APEX & ANDES Series

Printer Command Language Developer's Manual ■ ■ ■

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CONTENTS

Introduction

This manual is intended to be used by software developers and system integrators with the purpose of developing applications that can print output results using Datamax-O'Neil wide range of mobile thermal printers. This section of the manual describes the various printer models, their main technical specifications and the communication interfaces available for each model. For specific information about the operation of each printer refer to the User's Guide.

Printer Models and Supported Features

The Datamax-O'Neil series of thermal printers offer a wide variety of solutions for printing applications. Communication interfaces and supporting flexible paper widths are shown in the table below. For additional information, please refer to the printer's User Guide.

Model	Max Paper Width	Max. Print Width	Max Print Dots	Sensors	Communication Interfaces						
					RS-232	USB	BT	IrDA	WiFi	MCR	SCR
APEX2	2.28"/58mm	1.89"/48mm	384	Front Black Mark	Std	NA	Std	Opt	Opt	Opt	Opt
APEX3	3.15"/80mm	2.83"/72mm	576	Front Black Mark	Std	NA	Std	Opt	Opt	Opt	Opt
ANDES3	3.15"/80mm	2.83"/72mm	576	Front & Back Black Mark	Std	Std	Opt*	Std	Opt*	Opt*	Opt*
APEX4	4.35"/110.6 mm	4.09"/104mm	832	Front Black Mark	Opt	Std	Std	Opt	Opt	Opt	Opt

Std = Standard

NA = Not Available

Opt = Optional

Datamax-O'Neil Printer Command Language (ExPCL)

This section describes the control codes and escape sequences comprising Datamax-O'Neil Printer Command Language (ExPCL).

Control characters defined as the set of characters encoding from 0x00 to .0x1F (ASCII values between 0 to 31)

The ExPCL defines commands that start with the ESC (Hexadecimal 1B or Decimal 27) character and then are followed for the command and the parameters. The general structure of the commands can be defined as follows:

ESC <Command> <Param1, Param2, ...,Param n>

Where:

ESC	Character Hexadecimal 1B or Decimal 27
Command	One or more ASCII characters that define a unique Datamax-O'Neil Printer Command Language
Param1	Input parameters for the command. The commands that accept just one parameter will be defined as "n" while commands with more than one parameter will be defined as "n1", "n2", etc.

Note that **spaces are not part of the commands** and the parameters are indicated as items typed in italics. For instance, the command ESC k *n* is used to select the character size of the resident fonts in the printers. The parameter *n* indicates the font type to choose with possible values between o and 9.

Parenthesis is not part of the command unless specified otherwise:

For example Esc K *n* CR

Escape Sequence:	ESC	K	1	CR
Hexadecimal:	1B	4B	31	0D
Decimal:	27	75	49	13

Note that CR means Carriage Return control character.

The following pages describe Datamax-O'Neil Command Language (ExPCL) components in more details. The commands have been grouped based on major functions.

Communications

This section describes various methods of controlling the flow of data to and from the printer. The set of control characters described below are used by the printer and the host while a communicating process is in place. Note that some handshaking methods are only supported by the RS-232C Serial interface and are not supported for the USB, IrDA, Bluetooth, or Wi-Fi interfaces.

End of Transmission   EOT

The printer sends an EOT character each time the printer's input buffer becomes empty (indicating that the printer is idle).

Control Code: EOT
Hexadecimal: 04
Decimal: 4

Note that this control character can be enabled and disabled using the command ESC P n. See detailed description of the command in Section: "Printer Control: Data Processing".

Transmitter On   XON

When selected XON/XOFF as flow control method of serial communication, this character is transmitted by the printer to indicate that the printer is on line and ready to receive data. After receiving this character the host computer will start sending data to the printer.

Control Code: XON
Hexadecimal: 11
Decimal: 17

Transmitter Off   XOFF

When selected XON/XOFF as flow control method of serial communication, this character is transmitted by the printer to indicate that the printer's buffer is nearly full and that the host computer should stop sending data. The communication process is reestablished after the printer transmits XON character to the host.

Control Code: XOFF
Hexadecimal: 13
Decimal: 19

Character Sets

Select Character Set   Esc F *n*

This command will select the character set that will be used when printing extended characters (Hexadecimal: 80 to FF; Decimal: 128 to 255).

n	Character Set
1	International Character Set
2	PC Line Drawing Character Set
A	16 bit font (Asian tables)

Example1: The following escape sequence will select the International character set.

```
Escape Sequence:     ESC   F    1
Hexadecimal:          1B   46   31
Decimal:              27   70   49
```

Refer to Appendices Section for complete list of characters contained in each character set.

Note that printers are set to International Character Set by default. When using the PC Line Drawing Character Set, the text line spacing should be set to zero in order to create continuous vertical lines.

This command is used in conjunction with the command ESC k n (or Esc K n, refer to Character Size and Line Spacing).

Character Size and Line Spacing

Select Character Pitch: Mode 1   ESC K *n* CR

This command sets the font size based on the number of character per inch. The parameter n can have the following values:

n	Character Pitch/Font	Character size	Columns Per Line		
			APEX2	APEX3 / Andes3	APEX4
0	~13 cpi Rotated / Courier mode 0	16 x 14	24 (rows/line)	36 (rows/line)	52 (rows/line)
1	~12 cpi Normal / Courier mode 1	16 x 23	24	36	52
2	~16 cpi Normal / Courier mode 2	12 x 23	32	48	69
3	~19 cpi Normal / Courier mode 3	10 x 23	38	57	83
4	~21 cpi Normal / Courier mode 4	09 x 23	42	64	92
5	~24 cpi Normal / Courier mode 5	08 x 23	48	72	104
6	~10 cpi Normal / Monospace 821BT	20 x 23	19	28	40
7	~20 cpi Normal / Monospace 821BT	10 x 23	38	57	80
8	~20 cpi Bold / Monospace 821BT	10 x 23	38	57	80
9	~20 cpi Short / Monospace 821BT	10 x 18	38	57	80
10	~4 cpi Bold	48 x 80	8	12	17
11	~25 cpi Verin	08 x 23	48	72	104
12	~22 cpi Verin	09 x 23	42	64	92
13	~20 cpi Verin	10 x 23	38	57	83
14	~16 cpi Verin	12 x 23	32	48	69
15	~12 cpi Verin	16 x 23	24	36	52

This command (ESC K n CR) must be sent prior to any printable characters on the line in order to take effect.

Example 1: The following escape sequence set the pitch to 12 CPI (Courier Font):

```
Escape Sequence:    ESC   K    1    CR
Hexadecimal:        1B    4B   31   0D
Decimal:            27    75   49   13
```

Example 2: The following escape sequence set the pitch to 25 CPI Verin Font:

```
Escape Sequence:    ESC   K    1    1    CR
Hexadecimal:        1B    4B   31   31   0D
Decimal:            27    75   49   49   13
```

Select Character Pitch: Mode 2   ESC k *n*

This command is used for backward compatibility when Legacy or Factory fonts are selected. The command sets the font size based on the number of character per inch. The parameter *n* can have the following values:

n	Character Pitch/Font	Character size	Columns Per Line		
			APEX 2	APEX 3 Andes3	APEX4
0	~13 cpi Rotated / Courier mode 0	16 x 14	24 (rows/line)	36 (rows/line)	52 (rows/line)
1	~12 cpi Normal / Courier mode 1	16 x 23	24	36	52
2	~16 cpi Normal / Courier mode 2	12 x 23	32	48	69
3	~19 cpi Normal / Courier mode 3	10 x 23	38	57	83
4	~21 cpi Normal / Courier mode 4	09 x 23	42	64	92
5	~24 cpi Normal / Courier mode 5	08 x 23	48	72	104
6	~10 cpi Normal / Monospace 821BT	20 x 23	19	28	40
7	~20 cpi Normal / Monospace 821BT	10 x 23	38	57	80
8	~20 cpi Bold / Monospace 821BT	10 x 23	38	57	80
9	~20 cpi Short / Monospace 821BT	10 x 18	38	57	80

This command (ESC k *n*) must be sent prior to any printable characters on the line in order to take effect.

Example: The following escape sequence set the pitch to 12 CPI (Courier font):

```
Escape Sequence:    ESC   k    1
Hexadecimal:        1B    6B   31
Decimal:            27    107  49
```

Character Size and Line Spacing – Width and Height

Double Wide ON   SO

This command sets any printed characters to double wide.

Control Code: SO
Hexadecimal: 0E
Decimal: 14

Double Wide OFF   SI

This command disables the double wide feature.

Control Code: SI
Hexadecimal: 0F
Decimal: 15

Double High ON   FS

This command enables double high printing. The characters printed after this control character will be printed as double height and also the interline spacing is doubled in height. This feature will be disabled using the control character GS. Refer to the "Double High OFF" control character for more details.

Control Code: FS
Hexadecimal: 1C
Decimal: 28

Double High OFF   GS

This command disables double high printing.

Control Code: GS
Hexadecimal: 1D
Decimal: 29

Set Text Line Spacing   ESC a *n*

This command sets the line spacing between successive printed text lines (dot row). Each dot row is 0.125mm.

$0 \leq n \leq 40$) decimal= . If n value is greater than 0x28 or Decimal 40, then n will be set to 0x28)Decimal 40).

Example: The following escape sequence sets the line spacing to zero (as needed when printing line drawing characters when the PC Line Drawing character set is selected).
Escape Sequence: ESC   a   NUL
Hexadecimal: 1B   61   00
Decimal: 27   97   0

Example 2: The following escape sequence sets the line spacing to 40 dot lines (0x28 and Decimal 40)
Escape Sequence: ESC   a   (
Hexadecimal: 1B   61   28
Decimal: 27   97   40

Note 1: Printer's default settings are set to 3-dot line after each text line.

Note 2: Line spacing must be set to zero when printing PC Line-Draw characters, the, thus allowing graphic characters on successive lines to be connected.

Character Attributes

Emphasized Printing Mode   ESC U *n*

The Emphasized printing mode command will cause the printer to print text with bold appearance.

n	Selection
0	Emphasized Mode Off
1	Emphasized Mode On

Note that on power up the printer defaults to emphasized mode off.

Example1: The following escape sequence will enable the Emphasized printing mode.

Escape Sequence: ESC   U   1
Hexadecimal: 1B   55   31
Decimal: 27   85   49

All characters following this command will be emphasized. The emphasized command is terminated either by the Esc U 0 command or by cycling the printer power.

Example 2: The following escape sequence will disable the emphasized printing mode.

Escape Sequence: ESC   U   0
Hexadecimal: 1B   55   30
Decimal: 27   85   48

Underline Printing Mode   ESC U *n*

Underline printing mode may be used to underline text.

n	Selection
U	Underline Mode ON
u	Underline Mode OFF

Note that on power up the printer defaults to underline mode off.

Example1: The following escape sequence will enable the underline printing mode.

Escape Sequence: ESC   U   U
Hexadecimal: 1B   55   55
Decimal: 27   85   85

All characters following this command will be underlined. The underline command is terminated either by the Esc U u command or by cycling the printer power.

Example 2: The following escape sequence will disable the underline printing mode.

Escape Sequence: ESC   U   u
Hexadecimal: 1B   55   75
Decimal: 27   85   117

Reverse Print   ESC U *n*

The reverse print command enables the user to print white letters on a black background .Reverse printing begins with the characters following the command.

n	Selection
R	Reverse printing ON
n	Reverse printing OFF

Note that on power up the printer defaults to reverse printing off.

Example1: The following escape sequence will enable the reverse printing mode.

```
Escape Sequence:     ESC   U    R
Hexadecimal:          1B   55   52
Decimal:              27   85   82
```

All characters following this command will be reverse printed. The reverse printing command is terminated either by the Esc U n command or by cycling the printer power.

Example 2: The following escape sequence will disable the reverse printing mode.

```
Escape Sequence:     ESC   U     n
Hexadecimal:          1B   55    6E
Decimal:              27   85   110
```

Right to Left and Left to Right Printing   ESC F *n*

This command causes the printer to change the direction in which characters are printed. The printer direction default mode is set to Left to Right.

n	Selection
R	Right to Left
L	Left to Right

Note that on power up the printer defaults to left to right printing mode.

Example1: The following escape sequence will enable the right to left printing mode.

```
Escape Sequence:     ESC   F    R
Hexadecimal:          1B   46   52
Decimal:              27   70   82
```

All characters following this command will be printing right to left printed. The right to left printing command is terminated either by the Esc F L command or by cycling the printer power.

Example 2: The following escape sequence will disable the left to right printing mode.

```
Escape Sequence:     ESC   F    L
Hexadecimal:          1B   46   4C
Decimal:              27   70   76
```

Horizontal Position

Carriage Return   CR

This command prints the input buffer information and advances the paper to the next line. If the printer buffer is empty a line is advanced.

Control Code: CR
Hexadecimal: 0D
Decimal   13

Backspace   BS

This command removes the previous character from the print buffer.

Control Code: BS
Hexadecimal: 08
Decimal: 8

Horizontal Tab   HT

This command advances the cursor by the number of dots specified in the Horizontal Margins command

Control Code: HT
Hexadecimal: 09
Decimal: 9

Set Horizontal Tab Width   ESC T H *n*

This command sets the Horizontal Tab (HT) value. The parameter *n* has values between 0 and 255 with a default value of 100 dots..

Example: The following escape sequence sets the horizontal tab width to 50 dots.

Escape Sequence: ESC   T   H   2
Hexadecimal: 1B   54   48   32
Decimal: 27   84   72   50

Vertical Position

Line Feed   LF

This command prints the input buffer information and advances the paper to the next line.

Total Feed Length = Vertical size of the current font + Text Line Spacing

A Carriage Return (CR) is also performed to place the current print position at the beginning of the next line.

```
Control Code:           LF
Hexadecimal:            0A
Decimal :               10
```

Variable Size Line Feed   ESC J *n*

This command moves the paper forward as per the distance specified by the parameter *n* x 0.125mm. 0 ≤ *n* ≤ 255.

A Carriage Return (CR) is also performed to place the current print position at the beginning of the next line.

Example: The following escape sequence advances the paper ten millimeters. Each dot is 0.125mm so to advance the paper 10mm, the n parameter is 80 (10 / 0.125).

```
Escape Sequence:    ESC   J    P
Hexadecimal:        1B    4A   50
Decimal:            27    74   80
```

Variable Size Reverse Line Feed   ESC Q J *n*

This command moves the paper in reverse direction as per the distance specified by the parameter *n* x 0.125mm. 0 ≤ *n* ≤ 255.

A Carriage Return (CR) is also performed to place the current print position at the beginning of the next line.

Example: The following escape sequence moves the paper in the reverse direction ten millimeters. Each dot is 0.125mm so to reverse the paper 10mm, the n parameter is 80 (10 / 0.125).

```
Escape Sequence:    ESC   Q    J    P
Hexadecimal:        1B    51   4A   50
Decimal:            27    81   74   80
```

Vertical Tab   VT

This command advances the cursor the number of dot lines specified in the Vertical Margin command (below).

A Carriage Return (CR) is also performed to place the current print position at the beginning of the next line.

```
Control Code:       VT
Hexadecimal:        0B
```

Set Vertical Tab Height   ESC T V n

This command sets the vertical tab length in dot lines. 0 ≤ *n* ≤ 255.

The default value of the vertical tab is 203 dot lines.

Example: The following escape sequence sets the vertical tab to ten millimeters. Each dot is 0.125mm so to fixed the vertical distance of 10mm, the n parameter is 80 (10 / 0.125).

```
Escape Sequence:    ESC   T    V    P
Hexadecimal:         1B   54   56   50
Decimal:             27   84   86   80
```

Form Feed   FF

This command advances the paper by the number of lines specified in the Set Form Feed length in dot lines (below).

A Carriage Return (CR) is also performed to place the current print position at the beginning of the next line.

```
Control Code:    FF
Hexadecimal:     0C
Decimal          12
```

Set Form Feed Length in Dot Lines   ESC T F n1 n2

This command sets the Form Feed Length in Dot Lines. The total Form Feed distance is computed using the following formula: (n2 * 256 + n1). 0 ≤ *n1* ≤ 255. 0 ≤ *n2* ≤ 255. The default value is 1030 dot lines.

Note that the height of the font in dot lines will be subtracted from the total dot lines specified in the command.

Example: For a font 23 dot lines high and with an Esc T V 200 (0xC8) command sent, the actual VT value will be 200 – 23 = 177 dots.

Bar Codes

The Datamax-O'Neil printer series print several barcode symbologies including Linear and 2D barcodes. The following commands are used to print barcodes.

Print Bar Code   ESC *z t n h data CR LF*

This command will print a barcode without human readable text. The following table describes the Bar Code command structure.

Parameters:

t	Barcode
1	Code 39
2	Code 128,UCC/EAN-128
3	Interleaved 2 of 5
4	UPC/EAN/JAN
5	Codabar
9	PDF417 *

z	bar code is non-human readable
t	barcode type.
n	number of character bytes in data array. $1 \leq n \leq 255$
h	height of bar code printed in increments of 0.125mm
data	*n* characters to be encoded in the barcode.

*The parameters for the PDF417 barcode differ from the Linear Barcodes. See PDF-417 specifications for more detail.

Note that all barcodes are printed with the minimum bar width ("x-dimension") of 0.250mm, in compliance with the respective official specification.

Print Bar Code with Human Readable Text   ESC *Z t n h data CR LF*

This command prints a barcode with Human Readable Text below the barcode. Refer to the parameters of the prior command.

Z   Indicates human readable

Code 39 Specifications

Description	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone
Character set	36 alphanumeric (0-9, A-Z) and '-' 'space' '$' '/' '+' '%' Note: Only capital letters are supported.
Elements per symbol:	9 (5 bars, 4 spaces)
Character density	6.25 CPI
Bar width	0.25mm (narrow to wide ratio of 1:3).
Characters per line	2 Inch printer: 9 alphanumeric with auto center (maximum) 3 Inch printer: 12 alphanumeric with auto center (maximum) 4 Inch printer: 22 alphanumeric with auto center (maximum)

Example: The following command will print human readable barcode "CODE 39" of 1mm high (0.125*8= 1mm).

Escape Sequence:	Esc	Z	1	7	8	C	O	D	E	-	3	9	CR	LF
Hexadecimal:	1B	5A	31	07	08	43	4F	44	45	2D	33	39	0D	0A
Decimal:	27	90	49	7	8	67	79	68	69	45	51	57	13	10

Code 128 Specifications

Description	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone
Character set	Support for full 256 ASCII set among three subsets
Elements per symbol	6 (3 bars, 3 spaces)
Character density	9.1 CPI
Bar width	0.25mm
Characters per line	2 Inch printer: 13 alphanumeric characters or 26 numeric only (maximum) - automatically centered 3 Inch printer: 18 alphanumeric characters or 36 numeric only (maximum) - automatically centered 4 Inch printer: 32 alphanumeric characters or 36 numeric only (maximum) - automatically centered

Code 128 Start Character:

<start character> = {0x87, 0x88, 0x89} determines the character set to be printed

Start Character	Characters Sent to Printer	Characters Read by Bar Code Reader
IF <start character> is 0x87 CODE A	0x020 through 0x03F ASCII (#32 - #63)	0x020 through 0x03F ASCII (#32 - #63)
	0x040 through 0x07F ASCII (#64 - #127)	0x00 through 0x07F ASCII (#0 - #31)
IF <start character> is 0x88 CODE B	0x020 through 0x07F ASCII (#32 - #127)	0x020 through 0x07F ASCII (#32 - #127)
IF <start character> is 0x89 CODE C (Each number must be paired with another)	PAIRS 0x030 through 0x039 ASCII (#48 - #57)	PAIRS 0x030 through 0x039 ASCII (#48 - #57)

Code 128 Data Bytes:

<DATA>

The data bytes are defined by which character set is defined. The printer accepts all characters 0x20h - 0x7Fh with the translations defined above.

Also, characters 0x080 - 0x86 may be used as Code 128 control characters:

HEX	DEC	CODE A	CODE B	CODE C
0x080	128	FNC 3	FNC 3	
0x081	129	FNC 2	FNC 2	
0x082	130	SHIFT	SHIFT	
0x083	131	change to C	change to C	
0x084	132	change to B	FNC 4	change to B
0x085	133	FNC 4	change to A	change to A
0x086	134	FNC 1	FNC 1	FNC 1

FNC 1: Reserved CODE 128 character (used for UCC/EAN128)

FNC 2: Message append (not supported by *all* bar code readers)

FNC 3: Initialize bar code reader

FNC 4: Extend characters (bar code reader reads character + 128)

For example: 'a' is changed from #97 to #97+128 = #225

Note that it is possible to switch code sets in the middle of the bar code. This is useful with heavily numeric alphanumeric bar codes (see example below).

Example 1: The following escape sequence prints alphanumeric bar code "A2a", 12.5mm high, with human readable text:

n = 3 printed characters + 1 start character = 4

L = 12.5mm / 0.125mm = #100

start character = START B (full ASCII alpha numeric) = #136

Escape Sequence:	Esc	Z	2	4	d	88	A	2	a	CR	LF
Hexadecimal:	1B	5A	32	04	64	88	41	32	60	0D	0A
Decimal:	27	90	50	4	100	136	65	50	97	13	10

Example 2: The following escape sequence print all-numeric bar code "1234", 5mm high, non-human readable text:

n1 = 4 printed characters + 1 start character = 5

L = 5mm / 0.125mm = #40

start character = START C (numeric pairs) = #137

Escape Sequence:	Esc	z	2	5	(	89	1	2	3	4	CR	LF
Hexadecimal:	1B	7A	32	05	28	89	31	32	33	34	0D	0A
Decimal:	27	122	50	5	40	137	49	50	51	52	13	10

UCC/EAN-128 Specifications

Description

The UCC/EAN-128 specification is an internationally recognized format for application identifiers in code 128 bar codes. The bar code symbology is identical to Code 128. These identifiers are not intended for point-of-sale applications. Only recognized bodies of the UCC or EAN may assign application identifiers. More information may be found at:

http://www.ean.be/ for the EAN and

http://www.uc-council.org/   for the UCC

Example: The following escape sequence print all-numeric bar code "1234", 5mm high, with human readable text in EAN-128 format:

n1 = 1 start character + EAN specified + 4 printed characters = 6

L = 5mm / 0.125mm = #40

start character = START C (numeric pairs) = #137

Escape Sequence:	Esc	Z	2	6	(	89	FNC1	1	2	3	4	CR	LF
Hexadecimal:	1B	5A	32	06	28	89	86	31	32	33	34	0D	0A
Decimal:	27	90	50	6	40	137	134	49	50	51	52	13	10

Interleaved 2 of 5 Specifications

Description	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone
	numeric pairs
Character set	
Elements per symbol	10 (5 bars, 5 spaces)
Character density	1.11 CPI
Bar width	25mm
Characters per line	2 inch printer: 16 numeric (maximum), automatically centered
	3 inch printer: 24 numeric (maximum), automatically centered
	4 inch printer: 35 numeric (maximum), automatically centered

Example: The following escape sequence prints an Interleaved 2 of 5 barcode, encoding "12345678" with 10 mm high, human readable.

Escape Sequence:	Esc	Z	3	8	2	1	2	3	4	5	6	7	8		CR	LF
Hexadecimal:	1B	5A	33	08	32	31	32	33	34	35	36	37	38		0D	0A
Decimal:	27	90	51	8	50	49	50	51	52	53	54	55	56		13	10

UPC/EAN/JAN Specifications

Description	Each symbol starts with Leading Quiet Zone, followed with Left Guard Bars, Left Data Symbols, Center Bar Pattern, Right Data Symbols, Check Character, ending with Right Guard Bars and Trailing Quiet Zone.
	The UPC, EAN/JAN-8, EAN/JAN-13 specifications comprise an internationally recognized format for application identifiers. Unlike the UCC/EAN-128 specification, these identifiers are intended for point-of-sale applications. Only recognized bodies of the UCC and EAN may assign application identifiers. More information may be found at:
	http://www.ean.be/ for the EAN and
	http://www.uc-council.org/ for the UCC
	Numeric - fixed length
Character set	
Elements per symbol	4 (2 bars, 2 spaces)
Character density	14.5 CPI
Bar width	0.25mm
Characters per line	UPC-A: 11 - plus check digit (automatically centered)
	UPC-E: 6 - plus check digit (automatically centered)
	EAN/JAN-8: 7 - plus check digit (automatically centered)
	EAN/JAN-13: 12 - plus check digit (automatically centered)

Example 1: The following escape sequence will print a UPC-A bar code with the following: human readable, 30 mm high, containing "123456789012" where 2 is the check digit. Due to limited spacing CR LF are not shown at the end of this command.

Escape Sequence:	ESC	Z	4	12	240	1	2	3	4	5	6	7	8	9	0	1
Hexadecimal:	1B	5A	34	0C	F0	31	32	33	34	35	36	37	38	39	30	31
Decimal:	27	90	52	12	240	49	50	51	52	53	54	55	56	57	48	49

Example 2: The following escape sequence will print a UPC-E bar code with the following: human readable, 30 mm high, containing "1234565" where 5 is the check digit.

Escape Sequence:	ESC	Z	4	7	240	1	2	3	4	5	6	CR	LF
Hexadecimal:	1B	5A	34	07	F0	31	32	33	34	35	36	0D	0A
Decimal:	27	90	52	7	240	49	50	51	52	53	54	13	10

Example 3: The following escape sequence will print an EAN/JAN-8 bar code with the following: human readable, 30 mm high, containing "12345670" where 0 is the check digit.

Escape Sequence:	ESC	Z	4	8	240	1	2	3	4	5	6	7	CR	LF
Hexadecimal:	1B	5A	34	08	F0	31	32	33	34	35	36	37	0D	0A
Decimal:	27	90	52	8	240	49	50	51	52	53	54	55	13	10

Example 4: The following escape sequence will print an EAN/JAN-13 bar code with the following: human readable, 30 mm high, containing "1234567890128" where 8 is the check digit. Due to limited spacing CR LF are not shown at the end of this command.

Escape Sequence:	ESC	Z	4	13	240	1	2	3	4	5	6	7	8	9	0	1	2
Hexadecimal:	1B	5A	34	0D	F0	31	32	33	34	35	36	37	38	39	30	31	32
Decimal:	27	90	52	13	240	49	50	51	52	53	54	55	56	57	48	49	50

Note that all heights are total height, including a 1.23mm drop bar pattern printed after the bar code pattern.

Codabar Specifications

Description	Each symbol starts with Leading Quiet Zone, followed with Start Symbol, Data Symbols, ending with Stop Symbol and Trailing Quiet Zone
Character set	0-9, {$, -, :, /, ., +} and start/stop pairs {A/T, B/M, C/*, D/E}
Elements per symbol	7 (4 bars, 3 spaces)
Character density	8.1 CPI
Bar width	0.25mm
Characters per line	2 Inch Printer: 15 (maximum) plus start/stop, automatically centered
	3 inch printer: 20 (maximum) plus start/stop, automatically centered
	4 inch printer: 35 (maximum) plus start/stop, automatically centered

Example 1: The following escape command prints a Codabar barcode with the following: Encoding "123456", human readable, 20 mm high, start character A and stop character T

Escape Sequence:	ESC	Z	5	8	160	A	1	2	3	4	5	6	T	CR	LF
Hexadecimal:	1B	5A	35	08	A0	41	31	32	33	34	35	36	54	0D	0A
Decimal:	27	90	53	8	160	65	49	50	51	52	53	54	84	13	10

Example 2: The following escape command prints Codabar barcode with the following: Encoding "2468", human readable, 10 mm high, start character C and stop character *. .

Escape Sequence:	ESC	Z	5	6	P	C	2	4	6	8	*	CR	LF
Hexadecimal:	1B	5A	35	06	50	43	32	34	36	38	2A	0D	0A
Decimal:	27	90	53	6	80	67	50	52	54	56	42	13	10

GS1 DataBar Specifications

Description	GS1 DataBar symbols can **carry more information** and **identify small items** than the current EAN/UPC bar code. GS1 DataBar enables GTIN identification for hard-to-mark products like fresh foods, jewelry and do-it-yourself hardware products and can carry GS1 Application Identifiers such as serial numbers, lot numbers, and expiration dates.
Character set	numeric, alphanumeric, byte / binary, Kanji
QR Code Models	Model 1 is the original specification. Model 2 is an enhanced form of the symbology.
Error Correction Levels	Ultra High Reliability Level (30% of codewords can be restored) High Reliability Level (25% of codewords can be restored) Standard Level (15% of codewords can be restored) High Density Level (7% of codewords can be restored)
Data Modes	AUTO (do not need to specify the character mode) MANUAL (need to specify the character mode.)
Elements per symbol	Square dot/element with the following pixel multipliers: 1(none), 2, 4(default), 8, 16
Max. Characters	7366

QR Code Command Structure:

<ESC> – 'z' or 'Z' – '6' – TYPE – DATA SIZE – ELEMENT SIZE – X UNDERCUT – Y UNDERCUT – SEP ROW HEIGHT – MAX SEG PER ROW - [User's Data]

Parameters:

1) ESC(0x1B)

2) "Z"(0x5A) or "z"(0x7A) - Enables\disables annotation

3) "6"(0x36) - Selects GS1 DataBar barcode family

4) 1(SOH) through 12(FF) - selects symbology type, where:

New GS1 Databar

> 1(SOH) RSS-14 GS1 DataBar Omnidirectional
>
> 2(STX) RSS-14 Truncated GS1 DataBar Truncated
>
> 3(ETX) RSS-14 Stacked GS1 DataBar Stacked
>
> 4(EOT) RSS-14 Stacked Omnidirectional GS1 DataBar Stacked Omnidirectional
>
> 5(ENQ) RSS Limited GS1 DataBar Limited
>
> 6(ACK) RSS Expanded GS1 DataBar

Expanded

> 7(BEL) UPC-A
>
> 8(BS) UPC-E
>
> 9(HT) EAN-13
>
> 10(LF) EAN-8
>
> 11(VT) UCC/EAN-128 & CC-A/B
>
> 12(FF) UCC/EAN-128 & CC-C

5) 0(NULL)-256(0xFF) - number of bytes to encode. For more information please refer to "Data input string format:" section below.

6) 1(SOH)-12(FF) - pixels per X

7) 0(NULL)-3(ETX) - X pixels to undercut

8) 0(NULL)-3(ETX) - Y pixels to undercut

9) 1(SOH)-12(FF) * 2 - separator row height

10) 2(STX)-22(SYN) - maximum segments per row (22 default). Note this entry is only applicable for RSS Expanded symbology

11) Data string

Example: The following escape commands encode the data "1234567890123" in RSS14 Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <SOH> <EOT> <SOH> <NUL> <NUL> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2' '3'

Hexadecimal :

| 1b | 5a | 36 | 1 | 0d | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 |

Decimal:

| 27 | 90 | 54 | 1 | 13 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 | 50 | 51 |

Expected Result (not to scale):

Example: The following escape commands encode the data "1234567890123" in RSS14 Truncated Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <STX> <EOT> <SOH> <NUL> <NUL> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2' '3'

Hexadecimal :

| 1b | 5a | 36 | 2 | 0d | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 |

Decimal:

| 27 | 90 | 54 | 2 | 13 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 | 50 | 51 |

Expected Result (not to scale):

Example: The following escape commands encode the data "1234567890123" in RSS14 Stacked Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <ETX> <EOT> <SOH> <NUL> <NUL> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2' '3'

Hexadecimal :

| 1b | 5a | 36 | 3 | 0d | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 |

Decimal:

| 27 | 90 | 54 | 3 | 13 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 | 50 | 51 |

Expected Result (not to scale):

Example: The following escape commands encode the data "1234567890123" in RSS14 Stacked Omnidirectional Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <EOT> <EOT> <SOH> <NUL> <NUL> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2' '3'

Hexadecimal :

| 1b | 5a | 36 | 4 | 0d | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 |

Decimal:

| 27 | 90 | 54 | 4 | 13 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 | 50 | 51 |

Expected Result (not to scale):

Example: The following escape commands encode the data "1234567890123" in RSS Limited Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <ENQ> <EOT> <SOH> <NUL> <NUL> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2' '3'

Hexadecimal :

| 1b | 5a | 36 | 5 | 0d | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 |

Decimal:

| 27 | 90 | 54 | 5 | 13 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 | 50 | 51 |

Expected Result (not to scale):

Example: The following escape commands encode the data "DATAMAX-O'NEIL" in RSS Expanded Linear type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <ACK> <SO> <SOH> <NUL> <NUL> <SOH> <SYN> 'D' 'A' 'T' 'A' 'M' 'A' 'X' '-' 'O' ''' 'N' 'E' 'I' 'L'

Hexadecimal :

| 1b | 5a | 36 | 6 | 0e | 1 | 0 | 0 | 1 | 16 | 44 | 41 | 54 | 41 | 4d | 41 | 58 | 2d | 4f | 27 | 4e | 45 | 49 | 4c |

Decimal:

| 27 | 90 | 54 | 6 | 14 | 1 | 0 | 0 | 1 | 22 | 68 | 65 | 84 | 65 | 77 | 65 | 88 | 45 | 79 | 39 | 78 | 69 | 73 | 76 |

Expected Result (not to scale):

Example: The following escape commands encode the data "12345678901" in UPC-A type. Due to space limitation CR LF are not shown

Escape Sequence:

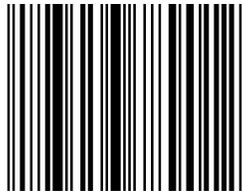<ESC> 'z' '6' <BEL> <VT> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1'

Hexadecimal :

| 1b | 5a | 36 | 7 | 0b | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 |

Decimal:

| 27 | 90 | 54 | 7 | 11 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 48 | 49 |

Expected Result (not to scale):

Example: The following escape commands encode the data "1234500006" in UPC-E type. Due to space limitation CR LF are not shown

Escape Sequence:

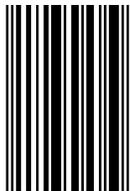<ESC> 'z' '6' <BS> <LF> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '0' '0' '0' '0' '6'

Hexadecimal :

| 1b | 5a | 36 | 8 | 0a | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 30 | 30 | 30 | 30 | 36 |

Decimal:

| 27 | 90 | 54 | 8 | 10 | 1 | 0 | 0 | 1 | 22 | 49 | 50 | 51 | 52 | 53 | 48 | 48 | 48 | 48 | 54 |

Expected Result (not to scale):

Example: The following escape commands encode the data "123456789012" in EAN-13 type. Due to space limitation CR LF are not shown

Escape Sequence:

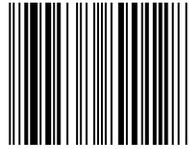<ESC> 'z' '6' <HT> <FF> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2'

Hexadecimal :

| 1b | 5a | 36 | 9 | 0c | 1 | 0 | 0 | 1 | 16 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 |

Decimal:

27 90 54 9 12 1 0 0 1 22 49 50 51 52 53 54 55 56 57 48 49 50

Expected Result (not to scale):

Example: The following escape commands encode the data "1234567" in EAN-8 type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <LF> <BEL> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '6' '7'
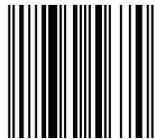
Hexadecimal :

1b 5a 36 0a 7 1 0 0 1 16 31 32 33 34 35 36 37

Decimal:

27 90 54 10 7 1 0 0 1 22 49 50 51 52 53 54 55

Expected Result (not to scale):

Example: The following escape commands encode the data "123456789012" in UCC EAN-128 & CC-A/B type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <VT> <FF> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2'

Hexadecimal :

1b 5a 36 0b 0c 1 0 0 1 16 31 32 33 34 35 36 37 38 39 30 31 32

Decimal:

27 90 54 11 12 1 0 0 1 22 49 50 51 52 53 54 55 56 57 48 49 50

Expected Result (not to scale):

Example: The following escape commands encode the data "123456789012" in UCC EAN-128 & CC-C type. Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'z' '6' <FF> <FF> <SOH> <NUL> <NUL> <SOH> <SYN> '1' '2' '3' '4' '5' '6' '7' '8' '9' '0' '1' '2'

Hexadecimal :

1b 5a 36 0c 0c 1 0 0 1 16 31 32 33 34 35 36 37 38 39 30 31 32

Decimal:

27 90 54 12 12 1 0 0 1 22 49 50 51 52 53 54 55 56 57 48 49 50

Expected Result (not to scale):

QR CODE Specifications

Description	The code consists of black modules (square dots) arranged in a square pattern on a white background. The information encoded may be made up of four standardized types ("modes") of data (numeric, alphanumeric, byte / binary, Kanji), or through supported extensions, virtually any type of data.
Character set	numeric, alphanumeric, byte / binary, Kanji
QR Code Models	Model 1 is the original specification. Model 2 is an enhanced form of the symbology.
Error Correction Levels	Ultra High Reliability Level (30% of codewords can be restored) High Reliability Level (25% of codewords can be restored) Standard Level (15% of codewords can be restored) High Density Level (7% of codewords can be restored)
Data Modes	AUTO (do not need to specify the character mode) MANUAL (need to specify the character mode.)
Elements per symbol	Square dot/element with the following pixel multipliers: 1(none), 2, 4(default), 8, 16
Max. Characters	7366

QR Code Command Structure:

<ESC> – 'z' or 'Z' – '7' – QR MODEL – ERROR CORRECTION – DATA MODE – MSB – LSB – PIXEL MULT - [User's Data]

or

<ESC> – 'z' or 'Z' – '7' – '1' or '2' – 'H', 'Q', 'M' or 'L' – 'A' or 'M' – MSB – LSB – PM - [User's Data]

Parameters

1) ESC(0x1B)

2) 'Z'(0x5A) or 'z'(0x7A) - Enables\disables annotation

3) '7'(0x37) - Selects QR Code barcode symbology

4) '1'(0x31) or '2'(0x32) - selects model, where:

    '1'(0x31) --- QR Code model 1 is the original specification while

    '2'(0x32) --- QR Code model 2 is an enhanced form of the symbology (default and recommended)

5) 'L', 'M', 'Q' or 'H' - QR Code Error correction level, where:

    'H' --- Ultra High Reliability Level

    'Q' --- High Reliability Level

    'M' --- Standard Level (default)

    'L' --- High Density Level

6) 'A' or 'M' - QR Code Data Input Modes <AUTO, MANUAL>, where:

    'A' --- AUTO (default)

'M' --- MANUAL

If you specify AUTO you do not need to specify the character mode.

If you specify MANUAL you will need to specify the character mode.

7) 0x00(NULL)-0xFF - MSB for a message length parameter

8) 0x00(NULL)-0xFF - LSB for a message length parameter

Total Message Length = (MSB * 256) + LSB

9) '0'(0x30) - '4'(0x34) - Pixel multiplier. '2' - (default)

Multiplication factor = 2^provided value. For Example: '0' -> 2^0=1, '1' -> 2^1=2, '2' -> 2^2=4, '3' -> 2^3=8 and '4' -> 2^4=16

10) 'N', 'A', 'B' or 'K' - Character mode(for MANUAL mode only), where:

'N' --- Numeric

'A' --- Alphanumeric (default)

'B' --- Binary

'K' --- Kanji

11) Data string

Example: The following escape commands encode the data "12345678". Due to space limitation CR LF are not shown

Escape Sequence:

<ESC> 'Z' '7' '2' 'M' 'A' <NUL> <FS> '2' 'h' 't' 't' 'p' ':' '/' '/' 'w' 'w' 'w' '.' 'd' 'a' 't' 'a' 'm' 'a' 'x' '–' 'o' 'n' 'e' 'i' 'l' '.' 'c' 'o' 'm'

Hexadecimal:

```
1 5 3 3 4 4   1 3 6 7 7 7 3 2 2 7 7 7 2 6 6 7 6 6 6 7 2 6 6 6 6 2 6 6 6
b a 7 2 d 1 0 c 2 8 4 4 0 a f f 7 7 7 e 4 1 4 1 d 1 8 d f e 5 9 c e 3 f d
```

Decimal:

```
          1 1 1 1       1 1 1   1   1   1   1   1 1 1 1 1       1 1
2 9 5 5 7 6   2 5 0 1 1 1 5 4 4 1 1 1 4 0 9 1 9 0 9 2 4 1 1 0 0 0 4 9 1 0
7 0 5 0 7 5 0 8 0 4 6 6 2 8 7 7 9 9 9 6 0 7 6 7 9 7 0 5 1 0 1 5 8 6 9 1 9
```


PDF 417 Specifications

Description	Each PDF 417 symbol character consists of a stack of vertically aligned rows between 3 and 90. Each row includes a start and a stop pattern, left and right row indicators and a maximum of 30 symbol characters. The symbol shall include a quite zone on all four sides
Character set	All ASCII and extended characters, 8-Bit binary data and up to 811,800 different character sets
Elements per symbol	Height: Variable (3 to 90 rows) and Width: Variable (90X to 583X)
Character/symbol	1850 text characters
Error correction	2 to 512

PDF417 Command Structure:

<ESC> – 'z' – '9' – CM – SL – SW – SH – EW – EH – MSB – LSB – [User's Data]

Parameters

CM: Compaction Mode. Select a mode to encode the user's data

Compaction Mode	Description	Encoding Capability
'0' (Future Use)	Byte Compaction Mode (BC)	All characters, (0-255)
'1' (Recommended)	Text Compaction Mode (TC)	ASCII only, (0-127) + Shift to BC Mode is implemented.
'2' (Future Use)	Numeric Compaction Mode (NC)	Digits Only, ('0'-'9')
A' (Future Use)	AUTO (combinations of all modes)	Mix of three compaction modes

SL: Security Level byte. This can be any digit from '0' to '8'. Set the value of the Security Level based on the number of   user's data to be encoded

Security Level	# Error-Check Code Words
'0'	2
'1'	4
'2' (recommended)	8
'3'	16
'4'	32
'5'	64
'6'	128
'7'	256
'8'	512

SW: Symbol Width byte. This is the total width length of the printed PDF417 symbol. The user may specify any value here, and the printer will calculate the actual width of the symbol & it will update this value again (Future Use). Recommended Value: '0' or 0x30

SH: Symbol Height byte. This is the total height length of the printed PDF417 symbol. The user may specify any value here, and the printer will calculate the actual width of the symbol & it will update this value again (Future Use). Recommended Value: '0' or 0x30

EW: Element Width byte. This is the width length of a single element in the PDF417 symbol, that is, bar/space width. Can be set to '1' or '2'

Element Width Value	Length in mil
'1'	4.9 mil
'2' (recommended)	9.8 mil

EH: Element Height byte. This is the height length of a single element in the PDf417 symbol, that is, bar/space height. A value between 0x03 to 0x0A can be used. **Recommended Value:** 0x06

MSB: Most Significant Byte: This byte represents the most significant byte of how many bytes to encode of User's Data. Maximum is 06 in hex, that is, MSB = 06h (max).

LSB: Least Significant Byte: This byte represents the least significant byte of how many bytes to encode of user's Data.

User's data: Data to be encoded in the barcode

Total number of user's data that can be encode is [MSB][LSB] = 0x06B8 = 1720 bytes, that is, only alphanumeric with security level set to its minimum value.

Setting the security level to a higher value, will result in less user data to be encoded, since the total number of code words that can fit in a PDF417 symbol are 929, and if security level is set to '8', then already 512 error code words are occupied in the symbol, and (929-512 = 417), so only about (417*2) alphanumeric data can be encoded with security level '8'.

If any parameter in the command line does not match the spec in this document, then an error message "Invalid Barcode" will be sent out from the printer's serial port.

Example: The following escape commands encode the data "12345678". Due to space limitation CR LF are not shown

Escape Sequence:

ESC	z	9	1	2	0	0	2	6	0	8	1	2	3	4	5	6	7	8

Hexadecimal :

1B	7A	39	31	32	30	30	32	06	00	08	31	32	33	34	35	36	37	38

Decimal:

27	122	57	49	50	48	48	50	6	0	8	49	50	51	52	53	54	55	56

Barcode Height Multiplier   ESC z h *n*

This command allows the user to change the height of a selected barcode using a multiplier with values $1 < n < 18$ (HEX values). The multiplier command can be sent prior to or after the **Print Barcode** sequence (ESC *z t n h data CR LF*)

Example:

The sequence below prints CODE39 barcode first of a height of 50 dots and then sets the new height to 3 x 50 dots.

To print CODE-39 of height 150 dots using the multiplier command send steps 1, 2, in the order below.

Barcode Height Multiplier

Escape Sequence:	ESC	z	h	3
Hexadecimal:	1B	7A	68	03
Decimal:	27	122	104	3

Printing Barcode:

Escape Sequence:	Esc	Z	1	7	2	C	O	D	E	-	3	9	CR	LF
Hexadecimal:	1B	5A	31	07	32	43	4F	44	45	2D	33	39	0D	0A
Decimal:	27	90	49	7	50	67	79	68	69	45	51	57	13	10

Graphics

The printer uses a single line thermal print head with elements spaced at 0.125mm. The 8-bit graphic commands enable control of each heating element of the print head. The commands also advance the paper in increments of 0.125mm. The number of heating elements can vary according to your printer model. Refer to the printer's User's Guide for specific information.

To select the 8-bit graphic mode, the user application must issue the ESC V command. After that, the user application must send two bytes to indicate the number of the graphic lines desired, followed with a packet of 72 bytes for each graphic line. The printer prints the graphic line and advances to the next line automatically.

8-Bit Graphics   ESC V *n1 n2 data*

8-bit Graphic mode is selected using the ESC V command. <n1> and <n2> is a 16 bit integer indicating the number of graphic lines of 72 characters each to be received. Valid Graphic character sets range from 0x00 to 0xFF Hex using bits 0-7

To achieve optimized smooth printing and to extend battery life when printing graphics, a print buffer is employed. The printer buffer accumulates a specific amount of data before actually printing the graphic data.

The following 8-bit graphic command is used to print a single line of graphic

Escape Sequence: ESC   V   SOH NUL   72 bytes of data

Hexadecimal: 1B   56   01   00   72 bytes of data
Decimal: 27   86   1   0   72 bytes of data

8 Bit Compressed Graphics   ESC v *height width counter data [c data] [c data] …*

This command differs from the 8 Bit Graphics command described above by reducing the number of bits (bytes) that have to be sent to the printer. This allows for faster data transfer between the host computer and the printer.

Graphic String Component	Function	
height (# of lines)	An eight bit value representing the number of dot-lines contained in the following data set	
width (# of bytes in each line)	An eight bit value representing the number of bytes to be contained in each dot-line of the following data set	
counter *r* (# of lines)	An eight bit value which describes how the following data will be processed	
	For Signed Values	{127 ≥ Counter ≥ 0} Process the next (Counter + 1) bytes of data as 8 bit graphics. {0 > Counter ≥ -128} Repeat the next single byte of data ((-Counter) + 1) times.
	For Unsigned Values	{127 ≥ Counter ≥ 0} Process the next (Counter+1) bytes of data as 8 bit graphics {128 ≥ Counter ≤ 255} Repeat the next Singe byte of data, ((256 – Counter)+1) times

Example: Compressed graphic

The following graphics data is to be printed:
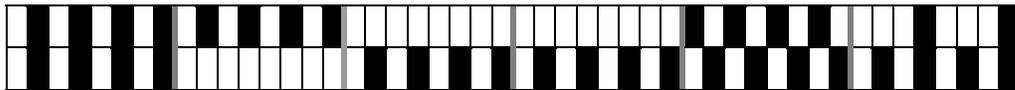
This data may be represented in hexadecimal:

0x55	0x55	0x00	0x00	0xAA	0x11
0x55	0x00	0x55	0x55	0x55	0x55

The RLE compressed graphics command:

	ESC	'v'	height	width	counter	data…									
DEC	27	118	2	6	255	85	255	0	3	170	17	85	0	253	85
HEX	0x1B	0x76	0x02	0x06	0xFF	0x55	0xFF	0x00	0x03	0xAA	0x11	0x55	0x00	0xFD	0x55

Printer Controls – Data Processing

The printer can be operated in two modes, Online and Buffer mode. In online mode, the characters are printed as they are received. In buffer mode, the characters received are stored in the print buffer and printed upon receipt of the EOT character (^D). Also if the printer is in Buffer Mode and the print buffer is full, the printer will start printing but will remain in the Buffer Mode until the Online Mode command is sent to the printer.

Enable Buffer Mode   **ESC P $**

This command selects the printer buffer mode.

```
Escape Sequence:    ESC   P    $
Hexadecimal:        1B    50   24
Decimal:            27    80   36
```

Disable Buffer Mode (Select Online Mode)   **ESC P #**

This command disables the printer buffer mode and selects the online mode. The online mode is the default mode of operation of the printer.

```
Escape Sequence:    ESC   P    #
Hexadecimal:        1B    50   23
Decimal:            27    80   35
```

Print Buffer Contents (Buffer Mode)   EOT

This command allows the printer to process all of the commands stored in the printer buffer. This command is valid only when the printer is in the buffer mode.

Control Code: EOT
Hexadecimal: 04
Decimal   04

Enable EOT Control Character Transmission (Currently Not Available)   ESC P +

When enabled, the printer transmits the EOT command character when the print buffer is empty. The End Of Text (EOT) control character is transmitted once when the printer buffer is empty.

Escape Sequence: ESC   P   +
Hexadecimal: 1B   50   2B
Decimal: 27   80   43

Disable EOT Control Character Transmission (Currently Not Available)   ESC P –

This command disables the EOT control character transmission. Therefore, the control character EOT is not transmitted when the printer buffer is empty

Escape Sequence: ESC   P   -
Hexadecimal: 1B   50   2D
Decimal: 27   80   45

Printer Controls – Printed Output Adjust

Print Contrast   ESC P *n*

This command sets the printer level of contrast or darkness of the printer.
The parameter *n* is the level of contrast. $1 \leq n \leq 9$.

The printed text or graphics contrast depends on the type of thermal paper used, the printer battery voltage and the printer contrast setting (selected by the host application).

The table below specifies recommended *n* values according to the media used.

Paper type	Low	Medium	High
P390	1	2 (*)	3
P300	4	5	6
Reserved (currently P300)	7	8	9

* The printer defaults to a contrast of '2'.

Note that the print speed and power consumption is affected by the contrast setting.

Example: The following escape sequence set the printer contrast to "7".

Escape Sequence: ESC   P   7
Hexadecimal: 1B   50   37
Decimal: 27   80   55

Printer Controls - Reset

Cancel   CAN

This command deletes the entire printer buffer and resets the printer to the power-up default values.

Control Code: CAN
Hexadecimal: 18
Decimal: 24

Reset printer and load default setup   ESC @

This command initializes all programmable attributes to factory default values. Custom programming, present in flash memory, will be restored as well, overriding the factory defaults.

Note: This command does not clear the print buffer! Use the Cancel (CAN) command to clear the buffer.

This command will not restore any changes that were burned into the flash memory such as: fonts, logos, default power up message or hardware information message. User programmable printer attributes and their factory defaults are shown in the table below:

Attribute	Factory Default
Font	Courier 3
Character set	International
Underline	Disabled
Bold	Disabled
Reverse Printing (White on Black)	Disabled
Double Width	Disabled
Double Height	Disabled
Line spacing	3 dots
Form Feed Length	2030 dots
Vertical Tab distance	203 dots
Horizontal Tab distance	100 dots
Printing direction	Left-to-right
Contrast	2
Sensor Sensitivity	255
Auto Power Down time	99 seconds

Printer Controls – Power

Auto Power Down Command   ESC M *n m 0 CR*

This command configures the printer Auto power-down timer.

In order to conserve battery life, the printer features an auto power down timer. If the printer is in the AUTO POWER DOWN MODE, the power down timer defaults to 99 seconds on initial power up. Refer to the printer User Manual for appropriate dip-switch positions.

The auto power down timer may be set or disabled by sending recognized command strings. The auto power down is re-started upon every character received.

The auto power down timer may be disabled by activating the <RTS> input line, or setting the auto power down timer to zero, the printer lowers the CTS output line and transmits AUXOFF followed by XOFF before power down. On power down the timer reverts to its default settings.

The parameters n1 and n2 may be set to '0' through '9'.

Example 1: The command Esc M 0   0 0   CR Disables the power out timer

Example 2: The command Esc M 9   9 0   CR Sets the timer to 99 seconds

Note that spaces are not part of the command

Extended Auto Power Down Command ESC M HH MM SS 0 CR

The 'Set Auto Power Down' command allows the user to program the printer to automatically shut down after a certain length of inactivity. This command accepts the following formats: (1) seconds, (2) minutes and seconds, or (3) hours, minutes and seconds. When used in conjunction with the Default Power-Up Setup command, this command will allow for the power down timer value to be saved permanently in Flash.

The following table details the available formats for this command:

Command String	Printer Response
Esc–'M'–'S_1' –'S_2'–'0'–CR	Sets the printer Auto power down timer to S_1S_2 seconds
Esc–'M'–'M_1'–'M_2'–'S_1' –'S_2'–'0'–CR	Sets the printer Auto power down timer to M_1M_2 minutes S_1S_2 seconds
Esc–'M'–'H_1'–'H_2'–'M_1'–'M_2'–'S_1' –'S_2'–'0'–CR	Sets the printer Auto power down timer to H_1H_2 hours M_1M_2 minutes S_1S_2 seconds

Here, H_1H_2, M_1M_2 and S_1S_2 are two decimal characters that denote hours, minutes and seconds respectively. Values range from '00' to '99' with values over 59 being carried over. Up to 18 hours may be specified. The CR character at the end of the command is mandatory.

Example 1: This escape sequence sets the Auto power down timer to 54 seconds

```
Escape Sequence:    ESC   M    5    4     0    CR
Hexadecimal:        1B    4D   35   34   30   0C
Decimal:            27    77   53   52   48   13
```

Example 2: This escape sequence sets the Auto power down timer to 1 hour 16 minutes 54 seconds. Note that 76 minutes was converted to 1 hour 16 minutes.

```
Escape Sequence:    ESC   M    7    6     5    4     0    CR
Hexadecimal:        1B    4D   37   36   35   34   30   0C
Decimal:            27    77   55   54   53   52   48   13
```

Example 3: This escape sequence sets the Auto power down timer to 18 hours. Note that 98 hours got truncated to 18 hours

```
Escape Sequence:    ESC   M    9    8    7    6    5    4     0    CR
Hexadecimal:        1B    4D   39   38   37   36   35   34   30   0C
Decimal:            27    77   57   56   55   54   53   52   48   13
```

Printer Status Commands

Query Print Buffer & Timer-MCR Status   STX

This command will cause the printer to print the battery status

Printer Response	
Print Buffer Status	ESC B <4 ASCII digits> CR LF
Timer-MCR Status	ESC M <4 ASCII digits> CR LF

Note that the first three digits of the Timer-MCR field correspond to the printer times. The last byte indicates that the MRC track is currently activated in the printer.

Query Print Buffer, Battery Voltage, Timer-MCR & Print Head Temperature   SYN

This command will cause the printer to send the following information to the host:

Printer Response	
Print Buffer Status	ESC B <4 ASCII digits> CR LF
Battery Voltage Status	ESC V <4 ASCII digits> CR LF
Timer-MCR Status	ESC M <4 ASCII digits> CR LF
Print Head Temperature	ESC T <4 ASCII digits> CR LF

Note that the first three digits of the Timer-MCR field correspond to the printer times. The last byte indicates that the MRC track is currently activated in the printer.

Print Battery Voltage   ESC P ^

This command will enable the printer to output the battery voltage reading.

```
Escape Sequence:    ESC   P     ^
Hexadecimal:        1B    50    5E
Decimal:            27    80    94
```

Query Printer Firmware Version   ESC P (

This command will cause the printer to send the Firmware Version to the host.

```
Escape Sequence:    ESC   P     (
Hexadecimal:        1B    50    28
Decimal:            27    80    40
```

After sending the previous command, the printer will respond with the following ASCII sequence:

ASCII Sequence: <string>   CR   LF

The <string> field represents the firmware version.

Query Printer Model and Hardware Revision Level ESC P)

This command will cause the printer to send the hardware model to the host.

Escape Sequence: ESC P)
Hexadecimal: 1B 50 29
Decimal: 27 80 41

After sending the previous command, the printer will respond with the ASCII sequence:
ASCII Sequence:<string> CR LF

The <string> field represents the hardware model.

Magnetic Card Reader

A three track Magnetic Card Reader is an option available on the Datamax-O'Neil printers. The MCR reader is designed to read magnetically encoded data from cards conforming to ANSI/ISO 7810, 7811 standards.

The MC reader converts the F2F encoded signals on the magnetic card, to ISO7811 compatible ASCII format and transmits the information to the host computer or terminal. Also, the MCR can read one, two or three tracks simultaneously and bi-directionally.

The table below summarizes the format of the data stored on each magnetic track.

Track Position	Track 1 ISO1 (IATA)	Track2 ISO2 (ABA)	Track3 ISO3(MINTS)
Recording Density	210 BPI	75 BPI	210 BPI
Recording Capacity	79 characters	40 characters	107 characters
Number of data bits	7	5	7
Card Thickness	.76 mm +/- 0.08 mm		

Read Magnetic Card Data ESC M *n1 n2 t* (CR) or ESC m *n1 n2 t* (CR)

This command activates the MRC reader and waits until the user swipes a card (or until the timer times out). The *<n1><n2>* parameters are used to set the MC reader's timer. "01" through "99" are valid timer settings. "00" disables the timer. The 't' value indicates which MCR track number to read.

The printer aborts and transmits the time-out error message if the operator fails to swipe a card within the time period set by the host application.

If the timer times out, the printer aborts the swipe process, transmits the timeout error message and switches off the <READING> LED. A good magnetic card swipe automatically terminates the read process. The following table details the possible combinations for this command:

Magnetic Card Command String	Description
ESC M n1n2 1 CR (CR = Carriage Return) or ESC m n1n2 1 CR (CR = Carriage Return)	Read Track1 only
ESC M n1n2 2 CR or ESC m n1n2 2 CR	Read Track2 only
ESC M n1n2 3 CR or ESC m n1n2 3 CR	Read Track3 only
ESC M n1n2 4 CR or ESC m n1n2 4 CR	Read Track1 and Track2 simultaneously
ESC M n1n2 5 CR or ESC m n1n2 5 CR	Read Track2 and Track3 simultaneously
ESC M n1n2 6 CR or ESC m n1n2 6 CR	Read Tracks 1,2 and 3 simultaneously

Example: The following escape sequence sets the timer to 99 seconds and activates the MRC to read the track #1.

Escape Sequence:	ESC	M	9	9	1	CR
Hexadecimal:	1B	4D	39	39	31	0C
Decimal:	27	77	57	57	49	13

or

Escape Sequence:	ESC	m	9	9	1	CR
Hexadecimal:	1B	6D	39	39	31	0C
Decimal:	27	109	57	57	49	13

Magnetic Card Data Output Format

The track data retrieved from a magnetic card is transmitted to the host in ISO7811 ASCII format as summarized in the table below. The first four characters ("%/1/") flag the track number, the track data follows the flag string terminated with '?'-CR-LF.

'%;+' are the track start characters, While '?' is the end of track character.

If no data is available for a track then that data field will be empty. If an Error is encountered on any track, a single 'E' will be the output for that track's data field. The ISO 7811 ASCII Format is detailed below:

Track1			Track 2			Track 3		
%/1/	Data	?CRLF	;/2/	Data	?CRLF	+/3/	Data	?CRLF

Magnetic Card Read Error Messages

The characters <%> and <E> preface all error messages. Following these two characters is a comma, two ASCII digits representing the error number (01 through 99), another comma, English description of the error encountered, and finally a CR-LF which terminates the <Error Message> string. The syntax is as follows:

<%><E>, nn, Error text in ASCII, <CR> <LF>

Where *nn* is the error number encountered

The printer may transmit three (3) types of Read Error messages. Refer to the table below for detailed description of the error messages.

Error #	Error Message Transmitted
05	Time-out Expired
07	Invalid Track Number
09	Cancel Request

Interfacing to the Magnetic Card Reader

This section details the software steps required to access the MC reader from a computer or a terminal.

(1) The Host selects the printer by activating the RTS input line or sending wake-up characters to the printer.

(2) The Printer Sends the XON command to the host to indicate that it is ready to receive data from the host.

(3) Once XON is received the host sends an ASCII serial command string to enable the magnetic card reader (e.g. Esc-m004-cr). The printer switches on the GREEN <READY> LED.

(4) Once the operator swipes the magnetic card, the printer transmits, in ASCII format, the track information found on the magnetic card.

A good read automatically switches off the MC reader and the <READY> LED.

(5) The <READY> LED illuminates RED if an error is encountered while reading the magnetic card.

The printer transmits a timeout error message if the operator fails to swipe a card in the time period set by the host application.

Cancel Magnetic Card Data Read Command   ESC C

This command cancels the MCR read process. The printer returns to online operation mode.

```
Escape Sequence:    ESC   C
Hexadecimal:         1B   43
Decimal:             27   67
```

Note that after executing this command the printer will send the message ", 09, Cancel Request" to the host.

Black Mark Sensing Control Commands

Set Paper-Out Sensitivity   ESC Q Q *n* CR

This command sets the paper-out sensor sensitivity level. 0 ≤ n ≤ 255.

This command sets the number of 0.125mm dot rows that the printer can advance paper before the sensor detects an out of paper error. The length of the paper sensitivity must be larger than the length of the black mark on the media to avoid paper out error.

The value selected for the sensitivity is dependent upon the height of the pre-printed black mark located on the label or form stock. The default power-on value *n* is 255 (0xFF).

Example: The following escape sequence sets the paper sensitivity to 6.25mm (50*0.125)

```
Escape Sequence:    ESC   Q    Q    50
Hexadecimal:         1B   51   51   32
Decimal:             27   81   81   50
```

Enable Black Mark Reporting   ESC Q R CR

This command enables the printer to send reporting messages to the host. Refer to "Black Mark Found" and "Black Mark not found" commands for details of the messages that are activated.

```
Escape Sequence:    ESC   Q    R    CR
Hexadecimal:         1B   51   52   0D
Decimal:             27   81   82   13
```

Disable Black Mark Reporting   ESC Q r CR

Prevents the printer from sending report messages to the host. Refer to "Black Mark Found" and "Black Mark not found" commands for details of the messages that are deactivated

```
Escape Sequence:    ESC   Q    r     CR
Hexadecimal:         1B   51   72    0D
Decimal:             27   81   114   13
```

Black Mark Sensing Command Mode

Forward Seek Black Mark   ESC Q F n CR

This command sets the printer to black mark seek mode using a forward feed operation. The value of forward feed is determined by the user in dot lines (n) where 0 ≤ n ≤ 255 dots. Each dot line corresponds to 0.250mm. If the black mark is found, the printer responds with the command "Black Mark Found", otherwise the printer responds with the command "Black Mark not Found". Both escape sequence responses are described below.

Example: The following escape sequence advances the paper 80 dot lines looking for a Black Mark.

```
Escape Sequence:    ESC   Q     F     P     CR
Hexadecimal:        1B    51    46    50    0D
Decimal:            27    81    70    80    13
```

Reverse Seek Black Mark   ESC Q B n CR

This command causes the printer to seek black mark using backward feed until n dot line feeds have been processed; each dot line feed is 0.25mm.

Not the using this command can cause a paper jam since the paper is advanced in reverse mode. The results may vary depending on the media used in the printer.

Black Mark Found (Response from printer)   ESC Q ? ? n1, n2

This message is sent to the host and indicates that a black mark has been found. The numbers n1 and n2 are the high and the low nibble, respectively, describing how many (0.25mm) dot lines were required to find black mark.

Black Mark Not Found (Response from Printer)   ESC Q 0 0 n1 n2

This message is sent to the host and indicates that a black mark has not been found. The numbers n1 and n2 are the high and the low nibble, respectively, describing how many (0.25mm) dot lines were processed before reporting black mark not found.

Black Mark Sensing Auto Mode

Enable Front Black Mark Sensor   ESC Q f e CR

This command will enable the printer's front black mark sensor and automatically disable the BACK side sensor.

```
Escape Sequence:    ESC   Q     f      e     CR
Hexadecimal:        1B    51    66     65    0D
Decimal:            27    81    102    101   13
```

Disable Front Black Mark Sensor   ESC Q f d CR

This command disables the printer's front black mark sensor.

```
Escape Sequence:    ESC   Q     f      d     CR
Hexadecimal:        1B    51    66     64    0D
Decimal:            27    81    102    100   13
```

Enable Back Black Mark Sensor   ESC Q b e CR

This command will cause the printer to enable the back black mark sensor and automatically disables the front side sensor.

```
Escape Sequence:    ESC   Q    b     e    CR
Hexadecimal:        1B    51   62    65   0D
Decimal:            27    81   98    101  13
```

Disable Back Black Mark Sensor   ESC Q b d CR

This command will disable the printer's back black mark sensor.

```
Escape Sequence:    ESC   Q    b     d    CR
Hexadecimal:        1B    51   62    64   0D
Decimal:            27    81   98    100  13
```

Disable Both Front and Back Black Mark Sensors   ESC Q f x CR or ESC Q b x CR

This command disables the printer's front and back black mark sensors.

```
Escape Sequence:    ESC   Q    f     x    CR
Hexadecimal:        1B    51   66    78   0D
Decimal:            27    81   102   120  13
```

or

This command disables the printer's front and back black mark sensors.

```
Escape Sequence:    ESC   Q    b     x    CR
Hexadecimal:        1B    51   66    78   0D
Decimal:            27    81   102   120  13
```

Printed Receipt/Label Presenter Positive Adjust   ESC Q D + n

This command will cause the printer to advance the paper to the distance specified by n dots after a form or label has been printed.

Example: The following escape sequence will feed the paper 112 dots.

```
Escape Sequence:    ESC   Q    D     +    112
Hexadecimal:        1B    51   44    2B   70
Decimal:            27    81   68    43   112
```

Printed Receipt/Label Presenter Positive Adjust   ESC Q P n

This command is identical to *Esc Q D + n* command and will cause the printer to advance the paper to the distance specified by n dots after a form or label has been printed.

Example: The following escape sequence will feed the paper 112 dots.

```
Escape Sequence:    ESC   Q    P    112
Hexadecimal:        1B    51   50   70
Decimal:            27    81   80   112
```

Printed Receipt/Label Presenter Negative Adjust (*)   **ESC Q D – n**

This command will cause the printer to move the paper backwards to a distance specified by *n* dots after a form or label has been printed.

Example: The following escape sequence will move the paper backwards 112 dots

```
Escape Sequence:    ESC   Q    D    -    112
Hexadecimal:        1B    51   44   2D   70
Decimal:            27    81   68   45   112
```

Note: In Auto Q-Mark Mode Form Feed length is limited to the following range: 609 – 3654 print dots. Default value is set to 1218 dots.

Page Print Commands - Configuration

Datamax-O'Neil printers can operate in two separate modes: Line Print Mode and Page Print Mode.

On Power Up the printer defaults to Line Print Mode. In this mode, all data is printed from top to bottom as it is received. In Page Print mode, the canvas is constructed in advance and the form is printed afterwards. This allows for positioning of text, barcodes, lines and rectangles at specific X and Y coordinates and also at specific angles – 0, 90, 180 and 270 degrees. The rendering process of the page is done in printer's memory.

Page Print Mode can be used to design a certain template and replace only variable data during communication.

Line Printing vs. Page Printing
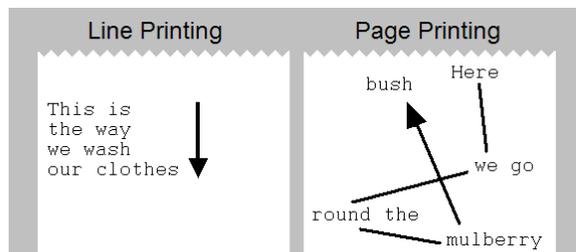
This section describes the commands which are supported in Page Print Mode.

Enter the Page Printing Mode   **ESC P P**

This command is required to enter Page Print Mode. Esc P P also works in conjunction with the following commands:

Command Name	Command String	Command Description
Enter Buffer Mode	Esc P $	Printer Enters Buffer Mode. All data is retained in the Buffer until ^ D (0x04) is received.
Exit Buffer Mode	Esc P #	Exits Buffer Mode and puts the printer into the Line print Mode
Print Buffer Content	^ D	Prints Buffer Content; Printer is ready to receive more data.

Mark Beginning of a Page   **BeginPage();**

This command follows Esc P P command and is used to indicate the beginning of a form in page printing mode.

Define the Page Size   **SetPageSize (*width*, *height*);**

This command is used to define the valid drawing area for a label or form. Two parameters are required: *width* and *height* of the form, measured in dots.

Set Margins   **SetMargin (*lm*, *tm*);**

This command sets the left margin to *lm* and the top margin to *tm*. The margin is then used as a start point (0, 0) for the form or label.

Mark Page End, Print and Exit   **EndPage();**

This command is used to end a form or label while in the Page Printing mode. This command also forces the printer to print a label or form.

Page Print Commands – Draw Commands

Draw Text   **DrawText (x,y,color,angle,"string");**

Draws text at any coordinate on the canvas.

DrawText "data" prints the text enclosed in the double quotes at the current cursor location. x and y specify where the text is to be printed (upper left corner of the first letter of the top line).

Parameters:
    x   specifies "x" axis location

    y   specifies "y" axis location

  Color   specifies text color: 0 = white, 1= black.
        User may print white text on an existing black background by specifying color = 0.

  Angle   specifies text direction

Angle	Print angle	Description
0	0 degrees Counter-clockwise	Prints text horizontally from left to right.
1	90 degrees Counter-clockwise	Prints text vertically in the upward direction
2	180 degrees Counter-clockwise	Prints text horizontally from right to left
3	270 degrees Counter-clockwise	Prints text vertically in the downward direction.

String   specifies the text to print

Multiple lines can be printed with a single 'DrawText' command by separating the lines with \n characters. Text formatting is accomplished by tags inserted in the string argument. The formatting is effective only in the string in which it appears and does not carry over to the subsequent DrawText commands. The text formatting commands are listed below.

Command	Name	Description
, 	Bold	Text enclosed by and appear in bold.
<u>, </u>	Underline	Text enclosed by <u> and </u> are underlined.
<h = value>	Text Height	Text height is magnified by the given numeric value. Use <h = 1> to return to original size.
<w = value>	Text Width	Text width is magnified by the given numeric value. Use <w = 1> to return to original size.
<f = value>	Font	Sets the font. value = {0 .. 9}.
\n	New Line	Moves the cursor to the beginning of the next line.
\<, \>, \", \\	Literals	Use backslashes to print these special characters.

Example: The figure below shows the use of the "\n" command as well as the effect of the angle command in the text being printed with the DrawText command
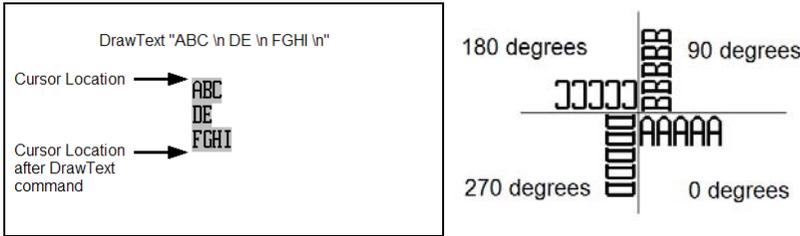
Draw Rectangle   DrawRectangle (x1, y1, x2, y2,color,width);

Draws a rectangle object at any coordinate on the canvas.

DrawRectangle command draws either a hollow or a filled rectangle. (x1, y1) and (x2, y2) specify the two diagonally opposing corners. All measurements are in dots.

Parameters:
  x1, y1   Top left corner coordinates (*x1, y1*)

  x2, y2   Bottom right corner coordinates (*x2, y2*)

  color   Specifies the line or fill color: 0 = white, 1 = black
            The user may draw a white rectangle on a black background only by specifying color
            parameter = 0.

  width   Specifies the line width of a hollow rectangle. A zero-width results in a filled rectangle

Draw Bar Code   DrawBarcode(x,y,angle,annotate,type,height, "data");

Draws a barcode object at any coordinate on the canvas.

Parameters:
  X   Indicates location on "x" axis of the left top corner

  Y   indicates location on "y" axis of the left top corner

  angle   Values 0, 1, 2, or 3 allow the barcode to be rotated 0, 90, 180, or 270 degrees respectively

  annotate   Setting a*nnotate* to 1 allows human-readable text to appear. '0' disables this function.

 *type*   Indicates the barcode type to be printed. The barcodes supported are listed below:

Type Value	Barcode type
1	Code 39
2	Code 128
3	Code 2 of 5
4	UPC
5	Codabar

height   Sets the height of barcode in units of dots

data   Specifies the content of the barcode. It is the user's responsibility to supply data that is appropriate for the chosen code. For example, Code 39 will not accept lower case letters. Refer to the Barcode Specification section for detailed information of characters accepted by each barcode

Example: The following commands are used to create code 39 barcode inside an outline box.

P$PP

BeginPage();

SetMargin(0,0);

SetPageSize(576,2496);

DrawRectangle(61,35,524,265,1,3);

DrawText(119,75,1,0,"<f=1>DEMO Page Printing Mode");

DrawBarcode(129,130,0,1,1,70,"CODE39");

EndPage();

P#
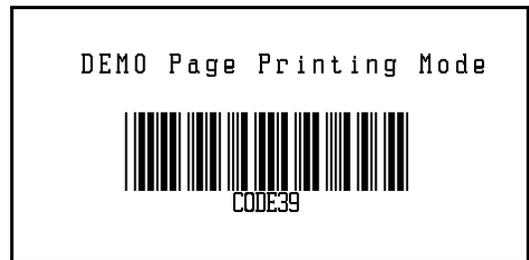
The printer also allows for Page Print mode and Line Print mode printing on the same page.

Example: Print text and barcode in Page Print Mode (without entering and exiting Buffer Mode) accompanied by text in Line Print Mode.

PP

BeginPage();

SetMargin(0,0);

SetPageSize(576,150);

DrawBarcode(71,60,0,1,1,25,"ABC123");

DrawText(7,10,1,0,"Test: Welcome to Page Print Mode");

DrawText(10,35,1,0,"This barcode 39 is printed in Page Print Mode");

DrawText(10,110,1,0,"Exiting Page Print Mode");

EndPage();

Welcome to Line Print Mode

This text line is printed in Line Print Mode.

You are now out of Page Print Mode!!!

Form Fiesta^{TM}

Form Fiesta is a Form and Label Generating Software that can be used to automate the label design process. It is provided to Datamax-O'Neil partners and customers at no charge. All supported commands are implemented in Form Fiesta and are automatically generated when an element is drawn onto the canvas on the screen. Developers can use Form Fiesta to generate a label and then copy the commands generated in the yellow section of the screen (these are the commands which render the image on the screen). The variable data can be acquired by the user's application and replaced in the command string.

Example: The code below demonstrates how to implement this using a simple VB program. 'CustomerName' and 'csCarModel' are two variables which are substituted in the string.

```
Private Sub Command1_Click()
        csTicket = Chr$(27) + "P$" + Chr$(27) + "PP" + vbCrLf + "BeginPage();" + vbCrLf
        csTicket = csTicket + "SetPageSize(400,200);" + vbCrLf
        csTicket = csTicket + "DrawRectangle(30,0,330,40,1,0);" + vbCrLf
        csTicket = csTicket + "DrawText(80,10,0,0,""<f=6><b>Dollar Rental"");" + vbCrLf
        csTicket = csTicket + "DrawText(30,60,1,0,""Customer"");" + vbCrLf
        csTicket = csTicket + "DrawRectangle(140,50,330,90,1,3);" + vbCrLf
        csTicket = csTicket + "DrawText(150,60,1,0,""" + CustomerName + """);" + vbCrLf
        csTicket = csTicket + "DrawText(30,110,1,0,""Model"");" + vbCrLf
        csTicket = csTicket + "DrawRectangle(140,100,330,140,1,3);" + vbCrLf
        If Option1.Item(0) Then csCarModel = "Taurus"
        If Option1.Item(1) Then csCarModel = "Cavalier"
        If Option1.Item(2) Then csCarModel = "Neon"
        csTicket = csTicket + "DrawText(150,110,1,0,""" + csCarModel + """);" + vbCrLf
        csTicket = csTicket + "EndPage()" +vbCrLf+Chr$(27)+"P#" + vbCr+Chr$(4)+vbCrLf
        Ticket.TicketText = csTicket
        Ticket.Visible = True
        MSComm1.CommPort = 1
        MSComm1.PortOpen = True
        MSComm1.Output = csTicket + vbCrLf
    MSComm1.PortOpen = False
    End Sub
```

The Form Fiesta installation program, as well as instructions for using the software, is available in the Developer's CD.

Download - Printer Default Setup

Select Setup Download mode   ESC D S

This command puts the printer into the Download mode. The printer will response with a '?' character.

```
Escape Sequence:    ESC   D    S
Hexadecimal:        1B    44   53
Decimal:            27    68   83
```

Start Default download process   ESC S L

This command alerts the printer that a file will now be downloaded.

```
Escape Sequence:    ESC   S    L
Hexadecimal:        1B    53   4C
Decimal:            27    83   76
```

Stop Download Process   ESC S T 0xFF CR

This command stops the downloading process.

```
Escape Sequence:    ESC   S       T    0xFF CR
Hexadecimal:        1B    53      54   255   0D
Decimal:            27    83      84   255   13
```

Store In Flash Default setup data   ESC S B CR

This command allows the printer to burn the command file in Flash memory. After finishing the process, the printer will respond with the"D! X" characters.

```
Escape Sequence:    ESC   S    B    CR
Hexadecimal:        1B    53   42   0D
Decimal:            27    83   66   13
```

Example: The following escape commands will change the default font to "k2" (48 characters per line). The "k2" font will be restored in place of the k3 value every time the printer is power cycle

The commands below must be sent sequentially:

```
Escape sequence 1:   ESC   D    S
Escape sequence 2:   ESC   S    L
Escape sequence 3:   ESC   k    2
```

(The previous command can be a binary file with a list of commands to initiate default start up)

```
Escape sequence 4:   ESC   S    T   0xFF  CR
Escape sequence 5:   ESC   S    B    CR
```

Download – Self test Message Hardware Information

Select Setup Download mode   ESC D S

This command puts the printer into the Download mode. The printer will response with a '?' character.

```
Escape Sequence:     ESC   D    S
Hexadecimal:         1B    44   53
Decimal:             27    68   83
```

Start Hardware Information download process   ESC S I

This command alerts the printer that a file will now be downloaded.

```
Escape Sequence:     ESC   S    I
Hexadecimal:         1B    53   49
Decimal:             27    83   73
```

Stop Download Process   ESC S T 0xFF CR

This command stops the downloading process.

```
Escape Sequence:     ESC   S    T    0xFF  CR
Hexadecimal:         1B    53   54   FF    0D
Decimal:             27    83   84   255   13
```

Store In Flash Default setup data   ESC S B CR

This command allows the printer to burn the command file in Flash memory. After finishing the process, the printer will respond with the "D!X" characters.

```
Escape Sequence:     ESC   S    B    CR
Hexadecimal:         1B    53   42   0D
Decimal:             27    83   66   13
```

Print Hardware Information   ESC L g 8

This command prints a hardware information message previously store in memory.

```
Escape Sequence:     ESC   L    g    8
Hexadecimal:         1B    4C   67   38
Decimal:             27    76   103  56
```

Example: The following escape commands will burn "Hardware Information" string into the flash memory. The "Hardware Information" string will be printed below battery voltage readings in the self test message.

The commands below must be sent sequentially:

```
Escape sequence 1:   ESC   D    S
Escape sequence 2:   ESC   S    I
Escape sequence 3:    Hardware Information

Escape sequence 4:   ESC   S    T    0xFF  CR
Escape sequence 5:   ESC   S    B    CR
```

Download – Logo

The *Graphic Logo* feature allows the storage of a formatted Bitmap file in nonvolatile memory. Up to eight memory sectors, of up to 64,000 bytes each, are reserved to store a *Graphic Logo* in the printer. Upon receipt of a *Graphic Logo* print command, the *Graphic Logo* data is sent to the printer. This feature allows printing of a stored graphic image as part of a receipt.

Logo images must be modified and saved to a .prn file prior to logo download.

The specifications for the logo memory are as follows:

Printer	Number of Logos	Bytes per logo	Dot lines per logo	Dots per line	Logo Locations Available
2 inch	8 (FLASH) 0 ≤ n ≤ 7	64,000	1365	384	0 - 7
3 inch	8 (FLASH) 0 ≤ n ≤ 7	64,000	910	576	0 - 7
4 inch	8 (FLASH) 0 ≤ n ≤ 7	64,000	630	832	0 - 3

Select Logo Download mode   ESC D L CR LF

This command places the printer in Flash Logo mode.

```
Escape Sequence:    ESC   D    L    CR   LF
Hexadecimal:        1B    44   4C   0D   0A
Decimal:            27    68   76   13   10
```

Before executing this command, the printer power must be cycled, alternatively the command ESC X X can be sent.

The printer responds by sending a '?' character to the host application indicating that the Flash Logo Mode is enabled.

Select logo Download Memory Location   ESC L G *n* CR LF

This command selects the memory location in which to store the logo. The parameter *n* can take values between 0 – 7 (*n* varies with printer model. Please refer to the above table).

```
Escape Sequence:    ESC   L    G    1    CR   LF
Hexadecimal:        1B    4C   47   31   0D   0A
Decimal:            27    76   71   49   13   10
```

Stop Logo Download Process   ESC L G 0xFF CR LF

This command terminates the logo uploading process.

The printer saves the received Logo data in Flash and sends D!X characters to the host, indicating that the logo data was saved successfully.
```
Escape Sequence:    ESC   L    G   0xFF  CR   LF
Hexadecimal:        1B    4C   47  0xFF  0D   0A
Decimal:            27    76   71  255   13   10
```

Print Logo   ESC L g *n*

This command prints a logo previously store in memory. The parameter *n* instructs the printer to print the graphic stored in memory location*s (refer to table above for logo location availability)*

Example 1: The following escape sequence will print the logo at memory location one.

```
Escape Sequence:      ESC   L    g    1
Hexadecimal:           1B   4C   67   31
Decimal:               27   76  103   49
```

Example 2: The following example replaces logo location 1 with the logo image contained in logo.prn file.

The following escape commands must be sent sequentially and are necessary to complete logo download.

```
Escape sequence 1:   ESC   D    L    CR   LF
Escape sequence 2:   ESC   L    G    1    CR   LF
```

Escape sequence 3:*logo.prn file*

```
Escape sequence 4:   ESC   L    G  0xFF  CR   LF
Escape sequence 5:   ESC   L    g    1
```

The following table represents the LED behavior for each Escape sequence during logo download.

Command	Description	Printer Response	LED Status
ESC D L CR LF	Select Logo Download Mode	?	Power LED - Flashing Green MRC & Error – Steady Red
ESC L G n CR LF	Select Memory Location	none	Power LED - Flashing green
Send Graphic Logo File	Send a Binary file with the Logo image	none	Power LED - Flashing green
ESC L G 0xFF CR LF	Stop Loading Graphic Logo	D!X	**While the logo is being burned** Power LED – Steady Green MRC & Error – Steady Red **When Burning complete** Power LED – Steady Green
ESC L g *n*	Print Graphic Logo	Printer Prints Logo n	none

Note: The above logo download commands are intended for Developers only. Please contact Customer Support for any Logo Download Utilities.

Download – Fonts

Enable Font Downloading   ESC D F CR

This command will enable the font download feature.

```
Escape Sequence:      ESC   D    F    CR
Hexadecimal:           1B   44   46   0D
Decimal:               27   68   70   13
```

Display Tables Information   ESC F I CR

This command will instruct the printer to display the font table's information at the host. The printer must be connected to the host in order to receive the font table's information.

```
Escape Sequence:      ESC   F   I  CR
Hexadecimal:           1B   46  49  0D
Decimal:               27   70  73  13
```

Command is valid after ESC, D, F, CR

Display Tables Information   **ESC D I CR**

Same description as the command directly above. This command is for Legacy printer's compatibility.

Escape Sequence:	ESC	D	I	CR
Hexadecimal:	1B	44	49	0D
Decimal:	27	68	73	13

Disable Font Download Mode   **ESC F X**

This command will disable the font download mode and put the printer in ready print mode.

Escape Sequence:	ESC	F	X
Hexadecimal:	1B	46	58
Decimal:	27	70	88

Display Font Download Current Settings   **ESC F S *m t k f* CR**

This command will instruct the printer to display the current font download settings. The printer will send the following string to the host:

Esc-'F'-'S' m t k f

Parameters

m	'0'=standard response, '1' =response with diagnostics message (default)
t	Font File type. t = '0'. BDF formatted file (default). t= '1' through '9' reserved
k	Font Table: column value. = '0' through '9'
f	Font Table: row value. f = '0' through '9'

Set Font Download Parameter   **ESC F P *m t k f* CR**

This command sets the font download parameters such as for the row and column of the font memory table. The command structure is detailed below.

Parameters

m	'0'=standard response, '1' =response with diagnostics message (default)
t	Font File Type. t = '0'. BDF formatted file (default). t= '1' through '9' reserved
k	Font Table: column value. = '0' through '9'
f	Font Table: row value. f = '0' through '9'

Select Load Operating Mode   ESC F M *m* CR

This command selects the load operating mode. Possible values for parameter *m* are '0': Standard response or '1' : Response with diagnostics message (default).

Command String	Command Description	Printer Response m =1	Printer Response m =0	LED Status
Esc-'D'-'F'	Enable font downloading	?	?	Communication LED – Flashing Green MCR/Printer Error LED –Steady Red
Esc-'F'-'I'	Display tables **I**nformation	Display installed Font tables info (refer to Table 5)	'1': if command correct '0': otherwise	Communication LED – Flashing Green MCR/Printer Error LED –Steady Red
Esc-'F'-'S'-<CR> or <LF>	Display font download current **S**ettings	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Communication LED – Flashing Green MCR/Printer Error LED –Steady Red
Esc-'F'-'P' – m - t - k - f - <CR> or <LF>	Set Font Download **P**arameter	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Communication LED – Flashing Green MCR/Printer Error LED –Steady Red
Esc-'F'-'M'- m - <CR> or <LF>	To select **M**ode	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Communication LED – Flashing Green MCR/Printer Error LED –Steady Red
Esc-'F'-'K'- k - <CR> or <LF>	To select font column(**K**) value	Esc-'F'-'S'-m t k f	'1': if command correct '0': otherwise	Communication LED - Flashing green
Esc-'F'-'F'- f - <CR> or <LF>	To select font row(**F**) value	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Communication LED - Flashing green
Esc-'F'-'L' – t - <CR> or <LF>	Select file type **and start of font download	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Communication LED - Flashing green
Send the .bdf file		Send the File		**While File is transferring:** Communication LED - Flashing Green **When transfer is complete:** Communication LED - Flashing Green Total number of characters transferred is displayed
Esc-'F'- 'B' <CR> or <LF>	To program or burn font on flash	**On burn process** **Complete:** D!X	**On burn process** **Complete:** D!X	**While the font is being burned in FLASH** Communication LED – Flashing Green MCR/Printer Error LED - Flashing Red **When Burning complete** Communication LED – Steady Green

Select Font Row   **ESC F F f CR**

This command selects the row value for the font tables. The parameter f can be set in the range of '0' to '9'

Select Font Column   **ESC F K k CR**

This command selects the column value for the font tables. The parameter k can be set in the range of '0' to '9'

Select File Type   **ESC F L t CR**

This command selects the file type to be uploaded. The parameter t has a range of values between '0' to '9'. The default value is '0' which means "BDF" format.

Save Font File in Flash   **ESC F B CR**

This command instructs the printer to program or burn font onto Flash memory.

The table below summarizes the font downloading commands supported by the Datamax-O'Neil printer along with the printer's expected LED status.

```
Escape Sequence:     ESC   F    B    CR
Hexadecimal:         1B   46   42   0D
Decimal:             27   70   66   13
```

Important Font Downloading Notes:

The file to be downloaded must be .BDF formatted.

When downloading, ensure that the metrics of the fonts to be downloaded are equal or smaller than the metrics of the existing font in the location in question; otherwise the fonts will not be downloaded correctly.

The escape sequence ESC D F CR must be the first command after power up, otherwise the printer will print the command instead of executing it. You can also use the commands ESC X X CR command to initialize the printer after other escape commands have been used.

Once a font has been downloaded, press the FEED button twice to exit the downloading mode. Shut the printer OFF by pressing the ON/OFF switch.

Each character's header uses .DBF font and represents the true size of the font bitmap.

Example1: For a 16x23 font, the header at the beginning of each character must appear as follows:

BBX 16 23 0 0

Example 2:   For a 10 x 23 font, the header at the beginning of each character must appear as:

BBX 10 23 0 0

If the font to be downloaded is one byte in size (8 x 23), the .BDF file must be one byte only in size. Otherwise the firmware will not accept the font!

Example 1: BBX 08 23 0 0	Example 2: BBX 08 23 0 0
BITMAP 0008 000F INCORRECT 0002 0003	BITMAP 08 0F CORRECT 02 03

The name of the font is indicated at the beginning of the .BDF file, therefore: FONT Font12C.BDF. If only the file is renamed, the firmware will not recognize it; in this case, the .BDF file must be opened and the file name must be changed as in the format shown previously in this paragraph.

The following section shows the steps required to upload a new font into the printer memory.

1) Have the .BDF font file available and ready. The file should contain all of the characters which are to be downloaded. When downloading, ensure that the Serial Port setting for the Terminal Program is configured for Hardware Handshaking. If the file is in .ASM format rather than a .BDF format, use Datamax-O'Neil's 'asm2bdf' utility to convert the file to .BDF format. Instructions on how to use the utility are available in the USING THE ASM2BDF UTILITY document available in the FONT section of the supplied Developer's CD.

2) Cycle Printer Power or Send **ESC X X** command

3) Send **Esc D F** and wait for a question mark to return from the printer. The Ready and Status LED should each illuminate in green.

4) Send **Esc F I** to view the current font table information

5) Send **Esc F K 1 <CR> or <LF>** – This will select the second column of the table – the Power LED will begin flashing Green and the Status LED will illuminate a steady RED.

6) Send **Esc F F 1 <CR>or <LF>** – This will select the second row of the table - the Power LED will start flashing Green and the Status LED will turn steady RED.

7) Send **Esc F L 0 <CR>or <LF>** which will signal that the file you are sending is .DBF format (this command is implemented primarily for future releases when users will be able to download more than one font format) - the Power LED will start flashing Green and the Status LED will illuminate a steady RED.

8) Send the .BDF file - While the File is transferring the Power LED is steady Green and the Status LED is steady RED – when the transfer is complete the Status LED switches OFF and the Power LED flashes Green. The .BDF font metrics must be equal or smaller than the metrics of the existing font.

9) Send **Esc F B <CR>or <LF>** - The Power (green) and Status (red) LEDs are steady while the font is burned in FLASH. When burning has been completed, both the Power LED (green) and the Status LED (red) begin flashing.

10) The .BDF font in the example above has been stored in the International Section of the Courier Mode 1 font (F = 1, k = 1). Unplug the Serial Cable, press the Feed button, and shut the printer OFF by pressing the ON/OFF button.

Bluetooth™ & WiFi Setup Command

Datamax-O'Neil printers can be placed in pass-thru mode. In pass-thru mode, data communication will only occur between the two selected UARTS. This mode of operation is used to setup the Bluetooth™ or 802.11b/g interface parameters. While in this mode, printing is disabled.

Select Pass-Thru Command Mode   **ESC P U *n1* U *n2* T *t0 t1 t2* (CR)**

This command sets the printer in pass-thru mode. In most serial applications the command can be sent manually or as a file. For UART selection only use ECU application.

Parameter	Description
n1	Source UART, values 0 – 4 UART0 = Serial Interface UART1 = Wireless Interface (BT, WiFi) UART2 = Wireless Interface (BT, WiFi) UART3 = IrDA Interface UART4 = USB Interface
n2	Destination UART, values 0 – 4 UART0 = Serial Interface UART1 = Wireless Interface (BT, WiFi) UART2 = Wireless Interface (BT, WiFi) UART3 = IrDA Interface UART4 = USB Interface
t0	Pass-thru timeout, value 0 – 9
t1	Pass-thru timeout, value 0 – 9
t2	Pass-thru timeout, value 0 – 9

Note: Pass-thru timeout value 000 is not a valid entry

Example 1: The Pass-thru sequence below is used to put Apex2 printer is Pass-thru mode from serial to Wireless with timeout value set to 999 seconds.

Escape Sequence:	ESC	P	U	0	U	2	T	9	9	9	CR
Hexadecimal:	1B	50	55	00	55	32	54	09	09	09	0D
Decimal:	27	80	85	0	85	50	84	9	9	9	13

Example 2: The Pass-thru sequence below is used to put Apex3 printer is Pass-thru mode from serial to Wireless with timeout value set to 999 seconds.

Escape Sequence:	ESC	P	U	0	U	1	T	9	9	9	CR
Hexadecimal:	1B	50	5	00	55	31	54	09	09	09	0D
Decimal:	27	80	85	0	85	49	84	9	9	9	13

Example 3: The Pass-thru sequence below is used to put Apex4 printer is Pass-thru mode from USB to Wireless with timeout value set to 999 seconds.

Escape Sequence:	ESC	U	4	U	2	T	9	9	9	CR
Hexadecimal:	1B	50	55	55	32	54	09	09	09	0D
Decimal:	27	80	85	85	50	84	9	9	9	13

Note: Pass-thru command is not available when Source (n1) = Destination (n2)
The Pass-thru mode terminates under three conditions:
After pressing the FEED button
After TIMEOUT duration specified in the pass-thru command has EXPIRED
After receiving three consecutive "#" characters.

Emulation

The printer's default mode of operation of Datamax-O'Neil Printers is the Datamax-O'Neil Printer Command Language (ExPCL). The emulations offered by Datamax-O'Neil Printers allow compatibility with printing systems and software created for printers offered by other mobile printer's manufacturers. The Datamax-O'Neil printers offer the following emulations:

O'Neil: Line Print Mode and Easy Print Mode

Zebra: CPCL Line Print Mode.

To select a temporary emulation mode the user must use the following command:

Select Emulation   ESC E *n*

This command selects emulation mode *n* by which future commands will be interpreted as described in the following table. The selected mode will be in effect until another Select Emulation command is received or the printer is manually reset by cycling power on the printer.

Once the emulation has been selected, please refer to the section of this manual that describes the commands available for that emulation.

Example: The following escape sequence will set the printer to O'Neil Emulation.
Escape Sequence: ESC   E   O
Hexadecimal: 1B   45   4F
Decimal: 27   69   79

n	Emulation Language
N	Datamax-O'Neil Printer Command Language
O	O'Neil Emulation Line Print Mode
Z	O'Neil Emulation EZ Print Mode
C	CPCL Emulation

The following table details the behavior of the printer to enter and exit the emulation mode.

Getting From (Mode Name)	Regular Mode(Datamax-O'Neil)	Line Print Mode	Easy Print Mode
Regular Mode (Datamax-O'Neil)		Esc E O	ESC E Z
O'Neil Easy Print Mode	ESC E N	{LP}	
O'Neil Line Print Mode	ESC E N		ESC E Z

Note: O'Neil EZ Print Mode and CPCL emulation are not supported in version 1.0.1

O'Neil Line Print mode

O'Neil Printers can operate in one of two modes: Easy Print mode and Line Print Mode. Only two commands are implemented in the Easy Print mode – **{LP}** which is the command which brings the printer from Easy Print Mode to Line Print Mode and the other command is **ESC E N (N for Normal Datamax-O'Neil Mode)** which brings the Datamax-O'Neil printer out of the Emulation into its regular Datamax-O'Neil command mode.

The table below details the list of supported commands of the O'Neil Line Print Mode emulation.

Esc C n	This command is ignored by the Datamax-O'Neil printer. It is recognized but no action is taken
Esc A n	This command sets the number of blank dot lines that are fed between character lines. "n" is the number of interline spacing Originally n = (0x01..0x9B) in our version however n = (0x01..0x0A).
CAN (^X)	Cancels the unprinted characters on the forming line.
Esc V n1 n2 104*number of lines bytes of data	Prints the next (n1*256 + n2) dot-lines as bit mapped graphics. The numbers n1n2 form a 16 bit set with the MSB first. The printer will remain in Graphic mode until the full number of bytes has been received.
Esc B/Esc E	Accepts compressed graphics data
SO (^N)	Set double wide print – with Datamax-O'Neil double wide does not mean burn the dot twice but rather increase the space between the characters
SI (^O)	Condensed printing – go back to normal mode
FF (^L)	Feeds 10 lines and the information in the buffer
LF (^J)	Line feed
CR (^M)	Carriage Return
Esc w n	Font Select – the Datamax-O'Neil Fonts are matched as close as possible to the Line Print fonts n (0x20..0x26) Esc w 20 - 16w x 23h Font Esc w 21 – 10w x 23h Font Esc w 22 – 16w x 23h Font Esc w 23 – 16w x 46h Font Esc w 24 - 12w x 23h Font Esc w 25 - 9w x 23h Font Esc w 26 - 16w x 23h Font
Esc H n	Doubles the height – no matter what the n value is
Esc Q n1n2	Advance n1n2 from Q mark – Datamax-O'Neil Printer can advance only up to 255 graphic lines from the Q Mark and the Q mark has to be within 255 lines from the beginning point.
Esc R n	This command switches between the two Character Tables in the Datamax-O'Neil Printer – International Character Table and Line Drawn Character Table.
Esc ! n	Set double high and double wide n = 16d (0x10) – double high n = 32d (0x20)– double wide n = 48d (0x30)– double high and wide
Esc @	Reset the printer to defaults Note: This command does not clear the print buffer! Use the Cancel (CAN) command to clear the buffer. This command will not restore any changes that were burned into the flash memory such as: fonts, logos, default power up message or hardware information message.
Esc EZ	Go to Easy Print Mode
{LP}	From EZ Print mode go to Line Print Mode

Communications Settings

Dip Switch Settings

The Datamax-O'Neil printers support Serial RS232, IrDA compatible infrared communication interfaces and USB*[1].Bluetooth™ and Wi-Fi communication are also available as an optional feature. Serial/USB IrDA, Wi-Fi and Bluetooth™ communication settings can be changed via a DIP switch located on the control card. In the following sections each setting is discussed in more detail.

Function (APEX2,3,4)	Switch #								Notes
Communication Interface	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	
RS232	OFF	OFF							Baud rate set by Dip switches 3,4 and 5
[1]IrDA	ON	OFF							Baud Rate can be negotiated up to the value specified through Dip switches 3,4 and 5
Bluetooth or 802.11g	OFF	ON							
N/A	ON	ON							Setting not supported
[2]USB	X	X			OFF	OFF	ON		
[3]USB Bootloader	X	X			ON	OFF	ON		
[4]Baud Rate			SW 3	SW 4	SW 5				RS232 and IrDA only
115200			OFF	OFF	OFF				
57600			ON	OFF	OFF				
38400			OFF	ON	OFF				
19200			ON	ON	OFF				
14400			OFF	OFF	ON				
9600			ON	OFF	ON				Use for fixed IrDA
2400			OFF	ON	ON				
1200			ON	ON	ON				
Parity Bit						SW 6	SW 7		
Parity Enabled (ODD)						ON	ON		Does not apply for IrDA
Parity Enabled (EVEN)						ON	OFF		Does not apply for IrDA
Auto Power Save								SW 8	
Power Save Enabled								ON	Auto Power Down
Power Save Disabled								OFF	Manual On/Off

[1] **If IrDA is not installed, printer will default to RS232 mode with baud rate 115200**
[2]**X** stands for **Don't Care**: Dip Switch 7 will override 1 and 2
[3]Firmware Applies to Apex 4 - Version 1.10 or later, Check availability for other printer models
[4]Baud Rate and Parity are applicable to RS232 and IrDA communication mode **ONLY**

Serial Communication (RS232C)

The RS232C Interface signals for the Datamax-O'Neil printers are terminated on a 6 PIN RJ type data connector located on the side of the printer. Six connections are provided from the Serial Interface to the host computer. A minimum of two connections are required for operation, RXD – pin 3 and Common – pin 1.The proper baud rate and protocol settings are required to communicate with the host device. The printer defaults to 115.2 K *BAUD, 8 DATA BITS, NO PARITY BIT, and two STOP BITs* on initial power up. Two communication handshaking protocols are supported by the Datamax-O'Neil printers, *Serial Busy protocol* and *XON/XOFF* protocols.

Serial Busy Protocol

For the *serial busy* handshaking mode, *request to send printer input* (RTS) and *clear to send printer output* (CTS) are used to control data flow to and from the printer.

The RTS and CTS are considered to be valid or active when the signal level is positive (3 to 12VDC). A positive RTS signal from the host device enables the printer. The RTS signal is monitored during data transmission from the printer to the host device, the printer transmits data to the host device only if RTS input is high. The printer raises CTS output when it is ready to accept data. The printer lowers CTS line when the print buffer has less than 256 unused locations.

XON/XOFF Protocol

For the *XON/XOFF* handshaking mode, the printer transmits XON (0x11) when it is ready to accept data, and XOFF (0x13) when the print buffer has fewer than 256 unused locations. Under XON/XOFF protocol, the data flow from the printer's serial port is halted on receipt of an **XOFF** from the Host device and resumed on receipt of a **XON**.

RS232C Connections

The RS232C Interface signals for the Datamax-O'Neil printers are terminated on a 6 PIN RJ25 type data connector located at the back of the printer.

Six connections are provided from the Serial Interface to the host computer. The table below lists the Serial Interface signals and pin-outs for the RJ25 connector while pin locations are shown in Figure below.

A minimum of two signal connections are required for operation, RXD - pin3 and Common - pin1.

RJ25 Connector PIN #	Functional Description	Signal Name
3	RS232 from Host (INPUT)	RXD
2	RS232 from Printer (OUTPUT)	TXD
6	Request to send from Host (INPUT)	RTS
4	Clear to send from Printer (OUTPUT)	CTS
1, 5	Logic common	COM

RS232C Technical Specifications

Name	Value
Data Transfer Rate	1200 – 115200 Baud
Word Length	10 or 11 bits
Start Bit	1
Data Bits	8
Parity Bit	None, Odd or Even
Stop Bits	Auto Select 1 or 2
Signal Levels	RS232C
Mark or Logical 1	-3 to -15 VDC
Space or Logical 0	+ 3 to + 15 VDC
Handshaking	Two modes are supported (Software and Hardware)
Hardware	RTS/CTS
Software	XON/XOFF
Auto Power Up	Positive Signal on RTS input switches the printer ON

RJ-25 DATA CONNECTOR
SHOWING PIN # LOCATIONS
FRONT-VIEW
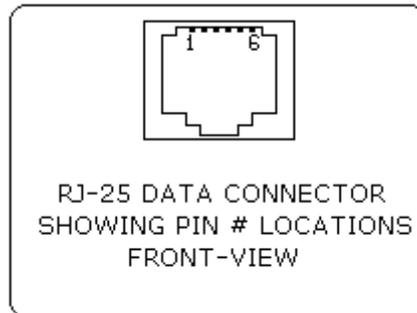
USB Communication (USB)

Overview

Apex printer comes equipped with a USB 2.0 slave port. Everything that can be done through the RS-232 port can now be done through the USB port, using A to B type USB cable. You may print to or send commands to the printer from a PC or any equipment that can act as a USB master.

Dip switch setting

To enable USB, you must set the dipswitches on the printer as below:

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
Any position	Any position	Any position	Any position	Any position	Off	On	Any position

Compatible Software

The host and printer communicate through a method called the "Virtual Com Port", in which a software intermediary called the "driver" makes the USB connection look like a com port to the end-application. Consequently, all software that communicates through the com port is compatible. You may continue to use legacy software, such as the TeraTerm terminal emulation software.

Software Driver Installation

You must install the USB driver before you can use USB communication on the printer. Turn on the printer and connect it to the PC with a USB cable. If the driver has never been installed before, a dialog box will appear. Reply by selecting "Install from a list or specific location" and indicating the location of the file usbprintercdc.inf supplied with the CD. The usbprintercdc.inf file points to the actual driver called msports.dll, which is a part of the Windows operating system.

Next, open the Windows Device Manager. (Control Panel > System > Hardware Tab > Device Manager) Under the Ports (COM & LPT), you should see an entry named "Datamax-O'Neil USB CDC Communications Port"

If you ever needed to uninstall the driver, you may do so by right-clicking on the "Datamax-O'Neil USB CDC Communications Port" from the Device Manager.

TeraTerm Example

TeraTerm is a free terminal emulator program. Make sure TeraTerm is not running when you connect the USB cable. Then run TeraTerm, select (Setup > Serial Port...) to configure it and save the configuration. There are only three items that you need to configure: Port, Data, and Flow control. All other parameters can be set to any value.

PORT	COM\<n\> where \<n\> is the port number where USB driver was installed
Data	8 bit
Baud rate	Any value
Parity	Any value
Stop	Any value
Flow control	None

Note: Select ENTER key on the keyboard to advance paper in the printer and to verify communication.

USB Technical Specifications

Pin	Name	Cable Color	Description
1	VCC	Red	+5V
2	D-	White	Data -
3	D+	Green	Data +
4	GND	Black	Ground

A to B type USB cable
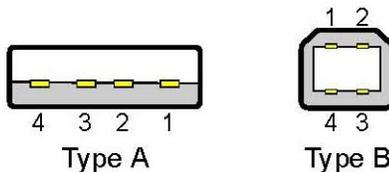
Bluetooth™ Communications

The printer control card communicates with the Bluetooth™ base band interface at 115.2 K Baud/sec for serial interface printers and 57.6 K Baud/sec for USB interface printers, using no parity. To select the Bluetooth™ interface, Dip Switch # 2 must be ON and all other Dip Switches must be OFF. If required by the host application to enter 0 (digit zero) for PIN number while connecting to the BT module. Bluetooth settings can be changed via the AT command set (Refer to Developer's CD for available AT commands).

The table below details the Bluetooth Datamax-O'Neil default settings:

Settings	Value
Name	APEX#, where # matches the printer model
Serial Settings	115200,8,n,2,n
USB Settings	57600, 8, n, 2, n
Discoverability mode	Generally Discoverable
Connectivity mode	GAP Connectable
Security mode	Security Disabled
Fixed PIN	0 (Zero)
Set Master/Slave Policy	Always let the connecting device select the master/slave role on incoming connections
Client Profile	Disable Client Services
Server Profile	Serial Port Profile Server enabled
Wireless Multi-drop mode	disabled, forward to host only
Set Serial Interface	RS232
Configuration over Bluetooth	Enabled
Power Save mode	Allow Sleep mode only
ESC sequence timing	500ms before ESC command & 500ms thereafter

The Bluetooth™ Interface Power Modification

The Bluetooth™ interface increases the battery power consumption by 50mA. To compensate for the increased power demand, the trickle charge rate is modified to help extend the life of the internal battery cartridge. The printer modification is such that the printer can be set to operate in either the *MANUAL POWER OFF* or *CONTINUOUS ON* mode. For Dip Switch settings on Power Save mode please refer to the Dip Switch Table above.

Manual Power OFF Mode

For the printer to be in Manual Power OFF mode Dip Switch # 8 must be OFF. When demonstrating RF wireless communication, turn the printer on by pressing the ON switch located at the front of the printer. The printer will remain active waiting for the wireless print command. Pressing the ON switch again will turn the printer OFF. For each wireless demonstration, turn the printer on by pressing the ON switch. Operation in this fashion will greatly extend the life of the battery cartridge. Unless the ON/OFF switch is pressed the printer will stay ON until the battery drains completely.

Automatic Power OFF Mode

To have the printer automatically SHUT DOWN after a period of time, turn Dip Switch # 8 ON. The printer will turn OFF after 99 seconds. The value of the default timer can be changed by using the command **ESC M n1n2 0 CR** command described earlier in the manual. Once power is cycled the printer reverts to the default 99 second value.

Infrared Communications (Option)

Set Dip Switch 1 to ON position. The printer can be powered up by pressing the power <ON/OFF> switch. If no IrDA connection is made, the printer will automatically power down to a lower power level to conserve battery life. It will remain in a "sleep" mode until an IrDA connection is made, at which time the printer will "wake" and print the requested data. Pressing the power switch again will turn the printer <OFF>.

Wi-Fi Communication (Option)

The printer control card communicates with the Wi-Fi interface at 115.2 K Baud/sec for serial interface printers and 57.6 K for USB interface printers. To select the WiFi interface, Dip Switch # 1 or Dip Switch # 2 (See Dip Switch Settings table above) must be ON and all other Dip Switches must be OFF. Below are the factory default settings of the Wi-Fi module. For more information please refer to the 802.11g kit available on the Developer's CD.

Settings	Value
IP address	192.168.1.96
DHCP mode	Disabled
Ad - Hoc mode	Enabled
Infrastructure mode	Disabled
SSID	APEX# , where # matches the printer model
Tunnel port	23 (to send data to the 802.11g module use this port number)

Printer Status Indicator LED Panel

The table below describes the normal function of each of the Printer's Status LEDs.

LED	Status	Condition	Function
LED # 1 Communication	GREEN	Flashing	Power is ON and the printer is in RS232/USB or IRDA mode
		Steady	Communicating with host
	BLUE	Flashing	Power is ON and the printer is in Bluetooth mode
		Steady	Transmitting/receiving
	Light Blue	Flashing	Power is ON and the printer is in 802.11b/g mode
		Steady	Transmitting/Receiving in 802.11 mode OR Printing Self test in 802.11 mode
LED # 2 Battery	AMBER	Steady	Battery being charged. The LED will turn off when the battery is fully charged
LED # 3 Magnetic Card Reader & Printer Error	GREEN	Steady	Indicates that MCR or SCR is ready to accept data
		Flashing	▪ Dip Switches 5 and 7 are ON – USB cable is plugged in. Note: If USB is unplugged, LED will flash Amber until printer is reset manually ▪ Serial Firmware upload Note: Firmware upload complete indicated by blue flashing LED #3

Error/ Warning LED Panel

LED #	LED Color/ Status	Description	Action Required
LED # 1 Communication	RED/ Steady	Low power indication:	Charge battery
LED # 1 **&** **LED # 3**	(#1) GREEN/ Flashing (#3) RED/ Flashing	Printer is in RS232 or USB mode and Printer Buffer is not empty.	Press Feed to clear error. Cycling printer power will result in printer buffer data loss.
	(#1) BLUE-GREEN Flashing* (#3) RED/ Flashing	Printer is in Bluetooth mode and Printer Buffer is not empty.	Press Feed to clear error. Cycling printer power will result in printer buffer data loss.
LED # 3 Magnetic Card Reader **&** Printer Error	GREEN Momentary flashing → RED Flashing	Printer has discovered and is parked on the Q-Mark	Advance Q-Mark to tear bar level to continue (refer to manual for Q-Mark commands)
	RED Flashing	Paper Error/ Paper Door Open/ Dip Switch 5 and 7 are ON	Insert paper properly (refer to User's Guide)/ Close paper door to clear error/ Place printer in correct mode
	RED Steady	Print Error: Printer out of paper	Replace roll of paper
	RED Flash Fast	Print head is hot. Printer will stop printing	Allow print head to cool off: restart print temperature recommended is 75°C
	Blue Flashing	Firmware upload via serial cable is completed successfully	Cycle printer power to continue

Appendix A: Flash Font Tables

The tables below show the Font Table organization in the Datamax-O'Neil Printers. There are two classes of font tables: Replaceable and Factory Fonts.

Please note each font table represents either the first or the second half of a font, not the complete 255 character set.

Replaceable Fonts Tables

The fonts in Red correspond to the replaceable fonts that can be modified via the font downloading commands.

Replaceable Fonts						
	k-0	**k-1**	**k-2**	**k-3**	**k-4**	**k-5**
		Courier 16X23	Courier 12X23	Courier 10X23	Courier 09X23	Courier 08X23
F0	Courier Mode 0(Rotated) I 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F
F1	Rotated PC Line Draw 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF
F2	Rotated PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF

Factory Fonts

Formed by the Monospace, Bold and Verin font sets, these font tables cannot be modified by the users.

Factory Fonts									
k- 6	**k-7**	**k- 8**	**k – 9**	**k- 10**	**k- 11**	**k- 12**	**k- 13**	**k- 14**	**k- 15**
Monospace 10x23	Monospace 10x23 - Bold	Monospace 20x23	Monospace 10x18	Bold 80x48	Verin 08X23	Verin 09X23	Verin 10X23	Verin 12X23	Verin 16X23
ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F
International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF
PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF

Courier International Font Table

Courier PC Line Graphic Table

Monospace Font Table

Rotated Font Table