

OKI

People to People Technology

MICROLINE
3390/3391

IBM-/EPSON-compatible

User Manual

Accessories



Roll Paper Stand (narrow version only)



Bottom Tractor (narrow, wide version),
Tractor feet



Cut Sheet Feeder, CSF
(1-Bin, 2-Bin; narrow, wide version)



Pull Tractor (narrow, wide version)



Serial Interfaces Cards:
RS-232C, RS-232C / Current Loop,
RS-422A

Legal note

The information contained in this manual is as complete, accurate and up-to-date as possible. Provided legally permissible, we shall accept no liability for consequential damage in connection with the use of this manual. Otherwise, we shall only be liable for intent or gross negligence. We make no guarantee that alterations to the software programs and devices of other manufacturers referred to in this manual will not affect the usability of the information contained in this manual.

The author reserves all rights. The manual may not be duplicated completely or in part in whatever form without the consent of the author.

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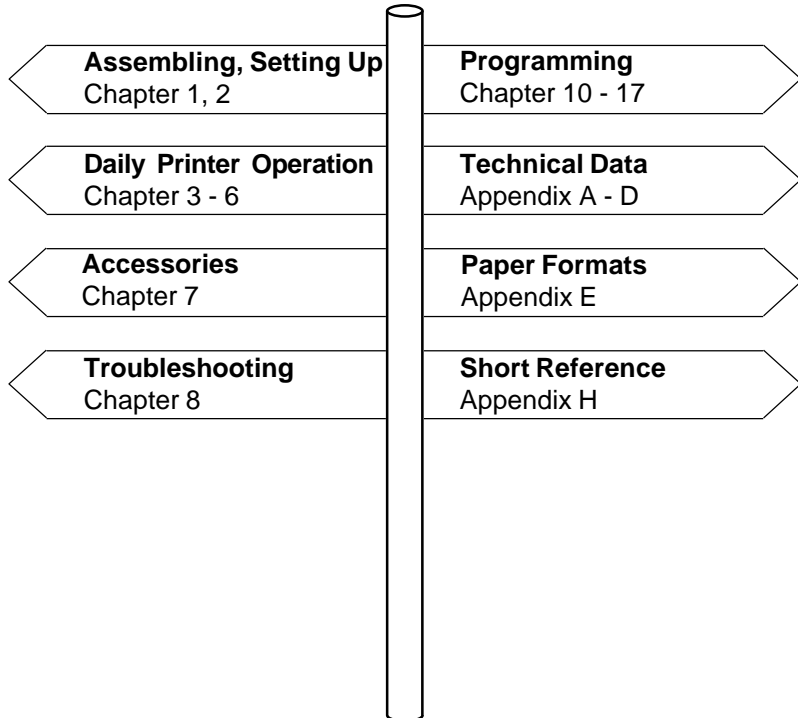
Please also read the information following the table of contents.

Guidance through the manual

The first part of this manual is directed largely at users who have no or very little technical knowledge. Experienced users, suppliers and technicians will find additional technical information in the "Programming" part and in the appendices.

There are three ways of accessing the information in this manual:

- You can read the text in the order in which the manual is arranged.
- You can find the passages you are looking for under the headings below or the table of contents.
- The index in appendix F will guide you to the passages in the manual relating to specific printer terms and messages.



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Safety advice

Your printer has been developed with the utmost care to ensure safe, reliable operation over many years. Like all electrical devices, there are a few basic precautions you need to observe. These precautions are necessary in the first instance for your own safety but also protect the printer against any damage. Please read through the manual carefully and keep it handy.

Make sure...

- the printer is standing on a stable, flat surface. To prevent overheating, there should be free space all around the printer; openings should not be covered. Never place the printer directly next to a radiator or the air outlet of an air-conditioning system. Do not expose the printer to direct sunlight;
- the printer does not come into direct contact with liquids.
- no objects are pushed into the ventilation slots of the printer as you run the risk of an electrical shock or could cause a fire;
- you only perform the routine maintenance on the printer described in the manual. Opening the case can result in an electrical shock or other harm. Make sure you always remove the plug from the mains socket before opening the printer case. Do not alter the printer in any way not described in the manual - this may cause damage to the printer and result in repairs for which you will be liable.

Like all electronic devices, the printer can be damaged by electrostatic charges. Static charges can form when walking on unsuitable floor coverings, for example, and are then transferred to the device by touching the case. Bear this in mind when choosing the location for the printer.

Setting up the printer

Power supply

Ensure yourself ...

- that the ratings of the power supply match the ratings shown on the back of the printer. If in doubt, ask your supplier;
- that the printer is connected to an earthed mains socket with the cable supplied;
- when using an extension cable or multiple socket that you do not exceed the maximum electrical load for this;
- all reasonable precautions have been taken to prevent damage to the power cable. Do not place objects on the cable and make sure it is routed so that nobody walks on it or trips over it;
- that a damaged cable is replaced immediately;
- before cleaning the printer or the case, that the power cable is removed from the power supply. Use only a clean cloth for cleaning. Do not use liquids or aerosol cleaners;
- you have removed the plug from the mains outlet to ensure complete isolation from the mains supply. The mains outlet you are using must be located close to the printer and be easily accessible.

Cable wiring

The three wires of the power cable are colour coded. The earth wire is yellow-green, the neutral wire is blue and the live current is on the brown wire.

Servicing / maintenance

Any servicing work on the machine that goes beyond the maintenance described in the manual should be carried out by an authorised supplier. We are not liable for damage arising due to unauthorised servicing or through improper maintenance by unauthorised personnel.

Advice and warning symbols

Observe all warnings and instructions stated on the product itself and in the accompanying documentation. At particularly important points in the manual, warnings are marked with appropriate symbols.

NOTE: text passages marked thus contain supplementary information or instructions.



WARNING - damage: this symbol indicates a possible cause of damage. Follow all instructions to prevent damage.



CAUTION - risk of injury: this symbol indicates a possible source of danger. Follow all instructions to prevent injury.



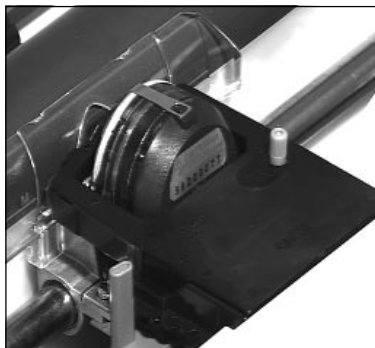
CAUTION - electricity: this symbol indicates a possible source of danger. Follow all instructions to prevent injury through an electrical shock.



CAUTION - hot: this symbol indicates a possible source of danger. Follow all instructions to prevent injury through heat.



Should you wish to replace the ribbon, do not touch the print head until it has stopped moving and has cooled down.



Printhead is HOT!

Meaning of text styles in the manual

To emphasise important passages in the text or differentiate between the meaning of a printer function and a printer message, the following text styles or emphases are used in the manual:

- **BOLD BLOCK CAPITALS** represent the display lamps of the control panel.
- **Bold letters** indicate the groups, positions and settings of the printer menu.
- **BLOCK CAPITALS** indicate the mode of the printer.
- *Italic BLOCK CAPITALS* indicate the buttons of the control panel.
- »Brackets« highlight a printer function.

Consumables / accessories

To ensure that the printer operates perfectly and provides the proper print quality, we recommend you use only original ribbons or accessories supplied by us. We accept no liability for damage resulting from the use of non-original ribbons or accessories which would have been avoided by using original ribbons or accessories.

Original ribbons and accessories can be purchased from your supplier.

To ensure good printing results, make sure you keep ribbons and printing materials (paper, transparencies, etc.) for the shortest time possible. Materials should be kept no longer than one year.

Machine-readable fonts

The perfect readability of fonts such as OCR-A, OCR-B or bar codes (EAN, UPC, Zip) by machines is affected by ...

- the printing technique (resolution, edge sharpness);
- the technical state of the printer;
- the quality of the printing medium (toner, ink ribbon);
- the state of the print material (glossiness, smoothness, coating, age, reflection, surface uniformity);
- the technical state of the reading device.

Further information

- Leave your printer components in their packing until the manual expressly describes when and how to install them.
- Do not fit or use the serial and parallel interface cables at the same time.
- Only use a clean cloth to clean the control panel and case.
- The oiling and greasing of moving parts by the user is unnecessary.
- If the machine is damaged, switch it off and remove the plug from the outlet socket. Immediately arrange for it to be repaired.
- Before contacting your supplier's customer service department, read the notes in Chapter 6. You may incur costs even during the warranty period if you call on customer service when the customer is expected to remedy the fault or defect himself as described in Chapter 6.
- **When sending off the machine, the carrier or insurer will not accept responsibility for damage due to unsuitable packing.**

Chapter 1: Assembling and setting up

Unpacking the printer

The printer is supplied in separate parts in a cardboard box.

1. Take the printer and components out of the box.
2. Remove the packing material. Keep the original packing so that you can transport the printer safely should the need arise later on.

Check that the individual items supplied are complete and undamaged. Supplied with the printer are:

Checking the items supplied



Narrow printer model



Printer parts

- Paper support
- Platen knob
- Power cable
- Ribbon cassette
- Interference filter (depending on model)

In addition, you will need a Centronics interface cable to connect the printer to the computer. Ask your supplier for one of these.

Assembling the printer

Location

Make sure ...

- the printer is standing on a stable, flat surface. To prevent overheating, make sure there is free space all around the printer; openings should not be covered. Never place the printer directly next to a radiator or the air outlet of an air-conditioning system. Do not expose the printer to direct sunlight;
- the printer does not come into direct contact with liquids;
- no objects are pushed into the ventilation slots of the printer as you run the risk of an electric shock, or other injury or causing damage to the printer;
- you only perform routine maintenance on the printer as described in the manual. Opening the case can result in an electric shock or other harm. Make sure you always remove the plug from the power socket before opening the case. Do not alter the printer in any way not described in the manual as this may cause damage to the printer and result in repairs for which you will be liable.

Like all electrical devices, the printer can be damaged by electrostatic charges. Static charges can form when walking on unsuitable floor coverings, for example, and are then transferred to the device by touching the case. Bear this in mind when choosing the location for the printer.

Power supply

Ensure yourself ...

- that the ratings of the power supply match the ratings shown on the back of the printer. If in doubt, ask your supplier;
- that the printer is connected to an earthed mains socket by means of the power cable supplied;
- when using an extension cable or multiple socket that you do not exceed the maximum electrical load for this;

- all reasonable precautions have been taken to prevent damage to the power cable. Do not place objects on the cable and make sure it is routed so that nobody walks on it or trips over it;
- that a damaged cable is replaced immediately;
- you have removed the mains plug from the socket to ensure complete isolation from the power supply. The socket provided for this must be located close to the printer and easily accessible.

Setting up the printer

Removing the transport packing

1. If a clear protective film is attached to the cover of the printer, you can remove this.



2. Open the cover of the printer and remove the transport packing. Make sure you keep this with the other packing material in case you have to transport the printer later on.



Inserting the ribbon cassette

Original ribbon cassettes are specially developed for your printer. Among other things, this concerns the ink, which contains lubricants, and the fabric of the ribbon.

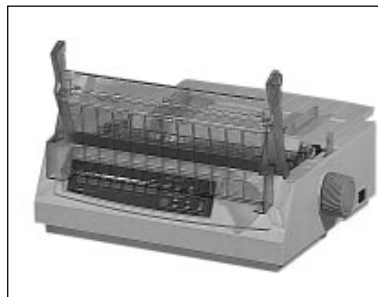


Warning!

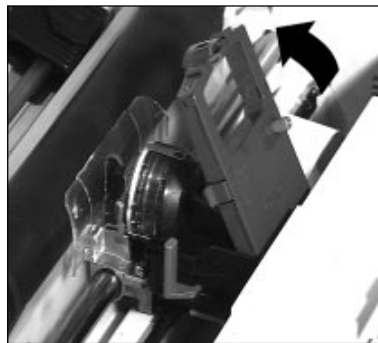
The use of non-original ribbons can result in damage to the print head. Use only the manufacturer's original ribbons.

A transparent ribbon guard is fitted to the front of the cassette. Do not remove it!

1. Take the ribbon out of the plastic wrapping.
2. Open the printer cover and move the print head to the middle of the platen.

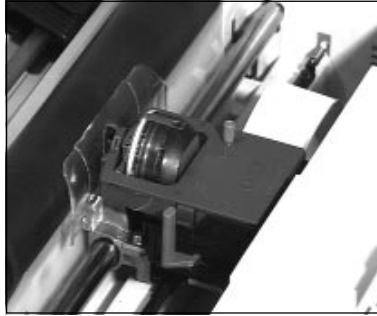


3. Place the cassette onto the cassette holder with the cutouts fitting onto the pins.



Insert ribbon cassette here

4. Tilt the cassette carefully down over the print head until you feel it click into place.
5. Turn the blue transport knob of the cassette in the direction of the arrow to tension the ribbon.
6. Close the cover of the printer.



Tilt down the cassette and tension ribbon

The paper support

The paper support with its guide rails enables the paper to be fed precisely into the printer.

1. Hold the support horizontally with the pegs on the support precisely aligned with the cutouts (◀/▶) in the case of the printer.
2. Press the support downwards on both sides until you feel it click into position.



Fitting the paper support



Raising the paper support

1. Slightly raise the paper support at the back.



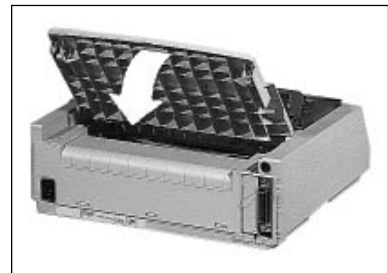
2. Pull the support forwards and slide it at this angle to its end position.



3. Align the guide rails so that they just touch the edges of the paper. A mark is provided on the left side of the paper support against which you align the left edge of the paper.



To move the paper support back into its horizontal position, raise it slightly and fold it down towards the back.



The paper support must be removed to fit accessories such as the cut sheet feeder or roll paper stand.

Removing the paper support

1. Move the paper support into the horizontal home position.



2. Press the paper support downwards at the back. This will disengage it from its catching arrangement.



The paper support must be refitted after removing the accessory.

The paper separator

The paper separator prevents paper being drawn back into the printer once it has been printed.

The paper separator has to be removed when you are using a tractor feed or cut sheet feeder (accessory). If the printer is to be used without either of these accessories, the separator must be replaced.

The paper separator is fitted to the printer at the factory.



Caution!

The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



Caution!

The print head may be hot and can burn your hands.
Wait until the print head has cooled down.

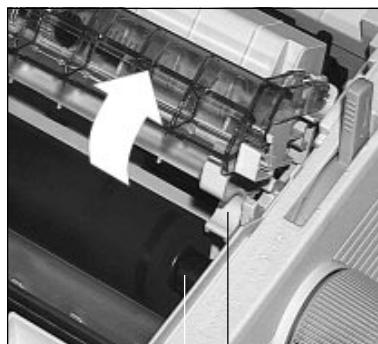
Removing the paper separator

Remove the paper separator by holding it on both sides and pulling it gently towards the front of the printer. Finally, fully remove the separator.



Fitting the paper separator

1. When you wish to refit the separator, fit the catches on both sides of the separator onto the platen axle.
2. Now press the separator downwards until the you hear the catches snap into place on both sides.



Platen axle

Catches

Connecting the printer to the computer

It is important to read the safety instructions on the first pages of this manual. Before you can use the printer, you have to connect it to your computer and to the power supply.

Your printer is supplied with a parallel Centronics interface as standard. A serial interface can be installed as an additional facility. This is described in Chapter 7; data on interfacing can be found in Appendix D.

Some printer models have an interference filter supplied with them. This square cable sleeve suppresses undesirable electromagnetic interference from other electrical sources by means of its ferrite core.

Fitting the interference filter
(cable sleeve)

1. Open the cable sleeve of the filter and fit it on the interface cable close to the connector at the printer end.



2. Snap the sleeve shut to close it; the cable now has interference suppression.



Note!

The parallel and serial interface cables must not be installed or used at the same time as this may cause malfunctions.

Fitting interface cable

1. Plug the printer end of the parallel interface cable into the socket on the back of the printer. Secure the cable by means of the two clips.
2. Connect the other end of the interface cable to the corresponding socket of your computer. Refer to the relevant instructions in your computer manual.



Parallel interface cable

Connecting the printer to the power supply



Caution!

There is electricity present and therefore a risk of an electric shock. Switch off the printer.

1. Plug the power cable into the power socket on the back of the printer. Make sure the printer is **switched off** (POWER OFF) when doing this.



Power switch

Power cable

2. Plug the other end of the cable into an earthed mains outlet socket.
3. Switch on the printer and the computer by means of the respective power switches.

Your printer is now ready for operation.

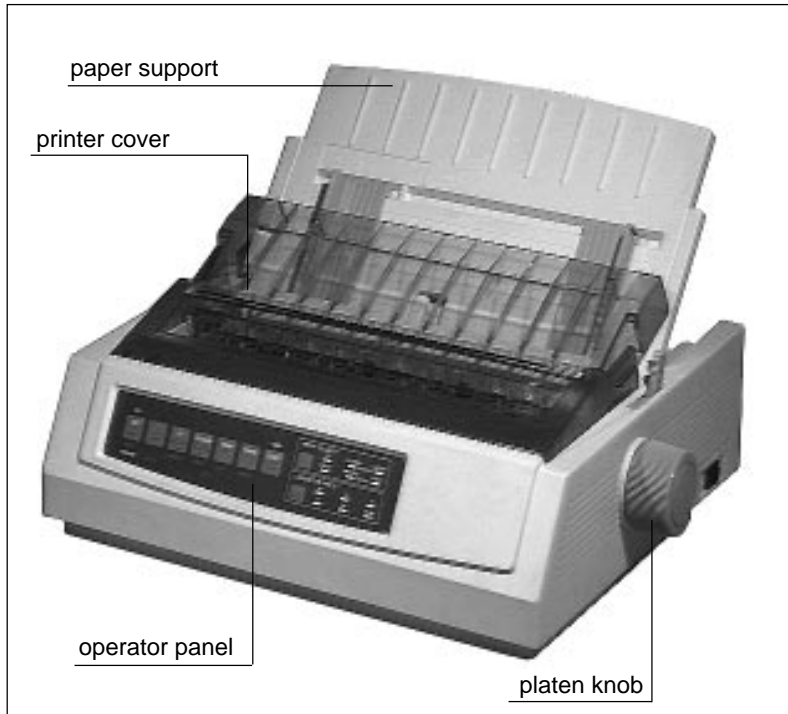
Emulation / printer drivers

In the chapter "Printer drivers" you will find information on how you can best match the emulation (language) of your printer to the driver of your application program in order to make full use the functions of the printer.

How to choose the emulation by means of the printer menu is described in the chapter "Printer menu settings".

Chapter 2: A guided tour of the printer

The printer and its components



Front view

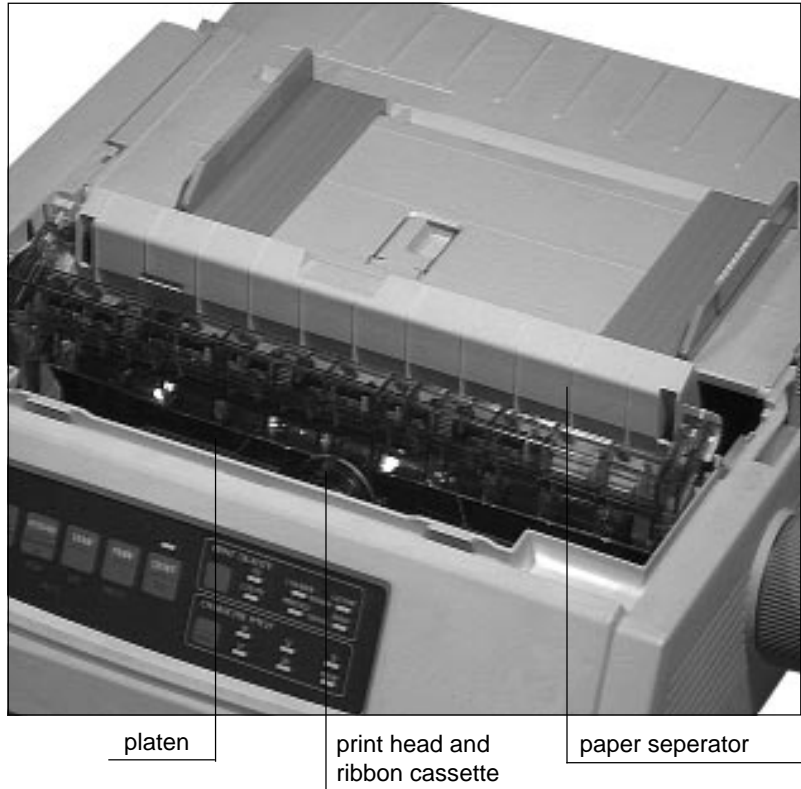
The **operator panel** indicators inform you of the operating status of the printer. You can also use it to enter settings and test the printer.

The **platen knob** enables you to advance the paper when the printer is **SWITCHED OFF**.

The **paper support** enables precise feeding of cut sheets of paper.

The **printer cover** consists of two sections and protects the printer mechanism from dirt and reduces the printing noise.

Inside view

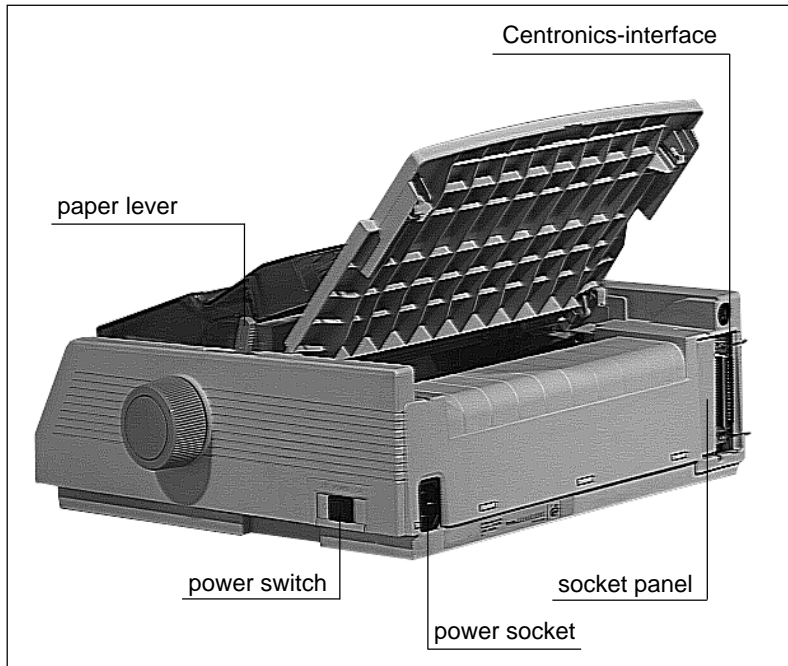


The **print head** is the part of the printer that contains the printing pins.

The original **ribbon cassette** contains the high-quality ink necessary for perfect printing.

The **platen** advances the paper during the printing process.

The **paper separator** prevents paper that has just been ejected from being drawn back into the printer.



Rear view

The printer and computer are connected by means of the interface socket. The parallel **Centronics interface** or a **serial interface** (accessory) are provided for this purpose.

The **socket panel** must be broken out in order to fit a serial interface.

Power is supplied to the printer by plugging the power cable into the **power socket**.

The printer is switched on or off by means of the **power switch**.

The paper feed is adjusted by means of the **paper lever**.

The operator panel

The operator panel allows you to control the printer and change settings. The indicator lamps show the current status of the printer. The meaning and function of the buttons depends on the current operating mode of the printer.

The indicator lamps



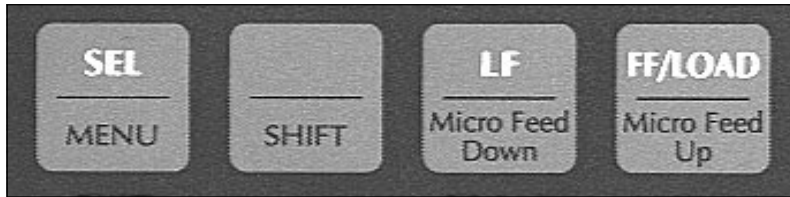
POWER: The printer is switched on.

ALARM: An error is present which is preventing normal printing operation (paper jam, end of paper).

SEL: The printer is ready (ON LINE) to receive data from the computer. If this lamp is not lit, the printer is in OFF LINE mode and not ready to receive data. If the lamp is blinking, the printer is in print suppress mode and is ignoring all data sent to it until this mode is cancelled.

MENU: The menu mode is activated. In this mode, you can alter printer settings as you wish and permanently store these settings. The menu mode is described in detail in Chapter 4. The **MENU** lamp blinks if the temperature control mechanism has reduced the printing speed in order to prevent overheating of the print head.

The buttons



Micro Feed Down: The paper is transported backwards in steps of 1/180 inch (downwards). Simultaneously press the *SHIFT* and *Down* buttons to be able to use the »Micro Feed Down« function.

Micro Feed Up: The paper is transported forwards in steps of 1/180 inch (upwards). Simultaneously press the *SHIFT* and *Up* buttons to be able to use the »Micro Feed Up« function.

SHIFT: To be able to use the bottom button functions such as *MENU* and *TOF*, simultaneously press the *SHIFT* button and the corresponding button.

SEL: Switches the printer ON LINE or OFF LINE as you wish. The associated indicator lamp is switched on or off. Pressing the *SEL* button also cancels a currently running self test, which is described in Chapter 6.

The assignment of the buttons mentioned below is independent of the operating status of the printer. If the printer is in ON LINE or OFF LINE mode, the functions named at the top of the buttons are effective.

Button functions in
ON LINE /
OFF LINE mode



LF: Pressing this button (Line Feed) causes the printer to feed the paper forwards by one line. If a cut sheet feeder is fitted (accessory) and there is no paper in contact with the platen, pressing this button will cause a new sheet of paper to be fed from the current paper tray to the first printable line on the paper.

FF/LOAD: Pressing this button (FF, Form Feed) causes the printer to transport the next sheet of paper to the top of the page and eject the previous one. If a cut sheet feeder is in use, a new sheet of paper is fed in as far as the top of the page. If continuous paper is in use and being fed from the back or below, the paper is advanced to the next top of form position.

TEAR: The top edge of the sheet is transported beyond the top of the page to the form tear-off position so that continuous paper already printed can be torn off. How to change the tear-off position is described further on.

PARK: You can use this button when continuous paper is inserted to change over to cut sheet feed temporarily without having to remove the continuous paper from the printer. Pressing this button causes continuous paper that is being fed from the back or below to be pulled back to the park position in order to free the paper path for cut sheets. The »Park« function is described further on.

QUIET: In quiet mode, the printing noise typical for matrix printers is alleviated by reducing the printing speed. You activate or deactivate quiet mode by pressing this button. When quiet mode is activated, the associated indicator lamp lights.

TOF: This button is used to set the first printable line or top of page (Top Of Form, TOF) for continuous paper. If there is no sheet in the paper path, the Top Of Form is reset to the standard setting (8.9 mm or 1/3 inch).

In this mode, you can adjust the printer to your individual requirements. The functions you select are automatically activated when you switch on the printer.

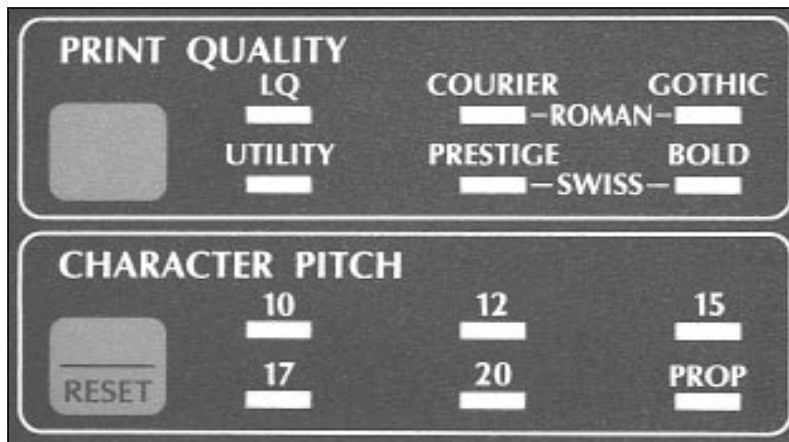
Button functions in menu mode

The alterations you make in the printer menu are stored in the printer and consequently become standard settings. They can however be changed again by software commands, via the operator panel or by resetting the menu.

The menu options and how to use the menu are described in detail in Chapter 4.

Print functions

Basic print functions can be adjusted by means of the function buttons described below. To do this, press the appropriate button until the required indicator lamp lights. You can change the functions in both ON LINE and OFF LINE mode.



In order to change a print function such as »Print Quality« (font type) or »Character Pitch« (character width), press the corresponding button until the setting you require is lit.

This part of the operator panel always indicates the current printer status. If a function is affected by a programming command, the associated display is also changed.

PRINT QUALITY

Further information on printing speed and print quality is to be found in "Appendix A: Technical Data".

The *PRINT QUALITY* button enables you to determine the print quality and the font you require for the document to be printed. An indicator lamp shows the currently activated font and print quality.

There are two print qualities available:

- **LQ**, Letter Quality: in letter quality, text is printed out with the highest resolution. The fonts listed below are available in this quality. Use one of these fonts when you wish to print high-quality documents.
 - Courier > **COURIER** is lit
 - Prestige > **PRESTIGE** is lit
 - Roman > **COURIER** and **GOTHIC** are lit
 - Swiss > **PRESTIGE** and **BOLD** are lit
 - Swiss Bold > **BOLD** is lit
 - Gothic > **GOTHIC** is lit
- **UTILITY**: In data processing quality, printing is faster, but the resolution is not as good as letter quality. In data processing quality, there is no choice of fonts.

You can print a list of the available fonts and their appearance. This is described in Chapter 8.

CHARACTER PITCH

These settings determine the width of a character in characters per inch (cpi). The settings **10**, **12**, **15**, **17.1** and **20** cpi are available. The setting, also known as *pitch* is normally 10 or 12 cpi for standard texts. However, should you wish to print more information on one page, in sheets of calculations for example, it is advisable to use a character pitch of 15, 17 or 20 cpi. Proportional spacing (**PROP**) makes the text more readable and gives it a typeset-like appearance.

Remember that the printing speed is reduced for fonts of higher quality.

The »Print Quality« and »Character Pitch« functions can also be controlled by means of the software.

To reset the printer to the settings selected in the menu, switch the printer OFF LINE and simultaneously press the buttons *SHIFT* and *RESET*. The printer switches to ready to print status (ON LINE).

RESET

Chapter 3: Paper handling

This chapter explains the different ways the printer handles paper (feeding, setting of printing position, changing between different types of paper).

Notes on paper types

- Always use good quality standard paper!

Please also read the notes in Appendices A and E.

	Feeding from ...	Weight
Cut sheets	Top	52 - 90 g/m ²
Continuous paper	Rear/bottom	
Single-part		45 - 90 g/m ²
Multi-part, NCR paper (sheet)		38 - 41 g/m ²
Multi-part with carbon paper (sheet)		38 - 45 g/m ²
Labels	Bottom	34 - 41 g/m ²
Transparencies	Top	≤ 0.1 mm

- The printer will also handle heavier weight paper sheets, multi-part paper, paper stickers on backing paper, etc.
- Recycled paper can also be used provided it matches the general paper specification. There may be a slight loss of quality due to the generally rougher quality of the paper.
- Do not use damaged sheets as the paper may be fed in incorrectly or may cause a jam.
- Unopened packets of paper should be kept flat in a cool, dry room until used. As soon as a packet is opened, the unused paper should be kept in a plastic bag. This will protect the paper against ambient moisture.
- **In order to ensure fault-free handling and the best print quality, it is best to carry out one or more trial prints before performing large print runs.**

Paper lever

Move the paper lever on the right side of the printer to the position that is appropriate to the feed path for the paper.



Continuous paper feeding: for continuous paper which is fed via the bottom or pull tractor feed, the lever must be in the **BOT** (bottom) position.



Cut sheet feeding: for feeding cut sheets via either the paper support or the cut sheet feeder, the lever must be in the **TOP** position.



Continuous paper feeding: if continuous paper is being fed from the back via the push or pull tractor feed, move the lever to **REAR**.



Adjusting for the paper thickness

Print head lever

The gap between the print head and platen is adjusted to the paper thickness or multi-part paper by means of the blue, five-position print head lever on the left side of the ribbon drive.



Paper thickness	Lever position
0.08 mm	1
0.15 mm	2
0.22 mm	3
0.29 mm	4
0.36 mm	5

Should you wish to print on thick types of paper, the gap between print head and platen must be increased:

Adjusting the print head gap



Caution!

The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



Caution!

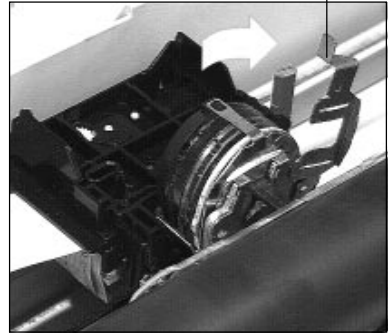
The print head may be hot and can burn your hands. Wait until the print head has cooled down.

1. Switch off the printer and open the printer cover.
2. Remove the ribbon cassette from the holder (see also Chapter 6).

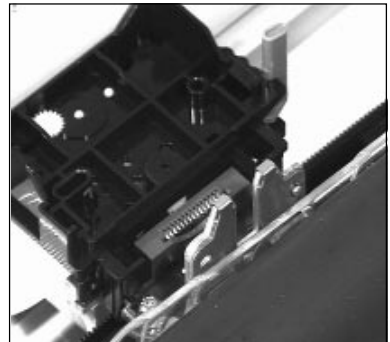


3. Release the locking plate of the print head by moving the plate upwards and sideways.
4. Remove the locking plate and place it to one side.

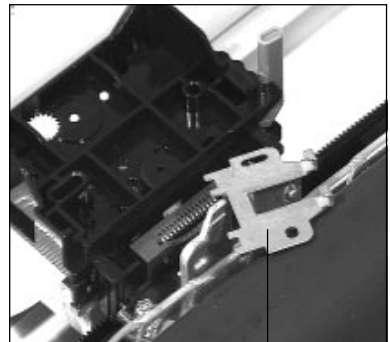
Locking plate



5. Remove the print head from its slot.



6. Take out the spacing plate.



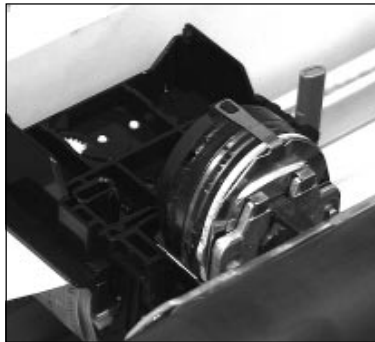
Spacing plate

7. Insert the plate in front of the print head holder, making sure that the plate fits evenly.

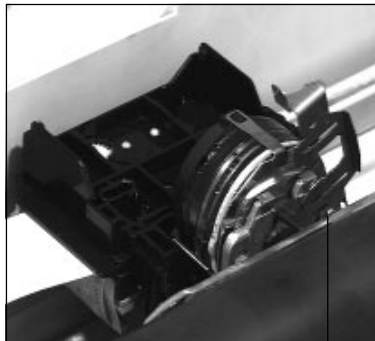


Print head holder

8. Replace the print head in the slot of the print head carriage.

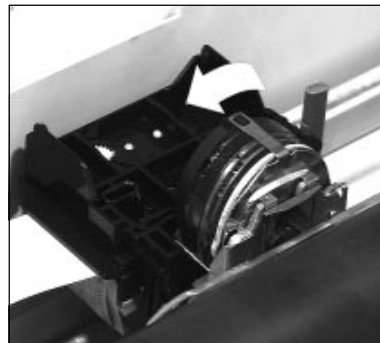


9. Place the locking plate onto the print head holder, making sure that the pin on the left of the holder properly fits into the hole in the locking plate.



Hole in locking plate

10. Pivot the locking plate down thus securing the print head.



11. Replace the ribbon cassette.
12. Close the cover of the printer and switch on the printer.



By repositioning the distance plate, the gap between the print head and the platen is increased. You are now able to print onto materials of the following thickness:

Paper thickness	Lever position
0.48 mm	1
0.55 mm	2
0.62 mm	3
0.69 mm	4
0.76 mm	5

Paper feed: cut sheets

The paper support ensures precise automatic feeding of cut sheets.

1. Move the paper lever on the right of the printer to the TOP position (cut sheet).
2. Switch the printer on.



3. Raise the paper support by lifting it at the back and sliding it into its locking position

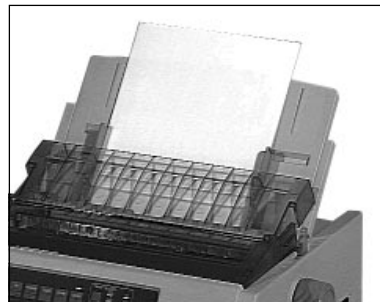


Warning!

Direct pressure on the platen can cause damage to the print head and pins.

Make sure the paper guide is correctly adjusted.

4. Insert a sheet of paper into the paper support and adjust the rails of the paper guide so that they just touch the edges of the paper. Start by aligning the left edge of the paper to the mark provided. The paper is automatically fed into the printer after the time set in the menu.



Note!

The left edge of the paper must be no more than 1.2 cm from the end of the platen.

5. Redefine the top of form if necessary by means of the »Top Of Form« function as described further on.

Paper feed: continuous paper

Long lists and large printing jobs are typical applications for continuous paper, which can be fed in from the bottom or rear of the printer as required.

Feeding continuous paper from the rear (internal tractor)

1. Move the paper lever on the right of the printer to the »Continuous paper, REAR« position.



2. Press downwards on the back of the paper support. This will release it from its catch. Remove it from the printer and place it to one side.

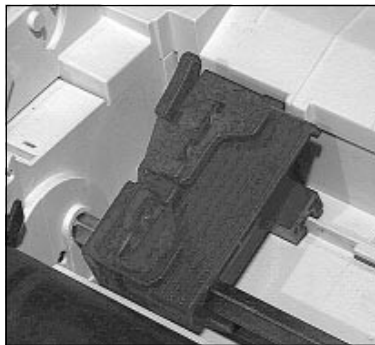


Warning!

Direct pressure on the platen can cause damage to the print head and pins.

Make sure the paper guide is correctly adjusted.

3. Release the catch lever of the left sprocket drive, adjust this to the required position and fasten the sprocket drive again.



4. Open the top part of the cover.



5. Place the continuous paper onto the first sprocket pins and close the cover again.



6. Adjust the right sprocket drive to suit the width of paper as described above. Open the cover of the right sprocket drive, place the continuous paper onto the first sprocket pins and close the cover.

7. Replace the paper support and switch the printer on. The print head will move to the left end of the platen, the active lamps of the operator panel will light. The **ALARM** lamp that lights in this case indicates that there is no paper at the printing position.



8. Press the *FF/LOAD* button, the paper is now transported to the initial printing position.

9. Set the top of form if necessary with the »Top Of Form« function. This is described later in the manual.

If the tractor feed is installed, you can also feed continuous paper from the bottom. This option is available if you have a printer stand or table with a slot which allows continuous paper to be fed in from below.

Installation of the tractor feed and paper handling is described in the chapter »Accessories«.

An additional bottom tractor feed gives you the means of feeding continuous paper from the bottom. In order to be able to use this function, you first have to fit the bottom tractor feed to allow the printer to be placed on the built-in supports.

Installation of the bottom tractor feed and paper handling is described in the chapter »Accessories«.

Feeding continuous paper from the bottom (tractor feed, accessory)

Feeding continuous paper from the bottom (tractor feed, accessory)

Switching between continuous paper and cut sheets (Park)

Your printer will allow you to switch without difficulty between printing on continuous paper and cut sheets. The continuous paper is removed from the paper path at the press of a button. You can then insert a cut sheet of paper which the printer will then draw in automatically.



Note!

Do not use the PARK function in conjunction with the pull tractor feed otherwise the continuous paper will run completely out of the tractor guide.

Changing from continuous paper to cut sheets

Do not forward paper to the PARK position by using the platen knob.

If continuous paper is being fed from the rear and you wish to change to cut sheets, proceed as follows:

1. Part the already printed pages along the perforation.
2. In ON LINE mode, press the *PARK* button. The continuous paper is transported backwards but remains held in the tractor feed.
3. Move the paper lever on the right of the printer to the middle position. The symbol for cut sheet handling (TOP) shows you the correct lever position.
4. Raise the paper support.
5. Place a sheet of paper on the paper support. Adjust the paper guide to the correct width. Start by aligning the left edge of the paper to the mark provided.
6. The paper is automatically fed in after the time set in the menu. If necessary, reset the top of form.

Changing from cut sheets to continuous paper

Do not forward paper to the PARK position by using the platen knob.

Should you wish to go back to continuous paper when you have finished printing, proceed as follows:

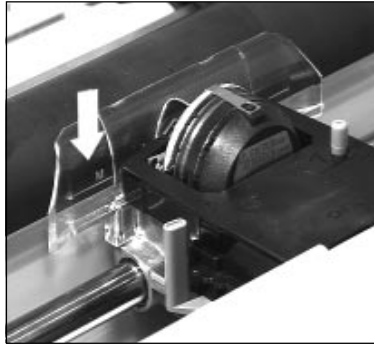
1. Press the *FF/LOAD* button to eject the cut sheet still in the printer. Do not use the platen knob to do this otherwise you will lose the top of form position you have set.
2. Move forwards the paper release lever on the right side of the printer; the symbol for continuous paper (REAR) shows you the correct position for the lever.
3. Press the *FF/LOAD* button again. The continuous paper previously removed from the paper path is drawn around the platen again.

This function is also available when you use an automatic cut sheet feeder (accessory).

Setting the top of page (Top Of Form)

With the »Top Of Form« function, you can set the line where printing is to start, the so-called top of form.

A clear paper guard is fitted at the front on the print head carriage. The red line (arrow) is the position on the current line at which the characters are printed. This line is very useful when setting the top of form position and during general printer operation.



Note!

If you are using the "Form Tear-Off" function, you first have to switch this off in the printer menu.

Should you wish to change the start of printing in the vertical direction (top of form), proceed as follows:

1. Transport the continuous paper to the next top of form or insert a cut sheet and let the printer automatically draw it in. Both occur on pressing the *FF/LOAD* button.
2. Switch the printer OFF LINE by pressing the *SEL* button; the *SEL* lamp lights.
3. Set the top of form by holding down the *SHIFT* button and simultaneously pressing one of the Micro Feed buttons. This will cause the paper to be transported *Up* or *Down* in steps of 1/180 inch.
4. The top of form chosen is stored once you have released the buttons. Switch the printer ON LINE again by pressing the *SEL* button.

Changing Top of Form

If you are using, for example, a text processing program which automatically sets a top margin, the top edge of the paper is to be set as the top of form.

*Do **not** forward paper to the new top of form position by using the platen knob.*



Note!

To set the top of form to the standard setting, simultaneously press the **SHIFT** and **TOF** buttons. There must be no paper in the print path when doing this.

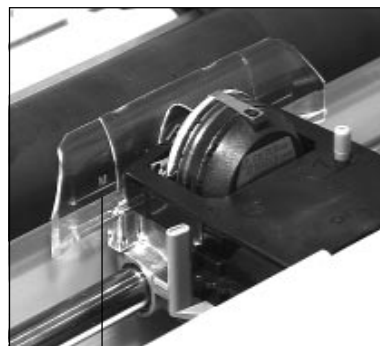
5. The top of form can be set differently for each type of paper feed, irrespective of whether you are feeding cut sheets manually, using the cut sheet feeder (CSF) or using continuous paper.

Indicating or changing the print position

The current print position is indicated by the »M« above the red line located on the clear paper guard of the print head carriage.

Should you wish to find out where the next printing position will be, simultaneously press the **SHIFT** and **PRINT QUALITY** buttons. The print head carriage will then move automatically to the new printing position.

If, when printing on pre-printed forms it is necessary to correct the current printing position in a horizontal direction or change to the next printing position, proceed as follows:



Print position (M)

1. Make sure that the printer is **ON LINE**; the **SEL** lamp lights.
2. Simultaneously press the **SHIFT** and **TEAR** buttons and the print head will move to the left. On pressing the **SHIFT** and **PARK** buttons, the print head will move to the right.

The distance the print head moves between the individual printing positions corresponds to the setting displayed under **CHARACTER PITCH**.

Automatic advance to Form Tear-Off position

If this function is active, printed pages of continuous paper are transported from the TOF position to the Form Tear-Off position to allow you to tear them off there. To do this, the continuous paper must be fed from the rear or via the additional bottom tractor feed (accessory) from below.



Note!

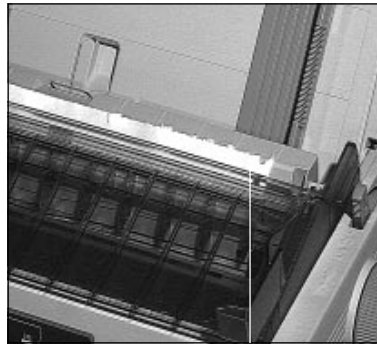
Do not use the »Form Tear-Off« function in conjunction with continuous labels on backing paper or with multi-layer forms as this can cause a paper jam.

Activate this function after setting the top of form position by means of the menu item **Form Tear-Off** for the paper path **Rear Feed** (rear of printer) or **Bottom Feed** (bottom tractor feed) by changing it from **Off** to the required time pause. After a 500 ms, one or two second pause without any further print data, the paper is transported to the tear-off position. You can then tear off the paper if you wish.

Use of the printer menu is described in Chapter 4.

The serrated tear-off edge, which you can use when the top part of the printer cover is folded forwards, is provided for this purpose.

If further data is sent to the printer, the page is pulled back to the current printing position or top of form.



Serrated tear-off edge

Checking the top of form

With the »Form Tear-Off« function activated, you can check and set the top of form by pressing the *TEAR* button in OFF LINE mode; the paper is drawn back to the top of form. Reset the top of form by pressing the *Micro Feed Up/Down* buttons with the *SHIFT* button pressed. The paper is transported to the tear-off position after making this setting.

Changing the tear-off position

Do not forward paper to the tear-off position by using the platen knob.

Should you wish to change the setting of the tear-off position, switch the printer OFF LINE with the **Form Tear-Off** function activated. Make sure the paper is at the tear-off position. Change the tear-off position by pressing the *Micro Feed Up/Down* buttons with the *SHIFT* button pressed.

When using graphics programmes, there may due to the amount of processing to be performed by the computer be pauses in the sending of data which cause the paper to be fed to the tear-off position. The unnecessary transporting of the paper can impair accurate registration of the graphics. In this situation, switch off the »Form Tear-Off« function.

Chapter 4: Printer menu settings

The printer menu

The printer menu is used to adjust your printer to suit the application. Thus, you can use the printer menu to choose the emulation. You can adjust the page length for continuous paper or cut sheets, change the font and make other settings. The changes made in the menu are stored in the printer and retained even after the printer is switched off. These settings can be changed by software commands from your application or by means of the operator panel. After switching the printer on or off, the values set in the menu come into force again. Changes to the printer menu are also retained if the mains power supply is disconnected from the printer.

The printer menu is structured as follows: at the top level, the functions are divided into so-called menu groups (GROUP). Within each group are to be found several menu items (ITEM). To each menu item in turn can be assigned a menu value (SET).

In order to change the value of a menu item, you must first call menu mode. To do this, hold down the *SHIFT* button and press the *MENU* button while the printer is in ON LINE mode. The menu mode can also be activated by holding down the *MENU* button when switching on the printer. This second option is still open to you when the operator panel is blocked by means of the **Operator Panel Function**. The menu mode is activated when the indicator lamp **MENU** is lit. The functions beneath the buttons are then activated.

Should you wish to print out the current menu settings, insert a sheet of paper in the printer and press the *PRINT* button. The menu will be printed out in data processing quality. If, in menu mode, the printing reaches the end of the paper, insert a new sheet and switch the printer ON LINE again. The print-out is immediately recommenced.

Activate menu mode

There must be paper in the printer.

Print menu settings

Changing the menu settings

- On pressing the *GROUP* button, the next group and the first menu item associated with it are output. If you simultaneously press the *SHIFT* button, the preceding menu group is selected.
- By means of the *ITEM* button, you can switch to the next menu item within a group. If you simultaneously press the *SHIFT* button, the preceding menu item is selected.
- Pressing the *SET* button causes the current setting of a menu item to be changed by displaying and activating the next available value. If you simultaneously press the *SHIFT* button, the preceding value is printed and activated.
- After setting the required value, you can select the next *ITEM* or next *GROUP* in order to make changes to the values there.
- After changing all the items you require, you can end menu mode by pressing the *EXIT* button when holding down the *SHIFT* button and the changes become effective.
- In order to reset the menu to its factory default, hold down the two buttons *LF* and *SEL* when switching the printer on.



Note!

Within menu mode, you can print out by means of the *PRINT* button a complete list of menu items with the current settings.

Example

Ex factory, the printer is set to character pitch **10 cpi**. In order to create a wide table you wish to use character pitch **17.1 cpi**. Proceed as follows:

1. The printer is in ON LINE mode. First press the *SHIFT* button, hold this down and then press the *MENU* button.
2. Press the *GROUP* button to switch from the first group **Printer Control** to the next group **Font**.
3. Press the *ITEM* button to switch from the first menu item **Print Mode** to the next menu item **Pitch**.

4. You can select a value for **Pitch**. Since the first value is **10 cpi**, you need to press the *SET* button three times until the value **17.1 cpi** appears.

Hold down the *SHIFT* button and press the *EXIT* button. The values last selected now become effective and the printer returns to print mode.

End menu mode

Below are summarised the functions for buttons in menu mode:

Button	Function
<i>SHIFT/MENU</i>	Pressing both buttons in ON LINE status activates menu mode.
<i>GROUP</i>	Calls the next group.
<i>SHIFT/GROUP</i>	Calls the previous group.
<i>ITEM</i>	Displays the next menu item within the current group.
<i>SHIFT/ITEM</i>	Displays the previous menu item within the current group.
<i>SET</i>	Displays the next value of the current item.
<i>SHIFT/SET</i>	Displays the preceding value of the current item.
<i>PRINT</i>	Prints out all menu items and the associated settings.
<i>SHIFT/EXIT</i>	Ends menu mode.

Chapter 4: Printer menu settings

The factory defaults for menu items are printed in bold.

The font LQ Orator can only be selected via the menu and not via the operator panel

GROUP	ITEM	SET
Printer Control	Emulation Mode	EPSON LQ , IBM PPR, IBM AGM
Font	Print Mode	LQ Courier , LQ Roman, LQ Swiss, LQ Swiss Bold, LQ Orator, LQ Gothic, LQ Prestige, Utility
	Pitch	10 CPI , 12 CPI, 15 CPI, 17.1 CPI, 20 CPI
	Proportional Spacing	No , Yes
	Style	Normal , Italics
	Size	Single , Double
Symbol Sets	Character Set	Set II , Set I
	Language Set	ASCII , French, German, British, Danish I, Swedish I, Italian, Spanish I, Japanese, Norwegian, Danish II, Spanish II, Latin American, French Canadian, Dutch, Swedish II, Swedish III, Swedish IV, Turkish, Swiss I, Swiss II, Publisher
	Zero Character	Unlashed , Slashed
	Code Page	USA , Canada French, Multilingual, Portugal, Norway, Turkey, Greek 437, Greek 869, Greek 928, Greek 437 Cyprus, Polska Mazovia, Serbocroatian I, Serbocroatian II, ECMA-94, Hungarian CWI, Windows Greek, Windows East Europe, Windows Cyrillic, East Europe Latin II-852, Cyrillic I-855, Cyrillic II-866, Kamenicky (MIK), ISO Latin 2, Hebrew NC-862, Hebrew OC, Turkey 857, Latin 5 (Windows Turkey), Windows Hebrew, Ukrainian, Bulgarian, ISO Latin 6 (8859/10), Windows Baltic, Baltic 774
	Slashed Letter O	No , Yes

GROUP	ITEM	SET
Rear Feed	Line Spacing	6 LPI, 8 LPI
	Form Tear-Off	Off, 500 ms, 1 sec, 2 sec
	Skip Over Perforation	No, Yes
	Page Width	13.6", 8"
	Page Length	12", 14", 17", 3", 3.5", 4", 5.5", 6", 7", 8", 8.5", 11", 11 2/3"
Bottom Feed	Line Spacing	6 LPI, 8 LPI
	Form Tear-Off	Off, 500 ms, 1 sec, 2 sec
	Skip Over Perforation	No, Yes
	Page Width	13.6", 8"
	Page Length	12", 14", 17", 3", 3.5", 4", 5.5", 6", 7", 8", 8.5", 11", 11 2/3"
Top Feed	Line Spacing	6 LPI, 8 LPI
	Bottom Margin	Valid, Invalid
	Page Width	13.6", 8"
	Page Length	11 2/3", 12", 14", 16.57", 3", 3.5", 4", 5.5", 6", 7", 8", 8.5", 11"
	Wait Time	1 sec, 2 sec, 500 ms
	Page Length Control	by MENU Setting, by Actual Page Length

*The menu item **Page Width** appears only for wide printer models.*

*The menu item **Page Width** appears only for wide printer models.*

*The menu item **Page Width** appears only for wide printer models.*

GROUP	ITEM	SET
Set-Up	Graphics	Uni-directional, Bi-directional
	Receive Buffer	8 K, 23 K, 1 Line
	Paper Out Override	No, Yes
	Print Registration	0, 0.05mm, 0.10mm, 0.15mm, 0.20mm, 0.25mm Left, 0.25mm Right, 0.20mm, 0.15mm, 0.10mm, 0.05mm
	Operator Panel Function	Full Operation, Limited Operation
	Reset Inhibit	No, Yes
	Print Suppress Effective	Yes, No
	Auto LF	No, Yes
	Auto CR	No, Yes
	CSF Bin Select	Bin 1, Bin 2
	SI Select Pitch (10 CPI)	17.1 CPI, 15 CPI
	SI Select Pitch (12 CPI)	12 CPI, 20 CPI
	Time Out Print	Valid, Invalid
	Auto Select	No, Yes
	Graphics Speed	Low, High
	Centering Position	DEFAULT, MODE1, MODE2
CSF Type	Wide, Narrow	

Auto CR appears only when IBM emulation is selected.

CSF Bin Select appears only when cut sheet feeder is installed with two trays.

SI Select Pitch (10/12 cpi) appears only when IBM emulation is selected.

MODE2 appears only for wide printer models.

CSF Type appears only for wide printer models.

GROUP	ITEM	SET
Parallel I/F	I-Prime	Buffer Print, Buffer Clear, Invalid
	Pin 18	+5 V, Open
	Auto Feed XT	Invalid, Valid

Auto Feed XT appears only when Epson emulation is selected.

The menu items of the group **Serial I/F** only appear when a serial interface is installed. The installation is described in the »Accessories« chapter, further technical information on interfaces is to be found in the «Interface Data« appendix.

GROUP	ITEM	SET
Serial I/F	Parity	None, Even, Odd
	Serial Data 7 / 8-Bits	8 Bits, 7 Bits
	Protocol	Ready / Busy, X-ON / X-OFF
	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

The menu items of group **CSF Bin 1** listed below appear only when a cut sheet feeder is installed. The menu items of the group **CSF Bin 2** accordingly appear only when a cut sheet feeder is installed with two trays.

Page Width appears only for wide printer model.

GROUP	ITEM	SET
CSF Bin 1	Line Spacing	6 LPI, 8 LPI
	Bottom Margin	Valid, Invalid
	Page Width	13.6", 8"
	Page Length	11 ^{2/3} ", 12", 14", 16.57", 3", 3.5", 4", 5.5", 6", 7", 8", 8.5", 11"
CSF Bin 2	Line Spacing	6 LPI, 8 LPI
	Bottom Margin	Valid, Invalid
	Page Length	11 ^{2/3} ", 12", 14", 16.57", 3", 3.5", 4", 5.5", 6", 7", 8", 8.5", 11"

Explanation of menu items

Emulation Mode: You use this item to define the command set. The emulations available to you are **Epson LQ**, **IBM ProPrinter** and **IBM AGM**. The Alternative Graphics Mode (AGM) includes partial compatibility with the Epson LQ series which is largely limited to graphics and line feed commands. The commands available in AGM are indicated in the appropriate chapters.

Printer Control

Print Mode: You can select here the required font for the document.

Font

Pitch: You set here the character width in characters per inch (cpi).

Proportional Spacing: The fonts in letter quality can optionally be printed with proportional spacing.

Style: You select normal or italic characters.

Size: You can switch between single font size and combination of expanded horizontal and vertical font.

Character Set: You can select here between IBM character sets **Set I** and **Set II**. In Epson emulation, Set II corresponds to an extension of the printable characters.

Symbol Sets

Language Set: When you select a national character set, this replaces some characters with the special characters of the respective language.

Zero Character: Select **Slashed** if you wish zero to have a slash through it in order to better differentiate it from capital O.

Code Page: A code page is a character set that contains country specific characters. In IBM emulation it can be used as character set I and II or as a fully printable character set. In Epson emulation, all characters can be made available via the "Extension of printable characters". In addition, certain characters in the lower range can be replaced by choosing a national character set (Language Set).

A table of all the character sets and code pages is to be found in Chapters 10, 14 and Appendix B.

Slashed Letter O: The characters ¢ (155) and ¥ (157) are replaced by Ø and Ø when **Yes** is selected.

Rear Feed,
Bottom Feed

Line Spacing: Select between **6 lpi** (lines per inch, corresponds to 1/6 inch line spacing) or **8 lpi** (corresponds to 1/8 inch line spacing).

Form Tear-Off: If this function is activated, continuous paper is automatically transported to the tear-off position after the time preset in the menu (500 ms, 1 sec, 2 sec). The **OFF** setting switches the Form Tear-Off function off. Further information on this function is to be found in the chapter »Paper Handling«.

Skip Over Perforation: Select **Yes** if you wish continuous paper to be automatically transported to the top of the next page 2.54 centimetres (1 inch) before it reaches the bottom edge of the page. If page formatting is performed by the software, set this item to **No** in order to avoid problems.

Page Width: This menu item is only offered with wide printer models. Select the page width for the paper you are using. The standard setting is **13.6 inch**.

Page Length: Select here the page length for the paper you are using to ensure the initial printing position is the same for each page.

Top Feed

Line Spacing: select between **6 lpi** (lines per inch, corresponds to 1/6 inch line spacing) or **8 lpi** (corresponds to 1/8 inch line spacing).

Bottom Margin: When **Valid** is set, a bottom margin of one inch (2.54 cm) is always left unprinted when feeding cut sheets via the paper support or when using an automatic cut sheet feeder.

Page Width: This menu item is only offered with wide printer models. Select the page width for the paper you are using. The standard setting is **13.6 inch**.

Page Length: Select here the page length for the paper you are using to ensure the initial printing position is the same for each page. The page length set here is only used if the value **By MENU Setting** has been selected in the menu item Page Length Control.

Wait Time: Where cut sheets are being fed from above via the paper support, the sheets are automatically drawn after the preset time.

Page Length Control: Where cut sheets are being fed from above (Top Feed), the page length can be set via the menu or program commands (**by Menu Setting**). If, however, you set the value by **Actual Page Length**, the page length is automatically detected by means of the end of page sensor.

Graphics: Select **Uni-directional** (from left to right only) to achieve more precise registration of graphics. With **Bi-directional**, the printing speed is increased.

Set-Up

Receive Buffer Size: Selects the volume of the receive buffer. If you set a large size for the receive buffer, the system can send greater volumes of data to the printer which then stores it in the buffer; the printer is ready to receive data for a longer period and the transfer of data from the computer is therefore not interrupted. If the receive buffer becomes full, however, the printer is not ready to receive for a longer period because of the large volume of data in the buffer which it has to process. If your system issues an error message when the buffer is set to a large size (e.g. unit error through timeout), you need to set a smaller buffer. The result is that the time intervals during which the printer is not ready to receive are shorter. Your system is consequently able to send data to the printer at shorter intervals.

In general, it is advisable to set the receive buffer as small as possible where the computer places the print data in temporary storage (»spooling«) by means of a print manager, for example. This applies to large and medium-sized data processing systems and when the printer is used in a network.

Paper Out Override: If the paper end sensor detects that there is less than 1 inch (2.54 cm) of paper left in the printer, it stops a current print job. If you set **Yes**, the sensor is deactivated thus enabling you to print to the bottom edge of the page when using cut sheets of paper. Make sure when setting **Yes** that the printer does not print on the platen.

Print Registration: Use this item during bi-directional printing in order to improve the horizontal registration. Normally, the appropriate value is **0**, although by setting another value you can alleviate possible registration problems when printing graphic data.

Operator Panel Functions: Normally, all the buttons of the operator panel are active, but if you choose **Limited Operation**, the buttons *PRINT QUALITY*, *CHARACTER PITCH* and menu mode are blocked. The corresponding functions can then only be controlled by the software. This function is particularly suitable for printers being used by one or more persons where the changing of settings is undesirable. Hold down the *MENU* button when switching on to call the menu in **Limited Operation** mode.

Reset Inhibit: Select **Yes** if you wish to suppress the initialisation command sent by the software or system. This initialisation command resets all the functions to the values you have set in the menu.

Print Suppress Effective: If the value **Yes** is selected in this menu item, the commands for print suppression are active in all emulations. If the value **No** is selected, the commands for print suppression are ignored.

Auto LF: After selecting **Yes**, the printer automatically adds a line feed each time it receives a carriage return command. Check whether your computer also adds a line feed. If your print-outs always have double-line spacing, you should select **No**. If lines are printed on top of each other, **Yes** is the correct value.

Auto CR applies only to IBM emulation.

Auto CR: If you wish the printer to perform a carriage return automatically each time it receives the line feed command, select **Yes** at this position.

CSF Bin Select appears only when an optional cut sheet feeder with two trays is installed.

CSF Bin Select: If you are using a cut sheet feeder with two bins, you can use this menu item to select one of these two bins as the standard bin and set different positions for the initial print line (top of form) for both bins. After quitting the menu, you can change the top of form position for the bin selected in the menu.

SI Select Pitch (10 cpi) and SI Select Pitch (12 cpi) apply only to IBM emulation.

SI Select Pitch (10 cpi): You can define here whether the command *SI* in IBM emulation selects a character pitch of 17.1 cpi or 20 cpi when 10 cpi is used.

SI Select Pitch (12 cpi): You can define here whether the command *SI* in IBM emulation selects a character pitch of 20 cpi or retains 12 cpi.

Time Out Print: If this function is activated and the printer receives no data for 150 ms, the data in the printer buffer is printed out.

Auto Select: If a sheet of paper has been fed automatically from the paper support when the setting is **No**, the printer stays in the OFF LINE status. If **Yes** is selected, the printer switches to ON LINE when a sheet of paper is fed and the **SEL** lamp lights.

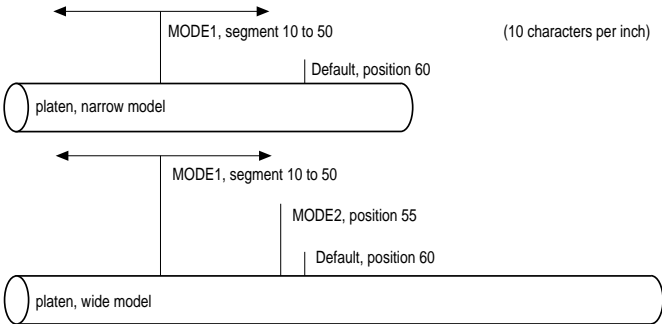
Graphics Speed: By means of this menu item, the printing speed for graphics of a lower resolution can be increased by selecting **High**.

Centering Position: This menu item is used to set the preferred position of the print head to suit the width of the paper format to be printed. The resultant reduction in print head movement optimises penetration, and over-saturation of the ribbon is largely avoided.

Refer to the table below to choose the recommended menu settings for the width of the paper format to be printed. Depending on the type of paper, it may be that the **MODE1** and **MODE2** settings can be used with paper widths larger than stated in the table. With heavier paper that is wider than A4, the **DEFAULT** setting may be necessary.

MODE2 only appears for wide printer models.

paper	narrower than 12.5 cm	12.5 to 20.9 cm	21.0 cm (A4 portrait)	wider than 21.0 cm
narrow model	MODE1	MODE1	DEFAULT	---
wide model	MODE1	MODE2	MODE2	DEFAULT



The diagram shows the preferred position of the print head in relation to the selected menu item. The print head is driven from this position to the next print position, with the shortest possible path being chosen.

CSF Type: The menu item **CSF Type** only appears for wide printer models. If you are working with a wide cut sheet feeder, the value must be set to **Wide**. If you are using a narrow cut sheet feeder with a wide printer, set the value to **Narrow**.

Parallel I/F

I-Prime: the signal on the I-Prime line of the parallel interface can either be ignored (**Invalid**), cause printing out of the current buffer (**Buffer Print**) or erase the print buffer (**Buffer Clear**).

Pin 18: pin 18 of the parallel interface can be switched to 5 volts or open if required.

This menu item applies only to Epson emulation.

Auto Feed XT: In essence, no line feed (*LF*) is performed after a carriage return (*CR*) if **Auto LF** is set to **No**. If, however, in Epson mode **Auto LF** is set to **No** and **Auto Feed XT** to **Valid**, a line feed is performed when an external Auto Feed Signal (Centronics pin 14) is issued. This special case can be necessary for certain combinations of hardware and software.

Serial I/F

In the case of serial data transmission, the data bits of a byte are sent one after the other via a line to the printer. For correct transmission, it may be necessary to change the interface settings so that they match the settings of your computer. If there is a serial interface installed and this has been activated in the menu, the menu items described below appear.

Parity: Selects the parity. For each byte of data, a start bit with logical value 1 is transmitted, followed by the 7 or 8 bits of data according to the data length defined. If required, a parity bit can follow for the purpose of data checking.

Serial data 7/8 bits: Defines the data format. It is necessary to differentiate between the data format (7 or 8 bits) and the transmission format (data bits plus parity bit set or not set).

Protocol: Selects the interface protocol. There are two protocols that can determine the sending and receiving of data. In the case of the Ready/Busy protocol, the DTR, RTS or SSD line indicates the printer's readiness to receive by means of the voltage level. In the case of the X-ON/X-OFF protocol, sending/receiving is controlled (handshake) via special characters transmitted on the data line.

Diagnostic Test: Activates a diagnostic test of the interface. For further information, please refer to Appendix D.

Busy Line: Defines the line to be used for the busy signal.

Baud Rate: Defines the speed of data transmission.

DSR Signal: Activates or deactivates the DSR signal (data set ready).

DTR Signal: Defines the status of the DTR signal (data terminal ready).

Busy Time: Selects the duration of the busy signal.

Chapter 5: Printer Control

Emulation

An emulation is a »copy« of the functions of a specified device. That means your printer is capable in a certain emulation of executing the commands and functions of this particular device. In addition, extra functions are in most cases provided that go beyond the performance specification of the emulated device.

To be able to use your printer with as many applications as possible, it is provided with the emulations **IBM ProPrinter**, **IBM ProPrinter AGM** and **Epson LQ**.

The IBM ProPrinter function "Load down user-defined characters into the printer, DLL" is not supported by this printer model.

Printer drivers

In order to be able to write application programs not designed for specific output devices such as a screen or printer, they are mostly provided with exchangeable program parts responsible for outputting the data, so-called drivers. A driver receives generally required outputting instructions from its own program and translates these into the special commands and functions of the printer for which the driver was written. When installing or setting up printer drivers, you should always refer to the manual for the respective program, as the programs may be available in versions written both at different times and for different countries. For that reason, the notes given here may not always be applicable to your program but are to be taken as generally applicable.

You will obtain the best support for your printer if you use a printer driver which precisely matches the name of your printer.

If there is no matching driver in your program, choose a driver for one of the emulations named below. Make sure that the printer driver agrees with the emulation you set in the menu of the printer.

To select another suitable printer driver, go through the following list from top to bottom and select the driver that most closely matches the name of your printer.



Note!

The lower the printer driver appears in the list, the fewer the functions supported.

Epson-Emulation

OKI ML 3390/3391
OKI ML 590/591 Elite
OKI ML 590/591
OKI ML 390/391 Elite
OKI ML 390/391
Siemens High Print 4008-N10/
Siemens High Print 4008-N60
Epson LQ 870/1170
Epson LQ 850/1150
Epson LQ 1500
Epson LQ

IBM-Emulation

OKI ML 3390/3391
OKI ML 590/591 Elite
OKI ML 590/591
OKI ML 390/391 Elite
OKI ML 390/391
Siemens High Print 4008-N10/
Siemens High Print 4008-N60
IBM ProPrinter X24 (4207)
IBM ProPrinter XL24 (4208)

Some software packages permit modification of the printer driver. Such a modification, however, requires an intensive study of the program and the control commands of the printer. A list of the available functions and the associated control commands is to be found in Chapters 10 and 14 of this manual. Please refer to the manual of your application program for more detailed notes on installation and modification of the printer driver. If in doubt, contact your software manufacturer or supplier.

Characters and control characters

The print data is transmitted by character. Every character is represented by 8 bits and thus expresses a certain position within the character set currently selected.

Most character sets are based on ASCII code (*American Standard Code for Information Interchange*).

There are different national variations for this character set. The so-called control characters are common to all the character sets. These are to be found at decimal positions 0 to 31 and effect functions such as page feed, line feed or carriage return. Some of these control characters modify character widths and are described in the appropriate chapters.

The so-called Escape character has a special significance among the control characters and is located at decimal position 27 (hexadecimal 1B). This control character introduces most commands for printers. One or more ASCII characters follow which in conjunction with the Escape character activate or deactivate print functions. At positions 32 to 255 are normally to be found printable characters. It is often possible to obtain special printable characters at the positions of the control characters by triggering them with an appropriate command.

The commands are listed in ASCII, decimal and hexadecimal form. If you are using a programming language, refer to your programming manual for the transfer of characters and control characters to the printer.

Printing under DOS

Most IBM PC and compatible PCs use MS-DOS, PC-DOS, DR-DOS or similar as the operating system. Although DOS has no print functions, like a text processing or graphics program, direct printing of ASCII or print files is nevertheless possible under DOS. In the examples listed below, it is assumed that the printer is connected to parallel interface LPT1 of the PC. If a different interface to LPT1 is used (e.g. LPT2, LPT3, COM1, COM2), the address in the examples must be correspondingly altered. Further details on the serial interface are to be found later in the manual.

TYPE

It is possible to print an ASCII or print file by using the TYPE command and diverting the output to the LPT1 device.

Example:

```
TYPE C:\AUTOEXEC.BAT > LPT1:
```

```
TYPE C:\TEXTS\LETTER.TXT > LPT1:
```

In the first instance, the file AUTOEXEC.BAT is printed from the root directory and in the second case the file LETTER.TXT is printed from the TEXTS subdirectory.

COPY

Files are copied between diskettes and hard disk and other devices by means of the COPY command. Thus, files can also be transmitted to the printer by means of COPY. When using the COPY command, the option »/B« should be activated so that binary and graphics files can also be copied without any limitations.

Example:

```
COPY /B C:\AUTOEXEC.BAT LPT1:
```

```
COPY /B C:\TEXTS\LETTER.TXT LPT1:
```

Similarly, one can also copy characters directly from the keyboard to the printer by means of the COPY command.

Example:

```
COPY CON: LPT1
```

```
THIS IS A SMALL TEST      Ctrl-Z or F6
```

CTRL-P

After entering the control character CTRL-P (hold down the CONTROL key and press the P key), texts output to the screen are simultaneously output to the current printer output device and printed out there. If, for example, the command DIR is entered via the keyboard, the file names of the current subdirectory are output not only to the screen but also to the printer.

For more detailed information on printing under DOS and the commands mentioned above, please refer to the manual for the operating system.

Entering the control character CTRL-P once again switches off printing of the screen data on the printer.

Printing under DOS with a serial interface (RS-232C)

When printing under DOS, make sure only the transmission protocol Ready/Busy (hardware handshake) is supported. Printing with the transmission protocol X-ON/X-OFF (software handshake) is only possible with software for remote data transfer such as Telix, ProCom or MS-Windows Terminal.

Remote data transfer programs of this kind are good for testing interfaces because it is easy to change or adjust the parameters.

Note also the following points:

- The settings for the serial interface in the menu of the printer must agree with the settings for the serial interface in the PC.
- The interface cable must be wired in accordance with the menu options.

Example:

The serial interface options in the printer are set at the factory as follows:

Parity	None
Serial data	8 bits
Protocol	Ready / Busy
Diagnostic Test	No
Busy Line	SSD-
Baud Rate	9.600 bps
DSR Signal	Valid
DTR Signal	Ready on Power up
Busy Time	200 ms

- The serial interface settings in the computer are defined with the MODE command as follows:

```
MODE COM1 : 9600 , n , 8 , 1 , p
```

Please refer to the DOS manual for more information on the MODE command.

- Notes and further information on the serial interface (wiring, pin assignment, etc.) are to be found in the Interface Data appendix.

Troubleshooting

Should your printer not print under DOS when using a serial connection, go through the following checklist:

1. Check whether there is a technical fault on the serial interface (RS-232C). To do this, perform the test described in Appendix D.
2. Check the settings of the items in the printer menu which relate to the serial interface. These settings must agree with the settings in your system.
3. Make sure the serial interface is correctly set up under DOS.
4. Check the interface cable. With the multitude of cables available, it is often difficult to find a cable suitable for your particular requirements. The interface cable described in Appendix D can be used both for transmission protocol X-ON/X-OFF and Ready/Busy (Busy Line DTR).

Chapter 6: Consumables and cleaning

Changing the ribbon cassette

If the contrast of the printed characters is deteriorating, the ribbon needs to be changed. To do this, proceed as follows:



Caution!

The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.

-
1. Switch the printer OFF LINE by pressing the *SEL* button; the *SEL* lamp is extinguished.
 2. Open the printer cover.



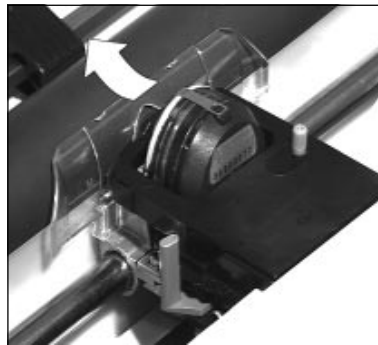
Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

-
3. Move the print head to the middle of the platen.



4. Hold the used ribbon cassette at the top and carefully lift it over the print head.



Lift cassette over the print head

Inserting a new ribbon cassette

The original ribbon cassettes of the manufacturer's are specially developed for your printer. Among other things, this concerns the ink, which contains lubricants, and the fabric of the ribbon.

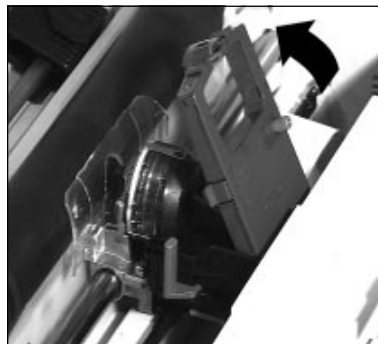


Warning!

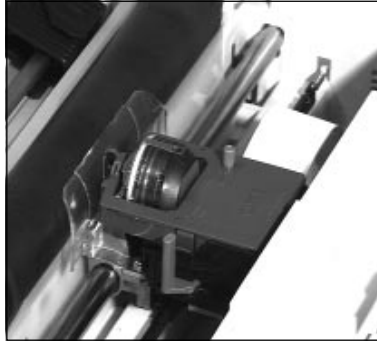
Non-original ribbons can damage the print head.
Use only the original ribbons of the manufacturer.

A clear ribbon guard is fitted to the front of the cassette. Do **NOT** remove it!

1. Take the ribbon out of its plastic packing.
2. Place the cassette with the cutout sections onto the pins of the cassette holder.



3. Tilt the cassette carefully down over the print head until you feel it click into place.
4. Turn the blue transport knob of the cassette in the direction of the arrow to tension the ribbon.
5. Close the printer cover and switch the printer ON LINE again by means of the *SEL* button.



Tilt cassette down over print head

Cleaning

To ensure constant problem-free printing, clean the printer every six months (or after 300 hours of operation).



Caution!

The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

- Before carrying out any cleaning, remove all accessories from the printer such as the cut sheet feeder or tractor feed.
 - Clean the area around the axle of the print head carriage and the platen with a clean, dry cloth.
-

- Remove paper dust only with a soft brush such as a paint brush.
- Do not grease or oil any parts within the printer, this can cause damage.
- Do not use any solvents or aggressive cleaning agents on the case or in the machine, this can cause damage.

Chapter 7: Accessories

The accessories described in this chapter extend the range of functions provided by your printer. For your safety, and to avoid damage to the machine:

- ... switch the printer off before installing accessories,
- ... remove the plug from the power supply.

Make sure you also read the safety information at the beginning of this manual.

Cut sheet feeder

A cut sheet feeder feeds single sheets of paper to the printer thus saving the operator having to feed paper manually sheet by sheet during large print jobs (multiple copies of letters, etc.). The printed pages are ejected onto the output tray.

The cut sheet feeder is available in different versions:

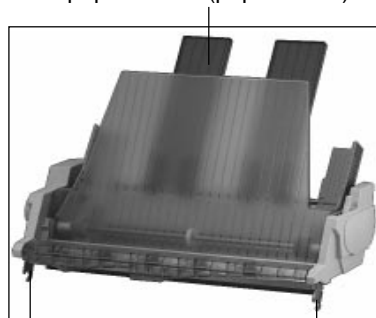
- Narrow sheet feeder with one paper tray
- Narrow sheet feeder with two paper trays (double tray)
- Wide sheet feeder with one paper tray
- Wide sheet feeder with two paper trays (double tray)

Front paper stand (paper eject)



Paper set lever

Rear paper stand (paper insert)

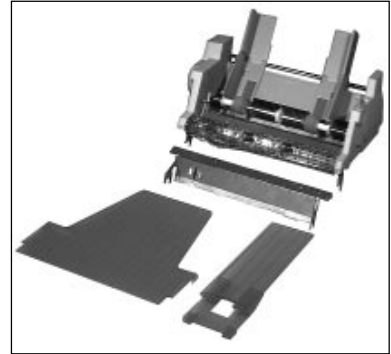


Mounting bracket

Checking the items supplied

Check that the individual items supplied are complete and undamaged. You should have received:

- 1 feed rail
- 1 front paper stand
- 1 to 4 rear paper stands



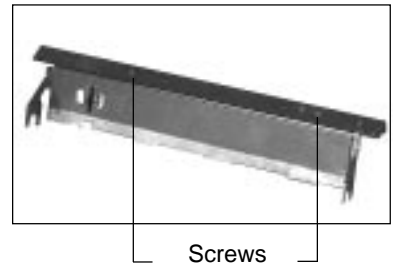
Remove the packing material. Keep the original packing material safe so that you can transport the sheet feeder safely at a later date if necessary.

Adjusting the length of the feed rail

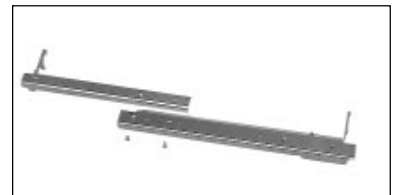
You will need a cross-head screwdriver for this.

The metal paper feed rail enables you to fit a narrow cut sheet feeder onto a wide printer. All that is required is to adjust the feed rail to the wide platen.

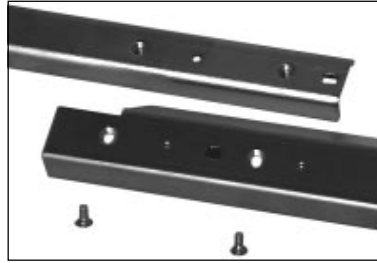
1. Undo and remove the screws on the top of the feed rail.



2. Lay the extension piece of the rail next to the appropriate holes so that they align on the right hand side.



3. Align the holes of the extension precisely to the holes of the rail.
4. Fasten the screws once again.



Extended in this way, the paper feed rail will now fit the wide printer. If, on the other hand, you are using the narrow printer, the rail must not be extended.



Install the feed rail as follows:

Installing the feed rail



Caution!

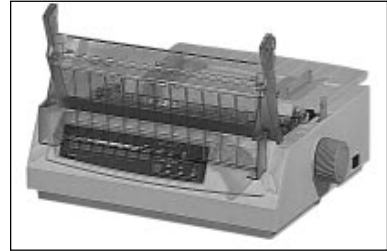
The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



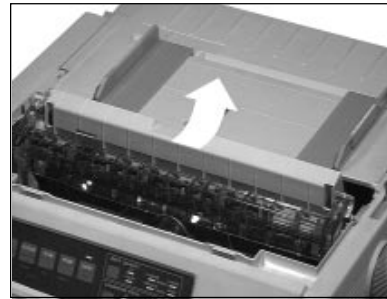
Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

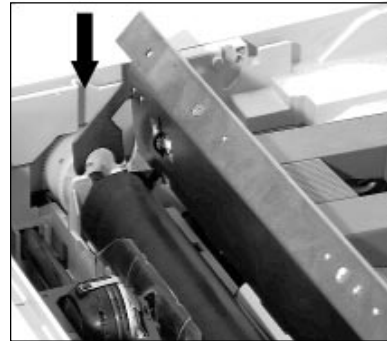
1. Switch the printer off and open the printer cover.
2. Remove the paper support (see also Chapter 1).



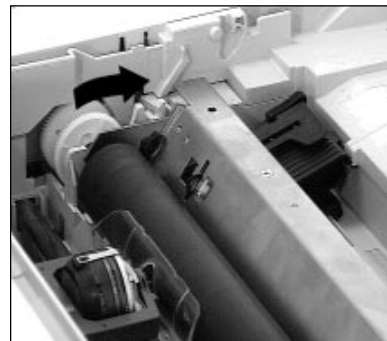
3. Remove the ribbed paper separator by first pulling it forwards and then removing it from its catch arrangement (see also Chapter 1).



4. Fit the feed rail with its mounting brackets at both ends of the platen. You should hear it click into place.



5. Gently tilt the rail backwards.

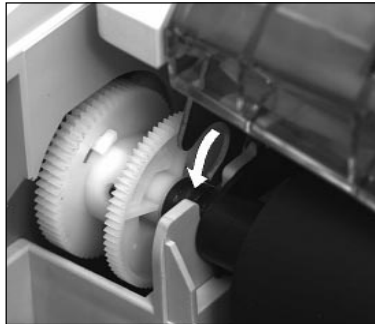


1. Install the cut sheet feeder with its mounting brackets onto both ends of the platen shaft so that it is firmly seated.



Installing the cut sheet feeder

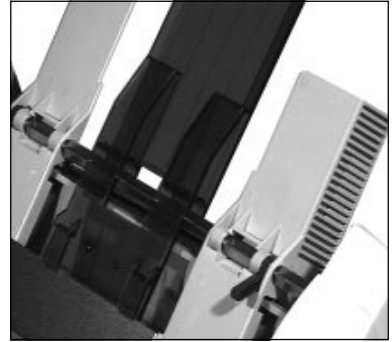
2. Turn the platen knob so that the gearwheel on the left end of the sheet feeder engages with the gearwheel of the platen.
3. Close the printer cover.



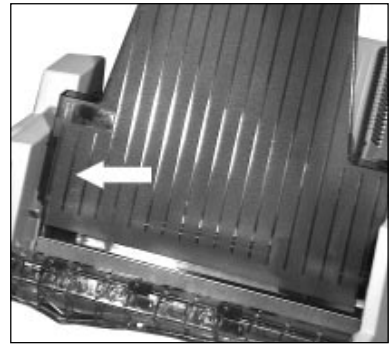
4. Connect the cable of the cut sheet feeder to the printer by plugging it into the socket provided to the left rear of the printer. The arrow on the plug shows the correct way to plug it in.



5. Fit the rear paper stand or stands as the case may be onto the rail of the paper guide.



6. Now insert the front paper stand.



7. To ensure that the machine feeds and handles the paper perfectly, the paper lever at the right end of the printer must point to the cut sheet symbol (middle position, TOP).

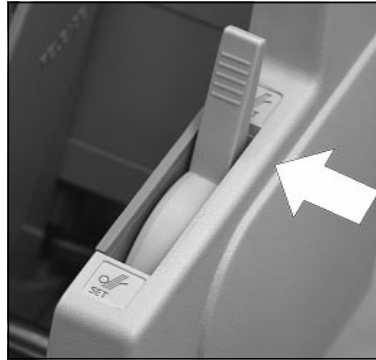


8. Switch the printer on.

The paper tray of the cut sheet feeder has a maximum capacity of 100 sheets (90 g/m²) or 170 sheets (60 g/m²) of standard paper. A mark on the left guide rail indicates the maximum amount of paper. Read also the further notes on paper in Chapter 3.

Paper feed

1. Set the paper set lever at the right end of the cut sheet feeder upwards to the RE-SET position. The paper tray will open towards the back.



Warning!

Direct pressure on the platen can cause damage to the print head and pins. Make sure the paper guide is correctly adjusted.

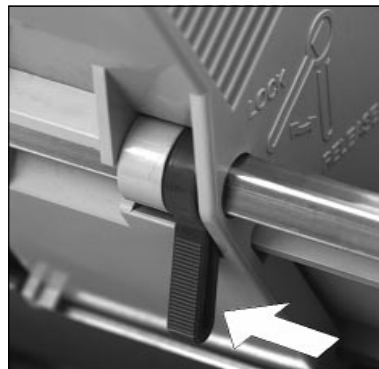
2. Take a stack of paper, fan it to part the sheets and insert it into the sheet feeder. Make sure the stack of paper is lying on the bottom of the tray.
3. Make sure the rear paper stands are positioned equally between the paper guides.



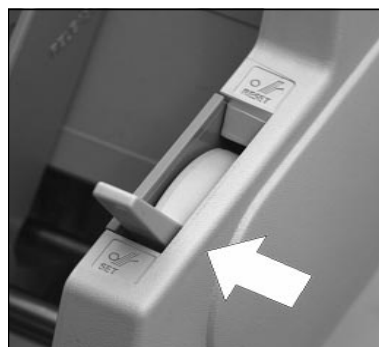
Paper
guides

Lever

4. Adjust the right paper guide so that the right side of the guide is flush with the right edge of the sheet of paper. Do not force the uprights together. The guide rail can be released and locked again by moving the locking lever to the appropriate position (RELEASE, LOCK).



5. Move the paper set lever of the sheet feeder to the SET position. If it is left released, the friction rollers cannot grip the paper and if printing is performed without paper, the print head and platen can be damaged.



Automatic paper feed

1. Make sure the setting of the menu item Page Length matches the paper format you are using. Further information on this is to be found in »Chapter 4: Printer menu settings«.
2. In ON LINE mode, feed the first sheet of paper with the *LF* or *FF/LOAD* button.
3. If necessary, redefine the top of form. This is described in »Chapter 3: Paper handling«.
4. To eject a sheet of paper, press the *FF/LOAD* button again. Do not use the platen knob.

Cut sheets can also be fed into the printer when the cut sheet feeder is installed. It is essential, however, that there is no paper in the normal paper path of the printer. There are two possible modes for manual feeding:

Manual paper feed

Feeding cut sheets

If the printer is ON LINE while paper is placed into the manual feed slot, it becomes the priority tray for a cut sheet. In the event of a multi-page print job, the printer will merely take the first sheet from the manual feed slot. All other sheets will be taken automatically from the current paper tray of the cut sheet feeder.



Changing over to the manual feed slot

If the printer is OFF LINE while paper is placed into the manual feed slot, it serves as the manual feed tray. The sheet you have inserted is drawn in automatically after the time set in the **Wait Time** menu.

If the **Auto Select** menu item is set to **No**, it will be necessary to press the **SEL** button after each automatic feed operation. If the **Auto Select** menu item is set to **Yes**, printing begins directly after the automatic feed operation.

For the subsequent pages of a print job, the printer waits for a further sheet of paper from the feed slot after the first sheet has been printed and ejected. At the same time, the **ALARM** lamp is lit and the **SEL** lamp is extinguished. Single sheets have to be inserted in the manual feed slot right to the end of the print job.

Changing over to normal printing operation

To change back to normal printing operation, you merely need to switch the printer back to ON LINE mode once the print job has finished. After this, the printer will take the next sheet to be printed from the current tray of the cut sheet feeder.

Feeding cut sheets and continuous paper

If you are using single-part continuous paper, you can leave the cut sheet feeder on the printer and alternately feed and process continuous paper and cut sheets from the sheet feeder. To do this, transport the continuous paper into the **PARK** position as described in Chapter 3. It is not possible to process multi-part forms with the cut sheet feeder installed. Use the tractor feed to process multi-part forms (accessory).

Printing area

Even though the cut sheet feeder permits printing of cut sheets from the top of the page, it is advisable to leave a top margin of 1/3 inch (0.85 cm) and a bottom margin of 1 inch (2.54 cm) as the print quality cannot be guaranteed in this area, and there are likely to be a greater number of paper jams.

The bottom limit of printing is defined by the menu item **Bottom Margin**. If **Bottom Margin** is set to **Valid**, a bottom margin of 1/2 inch (13 mm) is preset. If, on the other hand, this menu item is set to **Invalid**, the bottom margin depends on the page length set in the menu. The smallest possible bottom margin can be 0.5 mm. In this case, make sure the page length is correctly set.

Selecting the paper tray

If you have installed a cut sheet feeder with two paper trays, you can feed paper from either the front or rear tray as required. In many application programs, the choice of tray can be set in the software.

In the printer menu, it is possible to select the tray that is to be active as default on switching on the printer. Please refer to “Chapter 4: Printer menu settings” for this.

In addition, there are programming commands for choosing the tray in the respective emulations.

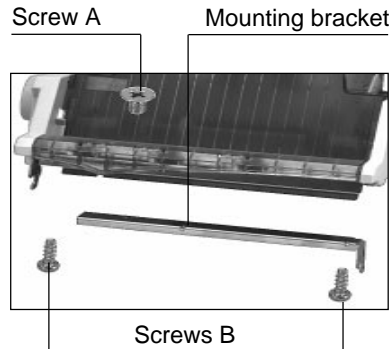
Removing the cut sheet feeder from the printer

Remove the cut sheet feeder from the switched-off printer by repeating the installation steps in the reverse order. The paper feed rail must also be removed. Now refit the paper separator and paper support as described in Chapter 1.

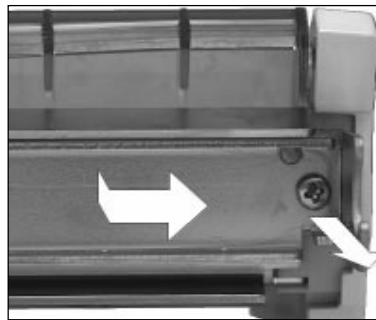
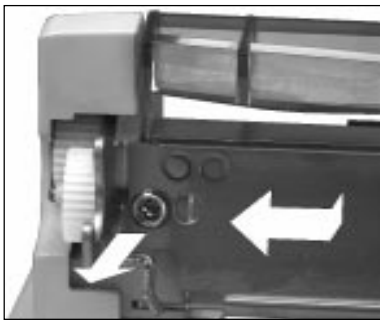
Should you wish to fit a narrow cut sheet feeder onto a wide printer, you will have to fit the mounting bracket for the wide roller as described below. You will need a cross-head screwdriver for this purpose.

Adjusting the mounting bracket

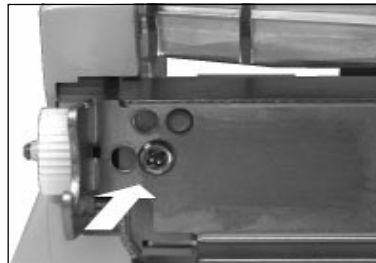
1. Undo and remove screw (A) on the inside of the output tray.
2. Turn the cut sheet feeder over and place it on a steady, level surface. The two screws (B) are now accessible.



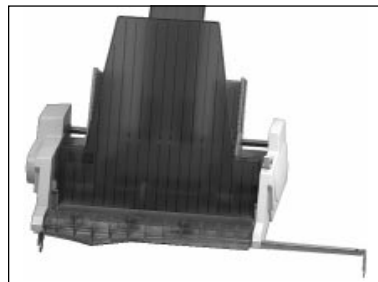
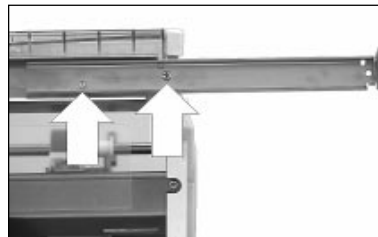
3. Undo and remove the screws (B) at both ends of the mounting bracket.



4. Carefully remove both parts of the mounting bracket from the cut sheet feeder.
5. Move the left bracket rail approximately 5 mm to the left. Align the fixing hole precisely to the pin and the threaded hole on the cut sheet feeder and screw the left screw (B) in again.



6. Move the right bracket rail approximately 15 cm to the right; the mounting bracket is now extended to approximately 45 cm wide. Align the fixing hole precisely to the pin and the threaded hole on the cut sheet feeder and refit the right hand screw (B).
7. Turn the cut sheet feeder over and fasten the screw (A) to the inside right of the output tray. Replace the cut sheet feeder on the printer as described further on.



The pull tractor feed

You feed continuous paper from the bottom when you wish to print types of paper that are not suitable for feeding around the platen. Such types of paper are multi-part forms, adhesive labels on backing paper and other special papers. You will need to use a pull tractor feed for this.

Checking the items supplied

Check that the individual items supplied are complete and undamaged. You should have received, depending on the model:

- 1 tractor feed (narrow or wide)
- 1 acoustic cover (narrow or wide)



Remove the packing material. Keep the original packing material safe so that you can transport the tractor feed safely at a later date if necessary.

To install the tractor feed, proceed as follows:

Installation



Caution!

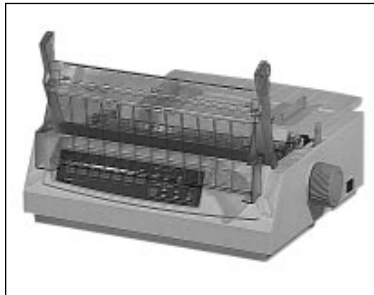
The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



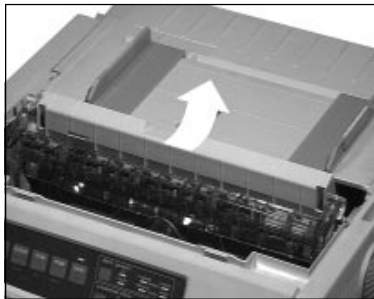
Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

1. Switch the printer off and open the printer cover.



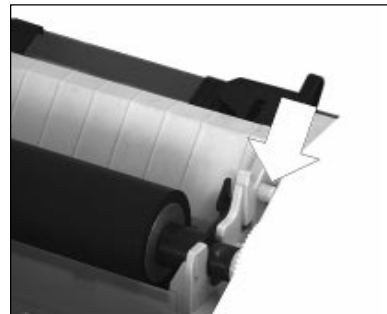
2. Remove the ribbed paper separator by first pulling it forwards and then removing from its retainer (see also Chapter 1).



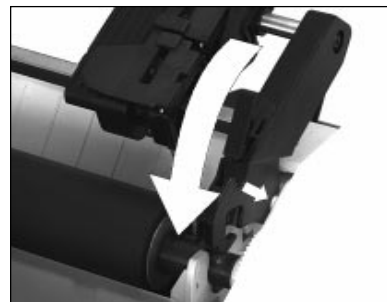
3. Remove the paper support by pressing it downwards at the back. This will release it from its catch (see also Chapter 1).



4. Fit the tractor feed onto the printer. When doing this, fit the slots at each end of the tractor onto the pins of the holder on the printer (arrow).



5. Tilt the tractor feed forwards. Pull the hooks on the outside of both ends of the tractor until you can hear it click into place on the platen at both ends.



6. Replace the printer cover with the acoustic cover supplied with the tractor feed and close it.
7. Refit the paper support (see Chapter 1).
8. Switch the printer on.



Note!

Do not use the “Park” function in conjunction with the tractor feed otherwise the continuous paper will run completely out of the tractor guide.

With the tractor feed fitted, you can feed continuous paper from below the printer and print on it. Before doing this, place the printer on a printer table provided with a feed slot. The stack of continuous paper is placed under the table.

Feeding continuous paper

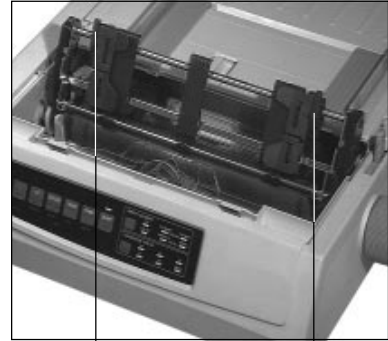
1. Switch the printer off.
2. Move the paper lever at the right side of the printer forwards to the continuous paper position (REAR); the symbol on the cover shows the correct position for the lever.
3. Feed the continuous paper through the feed slot in the bottom of the printer and up to the level of the platen. From above, pull the paper upwards beyond the tractor feed.



Warning!

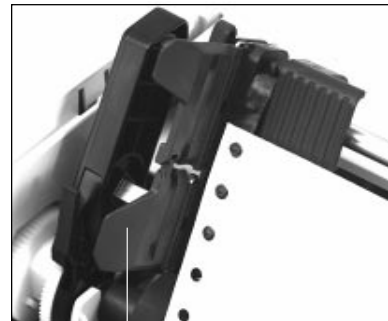
Direct pressure on the platen can cause damage to the print head and pins. Make sure the paper guide is correctly adjusted.

4. Release the locking lever for the left sprocket feed and move this to the required position. Fasten the left roller again with the locking lever.



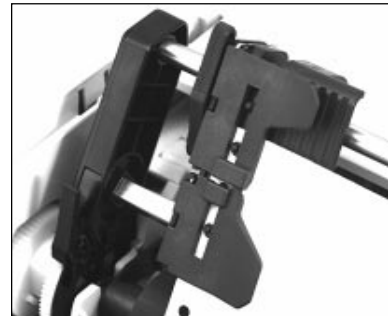
Locking lever

5. Open the cover of the left sprocket feed, fit the continuous paper onto the first two sprocket pins.



Cover of sprocket feed

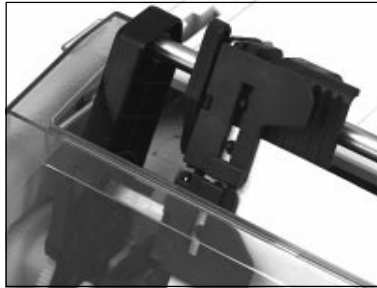
6. Close the cover again.



7. Now position the right hand sprocket feed in the same way to suit the width of paper. Make sure that the paper is slightly tensioned.



8. Switch the printer on. The print head will move to the left end of the platen and the active indicators on the operator panel will light.
9. Fit the new acoustic cover.



You can set the values for paper handling as you wish by means of the printer menu in the **Bottom Feed** group.

Remove the tractor feed from the switched-off printer by repeating the installation steps in the reverse order. The paper feed rail must also be removed. Now refit the paper separator and paper support as described in Chapter 1.

Removing the tractor feed

The bottom tractor feed

The bottom tractor feed gives you an additional means of feeding continuous paper from beneath the printer. For this purpose, the printer is raised up on the two feet supplied with the feeder.

Checking the items supplied

Check that the individual items supplied are complete and undamaged. You should have received, depending on the model:

- 1 bottom tractor feed (narrow or wide)
- 2 tractor feed feet



Remove the packing material. Keep the original packing material safe so that you can transport the tractor feed safely at a later date if necessary.

Fitting the bottom tractor feet

Before the tractor feed can be installed, the support feet for the tractor feed must be fitted:



Caution!

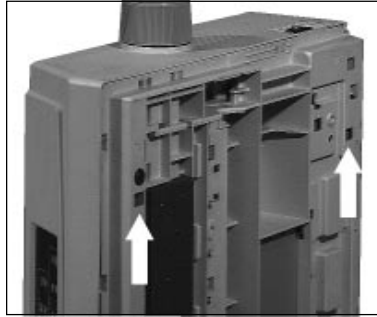
The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



Caution!

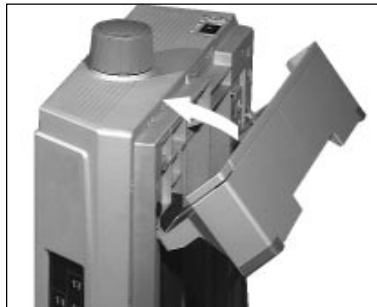
The print head may be hot and can burn your hands. Wait until the print head has cooled down.

1. Switch off the printer.
2. In order to fit the feet, set the printer on its left side with the platen knob pointing upwards. The right support foot is to be fitted first.
3. Hook the corners of the support foot into the cutouts provided for this in the bottom of the printer.



Cutouts

4. Press the foot carefully in the direction of the arrow towards the bottom of the printer so that its edges line up with those of the printer.



5. Before fitting the left foot, temporarily remove the platen knob to avoid damaging it. Set the printer on its right side in order to fit the left support foot in a similar way.

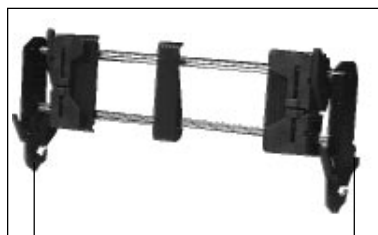


6. Once the two feet are fitted, you need to fold them out to allow you to install the tractor feed. As a result, the printer will tilt backwards. Replace the platen knob.



Installing the tractor feed

To install the tractor feed, you need firstly to fold out the two support feet. Then proceed as described below:



Mounting hooks

Cutouts



Caution!

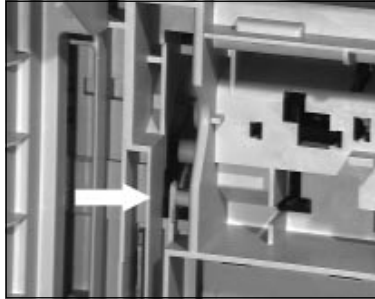
The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



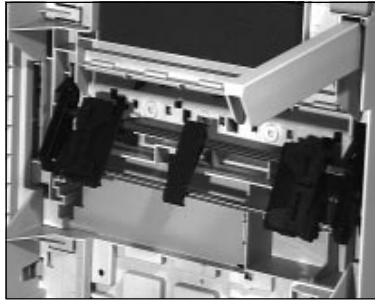
Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

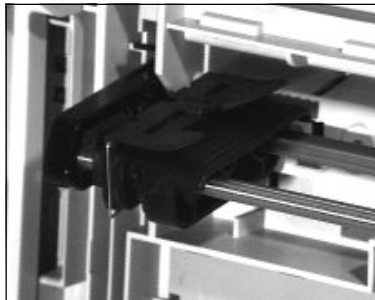
1. Place the tractor feed with the cutouts at both ends onto the retaining pins on the bottom of the printer (arrow).



2. Gently push the tractor feed towards the front of the printer.



3. The mounting hooks of the tractor feed must click audibly into place.



4. Place the printer back onto its support feet.
5. Switch the printer on.



Feeding continuous paper

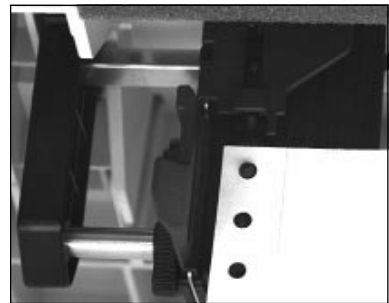
1. Move the paper lever on the right of the printer back to the continuous paper position (REAR). The symbol on the cover for cut sheet handling (TOP) shows you the correct lever position.



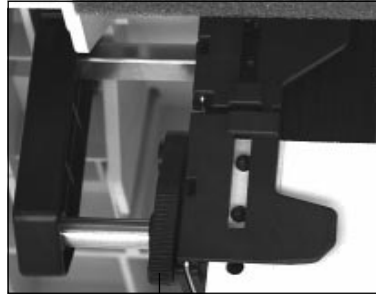
Warning!

Direct pressure on the platen can cause damage to the print head and pins.
Make sure the paper guide is correctly adjusted.

2. Place a stack of continuous paper underneath the printer or feed the continuous paper from below through the feed slot of a printer table.
3. Open the cover of the left hand sprocket feed, place the continuous paper onto the first two sprocket pins and close the cover again.

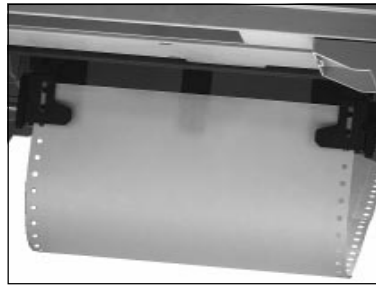


4. To adjust the left sprocket feed to suit the width of the paper, release the locking lever, pull forwards. Move the feed unit to the required position and lock it with the lever again.



Locking lever

5. Now adjust the right hand sprocket feed in the same way to suit the paper width. Open the cover of the right sprocket drive, place the continuous paper onto the first two sprocket pins and close the cover again. Lock the feed again with the lever.



6. Make sure the paper is slightly tensioned. Fold the support feet back in again.

7. Switch the printer on. The print head will move to the left end of the platen and the active indicators on the operator panel will light. The **ALARM** indicator which will also light indicates in this case that there is no paper at the print position yet.



8. The paper can now be transported to the print position by pressing the *FF/LOAD* button. Redefine the top of form position if necessary by means of the »Top Of Form« function. This is described in »Chapter 3: Paper handling«.

You can set the values for paper handling as you wish by means of the printer menu in the **Bottom Feed** group.

Changing between different formats of continuous paper

If you are feeding continuous paper from the rear and wish to use continuous paper from the bottom tractor feed, proceed as follows:

1. Part the printed pages along the perforation.
2. In **ON LINE** mode, press the *PARK* button. The continuous paper is transported backwards but remains held in the bottom tractor feed.
3. Move the paper release lever on the right side of the printer towards the back; the symbol for continuous paper handling from below shows the correct setting for the lever.
4. Press the *FF/LOAD* button. The continuous paper held in the bottom tractor feed is fed in. Redefine the top of form if necessary.

If the print job is finished and you wish to use the continuous paper from the bottom tractor feed, proceed as follows:

5. Part the printed pages along the perforation. Press the *PARK* button. The continuous paper is transported backwards but remains held in the bottom tractor feed.
6. Pull the paper release lever on the right side of the printer towards the front; the symbol for continuous paper handling from the rear shows the correct setting for the lever.
7. Press the *FF/LOAD* button. The continuous paper is again fed to the platen from the rear of the printer.

The roll paper stand

The roll paper stand permits you to use telex roll paper or special paper for specific applications.

Check that the individual items supplied are complete and undamaged. You should have received, depending on the model:

- 1 roll paper stand (only narrow)
- 1 paper support



Checking the items supplied

Remove the packing material. Keep the original packing material safe so that you can transport the roll paper stand safely at a later date if necessary.

Installation

To install the roll paper stand, proceed as follows:



Caution!

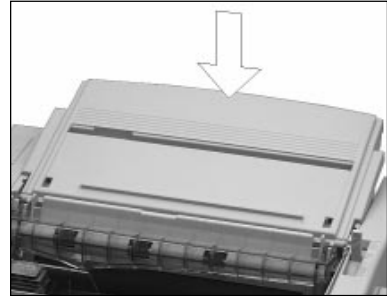
The print head moves and can cause injury to the hands. Switch the printer OFF LINE and wait until the print head stops moving.



Caution!

The print head may be hot and can burn your hands. Wait until the print head has cooled down.

1. Replace the old support with the new paper support provided with the roll paper stand. The paper support is installed as described in Chapter 1.



2. Place the hooks of the roll paper stand precisely in the cutouts of the paper support and tilt the support backwards. The connecting cable will point to the back when this is done.



3. Connect the cable plug of the roll paper stand to the socket on the back of the printer. The arrow on the plug shows the correct way to plug it in.



Paper feed

Insert the roll paper as described below:

1. Insert the roll shaft into the core of the paper roll and open the paper guide of the roll paper stand. Insert the shaft into the roll paper stand so that the slotted end of the shaft engages in the slot of the left holder and the paper runs off from the bottom.

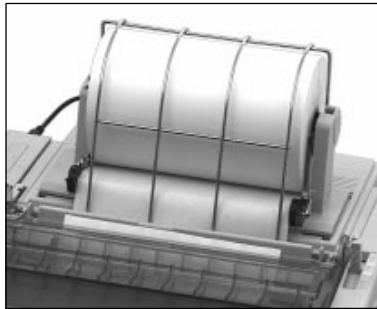
2. Slip the paper beneath the platen from the back with the edges of the paper lying against the platen. Now turn the platen knob to feed the paper around the platen.



Warning!

Direct pressure on the platen can cause damage to the print head and pins.
Make sure the paper guide is correctly adjusted.

3. Set the paper lever to the rear position. Align the left and right edges of the paper with the edges of the paper fed in from the back. When the roll paper is aligned properly, return the paper lever to the middle position.
4. Switch on the printer. The print head will move to the left end of the platen and the active indicators on the operator panel will light.
5. The paper can now be transported to the initial printing position by pressing the *FF/LOAD* button.



Note that you require special continuous paper in order to use the roll paper stand.

Interface cards

In addition to the built-in parallel interface, three other different serial interface cards are available:

- RS-232C
- RS-232C/Current Loop
- RS-422A

Installation

Technical details on these interfaces such as pin assignment, configuration by means of the printer menu and interface diagnostics are to be found in »Appendix D: Interface data«.

This section explains how to install the interface card.



Caution!

There is electricity present and therefore a risk of an electric shock. Switch off the printer and remove the plug from the power socket.



Warning!

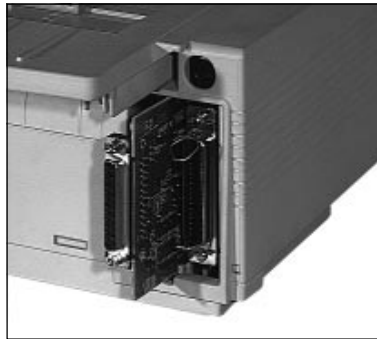
Static charges can damage the interface. Leave the interface card in its protective packing until the instructions describe when to install it.

1. Switch off the printer and remove the parallel interface cable.

2. Remove the panel on the right, rear side of the printer by breaking it out with a slot-head screwdriver or by cutting it out with a knife.

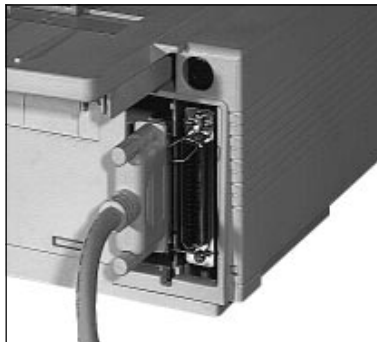


3. Take the card out of its packing and slide the card along the guide slot as far as the stop inside the case until you can feel it make contact. It will automatically engage there.



A clip may be enclosed which is not required for this model.

4. Plug the printer end of the interface cable into the socket on the back of the printer. Secure the cable with the two screws.





Note!

Make sure that the parallel and serial interface cables are not installed or used at the same time as this can result in malfunction.

5. Connect the other end of the interface cable to the appropriate socket of your computer. Read the corresponding instructions in your computer manual.
6. Switch on the printer again.

Chapter 8: Troubleshooting

Most printing problems are easy to solve. Before calling customer service, check the possible causes of faults below. Small malfunctions are usually very easy and quick to remedy yourself.

Possible faults

This summary covers both the fault and possible remedies. Ascertain in which part of the machine the malfunction is located and read the advice described. If you are not able to remedy a fault, contact your supplier.

What do I do if ...

... nothing happens when I turn on the printer?

The printer may not be connected to the power supply. Check whether the power cable is connected to both the printer and an earthed mains socket.

...the ALARM lamp lights?

The stock of paper may be used up or the paper release lever is not set to the type of paper presently being used (continuous paper or cut sheets). Once you have remedied the reason for the fault, turn the printer off and then on again in order to extinguish the **ALARM** lamp.

*Further information on **ALARM** messages is to be found at the end of the chapter.*

...the ALARM lamp is blinking?

There is an internal fault. Contact your supplier.

...the MENU lamp is blinking?

The temperature sensor in the print head has detected that the temperature is too high. The printer automatically reduces its throughput to allow the print head to cool down. Printing then continues at normal speed with no loss of data.

...nothing is being printed although the computer is sending data?

The printer may be switched OFF LINE. If the **SEL** lamp is not lit, press the *SEL* button. Check that the interface cable is correctly connected to your printer and computer.

...a paper jam occurs?

Paper jams rarely occur even if continuous paper and cut sheets are being alternately processed. Therefore, make sure the following points in particular are properly dealt with before printing:

- Continuous paper was not properly inserted in the transport sprockets of the pull or bottom tractor feed.
- You may have used unsuitable paper. Refer to the notes on paper in Chapter 3.

If you are still experiencing paper jams, proceed as follows:

- Switch off the printer.
- Open the printer cover.



Caution!

The print head may be hot and can burn your hands.
Wait until the print head has cooled down.

-
- If you are using continuous paper, tear off the paper already printed.
 - If the paper jam occurred at the ribbon guard, carefully move the print head to the side. Do not undo the screws of the ribbon carriage otherwise this will put the print head out of adjustment. Make sure there is no more paper between the ribbon guard and platen. Turn the platen knob to eject the paper carefully. Now remove all small pieces of paper from the printer.

The printer is now ready for operation again.

...individual dots of the print-out are missing?

The print head may be damaged. Contact your supplier.

...the print-out appears faint?

Replace the ribbon cassette with a new one as described in Chapter 6 and adjust the paper thickness correctly. If there is no marked improvement in the printing, contact your supplier.

...text processing files are printed differently to the settings defined in the printer menu or operator panel?

Many application programs send control commands to the printer at the start of and during data transmission. This »initialisation string« contains control characters and commands that set up the printer for the subsequent print job. These commands have priority over the settings selected via the operator panel or menu. Check in the associated manual whether you can alter the initialisation string. If this is the case, delete the unwanted commands.

...the menu and print function buttons are inoperative?

The function of the buttons can be deactivated by means of the menu item **Operator Panel Functions** of the printer menu. If the printer is part of a network or is shared by several people, the respective system administrator has probably used this option to prevent the printer settings being altered indiscriminately. Hold down the *MENU* button when switching on to be able to alter this item.

...if I wish to check the data sent by the computer to the printer?

Use the hex dump mode. To activate this mode, hold down the *FF/LOAD* button and the *SEL* button when switching on the printer. All data sent to the printer including text and printer commands will then be printed in hexadecimal form and ASCII format. When you wish to return to normal print mode, switch the printer off and then on again.

Fault tables

Malfunctions are indicated by the blinking of the **ALARM** lamp. The other lamps show the type of fault.

Faults that can be remedied by the user

- status of the indicator lamp unchanged
- indicator lamp is lit
- X indicator lamp is blinking

The messages listed point to faults that can generally be remedied by the user. If the fault message appears again after you have undertaken the remedy described, contact your supplier.

ALARM	SEL	MENU	10 cpi	15 cpi	Description
•	-	-	-	-	The stock of paper has run out. Top up with new paper.
•		-	x		The paper lever is set to the cut sheet symbol (TOP) although continuous paper is being used. Transport the continuous paper to the PARK position or choose another means of feeding the continuous paper.
•		-		x	A paper jam has occurred. Remove the paper and make sure the paper path is free. Press the <i>SEL</i> button.
	-	x	-	-	The print head, the LF or space motor became too hot, the printer automatically reduced its throughput.

Should the **ALARM** indicator lamp start blinking, refer to the following table.

If the remedies described are not successful, contact your supplier.

UTL	PRES	10 cpi	12 cpi	20 cpi	PROP	Description
•	•			•	•	<p>The serial interface card is incorrectly installed. Remove the card and re-install it.</p> <p>The drive of the print head carriage (space motor) is jammed or faulty.</p> <p>Make sure that no foreign material is preventing the carriage from moving correctly (staple, paper dust, etc.).</p> <p>The print head is not seated correctly on the print head carriage.</p> <p>Remember that the print head is sometimes hot. Open the clip that fastens the print head to the carriage. Press the print head carefully downwards. Inspect it to check that the head is correctly seated in its holder. Now close the fastening clip.</p>

Any other messages refer to more serious faults; see also the following table.

Major faults

The following fault messages are unlikely to be displayed in normal use. They are listed here for the sake of completeness. Should any of these faults occur, contact your supplier.

The **ALARM** lamp also blinks when these faults occur; the following lamps light permanently in addition.

10 cpi	15 cpi	17 cpi	20 cpi	PROP	UTL	PRES	BOLD	Cause
•								MPU, internal RAM
	•							Program ROM
			•					RAM
	•					•		internal character generator
	•						•	EEPROM
		•						Firmware time monitoring
		•			•			Firmware NMI signal
		•				•		Firmware BRK command
•						•		Serial interface card, MPU, internal RAM
	•				•			Serial interface card, ROM
			•		•			Serial interface card, RAM
				•	•			Head positioning
•				•		•		Print head gap
•				•				Print head contact
•				•	•			LF/space motor, driver

Testing options

The printer is provided with a number of simple means for testing that it is functioning correctly. Use one of the available tests when you wish to check whether the printer is working properly. Details on the program version and emulation of your printer are contained in the header above the following test print-outs. Keep this information handy in case you need to contact the service department.

This test can be used to check both the print quality and the paper handling. Pay particular attention to problems with paper feeding and ejection and irregularities with the print-out.

Continuous ASCII sample

- ASCII test on a cut sheet

Should you wish to print out a continuous ASCII alphabet, hold down the *QUIET/TOF* button when switching on the printer. Either insert a sheet of paper or press the *FF/LOAD* button to have a sheet fed from the cut sheet feeder (CSF).

- ASCII test on continuous paper

First mount the continuous paper in the tractor feed. Notes on the use of continuous paper are to be found in the chapter »Paper handling«. Press the *QUIET/TOF* button when switching on the printer.

The continuous test runs for several pages until terminated by pressing the *SEL* button. The continuous ASCII sample is printed over the entire printable area of the platen, so make sure with the wide model that appropriate paper is inserted.

Available fonts

This test will help you to check the current print quality and the available fonts. The print-out of available fonts covers one page and ends automatically, but can also be cancelled prematurely by pressing the *SEL* button.

- Font test on a cut sheet

You can obtain a print-out of all available fonts by holding down the *LF* button when switching on the printer. Either insert a cut sheet or press the *FF/LOAD* button to have a sheet fed from the cut sheet feeder (CSF).

- Font test on continuous paper

First mount the continuous paper in the tractor feed. Notes on the use of continuous paper are to be found in the chapter »Paper handling«. Hold down the *LF* button when switching on the printer.

Hex dump mode

Should you wish to check the data being sent by the computer to the printer, use the hexadecimal output. All data sent to the printer including text and printer commands will then be printed in hexadecimal form and ASCII format, with all codes that are non-printable in ASCII format shown as dots.

To activate this mode, hold down the *FF/LOAD* button and the *SEL* button when switching on the printer. For this test too, you can use the different methods described for feeding cut sheets and continuous paper.

The line of BASIC:

```
10 LPRINT CHR$(27); "0"; CHR$(30); This is an example of a  
                                hexadecimal dump!"
```

would be printed as follows:

Hex Data Dump

```
1B 30 1E 54 68 69 73 20 69 73 20 61 6E 20 65 78  .0.This is an ex  
61 6D 70 6C 65 20 6F 66 20 61 20 68 65 78 61 64  ample of a hexad  
65 63 69 6D 61 6C 20 64 75 6D 70 2E 0D 0A      ecimal dump!..
```

Should you wish to return to normal print mode, switch the printer off and on again.

Chapter 9: Packing the printer for transportation

Should you need to send off or transport the printer (dispatch, change of location, repairs), follow the instructions below to ensure the secure packing of your machine. Printers not packed in accordance with these instructions could be damaged during transportation. **Any guarantee for dot matrix printers will invalidate if these are not packed as described.** You will be responsible for cleaning work and repairs in this case. Use all of the original packing material for transportation.

1. Switch off the printer. Remove the power cable and interface cable.
2. Accessories must be packed separately.



Caution!

The print head may be hot and can burn your hands.
Wait until the print head has cooled down.

-
3. Remove the ribbon cassette. Move the print head to the left end of the platen and secure the print head with the transport packing material.



4. Pack the printer in the plastic bag supplied. Secure the printer in the box using the polystyrene packing material.
5. Close the box and stick it down.

Chapter 10: IBM - Standard Functions

This chapter contains the commands for controlling **IBM ProPrinter X24/XL24** emulation printer functions. The individual commands are listed within the function groups such as print quality, page formatting, etc.

The functions of the individual control commands are explained below. The commands are listed at the start of each section in decimal (Dec.), hexadecimal (Hex.) and in ASCII format.

Print quality

Function	Dec.	Hex.	ASCII	Select font
Select font	27 107 n	1B 6B n	ESC k n	
	n = 0: Roman			
	n = 1: Swiss			
	n = 2: Courier			
	n = 3: Prestige			
	n = 5: OCR-B			
	n = 7: Orator			
	n = 122: Swiss Bold			
	n = 124: Gothic			
	n = 126: typeface according to menu			

This command allows you to select a font. »Courier« is the most usual standard font, while »Gothic« gives your documents an attractive appearance. If you need a machine-readable font for special applications, then select »OCR-B«. You can also use the menu mode or the *PRINT QUALITY* button on the printer's control panel to select a typeface.

The OCR-B consists of the 14 characters 0 1 2 3 4 5 6 7 8 9 + - > <. All other characters are available in Courier.

Function	Dec.	Hex.	ASCII
Select typeface	27 91 73	1B 5B 49	ESC [I
	5 0	05 00	ENQ NUL
	m ₁ m ₂ p ₁ p ₂	m ₁ m ₂ p ₁ p ₂	m ₁ m ₂ p ₁ p ₂
	r ₁	r ₁	r ₁

In this command the Font-ID m₁ and m₂ is defined by the following sequence:

$m_1 = \text{integer value (Font-ID/256)}$

$m_2 = \text{Font-ID} - (m_1 * 256)$

Following values for m_1 and m_2 are fixed:

m_1	m_2	Typeface
0	0	no change
0	8	Courier
0	11	Courier
0	18	Courier
0	49	Courier
0	85	Courier
0	92	Courier
0	98	Courier
0	171	Courier
0	223	Courier
0	226	Courier
0	12	Prestige Elite
0	80	Prestige Elite
0	86	Prestige Elite
0	100	Prestige Elite
0	164	Prestige Elite
0	221	Prestige Elite
0	155	Roman
0	159	Roman
0	166	Roman
0	167	Roman
0	87	Letter Gothic
0	222	Letter Gothic
0	255	Letter Gothic
0	3	OCR-B

The parameters p_1 and p_2 define the character space (cpi) in increments of 1/1440 inch. This calculation corresponds to the one of m_1 and m_2 . Therefore, 10 cpi have the following value: $p_1 = 0$, $p_2 = 144$. If p_1 and p_2 both equal 0, the actual character pitch is kept.

Following values for p_1 and p_2 are defined:

P_1	P_2	Character pitch
0	0	no change
0	72	20 cpi
0	84	17 cpi
0	96	15 cpi
0	120	12 cpi
0	144	10 cpi

r_1 defines whether the proportional typeface is selected. In this case r_1 has the value 2. Is $r_1 = 1$ a non proportional typeface, it is selected. Is $r_1 = 0$ the last selected item (proportional or non proportional), it is kept.

Print modes

Function	Dec.	Hex.	ASCII	Character pitch
Start 10 cpi	18	12	DC2	
Start 12 cpi	27 58	1B 3A	ESC :	
Start 15 cpi	27 103	1B 67	ESC g	
Start 15/17.1 cpi	15	0F	SI	
Start 20 cpi	27 15	1B 0F	ESC SI	

The pitch is usually measured in characters per inch (cpi). For example, with 10 cpi 10 characters can be printed per inch (2.54 cm). Each character then occupies 1/10 of an inch. The pitch can also be defined via a multifunction command.

The function of the command *SI* for condensed printing mode depends on the menu items **SI Select Pitch (10 CPI)** and **SI Select Pitch (12 CPI)**. Starting from a pitch of 10 cpi a pitch of 15 or 17.1 can be selected with the command *SI* which can be defined in the menu item **SI Select Pitch (10 CPI)**. Starting from a pitch of 12 cpi a pitch of 20 cpi can be selected with the command *SI* if the value 20 cpi is set in the menu item **SI Select Pitch (12 CPI)**. If the value **12 CPI** is selected in the menu, the command *SI* will be ignored if starting from 12 cpi. The following table shows the possible pitches when using the command for double width printing.

The pitch can also be defined via the **CHARACTER PITCH** menu item or via the control panel. The spacing can also be defined via a multifunction command.

Double width printing

Function	Dec.	Hex.	ASCII
Start double width	27 87 49	1B 57 31	ESC W 1
Stop double width	27 87 48	1B 57 30	ESC W 0
Start double width	14 or	0E or	SO
Stop double width before end of the line	20	14	DC4

With these commands you can extend characters to double their normal width. If the actual character width is, for example, 12 cpi, the printer will print at 6 cpi after a command for double width printing. The following table shows all possible combinations.

The command *Double width printing* for one line is especially suitable for titles and headings, as the function is automatically deactivated at the end of the line. If a double width printing command is to be cancelled before the end of a line, you must send a *DC4* or *ESC W 0* command.

If double width printing is permanently activated via the command *ESC W 1*, this function can only be cancelled by entering *ESC W 0*; in this case *DC4* has no effect.

Pitch	Double width printing
10 cpi	5 cpi
12 cpi	6 cpi
15 cpi	7.5 cpi
17.1 cpi	8.5 cpi
20 cpi	10 cpi

If proportional spacing is activated, the use of double width printing gives double width proportional printing. As this does not have a fixed pitch, it is not shown in the table.

For certain applications the maximum number of characters in a line has to be indicated. This depends on the pitch selected. The following table shows the maximum number of characters per line.

Pitch	Characters per line	
	Narrow printer	Wide printer
5 cpi	40	68
6 cpi	48	81
7.5 cpi	60	102
8.5 cpi	68	116
10 cpi	80	136
12 cpi	96	163
15 cpi	120	204
17.1 cpi	137	233
20 cpi	160	272

Function	Dec.	Hex.	ASCII	Proportional spacing
Start proportional spacing	27 80 49	1B 50 31	ESC P 1	
Stop proportional spacing	27 80 48	1B 50 30	ESC P 0	

With proportional spacing the spacing between the individual letters varies according to the respective character width. With a fixed pitch all characters are created within a matrix of the same width. Proportional spacing, however, gives wide characters such as »w« or »M« more space and narrow characters such as »I« or »f« less space. The result is an attractive and more legible print image than with a fixed pitch.

Because of the different character widths proportional fonts do not have a fixed pitch. Precise margin settings in the case of full justified text, for example, is only possible if the word processing program supports proportional spacing.

This function can also be activated via the **Proportional Spacing** menu item or via the control panel. Proportional spacing is also available via multifunction commands.

Print attributes

Emphasized / enhanced

Function	Dec.	Hex.	ASCII
Start emphasized	27 69	1B 45	ESC E
Stop emphasized	27 70	1B 46	ESC F
Start enhanced	27 71	1B 47	ESC G
Stop enhanced	27 72	1B 48	ESC H

With emphasized, the dot patterns of the characters are printed horizontally offset with enhanced, they are vertically offset. Emphasized and enhanced are not available in near-letter quality.

Emphasized and enhanced can be combined to particularly highlight selected text.

Underline

Function	Dec.	Hex.	ASCII
Start underline	27 45 49	1B 2D 31	ESC - 1
Stop underline	27 45 48	1B 2D 30	ESC - 0

This command causes all printable characters including spaces to be underlined. Graphics and spaces skipped by a horizontal tabulator are not underlined.

Overscoring

Function	Dec.	Hex.	ASCII
Start overscoring	27 95 49	1B 5F 31	ESC _ 1
Stop overscoring	27 95 48	1B 5F 30	ESC _ 0

This command causes all printable characters including spaces to be overscored. Graphics and spaces skipped by a horizontal tabulator are not overscored.

Superscript / Subscript

Function	Dec.	Hex.	ASCII
Start superscript	27 83 48	1B 53 30	ESC S 0
Start subscript	27 83 49	1B 53 31	ESC S 1
Stop super/subscript	27 84	1B 54	ESC T

Superscript characters are printed above the base line and are used for exponents (x^2) and other typographical effects. Subscript is particularly suitable for chemical formulae (H_2O). Superscript and subscript characters are represented in all pitches in half character height and normal character width.

Function	Dec.	Hex.	ASCII	Italics
Start italics	27 37 71	1B 25 47	ESC % G	
Stop italics	25 37 72	1B 25 48	ESC % H	

Italic characters are printed sloping *slightly to the right* and particularly highlight individual words, sentences or whole paragraphs. You can also activate this function via the menu to print a complete document in italics.

Multifunction commands

Different print functions can be combined in a single escape sequence with multifunction commands.

Function	Dec.	Hex.	ASCII	Print quality, character pitch and typeface
Select print quality, pitch and font	27 33 n	1B 49 n	ESC I n	

The parameter n defines here the combination of print quality, pitch and font in accordance with the following table. Insert a value from the following table for n.

The following print qualities and pitches can also be selected via the control panel or the menu.

n	Print mode	Pitch	Font
0	Data Processing Quality	10 cpi	resident
2	Letter Quality	10 cpi	resident
3	Letter Quality	proportional	resident
4	Data Processing Quality	10 cpi	resident
6	Letter Quality	10 cpi	resident
7	Letter Quality	proportional	resident

n	Print mode	Pitch	Font
8	Data Processing Quality	12 cpi	resident
10	Letter Quality	12 cpi	resident
12	Data Processing Quality	12 cpi	resident
14	Letter Quality	12 cpi	resident
16	Data Processing Quality	17,1 cpi	resident
18	Letter Quality	17,1 cpi	resident
20	Data Processing Quality	17,1 cpi	resident
22	Letter Quality	17,1 cpi	resident
24	Data Processing Quality	15 cpi	resident
26	Letter Quality	15 cpi	resident
32	Data Processing Quality	20 cpi	resident
34	Letter Quality	20 cpi	resident

DLL = Down Line Loadable Font generator

The printer gives you two different print qualities: In data processing quality (**UTL**) a print speed of 260 characters per second (cps) at 10 cpi is reached, printing being bidirectional, i.e. one line from left to right, the next line from right to left, etc. This quality is suitable in particular for extensive lists and drafts.

Letter-quality (**LQ**), which reaches a speed of 87 cps at 10 cpi, should be used to create correspondence or documents. With this print quality the characters are printed in a high dot pattern resolution. This enables the creation of attractive documents when using a word processor.

These print qualities can be selected via the menu item **Print Mode** or the control panel.

Character size /
Line spacing

Function	Dec.	Hex.	ASCII
Character size /	27 91 64	1B 5B 40	ESC [@
Line spacing	4 0	04 00	EOT NUL
	0 0	00 00	NUL NUL
	n ₁ n ₂	n ₁ n ₂	n ₁ n ₂

When using double height, characters are extended to double their normal height. This function can be combined with double width and emphasized into a variety of print attributes. When using double height, you should increase the line spacing accordingly.

With this command, in addition to the character height you can also define the character width and the line spacing. The different combinations of these three functions result from the values for the variables n_1 and n_2 ; n_1 defines the character height and line spacing, and n_2 defines the character width.

n_1	Result
0	Current line spacing, current character height
1	Current line spacing, normal character height
2	Current line spacing, double character height
16	Single line spacing, current character height
17	Single line spacing, normal character height
18	Single line spacing, double character height
32	Double line spacing, current character height
33	Double line spacing, normal character height
34	Double line spacing, double character height

n_2	Result
0	Current character width
1	Standard character width
2	Double character width

Example:

If you want to print double height characters with double line spacing without changing the character width, you must enter the following BASIC instruction:

```
LPRINT CHR$(27); "[@"; CHR$(4); CHR$(0); CHR$(0);  
CHR$(0); CHR$(34); CHR$(0)
```

The parameters n_1 and n_2 are to be taken from the table.

Tabulators

Horizontal
tabulators

Function	Dec.	Hex.	ASCII
Skip to next horizontal tab	9	09	HT
Set horizontal tabs	27 68 n_1 ... n_k 00 $n = 1$ to 255 $k = 1$ to 28	1B 44 n_1 ... n_k 00	ESC D n_1 ... n_k NUL
Clear horizontal tabs	27 68 0	1B 44 00	ESC D NUL

When the printer is switched on tabulators are set automatically every eight columns starting with the ninth column. If a tabulator character (*HT*) is transmitted, the print head moves to the next set tab position before printing the following character.

The set tabulator position relates to the extreme left print column and not the set left margin (absolute reference). The actual position of a tab depends on the actual pitch at the time when loading the horizontal tab. When the pitch is changed, the tab position moves (relative position). It is mandatory to enter the tab positions in ascending order. The parameter n_1 indicates the column position of the first tab, n_2 to n_k accordingly the column positions of the other tabs to be set. Up to 28 ($n_1 \dots n_{28}$) tabs can be defined. The position of a horizontal tab relates absolutely to the character column zero, i.e. to the physical left margin. The command sequence must be ended with a *NUL* character.

The command *ESC D NUL* clears all horizontal tabs, including the standard tabs. If the printer is switched off and on, the standard tabs are available again. If no other tab is set up to the end of line, the tab jump command is ignored.

The command *ESC R* cancels any tab stops you have set and returns to the printer's defaults. This means that horizontal tab stops will occur every eight columns, and that there will be no vertical stops. A *VT* command will just produce a single line feed.

The maximum permissible values for tab positions can be seen from the following table.

Pitch	Max. tabulator position		Vertical tabulators
	Narrow printer	Wide printer	
10 cpi	79	135	
12 cpi	95	162	
15 cpi	119	203	
17.1 cpi	136	232	
20 cpi	159	255	

Function	Dec.	Hex.	ASCII	Vertical tabulators
Skip to next vertical tab	11	0B	VT	
Set vertical tabs	27 66 $n_1 \dots n_k 0$ k = 1 to 16 n = 1 to 255	1B 42 $n_1 \dots n_k 00$	ESC B $n_1 \dots n_k NUL$	

No vertical tabs are set when switching on the printer. Up to 16 vertical tabulator positions can be set, the positions being defined as a line number. They must be entered in ascending order and end with a *NUL* character. The parameter n_1 indicates the line number of the first tab, n_2 to n_k accordingly the line numbers of the other tabs to be set. Up to 64 vertical tabs can be defined ($n_1 \dots n_{64}$). *ESC B NUL* deletes all vertical tabs. If the command *VT* is entered without any tab positions being defined, a line feed is executed.

The actual position of a tab mark depends on the actual line spacing when loading the vertical tabs and does not move when line spacing is changed (absolute position). With the skip command for the vertical tabulator the paper is transported to the next tab position. If a skip command is entered without further vertical tab positions being set, a line feed is executed.

Function	Dec.	Hex.	ASCII	Reset tabs to default
Reset horizontal/ vertical tabs to default	27 82	1B 52	ESC R	

Use this command to cancel any tab stops you have set and return to the printer's defaults. This means that horizontal tab stops will occur every eight columns, and that there will be no vertical tab stops. A *VT* command will just produce a single line feed.

Positioning

Relative dot
positioning

Function	Dec.	Hex.	ASCII
Relative horiz. dot position to the right	27 100 $n_1 n_2$	1B 64 $n_1 n_2$	ESC d $n_1 n_2$
Relative horiz. dot position to the left	27 101 $n_1 n_2$	1B 65 $n_1 n_2$	ESC e $n_1 n_2$

With these commands you can indent a line, for example at the beginning of a paragraph, where the spacing is measured in relative dot columns. A dot-column is the space from the centre of one point to the centre to another point within a character pattern. This space is irrespective of the character space and comes to 1/120 inch.

With the variables n_1 and n_2 in this command a specific dot position can be defined at which the printout is to start. The values of the variables can be calculated using the following table:

$$n_1 = \text{dot position} - (n_2 * 256)$$

$$n_2 = \text{integer value (relative dot position/256)}$$

If you want to move the current print position for less than 256 point positions, you must replace n_1 by the corresponding number of dot columns and n_2 by the value 0. If you want to move the current print position for more than 256 point positions, you have to divide the number of dot columns by 256. Take the result for the values n_1 and n_2 and calculate according to above mentioned table. In this command send, the print head position is moved by $n_1 + (n_2 \times 256)$ point positions to the left or to the right side.

Have you chosen an indentation beyond the left or right margin this command is ignored. For an indentation of 80 dot columns to the left, type the following formula:

```
LPRINT CHR$ (27); "e"; CHR$ (80); CHR$ (0)
```

For an indentation of 600 dot columns to the right, type the following formula:

```
LPRINT CHR$ (27); "d"; CHR$ (88); CHR$ (2)
```

(600 : 256 = 2, remainder 88)

Function	Dec.	Hex.	ASCII	Indicate next print position
Start indication	27 105 1	1B 69 01	ESC i SOH	
Stop indication	27 105 0	1B 69 00	ESC i NUL	

With this command you can switch on and off the mode which enables indication of the next print position. The next print position is indicated by the character »M« on the red line which is on the transparent paper protector at the front on the print head carriage.

This mode can also be switched on and off via the control panel by simultaneously pressing the *SHIFT* and *PRINT QUALITY* keys. If this mode is activated, the data in the printer memory are printed out. With this mode switched on the following commands cause indication of the next print position by the above-mentioned marking: space with print head positioning (255 dec., FF hex.), backspace (*BS*), horizontal tab (*HT*), carriage return (*CR*), line feed commands, form feed (*FF*), commands for defining the next print position, delete buffer (*CAN*), delete character (*DEL*).

If the functions *Underline* or *Overscore* are switched on, then spaces with positioning, i.e. spaces skipped by horizontal tab or positioning commands, are underlined or overscored; the next print position is then not displayed.

Page formatting

Function	Dec.	Hex.	ASCII	Set page length
Page length in lines	27 67 n n = 0 to 50	1B 43 n	ESC C n	
Page length in inches	27 67 0 n n = 1 to 255	1B 43 00 n	ESC C NUL n	

By selecting page length you can inform the printer of the size of the paper used.

When the printer is switched on, the current position of the print head is registered as *Top of Form*, i.e. as the first print line on the page. When printing forms it is important that the page length is set to the dimensions of the form so that not only the first but also all following form sets are printed in the right position.

Normally a standard length can be set in the **Page Length** menu item, though the page length can also be defined by one of the above commands in inches or in the number of lines. If **Page Length Control** is set to **by MENU Setting**, the start position for the sheet is not reset.

Defining the page length in lines is done as a function of the current line spacing. However, any subsequent change of line spacing does not change the page length. When using these two commands to change the page length the form start position is reset, a *Skip over Perforation* defined by command is deactivated and the value for the skip over perforation selected in the menu item is used. Set vertical tabs are deleted.

Setting Top of Form

Function	Dec.	Hex.	ASCII
Set current print head position as Top of Form	27 52	1B 34	ESC 4

When printing cut sheets with cut sheet feeder (CSF) this command has no effect.

When entering this command the new TOF (Top of Form) is set at the respective position of the print head. However, the Top of Form can also be defined via the control panel. This is described in Chapter 2. If **Page Length Control** is set to **by MENU Setting** this command is ignored for cut sheets.

Skip over Perforation

Function	Dec.	Hex.	ASCII
Activate Skip over Perforation	27 78 n n = 1 to 255	1B 4E n	ESC N n
Deactivate Skip over Perforation	27 79	1B 4F	ESC O

With this function the lower area of a page can be skipped automatically. There is a *Form Feed* to the start of the next page (Top of Form).

The parameter »n« designates the number of lines to be skipped to the start of the next page. The lower margin actually to be skipped depends on the current line spacing. Subsequent changes of line spacing have no effect on the margin to be skipped. All line feed commands which place the print position in the area to be skipped cause a jump to the start of the next page.

If **Skip Over Perforation** is set at **Yes** in the printer menu, a bottom area of one inch (2.54 cm) is skipped to the next Top of Form. The number of lines to be skipped can be selected with the above *Skip* command. The command *ESC O* switches off the *Skip over Perforation* function.

The commands for setting page length similarly switch off Skip over Perforation. The actual menu setting for the function **Skip Over Perforation** is selected. If page formatting is taken over by the software, e.g. a word processing program, you should switch off Skip over Perforation by setting **Skip Over Perforation** in the printer menu to **No**. If the value for **Page Length Control** is set to **by MENU Setting**, no skip over perforation is executed with cut sheets.

Function	Dec.	Hex.	ASCII	Set margins
Set left and right margins	27 88 $n_1 n_2$ n_1 : left margin (0 to 254) n_2 : right margin (0 to 255)	1B 58 $n_1 n_2$	ESC X $n_1 n_2$	

In this command the parameters n_1 and n_2 define the left and right margins. The margin values are entered in character columns. The margin positions depend on the actual current pitch. Once the margins are set the positions are retained even after changing the pitch, provided the margins have not been expressly reset (absolute position). If you only want to change one margin position, just enter the value 0 for the margin not to be changed.

Margins should always be set at the start of a line.

Note that the value for the right margin must be larger than the left margin by the number of character columns given in the table. The right margin must not exceed the maximum values given below (see table below).

Pitch	Narrow printer		Wide printer	
	left n_1	right n_2	left n_1	right n_2
10 cpi / proportional	0-70	10-80	0-126	10-136
12 cpi	0-84	12-96	0-151	12-163
15 cpi	0-105	15-120	0-189	15-204
17.1 cpi	0-119	18-137	0-215	18-233
20 cpi / proportional	0-140	20-160	0-252	20-255

Function	Dec.	Hex.	ASCII
Set top and bottom margin	27 91 83 4 0 $m_1 m_2 p_1 p_2$	1B 5B 53 04 00 $m_1 m_2 p_1 p_2$	ESC [S EOT NUL $m_1 m_2 p_1 p_2$

In this command the parameters m_1 and m_2 define the top margin distance from the top of form to the top edge of the first line. The unit is $n / 1440$ inch. Calculate the values for m_1 and m_2 according to the following formula:

m_1 = integer value (top margin in $1/1400$ inch increments /256)

m_2 = top margin in $1/1400$ inch increments - ($m_1 * 256$)

The parameters p_1 and p_2 defines the bottom margin distance from the top of form to the top edge of the bottom margin. The unit is $n / 1440$ inch. The calculation follows the above listed formula. The bottom margin is the distance from the top of form to the bottom edge of the last line.

Line spacing

Variable line spacing

Usual line spacings for text are 6 or 8 lines per inch (lpi).

Function	Dec.	Hex.	ASCII
1/8 inch line spacing	27 48	1B 30	ESC 0
7/72 inch line spacing	27 49	1B 31	ESC 1
Menu defined line spacing (without ESC A n)	27 50	1B 32	ESC 2
1/6 inch line spacing (AGM)	27 50	1B 32	ESC 2
Select variable line spacing ($n/72$ inch)	27 65 n $n=1$ to 255	1B 41 n	ESC A n
Select variable line spacing ($n/60$ inch, AGM)	27 65 n $n=1$ to 255	1B 41 n	ESC A n
Deactivate ESC A n line spacing	27 50	1B 32	ESC 2

Function	Dec.	Hex.	ASCII
Set variable line spacing (n/216 inch)	27 51 n n= 1 to 255	1B 33 n	ESC 3 n
Set variable line spacing (n/180 inch, AGM)	27 51 n n= 1 to 255	1B 33 n	ESC 3 n
Set variable line spacing (n/360 inch)	27 37 56 n n= 1 to 255	1B 25 38 n	ESC % 8 n

With the variable spacing commands you can define the line spacings via the parameter »n« in multiples of 1/72 inch, 1/216 inch or 1/360 inch. These commands do not execute a line feed, but only set the line spacing which is used by a following line feed command.

The command *ESC A n* for a variable line spacing of n/72 inch assigns the desired value to the line spacing variable. The newly selected line spacing only becomes valid when it is activated by the command *ESC 2*. If *ESC 2* is sent without the line spacing having been changed by the preceding command *ESC A*, the printer resets the line spacing to the value which was selected in the menu under **Line Spacing**.

Alternate Graphics Mode (AGM)

This mode can be activated in the menu mode. AGM contains commands compatible with the Epson LQ printer series that are limited to Graphic- and Line feed commands. The commands available in AGM are marked.

If the Alternate Graphics Mode is selected in the menu *ESC A n* line spacing steps will change to n/60 inch and the *ESC 3 n* to n/180 inch.

Paper feed

Line feed	Function	Dec.	Hex.	ASCII
	Line feed	10	0A	LF
	Reverse line feed	27 93	1B 5D	ESC]
	Variable line feed (n/216 inch)	27 74 n n = 0 to 255	1B 4A n	ESC J n
	Variable line feed (n/180 inch, AGM)	27 74 n n = 0 to 255	1B 4A n	ESC J n
	Variable line feed (n/360 inch)	27 37 52 n n = 0 to 255	1B 25 34 n	ESC % 4 n
	Set line spacing units	27 91 92 4 0 m ₁ m ₂ P ₁ P ₂	1B 5B 5C 04 00 m ₁ m ₂ P ₁ P ₂	ESC [\ EOT NUL m ₁ m ₂ P ₁ P ₂

A line feed (*LF*) command causes the printer to print the data in the line buffer and then to move the print position down by the selected line spacing. If in the printer menu **Auto CR** is set at **Yes**, a carriage return is executed and the print position is set the the left margin. With a variable line feed of n/360 inch no carriage return is executed, despite the settings of the printer menu. If 0 is set for the parameter n in this command, no line feed is executed.

If the Alternate Graphics Mode is activated in the menu line feed by *ESC J n* is n/180 inch.

The command *ESC [\ EOT NUL m₁ m₂ p₁ p₂* sets the basis for line spacing is set in increments of 1/n inch for the commands *ESC A*, *ESC 3* and *ESC J*.

- The parameters m₁ and m₂ define the basis for line spacing for the command *ESC A*.

$$m_2 = \text{integer value (n / 256)}$$

$$m_1 = n - (m_2 * 256)$$

When the printer is turned on the basis for line spacing for *ESC A* is set to 1/72 inch, in AGM mode to 1/60 inch.

- The parameters p_1 and p_2 define the basis for line spacing for the commands *ESC 3* (variable line spacing) and *ESC J* (variable line feed).

$$p_2 = \text{integer value } (n / 256)$$

$$p_1 = n - (p_2 * 256)$$

When the printer is turned on the basis for line spacing for *ESC 3* and *ESC J* is set to 1/216 inch, in AGM mode to 1/180 inch.

The following table shows the permissible values for the parameters m_1 , m_2 and p_1 , p_2 . Values that are not listed in the table will be ignored.

m_1, p_1	m_2, p_2	Function
00	00	no change
48	00	Basis of 1/48 inch
72	00	Basis of 1/72 inch
96	00	Basis of 1/96 inch
120	00	Basis of 1/120 inch
144	00	Basis of 1/144 inch
180	00	Basis of 1/180 inch
216	00	Basis of 1/216 inch
240	00	Basis of 1/240 inch
160	05	Basis of 1/1440 inch

Function	Dec.	Hex.	ASCII	Form feed
Form feed	12	0C	FF	

If a form feed (*FF*) command is sent, the printer prints all data in the line buffer and sets the current print position at the start of the next page. You can also advance a page to the start of the next page by pressing the *FF* key on the control panel.

Control of the Cut Sheet Feeder

Printing cut sheets

Function	Dec.	Hex.	ASCII
Insert single sheet	27 25 73	1B 19 49	ESC EM I
Eject single sheet	27 25 82	1B 19 52	ESC EM R

A line feed command feeds a sheet of paper from the Cut Sheet Feeder (CSF) to the set Top of Form. Any sheet of paper already in the printer is ejected before a new one is fed in.

The eject command causes data in the printer buffer to be printed and the sheet to be ejected. If the page end or the area to be skipped at the page end is reached, the sheet is ejected and a new sheet is automatically fed in and advanced to the print position. Any defined Top of Form position, however, is disregarded. Therefore, when a Cut Sheet Feeder is installed the page change in the case of multipage documents must be done with the form feed command.

Bin selection

Function	Dec.	Hex.	ASCII
Select bin 1	27 25 49	1B 19 31	ESC EM 1
Select bin 2	27 25 50	1B 19 32	ESC EM 2

These commands are only effective when using a dual bin Cut Sheet Feeder (CSF) available as an accessory.

With the two bin selection commands you can, when using a dual bin Cut Sheet Feeder, define from which bin paper is to be fed.

When using the dual-bin feeder Top of Form positions can be set for each bin. You can select the priority bin in the printer menu with **CSF Bin Select** in the SET UP group. You can then define via the control panel the Top of Form position for the paper from the bin selected via the menu. You can, for example, feed a form with pre-printed letterhead from one bin, with a Top of Form position at a large distance from the top edge of the sheet, followed by single sheets from the other bin with a Top of Form position near to the top edge of the sheet.

Function	Dec.	Hex.	ASCII	Cut Sheet Feeder
Select Cut Sheet Feeder	27 91 70 3 0 $m_1 m_2 m_3$	1B 5B 46 03 00 $m_1 m_2 m_3$	ESC [F ETX NUL $m_1 m_2 m_3$	

The parameter m_1 defines the paper feed: $m_1 = 1$ means manual paper feed. With $m_1 = 3$ the current bin is selected again. The parameter m_2 is reserved and must be at 0 or 1. The parameter m_3 selects a bin when a Cut Sheet Feeder with two bins is installed: $m_3 = 1$ selects bin 1, with $m_3 = 2$ the next sheet is taken from bin 2.

Character sets

Function	Dec.	Hex.	ASCII	IBM character sets
IBM character set I	27 55	1B 37	ESC 7	
IBM character set II	27 54	1B 36	ESC 6	

The IBM character sets are constructed as 8-bit character sets, i.e. a character is assigned to each bit combination of a byte, with control commands being assigned to some values in the range from 0 to 31. The standard ASCII characters are assigned to the range from decimal 32 to 127. In IBM character set I, the range from decimal 128 to 159 is identical with that from decimal 0 to 31, while in IBM character set II special characters are to be found in this range. The range from decimal 160 to 255 is identical for IBM character sets I and II and contains the IBM graphic symbols and other special characters.

In the two following representations the non-printable ranges are marked grey. If there are printable characters in these ranges, you can print these out with the command *All character set*.

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

IBM character set I

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

IBM character set II

The IBM character sets I and II also differ in the range from decimal 0 to 31. In character set II printable characters being assigned to the decimal values 3 to 6 and 21, which are not available in character set I. The complete IBM character sets can be found in a subsequent chapter.

All character set

Function	Dec.	Hex.	ASCII
Print a character from the all character set	27 94 n n = character code	1B 5E n	ESC ^ n
Print several characters from the all character set	27 92 n ₁ n ₂ n ₁ , n ₂ = 0 to 255	1B 5C n ₁ n ₂	ESC \ n ₁ n ₂

With these commands control characters from the ranges decimal 0 to 31 of IBM character sets I and II and 128 to 159 of IBM character set I can be addressed as printable characters. This all character set is called IBM character set III or All Character Set. If only one character is being printed from the control range, ESC ^ n is to be used, where n has the value of the character to be printed.

With ESC \ n₁ n₂ the total number of the characters to be printed from the control range must be defined with the parameters n₁ and n₂:

$$n_2 = \text{integer value (total number of characters / 256)}$$

$$n_1 = \text{total number of characters - (n}_2 \text{ * 256)}$$

If you want to print fewer than 256 characters, you must replace n_1 with the respective number of characters and enter the value 0 for n_2 . If more than 256 characters are to be printed, you must divide the number of characters to be printed by 256. Then insert the integer value for n_2 and the remainder for n_1 .

If this command is sent, the next $n_1 + (n_2 \times 256)$ characters will be printed from the all character sets shown in Appendix B.

If you want to take the 80 characters from the all character set, you must enter the following BASIC instruction:

```
LPRINT CHR$( 27 ) ; "\ " ; CHR$( 80 ) ; CHR$( 0 )
```

To print the next 600 characters in this character set you must use the following instruction:

```
LPRINT CHR$( 27 ) ; "\ " ; CHR$( 88 ) ; CHR$( 2 )
```

(600 : 256 = 2, remainder 88.)

Function	Dec.	Hex.	ASCII	National character sets
Select national character set	27 33 n	1B 21 n	ESC ! n	

With this command you can replace some characters with national special characters. If you want to activate one of these character sets, you must insert the corresponding value from the table of national character sets for the parameter n.

Two different ASCII character sets are supported in which the numeric character is represented with or without slash respectively and 16 other national character sets. A zero with slash is particularly suitable for documents in which it is important to distinguish between zero and upper case O..

Character set	n
ASCII (Ø)	64
ASCII (0)	65
British	66
German	67
French	68
Swedish I	69

Character set	n
Danish	70
Norwegian	71
Dutch	72
Italian	73
French Canadian	74
Spanish	75
Swedish II	76
Swedish III	77
Swedish IV	78
Turkish	79
Swiss I	80
Swiss II	81
Legal/Publisher	90

A table with the national character sets is shown in Chapter 13.

Select Code Page

Function	Dec.	Hex.	ASCII
Select Code Pages	27 91 84	1B 5B 54	ESC [T
	5 0	05 00	ENQ NUL
	0 0	00 00	NUL NUL
	n ₁ n ₂ 0	n ₁ n ₂ 00	n ₁ n ₂ NUL

Code Pages are national variants of the IBM character set. Unlike national character sets the differences are in the range 0 to 255. The Code Pages are available as IBM Character Sets I and II and as an all character set. With the above command the Code Pages can be selected via their ID numbers.

The parameters n₁ and n₂ determine the ID number of the Code Page to be selected in accordance with the following formula:

$$n_1 = \text{integer value (ID number / 256)}$$

$$n_2 = \text{ID number - (n}_1 \text{ * 256)}$$

The overview shows the available Code Pages and their ID numbers. You will find the Code Pages shown in a following chapter.

ID	Code Page	n ₁	n ₂
437	USA	1	181
774	Baltic - 774	3	6
850	Multilingual	3	82
852	East Europe Latin II	3	84
855	Cyrillic I - 855	3	87
857	Turkish 857	3	89
860	Portugal	3	92
863	French Canadian	3	95
865	Norwegian	3	97
866	Cyrillic II - 866	3	98
869	Greek 869	3	101
895	Kamenicky (MJK)	3	127
1008	Greek 437	3	240
1009	Greek 928	3	241
1011	Greek 437 Cyprus	3	243
1012	Turkish	3	244
1014	Polish Mazovia	3	246
1015	ISO Latin 2	3	247
1016	Serbocroat I	3	248
1017	Serbocroat II	3	249
1018	ECMA-94	3	250
1019	Windows East Europe	3	251
1020	Windows Greek	3	252
1021	Latin 5 (Windows Turkish)	3	253
1022	Windows Cyrillic	3	254
1024	Hungarian CWI	4	0
1027	Ukrainian	4	3
1029	ISO Latin 6	4	5
1030	Hebrew NC - 862	4	6
1031	Hebrew OC	4	7
1032	Windows Hebrew	4	8
1034	Windows Baltic	4	10
1072	Bulgarian	4	48

The following BASIC line selects Code Page 437:

```
LPRINT CHR$( 27 ) ; CHR$( 91 ) ; CHR$( 84 ) ; CHR$( 5 ) ;
      CHR$( 0 ) ; CHR$( 0 ) ; CHR$( 0 ) ; CHR$( 1 ) ;
      CHR$( 181 ) ; CHR$( 0 ) ;
```

The Code Pages can also be selected via the printer menu by changing the values in the **Code Page** menu item for example from **USA** to **Multilingual**. The available Code Pages are shown in Appendix B.

Code Pages are used as tables of printable characters. The character columns 2 to 7 and A to F are available in IBM Character Set I. The IBM Character Set II enables you to have access to character columns 8 and 9, whereas IBM's All Printable Character Set gives you access to all 256 printable characters as described in the previous "IBM Character Set" section.

Other commands

Carriage return

Function	Dec.	Hex.	ASCII
Carriage return	13	0D	CR

If this command is entered, all data in the line buffer are printed and the next print position is set at the left margin. For short line seeking, the print head does not make these movements immediately; the print position is only logically set at the left margin. If **Auto LF** is set to **Yes** after each carriage return the printer executes a line feed command. This command deactivates double width printing for one line.

Backspace

Function	Dec.	Hex.	ASCII
Backspace	8	08	BS

With this command the print position is set to the last received printable character. This command is only executed if a printable character or a print command then follows.

The actual width of a backspace depends on the current pitch. When using proportional spacing the backspace command moves the print position 1/10 inch to the left. If the print position is reset to a superscript character, a reverse line feed is executed to the position of the character in question and the next character is printed superscript; however, the alignment may not be quite exact.

If the print position is to be reset by several characters, a backspace command must be entered for each character to be overprinted.

However, the print position cannot be reset beyond the left margin. With this command specially composed symbols which are not available in the character set used can be printed.

Function	Dec.	Hex.	ASCII	Delete buffer
Delete buffer	24	18	CAN	

This command deletes all printable characters in the line buffer. Functions set by commands are not reset, nor is the receive buffer deleted.

Function	Dec.	Hex.	ASCII	Automatic line feed
Activate automatic line feed	27 53 49	1B 35 31	ESC 5 1	
Deactivate automatic line feed	27 53 48	1B 35 30	ESC 5 0	

If automatic line feed is activated, the printer also executes a line feed when a carriage return command is received. This function can also be controlled via the menu item **Auto LF**.

Function	Dec.	Hex.	ASCII	Unidirectional printing
Start unidirectional printing	27 85 49	1B 55 31	ESC U 1	
Stop unidirectional printing	27 85 40	1B 55 30	ESC U 0	

To optimize throughput, printing of lines normally takes place alternately forwards (from left to right) and backwards (short line seeking, bidirectional printing).

In order to improve the alignment of lines lying underneath one another you can stipulate with this function that each line be printed starting from the left margin (unidirectional printing). You should use this option when precise vertical alignment of the individual lines is desired (bit image graphics, IBM graphic characters, tables).

The print speed is somewhat reduced with unidirectional printing, as the print head after printing a line is reset to the left margin to start the next line there. This function can also be activated for printing bit image graphics via the **Graphics** menu item.

Print suppress

Function	Dec.	Hex.	ASCII
Start print suppress	27 81 n n = 36 or # for narrow printers n = 35 or \$ for wide printers	1B 51 n	ESC Q n
Stop print suppress	17	11	DC1
Printer OFF LINE	27 106	1B 6A	ESC j

After receiving an *ESC Q n* the printer ignores all further data except for the command to end print suppress. The **SEL** lamp blinks in print suppress mode. After ending print suppress the **SEL** lamp is lit constantly and the printer is in ON LINE mode. With print suppress activated data can continue to be sent to the printer without being stored or printed, these data being suppressed. In OFF LINE status in contrast data can be transferred to the printer until the receive buffer is full. The printer then signals to the system that it cannot accept any more data. The data are thus retained.

End of paper sensor

Function	Dec.	Hex.	ASCII
Deactivate end of paper sensor	27 56	1B 38	ESC 8
Activate end of paper sensor	27 57	1B 39	ESC 9

With end of paper sensor activated the **ALARM** lamp lights when less than 0.5 inch remains to the end of the paper. The printer goes into OFF LINE status. At each press of the *SEL* key a single line is printed and a line feed executed. If printing is to be to the lower margin of a sheet, the end of paper sensor can be deactivated by the above command. The printer then takes the page length set in the menu or by a command to establish an end of paper. The end of paper sensor can be reactivated with *ESC 9*. The function can also be activated and deactivated with **Paper out Override**.

Function	Dec.	Hex.	ASCII	Select font via pitch/ point size
Select font via pitch / point size	27 16 70 Pn ₀ Pn Lp Hp	1B 10 46 Pn ₀ Pn Lp Hp	ESC DLE F Pn ₀ Pn Lp Hp	
	Pn ₀ = 0 to 255 (MSB ignored) Pn = 0 to 255 (MSB ignored) Lp = 0 to 255 Hp = 0 to 255 (MSB ignored)			

With this command a previously selected font can be scaled within limited ranges by defining the pitch and the point size.

- The parameter Pn₀ sets the number of parameters which follow this parameter. In this command the parameter Pn₀ must be set to 3. For values of Pn₀ < 3 this command is ignored. For values of Pn₀ > 3, Pn₀-3 data bytes are ignored which follow the parameter Hp.
- The parameter Pn defines the pitch and parameters Lp and Hp the point size of the font.
- Values from 0 to 255 are permitted for Pn, the most significant bit however being disregarded.
- For values 2 < Pn < 4 this command is ignored.
- For values > 4 the pitch of Pn/360 inch is assigned to the font.
- The value Pn = 0 does not alter the current pitch and Pn = 1 selects proportional spacing.
- The following relation between pitch and point size applies to proportional spacing:
Pitch = 360/INT (Point size * standard width / 10.5 + 0.5) cpi
- Point size is the size entered with parameters Lp and Hp. Standard width is the proportional width with a font size of 10.5 points.

The following relation applies to super/subscript with proportional spacing.

Point size	Character space
8 - 13	character space same as 8 points
10.5	character space same as $10.5 \times \frac{2}{3}$ points
14 - 64	character space in relation to point size as following

$$\text{Pitch} = 360/\text{INT}$$

$$(\text{Point size} \times \frac{2}{3} \times \text{standard width} / 10.5 + 0.5) \text{ cpi}$$

selected point size	normal size	super-/subscript	selected point size	normal size	super-/subscript
8	8	8	36	36	24
9	9	8	37	37	24
10	10	8	38	38	25
10.5	10.5	$10.5 \times \frac{2}{3}$	39	39	26
11	11	8	40	40	26
12	12	8	41	41	27
13	13	8	42	42	28
14	14	9	43	43	28
15	15	10	44	44	29
16	16	10	45	45	30
17	17	11	46	46	30
18	18	12	47	47	31
19	19	12	48	48	32
20	20	13	49	49	32
21	21	14	50	50	33
22	22	14	51	51	34
23	23	15	52	52	34
24	24	16	53	53	35
25	25	16	54	54	36
26	26	17	55	55	36
27	27	18	56	56	37
28	28	18	57	57	38
29	29	19	58	58	38
30	30	20	59	59	39
31	31	20	60	60	40
32	32	21	61	61	40
33	33	22	62	62	41
34	34	22	63	63	42
35	35	23	64	64	42

The point size is defined with the parameters Lp and Hp:

$$Np = Lp + Hp * 256$$

$$\text{Point size} = Np * 0.5$$

size of Np	Point size (points)	rounded size of Np
0	1)	0
$1 \leq Np \leq 17$	8	16
$18 \leq Np \leq 19$ ²⁾	9 ²⁾	18
Np = 20	10	20
Np = 21	10,5	21
$22 \leq Np \leq 23$	11	22
$24 \leq Np \leq 25$	12	24
$26 \leq Np \leq 125$	13 - 62	26 - 124 (all even digits)
$126 \leq Np \leq 127$	63	126
$128 \leq Np \leq 32767$	64	128

- 1) no change: If the point size assignment of a preceding font scaling command is still valid, this point size is used. If the point assignment is deleted, i.e. no point size is selected, the font is printed in the currently valid font size and current pitch (cpi).
- 2) The size of a font scaled to 9 points has the same appearance as that to a scaled font to 8 points.

The following table shows the reference of a selected character space (Pn) to a bitmapped font used by the printer if it is not scalable.

point-space (Pn)	8, 9		10		10,5		21	
	Bitmap	Print	Bitmap	Print	Bitmap	Print	Bitmap	Print
(cpi)	(cpi)		(cpi)		(cpi)		(cpi)	
1	8 prop.		prop.		prop.		prop.	dbl. height, dbl. width
5-21	8	comp.	12	comp.	12	comp.	12	comp., dbl. height
22-24	8		10	comp.	10	comp.	10	comp., dbl. height
25-30	8		12		12		12	dbl. height
31-36	8		10		10		10	dbl. height
37-42	8	bold	10	bold	10	bold	10	dbl. height, bold
43-48	8	dbl. width	10	comp., dbl. width	10	comp., dbl. width	10	comp., dbl. width, dbl. height
49-60	8	dbl. width	12	dbl. width	12	dbl. width	12	dbl. height, dbl. width
61-127	8	dbl. width	10	dbl. width	10	dbl. width	10	dbl. height, dbl. width

Following table shows the relation between selected font and the font used by the printer.

selected font	font used by printer				
	8,9	10/10.5	11-20	21	22-64
Courier	Courier	Courier	Courier	Courier	Courier
Roman	Roman	Roman	Roman	Roman	Roman
Swiss	Swiss	Swiss	Swiss	Swiss	Swiss
Prestige	Roman	Prestige	Courier ¹⁾	Prestige	Courier ¹⁾
Orator	Swiss	Orator	Courier ¹⁾	Orator	Courier ¹⁾
Swiss Bold	Swiss	Swiss Bold	Courier ¹⁾	Swiss Bold	Courier ¹⁾
Gothic	Swiss	Gothic	Courier ¹⁾	Gothic	Courier ¹⁾

¹⁾ Courier is used every time if a font is selected that is not scalable. With the pitches of 8, 9, 10 and 10.5 points the fonts are printed as bitmap fonts.

Special cases

- Point size is set to $N_p = 42$ (21 points). Proportional or fixed point size $P_n \geq 33$.
- If a font other than Courier, Roman or Swiss is selected, the character ($N_p = 42$, 21 points) is double width and double high in reference to point size $N_p = 21$ (10.5 points)
- Fixed character pitch: $5 \leq P_n \leq 33$
- A character for $N_p = 42$ (21 points) is double high in reference to point size $N_p = 21$ (10.5 points)

The following commands use the pitch set by this command:

ESC X: Set left and right margins

BS: Backspace

ESC D: Set horizontal tabs

If proportional spacing is selected, the pitch is calculated from the following formula for these commands:

Pitch = $360/\text{INT}(\text{point size} * 36/10.5 + 0.5)$ cpi

Printing in UTILITY

If a proportional font selected ($P_n=1$), the printer substitutes the Utility font by the chosen font via menu in letter quality. Is **UTILITY** selected in the printer menu it is substituted by Courier.

If a fixed pitch is selected, the pitches and point sizes are used given in the table of bitmapped character sets above.

If no point size is entered in this command ($L_p=H_p=0$), the point size is selected which was defined previously with this command. If the point size is deleted or not set, printing takes place with a size of 10.5 points.

The following commands are suppressed when this command is used for scaling fonts:

ESC W: double width printing

ESC [@: character size/line spacing

SI: condensed printing

SO, DC4: double width printing for one line

If a fixed pitch or proportional spacing is selected with this command, the **PROP** lamp lights in the **CHARACTER PITCH** indicator panel on the control panel.

This command is deleted by selecting a pitch with the commands *DC2, ESC :, ESC g, ESC SI, ESC P Pn* and *ESC I Pn*.

If the printer is reset, this command is similarly deleted and the step widths for the basic settings apply again.

Chapter 11: IBM - Graphics

Bit image graphics

One of the merits of dot matrix printing technology is its flexibility when printing dot patterns. Since you can address every dot within the printable area, all kinds of graphic objects can be portrayed in the graphics resolution you choose provided by the printer. Even the photos in a newspaper, when examined closer, consist of thousands of tiny dots.

The programming of dot patterns is a complex task. Even a simple graphic image can contain several hundred dots and designing readable characters is frequently associated with trial and error and considerable programming effort. For this reason, you should use one of the popular application programs for graphics or poster printing which supports one of the emulations available with this printer. These programs make possible, depending on the complexity, the creation on screen of drawings, images or poster type, permit the storing of sketches, merging of several images or objects and, of course, printing out in different graphic densities, whereby the program converts the graphics on the screen into graphics data which the printer can interpret.

Should you wish to write your own programs for graphics and individual characters, you should first acquaint yourself in detail with the way bit image graphics work. Irrespective of whether you are printing an image or designing downloadable characters and loading them into the printer, your program always has to define the pattern of the dots to be printed.

Physically, the print head of your printer is constructed with two vertically arranged columns each of 12 pins. The graphics data for these 24 pins are, on the other hand, structured into 3 columns lying one below the other each with 8 dot lines. The data are sent to the printer as a sequence of bytes each of 8 bits. To each of the eight bits of these three bytes is assigned a pin of the print head and can accept the value 1 or 0. With a value of 1, the corresponding pin is used to print. If a bit has the value 0, the associated pin is not used. Following an 8-bit graphic is defined.

Picture a byte as a column of 8 dots each corresponding to a bit. With bit image graphics, data in columns of this kind are printed next to each other. If you are writing your own program, you must convert the bit-by-bit dot pattern into a decimal or hexadecimal format and send it byte-by-byte to the printer.

The following diagram shows how you determine the decimal value of a certain pin pattern.

	Position value	Binary value
	128	2^7
●	+ 64	2^6
	32	2^5
●	+16	2^4
●	+8	2^3
●	+4	2^2
	2	2^1
●	+1	2^0
	<hr style="width: 80px; margin: 0 auto;"/> 93	entered as CHR\$(93)

In the diagram, the positions with the values 64, 16, 8, 4 and 1 are intended to be printable dots. Only these figures are added together to determine the value for this byte.

Your printer is capable of representing 8-dot graphics in order also to be able to print graphics which have been created for 9-pin dot matrix printers. For this is used a technique in which two pins together correspond to one pin of the 9-pin dot matrix printer in order to achieve a comparable and distortion-free image.

Since the 8-pin modes correspond to the more common standards, they are especially suitable for graphics programs which do not support 24-pin dot matrix printers.

24-pin graphics consist of columns each of 3 data bytes which together yield 24 printable graphic dots. The individual bytes are calculated in the same way as with 8-dot graphics.

	128	<input checked="" type="checkbox"/>	$128 \times 1 = 128$	
	64	<input type="checkbox"/>	$64 \times 0 = 0$	
	32	<input checked="" type="checkbox"/>	$32 \times 1 = 32$	
Byte 1	16	<input checked="" type="checkbox"/>	$16 \times 1 = 16$	Byte 1 = 183
	8	<input type="checkbox"/>	$8 \times 0 = 0$	
	4	<input checked="" type="checkbox"/>	$4 \times 1 = 4$	
	2	<input checked="" type="checkbox"/>	$2 \times 1 = 2$	
	1	<input checked="" type="checkbox"/>	$1 \times 1 = 1$	
<hr/>				
	128	<input type="checkbox"/>	$128 \times 0 = 0$	
	64	<input checked="" type="checkbox"/>	$64 \times 1 = 64$	
	32	<input checked="" type="checkbox"/>	$32 \times 1 = 32$	
Byte 2	16	<input checked="" type="checkbox"/>	$16 \times 1 = 16$	Byte 2 = 118
	8	<input type="checkbox"/>	$8 \times 0 = 0$	
	4	<input checked="" type="checkbox"/>	$4 \times 1 = 4$	
	2	<input checked="" type="checkbox"/>	$2 \times 1 = 2$	
	1	<input type="checkbox"/>	$1 \times 0 = 0$	
<hr/>				
	128	<input type="checkbox"/>	$128 \times 0 = 128$	
	64	<input checked="" type="checkbox"/>	$64 \times 1 = 64$	
	32	<input type="checkbox"/>	$32 \times 0 = 0$	
Byte 3	16	<input checked="" type="checkbox"/>	$16 \times 1 = 16$	Byte 3 = 87
	8	<input type="checkbox"/>	$8 \times 0 = 0$	
	4	<input checked="" type="checkbox"/>	$4 \times 1 = 4$	
	2	<input checked="" type="checkbox"/>	$2 \times 1 = 2$	
	1	<input checked="" type="checkbox"/>	$1 \times 1 = 1$	

dot set

dot not set

Graphics of high resolution

Function	Dec.	Hex.	ASCII
High resolution graphics	27 91 103 $n_1 n_2 m$	1B 5B 67 $n_1 n_2 m$	ESC [g $n_1 n_2 m$

The command shown above defines the graphic resolution and the mode 24-pin or quasi 8-pin graphics. The values n_1 , n_2 and m are explained in the text below.

Alternative Graphics Mode (IBM AGM)

This mode can be activated in the menu. It contains partial compatibility to the Epson LQ series but is principally restricted to graphics and line feed commands. The commands available in AGM or commands with another meaning are identified accordingly.

Function	Dec.	Hex.	ASCII
Graphic modes (only AGM)	27 42 m $n_1 n_2$	1B 2A m $n_1 n_2$	ESC * m $n_1 n_2$

See the table below for the value m for the two high resolution. Under »IBM«, you will see the value for the command ESC [g $n_1 n_2 m$. »AGM« gives the value for m should you use the command ESC * m in Alternative Graphics Mode.

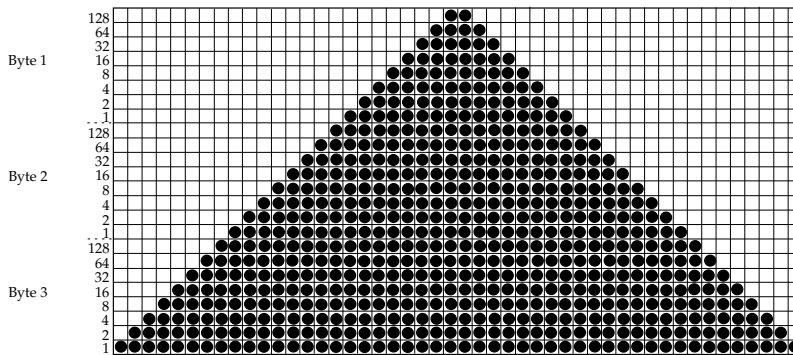
In the field »Width« the maximum number of dot columns for the narrow/wide printer model is given .

Density	Mode (pins)	Resolution (dpi)	Width	IBM	AGM
Single Density	8	60	480/816	0	0
Double Density	8	120	960/1632	1	1
High Speed, Double Density	8	120	960/1632	2	2
Quadruple Density	8	240	1920/3264	3	3
CRT I	8	80	640/1088	-	4
CRT II	8	90	720/1224	-	6
Single Density	24	60	480/816	8	32
Double Density	24	120	960/1632	9	33
CRT III	24	90	720/1224	-	38
Triple Density	24	180	1440/2448	11	39
Sexuple Density	24	360	2880/4896	12	40

You are properly using the performance of your printer if you choose one of the 24-pin modes. After selecting the required density, you can design your graphic and convert it step by step into data for the printer. Make sure that 24-pin graphics consist of a number of columns each composing 3 bytes.

The variables n_1 and n_2 communicate to the printer the total number of bytes including attribute and graphics data which follow the command sequence $ESC [g n_1 n_2$. The total number of data bytes consists of a mode byte m and the number of graphic bytes sent to the printer. In the case of 24-pin graphics, the parameters n_1 and n_2 must take account of the number of graphic bytes determined from the number of graphic columns times 3 and the attribute byte.

The second command $ESC * m n_1 n_2$ is only valid in Alternative Graphics Mode (AGM). It corresponds precisely to the Epson command for high resolution graphics. A description of this command and an example are to be found in Chapter 12.



Our example composes 48 columns. If the triangle is to be printed six times one after the other, the total number of columns is given by 6×48 , i.e. 288.

Since each graphic column consists of 3 graphic bytes, the values for n_1 and n_2 in the example graphic with 288 columns are:

$$1 \text{ (mode byte)} + 288 \text{ (columns)} * 3 \text{ (graphic bytes per column)} \\ = 865 \text{ bytes.}$$

From this are computed n_1 and n_2 as follows:

$$n_2 = \text{integer component (number of bytes/256), in the example: } n_2 = 3 \\ n_1 = \text{number of bytes} - n_2 \times 256, \text{ in the example: } n_1 = 97$$

Programming graphics

When programming graphics, do not add superfluous line feed commands. If you enter a semicolon after the data transferred in an LPRINT instruction, the print head will remain in the respective line.

Remember in addition that BASIC assigns to all printers a maximum line length of 80 characters. After receiving the data of 80 data bytes, a carriage return with line feed is sent automatically to the printer. Since graphics normally consist of a large number of bytes, this limit is soon exceeded and the image in question is printed out incorrectly. You can get around this problem by setting the line length to the maximum permissible value of 255. To do this, enter one of the following instructions at the beginning of your program:

For parallel printers:

```
WIDTH "LPT1:",255
```

For printers with serial interface which have been opened as #1:

```
WIDTH #1,255
```

Example:

When entering the program lines beginning with REM can be left out and the DATA instructions compiled in longer lines.

```
10 REM 24-pin graphics demo program IBM
   ProPrinter X(L) 24
20 OPEN "lpt1:bin" FOR OUTPUT AS #1:
   WIDTH "lpt1:", 255: REM Prepare for output

30 FOR MODE = 1 TO 4
40 IF MODE = 1 THEN PRINT #1, "24 pin single
   density"; CHR$(13); CHR$(10); CHR$(10); : D = 8:
   GOTO 80
50 IF MODE = 2 THEN PRINT #1, "24 pin double
   density"; CHR$(13); CHR$(10); CHR$(10); : D = 9:
   GOTO 80
60 IF MODE = 3 THEN PRINT #1, "24 pin triple
   density"; CHR$(13); CHR$(10); CHR$(10); : D = 11:
   GOTO 80
70 IF MODE = 4 THEN PRINT #1, "24 pin sextuple
   density"; CHR$(13); CHR$(10); CHR$(10); : D = 12:

80 PRINT #1, CHR$(27); "[g"; CHR$(96); CHR$(3);
   CHR$(D);
90 REM CHR$(27); is the density defined in lines 32,
   33, 34, 35 & 40
```



```
100 REM CHR$(96) and CHR$(3) state the number of
    graphic bytes: 6*48**3 = 864 = 96 + (3*256)
110 FOR I = 1 TO 6: REM Repeat triangle pattern 6
    times
120 FOR J + 1 TO 48: REM Triangle consists of 48
    columns
130 READ A, B, C: REM 3 bytes for each column
140 PRINT #1, CHR$(A); CHR$(B); CHR$(C); : REM Send to
    printer
150 NEXT J
160 RESTORE
170 NEXT I: PRINT #1, CHR$(13); CHR$(10); CHR$(10); :
    REM Next triangle
180 NEXT MODE

190 DATA 0, 0, 1, 0, 0, 3, 0, 0, 7, 0, 0, 15
200 DATA 0, 0, 31, 0, 0, 63, 0, 0, 127, 0, 0, 255
210 DATA 0, 1, 255, 0, 3, 255, 0, 7, 255, 0, 15, 255
220 DATA 0, 31, 255, 0, 63, 255, 0, 127, 255, 0,
    255, 255
230 DATA 1, 255, 255, 63, 255, 255, 127, 255, 255,
    255, 255, 255
240 DATA 31, 255, 255, 63, 255, 255, 127, 255, 255,
    255, 255, 255
250 DATA 255, 255, 255, 127, 255, 255, 63, 255,
    255, 31, 255, 255
260 DATA 15, 255, 255, 7, 255, 255, 3, 255, 255, 1,
    255, 255
270 DATA 0, 255, 255, 0, 127, 255, 0, 63, 255, 0,
    31, 255
280 DATA 0, 15, 255, 0, 7, 255, 0, 3, 255, 0, 1, 255
290 DATA 0, 0, 255, 0, 0, 127, 0, 0, 63, 0, 0, 31
300 DATA 0, 0, 15, 0, 0, 7, 0, 0, 3, 0, 0, 1

310 END
```

The program outputs to the printer 4 lines each of 6 triangles in the different graphic densities.

Graphics of low resolution

This relates to 8-pin modes which are supported by most graphics programs running under DOS. With these graphics, it is first necessary to choose the reproduction ratio which defines the assignment of graphic bits to the pins of the print head and thus also the graphic resolution for the graphics modes.

Function	Dec.	Hex.	ASCII
Activate single density graphics	27 75 $n_1 n_2$	1B 4B $n_1 n_2$	ESC K $n_1 n_2$
Activate double density graphics and half print speed	27 76 $n_1 n_2$	1B 4C $n_1 n_2$	ESC L $n_1 n_2$
Activate double density graphics	27 89 $n_1 n_2$	1B 59 $n_1 n_2$	ESC Y $n_1 n_2$
Activate quadruple density graphics	27 90 $n_1 n_2$	1B 5A $n_1 n_2$	ESC Z $n_1 n_2$

$n_1 = \text{total number} - (n_2 * 256)$

$n_2 = \text{total number graphic characters} / 256$

As with 24-pin graphics of high resolution, you also create a bit pattern in this case as a series of dot columns. In doing so, each graphic column is described in the 8-pin modes with one byte.

The variables n_1 and n_2 communicate to the printer how many bytes of graphic data will follow. Remember here that, in 8-pin mode, only one data byte is available per graphic column.

Graphic densities

The resolution of the four graphic densities of low resolution depends on the item »Aspect ratio« described later. The initiating command sequence for graphic printing determines one of the four possible resolutions.

Applying to the graphics modes that can be activated with *ESC Y* and *ESC Z* is the restriction that, in the horizontal direction, no immediately adjacent dots may be set. The dots, however, lie in any case so close together that a line appears to be drawn through them.

Following the command for activating the graphics mode in the respective density are two parameters designated n_1 and n_2 which communicate to the printer the number of graphic columns to be printed. In order to determine the values of these numbers, you need to define the number of graphic columns per line to be printed and divide this by 256. The value n_2 here is the integer component of the result, n_1 the remainder printed out as a whole number.

If, for example, 400 graphic columns are to be printed, n_1 and n_2 are computed as follows:

$$\begin{aligned} n_2 &= \text{integer}(400/256) && \text{in the example: } n_2 = 1 \\ n_1 &= 400 - 256 * n_2 && \text{in the example: } n_1 = 144 \end{aligned}$$

The number of dot columns specified by means of n_1 and n_2 must not exceed the maximum number of dot columns per line for the respective graphics density.

The last part of a graphics instruction contains numerical data which contains the actual image information.

Each column is represented by a byte containing 8 bits in which a 1 corresponds to a dot to be printed. A 0 shows that no dot is to be printed at this position. The highest dot is the MSB (most significant bit), the lowest dot the LSB (least significant bit). To each column in a line is assigned a numerical value. Add the values of the column positions at which dots are to be printed, and insert the total sum for each column beginning from the left in your program. An example for the calculation of column sums is to be found on the previous pages.

After calculating the sums for each column ($s_1, s_2,$ etc.), the complete instruction reads:

```
LPRINT CHR$(27); "K"; CHR$(144); CHR$(1);
CHR$(s1); CHR$(s1); ...; CHR$(s400)
```

The format is the same for all graphics. Merely the commands for opening the graphics in the respective resolutions and the maximum number of column bytes vary. The value in a column which portrays a certain dot pattern is always the same irrespective of the graphics resolution.

Aspect ratio

	Function	Dec.	Hex.	ASCII
Aspect ratio 5:6 (quasi 8-pin graphics)	Set aspect ratio	27 110 m	1B 6E m	ESC n m
	<p>The aspect of 8-pin graphics on a 24-pin dot matrix printer is achieved by grouping individual pins. When doing this, distortion of the image may occur.</p> <p>The command ESC n selects a ratio between the horizontal and vertical resolution, depending on the value m, for the 8-pin graphic modes <i>ESC K</i>, <i>ESC L</i>, <i>ESC Y</i> and <i>ESC Z</i>. When m = 0 or 1, the ratio is 5:6, when m = 2, it is fixed at 1:1. Values greater than 2 are ignored. The standard setting is the ratio 5:6, the different graphic modes are first explained with this ratio and later with the ratio set at 1:1.</p> <p>Graphics of <i>single density</i>, with a reproduction ratio of 5:6, have a resolution of 60 x 72 dots per inch.</p> <p>Graphics of <i>double density and half speed</i>, with a reproduction ratio of 5:6, have a quasi resolution of 120 x 72 dots per inch. Dots can be positioned with a horizontal accuracy of 1/120 inch. Directly adjacent dots in the horizontal direction are not printed. If, therefore, a dot appears in a certain row, no dot may be set in the next column of the same row. Otherwise, every second dot is ignored. Vertically adjacent dots are not subject to any restrictions.</p> <p>Graphics of <i>quadruple density</i>, with a reproduction ratio of 5:6, have a quasi resolution of 240 x 72 dots per inch. In this density, dot columns overlap by 3/4 of the width of a dot whereby only every second dot in a row can be printed. If a dot appears in a certain row and a dot is likewise set in the next column of the same row, this is not printed. Vertically adjacent dots are not subject to any restrictions.</p> <p>The assignment of the individual bits of a graphic byte with the reproduction ratio 5:6 for the four possible resolutions is portrayed in the following table.</p>			

bit number of the graphic byte	assigned printer pins
--------------------------------	-----------------------

7 (MSB)	1 to 3
6	3 to 5
5	6 to 8
4	8 to 10
3	11 to 13
2	13 to 15
1	16 to 18
0 (LSB)	18 to 20

The initiating command sequence for printing the graphic determines one of the four resolutions.

When the aspect ratio 1:1 is chosen, the assignment of the bits of a graphic byte to the pins of the print head depends on the resolution selected.

Aspect ratio 1:1

Graphics of single density with a aspect ratio of 1:1 have a resolution of 60 x 60 dots per inch. The assignment of bits of a graphic byte to the pins of the print head is shown in the following table.

bit number of the graphic byte	assigned printer pins
--------------------------------	-----------------------

7 (MSB)	1 to 3
6	4 to 6
5	9 to 9
4	10 to 12
3	13 to 15
2	16 to 18
1	19 to 21
0 (LSB)	22 to 24

Graphics of double density with normal or half speed at a aspect ratio of 1:1 have a resolution of 120 x 60 dots per inch. At this resolution, only 12 of the 24 pins of the print head are used per graphic byte.

In order to increase the throughput, the printer, under certain conditions, prints two graphic lines in one pass if this is possible.

The following table shows the assignment of pins when printing out a two-line graphic of double density in one pass.

<u>bit number of the graphic byte</u>	<u>assigned printer pins</u>
7 (MSB)	1 and 2
6	2 and 3
5	4 and 5
4	5 and 6
3	7 and 8
2	8 and 9
1	10 and 11
0 (LSB)	11 and 12
7 (MSB)	13 and 14
6	14 and 15
5	16 and 17
4	17 and 18
3	19 and 20
2	20 and 21
1	22 and 23
0 (LSB)	23 and 24

In order to guarantee the grouping of graphic lines described above, the following conditions must be fulfilled:

- The line spacing must be 8/120 inch.
- The command sequences with *ESC L* or *ESC Y* commands must be separated in each case by a carriage return (*CR*) and a line feed (*LF*).
- The length of the graphic lines may not go beyond the right margin of the page.
- The time pause between the two commands may be no longer than one second.

Graphics of quadruple density at a aspect ratio of 1:1 have a quasi resolution of 240 x 60 dots per inch. At this resolution, only 6 of the 24 pins of the print head are used per graphic byte. In order to increase the throughput, the printer, under certain conditions, prints four graphic lines in one pass if this is possible.

The following table shows the assignment of pins when printing out a four-line graphic of quadruple density in one pass.

bit number of the graphic byte assigned printer pins

7 (MSB)	1
6 or 5	2
4	3
3	4
2 or 1	5
0 (LSB)	6
7 (MSB)	7
6 or 5	8
4	9
3	10
2 or 1	11
0 (LSB)	12
7 (MSB)	13
6 or 5	14
4	15
3	16
2 or 1	17
0 (LSB)	18
7 (MSB)	19
6 or 5	20
4	21
3	22
2 or 1	23
0 (LSB)	24

In order to guarantee the grouping of graphic lines described above, the following conditions must be fulfilled:

- The line spacing must be 8/240 inch.
- The command sequences with *ESC Z* commands must be separated in each case by a carriage return (*CR*) and a line feed (*LF*).
- The length of the graphic lines may not go beyond the right margin of the page.
- The time pause between the two commands may be no longer than one second.

Notes on graphic programming

Make sure you enter exactly the same amount of column bytes as specified by n_1 and n_2 in the LPRINT instruction, otherwise you will not obtain the required results. Only the number of columns can be printed which are the maximum permissible for the respective combination of printer model and graphic density. If an LPRINT instruction contains more data, this can result in unwanted effects.

Remember the restrictions which apply to double density and normal speed and to quadruple density in relation to dot placing. In these cases, miss out at least one dot position between two dots in the same dot line. Adjacent dots are not printed.

The various programming languages offer the experienced user virtually unlimited possibilities for graphic programming.

Print alignment

If you place great store on vertical alignment over several graphic lines and can accept a low print speed, select the setting **Unidirectional** in the menu **Graphics**. With this setting, printing only takes place from left to right and this will avoid any horizontal offset in vertical lines which can arise with bidirectional printing. With the menu item **Print Registration** for bidirectional printing, you can adjust the vertical alignment of graphic lines to each other.

The standard setting for print alignment is 0. If you are not satisfied with the alignment, you can set this value from 0.25 mm to the left to 0.25 mm to the right.

Value	Shift
0.25 mm Right	0.25 mm to the right
0.20 mm Right	0.20 mm to the right
0.15 mm Right	0.15 mm to the right
0.10 mm Right	0.10 mm to the right
0.05 mm Right	0.05 mm to the right
0	no shift
0.05 mm Left	0.05 mm to the left
0.10 mm Left	0.10 mm to the left
0.15 mm Left	0.15 mm to the left
0.20 mm Left	0.20 mm to the left
0.25 mm Left	0.25 mm to the left

Chapter 12: IBM - Control Code Tables

Function	Dez.	Hex.	ASCII	Print quality
Select font	27 107 n	1B 6B n	ESC k n	
<i>or</i>	27 91 73 5 0	1B 5B 49 05 00	ESC [I ENQ NUL	
	$m_1 m_2 P_1 P_2$ r_1	$m_1 m_2 P_1 P_2$ r_1	$m_1 m_2 P_1 P_2$ r_1	

Function	Dez.	Hex.	ASCII	Print modes
Start 10 cpi	18	12	DC2	
Start 12 cpi	27 58	1B 3A	ESC :	
Start 15 cpi	27 103	1B 67	ESC g	
Start 17,1 cpi	15	0F	SI	
Start 20 cpi	27 15	1B 0F	ESC SI	
Start double width	27 87 49	1B 57 31	ESC W 1	
Stop double width	27 87 48	1B 57 30	ESC W 0	
Start double width for one line	14	0E	SO	
<i>or</i>	27 14	1B 0E	ESC SO	
Stop double width before end of line	20	14	DC4	
Start proportional spacing	27 80 49	1B 50 31	ESC P 1	
Stop proportional spacing	27 80 48	1B 50 30	ESC P 0	

Print attributes	Function	Dez.	Hex.	ASCII
	Start emphasized printing	27 69	1B 45	ESC E
	Stop emphasized printing	27 70	1B 46	ESC F
	Start enhanced printing	27 71	1B 47	ESC G
	Stop enhanced printing	27 72	1B 48	ESC H
	Start underline	27 45 49	1B 2D 31	ESC - 1
	Stop underline	27 45 48	1B 2D 30	ESC - 0
	Start overscoring	27 95 49	1B 5F 31	ESC _ 1
	Stop overscoring	27 95 48	1B 5F 30	ESC _ 0
	Start superscript	27 83 48	1B 53 30	ESC S 0
	Start subscript	27 83 49	1B 53 31	ESC S 1
	Stop super-/subscript	27 84	1B 54	ESC T
	Start italic	27 37 71	1B 25 47	ESC % G
	Stop italic	25 37 72	1B 25 48	ESC % H

Multifunction commands	Function	Dez.	Hex.	ASCII
	Print quality, character pitch and typeface	27 73 n	1B 49 n	ESC I n
	Character size / Line spacing	27 91 64 4 0 0 0 n ₁ n ₂	1B 5B 40 04 00 00 00 n ₁ n ₂	ESC [@ EOT NUL NUL NUL n ₁ n ₂

Function	Dez.	Hex.	ASCII	Tabulators
Horizontal tab position	9	09	HT	
Set horizontal tab	27 68 $n_1 \dots n_k 00$	1B 44 $n_1 \dots n_k 00$	ESC D $n_1 \dots n_k$ NUL	
Clear horizontal tab	27 68 0	1B 44 00	ESC D NUL	
Vertikal tab position	11	0B	VT	
Set vertical tab	27 66 $n_1 \dots n_k 0$	1B 42 $n_1 \dots n_k 00$	ESC B $n_1 \dots n_k$ NUL	
Reset horizontal/ vertical tabs to default	27 82	1B 52	ESC R	

Function	Dez.	Hex.	ASCII	Positioning
Relative horiz. dot position to the right	27 100 $n_1 n_2$	1B 64 $n_1 n_2$	ESC d $n_1 n_2$	
Relative horiz. dot position to the left	27 101 $n_1 n_2$	1B 65 $n_1 n_2$	ESC e $n_1 n_2$	
Start indication print position	27 105 1	1B 69 01	ESC i SOH	
Stop indication print position	27 105 0	1B 69 00	ESC i NUL	

Function	Dez.	Hex.	ASCII	Page formatting
Page length in lines	27 67 n	1B 43 n	ESC C n	
Page length in inches	27 67 0 n	1B 43 00 n	ESC C NUL n	
Set current print head position as Top Of Form	27 52	1B 34	ESC 4	
Activate Skip over Perforation	27 78 n	1B 4E n	ESC N n	
Deactivate Skip over Perforation	27 79	1B 4F	ESC O	

Page formatting	Function	Dez.	Hex.	ASCII
	Set left and right margins	27 88 $n_1 n_2$	1B 58 $n_1 n_2$	ESC X $n_1 n_2$
	Set top and bottom margins	27 91 83 4 0 $m_1 m_2 p_1 p_2$	1B 5B 53 04 00 $m_1 m_2 p_1 p_2$	ESC [S EOT NUL $m_1 m_2 p_1 p_2$
Line spacing	Function	Dez.	Hex.	ASCII
	1/8 inch line spacing	27 48	1B 30	ESC 0
	7/72 inch line spacing	27 49	1B 31	ESC 1
	Set 1/6 inch line spacing (AGM)	27 50	1B 32	ESC 2
	Menu defined line spacing (without ESC A n)	27 50	1B 32	ESC 2
	Deactivate ESC A n line spacing	27 50	1B 32	ESC 2
	Select variable line spacing (n/72 inch)	27 65 n	1B 41 n	ESC A n
	Select variable line spacing (n/60 inch, AGM)	27 65 n	1B 41 n	ESC A n
	Set variable line spacing (n/216 inch)	27 51 n	1B 33 n	ESC 3 n
	Set variable line spacing (n/180 inch, AGM)	27 51 n	1B 33 n	ESC 3 n
	Set variable line spacing (n/360 inch)	27 37 56 n	1B 25 38 n	ESC % 9 n

Function	Dez.	Hex.	ASCII	Paper feed
Line feed	10	0A	LF	
Reverse line feed	27 93	1B 5D	ESC]	
Variable line feed (n/216 inch)	27 74 n n = 0 to 255	1B 4A n	ESC J n	
Variable line feed (n/180 inch, AGM)	27 74 n n = 0 to 255	1B 4A n	ESC J n	
Variable line feed (n/360 inch)	27 37 52 n n = 0 to 255	1B 25 34 n	ESC % 4 n	
Set line spacing units	27 91 92 4 0 0 0 0 n	1B 5B 5C 04 00 00 00 00 n	ESC [\ EOT NUL NUL NUL NUL n	

Function	Dez.	Hex.	ASCII	Cut Sheet Feeder control
Insert single sheet	27 25 73	1B 19 49	ESC EM I	
Eject single sheet	27 25 82	1B 19 52	ESC EM R	
Select bin 1	27 25 49	1B 19 31	ESC EM 1	
Select bin 2	27 25 50	1B 19 32	ESC EM 2	
Select Cut Sheet Feeder	27 91 70 3 0 m ₁ m ₂ m ₃	1B 5B 46 03 00 m ₁ m ₂ m ₃	ESC [F ETX NUL m ₁ m ₂ m ₃	

Function	Dez.	Hex.	ASCII	IBM Character sets
IBM Chararacter Set I	27 55	1B 37	ESC 7	
IBM Chararacter Set II	27 54	1B 36	ESC 6	
Select national character set	27 33 n	1B 21 n	ESC ! n	
Select Code Page	27 91 84 5 0 0 0 n ₁ n ₂ 0	1B 5B 54 05 00 00 00 n ₁ n ₂ 00	ESC [T ENQ NUL NUL NUL n ₁ n ₂ NUL	

All Character set	Function	Dez.	Hex.	ASCII
	Print a character from the all character set	27 94 n	1B 5E n	ESC ^ n
	Print several characters from the all character set	27 92 n ₁ n ₂	1B 5C n ₁ n ₂	ESC \ n ₁ n ₂
Other commands	Function	Dez.	Hex.	ASCII
	Carriage return	13	0D	CR
	Backspace	8	08	BS
	Delete buffer	24	18	CAN
	Activate automatic line feed	27 53 49	1B 35 31	ESC 5 1
	Deactivate automatic line feed	27 53 48	1B 35 30	ESC 5 0
	Start unidirectional printing	27 85 49	1B 55 31	ESC U 1
	Stop unidirectional printing	27 85 40	1B 55 30	ESC U 0
	Start print suppress	27 81 n	1B 51 n	ESC Q n
	Stop print suppress	17	11	DC1
	Printer OFF LINE	27 106	1B 6A	ESC j
	Deactivate end of paper sensor	27 56	1B 38	ESC 8
	Activate end of paper sensor	27 57	1B 39	ESC 9
	Select font via pitch/ point size	27 16 70 Pn0 Pn Lp Hp	1B 10 46 Pn0 Pn Lp Hp	ESC DLE F Pn0 Pn Lp Hp

Function	Dez.	Hex.	ASCII	Graphics
High resolution graphics	27 91 103 n ₁ n ₂ m	1B 5B 67 n ₁ n ₂ m	ESC [g n ₁ n ₂ m	
High resolution graphics (only AGM)	27 42 m n ₁ n ₂	1B 2A m n ₁ n ₂	ESC * m n ₁ n ₂	
Aspect ratio	27 110 m	1B 6E m	ESC n m	
Activate single density graphics	27 75 n ₁ n ₂	1B 4B n ₁ n ₂	ESC K n ₁ n ₂	
Activate double density graphics and half print speed	27 76 n ₁ n ₂	1B 4C n ₁ n ₂	ESC L n ₁ n ₂	
Activate double density graphics	27 89 n ₁ n ₂	1B 59 n ₁ n ₂	ESC Y n ₁ n ₂	
Activate quadruple density graphics	27 90 n ₁ n ₂	1B 5A n ₁ n ₂	ESC Z n ₁ n ₂	

Chapter 13: IBM - Character Sets

This chapter contains the character sets available in IBM emulation. You can choose between two IBM character sets and numerous national character sets.

The code page command allows you to select character sets that replace some less frequently used characters with symbols used in a variety of European languages.

Character Set	Select	IBM-Character Sets
Select IBM Character Set I	ESC 7	
Select IBM Character Set II	ESC 6	
Print 1 character in All Character Set	ESC ^ n	
Select All Character Set	ESC \ n ₁ n ₂	

Character Set	Select	National Character Sets
ASCII (Ø)	ESC ! @	
ASCII (0)	ESC ! A	
British	ESC ! B	
German	ESC ! C	
French	ESC ! D	
Swedish I	ESC ! E	
Danisch	ESC ! F	
Norwegian	ESC ! G	
Dutch	ESC ! H	
Italian	ESC ! I	
French Canadian	ESC ! J	
Spanish	ESC ! K	
Swedish II	ESC ! L	
Swedish III	ESC ! M	
Swedish IV	ESC ! N	
Turkish	ESC ! O	
Swiss I	ESC ! P	
Swiss II	ESC ! Q	
Legal / Publisher	ESC ! Z	

Code Pages	Function	Dec.	Hex.	ASCII
	Select Code Page	27 91 84 5 0 0 0 n ₁ n ₂ 0	1B 5B 54 05 00 00 00 n ₁ n ₂ 00	ESC [T ENQ NUL NUL NUL n ₁ n ₂ NUL
ID	Code page		n ₁	n ₂
437	USA		1	181
774	Baltic - 774		3	6
850	Multilingual		3	82
852	East Europe Latin II		3	84
855	Cyrillic I - 855		3	87
857	Turkey 857		3	89
860	Portugal		3	92
863	French Canadian		3	95
865	Norwegian		3	97
866	Cyrillic II - 866		3	98
869	Greek 869		3	101
895	Kamenicky (MJK)		3	127
1008	Greek 437		3	240
1009	Greek 928		3	241
1011	Greek 437 Cyprus		3	243
1012	Turkey		3	244
1014	Polska Mazovia		3	246
1015	ISO Latin 2		3	247
1016	Serbo Croatic I		3	248
1017	Serbo Croatic II		3	249
1018	ECMA-94		3	250
1019	Windows East Europe		3	251
1020	Windows Greek		3	252
1021	Latin 5 (Windows Turkey)		3	253
1022	Windows Cyrillic		3	254
1024	Hungarian CWI		4	0
1027	Ukrainian		4	3
1029	ISO Latin 6 (8859/10)		4	5
1030	Hebrew NC - 862		4	6
1031	Hebrew OC		4	7
1032	Windows Hebrew		4	8
1034	Windows Baltic		4	10
1072	Bulgarian		4	48

ASCII Character Set

The »American Standard Code for Information Interchange« is a standardized character set of printable characters (**bold**) and control codes. The name of the control codes result from their usage in communication and data transmission. Some characters are used to activate printer functions as shown in the corresponding chapters. The entering of control codes may vary from program to program.

ASCII	Dez	Hex	Ctrl	ASCII	Dez	Hex	ASCII	Dez	Hex	ASCII	Dez	Hex
NUL	0	00	^@	[SP]	32	20	@	64	40	`	96	60
SOH	1	01	^A	!	33	21	A	65	41	a	97	61
STX	2	02	^B	"	34	22	B	66	42	b	98	62
ETX	3	03	^C	#	35	23	C	67	43	c	99	63
EOT	4	04	^D	\$	36	24	D	68	44	d	100	64
ENQ	5	05	^E	%	37	25	E	69	45	e	101	65
ACK	6	06	^F	&	38	26	F	70	46	f	102	66
BEL	7	07	^G	'	39	27	G	71	47	g	103	67
BS	8	08	^H	(	40	28	H	72	48	h	104	68
HT	9	09	^I	)	41	29	I	73	49	i	105	69
LF	10	0A	^J	*	42	2A	J	74	4A	j	106	6A
VT	11	0B	^K	+	43	2B	K	75	4B	k	107	6B
FF	12	0C	^L	,	44	2C	L	76	4C	l	108	6C
CR	13	0D	^M	-	45	2D	M	77	4D	m	109	6D
SO	14	0E	^N	.	46	2E	N	78	4E	n	110	6E
SI	15	0F	^O	/	47	2F	O	79	4F	o	111	6F
DLE	16	10	^P	0	48	30	P	80	50	p	112	70
DC1	17	11	^Q	1	49	31	Q	81	51	q	113	71
DC2	18	12	^R	2	50	32	R	82	52	r	114	72
DC3	19	13	^S	3	51	33	S	83	53	s	115	73
DC4	20	14	^T	4	52	34	T	84	54	t	116	74
NAK	21	15	^U	5	53	35	U	85	55	u	117	75
SYN	22	16	^V	6	54	36	V	86	56	v	118	76
ETB	23	17	^W	7	55	37	W	87	57	w	119	77
CAN	24	18	^X	8	56	38	X	88	58	x	120	78
EM	25	19	^Y	9	57	39	Y	89	59	y	121	79
SUB	26	1A	^Z	.	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	^[	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	^\	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	^]	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	^^	>	62	3E	^	94	5E	~	126	7E
US	31	1F	^_	?	63	3F	_	95	5F	DEL	127	7F

Conversion table

The layout of this conversion table corresponds to the following character set tables. The row and the column headers show the hexadecimal value of the characters. The table contains **decimal** and *octal values*. Example: hexadecimal 23 (column 2, row 3) is equal to decimal 35.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0 0	16 20	32 40	48 60	64 100	80 120	96 140	112 160	128 200	144 220	160 240	176 260	192 300	208 320	224 340	240 360
1	1 1	17 21	33 41	49 61	65 101	81 121	97 141	113 161	129 201	145 221	161 241	177 261	193 301	209 321	225 341	241 361
2	2 2	18 22	34 42	50 62	66 102	82 122	98 142	114 162	130 202	146 222	162 242	178 262	194 302	210 322	226 342	242 362
3	3 3	19 23	35 43	51 63	67 103	83 123	99 143	115 163	131 203	147 223	163 243	179 263	195 303	211 323	227 343	243 363
4	4 4	20 24	36 44	52 64	68 104	84 124	100 144	116 164	132 204	148 224	164 244	180 264	196 304	212 324	228 344	244 364
5	5 5	21 25	37 45	53 65	69 105	85 125	101 145	117 165	133 205	149 225	165 245	181 265	197 305	213 325	229 345	245 365
6	6 6	22 26	38 46	54 66	70 106	86 126	102 146	118 166	134 206	150 226	166 246	182 266	198 306	214 326	230 346	246 366
7	7 7	23 27	39 47	55 67	71 107	87 127	103 147	119 167	135 207	151 227	167 247	183 267	199 307	215 327	231 347	247 367
8	8 10	24 30	40 50	56 70	72 110	88 130	104 150	120 170	136 210	152 230	168 250	184 270	200 310	216 330	232 350	248 370
9	9 11	25 31	41 51	57 71	73 111	89 131	105 151	121 171	137 211	153 231	169 251	185 271	201 311	217 331	233 351	249 371
A	10 12	26 32	42 52	58 72	74 112	90 132	106 152	122 172	138 212	154 232	170 252	186 272	202 312	218 332	234 352	250 372
B	11 13	27 33	43 53	59 73	75 113	91 133	107 153	123 173	139 213	155 233	171 253	187 273	203 313	219 333	235 353	251 373
C	12 14	28 34	44 54	60 74	76 114	92 134	108 154	124 174	140 214	156 234	172 254	188 274	204 314	220 334	236 354	252 374
D	13 15	29 35	45 55	61 75	77 115	93 135	109 155	125 175	141 215	157 235	173 255	189 275	205 315	221 335	237 355	253 375
E	14 16	30 36	46 56	62 76	78 116	94 136	110 156	126 176	142 216	158 236	174 256	190 276	206 316	222 336	238 356	254 376
F	15 17	31 37	47 57	63 77	79 117	95 137	111 157	127 177	143 217	159 237	175 257	191 277	207 317	223 337	239 357	255 377

IBM Character Set I

ESC 7

ESC 7	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p			á	⋮	L	⌌	α	≡
1			!	1	A	Q	a	q			í	⋈	⌈	⌋	β	±
2			"	2	B	R	b	r			ó	⋈	⌈	⌋	Γ	≥
3			#	3	C	S	c	s			ú	l	l	⌌	π	≤
4			\$	4	D	T	d	t			ñ	l	l	⌌	Σ	ƒ
5			%	5	E	U	e	u			Ñ	l	l	⌌	σ	J
6			&	6	F	V	f	v			ª	l	l	⌌	μ	÷
7			´	7	G	W	g	w			º	l	l	⌌	τ	≈
8			(	8	H	X	h	x			é	l	l	⌌	Φ	°
9			)	9	I	Y	i	y			í	l	l	⌌	θ	•
A			*	:	J	Z	j	z			ı	l	l	⌌	Ω	.
B			+	;	K	[	k	{			½	l	l	⌌	δ	√
C			,	<	L	\	l	|			¼	l	l	⌌	∞	ⁿ
D			-	=	M	]	m	}			ı	l	l	⌌	φ	²
E			.	>	N	^	n	~			«	l	l	⌌	ε	▪
³ F			/	?	O	_	o				»	l	l	⌌	∩	

IBM Character Set II

ESC 6

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	⋮	L	⌌	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	l	l	⌌	π	≤
4	♦	§	\$	4	D	T	d	t	ä	ö	ñ	l	l	⌌	Σ	ƒ
5	♣		%	5	E	U	e	u	à	ò	Ñ	l	l	⌌	σ	J
6	♠		&	6	F	V	f	v	â	û	ª	l	l	⌌	μ	÷
7			´	7	G	W	g	w	ç	ù	º	l	l	⌌	τ	≈
8			(	8	H	X	h	x	ê	ÿ	é	l	l	⌌	Φ	°
9			)	9	I	Y	i	y	ë	ÿ	í	l	l	⌌	θ	•
A			*	:	J	Z	j	z	è	Û	ı	l	l	⌌	Ω	.
B			+	;	K	[	k	{	ï	ç	½	l	l	⌌	δ	√
C			,	<	L	\	l	|	î	£	¼	l	l	⌌	∞	ⁿ
D			-	=	M	]	m	}	ı	¥	ı	l	l	⌌	φ	²
E			.	>	N	^	n	~	Ä	Pt	«	l	l	⌌	ε	▪
⁴ F			/	?	O	_	o	△	Â	f	»	l	l	⌌	∩	

IBM All Chracter Sets

ESC ^ n oder
ESC \ n₁ n₂

ESC ^ n ESC \ n ₁ n ₂	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	á	▤	L	ll	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	⊥	⊥	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	—	⊥	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♠	—	&	6	F	V	f	v	â	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	é	¼	⌋	⌋	⌋	δ	√
C	♀	⌋	,	<	L	\	l	|	î	£	¼	⌋	⌋	⌋	∞	²
D	⌋	↔	-	=	M	]	m	}	ì	¥	½	⌋	⌋	⌋	φ	²
E	♠	▲	.	>	N	^	n	~	Ä	Pt	«	⌋	⌋	⌋	ε	▪
F	⊙	▼	/	?	O	_	o	△	Å	f	»	⌋	⌋	⌋	∩	

National Character Sets

ESC ! n

ESC ! n	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶				P		p	Ç	É	á	▤	L	ll	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	⊥	⊥	ll	π	≤
4	♦	¶		4	D	T	d	t	ä	ö	ñ	†	—	⊥	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♠	—		6	F	V	f	v	â	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		y	ë	Ö	⌋	⌋	⌋	⌋	θ	•
A	⊙	→	*	:	J	Z	j	z	è	Ü	⌋	⌋	⌋	⌋	Ω	·
B	♂	←	+	;	K		k		ï	é	¼	⌋	⌋	⌋	δ	√
C	♀	⌋	,	<	L		l		î	£	¼	⌋	⌋	⌋	∞	²
D	⌋	↔	-	=	M		m		ì	¥	½	⌋	⌋	⌋	φ	²
E	♠	▲	.	>	N		n		Ä	Pt	«	⌋	⌋	⌋	ε	▪
F	⊙	▼	/	?			o	△	Å	f	»	⌋	⌋	⌋	∩	

This table shows the ASCII character and the corresponding character that is replaced with when an alternative language character is selected by menu or command.

Value n	Character Set	Hexadecimal Value																
		23	24	26	30	40	4F	5B	5C	5D	5E	5F	60	69	7B	7C	7D	7E
@	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	[	ll	]	^	_	`	i	{	ij	}	~
I	Italian	£	\$	&	0	§	O	°	ç	é	^	_	ù	i	à	ò	è	ì
J	French Canadian	ü	\$	ë	0	à	Ø	á	ç	ê	î	ï	ô	i	é	ù	è	û
K	Spanish	!	\$	&	0	i	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	Turkey	ş	\$	ğ	0	Ş	O	i	ö	ü	Ğ	_	ç	ı	İ	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

Chapter 14: Epson - Standard Functions

This chapter contains the commands for controlling **Epson LQ** emulation printer functions. The individual commands are listed within the function groups such as print quality, page formatting, etc.

The functions of the individual control commands are explained below. The commands are listed at the start of each section in decimal (Dec.), hexadecimal (Hex.) and in ASCII format.

Print quality

Function	Dec.	Hex.	ASCII	Print quality
Data processing quality	27 120 0	1B 78 00	ESC x NUL	
Letter quality	27 120 1	1B 78 01	ESC x SOH	

The printer gives you two different print qualities: In data processing quality (**UTL**) a print speed of 260 characters per second (cps) is reached, printing being bidirectional, i.e. one line from left to right, the next line from right to left, etc. This quality is suitable in particular for extensive lists and drafts.

Letter-quality (**LQ**), which reaches a speed of 87 cps, should be used to create correspondence or documents. With this print quality the characters are printed in a high dot pattern resolution. This enables the creation of attractive documents when using a word processor.

These print qualities can be selected via the menu item **Print Mode** or the control panel.

Select font	Function	Dec.	Hex.	ASCII
	Select font	27 107 n	1B 6B n	ESC k n
		n = 0: Roman		
		n = 1: Swiss		
		n = 2: Courier		
		n = 3: Prestige		
		n = 5: OCR-B		
		n = 7: Orator		
		n = 122: Swiss Bold		
		n = 124: Gothic		
		n = 126: typeface according to menu		

This command allows you to select a font. »Courier« is the most usual standard font, while »Gothic« gives your documents an attractive appearance. If you need a machine-readable font for special applications, then select »OCR-B«.

The OCR-B consists of the 14 characters 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, +, -, >, <. All other characters are shown in Courier.

You can also use the menu mode or the *PRINT QUALITY* button on the printer's control panel to select a typeface.

Print modes

Character pitch	Function	Dec.	Hex.	ASCII
	Start 10 cpi	27 80	1B 50	ESC P
	Start 12 cpi	27 77	1B 4D	ESC M
	Start 15 cpi	27 103	1B 67	ESC g

The pitch is usually measured in characters per inch (cpi). For example, with 10 cpi 10 characters can be printed per inch (2.54 cm). Each character then occupies 1/10 of an inch.

The pitch can also be defined via the **Pitch** menu item or via the control panel. The spacing can also be defined via a multifunction command.

Function	Dec.	Hex.	ASCII	Condensed printing
Start condensed printing	15 or 27 15	0F or 1B 0F	SI or ESC SI	
Stop condensed printing	18	12	DC 2	

The commands *SI* and *ESC SI* have identical functions. If the print pitch is 10 cpi, then 17.1 cpi is used in condensed printing. With a print pitch of 12 cpi condensed printing is at 20 cpi. If a *DC2* command is sent, the printer returns to the print pitch which applied before *SI*.

Function	Dec.	Hex.	ASCII	Double width printing
Start double width	27 87 49	1B 57 31	ESC W 1	
Stop double width	27 87 48	1B 57 30	ESC W 0	
Start double width for one line	14 or 27 14	0E or 1B 0E	SO or ESC SO	
Stop double width before end of the line	20	14	DC 4	

With these commands you can extend characters to double their normal width. If the actual character width is, for example, 12 cpi, the printer will print at 6 cpi after a command for double width printing. The following table shows all possible combinations.

The command *Double width printing for one line* is suitable for titles and headings, as the function is automatically deactivated at the end of the line. If a double width printing command is to be cancelled before the end of a line, you must send a *DC4* or *ESC W 0* command.

If double width printing is permanently activated via the command *ESC W 1*, this function can only be cancelled by entering *ESC W 0*; in this case *DC4* has no effect.

Pitch	Double width	Condensed
10 cpi	5 cpi	17.1 cpi
12 cpi	6 cpi	20 cpi
15 cpi	7.5 cpi	not available
17.1 cpi	8.5 cpi	not available
20 cpi	10 cpi	not available

If proportional spacing is activated, the use of double width printing gives double width proportional printing. As this does not have a fixed pitch, it is not shown in the table.

For certain applications the maximum number of characters in a line has to be indicated. This depends on the pitch selected. The following table shows the maximum number of characters per line.

Pitch	Characters per line	
	Narrow printer	Wide printer
5 cpi	40	68
6 cpi	48	81
7.5 cpi	60	102
8.5 cpi	68	116
10 cpi	80	136
12 cpi	96	163
15 cpi	120	204
17.1 cpi	137	233
20 cpi	160	272

Double height printing

Function	Dec.	Hex.	ASCII
Start double height or	27 119 49 27 31 49	1B 77 31 1B 1F 31	ESC w 1 ESC US 1
Stop double height or	27 119 48 27 31 48	1B 77 30 1B 1F 30	ESC w 0 ESC US 0

With this command you can extend characters to double their normal height. Note that you must reset the line spacing according to the new character height.

Function	Dec.	Hex.	ASCII	Proportional spacing
Start proportional spacing	27 112 49	1B 70 31	ESC p 1	
Stop proportional spacing	27 112 48	1B 70 30	ESC p 0	

With proportional spacing the spacing between the individual letters varies according to the respective character width. With a fixed pitch all characters are created within a matrix of the same width. Proportional spacing, however, gives wide characters such as »w« or »M« more space and narrow characters such as »I« or »f« less space. The result is an attractive and more legible print image than with a fixed pitch.

Because of the different character widths proportional fonts do not have a fixed pitch. Precise margin settings in the case of full justified text, for example, is only possible if the word processing program supports proportional spacing. Proportional spacing is only available in letter quality

This function can also be activated via the **Pitch** menu item or via the control panel. Proportional spacing is also available via multi-function commands.

Function	Dec.	Hex.	ASCII	Character spacing
Set character spacing	27 32 n	1B 20 n	ESC SP n	
Standard character spacing	27 32 0	1B 20 00	ESC SP NUL	
	n=1 to 127			

With this command you can define the spacing between characters by entering a specific number of dot columns. Some word processing programs are able to specify the spacing between individual characters. If this option is supported by your application program, you can use this function.

Print attributes

Emphasized

Function	Dec.	Hex.	ASCII
Start emphasized	27 69	1B 45	ESC E
Stop emphasized	27 70	1B 46	ESC F

With emphasized, the dot patterns of the characters are printed horizontally offset.

Enhanced

Function	Dec.	Hex.	ASCII
Start enhanced	27 71	1B 47	ESC G
Stop enhanced	27 72	1B 48	ESC H

With enhanced, the dot patterns of the characters are printed vertically offset. Emphasized and enhanced can be combined to particularly highlight selected text.

Underline

Function	Dec.	Hex.	ASCII
Start underline	27 45 49	1B 2D 31	ESC - 1
Stop underline	27 45 48	1B 2D 30	ESC - 0

This command causes all printable characters including spaces to be underlined. Graphics and spaces skipped by a horizontal tabulator are not underlined.

Score type

Function	Dec.	Hex.	ASCII
Set score type	27 40 45 3 0 1 n ₁ n ₂	1B 28 2D 03 00 01 n ₁ n ₂	ESC (- ETX NUL SOH n ₁ n ₂

This command lets you specify the style and location of line scoring. The parameter n₁ defines the location, n₂ the style of the line.

n_1	Location	n_2	Style
1	underline	0	cancel scoring
2	strike-through	1	single line
3	overscore	2	double line
		5	single, broken line
		6	double, broken line

Function	Dec.	Hex.	ASCII	Superscript / Subscript
Start superscript	27 83 48	1B 53 30	ESC S 0	
Start subscript	27 83 49	1B 53 31	ESC S 1	
Stop super/subscript	27 84	1B 54	ESC T	

Superscript characters are printed above the normal characters and are used for exponents (x^2) and other typographical effects. Subscript is particularly suitable for chemical formulae (H_2O). Superscript and subscript characters are represented in all pitches in half character height and normal character width.

Function	Dec.	Hex.	ASCII	Italics
Start italics	27 52	1B 34	ESC 4	
Stop italics	25 53	1B 35	ESC 5	

Italic characters are printed sloping *slightly to the right* and particularly highlight individual words, sentences or whole paragraphs. You can also activate this function via the menu to print a complete document in italics.

Function	Dec.	Hex.	ASCII	Outline / Shadow
Start outline	27 113 1	1B 71 01	ESC q SOH	<i>Outline and shadow printing commands can only be used for printing characters, they cannot be used to print line graphics.</i>
Start shadow	27 113 2	1B 71 02	ESC q STX	
Start outline and shadow	27 113 3	1B 71 03	ESC q ETX	
Stop outline or outline	27 113 0	1B 71 00	ESC q NUL	

Use the outline and shadow effect to produce more interesting and stylish headings. They can be combined together as well as with emphasised and / or enhanced printing.

Multifunction commands

Print quality, pitch and font

Function	Dec.	Hex.	ASCII
Select print quality, pitch and font	27 33 n	1B 21 n	ESC ! n

With this command you can select different print functions by means of a single sequence. The parameter n defines here the combination of print quality, pitch and font in accordance with the following table:

Print function	Hexadecimal	Decimal
Underline	80	128
Italic	40	64
Double width	20	32
Enhanced	10	16
Emphasized	08	8
Condensed printing	04	4
Proportional printing	02	2
12 cpi	01	1
10 cpi	00	0

If, for example, you want to print a section in a document underlined, double width, emphasized and enhanced, you would normally have to send four different control commands to the printer. When using a multifunction command you only need to read off the values for the individual functions from the following table:

Underline = 128
 Double width = 32
 Enhanced = 16
 Emphasized = 8

Add up the values found and set the result for parameter n in the multifunction command.

$$n = 128 + 32 + 16 + 8 = 164$$

As soon as you send this command all nine of the above functions are activated or deactivated according to the parameter n. In order to determine which print attributes you can obtain with this com-

mand, you should run the following BASIC program which prints a sample of each of the possible combinations. As 256 combinations are available in total, it takes some time until all examples are printed out on about 12 pages.

```
10 multifunction command EPSON LQ
20 FOR i=0 TO 255
30 LPRINT: LPRINT
40 LPRINT CHR$(27);"!" ;CHR$(I);"ESC !" ;i;
   "selects this combination."
50 NEXT i
```

Tabulators

Function	Dec.	Hex.	ASCII	Horizontal tabulators
Skip to next horizontal tab	9	09	HT	
Set horizontal tabs	27 68 n_1 ... n_k 00	1B 44 n_1 ... n_k 00	ESC D n_1 ... n_k NUL	
	$n = 1$ to 255 $k = 1$ to 32			
Clear horizontal tabs	27 68 0	1B 44 00	ESC D NUL	

When the printer is switched on, tabulators are set automatically every eight columns starting at the ninth column. If a tabulator character (*HT*) is transmitted, the print head moves to the next set tab position before printing the following character.

The set tabulator position relates to the set left margin (relative reference). The actual position of a tab depends on the actual pitch at the time when loading the horizontal tab. When changing the pitch the tabulator position does not move (absolute position).

It is mandatory to enter the tab positions in ascending order. The parameter n_1 indicates the column position of the first tab, n_2 to n_k accordingly the column positions of the other tabs to be set. Up to 32 ($n_1 \dots n_{32}$) tabs can be defined. The position of a horizontal tab is relative to the set left margin. The command sequence must be ended with a NUL character.

The command *ESC D NUL* clears all horizontal tabs, including the standard tabs. If the printer is switched off and on, the standard tabs are available again. If no other tab is set up to the end of line, the tab skip command is ignored. When the printer is switched on the left margin equals the most left position. If you change left margin the position of the tabulators will change accordingly.

The maximum permissible values for tab positions can be seen from the following table.

Pitch	tabulator position	
	Narrow printer	Wide printer
10 cpi/Proportional	79	135
12 cpi	95	162
15 cpi	119	203
17.1 cpi	136	232
20 cpi	159	255

Vertical tabulators

Function	Dec.	Hex.	ASCII
Skip to next vertical tab	11	0B	VT
Set vertical tabs	27 66 n ₁ ... n _k 0 n = 1 to 16 n = 1 to 255	1B 42 n ₁ ... n _k 00	ESC B n ₁ ... n _k NUL

No vertical tabs are set when the printer is switched on. Up to 16 vertical tab positions can be set; the positions are defined as line numbers.

They must be entered in ascending order and end with a NUL character. The parameter n₁ indicates the line number of the first tab, n₂ to n_k accordingly the line numbers of the other tabs to be set.

Up to 16 vertical tabs can be defined (n₁...n₁₆). *ESC B NUL* deletes all vertical tabs.

If the command *VT* is entered without any defined tab position, a line feed is executed.

The actual position of a tab mark depends on the actual line spacing when loading the vertical tabs and does not move when line spacing is changed (absolute position). With the skip command for the vertical tabulator the paper is transported to the next tab position.

If a skip command is entered without further vertical tab positions being set, a line feed is executed.

Function	Dec.	Hex.	ASCII	Vertical tabulator channel
Select vertical tabulator channel	27 47 n	1B 2F n	ESC / n	
Load vertical format	27 98 n m ₁ ... m _k 0 k = 1 to 16 n = 0 to 7 m = 1 to 255	1B 62 n m ₁ ... m _k 00	ESC b n m ₁ ... m _k NUL	

You can set up to eight separate vertical tabulator groups - also called channels. The corresponding command *ESC b* has the same format as *ESC B*. Tab positions must be defined in ascending order and ended with NUL. You must also define for which channel tabs are to be set, by inserting a value between 0 and 7 for the variable n. After setting the desired tabs in the respective channel being used you can move to a vertical tab by specifying a channel with *ESC /* and then sending a *VT* command.

Example:

The following BASIC program sets tabs in three channels and then jumps to several vertical tabs in the various channels:

```

10  REM Vertical tabulator channel
20  REM tabulator stop in channel 0: line 10,
    20, 30, 40, 50
30  LPRINT CHR$(27); "b"; CHR$(0); CHR$(10);
    CHR$(20); CHR$(30); CHR$(40); CHR$(50);
    CHR$(0)
40  REM tabulator stop in channel 1: line 5, 15,
    35, 45, 55
50  LPRINT CHR$(27); "b"; CHR$(1); CHR$(5);
    CHR$(15); CHR$(35); CHR$(45); CHR$(55);
    CHR$(0)
60  REM tabulator stop in channel 2: line 12,
    24, 48

```

```

70  LPRINT CHR$(27); "b"; CHR$(2); CHR$(12);
    CHR$(24); CHR$(48); CHR$(0)
80  LPRINT CHR$(27); "/"; CHR$(1); : REM select
    channel 1
90  LPRINT CHR$(11); "This is printed in line 5"
100 LPRINT CHR$(11); "This is printed in line
    35"
110 LPRINT CHR$(27); "/"; CHR$(2); : REM select
    channel 2
120 LPRINT CHR$(11); "This is printed in line
    48"
130 LPRINT CHR$(27); "/"; CHR$(0); : REM select
    channel 0
140 LPRINT CHR$(11); "This is printed in line
    50"

```

Positioning

Horizontal dot position

Function	Dec.	Hex.	ASCII
Absolute horizontal dot position	27 36 $n_1 n_2$ $n_1 = 0 \text{ to } 255, n_2 = 0 \text{ to } 3$	1B 24 $n_1 n_2$	ESC \$ $n_1 n_2$
Relative horizontal dot position	27 92 $n_1 n_2$ $n_1, n_2 = 0 \text{ to } 255$	1B 5C $n_1 n_2$	ESC \ $n_1 n_2$

Using these commands you can position text or graphics exactly on a page. (Vertical positioning can also be achieved by variable line feed and by line spacing commands). With the variables n_1 and n_2 in both commands a specific dot position can be defined at which the printout is to start. The variable values are ascertained as follows:

$$n_2 = \text{integer value (dot position/256)}$$

$$n_1 = \text{dot position} - (n_2 * 256)$$

The command *ESC \$* uses the default or set left margin as reference point and moves the respective print position in 1/60 inch steps. For a narrow printer the maximum number of dots per (8 inches) is 480, for a wide model (13.6 inches) it is 816 dots. With absolute positioning of 5 inches (300/60) from the left margin the calculation of the parameters looks as follows:

$$n_2 = \text{integer value } (300 / 256) = 1$$

$$n_1 = 300 - (1 * 256) = 44$$

The command in BASIC is therefore:

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

With the command *ESC*\ the current print position can be moved to right or left in steps of 1/120 inches with Utility and 1/180 inches with Letter Quality. The difference from absolute positioning is that the next print position in each case is calculated from the current print position. If the print position is to be moved to the right, you proceed as in the example shown above.

Moving the relative printing position to the left is a little more complicated. First determine the number of necessary dots and subtract this value from 65.536 (2^{16}). Then calculate n_1 and n_2 using the above formula and enter the values as parameters in the command sequence.

If the respective dot position is outside the set margins, the commands for absolute or relative dot positioning are ignored. Therefore use the table below to find the maximum value in number of dots.

Print quality	Narrow printer	Wide printer
UTL (120 dpi)	960	1632
LQ (180 dpi)	1440	2448

Function	Dec.	Hex.	ASCII	Indicate next print position
Start indication	27 105 1	1B 69 01	ESC i SOH	
Stop indication	27 105 0	1B 69 00	ESC i NUL	

With this command you can switch on and off the mode which enables indication of the next print position. The next print position is indicated by the character »M« on the red line which is on the transparent paper protector at the front on the print head carriage.

This mode can also be switched on and off via the control panel by simultaneously pressing the *SHIFT* and *PRINT QUALITY* keys. If this mode is activated, the data in the printer memory are printed out. With this mode switched on the following commands cause indication of the next print position by the above-mentioned marking:

Space with print head positioning (255 dec., FF hex.), Backspace (BS), Horizontal Tab (HT), Carriage Return (CR), Line Feed commands, Form Feed (FF), commands for defining the Next Print Position, Delete Buffer (CAN), Delete Character (DEL).

If the functions *Underline* or *Overscore* are switched on, then spaces with positioning, i.e. spaces skipped by horizontal tab or positioning commands, are underlined or overscored; the next print position is then not displayed.

Text alignment

Function	Dec.	Hex.	ASCII
Text alignment	27 97 n	1B 61 n	ESC a n
	n = 0: Left justified n = 1: Centred n = 2: Right justified n = 3: Full justified		

With this command you define the alignment of text on a line:

The standard *left justified* function means that the text is aligned on the left margin, while it is ragged on the right.

With the *centred* function, the text is positioned in the centre between the left and right margins.

With the *right justified* function the text is aligned on the right margin, while it is ragged on the left.

With the *full justification* function the text is aligned flush between the left and right margins by inserting spaces between the words.

With centred, right and full justification a backspace cannot be executed. In fully justified a carriage return or line feed command can only be executed at the end of a paragraph, not after each line, i.e. the text must be sent to the printer as flowing text.

Page formatting

Function	Dec.	Hex.	ASCII	Set page length
Page length in lines	27 67 n n = 1 to 127	1B 43 n	ESC C n	
Page length in inches	27 67 0 n n = 1 to 22	1B 43 00 n	ESC C NUL n	

By selecting page length you can inform the printer of the size of the paper used. When is switched on the current position of the print head is registered as Top of Form, i.e. first print line on the page. When printing forms it is important that the page length is set to the dimensions of the form so that not only the first but also all following form sets are printed in the right position.

Normally a standard length can be set in the **Page Length** menu item, though the page length can also be defined by one of the above commands in inches or in the number of lines. For the latter it must not exceed 50 inches. Otherwise the command will be ignored.

If **Page Length Control** is by **MENU Setting**, the start position for the sheet is not reset. Defining the page length in lines is done as a function of the current line spacing. However, any subsequent change of line spacing does not change the page length. When using these two commands to change the page length the form start position is reset, a »Skip over Perforation« defined by command is deactivated and the value for the skip over perforation selected in the menu item is used. Set vertical tabs are deleted.

Function	Dec.	Hex.	ASCII	Skip over Perforation
Activate Skip over Perforation	27 78 n n = 1 to 127	1B 4E n	ESC N n	
Deactivate Skip over Perforation	27 79	1B 4F	ESC O	

With this function the lower area of a page can be skipped automatically.

There is a Form Feed to the start of the next page (Top of Form). The parameter »n« designates the lines to be skipped to the start of the next page. The lower margin actually to be skipped depends on the current line spacing. Subsequent changes of line spacing have no effect on the bottom margin to be skipped. All line feed commands which place the print position in the area to be skipped cause a jump to the start of the next page.

If **Skip over Perforation** is set at **Yes** in the printer menu, a bottom area of one inch (2.54 cm) is skipped to the next Top of Form. The number of lines to be skipped can be selected with the above Skip command. The command *ESC O* switches off the »Skip Over Perforation« function.

The commands for setting page length similarly switch off Skip over Perforation. The value for the function »Skip Over Perforation« selected as menu item is activated.

If page formatting is taken over by the software, e.g. a word processing program, you should switch off Skip over Perforation by setting **Skip over Perforation** in the printer menu to **No**.

Set margins

Function	Dec.	Hex.	ASCII
Set left margin	27 108 n n = 0 to 255	1B 6C n	ESC l n
Set right margin	27 81 n n = 1 to 255	1B 51 n	ESC Q n

Margins should always be set at the start of a line.

In these commands the parameter n defines the left and right margins. The margin values are entered in character columns. The margin positions depend on the actual current pitch. Once the margins are set the positions are retained even after changing the pitch, provided the margins have not been expressly reset (absolute position).

Note that the value for the right margin must be at least 1 inch larger than the left margin by the number of character columns given in the table. The right margin must not exceed the maximum values given below.

Pitch	Narrow printer		Wide printer	
	left n_1	right n_2	left n_1	right n_2
10 cpi / proportional	0-70	10-80	0-126	10-136
12 cpi	0-84	12-96	0-151	12-163
15 cpi	0-105	15-120	0-189	15-204
17.1 cpi	0-119	18-137	0-215	18-233
20 cpi / proportional	0-140	20-160	0-252	20-255

Line spacing

Function	Dec.	Hex.	ASCII	Variable line spacing
1/8 inch line spacing	27 48	1B 30	ESC 0	
Set 1/6 inch line spacing	27 50	1B 32	ESC 2	
Set variable line spacing (n/60 inch)	27 65 n n=1 to 255	1B 41 n	ESC A n	
Set variable line spacing (n/180 inch)	27 51 n n=1 to 255	1B 33 n	ESC 3 n	
Set variable line spacing (n/360 inch)	27 91 n n=1 to 255	1B 58 n	ESC [n	
Set variable line spacing (n/360 inch)	27 43 n n=1 to 255	1B 2B n	ESC + n	

Usual line spacings for text are 6 or 8 lines per inch (lpi).

With the variable spacing commands you can define the line spacings via the parameter n in multiples of 1/60 inch, 1/180 inch or 1/360 inch. This has no effect on the character height, but only changes the spacing between the lines. These commands do not execute a line feed, but only set the line spacing which is used by a following line feed command.

Paper feed

Line feed

Function	Dec.	Hex.	ASCII
Line feed	10	0A	LF
Variable line feed (n/180 inch)	27 74 n n = 0 to 255	1B 4A n	ESC J n
Variable line feed (n/360 inch)	27 93 n n = 0 to 255	1B 5D n	ESC] n
Reverse line feed (n/180 inch)	27 106 n	1B 6A n	ESC j n

A line feed command causes the printer to move the print position down. In contrast with a simple line feed command, with a variable line feed of n/180 or n/360 inch there is no carriage return, regardless of the settings in the printer menu. If 0 is set for the parameter n in this command, no line feed is executed.

The preset smallest possible step for the paper feed due to the design of your printer is 1/180 inch. Rounding errors are compensated for as far as possible.

Form feed

Function	Dec.	Hex.	ASCII
Form feed	12	0C	FF

If a form feed command is sent, the printer prints all data in the line buffer and sets the current print position at the start of the next page. You can also advance a page to the start of the next page by pressing the *FF/Load* key on the control panel.

Control of the Cut Sheet Feeder

Function	Dec.	Hex.	ASCII	Single-sheet printing
Insert single sheet	27 25 73	1B 19 49	ESC EM I	
Eject single sheet	27 25 82	1B 19 52	ESC EM R	

The feed command feeds a sheet of paper from the Cut Sheet Feeder (CSF) to the set Top of Form. Any sheet of paper already in the printer is ejected before a new one is fed in.

These commands are effective when using a Cut Sheet Feeder (CSF) available as an accessory.

The eject command causes data in the printer buffer to be printed and the sheet to be ejected. If the page end or the area to be skipped at the page end is reached, the sheet is ejected and a new sheet automatically fed and advanced to the print position. Any defined Top of Form position, however, is disregarded. Therefore, when a Cut Sheet Feeder is installed the page change in the case of multipage documents must be performed with the form feed command.

Function	Dec.	Hex.	ASCII	Bin selection
Select bin 1	27 25 49	1B 19 31	ESC EM 1	
Select bin 2	27 25 50	1B 19 32	ESC EM 2	

With the two bin selection commands you can define from which bin paper is to be fed when using a dual bin Cut Sheet Feeder.

These commands are effective when using a Cut Sheet Feeder (CSF) with two paper bins.

When using the dual-bin feeder, different Top of Form positions can be set for each bin. You can select the priority bin in the printer menu with **CSF Bin Select** in the **Set-Up** group. You can then define via the control panel the Top of Form position for the paper from the bin selected via the menu. You can, for example, feed a form with preprinted letterhead from one bin with a Top of Form position a large distance from the top edge of the sheet, followed by single sheets from the other bin with a Top of Form position near to the top edge of the sheet.

Character sets

Extension of printable characters

Function	Dec.	Hex.	ASCII
Activate extension of printable characters	27 54	1B 36	ESC 6
Deactivate extension	27 55	1B 37	ESC 7

The Epson Character Sets are constructed as 8-bit character sets, i.e. a character is assigned to each bit combination of a byte, with control commands being assigned to some values in the range from 0 to 31. The standard ASCII characters are assigned to the range from decimal 32 to 126. The value 127 (DEL) in the Epson emulation has the function of deleting the last character in the line buffer. The range from decimal 127 to 159 in the standard Epson Character Set is identical with that from decimal 0 to 31, while with extension of printable characters activated special characters are to be found in this range. If the Epson character set is activated and the extension deactivated, the selected character set is the same as the IBM character set I. Are both Epson character set and extension activated the selected set is similar to IBM character set II.

Assign character set

Function	Dec.	Hex.	ASCII
Activate italic character set	27 116 0	1B 74 00	ESC t NUL
Activate character set selected by menu	27 116 1	1B 74 01	ESC t SOH
Activate loadable character set	27 116 2	1B 74 02	ESC t STX
Activate graphic character set	27 116 3	1B 74 03	ESC t ETX

With these commands in the Epson character set the range from decimal 160 to 255 can be filled either with the characters from the range from decimal 32 to 127 in italic or with graphic symbols and special characters of the Code Page selected in the menu. With *ESC t STX* all characters from decimal 32 to 127 will be loaded into the upper half of the character set's range 160 to 255.

Function	Dec.	Hex.	ASCII	Select national character sets and Code Pages
Select national character set and Code Pages	27 82 n	1B 52 n	ESC R n	

With this command you can access special characters of a certain language. If you want to activate one of these character sets, you must insert the corresponding value from the table of national character sets for the parameter n.

n	Character set / Code Page
0	ASCII
1	French
2	German
3	British
4	Danish I
5	Swedish I
6	Italian
7	Spanish I
8	Japanese
9	Norwegian
10	Danish II
11	Spanish II
12	Latin American
13	French Canadian
14	Dutch
15	Swedish II
16	Swedish III
17	Swedish IV
18	Turkish
19	Swiss I
20	Swiss II
22	Polish Mazovia
23	ISO Latin 2
24	Serbocroat I
25	Serbocroat II
26	Multilingual 850
27	Norwegian 865
28	Portugal 860
29	Turkish
38	Greek 437

n	Character set / Code Page
39	Greek 928
41	Greek 437 Cyprus
42	ECMA-94
43	French Canadian
44	Cyrillic I - 855
45	Cyrillic II - 866
46	East Europe Latin II - 852
47	Greek 869
49	Windows East Europe
50	Windows Greek
51	Latin 5 (Windows Turkish)
52	Windows Cyrillic
54	Hungarian CWI
55	Kamenicky (MJK)
57	Turkish 857
60	Hebrew NC (862)
61	Hebrew OC
62	Windows Hebrew
64	Legal/Publisher
66	Ukrainian
67	ISO Latin 6 (8859-10)
68	Windows Baltic
72	Bulgarian
74	Baltic (774)

Chapter 17 and Appendix B give you an overview of Code Pages and character sets.

Other commands

Carriage return

Function	Dec.	Hex.	ASCII
Carriage return	13	0D	CR

If this command is entered, the printer prints all data in the line buffer and sets the next print position at the left margin. For short line seeking, the print head does not make these movements immediately; the print position is only logically set at the left margin. If **Auto LF** is set to **Yes** after each carriage return, the printer executes

a line feed command. This command deactivates double width printing for one line.

Function	Dec.	Hex.	ASCII	Backspace
Backspace	8	08	BS	

This command sets the print position at the last received printable character; it is executed if a printable character or a print command then follows.

The actual width of a backspace depends on the current pitch. When using proportional spacing the backspace command moves the print position for the first character to be overprinted to the left by the proportional width of that character. For all following *BS* commands the print position will be set 1/10 inch to the left. If the print position is reset to a superscript character, a reverse line feed is executed to the position of the character in question and the next character is printed superscript; however, the alignment may not be quite exact. If the print position is to be reset by several characters, a backspace command must be entered for each character to be overprinted. However, the print position cannot be reset beyond the left margin. With this command specially composed symbols can be printed which are not available in the character set used.

Function	Dec.	Hex.	ASCII	Delete Buffer
Delete buffer	24	18	CAN	

This command deletes all printable characters in the line buffer. Functions set by this command are not reset, nor is the receive buffer deleted.

Function	Dec.	Hex.	ASCII	Delete last character
Delete last character	127	7F	DEL	

This command deletes the last character entered into the print buffer. Spaces are also deleted by this command. If the last received character was a horizontal tab, one space only, but not the whole tabulator jump, is deleted. If the character to be deleted defines graphic data, the command is ignored.

Initialize printer

Function	Dec.	Hex.	ASCII
----------	------	------	-------

Initialize printer	27 64	1B 40	ESC @
--------------------	-------	-------	-------

This command deletes all data in the print buffer and activates the values selected in the print menu. Functions set via the control panel are reset. This procedure is also called initialization. If in the menu **Reset Inhibit** is set to **Yes**, the command is not executed. Numerous software packages send a reset command to initialize the printer before or after printing. In this way it is ensured that values used in a previous printing process are not inadvertently used for a subsequent print job.

Unidirectional printing

Function	Dec.	Hex.	ASCII
----------	------	------	-------

Start unidirectional printing	27 85 49	1B 55 31	ESC U 1
-------------------------------	----------	----------	---------

Stop unidirectional printing	27 85 40	1B 55 30	ESC U 0
------------------------------	----------	----------	---------

To optimize throughput, printing of lines normally takes place alternately forwards (from left to right) and backwards (short line seeking, bidirectional printing). In order to improve the alignment of lines lying underneath one another you can stipulate with this function that each line be printed starting from the left margin (unidirectional printing). You should use this option when precise vertical alignment of the individual lines is desired (bit image graphics, IBM graphic characters, tables).

The print speed is somewhat reduced with unidirectional printing, as the print head after printing a line is reset to the left margin to start the next line there. This function can also be activated for printing bit image graphics via the **Graphics** menu item.

Function	Dec.	Hex.	ASCII
----------	------	------	-------

Start unidirectional printing for one line	27 60	1B 3C	ESC <
--	-------	-------	-------

This command resets the print head to the left margin (print start position) to print the line following this command. The effect of the command is unidirectional printing for one line. Printing then continues bidirectionally, unless unidirectional printing is selected.

Function	Dec.	Hex.	ASCII	Print suppress
Start print suppress	19	13	DC3	
Stop print suppress	17	11	DC1	

After receiving a *DC3* the printer ignores all further data except for the command to end print suppress. The **SEL** lamp blinks in print suppress mode. After ending print suppress the **SEL** lamp is lit and the printer is in ON LINE mode. Print suppress can also be deactivated via the *SEL* key on the control panel.

When using the parallel interface print suppress only functions if a high level is at pin 36.

With print suppress activated data can continue to be sent to the printer without being stored or printed, these data being suppressed.

In OFF LINE status in contrast data can be transferred to the printer until the receive buffer is full. The printer then signals to the system that it cannot accept any more data. The data are thus retained.

Function	Dec.	Hex.	ASCII	End of paper sensor
Deactivate end of paper sensor	27 56	1B 38	ESC 8	
Activate end of paper sensor	27 57	1B 39	ESC 9	

With the end of paper sensor activated the **ALARM** lamp lights when less than 0.5 inch remains to the end of the paper. The printer goes into OFF LINE status.

At each press of the *SEL* key a single line is printed and a line feed executed.

If printing is to be to the lower margin of a sheet, the end of paper sensor can be deactivated by the above command. The printer then takes the page length set in the menu or by a command to establish an end of paper.

The end of paper sensor can be reactivated with *ESC 9*.

The function can also be controlled with **Paper out Override**.

Print speed	Function	Dec.	Hex.	ASCII
	Select print speed	27 115 n	1B 73 n	ESC s n

n = 1: start half print speed
n = 2: start normal print speed

With this command you can reduce the print speed to half, printing at half speed causing a lower noise level than printing at normal speed.

MSB default	Function	Dec.	Hex.	ASCII
	Set most significant bit (MSB) to 1	27 62	1B 3E	ESC >
	Set most significant bit (MSB) to 0	27 61	1B 3D	ESC =
	Delete MSB default	27 35	1B 23	ESC #

The command *ESC >* sets the most significant bit (MSB) of an incoming 8-bit data word to 1, while *ESC =* sets it to 0.

ESC # deactivates the MSB default selected with *ESC >* or *ESC =* so that all data are interpreted as sent by the system.

Additional ESC/P2 commands

ESC/P2 commands extend the scope of functions of the Epson emulation in the area of scalable fonts.

Setting step size and character spacing

Function	Dec.	Hex.	ASCII	Setting the basic spacing
Set horizontal basic step size (HMI)	27 99 Lp Hp Lp = 0 to 255 Hp = 0 to 255 (MSB ignored)	1B 63 Lp Hp	ESC c Lp Hp	

With this command is defined the basic step size, i.e. the spacing between two characters of a character set.

The parameters Lp and Hp specify the basic step size in accordance with the following formulae:

$$\begin{aligned} \text{Hp} &= \text{integer (basic step size / 256)} \\ \text{Lp} &= \text{basic step size} - (\text{Hn} * 256) \\ \text{HMI} &= (\text{Lp} + \text{Hp} * 256) / 360 \end{aligned}$$

The basic step size is not valid for bit image graphics and bar codes.

If the parameters Lp and Hp = 0 are set, this command is ignored and the previously fixed basic step size remains valid. If the basic step size $(\text{Lp} + \text{Hp} * 256) / 360 > 3$ inches is set, it is fixed at $36 / 360 = 1/10$ inch.

If the basic step size goes over the right margin, the printing is continued at the left margin of the next line. This command is also immediately valid within a line. The character spacing last set is the current one. The basic step size set with this command is overwritten by commands for setting character pitch and for selecting the font by means of character pitch and point size, if these commands are used after defining the basic step size.

The following commands use the basic step size defined with this command:

ESC I Pn, ESC Q Pn: Set left and right margin

ESC D: Setting of horizontal tabs

BS: Backspace

The set basic step size is deleted by the command for setting the character separation and the previously selected character pitch becomes valid again. A set character separation is in turn deleted by setting the basic step size.

If underlining is set, this is performed if this command is used.

The lamp display on the control panel is not altered by this command.

The commands for double-width font and for double-width font for one line and also the commands for condensed font are deleted by this command.

The basic step size is reset by the following commands and printed with the previously selected or newly set character pitch:

ESC P, ESC M, ESC g: commands for setting the character pitch,

SI, ESC SI: condensed font,

ESC W Pn: double-width font,

SO, ESC SO: double-width font for one line,

ESC w Pn, ESC US Pn: double-height font,

ESC p Pn: proportional font,
(the character pitch set in the menu is valid)

ESC x Pn Hp Lp: font defining by character pitch and point size

If the printer menu is called, the defined basic step size is deleted.

If the printer is reset by means of hardware, software or the control panel, the defined basic step size is deleted and the character pitch selected in the menu is valid.

Function	Dec.	Hex.	ASCII	Set page length in basic step sizes
Setting of page length in basic step sizes	27 40 67 Ln Hn Lp Hp	1B 28 43 Ln Hn Lp Hp	ESC (C Ln Hn Lp Hp	
	Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Lp = 0 to 255 Hp = 0 to 255 (MSB ignored)			

This command defines the page length of the currently selected paper path. The parameters Ln and Hn specify the number of parameters following this:

Hn = integer (number of characters / 256)
Ln = number of characters - (Hn * 256)

For this command, Hn = 0 and Ln = 2 must be set. With $Ln + Hn * 256 < 2$, this command is ignored. With $Ln + Hn * 256 > 2$, all Ln + Hn * 256 data following Lp, Hp are ignored.

The parameters Lp and Hp define the page length in whole multiples of the current basic step size:

Hp = integer (page length in basic step sizes / 256)
Lp = page length in basic step sizes - (Hp * 256)

Valid values for the basic step size are: 1/360, 1/180, 1/120, 1/90, 1/72 and 1/60 inch.

All page lengths in the range 1/360 inch to 22 inches are valid. If, in this command, values of Lp = Hp = 0 or $Lp + Hp * 256 > 22$ inches are used, this command is ignored and the previously set page length is retained.

This command is immediately valid in the current print line and the current print position becomes the top of page position. Where single cut sheets are being fed, the current print position does not become the top of page position if the menu item **Page Length Control** is set to the value **by Menu Setting**.

This command resets the perforation skip and the top and bottom non-printable margins. A previously selected top non-printable area is, however, taken into account from the next page on unless the top and bottom non-printable areas are re-defined immediately after this command.

A set-up vertical format unit and set vertical tabs are not reset by this command.

A defined page length is not affected if the basic step size is changed later on.

If the printer is reset, the page length in the initial setting becomes valid again.

Horizontal and vertical basic step size

Function	Dec.	Hex.	ASCII
Setting of horizontal and vertical basic step size	27 40 85 Ln Hn Pn	1B 28 55 Ln Hn Pn	ESC (U) Ln Hn Pn
	Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Pn = 0 to 255 (MSB ignored)		

With this command, the basic step sizes for the horizontal and vertical direction can be defined.

The parameters Ln and Hn specify the number of parameters which follow:

$$Hn = \text{integer (number of characters / 256)}$$

$$Ln = \text{number of characters} - (Hn * 256)$$

For this command, Hn = 0 and Ln = 1 must be set. With Ln = Hn = 0, this command is ignored. With $Ln + Hn * 256 > 1$, all $Ln + Hn * 256 - 1$ data following Pn are ignored. The parameter Pn specifies the basic step size = $Pn / 360$ inch. The following table gives the possible values:

Value of Pn	Defined basic step size
$0 \leq Pn \leq 9$	no change
$10 \leq Pn \leq 19$	1/360 inch
$20 \leq Pn \leq 29$	1/180 inch
$30 \leq Pn \leq 39$	1/120 inch
$40 \leq Pn \leq 49$	1/90 inch
$50 \leq Pn \leq 59$	1/72 inch
$60 \leq Pn \leq 69$	1/60 inch
$70 \leq Pn \leq 127$	no change

Commands which use the basic step sizes defined with this command and their standard setting:

ESC (c	set page format, 1/360 inch
ESC (C	set page length in basic step sizes, 1/360 inch
ESC \$	absolute horizontal dot position, 1/60 inch
ESC \	relative horizontal dot position, 1/80 inch, LQ 1/120 inch, UTL
ESC (V	absolute vertical print position, 1/360 inch

Vertical print positioning

Function	Dec.	Hex.	ASCII	Absolute vertical print positioning
Absolute vertical print positioning in units of the basic step size	27 40 86 Ln Hn Lp Hp	1B 28 56 Ln Hn Lp Hp	ESC (V Ln Hn Lp Hp	
	Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Lp = 0 to 255 Hp = 0 to 255 (MSB ignored)			

With this command, the printing position is adjusted absolutely in the vertical direction to the current top of page or to a set top margin of the printing area in multiples of the current basic step size.

The parameters Ln and Hn specify the number of parameters following this:

Hn = integer (number of characters / 256)
Ln = number of characters - (Hn * 256)

For this command, Hn = 0 and Ln = 2 must be set. With $Ln + Hn * 256 < 2$, this command is ignored. With $Ln + Hn * 256 > 2$, all Ln + Hn * 256 - 2 data following Pn are ignored.

The parameters Lp and Hp specify the absolute vertical distance of the print position from the current top of page position or a set top margin of the print area in multiples of the current basic step size (1/360, 1/180, 1/120, 1/90, 1/72, 1/60). The initial setting of the step size for this command is 1/360 inch.

$$Hp = \text{integer (absolute position / 256)}$$

$$Lp = \text{absolute position} - (Hn * 256)$$

This command is ignored if a position is specified which is more than 46.2 inches away from the current top of page position or a set top margin of the print area, or a position is specified which requires a feed backwards of more than 0.5 inch. By using this command several times, even a feed of more than 0.5 inch backwards can be achieved. The feed forwards takes place to no further than the next top of page position, backwards no further than the top of page position of the current page. If print areas are set, backwards feed takes place no further than the top margin of the print area. A feed into the bottom non-printable area, even due to a set perforation skip, causes a paper feed to the next top of page position.

If this command requires a backwards feed of the paper, it is ignored if the current line contains raster graphic commands.

The following table states the maximum values depending on the basic step size in inches:

Step size	1/360	1/180	1/120	1/90	1/72	1/60
Range	16639	8318	5546	4159	3327	2773

$$\text{Absolute position} = \text{step size} * (Lp + Hp * 256)$$

Relative vertical print positioning

Function	Dec.	Hex.	ASCII
Relative vertical print positioning in units of the basic step size	27 40 118 Ln Hn Lp Hp	1B 28 76 Ln Hn Lp Hp	ESC (v Ln Hn Lp Hp
	Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Lp = 0 to 255 Hp = 0 to 255 (MSB ignored)		

With this command, the printing position is adjusted relatively in the vertical direction to the current print position in multiples of the current basic step size.

The parameters Ln and Hn specify the number of parameters following this:

Hn = integer (number of characters / 256)

Ln = number of characters - (Hn * 256)

For this command, Hn = 0 and Ln = 2 must be set. With $Ln + Hn * 256 < 2$, this command is ignored. With $Ln + Hn * 256 > 2$, all Ln + Hn * 256 - 2 data following Pn are ignored.

The parameters Lp and Hp specify the relative vertical shift of the print position in multiples of the current basic step size.

Printable area

Function	Dec.	Hex.	ASCII	Define print areas
Setting of the page format in basic step sizes	27 40 99 Ln Hn Lb Hb	1B 28 63 Ln Hn Lb Hb	ESC (c Ln Hn Lb Hb	
	Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Lt = 0 to 255 Ht = 0 to 255 (MSB ignored) Lb = 0 to 255 Hb = 0 to 255 (MSB ignored)			

This command defines the top and bottom non-printable areas of the currently selected paper path.

The parameters Ln and Hn specify the number of parameters following this:

Hn = integer (number of characters / 256)

Ln = number of characters - (Hn * 256)

For this command, Hn = 0 and Ln = 4 must be set. With $Ln + Hn * 256 < 4$, this command is ignored. With $Ln + Hn * 256 > 4$, all Ln + Hn * 256 - 4 data following Lp, Hp are ignored.

The parameters Lt, Ht, Lb and Hb define the top (TP) and bottom (BP) non-printable areas in whole multiples of the current basic step size, measured from the previously defined top of page position (TOF):

Ht = integer (TP in basic step sizes / 256)

Lt = TP in basic step sizes - (Hp * 256)

Hb = integer (page length - BP in basic step sizes / 256)

Lb = page length - BP in basic step sizes - (Hp * 256)

Valid values for the basic step size are: 1/360, 1/180, 1/120, 1/90, 1/72, and 1/60 inch.

With the top margin limit, measured from the top of page position, is defined the top line of the printable area, with the parameter for the bottom margin limit, the bottom line of the printable area measured from the top of page position.

In the case of single sheets, from the automatic cut sheet feeder or the optional sheet guide, the areas of the top and bottom non-printable area are defined as follows when the menu item **Page Length Control** is set to the value **by Menu Setting**:

0 inch < top area < bottom area < 22 inches.

If the areas are set to 0 inches or to values more than 22 inches, or these areas are set to invalid values, this command is ignored.

With continuous paper and cut sheets by means of a cut sheet feeder, the areas of the top and bottom non-printable areas are defined as follows if the menu position **Page Length Control** is set to **by Actual Page Length**:

0 inch < top area < bottom area < page length.

If the areas are set to 0 inches or to values beyond the page length or these areas are set to invalid values, this command is ignored.

A set-up vertical format unit and set vertical tabs are not reset by this command.

A defined print area is not affected if the basic step size is changed later on.

If the printer is reset, the print area in the initial setting becomes valid again.

Select font

Function	Dec.	Hex.	ASCII	Select font
Select font by means of character pitch and point size	27 88 Pn Lp Hp Pn = 0 to 255 (MSB ignored) Lp = 0 to 255 Hp = 0 to 255(MSB ignored)	1B 58 Pn Lp Hp	ESC X Pn Lp Hp	

With his command, a previously selected font can be scaled in limited bounds when defining the character pitch and point size.

- The character pitch is defined by means of the parameter Pn, and by means of the parameters Lp and Hp, the point size of the font. For Pn, all values of 0 to 255 are permissible, the highest value bit, however, is not taken into account.
- With values $2 \leq Pn \leq 4$, this command is ignored.
- For values greater than 4, the character pitch Pn/360 inch is assigned to the font.
- The value Pn = 0 does not change the current character pitch and Pn = 1 selects proportional character pitch.
- In the case of proportional fonts, the following relation between character pitch and point size applies:

$$\text{Character pitch} = 360 / \text{INT}(\text{point size} * \text{standard width} / 10.5 + 0.5) \text{ cpi}$$
- Point size: the size specified by means of the parameters Lp and Hp: proportional width for a font size of 10.5 point.

For superscripts/subscripts, the following relation applies for proportional fonts:

Point size	Character pitch
8-13	character pitch as with a size of 8 points
10.5	character pitch as with a size of $10.5 \times \frac{2}{3}$ points
14-64	character pitch in relation to point size as follows

Character pitch = $360 / INT$
 (Point size * $\frac{2}{3}$ * standard width / $10.5 + 0.5$) cpi

Selected pointsize	Normal font	Super-/ Subscript	Selected pointsize	Normal font	Super-/ Subscript
8	8	8	36	36	24
9	9	8	37	37	24
10	10	8	38	38	25
10,5	10,5	$10,5 \times \frac{2}{3}$	39	39	26
11	11	8	40	40	26
12	12	8	41	41	27
13	13	8	42	42	28
14	14	9	43	43	28
15	15	10	44	44	29
16	16	10	45	45	30
17	17	11	46	46	30
18	18	12	47	47	31
19	19	12	48	48	32
20	20	13	49	49	32
21	21	14	50	50	33
22	22	14	51	51	34
23	23	15	52	52	34
24	24	16	53	53	35
25	25	16	54	54	36
26	26	17	55	55	36
27	27	18	56	56	37
28	28	18	57	57	38
29	29	19	58	58	38
30	30	20	59	59	39
31	31	20	60	60	40
32	32	21	61	61	40
33	33	22	62	62	41
34	34	22	63	63	42
35	35	23	64	64	42

The point size is determined by means of the parameters Lp and Hp:

$$Np = Lp + Hp * 256$$

$$\text{point size} = Np * 0.5$$

Refer to the following table for details:

Size specified of Np	Point size (dots)	Rounded up/down size of Np
0	1)	0
$1 \leq Np \leq 17$	8	16
$18 \leq Np \leq 19$ 2)	9 2)	18
Np = 20	10	20
Np = 21	10,5	21
$22 \leq Np \leq 23$	11	22
$24 \leq Np \leq 25$	12	24
$26 \leq Np \leq 125$	13 - 62	26 - 124 (all even digits)
$126 \leq Np \leq 127$	63	126
$128 \leq Np \leq 32767$	64	128

- 1) No change: if the point size assignment of a previous font scaling command is still valid, this point size is used. If the point size assignment is deleted, i.e. no point size is selected, the font is printed in the currently valid font size and the current character pitch (cpi).
- 2) The size of a font scaled to 9 points has the same appearance as that to a scaled to 8 point.

The table below gives the assignment of selected character pitch Pn to the bitmap fonts used by the printer if scaling is not possible:

Dots pitch (Pn)	8, 9		10		10,5		21	
	Bitmap (cpi)	Print	Bitmap (cpi)	Print	Bitmap (cpi)	Print	Bitmap (cpi)	Print
1	8 prop.		prop.		prop.		prop.	dbl. height, dbl. width
5-21	8	condensed	12	condensed	12	condensed	12	condensed, dbl. height
22-24	8		10	condensed	10	condensed	10	condensed, dbl. height
25-30	8		12		12		12	dbl. height
31-36	8		10		10		10	dbl. height
37-42	8	bold	10	bold	10	bold	10	dbl. height, bold
43-48	8	dbl. width	10	condensed, dbl. width	10	condensed, dbl. width	10	condensed, dbl. width, dbl. height
49-60	8	dbl. width	12	dbl. width	12	dbl. width	12	dbl. height, dbl. width
61-127	8	dbl. width	10	dbl. width	10	dbl. width	10	dbl. height, dbl. width

The following table shows the assignment of the selected font to the font used by the printer when scaling of the specified point size is possible:

selected font	font size used by printer				
	8,9	10/10,5	11-20	21	22-64
Courier	Courier	Courier	Courier	Courier	Courier
Roman	Roman	Roman	Roman	Roman	Roman
Swiss	Swiss	Swiss	Swiss	Swiss	Swiss
Prestige	Roman	Prestige	Courier ³⁾	Prestige	Courier ³⁾
Orator	Swiss	Orator	Courier ³⁾	Orator	Courier ³⁾
Swiss Bold	Swiss	Swiss Bold	Courier ³⁾	Swiss Bold	Courier ³⁾
Gothic	Swiss	Gothic	Courier ³⁾	Gothic	Courier ³⁾

- 3) The font Courier is used as a replacement by the printer when a font is selected in a point size in which it is not scalable. In the sizes 8, 9, 10 and 10.5 point, the fonts are printed as bitmap fonts.

Special cases

- The point size is set to $N_p = 42$ (21 point). Proportional and fixed character pitch ≥ 34 :
- If a font with the exception of Courier, Roman or Swiss is selected, the character for $N_p = 42$ (21 point) is twice as high and twice as wide as with a point size of $N_p = 21$ (10.5 point).

The following commands use the character pitch set by this command:

ESC I, ESC Q: set left and right margin

BS: backspace

ESC D: setting of horizontal tabs

If a proportional font is selected, the character pitch for these commands is calculated from the following formula:

Character pitch = $360 / \text{INT}(\text{point size} * 36 / 10.5 + 0.5)$ cpi

Downloadable characters

If characters have been downloaded into the printer from the system or by means of the copy function, these characters are printed as follows after defining the character pitch with this command:

Downloadable characters by means of the copy function

Character pitch	Size ≤ 21 point	Size > 21 point
$1 \leq P_n \leq 71$	10.5 point	10.5 point
$72 \leq P_n \leq 127$, double height	10.5 point, double width	10.5 point, double height, double width

Downloadable characters downloaded from system

Character pitch	Size \leq 21 point	Size $>$ 21 point
$1 \leq P_n \leq 71$	loaded bitmap	loaded bitmap, double height
$72 \leq P_n \leq 127$	loaded bitmap, double width	loaded bitmap, double height, double width

Printing in draft quality

If a proportional font is selected by means of this command ($P_n = 1$), the printer replaces the draft quality with the font selected in the menu in letter quality. If **Utility** is selected in the menu, the font is replaced by Courier.

If a fixed character pitch is selected by means of this command, printing takes place with the selected character pitch and character sizes stated in the table above for the bitmap character sets.

If no point size is specified in this command (L_p and $H_p = 0$), the point size is selected which was previously defined with this command. If the point size is deleted or not set, printing takes place with a size of 10.5 point.

The following commands are suppressed if this command is used for scaling fonts:

ESC W: double-width font

ESC w, US: font in double height

ESC SP: set character separation

SI, ESC SI: condensed font

SO, ESC SO: double-width font for one line

If, by means of this command, a fixed character pitch or proportional font is selected, the lamp **PROP** lights on the control panel in the display field **CHARACTER PITCH**.

This command is deleted when selecting a character pitch by means of the commands *ESC P*, *ESC M*, *ESC g*, *ESC p Pn* and *ESC ! Pn*. If the printer is reset, this command is deleted and the step sizes for the initial setting become valid again.

Character sets and code pages

Function	Dec.	Hex.	ASCII	Print characters from the fully printable character set
Print several characters from the fully printable character set	27 40 94 Ln Hn Data Ln = 0 to 255 Hn = 0 to 255 (MSB ignored)	1B 28 5E Ln Hn Data	ESC (^ Ln Hn Data	

With this command, all characters from the range decimal 1 to 255 of a code page are addressed as printable characters. The address 0 is treated as ASCII NUL code.

The parameters Ln and Hn specify the number of characters to be printed:

Hn = integer (number of characters / 256)

Ln = number of characters - (Hn * 256)

If the parameters Ln and Hn = 0 are set, this command is ignored. This command is effective for all selectable code pages.

Function	Dec.	Hex.	ASCII	Assign new code page
Assign new code page	27 40 116 Ln Hn Pn ₁ Pn ₂ Pn ₃ Ln = 0 to 255 Hn = 0 to 255 (MSB ignored) Pn ₁ = 0 to 255 (MSB ignored) Pn ₂ = 0 to 255 (MSB ignored) Pn ₃ = 0 to 255 (MSB ignored)	1B 28 74 Ln Hn Pn ₁ Pn ₂ Pn ₃	ESC (t Ln Hn Pn ₁ Pn ₂ Pn ₃	

With this command, four different characters sets can be assigned to the command *ESC t Pn*.

Hn = integer (number of characters / 256)

Ln = number of characters - (Hn * 256)

For this command, $Hn = 0$ and $Ln = 3$ must be set. With $Ln + Hn * 256 < 3$, this command is ignored. With $Ln + Hn * 256 > 3$, all $Ln + Hn * 256 - 3$ data following Lp , Hp are ignored.

The parameters Pn_2 and Pn_3 determine the code pages which are to be assigned to the parameter Pn_1 . The following values are permissible:

Pn_1 : 00H, 01H, 02H, 03H, 30H, 31H, 32H, 33H

Pn_2 : 00H, 01H, 03H, 07H, 08H, 09H

Pn_3 : 00H

The assignment of the parameters Pn_2 and Pn_3 to the selectable code pages is listed in the following table:

Pn_2	Pn_3	Code page
0	0	italic character set
1	0	PC437 (USA)
3	0	PC850 (Multilingual)
7	0	PC860 (Portugal)
8	0	PC863 (Canadian French)
9	0	PC865 (Norwegian)

If invalid values are assigned to the parameters Pn_1 , Pn_2 and Pn_3 , the previous assignment remains valid.

To each valid value of Pn_1 can be assigned one of the code pages listed in the above table. The selection of the code pages assigned to parameter Pn_1 is performed with the command $ESC t Pn$, whereby the parameters Pn_1 and Pn_2 must correspond.

In the initial setting after switching on or resetting the printer, the following assignments are valid:

Assignment	Pn ₁	Code page
0	00H, 30H	italic character set
1	01H, 31H	code page selected in the Code Page menu item
2	02H, 32H	downloadable character set
3	03H, 33H	graphic character set

The national character set selected in the **Language Set** menu position is valid for all assignments 0 to 3. The code page selected by means of *ESC t Pn* after the assignment therefore possesses the national version selected.

The copy command for the downloadable character set uses the current code page assignment.

The assignment 2 is used as standard for selection of the downloadable character set. If it has been overwritten with another assignment through this command, the downloadable character set can no longer be selected. The printer must be reset so that the standard assignment is valid again.

The selection of the national character set is not changed by changing the code page assignment.

If the current code page is selected by means of the command *ESC R Pn*, this code page is assigned to the parameter Pn₁ = 1. This code page must therefore be selected with the command *ESC t Pn = 1*. The code page selected with this command sequence contains no national variations however!

If a national variation is selected with the command *ESC R Pn* (Pn = 0-20, 64), the code page 437 (USA) with the previously selected national variation is assigned to the parameter Pn₁ = 1.

The assignment of the code page is reset to the initial setting under the following conditions:

- The printer is reset by hardware, software or the control panel.
- The printer menu is activated.

Chapter 16: Epson - Control Code Tables

Function	Dez.	Hex.	ASCII	Print quality
Data processing quality	27 120 0	1B 78 00	ESC x NUL	
Letter quality	27 120 1	1B 78 01	ESC x SOH	
Select font	27 107 n	1B 6B n	ESC k n	

Function	Dez.	Hex.	ASCII	Print modes
Start 10 cpi	18	12	ESC P	
Start 12 cpi	27 58	1B 3A	ESC M	
Start 15 cpi	27 103	1B 67	ESC g	
Start condensed printing <i>or</i>	15 27 15	0F 1B 0F	SI ESC SI	
Stop condensed printing	18	12	DC2	
Start double width	27 87 49	1B 57 31	ESC W 1	
Stop double width	27 87 48	1B 57 30	ESC W 0	
Start double width for one line <i>or</i>	14 27 14	0E 1B 0E	SO ESC SO	
Stop double width before end of line	20	14	DC4	
Start double height <i>or</i>	27 119 49 27 31 49	1B 77 31 1B 1F 31	ESC w 1 ESC US 1	
Stop double height <i>or</i>	27 119 48 27 31 48	1B 77 30 1B 1F 30	ESC w 0 ESC US 0	
Start proportional spacing	27 112 49	1B 70 31	ESC p 1	
Stop proportional spacing	27 112 48	1B 70 30	ESC p 0	

Print mode	Function	Dez.	Hex.	ASCII
	Set character spacing	27 32 n	1B 20 n	ESC SP n
	Standard character spacing	27 32 0	1B 20 00	ESC SP NUL

Print attributes	Function	Dez.	Hex.	ASCII
	Start emphasized	27 69	1B 45	ESC E
	Stop emphasized	27 70	1B 46	ESC F
	Start enhanced	27 71	1B 47	ESC G
	Stop enhanced	27 72	1B 48	ESC H
	Start underline	27 45 49	1B 2D 31	ESC - 1
	Stop underline	27 45 48	1B 2D 30	ESC - 0
	Set score type	27 40 45 3 0 1 n ₁ n ₂	1B 28 2D 03 00 01 n ₁ n ₂	ESC (- ETX NUL SOH n ₁ n ₂
	Start superscript	27 83 48	1B 53 30	ESC S 0
	Start subscript	27 83 49	1B 53 31	ESC S 1
	Stop super/subscript	27 84	1B 54	ESC T
	Start italic	27 52	1B 34	ESC 4
	Stop italic	25 53	1B 35	ESC 5
	Start outline	27 113 1	1B 71 01	ESC q SOH
	Start shadow	27 113 2	1B 71 02	ESC q STX
	Start outline and shadow	27 113 3	1B 71 03	ESC q ETX
	Stop outline or outline	27 113 0	1B 71 00	ESC q NUL

Function	Dez.	Hex.	ASCII	Multifunction commands
Print quality, character pitch and font	27 33 n	1B 21 n	ESC ! n	

Function	Dez.	Hex.	ASCII	Tabulators
Horizontal tab position	9	09	HT	
Set horizontal tab	27 68 n ₁ ... n _k 00	1B 44 n ₁ ... n _k 00	ESC D n ₁ ... n _k NUL	
Clear horizontal tab	27 68 0	1B 44 00	ESC D NUL	
Vertical tab position	11	0B	VT	
Set vertical tab	27 66 n ₁ ... n _k 0	1B 42 n ₁ ... n _k 00	ESC B n ₁ ... n _k NUL	
Select vertical tabulator channel	27 47 n	1B 2F n	ESC / n	
Load vertical format	27 98 n m ₁ ... m _k 0	1B 62 n m ₁ ... m _k 00	ESC b n m ₁ ... m _k NUL	

Function	Dec.	Hex.	ASCII	Positioning
Absolute horizontal dot position	27 36 n ₁ n ₂	1B 24 n ₁ n ₂	ESC \$ n ₁ n ₂	
Relative horizontal dot position	27 92 n ₁ n ₂	1B 5C n ₁ n ₂	ESC \ n ₁ n ₂	
Start indication	27 105 1	1B 69 01	ESC i SOH	
Stop indication	27 105 0	1B 69 00	ESC i NUL	
Text alignment	27 97 n	1B 61 n	ESC a n	

Page formatting	Function	Dez.	Hex.	ASCII
	Page length in lines	27 67 n	1B 43 n	ESC C n
	Page length in inches	27 67 0 n	1B 43 00 n	ESC C NUL n
	Activate Skip over Perforation	27 78 n	1B 4E n	ESC N n
	Deactivate Skip over Perforation	27 79	1B 4F	ESC O
	Set left margin	27 108 n	1B 6C n	ESC l n
	Set right margin	27 81 n	1B 51 n	ESC Q n
Line spacing	Function	Dez.	Hex.	ASCII
	1/8 inch line spacing	27 48	1B 30	ESC 0
	Set 1/6 inch line spacing	27 50	1B 32	ESC 2
	Set variable line spacing (n/60 inch)	27 65 n	1B 41 n	ESC A n
	Set variable line spacing (n/180 inch)	27 51 n	1B 33 n	ESC 3 n
	Set variable line spacing (n/360 inch)	27 91 n	1B 58 n	ESC [n
	Set variable line spacing (n/360 inch)	27 43 n	1B 2B n	ESC + n
Paper Feed	Function	Dez.	Hex.	ASCII
	Line feed	10	0A	LF
	Variable line feed (n/180 inch)	27 74 n	1B 4A n	ESC J n
	Variable line feed (n/360 inch)	27 93 n	1B 5D n	ESC] n
	Reverse line feed (n/180 inch)	27 106 n	1B 6A n	ESC j n
	Form feed	12	0C	FF

Function	Dez.	Hex.	ASCII	Cut Sheet Feeder control
Insert single sheet	27 25 73	1B 19 49	ESC EM I	
Eject single sheet	27 25 82	1B 19 52	ESC EM R	
Select bin 1	27 25 49	1B 19 31	ESC EM 1	
Select bin 2	27 25 50	1B 19 32	ESC EM 2	

Function	Dez.	Hex.	ASCII	Character sets
Activate extension of printable characters	27 54	1B 36	ESC 6	
Deactivate extension	27 55	1B 37	ESC 7	
Activate italic character set	27 116 0	1B 74 00	ESC t NUL	
Activate character set selected by menu	27 116 1	1B 74 01	ESC t SOH	
Activate loadable character set	27 116 2	1B 74 02	ESC t STX	
Activate graphic character set	27 116 3	1B 74 03	ESC t ETX	
Select national character set and Code Page	27 82 n	1B 52 n	ESC R n	

Function	Dez.	Hex.	ASCII	Other commands
Carriage return	13	0D	CR	
Backspace	8	08	BS	
Delete buffer	24	18	CAN	
Initialize printer	27 64	1B 40	ESC @	
Start unidirectional printing	27 85 49	1B 55 31	ESC U 1	
Stop unidirectional printing	27 85 40	1B 55 30	ESC U 0	

Other commands	Function	Dez.	Hex.	ASCII
	Start unidirectional printing for one line	27 60	1B 3C	ESC <
	Start print suppress	19	13	DC3
	Stop print suppress	17	11	DC1
	Deactivate end of paper sensor	27 56	1B 38	ESC 8
	Activate end of paper sensor	27 57	1B 39	ESC 9
	Select print speed	27 115 n	1B 73 n	ESC s n
	Set most significant bit (MSB) to 1	27 62	1B 3E	ESC >
	Set most significant bit (MSB) to 0	27 61	1B 3D	ESC =
	Delete MSB default	27 35	1B 23	ESC #
	Delete last character	127	7F	DEL

Graphics

Function	Dez.	Hex.	ASCII
High resolution graphics	27 42 m n ₁ n ₂	1B 2A m n ₁ n ₂	ESC * m n ₁ n ₂
Activate single density graphics	27 75 n ₁ n ₂	1B 4B n ₁ n ₂	ESC K n ₁ n ₂
Activate double density graphics and half print speed	27 76 n ₁ n ₂	1B 4C n ₁ n ₂	ESC L n ₁ n ₂
Activate double density graphics	27 89 n ₁ n ₂	1B 59 n ₁ n ₂	ESC Y n ₁ n ₂
Activate quadruple density graphics	27 90 n ₁ n ₂	1B 5A n ₁ n ₂	ESC Z n ₁ n ₂
Re-assign graphics	27 63 n m	1B 3F n m	ESC ? n m

Function	Dez.	Hex.	ASCII	Loadable characters
Copy standard character set into DLL	27 58 0 n 0	1B 3A 00 n 00	ESC : NUL n NUL	
Generate downloadable characters	27 28 0 n ₁ n ₂ d ₀ d ₁ d ₂ (Daten)	1B 26 00 n ₁ n ₂ d ₀ d ₁ d ₂ (Daten)	ESC & NUL n ₁ n ₂ d ₀ d ₁ d ₂ (Daten)	
Activate downloadable character set	27 37 1	1B 25 01	ESC % SOH	
Activate resident character set	27 37 0	1B 25 00	ESC % NUL	
Replace top character set with DLL character	27 116 2	1B 74 02	ESC † STX	

Additional ESC /P2 command

Function	Dez.	Hex.	ASCII	
Set horizontal basic step size (HMI)	27 99 Lp Hp	1B 63 Lp Hp	ESC c Lp Hp	Raster graphics
Setting page length in basic step sizes	27 40 67 Ln Hn Lp Hp	1B 28 43 Ln Hn Lp Hp	ESC (C Ln Hn Lp Hp	
Setting of horizontal and vertical basic set size	27 40 85 Ln Hn Pn	1B 28 55 Ln Hn Pn	ESC (U Ln Hn Pn	
Function	Dez.	Hex.	ASCII	Vertical print positioning
Absolute vertical print positioning in units of the basic step size	27 40 86 Ln Hn Lp Hp	1B 28 56 Ln Hn Lp Hp	ESC (V Ln Hn Lp Hp	
Relative vertical print positioning in units of the basic step size	27 40 118 Ln Hn Lp Hp	1B 28 76 Ln Hn Lp Hp	ESC (v Ln Hn Lp Hp	

Printable areas	Function	Dez.	Hex.	ASCII
	Setting of the page format in basic step sizes	27 40 99 Ln Hn Lt Ht Lb Hb	1B 28 63 Ln Hn Lt Ht Lb Hb	ESC (c Ln Hn Lt Ht Lb Hb

Select font	Function	Dez.	Hex.	ASCII
	Select font by means of character pitch and point size	27 88 Pn Lp Hp	1B 58 Pn Lp Hp	ESC X Pn Lp Hp

Character sets and Code Pages	Function	Dez.	Hex.	ASCII
	Print characters from the fully printable character set	27 40 94 Ln Hn Daten	1B 28 5E Ln Hn Daten	ESC (^ Ln Hn Daten
	Assign new code page	27 40 116 Ln Hn Pn ₁ Pn ₂ Pn ₃	1B 28 74 Ln Hn Pn ₁ Pn ₂ Pn ₃	ESC (t Ln Hn Pn ₁ Pn ₂ Pn ₃

Raster graphics	Function	Dez.	Hex.	ASCII
	Initialize raster graphics	27 40 71 Ln Hn Pn	1B 28 47 Ln Hn Pn	ESC (G Ln Hn Pn
	Raster graphics	27 46 Pc Pv Ph Pm Ln Hn Daten	1B 2E Pc Pv Ph Pm Ln Hn Daten	ESC . Pc Pv Ph Pm Ln Hn Daten

Chapter 17: Epson - Character Sets

This chapter contains the character sets available in Epson emulation. You can choose between three Epson character sets and numerous national character sets.

The code page command allows you to select character sets that replace some less frequently used characters with symbols used in a variety of European languages.

Character Set		Select	Epson - Character sets
Normal character set		ESC t NUL ESC 7	
Graphics character set		ESC t SOH ESC 7	
Normal character set expansion		ESC t SOH ESC 6	

n	Code Page	Select	National Character sets
0	ASCII	ESC R NUL	
1	French	ESC R SOH	
2	German	ESC R STX	
3	British	ESC R ETX	
4	Danish I	ESC R EOT	
5	Swedish I	ESC R ENQ	
6	Italian	ESC R ACK	
7	Spanish I	ESC R BEL	
8	Japanese	ESC R BS	
9	Norwegian	ESC R HT	
10	Danish II	ESC R LF	
11	Spanish II	ESC R VT	
12	Latin America	ESC R FF	
13	French Canadian	ESC R CR	
14	Dutch	ESC R SO	
15	Swedish II	ESC R SI	
16	Swedish III	ESC R DLE	
17	Swedish IV	ESC R DC1	
18	Turkey	ESC R DC2	
19	Swiss I	ESC R DC3	
20	Swiss II	ESC R DC4	
64	Legal / Publisher	ESC R @	

Code Pages	n	Code Page	Select
	22	Polska Mazovia	ESC R SYN
	23	ISO Latin 2	ESC R ETB
	24	Serbo Croatic I	ESC R CAN
	25	Serbo Croatic II	ESC R EM
	26	Multilingual - 850	ESC R SUB
	27	Norwegian	ESC R ESC
	28	Portugal	ESC R FS
	29	Turkey	ESC R GS
	38	Greek 437	ESC R &
	39	Greek 928	ESC R '
	40	Greek 851	ESC R (
	41	Greek 437 Cyprus	ESC R)
	42	ECMA-94	ESC R *
	43	French Canadian	ESC R +
	44	Cyrillic I - 855	ESC R ,
	45	Cyrillic II - 866	ESC R -
	46	East Europe Latin II - 852	ESC R .
	47	Greek 869	ESC R /
	49	Windows East Europe	ESC R 1
	50	Windows Greek	ESC R 2
	51	Latin 5 (Windows Turkey)	ESC R 3
	52	Windows Cyrillic	ESC R 4
	54	Hungarian CWI	ESC R 6
	55	Kamenicky (MJK)	ESC R 7
	57	Turkey 857	ESC R 9
	60	Hebrew NC (862)	ESC R <
	61	Hebrew OC	ESC R =
	62	Windows Hebrew	ESC R >
	66	Ukrainian	ESC R B
	67	ISO Latin 6 (8859/10)	ESC R C
	68	Windows Baltic	ESC R D
	72	Bulgarian	ESC R H
	74	Baltic - 774	ESC R J

ASCII Character Set

The »American Standard Code for Information Interchange« is a standardized character set of printable characters (**bold**) and control codes. The name of the control codes result from their usage in communication and data transmission. Some characters are used to activate printer functions as shown in the corresponding chapters. The entering of control codes may vary from program to program.

ASCII	Dez	Hex	Ctrl	ASCII	Dez	Hex	ASCII	Dez	Hex	ASCII	Dez	Hex
NUL	0	00	^@	[SP]	32	20	@	64	40	`	96	60
SOH	1	01	^A	!	33	21	A	65	41	a	97	61
STX	2	02	^B	"	34	22	B	66	42	b	98	62
ETX	3	03	^C	#	35	23	C	67	43	c	99	63
EOT	4	04	^D	\$	36	24	D	68	44	d	100	64
ENQ	5	05	^E	%	37	25	E	69	45	e	101	65
ACK	6	06	^F	&	38	26	F	70	46	f	102	66
BEL	7	07	^G	'	39	27	G	71	47	g	103	67
BS	8	08	^H	(	40	28	H	72	48	h	104	68
HT	9	09	^I	)	41	29	I	73	49	i	105	69
LF	10	0A	^J	*	42	2A	J	74	4A	j	106	6A
VT	11	0B	^K	+	43	2B	K	75	4B	k	107	6B
FF	12	0C	^L	,	44	2C	L	76	4C	l	108	6C
CR	13	0D	^M	-	45	2D	M	77	4D	m	109	6D
SO	14	0E	^N	.	46	2E	N	78	4E	n	110	6E
SI	15	0F	^O	/	47	2F	O	79	4F	o	111	6F
DLE	16	10	^P	0	48	30	P	80	50	p	112	70
DC1	17	11	^Q	1	49	31	Q	81	51	q	113	71
DC2	18	12	^R	2	50	32	R	82	52	r	114	72
DC3	19	13	^S	3	51	33	S	83	53	s	115	73
DC4	20	14	^T	4	52	34	T	84	54	t	116	74
NAK	21	15	^U	5	53	35	U	85	55	u	117	75
SYN	22	16	^V	6	54	36	V	86	56	v	118	76
ETB	23	17	^W	7	55	37	W	87	57	w	119	77
CAN	24	18	^X	8	56	38	X	88	58	x	120	78
EM	25	19	^Y	9	57	39	Y	89	59	y	121	79
SUB	26	1A	^Z	.	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	^[	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	^\	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	^]	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	^^	>	62	3E	^	94	5E	~	126	7E
US	31	1F	^_	?	63	3F	_	95	5F	DEL	127	7F

Conversion table

The layout of this conversion table corresponds to the following character set tables. The row and the column headers show the hexadecimal value of the characters. The table contains **decimal** and *octal values*. Example: hexadecimal 23 (column 2, row 3) is equal to decimal 35.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0 0	16 20	32 40	48 60	64 100	80 120	96 140	112 160	128 200	144 220	160 240	176 260	192 300	208 320	224 340	240 360
1	1 1	17 21	33 41	49 61	65 101	81 121	97 141	113 161	129 201	145 221	161 241	177 261	193 301	209 321	225 341	241 361
2	2 2	18 22	34 42	50 62	66 102	82 122	98 142	114 162	130 202	146 222	162 242	178 262	194 302	210 322	226 342	242 362
3	3 3	19 23	35 43	51 63	67 103	83 123	99 143	115 163	131 203	147 223	163 243	179 263	195 303	211 323	227 343	243 363
4	4 4	20 24	36 44	52 64	68 104	84 124	100 144	116 164	132 204	148 224	164 244	180 264	196 304	212 324	228 344	244 364
5	5 5	21 25	37 45	53 65	69 105	85 125	101 145	117 165	133 205	149 225	165 245	181 265	197 305	213 325	229 345	245 365
6	6 6	22 26	38 46	54 66	70 106	86 126	102 146	118 166	134 206	150 226	166 246	182 266	198 306	214 326	230 346	246 366
7	7 7	23 27	39 47	55 67	71 107	87 127	103 147	119 167	135 207	151 227	167 247	183 267	199 307	215 327	231 347	247 367
8	8 10	24 30	40 50	56 70	72 110	88 130	104 150	120 170	136 210	152 230	168 250	184 270	200 310	216 330	232 350	248 370
9	9 11	25 31	41 51	57 71	73 111	89 131	105 151	121 171	137 211	153 231	169 251	185 271	201 311	217 331	233 351	249 371
A	10 12	26 32	42 52	58 72	74 112	90 132	106 152	122 172	138 212	154 232	170 252	186 272	202 312	218 332	234 352	250 372
B	11 13	27 33	43 53	59 73	75 113	91 133	107 153	123 173	139 213	155 233	171 253	187 273	203 313	219 333	235 353	251 373
C	12 14	28 34	44 54	60 74	76 114	92 134	108 154	124 174	140 214	156 234	172 254	188 274	204 314	220 334	236 354	252 374
D	13 15	29 35	45 55	61 75	77 115	93 135	109 155	125 175	141 215	157 235	173 255	189 275	205 315	221 335	237 355	253 375
E	14 16	30 36	46 56	62 76	78 116	94 136	110 156	126 176	142 216	158 236	174 256	190 276	206 316	222 336	238 356	254 376
F	15 17	31 37	47 57	63 77	79 117	95 137	111 157	127 177	143 217	159 237	175 257	191 277	207 317	223 337	239 357	255 377

Normal Character Set

ESC t NUL ESC 7

ESC t NUL ESC 7	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p				0	@	P	`	p
1			!	1	A	Q	a	q			!	I	A	Q	a	q
2			"	2	B	R	b	r			"	2	B	R	b	r
3			#	3	C	S	c	s			#	3	C	S	c	s
4			\$	4	D	T	d	t			\$	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			(	8	H	X	h	x			(	8	H	X	h	x
9			)	9	I	Y	i	y			)	9	I	Y	i	y
A			*	:	J	Z	j	z			*	:	J	Z	j	z
B			+	;	K	[	k	{			+	;	K	[	k	{
C			,	<	L	\	l	|			,	<	L	\	l	|
D			-	=	M	]	m	}			-	=	M	]	m	}
E			.	>	N	^	n	~			.	>	N	^	n	~
F			/	?	O	_	o				/	?	O	_	o	

Graphics Character Set

ESC t SOH ESC 7

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	⋮	L	⊥	α	≡
1			!	1	A	Q	a	q			í	⋮	⊥	⊥	β	±
2			"	2	B	R	b	r			ó	⋮	⊥	⊥	γ	≥
3			#	3	C	S	c	s			ú	⊥	⊥	⊥	π	≤
4			\$	4	D	T	d	t			ñ	⊥	⊥	⊥	Σ	∫
5			%	5	E	U	e	u			Ñ	⊥	⊥	⊥	σ	J
6			&	6	F	V	f	v			ª	⊥	⊥	⊥	μ	÷
7			'	7	G	W	g	w			º	⊥	⊥	⊥	τ	=
8			(	8	H	X	h	x			¸	⊥	⊥	⊥	Φ	°
9			)	9	I	Y	i	y			⌈	⊥	⊥	⊥	θ	•
A			*	:	J	Z	j	z			⌋	⊥	⊥	⊥	Ω	.
B			+	;	K	[	k	{			½	⊥	⊥	⊥	δ	√
C			,	<	L	\	l	|			¼	⊥	⊥	⊥	∞	ⁿ
D			-	=	M	]	m	}			i	⊥	⊥	⊥	φ	²
E			.	>	N	^	n	~			«	⊥	⊥	⊥	∈	▪
F			/	?	O	_	o				»	⊥	⊥	⊥	∩	

Normal Character Set Expansion

ESC t SOH ESC 6

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	▯	L	ll	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▯	l	ll	β	±
2			"	2	B	R	b	r	é	Æ	ó	▯	T	ll	Γ	≥
3			#	3	C	S	c	s	â	ó	ú	l	l	ll	π	≤
4			\$	4	D	T	d	t	ä	ö	ñ	l	-	ll	Σ	f
5			%	5	E	U	e	u	à	ò	Ñ	l	+	F	σ	J
6			&	6	F	V	f	v	â	û	ª	ll	l	ll	μ	+
7			'	7	G	W	g	w	ç	ù	º	ll	l	ll	τ	=
8			(	8	H	X	h	x	ê	ÿ	¿	ll	l	ll	Φ	°
9			)	9	I	Y	i	y	ë	Ö	ll	ll	ll	ll	θ	•
A			*	:	J	Z	j	z	è	Û	ll	ll	ll	ll	Ω	.
B			+	:	K	[	k	{	ï	é	½	ll	ll	ll	δ	√
C			,	<	L	\	l	|	í	£	¼	ll	ll	ll	∞	ⁿ
D			-	=	M	] m	} i	¥	ì	ll	=	ll	ll	ll	φ	²
E			.	>	N	^	n	~	Ä	Pt	«	ll	ll	ll	€	▪
³ F			/	?	O	_	o		Å	f	»	ll	ll	ll	∩	

National Character Set

ESC R n

ESC R n	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0		P		p	Ç	É	á	▯	L	ll	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▯	l	ll	β	±
2			"	2	B	R	b	r	é	Æ	ó	▯	T	ll	Γ	≥
3			#	3	C	S	c	s	â	ó	ú	l	l	ll	π	≤
4			\$	4	D	T	d	t	ä	ö	ñ	l	-	ll	Σ	f
5			%	5	E	U	e	u	à	ò	Ñ	l	+	F	σ	J
6			&	6	F	V	f	v	â	û	ª	ll	l	ll	μ	+
7			'	7	G	W	g	w	ç	ù	º	ll	l	ll	τ	=
8			(	8	H	X	h	x	ê	ÿ	¿	ll	l	ll	Φ	°
9			)	9	I	Y		y	ë	Ö	ll	ll	ll	ll	θ	•
A			*	:	J	Z	j	z	è	Û	ll	ll	ll	ll	Ω	.
B			+	:	K		k		ï	é	½	ll	ll	ll	δ	√
C			,	<	L		l		í	£	¼	ll	ll	ll	∞	ⁿ
D			-	=	M		m		ì	¥	ì	ll	ll	ll	φ	²
E			.	>	N		n		Ä	Pt	«	ll	ll	ll	€	▪
³ F			/	?			o		Å	f	»	ll	ll	ll	∩	

This table shows the ASCII character and the corresponding character that is replaced with when an alternative language character is selected by menu or command.

Value n decimal	Character Set	Hexadecimal Value															
		23	24	26	40	4F	5B	5C	5D	5E	5F	60	69	7B	7C	7D	7E
0	USA	#	\$	&	@	O	[	\	\]	^	_	`	i	{	|	}	~
1	Fench	#	\$	&	à	O	°	ç	§	^	_	`	i	é	ù	è	¨
2	German	#	\$	&	§	O	Ä	Ö	Ü	^	_	`	i	ä	ö	ü	ß
3	British	£	\$	&	@	O	[	\	\]	^	_	`	i	{	|	}	~
4	Danish I	#	\$	&	@	O	Æ	Ø	Å	^	_	`	i	æ	ø	å	~
5	Swedish I	#	¤	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
6	Italian	#	\$	&	@	O	°	\	é	^	_	ù	i	à	ò	è	ì
7	Spanish I	Pt	\$	&	@	O	i	Ñ	í	^	_	`	i	ñ	ó	ú	~
8	Japanese	#	\$	&	@	O	[	¥	]	^	_	`	i	{	|	}	~
9	Norwegian	#	¤	&	É	O	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
10	Danish II	#	\$	&	É	O	Æ	Ø	Å	Ü	_	é	i	æ	ø	å	ü
11	Spanish II	#	\$	&	á	O	i	Ñ	í	é	_	`	i	í	ñ	ó	ú
12	Latin America	#	\$	&	á	O	i	Ñ	í	é	_	ü	i	í	ñ	ó	ú
13	French Canadian	ü	\$	ë	à	Ø	â	ç	ê	î	ï	ô	i	é	ù	è	û
14	Dutch	£	\$	&	@	O	[	IJ	]	^	_	`	i	{	ij	}	~
15	Swedish II	#	\$	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
16	Swedish III	§	\$	&	É	O	Ä	Ö	Å	Ü	_	é	i	ä	ö	å	ü
17	Swedish IV	§	¤	&	É	O	Ä	Ö	å	^	_	é	i	ä	ö	å	ü
18	Turkey	§	\$	ğ	Ş	O	i	ö	ü	Ğ	_	ç	ı	±	Ö	Ü	Ç
19	Swiss I	£	\$	&	ç	O	à	é	è	^	_	`	i	ä	ö	ü	"
20	Swiss II	£	\$	&	§	O	à	ç	è	^	_	`	i	ä	ö	ü	é
64	Legal / Publisher	#	\$	&	§	O	°	´	"	¶	±	`	i	©	®	†	™

Code Area Expansion

ESC I

Decimal	Character	Decimal	Character	Decimal	Character	Decimal	Character
0	à	16	§	128	à	144	§
1	è	17	ß	129	è	145	ß
2	ù	18	DC2	130	ù	146	DC2
3	ò	19	DC3	131	ò	147	DC3
4	ì	20	DC4	132	ì	148	DC4
5	°	21	ø	133	°	149	ø
6	£	22	"	134	£	150	"
7	BEL	23	Ä	135	BEL	151	Ä
8	BS	24	CAN	136	BS	152	CAN
9	HT	25	Ü	137	HT	153	Ü
10	LF	26	ä	138	LF	154	ä
11	VT	27	ESC	139	VT	155	ESC
12	FF	28	ü	140	FF	156	ü
13	CR	29	É	141	CR	157	É
14	SO	30	é	142	SO	158	é
15	SI	31	¥	143	SI	159	¥

Line Graphics Expansion Character Set, USA (ID 437) (selected by ESC t SOH ESC 6)

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

Appendix A: Technical Data

Printer

narrow model	80 characters (at 10 cpi)
wide model	136 characters (at 10 cpi)
print method	Impact dot matrix
printhead	24 pins, 0.2 mm diameter
ribbon	self-colouring textile ribbon, re-inking cartridge

Print Characteristics

Characters per inch (cpi)	10, 12, 15, 17.1, 20, proportional	
print speed (Characters per second, cps)	Letter Quality (LQ)	Data Processing Quality (UTL)
at 10 cpi	87	260
at 12 cpi	104	312
at 15 cpi	130	390
at 17.1 cpi	149	223
at 20 cpi	174	260
Dot matrix (horizontal x vertical)	35 x 18 points at LQ (10 cpi) 29 x 18 points at LQ (12 cpi) 18 x 18 points at LQ (15/17.1 cpi) 15 x 18 points at LQ (20 cpi) 9 x 17 points at UTL (10, 12, 17.1, 20 cpi) 7 x 17 points at UTL (15 cpi)	
Characters per line	narrow model	wide model
at 10 cpi	80	136
at 12 cpi	96	163
at 15 cpi	120	204
at 17.1 cpi	137	233
at 20 cpi	160	272
Paper feed speed	4.5 inches per second	
Line spacing fix:	6 and 8 lines per inch	
	variable: n/60, n/72, n/180, n/216, n/360 inch	

Interfaces	Centronics parallel
Option	RS-232C serial RS-422A serial RS-232C/Current Loop (combined) serial
Emulations	IBM ProPrinter X24/XL24 (<i>DLL is not supported</i>) Epson LQ
Buffer	max. 23 KByte receive buffer
Fonts/Typefaces	UTL, Data processing quality LQ: Courier, Roman, Swiss, Swiss Bold, Gothic, Prestige, Orator, special font OCR-B1
Barcodes	Code 39 UPC-A UPC-E EAN-8 (IAN8, JAN8) EAN-13 (IAN13, JAN13) Interleaved 2/5 Code 128 ZIP Code (Postnetzbarcode)
Graphic Resolution	
Vertical	180, 360 points/inch
Horizontal	60, 80, 90, 120, 180, 240, 360 points/inch
Paper Feed	
Top paper feed	automatic single sheet insertion
Top paper feed	with Cut Sheet Feeder (option)
Rear paper feed	with internal Push Tractor
Bottom Paper Feed	with Push Tractor (option)
Bottom Paper Feed	with Pull Tractor (option)

Paper Specifications

(see details in Appendix E)

number of copies

Original + 3 copies, multi-part forms

Cut Sheets

width	182 - 216 mm	(7.2 - 8.5 inches)	narrow model
	182 - 364 mm	(7.2 - 14.3 inches)	wide model
weight	45- 90 g/m ²	(12 - 24 lb)	

Cut Sheets via Cut Sheet Feeder

width	182 - 216 mm	(7.2 - 8.5 inches)	narrow CSF
	182 - 364 mm	(7.2 - 14.3 inches)	wide CSF
weight	60 - 90 g/m ²	(16 - 24 lb)	

Sprocket Paper, single-part forms

width	76 - 254 mm	(3 - 10 inches)	narrow model
	76 - 406 mm	(3 - 16 inches)	wide model
weight	45 - 90 g/m ²	(12 - 24 lb)	

Sprocket Paper, multi-part forms, pressure sensitive

width	76 - 254 mm	(3 - 10 inches)	narrow model
	76 - 406 mm	(3 - 16 inches)	wide model
thickness	< 0.36 mm	(< 0.014 inches),	rear paper feed
	< 0.44 mm	(< 0.017 inches),	bottom paper feed
weight	34 - 41 g/m ²	(9 - 11 lb)	

Sprocket Paper, multi-part forms, carbon interleaf

width	76 - 254 mm	(3 - 10 inches)	narrow model
	76 - 406 mm	(3 - 16 inches)	wide model
thickness	< 0.36 mm	(< 0.014 inches),	rear paper feed
	< 0.44 mm	(< 0.017 inches),	bottom paper feed
weight	38 - 45 g/m ²	(10 - 12 lb)	
weight of carbon	34 g/m ²	(9 lb)	

Printer weight

6.9 kg (narrow model)

8.9 kg (wide model)

Dimensions

	narrow model	wide model
width	398 mm (15.7 inches)	552 mm (21.8 inches)
height	145 mm (5.7 inches)	145 mm (5.7 inches)
depth	345 mm (13.6 inches)	345 mm (13.6 inches)

Dimensions (including platen knob, paper separator etc.)

width	436 mm (17.2 inches)	587 mm (23.1 inches)
height	147 mm (5.8 inches)	147 mm (5.8 inches)
depth	404 mm (15.9 inches)	404 mm (15.9 inches)

Electrical characteristics

Voltage 230 V (+10%, -14%),
Frequency 50/60 Hz (+/- 2%)

Power consumption Operation: 60 W
Standby: 12 W

Energy Star



Environmental Conditions

Temperature Operation: 5° to 40°C
Storage: -10° to 50°C (at Power Off)

Rel. Humidity Operation: 20% to 80%
Storage: 5% to 95% (no condensation)

Working noise

(according to ISO 7779) 54 db(A), Letter Quality
55 db(A), Data Processing Quality
50 db(A), Data Processing Quality/Quiet-Mode

Reliability

MTBF (Mean Time Between Failures)	10.000 hours (25% duty cycle and 35% page density)
MTTR (Mean Time To Repair)	15 minutes
printer life	12.000 hours (25% duty cycle and 35% page density)
ribbon life	2 million characters (depending on age of printing material, text- or graphic printing, age of ribbon)
print head life	200 million characters

Options

Pull Tractor, narrow
 Pull Tractor, wide
 Bottom Tractor, narrow
 Bottom Tractor, wide
 Cut Sheet Feeder:
 1-Bin, narrow
 1-Bin, wide
 2-Bin, narrow
 2-Bin, wide
 Roll Paper Stand, narrow
 Ribbon cassette, black
 Interface cards:
 RS-232C
 RS-422A
 RS-232C / Current Loop

Agency Approvals

FCC class A, class B
 UL 1950, CSA 1950
 EN 55022 class B (CE)
 EN 60950 (GS)
 BS EN 60950 (BS)
 IEC 950

Appendix B: Code pages

This chapter contains the code pages available in *IBM*- and *Epson* emulation, exceptions are marked. How to select a code page is described in Chapter 10 and 14.

ID	Code pages	page
437	USA	B-3
774	Baltic 774	B-3
850	Multilingual	B-4
852	East Europe Latin 2	B-4
855	Cyrillic I	B-5
857	Turkish 857	B-5
860	Portugese	B-6
863	French Canadian	B-6
865	Norwegian	B-7
866	Cyrillic II	B-7
869	Greek 869	B-8
895	Kamenicky (MJK)	B-8
1008	Greek 437	B-9
1009	Greek 928	B-9
1011	Greek 437 Cyprus	B-10
1012	Turkish	B-10
1014	Polska Mazovia	B-11
1015	ISO Latin 2	B-11
1016	Serbo Croatian I	B-12
1017	Serbo Croatian II	B-12
1018	ECMA-94	B-13
1019	Windows East Europe	B-13
1020	Windows Greek	B-14
1021	Latin 5 (Windows Turkish)	B-14
1022	Windows Cyrillic	B-15
1024	Hungarian CWI	B-15
1027	Ukrainian	B-16
1029	ISO Latin 6 (8859/10)	B-16
1030	Hebrew NC (862)	B-17
1031	Hebrew OC	B-17
1032	Windows Hebrew	B-18
1034	Windows Baltic	B-18
1072	Bulgarian	B-19

Conversion table

The layout of this conversion table corresponds to the following character set tables. The row and the column headers show the hexadecimal value of the characters. The table contains **decimal** and *octal* values. Example: hexadecimal 23 (column 2, row 3) is equal to decimal 35.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0 0	16 20	32 40	48 60	64 100	80 120	96 140	112 160	128 200	144 220	160 240	176 260	192 300	208 320	224 340	240 360
1	1 1	17 21	33 41	49 61	65 101	81 121	97 141	113 161	129 201	145 221	161 241	177 261	193 301	209 321	225 341	241 361
2	2 2	18 22	34 42	50 62	66 102	82 122	98 142	114 162	130 202	146 222	162 242	178 262	194 302	210 322	226 342	242 362
3	3 3	19 23	35 43	51 63	67 103	83 123	99 143	115 163	131 203	147 223	163 243	179 263	195 303	211 323	227 343	243 363
4	4 4	20 24	36 44	52 64	68 104	84 124	100 144	116 164	132 204	148 224	164 244	180 264	196 304	212 324	228 344	244 364
5	5 5	21 25	37 45	53 65	69 105	85 125	101 145	117 165	133 205	149 225	165 245	181 265	197 305	213 325	229 345	245 365
6	6 6	22 26	38 46	54 66	70 106	86 126	102 146	118 166	134 206	150 226	166 246	182 266	198 306	214 326	230 346	246 366
7	7 7	23 27	39 47	55 67	71 107	87 127	103 147	119 167	135 207	151 227	167 247	183 267	199 307	215 327	231 347	247 367
8	8 10	24 30	40 50	56 70	72 110	88 130	104 150	120 170	136 210	152 230	168 250	184 270	200 310	216 330	232 350	248 370
9	9 11	25 31	41 51	57 71	73 111	89 131	105 151	121 171	137 211	153 231	169 251	185 271	201 311	217 331	233 351	249 371
A	10 12	26 32	42 52	58 72	74 112	90 132	106 152	122 172	138 212	154 232	170 252	186 272	202 312	218 332	234 352	250 372
B	11 13	27 33	43 53	59 73	75 113	91 133	107 153	123 173	139 213	155 233	171 253	187 273	203 313	219 333	235 353	251 373
C	12 14	28 34	44 54	60 74	76 114	92 134	108 154	124 174	140 214	156 234	172 254	188 274	204 314	220 334	236 354	252 374
D	13 15	29 35	45 55	61 75	77 115	93 135	109 155	125 175	141 215	157 235	173 255	189 275	205 315	221 335	237 355	253 375
E	14 16	30 36	46 56	62 76	78 116	94 136	110 156	126 176	142 216	158 236	174 256	190 276	206 316	222 336	238 356	254 376
F	15 17	31 37	47 57	63 77	79 117	95 137	111 157	127 177	143 217	159 237	175 257	191 277	207 317	223 337	239 357	255 377

USA (ID 437)

IBM: 1B 5B 54 05 00 00 00 01 B5 00
Epson: not available

⁴³⁷ 0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	►		0	@	P	˘	p	Ç	É	á	⋮	L	ll	α	≡
1	☺	◄	!	1	A	Q	a	q	ü	æ	í	⋈	⊥	⸀	β	±
2	☹	↑	"	2	B	R	b	r	é	Æ	ó	⋈	T	Π	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	—	£	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♠	-	&	6	F	V	f	v	â	û	ª	‡	‡	Π	μ	+
7	●	‡	'	7	G	W	g	w	ç	ù	º	‡	‡	‡	τ	≈
8	■	↑	(	8	H	X	h	x	ê	ÿ	¿	‡	‡	‡	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	ƒ	‡	‡	‡	θ	•
A	◻	→	*	:	J	Z	j	z	è	Ü	ƒ	ll	ll	Γ	Ω	·
B	♂	←	+	;	K	[	k	{	ï	€	½	‡	‡	■	δ	√
C	♀	⊥	,	<	L	\	l	|	î	£	¼	‡	‡	■	∞	ⁿ
D	♂	↔	-	=	M	]	m	}	í	¥	ı	‡	=	■	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Pl	«	‡	‡	‡	€	▪
F	⊗	▼	/	?	O	_	o		Å	f	»	‡	‡	■	∩	

Baltic (ID 774)

IBM: 1B 5B 54 05 00 00 00 03 06 00
Epson: 1B 52 4A

⁷⁷⁴ 0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	►		0	@	P	˘	p	Ç	É	á	⋮	L	ā	α	≡
1	☺	◄	!	1	A	Q	a	q	ü	æ	í	⋈	⊥	č	β	±
2	☹	↑	"	2	B	R	b	r	é	Æ	ó	⋈	T	ę	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	è	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	—	ı	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	š	σ	J
6	♠	-	&	6	F	V	f	v	â	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	ƒ	‡	‡	‡	θ	•
A	◻	→	*	:	J	Z	j	z	è	Ü	ƒ	ll	ll	Γ	Ω	·
B	♂	←	+	;	K	[	k	{	ï	€	½	‡	‡	■	δ	√
C	♀	⊥	,	<	L	\	l	|	î	£	¼	‡	‡	■	∞	ⁿ
D	♂	↔	-	=	M	]	m	}	í	¥	ı	‡	=	■	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Pl	«	š	‡	‡	€	▪
F	⊗	▼	/	?	O	_	o		Å	f	»	‡	‡	■	∩	

Multilingual (ID 850)

IBM: 1B 5B 54 05 00 00 00 03 52 00
Epson: 1B 52 1A

850 26	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	á	⌘	L	ð	Ó	-
1	©	◀	!	1	A	Q	a	q	ü	æ	í	⌘	⌘	Ð	B	±
2	☉	↕	"	2	B	R	b	r	é	Æ	ó	⌘	T	Ê	Ô	=
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	Ë	Ò	³ / ₄
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	-	È	õ	¶
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	Á	+	ı	Ö	§
6	♠	-	&	6	F	V	f	v	â	û	ª	À	ã	í	μ	+
7	●	ˆ	'	7	G	W	g	w	ç	ù	º	À	Ã	î	ƒ	.
8	■	↑	(8	H	X	h	x	é	ý	¿	©	⌘	İ	ı	°
9	○	↓)	9	I	Y	i	y	ë	ö	®	¶	¶	⌘	Ú	¨
A	◉	→	*	:	J	Z	j	z	è	Ü	¬		⌘	Γ	Û	·
B	♂	←	+	;	K	[k	{	ı	ø	¹ / ₂	¶	¶	■	Û	¹ / ₂
C	♀	└	,	<	L	\	l		ı	£	¹ / ₄	¶	¶	■	ý	³ / ₄
D	♂	↔	-	=	M]	m	}	ı	Ø	ı	¢	=	ı	Ý	² / ₃
E	♂	▲	.	>	N	^	n	`	Ä	x	«	¥	¶	ı	-	■
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East Europe Latin 2 (ID 852)

IBM: 1B 5B 54 05 00 00 00 03 54 00
Epson: 1B 52 2E

852 46	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		▶		0	@	P	`	p	Ç	É	á	⌘	L	d	Ó	-
1	©	◀	!	1	A	Q	a	q	ü	Δ	í	⌘	⌘	Ð	B	˘
2	☉	↕	"	2	B	R	b	r	é	Í	ó	⌘	T	Đ	Ó	.
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	Ë	Ñ	˘
4	♦	¶	\$	4	D	T	d	t	ä	ö	À	†	-	d'	ń	˘
5	♣	§	%	5	E	U	e	u	û	L	ą	Á	+	Ñ	ń	§
6	♠	-	&	6	F	V	f	v	é	ı	Ž	Â	Ă	í	Š	+
7	●	ˆ	'	7	G	W	g	w	ç	Š	ž	Ë	ã	î	š	.
8	■	↑	(8	H	X	h	x	ı	ś	Ę	Ś	⌘	ě	Ř	°
9	○	↓)	9	I	Y	i	y	ë	Ö	ę	¶	¶	⌘	Ú	¨
A	◉	→	*	:	J	Z	j	z	Ó	Ü	¬		⌘	Γ	ı	·
B	♂	←	+	;	K	[k	{	ó	ř	ž	¶	¶	■	Ú	ú
C	♀	└	,	<	L	\	l		ı	ı'	Č	¶	¶	■	ý	Ř
D	♂	↔	-	=	M]	m	}	Ž	Ł	ś	Ž	=	T	Ý	ř
E	♂	▲	.	>	N	^	n	`	Ä	x	«	ž	¶	Û	ı	■
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Cyrillic I (ID 855)

IBM: 1B 5B 54 05 00 00 00 03 57 00
Epson: 1B 52 2C

855 41	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	A	Q	a	q	Ђ	Љ	А	▯	⊥	Л	Р	Ы
2	☹	↕	"	2	B	R	b	r	Г	Ь	Б	▯	Г	М	Р	Ы
3	♥	!!	#	3	C	S	c	s	Г	Ь	Б	l	†	М	с	з
4	♦	¶	\$	4	D	T	d	t	ё	һ	ц	†	—	н	С	З
5	♣	§	%	5	E	U	e	u	Ё	Ъ	Ц	x	+	Н	т	ш
6	♠	-	&	6	F	V	f	v	ё	к	д	X	к	о	Т	Ш
7	●	ˆ	'	7	G	W	g	w	Є	Ќ	Д	и	К	О	у	э
8	■	↑	(	8	H	X	h	x	ý	е	И	ℓ	п	У	Э	
9	○	↓)	9	I	Y	i	y	S	Ÿ	Е	≠	Г	⊥	ж	щ
A	◻	→	*	:	J	Z	j	z	ı	ф	ll	⊥	Г	Ж	Щ	
B	♂	←	+	;	K	[k	{	ı	Ц	Ф	Г	Г	■	в	ч
C	♀	—	,	<	L	\	l		ı	ю	г	⊥	Г	■	В	Ч
D	♂	↔	-	=	M] m	}	ı	ı	Ю	Г	ı	=	П	ь	•
E	♂	▲	.	>	N	^	n	~	j	ъ	«	Ÿ	≠	я	Ь	■
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Turkish 857 (ID 857)

IBM: 1B 5B 54 05 00 00 00 03
Epson: 1B 52 39

857 57	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	A	Q	a	q	ü	æ	í	▯	⊥	°	В	±
2	☹	↕	"	2	B	R	b	r	é	Æ	ó	▯	Г	È	Ò	
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	†	È	Ò	¾
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	—	È	ö	¶
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	Á	+	Ö	§	
6	♠	-	&	6	F	V	f	v	â	û	Ğ	Â	ã	í	μ	+
7	●	ˆ	'	7	G	W	g	w	ç	ù	ğ	À	Ã	İ		˙
8	■	↑	(8	H	X	h	x	ê	ı	ı	©	ℓ	İ	x	°
9	○	↓)	9	I	Y	i	y	ë	Ö	@	≠	Г	⊥	Ú	˙
A	◻	→	*	:	J	Z	j	z	è	Û	¬	ll	⊥	Г	Ú	˙
B	♂	←	+	;	K	[k	{	ı	ø	½	Г	Г	■	Û	¹
C	♀	—	,	<	L	\	l		ı	£	¼	⊥	Г	■	ı	³
D	♂	↔	-	=	M] m	}	ı	Ø	ı	¢	=	ı	ÿ		²
E	♂	▲	.	>	N	^	n	~	Ä	Ş	«	¥	≠	İ	—	■
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Portuguese (ID 860)

IBM: 1B 5B 54 05 00 00 00 03 5C 00
Epson: 1B 52 1C

860 28	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	A	Q	a	q	ü	À	í	⋮	⊥	⊞	Γ	±
2	☹	↕	"	2	B	R	b	r	é	È	ó	⋮	⊥	⊞	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ã	õ	ñ	†	-	⊥	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	⊥	σ	J
6	♠	-	&	6	F	V	f	v	Á	Ú	ª	⊥	⊥	⊥	μ	+
7	●	ˆ	'	7	G	W	g	w	ç	ù	º	⊥	⊥	⊥	τ	≈
8	■	↑	(8	H	X	h	x	ê	ì	¿	⊥	⊥	⊥	Φ	°
9	○	↓)	9	I	Y	i	y	Ê	Ô	°	⊥	⊥	⊥	θ	•
A	☉	→	*	:	J	Z	j	z	è	Û	¬	⊥	⊥	⊥	Ω	·
B	♂	←	+	:	K	[k	{	í	ç	½	⊥	⊥	■	δ	√
C	♀	˘	,	<	L	\	l		ô	£	¼	⊥	⊥	■	∞	ⁿ
D	♪	↔	-	=	M]	m	}	ì	Û	¼	⊥	=	■	φ	²
E	♫	▲	.	>	N	^	n	~	À	Û	«	⊥	⊥	■	ε	▪
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French Canadian (ID 863)

IBM: 1B 5B 54 05 00 00 00 03 5F 00
Epson: 1B 52 2B

863 43	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p	Ç	É	í	⋮	L	ll	α	≡
1	☺	◀	!	1	A	Q	a	q	ü	È	´	⋮	⊥	⊞	Γ	±
2	☹	↕	"	2	B	R	b	r	é	Ê	ó	⋮	⊥	⊞	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	Â	Ë	¨	†	-	⊥	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ï	,	‡	+	⊥	σ	J
6	♠	-	&	6	F	V	f	v	¶	û	³	⊥	⊥	⊥	μ	+
7	●	ˆ	'	7	G	W	g	w	ç	ù	¬	⊥	⊥	⊥	τ	≈
8	■	↑	(8	H	X	h	x	ê	ï	¿	⊥	⊥	⊥	Φ	°
9	○	↓)	9	I	Y	i	y	ë	Ô	¬	⊥	⊥	⊥	θ	•
A	☉	→	*	:	J	Z	j	z	è	Û	¬	⊥	⊥	⊥	Ω	·
B	♂	←	+	:	K	[k	{	í	ç	½	⊥	⊥	■	δ	√
C	♀	˘	,	<	L	\	l		î	£	¼	⊥	⊥	■	∞	ⁿ
D	♪	↔	-	=	M]	m	}	=	Û	¾	⊥	=	■	φ	²
E	♫	▲	.	>	N	^	n	~	À	Û	«	⊥	⊥	■	ε	▪
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Norwegian (ID 865)

IBM: 1B 5B 54 05 00 00 00 03 61 00
Epson: 1B 52 1B

⁸⁶⁵ 27	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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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	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	†	—	⊥	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♠	-	&	6	F	V	f	v	â	û	"	‡	‡	⊠	μ	÷
7	●	‡	'	7	G	W	g	w	ç	ù	°	⊠	⊠	‡	τ	≈
8	■	↑	(8	H	X	h	x	ê	ÿ	¿	⊥	‡	⊠	Φ	°
9	○	↓)	9	I	Y	i	y	ë	Ö	Ó	‡	⊠	⊠	θ	•
A	◻	→	*	:	J	Z	j	z	è	Û	¬	ll	⊥	Γ	Ω	·
B	♂	←	+	;	K	[k	{	ï	ø	½	⊠	⊠	■	δ	√
C	♀	¬	,	<	L	\	l		î	£	¼	⊠	‡	■	∞	ⁿ
D	♂	↔	-	=	M]	m	}	í	Ø	ı	⊠	=	■	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Þ	«	⊠	‡	■	ε	▪
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Cyrillic II (ID 866)

IBM: 1B 5B 54 05 00 00 00 03 62 00
Epson: 1B 52 15

⁸⁶⁶ 21	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◄	!	1	A	Q	a	q	Б	С	б	⋮	⊥	⊟	с	è
2	☹	↕	"	2	B	R	b	r	В	Т	в	⋮	⊤	⊠	т	€
3	♥	!!	#	3	C	S	c	s	Г	У	г	l	l	ll	у	€
4	♦	¶	\$	4	D	T	d	t	Д	Ф	д	†	—	⊥	ф	Ï
5	♣	§	%	5	E	U	e	u	Е	Х	е	‡	+	F	x	ï
6	♠	-	&	6	F	V	f	v	Ж	Ц	ж	‡	‡	⊠	ц	ÿ
7	●	‡	'	7	G	W	g	w	З	Ч	з	⊠	⊠	‡	ч	ÿ
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	ll	⊥	Γ	ъ	·
B	♂	←	+	;	K	[k	{	Л	Ы	л	⊠	⊠	■	ы	√
C	♀	¬	,	<	L	\	l		М	Ь	м	⊠	‡	■	ь	№
D	♂	↔	-	=	M]	m	}	Н	Э	н	⊠	=	■	э	¤
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Greek 869 (ID 869)

IBM: 1B 5B 54 05 00 00 00 03 65 00
Epson: 1B 52 2F

869 47	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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3	♥	!!	#	3	C	S	c	s			ú	ı	ı	Χ	ı	φ
4	♦	¶	\$	4	D	T	d	t			Α	ı	–	Ψ	κ	χ
5	♣	§	%	5	E	U	e	u		Ÿ	B	K	+	Ω	λ	§
6	♣	–	&	6	F	V	f	v	Â	ÿ	Γ	Λ	Π	α	μ	ψ
7	●	ˆ	'	7	G	W	g	w		©	Δ	M	P	β	v	ˆ
8	◼	↑	(8	H	X	h	x	•	Ω	E	N	⊥	γ	ξ	°
9	○	↓)	9	I	Y	i	y	¬	²	Z	⋮	⊥	⊥	ο	˙
A	◻	→	*	:	J	Z	j	z	ı	³	H	⊥	⊥	Γ	π	ω
B	♂	←	+	;	K	ı	k	{	'	ά	½	⊥	⊥	■	ρ	ϖ
C	♀	⊥	,	<	L	\	ı		,	£	Θ	⊥	⊥	■	σ	ϖ
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Kamenicky - MJK (ID 895)

IBM: 1B 5B 54 05 00 00 00 03 7F 00
Epson: 1B 52 37

895 55	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☉	◀	!	1	A	Q	a	q	ü	ž	ı	⋮	⊥	⊥	β	±
2	☉	↑	"	2	B	R	b	r	é	Ž	ó	⋮	⊥	⊥	Γ	≥
3	♥	!!	#	3	C	S	c	s	d'	ó	ú	ı	ı	⊥	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	ı	–	⊥	Σ	ƒ
5	♣	§	%	5	E	U	e	u	Ď	Ó	Ň	ı	+	⊥	σ	ı
6	♣	–	&	6	F	V	f	v	Ť	ú	Ů	⊥	⊥	⊥	μ	÷
7	●	ˆ	'	7	G	W	g	w	č	Ú	Ô	⊥	⊥	⊥	τ	≈
8	◼	↑	(8	H	X	h	x	ě	ý	š	⊥	⊥	⊥	φ	°
9	○	↓)	9	I	Y	i	y	Ě	Ö	ř	⋮	⊥	⊥	θ	•
A	◻	→	*	:	J	Z	j	z	Ĺ	Ů	ř	⊥	⊥	⊥	Ω	˙
B	♂	←	+	;	K	ı	k	{	ı	š	Ř	⊥	⊥	■	δ	√
C	♀	⊥	,	<	L	\	ı		ı	ı	¼	⊥	⊥	■	∞	ⁿ
D	♂	↔	-	=	M	ı	m	}	ı	Ÿ	§	⊥	=	■	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Ř	«	⊥	⊥	⊥	ε	■
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Greek 437 (ID 1008)

IBM: 1B 5B 54 05 00 00 00 03 F0 00
Epson: 1B 52 26

1008 38	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◄	!	1	A	Q	a	q	Β	Σ	κ	⋮	⊥	̄	α	±
2	☹	↑	"	2	B	R	b	r	Γ	Τ	λ	⋮	Τ	Π	ε	≥
3	♥	!!	#	3	C	S	c	s	Δ	Υ	μ	ι	†	⋮	η	≤
4	♦	¶	\$	4	D	T	d	t	Ε	Φ	ν	ι	—	⊥	ι	∫
5	♣	§	%	5	E	U	e	u	Z	X	ξ	‡	†	F	ι	J
6	♠	-	&	6	F	V	f	v	H	Ψ	ο	‡	‡	Γ	ο	+
7	●	‡	'	7	G	W	g	w	θ	Ω	π	Π	†	†	υ	≈
8	■	↑	(8	H	X	h	x	I	α	ρ	‡	⊥	‡	υ	·
9	○	↓)	9	I	Y	i	y	K	β	σ	‡	‡	⊥	ω	·
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C	♀	⊥	,	<	L	\	l		N	ε	υ	⊥	‡	■	∞	"
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Greek 928 (ID 1009)

IBM: 1B 5B 54 05 00 00 00 03 F1 00
Epson: 1B 52 27

1009 39	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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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	â	û		Á	Z	Φ	ζ	φ
7	●	‡	'	7	G	W	g	w	ç	ù	\$	'	H	X	η	χ
8	■	↑	(	8	H	X	h	x	ê	ÿ	·	É	θ	Ψ	ð	ψ
9	○	↓)	9	I	Y	i	y	ë	Ö	©	H	I	Ω	ι	ω
A	☐	→	*	:	J	Z	j	z	è	Û		Í	K	Ï	κ	ï
B	♂	←	+	;	K	[k	{	ï	é	«	»	Λ	ÿ	λ	ü
C	♀	⊥	,	<	L	\	l		î	£	¬	Ö	M	ά	μ	ό
D	♂	↔	-	=	M]	m	}	ì	¥		½	N	έ	ν	ύ
E	♂	▲	.	>	N	^	n	~	Ä	Pt		ÿ	Ξ	ή	ξ	ώ
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Greek 437 Cyprus (ID 1011)

IBM: 1B 5B 54 05 00 00 00 03 F3 00

Epson: 1B 52 29

¹⁰¹¹ 41	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	Α	Q	a	q	Β	Σ	κ	⋮	⊥	⊥	ά	±
2	☹	↕	"	2	Β	Ρ	b	r	Γ	Τ	λ	⋮	Τ	Π	έ	≥
3	♥	!!	#	3	С	S	c	s	Δ	Υ	μ	ι	⊥	⋮	ή	≤
4	♠	¶	\$	4	D	T	d	t	Ε	Φ	v	ι	—	⊥	ι	∫
5	♣	§	%	5	E	U	e	u	Z	X	ξ	‡	+	F	ι	J
6	♠	-	&	6	F	V	f	v	H	Ψ	o	⊥	⊥	⊥	ó	+
7	●	ˆ	'	7	G	W	g	w	Θ	Ω	π	⊥	⊥	⊥	ύ	≈
8	■	↑	(8	H	X	h	x	I	α	ρ	⊥	⊥	⊥	ϋ	°
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	⊥	⊥	■	£	√
C	♀	⊥	,	<	L	\	l		N	ε	υ	⊥	⊥	■	∞	"
D	♯	↔	-	=	M]	m	}	Ξ	ζ	φ	⋮	=	■	φ	²
E	♯	▲	.	>	N	^	n	~	O	η	χ	⊥	⊥	⊥	ί	▪
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Turkish (ID 1012)

IBM: 1B 5B 54 05 00 00 00 03 F4 00

Epson: 1B 52 1D

¹⁰¹² 29	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	Α	Q	a	q	ü	æ	í	⋮	⊥	⊥	β	±
2	☹	↕	"	2	Β	Ρ	b	r	é	Æ	ó	⋮	Τ	Π	Γ	≥
3	♥	!!	#	3	С	S	c	s	â	ô	ú	ι	⊥	⋮	π	≤
4	♠	¶	\$	4	D	T	d	t	ä	ö	ñ	ι	—	⊥	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♠	-	&	6	F	V	f	v	â	û	Ğ	⊥	⊥	⊥	μ	+
7	●	ˆ	'	7	G	W	g	w	ç	ù	ğ	⊥	⊥	⊥	τ	≈
8	■	↑	(	8	H	X	h	x	ê	î	ï	⊥	⊥	⊥	φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	ı	⊥	⊥	⊥	θ	·
A	☉	→	*	:	J	Z	j	z	è	Û	ı	⋮	⊥	⊥	Ω	·
B	♂	←	+	;	K	[k	{	î	é	½	⊥	⊥	■	δ	√
C	♀	⊥	,	<	L	\	l		î	£	¼	⊥	⊥	■	∞	"
D	♯	↔	-	=	M]	m	}	ı	¥	ı	⋮	=	■	φ	²
E	♯	▲	.	>	N	^	n	~	Ä	Ş	«	⊥	⊥	⊥	ε	▪
F	☼	▼	/	?	O	_	o	∅	Å	§	»	⊥	⊥	■	∅	

1014 23	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☺	◀	!	1	A	Q	a	q	ü	ę	Ż	▨	⌈	⌋	β	±
2	☹	↕	"	2	B	R	b	r	é	«	ó	▩	⌈	⌋	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	Ó	⌈	⌋	⌌	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ń	†	—	⌌	Σ	ƒ
5	♣	§	%	5	E	U	e	u	à	Ć	Ń	‡	+	F	σ	J
6	♠	-	&	6	F	V	f	v	ą	û	ź	‡	£	Π	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	ë	Ö	—	‡	⌋	⌈	θ	•
A	◻	→	*	:	J	Z	j	z	è	Û	—	⌌	⌌	Γ	Ω	'
B	♂	←	+	:	K	[k	{	ı	żł	½	⌈	⌋	■	δ	√
C	♀	↳	.	<	L	\	l		ı	Ł	¼	⌌	⌋	■	∞	ⁿ
D	♫	↔	-	=	M]	m	}	ć	¥	ı	⌌	=	■	φ	²
E	♫	▲	.	>	N	^	n	˘	Ä	ś	«	⌋	‡	■	ε	▪
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Polska Mazovia (ID 1014)

IBM: 1B 5B 54 05 00 00 00 03 F6 00
Epson: 1B 52 16

1015 23	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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2			"	2	B	R	b	r			˘	˘	Ā	Ń	ā	ň
3			#	3	C	S	c	s			Ł	ł	Ǻ	Ó	ǻ	ó
4			\$	4	D	T	d	t			π	˘	Ā	Ń	ā	ň
5			%	5	E	U	e	u			Ł	ł	Ĺ	Ń	ĺ	ń
6			&	6	F	V	f	v			Ś	ś	Ć	Ö	ć	ö
7			'	7	G	W	g	w			§	˘	Ç	x	ç	+
8			(8	H	X	h	x			˘	˘	Č	Ř	č	ř
9)	9	I	Y	i	y			Š	š	É	Û	é	û
A			*	:	J	Z	j	z			Ş	ş	Ę	Ú	ę	ú
B			+	:	K	[k	{			Ť	ť	Ě	Ů	ě	ů
C			'	<	L	\	l				Ž	ž	Ě	Ů	ě	ů
D			-	=	M]	m	}			—	"	Í	Ý	í	ý
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ISO Latin 2 (ID 1015)

IBM: 1B 5B 54 05 00 00 00 03 F7 00
Epson: 1B 52 17

Serbo Croatic I (ID 1016)

IBM: 1B 5B 54 05 00 00 00 03 F8 00

Epson: 1B 52 18

¹⁰¹⁶ 24	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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2	☉	↕	"	2	B	R	b	r	é	Æ	ó	▩	⊥	⌈	Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	l	-	⊥	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♣	-	&	6	F	V	f	v	â	û	ª	⊥	⊥	⌈	μ	+
7	●	˙	'	7	G	W	g	w	ç	ù	°	⌈	⌈	⊥	τ	≈
8	■	↑	(8	H	X	h	x	ê	ÿ	ı	⌈	⊥	⊥	Φ	°
9	○	↓)	9	I	Y	i	y	ë	Ö	¬	⌈	⌈	⊥	θ	•
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B	♂	←	+	;	K	Š	k	š	ı	€	½	⌈	⌈	■	δ	√
C	♀	└	,	<	L	Đ	l	đ	ı	£	¼	⌈	⌈	■	∞	ⁿ
D	♂	↔	-	=	M	Ć	m	ć	ı	¥	ı	⊥	=	■	φ	²
E	♂	▲	.	>	N	Č	n	č	Ä	Pt	«	⌈	⊥	■	€	▪
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Serbo Croatic II (ID 1017)

IBM: 1B 5B 54 05 00 00 00 03 F9 00

Epson: 1B 52 19

¹⁰¹⁷ 25	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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1	☉	◀	!	1	A	Q	a	q	ü	æ	ć	▨	⊥	⌈	β	±
2	☉	↕	"	2	B	R	b	r	é	Æ	d	▩	⊥	⌈	Γ	≥
3	♥	!!	#	3	C	S	c	s	Č	Đ	š	l	l	ll	π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ	l	-	⊥	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	‡	+	F	σ	J
6	♣	-	&	6	F	V	f	v	â	š	ª	⊥	⊥	⌈	μ	+
7	●	˙	'	7	G	W	g	w	ç	ù	°	⌈	⌈	⊥	τ	≈
8	■	↑	(8	H	X	h	x	ê	ÿ	ı	⌈	⊥	⊥	Φ	°
9	○	↓)	9	I	Y	i	y	Ž	Ö	¬	⌈	⌈	⊥	θ	•
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C	♀	└	,	<	L	\	l		Ć	£	¼	⌈	⌈	■	∞	ⁿ
D	♂	↔	-	=	M]	m	}	ı	¥	ı	⊥	=	■	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Pt	«	⌈	⊥	■	€	▪
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¹⁰¹⁸ 42	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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3	♥	!!	#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ó
4	♦	¶	\$	4	D	T	d	t	ä	ö	¤	´	Ä	Ö	ä	ö
5	♣	§	%	5	E	U	e	u	à	ò	¥	μ	Å	Õ	å	õ
6	♠	—	&	6	F	V	f	v	â	û		¶	Æ	Ö	æ	ö
7	●	ˆ	'	7	G	W	g	w	ç	ù	§	•	Ç	x	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
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ECMA-94 (ID 1018)

IBM: 1B 5B 54 05 00 00 00 03 FA 00
Epson: 1B 52 2A

¹⁰¹⁹ 49	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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8	■	↑	(8	H	X	h	x		“	,	˘	Č	Ř	č	ř
9	○	↓)	9	I	Y	i	y	‰	™	©	ª	É	Ù	é	ù
A	◼	→	*	:	J	Z	j	z	Š	š	Ş	ş	Ę	Ú	ę	ú
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Windows East Europe (ID 1019)

IBM: 1B 5B 54 05 00 00 00 03 FB 00
Epson: 1B 52 31

Windows Greek (ID 1020)

IBM: 1B 5B 54 05 00 00 00 03 FC 00

Epson: 1B 52 32

¹⁰²⁰ 50	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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5	♣	§	%	5	E	U	e	u	¥	μ	Ε	Υ	ε	υ
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Latin 5 (Windows Turkish) (ID 1021)

IBM: 1B 5B 54 05 00 00 00 03 FD 00

Epson: 1B 52 33

¹⁰²¹ 51	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
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3	♥	!!	#	3	C	S	c	s	f	"	£	³	Ã	Ó	ã	ó	
4	♦	¶	\$	4	D	T	d	t	"	"	¤	´	Ä	Ö	ä	ö	
5	♣	§	%	5	E	U	e	u	¥	μ	Å	Õ	å	õ	
6	♠	–	&	6	F	V	f	v	†	–	;	¶	Æ	Ö	æ	ö	
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9	○	↓)	9	I	Y	i	y	‰	™	©	¹	É	Û	é	ù	
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6	♠	_	&	6	Ф	V	f	v	†	—	І	¶	§	Ц	Н	ц
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9	○	↓)	9	І	Y	i	y	‰	™	©	№	Й	Щ	й	щ
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Windows Cyrillic (ID 1022)

IBM: 1B 5B 54 05 00 00 00 03 FE 00

Epson: 1B 52 34

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4	♦	¶	\$	4	Д	Т	d	t	ä	ö	ñ	ı	—	£	Σ	ƒ
5	♣	§	%	5	Е	U	e	u	à	Ó	Ñ	ı	+	ƒ	σ	Ј
6	♠	_	&	6	Ф	V	f	v	â	ü	ª	ı	ı	Π	μ	+
7	●	↑	'	7	Г	W	g	w	ç	Ú	Ö	ı	ı	ı	τ	≈
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9	○	↓)	9	І	Y	i	y	ë	Ö	ı	ı	ı	ı	θ	•
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C	♀	↳	,	<	L	\	l		î	£	¼	ı	ı	ı	∞	ⁿ
D	♂	↔	-	=	M]	m	}	í	¥	ı	ı	ı	ı	φ	²
E	♂	▲	.	>	N	^	n	~	Ä	Pl	«	ı	ı	ı	ε	▪
F	☼	▼	/	?	O	_	o	△	Á	f	»	ı	ı	ı	ı	∩

Hungarian CWI (ID 1024)

IBM: 1B 5B 54 05 00 00 00 04 00 00

Epson: 1B 52 36

Ukrainian (ID 1027)

IBM: 1B 5B 54 05 00 00 00 04 03 00
 Epson: 1B 52 42

¹⁰²⁷ ₆₆	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	Ø	▶		0	@	P	`	p	А	Р	а	▯	Л	л	р	Є
1	☺	◀	!	1	А	Q	a	q	Б	С	б	▯	Л	л	с	є
2	☹	↕	"	2	В	Р	b	r	В	Т	в	▯	Г	г	т	Г
3	♥	!!	#	3	С	С	c	s	Г	У	г	л	л	у	г	
4	♦	¶	\$	4	Д	Т	d	t	Д	Ф	д	і	—	Е	ф	Є
5	♣	§	%	5	Е	U	e	u	Е	Х	e	і	+	Ф	x	e
6	♠	-	&	6	Ф	V	f	v	Ж	Ц	ж	л	л	ц	і	
7	●	ˆ	'	7	G	W	g	w	З	Ч	з	л	л	ч	і	
8	■	↑	(	8	Н	X	h	x	И	Ш	и	л	л	ш	ї	
9	○	↓	)	9	I	Y	i	y	Й	Щ	й	л	л	щ	ї	
A	⊙	→	*	:	J	Z	j	z	К	Ъ	к	л	л	Г	ъ	
B	♂	←	+	;	K	[	k	{	Л	Ы	л	л	л	л	ы	
C	♀	~	,	<	L	\	l	|	М	Ь	м	л	л	л	ь	№
D	♂	↔	-	=	M	]	m	}	Н	Э	н	л	л	л	э	
E	♂	▲	.	>	N	^	n	~	О	Ю	о	л	л	л	ю	
F	⊗	▼	/	?	O	_	o		П	Я	п	л	л	л	я	

ISO Latin 6 / 8859-10 (ID 1029)

IBM: 1B 5B 54 05 00 00 00 04 05 00
 Epson: 1B 52 43

¹⁰²⁹ ₆₇	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p			°	Ā	Đ	ā	đ	
1			!	1	А	Q	a	q			À	á	Á	Ñ	á	ñ
2			"	2	В	Р	b	r			Ê	ē	Ā	Ô	â	ô
3			#	3	С	С	c	s			Г	g	Ā	Ó	ã	ó
4			\$	4	Д	Т	d	t			Ī	ī	Ā	Ô	ä	ô
5			%	5	Е	U	e	u			Ī	ī	Ā	Ô	â	ô
6			&	6	Ф	V	f	v			Ķ	ķ	Æ	Ö	æ	ö
7			'	7	G	W	g	w			Š	š	Į	Ū	į	ū
8			(	8	Н	X	h	x			Ł	ł	Č	Ø	č	ø
9			)	9	I	Y	i	y			Đ	đ	É	Û	é	û
A			*	:	J	Z	j	z			Š	š	Ę	Ú	ę	ú
B			+	;	K	[	k	{			Ŧ	ŧ	Ë	Û	ë	û
C			,	<	L	\	l	|			Ž	ž	È	Û	è	ü
D			-	=	M	]	m	}			-	Í	Ý	í	ý	
E			.	>	N	^	n	~			Ū	ū	Ī	Ŧ	ī	ŧ
F			/	?	O	_	o				Ń	ń	Ī	Ŧ	ĩ	ŧ

Hebrew NC (ID 1030)

IBM: 1B 5B 54 05 00 00 00 04 06 00
Epson: 1B 52 3C

¹⁰³⁰ 60	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	ø	▶		0	@	P	`	p	ן	ג	á	▤	L	ll	α	≡	
1	☺	◀	!	1	A	Q	a	q	כ	ס	í	▨	⌈	⌋	β	±	
2	☹	↕	"	2	B	R	b	r	ג	ע	ó	▩	⌈	⌋	Γ	≥	
3	♥	!!	#	3	C	S	c	s	ד	ף	ú	⌈	⌋	ll	π	≤	
4	♦	¶	\$	4	D	T	d	t	ה	ב	ñ	†	—	⌈	Σ	∫	
5	♣	§	%	5	E	U	e	u	ו	ץ	Ñ	‡	+	F	σ	J	
6	♠	—	&	6	F	V	f	v	ז	צ	^a	⌈	⌋	⌈	μ	+	
7	●	⋮	'	7	G	W	g	w	ח	פ	°	⌈	⌋	⌈	τ	≈	
8	■	↑	(	8	H	X	h	x	צ	ר	¿	⌈	⌋	⌈	Φ	°
9	○	↓	)	9	I	Y	i	y	ש	ר	⌈	⌋	⌋	⌋	θ	•
A	☐	→	*	:	J	Z	j	z	ך	ת	⌈	⌋	⌈	⌋	Ω	•	
B	♂	←	+	:	K	[	k	{	כ	ø	½	⌈	⌋	■	δ	√
C	♀	⌈	.	<	L	\	l	|	ל	£	¼	⌈	⌋	■	∞	ⁿ	
D	♂	↔	-	=	M]	m	}	ם	¥	ı	⌈	⌋	=	⌈	φ	²
E	♂	▲	.	>	N	^	n	~	נ	₪	«	⌈	⌋	⌈	⌋	€	▪
F	☼	▼	/	?	O	—	o		י	f	»	⌈	⌋	■	⌈	⌋	

Hebrew OC (ID 1031)

IBM: 1B 5B 54 05 00 00 00 04 07 00
Epson: 1B 52 3D

¹⁰³¹ 61	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	ø	▶		0	@	P	ן	ג	ן	ג	á	▤	L	ll	α	≡	
1	☺	◀	!	1	A	Q	כ	ס	כ	ס	í	▨	⌈	⌋	β	±	
2	☹	↕	"	2	B	R	ג	ע	ג	ע	ó	▩	⌈	⌋	Γ	≥	
3	♥	!!	#	3	C	S	ד	ף	ד	ף	ú	⌈	⌋	ll	π	≤	
4	♦	¶	\$	4	D	T	ה	ב	ה	ב	ñ	†	—	⌈	Σ	∫	
5	♣	§	%	5	E	U	ו	ץ	ו	ץ	Ñ	‡	+	F	σ	J	
6	♠	—	&	6	F	V	ז	צ	ז	צ	^a	⌈	⌋	⌈	μ	+	
7	●	⋮	'	7	G	W	ח	פ	ח	פ	°	⌈	⌋	⌈	τ	≈	
8	■	↑	(	8	H	X	צ	ר	ב	ר	¿	⌈	⌋	⌈	Φ	°
9	○	↓	)	9	I	Y	ש	ר	ש	ר	⌈	⌋	⌋	⌋	θ	•
A	☐	→	*	:	J	Z	ך	ת	ך	ת	⌈	⌋	⌈	⌋	Ω	•	
B	♂	←	+	:	K	[	כ	{	כ	ø	½	⌈	⌋	■	δ	√
C	♀	⌈	.	<	L	\	ל	|	ל	£	¼	⌈	⌋	■	∞	ⁿ	
D	♂	↔	-	=	M]	ם	}	ם	¥	ı	⌈	⌋	=	⌈	φ	²
E	♂	▲	.	>	N	^	נ	~	נ	₪	«	⌈	⌋	⌈	⌋	€	▪
F	☼	▼	/	?	O	—	י		י	f	»	⌈	⌋	■	⌈	⌋	

Windows Hebrew (ID 1032)

IBM: 1B 5B 54 05 00 00 00 04 08 00

Epson: 1B 52 3E

¹⁰³² 62	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p			°				ס	ז
1	☺	◀	!	1	A	Q	a	q		'		±			כ	ט
2	☹	↑	"	2	B	R	b	r	,	'	¢	²			ג	ע
3	♥	!!	#	3	C	S	c	s	f	"	£	³			ד	ף
4	♠	¶	\$	4	D	T	d	t	„	"	¤	'			ה	צ
5	♣	§	%	5	E	U	e	u	...	•	¥	μ			ו	ץ
6	♣	-	&	6	F	V	f	v	†	-	|	¶			ז	צ
7	●	ˆ	'	7	G	W	g	w	‡	-	§	•			ח	פ
8	◼	↑	(	8	H	X	h	x			¨	˘			ט	ך
9	○	↓	)	9	I	Y	i	y	‰	™	©	¹			י	ש
A	◼	→	*	:	J	Z	j	z			x	+			ך	ת
B	♂	←	+	;	K	[	k	{	<	>	«	»			כ	
C	♀	˘	'	<	L	\	l	|			¬	¹ / ₄			ל	
D	♂	↔	-	=	M	]	m	}			-	¹ / ₂			מ	
E	♂	▲	.	>	N	^	n	~			®	³ / ₄			נ	~
F	☼	▼	/	?	O	_	o				-				=	י

Windows Baltic (ID 1034)

IBM: 1B 5B 54 05 00 00 00 04 0A 00

Epson: 1B 52 44

¹⁰³⁴ 68	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	ø	▶		0	@	P	`	p			°	À	Š	ą	š	
1	☺	◀	!	1	A	Q	a	q		'	ı	±	Į	Ń	į	ń
2	☹	↑	"	2	B	R	b	r	,	'	¢	²	Ā	Ņ	ā	ņ
3	♥	!!	#	3	C	S	c	s		"	£	³	Č	Ó	č	ó
4	♠	¶	\$	4	D	T	d	t	„	"	¤		Ā	Ō	ā	ō
5	♣	§	%	5	E	U	e	u	...	▪		μ	Ā	Ō	ā	ō
6	♣	-	&	6	F	V	f	v	†	-	|	¶	Ē	Ö	e	ö
7	●	ˆ	'	7	G	W	g	w	‡	-	§	•	Ē	×	ē	+
8	◼	↑	(	8	H	X	h	x			Ø	ø	Č	Ū	č	ū
9	○	↓	)	9	I	Y	i	y	‰	™	©	¹	É	Ł	é	ł
A	◼	→	*	:	J	Z	j	z			Ŕ	ŗ	Ž	Ś	ż	ś
B	♂	←	+	;	K	[	k	{	<	>	«	»	Ē	Ū	ē	ū
C	♀	˘	'	<	L	\	l	|			¬	¹ / ₄	Ģ	Ū	ģ	ū
D	♂	↔	-	=	M	]	m	}				¹ / ₂	Ķ	Ž	ķ	z
E	♂	▲	.	>	N	^	n	~			®	³ / ₄	Ī	Ž	ī	ž
F	☼	▼	/	?	O	_	o				Æ	æ	Ł	ł		

Bulgarian (ID 1072)

IBM: 1B 5B 54 05 00 00 00 04 30 00

Epson: 1B 52 48

1072 72	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	Л	▤	α	≡
1	☺	◀	!	1	A	Q	a	q	Б	С	б	с	⊥	▨	β	±
2	☹	↕	"	2	B	R	b	r	В	Т	в	т	Т	▩	Γ	≥
3	♥	!!	#	3	C	S	c	s	Г	У	г	у	⊔	⊥	π	≤
4	♦	¶	\$	4	D	T	d	t	Д	Ф	д	ф	—	†	Σ	ƒ
5	♣	§	%	5	E	U	e	u	Е	Х	е	х	+	№	σ	J
6	♠	-	&	6	F	V	f	v	Ж	Ц	ж	ц	≠	§	μ	÷
7	●	‡	'	7	G	W	g	w	З	Ч	з	ч	||	¶	τ	≈
8	■	↑	(	8	H	X	h	x	И	Ш	и	ш	⊥	⊥	Φ	°
9	○	↓	)	9	I	Y	i	y	Й	Щ	й	щ	⊥	⊥	θ	•
A	◼	→	*	:	J	Z	j	z	К	Ъ	к	ъ	⊥	⊥	Ω	·
B	♂	←	+	;	K	[	k	{	Л	Ы	л	ы	⊥	■	δ	√
C	♀	└	,	<	L	\	l	|	М	Ь	м	ь	⊥	■	∞	"
D	♯	↔	-	=	M	]	m	}	Н	Э	н	э	=	■	φ	²
E	♮	▲	.	>	N	^	n	~	О	Ю	о	ю	⊥	■	∈	▪
F	⊗	▼	/	?	O	_	o		П	Я	п	я	⊥	■	∩	

Special character set OCR-B1

The listed code pages show the different character sets that are available in the various printer's typefaces. For example, **Codepage 437 (USA)** can be printed in Roman, Swiss, Courier etc.

In contrast to that the selection of OCR-characters (*Optical Character Recognition*) defines the character set as well as the typeface. The OCR-Code contains fixed characters, which can be read and processed by every OCR-scanner.

In Letter Quality (LQ) you can select OCR-B1 character sets, a derivative of the OCR-A-typeface and easy to read.

Function	Dec.	Hex.	ASCII
Select OCR-B1	27 107 5	1B 6B 05	ESC k ENQ

Although the OCR-typeface is available in various pitches, readability is only given in 10 cpi .

The actual, error free readability of typefaces like OCR-A, OCR-B or Barcodes (EAN, UPC, Zip) is influenced by ...

- the printing process (resolution, sharpness of edge).
- the technical quality of the printer.
- the quality of the print medium (toner, ribbon).
- the quality of the printing material (shine, smoothness, coating, age, reflection, surface's consistency).
- the technical quality of the scanner.

ESC K ENQ	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	⋮	L	⋮	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	ƒ
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	⊥	⊥	⊥	σ	J
6	♠		&	6	F	V	f	v	â	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	é	½	⊥	⊥	■	δ	√
C			,	<	L	\	l	|	î	£	¼	⊥	⊥	■	∞	"
D			-	=	M	]	m	}	ï	¥	ı	⊥	⊥	■	φ	²
E			.	>	N	^	n	~	Ä	Pt	«	⊥	⊥	■	ε	▪
F			/	?	O	_	o		Å	f	»	⊥	⊥	■	∩	

OCR-B1

IBM: 1B 6B 05

Epson: 1B 6B 05

Appendix C: Bar codes

The bar code was developed as an automated identification system for simplifying warehouse and stock taking procedures. The quality of the bar code is superior to OCR-A and OCR-B, as the quality of OCR-A and OCR-B may be affected by external influences.

This chapter only describes how to use the printer function »Bar code printing«.

The following factors may influence the readability of bar codes:

- the print process and the sharpness of the stripes.
- the status of the printer and of the print head.
- the quality of the pins and the pin mechanism.
- use of a multicoloured ribbon, its age and colour intensity.
- functionality of the device used.

Furthermore, the following characteristics of the labels influence the readability of bar codes:

- reflection
- smoothness of surface
- transparency
- surface's consistency
- colour
- age of labels



Note !

For further information about design and safety procedures used with bar codes, see the books "Codiertechnik - Der Schlüssel zum Strichcode", by B. Lenk and H.-G. Hansen, published by Ident, or "The Bar Code Book - Reading, Printing, and Specification of Bar Code Symbols" by Roger C. Palmer, published by Helmers Publishing, Inc.

We do not guarantee that bar codes printed with these commands can be read by all bar code readers. Before you use these commands we recommend that you test whether your bar code reader can read the printed bar codes.

Bar Code Types

You can print seven different types of bar codes. The bar codes are selected by the command sequences listed below.

The command sequences are:

EAN Codes	->	EAN 8	(IAN8, JAN8)
	->	EAN 13	(IAN13, JAN13)
UPC Codes	->	UPC-A	
	->	UPC-E	

Code 39

Code 128

Interleaved 2/5

ZIP Code	->	ZIP Code Bar Code
-----------------	----	-------------------

With all bar codes, except the bar code *UPC-E*, it is possible to calculate and print a checksum.

Because of the 24 dot matrix printing technique the smallest bar code size that can be printed is a Low-Density Code and/or an enlargement factor of 1.35.

EAN, *UPC* and *Code 128* type bar codes can be enlarged in seven steps. *Code 39* and *Interleaved 2/5* type bar codes the black and/or the white area can be enlarged in seven steps by two parameters. However, it is recommended that both areas be enlarged by the same value.

Positioning

When designing a bar code ensure that the character position of the bar code is absolute in order to avoid rounding and positioning errors.

Selection of Type and Size of Bar Code

Function	Dec.	Hex.	ASCII	Selecting the bar code
Select bar code	27 16 65 $p_1 n_1 \dots n_8$	1B 10 41 $p_1 n_1 \dots n_8$	ESC DLE A $p_1 n_1 \dots n_8$	

Use this command to select the type and the size of the bar codes.

Explanation of parameters:

- p_1 is the amount of data following p_1 (MSB is ignored). The command is invalid, when the value 0, 1 or 3 is assigned to p_1 . Valid values for p_1 are 2, 4, 5, 6, 7 and 8. If p_1 is equal to or greater than 9, all data after n_9 will be ignored.
- n_1 and n_2 select the type of bar code (high-order half byte is ignored).

n_1	n_2	Bar Code Type
0	1	EAN8
0	2	EAN13
1	0	UPC-A
1	4	UPC-E
2	0	Code 39
3	0	Interleaved 2/5
4	0	Code 128

Only the above listed parameters for n_1 , n_2 are valid. The command will be ignored when other data is transmitted.

- n_3 and n_4 determine the vertical length of the bar code. The length is determined by the following formula: $(n_3 * 10 + n_4) * (15/180)$ inch. If n_3 and n_4 are assigned the value 0, the current length will be used. If $(n_3 * 10 + n_4) \geq 25$, the length will be set to 24.

The length of the Start, Centre and the Stop bar for EAN and UPC codes is: $(n_3 * 10 + n_4) * (15/180) + 10/180$ inch.

4. n_5 selects the width of one bar code character. The minimum width of one character is 1/360 inch:

If you select the value 0 for n_5 , the current setting will be used. If $n_5 \geq 8$, n_5 will be set to 7.

With the bar code types *EAN8*, *EAN13*, *UPC-A*, *UPC-E* and *Code 128* the width of one bar code character is determined by n_5 .

The maximum values of a bar code character are listed in »Table 1«. Refer to »Table 2« for the width of the individual modules.

With *Code 39* or *Interleaved 2/5* the width of the black bar code element is determined by n_5 .

Refer to »Table 3« to determine the character width of *Code 39*, refer to »Table 4« and »Table 5« to determine the character width of *Code Interleaved 2/5*. The width of the modules are identical with *Code 39* and *Interleaved 2/5*. Refer to »Table 6« and »Table 7« to determine the width of the individual modules for these two types of bar codes.

5. You select the width of the space elements with n_6 :

n_6 is ignored with *EAN8*, *EAN13*, *UPC-A*, *UPC-E* or *Code 128*. When using *Code 39* or *Interleaved 2/5*, n_6 determines the width of the space element. The minimum width of the space element is 1/360 inch. If $n_6 = 0$, previous settings are used. If $n_6 \geq 8$, n_6 is set to 7.

6. The ratio between the wide and the narrow elements is determined by n_7 :

If $n_7 = 0$, previous settings will be used. If $n_7 \geq 8$, n_7 is set to 7.

If *EAN8*, *EAN13*, *UPC-A*, *UPC-E* or *Code 128* is selected, n_7 will be ignored.

Ratio table

n_7	1	2	3	4	5	6	7
Ratio	2:1	2,5:1	3:1	3,5:1	4:1	4,5:1	5:1

7. n_8 selects the print quality of plain writing.

Table for Selection of Plain Writing

n_8	Description
0	No plain (uncoded) writing
1	LQ character as plain writing

The character size of plain writing does not depend on the bar code, it is always set to 12 cpi.

The font of the LQ characters is the same as the font selected for receiving p_1 data.

Please note that this command does not start the printer.

The basic settings of this command are:

n_1, n_2	1, 0	UPC-A
n_3, n_4	0, 9	135/180 inch
n_5	1	1/72 inch
n_6	1	1/72 inch
n_7	1	2,5 : 1
n_8	2	LQ

Tables 1 through to 7 are used to calculate the width of the bar code. If the bar code to be printed extends beyond the right margin of the printing material, the print command will be ignored.

Please refer to tables 1 and 2 for determining the width of the *Codes EAN, UPC and Code 128*. Tables 3 through to 7 are reserved for *Code 39 and Interleaved 2/5*.

Table 1 shows the ratio between n_5 and the maximum width of a bar code character in combination with the bar code type.

Table 1

n_5	1	2	3	4	5	6	7
EAN8 / EAN 13 UPC-A /-E char. code/ODD	40	49	70	84	105	119	140
EAN8 / EAN 13 UPC-A /-E char. code/EVEN	41	49	70	84	105	119	140
UPC-A/EAN8 EAN 13 start/stop code	15	18	27	31	42	48	57
UPC-A/EAN8 EAN 13 centre bar	33	38	53	63	78	88	103
UPC-E start code	15	18	27	31	42	48	57
UPC-E stop code	36	42	60	72	90	102	120
Code 128 char. code /start code	64	77	110	132	165	187	220
Code 128 stop code	71	88	127	153	192	218	257

(unit: 1/360 inch)

Table of Module Widths

The width of the space element is listed below the width of the black elements.

A module is the narrowest element of a bar code. With *EAN*, *UPC* and *Code 128*, the wide elements may be up to four times as wide as one module. The table shows how wide the widths of the bar code elements of a code character are.

Table 2

n_5	Ratio	Single Module	Dual Module	Triple Module	Quadruple Module
1	1	3	9	13	19
		9	14	19	24
2	1,5	4	11	18	25
		10	17	24	31
3	2	7	17	27	37
		13	23	33	43

n_5	Ratio	Single Module	Dual Module	Triple Module	Quadruple Module
4	2,5	9	21	33	45
		15	27	39	51
5	3	12	27	42	57
		18	33	48	63
6	3,5	14	31	48	65
		20	37	54	71
7	4	17	37	57	77
		23	43	63	83

(unit: 1/360 inch)

Table 3

Code 39 / Interleaved 2/5 width of black element.

n_5 defines the width of the black element/bar. Together with n_7 the total width of the black element can be taken from table 3:

Type	n_5	1	2	3	4	5	6	7
Ratio		1	1.5	2	2.5	3	3.5	4
schmales Element		3	4	7	9	12	14	17
$n_7=1$		9	11	17	21	27	31	37
$n_7=2$		11	14	22	27	32	39	47
$n_7=3$		14	18	27	33	42	48	57
$n_7=4$		17	21	32	39	49	56	67
$n_7=5$		21	25	36	45	57	65	77
$n_7=6$		23	28	41	51	64	73	87
$n_7=7$		26	32	47	57	72	82	97

(Unit: 1/360 inch)

Table 4

Code 39 / Interleaved 2/5 width of black elemt.

n_6 defines the width of the narrow space element/bar. Together with n_7 the total width of the wide space element can be taken from table 3:

Type	n_6	1	2	3	4	5	6	7
Ratio		1	1.5	2	2.5	3	3.5	4
narrow element		9	10	13	15	18	20	23
$n_7=1$		15	17	23	27	33	37	43
$n_7=2$		19	21	28	33	41	46	53
$n_7=3$		22	24	33	39	48	54	63
$n_7=4$		25	28	38	45	56	63	73
$n_7=5$		27	31	43	51	63	71	83
$n_7=6$		31	35	48	57	71	80	93
$n_7=7$		34	38	53	63	78	88	103

(unit 1/360 Zoll)

Printing a 24-Pin Bar Code

Print Bar code

Function	Dec.	Hex.	ASCII
Printing a Bar code	27 16 66	1B 10 42	ESC DLE B
	$P_1(P_m)$	$P_1(P_m)$	$P_1(P_m)$
	DATA	DATA	DATA

This command does not select type and size of the bar code:

- Unit used is 360 dpi (full).
 - printing is always unidirectional.
1. P_1 is the amount of data according to P_1 .
 2. P_m selects the type of *Code 128*. If *Code 128* is not selected, P_m has to be omitted.
 - 41 H : Code 128 Set A
 - 42 H : Code 128 Set B
 - 43 H : Code 128 Set C
 3. If P_m is assigned any value other than the above mentioned value, the command will be ignored.
 4. »DATA«

5. Printing starts when the printer has received the entire command.

If $P_1 = 0$, the bar code cannot be printed.

6. The following values are valid for P_1 . The check digit code is regarded as one character:

(a)	EAN8	8 characters
(b)	EAN13	13 characters
(c)	UPC-A	12 characters
(d)	UPC-E	6 characters
(e)	Code 39	maximum of 50 characters
(f)	Interleaved 2/5	maximum of 50 characters
(g)	Code 128 (Set A, B, C)	maximum of 50 characters

If the *Code 128* is selected, P_m is regarded as one character.

The value for P_1 cannot be changed for bar code types listed under (a) to (d).

For the bar code types listed under (e) through to (f) you can select any value listed under number 6.

If P_1 is larger than the above-mentioned numbers, the command will be ignored.

7. The following characters are valid data for printing:

(a)	EAN8	0 (30H) to 9 (39H)
(b)	EAN13	0 (30H) to 9 (39H)
(c)	UPC-A	0 (30H) to 9 (39H)
(d)	UPC-E	0 (30H) to 9 (39H)
(e)	Code 39	SP (20H) to Z (5AH)
		43 characters, see Table 5
(f)	Interleaved 2/5	0 (30H) to 9 (39H)
(g)	Code 128 (Set A)	(00H) to (66H)
(h)	Code 128 (Set B)	(19H) to (7FH)
(i)	Code 128 (Set C)	(30H) to (3CH)
		for characters of <i>Code 128</i> , see Table 6

Only the above mentioned data and checksum code is valid.

8. A checksum is generated automatically by sending a checksum code at the end of the bar code data.

9 The checksum code is as follows:

- | | | | |
|-----|-----------------|-----|--------------|
| (a) | EAN8 | @ | (40H) |
| (b) | EAN13 | @ | (40H) |
| (c) | UPC-A | @ | (40H) |
| (d) | UPC-E | | not possible |
| (e) | Code 39 | @ | (40H) |
| (f) | Interleaved 2/5 | @ | (40H) |
| (g) | Code 128 (SetA) | g | (67H) |
| (h) | Code 128 (SetB) | CAN | (18H) |
| (i) | Code 128 (SetC) | @ | (40H) |

10. Calculation of Checksum

If a checksum code is sent after the data has been sent, the printer will calculate the checksum and print the checksum instead of the checksum code. However, you can calculate and transmit the checksum yourself.

Calculating the Checksum for *EAN8, UPC-A, Interleaved 2/5*

a: add all odd-numbered data positions
(starting on the left-hand side)

b: $a*3$

c: add all even-numbered data positions
(starting on the left-hand side)

d: $b+c$

e: $d \bmod 10$

f: $10-e$

f is the check digit

Example: bar code data 1234567@

a: $1+3+5+7 = 16$

b: $16*3 = 48$

c: $2+4+6 = 12$

d: $48+12 = 60$

e: $60 \bmod 10 = 0$ ($60 / 10 = 6$ Remainder 0)

f: $10-0 = 10$, $f := 0$ (If $f=10$, it is set to $f=0$)

Checksum is 0

If the amount of print data for *Code Interleaved 2/5* is an odd number, a 0 is added. This 0 is the first bar code character.

Calculating the checksum for EAN13

- a: add all even-numbered data positions
(start on the left-hand side)
- b: $a \times 3$
- c: add all odd-numbered data positions
(starting on the left-hand side)
- d: $b + c$
- e: $d \bmod 10$
- f: $10 - e$
- f is the checksum.

Example: bar code data 123456789012@

- a: $2+4+6+8+0+2 = 22$
- b: $22 \times 3 = 66$
- c: $1+3+5+7+9+1 = 26$
- d: $66+26 = 92$
- e: $92 \bmod 10 = 2$ ($92 / 10 = 9$ Remainder 2)
- f: $10 - 2 = 8$
- checksum is 8

No calculation takes place for *UPC-E*, it does not print the checksum.

Calculating the Checksum for Code 39

All values of the bar code data are added. The total is divided by 43, and the remainder is the checksum.

Table 5

Character	Value	Character	Value	Character	Value
0	0	F	15	U	30
1	1	G	16	V	31
2	2	H	17	W	32
3	3	I	18	X	33
4	4	J	19	Y	34
5	5	K	20	Z	35
6	6	L	21	-	36
7	7	M	22	.	37
8	8	N	23	Space	38
9	9	O	24	\$	39
A	10	P	25	/	40
B	11	Q	26	+	41
C	12	R	27	%	42
D	13	S	28		
E	14	T	29		

Example: bar code data 123LPJ23@

Addition of values: $1+2+3+25+21+19+1+2+3 = 77$

Division: $77/43 = 1$ Remainder 34

Value 34 = character Y

Checksum (character) = Y

Calculating the Checksum for Code 128

Each of the characters of Code 128 is assigned a reference value. When calculating the checksum, these values are added after they have been multiplied by a weighting. The weighting starts at 1 and is increased by the value 1 for every digit. In addition, the reference value of the start digit is added.

The total modulo 103 is the checksum.

The reference values are listed in Table 6. The different characters are divided into three character sets (Code A, B, C). Character set C consists exclusively of two-digit numbers (00 to 99). Each two-digit number is assigned a bar code unit. This results in a higher information density.

Example: bar code data 1234XYZg

Start in character set C, change to character set A.

a: Ref. Start character Set C = 105

b: Ref. character 12 = 12

c: Ref. character 34 = 34

d: Ref. change to Code A = 101

e: Ref. character X = 56

f: Ref. character Y = 57

g: Ref. character Z = 58

Calculation:

$$105+(1*12)+(2*34)+(3*101)+(4*56)+(5*57)+(6*58)=1345$$

$$1345 \text{ modulo } 103 = 4 \text{ (} 1345 / 103 = 13 \text{ Remainder } 6 \text{)}$$

Checksum is 6 (Reference value in Set A)

If you calculate this checksum yourself, you have to send the character HEX 26 to the printer in order to obtain the reference value 6 in Set A.

Table 6

Ref. Value	Code A		Code B		Code C	
	ASCII	Hex	ASCII	Hex	Digit	Hex
0	Space	= 20	Space	= 20	00	= 30,30
1	!	= 21	!	= 21	01	= 30,31
2	"	= 22	"	= 22	02	= 30,32
3	#	= 23	#	= 23	03	= 30,33
4	\$	= 24	\$	= 24	04	= 30,34
5	%	= 25	%	= 25	05	= 30,35
6	&	= 26	&	= 26	06	= 30,36
7	'	= 27	'	= 27	07	= 30,37
8	(	= 28	(	= 28	08	= 30,38
9	)	= 29	)	= 29	09	= 30,39
10	*	= 2A	*	= 2A	10	= 31,30
11	+	= 2B	+	= 2B	11	= 31,31
12	,	= 2C	,	= 2C	12	= 31,32
13	-	= 2D	-	= 2D	13	= 31,33
14	.	= 2E	.	= 2E	14	= 31,34
15	/	= 2F	/	= 2F	15	= 31,35

Appendix C: Bar codes

Ref. Value	Code A		Code B		Code C	
	ASCII	Hex	ASCII	Hex	Digit	Hex
16	0	= 30	0	= 30	16	= 31,36
17	1	= 31	1	= 31	17	= 31,37
18	2	= 32	2	= 32	18	= 31,38
19	3	= 33	3	= 33	19	= 31,39
20	4	= 34	4	= 34	20	= 32,30
21	5	= 35	5	= 35	21	= 32,31
22	6	= 36	6	= 36	22	= 32,32
23	7	= 37	7	= 37	23	= 32,33
24	8	= 38	8	= 38	24	= 32,34
25	9	= 39	9	= 39	25	= 32,35
26	:	= 3A	:	= 3A	26	= 32,36
27	;	= 3B	;	= 3B	27	= 32,37
28	<	= 3C	<	= 3C	28	= 32,38
29	=	= 3D	=	= 3D	29	= 32,39
30	>	= 3E	>	= 3E	30	= 33,30
31	?	= 3F	?	= 3F	31	= 33,31
32	@	= 40	@	= 40	32	= 33,32
33	A	= 41	A	= 41	33	= 33,33
34	B	= 42	B	= 42	34	= 33,34
35	C	= 43	C	= 43	35	= 33,35
36	D	= 44	D	= 44	36	= 33,36
37	E	= 45	E	= 45	37	= 33,37
38	F	= 46	F	= 46	38	= 33,38
39	G	= 47	G	= 47	39	= 33,39
40	H	= 48	H	= 48	40	= 34,30
41	I	= 49	I	= 49	41	= 34,31
42	J	= 4A	J	= 4A	42	= 34,32
43	K	= 4B	K	= 4B	43	= 34,33
44	L	= 4C	L	= 4C	44	= 34,34
45	M	= 4D	M	= 4D	45	= 34,35
46	N	= 4E	N	= 4E	46	= 34,36
47	O	= 4F	O	= 4F	47	= 34,37
48	P	= 50	P	= 50	48	= 34,38
49	Q	= 51	Q	= 51	49	= 34,39
50	R	= 52	R	= 52	50	= 35,30
51	S	= 53	S	= 53	51	= 35,31
52	T	= 54	T	= 54	52	= 35,32
53	U	= 55	U	= 55	53	= 35,33

Ref. Value	Code A		Code B		Code C	
	ASCII	Hex	ASCII	Hex	Digit	Hex
54	V	= 56	V	= 56	54	= 35,34
55	W	= 57	W	= 57	55	= 35,35
56	X	= 58	X	= 58	56	= 35,36
57	Y	= 59	Y	= 59	57	= 35,37
58	Z	= 5A	Z	= 5A	58	= 35,38
59	[	= 5B	[	= 5B	59	= 35,39
60	\	= 5C	\	= 5C	60	= 36,30
61	]	= 5D	]	= 5D	61	= 36,31
62	^	= 5E	^	= 5E	62	= 36,32
63	_	= 5F	_	= 5F	63	= 36,33
64	NUL	= 00	'	= 60	64	= 36,34
65	SOH	= 01	a	= 61	65	= 36,35
66	STX	= 02	b	= 62	66	= 36,36
67	ETX	= 03	c	= 63	67	= 36,37
68	EOT	= 04	d	= 64	68	= 36,38
69	ENQ	= 05	e	= 65	69	= 36,39
70	ACK	= 06	f	= 66	70	= 37,30
71	BEL	= 07	g	= 67	71	= 37,31
72	BS	= 08	h	= 68	72	= 37,32
73	HT	= 09	i	= 69	73	= 37,33
74	LF	= 0A	j	= 6A	74	= 37,34
75	VT	= 0B	k	= 6B	75	= 37,35
76	FF	= 0C	l	= 6C	76	= 37,36
77	CR	= 0D	m	= 6D	77	= 37,37
78	SO	= 0E	n	= 6E	78	= 37,38
79	SI	= 0F	o	= 6F	79	= 37,39
80	DLE	= 10	p	= 70	80	= 37,30
81	DC1	= 11	q	= 71	81	= 38,31
82	DC2	= 12	r	= 72	82	= 38,32
83	DC3	= 13	s	= 73	83	= 38,33
84	DC4	= 14	t	= 74	84	= 38,34
85	NAK	= 15	u	= 75	85	= 38,35
86	SYN	= 16	v	= 76	86	= 38,36
87	ETB	= 17	w	= 77	87	= 38,37
88	CAN	= 18	x	= 78	88	= 38,38
89	EM	= 19	y	= 79	89	= 38,39
90	SUB	= 1A	z	= 7A	90	= 39,30
91	ESC	= 1B	{	= 7B	91	= 39,31

Ref. Value	Code A		Code B		Code C	
	ASCII	Hex	ASCII	Hex	Digit	Hex
92	FS	= 1C	|	= 7C	92	= 39,32
93	GS	= 1D	}	= 7D	93	= 39,33
94	RS	= 1E	~	= 7E	94	= 39,34
95	US	= 1F	DEL	= 7F	95	= 39,35
96	FNC 3	= 60	FNC 3	= 19	96	= 39,36
97	FNC 2	= 61	FNC 2	= 1A	97	= 39,37
98	SHIFT	= 62	SHIFT	= 1B	98	= 39,38
99	Code C	= 63	Code C	= 1C	99	= 39,39
100	Code B	= 64	FNC 4	= 1D	Code B	= 3A
101	FNC 4	= 65	Code A	= 1E	Code A	= 3B
102	FNC 1	= 66	FNC 1	= 1F	FNC 1	= 3C
103	START Code A = ESC DLE A P ₁ 4 0 n ₃ ...n ₈ ESC DLE B P ₁ A Data					
104	START Code B = ESC DLE A P ₁ 4 0 n ₃ ...n ₈ ESC DLE B P ₁ B Data					
105	START Code C = ESC DLE A P ₁ 4 0 n ₃ ...n ₈ ESC DLE B P ₁ C Data STOP Code					

11. After printing the bar code the print head is positioned at the end of the first printed line.

12. If the bar code extends beyond the right margin, the command will be ignored and the bar code will not be printed. A »CR/LF« (Carriage Return/Line Feed) is performed and the bar code is printed in the next line, if the bar code is positioned beyond the right margin before the actual print command.

13. The following bar code types add a start bar, a center bar and a stop bar: *EAN8*, *EAN13*, *UPC-A*, *UPC-E*.

14. Notes for the *Code 128*:

The bar code start character of the different character sets is selected by choosing the option Pm of the command Printing a Bar Code (ESC DLE B P₁ Pm Data).

A stop character is printed automatically.

The checksum code for character set A, B and C are different. Therefore you must ensure that the code of the character set selected last is used.

Character set C consists of 100 two-digit numbers with the value 00 to 99. This makes numerical display in double density possible. Subsequently, two bytes are combined to one character when character set C is used. (see Table 6). However, if the amount of print data is an odd number, a zero is added before the first number. Otherwise a zero would be added to the last byte.

Example: bar code data "555"

The character string "0555" has to be sent to the printer.

A wrong character string "555" results in "5505".

Examples

The following are examples of the printing of bar codes and the command sequences in a hexadecimal format:

Bar code *EAN8*, 0.5 inch high, smallest width, plain writing LQ

```
1B 10 41 08 00 01 00 06 01 01 01 01      Select bar code
1B 10 42 08 31 32 33 34 35 36 37 40      Print bar code
```

Bar code *EAN13*, 1 inch high, medium width, plain writing LQ

```
1B 10 41 08 00 02 01 02 04 01 01 01      Select bar code
1B 10 42 0D 31 32 33 34 35 36 37 38      Print bar code
39 30 31 32 40
```

Bar code *UPC-A*, 2 inch high, largest width, no plain writing

```
1B 10 41 08 01 00 02 04 07 01 01 00      Select bar code
1B 10 42 0C 31 32 33 34 35 36 37 38      Print bar code
39 30 31 40
```

Bar code *UPC-E*, 1/6 inch high, small width, plain writing LQ

```
1B 10 41 08 01 04 00 02 02 01 01 02      Select bar code
1B 10 42 06 31 32 33 34 35 36            Print bar code
```

Bar code *Code 39*, 0.5 inch high, medium width, plain writing LQ

```
1B 10 41 08 02 00 00 06 02 02 02 01      Select bar code
1B 10 42 12 4F 4B 49 20 42 41 52 43      Print bar code
4F 44 45 20 44 52 55 43 4B 40
```

Bar code *Interleaved 2/5*, 1 inch high, large width, no plain writing

```
1B 10 41 08 03 00 01 02 04 04 04 00      Select bar code
1B 10 42 04 31 32 33 40                  Print bar code
```

Bar code *128 Set A*, 0.5 inch high, smallest width, plain writing LQ

```
1B 10 41 08 04 00 00 06 01 01 01 02      Select bar code
1B 10 42 0C 41 30 31 32 33 34 35 36      Print bar code
37 38 39 67
```

Printing a ZIP Code

Zip Code

Function	Dec.	Hex.	ASCII
Zip Code	27 16 67 $p_1 n_1 \dots n_{20}$	1B 10 43 $p_1 n_1 \dots n_{20}$	ESC DLE C p_1 DATA

This command is used for printing a zip code.

1. p_1 is the amount of data according to p_1 (MSB is invalid)
 p_1 is valid from 01H to 14H.

If the value of p_1 is not within this range, the command will be ignored.

If $p_1=1$ is sent together with a checksum, the command will also be ignored.

2. DATA stands for zip code data (MSB is invalid)

Valid data is within the range 0 (30H) to 9 (39H).

If the DATA is outside this range, the command is invalid.

3. Printing quality is equivalent to 360 dpi.
4. Printing starts when the printer has received the entire command.
5. The checksum can be added by the printer by sending the character "@".
6. If the bar code data extends beyond the right margin, the command will be ignored. In this case, a »CR/LF« (Carriage Return, Line Feed) will be performed.
7. After printing the bar code, the print head is positioned at the end of the first printed line.
8. Height of the upper print process is 21/180 inch, height of the lower print process is 7/180 inch.
9. A high bar is automatically added as start and stop character.
10. Calculating the checksum

All values are added. The deficit to the next digit that can be divided by 10 is the checksum.

Example: bar code data 123456789@

a: $1+2+3+4+5+6+7+8+9=45$

b: next digit which can be divided by 10 is 50

c: $50-45=5$

Checksum is 5

Example of a 9-digit Zip Code with checksum

1B 10 43 0A 31 32 33 34 35 36 37 38
39 40

Selection and
Printing of Zip Code

Setting the Print Position

Setting the print position

Function	Dec.	Hex.	ASCII
Setting the Print Position	27 16 64 P _{no} A ₁ A ₂ P ₁ P ₃ P ₃ P ₄	1B 10 40 P _{no} A ₁ A ₂ P ₁ P ₃ P ₃ P ₄	ESC DLE @ P _{no} A ₁ A ₂ P ₁ P ₃ P ₃ P ₄

1. The next horizontal position is set.
2. Description of the parameters:

P_{no} is the amount of data according to P_{no} (MSB is invalid):
06H is the default.

The command is invalid, if P_{no} < 06H.

A₁ determines the type of printing position:

A₁ odd = relative printing position from current position.

A₁ even = absolute printing position from left margin.

A₂ determines the direction of the relative positioning:

A₂ odd = backwards

A₂ even = forward

A₂ is invalid, if A₁ is even-numbered.

P₁ ... P₄ Set printing position:

Low-order half byte is valid (0 ... 9)

High-order half byte is invalid.

The absolute/relative printing position is calculated as follows:

$$P_1 * 1000 + P_2 * 100 + P_3 * 10 + P_4 * 1$$

The unit for positioning is as follows:

LQ 1/360 inch

UTL 1/240 inch

If the bar code is positioned so that it extends beyond the right margin, printing is suppressed. If the positioning extends the bar code beyond the right margin, a »CR/LF« (Carriage Return/Line Feed) is performed.

Appendix D: Interface Data

The printer's interface has to be configured according to the specifications of your computer system. This is particularly important when using a serial interface.

One prerequisite for making up an interface cable is basic knowledge about interface signals and wiring. You should also be familiar with the use of soldering irons.

Otherwise the purchase of an interface cable is recommended.

Parallel Interfacing (Centronics)

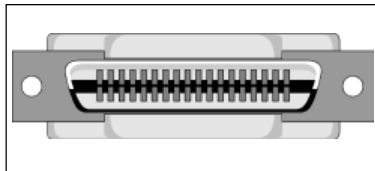
In a parallel interface the bits of one byte are transmitted simultaneously via eight separate lines. Additional lines control the flow of data. The bytes are transmitted in succession.

In the printer's menu you can select and configure the items **I-Prime**, **Pin 18** and **Auto Feed XT**.

To connect the printer to the computer you need a Centronics equivalent parallel cable with the following specifications:

Amphenol-plug, 36 pins, 57-30360, AMP 552274-1 or equivalent. Cover AMP 552073-1 or equivalent.

Shielded Beldon cable or equivalent cable with twisted pair conductors. The cable should not exceed 2 m and must be UL and CSA approved.



Appendix D: Interface Data

Pin Description	Pin	Signal	Direction	Description
	1	$\overline{\text{DATA STROBE}}$	To printer	When the signal changes from low to high level, input data is sampled.
	2-9	DATA BIT 1-8	To printer	Input data lines. The High level represents 1, the Low level represents 0
	10	$\overline{\text{ACKNOWLEDGE}}$	From printer	The High level of this signal indicates completion of data input or function operation.
	11	BUSY	From printer	The High level of this signal indicates that the printer cannot receive data. The low level of the signal indicates that the printer is ready for receiving data.
	12	PAPER END	From printer	The High level of this signal indicates that a paper end has been detected.
	13	SELECT	From printer	The High level of this signal indicates that the printer is in the select mode (ON LINE).
	14*	$\overline{\text{AUTOFEED}}$	To printer	In EPSON emulation a Low level of the signal activates the auto line feed.
	15	--	--	Not assigned.
	16	0 V	--	Signal ground
	17	CHASSIS GROUND	--	Frame ground
	18*	+ 5 V	From printer	+ 5-volt supply (max. 50 mA).
	19-30	0 V	--	Twisted pair return for pins 1 to 11.
	31 **	I-PRIME	To printer	Signal Low: Printer controller is initialised. The low level should be held for more than 0.5 ms.
	32	FAULT	From printer	When the paper end is detected this signal changes from High to Low.
	33	0 V	--	Signal ground
	34	--	--	Not assigned.
	35	--	--	Not assigned.
	36	SELECT-IN	To printer	The High level of this signal indicates that the printer can only be selected and deselected using DC1 and DC3 control codes.

* Pin 14 and 18 can be activated/deactivated by menu item **Auto Feed XT** or **Pin 18**.

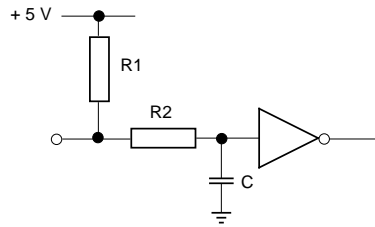
** The I-Prime signal at Pin 31 is activated by the menu item **I-Prime**: If you select **Invalid** the signal will be ignored. With **Buffer Print** and receiving an I-Prime signal, the printer will be reset after printing the content of the printer buffer. On **Buffer Clear** the printer will be reset at once and the contents of the printer buffer will be deleted.

Low level: 0,0 V to +0,8 V
 High level: +2,4 V to +5,0 V

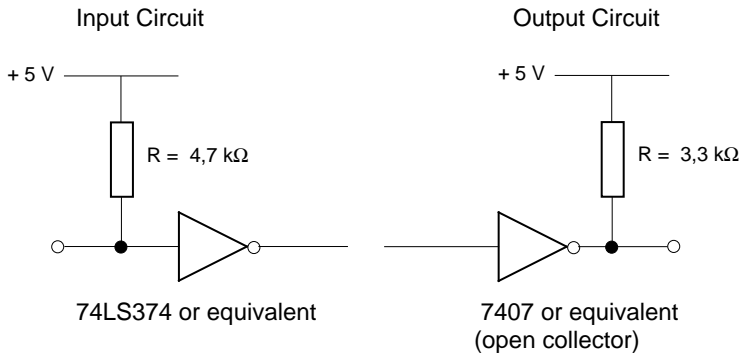
Signal level

Input circuit of DATA STROBE and I - PRIME line.

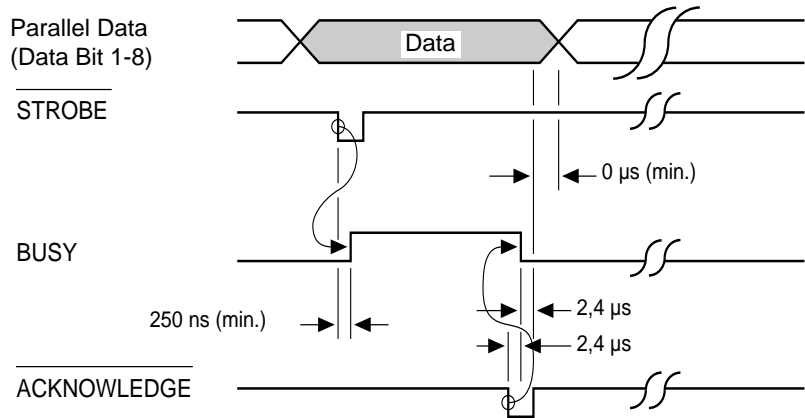
Signal	R1	R2	C
DATA STROBE	1 kΩ	33 Ω	560 pF
I - PRIME	3,3 kΩ	33 Ω	0,001 μF



Parallel Data line 1 to 8 (Pin 2 to 9)



Timing



Testing the Interface

To test the interface connection turn the computer and the printer on (POWER ON). Write the following test programme:

```
10 LPRINT "Everything's okay"
20 LPRINT "1/6 inch line spacing"
30 LPRINT CHR$ (12);: REM Line Feed
```

Type RUN and press the Return key. You will get the following print-out.

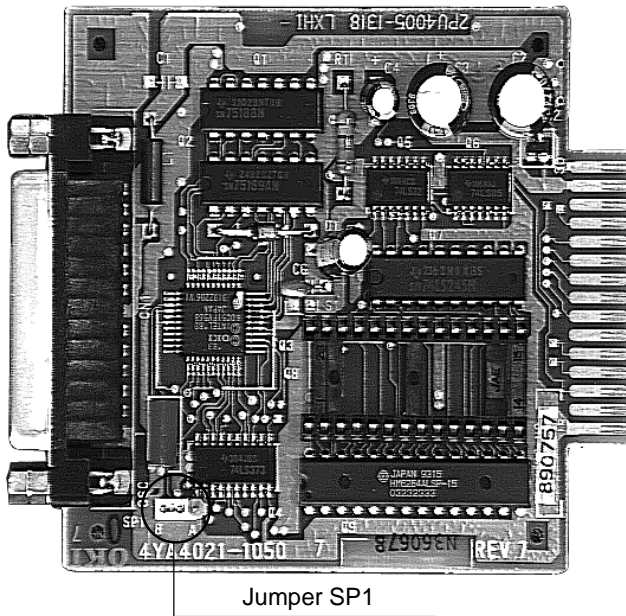
```
Everything's okay
1/6 inch line spacing
```

If everything is working properly you can start printing.

RS-232C Serial Interface

In a serial interface the bits of one byte are transmitted consecutively. Additional lines control the flow of data. This type of connection is often used with networks. Using a serial interface large distances can be covered without any disturbances.

When using a serial interface, correct wiring as well as correct setting of the interface parameters (configuration) is of importance. For most applications the default settings are sufficient. Occasionally you might have to change some parameters. Never change values which are not described in your computer or network manual.



Interface boards may vary in design.

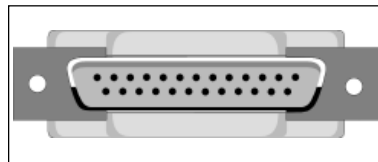
The position of jumper plug SP1 should never be changed. If the interface's control program is stored in the microprocessor, SP1 has to connect the two pins close to the interface connection (Position B). If the control program is stored in the EPROM, SP1 has to connect the two pins pointing away from the connection (Position A).

Technical specifications of a cable for a serial RS-232C-Interface:

25-pin plug: equivalent to DB25P

Plug housing: equivalent to DB-C2-J9.

Shielded Beldon cable or equivalent with a maximum length of 15 m. The cable should be a twisted-pair cable to prevent signal interference and must be UL- and CSA-certified. The printer has a 25-pin DB-25S-plug.



Pin assignment

Pin	Signal	Direction	Description
1	Protective Ground, PG	---	Connected to printer's casing.
2	Transmit Data, TD	From printer	Serial signal sent from the printer.
3	Receive Data, RD	To printer	Serial signal received by the printer.
4 *	Ready to Send, RTS	From printer	Indicates that the printer is ready to receive data.
5	Clear to Send, CTS	To printer	Indicates that system is ready to send data to printer.
6 **	Data Set Ready, DSR	To printer	Indicates that the system is ready.
7	Signal Ground, SG	---	Signal Ground.
8-10			Not assigned.
11 *	Flow Control, SSD	From printer	Indicates that the printer is not ready to receive data.
12-17			Not assigned.
18 ***	+5 V	From printer	Voltage of + 5 Volt (max. 100 mA).
19			Not assigned.
20 *	Data Terminal Ready, DTR	From printer	Indicates that printer is ready to receive data.
21-25			Not assigned.

* You can set Pin 4, 11 or 20 as flow control line by selecting the menu option **Busy Line**.

** You set the evaluation by selecting the menu option **DSR Signal (Valid = evaluate, Invalid = ignore)**.

*** You may set Pin 18 to +5 V by selecting the menu option **Pin 18**.

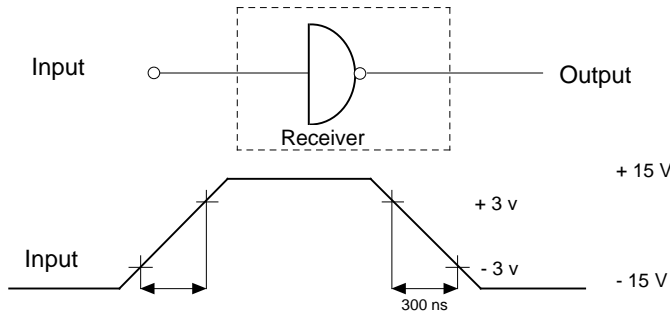
MARK Polarity: -3 to -15V: LOW = OFF = Logical "1"
 SPACE Polarity: +3 to +15V: HIGH = ON = Logical "0"

Signal levels

Input circuit

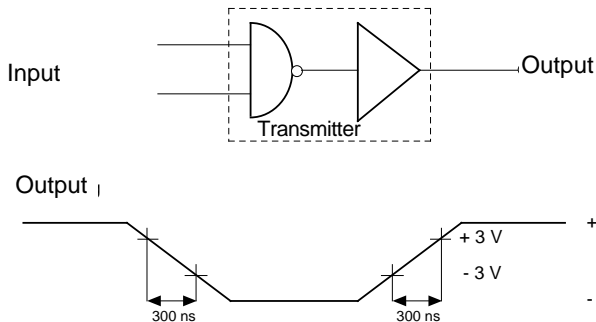
Equivalent to SN 75 154

Circuits



Output circuit

Equivalent to SN 75 188



With this protocol, the printer uses the voltage level on line RTS (4), SSD (11) or DTR (20) to inform the computer whether it is ready to receive data or whether its buffer is full. You can set the Busy line to one of above mentioned lines by selecting **Busy Line**. When the printer is ready to receive data, the Busy-line DTR or RTS is set to high-level (Space). If you select **Busy Line** to **SSD-**, line SSD is also set to high-level (Space) when the printer is ready to receive data. If you select **SSD+**, the line is set to low-level (Mark).

Ready/Busy protocol

With this protocol the printer uses the line Transmit Data TD (2) and the command X-ON (DC1) to inform the computer that it is ready to receive data. The command X-OFF (DC3) is used to inform the computer that the printer buffer is full.

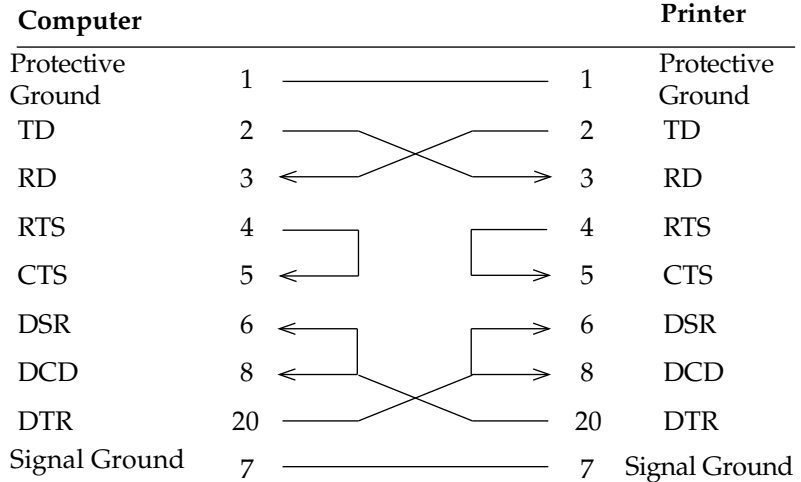
X-ON/X-OFF protocol

Interface Wiring

To indicate that the printer is ready to receive data, select **DTR**, **SSD+**, **SSD-** or **RTS** in the **Busy Line** menu.

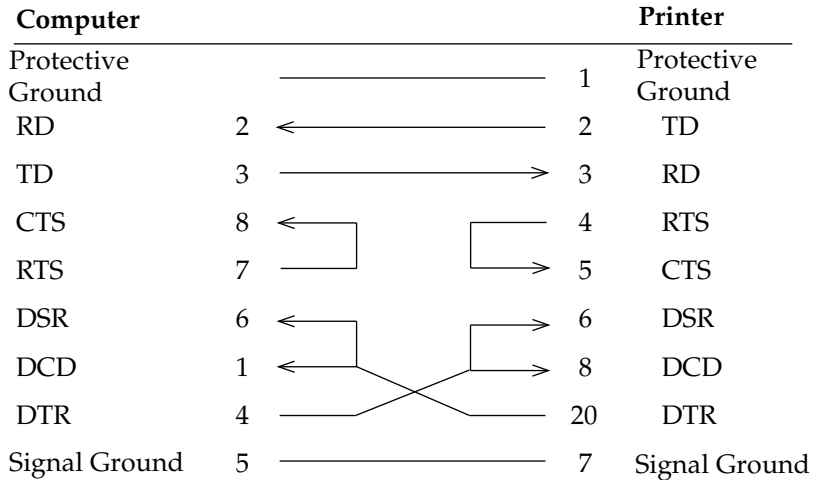
PC industry standard 25-pin to 25-pin

When using this circuit set the menu option **Busy Line** to **DTR** and **Protocol** to **READY/BUSY**. If you select the **X-ON/X-OFF** protocol, the setting for **Busy Line** is irrelevant. The value **DSR** of the printer menu must be set to **Invalid**.

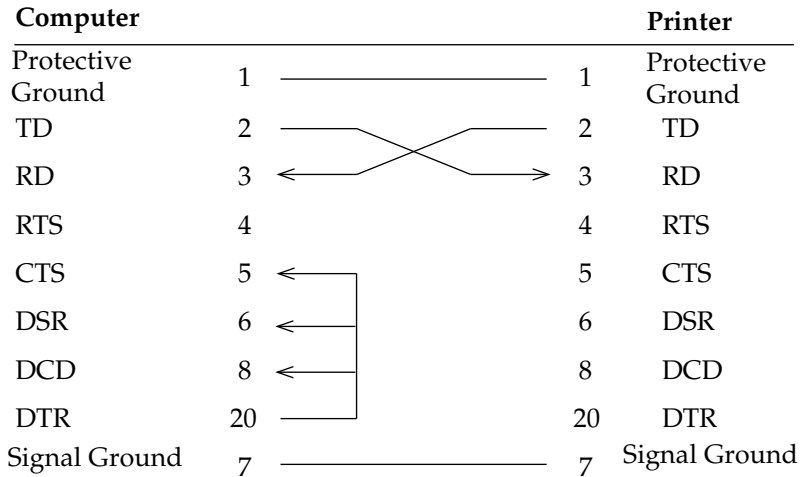


AT industry standard 9-pin to 25-pin

When using this circuit set the menu option **Busy Line** to **DTR** and **Protocol** to **READY/BUSY**. If you select the **X-ON/X-OFF** protocol, the setting for **Busy Line** is irrelevant. The value **DSR** of the printer menu must be set to **Invalid**.

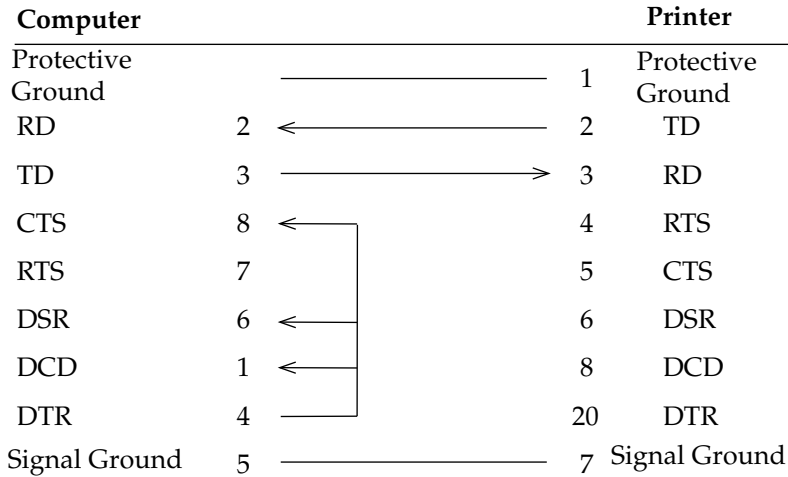


It is not possible to give a definitive statement about the connections on computer side. If problems occur using the X-ON/X-OFF protocol, refer to the circuit below. Please note that it is assumed that signal DTR is set to SPACE on the computer.



PC industry standard
25-pin to 25-pin

*Ensure that the printer menu option DSR is set to **Invalid**.*



AT industry standard
9-pin to 25-pin

*Ensure that the printer menu option DSR is set to **Invalid**.*

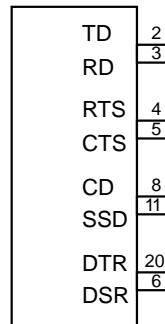
Interface test

If the menu option **Diagnostic Test** is set to **Yes** and the test plug described below is connected to the serial interface, a test of the serial interface is automatically carried out when the printer is turned on. The result of the test will be printed.

This process is repeated until the printer is switched off. The printer will return to normal operation, when you set the menu option **Diagnostic Test** to **No**.

If everything is working properly you can start printing.

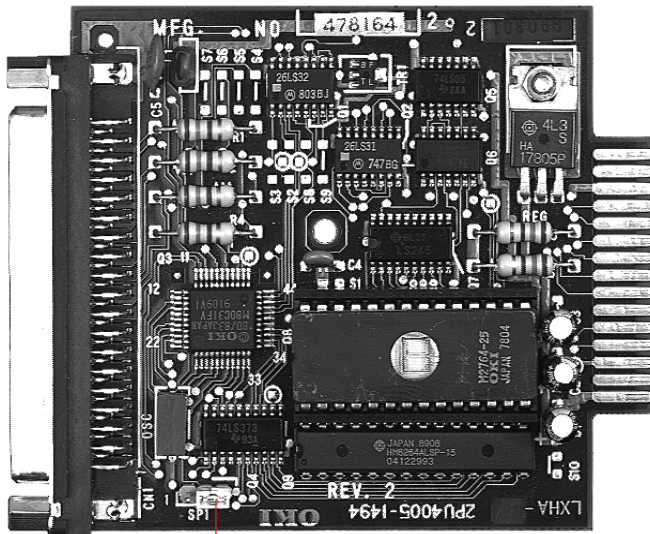
1 Canon DB-25S or equivalent plug



(RS-232C)

RS-422A Serial Interface

The RS-422A interface is often used when data is transmitted over long distances (max. 1.2 km). The type of data transmission is the same as used by the RS-232C interface, but the pin assignment and the signal levels are different. The transmission parameters of the RS-422A interface (configuration) on the printer side must therefore correspond to the system's parameters in this case as well.



Jumper SP1

Interface boards may vary in design.

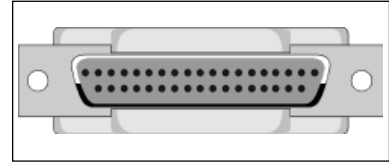
The position of jumper plug SP1 should never be changed. If the interface's control program is stored in the microprocessor, SP1 has to connect the two pins close to the interface connection (Position 1). If the control program is stored in the EPROM, SP1 has to connect the two pins pointing away from the connection (see figure).

The interface cable has to meet the following requirements:

37-pin plug: equivalent to DC-37P

Plug housing: equivalent DC-C1-J16.

Shielded twisted-pair data transmission cable IBM Type 1. UL- and CSA-certified. The printer has a 37-pin DC-37S connector.



Pin assignment

Pin	Signal	Direction	Description
1	Protective Ground, FG	---	Connected to the printer's casing
3 *	Flow Control, SSD+	from printer	With the Ready/Busy protocol this signal indicates that the printer is ready.
21	Flow Control, SSD-	from printer	
4	Send Data, SD+	from printer	Data sent from printer.
22	Send Data, SD-	from printer	
6	Receive Data, RD+	to printer	Data sent to printer.
24	Receive Data, RD-	to printer	
7 *	Ready to Send, RS+	from printer	With the Ready/Busy protocol this signal indicates that the printer is ready.
25	Ready to Send, RS-	from printer	
9	Clear to Send, CS+	to printer	Data transmission starts when printer confirms the signal as "Space".
27	Clear to Send, CS-	to printer	
11 **	Ready to Send, DM+	to printer	Indicates that data can be sent. The data is received as soon as the printer confirms this signal as "Space".
29	Ready to Send, DM-	from printer	
12 *	Terminal Ready, TR+	from printer	With the Ready/Busy protocol this signal indicates whether the printer is ready to receive data.
30	Terminal Ready, TR-	from printer	
2, 5, 8, 10, 13 to 18, 20, 23, 26, 28, 31 to 37			Not assigned.
19	Signal Ground, SG	---	Signal Ground

- * In the printer menu you can select Pin 3 and 21 (SSD), 7 and 25 (RS) or 12 and 30 (TR) as Busy line.
- ** Use the menu option DSR Signal to select whether the signal DM is evaluated (option valid) or ignored (option invalid) by the printer.

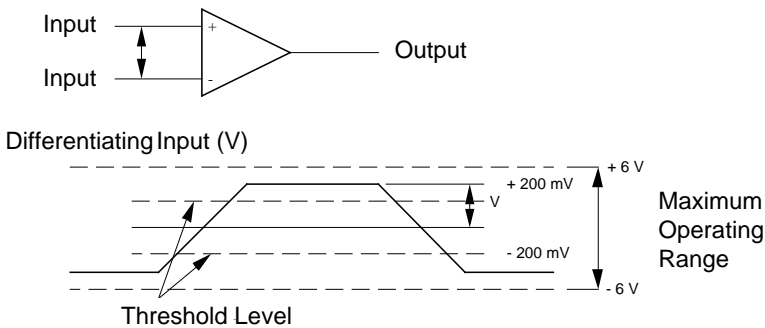
The signal levels described below are equivalent to the EIA-Standard RS-422A.

MARK Polarity: $-0,2$ to $-6,0V$: LOW = OFF = Logical "1"
 SPACE Polarity: $+0,2$ to $+6,0V$: HIGH = ON = Logical "0"

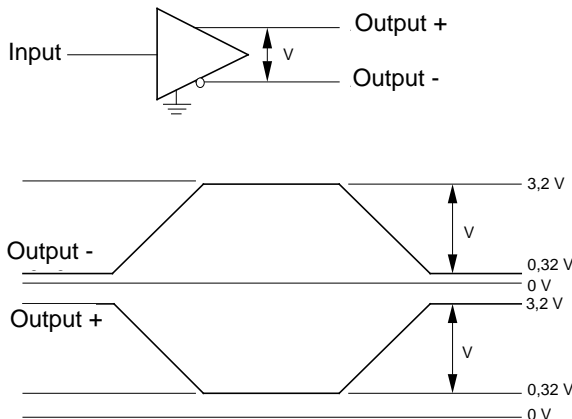
Signal levels

Input Circuit equivalent to Am 26LS32

Circuits



Output Circuit equivalent to Am 26LS31



Menu options for the serial interfaces (RS-232C, RS-422A)

Option	Action
Parity	Is odd or even parity used? odd parity - select Odd . even parity - select Even . no parity - select None .
Serial Data 7 or 8 Bits	Is the data format used 7 bit or 8 bit? 7-bit format - select 7 Bits . 8-bit format - select 8 Bits .
Protocol	Which protocol is used? Ready/Busy Protocol - select Ready/Busy . X-ON/X-OFF Protocol - select X-ON/X-OFF .
Diagnostic Test	Do you want to perform an I/F test? Yes - select Yes . Normal printing - select No .
Busy Line	Via which line is a Busy signal received? SSD -9 V - select SSD- . SSD +9 V - select SSD+ . DTR -9 V - select DTR . RTS -9 V - select RTS .
Baud Rate	Which baud rate (Bit/s, BPS) is used? 19.2000 Baud - select 19200 BPS . 9.600 Baud - select 9600 BPS . 4.800 Baud - select 4800 BPS . 2.400 Baud - select 2400 BPS . 1.200 Baud - select 1200 BPS . 600 Baud - select 600 BPS . 300 Baud - select 300 BPS .
DSR Signal	Does your system send a DSR signal to the printer? Yes - select Valid . No - select Invalid .
DTR Signal	When is a DTR signal sent? When turning the printer ON-LINE - select Ready on Select . When turning the printer on - select Ready on Power Up .
Busy Time	Which pulse duration is required for a Busy-signal? 200 ms - select 200 ms . 1 second - select 1 s .

When using a serial interface, set the menu options in above table as required by your system's interface.

After selection of the desired options it is recommended to print the menu.

Transmission Protocols

You can select the two protocols for the serial transmission (interface RS-232C and RS-422A) in the print menu as explained below.

The signal Busy is enabled (Busy), when less than 256 bytes are available in the interface buffer. The signal is disabled (Ready) after 200 ms or 1 second if sufficient buffer capacity has been freed within this period of time. If printing the buffer takes longer than 200 ms or 1 second the signal is disabled (Ready), as soon as sufficient capacity is available.

Ready/Busy

This protocol uses the ASCII characters DC3 (decimal 19) and DC1 (decimal 17) for the control of data transmission. As soon as there are less than 256 bytes available in the buffer, the code DC3 informs the sender that no more data can be received. The code DC3 is transmitted until no more data is transmitted. If it is possible to print the buffer within 200 ms or 1 second after having sent a DC3 signal, a DC1 signal displays 200 ms or 1 second after sufficient capacity has been freed that the printer is ready to receive data. If it takes longer than 200 ms or 1 second to release the buffer, the code DC1 is sent as soon as sufficient capacity is available.

X-ON/X-OFF

For both protocols the time period of 200 ms or 1 second can be selected in the menu option **Busy Time**.

Connections of the RS-422A Interface

In the RS-422A interface, the incoming and outgoing signals are connected to the ports via differential circuits. Therefore two lines are required for each signal to be transmitted. The inverted signals are identified with "+" and the non-inverted signals are identified with "-".

Four lines are required for this connection, two for the data sent to the printer and two for the status message sent from the printer to the computer.

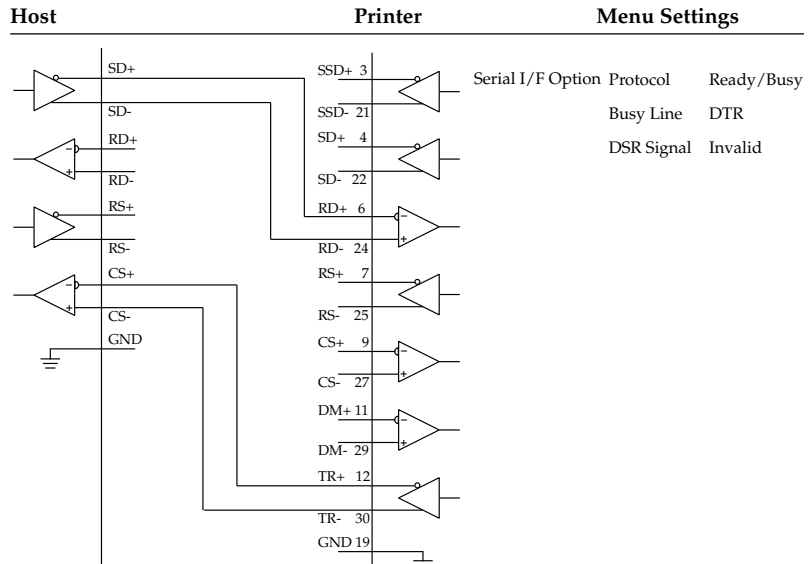
The polarity of the two lines required for each signal is particularly important. A connection with the signal ground between host and printer is not required.

As it is not possible to list all the different RS-422A- interface boards with the different pin assignments and port identifications ("+" and "-" for inverted signals or vice versa), only example circuits with inverted polarity are listed below. The required configuration of the computer is explained in detail. If SSD is used as Ready/Busy line the polarity of the ports "+" and "-" can be selected in the printer menu, where SSD+ is the polarity of the ports TR and RS (see diagram 2). If the ports SSD+ and SSD- are reversed, you have to select the option SSD-. If the printer prints data which is in no way similar to the data sent by the host, the polarity of the ports RD+ and RD- may be reversed.

The wiring of the dual serial interface board HP 24541B with the RS-422A interface of the printer is described as a circuit example. With this interface board the mode RS-232C or RS-422A can be used. For further information about the configuration of this board see the manual of the board.

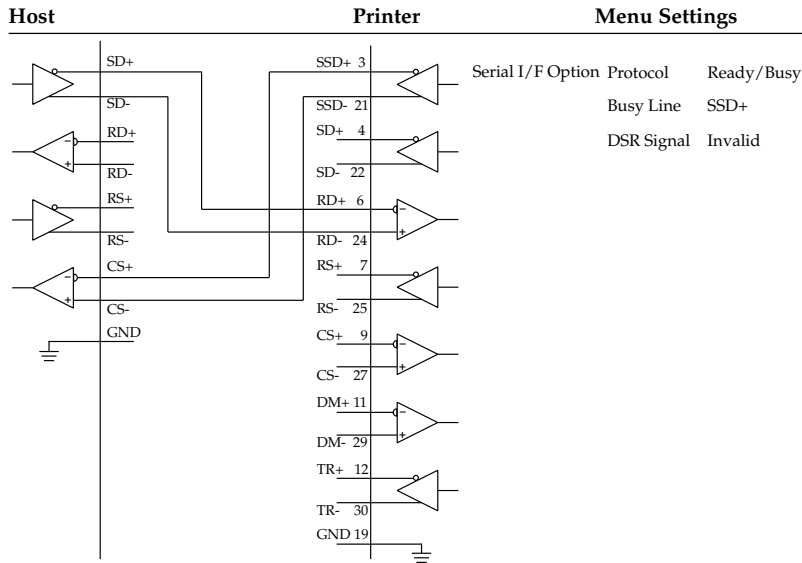
Diagram 1

Protocol: Ready/Busy
 Ready/Busy-Line (printer): TR



Protocol: Ready/Busy
 Ready/Busy-Line (printer): SSD+

Diagram 2



Protocol: Ready/Busy
 Ready/Busy-Line (printer): SSD-

Diagram 3

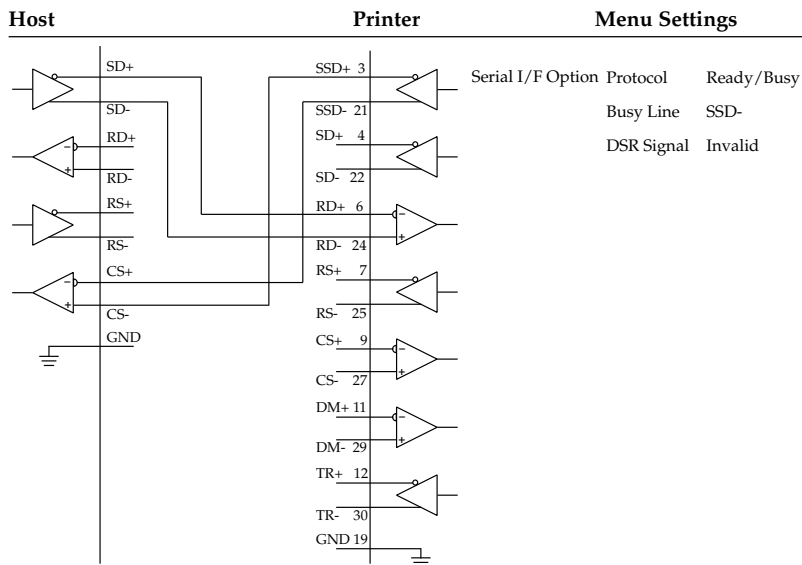


Diagram 4

Protocol: Ready/Busy
Ready/Busy-Line (printer): RS

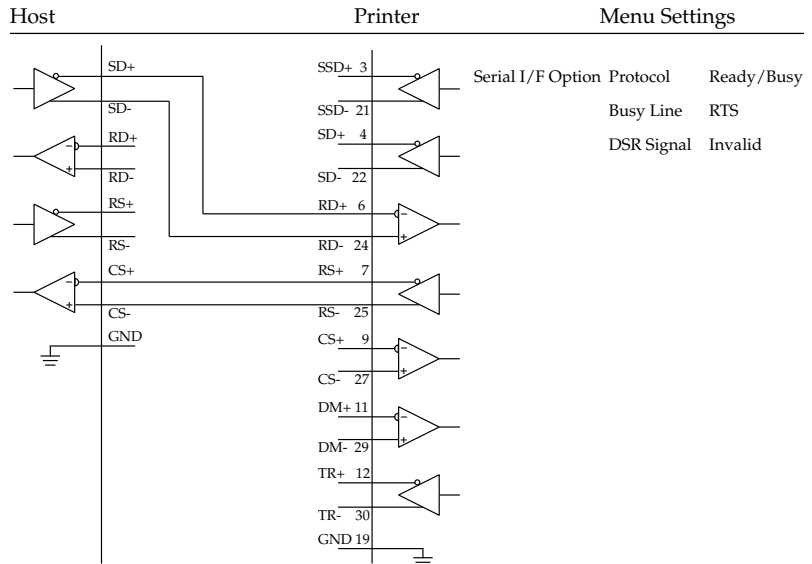
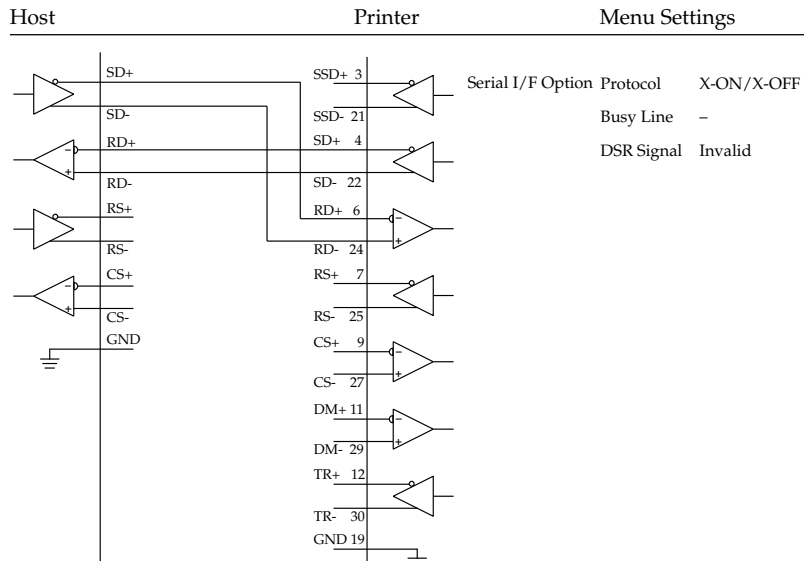


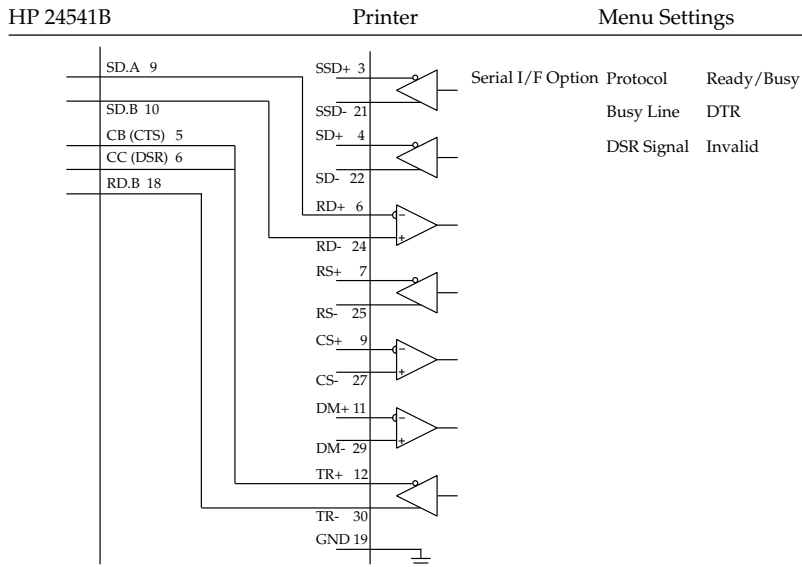
Diagram 5

Protocol: X-ON/X-OFF
Printer status line: SD



Protocol: Ready/Busy
Ready/Busy-Line (printer): SD

Diagram 6



In this circuit (connection of a HP 24541B interface board with RS-422A-Interface of the printer) the ports SD.A, Pin 9 and SD.B, Pin 10 are connected to the ports RD+, Pin 6 and RD-, Pin 24 of the printer interface. These are the two lines for the transmission of the print data.

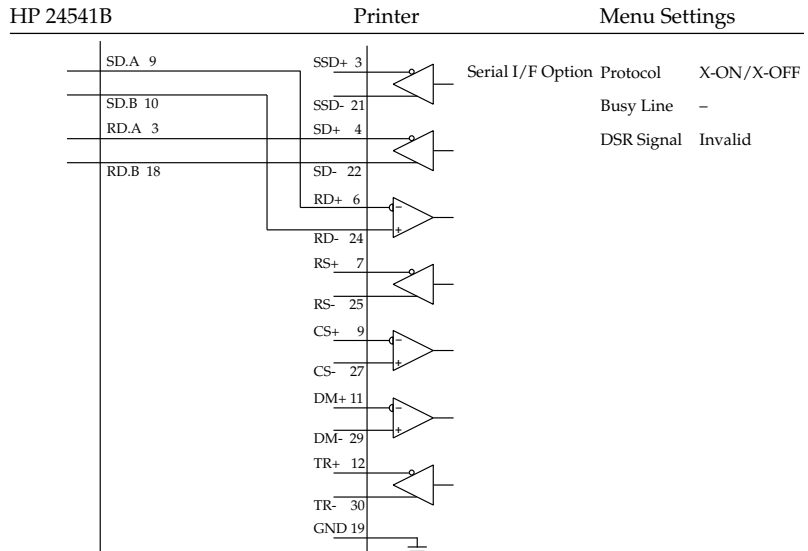
The two lines for the Ready/Busy-Signal are created by connecting ports CB (CTS), Pin 5 and RD.B, Pin 18 to the ports TR+, Pin 12 and TR-, Pin 30 of the printer interface. Additionally a connection to CC (DSR), Pin 6, is established on the host side from CB (CTS), Pin 5.

Looking at the two Ready/Busy-lines please note the following: although the port RD.B, Pin 18 on the host side is specific for the RS-422A interface, the second line is connected to the ports CB (CTS), Pin 5 and CC (DSR), Pin 6 of the RS-232C interface. This ensures the correct transmission of data with many applications, but it cannot be guaranteed for all applications.

When printer and software status signals X-ON and X-OFF are evaluated by an application while this circuit example is used, the correct data transmission with this type of interface board on the host side is not possible.

Diagram 7

Protocol: X-ON/X-OFF
 Printer status line: TD



In this circuit example (connecting a HP 24541B interface board with the RS-422A interface of the printer) the ports SD.A, Pin 9, and SD.B, Pin 10 are connected to ports RD+, Pin 6 and RD-, Pin 24 of the printer interface, as shown in example 6. In this circuit example (HP 24541B interface board connected to the RS-422A interface of the printer) the ports SD.A, Pin 9 and SD.B, Pin 10 are connected to the ports RD+, Pin 6 and RD-, Pin 24 of the printer interface. These are the two transmission lines for the print data.

The two lines for the printer status are established by connecting the ports RD.A, Pin 3 and RD.B, Pin 18 with the ports of the printer interface TR+, Pin 12 and TR-, Pin 30.

Please note the Ready/Busy-lines in this circuit: although port RD.B, Pin 18 on host side is specific for the RS-422A interface, the second line is connected to port RD.A, Pin 3 of the RS-232C interface. This ensures correct transmission of data with most applications, but it cannot be guaranteed for all applications.

If an application is confused by the fact that the software printer signals X-ON and X-Off are also sent to port RD.B, Pin 18 with dual function for software and hardware signals, the correct transmission of data with this interface board on host side is not possible.

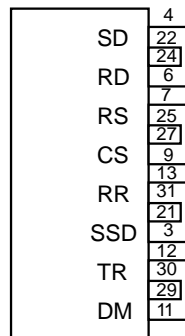
Interface Test

You can start a self test of the serial interface by using a test loop plug. The following plug is required for an interface test of the RS-422A interface:

If the menu option **Diagnostic Test** is set to **Yes** and the test loop plug is connected to the serial interface, a self test is carried out automatically. The result of the test will be printed.

This process is repeated until the printer is turned off. The printer will return to normal printing operation and is ready to receive data, when the menu option **Diagnostic Test** is set to **No**.

Canon DC-37P or equivalent plug



(RS-422A)

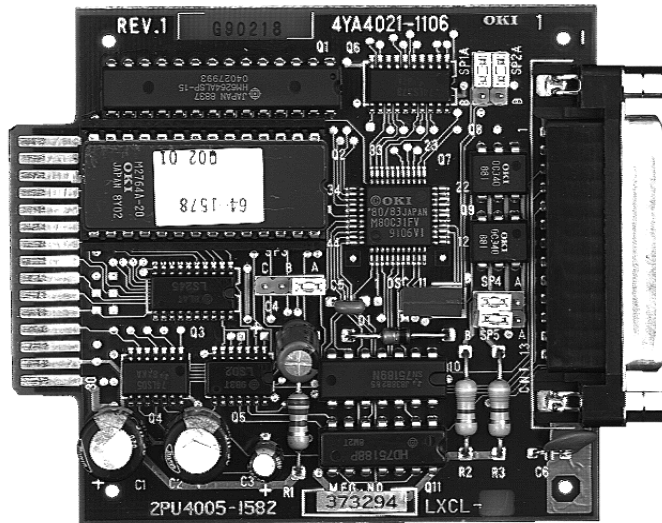
To set the printer to menu mode while **Diagnostic Test** is set to **Yes**, hold the *MENU* key down while switching the printer on.

Coresident RS-232C / Current Loop Interface

The arrangement of a short-circuit jumper on the printed circuit board determines whether this interface board is used as RS-232C or Current Loop interface. Both modes allow for three transmission protocols. The protocols are determined by the arrangement of jumpers or can be selected in the printer menu.

The following pages contain information about the correct jumper assignment and the correct menu selections for each mode as well as general technical details and information about transmission protocols.

Interface boards may vary in design.



Technical data

Term	Description
Interface type	RS-232C/Current Loop coresident
Data transmission	Serial (Start/Stop Synchronisation)
Transmission rate (bit/s)	110, 150, 300, 600, 1200, 2400, 4800, 9600 bit/s
Number of data bits	7 or 8 Bits*
Parity	Even, odd or no parity

* The transmission format of 7 bits without parity is not valid.

Term	Description
Number of stop bits	one or more bits
Transmission protocols	three protocols
Interface connection	on printer side: 25-pin plug, DB-25S or equivalent, on cable side: 25-pin plug, DP-25P or equivalent
Interface signals	see table for interface signals

The interface signals, pin assignment and circuits of the RS-232C coresident interface are not mentioned again here, as they are like the simple RS-232C interface, described earlier in this chapter..

Current Loop Interface

Pin	Signal	Direction	Description	Pin assignment
1	Protective Ground, PG	---	connected to the printer's casing	
2 - 6	---	---	not assigned	
7	Signal Ground, SG	---	Signal Ground	
8	---	---	not assigned	
9	Current Loop, D+ Receive loop	to printer	printer receive signal for serial data	
10	Current Loop, D- Receive loop	to printer	return line for D+ signal	
11,12	---	---	not assigned	
13	Signal Ground, SG	---	Signal Ground	
14 - 17	---	---	not assigned	
18	Current Loop, B+ Send loop	from printer	printer send signal for serial data *	
19	Current Loop, B- Send loop	from printer	return line for D+ signal	
20-25	---	---	not assigned	

* The functions of the circuit B+ -> B- differ depending on the protocol used. When selecting a protocol the functions are adjusted automatically:

- Ready/Busy Protocol: indicates that the printer is not ready to receive data. This type of protocol is also used for error detection.
- X-ON/X-OFF Protocol: serial data from printer (the printer only sends the codes DC1 and DC3).
- Centronics Blocked Duplex Protocol: serial data from printer (the printer only sends the codes ACK and NAK).

Interface selection

The selection of different interface modes, the transmission protocol and the number of lines used for the transmission is determined by the arrangement of the five jumpers SP1 to SP5, as shown in the table below, and by the menu settings of the printer.

You select the different modes by setting short-circuit jumper SP2 appropriately. The menu setting of the printer determines whether the Ready/Busy protocol or X-ON or X-OFF protocol is used.

The **Centronics Blocked Duplex** transmission protocol can only be selected by setting short-circuit jumper SP1 appropriately. The functions of the short-circuit jumpers and the menu settings are listed in the following table.

Functions of short-circuit jumper and protocol selection in printer menu

Interface	Protocol	Power Source	Number of Lines	SP1	SP2	SP3	SP4	SP5	Menu Settings
RS-232C	Ready/Busy	–	–	A	A	A	A/B	A/B	Ready/Busy
RS-232C	X-ON/X-OFF	–	–	A	A	A	A/B	A/B	X-ON/X-OFF
RS-232C	CBD *	–	–	B	A	A	A/B	A/B	**
Current Loop	Ready/Busy	passive	2	A	B	B	A	A	Ready/Busy
Current Loop	Ready/Busy	passive	4	A	B	C	A	A	Ready/Busy
Current Loop	Ready/Busy	active	2	A	B	B	B	A	Ready/Busy
Current Loop	Ready/Busy	active	3	A	B	C	B	B	Ready/Busy
Current Loop	X-ON/X-OFF	passive	2	A	B	B	A	A	X-ON/X-OFF
Current Loop	X-ON/X-OFF	passive	4	A	B	C	A	A	X-ON/X-OFF
Current Loop	X-ON/X-OFF	active	2	A	B	B	B	A	X-ON/X-OFF
Current Loop	X-ON/X-OFF	active	3	A	B	C	B	B	X-ON/X-OFF

Interface	Protocol	Power Source	Number of Lines	SP1	SP2	SP3	SP4	SP5	Menu Settings
Current Loop	CBD *	passive	2	B	B	B	A	A	**
Current Loop	CBD *	passive	4	B	B	C	A	A	**
Current Loop	CBD *	active	2	B	B	B	B	A	**
Current Loop	CBD *	active	3	B	B	C	B	B	**

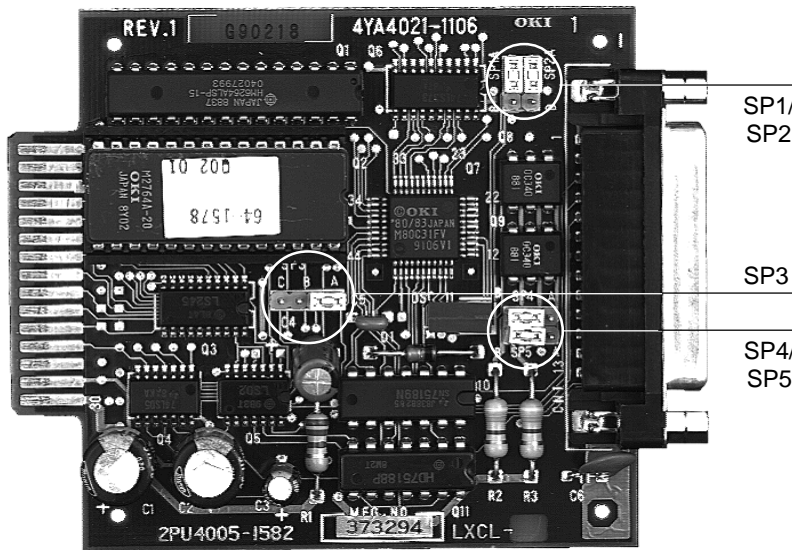
* CBD = Centronics Blocked Duplex

** Protocol setting in menu will not be applied.

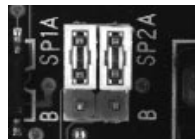
Rearrange the jumpers only when the printer is turned off.

The component layout diagram of the printed circuit board for the coresident serial RS-232C/Current Loop interface and the arrangement of the jumpers (SP1 - SP5) is shown in the following figures.

Component layout diagram



SP 3: Pin Assignment



SP1: Protocol Selection
SP2: RS-232C/Current Loop



SP4: Power Source/
Receive Loop
SP5: Power Source/
Send Loop

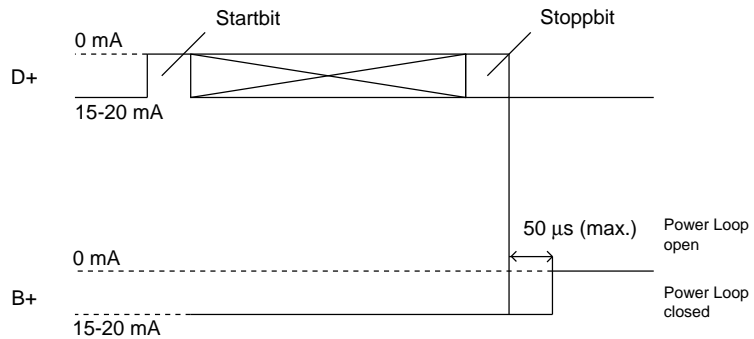
Transmission Protocols

The following pages explain the transmission procedures of the three different types of protocol.

Ready/Busy Protocol

If the printer is unable to receive data, the current loop for signal B + opens when the 50 μ s following the stop bit of the last character is received.

Timing Diagram



Block format: any

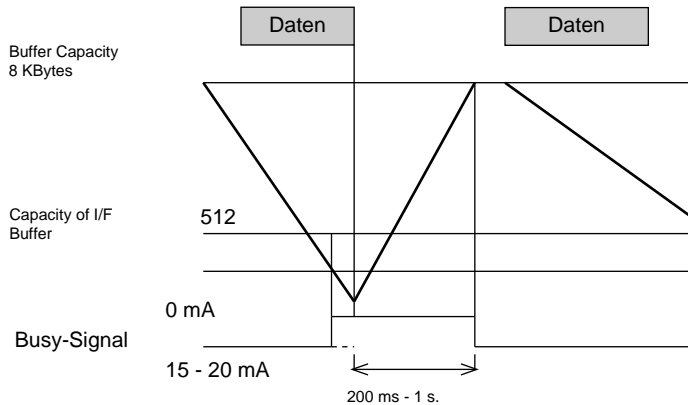
Error Message: a parity error is displayed as @ (4OH).

Display of Busy Status: the minimum interval during which the printer is unable to receive data is selected in the **Busy Time** menu. The interval for the Busy signal can be set to either 200 ms or 1 second.

The printer is not ready to receive data if the capacity of the interface buffer drops below 521 bytes. The printer is ready to receive data again when 512 bytes are free in the printer buffer after 200 ms or 1 s have elapsed. If the memory threshold of 512 bytes is not reached during the busy status of 200 ms or 1 s, the printer only signals its ability to receive data when more than 512 bytes of memory are available.

Timing diagram

X-ON / X-OFF Protocol



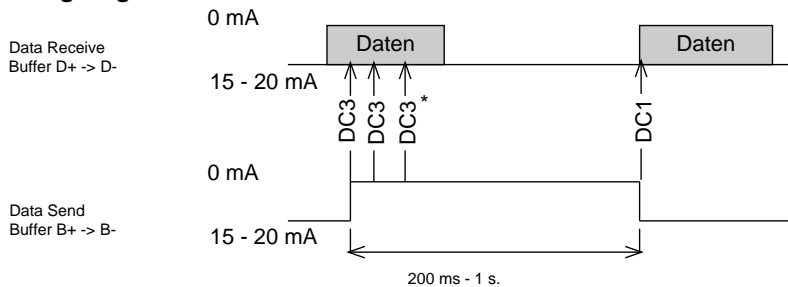
Block format: unblocked

Error message: a parity error is displayed as @ (40H).

Display of Busy Status: as soon as the capacity of the interface buffer drops below 512 Byte, the printer sends a DC3 signal to the sender indicating that no data can be received. The signal DC3 is only sent as long as data is sent to the printer (see note).

If after 200 ms or 1 s, 512 bytes or more memory is available, the printer sends the signal DC1 to the sender indicating that it is ready to receive data. The signal DC1 is only sent as soon as 512 Byte or more memory is available. (Select the setting 200 ms or 1 s in the Busy Time menu.)

Timing diagram



* If data is sent while the printer is unable to receive data, the code DC3 is sent every time data arrives at the printer.

Centronics Blocked Duplex (CBD) Protocol

Block format: STX + Data + ETX

Data outside a block is ignored.

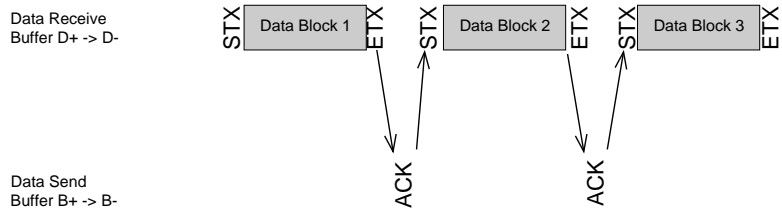
Error Detection:

A block was transmitted correctly: after having received an ETX signal an ACK signal is transmitted to the sender confirming that the data was received without any errors.

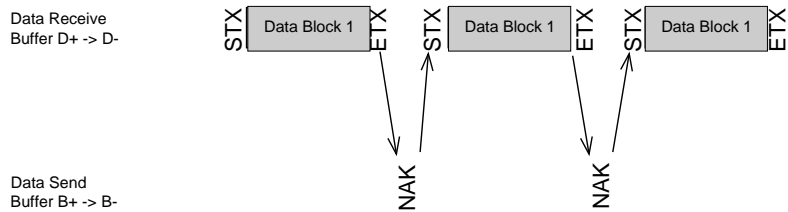
A block was transmitted incorrectly: after having received an ETX signal a NAK signal is transmitted to the sender indicating that an error occurred during the transmission. On receipt of the NAK signal the block has to be transmitted again.

Display of Busy Status: None

If no error was detected:



If an error was detected:



Data for Bitmap Graphics

The above mentioned timing diagrams are only valid as long as the printer is in text mode. The start character STX and the stop character ETX are only interpreted as control characters of the CBD transmission protocol in text mode. Please note the following if you want to print bitmap graphics:

Maximum length of block: 0 to 1 KByte (8 KByte)

The maximum length of a block of data equals the capacity of the interface's printer buffer. This capacity should not exceed 1 KByte.

If a parity error occurs or if the buffer overflows during the transmission, the block causing the error is ignored, a NAK signal is sent and the block is requested again.

Connections of the Current Loop Interface

Please note that closed loops are created when using a current loop interface in order to connect the sender (host) to the receiver (printer).

Connections with one or more current loops can also be produced. If only one current loop is used, only the blocked Centronics Blocked Duplex transmission protocol can be used. When using only one circuit, the receiving and sending circuit of the host and printer must be connected in series. It is therefore not possible to receive print data and send status messages simultaneously. Each current loop has to contain a power source which can be made available by either the host or the printer. Several power sources are not allowed within one loop.

Only example circuits are listed below as it is not possible to show the numerous Current Loop interfaces with the different circuits. The required printer configuration is explained in detail.

As an example, the connection of the IBM Asynchronous Communication Adapter to the Current Loop interface of the printer is described. With this adapter the operating mode can be set to RS-232C interface or Current Loop interface. For further information about the configuration of this adapter see *IBM Personal Computer Technical Reference Manual, P/N 6936844*.

Diagram 8

Connection: 4-wire
 Power source receive loop: Host
 Power source send loop: Host

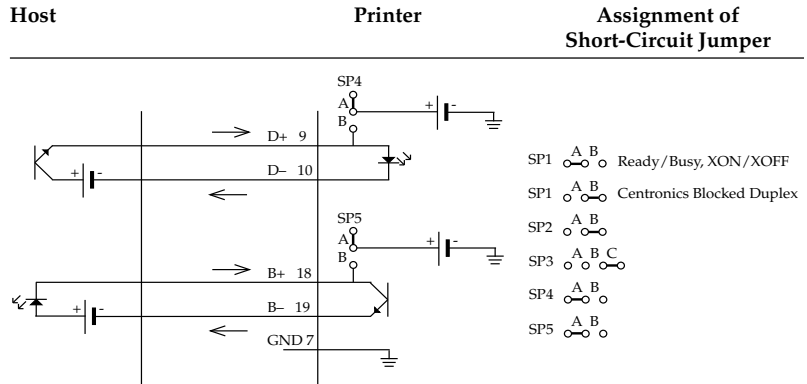
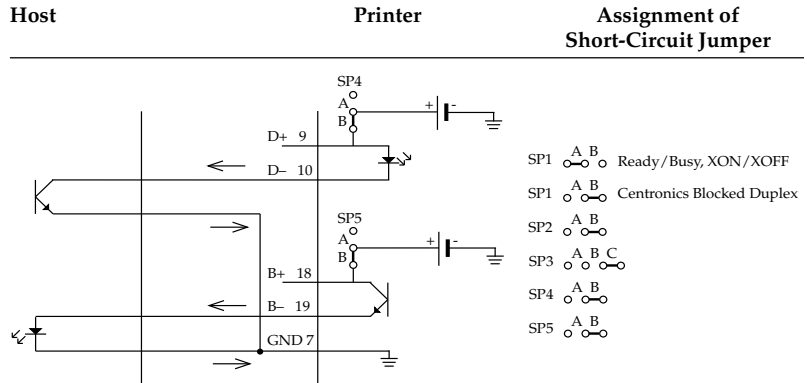


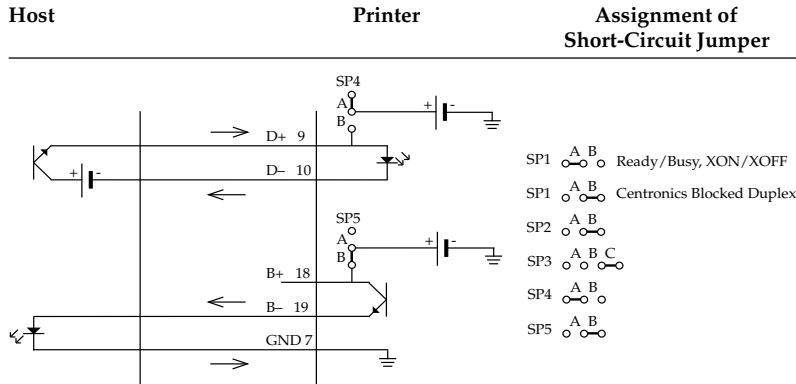
Diagram 9

Connection: 4-wire / (3-wire)
 Power source receive loop: Printer
 Power source send loop: Printer



Connection: 4-wire
 Power source receive loop: Host
 Power source send loop: Printer

Diagram 10



Connection: 4-wire
 Power source receive loop: Printer
 Power source send loop: Host

Diagram 11

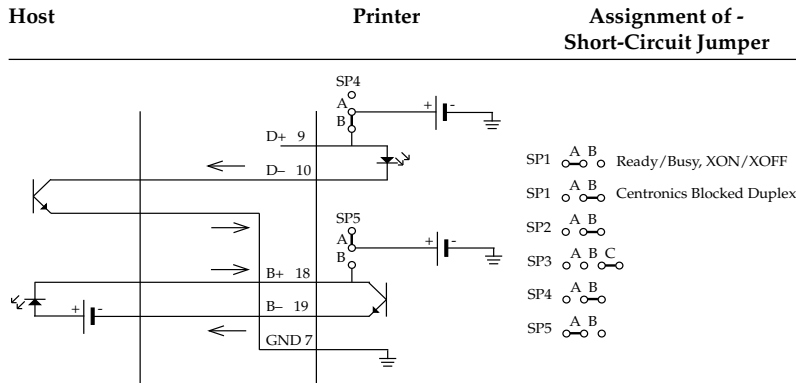


Diagram 12

Connection: 3-wire
 Power source receive loop: Printer
 Power source send loop: Printer

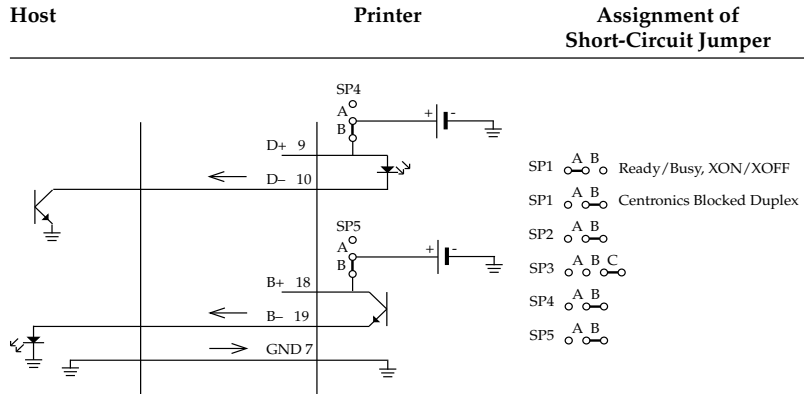
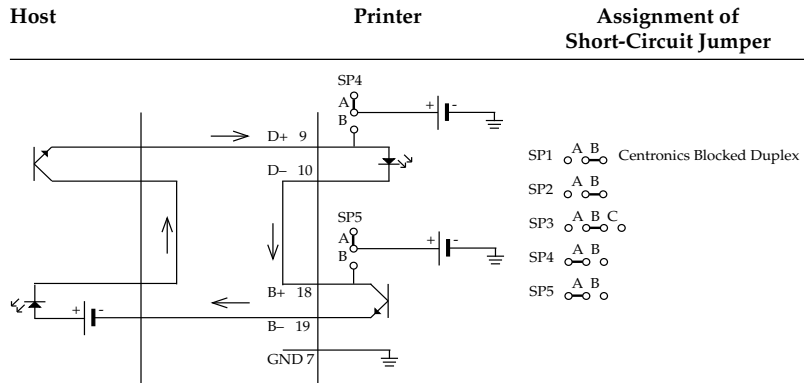


Diagram 13

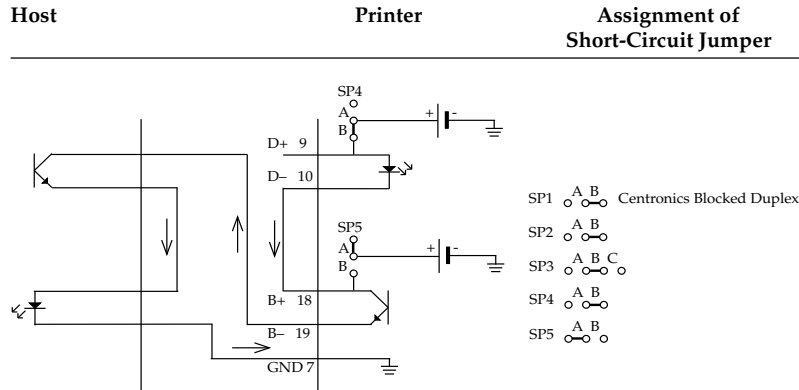
Connection: 2-wire
 Power source receive loop: none
 Power source send loop: Host



In combination with this circuit you can only use the Centronics Blocked Duplex protocol in order to ensure the correct transmission of data.

Connection: 2-wire
 Power source receive loop: Printer
 Power source send loop: None

Diagram 14



In combination with this circuit you can only use the Centronics Blocked Duplex protocol in order to ensure the correct transmission of data.

One must differentiate between 2-wire-connections (see diagram 13 and 14) and circuits in which only the receive loop D+ -> D- of the printer is connected. Strictly speaking these are 4-wire circuits (see diagram 8 to 11), in which the send loop B+ -> B- of the printer is not integrated in the circuit. It is therefore not possible to control the printer status (Ready to Receive or Receive Buffer Full).

Technical note

This circuit is often used by measuring systems and unit controls to which a log printer is connected. Received data is printed immediately without having to store it in the buffer. Even if a low transmission rate is used, no data is lost.

To ensure a constant power supply of 15 mA to 20 mA, the wire resistance as well as the number of electronic components in the current loop has to be considered. This means that the appropriate current control resistors of the power source used have to be adjusted to the prevailing electrical conditions on either the printer or the computer.

The above mentioned procedures should only be carried out by trained technicians referring to the technical documentation (circuit diagrams etc.) of the printer interface and the computer interface.

Examples
Diagram 15

Connection: 2-wire
Power source receive loop: Printer
Power source send loop: None

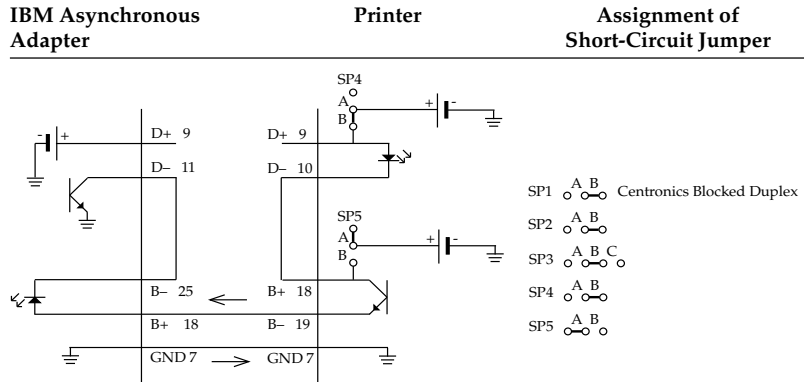
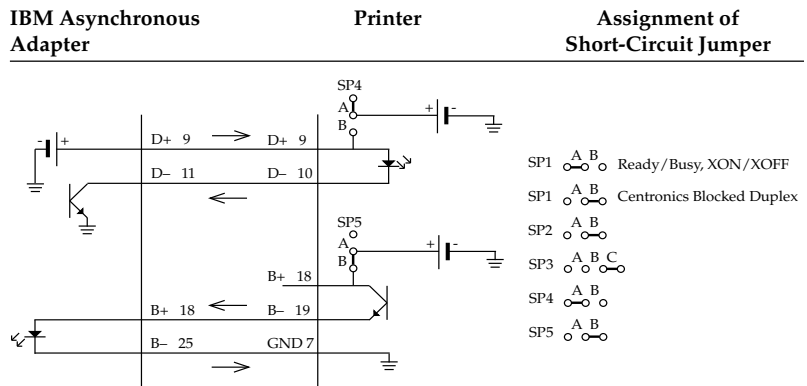


Diagram 16

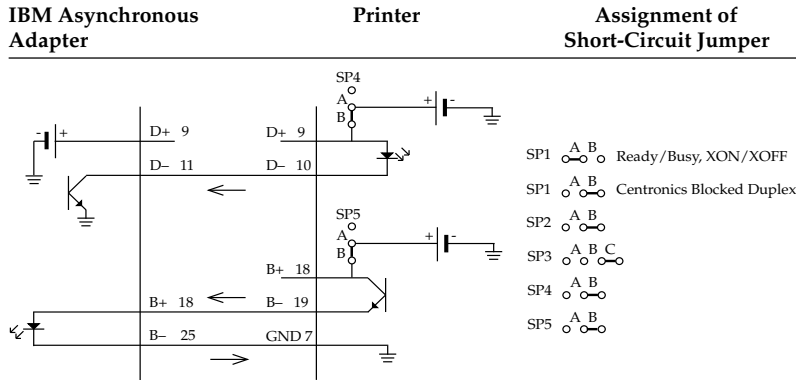
Connection: 4-wire
Power source receive loop: Host
Power source send loop: Printer

This connection is equivalent to circuit diagram 10.



Connection: 3-wire
 Power source receive loop: Printer
 Power source send loop: Printer

Diagram 17



This connection is equivalent to circuit diagram 12.

This connection is equivalent to circuit diagram 12. A circuit according to diagram 13 is not possible with the IBM Asynchronous Adapter, as the voltage supplied by this adapter's power source is not sufficient for the interfaces. Please refer to the section »Technical Note« earlier on in this chapter.

You can use the Centronics Blocked Duplex protocol only in combination with above circuit.

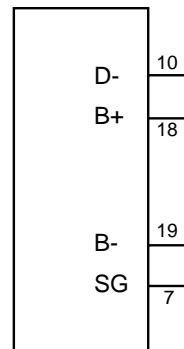
Interface Test

Connect the test loop plug described below to the interface in order to perform an interface test.

Select **Yes** in the **Diagnostic Test** menu to enable the interface test of the printer.

- Connect the test loop plug to the connector of the serial interface.
- Connect short-circuit jumper SP2 to side B and SP3 to side B to select the Current Loop operating mode. Plug SP4 into side B and SP5 into side A to activate the interface connection with two transmission lines and a power source on the printer side. This circuit is equivalent to diagram 14.

Canon DB-25S or equivalent



(Current Loop)

- Turn the printer on. The printer buffer, interface driver and receive loop functions on the serial interface are now tested. On completion of this test all characters are printed in a test pattern.

The result is printed as follows:

The message `CORESIDENT SERIAL I/F F/W xx.xx YR4064-1578 LOOP TEST` will be printed, where `xx.xx` is replaced by the current ROM version.

The printer checks the buffer and prints `RAM = GOOD`, if no error occurred or `RAM = BAD`, if an error occurred during the memory test.

The signal logic is also tested. The message `CURRENT LOOP I/F = GOOD` is printed if no error was detected. If an error occurred, the message `CURRENT LOOP I/F = BAD` is printed.

Contact your local dealer, if the message `CURRENT LOOP I/F = BAD` is printed.

From the printer's send loop, hexadecimal characters from 20H to 7FH are transmitted into the receive loop. These characters are stored in the buffer and printed.

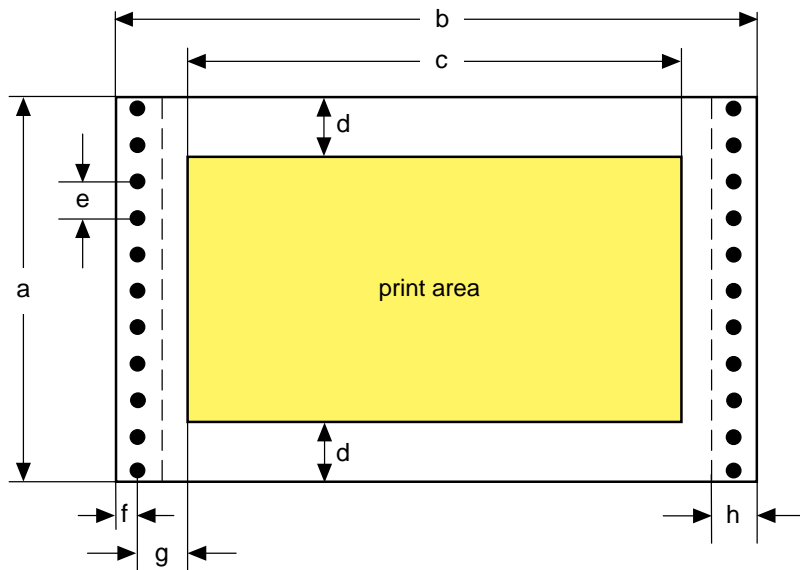
This process is repeated until the printer is turned off. The printer returns to normal operation when you set the **Diagnostic Test** menu option to **No**.

To set the printer to menu mode while the **Diagnostic Test** option is set to **Yes**, hold the menu key down while switching the printer on.

Appendix E: Paper formats and print areas

Continuous Paper

Continuous paper must be punched and folded to sheet length (a). You can use up to four layers of paper (including the original when using duplicating paper).



- a = 76,2 to 431,8 mm
- b = 76,2 to 254 mm /
76,2 to 406,4 mm
- c = printable width
- d = 16,9 mm
- e = 12,7 mm
- f = 6,35 mm
- g = 6,35 to 22,2 mm
- h = 12,7 mm

- The width (b) must be between 76.2 and 254 mm for small printers and between 76.2 and 406.4 mm for large printers.
- You can use paper lengths between 76.2 and 431.8 mm.
- Do not print within 8.9 mm (corresponding to four lines at six lpi) before and after a perforation in order to avoid printing on the perforation.
- For (g) you can select a distance of 6.35 to 22.2 mm to the transportation holes by moving the spiked cylinders. Paper with binding holes must not be printed on the left of these holes.

Format

- When using single-layer paper the respective first character can be printed at a distance of 6.35 mm to the transportation holes. To avoid printing on the perforation maintain a distance of 12.7 mm to the perforation.
- When using multiple-layer paper do not print within 12.7 mm of the transportation holes to avoid an impairment of the print quality by glued surfaces.

Weight

Continuous paper without duplicate

The weight must be between 45 and 90 g/m², the paper thickness must not exceed 0.36 mm.

Multiple sets, automatically duplicating

Multiple sets, automatically duplicating, print-sensitive or duplicating paper with a weight between 34 and 41 g/m² can be used.

Multiple sets with carbon

The weight must be between 38 and 45 g/m². The paper thickness must not exceed 0.36 mm. A carbon paper must have a maximum thickness of 0.03 mm

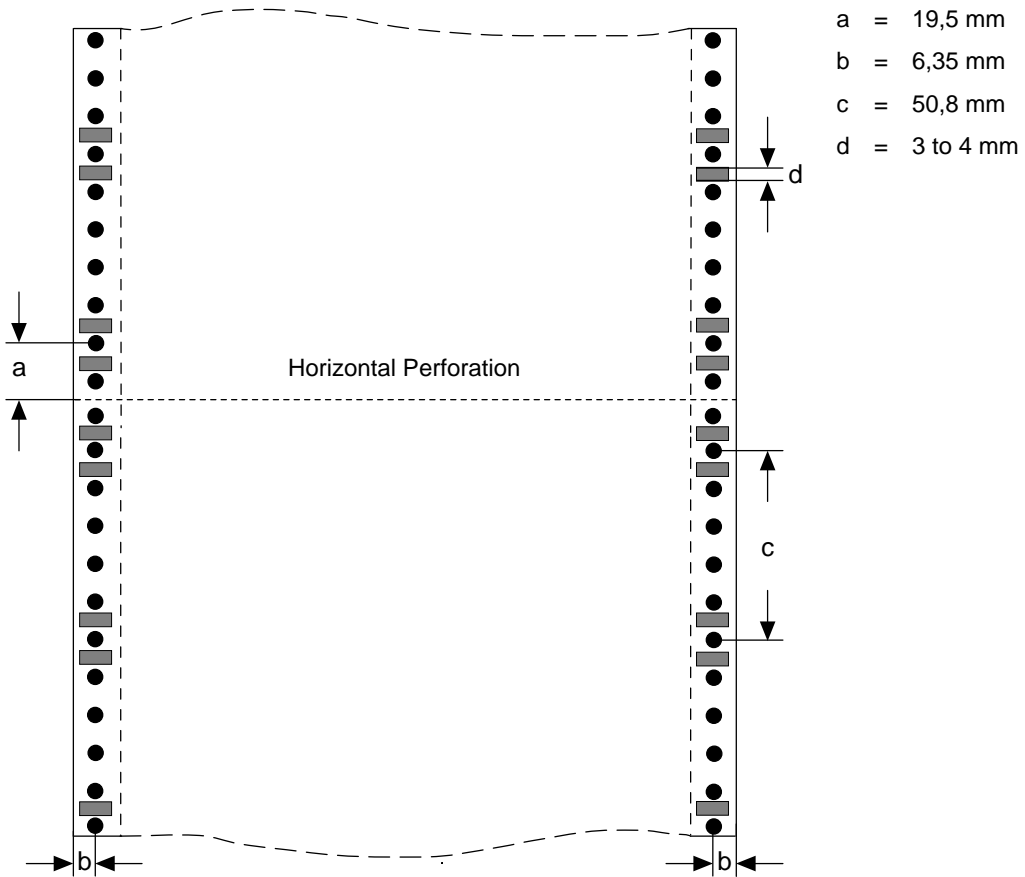
Paper Thickness

When using duplicating paper one original and up to 3 duplicates can be produced.

The paper thickness depends on the feeding direction of the paper. The paper thickness must not exceed a total of 0.36 mm, if the paper is fed from the reverse side of the printer. If the paper is fed from the bottom side of the printer the thickness must not exceed 0.44 mm. Labels for OCR-readers are an exception.

Perforation

- A perforation must withstand the fast transportation speed and must be easily separable.
- The bridges of a perforation must be firmly joined and not be separated at any point. Please note that a separated perforation tears easily.



Horizontal Perforation

Within a range of 1 to 2 mm there must not be any hole at the top or lower edge of the paper.

Vertical Perforation

If a vertical perforation is within the print area adjust the printer so that you do not print 6.35 mm to the left and right of the perforation (b). Avoid holes at the intersection of vertical and horizontal perforation.

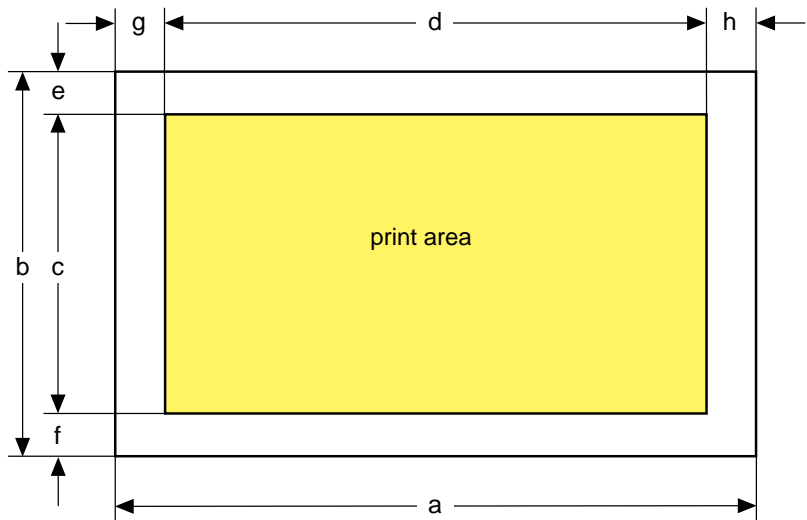
Further information

- The transportation holes must be exactly round and precisely punched. The rim may be toothed.
- The paper must be folded alternately along the horizontal perforation. Do not use paper lying in loops because problems with the paper feed may occur. Also avoid waves and wrinkles (mainly occurring with the first and last sheets of a new paper stack). Do not use these sheets.
- If the continuous paper is separated along the horizontal perforation, the separation rim must be straight, i.e. separation rims and corners must not be wavy or wrinkled.

Cut sheets

The standard paper format is DIN A4 (210 x 297 mm). Other paper formats (DIN A5, DIN B5, etc.) can also be used.

- a = 88,9 to 216 mm / 88,9 to 363 mm
- b = 76 to 420 mm
- c = printable length
- d = printable width
- e = min. 6,35 mm
- f = min. 4,35 mm
- g = 6,35 to 28,6 mm
- h = min. 6,35 mm



Format

- The paper width (a) is between 88.9 and 216 mm (small printer) and between 88.9 and 363 mm (large printer).
- The paper length (b) is 76 to 420 mm.
- The measurements for the non-printable area (g/h) are between 6.35 and 28.6 mm. For paper with a width of 304.8 mm the size must be between 19.05 and 28.6 mm.

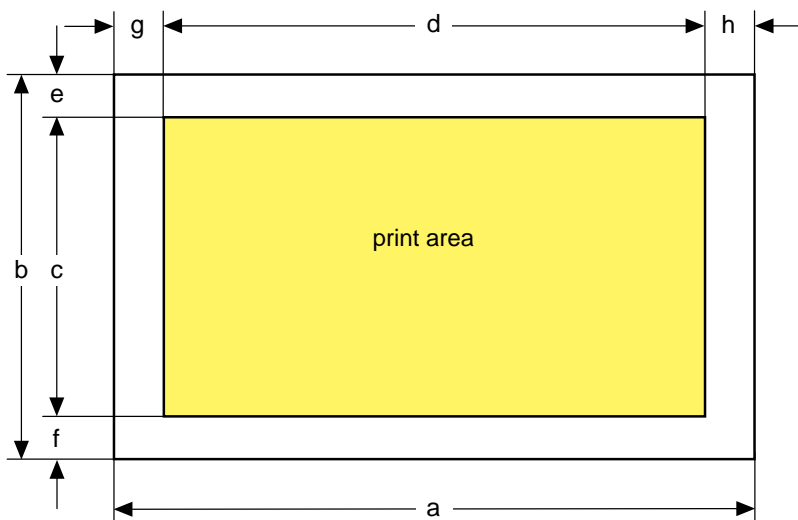
When using a cut sheet feeder (CSF), the cut sheet formats are different:

- The paper width (a) is between 182 and 216 mm (small printer) and between 182 and 364 mm (large printer).
- The paper length (b) is between 182 and 356 mm (small printer) and between 182 and 364 mm (large printer).

You can use paper weights between 45 and 90 g/m². When using cut sheets via the cut sheet feeder (CSF), the paper weight must not be less than 60 g/m² and must not exceed 90 g/m².

Weight

Labels (on single sheets)



- a = 88,9 to 216 mm / 88,9 to 363 mm
- b = 76 to 420 mm
- c = printable length
- d = printable width
- e = min. 6,35 mm
- f = min. 4,35 mm
- g = 6,35 to 28,6 mm
- h = min. 6,35 mm

- The paper width (a) is between 88.9 and 216 mm (small printer) and between 88.9 and 363 mm (large printer).
- The paper length (b) is between 76 and 420 mm.
- The non-printable left margin is between 6.35 and 28.6 mm. For paper with a width of 304.8 mm the size must be between 19.05 and 28.6 mm.

Format

Weight

The support paper for labels can be processed with a weight of 33 to 41 g/m². The overall thickness of 0.28 mm however must not be exceeded.

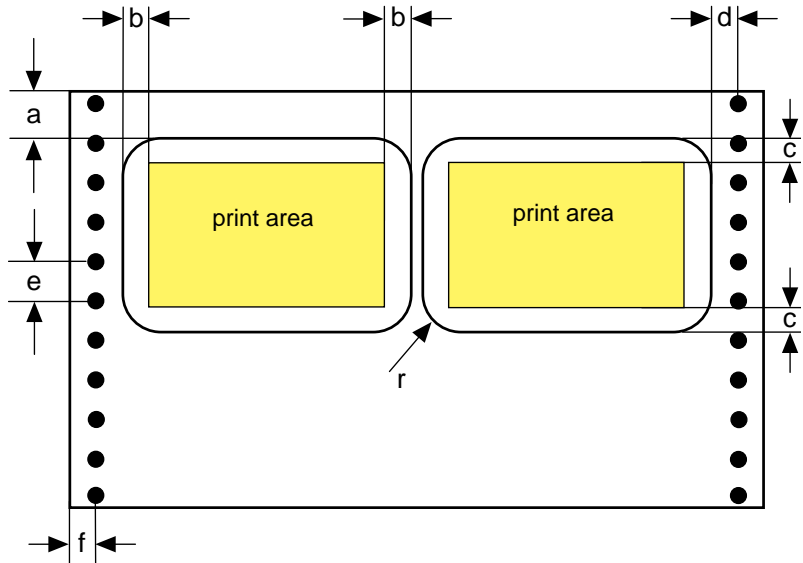
Further information

The condition of the support paper must ensure that the label is not removed when the paper is turned about 180° around a cylinder with a diameter of 27 mm. The labels must not detach during the process of printing or paper feeding. The support paper must be as bendable as possible. No labels should be removed from the support paper. A label must not have wrinkles or waves in the feed direction.

Labels (on continuous paper)

Labels on continuous paper must only be fed from the bottom side of the printer (with additional transportation unit for continuous paper).

- a = min. 6,35 mm
- b = min. 2,54 mm
- c = min. 2 mm
- d = min. 6,35 mm
- e = 12,7 mm
- f = min. 6,35 mm
- r = label corners must be rounded off



- The width of the label paper must be between 76.2 and 254 mm (small printer) and between 76.2 and 406.4 mm (large printer). **Format**
- You can use paper lengths between 76.2 and 431.8 mm.
- Do not print within 8.9 mm (corresponds to 5 lines at 6 lpi) before and after a perforation to avoid printing on the perforation.

The support paper of the labels can be processed with a weight of 33 to 41 g/m². The overall thickness of 0.28 mm must not be exceeded. **Weight**

- The condition of the support paper must ensure that the label is not removed if the paper is turned about 180° around a cylinder with a diameter of 27 mm. **Further information**
- The labels must not detach during the process of printing or paper feeding.
- The support paper must be as bendable as possible.
- No labels should be removed from the paper.
- A label must not have wrinkles or waves in the feed direction.
- The corners of the labels must be rounded off.
- A hole in the label corresponding to the horizontal perforation of the paper must be identical with the perforation. Holes must not appear within a range of 1 to 2 mm from both edges.
- There should not be any holes within 0.5 to 1 mm length from the upper right or left edge.

Appendix F: Index / Glossary

- **BOLD BLOCK CAPITALS** represent the display lamps of the control panel.
- **Bold letters** indicate the groups, positions and settings of the printer menu.
- **BLOCK CAPITALS** indicate the mode of the printer.
- *Italic BLOCK CAPITALS* indicate the buttons of the control panel.

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Glossary

Most terms are also explained in the context of the different sections. You will find these explanations via the index.

ASCII Character Set (American Standard Code for Information Interchange)

A standardized code for the character representation in computers which comprises as a 7-bit character set including 128 letters, figures, special characters and control characters.

Backspace (BS)

The print head is moved one character position to the left.

Bar Code

A small area with bars of different widths containing coded information. A bar code is grasped with optical readers. Depending on the printer type a bar code is part of the included fonts or can be printed as graphics.

Baud Rate

The speed of serial interfaces is given in steps per seconds, the unit is one baud. Common interfaces transmit exactly one bit per step. In this case the step speed corresponds to the data transmission rate (having the unit »bits per second«, bps).

Bidirectional Print

In the first line the print head moves from the left to the right, in the second line the direction is vice versa. This increases the print speed.

Bit

The smallest information unit in data processing. It can have the value 0 or 1. Eight bits are combined to one byte. One byte can represent 256 different values.

Bit Map

A bit map is made up of single dots which can be black or white. Bit maps are transmitted line-by-line (9 or 24 dot lines each) to the printer. Its resolution is decisive for the smallest dot size.

Boldface

Characters are printed twice to emphasize them. The second printed dot is slightly shifted to the right.

BS

See »Backspace«.

Buffer

A buffer is a memory area which is reserved (mostly temporarily). Apart from resident buffers there are variable (dynamic) buffers. Their size is automatically adapted to the requirements.

Byte

A group of 8 bits combines to one byte from which can represent a character or graphic data. A byte can have a value between 0 and 255.

Carriage Return (CR)

The print head is returned to the beginning of the line. Mostly the carriage return is combined with a line feed to move the print head to the next line.

Centronics Interface

This interface is mainly used to connect computers and printers. The Centronics interface is a parallel interface. The eight bits of one byte are transmitted simultaneously via eight data lines. Other signal lines control the data transmission (handshake).

Character

A character is an element from a defined character set. Printable and non-printable characters (control commands) are distinguished.

Character Set / Code Page

In a character set (= all representable characters) it is determined which characters (letters, figures, special characters) are available.

Character Spacing

Fonts with set character spacing and proportional fonts are distinguished.

Colour Ribbon

The colour ribbon is a continuous strip of inked fabric which is re-inked within the cartridge. By the stroke of the needle the ink is transmitted to the paper. See also »dot matrix printer«.

Compatibility

Compatibility is the »harmony« of different systems with each other. Compatible systems ensure an easy exchange of programs or devices without major modifications.

Continuous Paper

For the printing of lists, labels or duplicates mostly continuous paper is used which is taken from the stack (folded in Z-shape). Continuous paper is transported via the spikes of the transportation unit which locks into the lateral holes of the paper.

Control Characters

These non-printable characters of the ASCII character set activate functions such as form feed, line feed or carriage return. The command »Escape« activates command sequences (Escape commands).

cpi (characters per inch)

The pitch for non-proportional fonts is stated in characters per inch.

cps (characters per second)

The printing speed is measured in characters per second.

CR

See »Carriage Return«.

CSF

See »Cut Sheet Feeder«.

Cut Sheet

Cut sheets are fed between the platen and different transport rollers.

Cut Sheet Feeder (CSF)

By means of a cut sheet feeder the printer can process a stack of cut sheets without having to re-feed every single sheet. Cut sheet feeders with two feeding devices are also available.

Decimal

A term for a digit of the decimal system (based on the number 10).

DIP Switch (Dual Inline Package)

A DIP switch is an electronic component, often a series of small switches. It serves to pre-set the printer.

Dot

The smallest addressable unit in bit maps. One bit is assigned to every dot. The bit can have the value 1 for black (set dot) or 0 for white (non-set dot).

Dot Matrix Printer

The print characters are made up of dots (dot matrix). The needles strike the colour ribbon onto the paper and produce a dot. Depending on the number of pins 9-, 18- and 24-pin printers are distinguished. The needles are arranged in one or two columns. Common needle diameters are 0.3 mm for 9-pin printers and 0.2 mm for 24-pin printers. The resolution depends on the needle size, it defines the typeface.

dpi (dots per inch)

The graphic resolution is given in dots per inch. Usual resolutions for needle printers are between 60 and 288 dpi.

Driver

See »Printer Driver«.

Duplicates

With print-sensitive paper or duplicating paper with carbon duplicates (copies) can be made, because the printing is performed by stroke. Three duplicates for 24-pin printers and four duplicates for 9-pin printers are common.

Emulation

Emulation means that the functions of a device are imitated, for example the printer functions of the IBM ProPrinter. In general, your dot matrix printer offers additional commands and printer functions apart from the given options which can be made available by selecting the correct printer driver.

Epson Emulation

In the selected emulation the printer imitates the chosen printer type and performs the print commands of an Epson LQ printer (24 needles), for example.

Escape (ESC)

Escape is a non-printable control character of the ASCII character set (decimal 27, hexadecimal 18). Most print commands are initiated by the Escape-character.

FF

See »Form Feed«.

Font

A font is defined by the combination of different characteristics such as print quality or character spacing.

Form Feed (FF)

This printer command terminates one page and outputs it. By pressing the FF-key a form feed can be performed manually.

Hexadecimal

A term for a digit of the hexadecimal system (with a base of 16). The figures 0 to 9 and additionally the letters A to F (for the numbers 10 to 15) are used.

IBM Emulation

In the selected emulation the printer imitates the chosen printer type and can perform the print commands of the IBM ProPrinter, for example.

Impact Printer

A printer which transmits the characters to the paper by mechanical strokes. See also »dot matrix printer«.

Inch

One inch is equivalent to 2.54 centimetres. Technical data (resolution, for example) is given in inches.

Interface

An interface is a connection between computer and printer to perform the data exchange. Interfaces can be parallel or serial: parallel interfaces (Centronics) transmit data simultaneously byte-by-byte. Serial interfaces transmit data successively bit-by-bit.

Italics

A type style with characters that slant upwards to the right.

KByte

1024 bytes are one kilobyte.

Landscape

The paper is printed parallel to the longitudinal edge.

Letter Quality (LQ)

This font is only available for 24-pin printers because it requires a high resolution of the characters due to small needle diameters. By additional dots between the character matrix a uniform typeface is achieved. The print speed is reduced.

Line

A line is a horizontal sequence of characters. The width of a line is defined by the right and the left margin (beginning of the line). The line spacing (lpi, lines per inch) determines the height of a line.

Line Feed (LF)

This printer command transports the paper one line ahead. By pressing the LF-key a line feed can be performed manually. Most times a carriage return is also performed to move the print head to the beginning of the line.

Line Spacing

Common line spacing for the print of characters are 6 and 8 lines per inch (lpi). When printing graphics the selected line spacing must ensure that the lower needles adjoin the upper needles of the next line.

lpi (lines per inch)

The vertical distance of the print lines is given in lines per inch. Common values are 6 or 8 lpi.

Main Internal Storage (Random Access Memory, RAM)

In this write-read memory (random access memory) the data received is stored and prepared for line-by-line printout. Depending on the type the printer memory can be enlarged with additional modules and therefore relieve the computer. The contents of the RAM are lost, when the printer is switched off.

Matrix Printer

The characters are made up of a matrix of single dots. See »dot matrix printer«.

MByte

1024 bytes are one megabyte.

Memory

See »Main Internal Storage/RAM«.

Menu

By means of the menu you may select most of the functions of your printer such as paper format and emulation. The menu is selected via the operating screen.

Near Letter Quality (NLQ)

This font is available for most 9-pin printers, but it does not reach the print quality of letter quality.

OCR (Optical Character Recognition)

The OCR-code consists of exactly defined characters which can be read by every OCR-device.

Off-line

In this state the printer no longer receives data and is on stand-by. In the off-line mode you can modify the menu setting.

On-line

In this operating state data can be received, processed, and printed.

Parallel Interface

Connection element to transmit data between printer and computer. In a parallel interface the eight bits of one byte are transmitted simultaneously via eight data lines. Other signal lines control the data transmission (handshake).

Parameter

Most commands require additional variables which are mainly figures. These parameters are given either as printable ASCII characters or as decimal or hexadecimal figures.

Pitch

See »cpi«.

Platen

The platen transports the paper and acts up as a pad for the stroke of the needles. See also »dot matrix printer«.

Port

A port is an interface of the computer or printer to exchange data.

Printer Driver

A printer driver is a kind of »translator« to convert the text and graphic commands of a software program into a language understandable for the printer.

Print Head

The print head comprises the needles which strike the ribbon onto the paper. See also »dot matrix printer«.

Program

The operating system controls the basic functions of the computer such as input, output, and system administration. Word processors, spreadsheets or graphic programs can be operated by means of application programs.

Proportional Font

Each character occupies solely the space of its actual width. »l« requires less space than »m«, for instance. By using proportional fonts documents get a font-like, professional look. See also »set character spacing«.

Protocol, Handshake

A protocol secures the data transmission. Depending on the interface the printer outputs a message by control characters or separate signal lines that the receiving memory is full and is able to ensure a correct data reception and transmission.

Random Access Memory (RAM)

See »Main Internal Storage«.

Reset

Systems (computer, printer) are returned to their initial state.

Resident

A term used in data processing with respect to contents of the RAM.

Resolution

The resolution of the print depends on the pin diameter of the print head. The resolution is mostly measured in dots per inch (dpi). For graphics the resolution varies from 72 dpi (9-pin printer) up to 300 dpi (24-pin printer).

ROM (Read-Only Memory)

In this read-only memory which cannot be changed the firmware - the control program of the printer - is stored (emulation and control of the printing mechanism).

RS-232C Interface

A serial interface according to an American standard. It corresponds to the international ITU standard V.24 in conjunction with V.28 and German standard DIN 66020.

Serial Interface

A connection for data transmission (successively bit-by-bit) between printer and computer. Serial interfaces are suited for longer distances. See also »RS-232C«.

Set Character Spacing

Similar to typewriter fonts every character occupies the same space regardless of its actual width. See also proportional fonts. The character spacing is given in characters per inch (cpi).

Shift-Key

By pressing this key a second key function is activated.

Transportation Unit

It transports continuous paper safely and exactly. The spikes of the transport rollers grip the punched holes of the paper to push it or pull it.

For pushing, the transportation unit feeds the continuous paper from the reverse or bottom side through the printing mechanism.

For pulling, the transportation unit pulls the paper from the top side from the printing mechanism.

Unidirectional Print

The printer prints only in one direction (from the left to the right). Especially suited for the precise print of graphics.

Appendix G: Trademarks

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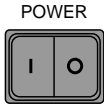

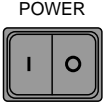












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Siemens and *High Print* are registered trademarks of Siemens Nixdorf Informationssysteme AG.

Appendix H: Short reference

Test (available fonts)		+	ON	
Test (ASCII-sample)		+	ON	
Hex dump mode				
		+	ON	
Reset printer menu				
		+	ON	
Reset top of form				
		+	ON	
Reset printer menu and top of form				
		+	ON	

Print mode ()

Line Feed 

Form Feed / Load paper 

Print mode ()

Form tear off



Park position, sprocket paper



Activate/Deactivate Quiet mode

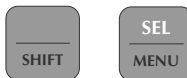


Activate Menu mode



Menu mode ()

Activate Menu mode



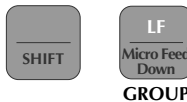
Print all menu items



Select menu group



Select previous menu group



Select menu item



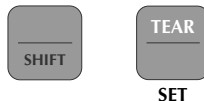
Previous item of a menu group



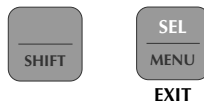
Select menu value (set)



Previous value of a menu group

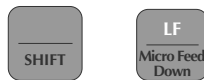


Save and exit menu mode



Top Of Form (^{SEL})

Micro feed down



Micro feed up



Save Top Of Form



Reset Top Of Form to default



Print position ()

Indicate print position



PRINT QUALITY



Set print position to the left



Set print position to the right



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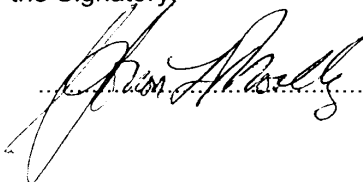
herewith declare that the equipment described below meets the requirements of the EMC directive 89/336/EEC.

Description of equipment:	24 Pin Dot Matrix Printer	
Model Number :	GE7200B	
Model Name:	ML 3390	
Applied standards:	EN50082-1/1992 (IEC801-2/1984) (IEC801-3/1984) (IEC801-4/1988)	EN50081-1/1992 (EN55022 Class B) EN61000-3-2/1995 EN60950

Name of Authorised Signatory: Mr Gordon L Woolley

Position of the Signatory: Director / General Manager

Signature



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20 Nov 96

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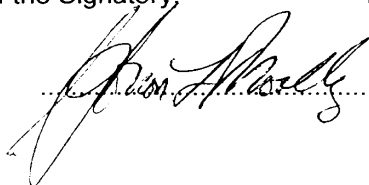
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