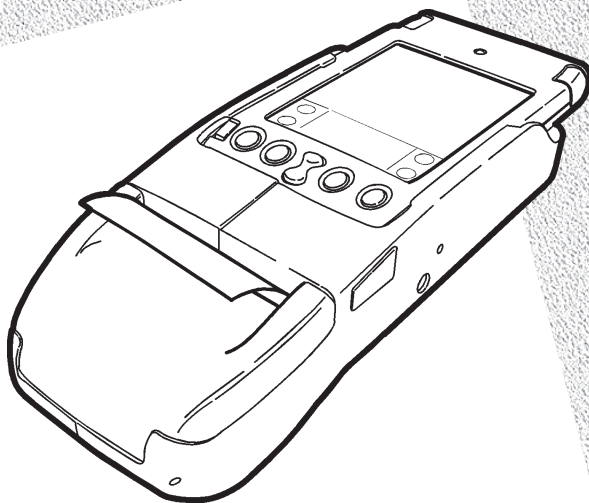


Programmer's Manual



Monarch[®]
6015[™] Printer

Monarch[®]
PAXAR

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INTRODUCTION

1

The Monarch® 6015™ printer works with application programs written for the Palm III™ series of organizers or the Symbol® SPT 1500. With these Palm Computing® connected organizers, the printer can print receipts for retail, healthcare, or industrial environments. Palm Computing is a subsidiary of 3Com® Corporation.

The application writes a data stream of commands (in the printer's control language) to the printer. It writes these commands either directly or through the Symbol Application Programming Interface (API). For information about the API, refer to Symbol's Web site (www.symbol.com).

Refer to the 3Com/Palm Computing Web site (www.palm.com) for more information about the Palm III series of organizers. Also, refer to the Stevens Creek Web site (www.stevenscreek.com) for various organizer applications.

The purpose of this manual is to describe the printer's control language. The commands can be either of the following:

- ◆ control characters (in hex format) that control the printer directly (physically manipulating the print buffer's contents, for example).
- ◆ character sequences that adjust the printer's performance or help you design the receipts to print.

Creating Data Streams

Creating a data stream involves coding a sequence of commands in the printer's control language. Then, you embed the data stream in the application, which writes it to the printer.

To create a data stream:

1. Draw a rough sketch of how you want the receipt to look. For example, a graphic may appear at the top, followed by the name of your organization, followed by a list of items purchased. Your receipt could be organized any number of ways.
2. Code the commands to implement your receipt design. See "Creating Formats" for more information.

3. Add any commands to the data stream related to how the printer performs. For example, at the data stream's beginning, enter the command to choose the operating mode. See "Configuring the Printer" for more information.
4. Embed the data stream in the application and test what you have written.

Conventions Used in this Manual

Following are the conventions used in the syntax descriptions of each command.

Symbol	Description
-	Separates items in the command sequence.
< >	Indicates a variable with a single-byte value.
' '	Indicates the value is a literal. Enter the value as it appears or use the ASCII hex values for the same characters.
()	Indicates a variable of any length.
# #	Indicates a variable of an exact length.
ESC	Indicates the beginning of a command sequence. Enter 1B hex for this item.
CR-LF	Indicates the end of a response from the printer. In the response, it is represented as 0D 0A hex.

These conventions make it easier for you to read the commands' syntax descriptions. They are not part of the data streams. For example, ESC-'F'-'1' may be the syntax description, but the application writes 1BF1 (1B 46 31 hex) to the printer.

 The printer ignores commands
 with syntax errors.

CREATING FORMATS

A format is the design of a receipt that the application prints with the printer. It consists of fields placed at various places on the format. Fields can contain text, graphics, and bar codes.

This chapter describes the commands used to create formats.

Creating Text Fields

Text fields can contain letters, numbers, and symbols. To specify text appearing on the format you create, write the text directly to the printer. There is no special command to use. There are, however, commands/control characters to select a character set to use and to format the text.

Selecting Character Sets

The printer can use the ANSI or ASCII character sets. These character sets are preloaded in the printer. ANSI characters are the default.

Command	Description
ESC-'F'-'1'	Selects ANSI characters.
ESC-'F'-'2'	Selects ASCII characters.

Formatting Text

For the text on your format, you can choose the font and its size, spacing, and style (normal or bold).

Command	Description
1C hex (Extend)	Prints characters twice as high as normal.
1D hex (Extendoff)	Stops printing characters twice as high as normal.
ESC-'U'-<mode> <mode>	Turns bold printing on or off. 0 Turn off bold printing. 1 Turn on bold printing.
ESC-'k'- 	Selects a font. 0 Large Rotated (90 degrees clockwise) - 24 columns per line 1 Large Normal - 24 columns per line 2 Standard Bold - 32 columns per line 3 Standard Normal - 38 columns per line 4 Reduced Bold - 42 columns per line 5 Reduced Normal - 48 columns per line
ESC-'A'-<space> <space> Example: ESC-A-2 (1B 41 02 hex)	Sets the space to leave between lines of text when they are printed. 0-10 The amount of space (in increments of .125 mm). The default is 3 (.375 mm). Sets the space between lines of text to .25 mm.

Creating Graphic Fields

You print data stream graphics one line at a time. To create a line, you specify bits to turn off or on. Bits turned off represent white space, and bits turned on represent part of the graphic. There is a .125 mm gap between consecutive lines.

Command	Description
ESC-'V'-01 hex-00 hex- #data# #data#	Prints a graphic line. 48 hex bytes, indicating the dots to turn on or off. For example, if a specified byte is FF, all the dots are on. If it is 01, only one dot is on, and the other 7 are off. If you accidentally specify less than 48 bytes, the printer does not print the graphic. If you specify more than 48 bytes, a fatal exception occurs.

You do not directly specify the bits turned on or off.
You specify the bits in groups of eight by using hex
values.

Example

This line of code prints a solid horizontal line of dots.

```
ESC-V-1-0-FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
```


Creating Bar Code Fields

The printer can print the following bar codes, with or without human-readable data.

- ◆ Code 39
- ◆ Codabar
- ◆ Interleaved 2 of 5
- ◆ Code 128 (UCC/EAN-128)
- ◆ UPC/EAN/JAN

Command	Description
ESC-'z'-<bctype>- <length>-<height>- <data>	Prints a bar code without human-readable data.
ESC-'Z'-<bctype>- <length>-<height>- <data>	Prints a bar code with human-readable data.
<bctype>	The type of bar code to print (values are the ASCII representation, not hex). '1' Code 39 '2' Code 128 (UCC/EAN-128) '3' Interleaved 2 of 5 '4' UPC/EAN/JAN '5' Codabar
<length>	The length of the bar code data (in hex). This value is dependent on the bar code you choose with <bctype> (see below).
<height>	The height of the bar code (in hex) in increments of .125 mm. <height> can be no smaller than 14 . For example, 14 = 2.5 mm, 15 = 2.625 mm, etc. For UPC/EAN/JAN bar codes, the height you specify will include a 1.25 mm drop bar pattern after the bar code.
<data>	The data for the bar code. Its length must equal <length>. See the following table for data restrictions, which vary by bar code.

Specifying Particular Bar Codes

Values for the <length> and <data> parameters depend on the type of bar code you choose with <bctype>.

Bar Code	<length>	<data>
Code 39	9 (maximum)	0-9, A-Z, -, (space), \$, /, +, and %
Interleaved 2 of 5	16 (maximum)	Pairs of numeric characters (0-9)
UPC/EAN/JAN	UPCA: 12 UPCE: 7 EAN/JAN-8: 8 EAN/JAN-13: 13 These lengths are fixed and all include a check digit.	0-9
Codabar	15 (maximum) plus start and stop characters. The printer adds the stop character automatically.	Data: 0-9, \$, -, :, /, .., and +. Start: a (the default), b, c, or d.

Code 128 (UCC/EAN-128) Details

<length> can be a maximum of 13 (with alphanumeric/control code data) or 26 (if subset C and numeric pairs are used).

Each subset enables the bar code to contain different characters. Subset A uses 20-3F hex and 40-7F hex (read by the bar code reader as 00-7F hex), subset B uses 20-7F hex, and subset C uses 30-39 hex.

The first character of <data> must specify the subset to be used: A, B, or C (listed as 87, 88, and 89 hex, respectively). The rest of the data can be all 256 ASCII characters by using a combination of the subsets. The data must appear as numeric pairs corresponding to the hex values for the ASCII character in question.

You can change subsets in mid-stream by using certain hex values in the data. Use 85, 84, and 83 hex to switch to subsets A, B, and C, respectively. To change the next character only to another subset, use 82 hex. With this option, you can only change between subsets A and B.

You can also insert Code 128 function characters into the data. Function 1 uses the reserved Code 128 character (UCC/EAN128), function 2 appends data, function 3 initializes the bar code reader, and function 4 extends characters (for example, 'a' (97 decimal) is changed to 'β' (225 decimal) by adding 128 to it. Use 86 hex to specify Function 1 (all three subsets). Use 81 and 80 hex to specify Function 2 and Function 3, respectively (subsets A and B only). To specify Function 4, use 85 hex in subset A and 84 hex in subset B. Function 4 is unavailable in subset C.

Positioning Fields

These commands/control characters help you move the supply through the printer to position the fields on the receipt. The application could also write spaces to the printer before it prints text.

Command	Description
D hex (CR)	Advances to the beginning of the next line and turns bold printing off.
C hex (FF)	Advances 10 lines.
14 hex (Norm)/F hex (SI)	Sets the printer to 48-column mode.
E hex (SO)	Sets the printer to 24-column mode.
B hex (VT)	Advances 5 lines.
9 hex (HT)	Tabs to the next position or the beginning of the next line.
A hex (LF)	Advances to the beginning of the next line. The default amount of space between lines is .375 mm for text and .125 mm for graphics.
ESC-'J'-<num> <num>	Performs a specified number of line feeds. 1-FF The amount of space (in hex). The default is 1 (.125 mm).

CONFIGURING THE PRINTER

You must configure the printer before printing with it. This chapter describes the configuration commands.

Selecting Operating Modes

The printer works in either online or buffer mode. In online mode, the printer prints characters as soon as they are received. In buffer mode, the printer receives and stores characters, and then prints them upon receipt of an EOT control character (4 hex).

Command	Description
ESC-'P'-'#'	Selects online mode.
ESC-'P'-'\$'	Selects buffer mode.

Setting the Print Contrast

The print contrast depends on the battery voltage and the print contrast setting. The print contrast setting also affects the print speed. A high contrast indicates a slow speed and vice versa.

We recommend designing your applications so the user can adjust the print contrast.

Command	Description
ESC-'P'-<value> <value>	Sets the print contrast. 0-9 0 is the highest contrast and 9 is the lowest contrast. The default is 5 .

Setting the Power Mode

The printer can operate in five different power modes, each using a different number of printhead sections. The mode selected also affects the print speed. The larger the number of dots used, the faster the printer speed.

Command	Description
ESC-'P'-<value> <value>	<p>Sets the power mode.</p> <p>The number of printhead sections to use, specified in hex. How you specify this value is dependent on the language the application is written in. For example, in C, you would use 0x01 to select one printhead section.</p> <ul style="list-style-type: none">1 Prints using one printhead section.2 Prints using two printhead sections.3 Prints using three printhead sections.6 Prints using six printhead sections.7 Default. Dynamically chooses the number of printhead sections to use (1, 2, 3, or 6), depending on what is printed.

Checking the Battery Voltage

The following commands/control characters involve the printer's battery.

Command	Description
ESC-'P'-'^'	Prints the battery voltage.
ESC-'P'-'!' 16 hex (Ctrl-V)	Requests the battery voltage from the printer. NiCD and NiMH batteries only. Requests the print buffer and battery statuses. The printer responds with: ESC-'B'-(pbchars)-CR-LF-ESC-'V'-#volts#-CR-LF (pbchars) The number of characters currently in the print buffer. #volts# Four ASCII characters. The first three are the battery voltage (form x.x). The fourth character categorizes the voltage listed to give it a reference. Values are 1-4 , where 1 is high and 4 is low.

We recommend designing your applications so the user can check the printer's battery voltage.

Using the Power-Off Timer

The printer has a power-off timer to conserve battery life. After a specified period of inactivity occurs, the printer goes into sleep mode. You can specify the length of this period. The printer returns to normal mode when it starts receiving commands again.

Command	Description
ESC-'C'	Sets the inactivity period to the default (20 seconds).
ESC-'M'-<digit1>-<digit2>-0-CR <digit1> and <digit2> Example: ESC-M-5-6-0-CR (1B 4D 35 36 30 0D hex)	Sets the power-off timer. Use D hex for the carriage return character (CR). 0-9 The number of seconds to set the timer to. To disable the timer, set both parameters to 0 . Sets the inactivity period to 56 seconds.

Be careful when using buffer mode. If there is data in the print buffer when the printer goes into sleep mode, you will lose that data.

Checking Version Information

Your application can check the versions of both the printer hardware and firmware.

Command	Description
ESC-'P'-'('	Requests the firmware version. The printer responds with: ESC-'('-'#version#'-CR-LF #version# Four ASCII characters representing the firmware version.
ESC-'P'-'('	Requests the hardware version. The printer responds with: ESC-'('-'097'-'<version>'-'CR-LF #version# An ASCII character representing the hardware version.

Communicating with the Organizer

The printer and organizer must use these values for the communication parameters:

- ◆ **Baud Rate** - 19200
- ◆ **Stop Bits** - 2
- ◆ **Parity** - None
- ◆ **Data Bits** - 8

Have the organizer use hardware (RTS/CTS) communications protocol when communicating with the printer.

These control characters are related to communications between the printer and the organizer.

Command	Description
13 hex (Xoff)	Indicates a complete data transmission.
11 hex (Xon)	Ready to accept data.

Miscellaneous Control Characters


Command	Description
18 hex (Cancel)	Re-initializes the printer.
2 hex (Ctrl-B)	Requests the print buffer status. The printer responds with: ESC-'B'-<pbchars>-CR-LF <pbchars> The number of characters currently in the print buffer.
8 hex (BS)	Removes the last character entered in the print buffer.

SAMPLE DATA STREAM

How you send the data stream to the printer is dependent on the language your application is written in. For example, the following data stream (consisting of several strings that the application writes to the printer) makes use of C notations for carriage returns (\r), new lines (\n), and the C method for representing hex numbers (x06, for example).

The data stream prints the label on the right.

```
"\x1bP#\r\n\r\n" \
"      Paxar/Monarch\n" \
"      170 Monarch Ln.\n" \
"      Miamisburg, OH 45342\n" \
"      Phone: (937) 865-2123\r\n\r\n" \
"      SALES RECEIPT\r\n\r\n" \
" Description          Qty.   Total\n" \
" 1. Monarch 9490      5     3495\n" \
" 2. Monarch 9403      4     995\n" \
" 3. Monarch 6035      3    4995\n" \
" 4. Monarch 6030      2    2995\n" \
" 5. Monarch 9450      1     995\n" \
"                      -----\n" \
"                      Total    13475\r\n\r\n" \
" \
" AMEX 37xyz55xx315001\n" \
" Exp. Date 10/01\r\n\r\n\r\n" \
" \x1bz1\x06\x64" \
"123456\n\x0c"
```

Paxar/Monarch 170 Monarch Ln. Miamisburg, OH 45342 Phone: (937) 865-2123		
SALES RECEIPT		
Description	Qty.	Total
1. Monarch 9490	5	3495
2. Monarch 9403	4	995
3. Monarch 6035	3	4995
4. Monarch 6030	2	2995
5. Monarch 9450	1	995
	Total	13475
AMEX 37xyz55xx315001		
Exp. Date 10/01		
		

For supplies, service, or assistance call toll free:

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