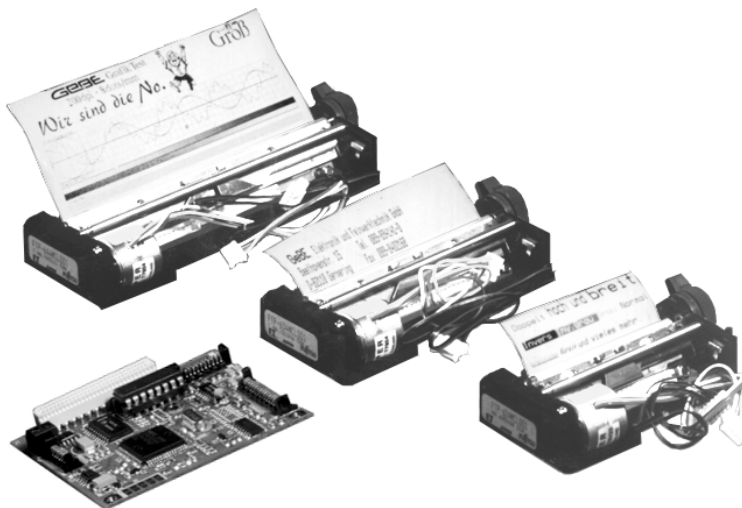


Thermal Printer Controller

GCT-6883 / 6884

Controller for Fujitsu FTP6x2 Series Thermal Printer für 24 VDC



GeBE

Elektronik und
Feinwerktechnik GmbH

Module und Geräte zum Eingeben,
Auswerten, Anzeigen und Ausdrucken
analoger und digitaler Daten.

GeBE Dokument-Nr.:

MAN-E-377-V2.23

Stand: 11.04.2003

Gedruckt: 16.04.2003

Hardware:

V1.2 ('6883) / V1.0 ('6884)

Software: > GE3052

English: MAN-E-377



Usermanual

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1. History of Changes in this Document

Version	Date	Changes
V 1.0	10-8-1999	
V 1.1	10-28-1999	Height 8-fold instead of quadruple, string length > 120 characters, ESC Y, X if faultless, message: < XON R X (or error)>
V 1.2	1-12-2000	
V 2.0	6-13-2000	
V 2.1	1-9-.2001	
V 2.11	7-3-.2001	Mounting holes
V 2.2	11-20-.2001	Centronics status, position counter, adjustable mark length, Euro character, auto paper load for label control, memory limitation for TINIT
V 2.21	5-6-.2002	Transmitter disable in interface parameter of the serial interface
	5-8-.2002	Message & printing can be turned off in case of transfer errors (starting with software GE-3052)
	5-13-2002	Data mode
	7-23-2002	New paragraph: 5.3.2.2 Load Level of the Outputs (J2/Parallel)
	8-6-.2002	Important typing error: SPI Bus instead of SCI Bus under 6.2. Preconfigured Cables, PC Connection Cables
		GKA-351 has nothing to do with "GAP Sensor" under 6.2. Preconfigured Cables
V2.22	10-30-2002	4.5.2.3. Programming and Erasing: Number = 256 x <High-No> + <Low No> instead of 255 x ...
V2.23	11.04.2003	4.1. three standard fonts / 4.2.cyr. font / 4.4.1.; 4.6.1, and 5.3.3. buffer(emptying) / 4.3.2., and 4.4.3. Form Mode / Standard Mode / 4.5 T10 and T15 added / 4.4.8.3. Option LED

2. Printer Mechanism Series FTP6x2 - Features, Summary

	Unit	FTP622	FTP632	FTP642
Weight	g	81	94	125
Width (a)	mm	82	108	138
Length	mm	48		
Height	mm	20		
Printing Width	mm	56	72	104
Paper Width	mm	57,5 / 59,5 ± 0,5	79,5 / 84,5 ± 0,5	111,5 / 113,5 ± 0,5
Resolution	Pkt/Linie	448	576	832
	Pkt/mm	8,0		
Max. Print Speed	Linien/s	640,0		
	mm/s	80 (Typ. 80)	80 (Typ. 65)	80 (Typ. 50)
Voltage of Logic Vcc	V	5VDC ± 5%		
Power Voltage Vp	V	24 VDC ± 10%		
Power Current Av.	A	1	1,50	2
Power Current Max	A	2	3	4
Life Span	km	50		
Operating Temperature	°C	0 - 50°C		
Humidity	%	20 - 85		

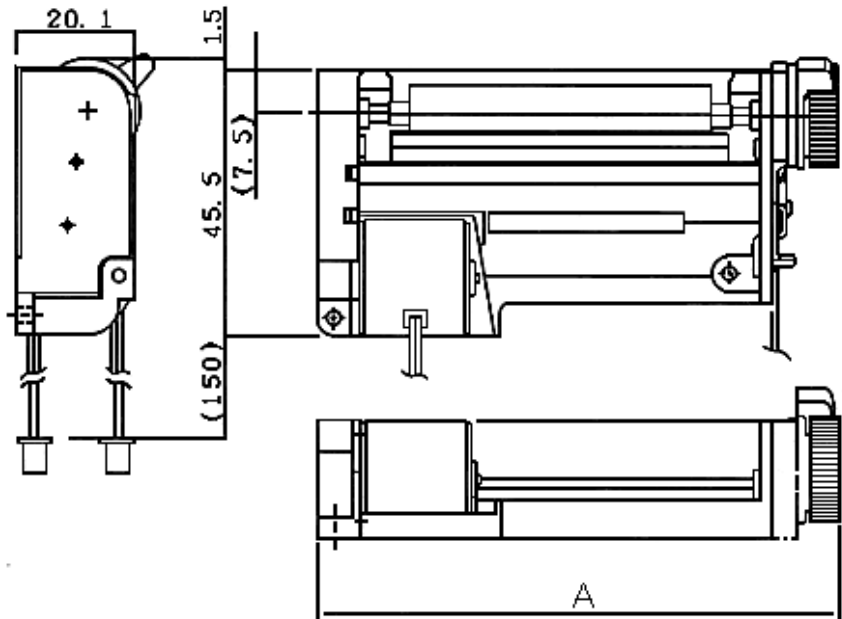
Printing:

A fixed print comb prints with 8 dots/mm on 58/60, 80/85, or 112/114 mm wide thermal paper.

The paper guide in the front is used for narrower paper. The paper guide in the back is used for thicker papers and label printing.

Paper Guide:

A stepper motor transports the paper forward and reverse. For paper insertion, lift the lever at the printer mechanism. By lifting the print head, the paper can be inserted with a manual wheel.



Sensors:

A reflex light barrier ensures that paper is inserted.

Two different printer mechanisms are available: The model MCL001 has the sensor located at the front paper guide, while the model MCL002 has it at the back guide.

A switch monitors the position of the head lever.

The head temperature is monitored by a thermistor.

Mounting:

The mechanism is installed in a stable plastic frame, and can be mounted with 2 hooks and 3 screws.

3. Controller Board GCT-6883/6884 - Features, Summary

GCT-6883 / 6884 with FTP6x2	Unit	GCT-6883	GCT-6884	Comment
Weight	g	60	70	
Length	mm	118,51	96,5	
Width	mm	58,6	58,6	
Height	mm	15	15	
Logic Voltage	V	24VDC \pm 10%		11 - 26.5 VDC on request
Logic Current	mA	60,0		Interfaces not connected
Operating Temperature	°C (°F)	-10 - 65		Environment
Storage Temperature	°C (°F)	-20 - 85		Environment

Compact Design:

GeBE designed the dimensions of the controller board (L x W x H = 96.5 x 5.68x 15 mm³), so it fits directly underneath the printer mechanism. This is achieved through an SMD technique. It is provided with matching mounting holes.

Power Supply:

Due to the high currents, electricity is conducted through screw clamps. Digital power is supplied through an integrated voltage converter from the power component.

Parallel Interface:

The parallel interface (similar to Centronics) is carried out through a 16 pin connector on the board.

Serial Interface:

The RS232 interface (standard component) is carried out through a 10 pin connector on the board.

If TTL levels are required (e.g. for external level converters), the internal converter can be replaced by 0-Ohm bridges. Handshake lines that are not active are terminated through solder bridges on the board.

Several different interface adapters can be connected to the serial TTL interface. These adapters allow e.g. an electrically insulated optical coupling or a RS-422, RS-485 or a 20mA current loop.

The Periphery:

A paper rewinder, a remaining paper sensor, and an AUX sensor can be connected. The AUX sensor can be used as a **paper output sensor** during operation with a cutter, as a **Label peeling sensor** or as a **gap sensor** for label printing.

.Console:

A console with max. 2 control buttons (feed,test) and 2 LEDs (status,options) can be connected to an 8 pin connector.

Central μ -Computer System:

The heart of the controller board is a system of a micro processor with a 1 kbyte RAM and a 32kbyte flash ROM. A serial EEPROM can be assembled optionally. Settings, custom texts, and logos can be filed in up to 32 kbyte.

Monitoring, Watchdog:

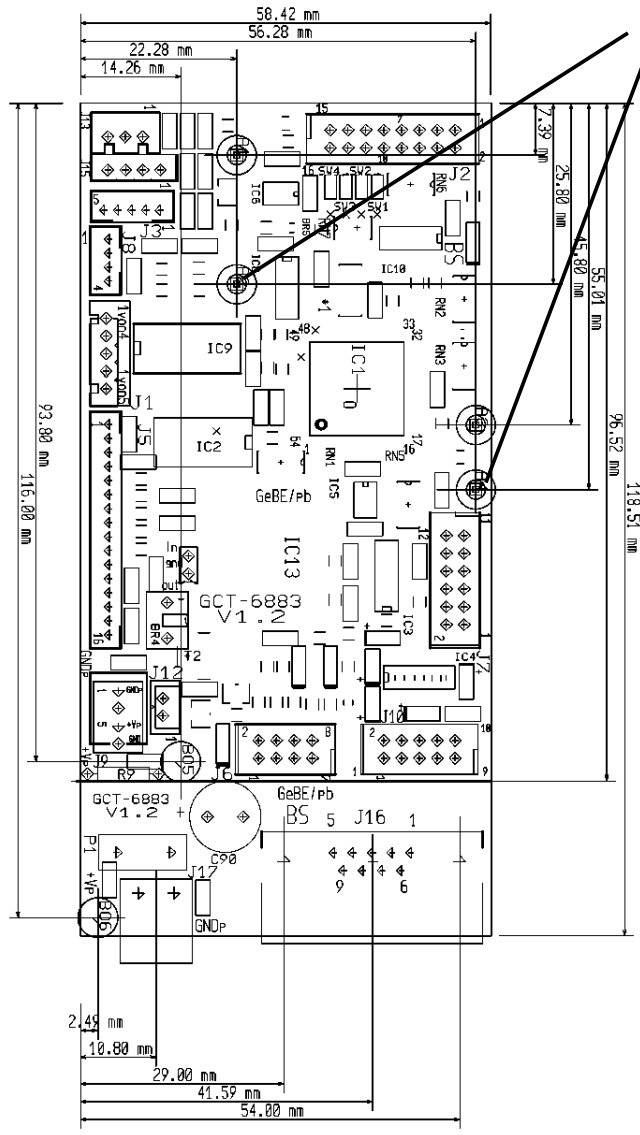
In order to permanently ensure a correct function of the controller board, even in an environment with high electromagnetic interference, the controller has a built-in operating voltage control and a watchdog.

Self Test:

A test printing can be initiated with the test button, or also through the feed button during reset.

Cutter:

The controller can control an auto cutter that is available as an option. The user can choose between cutting and perforating by command.



Please do not use this holes for assembling

4.3. Command Set

4.3.1. Nomenclature

The following terms are used in the tables below:

If possible, all codes and parameters of a command are named with their ASCII name. If that does not make sense, a hexadecimal value is given.

Hexadecimal values that appear in the comment text are marked with a preceding \$-symbol.

Control codes are written in pointed brackets (<LF> = Line feed: = \$0A).

Characters of the character set are in quotes ("E" = \$45).

Variable parameters are symbolized by small letters (l, m, n ...).

2-byte values consist of a leading 'Most Significant Byte' (MSB), and an immediately following 'Least Significant Byte' (LSB). They calculate the value $t = \text{MSB} * 256 + \text{LSB}$.

4.3.2. Table of Commands

Command (ASCII)	Function
<CR>	Print command, one line paper feed
<CR> <LF>	Print command, one line paper feed
<LF>	Print command, one line paper feed
<LF> <CR>	Print command, one line paper feed
<FF>	Form feed to a set length or flag (TOF)
<ESC> "@"	Initialize the printer through a RESET pulse
<ESC> "A"	Erase data in print buffer
<ESC> "b" <P-Liste>	Print bar code (EAN8, EAN13, CODE 39, 2 out of 5 interleaved)
<ESC> "C" n	0: full cut / 1: half cut / 2: cutter init
<ESC> "D" n	Print text mode / data mode
<ESC> "F" lh ll	Paper feed by lh x 256 + ll lines
<ESC> "G" g1....gn	Print pixel graphics, graphic line (old command)
<ESC> "g" n g1....gn	Pixel graphics PCL5, print graphic line with a length of n byte
<ESC> "H" n	Change character height from 0: normal height to 7: 8 x height
<ESC> "h" n	Set virtual width of the printer mechanism
<ESC> "I" n	Print black on white / white in black
<ESC> "j" n	Control LED 2 (option LED)
<ESC> "k"	Send back current status
<ESC> "L" n	Print with / without underline
<ESC> "l" ph pl	Select page length
<ESC> "M" n	Print black / gray
<ESC> "m" n	Select graphic mode
<ESC> "N" ph pl	Absolute TAB to dot position $p = 256 \times ph + pl$.
<ESC> "n" n <Data>	Send back data string through serial interface
<ESC> "o"	Set beginning of page
<ESC> "P" n	Select character set no. n
<ESC> "p" n m	Select form or standard mode, and set distance between the selected light barrier and the print head
<ESC> "q" "Nr"	Auto load with closed print head in form mode
<ESC> "Q" n	Select print quality, from 0: lower quality to 3: high quality
<ESC> "R" ph pl	Relative TAB forward/reverse by p dots; $p = 256 \times ph + pl$
<ESC> "S" n	Increase horizontal spacing
<ESC> "s" n	Load stored text file
<ESC> "T" x	Print stored text file no. x. $x = \{ 0, \dots, 9 \}$
<ESC> "u" n	Erase stored text file.
<ESC> "V" "X"	Send synchronous character "X" through the serial interface
<ESC> "v"....	Read out stored text file or statistics.
<ESC> "W" n	Print normal width / double width
<ESC> "x" n	enable/disable restoring messages in the messagebuffer
<ESC> "Y" n	Select blackening of paper individually (n= 10 ...75)
<ESC> "[" n	Select power consumption (n= 32 ...96)
<ESC> "\" lh ll	Reverse paper feed by lh x 256 + ll lines.
<ESC> "]" n	Select baud rate and interface parameters
<ESC> "]" n	Set marker length in print lines
<ESC> "_" n	Warte, bis Etikett entnommen (only aux light barrier)
<ESC> " " n m	Request of the Centronics Status

4.4. Command Set - Detailed Descriptions

4.4.1. Print Commands

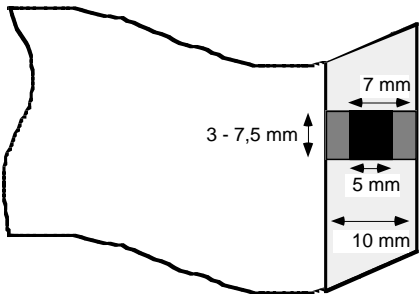
Command (ASCII)	Command (hex)	Function
<CR>	0D	Print command, one line paper feed. An immediately following <LF> will be ignored.
<LF>	0A	Print command, one line paper feed. An immediately following <CR> will be ignored.
<CR> <LF>	0D 0A	Print command, one line paper feed.
<LF> <CR>	0A 0D	Print command, one line paper feed.
Characters > Characters/Line		Characters that do not fit in a line will initiate the printing of that line.
String longer than 120 characters		Besides the printable characters, a large number of control characters can be written into the character buffer without initiating the printing of the following line. This could result in a blocking of the printer. Therefore, the printing of a line will be initiated, when the data string for the structure of a line reaches about 120 bytes or datas, even if the description of the line is not complete. For buffer size see 5.3.3. Serial Interface XON/XOFF
<ESC> "V" "X"	1B 56 x	Print and report synchronous character "X" through the serial interface. If the line buffer is not empty, this command will also initiate the printing of the current line. See also 4.4.7.3.

4.4.2. Positioning (Horizontally and Vertically)

Command (ASCII)	Command (hex)	Function
<ESC> "F" l _h l _l	1B 46 l _h l _l	Paper feed by l _h x 256 + l _l lines. This command can only be given at the beginning of a line and will be ignored otherwise. The transport is limited to 300mm (2400 dot lines).
<ESC> "\ " l _h l _l	1B 5C l _h l _l	Reverse paper feed by l _h x 256 + l _l lines. Limited to 300mm (2400dot lines). This command can only be given at the beginning of a line and will be ignored otherwise. Do not use this command, when a paper rewriter is used. After a reverse feed, the printer will feed forward for 8 dot lines to compensate for the gear play. ATTENTION: The paper may not be transported too far backwards. Otherwise, the paper will become mis-aligned, so the rubber roll will not be able to transport the ejected paper forward again.
<ESC> "N" p _h p _l FTP622: n = 448 FTP632: n = 576 FTP642: n = 832	1B 4E p _h p _l	Absolute TAB to dot position p = 256 x p _h + p _l ; 0 p _l n. This command allows an exact positioning to the dot at a print start position for text and bars within a line. Here, dot n outside the print line represents a position, at which the printer expects the next command. This way, a command (e.g. Print gray") can be effective up to the last position n-1. After that, it can be canceled (e.g. "Print black"). If the requested positioning exceeds the available span of a line (0 ... n), the command will be ignored.
<ESC> "R" p _h p _l FTP622: n = 56 FTP632: n = 72 FTP642: n = 104	1B 52 p _h p _l	Relative TAB forward/reverse by p dots; l p = 256 x p _h + p _l p is determined as an integer number with plus or minus sign as follows: p _h := FFFD FFFE FFFF 0000 0001 0002 0003 ... p := -3 -2 -1 0 +1 +2 +3 ... If the requested positioning exceeds the available span of a line (0 ... n), the command will be ignored.
<ESC> "h" n	1B 68 n	Select the width of the printer mechanism in bytes. This command only works for text printing. It can be used to change the number of characters per line. The minimum width is 24Byte (24 mm).

4.4.3. Form Feed, TOF

This Printer can be used to print on Labels or Formulas with a Blackmark or a Hole = form mode. This mode is set by selecting a light barrier for "label gap" recognition through <esc> "p".

Command (ASCII)	Command (hex)	Function
<FF>	0C	Form feed: Printing and line feed up to recognition of the TOF flag or the set page length. A form feed resets the page counter to zero. If the length of the form is exceeded and the counter overflows during the printing process, the position counter will stop at the page length value. A form feed will then only set the counter to zero. A reverse transport will be considered, even if it exceeds the limit of the form.
<ESC> o	1B 6F	Set beginning of page to current cursor position. This command will set the internal position counter to zero.
<ESC> "v" "g"	1B 39	Read cursor-position counter: (only in the form mode) The counter is at zero after reset and is counted up or down through forward or reverse paper transport. The counter is also reset to zero after a FF, or with the command "Set beginning of page" (ESC o). Afterwards the controller is reporting back with 8 hexadecimal digits that represent the current transport in lines from the margin of the current form. Important: If this command is given immediately after printable data, it may be processed before all lines have been printed. For this reason, a sync command should be given before the "read position" command in order to delay the processing until the printer is finished processing data.
<ESC> "_ " n	1B 5F	Wait until label was taken , plus n x 25 ms This command is given after a form feed. Refers to the AUX-LS (to be mounted on the front of the printer)
<ESC> l <High-Feed> <Low Feed>	1B 6C xh xl	Set page length in 1/8 mm. Sets the form feed length for operation without light barrier, or the maximum feed length as a termination criterion, when light barriers are used. If a gap is not found or a flag is recognized during the set length, when the light barriers are in use, the feed will be stopped. This command automatically sets the beginning of the page. Attention: For the MCL001/303, the flag will be located on the sensitive side, and for the MCL002/304 on the back side of the paper. The area of the flag may not be printed on. The beginning of the form is not the same as the flag, but depends on the positions of the light barriers. 
<ESC> "}" <length of marker in lines>	1B 7D n	Set marker length in print lines: (1 line = 1/8 mm) The default setting after reset is 3mm (24 lines). The maximum length is 7 mm (56 lines). Please note: It is not the actual marker length that is set, but the distance that the light barrier will "see" black for. (or a value below this length). At the margins of the marker, the light barrier may still report "paper present", depending on the marker and the paper.

Command (ASCII)	Command (hex)	Function
<ESC> p <distance> <flags>	1B 70 n m	<p>The parameter <light barrier distance> indicates the distance of the light barriers from the print comb minus label gap in 1/2 mm. (distance between internal light barrier and print comb = 5mm = 0Ah). The gap has to be considered when labels are used. A gap is recognized, when PE, which represents a gap or a flag, is reported for at least 5 mm. When the printer recognizes a gap, it will feed by the selected light barrier distance. If the light barrier is installed behind the print head, the reverse feed has to be done manually. <i>Never feed back a label that already left the print head.</i></p> <p>Authorized values for<light barrier flags>: xxxx xx00 b no light barrier, default = standard mode xxxx xx01 b internal paper end light barrier = form xxxx xx10 b NPE - light barrier (reflex type) mode xxxx xx11 b AUX - light barrier (fork type) = only relevant in form mode The remaining bits should be set to zero.</p> <p>Paper end recognition In the form mode, a PE can only be recognized, while the motor is moving. A PE is not triggered, when paper is removed from the inactive printer. However, it is triggered, if paper is not recognized for 60 dot lines (7.5 mm) with a moving motor. Therefore the gap or the marker can not extend beyond 7 mm.</p> <p>Insert paper (only relevant for form mode) Since the printer can not distinguish between a marker and a PE signal at the time the power is turned on, an auto paper load, like in normal mode, is not possible. The paper has to be inserted manually. If bit 2 of the <light barrier flags> is set and the print head is open, the printer will switch from the form mode back to normal mode. Therefore, an auto load can be performed, when the print head is open. With the closing of the print head, the printer will return to the form mode. During the auto-load transport, a marker will be ignored. After the auto paper load, a text file will be processed at the time the print head is closed, even if the printer is positioned at a marker. This text file contains a short feed, followed by a FF. The text file T10 will be executed after the head is closed, whether the printer is at a marker position or not. This file contains a short feed, followed by a form feed command. Text file T10 causes an instruction termination with 104 non-printing characters (from GE 3115). These operations will only occur, if the print head is closed. During the short feed, the printer determines whether there is a PE, in which case it will stop further printing or feeding. Opening and closing the print head during operation will not initiate a form feed.</p>
<ESC> q <No.>	1B 71 <No.>	<p>Auto load with closed print head: If a PE status is recognized at the time of the command input, the printer will switch to text file <No>. If the text file <No> contains a feed command, the paper will be transported by a marker length. As soon as the paper is detected, a FF to the next marker will occur. The command has to be at the end of the TINIT.</p> <p>Example: If the light barrier detects black when the printer is turned on, it will check for a marker. At the same time, the paper will be fed by the maximum marker length (here: 10 mm). If the light barrier still reports black afterwards, the paper end is determined. If it detects white, the paper is transported back to the original position (10 mm), and the paper status is ok. Due to the gear play, an exact positioning will not be possible.</p> <p>TINIT --> ...ESC q2 T2 --> ESC F <00h><50h> ESC qA ESC / <00h><50h></p> <p>Significance of text file "A": Text file "A" is empty. Its only significance is that in case of a PE, the calling file will be closed with the command ESC "qA". With this, the reverse paper transport can be prevented in the text file "T2" during PE.</p>

4.4.4. Formatting

4.4.4.1. Selecting the Character Size - Character Set, Width, Height

Command (ASCII)	Command (hex)	Function
<ESC> "P" "n"	1B 50 n	Select character set no. n. n = 1 ...number of character sets The controller masks value n with \$0F. Therefore, it can also be put in as an ASCII character "1", "2", "3", All character set can be mixed in one line.
<ESC> "H" "n"	1B 48 n	Print n + 1 times height. n := ASCII character "1", "2", "3", ... "7" 0: normal height, 1: double height, 2 : triple height, 7 : 8x height This command can be mixed with other heights within the same line.
<ESC> "W" "1"	1B 57 31	Print double width. This command can be mixed with normal width in the same line and will be valid until cancelled.
<ESC> "W" "0"	1B 57 30	Print normal width. This command will be valid until cancelled. This setting will follow a RE-SET.

4.4.4.2. Character Layout

Command (ASCII)	Command (hex)	Function
<ESC> "I" "0"	1B 49 30	Print black on white. This command will be valid until cancelled.
<ESC> "I" "1"	1B 49 31	Print white in black. This command will be valid until cancelled.
<ESC> "L" "0"	1B 4C 30	Print without underline. This command will be valid until cancelled. This setting will follow a RESET.
<ESC> "L" "1"	1B 4C 31	Print with underline. This command will be valid until cancelled.
<ESC> "M" "0"	1B 4D30	Print black. This command will be valid until cancelled. This setting will follow a RESET.
<ESC> "M" "1"	1B 4D31	Print gray. This command will be valid until cancelled. Does not work for graphic commands.
<ESC> "S" n	1B 52 n	Increase horizontal spacing (0 ≤ n ≤ 15; default=0) All subsequent characters will be printed with an additional space of n pixels (spaced characters).

4.4.4.3. Print Mode - Text / Data Mode and Quality Mode

Command (ASCII)	Command (hex)	Function
<ESC> "D" "n"	1B 44 30	Printing Line rotated by 180°, first line at the bottom page margin Print n := 0 text mode / n:= 1 data mode This command will not work for graphics. This command can be given at any position within a line, as long as the line is not completed. It will be valid until cancelled by the corresponding command. After RESET, the status predefined by switch 4 will go into effect.
<ESC> "Q" "n"	1B 51 n	Select letter-quality mode: The printer can simultaneously transport the paper during printing. This allows faster printing, however, it reduces the print quality. Four print quality levels can be selected, from " 0" for high print speed and lower print quality (standard setting), to "3" for slow print speed and high print quality. This command will be valid until cancelled.

4.4.5. Graphic Command, Compatible to Other GeBE Printers

Command (ASCII)	Command (hex)	Function
<ESC> "G" g1.....gn FTP622: n = 56 FTP632: n = 72 FTP642: n = 104	1B 47 g1....gn	<p>Pixel graphics (print a horizontal graphic line): g1 ...gn:= graphic bytes. In text mode, beginning from the left to the right, dot 0 is the MSB of the first byte, the dot on the very right is the LSB of the nth byte. A "1" in the respective bit position represents a black dot in the line. After the nth byte, the printer will automatically return to the character mode. It will ignore all commands while processing these n bytes.</p> <p>Mixing with text: If the graphic command is given and the current text line has not been completed by <CR> or <LF>, text and graphics will be mixed. The graphics will then begin in the top dot line of the text line. If the graphics were longer than the current text, the new text will begin with its top line in the line immediately following the graphics.</p>

4.4.6. Extended Graphic Commands (see PCL Specification)

The structure of the graphic data in these modes correspond to the commands of the PCL specification from version 4 on.

They are compatible with the Windows Compression procedure.

The processing of the compressed data takes about as much time as bit map printing alone.

Command (ASCII)	Command (hex)	Function
<ESC> "m" n	1B 6D n	<p>Sets the current graphic mode. 0 : Unencoded 1: Run length encoded 2: TIFF (4.0) encoded 3: Delta row encoded 4: X-byte offset (additional second parameter) 5: Reset delta row seed row</p> <p>This command will be valid until cancelled. The default value is 0.</p> <p>With the command <ESC>" m"\$04 n the graphics can be moved to the right. In order to e.g. set a left margin of 10 mm = 80 pixels, you give the command <ESC>" m" \$04 \$0A. Graphics that exceed the right margin are going to be cut off. The command <ESC>"m" \$05 will erase the seed row of the delta row graphics. The seed row is the current line that was printed last. The new line information is compared to the seed row. After the new line is printed, it will become the seed row. This command should always be given at the beginning of graphics that contain delta row commands. This is not necessary, if the first graphic line is not a delta row graphic.</p>

Command (ASCII)	Command (hex)	Function
<ESC> "g" n g1.....g n	1B 67 n g1....gn	<p>Pixel graphics (print a horizontal graphic line): Mixing with text: If the graphic command is given and the current text line has not been completed by <CR> or <LF>, text and graphics will be mixed. The graphics will then begin in the top dot line of the text - line. If the graphics are longer than the current text, the new text will begin with its top line in the line immediately following the graphics.</p> <p>0 : Unencoded n := length of the graphics in bytes, g1 ...gn:= graphic bytes to be printed. In text mode, beginning from the left to the right, dot 0 is the MSB of the first byte, the dot on the very right is the LSB of the nth byte. A "1" in the respective bit position represents a black dot in the line. After the nth byte, the printer will automatically return to the character mode. It will ignore all commands while processing these n bytes. The command <ESC> "g" n g1...gn is synonymous with the old command <ESC>" G" g1...gn, if n = n max. The graphic mode "0" for unencoded is the default setting. We recommend to use the den ESC g command for new projects.</p>
<ESC> "g" n <DATA>	1B 67 n <DATA>	<p>1 : Run length Encoded. n := length of the following graphic bytes. Run length interprets graphic information in byte pairs. The first byte is the repetition count byte for the second byte. A "0" for the repetition count byte means that the graphic byte will be printed once without being repeated, i.e. that a "1" means that the graphic byte will be printed twice. The repetition count byte has a range of 0 - 255, which translates into a print factor of 1 to 256. The second byte contains the graphic information that is to be printed. In text mode, beginning from the left to the right, the dot on the very right is the LSB. A "1" in the respective bit position represents a black dot in the line. After the line is completed, the printer will automatically return to the character mode. It will ignore all commands while processing these n bytes.</p> <p>2 : TIFF (4.0) Encoded.. n := length of the following graphic bytes. TIFF interprets graphic information as TIFF "pack bits" TIFF combines features of unencoded and run length encoding. The graphic information is preceded by a control byte. The control byte indicates (sign bit), whether the following byte is a graphic byte that is to be repeated (up to 127 times), or whether a number of bytes are following (up to 127) that are to be printed as bit map. A positive control byte is expecting bit map information, a negative control byte (two's complement) is expecting a repeat byte.</p> <p>3 : Delta Row. n := length of the following graphic bytes. Delta row will pick out the bytes from a line that are different from the bytes in the preceding line and copy only these. If only one bit is different, just that bit needs to be copied. The delta data consists of a command byte and 1 to 8 replacement bytes. The command byte contains two pieces of information, the number of replacement bytes (bit 7, 6, and 5), and the relative left offset of the last byte that was changed (bit 4, 3, 2, 1, and 0). The value 31 as offset expects a following <u>additional</u> offset byte. The value 255 of this additional offset byte expects another one ... In text mode, beginning from the left to the right, the dot on the very right is the LSB. A "1" in the respective bit position of a replacement byte represents a black dot in the line. After the line is completed, the printer will automatically return to the character mode. It will ignore all commands while processing these n bytes. Graphics and text can not be mixed with delta row.</p>

4.4.7. Bar Code

If there is print data in the current line, the printer will print them and then start a new line. In the new line, the bar code will be printed. Bar code is printed without plain text.

Command (ASCII)	Command (hex)	Function
<ESC> "b"	1B 62 <	Print bar code.
<Type> <Size> X _h X _l Y _h Y _l < Number> <String>	Type> <Size> X _h X _l Y _h Y _l n <String>	Type "A" - Code-39 with plain text; "a" - dito without plain text "B" - Code-2 of 5-interleaved with plain text; "b" - dito without plain text "C" - EAN 13 with plain text; "c" - dito without plain text "D" - EAN 8 with plain text; "d" - dito without plain text Size = Width of bars and spaces (0 ...7) $X = X_h * 256 + X_l$ Start position of the code in pixels as distance from left margin $Y = Y_h * 256 + Y_l$ Height of the bar codes in pixels without the plain text. Y is internally rounded to whole millimeters, e.g.:Y = 406 is printed as 50.0mm (Y \square 100mm = 800pixels). n = Number of bar code characters (n \square 30). String = Characters that represent the bar code information (not all characters are allowed; see below).

Available Bar Sizes:

Size (hex)	Width [Pixels] Narrow Element	Width [mm] Narrow Element	Width [Pixels] Wide Element	Width [mm] Wide Element
0	2	0,250	5	0,625
1	2	0,250	6	0,750
2	3	0,375	7	0,875
3	4	0,500	9	1,125
4	5	0,625	12	1,500
5	6	0,750	14	1,750
6	7	0,875	16	2,000
7	8	1,000	18	2,250

Character Set:

Code-39: 1234567890ABCDEFGHIJKLMNOPQRSTUVWXYZ\$/.+%<Space>

Code 2 out of 5 interleaved: 1234567890 (The number of characters n has to be even.)

EAN13: 1234567890 (Other characters will only result in the printing of the text information, but not of the bar code itself. The check amount, which is the 13th character, is calculated and added by the printer itself.)

EAN 8: 1234567890 (Other characters will only result in the printing of the text information, but not of the bar code itself. The check amount, which is the 8th

character, is calculated and added by the printer itself.)

Code Width:

Code-39: $6 * \text{wide} + 14 * \text{narrow} + n * (3 * \text{wide} + 7 * \text{narrow})$
Special characters may slightly differ from this formula.

Code 2 out of 5 interleaved: $1 \cdot \text{wide} + 6 \cdot \text{narrow} + n \cdot (2 \cdot \text{wide} + 3 \cdot \text{narrow})$
 EAN13: narrow element * 95
 EAN 8: narrow element * 95

The printing of bar code will be ignored, when:

- a wrong type or an unknown size was given,
- the number n given was either too big, or did not correspond with the type.

A white area will be 'printed' instead of bar code, when:

- the right line margin or the maximum height of 100mm would be exceeded,
- characters were put in that do not correspond with the character set of the code.

If the bar code is ignored, the characters of the string will be printed as plain text.

4.4.8. Special Commands, Initialization Commands

4.4.8.1. Cutting

Command (ASCII)	Command (hex)	Function
<ESC> "C" "n"	1B 43 n	<p>n = 0 : full cut The paper is cut off completely.</p> <p>n = 1 : half cut The cutting is done, so one small bridge is left .</p> <p>n = 2 : initialize cutter This command will be entered in T-INIT, when a cutter is used. The controller will then check after each RESET, whether the cutter is in the home position. If it is not, it will be moved into the home position. If there is no cutter assembled, no error will be reported. If the cutter is not in the home position and can not reach it within about 2 seconds, the error message "C" for blocked cutter will be reported, and the printing will stop.</p>

4.4.8.2. Baud Rate, Interface Parameters

Command (ASCII)	Command (hex)	Funktion																																
<ESC> "j" <baud rate> <Mode-Flags>	1B 5D <baud rate> <Mode-Flags>	<p>Configurating the Serial Interface:</p> <p>The controller will switch to the new baud rate, as soon as prior characters have been decoded and sent to the printer mechanisms. Therefore, it may happen that the baud rate command is not processed immediately, and the old setting remains valid.</p> <p>For this reason, it is important to use this command only, when the controller is idle. A good time is after a reset. At this time the printer can be inquired with the feedback of a synchronizing command (see "Timed Synchronization with other Devices").</p> <p>Authorized values for <baudrate> (binary): 1 : 1,200 Bd , 2: 2,400 Bd , 4 : 4,800 Bd , 9: 9,600 Bd , 19 : 19,200 Bd 38 : 38,400 Bd , 57 : 57,600 Bd , 76 : 76,800 Bd , 115 : 115,200 Bd</p> <p>Authorized values for <mode-flags> (binary):</p> <table> <tr> <td>0xxx xxxx b</td> <td>Serial interface transmitter turned on (default)</td> </tr> <tr> <td>1xxx xxxx b</td> <td>Serial interface transmitter turned off</td> </tr> <tr> <td>x1xx xxxx b</td> <td>Framing/overrun - error - output turned on</td> </tr> <tr> <td>x0xx xxxx b</td> <td>Framing/overrun - error - output turned off (default)</td> </tr> <tr> <td>xx00 xxxx b</td> <td>no parity</td> <td>xxxx 0xxx b</td> <td>7 data bits</td> </tr> <tr> <td>xx01 xxxx b</td> <td>zero parity</td> <td>xxxx 1xxx b</td> <td>8 data bits</td> </tr> <tr> <td>xx10 xxxx b</td> <td>odd parity</td> <td>xxxx x0xx b</td> <td>1 stop bit</td> </tr> <tr> <td>xx11 xxxx b</td> <td>even parity</td> <td>xxxx x1xx b</td> <td>2 stop bits</td> </tr> <tr> <td></td> <td></td> <td>xxxx xx0x b</td> <td>mode flags disabled</td> </tr> <tr> <td></td> <td></td> <td>xxxx xx1x b</td> <td>mode flags enabled</td> </tr> </table> <p>As a result of a parity or framing error, a "?" may be printed in place of the defective character, and a "?" followed by an "X" may be sent through the RS232-</p> <p>After a RESET, the DIP switch settings are checked, and then the baud rate is set accordingly. The serial interface transmitter will be disabled at first to prevent messages with different settings being sent than the ones selected. In order to select a different setting, it has to be stored in the TINIT.</p> <p>The command ESC] <00h> <00h> activates the serial interface transmitter without changing the current parameter settings. This command is stored in the TINIT. If the EEPROM TINIT is not used, this command must be positioned after the baud rate command.</p> <p>Through bit 7 of the MODE flags, the output through the serial interface can also be turned on or off completely.</p>	0xxx xxxx b	Serial interface transmitter turned on (default)	1xxx xxxx b	Serial interface transmitter turned off	x1xx xxxx b	Framing/overrun - error - output turned on	x0xx xxxx b	Framing/overrun - error - output turned off (default)	xx00 xxxx b	no parity	xxxx 0xxx b	7 data bits	xx01 xxxx b	zero parity	xxxx 1xxx b	8 data bits	xx10 xxxx b	odd parity	xxxx x0xx b	1 stop bit	xx11 xxxx b	even parity	xxxx x1xx b	2 stop bits			xxxx xx0x b	mode flags disabled			xxxx xx1x b	mode flags enabled
0xxx xxxx b	Serial interface transmitter turned on (default)																																	
1xxx xxxx b	Serial interface transmitter turned off																																	
x1xx xxxx b	Framing/overrun - error - output turned on																																	
x0xx xxxx b	Framing/overrun - error - output turned off (default)																																	
xx00 xxxx b	no parity	xxxx 0xxx b	7 data bits																															
xx01 xxxx b	zero parity	xxxx 1xxx b	8 data bits																															
xx10 xxxx b	odd parity	xxxx x0xx b	1 stop bit																															
xx11 xxxx b	even parity	xxxx x1xx b	2 stop bits																															
		xxxx xx0x b	mode flags disabled																															
		xxxx xx1x b	mode flags enabled																															

4.4.8.3. Option LED

Comm. (ASCII)	Comm. (hex)	Function
<ESC> "j" [flashing mode]	1B 6A n	<p>Controls the "optional" LED2 (at solder pad TP2):</p> <p>The lower 2 bits of parameter n [flashing mode] control the flashing speed Values of the lower 2 bits (binary):</p> <p>xxxxxx00 : app. 5.0 s xxxxxx01 : app. 2.5 s xxxxxx10 : app. 1.25 s xxxxxx11 : app. 0.63 s</p> <p>The upper 5 bits of n set the pulse/pause ratio. Bit 2 should always be set during flashing.</p> <p>Values of the upper 5 bits (binary): 000000xx : LED permanently off 000011xx : 1/31 111111xx : 31/31 LED permanently on</p> <p>With this function, a programmable TTL output may be produced as well, e.g. to control a cassier drawer,etc.</p>

4.4.8.4. Power Consumption, Adjustment of Blackening

Command (ASCII)	Command (hex)	Function
<ESC> "[" n	1B 5B n	<p>Set maximum power consumption: Sets the number of pixels that can collect current simultaneously, n multiplied by 4: The peak current is calculated as follows:</p> <p>$I = Vp \cdot \text{number of pixels} / 1500 \text{ Ohm} (+ IV_{cc} + I_{\text{motor}}(1.0A))$</p> <p>FTP622: minimum 128 pixels : n = 32 , up to maximum 384 pixels : n = 96</p> <p>FTP632: minimum 128 pixels : n = 32 , up to maximum 384 pixels : n = 96</p> <p>FTP642: minimum 192 pixels : n = 48 , up to maximum 384 pixels : n = 96</p>
<ESC> "Y" n	1B 59 n	<p>Adjust the blackening of the paper individually. n is a factor between 10 (lighter) and 75 (darker). Values outside of this range will not change the current setting. 25 is the default value after a RESET. If different values are required permanently, the command can be entered in the stored text file TINIT. A invalid factor will not affect the actual blackening.</p>

4.4.8.5. Buffer Initialization Commands

Command (ASCII)	Command (hex)	Function
<ESC> "@"	1B 40	<p>Initializes the printer with a self-generated RESET pulse, just like after power-on. Between the receiving and the processing of this command some time will pass, which depends on the filling level of the buffer. Data that is received during this time will get lost due to the reset. Therefore, there has to be a waiting period of about 2s after this command has been given, before any print data can follow. Afterwards, the controller will report its state of readiness as usual through the serial interface.</p>
<ESC> "A"	1B 41	Erase the data in the line buffer.

4.4.8.6. Synchronization

With this command, the printer can be synchronized with superior or peripheral devices. As an example, a certain action is to be done, after a certain text was finished being printed. Since the printer has a buffer, the user normally would not know, when this is the case. However, the printer can report this moment back through the serial interface, if the synchronization command was given subsequently to the text that is to be printed. All available characters can be used as synchronization commands. This also allows the monitoring of complex program sequences. It is recommended not to use characters that are also used as error messages.

Command (ASCII)	Command (hex)	Function
<ESC> "V" "X"	1B 56 x	<p>Print and report synchronous character X through the serial interface. X: = all available characters. If the line buffer is not empty, this command will also initiate the printing of the current line.</p>

4.5. Stored Text Files

The GeBE concept for stored text files represents a kind of file system in the printer memory. The controller can store up to 13 text files (T0 - T9 ,TQ ..S) that can be selected by the user. In addition to that, there is a text file memory T-init, in which the controller initialization commands are filed. If e.g. a printer is supposed to print in data mode with double height and bold, the respective commands are entered in the stored text file T-init. After the RESET, the controller will first process these commands. A stored text file can be called through another.

When no text files are stored in the EEPROM, the standard text files from the flash will be used. As soon as there are text files in the EEPROM, they will be substituted for the flash files. This works by the command "<ESC>"t"<Nr.>" in the Flash file. Values between 1 kbyte and 16 kbyte can be used for the EEPROM. The software will check for an EEPROM and its size. EEPROM text files can also be addressed directly through "<ESC>" t"<Nr>".

There are two separated blocks of stored text files. Block 1 contains the text files T0 - T9, block 2 contains the text files T-INIT, TQ, TR, and TS . Each text file can be programmed independently, however, the files can only be erased as a block (block 1 or block 2). The statistics data is completely independent of the stored text files, and has its own buffer and commands.

Block 1: T0 - T9 as custom macros, logos, etc.

Block 2: T-INIT as Initialization macro

TQ, TR, TS (for e.g. firmware status, serial number,)

Block 2 can be blocked in the EEPROM through the hardware.

Then, block2 will always have 1/4 of the total memory available.

In a 1K EEPROM there is space for 200 Bytes, in bigger types 456 Bytes.

Stored Text File TINIT:

After a power-on RESET, watchdog RESET, or software RESET, the text memory t-init is called at the end of the software initialization. The commands that are filed in T-init can now be sent to the printer in order to change the parameters.

Stored Text Files TQ, TR, and TS: (only in flash)

These stored text files work like the stored text files T0-9 , however, their erasing is linked to T-init.

Applications are e.g. serial numbers or firmware status.

Die text file TQ contains the software number: e.g. "GeBE GE-2790"

Stored Text File T0:

The printing of the stored text file T0 can be initiated with the command "Print stored text file no. 0", or after a RESET. If the feed button is pressed during a reset, the printing of this text file will begin. As a standard, information on the printer is stored in this memory.

Stored Text File T1:

The printing of the stored text file T1 can be initiated with the command "Print stored text file no. 1", or through the input "Test" (Connect button.). In the standard program, the stored text file no. 1 is called as a part of stored text file no. 0 with the command "Print stored text file no. 1".

Stored Text file T15:

This text file <esc> T @ calls TINIT.

Stored Text file T10:

This text file {104 zeroes} <DEZ 12> is for label printing (form mode). It is called after paper was exchanged.

4.5.1. Processing of Stored Text Files

Command (ASCII)	Command (hex)	Function
<ESC> "T" "X"	1B 54 x	Print stored text file no. x. x:= { 0, ... 9,Q,R,S}. The processing is "transparent" for the controller, meaning that for the controller the data of the stored text file appears to come through an interface.
ESC "n" <NUMBER> <DATA>	1B 6E <NUMBER> <DATA>	Send string to serial interface: This command is entered with the data in a text file. It can be used to enter serial numbers and scan them by command. Example: serial number1234567890 in stored text file S ESC n <10><1234567890> is entered in TS. When ESC TS is called,1234567890 will be sent back to the host. This command is similar to the command "Send synchronous character". The only differences are that the controller will not wait for the synchronization, and that a whole string can be sent through the serial interface.

4.5.2. Management of Stored Text Files

4.5.2.1. Reading the EEPROM Memory Space

With these commands, the user can inquire before programming, whether there is still enough memory space available. The content of a text file will not be erased by another programming, but will remain unused in the memory. An erasing only occurs with the command ESC "V" "5".

Command (ASCII)	Command (hex)	Function
ESC "v" "5" "T"	1B 76 35 54	Reading the available memory for T0 - T9. Readout format: The numbers are transferred to the host in the hex format as 2 bytes of 2 hex numbers each. Attention: Zeros in stored text files are stored as <zero> <number of zeros>. A file ends with two zeros. Therefore, the actual storage requirement of a file can differ from its length: The space requirement decreases, when several zeros follow each other, and increases for single zeros.
ESC "v" "5" "U"	1B 76 35 55	Reading the available memory space for TINIT. Readout format: The numbers are transferred to the host in the hex format as 2 bytes of 2 hex numbers each.
ESC "v" "6"	1B 76 36	Reading the EEPROM size. Readout format: The numbers are transferred to the host in the hex format as 2 bytes of 2 hex numbers each.

4.5.2.2 Reading Stored Text Files

With this command, the content of any text file can be read. Attention: This command should NOT, when the XON/XOFF-protocol function is turned on. XON / XOFF characters in the file (e.g. in graphics) are transferred uncoded. When XON/XOFF protocol is used, it is also important, that the printer buffer should not be in the XOFF status, before this command is sent, and that no further data should be sent to the printer during the reading of the text file in order to avoid the sending of an XOFF character. Otherwise, the printer might generate XON/XOFF characters that the host interprets as part of the file.

Command (ASCII)	Command (hex)	Function
ESC "v" "7" <No> DUMMY	1B 76 37 <No> DUMMY	Reading out the EEPROM file <No>: (0....9) Number of the T-INIT := @ Two bytes will follow (<High> <Low>) that are coded to 2 hex nibbles each, stating the length of the file. This is followed by the data of the file. The dummy byte can have any value, it is necessary for programming reasons. The command for the reading of the text files may not be part of a text file itself. If it is, in case of an invalid text file no., or when an EEPROM file is not programmed, the letter string 'XXXX' will be sent instead of the 4 hex numbers.
ESC "v" "8" <No> DUMMY	1B 76 38 <No> DUMMY	.Reading out the FLASH file <No>: (0....9,TQ, TR, TS) Function like ESC "v" "7" See description above.

4.5.2.3. Programming and Erasing

Passwords are necessary for the programming and erasing of files. These can be set separately for erasing and programming, or for block 1 and block 2, just as needed. At this time, the passwords <PROG> and <ERAS> are used.

Command (ASCII)	Command (hex)	Function
ESC "s" <No> PROG <high number> <low number> <data>	1B 73 <No> PROG <high number> <low number> <data>	Programming of the text files 0 - 9: <No> = Number of text files to be loaded, e.g. "9" for T9. PROG is the password that protects against accidental erasing. A text file can be programmed several times in a row without erasing. However, a re-organization of the memory will not occur. If programmed again, the memory space used for the first program will be lost until the next erasing. 256 x <High> + <Low> is the number of bytes to be loaded without the command sequence. <Data> = Data bytes in number stated above. Writing speed: app. 200 bytes/sec
ESC "s" " @" PROG <high number> <low number> <data>	1B 73 40 PROG <high number> <low number> <data>	Programming the stored text file T-INIT : For a description, see <ESC> s<No>.....
ESC "u" "T" ERAS	1B 75 54 ERAS	Erasing the stored text files 0 - 9 The stored text files T0 - T9 can only be erased together. ERAS is the password/protection from accidental erasing.
ESC "u" "U" ERAS	1B 75 55 ERAS	Erasing the TINIT file. ERAS is the password/protection from accidental erasing.

4.5.2.4. Error Codes for Programming and Erasing

Messages	Message serial	Comments
Errors:		
EE_NOERR	"E0"	EEPROM command completed error-free
EE_ERR_INVALID	"E1"	Invalid text file no. or invalid statistics variable no.
EE_ERR_PW	"E2"	Wrong password for erasing or programming of text files or statistics variables
EE_ERR_FULL	"E3"	Text file memory overflow
EE_ERR_TIMEOUT	"E4"	The maximum programming time for an EEPROM byte was exceeded during programming.
	'E5' - 'E9'	Future Use

4.5.3. Statistics

Während der Annahme von Daten bzw. während des Drucks ist der aktive Zustand. Nach Druckende wird umgeschaltet in den Stromsparmmodus, bei dem bereits deutlich weniger Energie benötigt wird ($RS232 < 3mA$). Zur weiteren Verringerung der Stromaufnahme gibt es 2 weitere Power Down Modi, welche unterschiedliche Eigenschaften und Optionen aufweisen, den Power Off und Sleep Mode.

Im Power Off Modus

Im Sleep Modus

4.5.3.1. Reading the Statistics Values in the EEPROM

The statistics variables are each stored in 16 words in the EEPROM. The values of all 16 words are added up. Altogether, this results in a value range of $65535 * 16 = 1.048.560$. That corresponds to 100 km or 12 years of continuous operation. Due to the splitting into 16 words, the EEPROM bits are written 65,535 times maximum (The manufacturer guarantees 100,000). When the maximum value of 0FFFFFFhex is reached, this value will be kept. An overflow to ZERO is disabled.

Command (ASCII)	Command (hex)	Function
ESC "v" "0"	1B 76 30	Reading the number of cuts. Readout format: The numbers are transferred to the host in the hex format as 4 bytes of 2 hex numbers each. Example: 0000B3A9, representing 45814 cuts.
ESC "v" "1"	1B 76 31	Reading of the total running performance of the printer mechanism in 1/10 meters. Readout format: The numbers are transferred to the host in the hex format as 4 bytes of 2 hex numbers each. Example: 000001A9 corresponds to 425, representing 42.5m paper length. The counter status in the EEPROM is incremented every 800 dot lines during forward and reverse paper transport.
ESC "v" "2"	1B 76 32	Reading the operating time in 1/10 hours. Readout format: The numbers are transferred to the host in the hex format as 4 bytes of 2 hex numbers each. Example: 000001A9 corresponds to 425, representing 42.5 hours of operation.
ESC "v" "3"	1B 76 33	Reading the paper length since the last change of paper in 1/10 meters. The numbers are transferred to the host in the hex format as 2 bytes of 2 hex numbers each. Example: 009C corresponds to 156, representing 15.6 m paper length. The counter status in the EEPROM is incremented every 800 dot lines during forward paper transport. A reverse transport will only decrement the current status in the memory. Only, if this counter exceeds the status of the EEPROM by more than 800 dot lines, the EEPROM value will be updated. A paper end will set the counter to zero.
ESC "v" "4"	1B 76 34	Reading of the last 10 status messages. Readout format: The controller sends the last 10 error reports back sequentially. 10 bytes follow, corresponding to the last 10 errors. If less than 10 errors are stored, the remaining values will be filled with binary zeros.
ESC "x" "n"	1B 78 n	Store all warnings in the EEPROM Errorbuffer n = "0 " Enable (standard) n = "1 " Disable

4.6. Status Messages

4.6.1. Automatic Status Output

Errors are reported through the parallel interface, the serial interface, and the error LED. Besides the data and handshake lines, the parallel interface also contains feedback lines that are switched accordingly, when errors occur. However, because of the limited number of lines, the feedback of errors is not always clear, when several errors would have to be reported simultaneously. Most of the time, the most fatal error will be reported first. In this case, the serial interface has the advantage that errors are reported sequentially.

After an error was cleared, the corresponding small letter is sent, followed by an "X" if no further error is active.

Messages	Serial Interface		Busy	/Fault	Select	Paper End	Error-LED	Comments
Faultless operation:				1	1	0	LED on	
Reset	"R"			0	0	0		Level on the status lines only short-term during phase of initialization Message: < XON R X(or error)>
Watchdog reset	"R"			0	0	0		After system failure
End of error	"X"			1	1	0	LED on	Also after reset, software, and watchdog resets
Buffer empty	X ON							Buffer emptied except for < =33 characters < DC1> = \$11
Puffer full	X OFF	1						Buffer filled with 158 characters, leaving space for 33 characters <DC3> = \$13
Synchronous feedback	all characters							Processing synchronization commands each sent character
Errors:		OK		1	1	0		
Head lifted	"H"	"h"		1	0	0	flash 1:1	
Paper end	"P"	"p"		1	0	1	flash 1:1	
10% paper end	"Z"	"z"		1	1	0	flash 3:1	only message - printing not canceled
Aux sensor	"G"	"g"		1	1	0		
Cutter blocked	"C"	"c"		0	1	0	flash 1:1	
Temp. low	"K"	"k"		0	1	0	flash 1:1	Print head temperature too low
Temp. high	"T"	"t"		0	1	0	flash 1:1	Print head temperature too high
Vp too low	"U"	"u"		0	1	0	flash 1:1	Print head voltage not valid, first recognized with start printing
Vp too high	"M"	"m"		0	1	0	flash 1:1	
EE-OK	"E0"							EEPROM command completed error-free
EE-invalid	"E1"							Invalid text file no. or invalid statistics variable no.
EE-password	"E2"							Wrong password for EEPROM access
EE-overflow	"E3"							Text file memory overflow
EE-time out	"E4"							EEPROM byte programming time exceeded
Parity Error	"?"							Parity or. Framing Error/ printing not canceled

4.6.2. Inquiring the Current Status

With this command, the user can inquire the current status of the printer.

Command (ASCII)	Command (hex)	Function
<ESC> "k" n	1B 6B n	<p>Send back all current status messages. The controller sends back all current status messages sequentially. If there is no error to report, an "X" will be sent back. This command will not be processed immediately. Since it is treated like a printable character, the processing will not begin, before all characters that were sent prior have been processed. For this special case, the error messages can be repeated automatically. n = 0 : The repeat function is turned off. n = 1 ... 254 The current printer status is sent in intervals of app. 1/10s x n to the host n = 255: Single inquiry without influence on the set repetition time.</p>
ESC "v" "4" ONLY possible with EEPROM		<p>Reading of the last 10 status messages. Readout format: The controller sends the last 10 error reports back sequentially. 10 bytes follow, corresponding to the last 10 errors. If less than 10 errors are stored, the remaining values will be filled with binary zeros.</p>

4.6.3 Inquiring the status through the Parallel Interface

The status of the NPE and the AUX sensor as well as the last synchronous message can be requested by command.

A question is asked and afterwards answered in a time window.

The SELECT line and the PAPER END line get a new meaning in the time window.

The validity of the answer in the time window is stated by the SELECT line.

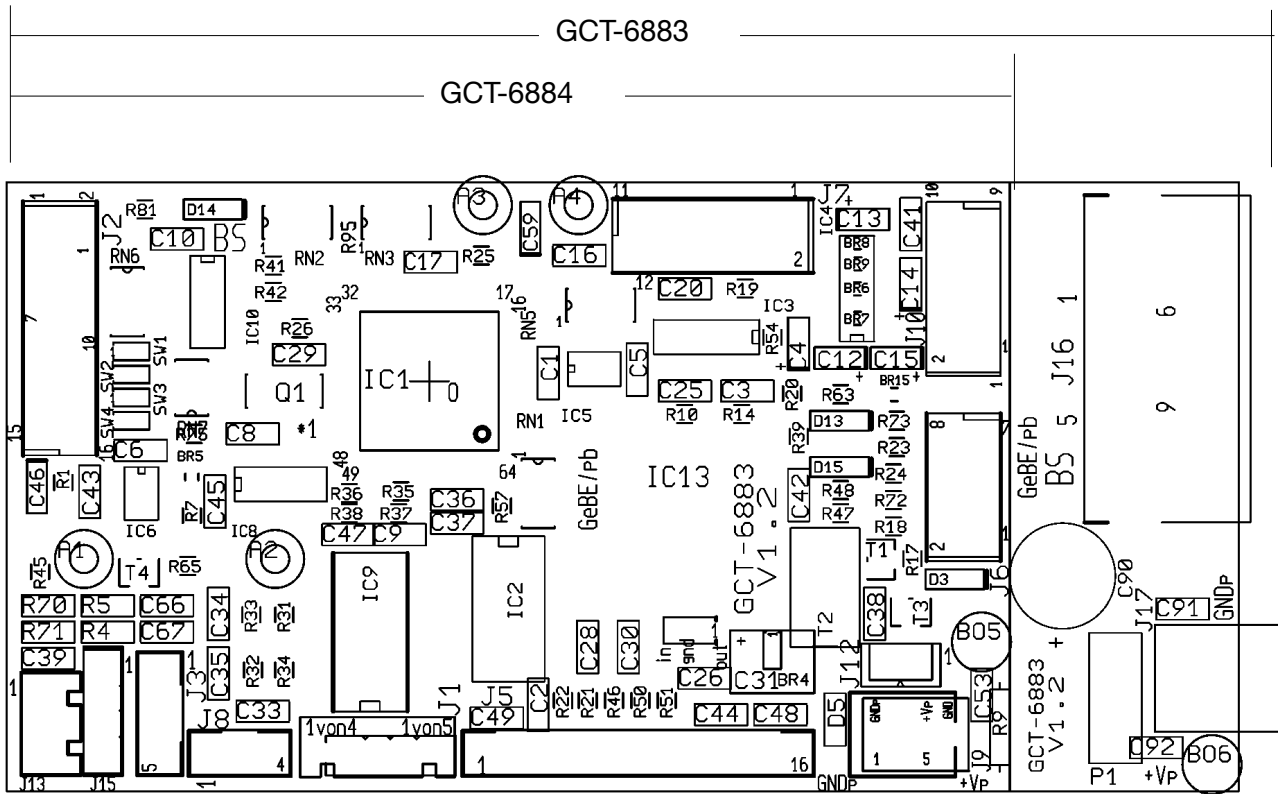
The PAPER END line is the YES / NO answer.

Command (ASCII)	Command (hex)	Function
ESC I "Parm1" <Parm2> <Parm3>	1B 7C "Parm1" <Parm2> <Parm3>	<p>Parm1: Which information is signalized: '0' : NPE Answer: PE : high = paper stock < NPE / PE : low = paper stock > NPE '1' : AUX Answer: PE : high = paper path open / PE : low = paper path used '2' : Sync character Answer: PE : high = last sync character = PARAM 2 PE : low = last sync character unequal PARAM 2</p> <p>All other parameters are undefined and don't give defined values.</p> <p>Parm2: Is only used for sync-character signalizing: A dummy value has to be given for the sensor request. The question: "Does the last sync-character equal Parm 2?" is answered through the PAPER END line.</p> <p>Parm3: Signalizing time in ms (binary 0 equals 256!!!).</p> <p>Example: Request process of the NPE or AUX before print start: 1. First, the faultless operation should be requested through the Centronics status lines. 2. Send status command, e.g. < 27dez 124dez 48dez 0dez 100dez > (Is amount of paper smaller than NPE ?Show this message for 100 ms.) 3. Error must be OK, select must go low. ---> When PE is high :=yes / PE low := no. 4. Everything OK, when select is high again.</p> <p>Request process of the sync character : The sync command and the request command are added to the queue at the end of the print data. When ESC V.. is processed, SELECT will go low for PARAM-time. After that, the status character can be requested any number of times. After the request, the character should be "erased" by selecting a new character.</p>

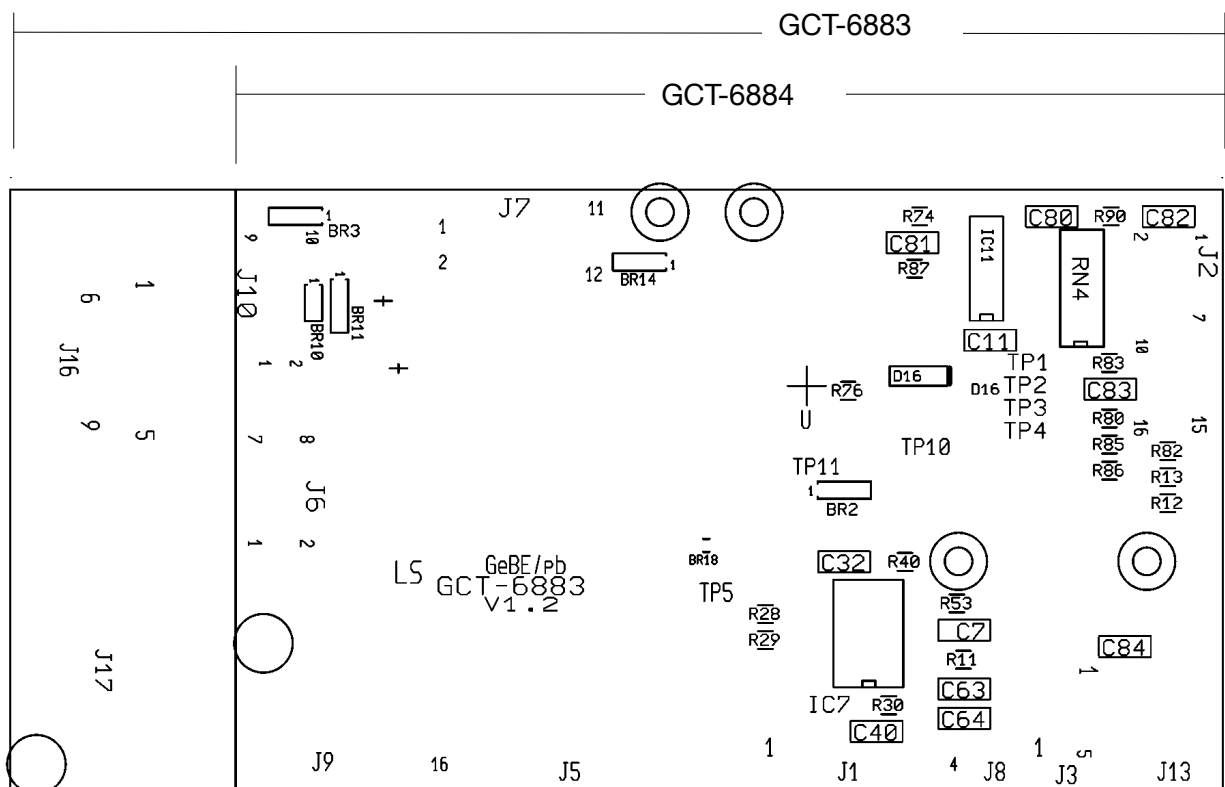
5. Controller Board REF! V1.2-Hardware

5.1. Layout

5.1.1. Assembling side: BS



5.1.2. Soldering side: LS



5.3. Connections

This chart is a summary of all connections of the controller board. The position of the connectors can be seen in the drawing in chapter 5.2 Layout. GeBE offers several different preconfigured cables and modules. These are either preconfigured on one end, or fit with an adapter for e.g. a PC connection. Further information can be found in the following detailed interface descriptions, and in the product list at the end of the manual.

Label	Pins	Name	Type of Connection	Connector	Manufacturer	GeBE Cable
J1	4	cutter	single wires	B4B-EH-A	JST	cutter part
J2	16	Centronics	ribbon cable	micro module	Lumberg	GKA-074 (one side) GKA-181 (PC adapter)
J3	5	sensors	single wires	B5B-PH-K	JST	
J5	16	print head	single wires	B16B-PH-K	JST	
J6	8	console	ribbon cable	micro module	Lumberg	
J7	12	SPI-USB	ribbon cable	micro module	Lumberg	
J8	4	motor	single wires	B4B-PH-A	JST	
J9	2	power supply	single wires	screw clamps (connector plug optional)	Riacon	GKA-245 (one side)
J10	10	Serial RS232/TTL	ribbon cable	micro module	Lumberg	GKA-072 (one side) GKA-080
J12	2	rewinder	single wires	B2B-EH-A	JST	GKA-320
J13	3	near paper end	single wires	B3B-XH-A	JST	
J15	4	aux sensor	single wires	B4B-XH-A	JST	
J16	9	Serial RS232/TTL		Sub-D-9pin socket		GKA-304
J17	2	power supply	single wires	screw clamps (connector plug optional)	Phoenix	GKA-245 (one side)

5.3.1. Power Supply

The connection is done through a 2 pin terminal strip. This is the standard component, and preferred due to its high load-carrying ability.

The power supply Vcc for the digital component is produced through a voltage transformer from the voltage Vp for the power component. Since the power component absorbs high currents, low-ohm current feeding is strictly required (short lines with a large cross section). If the power supply is not able to readjust fast enough, the GCT-6883 board can be equipped with a larger buffer capacitor.

5.3.1.1. Power Supply Connector J17 GCT-6883

PIN	Signal	Comment
1	Power GND	Connect with signal GND (see text)
2	24 V Power	

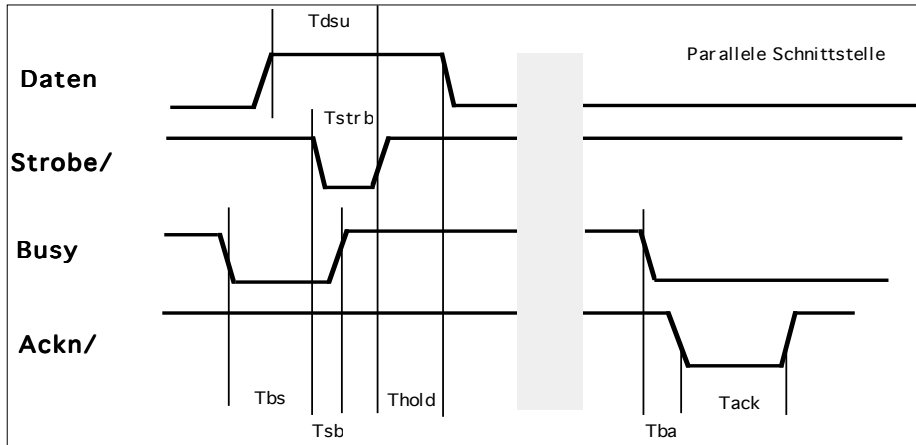
5.3.1.2. Power Supply Connector J9 GCT-6884

PIN	Signal	Comment
1	Power GND	Connect with signal GND (see text)
2	24 V Power	

5.3.2. Parallel Interface

The possible functions of the parallel interface are the transmission of print data, the generation of a reset (hard- or software), as well as the status feedback. The status feedback will not be as detailed as the one from the serial interface. The parallel interface is very fast, which qualifies it for the transmission of graphic data.

5.3.2.1. Timing of the Parallel Interface



Time	Name	min(μs)	typ(μs)	max(μs)	Comment
Tack	Ackn.pulse width		17		
Tba	Delay busy-ackn.			5,5	
Tbs	Busy setup	0,5			Time before the next strobe
Tdsu	Data setup	0,5			
T _{hold}	Data hold	0,5			With open collector-triggering, the minimum time is 3.5 μs. This value can be changed to other values by assembling the RC filters alternatively.
Tsb	delay strobe-busy	0,5			
Tstrb	Strobe pulse width	0,5			

5.3.2.2. Load Level of the Outputs (J2/Parallel)

The outputs (busy, /fault, paper end, /acknowledge, and select) are protected with series resistors of 100 ohm each (before July 2002 470 ohm). To guarantee valid low levels, pull-up resistors that may be connected inside the controlling host must not go below 1Kohm (before July 2002 3.3 Kohm) under any circumstance.

5.3.2.3. Pin Arrangement (J2/Parallel)

The connector for the parallel interface is a male multipoint micro module connector for ribbon cable connections. We offer a connection cable with an adapter board that has a 25 pin Sub-D-multipoint connector for a direct connection to a PX/XT/AT-compatible host.

Pin	Signal	Input/Output	Comment
1	Strobe/	I	Accepting data DB0 ..7 WITH THE RISING EDGE
2	DB0	I	
3	DB1	I	
4	DB2	I	
5	DB3	I	
6	DB4	I	
7	DB5	I	
8	DB6	I	
9	DB7	I	
10	BUSY	O	Becomes high with the falling edge of /strobe
11	GND digital		
12	/Input-Prime	I	
13	/Fault	O	See error messages
14	Paper End	O	See error messages
15	/Acknowledge	O	
16	Select	O	See error messages

5.3.3. Serial Interface

The possible functions of the serial interface are the transmission of print data and the handshaking.

Hardware Handshake

The handshake line DSR (data set ready) is controlled together with the monitoring of the total input buffer. The signal is controlled simultaneously with XON and XOFF. A handshake by the character does not occur. With the selected baud rates, the controller can immediately take all characters into the buffer memory without timing problems.

XON/XOFF - Protocol

The data transmission between host and controller board can either be controlled with the hardware handshake, or through XOFF and XON protocol.

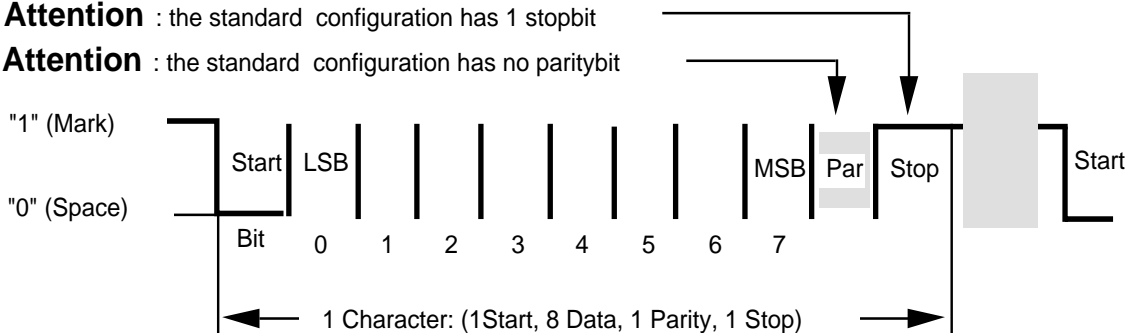
The input buffer has 190 bytes memory. Since many hosts are not able to stop the data stream immediately, a handshake is carried out, before the input buffer is completely filled.

When the memory is full leaving space for 32 characters, the controller will send the control code Xoff to stop the data stream from the host to the controller. When the buffer is reduced to 158 characters again, the controller will send an Xon signal. Then, the host can start sending more data. The host has to react within the appropriate time (< = 32 characters), in order to avoid a buffer overflow (Watch the receive buffer of the host, since it causes additional delay).

5.3.3.1. Timing of the Serial Interface

Attention : the standard configuration has 1 stopbit

Attention : the standard configuration has no paritybit



Signal	Level on TTL inter face	Level on RS-232 inter face
"1" (Mark)	+5V (TTL-level)	-3V ... -12V
"0" (Space)	0V (TTL-level)	+3V ... +12V

5.3.3.2. Serial TTL - Interface Adapters

The serial interface with TTL levels can be assembled only as an alternative to the RS232 interface. For that, the level adapter is replaced by 0- \square bridges. This is an assembly variant which can not be carried out by the user. The level position in accordance with the table above will then be:

logic-0 or space corresponds to +0 ...+0,8V, and logic-1 or mark corresponds to +2.4 ...+5V.

5.3.3.3. Serial RS232

The connector for the RS232 interface is a male multipoint micro module connector for ribbon cable connections. The arrangement that is shown below allows a 1:1 interface to connect an AT-compatible PC using a female 9 pin Sub-D multipoint connector with a crimp connection.

5.3.3.4. Pin Arrangement J16 GCT-6883

J15 is a Sub-D 9 pin socket with a 1:1 pin assignment to the PC. Therefore, a 0-modem is not necessary.

Pin	Signal	Input/Output	Comment
1	DCD	O	Connected with CTS and DTR
2	RXD	O	Error messages and Xon/Xoff messages
3	TXD	I	Print data
4	DTR	I	Connected with DCD and CTS
5	GND signal		
6	DSR	O	When the controller can accept data, the level will be logic-0
7	RTS	I	Handshake input of the controller (Standard : no function)
8	CTS	O	Connected with DCD and DTR
9	RI		Not connected

5.3.3.5. Pin Arrangement J10 GCT-6884

J10 is a micro module connector from Lumberg.

On request, GeB E supplies cable GKA-072 which has one open end, or a cable with Sub-D 9 pin connector like J16.

Pin	Signal	Input/Output	Bemerkung
1	DCD	O	Connected with CTS and DTR
2	DSR	O	When the controller can accept data, the level will be logic-0
3	RXD	O	Error messages and Xon/Xoff messages
4	RTS	I	Handshake input of the controller (Standard : no function)
5	TXD	I	Print data
6	CTS	O	Connected with DCD and DTR
7	DTR	I	Connected with DCD and CTS
8	RI		Not connected
9	GND signal		
10	+5V digital	I/O	Can alternatively be connected through bridge BR1 with VP

5.3.3.6. RS422/485, Current Loop, etc.

Other infaces are available on request.

Please send us your inquiry.

5.3.3.7. Firmware Download through the Serial Interface (Licence)

On request, it is possible to do a firmware update through the serial interface.

The internal flash of the controller can be programmed through the serial connector J10. For this, the input CTS/Vprog has to be pulsed, and DTR/reset has to be set.

The programming voltage $V_{prog} := 10,3V \pm 100mV$ (peak 200 mA)

Based on the NEC documentation "Flash Programming 78K Family" from 24sep89.

5.3.4. Operating Console J6

Paper Feed Button:

If the paper feed button is pressed, the paper will only be fed, after the printing of a line has been completely finished. Then, the paper will first be transported by only one character line (24 dot lines), followed by a small brake. If the button is still pressed afterwards, the paper will be fed continuously line by line, as long as the button stays pressed. This allows a specific feeding of just one line by shortly pressing the button. Afterwards, normal printing will be continued at the beginning of the following line.

Test Button:

When the test button is pressed, stored text file T1 will be printed. Depending on its contents, it can activate other stored text files.

LED_Error

This connection is used to connect an LED. You can find information on its control in the table "Error Messages".

LED_Option

This connection is used to connect an LED. Available for custom solutions.

Pin	Signal	Input/Output	Comment
1	Paper feed	I	
2	GND		
3	Vcc		Anode
4	LED-Error	O	Cathode
5	LED-Option	O	Cathode
6	Vcc		Anode
7	Test	I	
8	Reset In	I	

5.3.5. Peripheral Connections

5.3.5.1. Paper Rewinder J12

/rewinder is an open collector power output for ohmic and inductive loads up to 300 mA max. (short-term 800 mA). Here, a motor to rewind the printed paper can be connected to V_p . GeBE offers rewinders and mounting accessories. See product list.

Pin	Signal	Input/Output	Comment
1	rewinder + (Vpower)		Connected power supply
2	rewinder +		Collector to GND
Pin	Signal	Input/Output	Comment
1	rewinder + (Vpower)		Connected power supply
2	rewinder +		Collector to GND

5.3.5.2. Near Paper End Sensor "NPE" J 13

When this input is pulled toward GND, a message ("Z") will be triggered, and the error LED will flash 3:1 (on : off; see table "Messages").

Pin	Signal	Input/Output	Comment
1	GND		
2	NPE IN	I	Active low
3	NPE LED	O	Anode of the LED

5.3.5.3. AUX Sensor J 15

When this input is pulled toward GND, a message ("G") will be triggered, the error LED will not flash.

Pin	Signal	Input/Output	Comment
1	GND		
2	AUX IN	I	Active low
3	AUX_LED	O	Anode of the LED
4	GND		

5.3.6. Connection of the Printer Mechanism J5, J3, J8

This connector is reserved for the connection of the thermal printer mechanism REF!.

5.3.7. Expansion Bus SPI-USB J9

This is an expansion connector with a synchronous serial bus. It is carried out as a male multipoint micro module connector, but could also be carried out as a post connector with long pins in order to allow the installation of plug-in modules directly on the controller board.

Pin	Signal	Input/Output	Bemerkung
1	GND digital		
2	Vcc (+5V)		
3	CLK1		
4	MOSI1		
5	MISO1		
6	EN aux 0		
7	SPI IRQ		
8			
9	/EN aux 1		
10	/EN aux 2		
11	Vaux		
12	/Reset		

5.3.8. USB Interface (in Preparation)

GeBE is offering an USB adapter that can be connected to the SPI-USB expansion connector.

5.4. Presettings

5.4.1. Initialization Values After a Reset - (Software, DIL Switches)

The memory has an initialization text file "T-init ", in which the commands for the initialization of the controller are filed. If the printer is required to e.g. print with double height and inverse in data mode, the corresponding commands will be set in the stored text file T-init. After a RESET, the controller will first process these commands. All commands can be entered in a stored text file. The controller will interpret the calling of a stored text file, as if data is sent through an additional "virtual" interface.

One stored text file can be called through other ones.

Additional or different settings can be done by the manufacturer through entries in the stored text file T-init.

If there is an optional EEPROM, T-init can be changed through an interface.

Also see chapter "EEPROM".

In the standard program, a reset will have the same effect, as if the commands in the following table were given.

If the line feed button is still pressed after the processing of T-init, the stored text file T0 will be printed afterwards.

Command (ASCII)	Command (hex)	Function
<ESC> "A"	1B 41	Erasing the data in the print buffer
<ESC> "D" "0"	1B 44 30	Print in text mode (see solder bridges).
<ESC> "H" "0"	1B 48 30	Print normal height.
<ESC> "I" "0"	1B 49 30	Print black on white.
<ESC> "L" "0"	1B 4C 30	Print without underline.
<ESC> "M" "0"	1B 4D 30	Print black.
<ESC> "N" 0 0	1B 4E 0 0	Absolute TAB to dot position p = 0 (beginning of liine)
<ESC> "P" 1	1B 50 31	Select character saet #1.
<ESC> "Q" "0"	1B 51 30	Deactivate letter-quality mode.
<ESC> "S" 0	1B 52 0	Reset character spacing.
<ESC> "W" "0"	1B 57 30	Print normal width.
<ESC> "Y" \$19	1B 59 19	Set the blackening og the paper to a medium value of 25.
<ESC> "]" \$10	1B 5D 10	Set power consumption to min. value
<ESC> "[" x \$0A	1B 5B x 0A	Interface :baud rate ('x') according to jumper position,n,8,1
<ESC> "[" \$0 \$0	1B 5B 00 00	error messageing activ

5.4.2. Solder Bridges Baud Rate, Text/Data Mode

The controller board has 4 0 Ohm bridges. These bridges are inquired once during each RESET. During operation, the user can choose between text and data mode by software command at any time. After a POWER-ON RESET, the operating mode corresponding to the switch setting will always be selected first.

S1/	Name	Meaning	Comment															
S1/S2	Baudrate	<table border="1"> <tr> <td>S2</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>S1</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>Baud</td> <td>9600</td> <td>19200</td> <td>38400</td> <td>115200</td> </tr> </table>	S2	OFF	OFF	ON	ON	S1	OFF	ON	OFF	ON	Baud	9600	19200	38400	115200	Standard for GCT-6883: 115,200 baud Standard for GCT-6884: 9,600 baud. Other baud rates on request.
S2	OFF	OFF	ON	ON														
S1	OFF	ON	OFF	ON														
Baud	9600	19200	38400	115200														
S3	RS232/Centr	Choice, whether Centronics or RS232 is active.	Standard: not assembled (RS232)															
S4	Text/ data mode	Data mode: Printing rotated by 180°, first line at the bottom page margin	Standard: not assembled (text mode)															
R57	Custom	not used at this time	not used at this time															

	Name	Meaning	Comment
BR3	Vcc or Vp at J10/serial (switchable bridge)	Vcc at J10/Pin#10 Vp at J10/Pin#1 (Caution: high voltage!)	1-2 2-3
BR4	Potentialequalization (conductor line bridge)	Star point GND - GNDp	always closed
BR5	Reset threshold (cuttable bridge)	Together with R7, a resistor to set the reset threshold can be assembled through Br5, if IC6 is a TL7702BCD. Fixed reset threshold	open closed
BR6	TTL/RS232 for RTS (0 Ohm resistance)	The input RTS has a RS232 level. The input RTS has TTL levels (driver-IC I7 not assembled!)	open closed
BR7	TTL/RS232 for DSR (0 Ohm resistance)	The input DSR has a RS232 level The input DSR has TTL levels (driver-IC I7 not assembled!)	open closed
BR8	TTL/RS232 for TXD (0 Ohm resistance)	The input TXD has a RS232 level The input TXD has TTL levels (driver-IC I7 not assembled!)	open closed
BR9	TTL/RS232 for RXD (0 Ohm resistance)	The input RXD has a RS232 level The input RXD has TTL levels (driver-IC I7 not assembled!)	open closed
BR10	Termination of CTS (cuttable bridge)	BR10 connects CTS with BR11	closed open
BR11	Termination of CTS (conductor line bridge)	Standard : Output CTS is connected over BR11 (1-2) with Input DTR. Optional: CTS is connected with +10V (logic "1")	1-2 2-3
BR14	Vaux on SPI (J7/11) (cuttable bridge)	Vprog is Vaux Vp,h is Vprog	1-2 2-3
BR15	Termination of DCD (cuttable bridge)	If closed with an 0 Ohms resistor, DCD is connected with Vprog of the Microcontroller. This is used if the Internal Flash has to be programmed Attention: If BR15 is open, DCD is not connected.	open
--	DTR /RESet - . option	DTR can optional connected with Reset (with integrated treshold adjust) DTR < -1V froces Reset, DTR > +3V release Reset (Pulsewidth > 10µs).	R63 +D13+ D15

6. APPENDIX - Product List and Accessories

GeBE Article No.	GeBE Model Name	Description	Comment
		Thermal printer mechanism (spare part)	
	FTP622MCL001	Thermal printer mechanism, (58 mm)	ex stock
	FTP632MCL001	Thermal printer mechanism, (80 mm)	ex stock
	FTP642MCL001	Thermal printer mechanism, (112 mm)	ex stock
	FTP622MCL304	Thermal printer mechanism with cutter, (58 mm)	ex stock
	FTP632MCL304	Thermal printer mechanism with cutter, (80 mm)	ex stock
	FTP642MCL302	Thermal printer mechanism with cutter, (112 mm)	ex stock
	GCT-6883-V.24-Cut	Thermal printer controller with serial RS232 and cutter control	ex stock
	GCT-6884-Eval	Thermal printer controller completely assembled	ex stock
	GCT-6884-V.24	Thermal printer controller with serial RS232	ex stock
	GCT-6884-V.24-Cut	Thermal printer controller with serial RS232 and cutter control	on request
	GCT-6884-Centr.	Thermal printer controller Centronics	on request
	GCT-6884-Centr.-Cut	Thermal printer controller Centronics and cutter control	on request
	GCT-6884-TTL	Thermal printer controller with serial TTL	on request

6.1. Controller Equipment and Options

Standard Product List									
	Printer mechanism	serial interface standard 115kbos		Centronics	8 KByte EEPROM. optional up to 16 KByte	Near Paper End Input	Peeler or Paperexit Sensor Input	Paper take up device driver	Paper cutter driver
		RS232	TTL						
GCT-6883-28-V.24-Cut	FTP622	X Sub-D			X	X	X		X
GCT-6883-36-V.24-Cut	FTP632	X Sub-D			X	X	X		X
GCT-6883-52-V.24-Cut	FTP642	X Sub-D			X	X	X		X
GCT-6884-28-V.24	FTP622	X				X		X	
GCT-6884-36-V.24	FTP632	X				X		X	
GCT-6884-52-V.24	FTP642	X				X		X	
GCT-6884-28-EVAL	FTP622	X		X	X	X	X	X	X
GCT-6884-36-EVAL	FTP632	X		X	X	X	X	X	X
GCT-6884-52-EVAL	FTP642	X		X	X	X	X	X	X

6.2. Preconfigured Cables, PC-Connection Cables

GeBE Article No.	GeBE Model Name	Description	Comment
	GKA-271-240	Mechanism to controller: 16 single wires, 240 mm, JSTconnector	ex stock
	GKA-245	Power supply: 2x single wires, 1.0mm ² , 500mm, cable end sleeve, open end insulated	ex stock
	GKA-320	Paper rewinder: 2x single wires, 200mm, JST- connector, open end insulated	ex stock
	GKA-071	Console open: 8 pin ribbon cable, 500 mm, MICA-8 connec- tor, open end not insulated	ex stock
	GKA-073	SPI Bus open: 12 pin ribbon cable, 800 mm, MICA-12 connector, open end not insulated	ex stock
	GKA-072	RS232 open: 10 pin ribbon cable, 1000 mm, MICA-10 con- nector, open end not insulated	ex stock
	GKA-080	RS232 at PC: 10 pin ribbon cable, 1000 mm, con- troller: MICA-10 connector, PC: 9pin Sub-D socket connector	ex stock
	GKA-304	RS232 at PC: ONLY GCT6883 round cable, 2000 mm, controller: 9pin Sub-D connector PC: 9pin Sub-D socket connector	ex stock
	GKA-074	Centronics open: 16 pin ribbon cable, 1000 mm, MICA-16 con- nector, open end not insulated	ex stock
	GKA-181	Centronis an PC: 16 pin ribbon cable, 1000 mm, controller: MICA-16 connector, PC: 25pin Sub-D multipoint connector on jumber board	ex stock
	GKA-322-100	Near Paper End Sensor mit Kabel: JST- connector, 3x single wires, 100mm, to board with sensor	ex stock
	GKA-329-140	Aux Sensor mit Kabel: JST- connector, 4x single wires, 140mm, sensor with mounting holes	ex stock

6.3. Power Supplies

GeBE Article No.	GeBE Model Name	Description	Comment
	GNG-24V-2.5A-T	Power supply 85-265VAC to 24V DC	ex stock for FTP622 and 632
	GNG-24V-6.5A	Power supply 88-132 / 170-264 VAC to 24V DC	ex stock for FTP642

6.4. Interface Adapters

The assembly variant "TTL" we offer as an option has a serial interface with TTL level (0V-5V). Several different interface adapters can be connected to this TTL interface.

GeBE Artikel Nr	GeBE Model Name	Description	Comment
	GSW-RS422/485	Interface adapter TTL to RS422 level, 10 pin connector	ex stock
	GSW-RS422/485 Opto	Interface adapter TTL to RS422 level, opto isolated, D-SUB 15 pin connector	on request
	GSW-RS232-2/2-Opto-DC/DC	Interface adapter TTL to V.24 level, opto isolated with DC/DC-transformer, D-SUB 9pin connector	on request
	GSW-20mA-1/1-Opto-passive	Interface adapter TTL to 20mA current loop, opto isolated, passive operation, D-SUB 9pin female multipoint connector	on request
	GSW-20mA-1/1-Opto-active	Interface adapter TTL to 20mA current loop, opto isolated, active operation through built-in DC/DC-converter, D-SUB 9pin female multipoint connector	on request

6.5. Paper Roll Holders, Rewinders

xxx : 060, 080 or 114

GeBE Article No.	GeBE Model Name	Description	Comment
		Paper roll holders:	
	GPH-xxx-050	Paper roll holder (standard)	
	GPH-xxx-050-NPE	Paper roll holder with remaining paper sensor	
	GPW-K-xxx-062-24V	Paper rewinder 62mm disc 24volt	
	GPW-K-xxx-070-24V	Paper rewinder 70mm disc 24volt	
	GPW-K-Fuß	Mounting foot	

6.6. Paper

GeBE Article No.	GeBE Model Name	Description	Comment
	GPR-T01-058-048	Thermal paper roll, one-ply, 57.5±0.5mm wide, app. 48mm diameter, 12mm center	High quality, 5 years ex stock
	GPR-T01-080-048	Thermal paper roll, one-ply, 79.5±0.5mm wide, app. 48mm diameter, 12mm center	High quality, 5 years ex stock
	GPR-T01-112-048	Thermal paper roll, one-ply, 111.5±0.5mm wide, app. 48mm diameter, 12mm center	High quality, 5 years ex stock
	GPR-T01-060-070-025	Thermal paper roll, one-ply, 59.5±0.5mm wide, app. 70 mm diameter, 76g/m ² , 25 mm center	High quality, 5 years ex stock, thermal layer inside
	GPR-T01-085-070-025	Thermal paper roll, one-ply, 84.5±0.5mm wide, app. 48 mm diameter, 76g/m ² , 25 mm center	High quality, 5 years ex stock, thermal layer inside
	GPR-T01-114-070-025	Thermal paper roll, one-ply, 113.5±0.5mm wide, app. 48 mm diameter, 76g/m ² , 25 mm center	High quality, 5 years ex stock, thermal layer inside