSØ
A13	8	$\overline{MI}$
A12	9	$\overline{WR}$
A11	10	$\overline{RD}$
A10	11	$\overline{IOREQ}$
A9	12	$\overline{MREQ}$
A8	13	GND
A7	14	$\overline{HALT}$
A6	15	IEI
A5	16	IEO
A4	17	RESET
A3	18	$\overline{EX\ RESET}$
A2	19	$\overline{EX\ INT}$
A1	20	$\overline{EX\ WAIT}$
A0	21	$\overline{NMI}$
GND	22	GND

A : PARTS SIDE

I/O CARD for PRINTER

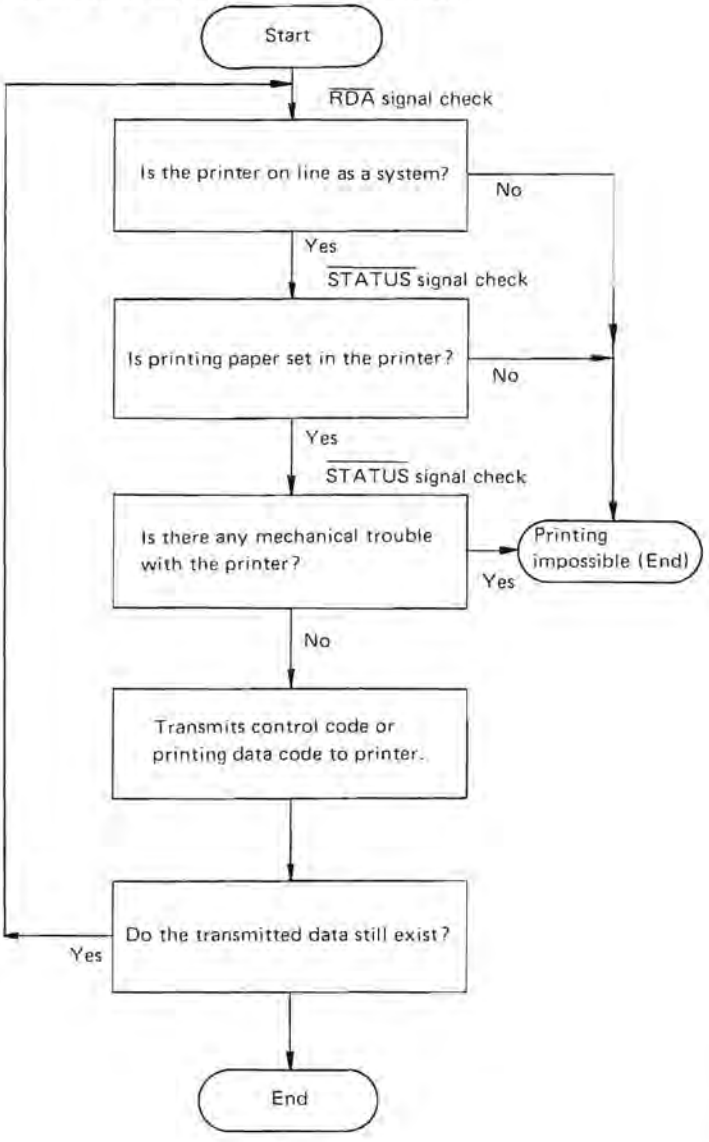
System Configuration of MZ-80P5



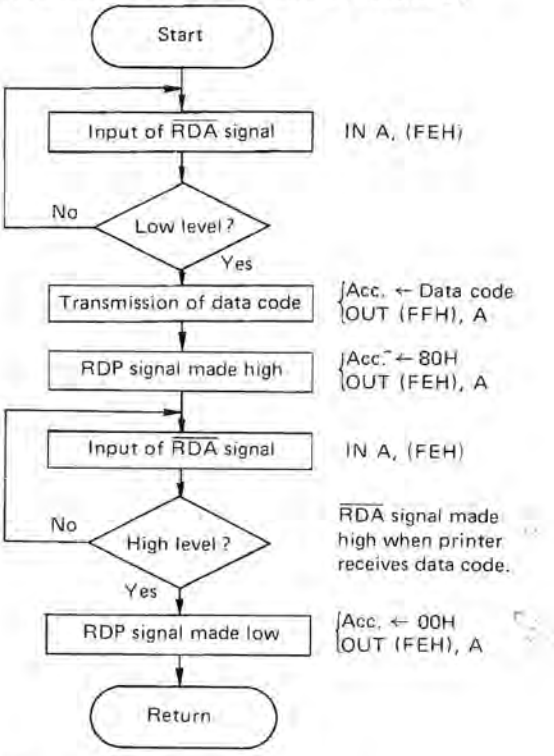
Examples of Control with Machine Language

This shows examples of programs when the MZ-80P5 is controlled by a program written in machine language. Here two programs are mainly taken up; one is the program sending the printing character code or control code to the printer, the other is for checking the status signal. They consist of some subroutine programs.

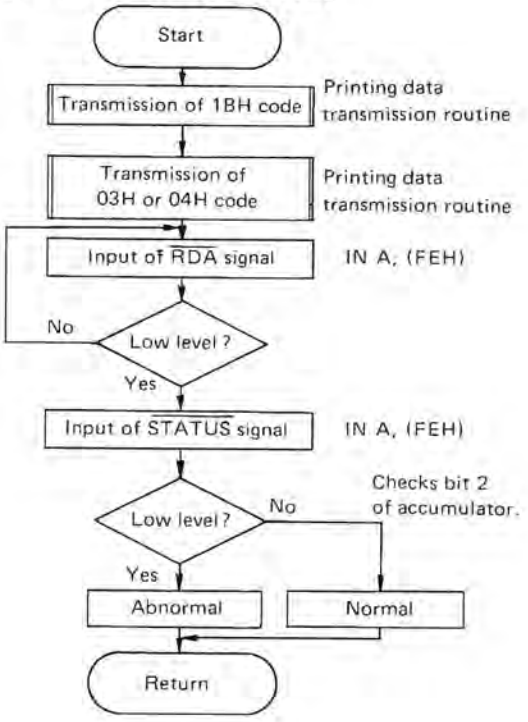
[Method of applying printer control]



[Printing Data Transmission Routine]



[Status Checking Routine]



```
0000                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0000                 ;       PRINTER MZ-80P5 CONTROL SUBROUTINE
0000                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0000                 ;
0000   P             PORT/I: EQU   FEH                ; INPUT PORT
0000   P             PORT/O: EQU   FFH                ; OUTPUT PORT
0000                 ;
0000                 ; JP ABNML: NO POWER, NO PAPER OR MECHANICAL TROUBLE
0000                 ; THEREFORE, MAKE THE PROGRAM FOR ABOVE CONDITIONS
0000                 ;
0000                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0000                 ;       DATA CODE TRANSFER SUBROUTINE
0000                 ;
0000                 ; BEFORE CALL "PRINT", SET TRANSFERED PRINT CODE IN ACC
0000                 ; ALL REGISTOR RESERVED ON NOMAL RETURN
0000                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0000                 ;
0000 F5              PRINT:  PUSH  AF
0001 3E00                    LD    A,00H
0003 CD1600                  CALL  RDA/CK             ; RDA SIGNAL IS LOW?
0006 F1                      POP   AF
0007 D3FF                    OUT   (PORT/O),A         ; DATA TRASFER
0009 3E80                    LD    A,80H
000B D3FE                    OUT   (PORT/I),A         ; IT MAMES RDP HIGH
000D 3E01                    LD    A,01H
000F CD1600                  CALL  RDA/CK             ; RDA SIGNAL IS HIGH?
0012 AF                      XOR   A
0013 D3FE                    OUT   (PORT/I),A         ; IT MAKES RDP LOW
0015 C9                      RET
0016                 ;
0016                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0016                 ;       RDA SIGNAL CHECK SUBROUTINE
0016                 ;
0016                 ; ONLY ACC. IS BROKEN ON NOMAL RETURN
0016                 ; RESARVED EXCEPT ACCUMULATOR(A)
0016                 ; BEFORE CALL "RDA/CK", SET FOLLOWING CODE IN ACC.
0016                 ; A=0:CHECKS IF RDA IS LOW LEVEL
0016                 ; A=1:CHECKS IF RDA IS HIGH LEVEL
0016                 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0016                 ;
0016 C5              RDA/CK: PUSH  BC
0017 D5                      PUSH  DE
0018 57                      LD    D,A
0019 1E0C                    LD    E,0CH
001B 010000                  LD    BC,0000H           ; FOR TIME DELAY
001E DBFE            LOOP:   IN    A,(PORT/I)
0020 E60D                    AND   0DH
0022 BA                      CP    D                  ; CHECKS RDA SIGNAL
0023 2003                    JR    NZ,+5              ; REPEAT
0025 D1                      POP   DE
```

```
0026 C1                  POP   BC
0027 C9                  RET                  ; NOMAL RETURN
0028 0B                  DEC   BC
0029 78                  LD    A,B
002A B1                  OR    C
002B 20F1                JR    NZ,LOOP
002D 1D                  DEC   E
002E 20EE                JR    NZ,LOOP
0030 D1                  POP   DE
0031 C1                  POP   BC
0032 C30000      E       JP    ABNML          ; PRINTER IS NOT ON LINE
0035             ;
0035             ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0035             ;       STATUS INPUT SUBROUTINE
0035             ;
0035             ; A=03H: FOR PAPER CHECK
0035             ; A=04H: FOR MECHA. TROUBLE CHECK
0035             ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0035             ;
0035 47          STATUS: LD    B,A
0036 3E1B                LD    A,1BH          ; 1BH = ESC CODE
0038 CD0000              CALL  PRINT          ; 1BH CODE TRANSFER
003B 78                  LD    A,B
003C CD0000              CALL  PRINT          ; 03H OR 04H TRANSFER
003F 3E00                LD    A,00H
0041 CD1600              CALL  RDA/CK
0044 DBFE                IN    A,(PORT/I)
0046 0F                  RRCA
0047 0F                  RRCA                 ; CARRY FLAG=BIT 2 OF A
0048 C9                  RET
0049             ;
0049             ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
0049             ;       STATUS CHECK SUBROUTINE
0049             ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
0049 3E03        STS/CK: LD    A,03H
004B CD3500              CALL  STATUS         ; PAPER CHECK
004E D20000      E       JP    NC,ABNML       ; PAPER IS LACK
0051 3E04                LD    A,04H
0053 CD3500              CALL  STATUS         ; MECHA. TROUBLE CHECK
0056 D20000      E       JP    NC,ABNML       ; PRINTER UNDER TROUBLE
0059 C9                  RET                  ; NOMAL RETURN
005A             ;
005A                     END
```

** Z80 ASSEMBLER PAGE 03 **

```
LOOP    001E  PORT/I  00FE  PORT/O  00FF  PRINT   0000  RDA/CK  0016
STATUS  0035  STS/CK  0049
```

Character Code Table (ASCII)

The MZ-80P5 has the printing characters and control codes shown below. The table is a matrix structure with the upper 4 bits corresponding to columns and the lower 4 bits corresponding to lines of the ASCII code. For example, the ASCII code for character "A" is 41H (hexadecimal code). ASCII code 20H is a space code. However, ASCII codes from 00H to 1FH in the table show control codes for the printer. (Refer to the section on control codes mentioned previously.)
However, printing is performed as shown in the chart when the printer receives codes from 01H to 06H. (These codes are ignored with BASIC SB-6510 and SB-5510.)
The characters the MZ-80P5 can print, those actually printed by the MZ-80P5, are shown on the following page. (They are a little different from the characters of the MZ-80B.)

Character Code Table

Upper 4 bits / Lower 4 bits	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 0000	NUL			0	@	P	`	p	‖	━	■	0	@	P	`	p
1 0001	⇩		!	1	A	Q	a	q	↓	¥	!	1	A	Q	a	q
2 0010	⇧	DC2	"	2	B	R	b	r	↑	£	"	2	B	R	b	r
3 0011	⇨		#	3	C	S	c	s	→	●	#	3	C	S	c	s
4 0100	⇦	DC4	$	4	D	T	d	t	←	○	$	4	D	T	d	t
5 0101	H		%	5	E	U	e	u	♠	┐	%	5	E	U	e	u
6 0110	C		&	6	F	V	f	v	♥	┘	&	6	F	V	f	v
7 0111	BEL		'	7	G	W	g	w	◆	┌	'	7	G	W	g	w
8 1000		CAN	(	8	H	X	h	x	♣	└	(	8	H	X	h	x
9 1001	HT		)	9	I	Y	i	y	├	┼	)	9	I	Y	i	y
A 1010	LF		*	:	J	Z	j	z	┤	│	*	:	J	Z	j	z
B 1011	VT	ESC	+	;	K	[	k	{	┬	─	+	;	K	[	k	{
C 1100	FF		,	<	L	\	l	|	┴	┴	,	<	L	\	l	|
D 1101	CR		—	=	M	]	m	}	┼	┬	—	=	M	]	m	}
E 1110	SO		.	>	N	^	n	~	┼	┤	.	>	N	^	n	~
F 1111	SI		/	?	O	¯	o	↴	┼	├	/	?	O	¯	o	π

[Character Code Table]

\ UPPER LOWER \	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 0000				0	@	P	`	p	‖	─	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1 0001	⇩		!	1	A	Q	a	q	↓	¥	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2 0010	⇧		"	2	B	R	b	r	↑	£	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3 0011	⇨		#	3	C	S	c	s	→	●	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4 0100	⇦		$	4	D	T	d	t	←	○	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5 0101	⊞		%	5	E	U	e	u	♠	┐	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 0110	⊛		&	6	F	V	f	v	♥	┘	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7 0111			'	7	G	W	g	w	♦	┌	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 1000			(	8	H	X	h	x	♣	└	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9 1001			)	9	I	Y	i	y	├	┼	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
A 1010			*	:	J	Z	j	z	┤	│	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B 1011			+	;	K	[	k	{	π	─	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C 1100			,	<	L	\	l	¦	╨	┴	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D 1101			-	=	M	]	m	}	╫	┬	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E 1110			.	>	N	^	n	~	┼	┤	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F 1111			/	?	O	_	o	↴	╫	├	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	π'

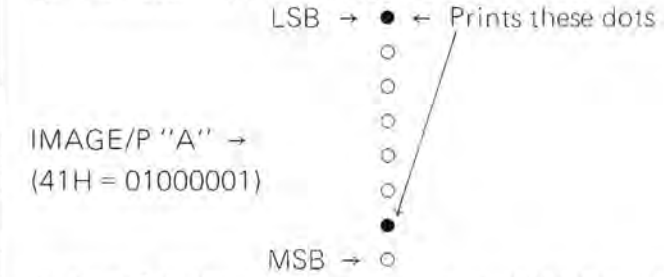
(Actual size)

(Note)
- Reverse characters are not completely reverse patterns of the original characters.
- Understand that reverse character printing in the 136 character/line mode is slightly unclear.

Printer Control with BASIC

With BASIC language, you can easily control the MZ-80P5 and print various formats. Here we will explain a method of printer control based on versions SB-6510 and SB-5510 of BASIC. Also refer to the BASIC Manual for the MZ-80B.

Command	Example	Meaning
LIST/P	LIST/P	Outputs to the printer the complete list of the BASIC text.
	LIST/P –100	Outputs to the printer the BASIC text to number 100.
	LIST/P 100–500	Outputs to the printer the BASIC text from number 100 to 500.
	LIST/P 500—	Outputs to the printer the BASIC text after number 500.
PRINT/P	PRINT/P A$	Outputs to the printer just as it is the contents of string variable A$.
	PRINT/P CHR$ (N)	For an N of 32≦N≦255, it considers this as an ASCII code, and outputs a matching character to the printer. It prints "A" if N = 65.
	PRINT/P CHR$ (5) (Form feed)	Feeds paper to top of the form position on the next page. It is called form feed. The function of the control button "TOP OF FORM" of the printer is controlled by software. **(Note)** It is equivalent to control code (ESC + 02H) of the printer.
	PRINT/P CHR$ (6) (Initialization)	Returns the printing mode to its initial condition. Furthermore, the form feed is carried out. It is called initial mode set. Initial mode means 80 digit mode, line space mode.
	PRINT/P CHR$ (16) (Line space mode)	Sets the printing mode for line spacing. It is called line space mode. **(Note)** It is equivalent to printer control code (ESC + 02H).
	PRINT/P CHR$ (17) (Non line space mode)	Sets the printing mode, completely closing up printing line space. It is called non line space mode. **(Note)** It is equivalent to printer control code (ESC + 00H).

Command	Example	Meaning
PRINT/P	PRINT/P CHR$ (18) (Double size mode)	Sets the mode to double the present printing size of the characters. It is called double size mode. There is a 40 digit mode and a 68 digit mode. **(Note)** It is equivalent to printer control code SO (0EH).
	PRINT/P CHR$ (19) (Cancellation of double size)	Cancels the double size mode. Returns to the 80 digit mode or 136 digit mode. **(Note)** It is equivalent to printer control code DC4 (14H).
	PRINT/P CHR$ (20) (Reduced mode)	Sets the printing mode as reduced characters of the normal size printing (80 digit mode). It is called reduced mode or 136 digit mode. With the bit image mode, it sets the 816 bit data in one line in the printing mode. **(Note)** It is equivalent to printer control code SI (0FH).
	PRINT/P CHR$ (21) (Cancellation of reduction)	Cancels the reduced mode. **(Note)** It is equivalent to printer control code DC2 (12H).
IMAGE/P	IMAGE/P "A"	Prints bit pattern vertically in response to ASCII code for character "A", i.e. in response to 41H.  IMAGE/P CHR$ (65) is equivalent to IMAGE/P "A". This printing is called bit image mode. **(Note 1)** Gives bit image data as string data. **(Note 2)** In the normal size printing mode, the bit image data length is a maximum of 480. (Bit image mode 1) **(Note 3)** With PRINT/P CHR$ (20), the bit image data length is a maximum of 816 (in the reduced mode). (Bit image mode 2)

Command	Example	Meaning
COPY/P		COPY/P command is used for output of the pattern (of one screen) displayed on the CRT screen of the MZ-80B (strictly speaking, data in V-RAM area) to the printer. Therefore, the printed pattern is a copy of the CRT screen. There are four styles of copy as explained below. Dot space of the horizontal line is reduced when it is set in the reduced mode.
	COPY/P 1	If the CRT screen shows data in the character V-RAM area, the data of that one screen is output to the printer.
	COPY/P 2	Within the graphic V-RAM area (graphic area 1, graphic area 2) it outputs data of the one screen contained in graphic area 1 to the printer and performs bit image pattern printing.
	COPY/P 3	It outputs data of the one screen contained in graphic area 2 to the printer and performs bit image pattern printing.
	COPY/P 4	Determines the logical sum (OR) of each bit of data contained in graphic area 1 and 2 as output data to the printer. Consequently, the pattern is printed as a pattern with the two patterns obtained from COPY/P 2 and COPY/P 3 superimposed.
PAGE/P	PAGE/P N	Determines the value of N as the maximum number of lines that can be printed on one page. The number of lines here is the number of lines in the space line mode. N is any integer from 1 to 255. The initial condition is 66 lines for one page.

(Note) • With BASIC, all the functions of the MZ-80P5 can not be used. If you want other controls, make the program yourself.
• With PRINT/P CHR$(M), this command is ignored when M is 0–4, 7–15, 22–31.

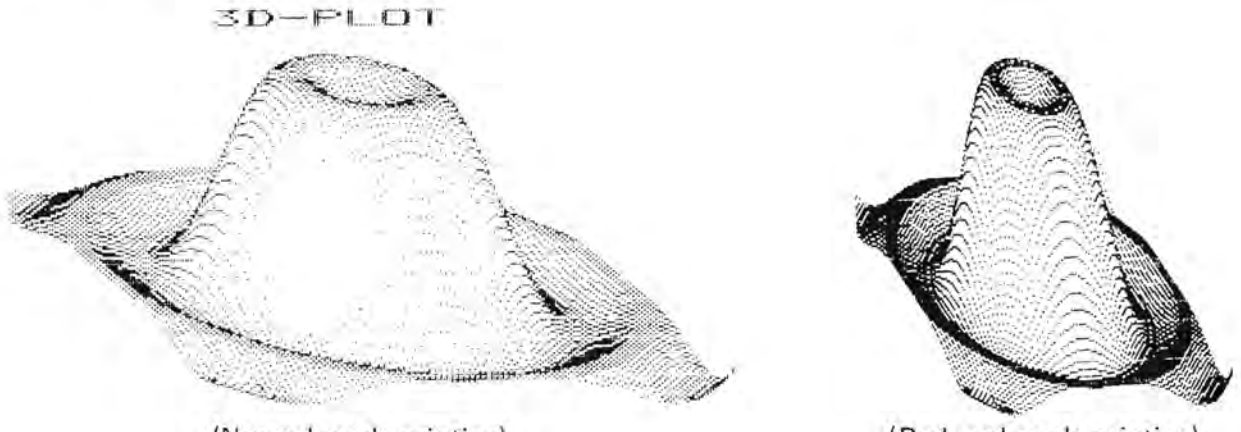
Examples of Printing with BASIC

Program 1. Bit Image Pattern with COPY/P Command

[Program List]

```
100 GRAPH I1:GRAPH C:GRAPH 01
110 PRINT CHR$(6)
120 DIM D(1,255)
130 FOR L=0 TO 255
140 D(0,L)=-1:D(1,L)=-1:NEXT
150 FOR Y=-180 TO 180 STEP4
160 FOR X=-180 TO 180 STEP4
170 R=π/180*SQR(X*X+Y*Y)
180 Z=100*COS(R)-30*COS(3*R)
190 DX=INT(116+X/2+(16-Y/2)/2)
200 DY=INT((130-Y/2-Z)/2)
210 IF (DX<0)+(DX>255) THEN 250
220 IF D(0,DX)=-1 THEN 300
230 IF DY<=D(0,DX) THEN 370
240 IF DY>=D(1,DX) THEN 390
250 NEXT:NEXT
260 PRINT/P CHR$(18);TAB(6);"3D-PLOT"
270 COPY/P 2
280 PRINT/P CHR$(5);CHR$(20):COPY/P 2
290 END
300 IF DX=0 THEN 360
310 IF D(0,DX-1)=-1 THEN 360
320 IF D(0,DX+1)=-1 THEN 360
330 D(0,DX)=INT((D(0,DX-1)+D(0,DX+1))/2)
340 D(1,DX)=INT((D(1,DX-1)+D(1,DX+1))/2)
350 GOSUB 410:GOTO 250
360 D(0,DX)=DY:D(1,DX)=DY:GOSUB 410:GOTO 250
370 GOSUB 410:D(0,DX)=DY:IF D(1,DX)=-1 THEN D(1,DX)=DY
380 GOTO 250
390 GOSUB 410:D(1,DX)=DY:IF D(0,DX)=-1 THEN D(1,DX)=DY
400 GOTO 250
410 SET DX,DY
420 RETURN
```

[Execution Result]



(Normal mode printing)

(Reduced mode printing)

Program 2. Bit Image Pattern with IMAGE/P Command

[Program List]

```
100 A$=CHR$($C0)+CHR$($C0):B$=CHR$($F0)+CHR$($F0)
110 D$=CHR$($FC)+CHR$($FC):E$=CHR$($CF)+CHR$($CF)
120 F$=CHR$($3C)+CHR$($3C):G$=CHR$($FF)+CHR$($FF)
130 H$=CHR$($3F)+CHR$($3F):I$=CHR$($0F)+CHR$($0F)
140 J$=CHR$($33)+CHR$($33):K$=CHR$($03)+CHR$($03)
150 L$=CHR$($C3)+CHR$($C3):M$=CHR$($00)+CHR$($00)
200 I1$=M$+M$+A$+B$+D$+E$+D$+D$+D$+E$+D$+B$+A$+M$+M$+M$+M$
210 I2$=M$+M$+H$+A$+I$+J$+J$+K$+J$+J$+I$+A$+H$+M$+M$+M$+M$
220 I3$=M$+M$+B$+D$+F$+F$+G$+G$+G$+F$+F$+D$+B$+M$+M$+M$+M$
230 I4$=M$+M$+L$+J$+H$+I$+K$+K$+K$+I$+H$+J$+L$+M$+M$+M$+M$
240 PRINT/P CHR$(17)
250 FOR M=0 TO 5:IMAGE/P I1$+I3$+I1$+I3$+I1$+I3$+I1$
260 IMAGE/P I2$+I4$+I2$+I4$+I2$+I4$+I2$
270 PRINT/P:NEXT
280 END
```

[Execution Result]

Specifications

Printing method	Impact dot matrix
Feed method	Variable sprocket feed
Kinds of characters	230 kinds (95 ASCII characters + 95 reverse characters of the 95 ASCII character + 40 other characters)
Character make-up	9(W) x 8(H) dot matrix (normal size character)
Line-to-line space	1/6 inch or determined by program
No. of digits	80 digits, 40 digits, 136 digits, 68 digits or determined by program
Page	66 lines/page (line space mode) or determined by program.
Printing speed	80 cps (characters per second) (ordinary size characters)
Printing direction	Bi-direction (with logical seeking) for normal size character printing (80 characters/line) and its double size character printing (40 characters/line). For bit image printing and other printing; uni-direction (left to right).
Printing paper	Fanfold paper (4 – 10 inch wide)
Copies	Max. of 3 copies (including original)
Printing paper thickness	Within 0.3mm
Ink ribbon	Special cartridge ribbon
Head life	Approx. 50 million characters (14 dot character printing)
Standard interface	8-bit parallel interface (special for Sharp personal computer MZ-80B)
Power supply	Local supply voltage (Should be power supply voltage indicated on rating plate.)
Power consumption	75W
Working temperature	5 ~ 35°C
Storage temperature	–20 ~ 50°C
External dimensions	Approx. 377(W) x 318(D) x 105(H)mm
Weight	Approx. 6.4 kg

(NOTE) Specifications and appearance are subject to change without prior notice for improvement. In such a case, the explanation here may be a little different from the product.

MEMO

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MZ-80P5
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