



Gesellschaft für Microdatentechnik mbH

## *Product Description*

### **Controller Board "ST-100-xx"**

**for**

**EPSON Miniprinter**

**Type: M-150, M-16x, M-18x and M-19x**

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Available as

ST-101-C ST-101-S2

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## **Features**

- Serial RS232 Interface (ST-100-S2).
- Centronics parallel Interface (ST-100-C).
- 6912 Character Input Buffer.
- Input for Paper Feed and Self Test.
- Normal and inverted print.
- Underline Text.
- Double width, double high or double width and double high. Normal and double width characters can be printed in one line. If there is at least one double high character the hole line is printed double high
- Bitimage graphics mode using EPSON line printer ESC K protocol.
- Fast paperfeed by paperfeed-switch or by "FEED"-Command (ESC J + n).
- Windows driver : "General / Text only" with good results
- Paper end control function
- Connector for Paper Winder

## **Self-Test**

The SELF-TEST is initiated by the ESC T command or by pressing the PAPER FEED switch while turning on power. SELF-TEST reports the version of the software installed, the model of printer connected, and various set-up parameters (such as interface type). The entire alphabet is also printed.

### Details of Printer Units

Model					
	M150 / M180	M190	M160 / M181	M163 / M182	M164 / M183
Paperwidth (mm)	44,5 / 57,5	57,5	57,5	57,5	57,5
(Inch)	1,75 / 2,25	2,25	2,25	2,25	2,25
Dots per line (ND)	96 / 144	144	144 / 180	192 / 216	240 / 252
Characters per line (NC)	16 / 24	24	24 / 30	32 / 36	40 / 42
Lines per second	1,0 / 1,7	2,5	0,7 / 1,3	0,5 / 1,1	0,4 / 1,0
	<b>M-15X</b>	<b>M-16X</b>	<b>M-18X</b>	<b>M-19X</b>	
Consumption					
Maximum.	3A	3A	4,5A	6,5A	
Average	0,8A	0,8A	1,0A	1,3A	

**Note:** Average consumption depends on number of dots printed.

### Connector for Power Supply ST-100

**P1** (ST-100-S2), - Power Supply - Molex # 22-27-2041=1x4, 0,100 inch.

A connector with short cables is available (Option).

<u>Pin</u>	<u>Name</u>	<u>Function</u>
1	+5	+5 Volts regulated d.c. for logic.
2	Ground	Connected.
3	Ground	Connected.
4	+V	+5,0 Volts. Regulated d.c. for motor supply. <i>(5,6 V for M-18X and M-19X)</i>

### Connectors for PAPER FEED and RESET

**P3** - 2 x 5 male connector

<u>Pin</u>	<u>Name</u>	<u>I/O</u>	<u>Function</u>
10	GROUND	-	Connected.
9	/PF	I	LOW = Paperfeed. LOW at power switch on = Self-Test.
8	GROUND	-	Connected.
7	/RST	I	LOW-Pulse initiates RESET.
6	GROUND	-	Connected.
5	PE-SEN	I	HIGH-Input = Paperend, LOW-Input = Paper OK.
4	+5 Volt	-	Pulled-up with 330 Ohm.
3	LED	O	Current source for LED-Lamp Paperend (if used) .
2	GROUND	-	Connected.
1	LED	O	Current source for LED-Lamp PWR-ON.

The electronic for handling paper-end-sensor is now part of the controller board.

**JP2** 3-pos. Connector for optical paper end detection by IC GP2A25

Pin 1: Sens. -; Pin 2: Sens. Out; Pin 3: Sens. +

**JP3** 2-pos. Connector for 5 VDC paper winder motor

Pin 1: Motor +; Pin 2: Motor -

### DIP-Switches (serial Version) ST-100-S2

<u>Pos.</u>	<u>On =</u>	<u>Off =</u>	<u>Function</u>
8	Inverse	Normal	Print.
7	M-190	M-16X/M-18X	Type of printing unit
6	7	8	Data bits.
5	Odd	Even	Parity.
4	Yes	Non	Parity check.
3	BR3		
2	BR2	} - See baud rate table.	
1	BR1		

NOTE: 7 DATA BITS, NO PARITY an 1 STOP BIT is NOT a valid combination to send to the printer.

### Baud Rate Table

<u>BR3</u>	<u>BR2</u>	<u>BR1</u>	<u>BAUD</u>
On	On	On	150
On	On	Off	300
On	Off	On	600
On	Off	Off	1200
Off	On	On	2400
Off	On	Off	4800
Off	Off	On	9600

### DATA Connector for serial RS232 Version

P4 (ST-100-S2) = 2 x 5 male connector - RS232 pin-compatible.

<u>Pin</u>	<u>Name</u>	<u>I/O</u>	<u>Function</u>
3	TXD	O	RS232 Transmitted Data (no function).
4	+5 V	O	Pulled-up.
5	RXD	I	RS232 Receive Data.
7	DTR	O	Hardware Handshake-Line.
9	GND	-	Logical Ground.

**Note:** Pin 1, 2, 6, 8 and 10 are not connected.

### DATA Connector for parallel Version

P4 (ST-100-C) = 2 x 13 male connector, CENTRONICS pinout compatible

<u>Pin</u>	<u>Name</u>	<u>I/O</u>	<u>Function</u>
1	/STB	I	Active low pulse to send data to printer.
3	D0	I	ASCII data bit 0 (lsb).
5	D1	I	ASCII data bit 1.
7	D2	I	ASCII data bit 2.
9	D3	I	ASCII data bit 3.
11	D4	I	ASCII data bit 4.
13	D5	I	ASCII data bit 5.
15	D6	I	ASCII data bit 6.
17	D7	I	ASCII data bit 7 (msb).
19	/ACK	O	Active low pulse when data is accepted.
21	BUSY	O	High level when printer cannot accept data.
23	PE	O	High level when printer is out of paper. (No paper-out sensor is furnished.)
4	/ERROR	O	Normally high, low = ERROR condition.
6	/INIT	I	Low pulse resets the ST-103-C.

Pin 25 is not connected.

Pins 2, 8, 10, 12, 14, 16, 18, 20, 22, 24 and 26 are grounds

### Solder Jumper E3 and E4 for parallel Version (ST-100-C only)

The parallel version has not dip switches but two solder jumpers:

- E3: Has to be shortened if printer module M-19X is used
- E4: Has to be shortened for normal printing.  
Standard delivery is for inverted printing.

## Control Codes

<u>hex</u>	<u>dec</u>	<u>Name</u>	<u>Function</u>
0A	10	LF	Line-Feed, advance paper one line.
0D	13	CR	PRINT contents of buffer, move the column pointer to LEFT MARGIN.
0E	14	SO	SET DOUBLE WIDTH print for text. SINGLE WIDTH and DOUBLE WIDTH print can intermix on any print line. DOUBLE WIDTH stays in effect until the CLEAR DOUBLE WIDTH command is received.
0F	15	SI	SET DOUBLE HEIGHT print mode for text . DOUBLE HEIGHT printing is on a line by line basis. The line will be SINGLE HEIGHT or DOUBLE HEIGHT depending on the mode when a line is printed. DOUBLE HEIGHT print mode is cleared when the CLEAR DOUBLE HEIGHT command is received.
14	20	DC4	CLEAR DOUBLE WIDTH print mode.
15	21	NAK	CLEAR DOUBLE HEIGHT print mode.
1B	27	ESC	ESCAPE (--> see ESCAPE sequences section).

## Escape Sequences

An ESCAPE SEQUENCE is the ESC character immediately followed by the byte or bytes as defined below to complete the sequence.

In the first column of the table below +n refers to another byte, +s refers to more than 1 byte to be sent to complete the command sequence.

The following abbreviations are used:

NC = Number of characters per line  
ND = Number of dots per line  
DL = Dot line  
CL = Character line  
LM = Left margin (default = 1)  
RM = Right margin (default = NC)  
BI = Bit-image graphics

	<u>hex</u>	<u>dec</u>	<u>Name</u>	<u>Function</u>
+n	20	32	(sp)	TAB to dot position "n". Range = 1 to RM*6. Command is ignored if n is out of range.
+n	2D	45	-	UNDERLINE MODE n=0 is OFF, n=1 is ON.
	30	48	0	Set line spacing to 9 DL/CL, (default).
	31	49	1	Set line spacing to 8 DL/CL, (no BI space).
	32	50	2	Set line spacing to 12 DL/CL.
	33	51	3	Same as ESC-A
	40	64	@	INITIALIZE PRINTER.
+n	41	65	A	Set line spacing to n DL/CL. n=0 to 8 is treated as n=8. n=9 to 127 is treated as n. n>127 is treated as (n-128).
+n	4A	74	J	FAST FEED paper n DL. The column counter is not changed.
+s	4B	75	K	BIT IMAGE MODE (--> see BI section)
+n	54	84	T	Self Test procedure
+s	58	88	X	Set MARGINS. (n1 & n2) smaller => left_margin; bigger=> right_margin.

## **Bit-Image-Graphics Protocol**

The ESC K protocol is similar to EPSON line printers with limitations due to the fact that the printers used to have a fixed number of dot positions (ND). If more data is specified than the printer being used is capable of printing, the first ND (left part) will be printed and the remaining columns of data will be ignored (truncated to ND). If the margins are changed with the ESC X +s command then the effective ND is also changed.

Protocol: ESC K n1 n2 (n2\*256 + n1 bytes of data) PRINT

Example: 1B<sub>hex</sub> K 16<sub>dec</sub> 1<sub>dec</sub> (272 bytes of data) 0D<sub>hex</sub>

will print 272 columns of BIT-IMAGE graphics (truncated at ND columns).

If the number of bytes = N, the values of n1 and n2 are:

n1 (lsb) = the remainder of dividing N by 256 (N MOD 256). The range is 0<sub>dec</sub> thru 255<sub>dec</sub> but any number larger than the number of dots per line will be truncated.

n2 (msb) = the integers quotient of dividing N by 256 (INT(N/256)). Any data for n2 > 0<sub>dec</sub> will be truncated.

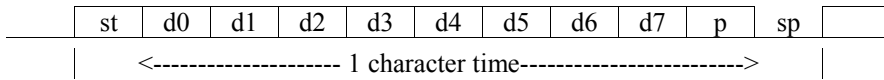
The character line spacing remains in effect so if the graphics is desired to be printed on adjacent character lines with no blank dot lines between the graphic lines, the line spacing must be set by sending ESC 1 (8 DL/CL).

The first byte of data will be printed in the current dot position as a vertical group of 8 dots defined by the data byte. The most significant bit of the byte will be printed at the top of the group of dots and the least significant bit will be printed at the bottom of the group of dots. (If the appropriate bit is a logical 1, a dot will be printed. If the bit is a 0, nothing will print at that position.) The second byte will be printed in the next dot position etc., etc., until the byte n1 + (n2 x 256) is printed. Printing does not occur until a PRINT command is received or until more than ND bytes of data are received.

Graphics data and ASCII text data can be printed on the same line by not printing until all required data is in the printer's input buffer. Printing does not occur until a PRINT command is received or if the ND counter gets greater than the ND for the printer.

This family of printers has solenoids mounted horizontally with each printing part of the dot positions for each dot line. Paper is automatically advanced one dot line as each dot line is printed. The motor is turned off any time the next line of data is not ready to be printed when the printer completes the previous character line. The motor must be turned on for one shuttle to get back in sync before any printing can be done, which causes the paper to feed one dot line. For graphics mode this means that DATA MUST BE SENT AT A FAST ENOUGH RATE THAT IT STAYS AHEAD OF THE PRINTER TO AVOID BLANK DOT LINES FROM OCCURRING between each 8 dot lines of BI data.

**Timing Diagram (serial Interface RS-232C)**



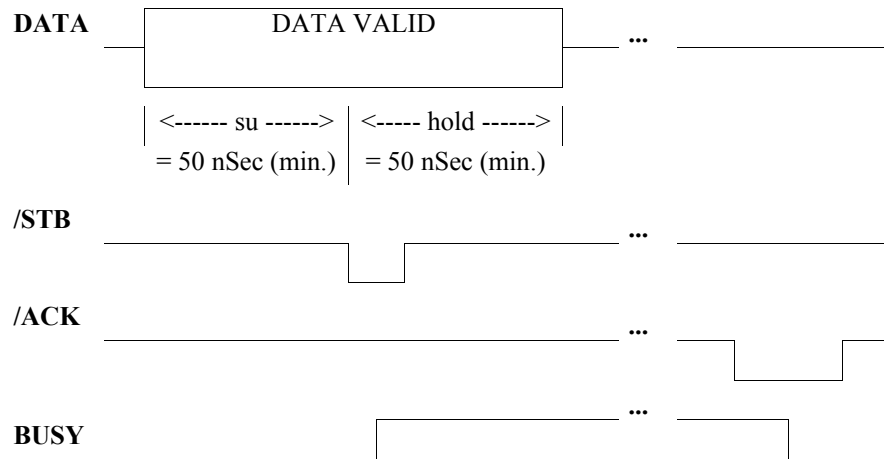
st = Start bit. sp = Stop bit. p = Parity bit (optional). d0 to d7 = Data bits. d7 is optional unless needed for graphics. Bitlength depends on Baud Rate.

**Note:** The data byte must be 10 bits minimum length. 7 DATA BITS, NO PARITY and 1 STOP BIT is NOT a valid combination to send to the printer.

**NOTE:** Polarity shown (START BIT high and STOP BIT low) is for RS232 voltage levels of serial data stream. . (± 12 Volt)

**Note:** Optional TTL-Level available.

**Timing Diagram (parallel Interface)**



su = Setup time DATA VALID to /STB LOW = 50 nanoseconds (min).  
 hold = Hold time /STB LOW to DATA can change = 50 nanoseconds (min).  
 /STB width = 20 nanoseconds (min).  
 /ACK width = 0.5 microseconds (typical).  
 /STB LOW to BUSY HIGH = 40 nanoseconds (typical).

**Controller ST-100-XX with Microprocessor MCU-101-CS**

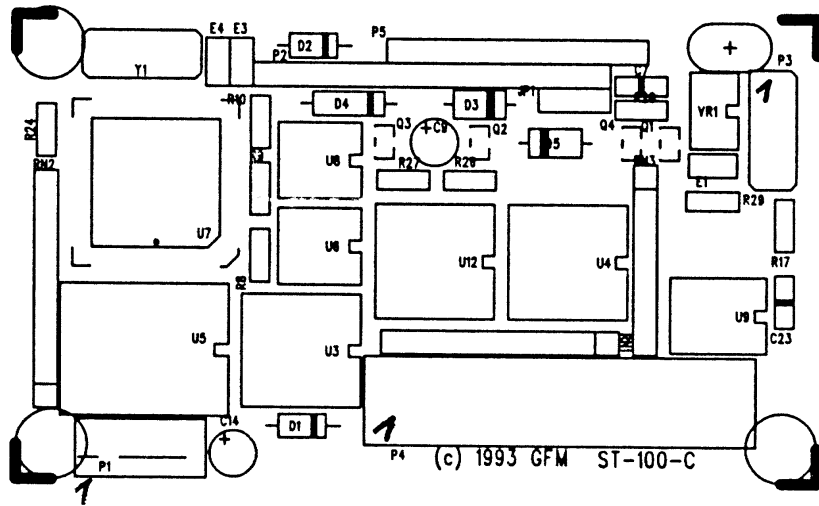
20<sub>hex</sub> to FF<sub>hex</sub> IBM/PC Character set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2x		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
3x	0	1	2	3	4	5	6	7	8	9	:	;	>	=	>	?
4x	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5x	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6x	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7x	p	q	r	s	t	u	v	w	x	y	z	{		}	~	█
8x	Ç	ü	é	â	ä	à	á	ç	ê	è	é	í	î	ï	Ë	À
9x	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	d'	£	¥	Ps	ƒ
Ax	á	í	ó	ú	ñ	Ñ	~	°	¿	Γ	γ	½	¼	;	«	»
Bx	█	█	█		†	‡		π	¶			¶	¶	¶	¶	¶
Cx	L	⊥	⊤	⊥	—	†	‡		¶	¶	¶	¶	¶	¶	¶	¶
Dx		¶	¶		¶	¶	¶	¶	¶	¶	¶	█	█	█	█	█
Ex	α	β	Γ	π	Σ	σ	μ	ν	Φ	θ	Ω	δ	ω	ó	€	π
Fx	≡	±	≥	≤	∫	∫	÷	≈	°	•	·	∫	n	2	■	ÿ

Self test shows version: T189-2.00

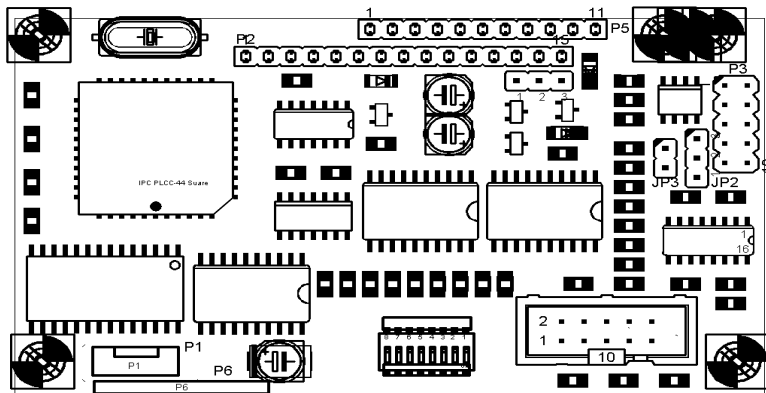
### ST-100-C PCB Equipment

Not a scaled illustration.



### ST-100-S2 PCB Equipment

Not a scaled illustration.



### ST-10X-XX PCB Dimensions

This illustration is not scaled.  
All figures are in mm.

