Xerox 4213 Laser Printer
Programmer Reference

European EME regulations

The Xerox 4213 laser printer meets the requirements of EN55022 Class B.

WARNING: Use of controls, adjustments, or performance of procedures other than those specified herein may result in a hazardous radiation exposure.

This product will produce ozone during normal operation. The ozone produced is dependent on copy volume and is heavier than air. Providing the proper environmental parameters as specified in Xerox installation procedures will ensure that concentration levels meet safe limits.

The 4213 has an ozone filter built into the print cartridge.

Laser safety

The following note is to meet the local requirements of Finland and Sweden.

LUOKAN 1 LASERLAITE
KLASS 1 LASER APPARAT

VAROITUS:
LAITTEEN KÄYTTÄMINEN MUULLA KUIN TÄSSÄ KYTTÖOHJEESSA MAINITULLA TAVALLA SAATTAA ALTISTAA KÄYTTÄJÄN TURVALLISUUSLUOKAN 1. YLITTÄVÄLLE LASERSÄTEILYLLE.

VARNING:
OM APPARATEN ANVÄNDS PÅ ANNAT SÄTT ÄN I DENNA BRUKSANSVISNING SPECFICERADE, KAN ANVÄNDAREN UTSÄTTAS FÖR O SYNLIG LASERSTRÄLNING, SOM ÖVERSKRIDER GRÄNSEN FÖR LASERKLASS 1.

Operational safety

Your Xerox equipment and supplies were designed and tested to meet strict safety requirements. These include safety agency examination, approval, and compliance with established environmental standards.

WARNING: Improper connection of the equipment grounding conductor can result in electrical shock.

Attention to the following notes ensures the continued safe operation of your equipment.

Never use a multi-plug adaptor to plug multiple power plugs into the same outlet.

Never attempt any maintenance function that is not specifically described in this guide.

Never operate the equipment if you notice unusual noises or odors. Disconnect the power cord from the power source receptacle and call your Rank Xerox customer service engineer to correct the problem.

If you need any additional safety information concerning the equipment or Xerox supplied materials, call your RX sales representative.

Notice

Specifications described in this publication are subject to change without notice. Use of some features may be limited by your hardware or software configuration. Consult your sales representative for details.

Related publications

Title

Xerox 4213 Laser Printer User Guide

Xerox 4213 Laser Printer Programmer Reference

Xerox Coax/Twinax Option (XCTO) Programmer Reference

Xerox 4213 Laser Printer Quick Reference Guide

Helpful Facts About Paper

Xerox 4213 XES Quick Reference Card

PostScript Language Reference Manual, 1985, Adobe Systems Incorporated, Addison-Wesley Publishing Company, Inc., Sixth printing April, 1987

PostScript Language Programme Design, 1988, Adobe Systems Incorporated, Glenn C. Reid, Addison-Wesley Publishing Company, Inc., Sixth printing April, 1988

PostScript Language Tutorial and Cookbook, 1985, Adobe Systems Incorporated, Addison-Wesley Publishing Company, Inc., Fifth printing March, 1987

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Appendices

Introduction

This manual is for anyone who wants to access and control the printer with commands instead of, or in conjunction with, application software.

When you load and configure your software application package you are asked to identify the type of printer that you will be using. This is generally known as selecting a printer driver. A printer driver translates the programming language into the specific language that the printer understands. The 4213 printer has the ability to operate in three different emulation modes:

- XES Mode
- HP LaserJet Mode
- PostScript Language Mode (optional)

Once this is done all commands sent to the printer are for that specific type of printer. It is important to know how your software application package is configured so that you know what control language you should use to programme.

It is recommended that you contact your software vendor before attempting to to use any of the control languages. They will usually be glad to assist you and can save you a great deal of time and frustration. In some cases they will modify the printer driver for you or provide you with a new printer driver that already contains the modifications you desire. If they are unable to assist you, then you should be able to use this Manual to control the printer. However, to perform most of the tasks covered here, some knowledge of programming is desirable.

Purpose of this manual

This reference manual provides information on such tasks for which you might use these printer commands including:

- Changing default settings

- Loading or changing character tables

- Accessing a feature on the printer that is not supported by an application software package

- Loading new fonts or accessing fonts not supported by an application software package

- Writing or modifying printer drivers in application software packages.

Once the software package has been configured for a specific printer it is then necessary to select a printer emulation for the 4213 printer. For directions on installing, enabling, and configuring a printer emulation, refer to the *Xerox 4213 Laser Printer User Guide.*

What this manual contains

Chapter 1: Interfaces

Chapter 2: XES Command Language Mode

Chapter 3: HP LaserJet Mode

Chapter 4: PostScript Language Mode

Appendix A: *Reassigning character tables* covers how to download character assignments from the host to the printer and how to change from one character set to another.

Appendix B: *Conversion tables for units of measure* shows how units of measure for margins and tabs translate into character pitch and lines per inch.

Appendix C: *Sixel encoding* shows how to format bitmap graphics so that the printer can process them.

Appendix D: *Reference tables* includes listings of control codes, character code assignments.

Appendix E: *XES compatibility* lists which commands on the Xerox 4235 printer are not supported on the 4213 printer.

Appendix F: *Default format parameters* contains margin and tab default values in the XES emulation.

Appendix G: *XES summary sheet*

Also included is an **Index**.

Variances

The following differences exist between the 4213 and 4046 laser printers:

- Pages may break differently on the two printers.

- To match rotation on the 4213, the 4045 must have an XGRAPH cartridge installed.

- Set the page buffer to "FULL" to correctly print complex pages.

- In XES mode, the underline character prints at the baseline on the 4045; on the 4213, this prints under the character descender.

Conventions used in this manual

The following conventions are observed in this manual:

E   The escape character (ASCII 27, 1BH) is represented with this symbol.

L   The line end (carriage return and line feed) is represented with this symbol.

Warning:	Warnings are associated with the safety of people.
Caution:	Cautions are associated with equipment safety.
Note:	A comment or explanation set off from from the text as a separate paragraph.
MB	This is the representation for megabyte.
KB	This is the representation for kilobyte.
K	The character "K" in conjunction with a numerical value, such as 256K, always represents a thousand.

In the index, the use of the lowercase "i" denotes an illustration, the lowercase "f" means a figure and the lowercase "t "refers to a table.

1. Interfaces

This chapter describes the interfaces supported by the 4213 Laser Printer, the Centronics and Dataproducts parallel, and the serial asynchronous.

Parallel interface

The 4213 Laser Printer supports two parallel interfaces: Centronics and Dataproducts. Each is described on the following pages.

The parallel interface cable

You must supply the interface cable to connect the 4213 to your host. The cable must meet the following specification in order to comply with FCC and VDE regulations.

Table 1-1. **interface cable specifications**

Type:	Twisted pairs, overall foil or braid shield
No. of conductors:	15 pairs
Wire size:	22 AWG stranded
Cable length:	Maximum length: Centronics or Dataproducts—10 feet (3.05metres)
Shield connection:	To the connector conductive case at the 4213; to the frame ground at the data source

Note   When connecting or disconnecting the parallel interface cable, make sure the printer is off line.

Centronics interface

Select the Centronics parallel interface

Centronics parallel interface is selected through the User Interface.

1. Press the Online H button.
2. Press the Menu A button.
3. Press the Last Page C button until HOST INTERFACE appears
4. Press theTest B button.
5. Press the Last Page C button until PARALLEL CENT appears.
6. Press the Select D button to select Centronics parallel.

Select metered data

With PARALLEL CENTR appearing on the User Interface:

1. Press the Test B button. METERED DATA appears on the User Interface.
2. Press the Test B button.
3. Press the Last Page C button to scroll through the two choices of **DISABLED** OR ENABLED. Disabled is the factory default.
4. Press the Select D button when your choice appears on the User Interface.

Return to print mode

Press the Online H button to return the 4213 to Print Mode.

Centronics connector

The Centronics interface uses an Amphenol 36-pin connector, #57-40360 or equivalent. This connector mates with an Amphenol #57-30360 or equivalent connector and is illustrated in figure 1-1. Centronics compatible Epson type interfaces for personal computers can also be used on the 4213. A standard female Centronics cable connection is supplied. The signals associated with each pin are described in Table 1-2. on the following page. Figure 1-1 shows the Centronics interface connector.

Figure 1-1.   **Centronics interface connector**

Centronics signals and pin assignments

Table 1-2 describes Centronics 100 signals and pin assignments.

Table 1-2. **Centronics signals and pin assignments**

Pin	Direction	Signal	Description
1	To printer	STROBE L	STROBE pulse low to read data. A strobe low signal raises BUSY line to high.
2	To printer	DATA BIT 1[1]	
3	To printer	DATA BIT 2[1]	
4	To printer	DATA BIT 3[1]	
5	To printer	DATA BIT 4[1]	
6	To printer	DATA BIT 5[1]	
7	To printer	DATA BIT 6[1]	
8	To printer	DATA BIT 7[1]	
9	To printer	DATA BIT 8[1]	
10	From printer	ACKNLG L	ACKNLG pulse low indicates data was received and printer is ready to receive more data.
11	From printer	BUSY H	BUSY "high" indicates the printer cannot receive data, (buffer is full). BUSY high occurs when an error condition exists.
12	From printer	PE H	Ground
13	From printer	SLCT H	A high signal indicates the printer is in the select state. A low signal occurs when the printer is deselected or if an error condition exists.
14			Ground (standard Centronics)
15	Printer to stunt box		2 MHz Field stunt box clock. The stunt box is not provided by Xerox.
16	0 volts		Logic ground

Table 1-2. **Centronics signals and pin assignments (continued)**

Pin	Direction	Signal	Description
17			Chassis ground
18	From printer		+5V (standard Centronics)
19-29	0 volts		TWP returns All at Logic ground.
30	0 volts		INIT ground
31	To printer	INIT L	The 4213 ignores this signal.
32	From printer	ERROR L	This signal is low when the printer is in an error state.
33			Open (standard Centronics)
34	Not used		
35			Ground (standard Centronics)
36	Not used		

[1] These signals are the 1st and 8th bits of parallel data and are active high for a logical 1.

Centronics interface timing

Figure 1-2 diagrams signal timing for the Centronics interface.

Figure 1-2.   **Centronics interface timing**

Table 1-3 describes Centronics interface voltage and current requirements

Table 1-3. **Centronics interface voltage and current requirements**

Voltage levels	0 (zero) and +5 VDC (nominal), TTI (SN 74LS00 series
Logic levels	Positive logic is assumed. A logic one (high) signal is defined as a voltage in the range of +2.4V to +5V, not to exceed a peak of +5.5V.
	A logic zero (low) signal is defined as a voltage in the range of 0.0V to 0.4V, not to exceed a peak negative voltage of -0.5V. However for received signals a voltage of up to +0.8V is recognised as a logic zero.
Current requirements	The printer interface sources up to -15 ma at +2.4V for a high output signal and sinks up to 14 ma for a low output.
	74LS374 ICs are used for data receivers with 1K ohm pull-up resistors, and 74LS244 ICs are used as drivers for Acknowledge, Busy, Select, etc.
Data rates	The 4213 supports burst data rates of up to 50 Kbytes per second for at least 512 bytes.

Dataproducts 2260

Select the Dataproducts parallel interface

The Dataproducts parallel interface is selected through the User Interface.

1. Press the Online H button.
2. Press the Menu A button.
3. Press the Last Page C button until HOST INTERFACE appears.

4.   Press the Test B button.

5.   Press the Last Page C button until PARALLEL DPROD appears.

6.   Press the Select D button to select Dataproducts parallel.

Dataproducts connector

The use of a pigtail conversion cable provides compatibility with the Dataproducts 2260 line printer controllers. The Dataproducts interface uses a 50-pin Winchester connector # MRA S D5J, which mates with a Winchester MRAC 50 P JKTCH connector, using 100 1020P pins. The pin names are provided in this figure only for the sake of information. They do not appear on the real connector.   The   maximum   cable   length   when   using   the Dataproducts interface is 10 feet (3.05 metres). Figure 1-3 shows the Dataproducts connector.

The   4213   does   not   support   Negative   Logic   mode   for Dataproducts 2260.

Figure 1-3.   **Dataproducts interface connector**

Dataproducts signals and pin assignments

Table 1-4 describes the signals and pin assignments for the Dataproducts 2260 interface.

Table 1-4.   **Dataproducts signals and pin assignments**

Pin	Signal	Source
B	Data 1	Host (LSB)
D	return	
F	Data 2	Host
J	return	
L	Data 3	Host
N	return	
R	Data 4	Host
T	return	
V	Data 5	Host
X	return	
Z	Data 6	Host
b	return	
n	Data 7	Host
k	return	
p	Data 8	Host
s	return	
j	Character Strobe	Host
m	return	
E	Demand Line	Printer
C	return	
CC	Ready	Printer
EE	return	

Table 1-4. **Dataproducts signals and pin assignments (continued)**

Pin	Signal	Source
y	ON LINE	Printer
AA	return	
x	Interface Connect Verify	Printer
v	Interface Connect Verify	Printer
W, H &P, M	Spare	Printer

Dataproducts interface timing

Figure 1-4 describes the Dataproducts interface timing when measured at the printer connector.

Figure 1-4. **Dataproducts interface timing**

Table 1-5.   **Dataproducts voltage and current requirements**

Voltage levels	0 (zero) and +5 VDC (nominal), TTI (SN 74LS00 series
Logic levels	Positive logic is assumed. A logic one (or high) signal is defined as a voltage in the range of +2.4V to +5V, not to exceed a peak of +5.5V.
	A logic zero (or low) signal is defined as a voltage in the range of 0.0V to 0.4V, not to exceed a peak negative voltage of -0.5V. However for received signals a voltage of up to +0.8V is recognised as a logic zero.
Current requirements	The printer interface sources up to -15 ma at +2.4V for a high output signal and sinks up to 14 ma for a low output.
	74LS374 ICs are used for data receivers with a 220 ohm pull-up resistors, and a 330 ohm pull-down resistor. 74LS244 ICs are used as drivers and for Ready, On-line and Demand.
Data rates	The 4213 supports burst data rates of up to 50 Kbytes per second for at least 560 bytes, or until a line-end or form-feed is detected.

Serial interface

The serial interface, as well as the serial interface features supported by the 4213, are selected through the User Interface. The serial interface connector is compatible with RS232-C DTE standards.

Select the serial interface

1. Press the Online H button.

2. Press the Menu A button.

3. Press the Last Page C button until HOST INTERFACE appears.

4. Press the Test B button.

5. Press the Last Page button C until SERIAL appears.

4. Press the Select D button to select SERIAL.

Set baud rate

Once SERIAL is selected, baud rate, parity and flow control can be set.

With SERIAL appearing on the User Interface:

1. Press the Test B button.

2. Press the Last Page C button until BAUD RATE appears.

3. Press the Test B button.

4. Press the Last Page C button to scroll through the baud rate options: 1,200, 2,400, 4,800, **9,600**, 19,200. 9,600 is the factory default.

5. Press the Select D button once your chosen baud rate appears.

Set parity

With the baud rate appearing on the User Interface, follow these steps:

1. Press the Menu A button.

2. Press the Last Page C button until PARITY appears.

3. Press the Test B button.

4. Press the Last Page C button to scroll through the parity options: 7 BIT ODD, 7 BIT EVEN, 7 BIT MARK, 7 BIT SPACE, 8 BIT ODD, 8 BIT EVEN, **8 BIT NONE.** 8 BIT NONE is the factory default.

5. Press the Select D button to select parity.

Note: For LJ2D emulation, 8 data bit mode is required.

Set flow control

With parity options appearing on the User Interface, follow these steps:

1. Press the Menu A button.

2. Press the Last Page C button until FLOW CONTROL appears.

3. Press the Test B button.

4. Press the Last Page C button to scroll through the two flow control choices: XON/OFF, DTR.

4. Press the Select D button to enter your choice.

Note: When connected to a modem, XON/OFF is required.

Return to printer operation

Press the Online H button to return the 4213 to Print Mode.

RS232 (serial) connector

The 4213 supports asynchronous modems and host employing the RS232C interface. The modems supported are Bell 103 and 212 compatible asynchronous modes communicating at rates of 1,200, 2,400, 4,800, 9,600, or 19,200 bps, half or full 2-sided. The printer is connected to a modem via a cable with a Cannon or Cinch DB-25P connector attached.

Figure 1-5 shows the RS232C connector.

Figure 1-5.   **RS232C (serial) connector**

Note Maximum length for the serial interface cable is 15 metres (50 feet).

Serial interface features supported

The 4213 supports the following serial interface features:

- Bit rate within a character may be up to 19.2K baud
- Baud rates of 1,200, 2,400, 4,800, 9,600, 19,200
- Character format: bit serial
- Character asynchronous
- Start bit (space)
- 7 or 8 data bits (1=mark, 0=space)
- Optional parity bit
- Stop bit (mark)
- Data bits represent a character.
- Least significant data bit leads
- Number of bits and polarity of parity are selectable via the User Interface.
- Parity error is enabled only when even or odd parity is selected.

Serial signals and pin assignments

Table 1-6 describes the signals and pin assignments used with the asynchronous serial interface.

Table 1-6. **Asynchronous serial signals and pin assignments**

Pin	Signal	Telephone Co. designation	CCITT designation
1	Protective Ground	AA	101
2	Transmitted Data	BA	103
3	Received Data	BB	104
4	Request to Send	CA	105
5	Clear to Send	CB	106
6	Data Set Ready	CC	107
7	Signal Ground (common return)	AB	102
8	Carrier Detect	CF	109
11	Printer Ready	None	None
20	Data Terminal Ready	CD	108

Null modem

A null modem is a device which eliminates both a modem and a telephone line. Figure 1-6 illustrates typical null modem wiring. When the 4213 is used with an asynchronous serial interface connected to a DTE host (such as a PC-compatible), a modem, modem eliminator, or a null modem is required. Figure 1-6 shows null modem wiring.

Figure 1-6.   **Null modem wiring**

2. XES command language mode

This chapter is for anyone using the Xerox Escape Sequence (XES) emulation on the Xerox 4213 laser printer.

Configuring the 4213 for the XES command language mode

Please refer to the *Xerox 4213 Laser Printer User Guide* for instructions on how to configure the 4213 printer to operate in XES mode.

Automatic mode switching

It is possible to have software loaded in the 4213 which enables you to switch from one emulation to another without reconfiguring the printer. This requires the use of the mode change command and the reset command.

Be careful to copy the commands exactly as they appear, including uppercase letters, punctuation, and spaces. The symbol L represents a carriage return (ASCII 13 or 0DH), line feed (ASCII 10 or 0AH), or both, depending on your computer system.

In the IBM PC Disk Operating System (DOS), carriage return and line feed are automatically entered when you press the Return key at the end of each line.

The mode change command

The mode change command resets your 4213, enabling it to accept printing commands in the desired emulation mode.

Note: Unpredictable results such as loss of data may occur if the mode change command is not entered with valid parameters.

Send the following commands to your printer, preferably in the form of a test file:

PostScript   Emulation

```
=MCK=EMULATE/POSTSCRIPT/END L
```

This information tells your printer to begin printing in the PostScript emulation mode.

HP PCL Emulation

```
=MCK=EMULATE/PCL/END L
```

This information tells your printer to begin printing in the HP PCL emulation mode.

XES   Emulation

```
=MCK=EMULATE/XDCS/END L
```

This information tells your printer to begin printing in the XES emulation mode. You can replace "XDCS" with either "XES" or "2700" in the mode change command to enter the XES emulation mode.

Note: A space is required immediately after the **=MCK=** sequence. A line ending following the **END** keyword completes the command.

The reset command

The reset command resets the 4213 laser printer, restoring it to the default settings that were in effect at the last power off cycle.

Send the following command to your printer, preferably in the form of a text file:

Reset

```
=MCK=RESET/END L
```

Definition of a printer command

The commands covered in this chapter are classified as *escape sequences.*

The escape sequence is a type of printer command that gets its name from its initial character, the escape character. (This is not the same as the escape *key* on your keyboard.) Escape is a non-printable control code with the hexadecimal ASCII value 1B.

In XES mode, the 4213 recognises the escape character as a signal to indicate that the letters and numbers making up the rest of the sequence are not text to be printed, but instructions to be executed.

Command syntax as expressed in this chapter

The parts of the printer commands, or escape sequences, will be shown as follows:

E	The escape character is represented by this character.
+**D**,	The literal, instruction part of the command. Punctuation marks in commands serve as delimiters.
H	User-entered variables are represented by an abbreviation.
comment	Other user-entered information, such as file names or Summary Sheet comments, are also represented in italics.
L	Line end (carriage return and line feed).

Note: The command must be entered in upper or lower case exactly as it is shown. Do not enter spaces between characters unless specified.

Three types of escape sequences

There are three basic types of escape sequences:

1. Job control commands
2. Simple commands
3. Commands with user-entered variables.

Job control commands

All jobs should begin and end with one or more job control commands.

A job control command serves one of two functions. It either sets job boundaries (telling the printer where your job starts and ends and what type of data it contains) or it formats the printed output in some way. When the printer receives a command to start a job, it finishes the current job, ejects any remaining pages from that job, and starts over.

In addition to the escape character, a job control command always includes:

- A plus symbol + that follows the escape character
- An instruction (an upper case letter)
- A line end.

A job control command sometimes includes:

- An *optional* comma inserted when you want a Summary Sheet.
- An *optional* comment that is printed on the Summary Sheet.

Occasionally, it also includes a user-entered variable.

Example   The command for starting a document:

E**+P**,*comment*L

+P	The plus symbol, followed by the instruction for starting a print job (uppercase P).
,	Optional request for a Summary Sheet to report errors upon execution of the next job command.
comment	An optional text message of up to 130 alphanumeric characters that will appear on the Summary Sheet.
L	The line end required to complete the command.

Simple commands

Simple commands are made up of the escape character and one or two other lower case characters. They do not require any line end command for completion.

Example   The command for centreing a line of text:

ᴇ**q**

q   The instruction for centreing (lowercase q).

Commands with user-entered variables

Commands with user-entered variables set parameters such as the line spacing or margin width. They may include punctuation marks that serve as delimiters and alphanumeric characters such as comments or file names. Some require a line end.

Example   The command for setting margins:

ᴇ**m***H*,*T*,*B*,*L*,*R*ʟ

m   The instruction for margins.

H,*T*,*B*,*L*,*R*   Variables - In this case, the values of the margin settings (Height, Top, Bottom, Left, Right) in pixels or fractions of an inch. The values are separated by commas.

ʟ   The line end required to complete the command.

The User-Defined Key, or substitute escape character

The User-Defined Key (UDK) should be used when:

• The host's escape character cannot be transmitted properly to the printer.

• You want a printout of a document that shows the printer commands as well as the document data.

At the start of a job, enter:

=ᴜᴅᴋ=*character*

=ᴜᴅᴋ=   Is the command to substitute an escape character

character   Indicates the character you have chosen for the UDK.

Thereafter, until the end of the job (or until you specify otherwise), the printer recognises the selected character as your escape character.

Example   To select the asterisk (*) as your escape character, enter:

`=UDK=`**`*`**

Thereafter,

For: **Enter:**

   `E+B,L`   `*+B,L`

   `Ed`   `*d`

Showing commands in printed output

For most jobs, if the User-Defined Key and other printer commands show up on the printed output, then the User-Defined Key has not been assigned properly. You can, however, assign it "improperly" if you want your output to show the commands. This is done by changing the assignment to a character other than the one used throughout the rest of the document.

Example   You have created a document using the asterisk (*) as the User-Defined Key, but want to change it to an at sign (@) *before sending it to the printer.* To change =UDK=* at the beginning of the document, enter:

`=UDK=`**`@`**

Converting the User-Defined Key to a printable character

While a character is serving as the User-Defined Key, it cannot be printed. If you want to use the User-Defined Key as a printable character at some point in a document, you can do so by selecting a new User-Defined Key.

As far as the printer is concerned, any time it receives the sequence =UDK=, the character immediately following the second equal sign is the new User-Defined Key.

Example   The percent symbol (%) is your current User-Defined Key and you want to print the sentence: "The test is 85% accurate." Enter:

=UDK=*The test is 85% accurate.=UDK=%

At the end of the sentence, the User-Defined Key is changed back to the percent symbol (%).

Printing the sequence =UDK= as text

To print =UDK= within the text of your document, enter the characters in such a way that the printer does not perceive them as a command. The simplest way is as follows: Whenever you reach the point at which =UDK= is to be printed, interrupt the character sequence with a Font ID Assignment command that reselects whatever font you are now using.

Example   You are using the font which, in your Font ID Assignment, has the ID number 1 and your current User-Defined Key is the asterisk (*). To print the first phrase in the paragraph above, enter:

To print =UDK*1= within the text of your document,

With the sequence thus interrupted, the printer does not recognise the characters as a command and prints them as text.

Cancelling a User-Defined Key

A User-Defined Key is cancelled after the Reset command. It is also cancelled whenever you reset the 4213 or switch emulations.

If you are using a substitute escape character or User-Defined Key, remember that it must be defined before it is used, then defined *again* after a Reset. The Reset command cancels a UDK.

Example   To process a document, clear all settings, then start over, enter the following:

```
=UDK=#

#+PL
```

(*Fonts assigned*)

(*Margin settings*)

(*All other job contents*)

```
#+XL

=UDK=#

#+PL
```

(*Contents of next job*)

Tips on selecting a UDK

When selecting a UDK, remember:

- **=UDK=** must be entered exactly as shown, in uppercase.

- You can select any printable character except:

    — Uppercase U, D, or K
    — The comma (,)
    — The equal sign (=)
    — The multinational umlaut accent character (¨) combined with either U, D, or K.

- Do not use the space character or any other non-printing character such as the backspace, delete, or control keys.

- Since this character must be unique in the file, select one that you will not use often, such as the asterisk (*) or cent sign character (¢). Using an alphanumeric character is not recommended.

- If you need to print the UDK once you have begun a job, you must convert it back to a printable character by selecting a new UDK.

Line end

As stated earlier, some commands require a line end. If a line end is not necessary, it should not be entered, since it adds a physical line to your page and returns the current printing position to the left margin. However, omitting a required line end will cause an error in the job.

Line end configuration may differ from one host system to another. It may be either a carriage return (0DH) or a line feed (0AH). Ensure that the line end for the 4213 matches that of your host.

How the printer defines a page

Page orientation

There are two types of page orientations:

- Portrait
- Landscape.

A portrait page is taller than it is wide; a landscape page is wider than it is tall. Page orientation is determined by the orientation of the *first* font to appear on the page.

Font orientation

As shown below, there are two types of font orientations:

- Portrait
- Landscape.

Portrait orientation is initiated when you select a portrait font.

Landscape orientation is initiated when you select a landscape font.

You can print landscape *and* portrait text on the same page by using the command Print Job (Mixed Font Orientation).

Note: If mixed font orientations are used on the same printed page, the first font used determines the page orientation for the entire page.

Figure 2-1. **Font and page orientation**

Coordinates, units of measure, and paper feed direction

The page on the 4213 is like a grid, with an origin, an x-axis, and a y-axis. Data can be placed virtually anywhere on the grid of the page. The basic unit of printable data is the *pixel* or *dot*, which is also the basic unit of measure used in all commands that set measurements.

The 4213 has a resolution of 300 dot-per-inch. Refer to appendix B, "Conversion tables for units of measure" for conversions to inches and millimetres. Figure 2-2 shows the origins, x-axis, y-axis, and dimensions for pages created on short-edge feed (letter, legal, A4) paper.

Figure 2-2.   **Specifications for short-edge feed paper**

Determining the paper feed edge

The paper feed edge is the edge that is fed first into the printer. The paper trailing edge is the edge fed last into the printer. Figure 2-3 shows the trailing edge and the feed edge.

Figure 2-3. **Paper feed edge and trailing edge**
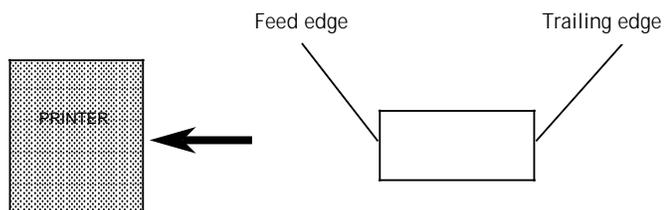
Page capacity

The page on the 4213 is 100% addressable when paper is fed from trays 1, 2, or the high-capacity feeder. There is a 6 mm wide lead edge deletion when feeding from the bypass tray. (The bypass tray accommodates special papers such as card stock, envelopes, and transparencies.)

Page imaging capabilities are determined by available memory.

Table 2-1. **Page capacity specifications**

Type of data	Capacity
Characters (bytes) per page	Limited by size of font.
Graphic windows per page	Determined by memory capacity.
Repeat graphic windows	Determined by memory capacity.
Maximum size of graphic window, in bytes	Equal to approximately the size of available memory.
Constant pages per variable page	1
Fonts per page	512
Characters per merge job	Determined by memory capacity.

Setting job boundaries

There are two commands for starting a document:

- Print Job (E+P L), which is used to start a document that will have one font orientation (either portrait or landscape) per page.

- Print Job (Mixed Orientation) (E+Q L), which is used to start a document that will have both landscape and portrait font orientations on the same page.

The command for ending a document is the Reset command. The Reset command ends all types of jobs, returns the printer to its default settings, and tells the printer that any data following it is part of a new job.

For documents created with the printer commands, you need the Print Job and Reset commands in order to:

- Separate print jobs. Print Job commands tell the printer that a new job has begun. If no Reset command (E+XL) is used, the printer processes your document as part of the job that preceded it, with the same parameters throughout.

- Request an XES Summary sheet (by having a comma follow the Print Job command).

- Notify the printer that a new job is being sent that has new parameters, such as fonts and margins, that are different from the defaults.

- Indicate whether or not changing to a different font orientation ends the page.

If you are processing more than one document and want to keep the same parameters for each, use Print Job at the beginning of each document, but do *not* use Reset at the end. This keeps all the parameters set with the other commands.

To start a new document with new parameters, enter Reset to clear all settings, then start over with Print Job or Print Job (Mixed Orientation) as the following table illustrates.

Command	Where to place it	What it does
E+P L	At beginning of job	Separates your job from last job printed.
E+Q L	At beginning of job	Separates your job from last job printed. (Mixed orientation.)
E+P L	At end of job	Separates your job from next job printed without resetting job parameters.
E+X L	At end of job	Separates your job from next job printed *and* resets job parameters to the printer default settings.

Examples

- For a typical document, you might enter:

   E+QL

   > *(Fonts assigned)*

   > *(Margin settings)*

   > *(All other job contents)*

   E+XL

Then send it to the printer.

- For a series of three documents, all of which are to have the same settings, you might enter

    `E+PL`

    (Fonts assigned)

    (Margin settings)

    (All other contents of job 1)

    `E+PL`

    (All other contents of job 2)

    `E+PL`

    (All other contents of job 3)

    `E+XL`

Then send them to the printer.

Print Job

Purpose Sets the starting boundary of a document that will have either a portrait or a landscape orientation.

Syntax

`E+P`,*comment*`L`

+P Instruction to start a document with one orientation per page.

, Optional request for a Summary Sheet to report errors upon execution of the next job command.

comment Optional comment on a Summary Sheet.

`L` Line end.

Where to place it At the start of the document data.

Example To start a document having a single font orientation, *with* a Summary Sheet having the comment "This page is of single font orientation", enter

`E+P`,This page is of single font orientation`L`

More Font selections are entered after Print Job (more information about this in the next chapter, "Using fonts"). In the example below, notice the "P" in each font name, which indicates that all fonts are of portrait orientation.

E+P,This page is of single font orientationL

E+1Helvetica14i2-PL   (Font name is Helvetica14i2-P)

E+2Helvetica10i2-PL   (Font name is Helvetica10i2-P)

E+3Helvetica8Bi2-PL   (Font name is Helvetica8i2B-P)

 Margins and all other job contents

E+XL

Including a font of landscape orientation here would cause the printer to start a new page whenever it encountered a change from landscape to portrait font, or vice versa, within the document. At the end of the job, your Summary Sheet would print an error message.

Print Job (Mixed Orientation)

Purpose Sets the starting boundary of a print job with both portrait and landscape orientations on the same page.

Syntax

E+Q,*comment*L

+Q	Instruction to start a document having mixed orientations.
,	Optional request for a Summary Sheet to report errors upon execution of the next job command.
comment	Optional comment on a Summary Sheet
L	Line end.

Where to place it   At the start of the document data.

Example   To begin a job having mixed font orientations, *with* a Summary Sheet having the comment "This page has two font orientations", enter:

E+Q,This page has two font orientationsL

More   Font selections are entered after Print Job (more about this in the next chapter, "Using fonts"). In the example below, notice the "P" for portrait and the "L" for landscape in the font names, indicating that both orientations are used.

E+Q,This page has two font orientationsL

E+1Helvetica12i2-PL   *(Font name is Helvetica12i2-P)*

E+2Helvetica10i2-PL   *(Font name is Helvetica10i2-P)*

E+3Helvetica8Bi2-PL   *(Font name is Helvetica8Bi2-P)*

E+3Titan14B-LL   *(Font name is Titan14B-L)*

Margins and all other job contents

E+XL

Reset

Purpose   Sets the boundary marking the end of the job and returns parameters to the default settings.

Syntax

E+**X**,*comment*L

+X	Instruction to end the job.
,	Optional request for a Summary Sheet to report errors upon execution of the next job command.
comment	Optional comment on a Summary Sheet.
L	Line end.

Where to place it   After all job data.

Example   To end a job, request a Summary Sheet, and include the comment "This job is now complete", enter:

E+X,This job is now completeL

More   Once the printer receives the Reset command, all parameters set by the other commands are cancelled, including font indexes and the UDK.

Using a Print Job rather than a Reset command to end one document and start the next instructs the printer to continue using all parameters entered during previous jobs.

Formatting the printed output

The commands discussed in this section determine the formatting of the job's printed output—how many copies will be printed, which paper tray you will print from, whether the document is 1-sided or 2-sided, and so on. These commands are:

— Print Multiple Copies
— Print Multiple Copies (Non-Collated)
— Paper Tray
— Bypass Slot Paper Size
— Offset
— 2-sided Start
— 2-sided Invert Start
— 2-sided Stop
— 2-sided Side Select.

You do not need the commands unless you want settings that are different from the defaults.

Also covered in this section is:

— Comment, which allows you to make notes in your job without their appearing in the printed output or otherwise affecting the job.

Multiple Copies

Purpose Determines the number of uncollated copies when more than one copy is desired.

Syntax

E+C*n,comment*L

+C	Instruction to print multiple copies.
n	Indicates the number of copies to be printed, up to 999 copies.
,	Optional request for a Summary Sheet
comment	Optional comment on a Summary Sheet.
L	Line end.

Where to place it Anywhere on the first page of the document.

Example To print 50 copies of a document, request a Summary Sheet, and print the comment "Distribute this to all committees", enter:

E+C50,Distribute this to all committeesL

More At the end of the job, enter Reset (E+X) command, unless you want the same number of copies for the next job.

If n = 0, the command is ignored and defaults to printing one copy.

The maximum number of copies that can be requested at the printer control panel is 99.

Multiple Copies (Non-Collated)

Purpose   Determines the number of uncollated copies printed when more than one is desired.

Syntax

E+E*n*,*comment*L

+E   Instruction to print multiple copies.

n   Indicates the number of copies to be printed, up to 999 copies.

,   Optional request for a Summary Sheet, if enabled through the printer control panel.

comment   Optional comment on Summary Sheet.

L   Line end.

Where to place it   Anywhere on the first page of the document.

Example   To print 50 copies of a document, request a Summary Sheet, and print the comment "Distribute this to all committees," enter:

E+E50,Distribute this to all committeesL

Pages will not be collated; the output will be 50 copies of page one, then 50 copies of page two, etc.

More   At the end of the job, enter a Reset (E+X) command, unless you want the same number of copies for the next job.

If n = 0, the command is ignored and defaults to printing one copy.

The maximum number of copies that can be requested at the printer control panel is 99.

Paper Tray

Purpose	Selects a paper source other than the default.

Syntax

```
Ecn
```

c Instruction for tray selection.

n Indicates tray selection in table 2-2:

Where to place it Before any printable data on the page. If Paper Tray is entered within the printable contents of the page, it will take effect on the *next* page.

Example To print from Tray 1, enter:

```
Ec1
```

More Entering Paper Tray overrides any selections made through the Emulation Menu for Paper Source and Auto Tray. With Paper Tray, when the selected paper tray is empty the printer stops and waits for the specified paper tray to be filled again.

Table 2-2. **Physical and logical paper tray selections**

Physical paper tray	Logical paper tray command: Ecn
HCF (optional high-capacity feeder), 1, 2	n=0
1	n=1
2	n=2
HCF	n=3
1	n=4
1, 2	n=5
HCF, 2	n=6
HCF, 1	n=7
Bypass	n=9

The command remains in effect until either a Reset command or another Paper Tray command is received. Thus, it is possible to change paper trays within a document as many times as you wish.

If more than one Paper Tray command is entered on a page, the printer recognises only the last one.

Notes: If Tray sequence mode is enabled, the same size paper trays, the same paper size, and the same paper type should be installed in the selected trays.

The factory default tray selection is trays 1 and 2.

Bypass Slot Paper Size

Purpose Indicates the paper size being fed through the bypass slot.

Syntax

> E**zyb***n*

zyb Instruction for paper size being manually fed.

n Indicates paper size selection

Where to place it At the start of the page, before any text prints, and after the Paper Tray selection command (E*c*9). If this command is entered after any printable data, it takes effect on the *next* page.

Example To print from the bypass tray on letter-size paper, enter:

E*c*9E*zyb*0

Notes: This command accommodates paper sizes that will not print on the 4213. The user may get incorrect printed output that is formatted for the page size, but is not *printed* on that page size. The maximum paper width and length that can be used on the 4213 are 257 mm x 364 mm. The minimum length is 190 mm.

Specifying an *n* value smaller than the minimum length, such as *n*=6 (A6, 105 x 148 mm), or *n*=C [Postcard, (89 mm x 140 mm) (3.5″ x 5.5″)] will cause the printer to jam.

The 4213 printer defaults only to letter size and A4 margins with this command. Undesirable results may occur when the default margins do not match the actual paper size. Use margin commands to ensure correct formatting.

Adjustable sizes set for the bypass at the printer control panel are overriden by this command.

Table 2-3 shows the paper size and default margins of the *n* parameter.

Table 2-3. **Bypass tray paper size selections**

Physical paper size	n	Margin default
Letter (216 x 279 mm)	n=0	Letter
Legal (216 x 279 mm)	n=1	Letter
Ledger (279 x 432 mm)	n=2	Letter
A3 (297 x 420 mm)	n=3	A4
A4 (210 x 297 mm)	n=4	A4
A5 (148 x 210 mm)	n=5	A4
A6 (105 x 148 mm)	n=6	A4
C5 envelope (162 x 229 mm)	n=7	A4
DL envelope (110 x 220 mm)	n=8	A4
ISO B5 (176 X 250 mm)	n=9	A4
Executive/Monarch (184 x 267 mm)	n=A	Letter
Statement (140 x 216 mm)	n=B	Letter
Postcard (88.9 x 142 mm)	n=C	Letter
Eurolegal (8.5 x 13″)	n=D	Letter
Monarch envelope (98 x 191 mm)	n=E	Letter
#10 envelope (4.125 x 9.5″)	n=F	Letter

More
This command takes effect whenever the bypass slot is chosen, either through the Emulation Menu, or the paper source selection command (Ec9).

The command remains in effect until either a Reset command or another paper tray or bypass slot paper size command is received. The default value is restored after a reset.

If more than one bypass slot paper size command is entered on a page, the printer recognises only the last one.

Note: 2-sided printing is not possible with this command.

Offset

Purpose
Offsets sheets in the stacker at specified places in the job.

Syntax

```
Eo
```

Where to place it
Before any printable data on the page. If Offset is entered within the printable contents of the page, it takes effect on the *next* page.

More
The default condition for offsetting is set through the printer control panel. Pages can be offset:

— At job boundaries with E+P
— Upon explicit command (Eo).

Refer to the *Xerox 4213 Laser Printer User Guide* for information on setting the default.

The printer's offset feature works like a toggle; that is, each time either a job control command or an Offset command is entered, the condition of offsetting is toggled to its opposite state, which is either *enabled* or *disabled.* Thus, it is possible to change the state of offsetting within a job as many times as desired.

If you were printing a *2-sided* job and included an Offset command at the top of pages 2, 3, 4, 5, 6, and 7 (2/3, 4/5, and 6/7), no offsetting would appear because of the "toggling" of the command. If an Offset command were at the top of pages 3, 5, and 7, then pages 3/4 and 7/8 would offset, and all subsequent pages in other jobs would also offset.

To offset a mixed orientation job, use an `E +P` followed by an `E+Q` at the beginning of the job.

Note: This command is ignored if the Output Offset feature is disabled at the printer control panel.

2-sided (book)

Purpose   Enables 2-sided printing "head-to-head" (see 2-sided Inverted for "head-to-toe"). It also includes the option of shifting the margin of the second page.

Head-to-head 2-sided printing means that the page is printed in the same position on both the front and back pages. This manual is printed in regular head-to-head 2-sided page format.

Syntax

E**zyd***n*L

zyd   Instruction to start 2-sided printing.

n   The number of pixels by which the margin of the second page is shifted. If no value is entered for *n*, the second page is printed without shifting.

The left margin is shifted regardless of the page orientation.

L   Line end.

Where to place it   Before printable data on the first page to be printed 2-sided. If 2-sided is entered after the printable data, it takes effect on the next page, rather than on the current one.

More   If you choose to shift margins, ensure that the margins have been set within page boundaries so that none of the text runs off the page.

Both 2-sided and 2-sided Inverted are cancelled by 2-sided Stop.

2-sided printing can be enabled either through the printer control panel or with the printer commands. The printer commands override any defaults set through the printer control panel.

Note: 2-sided printing is not supported in the manual bypass.

2-sided Inverted (pad)

Purpose   Enables 2-sided printing "head-to-toe" (see 2-sided (book) for "head-to-head").   It also includes the option of shifting the margins of the second page.

Head-to-toe 2-sided printing means that the top of the front page is printed in the same position as the bottom of the back page.

Syntax

```
Ezyfnʟ
```

zyf   Instruction to start 2-sided printing.

n   The number of pixels by which the margin of the second page is shifted.   If no value is entered for *n*, the second page is printed without shifting.

The top margin is shifted regardless of the page orientation.

ʟ   Line end.

Where to place it   Before any printable data on the first page for which 2-sided printing is to start.   If 2-sided Inverted is entered on the page after printable data, it takes effect on the *next* page, rather than on the current one.

More   If you choose to shift margins, ensure that the margins have been set within page boundaries so that none of the text runs off the page.

Both 2-sided and 2-sided Inverted are cancelled by 2-sided Stop.

2-sided printing can be enabled either through the printer control panel or with the printer commands.   The printer commands override defaults set through the printer control panel.

2-sided Stop

Purpose Stops 2-sided printing and returns to 1-sided printing.

Syntax

```
EzyeL
```

zye Instruction to stop 2-sided printing.

L Line end.

Where to place it Any place on the *last* page to be printed in 2-sided format.

More Switching to and from 2-sided printing within a document can slow the printer's performance. If one page is to be printed 1-sided within a large 2-sided job, it may be more efficient to send a blank page for the second side of the 1-sided page.

The printer commands override defaults set through the printer control panel. Thus, a 2-sided Stop command can be used to override a default set for 2-sided printing.

2-sided Side Select

Purpose On a 2-sided page, selects the side of the page on which the next image will be placed. In effect, it causes a form feed, thus enabling you to skip a page at any given point within a 2-sided document.

Syntax

```
Ezyin
```

zyi Instruction to insert a form feed for a blank page.

n Indicates on which side of the page the printer is to continue printing:

   0   Select next side. Printing continues on the next side of the page (front or back)

   1   Select next *front* side. Printing continues on the next front side of the page

   2   Select next *back* side. Printing continues on the next back side of the page

Where to place it   Any place within the contents of the *preceding* page.

Example   Entering:

`Ezyi0`

within the current side of a page causes printing to continue on the *next* page (or next side of the page).   No blank page is inserted.

Entering:

`Ezyi1`

within the current side of a page causes printing to continue on the next *front* side of a page.   Therefore, if the current side is the front side; a form feed (blank page) is entered for the back side and printing continues on the front side of the *next* page.   If the current side is the back side, no blank page is entered.

Entering:

`Ezyi2`

within the current side of a page causes printing to continue on the next *back* side of a page.   Therefore, if the current side is the back side, a form feed (blank page) is entered for the front side; printing continues on the *back* side of the *next* page.   If the current side is the front side, no blank page is inserted.

More   In 1-sided mode, this command is ignored.

Comment

Purpose   Enables comments to be inserted into a coded document.   They do not appear in the printed output or on the Summary Sheet.

Syntax

E**zya***comment text*L

zya   Instruction to enter comments.

comment text   The comment itself.   Use any alphanumeric or special characters, as desired.

L   Line end.

Where to place it   Any place in the job.

Example   The following shows part of a coded document as it appears on screen, with comments inserted into the coding:

E+Xʟ

Eᴢʏᴀ Clear settings with the Reset commandʟ

E+Q,ʟ

Eᴢʏᴀ Start a new documentʟ

E+1Helvetica8Bi2-Pʟ

E+2Helvetica14Bi2-Pʟ

E1Eᴢʏᴀ Select fonts before setting marginsʟ

Fonts on the 4213

A *font* is a collection of letters, numbers and special characters all having the same *typeface*, *weight*, *size,* and *posture.*

Fonts utilised on the 4213 in XES mode are *digital fonts* — that is, each character or symbol in the font is a digitised bit map. Figure 2-4 shows a font character in bit map form. In electronic form, the printed pixels of the bitmap are represented by ones, the unprinted pixels, by zeros.

Figure 2-4. **A font character as a digitised bitmap**

Besides letters, numbers, and special characters, fonts can also include logos, signatures, or other images that are scanned, then digitised into font characters. These font characters are then assembled on a page to make a graphic image. Unlike other types of graphics, they do not require a graphic window. Graphic windows are discussed later in this manual.

How fonts are stored

Fonts for the 4213 are available in three forms:

1. Resident
2. On cartridge
3. On disk or tape (to download)

The XES emulation has a set of four resident fonts:

1. Titan10iso-P (U.S. portrait default)
2. Titan12iso-P (International portrait default)
3. XCP14iso-L (International landscape default)
4. XCP12.5iso-L (U.S. landscape default)

In XES mode, the 4213 is preset to print in XCP14iso-L. The other fonts can be selected through the Emulation Menu on the printer control panel or with application software (refer to the *Xerox 4213 Laser Printer User Guide).*

Cartridge fonts are indexed and used the same as downloaded fonts. The fonts in the font assignment must be spelled exactly as listed on the font status sheet including lower case letters.

Fonts on diskette or tape can be downloaded to the printer with the Font Load and Font Add commands.

Fonts can be deleted selectively with the Font Delete command. You can also delete *all* fonts from the memory (except for the system fonts) with the Font Unload command.

Note: Font assignment numbers on downloaded fonts may or may not be consecutive. The numbers are only meant to be identifiers and a gap does not imply anything is missing.

How to download fonts from the host computer

The example below demonstrates how to download fonts from a host computer running on MS-DOS in parallel. You create and transmit three files:

- File 1 defines the UDK (if the escape character cannot be used) and initiates the command Font Load (or Font Add) to the printer.

- File 2 copies the UDK and Font Load or Font Add command to the printer, and copies the fonts to the printer.

- File 3 defines the UDK again and resets the printer with the Reset command.

1. Assume that you are running MS-DOS and have loaded the font diskette into drive A of your host computer. You are now ready to create File 1. You are using the Commercial At symbol (@) as a UDK.

   At the C:> prompt on your computer screen, enter:

   copy con:start.doc
        (Press Return.)

   =UDK=@@+F,Font Load
        (Press Return.)

   <CTRL>z
        (Press Return.)

The file has been created to set the printer for font loading.

2. You are now ready to create File 2, which sends the commands and fonts to the printer.

   At the C:> prompt enter:

   copy con:download.bat
        (Press Return.)

   copy start.doc prn:
        (Press Return.)

   copy a:*.FNT prn:
        (Press Return.)

   copy stop.doc prn:
        (Press Return.)

   <CTRL>z
        (Press Return.)

The batch file has been created to load fonts to the printer.

3. Now create File 3, which resets the printer.

    At the C:> prompt enter:

    copy con:stop.doc
        (Press Return.)

    =UDK=@@+X,Font Load Complete
        (Press Return.)

    <CTRL>z
        (Press Return.)

4. All the necessary files have been created.

     At the C:> enter:

    download
        (Press Return.)

Downloading is complete.

Font Load

Purpose Loads fonts from storage media at the host computer to the printer.

Syntax

E+**F**,*comment*L

+**F**   Instruction to load font data.

,   Optional request for a Summary Sheet to report errors upon execution of the next job command.

comment   Optional comment to be printed on the Summary Sheet.

L   Line end.

Notes: When Font Load is used, all the other downloaded fonts on the printer are deleted.

Any constant page downloaded to the printer will be deleted when fonts are loaded or added.

Font Add

Purpose Adds fonts to previously downloaded fonts. The additional fonts come to the printer from storage media at the host computer.

Syntax

E+**A**,*comment*ʟ

+A   Instruction to load font data.

,   Optional request for a Summary Sheet to report errors upon execution of the next job command.

comment   Optional comment to be printed on the Summary Sheet.

ʟ   Line end.

Note: Any constant page downloaded to the printer will be deleted when fonts are added or loaded.

Font Delete

Purpose Deletes selected font files from the printer.

Syntax

E+**B**,*comment*ʟ

*fontname*ʟ

+B   Instruction to delete stored font file.

,   Optional request for a Summary Sheet to report errors upon execution of the next job command.

Note: When you want to delete more than one font file, separate each font file name with a comma.

comment   Optional comment on the Summary Sheet.

ʟ   A line end separates the command from the font names.

fontname   Name of font or fonts to be deleted

ʟ   Line end.

Example To delete two fonts, "Classic8iso-L "and "Classic6iso-L," and to request a Summary Sheet with the command "These two fonts are now deleted" enter:

E+B,These two fonts are now deletedʟ

Classic8iso-L,Classic6iso-Lʟʟ

File names must be entered *exactly* as they are named, including upper and lower case letters, and punctuation.

Font Unload

Purpose Deletes all downloaded font files from the printer.

Syntax

E+**U**,*comment*ʟ

+U	Instruction to delete stored font files.
,	Optional request for a Summary Sheet to report errors upon execution of the next job command.
comment	Optional comment on the Summary Sheet.
ʟ	Line end.

Example To delete all fonts and to request a Summary Sheet with the comment "All fonts are now deleted" enter:

E+U,All fonts are now deletedʟ

Using fonts in a document

If you are using only the default font in your document, you do not need the commands discussed here. However, if you want to access other fonts on the printer, instruct the printer with the Font ID Assignment command. This command sets up your font selections in an index and assigns an identification number to each. You then select from this font index at any place in the document with the Font Change command.

The most common place to enter Font ID Assignment is immediately after Print Job and any job formatting commands (such as Paper Tray). However, you can set up an index anywhere in the document. The advantage of this is that, while you can index up to 10 fonts (using 10 different font ID numbers) with a single Font ID Assignment, more than 10 may be used by repeatedly creating *new* indexes throughout the document.

The number of fonts that can be used on a page is limited only by the memory capacity of the printer.

Up to 512 fonts (including cartridge fonts) can be present at the same time, provided the downloaded fonts do not exceed the available memory of the printer. Because there are four resident fonts, 508 is the maximum number of fonts the user can download.

Note: The 4213 may require up to 10% more internal storage for existing XES fonts from previous XES printers.

Font ID Assignment

Purpose Sets up a numbered index of up to 10 fonts stored on the printer. These fonts can then be selected by their ID numbers in the document.

Syntax

E+*nfontname*L

+*n* The instruction to assign an ID number, with n being the number from 0 to 9.

fontname The name of the font to correspond to this number.

L Line end.

Where to place it After the Print Job command and the Paper Tray command, or any point in the document where you want to select fonts.

Example   To create an index of five fonts, enter:

E+0Classic8iso-LL

E+1Classic8Biso-LL

E+2Classic6iso-LL

E+3Classic12iso-LL

E+4Classic10iso-LL

Once the files have been assigned identification numbers, they are selected by number with the Font Change command. For example, to select Classic8Biso-L within a document, enter

E1

More   The font name must be entered exactly as it is listed on the font directory, including the correct uppercase and lowercase letters.

Although only 10 fonts can be entered into an index with Font ID Assignment, you can use more fonts by reassigning font ID numbers within the document.

For example, if you were using the font index created above in a report, in one part of the report you can use font 3 as it is assigned above by entering:

E+3Classiciso12-LL

In another part of the report, you can replace this font with another by entering

E+3Classic14iso-LL

Unless fonts are reassigned with a new Font ID Assignment, the font assignments extend across job boundaries until a Reset command is received.

It is also possible to give more than one ID number to a font; in such a case, you can use either number with the Font Change command to select that font.

If you try to assign an index number to a font that is not available, the printer ignores all references to that ID number and prints an error message on the Summary Sheet. Since the font ID number is ignored, the text continues to print in the current font.

Font Select

Purpose	Selects a font from those listed in the index created with Font ID Assignment.
Syntax	

> E*n*

n	The ID number for the font, from 0 to 9.
Where to place it	Anywhere in the document at which you want to use this font.
Example	From the following index:

E+0Classic8iso-LL

E+1Classic8Biso-LL

E+2Classic6iso-LL

E+3Classic12iso-LL

E+4Classic10iso-LL

to select Classic8Biso-L within a document, enter:

E1

More If you specify a number that is not assigned first with a Font ID Assignment, the printer continues printing with the current font. An error message appears on the Summary Sheet.

To select the default landscape font (without having assigned a font ID), use E0.

To select the default portrait Titan font (without having assigned a font ID), use E1.

You may want to select either the default portrait or landscape font to identify the page orientation. The first font called out determines the orientation of the page.

Setting units of measure

Margins and tabs are set either in units of five pixels (1/60 inches) or in units of one pixel (1/300 inches). You select the unit of measure by entering Units—1/60th or Units—1/300th. The Units commands are entered *before* those for margins or tabs settings. They need not be entered immediately before, however. You do not need to enter a Units command more than once in a job.

When the printer is powered on, units of measure are set at 1/60th inches automatically. The Reset command, which clears all settings, also returns the units to 1/60 inches. Thus, at the start of a job, if you want to use 1/60 inch for your unit of measure, you need not use the Units command.

If your job requires calculations for absolute or relative placement of text, or for nongraphic lines, all of which are measured in units of one pixel or 1/300 inch, you may want to select Units—1/300 for margins and tabs as well.

Appendix B, "Conversion tables for units of measure," lists 1/60 and 1/300 inch equivalents for inches, millimetres, 10-pitch characters, and 12-pitch characters.

Units—1/60

Purpose Sets five pixels (1/60 inch or .42 millimetres) as the unit of measure for margins and tabs.

Syntax

```
Ezg
```

Where to place it Before the margins or tabs command to which it applies.

Units—1/300

Purpose Sets one pixel (1/300 inch or .08 millimetres) as the unit of measure for margins and tabs.

Syntax

```
Ezf
```

Where to place it Before the margins or tabs command to which it applies.

About margins

The most common place in the job to enter the margin settings is *after* the Font ID Assignment or Font Change commands. This is because the font determines the orientation of the page. Refer to "How the printer defines a page," for additional information on page and font orientations.

You can set:

- All four margins for a page with the Margins command

- One margin individually with the Margin Top, Margin Bottom, Margin Left, or Margin Right commands.

All margins commands are cleared either by another Margins command or by a Reset command.

More about page and font orientations

On a page of *single* font orientation, if a change of setting for page height and/or top margin is entered within the printable contents of the page, the new setting goes into effect at the start of the *next* page.

On a page of *mixed* font orientation, when a change of setting for page height and/or top margin follows a change of orientation, the new setting goes into effect immediately.

Margin settings do not adjust automatically with a change of orientation. If a page is of mixed font orientation, the margins should be reset with each change. If margins from the previous orientation are used, the printer may interpret them as being outside the page boundaries; it then reverts to the default margins.

More about page boundaries

Normally, the printer does not print beyond the right margin nor make line-end decisions. Lines that are too long to fit within the margins will be cut off.

Selecting a larger font after composing a page in a smaller font could cause your text to be cut off at the right margin.

If you enter a change of setting within the printable contents of a page and the new setting for the bottom margin is below the current text position, the bottom margin goes into effect for the next page.

Setting illogical margins, (such as a top margin below a bottom one), or setting margins out of page boundaries causes the printer to revert to the default margins.

If the printer receives several Margins commands while formatting a page, the last command it receives will be used on the *next* page.

Text placement restrictions on the 4213 printer

The following restrictions apply to page boundaries on the 4213 printer:

- Any text printing beyond the bottom edge of the paper is printed on the next page.

- Any character printing beyond the right edge of the paper is not printed.

Margins

Purpose   Sets all four margins for a page.

Syntax

Em*H*,*T*,*B*,*L*,*R*Ꝇ

m	Instruction to set margins.
H,*T*,*B*,*L*,*R*	Margin values in units of either five pixels (1/60th inch or .42 mm) or one pixel (1/300th inch or .08 mm), with commas to separate values.
H	Height of the page. The distance between the top edge and the bottom edge of the page.
T	Top margin. The distance from the top edge of the page to the baseline of the characters in the first line of text.
B	Bottom margin. The distance from the bottom edge of the page to the baseline of the last line of text.

L	Left margin. The distance from the left edge of the page to the left side of the first character where each line is to be printed.
R	Right margin. The distance from the *left* edge of the page to where the right side of the last character in each line is to be printed.
L	Line end.

Where to place it   After the Units command, before any printable data of the page for which it is to take effect. If the command is placed *within* printable data, it takes effect on the *next* page.

Example   To set margins for an 216 by 279 mm portrait page: page height, 279 mm; top margin, 1 inch; bottom margin, 1 inch; left margin, 1.5 inches; right margin, 7.5 inches from the left edge.

With units of measure in five pixels (1/60 inches), enter:

Em660,60,60,90,450L

With units of measure in 1/300 inch (or pixels), enter:

Em3300,300,300,450,2250L

Refer to figures 2-5 and 2-6.

Figure 2-5.   **Measuring a portrait page**

Figure 2-6.   **Measuring a landscape page**

Setting independent margins

The Margin Top, Margin Bottom, Margin Left, and Margin Right commands allow you to set or change one or more margins on a page without affecting other margins selected using the default margins or the regular margin commands.

If margins have been defined with the Margins command and then an independent Margins command is entered, the printer continues to use the measurements in the Margins command for all other settings. If no other margins have been set, the printer uses the defaults for the other settings.

The same rules that apply to the Margins command also apply to the commands for independent margins.

Margin Top

Purpose   Sets the top margin without affecting the other margins.

Syntax

> Ezn*T*L

zn   Instruction to set top margin.

T   The distance (in units of 1/60 or 1/300 inch) from the top edge of the page to the baseline of the characters in the first line of text to be printed.

L   Line end.

Where to place it   After the Units command, before any printable data on the page for which it is to take effect. If the command is placed within printable data, it takes effect on the next page.

Margin Bottom

Purpose   Sets the bottom margin without affecting the other margins.

Syntax

> Ezq*B*L

zq   Instruction to set bottom margin.

B   The distance (in units of 1/60 or 1/300 inch) from the bottom edge of the page to the baseline of the characters in the last line of text to be printed.

L   Line end.

Where to place it   After the Units command, before any printable data on the page for which it is to take effect. If the command is placed within printable data, it takes effect on the next page.

Margin Left

Purpose   Sets the left margin without affecting other margin settings.

Syntax

```
Ezkᴸᴸ
```

zk   Instruction to set left margin.

L   The distance (in units of 1/60 or 1/300 inch) from the left edge of the page to where the left side of the first character in each line is to be printed.

ᴸ   Line end.

Where to place it   After the Units command, before any printable data on the page for which it is to take effect.

Margin Right

Purpose   Sets the right margin without affecting the other margins.

Syntax

```
Ezmᴿᴸ
```

zm   Instruction to set right margin.

R   The distance (in units of 1/60 or 1/300 inch) from the left edge of the paper to where the right side of the last character of text in the line is to be printed.

ᴸ   Line end.

Where to place it   After the Units command,before any printable data   on the page for which it is to take effect.

About tabs

The tabs commands include:

- Tabs Horizontal
- Tabs Clear Horizontal
- Tabs Vertical
- Tabs Clear Vertical.

More about job boundaries

The tabs you enter with commands remain in effect until the printer receives either a Tab Clear or a Reset command.

A Tabs Clear Horizontal command clears *all* horizontal tabs, including defaults, until the end of the job or until a new Tabs Horizontal is entered.

A Tabs Clear Vertical command clears *all* vertical tabs, including defaults, until the end of the job or until a new Tabs Vertical.

If no tabs have been set for a job and a tab is indicated within its contents, the printer automatically uses the following default tabs:

Horizontal: Every sixth character from the left margin
Vertical: Every inch.

Note: If no tabs have been set for a job using a portrait font, the 4213 automatically uses the default portrait tabs. If no tabs have been set for a job using a landscape font, the 4213 automatically uses the default landscape tabs.

More about page boundaries

You may set a line of tabs in any numerical order on the page; the printer sorts them in ascending order.

Ensure that your tab settings do not exceed the page boundaries. A tab setting beyond page boundaries may cause a page feed.

If you set a horizontal tab beyond the *right margin*, the printer will process it as a space; no text will print beyond the margin. If you set a vertical tab beyond a *bottom margin*, the printer will process it as a page feed; no text will print beyond the margin.

Tabs Horizontal

Purpose   Defines tabs across the page, measuring from the left edge of the page. Whenever you press the tab key on the host computer once the tabs are set, the printer skips from the current text position to the next horizontal tab position.

Syntax

Et*n1,n2,...,n160*L

t	Instruction to set horizontal tabs.
n1,n2,..,n160	Tab settings across the page starting from the left edge. Up to 160 tabs can be set in one command. Commas separate values. See table 2-4 for default horizontal tab values for portrait and landscape pages.
L	Line end.

Where to place it At the start of the job or anywhere a horizontal tab is desired.

Example Figures 2-7 and 2-8 show a line of tabs across an 216 by 279 mm portrait page. Figure 2-7 shows the settings in units of five pixels (1/60 inches). Figure 2-8 shows the same settings in units of one pixel (1/300 inches).

More Up to 160 horizontal tabs may be set per job. If you try to set more, the printer will consider all tabs to the right of the last tab setting as spaces. This will affect the appearance of the page.

Table 2-4. **Default values for horizontal tabs**

Position	U.S. portrait	U.S. landscape	International portrait	International landscape
1st tab	1.1 inch 28 mm 330 dots	1.1 inch 28 mm 330 dots	1.04 inch 26.4 mm 313 dots	1.04 inch 26.4 mm 313 dots
Intervals	0.44 inch 11.2 mm 132dots	0.44 inches 11.2 mm 132 dots	0.48 inches 12.2 mm 144 dots	0.48 inches 12.2 mm 144 dots

Figure 2-7.   **1/60 inch units.**

Et90,150,160,210,255,270,330,345,390,420L

Figure 2-8.   **1/300 inch units.**

Et450,750,800,1050,1275,1350,1650,1725,1950,2100L

Tabs Clear Horizontal

Purpose	Clears all horizontal tab settings in a job, including the default settings.

Syntax

```
Ed
```

d   Instruction to clear all horizontal tab settings.

Where to place it   Anywhere *before* the place in the job at which the current tab settings are to be cleared.

More   If horizontal tabs are cleared and no new ones are set, the printer considers a horizontal tab character as a space.

Tabs Vertical

Purpose Defines tabs down the page, measuring from the top edge of the page. Once vertical tabs are set, whenever you press the vertical tab key on the host computer, the printer skips from the current text position to the next vertical tab position.

Syntax

E**v***n1,n2,.....,n125* L

v Instruction to set vertical tabs

n1,n2,..,n125 Tab settings starting from the top edge. Up to 125 tabs can be set in one command. Commas separate values. The positions of the first tab and tab intervals for U.S. and international paper, both landscape and portrait, appears in table 2-5.

The printer maintains up to 125 vertical tabs in memory per job. See table 2-6 for maximum tab values for portrait and landscape pages in letter and legal size.

L Line end.

Where to place it At the start of the job, or anywhere a vertical tab is desired.

Example Figures 2-9 and 2-10 show a line of tabs down an 216 x 279 mm landscape page. Figure 2-9 shows the settings in units of five pixels (1/60 inches). Figure 2-10 shows the same settings in units of one pixel (1/300 inches).

More Up to 125 vertical tabs may be set per job. If you attempt to tab past the bottom margin, the printer will skip to the top margin of the following page.

Table 2-5. **Initial vertical tab positions and tab intervals**

Position	U.S. portrait	U.S. landscape	International portrait	International landscape
1st tab	1.1 inch 28 mm 330 dots	1.1 inch 28 mm 330 dots	1.0 inch 25.4 mm 300 dots	0.95 inches 23.1 mm 287 dots
Intervals	1.0 inch 17.8 mm 210 dots	0.7 inches 17.8 mm 210 dots	1.0 inches 25.4 mm 300 dots	0.7 inches 17.8 mm 210 dots

Table 2-6. **Maximum values for vertical tabs**

Units	Letter portrait	Letter landscape	Legal portrait*	Legal landscape*
1/60	660	510	780	510
1/300	3300	2550	3900	2550

* 8.5 x 13

Figure 2-9.   **Vertical tabs in 1/60 inch units.**

Ev90,120,150,160,210,255,270,330,345,390,420,450L

Figure 2-10.   **Vertical tabs in 1/300 inch units.**

E **v** 450, 600, 750, 800, 1050, 1275, 1350, 1650, 1725,1959, 2100, 2250L

Tabs Clear Vertical

Purpose   Clears all vertical tab settings in a job.

Syntax

```
Ee
```

e   Instruction to clear all vertical tab settings.

Where to place it   Anywhere *before* the place in the job at which the current tab settings are to be cleared.

More   If vertical tabs are cleared and no new ones are set, the printer considers any vertical tab character encountered in the document as a page end.

Justifying and centreing between margins

About justification

To justify text between margins, use the Justification command. This command is cleared with the Justification Stop Command.

About centreing

To centre text between margins, use the Centre command.

A Centre command overrides a Justification Start command. Once you insert a Centre command, a line will not justify, even with a Justification Start command.

Any spaces or tabs placed on a line that has a Centre command will be included in the text to be centred.

Do not try to centre a line by moving it to the centre of the host screen then following with the Centre command. The spaces from the left margin will be included as if they were characters and your text will not be centred.

Justification Start/Stop

Purpose   Justifies text between right and left margins.

Syntax

> E**j**

j   Instruction to start justification.

Syntax

> E**k**

k   Instruction to stop justification.

Where to place it   Anywhere justification is desired, with the start command placed immediately before the first character in the line to be affected, the stop command placed immediately after the last character in the line to be affected.

Example   To produce:

The   printer   justifies   text   by   varying   space between all the words on the line. However, the printer does not make line ending or hyphenation decisions.   You   must   enter   the   appropriate   line ends for each line.

Enter:

E**j**The printer justifies text by varying space⌐
between all the words on the line. However,the ⌐
printer does not make line ending or hyphenation⌐
decisions. You must enter the appropriate line⌐
E**k** ends for each line.⌐

More   The minimum distance between words cannot be *less than* half the space character, nor can it be *more than* three times the space character. If these guidelines are not followed, the printer will not justify the line.

When justifying a single line of text, enter a line end *before* the Justification Stop command. For example:

E**j**This is a single line of text to be justified.⌐E**k**

You can justify an entire document by giving the Justification Start command at the beginning of the text. However, to improve the appearance of the text, you may want to enter the Justification Stop command before the last line of each paragraph, then, at the beginning of the next paragraph, enter another Justification Start.

Centre

Purpose   Centres a line of text between the left and right margins.

Syntax

Eq

q   Instruction to centre a line of text.

Where to place it   Anywhere within the line to be centred.

Example   To produce:

> To centre text
>
> between the left and
>
> right margins,
>
> use this command.

Enter:

E**q**To centre textL

E**q**between the left andL

E**q**right margins,L

E**q**use this command.L

More   Since the line end itself acts as a signal to stop centreing, you can insert the Centre command anywhere within the line, as long as it is inserted *before* the line end.

If a Centre command is entered in a line that has been placed with the Text Placement Absolute command, the line will still be placed vertically between the current margins. The *vertical* positioning of the Text Placement Absolute is still valid, but the *horizontal* positioning is overridden by the Centre command. Refer to "About the page formatting features," for information on Text Placement Absolute.

When the printer receives a Centre command for a line that extends beyond both left and right margins, it extends the excess equally beyond both margins; an error message appears on your Summary Sheet.

About the page formatting features

This section covers commands that enable you to:

- Select line spacing other than regular, single line spacing with either the Line Spacing command (for spacing that is font based) or the Line Spacing Absolute command (for spacing set pixel by pixel)

- Place text (or any digitised font characters such as logos or signatures) at virtually any point on the grid of the page with either the Text Placement Absolute command (for placing text relative to the page origin) or the Text Placement Relative command (for placing text relative to the current text position).

- Draw horizontal and vertical lines along the page axes with Line Draw X and Line Draw Y commands in 15 degrees of shading.

Most of these commands use the grid of the page (the origin, x-axis, and y-axis), which is discussed in "How the printer defines a page."

Line Spacing

Purpose Adjusts the amount of spacing between lines of text. Line Spacing is *font based*; that is, it gives you five choices for spacing, all of which are based on the size of the *largest current font* on the line.

Syntax

E**i**_n_

i Instruction for line spacing.

_n_ The amount of spacing, based on the largest current font:

0 Single spacing

1 One and a half-line spacing

2 Double spacing

3 Triple spacing

4 Half line spacing

Where to place it   Immediately before the beginning of the line for which the new spacing is intended (preferably, at the end of the previous line).

Example   To produce:

Text printed in this font with normal, single
spacing looks like this.

Entering a Line Spacing command with

a parameter of 2 will cause text to double

space like this.

Enter a Line Spacing command with a parameter of

0 to return text to normal,single spacing.

Enter:

Text printed in this font with normal,singleL
spacing looks like this.Ei2L
Entering a Line Spacing command withL
a parameter of 2 will cause text to doubleL
space like this.Ei0 L
Enter a Line Spacing command with a parameterL
of 0 to return text to normal,single spacing.L

More   Overstriking of characters may occur when half line spacing is selected; it may also occur if a line is placed using a Vertical Tabs, Text Placement Relative, or Text Placement Absolute command.

Line Spacing Absolute

Purpose   Adjusts the amount of spacing between lines of text. Unlike Line Spacing, which is font based, Line Spacing Absolute adjusts spacing pixel by pixel.

Syntax

EipnL

ip   Instruction for interline spacing.

n   The new line spacing expressed in pixels (1/300th inch or .08 mm).

L   Line end.

Where to place it   Immediately before the beginning of the line for which the new spacing is intended (preferably, at the end of the previous line).

Example   Enter:

These lines of text have normal, single lineʟ
spacing until you enter a Line Spacing Absoluteʟ
command with a parameter of 75.Eip75ʟ
At this point,the baselines of the text areʟ
placed 75 pixels (one quarter inch) apartʟ
like this.Ei0ʟ
To return to the previous line spacing, enterʟ
Line Spacing or Line Spacing Absolute withʟ
the original spacing value,ʟ
or if at the end of the job, issue E+X to reset to defaults.ʟ

To produce:

These lines of text have normal, single line
spacing until you enter a Line Spacing Absolute
command with a parameter of 75.

At this point,the baselines of the text

are placed 75 pixels (one quarter inch) apart

like this.
To return to the previous line spacing, enter
Line Spacing or Line Spacing Absolute with
the original spacing value,
or if at the end of the job, issue to reset to defaults.

More   The printer always prints at least one line per page, no matter how high the parameter entered for spacing.

Text Placement Absolute

Purpose   Places text in any specified location on the page, starting from the page origin. It can also be used to place logos, signatures, or any other data that has been digitised into font characters.

Syntax

> E a*X,Y*L

a	Instruction for absolute placement.
X	The distance in pixels from the origin of the page, along the x-axis, to the starting point of the text line.
Y	The distance in pixels from the origin of the page, along the y-axis, to the starting point of the text line.
,	A comma separates these variables.
L	Line end.

Where to place it   Immediately before the text to be placed.

Example   To place a line of text, the starting point of which will be 1200 pixels (100 mm/4 inches) from the origin of the page along the x-axis, and 1650 pixels (140 mm) from the origin of the page along the y-axis, enter:

Ea1200,1650L (Text)L

Figures 2-11 and 2-12 show how the command works on short-edge feed paper, in landscape and portrait orientations. Compare the origins and the x- and y-axis of each page orientation.

More   As shown in figures 2-11 and 2-12, Text Placement Absolute places portrait fonts differently than landscape fonts. When you are placing text with portrait fonts, the command defines the starting point for the *baseline* of the first character. When you are placing text with landscape fonts, the command defines the top left corner of the *character cell* of the first character.

Figure 2-11. **Absolute placement of a portrait font on a short edge feed portrait page**.

`Ea1500,3000L`

He who laughs
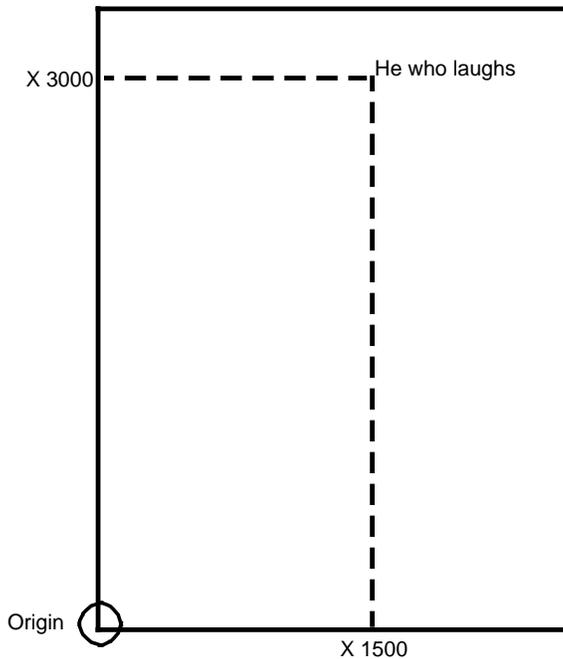
Figure 2-12. **Absolute placement of a landscape font on a short edge feed landscape page.**

`Ea1800,600L`

The game is not over until it's over.
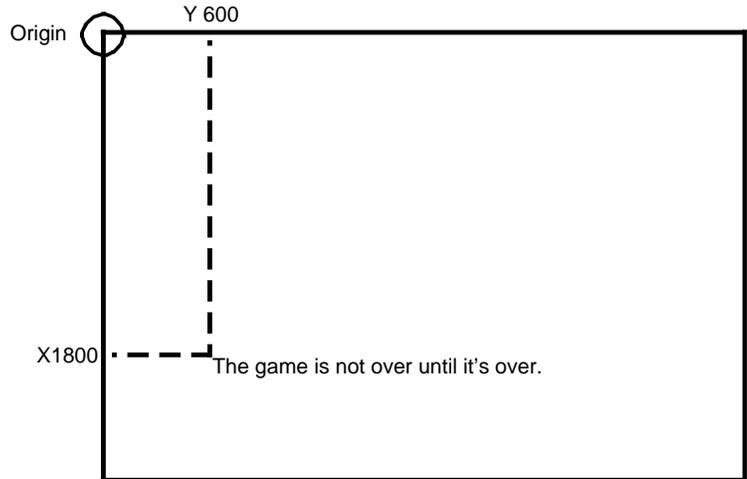
Text Placement Relative

Purpose Places text in any specified location on the page, starting from the current text position. It can also be used to place logos, signatures, or any other data that has been digitised into font characters.

Syntax

Er*Dnc*

r	The instruction for relative placement
D	A character indicating the direction from the current text position in which the text is to be placed:

	u	Up
	d	Down
	l	Left
	r	Right

n	The distance in pixels (or 1/300th inch) from the current text position to the new text position.
c	Any non-numeric character can be used to complete this command.

Note: This is one of a few commands using a printable character rather than a line end for completion. *Do not use a line end.*

Where to place it   Immediately after the current text (that is, the text being used as a point of reference) and immediately before the text to be affected.

More   For both landscape and portrait pages, it is possible to print text off the left edge of the page. For example, entering Erl3000b will not cause an error. However, any text after the command and before a line end will print off the page.

Example   To place text 75 pixels to the left of the current position, enter

*(Current text)*Erl75e(New text)

As shown in figure 2-13, the final word of a sentence is placed 1500 pixels down from the current text position.

Figure 2-13.   **Relative placement 1500 pixels down**

To produce:

Enter:

He who laughs**Erd**1500*e*last.

Line Draw X

Purpose   Draws a line along the x-axis of the page.

On short edge feed paper, this line runs horizontally across a portrait page, vertically down a landscape page

Syntax

E**x***X,Y,L,T,S*L

x   The instruction for a line to be drawn along the x-axis.

x   The x-coordinate of the starting point of the line; the distance in pixels from the page origin, along the x-axis, to the starting point.

	Y	The y-coordinate of the starting point of the line; the distance in pixels from the page origin, along the y-axis to the starting point.
	L	The length of the line; the distance in pixels from the starting point to the end point.
	T	The thickness of the line, in pixels.
	S	The degree of ink shading on a scale of 0 to 15. If no shading is desired, the s value can be omitted. See figure 2-16 for the 15 degrees of shading.
	,	Commas separate the variables.
	L	Line end.

Where to place it   At any point in the job where the line is desired.

Example   See the sample that follows.

More   The Line Draw commands create *nongraphic* lines; that is, lines that do not need graphic windows. Nongraphic lines can only be drawn on either the x- or y-axis, horizontally or vertically; they cannot be drawn diagonally. Refer to "What is a graphic window" for information on graphics windows.

The following figure shows a horizontal line drawn on the x-axis of a short edge feed portrait page, the starting point of which begins at four inches across the page and 6 inches up. It is two inches long and 80 pixels thick. It is printed in black; no shade of grey is selected.

Figure 2-14.   **Line Draw X command**

To produce:

Enter: E**x**1200,1800,600,80L

Line Draw Y

Purpose   Draws a line along the y-axis of the page.

On short edge feed paper, this line runs vertically up a portrait page, horizontally across a landscape page..

Syntax

E**y**X,Y,L,T,SL

y   The instruction for a line to be drawn along the y-axis.

x   The x-coordinate of the starting point of the line; the distance in pixels from the page origin, along the x-axis, to the starting point.

Y	The y-coordinate of the starting point of the line; the distance in pixels from the page origin, along the y-axis, to the starting point.
L	The length of the line; the distance in pixels from the starting point to the end point.
T	The thickness of the line, in pixels.
S	The degree of ink shading on a scale of 0 to 15. If no shading is desired, the s value can be omitted. See figure 2-16 for the 15 degrees of shading.
,	Commas separate these variables.
L	Line end.

Where to place it At any point in the job where the line is desired.

Example See the sample that follows:

More The Line Draw commands create *nongraphic* lines; that is, lines that do not need graphic windows. Nongraphic lines can only be drawn on either the x- or y-axis, horizontally or vertically. Refer to "What is a graphic window," for information on graphics windows.

The following figure shows a vertical line drawn on the y-axis of a short edge feed portrait page, the starting point of which begins at three inches across the page and 6 inches up. It is four inches long and 20 pixels thick. It is printed in black; no shade of grey is selected.

Figure 2-15.   **Line Draw Y command**

To produce:

Enter: E**y**900,1800,1200,20**L**

Figure 2-16. **Fifteen degrees of shading for the Line Draw commands**

About character formatting

The character formatting commands provide some character control without a change of fonts. You can do the following:

- Bold (although a bold font may be preferable)

- Underline

- Overstrike with any printable character

- Create subscripts or superscripts.

Note: These commands increase page complexity and can slow the performance of the printer.

Italics

There is no command for italicising characters. You must select an italic font with the Font ID Assignment and Font Change commands, see "Fonts on the 4213 printer").

Bold Start/Bold Stop

Purpose   Creates boldface text without the use of a bold font.

Syntax

Eb

Syntax

Ep

b   Instruction to start bold.

p   Instruction to stop bold.

Where to place it   Anywhere bolding is desired, enter the Bold Start command immediately before the first character to be bolded and the Bold Stop command immediately after the last character to be bolded.

Example   To produce:

It is possible to bold text **without using a bold font**; simply insert the appropriate commands.

Enter:

It is possible to bold text **Eb**without using a bold font;
Epsimply insert the appropriate commands.

More   In most cases, using a bold font gives better results, especially for large sections of text.

Underline Start/Underline Stop

Purpose   Underlines text.

Syntax

Eu

Syntax

Ew

u   Instruction to start underlining.

w   Instruction to stop underlining.

Where to place it   Anywhere underlining is desired.

Example   To produce:

It is possible to underline text <u>by using the following commands</u>: Underline Start and Underline Stop.

Enter:

It is possible to underline text**Eu**by using the following
commands**Ew**: Underline start and Underline stop.

More   Both the thickness of the underline and its distance from the character it underlines are determined by the size of the current font in the line. So if you underline in a large font and then change to a small font for the text in the next line, you may want to enter the Font Change command for the smaller font *before* entering the line end. This will prevent the underline for the larger font from crowding the smaller characters on the next line.

The underline character prints under the character descender.

Overstrike Start/Overstrike Stop

Purpose	Overstrikes text with any selected printable character.

Syntax

```
Ezox
```

Syntax

```
Ezp
```

zo	Instruction to start overstriking.
x	Whatever character you choose to act as the overstrike character.
zp	Instruction to stop overstriking.
Where to place it	Anywhere in the text where overstriking is desired, with the Overstrike Start command immediately before the first character to be overstruck, and the Overstrike Stop command immediately after the last character to be overstruck.
Example	To produce:

The hyphen - is used as the overstrike character.

You can use the overstrike commands to strike out ~~certain portions of~~ text with any character you choose.

Enter:

You can use the overstrike commands to strike out
Ezo-certain portions of**Ezp** text with any
character you choose.

Note: Spaces are not overstruck in justified text.

Subscript Start/Subscript Stop

Purpose	Subscripts characters.

Syntax

```
El
```

Syntax	Es

| I | Instruction to start subscripting. |
| s | Instruction to stop subscripting. |

Where to place it Anywhere subscripting is desired, with the start command immediately before the first character to be subscripted, the stop command immediately after the last character to be subscripted.

Example To produce:

C_2H_5OH

Enter:

CEI*2*EsHEI*5*EsOH

More The subscript commands cannot be used to:

- Subscript a subscript

- Index down a page

- End a superscript.

The distance of a subscript character from a regular character depends on the current font size. Thus, if you want to use a smaller or larger font for the subscript, give the Font Change command immediately after Subscript Start and return to the original font before Subscript Stop.

In the example below, the regular letters are entered using font number 5, and the subscripts are entered using the smaller font number 6.

To produce:

C_2H_5OH

Enter:

E*5*CEIE*62*E*5*E*s*HEIE*65*E*5*E**s**OH

To underline a subscript at its own level, give the Underline Start command *after* the Subscript Start command.

Superscript Start/Superscript Stop

Purpose Superscripts characters.

Syntax
```
Eh
```

Syntax
```
Es
```

h   Instruction to start superscripting.

s   Instruction to stop superscripting.

Where to place it   Anywhere superscripting is desired, with the Superscript Start command immediately before the first character to be affected, and the Stop command immediately after the last character to be affected.

Example   To produce:

To thine own self be true.[a]

Enter:

To thine own self be true.**Eh***a***Es**

More   The superscript commands cannot be used to:

- Superscript a superscript

- Index up a page

- End a subscript

The distance from a superscript character to a regular character depends on the current font size. If you want to use a smaller or larger font for the superscript, give the Font Change command immediately after Superscript Start and return to the original font before Superscript Stop.

In the example below, the regular letters are entered using font number 3, and the superscript is entered using font number 4.

To produce:

To thine own self be true.[a]

Enter:

E*3*To thine own self be true.**Eh****E***4a***E***3***Es**.

To underline a superscript at its own level, give the Underline Start command *after* the Superscript Start command.

What is a constant page?

A constant page is a document created especially for merging with other documents. A document to be merged with a constant page is referred to as a *variable page* (figure 2-17). You can only merge one constant page with a variable page. The constant page and variable page do not need to be of the same orientation.

A constant page in the 4213 may include:

• Text

• Nongraphic lines (Line Draw commands)

• Logos, signatures, or any other data digitised into font characters

• Graphic windows.

• A constant page is created with the Merge Page Load command and remains in the printer *until you do one of the following tasks:*

— Unload it with the Merge Page Unload command.

— Load another constant page.

— Load fonts.

— Switch emulations.

— Power the printer off.

Figure 2-17.   **Constant page**
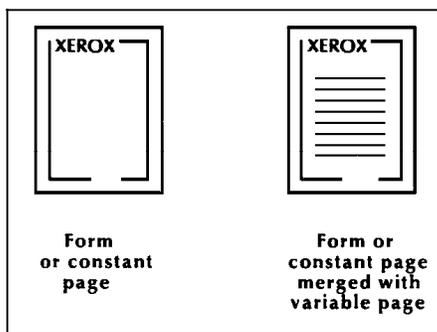
Creating constant pages

Note that you start creating the document with Merge Page Load, not with Print Job, which is used to start most other documents.

A constant page is ended with either:

•   a form feed (<FF>)

•   a Print Job command (E+P)

•   a Print Job (Mixed Orientation) command (E+Q), or

•   a Reset command (E+X).

Note: The Reset command (E+X) cancels the font, margin, and tab assignments, which have to be reassigned in the constant page to be merged.

Data capacity for each

"How the printer defines a page," lists page capacity for all types of data, including constant pages. Data capacity is the same for both, that is, it is limited only by the amount of space available in the printer's memory.

Merge Page Load

Purpose   Creates a constant page and keeps it in the printer's memory temporarily.

Syntax

E+M,*comment*L

+M   Instruction to start a constant page.

,   Optional request for a Summary Sheet to report errors upon execution of the next job command.

comment   Optional comment on Summary Sheet.

L   Line end.

Where to place it   At the beginning of the constant page data.

Example   `E+M`,This begins a constant page`L`

More   End the constant page with a Reset command (`E+`**X**).

Notes: Using Font Load or Font Add commands within the Merge Page Load command deletes the newly defined constant page.

The Graphic Window Repeat command is not supported when this command is in effect.

Merge Page Unload

Purpose   Erases the constant page from the printer's memory.

Syntax

`E+`**V**, *comment*`L`

+**V**   Instruction to erase a constant page.

,   Optional request for a Summary Sheet to report errors upon execution of the next job command.

comment   Optional comment on Summary Sheet.

`L`   Line end.

Example   `E+V`,This constant page is now erased`L`

More   This command technically sets an end of job boundary. However, unlike a Reset command, it does not return settings to the defaults, *except* for the Multiple Copies command.

If, within job boundaries, Merge Page Unload is entered *after* Multiple Copies, Multiple Copies is cancelled and the default takes effect.

For example, entering commands in the following order will cancel the request for three copies:

E+P∟   *(Print Job)*

E+C*3*∟   *(Multiple Copies)*

E+V∟   *(Merge Page Unload)*

   (Printable contents of job)

E+X∟   *(Reset)*

To prevent this, switch the order of Merge Page Unload and Multiple Copies:

E+P∟

E+V∟

E+C*3*∟

   (Printable contents of job)

E+X∟

A constant page is also erased when fonts are downloaded, when a selected font is deleted, when a new constant page is loaded, or when the printer is powered off.

Merging constant pages

For as long as a constant page is kept in memory, it can be selected for merging. The commands for merging are:

- Merge Start
- Merge Stop

Merge Page Start and Merge Page Stop are entered on the variable page.

Merge Start

Purpose   Starts merging the constant page with the variable page.

Syntax	Eze

ze   Instruction for constant page merging.

Where to place it   Anywhere on the variable page *after* Print Job.

More   The printer continues merging the page with subsequent pages until it receives a Merge Stop or a Reset command.

If no merge page is in memory when the command is received, the printer ignores the command.

Merge Stop

Purpose   Stops the merging of the constant page with the variable page.

Syntax	Ezd

zd   Instruction to stop merging.

Where to place it   Within the contents of the *last* page you want merged. The page in which Merge Stop is entered will be merged, but the subsequent page will not.

Graphics on the 4213

Graphics supported on the 4213 include:

- Raster graphics
- Vector graphics
- Macro graphics.

These three types of graphics must be created within the boundaries of a *graphic window*. (Graphic images that have been digitised into font characters, such as logos or signatures, do not require a graphic window.)

Note: There may be a minor difference in appearance of complex graphics on the 4045 laser printer and the 4213 laser printer.

Raster graphics

Raster graphics are images made up of binary bit maps (0s and 1s) loaded from the host into the graphic window. When the printer receives the bitmap into the window, it prints a pixel on the page for each binary 1 and leaves the pixel blank for each binary 0 (see figure 2-18).

For the printer to receive the bitmap data and interpret it correctly, the data must be *sixel-encoded*. Refer to the procedure for sixel encoding in appendix C.

Raster graphic data is the default. Unless you select vector or macro graphics with the graphics commands, the printer automatically initialises the window for raster data. If you create a graphics file for raster data, you can add commands for vector graphics at the end of the file.

Figure 2-18.   **Raster   data**

Complex raster graphic
Setting the page buffer to "FULL" (full page imaging) in the XES emulation submenu means that the 4213's memory dedicated to this imaging is no longer available for user downloaded fonts or graphics or any other temporary use. This means that a full page graphic that prints completely in "PARTIAL" imaging may not print if the page buffer is set to "1 FULL" or "2 FULL."

Example: A 2.5 MB system with 2 FULL page imaging can store only a small number of fonts (about 8 fonts of 25KB each) or graphics. That same 2.5 MB system with "PARTIAL" imaging could store 2 full page graphics or over 80 25KB fonts. The same full page graphic prints completely in partial imaging but not in 2 full page imaging.

Vector graphics

Vector graphics are images made of point-to-point lines created by command. The three commands for vector graphics are:

- Graphic Line
- Graphic Arc
- Graphic Fill.

Macro graphics

Macro graphics are images made with high level commands, which perform several functions at once. The 4213 has two macro graphics:

- Pie Chart
- Graphic Box.

What is a graphic window?

A graphic window is an area, defined on the page, that the printer recognises as graphic data. It can be temporarily stored in the printer. The commands for defining and storing graphic windows are:

- Graphic Window
- Graphic Window Repeat.

If a graphic window has been stored in the printer's memory, it remains until you power off the printer, switch emulations, or perform a reset.

Note: If the printer receives graphic data that is incomplete, e.g. the data has fewer bytes than the window size, the next Form Feed command may be ignored, causing unpredictable results.

Origin and page orientation

The graphic window's origin is always the corner of the window closest to the upper left hand corner of the page. It is independent of page origin, feed direction, or paper size. (See figure 2-19).

Since window boundaries cannot be seen on your host computer screen, you may want to sketch an outline of the window on paper, then enter the commands based on the measurements in your sketch.

Figure 2-19. **Graphic windows for portrait and landscape printing**

Placement on the page

You can define a window so that part of it is located either above the top of the page or below the bottom of the page. If you place an entire window off the page, nothing is printed and an error message appears on the XES Summary Sheet.

You can place windows and copied windows on top of each other on the page. However, this type of page complexity may slow the processing speed of the printer.

Other characteristics

With the Graphic Window command, you determine:

- Whether or not the window will be magnified to appear larger on the printed output than its actual size; and, if so, by how much. You can select magnification for a window when you want a graphic to cover a larger area on the page but do not want to use the memory required for a large window. Magnifying a window, however, reduces its resolution.

- What type of graphics data—raster, vector, or macro—the window will contain.

- Whether the graphics will be reversed. When graphic images are reversed, a black image on a white background becomes a white image on a black background and vice versa.

- The location and size of the window, given in two pairs of x- and y-coordinates, as shown in figure 2-19. The first coordinates, X and Y, set the location of the window's origin on the page. The second coordinates, S_x and S_y, set the size of the window. The unit of measure is the pixel.

Scan direction for raster graphics

The x-axis and y-axis of a graphic window are not related to those of the physical page. The scan direction for a graphic window always runs along its x-axis (from X to S_x). Raster data fills the window in this direction. This differs from the scan direction of the page, which runs along the page's y-axis. Figures 2-19 and 2-20 show how the scan direction of the page differs from that of the graphic window.

In a job using raster data, the Graphic Window command is followed immediately by the sixel encoded bitmap, which is sent to the printer from the host.

When defining a window for *raster* graphics, ensure that the number of pixels you enter for its size along the x-axis is a multiple of eight. You do not need to made a similar calculation for the window's y-direction; the printer does this automatically.

Graphic Window

Purpose   Defines an area on the page for graphics.

Syntax

E**gw***M(or Mx/My),I,R;X,Y,Sx,Sy*L

gw   The instruction for graphic window. Commas separate the variables.

M or
Mx/My   The degree of magnification. M_x represents magnification in the horizontal or x-direction; M_y represents magnification in the vertical or y-direction.

        If only one value for M is entered, then magnification is the same for both directions.

        0 or *1*   No magnification

        2   Window size on the printed page appears twice its actual size.

        4   Window size on the printed page appears four times its actual size.

        For example, 2/4 indicates that the window size is to appear doubled in the horizontal direction and quadrupled in the vertical direction.

I   The type of graphics data the window will contain. Also indicates whether the image will be printed as is, or if it will be reversed.

        0   Raster data

        1   Reversed raster data

        2   Vector or macro data

        3   Reversed vector or macro data

R   The factor for rotation in the current orientation.

        0   No rotation

        1   32°C (90°F) counterclockwise

        2   180° counterclockwise

        3   270° counterclockwise

;   The semicolon is required. If it is omitted, the command is ignored.

X , Y   The origin of the graphic window. X is the distance along the page's x-axis from the page's origin to the graphic window's origin. Y is the distance along the page's y-axis from the page origin to the graphic window origin.

Sx,Sy   The size of the graphic window, in the horizontal and vertical directions, respectively. Sx is the number of pixels making up the size in the horizontal direction, measured from the graphic window origin. Sy is the number of pixels making up the size in the vertical direction, measured from the graphic window origin.

L   Line end.

Where to place it   At any place within the document where graphics are desired.

More   Fields before the semicolon in the command are optional; fields *after* it are required. Thus, you could leave the M , I and R fields blank; the printer will still create a window based on the values entered for X,Y,Sx,Sy. If you enter a value for R, but none for M and I, then commas must be inserted in place of M and I. The command for such a window looks like this if 180° rotation is chosen:

Egw,,2;900,3000,600,450L

Example   To create a graphic window:

• With no magnification

• Filled with vector commands

• Whose origin is located 900 pixels on the x-axis, 3000 pixels on the y-axis from the origin of the page

• Measuring from its own origin, 600 pixels along its x-axis, 450 pixels on its y-axis,

Enter:

Egw*1,2*;**900,3000,600,450L**

Figure 2-20.   **A graphic window on a page**

Note: A 4046 laser printer requires an XGRAPH cartridge to match the rotated image on the 4213 laser printer.

More about graphic windows

Page capacity for graphic windows

The size of a graphic window depends on the amount of memory installed in the printer.

The largest graphic window can be up to one half the available memory. Only one window at a time can be stored.

Large amounts of graphics and fonts together on the same page can slow the printer's performance. For information on total page capacity, see, "How the printer defines a page."

You can use memory more effectively by creating smaller windows, then magnifying them to appear larger on the page (with lower resolution).

More about magnification

Graphic images can be magnified in two ways:

- Proportionally
- Anamorphically.

An image magnified *proportionally* looks the same as its original, except that it is larger and has lower resolution. The image has been magnified by the same amount in both the x- and y-directions.

An image magnified *anamorphically* is larger in one direction—either x or y.

Magnification and resolution

Magnifying an image decreases its resolution by an equal amount. In other words, an image that has been doubled will have half the normal resolution. Images in an unmagnified window contain 300 pixels per inch. When the window contents are doubled, the images have 150 pixels per inch and the dots are doubled in size. Figure 2-21 illustrates the difference in resolution.

Figure 2-21. **Magnification and resolution**

Magnification and window placement

When a graphic window is magnified, it is expanded *downward* and *to the right* from the graphic window origin. To keep the magnified window from expanding off the page, place the window origin so that it is near the upper left hand corner of the page.

You can also determine placement of the magnified window by multiplying the magnification number (2 or 4) by the window's size in the x- and y-directions, then measuring from the origin downward for the y-dimension and to the left for the x-dimension.

For example, in the landscape page in figure 2-22, your origin is 1300, 1200 for a window that is 450 pixels in the x-direction and 1100 pixels in the y-direction. If this window is magnified by 2, the final size of the printed graphic is 900 pixels by 2200 pixels. At its current position, the graphic will print off the bottom edge of the page.

The solution is to move the window origin up. Moving the window 950 pixels up places the bottom edge of the window along the bottom edge of the paper. Adding a margin of 50 pixels results in a new origin of 300,1200. (See figure 2-22.)

Figure 2-22.   **Changing placement for a magnified window**

Reversing images

Figure 2-23 illustrates how the printer reverses a graphic image when instructed within the Graphic Window command.

Figure 2-23.　**Normal printing and reversed printing.**

Rotating images

Figure 2-24 illustrates how the printer rotates a graphic window and its contents if so instructed within the Graphic Window command. Notice how rotation affects graphic window positioning and how images look when rotated 90 degrees, 180 degrees and 270 degrees. Rotation is counterclockwise. The window origin remains the same.

Figure 2-24. **Graphic window rotation**

Graphic commands and the current text position

If you do not specify coordinates for a graphic window origin within the graphic window command, the printer will use the *current text position*, that is, wherever the next character of text would be, as a default point for the graphic window origin. (Otherwise, text positioning and graphic window positioning are independent from one another.)

If you place a graphic window at the current text position on a page and add a paragraph to text above the graphic window, the window moves down automatically. The current text position is not affected by the creation of a graphic window. If you start entering text after creating a graphic window, the characters will begin printing after the last position in which text was entered on the page. Figure 2-25 gives an example of the graphic window relative to the current text position.

Figure 2-25. **Current text position**

Text before graphic window.   Text after.

Note: You may want to use the Text Placement Absolute and Text Placement Relative commands (see "About page formatting features") for placing text on a page with a large number of graphics.

Graphic commands and the current graphic position

The current graphic position may be defined as the set of x- and y-coordinates for the last graphic image created on the page. These coordinates in either the Graphic Line or the Graphic Box command will update the current graphic position.

Copying graphic windows

Once you have defined a graphic window, it can be copied elsewhere on the page. Graphic windows are copied with the Graphic Window Repeat command.

A copied graphic window has exactly the same characteristics as the original. If it is a stored window, its contents may be magnified, reversed, or added to, but *cannot* be rotated.

After a graphic window has been defined and copied on the same page before being printed, any new data entered into the original window also appears in the duplicate window when the document is printed.

The coordinates you set in the Graphic Window Repeat command define the origin of the first copy, then the origins of any other copies of that window. You may set coordinates for multiple copies of a window with a single Graphic Window Repeat command. Each set of x- and y-coordinates in the command defines an origin for a copied window.

Note: On the 4213 laser printer, the number of copied windows is limited by memory unless you are operating in full bit map mode.

Graphic Window Repeat

Purpose   Copies a graphic window and places it on the page.

Syntax

$$\mathbb{E}\mathbf{gr}M\textit{(or Mx/My),I;X1,Y1,Xn,Yn}\mathbb{L}$$

gr	Instruction to copy a graphic window.
M or	
Mx/My	The degree of magnification for the duplicate window. M_x is horizontal magnification; M_y, vertical magnification.

0 or 1   No magnification
2   Duplicate window size doubled
4   Duplicate window size quadrupled

I	The type of graphics data contained in the window. Also, whether the contents will be reversed.

Graphics data in a duplicate window can be changed from regular to reversed or vice versa. In other words, raster data can be changed to reversed raster data.

0   Raster data
1   Reversed raster data
2   Vector or macro data
3   Reversed vector or macro data

;	The semicolon is required. If it is missing, the command is ignored. Commas separate the other variables.
X,Y	The origin of the duplicate window. X is the distance along the x-axis of the page to the duplicate window origin. Y is the distance along the y-axis of the page to the duplicate window origin.

Xn,Yn	Origins of other duplicate windows if more than one is to be made on the page. X_n is the distance along the x-axis of the page to the duplicate window origin. Y_n is the distance along the y-axis of the page to the duplicate window origin.
L	Line end.

Where to place it   Wherever you want a duplicate of a window.

Example   In figure 2-26, the window that was defined in the example for the Graphic Window command (refer to figure 2-20) is copied to another location on the same page. This is the command that defined the original window:

E**gw** *1,2*;**900,3000,600,450**L

To copy this window with the following changes:

- Change the vector data to reversed vector data

- Duplicate it on the same page at the coordinates 900, 1500.

Enter:

E**gr***0,3*;*900,1500*L

Note: The Graphic Window Repeat command is not supported within a Merge Page Load (E+M) job.

Figure 2-26.   **A graphic window copied at another location on the   page**

Creating graphic images

The commands for creating graphic images are:

- Graphic Line
- Graphic Arc
- Graphic Box
- Graphic Fill
- Graphic Pie Chart.

All must be created within a graphic window, which means a Graphic Window command must precede them in the job.

All measurements for the commands are in pixels, unless otherwise indicated.

For the X and Y variables in the commands, any number from minus 16,000 to 16,000 may be specified. Negative and positive numbers outside window boundaries are acceptable, but only the segment of the image within the window will print.

When a number for X is missing in a command, the printer uses the x-coordinate from the current graphic position. When a number for Y is missing, the printer uses the y-coordinate from the current graphic position.

Each command includes a variable for the line thickness of the image drawn. The maximum line thickness for a graphic image is 15 pixels; even if you enter a larger number, the line prints 15 pixels thick and no error is reported. If no variable for thickness is entered in the command, the printer uses three pixels as a default.

If a line thickness of zero is entered, no image prints; however, the current graphic position changes to the last set of x- and y-coordinates entered.

Graphic Line

Purpose   Draws lines between any two points within the graphic window.

Syntax

E**gl**T;$X1,Y1,X2,Y2,Xn,Yn$L

gl	The instruction to draw a graphic line.
T	The thickness of the line. The maximum value is 16. No error message is generated if a greater value is entered.
;	The semicolon is required. If it is omitted, the command is ignored. Commas separate the other variables.
$X1,Y1$	The coordinates of the first point in the line. X is the horizontal distance, from the left edge of the graphic window. Y is the vertical distance, from the top edge of the graphic window.
$X2,Y2$	The coordinates of the second point in the line.
Xn,Yn	The coordinates of the next point in the line.
L	Line end.

More   You can have as many sets of coordinates for a line as desired.

If the value for X_1 is omitted, the printer uses the x-coordinate from the current graphic position. If this line is the first graphic image drawn in the window, the x-coordinate of the window origin is substituted for the x-value.

If the value for Y_1 is omitted, the printer substitutes the y-coordinate from the current graphic position. If this line is the first graphic drawn in the window, the y-coordinate of the window origin is used as the y-value.

If the value for X_2 is omitted, the printer repeats the first x-coordinate, X_1. For all succeeding coordinates, the x-coordinate of the preceding point is used as a default if a new value is missing.

If the value for Y_2 is omitted, the printer repeats the first y-coordinate, Y_1. For all succeeding coordinates, the   y-coordinate of the preceding point is used as a default if a new value is missing.

Example   To create the line in figure 2-27 which is five pixels thick and draws four lines between five pair of coordinates, enter:

Egl5;150,1050,300,600,600,975,900,525,1200,1050L

Figure 2-27. **A graphic line drawn inside a graphic window**

Graphic Arc

Purpose   Draws arcs and circles within the graphic window (figure 2-28).

Syntax

E**ga***T;X,Y,r,S1,E1,Sn,En*L

ga   The instruction for a graphic arc.

T   Line thickness of the figure. This number can not exceed one half the radius.

;   The semicolon is required. If omitted, the command is ignored. Commas separate the other variables.

X,Y   The coordinates for the centre of the arc. X is the horizontal distance from the left edge of the graphic window to the centre point. Y is the vertical distance from the top edge of the graphic window to the centre point.

r	The radius of the arc.
S1	The starting point of the arc, expressed in degrees on a circle. The printer draws in a counterclockwise direction.
E1	The ending point of the arc, expressed in degrees.
Sn,En	Additional pairs of starting and ending angle degrees, as many as desired. If either point is missing from the pair, the other is ignored and an error message appears on the Summary Sheet. The starting degree cannot be the same as the ending degree. Degrees must be positive, whole numbers.
L	Line end.

Figure 2-28. **Arcs**

More   If the degree of either the starting angle S_n or the ending angle E_n is missing, the printer ignores the command. If neither a starting nor an ending degree is indicated, the printer draws a complete circle.

Example To create the four arcs in figure 2-29 with the following specifications:

- Drawn with a line 13 pixels thick

- Having the same centre point, at coordinates 375, 375 in the graphic window

- With a radius of 225 pixels

- Drawn as follows:

  — Arc 1 from 45 degrees to 135 degrees
  — Arc 2 from 155 degrees to 205 degrees
  — Arc 3 from 225 degrees to 315 degrees
  — Arc 4 from 335 degrees to 25 degrees.

Enter:

`Ega13;375, 375, 225, 45,135, 155,205, 225,315, 335,25L`

Figure 2-29.   **Four arcs drawn with one command**

Graphic Box

Purpose Draws a rectangle by defining two sets of right angles. Two coordinates define the diagonal corners. The printer then fills in the vertical and horizontal lines for the top, bottom, and sides.

Syntax

$$\text{E}\textbf{gb}T;X1,Y1,X2,Y2\text{L}$$

gb Instruction to create a graphic box.

T Line thickness of the figure. The maximum value is 16 pixels. No error message is generated if a greater value is entered.

The width is distributed equally on the inside and outside of the box. The 4213 adjusts the width if it cannot be distributed equally.

; The semicolon is required. If it is omitted, the command is ignored. Commas separate the other variables.

X1,Y1 The coordinates of the first of two points that make up diagonally opposite corners. X_1 is the horizontal distance from the left edge of the graphic window. Y_1 is the vertical distance from the top edge of the graphic window.

X2,Y2 The coordinates of the second of two points.

L Line end.

More If a value for X_1 is omitted, the printer will use the x-coordinate from the current graphic position. If this box is the first graphic drawn in the window, the x-coordinate of the window origin is substituted as the x-value of the corner.

If a value for Y_1 is omitted, the printer will use the y-coordinate from the current graphic position. If this box is the first graphic drawn in the window, the y-coordinate of the window origin is substituted as the y-value of the corner.

Example To create the box in figure 2-30:

• Drawn with a line seven pixels thick

• The coordinates of one corner set at 75,225 in the graphic window

- The diagonal opposite coordinates set at 525,675 within the graphic window

Enter:

Egb7;75,225, 525,625L

Figure 2-30. **A graphic box within a window**

Graphic Fill

Purpose   Fills a closed graphic figure with a pattern. The pattern can be one of the predefined patterns in figure 2-31, or can be created by the user.

Syntax

Egf*P;X,Y,Xn,Yn*L

gf   The instruction for a fill pattern.

P   Indicates the pattern selection.

                0   User defined pattern
                2-17   One of the predefined patterns in figure 2-31

;   The semicolon is required before the next set of variables. If the semicolon is missing, the command is ignored. Commas separate the other variables.

X,Y	Indicates the starting point or seed point of the fill patterns. X is the horizontal distance in pixels from the window's origin to the seed point. Y is the vertical distance in pixels from the window origin to the seed point.
Xn,Yn	Indicates the next seed point for this fill pattern. If you are using a predefined pattern, you may specify as many seed points in one command as desired. With a user-defined pattern, only one seed point can be specified per command.
`L`	Line end.

Figure 2-31. **Predefined fill patterns**

Example   Figure 2-32 is created in the following manner:

- A graphic window is defined with the Graphic Window command. It is 300 by 300 pixels.

- A rectangle with Graphic Box. At 297 pixels square, it nearly fills the window.

- A line with Graphic Line. It consists of five segments between six pair of coordinates.

- The last command, Graphic Fill, selects pattern 7 and defines one seed point in the closed figure made by the line and two sides of the rectangle. Shown in the figure is the seed point location, at coordinates 170,250.

E**gw**1,2;,,300,300L

E**gb**5;3,3,297,297L

E**gl**;3,3,100,250,150,200,200,200,250,150,297,297L

E**gf**7;170,250L

Figure 2-32.   **Fill pattern bounded by a graphic figure**

More   If 0 for a user-defined pattern is entered for P, the fill pattern data is entered after the line end of the Graphic Fill command. User-defined data must be sixel encoded. Refer to appendix C for information on sixel encoding.

You cannot fill an area with more than one pattern.

A fill must start in a closed figure, that is, one surrounded by printed lines. However, the edge of the window can also serve as a boundary for a fill.

The edge of the page cannot serve as a boundary for a fill.

Nongraphic line commands (Line Draw X and Line Draw Y) cannot contain fill patterns even when defined within the boundaries of a graphic window. Notice in figure 2-33 that the pattern is contained only at the boundaries of the closed graphic images.

Example Figure 2-33 is created in the following manner:

- A graphic window is defined with the Graphic Window command.

- Line Draw X and Line Draw Y commands create the inner rectangle. This is a nongraphic image.

- A circle is drawn with the Graphic Arc command.

- A line is drawn through the circle with Graphic Line command. Note that it is defined so that it breaks as it passes through the circle.

- The outside rectangle is drawn with Graphic Box.

- The Graphic Fill command selects pattern 17 and defines one seed point between the inside of the graphic box and the outside of the graphic circle.

E**gw**,2;500,3000,700,700Ŀ

E**x**553,2947,594,3Ŀ

E**x**553,2350,594,3Ŀ

E**y**553,2350,597,3Ŀ

E**y**1147,2350,597,3Ŀ

E**ga**5;350,350,100,0,360Ŀ

E**gl**5;350,3,350,250Ŀ

E**gl**15;350,450,350,697Ŀ

E**gb**5;3,3,697,697Ŀ

E**gf**17;150,150Ŀ

Figure 2-33. **A fill pattern between the boundaries of two graphic images, a circle and a rectangle**

Graphic Pie Chart

Purpose   Creates a complete pie chart, including fill patterns. You can also offset single "slices" from the rest of the pie chart.

Syntax

E**gp**_T;X,Y,r,%1/F1/O1,%n/Fn/On_L

gp	The instruction for a pie chart.
_T_	Line thickness of the figure. Line thickness should not be greater than 1/2 the radius, otherwise unexpected results may occur.
_;_	The semicolon is required. If it is omitted, the command is ignored. Commas separate the other variables.
_X,Y_	The centre point of the pie chart. X is the horizontal distance from the window origin to the centre point. Y is the vertical distance from the window origin to the centre point.
_r_	The radius of the pie chart.

%1	The percent of the pie to be taken up by the first pie slice. The total of all percentages must add up to 100.
/	A slash separates this percentage from the fill pattern number and offset value. Both the fill pattern and offset value are optional.
F1	The number of the fill pattern selection (refer to Graphic Fill).
O1	The offset value, if the slice is to be offset from the centre; the distance from the centre point of the pie to the narrowest point in the pie slice.
%n/Fn/On	Parameters for all remaining pie slices: percentage, fill pattern, and offset value, respectively.
L	Line end.

More   As with the graphic arc, the pie is drawn in a counterclockwise direction.

Remember that the slices are defined in percentages, not angles. Percentages must total 100%.

If the sum of the pie slice is less than 100%, the pie is not closed. If the sum of the pie is greater than 100%, all slices above 100%, whether whole or partial, are ignored, and the pie is not closed. An error message appears on the Summary Sheet.

Note   It is not recommended to use zero as a percentage.

Example   To create the pie chart in figure 2-34:

- Drawn with a line five pixels thick

- At coordinates 450,450 in the graphic window

- With a radius of 285 pixels

- Consisting of five slices:

  — Slice 1 is 20% and is filled with pattern 10; it is offset by 10 pixels.

  — Slice 2 is 30% and is filled with pattern 13; it is offset by 10 pixels.

  — Slice 3 is 10% and is filled with pattern 2; it is offset by 50 pixels.

— Slice 4 is 15 % and is filled with pattern 12; it is offset by 10 pixels.

— Slice 5 is 25% and is filled with pattern 17; it is offset by 10 pixels.

Enter:

Egp5;450,450,285,20/10,30/13/10,10/2/50,15/12/ 10,25/17/10**L**

Figure 2-34.   **Creating a pie chart**

More about Graphic Pie Chart

When creating a pie slice, the printer subtracts the line thickness of the figure from its radius, then uses the remainder as the location of the seed point.

For example, in Figure 2-34, the line thickness of the figure is five pixels. Five pixels is subtracted from the radius. This is the seed point for the fill pattern.

The purpose of the data monitor

The data monitor is a data analysing tool used by the system manager or Xerox representative. It prints the hexadecimal values of incoming character codes and is invoked either by the Data Monitor command or through the Diagnostics menu.

The data monitor may be used to:

- Check for correct printer command syntax
- Check the integrity of the data files
- Check the integrity of font and graphics data.

Note: A data monitor will not print on size A5 paper.

Data Monitor

Purpose
Prints the hexadecimal codes representing all characters received by the printer. Allows the user to analyse data being sent from the host.

Syntax

E+**D**

+D   Instruction to print job contents in hexadecimal values.

Where to place it
Immediately before the document data that is to be printed in hexadecimal.

More
Once the Data Monitor command is entered, it continues to print in hexadecimal code until a Reset command is entered.

Figure 2-35.   **Data monitor printout**

Figure 2-36.   **Close up of data monitor printout**

Note the following about the data monitor printout:

• The characters printed on the right half of the printout are either ISO or EBCDIC characters. The data monitor always uses the translation table for EBCDIC data, regardless of the language selected. If ASCII encoding is selected, ISO characters are printed.

• The *Page number* refers to the pages of the printout, not of the transmitted job.

(Those in figures 2-35 and 2-36 are ISO).

See the *Xerox 4213 User Guide*, Diagnostics chapter for more information on using the data monitor.

Character codes on the Xerox 4213

For the printer to print the characters in a font, each character is assigned a hexadecimal code. The code assigned to a character may vary, according to the data encoding system (ASCII, EBCDIC, or ISO), the language selection, and the characters available in the font selected.

When the host sends the printer a hexadecimal code for a character, the printer knows which character to print because of the assigned table linking the code to each character.

This section discusses the data encoding systems, or coding schemes, supported on the 4213 printer, how to load a table of characters using the Character Reassignment command, and how to switch from one table to another using the Language command.

The actual language code mappings are found in Appendix A. Other tables needed for character assignments are in appendix D, "Reference tables."

Supported coding schemes

Tables D-2, D-3, and D-4 in appendix D list the coding schemes supported by the 4213 printer: ASCII, ISO, and EBCDIC. The ISO coding scheme has been derived by the International Organisation for Standardisation and is intended for use in international markets. Note that the ASCII code set is essentially a subset of the ISO set.

Control codes

Table D-1 lists control codes (with hex value less than 20 in ASCII or ISO; less than 40 in EBCDIC) that are meaningful to the 4213 printer, their most common uses in those environments, and the ways in which the printer responds to them.

7-bit coding schemes

Non-EBCDIC hosts may transmit 7-bit codes to the 4213 printer; however, 7-bit coding schemes are normally unable to invoke font characters whose assigned code has a value greater than 7FH (the primary code set). Most fonts have some characters within the range 80H to FFH (the secondary code set). Multinational character mapping uses characters in the range 80H to FFH to construct a language specific, 7-bit mapping table that includes all standard national language characters.

The Special Table

The Special Table is a translation table that has been designed especially for users operating in an IBM 3274 coaxial connection environment. It can be selected using the Language command (selecting language G).

Note: The Special Table does not recognise control codes (i.e., hexadecimal values less than EBCDIC 40H) or the space character (EBCDIC 40H). These codes must be reassigned to a valid value in the table before they can be used.

Do not select the Special Table for systems using the ASCII encoding.

The Special Table provides 91 codes for symbols, plus the following predefined codes:

EBCDIC 4AH yields ASCII OCH (FF)

EBCDIC 5FH yields ASCII 15H (NL); may be used in place of (CR) and (LF) or line end.

EBCDIC 6AH yields ASCII 1BH (ESC)

EBCDIC 79H yields ASCII 20H (space)

User defined translation tables

A user defined code assignment table can be created and downloaded to the printer, where it remains available as an alternate language selection (language H in the Language command).

Translation table structure

A downloaded translation table, which is created with the Character Reassignment command, has three parts:

- The table load initiator, which is the E+T,L part of the command. It signals to the printer that the data following it is a character table data.

- The table data record or records. This part of the command contains the actual code assignment data. The data may be sent as one long record, or as a series of records.

- The table load terminator, which is the XL part of the command. It signals to the printer that all data records have been sent.

More about the table data record

The data record tells the printer how a new table is to translate incoming data. The format of the table data is very specific and must be followed carefully. The data may be grouped either in one long record or in a series of records.

Each record consists of six elements:

1. The start-of-record indicator
2. The record-type indicator
3. Byte count
4. Load address
5. Table entries
6. Record terminator.

Note: In the descriptions that follow, hexadecimal values are expressed as two alphanumeric characters followed by H. For example, if a field contains a hexadecimal value with a length of two bytes, the field will consist of the two characters used to represent that value as typed at the keyboard. Where alphanumeric characters are indicated, they are enclosed in double quotes, for example "OB".

1. The start-of-record indicator

This is always the letter "S."

2. The record-type indicator

This is a "2," "3," or "4." Each number has a significance:

- 2 alters the U.S. English table for use with any non-ISO font when language H has been specified. (Language H is specified automatically upon completion of the Table download.)

- 3 and 4 alter only the ISO table. The ISO table serves as a base for both ASCII and EBCDIC multinational mappings.

3. Byte count

This is one half the number of bytes (characters) in the *remainder* of the record, including the load address and the two "F"s at the end. Each character in the record represents a four bit hexadecimal value and is always two bytes long.

4. Load address

This is the first hex location to be altered, multiplied by two, and is always four characters long.

For example, if the first location to be altered is 40H, the value to be entered as the load address is "0080". Two leading 0s have been added to produce four characters.

Entry 1 of the table data applies to this location. The printer assumes that all subsequent entries apply to successive hex values. For example, if the load address is 5BH, entry 1 will be applied to hex location 5BH, entry 2 will be applied to hex location 5CH, entry 3 will be applied to hex location 5DH, and so on.

Table D-8 lists hexadecimal values multiplied by two.

5. Table entries

The table data consists of a series of four character entries, one for each location from the load address to the last location to be altered. Intervening locations which do not need to be altered must be included. This is done simply by reassigning their normal hex value; for example, by assigning 7BH to hex location 7BH.

The four characters include the following information:

• The first two characters are the new hex value being assigned to the current location.

   For example, suppose that the Japanese yen sign (A5H) is to be printed from an ISO font. Suppose also that the backslash (5CH) is not needed. A downloaded table can be used to assign the hex value A5H to location 5CH. If 5CH were the first table location, A5H would be the first two bytes of entry 1 in the table data.

- The second two characters of each entry are the hex location of a floating accent character to be printed along with the character specified by the first two bytes. Only the value from column C should be included. The printer automatically selects an accent from column 8 or C, depending on the height of the character with which it is associated. If no floating accent is needed, two 0s should be included here.

For another example, suppose there is no math font in the printer, and the symbol "<" is to be printed. A table could be created that prints the less than sign (<, 3CH) along with the floating underscore character (_, CCH). Suppose you are willing to sacrifice the ampersand (&, 26H). The four byte entry for location 26 would be 3CCCH. Now, if you invoke the downloaded table and send 26H, the printer will print <.

6. Record terminator

The last two characters of every record are the characters "FF". These two bytes must be included in the byte count at the beginning of the record.

Character Reassignment

Purpose   Transmits new character assignments from the host to storage on the printer. This table can then be accessed with the Language command.

Syntax

E+T,*comment*Ł*data record* Ł

+T	Instruction to start loading character table data.
,	Optional request for a job Summary Sheet.
comment	Optional comment on a job Summary Sheet.
Ł	Line end.
data record	A sample record is provided in the example below. The data record is discussed in detail in the preceding section, "More about the table data record."
Ł	Line end.

Where to place it   At the start of the job.

Example   To move the % symbol from its current hex location of 25H to a new location at 7EH, enter:

`E+T,L`

`ES40500FC2500FFXL`

The data record in this example is summarised below.

S	A data record always begins with the letter "S".
4	4 is used here. The use of other numbers excludes certain fonts.
05	Use 05 as the byte count to move one character at a time.
00FC2500	The data following the byte count consists of the the hex values of the character or characters being assigned.
FF	Always put FF at the end of each record. To move more characters, make additional records.
XL	X and L together terminate table loading and should be included after the FF in the last record.

More   The Reset command returns the printer to the default language.

Load Translation Table

Purpose   Loads a special translation table for Laserpage software. This command performs the same function as the `E+T` command, but does not cause a page eject.

Syntax

```
Ezt
```

Language

Purpose		Switches the printer from the current character table to another character table.

Syntax

```
Ezlc
```

zl   Instruction to change character table.

c   The table selected:

0   U.S. English
1   U.K. English
2   French
3   Dutch
4   Spanish
5   Italian
6   Danish
7   Norwegian
8   Finnish
9   German
A   Swedish
B   Belgian
C   French Canadian
D   Portuguese
E   Latin American
F   The Default Language
G   The Special Table (3274) (Custom Cartridge)
H   User-defined or downloaded table

Where to place it   At any place in a job at which a new table is desired.

Example   To switch from the current character table to the table for the Danish language, enter:

Ezl6

More   The Reset command returns the printer to the default language.

Sample job

Suppose that a site does most of its business with firms in the United States, so that the U.S. English code mapping, illustrated in table 2-7, is suitable for most applications, but that it is also necessary to print the following:

Pound sterling

Yen sign

International
currency symbol

Suppose also that the printing of the following characters can be sacrificed.

Backslash   \ , 5CH

Spacing circumflex   ⌃ , 5EH

Spacing grave   ` , 60H

A custom translation table might be built as follows.

Table 2-7.   **U.S. English code mapping**

Building the file

First determine the load address of the entry to be included in the table. The lowest value to be changed is 5CH. Therefore, as shown in the double hex values listed in table D-8, the load address for this table is B8. Since the load address must always be four characters in length, the value to be included as the load address is "00B8".

Next, build the entries to be included in the table:

- The first entry, at location 5C, is to contain the pound sign in the altered table. The pound sterling sign is found in the ISO table at location A3. Since it is not to be associated with an accent character, the first entry is "A300".

- The second entry falls at location 5D. Since this location is not to be changed, the entry here is "5D00".

- The third entry falls at 5E. This location is to be changed to the yen sign, which is found in the ISO table at location A5. It is not to be associated with an accent, so the third entry is "A500".

- The fourth entry, at 5F, is not to be changed: "5F00".

- The fifth entry, at 60, is to be changed to the international currency symbol, from location A8 in the ISO table. The fifth entry is "A800".

Thus far, including the load address and the five entries, the table record consists of the following characters:

00B8A3005D00A5005F00A800

Adding two "F"s to the end of the record yields:

00B8A3005D00A5005F00A800FF

It is now possible to determine the byte count to be included in the record: one load address (four characters), plus five 4-character entries, plus two "F"s yields:

$$4 + (5 \times 4) + 2 = 26$$

The byte count is one half the actual number of characters in the record and must be expressed as a hexadecimal value (26 ÷ 2 = 13). Table D-7 provides a decimal to hex equivalence table that shows that decimal 13 equals decimal 0D. Now the record contains the following characters:

0D00B8A3005D00A5005F00A800FF

The last determination to be made is the record type. Since ISO characters are to be used in this table, either "3" or "4" is appropriate. The entire file then becomes:

```
E+TL

S40D00B8A3005D00A5005F00A800FFL
```

The components of this table record are shown in figure 2-37.

Figure 2-37.   **Completed table download record**

Invoking the base table

Before sending the table data file to the printer, ensure to invoke the mapping table that is to serve as the base table.

When the printer receives the Character Reassignment command, it creates a new table by laying the new data over the mapping table that is currently in effect. Locations not specified in the table data remain the same in the new table as in the original table over which it was laid. (See figure 2-38.) In this example, the new data in the example discussed above is laid over the U.S. English table. The new table is illustrated in table 2-8.

Figure 2-38.   **New character assignments over original table**

Table 2-8.   **Customised mapping table (U.S. English code)**

More about creating tables

The following are important points to remember about creating tables:

- New tables are created by overlaying other tables; always invoke the base table before transmitting new table data to the printer.

- The table data may consist of one or more records.

- The record-type indicator must be selected carefully to avoid changing the wrong tables in the system.

- The load address is always doubled.

- The following locations are assigned to control codes, to frequently used alphanumeric characters, and to characters used in printer command language. It is recommended that these locations not be changed:

  — Any control code location (less than 20H in ISO or ASCII, or less than 40H in EBCDIC)

  — ISO 30H to 39H (numerals 0 to 9), EBCDIC F0H to F9H

  — ISO 41H to 5AH (letters A to Z), EBCDIC C1H to C9H, D1H to D9H, and E2H to E9H

  — To 89H, 91H to 99H, and A2H to A9H

  — ISO 20H, EBCDIC 40H—space character

  — ISO 2BH, EBCDIC 4EH—plus sign (+)

  — ISO 2CH, EBCDIC 6BH—comma (,)

  — ISO 3D, EBCDIC 7EH—equals sign (=)

  — ISO 24H, EBCDIC 5BH—dollar sign ($).

- Each record must be terminated with two "F"s.

The new table remains in the system and can be selected with the Language command. The new table becomes language H.

3. LJ series 2D emulation

The LJ2D emulation can accept fonts from a variety of sources. Some fonts are built into the 4213 printer. Others may be accessed from a cartridge or downloaded from a file. This chapter describes fonts and the font handling capabilities of the LJ2D emulation and covers the following topics:

- Font compatibility
- Primary and secondary fonts
- Font characteristics
- Font selection
- Resident fonts.

Font compatibility

The LJ2D emulation accepts Soft Fonts designed for the HP LaserJet, HP LaserJet +, and HP LaserJet II printers. These fonts may be supplied by Rank Xerox or third-party vendors.

The 4213 LJ2D emulation is also capable of using fonts stored in Xerox 4213 font cartridges. These cartridges may hold up to one megabyte of fonts but are not physically compatible with LaserJet font cartridges. Rank Xerox supplies a range of 4213 font cartridges which provide the same features as the HP LaserJet font cartridges.

Although fonts used in the LJ2D emulation are comparable to the HP LaserJet fonts, there may be some variance in appearance between characters from different sources.

Primary and secondary fonts

The LJ2D emulation allows the user to select two fonts, a primary and a secondary font, and switch between them.

Most font commands have two versions, one for the primary font and another for the secondary font. Once selected, it is possible to switch between them using the single-byte control codes Shift In (SI) (hexadecimal 0F, decimal 15) and Shift Out (SO) (hexadecimal 0E, decimal 14).

The primary font is the default font.

Font characteristics

A font is a set of printable characters that have common features:

- Orientation
- Symbol set
- Font source
- Spacing.
- Pitch
- Height
- Style
- Stroke weight
- Typeface.

Orientation

The orientation of a font defines whether the font characters are printed parallel to the short edge of the paper (portrait orientation) or the long edge (landscape orientation).

Note: The Printer Status Sheet identifies the fonts by their orientation. Choosing a portrait font automatically causes the printer to print in portrait orientation; landscape fonts function likewise.

Text orientations cannot be mixed in the LJ series 2D emulation. Therefore once the orientation is selected, only fonts of that orientation may be printed on a single page. The top, left, and right margins apply to different edges of the paper depending on whether portrait or landscape orientation is selected.

Selecting the orientation of a font also affects the coordinate system used to describe a particular point on the page, as shown in figures 3-1 and 3-2.

Figure 3-1.   Portrait   orientation   page   layout   (y,x)
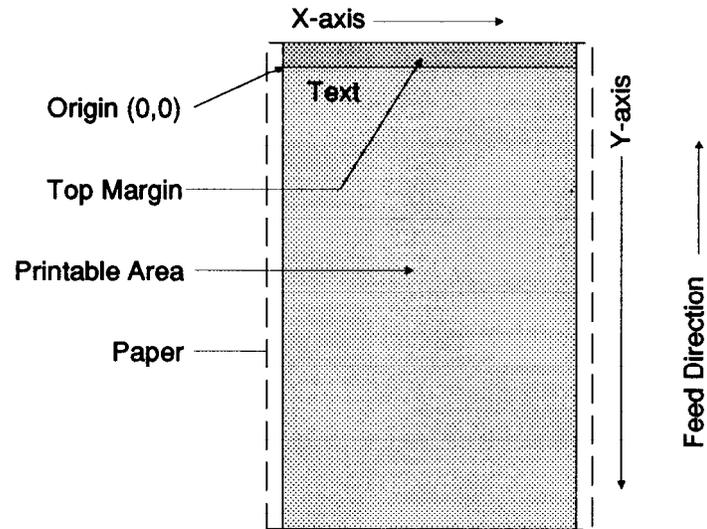
Figure 3-2.   Landscape orientation page layout (x,y)
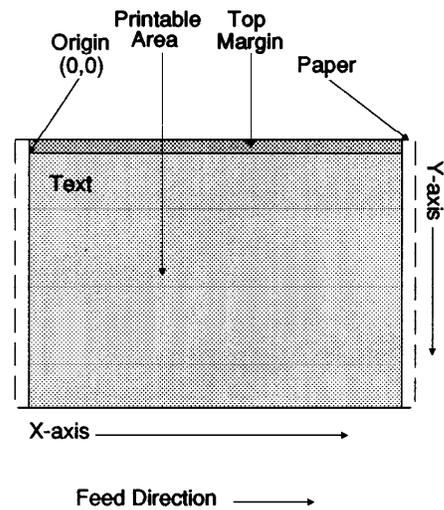
Symbol set

The symbol set defines the characters available in a font and the numeric values with which they are associated. Symbol sets are designed for different languages and applications where special characters are required.

Each font matches a specific symbol set. Therefore, for a font to be available in more than one symbol set, there must be a separate version of the font in the printer for each symbol set.

Font source

The Printer Status Sheet identifies a font as coming from the following sources:

- Resident, including the internal Laser Jet II 'F' cartridge
- The left cartridge slot
- The right cartridge slot
- Downloaded as a Hewlett-Packard Soft Font.

Spacing

Spacing indicates whether a font is proportionally spaced or of fixed pitch. Characters in a proportionally-spaced font have varying widths (e.g., the letter "i" takes up less space on a line than the letter "m."). Fixed-pitch characters, on the other hand, occupy all the same amount of space.

Pitch

Pitch specifies the number of characters per inch (cpi) printed by a fixed-pitch font. The pitch characteristic has no bearing on proportionally-spaced fonts.

Height

The height of a font is measured in points (1/72nd of an inch) from the lowest descender to the top of the highest character (excluding accents).

Style

Style refers to whether characters are upright or italic.

Stroke weight

The stroke weight determines the degree of darkness of the font. This can vary from ultra thin to ultra black, with seven grades of shading, medium being the normal stroke weight. Most applications use two stroke weights: medium and bold.

Typeface

A typeface can be defined as the specific design of a set of font characters. Characters of a given typeface share a similar style.

Font selection

You may select fonts either by their characteristics or by using a font ID number. All font selection commands have two forms, one for the primary font and one for the secondary font.

Font select commands are listed later under "PCL4 command reference."

Font selection by characteristics

The user selects fonts according to their characteristics. The printer follows a "best fit" system to search for the font which most closely matches the one requested. The characteristics for font selection are listed in order of priority:

- Symbol set
- Spacing
- Pitch
- Height
- Style
- Stroke weight
- Typeface
- Soft font with the lowest ID number
- Left cartridge
- Right cartridge
- Internal font orientation.

If you select landscape orientation and only one landscape font is available, that font will be used regardless of the other characteristics.

If more than one font matches the request after the printer compares all characteristics, it chooses the font based on its source: Downloaded fonts are chosen first, with lower font ID numbers superseding the higher ones. If no downloaded font matches, the printer examines the cartridge fonts and, finally, the internal fonts.

Font selection by ID

When downloading fonts from a host computer, you must assign an ID number with the Font ID command (E   *c#D). A font can be referenced later with the command Font Selection by ID (E (#X).

The Font Selection by ID command is not suitable for use in multi-user environments where other users may delete downloaded fonts. In this case, users are encouraged to select all fonts by font characteristics.

Font assignment numbers on downloaded fonts may or may not be consecutive. The numbers are only meant to be identifiers and a gap does not imply anything is missing.

Resident fonts

The LJ2D emulation supports a number of typefaces and symbol sets. Table 3-1 shows the 7 built-in fonts which resemble the resident fonts in a LJ2D printer.

The internal fonts are Courier, Courier Bold, and Line Printer in portrait mode.

Table 3-1. **Resident LJII fonts**

Typeface	Weight	Style	Point	Pitch	Symbols
Courier	Medium (0)	Upright	10	12	Roman 8
Courier	Medium (0)	Upright	10	12	ECMA-94
Courier	Medium (0)	Upright	10	12	PC-8
Courier	Medium (0)	Upright	10	12	PC-8 (D/N)
Courier	Medium (0)	Upright	10	12	PC-850
Courier	Medium (0)	Upright	10	12	Legal
Courier	Medium (0)	Upright	12	10	Roman 8
Courier	Medium (0)	Upright	12	10	ECMA-94
Courier	Medium (0)	Upright	12	10	PC-8
Courier	Medium (0)	Upright	12	10	PC-8 (D/N)
Courier	Medium (0)	Upright	12	10	PC-850
Courier	Medium (0)	Upright	12	10	Legal
Courier	Medium (0)	Italic	10	12	Roman 8
Courier	Medium (0)	Italic	10	12	ECMA-94
Courier	Medium (0)	Italic	10	12	PC-8
Courier	Medium (0)	Italic	10	12	PC-8 (D/N)
Courier	Medium (0)	Italic	10	12	PC-850
Courier	Medium (0)	Italic	10	12	Legal
Courier	Medium (0)	Italic	12	10	Roman 8
Courier	Medium (0)	Italic	12	10	ECMA-9
Courier	Medium (0)	Italic	12	10	PC-8
Courier	Medium (0)	Italic	12	10	PC-8 (D/N)

Table 3-1.   **Resident LJII fonts (continued)**

Typeface	Weight	Style	Point	Pitch	Symbols
Courier	Medium (0)	Italic	12	10	PC-850
Courier	Medium (0)	Italic	12	10	Legal
Courier	Bold (3)	Upright	10	12	Roman 8
Courier	Bold (3)	Upright	10	12	ECMA-9
Courier	Bold (3)	Upright	10	12	PC-8
Courier	Bold (3)	Upright	10	12	PC-8 (D/N)
Courier	Bold (3)	Upright	10	12	PC-850
Courier	Bold (3)	Upright	10	12	Legal
Courier	Bold (3)	Upright	12	10	Roman 8
Courier	Bold (3)	Upright	12	10	ECMA-9
Courier	Bold (3)	Upright	12	10	PC-8
Courier	Bold (3)	Upright	12	10	PC-8 (D/N)
Courier	Bold (3)	Upright	12	10	PC-850
Courier	Bold (3)	Upright	12	10	Legal
LinePrinter	Medium (0)	Upright	8.5	16.66	Roman 8
LinePrinter	Medium (0)	Upright	8.5	16.66	ECMA-9
LinePrinter	Medium (0)	Upright	8.5	16.66	PC-8
LinePrinter	Medium (0)	Upright	8.5	16.66	PC-8 (D/N)
LinePrinter	Medium (0)	Upright	8.5	16.66	PC-850
LinePrinter	Medium (0)	Upright	8.5	16.66	Legal

Cartridge fonts

Please refer to the *Xerox 4213 Laser Printer User Guide* for the cartridges that can be used by the LJ 2D emulation. Cartridges are listed by part number.

Font cartridges must be installed while the 4213 is powered off. Font cartridges installed while the printer is on are not recognised, and may lock up the printer.

PCL4 command structure

The LJ series 2D emulation uses a set of commands similar to the Printer Command Language (PCL) used to control the HP LaserJet printers (HP LaserJet, HP LaserJet+, and HP LaserJet 500+, HP Laserjet II and IID).

There are two types of commands:

- Control codes
- Escape sequences.

Control codes

Control codes are single-byte commands which perform simple functions such as backspace, carriage return, line feed, and form feed.

In most cases control codes are taken from the unprintable part of the ASCII character set which covers the decimal values from 0 to 31 (hexadecimal 00 to 1F). If a character set includes printable characters with values below decimal 31, the Transparent Data command (E &p#X) may be used to access the characters.

Control codes usually elicit an immediate response from the printer and do not perform any deferred or preparatory functions. The only exception is the escape character (hexadecimal 1B, decimal 27), which is prefixed to a command to tell the printer that the data which follows is a command to be executed and not text to be printed.

Escape sequences

Escape sequences are multi-character commands preceded by the escape character. Escape sequences may or may not have parameters.

Escape sequences with parameters

Escape sequences with parameters either access a specific feature of the printer, such as a font, or transmit variable data such as margin settings. These escape sequences are subdivided as follows:

- Escape character
- Variable sequence character
- Group character
- Numeric variable
- Parameter character
- Final parameter character
- Binary data.

Escape sequences without parameters

The escape sequences without parameters perform an action such as resetting the printer. These commands are typically two characters long: escape followed by a character between hexadecimal 30 and 7E (decimal 48 and 126).

Variable sequence character

The variable sequence character indicates that the escape sequence contains a parameters with variable data. The variable sequence character must be in the range of hexadecimal 21—2F (decimal 33—47).

Group character

The group character determines the type of operation to be performed by the printer. The group character falls in the range of hexadecimal 60—7E (decimal 96—126).

Numeric variable

The numeric variable is a decimal number represented as an ASCII string. Some commands allow the string to be preceded by a plus (+) or minus (-) sign, and others allow the number to include a fractional part after a decimal point represented by the full stop (.) character. If the numeric variable is not provided, it is assumed to be zero.

Parameter character

The parameter character indicates the parameter to which the previous numeric variable applies. The parameter character is only used when several escape sequences are combined. The parameter character may be within the range of hexadecimal 60—7E (decimal 96—126), and is a lowercase version of the final parameter.

Final parameter character

The final parameter character, which also references the previous numeric variable, is used to end an escape sequence. The final parameter character is always uppercase.

Table 3-2 summarises the use of parameter and final parameter characters.

Table 3-2. **Using parameter and final parameter characters**

Upper case	Lower case	Sequence
X		A *final* parameter in a combination of escape sequences.
X		A *single* escape sequence.
	x	A *non-final* parameter linking a series of escape sequences.

Binary data

The binary data is optional eight-bit data which is downloaded immediately after an escape sequence. The length of the binary data in bytes is normally specified by the preceding numeric variable.

Figure 3-3. **Single Escape Sequence**
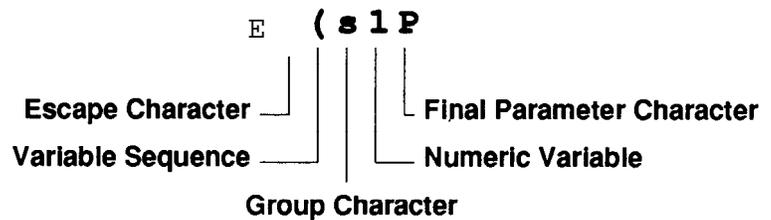
Combining escape sequences

Escape sequences may be written in separate strings (figure 3-3) or linked together for simplicity (figure 3-4). Commands with variables may be combined if the variable sequence character and the group character are the same for each command. The following rules apply:

• The escape character, the variable sequence character, and the group character are omitted from all but the first escape sequence when sequences are combined.

- All alphabetic characters in the combined sequence must be lowercase except for the *last* final parameter character which is uppercase. The characters which would be final parameter characters in uncombined escape characters are converted to lowercase and referred to as parameter characters.

- The commands are interpreted from left to right, so the leftmost command (starting with escape) is executed first and the rightmost command (ending with the final parameter character and optionally binary data) is executed last.

Figure 3-4.   **Combined   Escape   Sequence**
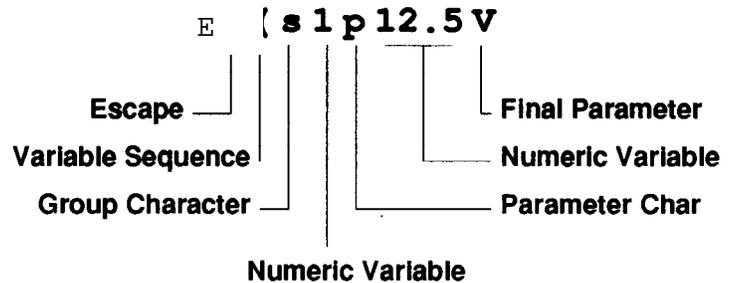
PCL4 command reference

This section describes the commands (escape sequences) that control the 4213 Laser Printer when it emulates the Hewlett-Packard LaserJet IID printers. The commands, which make up the "Printer Control Language 4 (PCL4)," are divided into the following categories:

- Job control commands
- Page control commands
- Cursor positioning commands
- Font control commands
- Graphics commands
- Macros.

Job control commands

The job control commands affect an entire print job.

Printer Reset

Purpose   The Printer Reset command restores the printer to its default settings. This command deletes any temporary fonts and macros from memory and prints any data remaining in the printer buffer. It is recommended to use the Printer Reset command at the beginning of each job.

Syntax

E E

    Hex   1B 45
    Dec   27 69

Number of Copies

Purpose   The Number of Copies command causes the 4213 to print a specified number of copies for each page of data received until either the number of copies is changed or a Printer Reset command is issued.   This command can be issued anywhere within a page and acts on the current page and all subsequent pages.

Syntax

E &l#X

where # is the number of copies to print between 1 and 99.

Example   To select 10 copies of a single page of document, enter:

E &l10X

    Hex   1B 26 6C 31 30 58
    Dec   27 38 108 49 48 88

1-sided/2-sided

Purpose   The 4213 can print on one side (1-sided) or both sides (2-sided) of a page.

Syntax

E   &l#S

Hex   1B 26 6C # 53
Dec   27 38 108 # 83

where   # = 0 is 1-sided
       # = 1 is 2-sided, long-edge binding
       # = 2 is 2-sided, short-edge binding.

2-sided printing is not supported in the LJ Series 2D emulation when the manual bypass feature is used.

Left Offset Registration

Purpose   This command specifies the position of the logical page across the width (short side) of the physical page.

Syntax

E   &l#U

Hex   1B 26 6C # 55
Dec   27 38 108 # 85

where #   is a positive or negative number expressed in decipoints (1/720th inch) and valid up to four decimal places. A positive value moves the logical page to the right along the width of the physical page *except* on the back side of sheets printed in long-edge-binding 2-sided mode, where the logical page moves to the left. A negative value moves the logical page to the left, except on the back side of sheets printed in long-edge-binding 2-sided mode, where it moves to the right.

Notes   • Page orientation has no effect on this command.

• The value # represents an absolute move in relation to the default position of the logical page and *not* the current position.

• Positioning the logical page outside the printable area may cause loss of data.

Top Offset Registration

Purpose   This command designates the position of the logical page across the length (long side) of the physical page.

Syntax

E &l#Z

```
Hex    1B 26  6C # 5A
Dec    27 38 108 # 90
```

where # is a positive or negative number expressed in decipoints (1/720th inch) and valid up to four decimal places. A positive value moves the logical page down along the length of the physical page *except* on the back side of sheets printed in horizontal-binding 2-sided mode, where the logical page moves up. A negative value moves the logical page up, except on the back side of sheets printed in horizontal-binding 2-sided mode, where it moves down.

Notes   • Page orientation has no effect on this command.

• The value # represents an absolute move in relation to the default position of the logical page and *not* the current position.

• Positioning the logical page outside the printable area may cause loss of data.

2-sided Page Side Selection

Purpose   This command causes the printer to skip a page while printing in 2-sided. If a front or back page is being formatted while the command is sent to the printer, the printer stops formatting, ejects the current page, and prints on the side specified by the value #.

Syntax

E &a#G

where # = 0 selects the next side
        # = 1 selects the front side
        # = 2 selects the back side.

Example   To start printing the first chapter of a document on the front side of a page, enter the following command:

E &a1G

> Hex 1B 26 61 31 47
> Dec 27 38 97 49 71

Page control commands

The page control commands define the shape and size of the page.

Paper Source

Purpose   The Paper Source command specifies one of four locations for paper or prints the current page.

Syntax

E &l#H

where # is one of the values in table 3-3.

Table 3-3.   **Paper source values**

#	Paper Source
0	Prints the current page
1	Tray 1 (upper paper tray)
2	Manual feed slot
3	Manual envelope feed
4	Tray 2 (lower paper tray)
6	Optional envelope feeder

Example   To feed from the lower tray (2) enter:

Ε &l4H

Hex   1B 26 6C 34 48
Dec   27 38 108 52 72

Page Size

Purpose   The Page Size command determines the physical size of paper, which sets the limits of the logical page. The top, left, and right margins are set to the defaults for the size of paper chosen, as is the text length. Automatic macro overlays are turned off, and any unprinted data is printed.

If the paper size requested is not available in the paper tray(s), a message requesting the correct paper tray is displayed on the printer control panel.

Syntax

Ε **&l#A**

where # is one of the paper or envelope sizes in table 3-4.

Note: Envelopes must be fed manually through the feeder.

Example   To print on legal-size paper enter:

Ε &l3A

Hex   1B 26 6C 33 41
Dec   27 38 108 51 65

Table 3-4.   **Paper size values**

#	Paper Size
1	Executive (184 x 267mm) (7.25 x 10.5 inches)
2	Letter (216 x 279 mm) (8.5 x 11 inches)
3	Legal (216 x 356 mm) (8.5 x 14 inches)
26	A4 (210 mm x 297 mm)
80	Monarch 7 (98 x 191 mm) (3 7/8 x 7 1/2 inches)
81	Commercial 10 - Business (105 x 241 mm) (4 1/8 x 9 1/2 inches)
90	International DL envelope (110 mm x 220 mm)
91	International C5 envelope (162 mm x 229 mm)

Page Length

Purpose   The Page Length command determines the length of the text area in lines of text, which in turn defines the physical size of paper required. The top, left, and right margins are set to the defaults for the size of paper required. Automatic macro overlays are turned off, and any unprinted data is printed.

If paper in the size requested is not available in the paper tray(s), a message requesting the correct paper tray is displayed on the printer control panel.

If paper requested is available in one of the paper trays on a two-tray machine and the paper source is set to automatic, the correct tray is used automatically.

Syntax

E &l#P

where # is the number of lines on the page based on the current line spacing. See tables 3-5 and 3-6 for the page length values applying to some standard paper sizes at six and eight lines per inch.

Note: The physical size of paper required to accommodate a given number of lines on a page will vary depending on the line spacing.

Table 3-5.   **Portrait paper length values**

Page size	At 6 lines per inch	At 8 lines per inch
Letter	66	88
Legal	84	112
A4	70	90
Executive	63	84

Table 3-6.   **Landscape paper length values**

Page size	At 6 lines per inch	At 8 lines per inch
Letter	51	68
Legal*	----	----
A4	49	58
Executive	43	58

*   First use 84, as in the example, then change orientations with the command E   &l10.

Example   To set the page length for legal paper at six lines per inch enter:

E &l84P

    Hex   1B 26 6C 38 34 50
    Dec   27 38 108 56 52 80

Orientation

Purpose   The Orientation command defines the position of the logical page and the direction in which the 4213 will print in relation to the physical page.

Syntax

^{E} &l#O

Hex   1B 26 6C #
Dec   27 38 108 #

where   # = 0 is portrait
             # = 1 is landscape.

The default orientation is portrait (0).

Left Margin

Purpose   The Left Margin command sets the distance between the left edge of the text and the left edge of the printable area regardless of paper orientation.

The left margin is set as a column number. The width of a column is determined by the Horizontal Motion Index (HMI) command, which sets the horizontal spacing of characters in fixed-pitch fonts. The HMI is used as a unit of measurement for selecting the margin, but once set, the margin does not change with later HMI commands.

The default left margin is at column zero, which is 50 pixels (1/6th inch) from the left edge of the paper in portrait mode and 60 pixels (1/5th inch) from the left edge of the paper in landscape mode.

Syntax

^{E} &a#L

where # is the column number at which printing starts.

Note: If the Left Margin command specifies a column with a value greater than that of the right margin, the command is ignored.

Example   To set the left margin at column 8, enter:

E &a8L

   Hex   1B 26 61 38 4C
   Dec   27 38 97 56 76

Right Margin

Purpose   The Right Margin command sets the distance between the right edge of the text and the left edge of the printable area regardless of paper orientation. The printable area begins 50 pixels (1/6th inch) from the left edge of the paper in portrait mode and 60 pixels (1/5th inch) from the left edge of the paper in landscape mode.

The right margin is set as a column number. The width of a column is determined by the Horizontal Motion Index (HMI) command, which sets the horizontal spacing of characters in fixed-pitch fonts. The HMI is used as a unit of measurement for selecting the margin, but once set the margin does not change with later HMI commands..

Syntax

E &a#M

where # is the column number at the end of the line.

Note: If the Right Margin command specifies a column which exceeds the right edge of the logical page, the margin is set to the edge of the printable area. If the command specifies a column to the left of the left margin, the command is ignored.

Example   To set the right margin at column 72, enter:

E &a72M

   Hex   1B 26 61 37 32 4D
   Dec   27 38 97 55 50 77

Clear Horizontal Margins

Purpose   The Clear Horizontal Margins command causes the left and right margins to be reset to their default values at the left and right edges of the printable area.

Syntax

E 9

    Hex   1B 67 39
    Dec   27 103 57

Top Margin

Purpose   The Top Margin command sets the distance between the top of the printable area and the top of the text regardless of paper orientation. The top margin is defined as a number of lines. The height of the lines is determined by the Vertical Motion Index (VMI) command, which sets the vertical spacing of lines.   The VMI is used as a unit of measurement for setting the margin, but once set, the margin does not change with later VMI commands.

Syntax

E &l#E

where # is the number of the line on which text starts.

Example   To set the top margin at six lines, enter:

E &l6E

    Hex   1B 26 6C 36 45
    Dec   27 38 108 54 69

Text Length

Purpose   The Text Length command sets the number of lines on which text may be printed. If the Vertical Motion Index (VMI) is zero, or the sum of the text length and the top margin is greater than the length of the printable area, the command is ignored.

The text length is set to the user default whenever the page orientation, length, size, or top margin is changed. The user default is calculated as the quotient (integer) of the following equation:

(Printable Area Length-TopMargin-)48 ÷ VMI

where Printable Area Length and Top Margin are measured in inches.

Syntax

Ε **&l#F**

where # is the number of lines of text required.

Example   To set a text length of 55 lines, enter:

Ε &l55F

> Hex   1B 26 6C 35 35 46
> Dec   27 38 108 53 53 70

Perforation Region

Purpose   The Perforation Region command determines the action of the printer when text is positioned below the bottom line of text defined by the Text Length command. When the Perforation Region is enabled, text which would fall below the bottom line specified by the Text Length command is moved automatically to the top of the text area on the next page.

When Perforation Region is not enabled, text may extend beyond the bottom of the text area and may not be printed if it continues out of the printable area. The default setting is Perforation Region enabled. The size of the perforation region depends on the dimensions specified by the Page Size and Page Length commands.

Syntax

Ε **&l#L**

where   # = 0 disables Perforation Region
        # = 1 enables Perforation Region.

Example   To enable Perforation Region, enter:

E &l1L

    Hex   1B 26 6C 31 4C
    Dec   27 38 108 49 76

Horizontal Motion Index

Purpose   The Horizontal Motion Index (HMI) command determines the distance between columns. When proportional spaced fonts are selected, the HMI command affects only the space character. When fixed-space fonts are selected, the HMI command affects all the printable characters.

Syntax

> E **&k#H**

where # is a number between 0 and 840 representing the width of a column in units of 1/120th of an inch. The # is valid up to four places to the right of the decimal point.

The HMI is reset to the current default when font orientation, symbol set, height, pitch, or spacing are set, and when the current font is changed. The default value of HMI depends on the current font. Use the following formula to calculate the HMI:

HMI = 120 ÷ characters per inch

Example   To set the HMI for a 12 pitch font (12 characters per inch), enter:

E &k10H

    Hex 1B 26 6B 31 30 48
    Dec 27 38 107 49 48 72

Vertical Motion Index

Purpose   The Vertical Motion Index (VMI) command sets the distance between rows in 48ths of an inch. The default VMI is 8/48ths which prints as six lines per inch.

Syntax

E &l#C

where # is the distance between rows in 48ths of an inch. # must be between 0 and 336. The # is valid to four places to the right of the decimal point. Use the following formula to calculate the VMI:

VMI = 48 ÷ lines per inch

Example

To print four lines per inch, set the VMI to 12:

E &l12C

Hex 1B 26 6C 31 32 43
Dec 27 38 108 49 50 67

Line Spacing

Purpose

The Line Spacing command affects the VMI in lines per inch. The command specifies the number of lines per inch to be printed.

Syntax

E &l#D

where # is one of the following valid settings for lines per inch: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48.

Example

To set line spacing at eight lines per inch, enter:

E &l8D

Hex 1B 26 6C 38 44
Dec 27 38 108 56 68

Cursor positioning commands

The cursor positioning commands specify exactly where the next character or graphic is to be placed on the page. These commands define print position in 300ths of an inch (spots), 720ths of an inch (decipoints), and columns or rows.

Horizontal Cursor Position (Columns)

Purpose The Horizontal Cursor Position (Columns) defines the absolute or relative position of the horizontal cursor in units of columns on the current line. The width of a column is defined by the current Horizontal Motion Index (HMI) setting.

Syntax

E &a#C

where # is the number of columns to move or the column to move to. The # is valid up to four places to the right of the decimal point.

Absolute move: If the # value has no sign, the cursor is moved to column #.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # columns to the right of the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # columns to the left of the current cursor position.

If the # value specifies a column beyond the left or right edges of the printable area, the cursor is moved to the appropriate edge of the printable area.

Example To move the current print position to column 30 from column 5, enter:

E &a30C

    Hex   1B 26 61 33 30 43
    Dec   27 38 97 51 48 67

or, as a relative move,

E &a+25C

    Hex   1B 26 61 2B 32 35 43
    Dec   27 38 97 43 50 53 67

Horizontal Cursor Position (Decipoints)

Purpose The Horizontal Cursor Position (Decipoints) defines the absolute or relative position of the horizontal cursor in units of decipoints (1/720th of an inch). Position 0 is flush with the left boundary of the printable area.

Syntax

E **&a#H**

where # is the number of decipoints to move or the absolute position to move to. The # is valid to two decimal places to the right of the decimal point.

Absolute move: If the # value has no sign, the cursor is moved # decipoints to the right of the left edge of the printable area.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # decipoints to the right of the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # decipoints to the left of the current cursor position.

If the # value specifies a position beyond the left or right edges of the printable area, the cursor is moved to the appropriate edge of the printable area.

Example

To move the current cursor position from 720 decipoints (1 inch from position 0) to 2160 decipoints (3 inches from position 0), enter:

E &a2160H

    Hex   1B 26 61 32 31 36 30 48
    Dec   27 38 97 50 49 54 48 72

or, as a relative move,

E &a+1440H

    Hex   1B 26 61 2B 31 34 34 30 48
    Dec   27 38 97 43 49 52 52 48 72

Horizontal Cursor Position (Spots)

Purpose

The Horizontal Cursor Position (Spots) defines the absolute or relative position of the horizontal cursor in units of spots (1/300th of an inch). Position 0 is flush with the left boundary of the printable area.

Syntax

> E *p#X

where # is an integer representing the number of spots to move or the absolute position to move to.

Absolute move: If the # value has no sign, the cursor is moved # spots to the right of the left edge of the printable area.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # spots to the right of the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # spots to the left of the current cursor position.

If the # value specifies a position beyond the left or right edges of the printable area, the cursor is moved to the appropriate edge of the printable area.

Example

To move the current cursor position from 300 spots (1 inch from position 0), to 1500 spots (5 inches from position 0), enter:

E *p1500X

    Hex   1B 2A 70 31 35 30 30 58
    Dec   27 42 112 49 53 48 48 88

or, as a relative move,

E *p+1200X

    Hex   1B 2A 70 2B 31 32 30 30 58
    Dec   27 42 112 43 49 50 48 48 88

Vertical Cursor Position (Rows)

Purpose

The Vertical Cursor Position (Rows) defines the absolute or relative position of the vertical cursor in units of rows. The height of a row is defined by the current Vertical Motion Index (VMI) setting.

Syntax

> E &a#R

where # represents the number of rows to move or the row to move to. The # is valid up to four places to the right of the decimal point.

Absolute move: If the # value has no sign, the cursor is moved down # rows from the top margin.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # rows down from the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # rows up from the current cursor position.

If an absolute # value (i.e., with no sign) or negative # value exceeds the top or bottom edges of the printable area, the cursor is moved to the appropriate edge of the printable area. If a positive # value specifies a position beyond the bottom of the printable area, the cursor is moved off the page. The Vertical Cursor Position commands ignore the perforation region.

Example To move the cursor from line 25 to line 2, enter:

E &a2R

    Hex   1B 26 61 32 52
    Dec   27 38 97 50 82

or, as a relative move,

E &a-23R

    Hex   1B 26 61 2D 32 33 52
    Dec   27 38 97 45 50 51 82

Vertical Cursor Position (Decipoints)

Purpose The Vertical Cursor Position (Decipoints) defines the absolute or relative position of the vertical cursor in units of decipoints (1/720th of an inch). The height of a row is defined by the current Vertical Motion Index (VMI) setting.

Syntax

E **&a#V**

    Hex   1B 2A 61 # 56
    Dec   27 42 97 # 86

where # represents the number of decipoints to move or the absolute position to move to. The # is valid up to two places to the right of the decimal point.

Absolute move: If the # value has no sign, the cursor is moved # decipoints down from the top margin.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # decipoints down from the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # decipoints above the current cursor position.

If the # value specifies a position beyond the top or bottom edges of the printable area, the cursor is moved to the appropriate edge of the printable area.

Vertical Cursor Position (Spots)

Purpose   The Vertical Cursor Position (Spots) defines the absolute or relative position of the vertical cursor in units of spots (1/300th of an inch). The height of a row is defined by the current Vertical Motion Index (VMI) setting.

Syntax

E *p#Y

> Hex   1B 2A 70 # 59
> Dec   27 42 112 # 89

where # is an integer representing the number of spots to move or the absolute position to move to.

Absolute move: If the # value has no sign, the cursor is moved # spots down from the top margin.

Relative move, positive: If the # value is preceded by a plus (+) sign, the cursor is moved # spots down from the current cursor position.

Relative move, negative: If the # value is preceded by a minus (-) sign, the cursor is moved # spots above the current cursor position.

If the # value specifies a position beyond the top or bottom edges of the printable area, the cursor is moved to the appropriate edge of the printable area.

Half-line Feed

Purpose The Half-line Feed command moves the cursor half a row down the page without changing columns. The distance moved is half the current Vertical Motion Index (VMI) setting, which may have been defined by a VMI or Line Spacing command.

Syntax

E =

    Hex   1B 3D
    Dec   27 61

Line Termination

Purpose The Line Termination command controls the way the printer responds to the conventional line-ending characters, carriage return (CR), line feed (LF), and form feed (FF).

Syntax

E &k#Gz

    Hex   1B 26 6B # 47
    Dec   27 38 107 # 71

where # selects one of the line-ending options shown in table 3-7.

Table 3-7.   **Line   ending   options**

#	Line endings	
	Host	**Printer**
0	CR LF FF	CR LF FF
1	CR LF FF	CR+LF LF FF
2	CR LF FF	CR CR+LF CR+FF
3	CR LF FF	CR+LF CR+LF CR+FF

The default setting is zero (no translation).

End-of-Line Wrap

Purpose   The End-of-Line Wrap command causes the printer to generate a carriage return and line feed, when the cursor reaches the right margin, and print on the next line. With this option disabled, the printer will clip all text printed past the right margin.

The default setting is End-of Line Wrap disabled.

Syntax

^{E} &s#C

Hex   1B 26 73 # 43
Dec   27 38 115 # 67

where   # = 0 enables End-of-Line Wrap
        # = 1 disables End-of-Line Wrap.

Push/Pop Cursor Position

Purpose   The Push/Pop Cursor Position command enables the current cursor position to be stored and recalled at a later time. Up to twenty cursor positions may be stored in a last-in first-out (LIFO) stack, where the item most recently pushed onto the stack is the first to come off the stack.

Syntax

^{E} & f # S

Hex   1B 26 66 # 53
Dec   27 38 102 # 8

where   # = 0—Push (store cursor position)
        # = 1—Pop (recall cursor position).

The # value of zero pushes the cursor position onto the stack and a value of one pops it off the stack and restores the cursor to the previous position.

Control codes for cursor positioning

The following control code are used to move the cursor.

Carriage Return (CR)

CR (hexadecimal 0D, decimal 13) moves the cursor to the left margin on the current line.

Space (SP)

SP (hexadecimal 20, decimal 32) moves the cursor one column to the right of the current position. If space is defined as a printable character, the character is printed.

Backspace (BS)

BS (hexadecimal 08, decimal 8) moves the cursor left by the width of the last printed character or space. With fixed-pitch fonts, the backspace distance is the current Horizontal Motion Index (HMI). With proportionally-spaced fonts, a single backspace centres the new character over the character to the left. When multiple backspaces are used, each backspace moves back by the width of the last character printed, regardless of the width of the character being backspaced over.

Horizontal Tab (HT)

HT (hexadecimal 09, decimal 9) moves the cursor to the next tab position on the row. Tab positions are defined at the left margin and every eight columns thereafter.

Line Feed (LF)

LF (hexadecimal 0A, decimal 10) moves the cursor down one row within the same column. The height of the row is defined by the current Vertical Motion Index (VMI) which has been set by a VMI or a Line Spacing command.

Form Feed (FF)

FF (hexadecimal 0C, decimal 12) moves the cursor to the same column on the top line of the next page.

Font commands

When you select a font, the 4213 printer searches its memory for one that most closely matches your choice. The printer selects the "best fit" according to eleven font characteristics, in order of importance:

- Symbol set
- Spacing
- Pitch
- Height
- Style

- • Stroke weight
- • Typeface
- • Soft font with the lowest ID number
- • Left cartridge
- • Right cartridge
- • Internal font orientation.

Font selection can only be guaranteed if the total set of font commands shown on the following pages is used. Failure to specify any of the font characteristics may result in selection of a font that differs from the HP font.

Symbol Set

Purpose The Symbol Set command sends the printer a numeric code corresponding to a symbol set. If a non-existent symbol set is selected, the printer continues to use the last symbol set accessed. There are separate Symbol Set commands for the primary and secondary fonts.

Syntax

E (ID

The secondary font symbol set command is:

E)ID

where ID is one of the two-character symbol set ID's given in table 3-8.

Example To use ISO25: French for the primary symbol set and ISO4: United Kingdom for the secondary symbol set, enter the following commands:

E (0F

    Hex   1B 28 30 46
    Dec   27 40 48 70

and

E)1E

    Hex   1B 29 31 45
    Dec   27 41 49 69

Table 3-8. **LJ2D symbol sets with ID numbers**

ID	Symbol Set	ID	Symbol Set
0A	Math-7	3Q	OCR-B Extended
0B	Tax Linedraw	11Q	ECMA-94
0D	ISO 60: Norwegian version 1*	0S	ISO 11: Swedish: Names
1D	ISO 61: Norwegian version 2*	1S	HP Spanish
0E	Roman Extension	2S	ISO 17: Spanish
1E	ISO 4: United Kingdom	3S	ISO 10: Swedish/Finnish
0F	ISO 25: French	4S	ISO 16: Portuguese
1F	ISO 69: French	5S	ISO 84: Portuguese
0G	HP German	6S	ISO 85: Spanish IBM
1G	ISO 21: German	0T	Line Draw
8G	Greek-8	0U	ISO 6: ASCII
0I	ISO 15: Italian	1U	Legal
0K	ISO 14: JIS ASCII	2U	ISO 2: International Reference Version
2K	ISO 57: Chinese	7U	OEM-1
1M	Technical-7	8U	HP Roman-8
8M	Math-8	10U	PC-8
0N	ISO 100: ECMA-94 (Latin 1)	11U	PC-8 (D/N)
0O	OCR A	12U	PC-850
1O	OCR B	15U	Pi Font
0Q	Math-8A	0Y	Bar Code 3 of 9
1Q	Math-8B	8Y	EAN/UPC
2Q	Pi Font A		

* The Danish symbol set is part of the Norwegian sets.

Spacing

Purpose   The Spacing command instructs the printer to accept proportionally-spaced or fixed-pitch fonts. If proportional spacing is selected but no proportionally-spaced font is available, the printer will designate a fixed-pitch font instead. Separate commands exist for selecting the spacing mode of the primary and secondary fonts.

Syntax

E (s#P

The Spacing command for the secondary font is:

E)s#P

where   # = 0 sets fixed pitch
        # = 1 sets proportional spacing.

Example   To select the primary for as proportional and the secondary font as fixed-pitch, enter the following commands:

E (s1P

Hex   1B 38 73 31 50
Dec   27 40 115 49 80

and

E)s0P

Hex   1B 29 73 30 50
Dec   27 41 115 48 80

Pitch

Purpose   The Pitch command selects the character spacing of fixed-pitch fonts in characters per inch (cpi). If the pitch requested is unavailable, the printer searches for the next size up; failing that, the next size down. There are separate Pitch commands for the primary and secondary fonts.

Syntax

Eᴄ (s#H

where # is a real number valid up to two decimal places.

The Pitch command for the secondary font is:

Eᴄ)s#H

Example   To set the primary font as 12-pitch and the secondary font as 10-pitch, enter:

Eᴄ (s12H

> Hex   1B 28 73 31 32 48
> Dec   27 40 115 49 50 72

The Pitch command for the secondary font is as follows:

Syntax

Eᴄ)s10H

> Hex   1B 29 31 30 48
> Dec   27 41 49 48 72

Height

Purpose   The Height command selects the character height of the font in points (72nds of an inch).   There are separate commands to select height for the primary and secondary fonts. If the selected height is unavailable, the closest match is used. Fonts within a quarter of a point of the requested height are seen by the printer as identical selections.

Syntax

Eᴄ (s#V

where # is the selected height in points up to two decimal places.

The Height command for the secondary font is:

Eᴄ)s#V

Example   To select a primary font of 8 points and a secondary font of 14.6 points, enter:

and

E)s8V

>   Hex   1B 29 73 38 56
>   Dec   27 41 115 56 86

E (s14.6V

>   Hex   1B 28 73 31 34 2E 36 56
>   Dec   27 40 115 49 52 46 54 86

Style

Purpose   The Style command selects upright or italic characters. Two Style commands exist for the primary and secondary fonts. If the style requested is not available, the Style command is ignored.

Syntax

E (s#S

The Style command for the secondary font is:

E)s#S

where   # = 0 selects upright
         # = 1 selects italic.

Example   To select italics for the primary font and upright for the secondary, enter:

E (s1S

>   Hex 1B 28 73 31 53
>   Dec 27 40 115 49 83

and

E)s0S

>   Hex   1B 29 73 30 53
>   Dec   27 41 115 48 83

Stroke Weight

Purpose   The Stroke Weight command selects the degree of bolding. There is a separate command for the primary and secondary fonts. Medium weight fonts have a stroke weight of zero, light weight fonts have a negative stroke weight, and heavy weight fonts have a positive stroke weight. If the requested stroke weight is zero or greater and the weight is not available, the printer accesses the next heavier font. If the requested weight has a negative value and is not available, the next lighter font is used.

Syntax

E (s#B

The Stroke Weight command for the secondary font is:

E)s#B

where # is one of the values in table 3-9.

Example   To request a medium primary font and a bold secondary font, enter:

E (s0B

    Hex   1B 28 73 30 42
    Dec   27 40 115 48 66

and

E) s+3B

    Hex   1B 29 73 2B 33 42
    Dec   27 41 115 43 51 66

Table 3-9.   **Gradations of Stroke weight**

#	Stroke Weight
-7	Ultra Thin
-5	Thin
-3	Light
0	Medium
+3	Bold
+5	Black
+7	Ultra Black

Typeface

Purpose   The Typeface command   selects the typeface used by the primary and secondary fonts.

Syntax

E (s#T

The Typeface command for the secondary font is:

E)s#T

where # is a code number from table 3-10.

Example   To use Swiss721 as a primary font and Courier for the secondary font, enter:

E (s4T

    Hex   1B 28 73 34 54
    Dec   27 40 115 52 84

and

E)s3T

    Hex   1B 29 73 33 54
    Dec   27 41 115 51 84

Table 3-10. **Typefaces and code numbers**

#	Typeface
0	LinePr
3	Courier
4	Swiss721
5	Dutch801 (Times Roman)
6	LetterGothic
8	PElite
11	Presentations
17	Optima
18	Garamond
19	Cooper Black
20	Coronet Bold
21	Broadway
22	Bauer Bodoni Black Condensed
23	Century Schoolbook
24	University Roman
100	Times New Roman
101	Garamond
102	Bodini
104	Rockwell
105	Ariel
107	Baskerville

Table 3-10. **Typefaces and code numbers (continued)**

#	Typeface
111	Century School Book
113	Gillsans
200	Signatures
201	Logos
202	Forms
203	Macros

Note: Names of typefaces are registered trademarks. Use of typefaces may be subject to licensing agreements.

Default Font

Purpose The Default Font command restores all font characteristics (except orientation) to those of the user default font. Separate commands exist for the primary and secondary font.

Syntax

> E_c (3@

> E (3@

Hex   1B 28 33 40
Dec   27 40 51 64

The Default Font command for the secondary font is as follows:

E)3@

Hex   1B 29 33 40
Dec   27 41 51 64

Note: If the user default font is proportionally spaced, its pitch is not affected by the Default Font command.

Transparent Data

Purpose The Transparent Data command allows the 4213 printer to literally print any data sent, including unprintable control codes (e.g., escape or form feed). This is particularly useful when accessing graphic characters in the IBM PC symbol set which fall in the lower ASCII range.

Syntax

E **&p#X[transparent data]**

where # is the number of bytes of transparent data. (The brackets are not to be typed in.)

Example To print the form feed (hexadecimal 0C. decimal 12) as a female symbol, enter:

E &p1X[12]

> Hex   1B 26 70 0C
> Dec   27 38 112 12

Underline

Purpose The Underline command enables or disables underlining and selects fixed or floating underlining.

Fixed underlining

Characters are underlined at a fixed distance of 1/60th of an inch below the character baseline, regardless of character size and style.

Floating underlining

Characters underlined at the distance specified by whatever font on the line requires the greatest separation between the character baseline and the underline.

Syntax

_E **&d#D**

    Hex   1B 26 64 # 44
    Dec   27 38 100 # 68

where   # = 0 is fixed underline
           # = 3 is floating underline.

Disable Underline

Purpose   Disable Underline cancels the Underline command.

Syntax

_E **&d@**

    Hex   1B 26 64 40
    Dec   27 38 100 64

Primary and secondary fonts

The control codes Shift In (SI) with the hexadecimal value 0F, decimal 15, and Shift Out (SO) with the hexidecimal value 0E, decimal 14, allow the user to alternate between primary and secondary fonts, respectively.

Font ID

Purpose   The Font ID command assigns an ID number to a font. The font must then be referenced by its ID through subsequent font management commands, such as Font Selection, Font Control, or Font Descriptor.

Syntax

_E ***c#D**

Syntax

where # is an ID number ranging from 0 to 32767.

Example   To specify a font ID number of 2 enter:

E *c2D

    Hex   1B 2A 63 32 44
    Dec   27 42 99 50 68

Font Control

Purpose   The Font Control is the main command for managing downloaded fonts. It deletes downloaded fonts and determines whether a Soft Font is automatically removed at a printer reset.

Syntax

E *c#F

where # is one of the values in table 3-11.

Example   To make a Soft Font with an ID of 1 temporary enter:

E *c4F

    Hex   1B 2A 63 34 46
    Dec   27 42 99 52 70

Table 3-11.   **Font Control functions**

#	Function
0	Delete all soft fonts
1	Delete all temporary soft fonts
2	Delete downloaded font specified by last font ID command
3	Delete character code.
4	Make downloaded font specified by last font ID command temporary
5	Make downloaded font specified by last font ID command permanent
6	Copy/assign font.

Notes
- Temporary downloaded fonts are removed each time the printer is reset. Permanent downloaded fonts are retained through resets but are lost when the printer is turned off.

- If the primary or secondary font is deleted, the font most closely resembling the deleted font is chosen from the remaining fonts to be the new primary or secondary font.

Font Selection by ID

The Font Selection by ID command designates a downloaded font as the primary or secondary font by its ID number. There are separate commands for selecting primary and secondary fonts. The following command selects a primary font:

Syntax

```
E (#X
```

```
Hex 1B 28 # 58
Dec 27 40 # 88
```

To select a secondary font enter:

Syntax

```
E )#X
```

```
Hex    1B 29 # 58
Dec    27 41 # 88
```

where # is the font ID number.

Font assignment numbers on downloaded fonts may or may not be consecutive. The numbers are only meant to be identifiers and a gap does not imply anything is missing.

Font Descriptor

Purpose   The Font Descriptor command creates a header, or descriptor, for a font being downloaded to the printer. The Font Descriptor command normally follows a Font ID command.

Syntax

Eᶜ)s#W[font descriptor + data]

Hex   1B 29 73 # 57
Dec   27 41 115 # 87

where # is the number of bytes in the font descriptor that follows. (The brackets are not to be entered.) The font descriptor is normally 64 bytes long.

The font descriptor contains values for the following font characteristics:

• font type
• baseline distance
• cell width
• cell height
• orientation
• fixed/proportional spacing
• symbol set
• pitch
• height
• style
• stroke weight
• typeface.

For information on how to format a font descriptor block refer to the *Hewlett-Packard Laser Printer Technical Reference Manual*.

Character Code

Purpose   The Character Code command specifies the decimal ASCII value of the next character to be downloaded.

Syntax

Eᶜ *c#E

where # is the single-byte decimal character code.

Example   To specify a character code for the letter "J," enter:

Ε *c74E

> Hex   1B 2A 63 4A 45
> Dec   27 42 99 74 69

Character Descriptor and Data

Purpose   The Character Descriptor and Data command is used for downloading a character to the printer. The downloaded character has the ASCII character code previously assigned through the Character Code command.

Syntax

Ε (s#W[character descriptor + data]

> Hex   1B 28 73 # 57
> Dec   27 40 115 # 87

where # is the number of bytes (up to 32767) in the character descriptor and data following the command. (The brackets are not to be entered.)

The character descriptor and data contains byte values for the following characteristics:

- Orientation
- Left offset
- Top offset
- Character width
- Character height
- Delta X
- Character data.

Note: The 4213 and LaserJet resident fonts do not have identical character spacing (height and width). The differences between characters are slight but become more noticeable on a full page of text. This issue of character spacing does not apply to HP Soft Fonts or to 4213 cartridge fonts.

For information on how to format a character descriptor and data block, refer to the *Hewlett-Packard Laser Printer Technical Reference Manual.*

Graphics commands

Graphics commands are used to download raster data to form bit map images. Expressed in dots corresponding to bits, images can be created in rectangular shapes with a variety of fill and shading patterns.

When the printer receives graphic data that is incomplete, e.g. the data has fewer bytes than the window size, the next Form Feed commands may be ignored, causing unpredictable results.

Raster Graphics Resolution

Purpose The Graphics Resolution command controls the resolution (number of spots per inch) used when printing downloaded raster information as bitmap graphics. *This command must precede the Start Graphics command*

Note: When the page buffer is set to ″FULL″ (full page imaging) in the LJ2D emulation submenu, the memory the 4213 dedicates to this imaging is no longer available for user downloaded fonts or graphics or any other temporary use. This means that a full page graphic that prints completely in ″PARTIAL″ imaging may not print if the page buffer is set to ″1 FULL or 2FULL″.

Example: A 2.5 MB system with ″2 FULL″ page imaging can store only a small number of fonts (about 8 fonts of 25KB each) or graphics. That same 2.5 MB system with ″PARTIAL″ imaging could store 2 full page graphics or over 80 25 KB fonts. The same full page graphic prints completely in partial imaging, but not in ″2 FULL″ page imaging.

Syntax

Ε *t#R

Hex   1B 2A 74 # 52
Dec   27 42 116 # 82

where # is one of the values in table 3-12.

Example To print graphics in 150 dots per inch, enter:

Ε *t150R

Hex   1B 2A 74 31 35 30 52
Dec   27 42 116 49 53 48 82

Table 3-12.　**Values for graphics resolution**

#	Graphics Resolution
75	75 spots per inch
100	100 spots per inch
150	150 spots per inch
300	300 spots per inch

Raster Graphics Presentation Mode

Purpose　This command designates how the raster image will appear on the logical page.

Syntax

```
E  *r#F
```

where　# =　0 - Raster graphics are printed in the orientation of the logical page.

　　　　# =　3 - Raster graphics are printed along the width of the physical page, regardless of the orientation of the logical page.

Start Graphics

Purpose　The Start Graphics command initialises the printer for subsequent Transfer Raster Data commands and determines the location of the left graphics margin.

The left graphics margin may be set at the left edge of the printable area or at the current X value of the cursor position.

After receiving the Start Graphics command, the printer sets the graphics resolution and left graphics margin until it receives an End Graphics command.

Syntax

E *r#A

hex 1B 2A 72 # 41
Dec   27 42 114 # 65

where # one of the two values in table 3-13.

Table 3-13.   **Graphics margin settings**

#	Left graphics margin
0	Left edge of printable area
1	Current cursor position

Transfer Raster Data

Purpose   The Transfer Raster Data command precedes a single row of raster graphics data. The resolution of the data has been selected through the Graphics Resolution command, and the left graphics margin defined by the Start Graphics command. The raster data is printed at the current Y position.

Raster data is always printed parallel to the feed edge of the paper, regardless of the paper or page orientation. Because the coordinate system is different for portrait and landscape pages, the positional change required to establish the start point of the next row of data is different for each orientation. On a portrait page the Y position is automatically incremented after each row of raster data. On a landscape page the X position is automatically decremented after each row.

Each byte of raster data received comprises eight bits corresponding to eight individual dots. The most significant bit is the leftmost dot. If a bit is set high, a dot is printed; if a bit is set low, no dot is printed. Each dot is expanded to the resolution specified by the Graphics Resolution command. Raster data ignores the boundaries of the text area and is unaffected by perforation skip mode.

Syntax

E *b#W[# bytes of raster data]

Hex   1B 2A 62 # 57
Dec   27 42 98 # 87

where # is the number of bytes in this row. (The brackets are not to be entered.)

End Graphics

    Purpose   The End Graphics command tells the printer that the transfer of raster graphics is complete.

    Syntax

> E   *rB

Hex   1B 2A 72 42
Dec   27 42 114 66

Horizontal Rectangle Size (Decipoints)

    Purpose   The Horizontal Rectangle Size (Decipoints) command defines the width, in decipoints (720ths of an inch), of the next rectangle to be drawn.

    Syntax

> E   *c#H

Hex   1B 2A 63 # 48
Dec   27 42 99 # 72

where # is a number up to four decimal places representing the width of the rectangle in decipoints.

Horizontal Rectangle Size (Spots)

    Purpose   The Horizontal Rectangle Size (Spots) command defines, in spots (300ths of an inch), the width of the next rectangle to be drawn.

    Syntax

> E   *c#A

Hex   1B 2A 63 # 41
Dec   27 42 99 # 65

where # is an integer representing the width of the rectangle in spots.

Vertical Rectangle Size (Decipoints)

Purpose The Vertical Rectangle Size (Decipoints) command defines in decipoints (720ths of an inch) the height of the next rectangle to be drawn

Syntax

Ε *c#V

Hex 1B 2A 63 # 56
Dec 27 42 99 # 86

where # is a number up to four decimal places representing the height of the rectangle in decipoints.

Vertical Rectangle Size (Spots)

Purpose The Vertical Rectangle Size (Spots) command defines in spots (300ths of an inch) the height of the next rectangle to be drawn.

Syntax

Ε *c#B

Hex 1B 2A 63 # 42
Dec 27 42 99 # 66

where # is an integer representing the height of the rectangle in spots.

Area Fill ID

Purpose The Area Fill ID command sets the level of shading or type of fill pattern to be used when filling a rectangular area. There are six fill patterns and eight densities of shading. Each of the fill patterns is identified by a number between 1 and 6. Each shading density covers a range of values from 1% to 100%.

Syntax

Ε *c#G

Hex 1B 2A 63 # 47
Dec 27 42 99 # 71

where # is a value between 1 and 6 for a fill pattern or between 1 and 100 for shading (see figures 3-5 and 3-6.)

Figure 3-5.   **Area Fill patterns 1-6**
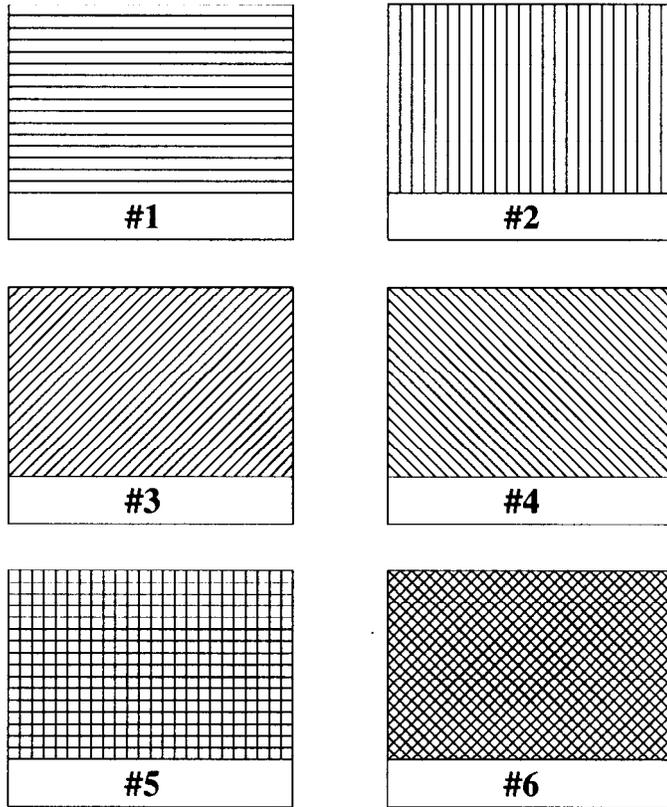
Figure 3-6.   **Area Fill shading density**

1 - 2%	3 - 10%
11 - 20%	21 - 35%
36 - 55%	56 - 80%
81 - 99%	100%
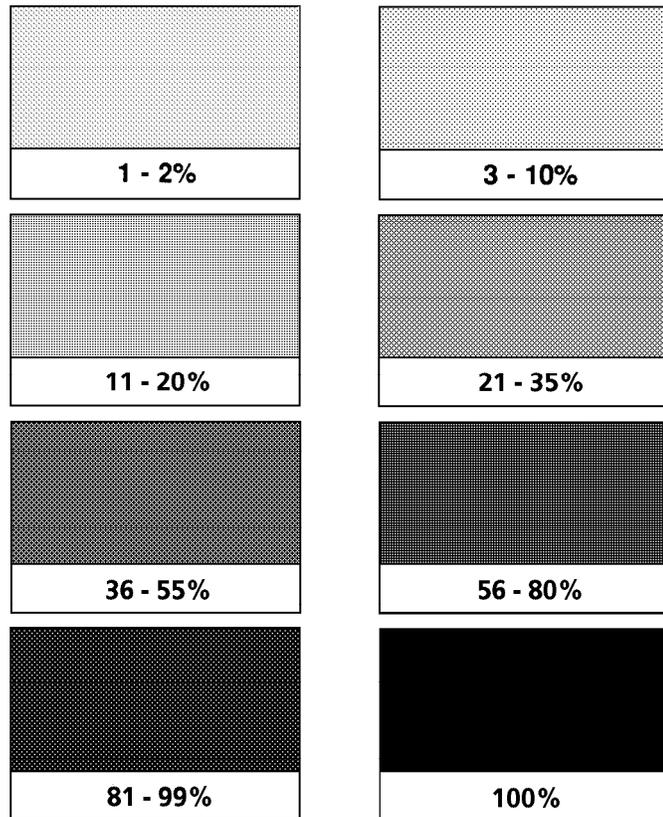
Note: A Fill Rectangular Area command must follow an Area Fill ID command.   The Fill Rectangular Area command specifies whether the rectangle is to be filled with shading or one of the fill patterns.

Fill Rectangular Area

Purpose The Fill Rectangular Area command prints the rectangle defined by the Vertical and Horizontal Rectangle Size commands and specifies whether it is to be filled with shading, one of the fill patterns, or solid black. For solid black fill, the Area Fill ID command is not required. For shading or a fill pattern, the Area Fill ID command must be used ahead of the Fill Rectangular Area command.

The rectangle is printed with its top left corner at the current cursor position, which is unaffected by the command. The command ignores text boundaries, but any part of the rectangle falling outside of the printable area is not printed.

Syntax

E *c#P

> Hex   1B 2A 63 # 50
> Dec   27 42 99 # 80

where # is a value from table 3-14.

Table 3-14.   **Fill types for rectangular areas**

#	Rectangle Fill Type
0	Solid Black Fill
2	Shading
3	Pattern

Examples of filled rectangles

Example 1 To print a 2- by 3-inch rectangle, enter the following commands:

1.   E *p300x300Y

>   (Moves cursor one inch down and one inch across)

2. E *c600A

   (Sets rectangle width at 2 inches.)

3. E *c900B

   (Sets rectangle height at 3 inches.)

4. E *c0P

   (Prints the rectangle as a black area.)

Example 2   To print a 2- by 3- inch rectangle with 50% shading, enter the following commands:

1. E *p300x300Y

   (Moves cursor one inch down and one inch across)

2. E *c600A

   (Sets rectangle width at 2 inches.)

3. E *c900B

   (Sets rectangle height at 3 inches.)

4. E *c50G

   (Uses an Area Fill ID of 50.)

5. E *c2P

   (Prints the shaded rectangle.)

Example 3   To print a 2- by 3- inch rectangle filled with a grid-pattern instead of shaded, follow steps 1 through 3 in example 2, and replace steps 4 and 5 with the following commands:

4. E *c5G

   (Uses an Area Fill pattern for a grid (ID#5.)

5. E *c3P

   (Prints the rectangle filled with a pattern.)

Macro commands

Macros are single commands that execute a series of commands in sequence. The two Macro commands are:

- Macro ID
- Macro Control.

Macro ID

Purpose The Macro ID command provides an ID number for the following macro commands. The ID number may be in the range 0 through 32767.

Syntax

E &f#Y

Hex   1B 26 66 # 59
Dec   27 38 102 # 89

where # is the value of the macro ID number used.

Macro Control

Purpose The Macro Control command can define, delete, and execute macros.

Syntax

E &f#X

Hex   1B 26 66 # 58
Dec   27 38 102 # 88

where # is a value shown in table 3-15.

Notes
- A temporary macro is automatically deleted during a printer reset. The temporary macro is the default.

- A permanent macro is not deleted during a printer reset.

- An automatic-overlay macro is the final operation in printing a page. Before the macro is executed, an overlay print environment replaces the current modified print environment. After execution of the macro, the former print environment is restored.

- Macros can be nested only two levels deep.

- The only control operations that may be used within a macro are 3 (Call) and 2 (Execute).

Table 3-15. **Macro control functions**

#	Function
0	Start macro definition (last ID specified)
1	Stop macro definition
2	Execute macro (last ID specified)
3	Call macro (last ID specified)
4	Enable auto-overlay macro (last ID specified)
5	Stop auto-overlay
6	Delete all macros
7	Delete all temporary macros
8	Delete macro (last ID specified)
9	Make macro temporary (last ID specified)
10	Make macro permanent (last ID specified)

Example of a macro

The following example demonstrates how to use the Macro Control and Macro ID commands to create and execute a macro that downloads a font to the printer and prints a letterhead.

1. E &f1Y

   (Assign 1 to Macro ID.)

2. E &f0X

   (Start macro definition of ID 1.)

3. E &a10c4R

   (Sets starting column for X and row for Y position.)

4. E &IO E 8U E (s1p10h14v0s+7b23T

   (Selects a primary font with the following characteristics:

   - Portrait orientation
   - HP Roman-8 symbol set
   - Proportional spacing
   - 10 characters per inch
   - 14 points in height
   - Upright (style)
   - Ultra black (stroke weight)
   - Century Schoolbook (typeface).

5. Styler Systems
   701 South Aviation Blvd.
   M/S ES AE-336
   El Segundo, CA 90245

   (Literal text.)

6. E &a10c12R

   (Position a black line.)

7. E *c1v20H

   (Set height and width of line.)

8. E *c0P

   (Print rectangle.)

9. E &a10c10R

   (Set print position for first line of text.)

To execute the macro enter:

E &f1x2X

4.   PostScript emulation

This chapter highlights certain programming features specific to the 4213's emulation of the Postscript Page Description Language (PDL) and describes how this PDL differs from other implementations of the PostScript language. Because this chapter serves as a supplement, we have omitted the standard information already described in the *PostScript® Language Reference Manual* and related publications.

The reference material in this chapter is intended for programmers who design host software to be used on the 4213 or who write their own programmes in the PostScript page description language.

Userdict operators for page type

The following operators are defined in **userdict**; they accept no arguments and yield no results. They select the imageable area that corresponds to each type of paper, with the width referring to the imageable area extending in the direction of the x-coordinate, and the height referring to the y-coordinate.

papername   **—papername—**

Only the imageable area, and not the paper type, can be selected with **papername**. Valid strings for **papername** are shown in table 4-1 on the next page.

Table 4-1. **Paper and envelope sizes**

Paper/envelope name	Paper/envelope size	Imageable area
LETTER	216 x 279 mm (8.5" x 11")	206 x 273 mm (8.1" x 10.75")
A4	210 x 297 mm (8.27" x 11.69")	199 x 290.5 mm
EXECUTIVE	184 x 267 mm (7.25" x 10.5")	176 x 260 mm (6.93" x 10.25")
B5	182 x 257 mm (7.15" x 10.1")	171 x 251 mm (6.75" x 9.9")
COM10ENVELOPE	105 x 241 mm (4.125" x 9.5")	95 x 235 mm (3.73" x 9.25")
DLENVELOPE	110 x 220 mm (4.33" x 8.66")	101.5 x 213.2 mm
MONARCENVELOPE	98 x 191 mm (3.875" x 7.5")	88 x 184 mm (3.45" x 7.25")
7 x 9	178 x 229 mm (7" x 9")	168 x 222 mm (6.61" x 8.73")
HALFLETTER	140 x 216 mm (5.5" x 8.5")	130 x 208 mm (5.1" x 8.2")
TWOTHIRDSA4	198 x 210 mm (7.8" x 8.27")	187.5 x 203.2 mm
C5ENVELOPE	162 x 229 mm (6.38" x 9.01")	152 x 222 mm (5.98" x 8.75")
A5	148.5 x 210 mm (5.85" x 8.27")	138.1 x 203.2 mm
LEGAL	216 x 356 mm (8.5" x 14")	206 x 349 mm (8.1" x 13.75")
EUROLEGAL	210 x 330 mm (8.28 x 13")	210 x 330 mm
B4	257 x 363 mm (10.1" x 14.3")	246 x 358 mm (9.7" x 14.1")
10 x 14	254 x 356 mm (10" x 14")	244 x 349 mm (9.6" x 13.75")

System parameters

The PDL in the 4213 uses a variety of programming parameters which fall into two categories:

- Non-volatile, or persistent, parameters stored in Non-Volatile memory (NVRAM).

- Volatile parameters which remain in memory only until the end of the current job or the printer is powered off.

These parameters are stored in a special dictionary called **statusdict**. These parameters can be changed through a PostScript programme using operators that access **statusdict**. Most persistent parameters can also be changed from the User Interface.

Statusdict operators

Following is a list of operators found in **statusdict**. These operators can be invoked once **statusdict** has been pushed onto the dictionary stack. You can gain access to **statusdict** by issuing **statusdict begin** at the start of a programme and use the operators by calling them by name.

In order to change persistent parameters, however, you must first exit from the normal **save** and **restore** context used by the server to prevent changes in the virtual memory from extending past the job boundaries. Use the following statement:

serverdict begin [password] **exitserver**

[*password*] is the system administrator password with a default value of zero. It can be changed to any other integer with the operator **setpassword**. In general, it is not advisable to change the password from the default value of zero. Many application programmes look for the password set to zero and will not function if the password is changed. An incorrect password returns the error message "PasswordIncorrect". The correct password causes the server to respond with the following message:

%%[exitserver:permanent state may be changed]%%

After the server has acknowledged the exit request, you are permitted to run a programme using **statusdict** operators that change persistent parameters. Operators that set persistent parameters are marked with an asterisk. To change these parameters, you must first exit the normal server mode. You can inquire about the current state of persistent parameters without using the exitserver mode, and accessing **statusdict** only. Parameters that remain in effect for the current job only can also be changed via **statusdict** only.

System set up operators

pagecount
—**pagecount** *integer*

This operator returns the number of pages the controller has generated. It reflects the pages generated in all emulations, not just the Postscript emulation.

setprintername*
string **setprintername**—

printername
string **printername** *substring*

String represents the printer's name and is printed on the configuration sheet. The name can be up to 32 characters long and should consist of printable characters. Avoid using the characters (:) or (@).

setsccinteractive*
—*channel baud options* **setsccinteractive**

sccinteractive
—*channel baud options* **sccinteractive**

Because communications options can be selected through the User Interface, the operator **setsccinteractive** is ignored by the PDL interpreter in the printer. The operator **sccinteractive** reports the current communications options to the host.

setsccbatch*
channel baud options **setsccbatch** —

sccbatch
channel **sccbatch** baud options

The printer ignores the **setsccbatch** operator because the user can select the communications options through the User Interface. The **sccbatch** operator always returns the active communications options on the printer.

setdojamrecovery   —*boolean* **setdojamrecovery**

Sets the state of jam recovery on (*true*) or off (*false).*

dojamrecovery   **— dojamrecovery** *boolean*

Tells if jam recovery is on (*true*) or off (*false*).

product   **—product** *string*

This operator returns the *string* Xerox 4213.

revision   **—revision** *intege*r

Returns the revision number of the device specific portion of the PostScript interpreter.

Timeout operators

setdefaulttimeout*   —*job manualfeed wait* **setdefaulttimeouts**—

This operator sets the default values (in seconds) used at the start of each job to initialise the job, manual feed and wait timeouts. A value of zero sets the timeout to infinity.

defaulttimeout   **— defaulttimeouts** *job manualfeed wait*

Returns the default job, wait and manual feed timeouts(in seconds).

setjobtimeout   **—** *integer* **setjobtimeout**

Sets the job timeout to the specified *integer (in seconds).*

jobtimeout   **— jobtimeout** *integer*

Returns the number of seconds the printer waits before the current job timeout occurs.

manualfeedtimeout   **— manualfeedtimeout** *integer*

Indicates how many seconds the printer will wait for a page to be manually fed before it cancels the job.

waittimeout — **waittimeout** *integer*

Indicates how many seconds the printer will wait to receive more characters before it cancels the job.

Output positioning operators

maxoutputposition — **maxoutputposition** *integer*

This operator returns the value 1.

outputposition — **outputposition** *integer*

This operator returns the value 0 or 1, depending on the state of the output jogger.

setoutputposition — *integer* **setoutputposition**

This operator accepts an integer in the range 0 to 1. The output positioning mechanism does not change to that value unless **outputpositioning** is *true.* If **outputpositioning** is *false*, there is no change in the output position.

outputpositioning — **outputpositioning** *boolean*

This operator returns a boolean value which indicates whether **setoutputposition** would take effect, if attempted.

setoutputpositioning — *boolean* **setoutputpositioning**

This operator accepts a boolean value and sets the state returned by **outputpositioning**.

defaultoutputposition — **defaultoutputposition**

This operator returns the default state that **outputpositionin**g will return at the start of a new job.

setdefaultoutputpositioning — **setdefaultoutputpositioning**

This operator sets the default state of **defaultoutputpositioning** as chosen from the User Interface.

2-sided operators

setdefault2-sidedmode*	— *boolean* **setdefault2-sidedmode**

Sets the value of **default2-sidedmode**. When *true*, the default printing mode is 2-sided. When *false*, it is 1-sided.

default2-sidedmode	— **default2-sidedmode** *boolean*

This operator returns a *boolean* indicating the current default mode. *True* indicates 2-sided mode; false, 1-sided mode.

set2-sidedmode	— *boolean* **set2-sidedmode**

Turns 2-sided printing on or off for the current job. *True* turns 2-sided on and *false* turns it off.

2-sidedmode	— **2-sidedmode** *boolean*

This operator returns a *boolean* indicating the current printer mode. *True* is 2-sided mode and *false* is 1-sided.

setdefaulttumble*	— *boolean* **setdefaulttumble**

Sets the default value for **tumble**. If this operator is *true*, the second side of a 2-sided page is upside-down compared to the first side. If *false*, the first and second sides have the same orientation.

defaulttumble	— **defaulttumble** *boolean*

Returns a *boolean* indicating whether **tumble** is on or off.

settumble	— *boolean* **settumble**

This operator turns **tumble** on or off for the current job only. Once the current job is finished, **tumble** is set to the default.

tumble	— **tumble** *boolean*

Returns a *boolean* indicating how text is oriented on a 2-sided page. *True* indicates the second side of a 2-sided page is upside-down compared to the first side. *False* indicates the orientation is the same on both sides of the page.

firstside   — **firstside** *boolean*

Returns a *boolean* indicating whether the image being created will be printed on the first side of a logical page. For the first page of a job, this value is always *true.*

Tray selection operators

setdefaultpapertray*   — *intege*r **setdefaultpapertray**

Four selections are available with the multiple tray 4213:

    0   UPPER TRAY
    1   LOWER TRAY
    2   HCF (High capacity feeder)
    3   MANUAL/MMF

When beginning a job, the server selects the default paper tray, and sets the size, and imageable area to the size of the paper in that tray. Once the job begins, you can change paper trays and the imageable area in a number of ways (refer to **setpapertray**, and **papername**).

defaultpapertray   — **defaultpapertray** *integer*

This operator returns an *integer* representing the default tray number set in **setdefaultpapertray**.

setpapertray   *integer* **setpapertray** —

Selects the paper tray to be used for the current job only, using the number assignments defined in **setdefaultpapertray** above. The imageable area is set by the size of the paper in the tray. This command is used to change the paper tray within a job. The next job will use the tray specified by **setdefaultpapertray**.

papertray   — **papertray** *integer*

This operator returns an *integer* indicating which tray to feed from for the current job.

The values returned are:

    0   UPPER TRAY
    1   LOWER TRAY
    2   HCF (High capacity feeder)
    3   MANUAL/MMF

setdefaulttrayswitch* — *boolean* **setdefaulttrayswitch**

Sets automatic tray switching on or off. If this feature is turned on, and the specified trays runs out of paper, the printer will search other trays for the same size paper and continue printing. If no paper of the same size is found, then the User Interface indicates out of paper. The sequence used to search the other paper trays is selectable through the User Interface, and is described in appendix A4 of the 4213 User Guide.

defaulttrayswitch — **defaulttrayswitch** *boolean*

This operator returns a *boolean* indicating whether **defaulttrayswitch** is on (*true*) or off (*false*).

settrayswitch — *boolean* **settrayswitch**

This operator turns automatic tray switching on or off for the current job only. On is *true* and off is *false*. When the current job ends, automatic tray selection is determined by the value of **defaulttrayswitch**.

trayswitch — **trayswitch** *boolean*

This operator returns a *boolean* indicating whether automatic tray switching is on (*true*) or off (*false*).

manualfeed — **manualfeed** *boolean*

This variable determines whether paper will be fed from the manual feeder. If set to true, then the printer will request that the next sheet be loaded in the manual feed slot. The image will be formatted to the last paper size selected, either by default, requesting a specific tray or using the **papername** operator to request specific imageable area.

lettertray — **lettertray**

This causes the 4213 to look for a tray with letter size paper. If such a tray is found, the page type is set to **letter** and **papertray** is set to that tray. If a tray with letter size paper is not found, a rangecheck error occurs and the page type and **papertray** values are not changed.

legaltray — **legaltray**

This causes the 4213 to look for a tray with legal size paper. If such a tray is found, the page type is set to **legal** and **papertray** is set to that tray. If a tray with legal size paper is not found, a rangecheck error occurs and the page type and **papertray** values are not changed.

executivetray — **executivetray**

This causes the 4213 to look for a tray with executive size paper. If such a tray is found, the page type is set to **executivepage** and **papertray** is set to that tray. If a tray with executive size paper is

not found, a rangecheck error occurs and the page type and **papertray** values are not changed.

A4tray — **A4tray**

This causes the 4213 to look for a tray with A4 tray size paper. If such a tray is found, the page type is set to **A4** and **papertray** is set to that tray. If a tray with A4 size paper is not found, a rangecheck error occurs and the page type and **papertray** values are not changed.

com10envelopetray — **com10envelopetray**

This causes the 4213 to look for an envelope tray. If such a tray is found, and com10 was selected from the User Interface, the page type is set to **com10envelope** and **papertray** is set to that tray. If a proper tray is not found, a rangecheck error occurs and page type and **papertray** values are not changed.

c5envelopetray — **c5envelopetray**

This causes the 4213 to look for an envelope tray. If such a tray is found, and c5 was selected from the User Interface, the page type is set to **c5envelope** and **papertray** is set to that tray. If a proper tray is not found, a rangecheck error occurs and page type and **papertray** values are not changed.

dlenvelopetray — **dlenvelopetray**

This causes the 4213 to look for an envelope tray. If such a tray is found, and dl was selected from the User Interface, the page type is set to **dlenvelope** and **papertray** is set to that tray. If a proper tray is not found, a rangecheck error occurs and page type and **papertray** values are not changed.

Handling syntax errors

Errors detected by the 4213 interpreter are reported to the host only when the serial interface is used. The message is sent to the host in the following form:

%%[error type and cause]%%

Syntax errors are caused usually by poorly written PostScript masters or insufficient memory space in the printer. You can define what action the printer should take when an error occurs. The action taken by the printer is a default error message reported in the following form:

%%[Error:error,OffendingCommand:command]%%

If the error occurred in the batch mode, the error message is followed by the line:

%%[Flushing: rest of job (to end-of-file) will be ignored]%%

After receiving an error message, you should send an EOT code 4H to the printer to reset the PDL interpreter, or all further data sent to the printer will be ignored. In the DOS environment you can reset the printer by typing the following at the C> prompt:

C> echo ^D > LPT1 [or COM1, etc.]

^D signifies "Control D," and is obtained by holding down the control key and pressing the letter D.

Handling printer errors

Printer errors are returned to the host computer in interactive mode only when the serial interface is used. Errors appear in the following form:

%%[PrinterError: cause of error]%%

Printer error messages are listed in the PostScript Language Reference Manual.

Table 4-2. **Letter paper throughput (images/minute)**

Memory in MB	Jam recovery on		Jam recovery off	
	Simplex	Duplex	Simplex	Duplex
4.5	13.0	4.1	13.0	9.4
6.5	13.0	7.4	13.0	10.9
8.5	13.0	10.4	13.0	10.9
10.5	13.0	10.4	13.0	10.9

Table 4-3. **Legal paper throughput (images/minute)**

Memory in MB	Jam recovery on		Jam recovery off	
	Simplex	Duplex	Simplex	Duplex
4.5	7.0	3.8	10.5	4.9
6.5	10.5	3.8	10.5	8.5
8.5	10.5	7.8	10.5	9.7
10.5	10.5	9.7	10.5	9.7

Table 4-4. **A4 paper throughput (images/minute)**

Memory in MB	Jam recovery on		Jam recovery off	
	Simplex	Duplex	Simplex	Duplex
4.5	7.4	3.7	13.0	5.0
6.5	13.0	7.4	13.0	10.9
8.5	13.0	10.4	13.0	10.9
10.5	13.0	10.4	13.0	10.9

Table 4-5. **VM and font cache allocation**

Memory in MB	VM (Bytes)	Font cache (Bytes)
4.5	530K	260K
6.5	530K	700K
8.5	640K	700K
10.5	1000K	1000K

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