OKI

People to People Technology

# MICROLINE 320/321 ELITE

# *IBM®/EPSON® – 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. Oki assumes no responsibility for the results of errors beyond its control. Oki also cannot guarantee that changes in software and equipment made by other manufacturers and referred to in this book will not affect the applicability of the information in this manual.



Written and produced by Oki. Please address any comments to Oki.



This product complies with the requirements of the Council Directives 89/336/EEC and 73/23/EEC on the approximation of the laws of the member states relating to electromagnetic compatibility and low voltage.

# IMPORTANT SAFETY INSTRUCTIONS

Your Oki printer has been carefully designed to give you years of safe, reliable performance. As with all electrical equipment, however, there are a few basic precautions you should take to avoid hurting yourself or damaging the printer:

- Read the setup and operating instructions in this Handbook carefully. Be sure to save it for future reference.

- Read and follow all warning and instruction labels on the printer itself.

- Unplug the printer before you clean it. Use only a damp cloth; do not use liquid or aerosol cleaners.

- Place your printer on a firm, solid surface. If you put it on something unsteady, it may fall and be damaged; if you place it on a soft surface, such as a rug, sofa, or bed, the vents may be blocked, causing the printer to overheat.

- To protect your printer from overheating, make sure all openings on the printer are not blocked. Do not put the printer on or near a heat source, such as a radiator. If you put it in any kind of enclosure, make sure it is well ventilated.

- The printhead can get quite hot when it has been printing for a length of time. Do not touch the printhead until it has had a chance to cool off.

- Do not use your printer near water, or spill liquid of any kind into it.

- Be certain that your power source matches the rating listed on the back of the printer. If you are not sure, check with your dealer or with your local power company.

- Your printer has an earthed plug as a safety feature, and will only fit into an earthed socket. If you cannot plug it in, chances are you have an older, non-earthedsocket. Contact an electrician to have the socket replaced. Do not use an adapter to defeat the earthing.

- To avoid damaging the power cord, do not put anything on it or place it where it will be walked on. If the cord becomes damaged or frayed, replace it immediately.

- If you are using an extension cord or power strip with the printer, make sure that the total of the amperes required by all the equipment on the extension is less than the extension's rating. The total ratings of all equipment plugged into the outlet should not exceed 15 amperes.

- Do not poke anything into the ventilation slots on the sides of the printer; you could get a shock or cause a fire.

- Aside from the routine maintenance described in this Handbook, do not try to service the printer yourself; opening the cover may expose you to shocks or other hazards. Do not make any adjustments other than those outlined in the Handbook—you may cause damage requiring extensive repair work.

- If anything happens that indicates that your printer is not working properly or has been damaged, unplug it immediately. These are some of the things to look for:

  The power cord or plug is frayed or damaged.

  Liquid has been spilled into the printer, or it has been exposed to water.

  The printer has been dropped, or the cabinet is damaged.

  The printer does not function normally when you are following the operating instructions.

# Table of Contents

# Introduction

This Guide is arranged to help you get your new MICROLINE 320 Elite or 321 Elite printer set up and running quickly as well as providing you with more detailed information for future reference. Here is how it is organised:

The first section shows you how to get the printer ready, connect it to your computer, and how to load paper.

**Chapter 2 Operation** describes how to control your printer from the front panel, and gives you some hints on what to do if you are having problems.

In **Chapter 3** you will find a few hints and general guidelines on installing and using software with your printer, as well as some specific information on PC/MS-DOS. You will also find a few tips on BASIC should you want to write your own programs.

**Chapter 4 IBM Compatible Modes Standard Features** provides details on all of the printer's features and the commands controlling them for both the IBM Proprinter XL and Graphics Printer emulation. This chapter also identifies those features and commands that are common to the Epson FX emulation. This chapter will be useful even if you do not do your own programming, because it contains information regarding the printer's features and how to use them.

**Chapter 5 IBM Compatible Modes Advanced Features** describes how to program graphics and custom (downloaded) character sets for the IBM modes. These are complex and time-consuming jobs.

**Chapter 6 Epson Compatible Mode Standard Features** provides details on the Epson emulation features and commands that are different from the IBM emulation. These Epson features and commands are not described in Chapter4.

**Chapter 7 Epson Compatible Mode Advanced Features** describes how to program graphics and custom (downloaded) characters in the Epson mode.

There are also a number of appendices at the end of the book containing reference material on control codes, character sets, interfacing, and product specifications.

# 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 that the manufacturers recommend. Ask for them by name.

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

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

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

You can order them from your printer supplier.

## IMPORTANT

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

| | |
|---|---|
| **GREEN AND YELLOW** | **EARTH** |
| **BLUE** | **NEUTRAL** |
| **BROWN** | **LIVE** |

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug — PROCEED AS FOLLOWS:

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

**WARNING: THIS APPARATUS MUST BE EARTHED**

Ensure that your equipment is connected correctly.
If you are in any doubt, please consult aqualified electrician.

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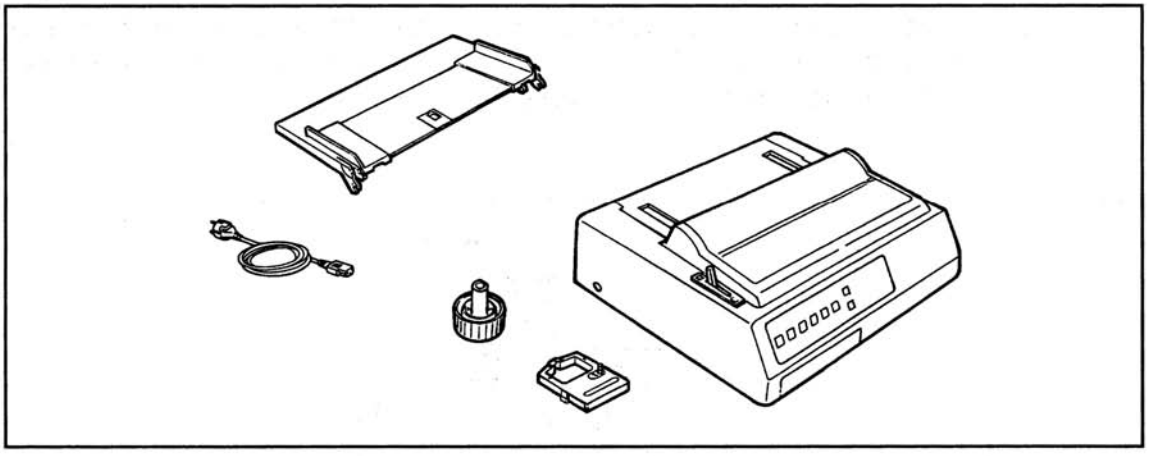
Chapter 1

# Setup

Choose a sturdy table, desk or printer stand to place your printer on when you remove it from the carton. Remove the styrofoam sides—be sure to save all packing materials in case you need to ship the printer again—and check the box for these contents:

- ML320/321 Elite printer
- Paper separator
- Power cord
- Platen knob (fitted)
- Ribbon cartridge
- Printer Handbook

**Note**: Interface cable and paper are sold separately.

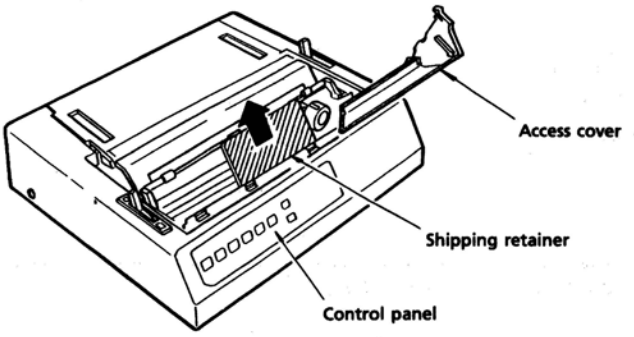


If any of these items are missing or damaged, see your dealer for replacement.

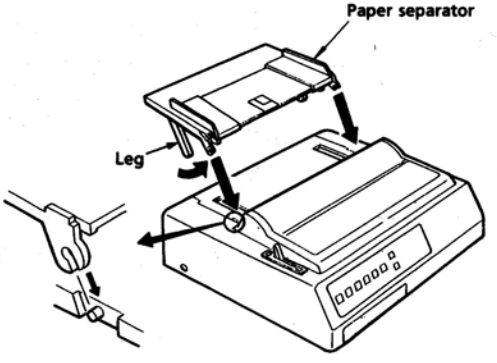
# Preliminaries

Do not plug the printer in until it is set up and ready to operate.

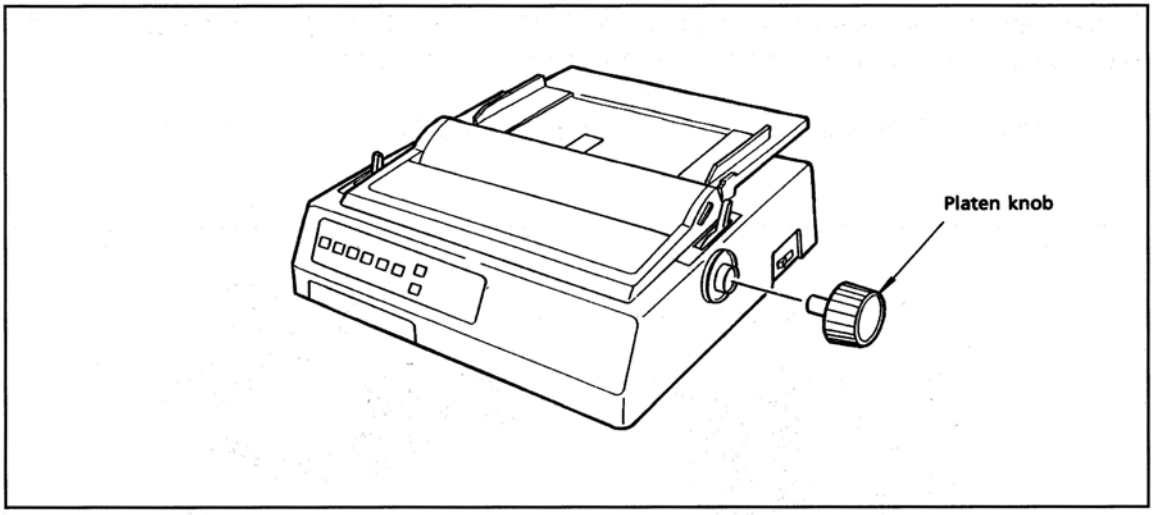
1. Remove the clear protective film from the control panel and access cover.
2. Open the access cover and remove the shipping retainer. Be sure to save it with the other packing materials in case you ship the printer.



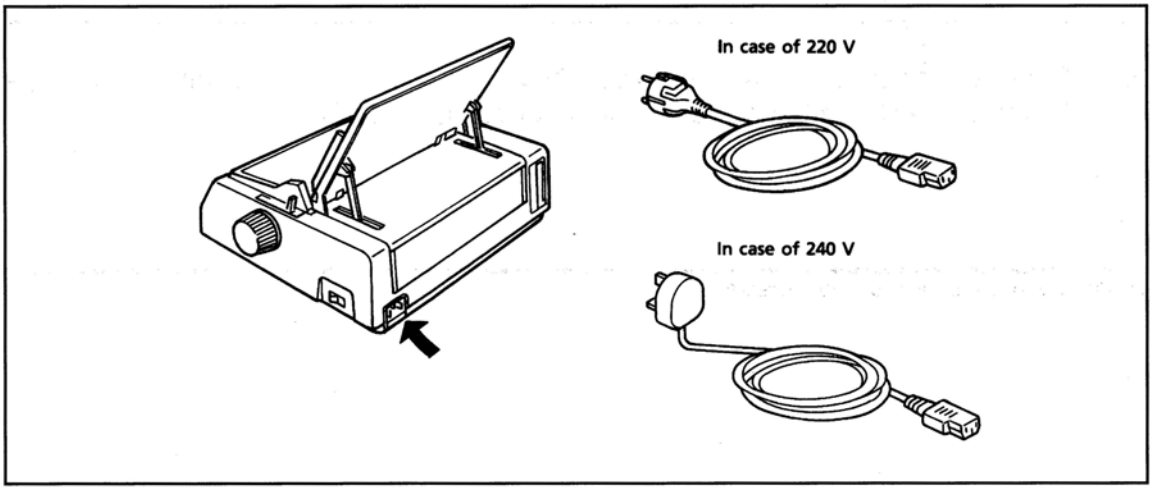

3. Install the paper separator. Open the rear cover of the printer. Holding the legs closed against the paper separator, place the tab on the side of the separator over the stud on the side of the rear cover. Pull gently on the other tab to slide it over the stud on the other side of the rear cover, then close the rear cover.



4. The platen knob should already be fitted to the right side of the printer. However, if it has been removed for any reason, match the flat side of the knob to the flat side of the platen shaft.




5. Make sure that the power switch is OFF. Plug the power cord into the back of the printer. Plug the other end into an earthed socket.

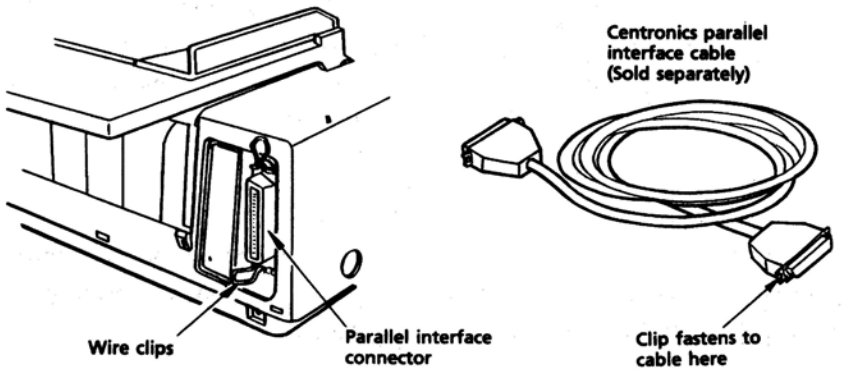



**Important**: Make sure the socket is earthed. Do not use an adaptor to defeat the earthing.

# Connecting with the Computer

These instructions are for the standard parallel interface. If you have the optional serial interface, see the appendix for installation and connection details.

1. Make sure both the printer and the computer are OFF.




2. Plug the interface cable into the port on the back of your printer. Fasten the wire clips on the connector to the cable in order to attach it securely.

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**Note**: Interface cables are sold separately.

# Inserting the Ribbon Cartridge

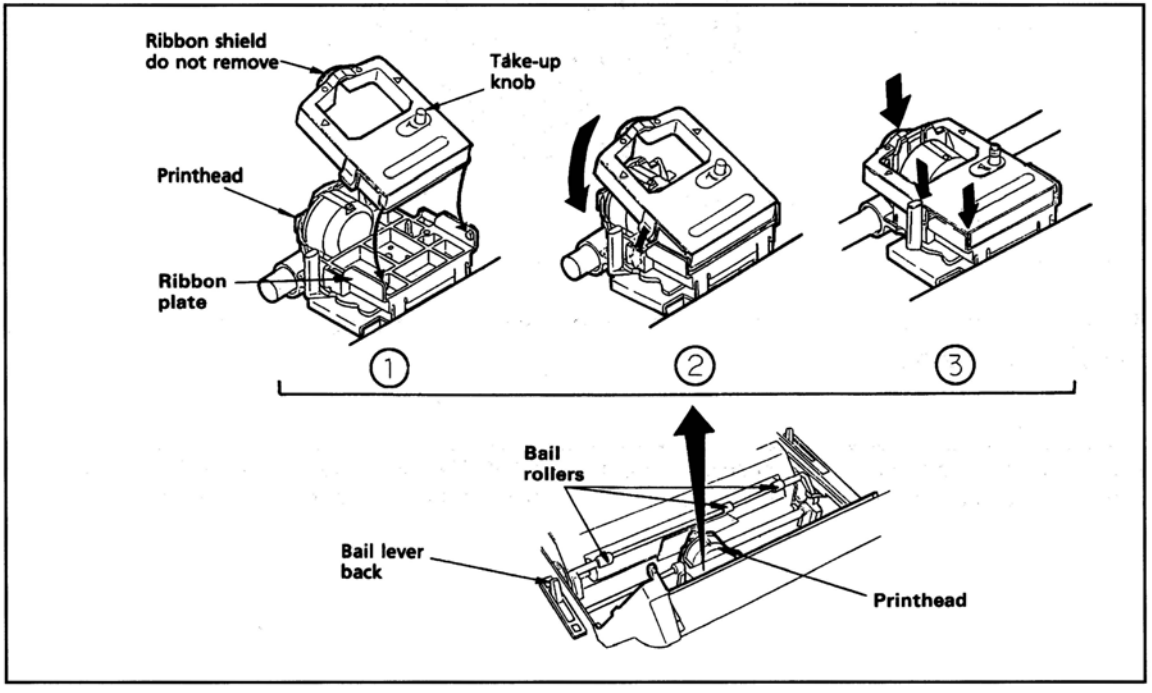
1. Open the access cover.

2. Position the printhead between the bail rollers. Make sure the bail is closed.

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

3. Hold the ribbon cartridge with the blue take-up knob facing up and the flat end towards the front of the printer.

4. Place the flat end into the ribbon plate, then lower the front of the cartridge over the printhead until it snaps into place.




5. Turn the take-up knob in the direction of the arrow on the cartridge to take up the slack in the ribbon.

6. The headgap lever by the side of the cartridge adjusts for different paper thicknesses. Set the headgap to :

    1. For one- or two-part forms.
    2. For three- or four-part forms.
    3. For envelopes or extra-thick paper.

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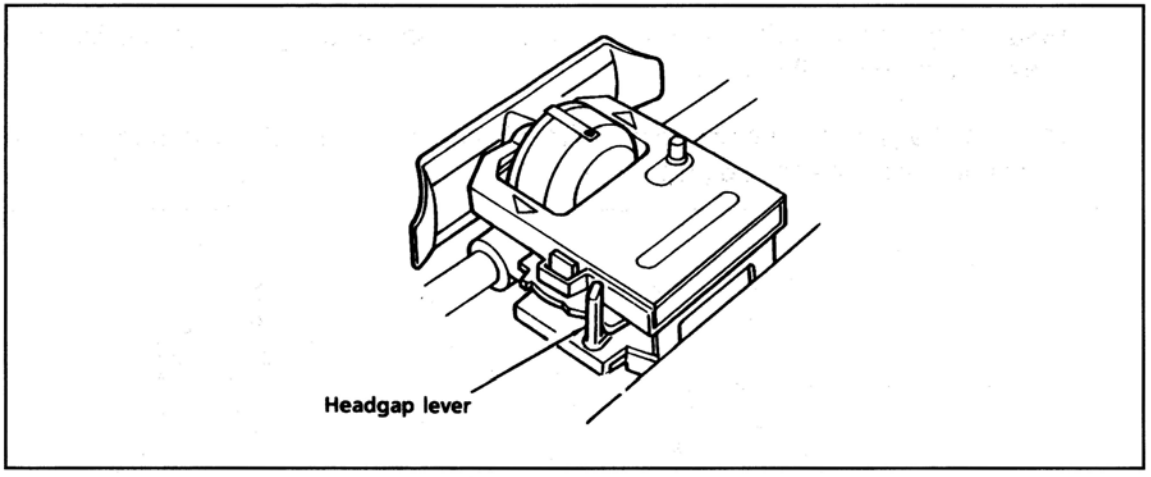
**Note**: The printer automatically reduces the print speed if the headgap lever is set to 3 in order to improve the print quality with envelopes or extra thick paper.




To remove the ribbon cartridge, pull up at the positions indicated by the two arrows on the top of the cartridge.

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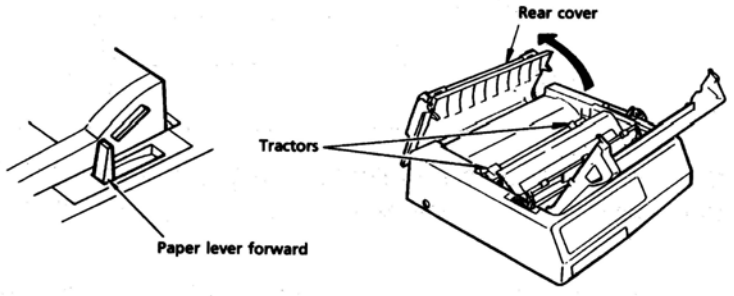
**Important**: Be sure to use ribbons specifically for use with MICROLINE 320/321 or MICROLINE 100 series printers. Ribbon cartridges for ML390/391 printers look similar, but they do not fit in the ML320/321.

# Loading Paper

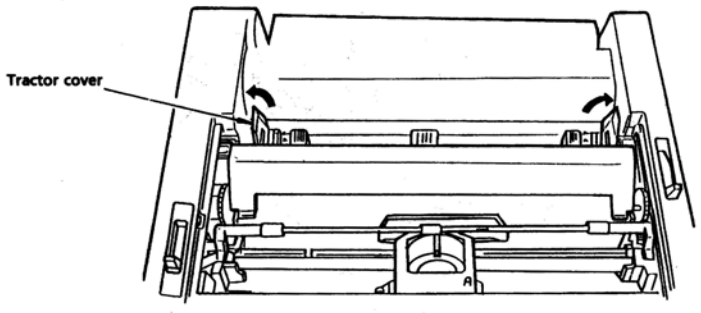
The ML320/321 can handle many different types of paper with pushbutton ease. Check Appendix D for details on paper specifications.

## Rear feed, continuous forms

1. Make sure the paper lever is forward.




2. Open the rear cover to expose the tractors.
3. Open the tractor covers.




4. Pull the paper through the opening between the printer and the rear cover.
5. Place the first two sprocket holes on each side of the page over the pins. Close tractor covers. To adjust the tractors for the width of paper, pull the lock levers forward, slide the tractors into position, then push back to lock.

There are reference marks on the printer to show the recommended left edge position for the two most common paper sizes.

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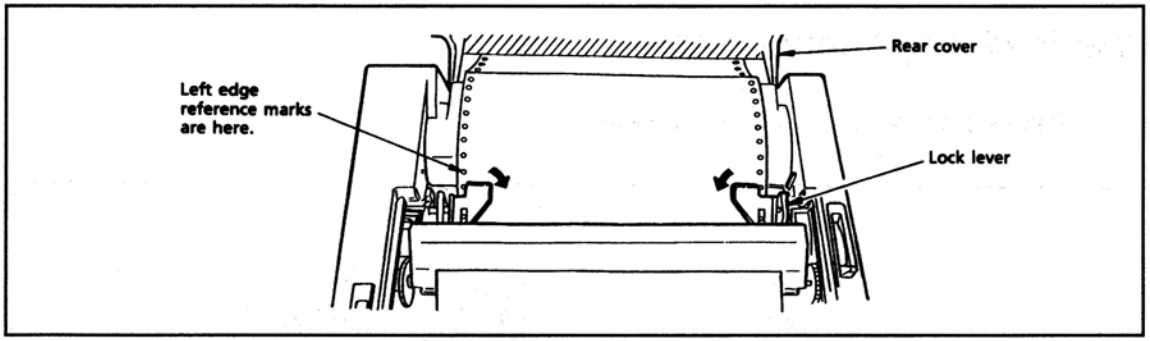
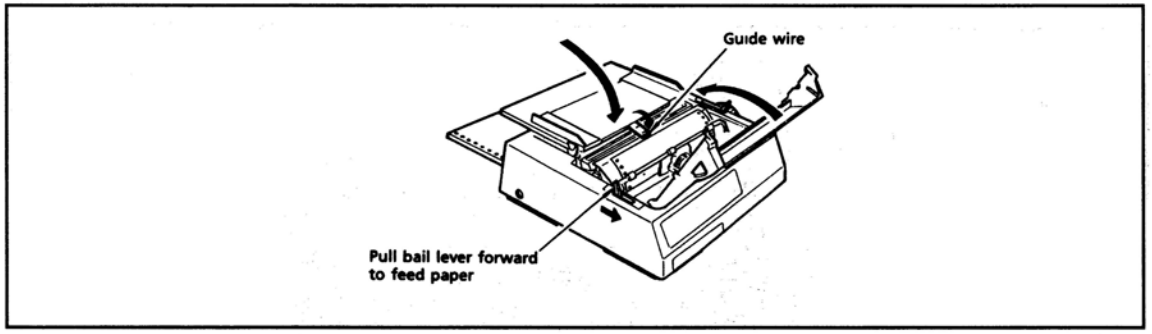
**Important**: Do not position the left edge of the paper more than 1/2 inch from the end of the platen. The paper must cover the groove in the left side of the platen; if it does not the printer will signal a paper out ALARM.




6. Close the rear and access covers. Make sure the paper separator is flat on the printer. Open the guide wire, which keeps paper from curling back into the printer.

7. Turn the printer on. The printhead will move to the left side of the platen and the control panel will light up. The ALARM light will also come on, but do not be concerned, it is just telling you that there is no paper loaded.




8. Pull the bail lever forward. The paper will automatically feed into the printer and the ALARM light will go out.
9. When the paper has stopped moving, push the bail lever back.
10. Adjust the Top of Form (see next page) and press the SEL button (the SEL light will go on) and you are ready to print.

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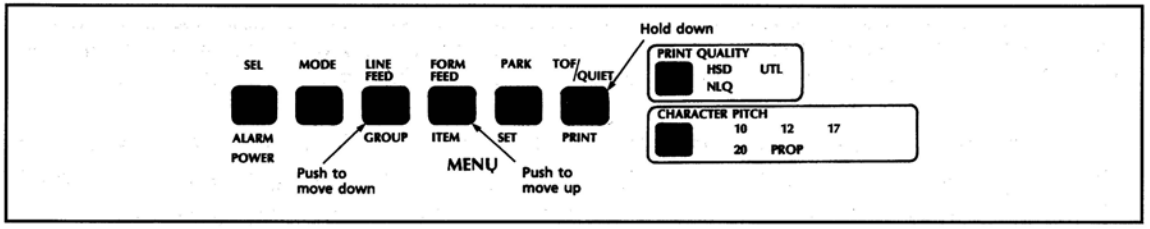
**Important:** Do not use the Form Feed to load paper.

# Setting Top of Form

**If Form Tear Off is ON**, hold down the TOF/QUIET button and press:

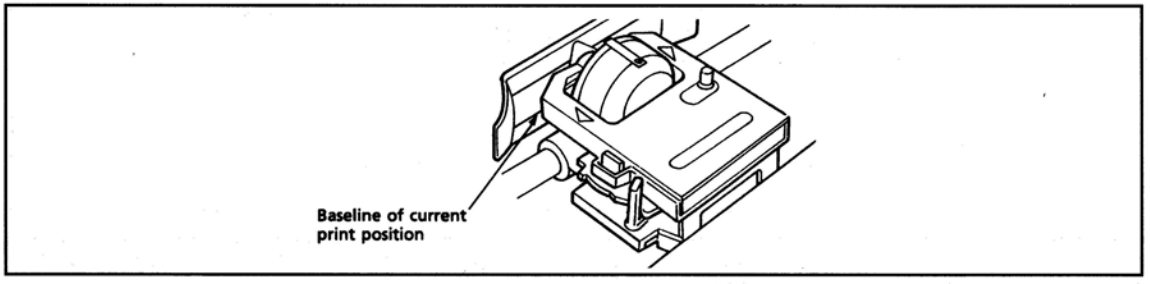
FORM FEED to move the paper up, or
LINE FEED to move the paper down.

This moves the paper in very fine increments—1/144 inch to be exact—so you can position the top of form precisely. The amount you can move the paper down using this method is limited to avoid potential paper jams.




The lower red line on the paper shield shows the baseline of the current printing position to help you place the top of form where you want it.

When the top of form is set where you want it, press the TOF/QUIET button. This will record the position permanently in the printer's memory—even when the printer is turned off — until you reset it.




**If Form Tear Off is OFF**, adjust the top of form by turning the platen knob, then press the TOF button. (The SEL light should be out). The lower red line on the paper shield shows the baseline of current print position to help you place the top of form where you want it.

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**Important**: Make sure the paper is held in place by the bail. If the top of the page is set below the bail, paper will catch on the bail and cause a jam.

## Form tear off

Form tear off makes paper handling even simpler with the MICROLINE 320/321. When you are using rear-fed continuous form paper, you can easily tear off a printed sheet without wasting paper or readjusting the printer.

To activate this feature, enter Menu Select mode and set the FORM TEAR OFF item to ON — it is in the Vertical Control group. Then set top of form as described on the previous page. When you release the TOF/QUIET button, the paper advances from the initial printing position to the tear off position — the top of the page is even with the tear bar, located under the clear top of the access cover.

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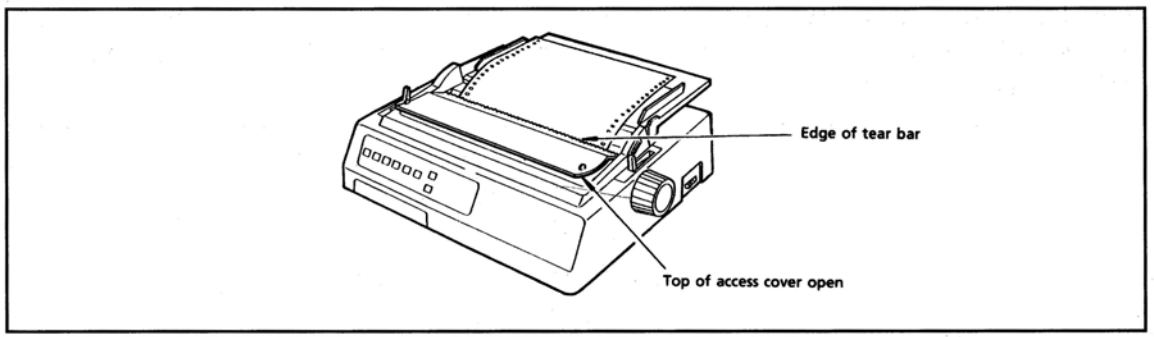
**Note**: You can check the initial printing position at any time: press the SEL button to deselect the printer, then press TOF/QUIET: the paper will move down to the initial printing position until you release the button.

The page stays in the tear off position until the printer receives data: then the paper moves down to the initial printing position to print. A few seconds after printing stops, the paper moves up to the tear off position. Now it is easy to tear off the printed page along its perforation: just open the clear top of the access cover and tear the page off against the tear bar.

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**Note**: Some programs, such as high resolution graphics packages, pause occasionally while sending data to the printer. If the pause lasts more than two seconds, the paper will advance to the tear off position until more data is received. No data will be lost, but this extra paper movement can cause uneven print registration in graphics. If you have this problern, use the menu to deactivate forms tear off.

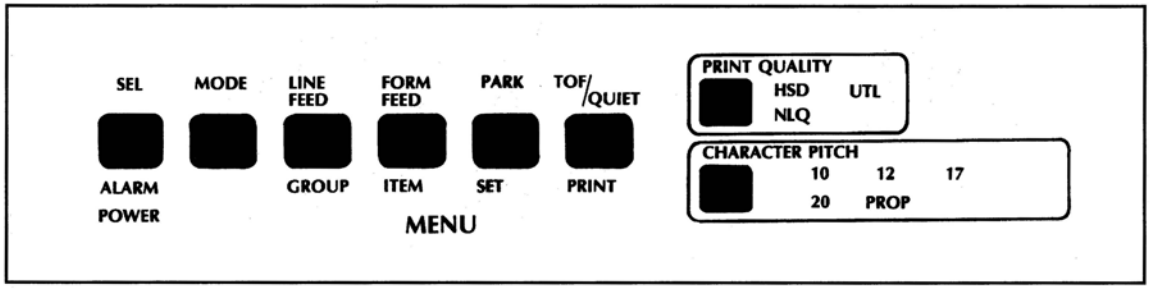
Do not use forms tear off when printing on labels or multipart forms. Labels should only be fed from the bottom of the printer.

## Paper park

This handy feature makes it easy for you to switch from continuous forms to single sheet paper and back.

To park the paper:

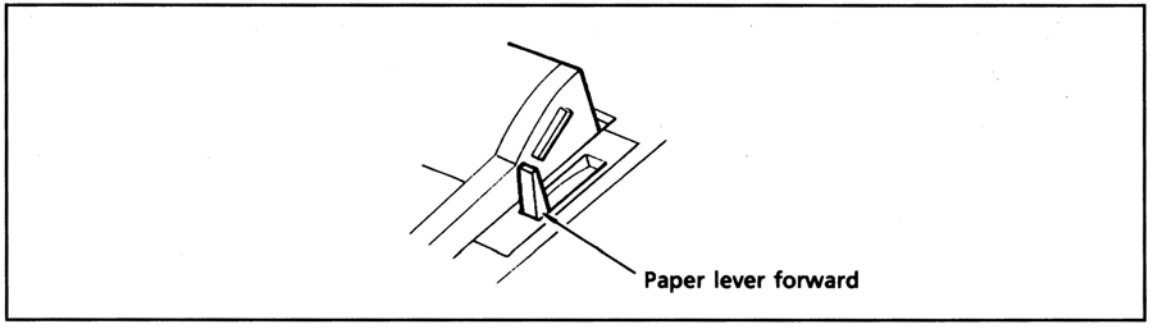
1. Tear off any printed pages.
2. Press the PARK button. The paper will retract from the paper path.




Push the paper lever back to the single sheet setting, and you are ready to insert single sheets. See "Loading Single Sheets."

To return continuous forms to the printer:

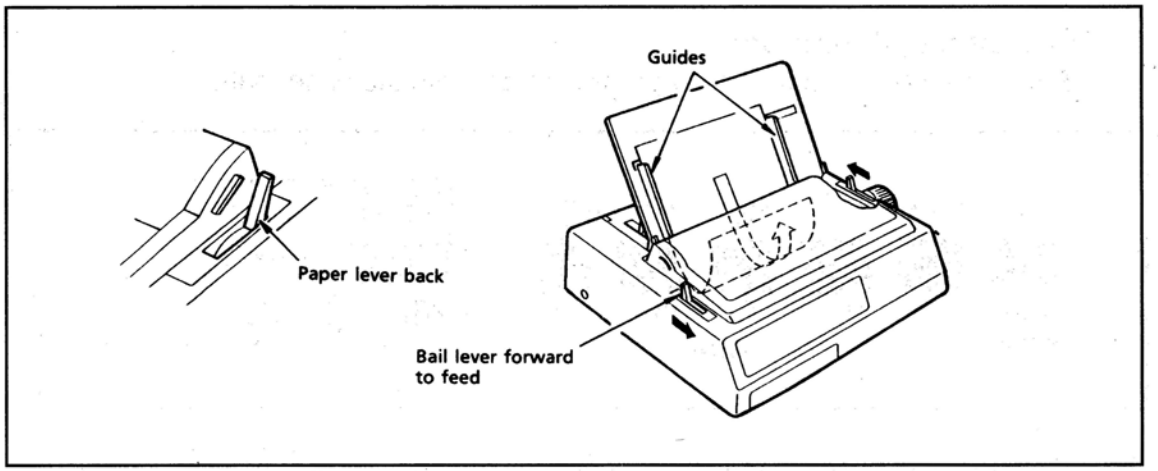
1. Make sure the paper lever is set for continuous forms (lever forward).




2. Pull the bail lever forward. The paper will advance to the front of the platen.
3. Push the bail lever back and adjust the top of form, if necessary.

## Loading single sheets

1. If you have continuous form-paper in the printer, use the paper park feature to back it out of the paper path.
2. Push the paper lever to the single sheet setting (toward the back of the printer).

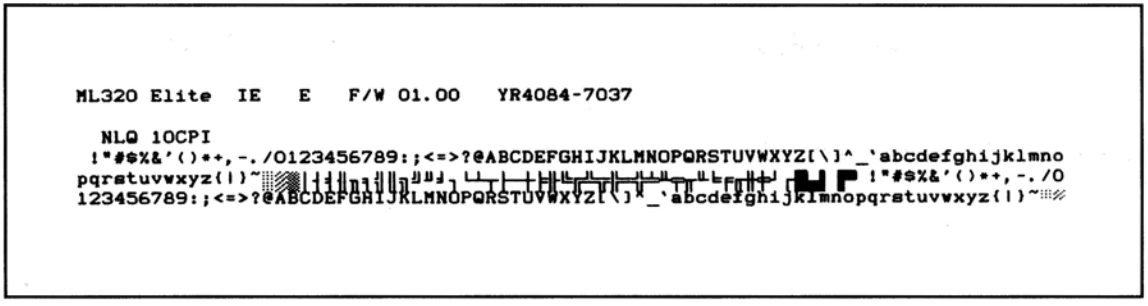



3. Push the guide wire back into its locked position on the paper separator. Raise the separator to its upright position.
4. Set a sheet of paper on the paper separator and adjust the guides so that they are barely touching the edges of the paper. (There is a reference mark on the separator for the left paper edge.)
5. Pull the bail lever forward. The paper will automatically feed into the printer.
6. Push the bail back.
7. If necessary adjust the top of form.

# Running a Self Test

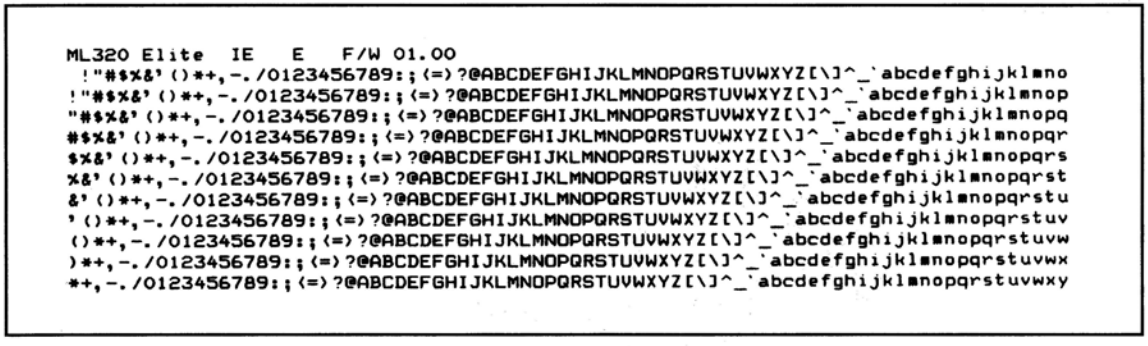
After you have installed ribbon and paper, you are ready to run one of two self tests. Do this any time you want to make sure the printer is functioning properly. Both test patterns print in $8^1/_2$ inch format in the 320. In the 321 the continuous test is the whole width of the platen.

Holding down LF while turning on the printer produces :




A limited sample of every available print style. When complete (about two pages), the printer stops and the SEL light goes on.

Holding down TOF/QUIET while turning on the printer produces :




A continuous sample of the default print style.

To stop either test, press the MODE button.

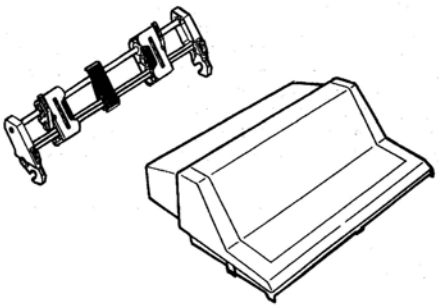
The self test printout also provides information about your printer.

| Printer model | Emulation (Epson/IBM) | European version | Firmware revision number |
|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ |
| **ML320 Elite** | **I E** | **E** | **F/W 01.00** |

Have this information at hand if you call for service.

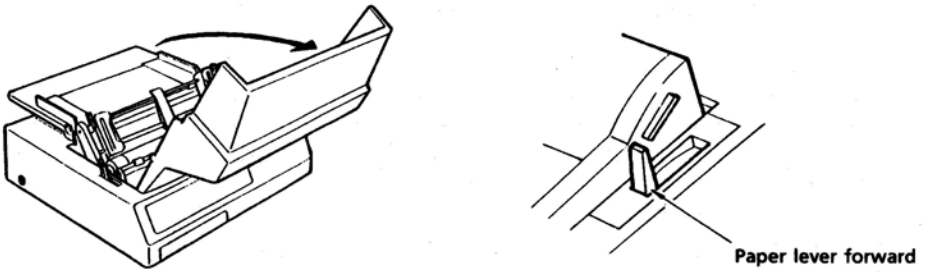
## Optional Accessories

Pull Tractor Kit

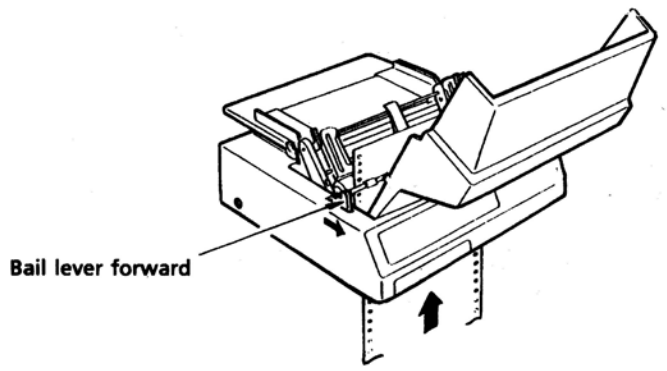


## Loading bottom feed paper

1. Place your printer on a slotted stand. Put the paper in a stack underneath the slot. Ensure that the Pull Tractor Unit is attached.
2. Open the access cover if it is closed and make sure that the paper lever is in the continuous forms (forward) position.

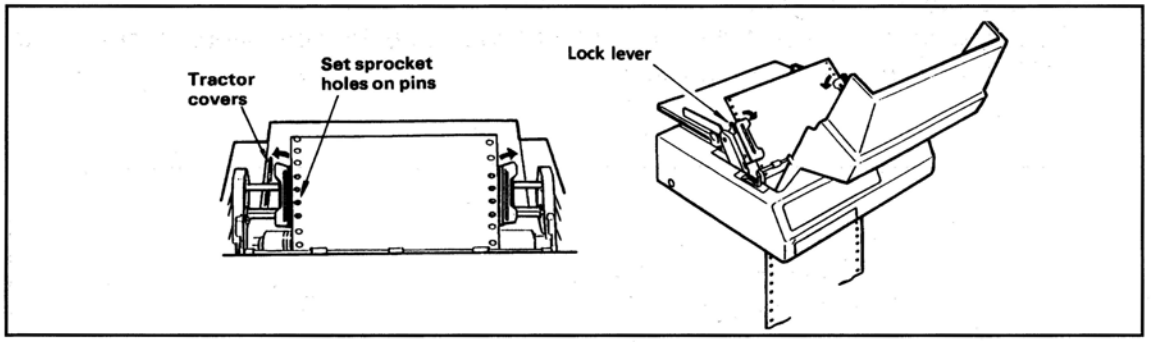



3. Open the bail (bail lever forward) and push the paper up through the slot in the bottom of the printer until it is between the bail and the platen.



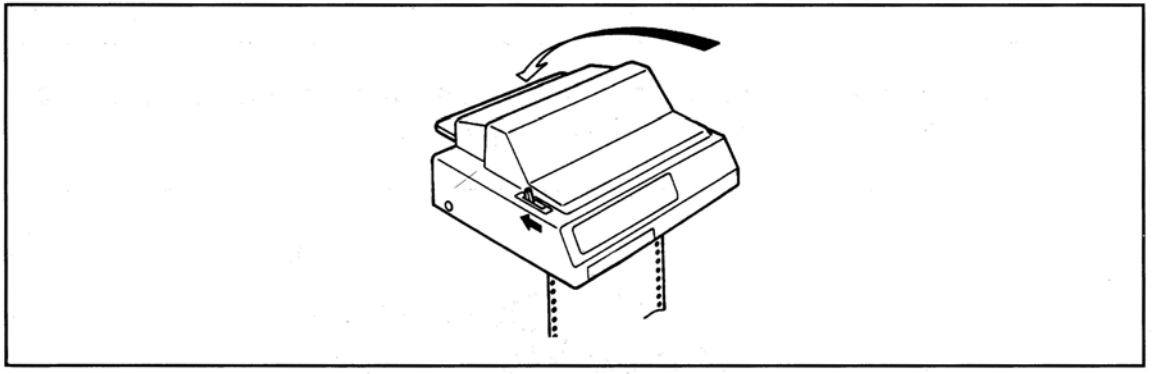

4. Open the tractor covers.

5. Place the sprocket holes over the pins and close the tractor covers. To adjust the tractors for the width of the paper, pull the lock levers forward, slide the tractors into position, then push the levers back to lock.




**Important**: Do not position the left edge of the paper more than 1/2 inch from the end of the platen. The paper must cover the groove in the left side of the platen; if it does not the printer will siganal a paper out alarm.

6. Close the access cover. Make sure the paper separator is flat on the printer.



7. Use the platen knob to adjust to top of form—the lower red line on the ribbon shield shows the base line of the current print position. If the printer is on, deselect it, then press the TOF/QUIET button to set the top of form. If the printer is off, top of form will automatically be set when you turn on the power.

**Important**: Do not position the top edge of the paper below the bail or you will cause a paper jam.
Do not use the paper park feature as the paper will disengage from the pull tractor if you do so. This will also happen if you use too many reverse line feeds.
Labels should only be fed from the bottom.

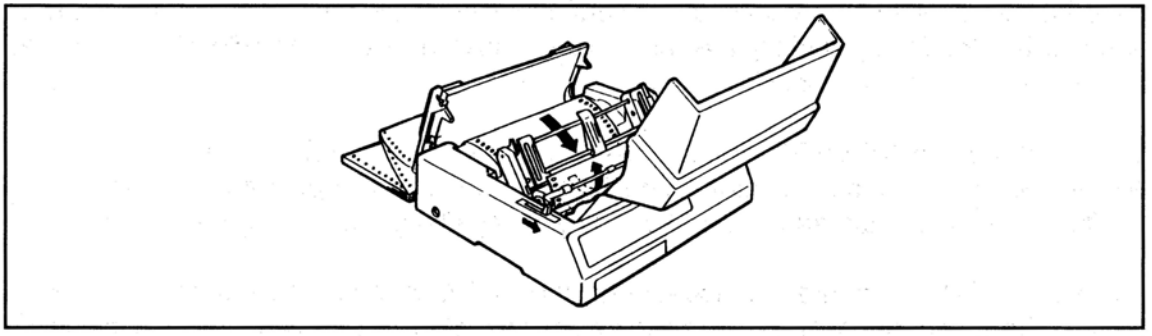
## Loading rear feed paper using both tractors

This arrangement feeds continuous-form paper through both the built-in tractor and the optional pull tractor. It is particularly handy when you are printing on multipart forms or when you are using reverse line feeds.

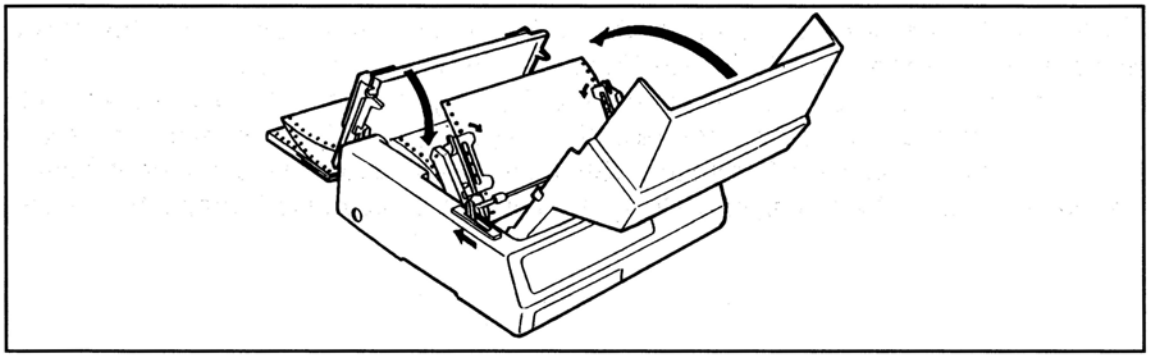
---

**Important:** Do not use PARK or too many reverse Line Feeds. (Paper will come out of pull tractors.) Labels should only be fed from the bottom.

1. Follow the instructions (1-5) for loading rear feed paper with the built-in tractor.
2. Using the platen knob, wind the paper up to the pull tractor.



3. Push the paper lever back to the single sheet position. This disengages the built-in tractor so you can adjust the paper on the pull tractor.
4. Open the tractor covers, set the paper holes on the sprocket pins, adjust the tractors and close the tractor covers.



5. Pull the paper release lever forward to continuous position, use the platen knob to take up the slack in the paper and push the bail lever back.

## Continuous Form Operation with Cut Sheet Feeder Installed

If you use single part continuous form paper, you can leave the CSF installed on your printer and alternate between printing on continuous form paper or on single sheets inserted from the CSF. The paper lever (on the righthand side of the printer) is used to select between the operating modes.

When the printer is turned on, and there is no paper present on the platen, the CSF mode is established. To activate the continuous form operation with the CSF installed, deselect the printer and set the paper lever to the continuous position (front). The continuous form paper is then loaded by pushing the bail arm towards the platen (the CSF will force the bail arm to return to an open position).

Do not use the FORM FEED button to load continuous form paper, as a sheet from the CSF will also be inserted into the printer. Once the continuous form paper has been loaded, the FORM FEED button advances the paper by the page length set in the menu.

To switch to the CSF operation mode, press the PARK button on the control panel of the printer. The continuous form paper retracts from the platen. Set the paper lever to the single sheets position (back). The CSF mode is now established.

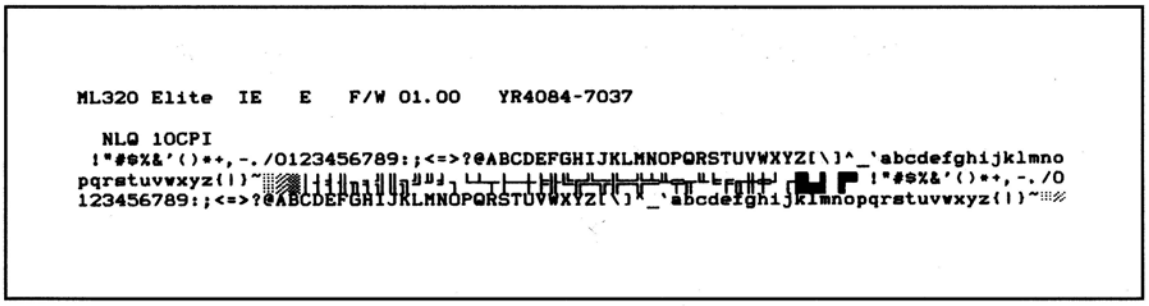
A single sheet is fed from either the CSF loading tray or the manual slot, into the printer, using either the FORM FEED or LINE FEED buttons. Once a sheet has been inserted into the printer, the LINE FEED button advances the sheet one line at a time.

Single sheets cannot be loaded from the CSF manual loading slot using the BASIC command for form feeding—CHR$(12). This command causes the sheet in the manual slot to be immediately ejected from the printer. A CHR$(12) command will eject a sheet from the printer and insert a new one from the CSF loading tray. A BASIC line feed command—CHR$(10)—will insert a sheet from the CSF, if there is no paper in the printer. If a sheet is already present in the printer, the CHR$(10) command will advance the paper by one line.

# Running a Self Test

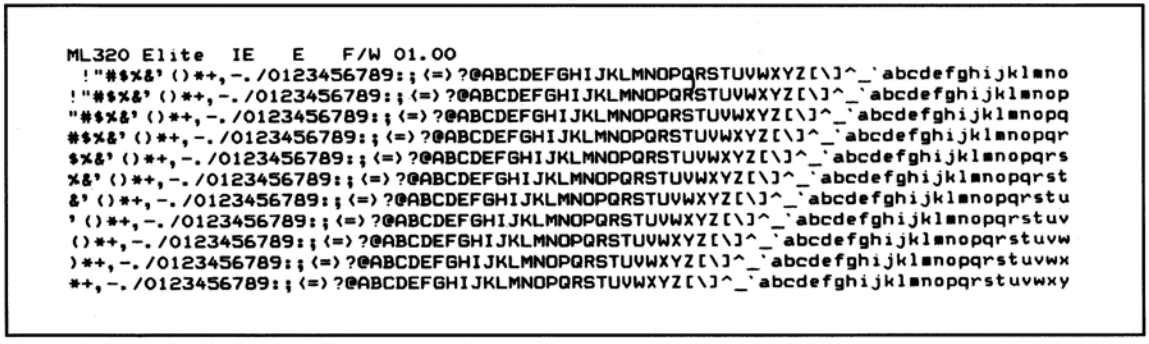
After you have installed ribbon and paper, you are ready to run one of two self tests. Do this any time you want to make sure the printer is functioning properly. Both test patterns print in $8^1/_2$ inch format in the 320. In the 321 the continuous test is the whole width of the platen.

Holding down LF while turning on the printer produces :




A limited sample of every available print style. When complete (about two pages), the printer stops and the SEL light goes on.

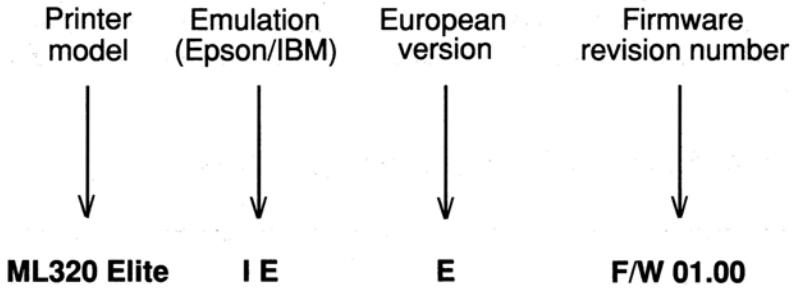
Holding down TOF/QUIET while turning on the printer produces :




A continuous sample of the default print style.

To stop either test, press the MODE button.

The self test printout also provides information about your printer.



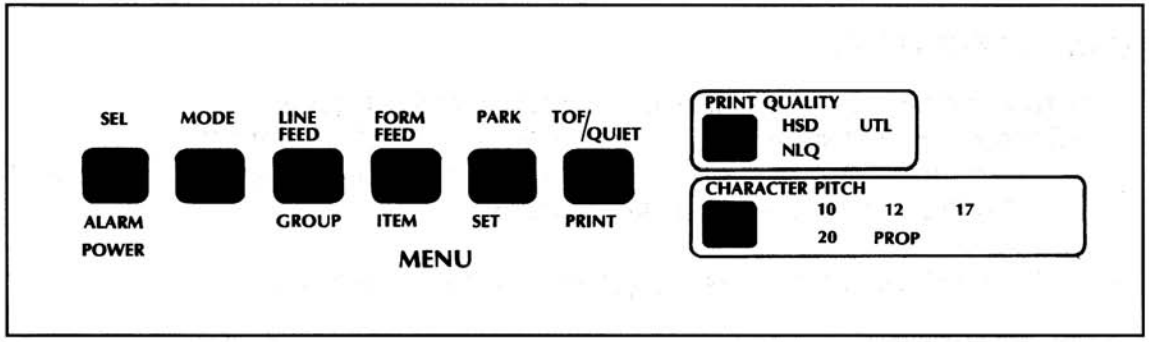

Have this information at hand if you call for service.

Chapter 2

# Operation

## Using the Control Panel

The ML320/321's control panel does more than manipulate paper: it gives you fingertip command over most of the printing features that affect the look of your documents. You can change basic features of each document straight from the panel. Using the Menu Select mode—entered directly from the panel—you can alter the default settings of other features. (The defaults are those characteristics set automatically when you turn on or reset the printer.) You can also configure the printer for your system without setting hard-to-reach switches.




### Button functions

**SEL light:** When this light is ON, the printer is selected and ready to receive data from the computer. When the light is OFF, the printer is deselected and cannot receive data.

When the light is blinking, the printer is in Print Suppress condition and will ignore all data until the Print Suppress condition is turned off.

**SEL Button:** Push this button to select or deselect the printer (SEL light is ON or OFF).

**ALARM light:** This light indicates either that paper is out or that there is an internal problem requiring service.

**POWER light:** This light indicates that the printer is turned on.

**MODE button:** Selects print mode or menu select mode. (MENU light on or off).
**MENU light:** When this light is OFF, the printer is in print mode and the functions above the buttons are active. When the light is ON the menu select mode is active and the features below the buttons are in operation.\

**PRINT MODE**

**LINE FEED button:** Advances the paper by one line feed (default line feed unless a new line feed has been set by command).
**FORM FEED button:** Ejects a sheet of paper from the printer. If the CSF is installed, a new sheet is automatically inserted. The FORM FEED button should not be used to load paper.
**PARK button:** Retracts continuous form paper from the platen, allows you to switch from single sheet paper to continuous form paper and back again.
**TOF/QUIET button:** When the SEL light is ON, this button will switch to and from the quiet printing mode. When the SEL light is OFF, this button sets the Top Of Form at the present printhead position.

**MENU SELECT MODE**

**GROUP button:** Switches between the broad menu categories.
**ITEM button:** Displays the features contained in each of the categories.
**SET button:** Selects and stores the options available for each feature in the menu.
**PRINT button:** Prints the current menu settings.

**PRINT QUALITY button:** Selects the quality of print and the typeface.

**CHARACTER PITCH button:** Selects the size of the printed characters

**COMBINATION FEATURES** (Hold down the following buttons while turning power-on).

**SEL & MODE:** Reset the printer menu to default settings.
**SEL & FORM FEED:** Enter the hexadecimal dump mode. To exit this mode the printer must be turned OFF then ON again.
**LINE FEED:** A limited sample of each print style available is produced. This test can be stopped by pressing the MODE button.
**TOF/QUIET:** A continuous printing test is initiated. This test is terminated by pressing the MODE button.
**TOF/QUIET & PARK:** Reset the paper loading position to the factory default setting.

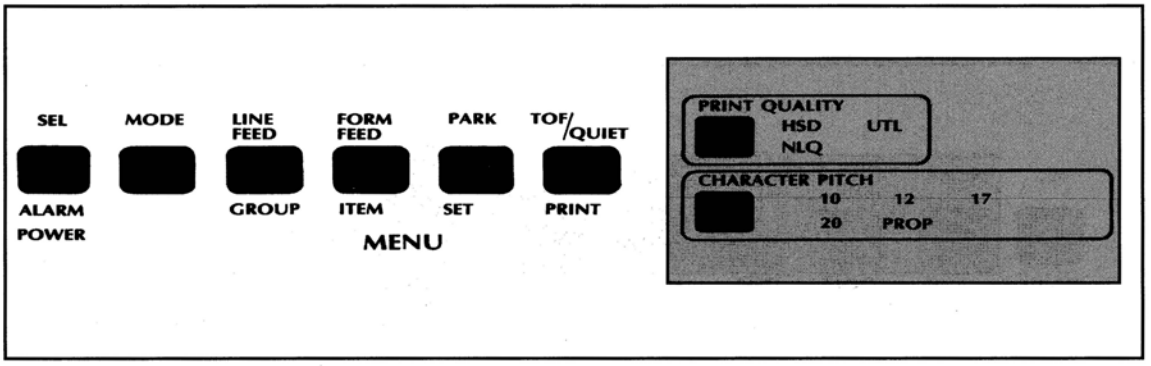
---

**Note:** All buttons on the control panel are active regardless of whether the printer is selected or deselected.

# Print Characteristics

These buttons let you control basic printing features without modifying your software. Simply press a button until the selection you want lights up. You can change feature when the printer is either selected or deselected.

**Note:** This part of the panel always reflects the state of the printer. If your software changes one of these features,the corresponding light will change, too.




1. **Print quality**

   NLQ: Near Letter Quality. The highest level of print quality for your most important documents.
   UTL: Utility. Higher speed printing for drafts, internal documents, and high volume data printing.
   HSD: High Speed Draft. Use it for quick printouts of preliminary drafts and long documents. If HSD is set along with 12 cpi, the SSD (Super Speed Draft) is activated. This is the fastest print speed (360 cps).

2. **Character pitch**

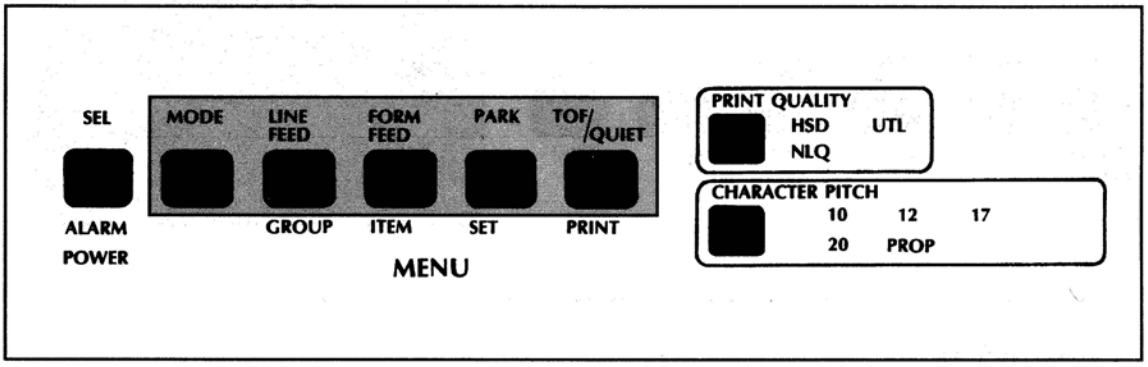
   10, 12, 17, 20: These determine the width of the characters, indicated in characters per inch (cpi). Normally 10 and 12 pitch are used for standard text; 17 and 20 pitch are used when you want to get more information on a page—in spreadsheets for example. 15 cpi is selected when both 12 cpi and 17.1 cpi are lit.

   PROP: Proportionally spaced, is not available in HSD. The amount of space allowed for each character varies according to the width of the character; for example, "i" takes less space than "w" does.

   This improves legibility and gives a more polished "typeset" look.

# The MODE Button

This button controls the functions of the next four buttons on the panel by switching the printer between Print mode and Menu Select mode. When the printer is in Print mode, the functions shown above the buttons are active: this is the state of the printer when you turn it on. When the printer is in Menu Select mode, the MENU indicator lights, and the functions shown below the buttons are active—this lets you customise the default settings for a number of printer features directly from the control panel.




## Print mode

1. **LINE FEED button:** Press the button to advance the paper one line.

2. **FORM FEED button:** Press this button to advance the paper to the first print line of the next page.

3. **PARK button:** Use this button with continuous-form paper. When you press it, the paper retracts from the front of the printer so you can use single sheets without completely removing the continuous forms.

4. **TOF/QUIET button:** When the printer is deselected, press this button to set the position of the first print line on the page ("top of form").

   When the printer is selected, press this button to enter the Quiet mode ("QUIET" lights on the panel). This mode reduces the sound produced by the printer by slowing the printing speed. Return to normal operation by pressing the button again with the printer selected.

## Menu select mode

In this special mode, you can customise your printer so that the features you want are automatically active when you turn it on. The selections you make on the menu are stored in the printer's permanent memory, and, in effect, become default settings, although they can be changed through software commands, through the control panel, or through resetting the menu.

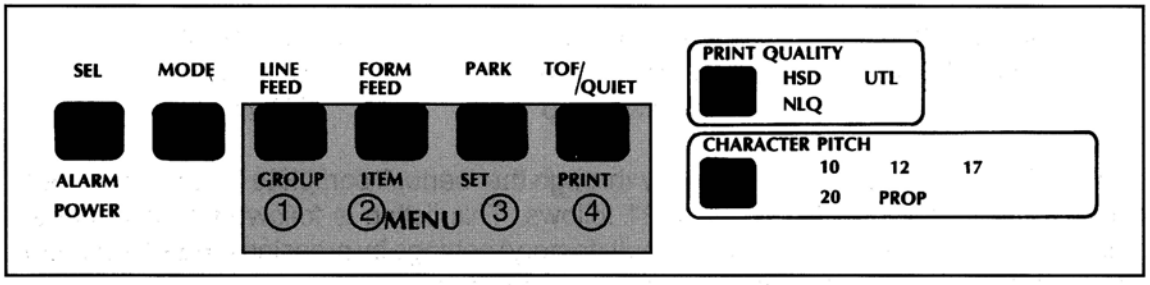
---

**Note:** You can override features set on the menu using either the front 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 when the printer is unplugged.

To enter Menu Select mode:
Make sure the printer has ribbon and paper.
Press MODE.

The SEL light goes out, the MENU light goes on, indicating that the menu functions, listed below the print buttons are active. If you want to print out the entire menu with its current settings, press the PRINT button. When you are ready to start changing settings, press GROUP, and the first line of the menu prints. Here is how it is arranged.

| Font | Print Mode | Utility |
|---|---|---|
| GROUP of | ITEM within | Current SETting |
| related items | the group | for the item |




When the MENU light is on, the bottom buttom functions are active

① ② ③ Press these buttons to move to the next GROUP, ITEM, and SETting, respectively.

④ Press this button at any time to print a complete listing of the menu with its current settings.

---

**Note:** We recommend that you print out the menu whenever you change it to keep for reference.

When you have made all the changes you want, press MODE to record the changes and return to Print mode. (MENU light goes out.)

## Examples

1. When you press SET, this line:

| Font | Print Mode | Utility |
|---|---|---|

changes to this:

| Font | Print Mode | NLQ Courier |
|---|---|---|
| Same GROUP | Same ITEM | New SETting |

The printer will now print using NLQ Courier

2. When you press ITEM, this line:

| Font | Print Mode | Utility |
|---|---|---|

changes to this:

| Font | Pitch | 10 CPI |
|---|---|---|
| Same GROUP | Next ITEM | Current SETting for new item |

To change pitch, press SET until the one you want prints.

3. When you press GROUP, this line:

| Font | Print Mode | Utility |
|---|---|---|

changes to this:

| General Control | Emulation Mode | Graphics Printer |
|---|---|---|
| Next GROUP | Current ITEM in new group | Current SETting |

Use the GROUP button to move quickly through the menu.A complete listing of the menu items and selections for the ML320/321 follows. This listing is followed by explanatory notes. The menu can be reset to the default (factory) settings by pressing the SELect button and the MODE button simultaneously during a power on.

## Menu Selections

Factory settings are printed in **bold**.

| Group | Item | Settings |
|---|---|---|
| FONT | PRINT MODE | **UTILITY,** NLQ COURIER, NLQ SANS SERIF, HSD |
| | PITCH | **10,** 12, 15, 17.1, 20, PROP. |
| | STYLE | **NORMAL,** ITALICS |
| | SIZE | **SINGLE,** DOUBLE |
| | SI SELECT (IBM) | **17.1 CPI,** 15 CPI |

| GROUP | ITEM | SETTINGS |
|---|---|---|
| GENERAL CONTROL | EMULATION MODE | **GRAPHICS PRINTER,** PROPRINTER, EPSON FX |
| | GRAPHICS | **BIDIRECTIONAL,** UNDIRECTIONAL |
| | BUFFER SIZE | **NORMAL,** REDUCED |
| | PAPER OUT OVERRIDE | **NO,** YES |
| | PRINT REGISTRATION | **0,** -1,-2, -3, -4, -5, +5, +4, +3, +2, +1 |
| | OPERATOR PANEL FUNCTIONS | **FULL OPERATION,** LIMITED OPERATION |
| | RESET INHIBIT | **NO,**YES |
| | PRINT SUPPRESS EFFECTIVE | **VALID,** INVALID |
| | PAGE WIDTH (ML 321 only) | **13.6 INCHES,** 8 INCHES |
| | CPU COMPENSATION | **STANDARD,** Special |
| VERTICAL CONTROL | LINE SPACING | **6 LPI,** 8 LPI |
| | FORM TEAR OFF | **OFF,** 300mS, 1 SEC, 2 SEC |
| | SKIP OVER PERFORATION | **NO,** YES |
| | AUTO LF | **NO,** YES |
| | AUTO CR (IBM) | NO, **YES** |
| | AUTO FEED XT (EPSON) | **INVALID,** VALID |
| | PAGE LENGTH | **12 INCHES,** 11 INCHES, 11-2/3 INCHES 14 INCHES,17 INCHES, 3 INCHES, 3.5 INCHES, 4 INCHES, 5.5 INCHES, 6 INCHES 7 INCHES, 8 INCHES, 8.5 INCHES |
| | SHEET PAGE LENGTH | **11-2/3 INCHES,** 14 INCHES, 16.57 INCHES 3 INCHES, 3.5 INCHES, 4 INCHES, 5.5 INCHES, 6 INCHES, 7 INCHES, 8 INCHES 8.5 INCHES, 11 INCHES, 12 INCHES |
| | CSF BIN SELECT | **BIN1,** BIN2 |
| SYMBOL SETS | CHARACTER SET | **IBM SET 2,** IBM SET 1 |
| | CODE PAGE | **USA,** MULTILINGUAL, NORWAY, PORTUGAL, TURKEY, GREEK-928, GREEK-851, GREEK-437, CYRILLIC, POLSKA MAZOVIA,POLSKA PC LATIN 2, SERBO CROATIC I, SERBO CROATIC II, ECMA-94. |
| | LANGUAGE SET | **AMERICAN,** FRENCH, GERMAN, BRITISH, DANISH I, SWEDISH I, ITALIAN, JAPANESE, SPANISH I, NORWEGIAN, DANISH II, SPANISH II, LATIN AMERICAN, FRENCH CANADIAN, DUTCH, SWEDISH II, SWEDISH III, SWEDISH IV, TURKISH, SWISS I, SWISS II. |
| | ZERO CHARACTER | **UNSLASHED,** SLASHED |
| | SLASHED LETTER O | **NO**, YES |
| | DLL UTILITY (IBM) | **NORMAL,** SPEC I, SPEC II |
| SERIAL INTERFACE OPTIONS | PARITY | **NONE,** ODD, EVEN |
| | SERIAL DATA 7- or 8-BITS | **8,** 7 |
| | PROTOCOL | **READY/BUSY,** XON/XOFF |
| | DIAGNOSTIC TEST | **NO,** YES |
| | BUSY LINE | **SSD-,** SSD+, DTR, RTS |
| | BAUD 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

**Print Mode:** Choose the NLQ Courier or Sans Serif font 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.

**SI Select (IBM):** This chooses the function of the SI code between 15 CPI and 17.1 CPI.

**Emulation Mode:** Select the printer command set you want your ML320/321 to use. Choose Epson FX series, IBM Proprinter XL or IBM Graphics Printer. See Chapter 4 for selection.

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

**Buffer size:** When the buffer size option is set to **NORMAL** the minimum receive buffer size in Epson mode is 27 kbytes. The minimum receive buffer size in IBM mode is 15 kbytes. If there are problems with device time-outs due to the time taken to clear the printer buffer when full, select the **REDUCED** buffer size. The buffer size for both modes becomes 256 bytes, thus less time is taken to empty the buffer and the computer will resume transmitting the 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 use 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.

**Print Registration:** Use this item 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. (See Chapters 5 and 7.)

**Operator Panel Functions:** Full Operation is the normal setting. Choose Limited Operation to deactivate the PRINT, QUALITY, CHARACTER PITCH, and MODE buttons. You can then 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.

This feature also prevents access to the menu. If you want to reactivate the menu, turn off the printer, then hold down the MODE button and turn the printer on again. Follow the normal menu procedures to reset this item to Full Operation.

**Reset Inhibit:** Choose Yes if you want the printer to ignore your software's initialisation commands. This allows you to set printer features using the control panel which will not be automatically overridden by the initialisation string that is often sent by the software package at the beginning of each job.

**Print Suppress Effective:** Select VALID 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 INVALID.

**Page Width:** This feature only appears in the menu in the ML321 printer. 13.6 inches is the default setting. Choose 8 inches when you are printing in A4 portrait orientation.

**CPU Compensation:** Select standard if the printer is to be used with Microsoft Windows version 2.xx. This avoids a Centronics Parallel Interface Timing problem.

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

**Form Tear Off:** If the selection Form Tear Off is On, continuous form paper will automatically advance to its tear off position after the time selected in the menu has elapsed (300mS, 1 second or 2 seconds). If the selection is set to OFF, the paper will not advance to the tear off position when no data is received.

**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.

**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 always 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.

**Auto Feed XT (Epson):** Usually there is no Line Feed after a Carriage Return if the Auto Line Feed is to No. However, in the Epson emulation, if the Auto Line Feed is 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

**Page Length:** Choose the length of paper you are using. This enables the printer to keep track of the initial printing position on each page ("top of form").

**Sheet Page Length:** Cut Sheet Page length can be set independently from continuous form length.

**CSF Bin Select:** This option allows you to select each of the bins in a dual bin CSF and store separate Top Of Form settings for each of the bins. The TOF can be set for each bin after exiting the menu select mode.

**Character Set:** Choose IBM Character Set 1 or Set 2. (See Appendix B.) In the Epson mode, Set 1 is the Italic Character Set and Set 2 is the Graphic Character Set.

**Code Page:** This allows several character sets containing special characters to be accessed.

**Language Set:** These sets replace certain symbols with special characters used in the respective foreign languages. (See National Character Sets in Chapters 5 and 7.)

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

**Slashed Letter O:** Character ¢ (155) and ¥ (157) will be set to ø and Ø, if this item is set to yes.

**DLL Utility (IBM):** This option allows you to choose between three different accessing areas for the DLL.

The following items are used only if the optional serial interface has been installed. 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 about 300 hours of operation), take a clean, dry 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.

# Problem Solving

Here are some of the most common printer problems and how to solve them. If you are still having difficulties, get help from your dealer.

**What if ... nothing happens at all when I turn on the printer?**

The printer may not be plugged in. Check the power cord connection to the printer and the outlet. If you are using a power strip, make sure it is turned on.

**... the ALARM light goes on?**

You may be out of paper, or the paper has jammed. The SEL light will also go out, so when you have reloaded paper, the paper must cover the groove in the left side of the platen, press the SEL button. If the ALARM light does not go out when you reload paper, then there is probably a malfunction in the printer that requires service.

**... the printer does not print when the computer sends it data?**

The printer may be deselected—If the SEL light is out, press the SEL button.

**... the paper keeps jamming?**

Several things can cause paper jams. Here are a few tips on how to avoid them:

- Be sure to set top of form above the bail (column indicator). If you set it below, the top of the page will catch on the bail.
- Always use the bail lever or the platen knob to feed paper into the printer. Do not use the FF button for this: if you do, the paper will catch on the bail or the access cover.

If the paper does jam, back it out of the printer carefully using the platen knob. Be sure to remove any shreds of paper from the printer.

**... the printer suddenly changes to unidirectional printing, then stops completely and the menu light flashes?**

This is a feature designed to protect the printhead. Heat can build up in the printhead when it has been printing for a long time, so when the printhead reaches a certain temperature, the printer switches to unidirectional printing. If heat continues to increase, the printer will stop until the printhead cools down, then it resumes printing.

**... there are dots missing in my printouts?**

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

**... my word processor files do not print the way the menu and front panel is set?**

Before sending a file to the printer, many word processors send an "initialisation string." This string contains codes that reset the printer to a default set of features, otherwise the printer might accidentally print using features set for a previous job. The codes will override panel or menu settings. The printer's menu can be set in order to ignore these initialisation commands. Set the menu option RESET INHIBIT to YES to maintain control panel setting for a job.

**... the menu and print feature buttons do not work?**

The OPERATOR PANEL FUNCTIONS item on the printer menu can be used to disable these features. If the printer is part of a customised system or if it is used by a number of people, the system manager may have used this option to make sure the printer is always set properly.

**... I want to cancel all of the changes that I have made to the menu?**

By holding down the SEL and MODE buttons simultaneously while you turn on the printer, you will reset the printer menu to the factory default settings.

**... I want to check the data my computer is sending to the printer?**

Use the hexadecimal dump mode. To enter this mode, hold down the SEL and FF buttons while you turn on the printer. All data sent to the printer, including text and printer commands, will print in both hexadecimal and ASCII format. (In the ASCII format, all non-printable codes will be represented by a period.) For example, this line of BASIC code:

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

would print like this:

```
1B 30 1E 31 32 33 34 35 0A 0D 0A              .0. 12345...
```

To return to normal printing, turn the printer off, then on again.

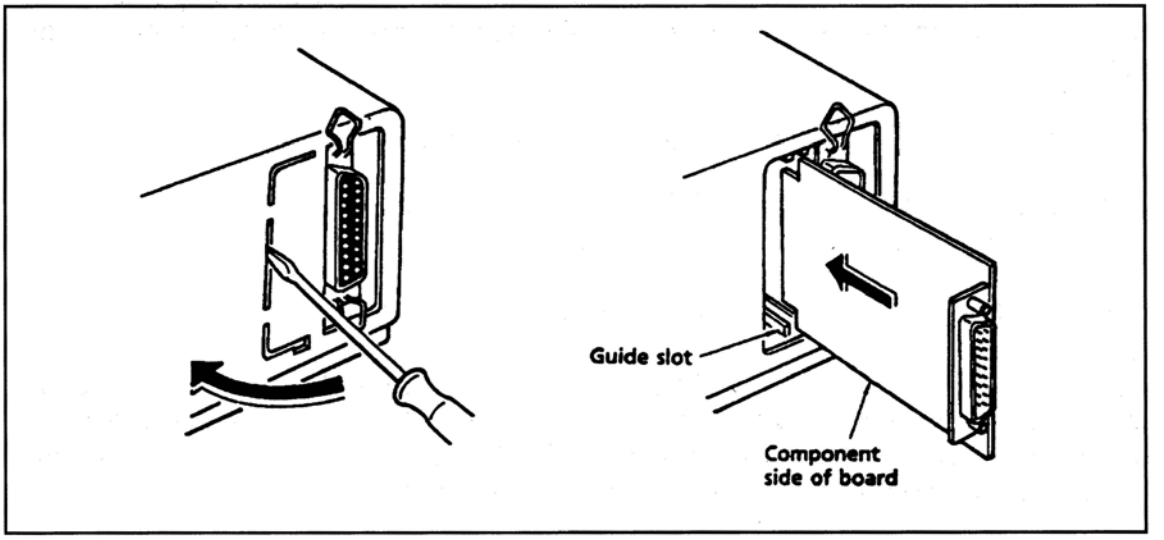
# Installing the Optional Serial Interface

This section explains how to install the optional serial interface board RS-232C and RS-422. For details on menu options, cabling and diagnostic testing, see Appendix C.

## Installation

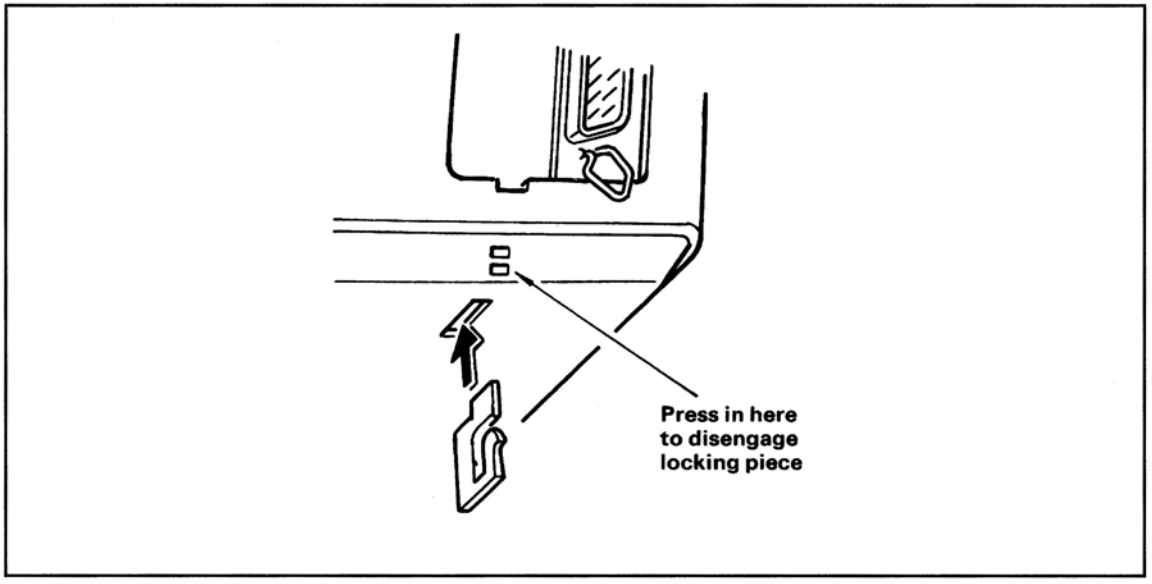
**Important:** Handle the interface board with care to avoid damaging its components. The components can also be damaged by static discharges. We recommend that you leave the board in its protective packaging until you have read these instructions and are ready to install it. Make sure the printer is unplugged before you install the board.

1. Remove the plastic covering over the serial board opening in the rear of the printer. Use a small knife or flat-head screwdriver to pry it free.




2. Holding the board by the cable connector with the components facing **away** from the parallel interface, gently slide it into the opening against the guides at the top and bottom. Press it firmly into place.

3. Lock the board into place by inserting the plastic locking piece into the hole in the printer base below the board opening. Push the top of the serial board down as you push the locking piece up. The piece will click into place.




4. Connect the interface cable (sold separately) to the printer interface connector and to the serial port of your computer. Be sure to tighten the screws on both ends of the cable to keep it in place.

---

**Important:** Make sure that you do not have a parallel cable connected to the printer when you are using the serial interface. You can switch to the parallel interface without removing the serial board, but only one cable can be attached at a time.

Chapter 3

# Computer Control

## Commercial Software

This chapter explains the fundamentals of controlling the printer through your computer. It covers MS-DOS printing commands, the fundamentals of setting up a software package for use with your printer, and some tips on writing BASIC programs to control your printer. This information should help you get started, be sure to read your software documentation carefully for more details.

### DOS 2.0 and higher

Most IBM PC and compatible personal computers use PC-DOS or MS-DOS as their operating system. Although DOS is much more limited in printing capabilities than word processing or graphics software, there are some commands in DOS that you can use to control your printer.

### DOS commands for printing ASCII text files

PRINT filename
TYPE filename > devicename
COPY filename devicename

If you have used a word processor or other software package to prepare your document, it is usually easier to use that package's print commands to print it. This is particularly true if the software lets you control a document's appearance —page length, margins, printing features, and so on. However, if your software does not control these kinds of features, it is just as easy to print using DOS commands. Some packages even have a "print to disk" feature, so you can save the file on a disk in a format that DOS can later read and send to the printer.

#### PRINT

PRINT is a background utility that lets you print a file while you are running another program. Once you have given the command to print your file, you can go on to another task on your computer, without waiting until printing is finished.

**Note:** PRINT is not a DOS command but a separate program, so if you want to use it, the file PRINT.COM must be on one of your disks.

**Example**

In this example, we are going to print a file called NOTES.TXT, which is on the WORK subdirectory of the computer's hard disk drive (drive C:). The PRINT.COM program file is in the main (root) directory of the C: drive.

Begin by typing the following at the C: prompt:

```
print c: \ work \ notes.txt [RETURN]
```

You will see this display on your screen:

```
Name of list device [PRN]:
```

If your printer is connected to the LPT1: parallel printer port, just press [RETURN]; if it is connected to another port (LPT2:, COM1:, or COM2:), type the name of the port and press [RETURN].

Next you will see this display:

```
Resident part of PRINT installed
C: \ WORK \ NOTES.TXT is currently being printed
```

And the file will print.

---

**Note:** If you are not sure which printer port your system uses, try pressing return to specify [PRN]. The device name PRN refers to LPT1:, the default DOS port. This is the port most printers are connected to. Once you have used PRINT during a work session, DOS will "remember" the device you specified and will not have to ask you again where the printer is. Of course, turning off the computer or restarting it will erase this information from memory.

**TYPE**
If you do not have a copy of PRINT.COM available, you can use TYPE, redirecting the file to your printer. If you are not using LPT1: as your printer port, substitute the name of your port for lpt1 in our example.

**Example**

```
type c: \ work \ notes.txt > lpt1
```

COPY Just as you use this command to copy a file from one disk or directory to another, you can copy a text file to the printer. If you are not using LPT1: as your printer port, substitute the name of your port for lpt1 in our example.

**Example**

```
copy c: \ work \ notes.txt  lpt1
```

If your system does not use LPT1: to connect the printer to the computer, you can specify which port DOS should use as its default. At the DOS prompt, enter the appropriate MODE command(s).

| **Serial interface** | **Parallel interface** |
|---|---|
| First enter<br>MODE COM1:9600,N,8,1,P<br>Then enter:<br>MODE LPT1: = COM1: | Enter:<br>MODE LPT2: |

Note: The serial interface board is an option for the Microline 320/321 printer. See your dealer for ordering information.

If your serial interface is COM2:, replace COM1: in the commands shown above with COM2:. Likewise, your parallel interface may be LPT3:, in which case, change the MODE command to MODE LPT3:.To avoid having to re-enter the MODE command(s) every time you reset the computer, enter them in your computer's AUTOEXEC.BAT file. To create an AUTOEXEC.BAT file or edit an existing one, use a text editor or a word processor in a mode that allows you to create ASCII text files. If you are editing your system's AUTOEXEC.BAT file, be sure not to change or delete anything already in the file.

For more information on working with AUTOEXEC.BAT files, see your DOS manual.

Your Microline 320 or 321 printer is designed to emulate three different printers: the Epson FX series, the IBM Proprinter XL, and the IBM Graphics Printer. The menu item General Control/Emulation mode lets you select one of these emulations.

Most software running on today's personal computers is capable of printing on at least one of these standard printers. Usually, all you will have to do to run your software is find out how the program selects a printer. Then match the software printer selection to the printer emulation you have chosen on the printer's menu.

There are too many software packages for us to give details on installing and modifying drivers for each one.

If you decide to customise a driver, use the descriptions of the control codes in Chapter 4 to get an idea of what kinds of features you can add and the codes you will need to control them. Start with an existing driver, make a backup copy of it, and then add the features and settings you want.

Of course, the best source of information about customising drivers is your software package's manual, so be sure to study it carefully before you start.

The LPRINT command in BASIC makes output go to the printer rather than to the screen. To send text to the printer, simply enclose the words in double quotes:

```
LPRINT "A line of text"
```

The statement above prints the line of text, and then moves the printing position to the beginning of the next line. If you don't want this automatic carriage return and line feed, put a semicolon (;) after the data:

```
LPRINT "A line of text";
LPRINT "... and this text is on the same line"
```

Keep in mind, however, that BASIC automatically adds a carriage return and line feed after the 80th character in a line. If necessary, you can use a WIDTH statement to change this.

For serial printers

If you are using your printer with a serial interface, you have to be sure to redirect output from the computer to the serial port you are using, either COM1: or COM2:, rather than to the default port, LPT1:. There are two ways to do this:

1. If you are using DOS, you can use the MODE command. Then, use the LPRINT command in your BASIC programs, just as we do in our examples.

2. You can also redirect output to COM1: or COM2: from within BASIC, by opening the the port as a file and printing your data to that file. If you want to run any of our sample programs, you will need to modify them. At the beginning of your program, include one of these statements:

```
OPEN "COM1:9600,N,8,1"AS #1
OR
OPEN "COM2:9600,N,8,1"AS # 1
```

Then, to print data, use the PRINT#1 command, being sure to include a comma between the # 1 and the data:

```
PRINT#1, "A line of text"
```

Like the PRINT command, PRINT # 1 automatically moves the print position to the next line unless you use a semicolon (;) after the data.

When you send an LPRINT statement, the text between the quotation marks is converted to a string of numbers, which are then processed by the printer and output as the dot patterns that make up the individual characters. Each character is assigned a numeric value according to the American Standard Code for Information Interchange (ASCII). Since ASCII is a standard coding system, most computers, printers and other electronic devices can intercept ASCII data.

There are 256 ASCII codes. The codes from 0 to 127 are completely standardised (with a handful of minor exceptions), while those from 128 to 255 are used in a less standard way to represent a variety of special characters. Although most ASCII codes represent alphanumeric and punctuation symbols, you will notice that the codes from 0 to 31, as well as 127, do not correspond to normal characters. These are control codes, special characters used to control a wide range of peripheral equipment, from monitors to modems to the devices that interest us here, printers.

One of the most important control codes is the ESC character, decimal 27, hexadecimal 1B. Many of the more complicated commands begin with ESC, which serves as a signal to the printer that what follows is to be interpreted as a command rather than just a string of characters.

Since the control codes do not represent any character on your keyboard, you cannot send them to the printer enclosed in double quotes, as you would with text. Instead, you have to use the CHR$ function, which lets you send the decimal or hexadecimal value for a character. For example, the escape character is represented as CHR$(27), or, in hexadecimal, as CHR$(&H1B). (Notice that hexadecimal numbers in BASIC are preceded by &H to distinguish them frorn simple letters or decimal numbers.)

Of course, you can also use the CHR$ function to output printable characters; for instance, CHR$(65) represents the letter A. However, it is usually easier to type letters, numbers and punctuation marks, and your BASIC programs will be much easier to read if you use literal characters, enclosed in quotes, wherever possible.

Another use for the CHR$ function is to send the value you are assigning to the variable in a printer command. Some commands expect you to fill in a numeric value, representing tab stops, line spacing, etc. These values have to be given as the argument to a CHR$ function.

Chapter 4

# IBM Modes Standard Features

The following chapters explain all the available features that can be changed, starting with the basic functions for IBM modes (**Graphics and Proprinter XL** 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 6 and 7. A quick reference will be supplied at the beginning of Chapter 6 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:

**G** Indicates a command which works in the Graphics printer mode.

**P** Commands work in the Proprinter XL 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 320/321 offers you the choice of 10 character sizes:

| | |
|---|---|
| pica | (10 characters per inch) |
| elite | (12 CPI ) |
| fine print | (15 CPI) |
| fine print | (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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Begin 10 CPI (Pica) | 18 | 12 | DC2 | P G |
| Begin 12 CPI (Elite) | 27 58 | 1B 3A | ESC : | P G |
| Begin 15 or 17.1 CPi (Fine print) | 15 | 0F | SI | P G |
| Begin 15 CPI (Fine print) | 27 103 | 1B 67 | ESC g | P G F |

**Note**: 17.1 CPI or 15 CPI will only be set if the current pitch setting is 10 CPI.
20 CPI is only available by menu setting or control panel setting.
15 or 17.1 CPI will be selected by the SI command depending on the menu item—SI Select.

In IBM-modes, 15 CPI, 17.1 CPI and 20 CPI (and their double-width counterparts) are not available when Near Letter Quality mode is selected.

| Double width | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Begin double width printing for one line | 14 | 0E | SO | P G F |
| Cancel double width printing for one line | 20 | 14 | DC4 | P G F |
| Begin double width printing (not cancelled by end of line) | 27 87 49 | 1B 57 31 | ESC W 1 | P G F |
| Cancel double width printing | 27 87 48 | 1B 57 30 | ESC W 0 | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 G |

This command is only for the Proprinter XL 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<br>Standard height characters |
| 2 | LF Unchanged<br>Double height characters |
| 16 | Single LF/<br>Character height unchanged |
| 17 | Single LF/<br>Standard height characters |
| 18 | Single LF/<br>Double height characters |
| 32 | Double LF/<br>Character height unchanged |
| 33 | Double LF/<br>Standard height characters |
| 34 | Double LF/<br>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 ESCape 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 overleaf shows the maximum number of characters per line for each character pitch.

## Table 1 Maximum Number of Characters Per Line

| Character Size | Printer Model | |
|---|---|---|
| | ML320 | ML321 |
| Pica (10 CPI)<br>CHR$(18) | 80 | 136 |
| Elite (12 CPI)<br>CHR$(27);CHR$(58) | 96 | 163 |
| Condensed (15 CPI) | 120 | 204 |
| Condensed (17.1 CPI)<br>CHR$(15) | 132* | 233 |
| Condensed (20 CPI)** | 160 | 272 |
| Double Pica (5 CPI)<br>CHR$(18);CHR$(14) | 40 | 68 |
| Double Elite (6 CPI)<br>CHR$(27);CHR$(58);CHR$(14) | 48 | 81 |
| Double Condensed (7.5 CPI)** | 60 | 102 |
| Double condensed (8.5 CPI)<br>CHR$(15);CHR$(14) | 66 | 116 |
| Double condensed (10 CPI)** | 80 | 136 |

* 137 if Proprinter is selected

** 15 and 20 CPI are only available through menu setting or control panel setting

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.

## 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 250 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 300 cps in 10 CPI or 360 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 62.5 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.

**Note**: Characters cannot print at 15, 17.1 or 20 CPI in Near Letter Quality mode. If you send a command for that pitch, the 15, 17.1 or 20 CPI position will print in Utility mode.

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

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

| Print mode | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Near Letter Quality (NLQ) mode | 27 73 51 | 1B 49 33 | ESC I 3 | G |
| Utility mode (UTL) | 27 73 49 | 1B 49 31 | ESC I 1 | G |
| High Speed Draft (HSD) mode | 27 35 48 | 1B 23 30 | ESC # 0 | P G |
| Begin Italics Printing | 27 37 71 | 1B 25 47 | ESC % G | P G |
| Stop Italics Printing | 27 37 72 | 1B 25 48 | ESC % H | P G |
| **Important**: These modes can also be selected with the Menu Select Mode. When PRINT MODE appears, you can select UTILITY, NLQ, HSD or ITALICS. | | | | |
| Near Letter Quality (NLQ) mode | 27 73 50 | 1B 49 32 | ESC I 2 | P |
| Utility mode (UTL) | 27 73 48 | 1B 49 30 | ESC I 0 | P |
| **Note**: Clearance between NLQ characters is variable. | | | | |

In Proprinter mode there is another command to turn NLQ Printing on and off:

| NLQ mode | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| NLQ mode on | 27 71 | 1B 47 | ESC G | P |
| NLQ mode off | 27 72 | 1B 48 | ESC H | P |

## 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 'w' would. The proportional spacing command can be given anywhere on a line.

| Proportional spacing | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Proportional spacing on | 27 37 80 | 1B 25 50 | ESC % P | G |
| Proportional spacing off | 27 37 81 | 1B 25 51 | ESC % Q | G |
| **Note**: Proportional spacing will be suppressed in utility and HSD mode, bit image graphics and line graphics. | | | | |
| 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 |
| **Note**: In the Proprinter mode the printout will be UTL + Proportional if you have HSD set, and proportional emphasised when printing from the utility DLL. | | | | |

## 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Change spacing between characters | 27 86 1-11 | 1B 56 01-08 | ESC V SOH - VT | P G |
| Return to standard spacing between characters | 27 86 0 | 1B 56 00 | ESC V NUL | P G |

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

The final number 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) and 1/144 inch (0.18 mm). 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 320/321 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Select Character Set 1 | 27 55 | 1B 37 | ESC 7 | P G |
| Select Character Set 2 | 27 54 | 1B 36 | ESC 6 | P G |

**Code Page Option:** This option 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.

| National characters | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Select code page | 27 91 84<br>5 0 0 0 n1<br>n2 0 | 1B 5B 54<br>05 00 00 00<br>n1 n2 00 | ESC [ T ENQ<br>NUL NUL<br>NUL n1 n2<br>NUL | P A |

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

---

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

To select code pages in IBM emulation, take the IBM ID number and divide it by 256, Assign this number to n1 and the remainder to n2.

**Example:**
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);

**IBM Code Pages**

| ID | Code page |
|---|---|
| **437** | **USA** |
| **850** | **Multilingual** |
| 851 | (reserved) |
| 852 | (reserved) |
| 853 | (reserved) |
| 855 | (reserved) |
| **860** | **Portugal** |
| 862 | (reserved) |
| 863 | (reserved) |
| 864 | (reserved) |
| **865** | **Norway** |
| 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** |

| 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 1 | 69 | 45 | E |
| DANISH | 70 | 46 | F |
| NORWEGIAN | 71 | 47 | G |
| DUTCH | 72 | 48 | H |
| ITALIAN | 73 | 49 | I |
| FRENCH-CANADIAN | 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 |

**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, Swiss, French-Canadian, and Spanish. 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Select International Character Set | 27 33 64 - 81 | 1B 21 40 - 51 | ESC ! @ - Q | P G |
| where "n" is the code for the character shown in the following 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 | â | 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 | i | ö | ü | Ğ | _ | ç | ı | i | 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 |

### 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.

You cannot use these features when the printer is in Near Letter Quality mode.

| Enhanced and emphasised printing | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Start emphasised (horizontal offset) printing | 27 69 | 1B 45 | ESC E | P G F |
| Stop emphasised printing | 27 70 | 1B 46 | ESC F | P G F |
| Start enhanced (vertical offset) printing | 27 71 | 1B 47 | ESC G | G F |
| Stop enhanced printing | 27 72 | 1B 48 | ESC H | G F |
| Start enhanced printing in Graphics Mode<br>This is stopped with the command for Utility or NLQ mode. | 27 73 50 | 1B 49 32 | ESC I 2 | G |

### 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Start superscripts | 27 83 48 | 1B 53 30 | ESC S 0 | P G F |
| Start subscripts | 27 83 49 | 1B 53 31 | ESC S 1 | P G F |
| Stop superscripts or subscripts | 27 84 | 1B 54 | ESC T | P G F |

### Underlining

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

| Underlining | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Start continuous underlining | 27 45 49 | 1B 2D 31 | ESC - 1 | P G F |
| Stop underlining | 27 45 48 | 1B 2D 30 | ESC - 0 | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Start overscoring | 27 95 49 | 1B 5F 31 | ESC _ 1 | P |
| Stop overscoring | 27 95 48 | 1B 5F 30 | ESC _ 0 | P |

### 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.

Page Length and Top of Form can be, and usually are, set with the controls on the printer operating panel. They can also be set using the control codes below in a program.

| Formatting features | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set page length by number of lines per page | 27 67 n | 1B 43 n | ESC C n | P G F |
| Set page length by number of inches per page. | 27 67 0 n | 1B 43 00 n | ESC C NUL n | P G 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 G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set lines at 8 LPI | 27 48 | 1B 30 | ESC 0 | P G F |
| Set lines at 10.2 LPI | 27 49 | 1B 31 | ESC 1 | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set lines per inch in multiples of 1/72 in. | 27 65 1-85 | 1B 41 01-55 | ESC A SOH-U | P G F |

The last code is the multiple you wish and is a number less than 85 and greater than 1.

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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Activate fine line spacing | 27 50 | 1B 32 | ESC 2 | P G |

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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set lines per inch in multiples of 1/216 in. | 27 65 1-255 | 1B 33 01-FF | ESC 3 n | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Execute variable line feed | 27 74 1-255 | 1B 4A 01-FF | ESC J n | P G 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 ML320/321 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:

| Automatic skip-over perforation | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Vary distance skipped-over perforation | 27 78 1 - 255 | 1B 4E 01 - FF | ESC N n | P G F |
| Stop skip-over perforation | 27 79 | 1B 4F | ESC O | P G F |

**Note:** In this command, the 1 to 127 for Graphics printer and 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Indenting | 27 37 66<br>"0001"-"9999" | 1B 25 42<br>n2 n3 n4 | ESC % B<br>"0001"-"9999" | P G |

The column number (0001 to 9999) must be a four-digit number and cannot be less than the left margin or exceed the right margin. If you are programming in 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set page margins | 27 88 n1 n2 | 1B 58 n1 n2 | ESC X n1 n2 | P G |

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 (note) and then the range is checked.

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

| | CPI | | | | |
|---|---|---|---|---|---|
| | 10 | 12 | 15 | 17.1 | 20 |
| ML320 (Narrow width) | 80 | 96 | 120 | 132* | 160 |
| ML321 (Wide width) | 136 | 163 | 204 | 233 | 272 |

* In Proprinter mode this setting allows up to 137 columns in 17.1 CPI.

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 the 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 ML320 and ML321. 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set character column tabs | 27 68<br>1st tab... 0 | 1B 44<br>1st tab...00 | ESC D<br>1st tab...NUL | P G 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 ML321 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.

| Model | Maximum character columns per line at | | | | |
|---|---|---|---|---|---|
| | 10CPI | 12CPI | 15CPI | 17.1CPI | 20CPI |
| ML320 | 80 | 96 | 120 | 132* | 272 |
| ML321 | 136 | 163 | 204 | 233 | |

* 137 if Proprinter is selected.

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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Skip to next tab stop | 9 | 09 | HT | P G F |
| Clear tab stops | 27 68 0 | 1B 44 00 | ESC D NUL | P G 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 Graphic printer mode the VT command does a line feed. 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 to16 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Set vertical tabs | 27 66 1... 64 0 | 1B 42 01 40 00 | ESC B SOH ... @ NUL | P G F |
| Cancel vertical tabs | 27 66 0 | 1B 42 00 | ESC B NUL | P G F |
| Skip to next vertical tab | 11 | 0B | VT | P G 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.

### 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Carriage return | 13 | 0D | CR | P G F |
| Insert line feed | 10 | 0A | LF | P G F |

### Reverse line feed

| Reverse line feed | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Reverse line feed | 27 93 | 1B 5D | ESC ] | P G F |

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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Paper-out override | 27 56 | 1B 38 | ESC 8 | P G F |
| Reactivate paper-out sensor | 27 57 | 1B 39 | ESC 9 | P G F |

### Clear buffer

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

| Clear buffer | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Clear buffer | 24 | 18 | CAN | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Start unidirectional printing | 27 85 49 | 1B 55 31 | ESC U 1 | P G F |
| Return to bidirectional printing | 27 85 48 | 1B 55 30 | ESC U 0 | P G 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 :

| Home head | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Home head | 27 60 | 1B 3C | ESC < | G F |

### Back spacing

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.

| Back spacing | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Print suppress mode on (ML321) | 27 81 22 | 1B 51 16 | ESC Q SYN | P |
| Print suppress mode on (ML320) | 27 81 3 | 1B 51 03 | ESC Q ETX | P |
| Print suppress mode off | 17 | 11 | DC1 | P F |

### 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 Character Set | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 91 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 instead 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Insert sheet | 27 25 73 | 1B 19 49 | ESC EM I | P G F |
| Eject sheet | 27 25 82 | 1B 19 52 | ESC EM R | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Bin 1 | 27 25 49 | 1B 19 31 | ESC EM 1 | P G F |
| Bin 2 | 27 27 50 | 1B 19 32 | ESC EM 2 | P G 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Sheet feed option | 27 91 70 | 1B 5B 46 | ESC [ F | P G |

**Description of Parameters**

n 1 n2 : number of parameters
m 1: 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=0 and n2=0.

m1 defines paper feeding method and m2 is constantly set at 1. m3 defines the Bin number.

m1=1 set manually inserting mode
m1=3 set CSF inserting mode

m3=0 no change
m3=1 Bin_1
m3=2 Bin_2

For example, to specify cut sheet feeding from Bin 2:
LPRINT CHR$(27);CHR$(91 );CHR$(70);CHR$(3);CHR$(0);CHR$(3);CHR$(1 );CHR$(2);

Chapter 5

# IBM Modes Advanced Features

## Downline Loadable Character Generator (DDL)

## Graphics printer mode

### Your own custom characters

In addition to the standard 96-character set, the ML320 and ML321 have a separate printer memory reserved for extra characters you may want to use for special purposes. You can create and store up to 160 symbols, or design a complete 96-character font.

The memory for the downline loadable character generator (DLL for short) is backed up by a battery. Stored data is therefore maintained even after the printer is turned off.

Designing characters involves a little bit of work. First, you have to design your character or symbol as a dot pattern on a matrix. Then you have to translate the pattern into numeric data the printer can understand. After that you have to assign it to a specific address location so you know where it is when you need it. Next you have to include it in a program to load the information into the printer's memory. After you have done all that, you must save the program in a permanent storage device, such as your computer's disk system, so you will have it when you want it. It sounds difficult, but it is easy after you practice.

### Designing your character

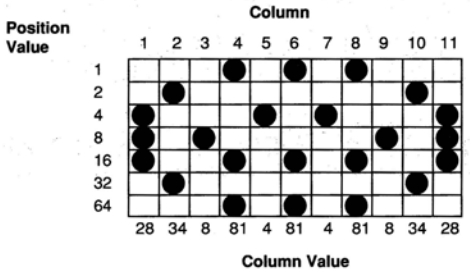
Each character you design will ultimately be printed in a pattern called a matrix. The matrix consists of 11 columns, each with 7 rows of dots, so there are a total of 77 dot positions available for a character.

---

**Important**: Please note that not all 77 positions are available for a single character. You cannot place two dots in the same row in adjoining columns. So, for example, you can place a dot in row 1 of columns 1 and 3 or columns 2 and 4, but you cannot put dots in row 1 of columns 1 and 2. If you accidentally enter dots on the same row of adjacent columns, the second dot will not be printed.

Now it is time to map out your character. After you do that, you are ready to convert your matrix into data the printer understands. We will design a simple character as an example.

The design for the character:



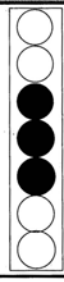

**Converting dot patterns into printer data**

In this step you translate the dot pattern into a numeric code the printer and computer can understand. To help you, we assigned a numeric value to each row in the matrix. Just add the values of the rows where you want dots to appear in each column. The following diagram shows the proper values.

**If you are familiar with binary numbers:**

Each column is represented by an 8-bit binary number. A dot is represented by a "1" and a blank space is "0"; the top dot is LSB (Least Significant Bit), and the bottom dot is the MSB (Most Significant Bit). The bit positions are shown in Table 1 for reference.

**Table 1**

| Row | Dot Position in column | Decimal value | Bit |
|---|---|---|---|
| 1 |  | 1 | $2^0$ LSB |
| 2 | | 2 | $2^1$ |
| 3 | | 4 | $2^2$ |
| 4 | | 8 | $2^3$ |
| 5 | | 16 | $2^4$ |
| 6 | | 32 | $2^5$ |
| 7 | | 64 | $2^6$ MSB |

For example, in column 1 of our character there are dots in rows 3, 4, and 5, so add:

4 + 8 + 16 = 28

Column 2 has dots in rows 2 and 6, so add:

2 + 32 = 34

**Continue for the whole pattern.**

**Ascenders and Descenders**

Although only seven rows can be printed at a time, the character matrix actually has nine rows. An ascender character prints in rows one through seven and sits on the print line of row seven. Descender characters (letters with "tails", such as g, j, p, q, and y,) extend the below the print line, so they print in rows three through nine. If you want to print the same character as both an ascender and a descender, the numeric data for the columns is the same; only the code sequence to load the data differs. We will load our character both ways to demonstrate this.

**Loading the data**

There are two ways to load characters into the DLL. They can be loaded one by one, or 96 characters can be copied at once. Decimal characters Nos. 32 to 127 in the code table are copied. The command for copying is as follows:

| Load characters to DLL | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Load characters to DLL | 27 36 | 1B 24 | ESC $ | G |

The DLL memory is retained after the printer is turned off. Therefore, it need not be reloaded or copied unless it is to be changed.

At factory shipment, the DLL contains ASCII code character patterns. For our example, we will create an ascender and a descender character.

| Load ascender or descender | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Load ascender | 27 37 65<br>m n1 n11 | 1B 25 41<br>m n1 n11 | ESC % A<br>m n1 n11 | G |
| Load descender | 27 37 68<br>m n1 n11 | 1B 25 44<br>m n1 n11 | ESC % D<br>m n1 n11 | G |

m = the character to be changed
n1-n11 = the new characters column data.

Next, choose a character from the standard character set to represent your new character. Any ASCII character numbered between 32 and 127 on the decimal code table will do. This works well if you are creating an entire character set. However, if you plan to create just a few characters it is a good idea to choose an ASCII character you seldom use, such as ^ or @. You can then combine your custom-designed characters with standard characters easily.

Let us choose the @ character to represent our customised character.

Our LPRINT statement starts like this:

```
LPRINT CHR$(27);"%A";"@";
```

Next comes the column data:

```
LPRINT CHR$(27);"%A";"@";CHR$(28);CHR$(34);CHR$(8);CHR$(81);CHR$(4);
       CHR$(81); CHR$(4);CHR$(81);CHR$(8);CHR$(34);CHR$(28)
```

The statement automatically ends after the data for the 11th column. You must include data for all 11 columns and you must use a separate statement for each character you want to load.

Let us load the same character as a descender, using ^ as the representation:

```
LPRINT CHR$(27);"% D";"^";CHR$(28);CHR$(34);CHR$(8);CHR$(81 );CHR$(4);
       CHR$(81);CHR$(4);CHR$(81);CHR$(8);CHR$(34);CHR$(28)
```

**Printing downline loadable characters**

In our example, we used just two ASCII code locations in the DLL. Enter this code sequence to switch to the downline loadable character set:

| Printing DLL Characters | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Switch to DLL char. set | 27 37 89 | 1B 25 59 | ESC % Y | G |

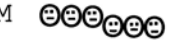
After you enter the DLL mode with this command, your customised characters will be printed whenever the selected key is pressed. If the dot pattern data was not changed, the standard character will be printed. In the program for our example, we loaded the ascender character into ASCII code location decimal 64 ("@") and the descender character into ASCII code location decimal 94 ("^").

Here is the program:

```
10 LPRINT CHR$(27);CHR$(36)
20 LPRINT CHR$(27);"%A";"@";CHR$(28);CHR$(34);CHR$(8);
   CHR$(81);CHR$(4);CHR$(81);CHR$(4);CHR$(81);CHR$(8);CHR$(34);CHR$(28)
30 LPRINT CHR$(27);"% D";"^";CHR$(28),CHR$(34);CHR$(8);
   CHR$(81);CHR$(4);CHR$(81);CHR$(4);CHR$(81);CHR$(8);CHR$(34);CHR$(28)
40 LPRINT CHR$(27);CHR$(37);CHR$(89)
50 LPRINT "NORMAL SET MMMMMM @@@ ^^^ NORMAL AGAIN MMM"
60 LPRINT CHR$(27);CHR$(73);CHR$(49)
```

Line 10 loads the standard character set into the DLL RAM (Random Access Memory).
Line 20 loads the dot pattern data for the ascender character in the address represented by @.
Line 30 loads the dot pattern data for the descender character in the address represented by ^.
Line 40 switches the printer into DLL Utility mode.
Line 50 prints the statement with the ascender and descender characters.
Line 60 exits the DLL mode.

The printout will look like this:

NORMAL SET MMMMMMM  NORMAL AGAIN MMM

If you would like to print the DLL characters in Near Letter Quality (NLQ), you can select the simulated Near Letter Quality DLL. In the simulated downline loadable character set, the dot pattern information for each DLL character that you have designed and loaded is duplicated. In its second pass for Near Letter Quality mode, the printer augments this data, and fills out the character making it appear like an actual Near Letter Quality character.

You must design and load the dot pattern data for your DLL characters as described previously. Then you can select the simulated Near Letter Quality DLL.

| Simulated NLQ DDL | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Simulated NLQ DDL | 27 37 90 | 1B 25 5A | ESC % Z | G |

In the Downline Loadable Character Generator (in Utility and simulated NLQ printing modes) there are two ASCII code areas reserved for loading customised characters (32-127 (96 characters) and 160-223 (64 characters)).

The two alternatives, SPEC 1 and SPEC 2, to the DLL Utility in the Menu Select mode enable the assignment of custom-designed characters to the ASCII code locations of national characters (128-159), Greek characters and mathematical symbols (224-239 and 240-255).

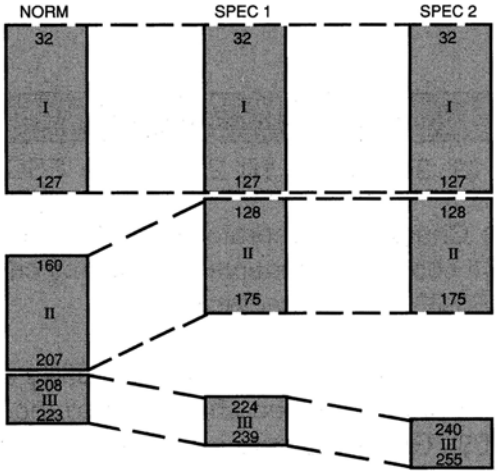
The loading addresses in the DLL remain the same, however with the necessary conversion the newly defined characters appear in the required positions.

| Location | Loading address (L) | Access address at Menu-value | | |
|---|---|---|---|---|
| | | NORM | SPEC 1 | SPEC 2 |
| I | 32-127 | L | L | L |
| II | 160-207 | L | L-32 | L-32 |
| III | 208-223 | L | L+16 | L+32 |

L = Loading Address

For example, to specify a new character in the place of "ß" (position 225 in the IBM Character Set II), the position 209 can be loaded in the menu under DLL UTILITY "SPEC 1" and the desired character matrix can be defined, subsequently, when the ASCII character 225 is specified, the described conversion will take place and the newly defined character will be printed instead of "ß". The following graphic may illustrate the procedure.

**Access Address Depending on Menu-Value**




| Exit DLL Mode | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Exit DLL (start utility mode) | 27 73 49 | 1B 49 31 | ESC I 1 | G |
| Exit DLL (start NLQ mode) | 27 73 51 | 1B 49 33 | ESC I 3 | G |

**Proprinter mode**

| Proprinter Mode DLL | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| 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 trademarks and symbols using your keyboard.Loading procedure is a bit complicated, so it is broken down into steps. You will find 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 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 the 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 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 x 13) + 2 = 1224
n2 = int (1224/256) = 4
n1 = 1224 - (n2 x 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 replace 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. 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 x 13) + 2 = 41, while the second statement loads only one character, making the formula (1 x 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.

| | | Character width | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **Start position** | **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 | X9 | X | 11 |
| | **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 | 10 | 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.

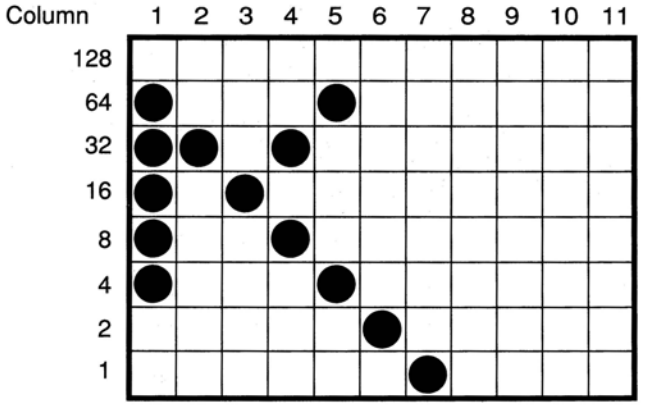
In order to use the DLL in proportional mode you must specify proportional mode using ESC P1 before printing. In non-proportional mode the characters will be printed in full width, attribute byte 2 will then be ignored.

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:




**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!

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. Add: 64 + 32 + 16 + 8 + 4 = 124. Continue the same procedure for columns 2 through 11. Column totals are: 124, 32,16, 40, 68, 2,1, 0, 0, 0, 0.

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);

... and 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 16. This selects the Quasi-NLQ downloaded character generator. Or you can select Utility mode with the ESC 14 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 | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Clear DLL | 27 61 0 0 | 1B 25 00 00 | ESC=NUL NUL | P |

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

| Exit DLL | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Start Utility Mode | 27 73 48 | 1B 49 30 | ESC I 0 | P |
| Start NLQ Mode | 27 73 50 | 1B 49 32 | ESC I 2 | P |

# Graphics

The bit image graphics feature lets your printer create almost any kind of illustration by printing a dot at any location on the page. In IBM Modes your MICROLINE works correctly 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.

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

There are four modes of GRAPHICS available in the 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 203 mm (8 inches) for the ML320 and 345.4 mm (13.6 inches) for the ML321.

| Graphics Resolution | Decimal | Hexadecimal | ASCII | Compatibility |
|---|---|---|---|---|
| Single density graphics | 27 75 n1 n2 | 1B 4B n1 n2 | ESC K n1 n2 | P G F |
| Double-density half-speed graphics | 27 76 n1 n2 | 1B 4C n1 n2 | ESC L n1 n2 | P G F |
| Double-density normal-speed graphics | 27 89 n1 n2 | 1B 59 n1 n2 | ESC Y n1 n2 | P G F |
| Quadruple density graphics | 27 90 n1 n2 | 1B 5A n1 n2 | ESC Z n1 n2 | P G F |

Single-density graphics have a resolution of 60 x 72 dots per inch, and have a maximum width of 480 dots per line for the ML320 and 816 dots per line for the ML321.

Double-density, half-speed graphics have a resolution of 120 x 72 dots per inch, and a maximum width of 960 dots per line for the ML320 and 1632 dots per line for the ML321. 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 960 dots per line for the ML192 and 1632 dots per line for the ML321. 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.

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

Quadruple-density graphics have a resolution of 240 x 72 dots per inch, and a maximum width of 1920 dots per line for the ML320 and 3264 dots per inch for the ML321. 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.

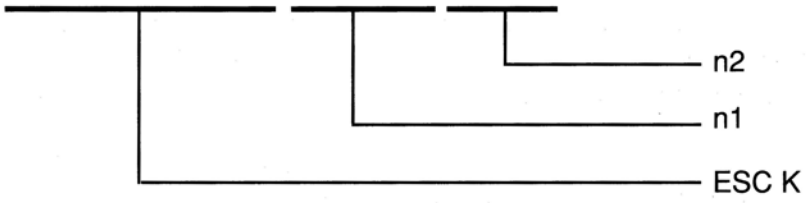
### Example

Suppose you want to print 400 columns of graphics

n2 = int (400/256) = 1
n1 = 400 - (256 x 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)
```




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))
```

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

**Maximum graphics columns per line**

| Graphics mode | ML320 | ML321 |
|---|---|---|
| ESC K (single density) | 480 | 816 |
| ESC L/ESC Y (double density) | 960 | 1632 |
| ESC Z (quadruple density) | 1920 | 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)

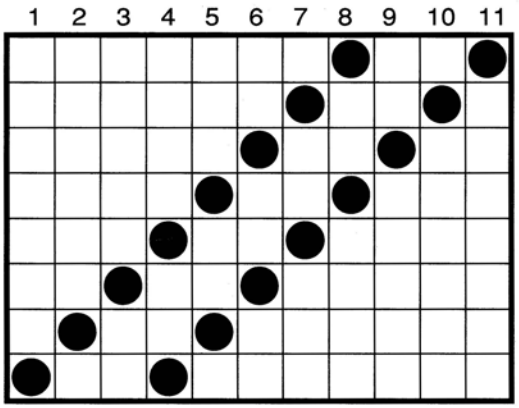
If we call the number for each column c1, c2, etc., the complete statement is:

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. On graph paper the lines look like this:




**Step 1** Begin with LPRINT and Start Graphics code for single density graphics this time:

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

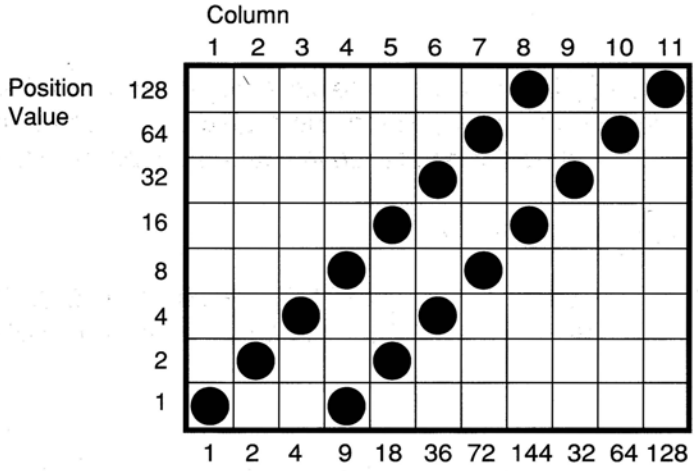
**Step 2** Count the columns in the image. There are 11, so we calculate n1 and n2:

n2 = int (11/256) = 0
n1 = 11-(n2 x 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:




then 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** Now run the program. The result should look like this:

If not, check your arithmetic and typing, and try again.

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

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

Run the program and compare:

Notice that the angle is steeper and the two lines are closer together. This is because each individual column now overlaps the next column. Note 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 LPRINTCHR$(27);CHR$(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 prograrn 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 FORJ = 1 to 4
75 NEXT J
```

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

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). To print a continuous image with no gaps between lines, use ESC A to change line height to 8/72 inch and ESC 2 to activate the change.The following programme 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 your combination old 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 LPRINTCHR$(27);CHR$(75);CHR$(NDOTSMOD 256);
   CHR$(FIX(NDOTS/256));
40 FOR X =1 TO NDOTS
50 READ C
60 LPRINT CHR$(C);
70 NEXT X
90 DATA 2,4,8,16,32, . . .
```

This method makes it easier to check and modify your data. Using a variable like NDOTS helps ensure the amount of program data matches the number of columns 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 should experiment with 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 (I) at each registration value. Use the setting that produces the straightest column.

**Print Registration Settings**

| Setting | Resulting movement |
|---|---|
| +5 | 0.25 mm to the right |
| +4 | 0.20 mm to the right |
| +3 | 0.15 mm to the right |
| +2 | 0.10 mm to the right |
| +1 | 0.05 mm to the right |
| 0 | no movement |
| -1 | 0.05 mm to the left |
| -2 | 0.10 mm to the left |
| -3 | 0.15 mm to the left |
| -4 | 0.20 mm to the left |
| -5 | 0.25 mm 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
```

Chapter 6

# 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 print | ESC U |
| Unidirectional (1 line) | ESC < |
| Backspace | BS |
| Print suppress off | DC1 |
| Cut Sheet Feeder | ESC EM 1/R/1/2 |
| Graphics | ESC K/L/Y/Z |
| 15 CPI | ESC g |

# Character Pitch

## Character pitch

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

| Character pitch | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 (see the following table).

| 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 |

**Note:** **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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 4.

Expand your characters to double height with the following command.

| Double height | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 |

# Print Modes

## Printing modes

| Printing mode | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 Sanserif | 27 107 49 | 1B 6B 31 | ESC k 1 | F |

For fast printing at 250 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 300 CPS in 10 CPI and 360 CPS in 12 CPI. 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 62.5 CPS. This is useful for letters and other important documents.

| Auto justification | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Begin auto justification in NLQ mode | 27 97 n | 1B 16 n | ESC a n | F |

The command for the auto justification in NLQ mode lets you program the printer to lay out 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 the "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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 MICROLINE will return to its previous settings.

| Proportional spacing | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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.

# Character Sets

| National characters | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 R7 sets Spanish 1 when Standard Italic Character set is selected.

ESC R7 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 Pages

| n | Epson Italic<br>ESC t NUL | Epson Graphics<br>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 |

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

| 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 | # | $ | & | @ | 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 | [ | \ | ] | ^ | _ | ` | 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 | Pt | $ | & | @ | 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 |
| OD 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 | i | ö | ü | Ğ | _ | ç | ı | ± | 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 |

## Epson Character Sets

| Select Character Set | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 tables).

| Code expansion area | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Code expansion arera (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 (see Page 6—4).

## Composite Command

If you want to program your MICROLINE 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 an 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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.

### Variable line feed

| Line feed | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Reverse line feed | 27 106 n | 1B 6A n | ESC j n | F |
| n = 0 to 255 | | | | |

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.

Reverse line feed is available on ML320 80-column printer only.

### Absolute and relative dot positioning

| Dot positioning | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 = Int. (dot position/256) n1 = Dot pos. - (n2 x 256)

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

n2 = Int.(300/256) = 1
n1 = 300 - (1 x 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.

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

---

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

### 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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.

| ML320 | | | | | |
|---|---|---|---|---|---|
| **CPI** | **10** | **12** | **15** | **17** | **20** |
| **n1** | 0 ≤ n1 ≤ 78 | 0 ≤ n1 ≤ 93 | 0 ≤ n1 ≤ 117 | 0 ≤ n1 ≤ 133 | 0 ≤ n1 ≤ 156 |
| **n2** | 2 ≤ n2 ≤ 80 | 3 ≤ n2 ≤ 96 | 3 ≤ n2 ≤ 120 | 4 ≤ n2 ≤ 137 | 4 ≤ n2 ≤ 160 |
| | n2 ≥ n1 + 2 | n2 ≥ n1 + 3 | n2 ≥ n1 + 3 | n2 ≥ n1 + 4 | n2 ≥ n1 = 4 |
| **ML321** | | | | | |
| **n1** | 0 ≤ n1 ≤ 134 | 0 ≤ n1 ≤ 160 | 0 ≤ n1 ≤ 192 | 0 ≤ n1 ≤ 229 | 0 ≤ n1 ≤ 251 |
| **n2** | 2 ≤ n2 ≤ 136 | 3 ≤ n2 ≤ 163 | 3 ≤ n2 ≤ 195 | 4 ≤ n2 ≤ 233 | 4 ≤ n2 ≤ 255 |
| | n2 ≥ n1 + 2 | n2 ≥ n1 + 3 | n2 ≥ n1 + 3 | n2 ≥ n1 + 4 | n2 ≥ 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 ≥ 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 you have, you have your MICROLINE set in 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 Verticai 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Master reset | 27 64 | 1B 40 | ESC @ | F |

## Print suppress

| Print suppress | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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).

Chapter 7

# Epson FX Mode Advanced Features

## Downline Loadable Character Generator (DLL)

| DLL | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| Copy ROM to DLL RAM<br>n = 0 Copy Courier font<br>n = 1 Copy Sans Serif Font | 27 58 0<br>n 0 | 1B 3A 00<br>n 00 | ESC : NUL<br>n NUL | F |
| Load character into DLL | ESC & NUL | 27 38 0 | 1B 26 00 | F |
| Designate Utility DLL | ESC % SOH | 27 37 1 | 1B 25 01 | F |
| Designate normal character generator | ESC & NUL | 27 37 0 | 1B 25 00 | 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. So, 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

Any number of characters between 1 and 256 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.

Therefore 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".

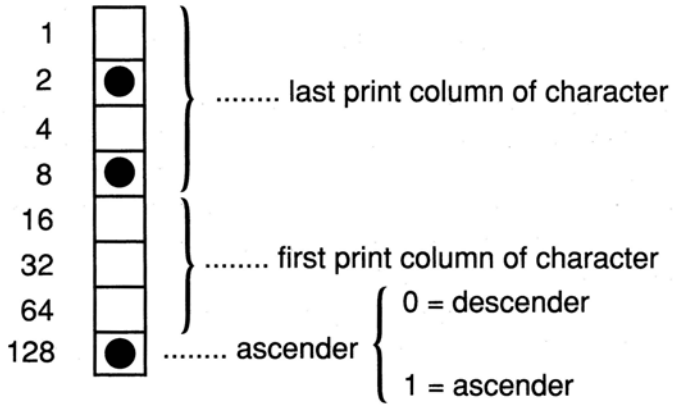
When you have loaded your customised characters they will remain in the DLL RAM in the location of the characters that they replaced.

### 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 emphasised 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**

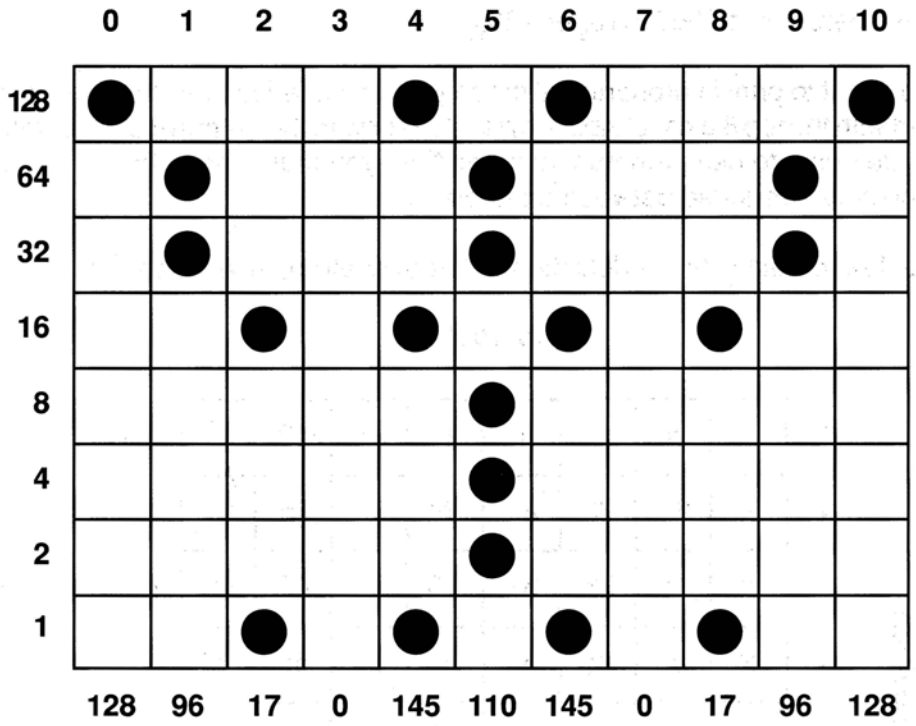
| Start position | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|
| **0** | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| **1** | X | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| **2** | X | X | 38 | 39 | 40 | 41 | 42 | 43 |
| **3** | X | X | X | 55 | 56 | 57 | 58 | 59 |
| **4** | X | X | X | 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 |

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:




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 Programme Example: Loading One Nonproportional Character

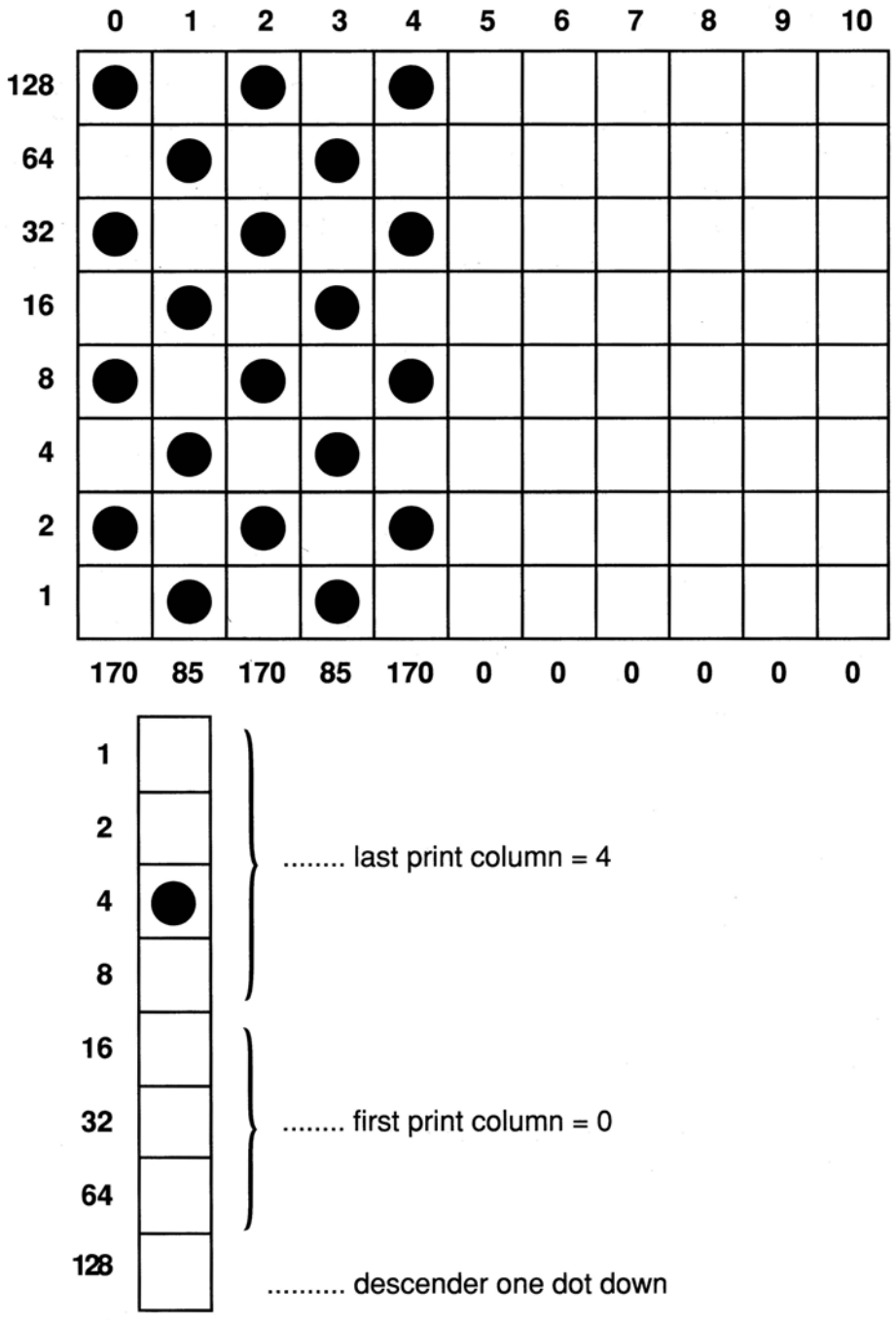
```
 10 LPRINT CHR$(27);CHR$(58);CHR$(0);CHR$(0)
                          REM *** COPY ROM (COURIER) INTO DLL CG
 30 LPRINT CHR$(27);CHR$(38);CHR$(0)
                          REM *** LOAD DLL CG **********
 40 LPRINT "A";"A";:  REM *** LOAD FROM A TO A *********
 70 LPRINT CHR$(138);: REM *** SEND 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$(128)
                            REM *** SELECT DLL **********
120 LPRINT "Now please take a look at the capital Greek psi A A A A A"
130 LPRINT CHR$(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.




The attribute byte is 4.

Here is the Programme Example: Loading One Proportional Character

```
10 LPRINT CHR$(27);CHR$(58);CHR$(0);CHR$(0)
                          REM *** COPY ROM (COURIER) INTO DLL CG
   20 LPRINT CHR$(27);CHR$(38);CHR$(0)
                          REM *** LOAD DLL CG **********
   30 LPRINT "B";"B";:   REM *** LOAD FROM B TO B *********
   40 LPRINT CHR$(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)
                         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
```

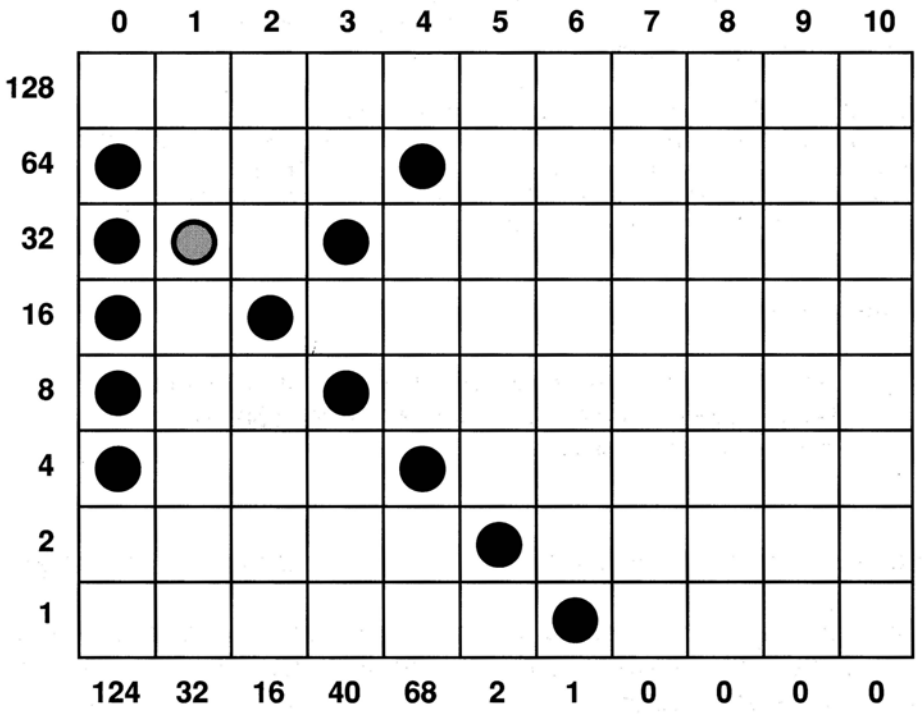
When proportional mode is selected the character is printed in the emphasised mode.

To see what a difference the attribute byte has in the proportional mode try running the programme 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.




**Note:** It is not possible to print adjacent dots (e.g. ), but you can load them.

Here is the Programme Example: Loading Multiple Characters

```
10 LPRINT CHR$(27);CHR$(58);CHR$(0);CHR$(0)
                      REM *** COPY ROM (COURIER) INTO DLL CG
20 LPRINT CHR$(27);CHR$(38);CHR$(0)
                      REM *** LOAD DLL CG **********
30 LPRINT "A";"C";:  REM *** LOAD FROM A TO C *********
40 LPRINT CHR$(138);:
                     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 ▮ ϰ
```

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-graphic.

**Select bit-image graphic density**

| Bit-Image graphic density | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| 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 | Quadruple 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 hardcopies from video screens.

Here is the programme:

```
10 REM demo of different densities
 20 :
 30 DATA 128,64,32,144,72,36,18,9,4,2,1,0,0,0,0:       REM pattern data
 40 :
 45 WIDTH "lpt1:",255
 50 RESTORE
 51 AP$=""
 55 :
 60 FOR N = 1 TO 15
 70 READ P
 80 AP$ = AP$+CHR$(A):              REM create graphic string
 90 NEXT N
100 :
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).

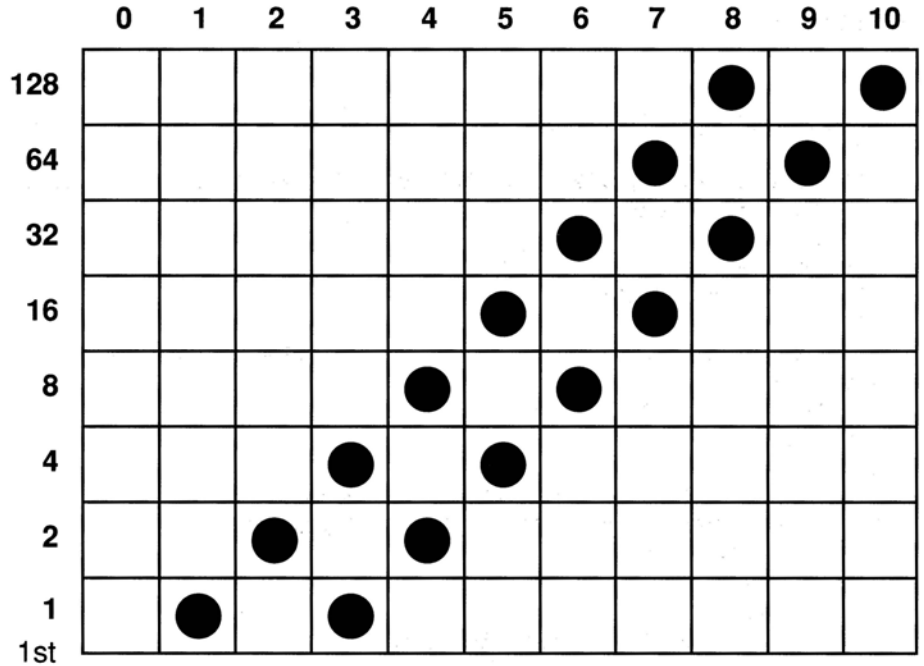
### Nine Pin APA-Graphic-mode

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

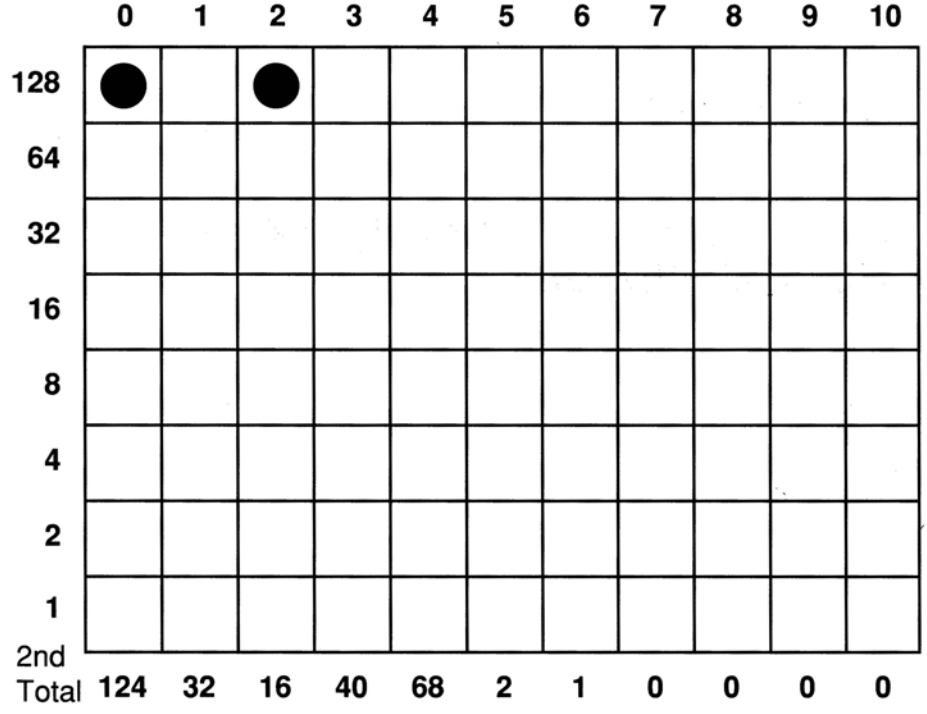
| Bit-Image graphic density | Decimal | Hexa-decimal | ASCII | Compati-bility |
|---|---|---|---|---|
| Select bit-image graphic density | 27 94 m n n2 | 1B 5E m n1 n2 | ESC ^ m n1 n2 | F |

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 the IBM-Bit Image graphic 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 |




First byte




Second byte

For every column the first and second bytes must be sent as the data for the nine-pin graphic.

Here is the programme:

```
10 REM 9 pin graphic demo
 20 :
 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
 50 :
 60 RESTORE
 70 WIDTH "lpt1:",255
 80:
 90 FOR I = 1 TO 22                          REM create graphic string
100 READ A
110 AP$ = AP$+CHR$(A)
120 NEXT I
130 :
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 Modes

P = Proprinter XL Mode G = Graphics printer Mode F = Epson FX Mode

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **Automatic line feed** | | | | |
| Auto LF OF | 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 |
| **Carriage return** | | | | |
| Carriage return | CR | 13 | 0D | P G |
| **Character sets** | | | | |
| IBM Character set I | ESC 7 | 27 55 | 1B 37 | P G |
| IBM Character set II | ESC 6 | 27 54 | 1B 36 | P G |
| International character set | ESC ! n | 27 33 n | 1B 21 n | P G |
| Select code page | ESC [ T ENQ NUL NUL NUL n1 n2 NUL | 27 91 84 5 0 0 0 n1 n2 0 | 1B 5B 54 05 00 00 00 n1 n2 00 | P G |
| Print from all character set (one character only) | ESC ^ n | 27 94 n | 1B 5E n | P |
| Print from all character set (continuously) | ESC \ n1 n2 | 27 92 n1 n2 | 1B 5C n1 n2 | P |
| **Character pitch** | | | | |
| 10 CPI (pica) | DC2 | 18 | 12 | P G |
| 12 CPI (elite) | ESC : | 27 58 | 1B 3A | P G |
| 15 or 17 CPI (condensed) | SI | 15 | 0F | P G |
| 15 CPI (condensed) | ESC g | 27 103 | 1B 67 | P G F |
| **Clear Buffer** | | | | |
| Clear Buffer | CAN | 24 | 18 | P G |
| **Cut sheet feeder** | | | | |
| CSF single sheet eject | ESC EM R | 27 25 82 | 1B 19 52 | P G F |
| CSF single sheet insert | ESC EM I | 27 25 73 | 1B 19 49 | P G F |
| **Double height** | | | | |
| Double height characters | ESC [ @ | 27 91 64 | 1B 5B 40 | P G F |

# IBM Modes

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **Double width** | | | | |
| Double width (for one line only) | SO | 14 | 0E | P G |
| Double width OFF (before end of line) | DC4 | 20 | 14 | P G |
| Double width OFF | ESC W 0 | 27 87 48 | 1B 57 30 | P G |
| Double width ON | ESC W 1 | 27 87 49 | 1B 57 31 | P G |
| **Downline loadable chr.gen.** | | | | |
| Copy std set to DLL CG | ESC $ | 27 36 | 1B 24 | G |
| 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 |
| Designates DLL quasi-NLQ | ESC % Z | 27 37 90 | 1B 25 5A | G |
| Designates DLL UM chr. set | ESC % Y | 27 37 89 | 1B 25 59 | G |
| Exit DLL | ESC I 1 | 27 73 49 | 1B 49 31 | G |
| | or ESC 13 | 27 73 51 | 1B 49 33 | |
| Exit DLL | ESC I 0 | 27 73 48 | 1B 49 30 | P |
| | or ESC I 2 | 27 73 50 | 1B 49 32 | |
| Load DLL ascender | ESC % A | 27 37 65 | 1B 25 41 m | G |
| | m n1-n11 | m n1-n11 | n1-n11 | |
| Load DLL descender | ESC % D | 27 37 68 | 1B 25 44 m | G |
| | m n1-n11 | m n1-n11 | n1-n11 | |
| Load Ppr DLL CG | ESC = n1 | 27 61 n1 | 18 3D n1 | P G |
| Enhanced ON (double strike) | ESC G | 27 71 | 1B 47 | G |
| **Emphasised/enhanced** | | | | |
| Designates enhanced mode | ESC I 2 | 27 73 50 | 1B 49 32 | G |
| Emphasised OFF | ESC F | 27 70 | 1B 46 | P G |
| Emphasised ON | ESC E | 27 69 | 1B 45 | P G |
| Enhanced OFF (double strike) | ESC H | 27 72 | 1B 48 | G |
| Enhanced ON (double strike) | ESC G | 27 71 | 1B 47 | G |

# IBM Modes

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **Formatting** | | | | |
| Form feed | FF | 12 | 0C | P G |
| Form length by inches (n=1 to 22 (XL:255)) | ESC C NUL n | 27 67 0 n | 1B 43 00 n | P G |
| Form length by lines (n =1 to 127; (XL:255)) | ESC C n | 27 67 n | 1B 43 n | P G |
| 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 G |
| Density double half speed (120 x 72 DPI) (Quasi NLQ) | ESC L n1 n2 | 27 76 n1 n2 | 1B 4C n1 n2 | P G |
| Density Quadrupl (240 x 72 DPI) | ESC Z n1 n2 | 27 90 n1 n2 | 1B 5a n1 n2 | P G |
| Density single (60 x 72 DPI) | ESC K n1 n2 | 27 75 n1 n2 | 1B 4B n1 n2 | P G |
| **Horizontal tabs** | | | | |
| Horizontal tabulator skip | HT | 9 | 09 | P G |
| HTABS clear | ESC D NUL | 27 68 0 | 1B 44 00 | P G |
| HTABS set by characters (k = 28 max.) | ESC D n1 - nk NUL | 27 68 n1 - nk 0 | 1B 44 n1 - nk 00 | P G |
| **Indenting** | | | | |
| INDENTING (print pos. by dot) | ESC % B n1 - n4 | 27 37 66 n1 - n4 | 1B 25 42 n1 - n4 | P G |
| **Italics** | | | | |
| Italics (SLANT) OFF | ESC % H | 27 37 72 | 1B 25 48 | P G |
| Italics (SLANT) ON | ESC % G | 27 37 71 | 1B 25 47 | P G |
| **Line Feed** | | | | |
| Line Feed | LF | 10 | 0A | P G |
| VAR. Line Feed n/216inch | ESC J n | 27 74 n | 1B 4A n | P G |

# IBM Modes

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **Line spacing** | | | | |
| 6 LPI (without prev. ESC A n) | ESC 2 | 27 50 | 1B 32 | P G |
| 8 LPI | ESC 0 | 27 48 | 1B 30 | P G |
| Enable variable line spacing (activates ESC A n) | ESC 2 | 27 50 | 1B 32 | P G |
| Line spacing 7/72 inch (for 7-bit graphics | | | | |
| Var.line spacing n/216 inch (n=0 to 255) | ESC 3 n | 27 51 n | 1B 33 n | P G |
| Variable line spacing n/72 inch (ESC 2 must follow!!) (n=1 to 85) | ESC A n | 27 65 n | 1B 41 n | P G |
| **Margins** | | | | |
| Margin set left and right (by character columns) | ESC X n1 n2 | 27 88 n1 n2 | 1B 58 n1n2 | P G |
| **Near Letter Quality** | | | | |
| Designates NLQ mode (Near Letter Quality)\ | ESC I 3 | 27 73 51 | 1B 49 33 | G |
| Designates NLQ mode (Near Letter Quality) | ESC I 2 | 27 73 50 | 1B 49 32 | P |
| NLQ mode start | ESC G | 27 71 | 1B 47 | P |
| NLQ Mode stop | 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 G |
| Paper-out sensor ON | ESC 9 | 27 57 | 1B 39 | P G |
| **Print head direction** | | | | |
| Unidir. print (home head) (for one line on ly) | ESC < | 27 60 | 1B 3C | G |
| Unidirectional print OFF | ESC U 0 | 27 85 48 | 1B 55 30 | P G |
| Unidirectional print ON | ESC U 1 | 27 85 49 | 1B 55 31 | P G |

# IBM Modes

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **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 % Q | 27 37 81 | 1B 25 51 | G |
| Proportional spacing OFF (for the proprint er mode) | ESC P 0 | 27 80 48 | 1B 50 30 | P |
| Proportional spacing ON | ESC % P | 27 37 80 | 1B 25 50 | G |
| Proportional spacing ON (for the proprinter mode) | ESC P 1 | 27 80 49 | 1B 50 31 | P |
| **Skip-over perforation** | | | | |
| Skip-over perforation (n=1 to 1227 (XL:255) | ESC N n | 27 78 n | 1B 4E n | P G |
| Skip-over perforation OFF | ESC O | 27 79 | 1B 4F | P G |
| **Spacing between characters** | | | | |
| Space between characters (n=0 to 11) | ESC V n | 27 86 n | 1B 56 n | P G |
| **Subscript/superscript** | | | | |
| Subscript/Superscript OFF | ESC T | 27 84 | 1B 54 | P G |
| Subscript ON (SOH or any odd no.) | ESC S 1 | 27 83 49 | 1B 53 31 | P G |
| Superscript ON (NUL or any even No.) | ESC S 0 | 27 83 48 | 1B 53 30 | P G |
| **Underlining** | | | | |
| Underlining OFF (underscore) | ESC - 0 | 27 45 48 | 1B 2D 30 | P G |
| Underline ON (underscore) | ESC - 1 | 27 45 49 | 1B 2D 31 | P G |

# IBM Modes

| Function | Control Code | | | Compatibility |
|---|---|---|---|---|
| | ASCII | Decimal | Hexadecimal | |
| **Utility/draft mode**<br>Designates HSD mode (SSD at 12 CPI) | ESC # 0 | 27 35 48 | 1B 23 30 | P G |
| Designates Utility mode | ESC I 1 | 27 73 49 | 1B 49 31 | G |
| Designates Utility mode | ESC I 0 | 27 73 48 | 1B 49 30 | P |
| **Vertical tabs**<br>Cancel VTABS, set HTABS 8. | ESC R | 27 82 | 1B 52 | P |
| Vertical tabulator cancel | ESC B NUL | 27 66 0 | 1B 42 00 | P G |
| Vertical tabulator set | ESC B n1... n64 NUL | 27 66 n1... n64 0 | 1b 42 n1... n64 00 | P G |
| Vertical tabulator skip (same as LF if no tab) | VT | 11 | 0B | P G |

# Epson FX Mode

(FX - 85/FX - 105 Compatible)

| Function | Control Code | | |
|---|---|---|---|
| | ASCII | Decimal | Hexadecimal |
| **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 78 | 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 |
| 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 area expansion** | | | |
| Code area expansion (0 - 31 and 128 - 159) | ESC I 1 | 27 73 49 | 1B 49 31 |
| Return areas to control areas | ESC I 0 | 27 73 48 | 1B 49 30 |
| Code area expansion (128 - 159 and 255) | ESC 6 | 27 54 | 1B 36 |
| Returns areas to control areas | ESC 7 | 27 55 | 1B 37 |
| **Composite selection** | | | |
| Composite selection (of printmodes) | ESC ! n | 27 33 n | 1B 21 n |

# Epson FX Mode

| Function | Control Code | | |
|---|---|---|---|
| | ASCII | Decimal | Hexadecimal |
| **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 |
| **Downline loadable chr.gen.** | | | |
| Copy STD 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 |

# Epson FX Mode

| Function | Control Code | | |
|---|---|---|---|
| | ASCII | Decimal | Hexadecimal |
| **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 | ESC * m n1 | 27 42 p n1 | 1B 2A pn1 |
| m = 0 to 7 | n2 v1 - vk | n2 v1 - vk | n2 v1 - vk |
| Select 9 bit graphics | ESC ^ m n1 | 27 94 m n1 | 1B 5E m n1 |
| m = 0 to 9 | n2 v... | n2 v... | 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 |
| **Horizontal tabs** | | | |
| Horizontal tabulator skip | HT | 9 | 09 |
| HTABS clear | ESC D NUL | 27 68 0 | 1B 44 00 |
| HTABS set by characters (k = max. 32) | ESC D n1 - nk NUL | 27 68 n1 - nk 00 | 1B 44 n1 - 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 |
| Var. line feed n/216 inch (n = 0 to 255) | ESC J n | 27 74 n | 1B 4A n |
| Var. rev. line feed n/216 inch (n = 0 to 255) | ESC j n | 27 106 n | 1B 6A n |

# Epson FX Mode

| Function | Control Code | | |
|---|---|---|---|
| | ASCII | Decimal | Hexadecimal |
| **Line Spacing** | | | |
| 6 LPI | ESC 2 | 27 50 | 1B 32 |
| 8 LPI | ESC 0 | 27 48 | 1B 30 |
| Line spacing 7/72 inch (for 7 bit graphics) | ESC 1 | 27 49 | 1B 31 |
| VAR. Line spacing n/216 inch (n = 1 to 255) | ESC 3 n | 27 51 n | 1B 33 n |
| VAR. Line spacing n/72 inch (n = 1 to 85) | ESC A n | 27 65 n | 1B 41 n |
| **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 |
| **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 (left, mid, right, full) | ESC a n | 27 97 n | 1B 61 n |
| 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** | | | |
| Unidir. print (home head) for one line only) | ESC < | 27 60 | 1B 3C |
| Unidirectional print OFF | ESC U 0 | 27 85 48 | 1B 55 30 |
| Unidirectional print ON | ESC U 1 | 27 85 49 | 1B 55 31 |

# Epson FX Mode

| Function | Control Code | | |
|---|---|---|---|
| | ASCII | Decimal | Hexadecimal |
| **Print suppress** | | | |
| Print suppress OFF | DC1 | 17 | 11 |
| Print suppress ON (no print until "DC1") | DC3 | 19 | 13 |
| **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 character** | | | |
| Space between characters (n = 0 to 127) | ESC SP n | 27 32 n | 1B 20 n |
| **Subscript/superscript** | | | |
| Subscript OFF (also superscript OFF) | ESC T | 27 84 | 1B 54 |
| Subscript ON | ESC S 1 | 27 83 49 | 1B 53 31 |
| Superscript OFF (also subscript 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 (same as LF if no tab) | VT | 11 | 0B |

# Character Tables

## IBM Character Tables

### IBM Character 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 | | | ' | 7 | G | W | g | w | | | 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 | ╝ | ╠ | ■ | ∞ | ⁿ |
| D | CR | | - | = | M | ] | m | } | CR | | ¡ | ╜ | ═ | ▌ | Ø | ² |
| E | SO | | . | > | N | ^ | n | ~ | SO | | « | ╛ | ╬ | ▐ | ∈ | ∎ |
| F | SI | | / | ? | O | _ | o | | SI | | » | ┐ | ╧ | ▀ | ∩ | |

## IBM Character 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 | ▓ | ┬ | ╥ | 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 | | | ' | 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 | ₧ | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | SI | | / | ? | O | _ | o | | Â | ƒ | » | ┐ | ╧ | ▀ | ∩ | |

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

## IBM Code Pages

| ID | Code Page |
|---|---|
| **437** | **USA** |
| **850** | **Multilingual** |
| 851 | (reserved) |
| 852 | (reserved) |
| 853 | (reserved) |
| 855 | (reserved) |
| **860** | **Portugal** |
| 862 | (reserved) |
| 863 | (reserved) |
| 864 | (reserved) |
| **865** | **Norway** |
| 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** |

## 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 | ▓ | ┴ | Đ | 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 | » | ┐ | ¤ | ▀ | ´ | |

## Code Page 865 (Norway)

| | 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 | Pt | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Å | ƒ | ¤ | ┐ | ╧ | ▀ | ∩ | |

## Code Page 860 (Portugal)

| | 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 | ò | ╣ | ╔ | ┘ | θ | • |
| A | ◙ | → | * | : | J | Z | j | z | è | Ü | ¬ | ║ | ╩ | ┌ | Ω | · |
| B | ♂ | ← | + | ; | K | [ | k | { | ï | ¢ | ½ | ╗ | ╦ | █ | δ | √ |
| C | ♀ | ∟ | , | < | L | \ | l | \| | î | £ | ¼ | ╝ | ╠ | ▄ | ∞ | n |
| D | ♪ | ↔ | - | = | M | ] | m | } | ì | ¥ | ¡ | ╜ | ═ | ▌ | ϕ | 2 |
| E | ♫ | ▲ | . | > | N | ^ | n | ~ | Ä | Ş | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Å | ş | » | ┐ | ╧ | ▀ | ∩ | |

## Code Page Turkey

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | ÿ | ¿ | ╕ | ╚ | ╪ | Φ | ° |
| 9 | ○ | ↓ | ) | 9 | I | Y | i | y | ë | Ö | ò | ╣ | ╔ | ┘ | θ | • |
| A | ◙ | → | * | : | J | Z | j | z | è | Ü | ¬ | ║ | ╩ | ┌ | Ω | · |
| B | ♂ | ← | + | ; | K | [ | k | { | ï | ¢ | ½ | ╗ | ╦ | █ | δ | √ |
| C | ♀ | ∟ | , | < | L | \ | l | \| | î | £ | ¼ | ╝ | ╠ | ▄ | ∞ | ⁿ |
| D | ♪ | ↔ | - | = | M | ] | m | } | ì | ¥ | ¡ | ╜ | ═ | ▌ | ϕ | ² |
| E | ♫ | ▲ | . | > | N | ^ | n | ~ | Ä | Ş | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Å | ş | » | ┐ | ╧ | ▀ | ∩ | |

## Code Pager 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 | | ° | ΐ | Π | ϑ | 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 | ¦ | A | Z | Φ | ζ | φ |
| 7 | • | ↨ | ' | 7 | G | W | g | w | ç | ù | $ | · | H | X | η | χ |
| 8 | ◘ | ↑ | ( | 8 | H | X | h | x | ê | ÿ | ¨ | E | θ | Ψ | ϑ | ψ |
| 9 | ○ | ↓ | ) | 9 | I | Y | i | y | ë | Ö | © | H | I | Ω | ι | ω |
| A | ◙ | → | * | : | J | Z | j | z | è | Ü | | I | K | Ï | κ | ΰ |
| B | ♂ | ← | + | ; | K | [ | k | { | ï | ¢ | « | » | Λ | Ÿ | λ | υ |
| C | ♀ | ∟ | , | < | L | \ | l | \| | î | £ | ¬ | O | M | ά | μ | ό |
| D | ♪ | ↔ | - | = | M | ] | m | } | ì | ¥ | | ½ | N | έ | ν | ύ |
| E | ♫ | ▲ | | > | N | ^ | n | ~ | Ä | Pt | | Y | Ξ | ή | ξ | ώ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Å | ƒ | – | Ω | O | ί | ο | |

## 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 | Ί | ΐ | ▒ | └ | Τ | ζ | – |
| 1 | ☺ | ◀ | ! | 1 | A | Q | a | q | ü | | ΰ | ▓ | ┴ | Υ | η | ± |
| 2 | ☻ | ↕ | " | 2 | B | R | b | r | é | Ό | ό | ▓ | ┬ | Φ | ϑ | υ |
| 3 | ♥ | !! | # | 3 | C | S | c | s | â | ô | ύ | ┃ | ├ | Χ | ι | φ |
| 4 | ♦ | ¶ | $ | 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 | ● | ↨ | ' | 7 | G | W | g | w | ç | ù | Δ | Μ | Ρ | β | ν | ¸ |
| 8 | ◘ | ↑ | ( | 8 | H | X | h | x | ê | Ώ | Ε | Ν | ╚ | γ | ξ | ° |
| 9 | ○ | ↓ | ) | 9 | I | Y | i | y | ë | Ö | Ζ | ╣ | ╔ | ┘ | ο | ¨ |
| A | ◙ | → | * | : | J | Z | j | z | è | Ü | Η | ║ | ╩ | ┌ | π | ω |
| B | ♂ | ← | + | ; | K | [ | k | { | ï | ά | ½ | ╗ | ╦ | █ | ρ | ύ |
| C | ♀ | ∟ | , | < | L | \ | l | \| | î | £ | θ | ╝ | ╠ | ▄ | σ | ϑ |
| D | ♪ | ↔ | - | = | M | ] | m | } | Ε | έ | Ι | Ξ | ═ | δ | ς | ώ |
| E | ♫ | ▲ | . | > | N | ^ | n | ~ | Ä | η | « | Ο | ╬ | ε | τ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Η | ί | » | ┐ | Σ | ■ | ΄ | |

## Code Page 437 (Greek)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | ▓ | ┬ | ╥ | ε | ≥ |
| 3 | ♥ | !! | # | 3 | C | S | c | s | Δ | Y | μ | ┃ | ├ | ╙ | ή | ≤ |
| 4 | ♦ | ¶ | $ | 4 | D | T | d | t | E | Φ | ν | ┤ | ─ | ╘ | ΐ | ⌠ |
| 5 | ♣ | § | % | 5 | E | U | e | u | Z | X | ξ | ╡ | ┼ | ╒ | ι | ⌡ |
| 6 | ♠ | – | & | 6 | F | V | f | v | H | Ψ | ο | ╢ | ╞ | ╓ | 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 | Ø | ▶ | | 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 | { | П | Ы | п | ╗ | ╦ | ■ | ы | ± |
| C | ♀ | ∟ | , | < | L | \ | l | \| | М | Ь | м | ╝ | ╠ | ■ | ь | № |
| D | ♪ | ↔ | - | = | M | ] | m | } | Н | З | н | ╜ | = | ▌ | з | ¤ |
| 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 |
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| 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 | ª | ╢ | ╞ | ╓ | 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 | ₧ | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Ć | ƒ | » | ┐ | ╧ | ■ | ∩ | |

## Code Page Serbo Croatic 1

| | 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 | đ | î | £ | ¼ | ╝ | ╠ | ▄ | ∞ | ⁿ |
| D | ♪ | ↔ | - | = | M | ] | m | ć | ì | ¥ | ¡ | ╜ | ═ | ▌ | Ø | ² |
| E | ♫ | ▲ | . | > | N | ^ | n | č | Ä | Pt | « | ╛ | ╬ | ▐ | ∈ | ■ |
| F | ☼ | ▼ | / | ? | O | _ | o | ⌂ | Å | ƒ | » | ┐ | ╧ | ▀ | ∩ | |

## Code Page Serbo Croatic 2

| | 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 | ▓ | ┬ | ╥ | Γ | ≥ |
| 3 | ♥ | !! | # | 3 | C | S | c | s | Č | Đ | š | ┃ | ├ | ╙ | 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 | Š | 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 | 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 | ò |
| 3 | ♥ | !! | # | 3 | C | S | c | s | â | ô | £ | ³ | Ã | Ó | ã | ô |
| 4 | ♦ | ¶ | $ | 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 | ● | ↨ | ' | 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

## Epson 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 | | | ' | 7 | G | W | g | w | | | ' | 7 | G | W | g | w |
| 8 | BS | CAN | ( | 8 | H | X | h | x | BS | CAN | ( | 8 | H | X | h | x |
| 9 | HT | | ) | 9 | I | Y | i | y | HT | | ) | 9 | I | Y | i | y |
| A | LF | | * | : | J | Z | j | z | LF | | * | : | J | Z | j | z |
| B | VT | ESC | + | ; | K | [ | 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 | |

## Epson EMC 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 | | | ' | 7 | G | W | g | w | | | 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 | ESC | + | ; | K | [ | k | { | VT | ESC | ½ | ▒ | ╦ | ╦ | ▒ | δ | √ |
| C | FF | | , | < | L | \ | l | \| | FF | | ¼ | ▒ | ╠ | ▒ | ∞ | ⁿ |
| D | CR | | - | = | M | ] | m | } | CR | | ¡ | ▒ | ═ | ▒ | ϕ | ² |
| E | SO | | . | > | N | ^ | n | ~ | SD | | « | ▒ | ╬ | ▒ | ∈ | ∎ |
| F | SI | | / | ? | O | _ | o | | SI | | » | ▒ | ╧ | ▒ | ∩ | |

## Epson 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 | Ş | | 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 | | | ' | 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 | |

## Epson 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 | ▓ | ┬ | ╥ | 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 | | | ' | 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 | ¥ | ¡ | ╜ | ═ | ▌ | φ | ² |
| E | SO | | . | > | N | ^ | n | ~ | Ä | ₧ | « | ╛ | ╬ | ▐ | ∈ | ■ |
| 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 |
| OD H | French-Canadian | ü | $ | ë | à | Ø | â | ç | ê | î | ï | 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 | å | 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 | i | ö | ü | Ğ | _ | ç | i | ± | 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 |

| n | Epson Italic<br>ESC t NUL | Epson Graphics<br>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 |

## 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 |
| 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 |
| 31 | ¥ | 159 | ¥ |

*BEL is unavailable.

## 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 | Á | 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 | â | 140 | î | 149 | ò | 158 | Pt |
| 132 | ä | 141 | ì | 150 | û | 159 | ƒ |
| 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 |
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| 0 | | | | 0 | @ | P | ` | p | Ç | É | á | ▒ | └ | ð | Ó | - |
| 1 | | DC1 | ! | 1 | A | Q | a | q | ü | æ | í | ▓ | ┴ | Ð | 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 | | | ' | 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 (Norway)

| | 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 | | | ' | 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 | ₧ | « | ╛ | ╬ | ▌ | ∈ | ■ |
| F | SI | | / | ? | O | _ | o | ⌂ | Å | ƒ | ¤ | ┐ | ╧ | ■ | ∩ | |

## Code Page 860 (Portugal)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | | | ' | 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 Turkey

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | | | ' | 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 |
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| 0 | | | | 0 | @ | P | ` | p | Ç | É | | ° | ΐ | Π | ϑ | π |
| 1 | | DC1 | ! | 1 | A | Q | a | q | ü | æ | ‘ | ± | A | P | α | ρ |
| 2 | | DC2 | " | 2 | B | R | b | r | é | Æ | ’ | ² | B | | 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 | 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 | BS | CAN | ( | 8 | H | X | h | x | ê | ÿ | ¨ | Έ | θ | Ψ | ϑ | ψ |
| 9 | HT | | ) | 9 | I | Y | i | y | ë | Ö | © | Ή | I | Ω | ι | ω |
| A | LF | | * | : | J | Z | j | z | è | Ü | | Ί | K | Ϊ | κ | ΐ |
| B | VT | ESC | + | ; | K | [ | k | { | ï | ¢ | « | » | Λ | Ÿ | λ | υ |
| C | FF | | , | < | L | \ | l | \| | î | £ | ¬ | Ό | M | ά | μ | ό |
| D | CR | | - | = | M | ] | m | } | ì | ¥ | | ½ | N | έ | ν | ύ |
| E | SO | | | > | N | ^ | n | ~ | Ä | Pt | | Ύ | Ξ | ή | ξ | ώ |
| F | SI | | / | ? | O | _ | o | ⌂ | Å | ƒ | - | Ω | O | ί | ο | |

## 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 | Τ | ΐ | ▒ | └ | Τ | ζ | – |
| 1 | | DC1 | ! | 1 | A | Q | a | q | ü | | ΰ | ▓ | ┴ | Υ | η | ± |
| 2 | | DC2 | " | 2 | B | R | b | r | é | Ό | ά | ▓ | ┬ | Φ | ϑ | ϒ |
| 3 | | DC3 | # | 3 | C | S | c | s | â | ô | έ | │ | ├ | Χ | ι | φ |
| 4 | | DC4 | $ | 4 | D | T | d | t | ä | ö | Α | ┤ | ─ | Ψ | κ | χ |
| 5 | | | % | 5 | E | U | e | u | à | Υ | Β | Κ | ┼ | Ω | λ | ϗ |
| 6 | | | & | 6 | F | V | f | v | Α | û | Γ | Λ | Π | α | μ | ψ |
| 7 | | | ' | 7 | G | W | g | w | ç | ù | Δ | Μ | Ρ | β | ν | ¸ |
| 8 | BS | CAN | ( | 8 | H | X | h | x | ê | Ω | 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 | ϒ |
| C | FF | | , | < | L | \ | l | \| | î | £ | θ | ╝ | ╠ | ▄ | σ | ϓ |
| D | CR | | - | = | M | ] | m | } | Ε | ε | Ι | Ξ | ═ | δ | ς | ώ |
| E | SO | | . | > | N | ^ | n | ~ | Ä | η | « | Ο | ╬ | ε | τ | ▪ |
| F | SI | | / | ? | O | _ | o | ⌂ | Η | ί | » | ┐ | Σ | ■ | ΄ | |

## Code Page 437 (Greek)

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 0 | | | | 0 | @ | P | ` | p | A | P | ι | ▒ | └ | ╙ | ω | ≡ |
| 1 | | DC1 | ! | 1 | A | Q | a | q | B | Σ | κ | ▓ | ┴ | ╤ | α | ± |
| 2 | | DC2 | " | 2 | B | R | b | r | Γ | T | λ | ▓ | ┬ | ╥ | ε | ≥ |
| 3 | | DC3 | # | 3 | C | S | c | s | Δ | Y | μ | ┃ | ├ | ╙ | η | ≤ |
| 4 | | DC4 | $ | 4 | D | T | d | t | E | Φ | ν | ┫ | ─ | ╘ | ι | ⌠ |
| 5 | | | % | 5 | E | U | e | u | Z | X | ξ | ┣ | ┼ | ╒ | ι | ⌡ |
| 6 | | | & | 6 | F | V | f | v | H | Ψ | ο | ╣ | ╞ | ╓ | ό | ÷ |
| 7 | | | ' | 7 | G | W | g | w | θ | Ω | π | ╗ | ╟ | ╫ | ύ | ≈ |
| 8 | BS | CAN | ( | 8 | H | X | h | x | I | α | ρ | ╕ | ╚ | ╪ | υ | ° |
| 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 |
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| 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 | | | ' | 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 | З | н | ▒ | ═ | ▌ | з | ¤ |
| 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 |
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| 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 | Ł | 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 | | | ' | 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 | « | ╛ | ╬ | ▐ | ∈ | ■ |
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## Code Page Polska PC Latin 2

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | d | 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 | | | ' | 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 | « | ╞ | ╬ | ▐ | ∈ | ■ |
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## Code Page Serbo Croatic 1

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | ▓ | ┬ | ╥ | 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 | | | ' | 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 | Š | k | š | ï | ¢ | ½ | ╗ | ╦ | █ | δ | √ |
| C | FF | | , | < | L | Đ | l | đ | î | £ | ¼ | ╝ | ╠ | ▄ | ∞ | ⁿ |
| D | CR | | - | = | M | ] | m | ć | ì | ¥ | ¡ | ╜ | ═ | ▌ | Ø | ² |
| E | SO | | . | > | N | ^ | n | č | Ä | ₧ | « | ╛ | ╬ | ▐ | ∈ | ■ |
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## Code Page Serbo Croatic 2

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
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| 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 | | | ' | 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 | · |
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## 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 | Ð | 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 | ò |
| 3 | | DC3 | # | 3 | C | S | c | s | â | ô | £ | ³ | Ã | Ó | ã | ó |
| 4 | | DC4 | $ | 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 | 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 |
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Appendix C

# Interfacing

This appendix will help you to design 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

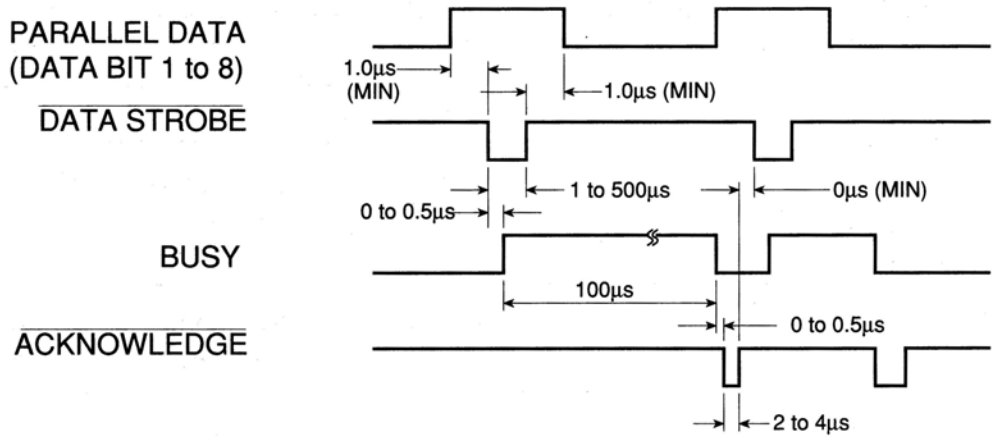
| Pin No. | Signal Name | Direction | Description |
|---|---|---|---|
| 1 | $\overline{\text{DATASTROBE}}$ | To printer | When this signal changes from low to high level, input data is sampled. |
| 2 | DATABIT 1 | To printer | Input data lines. The high level represents 1, and the low level represents 0 |
| 3 | DATABIT 2 | | |
| 4 | DATABIT 3 | | |
| 5 | DATABIT 4 | | |
| 6 | DATABIT 5 | | |
| 7 | DATABIT 6 | | |
| 8 | DATABIT 7 | | |
| 9 | DATABIT 8 | | |
| 10 | $\overline{\text{ACKNOWLEDGE}}$ | From Printer | Low signal level indicates end of data input or function operation |
| 11 | BUSY | From Printer | High signal level shows printer cannot receive data.Low signal level indicates printer is ready for receiving data |

| Pin No. | Signal Name | Direction | Description |
|---|---|---|---|
| 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* | $\overline{\text{AUTOFEED}}$ | 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 | $\overline{\text{INPUT PRIME}}$ | 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 | $\overline{\text{FAULT}}$ | From Printer | When the paper end is detected, this signal changes from high to low level |
| 36 | $\overline{\text{SELECT-IN}}$ | To Printer | 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 14 is controlled by menu.

** Pin 18 is controlled by a jumper plug in the printer. This plug is not connected at the factory default setting.

## Timing



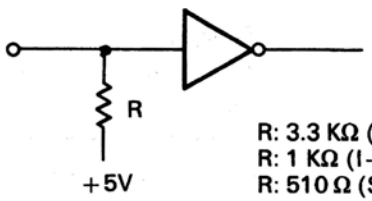

**Note:** The minimum value of TB (busy-on time) is 20 µs, and the maximum value is the time spent for printing, carriage return, and line feed.

## Signal levels

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

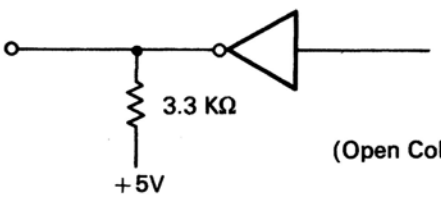
## Circuit

### (1) Receiver




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

### (2) Driver




(Open Collector)

# 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 | Symbol | 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 | Symbol | 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.

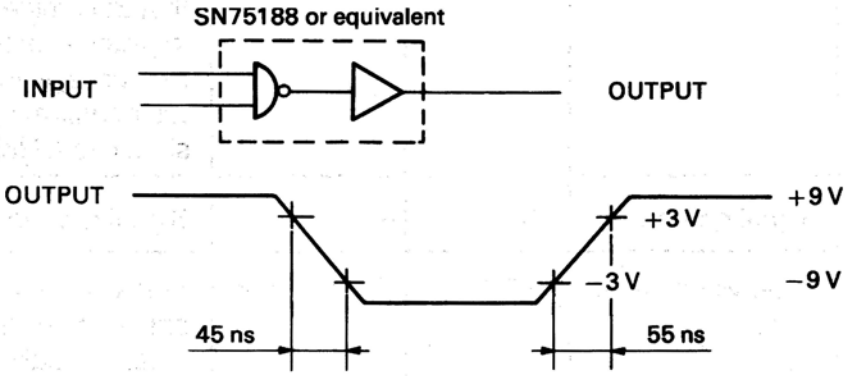
## Signal Levels

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

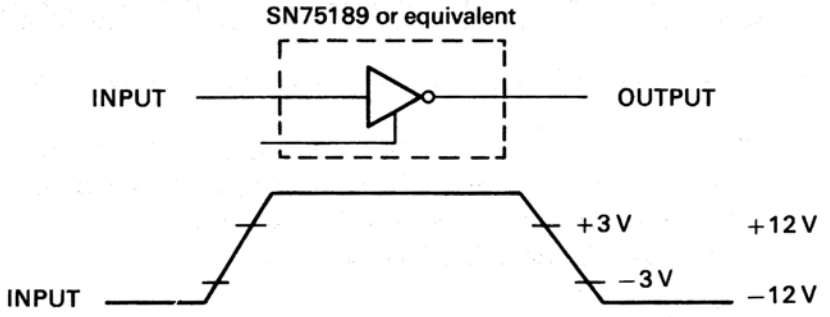
-15 to -3 V: LOW = OFF = LOGIC "1"
+15 to +3 V: HIGH = ON = LOGIC "0"

## Circuit

### (1) Driver



## (2) Receiver



# Serial Interfacing (RS-422A)

To construct a cable for an RS422A serial configuration, you will need:

- DB25P equivalent 25-pin plug, shell equivalent to DB-C1-J16.
- Beldon (or equivalent) SHIELDED cable with twisted pair conductors. Must be UL and CSA approved. The Cable MUST be shielded.
- The printer has a 37-pin DC-37S receptacle.

## Pin description

| Pin No. | Signal | Code | Direction | Connection | Function |
|---|---|---|---|---|---|
| 1 | Shield | SHILD | — | — | Cable shield |
| 3 (Note 2) | Supervisory send data | SSD | From printer | A-A' | Signal to indicate printer cannot receive data in Ready/Busy protocol |
| 21 | Supervisory send data | SSD | From printer | B-B' | |
| 4 | Send data | SD | From printer | A-A' | Data from printer |
| 22 | Send data | SD | From printer | B-B' | |
| 6 | Receive data | RD | To printer | A-A' | Data to printer |
| 24 | Receive data | RD | To printer | B-B' | |
| 7 (Note 2) | Request to send | RS | From printer | A-A' | Signal to indicate printer cannot receive data in Ready/Busy Protocol |
| 25 | Request to send | RS | From printer | B-B' | |

| Pin No. | Signal | Code | Direction | Connection | Function |
|---|---|---|---|---|---|
| 6 | Clear to send | CS + | To printer | A-A' | Reply signal to RS Printer transmits data after confirming this signal as a space |
| 24 | Clear to send | CS - | To printer | B-B' | |
| 11 (Note 3) | Data mode | DM | To printer | A-A' | Indicates that data can be sent. Printer receives data after confirming this signal as a space |
| 29 | Data mode | DM | To | B-B' | |
| 12 (Note 2) | Terminal RDY | TR | From printer | A-A' | Signal to indicate printer cannot receive data in Ready/Busy protocol |
| 30 | Terminal RDY | TR | From printer | B-B' | |
| 19 | Signal ground | SG | — | — | Signal ground |

**Notes:**
1. Pins 2, 5, 8, 10, 13, to 18, 20, 23, 26, 28, 31, and 32 to 37 are not used.
2. Pins 3 and 21 (SSD), 7 and 25 (RS), or 12 and 30 (TR) can be set selected as the busy lines by menu.
3. DM signal valid/invalid can be set by menu.

## Signal levels

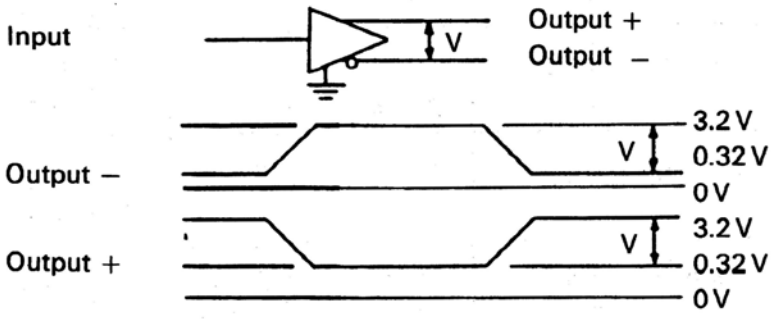
Serial interface signal levels are as specified below, and meet EIA standard RS-422A.

-0.2 V to -6.0 V: Mark = Off = Logic "1"
+0.2 V to +6.0 V: Space = On = Logic "0"

## Circuit

### (1) Line driver

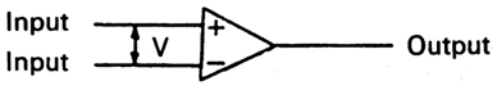
Equivalent to Am26LS31

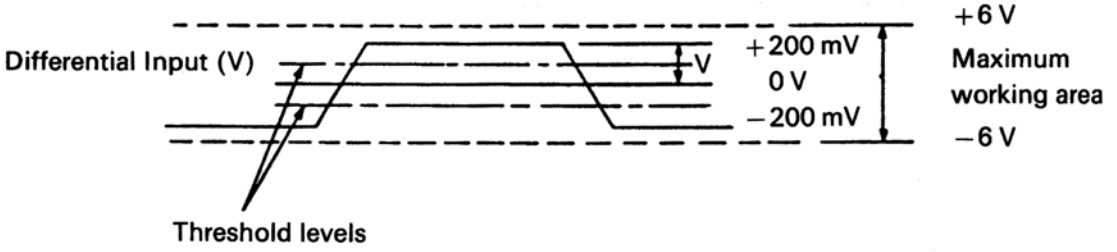



Above values assume a power supply voltage of +5V.

### (2) Line receiver

Equivalent to Am26LS32



# Menu Selections for Serial Interfacing (RS-232C, RS-422A)

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

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

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

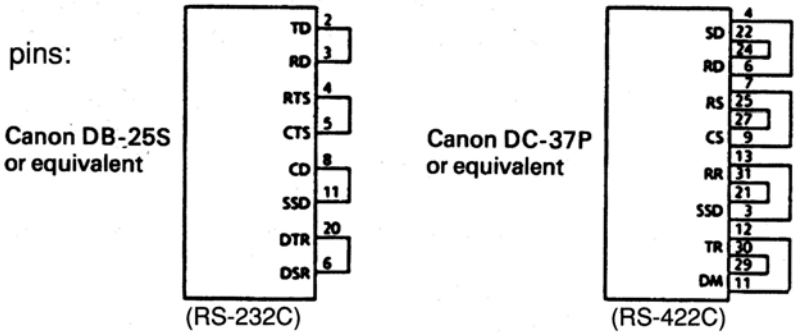
Once you have set the menu, make a printout of it for future reference.

## 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:




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.

---

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

   - 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.

## Communication procedures

Two types of communication procedures for the serial interfaces RS-232C and RS-422A can be selected by 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.

Appendix D

# Specifications

| | | |
|---|---|---|
| **Print method** | Impact dot matrix | |
| **Printhead** | 9 pin | |
| **Print Speed** | | |
| SSD | 360 cps at 12 cpi | |
| HSD | 300 cps at 10 cpi | |
| Utility | 250 cps at 10 cpi | |
| Letter | 62.5 cps at 10 cpi | |
| **Characters per line** | ML320 | ML321 |
| at 10 cpi | 80 | 136 |
| at 12 cpi | 96 | 163 |
| at 17.1 cpi | 137 | 233 |
| at 20 cpi | 160 | 272 |
| **Reliability** | | |
| Mean Time Between Failures (MTBF) | 5000 hours at 25% duty cycle, 35% page density | |
| Mean Time To Repair (MTTR) | 15 minutes | |
| Printhead life | 200 million characters | |
| Ribbon life | 3 million characters | |
| **Electrical characteristics** | | |
| Voltage | 220/240 V A C | |
| Frequency | 50/60 Hz $\pm$ 2% | |
| **Interface** | Centronics parallel standard | |
| | RS232C serial optional | |
| | RS422A serial optional | |
| **Dimensions** | ML320 | ML321 |
| Size | Depth 345mm (13.6 inch) | Depth 345mm (13.6 inch) |
| | Width 398mm (15.7 inch) | Width 552mm (21.7 inch) |
| | Height 116mm (4.6 inch) | Height 116mm (4.6 inch) |
| Weight | 8.4 kg (16 lb) | 10.1 kg (20 lb) |
| **Paper specifications** | | |
| Width | 76.2mm to 254.0mm (3 inch to 10 inch) | ML320 |
| | 76.2mm to 406.4mm (3 inch to 16 inch) | ML321 |
| **Continuous forms** | | |
| Single part forms | | |
| Weight | 12 to 24 lb. (45 - 90 g/m$^2$) | |
| Thickness | 0.051mm to 0.36mm (0.0020 inch to 0.0049 inch) | |

| | |
|---|---|
| **Continuous forms** (contd.) | |
| Multipart - carbon lined or pressure sensitive | |
| Weight | 9 to 11 lb. (24-41 g/m$^2$ ) |
| Number of copies | Original plus 3 copies |
| Thickness | 0.36mm max. (0.014 inch max.) |
| Multipart - interleaf | |
| Weight | Paper: 10 to 12 lb. (37.5-45 g/m$^2$ )<br>Carbon: 9 lb. |
| Number of copies | Original plus 3 copies |
| Thickness | 0.36mm max (0.014 inch max.) |
| **Cut sheets** | |
| Single part | |
| Weight | 12 to 24 lb. (45-90 g/m$^2$ ) |
| Thickness | 0.051mm to 0.124mm (0.002 inch to 0.0049 inch) |
| **Envelopes** (individual) | |
| Weight | 24 lb max (90 g/m$^2$ ) |
| Thickness | 0.406mm (0.016 inch max.) |
| Dimensions | 165mm x 92mm (6 1/2 inch x 3 5/8 inch)<br>225.4mm x 98.4mm (8 7/8 inch x 3 7/8 inch)<br>241.3mm x 104.8mm (9 1/2 inch x 4 1/8 inch) |
| **Card stock** | |
| Weight | 40 lb max. (163 g/m$^2$ ) |
| Thickness | 0.20mm (0.008 inch max.) |
| Dimensions | 127mm x 203mm max. (5 inch x 8 inch max.) |
| **Note:** use with bottom feed only | |
| **Labels** | |
| Carrier | 208.3mm max. (8 1/5 inch max.) width |
| Thickness | 0.28mm max. (0.011 inch max.) |
| **Note:** Use bottom feed only. Do not use fabric labels. Do not print on the edge or perforation of the label | |
| **Transparencies** | |
| Thickness | 0.10mm max. (0.004 inch max.) |
| Dimensions | 210mm W x 297mm L |

Specifications subject to change without notice

**Oki Systems (UK) Limited**
550 Dundee Road
Slough Trading Estate
Slough
Berks SL1 4LE
England
Tel: 44 (0) 753 819819
Fax: 44 (0) 753 819899

**Oki Systems (Norway) A/S**
Hvamsvingen 9
PO Box 174
N-2013 Skjetten
Norway
Tel: 47 (0) 63 89 36 00
Fax: 47 (0) 63 89 36 01

**Oki Systems (Ireland) Limited**
The Square Industrial Complex
Tallaght
Dublin 24
Ireland
Tel: 353-1-459 8666
Fax: 353-1-459 8840

**Oki Systems (Espana)**
C/Goya 9
Madrid 28001
Spain
Tel: 34 1 5777336
Fax: 34 1 5762420

**Oki Systems (Danmark) a.s.**
Park Allé 382
2625 Vallensbæk
Denmark
Tel: 45 (0) 43 666500
Fax: 45 (0) 43 666590

**Oki Systems (Sweden) AB**
PO Box 131
Stormbyvaegen
S-163 55 Spanga
Sweden
Tel: 46 (0) 8 7955880
Fax: 46 (0) 8 7956527

**Oki Systems (Italia) S.p.A.**
Centro Commerciale
"Il Girasole"
Palazzo Cellini – 3.05/B
20084 Lacchiarella (MI)
Italy
Tel: 39 (0) 2 90076410
Fax: 39 (0) 2 9007549

**Oki Systems (Holland) b.v.**
Kruisweg 765 (PO Box 690)
NL-2132 NG (2130 AR)
Hoofddorp
Holland
Tel: 31 (0) 20 6531531
Fax: 31 (0) 20 6531301

**Oki Systems (Deutschland) GmbH**
Hansallee 187
40549 Düsseldorf
Germany
Tel: 49 (0) 211 5266-0
Fax: 49 (0) 211 5933-45

**Oki Systèmes (France) S.A.**
44-50 Avenue du Général de Gaulle
94240 L'Hay les Roses
France
Tel: 33 (1) 46158000
Fax: 33 (1) 41240040

**Oki Europe Limited**
Branch Office (Prague)
IBC, Pobrezni 3
186 00 Praha 8
Czech Republic & Slovakia
Tel: 422 232 66 41 (232 66 42)
Fax: 422 232 66 21

**Oki Europe Limited**
Branch Office (Poland)
UL Grzybowska 80-82
PL-00840 Warsaw
Poland
Tel: 482 661 5407
Fax: 482 661 5451

**Oki Europe Limited**
Europa Center
Karoly (Tanacs) KRT 11.5A
H-1075 Budapest
Hungary and Romania
Tel: 361 269 7871 (361 269 7873)
Fax: 361 269 7872

**EUROPEAN HEAD OFFICE**
**Oki Europe Limited**
Central House
Balfour Road
Hounslow
Middlesex TW3 1HY
England
Tel: 44 (0) 81 577 9000
Fax: 44 (0) 81 572 7444

**EUROPEAN TECH. CENTRE**
**Oki Europe Limited**
750/751 Deal Avenue
Slough Trading Estate
Slough
Berks SL1 4SH
England
Tel: 44 (0) 753 820164
Fax: 44 (0) 753 693797

**OKI DATA CORPORATION**
4-11-22 Shibaura
Minato-Ku
Tokyo 108
Japan

# MICROLINE 320/321 ELITE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