

Meto SP 40 II

Label Printer

**Programming
Manual**



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Contents

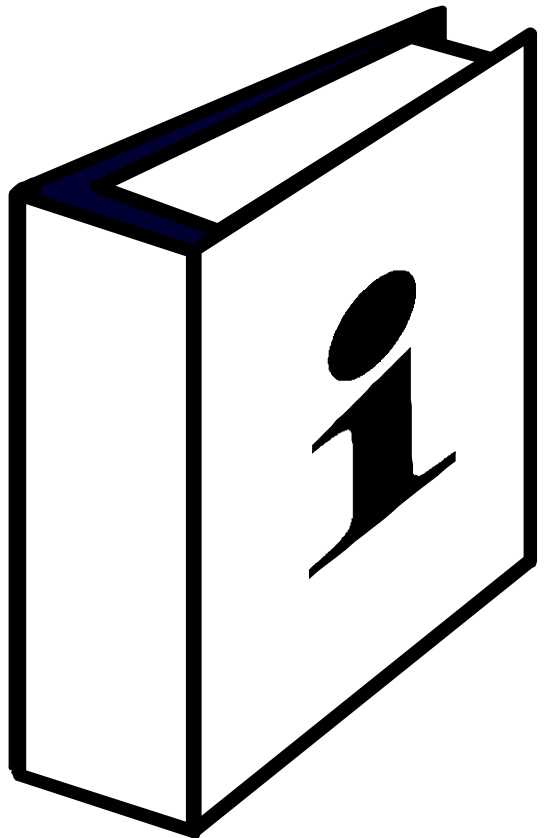
PART I	INTRODUCTION	I-1
Chapter 1	The Manual	1-1
1.1	Scope	1-1
1.2	Conventions	1-3
1.3	Organisation	1-5
Chapter 2	The Language	2-1
2.1	Printer Languages	2-1
2.2	SP40 PDL Foreword	2-3
Chapter 3	The Preliminaries	3-1
3.1	Environment Setup	3-2
3.2	Interface Setup	3-7
3.3	Programming Considerations	3-13
3.4	Key Operation	3-19
PART II	SYNTAX	II-1
Chapter 4	Command Structure	4-1
4.1	Comparative Syntax	4-1
4.2	Command Sequence	4-2
4.3	Control Characters	4-4
4.4	Transmission Sequence	4-6
Chapter 5	Response Structure	5-1
5.1	Online Responses	5-1
5.2	Serial Interface Responses	5-2
PART III	COMMANDS	III-1
Chapter 6	Command Overview	6-1
6.1	Command Usage	6-1
6.2	Command List	6-2



Chapter 7	Command Descriptions	7-1
7.1	General Commands	7-2
7.2	Configuration Commands	7-5
7.3	Layout Commands	7-23
7.4	Data commands	7-68
7.5	Print Commands	7-76
7.6	Flash Card Commands	7-99
PART IV	ERRORS	IV-1
Chapter 8	Error Overview	8-1
8.1	Troubleshooting	8-1
8.2	Error List	8-3
Chapter 9	Error Descriptions	9-1
9.1	Communication Errors	9-2
9.2	Message Translations	9-6
PART V	APPENDICES	V-1
Appendix A	Interfaces	A-1
Appendix B	Barcodes	B-1
Appendix C	Characters	C-1
Appendix D	Data Structures	D-1
Appendix E	Examples	E-1
Appendix F	Fonts	F-1
Appendix G	Glossary	G-1
Appendix H	Trademarks	H-1
Appendix I	International Addresses	I-1
Appendix J	Index	J-1



PART I INTRODUCTION





This Part of the Manual introduces the Manual itself and SP40 PDL. It explains preliminary actions required to set up the printing environment. *Be sure to read this Part if you have not worked with SP40 PDL before.*

- ❑ Chapter 1, The Manual, first defines the scope and purpose of the Manual. Then it explains its conventions and organisation.
- ❑ Chapter 2, The Language, first introduces general computer-to-printer communications. Then, it explains the concept of printer languages in general and the METO printer languages, with a foreword on SP40 PDL, in particular.
- ❑ Chapter 3, The Preliminaries, explains what needs to be done before printing via SP40 PDL: First, the environment setup is described. Then, printer programming considerations are explained.

*For syntax rules,
see PART II, SYNTAX;
for commands,
see PART III, COMMANDS;
for a list of errors,
see PART IV, ERRORS;
for all other data,
see PART V, APPENDICES.*



Chapter 1 The Manual

This Chapter introduces the manual itself, its scope, conventions and organisation.

- ❑ Section 1.1, Scope, defines the validity and purpose of the manual and its target group;
- ❑ Section 1.2, Conventions, explains the typographic conventions used in this manual;
- ❑ Section 1.3, Organisation, explains the systematic arrangement of information in this manual.

For introductory information on SP40 PDL, see Chapter 2, The Language; for environment setup information, see Chapter 3, The Preliminaries.

1.1 Scope

This Section tells you what to expect from the Manual: It defines the validity and purpose of the Manual and its target group.

- ☑ **This Programming Manual is a completely revised edition (Edition 2.0), reflecting the expanded SP40 PDL commands for more printer options, such as the Euro capability. We hope that this reorganisation will make SP40 PDL information more accessible and clearer.**



Validity

This SP40 PDL Programming Manual, Edition 2.0, Art. No. 417 688 A, describes the METO SP40 Page Description Language. It replaces the METO SP40 PDL 1.x Programming Manual, Art. No. 417 688, 10/94.

This Manual is only valid for the SP40 Barcode Label Printer equipped with Firmware Version 1.60 Standard or higher. Not all commands and features described in this manual are available in older versions of the printer. Ask your METO representative for a firmware upgrade.

- ☑ **Please note that the SP40 printer is Y2K (year 2000) compliant.**

Purpose

The purpose of this Programming Manual is to introduce the SP40 PDL, to explain its structure and application and to serve as a reference for its syntax, commands and errors.

It does not teach programming nor data communications theory. Neither is it a substitute for the user's manual of your printer or for the instructions supplied with any optional equipment.

Target Group

This Programming Manual is aimed at all SP40 PDL users and application developers. No prior programming experience is required, but some experience with computer communications is helpful. You should, however, be familiar with the operation of your printer (see *the User's Manual for your printer*).



1.2 Conventions

This Programming Manual makes use of the following conventions:

- ❑ Text consists of letters, punctuation signs and other symbols. In data processing each of these elements corresponds to a character code. **References to a printable character are enclosed in single quotes.**
- ❑ Some non-printable character codes are used to control text. For example, to end the current line and to continue at the left margin of the next is called a carriage return. **References to a control character are enclosed by '<' and '>'.** The carriage return symbol, for example, is <CR>.
- ❑ In programming and printer languages, a printable text or display message is called a string. **References to strings, values and options are also in single quotes.**

Notices

Important text is in bold type. Notices are preceded by the '☒' sign. Here is an example:

- ☒ **An SP40 PDL program must always take account of the different printer capabilities.**

Instructions

A solid square indicates an instruction point.

Example: To connect the printer to the PC/host:

- Decide which interface(s) to connect.
- Using the appropriate cable, connect the printer and PC/host interfaces.



Lists

An empty square indicates an item in a list.

Example: Here an overview of the interfaces on the SP40:

- ☐ serial RS-232C (standard),
- ☐ parallel/Centronics (optional),
- ☐ I/O expansion (optional),
- ☐ flash memory card (optional).

Object Language

The object language, SP40 PDL, is the subject of this Programming Manual. To distinguish the object language text from the explanatory text, SP40 PDL text is in bold Courier New type.

- ☒ **Neither spaces nor quotes may be included in the object code—unless expressly stated. They are used in the examples in this Manual only for reading clarity.**

Example: [Hello <SP> world! <CR>]

Cross-references

All references to other parts of the Manual are in italics.

Example: *For a comprehensive list of technical terms, see Appendix G, Glossary.*



1.3 Organisation

This Programming Manual is divided into five parts, separated by tabbed dividers with a brief description of the respective contents. Each Part deals with a major SP40 PDL topic or organisational aspect.

- PART I:** The INTRODUCTION Part introduces the manual itself and SP40 PDL and it explains the preliminary actions required to set up the printing environment.
- PART II:** The SYNTAX Part describes the structure governing SP40 PDL. It specifies the command and response structures.
- PART III:** The COMMANDS reference Part offers a systematic list of all SP40 PDL commands needed to set up and configure the printer and to manipulate and process label layouts and variable data and to perform printing or other tasks.
- PART IV:** The ERRORS reference Part offers a troubleshooting aid and a systematic list of all SP40 PDL errors which can occur, their causes, effects and remedies.
- PART V:** The APPENDICES Part contains useful information for processing and printing labels via SP40 PDL, including printer interface diagrams, a list of barcodes, character sets, other data structures, sample labels with the SP40 PDL code used to create them, font tables, a list of trademarks, a glossary, a list of Metro addresses and an index.



PART I, INTRODUCTION

Chapter 1, The Manual, 1.3, Organisation

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Chapter 2 The Language

This Chapter introduces the concept of page description languages and SP40 PDL.

- Section 2.1, Printer Languages, introduces page description languages used to control printers.
- Section 2.2, SP40 PDL Foreword, explains the validity, use and basic features of SP40 PDL.

For environment setup information, see Chapter 3, The Preliminaries; for detailed SP40 PDL rules, see PART II, SYNTAX.

2.1 Printer Languages

Data processing equipment, such as a personal computer (PC) or mainframe, uses digital communication means to correspond with other data processing units or peripheral equipment, such as a connected printer.

On the hardware level, the transfer of data is realised by interfaces, such as serial or parallel printer ports. *For specific SP40 information on data communications, see Appendix A, Interfaces.*

On an other level, the transmitted data must be coded and interpreted. This task is often realised by printer drivers. These drivers translate the print data into commands that can be understood by a printer's interpreter.



A printer language conveys instructions to a printer to print data or graphics in a defined way. These instructions can be simple commands to a line printer to go to the top of the next form, to print a centred title in bold Times Roman type with a height of 20 typographic points, to carry out a line feed, <LF>, and a carriage return, <CR>, then to print a given string in Helvetica, 12 points, and, finally, to perform a form feed, <FF>.

Page Description Languages

The primary object of high-level printer languages, such as PostScript, is to describe a desired image on a print medium, such as a page. A Page Description Language (PDL) describes the appearance of text, graphic elements and images for communication purposes and is generally device independent. However, a printer must be equipped with an interpreter of that language to understand the printing instructions.

Whereas PostScript is well suited for describing brochures and entire publications, such as this Manual, high-speed label printing requires other capabilities. High-speed quality thermal label printers for industrial and commercial applications, such as the SP40, have special demands on the language. SP40 PDL meets these demands.



2.2 SP40 PDL Foreword

SP40 PDL, the SP40 Page Description Language, is dedicated to the METO SP40 Barcode Label Printer.

SP40 PDL Use

SP40 PDL is a command-oriented language. Basically, the data to be printed are appended to one or more commands, which can be created with a simple DOS editor. The command sequence, including an instruction to print the data a given number of times is then transmitted to the printer.

SP40 PDL Features

SP40 PDL lets you print barcodes, logos and different fonts. You can rotate, scale and link label elements. SP40 PDL supports international characters, letter quality fonts and allows the printing of country specific symbols including the Euro sign.



PART I, INTRODUCTION
Chapter 2, The Language, 2.2, SP40 PDL Foreword

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Chapter 3 The Preliminaries

This Chapter discusses preliminary environment setup tasks and some basic concepts regarding media processing the SP40.

- ❑ Section 3.1, Environment Setup, describes the communication prerequisites and the setup of the printer and PC/host environments;
- ❑ Section 3.2, Interface Setup, explains how to set up the interfaces on the printer and PC/host and how to configure the interface parameters;
- ❑ Section 3.3, Programming Considerations, discusses programming aspects in view of media processing and SP40 features;
- ❑ Section 3.4, Key Operation, describes the operating panel, its elements and functions;

*For introductory information on SP40 PDL,
see Chapter 2, The Language;
for detailed SP40 PDL rules,
see PART II, SYNTAX;
for detailed SP40 PDL commands,
see PART III, COMMANDS;
for detailed descriptions of interfaces,
see Appendix A, Interfaces.*



3.1 Environment Setup

It is assumed that you are familiar with the operation of your printer and that you, or an operator on site, can set up the printer for use with the media and ribbon of choice.

If there is any doubt about media loading or other preliminary tasks for printer operation, refer to the printer's user's manual, before on-line operation via SP40 PDL.

Hardware Prerequisites

Printer: An SP40 PDL printer.

Host: The PC/host (mainframe computer, workstation or other data processing equipment on which SP40 PDL programs are to be created) must be equipped with an interface. The serial interface is standard.

See Cables below and Appendix A, Interfaces, for pin-outs and connection diagrams.

Interfaces: Here an overview of the interfaces on the SP40:

- ☐ serial RS-232C (standard),
- ☐ parallel/Centronics (optional),
- ☐ I/O expansion (optional) and
- ☐ flash memory card (optional).

- ☒ **Please note that serial data transmission is slower than parallel data transmission, but bi-directional. Bi-directional transmission is prerequisite for reception of printer responses, such as status and error messages. Also, parallel interface cables are generally limited to a length of 10 m.**

For further, detailed information on the interfaces, their pin-outs and signal lines, see Appendix A, Interfaces.



Cables: The printer must be connected to the PC/host by a serial (or parallel) cable.

- ☒ **Please note that the use of METO connection cables will avoid hardware damage and connection problems.**

Tools: No tools or other devices are needed.

Software Prerequisites

Communications: No special software for data transmission is needed, but a communications program, such as Smartcom or PROCOMM PLUS, may be preferable because it makes data transfer easier. Such a program also offers bi-directional communications (chat mode) and other features.

Microsoft Windows also includes communications programs:

- ☐ HyperTerminal (HYPERTRM.EXE on the Windows 95/98 installation disks or CD),
- ☐ Terminal (TERMINAL.EXE in Windows 3.11 and Windows for Workgroups).
- ☒ **Please note that PC operating systems, such as MS-DOS, are able to transfer data without a communications program.**

Word processing: SP40 PDL commands and data must be created or edited by some means. A word processor, such as Microsoft Word or Word Perfect, or any text or hex editor can be used, as no non-printable control characters are needed for SP40 PDL. Utilities, such as the Norton Commander, also offer good editing capabilities. PC operating systems include editors suited for SP40 PDL editing as well:

- ☐ Editor or MS-DOS Editor (EDIT.COM in MS-DOS).



- ☑ **Please note that word processors often store documents in non-compatible formats. Therefore, SP40 PDL sequences must be saved as ASCII text.**
- ☑ **Please note that PC operating systems, such as MS-DOS, also offer basic on-screen editing on the command level.**

Graphics processing:

No graphics program is required. Any paint program, such as Paint or Paintbrush (Windows' PBRUSH.EXE) can be used to import, manipulate and store bitmapped graphics.

- ☑ **Please note that SP40 PDL only handles bitmapped graphics. The bitmaps are transmitted directly to the bitmap buffer or stored as 'Symbol font' characters. Only the black and white Paintbrush format (*.PCX) and the special SP40 format are accepted.**

Hardware Connection

The printer must be physically connected to the PC/host via a connection cable before data communications can take place.

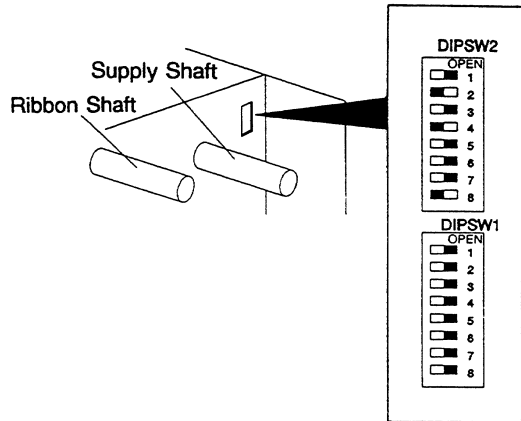
To connect the printer to your PC/host:

- Decide which interface(s) to connect, considering need for printer responses, networking, speed and distances.
- Using the appropriate cable(s), connect the printer and PC/host interfaces.
See Cables above.



DIP Switch Functions

The SP40 is equipped with two DIP switches located on the right hand side of the media supply shaft (DIPSW1 and DIPSW2):



The DIP switches have the following functions:

- ❑ DIP Switch 1 (DIPSW1) controls the language and media setup parameters and
- ❑ DIP Switch 2 (DIPSW2) controls the interface setup parameters (see Section 3.2, Interface Parameters).

☑ **Be sure to turn the printer off before setting the DIP switches.**

The DIP switch status is read when the printer power is turned on.

☑ **Note: Bold settings are default values.**



Language and Media Setup Parameters

To set your language and media supply requirements:

- Set the switches on DIPSW1 (the lower DIP switch) as appropriate.

This is DIP Switch 1 (DIPSW1) (*for DIP Switch 2, see Section 3.2*):

SW	Position			Function	Note
1	OFF			Without RS	Automatic ribbon saving
	ON			With RS	
2, 3 and 4	2	3	4		LCD error message display language
	OFF	OFF	OFF	English	
	ON	OFF	OFF	German	
	OFF	ON	OFF	French	
	ON	ON	OFF	Dutch	
	OFF	OFF	ON	Spanish	
	ON	OFF	ON	Japanese (Note 1)	
	OFF	ON	ON	Italian	
5	OFF			No	Auto form feed standby in cut mode
	ON			Yes	
6	OFF			Without Rewinder / normal cut	Use of built-in Rewinder or cut option
	ON			With Rewinder / head-up cut	
7	OFF			Unused	Set to OFF
	ON				
8	OFF			Unused	Set to OFF, otherwise the printer will not function properly.
	ON				

- ☑ If Japanese is selected, the character code is different (see *Appendix C, Characters*).



3.2 Interface Setup

- ☒ **Be sure to turn the printer off before setting the DIP switches. Note: Bold settings are default values.**

This is DIP Switch 2 (DIPSW2):

SW	Position		Function	Note
1 and 2	1	2		Transmission speed
	OFF	OFF	2400 BPS	
	ON	OFF	4800 BPS	
	OFF	ON	9600 BPS	
	ON	ON	19200 BPS	
3	OFF		1 bit	Stop bit length
	ON		2 bits	
4	OFF		7 bits	Data bit length
	ON		8 bits	
5	OFF		Without	With/without parity
	ON		With	
6	OFF		Even	Parity (valid only when 5 is ON)
	ON		Odd	
7 and 8	7	8		Transmission control system
	OFF	OFF	X-On/X-Off protocol (X-On is not output on power on, X-Off is not output on power off)	
	ON	OFF	Ready/Busy (DTR) protocol (X-On is not output on power on, X-Off is not output on power off)	
	OFF	ON	X-On/X-Off + Ready/Busy protocol (X-On is output on power on, X-Off is output on power off)	
	ON	ON	X-On/X-Off protocol (X-On is not output on power on, X-Off is not output on power off)	



The DIP switch status is read when the printer power is turned on. After connecting the printer to your PC/host, the desired interface (transmission control system) must be selected on your printer. For serial transmission, the flow-control protocol must be set. These are the serial interface protocols:

- ☐ X-On/X-Off (<DC1>/<DC3>),
- ☐ Ready/Busy (<DTR>) and
- ☐ X-On/X-Off AND Ready/Busy (<DC1>/<DC3> AND (<DTR>).

X-On/X-Off: An SP40 software flow-control protocol. The printer sends X-On (<DC1>) to indicate readiness to accept data from the PC/host. It sends X-Off (<DC3>) when its receive buffer is full.

Ready/Busy: An SP40 hardware flow-control protocol. The printer sends Ready (<DTR> is high) to indicate readiness to accept data from the PC/host. It sends Busy (<DTR> is low) when its receiver buffer is full.

X-On/X-Off AND Ready/Busy: An SP40 combination flow-control protocol. The printer sends Ready (<DTR> is high) AND X-On (<DC1>) to indicate readiness to accept data from the PC/host. It sends Busy (<DTR> is low) AND X-Off (<DC3>) when its receiver buffer is full.

The flow-control parameters and protocol (transmission control system) are set on the upper DIP switch on the right hand side of the supply shaft of your printer (DIPSW2).

To set the interface parameters:

- On DIP Switch 2 (DIPSW2) set switches 1 to 6 (SW1 to SW6) to the flow-control parameters you wish to use.

Here an example:

- ☐ SW1 OFF, SW2 ON = 9600 Baud,
- ☐ SW3 OFF = 1 stop bit,



- ☐ SW4 ON = 8 data bits and
 - ☐ SW5 OFF = no parity (SW6 sets odd or even parity if SW5 is ON).
 - ☒ On DIP Switch 2 (DIPSW2) set switches 7 and 8 (SW7 and SW8) to the protocol you wish to use (depending on the interface and operating system on your PC/host). You may need to test this by trial and error.
- ☒ **Please note that MS-DOS cannot handle the serial flow-control protocol, X-On/X-Off: If you transmit data directly from MS-DOS, use the Ready/Busy hardware handshake protocol.**

Refer to Appendix A, Interfaces, for details on protocols, signals and connectors and to the ASCII Control Code Table in Appendix C, Characters, *for decimal and hex values of the signal names.*

PC/Host Interface

The desired interface must also be selected on your PC/host. For serial transmission, the flow-control protocol and other parameters must be set to match those of the printer.

DOS/MS-DOS

To set up a serial port and to copy a file called METOTEST.SP4 directly to that port:

- ☒ On the command line, i.e. at the prompt, (for serial port 1) enter:
'doskey' <CR>
'mode com1:96,n,8,1,p' <CR>
'copy METOTEST.SP4 com1: /b' <CR>.

DOSKEY.COM is a memory resident program to allow navigating to previous commands, command line editing and macro handling. It takes up approx. 3 KB of RAM. It is not neces-



sary to use this program, but it is a big help when you are working directly under DOS.

MODE.COM performs a variety of communications and display tasks. Here it is used to configure serial interface port 1 to 9600 Baud, no parity, 8 data bits, 1 stop bit and automatic transmission retry. If your printer is connected to another port, change the 'com' parameter to the correct port number.

- ☑ **When using DOS, MODE parameter 'p' will set the hardware handshake protocol and retry option.**

COPY transmits file METOTEST.SP4 via serial port 1 to the printer in binary code ('/b').

- ☑ **Remember to always add the binary code parameter to the COPY command to avoid transmission errors.**

DOSKEY and MODE only need to be called once per computer session. Thus, you may wish to put these two commands into a short batch file or to add them to your AUTOEXEC.BAT boot file.

With these versions of the operating system (DOS/ MS-DOS), you can use the Editor (EDIT.COM) to create basic SP40 PDL files, but do not edit or transmit fonts or graphics using this program. It is better to use a hex editor or to copy the edited file directly to a port. You must also configure the serial port with the MODE command. However, you can select the desired port in the Editor's Options menu.

Also with older versions of the operating system (MS-DOS/DOS), data to be printed via a serial port must be redirected from the parallel port. To do this:

- On the command line, i.e. at the prompt, (for serial port 1) enter:
`'mode lpt1: = com1:' <CR>.`



Windows

- ☑ Please do not use the Editor (EDIT.COM) to transmit fonts or graphics, as this program appends unwanted data. It is better to use a different editor or to copy the edited file directly to a port (see DOS above).
- ☑ Please do not attempt to run the Editor (EDIT.COM) and Terminal/HyperTerminal (Windows 95/98/NT) at the same time to prevent port access conflicts.
- ☑ Please note that if you send a file in HyperTerminal, you will not be able to edit it. You must send another file before you can edit the first one.

Windows 3.x: Here you can use the Terminal program in the Accessories group to send and receive data. After it is invoked, set it up as follows:

- Select the (default) serial port.
- Under Terminal preferences in the Settings menu, select 'local echo' and '<CR>/<LF> inbound'.
- Under Communications in the Settings menu, set the Baud rate to '9600' and Flow control to 'hardware'.

You may wish to save these settings to avoid entering them again in future Terminal sessions.

To send a file from Terminal:

- Select to Transfer and Send text file.

Windows 95/98: Windows 95/98 offers HyperTerminal, a more advanced communications program. Once it is installed from your Windows 95/98 installation disks or CD, you can invoke it from the Accessories group. Then proceed as follows:



- For New connection in the dialogue box, enter an easy name, such as 'SP4', and select an icon.
- For Connect using, select 'direct' to the desired port.
- Then set the serial port parameters to match those of the printer.

In subsequent sessions, just select the icon instead of entering all the parameters.

To keep the HyperTerminal screen clear, open Properties in the File menu and under Settings, ASCII Setup, select 'append line feeds to incoming line ends' and save to file.

To send a file from HyperTerminal:

- Select to Transfer and Send text file.

Windows NT: Windows NT offers HyperTerminal like Windows 95/98.

MODE is implemented slightly differently under Windows NT. To set up a serial port and to copy a file called METOTEST.SP4 directly to that port under Windows NT:

- On the command line, i.e. at the prompt, (for serial port 1) enter:
'doskey' <CR>
'mode com1:96,n,8,1,p' <CR>
('p' sets the hardware handshake) or
'mode com1:96,n,8,1,x' <CR>
('x' sets X-On/X-Off).
- ☑ **If you use DOS or the DOS box under Windows NT, the MODE parameter 'p' will set the hardware handshake protocol, 'x' will set X-On/X-Off. To automatically retry transmission is default.**
- ☑ **Remember to always add the binary code parameter to the COPY command to avoid transmission errors.**



- ☑ For problems in a LAN, add '/z' to the COPY command (e.g. 'copy METOTEST.SP4 com1: /b /z' <CR>).

Windows NT also offers alternative parameter entry for the MODE command. Here each parameter can be set individually (see *your Windows NT manual*).

3.3 Programming Considerations

Here are some printer processing concepts as used by METO which you need to understand, if you wish to create sophisticated label layouts and fully utilise the advanced METO printer technology. But first a word on print media, data and label layout.

- Media:** Print media are the (adhesive) labels, tags and tickets printed by the METO printers. The Programming Manual uses this term to refer to print stock. The term media is often used instead of label in its general sense, because the term label is a specifically defined print unit term (see below). Ribbons for thermal transfer printing are not media. In this Manual media are always printing stock media, such as a label roll, a pad of fan-fold tags or a strip of labels with backing paper.
- Data:** Print data are the texts and graphic images to be printed on the media. Thus data can consist of strings (print characters or symbols) or bitmaps (bitmapped graphics).
- Layout:** The position, orientation, size and appearance of data to be printed on the media.



Media Processing Concepts

The label to be printed on the media is defined by a system of three terms:

- ☐ fields,
- ☐ layouts and
- ☐ data.

Field: A field is an abstract data element. Fields can be logos, texts, barcodes, frames or other field types. A field's content may be variable and possibly entered later, e.g. just before printing.

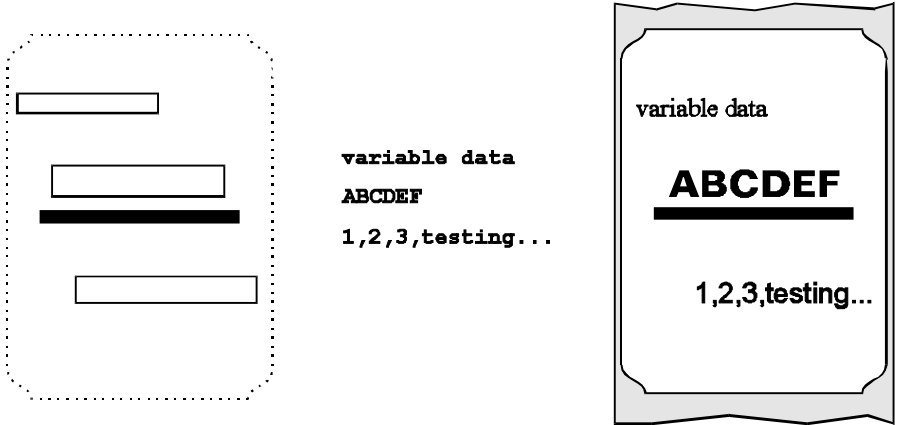
Layout: A layout is a set of instructions for field layout, content and printing. Actual data may or may not be included.

Data: Variable data comprises the information to actually be printed, not the layout data.



Here a diagram to illustrate the relationship between layouts and variable data:

Layout + variable data = printed label



Graphic Data

SP40 PDL allows graphic data to be transmitted to the printer as a bitmapped data block with the appropriate command.

- ☑ **The printer only accepts graphics in the black and white Paintbrush format (*.PCX) or in the special SP40 PDL format.**

Input Buffer

Generally, the transmitted data are received by the printer's input buffer. Here the data are evaluated and conveyed to other buffers or memory areas.



Media Modes

Here are the definitions of the media processing terms:

- Batch:** This is a mode for printing multiple labels or tags jointly.
- Strip:** This is a mode in which one label or tag is processed at a time with backfeed. It can be used for dispensing single labels.
- Cut:** If a Cutter is installed, the media can be cut at pre-defined intervals.

The various aspects of these processing modes are explained in detail in the associated commands.

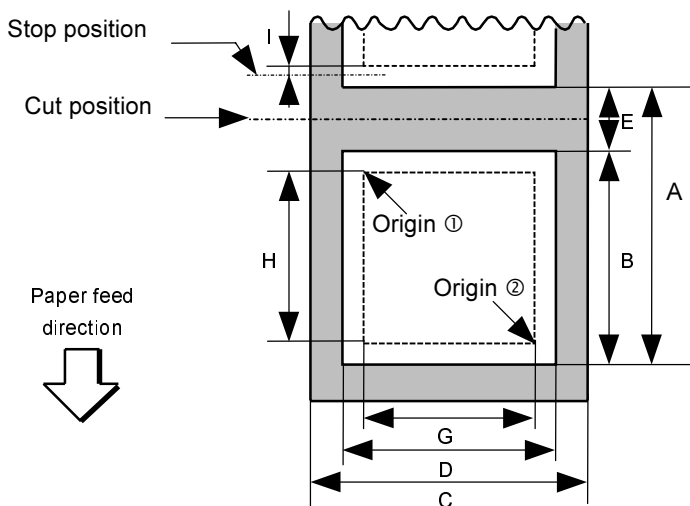
Media Dimensions

Here are the definitions of the media terms:

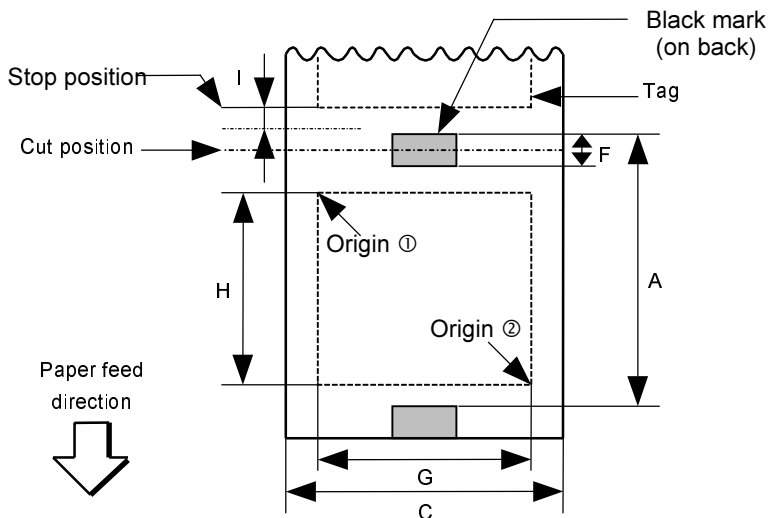
- Physical page width:** Width of the media including backing paper.
- Physical page length:** Length of the media including the length of a gap, blackmark or inter-label space (can be detected automatically by the printer).
- Label width:** The width of the printable label or tag itself, i.e. the physical page width including the left and right margins (e.g. pre-printed area), but excluding the backing paper.
- Label length:** Identical to the physical page length (for gap media), the desired label length (for continuous media).
- Layout width:** The label width minus the margins divided by the number of horizontal layouts.
- Layout length:** The length of the printed layout (automatically computed by the printer).
- Gap length:** The length of a gap, blackmark etc.



These media parameters are supported by the SP40 PDL printers for labels:



These media parameters are supported by the SP40 PDL printers for tags:





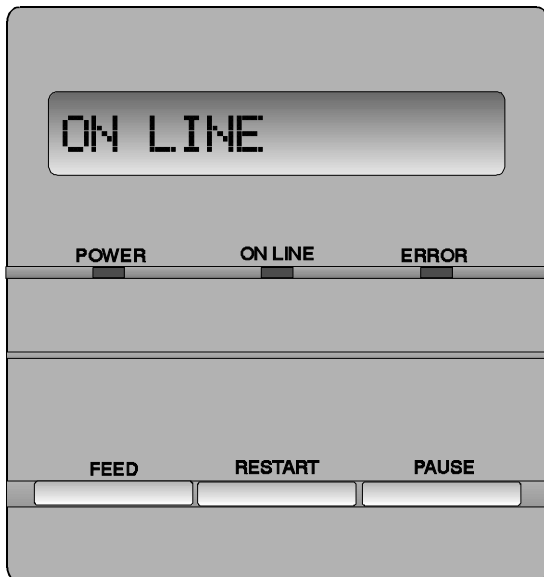
Label dispense mode			Range in mm		
			Batch	Strip	Cut
A: Physical page length	Span of one label (label pitch)		10.0 to 999.0	25.4 to 999.0	38.0 to 999.0
	Span of one tag (tag pitch)		10.0 to 999.0	25.4 to 999.0	25.4 to 999.0
B:	Label length (in cut mode: length B ≥ 35.0 mm - (gap length / 2)		8.0 to 997.0	23.4 to 997.0	25.0 to 993.0
C:	Physical page width		50.8 to 112.0		
D:	Label width		47.8 to 109.0		
E:	Label-to-label gap / gap length		2.0 to 20.0		6.0 to 20.0
F:	Black mark length		2.0 to 10.0		
G:	Effective print width		10.0 to 104.0		
H: Effective print length	Label	Standard memory (w/o expansion)	6.0 to 384.0	21.4 to 384.0	23.0 to 384.0
		Max. memory	6.0 to 896.0	21.4 to 896.0	23.0 to 896.0
	Tag	Standard memory (w/o expansion)	8.0 to 384.0	23.4 to 384.0	
		Max. memory	8.0 to 896.0	23.4 to 896.0	
I: Print speed up/slow down area			1.0		
Max. effective print length for "on-the-fly"		Standard	192.0		
		Max. memory	448.0		
Outer roll diameter			200 max.		
Thickness		Label	0.13 to 0.17		
		Tag	0.15 to 0.29		

Ribbon	Range as indicated
Width	68 to 112 mm
Length	600 metres
Outer diameter	90 mm max.



3.4 Key Operation

This is the operating panel:



The LCD displays messages to indicate the printer status (1 line of 16 characters).

The LED functions are as follows:

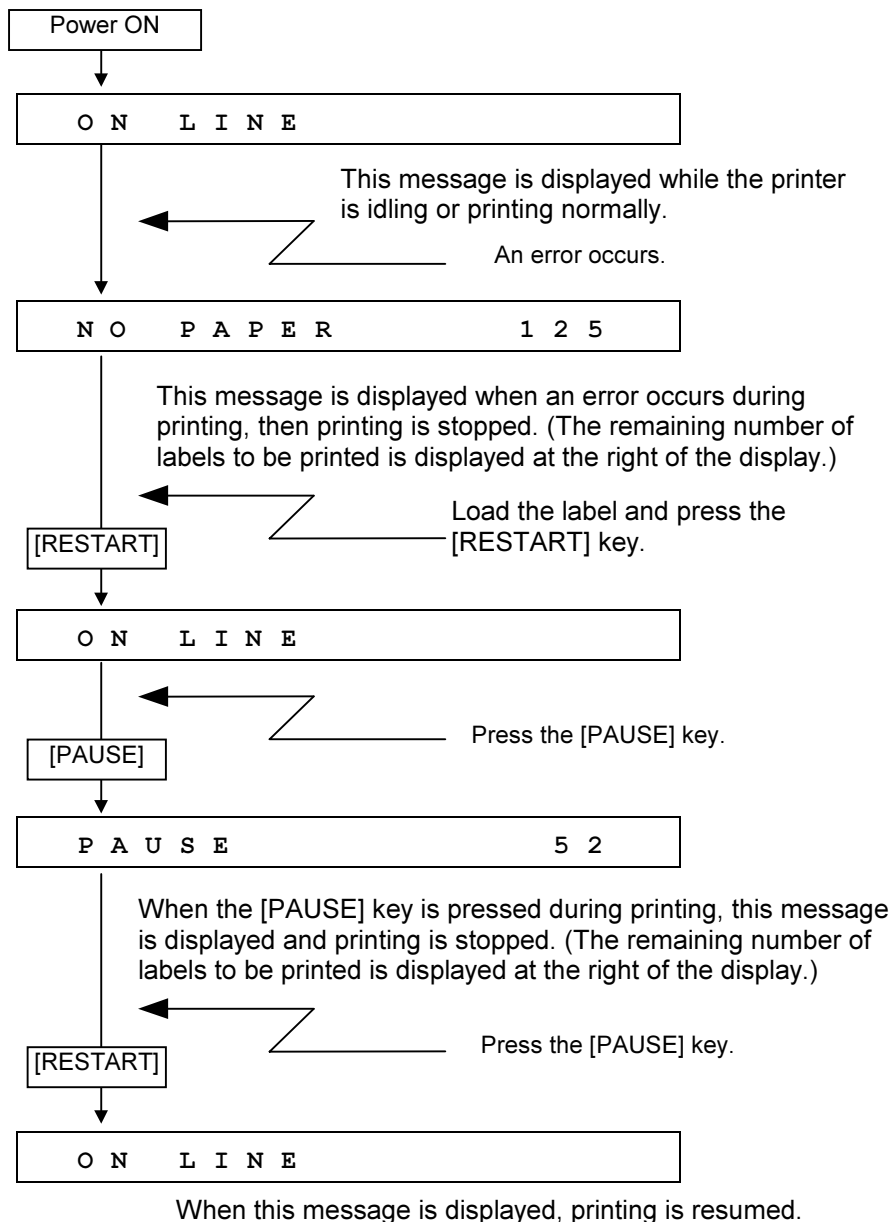
- POWER:** Indicates that the printer power is ON or OFF.
- ON LINE:** Indicates that the printer is ready for communication. Flashes while receiving data.
- ERROR:** Indicates that the printer is in an error state.

The key functions are as follows:

- [FEED]:** Feeds one sheet of paper.
- [RESTART]:** Resumes printing after temporary stop of label printing or after an error.
- [PAUSE]:** Stops label printing temporarily.



Example of Online Operation





- ☑ **Note:** [Remaining number of labels to be printed] = [Designated number of labels] - [number of labels/tags normally printed until the error occurs].

Online Mode Functions

The online mode provides the following functions for issuing labels and setting the threshold:

- ☐ Issuing labels (by external equipment interface commands),
- ☐ paper feed (by the [FEED] key),
- ☐ pause (halts issuing labels by the [PAUSE] key),
- ☐ restart (re-issues labels by the [RESTART] key after halting issuing labels or after the occurrence of an error),
- ☐ reset (enters an usual initial state which is obtained after the power is turned on, using the [RESTART] key),
- ☐ error indication,
- ☐ threshold setting (printed labels) and
- ☐ various parameter setting (parameters including feed fine adjustment and print density fine adjustment are programmed).



PART I, INTRODUCTION
Chapter 3, The Preliminaries, 3.4, Key Operation

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PART II SYNTAX





This Part of the Manual describes the command and response structure governing SP40 PDL. *Refer to this Part whenever you are unsure of SP40 PDL 'grammar' or 'punctuation'.*

- ❑ Chapter 4, Command Structure, describes the structure of the command sequence and specifies the required control characters.
- ❑ Chapter 5, Response Structure, describes the structure of the printer responses.

*For preliminary information,
see PART I, INTRODUCTION;
for a list of commands,
see PART III; COMMANDS;
for a list of errors,
see PART IV, ERRORS;
for all other data,
see PART V, APPENDICES*



Chapter 4 Command Structure

This Chapter explains the SP40 PDL transmissions to the printer.

- ❑ Section 4.1, Comparative Syntax, explains the concept of syntax, commands and parameters in general;
- ❑ Section 4.2, Command Sequence, describes the SP40 PDL transmission and command structure;
- ❑ Section 4.3, Control Characters, lists the characters used by SP40 PDL to signal the start and end of command elements.
- ❑ Section 4.4, Transmission Sequence, describes SP40 PDL transmissions.

For setup and preliminary information, see Chapter 3, The Preliminaries; for printer responses, see Chapter 5, Program Structure.

4.1 Comparative Syntax

Syntax is a term for the rules governing the grammatical arrangement of words in a language. This may seem complicated, but SP40 PDL syntax is very simple compared to that of a natural language, such as English.

As opposed to a computer language, SP40 PDL is linear. There are no branches, no jumps, no loops, and no iterations. Like procedural languages, such as Pascal or C, SP40 PDL has a very definite beginning and end of program or sequence, but there are no functions, no declarations and no inclusions.



Procedures

A command can be compared to a procedure in a computer language. A Pascal or C procedure instructs the computer to perform a certain task, such as to add two values; an SP40 PDL command instructs the printer to perform a task, such as to print a label.

Parameters

A parameter is a variable, such as a selection, a value or a string, governed by the command. It expresses a choice, specifies a quantity or imparts data along with the command.

4.2 Command Sequence

SP40 PDL transmissions from a PC/host to a printer are called command sequences. A command sequence is initiated by control code '<', start of command sequence, and terminated by control code '>', end of command sequence. This is the structure of the command sequence:

<	[Command_1] [Command_2] [Command_n]	>
---	-------------------------------------	---

SP40 PDL Command Format

An SP40 PDL command consists of a command code to instruct the printer to perform a given task. The command may include one or more parameters.

Every single command within a command sequence is enclosed by square brackets, '[' and ']', The parameters or parameter groups belonging to a command are enclosed in parentheses, '(' (double quotes). The parameters



within a group are separated from each other by colons, ':'. Parameters and parameter groups must be in sequence.

Optional parameters and parameter groups can be skipped. An additional colon indicates skipped parameters; skipped groups are indicated by an additional (empty) set of parentheses. Characters outside these delimiting control codes are considered comments.

This is the structure of the commands:

[Command Sub-command "Param_1:Param_2:Param_n"]
---	---	---

Here are some format examples

Command and Parameters	Comment
[CMD SUB "P_1:P_2:Opt_P_3:Opt_P_4"]	All parameters included
[CMD SUB "P_1:P_2:Opt_P_3"]	Optional parameter 4 left out
[CMD SUB "P_1:P_2"]	Optional parameter 3 and 4 left out
[CMD SUB "P_1:P_2::Opt_P_4"]	Optional parameter 3 left out
[CMD SUB "P_G_1" "O_P_G_2" "O_P_G_3"]	All parameter groups included
[CMD SUB "P_G_1" "O_P_G_2"]	Optional parameter group 3 left out
[CMD SUB "P_G_1"]	Optional group 2 and 3 left out
[CMD SUB "P_G_1" "" "O_P_G_3"]	Optional parameter group 2 left out



- ☑ **Note:** Only use the commands and parameters described in this manual. Otherwise the printer operation will not be guaranteed. The commands may only be used in online mode. If any command is transmitted in the system mode, the printer will not operate properly. However, the Reset command (`<[Wr]>`) may be used.

4.3 Control Characters

The SP40 PDL syntax rules demand specific control characters to initiate, terminate and separate the structural elements.

- ☑ **Note:** Control characters cannot be printed directly. The control characters are: '<', '>', '[', ']', '"', ':', '\'. To print such a control character, e.g. in a data field, it must be preceded by '\P'. E.g. the sequence '\P"' will print out a parentheses '"'

Also: Character '>' is used in some barcode data as a control character (e.g. in PDF417 and MaxiCode). To print this character in such a case, enter '>0'. *For further details, see Appendix B, Barcodes.*



These are the SP40 PDL control characters:

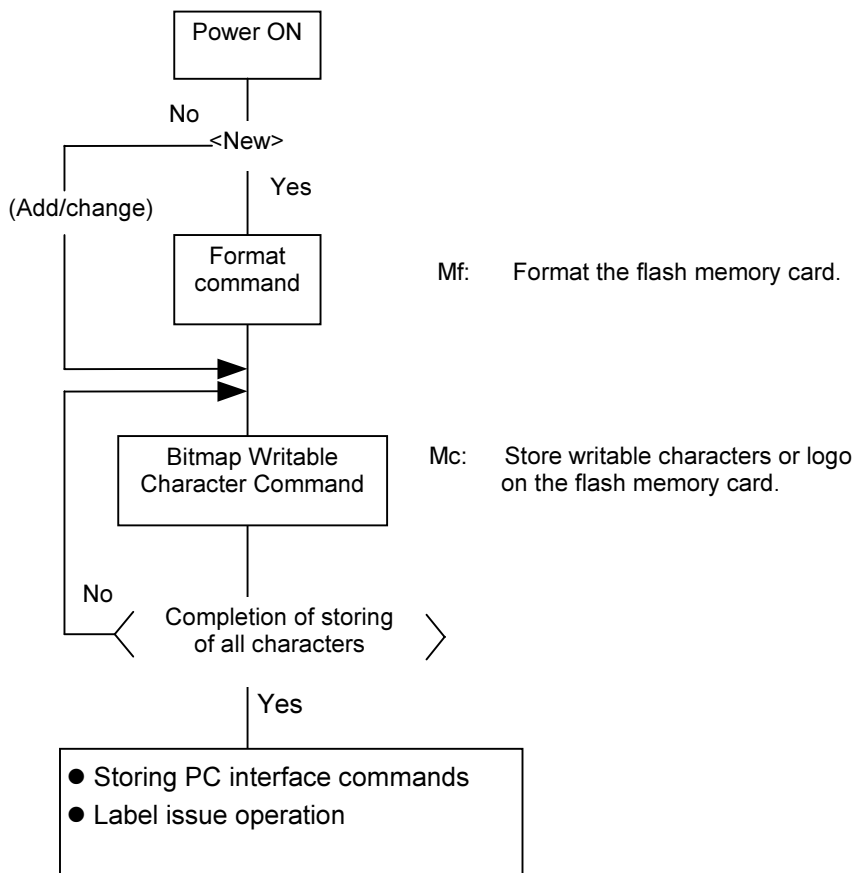
Char.	Hex	Decimal	Function
<	3C _h	060	start of command sequence
>	3E _h	062	end of command sequence
[	5B _h	091	start of command
]	5D _h	093	end of command
:	3A _h	058	parameter element separator
"	22 _h	034	start and end of parameter group
\	5C _h	092	special control sequence follows (the escape character, <ESC>)
\P	5C _h 50 _h	092 080	prints following control character
\dxyz or \Dxyz	5C _h 64 _h 3x _h 3y _h 3z _h or 5C _h 44 _h 3x _h 3y _h 3z _h	092 100 8+x 48+y 48+z or 092 068...	converts a 3-digit decimal number into an ASCII code (according to IBM Table 850)
\oxyz or \Oxy	5C _h 6F _h 3x _h 3y _h 3z _h or 5C _h 4F _h 3x _h 3y _h 3z _h	092 111 48+x 48+y 48+z or 092 079...	converts a 3-digit octal number into an ASCII code (according to IBM Table 850)
\hxy or \Hxy	5C _h 68 _h 3x _h 3y _h or 5C _h 48 _h 3x _h 3y _h	092 104 48+x 48+y 48+z or 092 072...	2-digit hex number is converted into one ASCII code according to IBM Table 850
\d225	5C _h 64 _h 32 _h 32 _h 35 _h	092 100 50 50 53	represents character 'ß' (option 1)
\o341	5C _h 6F _h 33 _h 34 _h 31 _h	092 111 51 52 49	represents character 'ß' (option 2)
\hE1	5C _h 68 _h 45 _h 31 _h	092 104 69 49	represents character 'ß' (option 3)



4.4 Transmission Sequence

Initialisation

Writable characters, logo, and PC interface commands must be stored before the label issue operation. **Storing writable characters and logo:**

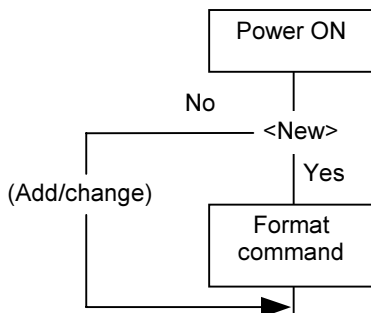




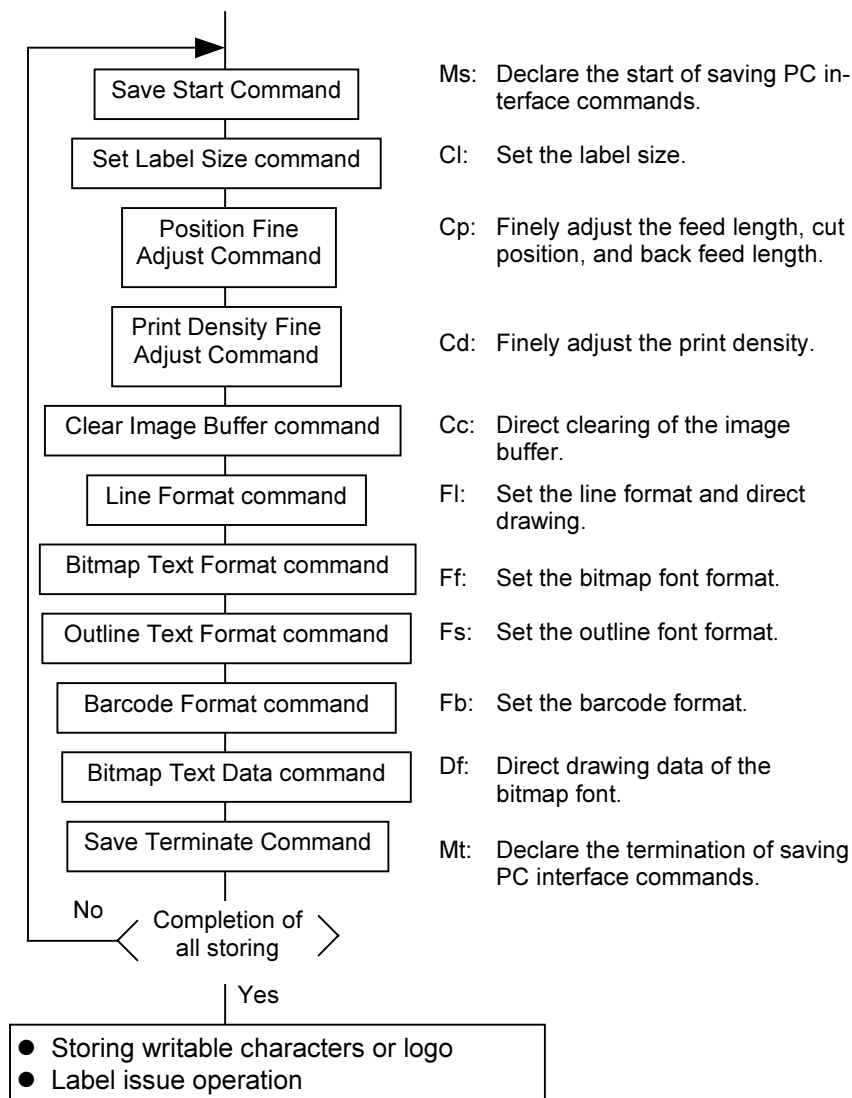
Please note the following:

- ❑ Storing writable characters or logo is not necessary if not required.
- ❑ A flash memory card is necessary for storing writable characters or logo.
- ❑ Unless the Format command is sent before storing already stored writable characters or logo (storing the same numbers), memory will be consumed every such storing.
- ❑ Before another operation (storing PC interface commands, label issue operation) is performed after storing writable characters or logo, the image buffer will be cleared automatically.
- ❑ If another storing operation is not continued after storing writable characters or logo, the printer automatically enters online mode (label issue operation) after about 10 seconds. In this case, the image buffer will be cleared automatically.
- ❑ The flash memory card should be inserted/removed when the power is off. If the card is inserted to register data for the writable characters or logo after the power is turned on, the data may be damaged.

Storing PC interface commands:



Mf: Format the flash memory card.





Please note the following:

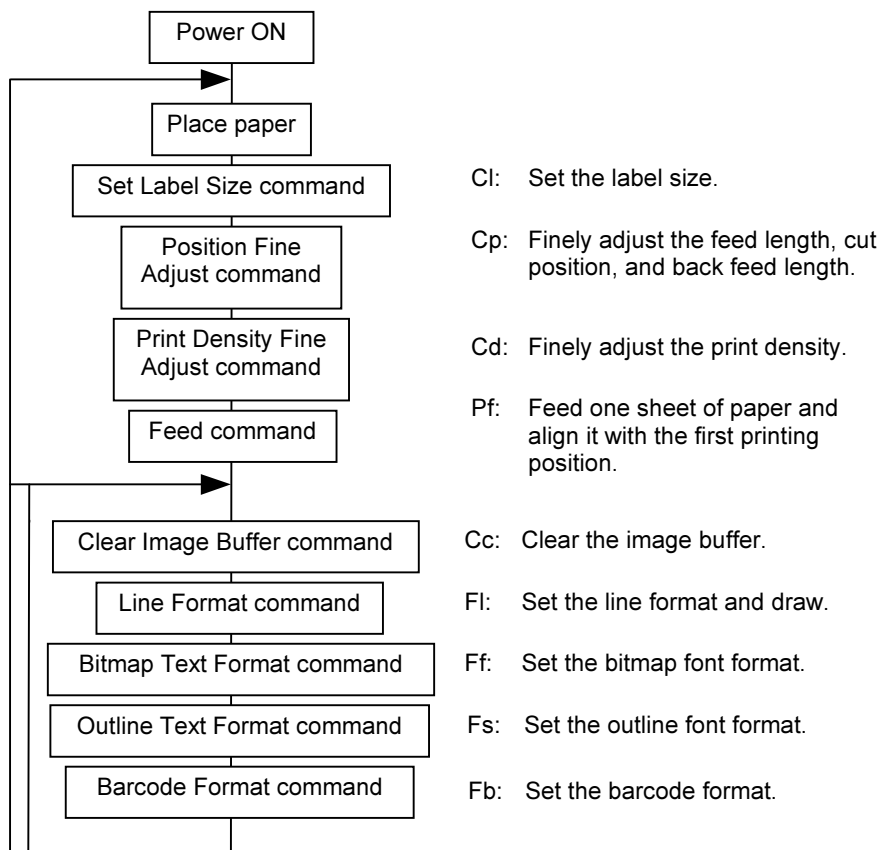
- ❑ Storing PC interface commands is not necessary if not required.
- ❑ A flash memory card is necessary for storing PC interface commands.
- ❑ Unless the Format command is sent before storing already stored PC interface commands (storing the same numbers), memory will be consumed every such storing.
- ❑ Before another operation (storing writable characters or logo, label issue operation) is performed after storing PC interface commands, the image buffer will be cleared automatically.
- ❑ Select commands to be stored as occasion demands.
- ❑ If another storing operation is not continued after storing PC interface commands, the printer enters online mode (label issue operation) after about 10 seconds. In this case, the image buffer will be cleared automatically.
- ❑ The flash memory card should be inserted/removed when the power is off. If the card is inserted to register the PC interface commands after the power is turned on, data may be damaged.

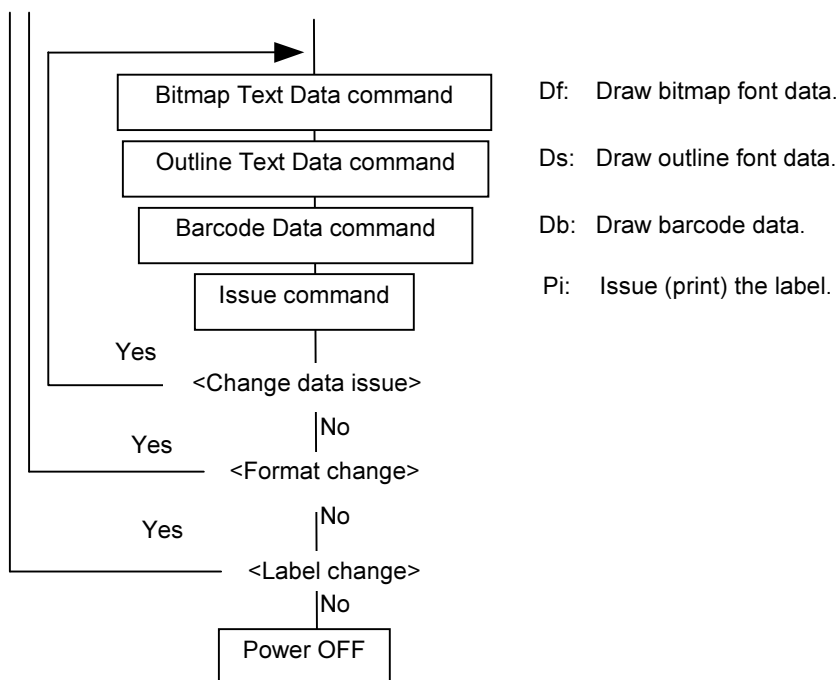


Label Issue Operation

An example of the label issue operation is described below.

If the Recall Saved Data command is not used:



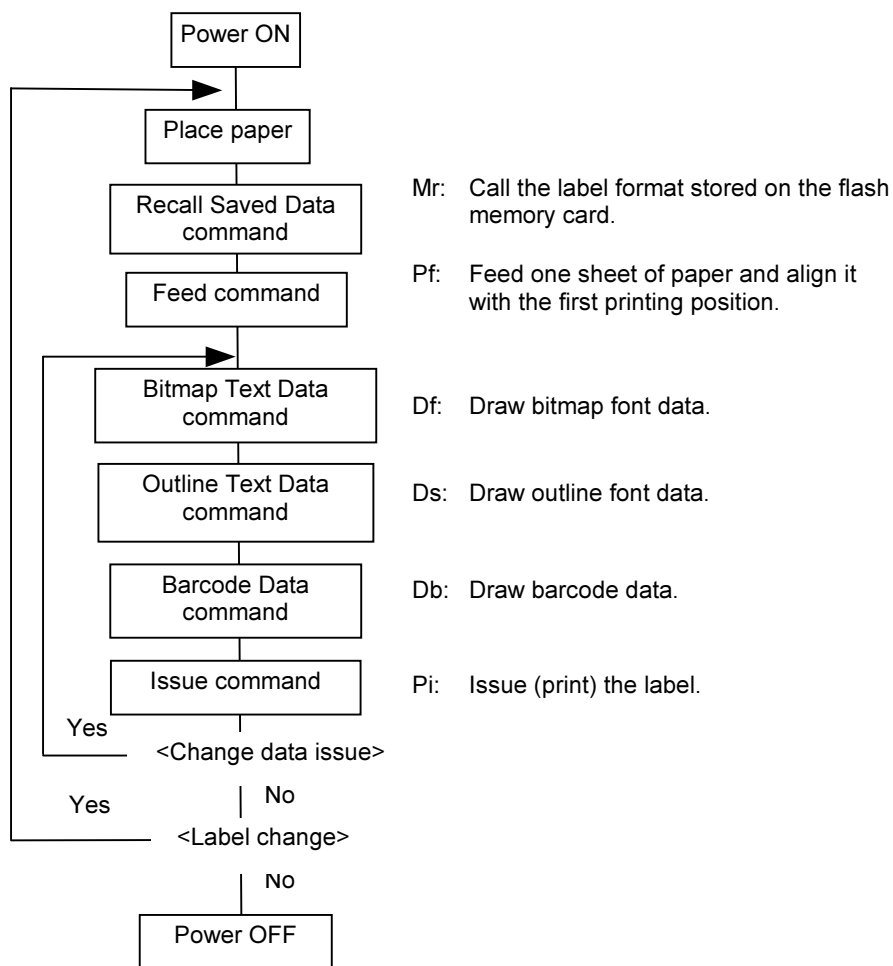


Please note the following:

- ❑ When placing new paper, the Set Label Size command and Feed command must always be sent. When using the same paper after the power is turned off and then on, the Set Label Size command and Feed command may be omitted.
- ❑ After the power is turned off and then on, the Bitmap Font, Outline Font, and Barcode Format commands should be sent as occasion demands because they are not protected in memory.



If the Recall Saved Data command is used:



Please see the note on the previous page on inserting new paper.



Chapter 5 Response Structure

This Chapter explains the SP40 PDL transmissions to the PC/host.

- ❑ Section 5.1, Online Responses, explains the responses from the printer in general;
- ❑ Section 5.2, Serial Interface Responses, describes the SP40 PDL responses for serial transmission;

For setup and preliminary information, see Chapter 3, The Preliminaries; for the command structure, see Chapter 4, Command Structure.

5.1 Online Responses

Depending on the interface being used and the set communications protocol, a printer can respond online to the commands it receives from a PC/host.

Signal Responses

At the signal level, a printer can respond to commands by transmitting a control code in a serial interface protocol or by activating an acknowledge, busy or error signal through the parallel interface.

Serial interface: The data flow protocols as well as the hardware handshake protocol allow all possible response codes. Some computers, however, do not accept any responses other than <X-On> or <X-Off>.



Parallel interface: The optional parallel interface is unidirectional. SP40 PDL command sequences can be transmitted to the printer, but no direct response codes can be obtained. However, signal lines are set high (H) or low (L) to indicate various response codes.

Optional I/O expansion: Indicates whether printer is switched on, feeding, printing, parsing or in error mode. *For details, see the User's Manual.*

- ☑ **Please note that no SP40 PDL responses can be obtained from the printer, if the parallel interface is being used: Activate the serial interface to obtain SP40 PDL responses.**

5.2 Serial Interface Responses

Functions

There are the following two kinds of status response functions.

Response at end of normal transmission

Status transmission function at the end of normal transmission and occurrence of an error (auto status transmission):

If the option for “status response” has been selected, the printer sends status to the host computer at the feeding and at the issuing normally (batch/cut mode: after the designated number of labels are printed, strip mode: after printing one label). In online mode, the head up/down status is sent to the host computer.

When each error occurs, the status is sent to the host computer.



The remaining count of the status response indicates the remaining count of the batch currently being printed. No remaining count of the batch waiting to be printed is transmitted.

Response upon status request

Status transmission function by status request (Status Request command):

Upon request to send status by the Status Request command, the printer sends the latest status indicating its current status to the host computer, regardless of the option for "status response/no status response." The remaining count indicates the remaining count of the batch currently being printed. No remaining count of the batch waiting to be printed is transmitted. This command is not stored in the receive buffer and executed immediately after reception.

Status Format

{	Status			Remaining count				}
7BH	3XH	3XH	3XH	3XH	3XH	3XH	3XH	7DH
start	status details*		"1" or "2"	0000 ~ 9999 (fixed as 0000 in save mode)				end

*For explanation of status details, see PART IV, Errors.

Type of status: "1" (31H): Status Request command
 "2" (32H): Auto status transmission

*For error codes, see PART IV, ERRORS.
 Printer troubleshooting and error handling is dealt with in the printer's user's manual.*

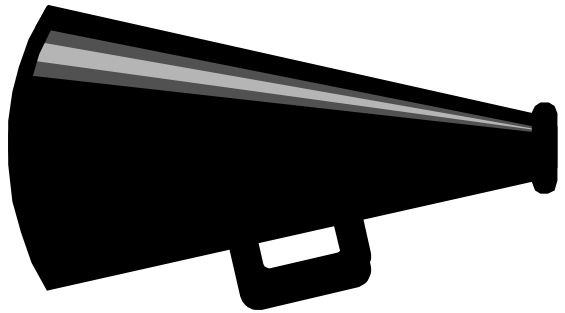


PART II, SYNTAX
Chapter 1, , 5.2, Serial Interface Responses

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PART III COMMANDS





This Part of the Manual offers an overview and a systematic list of all SP40 PDL commands needed to configure the printer and to manipulate and process layouts and data.

Refer to this Part to look up commands and their parameters.

- ❑ Chapter 6, Command Overview, gives you an overview of all commands;
- ❑ Chapter 7, Command Descriptions, describes all commands for configuring the printer and for manipulating or processing label layouts and variable data.

*For preliminary information,
see PART I, INTRODUCTION;
for syntax rules,
see PART II, SYNTAX;
for a list of errors,
see PART IV, ERRORS;
for all other data,
see PART V, APPENDICES.*



Chapter 6 Command Overview

This Chapter lists and explains all the commands you can use online.

- ❑ Section 6.1, Command Usage, explains how to use the commands in a command sequence;
- ❑ Section 6.2, Command List, lists the commands, the SP40 PDL code and number of the page where the command is described in detail.

For detailed explanations of specific commands and parameters, see Chapter 7, Command Descriptions.

6.1 Command Usage

The usage of the individual SP40 PDL commands is described in the following chapter, Chapter 7, Command Descriptions. The descriptions themselves are self-explanatory.

For instructions on getting started and setting up the interface and other parameters, see Chapter 3, Preliminaries. For information on the command syntax, see Chapter 4, Command Structure. For information on the SP40 responses, see Chapter 5, Response Structure. For examples of some of these commands, see Appendix E, Examples.



6.2 Command List

This list gives you an overview of the SP40 PDL commands, their ASCII code and the number of the page where the command is described in detail.

Command	ASCII	Page
General Commands		
Identification code	[Ci]	7-2
Clear image buffer	[Cc]	7-2
Reset printer	<[Wr]>	7-3
Status request	<[Ws]>	7-4
Configuration Commands		
Set label size	[Cl...]	7-5
Position fine adjust	[Cp...]	7-10
Print density fine adjust	[Cd...]	7-21
Enable standard verifier	[Cy...]	7-22
Layout Processing Commands		
Clear/reverse area	[Fa...]	7-23
Line format	[Fl...]	7-26
Text format (bitmap font)	[Ff...]	7-31
Text format (outline font)	[Fs...]	7-33
Barcode format	[Fb...]	7-43
Graphic format (and data)	[Fg...]	7-61



Command	ASCII	Page
Data Processing Commands		
Text data (bitmap font)	[Df . . .]	7-31
Text data (outline font)	[Ds . . .]	7-33
Barcode data	[Db . . .]	7-70
Link field data	[Dl . . .]	7-75
Print Commands		
Issue label	[Pi . . .]	7-76
Feed label	[Pf . . .]	7-89
Eject label	[Pe]	7-94
Forward/reverse feed	[Pc . . .]	7-96
Flash Card Commands		
Format card	[Mf . . .]	7-99
Bitmap writable character	[Mc . . .]	7-101
Save start	[Ms . . .]	7-107
Save terminate	[Mt]	7-109
Recall saved data	[Mr . . .]	7-110



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Chapter 7 Command Descriptions

This Chapter lists and explains all the commands in detail.

- ❑ Section 7.1, General Commands, describes the general printer commands;
- ❑ Section 7.2, Configuration Commands, describes the size, position and other configuration commands;
- ❑ Section 7.3, Layout Commands, describes the label layout processing (formatting) commands;
- ❑ Section 7.4, Data commands, describes the variable data processing commands;
- ❑ Section 7.5, Print Commands, describes the issue, feed and eject commands;
- ❑ Section 7.6, Flash Card Commands, describes the commands needed for Flash Card utilisation.

For a survey of all commands, see Chapter 6, Command Overview.



7.1 General Commands

This Section describes the general printer commands.

Identification code: `[Ci]` (as of V. 1.2)

Function: Display the identification code on the LCD.

Explanation: When the printer receives the identification code command, it displays the ID code of the software in the printer on the LCD then enters a pause state (after completing the label issue, if the issue command has been sent). The pause state is cleared by the `[RESTART]` key and the LCD displays the original message.

Notes: During a pause, a halt due to an error or a head open state, the identification code command is not processed even if the command is received. In this case, the command is processed after the above states are cleared.

Example: `<[Ci]>`

Clear image buffer: `[Cc]`

Function: Clear the image buffer for drawing characters, lines, barcodes, and graphics.

Explanation: After changing the label size, the image buffer must be cleared.

The increment/decrement designation is valid until the Clear Image Buffer command is transmitted.

The link field designation is effective until the Clear Image Buffer command is sent.

Example: `<[Cc]>`

**Reset printer:** <[Wr]>

- ☒ **The delimiters '<' and '>' must immediately enclose this command, i.e. no space between '<' and '[' or ']' and '>'!**

Function: Return the printer to its initial state.

Explanation: Return the printer to the same state as when the power was turned on. When the printer receives this command during printing, it returns to its initial state after issuing the label being printed. The next data must not be sent for a minimum of 3 seconds after this command is transmitted.

Notes: The reset command is effective in serial interface (RS-232C) only. In parallel interface (Centronics), the reset request signal (INPUT-PRIME) should be used.

When the printer receives a command in system mode, only the reset command can be used and any other command cannot be used.

If a command error or communication error occurs when receiving the reset command, the error message is displayed in online mode. However, it is not displayed in system mode.

After the code of the 'Writable character' command ([Mc]) or 'Graphic format' command ([Fg]) is received, the reset command is not processed until the printer receives the type of data.

Example: <[Wr]>



Status request: <[Ws]>

- ☑ **The delimiters '<' and '>' must immediately enclose this command, i.e. no spaces in between!**

Function: Send the printer status to the host computer.

Explanation: This command makes the printer send its status regardless of the setting of "status response/no status response". The status to be transmitted is the current printer status, and indicates the latest status only. The remaining count indicates the remaining count of the batch currently being printed. No remaining count of the batch waiting to be printed is transmitted.

Notes: The status request command is effective in serial interface (RS-232C) only. Since the status cannot be sent in parallel interface (Centronics), this command is not supported.

After the code of the 'Writable character' command ([Mc]) or 'Graphic format' command ([Fg]) is received, the status request command is not processed until the printer receives the type of data.

Example: <[Ws]>



7.2 Configuration Commands

This Section describes the size, position and other configuration commands.

Set label size: [C1 "aaaa:bbbb:cccc"]

Function: Set the size of a label or a tag.

Parameters: **aaaa:** Pitch length of the label or the tag.
Fixed as 4 digits (in 0.1 mm units)

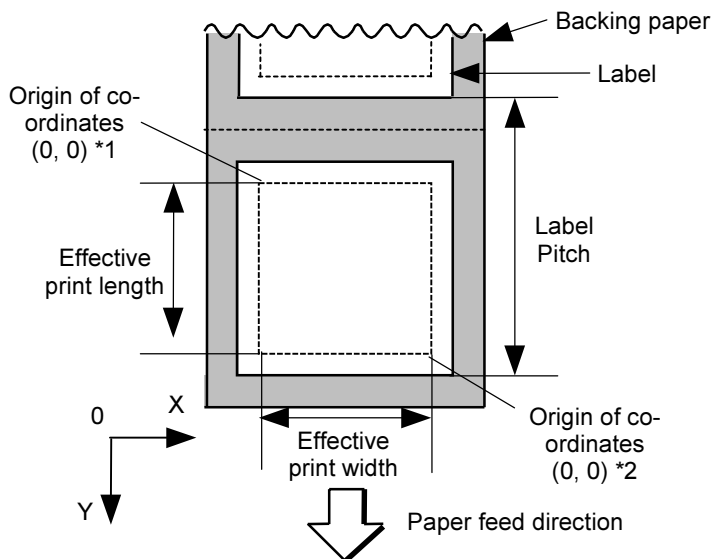
bbbb: Effective print width
Fixed as 4 digits (in 0.1 mm units)

cccc: Effective print length
Fixed as 4 digits (in 0.1 mm units)

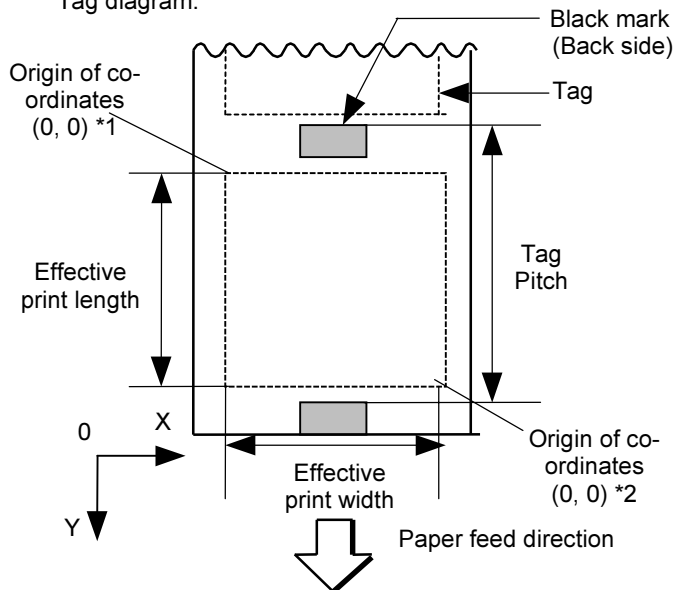
Explanation: *(for media specifications see following pages and under Media in Section 3.3, Programming Considerations)*



Label diagram:



Tag diagram:



*1: If printing bottom first (standard)

*2: If printing top first (upside down)



Notes: Before changing the label size or type of sensor, the Set Label Size command must first be transmitted.

The Set Label Size command is protected in memory (protected even if the power is turned off).

After sending the Set Label Size command, one sheet of paper must be fed by the Feed command (`[PF]`) and must be aligned with the first printing position prior to printing.

The origin of drawing co-ordinates, print stop position (head position at stop), and cut position are determined according to the parameters of the Set Label Size command as shown in the figure on the preceding page. For the print stop position in strip issue mode, refer to the section of the Position Fine Adjust command. The effective print area (*see under Media in Section 3.3, Programming Considerations*) is centred on the label/tag.

Printing cannot be performed in the slow up (1 mm) and slow down (1 mm) areas. Consequently, $[A: \text{label/tag pitch}] - [H: \text{effective print length}] \geq 2 \text{ mm}$ must be assumed. *See Media Dimensions In Section 3.3.*

The origin of drawing co-ordinates, print stop position (head position at stop), and cut position are adjustable by the Fine Adjust Command and according to the fine adjustment settings in System mode.

The tag rotation designation of the Issue command (`[Pi]`) causes the origin of drawing co-ordinates to be origin x1 for “printing bottom first” and to be origin y2 for “printing top first”, as shown in the figure. *See Media Dimensions In Section 3.3.*

The parameters must be as shown in the figure and table. Any value or paper outside the range results in a failure of printing or an error.

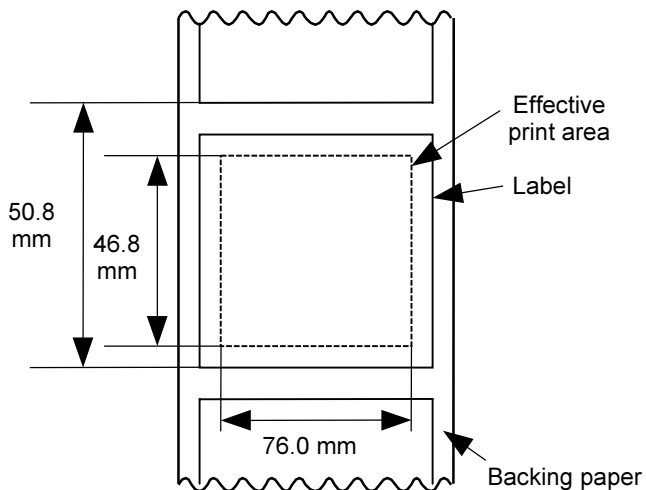


Where an effective print length within “max. effective print length for on-the-fly” is specified, labels even each with different data can be printed continuously without stopping every label because printing and drawing of the next label are processed at the same time. [On-the-fly issue]. However, printing may stop every label depending on the quantity of drawing data. Also, if the ribbon save issue is used, the On-the-fly issue will not be performed regardless of the data quantity.

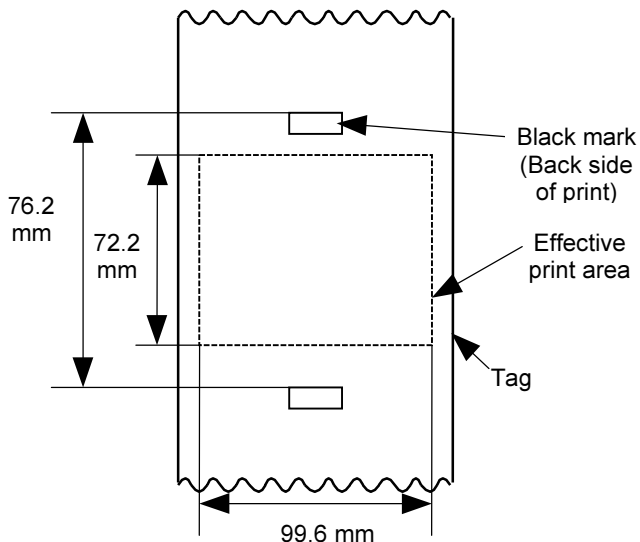
Examples: *(see following page)*



Label example: < [C1 "0508:0760:0468"]
[Pf "2:0:C:6:1"]>



Tag example: < [C1 "0762:0996:0722"]
[Pf "1:0:C:6:1"]>



**Position fine adjust:** [Cp " \pm bbb" " \pm ddd" " \pm fff"]

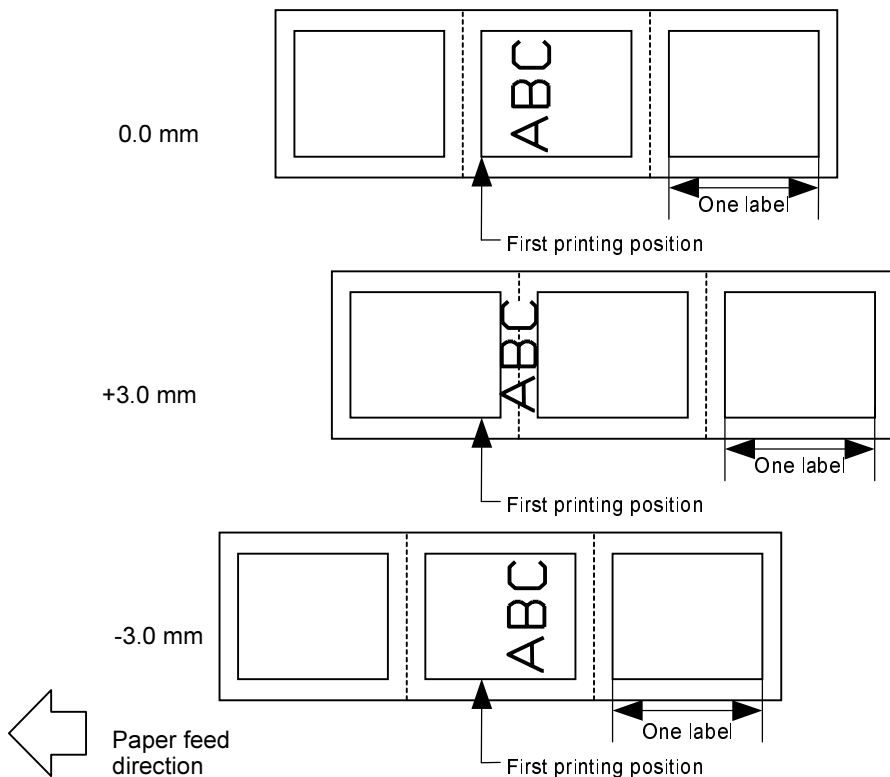
Function: Finely adjust the feed value so that the label will be shifted forward or backward from the automatically set first printing position. Finely adjust the cut position so that the label will be cut at a position shifted forward or backward from the automatically set cut position. Finely adjust the value for feeding back the label to the home position after cutting. Finely adjust the strip position so that the label will be shifted forward or backward from the automatically set strip position. Finely adjust the value for feeding back the label to the home position after stripping.

Parameters:

- \pm bbb:** Feed value to be finely adjusted.
000 to 500 (in 0.1 mm units)
 \pm : Indicates the direction, forward or backward (+: backward, -:forward).
- \pm ddd:** Amount for finely adjusting the cut position (or strip position).
000 to 500 (in 0.1 mm units)
 \pm : Indicates the direction, forward or backward (+: backward, -: forward).
- \pm fff:** Amount for finely adjusting the back feed. 00 to 99 (in 0.1 mm units)
 \pm : Indicates whether the back feed is to be increased or decreased
(+: increase, -: decrease).



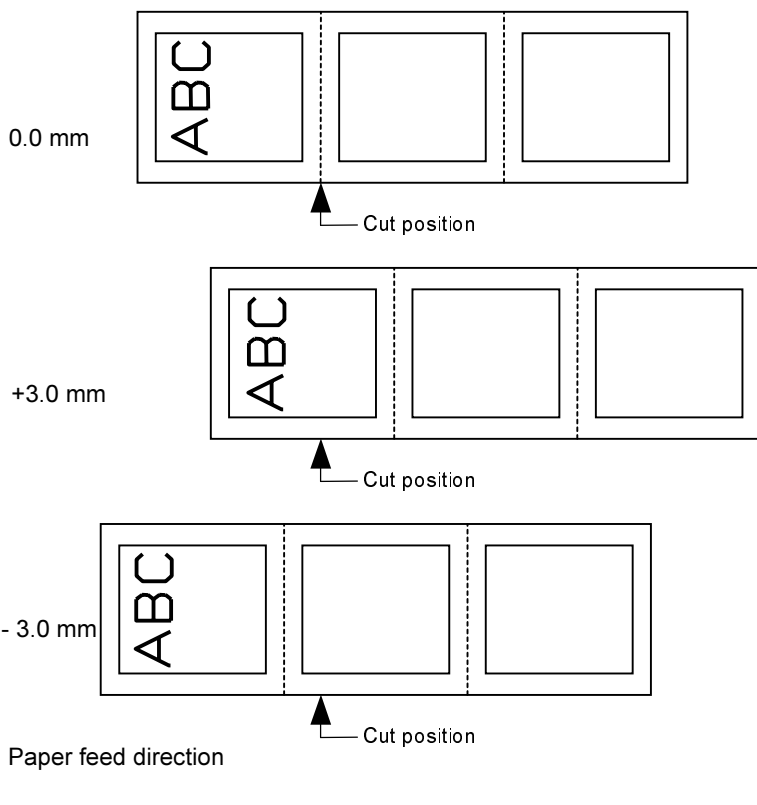
Explanation: Feed Length Fine Adjustment
(To finely adjust the feed for shifting backward or forward)





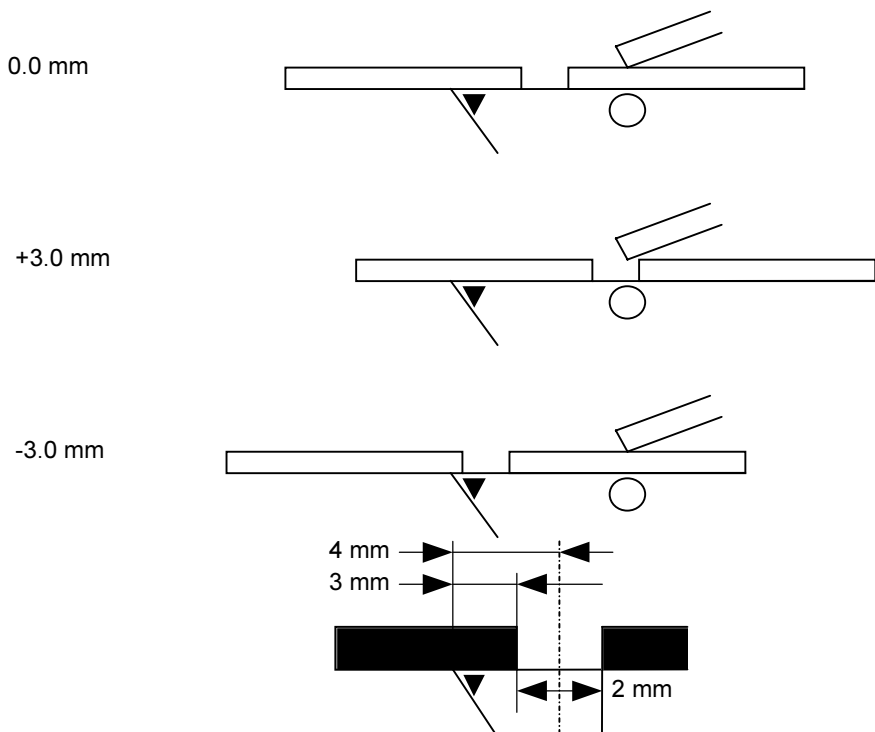
Cut position Fine Adjustment

(To finely adjust the cut position for shifting backward or forward)





Strip Position Fine Adjustment



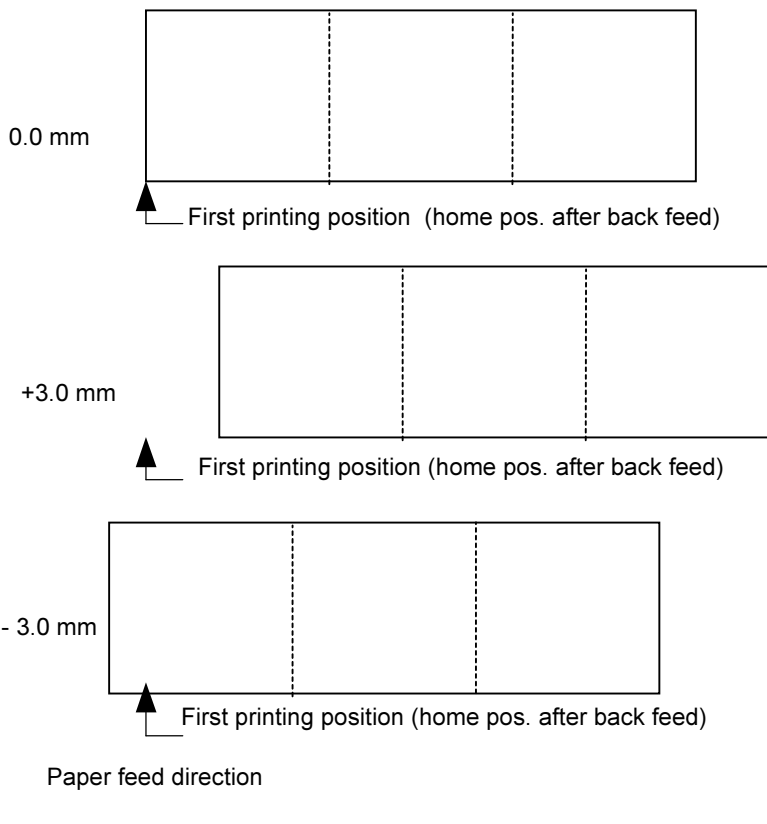
Printing in strip issue mode is stopped at the position where the distance from the middle point of the label-to-label gap to the top of the strip shaft is 4 mm, since the label-to-label gap is assumed to be 2 mm.

When the print stop position is not proper, the print stop position should be adjusted using the strip position fine adjust function. When the label-to-label gap is 5 mm or more, the effective print length should be set to the maximum (label pitch - 2 mm). Then, the print stop position should be adjusted using the strip position fine adjust function.



Back Feed Fine Adjustment

(To finely adjust the back feed for shifting backward or forward)





Notes: If the feed value fine adjustment, cut position (or strip position) fine adjustment or back feed value fine adjustment has been set in system mode (key operation on the printer), the fine adjustment value will be the fine adjustment in system mode.

The max. fine adjustment values are as follows. However, the max. feed fine adjustment value is limited within the label pitch.

Feed value fine adjustment: ± 50.0 mm

Cut position (or strip position) fine adjustment: ± 50.0 mm.

Back feed value fine adjustment: ± 9.9 mm.

After changing the fine adjustment value by this command, one label must be fed by the Feed command ([PF]) to adjust the first printing position.

Each fine adjustment value is protected in memory (protected even if the power is turned off).

If a fine adjustment value is improper, printing will not be performed correctly.

For example, if the back feed fine adjustment value is not set properly, the printing positions without cutting and after cutting will be different from each other. If the label is fed back excessively, the paper will not be fed correctly during printing.

The cut position (or the strip position) fine adjustment and back feed value fine adjustment are effective only when the printer is in cut issue or strip issue mode.



Procedure for label having a label pitch of less than 38 mm:

[Method 1]

When the following conditions are all met, the paper ejection operation in cut print mode is as follows.

Head lifted → Forward feed to the cut position → Head lowered → Cut → Head lifted → Reverse feed to the home position → Head lowered.

Conditions:

Issue command, Feed command, and Eject Command received.

Label pitch of 38.0 mm or less, cut performed, transmissive sensor, cut position fine adjustment of ± 10.0 mm or less, and print mode "C".

* The head is lifted/lowered only when the optional ribbon save module is attached. When the ribbon save module is not installed, use Method 2 since the head is not lifted/lowered.

[Method 2]

The minimum label pitch of the label that can be cut in normal use is 38.0 mm. When a label having a label pitch of less than 38 mm is used, the edge of the label is caught by the edge of the thermal head during a backfeed to the home position after cutting the gap area between labels. Therefore, the label may not be fed back to the proper home position.

By performing the cut position fine adjustment according to the following procedure, the above problem will be solved. However, when this procedure is used, one or more printed labels are left between the head and the Cutter. Therefore, the left labels should be removed by an issue or feed of a label.



Cut Position Fine Adjustment Value Calculation:

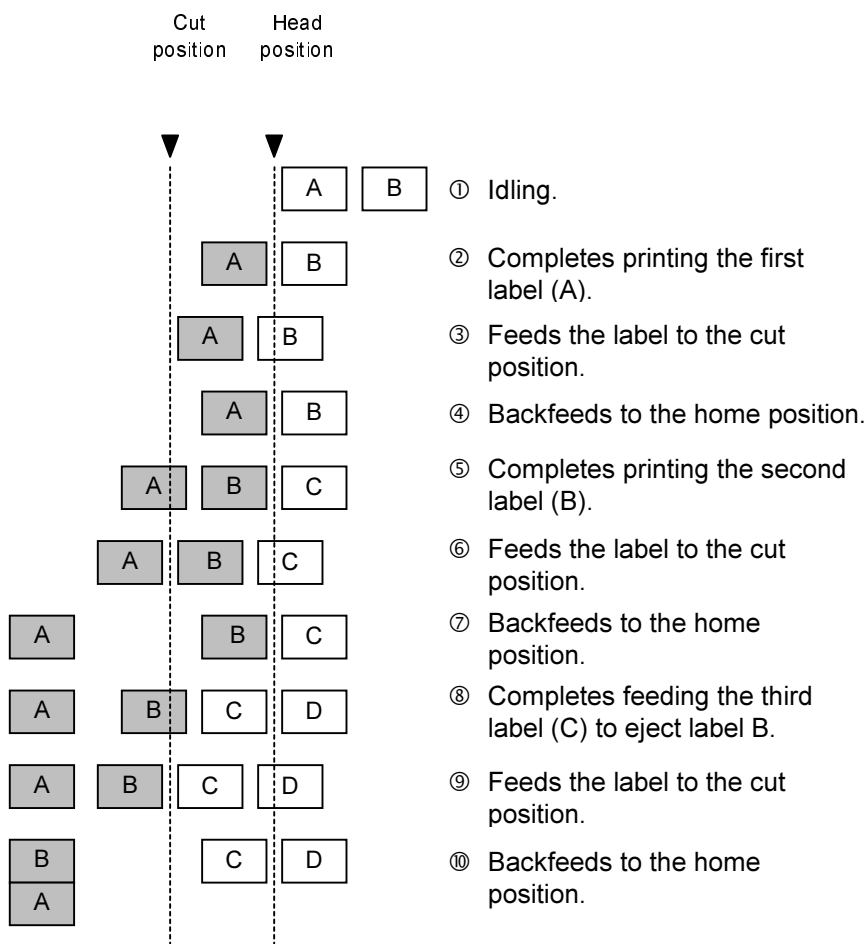
The cut position fine adjustment value can be calculated using the following method. Even if a back feed to the proper home position is not performed using this value, the cut position should be adjusted with a desired value.

- ☑ **Remember: The cut position fine adjustment value is the number of entire labels between the head and the Cutter blade times the physical page length (using integer division, i.e. whole numbers only).**
- ☑ **The distance between the print-head and the Cutter blade is 32.8 mm.**

Example (for a physical page length = 30.0 mm): The cut position fine adjustment value is $(32.8/30.0) * 30.0 = (1) * 30.0 = 30.0$ mm.



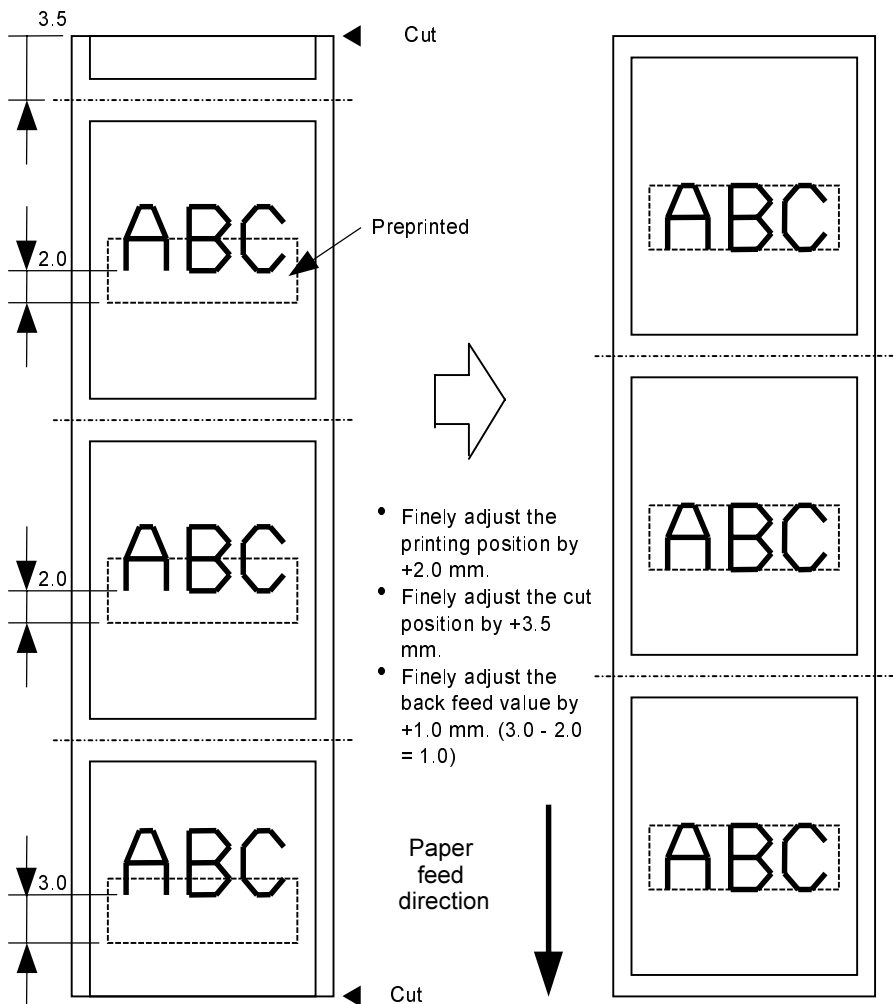
Operation Example:



Examples: (see following pages)

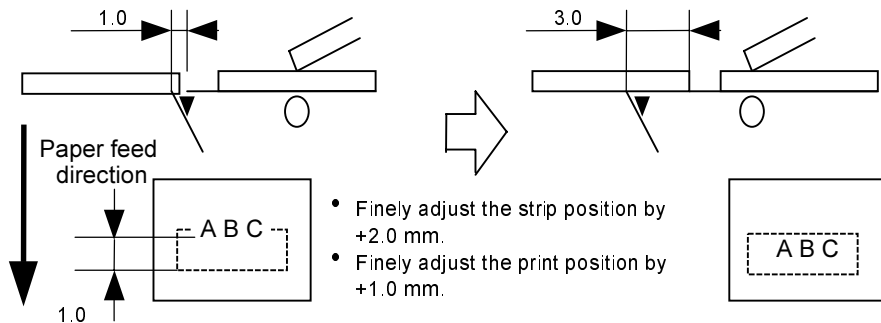


Cut example: <
 [Cp "+020" "+035" "+10"]
 [Pf "2:1:C:6:1"]
 >





Strip example: <
[Cp "+010" "+020" "+00"]
[Pf "2:0:D:6:2"]
>





Print density [Cd " \pm bb:c"] fine adjust:

Function: Finely adjust the automatically set print density (contrast).

Parameters: \pm bb: Print density fine adjustment value
00 to 10 (in units of 1 step)
+: Increase (darker)
-: Decrease (lighter)

c: Indicates the mode for fine adjustment, thermal transfer or direct thermal.
0: Thermal transfer
1: Direct thermal

Explanation: If the print density fine adjustment value has been set in system mode (key operation on the printer), the fine adjustment value will be the sum of the fine adjustment by this command and the fine adjustment in system mode. The respective max. fine adjustment values each are ± 10 .

The fine adjustment values in thermal transfer mode and direct thermal mode can be set independently.

The Print Density Fine Adjust command is protected in memory (protected even if the power is turned off).

The fine adjustment value for both fine adjust command and system mode fine adjustment is 00 at shipment from the factory.

The max. value for each print speed is as follows. When the value exceeds the maximum, it is automatically corrected to the max. value, and then the printer prints.

3"/sec:	+10 step
6"/sec:	+5 step
10"/sec:	+2 step



Example: To set the density in thermal transfer mode to +3, and in direct thermal mode to -2.

```
<
[Cd "+03:0"]
[Cd "-02:1"]
>
```

Enable standard verifier: [Cy "a"] (as of V. 1.3)

Function: Enable or disable the standard verifier signals at OUT_4 port of optional interface board.

Parameters: a: Mode
0: Disable verifier
1: Enable verifier

Explanation: When "1" is entered in the parameter, OUT_4 on the optional interface board receives the sync. signal.
When "0" is entered in the parameter, the communication between the printer and the verifier is disabled.
The command is backed up by the memory. So even if the power is disconnected the command is not lost.

Example: < [Cy "1"]>



7.3 Layout Commands

This Section describes the label layout processing (formatting) commands.

Clear/reverse area: [Fa "aaaa:bbbb" "cccc:dddd"
"e"]

Function: Clear the designated area or reverse the white/black dot pattern in the designated area in the drawing area.

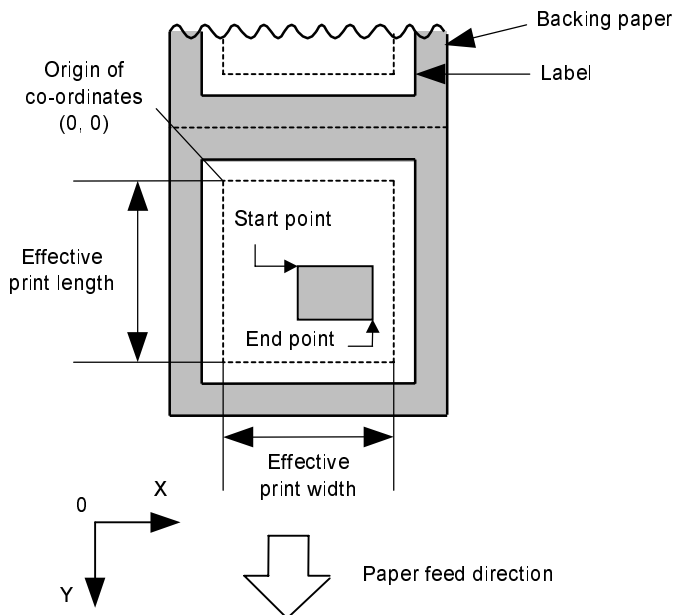
Parameters:

- aaaa:** Designated area start point X co-ordinate
Fixed as 4 digits (in 0.1 mm units)
- bbbb:** Designated area start point Y co-ordinate
Fixed as 4 digits (in 0.1 mm units)
- cccc:** Designated area end point X co-ordinate
Fixed as 4 digits (in 0.1 mm units)
- dddd:** Designated area end point Y co-ordinate
Fixed as 4 digits (in 0.1 mm units)
- e:** Type of clear
 - A: Clears the contents in the designated area to zeros.
 - B: Reverses the white/black dot pattern in the designated area.

Explanation: (see following page)



Explanation: If printing bottom first (standard); for top first printing, start and end points are reversed.



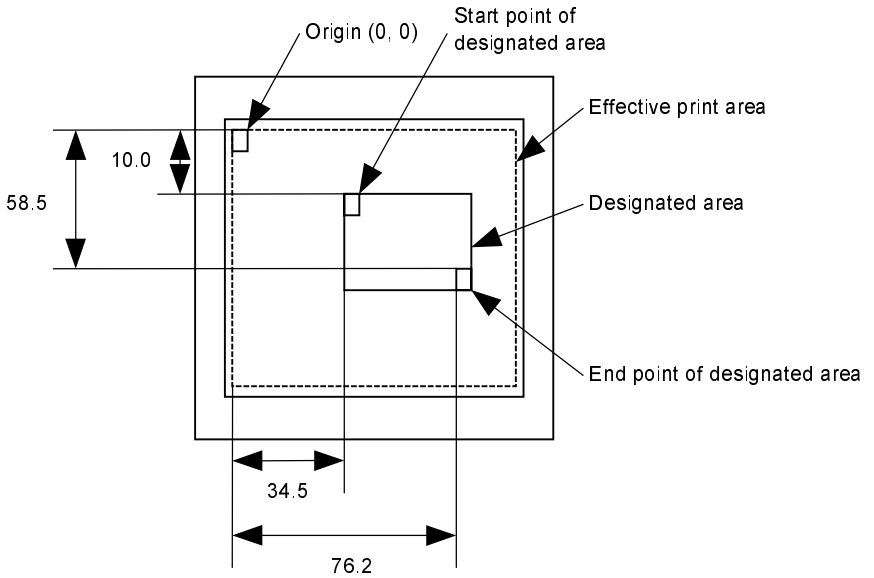
Notes: The result is the same even if the start and end point co-ordinates are reversed.

The result is the same even if the start and end point co-ordinates are set to an upper right and a lower left points, respectively.

The start and end co-ordinates of the designated area must be set within the effective print area (see under *Media in Section 3.3, Programming Considerations*) set by the Set Label Size command.



Example: <
[Fa "0345:0100" "0762:0585" "A"]
>





Line format: [F1 "aaaa:bbbb" "cccc:dddd"
 "e:f:ggg"]

Function: Set the line format and draw the line.

Parameters: **aaaa:** Start point X co-ordinate
 Fixed as 4 digits (in 0.1 mm units)

bbbb: Start point Y co-ordinate
 Fixed as 4 digits (in 0.1 mm units)

cccc: End point X co-ordinate
 Fixed as 4 digits (in 0.1 mm units)

dddd: End point Y co-ordinate
 Fixed as 4 digits (in 0.1 mm units)

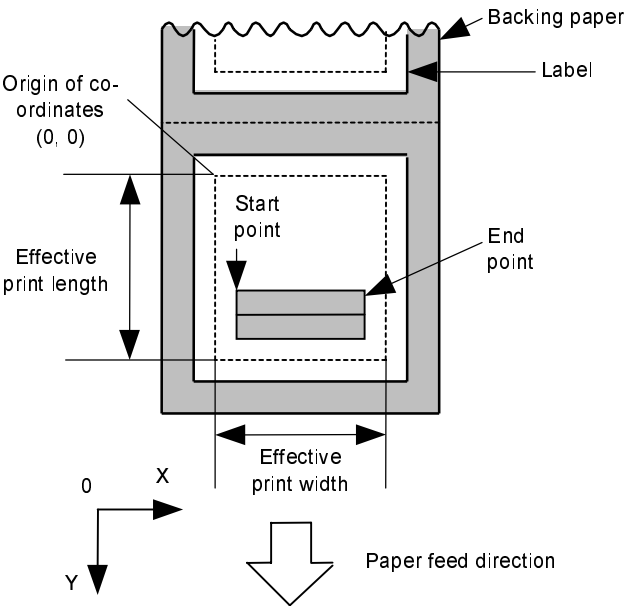
e: Type of line
 0: Line (horizontal, vertical, slanted)
 1: Square

f: Number of line width dots
 1 to 9 (in 0.1 mm units)

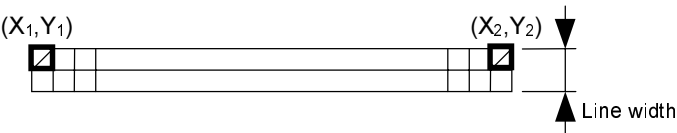
ggg: Radius of rounded corners of a square
 (omissible) as of V. 1.2
 Fixed as 3 digits (in 0.1 mm units)



Explanation: If printing bottom first (standard); for top first printing, start and end points are reversed.

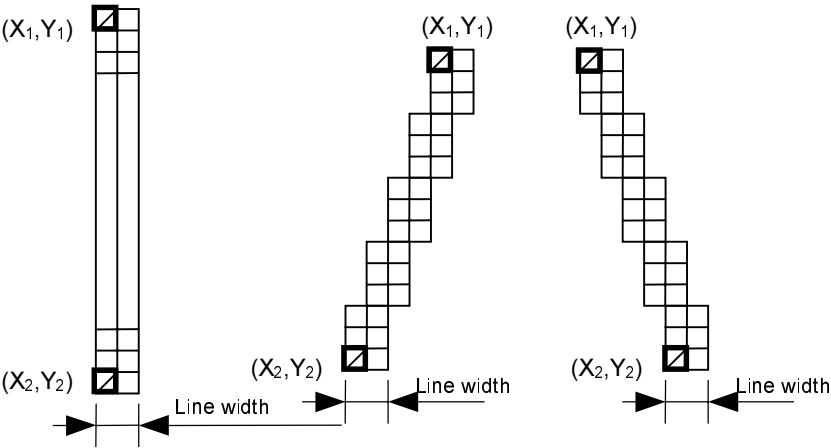


Examples: Horizontal line (For $|Y_2 - Y_1| = 0$)

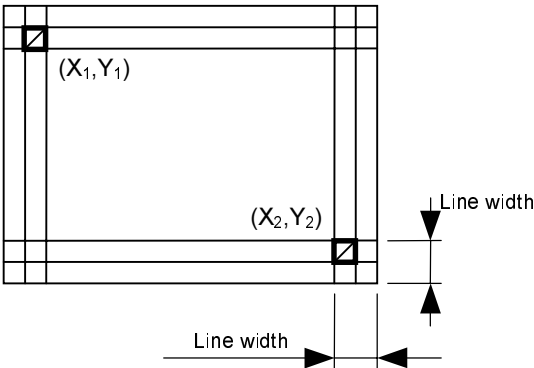


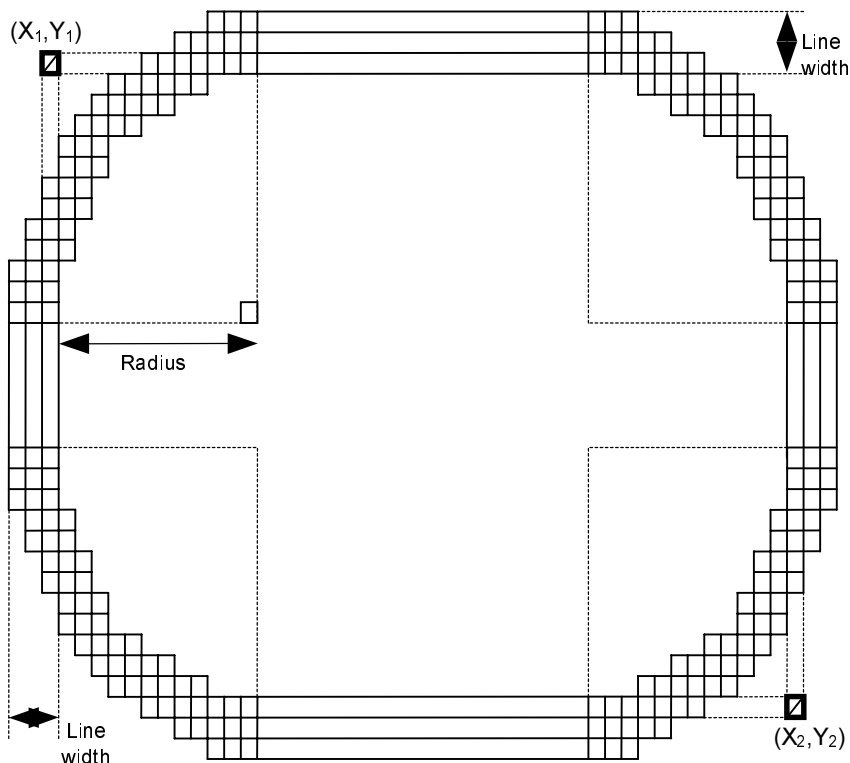


Vertical (For $|X_2 - X_1| = 0$)
and slanted line ($|X_2 - X_1| \leq |Y_2 - Y_1|$)



Square with radius of rounded corners = 000
or parameter omitted





Radius of rounded corners \neq 000

Notes: In line designation, a horizontal line, vertical line or slant line is drawn according to the start and end point co-ordinates.

The result is the same even if the start and end point co-ordinates are reversed.

The start and end point co-ordinates must be set so that the result of line drawing will be within the effective print area (see under *Media* in Section 3.3, *Programming Considerations*) set by the Set Label Size command.



Programming the radius of the rounded corner is effective only when the type of line is '1' (square). When the type of line is '0', designation of the radius is ignored.

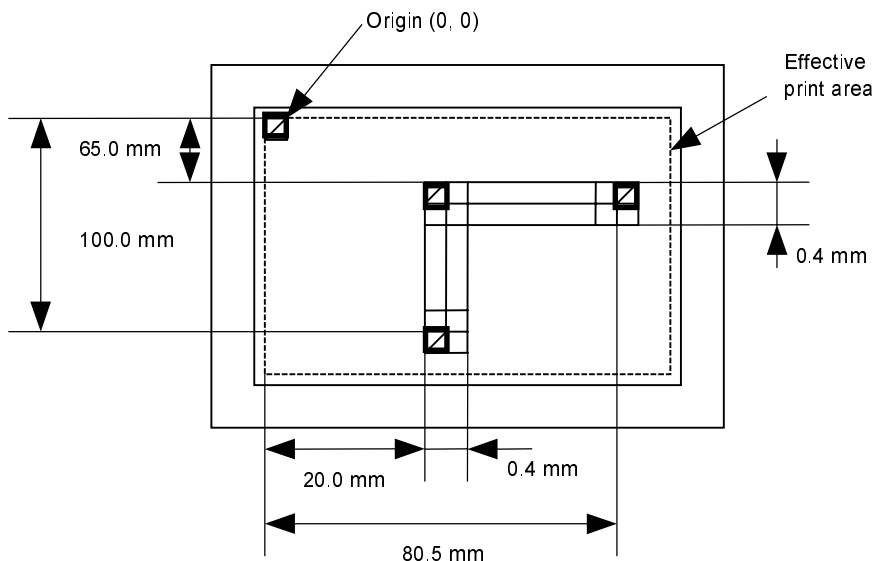
When the type of line is '1', and the radius of the rounded corner is '000' or omitted, a square is printed.

A circle is assumed when:

$$|x_2 - x_1| / 2 = |y_2 - y_1| / 2 \leq \text{Radius of rounded corners.}$$

Example:

```
<  
[F1 "0200:0650" "0805:0650" "0:4"]  
[F1 "0200:0650" "0200:1000" "0:4"]  
[Pi "0001" "2:C:6:0:0" "0"]  
>
```





Text format/ [Ff "aaaa:bbbb" "ccc" "dd"
Type 1, bitmap font: "ee:f" "gg:hh"
 "tjj:kk:ll"
 "m:toooooooooooo:pp"
 "qqq...qqq:rr1:rr2:...:
 rr20"]

(*italics* = optional parameter)

Function: Set the format indicating at which the bitmap font is to be printed and how it is to be printed.

Parameters:

- aaaa:** Print origin of X co-ordinate of character string
Fixed as 4 digits (in 0.1 mm units)
- bbbb:** Print origin of Y co-ordinate of character string
Fixed as 4 digits (in 0.1 mm units)
- ccc:** Character string number 000 to 199 (two digits, 00 to 99, also acceptable)
- dd:** Rotational angles of a character and character string
00: 0° (char.) 0° (char.-string)
11: 90° (char.) 90° (char.-string)
22: 180° (char.) 180° (char.-string)
33: 270° (char.) 270° (char.-string)
- ee:** Type of font: *See Appendix F, Fonts.*
01: Writable character 1 (1 × 1 to 720 × 720) to Writable character 40 (1 × 1 to 720 × 720)
* The following fonts are proportional:
A, B, C, D, E, F, G, H, I, J, K, L
- f:** Select the black character or reverse character.
B: Black character
W: Reverse character



- gg:** Character horizontal magnification
1 to 9 (in magnifications)
* Two digit designation enables magnifications in 0.5 units
(05 ~ 95: 0.5 to 9.5 magnifications).
- hh:** Character vertical magnification
1 to 9 (in magnifications)
* Two digit designation enables magnifications in 0.5 units
(05 ~ 95: 0.5 to 9.5 magnifications).
- ±jj:** Fine adjustment of character-to-character space (omissible)
Number of space dots between characters
00 to 99 (in dots)
+: Increase
- : Decrease
- kk: ll:** Designates the bold character (omissible).
kk: Number of horizontal shift dots
00 to 16 (in dots)
ll: Number of vertical shift dots
00 to 16 (in dots)
- m:** Type of the check digit to be attached (omissible)
0: Modulus 10
(Draws data and check digit)
1: Modulus 43
(Draws data and check digit)
2: DBP Modulus 10
(Draws check digit only)
(as of V. 1.2 only)
- ±ooooooooo:** Increment and decrement (omissible)
Skip value
0000000000 to 9999999999
+: Increment
-: Decrement



pp: Number of zeros to be suppressed
00 to 20

qqq . . . *qqq*: Data string to be printed
(omissible) as of V. 1.2
Max. 255 digits

rr1 . . . *rr20*: Link field number
(omissible) as of V. 1.2
01 to 99 (1 to 99 can be also used.)
Up to 20 fields can be designated
using ':':

Text format/ Type 2, outline font:

[Fs "aaaa:bbbb" "cc" "dd"
"e:f" "gggg:hhhh" "*±jjj*"
"*m:±ooooooooo:pp*"
"*qqq* . . . *qqq:rr1:rr2: . . . :*
rr20"]

Function: Set the format to indicate the position on the label, at which the outline font is to be printed and how it is to be printed.

Parameters: *aaaa*: Print origin of X co-ordinate of the character string
Fixed as 4 digits (in 0.1 mm units)

bbbb: Print origin of Y co-ordinate of the character string
Fixed as 4 digits (in 0.1 mm units)

cc: Character string number 00 to 99

dd: Rotational angles of a character and character string
00: 0° (char.) 0° (char.-string)
11: 90° (char.) 90° (char.-string)
22: 180° (char.) 180° (char.-string)
33: 270° (char.) 270° (char.-string)

e: Type of font
A: FONT1 (Helvetica bold)
B: FONT2 (Helvetica bold proportional)



- f:** Selects the black character or reverse character.
B: Black character
W: Reverse character
- gggg:** Character width
0020 to 0850 (in 0.1 mm units)
- hhhh:** Height of the character
0020 to 0850 (in 0.1 mm units)
- ±jjj:** Fine adjustment of character-to-character space (omissible):
Number of space dots between characters 000 to 512 (in dots)
+: increase, -: decrease
- m:** Type of the check digit to be attached (omissible)
0: Modulus 10
(Draws data and check digit)
1: Modulus 43
(Draws data and check digit)
2: DBP Modulus 10
(Draws check digit only)
(as of V 1.2)
- ±ooooooooo:** Increment (+) and decrement (-) (omissible)
- pp:** Zero suppression (omissible)
Number of zeros to be suppressed
00 to 20
- qqq. . . qqq:** Data string to be printed (omissible) as of V. 1.2
Max. 254 digits
- rr1: . . . :rr20:** Link field number (omissible) as of V. 1.2
01 to 99 (1 to 99 can also be used)
Up to 20 fields can be designated using ':':

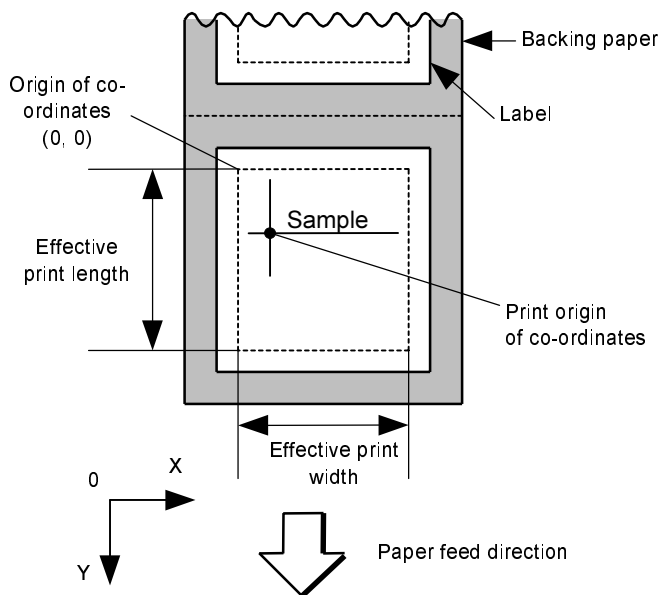


Explanation: Character string number:

When drawing by the Text Data command, the format designated by the character string number is selected.

Print origin of co-ordinates:

If printing bottom first (standard); for top first printing, start and end points are reversed.



The print origin of co-ordinates must be set so that the result of character drawing will be within the effective print area (see under *Media in Section 3.3, Programming Considerations*) set by the Set Label Size command.

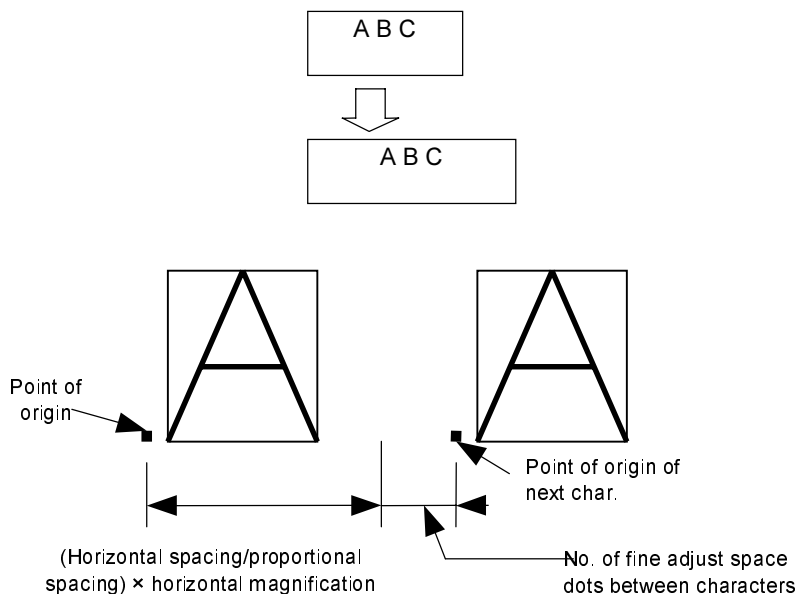
For character width and height, see Appendix C, Characters. For type of font, see Appendix F, Fonts. For printouts, see Appendix F, Fonts.



Fine adjustment of character-to-character space:

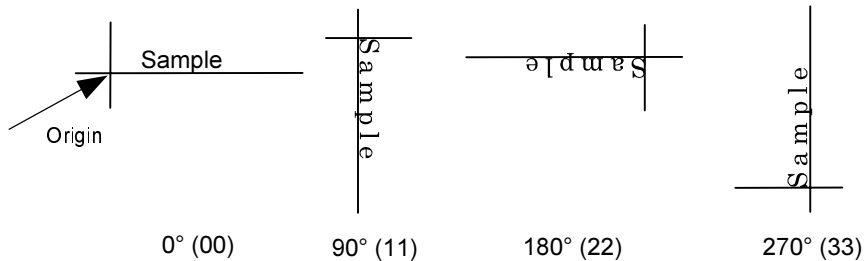
If no character-to-character space is specified or the number of space dots between characters is 0, drawing will take place according to the horizontal spacing/proportional spacing determined for each character. If character-to-character space is specified, drawing will take place according to the value obtained by adding the character spacing/proportional spacing to the specified value.

The horizontal spacing/proportional spacing are increased or decreased depending on the character size.





Rotational angles of a character and string:



Selection of character background:

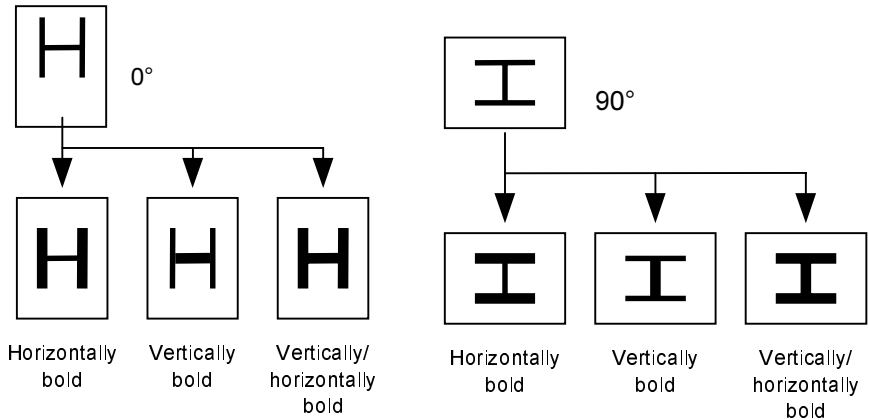
For bitmap fonts:

A reverse letter is (6 × magnifications) dots wider and longer than a black letter. In this case, the magnification is the horizontal magnification or vertical magnification whichever is larger.

For outline fonts:

A reverse letter is wider and longer than a black letter. Here the number of dots to be increased varies according to the character size.

Bold character designation:





Check digit to be attached:

When Modulus 10 or Modulus 43 is selected, the check digit of a data row is calculated and attached to the data row for drawing. When Modulus 10 is designated and the data includes any data other than the numerals, the data row will not be drawn. When Modulus 43 is designated and the data includes any character other than CODE39, no drawing will take place.

When DBP Modulus 10 is selected, the check digit of a data row is calculated and only the check digit is drawn. When the data includes any data other than the numerals, however, drawing is not performed.

- * DBP Modulus 10 is Modulus 10 for Deutsche Bundespost Postdienst only.

Increment/decrement:

Printing is performed while the data is incremented or decremented each time a label is issued. Where the data row includes any data other than numerals, the data row will not be drawn. Where the data row exceeds the maximum number of digits (40), the data row will not be drawn, either.

Initial value	0000	0000	0000	0000	999999
INC/DEC	+10	+10	+10	+10	+1
Zero suppression	Not designated	5	3	0	3
1st label	0000	0000	000	0000	999999
2nd label	0010	0010	010	0010	000
3rd label	0020	0020	020	0020	001
4th label	0030	0030	030	0030	002
5th label	0040	0040	040	0040	003



Zero suppression:

No. of zeros to be suppressed	0	1	2	2	3	4	5
Data	0000	0000	0000	0A12	0123	0123	0123
Print	0000	0	00	A12	123	0123	0123

The leading zero(s) in a data row is replaced by a space(s) according to the designated number of digits. However, if the number of digits to be suppressed is greater than the data row, the data row will be drawn without zero suppression. Where the data row exceeds the maximum number of digits (40), the data row will not be drawn.

Data string to be printed:

Drawing data can be programmed by designating the number of digits in the last parameter group. Up to 254 digits can be printed. (If the number of digits exceeds 254, exceeding data will be discarded.)

For the character code table, refer to the character code table in Appendix C, Characters.

Link field number:

The link field number can be programmed by designating it at the end of the last parameter group. After the link field number is designated using the Format command, the data strings are linked by the link field data command to draw an image.

Up to 20 fields can be linked.

For examples, see Appendix E, Examples.



Notes: The check digit attach, increment/decrement, and zero suppress processes are performed according to the following priority. If any of the conditions is improper, no drawing will take place.

For example, the zero(s) is replaced by a space(s) as a result of zero suppression but the modulus 10 designated to be attached cannot be calculated.

Increment/decrement > zero suppression > attachment of check digit.

Up to 32 fields for which incrementing/decrementing has been designated can be drawn. If a total of bitmap font, outline font or barcode increment/decrement fields exceeds 32, drawing will take place without incrementing/decrementing any excessive field. The field to be incremented or decremented is incremented or decremented until the Clear Image Buffer command ([C_c]) is transmitted.

Example:

- 1) Format command
(Increment character string No. 001 (+1))
- 2) Format command
(No incrementing for character No. 002)
- 3) Format command
(Increment character string No. 003 (+2))
- 4) Clear Image Buffer command
- 5) Data command
(character string No. 001 "0001")
- 6) Data command
(character string No. 002 "AB-")
- 7) Data command
(character string No. 003 "0100")



8) Issue command (2 labels)

0001

AB - 0100

0002

AB - 0102

9) Issue command (1 label)

0003

AB - 0104

10) Clear Image Buffer command

11) Data command
(character string No. 002 "00000")

12) Issue command (1 label)

00000

The Bitmap Text Format command may be connected to the Outline Text Format command when transmitted or vice versa.



When the drawing data is changed per label issue during printing, the field of the drawing data for the previous label is automatically cleared using the character string number, then the next drawing data is printed. Therefore, the character string number that differs according to the drawing fields should be designated. Since the automatic field clear is not performed between the Clear command (`[C]`) and Issue command (`[P]`), the fixed data may be drawn using the same character string number. In this case, the Format command and Data command should be sent alternately. (After the Issue command is sent, the fields with the same character string number are automatically cleared until the Clear command is sent.)

When characters overlap due to the character-to-character space fine adjustment, the outline font is not painted properly. Program the fine adjust value so that characters will not overlap. Also, when drawings such as lines or characters are on the outline font drawing position, the outline font is not painted properly. Program the fine adjust value so that the drawing will not overlap.

The link field designation is cleared by omitting the link field designation using the same character string number and reformatting data. The link field designation can be also cleared by the Clear Image Buffer command.

A print data string and link field number cannot be programmed at the same time. If print data is set, i.e. the first digit is not the symbol ':', all data will be regarded as print data, including ':' and link data.

Also see: *Bitmap Text Data command*
 Outline Text Format command
 Barcode Format command
For examples, see Appendix E, Examples.



Barcode format: [Fb . . .]
(see Formats for various types below)

Function: Set the format to indicate the position on the label, at which the barcode is to be printed and how it is to be printed.

For UPC/EAN, CODE93, CODE128,
UCC/EAN128:

Format: Type 1: [Fb "aaaa:bbbb" "cc" "k" "d:e:p"
"1111" "ff" "~~t~~nnnnnnnnnn:qg" "ooo"
"sss...sss:tt1:tt2:...:tt20"]

For 2/5, CODE39, MSI, NW7:

Format: Type 2: [Fb "aaaa:bbbb" "cc" "k" "d:e:p:r"
"1111" "ff:gg:hh:ii:jj"
"~~t~~nnnnnnnnnn:qg"
"sss...sss:tt1:tt2:...:tt20"]

For PDF417 (two-dimensional code)
as of V. 1.3:

Format: Type 3: [Fb "aaaa:bbbb" "cc" "k" "d:e"
"1111" "ff:gg"
"sss...sss:tt1:tt2:...:tt20"]

For MaxiCode (two-dimensional code)
as of V. 1.5:

Format: Type 4: [Fb "aaaa:bbbb" "cc" "k" "d:e"
"ff:gg:h"]



- Parameters for all types:
- aaaa:** Print origin of X co-ordinate of the barcode
Fixed as 4 digits (in 0,1 mm units)
 - bbbb:** Print origin of Y co-ordinate of the barcode
Fixed as 4 digits (in 0,1 mm units)
 - cc:** Barcode number 00 to 31
 - ...**
 - sss...sss:** Data string to be printed
(omissible)
Max. 126 digits. However, it varies according to the type of barcode.
 - tt1:...:tt20:** Link field number (omissible)
01 to 99 (1 to 99 can also be used)
Up to 20 fields can be designated using '!'.
- Parameters for Type 1:
- d:** Type of barcode
 - 0: JAN8, EAN8
 - 5: JAN13, EAN13
 - 6: UPC-E
 - 7: EAN13 + 2 digits
 - 8: EAN13 + 5 digits
 - 9: CODE128
(with auto code selection)
 - A: CODE128
(without auto code selection)
 - C: CODE39
 - G: UPC-E + 2 digits
 - H: UPC-E + 5 digits
 - I : EAN8 + 2 digits
 - J: EAN8 + 5 digits
 - K: UPC-A
 - L: UPC-A + 2 digits
 - M: UPC-A + 5 digits
 - N: UCC/EAN128



- e:** Type of check digit
 1: Without attaching check digit
 2: Check digit check
 WPC Modulus 10
 CODE93 Modulus 47
 CODE128 PSEUDO 103
 3: Check digit auto attachment (1)
 WPC Modulus 10
 CODE93 Modulus 47
 CODE128 PSEUDO 103
 UCC/EAN128 Mod. 10 + 103
 4: Check digit auto attachment (2)
 WPC Modulus 10 + Price C/D
 4 digits
 5: Check digit auto attachment (3)
 WPC Modulus 10 + Price C/D
 5 digits
- ff:** 1-module width
 01 to 15 (in dots)
- k:** Rotation angle of barcode
 0: 0 °
 1: 90 °
 2: 180 °
 3: 270 °
- l1111:** Barcode height
 0000 to 0100 (in 0,1 mm units)
- ~~nnnnnnnnnn~~:** Increment (+) or decrement (-)
 Skip value
 0000000000 to 9999999999
- ooo:** Length of the WPC guard bar
 (omissible)
 000 to 100 (in 0.1 mm units)
- p:** Selection of print or non-print of
 numerals under bars (omissible)
 0: Non-print
 1: Print
- qq:** Number of zeros to be suppressed
 (omissible) 00 to 20



- Parameters for Type 2:
- d: Type of barcode
 - 1: MSI
 - 2: Interleaved 2 of 5 (ITF)
 - 3: CODE39 (standard)
 - 4: NW7
 - 5: JAN13, EAN13
 - B: CODE39 (full ASCII)
 - O: Industrial 2/5 (as of V 1.2)
 - e: Type of check digit
 - 1: Without attaching check digit
 - 2: Check digit check
 - CODE39 Modulus 43
 - MSI IBM Modulus 10
 - ITF Modulus 10
 - Industrial 2 of 5 Modulus check character
 - 3: Check digit auto attachment (1)
 - CODE39 Modulus 43
 - MSI IBM modulus 10
 - ITF Modulus 10
 - Industrial 2 of 5 Modulus check character
 - 4: Check digit auto attachment (2)
 - MSI IBM modulus 10
 - + IBM modulus 10
 - 2/5i, ITF DBP Modulus 10
 - 5: Check digit auto attachment (3)
 - MSI IBM modulus 11
 - + IBM modulus 10
 - ff: Narrow bar width
01 to 99 (in dots)
 - gg: Narrow space width
01 to 99 (in dots)
 - hh: Wide bar width
01 to 99 (in dots)
 - ii: Wide space width
01 to 99 (in dots)
For industrial 2 of 5, the value is fixed to 00



	jj:	Character-to-character space width 01 to 99 (in dots) In case of MSI and ITF, character-to-character space width is set to 00
	k:	Rotation angle of barcode 0: 0 ° 1: 90 ° 2: 180 ° 3: 270 °
	l111:	Barcode height 0000 to 0100 (in 0,1 mm units)
	nnnnnnnnnn:	Increment (+) or decrement (-) (omissible) Skip value 0000000000 to 9999999999
	p:	Selection of print or non-print of numerals under bars (omissible) 0: Non-print 1: Print
	qq:	Number of zeros to be suppressed (omissible) 00 to 20
	r:	Restricted auto-attachment of start/stop code (omissible) — if this parameter is left out, the printer will add start/stop code automatically. N: Start/stop code unattached T: Attachment of start code only P: Attachment of stop code only
Parameters for <u>Type 3</u> :	d:	Type of barcode P: PDF417 (two-dimensional code)
	e:	Security level 0: Level 0 1: Level 1 8: Level 8
	ff:	1-module width 01 to 10 (in dots)



gg: Number of columns (strings)
01 to 30

k: Rotation angle of barcode
0: 0 °
1: 90 °
2: 180 °
3: 270 °

1111: Bar row height
0000 to 0100 (in 0,1 mm units)

Parameters for Type 4:

d: Type of barcode
Z: MaxiCode (two-dimensional code)

e: MaxiCode mode designation
(omissible)
2: Mode 2 (default)
3: Mode 3
4: Mode 4
6: Mode 6

Only modes 2, 3, 4 and 6
are supported. otherwise the
designation is corrected as follows:

Mode	Mode actually processed
Omitted	Mode 2
Mode 0	Mode 2
Mode 1	Mode 4
Mode 2	Mode 2
Mode 3	Mode 3
Mode 4	Mode 4
Mode 5	Mode 2
Mode 6	Mode 6
Mode 7	Mode 2
Mode 8	Mode 2
Mode 9	Mode 2

ff: Code number
(Connection setting (omissible))
01 to 08 (default=01)

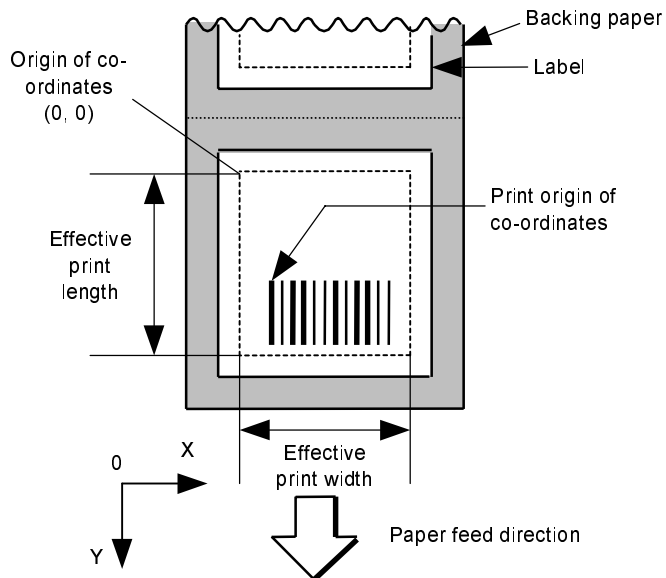
gg: Number of divided codes
(Connection setting (omissible))



- h: Attachment of Zipper block and Contrast block (omissible)
 0: No attachment of Zipper block and Contrast block (default)
 1: Attachment of Zipper block and Contrast block
 2: Attachment of Zipper block
 3: Attachment of Contrast block
- k: Not used for this type of barcode (included only for compatibility reasons): will be ignored

Explanation: Barcode number:
 When drawing with the Barcode Data command, the format designated by the barcode number is selected.

Print origin of co-ordinates:
 If printing bottom first (standard); for top first printing, start and end points are reversed.



The print origin of co-ordinates must be set so that the result of barcode drawing will be within the effective print area (see under *Media in*



Section 3.3, Programming Considerations) set by the Set Label Size command.

Type of barcode:

See Appendix B, Barcodes.

Type of check digit:

Where no check digit is attached, the barcode of the data row will be drawn. If each check digit checked according to the type of barcode is normal, the barcode will be drawn. If the check digit not meeting the requirement is designated, the barcode will not be drawn.

In the case of the check digit auto attachment, each check digit is attached according to the type of barcode and the barcode is drawn. If the type of barcode is Code93, Code128 (with auto code selection), or UCC/EAN128, the check digit will always be attached regardless of the designation of the type of check digit.

If the barcode is of type EAN or UPC, the designation of no check digit attachment automatically assumes the check digit check. DBP Modulus 10 is for Deutsche Bundespost Postdienst only.



Bar width, space width and character-to-character space:

Designate the bar, space, and character-to-character space widths according to the type of barcode. Note that the designated proper value differs according to the rotational angle of barcode, type, number of digits, print speed, paper and ribbon used, etc. Examples of such designations are listed below. (1 dot = 1/8 mm)

For JAN, EAN, UPC, CODE93, CODE128, UCC/EAN128 or PDF417 a 2 to 6-module width is calculated automatically when a 1-module width is designated.

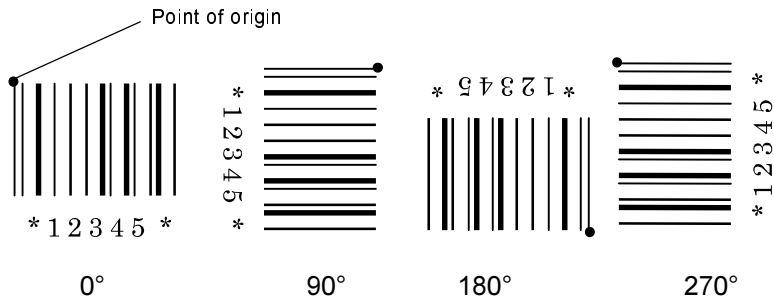
Type of barcode	1 module	2 modules	3 modules	4 modules	5 modules	6 modules
	Bar/Space	Bar/Space	Bar/Space	Bar/Space	Bar/Space	Bar/Space
JAN, EAN, UPC	3	6	9	12	-	-
CODE 93	2	4	6	8	-	-
CODE128, EAN128	2	4	6	8	-	-
PDF417	2	4	6	8	10	12

Type of barcode	Narrow		Wide		Character-to-character
	Bar	Space	Bar	Space	
MSI	2	2	6	6	0
ITF	2	2	6	6	0
CODE39	2	2	6	6	2
NW7	2	2	6	6	2
Industrial 2 of 5	2	2	6	0	2

When NW7 is used, transmission of the space character assumes the space of (narrow space × 12) dots. In this case, the space is max. 255 dots.



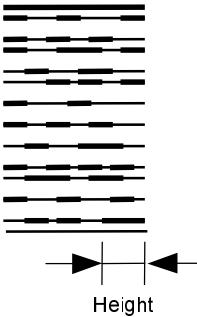
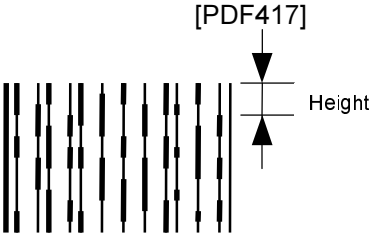
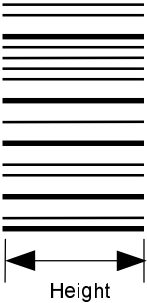
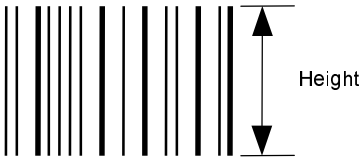
Rotational angle of barcode:



Ignored for MaxiCode.



Barcode height:

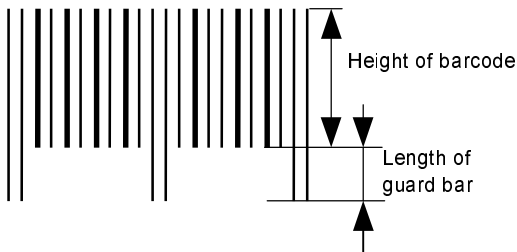


When the barcode height is 0000, barcode (including guard bar) and numerals under bars are not drawn. However, the barcode printed on the previous label is cleared.

Length of guard bar:

The length of guard bar is valid only when the type of barcode is WPC.

It is ignored in any other cases.

Numerals under bars:

Numerals are not or provided under bars according the parameter for the presence or absence of numerals under bars. The contents of numerals under bars to be printed vary according to the type of barcode. The character set of numerals under bars is OCR-B or Prestige Elite. Such numerals are enlarged or reduced only horizontally according to the width of the barcode. They are drawn vertically in the fixed one magnification.

Start/Stop Code:

- ☐ This parameter is valid only when the type of barcode is CODE39 and NW7.
- ☐ Where the parameter is designated, the program will not check if the transmit print data is with a start code and stop code.
- ☐ When the parameter is omitted for CODE39 and NW7, a start/stop code will be attached. The code to be added is “*” for CODE39, and “a” for NW7.



Increment/decrement:

Printing is performed while the data is incremented or decremented each time a label is issued. Where the data row includes any data other than numerals, the data row will not be drawn. Where the data row exceeds the maximum number of digits (40), the data row will not be drawn, either.

When CODE128 (without auto code selection) is used, the number of the start code (code A, code B and code C) digits is regarded as 2.

Initial value	0000	0000	0000	0000	999999
INC/DEC	+10	+10	+10	+10	+1
Zero suppression	Not designated	5	3	0	3
1st label	0000	0000	000	0000	999999
2nd label	0010	0010	010	0010	000
3rd label	0020	0020	020	0020	001
4th label	0030	0030	030	0030	002
5th label	0040	0040	040	0040	003

Zero suppression

(number of zeros to be suppressed):

	0	1	2	2	3	4	5
Data	0000	0000	0000	0A12	0123	0123	0123
Print	0000	0	00	A12	123	0123	0123

The leading zero(s) in a data row is replaced by a space(s) according to the designated number of digits. However, if the number of digits to be suppressed is greater than the data row, the data row will be drawn without zero suppression. Where the data row exceeds the maximum number of digits (40), the data row will not be drawn.



When the print data including start/stop code is sent to sending print data, the start/stop code is also counted as a digit. When the barcode type is JAN, EAN, UPC or UCC/EAN 128, the data will be drawn without zero suppression.

Data string to be printed:

Drawing data can be programmed by designating the number of digits in the last parameter group. The maximum number of digits to be printed varies according to the types of barcodes. *For the barcode code tables refer to Appendix B, Barcodes.*

Link field number:

The link field number can be programmed by designating it after the symbol ':' in the last parameter group. After the link field number is designated using the format command, the data strings are linked by the link field data command to draw an image. Up to 20 fields can be linked.

Explanation for PDF417:

Security level:

The PDF417 contains a function to correct a code reading error using an error correcting code word and restore normal data. The security level is designated according to usage to perform the error correction function.



Security level	Error Correction Ability	Number of error correction code words
Level 0	<div style="text-align: center;"> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80px;">Low</div> <div style="display: flex; align-items: center; justify-content: center; margin: 10px auto; width: 80px;"> <div style="border-left: 1px solid black; border-right: 1px solid black; height: 100px; margin: 0 5px;"></div> </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80px;">High</div> </div>	0
Level 1		2
Level 2		6
Level 3		14
Level 4		30
Level 5		62
Level 6		126
Level 7		254
Level 8		510

Number of columns (strings):

The number of lines is variable in the PDF417. The line length (number of data strings) is also variable. Therefore, a symbol can be created in a form that can be easily printed, by changing the proportion of the height and width.

The number of columns (data strings) is variable between 1 to 30.

If the number of columns is small when data amount is large and security level is also high, drawing may not be performed. This is because the number of lines exceeds 90 when the number of columns becomes small. (When the PFD417 is used, the number of lines of symbols is limited from 3 to 90.)

Explanation for MaxiCode:

Connection setting:

For MaxiCode, data can be divided into a max. of 8 codes.

Notes: The check digit attach, increment/decrement, and zero suppress processes are performed according to the following priority. If any of the conditions is improper, no drawing will take place.



For example, the zero(s) is replaced by a space(s) as a result of zero suppression but the modulus 10 designated to be attached cannot be calculated.

Increment/decrement > zero suppression > attachment of check digit

Up to 32 fields for which incrementing/decrementing has been designated can be drawn. If a total of bitmap font, outline font or barcode increment/decrement fields exceeds 32, drawing will take place without incrementing/decrementing any excessive field. The field to be incremented or decremented is incremented or decremented until the Clear Image Buffer command ([Cc]) is transmitted.

Example:

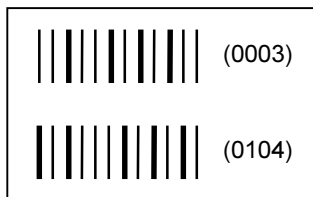
- ❑ Format command (Increment character string No. 01 (+1))
- ❑ Format command (Increment character string No. 02 (+2))
- ❑ Clear Image Buffer command
- ❑ Data command (character string No. 01 "0001")
- ❑ Data command (character string No. 02 "0002")



- ❑ Issue command (2 labels)



- ❑ Issue command (1 label)



- ❑ Clear Image Buffer command
- ❑ Data command (character string No. 002 "3000")
- ❑ Issue command (1 label)



More than one Barcode Format command can be connected when transmitted.



When the drawing data is changed per label issue during printing, the field of the drawing data for the previous label is automatically cleared using the barcode number, then the next drawing data is printed. Therefore, the barcode number that differs according to the drawing fields should be designated. Since the automatic field clear is not performed between the Clear command ([C_c]) and Issue command ([P_i]), the fixed data may be drawn using the same barcode number. In this case, the Format command and Data command should be sent alternately. (After the Issue command is sent, the fields with the same barcode number are automatically cleared until the Clear command is sent.)

The link field designation is cleared by omitting the link field designation using the same barcode number and reformatting data.

The link field designation can be also cleared by the Clear Image Buffer command.

A print data string and link field number cannot be programmed at the same time.

If print data is set, i.e. the first digit is not the symbol ':', all data will be regarded as print data, including ':' and link data.

Refer to: *Text Data command*
 Text Format command
 Barcode Data command

For examples, see Appendix E, Examples.



Graphic format: [Fg "aaaa:bbbb" "cccc:dddd"
"e" "fff...fff"]

Function: Draw graphic data.

Parameters: **aaaa:** Print origin of X co-ordinate for drawing graphic data
Fixed as 4 digits (in 0.1 mm units)

bbbb: Print origin of Y co-ordinate for drawing graphic data
Fixed as 4 digits (in 0.1 mm units)

cccc: Number of graphic width dots
Fixed as 4 digits (in dots)

dddd: No of graphic height dots
Fixed as 4 digits (in dots)

e: Type of graphic data
0: Nibble mode (4 dots/byte)
Overwrite drawing
1: Hex. mode (8 dots/byte)
Overwrite drawing
P: PCX graphics mode (as of V 1.2)

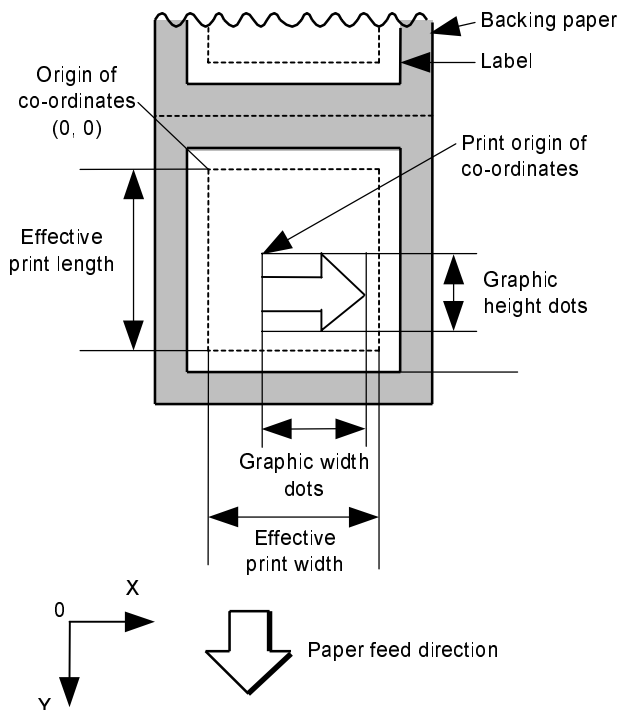
fff...fff: Graphic data

Explanation: When the graphic data "0", "1" or "P" is selected, the graphic data is drawn by overwriting the image buffer.



Print origin of co-ordinates:

If printing bottom first (standard); for top first printing, start and end points are reversed.





The number of graphic bytes sent down must correspond exactly to the width and height defined.

Nibble mode:

- The graphic data is separated into four dot units and sent in the following order (**1** → **132**). (high order digit: “3”)
- The graphic data is 30H to 3FH.
- The minimum unit in the X direction is 8 dots. Dots with no data are transmitted as data 0.
- The graphic data count must be as follows:
Graphic data count = {(number of graphic width dots + 7)/8} × number of graphic height dots × 2

* The value in the brackets is truncated to the next whole number.

Hex mode:

- The graphic data is separated into eight dot units and sent in the following order (**1** → **66**).
- The data of graphic data is 00H to FFH.
- The minimum unit in the X direction is 8 dots. Dots with no data are transmitted as data 0.
- The graphic data count must be as follows:
Graphic data count = {(number of graphic width dots + 7)/8} × number of graphic height dots

* The value in the brackets is truncated to the next whole number



PCX graphics mode:

The graphic data must be preceded by a header of 128 bytes.

The graphic data is either separated into 8 dots units or packed using Run Length Encoding (RLE).

The graphic data is 00H to FFH.

The minimum unit in X direction is 8 dots.

Distortion errors:

If you have problems with distortion even though the image appeared correctly on screen, this may be due to a run-length error. This may occur if you use PC-Paintbrush to cut out parts of a picture. To overcome this problem, use 'GRAYTOBW.EXE' that comes with most PC-Paintbrush versions. Call up the program with option '/R' activating the run-length error correction.

Notes: The print origin of co-ordinates must be set so that result of drawing the graphic data will be within the effective print area (*see under Media in Section 3.3, Programming Considerations*) set by the Set Label Size command.

The number of graphic width dots and number of graphic height dots must also be set so that the result of drawing the graphic data will be within the effective print area set by the Set Label Size command in the same manner as above.

Both width and height are 8 dots/mm.

The actual result of drawing may deviate within ± 0.5 mm in the X direction with respect to the designated print origin of X co-ordinate.

To draw the received graphic data at high speed, the data is directly developed into the image buffer without applying correction to each bit with respect to the designated X co-ordinate. Consequently, an error of up to 4 bits occurs.

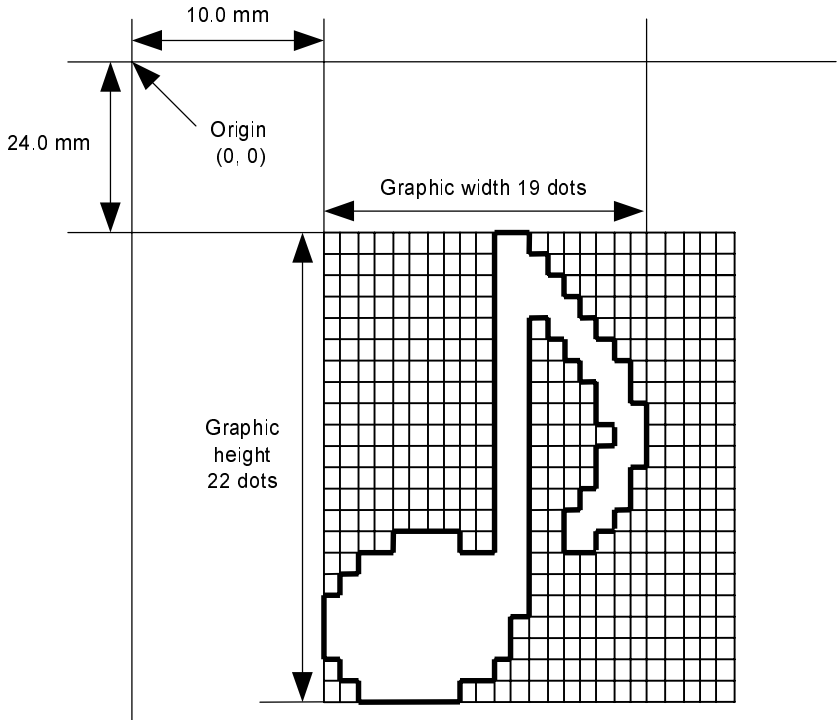


The graphic data overwrites the image buffer.

When using PCX graphics mode the parameters 'graphic width dots' and 'graphic height dots' can be set to '0000'. This will cause the printer to print the graphics in its original size (as specified in the PCX graphics file). This is only possible if the complete size of the PCX graphics data will fit within the effective print area (*see under Media in Section 3.3, Programming Considerations*).



Example: Please note that the graphics data in this example was split into several line for better reading only. Do not add <CR>/<LF>.



```
<
[Cc]
[Fg "0100:0240" "0019:0022" "0"
"003000003800003<00003>00
0037000033800031<00030<0
0030>00030600030>00030<0
0031<00033800?33003??000
7??000???000??>000??<000
7?<0003?0000"]
[Pi "0001" "000" "2:C6:0:0" "0"]
>
```



7.4 Data commands

This Section describes the variable data processing commands.

Text data (bitmap font): [Df "aaa" "bbb...bbb"]

Function: Provide data for the bitmap font row.

Parameters: **aaa:** Character string number
000 to 199 (Two digits, 00 to 99, also acceptable)
bbb...bbb: Data string to be printed
Max. 254 digits (Any excess data will be discarded.) *For the character codes, refer to the character code table in Appendix C, Characters.*

Explanation: No processing will be performed for the field that contains no print data due to the omission.

When the field partially loses print data due to the omission, the only remaining data will be processed as print data.

The Link Field Data command can be used for the bitmap font fields, outline font fields, and barcode fields.

Examples: *See Appendix E, Examples*

Also see: Text Format command



Text data [Ds "aa" "bbb...bbb"]
(outline font):

Function: Provide data for the outline font row.

Parameters: aa: Character string number
00 to 99
bbb...bbb: Data string to be printed
Max. 254 digits (Any excess data will
be discarded.) *For the character codes,
refer to the character code table in
Appendix C, Characters.*

Explanation: No processing will be performed for the field
that contains no print data due to the omission.

When the field partially loses print data due to
the omission, the only remaining data will be
processed as print data.

The Link Field Data command can be used for
the bitmap font fields, outline font fields, and
barcode fields.

Examples: *See Appendix E, Examples*

Also see: Text Format Outline command



Barcode data: [Db "aa" "bbb...bbb"]

Function: Provide data for the barcode.

Parameters: aa: Barcode number 00 to 31
bbb...bbb: Data string to be printed
The maximum number of digits varies according to the type of barcode.

For MaxiCode
(two-dimensional code):

Format: For Mode 2 or 3:
[Db "aa" "bbbbbbbbbbcccddeeeeee
... eeeee"]

For Mode 4 or 6:
[Db "aa" "ffffffffffggggg
... ggggg"]

Parameters: aa: Barcode number 00 to 31
bbbbbbbbbb: Postal code
Fixed as 9 digits
Mode 2:
b1b2b3b4b5
ZIP code. Fixed as 5 digits. (Numeric)
b6b7b8b9
ZIP code extension. Fixed as 4 digits
(Numeric)
Mode 3:
b1b2b3b4b5b6
ZIP code. Fixed as 6 digits.
(Character "A" of code set).
b7b8b9
Vacant. Fixed as 3 digits. (20H)
ccc: Class of service. Fixed as 3 digits.
(Numeric)
ddd: Country code. Fixed as 3 digits.
(Numeric)
eee ... eee: Message data strings.
84 digits.



fffffffff: Primary message data strings.
9 digits.

ggg . . . ggg: Secondary message data
strings. 84 digits.

In all cases:

Explanation: Data check:

If there is data in the data row, which does not meet the type of barcode, the barcode will not be drawn. If wrong code selection takes place in the data row of CODE128 (no auto code selection), the barcode will not be drawn.

Number of characters of data:

When data exceeding the maximum number of characters (2000 digits for PDF417), exceeding data will be discarded. When the number of characters does not correspond to the barcode type, the barcode is not be drawn.

Number of digits of data:

When data exceeding the maximum number of digits is sent, the excessive data will be discarded. For the maximum number of digits for each barcode, see below.

□ PDF417: 2000 digits

□ MaxiCode: 93 digits

When the number of digits does not correspond to the barcode type, the barcode is not be drawn.

For the MaxiCode, the maximum number of digits varies according to the mode. In mode 2 or 3 and mode 4 or 6, it is 84 digits and 93 digits, respectively.

Number of characters of data for PDF417:

When PDF417 is used, the number of symbol characters called code words is limited to 928 or less. Moreover, the data compression rate varies according to modes is as follows.

When alphabets and numerics are mixed in data in EXC mode, for example, however, the maximum value becomes smaller, since the internal mode switching code is used.

To correct a reading error by designating the security level, the maximum value becomes smaller, since the error correction code words are used.

When the number of digits of the code word exceeds 928, or when the number of lines exceeds 90, the symbols are not drawn.

Extended Alphanumerical Compaction (EXC) mode: 1850

Binary/ASCII Plus mode: 1108

Numeric compaction mode: 2000

Code 128 code selection:

If the case of CODE128 (with auto code selection), code selection is performed in the following manner. (Conforming to USS-128 APPENDIX G)

Determining the start character:

- ❑ If the data begins with four or more consecutive numerals, the start code to be used is <CODE C>.
- ❑ In any other case, if a control character appears before a small letter or four or more consecutive numerals, the start code is <CODE A>.
- ❑ In none of the above cases, the start code is <CODE B>.

If the data begins with an odd number of digits:

- ❑ Insert the <CODE A> or <CODE B> character just before the last numeric data. When <FNC1>, if found in the number, breaks a pair of digits in the number, insert



the <CODE A> or <CODE B> character before the numeric data preceding the <FNC1>.

If four or more digits of numeric data continue in <CODE A> or <CODE B>.

- ❑ When the numeric data is an even number of digits, insert the <CODE C> character just before the first numeric data.
- ❑ When the numeric data is an odd number of digits, insert the <CODE C> character immediately after the first numeric data.

If a control character appears in <CODE B>:

- ❑ In the subsequent data, when a small letter appears before the next control character or four or more consecutive digits, insert the <SHIFT> character before the first control character.
- ❑ When not so, insert the <CODE B> character just before the first control character.

If a small letter appears in <CODE A>:

- ❑ In the subsequent data, when a control character appears before the next small letter or four or more consecutive digits, insert the <CODE B> character before the first small letter.
- ❑ When not so, insert the <CODE B> character just before the first small letter.

If any data other than the numerals appears in <CODE C>:

- ❑ Insert the <CODE A> or <CODE B> character just before the data other than the numerals.

Code 128 code selection check:

Check if selection of <CODE A>, <CODE B> or <CODE C> of CODE128 has been set correctly. If an error is found, the bar code will not be drawn.

Conditions causing an error:

- ❑ No start code is designated.



- ❑ A small letter (including { , | , } , ~ , _) is found in <CODE A>.
- ❑ A control character is found in <CODE B>.
- ❑ Any data other than the numerals, <FNC1>, <CODE A>, and <CODE B> is found in <CODE C>.
- ❑ There are two or more consecutive <SHIFT> characters.
- ❑ The number in <CODE C> is an odd number of digits.
- ❑ <SHIFT> is followed by <CODE A>, <CODE B> or <CODE C>.

For MaxiCode:

When other than numeric is included in the data string of zip code (mode 2), zip code extension, class of service or country code, a MaxiCode is not drawn.

If the message data string is less than 84 digits when mode 2 or 3 is selected, the printer adds a <CR> (000000) at the end of the data, and the remaining digits will be padded with <FS>s (011100). When message data exceeding 84 digits is received, the excess data will be discarded before drawing a MaxiCode.

If the message data is less than 93 digits (9 digits + 84 digits) when mode 4 or 6 is selected, the printer adds a <CR> (000000) at the end of the data, and the remaining digits will be padded with <FS>s (011100). When message data exceeding 93 digits is received, the excess data will be discarded before drawing a MaxiCode.

Mode 6 should not be used for usual operation since it is used for scanner programming.

When data (00H) is included in the data string of the MaxiCode, the printer draws the data up to the <NUL> data.

Examples: *See Appendix E, Examples*



Link field data: [D] "aaa...aaa" "bbb...bbb"
"xxx...xxx"] (as of V 1.2)

Function: Provide data for the link fields.

Parameters: aaa...bbb: Data string of link field no. 1
bbb...bbb: Data string of link field no. 2
...
xxx...xxx: Data string of link field no. n

Explanation: Link field data string:
After the link field number is designated in the format command, data strings are linked using the link field data command to draw an image.

Up to 254 digits of data strings can be linked.
For barcodes, up to 126 digits can be linked.
(The value varies according to the type of barcode.) For PDF417 barcode up to 2000 digits of data strings can be linked.

When the number of digits exceeds the maximum value, exceeding data will be discarded.

Up to 99 data strings can be linked.

Up to 2048 bytes can be used as the command length ('[' to ']') of the link field data command.

When the data string is omitted in the link field data command, the following processing is performed:

- ❑ No processing will be performed for the field that contains no print data due to the omission.
- ❑ When the field partially loses print data due to the omission, the only remaining data will be processed as print data.

The link field data command can be used for the bitmap font fields, outline font fields and barcode fields (except MaxiCode).



7.5 Print Commands

This Section describes the issue, feed and eject commands.

Issue label:	[Pi "aaaa" "bbb" "c:d:e:f:g" "h"]
Function:	Issue labels according to the print conditions programmed.
Parameters:	<p>aaaa: Number of labels to be issued 0001 to 9999</p> <p>bbb: Cut interval. Designates the number of pieces to be printed before the backing paper is cut. 000 to 100 (no cut when 000)</p> <p>c: Type of sensor 0: No sensor 1: Reflective sensor (when using normal labels) 2: Transmissive sensor (when using normal labels) 3: Transmissive sensor (when using pre-printed labels) 4: Reflective sensor (when using a manual threshold value) (as of V 1.6)</p> <p>d: Issue mode C: Batch mode (cut issue, stop and cut, with back feed) D: Strip mode (with back feed)</p> <p>e: Issue speed 3 (1,2,4): 3"/sec. 6 (5,7): 6"/sec. A (8,9): 10"/sec.</p>



- f: With/without ribbon
 0: Without ribbon
 1: With ribbon
 (with ribbon saving function)
 2: With ribbon
 (without ribbon saving function)
- * With ribbon, transmissive/
 non-transmissive conforms to the
 system mode.
- g: Designates tag rotation.
 0: Printing bottom first
 1: Printing top first
- h: Type of status response
 0: No status response
 1: Status response

Explanation: Number of labels to be issued:

If increment/decrement is not specified, the designated number of pieces with the same drawing dot will be issued.

If increment/decrement is specified, the designated number of pieces will be issued while incrementing/decrementing the piece of the designated drawing area.

The increment/decrement designation is valid until the Clear Image Buffer command ([Cc]) is transmitted.

Cut interval:

The cut interval is valid only when the Cutter has been installed and the issue mode is "C". If an error occurs during an issue after the cut interval is designated, and then printing is restarted, the printer ejects the printed paper then resumes printing on the paper where the error occurred.

If no subsequent command is received from the PC for 3 seconds after cut-issuing the last label, when the cut interval is valid and DIP



SW 1-5 is set to ON (with the automatic forward feed standby), the printer automatically performs a 10-mm forward feed.

When the Issue command is received during the automatic forward feed standby, an issue is started after a reverse feed to the original position.

The power should not be turned off then on, or the printer should not be placed in a pause/reset state before the automatic forward feed, since the automatic forward feed is not performed when the paper is fed by turning the power off then on, or by pressing the [FEED] key of the printer in the pause/reset state.

If the paper is fed by pressing the [FEED] key of the printer during the forward feed standby, the printer feeds one label, cuts, performs the automatic forward feed then stops.

For cutting the label having label pitch of 38 mm or less, refer to the section regarding the Position Fine Adjustment command.

Type of sensor:

- ❑ No sensor:
Printing takes place according to the parameter designated by the Set Label Size command.
- ❑ Reflective sensor:
Printing takes place according to the parameter designated by the Set Label Size command. However, the black mark provided on the back side of the tag paper is automatically sensed by the reflective sensor and the paper position is finely adjusted every piece.
- ❑ Transmissive sensor (when using normal labels):
Printing takes place according to the parameter designated by the Set Label Size command. However, the label-to-label gap

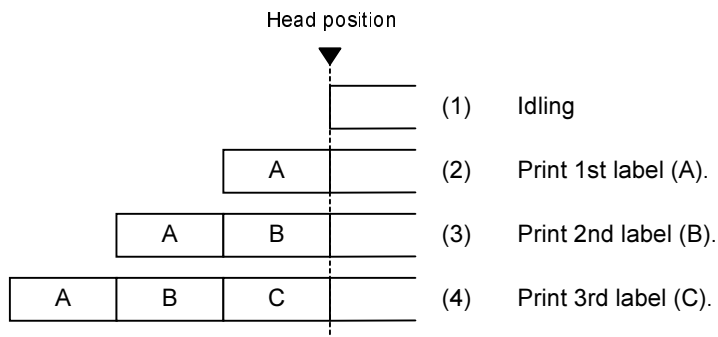


is automatically sensed by the reflective sensor and the paper position is finely adjusted every piece.

- Transmissive sensor (when using pre-printed labels):
Printing takes place according to the parameter designated by the Set Label Size command. However, the label-to-label gap is automatically sensed by the transmissive sensor and the paper position is finely adjusted every piece according to the value set by the threshold set operation (key operation).
- Reflective sensor (when using a manual threshold value):
Printing takes place according to the parameters designated by the Set Label Size command. However, the black mark provided on the back of the tag paper is automatically sensed by the reflective sensor and the paper position is finely adjusted every piece, according to the set threshold setting value (set using keys).

Issue mode:

[Batch mode (cut interval 0)]



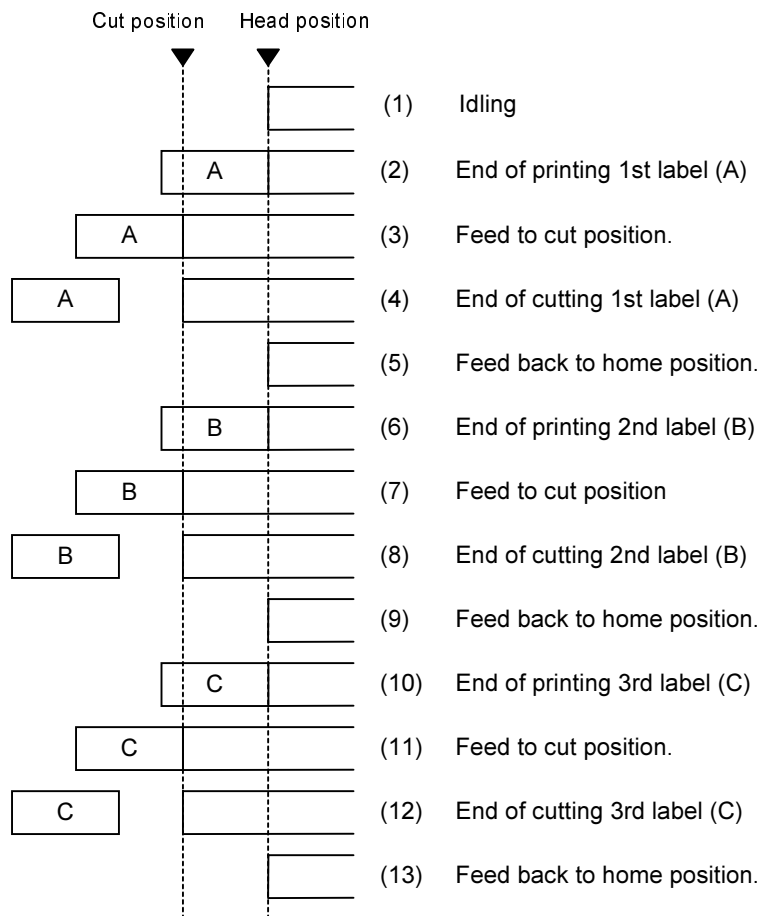


PART III, COMMANDS

Chapter 7, Command Descriptions, 7.5, Print Commands

[Batch mode (other than cut interval 0)]

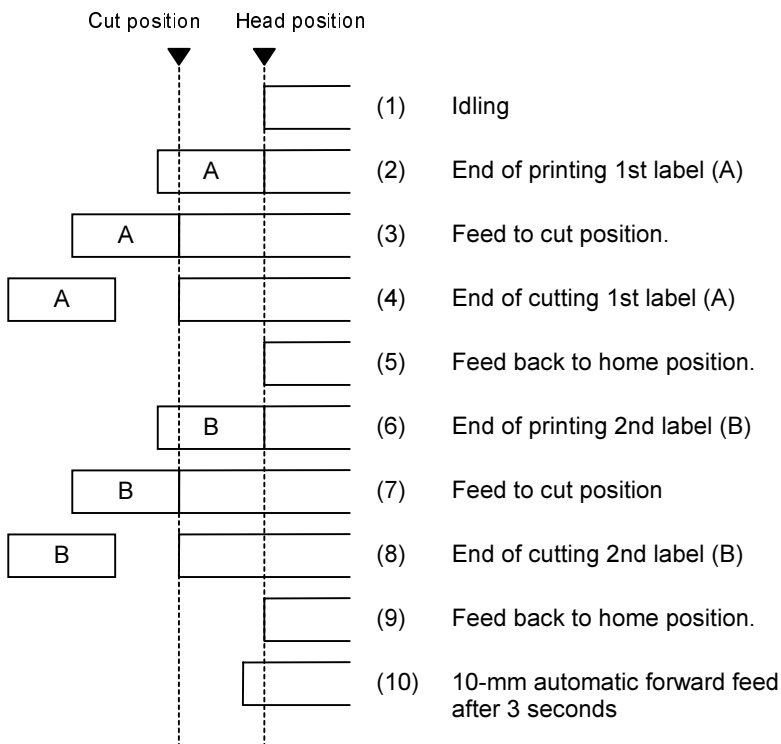
When DIP SW1-5 is turned off (without the automatic forward feed standby):





[Batch mode (cut interval 1, 2 labels to be issued)]

When DIP SW1-5 is turned on (with the automatic forward feed standby):



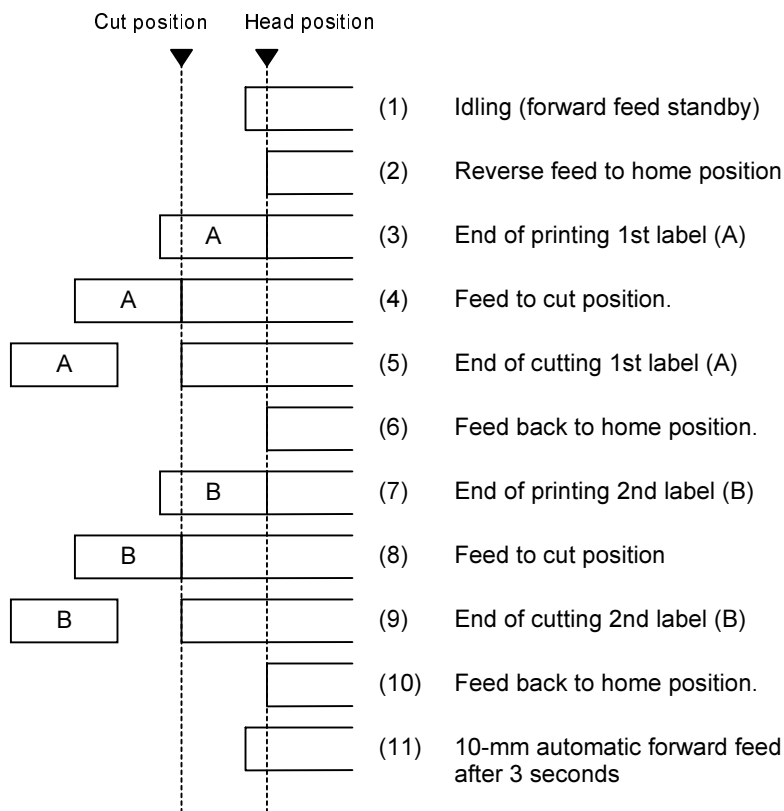


PART III, COMMANDS

Chapter 7, Command Descriptions, 7.5, Print Commands

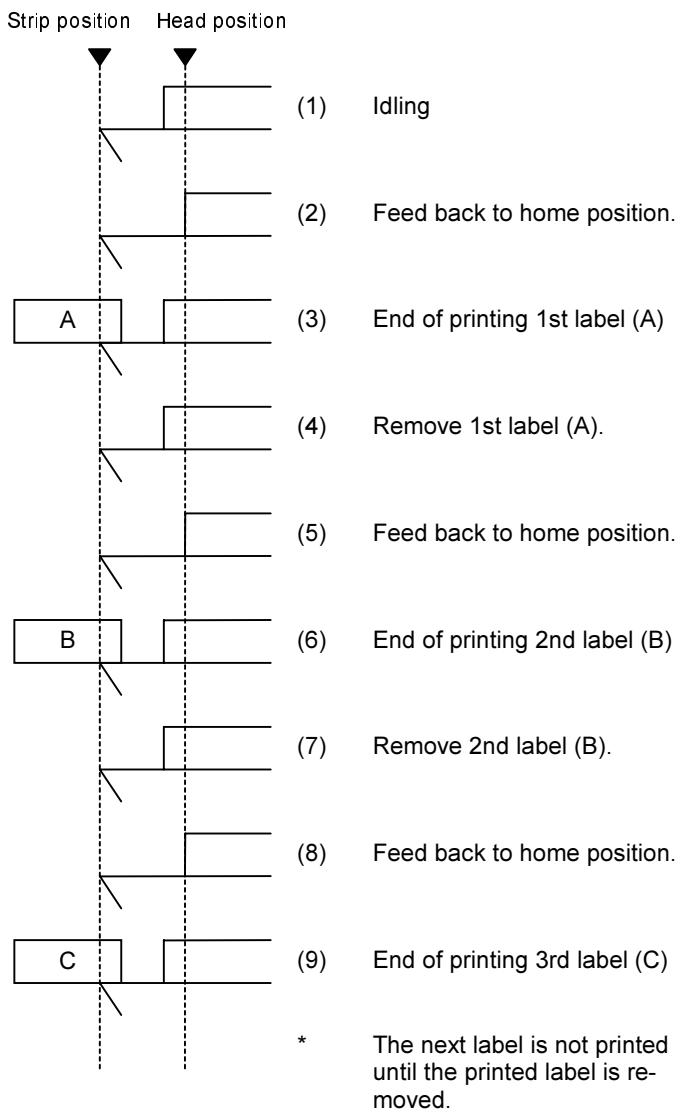
[Batch mode (cut interval 1, 2 labels to be issued) during forward feed standby]

When DIP SW1-5 is turned on (with the automatic forward feed standby):





[Strip mode]



Issue speed:

Printing takes place at the designated speed. Ribbon saving and back feed also take place at the same designated speed. However, the back feed speed in cut mode and strip mode is 3"/sec.

Parameter	Speed
1	3"/sec
2	
3	
4	
5	6"/sec
6	
7	
8	10"/sec
9	
A	

With/without ribbon:

Without ribbon: Use direct thermal paper.

With ribbon: Use thermal transfer ribbon.

With ribbon saving:

- When there is the following non-print area (in the feed direction) in batch mode, cut mode or strip mode, ribbon saving is performed automatically.

3"/sec., 6"/sec.: 20 mm or more

10"/sec.: 30 mm or more

- The minimum print area (in the feed direction) in ribbon saving issue is 8 mm. When the print area is less than 8 mm, printing is performed by automatically assuming the minimum print area of 8 mm.
- Ribbon saving is performed for up to 4 fields (4 printing fields + 4 ribbon saving fields).

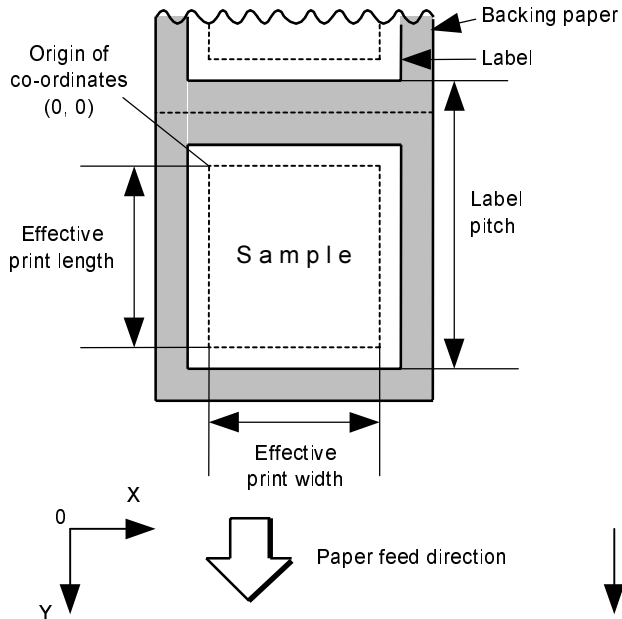


- ❑ When the ribbon saving issue is performed, on-the-fly issue is not performed regardless of data quantity or print length.
- ❑ “Without ribbon saving function” is selected in the Issue command parameter setting or in DIP switch setting, no ribbon saving will take place.

Tag rotation:

The origin of co-ordinates and printing direction vary according to the designation of tag rotation.

Printing bottom first (standard):





For printing top first (upside down), the origin of the co-ordinates (0,0) is in the opposite corner, the text is upside down. This is true for labels as well as tags.

Status response:

When the option with status response has been selected, a status response is made at the end of printing or if an error occurs.

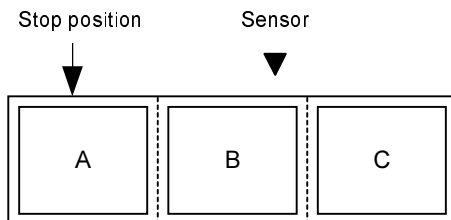
In batch mode and cut mode, the print end status response is made after printing on the designated number of labels.

In strip mode, the status response is made after printing one label.

- ☒ **Do not change the parameter for status response/no status response during printing, the status response may not be performed properly.**

Notes: Improvement of the processing to stop the label at the home position:

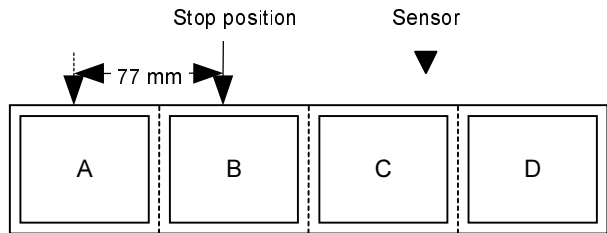
When the gap between labels (black mark) is found after the head open state is detected, the value to stop at the home position of each label between the head and the sensor is set again.



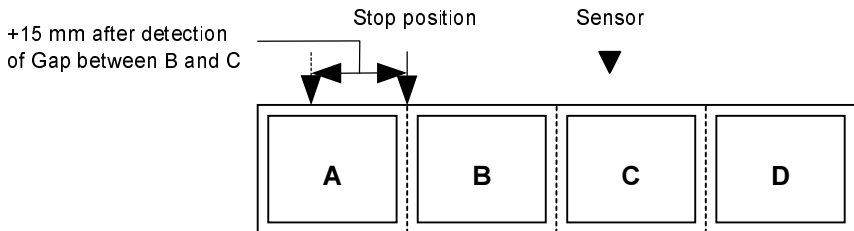
- ☐ The paper is moved in the above state.
- ☐ Stop position after feeding one label



<< Before improvement >>



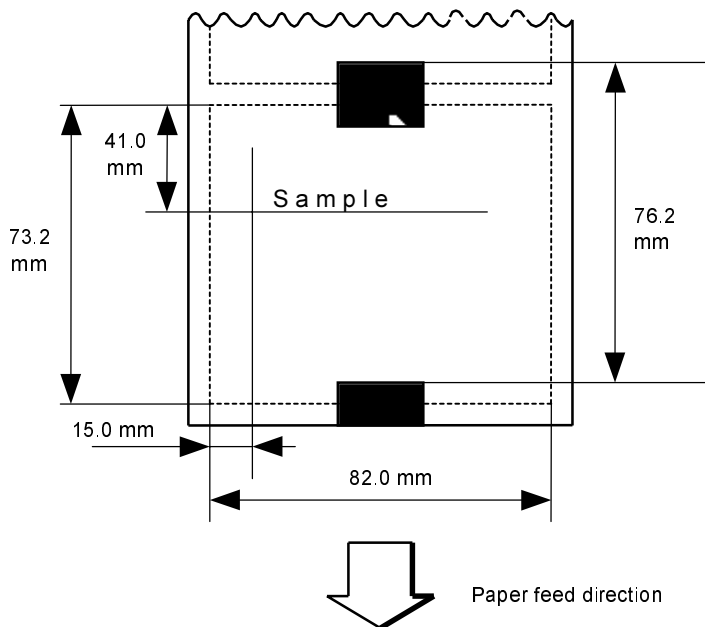
<< After improvement >>



- ☑ **An error will result when feed jam conditions are met.**



Example:



```
<  
[Cc]  
[Ff "0150:0410" "001"  
  "00" "A:8" "1:1"]  
[Df "001" "Sample"]  
[Pi "0004" "001"  
  "1:C:6:2:0" "1"]  
>
```

**Feed label:** [Pf "a:b:c:d:e"]

Function: Feed the paper.

Parameters:

- a: Type of sensor
 - 0: No sensor
 - 1: Reflective sensor
 - 2: Transmissive sensor
(when using normal labels)
 - 3: Transmissive sensor
(when using pre-printed labels)
 - 4: Reflective sensor
(when using a manual threshold
value) (as of V 1.6)
- b: Selects cut or non-cut
 - 0: Non-cut
 - 1: Cut
- c: Feed mode
 - C: Batch mode
(cut issue, stop and cut, with
back feed)
 - D: Strip mode (with back feed)
- d: Feed speed
 - 3 (1,2,4): 3"/sec.
 - 6 (5,7): 6"/sec.
 - A (8,9): 10"/sec.
- e: With/without ribbon
 - 0: Without ribbon
 - 1: With ribbon
(with ribbon saving function)
 - 2: With ribbon
(without ribbon saving function)
 - * With ribbon, transmissive/non-
transmissive conforms to system
mode.



Explanation: Type of sensor:

No sensor:

Feeding takes place according to the parameter designated by the Set Label Size command.

Reflective sensor:

Feeding takes place according to the parameter designated by the Set Label Size command. However, the black mark provided on the back side of the tag paper is automatically sensed by the reflective sensor and the stop position is finely adjusted.

Transmissive sensor

(when using normal labels):

Feeding takes place according to the parameter designated by the Set Label Size command. However, the label-to-label gap is automatically sensed by the reflective sensor and the stop position is finely adjusted.

Transmissive sensor

(when using pre-printed labels):

Feeding takes place according to the parameter designated by the Set Label Size command. However, the label-to-label gap is automatically sensed by the transmissive sensor and the stop position is finely adjusted according to the value set by the threshold set operation (key operation).

Reflective sensor

(when using a manual threshold value):

Feeding takes place according to the parameters designated by the Set Label Size command. However, the black mark provided on the back of the tag paper is automatically sensed by the reflective sensor and the paper position is finely adjusted every piece, according to the set threshold setting value (set using keys).

Cut/non-cut:

This option is valid in batch feed mode only.
(Non-cut is selected in strip mode.)

If no subsequent command is received from the PC for 3 seconds after cut-feeding when DIP SW1-5 is set to ON (with the automatic forward feed standby) in cut mode, the printer automatically performs a 10-mm forward feed.

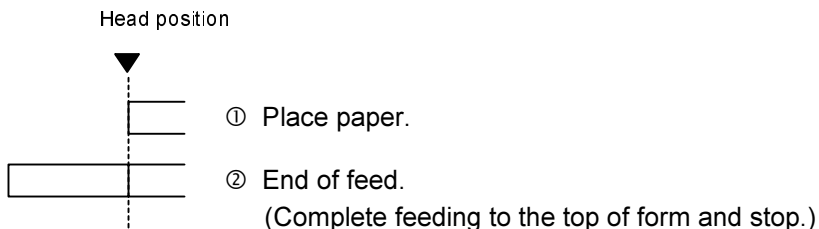
When the Feed command is received in the forward feed standby state, the printer performs a reverse feed to the original position.

For notes, refer to the section regarding the Issue command.

For cutting the label having label pitch of 38 mm or less, refer to the section regarding the Position Fine Adjustment Command.

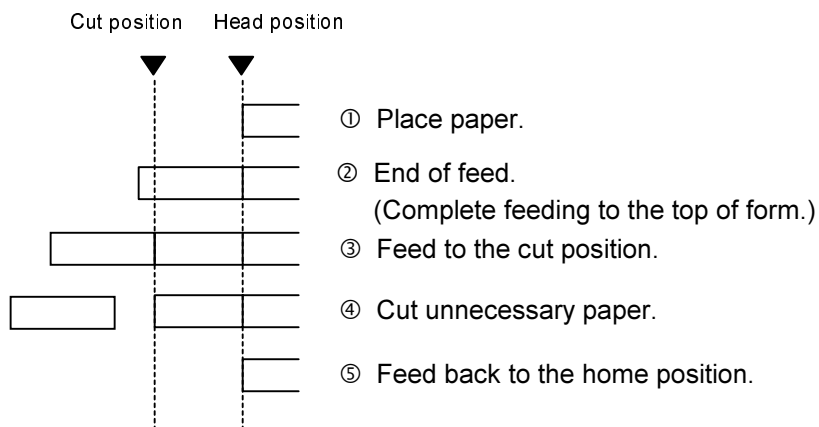
Feed mode:

[Batch (non-cut)]

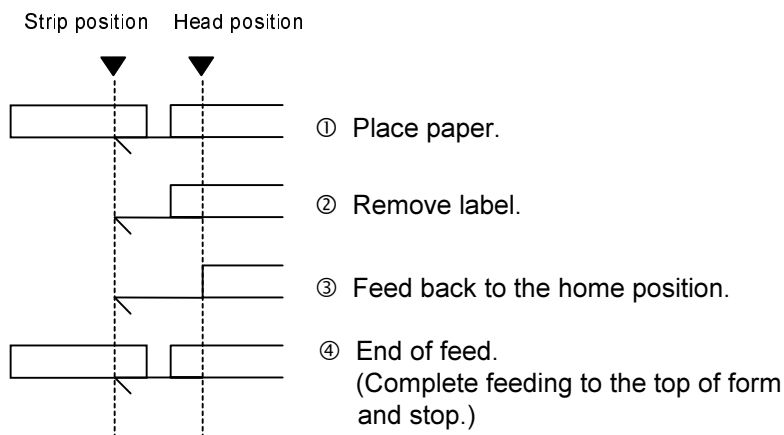




[Batch (cut)]



[Strip]



Feed speed:

Feed the paper at the designated speed. Ribbon saving and back feed also take place at the same designated speed. However, the back feed speed in cut mode or strip mode is 3"/sec.

Parameter	Speed
1	3"/sec
2	
3	
4	
5	6"/sec
6	
7	
8	10"/sec
9	
A	

With/without ribbon:Without ribbon:

The ribbon motor is not operated at feed.

With ribbon:

The ribbon motor is operated at feed.

With ribbon saving:

When the DIP switch is set to auto ribbon saving, ribbon saving will be performed automatically. When the option for no ribbon saving has been selected or the DIP switch is set to no auto ribbon saving, no ribbon saving will take place.



Notes: If a change of label size or type of sensor, feed fine adjustment, cut position fine adjustment (or strip position fine adjustment) or back feed fine adjustment is made, one label must be fed to adjust the first printing position prior to printing.

The parameter of the Feed command is protected in memory (protected even if the power is turned off).

When "status response" is selected in the Issue command parameter setting, a status response is made after the end of feed or when an error occurs.

For explanation about the processing to stop the label at the home position, refer to the section regarding the Issue command.

Example: <
[Pf "1:1:C:6:2"]
>

Eject label: [Pe]

Function: Eject (cut) the label presently remaining between the head and the Cutter and return to the original position.

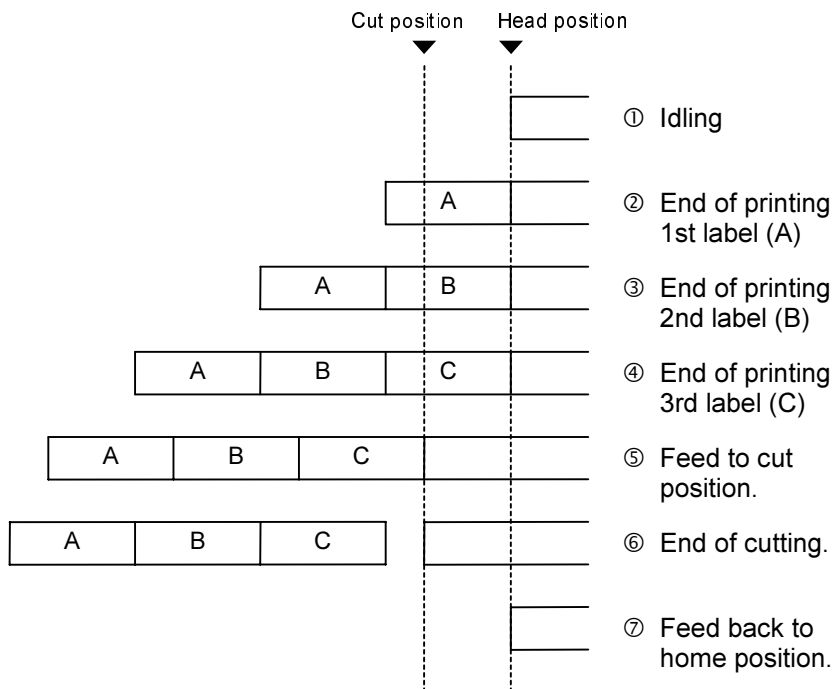
Notes: If no subsequent command is received from the PC for 3 seconds after ejection when DIP SW1-5 is set to ON (with the automatic forward feed standby), the printer automatically performs a 10-mm forward feed.

When the Eject command is received in the forward feed standby state, the printer feeds the label in reverse to the original position and ejects it.

For notes, refer to the section regarding the Issue command. For ejecting the label having label pitch of 38 mm or less, refer to the section regarding the position fine adjustment.



Example:



```

<
[Cc]
[Ff "0200:0125" "001"
  "00" "A:B" "1:1"]
[Df "001" "A"]
[Pi "0001" "000"
  "1:C:6:2:0" "1"]
[Df "001" "B"]
[Pi "0001" "000"
  "1:C:6:2:0" "1"]
[Df "001" "C"]
[Pi "0001" "000"
  "1:C:6:2:0" "1"]
[Pe]
>

```



Forward/ [Pc "±aaaa"]
Reverse feed:

Function: After printing or feeding the paper, feed the paper to a manually cut position.

When issuing the next label, feed the paper back to the first printing position.

Parameters: ±aaaa: Feed value by which the paper is fed forward or backward.
0030 to 2000 (in 0.1 mm units)

Notes: When the [FEED] key is pressed on the printer, one label is fed, and then fed by the forward feed value automatically if the Forward Feed command has already been transmitted.

The Forward/Reverse Feed command is protected in memory (protected even if the power is turned off).

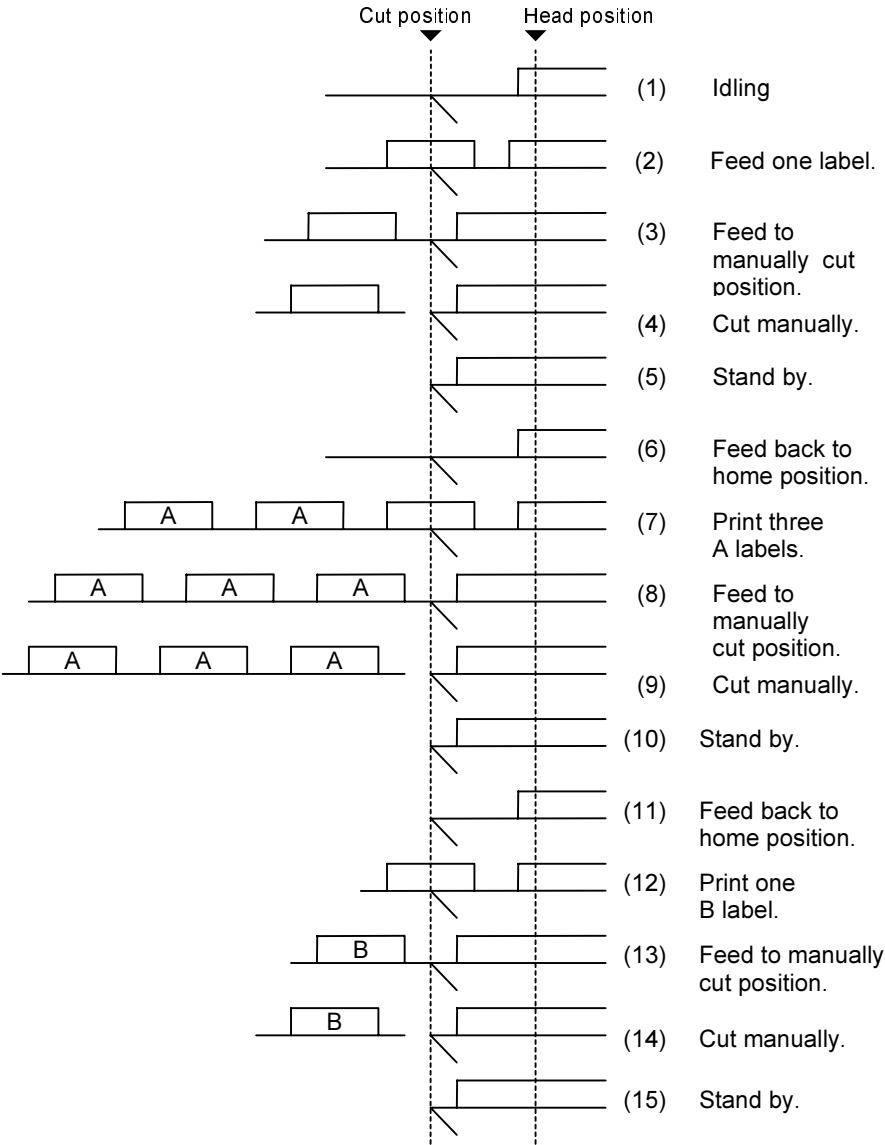
The Forward/Reverse Feed command is ignored in strip mode and cut issue mode.

The Forward/Reverse Feed command feeds the label without ribbon saving even if the ribbon saving issue is designated.

The forward feed is performed at the speed designated in the Issue command or Feed command. The reverse feed is performed at the speed of 3"/sec.



Example:





```
<
[Pe "+0120"]
cut manually
[Pi "0003" "000"
  "2:C:6:2:0" "1"]
[Pe "+0120"]
cut manually
[Pe "-0120"]
[Pi "0001" "000"
  "2:C:6:2:0" "1"]
[Pe "+0120"]
>
```




7.6 Flash Card Commands

This Section describes the commands needed for Flash Card utilisation.

☑ **Optional I/O Expansion Board is needed**

Format card: [Mf "a"]

Function: Format (initialise) the flash memory card.

Parameters: a: Formatting (initialising) range
A: All area of flash memory card
B: PC save area of flash memory card
C: Writable character area of flash memory card

Explanation: The flash memory card can be roughly divided into the PC save area and writable character area. They can be formatted (initialised) either separately or at the same time.

When using a new flash memory card, the area to be used must be formatted (initialised) and then the PC save or writable characters must be stored.

After formatting, the remaining memory is the PC save area (255 Kbytes) and writable character area (715 Kbytes). However, when the 4-Mbyte flash memory card is used, the remaining memory is the PC save area (895 Kbytes) and writable character area (3147 Kbytes). The remaining memory is displayed on the LCD.

When storing already stored data (PC save, writable characters, logo) again, memory is consumed with every storing unless the Format command ([Mf]) is transmitted.



When performing the label issue operation after sending the Format command, the image buffer is automatically cleared.

When storing of writable characters, logos, or PC interface commands is not continued, the printer automatically enters the online mode (label issue operation) after about 10 seconds. In this case, the image buffer is automatically cleared.

Also see: *Bitmap Writable Character Command*
 Save Start Command
 Save Terminate Command

Example: <
 [Mf "A"]
 >



Bitmap writable character: [Mc "aa:b" "cccc:ddd" "eee:fff:ggg" "h" "iii...iii"]

Function: Write writable characters and logo on the flash memory card.

Parameters:

- aa:** Writable character set
01 to 40
- b:** Writable character code
20H to FFH (Set in hex.)
- ccc:** Left offset
000 to 719 (in dots)
- ddd:** Top offset
000 to 719 (in dots)
- eee:** Character width
001 to 720 (in dots)
- fff:** Character height
001 to 720 (in dots)
- ggg:** Horizontal spacing/proportional spacing
000 to 999 (in dots)
- h:** Type of writable character data
0: Nibble mode (4 bits/byte)
1: Hex. mode (8 bits/byte)
- iii...iii:** Writable character data to be stored

Explanation: Type of writable character:

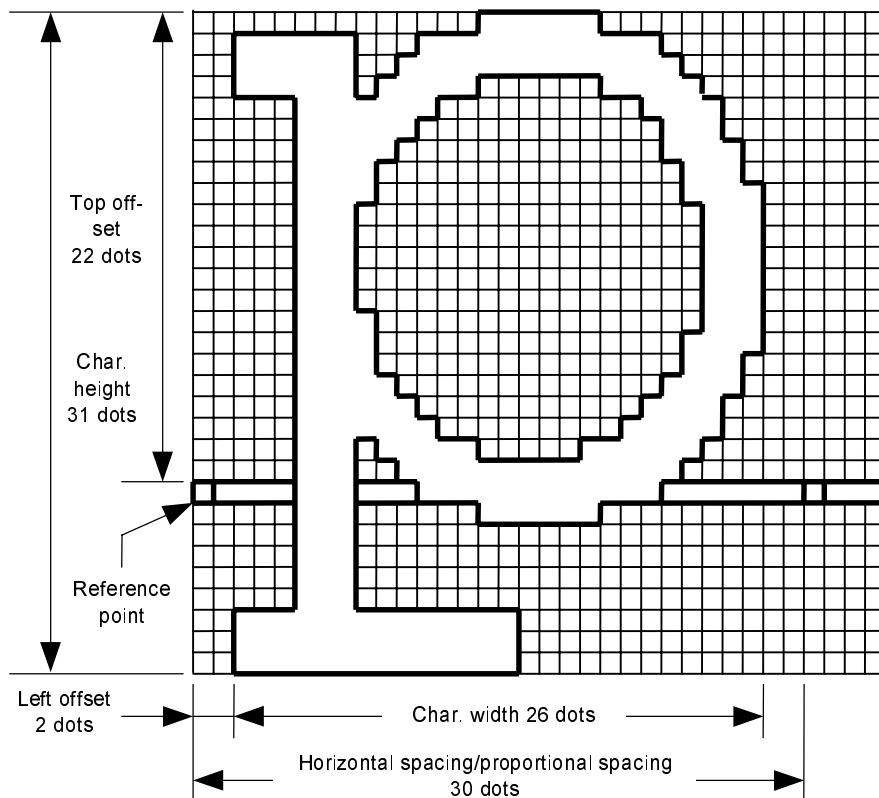
Up to 40 writable character sets can be stored. However, the maximum number of characters varies depending on the writable character size and number of characters because of the limited memory capacity.



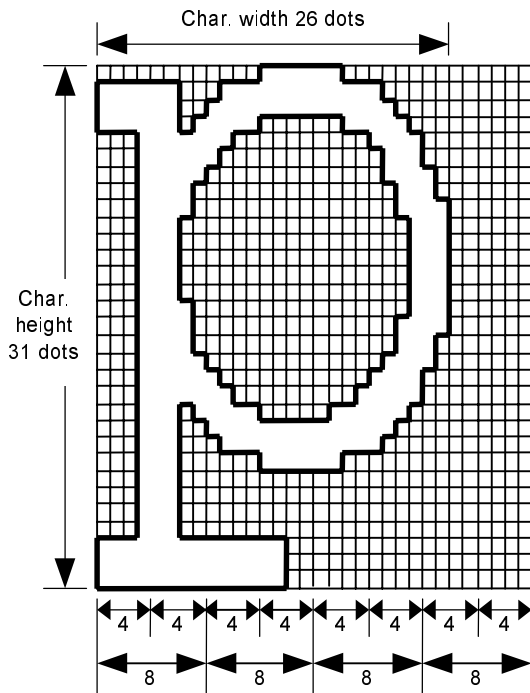
Character code:

Up to 224 characters can be stored per character set. The maximum number of characters in 40 sets \times 224 characters = 8960 characters. It varies depending on the writable character size and number of characters because of the limited memory capacity.

Writable character data:



Chapter 7, Command Descriptions, 7.6, Flash Card Commands



Number of graphic bytes sent down must correspond exactly to the width and height defined.

Nibble mode:

Nibble mode															
1	30H	2	30H	3	30H	4	3FH	5	3CH	6	30H	7	30H	8	30H
9	3FH	10	3CH	11	37H			.							
								.							
								.							
								.							
								.							
								.							
								.						240	30H
241	3FH	242	3FH	243	3FH	244	3CH	245	30H	246	30H	247	30H	248	30H



The writable character data to be stored is separated into four dot units and sent in the following order (**1** → **248**). (high order digit: “3”)

The data of writable characters to be stored is 30H to 3FH.

The minimum unit in the X direction is 8 dots. Dots with no data are transmitted as data 0.

The data count of writable characters to be stored must be as follows:

Data count of writable characters to be stored
= {(number of char. width dots + 7)/8}
× number of char. height dots × 2

* The value in the brackets is truncated to the next whole number.

Hex. mode:

Hex. mode							
1	00H	2	0FH	3	C0H	4	00H
5	FCH	6	7FH				
				.			
				.			
				.			
				.			
				.			
				.			
				.			
				.		120	00H
121	FFH	122	FCH	123	00H	124	00H

The writable character data to be stored is separated into eight dot units and sent in the following order (**1** → **124**).

The data of writable characters to be stored is 00H to FFH.

The minimum unit in the X direction is 8 dots. Dots with no data are transmitted as data 0.



The data count of writable characters to be stored must be as follows:

Data count of writable characters to be stored

= $\{(\text{number of char. width dots} + 7)/8\}$

× number of char. height dots

* The value in the brackets is truncated to the next whole number.

To convert PCX files to HEX mode, contact METO and ask for DOS program PCX2SP40.EXE.

Notes: With the same writable character set designated, character width and character height can be designated for each writable character code. In other words, character size can be changed for each character, thus saving memory.

Proportional spacing and descending of characters are possible according to the parameters of horizontal spacing/proportional spacing, left offset, and top offset.

When top offset = 000, the reference coordinates are at the above left in drawing because the base line is at the top. (Co-ordinate setting is facilitated for logo.)

Even if any character set or character code is selected, no memory will be wasted.

When using a new flash memory card, the Format command ([MF]) must be transmitted. The remaining memory capacity after formatting is the writable character area (715K bytes). However, when the 4-Mbyte flash memory card is used, the remaining memory is 3147 Kbytes.

The already stored character code can be stored again if the Writable Character Command ([MC]) is transmitted but memory will be consumed every storing again. Memory can be efficiently used by sending the Format command ([MF]) before storing.



When performing the label issue operation after sending the Bitmap Writable Character Command ([M_C]), the image buffer is cleared automatically.

When the storing operation is not continued after storing the writable character and logos, the printer automatically enters online mode (label issue operation) after about 10 seconds. In this case, the image buffer will be cleared automatically.

Example: Writable character set: 03,
writable character code: 70hex (= 'p').

Please note that the graphics data in this example was split into several lines for better reading only. Do not add <CR>/<LF>.

```
<
[Mf "C"]
[Mc "03:p" "002:022"
"026:031:030" "0"
"000?<000?<7??800?<???<00?=03>00
1?<00?001?8007001?0007801>000380
1>0003<01<0001<01<0001<01<0001<0
1>0001<01<0001<01<0001<01>0003<0
1>0003801?0007801?800?001?<01?00
1=?07>001<???<001<7??8001<0?<000
1<0000001<0000001<0000001<000000
???<0000???<0000???<0000"]
>
```

Also see: *Format command*

**Save start:** [Ms "aa" "b"]

Function: Declare the start of saving PC interface commands.

(Place the printer in the mode where PC interface commands are written on the flash memory card.)

Parameters: aa: Identification number (save No.) used for saving or calling 01 to 99

b: Status response at save time

0: No status response

1: Status response

Notes: Up to 99 kinds of PC interface commands can be stored. The maximum number of PC interface commands varies according to the PC interface command capacity to be stored because of the limited memory capacity. The storable command capacity per saving operation is maximum 65533 bytes.

When using a new flash memory card, the Format command must be transmitted. The remaining memory after formatting is the PC save area (255 Kbytes). However, when the 4-Mbyte flash memory card is used, the remaining memory is 895 Kbytes.

The already stored save number can be stored again when the Save Start command is sent after declaring the termination of saving. However, the memory is consumed every storing again. The memory can be used efficiently by sending the Format command before storing.



After sending the Save Start command any command other than the following will be saved into the flash memory without being analysed.

- Save Start command
- Save Terminate command
- Recall Saved Data command
- Bitmap Writable Character command
- Reset command
- Status Request command
- Format command

No error check is made for the commands at save time.

Example: <
[Mf "B"]
[Ms "01" "0"]
[Cc]
[Ff "0200:0125" "001" "00"
"A:B" "1:1"]
[Mt]
>

Also see: *Save Terminate Command*
Format command



Save terminate: [Mt]

Function: Declare the termination of saving PC interface commands.

Note: If the storing operation is not continued after storing the PC interface command, the printer enters online mode (label issue operation) after about 10 seconds. In this case, the image buffer will be cleared automatically.

Example: <
[Mt]
>

Refer to: *Save Start command.*

**Recall saved data:** [Mr "aa" "b:c"]

Function: Calls saved PC interface commands.

Parameters: aa: Save number of the file to be called
01 to 99

b: Status response when calling the data
0: No status response
1: Status response

c: Auto call at power on time
L: Auto call
M: No auto call

Notes: If the relevant save number is not found, an error will result.

However, if no save number subject to auto call is found with the option for auto call at power on time selected, the option for no auto call will be selected causing no error.

If a command error is found in the PC interface command in auto call at power on time by the Recall Saved Data command, a command error will result. After an error has occurred, the power must be turned off. The option for no auto call is selected when the power is turned on again.

The printer enters online mode (label issue operation) when the Recall Saved Data command is sent after the Save Terminate command.

Example: <
[Mr "01" "0" "L"]
[Df "001" "Sample"]
[Pi "0002" "000" "2:C:6:0:0" "0"]
>

Also see: *Save Start command*
Save Terminate command



PART IV ERRORS





This Part of the Manual is an SP40 PDL error handling guide. It describes potential errors and their causes and suggests practical preventive or remedial measures. *Refer to this Part to look up any error messages you may receive.*

- ❑ Chapter 8, Error Overview,
gives you some troubleshooting hints and a tabular overview of all the errors;
- ❑ Chapter 9, Error Descriptions,
describes the errors, their causes, effects and the remedial measures you can take if they occur.

*For preliminary information,
see PART I, INTRODUCTION;
for syntax rules,
see PART II, SYNTAX;
for a list of commands,
see PART III, COMMANDS;
for all other data,
see PART V, APPENDICES.*



Chapter 8 Error Overview

This Chapter lists and explains all the errors you may encounter during online SP40 PDL printer operation.

- ❑ Section 8.1, Troubleshooting, explains the different types of SP40 PDL and printer errors and how they are processed;
- ❑ Section 8.2, Error List, lists the errors and the number of the page where the error is described in detail.

For a detailed list of errors, their causes, effects and remedies, see Chapter 9, Error Codes.

8.1 Troubleshooting

- ☑ **It is strongly recommended to start every data communication with the 'Status request' command. This ensures that no error states exist as a result of previous commands.**

If you do NOT get a reaction from the printer online, ensure that

- ❑ the printer is connected to mains,
- ❑ the printer is turned on,
- ❑ the interface cable is connected properly,
- ❑ labels are loaded and print-head is closed,
- ❑ the printer is set to online.



Troubleshooting Table

Problem	Solution
Hardware or software trouble	See Section 8.2, Error List.
	Otherwise turn power off then on again
	If the problem persists, contact your service representative
No print	Ensure that media and ribbon are loaded correctly
	Ensure that print-head is set correct
	Check cable connection between printer and host/PC
Dots missing in print-out	Check if print-head is dirty: If so, clean
	If the problem persists, contact your service representative
Unclear or blurred printing	Check print-head: If dirty, clean
	Check media: If poor quality, replace
	Check ribbon state: If bad or faulty, replace
	If the problem persists, contact your service representative
Power does not come on	Plug power cord into wall socket
	Check circuit-breakers and fuses
	Plug a different appliance into wall socket to ascertain whether power is supplied or not
	If the problem persists, contact your service representative.
Printer does not cut	Check for paper jam
	If the problem persists, contact your service representative
Raised nap where media was cut	Clean cutter blades
	Replace worn blades (service representative)
	If the problem persists, contact your service representative



8.2 Error List

If the printer detects any of the following errors, it will display the error message (LCD, LED), output a status response (serial interface, parallel interface) and stop its operation.

Conventions and meaning of symbols in the following table:

If a command error is found in the command received, 16 bytes of the command in error, starting from the command call, will be displayed (however, <LF> and <NUL> will not be displayed).

When the error command is displayed, “? (3FH)” is displayed for codes other than 20H to 7FH and A0H to DFH.

○	: On
⊙	: Blinking
●	: Off
****	: Remaining count: □□□□ to 9999 pieces
###	: Remaining memory capacity for PC saving (0 to 895 KBytes)
%%%%	: Remaining memory capacity for storing writable characters (0 to 3147 KBytes)



PART IV, ERRORS

Chapter 8, Error Overview, 8.2, Error List

LCD Messages	LEDs			Acceptance of Status Request or Reset Command	
	POWER	ON LINE	ERROR	Restore by [RESTART] key possible	
				Printer Status	
ON LINE	○	○	●	In online mode	- Y
ON LINE	○	⊙	●	In online mode (Communicating)	- Y
HEAD OPEN	○	●	●	The head was opened in on-line mode.	- Y
PAUSE ****	○	●	●	In pause mode	Y Y
COMMS ERROR	○	●	○	A parity error, overrun error or framing error has occurred during communication by RS-232C.	Y Y
PAPER JAM ****	○	●	○	A paper jam occurred during paper feed.	Y Y
CUTTER ERR ****	○	●	○	An abnormal condition occurred at the Cutter.	Y Y
NO PAPER ****	○	●	○	The label has run out.	Y Y
NO RIBBON ****	○	●	○	The ribbon has run out.	Y Y
HEAD OPEN ****	○	●	○	An attempt was made to feed or issue with the head open. (except the [FEED] key and expansion I/O.)	Y Y
EXCESS HEAD TEMP	○	●	○	The thermal head temperature has become excessively high.	N Y
RIBBON ERR ****	○	●	○	An abnormal condition occurred in the sensor for determining the torque for the ribbon motor.	Y Y



LCD Messages	LEDs			Acceptance of Status Request or Reset Command		
	POWER	ON LINE	ERROR	Restore by [RESTART] key possible		
				Printer Status		
REWIND FULL ****	○	●	○	An overflow error has occurred in the Rewinder.	Y	Y
SAVING ### %%%%	○	○	●	In writable character or PC command save mode	-	Y
FLASH WRITE ERR.	○	●	○	An error has occurred in writing in the flash memory	N	Y
FORMAT ERROR	○	●	○	An erase error has occurred in formatting the flash memory.	N	Y
FLASH CARD FULL	○	●	○	Saving failed because of the insufficient capacity of the flash memory.	N	Y
Display of error command	○	●	○	A command error has occurred in analysing the command.	Y	Y
DIVIDE ERROR	○	●	○	A zero dividing error has occurred.	N	N
UNUSED CODE TRAP	○	●	○	An undefined command was fetched.	N	N
POWER FAILURE	○	●	○	A momentary power interruption has occurred.	N	N
EEPROM ERROR	○	●	○	An EEPROM for back-up cannot be read/written properly.	N	N



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Chapter 9 Error Descriptions

This Chapter lists and explains all the online errors, their causes, effects and remedies in detail.

- ❑ Section 9.1, Error Descriptions, lists the errors, their respective SP40 PDL code, cause, effect and remedy;
- ❑ Section 9.2 Message Translations, shows the translations of error messages.

For general error processing information and a survey of all error codes, see Chapter 8, Error Overview.

- ☑ **Note:** It is possible to obtain unwanted results, for instance on printed labels, without causing an SP40 PDL error or triggering a fault condition in the printer.

Such subjective 'errors', e.g. the wrong placement or poor appearance of fields on a label can usually be corrected by modifying the layout.



9.1 Communication Errors

Here is a list of the online errors, their respective error code, cause, effect and remedy:

Display of command: An error results if a command length error, command transmission sequence error, command format error or parameter designation error is found in analysing the command. An error results if the format command of a field is not transmitted and its data command is transmitted. When calling the PC save command of the field that is not saved is attempted, an error results. An undefined command is not detected as an error, and data is discarded until ']' or '>' is received.

COMMS ERROR: An error results if a framing error, overrun error or parity error is found during data reception when using the serial interface (RS-232C).

- * At the moment when a command error or hard error occurs, the printer shows the error message and makes status response before stopping. The Status Request command and Reset command only can be processed and other commands are not processed. When the printer is restored by the [RESTART] key, the printer enters the initial state that is obtained after the power is turned on.

Issuing and Feeding Errors

PAPER JAM: When the relation between the programmed label (or tag) pitch (A) and the label (or tag) pitch detected by the sensor (B) is not indicated by the following formula, an error will result:

$$(A) \times 50\% \leq (B) \leq (A) \times 150\%$$

- ☐ A paper jam has occurred during paper feed.
- ☐ The paper is not placed properly.



- ☐ The actual label does not match the type of the sensor selected.
- ☐ The sensor position is not aligned with the black mark.
- ☐ The actual label size does not meet the designated label length.
- ☐ No label-to-label gap is detected due to pre-print.
- ☐ The sensor is not thoroughly adjusted. (The sensor is not adjusted for the label to be used.)

If the stripped label does not cover the strip sensor when printing or feeding is completed in strip mode, an error will result.

CUTTER ERROR: When the Cutter home position sensor does not operate 1.5 seconds or more after the Cutter motor is driven, an error will result.

- ☐ A paper jam has occurred at the Cutter. (The Cutter does not return to the home position.)
- ☐ The Cutter does not move from the home position.

NO PAPER: When the transmissive sensor and reflective sensor detect the label end state in 5 mm continuously, an error will result.

If the transmissive sensor and reflective sensor detect the label end state when an issue, feed and ejection is attempted when the printer stops, an error will result.

NO RIBBON: If the ribbon end sensor detects the ribbon end state in 5 mm continuously when the ribbon is designated, an error will result.

If the ribbon end sensor detects the ribbon end state when the ribbon designation has been selected, and an issue, feed and ejection is attempted when the printer stops, an error will result.

HEAD OPEN: If the head open sensor detects the open state in 5 mm continuously, an error will result.



If the head open sensor detects the open state when an issue, feed and ejection is attempted in the printer stop state, an error will result.

However, the feeding by the [FEED] key on the printer and the issuing and feeding by the expansion I/O are not included.

EXCESS HEAD TEMP: When the open-air temperature detection thermistor detects a high temperature, an error will result.

When the thermal head temperature detection thermistor detects a high temperature, an error will result.

RIBBON ERROR: When the ribbon rewind motor sensor and ribbon back tension motor sensor does not perform detection if twice the prescribed time has passed, an error will result.

- ☐ An abnormal condition has occurred in the sensor for determining the torque for the ribbon motor.
- ☐ A ribbon jam has occurred.
- ☐ The ribbon has run out.
- ☐ The ribbon is not installed.

REWIND FULL: If the Rewinder overflow sensor detects the overflow state in 5 mm continuously when the strip function or the built-in Rewinder is selected, an error will result.

If the overflow sensor detects an overflow state when an issue, feed or ejection is attempted with the printer being stopped after the strip function or the built-in Rewinder is selected, an error will result.

- * At the moment an error occurs, the printer shows the error message, makes a status response, and then the printer stops. Only the Status Request command and Reset command can be processed. Restoration using the [RESTART] key is possible except for an abnormal thermal head temperature error. (Issue



is resumed starting with the label for which the error had occurred.)

Character and Command Errors

- FLASH WRITE ERR.:** An error has occurred in writing in the flash memory.
- FORMAT ERROR:** An erase error has occurred in formatting the flash memory.
- FLASH CARD FULL:** Storing is impossible because of the insufficient flash memory capacity.
- * At the moment when an error occurs, the printer shows the error message and makes status response before stopping. The Status Request command and Reset command only can be processed and other commands are not processed. Restoration using the [RESTART] key is impossible.

System Errors

- DIVIDE ERROR:** The CPU has detected a zero dividing error. (The program is not running normally.)
- UNUSED CODE TRAP:** The CPU has fetched an undefined command. (The program is not running normally.)
- POWER FAILURE:** A momentary power interruption has occurred.
- * At the moment when an error occurs, the printer shows the error message and makes status response before stopping. (None of the commands and key operations will be processed.)
- EEPROM ERROR:** The EEPROM for back-up cannot be read/written properly.
- SAVING:** Printer is busy saving data in writable character or PC command save mode.



Reset Processing

When the [RESTART] key is pressed for more than 3 seconds during the error which can be cleared by the [RESTART] key and during a pause, the printer returns to the initial status which is obtained after the power is turned on.

9.2 Message Translations

Here are the LCD messages in different languages:

No.	ENGLISH
1	ON LINE
2	HEAD OPEN
3	PAUSE *****
4	COMMS ERROR
5	PAPER JAM *****
6	CUTTER ERROR*****
7	NO PAPER *****
8	NO RIBBON *****
9	HEAD OPEN *****
10	EXCESS HEAD TEMP
11	RIBBON ERROR*****
12	REWIND FULL ****
13	SAVING ### %%%%
14	FLASH WRITE ERR.
15	FORMAT ERROR
16	FLASH CARD FULL

No.	GERMAN
1	ON LINE
2	KOPF OFFEN
3	PAUSE *****
4	UEBERTR.-FEHLER
5	PAPIERSTAU *****
6	MESSERFEHL. *****
7	PAPIERENDE *****
8	FARBB.-ENDE *****
9	KOPF OFFEN *****
10	KOPF UEBERHITZT
11	FB-FEHLER *****
12	AUFWI.VOLL *****
13	SP.-MOD ### %%%%
14	FLASH FEHLER
15	FORMATFEHLER
16	FLASH ZU KLEIN

PART IV, ERRORS
Chapter 9, Error Descriptions, 1.1,



No.	FRENCH
1	PRETE
2	TETE OUVERTE
3	PAUSE *****
4	ERR. COMMUNICAT.
5	PB. PAPIER *****
6	PB. CUTTER *****
7	FIN PAPIER *****
8	FIN RUBAN *****
9	TETE OUVERTE*****
10	TETE TROP CHAUDE
11	ERREUR RUBAN*****
12	ERR.REMB. *****
13	MEM LIB ### %%%%
14	ERREUR MEM FLASH
15	ERREUR DE FORMAT
16	MEM INSUFFISANTE

No.	DUTCH
1	IN LIJN
2	KOP OPEN
3	PAUZE *****
4	COMM. FOUT
5	PAPIER VAST *****
6	SNIJMES FOUT*****
7	PAPIER OP *****
8	LINT OP *****
9	KOP OPEN *****
10	TEMP.FOUT
11	LINT FOUT *****
12	OPROL VOL *****
13	MEM ### %%%%
14	FLASH MEM FOUT
15	FORMAAT FOUT
16	GEHEUGEN VOL

No.	SPANISH
1	ON LINE
2	CABEZAL ABIERTO
3	PAUSA *****
4	ERROR COMUNICACI
5	ATASCO PAPEL*****
6	ERROR CORTAD*****
7	SIN PAPEL *****
8	SIN CINTA *****
9	CABEZA ABIER*****
10	TEMP.CABEZA ALTA
11	ERROR CINTA *****
12	REBOBI.LLENO*****
13	SALVAR ### %%%%
14	ERROR ESCRITURA
15	ERROR DE FORMATO
16	MEMORIA INSUFICI

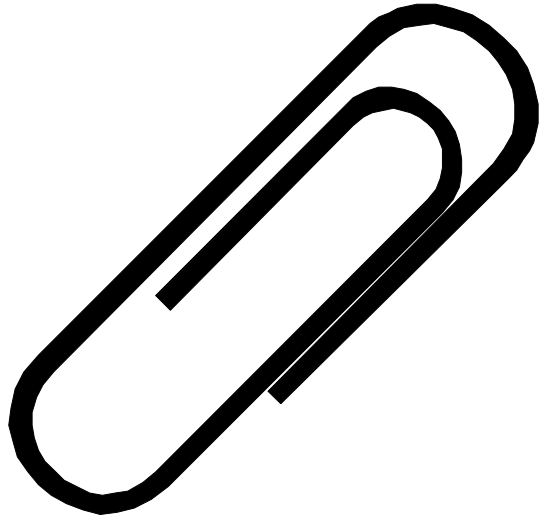
No.	ITALIAN
1	PRONTA
2	TESTA APERTA
3	PAUSA *****
4	ERR. COMUNICAZ.
5	CARTA INCEP.*****
6	ERR. TAGL. *****
7	NO CARTA *****
8	NO NASTRO *****
9	TESTA APERTA*****
10	TEMP. TESTA ALTA
11	ERR. NASTRO *****
12	RIAVV.PIENO *****
13	SALVA ### %%%%
14	ERR.SCRITT.CARD
15	ERR.FORMATTAZ.
16	MEM.CARD PIENA



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PART V APPENDICES





This Part of the Manual contains useful information for processing and printing labels via SP40 PDL. *Refer to this part for peripheral data.*

- ❑ Appendix A, Interfaces,
describes the interfaces and add-ons;
- ❑ Appendix B, Barcodes,
describes the barcode types;
- ❑ Appendix C, Characters,
comprises tables of character sets;
- ❑ Appendix D, Data Structures,
comprises information on data structures;
- ❑ Appendix E, Examples,
comprises sample labels and code;
- ❑ Appendix F, Fonts,
comprises information on supported fonts,
- ❑ Appendix G, Glossary,
comprises technical terms and explanation;
- ❑ Appendix H, Trademarks,
lists the trademarks in this Manual;
- ❑ Appendix I, International Addresses,
lists the world-wide METO addresses;
- ❑ Appendix J, Index,
lists key words and page numbers.

*For preliminary information,
see PART I; INTRODUCTION;
for syntax rules;
see PART II, SYNTAX;
for a list of commands,
see PART III, COMMANDS;
for a list of errors,
see PART IV, ERRORS.*



Appendix A Interfaces

This appendix contains detailed data on METO printer and PC/host interfaces. *For in-depth information on connection, setup and initialisation of the printer and PC/host interfaces, however, see Chapter 3, The Preliminaries.*

- ☑ **The SP40 printer is equipped with a standard serial interface. The parallel interface is optional. The use of original METO connection cables will prevent hardware damage and connection problems.**

A.1 Serial Interface

Type:	Conforming to RS-232C
Mode of Communication:	Full duplex
Transmission Speed:	2400, 4800, 9600, 19200 BPS
Synchronisation Method:	Start-stop synchronisation
Start Bit:	1 bit
Stop Bit:	1, 2 bits
Data Length:	7, 8 bits
Parity:	None, even, odd
Error Detection:	Parity Error Vertical parity error check Framing Error This error occurs if no stop bit is found in the frame specified with the start bit Overrun Error This error occurs if the next data is input before the data input to the UART from the



host is read by the printer CPU

Receive Buffer: 5K bytes

Transmission Control: - X-On/X-Off (DC1/DC3) Protocol
- Ready/Busy (DTR) Protocol
- X-On/X-Off (DC1/DC3) Protocol
+ Ready/Busy (DTR) Protocol

X-On/X-Off (DC1/DC3) Protocol:

- ❑ When initialised after power on, this printer becomes ready to receive data and sends an X-On code (11H). (Transmission or non-transmission of X-On code is selectable by means of the DIP switch.)
- ❑ The printer sends an X-Off code (13H) when the blank positions in the receive buffer become 800 bytes or less.
- ❑ The printer sends an X-On code (11H) when the blank positions in the receive buffer are 2K bytes or more.
- ❑ When there are no blank positions in the receive buffer, the printer discards data received exceeding the receive buffer capacity, without storing it in the buffer. (After detecting the X-Off code, the host computer must stop transmission before the printer receive buffer becomes full.)
- ❑ The printer sends an X-Off code (13H) when the power is off. (Transmission or non-transmission of the X-Off code is selectable by means of the DIP switch.)

Ready/Busy (DTR) Protocol:

- ❑ When initialised after power on, this printer becomes ready to receive data and turns the DTR signal to "High" level (READY).
- ❑ The printer turns the DTR signal to "Low" level (BUSY) when the blank positions in the receive buffer are 800 bytes or less.
- ❑ The printer turns the DTR signal to "High" level (READY) when the blank positions in the receive buffer are 2K bytes or more.
- ❑ When there are no blank positions in the receive buffer, the printer discards data re-



ceived exceeding the receive buffer capacity, without storing it in the buffer. (After detecting the BUSY signal, the host computer must stop transmission before the printer receive buffer becomes full.)

X-On/X-Off (DC1/DC3) Protocol + Ready/Busy (DTR) Protocol:

- ❑ When initialised after power on, this printer becomes ready to receive data and turns the DTR signal to “High” level (READY). It also sends an X-On code (11H).
 - ❑ When the blank positions in the receive buffer are 800 bytes or less, the printer turns the DTR signal to “Low” level (BUSY) and sends an X-Off code (13H).
 - ❑ When the blank positions in the receive buffer are 2K bytes or more, the printer turns the DTR signal to “High” level (READY) and sends an X-On code (11H).
 - ❑ When there are no blank positions in the receive buffer, the printer discards received exceeding the receive buffer capacity, without storing it in the buffer. (After detecting the X-Off code or BUSY signal, the host computer must stop transmission before the printer receive buffer becomes full.)
 - ❑ The printer sends an X-Off code (13H) when the power is off.
- ☑ **Note: In Ready/Busy (DTR) Protocol, data should be sent 200 ms or later after the DTR signal becomes “High” level (READY) when the printer is turned on.**



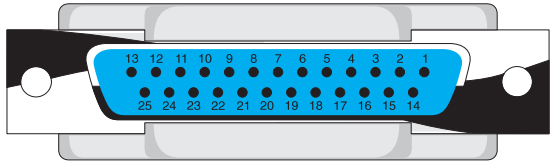
Serial Interface Connector

Connector Pin Assignment and Signal Description:

Pin No.	Signal Name	Function	Signal Direction
1	FG	<ul style="list-style-type: none">● Ground line for circuit protection	
2	RD	<ul style="list-style-type: none">● Line for data which the printer receives from the host.● Logic 1 is a Low level, while logic 0 is a High level.● It is in the Low (Mark) state when no transmission is in progress.	← Host
3	TD	<ul style="list-style-type: none">● Line for data which the printer sends to the host.● Logic 1 is a Low level, while logic 0 is a High level.● It is in the Low (Mark) state when no transmission is in progress.	Printer →
4	CTS	<ul style="list-style-type: none">● Input signal from the host.● For the printer to send data, the signal must be “High” level.	← Host
5	RTS	<ul style="list-style-type: none">● Output signal to the host.● It indicates that there is data to be output to the host.● After the power is turned on, it is always at “High” level.	Printer →
6	DTR	<ul style="list-style-type: none">● Output signal to the host.● It indicates the ready state for the received data.● It is at “Low” level when the receive buffer is near full, and at “High” level when near empty.	Printer →
7	SG	<ul style="list-style-type: none">● Ground line for all data and control signals.	
20	DSR	<ul style="list-style-type: none">● Input signal from the host.● For the printer to receive data, it must be at “High” level.	← Host



This is the 25-pin serial connector:



The 25-pin connector has the following pin-out:

Pin	Signal	I/O	Description
1	shield	—	chassis
2	RXD	in	receive data
3	TXD	out	transmit data
4	CTS	in	clear to send
5	RTS	out	request to send (4.7 kOhm, +5 VDC)
6	DTR	in	data terminal ready
7	GND	—	signal ground
20	DSR	out	data set ready*

All these signals must be connected 1:1 to the host.



Serial Interface Status

LCD Message	Printer Status	Detail Status	
		Auto Status Transmission	Status Request Command
ON LINE	The head was closed with the head open.	00	00
HEAD OPEN	The head was opened in on-line mode.	01	01
ON LINE	In operation (Analysing command, printing, feeding)	—	02
PAUSE	In pause mode	—	04
ON LINE	Waiting for stripping	—	05
Display of error message	A command error was found in analysing the command.	06	06
COMMS ERROR	A parity error, overrun error or framing error occurred during communication by RS-232C	07	07
PAPER JAM	A paper jam occurred during paper feed.	11	11
CUTTER ERROR	An abnormal condition occurred at the Cutter.	12	12
NO PAPER	The label has run out.	13	13
NO RIBBON	The ribbon has run out.	14	14
HEAD OPEN	An attempt was made to feed or issue with the head open. (except the [FEED] key and expansion I/O)	15	15
EXCESS HEAD TEMP	The thermal head temperature has become excessively high.	18	18
RIBBON ERROR	An abnormal condition occurred in the sensor for determining the torque for the ribbon motor.	21	21



LCD Message	Printer Status	Detail Status	
		Auto Status Transmission	Status Request Command
REWIND FULL	An overflow error has occurred in the Rewinder.	22	22
ON LINE	The label issue has terminated normally.	40	–
ON LINE	The feed has terminated normally.	41	–
SAVING ### %%%	In writable character or PC command save mode	–	55
FLASH WRITE ERR.	An error has occurred in writing the flash memory.	50	50
FORMAT ERROR	An erase error has occurred in formatting flash memory.	51	51
FLASH CARD FULL	Saving failed because of the insufficient capacity of the flash memory.	54	54
Display of error message	A command error has occurred in analysing the command.	06	06
COMMS ERROR	A parity error, overrun error or framing error has occurred during communication by RS-232C.	07	07

Also see Chapter 5, Response Structure and the Status Request command in Chapter 7.



A.2 Parallel Interface

The external, visible part of the parallel interface is generally a 36-pin Centronics connector. For parallel data transmission, a number of data bits are transmitted simultaneously, usually byte for byte. The parallel interface is uni-directional, i.e. the connected printer cannot respond with (error or status) messages to the host. Error handling in the printer is independent of the selected interface. However, upon error, the printer will go into the stop-on-error mode, depending on the set error level.

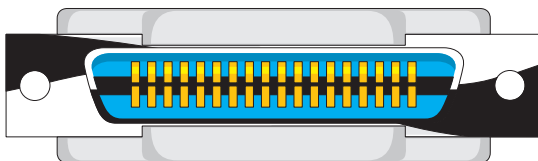
As opposed to the serial interface, there are no parameters to be set, as the parallel interface always uses the same settings and the same flow control.

Generally, if one of the error signals is set, all on-line operations are halted.

- ☑ **Please note that the parallel interface is uni-directional, i.e. the printer is not able to send (error or status) messages to the PC/host. However, if on-line operation is halted, an error signal is set. Also always add 'B' for binary files when using the DOS 'COPY' command.**

Parallel Interface Connector

This is the Centronics connector:





Connector Pin Diagram

Pin No.	Signal Name	Pin No.	Signal Name
1	DATA • STB	19	TWISTED PAIR GND (PIN1)
2	DATA 1	20	TWISTED PAIR GND (PIN2)
3	DATA 2	21	TWISTED PAIR GND (PIN3)
4	DATA 3	22	TWISTED PAIR GND (PIN4)
5	DATA 4	23	TWISTED PAIR GND (PIN5)
6	DATA 5	24	TWISTED PAIR GND (PIN6)
7	DATA 6	25	TWISTED PAIR GND (PIN7)
8	DATA 7	26	TWISTED PAIR GND (PIN8)
9	DATA 8	27	TWISTED PAIR GND (PIN9)
10	ACK	28	TWISTED PAIR GND (PIN10)
11	BUSY	29	TWISTED PAIR GND (PIN11)
12	PE	30	TWISTED PAIR GND (PIN31)
13	PAUSE	31	INPUT • PRIME
14	0V	32	FAULT
15	NC	33	0V
16	0V	34	NC
17	CHASSIS GND	35	NC
18	+5V	36	NC



Parallel Interface Status

LCD Messages	Printer Status	Output Signal			
		BUSY	PAUSE	FAULT	PE
ON LINE	In online mode	L	H	H	L
ON LINE	In online mode (communicating)	L, H	H	H	L
HEAD OPEN	The head was opened in on-line mode.	H	L	L	L
PAUSE	Paused by the [PAUSE] key	H	L	L	L
ON LINE	Data was set from the host with the receive buffer full.	H	H	H	L
ON LINE	After data was set from the host with the receive buffer full, there is room in the receive buffer.	L	H	H	L
ON LINE	Initialise process in execution (After the power is turned on or INPUT • PRIME received)	H	L	L	L
Display of error command	A command error has occurred in analysing the command.	H	L	L	L
PAPER JAM	A paper jam occurred during paper feed.	H	L	L	L
CUTTER ERROR	An abnormal condition occurred at the Cutter.	H	L	L	L
NO PAPER	The label has run out.	H	L	L	H
NO RIBBON	The ribbon has run out.	H	L	L	H
HEAD OPEN	An attempt was made to feed or issue with the head open. (except the [FEED] key and expansion I/O)	H	L	L	L
EXCESS HEAD TEMP	The thermal head temperature has become excessively high.	H	L	L	L



LCD Messages	Printer Status	Output Signal			
		BUSY	PAUSE	FAULT	PE
RIBBON ERROR	An abnormal condition occurred in the sensor for determining the torque for the ribbon motor.	H	L	L	L
REWIND FULL	An overflow error has occurred in the Rewinder.	H	L	L	L
SAVING ### %%%	In writable character or PC command save mode	L	H	H	L
FLASH WRITE ERR.	An error has occurred in writing in the flash memory.	H	L	L	L
FORMAT ERROR	An erase error has occurred in formatting the flash memory.	H	L	L	L
FLASH CARD FULL	Saving failed because of the insufficient capacity of the flash memory.	H	L	L	L
DIVIDE ERROR	A zero dividing error has occurred.	H	L	L	L
UNUSED CODE TRAP	An undefined command was fetched.	H	L	L	L
POWER FAILURE	A momentary power interruption has occurred.	H	L	L	L
EEPROM ERROR	An EEPROM for back-up cannot be read/written properly.	H	L	L	L






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Appendix B Barcodes

Barcode Types





Here is a list of the supported barcodes with a graphic representation (not necessarily within specifications) and a brief description of each:

<div>EAN 13 / JAN 13</div> <div></div>	type 5
	CD: verify (2), calc. (3)
	This is a code with a fixed length of 13 digits including 1 check digit. If the option check digit calculation (3) is selected, the check digit must not be transmitted! The leading zero must never be transmitted!
<div>EAN 13 random weight</div> <div></div>	type 5
	CD: calc. w. price of len. 4 digits (4); calc. w. price of len. 5 digits (5)
	EAN 13 random weight differs from the standard EAN 13 code in that it has a second check digit and the leading '2'. Neither of the check digits is transmitted, as the check digit option is always calculation.
<div>EAN 13 add on 2 / random weight add on 2</div> <div></div>	type 7
	CD: verify (2), calc. (3); rw.: calc. w. price of len. 4 digits (4); calc. w. price of len. 5 digits (5)
	This code has a fixed length of 15 digits including 1 check digit. If the option check digit calculation (3, 4, 5) is selected, the check digit (s) must not be transmitted!




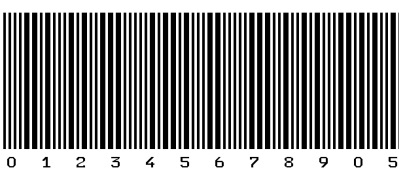


PART V, APPENDICES

Appendix B, Barcodes

<p>EAN 13 add on 5 / random weight add on 5</p> 	<p>type 8</p> <p>CD: verify (2), calc. (3); rw.: calc. w. price of len. 4 digits (4); calc. w. price of len. 5 digits (5)</p> <p>This code has a fixed length of 18 digits including 1 check digit. If the option check digit calculation (3, 4, 5) is selected, the check digit (s) must not be transmitted!</p>
<p>EAN 8 / JAN 8 / EAN 8 add on 2 / add on 5</p> 	<p>type 0, type I (add 2), type J (add 5)</p> <p>CD: verify (2), calc. (3)</p> <p>This code has a fixed length of 8 digits including 1 check digit. If the option check digit calculation (3) is selected, the check digit must not be transmitted!</p>
<p>UPC-A / UPC-A add on 2 / add on 5</p> 	<p>type K, type L (add 2), type M (add 5)</p> <p>CD: verify (2), calc. (3)</p> <p>This is a code with a fixed length of 12 (14, 17) digits including 1 check digit. If the option check digit calculation (3) is selected, the check digit must not be transmitted!</p>
<p>UPC-A System 2 / ... add on 2 / add on 5</p> 	<p>type K, type L (add 2), type M (add 5)</p> <p>CD: calc. w. price of len. 4 digits (4); calc. w. price of len. 5 digits (5)</p> <p>This code differs from the standard UPC-A in that it has a 2nd check digit and the leading '2'. Neither of the check digits (CDs) is transmitted, as the check digit option is always calculation.</p>


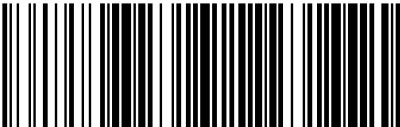




<p>UPC-E / UPC-E add on 2 / add on 5</p> 	<p>type 6, type G (add 2), type H (add 5)</p> <p>CD: verify (2), calc. (3)</p> <p>UPC-E has a fixed length of 8 digits including 1 check digit and a fix leading '0'. If the option check digit calculation (3) is selected, the check digit must not be transmitted!</p>
<p>2/5 interleaved</p> 	<p>type 2</p> <p>CD: verify (2), calc. (3)</p> <p>This is a purely numerical code with a variable, but even length. If an odd number of characters is transmitted, the printer will automatically insert a leading '0'.</p>
<p>2/5 German Post</p> 	<p>type 2</p> <p>CD: 4</p> <p>This is a special version of the 2/5 interleaved code with a fixed length of 12 or 14 digits including a specially calculated check digit.</p>
<p>2/5 industrial</p> 	<p>type O</p> <p>CD: none, verify (2), calc. (3)</p> <p>This is a purely numerical code with a variable, but even length. If an odd number is transmitted, the printer will add a leading '0'.</p>

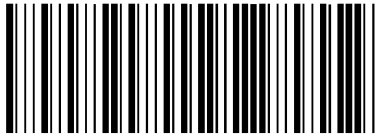


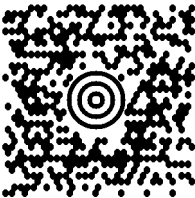


PART V, APPENDICES

Appendix B, Barcodes

<p>Code 39 (standard) / Code 39 (full ASCII)</p>  <p>* A B C 4 5 6 7 8 9 *</p>	<p>type 3 (standard), type B (full ASCII)</p> <p>CD: none (1), verify (2), calc. (3)</p> <p>This is a code with a variable length and a limited character set. The leading and trailing asterisks (*) must not be transmitted if auto-attachment is used.</p>
<p>Code 128</p>  <p>A B C 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 a</p>	<p>type 9 (with auto code) / type A (without auto code)</p> <p>CD: calc. (3)</p> <p>This is a code with a variable length of 3 to 125 digits and a limited character set which can be used with or without a check digit. <i>For data structure, see Barcode Details below.</i></p>
<p>EAN 128</p>  <p>00 1 2345678 901234567 5</p>	<p>type N</p> <p>CD: calc. (3)</p> <p>This is a special version of Code 128 with a fixed length of 21 digits including 2 CDs. As the check digits are always calculated by the printer, the max. no. of digits transmitted is 19.</p>
<p>Code 93</p>  <p>A B C 4 5 6 7 8 9 0 1 2 3 L 0</p>	<p>type C</p> <p>CD: calc. (3)</p> <p>This is a code with a variable length and a limited character set. In neither case will the two check digits be transmitted, as calculation is the only check digit option available.</p>



<p>MSI</p>  <p>1 2 3 4 5 6 7 8 9 7</p>	<p>type 1</p> <p>CD: none (1), verify (2), calc. (3, 4, 5)</p> <p>This is a code with a variable length of 2 to 15 digits and a limited character set which can be used with or without check digits. CD calc. 4 and 5 adds a second CD.</p>
<p>NW7</p>  <p>a 1 2 3 4 5 6 7 8 9 0 3 a</p>	<p>type 4</p> <p>CD: none (1)</p> <p>This is a code with a variable length and a limited character set. Start and stop code must not be transmitted if auto-attachment is used.</p>
<p>PDF417</p>  <p>A B C 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 x y z</p>	<p>type P</p> <p>security level: 0 to 8</p> <p>This is a two-dimensional barcode with a variable length and height. Several security levels are used instead of a CD. <i>For data structure, see Barcode Details below.</i></p>
<p>MaxiCode</p> 	<p>type Z</p> <p>mode designation: 2 to 6</p> <p>This is a two-dimensional alphanumeric barcode with a fixed length of 100 digits. <i>For data structure, see Barcode Details below.</i></p>



Barcode Details

Here are the details on CODE 128, PDF417 and MaxiCode. *Also see Barcode Types above as well as the Barcode Format and Barcode Data commands.*

CODE 128

How to transmit control code data:

NUL (00H)	→	'>@' (3EH, 40H)
SOH (01H)	→	'>A' (3EH, 41H)
STX (02H)	→	'>B' (3EH, 42H)
to		
GS (1DH)	→	'>]' (3EH, 5DH)
RS (1EH)	→	'>^' (3EH, 5EH)
US (1FH)→		'>_ ' (3EH, 5FH)

How to transmit special codes:

Value

30 (Character '>')	→	'>0'
95	→	'>1'
96	→	'>2'
97	→	'>3'
98	→	'>4'
99	→	'>5'
100	→	'>6'
101	→	'>7'
102 <FNC1>	→	'>8'

Designation of start code:

START <CODE A>	→	'>7'
START <CODE B>	→	'>6'
START <CODE C>	→	'>5'



Value Code Table for CODE 128

VALUE	CODE A	CODE B	CODE C
0	SP	SP	00
1	!	!	01
2	"	"	02
3	#	#	03
4	\$	\$	04
5	%	%	05
6	&	&	06
7	'	'	07
8	(	(	08
9	)	)	09
10	*	*	10
11	+	+	11
12	,	,	12
13	-	-	13
14	.	.	14
15	/	/	15
16	0	0	16
17	1	1	17
18	2	2	18
19	3	3	19
20	4	4	20
21	5	5	21
22	6	6	22
23	7	7	23
24	8	8	24
25	9	9	25
26	:	:	26
27	;	;	27
28	<	<	28
29	=	=	29
30	>	>	30
31	?	?	31
32	@	@	32
33	A	A	33
34	B	B	34
35	C	C	35

VALUE	CODE A	CODE B	CODE C
36	D	D	36
37	E	E	37
38	F	F	38
39	G	G	39
40	H	H	40
41	I	I	41
42	J	J	42
43	K	K	43
44	L	L	44
45	M	M	45
46	N	N	46
47	O	O	47
48	P	P	48
49	Q	Q	49
50	R	R	50
51	S	S	51
52	T	T	52
53	U	U	53
54	V	V	54
55	W	W	55
56	X	X	56
57	Y	Y	57
58	Z	Z	58
59	[	[	59
60	\	\	60
61	]	]	61
62	^	^	62
63	_	_	63
64	NUL	-	64
65	SOH	a	65
66	STX	b	66
67	ETX	c	67
68	EOT	d	68
69	ENQ	e	69
70	ACK	f	70
71	BEL	g	71

VALUE	CODE A	CODE B	CODE C
72	BS	h	72
73	HT	i	73
74	LF	j	74
75	VT	k	75
76	FF	l	76
77	CR	m	77
78	SO	n	78
79	SI	o	79
80	DLE	p	80
81	DC1	q	81
82	DC2	r	82
83	DC3	s	83
84	DC4	t	84
85	NAK	u	85
86	SYN	v	86
87	ETB	w	87
88	CAN	x	88
89	EM	y	89
90	SUB	z	90
91	ESC	{	91
92	FS	|	92
93	GS	}	93
94	RS	~	94
95	US	DEL	95
96	FNC3	FNC3	96
97	FNC2	FNC2	97
98	SHIFT	SHIFT	98
99	CODE C	CODE C	99
100	CODE B	FNC4	CODE B
101	FNC4	CODE A	CODE A
102	FNC1	FNC1	FNC1

103	START CODE A
104	START CODE B
105	START CODE C



PDF417

The following modes are automatically selected according to the code used:

Mode	Code	Details
EXC mode	Alphanumeric, symbol	0 to 9, A to Z, a to z, space, ! " # \$ % & ' () * + , - . / : ; < = > ? @ [\] ^ _ { } ~ <CR> <HT>
Binary / ASCII plus mode	Binary International character set	00 hex to FF hex
Numeric Compaction mode	Numeric	0 to 9

1. How to transmit control code data:

NUL (00 Hex)	'>@'	(3E Hex, 40 Hex)
SOH (01 Hex)	'>A'	(3E Hex, 41 Hex)
STX (02 Hex)	'>B'	(3E Hex, 42 Hex)
...
GS (1D Hex)	'>J'	(3E Hex, 5D Hex)
RS (1E Hex)	'>^'	(3E Hex, 5E Hex)
US (1F Hex)	'>_'	(3E Hex, 5F Hex)

2. How to transmit a special code:

'>' (3E Hex)	'>0'	(3E Hex, 30 Hex)
--------------	------	------------------



MaxiCode

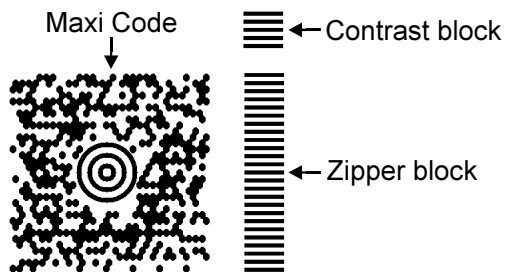
How to send control code data:

SOH (01H)	→	'>A'	(3EH, 41H)
STX (02H)	→	'>B'	(3EH, 42H)
to			
GS (1DH)	→	'>J'	(3EH, 5DH)
RS (1EH)	→	'>^'	(3EH, 5EH)
US (1FH)	→	'>_'	(3EH, 5FH)

How to send a special code

'>' (3EH)	→	'>0'	(3EH, 30H)
-----------	---	------	------------

Attachment of Zipper and Contrast blocks:





MaxiCode Value Table

Symbol Character Value		Code Set A		Code Set B		Code Set C		Code Set D		Code Set E	
Decimal	Binary	Character	Decimal	Character	Decimal	Character	Decimal	Character	Decimal	Character	Decimal
0	000000	CR	13	'	96	À	192	à	224	NUL	0
1	000001	A	65	a	97	Á	193	á	225	SOH	1
2	000010	B	66	b	98	Â	194	â	226	STX	2
3	000011	C	67	c	99	Ã	195	ã	227	ETX	3
4	000100	D	68	d	100	Ä	196	ä	228	EOT	4
5	000101	E	69	e	101	Å	197	å	229	ENQ	5
6	000110	F	70	f	102	Æ	198	æ	230	ACK	6
7	000111	G	71	g	103	Ç	199	ç	231	BEL	7
8	001000	H	72	h	104	È	200	è	232	BS	8
9	001001	I	73	i	105	É	201	é	233	HT	9
10	001010	J	74	j	106	Ê	202	ê	234	LF	10
11	001011	K	75	k	107	Ë	203	ë	235	VT	11
12	001100	L	76	l	108	Ì	204	ì	236	FF	12
13	001101	M	77	m	109	Í	205	í	237	CR	13
14	001110	N	78	n	110	Î	206	î	238	SO	14
15	001111	O	79	o	111	Ï	207	ï	239	SI	15
16	010000	P	80	p	112	Ð	208	ð	240	DLE	16
17	010001	Q	81	q	113	Ñ	209	ñ	241	DC1	17
18	010010	R	82	r	114	Ò	210	ò	242	DC2	18
19	010011	S	83	s	115	Ó	211	ó	243	DC3	19
20	010100	T	84	t	116	Ô	212	ô	244	DC4	20
21	010101	U	85	u	117	Õ	213	õ	245	NAK	21
22	010110	V	86	v	118	Ö	214	ö	246	SYN	22
23	010111	W	87	w	119	×	215	÷	247	ETB	23
24	011000	X	88	x	120	Ø	216	ø	248	CAN	24
25	011001	Y	89	y	121	Ù	217	ù	249	EM	25
26	011010	Z	90	z	122	Ú	218	ú	250	SUB	26
27	011011	[EC]		[EC]		[EC]		[EC]		[EC]	
28	011100	FS	28	FS	28	FS	28	FS	28	[Pad]	
29	011101	GS	29	GS	29	GS	29	GS	29	[Pad]	
30	011110	RS	30	RS	30	RS	30	RS	30	ESC	27
31	011111	[NS]		[NS]		[NS]		[NS]		[NS]	
32	100000	Space	32	(	123	Û	219	û	251	FS	28
33	100001	[Pad]		[Pad]		Ü	220	ü	252	GS	29
34	100010	"	34	)	125	Ý	221	ý	253	RS	30
35	100011	#	35	~	126	Þ	222	þ	254	US	31
36	100100	\$	36	DEL	127	ß	223	ÿ	255	{C159}	159
37	100101	%	37	:	59	ª	170	;	161	NBSP	160
38	100110	&	38	<	60	¬	172	"	168	¢	162

PART V, APPENDICES

Appendix B, Barcodes



Symbol Character Value		Code Set A		Code Set B		Code Set C		Code Set D		Code Set E	
39	100111	'	39	=	61	±	177	«	171	£	163
40	101000	(	40	>	62	²	178	—	175	¤	164
41	101001	)	41	?	63	³	179	°	176	¥	165
42	101010	"	42	[	91		181	'	180		166
43	101011	+	43	\	92	¹	185	•	183	\$	167
44	101100	.	44	]	93	°	186		184	©	169
45	101101	-	45	^	94	¼	188	»	187	SHY	173
46	101110	.	46	_	95	½	189	¿	191	®	174
47	101111	/	47	Space	32	¾	190	{C138}	138	¶	182
48	110000	0	48	.	44	{C128}	128	{C139}	139	{C149}	149
49	110001	1	49	.	46	{C129}	129	{C140}	140	{C150}	150
50	110010	2	50	/	47	{C130}	130	{C141}	141	{C151}	151
51	110011	3	51	:	58	{C131}	131	{C142}	142	{C152}	152
52	110100	4	52	@	64	{C132}	132	{C143}	143	{C153}	153
53	110101	5	53	!	33	{C133}	133	{C144}	144	{C154}	154
54	110110	6	54	|	124	{C134}	134	{C145}	145	{C155}	155
55	110111	7	55	[Pad]		{C135}	135	{C146}	146	{C156}	156
56	111000	8	56	[2 Shift A]		{C136}	136	{C147}	147	{C157}	157
57	111001	9	57	[3 Shift A]		{C137}	137	{C148}	148	{C158}	158
58	111010	:	58	[Pad]		[Latch A]		[Latch A]		[Latch A]	
59	111011	[Shift B]		[Shift A]		Space 32		Space 32		Space 32	
60	111100	[Shift C]		[Shift C]		[Lock In C]		[Shift C]		[Shift C]	
61	111101	[Shift D]		[Shift D]		[Shift D]		[Lock In D]		[Shift D]	
62	111110	[Shift E]		[Shift E]		[Shift E]		[Shift E]		[Lock In E]	
63	111111	[Latch B]		[Latch A]		[Latch B]		[Latch B]		[Latch B]	



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Appendix C Characters

This Appendix gives you tabular information on the supported symbol sets, the characters and symbols you can print, the control codes you can use and the character sizes for the standard font. *For information on fonts, see Appendix F, Fonts.*

Printing Special Characters

- ☑ **The actual characters printed depend on the character set you use. Some characters may not be accessible or not look like those in other character sets.**

Euro Symbol

The METO printers now support the Euro symbol, '€'. The standard Euro symbol is located at position 7F_h; the font specific Euro symbol is dependent on the configuration in the system mode.



ASCII Control Code Table (00_h to 7F_h)

<NUL> Char	0 Dec	00 Hex	(*) Char	32 Dec	20 Hex	@ Char	64 Dec	40 Hex	` Char	96 Dec	60 Hex
<SOH>	1	01	!	33	21	A	65	41	a	97	61
<STX>	2	02	Ö	34	22	B	66	42	b	98	62
<EXT>	3	03	#	35	23	C	67	43	c	99	63
<EOT>	4	04	\$	36	24	D	68	44	d	100	64
<ENQ>	5	05	%	37	25	E	69	45	e	101	65
<ACK>	6	06	&	38	26	F	70	46	f	102	66
<BEL>	7	07	Ö	39	27	G	71	47	g	103	67
<BS>	8	08	(	40	28	H	72	48	h	104	68
<HT>	9	09	)	41	29	I	73	49	i	105	69
<LF>	10	0A	*	42	2A	J	74	4A	j	106	6A
<VT>	11	0B	+	43	2B	K	75	4B	k	107	6B
<FF>	12	0C	,	44	2C	L	76	4C	l	108	6C
<CR>	13	0D	-	45	2D	M	77	4D	m	109	6D
<SO>	14	0E	.	46	2E	N	78	4E	n	110	6E
<SI>	15	0F	/	47	2F	O	79	4F	o	111	6F
<DLE>	16	10	0	48	30	P	80	50	p	112	70
<DC1>	17	11	1	49	31	Q	81	51	q	113	71
<DC2>	18	12	2	50	32	R	82	52	r	114	72
<DC3>	19	13	3	51	33	S	83	53	s	115	73
<DC4>	20	14	4	52	34	T	84	54	t	116	74
<NAK>	21	15	5	53	35	U	85	55	u	117	75
<SYN>	22	16	6	54	36	V	86	56	v	118	76
<ETB>	23	17	7	55	37	W	87	57	w	119	77
<CAN>	24	18	8	56	38	X	88	58	x	120	78
	25	19	9	57	39	Y	89	59	y	121	79
<SUB>	26	1A	:	58	3A	Z	90	5A	z	122	7A
ESC>	27	1B	;	59	3B	[	91	5B	{	123	7B
<FS>	28	1C	<	60	3C	\	92	5C	|	124	7C
<GS>	29	1D	=	61	3D	]	93	5D	}	125	7D
<RS>	30	1E	>	62	3E	^	94	5E	~	126	7E
<US>	31	1F	?	63	3F	_	95	5F	€	127	7F

☒ For the X-On/X-Off data flow protocol:
X-On = <DC1>, X-Off = <DC3>



ASCII Control Code Table (80_h to FF_h)

Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex
Ç	128	80	á	160	A0		192	C0	Ó	224	E0
ü	129	81	í	161	A1		193	C1	ß	225	E1
é	130	82	ó	162	A2		194	C2	Ô	226	E2
â	131	83	ú	163	A3		195	C3	Ò	227	E3
ä	132	84	ñ	164	A4		196	C4	õ	228	E4
à	133	85	Ñ	165	A5		197	C5	Ö	229	E5
å	134	86	ª	166	A6	ã	198	C6	µ	230	E6
ç	135	87	º	167	A7	Ã	199	C7	þ	231	E7
ê	136	88	¿	168	A8		200	C8	þ	232	E8
ë	137	89	®	169	A9		201	C9	Ú	233	E9
è	138	8A	¬	170	AA		202	CA	Û	234	EA
ï	139	8B	½	171	AB		203	CB	Ü	235	EB
î	140	8C	¼	172	AC		204	CC	ý	236	EC
ì	141	8D	¡	173	AD		205	CD	Ý	237	ED
Ä	142	8E	«	174	AE		206	CE	—	238	EE
Å	143	8F	»	175	AF	æ	207	CF	´	239	EF
É	144	90	€	176	B0	ð	208	D0	-	240	F0
æ	145	91		177	B1	Ð	209	D1	±	241	F1
Æ	146	92		178	B2	Ê	210	D2	=	242	F2
ô	147	93		179	B3	Ë	211	D3	¾	243	F3
ö	148	94		180	B4	È	212	D4	π	244	F4
ò	149	95	À	181	B5	Ì	213	D5	§	245	F5
û	150	96	Â	182	B6	Í	214	D6	÷	246	F6
ù	151	97	Ã	183	B7	Î	215	D7	,	247	F7
ÿ	152	98	©	184	B8	Ï	216	D8	°	248	F8
Ö	153	99		185	B9		217	D9	¨	249	F9
Ü	154	9A		186	BA		218	DA	·	250	FA
ø	155	9B		187	BB		219	DB	¹	251	FB
£	156	9C		188	BC		220	DC	²	252	FC
Ø	157	9D	¢	189	BD	¡	221	DD	³	253	FD
x	158	9E	¥	190	BE	ì	222	DE	■	254	FE
f	159	9F		191	BF		223	DF	(+)	255	FF

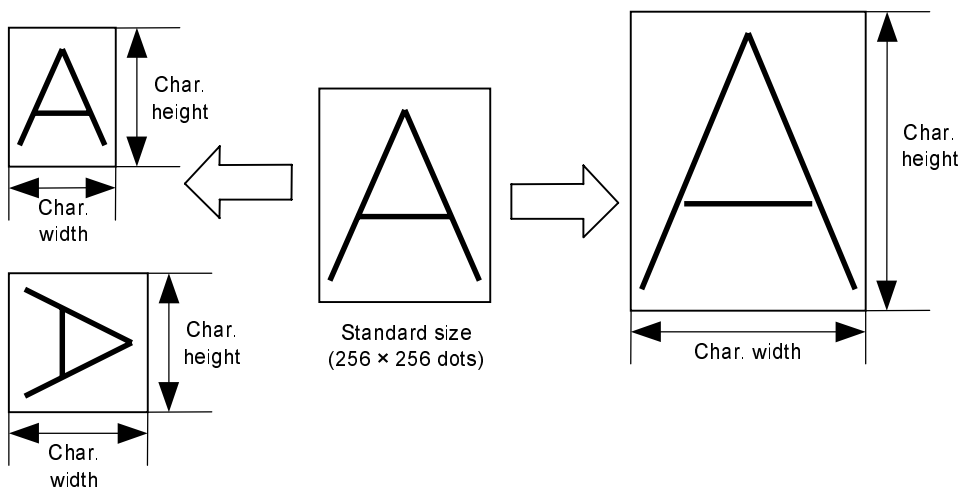
(*) = the space character, <SP>;

(+) = the 'non-breaking' space character, <NBS>.

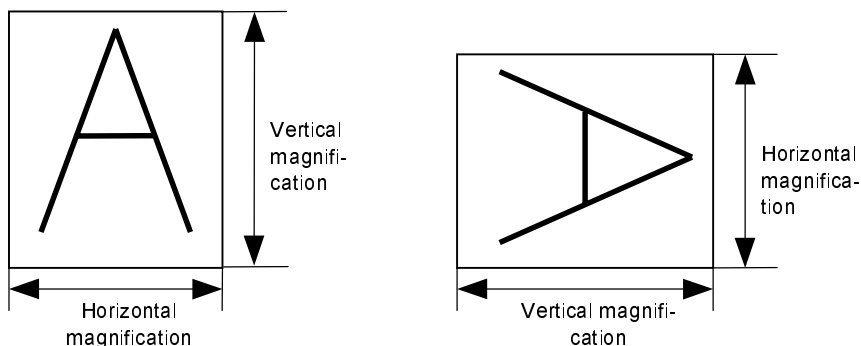


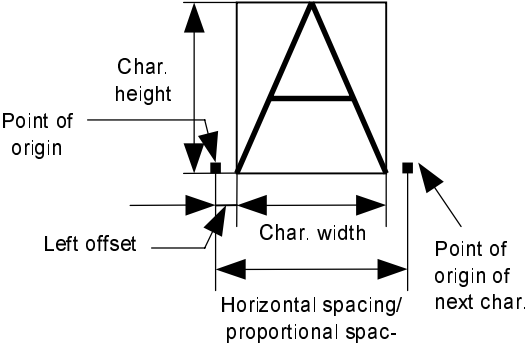
Character width and height

This is how the character widths and heights are determined for the various command parameters:

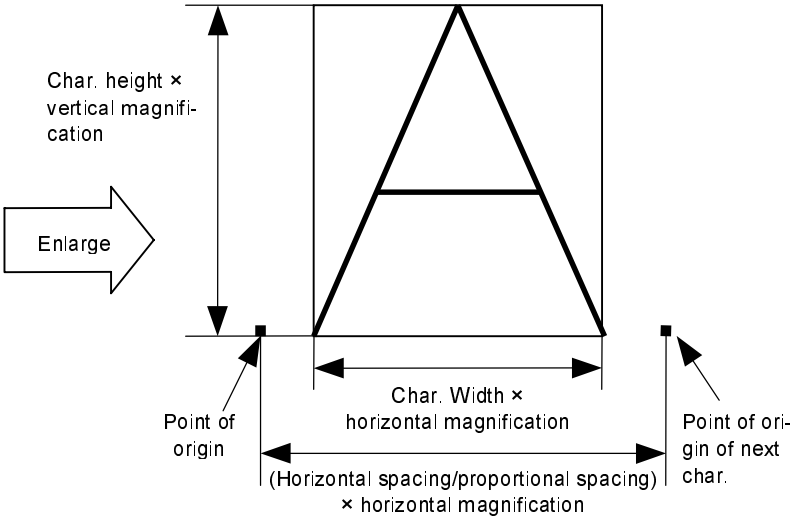


Horizontal magnification and vertical magnification:





Relationship between drawing co-ordinates and magnification:





Character Code Tables

Times Roman, Helvetica, Letter Gothic, Prestige Elite, Courier

The following are the character code tables. However, the characters which can be printed are different according to the character type, i.e. not all fonts have implemented all symbols.

(1) PC-850

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	'	p	Ç	É	á	€		ð	Ó	–
-1			!	1	A	Q	a	q	ü	æ	í			Ð	ß	±
-2			"	2	B	R	b	r	é	Æ	ó			Ê	Ô	=
-3			#	3	C	S	c	s	â	ô	ú			Ë	Ò	¼
-4			\$	4	D	T	d	t	ä	ö	ñ			È	õ	¶
-5			%	5	E	U	e	u	à	ò	Ñ	Á		ı	Õ	§
-6			&	6	F	V	f	v	â	û	ª	Â	ã	İ	µ	÷
-7			'	7	G	W	g	w	ç	ù	º	Ã	Ä	Î	þ	„
-8			(	8	H	X	h	x	ê	ÿ	¿	©		Ï	ƒ	°
-9			)	9	I	Y	i	y	ë	Ö	®				Ú	“
-A			*	:	J	Z	j	z	è	Ü	¬				Û	•
-B			+	;	K	[	k	{	ï	ø	½				Ü	¹
-C			,	<	L	\	l	|	î	£	¼				Ý	³
-D			-	=	M	]	m	}	ì	Ø	ı	¢		ı	Ÿ	²
-E			.	>	N	^	n	~	Ä	×	«	¥		İ	–	■
-F			/	?	O	_	o	¸	Å	f	»		¤		'	(+)

The Euro currency symbol B0 (hex) can be changed in the parameter setting in the system mode.



(2) PC-8

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	'	p	Ç	É	á	€			α	≡
-1			!	1	A	Q	a	q	ü	æ	í				ß	±
-2			"	2	B	R	b	r	é	Æ	ó				Γ	≥
-3			#	3	C	S	c	s	â	ô	ú				π	≤
-4			\$	4	D	T	d	t	ä	ö	ñ				Σ	∫
-5			%	5	E	U	e	u	à	ò	Ñ				σ	J
-6			&	6	F	V	f	v	å	û	ª				μ	+
-7			'	7	G	W	g	w	ç	ù	º				τ	≈
-8			(	8	H	X	h	x	ê	ÿ	¿				Φ	°
-9			)	9	I	Y	i	y	ë	Ö	¬				Θ	•
-A			*	:	J	Z	j	z	è	Ü	¬				Ω	·
-B			+	;	K	[	k	{	ï	ø	½				δ	√
-C			,	<	L	\	l	|	î	£	¼				∞	η
-D			-	=	M	]	m	}	ï	¥	¡				φ	²
-E			.	>	N	^	n	~	Ä	Pt	«				ε	■
-F			/	?	O	_	o		Å	f	»				○	(+)

The Euro currency symbol B0 (hex) can be changed in the parameter setting in the system mode.



Presentation

(1) PC-850

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	'	P				€				-
-1			!	1	A	Q	A	Q								
-2			"	2	B	R	B	R								
-3			#	3	C	S	C	S								
-4			\$	4	D	T	D	T								
-5			%	5	E	U	E	U								
-6			&	6	F	V	F	V								
-7			'	7	G	W	G	W								
-8			(	8	H	X	H	X								
-9			)	9	I	Y	I	Y								
-A			*	:	J	Z	J	Z								
-B			+	;	K	[	K	{								
-C			,	<	L	\	L	|								
-D			-	=	M	]	M	}								
-E			.	>	N	^	N	~				¥				
-F			/	?	O	_	O	☐								(+)

The Euro currency symbol B0 (hex) can be changed in the parameter setting in the system mode.

(2) PC-8:

The symbol '¥' is indicated by BE (hex) for the PC-850 and 9D (hex) for the PC-8. The symbol '☐' is indicated by F0 (hex) for the PC-850 and this symbol does not exist for the PC-8.



OCR-A

(1) PC-850

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	h	p								-
-1			!	1	A	Q	a	q								
-2			"	2	B	R	b	r								
-3			#	3	C	S	c	s								
-4			\$	4	D	T	d	t								
-5			%	5	E	U	e	u								
-6			&	6	F	V	f	v								
-7			'	7	G	W	g	w								
-8			(	8	H	X	h	x								
-9			)	9	I	Y	i	y								
-A			*	:	J	Z	j	z								
-B			+	;	K	Ǝ	k	ƒ								
-C			,	<	L	\	l	|								
-D			-	=	M	]	m	}								
-E			.	>	N	^	n	Ɔ				¥				
-F			/	?	0		o	■								(+)

PC-8:

The symbol '¥' is indicated by BE (hex) for the PC-850 and 9D (hex) for the PC-8. The symbol '-' is indicated by F0 (hex) for the PC-850 and this symbol does not exist for the PC-8.



OCR-B

(1) PC-850

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0		P	'	p	0							-
-1			!	1	A	Q	a	q	¹							
-2			"	2	B	R	b	r	²							
-3			#	3	C	S	c	s	³							
-4			\$	4	D	T	d	t	⁴							
-5			%	5	E	U	e	u	⁵							
-6			&	6	F	V	f	v	⁶							
-7			'	7	G	W	g	w	⁷							
-8			(	8	H	X	h	x	⁸							
-9			)	9	I	Y	i	y	⁹							
-A			*	:	J	Z	j	z								
-B			+	;	K	[	k	{								
-C			,	<	L	\	l	|								
-D			-	=	M	]	m	}								
-E			.	>	N	^	n	~				¥				
-F			/	?	O	_	o									(+)

PC-8:

The symbol '¥' is indicated by BE (hex) for the PC-850 and 9D (hex) for the PC-8. The symbol '-' is indicated by F0 (hex) for the PC-850 and this symbol does not exist for the PC-8.



Outline Font

(1) PC-850

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	'	p	Ç	É	á	€				–
-1			!	1	A	Q	a	q	ü	æ	í	€			ß	±
-2			"	2	B	R	b	r	é	Æ	ó					
-3			#	3	C	S	c	s	â	ô	ú					
-4			\$	4	D	T	d	t	ä	ö	ñ				ö	
-5			%	5	E	U	e	u	à	ò	Ñ					§
-6			&	6	F	V	f	v	â	û	ª		ã		μ	÷
-7			'	7	G	W	g	w	ç	ù	º					
-8			(	8	H	X	h	x	ê	ÿ	¿					°
-9			)	9	I	Y	i	y	ë	Ö						
-A			*	:	J	Z	j	z	è	Ü	¬					·
-B			+	;	K	[	k	{	ï	ø	½					
-C			,	<	L	\	l	|	î	£	¼					
-D			-	=	M	]	m	}	ì	Ø	ì	¢				²
-E			.	>	N	^	n	~	Ä		«	¥				■
-F			/	?	O	_	o	€	Å	f	»		¤			(+)

The Euro currency symbol B0 (hex) can be changed in the parameter setting in the system mode. We recommend 7F (hex) as alternative coding.



(2) PC-8

hex	0-	1-	2-	3-	4-	5-	6-	7-	8-	9-	A-	B-	C-	D-	E-	F-
-0			(*)	0	@	P	'	p	Ç	É	á	€			α	≡
-1			!	1	A	Q	a	q	ü	æ	í	€			ß	±
-2			"	2	B	R	b	r	é	Æ	ó				Γ	≥
-3			#	3	C	S	c	s	â	ô	ú				π	≤
-4			\$	4	D	T	d	t	ä	ö	ñ				Σ	∫
-5			%	5	E	U	e	u	à	ò	Ñ				σ	∫
-6			&	6	F	V	f	v	å	û	ª				μ	÷
-7			'	7	G	W	g	w	ç	ù	º				τ	≈
-8			(	8	H	X	h	x	ê	ÿ	¿				Φ	°
-9			)	9	I	Y	i	y	ë	Ö	¬				Θ	•
-A			*	:	J	Z	j	z	è	Ü	¬				Ω	·
-B			+	;	K	[	k	{	ï	ø	½				δ	√
-C			,	<	L	\	l	|	î	£	¼				∞	ⁿ
-D			-	=	M	]	m	}	ï	¥	¡				φ	²
-E			.	>	N	^	n	~	Ä	Pt	«				ε	■
-F			/	?	O	_	o	€	Å	f	»				○	(+)

The Euro currency symbol B0 (hex) can be changed in the parameter setting in the system mode. We recommend 7F (hex) as alternative coding.



Appendix D Data Structures

This Appendix gives you tabular information on data structures not found elsewhere in this manual.

For information on layout and data structures, see the pertinent chapters in PART II, SYNTAX.

Euro Conversion Rate

These are the official Euro conversion rates (at date of print) for the 11 member states as published by the European Commission (present non-members in italics with current exchange rate as per European Central Bank):

Currency	Conversion Rate
BEF (& LUF)	40.3399
<i>CHF</i>	<i>1,607</i>
<i>DKK</i>	<i>7.445</i>
DEM	1.95583
<i>GRD</i>	<i>333,1</i>
ESP	166.386
FRF	6.55957
IEP	0.787564
ITL	1936.27
NLG	2.20371
ATS	13.7603
PTE	200.482
FIM	5.94573
<i>SEK</i>	<i>8,485</i>
<i>GBP</i>	<i>0.6201</i>
<i>NOK</i>	<i>8,079</i>
NOR	8.64750



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Appendix E Examples

This Appendix contains SP40 PDL programming code examples. You may wish to copy these examples and print out the associated labels on your printer for practice. Later, you can modify these layouts and data for your own applications. *For examples to command usage, also see the relevant commands in PART III; COMMANDS.*

- ☑ **The entire command strings in these examples obviously do not fit on one line. Thus they are divided into several lines. Do not insert <CR>/<LF> in your commands.**



Example 1: My first label

```
< [Cc]
  [Cd "+00:0"]
  [Fb "0350:0300"
    "00"
    "0"
    "0:3:1"
    "0150"
    "03"
    "+00000000001:00"
    "020"
  ]
  [Db "00" "1234567"]

  [Ff "0350:0550"
    "001"
    "00"
    "N:B"
    "1:1"
    "-04"
  ]
  [Df "001" "My first label"]

  [Pi "0001" "000" "2:C:6:0:0" "0"]
>
```

x:y position
barcode field number
direction
barcode type :
check digit :
human readable
height
1-module with
count : zeros suppressed
length guard bar

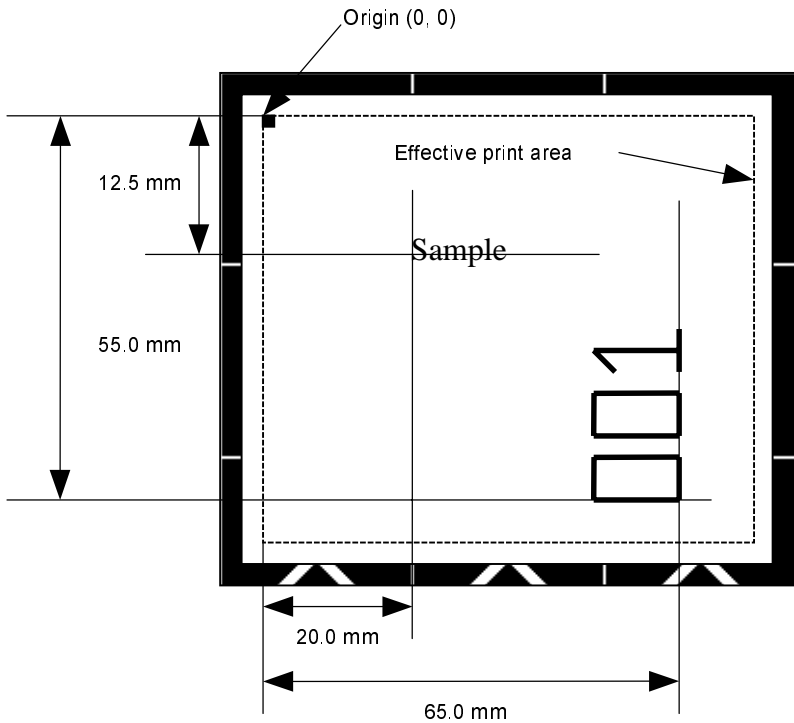
x:y position
text field number
direction
font type
magnification
char spacing





Example 2: Text 1

```
< [Cc]
[Ff "0200:0125" "001" "00" "B:B" "1:1"]
[Ff "0650:0550" "002" "33" "S:B" "4:4"]
[Df "001" "Sample"]
[Df "002" "001"]
[Pi "0002" "000" "2:C:6:0:0" "0"]
>
```

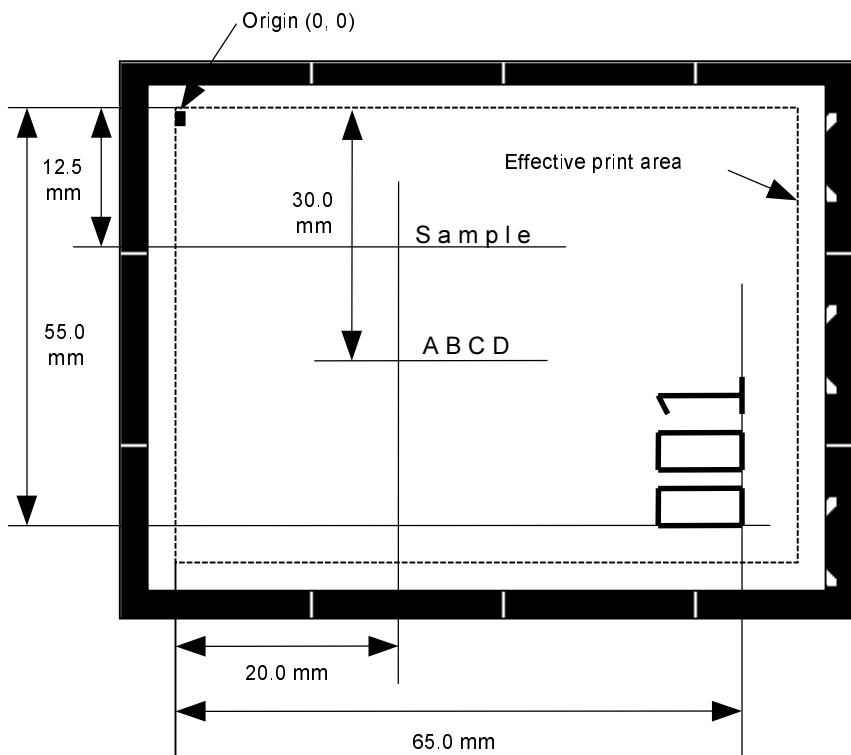




Example 3: Text 2 (bitmap fonts)

```
< [Cc]
[Ff "0200:0300" "000" "00" "A:B" "1:1" "" "" "ABCD"]
[Ff "0200:0125" "001" "00" "A:B" "1:1"]
[Ff "0650:0550" "002" "33" "G:B" "2:2" ""
":+0000000001"]

[Df "001" "Sample"]
[Df "002" "001"]
[Pi "0002" "000" "0:C:A:0:0" "0"]
>
```



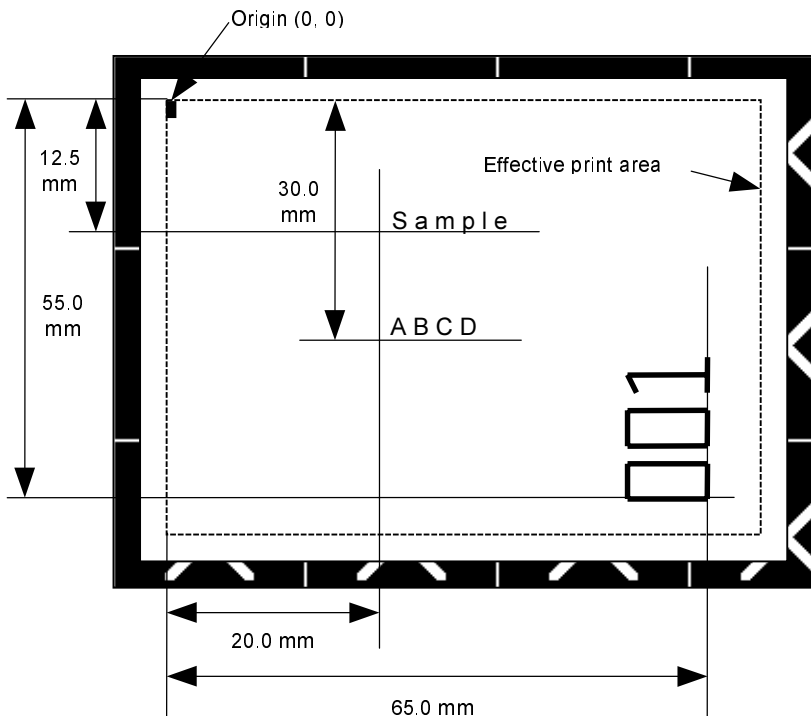


Example 4: Text 3 (outline fonts)

```
< [Cc]
  [Fs "0200:0300" "00" "00" "B:B" "0080:0080" "" ""
    "ABCD"]
  [Fs "0200:0125" "01" "00" "B:B" "0100:0100"]
  [Fs "0650:0550" "02" "33" "B:B" "0200:0150" ""
    ":+00000000001"]

  [Ds "01" "Sample"]
  [Ds "02" "001"]

  [Pi "0002" "000" "0:C:A:0:0" "0"]
>
```



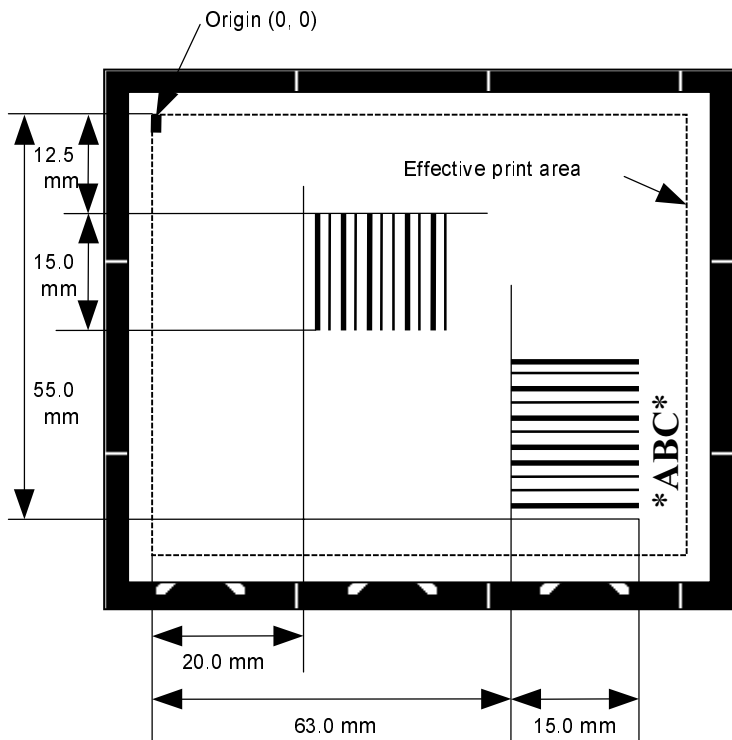


Example 5: Barcodes

```
< [Cc]
[Fb "0200:0125" "01" "0" "3:1:1" "0150"
  "02:02:06:06:02" "" "12345"]
[Fb "0630:0550" "02" "3" "3:1:1:N" "0150"
  "02:04:07:08:04" "+00000000:00"]

[Db "02" "*ABC*"]

[Pi "0002" "000" "0:C:A:0:0" "0"]
>
```





Example 6: Barcode 128SCC

Barcode (N) UCC/EAN128 (Code 128 SCC) with special human readable

```
< [Cc]
  [Cd "+00:0"]
  [Fb
    "0100:0400"          x:y position
    "00"                 barcode number
    "0"                   direction
    "N:3:0"               barcode type :
                           check digit :
                           human readable
    "0200"                height
    "04"                  1-module with
    "+00000000001:00"     count :
                           zeros suppressed
    "010"                 length guard bar
    ":01:02:03:04"        link fields
  ]

  [Ff
    "0150:0380"           x:y position
    "001"                 text number
    "00"                   direction
    "A:B"                  font type
    "15:20"                font size
    ""
    "0:+00000000001:00"   check digit :
                           count :
                           zeros suppressed
    ":01:02:03:04"        link fields
  ]

  [Dl "10" "0" "0615535" "678787001" ]

  [Ff "0100:0250" "003" "00" "A:B" "1:1" ]
  [Df "003" "Code 128 SCC"]

  [Pi "0002" "000" "2:C:6:0:0" "0"]
>
```





Example 7: ACME Gourmet

```
< [Cc]
  [Fs "0100:0200" "01" "00" "B:B" "0090:0090"]
  [Fs "0120:0330" "02" "00" "A:B" "0060:0060" "-010"]
  [Fl "0100:0250" "0850:0350" "1:9"]
  [Ff "0250:0450" "001" "00" "K:B" "05:05"]
  [Fb "0300:0500" "01" "0" "5:3:1" "0100" "03" ""
    "020"]
  [Ff "0250:0700" "002" "00" "N:B" "1:1" "-03"]

  [Ds "01" "ACME Gourmet"]
  [Ds "02" "MeWow! Cat Food"]
  [Df "001" "minced mare à la mère"]
  [Db "01" "123456789012"]
  [Df "002" "ACME Corp., Dogpatch, N.C."]

[Pi "0001" "000" "2:C:A:0:0" "0"]
>
```



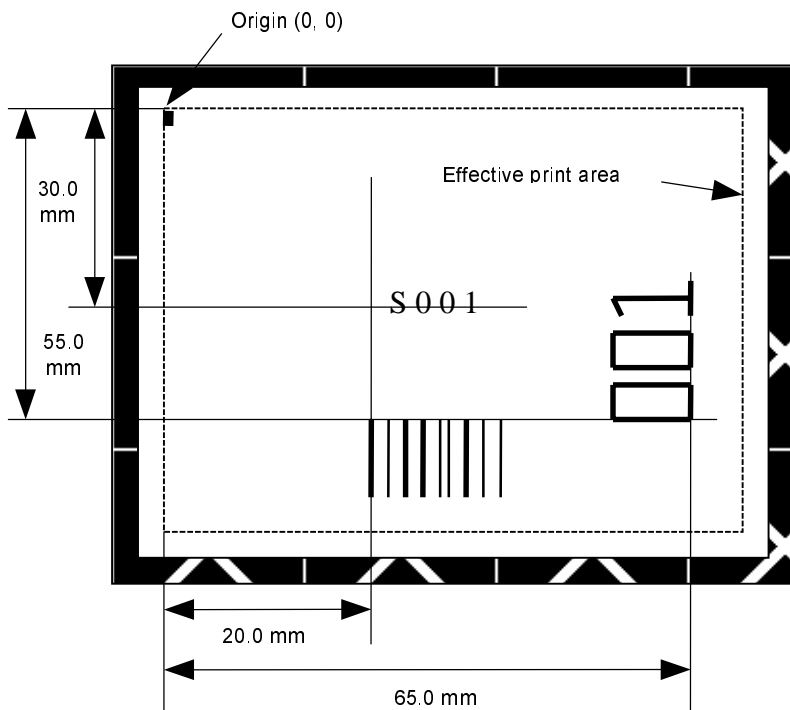


Example 8: Text, barcode and link 1

```
< [Cc]
[Ff "0200:0300" "001" "00" "C:B" "1:1" "" ""
   ":01:02"]
[Fs "0650:0550" "01" "33" "B:B" "0200:0150" "" ""
   ":02"]
[Fb "0200:0550" "01" "0" "3:1:1:" "0150"
   "02:02:06:06:02" "" ":01:02"]

[Dl "S" "001"]

[Pi "0002" "000" "0:C:A:0:0" "0"]
>
```





Example 9: Link 2

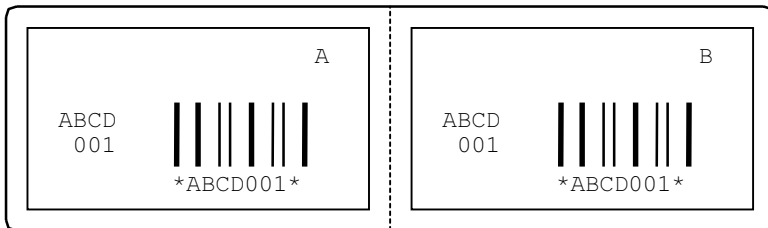
Linked fields on 2 parallel labels:

```
<
[Cc]
[Ff "0400:0150" "001" "00" "A:B" "1:1" "" "" ":01"]
[Ff "0000:0250" "002" "00" "A:B" "1:1" "" "" ":03"]
[Ff "0000:0330" "003" "00" "A:B" "1:1" "" "" ":04"]
[Fb "0150:0200" "01" "0" "3:1:1" "0150"
  "02:02:06:06:02" "" ":03:04"]

[Ff "0950:0150" "004" "00" "A:B" "1:1" "" "" ":02"]
[Ff "0550:0250" "005" "00" "A:B" "1:1" "" "" ":03"]
[Ff "0550:0330" "006" "00" "A:B" "1:1" "" "" ":04"]
[Fb "0700:0200" "02" "0" "3:1:1" "0150"
  "02:02:06:06:02" "" ":03:04"]

[Dl "A" "B" "ABC" "001"]

[Pi "0001" "000" "2:C:A:0:0" "0"]
>
```





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Appendix F Fonts

This Appendix gives you information on the SP40 PDL fonts. *For information on characters, see Appendix C, Characters.*

Here are the parameter values for the font types used in various commands:

Bitmap fonts:

A :	Times Roman (Medium)	12 points
B :	Times Roman (Medium)	15 points
C :	Times Roman (Bold)	15 points
D :	Times Roman (Bold)	18 points
E :	Times Roman (Bold)	21 points
F :	Times Roman (Italic)	18 points
G :	Helvetica (Medium)	9 points
H :	Helvetica (Medium)	15 points
I :	Helvetica (Medium)	18 points
J :	Helvetica (Bold)	18 points
K :	Helvetica (Bold)	21 points
L :	Helvetica (Italic)	18 points
M :	Presentation (Bold)	27 points
N :	Letter Gothic (Medium)	14.3 points
O :	Prestige Elite (Medium)	10.5 points
P :	Prestige Elite (Bold)	15 points
Q :	Courier (Medium)	15 points
R :	Courier (Bold)	18 points
S :	OCR-A	12 points
T :	OCR-B	12 points

Outline fonts:

A :	Helvetica Bold Monospaced
B :	Helvetica Bold Proportional



Samples

<A> Times Roman medium: 12 point

0123456789!"#\$%&'()*+,-./:;<=>?@€

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

 Times Roman medium: 15 point

0123456789!"#\$%&'()*+,-./:;<=>?@€

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

<C> Times Roman bold: 15 point

0123456789!"#\$%&'()*+,-./:;<=>?@€

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

<D> Times Roman bold: 18 point

0123456789!"#\$%&'()*+,-./:;<=>?@€

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

<E> Times Roman bold: 21 point

0123456789!"#\$%&'()*+,-;=>?@€

ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz



<F> *Times Roman italic: 18 point*

0123456789!"#\$%&'()*+,-./:;<=>?@€
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<G> Helvetica medium: 9 point

0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<H> Helvetica medium: 15 point

0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<I> Helvetica medium: 18point

0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<J> **Helvetica bold: 18 point**

0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz



<K> **Helvetica bold: 21 point**
0123456789!"#\$%&'()*+;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<L> *Helvetica italic: 18 point*
0123456789!"#\$%&'()+,-./:;<=>?@*
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<M> **PRESENTATION BOLD: 27PT.**
01239!"#\$%&'()* />?@€
ABCDEFGHIJKLMNOPQRSTUVWXYZ
ABCDEFGHIJKLMNOPQRSTUVWXYZ

<N> Letter Gothic medium: 14,3 point
0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz

<O> Prestige Elite medium: 10,5 point
0123456789!"#\$%&'()*+,-./:;<=>?@
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz



<P> Prestige Elite bold: 15 point
 0123456789!"#\$%&'()*+,-./:;<=>?@
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz

<Q> Courier medium: 15 point
 0123456789!"#\$%&'()*+,-./:;<=>?@€
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz

<R> Courier bold: 18 point
 0123456789!"#\$%&'()*+<>?@€
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz

<S> OCR-A: 12 point
 0123456789!"#\$%&'()*+,-./:<>¥
 ABCDEFGHIJKLMNOPQRSTUVWXYZ

<T> OCR-B: 12 point
 0123456789!"#\$%&'()*+,-./:<>¥
 ABCDEFGHIJKLMNOPQRSTUVWXYZ

Outline Font: <A> Helvetica bold
 0123456789!"#\$%&'()*+,-./:;<=>?@
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz

Outline Font: Helvetica bold proportional
 0123456789!"#\$%&'()*+,-./:;<=>?@€
 ABCDEFGHIJKLMNOPQRSTUVWXYZ
 abcdefghijklmnopqrstuvwxyz



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Appendix G Glossary

This appendix briefly explains some important terms, abbreviations and signals.

A

ANA Article Numbering Association.

Analogue signal A signal, such as voice or music, varying in a continuous manner (*see Digital signal*).

ANSI American National Standardization Institute.

ASCII American Standard Code for Information Interchange: A 7-bit code standardised by the American National Standards Institute to establish compatibility between data services. Equivalent to the ISO 7-bit code.

B

Barcode A string of characters forming a code which can be read by a scanner.

Baseline The zero line of an axis from which (X-/Y-) positions are measured: The left (X-position) and bottom edge (Y-position) of the label.

Batch This is a mode for printing multiple labels or tags jointly.

Baud Unit of signalling speed equal to the number of signal events per second: Not necessarily, but often, the same as bits per second.

Bit Contraction of **binary digit**: The smallest unit of data. A bit is either set (one) or not set (zero).

Bitmap An image consisting of dots. A dot is usually represented by a bit in a file or program (*see pixel oriented image*).



Block	A sequence of continuous data characters or bytes transmitted as an unit.
BPS	Bit per second: Communications transmission speed.
Buffer	A storage device used to compensate for a difference in rate of data flow when transmitting data from one device to another.
Byte	A binary element usually comprising eight bits. A KByte (KB) equals 1024 bytes.

C

CCG	Centrale für Coorganisation Gesellschaft: A society for rationalisation of information exchange between retail and industry.
Character	A letter, figure, number, punctuation or other symbol contained in a message or used in a control function.
Character set	The characters that can be coded and/or printed by a particular machine; symbol sets for different languages.
Check digit	A digit to ensure that the barcode (or other coded information or transmission) is correct. The last digit is calculated in a special way (depending on the type of barcode).
Code	Here the characters and symbols of a programming language (e.g. the program examples in this Manual are 'SP40 PDL code'.
<CR>	Carriage Return (ASCII 0D _n).
Cut	If a Cutter is installed, the media can be cut at pre-defined intervals.

D

Data bits	Contain the actual information transmitted.
<DC>	Device Control 1...4 (ASCII 11 _n ...14 _n).



DCE	Data Communications Equipment: The equipment that provides the functions required to establish, maintain and Terminate a connection and that provides the signal conversion required for communication between different pieces of DTE (data terminal equipment).
	Delete (ASCII 7F _h).
Digital signal	A discrete or discontinuous signal: one whose various states are identified with discrete levels or values, such as zero (low) and one (high).
DIN	Deutsches Institut für Normung e.V.: the German Standards Institute.
DIP	Dual in-line package.
DOS	Disk operating system.
DPI	Dots per inch , also written as 'd.p.i.'. A common measure of resolution, especially in printing.
DRAM	Dynamic RAM.
DTE	Data terminal Equipment: A machine that provides data in the form of digital signals at its output, e.g. a PC or other computer.
DTR	Data Terminal Ready.
E	
E-EPROM	Electronically erasable programmable ROM.
EAN	European Article Number. A type of barcode format standardised by the International E.A.N. Association.
<ESC>	Escape (ASCII 1B _h).



F

- Field** In SP40 PDL: An abstract unit of data which may or may not be directly printed on a label. Usually a field is a space reserved on the label for a specific label element, e.g. a barcode, price, text, line or frame.
- Flash-card** Memory card with an erasable memory (see *E-EPROM*).
- Full-duplex** A communications system or equipment capable of simultaneous two-way communications (see *Half-duplex*).

H

- Half-duplex** A communications system or equipment capable of two-way communications, but only in one direction at a time (see *Full-duplex*).
- Handshake** Exchange of predetermined codes and signals between two data terminals to establish a connection.
- Host** A computer or similar device used to control connected equipment.

I

- IATA** International **A**ir **T**ransport **A**ssociation.
- Interface** A shared boundary defined by common physical interconnection characteristics, signal characteristics and meanings of interchanged signals.
- ISO** International **S**tandards **O**rganisation: Establishes international standards often based on national standards, such as ASCII or DIN.
- ITF** Interleaved **T**wo of **F**ive: A larger barcode version of the 2/5 barcode for outer carton coding.



L

Label	In SP40 PDL: A label is a physical piece of paper or other print media stock.
LCD	Liquid crystal display.
LED	Light emitting diode.
Layout	In SP40 PDL: A layout determines the combination of the label details, e.g. barcode, text and price, the positions etc. of the fields.
Length of field	In SP40 PDL: The length of a field indicates how many characters can be entered. The maximum number is determined by the label and character size.
<LF>	Line Feed (ASCII 0A _h).
Lines	In SP40 PDL: A field can be occupied by lines or frames, where lines are defined as frames with either the height or length zero.
Link	In SP40 PDL: A transfer of data from one field (source field) to another (target field). In communications: A circuit or transmission path, including all equipment, between a sender and a receiver.
Logo	A graphic image, e.g. of a symbol representing a company.
LQ	Letter quality: a high quality font, such as for correspondence, usually proportional and scaleable.

M

Media	In label printing, the labels, tags and tickets which bear the printed data.
MemCard	A (METO) memory card.

N

NOVRAM	Non-volatile RAM .
---------------	---------------------------



<NUL> Null (ASCII 00_n).

O

OCR Optical character recognition.

Object oriented image A collection of mathematical formulas describing the elements which comprise the drawing. Also referred to as a 'vector graphic' (see *Pixel oriented image*).

Offline The operating mode in which only the printer's operating elements are used.

Online The operating mode in which the printer is operated remotely by a host.

P

Parallel data Data bits are transmitted simultaneously, e.g. one byte at a time, instead of serially.

Parity bit Used to verify correct transmission. Parity is either odd or even.

PCMCIA card **P**ersonal **C**omputer **M**emory **C**ard **I**nternational **A**ssociation: An industry-standard plug-in memory card, such as used in notebook PCs.

PCX File name extension for the Paintbrush format.

PDL **P**age **d**escription language.

PE **P**aper **e**mpy: Parallel port line.

Pitch A distance between corresponding points on adjacent members of a body of regular form.

Pixel oriented image A collection of (rastered) dots stored as patterns of set bits. Also called a 'bitmap' (see *Object oriented image*).

Preset digits In SP40 PDL: A fixed string of characters in a field.



Protocol	The rules for communication between like processes, giving a means to control the orderly communication of information between stations on a data link.
PSU	P ower s upply u nit.
R	
RAM	R andom-access m emory.
ROM	R ead-only m emory.
RTC	R ead-time c lock.
S	
SCC	S hipping C ontainer C ode.
Serial transmission	A method of information transfer in which the bits comprising a character are sent in sequence one at a time.
Source (field)	In SP40 PDL: A linked field from which data are transferred to a target field.
<SP>	S pace (ASCII 20 _h) [blank].
SRAM	S tatic R AM.
SSCC	S erial SCC (Shipping Container Code).
Start bit	The first bit or element transmitted in the asynchronous transmission of a character to synchronise the receiver.
Stop bit	The last bit or element transmitted in the asynchronous transmission of a character to return the circuit to the idle state.
Strip	This is a mode in which one label or tag is processed at a time with backfeed. It can be used for dispensing single labels
Symbol set	The characters, symbols and control codes at a given location in a list or table. A character map or code table defined for different operating systems, languages or other aspects.



T

- Target (field)** In SP40 PDL: A linked field to which data are transferred from a source field.
- Thermal array** The part of a print-head which comprises the heated printing elements.
- Threshold** An intensity or (minimum) value of a signal that will produce a specified response or effect.

U

- UPC** **Universal Product Code** used in the USA and Canada. A type of barcode format.
- UPC/A** A **UPC** barcode used in the USA for food.
- UPC/E** Shortened version of the UPC/A barcode (zero suppression).

V

- Variable data** In SP40 PDL: After designing a layout, a variable field (for example, text or barcode) can be filled up with variable data, i.e. data that may vary from entry to entry.

X

- <X-On>/<X-Off>** Software-controlled data transfer codes to enable/disable transmission.


Y

- Y2K** **Year 2000.** Refers to 'year 2000 compliance', i.e. capability of firmware or software to cope with dates in the new millennium. All METO printers are Y2K compliant.



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PART V, APPENDICES
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PART V, APPENDICES
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Appendix J Index

2

2/5 German Post	B-3
2/5 industrial	B-3
2/5 interleaved	B-3

A

Addresses	I-1
ASCII control codes	C-2

B

Barcode data	7-70
Barcode format	7-43
Barcodes	B-1
Batch	3-16
Bitmap writable character...	7-101

C

Cables	3-3
Character width and height	C-4
Characters	C-1
Clear image buffer	7-2
Clear/reverse area	7-23
Code 128	B-4

B-4

Code 39	B-4
Code 93	B-4
Command	
descriptions	7-1
format	4-2
list	6-2
overview	6-1
overview	6-2
sequence	4-2
structure	4-1
syntax	4-1
usage	6-1
Commands	7-1
COMMS ERROR	9-2

Communications	3-3
Communication errors	9-2
Configuration commands	7-5
Connections	3-4
Control characters	4-4
Control codes	C-2
Conventions	1-3
Conversion rate	D-1
Currency	D-1
Cut	3-16
CUTTER ERROR	9-3

D

Data	3-13, 3-14
Data commands	7-68
Data structures	D-1
DIP switch functions	3-5
DIVIDE ERROR	9-5
DOS	3-9

E

EAN 13	B-1
add on	B-1
random weight	B-1
B-2	
EAN 8	B-2
EEPROM ERROR	9-5
Eject label	7-94
Enable standard verifier	7-22
Environment setup	3-2
9-1	
Error descriptions	9-1
Error list	8-3
Error overview	8-1
Euro conversion rate	D-1
Euro symbol	C-1
Examples	E-1
EXCESSIVE HEAD TEMP	9-4



- F**
Feed label..... 7-89
Field..... 3-14
FLASH CARD FULL..... 9-5
Flash card commands..... 7-99
FLASH WRITE ERROR..... 9-5
Fonts..... F-1
Format card..... 7-99
FORMAT ERROR..... 9-5
Forward/reverse feed..... 7-96
- G**
Gap length..... 3-16
General commands..... 7-2
Glossary..... G-1
Graphic data..... 3-15
Graphic format..... 7-61
Graphics processing..... 3-4
- H**
Hardware connection..... 3-4
Hardware prerequisites..... 3-2
HEAD OPEN..... 9-3
Host..... 3-2
- I**
I/O expansion..... 5-2
Identification code..... 7-2
Input buffer..... 3-15
Interface..... 3-9
Interface setup..... 3-7
Interfaces..... 3-2, A-1
International addresses..... I-1
Issue label..... 7-76
- K**
Key operation..... 3-19
- L**
Label
 length..... 3-16
 width..... 3-16
Label issue..... 4-10
Language..... 2-1
Layout..... 3-13, 3-14
 length..... 3-16
 width..... 3-16
Layout commands..... 7-23
Line format..... 7-26
Link field data..... 7-75
- M**
Manual..... 1-1
 conventions..... 1-3
 organisation..... 1-5
MaxiCode..... B-5, B-9
Media..... 3-13
 dimensions..... 3-16
 modes..... 3-16
 setup..... 3-6
Media processing..... 3-14
Message translations..... 9-6
MS-DOS..... 3-9
MSI..... B-5
- N**
NO PAPER..... 9-3
NO RIBBON..... 9-3
NW7..... B-5
- O**
Online mode functions..... 3-21
Online responses..... 5-1
- P**
Page
 length..... 3-16
 width..... 3-16
Page Description Languages..... 2-2
 3-16
PAPER JAM..... 9-2
Parallel interface..... A-8
 status..... A-10
PDF417..... B-5, B-8
Position fine adjust..... 7-10
POWER FAILURE..... 9-5
Preliminaries..... 3-1
Print commands..... 7-76
Print density fine adjust..... 7-21
Printer..... 3-2

PART V, APPENDICES

Appendix J, Index



Printer Languages 2-1
Printing special characters C-1
Programming considerations 3-13

R

Ready/Busy 3-8
Recall saved data 7-110
Reset printer 7-3
Response structure 5-1
REWIND FULL 9-4
RIBBON ERROR 9-4

S

Save start 7-107
Save terminate 7-109
Scope 1-1
Serial interface responses 5-2
Serial interface 5-1
 status A-6
Serial Interface A-1
Set label size 7-5
Setup interface 3-9
Signal responses 5-1
Software Prerequisites 3-3
 Command 4-2
 Examples E-1
Special characters C-1
Status format 5-3
Status request 7-4
Strip 3-16
Support I-1

Syntax 4-1

T

Target group 1-2
Text data
 bitmap font 7-68
 outline font 7-69
Text format
 bitmap font 7-31
 outline font 7-33
Tools 3-3
Trademarks H-1
Transmission sequence 4-6
Troubleshooting 8-1

U

UNUSED CODE TRAP 9-5
UPC/A B-2
UPC/E B-3

V

Validity 1-2

W

Windows 3-11
 95/98 3-11
 NT 3-12
Word processing 3-3

X

X-On/X-Off 3-8



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