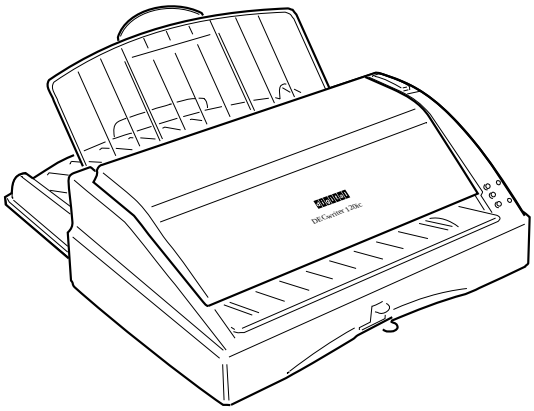
DECcolorwriter 120ic Printer

User Guide



Order Number: EK-LJ12E-UG-001

DECcolorwriter 120ic Printer

User Guide

Order Number: EK-LJ12E-UG-001

Digital Equipment Corporation
Maynard, Massachusetts

First Printing, August 1994

International Standards Conformity

This equipment conforms to the specifications of the EEC Directive 87/308 on the prevention and elimination of radio-frequency disturbances.

Si dichiara che questa apparecchiatura è conforme alle disposizioni della direttiva CEE/87/308 per la prevenzione ed eliminazione dei radiodisturbi (D.M. 13 aprile 1989).

Ce matériel est conforme aux normes CEE/87/308 sur la prévention et l'élimination des perturbations radio-électriques.

Dieses Gerät entspricht den EWG 87/308 und VDE 0871 Bestimmungen für Verhütung und Beseitigung von Funkstörungen.

Este aparato responde a las especificaciones de la norma CEE/87/308 sobre la prevención y eliminación de radiointerferencias. La localización e indentificación de los elementos antiparasitarios se halla descrita en el manual de asistencia técnica del producto.

NOTE: This equipment has been tested and found to comply with the limits for a CLASS B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet of a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for assistance.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Connection of peripherals requires the use of grounded shielded signal cables.

This digital equipment does not exceed the CLASS B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Industry Canada.

Ce dispositif numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de CLASSE B prescrites dans la norme sur le matériel brouilleur : "Appareils Numériques", NMB-003 édictée par le ministère des Communications.

Normenkonformität und Zulassungen

Dieses Gerät entspricht den BMPT-Verfügungen 243/1991 und 46/1992 sowie DIN VDE 0878 Teil 3/11.89, zur Vermeidung von Funkstörungen. Zusatz für periphere Geräte (z.B. Monitore, Drucker)

Dieses Gerät trägt als Hinweis, daß es den Funk-Entstöranforderungen der BMPT- Verfügung Nr. 243/1991 entspricht, das VDE-Funkschutzzeichen. Der Zusatz "Vfg. 243/P" soll in Kurzform ausdrücken, daß es sich um ein peripheres (nicht selbständig betreibbares) Gerät handelt, das nur einzeln den Funk- Entstöranforderungen der Grenzwertklasse B nach DIN VDE 0878 Teil 3/11.89 und der BMPT-Verfügung 243/1991 entspricht.

Wird das Gerät innerhalb einer Anlage zusammen mit anderen Geräten betrieben, muß bei Inanspruchnahme der "Allgemeinen (Betriebs-) Genehmigung" nach der BMPT-Verfügung 243/1991 die gesamte Anlage der Grenzwertklasse

B nach DIN VDE 0878 Teil 3/11.89 sowie den Voraussetzungen nach 2 und den Auflagen nach 3 der BMPT-Verfügung 243/1991 entsprechen.

Dies ist in der Regel nur dann erfüllt, wenn das Gerät in einer Anlage betrieben wird, die typgeprüft und mit dem VDE-Funkschutzzeichen mit dem Zusatz "Vfg. 243" gekennzeichnet ist.

Für Geräte welche der DPR-Verfügung 1046/1984 entsprechen und dem VDE- Funkschutzzeichen mit dem Zusatz "0871-B/P" gekennzeichnet sind, gilt obiges sinngemäß.

GS Dieses Gerät ist nach dem Gerätesichereitsgesetz GSG i.d.F. vom GS 13.8.1979 3 Abs. 4 geprüft.

Netzleitung

Netzleitung muß geprüftem Typ H05VV entsprechen.

Schallemissionswerte

Werteangaben nach ISO 9296 und ISO 7779 / DIN EN27779 :

	Schalleistungspegel LwAd,B		**Scalldruckpegel LpAm, dBA (Zuchauerpositionen)**	
	Leerlauf	**Betrieb**	**Leerlauf**	**Betrieb**
Draft	- -	6,3	- -	47
Briefqualität	- -	6,1	- -	46

[Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital Equipment Vertretungen erhältlich. 1 B = 10 dBA.]

Limited Warranty

Digital Equipment Corporation warrants to the purchaser that this product is free from defects in workmanship and materials and will perform substantially in accordance with the documentation accompanying the product for a period of two years from the date of purchase of this product. Digital's warranty does not apply to conditions resulting from improper use, external causes, or modifications to this product. Digital does not warrant that the operation or execution of the product shall be uninterrupted or error-free. This limited Warranty does not apply to any third party software products which come with their own software product warranty, if any.

Some jurisdictions do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Digital will either repair, refurbish, or replace the product through a standard, Return-to Digital Warranty. The purchaser pays for one-way transportation and insurance to the return center authorized by Digital's Technical Support and Service Hotline. For customers outside the United States of America, a different local warranty may apply. To obtain details, contact your local Digital sales office or place of purchase.

For warranty services under your Return-to-Digital Warranty within the continental United States of America, please call our toll-free Technical Support and Service Hotline at: 1-800-354-9000, push 42 for warranty operator. In Canada call 1-800-267-5251 (English), or 1-800-267-2603 (French). For customers in other parts of the world, please call your local sales office for support and service. Retain your dated sales receipt as your proof of purchase and warranty. You will also be asked to furnish Model and Serial Numbers.

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Some jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which depend on local law.

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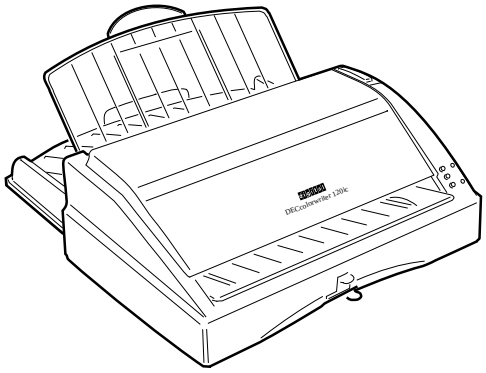
Preface

This chapter introduces the features of the DECcolorwriter 120ic printer and explains the purpose and the structure of the documentation set.

Congratulations on your purchase of the DECcolorwriter 120ic. This non-impact printer is designed and constructed to guarantee excellent reliability. It will give you consistent print quality of both text and high resolution graphics. It also offers high speed printing associated with the advantage of compact size and quiet operation.



Features

A number of benefits are provided by the DECcolorwriter 120ic, including the following:

High quality color printing

Your printer allows you excellent color printing, using "drop on demand" thermal ink jet technology. It produces a laser-like print density of up to 300 x 300 dots per inch (dpi). For monochrome printing, note that the black ink is water-resistant.

Multimedia printing

The standard paper handling devices allow the use of a wide range of media types and sizes: paper or transparencies single sheets (Letter, A4, Legal...), envelopes (COM-10, DL...). The Printer Drivers are specially designed to optimize printing using these different media.

Low cost ownership

The monochrome print head has a rechargeable system which allows you to only change the ink cartridge, instead of changing the whole print head. Furthermore, the DECcolorwriter 120ic Printer Driver includes an Economy mode designed to save ink.

The DECcolorwriter 120ic has a very low power consumption (25 W - less than a standard light bulb). This consumption is conformable to EPA (Environment Protection Agency) norms.

Ease of use

The user-friendly driver interface and the simple operator panel make this printer very easy to use. A Setting Up Your Printer booklet is also provided to help you quickly install your DECcolorwriter 120ic.

Compatibility

This printer can be connected to personal computers with a standard parallel or optional serial interface. Compatible with MS-Windows and many other software applications commonly used with this class of printer, it can be used in most working environments. The resident firmware emulates the HP DeskJet 500C printer (extended PCL-III commands).

Numerous options

Additional emulations (EPSON LQ 850, IBM Proprinter X24, including character sets), RAM and fonts, which increase and extend the printer's operating range, are available as options.
The serial interface kit represents another useful option.

Configured in the appropriate operating environment, this compact size printer is the ideal output tool for Word Processing and Desktop Publishing applications.

The Documentation Set

The Setting Up Your Printer Booklet

This is a quick guide that contains everything you need to know to install your printer for the first time. It may also be useful to read the Preface and Chapter 1 of the User Guide to get to know your printer thoroughly before you start.

The User Guide

This manual contains all the information required to install, configure and operate the printer. It is intended for use by both first-time and experienced users.

The Structure of the Manual

The manual is structured for consecutive and reference reading. We recommend you read and follow all the instructions carefully. Always refer to the manual whenever you encounter a problem. The objectives of the chapters are as follows:

Chapter 1 - Introducing DECcolorwriter 120ic
This chapter helps you check you have received everything you need, locate the most suitable environment for the printer, and identify the various parts and controls on the printer.

Chapter 2 - Getting Started
This chapter shows you how to insert the paper input tray, mount the paper output tray, load paper, connect the printer to your computer and to the power outlet, install the ink jet print head, run the printer self test, install the Windows Printer Drivers, and run the Windows print tests.

Chapter 3 - Operating the Printer
This chapter discusses the types of media you can use with your DECcolorwriter 120ic printer. It also describes how to print within the Windows 3.1x environment.

Chapter 4 - Maintenance
This chapter helps you perform day-to-day maintenance during the printer's working life.

Chapter 5 - Troubleshooting
This chapter contains a troubleshooting guide, for problems which may occur, and how to solve them. It also contains information on how to contact Digital Services Centers when you require support.

A series of appendices describe the accessories and options available, the resident and optional fonts, DOS printer controlling, the characters tables, the command codes for the resident emulation and the technical characteristics.

The manual also contains a glossary of terms and an alphabetical index.

NOTE: In the sections regarding the logical connection to the computer, and the installation and use of software, this manual can provide only a general outline with some basic hints. For more detailed information, you must consult the documentation of your operating system and application packages.

Conventions

The text contains three different types of annotation which should always be read.

NOTE: This NOTE gives you, or indicates where you can find, additional information.

CAUTION: *This CAUTION should catch your attention, advising you of a particular situation / problem which may occur / be avoided as a result of a certain sequence of operations.*

It may also contain a reminder to execute a particular operation.

WARNING: This WARNING indicates a specific procedure which must be strictly observed.

Failure to comply with the instructions given may result in injury to the operator and / or damage to the printer.

1

Introducing DECcolorwriter 120ic Printer

This chapter helps you check you have received everything you need, choose the most suitable environment for the printer, and identify the various parts and controls.

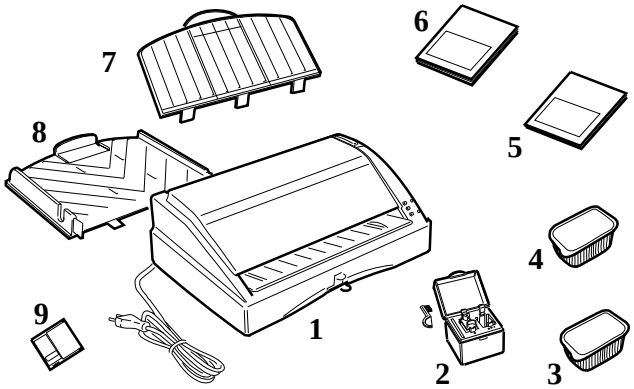
Unpacking the Printer

- Lay down the carton flat, with the opening to one side.
- Take the storage box, the plastic box and the printer out of the carton. Remove all packing and securing tapes from the printer and its accessories. You may also remove the label on the top cover.

CAUTION: *Keep the carton and all the packing materials in case you have transport the printer any distance, relocate it, or return it to Digital Services for maintenance.*

As soon as you have unpacked the printer and its accessories, check that all the parts have been delivered and are undamaged.

Carton Contents



Carton contents

1. Printer
2. Print head storage box

Plastic box

3. Monochrome print head
4. Color print head
5. Setting Up Your Printer booklet
6. DECcolorwriter 120ic Printer User Guide
7. Paper output tray
8. Paper input tray
9. DECcolorwriter 120ic Printer Drivers diskette

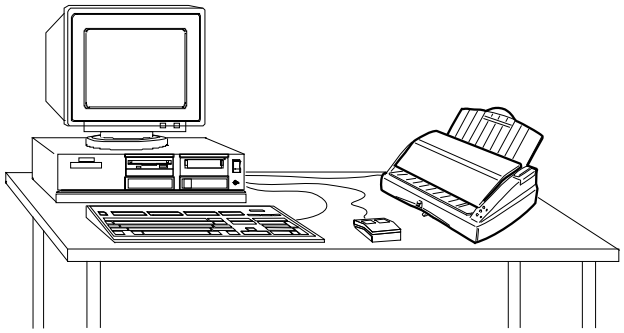
CAUTION: *If anything is missing or damaged, call your dealer immediately.*

Printer Location

Place the printer on an ample, flat, stable surface near to your computer.

Make sure there is a convenient, independent power outlet to which you can connect the printer.

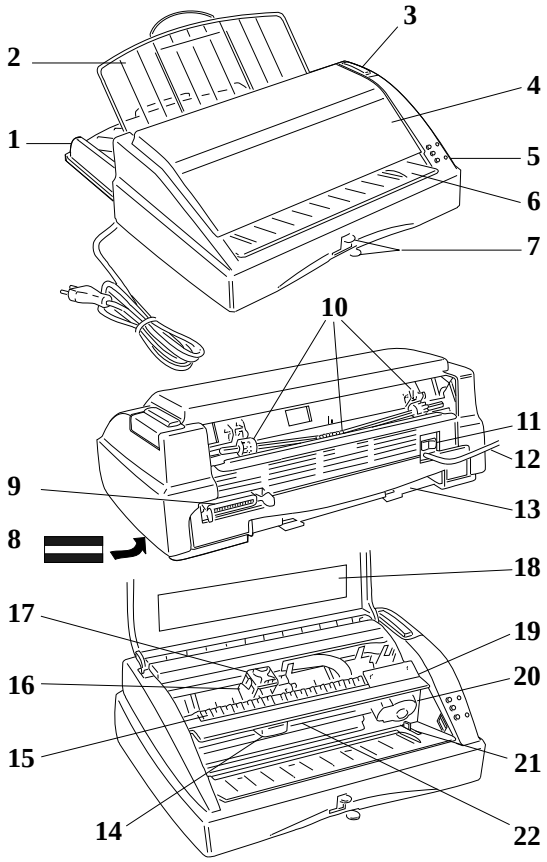
Do NOT leave the printer exposed to direct sunlight or heat sources, or in dusty or dirty environments.



Printer location

Make sure that there is enough space around the printer for all its parts to be accessed comfortably.

Printer Parts



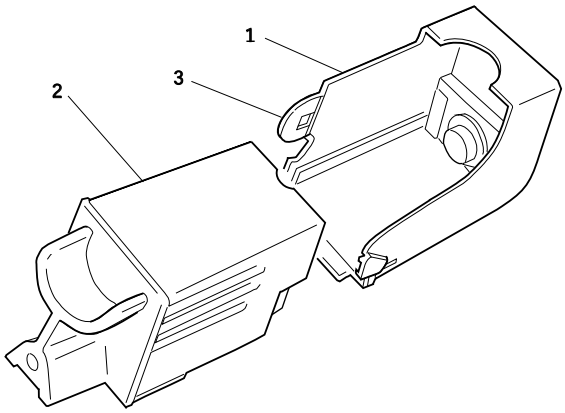
Front / rear / inside views

The figures on the previous page show a front, rear and internal front view of the printer. The following parts are indicated :

1. Paper input tray
2. Paper output tray
3. Slot for optional emulation / font card (covered)
4. Top cover
5. Operator panel
6. Paper insertion guide (for manual paper feed)
7. Paper loading (securing and centering) levers
8. Electrical data plate (on underside of printer)
9. Parallel interface cable socket
10. Mounting slots for paper output tray
11. Main ON/OFF switch
12. Power cable
13. Paper input tray insertion area
14. Ink slide
15. Selector switches
16. Print head carriage
17. Ink jet print head
18. Instruction template on inside top cover
19. Selector switches cover (open)
20. Carriage motor
21. Print head selection lever
22. Ink tube

Monochrome Print Head

The monochrome (black ink) print head consists of an outer casing (**1**), with the nozzles and electrical contacts, and a replaceable ink cartridge (**2**) which fits inside the outer casing and is held in place by the ring (**3**).



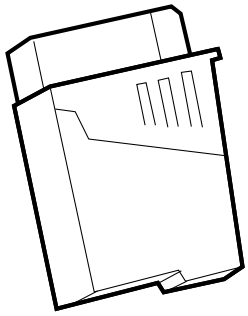
Monochrome print head

NOTE: For information on how to insert / remove the print head in / from the printer, see the sections entitled "Installing the Print Head" in Chapter 2 of this manual and "Changing the Print Head" in Chapter 4 of this manual.

NOTE: For information on how to replace the ink cartridge, see the section entitled "Replacing the Monochrome Ink Cartridge" in Chapter 4 of this manual.

Color Print Head

The color print head is larger than the monochrome print head and includes an ink cartridge with three ink reservoirs for colored inks. Unlike the monochrome print head, the color print head and ink cartridge are a single unit and cannot be replaced separately.

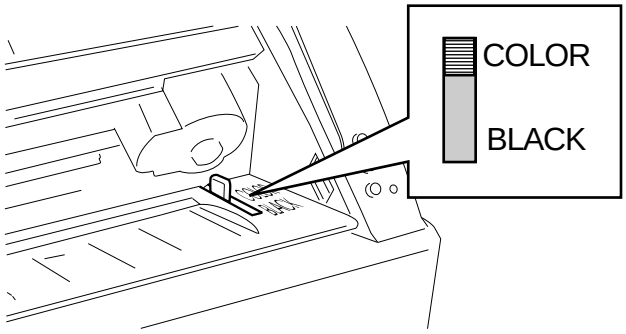


Color print head

NOTE: For information on how to insert / remove the print head in / from the printer, see the sections entitled "Installing the Print Head" in Chapter 2 of this manual and "Changing the Print Head" in Chapter 4 of this manual.

Print Head Selection Lever

The print head selection lever is located on the manual paper insertion guide, under the top cover.



Print head selection lever

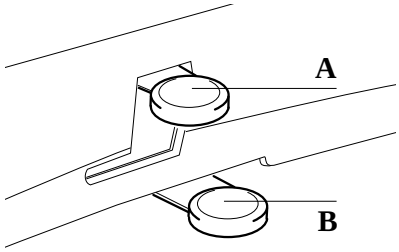
This lever must be positioned on the BLACK position, towards the front of the printer (according to the indications engraved near the lever) when a monochrome (black ink) print head is used.

If the color print head is inserted, this lever must be positioned on the COLOR position, towards the inside of the printer (according to the indications engraved near the lever).

NOTE: For information on the positioning of the print head selection lever, see the sections "Installing the Print Head" in Chapter 2.

Paper Loading Levers

On the lower front of the printer there are two levers which control the centering and the securing of the paper in the paper tray. On the inside of the top cover, the template illustrates the functions of these levers for the paper loading operation.



***A**: Paper securing lever - **B**: Paper centering lever*

Paper Securing Lever (Upper Lever A)

To release the paper:

- Lower and move to the left.

To secure the paper:

- Move to the right and raise.

Paper Centering Lever (Lower Lever B)

To open the lateral guides:

- Move to the right.

To close the lateral guides and centre the paper:

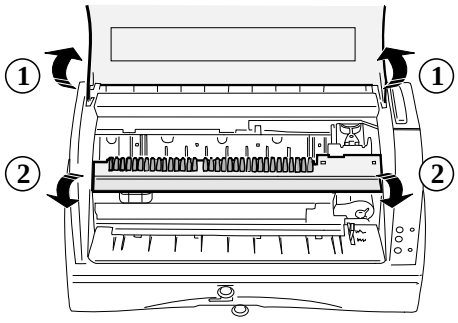
- Move to the left.

Selector Switches

Selector switches are used on this printer to select functional features, such as resident font used, character style, paper size...

To access the selector switches:

- Lift up the top printer cover (**1**).
- Open the selector switches cover (**2**). A label identifies the different selector switches.



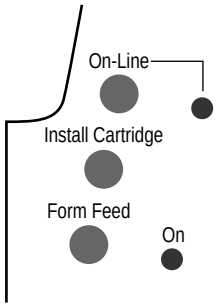
Opening the selector switches cover

The different selector switches settings are displayed on the label located inside the top cover.

NOTE: For more information about selector switches settings, see Appendix C "Printer Controlling".

Operator Panel

The operator panel, on the right hand side of the printer, has three buttons and two indicators (LED: Light-Emitting Diodes).



Operator panel

Indicators

On Line

- Lit	Indicates that the printer is in the ON LINE operating state (under operator and computer system control).
- Flashing slowly	Indicates that there is no paper in the printer or that the paper is loaded incorrectly (warning operating state).
- Flashing rapidly	Indicates a failure operating state.
- Off	Indicates that the printer is in the OFF LINE operating state (under operator control only).

On

- Lit	Indicates that the printer is switched on, and remains lit until the printer is switched off.

On-Line + On

- Flashing alternately	Indicates an end of ink condition or that no print head is installed.
- Flashing sequence	**On-Line** *twice followed by* **On** *once* Indicates incompatibility between the type of print head inserted and the print head selection lever position.
- Flashing sequence	**On-Line** *five times followed by* **On** *once* Indicates that the print head inserted does not match the data received from the printer (the Printer Driver requires a different print head type).

At printer switch-on, after the correct execution of the mechanical reset, the **On** and **On-Line** indicators will both be lit and steady.

Buttons

The button functions depend on the printer operating states. When it is switched on, the printer will be in one of the following conditions:

Operating States

- ON LINE — **On-Line** *indicator lit*

  The printer is ready to receive data.

- OFF LINE — **On-Line** *indicator off*

  State imposed by the operator, who has pressed the On-Line button. Any printing operation is suspended. Return the printer to the ON LINE operating state by pressing the On-Line button.

- WARNING — **On-Line** *indicator flashing slowly*

  State caused by lack of paper or incorrectly loaded paper during a printing operation. Load paper carefully and then return the printer to ON LINE operating state by pressing the On-Line button.

- WARNING — **On-Line** *and* **On** *indicators flashing alternately*

  State caused by end of ink condition. Load new print head, and then return the printer to ON LINE operating state by pressing the Install Cartridge button.

- WARNING	**On-Line** *and* **On** *indicators flashing with the sequence* **On-Line** *twice followed by* **On** *once* State caused by incompatibility between the type of print head inserted and the position of the print head selection lever. Load the correct type of print head and / or position the print head selection lever correctly, and then return the printer to the ON LINE operating state by pressing the Install Cartridge button.
- WARNING	**On-Line** *and* **On** *indicators flashing with the sequence* **On-Line** *five times followed by* **On** *once* State caused by incompatibility between the type of print head inserted and the Printer Driver loaded. Insert correct type of print head, and then return the printer to the ON LINE operating state using the Install Cartridge button.

Functional States

One of the following states will be present in the ON LINE or OFF LINE operating states.

- FREE	No data to be printed.
- BUSY	From the reception of data until the completion of its printing.
- IDLE	Data to be printed, but awaiting a Form Feed command (from console or line).

Buttons Functions

- On-Line	Toggles the printer ON LINE / OFF LINE operating states. Affects the **On-Line** indicator status.
- Install Cartridge	Positions the print head carriage for a print head replacement operation. Replacement request signalled by status of **On** and **On-Line** indicators. Replacement anomalies signalled by status of same indicators.
- Form Feed	*Printer ON LINE and FREE* Commands the manual insertion of a single sheet of paper to the Top of Form (TOF) position, even if insertion from the paper tray is selected (selector switch C OFF). If paper is already present in the printer, causes its expulsion.

- Form Feed — *Printer ON LINE and BUSY, paper already inserted*

  Executes the "FLUSH" function which consists of the immediate printing of any pending data, and the expulsion of the printed page.

- Form Feed — *Printer OFF LINE and paper already inserted*

  Expels the paper present in the printer.

- Form Feed — *Printer OFF LINE and no paper in the printer*

  Commands the manual insertion of a single sheet of paper to the Top of Form (TOF) position, even if insertion from the paper tray is selected (selector C OFF).

Functions Activated with Button Combinations

Function	Button(s)	Operation
Print test	Install Cartridge + mains switch	*Before activating this function, check that there is paper loaded in the paper tray.* Pressing and holding down this button while switching on the printer starts the print test (see Chapter 2).
Hexa-decimal printing	On-Line + Install Cartridge + mains switch	*Before activating this function, check that there is paper loaded in the paper tray.* Pressing and holding down these buttons while switching on the printer causes all subsequent data transmitted to the printer to be printed in hexadecimal format (see Appendix C)

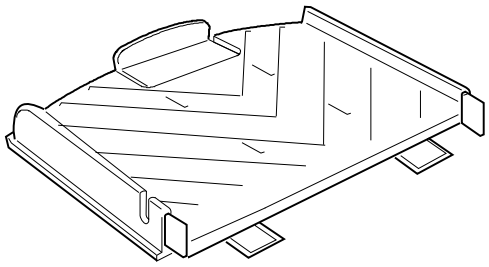
2

Getting Started

This chapter describes how to insert the paper input tray, mount the paper output tray, load paper into the printer, connect the printer to your computer and to the power outlet, insert the print head in the printer, run the printer self test, install the Windows drivers from the diskette supplied with the printer and run the Windows print test from Write.

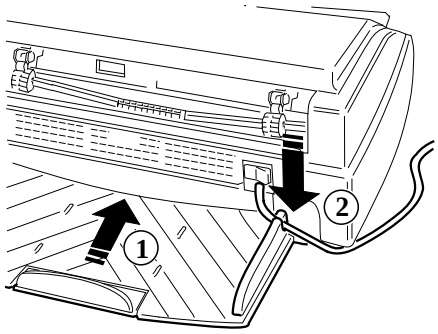
Inserting the Paper Input Tray

Paper is fed into the printer from a tray which is located in the base of the printer (ASF - Automatic Sheet Feeder). Before loading any paper, you must mount the external part of the ASF, which is supplied as a separate piece with the printer. The paper input tray can contain 70 x 21 lb (80g/m2) sheets of paper (Letter, A4...).



Paper input tray

- Align the mounting feet of the paper input tray with the support slots on the printer and push the paper tray into the base of the printer (**1**).
- Fit the power cable in the notch on the right side of the tray (**2**).

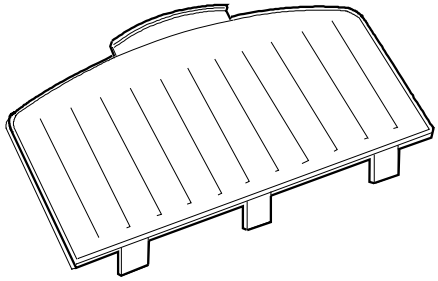


Inserting the paper input tray

CAUTION: *Push the external part of the paper tray in as far as it will go, against the printer casing.*

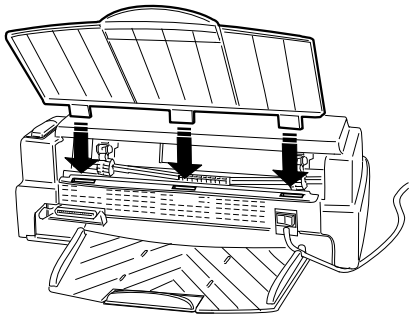
Mounting the Paper Output Tray

Printed pages are expelled from the printer into an output tray which is fitted to the upper rear of the printer. This clear plastic tray is supplied as a separate piece with the printer. The paper output tray can contain up to 30 x 21 lb (80 g/m2) sheets. Its central part must be extended in order to support the printed pages correctly.



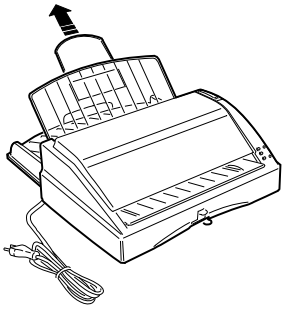
Paper output tray

- Insert the paper output tray feet into the corresponding slots in the rear casing of the printer.



Mounting the paper output tray

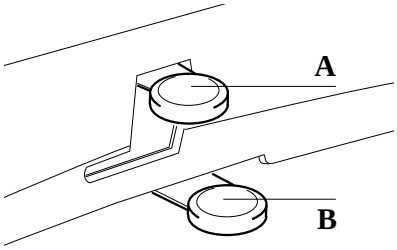
- Pull out the extendible support of the paper output tray to ensure the ejected sheets of paper are properly supported by the printer.



Pulling out the extendible support

Loading Paper into the Printer

On the lower front of the printer there are two levers which control the centering and the securing of the paper in the paper tray. On the inside of the top cover, the template (identified ASF) illustrates the functions of these levers for the paper loading operation (the numbers in brackets in the following explanation represent the operation steps).

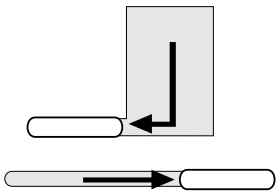


***A**: Paper securing lever - **B**: Paper centering lever*

NOTE: For information on the types of paper you can use, the printing side, manual insertion and the page layout, see the section entitled "Media Characteristics" in Chapter 3.

To load the paper:

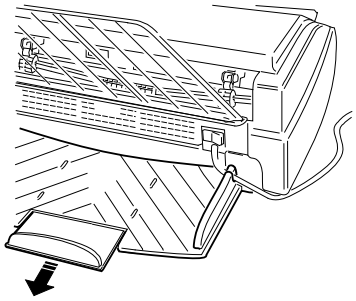
- Move the lower lever **B** to the right (**2** on the top cover template), to release the lateral guides which keep the paper centred.
- Lower and move to the left the upper lever **A** (**1**).



Moving the levers to insert the paper

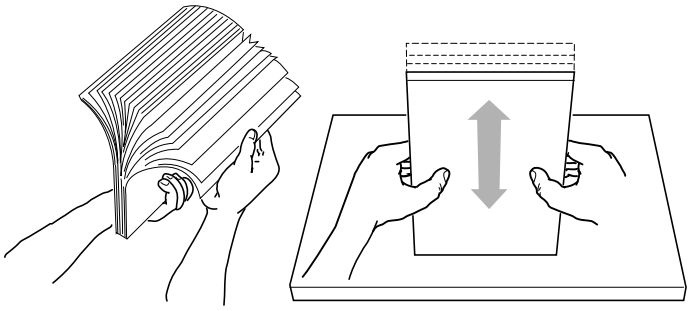
CAUTION: *Take care not to force the levers, so that the paper guides hold but DO NOT CRUMPLE the paper.*

- To simplify paper loading, pull out the extendible rear guide on the paper tray.



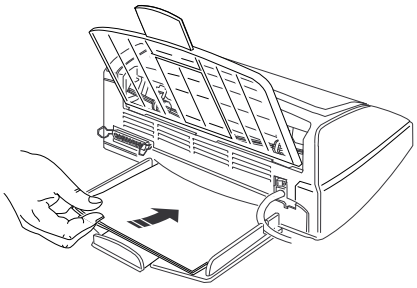
Extending the input tray guide

- Fan the paper thoroughly to reduce static build-up, and ensure the edges of the paper are neatly stacked, so that the individual sheets feed smoothly through the printer.



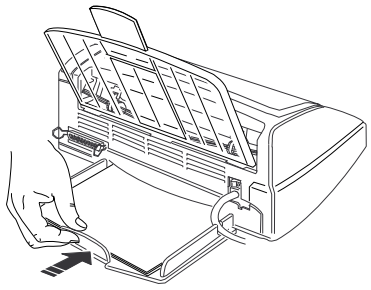
Fanning the paper

- Load the paper in the tray, pushing it in carefully until it stops against the bottom of the printer.



Loading paper in the input tray

- Position the rear guide against the rear edge of the paper.

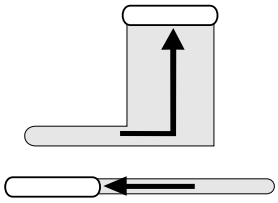


Closing the input tray

CAUTION: *Do NOT force into the tray more paper than that permitted by the physical limit of the printer casing (tray capacity approximately 70 x 21 lb sheets of paper).*
Printing on both sides of the paper may increase the risk of misfeeds or paper jams.

- Once you have inserted the paper, gently move the lower lever B to the left to close the lateral guides and centre the paper (4).

- Move the upper lever A to the right and raise it (5).



Moving the levers to secure the paper

CAUTION: *Make sure the paper feeds smoothly and that it is not held too tightly nor that it has too much play.*

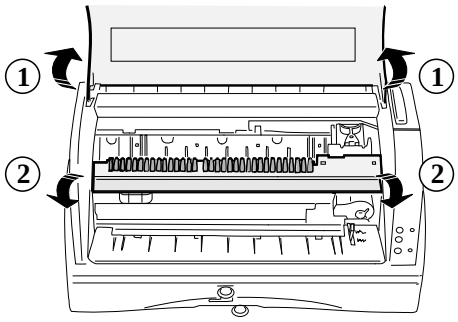
Checking the Selector Switches

Selector switches are used on this printer to select functional features, such as resident font used, character style, paper size...

CAUTION: *Check that the* ***Paper Size*** *selector switch #3 is ON and that all the other selector switches are OFF. This is the default setting for Letter size paper.*

To check the selector switches settings:

- Lift up the top printer cover (**1**).
- Open the selector switches cover (**2**).



Opening the selector switches cover

- Check that all the selector switches are OFF (DOWN position, according to the top cover label), except the **Paper Size** selector switch #3 (ON: UP position).
- Close the selector switches cover and then the top cover.

NOTE: For more information on the selector switches settings, see the section entitled "Selector Switches Set-Up Procedure" in Appendix C.

Connecting to the Computer

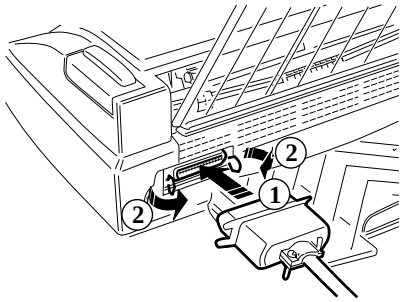
Your printer is connected to a computer by means of an interface cable.

CAUTION: *The parallel interface cable is not included in the printer package. Your dealer can supply you with the necessary interface cable.*

This printer uses a parallel, Centronics-like interface with a 36-pin female connector.

Connecting the Parallel Interface Cable

- Switch off first your printer.
- Plug the interface cable connector into the socket on the rear of the printer (**1**), and close the spring clips on either side of it to hold it in place (**2**).



Inserting the parallel interface cable

- Connect the other end of the interface cable to the appropriate interface connector socket (port) on your computer.

NOTE: For printer handling by the computer, see the "Installing the Windows Printer Drivers" section and Chapter 3 "Operating the Printer".

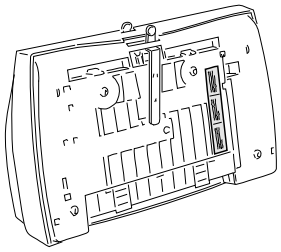
Connecting to the Power Outlet

CAUTION: *BEFORE connecting the printer to the power outlet and / or switching it on, read all the following points carefully.*

WARNING: The manufacturer declines all responsibility for accidents to persons or damage to the printer arising from the non-observance of the following procedure.

CAUTION: *Make sure the power outlet supplies the voltage indicated on the electrical data plate on the base of the printer.*

WARNING: If the electrical data plate indicates a different voltage, call your dealer immediately. DO NOT, UNDER ANY CIRCUMSTANCES, CONNECT OR SWITCH ON THE PRINTER.



Electrical data plate

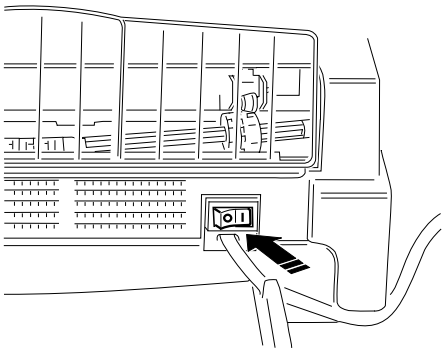
- Make sure that the plug on the power cable is of the type accepted by the power outlet you intend to use; if it is not, call your dealer.

  Do NOT attempt to change the plug yourself.

- Make sure the printer is switched OFF **BEFORE** plugging into the power outlet socket (see "Switching On the Printer" section).

Switching On the Printer

After checking ALL the previous points, and ONLY if no further intervention is required, plug into the power outlet socket and switch on the printer (the **On** indicator lights).



Switching on the printer

Whenever the printer is switched on:

- It undergoes a series of internal checks.
- It any faults are found, the **On-Line** indicator on the operator panel will flash rapidly. Should this happen, switch the printer off and then on again. If the fault persists, call your dealer or the technical assistance service.
- A mechanical reset is executed and the switches selectors are read. The print head carriage stops in the extreme right-hand position (rest position).
- If no faults are found, the printer will be in ON LINE condition (**On** and **On-Line** indicators lit).

- Switch off the printer.

NOTE: *If you have had any problems, check that you have executed correctly all the procedures described in this section; if you have, see the Chapter 5 "Troubleshooting".*

Installing the Print Head

The monochrome print head has an "ink detection" sensor which guarantees optimum printing quality by allowing the timely replacement of the print head or ink cartridge.

The following procedure applies to both print heads (monochrome and color).

To install a print head:

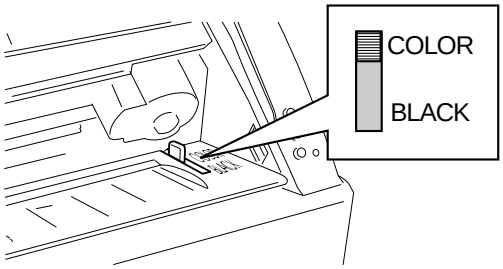
- Switch on the printer.

CAUTION: *Before installing a print head, check that the print head selection lever matches the print head type you intend to insert.*

- Lift up the top printer cover.
- Press the Install Cartridge button on the operator panel.

  The print head carriage moves to the print head loading position, at the centre of the carriage shaft (the **On** and **On-Line** indicators start flashing alternately).

- Move the selection lever (located on the right side of the inside paper guide) to the position that matches your print head type, according to the indications engraved near the lever.

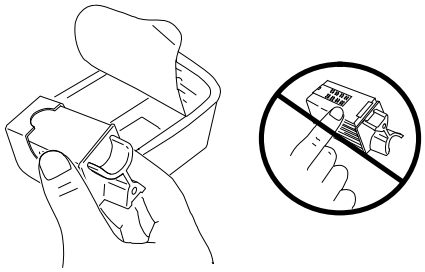


Print head selection lever

If the lever position does not match the print head type, the print head will not return to its rest position and the **On-Line** and **On** indicators will flash in sequence (**On-Line** twice followed by **On** once).

- Open the sealed print head container.
- Remove the print head from its container, holding it by the casing, at the opposite side from the protective tape.

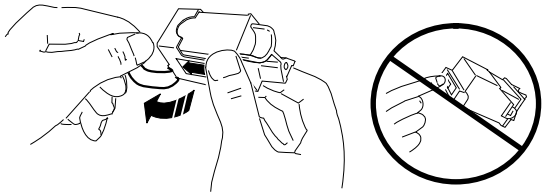
CAUTION: *Do not touch the electrical contacts or sit the print head on them.*



Removing the print head from its container

- Still holding the print head casing, **remove the transparent protective tape**, pulling its tab end in the direction indicated by the arrow.

CAUTION: *Do not touch the printing nozzles or sit the print head on them.*

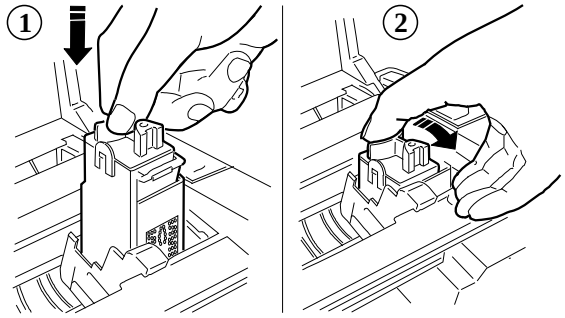


Removing the protective tape

- **With the electrical contacts facing towards the front of the printer**, insert the print head in its carriage by:

  1. Pushing it down into the carriage

  2. Pulling it towards the front of the printer until it clicks



Inserting and blocking the print head

  If the print head is correctly installed and matches the selection lever position, the indicators stop flashing.

- Close the top cover and press the Install Cartridge button on the operator panel.

  The print head carriage moves to the print head storage position, at the right of the carriage shaft.

If you have problems inserting the print head:

- Make sure the print head carriage is in the print head loading position.
- Check that the print head chamber is clean and free of foreign bodies.
- Check that the print head selection lever position is compatible with the type of print head inserted.
- NEVER force the print head into the chamber.

CAUTION: *If you have problems when inserting the print head, always remove it completely and repeat the entire insertion operation.*

NOTE: To remove the print head, see the "Changing the Print Head" section in the Chapter 4 "Maintenance".

Running the Printer Self Test

Before running the printer test, please check the following:

- Printer is switched off
- Paper is loaded in the tray
- Paper securing lever (**A**) is in the **Lock position** (upper position)
- Print head is properly installed

To start the printer self test:

- Hold down the Install Cartridge button on the operator panel, while you switch on the printer.
- Keep holding down the Install Cartridge button until the printer begins printing.
  - With a monochrome (black ink) print head, the automatic print test produces 4 test sheets.
  - With a color print head, a single test sheet is produced.

If there is no paper in the printer, the **On-Line** indicator will flash slowly. You must load paper in the paper input tray and then press the Form Feed button.

To suspend the print test temporarily:

- Press the On-Line button (pressing this button a second time will cause printing to resume).

To abandon the print test:

- You must switch the printer off.

Once the test is completed and the last sheet of paper expelled, the printer will go automatically into ON LINE condition.

Check the print quality of the test, making sure that all the characters are clearly defined and complete.

NOTE: If any problem occurs, see Chapter 5 "Troubleshooting" of this manual for corrective actions.

Printer Self Test Contents

Monochrome Print Head

If you have inserted a black print head, the print test will require at least four sheets of paper (see the examples on the pages which follow).

- Check that all the characters are clearly defined and complete.

First Page

The first line of the print test contains information on the printer status:

- At the left hand margin: the resident (or selected) emulation
- At the right hand margin: the name, date of issue and level of the printer firmware.

The second line of print test indicates the print head type and is followed by the print head test which allows you to check whether any dots are missing. A list of defective nozzles (if any) is indicated after the test. The defective nozzles are identified by their number after the text: "Nozzles test Fail on". Otherwise, the text "Nozzles test Pass" is printed.

NOTE: If there are defective nozzles, see the section entitled "Priming the Monochrome Print Head" in Chapter 4 "Maintenance" for the possible solutions to this problem. Then repeat the print test.

Then follows a list of the current feature settings (Set-Up), with a graphic representation of the selector switches positions (small black rectangles: OFF position, large black rectangles: ON position).

The currently selected character set table appears at the bottom of the test.

Second and Subsequent Pages

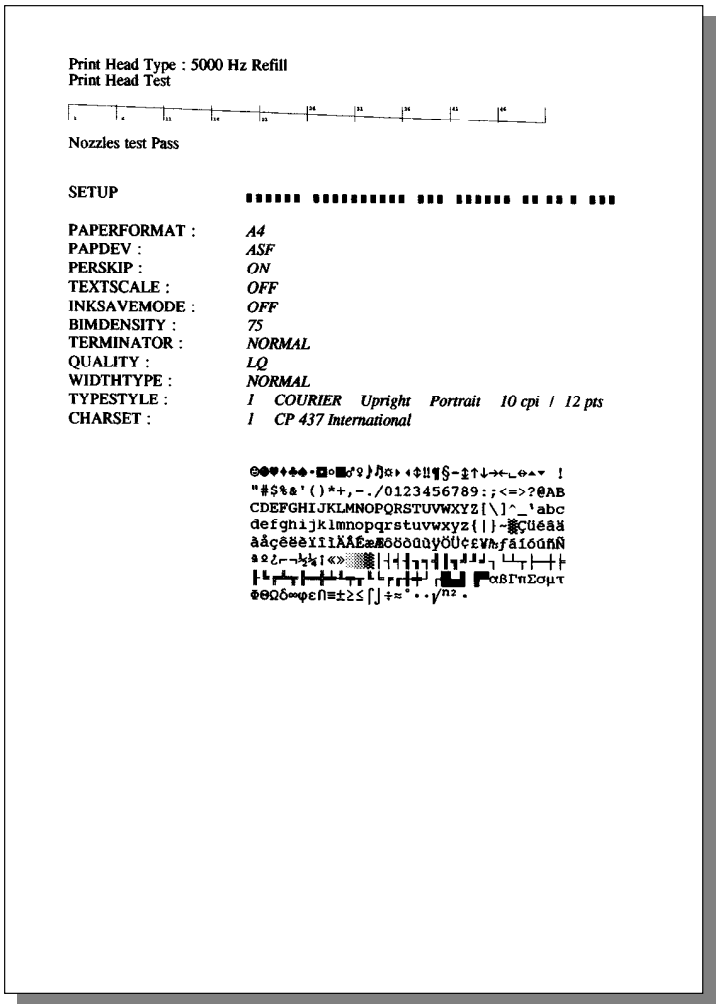
Samples of the resident (and, if present, optional) fonts in **portrait** and / or **landscape** with all their attributes (see the section entitled "Selector Switches Set-Up Procedure" in Appendix C and the section entitled "Resident Fonts" in Appendix B).

Color Print Head

If you have inserted a **color** print head, the print test will require one sheet of paper. The print test will consist of three graphic samples (one for each of basic colors in the print head) from which you can check the correct operation of each group of nozzles.

- Check that the colored bands are bright and consistent in hue.

NOTE: In case of problems, refer to the Chapter 5 "Troubleshooting".



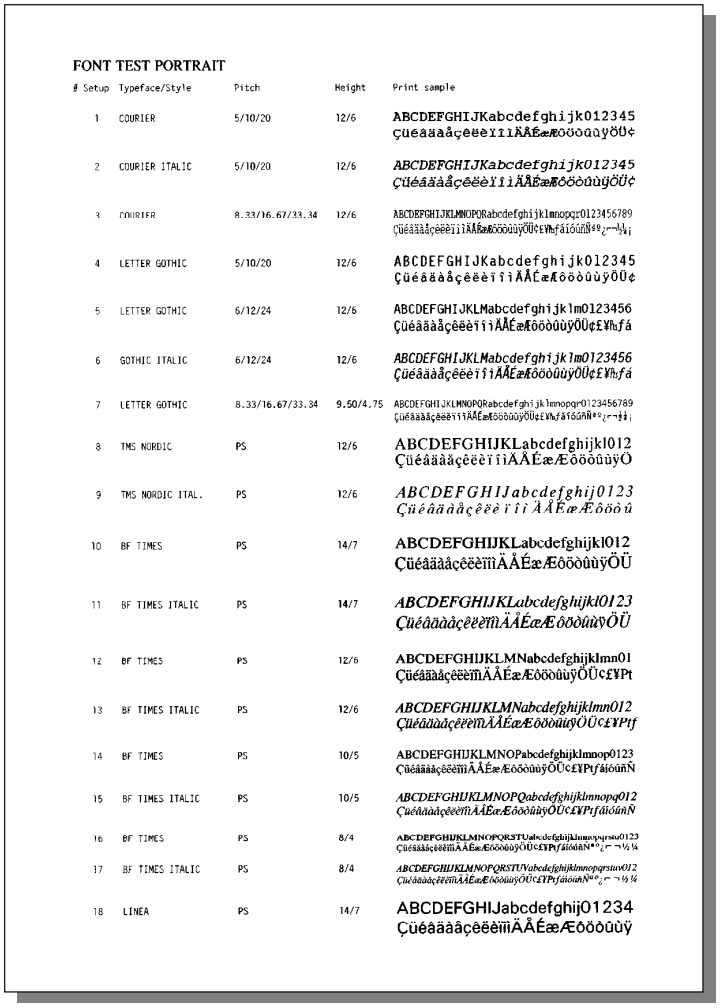
Print Head Type : 5000 Hz Refill
Print Head Test

Nozzles test Pass

SETUP

PAPERFORMAT :	*A4*
PAPDEV :	*ASF*
PERSKIP :	*ON*
TEXTSCALE :	*OFF*
INKSAVEMODE :	*OFF*
BIMDENSITY :	*75*
TERMINATOR :	*NORMAL*
QUALITY :	*LQ*
WIDTHTYPE :	*NORMAL*
TYPESTYLE :	*1 COURIER Upright Portrait 10 cpi / 12 pts*
CHARSET :	*1 CP 437 International*

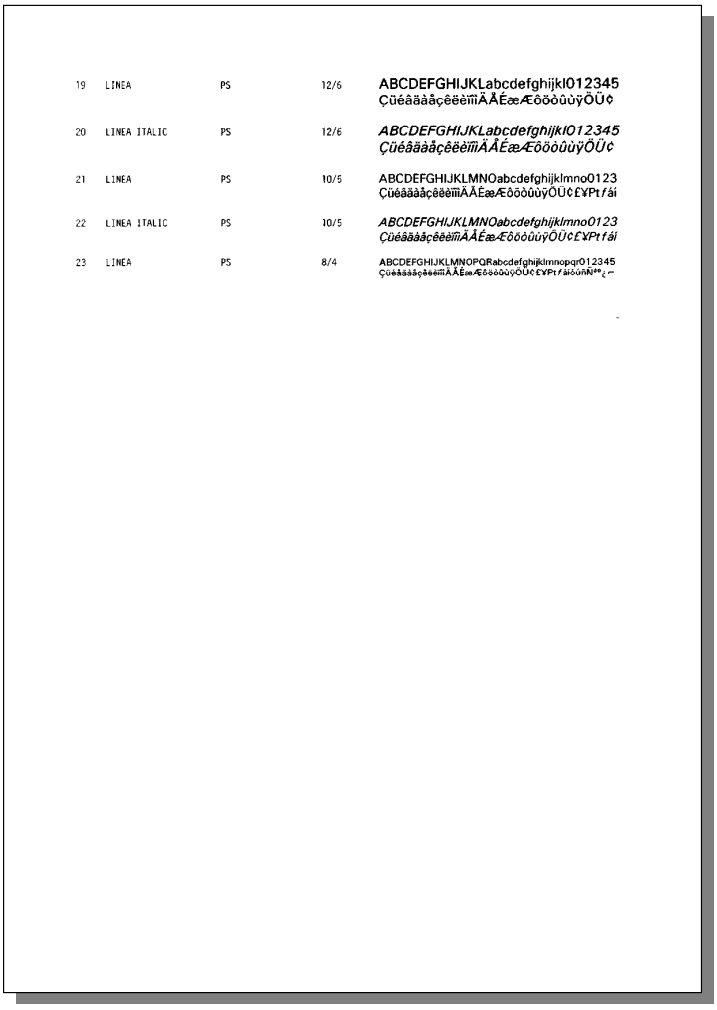
Example of monochrome print test: Page 1



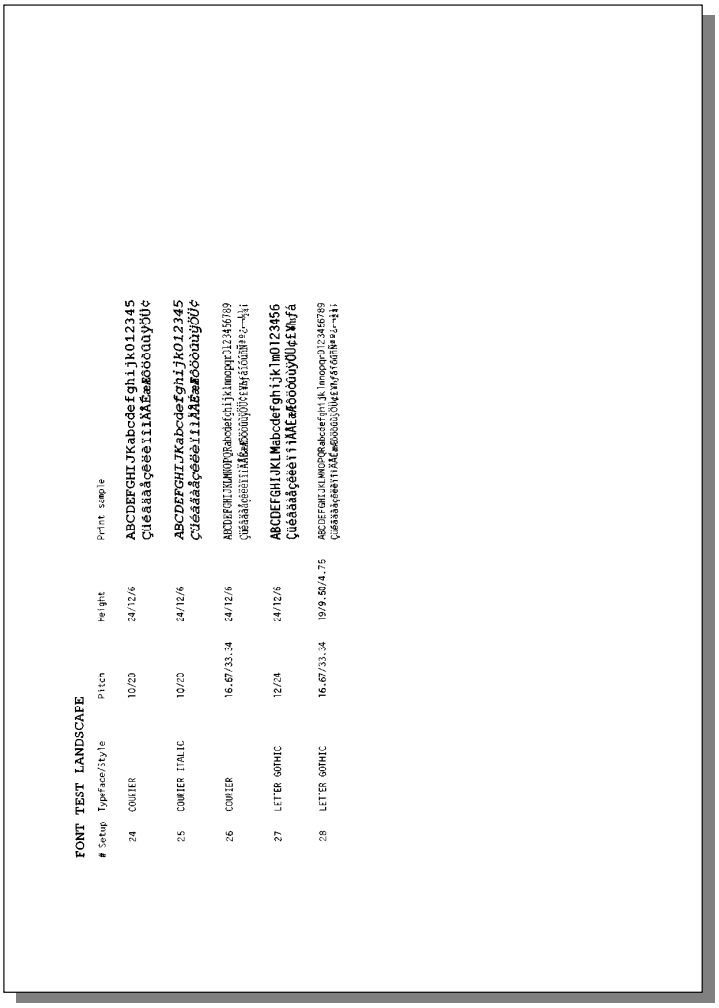
FONT TEST PORTRAIT

# Setup	Typeface/Style	Pitch	Height	Print sample
1	COURIER	5/10/20	12/6	ABCDEFGHIJKabcdefghijk012345 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢
2	COURIER ITALIC	5/10/20	12/6	*ABCDEFGHIJKabcdefghijk012345* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢*
3	COURIER	8.33/16.67/33.34	12/6	ABCDEFGHIJKLMNOPQRabcdefghijklmnopqr0123456789 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢¥ƒáíóúñÑ°¿¬½¡
4	LETTER GOTHIC	5/10/20	12/6	ABCDEFGHIJKabcdefghijk012345 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢
5	LETTER GOTHIC	6/12/24	12/6	ABCDEFGHIJKLMabcdefghijklm0123456 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥ƒáíóúñÑ
6	GOTHIC ITALIC	6/12/24	12/6	*ABCDEFGHIJKLMabcdefghijklm0123456* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥ƒáíóúñÑ*
7	LETTER GOTHIC	8.33/16.67/33.34	9.50/4.75	ABCDEFGHIJKLMNOPQRabcdefghijklmnopqr0123456789 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥ƒáíóúñÑ°¿¬½¡
8	TMS NORDIC	PS	12/6	ABCDEFGHIJKLabcdefghijkl012 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖ
9	TMS NORDIC ITAL.	PS	12/6	*ABCDEFGHIJabcdefghij0123* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòû*
10	BF TIMES	PS	14/7	ABCDEFGHIJKLabcdefghijkl012 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ
11	BF TIMES ITALIC	PS	14/7	*ABCDEFGHIJKLabcdefghijkl0123* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ*
12	BF TIMES	PS	12/6	ABCDEFGHIJKLMNabcdefghijklmn01 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Pt
13	BF TIMES ITALIC	PS	12/6	*ABCDEFGHIJKLMNabcdefghijklmn012* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Ptf*
14	BF TIMES	PS	10/5	ABCDEFGHIJKLMNOPabcdefghijklmnop0123 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Ptfáíóúñ Ñ
15	BF TIMES ITALIC	PS	10/5	*ABCDEFGHIJKLMNOPQabcdefghijklmnopq012* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Ptfáíóúñ Ñ*
16	BF TIMES	PS	8/4	ABCDEFGHIJKLMNOPQRSTUabcdefghijklmnopqrstu0123 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Ptfáíóúñ Ñ°¿¬½¼
17	BF TIMES ITALIC	PS	8/4	*ABCDEFGHIJKLMNOPQRSTUVabcdefghijklmnopqrstuv012* *ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥Ptfáíóúñ Ñ°¿¬½¼*
18	LINEA	PS	14/7	ABCDEFGHIJabcdefghij01234 ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿ

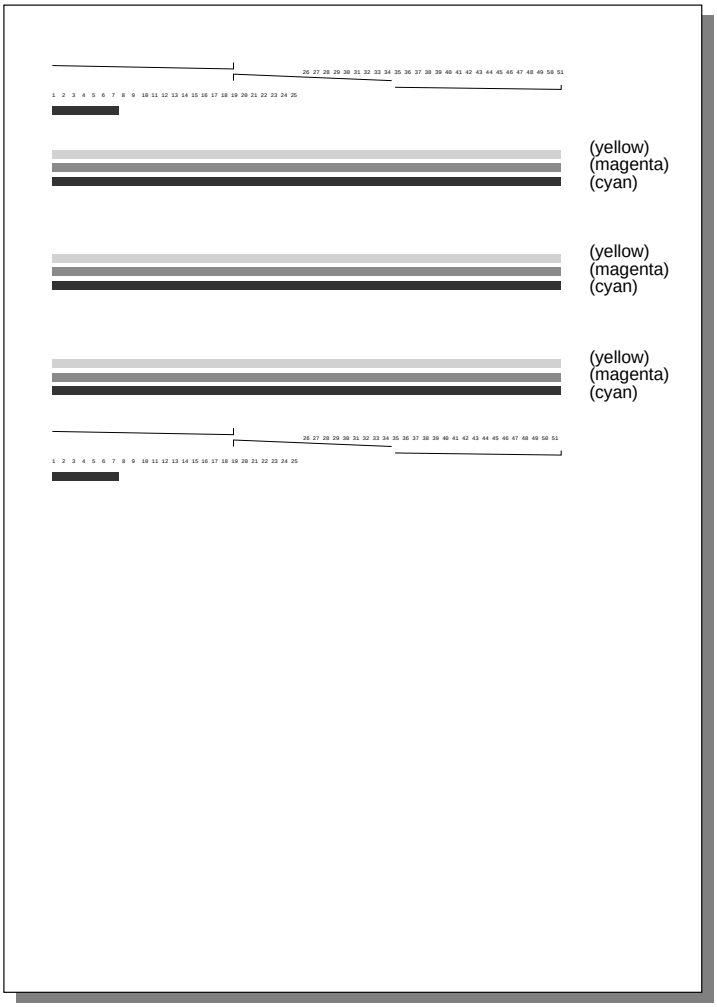
Example of monochrome print test: Page 2



Example of monochrome print test: Page 3



Example of monochrome print test: Page 4



Example of color print test

Installing the Windows Printer Drivers

Before you can print from a Windows 3.1x application, you must first install the two Windows printer control programs (printer drivers) that are provided on the Printer Drivers diskette.

NOTE: For more information about using Windows 3.1x, consult the Microsoft Windows User's Guide.

The **Digital DECwriter 110i** Printer Driver is designed to print text and grayscale graphics. The **Digital DECcolorwriter 120ic** Printer Driver is designed to print color graphics.

NOTE: For more information about selecting the proper printer diver, see the section "Selecting the Proper Windows Printer Driver" in Chapter 3.

For more information about the Printer Driver concept, see the section "Printer Drivers" in Appendix C.

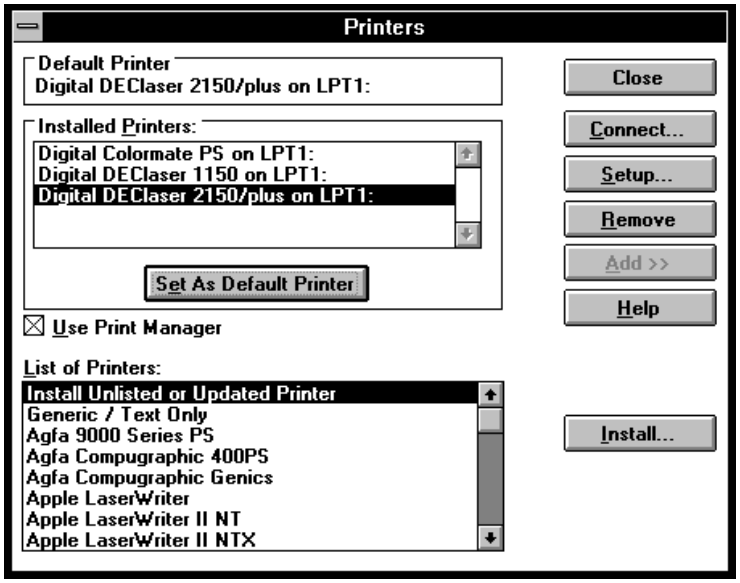
To install the Windows printer driver:

- Switch on your printer and PC.
- Insert the Driver diskette into your diskette drive.
- Start up Windows on your PC and do the following:
    1. In the **Main** window, double click on the **Control Panel** icon.

2. In the **Control Panel** window, double click on the **Printers** icon.

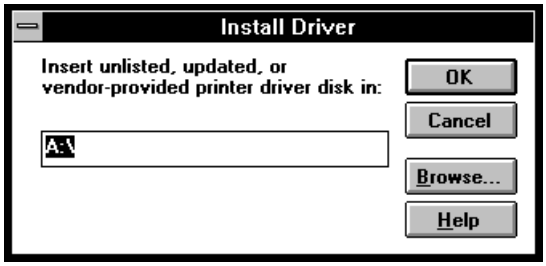
3. If the **Installed Printers** box is empty, go to the step 5 of these instructions.

4. If the **Installed Printers** box already contains one or more printer names, click on the **Add>>** button.

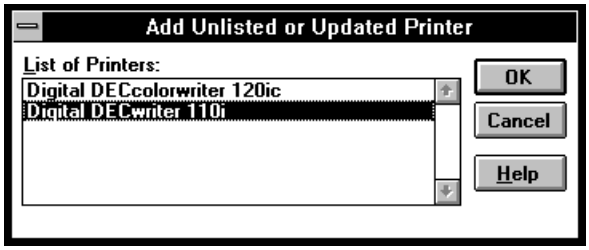


5. Check that the item **Install Unlisted or Updated Printer** in the **List of Printers** box is highlighted and then click once on the **Install...** button.

6. Check that the **Install Driver** dialogue box indicates the PC drive in which you have inserted your Driver diskette. If it does not, change the drive letter to the correct one.



7. In the **Add Unlisted or Updated Printer** window, select the **Digital DECwriter 110i** driver.

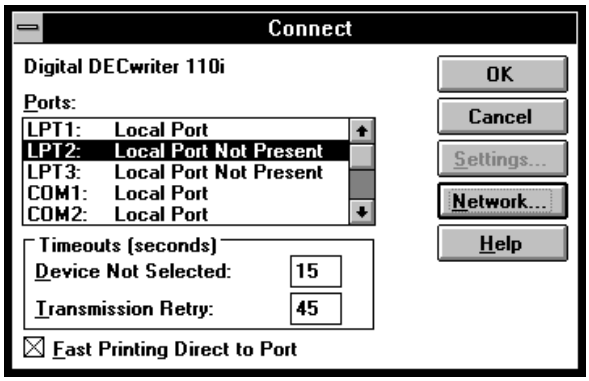


   The **Digital DECwriter 110i** driver then appears in the **Installed Printers** box.

8. Repeat steps 5 to 7 to install the **Digital DECcolorwriter 120ic** driver.

9. Check that the driver you intend to use is listed as connected to LPT1 port (or the port to which your printer is actually connected).

   If it is not, click on the **Connect...** button and choose **LPT1** (or the port to which your printer is actually connected) in the **Ports** list.



10. In the **Printers** window, select the driver you intend to use.

    Click on the **Set As Default Printer** in the **Printers** window and close the window to complete the installation.

Running the Windows Print Test

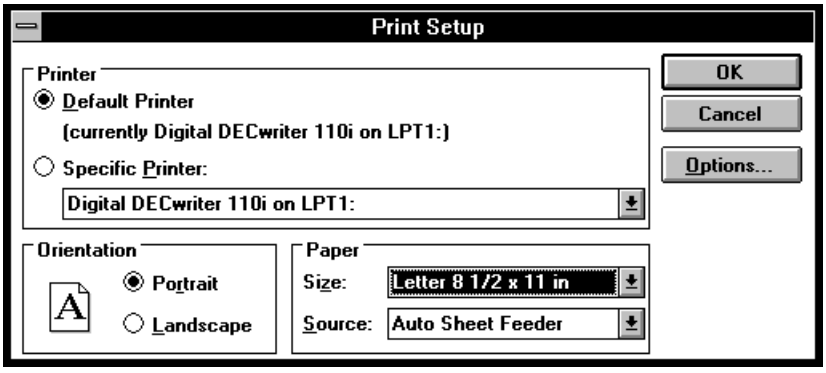
Before printing from a Windows 3.1 application, you can check your drivers are properly installed by printing the test files that are provided on the Driver diskette.

To run the Windows print test:

- Insert the Driver diskette in your diskette drive.
- Run the Write program, (refer to your Windows manual for instructions on running Write).

- From the **File** menu, choose **Open**.
- In the **Drives** box, select the drive where you have inserted the Printer Driver diskette, for example **A:**.
- In the **Directories** box, open the **tests** sub directory:
  - To run the print test with the monochrome print head, select the **testblk.wri** file.
  - To run the print test with the color print head, select the **testcol.wri** file.

- From the **File** menu, choose **Print Setup...**:
  - To run the print test with the monochrome print head, select the **Digital DECwriter 110i** driver in the **Specific Printer** list.
  - To run the print test with the color print head, select the **Digital DECcolorwriter 120ic** driver in the **Specific Printer** list.



- Check that the Letter paper size is selected in the **Paper** box.
- Click on **OK** button.
- Select **Print...** from the **File** menu.
- Check the quality of the print out.

Your printer is now set up for printing from Windows applications.

3

Operating the Printer

This chapter indicates the types and characteristics of the paper you can use, how to insert documents and envelopes manually and how to print colour and monochrome using the Windows printer drivers.

Media Printing Side

The printing side depends on the type of insertion. Knowing the printing side is very useful for printing on envelopes or preprinted paper, such as letterhead and overhead transparencies.

Automatic Insertion Printing Side

When using the Automatic Sheet Feeder, you have to load the pages with the side you want to print on **face down**. If you are using letterhead, insert the top of the paper first.

Manual Insertion Printing Side

When using the manual insertion (especially for the envelopes), you have to load the pages with the side you want to print on **face up**. If you are using letterhead, insert the top of the paper first.

Media Characteristics

The standard paper handling devices allow the use of a wide range of media types and sizes. The printer drivers are specially designed to optimize printing using such different media.

Paper Types

Most types of paper give good printing quality. Best results are obtained using standard photocopy paper, which has a paper weight of between 18 and 24 lb/ream (70 to 90 g/m2).

CAUTION: *Always test thoroughly the type of paper you intend to use. Sub-standard paper can affect the quality of printing.*

Make sure the sheets are inserted in the paper tray to print on the correct side of the paper (see indication arrow on paper wrapping, if present).

Printing on both sides of the paper may increase the risk of misfeeds or paper jams.

Transparencies

The DECcolorwriter 120ic can be used to print color transparencies for use with an overhead projector.

NOTE: Only Digital Equipment Corporation's LJ50X series transparency film gives satisfactory results. The film is specially formulated to absorb the ink. See Appendix A "Accessories and Options" for ordering information.

You can store or project transparencies 5 minutes after printing, but avoid touching the images.

Inserting Transparencies

When inserting transparencies (manually or with the Automatic Sheet Feeder), **insert the glued edge first**.

NOTE: See the section "Media Printing Side" in this chapter to properly insert the transparencies in the printer.

Dimensions

The following table contains the dimensions of the types of pages and envelopes which you can use in your printer:

Single Sheets	
US Letter	8.5 in x 11 in 215.9 mm x 279.4 mm
US Legal	8.5 in x 14 in 215.9 mm x 355.6 mm
US Exec	7.25 in x 10.5 in 184.2 mm x 266.7 mm
A4	210 mm x 297 mm 8.26 in x 11.7 in
A5 (landscape)	210 mm x 148.5 mm 8.26 in x 5.85 in
Free	210 mm x 462.4 mm 8.26 in x 18.5 in

Envelopes	
COM-10	241.3 mm x 104.7 mm 9.5 in x 4.125 in
DL	220 mm x 110 mm 8.66 in x 4.33 in
C5	229 mm x 165 mm 9.02 in x 6.5 in

Standard size single sheets can be inserted either automatically from the paper tray or manually through the front of the printer. Free format paper sizes must be inserted manually.

Inserting Envelopes

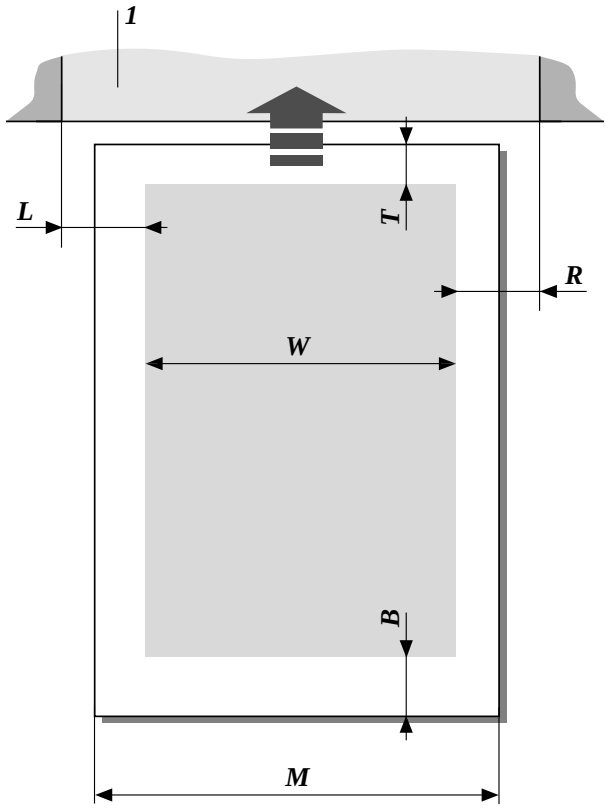
Envelopes can **only** be inserted manually.

- Align the short side against the guide on the right of the insertion slot, with the printing side face up and the sealing flap face down.

Print Area

The following figure and table give the measurements for the print area on the standard page sizes handled by the printer (all measurements are indicated in millimetres and inches). The printer can print a maximum of 60 lines on a Letter page with 6 lpi linespacing with default settings.

NOTE: This value can be increased to 66 lines with specific selector switches settings (**D and E** selector switches ON, see Appendix C).



*Dimensions identification (**1**: Printer mechanical path)*

Dimensions/ Page Format	M	W	L	R	T	B
Letter/Legal	215.9 mm 8.5 in	203.2 mm 8 in	6.4 mm 0.25 in	6.4 mm 0.25 in	1 mm 0.04 in	12.7 mm 0.5 in
US Executive	184 mm 7.25 in	184 mm 7.25 in	---	---	1 mm 0.04 in	12.7 mm 0.5 in
A4	210 mm 8.26 in	203.2 mm 8 in	3.4 mm 0.134 in	3.4 mm 0.134 in	1 mm 0.04 in	12.7 mm 0.5 in
A5	210 mm 8.26 in,	203.2 mm 8 in	3.4 mm 0.134 in	3.4 mm 0.134 in	1 mm 0.04 in	12.7 mm 0.5 in

Dimensions/ Envelope Format	M	W	T	B
COM-10	241.3 mm 9.5 in	241.3 mm 9.5 in	1 mm 0.04 in	12.7 mm 0.5 in
C5	229 mm 9.02 in	229 mm 9.02 in	1 mm 0.04 in	12.7 mm 0.5 in
DL	220 mm 8.66 in	220 mm 8.66 in	1 mm 0.04 in	12.7 mm 0.5 in

- **M**: maximum width of sheet
- **W**: maximum print line length
- **L**: minimum left margin
- **R**: minimum right margin
- **T**: minimum top margin
- **B**: minimum bottom margin

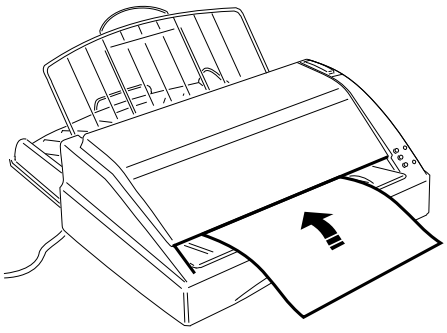
Inserting a Document Manually

To insert a document manually:

- With the printer switched on, position a sheet of paper on the paper guide, aligning it with the corresponding guide at the left edge of the insertion slot.

  Envelopes should be aligned with the guide on the right of the insertion slot. They should be placed with their short side against the guide and with the printing side face up and the sealing flap face under.

- Push the paper in until it stops against the feed rollers.



Manually inserting the paper

CAUTION: *If you intend to insert single documents systematically, you must first switch off the printer, set the selector C in its ON position and then switch the printer on again (see the section entitled "Selector Switches Set-Up Procedure" in Appendix C).*

The document / envelope must not be crumpled or torn, otherwise it may jam or even not be inserted.

- Press the Form Feed button; the paper will be fed in to the first print position.
- Send the text to be printed.

  Normally, after printing, the paper is expelled through the rear of the printer into the paper output tray. However, if the paper is not ejected, press the Form Feed button.

Printing with Windows Applications

All the features of the DECcolorwriter 120ic printer can be accessed within Windows applications after having installed the two Printer Drivers which are provided on the Driver diskette. These features allow you a great degree of control over your printer, both monochrome and color printing.

Selecting the Proper Windows Printer Driver

The **Digital DECwriter 110i driver** is designed to print text and grayscale graphics and allows you access to all installed fonts, including the resident fonts and optional card fonts. This driver is to be used **only** with a monochrome print head.

The **Digital DECcolorwriter 120ic driver** is designed to print color graphics. It allows you access only to soft fonts (such as TrueType and other installed scalable fonts) in the applications Characters menu, but the files using resident fonts can nevertheless be printed using graphic mode. You can use this driver with a monochrome or a color print head.

It is recommended to use the DECwriter 110i (monochrome) printer driver for all text intensive printouts such as word processing files, so that you can benefit from the faster printing of the resident printer fonts. You should use the color printer driver primarily for printing graphics files.

NOTE: You cannot print the printer's resident landscape fonts (Courier and Letter Gothic) in Windows landscape environment. To print in landscape, you must use the Windows screen fonts (TrueType, bitmap) or programmes such as FaceLift® (Bitstream).

Printer Drivers Setup

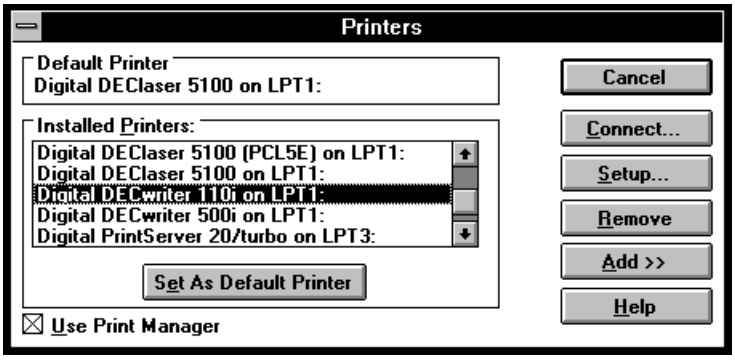
To apply the Drivers setup to the Windows applications you intend to use, change the parameters from the **Control Panel**.

To change the setup from the Control Panel:

- In the **Main** window, double click on the **Control Panel** icon.

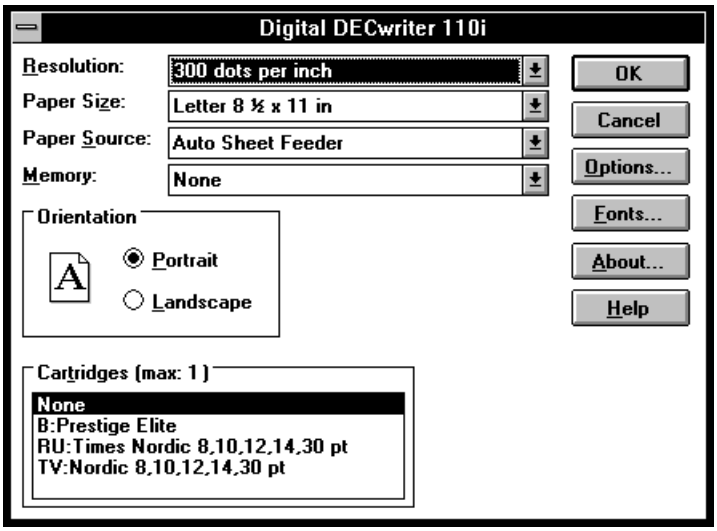
- In the **Control Panel** window, double click on the **Printers** icon.

- In the **Printers** window, select the Printer Drivers you intend to change.

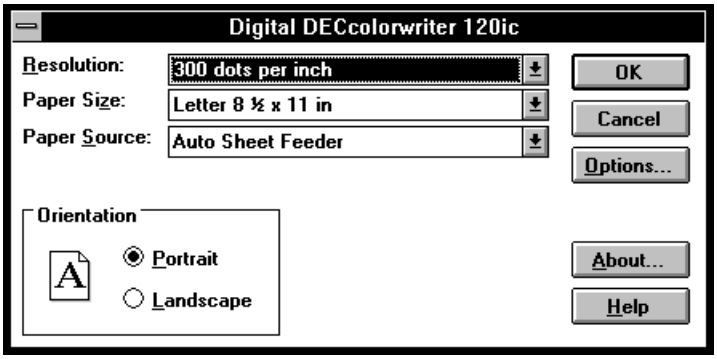


- Click on the **Setup...** button.

  The selected Printer Driver setup window appears:



Digital DECwriter 110i setup window



DECcolorwriter 120ic setup window

Common Setup Parameters

The following parameter settings apply to both Digital DECwriter 110i and DECcolorwriter 120ic Printer Drivers.

Resolution

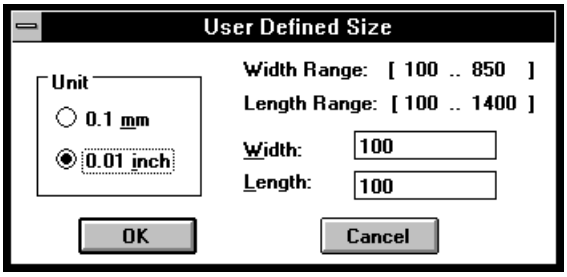
- 300 dots per inch
- 150 dots per inch
- 75 dots per inch

This allows you to select the graphic density for images printing. Select the higher resolution to obtain fine printing. By selecting the lower resolution, you will increase the printing speed.

Paper Size

Several sizes are available to define sheets or envelopes formats (Letter, Legal, Executive, A4, Envelope C5...).

The **User Defined Size...** option allows you to define your own specific page format.



Select the measurement unit and specify the width and the length of the sheet on which you intend to print. Respect the range specifications which are indicated in the window.

Paper Source

- Auto Sheet Feeder	Select this option to print on the paper loaded in the ASF - Automatic Sheet Feeder input tray. This is the default setting.
- Envelope Manual Feed	Select this option to print on manually inserted envelopes.
- Manual Feed	Select this option to print on manually inserted sheets.

Orientation

- Portrait
- Landscape

This option allows you to change the printing orientation. The small icon (an "**A**" in a page) near the buttons shows you what you have selected.

Specific Digital DECwriter 110i Setup Parameters

The following parameter settings apply only to the Digital DECwriter 110i Printer Driver.

Memory

- None
- 256 KB

You have to select the **256 KB** option if you have inserted the optional memory card in your printer (see the Appendix A "Accessories and Options" for more information about how to install it). Additional memory is necessary to load soft fonts in your printer.

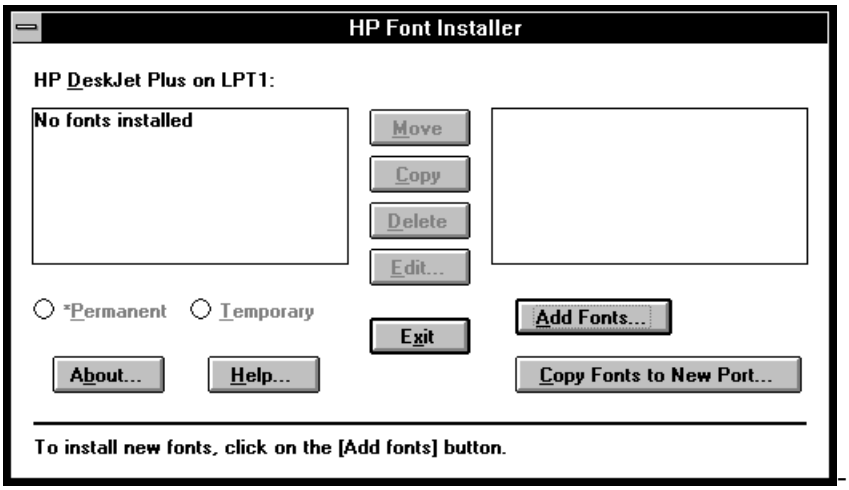
Cartridges

- None
- B:Prestige Elite
- RU:Times Nordic 8,10,12,14,30 pt
- TV:Nordic 8,10,12,14,30 pt

You have to select one of these fonts if you have inserted the corresponding optional font card in your printer (see the Appendix B "Fonts" for more information about the purpose of the font card, and how to install it). Then, the corresponding font will appear as a resident font in the Font list within your application.

HP Font Installer Window

The HP Font Installer is a tool for installing fonts temporarily or permanently in your printer. You access this tool by clicking on the **Fonts...** button.

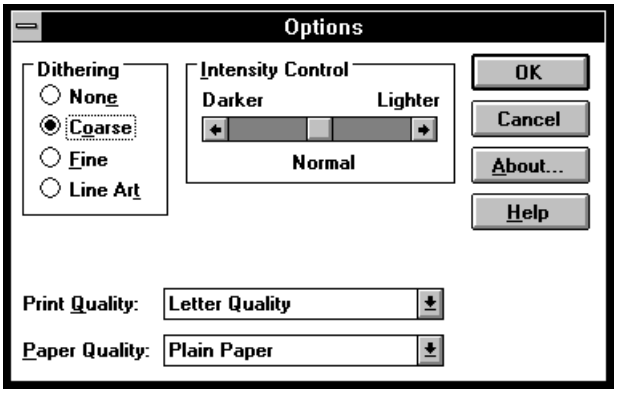


NOTE: For more information about the HP Font Installer, consult on-line help by clicking on the **Help...** button.

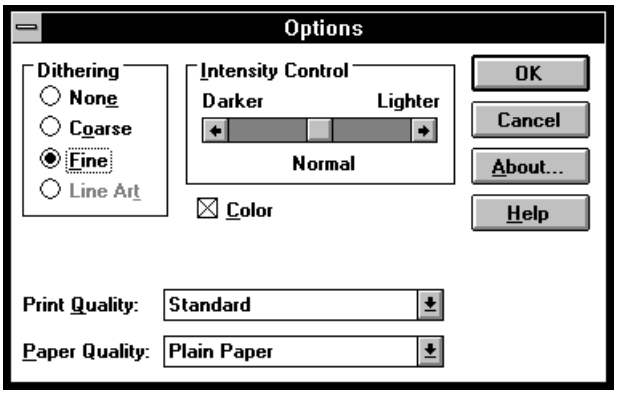
Common Setup Options

The following options settings apply to both the Digital DECwriter 110i and DECcolorwriter 120ic Printer Drivers.

- To access the **Options** window, click on the **Options...** button.



Digital DECwriter 110i Options window



Digital DECcolorwriter 120ic Options window

Dithering

This option defines the way that the colors are mixed for color printing or the tonal range of the grayscale for monochrome printing.

- None	Only prints in seven colors with a color print head and black and white with a monochrome print head.
- Coarse	Default value for 300 dpi resolution. Produces dark and thick printing
- Fine	Recommended for producing smoother images.

Intensity Control

This option increases or decreases the darkness of graphics. For best results the following recommendations are given:

- 1st choice	- **Dithering** = **Fine** - **Intensity**: set between **Normal** and **Lighter**
- 2nd choice	- **Dithering** = **Coarse** - **Intensity**: set at **Normal**

Print Quality

- Draft	**Draft** gives lowest resolution associated with fastest print speed.
- Presentation	**Presentation** is used for printing grayscale or color graphics. It gives the highest resolution associated with the slowest print speed.

Paper Quality

- **Plain Paper**
- **Transparency**

It is important to select the type of paper being used, as the ink will behave differently according to the surface.

Specific Digital DECwriter 110i Setup Options

The following options settings apply only to the Digital DECwriter 110i Printer Driver.

Dithering

- Line Art	For black printing only, when well defined borders between black and white and gray shades are required. Not recommended for scanned images.

Print Quality

- Letter Quality	**Letter Quality** gives the highest text resolution and the slowest print speed.

Specific Digital DECcolorwriter 120ic Setup Options

The following options settings apply only to the DECcolorwriter 120ic Printer Driver.

Color

Select this option and insert a color print head to obtain color printing.

NOTE: By deselecting this option, you can obtain monochrome printing by using a monochrome print head. See the section "Monochrome Printing with the DECcolorwriter 120ic Driver" in this chapter.

Print Quality

- Economy	**Economy** mode increases the print life of the ink cartridge with only a slight reduction of the **Standard** quality. **Draft** mode actually provides the longest print life, but a greater reduction in print quality.
- Standard	**Standard** is the default quality for 300 dpi resolution. It offers a good compromise between speed and resolution.
- High Quality	**High Quality** is the compromise between **Standard** and **Presentation**.

Paper Quality

- **Coated Paper**

This type of paper will allow you to obtain good results for color printing, as the paper will not absorb the ink in the same way as plain paper. You can use all print qualities with this type of paper, except **Draft**. Nevertheless, **Economy** mode may provide better results on some coated papers than **Standard** mode.

Monochrome Printing with the DECcolorwriter 120ic Driver

Monochrome printing with the DECcolorwriter 120ic driver allows you to print enhanced grayscale graphics and also gives you access to a larger choice of **Print Quality** and **Paper Quality** options.

To print in monochrome using the DECcolorwriter 120ic driver:

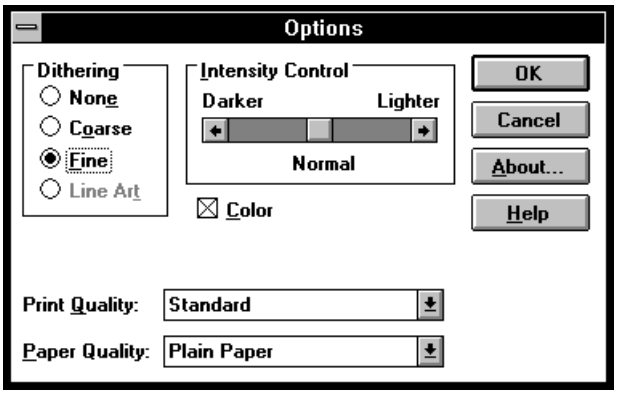
- Deselect the color in the **Options** dialogue box
- Replace the color print head with the monochrome print head.

Monochrome printing can be achieved with the color print head which creates a composite black by combining the colored inks. This, however, is not recommended as the black color quality is low and it is a much slower and costlier method of printing.

To switch to monochrome printing:

- Select the DECcolorwriter 120ic Printer Setup dialogue box (from the **Control Panel** or from your application **File** menu).

- Click on the **Options...** Button.



- Click on the **Color** box to deselect the color printing (no cross indicates that color is deselected).
- Install the monochrome print head in the printer.

You are now ready for monochrome printing.

Assistance

If you have any problems or require assistance, contact your dealer.

Keep the Drivers diskette with your printer documentation, for re-use, if necessary.

4

Maintenance

This chapter describes basic maintenance operations you will be required to perform during the printer's working life. It is important that you are familiar with the different parts of your printer. Refer to "Introducing DECcolorwriter 120ic Printer" before you attempt the operations described in this chapter.

Basic Maintenance Operations

This printer is designed to require only minimum maintenance. However, everyday use will give rise to a number of simple printer-care operations.

WARNING: If you detect serious mechanical damage to or a failure in the printer, do not attempt to repair it yourself!

CALL THE DIGITAL SERVICE CENTER or your retailer. See the Digital Customer Services Centers listing in the Chapter 5 "Troubleshooting", for contact in your area.

Changing the Print Head

We recommend you to ALWAYS use your original supplier for print heads and ink cartridges.

The print head is removed either to replace it or to ensure correct insertion, in the case of faulty printing. The following section applies to both monochrome and color print heads.

If dots or lines are not printed completely, remove the print head completely and replace / reinsert it, and / or execute the print head cleaning and / or PRIME operations (see the specific sections in this chapter).

When the an "end of ink" condition is indicated by the **On-Line** and **On** indicators flashing alternately, you must either replace the ink cartridge (monochrome print heads only) or, if necessary, change the entire print head.

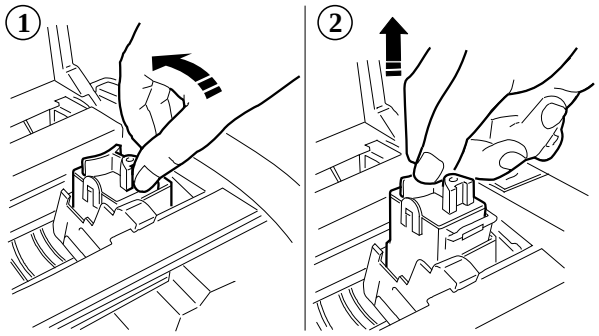
WARNING: When the printer is already switched on and a print operation is running, press the On-Line button to interrupt printing BEFORE opening the top cover.

To return the printer to operating state, close the top cover and press the On-Line button.

To remove the entire print head:

- Press the Install Cartridge button on the operator panel.
- The print head carriage will move to the print head loading position, at the centre of the carriage shaft.
- Open the top cover.

- Push the entire print head towards the rear of the printer (**1**) and pull it upwards (**2**), holding it by its finger-and-thumb grip.

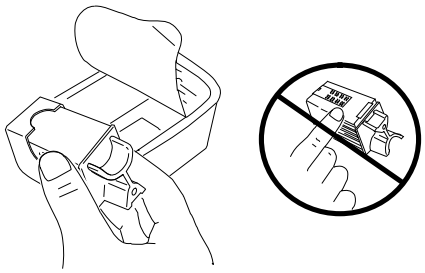


Removing the print head

To insert a new print head:

- Open the sealed print head container.
- Remove the new print head from its container, holding it by the casing, at the opposite end from the protective tape.

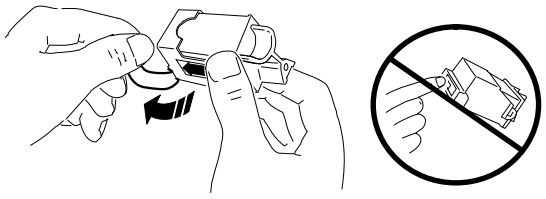
CAUTION: *Do not touch the electrical contacts or sit the print head on them.*



Removing the print head from its container

- Still holding the print head casing, **remove the transparent protective tape**, pulling its tab end in the direction indicated by the arrow.

CAUTION: *Do not touch the printing nozzles or sit the print head on them.*

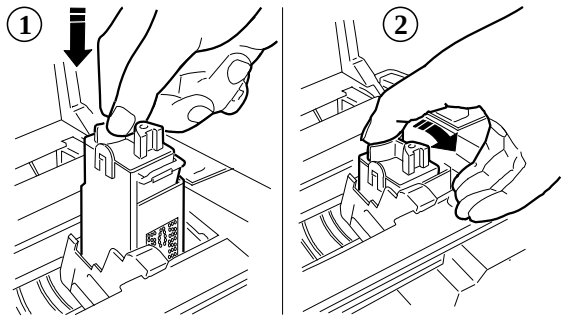


Removing the protective tape

- Holding the print head by its finger-and-thumb grip and **with the electrical contacts facing towards the front of the printer**, insert the print head in its carriage by:

1. Pushing it down into the carriage

2. Pulling it towards the front of the printer until it clicks



Inserting and blocking the print head

If the print head is correctly installed and matches the selection lever position, the indicators stop flashing.

- Close the top cover and press the Install Cartridge button on the operator panel.

  The print head carriage moves to the print head storage position, at the right of the carriage shaft.

CAUTION: *If you have set the printer to operate with a* ***color print head*** *(print head selection lever towards the inside of the printer) and the print head you have inserted is a monochrome one, the print head carriage will not return to its rest position and the* ***On-Line*** *and* ***On*** *indicators will flash in sequence (****On-Line*** *twice followed by* ***On*** *once). You must change the position of the print head selection lever. This lever will only move if the print head carriage is in the loading position.*

If the indicators flash with the sequence ***On-Line*** *five times followed by* ***On*** *once, this indicates that the print head inserted is not compatible with the currently loaded printer driver options.*

If you have problems inserting the print head, always remove it completely and repeat the entire insertion operation, checking the following:

- Make sure the print head carriage is in the print head loading position.
- Check that the print head chamber is clean and free of foreign bodies.
- Check that the print head selection lever position is compatible with the type of print head inserted.
- **NEVER** force the print head into the chamber.

Cleaning the Print Head

If you encounter printing quality problems, run the self print tests which are described in Chapter 2. This test will demonstrate whether the print head nozzles are operating properly or not. If you find that there are problems, perform the following steps. The following section applies to both monochrome and color print heads.

To clean the print head:

- Remove the print head from the printer.
- Clean the electrical contacts on the print head and on the print head carriage with the brush supplied with the storage box.

CAUTION: *If there are traces of ink on the electrical contacts, you MUST NOT use the brush, otherwise you may permanently damage them. Instead use an absorbant material, such as blotting paper, to remove the ink traces from the contacts.*

- Insert the print head in the printer and run the print test again.

If you are still unable to make the print head operate correctly, do the following:

- Dampen a paper tissue and then squeeze it to remove excess water.
- Remove the print head from the printer.
- Holding the print head with the printing nozzles facing downwards, blot it against the paper tissue, pressing lightly. Repeat this on different areas of the paper tissue until the ink nozzles are clean.
- Insert the print head in the printer and run the print test again.

If the print head still does not operate correctly, you must change, or if it is monochrome, prime the print head (see the specific sections in this chapter).

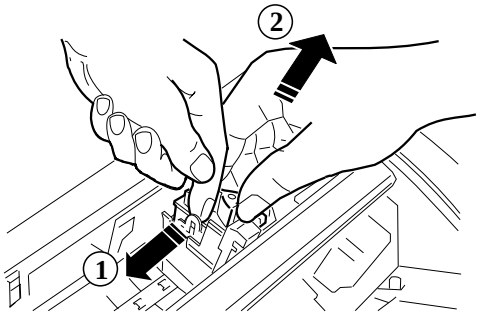
Replacing the Monochrome Ink Cartridge

When the ink detection feature signals an "end of ink" situation (the **On-Line** and **On** indicators flashing alternately, a print head being installed), you must either replace the monochrome ink cartridge, or change the entire print head. The use of Digital replacement ink cartridges provides you with the most cost effective printing solution available.

After using a number of replacement ink cartridges (up to 10, depending on work load and storage), your printer may begin to experience some degradation in print performance, such as excessive smudging or missing dots. If this is the case, you should replace the print head.

NOTE: See the Appendix A "Accessories and Options" for the order numbers for the set of 2 ink cartridges and the print head.

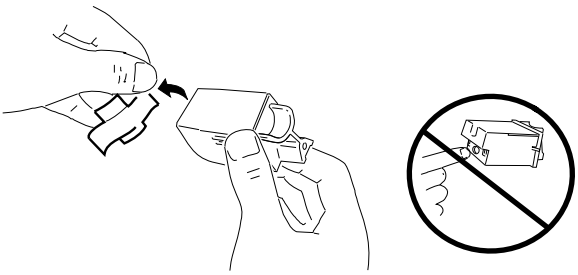
- Press the Install Cartridge button, to move print head carriage to the print head loading position.
- Open the top cover of the printer.
- To remove the ink cartridge, move aside the plastic tab (**1**), leaving the print head casing in its carriage and pull out the ink cartridge (**2**).



Removing the ink cartridge

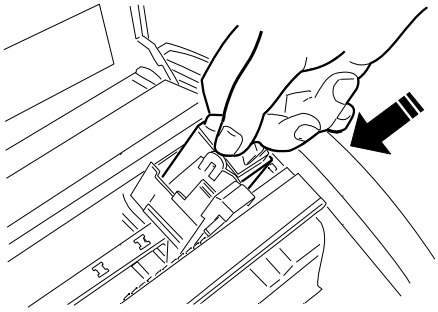
- **Remove the transparent protective tape** from the new ink cartridge, pulling it in the direction indicated by the arrow.

CAUTION: *Do NOT touch the ink pad area on the cartridge.*



Removing the protective tape from the ink cartridge

- Insert the new cartridge in the print head casing **immediately**, pushing gently until it clicks into place.



Inserting the ink cartridge

- Close the top cover of the printer.
- Press the Install Cartridge button.

The print head carriage moves to its rest position.

If the new ink cartridge is not inserted correctly, the **On-Line** and **On** indicators will flash alternately. You must repeat the replacement operation completely.

CAUTION: *Always keep the ink cartridges sealed until they are to be used.*

Do NOT attempt to re-ink the cartridge, as this damages the print head and the printer.

NOTE: If the quality of printing is not optimum, try priming the print head (see the following).

Priming the Monochrome Print Head

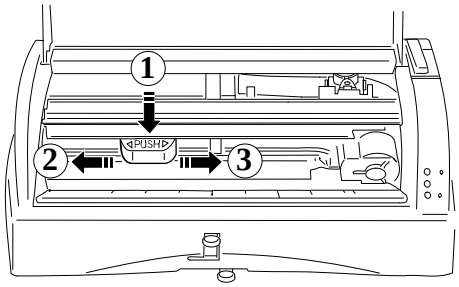
You need to prime the monochrome print head to clear the ink nozzles. This operation applies **only** to monochrome print head.

If, after inserting a new print head or during a printing operation, the print quality is not optimal or deteriorates, prime the print head to improve it. Poor print quality is usually caused by air bubbles which block one or more of the print head nozzles; priming will clear any blockage.

To prime the print head, proceed as follows:

- Set the printer OFF LINE (pressing the On-Line button), to move the print head carriage to its rest position.
- Open the top cover of the printer.

- Pressing down the ink slide (labeled **<PUSH>**) (**1**), move it slowly from right to left along the full length of its shaft (**2**). Release the slide and return it to the right edge (**3**).



Priming the print head

- Repeat the operation until ink appears in the tube below the slide.
- Press Install Cartridge to move the print head carriage to the head loading position, and repeat the above operation to empty the tube.
- Press Install Cartridge to return the print head carriage to its rest position.
- Close the top cover
- Press On-Line to return the printer to ON LINE condition.

If priming the print head does not result in improved print quality, switch the printer off and then on again, and prime the print head again.

WARNING: Priming MUST NOT be repeated systematically, as it will damage the print head. For used print heads, it should ONLY be attempted as a last resort, before changing the ENTIRE print head.

Transporting the Printer

Although your DECcolorwriter 120ic printer is small, it is not a portable printer and you need to take care when transporting it.

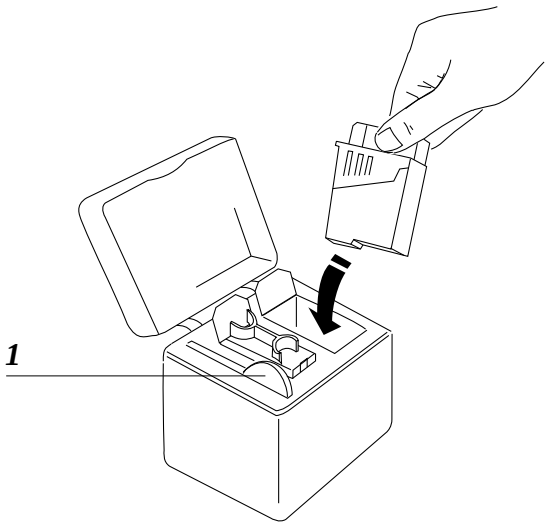
To prepare your printer before transporting it:

- Remove the print head and store it into the storage box to prevent it from drying out.
- Detach the interface cable and unplug the power cable.
- Remove paper from the paper input and output trays.
- Tape the paper insertion guide to the lower front of the printer.
- Repack the printer in its original packing materials.

Storing the Print Heads

The print head storage box is provided to store safely the print head not in use. This box has 2 slots, one for the monochrome print head and the other for the color print head.

When removing a print head from its sealed container or from the printer, you should store it immediately in the storage box to ensure it is properly protected and will not dry out.



Storing a print head

Inside the storage box, there is a small brush (**1**) which you can use to clean gently the electrical contacts on the print head or the print head carriage, if necessary.

WARNING: You should not use the brush to clean the ink nozzles, as this could permanently damage them.

5

Troubleshooting

Information about troubleshooting in this chapter provides solutions to most of the common problems. However, if the printer does not operate correctly after following the recommendations, contact your local Digital Services Center or retailer where you bought your printer, see the list below.

Contacting your Digital Services Center

Before calling for support, you should prepare the following information:

- The serial and model number of the printer, which is found on the electrical data plate (on the underside of printer).
- A summary of the problem.
- The details of your configuration: hardware and applications software.
- The operator panel indicator Error Status or specific failure symptoms.

Returning the Printer for Maintenance

If you are asked to return the printer for repair, please follow the instructions below to ensure you receive the best and most efficient service possible.

To prepare returning the printer:

- Prepare the printer for transport, see Chapter 4.
- Include your name, address and your telephone number.
- Enclose the following details:
  - The complete configuration details when problems occurred, including cable type, interface type, application software used.
  - The problem description.
  - A sample of the printing problem, if appropriate.
  - A copy of purchase receipt to establish the warranty period.

Digital Customers Services Centers

(*) indicates free numbers.

Country		Phone Number
U.S.A.		1-800-354-9000 *
Australia		008 252277 *
Austria		1-86630-2000
Belgium		02-7297744
Canada	English	1-800-267-5251 *
	French	1-800-267-2603 *
Denmark		80301005
Finland		800-2878
France		1-46873109
Germany		0130-7702
Greece		1-6821980

Country		Phone Number
Crete		237576
Thessaloniki		423760
Hungary		01-1810966
Eire		01-381216
Israel		09-593300
Italy		1-678-20062
Japan		0120-113035 *
Korea		2-7991333
Netherlands		030-832888
New Zealand		080 080 1272 *
Norway		2-2768600
Portugal		01-3889100
Singapore		3366129
Spain	Barcelona	03-4012222
	Madrid	01-583-4257
Sweden		08-988835
Switzerland		155-5544 *
Taiwan		080 211 393 *
Thailand		66-254-8191
UK.		0256-57122

Windows Warnings

For more information about Windows warnings, consult either the on-line help (provided in the Printer Driver), or the "Printing" section of the "Troubleshooting" chapter in the "Getting Started with Microsoft Windows" manual.

Indicators Warnings

On-Line *and* ***On*** *indicators flashing alternately*

State caused by end of ink condition. Load a new print head, and then return the printer to the ON LINE operating state by pressing the Install Cartridge button.

On-Line *and* ***On*** *indicators flashing with the sequence* ***On-Line*** *twice followed by* ***On*** *once*

State caused by incompatibility between the type of print head inserted and the position of the print head selection lever. Load the correct type of print head and / or position the print head selection lever correctly, and then return the printer to the ON LINE operating state by pressing the Install Cartridge button.

On-Line *and* ***On*** *indicators flashing with the sequence* ***On-Line*** *five times followed by* ***On*** *once*

State caused by an incompatibility between the type of print head inserted and the printer driver loaded. Insert the correct type of print head, and then return the printer to the ON LINE operating state by pressing the Install Cartridge button.

On-Line *indicator flashing slowly*

State caused by lack of paper during a printing operation. Load paper and then return the printer to the ON LINE operating state by pressing the On-Line button.

On-Line *indicator flashing rapidly*

State caused by an operating failure.

Solving Problems

Contents

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Printing Stops 5-12
Printed Characters Are Faint 5-12
Printing with Missing Dots 5-13
Poor Print Quality 5-13

Installation Problems

Missing or Damaged Parts

- Contact your dealer immediately.

Printer Does Not Switch On

No power supply (no indicators are on).

- Check that the printer is switched on.
- Check that the power cable is inserted correctly in the printer and in the power outlet.
- Check that power is supplied through your power outlet.

No Initial Mechanical Reset

At power-on, the print head carriage does not move.

- Check that the carriage path is not obstructed.
- Try switching the printer off and then on again.
- If the **On-Line** indicator is flashing rapidly, there is a failure on the main board; call a Digital sales representative or your retailer.

Print Test Did Not Run

- Switch off the printer, then switch it on again, remembering to hold down the On-Line button until the print test starts.
- If the carriage does not move, check that its path is not obstructed.
- If the **On-Line** indicator flashes slowly and there is no paper in the printer; load paper in the paper input tray and press the Form Feed button.
- If the **On-Line** indicator flashes slowly and there is paper in the printer: the paper centering guides may prevent the paper from loading; move the lever **B** slightly to the right to open the centering guides and release the paper, and then restart the print test (see the **Paper Does Not Load** section below).
- If the **On** and **On-Line** indicators flash alternately:
  - Check that the print head is inserted correctly and matches the position of the print head selection lever. Check the lever position and, if necessary, remove and reinsert the print head. Remember to press Install Cartridge before and after either of these procedures.
  - The print head ink cartridge needs replacing; follow the instructions given in the section entitled *Changing the Print Head / Replacing the Monochrome Ink Cartridge* in the Chapter 4, to insert / replace the print head / ink cartridge.

Problems with Connection to Computer

- Check that your interface cable is of the correct type.
- Make sure you have fixed the interface connectors properly both to the printer and to the computer.
- Check that you have configured your application correctly (see your application manual).

Paper Problems

NOTE: Always use paper in perfect condition and within the specifications defined (see Chapter 3).

No Paper

If, on a print command or during a print operation, there is no paper to load in the printer, the **On-Line** indicator flashes slowly.

- To clear this condition, load more paper in the paper tray or, if the manual paper feed feature is selected, feed paper manually and press Form Feed. Refer to Chapter 3 for details about manual paper feeding.

Paper Does Not Load

- Check that the size and weight of the paper used are within the limits allowed.
- Make sure the paper is feeding straight.
- Make sure that you are trying to load from the selected paper device (selector switch **C OFF** for paper feed from tray, **ON** for manual feed).
- Check that the paper guides are not too tight against the paper stack. If they are, open them by moving the lever **B** slightly to the right. See also the **Paper Jams** section below.
- Paper jamming (see below).

Single Sheets / Envelopes Not Loaded (or Loaded Incorrectly)

The paper / envelope has been inserted incorrectly (not aligned with the correct margin indicator - left for single sheets, right for envelopes).

- If your application program does not send a paper feed command, position a sheet of paper manually and press Form Feed.
- Remove all the paper from the paper tray, fan it thoroughly, and then reload it, aligning it correctly in the tray.

Paper Jams or Tears

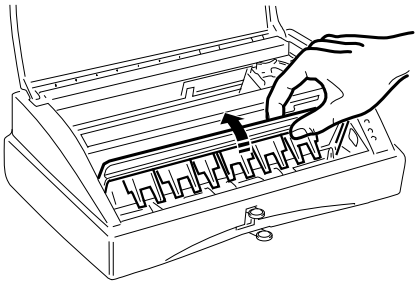
If the page has almost finished printing:

- Set the printer OFF LINE.
- Release the paper in the paper tray, using the levers on the lower front of the printer.
- Open the top cover and remove the jammed paper.
- To resume printing, close the top cover and the paper tray, and then press On-Line.

If the paper jams inside the paper tray:

- Switch off the printer.
- Open the top cover.
- Move the print head carriage from its rest position, sliding it carefully along its shaft.
- Move the print head selection lever to the COLOR position (if it is not already in this position).

- Release the paper in the paper tray, using the levers on the lower front of the printer.
- Remove the paper insertion guide (which also serves as the paper tray cover).



Removing the paper insertion guide

- Remove the jammed paper, drawing it out carefully from the rear, with taking care not to damage the feed mechanism.
- Replace the paper insertion guide.
- Return the print head selection lever to its original position.
- Push the print head carriage gently back to its rest position at the right hand side.
- Close the top cover.
- Remove the remaining paper from the paper tray, check it for and remove any damaged sheets, fan it again and reload the tray.
- Close the paper tray.
- Switch on the printer.

CAUTION: *The most common cause of paper jamming inside the paper tray is the addition of paper to the tray when it is not empty and / or the incorrect loading of paper.*

When adding paper to the paper tray or after removing jammed paper, ALWAYS remove any paper already in the tray, fan it, and reload it all as a single pack.

Printing Problems

Printer Does Not Print / Receive Data

- Check that the printer is switched on (**On** indicator lit).
- Check the physical (cables) and logical (application and printer driver) connections between the printer and computer.
- Check that the printer is ON LINE (**On-Line** indicator lit), and that the computer is switched on.
- Check that you have removed the transparent protective tape from the print head.
- Press Form Feed. If data is in the printer input buffer, this will complete the printing of the contents of the print buffer. In some cases, under DOS, data is sent to the printer with no Form Feed command, consequently data may be ready for printing but the printer is waiting for the Form Feed command before it starts printing.

If the carriage does not move and the ***On-Line*** *indicator is flashing rapidly:*

- Switch the printer off, check for and remove the cause of any blockage and then switch the printer on again.

If the ***On-Line*** *indicator flashes slowly:*

- Check that the paper loads correctly.

*If the **On** and **On-Line** indicators flash alternately:*

- Check that the print head is inserted correctly and matches the print head selection lever position.

- The print head / ink cartridge may need replacing; follow the instructions given in the section entitled *Changing the Print Head / Replacing the Monochrome Ink Cartridge* in the Chapter 4, to insert / replace the print head / ink cartridge.

Printing Stops

*If the **On-Line** indicator flashes slowly and there is no paper in the printer:*

- Reload the paper tray or, if the manual paper feed feature is selected, feed paper manually and press Form Feed. Refer to Chapter 3 for details about manual paper feeding.

*If the **On** and **On-Line** indicators flash alternately, the print head / ink cartridge needs replacing:*

- Follow the instructions given in the sections entitled *Changing the Print Head / Replacing the Monochrome Ink Cartridge* in the Chapter 4, to insert / replace the print head / monochrome ink cartridge.

Printed Characters Are Faint

- Prime the print head to clear the ink nozzles, see Chapter 4.

Printing with Missing Dots

- Prime the print head to clear the ink nozzles, or replace the print head.
- Clean the electrical contacts on the print head and those in its chamber (see Chapter 4).

Poor Print Quality

- Prime the print head to clear the ink nozzles.
- Turn over the paper pack in the paper tray, so as to print on the other side of the paper.
- Make sure you are using good quality paper.

A

Accessories and Options

This appendix lists the accessories and optional items that are available on request as well as their order numbers. It also describes how to insert a memory card in the printer.

Accessories

Monochrome Print Head and Ink Cartridge

The monochrome print head, consisting of a printing unit and a replaceable ink cartridge, is available packaged as follows:

- Set of 1 complete monochrome print head (printing unit + ink cartridge) and 1 monochrome ink cartridge **LJ50X-AB**
- Set of 2 monochrome ink cartridges (400 pages life each) **LJ50X-AC**

Color Print Head

The color print head, consisting of a single unit, including the printing unit and the ink cartridge (not replaceable), is available packaged as follows:

- Set of 1 color print head (200 pages life) **LJ50X-AK**

Transparencies

Digital transparencies are available in two sheet sizes:

- Letter size (50 sheets box) **LJ50X-AE**
- A4 size (50 sheets box) **LJ50X-AF**

Options

PCMCIA Emulation Card

- IBM Proprinter X24 / EPSON LQ 850 multi-emulation **LJ11X-IE**

PCMCIA Font Cards

Each font card is supplied with a booklet which illustrates the font card contents and explains the font selection procedure.

- Font Card B Prestige Elite / 7-10 pt / 16.67-12 cpi
  Letter Gothic / 12 pt / 12 cpi
  Line Draw **LJ50X-CH**
- Font Card R,U Times Nordic / 8-10-12-14-30 pt / PS **LJ50X-CJ**
- Font Card T,V Nordic / 8-10-12-14-30 pt / PS **LJ50X-CK**

PCMCIA RAM Card

Other standard PCMCIA Type 1 cards up to 4 Mbytes, available on the market, can be used.

- 256 KB card **LJ50X-DB**

Serial Interface

- User-installable kit for EIA RS 232C / V24 interface **LJ50X-SI**

Parallel Data Cables

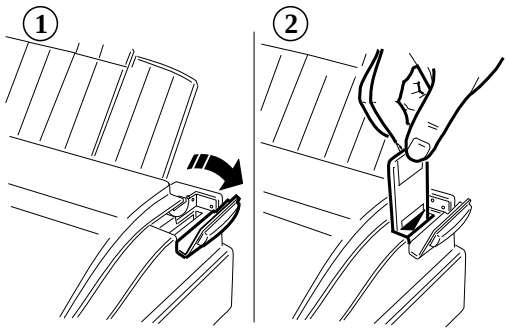
- 10 ft parallel shielded cable **BC19M-10**
- 6 ft parallel shielded cable **BC19M-06**

Optional Card Insertion

WARNING: Always insert / remove the optional card with the printer switched off. Insertion / removal with the printer switched on and / or operating will cause a hardware reset and the risk of damaging the printer and the optional card.

The optional memory card (256 KB) is necessary to expand the memory capacity, so that you can load soft fonts. Optional cards can be inserted, one at a time, in the slot on the rear right hand side of the printer.

- Open the optional card slot cover (**1**).
- Insert the optional card so that the symbol ∫ on the label, indicating the insertion direction, is facing outwards (**2**).
- Push the optional card down into the slot until it snaps into the connector on the main board.



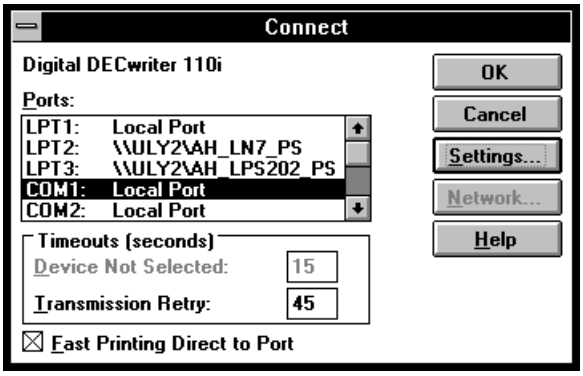
Inserting the optional card

Do not force the card into the printer. If the card does not insert smoothly, check that it is compatible with your printer, and that you are inserting it correctly.

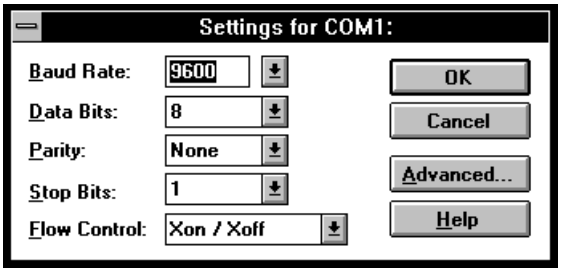
Using the Serial Interface within Windows

If you intend to use the serial interface option and print from a Windows environment, you have to specify this connection in your printer Setup.

- In the **Printers** dialogue box, click on the **Connect...** button.



- Select the serial port you intend to use (usually **COM 1**) in the **Ports** box.
- Click once on **Settings...** to check that the transmission parameters are correct for the type of serial transmission you intend to use.



- Click once on **OK** to close each dialogue box you open.
- Click once on **Close** to close the **Printers** dialogue box.

B

Fonts

This appendix describes the characteristics of the resident and optional fonts available.

Introduction

A "font" is a group of characters which all belong to the same character set and have the same typeface, the same style, the same height and print pitch and the same stroke weight.

Your printer can use fonts from the following sources:

- Resident fonts, which are always available
- Optional fonts on memory cards
- Scalable fonts resident in your MS-Windows application

Resident Fonts

The fonts resident in the printer have the following characteristics (the values in bold face are the base values):

Typeface: Courier

Orientation	Portrait	Portrait	Landscape	Landscape
Character Set *	CP 437 International	CP 437 International	CP 437 International	CP 437 International
Horizontal Spacing	Fixed	Fixed	Fixed	Fixed
Pitch (cpi)	5 - 8.33 **10** - **16.67** 20 - 33.34	5 - **10** - 20	**10** - **16.67** 20 - 33.34	**10** - 20
Height (dots)	6 - **12**	6 - **12**	6 - **12** - 24	6 - **12** - 24
Style	Upright	Italic	Upright	Italic
Stroke Weight	Medium/Bold	Medium/Bold	Medium/Bold	Medium/Bold

* Default character set; other resident character sets are available (see Appendix D).

Typeface: Letter Gothic

Orientation	Portrait	Portrait	Portrait	Landscape
Character Set *	CP 437 International	CP 437 International	CP 437 International	CP 437 International
Horizontal Spacing	Fixed	Fixed	Fixed	Fixed
Pitch (cpi)	5 - 6 - **10** - **12** 20 - 24	6 - **12** - 24	8.33 - **16.67** 33.34	**10** - **16.67** - 20 33.34
Height (dots)	6 - **12**	6 - **12**	4.75 - **9.5**	4.75 - 6 - **9.5** **12** - 19 - 24
Style	Upright	Italic	Upright	Upright
Stroke Weight	Medium/Bold	Medium/Bold	Medium/Bold	Medium/Bold

* Default character set; other resident character sets are available (see Appendix D).

Typeface: Times Nordic

Orientation	Portrait	Portrait
Character Set *	CP 437 International	CP 437 International
Horizontal Spacing	PS	PS
Height (dots)	6 - **12**	6 - **12**
Style	Upright	Italic
Stroke Weight	Medium/Bold	Medium/Bold

* Default character set; other resident character sets are available (see Appendix D).

Typeface: Book Face Times +

Orientation	Portrait	Portrait
Character Set *	CP 437 International	CP 437 International
Horizontal Spacing	PS	PS
Height (dots)	4 - 5 - 6 - 7 - 8 - 10 - 12 - 14	4 - 5 - 6 - 7 - 8 - 10 - 12 - 14
Style	Upright	Italic
Stroke Weight	Medium/Bold	Medium/Bold

+ Not available if a non-Western character generator is selected (see Appendix D).
* Default character set; other resident character sets are available (see Appendix D).

Typeface: Linea +

Orientation	Portrait	Portrait
Character Set *	CP 437 International	CP 437 International
Horizontal Spacing	PS	PS
Height (dots)	4 - 5 - 6 - 7 - 8 - 10 - 12 - 14	4 - 5 - 6 - 7 - 8 - 10 - 12 - 14
Style	Upright	Italic
Stroke Weight	Medium/Bold	Medium/Bold

+ Not available if a non-Western character generator is selected (see Appendix D).
* Default character set; other resident character sets are available (see Appendix D).

Line Draw

This font is available ONLY in portrait orientation with 12 cpi spacing, 12 dot height and medium stroke weight.

The standard print test contains a print sample (the default character set) of all the resident fonts.

Before loading soft fonts in your printer, you must expand the memory capacity, using the optional 256 KB memory card (or standard PCMCIA Type 1 memory cards).

NOTE: The instructions for the installation and use of the optional font cards and soft fonts are supplied with the individual options.

Two independent fonts, **primary font** and **secondary font** , are always active in the printer. Their characteristics can be modified independently, one at a time. You can alternate between the currently active primary and secondary fonts using the command codes "SI" and "SO" (see Appendix E "Command Codes").

Font Handling Using Command Codes

Down-Line Loading of Fonts

This section contains a summary of the command codes which handle the optional fonts available in the font cards. For further and more detailed information refer to the manual supplied with the specific font card.

With the optional font card inserted and selected, you can use the following command codes to assign a name and ID to the font required, load and store it in the printer and clear it.

ASCII	Decimal	Hexadecimal	Description
ESC) s n W ..	27 41 115 n 87	1B 29 73 n 57	Name of Font to be loaded
ESC * c n D	27 42 99 n 68	1B 2A 63 n 44	ID Assignment for Font to be loaded
ESC * c n E	27 42 99 n 69	1B 2A 63 n 45	ASCII Code of Character to be loaded
ESC (s n W ..	27 40 115 n 87	1B 28 73 n 57	Bit Map of Character to be loaded
ESC * c 0 F	27 42 99 48 70	1B 2A 63 30 46	Clears all Fonts loaded
ESC * c 1 F	27 42 99 49 70	1B 2A 63 31 46	Clears all Temporary Fonts loaded
ESC * c 2 F	27 42 99 50 70	1B 2A 63 32 46	Clears Last Font loaded
ESC * c 4 F	27 42 99 52 70	1B 2A 63 34 46	Stores Font loaded as Temporary
ESC * c 5 F	27 42 99 53 70	1B 2A 63 35 46	Stores Font loaded as Permanent
ESC (n X	27 40 n 88	1B 28 n 58	Selects Primary Identifier for Font loaded
ESC) n X	27 41 n 88	1B 29 n 58	Selects Secondary Identifier for Font loaded

C

Printer Controlling

The first part of this appendix gives you some useful information about the way your printer interfaces with your system and applications. Read this section to clarify any initial problems or for more insight into some features of the printer Set-Up and the software installation process. The second part of this appendix is dedicated to setting up the printer using the selector switches. The third section explains how to carry out hexadecimal printing.

The Communication Protocol

One of the most crucial things which affects the correct working of your printer and computer is the setting of the communication protocol. If the protocols do not match, you will not obtain satisfactory results or even none at all.

It is not difficult to set the protocols correctly, but **it is absolutely necessary that the communication parameters in the printer and in the computer be compatible**.

NOTE: The information given in this section refers to MS-DOS environment as it is the most widely-used. For other environments the same logic remains true, but see the related documentation for details.

The indications given here are sufficient for MS-DOS up to release 6.0.

Parallel Interface

With the resident parallel interface, you do not have to do anything, as the only variable parameter is the data format "word length", which, in the PC, is always set to 8. This is the printer's default setting.

The parallel communication protocol can be activated using the following MS-DOS command (consult your MS-DOS manual for the complete syntax):

```
MODE LPT1:(characters per line),(line spacing),P
```

To address the parallel printer interface as a logical output device, you can use one of the following names: LPT1 or PRN. It is also possible to redirect output prepared for the parallel interface to a serial interface, using the command:

```
MODE LPT1:=COMn:
```

Serial Interface

If you install the optional serial interface in your printer, to use it you must pair up the printer's protocol with the one in your computer. The protocol can either be programmed in the printer (for the parameters and programming procedure, see the specific sections in this chapter), or you can adapt your computer to the printer setting using the command:

```
MODE COMn:(baud),(parity),(word length),(stop bits),p
```

where "n" is the number (usually 1) of the addressed interface board, and baud requires only a two digit number.

Printing Methods within DOS Environment

Once your printer and computer are connected correctly and the logical link established, you can use the printer to its full extent. If you ran the print test when you installed the printer, you saw the printer execute an internally-commanded operation. You can now have the printer print something on your command. The following section contains some basic operations, which do not require the processing of an application.

CAUTION: *For all following operations make sure the printer is switched on, with paper and print head loaded, and that it is ON LINE.*

Printing a Text Screen

The easiest way to obtain a print-out is a screen dump. Let us presume you are in your operating system and have made a Directory Listing with the command **DIR**. If you want this list printed out for future reference, simply press SCR PRT (Print Screen) on your PC keyboard (on some PCs, SHIFT is also required simultaneously). The printer will start to print everything you see on the screen exactly as you see it. You regain the control of your keyboard when the necessary data transmission to the printer is finished.

NOTE: This method works from within all applications which handle the screen in text mode (certain types of graphics may not be printed).

Printing Text Files

The most common printer operation is the printing of a complete text or data file. When you have printable files, prepared by your editor, word processor, database etc., you can send them to print using one of the following methods.

NOTE: A printable file is one which contains only the data to print and probably appropriate printer control commands and is basically line oriented (closes each printable line with CR/LF). Printing with applications is explained in a specific section in this chapter.

When you have the system prompt, type one of the following commands:

`print {filename}` This invokes the print utility of your operating system. The first time you call it, it will ask you to confirm or change the output port. For details about file spooling etc., see in your DOS Manual.

NOTE: This command executes a Form Feed automatically after each document is printed.

`type {filename}>prn` This utility normally lists the contents of a file on your screen, but in this case redirects it to the printer, allowing you to interrupt printing with CTRL - C, as you would do for the screen. This command will execute an automatic Form Feed at the end of a document only if it is included in the document itself.

`copy {filename}/B prn` This command also sends the file to the printer. If you send graphic or DLL (i.e. fonts) files to the printer, remember use the optional "/B" parameter in the command to override any End Of File (=EOF =26D) command, which otherwise would cause DOS to discontinue the data transfer.

NOTE: For more detailed information about these commands, consult your MS-DOS manual.

Software Applications

The printer performance can be controlled using software programs developed for a wide variety of applications, such as word processor, spread sheet, data base, graphics, etc. The software transmits the operating information to the printer in two different ways, with:

- The Printer Driver: the part of the program which controls the selected printer
- Incorporated commands: inserted directly in the text to be printed.

Printer Drivers

To print a document using a software application program, you must have a computer, an application program and a printer. Just as you must have an interface cable to connect your computer and printer, so must you also have a driver which interfaces your application program with your printer.

A Printer Driver is a software program written specifically for an application and a particular printer model. The Printer Driver controls the printer behavior, loading information from your software and transmitting it to the printer to create a document. When you select the print attributes (bold, italic, etc.) for a document, the software transmits the corresponding codes to the Printer Driver. The driver interprets the software codes and sends an equivalent series of commands to the printer (see Appendix E "Command codes"). The printer prints the document with the print attributes desired.

The Printer Driver transmits both characters, numbers and / or symbols for printing and also instructions on how the data received should be printed. It has, however, two limitations:

Due to the application software

A driver can handle only the information transmitted to it by the application program. If, for example, the application does not handle bold-face, your printer will never print in boldface, even though it is capable of doing so.

Inherent to the driver

Only the information contained in the driver program can be acted upon. If, for example, the driver program does not contain the instructions for boldface, your printer will never print in boldface, even though it is capable of doing so.

To overcome the second limitation, and allow you to use all your printer's features, the manufacturer has developed and will continue developing, in collaboration with software houses, specific Printer Drivers for the most common software application packages.

To optimize the use of your printer, use its specific driver which is either:
- In a diskette supplied with the printer
- Inserted directly in your software application program (just select your printer name in the list of printers available), or in a supplementary printer driver disk (e.g. Printer Driver Library).

If you cannot find the specific driver for your application program, contact your dealer for information on its availability. In the meantime, you can use a driver corresponding to the emulation in your printer, even though this will probably not exploit fully all your printer's functions and features.

NOTE: The driver you select must be compatible with the resident printer emulation (HP PCL III+) or with one or other of the optional emulations (IBM Proprinter X24 or EPSON LQ 850) installed using an emulation card (see Appendices A and D, and the specific documentation supplied with the optional emulation card).

Emulation Selected	Compatible Drivers	Additional Information
HP DeskJet 500/500C	DECwriter 110i	This is the specific printer driver. It exploits all the features of your printer. If you intend to use an optional font card, you must indicate its selection in the driver Set-Up procedure.
HP DeskJet 500/500C	DECcolorwriter 120ic	This is the specific printer driver. It exploits all the features of your printer. **NOTE:** Color printing does not allow access to resident printer fonts.
IBM Proprinter X24	IBM Proprinter IBM X24	Matrix printer drivers which interpret only a minimal part of your printers features.
Epson LQ 850	EPSON LQ 850	(No color printing)

NOTE: To check that all the features you require are programmed and operating correctly, you can run a print test before switching to your normal working procedure.

Some software will ask you to define a communication port for your printing output. If you are working with a PC, choose "**LPT1:**" for the parallel interface.

Incorporated Commands

A printer command code is usually a series of otherwise normally printable characters inserted in the data string sent to the printer. To make the printer understand which characters are to be interpreted as command and which as printable characters, there is a simple convention: all "characters" that have, according to the character table, a decimal value less than 32 are interpreted as control codes. Some of them result in printer action when they are received, others do not (see Appendix F).

There is also a special command ESCAPE (decimal code 27, named ESC) which is used by most printer emulations to open a command sequence (also known as ESCAPE sequence). It is followed by one or more additional characters, which serve as identifiers and parameters, belonging to the range of printable characters or control codes available (see Appendix E).

Sending Files to the Printer

When you want to print from a word processor, spread sheet, database, graphic package or other application, always use the built-in print function they offer. Do not attempt to send one of the package's work files directly to the printer, as they rarely have a format which can be executed directly by the printer. The only exception are line oriented editors.

If you need to print documents independent of the application package, use the function "print to a file", which some (but not all!) packages offer. The data written to this file is then exactly like the output otherwise sent to the printer. You can now send these files to print from the operating system level with the commands described already in the section "Printing Text Files".

When using an application package, the package itself usually takes care of the correct setting of the page layout parameters, overriding those defined in SET-UP. Some packages, however, do not; when using them, check that all the selectable parameters are compatible, and bear in mind the following:

- If your printer has a physical TOF and BOF margin, make sure your form length definition falls WITHIN these pre-set margins. If not, you may encounter the situation where the printer executes an automatic form feed when printing arrives at the bottom margin and the software executes another one just after the start of the next page.

- When defining the line length for your print output, make sure the left margin plus the line of text do not exceed physical line length. The amount of printable characters per line varies, as it depends on the letter size and spacing, but when the print carriage reaches its rightmost position and there are some characters left, the printer may either ignore the excess characters or automatically print them on the following line. This can destroy your text layout.

Printer Programming within DOS Environment

This section explains how to change the printer settings either using the selector switches on the covered shaft in front of the print head carriage or by varying the values given in the Printer Driver. Programming the printer with the selector switches is absolutely necessary to control your printer features within DOS environment.

NOTE: The Windows Driver settings overwrite the corresponding selector switches settings.

Factory Settings

When you receive the printer, its basic operating features are already set with pre-defined values (default values). These factory settings will probably meet your requirements. If they do not, you can change them, using the Set-Up procedure.

NOTE: Always switch off the printer before changing the positions of the selector switches, as their position is read only at printer switch-on.

The following table provides the factory settings determined by all the selector switches in the **OFF** position, with the exception of the Paper Size selector switches, which are explained later in this chapter.

Features	Factory Settings
Font	**Courier Upright Portrait 10 cpi 12 pt**
Text Width	**Normal**
Print Quality	**Letter Quality**
Paper Insertion	**Paper Tray**
Perforation Skip	**Enabled**
Text Scale Mode	**Disabled**
Graphic Density	**75 dpi**
Automatic Line Feed	**Disabled (CR=CR)**
Ink Save Mode (Text)	**Disabled**
Paper Size	**Letter**
Character Set	**CP 437 International**
If optional serial interface is installed:	
Baud Rate	**2400**
Parity	**None**
Handshake	**Hardware**

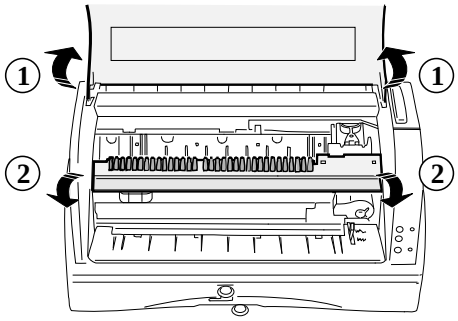
Selector Switches Set-Up Procedure

Access to the Selector Switches

NOTE: To redefine the programmable features using the printer Set-Up procedure, the printer must be switched off.

- Open the top cover of the printer (**1**) and the selector switches cover (**2**).

  On the inside of the top cover, there is a template which indicates the feature assigned to each switch. The names of the feature groups are also indicated on the inside of the selector switches cover.

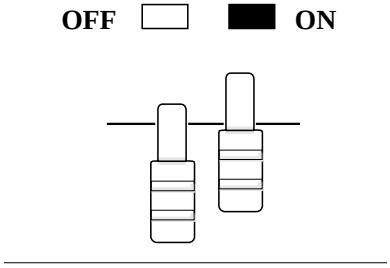


Opening the selector switches cover

How to Select the Feature Settings

Each switch has two positions:

- **OFF** down
- **ON** up (alternative value for each specific feature)



Selector switches position meanings

To alter the setting of the feature(s), just change the position(s) of the specific selector switch(es).

Termination of Set-Up Procedure

- Once you have completed the selection of the feature values you require, close the selector switches cover and the top cover, then switch on the printer.

  During the initial mechanical reset, the printer "reads" the position of the switches and will be ready to print with the features you have defined.

Programmable Features

The 33 switches are assigned to the programmable features singly, or in some cases, in groups (for Font, Paper, Character Set). Starting from the left, the switches are designated as follows:

- A group of six switches (numbered 1 to 6) which select the font
- Eight selectors, indicated alphabetically (A to H), which select individual print attributes and features
- Two switches which are reserved
- A group of three switches (numbered 1 to 3) which select the paper size
- A group of six switches (numbered 1 to 6) which select the character set
- A group of five switches (numbered 1 to 5) which select the optional serial interface characteristics
- A group of three switches (numbered 1 to 3) which are reserved

Resident Emulation (HP DeskJet 500)

In the following section, factory settings are displayed in bold-face type within the tables and switches ON positions are identified by gray cells.

Fonts

The first six selectors define the print font to be used. To select a resident font other than the factory setting (Courier Upright Portrait 10 cpi / 12 pt), ONLY the selector switch(es) corresponding to the specific font required (see following table) should be raised; the others MUST remain down.

Example: to select Times Nordic Italic PS / 12 pt, set switches 3 and 6 ON and switches 1, 2, 4 and 5 OFF.

NOTE: For information on the resident and optional fonts available, and their characteristics, see Appendix B.

1	2	3	4	5	6	Font
						Courier Upright Portrait 10 cpi / 12 pt
					■	Courier Upright Portrait 10 cpi / 12 pt
				■		Courier Italic Portrait 10 cpi / 12 pt
				■	■	Courier Upright Portrait 16.67 cpi / 12 pt
			■			Letter Gothic Upright Portrait 10 cpi / 12 pt
			■		■	Letter Gothic Upright Portrait 12 cpi / 12 pt
			■	■		Letter Gothic Italic Portrait 12 cpi / 12 pt
			■	■	■	Letter Gothic Upright Portrait 16.67 cpi / 9.50 pt
		■				Times Nordic Upright Portrait PS / 12 pt
		■			■	Times Nordic Italic Portrait PS / 12 pt
		■		■		BF Times Upright Portrait PS / 14 pt
		■		■	■	BF Times Italic Portrait PS / 14 pt
		■	■			BF Times Upright Portrait PS / 12 pt
		■	■		■	BF Times Italic Portrait PS / 12 pt
		■	■	■		BF Times Upright Portrait PS / 10 pt
		■	■	■	■	BF Times Italic Portrait PS / 10 pt
	■					BF Times Upright Portrait PS / 8 pt
	■				■	BF Times Italic Portrait PS / 8 pt
	■			■		Linea Upright Portrait PS / 14 pt
	■			■	■	Linea Upright Portrait PS / 12 pt
	■		■			Linea Italic Portrait PS / 12 pt
	■		■		■	Linea Upright Portrait PS / 10 pt
	■		■	■		Linea Italic Portrait PS / 10 pt
	■		■	■	■	Linea Upright Portrait PS / 8 pt
	■	■				Courier Upright Landscape 10 cpi / 12 pt
	■	■			■	Courier Italic Landscape 10 cpi / 12 pt
	■	■		■		Courier Upright Landscape 16.67 cpi /12 pt
	■	■		■	■	Letter Gothic Upright Landscape 12 cpi / 12 pt
	■	■	■			Letter Gothic Upright Landscape 16.67 cpi / 9.50 pt
■						External fonts

NOTE: If an optional font card is used, selector 1 must be set ON, then, depending on which of the fonts in the card is to be selected, set switches 2 to 6 accordingly (see Appendix B and the documentation supplied with the specific font card). The fonts can also be selected using command codes (see Appendix E).

Print Attributes and Other Features

The features assigned to selectors A to J, indicated on the template on the inside of the top cover, are the alternative feature values. I.e., they are the values implemented when the corresponding selector switch is set in its ON position.

Switch	Feature	OFF	ON
A	Text Width	**Normal**	Compressed
B	Print Quality	**Letter Quality**	Draft
C	Paper Insertion	**Paper Tray**	Manual
D	Perforation Skip *	**Enabled** BOF = 12.7 mm TOF = 12.7 mm	Disabled BOF = 12.7 mm TOF = 0 mm
E	Text Scale Mode **	**Disabled**	Enabled
F	Graphic Density ***	**75 dpi**	300 dpi
G	Automatic Line Feed	**Disabled** CR = CR : only carriage return	Enabled CR = CR + LF : carriage return + line feed
H	Ink Save Mode (Text)	**Disabled**	Enabled
I	Reserved		
J	Reserved		

* Perforation Skip - see also command code **ESC & l n L**, Appendix E
** Text Scale Mode - see also command code **ESC & k 6 W**, Appendix E
*** Graphic Density - see also command code **ESC * t n R**, Appendix E

NOTE: To print up to 66 lines of text on a Letter page (70 lines on a A4 page), set both **D and E** selector switches ON.

Paper Size

Paper Size selector switches (numbered 1 to 3) define the paper size to be used. To select a paper size other than the factory setting (Letter), ONLY the switch(es) corresponding to the paper size required (see following table) should be raised; the others MUST remain down.

Example: to select Envelope, set switches 2 and 3 ON and switch 1 OFF.

1	2	3	Paper Size
			A4
		■	**Letter**
	■		Legal
	■	■	Envelope
■	■	■	Other * (max. 462 mm)

* Other - to select any of the other paper sizes, use the command code **ESC & l n A**, Appendix E

Character Sets

Character Sets switches (numbered 1 to 6) define the character set to be used. To select a character set other than the factory setting (CP 437 - International), ONLY the selector(s) corresponding to the character set required (see following table) should be raised; the others MUST remain down.

Example: to select Legal character set, set switches 2, 5 and 6 ON and switches 1, 3 and 4 OFF.

1	2	3	4	5	6	Character Set
						CP 437 - International
					■	CP 437 - International
				■		Roman-8
				■	■	PC 8 Denmark/Norway
			■			CP 850 (Multilingual)
			■		■	ECMA 94 Latin 1
			■	■		ISO 4 - United Kingdom
			■	■	■	ISO 21 - Germany
		■				ISO 69 - France
		■			■	ISO 15 - Italy
		■		■		ISO 60 - Norway 1
		■		■	■	ISO 61 - Norway 2
		■	■			ISO 11 - Sweden Names
		■	■		■	ISO 10 - Sweden
		■	■	■		ISO 17 - Spain
		■	■	■	■	ISO 6 - ASCII
	■					ISO 2 - IRV
	■				■	ISO 16 - Portugal
	■			■		ISO 14 - JIS ASCII
	■			■	■	Legal
	■		■	■		CP 860 - Portugal
	■		■		■	Danish OPE I
	■		■	■		UNIX International

1	2	3	4	5	6	Character Set
	■		■	■	■	Danish OPE II
	■	■				Spain II
	■	■			■	CP 863 - French Canadian
	■	■		■		PC-WIN - ANSI Windows 3.1
	■	■		■	■	CP 852 - Latin 2
	■	■	■			ISO 8859 / 2 - Latin 2
	■	■	■		■	PC-WIN - Eastern Windows 3.1
	■	■	■	■		CP 857 - Turkey
	■	■	■	■	■	ISO 8859 / 9 (Turkey)
■						PC-WIN - Turkish Windows 3.1
■					■	CP 866 - Cyrillic
■						CP 855 - Cyrillic
■					■	ISO 8859 / 5 (Cyrillic)
■			■			PC-WIN - Cyrillic Windows 3.1
■			■		■	CP 210 - Greece
■			■	■		CP 851 - Greece
■			■	■	■	ISO 8859 / 7 (Greece)
■		■				PC-WIN - Greek Windows 3.1
■		■			■	CP 862 - Hebrew
■		■		■		ISO 8859 / 8 (Hebrew)
■		■		■	■	PC Slovenia
■		■	■			PC Kamenicky
■	■	■	■	■	■	Default set in optional card

Optional Serial Interface

Serial Interface selector switches (numbered 1 to 5) define the setting for the optional serial interface. ONLY the switch(es) corresponding to the setting(s) required (see following table) should be raised; the others MUST remain down.

Example: factory settings with all five selectors in OFF position (2400 baud, no parity, hardware handshake).

1	2	3	4	5	Serial Interface
					Baud rate : 2400
	■				Baud rate : 9600
■					Baud rate : 19200
■	■				Baud rate : 38400
					Parity : none
			■		Parity : even
		■			Parity : odd
					Handshake : hard
				■	Handshake : soft

NOTE: See the Appendix A for details about selecting the connection parameters within Windows environment with the serial interface option.

Reserved

The last three selectors switches on the selector bar (1 to 3) are not currently assigned to any parameters in the resident emulation.

NOTE: The position of these selectors should NOT be altered.

Hexadecimal Print-Out

Hexadecimal printing is a diagnostic feature which allows you to analyze all the bytes transferred from the computer to the printer. Each byte transmitted is printed in hexadecimal format, allowing you to check the data codes received.

Running a Hexadecimal Print-Out

NOTE: Make sure that the print head is inserted and that there is paper in the paper tray. The hexadecimal print-out is started from a printer-off condition.

- Holding down the On-Line and Install Cartridge buttons, switch on the printer. (Keep the buttons held down until printing starts.)

Any data now transmitted to the printer will be printed in hexadecimal format (see example below); ESCAPE sequences are not executed. If there is no paper in the printer, the **On-Line** indicator will start flashing. You must load paper in the paper input tray and then press the **Form Feed** button.

To suspend the print-out temporarily:

- Press the On-Line button (pressing this button a second time will cause printing to resume).

To exit from hexadecimal print-out mode:

- Switch the printer off.

When the print job has finished, check it to see that the hexadecimal codes printed correspond exactly to what you entered on your computer.

Example of hexadecimal print-out:

```
1B 26 6C 30 4C 1B 26 6C 30 45 1B 26 6C 36 36 46     ⇓&l0L ⇓&l0E ⇓&l66F
1B 2A 74 33 30 30 52 20 42 75 62 62 6C 65 20 20     ⇓*t300R Bubble
49 6E 6B 20 4A 65 74 20 50 72 69 6E 74 65 72        Ink Jet Printer
```

NOTE: If you have any problems obtaining a hexadecimal print-out, check that you have followed the procedure correctly. If you still experience problems, see Chapter 5 "Troubleshooting".

D

Emulation and Character Sets

This chapter introduces the concepts of emulation and character sets and explains the practical results they have on your work.

The Concept of Emulation

The printer interprets the data transmitted from the computer, checking it for certain control sequences. If any such sequences are found, the printer performs a specific function. There is no universal data control method.

As printer technology has developed, most major printer manufacturers have created their own standards for printer control, depending on the type of printer technology used, the intended application range, etc. Other manufacturers have chosen to comply with these standards, producing printers which behave exactly as a manufacturer-original.

To be compatible with all the various standards, a printer must be extremely flexible. This printer is a front-runner in terms of versatility. Its resident firmware and optional memory cards give you the possibility of operating in several different emulation environments.

The default command code set for the standard printer version is the Hewlett-Packard PCL level III Extended (Printer Command Language) - see Appendix E for an overview of the command codes. Two optional emulations are also available on memory card: IBM Proprinter X24 and EPSON LQ 850 (contact your dealer for details). Depending on the applications you intended to use, you can choose the emulation which best suits your needs (see Appendix C "Printer Controlling").

NOTE: Once an optional emulation card has been inserted and selected, only the command code set contained in it will be used. To return to the resident emulation, the printer MUST be switched off, the optional card removed and the printer switched on again.

Character Sets

A character set is a group of characters and symbols concerning a language or a specific technical language (mathematical or scientific). The character sets include punctuation signs and figures. In the PC and printer world, a character set contains up to 255 different "characters". Of these 255 characters, the codes from 0 to 127 are standardised and contain the so-called ASCII codes. This is the American character set, which excludes all European national characters and symbols as well as the semi-graphic signs.

The assignment of codes between 128 and 255 varies from country to country, from hardware to hardware, from operating system to operating system and often even from application software to application software. Before selecting a particular set, you must read your operating system / software application documentation carefully.

In the majority of cases, the printer's factory setting (**CP 437 International**) will be the one you require. If not, your printer offers you a wide choice of resident character sets:

Character Sets
CP 437 - International
Roman-8
PC 8 Denmark/Norway
CP 850 (Multilingual)
ECMA 94 Latin 1
ISO 4 - United Kingdom
ISO 21 - Germany
ISO 69 - France
ISO 15 - Italy
ISO 60 - Norway 1
ISO 61 - Norway 2
ISO 11 - Sweden Names
ISO 10 - Sweden
ISO 17 - Spain
ISO 6 - ASCII
ISO 2 - IRV
ISO 16 - Portugal
ISO 14 - JIS ASCII
Legal
CP 860 - Portugal
Danish OPE I
UNIX International
Line Draw

Character Sets
Danish OPE II
Spain II
CP 863 - French Canadian
PC-WIN - ANSI Windows 3.1
CP 852 - Latin 2
ISO 8859 / 2 - Latin 2
PC-WIN - Eastern Windows 3.1
CP 857 - Turkey
ISO 8859 / 9 (Turkey)
PC-WIN - Turkish Windows 3.1
CP 866 - Cyrillic
CP 855 - Cyrillic
ISO 8859 / 5 (Cyrillic)
PC-WIN - Cyrillic Windows 3.1
CP 210 - Greece
CP 851 - Greece
ISO 8859 / 7 (Greece)
PC-WIN - Greek Windows 3.1
CP 862 - Hebrew
ISO 8859 / 8 (Hebrew)
PC Slovenia
PC Kamenicky

NOTE: In the above table, the character sets displayed in bold-face type exclude the use of internal fonts Book Face Times and Linea, and are not available if an optional font card is inserted and selected.

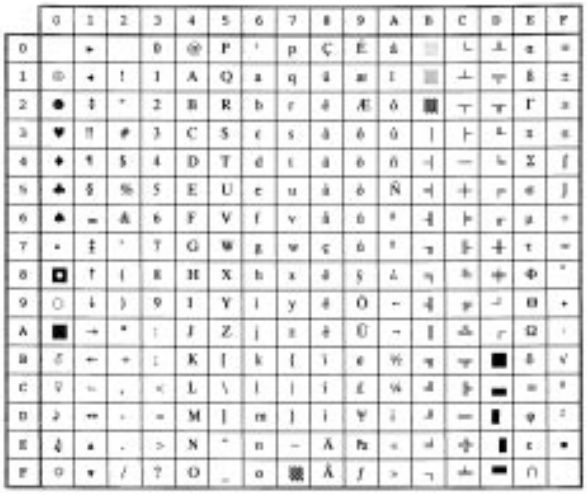
The character assignment tables for the resident sets are given at the end of this appendix.

The character sets can be selected using the printer Set-Up procedure (see Appendix C) or using command codes (see the following table). The Open bracket, in the ESCAPE sequence, indicates the selection of the primary character set; the Close bracket indicates the selection of the secondary character set.

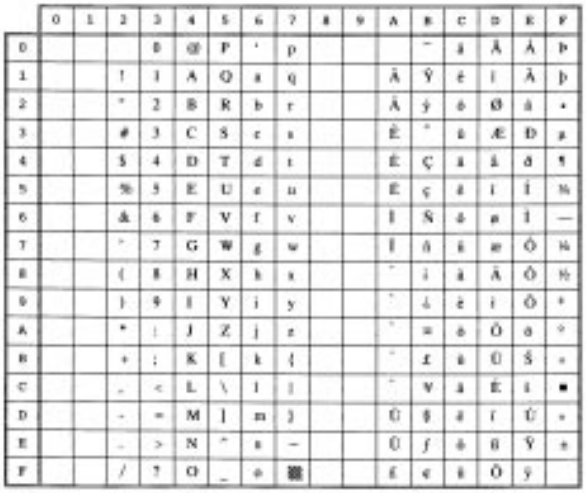
Character Set	Command Codes	
	Primary Set	Secondary Set
CP 437 - International	ESC (10 U	ESC) 10 U
Roman-8	ESC (8 U	ESC) 8 U
PC 8 Denmark/Norway	ESC (11 U	ESC) 11 U
CP 850 (Multilingual)	ESC (12 U	ESC) 12 U
ECMA 94 Latin 1	ESC (0 N	ESC) 0 N
ISO 4 - United Kingdom	ESC (1 E	ESC) 1 E
ISO 21 - Germany	ESC (1 G	ESC) 1 G
ISO 69 - France	ESC (1 F	ESC) 1 F
ISO 15 - Italy	ESC (0 I	ESC) 0 I
ISO 60 - Norway 1	ESC (0 D	ESC) 0 D
ISO 61 - Norway 2	ESC (1 D	ESC) 1 D
ISO 11 - Sweden Names	ESC (0 S	ESC) 0 S
ISO 10 - Sweden	ESC (3 S	ESC) 3 S
ISO 17 - Spain	ESC (2 S	ESC) 2 S
ISO 6 - ASCII	ESC (0 U	ESC) 0 U
ISO 2 - IRV	ESC (2 U	ESC) 2 U
ISO 16 - Portugal	ESC (4 S	ESC) 4 S
ISO 14 - JIS ASCII	ESC (0 K	ESC) 0 K
Legal	ESC (1 U	ESC) 1 U
CP 860 - Portugal	ESC (33 I	ESC) 33 I

Character Set	Command Codes	
	Primary Set	Secondary Set
Danish OPE I	ESC (35 P	ESC) 35 P
UNIX International	ESC (13 U	ESC) 13 U
Danish OPE II	ESC (34 P	ESC) 34 P
Spain II	ESC (33 P	ESC) 33 P
CP 863 - French Canadian	ESC (34 I	ESC) 34 I
PC-WIN - ANSI Windows 3.1	ESC (19 U	ESC) 19 U
CP 852 - Latin 2	ESC (17 U	ESC) 17 U
ISO 8859 / 2 - Latin 2	ESC (2 N	ESC) 2 N
PC Slovenia	ESC (57 P	ESC) 57 P
PC Kamenicky	ESC (58 P	ESC) 58 P
PC-WIN - Eastern Windows 3.1	ESC (9 E	ESC) 9 E
CP 857 - Turkey	ESC (51 P	ESC) 51 P
ISO 8859 / 9 (Turkey)	ESC (5 N	ESC) 5 N
PC-WIN - Turkish Windows 3.1	ESC (5 T	ESC) 5 T
CP 866 - Cyrillic	ESC (43 P	ESC) 43 P
CP 855 - Cyrillic	ESC (44 P	ESC) 44 P
ISO 8859 / 5 (Cyrillic)	ESC (10 N	ESC) 10 N
PC-WIN - Cyrillic Windows 3.1	ESC (55 P	ESC) 55 P
CP 210 - Greece	ESC (37 P	ESC) 37 P
CP 851 - Greece	ESC (40 P	ESC) 40 P
ISO 8859 / 7 (Greece)	ESC (49 P	ESC) 49 P
PC-WIN - Greek Windows 3.1	ESC (56 P	ESC) 56 P
CP 862 - Hebrew	ESC (36 P	ESC) 36 P
ISO 8859 / 8 (Hebrew)	ESC (50 P	ESC) 50 P
Line Draw	ESC (0 L	ESC) 0 L

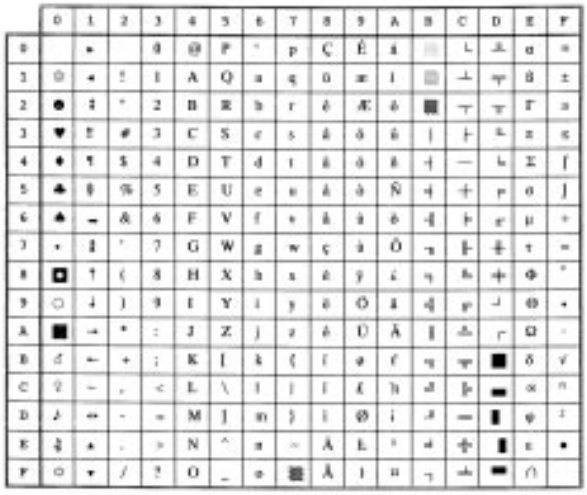
Resident Character Sets Tables



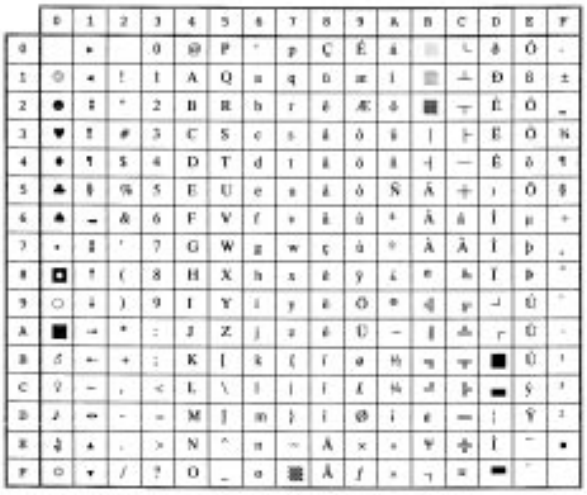
CP 437 International



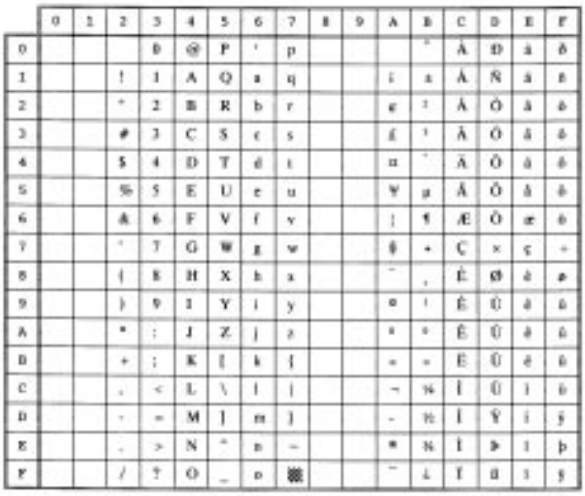
Roman-8



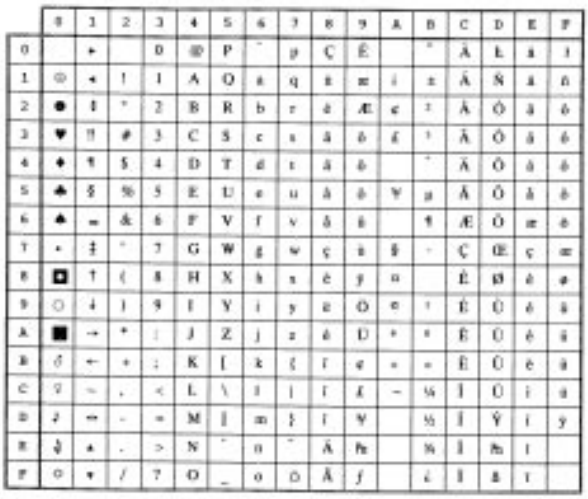
PC 8 Denmark/Norway



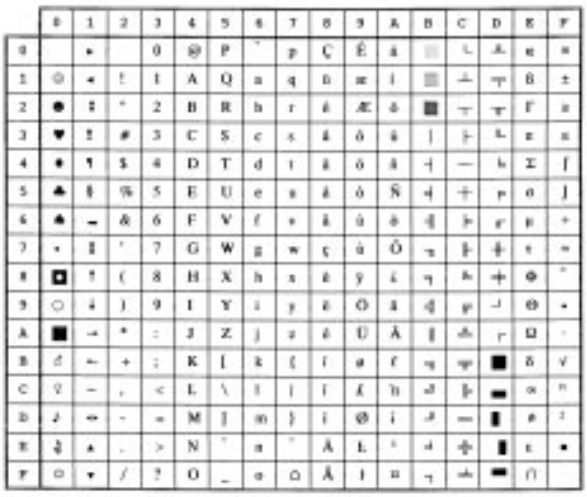
CP 850 (Multilingual)



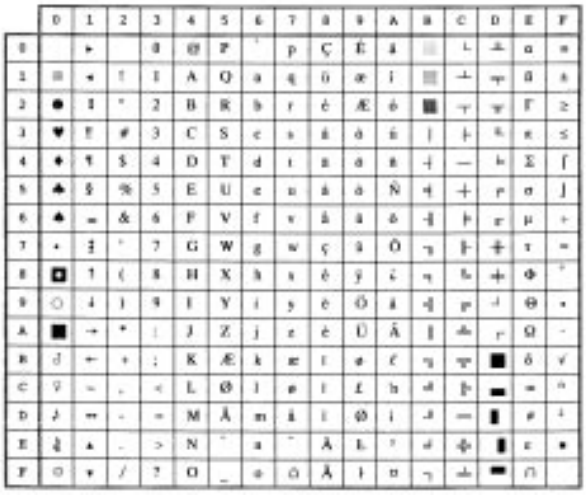
ECMA 94 Latin 1



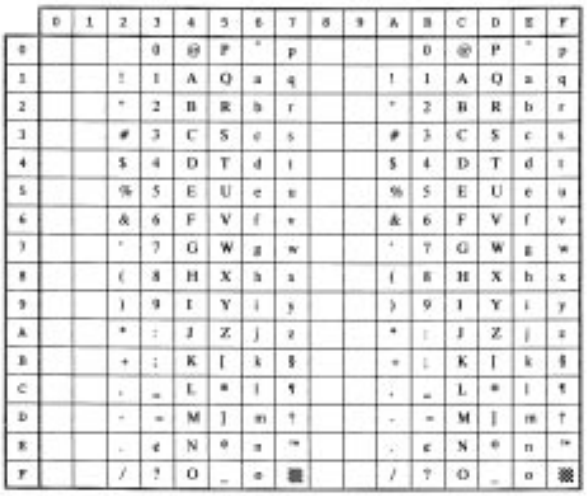
UNIX International



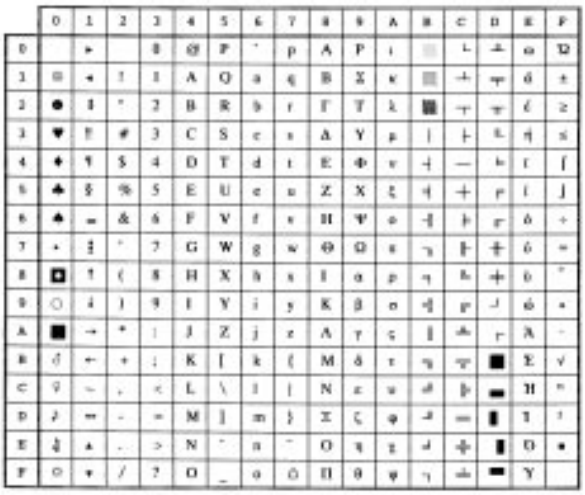
Danish OPE I



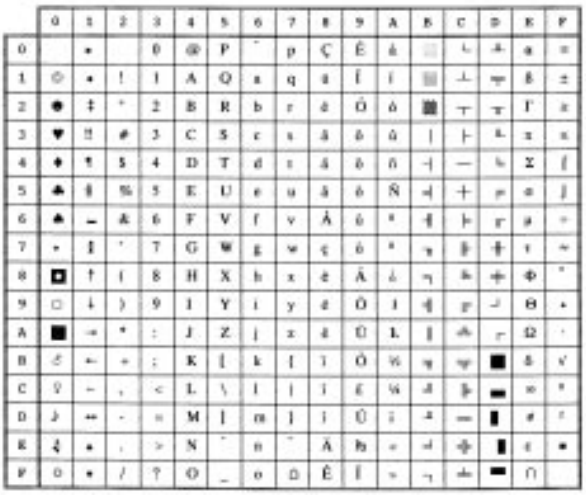
Danish OPE II



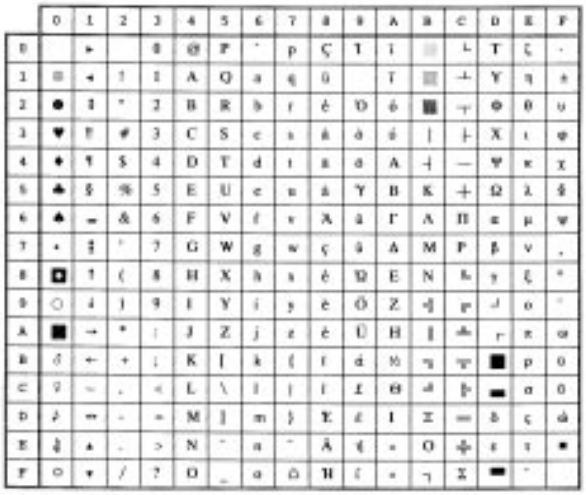
Legal



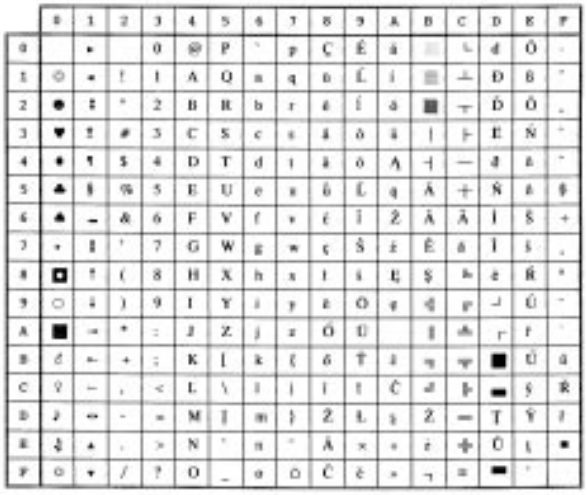
CP 210 - Greece



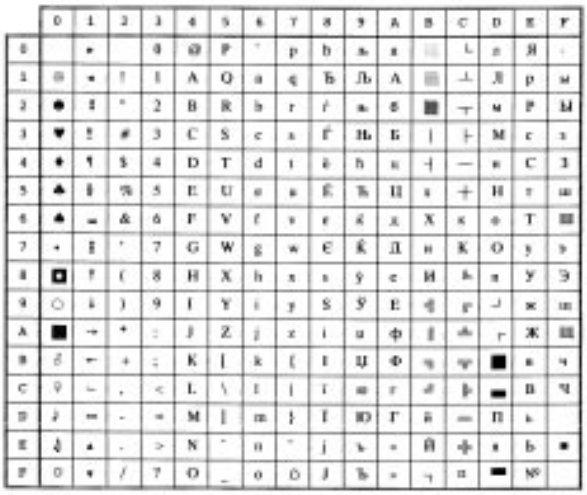
Spain II



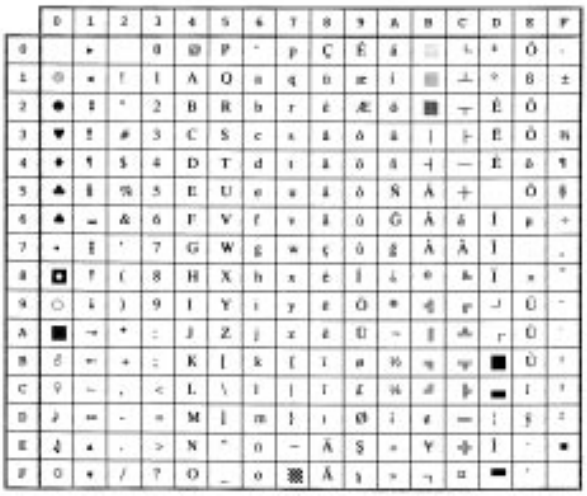
CP 851 - Greece



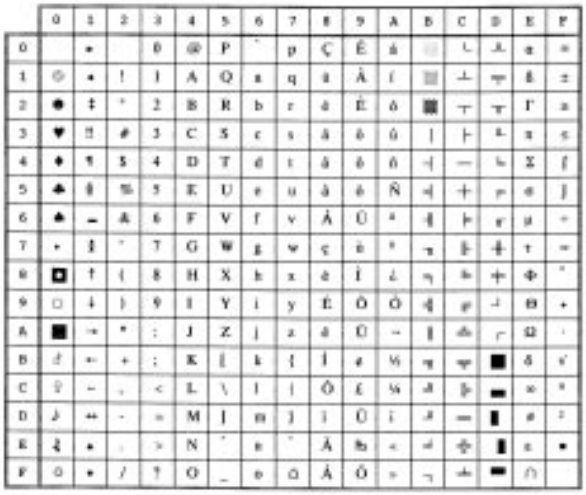
CP 852 - Latin 2



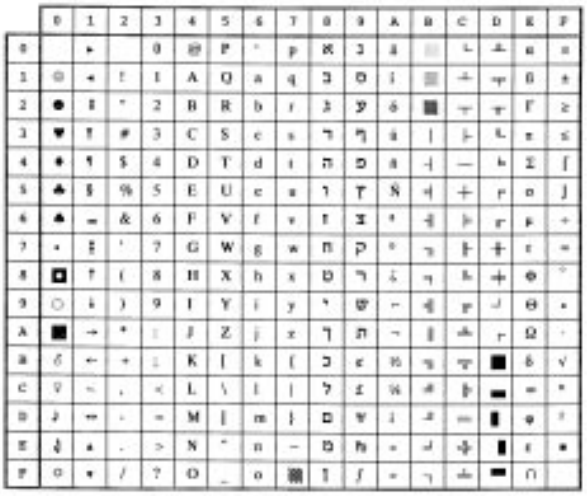
CP 855 - Cyrillic



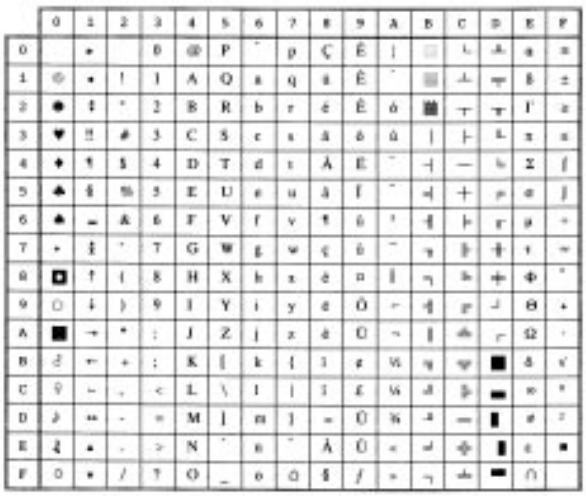
CP 857 - Turkey



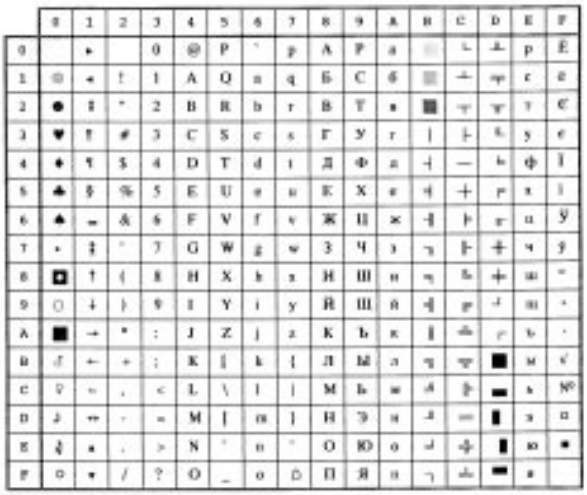
CP 860 - Portugal



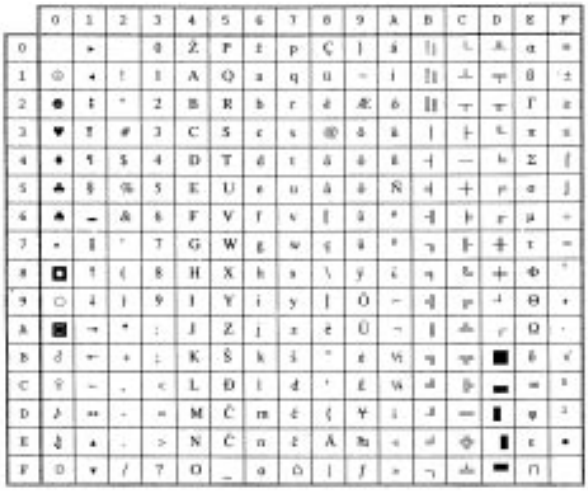
CP 862 - Hebrew



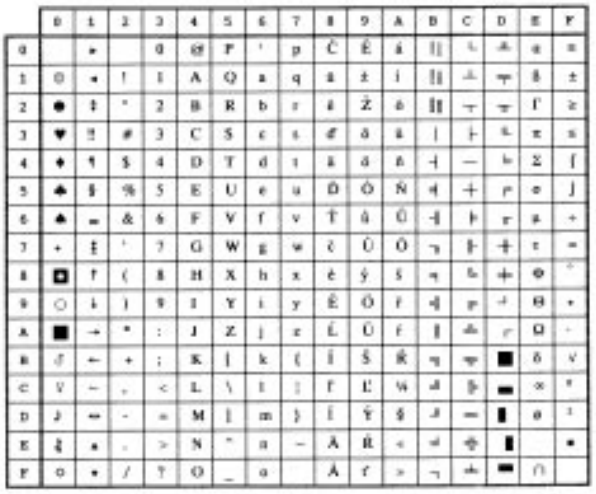
CP 863 - French Canadian



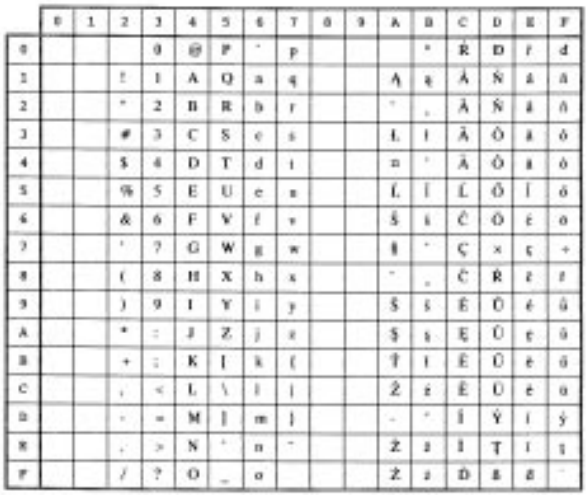
CP 866 - Cyrillic



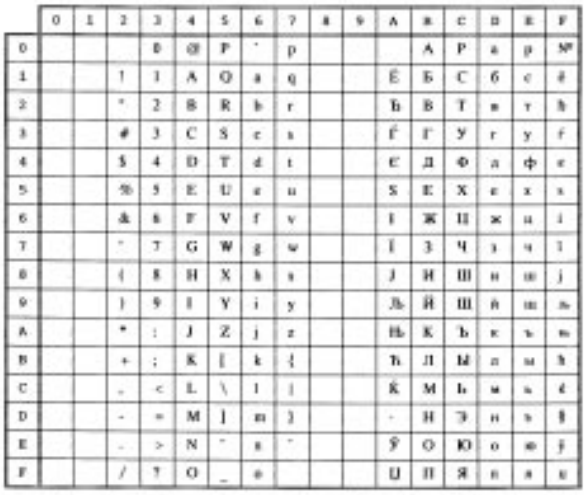
PC Slovenia



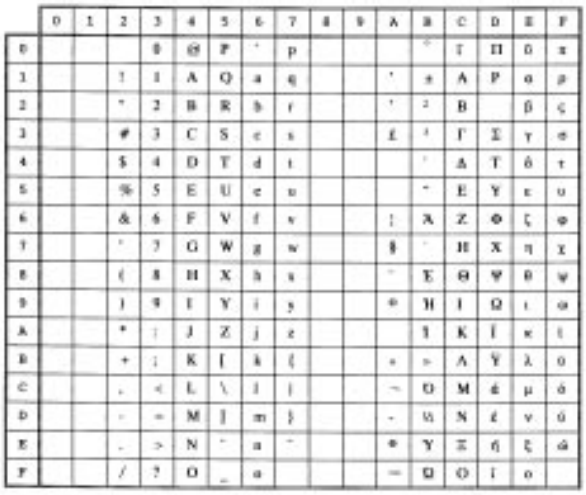
PC Kamenicky



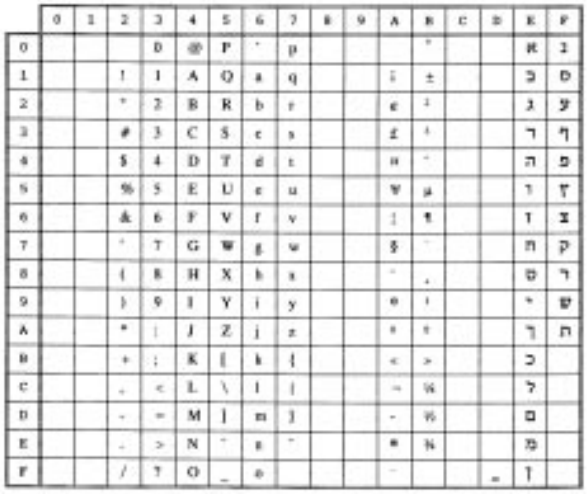
ISO 8859 / 2 (Latin 2)



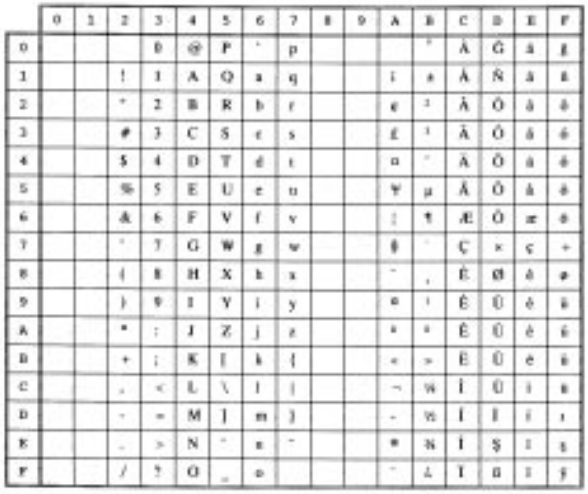
ISO 8859 / 5 (Cyrillic)



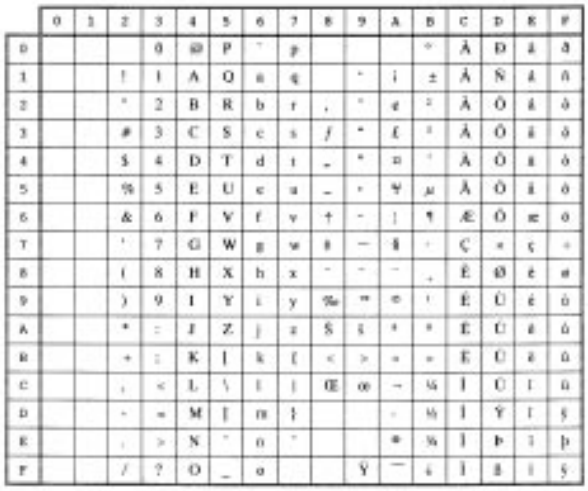
ISO 8859 / 7 (Greece)



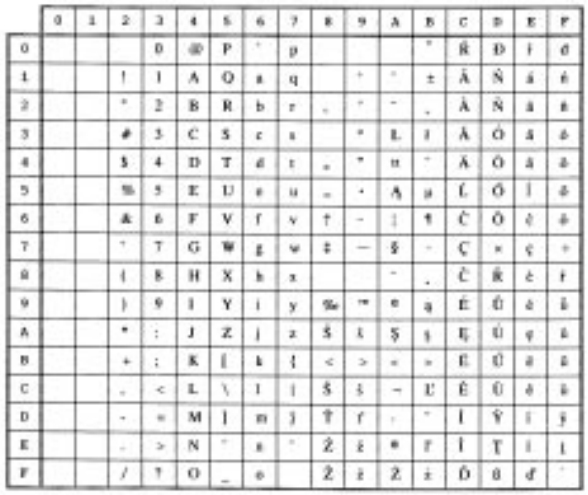
ISO 8859 / 8 (Hebrew)



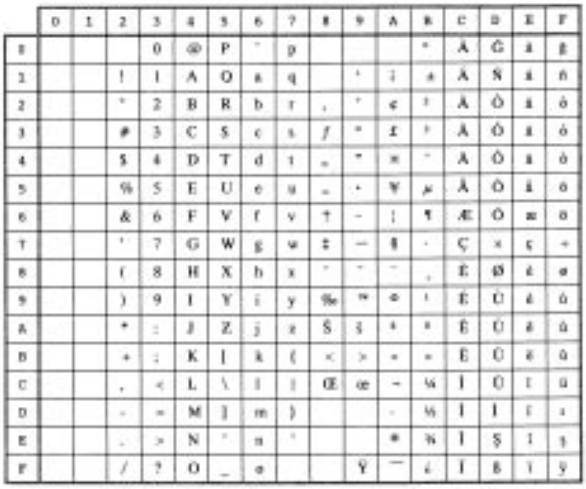
ISO 8859 / 9 (Turkey)



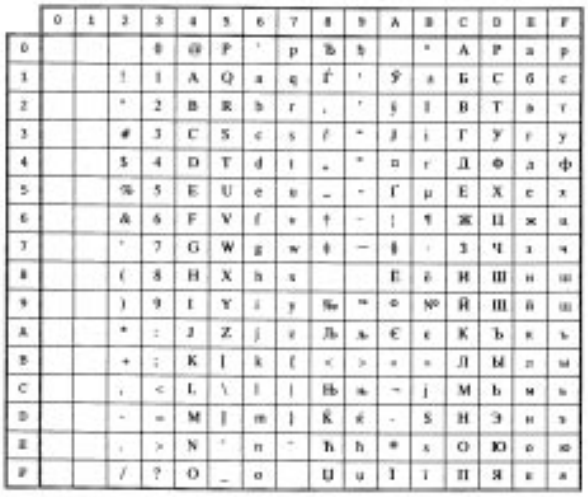
PC-WIN - ANSI Windows 3.1



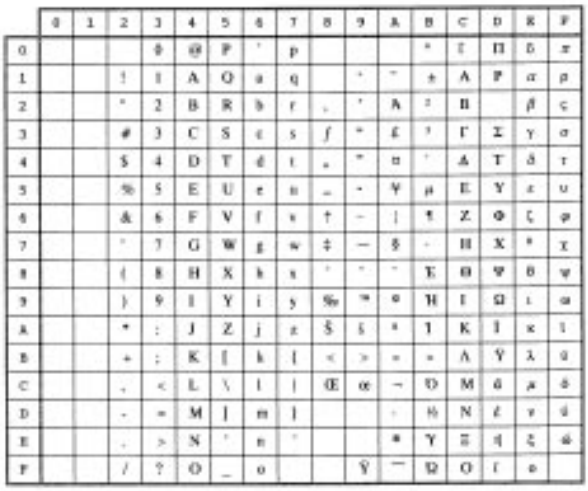
PC-WIN - Eastern Windows 3.1



PC-WIN - Turkish Windows 3.1



PC-WIN - Cyrillic Windows 3.1



PC-WIN - Greek Windows 3.1

ISO Tables - Common Characters

	00	10	20	30	40	50	60	70
00				0		P		p
01			!	1	A	Q	a	q
02			"	2	B	R	b	r
03				3	C	S	c	s
04				4	D	T	d	t
05			%	5	E	U	e	u
06			&	6	F	V	f	v
07			'	7	G	W	g	w
08			(	8	H	X	h	x
09			)	9	I	Y	i	y
0A			*	:	J	Z	j	z
0B			+	;	K		k	
0C			,<	L		l		
0D			-	=	M		m	
0E			.	>>	N		n	
0F			/	?	O	_	o	

ISO Tables - Variable Characters

	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
ISO 2	#	¤	@	[	\	]	^	`	{	|	}	--
ISO 4	£	$	@	[	\	]	^	`	{	|	}	--
ISO 6	#	$	@	[	\	]	^	`	{	|	}	~
ISO 10	#	¤	@	Ä	Ö	Å	^	`	ä	ö	å	--
ISO 11	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ISO 14	#	$	@	[	¥	]	^	`	{	|	}	--
ISO 15	£	$	§	o	ç	é	^	ù	à	ò	è	ì
ISO 16	#	$	§	Ä	Ç	Ö	^	`	à	ç	ö	o
ISO 17	£	$	§	¡	Ñ	¿	^	`	o	ñ	ç	~
ISO 21	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ISO 60	#	$	@	Æ	Ø	Å	^	`	æ		å	--
ISO 61	§	$	@	Æ	Ø	Å	^	`	æ		å	|
ISO 69	£	$	à	o	ç	§	^	µ	é	ù	è	..

E

Command Codes

This appendix gives a summary of the command codes which constitute the complete set of commands for the resident HP DeskJet Plus emulation.

Introduction

When the printer is set for a particular emulation, it will interpret ONLY the set of commands belonging to that emulation.

A printer command consists typically of one or more characters imbedded in the flow of data transmitted to the printer. To make the printer understand which characters are to be interpreted as commands and which as printable characters, there is a simple built-in convention: all "characters" that have, according to the character table, a decimal value less than 32 are interpreted as control codes. Some of them result in an action, when they are received, others do not. The ones causing printer action can be found in the command code description.

There is also a special command ESCAPE (decimal code 27, named ESC) which is used by most printer emulations to open a command sequence. It is followed by one or more additional characters, which are identifiers and parameters, belonging to the printable characters or to those from the range of control codes.

NOTE: If your printer receives commands which are not compatible with the emulation in use, it will ignore them, print them as normal characters or even block. Whatever happens, no serious harm will be done to your printer. To clear the situation, just switch the printer off and on again.

Use of Control Codes

When you program, you will have to insert the desired control codes in the program code. Some general points should be kept in mind when implementing them:

- As Control Codes are generally not regarded as printable data, they do not take up space in the final output. E.g.: the print out of a data string of 150 characters, of which 80 are control codes, will result in the printing of 70 characters and may well stay in one line.

- **Do not insert spaces within a control sequence nor between the sequence and the printable data! The command code descriptions contain spaces only for the purpose of legibility.**

- Some commands are valid only for one line (until next carriage return), others, until they are disabled.

- File format in MS-DOS closes each line with a CR+LF pair. Unix and similar systems use only an LF. The factory setting of the printer for "new line" creation (LF=LF / CR=CR) will thus work correctly for MS-DOS, but has to be **LF=LF+CR** / **CR=CR** in UNIX environment. Adjust the parameter setting during Set-Up or using a command code, if necessary.

- Using the reset command anywhere within the application cancels ALL settings executed by the software and returns to the default settings as programmed in the last Set-Up operation and memorised by the printer.

- A few of the commands have a built-in order of priority with respect to others, or within their own functional group.

Command Codes Reference Tables

Basic Operations

ASCII	Decimal	Hexadecimal	Description
BS	8	08	Backspace
HT	9	09	Horizontal Tabulation
LF	10	0A	Line Feed
FF	12	0C	Form Feed
CR	13	0D	Carriage Return
SO	14	0E	Activates Secondary Font
SI	15	0F	Activates Primary Font
SP	32	20	Space
DEL	127	7F	Delete (ignored)

Fonts and Character Sets

ASCII	Decimal	Hexadecimal	Description
ESC (n @	27 40 n 64	1B 28 n 40	Primary Font
ESC) n @	27 41 n 64	1B 29 n 40	Secondary Font
ESC & l 0 O	27 38 108 48 79	1B 26 6C 30 4F	PORTRAIT Print Orientation
ESC & l 1 O	27 38 108 49 79	1B 26 6C 31 4F	LANDSCAPE Print Orientation
ESC (n m	27 40 n m	1B 28 n m	Primary Character Set Definition
ESC) n m	27 41 n m	1B 29 n m	Secondary Character Set Definition

Color Printing

ASCII	Decimal	Hexadecimal	Description
ESC * b n V	27 42 98 n 86	1B 2A 65 n 56	Data Transfer in Planes
ESC * r n U	27 42 114 n 55	1B 2A 72 n 37	Selects Monochrome / Color Printing
ESC * o n D	27 42 111 n 68	1B 2A 6F n 44	Image Depletion
ESC * o n Q	27 42 111 n 81	1B 2A 6F n 51	Shingling

Down-Line Loading

Optional Font Card Inserted and Selected
See specific section in Appendix B and the manual supplied with the Font Card

Print Attributes

ASCII	Decimal	Hexadecimal	Description
ESC (s + 1 U	27 40 115 43 49 85	1B 28 73 2B 31 55	Superscripts
ESC (s - 1 U	27 40 115 45 49 85	1B 28 73 2D 31 55	Subscripts
ESC (s 0 U	27 40 115 48 85	1B 28 73 30 55	Clears Superscripts / Subscripts
ESC (s 0 P	27 40 115 48 80	1B 28 73 30 50	Selects Fixed Horizontal Spacing
ESC (s 1 P	27 40 115 49 80	1B 28 73 31 50	Selects Proportional Horizontal Spacing
ESC (s n H	27 40 115 n 72	1B 28 73 n 48	Fixed Horizontal Pitch
ESC (s n V	27 40 115 n 86	1B 28 73 n 56	Character Height
ESC (s 0 S	27 40 115 48 83	1B 28 73 30 53	Upright Print Style
ESC (s 1 S	27 40 115 49 83	1B 28 73 31 53	Italic Print Style
ESC (s 0 B	27 40 115 48 66	1B 28 73 30 42	Medium Stroke Intensity
ESC (s 3 B	27 40 115 51 66	1B 28 73 33 42	Bold Stroke Intensity
ESC (s n T	27 40 115 n 84	1B 28 73 n 54	Character Typeface
ESC (s 1 Q	27 40 115 49 81	1B 28 73 31 F-1751	DRAFT Printing
ESC (s 9 Q	27 40 115 57 81	1B 28 73 39 51	DRAFT Printing
ESC (s 2 Q	27 40 115 50 81	1B 28 73 32 51	LETTER QUALITY Printing
ESC & d n D	27 38 100 n 68	1B 26 64 n 44	Underscore
ESC & d @	27 38 100 64	1B 26 64 40	Clears Underscore
ESC & k n E	27 38 107 n 69	1B 26 6B n 45	Underscore for One Line

Page Size

ASCII	Decimal	Hexadecimal	Description
ESC & l n A	27 38 108 n 65	1B 26 6C n 41	Paper Size
ESC & l n L	27 38 108 n 76	1B 26 6C n 4C	Skip over Bottom of Form
ESC & l n D	27 38 108 n 68	1B 26 6C n 44	Line Feed (in LPI)
ESC & l n C	27 38 108 n 67	1B 26 6C n 43	Line Feed (in n /48 in)
ESC & l n P	27 38 108 n 80	1B 26 6C n 50	Page Length
ESC =	27 61	1B 3D	Half Line Feed Forward
ESC & a n L	27 38 97 n 76	1B 26 61 n 4C	Left Margin
ESC & a n M	27 38 97 n 77	1B 26 61 n 4D	Right Margin
ESC 9	27 57	1B 39	Clears Left and Right Margins
ESC & l n E	27 38 108 n 69	1B 26 6C n 45	Top of Form (TOF)
ESC & l n F	27 38 108 n 70	1B 26 6C n 46	Print Area Length

Vertical Positioning of Cursor

ASCII	Decimal	Hexadecimal	Description
ESC & a n R	27 38 97 n 82	1B 26 61 n 52	Positioning on Line "n"
ESC & a + n R	27 38 97 43 n 82	1B 26 61 2B n 52	Positioning "n" Lines Forward
ESC & a - n R	27 38 97 45 n 82	1B 26 61 2D n 52	Positioning "n" Lines Back
ESC * p n Y	27 42 112 n 89	1B 2A 70 n 59	Positioning on Dot "n"
ESC * p + n Y	27 42 112 43 n 89	1B 2A 70 2B n 59	Positioning "n" Dots Forward
ESC * p - n Y	27 42 112 45 n 89	1B 2A 70 2D n 59	Positioning "n" Dots Back
ESC & a n V	27 38 97 n 86	1B 26 61 n 56	Positioning on Decipoint "n"
ESC & a + n V	27 38 97 43 n 86	1B 26 61 2B n 56	Positioning "n" Decipoints Forward
ESC & a - n V	27 38 97 45 n 86	1B 26 61 2D n 56	Positioning "n" Decipoints Back

Horizontal Positioning of Cursor

ASCII	Decimal	Hexadecimal	Description
ESC & a n C	27 38 97 n 67	1B 26 61 n 43	Positioning First Print Position in Column "n"
ESC & a + n C	27 38 97 43 n 67	1B 26 61 2B n 43	Positioning "n" Columns to the Right
ESC & a - n C	27 38 97 45 n 67	1B 26 61 2D n 43	Positioning "n" Columns to the Left
ESC * p n X	27 42 112 n 88	1B 2A 70 n 58	Positioning First Print Position on Dot "n"
ESC * p + n X	27 42 112 43 n 88	1B 2A 70 2B n 58	Positioning "n" Dots to the Right
ESC * p - n X	27 42 112 45 n 88	1B 2A 70 2D n 58	Positioning "n" Dots to the Left
ESC & a n H	27 38 97 n 72	1B 26 61 n 48	Positioning First Print Position on Decipoint "n"
ESC & a + n H	27 38 97 43 n 72	1B 26 61 2B n 48	Positioning "n" Decipoints to the Right
ESC & a - n H	27 38 97 45 n 72	1B 26 61 2D n 48	Positioning "n" Decipoints to the Left
ESC & k n H	27 38 107 n 72	1B 26 6B n 48	Horizontal Motion Index (HMI) n /120 in

Graphic Printing

ASCII	Decimal	Hexadecimal	Description
ESC * t n R	27 42 116 n 82	1B 2A 74 n 52	Graphic Resolution
ESC * r n S	27 42 114 n 83	1B 2A 72 n 53	Graphic Printing Width
ESC * b 0 M	27 42 98 48 77	1B 2A 62 30 4D	Normal Graphic Printing
ESC * b 1 M	27 42 98 49 77	1B 2A 62 31 4D	Compacted Mode 1
ESC * b 2 M	27 42 98 50 77	1B 2A 62 32 4D	Compacted Mode 2
ESC * b 3 M	27 42 98 51 77	1B 2A 62 33 4D	Compacted Mode 3
ESC * b 9 M	27 42 98 57 77	1B 2A 62 39 4D	Compacted Mode 9
ESC * r n Q	27 42 114 n 81	1B 2A 72 n 51	Graphic Printing Quality
ESC * r n A	27 42 114 n 65	1B 2A 72 n 41	Start Graphic Printing
ESC * b n W ..	27 42 98 n 87 ..	1B 2A 62 n 57 ..	Send Data for Graphic Printing
ESC * b n X	27 42 98 n 88	1B 2A 62 n 58	Horizontal (X) Offset
ESC * b n Y	27 42 98 n 89	1B 2A 62 n 59	Vertical (Y) Offset
ESC * r B	27 42 114 66	1B 2A 72 42	End Graphic Printing

Others

ASCII	Decimal	Hexadecimal	Description
ESC E	27 69	1B 45	Logical Reset
ESC z	27 122	1B 7A	Autodiagnostics
ESC Y	27 89	1B 59	Code Printing
ESC Z	27 90	1B 5A	Disables Code Printing
ESC & p n X ..	27 38 112 n 88 ..	1B 26 70 n 58 ..	Transparent Printing Mode
ESC & s n C	27 38 115 n 67	1B 26 73 n 43	Wrap Around
ESC & k n G	27 38 107 n 71	1B 26 6B n 47	Print Line Closure
ESC & k n F	27 38 107 n 70	1B 26 6B n 46	SO/SI enabled for One Line
ESC & k n W	27 38 107 n 87	1B 26 6B n 57	Print Direction
ESC & k n W	27 38 107 n 87	1B 26 6B n 57	Text Scaling
ESC & l 0 H	27 38 108 48 72	1B 26 6C 30 48	Paper Expulsion
ESC & l 1 H	27 38 108 49 72	1B 26 6C 31 48	Paper Feed from Paper Tray
ESC & l 3H	27 38 108 51 72	1B 26 6C 33 48	Manual Paper Feed (sheet/envelope)

F

Technical Characteristics

This appendix summarises, the printer's technical and functional characteristics. It also describes the printer interface specifications.

Printing Technique	Non-impact, bubble ink jet
Black Print Head	- With replaceable ink cartridge and water-resistant ink - Resolution: 300 x 300 dpi - Repetition frequency: 5000 Hz - Nozzles: 50 (in 4 groups of 12 or 13) - Vertical construction (2 columns of 25 nozzles) - Ink cartridge life: 90,000,000 dots (400,000 characters, average) - No. cartridges per print head: up to 10 (depending on usage)
Color Print Head	- Monoblock disposable - Resolution: 300 x 300 dpi - Repetition frequency: 3000 Hz - Nozzles: 51 (in 3 vertical groups: yellow, magenta, cyan) - Vertical construction (2 columns, one of 25 and one of 26 nozzles) - Print head life: 200 pages at 8% capacity
Print Matrix	300 x 300 dpi

Print Definition (Vertical x Horizontal)	- 1/150 in x 1/300 in for Draft - 1/300 in x 1/300 in for LQ
Print density	75, 100, 150, 300 dpi
Print Pitch	10, 12, 16.67 cpi; PS Each basic fixed pitch value can be condensed to half and expanded to double its value (e.g.: 10 cpi: 5 cpi / 20 cpi)
Print Orientation	Portrait and Landscape
Print Line Length (A4 paper size)	Portrait orientation: - 80 characters with 10 cpi pitch - 96 characters with 12 cpi - 132 characters with 16.67 cpi pitch Landscape orientation: - 112 characters with 10 cpi pitch - 134 characters with 12 cpi -186 characters with 16.67 cpi
Printing Speed	- DOS and similar environments: 180 cps in Draft, 120 cps in LQ - Windows and similar environments: DRAFT : up to 3 pages per minute (ppm) - Letter Quality : up to 3 ppm NOTE: These values may vary depending on the software application and / or the type of computer used
Work Load	Not to exceed 350 pages per day nor 1000 pages per month, including 160 color pages
Print Path	Bi-directional
Graphic Printing	Bit Image Mode - Density: 300 x 300 dpi
Ink Save Mode	10 % ink saving in graphics mode
Linespacing	- Elementary value: 1/300 in - Resident value: 1/6 in (4.23 mm)
Vertical Paper Motion	4 in/s (101.6 mm/s)
Printer Emulation	- Resident : HP PCL III + - Optional : IBM X24 / EPSON LQ 850 (on emulation card)

Resident Fonts	- **Courier**: Upright / Italic; Portrait / Landscape - **Letter Gothic**: Upright / Italic - Portrait; Upright - Landscape - **Book Face Times**: Upright / Italic - Portrait - **Times Nordic**: Upright / Italic - Portrait - **Linea**: Upright / Italic - Portrait - **Line Draw**
Fonts Cards	One optional memory card at a time (see Appendix B)
Paper Handling	- Automatic: ASF (tray capacity: 70 x 21 lb sheets (80 g/m2)) - Manual: including thick documents, film, envelopes (weight up to 135 g/m2) See Chapter 3 for paper characteristics
Interface	- Resident: Parallel (Centronics) - Optional: Serial RS 232C / V 24
RAM	128K bytes
Operating Environment	- Temperature: 15 to 35 ^{o}C - Relative Humidity: 15% - 85%
Noise Emittance	ISO 7779 print test (ECMA 74 text) with 10 cpi pitch: 46 dBA Letter Quality print mode Front bystander position
Electrical Characteristics	- Voltage: 115 V (+/- 10%) 220 / 230 V (+6% / -10%) 240 V (+ 6% / - 10%) - Frequency: 50 or 60 Hz - Power absorbed (operate): 25 W
Certification	*For power supply voltage 115 V (USA and Canada)* - Electromagnetic Compatibility: FCC Class B "Certified" - Safety Regulations: USA: UL 1950/478, Canada: CSA C22.2 *For power supply voltage 220 - 240 V* - Electromagnetic Compatibility: EN 55022 Class B, CEE 87/308, VDE 0871 level B (DBP Verf. 243/1991) - Safety Regulations: EN 60950 + Nordic Deviations, Germany: GS (EN 60950/9.88 e ZH/618)

Physical Characteristics	Printer ready for use - **Height**: 11.05 in (281 mm) - **Width**: 14.21 in (361 mm) - **Depth**: 14.21 in (361 mm) - **Weight**: 8.8 lbs (4 kg)

Character Sets
CP 437 - International
Roman-8
PC 8 Denmark/Norway
CP 850 (Multilingual)
ECMA 94 Latin 1
ISO 4 - United Kingdom
ISO 21 - Germany
ISO 69 - France
ISO 15 - Italy
ISO 60 - Norway 1
ISO 61 - Norway 2
ISO 11 - Sweden Names
ISO 10 - Sweden
ISO 17 - Spain
ISO 6 - ASCII
ISO 2 - IRV
ISO 16 - Portugal
ISO 14 - JIS ASCII
Legal
CP 860 - Portugal
Danish OPE I
UNIX International
Line Draw

Character Sets
Danish OPE II
Spain II
CP 863 - French Canadian
PC-WIN - ANSI Windows 3.1
CP 852 - Latin 2
ISO 8859 / 2 - Latin 2
PC-WIN - Eastern Windows 3.1
CP 857 - Turkey
ISO 8859 / 9 (Turkey)
PC-WIN - Turkish Windows 3.1
CP 866 - Cyrillic
CP 855 - Cyrillic
ISO 8859 / 5 (Cyrillic)
PC-WIN - Cyrillic Windows 3.1
CP 210 - Greece
CP 851 - Greece
ISO 8859 / 7 (Greece)
PC-WIN - Greek Windows 3.1
CP 862 - Hebrew
ISO 8859 / 8 (Hebrew)
PC Slovenia
PC Kamenicky

Printer Interface

This section contains a brief description of the technical interface characteristics. For the logical connection to your computer and / or application program, see Chapters 2, and Appendices C and E in this manual and read also the instructions given in the computer / application manual.

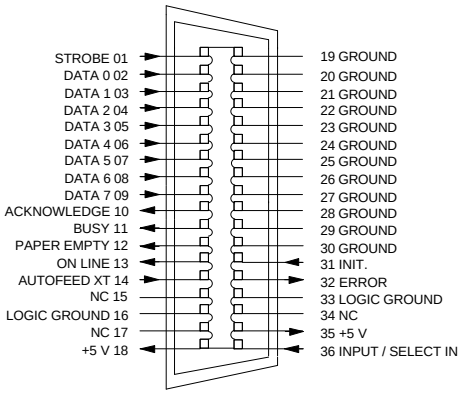
The printer is connected to a PC by means of the resident parallel (Centronics) interface. For correct data transmission / reception, the computer to which your printer is connected must have the same type of interface.

Parallel Interface Characteristics

The parallel interface cable must be a standard shielded, twisted pair cable, with the connector and shield connected.

Compatibility	CENTRONICS
Circuit Logics	CMOS
Data Format	8 bits
Logic Voltage Levels	TTL-compatible
Connector	Amphenol 36 pins (female)

The following diagram illustrates the pins and corresponding signals on the parallel interface connector.



Connector pins and corresponding signals

The following table contains the signals exchanged by the printer and computer, and their meanings, in standard Centronics mode.

PIN	SIGNAL DIRECTION	SIGNAL DESCRIPTION
1	To printer	**$\overline{\text{STROBE}}$** Signal, valid at logic level 0, used to transfer data to the printer. Pulse duration must be at least 0.5 ms.
2 - 9	To printer	**DATA 0 - 7** These 8 lines carry the data transmitted to the printer. Signal duration must be stable at least 0.5 ms before the falling edge of STROBE signal, and remain stable at least 0.5 ms after its rising edge. Data 7 is the most significant bit but is not used in 7-bit ASCII mode

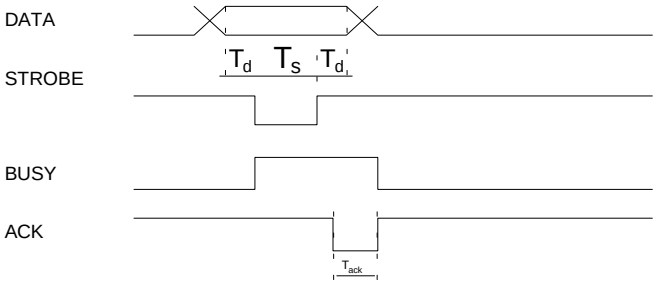
PIN	SIGNAL DIRECTION	SIGNAL DESCRIPTION
10	From printer	**$\overline{\text{ACKNOWLEDGE}}$** Normally at 1; pulsed at 0 to indicate that the printer has accepted the single character transmitted.
11	From printer	**BUSY** Normally at 0; logic level 1 indicates that the printer cannot accept any characters, and is activated in the following cases: during data transfer, buffer full, error condition.
12	From printer	**PAPER EMPTY** Normally at 0; set at 1 if there is no paper. This signal is asynchronous with respect to Strobe, Busy and Acknowledge.
13	From printer	**ON LINE** Set at 1, indicates that the printer is selected (READY) Set at 0, indicates that the printer is OFF LINE. The level of this signal can be changed using command code ESC Q (printer deselection) in IBM emulation.
14	To printer	**AUTOFEED XT** *Significant ONLY for EPSON emulation.* At logic level 0, indicates that auto LF (CR = CR+LF) is active.
16	---	**LOGIC GROUND** Logic ground level (0 V)
18	From printer	**+5 V**
19 - 30	---	**SIGNAL GROUND** Twisted pair return lines.
31	To printer	**$\overline{\text{INIT}}$** A level 0 pulse of width greater than 10 ms (sent by computer) resets the printer and clears the print buffer.

PIN	SIGNAL DIRECTION	SIGNAL DESCRIPTION
32	From printer	**$\overline{\text{ERROR}}$** Normally at 1; set at 0 for anomalies such as paper jam, printer fault condition.
33	---	**LOGIC GROUND** Logic ground level (0 V).
35	From printer	**+5 V** Supplied across a 4.7 kW resistor.
36	To printer	**SELECT-IN** Not significant for resident emulation. *Significant only for optional EPSON emulation.* Command codes DC1/DC3 are handled only when the signal is at level 1.

Slow Down Mode

To avoid "time-out" problems with MS-DOS operating systems, the printer automatically reduces the reception speed when the line buffer is 60 characters from capacity. In this situation, the printer accepts only one character every five seconds from the line, thus guaranteeing that there will be no reception interruption for time-out for at least 300 seconds. Once the data has been unloaded by a print operation, the reception speed will return to its normal value.

Signal Timing

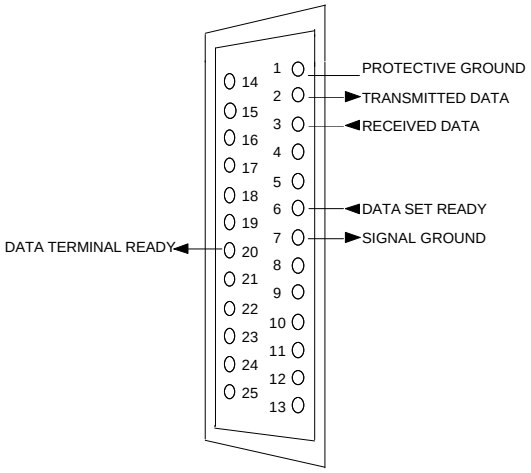


Td (min) = 0.5 µs
Ts (min) = 0.5 µs
Tack = 5.0 µs

Serial Interface Characteristics (Option)

Binary Status	1	0
Signal	MARK	SPACE
Function	OFF	ON
Voltage	> -3 V	> +3 V

Line Buffer Capacity	8K bytes
Connector	25-pin CANNON



Serial connector pin positions and corresponding signals

The following table describes the signals present on the interface connector.

PIN	SIGNAL	DESCRIPTION
1	Protective Ground	This wire must be electrically bonded to the printer casing.
2	Transmitted Data (TxD)	This wire carries the Printer Data to the computer.
3	Received Data (RxD)	This wire carries data from the computer to the printer. Data reception is governed by the ON status of the Data Terminal Ready signal.
6	Data Set Ready (DSR)	The computer uses this wire to signal to the printer that it is ready for data transfer to and from the printer.
7	Signal Ground (GND)	This wire established the Signal Ground reference potential for all the interchange circuits.
20	Data Terminal Ready (DTR)	The printer uses this wire to ask the computer to initiate communication or to indicate that it is busy. Data Terminal Ready is ON when the printer is switched ON and able to receive data.

Logical Connection

NOTE: Once you have connected the printer to the computer, you must check that the serial interface parameters (see Chapter 4) are compatible with any other specific instructions in the operating environment / application program you are using.

Adjusting the Communication Protocol on the Serial Interface

Once you have installed the optional serial interface, you must pair up the printer's protocol with the one in your system. If you decide to adapt the computer to the printer's setting, use the command:

```
copy COMn:[baud],[parity],[8],[stop bits],p
```

where "n" is the number (normally 1) of the addressed interface board, baud needs only a two digit number and "8" is the fixed value of the word length.

High-end applications and user shells have their own, easy-to-handle, device drivers for these tasks (see the specific documentation).

Data Exchange Procedures

The following communications procedures (see Appendix C) are available:

- Free-running with digital Break : XON (DC1)/XOFF (DC3) (default value)
- Free-running with analogical Break.

Free-Running with XON (DC1)/XOFF (DC3) Digital Break

In this procedure, the printer sends two codes to the computer to indicate the line buffer status. When the line buffer is 500 bytes from capacity, the printer will send a BREAK signal (interruption of data transmission), using ASCII code DC3 (XOFF) on TxD (pin 2), to the computer, requesting the transmission interruption.

If, after DC3 has been sent, the computer continues transmitting, when the line buffer is 500 characters from capacity, signal DTR (pin 20) will be set OFF (-V).

When at least 1000 characters have been unloaded (in a print operation), the printer will send ASCII code DC1 (XON), so that data transmission can resume (DTR returns to +V).

Free-Running with Analogical Break

In this procedure, the printer sends a Break signal on wire DTR (pin 20) (-V) when the line buffer is 500 bytes from maximum capacity, requesting the interruption of data transmission from the computer.

When at least 1000 characters have been unloaded (in a print operation), the printer inverts the logic level of Break, so that data transmission can resume.

Glossary

ASCII-Table
(American Standard Code of Information Interchange); standardized code and character assignment table from 0 to 127 decimal.

Backspace (BS)
Control character, which makes the print head move back one character; cannot delete the character as on the screen.

BASIC
Easy-to-handle programming language, which comes together with the MS-DOS operating system (GWbasic).

Bi-directional Print
A mode of print execution, in which the print head does not return idle to the left margin, but outputs the next print line in the reverse order while returning to the left margin.

BIM
(Bit Image Mode); printing mode, in which a byte is not interpreted as character. Its bits cause the individual nozzles of the print head to print or not.

Bit
Smallest information item; a signal set to 0 or 1. Eight bits make one byte (character).

BOF
Bottom Of Form; the area at the foot of each form, in which printing will not be possible (it will be skipped automatically).

Buffer
Built-in memory in the printer, in which data will be stored until it is printed.

Byte
Standard unit for character / symbol representation. A byte consists of 8 bits.

Carriage Return (CR)
Moves the print head horizontally to the beginning of the line. The print head does not automatically go to next print line (unless programmed to do so).

Character Generator
A resident printer program, which converts a character code (byte) into a pixel matrix for printing.

Character Set
Assignment table between a code and a specific printable character (usually in connection with national languages). Compressed printing, see "condensed printing".

Condensed Printing
A print mode which normally has a character spacing density higher than 12 cpi (16.6 or 20 cpi).

CPI
Characters per inch; indicates the number of characters which can be printed in one inch.

Data Format
Refers to the format in which a byte is transmitted to and interpreted by the printer.
For parallel transmission only the definition of the number of bits per byte are important.

DATASCOPE
Another name for the hexadecimal print mode (see glossary item).

dB (decibel)
Unit of measurement for sound.

Default
The standard initial setting of a feature or a parameter. Can usually be modified.

DLL Font
A special character font (Down Line Loaded), which assigns a user-defined matrix layout as the printable character of a given code.

Dot Matrix
Printing technology which creates characters (and graphics) by the composition of programmed columns of dots.

Double Width Printing
Each character (even SPACE) is stretched horizontally to double the nominal pitch width.

Down Line Loading
A procedure in which a file containing a user-defined or packaged font is loaded in the printer memory using an ESCAPE sequence (see item).

DRAFT
Print mode with lowest dot resolution. Allows fast printing.

Driver
Software program which controls output to the printer and does necessary code conversions between application program and printer.

Elementary Spacing
Smallest possible horizontal or vertical movement of the print head.

Emulation
Set of commands that can be interpreted by the printer to emulate a proprietary printer.

ESCAPE Character
The special character with the decimal value 27 (ESC), which tells the printer that the following character(s) form a control sequence.

ESCAPE Sequence
A set of characters, starting with the ESC character, which controls an action of the printer as defined by its emulation.

Factory Settings
Printer settings defined by the manufacturer; also known as default settings (see item).

Firmware
The built-in control intelligence of the printer which cannot be changed by the user.

Font
A set of characters available in a certain typeface and size.

Font Card
An additional plug-in extension of printer memory, which contains one or more fonts (see glossary item). Also called optional or emulation card.

Form Feed (FF)
The action executed by the printer, when commanded to go to the first print line of following page. Called by the command FF or automatically when printing arrives at BOF.

Handshaking
The signal exchange between the printer and the controlling system, which regulates the loading of data to the printer's buffer and avoids overflow of this buffer.

Hexadecimal format
A printing mode in which the transmitted characters (and also control codes) are printed as two digit hexadecimal codes. Used for debugging. Also known as DATASCOPE.

Initialization
The process at printer switch-on in which the printer executes an automatic self-diagnosis of its hardware and loads the settings as defined in programming (Set-Up). Reset by command also causes (re-)initialization of the printer (but without hardware check).

Ink Cartridge
The ink reservoir of the standard print head which can be detached from the outer casing and replaced when empty.

Ink Save Mode
A method of printing in which continuous black areas are not printed with the maximum number of print nozzles available activated.

Interface
Physical (with cable) and logical (synchronization and interpretation of signals) connection of the printer with a host system / computer.

ISO Table
(International Standardization Organization); a convention which assigns to certain ASCII codes (see item) a one-per-nation set of special European characters.

Landscape
Page orientation in which the characters are printed along the long side of the paper.

Line Buffer
The RAM memory of the printer where incoming data is stored until it is processed. The filling of the line buffer is controlled by the handshaking (see item) procedure of the transmission protocol.

Line Feed (LF)
Vertical movement of the print head on reception of the specific command (LF). Does not automatically return the print head to the beginning of the new line (unless programmed to do so).

LOCAL Condition
Another word for the printer Off-Line state (see item).

LQ Print Mode
Letter Quality; printing with a high character definition which approaches solid character profiles.

Memory Card
A cartridge that contains the circuitry and ROM chips which make up the firmware for a selected emulation / character generator.

Off-Line
Printer operating condition in which data and commands through the computer connection are not accepted, but which permits the execution of operations using the operator panel.

On-Line
Operating condition in which the printer is completely controlled by its host.

Parallel Interface
A means of connecting the printer to a computer with a defined standard plug and pin assignment (usually Centronics). Data is transmitted by 8 "parallel" lines, that is, one complete byte at a time. Used for short distances (max. 1.5m).

Parameter
A value or setting for a command or feature.

PCL Commands
Printer Command Language; the resident emulation of the printer. A proprietary name of Hewlett-Packard Company.

Pitch
The character spacing measured in characters per inch.

Point Size
Size of the smallest element used to create the character image (default value: 1/300 in).

Portrait
Page orientation in which the characters are printed across the short side of the paper.

Prime Operation
The print head cleaning operation in which ink is forced through the nozzles to clear them.

Print Buffer
An intermediate buffer in which data coming from the line buffer is stored, until the transmission of a code which commands printing.

Proportional Printing
A print mode in which the print head movement is proportional to the width of the character printed. Lines of the same length may therefore contain different numbers of characters.

RAM
(Random Access Memory); A memory area which may be written to repeatedly, for example, the print buffer, font loading area etc.(volatile, that is, loses contents when overwritten or at printer switch-off).

Release X.X
Indicates the version / updating level of the firmware.

Reset
Commands the printer to clear the buffer and all temporary settings, returning to an initial switch-on state.

Resolution
Print density defined as the number of dots printed per inch (default value: 300 dpi).

ROM
(Read Only Memory); A memory area which can be read (used) but not modified and contains e.g. the built-in character generator, command code emulation etc. (not volatile).

Scalable Font
A file containing the basic elements of a set of characters the size of which can be enlarged and / or reduced (within the specifications indicated) by the user.

Set-Up
A printer operating mode in which it is possible to define the printer settings and memorize them.

Soft Font
A file containing the definition of a set of characters in a certain typeface which can be loaded to the printer memory.

Subscript
A print mode in which the characters are printed in reduced size in the lower half of character frame.

Superscript
A print mode in which the characters are printed in reduced size in the upper half of character frame.

TOF
(Top Of Form) the space on top of a form in which printing is not possible. Will be skipped automatically on the execution of an FF.

User Settings
Printer settings defined by the user, in Set-Up mode, and loaded at each printer switch-on.

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