EXTECH INSTRUMENTS

3750T PORTABLE THERMAL PRINTER

3750THS Developers Manual

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3750T Developers Manual - Table of Contents

1.0 Extech 3750T Printer Character Set

Character Sets can be grouped into 3 categories – Control Characters, ACII Print Characters and Extended Print Characters.

- ***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 User Selectable "PC Line Draw" character set.
  - **ONLY ONE** of the ***Extended Character Sets*** may be selected per print line

1.1 Control Characters

The following set of characters are reserved, for 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	0x04 / 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	0x08 / 08	Back Space ***Remove previous character in print buffer.***
HT	^I	0x09 / 09	Horizontal Tab ***Tab to 5,9,13,17,21,25,29,33,37 or to the beginning of next line.***
LF	^J	0x0A / 10	Line Feed ***Advance to beginning of next line.***
VT	^K	0x0B / 11	Vertical Tab ***Advance 5 lines.***
FF	^L	0x0C / 12	Form Feed ***Advance 10 lines.***
CR	^M	0x0D / 13	Carriage Return ***Advance to beginning of next line.***
SO	^N	0x0E / 14	Shift Out ***Printer defaults to 36 column mode***
SI	^O	0x0F / 15	Shift In ***Printer defaults to 57-column mode.***
XON	^Q	0x11 / 17	Transmitter On ***Printer to Host: Ready to receive data.*** ***Host to printer: The host is ready to receive data.***
AUXON	^R	0x12 / 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	0x13 / 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	0x14 / 20	***Return to default to 57 column mode***
AUXOFF	^U	0x15 / 21	Printer to Host: printer is off ***Transmitted to host before power down or paper out.***
CANCEL (OPTIONAL)	^X	0x18 / 24	Cancel and reset printer ***Print buffer is reset and printer placed in initial power-up default settings. Terminate by pressing ON/OFF switch twice.***
ESC	^[	0x1B / 27	Escape ***Escape character precedes graphics and printer operating modes. Refer to escape command section.***
EXTEND	^\	0x1C / 28	Extended print ***All characters following this command are printed double high.***
EXTEND OFF	^]	0x1D / 29	Extended print off/Normal print ***All characters following this command are printed normal height.***

Table 1.0 - Control Characters

1.2 Printable Character Sets

The printer has two resident character sets – namely Courier International and Courier PC Line Draw. Two commands are defined to select these character sets.

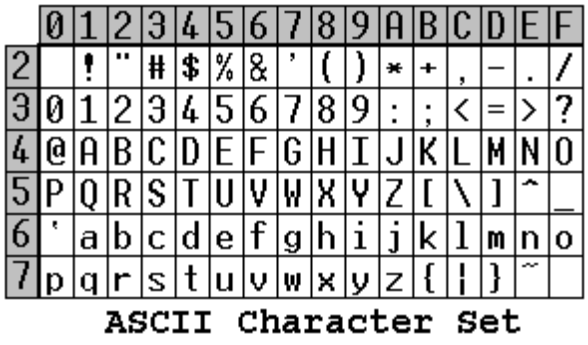
Command String	*Selected Character Set*
Esc – 'F' –' 1'	*Courier International Character Set*
Esc – 'F' –' 2'	*Courier PC Line- Draw Character Set*

Table 1.1 - Printable Character Sets

Note: Printer default Character Set is set to Courier International Character Set

1.2.1 ASCII and Extended International Character Set { 0x80..0xFF}

ESC-'F'-'1' command string selects the ***International*** character set. Printer defaults on this character set on power up.



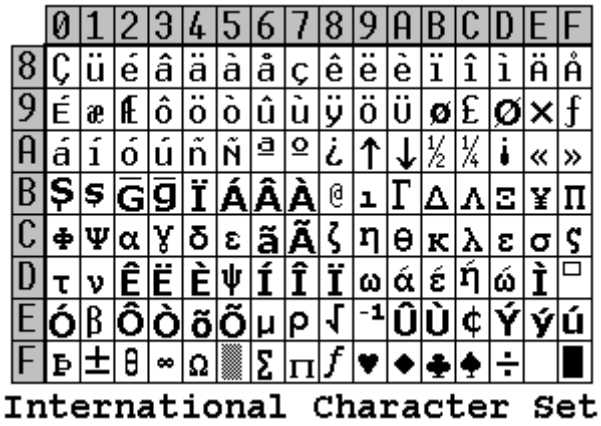


Figure 1.0 International Character Set

1.2.2 ASCII and Extended PC Line Draw Character Set{0x80..0xFF}

ESC-'F'-'2' command string selects ***PC Line-draw*** character set.

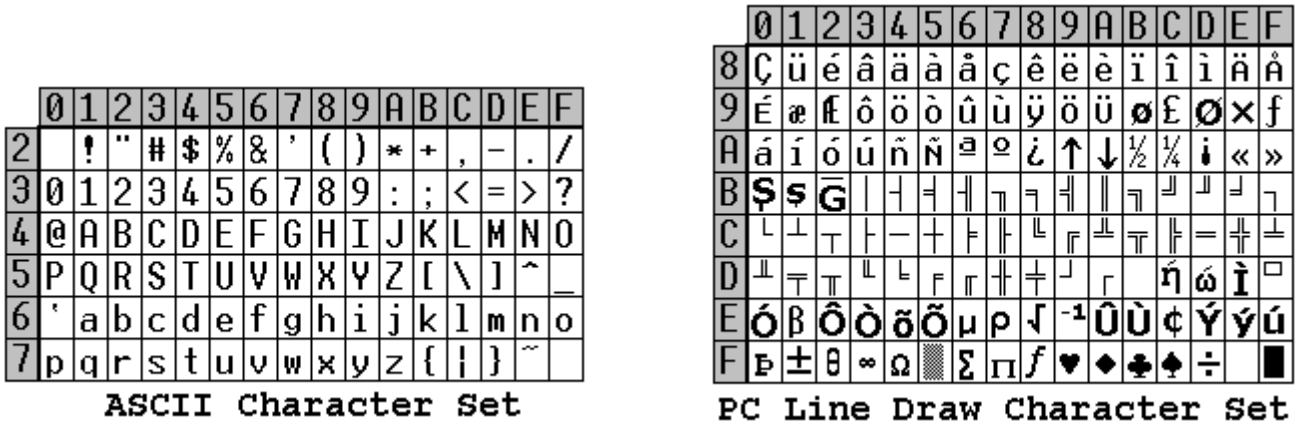


Figure 1.2 – PC Line Draw Character Set

2.0 Extech 3750T Printer Font Control

Four commands are defined with the Extech 3750T printer which allow the user to select different typefaces, change the character height, width as well as add emphasis to the printed text if desired. The following sections explain in detail how to modify each of the features listed in this paragraph.

2.1 Printer Font Commands to select different character width

Listed below are the fonts installed and the three character command string to select them.

FONT NAME	PITCH	COLUMNS PER LINE	CHARACTER SIZE (WxH)	SOFTWARE COMMAND
Courier Mode 5	24 CPI normal	72	8x23	ESC+'k'+'5'
Courier Mode 4	21 CPI normal	64	9x23	ESC+'k'+'4'
Courier Mode 3	19 CPI normal	57	10x23	ESC+'k'+'3'
Courier Mode 2	16 CPI normal	48	12x23	ESC+'k'+'2'
Courier Mode 1	12 CPI normal	36	16x23	ESC+'k'+'1'
Courier Mode 0	13 CPI ***rotated***	***24 (rows per line)***	*14x16*	*ESC+'k'+'0'*
MSP Font Mode 4		*36*		ESC+'F'+'4'
MSP Font Mode 5		*48*		ESC+'F'+'5'
MSP Font Mode 6		*57*		ESC+'F'+'6'
MSP Font Mode 7		*64*		ESC+'F'+'7'
MSP Font Mode 8		*72*		ESC+'F'+'8'
MSP Font Mode 9		*96*		ESC+'F'+'9'

Table 2.0 – Installed Fonts

Note: Default printer settings are set to 16 CPI 48 columns per line.

2.2 Character Height Control Commands

A single byte control command is defined to control the printed character height. Normal height of a character is 23 . EXTEND control character (^ \)selects a double height which is equal to 46 . EXTEND OFF control character (^])selects a normal height. The command is applied to all the characters on a line following the control character.

Character	*Control*	*Hex/Dec*	*Control Action*
EXTEND	^\	0x1C/28	Extended Print ***All characters following this command are printed double high***.
EXTEND OFF	^]	0x1D/29	Extended Print Off/Normal Print ***All characters following this command are printed normal height***.

Table 2.1 – Height Control Commands

Note: Default printer settings are set to Normal Print.

2.3 Character Bold/Emphasized Print Control Commands

A line of text using a resident font may be emphasized with the three character commands from the table below.

Command String	*Action Taken*
Esc – 'U' – '1'	Enable emphasized print starting with the current text line
Esc – 'U' – '0'	Disable emphasized print starting with the current text line.

Table 2.2 – Character Emphasis Print Control

Note: Default Printer Settings are set to Esc – U - 0

2.4 Line Spacing Commands

To set the line spacing between successive printed text lines and the number of line feeds desired at the beginning of a line , use the three character commands from the table below. It is important to mention that while printing PC Line-Draw characters , the line spacing must be set to zero, thus allowing graphic characters on successive lines to be connected.

Command String	*Command Description*
Esc – 'a' - n	Where n is the number of graphic-line-spacing, in increments of 0.125 mm. n = { 0..10}
Esc – 'J'-n	Where n is the number of desired 0.125mm graphic line feeds n = {0..255}.

Table 2.3 – Character Line Spacing

Note: Printer default setting is 3-dot line spacing after each printed text line. Please note that when a character has the '' around it , this means that it has to be types exactly as shown. On the other hand characters that don't have the '' around it like the "n" in the example above have to be entered while the Alt key on the keyboard is being held.

2.5 Underline Command (Available on version 118v140U)

The following section describes the function of the underline feature for the S3750THS printer. This feature is available on per character basis and can be applied to a single character.

Command Name	Command Description	Action Taken
Esc F w	Selects Underline Mode	All characters following this command will be underlined until the Esc F h command or until the end of the current line.
Esc F h	Deselects Underline Mode	All characters following this command will NOT be underlined until an Esc F w command is received.

Examples:

The table below demonstrates examples of the underline command usage.

Command String	Generated Output
Esc -'F'- 'w' – '12345' Esc - 'F' – 'h' 12345	1234512345
Esc - 'F' - 'w' – '1234567'- CR- '12345'	1234567 12345

Note:

Please note that the **''** and the **–** characters are not part of the command string.

3.0 8-Bit Dot Addressable Graphic Commands

The Extech 3750T printer uses a single line thermal head, which has 576 heating elements pitched at 0.125 mm. The total print width is 48 mm. The 8-bit graphic commands enable control of each one of the 576 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 a packet of 72 bytes for each graphic line. The printer prints the graphic line and advances to the next line automatically.

3.1 8- Bit Dot addressable Graphic Commands

The following table displays the 8-bit dot addressable graphic commands and the printer actions. It also illustrates the Commands with an example. Please note that characters <> ‘’ and ‘-‘ are not part of the command string.

Command String	*Printer Action*
Esc-’V’-n1-n2	8-bit Graphic mode is selected.<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 are from 0x00 to 0xFF Hex using bits 0-7.
Esc-’J’-n	Performs <n*0.125mm> feed.
Esc-V-0x01-0x00	’72 bytes of data’ This code prints a single line of graphic.

Table 3.0 – 8-bit Dot addressable Graphic Commands

3.2 8-Bit Compressed Graphic Commands

The 2 tables below describe the command used to print compressed graphics as well as explain in detail each of the components of the command string.

Command String	*Printer Action*
Esc-’v’-height-width-counter-data-counter-data….	Prints a compressed graphic with the specified attributes.

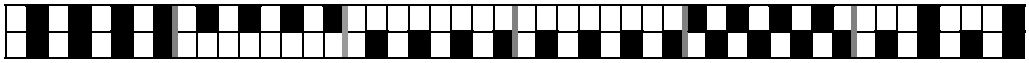
Table 3.1 – 8-bit Compressed Graphic Commands

Graphic String Component		*Function of the component*
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	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

Table 3.2 - Components of the compressed graphics command string

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	0x1B	0x76	0x02	0x06	0xFF	0x55	0xFF	0x00	0x03	0xAA	0x11	0x55	0x00	0xFD	0x55

3.3 A quick Review of Graphic Logo Commands

Graphic Images can be stored in the form of a logo. This allows the printer to store them in memory locations and print them as needed. The Extech 3750T printer currently supports 8 logos. Single Byte Command is used to select a specific logo location. In the commands below 'n' can be any number from 0 – 7. For more detailed description of the Graphic Logo Commands please refer to the Flash Logo Commands section in this document.

Command	***Command Description***	***Printer Response***
Esc – 'D'-'L'-n	Select Flash Logo Mode	?
Esc – 'L'-'G'-n	Load/Record Graphic Logo	none
Esc- 'L'-'G'-<0xFF>	Stop Loading Graphic Logo	D!X
Esc-'L'-'g'-n	Print Graphic Logo	Printer Prints Logo n

Table 3.3 – Graphic Logo Commands

4.0 Bar Codes

The Extech 3750T printer supports several bar code symbologies. Two commands are defined for printing bar codes.

Bar Code Command Formats	***Printer Action***	***Command String Components***
Esc- 'z'-n1-n2-L-[data]	Prints Bar code only	n 1 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
Esc- 'Z'-n1-n2-L-[data]	Prints Bar code and ASCII visible	

Table 4.0 – Bar Code Command Formats

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

4.1 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).

Command String	*Printer Output*
Esc-'Z'-'1'-0x07- 0x0a-'CODE-39'	Prints CODE -39, 1mm high

Table 4.1 – CODE 39 Example

4.2 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 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)

Table 4.2 – Code 128 Start Character

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

Table 4.3 – Code 128 Data Bytes

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

Notice: 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).

Code 128 EXAMPLES:

Print 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

#27	#90	#50	#04	#100	#136	#65	#50	#97
0x1B	0x5A	0x32	0x04	0x64	0x88	0x41	0x32	0x60
ESC	‘Z’	‘2’	0x04	‘d’	0x88	‘A’	‘2’	‘a’

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) = #137

#27	#122	#50	#05	#40	#137	#49	#50	#51	#52
0x1B	0x7A	0x32	0x05	0x28	0x89	0x31	0x32	0x33	0x34
ESC	‘z’	‘2’	0x05	‘(’	0x89	‘1’	‘2’	‘3’	‘4’

4.2.1 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

EAN 128 EXAMPLES:

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

#27	#90	#50	#06	#40	#137	#134	#49	#50	#51	#52
0x1B	0x5A	0x32	0x06	0x28	0x89	0x86	0x31	0x32	0x33	0x34
ESC	'Z'	'2'	0x06	'('	0x89	FNC1	'1'	'2'	'3'	'4'

4.3 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:

Command String	*Printer Output*
Esc- 'Z'-'3'- 0x0A – 0x50 – '1234567890'	Prints interleaved 2 of 5 " 12345678" , 10 mm high

Table 4.4 – Interleaved 2 of 5 - Example

4.4 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).

Examples:

Command String	***Printer Output***
Esc – 'Z'- '4' – 0x0C-0xB8 - '123456789'	Prints UPC- A "123456789", 23 mm high
Esc – 'Z'-'4'-0x07-0xB8 – '0783491'	Prints UPC-E "0783491", 23 mm high
Esc-'Z'-'4'-0x08-0xC8-'65432109'	Prints EAN/JAN-8 "65432109", 25 mm high
Esc-'Z'-'4'-0x0D-0xA0 – '6543216543219'	Prints EAN/JAN – 13 "6543216543219", 20 mm high

Table 4.5 - UPC/EAN/JAN Examples

Note: in all the examples where '9' is the last digit to be sent the received check digit '9' is ignored and recalculated in the printer. Also all heights are total height, including a 1.23mm drop bar pattern printed after the bar code pattern.

4.5 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.

Examples:

Command String	**Printer Output**
Esc-‘Z’- ‘5’-0x0A-0x78-‘A123456T’	Prints Codabar “123456” , 15 mm high using the A start character
Esc-‘Z’-‘5’-0x06-0x50-‘C2468*’	Prints Codabar “2468” , 10 mm high using the C start character

Table 4.6 – Codabar examples

5.0 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.

5.1 Print Contrast Control Command

Print Contrast Control Command String	*Description of String Components*
Esc-‘P’-‘n’	n= ASCII ‘0’ through ‘9’ { 0x30..0x39} ‘0’ Highest contrast and lowest print speed ‘9’ Lowest contrast and highest print speed

Table 5.0 – Print Contrast Control Command

Note: Default setting is Esc-‘P’ – ‘5’

5.2 Printer Peak-Power Control Command

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’-0x01	Heat < 64 elements at a time	Less than 1.0 Amp
2- Medium	Esc-‘P’-0x02	Heat <128 elements at a time	Less than 2.0 Amps
3- High	Esc-‘P’-0x03	Heat < 192 elements at a time	Less than 3.0 Amps
4- Very High	Esc-‘P’-0x06	Heat < 576 elements at a time	Less than 9.0 Amps
5- Auto Control	Esc-‘P’- 0x07	64,128,192, or 576 at a time	1.5 to 3.0 Amps

Table 5.1 – Printer Peak Power Control Command

The printer default is **Auto Control Mode**. While in auto-peak-power mode, 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

5.3 Printer Battery Voltage Monitor Commands

The battery voltage level may be printed or polled by the host device application using the **ESC – 'P' -** '^' or <**CTRL V**> command strings, respectively.

Command String	*Printer Response*
Esc – 'P'- '^'	Prints Battery Voltage
CTRL V	Transmit Battery Voltage

Table 5.2 – Printer Battery Voltage Monitor Commands

5.4 Auto Power Down Command

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.

Command String	*Printer Response*
Esc-'M'-'n1' – 'n2' – '0'-'CR'	Sets the printer Auto power down timer (.n1 and n2 may be '0' to '9')
Esc – 'C'	Resets The Auto Power down to 20 seconds

Table 5.3 - Auto power down commands

Auto Power Down Command Examples:

Command String	*Printer Response*
Esc – 'M' – '0'- '0'- '0' – 'CR'	Disable the power out timer
Esc – 'M'- '9' – '9' – '0' – 'CR'	Set the timer to 99 seconds

Table 5.4 – Auto Power Down Command Examples

5.5 Printer Operating Mode Commands

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(^D).

Command String	*Selected Mode*
Esc-'P'-'#'	Selects Online Mode
Esc-'P'-'$'	Selects Buffer Mode

Table 5.5 – Printer Operating Mode Commands

5.6 Supervisory commands

Single byte supervisory commands are designed to provide the user of the printer with the current battery and print buffer status. The single byte supervisory commands and serial RS232 response strings are summarized below.

Note: <4 ASCII hex digits> are read as hex nibbles ORed with 0x30.

Printer Command	*Command String*	*Printer Response*	
Print Status Request	<CTRL B>	Print Buffer Status	<Esc><'B'> <4 ASCII hex digits> <CR><LF>
		Magnetic Card Reader Status	<Esc> <'M'> <4 ASCII hex digits> <CR><LF>
Battery Status Request	<CTRL V>	Print Buffer Status	<Esc><'B'> <4 ASCII hex digits> <CR><LF>
		Battery Voltage Status	<Esc><'V'> <4 ASCII dec digits> <CR><LF>
		Magnetic Card Reader Status	<Esc><'M'> <4 ASCII hex digits> <CR><LF>
Firmware Version Query	<ESC><'P'><'('>	Firmware Version	<Esc> <'('> <4 ASCII characters><CR><LF>
		Example v1.00	<Esc ><'('> <'1' '0' '0' '' > <CR><LF>
Hardware Model Query	<ESC><'P'><')'>	Hardware Version	<ESC><')'> <4 ASCII characters> <CR><LF>
Disable EOT response	<ESC><'P'><'+'>	Disable Buffer Empty response	NONE-EOT (^D) is not transmitted
Enable EOT response	<ESC><'P'><'-'>	Enable Buffer Empty response (printer ready for more data)	EOT (^D) transmitted on buffer empty
EOT	^D/0x04	Buffer Empty Response	Transmitted if printer buffer empty and the printer is ready for more data.

Table 5.6 – Supervisory Commands

6.0 Label and Form Printing With Black Mark Option

The Extech 3750T thermal printer can print on label and preprinted form stocks, with black mark located on the right side of the paper stock. The printer paper out sensor is used to sense the black mark position.

6.1 Black Mark Operation

Follow these steps to use the black mark option.

- 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 label or form stock. The default power on value of ***<n>*** is 40d (0x28).
- Issue **<ESC> <'Q'> <'F'> <*m*>** or **<ESC> <'Q'> <'B'> <*m*>** printer Command to find the black mark. The command position's the label or the form for printing.
- Wait for **<ESC> <'Q'> <0x3F> <0x3F>** <***n1***> <***n2***> black mark found response from the printer.
- Send the data to be printed.

6.2 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.
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'> <0x3F> <0x3F> <*n1*> <*n2*>**	***n1*** and ***n2*** are the high and the low nibble, respectively, describing how many (0.25mm) dot lines were required to find black mark.
Printer Black Mark Response: **Paper Not Found**	**<ESC> <'Q'> <0x30> <0x30> <*n1*> <*n2*>**	***n1*** and ***n2*** are the high and the low nibble, respectively, describing how many (0.25mm) 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*** The total number of 0.125mm dot lines processed, while seeking the black mark.

n1 holds the high four bits (0x30 + 4 high bits).

n2 holds the low four bits (0x30 + 4 low bits).

n1 and ***n2*** can have values 0x30 through 0x3f.

Table 6.0 – Black Mark Printer Cmmands

Appendix A

A.1 Flash Font Download for model 2500THS/1500T and S3750 THS

The major difference between the table organization in the 3500T/THS and the 2500/1500 and 3750 is that in the 3500 there are banks and tables while in the second group of printers there are no tables – only banks. Another difference is that the ASCII and extended tables for each font are place right one after another and that is why it does not matter if you send Esc D A or ESC D X in the beginning. As long as you specify the correct location the desired character or font will get downloaded in the right spot. Both the ASCII and the Extended characters for each font are in this big table so to say. You only need to specify the bank number (0..7) – no table number is needed. You still have to send a number for the table just so the command is consistent all through the models – the number however is disregarded.

To protect the installed fonts from accidental corruption, the Flash Font commands described in Table 7.4 are required to be the first commands received by the printer when it is powered on.

Command	2500THS/1500T and 3750 THS
<ESC> <'D'> <'A'> <n> Or <ESC ><'D'><'X'> <n> Where n (0..7)	**Select flash font Download mode**
<ESC> <'D'> <n1> <n2> <data>	**Upload an ASCII character.** **n1**: **TABLE** to save the character in. This is still kept for compliance with the old command but the table number is disregarded by the printer. **n2**: Character code (Shows the beginning position to download in the table) {0x21 .. 0x7F} {CHR$(33) .. CHR$(127)}
<ESC> <'D'> <0xFF>	**Save the font uploaded and terminate font upload process,**

Table A.1 - ***Flash Font Upload commands***

A.2 Flash Font Tables for Models 2500THS/1500T and S3750THS

Flash fonts are stored in 7 banks. Each bank holds one complete table (The table holds both ASCII and extended characters) . Thus for example Courier Font 1 & 2 International is in bank 0, Courier 3 International is in Bank 1, Courier 1 & 2 Line Draw is in Bank 4 (notice that the empty banks do not count)., etc.

8000:	Courier 1 & 2 12 x 23 International (10304 bytes) **A840h**	ROTATED 14 x 23 International (23 x 2 x 224 = 10304B) **A840h**	Courier 1 & 2 12 x 23 Line Draw (10304 bytes) **A840h**	ROTATED 14 x 23 Line Draw (10304 bytes) **A840h**
AAAA:	Courier 3 10 x 23 International (10304 bytes) **D2EAh**		Courier 3 10 x 23 Line Draw (10304 bytes) **D2EAh**	
D554:	Courier 4 & 5 8 x 23 International (10304 bytes) **FD94h**		Courier 4 & 5 8 x 23 Line Draw (10304 bytes) **FD94h**	
	PG3=0 PG2=0 !PSEN & RD **FS0**	PG3=0 PG2=1 !PSEN & RD **FS1**	PG3=1 PG2=0 !PSEN & RD **FS2**	PG3=1 PG2=1 !PSEN & RD **FS3**

Flash Font Print Commands for models 2500THS , 3500T and 3750THS

The table below describes the commands needed to print with a certain font. Please note that character '-' is not part of the string. The default Printer setting is Courier International 21CPI (decimal code 27 107 4). These commands are valid for 1500/2500, 3500T, 3750 and 4500THS.

Font Type Command String	*Font Name*	*Font Print Command*	*File Name of File to restore Factory Font*
International (Esc – F1)	Courier International 12 CPI & 16 CPI	Esc-k-1 Prints 12 CPI Esc–k-2 Prints 16 CPI	EX-GRP-12.DWN
	Courier International 19 CPI	Esc – k – 3 Prints 19 CPI	EX-GRP-10.DWN
	Courier International 21 CPI & 24 CPI	Esc-k-4 Prints 21 CPI Esc-k-5 Prints 24 CPI	EX-GRP-08.DWN

	Rotated Courier International	Esc-k-0	
Graphic (Esc –F2)	Courier Graphic 12 CPI & 16 CPI	Esc-k-1 Prints 12 CPI Esc-k–2 Prints 16 CPI	EX-INT-12.DWN
	Courier Graphic 19 CPI	Esc–k–3Prints 19 CPI	EX-INT-10.DWN
	Courier Graphic 21 CPI & 24 CPI	Esc–k–4 Prints21 CPI Esc–k–5 Prints24 CPI	EX-INT-08.DWN
	Rotated Courier Graphic	Esc-k-0	

Table A.2 - Flash Font Print Commands

A.1.3 Default International and PC Line Graphic Font (08w x 23h)

International Font - 08w x 23h
Command string to Select:
esc-<F1>
esc-<k4> or esc-<k5>
File Name: TB-A-08.DW2 + TBXn0823.DW1

PC Line Graphic - 08w x 23h
Command string to Select:
esc-<F2>
esc-<k4> or esc-<k5>
File Name: TB-A-08.DW2 + TBXi0823.DW1

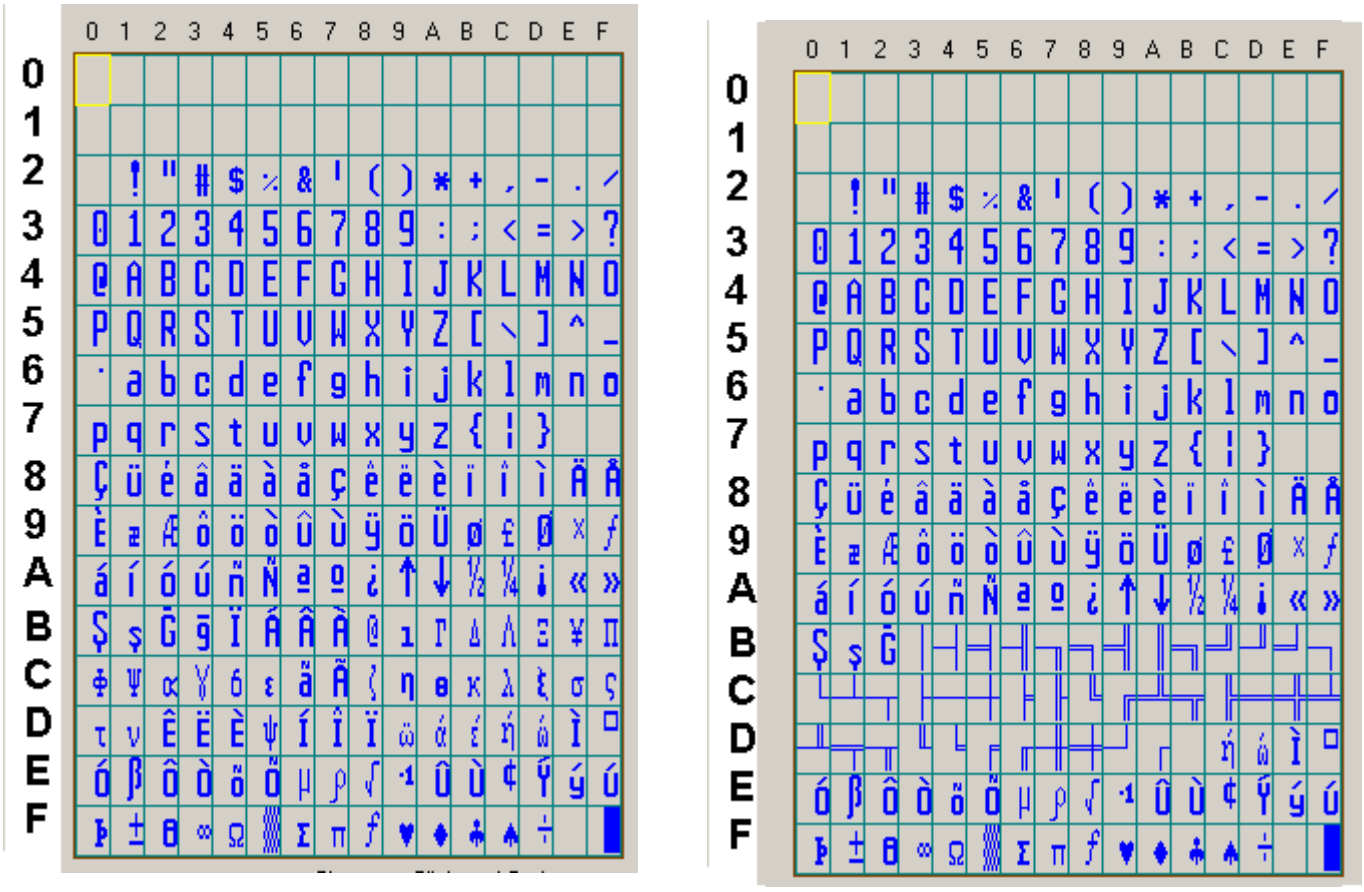
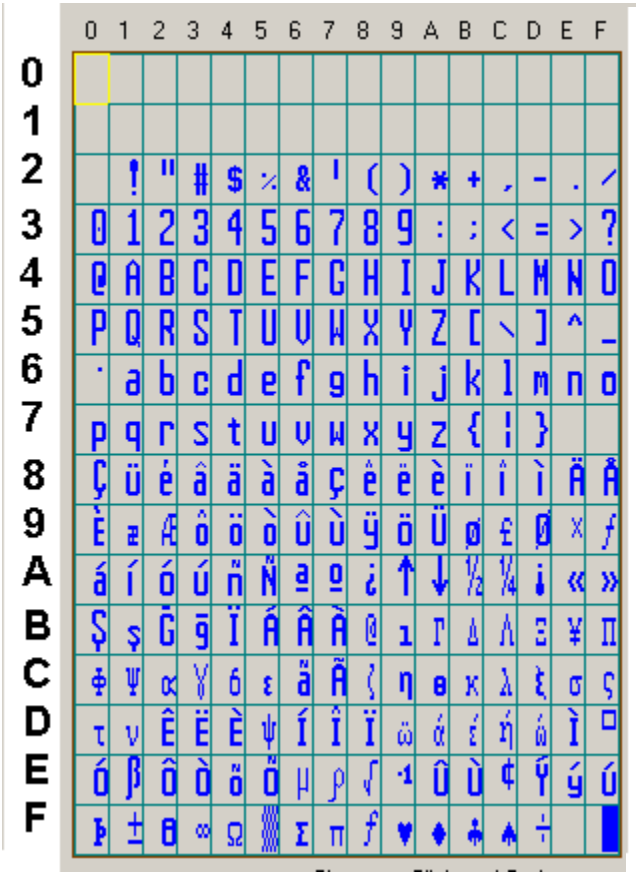


Table A.3 - Default International and PC Line Graphic Font (08x23h)

A.1.4 Default International and PC Line Graphic Font (10w x 23h)

International Font - 10w x 23h
Command string to Select:
esc-<F1>
esc-<k3>
File Name: TB-A-10.DW1 + TBXn1023.DW1



PC Line Graphic - 10w x 23h
Command string to Select:
esc-<F2>
esc-<k3>
File Name: TB-A-10.DW1 + TBXi0823.DW1

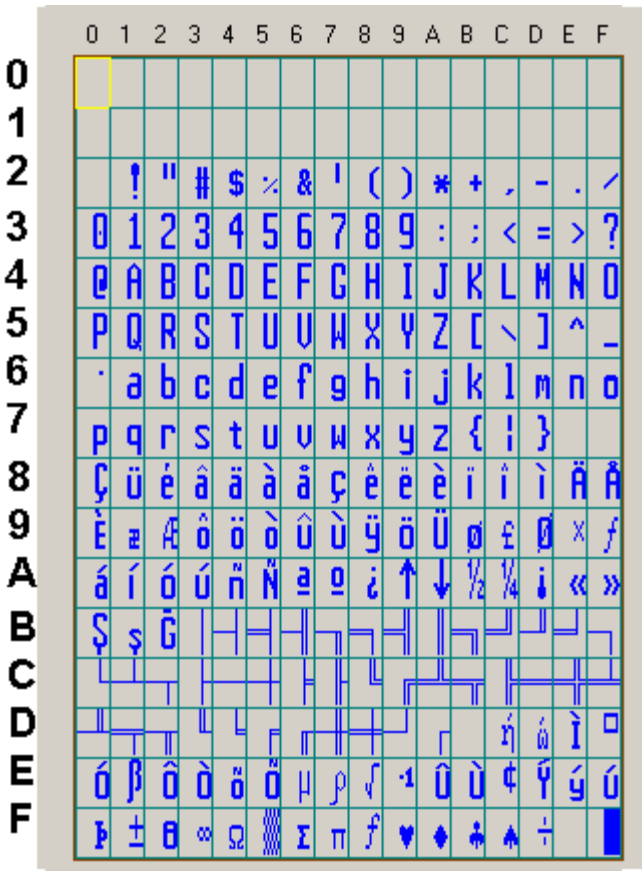


Table A.4 - Default International and PC Line Graphic Font (10x23h)

A.1.5 Default International and PC Line Graphic Font (12w x 23h)

International Font - 12w x 23h
Command string to Select:
esc-<F1>
esc-<k1> or esc-<k2>

PC Line Graphic - 12w x 23h
Command string to Select:
esc-<F2>
esc-<k1> or esc-<k2>

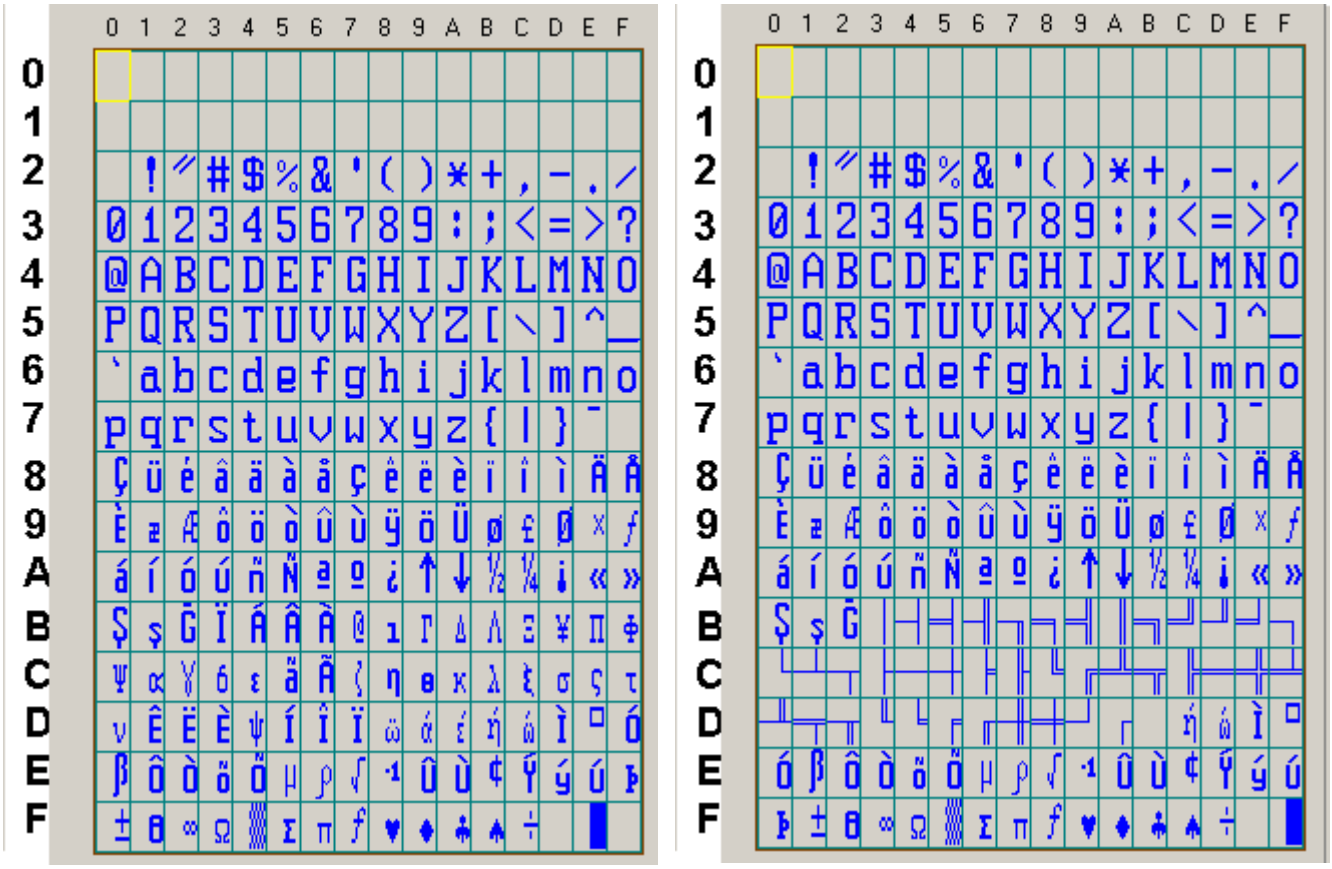


Table A.5 - Default International and PC Line Graphic Font (12x23h)

A.1.6 EXAMPLE:

In this example the character ‘A’ (character code 0x41) stored in ASCII TABLE ‘0” is replaced with user designed 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.

		‘LEFT BYTE’								‘RIGHT BYTE’							
Line	**Value (HEX)**	80	40	20	10	8	4	2	1	80	40	20	10	8	4	2	1
		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
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**			
13	**03 F8**							**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**																

Figure 7. 1 – User defined character ‘A’ drawn as 12Wx23H matrix.

STEP 2 – Enter flash font program mode:

Send **<ESC> <'D'> <'A'> <0>** to select ASCII flash font upload and wait for the printer to deactivate the CTS line. For the 2500 or the 3750 printers the last number can be anything between 0..7

STEP 3 – Wait for the printer ready indicators:

Wait for the printer to reactivated the CTS line and transmitted the character '?'

STEP 3 – Load new the character:

Upload the user defined ASCII 'A' character.

The basic command format and an actual command string are shown below:

<ESC> <'D'> <ASCII TABLE 0> <Character Code> <46 byte dot matrix data> //for the 3750 or 3750 the table # does not matter as long as you specified the bank number.

<ESC> <'D'> <0> <0x41> <0x00> <0x00>

<0x00> <0x40> <0x00> <0xE0> <0x00> <0xA0> <0x01> <0xB0> <0x01> <0x10> <0x01> <0x10> <0x01> <0x10>

<0x01> <0x10> <0x03> <0x18> <0x03> <0x18> <0x03> <0xF8>

<0x03> <0xF8> <0x02> <0x08> <0x02> <0x08> <0x06> <0x0C>

<0x06> <0x0C> <0x04> <0x04> <0x04> <0x04> <0x04> <0x04>

<0x0E> <0x0E> <0x0E> <0x0E> <0x00> <0x00>

STEP 5 – Save the modified character to flash:

Sending the command <ESC>-'D'- <0xFF> {CHR$(27) + 'D' + CHR$(255)}, copies the revised character to the printer flash location.
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**.

STEP 6 – Cycle the printer power:

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.

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.

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.

A.2.0 Graphic Logo Print Option

The following paragraphs summarize the operation of the *Graphic Logo* feature for the Extech S3750THS printer. The *Graphic Logo* feature enables the storage of formatted Bitmap file in nonvolatile memory. Up to eight memory sectors of up to 12,816 bytes each, are reserved to store *Graphic Logo* in the printer Upon receipt of a *Graphic Logo* print command, the *Graphic Logo* data is sent to the printer. The feature enables printing of a stored graphic image as part of a receipt.

Specification

Printer	*Number of Logos*	*Bytes per logo*	*Dot lines per logo*	*Dots per line*
3750	8 (FLASH) n =(0..7)	12,816	178	576

Graphic Logo Operation S3750THS

- On initial power-up, the Host application selects the *Flash Logo Mode* by sending the command String:
  <ESC - D – L -n>.
  Printer responds by sending ? character to the host application indicating that the *Flash Logo Mode* is enabled.

- The Host application selects the *Graphic Logo record mode* by sending the load command:
  <ESC - L - G - n>.

- Once printer is placed in record mode, the *Graphic Logo* is downloaded using 8-bit graphic command:
  <ESC> <V> <0x01> <0x00> <72 bytes of Graphic data>

- The *Graphic Logo record mode i*s terminated automatically after receiving 178 graphic lines, or upon receiving the Graphic *Logo record terminate* command string.
  ESC - L - G - < 0xff >

- Printer saves the received Logo data in flash and sends D!X characters to the host, indicating that logo data was saved. The printer power must be cycled to return to normal operating mode.

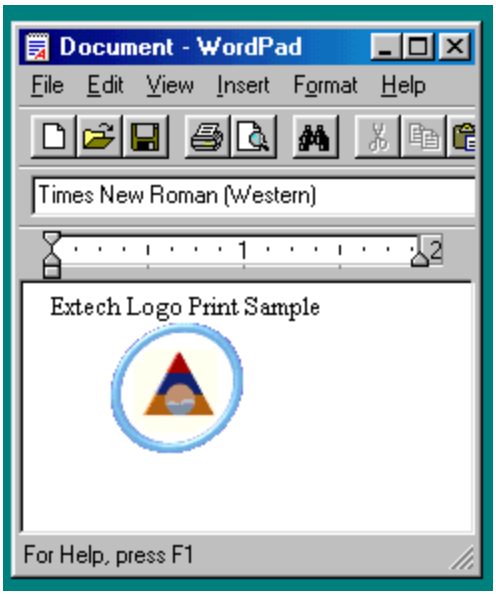
Command	Command Description	Printer Response
Esc – D-L-n	Select Flash Logo Mode	?
Esc – L-G-n	Load/Record Graphic Logo	none
Esc- L-G-<OxFF>	Stop Loading Graphic Logo	D!X
Esc-L-g-n	Print Graphic Logo	Printer Prints Logo n

Please note: The characters '-' , '<' or '>' are not part of the command string. Decimal code for Esc is (27).

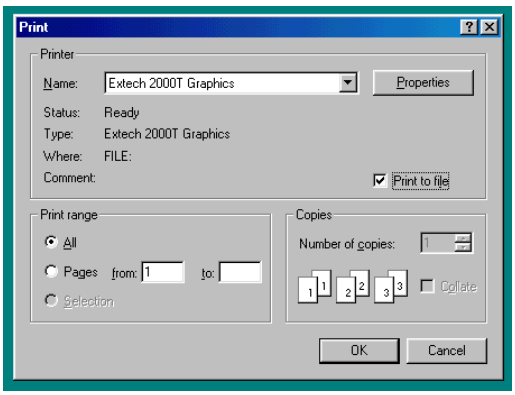
Generating Graphic Logos

To generate the graphic logo follow these steps:

- Install the Extech windows printer driver
- Use Wordpad or any Windows application to prepare your logo document
  From printer Setup of Wordpad application Set the paper margins to 0.12”.



- Print your logo document to a file, name it <LOGO.PRN>, using The Extech Windows driver.



Go to DOS Window and start the EDIT program.

Go to Start and then select RUN and in the RUN window type EDIT and press ENTER. The program will open.

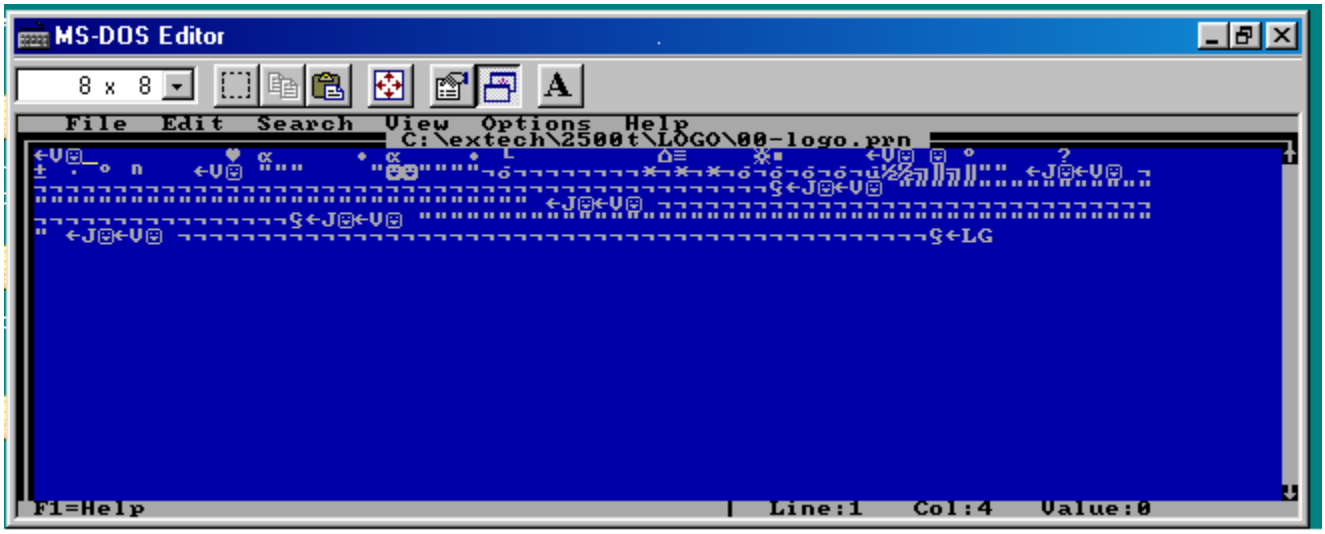
- Open <LOGO.PRN> file in BINARY mode.

  Press <Ctrl> <Home> to place cursor at the beginning of file.

  Delete everything in the beginning of the file up to but not including the arrow and the capital letter V next to it.

Move cursor to the end of the file, by pressing control End on your keyboard, There you will see 2 characters - a character which resembles a circle with a cross attached to it (the FF character) and the line feed character. Delete these two characters. Add the LOGO RECORD END command string by typing Esc LG 255. If you never worked with the EDIT program here is how you have to type it. Press CTRL key and the letter P . Then press the Esc key. Then type LG and then press the ALT key and type 255.

- Save the modified <logo.prn> file.



Uploading Graphic Logos

To copy the Logo file to the printer follow these steps:

- Use a serial communication program like Telix, Procomm or Windows HyperTerminal or Tera Term.
- Check that the application is set to the same baud rate and parity as the printer.
- Upload the LOGO.PRN file to the printer using a BINARY file transfer protocol. Follow these steps to upload a logo file. Please note that all commands have to be typed exactly as shown because the software is case sensitive.

  1) Cycle the power of the printer
  2) Type Esc- D-L-n (This shows the location where you want to download the logo 0..7)
  3) Wait until a question mark comes back from the printer
  4) Type Esc L-G-n (can be any number and does not affect the logo download location)
  5) Send the logo file which you have just created
  6) Wait for D!X response to come back from the printer. This indicates that file transmission and storage is completed.
  7) Cycle power
  8) To test the LOGO.prn file issue print commands : Esc – L – g – n

Appendix B

Three Track magnetic Card Reader Option

A three track **M**agnetic **C**ard **R**eader is available on the Extech 3750T model printers. The MC 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 transmit the information to the host computer or a terminal.
The MC reader 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 MC reader.
- Set the auto time-out software timer
- Report MCR Read errors
- Report MC reader status.

B1.0 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***		

Table B.0 – Card Specifications

B2.0 Magnetic Card Read command strings

Six Commands strings are provided, to read the magnetic cards. These commands are summarized in the tables below. The general syntax for commands are as follows:

Command String – General Syntax	<ESC><'M'><*n*>< *n*> Track #CR
Command String - Example	<ESC><'M'> '9' ' 9' 1 CR

Table B.1 – Magnetic Card Read Command Strings – general form

- The ESC-M command turns on the power to the MC Reader

- The next two bytes, ***<nn>*** are used to set the MC reader's timer. "01" through "99" are valid timer settings and "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.
- On timeout printer aborts the swipe process, transmits timeout error message and turns off the <READING> LED.
- A good magnetic card swipe automatically terminates the read process.

Magnetic Card Command String	***Description***
ESC – M - nn - 1 – CR (CR = Enter)	Read Track1 only
ESC – M - nn - 2 – CR	Read Track2 only
ESC – M - nn - 3 – CR	Read Track3 only
ESC – M - nn - 4 – CR	Read Track1 and Track2 simultaneously
ESC – M - nn - 5 – CR	Read Track2 and Track3 simultaneously
ESC – M - nn - 6 – CR	Read Tracks 1,2 and 3 simultaneously
ESC – C	Cancel MC Read process
nn = ASCII "01" through "99" seconds nn = "00" disables the MC reader timer	

Table B.2 – Magnetic Card Read Command Strings - Details

B.3.0 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 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

Table B.3 - ISO 7811 ASCII Format

B.4.0 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, English description of the error encountered and finally CR-LF terminating the <Error Message> string. The syntax is as follows:

Error Message (General Form)	<%><E>, nn , Error text in ASCII, <CR> <LF>

Table B.4 – Error Message – General Form

- Where *nn* is error number encountered.
  The printer may transmit Four (4) types of Read Error messages. The following messages terminated with CR-LF are returned by the firmware:

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

Table B.5 – Error Message – Specific Examples

B.5.0 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 ASCII serial command string* to enable the magnetic card reader (e.g. Esc-m004-cr). The printer turns on the GREEN <**READY**> LED.
- Once the operator swipes the magnetic card, the *printer transmits in ASCII format* the tracks information found on the magnetic card.
- A good read automatically turns off the MC reader and the <**READY>** LED.
- The **<READY>** LED illuminates RED if an error is encountered, while reading the magnetic card.
- Printer transmits timeout error message if the operator fails to swipe a card in the time period set by the host application.

Appendix C

Printer Configurations

The 3750T printers support Serial RS232 and IrDA compatible infrared communication interfaces. Blue Tooth communication is also available as an optional feature. Serial, IrDA 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.

S3750 DIP SWITCH SETTINGS

Dip Switch	Function	Switch #	Switch #	Switch #	Switch #	Notes
1, 2, 3, 6	**Communication Interface**	**SW 1**	**SW 2**	**SW 3**	**SW 6**	
	RS 232	OFF	OFF	OFF		Also set 4&5
	IrDA and RS232	ON	OFF	OFF		9600 baud
	IrDA ONLY	ON	ON	OFF		Also set 4&5
	IR Direct Mode	ON	ON	OFF	ON	9600 baud
	802.11b and RS232	OFF	OFF	ON		Also set 4&5
	802.11b ONLY	OFF	ON	ON		Also set 4&5
	BT and RS 232	OFF	OFF	ON		Also set 4&5
	BT ONLY	OFF	ON	ON		Also set 4&5
4, 5	**Comm. 1 - Baud Rate**	**SW4**	**SW5**			**Serial RS2323 Rate**
	38,400	OFF	OFF			BT & 802
	19,200	OFF	ON			
	9,600	ON	OFF			
	2,400	ON	ON			
4, 5	**Comm. 2 Baud Rate**	**SW 4**	**SW 5**			**IrDA Rate**
	9,600	OFF	OFF			Fixed
	9600 to 38400 Baud	ON	OFF			Variable
6	**Parity bit**	**SW 6**				
	Parity Enabled	ON				
	Parity Disabled	OFF				
7	**Odd/ Even**	**SW 7**				
	Even Parity Checker	ON				
	Odd Parity Checker	OFF				
8	**Auto Power Save**	**SW 8**				
	Power save disabled	OFF				Manual ON/OFF
	Power save enabled	ON				Auto Power Down

Note: The 3750THS printer also supports direct IR printing. For direct IR to work you need Dip switches 1 and 6 in the ON position and all other Dip switches need to be OFF.
Please note that if Dip Switch # 1 is OFF then the function of Dip Switch # 6 is as described in the table above. If Dip Switch # 1 is ON then Dip Switch # 6 being ON or OFF determines whether we are in Direct IR or regular IrDA mode.

C.1.0 Serial Communication Rate and Parity

The RS232C Interface signals for the 3750T Series 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 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 38400 *BAUD, 8 DATA BITS, NO PARITY BIT, and one STOP BIT* on initial power up. Two communication handshaking protocols are supported by the 3750T, *Serial Busy protocol* and *XON/XOFF* protocols.

C.1.1 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.

C.1.2 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.

C.1.3 RS232C CONNECTIONS

The RS232C Interface signals for the Extech 3750T 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 pinouts on the RJ25 connector while pin locations are shown in Figure 2.
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

Table C.1 – Serial Interfaces Signals and pinouts

C.1.4 RS232C TECHNICAL SPECIFICATIONS

Technical Specification Name	*Technical Specification Value*
Data Transfer Rate	2400 – 38.4K 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 turns printer on

Table C.2. – RS232C – Technical Specifications

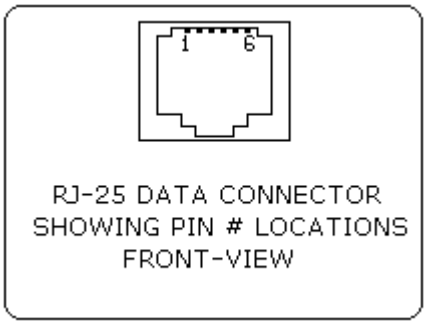


Figure 2.0
RJ-25 Data Connector

C.2.0 Infrared Communications (IrDA)

For IrDA mode to work, Dip Switch #1 must be in the <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" up and print the requested data . Pressing the power switch again will turn the printer <OFF>. The table below shows the required printer settings for IrDA mode. In order for the printer to be in IrDA mode dip switch # 1 has to be On.

Dip Switch	Function	Switch #	Switch #
1	**Communication Interface**	**SW1**	**SW 4**
	IrDA Fixed at 9600	On	OFF
1 and 4	Variable IrDA 9600- 38400	ON	ON

Table C.3 – IrDA Mode

2.1 Direct IrDA

Direct IrDA is also supported by the Extech 3750THS printer. When in that mode the printer surpasses the IrDA stack . For the printer to be in direct IrDA mode you need to have Dip Switch # 1 and Dip Switch # 6 in the ON position.

C.3.0 Bluetooth Communications (Option):

The 3750T Printer Supports a Bluetooth Option. The printer control card communicates with the Bluetooth™ base band interface at 38.4K Baud/sec using no parity. To select the Bluetooth™ interface Dip Switch # 3 has to be ON and all other Dip Switches have to be OFF.

C.3.1 The Bluetooth™ interface power modification

The Bluetooth™ interface increases the battery power consumption by 50 milli Amp. To compensate 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 of operation.

C.3.2 MANUAL POWER OFF mode

When demonstrating RF wireless communication, turn the printer on by pressing the ON switch located on the left side 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, again turn the printer on by pressing the ON switch. Operation in this fashion will greatly extend the life of the battery cartridge.

C.3.3 EXTENDED CONTINUOUS ON mode

If it is desired to leave the printer on for extended operation, it would be necessary to switch dip switch #8 to the OFF position. Be aware that operating with dip switch #8 in this OFF position means that the printer is always ON thus placing the highest current demand from the battery resulting in reduced battery charge life.

3750T QUICK REFERENCE

ASCII Control Characters:

Character	*Hex/Dec*	*CONTROL ACTION*	*Section*
EOT	04/04	End Of Text	1.1
BS	08/08	Back Space	1.1
HT	09/09	Horizontal Tab	1.1
LF	0A/10	Line Feed	1.1
VT	0B/11	Vertical Tab	1.1
FF	0C/12	Form Feed	1.1
CR	0D/13	Carriage Return	1.1
SO	0E/14	Shift Out	1.1
SI	0F/15	Shift In	1.1
XON	11/17	Transmitter On.	1.1
AUXON	12/18	Printer on.	1.1
XOFF	13/19	Printer receiver is off	1.1
NORM	14/20	Return to default 42 column mode	1.1
AUXOFF	15/21	Printer to Host: printer is off	1.1
CANCEL	18/24	Cancel and reset printer BUFFER	1.1
ESC	1B/27	Escape	1.1
EXTEND	1C/28	Extended print	1.1
EXTEND OFF	1D/29	Extended print off/Normal print	1.1

Table QR1 – ASCII Control Characters

Printer Font Commands – Courier Character Set:

Font Name	*Character size (WxH)*	*Command String*	*Section*
24 CPI normal	8x23	ESC+'k'+'5'	2.1
21 CPI normal	9x23	ESC+'k'+'4'	2.1
19 CPI normal	10x23	ESC+'k'+'3'	2.1
16 CPI normal	12x23	ESC+'k'+'2'	2.1
12 CPI normal	16x23	ESC+'k'+'1'	2.1
13 CPI rotated	14x16	ESC+'k'+'0'	2.1

Table QR 2 – Printer Font Commands – Courier Character Set

Printer Font Commands:

Command String	*Printer Action*	*Section*
ESC – 'F' – '1'	Selects "International" character set	A.1.2.
ESC – 'F' – '2'	Selects "PC Line Draw" character set	A.1.2.
ESC – 'U' – '1'	Enable emphasized print	2.3
ESC – 'U' – '0'	Disable emphasized print	2.3

Table QR3 - Printer Font Commands

Printer Graphic Commands:

Printer Command String	*Printer Action*	*Section*
ESC – 'A' – *n*	Select dot line spacing between printed lines.	2.4
ESC – 'J' – *n*	Graphic Line Feed command	2.4
ESC – 'P' – '#'	Select Online mode, characters printed as received	5.5
ESC – 'P' – '$'	Select Buffer mode, characters are printed on (^D)	5.5
ESC – 'V' – *n1 – n2 – <data>*	8-bit Graphic command	3.1
ESC – 'v' – *n1 – n2 – <data>*	8-bit Compressed Graphic Command	3.2

Table QR4 - Printer Graphic Commands

Graphic Logo and Bar code commands:

Command String	*Printer Action*	*Section*
ESC – 'L' – 'G' – *n*	Prepare printer to load image	A.2.2
ESC – 'G' – 0x0FF	Loading Logo Complete	A.2.2
ESC – 'L' – 'g' – *n*	Print stored logo image	A.2.2
ESC – 'z' – *n1 – n2* – L – [data]	Print Bar Code without visible text	4.0
ESC – 'Z' – *n1 – n2* – L – [data]	Print Bar Code with visible text	4.0
ESC – 'Q' – 'J' – *n*	Reverse Dot Feed	6.2
ESC – 'Q' – 'Q' – *n*	Set Out of Paper Sensitivity	6.2
ESC – 'Q' – 'F' – *m*	Set Forward Black Mark Seek	6.2
ESC – 'Q' – 'B' – *m*	Reverse Black Mark Seek	6.2

Table QR 5 – Graphic Logo and Bar Code Commands

Printer Supervisory and Control Commands

Command String	*Printer Action*	*Section*
^V	Buffer, power timer & battery status	5.6
^B	Buffer status	5.6
ESC – 'P' – '^'	Print Battery Voltage	5.3
ESC – 'P' – *alpa*	Time and date print and control	
ESC – 'M' – '000' - cr	Disable the power down timer	5.4
ESC – 'M' – '*nn*0' - cr	Sets the power down timer to *nn* seconds	5.4
ESC – 'C'	Reset Auto power down to 20 seconds	5.4
ESC – 'P' – '('	Firmware version query	5.6
ESC – 'P' – ')'	Hardware model query	5.6
ESC – 'P' – ' + '	EOT Disable	5.6
ESC – 'P' – ' – '	EOT Enable	5.6

Table QR6 – Printer Supervisory and Control Commands