OKI

People to People Technology

MICROLINE 3410

IBM® Compatible Printer Handbook

Note To Customers

Every effort has been made to ensure that the information in this document is complete, accurate and up-to-date. Mention of software packages manufactured by other companies does not necessarily constitute endorsement by OKI. We do not assume responsibility for errors beyond our control, nor can OKI guarantee that changes in the software and equipment made by other manufacturers and referred to in this book will not affect the applicability of information in this book.

Contents

Introduction

The Setup Guide will help you get your new printer up and running quickly. Here is how it is organised:

Setup, shows you how to get the printer ready, connect it to your computer, install the standard and optional paper handling accessories, load different types of paper and run a self test.

Operation, describes how to run your printer using the control panel and gives you some hints on what to do if you are having problems.

If you want more details about working with software or advanced topics like graphics, read the **Reference Guide**. Use it to find out more about particular commands or to explore your MICROLINE's advanced capabilities.

In addition to this manual, make sure you have the following items:
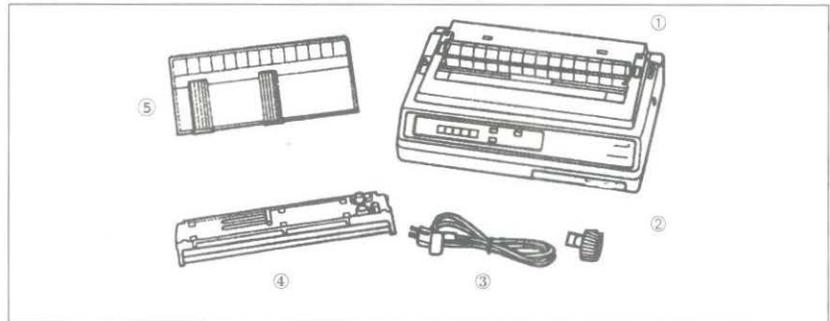
1. MICROLINE printer
2. Platen knob (fitted)
3. Power cord
4. Ribbon cartridge
5. Paper support

Paper and interface cable sold separately.

Important Note

If you are like most printer users you probably will not need to read this entire book. Rather, you will flip from section to section as required to learn how to make your printer do what you want it to do. The Setup Guide contains information on loading paper and most of the mechanical aspects of running your printer. The Reference Guide pertains more to controlling your printer's features, such as format and print settings, and the method of doing so.

- Chapters 3 and 4, IBM Standard and Advanced control code references, give you the command codes and descriptions of their functions.

- Chapters 5 and 6, Epson Standard and Advanced control code references, give you the command codes and descriptions of their functions.

- The Appendices provide you with code reference tables and interfacing information, as well as other tables and technical references you may require.

Selecting Drivers

Printer drivers are usually written for a particular model of printer and identified by the name of that printer. Although most packages offer several selections, they cannot have drivers for every printer. Therefore, you may have to choose a driver that was not specifically written for the ML3410 but is compatible or nearly so. Installing a driver is normally a simple process of making a selection from a menu. Look for one of the following printers on your software's printer driver selection. As you go further down each list, you will have access to fewer ML3410 features.

IBM EMULATION	EPSON EMULATION
IBM XL24/IBM 4207, 4208 IBM PPR XL/IBM 4202 IBM PPR/IBM 4201	Epson FX

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 terrninal rnarked 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 or BLUE.

WARNING: THIS APPARATUS MUST BE EARTHED

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

Setup

Preliminaries

Open the access cover and remove the shipping restraint. (Save the shipping restraint with the packaging materials).
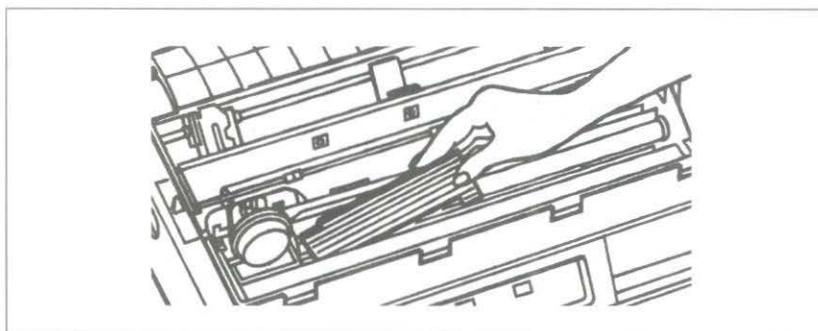
The platen knob should already be fitted to the right hand side of the printer. However, if this is not the case, or it is removed for some reason, the flat side of the shaft should be lined up with the flat side of the knob.
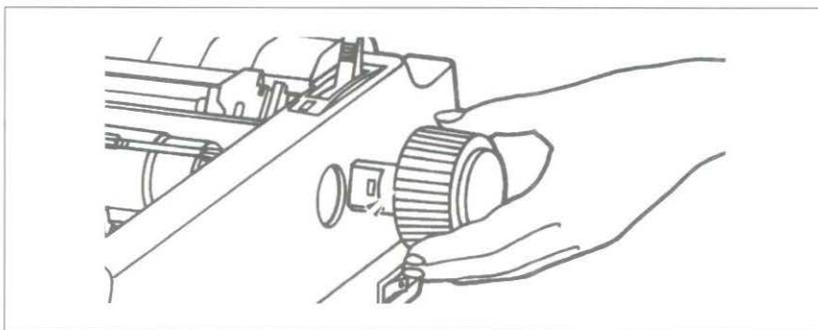
Connecting to Your Computer

Before you can use your printer, you need to attach it to your computer using an interface cable.

Note: Interface cables are not supplied with the printer.

Power cable   Interface cable
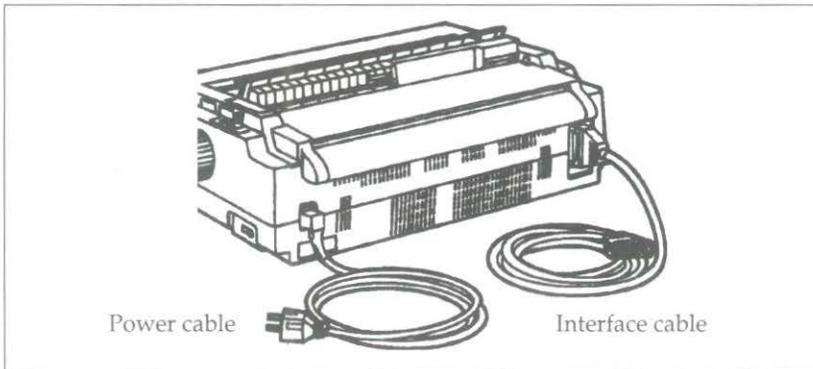
Microline 3410 Printer (Rear view)

1. Make sure both your computer and your printer are switched OFF.

2. Attach the power cord to the socket in the rear of the printer, and plug it into an earthed power source.

Note: Do not use an unearthed adapter with your printer. The printer must be connected to an earthed power supply.

3. Plug the printer end of your interface cable into the connector at the rear of the printer. Your printer has two interface ports. Loosen the metal plate with a Phillips screwdriver and slide to uncover the proper connector for the interface cable you are using.

Serial interface   Parallel interface

Tighten screw to   Fasten clips to
fasten cable   cable
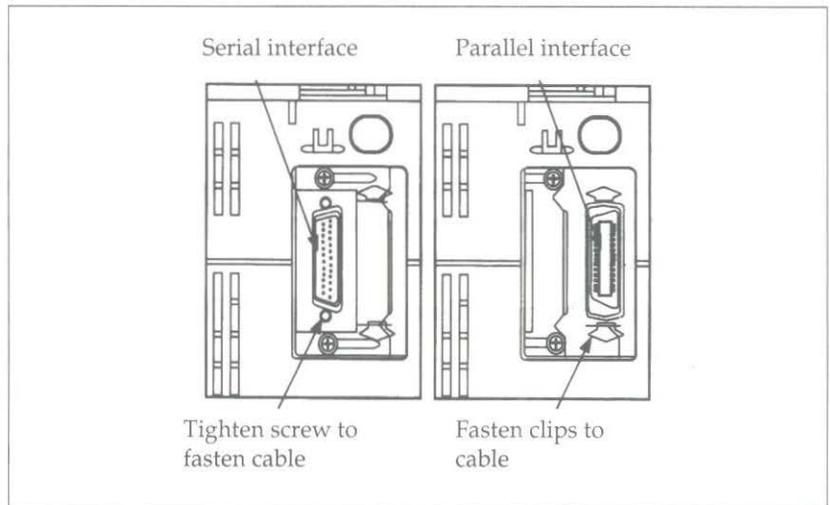
Note: Set the serial interface option in the menu so that it matches the printer interface of your computer

4. Connect the other end of your interface cable to the printer port on your computer.

Inserting the Ribbon Cartridge

IMPORTANT

You have just bought the best printer, so be sure to use the only ribbons recommended for it. Original OKI ribbons are the only ones recommended. 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. They are prone to shredding, which can cause damage to your printhead. That is why any short term savings on cheaper 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.

1. Unpack the ribbon cartridge. Remove the shipping restraint and push the idler roller lock to the right to free the idler roller.
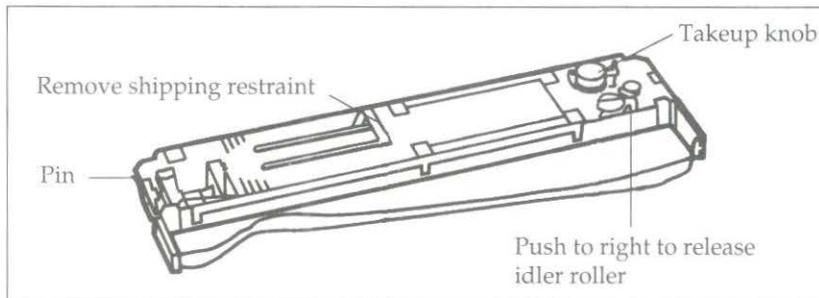
ML3410 Ribbon cartridge

2. Open the printer access cover.

3. Centre the printhead.

Note: The printhead can get very hot during extended periods of printing—be sure to let it cool off before you touch it.

4. Place the ribbon into the printer so that the pins on the ribbon cartridge fit into the notches in the side plates of the printer. Push down so that the cartridge snaps into position.

Centre the printhead
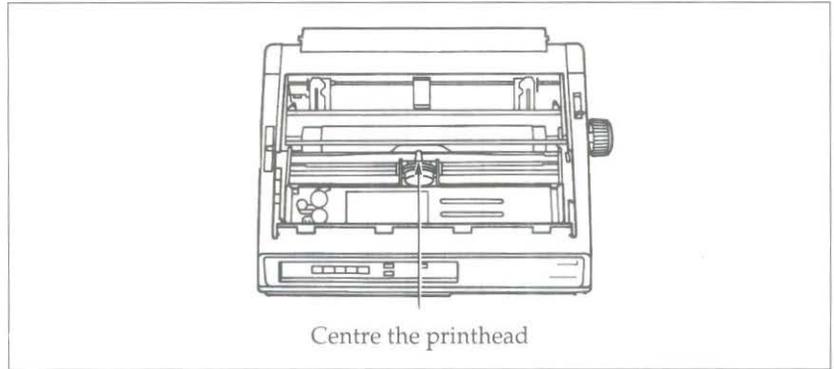
5. Thread the ribbon around the posts on the printhead, making sure that you follow the proper path (refer to the following illustration).

Thread ribbon around posts as shown
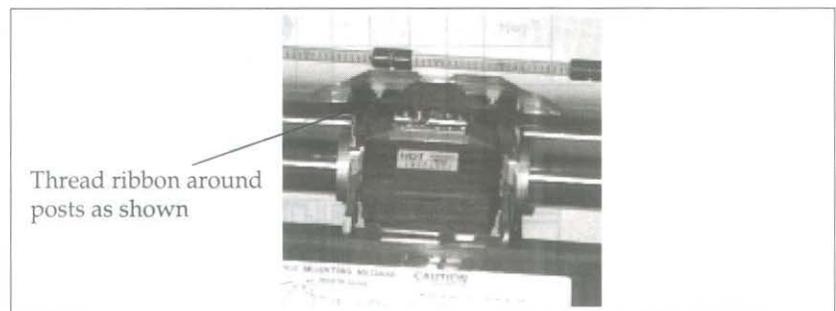
6. Turn the take-up knob clockwise to take up any ribbon slack.

Adjusting the Printhead Gap

The blue head gap lever (located on the right-hand side of the printer, below the access cover) adjusts the printhead for printing on different types of paper. These are the recommended settings. They can be adjusted for ease of feeding and quality.

Important: The incorrect setting of the printhead gap lever can cause printhead damage or ribbon jams. To avoid these problems set the printhead gap for the type of stationery being used.

	Ream weight		Lever position								
			1	2	3	4	5	6	7	8	9
Single part paper	45-90 g/m² (12-24lb)		●								
Multiple part paper (interleaf paper)	35-40g/m² (9-11 lb)	2 part		●	●						
		3 part			●	●					
		4 part					●				
		5 part						●			
		6 part							●		
Multiple part paper (pressure - sensitive paper, carbon - lined paper)	38-45g/m² (10-12 lb)	2 part		●							
		3 part			●						
		4 part			●						
		5 part				●					
		6 part					●				
		7 part						●			
		8 part							●		
Labels					●	●					
Envelopes							●	●	●	●	●

Printhead gap lever
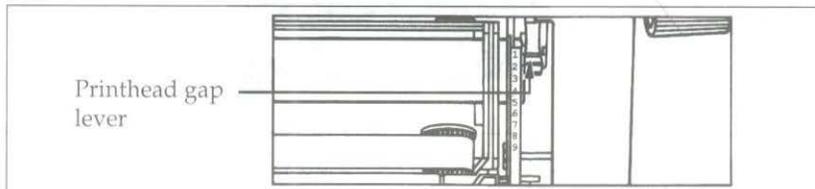
Installing the Paper Support

Paper support

Holes pop
into tabs
on the
rear cover

Brace holds support upright
for single sheets of paper
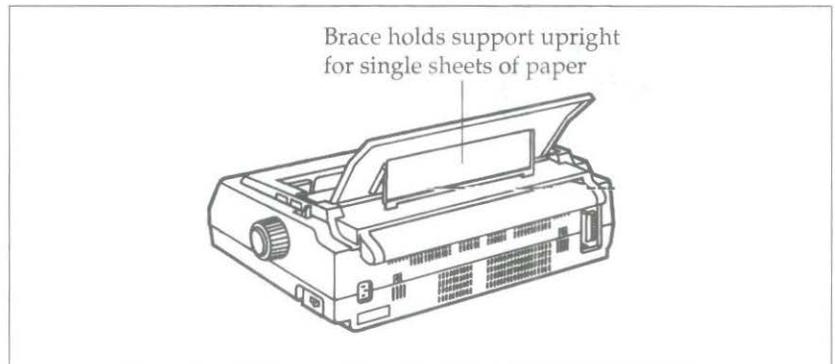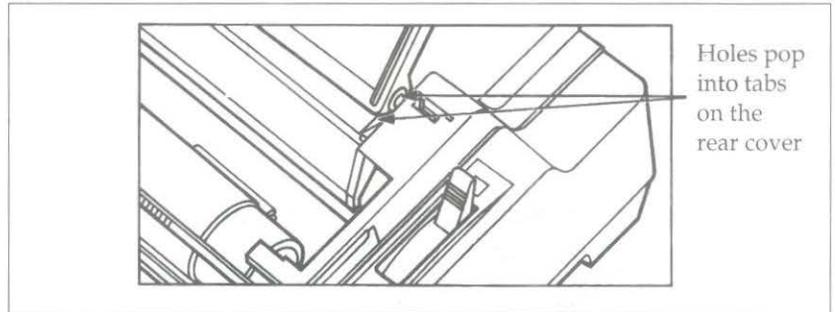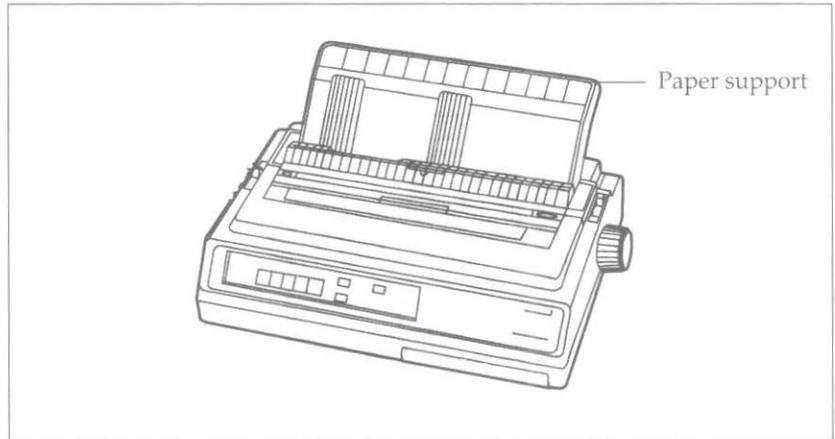
Installing the Paper Separator

Opens to prevent paper from curling
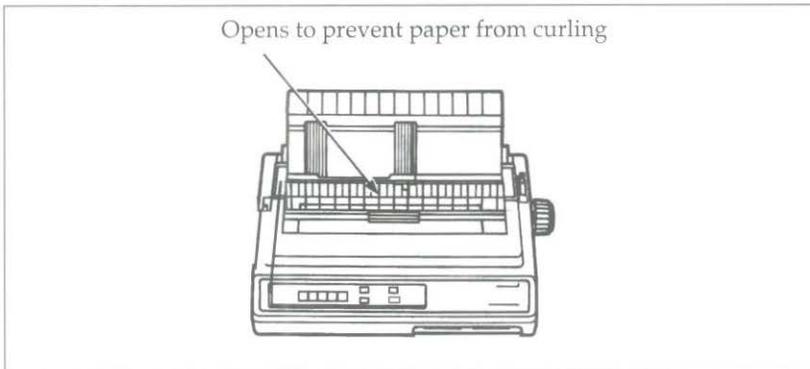
1. Open front and back covers.

2. Locate lugs at rear of unit into grooves, and push unit down into position on to platen.

Paper separator
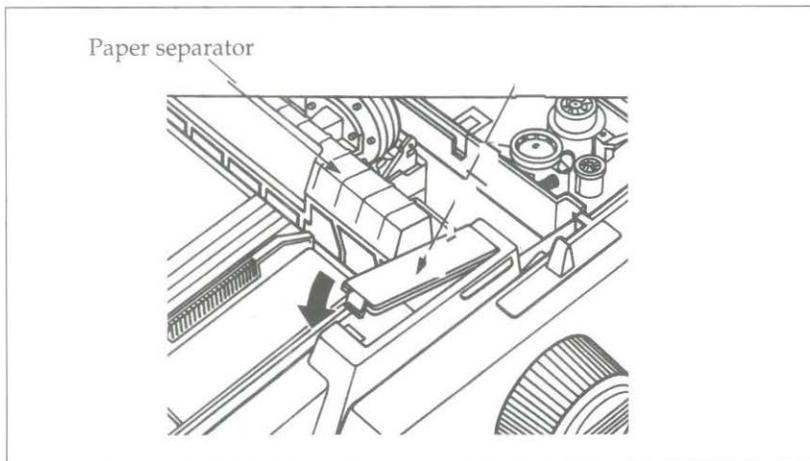
3. Close covers.

Loading Rear Feed Continuous-Form Paper

When printing on rear feed continuous form paper use the built-in tractor.

1. Open the rear cover.

2. Move the centre paper guides to the middle of the paper.

Rear cover   Paper guides
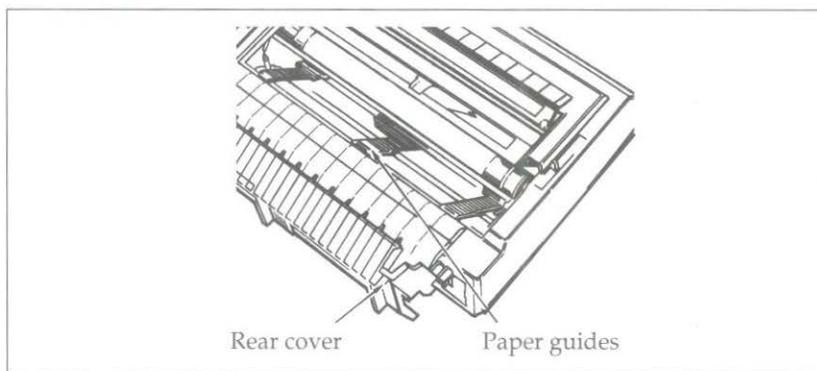
3. Insert the paper through the gap below the rear cover and pull through.

Insert paper   Pull paper through
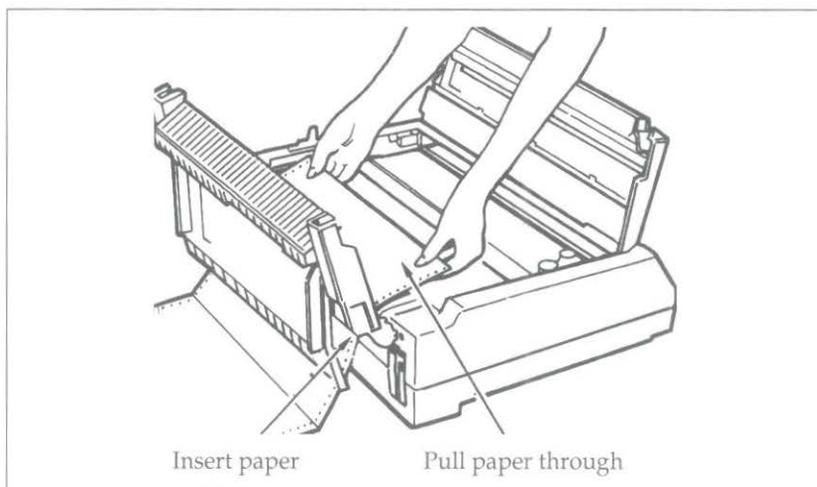
4. Move the left hand tractor to the required position. (Pull the lever forwards to unlock the tractor and slide to adjust. Push the lever back to lock.)

5. Open the tractor covers and set the first two sprocket holes on the paper on the tractor pins.

Tractor cover   Lever
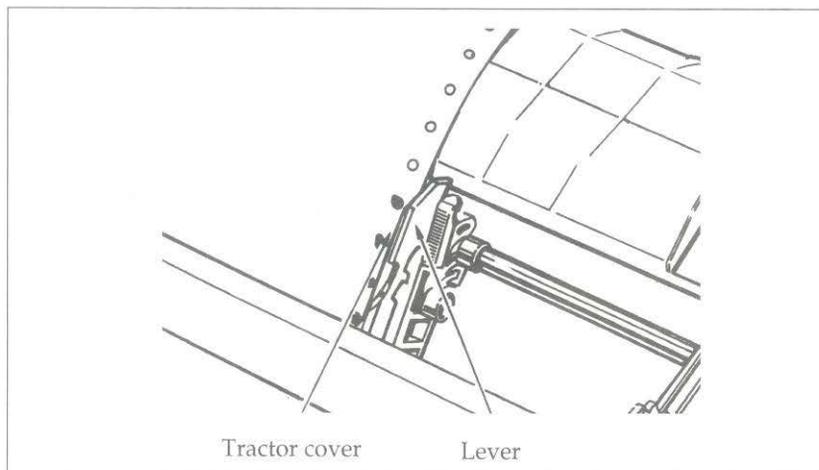
6. Adjust the right hand tractor to the width of the paper.

7. Close the tractor covers.

8. Close the rear cover.

9. Pull the paper lever forwards (to the continuous paper symbol).

10. Turn the printer ON. Press the FORM FEED button to advance the paper to the front of the printer.

11. Set the TOF, refer to **Setting the TOF** described in this chapter, to your requirements and you are ready to print.

Loading Single Sheet Paper

(No paper handling options installed)

1. If you have continuous-form paper in the printer, use the paper PARK feature to back it out of the printer. Press the PARK button. The paper will retract from the front of the printer.

2. Push the paper lever back to the single sheet setting (towards the back of the printer).

3. Raise the paper support to its upright position.
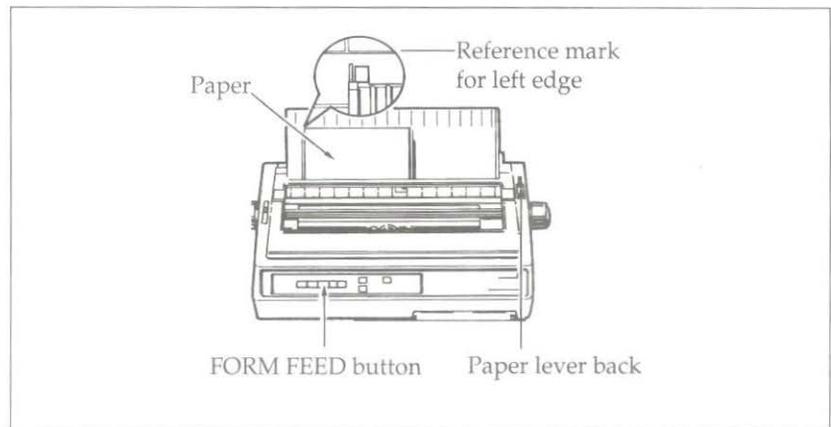
4. Place a sheet of paper on the support and adjust the guides for the width of the paper you are using. Start with the reference mark for the left edge.

5. Press the FORM FEED button to insert the paper into the printer.

6. Adjust the TOF if necessary. Refer to **Setting the TOF** described later in this chapter.

Loading Bottom Feed Paper

You can feed continuous-form paper from the bottom of the printer when you have the optional pull tractor installed.

Optional tractor unit
Open acoustic cover
Pull paper lever forwards
Pull bail lever forwards
Open front cover
Slide paper guide to middle of paper width
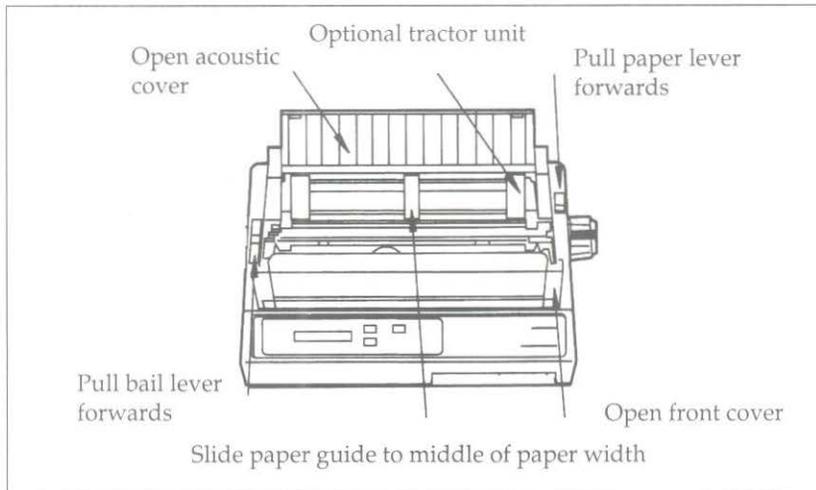
1. Open the acoustic cover on the pull tractor.

2. Open the printer access cover.

3. Pull the bail lever forwards.

4. Pull the paper lever forwards (to the continuous paper symbol).

5. Move the centre paper guides to the middle of the of the paper.

6. Push the paper up through the slot in the bottom of the printer and pull it up in front of the platen to the tractor.

7. Move the left hand tractor to the required position. (Pull the lever forwards to unlock the tractor and slide to adjust. Push the lever back to lock.)

8. Open the tractor covers and set the first two sprocket holes on the paper on the tractor pins.

Tractor cover   Lever
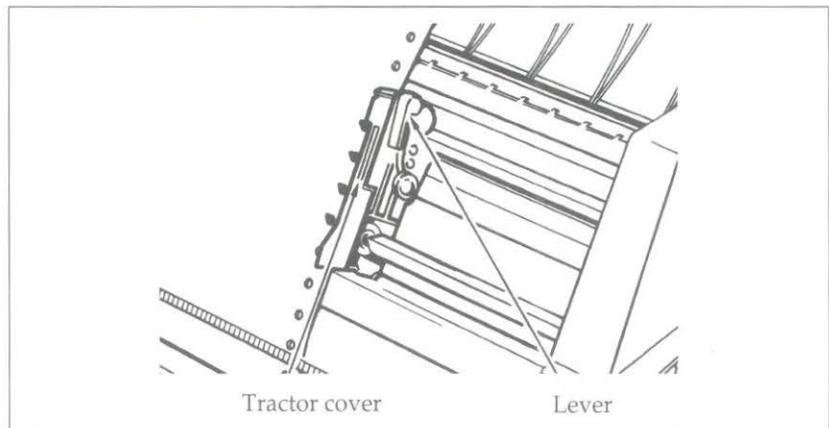
9. Adjust the right hand tractor to the width of the paper.

10. Close the tractor covers.

11. Push the bail lever back.

12. Close the printer access cover and the tractor acoustic cover.

Important: The front cover must be closed for the printer to operate.

Wind paper through

Close front cover first
then acoustic cover
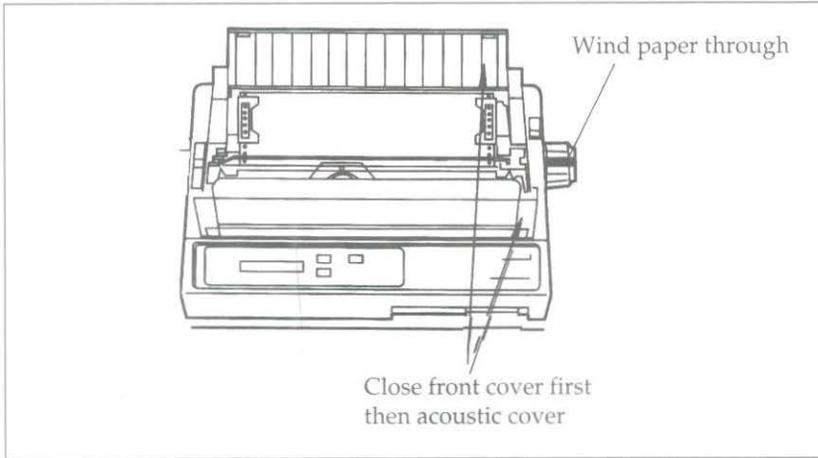
13. Set the TOF, referring to **Setting the TOF**, for your requirements and you are ready to print.

Setting the TOF

This establishes the position of the first print line on each page. The red line on the ribbon shield shows the baseline of the current position and helps you place the TOF where you want it.

If you are using a word processor that sets its own top margin, set the TOF for the topmost line on the page. Otherwise we recommend positioning the top of the page under the bail; the first line of printing will then be about one inch from the top of the page.

Red line shows baseline for printing

Bail
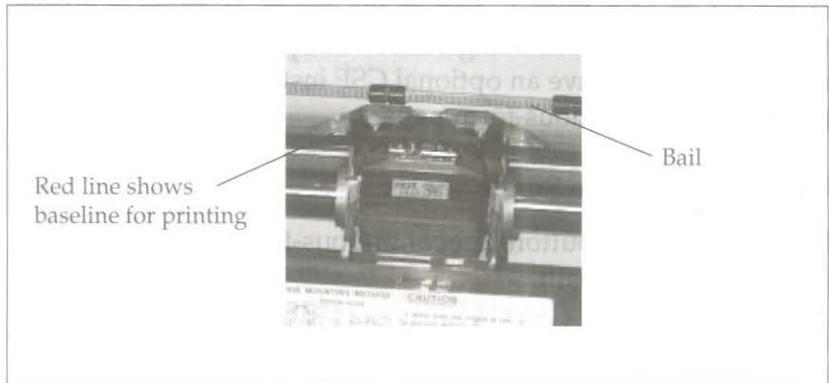
1. Press the FORM FEED button to advance the paper into the printer.

2. Press the SELECT button so that the SELECT light goes out.

3. **Continuous-form paper/Single Sheet paper:** Hold down the TOF button and the MICRO FEED buttons simultaneously. Use the MICRO FEED button which corresponds to the direction you wish to move the page. When the paper is in the correct position release both buttons.

4. Press the SELECT button to re-select the printer.

When using the MICRO FEED buttons paper is moved in increments of 1/144 inch allowing accurate positioning of the TOF.

Paper Park

Switching between continuous-form paper and single sheet paper is particularly easy with your printer. Its automatic parking feature allows you to back continuous-form paper out of the paper path at the touch of a button, and at the touch of another button automatically positions a single sheet. The paper park feature still works when you have an optional CSF installed on your printer whilst using continuous-form paper.

Continuous-form to Single Sheets

1. Press the PARK button. The continuous-form paper will retract from the paper path.

2. Push the paper lever back (to the single sheet setting).

3. Press the FORM FEED button to advance a sheet into the printer.

Single Sheet to Continuous-form

1. If there is a sheet in the printer, press the FORM FEED button to eject it.

2. Pull the paper lever forward (to the continuous-form setting).

3. Press the FORM FEED button to advance the continuous-form paper to the front of the printer.

Clearing Paper Jams

In the unlikely event that you experience paper jams while using either continuous-form paper or single sheets, the following guidelines explain in detail the correct procedure for the removal and resetting of the jammed paper.

1. Turn the printer OFF.

2. Open the access cover and set the head gap lever to the maximum setting 9.

3. Tear the paper off at the position of the push/pull tractor if you are using continuous form paper.

4. If paper is jammed at the ribbon protector, move the printhead assembly away from the jam carefully (ensure that there is no paper between the ribbon protector and the platen) and turn the platen knob to feed the remaining paper out of the front of the printer. If the paper jam occurs before the ribbon protector, turn the platen knob so that the paper retracts along its loading path.

5. Clear the paper path and ensure that there are no scraps of paper left in the paper's loading path or the printer.

6. Reset the head gap lever to the required position.

7. The printer is now ready for use.

Warning: Do not remove or loosen the ribbon protector screws at any time, as the protector is fixed at a precise setting.

Running a Self Test

After you have installed the ribbon and loaded paper, you are ready to run either of the two self tests. These tests allow you to check that your printer is functioning properly.

Holding down the FORM FEED button while switching the printer ON produces:

```
ML3410  EI     E     F/W 00.256  YR4089-3008
                     CG  01.00

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
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'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
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-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
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456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$
56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%
6789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&
789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'
89:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'(
9:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()
:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*
;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+
<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,
=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-
>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-.
?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./
@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./0
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./01
BCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./012
CDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./0123
DEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./01234
EFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./012345
FGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./0123456
```

A continuous sample of the default print style. This sample prints along the entire length of the platen, so be sure to use wide paper when running this test.

Holding down the LINE FEED button while turning the printer ON produces:

A limited sample of each available print style. When complete (about three pages), the printer stops and the SELECT light goes on.

To terminate either of these two self-tests, press the SELECT button. This will return the printer to its ready state and the SELECT light will be lit.

Optional Accessories

The following items are optional accessories for your printer.

Instructions for their installation is supplied with each item.

1.   Pull Tractor Unit

Acoustic cover

Paper guide   Optional
                     pull tractor
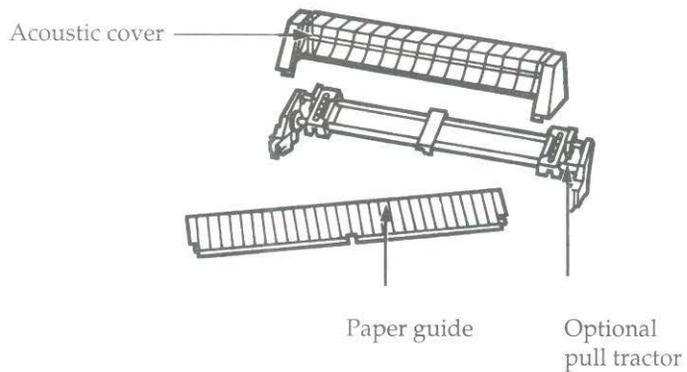
2. Cut Sheet Feeders

CSF 3001 (Single)
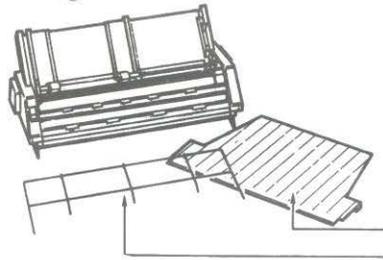
Output tray
Bin rack

CSF 3002 (Dual)
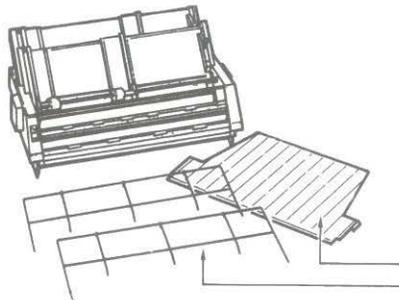
Output tray
Bin rack

3.	Bottom Feed Tractor Unit

Front Cover

Base Feed Unit
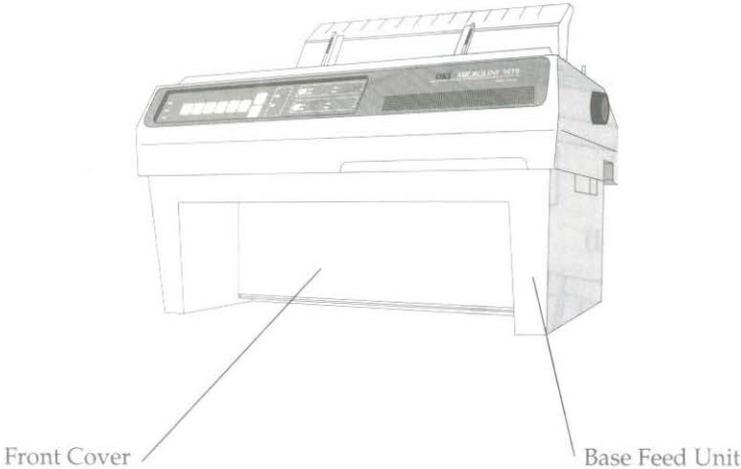
Operation

Using the Control Panel

The control panel puts many of your printer's functions within reach of your fingertips. It even lets you customise your printer for special applications without programming. Experiment with these controls and you will see how much your printer can do and how easy it is to use. The next few pages explain the basics of using the control panel.
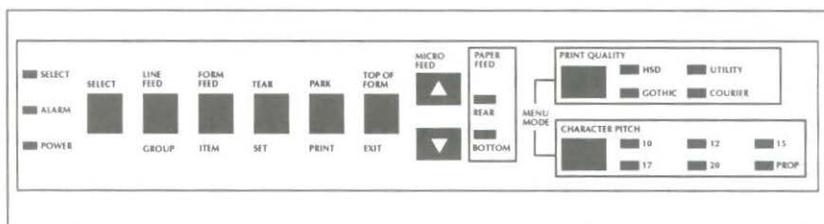
Basic Controls

POWER light: Lit when On.

ALARM light: Lit to indicate alarm condition: paper out, paper jam, cover open.

LINE FEED button: Moves paper up one line (when printer is selected or deselected). If a CSF is installed on the printer, pressing the LINE FEED button will cause a single sheet to be inserted when there is no paper in the printer.

FORM FEED button: Advances paper to the top of the next page (when printer is selected or deselected).

TOF button: When the printer is deselected this button sets the position of the first print line.

SELECT button: Selects or deselects the printer. When selected, the printer is ready to receive data; when deselected, it will not print. Pressing this button during a self-test will terminate the test and return the printer to its ready state.

SELECT lamp: Lights when printer is selected (ready to receive data); goes out when it is deselected. The light blinks when the printer is in Print Suppress mode (refer to the Menu Settings for more details).

PRINT QUALITY: Selects the quality of print of the typeface.

CHARACTER PITCH: Selects the size of the printed characters.

PRINT QUALITY and CHARACTER PITCH: When these two buttons are pressed at the same time, while the printer is on-line, the Menu Select Mode is activated.

PARK: Selects the park position for continuous paper, allowing single sheets to fed from the front of the printer.

TEAR: Advances the paper to the tear off position (serrated bar above acoustic cover), allowing continuous paper to be torn off at random.

MICRO FEED: Advances the paper 1/144 inch in the direction of the arrows for fine adjustment.
When pressing the MICRO FEED button together with the TOF button the insert position for paper is set.

The following buttons have special functions when you hold them down while turning the printer on:

LINE FEED: Activates the print samples self-test.

LINE FEED and SELECT: Resets the Menu to the factory settings.

FORM FEED: Activates the rolling ASCII print self-test.

SELECT and FORM FEED: Puts the printer into the Hex Dump Mode.

SELECT and TOF: Returns the printer to the default Menu settings. This option also sets the insert position for paper to the factory setting.

PARK and TOF: This option sets the insert position for paper to the factory setting.

BUTTON FUNCTIONS IN MENU SELECT MODE

When the printer is in the menu select mode, the features listed below the buttons are activated.

PRINT: Prints the current menu settings.

GROUP: Switches between the broad menu categories.

ITEM: Displays the features contained in each of the categories.

SET: Selects and stores the options available for each feature in the menu.

EXIT: Exits from the menu select mode and returns the printer to its ready state. The buttons are returned to their basic functions.

Print Characteristics

The print quality and character pitch buttons let you control basic printing features through your printer's control panel:

1. Press the SELECT button (SELECT light goes out).

2. Press the features that you wish to change (light goes on).

Note: If all the lights on the PRINT QUALITY section of the panel are out, the printer will print in the HSD MODE.

3. Press the SELECT button.

The panel always indicates the actual settings of the printer. If you change any of these features through your software, the panel lights will also change to reflect this feature choice.

The panel will only allow you to select valid combinations of features. For example, proportional spacing can only be selected when the print quality choice is set to NLQ. The two printing features available on the control panel offer the following selection of modes:

Print Quality

There are FOUR resident fonts which can be selected on your printer.

The resident fonts are:

COURIER: Selected when the COURIER light is lit.

GOTHIC: Selected when the GOTHIC light is lit.

UTILITY: Selected when the UTILITY light is lit.

HSD: Selected when the HSD light is lit.

COURIER: The COURIER mode produces crisp, clean characters, similar to a typewriter. Print in COURIER when you want your correspondence and reports to look especially polished. You can use COURIER mode to print 10, 12, 15, 17.1 and 20 Characters Per Inch (CPI), as well as proportional spacing.

GOTHIC: The GOTHIC mode also produces crisp, clean characters in the same way as COURIER. You can use GOTHIC mode to print 10, 12, 15, 17.1 and 20 Characters Per Inch (CPI), as well as proportional spacing.

UTILITY: The Utility mode is ideal for high-volume printing. It is much faster than NLQ, but the printed output is not as dense as the higher-quality modes. Utility mode supports all the character pitches.

HSD: High Speed Draft is the fastest of the print modes. Use it for quick printouts of long documents. High Speed Draft is only available at 15 and 17.1 CPI.

CHARACTER PITCH (width selections)

10, 12, 15, 17.1 and 20 CPI. Proportional spacing is available for use with resident COURIER, GOTHIC and UTILITY printing only.

Note: Pitches available with downloaded fonts are font dependent.

Using the Menu Select Mode

The Menu Select mode gives you fingertip control over some of your printer's most important features. Menu selections are chosen while in the Menu Select mode and retained in the printer's non-volatile memory. In effect your settings become the default settings, although they can be changed through software commands, through the control panel or through resetting the menu.

Note: You can override features set on the menu using either the control panel or commands sent from your computer. However, when you turn off the printer, features set by those methods will be cancelled. Features set on the menu will stay in effect, even when the printer is unplugged.

Entering the Menu Select Mode

Make sure that the printer is loaded with ribbon and paper.

Switch the printer ON. While the printer is on-line press the PRINT QUALITY and CHARACTER PITCH buttons simultaneously. The functions listed below the paper handling buttons become active.

If you press the PRINT button, the current menu will be printed in its entirety. It lists all the currently selected print features.

If you press the GROUP button, you can progress through the broad menu categories until you reach the category that you want to change.

Pressing the ITEM button allows you to select the feature of each category that you want to change.

Pressing the SET button lets you make the final selection for each item of the group

It is also possible to scroll up and down through the various selections by using the up and down arrows of the Micro Feed switches.

When you have made all the changes that you want, press the EXIT button to store the changes and to return to the print mode. The SELECT light will light to show that the printer is ready to print, and the control panel will indicate any changes that you made to the default settings while in the menu mode.

Note: If in the middle of the Menu Select mode you should run out of paper, the red alarm light on the control panel goes on and the printer goes off line. Reload paper and continue by pressing the SELECT button; the printer then resumes its function in the Menu Select mode.

Menu Selections

NOTE: Factory default settings are printed in bold.

Group	Item	Selections
Printer Mode	Emulation Mode	**IBM PPR**, EPSON FX
Font	Print Mode	**Utility**, NLQ Courier, NLQ Gothic , HSD
	Pitch	**l0CPI,** 12CPI, 15CPI, 17.1CPI, 20CPI, Proportional
	Style	**Normal,** Italics
	Size	**Single,** Double
Symbol Sets	Character Set	**Set II,** Set I
	Language Set	**American**, French, German, British, Danish I, Swedish I, Italian, Spanish I, Japanese, Norwegian, Danish II, Spanish II, Latin American, French Canadian, Dutch, Swedish II, Swedish III, Swedish IV, Turkish, Swiss I, Swiss II, Publisher
	Zero Character	**Unslashed**, Slashed
	Slash Letter O	**No**, Yes
Symbol Set	Code Page	**USA** Canada-French, Multilingual, Portugal, Norway, Turkey, Greek-437, Greek-851, Greek-928, Cyrillic, Polska Mazovia, Polska PC Latin 2, Serbo Croatic I, Serbo Croatic II, ECMA-94

Group	Item	Selections
Rear Feed	Line Spacing	**6LPI**, 8 LPI
	Form Tear off	**Off**, 500ms, 1 sec, 2 sec
	Skip Over Perforation	**No**, Yes
	Page Width	**13.6"**, 8"
	Form Length Base	**INCHES**, LINES
	Page Length	**12"**, 11", 11 2/3", 14", 17", 3", 3.5" 4", 5.5", 6", 7", 8", 8.5"
	Page Length (Lines*100)	**0**, 1
	Page Length (Lines*10)	**7**, 8, 9, 0, 1, 2, 3, 4, 5, 6
	Page Length (Lines*10)	**2**, 3, 4, 5, 6, 7, 8, 9, 0, 1
	Sheet Page Length	**11 2/3"**, 14", 16.57", 3", 3.5", 4", 5.5" 6", 7", 8", 8.5", 12", 11"
Bottom Feed	Line Spacing	**6LPI**, 8 LPI
	Form Tear off	**Off**, 500ms, 1 sec, 2 sec
	Skip Over Perforation	**No**, Yes
	Page Width	**13.6"**, 8"
	Page Length (Lines*100)	**0**, 1
	Page Length (Lines*10)	**7**, 8, 9, 0, 1, 2, 3, 4, 5, 6
	Page Length (Lines*10)	**2**, 3, 4, 5, 6, 7, 8, 9, 0, 1
	Sheet Page Length	**11 2/3"**, 14", 16.57", 3", 3.5", 4", 5.5" 6", 7", 8", 8.5", 12", 11"
Top Feed	Line Spacing	**6LPI**, 8 LPI
	Skip Over Perforation	**No**, Yes
	Page Width	**13.6"**, 8"

Group	Item	Selections
Top Feed	Page Length (Lines*100)	**0**, 1
	Page Length (Lines*10)	**7**, 8, 9, 0, 1, 2, 3, **4**, 5, 6
	Page Length (Lines*10)	**2**, 3, 4, 5, 6, 7, 8, 9, 0, 1
	Sheet Page Length	**11 2/3"**, 14", 16.57", 3", 3.5", 4", 5.5" 6", 7", 8", 8.5", 12", 11"
Set-Up	Graphics	**Bi-directional**, Uni-directional
	Receive Buffer Size	**16k**, 28k, 1 Line, 4k
	Paper Out Override	**No**, Yes
	Print Registration	**0**, 0.05, 0.1, 0.15, 0.2, 0.25mm left 0.25, 0.2, 0.15, 0.1, 0.05mm right
	Operator Panel Function	**Full Operation**, Limited Operation
	Reset Inhibit	**No**, Yes
	Print Suppress Effective	**Yes**, No
	Auto LF	**No**, Yes
	Auto CR	**No**, Yes
	CSF Bin Select	**Bin 1**, Bin 2
	SI Select Pitch (10 CPI)	**17.1 CPI**, 15 CPI
	SI Select Pitch (12 CPI)	**20 CPI**, 12 CPI
	Time Out Print	**Valid**, Invalid
	Auto Select	**No**, Yes
	Sensor Disable	**No**, Yes
Parallel I/F Invalid	I-Prime	**Buffer Print**, Buffer Clear,
	Pin 18	**+5V**, Open

Group	Item	Selections
	AutoFeed XT	**Invalid**, Valid
Serial I/F	Parity	**None,** Odd, Even
	Serial Data	**8 Bits,** 7 Bits
	7- or 8- Bits	
	Protocol	**Ready/Busy**, XON/XOFF
		Diagnostic Test **No,** Yes
	Busy Line	**SSD-,** SSD+, DTR, RTS
	Buad Rate	**9600 BPS,** 4800 BPS, 2400 BPS,
		1200 BPS, 600 BPS, 300 BPS,
		19200 BPS
	DSR Signal	**Valid**, Invalid
	DTR Signal	**Ready on Power Up,**
		Ready on Select
	Busy Time	**200 ms**. 1 Sec

Explanation of menu items

Emulation Mode: Select the printer command set you want your ML3410 to use. Choose Epson FX series or IBM Proprinter. See Chapter 3 and onwards for features of each mode.

Print Mode: Choose NLQ for Near Letter Quality printing, Utility for quicker printing, or HSD (High Speed Draft) for fastest printing speed.

Pitch: Choose character width measured in characters per inch (CPI), or proportionally spaced characters.

Style: Choose Normal (upright) or Italics (slanted).

Size: Choose Single or Double width and height.

Character Set: Choose IBM Character Set 2, Set 1 or Epson (see Appendix B) as the default character set.

Language Set: These sets replace certain symbols with special characters used in the respective foreign languages (see National Character Sets in Appendix B).

Zero Character: Choose Slashed when it is important to distinguish between a zero (0) and a capital letter O.

Slashed Letter O: Characters ¢ (155) and ¥ (157) will be set to slashed ø and slashed Ø if you set this item to YES.

Code Page: This option is available in both IBM and EPSON emulation. This allows several character sets containing special characters to be accessed using the format which selects IBM Character Sets 1 and 2 and the All Character Set.

Line Spacing: Choose 6 lines per inch (1/6 inch line spacing) or 8 LPI (1/8 inch line spacing).

Form Tear Off: Use this option to turn the forms tear off feature ON or OFF or to allow a waiting time after a form feed occurs. When it is set to offline, if the printer receives a FF or end of page is reached and there is no more data, the paper is fed to the TOF position and the printer is deselected. After the sheet has been removed the user should push the SEL switch to resume or start a print job. The default setting is OFF.

Skip Over Perforation: Choose YES if you want the printer to advance automatically to the next page when it comes within one inch of the bottom of the page. If your software has its own page formatting controls, set this item to NO to avoid interference.

Page Width: Choose the width of paper that you are printing on.

Form Length Base: This allows you to select the correct page length by number of inches or number of lines per page.

Page Length (Inches): Choose the length of continuous form paper in use. This enables the printer to keep track of the initial printing position on each page (TOF).

Page Length (Lines*100), (Lines*10), (Lines*1): Choose the length of continuous form paper in use by number of lines. The length can be from 0 to 127.

Graphics: Choose unidirectional (left to right only) for better graphics print registration at slower speed. Choose bidirectional for higher print speed.

Receive Buffer Size: Choose the size of the buffer (16K, 28K or 1 Line). This allows you to send large jobs to your printer, which can be held in a larger buffer, and reduce the time that your computer is busy sending data.

If your computer has problems with device time-outs due to the time taken to clear the buffer, select a smaller buffer size. The time taken to clear the buffer will be shorter and the computer will be able to resume transmitting data.

Paper Out Override: The paper out detector senses when less than one inch of paper remains in the printer and stops printing at that point. Choosing YES overrides the detector so you can print closer to the bottom of the page if you are using single sheets. Be careful if you use this feature: it lets the printer continue printing when there is no more paper, which causes loss of data and may damage the printhead and the platen. The default setting is NO.

Print Registration: Use this option with bidirectional bit image graphics to improve registration. Although 0 is generally the best selection, choosing another value may compensate for registration problems with some graphics software packages.

Operator Panel Functions: Full Operation is the normal setting. Choose Limited Operation to deactivate the PRINT QUALITY and CHARACTER PITCH buttons on the control panel. Then you can control these features only through your software. This can be useful when several people are using the printer and you do not want its settings changed.

Reset Inhibit: Choose YES if your software package or computer sends an initialization command at the start of each job. This initialization command will reset any features that you may have set to the menu default.

Print Suppress Effective: Select YES when you want the print suppress commands in each of the emulations to be active. The print suppress commands are ignored when this option is set to NO.

Auto LF: Choose YES to have the printer automatically add a Line Feed command to each Carriage Return command it receives. The choice depends on whether your computer adds a Line Feed. If your printout is consistently double spaced, select NO; if it overprints, choose YES.

Auto CR (IBM): Choose NO to prevent the printer from automatically adding a Carriage Return to each Line Feed command it receives. This feature only appears in IBM emulation.

CSF Bin Select: Select Bin 1 or Bin 2 for paper feed option.

SI Select (10 CPI): Selects 17.1 or 15 CPI.

SI Select (12CPI): Selects 20 or 12 CPI.

Time Out Print: When validated, if the printer does not receive print commands and nothing is received for 150msec, the buffer characters are printed. If invalidated, the buffer is not printed until print commands are received.

Auto Select: If selected, after paper is automatically loaded using the Form Feed button, the printer is set to ON-LINE. If NO is selected, the printer does not automatically come ON-LINE after paper has been loaded .

Sensor Disable: If deselected the TOP feed sensor is enabled. When using bottom feed, this should be set to YES.

The following options are used when the parallel interface is selected.

I-Prime: Buffer print— when this signal is received, the printer is initialised after the buffer data is printed. Buffer clear —the printer is initialised after the current line has been printed. Invalid— This signal is ignored.

Pin 18: This pin supplies 5V or zero volts as required by external device when connected to interface.

Auto Feed XT: There is normally no Line Feed after a Carriage Return if the Auto Line Feed is set to NO. However, in the Epson emulation, if the Auto Line Feed is set to NO and the Auto Feed XT is set to valid, a Line Feed is executed upon an Auto Feed signal on pin 14 of the parallel interface. This exception may be necessary for some hardware/software combinations.

The following options are used only if the serial interface is selected (see Appendix C for details).

Parity: Selects parity.

Serial Data 7- or 8- Bits: Selects data format. When the Serial Data 7- or 8- Bits is set to 7, the Parity must be set to either ODD or EVEN. 7- Bit Serial Data will not be printed correctly if the Parity is set to NONE.

Protocol: Selects interface protocol.

Diagnostic Test: Activates the printer's interface diagnostic test.

Busy Line: Selects line used for busy signal.

Baud Rate: Selects data transmission speed.

DSR Signal: Sets the Data Set Ready (DSR) signal.

DTR Signal: Selects Data Terminal Ready (DTR) signal status.

Busy Time: Sets busy signal timing.

Cleaning

Every six months (or after 300 hours of operation), take a clean, dry soft cloth and dust the area around the carriage shaft and platen. Be sure to remove any loose particles of paper. Do not use solvents or strong detergents on the cabinet. Be sure to turn the printer OFF before cleaning.

Make sure the photosensor, which is located on the paper chute behind the platen, is regularly cleaned, especially when signs of paper dust accumulate. Cleaning can be done using a cotton bud or any other suitable non-abrasive cleaning implement.

Auto Fan Stop

When the printer has been in the idle mode for a short time, the fan inside the printer will stop. The printer remains in the select mode and is ready to receive data. As soon as the printer starts to print the fan will resume operation.

Problem Solving

Why does nothing happen when I turn on the printer?

The printer may not be plugged in. Check the power cord connection to the printer and the outlet.

Why is the ALARM light on?

Check to see if:

- Paper is out.
- The paper lever is not set for the type of paper that you are using (single sheet or continuous-form paper).
- The front cover is open.

After correcting the alarm condition, you may have to turn the printer off and on again to make the ALARM light go out.

Why is the ALARM light not on when the printer is powered on and there is no paper loaded?

- Make sure that the photosensor which detects single sheet paper is not dirty from paper dust, (See Cleaning section, Page 2-17.)

If paper dust accumulates on the surface of this sensor, it is possible for the sensor to be activated, causing the printer to detect incorrectly that the paper has been loaded. While the printer is in this condition it is impossible for the user to load single sheet paper.

Why is the ALARM light flashing?

Turn the printer off and check to see if:

- The bail is open. Make sure the bail lever is towards the back of the printer.
- The paper or ribbon is jammed.
- Something is blocking the path of the printhead.

If you are unable to rectify these problems contact your nearest OKI service centre.

Why does the printer not print when data is sent from the computer?

You may have the printer deselected (the SELECT light is out). Press the SELECT button. If the SELECT light still does not come on, even though the POWER light is on, turn the printer OFF and check that the interface connection from the computer is secure.

Why are dots missing in my printout?

The headgap may not be set correctly. Try moving the headgap lever to a lower setting. If that does not help, the printhead may be damaged. Call for service.

Why does my ribbon come off?

- Make sure that the ribbon cartridge is seated properly.

- Ensure that the ribbon is properly located around the ribbon guide, as shown on the ribbon fitting instruction label.

How can I check the data that my computer is sending to the printer?

By entering the hexadecimal mode. Hold the SELECT and FORM FEED buttons down while turning the printer ON. All data sent to the printer, including text and printer commands, will be printed in hexadecimal format. For example, this line of BASIC code:

LPRINT CHR$(27);"0"; CHR$(30);"12345";CHR$(10)

would print in this format;

1B 30 1E 31 32 33 34 35 0A   . 0. 1 2 3 4 5.

To return to standard printing, turn the printer OFF then ON again.

IBM Modes Standard Features

The following chapters explain all the available features that can be changed, starting with the basic functions for IBM modes (**Proprinter** compatibility), followed by the advanced features.

Some of these commands will be applicable for the Epson mode as well. Those commands which only apply to the Epson mode will be dealt with in Chapters 5 and 6. A quick reference will be supplied at the beginning of Chapter 5 to let you know which commands for the Epson mode have already been dealt with in this first section. Beside each feature you will find one or more of the following letters to indicate in which mode(s) the command works:

P   Commands work in the Proprinter mode.

F   Commands work in the Epson FX mode.

A complete summary of all the control codes that are available in each mode can be found in Appendix A.

Characters Per Inch (CPI)

The numbers of characters per inch defines how many letters (or other symbols like numbers) can be printed in one inch. The MICROLINE 3410 EI offers you the choice of 10 character sizes:

pica	(10 characters per inch)
elite	(12 CPI)
fine print	(15 CPI)
condensed	(17.1 CPI)
condensed	(20 CPI)

and their expanded or double-width counterparts:

5 CPI	(double 10 CPI)
6 CPI	(double 12 CPI)
7.5 CPI	(double 15 CPI)
8.5 CPI	(double 17.1 CPI)
10 CPI	(double 20 CPI)

You will notice that the double-width command expands the characters so that fewer fit in an inch. If you want to separate your text into topics, this feature is ideal for printing headlines.

Although the default setting is 10 CPI, you can change the character pitch anytime by entering the following printer control codes.

Character Pitch	Decimal	Hex.	ASCII	Comp.
10 CPI (Pica)	18	12	DC2	P
12 CPI (Elite)	27 58	1B 3A	ESC :	P
17.1 or 20 CPI (Condensed print) (10 CPI becomes 17.1 CPI or 12 CPI becomes 20 CPI)	15	0F	SI	P
15 CPI (Fine print)	27 103	1B 67	ESC g	P F

Double Width	Decimal	Hex.	ASCII	Comp.
Begin double width printing for one line	14	0E	SO	P F
Cancel double width printing for one line	20	14	DC4	P F
Begin double width printing (not cancelled by end of line)	27 87 49	1B 57 31	ESC W 1	P F
Cancel double width printing	27 87 48	1B 57 30	ESC W 0	P F

Note: Double width printing in 10 CPI and 12 CPI can be combined with Near Letter Quality, emphasised, and enhanced printing. The ESC W 1 command takes priority over the SO command.

Double Height and/or Double Width	Decimal	Hex.	ASCII	Comp.
Begin double height and/or double width printing	27 91 64 n1 n2 m1...m4	1B 5B 40 n1 n2 m1...m4	ESC [@ n1 n2 m1...m4	P

This command is only for the Proprinter mode and sets either double height, double width or both, together with the control of line spacing. The table overleaf will help you choose the correct command for your requirements.

n1 and n2 are the number of bytes in the sequence. Normally this will be four so n1 = 4 and n2 = 0.

m1 to m4 are the modes available. m1 and m2 are ignored and are therefore constantly set at 0. m3 defines character height and line feed value. m4 defines character width.

Selecting m3

m3	Function
0	No Change
1	LF Unchanged
	Standard height characters
2	LF Unchanged
	Double height characters
16	Single LF/
	Character height unchanged
17	Single LF/
	Standard height characters
18	Single LF/
	Double height characters
32	Double LF/
	Character height unchanged
33	Double LF/
	Standard height characters
34	Double LF/
	Double height characters

m4 specifies either standard or double width characters as below:

    m4 = 0 No change
    m4 = 1 Standard
    m4 = 2 Double Width Chr.

Only m3 and m4 have to be selected according to the desired function. The complete ESC sequence is:

CHR$(27);"[@";CHR$(4);CHR$(0);CHR$(0);CHR$(0);CHR$(m3);CHR$(m4)

For certain applications you may need to know how many characters fit in one line. This depends on both the characters per inch and the paper width. Table 1 shows the maximum number of characters per line for each character pitch.

Table 1 Maximum Number of Characters Per Line

Character Size	
Pica (10 CPI) CHR$(18)	136
Elite (12 CPI) CHR$(27);CHR$(58)	163
Fine Print (15 CPI) CHR$(27);CHR$(103)	204
Condensed (17.1 CPI)	233
Condensed (20 CPI) CHR$(15)	272
Double Pica (5 CPI) CHR$(18);CHR$(14)	68
Double Elite (6 CPI) CHR$(27);CHR$(58);CHR$(14)	81
Double Fine Print (7.5 CPI) CHR$(27);CHR$(103);CHR$(14)	102
Double Condensed (8.5 CPI) CHR$(18);CHR$(15);CHR$(14)	116
Double Condensed (10 CPI) CHR$(27);CHR$(58);CHR$(15);CHR$(14)	136

IBM BASIC will not normally let you print more than 80 characters on a line. Enter a WIDTH statement to supersede this limitation. Read your IBM BASIC reference manual for an explanation of this command.

Print Modes

Near Letter Quality, Utility, High Speed Draft and Italics

The first time you turn your printer on, it will automatically print in utility mode. In this mode the printer prints bidirectionally: that is, printing one line from left to right, the next line from right to left, etc. This printing method increases the printer's speed so it prints 417 characters per second. You can use this mode for high-volume printing and for printing program listings or rough drafts.

If you can sacrifice a little print quality for speed, select High Speed Draft (HSD) mode. In this print mode, you can have printing at 550 cps in 10 CPI. However, draft mode is unavailable with double width, emphasised, enhanced, italics and proportional spacing.

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 slower (at 104 characters per second) because it prints each line twice. On the second pass, the printer fills in between the dot pattern printed on the first pass and forms a sharp, crisp letter. You get excellent results when you print your word-processing files in this mode.

Often when you are writing you may want to highlight a paragraph or keywords with italics. Italics are printed in NLQ mode also. In the Menu Select Mode, you will notice italics is designated by ITALICS (Italics characters).

Overleaf is a summary of the commands you need to enter.

Print Mode	Decimal	Hex.	ASCII	Comp.
High Speed Draft Mode (HSD)	27 35 48	1B 23 30	ESC # 0	P
Begin Italics Printing	27 37 71	1B 25 47	ESC % G	P
Stop Italics Printing	27 37 72	1B 25 48	ESC % H	P
Important: These modes can also be selected with the Menu select mode. When PRINT MODE appears, UTILITY, NLQ and HSD can be selected.				
Near Letter Quality Mode (NLQ)	27 71	1B 47	ESC G	F P
Select NLQ Gothic	27 73 50	1B 49 32	ESC I 2	P
Select NLQ Courier	27 73 51	1B 49 30	ESC I 0	P
Exit NLQ	27 72	1B 48	ESC H	F P
Note: Clearance between NLQ characters is variable.				

Proportional spacing

Proportional spacing gives a document a typeset look by adjusting the spacing between characters according to the width of a character, for example an 'i' would need less space than a 'w' would. The proportional spacing command can be given anywhere on a line.

Proportional Spacing	Decimal	Hex.	ASCII	Comp.
Proportional spacing on	27 80 49	1B 50 31	ESC P 1	P
Proportional spacing off	27 80 48	1B 50 30	ESC P 0	P

Spacing between characters

Some software packages let you specify the individual character width (see Proportional Spacing under the Menu Select mode), and the spacing between individual letters. Together, by varying the spacing between characters in proportion to their width, these features produce a more polished, typeset look. If you compare a printed book page with a typed page you will see the difference.

If your software package has this option, you must modify it by entering the control codes explained below. Follow the software package's instructions on modifying it.

When the printer is turned on, its standard character spacing is 3/120 inch (0.64 mm) at 10 CPI and 3/144 inch (0.53 mm) at 12 CPI. The control code described below lets you increase that spacing to a maximum of 14/120 inch (2.96 mm) and 14/144 inch (2.47 mm).

Spacing between characters	Decimal	Hex.	ASCII	Comp.
Change spacing between characters	27 86 n	1B 56 n	ESC V n	P
Return to standard spacing	27 86 0	1B 56 00	ESC V NUL	P

Important: This command is ignored when the printer is in bit-image blocks, or line graphics mode.

The final number "n" in this code is any number between 1 and 11. This lets you insert up to 11 dot spaces between each letter. Normally, your printer puts three dot spaces between each letter. If you want to use character spacing with proportional spacing, remember to specify proportional spacing in the last option of the Menu Select Mode (PROPORTIONAL SPACING) by selecting "YES" or using a software command. Be sure NLQ is the current value for PRINT MODE.

This command increases spacing between characters in multiples of:

1/120 inch (0.21 mm, 10 CPI)
1/144 inch (0.18 mm, 12 CPI),
1/180 inch (0.14 mm, 15 CPI)
1/206 inch (0.12 mm, 17.1 CPI) and
1/240 inch (0.11 mm, 20 CPI).

The maximum variable number is 11, so the maximum possible space between characters is:

14/120 inch (2.96 mm) at 10 CPI, or
14/144 inch (2.47 mm) at 12 CPI

After you set the spacing, it stays in effect until you turn off the printer, change the setting, or return to the standard spacing.

Character Sets

In the IBM-Modes your MICROLINE 3410 lets you choose between two IBM character sets and numerous international character sets.

IBM CHARACTER SETS

IBM Character Set 1 repeats many of the non-printable commands (such as ESC and NUL) at the higher end of the ASCII scale, at decimal locations 128 through 155. The ESC command, for example, can be given as either decimal value CHR$(27) or CHR$(155). In IBM Character Set 2, the high ASCII values are reserved for characters used in foreign languages. Both these character sets have line graphics characters and mathematical symbols at decimal locations 160 through 255 on the ASCII chart. IBM Character Set 2 also includes special characters in decimal locations 3 through 6: a heart, diamond, club and spade. The section on non-ASCII characters explains how to print these special characters.

Appendix B shows you the two IBM character sets

Character Sets	Decimal	Hex.	ASCII	Comp.
Select character set 1	27 55	1B 37	ESC 7	P
Select character set 2	27 54	1B 36	ESC 6	P

Code Page: This allows the user to select a Code Page which is then available as IBM Character Sets 1, 2 and the All Character Set (in IBM emulation). The characters are accessed in the same way, using the commands ESC 7 to select Character set 1, ESC 6 to select Character Set 2 and ESC ^ or ESC \ n1 n2 to select the All Character Set.

The Code Pages can be found in Appendix B.

IBM Code Page Selection

This command selects the IBM code page, IBM PPR only, defined by the ID number.

IBM Code Page	Decimal	Hex.	ASCII	Comp.
IBM Code Page	27 91 84 n1 n2 0 0 m1 m2 0	1B 5B 54 n1 n2 00 00 m1 m2 00	ESC [T n1 n2 NUL NUL m1 m2 NUL	P

Note: When Code Pages are selected, slashed zero can be selected by the menu.

These commands allow you to select character sets that replace some less frequently used characters with symbols used in a variety of European languages.

n1 and n2 are the number of bytes in the sequence. Normally this will be five, so n1=5 and n2=0.

To select code pages in IBM emulation, take the IBM ID number and divide it by 256. Assign this number to m1 and the remainder to m2. To specify code page 850 use this BASIC statement:

LPRINT CHR$ (27): "[T"; CHR$ (5); CHR$(0); CHR$ (0);
CHR$ (0); CHR$ (3); CHR$ (82); CHR$ (0);

ID	Code Page
437(1B5H)	USA
850(352H)	MULTILINGUAL
860(35CH)	PORTUGAL
863(35FH)	CANADA FRENCH
865(361H)	NORWAY
1008(3FOH)	GREEK-437
1009(3F1H)	GREEK-928
1010(3F2H)	GREEK-851
1012(3F4H)	TURKEY
1013(3F5H)	CYRILLIC
1014(3F6H)	POLSKA MAZOVIA
1015(3F7H)	POLSKA PC LATIN 2
1016(3F8H)	SERBO CROATIC I
1017(3F9H)	SERBO CROATIC II
1018(3FAH)	ECMA 94

IBM Code Page ID Number Assignment

ID	Code Page
437	USA
850	Multilingual
851	(reserved)
852	(reserved for Eastern Europe)
853	(reserved)
855	(reserved for Cyrillic–I)
860	Portugal
862	(reserved)
863	French-Canadian
864	(reserved)
865	Norway
866	(reserved for Cyrillic–II)
876	(reserved)
877	(reserved)
899	(reserved)
909	(reserved)
911	(reserved)
1000	(reserved)
1001	(reserved)
1002	(reserved)
1003	(reserved)
1004	(reserved)
1005	(reserved)
1006	(reserved)
1007	(reserved)
1008	Greek-437
1009	Greek-928
1010	Greek-851
1011	(reserved)
1012	Turkey
1013	Cyrillic
1014	Polska Mazovia
1015	Polska PC Latin 2
1016	Serbo Croatic 1
1017	Serbo Croatic 2
1018	ECMA 94
1019	(reserved for Windows East Europe)
1020	(reserved)
1021	(reserved)
1022	(reserved fro Windows Cyrillic)
1023	(reserved for Windows ANSI)
1024	(reserved for Hungarian CWI)

Character set	Character Set Codes		
	Decimal	Hexadecimal	ASCII
ASCII (Ø)	64	40	@
ASCII (0)	65	41	A
BRITISH	66	42	B
GERMAN	67	43	C
FRENCH	68	44	D
SWEDISH I	69	45	E
DANISH	70	46	F
NORWEGIAN	71	47	G
DUTCH	72	48	H
ITALIAN	73	49	I
FRENCH-CANAD'N	74	4A	J
SPANISH	75	4B	K
SWEDISH II	76	4C	L
SWEDISH III	77	4D	M
SWEDISH IV	78	4E	N
TURKISH	79	4F	O
SWISS I	80	50	P
SWISS II	81	51	Q
PUBLISHER	90	5A	Z

INTERNATIONAL CHARACTER SETS

With the Menu Select mode or with a programming command, you can access special characters used in a specific language. These languages include English (with British or American symbols), German, French, Swedish, Danish, Norwegian, Dutch, Italian, French-Canadian, Spanish and Publisher. When you select a language with the Menu Select mode or with the language command, some of the standard keyboard characters are replaced by new symbols. If you enter the British character set and press the # key, you get a Pound Sterling symbol: £. Although the # symbol will still appear on your screen, the printer will print the Pound Sterling symbol in its place.

International Character Sets	Decimal	Hex.	ASCII	Comp.
Select International character set	27 33 n	1B 21 n	ESC ! n	P
where n is the code for the character shown in the table				

The characters that change from language to language are shown in the following table

IBM NATIONAL CHARACTER SETS

ESC! n	Language	Decimal value																
		35	36	38	48	64	79	91	92	93	94	95	96	105	123	124	125	126
@	ASCII (Ø)	#	$	&	Ø	@	O	[	\	]	^	_	`	i	{	|	}	~
A	ASCII (0)	#	$	&	0	@	O	[	\	]	^	_	`	i	{	|	}	~
B	British	£	$	&	0	@	O	[	\	]	^	_	`	i	{	|	}	~
C	German	#	$	&	0	§	O	Ä	Ö	Ü	^	_	`	i	ä	ö	ü	ß
D	French	£	$	&	0	à	O	°	ç	§	^	_	`	i	é	ù	è	¨
E	Swedish I	#	¤	&	0	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
F	Danish	#	$	&	0	@	O	Æ	Ø	Å	Ü	_	`	i	æ	ø	å	ü
G	Norwegian	#	$	&	0	@	O	Æ	Ø	Å	^	_	·	i	æ	ø	å	~
H	Dutch	£	$	&	0	@	O	[	IJ	]	^	_	`	i	{	ij	}	~
I	Italian	£	$	&	0	§	O	°	ç	é	^	_	ù	i	à	ò	è	ì
J	French-Canadian	ü	$	ë	0	à	Ø	á	ç	ê	î	ï	ô	i	é	ù	è	û
K	Spanish	!	$	&	0	¡	O	Ñ	ñ	¿	ü	_	á	i	é	í	ó	ú
L	Swedish II	#	$	&	0	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
M	Swedish III	§	$	&	0	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
N	Swedish IV	§	¤	&	0	É	O	Ä	Ö	Å	^	_	é	i	ä	ö	å	ü
O	Turkish	ş	$	ğ	0	Ş	O	İ	Ö	Ü	Ğ	_	ç	ı	Í	ö	ü	ç
P	Swiss I	£	$	&	0	ç	O	à	é	è	^	_	`	i	ä	ö	ü	"
Q	Swiss II	£	$	&	0	§	O	à	ç	è	^	_	`	i	ä	ö	ü	é
Z	Legal/Publisher	#	$	&	0	§	O	°	´	¨	¶	±	`	i	©		†	™

Enhanced and emphasised printing

These print styles let you highlight text with bold letters. In both emphasised and enhanced printing the printer prints over the same text twice: the second pass is offset by a half-dot horizontally in emphasised printing, and by a half-dot vertically in enhanced printing.

Enhanced mode is not available in Near Letter Quality mode, but emphasised may be used.

Enhanced/Emphasised Printing	Decimal	Hex.	ASCII	Comp.
Start emphasised printing (horizontal offset)	27 69	1B 45	ESC E	P F
Stop emphasised printing	27 70	1B 46	ESC F	P F
Start enhanced printing (vertical offset)	27 71	1B 47	ESC G	P F
Stop enhanced printing	27 72	1B 48	ESC H	P F

Superscripts and subscripts

With this feature you print characters slightly above the print line (superscripts) for footnotes and exponents, and characters slightly below the line (subscripts) for formulas.

Superscripts and subscripts are half the width and height of standard characters at 10 CPI and 12 CPI, and half the height of standard characters at 15 CPI, 17.1 CPI or 20 CPI.

Superscripts and Subscripts	Decimal	Hex.	ASCII	Comp.
Start superscripts	27 83 48	1B 53 30	ESC S 0	P F
Start subscripts	27 83 49	1B 53 31	ESC S 1	P F
Stop super/subscripts	27 84	1B 54	ESC T	P F

Underlining

With this feature you can draw an unbroken line under characters and the spaces between characters.

Underlining	Decimal	Hex.	ASCII	Comp.
Start continuous underlining	27 45 49	1B 2D 31	ESC - 1	P F
Stop underlining	27 45 48	1B 2D 30	ESC - 0	P F

Note: The underline feature prints a line which overlaps the end of the tails on descending characters (that is p, g, etc.). This feature will not operate in the High Speed Draft (HSD) mode.

Overscoring

The overscore command causes a line to be drawn above the designated characters. Spaces specified by the horizontal tab command will not be overscored.

Overscoring	Decimal	Hex.	ASCII	Comp.
Start overscoring	27 95 49	1B 5F 31	ESC _ 1	P
Stop overscoring	27 95 48	1B 5F 30	ESC _ 0	P

Formatting Features

Page length, top of form, and form feed

After you set the page length, the printer knows what size paper you are using. When you switch your printer on, the current location of the print head is recorded as the top of form, the position of the first line of printing on the page below the top margin. Inserting a Form Feed command after printing several lines moves the paper to the first printing line of the next page.

Formatting Features	Decimal	Hex.	ASCII	Comp.
Set page length by number of lines per page	27 67 n	1B 43 n	ESC C n	P F
Set page length by number of inches per page	27 67 0 n	1B 43 00 n	ESC C NUL n	P F
Set Top Of Form (TOF) at current printhead position	27 52	1B 34	ESC 4	P
Advance paper to next TOF	12	0C	FF	P F

Line spacing

Unless you change the print menu, the printer is normally set to print 6 lines per inch (LPI); the distance from the bottom of one letter to the bottom of the one below is 4.23 mm (1/6 inch). If you want to fit more lines on to a page, use the 8-LPI command (3-mm (1/8 inch) spacing), or the 2.45 mm (7/72-inch) spacing—although this is mostly used in 7-Bit Graphics.

Line Spacing	Decimal	Hex.	ASCII	Comp.
Set lines at 8 LPI	27 48	1B 30	ESC 0	P F
Set lines at 10.2 LPI	27 49	1B 31	ESC 1	P F

Fine line spacing

For graphics or special effects, use the fine lines per inch commands, which change the spacing in multiples of 1/72 inch or 1/216 inch. This does not affect the height of characters; it changes only the spacing between the lines. For example, if you choose a fine lines per inch of 72/72 inch, there is 1 inch between the bottom of one line and the bottom of the next.

To set lines per inch in multiples of 1/72 inch, first use:

Fine Line Spacing	Decimal	Hex.	ASCII	Comp.
Set LPI in multiples of 1/72 in.	27 65 n	1B 41 n	ESC A n	P F

The last code "n" is the multiple you require and is a number with a decimal value greater than 1 and less than 85.

For the Epson Mode that is all you need to do. For the IBM modes you must also activate the lines per inch set using:

Fine Line Spacing	Decimal	Hex.	ASCII	Comp.
Activate fine line spacing	27 50	1B 32	ESC 2	P

This command activates the fine lines per inch set by the CHR$(27);"A";CHR$(1-85) command. You can use these two commands to to return to 6 LPI by having CHR$(1-85) equal 12. (12/72 inch equals 1/6 inch line spacing.)

Note: When no Fine Line Spacing is specified prior to an activate command, the default spacing in the current menu is activated.

To set lines per inch in multiples of 1/216 inch up to 255/216 inch, use this command:

Set Lines Per Inch (LPI)	Decimal	Hex.	ASCII	Comp.
Set LPI in multiples of 1/216 in.	27 51 1-255	1B 33 01-FF	ESC 3 n	P F

To execute a single line feed of 0.12 mm (1/216 inch) up to 29.98 mm (255/216 inch) use this command:

Variable Line Feed	Decimal	Hex.	ASCII	Comp.
Execute variable line feed	27 74 1-255	1B 4A 01-FF	ESC J n	P F

Note: For both these commands in Epson Mode n = 0-255

The last code equals a number between 1 and 255. This line spacing activates automatically when the printer receives this command.

For mechanical reasons, the ML3410 advances paper in multiples of 1/144 inch, not in multiples of 1/216 inch, which is the standard for IBM printers. To increase IBM compatibility, the printer multiplies the variable value (01 to 255) in your statement by 2/3 to approximate 1/216 inch. Because of rounding off, you may sometimes notice lines per inch varies slightly from your specified statement. For more precise spacing set your lines per inch in multiples of 1/72 inch wherever possible.

Automatic skip-over perforation
With this feature you can specify where the printer will skip from the bottom of one page to the top of form of the next page. The printer automatically skips over the perforation between pages of computer paper, and starts printing again at the next top of form. This feature can be used in a software program, eliminating the need for inserting the programming command for form feed (FF) after every page in your program. After the automatic skipping distance is set, you can print a program several pages long without worrying about the pages running together.

Before you set the automatic skip it is a good idea to set the form length and top of form.

Although you can select automatic skip-over perforation of one inch (bottom and top margins) in the Menu Select Mode, with the following command you can vary the distance skipped:

Auto Skip-Over Perforation	Decimal	Hex.	ASCII	Comp.
Vary distance skipped-over perf.	27 78 1-255	1B 4E 01-FF	ESC N n	P F
Stop skip-over perforation	27 79	1B 4F	ESC O	P F

* In this command, the 1 to 127 for Epson Modes or the 1 to 255 for Proprinter XL mode represent the number of lines skipped from the bottom of one page to the top of form of the next page.

Indenting

With this feature you can indent one line of print for beginning paragraphs, positioning headings, etc. The amount of indentation is calculated in dot columns. A dot column is the distance from the centre of one dot to the centre of the next dot within a character pattern. This distance varies according to the size of the character. The following table shows the measurements for each size:

		Character Width				
		10CPI	12CPI	15CPI	17.1CPI	20CPI
Dot Column Width	(inches)	1/120	1/144	1/180	1/206	1/240
	(mm)	0.21	0.18	0.14	0.12	0.11

You can set the indentation to the exact dot position distance from the print head's home position by entering the following control code sequence in your program:

Indenting	Decimal	Hex.	ASCII	Comp.
Indenting	27 37 66 n1 n2 n3 n4	1B 25 42 n1 n2 n3 n4	ESC % B n1 n2 n3 n4	P

The column number (n1, n2, n3, n4) must be a four-digit number and cannot be less than the left margin or exceed the right margin. If you are programming in BASIC using hexadecimal, remember to represent each of the four digits with a two-digit hexadecimal number. Be sure to include the semicolon (;) at the end of this code sequence, otherwise the command will not work.

You will notice that the actual amount of indentation varies with the character size, but the indentation relative to the next line remains the same.

Setting the page margins

Set the left and right margins with:

Set Page Margins	Decimal	Hex.	ASCII	Comp.
Set page margins	27 88 n1 n2	1B 58 n1 n2	ESC X n1 n2	P

n1: left margin
n2: right margin

nl and n2 are converted to a multiple of 1/120 inch according to the character pitch (10/12/15/17.1/20CPI) at the time. Thereafter, the distance from the home position does not change even when the character pitch is changed.

The valid ranges for n1 and n2 are as follows:

n	CPI				
	10	12	15	17.1	20
n1	1≤n1	1≤n1	1≤n1	1≤n1	1≤n1
n2	5≤n2	6≤n2	7≤n2	9≤n2	10≤n2
n2-n1	4≤n2-n1	5≤n2-n1	6≤n2-n1	8≤n2-n1	9≤n2-n1

The right margin must be at least 4 characters (at 10 CPI) to the right of the left margin. However, if n2 is greater than the default value, it is replaced with the default value and then the range is checked.

The default values for the right margin (n2) are as follows:

CPI				
10	12	15	17.1	20
136	163	204	233	272

If n1, n2, and n2-n1 are outside the range, the entire command is ignored and the left and right margins remain unchanged. The n1 and n2 values indicate left and right margins of the printable area.

Example

When $n1 = 10$ and $n2 = 100$, the print area is from column 10 to 100 with 91 printable columns.

The default value for the left margin is fixed at 1.

When the command is entered at the beginning of a line, it takes effect from that line. When it is entered in the middle of a line, it takes effect from the next line.

Automatic carriage return in word units as in IBM color printer is not performed.

Note: Word unit automatic carriage return means that when the right margin is exceeded, the last word is printed on the next line instead of being split at the end of a line. This is used with word processors.

Horizontal tabs

When you turn on the printer, tabs are set automatically for every eighth character. As with a typewriter, however, you can set your own horizontal tab stops on the ML3410. You set the stops with a line at the beginning of your program, and insert an HT code whenever you want to skip to the next tab stop. Some important distinctions will give you more flexibility.

You can set up to 28 tab stops in either IBM mode or up to 32 in Epson mode but you must enter them in left-to-right sequence or in ascending numeric order.

In the Epson mode the horizontal tabs should be relative to the actual left margin. In the IBM modes they are set from the absolute left margin (character column 0).

Character column tabs

Character Column Tabs	Decimal	Hex.	ASCII	Comp.
Set character column tabs	27 68 1st tab... 0	1B 44 1st tab... 00	ESC D 1st tab.... NUL	P F

Note: Character column number must be a one-byte binary. If you are programming in hexadecimal, remember that each digit must be represented by a two-digit hexadecimal number.

The location of the rightmost possible tab stop depends on the printer model (the ML3410 has a wider carriage) and the character size you are using (there are more characters on a line at 17.1 CPI than at 10 CPI). This chart shows the possible combinations.

	Maximum Character Columns Per Line at				
	10CPI	12CPI	15CPI	17.1CPI	20CPI
ML3410	136	163	204	233	272

If you try to skip to a tab stop set beyond the width of the page, or if you try to skip to a tab where none was set, the printer will advance the paper one line and begin printing at the first column of the next line.

Tab Stops	Decimal	Hex.	ASCII	Comp.
Skip to next tab stop	9	09	HT	P F
Clear tab stops	27 68 0	1B 44 00	ESC D NUL	P F

Vertical tabs

The command VT advances the paper to the next vertical tab stop position. If automatic carriage return is on, a CR is done after each VT.

In Epson or Proprinter mode, if the next tab stop is greater than the form length (or the form length minus skip perforation) or no vertical tab stops are set a VT is treated as a line feed.

Up to 16 Vertical Tabs can be set in the Epson mode or up to 64 positions on a page in Proprinter XL mode. The vertical tab positions are to be set in lines. The line at the top of the form is line number 1.

Vertical Tabs	Decimal	Hex.	ASCII	Comp.
Set vertical tabs	27 66 1 ... 64 0	1B 42 01 ... 40 00	ESC B SOH ...@ NUL	P F
Cancel vertical tabs	27 66 0	1B 42 00	ESC B NUL	P F
Skip to next vertical tab	11	0B	VT	F
Clear vertical tabs and set horizontal tabs*	27 82	1B 52	ESC R	P

* Horizontal tabs are set at every 8th position, starting at column 9.

Miscellaneous Features

Carriage return and line feed

When the printer receives a Carriage Return (CR) command, it will print a line of data and return the printhead to the left side of the page. When it receives a Line Feed (LF) command, the printer will advance the paper one line. Normally your computer will automatically add a carriage return and line feed at the end of a line, but at times you may want to include these commands in your program.

Note: Normally, the IBM PC adds a line feed command to each CR command. In IBM SET1, you can send a CHR$(141) Carriage Return command which causes a return without an automatic LF. If your printer prints several lines without advancing the paper, you will have to set the print menu option AUTO LF, to Y by using the Menu Select Mode.

Carriage Return and Line Feed	Decimal	Hex.	ASCII	Comp.
Carriage return	13	0D	CR	P F
Insert line feed	10	0A	LF	P F

Reverse line feed

Reverse Line Feed	Decimal	Hex.	ASCII	Comp.
Reverse Line Feed	27 93	1B 5D	ESC]	P

This executes an immediate reverse line feed, which is acted on only once upon receipt. Therefore, if you want to reverse several lines, the command must be sent once for each reverse line feed required. It is not possible to reverse over the Top of Form.

Note: The reverse line feed command should not be sent to a printer with a Pull Tractor Feed Unit attached.

Paper-out override

Anytime you want to disable the paper-out switch to keep the printer printing to the very bottom of the page, enter:

Paper-out Override	Decimal	Hex.	ASCII	Comp.
Paper-out override	27 56	1B 38	ESC 8	P F
Reactivate paper-out sensor	27 57	1B 39	ESC 9	P F

Clear buffer

This code eliminates a line of data if it has not yet been printed.

Clear Buffer	Decimal	Hex.	ASCII	Comp.
Clear buffer	24	18	CAN	P F

Print head direction

For some situations, such as when you are printing reports with columns requiring precise alignment, unidirectional printing improves graphics print quality with more accurate column alignment. After you specify this feature, the printer prints only in one direction, always from left to right.

Print head Direction	Decimal	Hex.	ASCII	Comp.
Start unidirectional printing	27 85 49	1B 55 31	ESC U 1	P F
Return to bidirectional printing	27 85 48	1B 55 30	ESC U 0	P F

The Home Head command sends the print head to the left margin (also called the home position) to print the line that follows the command. This unidirectional printing occurs for one line only, then normal printing resumes. To send the print head home, use the following codes:

Home Head	Decimal	Hex.	ASCII	Comp.
Home head	27 60	1B 3C	ESC <	F

Backspacing

A backspace command is not acted on by the printer until a character or print command is given after it. If you want to backspace repeatedly to make several different combined symbols, add the BS command after each character followed by the overprinted character. If superscript printing is indicated, a BS command causes the printer to perform a reverse linefeed to the backspace position and then prints the next character as a superscript. Alignment is not guaranteed.

To print one character and then move the printhead to the left and back over it to print another character, use the backspace command. This command helps create symbols not included on your keyboard, such as the plus/minus (±) sign, a cent sign and a less than or equal to sign.

Note: A backspace will not be performed beyond the left margin.

Backspacing	Decimal	Hex.	ASCII	Comp.
Execute back space	8	08	BS	P F

Automatic line feed

When the automatic line feed is on, the printer does a line feed each time it receives a carriage return (CR).

Automatic Line Feed	Decimal	Hex.	ASCII	Comp.
Automatic line feed on	27 53 49	1B 35 31	ESC 5 1	P
Automatic line feed off	27 53 48	1B 35 30	ESC 5 0	P

Print suppress mode

This feature lets you temporarily disconnect the printer from the computer by sending a control code through your program: an ESC Q SYN code tells the printer to ignore all data except the DC1 code; a DC1 code releases the printer from the print suppress mode.

The PRINT SUPPRESS EFFECTIVE option in the menu must be set to VALID in order for the print suppress commands to be active. If this option is set to INVALID, these commands will be ignored by the printer.

There is a difference between print suppress mode and the printer being deselected. When the printer enters print suppress mode, it continues to receive data but does not store or print it—so the data is lost. The SEL light blinks when print suppress is entered. Pressing the SEL button twice will reconnect the computer to the printer.

Print Suppress Mode	Decimal	Hex.	ASCII	Comp.
Print suppress mode on	27 81 22	1B 51 16	ESC Q SYN	P
Print suppress mode off	17	11	DC1	P

Print continuously

For programmers who would like to see what control codes were entered in a document, the following commands specify the printing of one or all normally non-printable characters below decimal 31 and between decimal 128 - 159 in IBM Set 1.

To print just one control character, use the ESC ^ Command followed by the control character you want to print.

Printing from the All Char. Set	Decimal	Hex.	ASCII	Comp.
Print one character from the All Character Set	27 94 n	1B 5E n	ESC ^ n	P
n = character to be printed				
Print continuously from the All Character Set	27 92 n1 n2	1B 5C n1 n2	ESC \ n1 n2	P
followed by the character to be printed				

To print all the control characters is a bit more complicated. You have to indicate how many characters to print. If you want less than 256 characters, then n1 is the number of characters and n2 is 0. For more than 255 characters, follow the ESC \ command with the total of the following formula:

$$n2 = int \ (Total \ number \ of \ characters/256)$$
$$n1 = Total \ number \ of \ characters - (n2 * 256)$$

When the ESC \ command is sent, the control codes do not operate but are printed as special characters which appear in the chart in Appendix B. For example, the ESC command prints as a left arrow. If the printer receives a code value for an unassigned character, a space is printed.

The All Character Set is to be found in Appendix B.

Cut Sheet Feeder

If you have an OKI optional Automatic Cut Sheet Feeder mounted on your Microline you can insert a new sheet of paper from the hopper.

Cut Sheet Feeder	Decimal	Hex.	ASCII	Comp.
Insert sheet	27 25 73	1B 19 49	ESC EM I	P F
Eject sheet	27 25 82	1B 19 52	ESC EM R	P F

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

If you are working with a Dual Bin Cut Sheet Feeder you can use the following commands to select between the bins:

Function	Decimal	Hex.	ASCII	Comp.
Bin 1	27 25 49	1B 19 31	ESC EM 1	P F
Bin 2	27 27 50	1B 19 32	ESC EM 2	P F

A separate TOF can be set for each of the bins on the CSF. This enables you to print on letter-headed paper, fed from one bin, leaving a large margin, followed by printing on pages fed from the other bin with a smaller margin.

Cut Sheet Feeder Control	Decimal	Hex.	ASCII	Comp.
Sheet feed option	27 91 70 n1 n2 m1 m2 m3	1B 5B 46 n1 n2 m1 m2 m3	ESC [F n1 n2 m1 m2 m3	P

Description of Parameters

n 1 n2 :   number of parameters
m1:   paper feeding technique
m2 :   type of media
m3 :   bin number

n1 and n2 are the number of bytes in the sequence. Normally this will be three, so n1=3 and n2=0; m1 defines paper feeding method, m2 is a constant set at 1 and m3 defines the Bin number.

m1 = 1   set manually inserting mode
m1 = 3   set CSF inserting mode
m2 = 1   constant
m3 = 0   no change
m3 = 1   Bin_1
m3 = 2   Bin_2

For example, to specify cut sheet feeding from Bin 2:

```
LPRINTCHR$(27);CHR$(91);CHR$(70);CHR$(3);CHR$(0);
CHR$(3);CHR$(1);CHR$(2);
```

Bell (BEL)

This command will sound the printer's bell every time the code is received.

Bell	Decimal	Hex.	ASCII	Comp.
BEL	7	07	BEL	P F

Emulation Mode

This command will change the emulation of the printer to the specified mode.

Emulation Mode	Decimal	Hex.	ASCII	Comp.
Emulation mode	27 123 n	1B 7B n	ESC { n	P F

n = 00h   IBM PPR Emulation
     01h   Not used
     02h   IBM PPR Emulation
     20h   Reserved for OKI Microline Standard
     21h   Reserved for OKI Microline Standard
     22h   Reserved for OKI Pacemark
     40h   Epson FX Emulation
     41h   Epson FX Emulation

The default value is subject to the menu setting. When the emulation is changed, print mode/status will return to the settled menu mode or terminated.

Deselect Mode

The printer will not receive further data, in IBM mode only, by setting a busy signal and turning the SEL lamp off, until the SEL button is pressed or the I-PRIME signal is received.

Deselect Mode	Decimal	Hex.	ASCII	Comp.
Deselect mode	27 106 00	1B 6A 00	ESC j NUL	P

Initial Status

This command returns the printer, both in IBM and EPSON mode, to its initial settings, i.e. after power is switched on.

Initial Status	Decimal	Hex.	ASCII	Comp.
Initial Status	27 125 00	1B 7D 00	ESC } NUL	P F

Reset Inhibit

This command returns the printer to its initial settings, if the menu item Reset Inhibit is set to NO.

Reset Inhibit	Decimal	Hex.	ASCII	Comp.
Reset Inhibit	27 91 75 n1 n2 m1 m2 m3 m4	1B 5B 4B n1 n2 m1 m2 m3 m4	ESC [K n1 n2 m1 m2 m3 m4	P

(n1 + n2 x 256) stands for the following parameters byte length.
m1 specifies the initialisation mode.
m2 specifies the ID number of the printer, 03h or 16h (to be specified).
m3 and m4 specify the menu setting, after initialisation.

IBM Modes Advanced Features

Downline Loadable Character Generator (DLL)

Proprinter Mode

Proprinter Mode DLL	Decimal	Hex.	ASCII	Comp.
Copy ROM to DLL	27 36	1B 24	ESC $	P
Load Character	27 61 (Data)	1B 3D (Data)	ESC = (Data)	P
Select Utility DLL	27 73 52	1B 49 34	ESC I 4	P
Select Quasi–NLQ DLL	27 73 54	1B 49 36	ESC I 6	P

Creating a custom character enables you to expand the characters and symbols available with your printer to include special trademarks and symbols through your computer keyboard. The loading procedure is complicated, so it is broken down to make it a little easier. The complete format for Load Character Font is:

CHR$(27); "="; n1n2 CHR$(20); code attr1 attr2 col1. . . col11.

n1 and n2 are derived from a formula that calculates the total number of characters to be loaded. Code is the ASCII decimal value for the first DLL character location. Attr is 0 for ascending characters and 1 for descending characters. CHR$(20) and null are constants which always appear in the command. Col1 . . . col11 are the column data for the actual characters to be loaded.

Step 1   Copy all characters (0–255) into the DLL RAM

The entire 256 characters in the character set are copied into the DLL RAM area using the command CHR$(27); "$";. Any number of characters can now be customised and the character and location will be stored in the DLL RAM in the corresponding address.

Step 2   Number of downloaded characters

Determine how many characters you want to download. We have chosen to design just one. Multiply that number by 13 and add 2 to the total. Our answer is 15. Here is the formula:

(Number of characters x 13) + 2 = TOTAL

Step 3 Entering the total

If the total is less than 256, then n1 is the total and n2 is 0. For our one character, n1 is 15 and n2 is 0. Enter the numbers into the Load Character Code, ESC = n1 n2

If the total is more than 255, then the total is divided by 256 with n1 being the remainder and n2 being the integer part of the result. It is easier to look at an example.

Say we have decided to create an entire character set of 94 characters. We would have:

$$(94 \times 13) + 2 = 1224$$
$$n2 = int (1224/256) = 4$$
$$n1 = 1224 - (n2 \times 256) = 200$$

So the command would look like this:

CHR$(27);" = ";CHR$(200);CHR$(4);

Step 4 The spacer code

Insert DC4(CHR$20) here to separate the individual character data you are going to load, Here is how the command looks now:

CHR$(27);" = ";CHR$(15);CHR$(0);CHR$(20);

Step 5 The start code

Insert the start code in the command. The start code is the first character being replaced by your new character. You can begin your custom character set at any point in the character table but remember that if you are loading more than one character, characters are replaced consecutively from the starting point. If you are loading three characters beginning at the letter A (65 decimal), you will end up replacing letters A, B and C. Then our start codes would be like this:

CHR$(27);" = ";CHR$(41);CHR$(0);CHR$(20);CHR$(65);CHR$(attr1);
CHR$(attr2);CHR$(col1). . . CHR$(col11);CHR$(attr1);CHR$(attr2);
CHR$(col1) . . . CHR$(col11);CHR$(attr1);CHR$(attr2);CHR$(col1). . .
CHR$(col11)

If we are replacing one character and never use the @ symbol, we
would give the start code as decimal 64.
So now we have this:

CHR$(27);" = ";CHR$(15);CHR$(0);CHR$(20);CHR$(64)

Note: Notice how the CHR$ following "=" changed in the last two statements. It
is because the first statement loads three characters, making the formula:

$(3 \times 13) + 2 = 41$ while the second statement loads only one character, making the
formula $(1 \times 13) + 2 = 15$.

Step 6   The two attribute byte codes

Now we define the characters to be loaded. Each character consists
of 13 bytes – 2 attribute bytes and 11 bytes of print data.

Attribute byte 1:

You have a choice of four values: These select ascender or descender
characters (values 0 or 128), or graphics characters (values 1 or 2).

    0:   The character is being printed with the lower 8 pins.
    128: The character is being printed with the upper 8 pins.

Using one of the other two values (1 or 2) you can quite easily create
characters which are similar to IBM–Graphic characters and which
are 12 dots high. Two passes make the printer print as if it has a 12–
pin printhead:

    1: Pins 9–12 print the same as pin 8 (Value 1).
    2: The pattern of pins 1–4 (values 128, 64, 32 and 16; see
       illustration in Step 6: Designing a Character) will be printed
       again on pins 9–12.

Attribute byte 2:

If you want to use proportional spacing you will have to define the print start position and the number of columns to be printed as well. If you use start position 3 and 5 half dots character width, the columns 3, 4, 5, 6 and 7 will be printed. Attribute byte 2 would then be 53.

Start Position	Character width										
	1	2	3	4	5	6	7	8	9	10	11
0	1	2	3	4	5	6	7	8	9	10	11
1	17	18	19	20	21	22	23	24	25	26	X
2	33	34	35	36	37	38	39	40	41	X	X
3	49	50	51	52	53	54	55	56	X	X	X
4	65	66	67	68	69	70	71	X	X	X	X
5	81	82	83	84	85	86	X	X	X	X	X
6	97	98	99	100	101	X	X	X	X	X	X
7	113	114	115	116	X	X	X	X	X	X	X

Positions marked with x and values outside this table are not valid. The only exception is the value 0, which can be used to select fixed spacing.

In order to use the DLL in proportional mode you must specify proportional mode using ESC P1 before printing. In non–proportional mode the characters will be printed in full width, attribute byte 2 will then be ignored.

Since the character we want to design will be a non–proportional descender character, this is the command:

CHR$(27);" = ";CHR$(15);CHR$(0);CHR$(20);CHR$(64);CHR$(128); CHR$(0);

Step 7   Creating your character(s)

Using the graph, we are going to create our character. Only eight rows are printed for a character. If the character is an ascender, row one will be used but not row nine. If it is a descender, row one will not be used but row nine will.

Our character is a descender. We are creating a special K. Here is how it is done:

Column	1	2	3	4	5	6	7	8	9	10	11
128											
64	●				●						
32	●	●		●							
16	●		●								
8	●			●							
4	●				●						
2						●					
1							●				
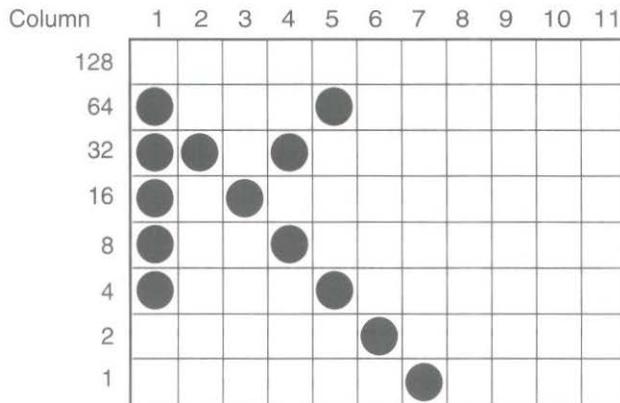
Note: Avoid contact between 2 dots on the horizontal lines. If this happens the data is loaded but the second dot will not be printed as you will see. It will be ignored!

Now for each column, regardless if there is a dot in it or not, add the values for each dot. So for column one we have a dot in rows 2, 3, 4, 5, and 6. Here is what we add:

$$64 + 32 + 16 + 8 + 4 = 124$$

Continue the same procedure for columns 2 through 11. Here are our column totals:

124, 32,16, 40, 68, 2,1, 0, 0, 0, 0

Now we can insert our column totals into the command:

CHR$(27);"=";CHR$(15);CHR$(0);CHR$(20);CHR$(64);CHR$(128);
CHR$(0);CHR$(124);CHR$(32);CHR$(16);CHR$(40);CHR$(68);
CHR$(2);CHR$(1);CHR$(0);CHR$(0);CHR$(0); CHR$(0);

That is how a character is loaded.

Note: The character(s) you have loaded remain in the downline loadable character generator until you turn off the printer, replace the character with another downloaded character or send the command to clear the downline buffer.

If you are loading more than one consecutive character, you must give a starter code for the first character you are adding. Then after you have loaded the 13 bytes of character data for the first character you have designed, you immediately follow it with the 13 bytes of character data for the next character and so on until all the characters are loaded. Remember each downloaded character replaces the next consecutive normal character.

Note: In order to load characters into non–consecutive locations in memory, you must use the complete command for each character.

Step 8   Printing the character

To print your character in Quasi–NLQ, use the command, ESC I 6. This selects the Quasi–NLQ downloaded character generator. Or you can select Utility mode with the ESC I 4 command. Whichever print mode you choose, be sure to follow the command with the character you replaced—in our case, we would enter the @ symbol. To clear the DLL, use this command:

Clear DLL	Decimal	Hex.	ASCII	Comp.
Clear DLL	27 61 0 0	1B 3D 00 00	ESC = NUL NUL	P

To return to the normal character set select a print mode.

Exit DLL	Decimal	Hex.	ASCII	Comp.
Start Utility Mode	27 73 48	1B 49 30	ESC I 0	P
Start Gothic Mode	27 73 50	1B 49 33	ESC I 2	P
Start Courier Mode	27 73 51	1B 49 32	ESC I 3	P

Graphics

The bit image graphics feature lets your printer draw almost any kind of illustration by printing a dot at any location on the page. In the IBM modes, your printer works properly with any graphics software package designed for the IBM Personal Computer.

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 tells you how), then dump it on to the page with the help of the PrtSc key on your computer. This feature of the IBM Personal Computer lets you print a reproduction of any image on your display screen.

When your screen image is complete, simply press the SHIFT key and the PrtSc key at the same time: whatever is on the screen is printed on the page.

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

Programming graphics

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

1. The control code sequence that puts the printer into graphics mode,
2. The number of columns of graphics to be printed, and
3. The coded information that tells the printer which dots to print in each column.

There are four modes of GRAPHICS available in IBM Modes. They differ in horizontal resolution, or density, which indicates how close together the dots are and 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 0.4 mm (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 345.4mm (13.6 inches) for the ML3410.

1. Control Codes

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

Graphics Resolution	Decimal	Hex.	ASCII	Comp.
Single density graphics	27 75 n1 n2	1B 4B n1 n2	ESC K n1 n2	P F
Double–density half–speed graphics	27 76 n1 n2	1B 4C n1 n2	ESC L n1 n2	P F
Double–density normal–speed graphics	27 89 n1 n2	1B 59 n1 n2	ESC Y n1 n2	P F
Quadruple density graphics	27 90 n1 n2	1B 5A n1 n2	ESC Z n1 n2	P F

where   n2 = total number of graphics characters/256
and   n1 = total - (n2 x 256)

Single–density graphics have a resolution of 60 x 72 dots per inch, and have a maximum width of 816 dots per line.

Double–density, half–speed graphics have a resolution of 120 x 72 dots per inch, and a maximum width of 1632 dots per line. In this mode, the print head slows so it can print dots that overlap by about 1/2 dot width.

Double–density, normal–speed graphics have a resolution of 120 x 72 dots per inch, and a maximum width of 1632 dots per line. 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.

Quadruple–density graphics have a resolution of 240 x 72 dots per inch, and a maximum width of 3264 dots per line. 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: Let us quickly review the restrictions on the ESC Y and ESC Z graphics modes. Basically, the restrictions just mean you cannot print a horizontal line with fully overlapping dots. Even with the skips, dots on the same row are close enough together that a line appears 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 of graphics to print. For ease of reference, we 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

$$n2 = int\ (400/256) = 1$$
$$n1 = 400 - (256 \times n2) = 144$$

If you want to print in single–density graphics mode, the beginning of your statement is:

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

n2

n1

ESC K
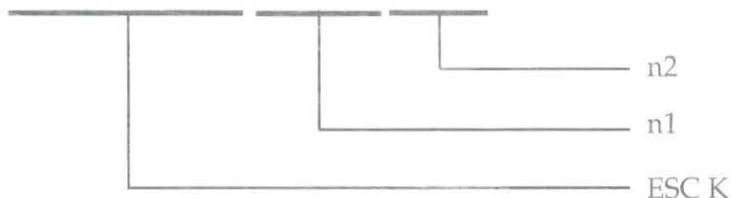
IBM BASIC includes two functions that make calculating n1 and n2 easy:

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 reference 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(N DOTS/256))
```

Important: 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 model and printer you are using (see the following table).

Maximum graphics columns per line

Graphics mode	
ESC K (single density)	816
ESC L/ESC Y (double density)	1632
ESC Z (quadruple density)	3264

3. Graphics information

The last part of the graphics statement contains numeric information 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 dots 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 strip is programmed as a separate LPRINT statement.

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

Note for those 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 on the table for reference. You can use the ASCII code chart in Appendix B 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:

64

+ 16
+ 8

+ 4

+ 1
_____
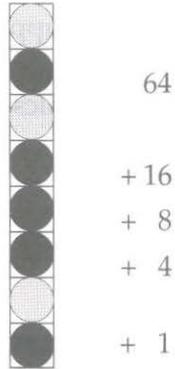
Enter 93 as CHR$(93)

If we call the number for each column c1, c2, etc., the complete statement is:

    LPRINT CHR$(27);CHR$(75);CHR$(144);CHR$(1);CHR$(c1);
    CHR$(c2); . . . ;CHRS(c400)

The format is the same for all density modes; the only differences are in the start graphics code and 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.

Step 1. Begin with LPRINT and the start graphics code for single density graphics this time:

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

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

$n2 = \text{int}(11/256) = 0$

$n1 = 11 - (n2 \times 256) = 11$; and add them to the statement:

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

Step 3. Add the dot values for each column
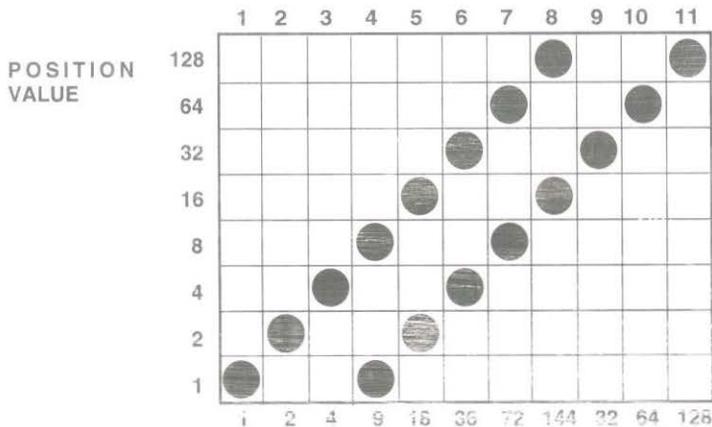
and add them to the statement:

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. Run the program. The result should look like this. If not, check the maths and typing and try again.

Now go back and change the Start Graphics code to the code for double density, half speed (ESC L):

10   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$(64); CHR$(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 column. 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 included any, 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$(4);CHR$(9);CHR$(18);CHR$(36);CHR$(72); CHR$(144);CHR$(32);CHR$(64);CHR$(128)

The result is:

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:

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

Note: The IBM Personal Computer is normally set for a maximum line length of 80 characters. The "WIDTH" command in Line 06 eliminates the length restrictions.

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.

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   REM'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 tell 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:

```
25   FOR J = 1 to 4
75   NEXT J
```

This loop causes the LPRINT statement to be repeated four times. Here is the result:

Notice there is a space between each line. 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). In order 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.

The following program has been modified to give a continuous image when printing.

```
05  REM'SAMPLE 4
06  Width "LPT1: ",255
10  NDOTS = 256
12  REM'MAXIMUM POSSIBLE COMBINATIONS
15  LPRINT CHR$(27);CHR$(65);CHR$(8)
16  REM'SET HEIGHT TO 8/72
18  LPRINT CHR$(27);CHR$(50)
20  REM'ACTIVATE LINE SPACING
25  FOR J=1 TO 4
30  LPRINT CHR$(27);CHR$(75);CHR$(NDOTS MOD 256);
    CHR$(FIX(NDOTS/256))
40  REM'START GRAPHICS 256 COLUMNS
50  FOR X = 1 TO NDOTS-1
60  LPRINT CHR$(X);
70  NEXT X: LPRINT: REM LINE FEED
75  NEXT J
```

The result looks like this :

Reminders

1. Make sure you enter column data for exactly the number of columns 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 only up to the maximum number of columns for the combination of printer model and graphics density mode. If more data is contained in the LPRINT statement, the excess is simply 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 creativity and your programming experience. In this section, we summarise 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, such as a straight line or a sine wave.

To simplify typing of the column data, you can enter the information 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$(NDOTS MOD256);
      CHR$(FIX(NDOTS/256));
40    FOR X =1 TO NDOTS
50    READ C
60    LPRINT CHR$(C);
70    NEXT X
100   DATA 2,4,8,16,32, . . .
```

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

Print Registration

The Print Registration Menu Select item is a bit image graphics option that is only used with bidirectional printing. It lets you fine–tune the horizontal printing position of a graphic image or table where precise column alignment is important.

You will probably need to experiment with the different settings to find which works best for your printouts. One way to determine the best value is by printing several columns of vertical bar characters (|) at each registration value. Use the setting that produces the straightest vertical column.

Print Registration Settings

Setting	Resulting movement
+0.25mm	0.25mm to the right
+0.20mm	0.20mm to the right
+0.15mm	0.15mm to the right
+0.10mm	0.10mm to the right
+0.05mm	0.05mm to the right
0	no movement
-0.05mm	0.05mm to the left
-0.10mm	0.10mm to the left
-0.15mm	0.15mm to the left
-0.20mm	0.20mm to the left
-0.25mm	0.25mm to the left

Testing Program Data With the Hexdump Mode

From time to time you might want to check the accuracy of data being sent from the computer to the printer. The hexadecimal dump mode is designed to do just that. In this mode the printer converts all received data into its hexadecimal equivalents.

Start the hexadecimal dump by pushing the SELECT and FORM FEED switches as you turn on the printer.

The printer starts printing as soon as 16 or more bytes of data (an entire line of data) have been received. When testing less than 16 bytes of data, you must push the SELECT switch again after entering this mode before the printer can start printing.

In this mode, all data, including control codes sent to the printer, is printed in hexadecimal form. If data extends for longer than a page, the printer automatically skips over the last inch of one sheet and resumes printing at the next top of form provided that the menu select option SKIP OVER PERFORATION is set to YES.

Exit this mode by turning off the printer.

Here is an example of how data from the computer in BASIC format:

LPRINT CHR$(27);CHR$(48);CHR$(30);"12345";CHR$(10)

is converted into hexadecimal format:

1B 30 1E 31 32 33 34 35 0A

Epson FX Mode Standard Features

This chapter gives you the commands that you will need to control the printing features if you have selected the Epson FX mode in the menu. As we mentioned in the introduction some commands have already been dealt with in the previous section. These are briefly listed below as a quick reference:

Common features to IBM modes

Features	Command
Double width	SO/DC4/ESC W
Emphasised	ESC E/F
Enhanced	ESC G/H
Super/subscripts	ESC S/T
Underlining	ESC -
Form length	ESC C
FF	FF
6/8 LPI	ESC 2/0
Line spacing	ESC A/J/3
Skip over perforation	ESC O/N
HTABS	HT/ESC D
VTABS	ESC B/VT
CR	CR
LF	LF
Paper out on/off	ESC 8/9
Clear buffer	CAN
Uni/bidirectional printing	ESC U
Unidirectional (1 line)	ESC <
Backspace	BS
Print suppress off	DC1
Cut Sheet Feeder	ESC EM I/R/1/2
Graphics	ESC K/L/Y/Z
15CPI	ESC g

Character Pitch

Character pitch

With these commands you can alter the size of your printed character.

Character pitch	Decimal	Hex.	ASCII	Comp.
Begin 10 CPI (Pica)	27 80	1B 50	ESC P	F
Begin 12 CPI (Elite)	27 77	1B 4D	ESC M	F
Begin Condensed mode	27 15 or 15	1B 0F or 0F	ESC SI or SI	F
Stop Condensed mode	18	12	DC2	F

The size of the condensed print depends on which pitch is selected at the time the command to set the condensed mode is sent.

Selection	Current pitch	Resulting pitch
After DC2	17.1 CPI	10 CPI
(condensed mode off)	20 CPI	12 CPI
After ESC SI	10 CPI	17.1 CPI
(condensed mode on)	12 CPI	20 CPI

Notes:

1. None of these commands cancel the double width mode.

2. For certain applications you may need to know the number of characters that fit in one line. The table in Chapter 4 shows the maximum number of characters per line for each character pitch.

Expand your characters (double width print) for one line only.

Double width	Decimal	Hex.	ASCII	Comp.
Double width printing for one line only	27 14	1B 0E	ESC SO	F

Note: You are also able to specify the area of double width using the commands in Chapter 3.

Expand your characters to double height with the following command.

Double height	Decimal	Hex.	ASCII	Comp.
Start double height	21 119 49	1B 77 31	ESC w 1	F
End double height	27 119 48	1B 77 30	ESC w 0	F

Printing modes

Printing mode	Decimal	Hex.	ASCII	Comp.
Utility mode (UTL)	27 120 0	1B 78 00	ESC x NUL	F
High Speed Draft (HSD) mode	27 40 48	1B 28 30	ESC (0	F
Near Letter Quality (NLQ) mode	27 120 1	1B 78 01	ESC x SOH	F
NLQ Courier	27 107 48	1B 6B 30	ESC k 0	F
NLQ Gothic	27 107 49	1B 6B 31	ESC k 1	F

For fast printing at 417 Characters Per Second (CPS) use the Utility mode. You will find this useful for high-volume printing, program listings or drafts.

If you can sacrifice a little print quality for speed, select High Speed Draft (HSD) mode. In this print mode, you can have printing at 555 CPS in 10 CPI. However draft mode is unavailable with double width, emphasised, enhanced, italics and proportional spacing.

When print quality counts, Near Letter Quality (NLQ) mode offers high quality printing at 104 CPS. This is useful for letters and other important documents.

Auto-justification	Decimal	Hex.	ASCII	Comp.
Begin auto-justification in NLQ mode	27 97 n	1B 61 n	ESC a n	F

The command for the auto justification in NLQ mode lets you program the printer to layout your text in accordance with the following table.

n=	Justification
0	Left
1	Centre
2	Right
3	Full

Left (the default value) means that your text will be aligned to the left margin.

To centre a line of text between the left and right margins (for example, for headings, titles or captions) use the CHR$(27);"a";CHR$(1) command.

"Right" justification is the opposite of the Left command. This means that the right margin will end evenly but the text at the left margin will be uneven.

Finally Full justification adds the necessary spaces to a line of text so that both the right and left margins are even. This is carried out when the line buffer becomes full.

Italics

You may want to highlight a phrase by printing it in italics. You can switch to the alternate character set (see Appendix B) with the command:

Italics	Decimal	Hex.	ASCII	Comp.
Begin Italics printing	27 52	1B 34	ESC 4	F
Stop Italics printing	27 53	1B 35	ESC 5	F

Setting the MSB (7/8 bit commands)

The other method of printing italics is to set the MSB (Most Significant Bit) to 1.

Setting the MSB	Decimal	Hex.	ASCII	Comp.
Set MSB to 1	27 62	1B 3E	ESC >	F
Reset MSB	27 35	1B 23	ESC #	F
Set MSB to 0	27 61	1B 3D	ESC =	F

This limits the range of the CHR$ codes to the area from 128 to 255 decimal. If this command is used all characters will be printed in italics (even if ESC 5 is sent) until the MSB is reset which means that bit 8 will be set as it is sent from your computer.

You can also set bit 8 (MSB) to 0. This means that you can only print characters from the lower half of the character set (0 to 127).

Proportional spacing

To give your text a more professional, typeset look you can switch on the proportional spacing. If the printer is in Utility Downline Loadable Character Generator (DLL) mode when the start code is sent, the result will be: Utility DLL in proportional but emphasised.

On switching off the proportional mode your printer will return to its previous settings.

Proportional spacing	Decimal	Hex.	ASCII	Comp.
Begin proportional spacing	27 112 49	1B 70 31	ESC p 1	F
Stop proportional spacing	27 112 48	1B 70 30	ESC p 0	F

Note: This mode does not work with compressed or elite printing. If you set proportional together with 17.1 CPI you will get proportional printed text, but in pica (10 CPI).

Space between characters

Space between characters	Decimal	Hex.	ASCII	Comp.
Space between characters	27 32 n	1B 20 n	ESC SP n	F

You can set the dot space between the characters of the text to suit your own needs.

The variable "n" is the number of dots to be added to the right of each character.

CPI	Value of n (in inches)
10	1/120
12	1/144
15	1/180
17.1	1/206
20	1/240

Note: This command is only valid for NLQ and Utility modes.

Set NLQ Mode

NLQ Mode	Decimal	Hex.	ASCII	Comp.
Set NLQ mode	27 75 n1	1B 4B n1	ESC K n1	F

n1 = 00h, 30h, 80h or B0h – Courier typeface will be selected.
n1 = 01h, 31h, 81h or B1h – Gothic typeface will be selected.
The other n1 values remain unaffected.

Character Sets

National characters	Decimal	Hex.	ASCII	Comp.
Select national character set and code pages	27 82 n	1B 52 n	ESC R n	F

The Epson emulation offers a set of national character sets and code pages. The following tables give the value of n to select the different character sets. When a code page is selected and national character set command is sent, the code page will be reset to USA.

Slashed zero can be selected by the menu even although code page is selected. ESC R 7 sets Spanish 1 when Standard Italic Character set is selected.

ESC R 7 sets Cyrillic code page when Graphic character set is selected.

When the code page selection command is sent the national character set will be reset to default.

National Character Sets / Code Page Assignment

n	Epson Italic ESC t NUL	Epson Graphics ESC t SOH
0	American	American
1	French	French
2	German	German
3	British	British
4	Danish I	Danish I
5	Swedish I	Swedish I
6	Italian	Italian
7	**Spanish I**	**Code Page Cyrillic**
8	Japanese	Japanese
9	Norwegian	Norwegian
10	Danish II	Danish II
11	Spanish II	Spanish II
12	Latin American	Latin American
13	French Canadian	French Canadian
14	Dutch	Dutch
15	Swedish II	Swedish II
16	Swedish III	Swedish III
17	Swedish IV	Swedish IV
18	Turkish	Turkish
19	Swiss I	Swiss I
20	Swiss II	Swiss II
21	Code Page Cyrillic	Code Page Cyrillic
22	Code Page Polska Mazovia	Code Page Polska Mazovia
23	Code Page Polska PC Latin 2	Code Page Polska PC Latin 2
24	Code Page Serbo Croatic I	Code Page Serbo Croatic I
25	Code Page Serbo Croatic II	Code Page Serbo Croatic II
26	Code Page Multilingual 850	Code Page Multilingual 850
27	Code Page Norway 865	Code Page Norway 865
28	Code Page Portugal 860	Code Page Portugal 860
29	Code Page Turkey	Code Page Turkey
38	Code Page Greek 437	Code Page Greek 437
39	Code Page Greek 928	Code Page Greek 928
40	Code Page Greek 851	Code Page Greek 851
42	Code Page ECMA 94	Code Page ECMA 94
43	Code Page Canada French	Code Page Canada French
44	Reserved for code page 855 Cyrillic I	Reserved for code page 855 Cyrillic I
45	Reserved for code page 866 Cyrillic II	Reserved for code page 866 Cyrillic II
46	Reserved for code page 852 East Europe	Reserved for code page 852 East Europe
47	Reserved	Reserved
48	Reserved	Reserved
49	Reserverd for Windows East Europe	Reserverd for Windows East Europe

n	Epson Italic ESC t NUL	Epson Graphics ESC t SOH
50	Reserved	Reserved
51	Reserved	Reserved
52	Reserved for Windows Cyrillic	Reserved for Windows Cyrillic
53	Reserved for Windows ANSI	Reserved for Windows ANSI
54	Reserved for Hungarian CWI	Reserved for Hungarian CWI
64	Publisher	Publisher

Note: For Code Pages Character Sets refer to Appendix B.

ESC R n	Language	\#35	36	38	64	79	91	Decimal value 92	93	94	95	96	105	123	124	125	126
00 H	AMERICAN	#	$	&	@	O	[	\	]	^	_	`	i	{	|	}	~
01 H	FRENCH	#	$	&	à	O	°	ç	§	^	_	`	i	é	ù	è	¨
02 H	GERMAN	#	$	&	§	O	Ä	Ö	Ü	^	_	`	i	ä	ö	ü	ß
03 H	BRITISH	£	$	&	@	O	E	\	]	^	_	`	i	{	|	}	~
04 H	DANISH I	#	$	&	@	O	Æ	Ø	Å	^	_	`	i	æ	ø	å	~
05 H	SWEDISH I	#	¤	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
06 H	ITALIAN	#	$	&	@	O	°	\	é	^	_	ù	i	à	ò	è	ì
07 H	SPANISH I	R	$	&	@	O	¡	Ñ	¿	^	_	`	i	¨	ñ	}	~
08 H	JAPANESE	#	$	&	@	O	[	¥	]	^	_	`	i	{	|	}	~
09 H	NORWEGIAN	#	¤	&	É	O	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
0A H	DANISH II	#	$	&	É	O	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
0B H	SPANISH II	#	$	&	á	O	¡	Ñ	¿	é	_	`	i	í	ñ	ó	ú
0C H	LATIN AMERICAN	#	$	&	á	O	¡	Ñ	¿	é	_	ü	i	í	ñ	ó	ú
0D H	FRENCH-CANADIAN	ü	$	ë	à	Ø	â	ç	ê	î	ï	ô	i	é	ù	è	û
0E H	DUTCH	£	$	&	@	O	[	IJ	]	^	_	`	i	{	ij	}	~
0F H	SWEDISH II	#	$	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
10 H	SWEDISH III	§	$	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
11 H	SWEDISH IV	§	¤	&	É	O	Ä	Ö	Å	^	_	é	i	ä	ö	å	ü
12 H	TURKISH	ş	$	Ğ	Ş	O	İ	ö	ü	ğ	_	ç	ı	İ	ö	ü	Ç
13 H	SWISS I	£	$	&	ç	O	à	é	è	^	_	`	i	ä	ö	ü	"
14 H	SWISS II	£	$	&	§	O	à	ç	è	^	_	`	i	ä	ö	ü	é
64 H	PUBLISHER	#	$	&	§	O	·	'	"	¶	±	¨	i	©	·	†	°

Epson Character Sets

Select Character Set	Decimal	Hex.	ASCII	Comp.
Normal	27 116 0	1B 74 00	ESC t NUL	F
Line Graphics	27 116 1	1B 74 01	ESC t SOH	F

These commands allow you to select the type of characters that are
printed in the upper half of the Epson character tables. All of the
available character sets can be found in Appendix B.

The normal character set duplicates the characters in positions 32
to 127 in italic style in the upper half of the set. The international
characters are also available in italic printing when this set is
selected.

The line graphics character set has various graphic and mathematical symbols present in positions 160 to 255, the upper half of the character set.

Code area expansion

Code area expansion	Decimal	Hex.	ASCII	Comp.
Code area expansion (0–31 and 128–159)	27 73 49	1B 49 31	ESC I 1	F
Return areas to control codes	27 73 48	1B 49 30	ESC I 0	F

This allows you to access and print the characters stored in the ASCII areas 0 to 31 and 128 to 159 that are normally reserved for control codes. (See the Unassigned Codes table in Appendix B).

Resetting the code expansion command returns the ASCII areas 0-31 and 128-159 to control codes.

You can open the control areas from 128 to 159 and 255 (decimal) to give you access to the international characters that are stored there (see the following Code Expansion Area table).

Code expansion area	Decimal	Hex.	ASCII	Comp.
Code expansion area (128-159 and 255)	27 54	1B 36	ESC 6	F
Return areas to control codes	27 55	1B 37	ESC 7	F

Note: The access to 128-255 is also influenced by the setting of the MSB.

Composite Command

If you want to program your ML3410 with a combination of print modes for a particular paragraph or line you can save typing in each command separately by using one command.

Composite command	Decimal	Hex.	ASCII	Comp.
Composite command	27 33 n	1B 21 n	ESC ! n	F

This is made possible through the specification of the variable "n" as you will see from the following table:

Print mode	Decimal	Hex.
Underline	128	80
Italics	64	40
Double width	32	20
Double strike*	16	10
Emphasised	8	08
Condensed	4	04
Proportional	2	02
Elite	1	01
Pica	0	00

* In menu as ENHANCED mode.

Some of these options will not be available together. For example, it is obviously not possible to choose Elite and Pica together in one command.

Maybe a short example will make this, rather complicated command, a little clearer:

Let us say you want to set your printer up to print a document where all the text will be in underlined, double width, emphasised and enhanced (double strike).

This would normally entail programming four different commands before you could start printing. With this composite command you only need to take the values for each mode from the table above: Underlined = 128, Double Width = 32, Double Strike = 16 and Emphasised = 8. Now we add these values together and incorporate the result in the command like this:

$$n = 128 + 32 + 16 + 8 = 184$$

Your command should now be CHR\$(27);"!";CHR\$(184) and from the receipt of this one command your printer will print underlined, double width, emphasised and double strike text until it is changed again.

There is no need to reset each mode separately either. When you select a new combination the printer takes care of all the resettings.

Half speed printing

The half speed command can be used to set the printer to half the normal speed when printing in the Utility mode. This has no effect on the graphics and only reduces the printer noise.

Half speed printing	Decimal	Hex.	ASCII	Comp.
Switch to half speed printing	27 115 49	1B 73 31	ESC s 1	F
Switch to normal speed printing	27 115 48	1B 73 30	ESC s 0	F

Note: Half speed printing is not available in HSD or NLQ modes.

Formatting Features

Variable line feed

Line feed	Decimal	Hex.	ASCII	Comp.
Reverse line feed n = 0 to 255	27 106 n	1B 6A n	ESC j n	F

The reverse line feed command enables you to set a fine reverse LF of n/216 inches to your own requirements. This command is carried out only once so if you want to skip back a few times you will have to send the command once for each back-skip required.

It is not possible to reverse back over the Top Of Form.

We do not recommend that you use this command if you have the normal tractor feed unit fitted.

Absolute and relative dot positioning

Dot positioning	Decimal	Hex.	ASCII	Comp.
Absolute dot positioning	27 36 n1 n2	1B 24 n1 n2	ESC $ n1 n2	F
Relative dot positioning	27 92 n1 n2	1B 5C n1 n2	ESC \ n1 n2	F

The absolute dot position code sets the next printing position by counting in 1/60 inch dot units from the left margin.

n1 is decimal number between 0 and 255; n2 is a decimal number between 0 and 3.

Using these two variables you can specify the specific dot position where your printing should start. You can calculate the variables with this formula:

$$n2 = \text{Int. (dot position}/256) \quad n1 = \text{Dot pos.} - (n2 \times 256)$$

For example, if you wanted to start printing 300 dots in from the left margin your calculation would look like this:

$$n2 = \text{Int.}(300/256) = 1$$
$$n1 = 300 - (1 \times 256)$$
$$n1 = 300 - 256 = 44$$

so your command would read:

CHR$(27);"$";CHR$(44);CHR$(1);

To set the relative position the procedure is very similar except that the position is calculated in 1/120 inch dot spacing. The main difference is that, as the name suggests, the next printing position is calculated using the last printing position immediately before receipt of the command as the reference.

To move the print position to the right, calculate n1 and n2 from the number of dots that are required and enter these values into the command:

CHR$(27);CHR$(92);CHR$(n1);CHR$(n2).

Moving the relative print position to the left is a little more complicated. Firstly, determine the number of dots required. Subtract this value from 65536 (2^{16}). Finally, calculate n1 and n2 using the formula given above and enter the values into the command format.

Note: n1 and n2 are both decimal numbers between 0 and 255.

Both commands will be ignored if they set the dot position outside the margin limits.

Setting margins

The left margin is set n1 characters from the head home position. The right margin is set n2 characters from the head home position.

Setting margins	Decimal	Hex.	ASCII	Comp.
Set left margin	27 108 n1	1B 6C n1	ESC l n1	F
Set right margin	27 81 n2	1B 51 n2	ESC Q n2	F

The value of the variables n1 and n2 must be within the ranges specified in the following table. Values outside these ranges will be ignored.

CPI	10	12	15	17	20
n1	$0 \leq n1 \leq 134$	$0 \leq n1 \leq 160$	$0 \leq n1 \leq 192$	$0 \leq n1 \leq 229$	$0 \leq n1 \leq 251$
n2	$2 \leq n2 \leq 136$	$3 \leq n2 \leq 163$	$3 \leq n2 \leq 195$	$4 \leq n2 \leq 233$	$4 \leq n2 \leq 255$
	$n2 \geq n1 + 2$	$n2 \geq n1 + 3$	$n2 \geq n1 + 3$	$n2 \geq n1 + 4$	$n2 \geq n1 + 4$

How to use this table

When setting the right margin at 10 CPI, the right margin (n2) must be set at least two characters to the right of the left margin (n1). Therefore, n2 must be greater than or equal to n1 + 2; ($n2 \geq n1+2$).

Setting the left margin does not affect the right margin. It does clear all the Horizontal Tabs and resets them every 8 characters starting with the new margin as position 0.

The left margin depends on the pitch at the time of setting. If the character pitch is changed the left margin will not move to accommodate this change.

Even if your printer is set to proportional mode, the column width will still be set in normal character size.

Warning: Any graphics data after the right margin will be lost. With text this is not the case. Should your text exceed the right margin, the first character that goes beyond the limit set will become the first character on the next line.

The Set Vertical Format Unit command has the same function as the Vertical Tab set (ESC B) but for 8 different channels (n= 0 . . .7). In this way it is possible to define up to eight groups each with up to 16 vertical tabs which can be called up with the select Vertical Format Unit command.

Vertical format unit	Decimal	Hex.	ASCII	Comp.
Set vertical format unit	27 98 n m1...m16 0	1B 62 n m1...m16 00	ESC b n m1 ...m16 NUL	F
Select vertical format unit	27 47 n	1B 2F n	ESC / n	F

This selects one of the 8 Vertical Format Units that were set up with the command 27/98/n/m1...m16/0. Where n is the number of the channel (n=0 to 7), and m is a specific line number and can be from 1 to 255.

Note: At power up the VFU channel n is set to 0.

Miscellaneous Features

Delete last character

Delete last character	Decimal	Hex.	ASCII	Comp.
Delete last character	127	7F	DEL	F

The CHR$(127) code deletes the last character data that was input in the print buffer.

If the code to be deleted was a space, CHR$(32), one space will be deleted on receipt of this command. If the last data was a horizontal tab skip, then only one space will be deleted—not the whole skip. If the data which is to be deleted is in the form of Bit Image Graphics data then this command is ignored.

Master reset

You can reset your MICROLINE to its default menu settings, clear the print buffer, and set the Top Of Form to the current printhead position. If RESET INHIBIT is YES in the menu this command will be ignored.

Master reset	Decimal	Hex.	ASCII	Comp.
Master reset	27 64	1B 40	ESC @	F

Print Suppress

Print suppress	Decimal	Hex.	ASCII	Comp.
Print suppress on	19	13	DC3	F
Print suppress off	17	11	DC1	F

After the printer has received the DC3 code it will ignore all further data sent from the host until the code DC1 is received. The data will not be stored or printed.

During the time that the printer is in this mode the SEL lamp will flash. The printer can only be reselected with DC1—the SEL switch will not reselect the printer.

Note: The PRINT SUPPRESS EFFECTIVE option in the menu must be set to VALID in order for these commands to be active. If this option is set to INVALID the commands will be ignored by the printer. (The SELECT-IN signal in the interface PIN 36, must be set to high, otherwise the DC1/DC3 command will be ignored).

Bell

This command will sound the printer's bell every time this code is received.

Bell	Decimal	Hex.	ASCII	Comp.
BEL	7	07	BEL	P F

Epson FX Mode Advanced Features

Downline Loadable Character Generator (DLL)

DLL	Decimal	Hex	ASCII	Comp.
Copy ROM to DLL RAM n = 0 Copy Courier font n = 1 Copy Sans Serif Font	27 58 0 n 0	1B 3A 00 n 00	ESC : NUL n NUL	F
Load character into DLL	27 38 0 data	1B 26 00 data	ESC & NUL data	F
Designate Utility DLL	27 37 1	1B 25 01	ESC % SOH	F
Designate normal character generator	27 37 0	1B 25 00	ESC % NUL	F

In addition to the normal character set, the Epson mode offers a Downline Loadable (DLL) character generator for custom-designed character patterns. The ESCape sequence for loading the DLL had the following structure:

CHR$(27);":";CHR$(0);CHR$(n);CHR$(0)	Copy ROM to DLL RAM
CHR$(27);"&";CHR$(0):	Load DLL character generator
CHR$(i); CHR$(j);	Assign characters to be customised
CHR$(a);	Assign attribute byte
CHR$(c0); . . . .CHR$(c10n);	DLL character data
CHR$(27);"%";CHR$(1);	Select DLL mode
CHR$(27);"%";CHR$(0)	Exit DLL mode

The following steps outline the procedure for creating your custom-designed characters.

Step 1 Copy ROM to DLL RAM area

The ESC : NUL n NUL command copies the entire normal character set to the DLL RAM area. The variable n allows you to determine the style of the resident NLQ typeface which will be downloaded (n=0: NLQ Courier; n=1: NLQ Sans Serif).

The typeface that is downloaded is the one which all characters will be printed in whenever the DLL is selected. Therefore, if your printer is set for NLQ Sans Serif and you send the command to copy the ROM NLQ Courier typeface to the DLL RAM [CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);], when you select the DLL mode, your printer will print all the following data in the NLQ Courier typeface, until you exit the DLL.

Step 2 Load DLL character generator

You can create and store up to 256 characters for your personal purpose, but the characters from 0 to 31 and 128 to 159 are not printable (unless you have selected Print Unassigned Code).

The DLL character generator is loaded using the command ESC & NUL. The information which follows this command determines all aspects of the character which you are creating.

Step 3 Assign characters to be customised

Most characters between 1 and 256 can be customised, although some characters are not printable at all (CHR$(7) to(15)). A total of 14 characters are not printable, thus 242 characters can be customised.

You must send information to the printer regarding the first character and the last character that you will be replacing with your new characters. The characters are replaced in sequence, starting from the first character you assign.

If you wish to create 3 characters, and the first character that you want to replace is the letter "A", you enter CHR$(65);CHR$(67). These are the decimal equivalents of A and C. You can now load your DLL characters in place of the letters A, B and C.

When you have loaded your customised characters they will remain in the DLL RAM in the location of the characters that they replaced.

Step 4 Send the attribute byte

Every new defined character which will be loaded into the DLL RAM needs a control byte, the attribute byte.

This attribute byte has three functions.

- – ascender or descender
- – start column (only affects proportional printing)
- – stop column (only affects proportional printing)
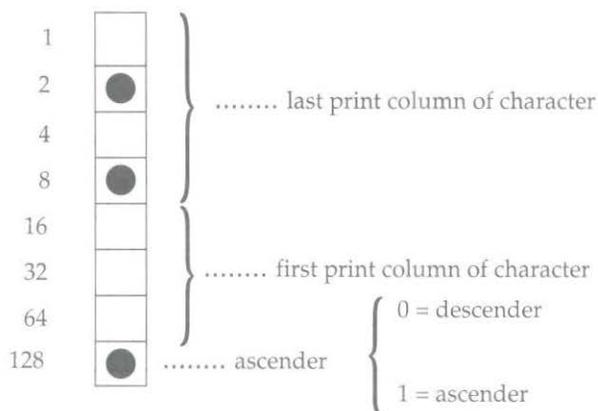
In the example the character starts in column 0 and ends in column 10. A maximum of 12 columns can be loaded but the last column is reserved for proportional characters, which are printed in enhanced mode. The standard setting for column 11 for non-proportional use of the self created character set is 0. When the most significant bit is set to 0 the complete matrix is shifted 1 dot down to print descender characters. The attribute byte for the example character is 10001010_2 or 138_{10}.

If you do not want to print in proportional mode you only need to specify if the character is to be printed with the top 8 pins (attribute byte =128) or with the bottom 8 pins (attribute byte = 0).

If you are going to use proportional mode then you must define the character width including the space required between characters.

The table below will simplify the definition of the attribute byte value for you.

Stop position

	4	5	6	7	8	9	10	11
0	4	5	6	7	8	9	10	11
1	X	21	22	23	24	25	26	27
2	X	X	38	39	40	41	42	43
3	X	X	X	55	56	57	58	59
4	X	X	X	X	72	73	74	75
5	X	X	X	X	X	89	90	91
6	X	X	X	X	X	X	106	107
7	X	X	X	X	X	X	X	123

Start position (row labels on left)

x = not allowed.
Values outside this table not allowed.
To print with the top 8 pins add 128 to these values.
To print with the bottom 8 pins (descenders) use the values straight from the table.

For our example we have start position in column 0 and the stop column is 10 so we look along the 0 row until we are under the 10 column and read the value from the table, which equals 10. We are not printing this character as a descender so we must add 128 to this value giving us our attribute byte total 138.

Step 5   Creating the character

Let us make a Greek character, the capital psi:

	0	1	2	3	4	5	6	7	8	9	10
128	●				●		●				●
64		●				●				●	
32		●				●				●	
16			●		●		●		●		
8						●					
4						●					
2						●					
1			●		●		●		●		
	128	96	17	0	145	110	145	0	17	96	128

The reason for this step is to convert a character pattern into a string of bytes which can be transmitted to the printer. Each column is represented by one 8-bit binary number (also called a byte!). This byte can be calculated by adding the decimal values of the dots that should be printed. For example in the first column the dots with the value 32 and 64 should be set. That means the first byte has the value 96 decimal and can be sent to the printer as the BASIC command CHR$(96). So we can prepare the data string for the example character as follows:

CHR$(128);CHR$(96);CHR$(17);CHR$(0);CHR$(145);
CHR$(110);CHR$(145);CHR$(0);CHR$(17);CHR$(96);
CHR$(128)

Step 6 Entering DLL mode

Once you have loaded your character you can print it anytime you want by entering the DLL mode and sending the value for the character to the printer. The DLL mode is entered by using the ESC % SOH sequence. If the font that you copied to the DLL RAM area is different from the one you were printing in before entering the DLL, you will notice that all characters following the ESC % SOH command are printed in the DLL font.

When you send the command ESC % NUL, the command to return to the normal character set (exiting from DLL) your characters will return to printing in the previously selected font.

Here is the program example: Loading one non-proportional character

```
10   LPRINT CHR$(27);CHR$(58);CHR$(0);CHR$(0);CHR$(0);:
20   REM *** COPY ROM (COURIER) INTO DLL CG
30   LPRINT CHR$(27);CHR$(38);CHR$(0)
35   REM *** LOAD DLL CG **********
40   LPRINT "A";"A";:  REM *** LOAD FROM A TO A *********
70   LPRINT CHR$(138);: REM *** SEND ATTRIBUTE BYTE ********
90   LPRINT CHR$(128);CHR$(96);CHR$(17);CHR$(0);
     CHR$(145);CHR$(110)
100  REM *** SEND PATTERN DATA ************
110  LPRINT CHR$(27);CHR$(37);CHR$(96);CHR$(128)
115  REM *** SELECT DLL **********
120  LPRINT "Now please take a look at the capital Greek psi A A A A A"
130  LPRINT CHR$(27);CHR$(37);CHR$(0); :REM SELECT NORMAL CG
140  END
```

The printout looks like this:

```
Now please take a look at the capital
Greek psi Ψ Ψ Ψ Ψ Ψ
```

Loading proportional characters

The attribute byte makes it possible to manipulate the character width and print proportional letters. As mentioned above, the attribute byte contains start and stop column in binary form.

	0	1	2	3	4	5	6	7	8	9	10
128	●		●		●						
64		●		●							
32	●		●		●						
16		●		●							
8	●		●		●						
4		●		●							
2	●		●		●						
1		●		●							
	170	85	170	85	170	0	0	0	0	0	0

1	
2	
4	●
8	
16	
32	
64	
128	

.... last print column = 4

The attribute byte is 4.

.... first print column = 0

.... descender one dot down
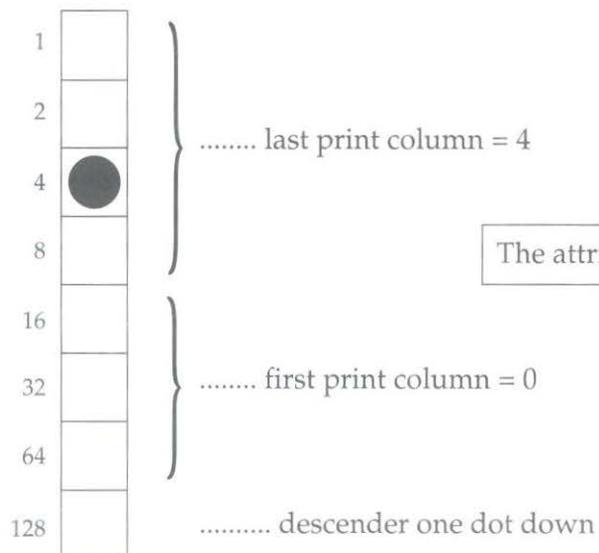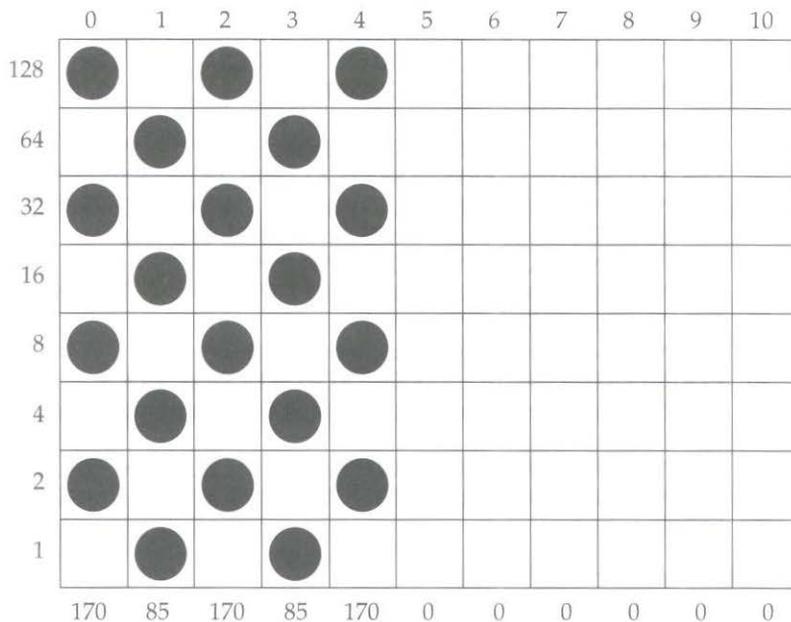
Here is the program example: Loading one proportional character

```
10   LPRINT CHR$(27); CHR$(58); CHR$(0); CHR$(0); CHR$(0);
15   REM *** COPY ROM (COURIER) INTO DLL CG
20   LPRINT CHR$(27); CHR$(38);CHR$(0);
25   REM *** LOAD DLL CG **********
30   LPRINT "B";"B"; :   REM *** LOAD FROM B TO B *********
40   LPRINT CHR$(4); :    REM *** SEND ATTRIBUTE BYTE ********
50   LPRINT CHR$(170); CHR$(85); CHR$(170); CHR$(85); CHR$(170);
     CHR$(0)CHR$(0); CHR$(0); CHR$(0); CHR$(0); CHR$(0);
60   REM *** SEND PATTERN DATA ***********
70   LPRINT CHR$(27); CHR$(37); CHR$(1); CHR$(0);
75   REM *** SELECT DLL **************
80   LPRINT "Now please take a look at the BBBBBB"
90   LPRINT CHR$(27); "p1"; :   REM PROPORTIONAL MODE
100  LPRINT "Now please take a look at the BBBBBB in proportional
     mode"
110  LPRINT CHR$(27); CHR$(37); CHR$(0); :REM SELECT NORMAL CG
120  LPRINT CHR$(27); "p0"; :   REM NON-PROPORTIONAL MODE
130  END
```

And this is the result!

```
Now please take a look at the ||||||
Now please take a look at the ||||| in
proportional mode
```

When proportional mode is selected the character is printed in the emphasised mode.To see what a difference the attribute byte has in the proportional mode try running the program again but this time use CHR$(6); in line 40. You will see that the characters are further apart. This is because column 6 was defined as the last print column.

```
Now please take a look at the ||||||
Now please take a look at the ||||| in
proportional mode
```

Loading multiple characters into DLL

As a third example this chapter will explain how to load more than one character into the DLL-RAM. The characters created in examples 1 and 2 along with the special K, that was used in the PROPRINTER-DLL chapter will be loaded.

	0	1	2	3	4	5	6	7	8	9	10
128											
64	●				●						
32	●	○		●							
16	●		●								
8	●			●							
4	●				●						
2						●					
1							●				
	124	32	16	40	68	2	1	0	0	0	0
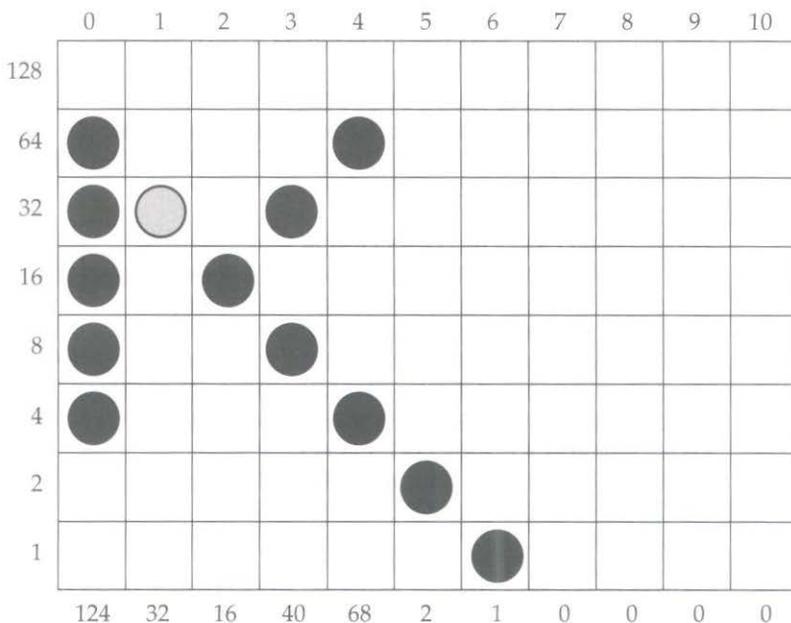
Note: It is not possible to print adjacent dots (e.g. ○), but you can load them.

Here is the program example: Loading multiple characters

```
10     LPRINT CHR$(27);CHR$(58);CHR$(0);CHR$(0);CHR$(0);:
15     REM *** COPY ROM (COURIER) INTO DLL CG
20     LPRINT CHR$(27);CHR$(38);CHR$(0)
25     REM *** LOAD DLL CG **********
30     LPRINT "A";"C";:  REM *** LOAD FROM A TO C *********
40     LPRINT CHR$(138);:
45     REM *** SEND ATTRIBUTE BYTE FOR A ********
50     LPRINT CHR$(128);CHR$(96);CHR$(17);CHR$(0);CHR$(145);
       CHR$(110)CHR$(145);CHR$(0);CHR$(17);CHR$(96);CHR$(128)
60     REM *** SEND PATTERN DATA FOR A************
70     LPRINT CHR$(4)
       REM *** SEND ATTRIBUTE BYTE FOR B ***************
80     LPRINT CHR$(170);CHR$(85);CHR$(170);CHR$(85);CHR$(170);
       CHR$(0)CHR$(0);CHR$(0);CHR$(0);CHR$(0);CHR$(0)
90     REM *** SEND PATTERN DATA FOR B **********
100    LPRINT CHR$(134);:    REM *** ATTRIBUTE BYTE FOR C ******
110    LPRINT CHR$(124);CHR$(32);CHR$(16);CHR$(40);CHR$(68);
       CHR$(2);CHR$(1);CHR$(0);CHR$(0);CHR$(0);CHR$(0);
115    REM *** SEND PATTERN DATA FOR C **********
120    LPRINT "Now we have changed 'ABC' INTO    ";
130    LPRINT CHR$(27);CHR$(37);CHR$(1);CHR$(0);:
       REM **** SELECT DLL ******
140    LPRINT "A B C"
150    LPRINT CHR$(27);CHR$(37);CHR$(0);: REM SELECT NORMAL CG
160    END
```

The result:

    Now we have changed 'A B C' INTO   Ψ ▌ K

Graphics

The following control codes are the same as the IBM-mode.

ESC K n1 n2	single density
ESC L n1 n2	double density half speed
ESC Y n1 n2	double density normal speed
ESC Z n1 n2	quad density

Please refer to IBM Graphics in Chapter 5 for an explanation of these commands.

The Epson-mode offers an additional way to select bit image graphics.

Select bit-image graphic density

Bit Image Graphic Density	Decimal	Hex	ASCII	Comp.
Select bit image graphic density	27 42 p n1 n2	1B 2A p n1 n2	ESC * p n1 n2	F

The parameter "p" defines the graphic mode

p	Mode	Dots/inch
0	Normal density	60
1	Dual density	120
2	Dual density, double speed	120
3	Quad density	240
4	CRT graphics	80
5	Plotter graphics (1:1)	72
6	CRT graphics II	90
7	Plotter graphics, double density	144

Note: Modes 0 to 3 are the same as ESC K, L, Y and Z. In mode 2 and 3 adjacent dots cannot be printed.

There is no difference in programming bit-image graphics between the Epson- and the IBM-mode, but here it is possible to use a further four printout densities.

Mode 4 is especially useful for making hard copies from video screens.

Here is the program:

```
10    REM demo of different densities
30    DATA 128,64,32,144,72,36,18,9,4,2,1,0,0,0,0:      REM pattern data
45    WIDTH "lpt1:",255
50    RESTORE
51    AP$=""
60    FOR N = 1 TO 15
70    READ A
80    AP$ = AP$+CHR$(P):          REM create graphic string
90    NEXT N
110   FOR P = 0 TO 7:    REM graphic modes 0 to 7
115   LPRINT "this is mode ";P;"   ";
120   LPRINT CHR$(27);"*";CHR$(P);CHR$(150);CHR$(0);
                             REM init graphic
130   FOR N = 1 TO 10
140   LPRINT AP$;:   REM send data
150   NEXT N
155   LPRINT CHR$(10);CHR$(10);:    REM send line feed
160   NEXT P
170   END
```

The Result:

```
this is mode   0 \ \ \ \ \ \ \ \ \ \ \ \
this is mode   1 \\\\\\\\\\
this is mode   2 \\\\\\\\\\
this is mode   3 ||||||||||
this is mode   4 \ \ \ \ \ \ \ \ \ \ \
this is mode   5 \ \ \ \ \ \ \ \ \ \ \ \
this is mode   6 \ \ \ \ \ \ \ \ \ \
this is mode   7 \\\\\\\\\\
```

Change of graphic control sequence

It is possible to assign the ESC K, L, Y, Z commands to another graphics mode with the following control string

CHR$(27);CHR$(63);CHR$(m);CHR$(p)
ESC ? m p
1A 3F m p

Note: m is one of the letters K, L, Y or Z. p is the graphic mode as described in the table at the start of this graphics section. For example, if you wanted to have single density plotter graphics when ESC K is received then you would use the command CHR$(27);"?K";CHR$(5).

Nine Pin APA-Graphic-mode

The nine pin graphic mode can be used to minimize printhead movement.

Bit Image Graphic Density	Decimal	Hex	ASCII	Comp.
Select bit image graphic density	27 94 m n1 n2	1B 5E m n1 n2	ESC ^ m n1 n2	F

The value of m determines the density of the graphic. The density and corresponding value for m is given in the following table. Refer to IBM-bit image graphics for the calculation of n1 and n2.

m	Graphic Density	DPI
0	Single density	60
1	Double density	120
2	Double density, double speed	120
3	Quadruple density	240
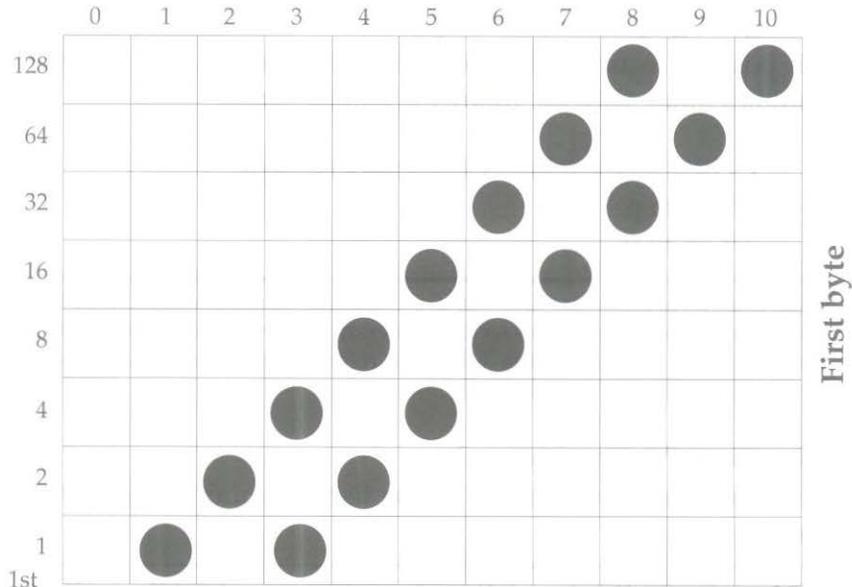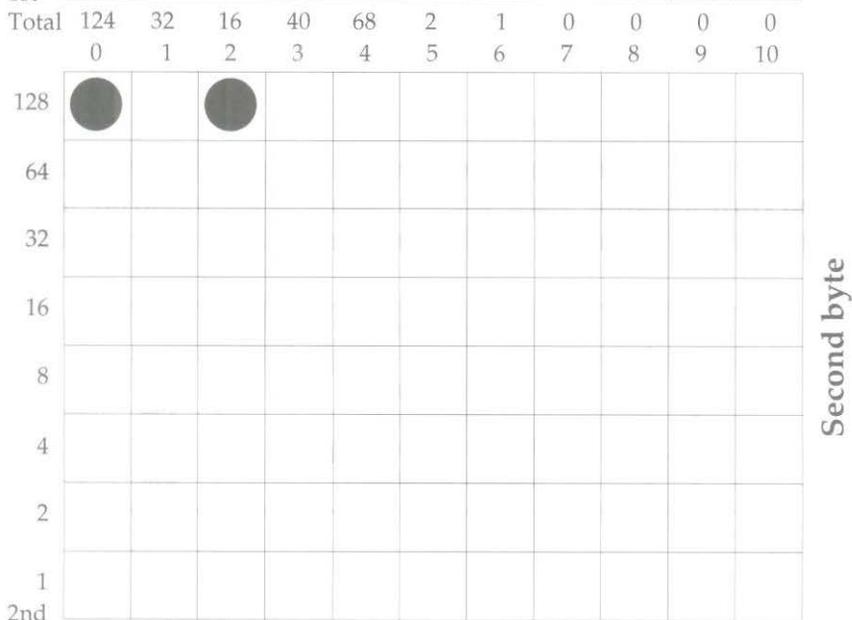
	0	1	2	3	4	5	6	7	8	9	10
128									●		●
64								●		●	
32							●		●		
16						●		●			
8					●		●				
4				●		●					
2			●		●						
1		●		●							
1st Total	124	32	16	40	68	2	1	0	0	0	0

First byte

	0	1	2	3	4	5	6	7	8	9	10
128	●		●								
64											
32											
16											
8											
4											
2											
1											
2nd Total	124	32	16	40	68	2	1	0	0	0	0

Second byte

6 – 14 Epson FX Mode Advanced Features

Here is the program:

```
10   REM 9 pin graphic demo
30   DATA 0,128,1,0,2,128,5,0,10,0,20,0,40,0,80,0,160,0,64,0,128,0
40   REM pattern data
60   RESTORE
70   WIDTH "lpt1:",255
90   FOR I = 1 TO 22:      REM create graphic string
100  READ A
110  AP$ = AP$+CHR$(A)
120  NEXT I
140  FOR M = 0 TO 1:      REM single and double density
150  LPRINT CHR$(27);"^";CHR$(M);CHR$(220);CHR$(0);
155  FOR I = 1 TO 20
160  LPRINT AP$;
165  NEXT I
170  LPRINT CHR$(10);:  REM line feed
180  NEXT M
190  END
```

The printout should look like this:

Control Code Tables

IBM Mode

P = Proprinter Mode   F = Epson FX Mode

Function	ASCII	Decimal	Hex.	Comp.
Automatic line feed				
Auto LF OFF	ESC 5 0	27 53 48	1B 35 30	P
Auto LF ON (LF after each CR)	ESC 5 1	27 53 49	1B 35 31	P
Backspace				
Backspace	BS	8	08	P F
Carriage return				
Carriage return	CR	13	0D	P F
Character sets				
IBM Character Set 1	ESC 7	27 55	1B 37	P
IBM Character Set 2	ESC 6	27 54	1B 36	P
International Character Set	ESC ! n	27 33 n	1B 21 n	P
Select code page	ESC [T ENQ	27 91 84	1B 5B 54 05	P
	NUL NUL	5 0 0 0	00 00 00 n1	
	NUL n1 n2	n1 n2 0	n2 00	
	NUL			
Print from All Character Set	ESC ^ n	27 94 n	1B 5E n	P
(one character only)				
Print from All Character Set	ESC \n1 n2	27 92 n1 n2	1B 5C n1 n2	P
(continuously)				
Character pitch				
10 CPI (pica)	DC2	18	12	P
12 CPI (elite)	ESC :	27 58	1B 3A	P
17 or 20 CPI (condensed)	SI	15	0F	P
15 CPI (fine print)	ESC g	27 103	1B 67	P F
Clear Buffer				
Clear Buffer	CAN	24	18	P F

Function	ASCII	Decimal	Hex.	Comp.
Bin Selection				
Select Bin 1	ESC EM 1	27 25 49	1B 19 31	P F
Select Bin 2	ESC EM 2	27 25 50	1B 19 32	P F
Cut sheet feeder				
CSF single sheet eject	ESC EM R	27 25 82	1B 19 52	P F
CSF single sheet insert	ESC EM I	27 25 73	1B 19 49	P F
Double height				
Double height characters	ESC [@	27 91 64	1B 5B 40	P
	n1 n2 m1..m4	n1 n2 m1..m4	n1 n2 m1..m4	
Double width				
Double width (one line only)	SO	14	0E	P F
Double width OFF (before end of line)	DC4	20	14	P F
Double width OFF	ESC W 0	27 87 48	1B 57 30	P F
Double width ON	ESC W 1	27 87 49	1B 57 31	P F
Dowr:line loadable chr. gen.				
Copy standard set to DLL CG	ESC $	27 36	1B 24	P
Designate DLL NLQ mode (Quasi-NLQ)	ESC I 6	27 73 54	1B 49 36	P
Designate DLL Utility mode	ESC I 4	27 73 52	1B 49 34	P
Exit DLL	ESC I 0	27 73 48	1B 49 30	P
	or ESC I 2	27 73 50	1B 49 32	
Load Proprinter DLL CG	ESC = n1	27 61 n1	18 3D n1	P
	n2 DC4...	n2 20 ...	n2 14 ...	

Function	ASCII	Decimal	Hex.	Comp.
Enhanced/Emphasised				
Designates enhanced mode	ESC I 2	27 73 50	1B 49 32	P
Emphasised OFF	ESC F	27 70	1B 46	P F
Emphasised ON	ESC E	27 69	1B 45	P F
Enhanced OFF (double strike)	ESC H	27 72	1B 48	P F
Enhanced ON (double strike)	ESC G	27 71	1B 47	P F
Formatting				
Form feed	FF	12	0C	P F
Form length by inches (n=1 to 22 (XL:255))	ESC C NUL n	27 67 0 n	1B 43 00 n	P F
Form length by lines (n =1 to 127; (XL:255))	ESC C n	27 67 n	1B 43 n	P F
TOF set	ESC 4	27 52	1B 34	P
Graphics density				
Density double (120 x 72 DPI)	ESC Y n1 n2	27 89 n1 n2	18 59 n1 n2	P
Density double half speed (120 x 72 DPI) (Quasi-NLQ)	ESC L n1 n2	27 76 n1 n2	1B 4C n1 n2	P
Density quadruple (240 x 72 DPI)	ESC Z n1 n2	27 90 n1 n2	1B 5A n1 n2	P
Density single (60 x 72 DPI)	ESC K n1 n2	27 75 n1 n2	1B 4B n1 n2	P
Horizontal tabs				
Horizontal tabulator skip	HT	9	09	P F
HTABS clear	ESC D NUL	27 68 0	1B 44 00	P F
HTABS set by characters (k = 28 max.)	ESC D n1 - nk NUL	27 68 n1 - nk 0	1B 44 n1 - nk 00	P F
Indenting				
Indenting (print position by dot)	ESC % B n1 - n4	27 37 66 n1 - n4	1B 25 42 n1 - n4	P
Italics				
Italics (Slant) OFF	ESC % H	27 37 72	1B 25 48	P
Italics (Slant) ON	ESC % G	27 37 71	1B 25 47	P
Line Feed				
Line Feed	LF	10	0A	P F
Var. Line Feed n/216inch (n=1 to 255)	ESC J n	27 74 n	1B 4A n	P F

Function	ASCII	Decimal	Hex.	Comp.
Line spacing				
6 LPI (without prev. ESC A n)	ESC 2	27 50	1B 32	P F
8 LPI	ESC 0	27 48	1B 30	P F
Enable variable line spacing (activates ESC A n)	ESC 2	27 50	1B 32	P
Line spacing 7/72 inch (for 7-bit graphics	ESC 1	27 49	1B 31	P F
Variable line spacing n/216 inch (n=0 to 255)	ESC 3 n	27 51 n	1B 33 n	P F
Variable line spacing n/72 inch (ESC 2 must follow !) (n=1 to 85)	ESC A n	27 65 n	1B 41 n	P F
Margins				
Margin set left and right (by character columns)	ESC X n1 n2	27 88 n1 n2	1B 58 n1 n2	P
Near Letter Quality				
NLQ On	ESC G	27 71	1B 47	P
Designates NLQ Courier mode	ESC I 3	27 73 51	1B 49 33	P
Designates NLQ Gothic mode	ESC I 2	27 73 50	1B 49 32	P
NLQ Off	ESC H	27 72	1B 48	P
Overscore				
Overscore OFF	ESC _ 0	27 95 48	1B 5F 30	P
Overscore ON	ESC _ 1	27 95 49	1B 5F 31	P
Paper-out sensor				
Paper-out sensor OFF	ESC 8	27 56	1B 38	P F
Paper-out sensor ON	ESC 9	27 57	1B 39	P F
Print head direction				
Unidirectional print OFF	ESC U 0	27 85 48	1B 55 30	P F
Unidirectional print ON	ESC U 1	27 85 49	1B 55 31	P F

Function	ASCII	Decimal	Hex.	Comp.
Print suppress				
Print suppress OFF	DC1	17	11	P
Print suppress ON (no print until DC1)	ESC Q SYN	27 81 22	1B 51 16	P
Proportional Spacing				
Proportional spacing OFF	ESC P 0	27 80 48	1B 50 30	P
Proportional spacing ON	ESC P 1	27 80 49	1B 50 31	P
Skip-over perforation				
Skip-over perforation (n=1 to 127 (XL:255))	ESC N n	27 78 n	1B 4E n	P
Skip-over perforation OFF	ESC O	27 79	1B 4F	P
Spacing between characters				
Space between characters (n=1 to 11)	ESC V n	27 86 n	1B 56 n	P F
Return to standard spacing	ESC V 0	27 86 00	1B 56 00	P F
Superscript/subscript				
Subscript ON (SOH or any odd number)	ESC S 1	27 83 49	1B 53 31	P
Superscript ON (NUL or any even number)	ESC S 0	27 83 48	1B 53 30	P
Super/Subscript OFF	ESC T	27 84	1B 54	P
Underlining				
Underlining OFF (underscore)	ESC - 0	27 45 48	1B 2D 30	P
Underlining ON (underscore)	ESC - 1	27 45 49	1B 2D 31	P

Function	ASCII	Decimal	Hex.	Comp.
Utility/draft mode				
Designates HSD mode	ESC # 0	27 35 48	1B 23 30	P
Designates Utility mode	ESC I 1	27 73 49	1B 49 31	P
Designates Utility mode	ESC I 0	27 73 48	1B 49 30	P
Vertical tabs				
Cancel VTABS, set HTABS.	ESC R	27 82	1B 52	P
Vertical tabulator cancel	ESC B NUL	27 66 0	1B 42 00	P F
Vertical tabulator set	ESC B n1... n64 NUL	27 66 n1... n64 0	1B 42 n1... n64 00	P F
Vertical tabulator skip (same as LF if no tab)	VT	11	0B	F
Miscellaneous Commands				
BEL (sound printer's bell)	BEL	7	07	P F
Emulation Mode	ESC {n	27 123	27 7B n	P F
Deselect Mode	ESC j NUL	27 106 0	1B 6A 00	P
Initial Status	ESC } NUL	27 125 0	1B 7D 00	P F
IBM Code Page Selection	ESC [T n1 n2 NUL NUL m1 m2 NUL	27 91 84 n1 n2 0 0 m1 m2 0	1B 5B 54 n1 n2 00 00 m1 m2 00	P
Bar Code Selection	ESC DLE A n1 m1 m2 m3 m4 m5 m6 m7 m8	27 16 65 n1 m1 m2 m3 m4 m5 m6 m7 m8	1B 10 41 n1 m1 m2 m3 m4 m5 m6 m7 m8	P F
Bar Code Printing	ESC DLE B n1 [data]	27 16 66 n1 [data]	1B 10 42 n1 [data]	P F
Post Net Barcode printing	ESC DLE C n1 [data]	27 16 67 n1[data]	1B 10 43 n1 [data]	P F
Reset Inhibit	ESC [K n1 n2 m1 m2 m3 m4	27 91 75 n1 n2 m1 m2 m3 m4	1B 5B 4B n1 n2 m1 m2 m3 m4	P

Epson FX Mode

(FX-85/FX-105 compatible)

Function	ASCII	Decimal	Hex.
Backspace			
Backspace	BS	8	08
Carriage return			
Carriage return	CR	13	0D
Character set			
Code expansion OFF (128 - 159 + 255 CTRL code)	ESC 7	27 55	1B 37
Code expansion ON (128 - 158 + 255 printable)	ESC 6	27 54	1B 36
National character set	ESC R n	27 82 n	1B 52 n
Normal character set	ESC t NUL	27 116 0	1B 74 00
Line graphics character set	ESC t SOH	27 116 1	1B 74 01
Unassigned code print OFF (CTRL code 0 - 31 128 - 159)	ESC I 0	27 73 48	1B 49 30
Unassigned code print ON (CHR$ and control codes)	ESC I 1	27 73 49	1B 49 31
Character Pitch			
10 CPI (pica)	ESC P	27 80	1B 50
12 CPI (elite)	ESC M	27 77	1B 4D
15 CPI	ESC g	27 103	1B 67
17 CPI, 20 CPI if 12 (condensed)	SI	15	0F
17 CPI, 20 CPI if 12 (condensed)	ESC SI	27 15	1B 0F
Reset condensed mode (20 -> 12 + 17 -> 10 CPI)	DC2	18	12
Clear buffer			
Clear buffer	CAN	24	18
Clear buffer/master reset (sets defaults)	ESC @	27 64	1B 40
Code Page Selection	ESC R n	27 82 n	1B 52 n

Function	ASCII	Decimal	Hex.
Composite selection			
Composite selection (of print modes)	ESC ! n	27 33 n	1B 21 n
Cut sheet feeder			
CSF single sheet insert	ESC EM I	27 25 73	1B 19 49
CSF single sheet eject	ESC EM R	27 25 82	1B 19 52
Dual Bin 1 select	ESC EM 1	27 25 49	1B 19 30
Dual Bin 2 select	ESC EM 2	27 25 50	1B 19 31
Delete			
Delete last character (in buffer)	DEL	127	7F
Dot position			
Dot position absolute (in 1/60 inch units)	ESC $ n1 n2	27 36 n1 n2	1B 24 n1 n2
Dot position relative (in 1/120 inch units)	ESC \ n1 n2	27 92 n1 n2	1B 5C n1 n2
Double height			
Double height OFF	ESC w 0	27 119 48	1B 77 30
Double height ON	ESC w 1	27 119 49	1B 77 31
Double width			
Double width (for one line only)	ESC SO	27 14	1B 0E
Double width (for one line only)	SO	14	0E
Double width OFF (before end of line)	DC4	20	14
Double width OFF	ESC W 0	27 87 48	1B 57 30
Double Width ON	ESC W 1	27 87 49	1B 57 31

Function	ASCII	Decimal	Hex.
Downline loadable chr.gen.			
Copy standard set to DLL CG	ESC : NUL NUL NUL	27 58 0 0 0	1B 3A 00 00 00
Designates DLL CHR. SET	ESC % SOH	27 37 1	1B 25 01
Exit DLL (to DP-mode)	ESC % NUL	27 37 0	1B 25 00
Load DLL character	ESC & NUL n m a p1	27 38 0 n m a p1	1B 26 00 n m a p1
Emphasised/enhanced			
Emphasised OFF	ESC F	27 70	1B 46
Emphasised ON	ESC E	27 69	1B 45
Emphasised OFF (double strike)	ESC H	27 72	1B 48
Enhanced ON (double strike)	ESC G	27 71	1B 47
Formatting			
Form Feed	FF	12	0C
Form length by inches (n = 1 to 22)	ESC C NUL n	27 67 0 n	1B 43 00 n
Form length by lines (n = 1 to 127)	ESC C n	27 67 n	1B 43 n
Graphic modes			
Select 8-bit graphics m = 0 to 7	ESC * m n1 n2 v1 - vk	27 42 m n1 n2 v1 - vk	1B 2A m n1 n2 v1 - vk
Select 9-bit graphics	ESC ^ m n1 n2 v...	27 94 m n1 n2 v...	1B 5E m n1 n2 v...
Graphics density			
Density double (120 x 72 DPI)	ESC Y n1 n2	27 89 n1 n2	1B 59 n1 n2
Density double half speed (120 x 72 DPI)	ESC L n1 n2	27 76 n1 n2	1B 4C n1 n2
Density quadruple (240 x 72 DPI)	ESC Z n1 n2	27 90 n1 n2	1B 5A n1 n2
Density single (60 x 72 DPI)	ESC K n1 n2	27 75 n1 n2	1B 4B n1 n2
Reassign ALT. graph codes (ESC * to ESC K, L, Y, Z)	ESC ? m p	27 63 m p	1B 3F m p

Function	ASCII	Decimal	Hex.
Horizontal tabs			
Horizontal tabulator skip	HT	9	09
HTABS clear	ESC D NUL	27 68 0	1B 44 00
HTABS set by characters	ESC D	27 68 n1 -	1B 44 n1 -
(k = max. 32)	n1 - nk NUL	nk 00	nk 00
Italics			
Italics OFF	ESC 5	27 53	1B 35
Italics ON	ESC 4	27 52	1B 34
Line feed			
Line feed	LF	10	0A
Variable line feed n/216 inch	ESC J n	27 74 n	1B 4A n
(n = 0 to 255)			
Variable rev. line feed n/216 inch	ESC j n	27 106 n	1B 6A n
(n = 0 to 255)			
Line Spacing			
6 LPI	ESC 2	27 50	1B 32
8 LPI	ESC 0	27 48	1B 30
Line spacing 7/72 inch	ESC 1	27 49	1B 31
(for 7-bit graphics)			
Variable line spacing n/216 inch	ESC 3 n	27 51 n	1B 33 n
(n = 1 to 255)			
Variable line spacing n/72 inch	ESC A n	27 65 n	1B 41 n
(n = 1 to 85)			
Margins			
Margin left set	ESC l n	27 108 n	1B 6C n
Margin right set	ESC Q n	27 81 n	1B 51 n
Miscellaneous			
Half speed printing OFF	ESC s 0	27 115 48	1B 73 30
Half speed printing ON	ESC s 1	27 115 49	1B 73 31

Function	ASCII	Decimal	Hex.
MSB setting			
Cancel MSB setting	ESC #	27 35	1B 23
MSB set 0	ESC =	27 61	1B 3D
MSB set 1	ESC >	27 62	1B 3E
Near Letter Quality			
NLQ auto justification	ESC a n	27 97 n	1B 61 n
(left, mid, right, full)			
Select font NLQ	ESC x SOH	27 120 1	1B 78 01
Paper out sensor			
Paper out sensor OFF	ESC 8	27 56	1B 38
Paper out sensor ON	ESC 9	27 57	1B 39
Print head direction			
Unidirectional print (home head)	ESC <	27 60	1B 3C
for one line only)			
Unidirectional print OFF	ESC U 0	27 85 48	1B 55 30
Unidirectional print ON	ESC U 1	27 85 49	1B 55 31
Print suppress			
Print suppress OFF	DC1	17	11
Print suppress ON	DC3	19	13
(no print until DC1)			
Proportional spacing			
Proportional spacing OFF	ESC p 0	27 112 48	1B 70 30
Proportional spacing ON	ESC p 1	27 112 49	1B 70 31
Skip-over perforation			
Skip-over perforation (n = 1 to 127)	ESC N n	27 78 n	1B 4E n
Skip-over perforation OFF	ESC O	27 79	1B 4F
Spacing between characters			
Spacing between characters	ESC SP n	27 32 n	1B 20 n
Set NLQ Mode	ESC K n1	1B 4B n1	1B 4B n1
(n = 0 to 127)			

Function	ASCII	Decimal	Hex.
Subscript/superscript			
Sub/superscript OFF	ESC T	27 84	1B 54
Subscript ON	ESC S 1	27 83 49	1B 53 31
Sub/superscript OFF	ESC T	27 84	1B 54
Superscript ON	ESC S 0	27 83 48	1B 53 30
Underlining			
Underline OFF (underscore)	ESC - 0	27 45 48	1B 2D 30
Underline ON (underscore)	ESC - 1	27 45 49	1B 2D 31
Utility/draft mode			
Designates HSD mode (SSD at 12 CPI)	ESC (0	27 40 48	1B 28 30
Select font utility	ESC x NUL	27 120 0	1B 78 00
Vertical format unit			
VFU channel select (n = 0 to 7)	ESC / n	27 47 n	1B 2F n
VFU load (k = 1 to 16)	ESC b n m1 ...mk NUL	27 98 n m1 ... mk 0	1B 62 n m1 ...mk 00
Vertical tabs			
Vertical tabulator cancel	ESC B NUL	27 66 0	1B 42 00
Vertical tabulator set	ESC B n1... n16 NUL	27 66 n1... n16 0	1B 42 n1... n16 00
Vertical tabulator skip	VT	11	0B
Barcode Print Application			
Barcode Selection	ESC DLE A n1 m1 m2 m3 m4 m5 m6 m7 m8	27 16 65 n1 m1 m2 m3 m4 m5 m6 m7 m8	1B 10 41 n1 m1 m2 m3 m4 m5 m6 m7 m8
Barcode Printing	ESC DLE B n1 [data]	27 16 66 n1 [data]	1B 10 42 n1 [data]
Post Net Barcode	ESC DLE C n1 [data]	27 16 67 n1 [data]	1B 10 43 n1 [data]

Character Tables

IBM Character Tables

Set 1 (selected by ESC 7)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p			á	▦	└	⊥⊥	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	▨	⊥	⊤	ß	±
2		DC2	"	2	B	R	b	r		DC2	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s		DC3	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	BEL		º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	HT		⌐	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	LF		¬	║	╩	┌	Ω	·
B	VT		+	;	K	[	k	{	VT	ESC	½	╗	╦	■	δ	√
C	FF		,	<	L	\	l	|	FF		¼	╝	╠	■	∞	η
D	CR		-	=	M	]	m	}	CR		¡	╜	=	■	Ø	²
E	SO		.	>	N	^	n	~	SO		«	╛	╬	■	∈	∎
F	SI		/	?	O	_	o		SI		»	┐	⊥	■	∩	

Set 2 (selected by ESC 6)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▦	└	⊥⊥	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▨	⊥	⊤	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	⊤	π	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	⊥	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	⊢	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	┤	┼	⊨	σ	⌡
6			&	6	F	V	f	v	å	û	ª	┨	┝	π	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╥	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╡	╔	┘	θ	∎
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╧	╒	Ω	·
B	VT		+	;	K	[	k	{	ï	¢	½	╖	╥	■	δ	√
C	FF		,	<	L	\	l			î	£	¼	╜	╟	■	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	¥	¡	╝	=	▮	Ø	²
E	SO		.	>	N	^	n	~	Ä	Pt	«	┙	╬	■	∈	∙
F	SI		/	?	O	_	o		Â	ƒ	»	┐	⊥	■	∩	

All Character Set (selected by ESC^ or ESC [\] n1 2)
(Code Page 437 - USA)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		▶		0	@	P	`	p	Ç	É	á	▦	└	╨	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▨	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	ø	½	╗	╦	█	δ	√
C	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	ì	¥	¡	╜	=	▌	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	Pt	«	╛	╬	▐	∈	∎
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	╧	▀	∩	

IBM National Character Sets

ESC! n	Language	35	36	38	48	64	79	91	92	93	94	95	96	105	123	124	125	126
																		Decimal value
@	ASCII ( )	#	$	&	Ø	@	O	[	\	]	^	_	`	i	{	|	}	~
A	ASCII (0)	#	$	&	O	@	O	[	\	]	^	_	`	i	{	|	}	~
B	British	£	$	&	O	@	O	[	\	]	^	_	`	i	{	|	}	~
C	German	#	$	&	O	§	Ö	Ä	Ö	Ü	^	_	`	i	ä	ö	ü	ß
D	French	£	$	&	O	à	O	°	ç	§	^	_	`	i	é	ù	è	¨
E	Swedish I	#	¤	&	O	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
F	Danish	#	$	&	O	@	O	Æ	Ø	Å	Ü	_	`	i	æ	ø	å	ü
G	Norwegian	#	$	&	O	@	O	Æ	Ø	Å	^	_	`	i	æ	ø	å	~
H	Dutch	£	$	&	O	@	O	[	IJ	]	^	_	`	i	{	ij	}	~
I	Italian	£	$	&	O	§	O	°	ç	é	^	_	ù	i	à	ò	è	ì
J	French-Canadian	ü	$	é	O	à	Ø	á	ç	ê	î	ï	ô	i	é	ù	è	û
K	Spanish	!	$	&	O	¡	O	Ñ	ñ	¿	ü	_	á	i	é	í	ó	ú
L	Swedish II	#	$	&	O	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
M	Swedish III	§	$	&	O	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
N	Swedish IV	§	¤	&	O	É	O	Ä	Ö	Å	^	_	é	i	ä	ö	å	ü
O	Turkish	ş	$	ğ	O	Ş	O	İ	Ö	Ü	G	_	ç	ı	f	ö	ü	ç
P	Swiss I	£	$	&	O	ç	O	à	é	è	^	_	`	i	ä	ö	ü	"
Q	Swiss II	£	$	&	O	§	O	à	ç	è	^	_	`	i	ä	ö	ü	é

IBM Code Pages

ID	Code Page
437	USA
850	Multilingual
851	(reserved)
852	(reserved for East Europe)
853	(reserved)
855	(reserved for Cyrillic I)
860	Portugal
862	(reserved)
863	(reserved)
864	(reserved)
865	Norway
866	(reserved for Cyrillic II)
876	(reserved)
877	(reserved)
899	(reserved)
909	(reserved)
911	(reserved)
1000	(reserved)
1001	(reserved)
1002	(reserved)
1003	(reserved)
1004	(reserved)
1005	(reserved)
1006	(reserved)
1007	(reserved)
1008	Greek 437
1009	Greek 928
1010	Greek 851
1011	(reserved)
1012	Turkey
1013	Cyrillic
1014	Polska Mazovia
1015	Polska PC Latin 2
1016	Serbo Croatic 1
1017	Serbo Croatic 2
1018	ECMA 94
1019	(reserved for Windows East Europe)
1020	(reserved)
1021	(reserved)
1022	(reserved for Windows Cyrilic)
1023	(reserved for Windows ANSI)
1024	(reserved for Hungarian CWI)

Code Page 850 (Multilingual)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	á	▨	└	ð	Ó	-
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▨	┴	Ð	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▨	┬	Ê	Ô	=
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	Ë	Ò	¾
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	È	õ	¶
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	Á	┼	ı	Õ	§
6	♠	▬	&	6	F	V	f	v	å	û	ª	Â	ã	Í	µ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	º	À	Ã	Î	þ	¸
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	©	╚	Ï	Þ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	®	╣	╔	┘	Ú	¨
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Û	·
B	♂	←	+	;	K	[	k	{	ï	ø	½	╗	╦	█	Ù	¹
C	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	▄	ý	³
D	♪	↔	-	=	M	]	m	}	ì	Ø	¡	¢	=	¦	Ý	²
E	♫	▲	.	>	N	^	n	~	Ä	×	«	¥	╬	Ì	¯	■
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	¤	▀	´	

B – 6 Character Tables

Code Page 865 (Norwegian)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø	▶		0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7	●	↕	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	◎	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	ø	½	╗	╦	█	δ	√
C	♀	∟	,	<	L	\	l			î	£	¼	╝	╠	▄	∞	η
D	♪	↔	-	=	M	]	m	}	ì	Ø	¡	╜	=	▌	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	∈	■
F	☼	▼	/	?	O	_	o	⌂	Å	ƒ	¤	┐	┴	▀	∩	

Code Page 860 (Portugese)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		▶		0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1	☺	◄	!	1	A	Q	a	q	ü	À	í	▒	┴	╤	ß	±
2	☻	↕	"	2	B	R	b	r	é	È	ó	▓	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ã	õ	ñ	┤	─	╘	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6	♠	▬	&	6	F	V	f	v	Á	Ú	ª	╢	╞	╓	μ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	Ì	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	Ê	õ	Ò	╣	╔	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	Í	¢	½	╗	╦	■	δ	√
C	♀	∟	,	<	L	\	l			Ô	£	¼	╝	╠	▬	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	ì	Ù	¡	╜	=	▬	φ	²
E	♫	▲	.	>	N	^	n	~	Ã	Pt	«	╛	╬	▮	ε	▪
F	☼	▼	/	?	O	_	o	⌂	Â	Ó	»	┐	╧	▬	∩	

Code Page Turkish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	á	▦	└	⊔	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▨	┴	┬̄	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	∏	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	⊔	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	├	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╔	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	Ğ	╢	╠	∏	μ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	ğ	╖	╟	╫	τ	≈
8	◙	↑	(	8	H	X	h	x	ê	İ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	ı	¥	¡	╜	═	▐	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	Ş	«	╛	╬	█	∈	■
F	☼	▼	/	?	O	_	o	⌂	Å	ş	»	┐	┴	▀	∩	

Code Page 928 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	ç	É		°	ϒ	Π	υ	π
1	☺	◀	!	1	A	Q	a	q	ü	æ	'	±	A	P	α	ρ
2	●	↕	"	2	B	R	b	r	é	Æ	'	²	B		β	ς
3	♥	‼	#	3	C	S	c	s	â	ô	£	³	Γ	Σ	γ	σ
4	♦	¶	$	4	D	T	d	t	ä	ö		´	Δ	T	δ	τ
5	♣	§	%	5	E	U	e	u	à	ò		^	E	Y	ε	υ
6	♠	─	&	6	F	V	f	v	å	û	¦	Ά	Z	Φ	ζ	φ
7	●	↨	'	7	G	W	g	w	ç	ù	$	·	H	X	η	χ
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¨	Έ	θ	Ψ	ϑ	ψ
9	○	↓	)	9	I	Y	i	y	ë	Ö	©	Ή	I	Ω	ι	ω
A	◙	→	*	:	J	Z	j	z	è	Ü		Ί	K	Ϊ	κ	ί
B	♂	←	+	;	K	[	k	{	ï	¢	«	»	Λ	Ϋ	λ	υ
C	♀	∟	,	<	L	\	l	|	î	£	¬	Ο	M	ά	μ	ό
D	♪	↔	-	=	M	]	m	}	ì	¥	½	N	έ	ν	ύ
E	♫	▲	.	>	N	^	n	~	Ä	Pt		Υ	Ξ	ή	ξ	ώ
F	☼	▼	/	?	O	_	o	△	Å	ƒ	-	Ω	O	ΐ	o	

Code Page 851 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	⌐	ι	▦	└	T	ζ	─
1	☺	◀	!	1	A	Q	a	q	ü		ΐ	▨	⊥	Y	η	±
2	☻	↕	"	2	B	R	b	r	é	Ό	ό	▓	⊤	Φ	ϑ	υ
3	♥	‼	#	3	C	S	c	s	â	ô	ύ	│	├	X	ι	φ
4	♦	¶	$	4	D	T	d	t	ä	ö	Ά	┤	─	Ψ	κ	χ
5	♣	§	%	5	E	U	e	u	à	Ύ	Β	K	┼	Ω	λ	§
6	♠	─	&	6	F	V	f	v	Ά	û	Γ	Λ	Π	α	μ	ψ
7	●	↕	'	7	G	W	g	w	ç	ù	Δ	M	P	β	ν	.
8	◘	↑	(	8	H	X	h	x	ê	Ω	E	N	╚	γ	ξ	·
9	○	↓	)	9	I	Y	i	y	ë	ö	Z	╣	╔	┘	ο	¨
A	◙	→	*	:	J	Z	j	z	è	Ü	H	║	╩	┌	π	ω
B	♂	←	+	;	K	[	k	{	ï	ά	½	╗	╥	■	ρ	υ
C	♀	─	,	<	L	\	l	|	î	£	θ	╝	╟	■	σ	υ
D	♪	↔	-	=	M	]	m	}	Έ	έ	I	Ξ	=	δ	ς	ώ
E	♫	▲	.	>	N	^	n	~	Ä	ή	«	O	╤	ε	τ	■
F	☼	▼	/	?	O	_	o	△	Ή	ί	»	╖	Σ	■	´	

Code Page 437 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	A	P	ι	▦	└	╙	ω	≡
1	☺	◄	!	1	A	Q	a	q	B	Σ	κ	▨	┴	╤	ά	±
2	●	↕	"	2	B	R	b	r	Γ	T	λ	▓	┬	π	ε	≥
3	♥	‼	#	3	C	S	c	s	Δ	Y	μ	│	├	╨	ή	≤
4	♦	¶	$	4	D	T	d	t	E	Φ	ν	┤	─	╘	ι	⌠
5	♣	§	%	5	E	U	e	u	Z	X	ξ	╡	┼	╒	ί	⌡
6	♠	▬	&	6	F	V	f	v	H	Ψ	ο	╢	╞	Π	ό	÷
7	●	↕	'	7	G	W	g	w	θ	Ω	π	╖	╟	╫	ύ	≈
8	◘	↑	(	8	H	X	h	x	I	α	ρ	╕	╚	╪	υ	°
9	○	↓	)	9	I	Y	i	y	K	β	σ	╣	╔	┘	ώ	∙
A	◙	→	*	:	J	Z	j	z	Λ	γ	ς	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	M	δ	τ	╗	╦	█	δ	√
C	♀	∟	,	<	L	\	l			N	ε	υ	╝	╠	■	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	Ξ	ζ	φ	╜	=	■	φ	²
E	♫	▲	.	>	N	^	n	~	O	η	χ	╛	╬	■	∈	■
F	☼	▼	/	?	O	_	o	△	Π	ϑ	ψ	┐	┴	■	∩	

Cyrillic

¶	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	∅	►		0	@	P	`	p	А	Р	а	▒	└	╨	р	Ё
1	☺	◄	!	1	A	Q	a	q	Б	С	б	▓	┴	╤	с	ё
2	☻	↕	"	2	B	R	b	r	В	Т	в	█	┬	╥	т	∕
3	♥	‼	#	3	C	S	c	s	Г	У	г	│	├	╙	у	\
4	♦	¶	$	4	D	T	d	t	Д	Ф	д	┤	─	╘	ф	∕
5	♣	§	%	5	E	U	e	u	Е	Х	е	╡	┼	╒	х	\
6	♠	▬	&	6	F	V	f	v	Ж	Ц	ж	╢	╞	╓	ц	→
7	●	↨	'	7	G	W	g	w	З	Ч	з	╖	╟	╫	ч	←
8	◘	↑	(	8	H	X	h	x	И	Ш	и	╕	╚	╪	ш	↑
9	○	↓	)	9	I	Y	i	y	Й	Щ	й	╣	╔	┘	щ	↓
A	◙	→	*	:	J	Z	j	z	К	Ъ	к	║	╩	┌	ъ	÷
B	♂	←	+	;	K	[	k	{	Л	Ы	л	╗	╦	█	ы	±
C	♀	∟	,	<	L	\	l	|	М	Ь	м	╝	╠	▄	ь	№
D	♪	↔	-	=	M	]	m	}	Н	Э	н	╜	═	▌	э	¤
E	♫	▲	.	>	N	^	n	`	О	Ю	о	╛	╬	▐	ю	■
F	☼	▼	/	?	O	_	o	⌂	П	Я	п	┐	╧	▀	я	

Code Page Polska Mazovia

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		▶		0	@	P	`	p	Ç	Ę	ź	▦	└	╨	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	ę	ż	▨	┴	╤	β	±
2	☻	↕	"	2	B	R	b	r	é	ł	ó	▓	┬	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ó	│	├	╨	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ń	┤	─	╞	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	Ć	Ń	╡	┼	╟	σ	⌡
6	♠	▬	&	6	F	V	f	v	ą	û	ź	╢	╟	╓	μ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	ż	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	Ś	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ê	ö	⌐	╣	╔	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╤	■	δ	√
C	♀	∟	,	<	L	\	l	|	î	Ł	¼	╝	╟	■	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	ć	¥	¡	╜	=	■	φ	²
E	♫	▲	.	>	N	^	n	`	Ä	ś	«	╛	╬	■	∈	■
F	☼	▼	/	?	O	_	o	△	Ą	ƒ	»	┐	┴	■	∩	

Code Page Polska PC Latin 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		▶		0	@	P	`	p	Ç	É	á	▦	└	⊥	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▨	⊥	┬	ß	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┬	∏	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	⊥	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	Ą	┤	─	└	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	ą	┤	┼	┌	σ	⌡
6	♠	▬	&	6	F	V	f	v	ć	û	▪	┤	├	∏	µ	÷
7	●	↨	'	7	G	W	g	w	ç	Ś	º	∏	┼	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ł	ś	Ę	┐	└	≠	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	ę	┤	┌	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	║	⊥	┌	Ω	·
B	♂	←	+	;	K	[	k	{	ï	¢	ź	┐	┬	■	δ	√
C	♀	∟	,	<	L	\	l			î	£	¼	┘	├	■	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	Ź	Ł	¡	┘	=	■	Ø	²
E	♫	▲	.	>	N	^	n	`	Ä	Pt	«	┤	╫	■	∈	■
F	☼	▼	/	?	O	_	o	△	Ć	ƒ	»	┐	⊥	■	∩	

Code Page Serbo Croatic I

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	Ž	P	ž	p	Ç	É	á	▨	└	⊥⊥	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▨	⊥	⊤⊤	β	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	⊤	⊓	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	⊔	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	─	┝	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	┥	┼	┍	σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª	┥┤	┝	⊓	µ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	º	⊓	┼	┿	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	⊔	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	¬	┥	┌┌	┘	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	⌐	║	⊥⊥	┌	Ω	·
B	♂	←	+	;	K	Š	k	š	ï	¢	½	┐	⊤⊤	■	δ	√
C	♀	∟	,	<	L	Đ	l	ð	î	£	¼	┘	┝	■	∞	η
D	♪	↔	-	=	M	]	m	ć	ì	¥	¡	⊔	=	■	Ø	²
E	♫	▲	.	>	N	^	n	č	Ä	Pt	«	┤	╬	■	∈	■
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	⊥	■	∩	

Code Page Serbo Croatic II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	č	▦	└	⊔	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	ć	▨	⊥	⊤	β	±
2	●	↕	"	2	B	R	b	r	é	Æ	ð	▓	⊤	π	Γ	≥
3	♥	‼	#	3	C	S	c	s	č	Đ	š	│	├	⊔	π	≤
4	♦	¶	$	4	D	T	đ	t	ä	ö	ñ	⊣	—	⊨	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	⊣	+	⊩	σ	⌡
6	♠	─	&	6	F	V	f	v	å	Š	ª	⊣	⊢	π	μ	÷
7	●	↨	'	7	G	W	g	w	ç	ù	º	⊤	⊩	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	⊐	⊔	‡	Φ	°
9	○	↓	)	9	I	Y	i	y	ž	Ö	⌐	⊣	⊩	⌐	θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬	‖	⊥	⌐	Ω	·
B	♂	←	+	;	K	[	k	{	ž	ø	½	⊓	⊤	■	δ	√
C	♀	∟	,	<	L	\	l	¦	ć	£	¼	⊔	⊩	■	∞	ⁿ
D	♪	↔	-	=	M	]	m	}	ì	¥	¡	⊔	=	■	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	Pt	«	⊐	╫	■	∈	■
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	⌐	⊥	■	∩	

Code Page ECMA - 94

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø	▶		0	@	P	`	p	Ç	É		°	À	Ð	à	ð
1	☺	◀	!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2	☻	↕	"	2	B	R	b	r	é	Æ	¢	²	Â	ò	â	ì
3	♥	‼	#	3	C	S	c	s	â	ô	£	³	Ã	ó	ã	ó
4	♦	¶	$	4	D	T	d	t	ä	ö	¤	´	Ä	ô	ä	ô
5	♣	§	%	5	E	U	e	u	à	ò	¥	µ	Å	õ	å	õ
6	♠	▬	&	6	F	V	f	v	å	û	¦	¶	Æ	ö	æ	ö
7	●	↨	'	7	G	W	g	w	ç	ù	§	·	Ç	×	ç	÷
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ø	è	ø
9	○	↓	)	9	I	Y	i	y	ë	ö	©	¹	É	Ù	é	ù
A	◙	→	*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B	♂	←	+	;	K	[	k	{	ï	¢	«	»	Ë	Û	ë	û
C	♀	∟	,	<	L	\	l	|	î	£	¬	¼	Ì	Ü	ì	ü
D	♪	↔	-	=	M	]	m	}	ì	¥	-	½	Í	Ý	í	ý
E	♫	▲	.	>	N	^	n	~	Ä	Pt	-	¾	Î	þ	î	Þ
F	☼	▼	/	?	O	_	o	⌂	Å	ƒ	-	¿	Ï	ß	ï	ÿ

Epson Character Tables

Normal Character Set (selected by ESC t NUL ESC 7)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				ø	@	P	`	p			SP	ø	@	P	`	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	#	3	C	S	c	s		DC3	#	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			&	6	F	V	f	v			&	6	F	V	f	v
7	BEL		'	7	G	W	g	w	BEL		'	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	[	k	{	VT	ESC	+	;	K	[	k	{
C	FF		,	<	L	\	l	|	FF		,	<	L	\	l	|
D	CR		-	=	M	]	m	}	CR		-	=	M	]	m	}
E	SO		.	>	N	^	n	`	SO		.	>	N	^	n	~
F	SI		/	?	O	_	o		SI		/	?	O	_	o	

Line Graphics Character Set
(selected by ESC t SOH ESC 7)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p			á	▦	└	⊥⊥	α	≡
1		DC1	!	1	A	Q	a	q		DC1	í	▨	⊥	⊤	ß	±
2		DC2	"	2	B	R	b	r		DC2	ó	▓	⊤	∏	Γ	≥
3		DC3	#	3	C	S	c	s		DC3	ú	│	├	⊔	π	≤
4		DC4	$	4	D	T	d	t		DC4	ñ	┤	─	⊢	Σ	⌠
5			%	5	E	U	e	u			Ñ	┥	+	⊩	σ	⌡
6			&	6	F	V	f	v			ª	┨	┝	∏	μ	÷
7	BEL		'	7	G	W	g	w	BEL		º	ᴨ	┠	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	BS	CAN	¿	┐	┗	╪	Φ	°
9	HT		)	9	I	Y	i	y	HT		⌐	┥	┎	┘	θ	■
A	LF		*	:	J	Z	j	z	LF		¬	║	⊥	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	VT	ESC	½	┑	┯	■	δ	√
C	FF		,	<	L	\	l	|	FF		¼	┙	┠	■	∞	η
D	CR		-	=	M	]	m	}	CR		¡	┘	=	▮	Ø	²
E	SO		.	>	N	^	n	~	SD		«	┘	╫	▮	∈	▪
F	SI		/	?	O	_	o		SI		»	┐	⊥	■	∩	

Normal Character Set Expansion (selected by ESC t NUL ESC 6)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	`	p	à	§		0	@	P	`	p
1		DC1	!	1	A	Q	a	q	è	ß	!	1	A	Q	a	q
2		DC2	"	2	B	R	b	r	ù	Æ	"	2	B	R	b	r
3		DC3	#	3	C	S	c	s	ò	æ	#	3	C	S	c	s
4		DC4	$	4	D	T	d	t	ì	Ø	$	4	D	T	d	t
5			%	5	E	U	e	u	°	ø	%	5	E	U	e	u
6			&	6	F	V	f	v	£	¨	&	6	F	V	f	v
7	BEL		'	7	G	W	g	w	¡	Ä	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x	¿	Ö	(	8	H	X	h	x
9	HT		)	9	I	Y	i	y	Ñ	Ü	)	9	I	Y	i	y
A	LF		*	:	J	Z	j	z	ñ	ä	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{	¤	ö	+	;	K	[	k	{
C	FF		,	<	L	\	l	|	Pt	ü	,	<	L	\	l	|
D	CR		–	=	M	]	m	}	Å	É	–	=	M	]	m	}
E	SO		.	>	N	^	n	~	å	é	.	>	N	^	n	~
F	SI		/	?	O	_	o		ç	¥	/	?	O	_	o	

Line Graphics Expansion Character Set
(selected by ESC t SOH ESC 6)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▦	└	⊔	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▨	⊥	⊤	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	⊤	π	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	⊔	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	⊢	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	┤	+	⊩	σ	⌡
6			&	6	F	V	f	v	å	û	ª	┨	├	⊓	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	┓	┠	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	┛	⊔	‡	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	┥	┏	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	‖	⊥	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	┑	⊤	■	δ	√
C	FF		,	<	L	\	l	|	î	£	¼	┙	┠	■	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	¥	¡	⊔	=	■	Ø	²
E	SO		.	>	N	^	n	~	Ä	Pt	«	┨	╬	▌	∈	▪
F	SI		/	?	O	_	o		Å	ƒ	»	┐	⊥	■	∩	

Epson National Character Sets

ESC R n	Language	Decimal value															
		35	36	38	64	79	91	92	93	94	95	96	105	123	124	125	126
00 H	American	#	$	&	@	0	[	\	]	^	_	`	i	{	|	}	~
01 H	French	#	$	&	à	0	°	ç	§	^	_	`	i	é	ù	è	¨
02 H	German	#	$	&	§	0	Ä	Ö	Ü	^	_	`	i	ä	ö	ü	ß
03 H	British	£	$	&	@	0	[	\	]	^	_	`	i	{	|	}	~
04 H	Danish I	#	$	&	@	0	Æ	Ø	Å	^	_	`	i	æ	ø	å	~
05 H	Swedish I	#	¤	&	É	0	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
06 H	Italian	#	$	&	@	0	°	\	é	^	_	ù	i	à	ò	è	ì
07 H	Spanish I	Pt	$	&	@	0	¡	Ñ	¿	^	_	`	i	¨	ñ	}	~
08 H	Japanese	#	$	&	@	0	[	¥	]	^	_	`	i	{	|	}	~
09 H	Norwegian	#	¤	&	É	0	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
0A H	Danish II	#	$	&	É	0	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
0B H	Spanish II	#	$	&	á	0	¡	Ñ	¿	é	_	`	i	í	ñ	ó	ú
0C H	Latin-American	#	$	&	á	0	¡	Ñ	¿	é	_	ü	i	í	ñ	ó	ú
0D H	French-Canadian	ü	$	ê	à	Ø	â	ç	ê	î	ì	ô	i	é	ù	è	û
0E H	Dutch	£	$	&	@	0	[	IJ	]	^	_	`	i	{	ij	}	~
0F H	Swedish II	#	$	&	É	0	Ä	Ö	Å	Ü	_	é	i	ä	ö	à	ü
10 H	Swedish III	§	$	&	É	0	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
11 H	Swedish IV	§	¤	&	É	0	Ä	Ö	Å	^	_	é	i	ä	ö	å	ü
12 H	Turkish	ş	$	ğ	Ş	0	İ	ö	ü	Ğ	_	ç	ı	±	Ö	Ü	Ç
13 H	Swiss I	£	$	&	ç	0	à	é	è	^	_	`	i	ä	ö	ü	"
14 H	Swiss II	£	$	&	§	0	à	ç	è	^	_	`	i	ä	ö	ü	é

National Character Sets / Code Pages

n	Epson Italic ESC t NUL	Epson Graphics ESC t SOH
0	American	American
1	French	French
2	German	German
3	British	British
4	Danish I	Danish I
5	Swedish I	Swedish I
6	Italian	Italian
7	Spanish I	Code Page Cyrillic
8	Japanese	Japanese
9	Norwegian	Norwegian
10	Danish II	Danish II
11	Spanish II	Spanish II
12	Latin American	Latin American
13	French Canadian	French Canadian
14	Dutch	Dutch
15	Swedish II	Swedish II
16	Swedish III	Swedish III
17	Swedish IV	Swedish IV
18	Turkish	Turkish
19	Swiss I	Swiss I
20	Swiss II	Swiss II
21	Code Page Cyrillic	Code Page Cyrillic
22	Code Page Polska Mazovia	Code Page Polska Mazovia
23	Code Page Polska PC Latin 2	Code Page Polska PC Latin 2
24	Code Page Serbo Croatic I	Code Page Serbo Croatic I
25	Code Page Serbo Croatic II	Code Page Serbo Croatic II
26	Code Page Multilingual 850	Code Page Multilingual 850
27	Code Page Norway 865	Code Page Norway 865
28	Code Page Portugal 860	Code Page Portugal 860
29	Code Page Turkey	Code Page Turkey
38	Code Page Greek 437	Code Page Greek 437
39	Code Page Greek 928	Code Page Greek 928
40	Code Page Greek 851	Code Page Greek 851
42	Code Page ECMA 94	Code Page ECMA 94
43	Code Page Canada French	Code Page Canada French
44	Reserved for Code Page 855 Cyrilic I	Reserved for Code Page 855 Cyrilic I
45	Reserved for Code Page 866 Cyrillic II	Reserved for Code Page 866 Cyrillic II
46	Reserved for Code Page 852 East Europe	Reserved for Code Page 852 East Europe
47	Reserved	Reserved
48	Reserved	Reserved
49	Reserved for Windows East Europe	Reserved for Windows East Europe

Epson Print Unassigned Codes (selected by ESC I)

Decimal		Decimal	
0	à	128	*à*
1	è	129	*è*
2	ù	130	*ù*
3	ò	131	*ò*
4	ì	132	*ì*
5	o	133	*o*
6	£	134	£
7	BEL	135	BEL
8	BS	136	BS
9	HT	137	HT
10	LF	138	LF
11	VT	139	VT
12	FF	140	FF
13	CR	141	CR
14	SO	142	SO
15	SI	143	SI
16	§	144	§
17	ß	145	ß
18	DC2	146	DC2
19	DC3	147	DC3
20	DC4	148	DC4
21	ø	149	ø
22	¨	150	¨
23	Ä	151	Ä

Decimal		Decimal	
24	CAN	152	CAN
25	ü	153	ü
26	Ä	154	Ä
27	ESC	155	ESC
28	ü	156	ü
29	É	157	É
30	é	158	é

Code Expansion Area for Epson Normal Character Set (ESC t NUL ESC 6)

Dec. code		Dec. code		Dec. code		Dec. code	
128	à	137	Ñ	146	Æ	155	¢
129	è	138	ñ	147	æ	156	ü
130	ù	139	¤	148	Ø	157	É
131	ò	140	Pt	149	ø	158	é
132	ì	141	Å	150	¨	159	¥
133	o	142	å	151	Å	255	
134	£	143	ç	152	ö		
135	ì	144	§	153	ü		
136	¿	145	ß	154	ä		

Code Expansion Area for Epson Normal Character Set (ESC t SOH ESC 6)

Dec. code		Dec. code		Dec. code		Dec. code	
128	Ç	137	ë	146	Æ	155	¢
129	ü	138	è	147	ô	156	£
130	é	139	ï	148	ö	157	¥
131	á	140	î	149	ò	158	Pt
132	ä	141	ì	150	û	159	f
133	à	142	Ä	151	ù	255	
134	å	143	Å	152	ÿ		
135	ç	144	É	153	ö		
136	ê	145	æ	154	ü		

Code Page 850 (Multilingual)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	ð	Ó	-
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	⊥	Đ	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	┬	Ê	Ô	=
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	Ë	Ò	¾
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	—	È	õ	¶
5			%	5	E	U	e	u	à	ò	Ñ	Á	┼	ı	Õ	§
6			&	6	F	V	f	v	å	û	ª	Å	ã	Í	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	À	Ã	Î	þ	,
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	©	╚	Ï	Þ	°
9	HT		)	9	I	Y	i	y	ë	Ö	®	╣	╔	⌐	Ú	¨
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	⌐	Û	·
B		ESC	+	;	K	[	k	{	ï	ø	½	╗	╦	■	Ù	¹
C	FF		,	<	L	\	l			î	£	¼	╝	╠	■	ý	³
D	CR		-	=	M	]	m	}	ì	Ø	¡	¢	=	¦	Ý	²
E	SO		.	>	N	^	n	~	Ä	×	«	¥	╬	Ì	‾	■
F	SI		/	?	O	_	o	△	Å	ƒ	»	┐	¤	■	´	∎

Code Page 865 (Norwegian)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B		ESC	+	;	K	[	k	{	ï	ø	½	╗	╦	■	δ	√
C	FF		,	<	L	\	l	|	î	£	¼	╝	╠	■	∞	η
D	CR		-	=	M	]	m	}	ì	Ø	¡	╜	=	■	φ	2
E	SO		.	>	N	^	n	~	Ä	Pt	«	╛	╬	■	∈	■
F	SI		/	?	O	_	o	△	Å	ƒ	¤	┐	⊥	■	∩	

Code Page 860 (Portugese)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	À	í	▒	┴	╤	ß	±
2		DC2	"	2	B	R	b	r	é	È	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	ã	õ	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	Á	ú	ª	╢	╞	╓	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	Ì	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	Ê	Õ	Ò	╣	╔	┘	θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	Í	¢	½	╗	╦	█	δ	√
C	FF		,	<	L	\	l			Ô	£	¼	╝	╠	▄	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	Ù	¡	╜	═	▌	φ	²
E	SO		.	>	N	^	n	~	Ã	₧	«	╛	╬	▐	∈	■
F	SI		/	?	O	_	o	⌂	Á	Ó	»	┐	╧	▀	∩	

Code Page Turkish

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▒	┴	╥	ß	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	╨	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╞	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	Ğ	╢	╟	╓	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	ğ	╖	╫	╬	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	İ	¿	╕	╚	╈	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B		ESC	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	FF		,	<	L	\	l	¦	î	£	¼	╝	╠	█	∞	ⁿ
D	CR		-	=	M	]	m	}	ı	¥	¡	╜	=	█	φ	²
E	SO		.	>	N	^	n	~	Ä	Ş	«	┘	╬	█	∈	∎
F	SI		/	?	O	_	o	△	Å	ş	»	┐	┴	■	∩	

Code Page 928 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	ΰ	Π	υ	π
1		DC1	!	1	A	Q	a	q	ü	æ	'	±	Α	Ρ	α	ρ
2		DC2	"	2	B	R	b	r	é	Æ	'	²	Β		β	ς
3		DC3	#	3	C	S	c	s	â	ô	£	³	Γ	Σ	γ	σ
4		DC4	$	4	D	T	d	t	ä	ö		´	Δ	Τ	δ	τ
5			%	5	E	U	e	u	à	ò		^	Ε	Υ	ε	υ
6			&	6	F	V	f	v	å	û	¦	Ά	Ζ	Φ	ζ	φ
7	BEL		'	7	G	W	g	w	ç	ù	$	·	Η	Χ	η	χ
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¨	Έ	Θ	Ψ	ϑ	ψ
9	HT		)	9	I	Y	i	y	ë	Ö	©	Ή	Ι	Ω	ι	ω
A	LF		*	:	J	Z	j	z	è	Ü		Ι	Κ	Ϊ	κ	ΐ
B	VT	ESC	+	;	K	[	k	{	ï	¢	«	»	Λ	Ϋ	λ	υ
C	FF		,	<	L	\	l	|	î	£	¬	Ό	Μ	ά	μ	ό
D	CR		–	=	M	]	m	}	ì	¥		½	Ν	έ	ν	ύ
E	SO			>	N	^	n	~	Ä	Pt		Ύ	Ξ	ή	ξ	ώ
F	SI		/	?	O	_	o	△	Å	ƒ	–	Ώ	Ο	ί	o	

Code Page 851 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	Ί	ϊ	░	└	Τ	ζ	
1		DC1	!	1	A	Q	a	q	ü		ΐ	▒	┴	Υ	η	±
2		DC2	"	2	B	R	b	r	é	Ό	ό	▓	┬	Φ	ϑ	υ
3		DC3	#	3	C	S	c	s	â	ô	ύ	│	├	Χ	ι	φ
4		DC4	$	4	D	T	d	t	ä	ö	Α	┤	─	Ψ	κ	χ
5			%	5	E	U	e	u	à	Ύ	Β	Κ	┼	Ω	λ	§
6			&	6	F	V	f	v	Ά	û	Γ	Λ	Π	α	μ	ψ
7	BEL		'	7	G	W	g	w	ç	ù	Δ	Μ	Ρ	β	ν	΅
8	BS	CAN	(	8	H	X	h	x	ê	Ώ	Ε	Ν	╚	γ	ξ	°
9	HT		)	9	I	Y	i	y	ë	Ö	Ζ	╣	╔	┘	ο	¨
A	LF		*	:	J	Z	j	z	è	Ü	Η	║	╩	┌	π	ω
B	VT	ESC	+	;	K	[	k	{	ï	ά	½	╗	╦	█	ρ	ϋ
C	FF		,	<	L	\	l	|	î	£	Θ	╝	╠	▄	σ	ΰ
D	CR		-	=	M	]	m	}	Έ	έ	Ι	Ξ	═	δ	ς	ώ
E	SO		.	>	N	^	n	~	Ä	ή	«	Ο	╬	ε	τ	■
F	SI		/	?	O	_	o	△	Ή	ί	»	┐	Σ	▀	΄	

Code Page 437 (Greek)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	A	P	ι	▦	└	╨	ω	≡
1		DC1	!	1	A	Q	a	q	B	Σ	κ	▨	┴	╤	ά	±
2		DC2	"	2	B	R	b	r	Γ	T	λ	▩	┬	Π	έ	≥
3		DC3	#	3	C	S	c	s	Δ	Y	μ	│	├	╨	ή	≤
4		DC4	$	4	D	T	d	t	E	Φ	ν	┤	─	╘	ΐ	⌠
5			%	5	E	U	e	u	Z	X	ξ	╡	┼	╒	ί	⌡
6			&	6	F	V	f	v	H	Ψ	ο	╢	╞	Π	ό	÷
7	BEL		'	7	G	W	g	w	θ	Ω	π	╗	╟	╫	ύ	≈
8	BS	CAN	(	8	H	X	h	x	I	α	ρ	╕	╚	╪	ϋ	°
9	HT		)	9	I	Y	i	y	K	β	σ	╣	╔	┘	ώ	·
A	LF		*	:	J	Z	j	z	Λ	γ	ς	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	M	δ	τ	╖	╦	█	δ	√
C	FF		,	<	L	\	l	|	N	ε	υ	╜	╠	▄	∞	ⁿ
D	CR		-	=	M	]	m	}	Ξ	ζ	φ	╝	═	█	φ	²
E	SO		.	>	N	^	n	~	O	η	χ	╛	╬	█	∈	■
F	SI		/	?	O	_	o	△	Π	ϑ	ψ	┐	┴	▆	∩	

Code Page Cyrillic

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	А	Р	а	▒	└	⊔	р	Ё
1		DC1	!	1	A	Q	a	q	Б	С	б	▓	⊥	╤	с	ё
2		DC2	"	2	B	R	b	r	В	Т	в	█	┬	╥	т	/
3		DC3	#	3	C	S	c	s	Г	У	г	│	├	╙	у	\
4		DC4	$	4	D	T	d	t	Д	Ф	д	┤	─	╘	ф	/
5			%	5	E	U	e	u	Е	Х	е	╡	┼	╒	х	\
6			&	6	F	V	f	v	Ж	Ц	ж	╣	╞	╓	ц	→
7	BEL		'	7	G	W	g	w	З	Ч	з	╖	╟	╫	ч	←
8	BS	CAN	(	8	H	X	h	x	И	Ш	и	╕	╚	╪	ш	↑
9	HT		)	9	I	Y	i	y	Й	Щ	й	╣	╔	┘	щ	↓
A	LF		*	:	J	Z	j	z	К	Ъ	к	║	╩	┌	ъ	÷
B	VT	ESC	+	;	K	[	k	{	П	Ы	п	╗	╤	█	ы	±
C	FF		,	<	L	\	l	|	М	Ь	м	╝	╟	█	ь	№
D	CR		-	=	M	]	m	}	Н	Э	н	╜	=	█	э	¤
E	SO		.	>	N	^	n	`	О	Ю	о	┤	╬	█	ю	
F	SI		/	?	O	_	o	△	П	Я	п	┐	╧	█	я	

Code Page Polska Mazovia

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	Ę	ź	▓	└	⊥	α	≡
1		DC1	!	1	A	Q	a	q	ü	ę	ż	▓	┴	╤	β	±
2		DC2	"	2	B	R	b	r	é	Ż	ó	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ó	│	├	╨	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ń	┤	─	┕	Σ	⌠
5			%	5	E	U	e	u	à	Ć	Ń	╡	┼	╞	σ	⌡
6			&	6	F	V	f	v	ą	û	ź	╢	╟	╥	µ	÷
7	BEL		'	7	G	W	g	w	ç	ù	ż	╖	╫	╪	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	Ś	¿	╕	╙	‡	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	⌐	╣	╓	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╨	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	½	╗	╤	■	δ	√
C	FF		,	<	L	\	l	|	î	¿	¼	╝	╠	■	∞	ⁿ
D	CR		-	=	M	]	m	}	ć	¥	¡	╜	=	▌	φ	²
E	SO		.	>	N	^	n	`	Ä	ś	«	╛	╪	▐	∈	■
F	SI		/	?	O	_	o	△	Ą	ƒ	»	┐	⊥	■	∩	

Code Page Polska PC Latin 2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▦	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▨	┴	╤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ð	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4		DC4	$	4	D	T	đ	t	ä	ö	Ą	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	ą	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	ć	û	ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	ç	Ś	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	Ł	ś	Ę	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	ę	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ï	¢	ź	╗	╦	█	δ	√
C	FF		,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	ⁿ
D	CR		-	=	M	]	m	}	Ź	Ł	¡	╜	=	▌	φ	²
E	SO		.	>	N	^	n	´	Ä	Pt	«	╛	╬	▐	∈	■
F	SI		/	?	O	_	o	△	ć	ƒ	»	┐	╧	▀	∩	

Code Page Serbo Croatic I

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	Ž	P	ž	p	Ç	É	á	▦	└	⊥⊥	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▨	⊥	⊤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	ó	▓	⊤	π	Γ	≥
3		DC3	#	3	C	S	c	s	â	ô	ú	│	├	⊔⊔	π	≤
4		DC4	$	4	D	T	đ	t	ä	ö	ñ	┤	─	┝	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	┥	┼	┝	σ	⌡
6			&	6	F	V	f	v	å	û	ª	┥│	┝	π	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	π	┼├	┼┼	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	┐	⊔⊔	‡	Φ	°
9	HT		)	9	I	Y	i	y	ë	Ö	¬	┤│	├├	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	┌	║	⊥⊥	┌	Ω	·
B	VT	ESC	+	;	K	Š	k	š	ï	¢	½	┐	⊤⊤	█	δ	√
C	FF		,	<	L	Đ	l	ð	î	£	¼	┘	├├	█	∞	η
D	CR		-	=	M	]	m	ć	ì	¥	¡	⊥	=	█	Ø	²
E	SO		.	>	N	^	n	č	Ä	Pt	«	┤	┼├	█	∈	∎
F	SI		/	?	O	_	o	△	Å	ƒ	»	┐	⊥	█	∩	

Code Page Serbo Croatic II

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	ç	É	č	▦	└	╨	α	≡
1		DC1	!	1	A	Q	a	q	ü	æ	í	▨	┴	╤	β	±
2		DC2	"	2	B	R	b	r	é	Æ	đ	▓	┬	╥	Γ	≥
3		DC3	#	3	C	S	c	s	Č	Đ	š	│	├	╙	π	≤
4		DC4	$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	Š	ª	╢	╞	╓	μ	÷
7	BEL		'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT		)	9	I	Y	i	y	ž	Ö	⌐	╣	╔	┘	θ	∙
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B	VT	ESC	+	;	K	[	k	{	ž	ø	½	╗	╦	■	δ	√
C	FF		,	<	L	\	l	|	ć	£	¼	╝	╠	■	∞	ⁿ
D	CR		-	=	M	]	m	}	ì	¥	¡	╜	=	■	φ	²
E	SO		.	>	N	^	n	~	Ä	Pt	«	┙	╬	■	∈	■
F	SI		/	?	O	_	o	△	Å	ƒ	»	┐	┴	■	∩	

Code Page ECMA 94

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	À	Đ	à	ð
1		DC1	!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2		DC2	"	2	B	R	b	r	é	Æ	¢	²	Â	ò	â	ì
3		DC3	#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ò
4		DC4	$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ö
5			%	5	E	U	e	u	à	ò	¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	¦	¶	Æ	Ö	æ	ö
7	BEL		'	7	G	W	g	w	ç	ù	§	°	Ç	×	ç	+
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ø	è	ø
9	HT		)	9	I	Y	i	y	ë	ö	©	¹	É	Ù	é	ù
A	LF		*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B	VT	ESC	+	;	K	[	k	{	ï	¢	«	»	Ë	Û	ë	û
C	FF		'	<	L	\	l	|	î	£	¬	¾	Ì	Ü	ì	ü
D	CR		-	=	M	]	m	}	ì	¥	-	½	Í	Ý	í	ý
E	SO		.	>	N	^	n	~	Ä	Pt	®	¾	Î	þ	î	Þ
F	SI		/	?	O	_	o	△	Å	ƒ	¯	¿	Ï	ß	ï	ÿ

Hex/Decimal 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: This table converts hexadecimal values to decimal.

Example: Value A8 in hexadecimal; follow column A **down** until it intersects row 8. The decimal value is 168.

Appendix C

Interfacing

This appendix will help you to make a SHIELDED interface cable that connects your printer to your computer. This requires some knowledge of electronics (signals, wiring, soldering and crimping) to be designed properly. If you are not technically oriented, we recommend that you purchase a SHIELDED interface cable from your dealer.

Parallel Interfacing

The printer requires a Centronics-equivalent parallel cable with the following:

- Amphenol 57-30360 or AMP 552274-1 plug (or equivalent) with 36 pins.
- AMP 552073-1 (or equivalent) cover.
- Beldon (or equivalent) SHIELDED cable with twisted pair conductors. It cannot exceed 1.8 Metres in length and must be UL and CSA approved. The Cable MUST be shielded.

Pin description

Pin No.	Signal Name	Direction	Description
1	DATASTROBE	To printer	When this signal changes from low to high level, input data is sampled
2	DATABIT 1	To printer	Input data lines. The high level represents 1, and the low level represents 0
3	DATABIT 2		
4	DATABIT 3		
5	DATABIT 4		
6	DATABIT 5		
7	DATABIT 6		
8	DATABIT 7		
9	DATABIT 8		
10	ACKNOWLEDGE	From Printer	The low level of this signal indicates completion of data input or function operation

Pin No.	Signal Name	Direction	Description
11	BUSY	From Printer	The high level of this signal indicates the printer cannot receive data. The low level of this signal indicates that the printer is ready for receiving data
12	PAPER END	From Printer	The high level of this signal indicates that the paper end has been detected
13	SELECT	From Printer	The high level of this signal\ indicates that the printer is in the select (online) state
14	AUTOFEED	To Printer	In Epson mode, the low level of this signal activates the Auto-line feed
16,33	0V	—	Signal ground
17	CHASSIS GROUND	—	Frame ground
18*	+ 5 V	From Printer	+ 5V supply (50mA, maximum)
19 to 30	0V		Twisted pair return for pins 1 to 11
31	INPUT PRIME	To Printer	When the signal goes to low level, printer controller is initialised. The low level should be held for more than 0.5 ms
32	FAULT	From Printer	When the paper end is detected, this signal changes from high to low level
36	SELECT-IN	To Printer	The high level of this signal indicates that the printer can only be selected and deselected using the DC1 and DC3 control codes
15,34,35	—	—	Unused

*   Pin 18 is controlled by menu setting.

Timing

PARALLEL DATA
(DATA BIT 1 to 8)

1.0μs (MIN) →

← 1.0μs (MIN)

DATA STROBE

← 1 to 500μs → ← 0μs (MIN)

0 to 0.5μs → ←

BUSY

100μs

ACKNOWLEDGE

→ ← 0 to 0.5μs

→ ← 2 to 4μs
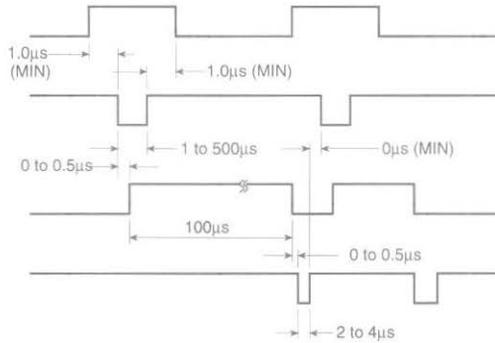
Note: The minimum value of TB (busy-on time) is 20 ms, and the maximum value is the time spent for printing, carriage return, and line feed.

Signal levels
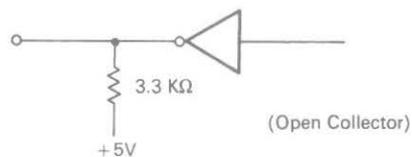
Low level: 0.0 V to 0.8 V
High level: +2.4 V to 5.0 V

Circuit

(1) Receiver

R: 3.3 KΩ (Data 1 ~ Data 8
R: 1 KΩ (I-PRIME)
R: 510 Ω (STB)

+5V

(2) Driver

3.3 KΩ

(Open Collector)

+5V
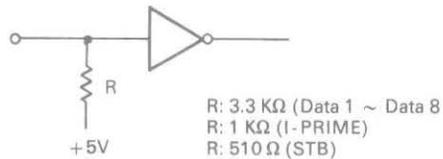
Serial Interfacing (RS-232C)

To construct a cable for an RS-232C serial configuration, you will need:

- DB25P equivalent 25-pin plug, shell equivalent to DB-C2-J9.
- Beldon (or equivalent) SHIELDED cable with twisted pair conductors. Must be UL and CSA approved. The cable MUST be shielded.
- The printer has a 25-pin DB-25S receptacle.

Pin description

Pin No.	Signal	Sym.	Direction	Description
1	FRAME GROUND	FG	—	Connected to printer frame (frame ground)
2	TRANSMITTED DATA	TD	From Printer	Serial data signal transmitted from printer
3	RECEIVED DATA	RD	To Printer	Serial data signal received by printer
4 (Note 1)	REQUEST TO SEND	RTS	From printer	Signal to indicate that the printer is not ready for receiving data in Ready/Busy protocol
6 (Note 2)	DATA SET READY	DSR	To printer	Signal to notify printer that transmitter is ready for transmission. Printer receives data after confirming this signal as a HIGH
7	SIGNAL GROUND	SG	—	Signal ground
11	SUPERVISORY SEND DATA	SSD	From printer	Signal to indicate that the printer is not ready for receiving data in Ready/Busy protocol

Pin No.	Signal	Sym.	Direction	Description
20 (Note 1)	DATA TERMINAL READY	DTR	From printer	Signal to indicate that the printer is not ready for receiving data in Ready/Busy protocol
5,8 to 10, 12 to 19 21 to 25	—	—	—	Unused

Notes:
1. SSD signal output can be selected between pins 4, 11, 20 by menu.
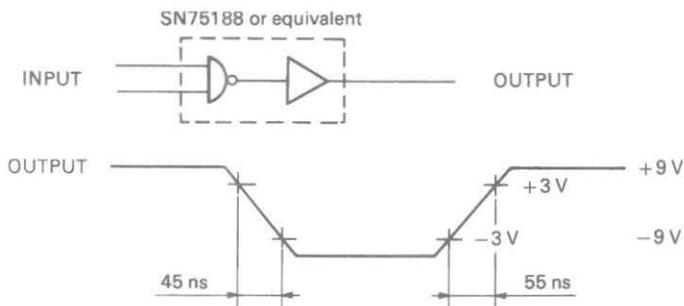2. DSR signal valid/invalid can be set by menu.

Signal Levels

RS-232C interface signal levels are as specified below, and meet the EIA standard RS-232C.

-15 to -3V: LOW = OFF = LOGIC "1"
+15 to +3V: HIGH = ON = LOGIC "0"

Circuit

(1) Driver

(2) Receiver

SN75189 or equivalent

INPUT ——————▷○—————— OUTPUT

INPUT _____/‾‾‾‾‾‾_____ +3 V   +12 V
                          −3 V   −12 V
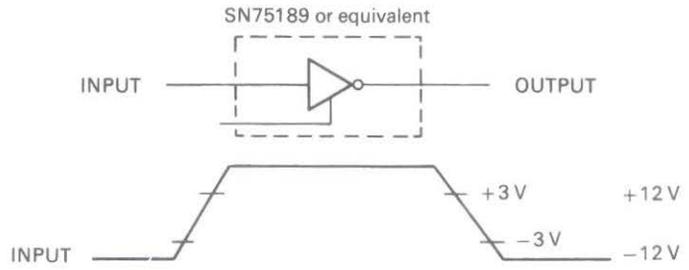
Menu Selections for Serial Interfacing (RS-232C)

Chapter 1 explains how to use your printer's Menu Select mode. If you are using the serial interface, set the following Menu Select options according to your computer's interface requirements.

Printout	Action
PARITY	Does your system use ODD or EVEN parity? ODD parity—select ODD EVEN parity—select EVEN NONE—select NONE
SERIAL DATA 7/8 BITS	Does your system use 7- or 8-bit format? 7-bit format—select 7 8-bit format—select 8
PROTOCOL	What protocol does your system use? Ready-Busy protocol—select READY/BUSY XON/XOFF protocol—select XON/XOFF
DIAGNOSTIC TEST	Do you want to perform a diagnostic test? Yes—select YES Normal operation—select NO
BUSY LINE	Which line will your system use to recognise a busy signal? SSD -9V—select SSD- SSD +9V—select SSD+ DTR -9V—select DTR RTS -9V—select RTS
BAUD RATE	What baud rate does your system use? 19200 baud—select 19.2 9600 baud—select 9.6 4800 baud—select 4.8 2400 baud—select 2.4 1200 baud—select 1.2 600 baud—select 0.6 300 baud—select 0.3
DSR SIGNAL	How does your system handle the Data Signal Ready signal? Valid—Select VALID Invalid—Select INVALID

| Printout	Action
DTR SIGNAL	When is the DTR signal required? When printer is selected—choose READY ON SELECT When printer is turned ON—choose READY ON POWER UP
BUSY TIME	What is the length of a busy signal? 200ms—select 0.2 1 second—select 1

Once you have set the menu, make a printout of it for future reference.

Local tests

Serial interface

After you have configured an interface cable for your computer and printer, you may want to spend a few extra minutes making a test connector. This test connector can be used to monitor the operation of the interface. Simply follow these instructions.

Jumper the following pins:

Canon DB–25S
or equivalent

TD	2
RD	3
RTS	4
CTS	5
CD	8
SSD	11
DTR	20
DSR	6

RS-232C
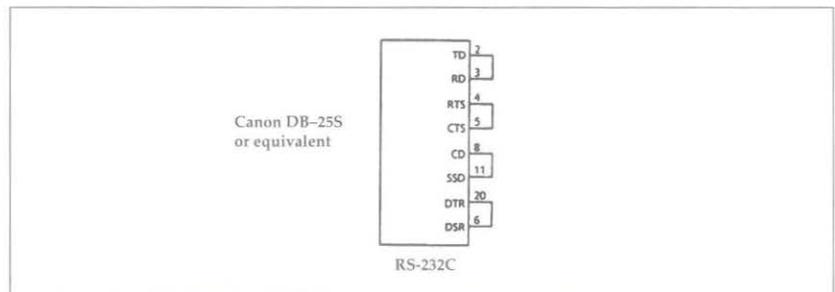
Place the printer in the circuit test mode by specifying Y in response to the menu item DIAG TEST.

Now you can run the local test.

1. Plug the test connector into the serial interface receptacle.

2. Turn the printer ON. The serial interface will check the memory function of the printer's message buffer, the interface driver and the receiver circuit, and then print all the characters in a test pattern.

3. This test button can be stopped only by turning the printer OFF or pressing the SELECT button.

4. The test produces the following:

- The printer prints this message: LOOP TEST

- The message buffer size is printed.

- The printer checks the memory function of the message buffer, then prints OK if the memory check is good, or BAD if the memory check is faulty.

- The signal logic is checked, and if this is faulty, BAD is also printed.

- Hexadecimal characters from 20 to 7F are transmitted through the TD (Transmit Data) line, and received through the RD (Receive Data) line, then written to the message buffer. The above stored data is then printed.

- This process repeats until the printer is turned OFF or until you press the SELECT button.

Note: If BAD is printed, call your dealer for assistance.

Communication procedures

Two types of communication procedure for RS–232C serial interfaces can be selected via the menu. These procedures or protocols are briefly described below.

Ready/busy protocol
The busy signal turns on when the space in the interface buffer becomes less than 256 bytes. The busy signal turns off (becomes Ready) after 200 ms or 1 second has passed if the recovery has occurred within 200 ms or 1 second. If the timing of recovery exceeds 200 ms or 1 second, the busy signal turns off (becomes Ready) immediately after the recovery has occurred.

XON/XOFF protocol
This protocol uses the ASCII characters DC3 (decimal 19) and DC1 (decimal 17) as follows. The DC3 will be sent to the transmission side immediately after the room in the interface buffer has become less than 256 bytes to inform that receiving is impossible.

The transmission of DC3 stops when the data receiving has stopped. If the timing of recovery of 256 bytes is within 200 ms or 1 second after DC3 is sent, DC1 will be sent 200 ms or 1 second after the recovery to inform that receiving is possible again.

If the timing of recovery exceeds 200 ms or 1 second, the DC1 is sent immediately after the recovery has occurred.

200 ms or 1 second busy time for both protocols can be selected by menu.

Specifications

Printing Mechanism	
Printing method	Dot matrix
Print head	9 pins
Print head life	200 million characters

Performance

Printing Speeds	
High Speed Draft (HSD)	550 cps
Utility	417 cps
Near Letter Quality (NLQ)	104 cps

Matrix (H x V)			
	HSD	Utility	NLQ
	7 x 9	9 x 9	17 x 17

Characters per line	
10 cpi	136
12 cpi	163
15 cpi	204
17.1 cpi	233
20 cpi	272

Characters per inch	
NLQ, Utility	10, 12, 15, 17.1, 20 and Proportional
HSD	10, 12, 15, 17.1, 20

Graphics resolution	
Vertical	72, 144 dpi
Horizontal	60, 72, 80, 90, 120, 144, 240 and 288 dpi

Paper slew rate	
Single part forms	10 inches per second
Multiple part forms	8 or 6 inches per second (depends on thickness)

Printing Characteristics	
Resident Fonts	High Speed Draft
	Utility
	Courier (NLQ mode)
	Gothic (NLQ mode)

Resident bar code format	
	Code 3 of 9
	UPC A
	UPC E
	EAN 8
	EAN 13
	Interleaved 2 of 5
	Code128
	Post Net Barcode

Printing buffer	28KB maximum (selectable by menu operation)
Emulation	
Standard	IBM Proprinter XL/Epson FX 850 co-resident
Optional	OKI Microline 321/OKI Pacemark 2410 co-resident
Paper Handling	
Paper Feed	Top with automatic single sheet feeding
	Top with optional cut sheet feeder
	Rear with push tractor
	Bottom with optional pull tractor
	Bottom with optional bottom power tractor
Number of copies	Original + 7 copies maximum (carbonless)
	Original + 5 copies maximum (interleaved)
Paper thickness	
Rear feed	0.014 in (0.36mm) maximum
Bottom feed	0.020 in (0.51mm) maximum
Paper weight	
Cut sheet	14 to 24 lb (53 to 90g/m²)
Continuous	12 to 24 lb (45 to 90 g/m²) - Single part
	9 to 12 lb (38 to 45 g/m²) - Multiple part
Continuous paper width	3 to 16 inches (76 to 406 mm)
Operating conditions	
Operation Temperature	5 to 40°C
Humidity	20 to 80% relative humidity without condensation
Storage Temperasture	-40 to 70°C
Humidity	5 to 95% relative humidity without condensation
Electrical power supply	
Main voltage	230V AC (+6%, -14%)
	240V AC (±10%)
Frequency	50/60Hz (± 2%)
Consumption	220VA when operating
Noise level	58 dBA
Dimensions	
Height	180mm
Width	570mm
Depth	417mm
Weight	18kg

Reliability MTBF MTTR	8000 hours (25% duty cycle) 15 minutes
Interface	Centronics parallel and RS-232C serial co-resident
Accessories	Power bottom tractor feeder unit Pull tractor kit Single bin cut sheet feeder Dual bin cut sheet feeder Black fabric ribbon
Safety approvals	VDE/BSI

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