PRINTEKMOBILE™

Mt Series

Programmer's Manual

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Acknowledgements

Specifications subject to change without notice.

Table Of Contents

Printer Characters

For the purposes of software development, there are three types of characters, which may be transmitted to or from the printer:

Control Characters
- Defined as character encoding {0x00..0x1F}
- Designed to control the printer operation

ASCII Print Characters
- Defined as character encoding {0x20..0x7F}
- Factory default – ISO defined US-ASCII alpha-numeric character set

Extended Print Characters
- Defined as character encoding {0x80..0xFF}
- Factory default – "International" and "PC Line Draw" character sets

  Note: *ONLY ONE of the Extended Character Sets may be selected per print line*

Control Characters

{0x00..0x1F}

The following set of characters is reserved, to assist in printer control. The printer also provides single byte responses to inform the host of the printer status.

Character	Control	Hex / Dec	CONTROL ACTION
EOT	^D	04 / 04	End Of Text *Printer sends an EOT character when buffer is empty; tells the host device that printer is in idle mode.*
BS	^H	08 / 08	Back Space *Remove previous character in print buffer.*
HT	^I	09 / 09	Horizontal Tab *Tab to 5,9,13,17,21,25,29,33,37 or to the beginning of next line.*
LF	^J	0A / 10	Line Feed *Advance to beginning of next line.*
VT	^K	0B / 11	Vertical Tab *Advance 5 lines.*
FF	^L	0C / 12	Form Feed *Advance 10 lines.*
CR	^M	0D / 13	Carriage Return *Advance to beginning of next line.*
SO	^N	0E / 14	Shift Out *Printer defaults to 24 column mode*
SI	^O	0F / 15	Shift In *Printer defaults to 42-column mode.*

Printer Characters

Character	Control	Hex / Dec	CONTROL ACTION
XON	^Q	11 / 17	Transmitter On *Printer to Host: Ready to receive data.* *Host to printer: The host is ready to receive data.*
AUXON	^R	12 / 18	Printer on *Printer to Host: Printer is on line. Transmitted after initial power up or clearing of printer jam or paper reload.*
XOFF	^S	13 / 19	Printer receiver is off *Printer to Host: Print Buffer is full or other error condition.* *Host to Printer: host device transmitter off.*
NORM	^T	14 / 20	*Return to default 42 column mode*
AUXOFF	^U	15 / 21	Printer to Host: printer is off *Transmitted to host before power down or paper out.*
CANCEL	^X	18 / 24	Cancel and reset printer *Print buffer is reset and printer placed in initial power-up default settings.*
ESC	^[	1B / 27	Escape *Escape character precedes graphics and printer operating modes. Refer to escape command section.*
EXTEND	^\	1C / 28	Extended print *All characters following these commands are printed double high.*
EXTEND OFF	^]	1D / 29	Extended print off/Normal print *All characters following this command are printed normal height.*

ASCII Print Characters

The printer is delivered with a single factory installed ASCII character set. The factory default is based on the ISO defined US-ASCII table. The printable characters in the lower half of the character set (0x20-0x7F) are shown below.

ASCII Character Set

Extended Print Characters

The Extended Print Characters are the upper half of the character set (0x80-0xFF).

There are two extended character sets which may be selected using the ESC F *n* command. The character representations for each set are shown below.

ESC F 1

Selects the *International* character set

International Character Set

ESC F 2

Selects *PC Line-draw* character set

PC Line Draw Character Set

Resident Character Sets

Typefaces

For each resident character set, several font typefaces, or sizes, are available. This provides the character pitches with the associated columns-per-line as shown in the following table.

A total of four different font tables are used to generate the typefaces. At power up, the default selection is Courier Mode 2.

FONT NAME	PITCH	COLUMNS PER LINE		SIZE (WxH)	COMMAND
		Mt2	**Mt3/3-II**		
Courier Mode 5	24 CPI	48	72	8x23	ESC k 5
Courier Mode 4	21 CPI	42	63	9x23	ESC k 4
Courier Mode 3	19 CPI	57	57	10x23	ESC k 3
Courier Mode 2	16 CPI	32	48	12x23	ESC k 2
Courier Mode 1	12 CPI	24	36	16x23	ESC k 1
Courier Mode 0 (Rotated)	13 CPI	24 (rows)	32 (rows)	14x16	ESC k 0

Example: Select Courier Mode 4

Escape Sequence: ESC   k   4
Hexadecimal: 1B   6B   34

Emphasized Print

For the normal typeface characters, the individual lines or strokes of each character are finer, giving a more airy feel to the typeface. Emphasized characters have a heavier or thicker line width, putting more emphasis on the text. A line of text using a resident font may be emphasized using the following command:

ESC U 1   Enable emphasized print starting with the current text line.

ESC U 0   Disable emphasized print starting with the current text line.

Example: Select Emphasized

Escape Sequence: ESC   U   1
Hexadecimal: 1B   55   31

Line Spacing

The line spacing between successive printed text lines may be set using the text line spacing command (ESC a n). While printing *PC Line-draw* characters, the line spacing must be set to zero by issuing the ESC a 0 command string, this setting allows connection of graphic characters on successive lines.

During text print, line feeds may be performed at 0.125mm resolution using the graphic linefeed command (ESC – 'J' – n).

ESC a n   Where n is the number of graphic-line-spacing, in increments of 0.125mm. $n = 0…10$. The printer default setting is 3-dot line spacing after each printed text line ($n = 3$)

ESC J n   Where n is the number of desired 0.125mm graphic line feeds. $n = 0…255$.

Example 1: Set line spacing to 5 dot lines between character rows.

Escape Sequence: ESC   a   5
Hexadecimal: 1B   61   05

Example 2: Perform 50 graphic line feeds.

Escape Sequence: ESC   J   50
Hexadecimal: 1B   4A   32

Flash Based Font Download

The Mt2 and Mt3 printers provide the user the ability to replace the factory-installed fonts. This allows the printer to adapt to many application specific character sets.

> **Note:** To protect the fonts from accidental corruption these must be the first commands received by the printer when it is powered on.

Normal ASCII Font Download

(RS-232 only)

Enter flash ASCII font program mode: ESC D A *n*

   n: Reserved for future use ('0' is recommended)

   Note: T*his command must be the first ESC command received upon activating the printer.*

   1.   The printer will deactivate the CTS line and copy the requested Flash bank to SRAM.
   2.   When the copying process is complete, the CTS will become active and the printer will transmit a '?' (0x3F).
   3.   Any character not accepted, as part of a font load command will be echoed back to the terminal device.

To Load an ASCII character: ESC D *n1 n2 data*

   n1:   TABLE to save the character in {0x30, 0x31, 0x32, 0xFF}
            (0xFF = quit)

   n2:   Character code {0x21 .. 0x7F} {CHR$(33) .. CHR$(127)}

   data: 16 x 23 bit (W x H) character matrix (46 bytes total). Each character must also fit into the matrix specified by the font size (see table below).

TABLE '0'	**Courier Modes 1 & 2** **12 & 16 cpi** (12 x 23)
TABLE '1'	**Courier Mode 3** **19 cpi** (10x23)
TABLE '2'	**Courier Modes 4 & 5** **21 & 24 cpi** (8x23)

Extended Font Download

(RS-232 only)

Enter flash *extended font* program mode: ESC D X *n*

    n: Font BANK to modify {'0', '1', '2', '3'} {0x30, 0x31, 0x32, 0x33}

    Note: *This command must be the first ESC command received upon activating the printer.*

1. The printer will deactivate the CTS line and copy the requested Flash bank to SRAM.

2. When the copying process is complete, the CTS will become active and the printer will transmit a '?' (0x3F).

3. Characters not recognized, as part of a font load command will be echoed back to the terminal device.

To Load an extended character: ESC D *n1 n2 data*

    n1:   *TABLE to save the character in {0x30, 0x31, 0xFF} (0xFF = quit)*

    n2:   *character code {0x80 .. 0xFF} {CHR$(128) .. CHR$(255)}*

    data: *16 x 23 bit (W x H) character matrix (46 bytes total). Each character must also fit into the matrix specified by the font size (see table below).*

	BANK '0'	BANK '1'	BANK '2'	BANK '3'
TABLE '0'	**International 12 & 16 cpi (Courier Modes 1 & 2)** (12x23)	**International 19 cpi (Courier Mode 3)** (10x23)	PC Line Draw 12 & 16 cpi **(Courier Modes 1 & 2)** (12x23)	PC Line Draw **19 cpi (Courier Mode 3)** (10x23)
TABLE '1'	**International Rotated (Courier Mode 0)** (14x23)	**International 21 & 24 cpi (Courier Modes 4 & 5)** (8x23)	**PC Line Draw Rotated (Courier Modes 0)** (14x23)	**PC Line Draw 21 & 24 cpi (Courier Modes 4 & 5)** (8x23)

EXAMPLE: **To load a new character 'A'**

STEP 1 –   **Describe the Bitmap:**

    This is best done within a font-editing program. Characters must be **right justified** within the 16 x 23 bit cell. To ensure the characters do not run together, care should be taken to leave at least a single line of space on one side of each character.

Line	Value (HEX)	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
				'LEFT BYTE'								'RIGHT BYTE'					
1	00 00																
2	00 40										X						
3	00 E0									X	X	X					
4	00 A0									X		X					
5	01 B0								X	X		X	X				
6	01 10								X				X				
7	01 10								X				X				
8	01 10								X				X				
9	01 10								X				X				
10	03 18						X	X					X	X			
11	03 18						X	x					X	X			
12	03 F8						X	X	X	X	X	X	X	X			
13	03 F8						X	X	X	X	X	X	X	X			
14	02 08						X							X			
15	02 08						X							X			
16	06 0C					X	X							X	X		
17	06 0C					X	X							X	X		
18	04 04					X									X		
19	04 04					X									X		
20	04 04					X									X		
21	0E 0E				X	X	X						X	X	X		
22	0E 0E				X	X	X						X	X	X		
23	00 00																

STEP 2 –   **Enter flash font program mode:**

Using the ESC D A 0 (Hexadecimal 1B 44 41 30) command to program the ASCII (0x20 – 0x7F) character sets. The printer will deactivate the CTS line.

STEP 3 –   **Load new character shape for 'A':**

Once the printer has re-activated the CTS line, and transmitted the character '?', it is possible to modify the character sets. Transmit the command ESC D 0 A (Hexadecimal 1B 44 30 41) followed by the data derived from the bitmap as shown. The order of transmission is

> Line 1 Left Byte, Line 1 Right Byte,
> Line 2 Left Byte, Line 2 Right Byte
> …
> Line 23 Left Byte, Line 23 Right Byte.

STEP 4 –   **Save modified character sets:**

Currently all of the character sets are in the printer SRAM and may not be used for printing. To save the modified character sets into the flash memory, enter the command ESC D -xFF (Hexadecimal 1B 44 FF).

The printer will transmit the character 'D' and then proceed to save the fonts to flash memory. **THE PRINTER POWER MUST REMAIN ACTIVE AT THIS TIME.**

Once the fonts have been saved into flash memory, the printer will transmit the character '!'. At this time, the printer will transmit an 'X' every 500 milliseconds.

STEP 5 –   **Cycle the printer power:**

To ensure optimal operation of the printer, remove the battery cartridge from the printer for several seconds. Replace the battery cartridge and the new fonts will be ready for use.

Graphic Commands

8-Bit Dot Addressable Graphics

The printer uses a single line thermal print head with elements spaced at 0.125mm. The Mt2 print head has 384 thermal elements for a total print width of 48mm, and the Mt3 has 576 elements for a print width of 77mm. The 8-bit graphic commands enable control of each one of the heating elements and advancing of the paper by increments of 0.125 mm.

To select the 8-bit graphic mode the user application must issue the ESC V command. Next, the host application sends two bytes to indicate the number of the graphic lines desired, followed with packet of 48 bytes for each graphic line in the Mt2, or 72 bytes for each graphic line in the Mt3 or Mt3-II. The printer prints the graphic line and advances to the next line automatically.

8-Bit Dot Addressable Graphics commands

ESC V *n1 n2 data*

> *n2 n1*   16 bit integer indicating the number of graphic lines to be received.
> *data*   48 bytes of graphic data for the Mt2, or 72 bytes for the Mt3/Mt3-II.
> Valid Graphic Character set is from 0x00 to 0xFF Hex using bits 0-7.

Example: ESC V 0x01 0x00 and 72 bytes of *data* prints a single line of graphics on an Mt3/Mt3-II.

8-Bit Compressed Graphics

ESC v *height width counter data counter data…*

> *height*   An eight bit value representing the number of dot lines contained in the following data set.

> *width*   An eight bit value representing the number of bytes to be contained in each dot line of the following data set.

> *counter* An eight bit value describing how to process the following data:

> For **signed** values *counter* may be interpreted as follows:

> {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 *counter* may be interpreted as follows:

> {127 ≥ *counter* ≥ 0} Process the next (*counter* + 1) bytes of *data* as 8 bit +1 times graphics.
> {128 ≤ *counter* ≤ 255} Repeat the next single byte of data, ((256 – *counter*).

Compressed Graphics Example:

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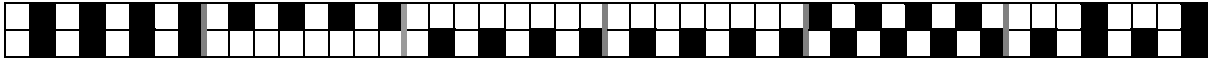
This data may be represented in hexadecimal:

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	1B	76	02	06	FF	55	FF	00	03	AA	11	55	00	FD	55

Graphic Logo Commands

Storing graphic logos in the printer's memory will greatly reduce data trasmission time whenever the logo needs to be printed. The Mt2 and the Mt3-II support up to eight logos, while the Mt3 supports only one.

A utility program is available for Windows desktop systems that will assist in creating the graphic definition of a logo. This graphic definition provides the graphic commands required in STEP 3, below. The utility. 'prn2logo.exe' is provided on the *Mt Series Developer's CD* and may also be downloaded from www.printek.com. Please refer to the documentation provided with the utility for more information.

Mt2 Enter Flash Logo Mode:	**ESC D L *n***
Mt3 Enter Flash Logo Mode:	**ESC D L**
Mt3-II Enter Flash Logo Mode:	**ESC D L *n***
Load /Record Graphic Logo:	**ESC L G *n***
Stop Loading Graphic Logo:	**ESC L G 0xFF**
Print Graphic Logo:	**ESC L g *n***

Note: The Mt2 supports 8 logos. *n* = 0-7.
The Mt3 supports 1 logo. *n* = 0.
The Mt3-II supports 8 logos. *n* = 0-7.

Graphic Logo Operation

STEP 1 –   **Enter Flash Logo Program Mode:**

Mt2:   ESC D L *n*   (Hexadecimal 1B 44 4C and *n* = 30 – 37).

Mt3:   ESC D L   (Hexadecimal 1B 44 4C)

Mt3-II: ESC D L *n*   (Hexadecimal 1B 44 4C and *n* = 30 – 37).

Once received, the printer will deactivate the CTS line.

Note: *This command must be the first ESC command received upon activating the printer.*

STEP 2 –   **Start Logo Download:**

Once the printer has re-activated the CTS line, and transmitted the character '?' it is possible to start the logo download. The host application selects the Graphic Logo record mode by sending the load command:

Mt2:   ESC L G *n*   (Hexadecimal 1B 4C 47 and *n* = 30 – 37)

Mt3:   ESC L G 0   (Hexadecimal 1B 44 4C 30).

Mt3-II: ESC L G *n*   (Hexadecimal 1B 44 4C and *n* = 30 – 37).

Note: *Any character not accepted as part of a logo load command will be echoed back to the host.*

STEP 3 –   **Transmit Logo:**

While in record mode, the Graphic Logo is downloaded using the 8-bit graphic command:

Mt2:   ESC V *n1 n2* 48 bytes of graphic *data*

Mt3:   ESC V *n1 n2* 72 bytes of graphic *data*

Mt3-II: ESC V *n1 n2* 72 bytes of graphic *data*

STEP 4 –   **Save Logo to Flash Memory:**

At this time the logo is stored in the printer SRAM and may not be used for printing. To save the logo into the flash memory, enter the command:

ESC L G 0xFF   (Hexadecimal 1B 4C 47 FF)

The printer will transmit the character 'D' and then proceed to save the logo to flash memory. THE PRINTER POWER MUST REMAIN ACTIVE AT THIS TIME.

Once the logo has been saved into flash memory, the printer will transmit the character '!'. At this time, the printer will transmit an 'X' every 500 milliseconds.

STEP 5 –   **Cycle the printer power:**

To ensure optimal operation of the printer, remove the battery cartridge from the printer for several seconds. Replace the battery cartridge and the new logo will be ready for use.

Bar Codes

The Printek Mt2 and Mt3 printers support several bar code symbologies. Two commands are defined for printing bar codes:

Bar Code Command Formats: **ESC z n1 n2 L data**
                             ESC Z n1 n2 L data

z	print bar code only
Z	prints bar code and ASCII human readable text
n1	bar code type

	'1'	Code 39
	'2'	Code 128, UCC/EAN-128
	'3'	Interleaved 2 of 5
	'4'	UPC/EAN/JAN
	'5'	Codabar

n2	number of character bytes in data array 1 - 255
L	height of bar code printed in increments of 0.125mm

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

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: 12 with auto center (maximum).

Example: Print "CODE-39", 1 mm high.

Escape Sequence:	ESC	Z	1	7	8	C	O	D	E	-	3	9
Hexadecimal:	1B	5A	31	07	08	43	4F	44	45	2D	33	39

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:	18 alphanumeric to 36 numeric only (maximum) - automatically centered.
Code 128 Start character:	<start character> {0x87, 0x88, 0x89} determines the character set to be printed.

IF <start character> is 0x87 CODE A:

Characters Sent To Printer	Characters Read By Bar Code Reader
0x020 through 0x03F ASCII	0x020 through 0x03F ASCII
0x040 through 0x07F ASCII	0x00 through 0x07F ASCII

IF <start character> is 0x88 CODE B:

Characters Sent To Printer	Characters Read By Bar Code Reader
0x020 through 0x07F ASCII	0x020 through 0x07F ASCII

IF <start character> is 0x89 CODE C:

Characters Sent To Printer	Characters Read By Bar Code Reader
PAIRS 0x030 through 0x039 ASCII	PAIRS 0x030 through 0x039 ASCII

Note: *With CODE C - each number must be paired with another.*

Code 128 *data* Bytes:

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: *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: Print alphanumeric bar code "A2a", 12.5mm high, with human readable text.
     n1 = 3 printed characters + 1 start character = 4
     L = 12.5mm / 0.125mm = 100
     start character = START B (full ASCII alpha numeric) = 0x88

Escape Sequence:	ESC	Z	2	4	100	STARTB	A	2	a
Hexadecimal:	1B	5A	32	04	64	88	41	32	61

Example 2: Print all-numeric bar code "1234", 5mm high, without human readable text.
     n1 = 4 printed characters + 1 start character = 5
     L = 5mm / 0.125mm = #40
     start character = START C (numeric pairs) = 0x89

Escape Sequence:	ESC	z	2	5	40	STARTC	1	2	3	4
Hexadecimal:	1B	7A	32	05	28	89	31	32	33	34

Example 3: Print alphanumeric bar code "AB31234", 7mm high, without human readable text.
     n1 = 7 printed characters + 1 start character + 1 control character = 9
     L = 7mm / 0.125mm = #56
     start character = START B (alpha-numeric) = 0x89

Escape Sequence:	ESC	z	2	0	56	STARTB	A	B	3	0x83	1	2	3	4
Hexadecimal:	1B	7A	32	09	38	89	41	42	33	83	31	32	33	34

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 www.ean.be for the EAN and/or www.uc-council.org for the UCC

Example: Print all-numeric bar code "1234", 5mm high, with human readable text.
     n1 = 1 start character + EAN specifier + 4 printed characters = 6
     L = 5mm / 0.125mm = #40
     start character = START C (numeric pairs) = 0x89

Escape Sequence:	ESC	Z	2	6	40	STARTC	FNC1	1	2	3	4
Hexadecimal:	1B	5A	32	06	28	89	86	31	32	33	34

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.

Character set: numeric pairs.

Elements per symbol: 10 (5 bars, 5 spaces)

Character density: 11.11 CPI

Bar width: 0.25mm

Characters per line: 24 numeric (maximum), automatically centered.

Example: Print "12345678", 10mm high.

Escape Sequence:	ESC	Z	3	8	80	1	2	3	4	5	6	7	8
Hexadecimal:	1B	5A	33	08	50	31	32	33	34	35	36	37	38

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

Character set: numeric - fixed length.

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: Print UPC-A, 123456123459, 23 mm high.

Escape Sequence:	ESC	Z	4	12	184	1	2	3	4	5	6	1	2	3	4	5	9
Hexadecimal:	1B	5A	34	0C	B8	31	32	33	34	35	36	31	32	33	34	35	39

   Note: The received check digit '9' is ignored and recalculated in the printer.

Example 2: Print UPC-E, 0783491, 23 mm high.

Escape Sequence:	ESC	Z	4	7	184	0	7	8	3	4	9	1
Hexadecimal:	1B	5A	34	07	B8	30	37	38	33	34	39	31

Example 3: Print EAN/JAN-8, 65432109, 25 mm high.

Escape Sequence:	ESC	Z	4	8	200	6	5	4	3	2	1	0	9
Hexadecimal:	1B	5A	34	08	C8	36	35	34	33	32	31	30	39

   Note: The received check digit '9' is ignored and recalculated in the printer.

Example: Print EAN/JAN-13, 6543216543219, 20 mm high.

Escape Sequence:	ESC	Z	4	13	160	6	5	4	3	2	1	6	5	4	3	2	1	9
Hexadecimal:	1B	5A	4	0D	A0	36	35	34	33	32	31	36	35	34	33	32	31	39

   Note: The received check digit '9' is ignored and recalculated in the printer.

   Note: UPC/EAN/JAN height: All heights are total height, including a 1.25mm drop bar pattern printed
      after the barcode 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:	20 (maximum) plus start/stop, automatically centered.

Example 1: Print 123456, 15 mm high using the 'A' start character the host transmits.

Escape Sequence:	ESC	Z	5	8	120	A	1	2	3	4	5	6	T
Hexadecimal:	1B	5A	35	08	78	41	31	32	33	34	35	36	54

Example 2: Print 2468, 10 mm high using the C start character the host transmits.

Escape Sequence:	ESC	Z	5	6	80	C	2	4	6	8	*
Hexadecimal:	1B	5A	35	06	50	43	32	34	36	38	2A

Black Mark Sensing

The Printek thermal printers can print on preprinted form stocks, with a black mark located on the right side of the front face of the paper stock. The printer paper out sensor is used to sense the black mark position.

Black Mark Operation

Follow these steps to use black mark sensing:

- Set the paper out sensor sensitivity level by issuing ESC Q Q *n* command string. The value selected for the sensitivity is dependant upon the height of the pre-printed black mark located on the form stock. The default power on value of *n* is 40.

- Issue ESC Q F *m* -or- ESC Q B *m* printer Command to find the black mark. The command positions the form for printing.

- Wait for ESC Q ? ? *n1 n2* black mark found response from the printer.

- Send the data to be printed.

Black Mark Printer Commands

Black Mark Command	Command String	Description
Reverse Dot Feed	ESC Q J *n*	Perform *n* reverse dot line feeds, 0.125mm each.
Out of Paper Sensitivity	ESC Q Q *n*	On paper detect fail, postpone the paper out error response for *n* 0.125mm dot lines before flagging a paper out error. *n* = 0…255
Forward Black Mark Seek	ESC Q F *m*	Seek black mark using forward feed until *m* dot line feeds have been processed. Each dot line feed = 0.250mm.
Reverse Black Mark Seek	ESC Q B *m*	Seek black mark using backward feed until *m* dot line feeds have been processed. Each dot line feed = 0.250mm.
Printer Black Mark Response: Paper Found	ESC Q ? ? *n1 n2*	*n1* and *n2* are the high and the low nibble, respectively, describing how many 0.250mm dot lines were required to find black mark.
Printer Black Mark Response: Paper Not Found	ESC Q 0 0 *n1 n2*	*n1* and *n2* are the high and the low nibble, respectively, describing how many 0.250mm dot lines were processed before reporting black mark status.

Notes:
n = Total number of 0.125mm dot lines, 0x00 through 0xFF.
m = Total number of 0.250mm dot lines, 0x00 through 0XFF.
n1 and *n2* = Total number of 0.125mm dot lines processed, while seeking black mark.
   n1 holds the high four bits (0x30 + 4 high bits of count).
   n2 holds the low four bits (0x30 + 4 low bits of count).
   n1 and *n2* can have values 0x30 through 0x3F.

Printer Controls

Print Contrast Control

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

Ten levels of printer contrast settings are supported. This feature insures operation with different grades of thermal paper available. The printer defaults to the middle contrast. The contrast may be changed by the host application, using the ESC P n command string.

During the printing process, the battery voltage and the thermal head temperature are monitored. The print contrast is adjusted to assure consistent printout. The print speed is affected by the contrast setting; fastest print speed is achieved if the contrast is set to 9.

Print Contrast Control Command

Set the print contrast level: **ESC P n**

> n = ASCII '0' through '9' {0x30...0x39}
> 0 = Highest contrast & lowest print speed
> 5 = Default
> 9 = Lowest contrast & highest print speed

Printer Peak-Power Control

The *peak power* control commands enable the operation of the printer with wide range of battery chemistries and peak capacities.

The printer may be operated in five peak-power modes, as listed in the table below.

Power Mode	Command	Maximum Dots Selected	Maximum Current
1 - Low	ESC P 1	Heat <64 elements at a time	Less than 1.0 Amp
2 - Medium	ESC P 2	Heat <128 elements at a time	Less than 2.0 Amps
3 - High	ESC P 3	Heat <192 elements at a time	Less than 3.0 Amps
4 - Very	ESC P 6	Heat <576 elements at a time	Less than 9.0 Amps
5 - Auto	ESC P 7	64, 128, 192, or 576 at a time	1.5 to 3.0 Amps

The printer default is Auto. While in auto-peak-power mode, the printer counts the number of dots to be fired and selects the appropriate power mode depending on the available battery capacity. The peak-power setting directly affects the printing speed; printing is slowest for Low peak-power mode.

> **Note:** The on-board brownout circuit resets the printer controller if peak-power usage exceeds the batteries power capacity.

Example: Set Printer Peak Power Control to medium.

Escape Sequence: ESC   P   2
Hexadecimal: 1B   50   02

Auto Power Down Feature

In order to conserve battery life the printer features an *auto power down* timer. The power down timer defaults to 20 seconds on initial power up.

The *auto power down* timer may be set or disabled by sending recognized command strings. The *auto power down* is re-started on 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 with XOFF before power down.

Auto Power Down Command

The auto power down command string: **ESC M *n1 n2* 0 CR** where ***n1*** or ***n2*** may be '0' to '9'.

Reset Auto power down to 20 seconds: **ESC C**

Example 1: Set auto power down to occur after 99 seconds.

Escape Sequence:	ESC	M	9	9	0	CR
Hexadecimal:	1b	4D	39	39	30	0D

Example 2: Disable auto power down.

Escape Sequence:	ESC	M	0	0	0	CR
Hexadecimal:	1B	4D	30	30	30	0D

Example 3: Reset auto power down to twenty seconds.

Escape Sequence:	ESC	C
Hexadecimal:	1B	43

Operating Mode

The printer can be operated in two modes, *Online* or *Buffer modes*. 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 EOT character.

Printer operating mode commands

ESC P #   Select *Online mode*. Characters are printed as received.

ESC P $ Select *Buffer mode*. Characters are buffered until receipt of an EOT (0x04).

Example: Select Buffer Mode.

Escape Sequence:	ESC	P	$
Hexadecimal:	1B	50	24

Print Buffered Data:

Control Code:	EOT
Hexadecimal:	04

Printer Status Commands

Print Battery Voltage

The battery voltage level may be printed using the following command.

     Print Battery Voltage: **ESC P ^**

     Transmit Battery Voltage: **CTRL-V**

Example: Print the battery voltage.

Escape Sequence: ESC   P   ^
Hexadecimal: 1B   50   5E

Supervisory Commands

Single byte supervisory commands are designed for host applications to be able to obtain current status information from the printer. The single byte supervisory commands and serial RS232 response strings are summarized below.

    Note: <4 ASCII hex digits> in the table below are read as hex nibbles OR'ed with 0x30.

Command Description	Status Commands	Printer Responses
Print status request:	**CTRL-B**	
Print buffer status:		ESC B <4 ASCII hex digits> CRLF
Magnetic card reader status:		ESC M <4 ASCII hex digits> CRLF
Battery status request:	**CTRL-V**	
Print buffer status:		ESC B <4 ASCII hex digits> CRLF
Battery Voltage status:		ESC V <4 ASCII decimal digits> CRLF
Magnetic card reader status		ESC M <4 ASCII hex digits> CRLF
Firmware version query:	**ESC P (>**	
Firmware version:		ESC (<4 ASCII characters> CRLF
Example v1.00:		ESC (1 0 0 SPACE CRLF
Hardware model query:	**ESC P)**	
Hardware model:		ESC) <4 ASCII characters> CRLF
Example:		ESC) 1 0 3 C CRLF *

*   103 represents the Mt3 printer, **'C'** is the hardware revision letter.
    108 represents the Mt2 printer.
    118 represents the Mt3-II printer

Magnetic Card Reader

A three track Magnetic Card Reader (MCR) is optionally available on all Printek Mt series model printers. The MCR is designed to read magnetically encoded data from cards conforming to ANSI/ISO 7810, 7811 standards.

The MCR converts the F2F encoded signals on the magnetic card to ISO7811 compatible ASCII format and transmit the information to the host computer or a terminal.

The MCR can read one, two, or three tracks simultaneously and bi-directionally.

Set of printer ESC software commands are supported in order to provide the following operating features:

- Select the MCR.

- Set the auto time-out software timer

- Report MCR Read errors

- Report MCR status.

Card Specifications

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		

Magnetic Card Read Command Strings

- Six Commands strings are provided, to read the magnetic cards. These commands are summarized in the table below.

- The general syntax for commands are as follows:

ESC M *n1 n2 t* CR

- The ESC M command turns on the power to the MCR.

- The next two bytes, *n1 n2*, are used to set the reader's timer. '01' through '99' are valid timer settings. '00' disables the timer.

- 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.

Magnetic Card Reader

- On timeout, the printer aborts the swipe process, transmits timeout error message and turns off the MCR Indicator.

- A good magnetic card swipe automatically terminates the read process.

Magnetic Card Command String	Description
ESC M *n1 n2* 1 CR	Read Track1 only
ESC M *n1 n2* 2 CR	Read Track2 only
ESC M *n1 n2* 3 CR	Read Track3 only
ESC M *n1 n2* 4 CR	Read Track1 and Track2 simultaneously
ESC M *n1 n2* 5 CR	Read Track2 and Track3 simultaneously
ESC M *n1 n2* 6 CR	Read Tracks 1,2 and 3 simultaneously
ESC C	Cancel Read process

Example: Read tracks 2 & 3 with a twenty second timeout.

Escape Sequence: ESC   M   2   0   5   CR
Hexadecimal: 1B   4D   32   30   35   0D

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 ? CRLF.

"%;+" are the track start sentinel characters, while "?" is the end of track sentinel character.

If no data is available for a track that data field will be empty. If an Error is encountered on any track a single "E" will be the output for that tracks' data field.

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, the error number in ASCII (01 through 99), another comma, an English description of the error encountered, and finally CRLF terminating the Error Message string.

The syntax is as follows:

        % E, *nn*, Error text in ASCII, CRLF

The printer may transmit Four (4) types of Read Error messages. The following messages terminated with CRLF are returned.

Error #	Error Message Transmitted
05	Time-out Expired
07	Invalid Track Number
08	Unsupported Track Selected
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.

- The host selects the printer by activating the RTS input line or sending wake-up characters to the printer.

- The printer sends the XON command to the host to indicate that it is ready to receive data from host.

- Once XON is received, the host sends the command to enable the magnetic card reader (ESC M 0 0 4 CR). The printer turns on the GREEN MCR Indicator.

- Once the operator swipes the magnetic card, the printer transmits the track(s) information found on the magnetic card.

- A good read automatically turns off the reader and the indicator.

- The MCR indicator 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.

Serial Communications

The proper baud rate and protocol settings are required to communicate with the host device. The printer defaults to 192*00 BAUD, 8 DATA BITS, NO PARIT, and one STOP BIT* on initial power up.

Two communication handshaking protocols are supported, *Serial Busy protocol* and *XON/XOFF* protocols.

Serial Busy Protocol

For the serial busy handshaking mode, the Request To Send printer input (RTS) and Clear To Send printer output (CTS) are used to control data flow to and from the printer.

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 when it is ready to accept data. The printer lowers CTS 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) for the print buffer has less than 256 unused locations. Under XON/XOFF protocol, the data flow out of the printer's serial port is halted on receipt of XOFF from Host device and resumed on receipt of XON.

RS232C Connections

The RS232C Interface signals for the printer are terminated on a 6 PIN RJ 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 out on the RJ connector followed by the pin locations on the connector.

RJ   DATA CONNECTOR
SHOWING PIN # LOCATIONS
FRONT-VIEW
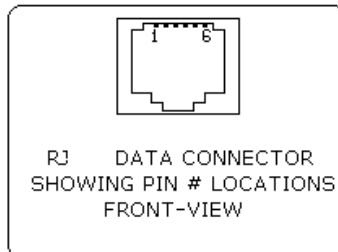
| PIN #	FUNCTIONAL DESCRIPTION	SIGNAL NAME
1, 5	Logic common	COM
2	RS232 from Printer (OUTPUT)	TXD
3	RS232 from Host (INPUT)	RXD
4	Clear to send from Printer (OUTPUT)	CTS
6	Request to send from Host (INPUT)	RTS

Serial Connector Pin Assignments

RS-232C Technical Specifications

- Data transfer rate: 2400 - 38.4K Baud
- Word length: 10 or 11 bits
- Start bit   1
- Data Bits   7 or 8
- Parity Bit   None, odd or even
- Stop bits   1 or 2
- Signal levels: RS232C
- Mark or Logical 1:   -3 to -15VDC
- Space or Logical 0:   +3 to +15VDC
- Handshaking: Two modes are supported
- Hardware: RTS/CTS
- Software: XON/XOFF
- Auto power up: Positive signal on RTS input turns printer on.

Printer Configuration

Mt2 Series

Communication and other settings may be changed via the switches located inside the printer. The following figure shows the location of the switches, and the table shows the switch assignments. For more information, please refer to the *Mt2 Series Operator's Manual*.
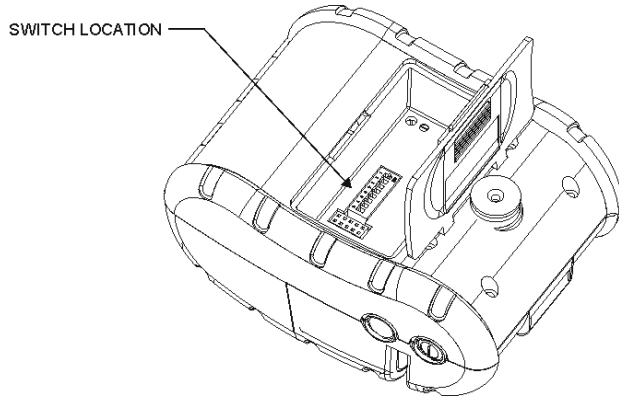
The diagram below shows switch settings for IrDA communications and Auto Power Off enabled.
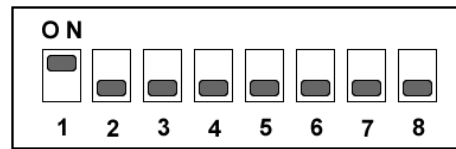
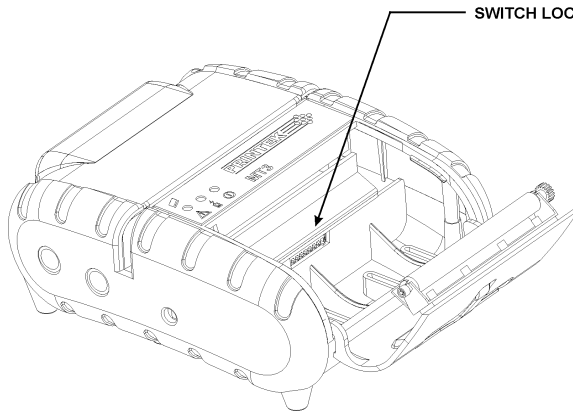
Sample Switch Setting

Configuration Switch Location

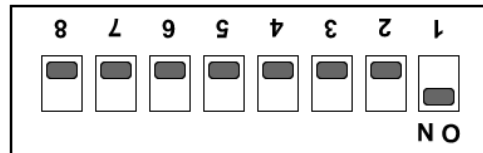| Switch Position(s)		Function
SW1		Communication Interface
Off		RS232/Bluetooth Enabled
On		IrDA Enabled
SW2	**SW3**	**Baud Rate**
Off	Off	38,400
Off	On	19,200
On	Off	9,600
On	On	2,400
SW4		**Manual Power Control (Mt2B)**
Off		Manual Control Disabled
On		Manual Control Enabled
SW5		**Reserved**
SW6	**SW7**	**Parity bit**
Off	Off	No Parity
On	Off	Odd Parity
On	On	Even Parity
SW8		**Reserved**

Mt2 Switch Assignments

Mt3 Series

Communication and other settings may be changed via the switches located inside the printer. The following chart explains the various conditions obtained through the various configuration switch settings. For more information, please refer to the *Mt3 Series Operator's Manual*

Note: In order for switch changes to take effect, the printer power must be reset.

The diagram below shows switch settings for IrDA communications and Auto Power Off enabled.

Example: SW1 Shown in On position
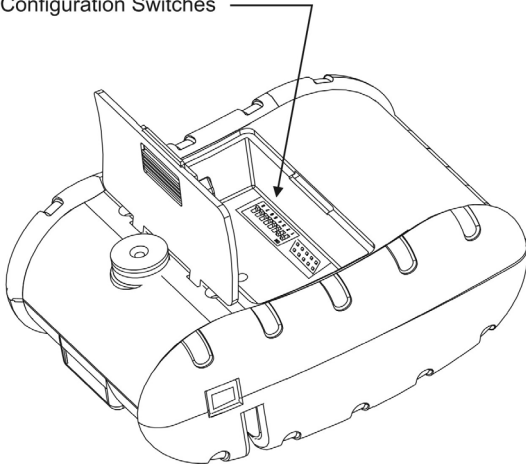
Configuration Switch Location

Switch Position(s)		Function
SW1		**Communication Interface**
Off		RS232/Bluetooth Enabled
On		IrDA Enabled
SW2	**SW3**	**Baud Rate**
Off	Off	38,400
Off	On	19,200
On	Off	9,600
On	On	2,400
SW4	**SW5**	**Parity bit**
Off	Off	No Parity
On	Off	Odd Parity
On	On	Even Parity
SW6		**Hardware Reset**
On		Enable Reset
Off		Disable Reset (Default)
SW7		**Reserved**
SW8		**Printer Power Control**
On		Continuous Power On Enabled
Off		Auto Power Off Enabled

**Mt3 Switch Assignments**

Mt3-II Series

Communication and other settings may be changed via the switches located inside the printer. The following chart explains the various conditions obtained through the various configuration switch settings. For more information, please refer to the *Mt3-II Series Operator's Manual*

Configuration Switch Location

The diagram below shows switch settings for Bluetooth or Wi-Fi communications.
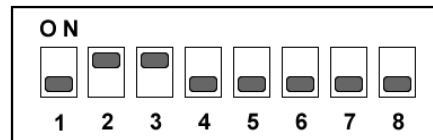
Switches 2 & 3 Shown In ON Position

Switch Position(s)		Function
SW1		**IrDA Interface**
OFF		Disabled
ON		Enabled
SW2		**RS-232C Interface**
OFF		Enabled
ON		Disabled
SW3		**Bluetooth/Wi-Fi Interface**
OFF		Disabled
ON		Enabled
SW4	**SW5**	**Baud Rate**
OFF	OFF	38,400
OFF	ON	19,200
ON	OFF	9,600
ON	ON	2,400
SW6	**SW7**	**Parity**
OFF	X	No Parity
ON	OFF	Even Parity
ON	ON	Odd Parity
SW8		**Reserved**

Mt3-II Switch Assignments

Command Quick Reference

ASCII Control Characters:

Character	Hex/Dec	CONTROL ACTION
EOT	04 / 04	End Of Text
BS	08 / 08	Back Space
HT	09 / 09	Horizontal Tab
LF	0A / 10	Line Feed
VT	0B / 11	Vertical Tab
FF	0C / 12	Form Feed
CR	0D / 13	Carriage Return
SO	0E / 14	Shift Out
SI	0F / 15	Shift In
XON	11 / 17	Transmitter On.
AUXON	12 / 18	Printer on.
XOFF	13 / 19	Printer receiver is off
NORM	14 / 20	Return to default 42 column mode
AUXOFF	15 / 21	Printer to Host: printer is off
CANCEL	18 / 24	Cancel and reset printer BUFFER
ESC	1B / 27	Escape
EXTEND	1C / 28	Extended print
EXTEND OFF	1D / 29	Extended print off/Normal print

Printer Font Commands – Courier Character Set:

Font Name	Character size (WxH)	Command String
24 CPI normal	8x21	ESC k 5
21 CPI normal	9x21	ESC k 4
19 CPI normal	10x21	ESC k 3
16 CPI normal	12x21	ESC k 2
12 CPI normal	16x21	ESC k 1
13 CPI rotated	14x16	ESC k 0
MSP Font 10-32 CPI	Dot Matrix Fonts	ESC F 3 through 8

Printer Font Commands:

Command String	Printer Action
ESC F 1	Selects "International" character set
ESC F 2	Selects "PC Line Draw" character set
ESC U 1	Enable emphasized print
ESC U 0	Disable emphasized print

Printer Graphic Commands:

Printer Command String	Printer Action
ESC A *n*	Select dot line spacing between printed lines.
ESC J *n*	Graphic Line Feed command
ESC P #	Select Online mode, characters printed as received
ESC P $	Select Buffer mode, characters are printed on (^D)
ESC V *n1 n2 data*	8-bit Graphic command
ESC v *n1 n2 data*	8-bit Compressed Graphic Command

Magnetic Card Reader Control Commands

Command String	Printer Action
ESC M *nn track* CR	Enable MCR with *nn* auto timeout to read *track* track(s)
ESC C	Cancel MCR read process

Graphic Logo and Bar code commands:

Command String	Printer Action
ESC L G *n*	Prepare printer to load image
ESC G 0x0FF	Loading Logo Complete
ESC L g *n*	Print stored logo image
ESC z *n1 n2* L *data*	Print Bar Code without visible text
ESC Z *n1 n2* L *data*	Print Bar Code with visible text
ESC Q J *n*	Reverse Dot Feed
ESC Q Q *n*	Set Out of Paper Sensitivity
ESC Q F *m*	Set Forward Black Mark Seek
ESC Q B *m*	Reverse Black Mark Seek

Printer Supervisory and Control Commands

Command String	Printer Action
^V	Buffer, power timer & battery status
^B	Buffer status
ESC P ^	Print Battery Voltage
ESC P *alpha*	Time and date print and control
ESC M 0 0 0 CR	Disable the power down timer
ESC M *n n* 0 CR	Sets the power down timer to *nn* seconds
ESC M C	Reset Auto power down to 20 seconds
ESC P (	Firmware version query
ESC P)	Hardware model query

Resident Character Sets:

ASCII Character Set

International Character Set

PC Line Draw Character Set

Glossary of Terms

802.11	Wireless networking communication standards created by IEEE.
access point	An interface between a wireless network and a wired network.
Ad-Hoc	A Wi-Fi network consisting of only stations (no access point). Same as Peer-to-Peer.
ASCII	American Standard Code for Information Interchange.
authentication	The process a Wi-Fi station uses to identify itself to another station.
bandwidth	The amount of data that be transferred in a given period of time.
baud rate	The rate at which characters are transmitted over a serial interface. This is also often referred to as bits per second.
binary	Base two numbering system. Digits are represented by the characters 0 and 1.
bit	A single binary digit.
Bluetooth®	A definition for short range radio frequency communications.
client	Any node on a network that requests services from another node (server).
control code	A single, non-printing character which is used to control the configuration or operation of the printer.
character pitch	The horizontal spacing of characters. Measured in cpi.
cpi	Characters per inch.
current line	The line upon which the next character will be printed.
current print position	The column on the current line where the next character will be printed.
default	Value or configuration assumed when the printer is powered on or reset.
DHCP	Dynamic Host Configuration Protocol. A method used to centrally control the assignment of IP addresses on a network.
dpi	Dots per inch. Generally used to refer to graphics density or resolution.
escape sequence	String of characters beginning with the escape (ESC) character which is used to control the configuration or operation of the printer. The characters which are part of this string are not printed.
font	A group of characters of a given shape or style.
hexadecimal	Base sixteen numbering system. Digits are represented by the characters 0 through 9 and a through f.
IEEE	Institute of Electrical and Electronic Engineers
infrastructure	A Wi-Fi network consisting of stations connecting to a wired network or other stations via an access point.
interface	The connection between the printer and the host computer.

Glossary of Terms

IP	Internet Protocol. A specification for packets, or datagrams, of data and an addressing method to allow the exchange of data with another system. Must be combined with another protocol such as TCP to create a complete connection with the other system.
LAN	Local Area Network.
LED	Light emitting diode.
line pitch	The vertical spacing of rows of characters. Measured in lpi.
lpi	Lines per inch.
margin	An area along any edge of a form where data may not be printed.
MSB	Most significant bit. In a character, this refers to bit seven (of 0 to 7).
node	Any device connected to a network.
parity	A method used for detecting errors within a single character transmitted or received via an interface.
Peer-to-Peer	A network consisting of only stations (no access point or central server). Same as Ad-Hoc.
reset	Initialization of various operating parameters of the printer to the value or state assumed when the printer is powered on.
RS-232C	An EIA standard for serial data transmission.
server	Any node on a network that provides services to another node (client).
SSID	Service Set IDentifier. An identifier attached to packets on a Wi-Fi network that identify the particular network the packets are intended for.
TCP	Transmission Control Protocol. A specification that controls the connection between systems on a network.
WAN	Wide Area Network. Refers to connections that allow one LAN to communicate with another LAN(s).
WEP	Wired Equivalent Privacy. A security protocol for wireless LANs designed to provide data security similar a wired LAN.
Wi-Fi®	Refers to any of the IEEE 802.11 standards.
WLAN	Wireless Local Area Network. A LAN made up of wireless nodes.