IMPORTANT

You have just bought the best printer, so be sure to use only the ribbons recommended for it. Original OKI ribbons are the only ones that the manufacturers recommend. Ask for them by name.

Please remember that if you buy any other ribbon your warranty may be invalidated.

Purchasing inferior ribbons really does not make sense. They do not last as long. What is more, they are prone to shredding, which can cause damage to your printhead. Any short term savings on cheap ribbons are quickly lost.

So do not waste your time and money . . . insist on OKI consumables for your OKI printer.

You can order them from your printer supplier.

CONTENTS

SPECIAL NOTE

This manual will help you install and use your new OKI printer. It contains everything you need to know to print with your MICROLINE's special features. If you still need assistance after reading this book, please contact your dealer for fast personal service. If your dealer cannot answer your questions, please ask us.

Every effort has been made to ensure that the information in this document is complete, accurate, and up-to-date. OKI assumes no responsibility for the results of errors beyond its control. OKI also cannot guarantee that changes in software and equipment made by other manufacturers, and referred to in this book, will not affect the applicability of the information in this book.

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IMPORTANT

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

GREEN AND YELLOW	EARTH
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 coloured GREEN AND YELLOW must be connected to the terminal in the plug marked with the letter E or by the safety earth symbol or coloured GREEN or GREEN AND YELLOW. The wire coloured BROWN must be connected to the terminal marked with the letter L or coloured RED. The wire coloured BLUE must be connected to the terminal marked with the letter N or coloured BLACK.

WARNING: THIS APPARATUS MUST BE EARTHED

Ensure that your equipment is connected correctly. If you are in any doubt consult a qualified electrician.

Setting Up Your Printer

Your new OKI printer is packed in a protective container along with this manual and some extra items you will need. These items include:

Paper separator

AC cable

Platen knob (fitted)

Ribbon cartridge
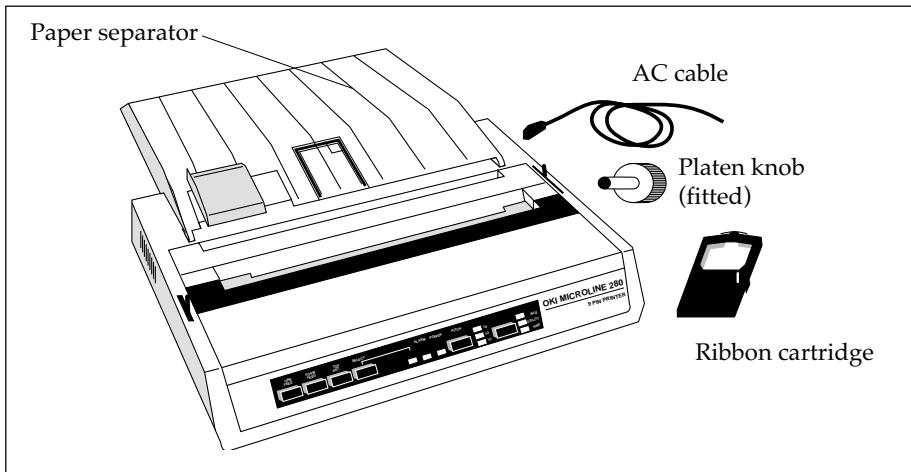
1. Do not plug in your printer until the following steps have been completed.

2. Remove the access cover by inserting your hand in the top cover slot (see figure below) and lifting.

Slot

Access cover
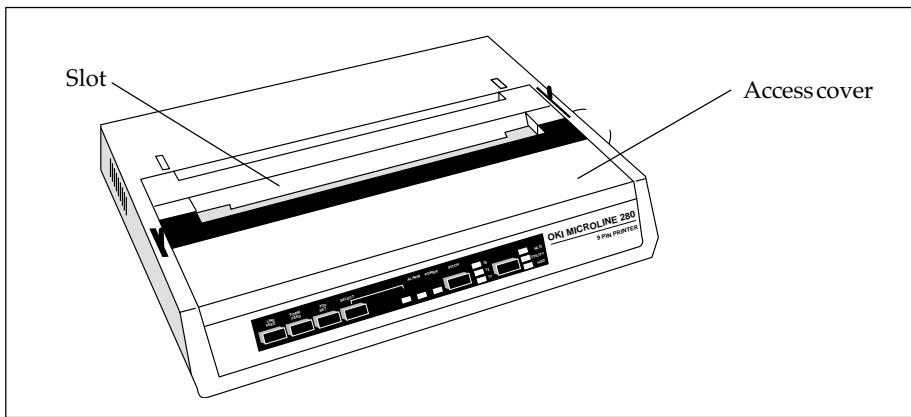
3. Remove the carriage shipping restraint that keeps the print head in place.

Carriage shipping restraint
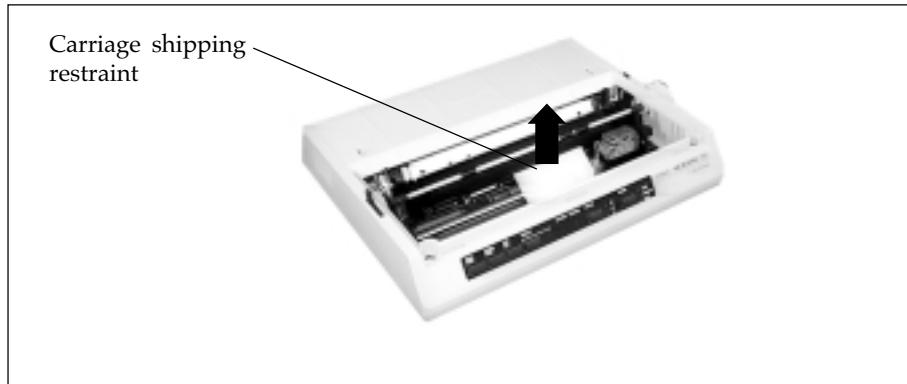
4. Gently slide the print head to the middle of the printer or to the left-hand side so that it is away from the rollers on the column indicator bar.

Print head

Column indicator bar
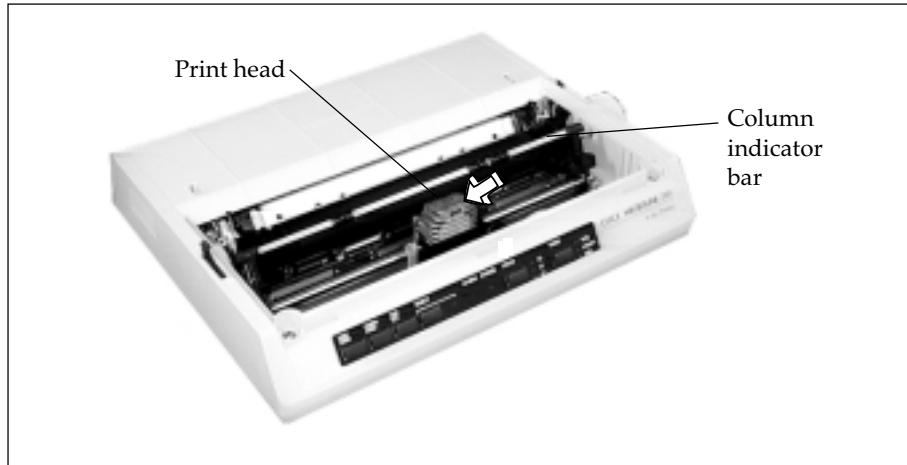
5. Place the black ribbon cartridge on the ribbon cartridge holder. The easiest method is to tilt the back of the cartridge so that it slides into the area of the plate that is nearest the front of the printer, then lower the top of the cartridge (where the plastic ribbon shield is located) over the print head. The tabs on both sides of the cartridge should align perfectly with the inserts on the print head plate.

Important: Only use genuine OKI ribbon cartridges in your printer. Do not remove the ribbon shield.
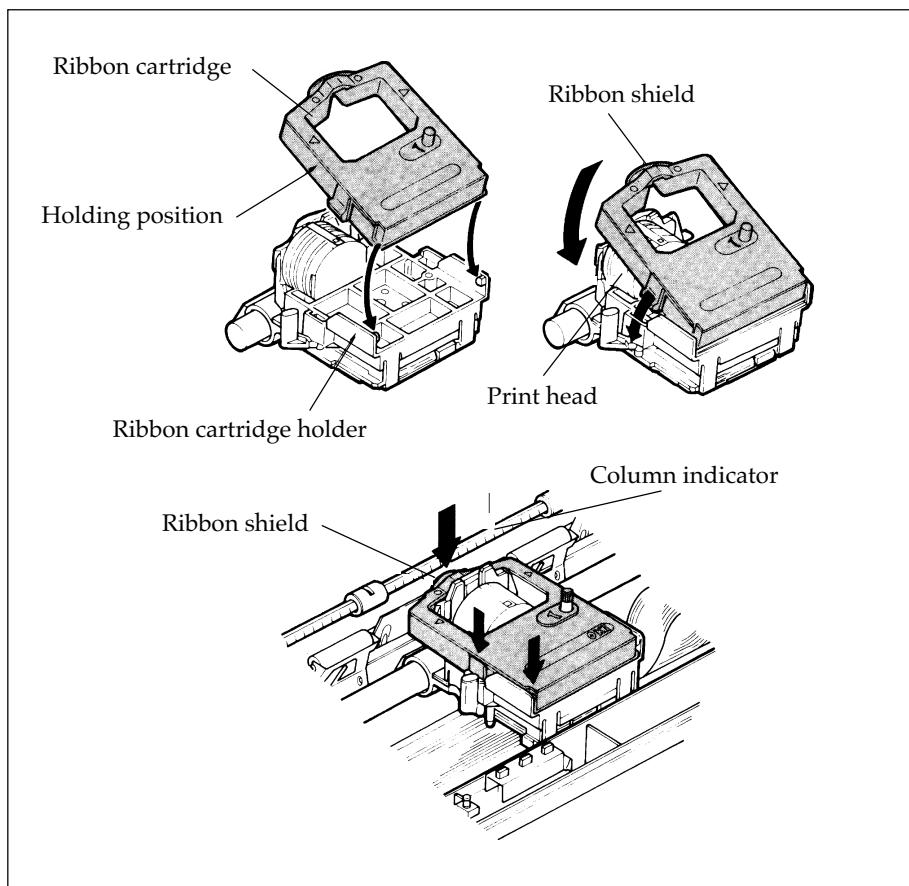
6. Press gently on the cartridge until you feel it snap into place. To remove the ribbon cartridge, make sure the print head is moved away from the edge of the platen, then grasp the cartridge on both sides of the print head and lift up.

7. The three-position blue lever located to the left of the ribbon cartridge is used to adjust the print head gap for single or multi-part paper. When single part paper or two part paper is in the printer, slide the blue lever forwards towards the print head. To print on three or four part paper, slide the lever away from the print head.

Column indicator bar

Paper release lever

Print head gap lever
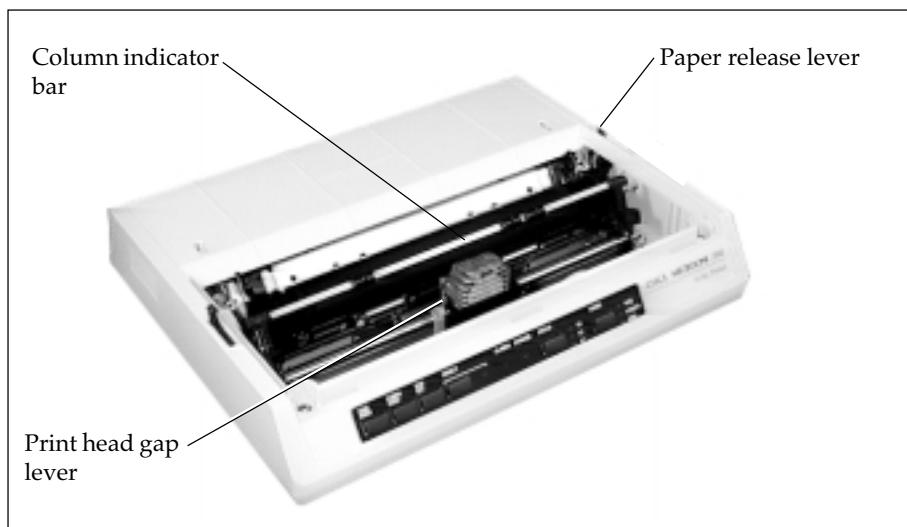
8. The platen knob should already be fitted to the right hand side of the printer. However, if this is not the case, or if it has been removed for any reason, align its slot with the spigot on the platen shaft.

9. Try running a self test to make sure your new printer is working correctly. Insert a piece of computer paper (with sprocket holes) or a single sheet of typing paper into the printer as you would insert it in a typewriter. If you are unfamiliar with typewriters, here is the method:

    a. Open the paper release lever by sliding it towards you.

    b. Insert the paper as far as you can into the slots provided by the black paper guides.

Paper guides

c. Close the paper release lever.

d. Turn the platen knob clockwise away from you to pull the paper around the platen and behind the column indicator bar.

e. Move the column indicator bar back on to the platen so that the rollers rest on the paper you have just inserted.

10. Advance the paper, using the platen knob, until 1 inch of paper appears above the column indicator bar.

11. Replace the access cover:

a. Insert the three tabs in the edge of the access cover into the holes on the top front edge of the printer.

b. Lower the access cover on to the printer.

12. Grasp the paper and pull it through the opening in the access cover. Use the platen knob if you need more paper.

13. Insert the connector end of the power cord into the socket at the rear of the printer.

14. Make absolutely certain that the ON/OFF power switch on the side of the printer is OFF. (A sudden power surge can damage the printer.)

15. Plug the power cord into an earthed (three-pronged) electrical socket.

Important: The printer must be earthed at all times.

16. To print the self test, hold down the LINE FEED button and turn the power switch ON. When the printer is powered on (indicator lights), release the LINE FEED button.

Line feed — SELECT button — SELECT indicator
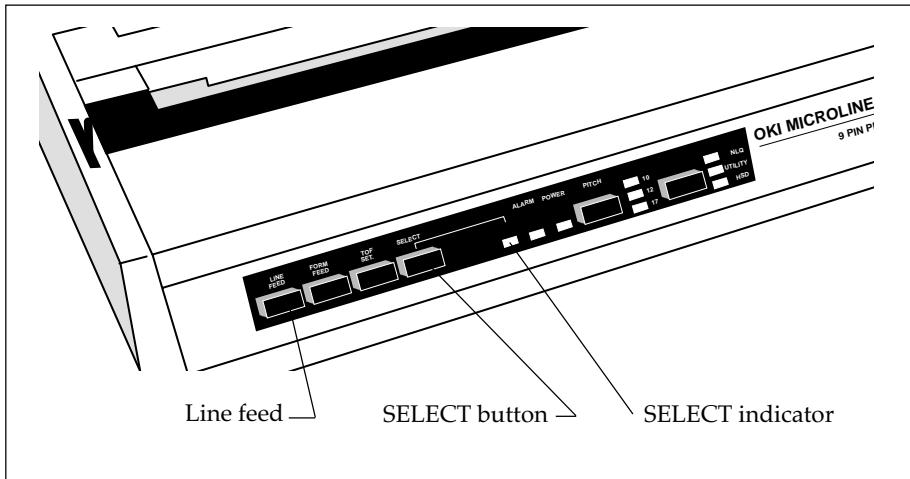
17. The following test pattern will be printed, beginning with a printer revision number that is followed by a rolling character pattern .

```
ML280          EPS    E   F/W 01.00    4YR4100-7200
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvwx
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvwxy
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvwxyz
```

Note: During self test printing the SELECT indicator is not lit.

18. To stop the test, press the SELECT button or turn the power switch OFF.

After the printer has shown that it is functioning correctly, it is ready to be connected to your computer using an interface cable. If you do not have one, see your computer dealer or, if you have the equipment and the technical expertise, make your own cable using the instructions in Appendix C.

Connecting to your computer

You will need either a parallel or serial interface cable to connect your computer to your printer. Before you connect the cable, make sure both printer and computer power is OFF.

Connecting a Parallel Interface

1. Insert the 36-pin plug into the appropriate socket on the rear of the printer.

Parallel interface cable
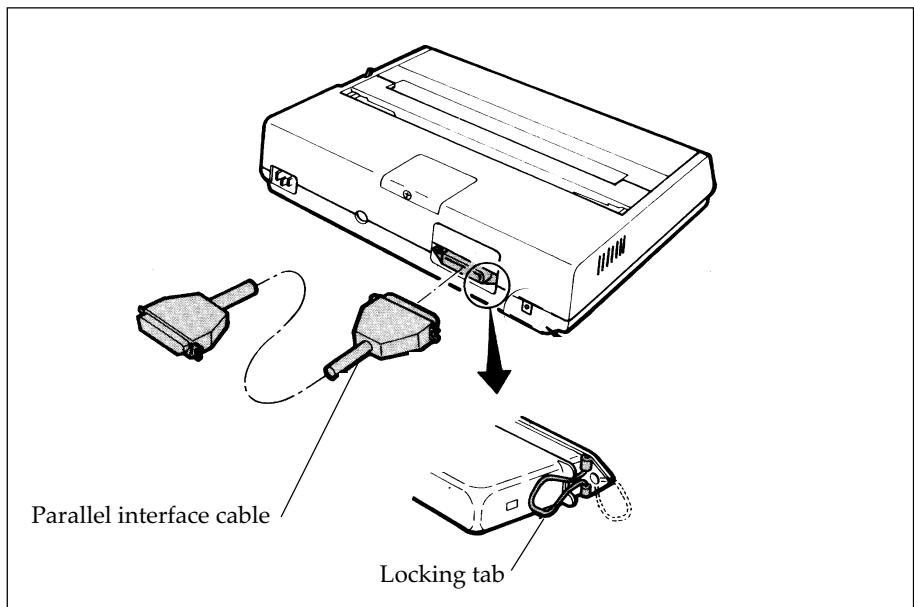
Locking tab

2. Snap the two wire locking tabs on to the plug.

3. Insert the other end of the cable into your computer. You may also connect it to another peripheral device, such as a disk drive, if your equipment is designed for daisy chain connection.

4. Turn on the equipment and try the one line BASIC program shown below, using the proper print statement for your computer (the example uses LPRINT). Make sure you have paper and ribbon in the printer.

5. Type: LPRINT "EVERYTHING'S OKAY" and then run the program.

6. Your printer should print this at 10 characters per inch.

```
EVERYTHING'S OKAY
```

Note: If the printer did not print, make sure you entered the program correctly. Some computers require that you assign a number to the printer and specify that number in your print statement; for example OPEN # 3 means the printer is on line # 3 to the computer.

7. Now try this BASIC program (change it, if necessary, to suit your computer's requirements):

```
10 LPRINT "THIS IS LINE ONE"
20 LPRINT "AND THIS IS LINE TWO"
```

8. The printout should look like this:

```
THIS IS LINE ONE
AND THIS IS LINE TWO
```

If it is overprinted, make a small adjustment to the printer switch settings so that a line feed is automatically inserted at the end of a line. (See Page 1-12 for details.)

Setting the internal DIP switches

Before altering the settings of the eight DIP switches, please read the instructions on Page 1-14. These DIP switches are under the small cover on the top of the printer. They allow the selection of a specific language and to make the printer meet the requirements of your computer. This section describes the switches and their factory settings.

Circuit board control switches

Function switch access hole

Switch cover
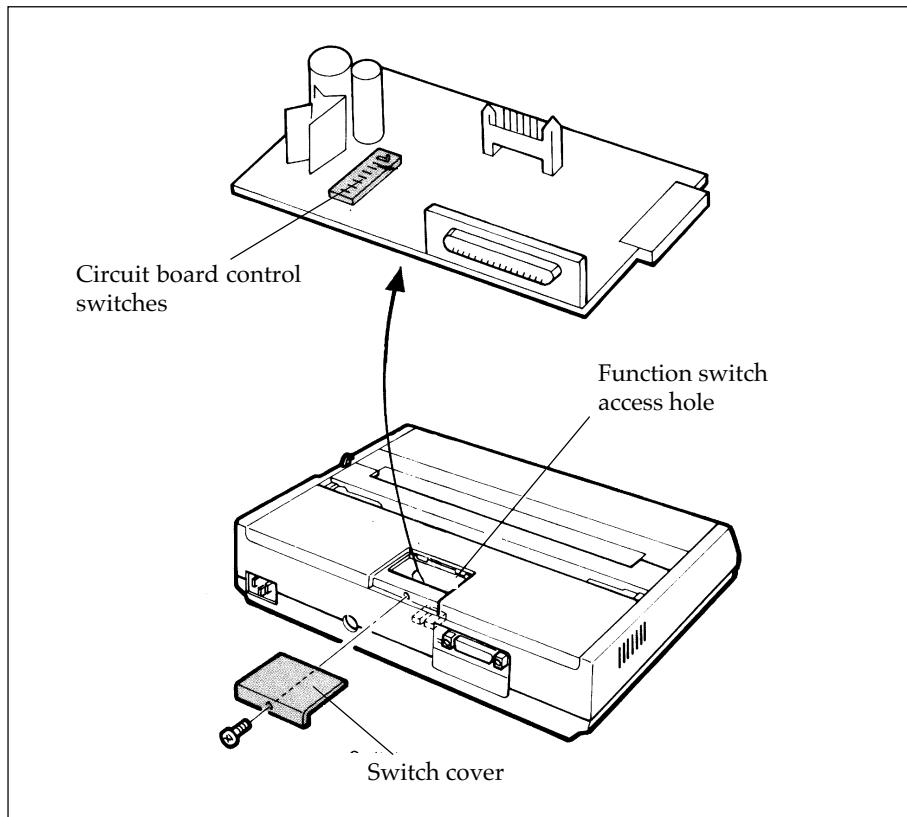
Note: If you have the optional interface board installed, this switch is located on the lower board.

Switches 1 to 5 work in combination to select a foreign language (or computer character set). The following table shows the correct switch settings for all available languages.

Language	Switch Number					Page Length (inches)
	1	2	3	4	5	
USA	OFF	OFF	OFF	OFF	OFF	12
French	ON	OFF	OFF	OFF	OFF	12
German	OFF	ON	OFF	OFF	OFF	12
British	ON	ON	OFF	OFF	OFF	12
Danish 1	OFF	OFF	ON	OFF	OFF	12
Swedish 1	ON	OFF	ON	OFF	OFF	12
Italian	OFF	ON	ON	OFF	OFF	12
Spanish	ON	ON	ON	OFF	OFF	12
Japanese	OFF	OFF	OFF	ON	OFF	12
Norwegian	ON	OFF	OFF	ON	OFF	12
Danish 2	OFF	ON	OFF	ON	OFF	12
Dutch	ON	ON	OFF	ON	OFF	12
Swedish 2	OFF	OFF	ON	ON	OFF	12
Swedish 3	ON	OFF	ON	ON	OFF	12
Swedish 4	OFF	ON	ON	ON	OFF	12
Turkish	ON	ON	ON	ON	OFF	12
Swiss 1	OFF	OFF	OFF	OFF	ON	12
Swiss 2	ON	OFF	OFF	OFF	ON	12
USA	OFF	ON	OFF	OFF	ON	11
French	ON	ON	OFF	OFF	ON	11
German	OFF	OFF	ON	OFF	ON	11
British	ON	OFF	ON	OFF	ON	11
Danish 1	OFF	ON	ON	OFF	ON	11
Swedish 1	ON	ON	ON	OFF	ON	11
Italian	OFF	OFF	OFF	ON	ON	11
Spanish	ON	OFF	OFF	ON	ON	11
Japanese	OFF	ON	OFF	ON	ON	11
Norwegian	ON	ON	OFF	ON	ON	11
Danish 2	OFF	OFF	ON	ON	ON	11
Dutch	ON	OFF	ON	ON	ON	11
Swedish 2	OFF	ON	ON	ON	ON	11
Swedish 3	ON	ON	ON	ON	ON	11

It is recommended that you set the printer for the language or character set you use most. You can use a program command (see Page 3–9) to change to another language within a document, so it is not necessary to change these switch settings if you use more than one language.

Switch 6 is the automatic line feed selection. Before shipment, it is set to OFF. If you discover that your text is being overprinted, it may be because your computer does not send a line feed at the end of a line. In that event, set this switch to ON and the printer will insert an automatic line feed at the end of each line. If your computer automatically sends a line feed at the end of every line you can use this feature to double space a document by setting it to the ON position.

Switch 7 selects the slashed or unslashed zero font. The slashed zero font should be chosen when it is important to distinguish between a zero and a capital O. The switch is set to OFF to select the unslashed zero and to ON to select the slashed zero.

Switch 8 selects the roll paper stand (RPS) or the cut-sheet feeder (CSF) To select the cut-sheet feeder move this switch to the ON position.

Changing the DIP-switch settings

All the switches are set to OFF when the printer leaves the factory.

To reset the switches, proceed as follows:

1. Make sure the printer is OFF and the power cable is unplugged.
2. Using a Phillips-head screwdriver, remove the screw on the switch cover at the back of the printer and remove the cover.
3. Use a sharp tipped instrument, such as a ballpoint pen or toothpick, to slide the appropriate switch(es) to the required new setting.
4. Replace the switch cover and tighten the screw.

Optional Accessories

Roll paper stand

Tractor feed option kit

Tractor feed unit

Access cover

Acoustic cover

Cut Sheet Feeder

Rear sheet support

Front sheet support

Left paper guide

Cut-sheet feeder unit

Paper test lever

Front sheet guide
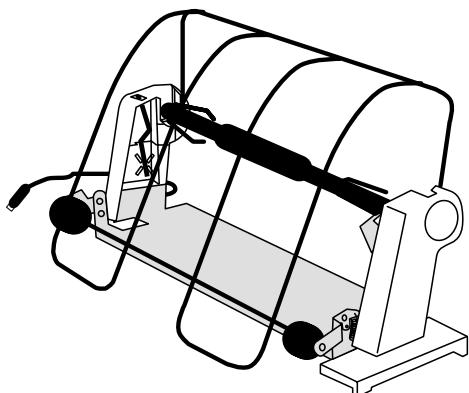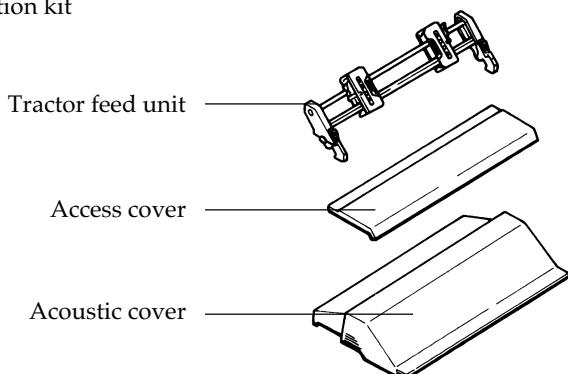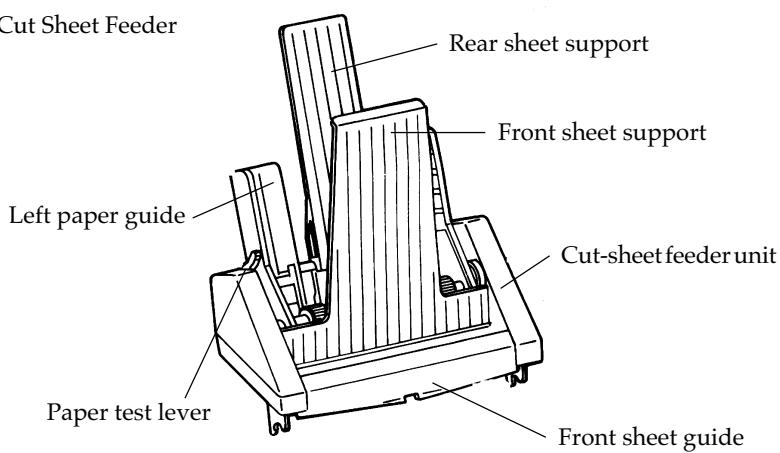
Interface Equipment

RS-232C serial board
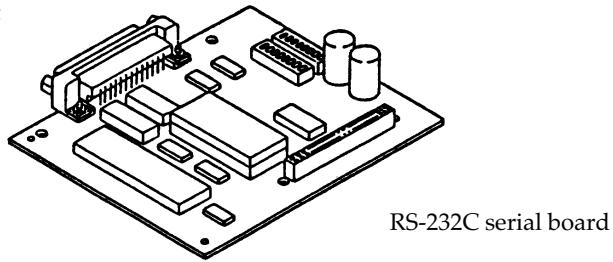
Operating Your Printer

Buttons, levers and indicators

Before using your printer, it is worth familiarising yourself with the buttons, levers and indicators on the printer and to understand the various methods of loading paper.

The front panel of the printer has six buttons, two of which were briefly introduced in the setup procedure. In addition, there are nine indicator lights that show the status of the printer, mode and pitch selected.

LINE FEED	FORM FEED	TOF SET	SELECT	ALARM	POWER	PITCH	MODE
						■ 10	■ NLQ
						■ 12	■ UTILITY
						■ 17	■ HSD
	BUTTONS			INDICATORS			
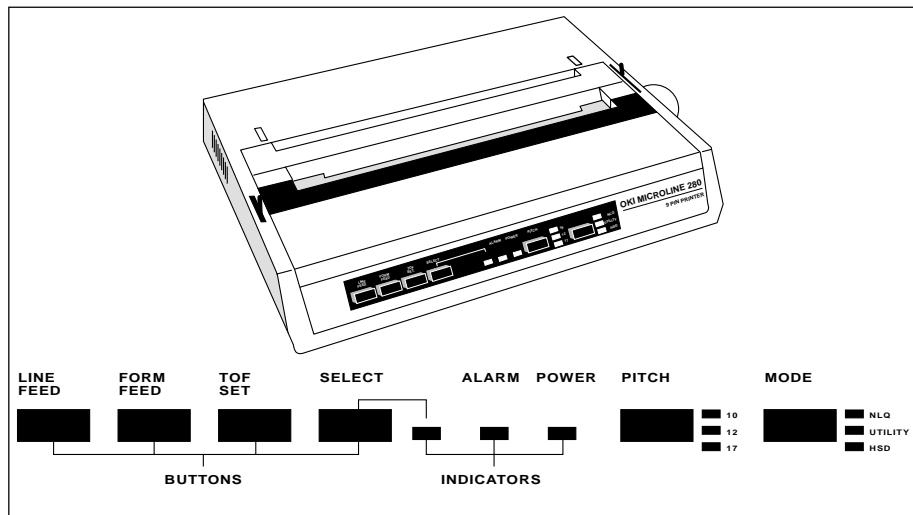
POWER Indicator: Indicates that the printer power is turned ON .

SELECT Button: Pressing this button after the printer power is ON places the printer in deselect mode. In this mode the computer cannot communicate with the printer. To return to select mode, simply press this button again. Turning the printer ON whilst holding down the SELECT and FORM FEED buttons switches on the HEX-dump mode.

Hex mode generates data rather than text, and a sample is shown below. To terminate this mode, switch the printer supply off and on again.

```
Hex Data Dump

1B 41 08 0D 0A 1B 32 0D 0A 1B 4B 00 01 01 02 03      .A....2...K.....
04 05 06 07 08 09 0A 0B 0C 0D 0A 0E 0F 10 11 12      ................
13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22      .............. !"
23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32      £$%&'()*+,-./012
33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F 40 41 42      3456789:;<=>?@AB
43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52      CDEFGHIJKLMNOPQR
53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62      STUVWXYZ[\]^_`ab
63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72      cdefghijklmnopqr
73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F 80 81 82      stuvwxyz{|}~....
83 84 85 86 87 88 89 8A 8B 8C 8D 8E 8F 90 91 92      ................
93 94 95 96 97 98 99 9A 9B 9C 9D 9E 9F A0 A1 A2      .............. !"
A3 A4 A5 A6 A7 A8 A9 AA AB AC AD AE AF B0 B1 B2      £$%&'()*+,-./012
B3 B4 B5 B6 B7 B8 B9 BA BB BC BD BE BF C0 C1 C2      3456789:;<=>?@AB
C3 C4 C5 C6 C7 C8 C9 CA CB CC CD CE CF D0 D1 D2      CDEFGHIJKLMNOPQR
D3 D4 D5 D6 D7 D8 D9 DA DB DC DD DE DF E0 E1 E2      STUVWXYZ[\]^_`ab
E3 E4 E5 E6 E7 E8 E9 EA EB EC ED EE EF F0 F1 F2      cdefghijklmnopqr
```

Switching on the printer supply whilst holding down the SELECT and LINE FEED buttons will generate a rolling ASCII character display. Pressing the SELECT button stops this test. A sample is shown below.

```
ML280    IBM    E  F/W 01.01    YR4067-7145
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
```

TOF SET Button: To set the first line position on each page (Top of Form), deselect the printer, hold down the TOF button and press the FORM FEED to move the paper up, or the LINE FEED to move the paper down until the print head is in the desired position.

	Release and then press the TOF SET button to record the position, then reselect the printer by pressing the SELECT button. 17.1 character per inch can be selected by holding down the TOF SET button when switching the printer supply on.
SELECT Indicator:	Works together with the SELECT button. Lights when the printer is selected (ready to receive data from the computer). It is not lit when the printer is deselected or during self tests. If an abnormal status is detected during the self test, the indicator flashes.
FORM FEED Button:	Pressing this button advances the paper to the top of the next page, as set by the TOF SET button. NLQ (Near Letter Quality) print can be selected with this button by holding it down whilst switching on the printer supply.
ALARM Indicator:	Lights when paper runs out (unless the alarm disable command has been used). Printing stops until the paper supply is replenished. It also lights if a jam is detected whilst using the CSF. It also flashes if high temperatures are detected in the printhead or space motor. Allow the printer to cool down before re-using.
LINE FEED Button:	Advances the paper one line when the printer is deselected. A demonstration page illustrating the print styles available on your printer can be generated by holding down this button whilst switching on the printer supply. When the demonstration page is completed, the printer will automatically revert to 10 cpi Utility mode. An example of this printout is on the next page.

```
ML280    IBM    E   F/W 01.01    YR4067-7145
```

UTL 10 CPI ... for speed and easy readability !
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└
┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

NLQ 10 CPI ... for high quality correspondence !
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└
┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

NLQ 12 CPI
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Ç
üéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀α
ßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

UTL 12 CPI
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Ç
üéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀α
ßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

UTL 17 CPI
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñ
Ñªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

SSD
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■ !"#$%&'()*+,-./0123
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôö
òûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

HSD 10 CPI
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»αßΓπΣ
σµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abc
defghijklmnopqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»αßΓπΣ
σµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

HSD 17 CPI
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñ
Ñªº¿⌐¬½¼;«»αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»αßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

UTL 10 CPI Double Width
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿ
ÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└
┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦ
ΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

NLQ 12 CPI Double Width
```
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Ç
üéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜø£Ø׃áíóúñÑªº¿⌐¬½¼;«»▒░▓│┤╡╢╖╕╣║╗╝╜╛┐└
┴┬├─┼╞╟╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀α
ßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

PITCH Button: This button allows manual character pitch selection. The appropriate lamp lights upon selection. The lamps also light as software changes are implemented, for example, normal to condensed.

MODE Button: Similar function to above, but this refers to the print quality selected: NLQ, Utility or High Speed Draft.

The levers on the printer allow you to adjust the paper.

PAPER LOCK / RELEASE LEVER: Open (slide forwards) for inserting paper, and adjusting paper, and when using tractor fed computer paper. Close (slide back) for use with roll paper and for single sheets.

PAPER GAP ADJUSTMENT: This lever selects the use of fan-fold or single sheet paper, as shown by the symbols at the two extremities of its slot.

Move the lever to:

for fan-fold paper

for single sheet paper.

Paper loading

Three types of paper can be used with your printer:

- Single sheet paper — with/without the optional cut-sheet feeder
- Roll paper — using the optional roll paper stand
- Fan-fold paper — with without the optional tractor feed unit.

Illustrations on the installation and use of the above mentioned optional extras follow later in this chapter.

When using fanfold paper, adjust the distance between the sprocket pins at the ends of the platen to correspond to the holes in the paper. See Page 2-16 for full details.

Fan-fold paper can be fed from the rear of the printer, or, if a slotted printer stand is available, from the bottom.

Rear Feed Paper Loading:

1. Put the printer on a desk or table.

2. Place the box of paper behind the printer.

3. Remove the access cover and lift the column indicator bar.

4. Open the paper release lever.

5. Insert the first sheet of paper in the paper guides.

6. Push the paper in just enough so that its sprocket holes engage the sprocket pins located on the platen ends.

7.   Turn the platen knob to advance the paper until it appears in front of the platen.

Paper guides

Column indicator bar

Paper release lever
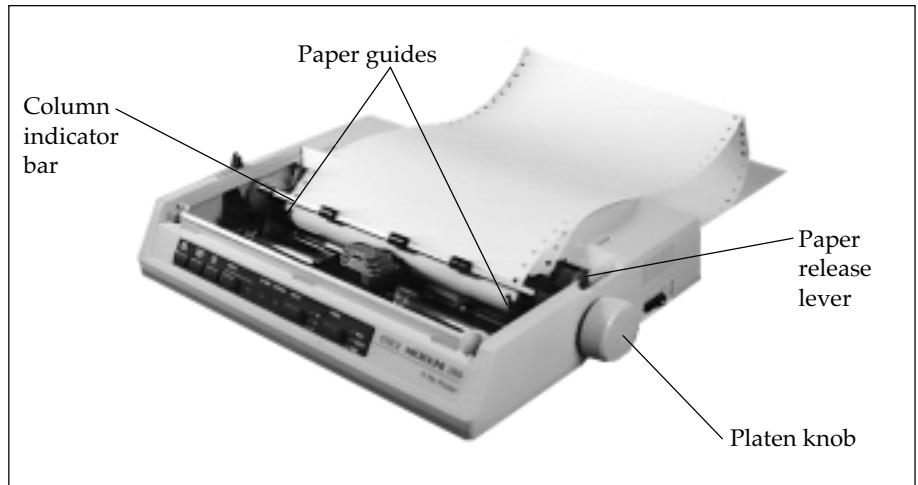
Platen knob

8. Lower the column indicator bar.

9. Use the platen knob to advance the paper to the first printing line.

10. Replace the access cover.

Bottom Feed Paper Loading

1. Place the printer on a slotted printer stand, carefully aligning the slot in the stand with the opening in the base of the printer.

2. Place the box of paper under the printer stand.

3. Remove the access cover and lift the column indicator bar.

4. Pull the paper release lever towards the fan-fold paper symbol.

5. Insert the first sheet of paper through the opening in the bottom of the printer.
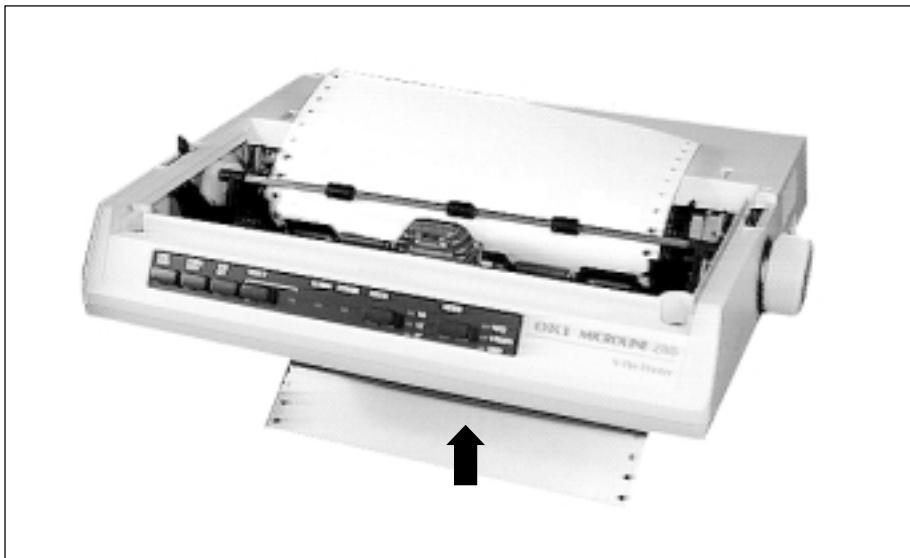
6. Slide the paper up until it appears in front of the platen.

7. Lower the column indicator bar.

8. Use the platen knob to advance the paper to the first printing line.

9. Replace the access cover.

Loading single sheets

Your printer can accomodate single sheets of 216 by 297 or 355mm (8.5 by 11-inch or 14-inch) paper. Only one copy, with no carbons, can be printed at a time.

Remove the tractor feed unit and any other accessories before using the paper separator.

Operation

1. Place the paper release lever in its closed (rear) position.

2. Switch the printer OFF-LINE (press the SELECT switch).

3. Close the paper bail lever (To its rearward position).

4. Raise the paper separator as shown in the figure below.

5. Adjust the cut sheet guide on the paper separator to position the left edge of the paper sheet.

Line mark
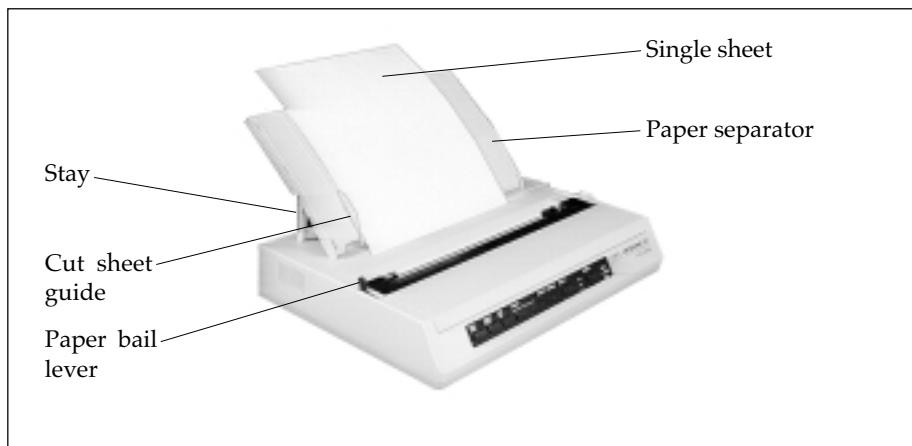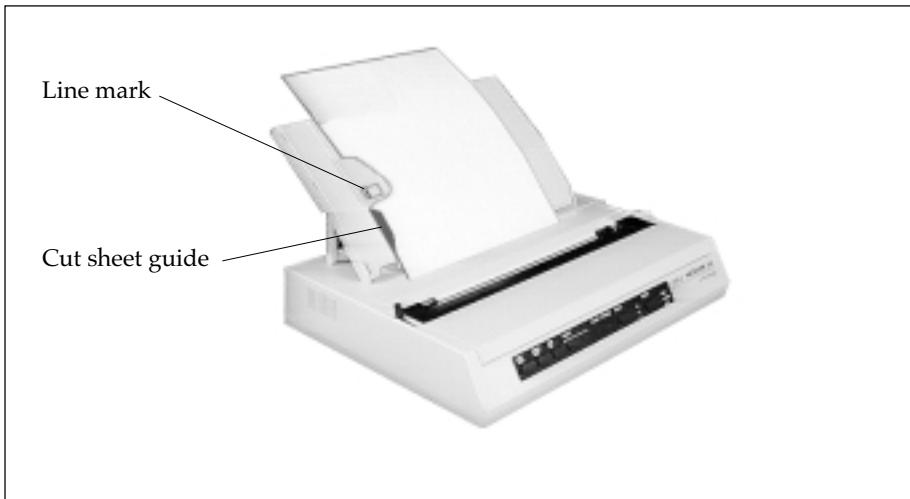
Cut sheet guide

NOTE: When letter-size paper is used, set the cut sheet guide to the line mark on the paper separator. 80-character width text (10 CPI) is then positioned centrally on the paper.

6. Insert a single sheet along the cut sheet guide until it reaches the pinch roller. Be sure to keep the paper inside the platen ends otherwise the built-in sprocket pins will tear it.

7. Open the paper bail lever by pulling it towards the front of the printer. The sheet of paper will be pulled around the platen.

8. Close the paper bail lever, ensuring that the paper has been positioned correctly.

9. Press the SELECT button to bring the printer ON-LINE.

Chapter 3
Programming

Now that you are familiar with the outside of the printer, you can begin printing documents using the default settings of the printer, that is, the kind of printing your printer is set up to do when you turn it on:

Utility Mode*
10 characters per inch
6 Lines per inch
Horizontal tabs at every eighth character
Vertical tabs at one inch intervals

This may be all you ever need.

If you plan to print tables, charts, graphics, or documents with indented text, subscripts, superscripts, etc., you should read this chapter to learn how and when to use the special printing features.

First, here are the available printing options:

Carriage Return:	If your computer does not automatically add a carriage return at the end of a line, you may add one to your program.
Unidirectional Printing:	With this method, characters are printed from left to right, which is useful for tables and charts where accuracy is important.
Horizontal Tabs:	Sets tabs at predetermined intervals; perfect for accounting reports, tables, and charts.
Line Spacing:	Gives you a choice of 6 or 8 lines per inch.
Formatting:	Adjusts printing to a particular paper size, controls the line where printing begins, and automatically advances the paper when less than 1 inch remains at the bottom of a page. See skip over perforation function.

* NLQ mode will be selected by pushing the FORM FEED switch during power-up.

Skip Over Perforation:	If you use fanfold paper with your printer, you may need to use this command to instruct the printer to automatically advance the paper over the perforations.
Character Pitch:	You can change from 10 to 12 or 17.1 characters per inch and you can also double the character width (10 characters per inch to 5 characters per inch, 12 characters per inch to 6 characters per inch and 17.1 characters per inch to 8.5 characters per inch).
Enhanced/Emphasized:	Prints characters in a bolder type, commonly used for titles and subtitles.
Underlining:	Underlines a word or group of words.
Character Sets:	Choose from two different character sets; IBM character set one or two is selectable. There is also a switch selection which enables you to power up the printer in either set and to establish the default character set.
APA Graphics:	Enables you to draw graphs, charts, and pictures.
Cancel:	Clears the data in the print buffer.

What you do next depends on whether you have invested in a software package. If you have, skip to page 3-17 for advice on how to add these features to your prepackaged software. If you do not have a software package, continue reading.

The printer will not do certain things unless you specifically tell it to. You instruct the printer to change the way it prints by sending special codes through your computer. When you write a program, you include the codes for printing features you want in your program. In BASIC, for example, include them in an LPRINT statement.

Basic Programming

If you are familiar with programming, skip this section and go straight to the control codes.

Although we wrote our examples in Microsoft's BASIC programming language, the principles are similar for other languages. The examples demonstrate how to select a few of your printer's special features and try them. Later the features are explained in detail.

An LPRINT statement, or print statement, tells the computer to send information to the printer. Take a minute to check your BASIC manual to find out what form this takes in your version of BASIC.

Make sure your printer is ready to print (ribbon in, paper loaded, power ON, SEL indicator lit) and experiment a little with the print commands.

Type the following one-line program:

    LPRINT "WHO YOU GONNA CALL?"

2. Press RUN, then RETURN or CR.

3. The printer will then print:

```
   WHO YOU GONNA CALL?
```

Computers cannot understand letters. They use only numbers, more specifically, binary numbers (1s and 0s). When carrying out an LPRINT command, the computer sends the printer a code number for each character (letter, symbol, punctuation mark) within the quotation marks. As the printer receives each number, it prints the dot pattern associated with that number.

The American Standard Code for Information Interchange (better known as ASCII) is the standard code used by computers. Appendix D gives the ASCII code numbers along with their hexadecimal, binary, and decimal equivalents. You can enter these ASCII numbers directly in your LPRINT statement by using the CHR$ (Character String) function.

The CHR$ command sends the ASCII command in parentheses to the printer. For example, we can write a program this way:

LPRINT CHR$(79);CHR$(75);CHR$(73)

This is obviously a tedious way to write, but you need to understand the concept when you want to use certain commands.

Keep in mind that there is a big difference between ASCII code numbers and numbers that are printable characters. For example, if you want to print the number 1 using an LPRINT statement, you would type this:

　　　LPRINT CHR$(49)

You can also print numbers and symbols by putting them within quotes, like this:

　　　LPRINT "1"

So far, we have discussed printable characters, ASCII codes located between decimal 32 and decimal 127. Non-printable codes, located between 0 and 31, do not tell the printer to print something. They instruct the printer how to print something. The ASCII chart in the back of this handbook shows that these codes have abbreviations, such as FF and US. Some of these abbreviations make sense (FF, for instance, stands for form feed) but others do not unless you are a telecommunications expert.

Let us try a few, starting with the ASCII non-printable code US. When the printer receives the SO command, it will print the next data with double width.

    10 LPRINT "HELLO"
    20 LPRINT CHR$(14); "HELLO"

Now run the program. This is what you should get:

```
    HELLO
    HELLO
```

ASCII code SO is non-printable, so you must use the decimal or hexadecimal form of the command within a CHR$ statement. Nothing in quotes will work. Like most commands that change the way the printer is printing, the SO (double width) command remains in effect until either the end of a line is reached or you send a command to cancel it. See what happens if you run the sample program a second time:
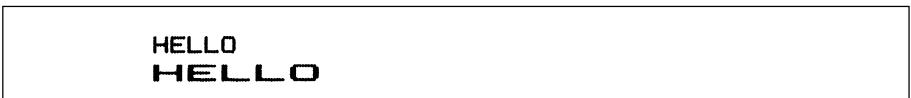
```
    HELLO
    HELLO
```

The second time, the first line is printed standard width. Because the SO command is not in effect by the end of a line. To return to standard size printing (10 characters per inch) you have to put in CHR$(20), like this:

```
10 LPRINT"HELLO"
20 LPRINT CHR$(14);"HELLO";CHR$(20);"___HELLO AGAIN"
```

Note: _ means space.

That is what you should get:

```
HELLO
HELLO      HELLO AGAIN
```

To avoid any unpleasant surprises, you may want to insert codes at the end of a document to cancel whichever feature(s) you selected and to reset the printer to the normal start-up condition.

If you have a Software Package

Software packages make the printer's special features, such as smaller type fonts, subscripts, underlining, etc., much easier to use. To add the features to your package, read your software documentation for instructions, paying particular attention to any limitations—for example, some software packages let you select a printing feature for an entire document but do not allow you to change features within a document. Other packages may not accept the page formatting commands, such as horizontal tabs, which are available with your printer.

When you install your package, you probably need to select the features you are going to be using from a list called a menu. Several software packages actually list names of printers on the menu, so that all you need to do is select the IBM Graphic printer from that list—the software package will then automatically use the commands for your printer. If they are not on the menu, pick the closest general description; "Teletype printer that does not backspace" is often the best.

With some software packages, such as WordStar, you can easily modify or install your program to accept your printer's commands by inserting codes into the program. Still other packages let you embed commands within a document itself by preceding the command with "/OUT" or something similar. VisiCalc is a popular package that provides a setup option as part of the printing procedure—you simply specify at the beginning of a document what printing features you will be using.

If your computer is equipped with BASIC, you have an alternative to selecting features. After you load BASIC, run a simple one or two line program telling the printer to change a feature(s).

Without turning the printer off, load and run your software package. For example, suppose you wanted to print at 12 characters per inch:

1. Load BASIC

2. Type the command: LPRINT CHR$(27);CHR$(58)

Note: You do not have to know how to program to do this, but be sure to check your computer documentation to see what statement to use (we use LPRINT) before each command. Not all versions of BASIC are the same.

3. Press RUN, then RETURN or CR.

4. Without turning the printer off, enter your software package.

What you have just typed causes the computer to send a command to the printer to go into 12 characters per inch mode. When you load and run your software, all printing thereafter will be at 12 characters per inch until you turn the printer off or send a command to change the characters per inch setting.

There is one exception to this method, however: You cannot use this method if your computer sends an I-Prime signal before you load a program. An I-Prime signal is sent by some computers to cancel any special commands that were previously in effect so that you can start fresh with each new document.

Programming the printer

For each printing feature explained in this chapter, three different forms of each code are listed as follows:

ASCII	Decimal	Hexadecimal
ESC 1 Standard abbreviation in ASCII-used for reference	27 49 Standard presentation of Decimal Code. A variation of the same command is CHR$(27);CHR$(49)	1B 31 Hexadecimal code used by some software packages to enter printing commands. A variation of the same command is CHR$(&H1B); CHR$(&H31)

Carriage return and line feed

ASCII	Decimal	Hexadecimal
CR	13	0D

Carriage return tells the printer to print the line of data and returns the print head to the left side of the page. IBM PC adds a line feed after a carriage return unless 128 is added to the command. If you send a CHR$(141), therefore the result is just a carriage return; for IBM SET 1 only.

ASCII	Decimal	Hexadecimal
LF	10	0A
VT	11	0B

Line feed advances the paper one line; line spacing is 1/6 inch unless it is reset.

Horizontal Tabulation

ASCII	Decimal	Hexadecimal
ESC D 0	27 68 0	1B 44 00

Horizontal tabs are set at every 8th character when power is first switched ON. To eliminate the tab settings, use the ESC D 0 command.

Horizontal Tabbing

ASCII	Decimal	Hexadecimal
HT	9	09

Advances to the next tab position which occurs every 8th character. The command is ignored if it exceeds the right margin or the maximum number of settings.

```
20 LPRINT "TAB";
30 LPRINT CHR$(9);"TAB AGAIN"
```

```
TAB      TAB AGAIN
```

Line Spacing

The default line spacing for the printer is 6 lines per inch. This means that when the printer power is turned on, the spacing from the bottom of one line to the bottom of the next line on the same page is automatically set to 1/6 inch. This is also the normal spacing of a standard typewriter.

The line spacing can be changed to 8 lines per inch to fit more lines of printing per page, and for special effects, you can also vary line spacing in multiples of 1/72 or 1/126 inch. This affects space between lines only, not the height of the characters.

ASCII	Decimal	Hexadecimal
ESC 0	27 48	1B 30

The ESC 0 command sets line spacing to 1/8 inch.

ASCII	Decimal	Hexadecimal
ESC 1	27 49	1B 31

The ESC 1 command sets line spacing to 7/72 inch.

ASCII	Decimal	Hexadecimal
ESC A n	27 65 1-85	1B 41 01-55

The ESC A command is a user-selectable line space setting that enables you to choose a setting in increments of 1/72 inch. You can select a maximum line space setting of 85/72 inches, which is the equivalent of one printed line every 1-13/72 inches.

ASCII	Decimal	Hexadecimal
ESC 2	27 50	1B 32

The ESC 2 command implements the line spacing set by the ESC A command. Should no ESC A command precede the ESC 2 command, the default line spacing (6 LPI) will be activated by the ESC 2 command.

Fine Line Spacing

ASCII	Decimal	Hexadecimal
ESC 3 n	27 51 1-255	1B 33 01-FF

The ESC 3 command is a user-selectable line space setting command that lets you choose a setting in increments of 1/216 inch. You can select a maximum line space setting of 255/216 inches, which is the equivalent of one printed line every 1-39/216 inches. (See Note).

ASCII	Decimal	Hexadecimal
ESC J n	27 74 1-255	1B 4A 01-FF

The ESC J command allows you to interrupt the set line spacing and reset the line spacing for a single line to a multiple of 1/216 inch. You can select a maximum space setting of 255/216 inches, which is the equivalent of a 1-39/216 inches line space. Upon receipt of the ESC J command, the printer prints out the line containing the command and advances the paper the distance specified by the command. Line spacing then returns to the previous setting, and the printer continues to print. (See Note).

Note: (For ESC 3 and ESC J) The standard IBM printer advance is expressed in multiples of 1/216 inch. IBM-compatible MICROLINE hardware performs paper advances in multiples of 1/144 inch rather than 1/216 inch; therefore, MICROLINE software automatically multiplies the number specified in ESC 3 and ESC J statements by 2/3 to perform the most precise IBM emulation.

If the multiples specified in your ESC 3 or ESC J statements are not evenly divisible by 3, fine line spacing may be slightly more or slightly less than you specified. If the number you selected leaves a remainder of 1 when it is divided by 3, spacing will be slightly less than specified. If the number you selected leaves a remainder of 2, spacing will be slightly more than specified. When the number you select is evenly divisible by 3, fine line spacing is always exact.

The ESC A line spacing selection, which selects line spacing in multiples of 1/72 inch, is always accurate.

Page Length Setting

ASCII	Decimal	Hexadecimal
ESC C n (in lines)	27 67 1-127	1B 43 01-7F
ESC C NUL n (in inches)	27 67 0 1-22	1B 43 00 01-16

The printer page length set is user selectable in either inch or line increments where n is either a two or three digit number. Selectable line length settings range between 1 to 127; selectable inch length settings range between 1 to 22. The line length default setting is 66 lines per page (11 inches) with a 6 LPI line spacing. You can also set page length using the internal switch setting.

Top of Page

ASCII	Decimal	Hexadecimal
ESC 4	27 52	1B 34

The top margin on a page can be set by issuing this command.

Wherever the print head is at the time this command is given will be the first printing line. You can also set the top of page using the TOF switch on the outside panel.

Form Feed

ASCII	Decimal	Hexadecimal
FF	12	0C

Prints the data in the print buffer, returns the carriage, then advances the paper to the top margin of the next page.

Note: (TRS-80 owners only.) This command is not valid with your computer.

Skip Over Perforation

ASCII	Decimal	Hexadecimal
ESC N n	27 78 n (n = 1-127)	1B 4E n (n= 01-7F)
ESC O	27 79	1B 4F

If n is any value between 1 and 127, the printer automatically advances to the top margin of the next page when there is only 1 inch left at the bottom of a page. (This command is ignored if the value of n is more than page length.)

In order to deselect Skip Over Perforations use the command ESC O. In BASIC format, the value of n must appear in a CHR$ statement.

Changing Character Size

ASCII	Decimal	Hexadecimal
DC2 (10 CPI)	18	12
ESC : (12 CPI)	27 58	1B 3A
SI (17.1 CPI)	15	0F
SO (double width)	14	0E
DC4 (cancels double width before line end)	20	14
ESC W 1	27 87 49	1B 57 31
ESC W 0	27 87 48	1B 57 30

The character size switches to 10 characters per inch (CPI) after the printer receives the DC2 command. The character size becomes 12 CPI when the ESC: command is received and 17.1 CPI when the SI command is received.

Note: When the power is turned on while the TOF switch is depressed, the printer is set to 17.1 CPI. You can also set the printer to 17.1 CPI at power ON by setting internal switch 2 to the condensed print mode. The printer will print in 17.1 CPI until power is turned OFF or a command is sent to change the character size.

You can double the width of 10, 12, and 17.1CPI print by inserting the US command after the character size you want doubled. This command doubles the size of characters that follow the command on one line. The DC4 command can also be implemented on the same line as an SO command. The DC4 command cancels double width printing before the end of a line. This enables you to emphasize specific words or characters within a single line, and to automatically return to your preselected type size.

The ESC W 1 and ESC W 0 commands override both DC4 and SO commands, and can be utilized to either permanently implement or cancel double-width printing within a program or document. The ESC W 1 command implements double-width printing; the ESC W 0 command cancels it.

Character size can be changed in the middle of a line unless your software package does not allow you to do that. The table below indicates the maximum number of characters per line in each character size:

Size	Command	Maximum Characters per line
10 CPI	DC2	80
12 CPI	ESC :	96
17.1 CPI	SI	132
5 CPI	DC2 SO	40
6 CPI	ESC : SO	48
8.5 CPI	SI SO	66

Note: Some forms of BASIC will not allow you to print more than 80 characters on a line. Check your BASIC manual to see if you can override this limitation by using a WIDTH statement.

```
10  LPRINT CHR$(18);"PICA pica 10 cpi"
20  LPRINT CHR$(27);CHR$(58);"ELITE elite 12 cpi"
30  LPRINT CHR$(15);"CONDENSED condensed 17 cpi"
40  LPRINT CHR$(18);"Back to 10 cpi"
50  LPRINT CHR$(14);"Double pica"
60  LPRINT CHR$(27);CHR$(58);CHR$(14);"Double elite"
70  LPRINT CHR$(15);CHR$(14);"Double condensed"
```

```
PICA pica 10 cpi
ELITE elite 12 cpi
CONDENSED condensed 17 cpi
Back to 10 cpi
Double pica
Double elite
Double condensed
```

Underlining

ASCII	Decimal	Hexadecimal
ESC - 1 (n: odd)	27 45 49	1B 2D 31
ESC - (n: even)	27 45 48	1B 2D 30

Use the ESC - command to start underlining a word or group of words. Use the ESC - command to stop underlining. The printer will continue to underline until the command is given to stop it (either ESC - 0, or the printer is powered down). (Because the underline is drawn by the ninth dot, the last dot in some descender characters will be overlapped.)

Underlining under the spaces designated by horizontal tabs is also available.

```
10  LPRINT "This line is not underlined"
20  LPRINT CHR$(27);"-";CHR$(1);"but this line is underlined"
30  LPRINT CHR$(27);"-";CHR$(0);"This line is not underlined"
```

```
This is not underlined
but this is underlined
This line is not underlined
```

Superscript and Subscript

ASCII	Decimal	Hexadecimal
ESC S 0	27 83 48	1B 53 30
ESC S 1	27 83 49	1B 53 31
ESC T	27 84	1B 54

If you want to print superscript characters (characters appearing above the normal print line), send the ESC S 0 command before the characters, symbols, or word(s) you want printed in superscript. To return to printing on the normal print line, use the ESC T command.

If you want to print subscript characters (characters appearing below the normal print line), use the ESC S1 command before entering the characters. To return to printing on the normal print line, use the ESC T command.

Superscript and subscript characters are printed in normal characters.

```
10 LPRINT "This is ";
20 LPRINT CHR$(27);"S";CHR$(0);"superscript"
30 LPRINT CHR$(27);"T";"This is ";
40 LPRINT CHR$(27);"S";CHR$(1);"subscript"
50 LPRINT CHR$(27);"T";"This is back to normal."
```

This is ^superscript

This is ~subscript

This is back to normal

Enhanced and Emphasized Printing

ASCII	Decimal	Hexadecimal
ESC E	27 69	1B 45
ESC F	27 70	1B 46
ESC G	27 71	1B 47
ESC H	27 72	1B 48

Enhanced printing provides a deeper resolution of each character because each dot contained in a normal character is doubled vertically, creating a darker impression. The ESC G command is a good feature to use for headlines and subtitles and can be used in conjunction with double-width characters.

Emphasized printing, obtained by entering the ESC E command, causes each character to be doubled horizontally, creating a bolder image for titles, subtitles, or emphasizing word(s) within a document.

To return to the normal character set from emphasized mode, enter the ESC F command. To return to the normal character set from enhanced mode, enter the ESC H command. Neither feature is available for subscripts or superscript characters nor in line graphics.

Emphasized and enhanced printing can also be done simultaneously for special effects.

```
10 LPRINT CHR$(27);CHR$(71);"ENHANCED"
15 LPRINT CHR$(27);CHR$(72)
20 LPRINT CHR$(27);CHR$(69);"EMPHASIZED"
25 LPRINT CHR$(27);CHR$(70)
30 LPRINT CHR$(27);CHR$(71);CHR$(27);CHR$(69);
"ENHANCED/EMPHASIZED"
35 LPRINT CHR$(27);CHR$(72);CHR$(27);CHR$(70)
```

ENHANCED

EMPHASIZED

ENHANCED/EMPHASIZED

Character Sets

ASCII	Decimal	Hexadecimal	Character Set
ESC 6	27 54	1B 36	II
ESC 7	27 55	1B 37	I

If you use Spanish for all your documents it is better to make the selection on the internal switches so that the printer normally uses that language.

Cut Sheet Feeder

ASCII	Decimal	Hexadecimal
ESC EM I	27 25 73	1B 19 49
ESC EM R	27 25 82	1B 19 52

If you are printing program outputs using the Cut-Sheet Feeder, you must include the Cut-Sheet Feeder insert and eject commands. When the printer receives the PRINT command, it inserts a sheet of paper and starts printing. Each time the printer receives the Cut-Sheet Feeder insert command, it ejects the printed sheet then inserts a new sheet. Use the Cut-Sheet Feeder eject command at the end of your program if you want the printer to eject the printed sheet without inserting a new sheet.

You can use the CHR$(27); CHR$(25); "I" command to insert a new sheet of paper from the hopper. If paper is already in the printer this sheet will be ejected first before the new sheet is fed in. (In normal use this is achieved by using the FF code).

Should you wish to eject a sheet then use the CHR$(27); CHR$(25); "R" command.

Note: A LF command at the end of a page also causes the next sheet to be loaded.

Bit Image Graphics

ASCII	Decimal	Hexadecimal
ESC K	27 75	1B 4B
ESC L	27 76	1B 4C
ESC Y	27 89	1B 59
ESC Z	27 90	1B 5A

Using bit image graphics, you can draw almost any kind of illustration with your printer.

Bit image graphics mode enables your printer to draw almost any kind of illustration by printing a dot at any location on the page. Your IBM-compatible MICROLINE will work properly with any graphics software package designed for the IBM Personal Computer and IBM Graphics Printer. No software modification is required; images will be printed without distortion.

If you have IBM DOS you can use a software package (or BASIC commands such as CIRCLE, LINE, and DRAW) to create an image on the display screen (your software or BASIC manual will explain how), then dump it on to the page via the Prt Sc command key on your computer. The next section, Screen Dumps, gives some examples.

The section called Programming Bit Image Graphics explains what you need to know in order to write your own graphics programs in BASIC without using the screen dump method.

Screen Dumps

This feature lets you print a reproduction of any image on your display screen. Simply press the SHIFT key and the Prt Sc key at the same time; whatever is on the screen will be printed on the page.

Programming Bit Image Graphics

You can also write a program that prints a graphics image directly, without transferring it from the display screen. This section explains how to do this using BASIC statements.

Your printer prints graphics images in successive columns of eight dots. The LPRINT statement that tells the printer to do this has three components:

● The control code sequence that puts the printer into graphics mode,

● The number of columns to be printed, and

● The coded data that tells the printer which dots to print in each column.

First, we discuss each part separately, then put them together.

There are four modes of bit image graphics available with the IBM-compatible MICROLINE. They differ in horizontal resolution, or density. This indicates how close together the dots are; it is measured by the number of dots per inch. All modes have a vertical resolution of 72 DPI. For reference, the diameter of a dot is 1/72 inch. The modes are discussed in more detail in the next section on control codes.

The maximum width of a graphics image is 8 inches for the printer.

1. Control Codes

A graphics LPRINT statement begins with a control code that tells the printer to print a graphics image. Each graphics mode has a different control code.

ESC K	27 75 Single Density	1B 4B (hex) 60 x 72 DPI
	Max. dots / line	480
ESC L	27 76 Double Density, half speed	1B 4C (hex) 120 x 72 DPI
	Max. dots / line	960
	In this mode, the printhead slows down so it can print dots that overlap by about 1/2 dot width.	
ESC Y	27 89 Double Density, normal speed	1B 59 (hex) 120 x 72 DPI
	Max. dots / line	960
	This mode has the same density as ESC L and prints at normal speed; however, you cannot print dots in the same row in adjacent columns. In other words, after you have printed a dot in one particular row, you cannot print on that row in the next column.	
ESC Z	27 90 Quadruple Density	1B 5A (hex) 240 x 72 DPI
	Max. dots / line	1920
	This mode prints dot columns that overlap by about 3/4 dot width. It can print only every other dot on the same row. In other words, after you have printed a dot in one particular row, you cannot print on that row in the next column.	

Note: Take a minute to think through the restrictions on the ESC Y and ESC Z graphics modes. Basically, it means that you cannot print a horizontal line with fully overlapping dots. Even with the skips, dots on the same row are close enough together so that a line will appear solid. You can, however, print dots in other rows. This allows you to create much finer curves and diagonal lines in these high-density modes.

2. Number of Columns

The start graphics code is followed by two numbers telling the printer how many columns to print. For ease of reference, call these numbers n1 and n2.

To find the value of these numbers, determine how many columns you want to print, then divide it by 256. The value of n2 is the integer portion of the quotient, and the value of n1 is the remainder expressed as an integer.

Example:
Suppose you want to print 400 columns of graphics:

$$
\begin{array}{r}
n2 = 1 \\
256 \,\overline{)\,400} \\
256 \\
\hline
n1 = 144
\end{array}
$$

If you want to print in single density graphics mode, the beginning of your statement should look like this:

LPRINT CHR$(27);CHR$(75);CHR$(144);CHR$(1)

                                                    n2

                                                    n1

                                                    ESC K
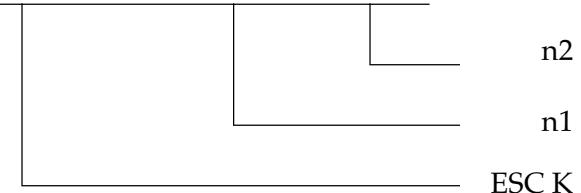
IBM BASIC includes two functions that make calculating nl and n2 very easy:

- MOD divides two numbers and returns the integer remainder,

- FIX removes the fractional portion of a numeric expression without rounding it off.

See your BASIC Manual for details.

Using these functions, you can express our sample numbers this way:

```
10   NDOTS = 400
20   LPRINT CHR$(27);CHR$(75);CHR$(NDOTS MOD 256);
     CHR$(FIX(NDOTS/256))
```

Note: The number of dot columns expressed by n1 and n2 cannot be greater than the maximum number of dot columns per line allowed for the graphics mode you are using (see table below).

Maximum Graphics Columns Per Line

Graphic's mode	
ESC K (Single Density)	480
ESC L / ESC Y (Double Density)	960
ESC Z (Quadruple Density)	1920

If the value entered is greater than the allowed maximum, the proper maximum value will automatically be entered.

3. Graphics Data

The last part of the graphics statement contains numeric data that tells the printer to print dots at specific positions in each column. It is easiest to lay out your image on graph paper, filling in the squares where you want a dot to appear. (If you want to use higher density graphics, keep in mind that the columns will overlap, and remember any restrictions that may apply.) Then divide the image into strips of eight rows. Each row will be programmed as a separate LPRINT statement.

Each position in the column has a numeric value as shown in the table below. Simply add the values of the column positions where you want dots to appear, then enter the total in your LPRINT statement.

Note: (For people familiar with binary numbers.) Each column is represented by an 8-bit binary number. A dot represents a 1 and a space is 0; the top dot is the MSB (most significant bit) and the bottom dot is the LSB (least significant bit.) The bit positions are shown in the table for reference. You can use the ASCII code chart in Appendix D as a conversion table.

Column Position Values

Column Position	Decimal Value	Bit
◯	128	2^7
◯	64	2^6
◯	32	2^5
◯	16	2^4
◯	8	2^3
◯	4	2^2
◯	2	2^1
◯	1	2^0

Example:

$$
\begin{array}{r}
64 \\
16 \\
8 \\
4 \\
1 \\
\hline
\end{array}
$$

Enter 93   as CHR$(93)

If we call the number for each column C1, etc., then the complete statement looks like this:

LPRINT   CHR$(27);CHR$(75);CHR$(144);CHR$(1);CHR$(C1);
          CHR$(C2); ... ;CHR$(C400)

column data col. 1 ...col. 400

The format is the same for all density modes; the only differences are in the start graphics code and in the maximum amount of column data that can follow. The number representing any particular pattern of dots in a column is the same regardless of graphics mode.

Putting it Together

Now we can work through a simple example. Suppose we want to draw two diagonal lines. As drawn on graph paper, they look like this:
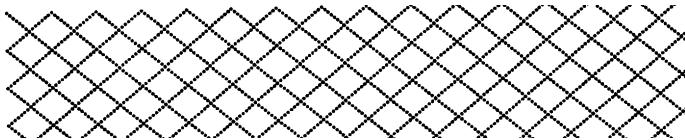
Step 1. Begin with LPRINT and the start graphics code for single density graphics:

    10 LPRINT CHR$(27);CHR$(75);

Step 2. Count the columns in the image. There are 11, so we calculate n1 and n2:

$$
\begin{array}{rcc}
n2 = & & 0 \\
 & 256 & \overline{)\,11} \\
 & & 0 \\
\hline
n1 = & & 11
\end{array}
$$

and add them to the statement:

    10 LPRINT CHR$(27);CHR$(75);CHR$(11);CHR$(0)

Step 3. Next add the dot values for each column and insert them in the statement:

```
10   LPRINT CHR$(27);CHR$(75);CHR$(11);CHR$(0);CHR$(1);CHR$(2)
     CHR$(4);CHR$(9);CHR$(18);CHR$(36);CHR$(72);CHR$(144);
     CHR$(32);CHR$(64);CHR$;(128)
```

Step 4. Now run the program. The result should look like this:

If it does not, check your arithmetic and typing, then try again.

Now go back and change the start graphics code to double density, half speed (ESC L):

```
20   LPRINT CHR$(27);CHR$(76);CHR$(11);CHR$(0);CHR$(1),CHR$(2)
     CHR$(4);CHR$(9);CHR$(18);CHR$(36);CHR$(72);CHR$(144);
     CHR$(32);CHR$(64);CHR$(128)
```

Run the program and compare:

Notice that the angle is steeper and the two lines are closer together. This is because each individual column now overlaps the next one. Notice also that it prints more slowly, although with this amount of printing the difference in speed may be hard to detect.

Now try double density, normal speed (ESC Y):

```
30  LPRINT CHR$(27);CHR$(89);CHR$(11);CHR$(0);CHR$(1);
    CHR$(2);CHR$(4);CHR$(9);CHR$(18);CHR$(36);CHR$(72);
    CHR$(144);CHR$(32);CHR$(64);CHR$(128)
```

Aside from printing speed, there should be no difference, because the pattern does not include adjacent dots; if it had, some dots would have been skipped.

Finally, try quadruple density (ESC Z):

```
40  LPRINT CHR$(27);CHR$(90);CHR$(11);CHR$(0);CHR$(1);
    CHR$(2);CHR$(4);CHR$(18);CHR$(36);CHR$(72);
    CHR$(144); CHR$(32);CHR$(64);CHR$(128)
```

Compare the results:

The angle is even steeper, and the two lines have merged into one thick line because of even greater overlap.

Here is another sample program that uses a FOR-NEXT loop to print all the possible combinations of dots and spaces in numeric order:

```
10   REM SAMPLE 2
20   WIDTH "LPT1:",255
30   NDOTS = 256 'MAXIMUM POSSIBLE COMBINATIONS
40   LPRINT CHR$(27);CHR$(75);CHR$(NDOTS MOD 256);
     CHR$(FIX(NDOTS/256));
50   REM START GRAPHICS 256 COLUMNS
60   FOR I=0 TO NDOTS-1
70   LPRINT CHR$(I);
80   NEXT I
90   PRlNT:REM LINE FEED
```

A word of explanation about line 20. The IBM Personal Computer is set for a maximum line length of 80 characters, so it adds a Carriage Return and Line Feed after the 80th character. Because the data for each column is treated as a character, your computer will send CR and LF codes after the data for the 80th column, and the printer will interpret these codes as graphics information and print them. A WIDTH statement changes the maximum length of a line, and placing the number 255 in a WIDTH statement eliminates any length restriction. (See your IBM BASIC Manual for details.)

The printout looks like this:
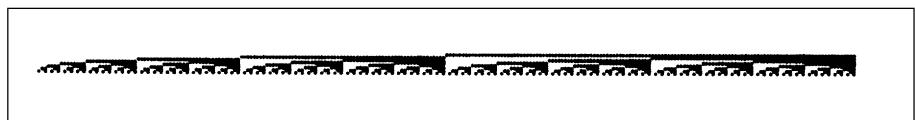
You can vary the length of the graphics line by changing the value of NDOTS.

Try changing the density in this program and see what happens. Save this program; you will need it later.

Combining Text and Graphics

You can mix normal text printing and graphics on the same line. Here is an example using the image coded in the last section:

```
05   'SAMPLE 3
10   LPRINT "TEXT PRINTING ";CHR$(27);CHR$(75);
     CHR$(11);CHR$(0);CHR$(1);CHR$(2);CHR$(4);CHR$(9);
     CHR$(18);CHR$(36);CHR$(72);CHR$(144);CHR$(32);
     CHR$(64);CHR$(128); " TEXT PRINTING AGAIN"
```

Here is the result:

```
   TEXT PRINTING  ⫽  TEXT PRINTING AGAIN
```

The printer prints normally until it receives the start graphics code. It then prints the number of graphics columns specified by n1 and n2 and automatically returns to normal printing.

Note: Be careful to enter the amount of graphics data you told the printer to expect; otherwise the results will be garbled

Printing Multiline Graphics

One LPRINT statement cannot print more than one line of graphics, so you have to enter a separate LPRINT statement for each subsequent line of graphics.

To illustrate this, add these lines to the SAMPLE 2 program:

```
40 FOR J = 1 TO 4
75 NEXT J
```

This loop causes the LPRINT statement to be repeated four times. Here is the result:
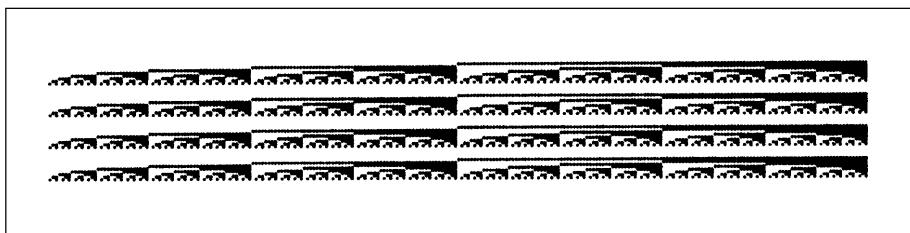
Notice that there is a space between each pair of lines. This is because the standard distance from the top of one line to the top of the next is 1/6 inch, but a column of graphics is only 1/9 inch high (8 dots x 1/72 inch per dot = 8/72 inch = 1/9 inch). To print a continuous image with no gaps between the lines, you must use the ESC A command to change line height to 8/72 inch and ESC 2 to activate the change. Add these lines:

```
30 LPRINT CHR$(27);CHR$(65);CHR$(8)
35 LPRINT CHR$(27);CHR$(50)
```

The modified program now looks like this:

```
10      REM SAMPLE 2
15      WIDTH "LPT1:",255
20      NDOTS = 256
25      REM MAXIMUM POSSIBLE COMBINATIONS
30      LPRINT CHR$(27);CHR$(65);CHR$(8)
35      LPRINT CHR$(27);CHR$(50)
40      FOR J = 1 TO 4
45      LPRINT CHR$(27);CHR$(75);CHR$(NDOTS MOD 256);
        CHR$(FIX (NDOTS/256));
50      REM START GRAPHICS 256 COLUMNS
55      FOR I=0 TO NDOTS-1
60      LPRINT CHR$(I);
65      NEXT I
70      LPRINT : REM LINE FEED
75      NEXT J
```

The result looks like this:
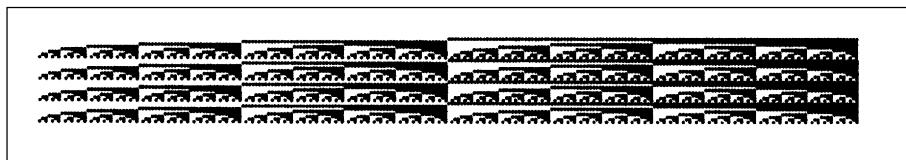
Reminders

1. Make sure you have entered column data for the same number of columns as specified by n1 and n2 in your LPRINT statement. If you enter too much or too little data, the results will be garbled.

2. You can print no more than the maximum number of columns for your graphics density mode. If more data is contained in the LPRINT statement, the excess will simply be ignored.

3. Observe the limitations on dot placement in these graphics density modes:

Double density, normal speed (ESC Y) and quadruple density (ESC Z) skip at least one dot position between dots on the same horizontal row. The printer will not print a dot placed closer than this.

Hints

The ways you can use features of BASIC to program graphics are limited only by your imagination and your programming experience. In this section we summarize the tricks used in the examples and suggest a few new ones.

MOD and FIX can be very helpful in calculating the number of columns of graphics data.

You can use the type of FOR-NEXT loop shown in sample 2 in some cases where the dot pattern can be described by a mathematical function; a straight line or a sine wave, for example.

To simplify typing the column data, you can enter the values in a DATA statement, then use a READ statement in a loop to print it. Here is a model:

```
       .
       .
       .
30     LPRINT CHR$(27);CHR$(75);CHR$(NDOTS MOD 256);
       CHR$(FIX(NDOTS/256);
40     FOR I = 1 TO NDOTS
50     READ C
60     LPRINT CHR$(C):
70     NEXT I
       .
       .
       .
100    DATA 2, 4, 8, 16, 32...........
```

This method makes it easier to check and modify your data. Using a variable such as NDOTS helps to make sure the amount of data in the program matches the number of columns you have specified.

Cancel Function

ASCII	Decimal	Hexadecimal
CAN	24	18

The cancel code clears the printer buffer. All control codes remain in effect until you give a specific command to change them or turn the printer off, with the exception of SO (double-width), which is cancelled.

Line Feed

ASCII	Decimal	Hexadecimal
LF	10	0A
VT	11	0B

Execution of the VT or LF command causes one line of data to be printed, and also causes the paper to advance one line.

Paper Out

ASCII	Decimal	Hexadecimal
ESC 8	27 56	1B 38
ESC 9	27 57	1B 39

If you want to disable the paper out alarm (the paper indicator will not light when paper is low) enter the ESC 8 command. If you want to be signaled by the printer when paper is low or out, (this is the default setting) use the ESC 8 command.

Near Letter Quality Mode

ASCII	Decimal	Hexadecimal
ESC I ETX	27 73 3	1B 49 03

When you want to make a good impression with a memorandum or letter, use OKI's special near letter quality mode. In this mode the printer prints over each line twice. On the second pass, the printer fills in the dot pattern to form a sharp, crisp letter. You get great results when you print your word-processing files in this mode.

Utility Mode

ASCII	Decimal	Hexadecimal
ESC I SOH	27 73 1	1B 49 01

The first time you turn your printer on, it will automatically print in utility mode. In this mode, the printer prints bidirectionally. This printing method increases the printer's speed, so it prints 200 characters per second.

HSD Mode

ASCII	Decimal	Hexadecimal
ESC # 0	27 35 48	1B 23 30

This printing method increases the printer's speed, so it prints 240 characters per second.

Appendix A
Programming Commands

Description	ASCII	Decimal	Hexadecimal
Carriage Return Prints data and returns print head to the left margin position	CR	13	0D
Character Sets Selects Character Set One Selects Character Set Two	ESC 7 ESC 6	27 55 27 54	1B 37 1B 36
Character Size 10 CPI 12 CPI 17.1 CPI Double width Turns off double width before end of line Turns double width on permanently Turns double width off permanently	DC2 ESC : SI SO DC4 ESC W 1 ESC W 0	18 27 58 15 14 20 27 87 49 27 87 48	12 1B 3A 0F 0E 14 1B 57 31 1B 57 30
Clear Buffer Resets normal width	CAN	24	18
Cut Sheet Feeder Single sheet insert Single sheet eject	ESC EM I ESC EM R	27 25 73 27 25 82	1B 19 49 1B 19 52
Emphasized/Enhanced Printing Doubles characters vertically (enhanced) Doubles characters horizontally (emphasized) Cancels emphasized printing Cancels enhanced printing	ESC G ESC E ESC F ESC H	27 71 27 69 27 70 27 72	1B 47 1B 45 1B 46 1B 48

Description	ASCII	Decimal	Hexadecimal
Formatting Specifies the length of a page	ESC C n or ESC C NUL m	27 67 n 27 67 0 m	1B 43 n 1B 43 00 m
Skip over perforation advances paper when less than 1 inch remains at bottom of page	ESC N n	27 78 n	1B 4E n
Cancels skip over perforation	ESC O	27 79	1B 4F
Form Feed Prints data in buffer, returns the carriage, then advances paper to the top of the next page	FF	12	0C
Graphics Prints data in single-density bit image graphics mode; 60 x 72 DPI	ESC K	27 75	1B 4B
Prints data in half-speed, double-density bit image graphics mode; 120 x 72 DPI.	ESC L	27 76	1B 4C
Prints data in normal-speed, double-density bit image graphics mode; 120 x 72 DPI.	ESC Y	27 89	1B 59
Prints data in quadruple-density bit image graphics mode; 240 x 72 DPI	ESC Z	27 90	1B 5A
Horizontal Tab Tabs to next horizontal tab stop	HT	9	09
Cancel tabs	ESC D NUL	27 68 0	1B 44 00
Line Feed Advances paper one line	LF	10	0A
Advances paper one line	VT	11	0B

Description	ASCII	Decimal	Hexadecimal
Line Spacing			
Loads variable fine line spacing	ESC A n	27 65 n	1B 41 n
Sets line spacing to variable fine line spacing	ESC 2	27 50	1B 32
Set the line feed to 7/72 inch	ESC 1	27 49	1B 31
8 LPI	ESC 0	27 48	1B 30
Sets the specified line space	ESC 3 n	27 51 n	1B 33 n
Line spaces n/216 inch	ESC J n	27 74 n	1B 4A n
Paper Out Alarm			
Paper indicator lights whenever paper is low or out.	ESC 9	27 57	1B 39
Printer will not respond to a paper out condition. Printer will continue printing even if paper is out	ESC 8	27 56	1B 38
Print Mode			
NLQ mode	ESC I ETX	27 73 3	1B 49 03
UTILITY mode	ESC I SOH	27 73 1	1B 49 01
HSD mode	ESC # 0	27 35 48	1B 23 30
Superscript and Subscript			
Selects superscripts	ESC S 0	27 83 48	1B 53 30
Cancels superscript and subscripts	ESC T	27 84	1B 54
Selects subscripts	ESC S 1	27 83 49	1B 53 31
Underlining			
Begin underlining	ESC - 1	27 45 49	1B 2D 31
Stop underlining	ESC - 0	27 45 48	1B 2D 30

Appendix B
Character Sets

Standard Code Table (selected by ESC ! 0)

	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
0			SP	③	④	P	⑪	p			SP	③	④	P	⑪	p
1		DC1	!	1	A	Q	a	q		DC1	!	1	A	Q	a	q
2		DC2	"	2	B	R	b	r		DC2	"	2	B	R	b	r
3		DC3	①	3	C	S	c	s		DC3	①	3	C	S	c	s
4		DC4	$	4	D	T	d	t		DC4	$	4	D	T	d	t
5			%	5	E	U	e	u			%	5	E	U	e	u
6			②	6	F	V	f	v			②	6	F	V	f	v
7			'	7	G	W	g	w			'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x	BS	CAN	(	8	H	X	h	x
9	HT		)	9	I	Y	i	y	HT		)	9	I	Y	i	y
A	LF		*	:	J	Z	j	z	LF		*	:	J	Z	j	z
B	VT	ESC	+	;	K	⑥	k	⑫	VT	ESC	+	;	K	⑥	k	⑫
C	FF		,	<	L	⑦	l	⑬	FF		,	<	L	⑦	l	⑬
D	CR		–	=	M	⑧	m	⑭	CR		–	=	M	⑧	m	⑭
E	SO		.	>	N	⑨	n	⑮	SO		.	>	N	⑨	n	⑮
F	SI		/	?	⑤	⑩	o	■	SI		/	?	⑤	⑩	o	■

Note: See Page 1-17 for Character Set Table, and description of national characters, i.e. ③.

Block Graphics 8-Bit Code Table (selected by ESC ! 1)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	③	④	P	⑪	p								
1		DC1	!	1	A	Q	a	q								
2		DC2	"	2	B	R	b	r								
3		DC3	①	3	C	S	c	s								
4		DC4	$	4	D	T	d	t								
5			%	5	E	U	e	u								
6			②	6	F	V	f	v								
7			'	7	G	W	g	w								
8	BS	CAN	(	8	H	X	h	x								
9	HT		)	9	I	Y	i	y								
A	LF		*	:	J	Z	j	z								
B	VT	ESC	+	;	K	⑥	k	⑫								
C	FF		,	<	L	⑦	l	⑬								
D	CR		–	=	M	⑧	m	⑭								
E	SO		.	>	N	⑨	n	⑮								
F	SI		/	?	⑤	⑩	o	▪								

Appendix C
Specifications

1. **Performance**

   Print Speed
   Utility mode (UTL)   200 cps at 10, 12, and 17.1 CPI
   Near Letter Quality (NLQ) mode   50 cps at 10 and 12 CPI
   High Speed Draft (HSD)   240 cps at 10 and 17.1 CPI
   Super Speed Draft (SSD)   300 cps at 12 CPI

   Resident fonts   High Speed Draft, Utility,
                                     Courier (NLQ mode)

   Print Technique   Bidirectional/short line seeking

2. **Printing**

   Dot Matrix, standard characters   9 x 17 (NLQ)
                                     9 x 9 (UTL)
                                     7 x 9 (HSD)
   Characters per line   80 standard size
                                     132 condensed size

3. **Media**

   Number of sheets   Original + 3 copies
   Paper feed   Top with paper separator
                                     Top with optional cut sheet feeder
                                     Rear with pin platen feed
                                     Bottom with optional pull tractor
   Paper thickness   0.011in (0.28mm) maximum
   Paper weight   14-20lb. (53-75g/m^2 (fanfold)
                                     16-21lb. (60-81g/m^2 (cut sheet)
   Continuous paper width   3 to 9.5in (76 to 241mm)

   Ribbon   Cartridge with 3 million character
                                     life
                                     Seamless ribbon with reinking

4. **Interfaces**

   Parallel   Centronics
   Serial   RS-232C

5. **Reliability**

Mean Time Between Failures (MTBF)	6,000 hours
Mean Time To Repair (MTTR)	15 minutes
Print head life	200 million characters

6 . **Operating Conditions**

Operation	Temperature	5˚ to 40˚C
	Humidity	20 to 80% RH without condensation
Storage	Temperature	-40˚ to 70˚C
	Humidity	5 to 95% RH without condensation

7. **Electrical Requirements**

Voltage	230 VAC (+6%, -14%)
	240 VAC (± 10%)
Frequency	50/60 Hz (± 2%)

8. **Noise Level**　　　　　　　　58 dBA

9. **Physical Specifications**

Width	360 mm
Depth	275 mm
Height	80 mm
Weight	4.5 kg

10. **Accessories and Consumables**

Pull tractor kit	Automatic cut sheet feeder
Roll paper stand	19.2kb RS–232C serial interface
9.6kb Current Loop serial interface	Black fabric ribbon cartridge

Hexadecimal Conversion Table

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
1	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
2	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
3	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
4	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
5	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
6	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
7	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
8	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
9	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
A	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
B	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
C	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
D	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
E	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
F	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Note: Hexadecimal values are represented in the first row and column.
For a hexadecimal value of 9A, look along the top row for the first digit (9). Look down the left-hand column for the second digit (A). The decimal equivalent value will be found where column 9 and row A intersect.
Therefore: 9A (hex.) = 154 (decimal).