EXTECH
INSTRUMENTS
4500T PORTABLE THERMAL PRINTER

4500THS Developers Manual

Rev. E

4500T Developers Manual - Table of Contents

1.0 Extech 4500T Printer Character Set

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

- *Control Characters*
  - o Defined as character encoding {0x00..0x1F}
  - o Designed to control the printer operation
- *ASCII Print Characters*
  - o Defined as character encoding {0x20..0x7F}
  - o Factory default – ISO defined **US-ASCII** alpha-numeric character set
- *Extended Print Characters*
  - o Defined as character encoding {0x80..0xFF}
  - o Factory default – "International" and User Selectable "PC Line Draw" character set.

1.1 Control Characters

The following set of characters is 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.*
HT	^I	0x09 / 09	Horizontal Tab *The horizontal TAB command advances the cursor by the number of dots specified in the HT set up command.*
LF	^J	0x0A / 10	Line Feed *Advance to beginning of next line.*
VT	^K	0x0B / 11	Vertical Tab *Advance the cursor by the number of dot lines specified in the VT set up command.*
FF	^L	0x0C / 12	Form Feed *Advance the paper (FEED) by the number of lines specified in the Form Feed Set Up command.*
BS	^H	0x08 /08	Back Space *Back Space. Remove Previous character in Print Buffer.*
CR	^M	0x0D / 13	Carriage Return *Advance to beginning of next line.*
SO	^N	0x0E / 14	Shift Out *Every character following this command will be printed in double wide.*
SI	^O	0x0F / 15	Shift In *Every character following this command will be printed in single width.*
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.*
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 cleared.*
ESC	^[	0x1B / 27	Escape *Escape character precedes graphics and printer operating modes. Refer to escape command section.*
EXTEND	^\	0x1C / 28	Double High *All characters following this command are printed in double height.*
EXTEND OFF	^]	0x1D / 29	Normal Height *The normal height command cancels the Double High command. All character following this command will be printed single 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 4500T Printer Font Control

Several commands are defined with the Extech 4500T printer which allows the user to select different typefaces, change the character height, width as well as add emphasis or underline the printed text if desired. The following sections explain in detail how to modify each of the features listed in this paragraph. For complete details on Character sets as well as Font downloading please refer to Appendix A in this manual.

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	CHARACTER SIZE (WxH)	SOFTWARE COMMAND	DOWNL.	Num of Chars / Line
Monospace 821BT	20CPI Short Font	10x18	ESC+'k'+'9'	NO	80
Monospace 821BT	20CPI Bold	10x23	ESC+'k'+'8'	NO	80
Monospace 821BT	20CPI Normal	10x23	ESC+'k'+'7'	NO	80
Monospace 821BT	10 CPI Normal	20x23	ESC+'k'+'6'	NO	40
Courier Mode 5	24 CPI normal	8x23	ESC+'k'+'5'	YES	104
Courier Mode 4	21 CPI normal	9x23	ESC+'k'+'4'	YES	92
Courier Mode 3	19 CPI normal	10x23	ESC+'k'+'3'	YES	80
Courier Mode 2	16 CPI normal	12x23	ESC+'k'+'2'	YES	69
Courier Mode 1	12 CPI normal	16x23	ESC+'k'+'1'	YES	52
Courier Mode 0	13 CPI *rotated*	*16x14*	*ESC+'k'+'0'*	YES	52

Table 2.0 – Installed Fonts

Note: Default printer settings are set to Courier Mode 3 - 19 CPI 80 columns per line.

2.2 Character Width Control Commands

A single byte control command is defined to control the printed character width.

Character	Control	Hex/Dec	Control Action
SO	^N	0x0E / 14	Shift Out
			Each dot of the Character bit- Map is burned twice
SI	^O	0x0F / 15	Shift In
			Each dot of the Character bit - Map is burned once

Table 2.1 - Character width control commands

Note: On power up the printer defaults to a single character width mode.

2.3 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.

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 2.2 – Height Control Commands

Note: Default printer settings are set to Normal Print.

2.4 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 2.3 – Character Emphasis Print Control

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

2.5 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..255}
Esc – 'J'- n	Where n is the number of desired 0.125mm graphic line feeds n = {0..255}.

Table 2.4 – 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 typed 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. When using the above commands the height of the font in dot lines will be subtracted from the total dot lines specified in the command.

2.6 Underline Command

The underline command allows the user to underline the desired portion of the text on a specific line or the entire line if desired. Below are the command structure details.

Command String	Action Taken
Esc – 'U' – 'U'	All characters following this command will be underlined. The underline command is terminated either by the Esc U n command or by cycling the printer power.
Esc – 'U'- 'u'	All characters following this command will not be underlined.

Table 2.5 – Underline Command

Note: On power up the printer defaults to non underlined mode.

2.7 Reverse Printing Command

The reverse printing command enables the user to print in white letters on a black background. Below are the command structure details.

Command String	Action Taken
Esc – 'U' – 'R'	Enable reverse printing starting with the characters following the command. The reverse printing is terminated by the Disable Reverse Command or by cycling the power.
Esc – 'U'- 'n'	Disable reverse printing starting with the characters following the command. The disable reverse printing is terminated by the Enable Reverse Command or by cycling the power.

Table 2.6 - Reverse Printing Command

Note: On power up the printer defaults to normal printing mode.

2.8 Printing direction

The printing direction command allows the user to choose between right-to-left or left-to-right print text directions.

Command String	Printer Action
Esc-F-R	Right to left print
Esc-F-L	Left to right print

Table 2.7 – Printing Direction Command

2.9 HT VT and FF Set Up Commands

The three command strings described in that section enable the user to set the HT, VT and FF values.

Command String	Action Taken
Esc T F n1 n2	Sets up the FF value in dot lines (n2 * 256 + n1) where n1 and n2 = (0..255). Default value =2030
Esc T V n	Sets the VT value in dot lines - n =(0..255) Default : n=203
Esc T H n	Set the HT value in dot lines – n = (0..255) Default : n=100

Table 2.8 – HT VT and FF Set Up commands

Note: When using the set up commands the height of the font in dot lines will be subtracted from the total dot lines specified in the command. Thus for example if you are using a font which is 23 dot high and you send Esc T V 200 (0xC8) the actual VT value will be 200 – 23 = 177 dots.

2.10 Default Power Up Set UP

A new feature in the 4500THS printer is that the user does not have to use the default set up of commands anymore. Thus for example if the printer defaults to 83 columns on power up and you have an application where you need the printer to default to 52 columns on power up you can easily achieve that by following the instructions below. Please note that ANY of the supported printer attributes can be set using this method. However please be careful to send meaningful commands only, otherwise you are risking of corrupting the firmware.

The commands below must be sent sequentially:
====================================
  ➢ Send <Esc> <'X'> <'X'>
  ➢ Send <Esc> <'D'> <'S'>
  ➢ Send <Esc> <'S'> <'L'>
  ➢ Send a binary file to initiate default start up
  ➢ Send <Esc> <'S'> <'T'> <0xFF> <CR><LF>
  ➢ Send <Esc> <'S'> <'B'> <CR><LF>

Note: The commands to change the default features have to be the first commands sent after power up.

Printer Command	Command Description	Printer Response
<Esc> <'X'> <'X'>	Enables flash programming mode	None
<Esc> <'D'> <'S'>	Puts the printer into downloading mode	<'?'>
<Esc> <'S'> <'L'>	Tells the printer that we will be loading a file next	None
Send File with Set Up commands	Send the binary file which contains the printer commands	None
<Esc> <'S'> <'T'> <0xFF> <CR><LF>	Stop Loading	None
<Esc> <'S'> <'B'> <CR><LF>	Burn the file in Flash	<"D!X">

Table 2.9 – Default Set Up Commands

Example:

Esc X X
Esc D S
Esc S L
Esc k 1
Esc S T 0xFF <CR><LF>
Esc S B <CR><LF>

The example above will set the printer to default to 52 lines on power up.

2.11 Restore Defaults Command

The *Restore Defaults* command initializes all programmable attributes to factory default values. If custom programming is present in flash memory, these will be restored as well, overriding the factory defaults. Note: This command **does not** cancel the print buffer!

Command String	Action taken
Esc–'@'	Restores default values on printer

Table 2.10 -   Restore Default Command

User programmable printer attributes and their factory defaults are shown in the table below:

Attribute	Factory Default
Font	Courier 3
Character set	International
Underline	Disabled
Bold	Disabled
Reverse Printing (White on Black)	Disabled
Double Width	Disabled
Double Height	Disabled
Line spacing	3 dots
Form Feed distance	2030 dots
Vertical Tab distance	203 dots
Horizontal Tab distance	100 dots
Printing direction	Left-to-right
Contrast	5
Sensor Sensitivity	40
Auto Power Down time	99 seconds

Table 2.11 -   Programmable attributes and their default

3.0 8-Bit Dot Addressable Graphic Commands

The Extech S4500THS printer uses a single line thermal head, which has 832 heating elements pitched at 0.125 mm. The total print width is 104 mm. The 8-bit graphic commands enable control of each one of the 832 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 104 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.

To achieve optimized smooth printing and to extend battery life when printing graphics, a Buffer Mode has been implemented. In that mode the printer buffer accumulates an amount of data first and then prints the data out. That is why when printing in graphics you may notice a slight pause before the printer starts printing. Pay attention to the Power LED status – if steady that means data is being transferred across.

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 104 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	'104 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	$\{127 \geq$ Counter $\geq 0\}$ Process the next (Counter + 1) bytes of data as 8 bit graphics. $\{0 >$ Counter $\geq -128\}$ Repeat the next single byte of data ((-Counter) + 1) times.
	For Unsigned Values	$\{127 \geq$ Counter $\geq 0\}$ Process the next (Counter+1) bytes of data as 8 bit graphics $\{128 \geq$ Counter $\leq 255\}$ 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:
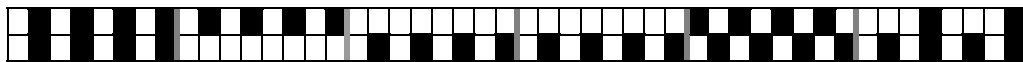
This data may be represented in hexadecimal:

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

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] <CR><LF>	Prints Bar code only	n1 bar code type
		    '1' Code 39
		    '2' Code 128,UCC/EAN-128
		    '3' Interleaved 2 of 5

Esc- 'Z'-n1-n2-L-[data] <CR><LF>	Prints Bar code and ASCII visible	'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

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: 22 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: 32 alphanumeric characters, or 36 numeric only (maximum) - automatically centered.

Code 128 Start character:

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

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

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 - 0x086 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: 35 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 - '123456789012'	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: 34 (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.

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'

5.1 Auto Power Down Command

In order to conserve battery life the printer features an *auto power down* timer. If printer is in AUTO POWER DOWN MODE (Dip Switch # 8 is ON) the power down timer defaults to 99 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. On power down the timer goes back to its default settings. See section 2.9 for saving settings permanently in FLASH.

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'	Cancels MCR.

Table 5.1 - 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 5.2 – Auto Power Down Command Examples

5.2 Extended Auto Power Down Command

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

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

Table 5. 3 - Auto Power Down Command

Here, H_1H_2, M_1M_2 and S_1S_2 are two decimal characters that denote hours, minutes and seconds respectively. Values range from '00' to '99' and values over 59 are carried over. Up to 18 hours may be specified, although the battery will usually not last that long. The CR character at the end of the command is mandatory. The *Print Status Request* command (^B) is useful for verifying that this command executed properly.

Command String	Hex	Action taken	Comment
[Esc] M 5 4 0 [CR]	1B 4D 35 34 30 13	Sets the Auto power down timer to 54 seconds	
[Esc] M 7 6 5 4 0 [CR]	1B 4D 37 36 35 34 30 13	Sets the Auto power down timer to 1 hour 16 minutes 54 seconds	76 minutes got converted into 1 hour 16 minutes
[Esc] M 9 8 7 6 5 4 0 [CR]	1B 4D 39 38 37 36 35 34 30 13	Sets the Auto power down timer to 18 hours	98 hours got truncated to 18 hours

Table 5.4 – Examples of the extended auto power down command

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5.3 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 digits> <CR><LF>
Battery and Print Head Status Request *(Battery voltage reading valid if adapter is not plugged in)*	<CTRL V>	Print Buffer Status	<Esc><'B'> <4 ASCII digits> <CR><LF>
		Battery Voltage Status	<Esc><'V'> <4 ASCII digits> <CR><LF>
		Print Head Temperature	<Esc><'T'> <4 ASCII 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 model	<ESC><')'> <4 ASCII characters> <CR><LF>

Table 5.5 – Supervisory Commands

5.4 Printer Error Conditions

Below is a table which describes Different Error conditions and their corresponding LED status:

Error Condition	LED Status	Error Condition Recovery
Print Head is Hot	Power LED – Flashing Red Status LED – Flashing Red	**Printer stops printing at:** Print Head Temperature of 79º C **Printer Resumes Printing at:** Print Head Temperature of 75º C
Printer is out of Paper/ Paper Door is Open	Power LED – Green Blue or Orange depending on communication mode Status LED – Steady RED	**Printer Stops printing when:** Out of paper or Paper Door is open **Printer Resumes Printing when:** Paper loaded or paper door is closed AND FEED button is pressed.
Battery Running Low Battery Voltage 6.5V	Battery Status LED- flashing RED When Battery is running low while printing is in progress.	**Finish printing current job and Recharge Battery!!!**
Battery Extremely Low Battery Voltage 6.3V	Battery LED – Steady Red Status LED - Flashing RED Occurs only when printer is initially powered ON and Battery is very Low	**Turn Printer OFF and Recharge Battery!!!**

Table 5.6 – Printer Error Conditions

Note: To recover from "Out of paper Error" it is necessary to press the FEED button in addition to loading the paper and/or closing the paper door. This is implemented in order to allow for the paper roll to adjust itself before continuing with the printout so that no characters get "cut off" the receipt.

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). Also if the printer is in *Buffer Mode* and the print buffer is full, then the printer will start printing but it will stay in the *Buffer Mode* until the *Online Mode* command is sent to the printer.

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

Table 5.7 – Printer Operating Mode Commands

5.6 End Of Text (EOT) Control Commands

End Of Text (EOT) control character is transmitted once when the printer buffer is empty. This control character can be enabled or disabled via the commands given in table 5.8.

Command String	Selected Mode
Esc-'P'-'+'	Enable EOT control character transmit
Esc-'P'-'-'	Disable EOT control character transmit

Table 5.8 – End Of Text (EOT) Control Commands

6.0 Label and Form Printing With Black Mark Option

The Extech S4500THS 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 40 (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:		

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 Commands

7.0 Page Printing Mode (Supported on firmware version 1.20 and later)

In addition to being a line printer, the Extech 4500THS can operate in Page Printing mode. Page Printing Mode can be used to design a certain format and replace only variable data during communication time. In line printing, text is printed from top to bottom in the order received. In page printing, text, barcodes as well as lines and rectangles can be placed at an arbitrary (x, y) coordinate.

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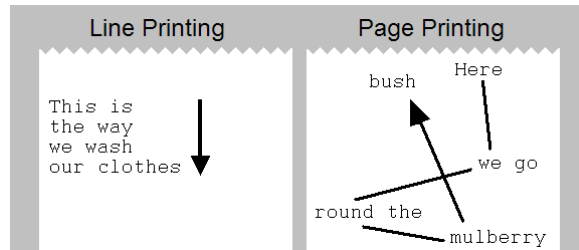
This section describes the commands which are supported by the Page Printing Mode.

7.1 Entering and Leaving Page Printing Mode

On Power up the Extech Printer goes into the default Line Printing Mode. In that mode all data is printed as it is received. In Page Printing mode, the canvas is constructed in advance and the form is printed afterwards. This allows for positioning of text, barcodes, lines and rectangles at specific X and Y coordinates and also at specific angles – 0, 90, 180 and 270 degrees.

The table below describes the commands necessary to enter and leave Page Printing Mode:

Command Name	Command String	Command Description
Enter Buffer Mode	Esc P $	Printer Enters Buffer Mode. In that mode all data is retained in the Buffer until ^ D (0x04) is received.
Enter Page Printing Mode	Esc P P	Places the printer in Page Printing Mode
Exit Buffer Mode	Esc P #	Places printer back in Line print Mode
Print Buffer Content	^ D	Prints Buffer Content and printer is ready to receive more data.

Table 7.0 – Commands to enter and leave Page Printing Mode

7.2 Page Printing Commands

Once the printer is placed in Page Printing Mode follow the commands from this section to draw objects on the canvas.

| Command	Parameters	Description
BeginPage	();	Enters page printing mode.
EndPage	();	Exits page printing mode and prints a label.
SetMargin	(*lm, tm*);	Sets the left margin to *lm* and top margin to *tm*.
SetPageSize	(*width, height*);	Defines the valid drawing area for a label.

Table 7.1 – Page Printing Commands

A page printing session begins with the BeginPage(); command and ends with the EndPage(); command. Rendering of a page is done in memory. The user is given the option to define the drawing area with SetMargin(*lm, tm*); and SetPageSize(*width, height*); commands. SetMargin(*lm, tm*); sets the left and top margins and SetPageSize(*width, height*); sets the size of a page. All the measurements are in dots

Text Command

Command	Parameters	Description
DrawText	(*x,y,color,angle,* "*string*");	Draws text at coordinate (x, y). *color* specifies text color. *angle* specifies text direction. *String* is the text to print.

Table 7.2 – Drawtext Command

DrawText "data" prints the text enclosed in the double quotes at the current cursor location. x and y specify where the text is printed. It is the upper left corner of the first letter of the top line, to be precise.
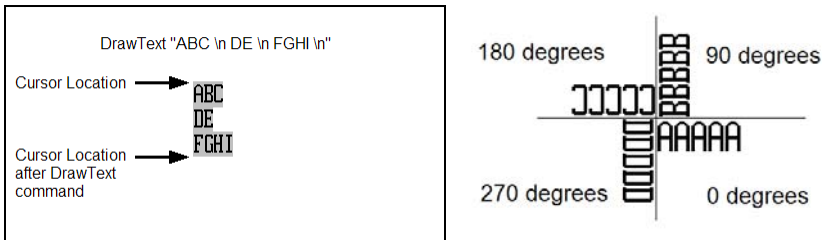
Color=1 prints black text. User may print white text on an existing black background by specifying color=0. Angle specifies the text direction, as follows:

Angle	Print angle	Description
0	0 degrees Counterclockwise	Prints text horizontally from left to right.
1	90 degrees Counterclockwise	Prints text vertically in the up direction
2	180 degrees Counterclockwise	Prints text horizontally from right to left
3	270 degrees Counterclockwise	Prints text vertically in the down direction.

Table 7.3 – Angle Parameter

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

Text Formatting Codes

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

Table 7.3 – Text Formatting Codes

DrawRectangle Command

Command	Parameters	Description
DrawRectangle	(*x1, y1, x2, y2,color,width*);	Draws a rectangle whose corners are (*x1, y1*) and (*x2, y2*). *color* specifies the line or fill color. *width* specifies the line width of a hollow rectangle. A zero-width results in a filled rectangle.

Table 7.4 – DrawRectangle Command

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

Barcode Command

Command	Parameters	Description
DrawBarcode	(*x, y, angle, annotate, type, height, "data"*);	Draws a 1-D barcode of the given angle, type, width and data at coordinate (x, y). Setting a*nnotate* to 1 causes human-readable text to appear below.

Table 7.5 –DrawBarCode Command

DrawBarcode draws a 1-D barcode. (x, y) specify where the upper left corner of the barcode is placed. Supplying values 0, 1, 2, or 3 to the *angle* parameter causes the barcode to appear rotated 0, 90, 180, or 270 degrees.Setting a*nnotate* to 1 causes human-readable text to appear below the barcode. 0 disables this. The type parameter specifies the barcode type as follows:

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

Table 7.6 – BarCode Ennumeration

The height parameter sets the height of barcode in units of dots. The "*data*" parameter specifies the content of the barcode. It is the user's responsibility to supply data that is appropriate for the chosen code. For example, Code 39 will not accept lower case alphabets.

7.3 Form Fiesta

Form Fiesta is a Form and Label Generating Software which can be used to automate the process of label design. It is provided to Extech partners and customers Free of charge. All supported commands from section 7.2 are implemented in Form Fiesta and are automatically generated when an element is drawn onto the canvas on the screen.
Developers can use Form Fiesta to generate a Label. Then they can copy the commands generated in the yellow section of the screen (these are the commands which render the image on the screen) in their application.
The variable data can be acquired by their application and replaced in the command string.
The code below demonstrates how to implement that in a simple VB program. **CustomerName** and **csCarModel** are two
variables which get substituted in the string.

```vb
Private Sub Command1_Click()
    csTicket = Chr$(27) + "P$" + Chr$(27) + "PP" + vbCrLf + "BeginPage();" + vbCrLf
    csTicket = csTicket + "SetPageSize(400,200);" + vbCrLf
    csTicket = csTicket + "DrawRectangle(30,0,330,40,1,0);" + vbCrLf
    csTicket = csTicket + "DrawText(80,10,0,0,""<f=6><b>Dollar Rental"");" + vbCrLf

    csTicket = csTicket + "DrawText(30,60,1,0,""Customer"");" + vbCrLf
    csTicket = csTicket + "DrawRectangle(140,50,330,90,1,3);" + vbCrLf
    csTicket = csTicket + "DrawText(150,60,1,0,""" + CustomerName + """);" + vbCrLf

    csTicket = csTicket + "DrawText(30,110,1,0,""Model"");" + vbCrLf
    csTicket = csTicket + "DrawRectangle(140,100,330,140,1,3);" + vbCrLf
    If Option1.Item(0) Then csCarModel = "Taurus"
    If Option1.Item(1) Then csCarModel = "Cavalier"
    If Option1.Item(2) Then csCarModel = "Neon"
    csTicket = csTicket + "DrawText(150,110,1,0,""" + csCarModel + """);" + vbCrLf

    csTicket = csTicket + "EndPage()" +vbCrLf+Chr$(27)+"P#" + vbCr+Chr$(4)+vbCrLf
```

```
    Ticket.TicketText = csTicket
    Ticket.Visible = True

    MSComm1.CommPort = 1
    MSComm1.PortOpen = True
    MSComm1.Output = csTicket + vbCrLf
    MSComm1.PortOpen = False
End Sub
```

Form Fiesta Install File as well as instructions on using the software are available on the Developer's CD under the Page Printing Folder.

Appendix A

A.1.0 Introduction

The 4500THS features improved font and logo table organization which requires a new set of downloading instructions. The paragraphs below describe in detail the 4500THS flash font and logo table organization as well as the procedures for Font and Logo Downloading.

A.1.1 Flash Font Tables

The table below shows the Font Table organization in the 4500THS printer. Please note the following:

1) The fonts in Red are permanent and can not be modified via the font downloading commands

2) Each font table represents either the first or the second half of a font, not the complete 255 character set. For instance the location R1-C1 of memory, contains the International characters set of Courier Mode 1 - 16x23 (starting from 0x80 to 0xFF).

REPLACEABLE USER FONTS						FACTORY FONTS			
Courier Mode 0 16x14	Courier Mode 1 16x23	Courier Mode 2 12x23	Courier Mode 3 10x23	Courier Mode 4 9x23	Courier Mode 5 8x23	Monospace 20x23	Monospace 10x23 Bold	Monospace 10x23	Monospace 10x18
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9
R0 (Rotated) l0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F	ASCII 0x20..0x7F
R1 Rotated PC Line Draw 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF	International Set 0x80..0xFF
R2 Rotated PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF	PC Line Draw 0x80..0xFF

Table A.0 – 4500THS Flash Font Table Organization

Note:
Use the following commands to select the memory location where the font will be uploaded (See Section A.1.4 for a detailed description of the commands)

Esc-'F'-'K'- **k** - <CR>   Where **k** is the value of the column (C)
Esc-'F'-'F'- **f** - <CR>   Where **f** is the value of the row (R)

For instance the commands Esc-'F'-'F'- **1** - <CR> and 'F'-'K'- **2** - <CR>, indicates that the new font will replace the current International-Courier Mode 2 set.

A.1.2 Selection Font Tables

Commands Esc-'F'-'**f**'- <CR> and Esc-'k'-'**x**' - <CR> are used to select a font table

	k0	k1	k2	k3	k4	k5	k6	K7	k8	k9
F1 **International** **Set**	Courier Mode 0 16x14 Rotated	Courier Mode 1 16x23	Courier Mode 2 12x23	Courier Mode 3 10x23	Courier Mode 4 9x23	Courier Mode 5 8x23	Monospace 20x23	Monospace 10x23 Bold	Monospace 10x23	Monospace 10x18
F2 **Pc Line** **Draw Set**	Courier Mode 0 16x14 Rotated	Courier Mode 1 16x23	Courier Mode 2 12x23	Courier Mode 3 10x23	Courier Mode 4 9x23	Courier Mode 5 8x23	Monospace 20x23	Monospace 10x23 Bold	Monospace 10x23	Monospace 10x18

Table A.1 – 4500 font sets

For instance commands Esc-'F'-'1'- <CR> and Esc-'k'-'3', select the International Courier Mode 3 (10wX23h)

A.1.3 Rotated Font Tables

Rotated Font Table

Table A.2 - Default Rotated Font Tables

To select the PC Line Draw graphic table use the command
　　　　Esc-'F'-'1' -<CR> or
　　　　Esc-'F'-'2' -<CR>

Next select the Courier Mode 0 rotated font table using the command
　　　　Esc-'k'-'0' : Select Rotated (16x14)

A.1.4 Default Courier International and PC Line Graphic Font

International Font Table

PC Line Graphic Table

Table A.1 - Default International and PC Line Graphic Font Tables

A.1.5 Monospace and Rotated Font Tables

Monospace Font Table   **Rotated Font Table**

Table A.2 - Default Monospace and Rotated Font Tables

A.1.6 Flash Font Downloading Commands

The table below summarizes all the font downloading commands supported by the 4500THS printer.

Command String	Command Description	Printer Response m =1	Printer Response m =0	LED Status
Esc-'D'-'F'	Enable font downloading	?	?	Power LED – Steady Green Status LED – Flashing Green
Esc-'F'-'I'	Display tables **I**nformation	Display installed Font tables info (refer to Table 5)	'1': if command correct '0': otherwise	Power LED – Steady Green Status LED – Flashing Green
Esc-'F'-'S'-<CR> or <LF>	Display font download current **S**ettings	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Power LED – Steady Green Status LED – Flashing Green
Esc-'F'-'P' – m - t - k - f - <CR> or <LF>	Set Font Download **P**arameter	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Power LED – Steady Green Status LED – Flashing Green
Esc-'F'-'M'- m - <CR> or <LF>	To select **M**ode	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Power LED – Steady Green Status LED – Flashing Green
Esc-'F'-'K'- k - <CR> or <LF>	To select font column(**K**) value	Esc-'F'-'S'-m t k f	'1': if command correct '0': otherwise	Power LED - Flashing green Status LED - Steady RED
Esc-'F'-'F'- f - <CR> or <LF>	To select font row(**F**) value	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Power LED - Flashing green Status LED - Steady RED
Esc-'F'-'L' – t - <CR> or <LF>	Select file type **and start of font download	Esc-'F'-'S' m t k f	'1': if command correct '0': otherwise	Power LED - Flashing green Status LED - Steady RED
Send the .bdf file		Send the File		**While File is transferring:** Power LED - Steady Green Status LED - Steady RED **When transfer is complete:** Power LED - Flashing Green Status LED - Shuts OFF
Esc-'F'- 'B' <CR> or <LF>	To program or burn font on flash	**On burn process Complete:** D!X	**On burn process Complete:** D!X	**While the font is being burned in FLASH** Power LED – Steady Green Status LED - Steady Red **When Burning complete** Power LED – Flashing Green Status LED – Flashing Red
m: Down load operating mode: *m =0,standard response* *m =1, response with diagnostic message (default)* *k: column value* *k = '0' through '9'* *f: row* *f = '0' through '9'* *t: Font File type..* *t = '0' BDF formatted font file (default)* *t= '1' through '9' reserved*				

Table A.3 – Font Download Commands

Important Font Downloading Notes:

- The file to be downloaded has to be in a .BDF format.
- When downloading make sure that the metrics of the fonts to be downloaded are equal or smaller than the metrics of the existing font in the certain location. Otherwise the fonts will not be downloaded correctly. For specific Font metrics please refer to the Font Table in section 2.1.
- **Esc – 'D' – 'F' <CR>** has to be the first Esc Command after Power Up or else the printer will print the command instead of executing it
- **Esc – 'X' - 'X' <CR>** command simulates that state and can be used to bring the printer in initial state after other Esc commands have been used.
- After a font has been downloaded press the FEED button twice to get the printer out of the downloading mode and then shut the printer OFF by pressing the ON/OFF switch.
- The header on top of each character in the .bdf font has to represent the true size of the font bit – map.
  Ex : for a 16x23 font the header at the beginning of each character needs to look like that:
      BBX 16 23 0 0
  Ex: for a 10 x 23 font the header at the beginning of each character needs to look like that:
      BBX 10 23 0 0
- If the font which you are going to download is one byte in size (8x 23) then in the .bdf file you will need to have one byte only.
  Otherwise the firmware will not accept the font!!!!!!!!
Ex:	**BBX 08 23 0 0**	
	BITMAP	
	0008	
	000F	**THIS IS WRONG**
	0002	
	0003	

Ex:	**BBX 08 23 0 0**	
	BITMAP	
	08	
	0F	**THIS IS CORRECT**
	02	
	03	
- The name of the font is indicated at the beginning of the .bdf file in the lines:
      FONT Font12C.BDF
   If you change the file name only the Firmware will not recognize the new name. You will need to open the .bdf file and change the name in the above line.

A.1.7. Font Downloading – Example

1) Have the .BDF font file available and ready. The file should contain all of the characters which you want to download. When downloading make sure that the Serial Port on your Terminal Program is configured for Hardware Handshaking. If the file you have is in .asm format rather than a .bdf format you can use Extech's asm2bdf utility to convert the file into a .bdf format. Instructions on how to use the utility are available in the USING THE ASM2BDF UTILITY DOCUMENT available in the FONT section on the Developer's CD.

2) Cycle Printer Power or Send Esc- 'X' -'X' command

3) Send **Esc D F** Wait for a question mark to come back from the printer. The Ready and status LED should both light up in green

4) Send **Esc F I** if you wish to see the current font tables Information

5) Send **Esc F K 1 <CR> or <LF>** – this will select the second column from the table above – the Power LED will start flashing Green and the Status LED will turn steady RED.

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

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

8) Send the .bdf file - While the File is transferring the Power LED is steady Green and the Status LED is steady RED – when the transfer is complete the Status LED shuts OFF and the Power LED is Flashing Green. **The metrics of the .bdf font have to be equal or smaller than the metrics of the existing font.**

9) Send **Esc F B <CR>or <LF>** - The Power(green) and Status(red) LEDs are steady while the font is being burned in FLASH and when completed both the Power LED (green) and the Status LED (red) start flashing.

10) The .bdf font which you just downloaded has been stored in the International Section of the Courier Mode 1 font. Unplug the Serial Cable, Press the Feed button and then shut the printer by pressing the ON/OFF button.

A.2.0 Graphic Logo Print Option

The following paragraphs summarize the operation of the *Graphic Logo* feature for the Extech S4500THS printer. The *Graphic Logo* feature enables the storage of formatted Bitmap file in nonvolatile memory. Up to eight memory sectors of up to 64,000 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.

A.2.1 Specification

Printer	Number of Logos	Bytes per logo	Dot lines per logo	Dots per line
4500HS	8 (FLASH) n =(0..7) 4-7 are optional	64,000	178	832

Table A.4 – Graphic Logo Specification

3) On initial power-up, the Host application selects the *Flash Logo Mode* by sending the command String:
   <ESC - D – L-<CR> or <LF>

   Printer responds by sending ? character to the host application indicating that the *Flash Logo Mode* is enabled.

4) The Host application selects the *Graphic Logo record mode* by sending the load command:
   <ESC – L – G – n-<CR> or <LF>

5) Once the printer is placed in record mode, the *Graphic Logo* is downloaded using 8-bit graphic command:
   <ESC> <V> <0x01> <0x00> <104 bytes of Graphic data>

6) The *Graphic Logo record mode i*s terminated upon receiving the Graphic *Logo record terminate* command string.
   ESC – L – G - 0xff -<CR> or <LF>

7) 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	LED Status
Esc – D-L-<CR>or <LF>	Select Flash Logo Mode	?	Power LED - Steady Green Status LED - Flashing Green
Esc – L-G-n-<CR>or <LF>	Load/Record Graphic Logo	none	Power LED - Steady green Status LED - Steady RED
Send Graphic Logo File	Send a Binary file with the Logo image	none	Power LED - Steady Green Status LED - Steady RED
Esc- L-G-<0xFF>-<CR>or <LF>	Stop Loading Graphic Logo	D!X	**While the logo is being burned in FLASH** Power LED – Steady Green Status LED - Steady Red **When Burning complete** Power LED – Flashing Green Status LED – Flashing Red
Esc-L-g-n	Print Graphic Logo	Printer Prints Logo n	none

Table A.5 – Graphic Logo Commands

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

A.2.2 Generating Graphic Logos

To generate the graphic logo follow these steps:

8) Install the Extech 4500THS printer driver
9) Use WordPad or any Windows application to prepare your logo document
   From printer Setup of WordPad application Set the paper margins to 0.16".
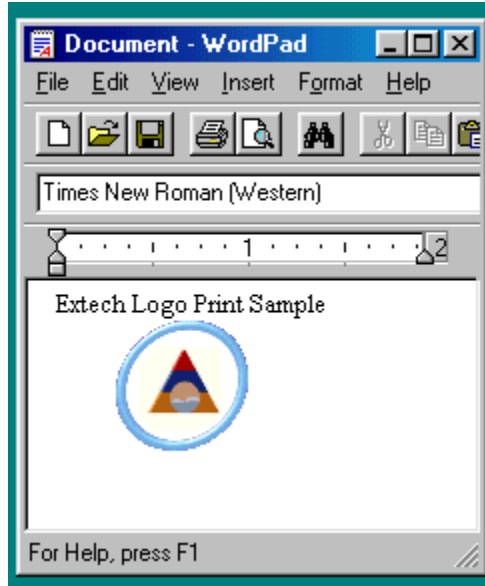
- Print your logo document to a file, name it <LOGO.PRN>, using The Extech 4500THS Windows driver.
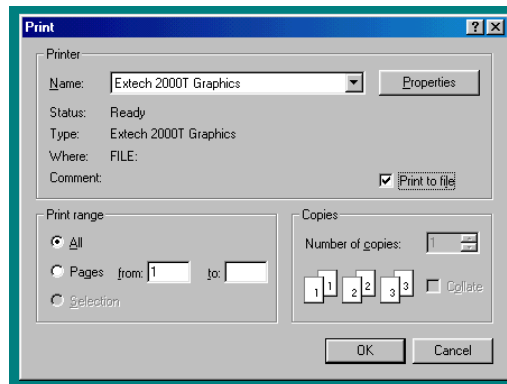
- Go to DOS Window and start the EDIT program.
    Go to Start and then select RUN and in the RUN window type EDIT and press ENTER. The program will open.
- Open <LOGO.PRN> file in BINARY mode.
    Press <Ctrl> <Home> to place cursor at the beginning of file.
    Delete everything in the beginning of 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.
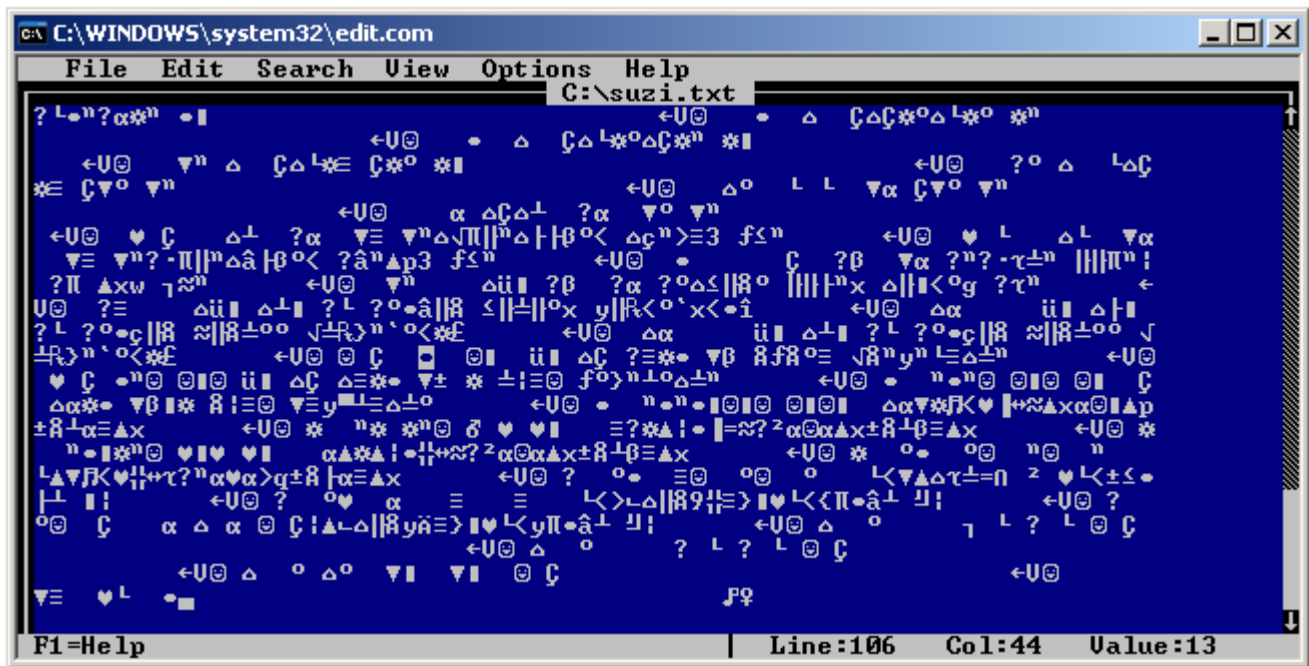
- Save the modified <logo.prn> file.

A.2.3.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.

    1) Cycle the power of the printer or Send Esc X X
    2) Type **Esc D L <CR> or <LF>**. Status LED will start Flashing Green
    3) Wait until a question mark comes back from the printer
    4) Type **Esc L G n <CR> or <LF>** (This shows the location where you want to download the logo 0..7). Status LED will turn Red
    5) Send the logo file which you have just created
    6) Send **Esc L G 0xFF <CR> or <LF>**
    7) Wait for **D!X** response to come back from the printer. This indicates that file transmission and storage is completed. Status LED will be flashing Red and the Power LED will be flashing Green
    8) After a logo has been downloaded , unplug the Serial Cable , Press the FEED button to get the printer out of the downloading mode and then shut the printer OFF by pressing the ON/OFF switch.
    9) To test the LOGO.prn file issue print commands : **Esc L g n** where n is the logo location that you want to print

Appendix B

B.1.0 Three Track magnetic Card Reader Option

A three track **M**agnetic **C**ard **R**eader is available on the Extech 4500THS 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.

B.1.1 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

B.2.0 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 (3) 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
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 <u>GREEN</u> <**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 <u>RED</u> 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

C.1.0 Introduction

The 4500THS printers support Serial RS232 and IrDA compatible infrared communication interfaces. Blue Tooth and 802.11 communication is also available as an optional feature. Serial, IrDA, 802.11 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.

4500THS DIP SWITCH SETTINGS

Dip Switch	Function	Switch #	Switch #	Switch #	Notes;
1 & 2	Communication Interface	SW 1	SW 2		
	RS232	OFF	OFF		
	IrDA	ON	OFF		Baud Rate can be negotiated up to the value specified through Dip switches 3,4 and 5
	Bluetooth	OFF	ON		BT Baud Rate set for 115 200 bps
	802.11b	ON	ON		802.11 Baud Rate set for 115200 bps
3 & 4 & 5	Baud Rate	SW 3	SW 4	SW 5	
	115200	OFF	OFF	OFF	
	57600	ON	OFF	OFF	

	38400	OFF	ON	OFF	
	19200	ON	ON	OFF	
	14400	OFF	OFF	ON	
	9600	ON	OFF	ON	Use for fixed IrDA
	2400	OFF	ON	ON	
	1200	ON	ON	ON	
6	Parity Bit	SW 6			
	Parity Enabled	ON			Does not apply for IrDA
	Parity Disabled	OFF			Does not apply for IrDA
7	Odd/Even	SW 7			
	Even Parity Checker	ON			Does not apply for IrDA
	Odd Parity Checker	OFF			Does not apply for IrDA
8	Auto Power Save	SW 8			
	Power Save Disabled	OFF			Manual On/Off
	Power Save Enabled	ON			Auto Power Down

Table C.0 – 4500THS Dip Switch Settings

C.2.0 Serial Communication Rate and Parity

The RS232C Interface signals for the 4500THS 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 115200 *BAUD, 8 DATA BITS, NO PARITY BIT, and two STOP BITs* on initial power up. Two communication handshaking protocols are supported by the 4500THS, *Serial Busy protocol* and *XON/XOFF* protocols.

C.2.1 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.2.2 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.2.3 RS232C Connections

The RS232C Interface signals for the Extech 4500THS are terminated on a 6 PIN RJ25 type data connector located at the back of the printer.
Six connections are provided from the Serial Interface to the host computer. The table below lists the Serial Interface signals and pin-outs 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 pin-outs

C.2.4 RS232C Technical Specifications

Technical Specification Name	Technical Specification Value
Data Transfer Rate	2400 – 115 200 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
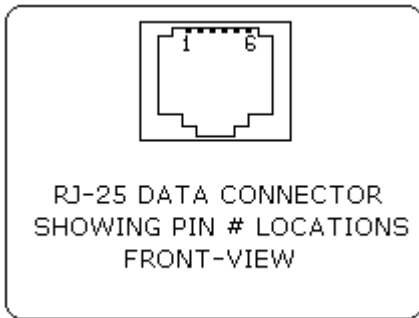
RJ-25 Data Connector

C.3.0 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.

Dip Switch	Function	Switch #	Switch #	Switch #	Notes;
1 & 2	Communication Interface	SW 1	SW 2		
	IrDA	ON	OFF		Baud Rate can be negotiated up to the value specified through Dip switches 3,4 and 5. For fixed IrDA use 9600 Baud

Table C.3 – IrDA Mode

C.3.0 Bluetooth Communications (Option)

The 4500THS Printer Supports a Bluetooth Communication Option. The printer control card communicates with the Bluetooth™ base band interface at 115.2 K Baud/sec using no parity. To select the Bluetooth™ interface Dip Switch # 2 has to be ON and all other Dip Switches have to be OFF. If required by the host application to enter a PIN number while connecting to the BT module enter 0 (zero). The settings on the BT module can be changed via the AT command set. Please check the BT folder on the developer's CD for further

details. Extech provides a utility (also available on the Developer's CD) which allows for an automatic change for some of the most widely used settings (PIN # , Name, MSTER/SLAVE mode). For LED status while in BT mode please refer to the LED status table in the 4500THS User's Guide.

Below are listed the BT module's default settings:

- ➢ Name: EXTECH Printer
- ➢ Serial Settings: 115200,8,n,2
- ➢ Discoverability mode: Generally Discoverable
- ➢ Connectability mode: GAP Connectable
- ➢ Security mode: Security Disabled
- ➢ Fixed PIN = 0
- ➢ Set Master/Slave Policy: Always let the connecting device select master/slave role on incoming connections
- ➢ Client Profile: Disable Client Services
- ➢ Server Profile: Serial Port Profile Server enabled
- ➢ Wireless Multi-drop mode: disabled, forward to host only
- ➢ Set Serial Interface: (RS232)
- ➢ Configuration over Bluetooth – Enabled
- ➢ Power Save mode: Allow Sleep mode only
- ➢ ESC sequence timing: 500ms before ESC command & 500ms after

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. For Dip Switch settings on Power Save mode please refer to the Dip Switch Table above.

C.3.2 MANUAL POWER OFF mode

For the printer to be in Manual Power OFF mode Dip Switch # 8 has to be turned OFF. 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. Unless you press the ON/OFF switch the printer will stay ON until the battery runs out.

C.3.3 AUTOMATIC POWR OFF mode

If you wish the printer to automatically **SHUT DOWN** after a period of time turn Dip Switch # 8 ON. The printer will turn OFF after 90 seconds. The value of the default timer can be changed by using the Esc M n1n2 0 CR command described earlier in the manual. Once power is cycled the printer goes back to the default 90 seconds value. To overcome that check section 2.9 in this manual.

C.4.0 802.11 Communication (Option)

The 4500THS Printer Supports an 802.11 Communication Option. The printer control card communicates with the 802.11 interface at 115.2 K Baud/sec. To select the 802.11 interface Dip Switch # 1 and Dip Switch # 2 has to be ON and all other Dip Switches have to be OFF. Below are the factory default settings of the 802.11 module. For more information please refer to the 802.11 kit available on the Developer's CD. For LED status while in 802.11 mode please refer to the LED status table in the 4500THS User's Guide.

> ➢ IP address: 192.168.1.96
> ➢ DHCP mode is not enabled
> ➢ Ad - Hoc mode is enabled/ Infrastructure mode is disabled
> ➢ SSID is NETGEAR
> ➢ Tunnel port = 23 (If you want to send data to the 802.11b module use this port number)
> ➢ Telnet port = 8023 (If you need to send commands to the 802.11b module use this port number)
> ➢ Bit Rate is set to 115200

C.5.0 Printer Status Indicator LED Panel

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

LED Indicator	State	Status
COMMUNICATION STATUS **LED # 1**	ON - GREEN	Flashing Green, indicates that Power is ON and that the printer is in RS232 or IrDA mode. Steady GREEN state when communicating with host.
	ON - BLUE	Flashing Blue, indicates that Power is ON and that the printer is in Bluetooth mode. Steady Blue state during transmit/receive.
	ON - Orange	Flashing Orange, it indicates the power is ON and that the printer is in 802.11b mode. Steady Orange state during transmit/receive.
BATTERY STATUS **LED # 2**	ON – YELLOW	The battery charger is charging the battery at a fast rate. The LED will turn off when the battery is fully charged.
	ON - RED	The battery voltage is low and needs charging.
	ON -GREEN	▪ Indicates that MCR is ready to accept data. ▪ Indicates that SCR is ready to accept data.

		Steady Red, indicates an MCR/SCR fault condition or a printer error. The printer is not ready to accept data.
MAGNETIC CARD READER STATUS **LED # 3**	ON - RED	▪ Steady Red, indicates an MCR/SCR fault condition or a printer error. The printer is not ready to accept data. ▪ Printer is out-of-paper or Paper door is open. ▪ Flashing Red, indicates the print head is hot and printing is paused. ▪ If in combination with a Steady RED Battery LED, a Flashing RED Status LED indicates low battery voltage. Note: Refer to the troubleshooting guide to determine error or fault condition.

Table C.4 – Printer Status Indicator LED Panel

Appendix D

Bluetooth Setup Commands

1.   Introduction

This document describes the commands available to configure the Bluetooth interface of the 4500THS printer. Using these commands the Bluetooth configuration can be changed in field to match the operating features supported by a host Bluetooth device.

The printer supports two methods for changing the Bluetooth configuration:
-       Over the Bluetooth interface.
-       Using serial RS232 Interface.

Extech Bluetooth Configuration Utility Applications are available for making the configuration changes. It is also possible to change the Bluetooth configuration using Hyper Terminal and command files provided.

2.   Changing Configuration **Over The Bluetooth Interface**

To configure the printer over the Bluetooth interface the printer has to be in Bluetooth mode and "Over the Bluetooth Option" must be enabled on the Bluetooth interface.

Step1: Establish Bluetooth connection and execute AT escape sequence. The default value of the escape character is '/' Note that the escape sequence consist of three consecutive escape characters. Hence, the character is used three times:

> Send: ///

Note: Escape sequence timing: 1000 ms of no data transmission required before and after the escape sequence for the escape sequence to be valid.

Step2: At this point Bluetooth module should be in command mode and be ready to accept any AT configuration command (Refer to the Section 5 - Table 3).
For the complete list of available AT command please refer to the "Serial Port Adapter AT Command Specification" document.
For example to change local name:

> Send: AT*AGLN="EXTECH ANDES 3",1

3.   Changing Configuration Using Serial RS232 Interface

Step1: To configure the printer using the serial RS232 interface, the printer has to be in *serial mode*. Placing all DIP switches in OFF position selects serial RS232 mode.

Step2: The printer is placed in buffer mode by the issuing *Buffer Mode Command* string:

> Send: <ESC><'P'><'$'>

Step3: The desired Bluetooth setup commands are issued to read or change the current settings.
Refer to **TABLE 3** for list of commands available and **EXAMPLE 1 & 2** for command formats.

> Send: <ESC> <'W'>< 'B'><'['>< STRING_1>< ']'> <CR>,…,

Step4: The printer is return to *Line Print Mode* by issuing the *Line mode command:*

> Send: <ESC><'P'><'#'>

Step 5: The control character 0x04 is issued to exit the buffer mode and apply the changes.

> Send: <EOT>

4. Bluetooth interface Setup Command String Format

Bluetooth Configuration READ command format
With Print: \<ESC> <'W'>< 'B'><'['>< STRING_1>< ']'> \<CR>   Without Print: \<ESC> <'W'>< 'b'><'['>< STRING_1>< ']'> \<CR>

TABLE 1 – Bluetooth configuration READ command Format

Bluetooth Configuration Write command format
With Print: \<ESC> <'W'>< 'B'><'['>< STRING_1><','>< STRING_2><','><'1'>< ']'> \<CR>   Without Print: \<ESC> <'W'>< 'b'><'['>< STRING_1><','>< STRING_2><','><'1'>< ']'> \<CR>

TABLE 2 – Bluetooth configuration WRITE command format

Bluetooth Configuration Usage Examples	
Read Command String	Notes
\<ESC>P$	Select Buffer Mode
\<ESC>Wb[login]\<CR>	Place Bluetooth interface in command mode
\<ESC>Wb[local-name] \<CR>	Read Bluetooth Local Name
\<ESC>Wb[local-bd-address] \<CR>	Read Bluetooth Local address
<0xff>	Exit Bluetooth read process
\<ESC>P#<0x0d>	Return to Online mode

EXAMPLE 1 – Listing the command strings to READ Bluetooth local name and address.

Bluetooth Configuration Usage Examples	
Read Command String	Notes
\<ESC>P$	Select Buffer Mode.
\<ESC>Wb[login]\<CR>	Place Bluetooth interface in command mode.
\<ESC>Wb[local-name,"EXTECH PRINTER",1] \<CR>	Write Bluetooth Local Name: Extech Printer ("" is part of command string).
\<ESC>Wb[fixed-pin-mode,"0",1]\<CR>	Write Bluetooth Pin Code: "0" Important Note: ("" is part of command string)
\<ESC>Wb[security-mode,2,1]\<CR>	Enable Link Level Security.
<0xff>	Exit Bluetooth read process.
\<ESC>P#<0x0d>	Return to Online mode.

EXAMPLE 2 – Listing the command strings to WRITE Bluetooth local name, address and enable security.

5. Bluetooth Setup Command Strings Supported:

Bluetooth Configuration Commands				
Description	**AT Commands For over BT configuration**	**Serial Commands <STRING_1>**	**Serial Parameters <STRING_2>**	**Notes**
Basic Settings				
Local Name	(AT*AGLN)	"local-name"	*Ex:* ' "Extech Printer" '	The double quotes are part of the command
Class of Device	(AT*AGLC)	"local-cod"		
Connectable	(AT*AGCM)	"connect-mode"	'1' or '2'	'1' <Not Connectable> **'2' <Connectable>**
Discoverable	(AT*AGDM)	"discover-mode"	'1' , '2' or '3'	'1' Not discoverable '2' Limited discoverable **'3' General Discover**
Pairable	(AT*AGPM)	"pairing-mode"	'1' or '2'	'1' Not pairable **'2' Pairable**
Security Settings				
Security Mode	(AT*AGSM)	"security-mode"	'1' or '2'	'1' None '2' Link Level
Pin Code	(AT*AGFP)	"fixed-pin-mode"	*Ex:* ' "1234" '	The double quotes are part of the command
Server Settings				
Server Profile	(AT*ADDSP)	"default-server-profile"	'1' , '2' or '3'	'1' None **'2' SPP** '3' DUN
Master/Slave Policy	(AT*AGMSP)	"master-slave-role"	'1' or '2'	**'1' Don't Care** '2' Always Master
Client Settings				
Client Profile	(AT*ADDCP)	"default-client-profile"	'1' , '2' or '3'	**'1' None** '2' SPP '3' DUN
Serial Settings				
Serial Settings	(AT*AMRS)	"rs232-settings"	Factory Default 115,400	Do not change
Serial Interface Type (restart)	(AT*AMSIT)	"serial-interface-type"	Factory Default serial	Do not change
Escape Timing	(AT*AMET)	"esc-seq-time"	Factory Default 1000 ms	Do not change
Optimization Settings				
Max Output Power	(AT*AMMP)	"max-output-power"	'1' , '2' or '3'	'1' Online **'2' Sleep** '3' Stop
Power Mode	(AT*AMPM)	"power-save-mode"		
Miscellaneous Settings				
Allow Configuration Over Air	(AT*ACCB)	"allow-config-over-bt"	'1' or '2'	**'1' Enable** '2' Disable
DTR/DSR Mode	(AT*AMDS)	"dsr-dtr-settings"	na	
Data Mode	(AT*ADDM)	"data-mode"	Read only	
Firmware Version	(AT*AILVI)	"firmware-version"	Read only	
Local BT Address	(AT*AILBA)	"local-bd-address"	Read only	
Inactivity Tik	(AT*ADIT)	"inactivity-tik"	Read only	
Command	(AT)	"command"	na	
Extech Specific Settings				
Attention to BT module	(///)	"login"		

TABLE 3 – Bluetooth configuration commands

4500THS 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
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 QR0 – ASCII Control Characters

Printer Font Commands – Courier and Monospace 821BT Character Set:

Font Name	Character size (WxH)	Command String	Section
Monospace821BT			
20CPI Short Font	10x16	ESC+'k'+'9'	2.1
20CPI Bold	10x23	ESC+'k'+'8'	2.1
20CPI Normal	10x23	ESC+'k'+'7'	2.1
10 CPI Normal	20x23	ESC+'k'+'6'	2.1
Courier			
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 QR1 – Printer Font Commands – Courier Character Set

Printer Font Commands:

Command String	Printer Action	Section
ESC – 'U' – '1'	Enable emphasized print	2.4
ESC – 'U' – '0'	Disable emphasized print	2.4
Esc - 'U' - 'U'	Enable Underline	2.6
Esc - 'U' – 'u'	Disable Underline	2.6
Esc – 'U' – 'R'	Enable Reverse Printing	2.7
Esc – 'U'- 'n'	Disable Reverse Printing	2.7
Esc – 'F'- 'R'	Right to left print	2.8
Esc – 'F'- 'L'	Left to right print	2.8

Table QR2 - Printer Font Commands

Printer Graphic Commands:

Printer Command String	Printer Action	Section
ESC – 'a' – *n*	Select dot line spacing between printed lines.	2.5
ESC – 'J' – *n*	Graphic Line Feed command	2.5
ESC – 'V' – *n1 – n2 – <data>*	8-bit Graphic command	3.1
ESC – 'v' – *n1 – n2 – <data>*	8-bit Compressed Graphic Command	3.2

Table QR3 - Printer Graphic Commands

Graphic Logo and Bar code commands:

Command String	Printer Action	Section
Esc – D – L <CR> or <LF>	*Enable download mode*	A.2.1
ESC – 'L' – 'G' – n <CR> or <LF>	*Specify logo location*	A.2.1
Esc – 'L'- 'G'- 0xFF <CR> or <LF>	*End Logo Download*	A.2.1
ESC – 'L' – 'g' – n	*Print stored logo image*	A.2.1
ESC – 'z' – n1 – n2 – L – [data] <CR>	*Print Bar Code without visible text*	4.0
ESC – 'Z' – n1 – n2 – L – [data] <CR>	*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 QR4 – Graphic Logo and Bar Code Commands

Printer Supervisory and Control Commands:

Command String	Printer Action	Section
^V	Buffer, power timer, Print Head & battery status	5.3
^B	Buffer status	5.3
ESC – 'M' – '000' - cr	Disable the power down timer	5.1
ESC – 'M' – '*nn*0' - cr	Sets the power down timer to *nn* seconds	5.1
ESC – 'C'	Reset Auto power down to 20 seconds	5.1
ESC – 'P' – '('	Firmware version query	5.3
ESC – 'P' – ')'	Hardware model query	5.3

Table QR5 – Printer Supervisory and Control Commands

Printer Operating Mode Commands:

Command String	Printer Action	Section
ESC – 'P' – '$ '	Selects Buffer Mode Printing	5.5
ESC – 'P' – '#'	Selects line Mode Printing	5.5

Table QR6 – Printer Operating Mode Commands

Document Revision History

Title	Revision History	Revision Date	Revisions Since Last Issue
4500T_Developers_Manual	Revision A	10-12-2005	Fist Issue
4500T_Developers_Manual	Revision B	12-15-2005	Font Section has been expanded to reflect features specific to 4500THS Font Downloading
4500T_Developers_Manual	Revision C	08-28-2006	Added the following sections: 2.10, 5.2, 5.5, Table QR6
4500T_Developers_Manual	Revision D	01-16-2007	Added Section 7 – Page Printing
4500T_Developers_Manual	Revision E	11-27-2007	Added Appendix A1.0 – A1.3, D; Sections 1.2, 2.8;