SC190

Control Board for printing mechanism Epson [R] M190 and M192

USER MANUAL

The aim of this manual is to provide instructions to enable the customer to make the best possible use of the product. Any suggestion regarding errors in its contents or possible improvements will be greatly appreciated
The products are continuously checked and improved. For this reason Custom Engineering S.r.l. reserves the right to modify the information contained in this manual without prior notice

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Techinical Specification :

	Column	
Character	24	40
Normal	1,7 x 2,6	1,1 x 2,6
Double height	1,7 x 5,2	1,1 x 5,2
Double width	3,4 x 2,6	2,2 x 2,6
Expanded	3,4 x 5,2	2,2 x 5,2
Graphic point	0,33 x 0,38	0,19 x 0,38
Point for line	144	240
Printing speed		
Lines/sec	2,5	1,5
Characters/sec	60	60
Feed (lines/sec)	6	3,6
Line buffer	24 byte	40 byte
Printing buffer	150 byte	
Printing method	Impact dot matrix	
Character matrix	6 x 10 points	
Printing mode	Normal or Reverse	
Character set	Normal and extended	
Standard interface	Serial and parallel TTL	
Optionally interface	RS232 and Centronics, Current Loop	
Supply	Double or single 5Vcc ± 10%	
Absorptions		
Medium in stand by	50 mA	
Medium in printing	900 mA	
Impulsive in printing	3.45 A (600 µSec.)	
Back Light Display	300 mA	
Environmental conditions		
Temperature	0 - 50 °C	
Relative humidity	10 % - 85 %	

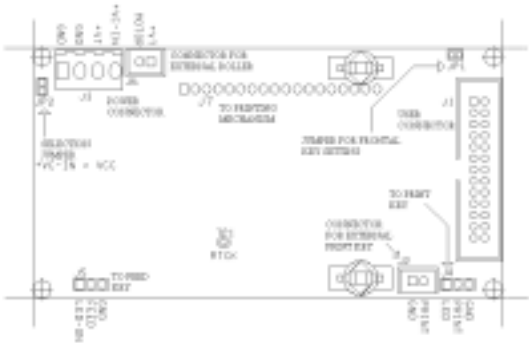
CONNECTION

Power supply, connector AMP MODUII 4 PIN, J3

N° pin	Function	Notes
1	GND	Square Pad
2	GND	
3	+VT	5 Vdc ± 10%
4	+VDC	5 Vdc ± 10%

PAD J4, connection to PRINT key

N° pin	Function	Notes
1	Led print	Square Pad
2	Print key	
3	GND	



Feed key e Led-ON J5

N° pin	Function	Notes
1	Led ON	Square Pad
2	Feed key	
3	GND	

External roller J6

N° pin	Function	Notes
1	+VT	Square Pad
2	MOTOR	

Print key J2

N° pin	Function	Notes
1	GND	Square pad
2	PRINT	

Pin out 26 Pin connector J1

PIN	Signal	PIN	Signal
1	GND	2	GND
3	GND	4	TP
5	+VT	6	+VT
7	+VT	8	+VT
9	+VDC	10	+VDC
11	GND	12	GND
13	TD	14	D6
15	D5	16	D4
17	D3	18	D2
19	D1	20	D0
21	D7	22	RESET
23	S-EN	24	READY/RTS
25	FEED	26	STB/RD

Pin out 20 Pin connector J1

PIN	Signal	PIN	Signal
1	+VT	2	+VT
3	+VDC	4	+VDC
5	GND	6	GND
7	TD	8	D6
9	D5	10	D4
11	D3	12	D2
13	D1	14	D0
15	D7	16	RESET
17	S-EN	18	READY/RTS
19	FEED	20	STB/RD

The corresponding signals are :

- GND Signal ground and power supply
- +VT Power supply to the printer needles and motore.
- +VDC Power supply to the logic card.
- S-EN Serial/parallel interface selection :(seriale = low).
- RESET Resetting initialises the printer's parameters (active at low level).
- FEED Signal in parallel with the contact of Feed key (active at low level).

TP Signal in parallel with the contact of Print key (active at low level).

- TD Data transmission pin in serial
- D0,..., D7. Data bus in parallel configuration. In serial communication, these are used to determine the transmission protocol.
- READY/RTS In parallel or serial configuration CTS/RTS indicate that the printer is ready to receive data
- STB/RD In parallel configuration communicates the printer that there is valid data on the data bus. In serial configuration this correspond to the data reception pin.

Jumper JP1

JP1	Option : Feed and Print key setting
Open	Disabled
Close	Enabled

Interface Selection :

S-EN	Interface
0	Serial
1	Parallel

BAUD RATE Selection

D0	D1	D2	BAUD
0	0	1	300
1	0	1	600
1	1	1	1200
0	1	1	2400
0	0	0	4800
1	0	0	9600

Protocol Selection

D7	D6	D5	Format
1	1	1	N,8,1
0	1	1	E,8,1
0	1	0	O,8,1
1	1	0	N,7,1
1	0	1	E,7,1
1	0	0	O,7,1

Where N,O,E are the type of parity used (None, Odd, Even), 8 and 7 are transmitted bit and 1 stop bit number. With these three configuration, the protocol is setted.

PAD J7 connection to printing mechanism

PIN	Signal	PIN	Signal
1	+VT	2	SL
3	GND	4	ZERO
5	+VT	6	MOT
7	AGO 7	8	AGO 5
9	AGO 8	10	AGO 6
11	AGO 3	12	AGO 1
13	AGO 2	14	+VT
15	+VT	16	AGO 4
17	SYNCR-	18	SYNCR+

The corresponding signals are :

- GND Signal ground and power supply
- +VT Power supply to the printer needles
- AGO1,...,AGO8 Printing head needles
- SL magnet for fast form feed
- ZERO This signal indicates the reset position of printing head
- MOT Motor excitation of printing truck
- SINCR Signal used for the synchronism of printing truck

INSTALLATION INSTRUCTION

Before supplied the controller card, verify :

- the supply is connected in a correct mode, that the supply correspond as is specified in the technical spefications.
- the connectors is connected in a correct mode.
- the printer is in your desired configuration.
- the environment conditions correspond as is specified in the technical spefications.

GENERAL INSTRUCTION

Custom Engineering S.r.l. declines all responsibility for accidents or damage to persons or property occurring as a result of tampering, structural or functional modifications, unsuitable or incorrect installation, environments not in keeping with the equipment's protection degree or with the required temperature and humidity conditions, failure to carry out maintenance and periodical inspection and poor repair work.
The printer is in conformity with the essential electromagnetic Compatibility and safety requirements laid down in Directives

- 89/336/EEC dated 3 May 1989 and subsequent revisions (Directive 92/31/EEC of 28 April 1992 and Directive 93/68/EEC of 22 July 1993)

In as much as was designed and constructed in conformity with the provisions laid down in the following Harmonised Standard :

- EN55022 (Limits and methods of measurements of radio interference characteristic of information technology Equipment)

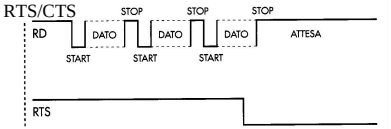
CE

TTL SERIAL

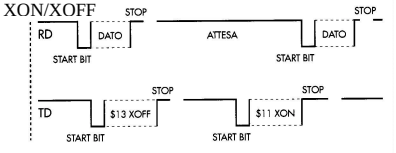
The signal characterising communication in the serial protocol are TD, RD, RTS if the protocol is RTS/CTS ; if the protocol is XON/XOFF has been selected the signals are TD and RD.

Transmission format

Protocol RTS/CTS



Protocol XON/XOFF

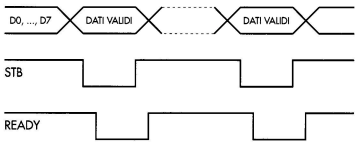


TTL PARALLEL

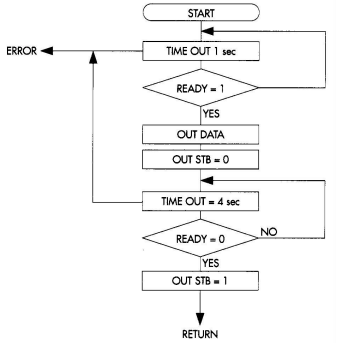
In parallel communications the signals that which can be used are :

1. 7 or 8 bit data bus
2. Strobe signal indicating data validity
3. Ready signal indicating that the printer is ready to receive data

Transmission Format

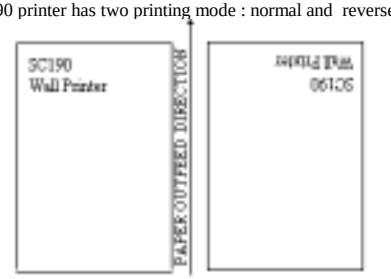


Flow chart



PRINTING MODE

The SC190 printer has two printing mode : normal and reverse.



CONTROL CHARACTER

List all commands for function management the printer.

ASCII	HEX	Description
	$00(1)	Printing in small characters
	$01(1)	Double width printing
	$02(1)	Double height printing
	$03(1)	Expanded printing
	$04(1)	Restores normal printing
	$0A	Forward feeds one line
	(n) $0B(1)	Forward feed (n) lines
	$0D	Prints line buffer
	$0F	Sets CRLF mode
	$11	Graphic mode
	$12	Prints the time and date
	$13	Sets the time and date in serial
	$14	Transmits the time and date in serial
	$17 (2)	Prints the 1st programmable character
	$18 (2)	Prints the 2snd programmable character
	$19(12	Prints the 3rd programmable character
	$1A(2)	Prints the 4th programmable character
	$1C(2)	Prints the 5th programmable character
	$1D(2)	Prints the 6th programmable character
	$1E(2)(3)	Prints the 7th programmable character
	$1F(2)(3)	Prints the 8th programmable character
ESC R	$1B $52	Sets the printer in Reverse mode
ESC N	$1B $4E	Sets the printer in Normal mode
ESC @	$1B $40	Resets the printer
ESC D	$1B $44	Enters the date in the line buffer
ESC T	$1B $54	Enters the time in the line buffer
ESC U	$1B $55	Enters the date (mm-dd-yy) in the buffer
ESC S	$1B $53	Enables the printing of seconds
ESC B	$1B $42	Sets characters font 1
ESC b	$1B $62	Sets characters font2
ESC O	$1B $4F	Transmit operating hours in serial
ESC o	$1B $6F	Prints total operating hours
ESC H	$1B $48	Clears total operanting hours
(aa) ESC r	(aa)$1B $72	Reads a piece of data at an address
(dd) ESC G	(dd) $1B $47	Write value (dd) in option register
(dd) ESC M	(dd) $1B $4D	Writes printing mode value (dd)
ESC p	$1B $70	Transmit the option register in serial
ESC m	$1B $6D	Transmits the printing mode in serial
ESC s	$1B $73	Transmits next character in serial
(aadd)ESC w	(aadd)$1B $77	Writes a piece of data (dd) in an address (aa)
ESC W (n)	$1B $57 (n)	Start saving block (n)
ESC V (n)	$1B $56 (n)	Prints block (n)
ESC E (n)	$1B $45 (n)	Transmits block (n) in serial
ESC Z	$1B $5A	Block saving completed
ESC J (n)	$1B $4A (n)	Loads programmable character (n)

NOTES :

(1) This command clears the line buffer and for this reason, it must not sent after an ASCII string not ended with CR or LF character, therefore this string will be deleted.

(2) Only software release 5.3

(3) For release software 4.3 the 1st and 2nd characters respectively programmable.

ASCII - Hex $00

Printing in small characters

The command is used for printing in small characters

ASCII - Hex $01

Double width printing

This command is use to activate double width printing

ASCII - Hex $02

Double height printing

The command "$02" is used to activate double height printing

ASCII - Hex $03

Expanded printing

This command is used to activate expanded printing

ASCII - Hex $04

Restores normal printing

The command is used for reverting to printing in small characters (it is identical to "$00" and is used when it is impossible to use the latter)

ASCII- Hex $0A

Forward feeds one line

The command forward feeds the printer by one line. If there are any characters in the line buffer, the buffer itself is automatically printed. A line feed is equivalent to 10 dots of normal printing.

ASCII - Hex $0B

Forward feeds (n) lines

The command "$0B" forward feeds the printer by the number of lines previously set. This must be an ASCII number from 0-9.

ASCII - Hex $0D

Prints line buffer

This command (carriage return) prints the line buffer. If the buffer is empty, nothing happens.

ASCII - Hex $0F

Sets CRLF mode

The command enables the CRLF option. It inhibits the action of the command "$0D", and keeping only the command "$0A" as a print command.

ASCII - Hex $12

Prints the time and date

This command prints the time and date in the following format :

hh : mm dd-mm-yy

If the expanded or double width formats are selected, only the time will be printed. If seconds printing is enabled, the format will be :

hh : mm : ss dd-mm-yy

In any event this command resets the line buffer

ASCII - Hex $11

Graphic mode

The command enables the P190 printer graphic mode, i.e. to print in graphic mode transmit the command $11 at the beginning of each line.

ASCII - Hex $13

Sets the time and date in serial

The command sets the time and date of the clock installed inside the P190. There are two ways of setting it : the first uses the 24-hour clock and the second the 12-hour a.m., p.m. clock. In the first case the 10 ASCII characters corresponding to the time and date have to be transmitted, followed by the command "$13". By example for setting the 12.45 19-01-93 send in sequence these character string :

$31-$32-$34-$35-$31-$39-$30-$31-$39-$33-$13

In the second case the 10 ASCII characters corresponding to the time and date preceded by "A" or "P", are sent to the printer followed by the command "$13". By example for setting the 12.45 A.M. 19-01-93 send in sequence these character string :

$41-$31-$32-$34-$35-$31-$39-$30-$31-$39-$33-$13

ASCII - Hex $14

Transmits the time and date in serial

The command transmits the contents of the Real Time Clock to the printer's serial port in the format of 11 ASCII characters

ASCII :ESC R - Hex :$1B $52

Sets the printer in reverse mode

The command selects reverse mode printing

ASCII :ESC N - Hex :$1B $4E

Sets the printer in normal mode

The command selects normal mode printing

ASCII :ESC @ - Hex :$1B $40

Resets the printer

This command resets the printer software. This command is identical to the hardware reset command.

ASCII :ESC D - Hex :$1B $44

Enters the date in the line buffer

The command is used for entering the date of the Real Time Clock fitted inside the printer in the line buffer. The format of the date is dd-mm-yy

ASCII :ESC T - Hex :$1B $54

Enters the time in the line buffer

The command is used for entering the time of the real Time Clock fitted inside the printer in the line buffer, the format of the time is hh-mm

ASCII :ESC U - Hex :$1B $55

Enters the date (mm-dd-yy) in the buffer

This command is used for entering the date, American style mm-dd-yy, of the Real time Clock fitted inside the printer in the line buffer.

ASCII :ESC S - Hex :$1B $53

Enables the printing of seconds

This command enables the printing of seconds when the time is requested with command " ESC T".

ASCII :ESC B - Hex :$1B $42

Sets character font 1

The command selects the first character font. The complete font is printed during self-test.

ASCII :ESC b - Hex :$1B $62

Sets character font 2

The command selects the second characters font. The complete font is printing during self-test

ASCII :[dd]ESC G - Hex :[dd]$1B $47

Write value (dd) in option register

By means of the command the printer configuration can be manipulated : You must transmit an ASCII byte to the printer to specify the configuration and "ESC G" command in sequence. The setting byte contains the following bits : d7-d6-d5-d4-d3-d2-d1-d0 where :

- D0 is used to enable setting of the RTCK: 0 disabled, 1 enabled ;
- D1 is use for setting the printing mode : 0 normal, 1 reverse
- D2 is used for setting data communication ; 0 to 8 bit, 1 to 7 bit
- D3 the printing of seconds :0 disabled, 1 enabled.
- D4sets/reset the carriage return "$0D" : 0 set, 1 reset.
- D5 this bit enables the printing of the first block (heading) as soon as the printer is switched on : 0.
- D6 selects the character fonts during printings : 0 font1, 1 font2.
- D7 this bit has no effect on the working of the printer for software release 4.3. from software release 5.3, 0 disables the lapsed time meter while 1 enables it

ASCII :ESC s - Hex :$1B $73

Transmits next character in serial

The command sets the printer to transmit the next character it receive. If, for example, we transmit "ESC A", the last character, A, will not be printed but will immediately be transmitted in serial.

ASCII :[dd]ESC M - Hex :$1B $4D

Writes printing mode value (dd)

The type of writing which can be define is described in the following table :

$00	Small characters printing
$01	Double width printing
$02	Double height printing
$03	Expanded printing

Automatically the printing mode is changed to the one selected and is stored in the non-volatile memory

ASCII :ESC p - Hex :$1B $70

Transmits the option register in serial

The command "ESC p" transmits the option register byte to the serial port of the printer. Obviously if the printer is using the parallel protocol, the command will produce no effect. The reply to this question is made in two ASCII bytes containing the option register value

ASCII-ESC 0 Hex $1B $4F

Transmits operating hours in serial

The command transmits the total operating hours of the printer to the serial port. These hours are allocated in the battery-driven Ram of the real time device fitted inside the printer. The transmission format is in ASCII standard and four characters are transmitted : in order of importance

ASCII ESC o Hex $1B $6F

Prints total operating hours

The command enters the total operating hours in the line buffer. These hours are allocated in the battery-driven Ram of the Real Time device fitted inside the printer. If, therefore, there is no real Time Clock, this command will produce no effect. As there are four characters it can reach a maximum of 9999 operation hours ; it then automatically zero-sets and continues counting

ASCII ESC H $1B $48

Clear total operating hours

The command clears the printer total operating hours.

ASCII (aa) ESC r Hex (aa) $1b $72

Reads a piece of data at an address

This command makes it possible to read in a location of the non volatile memory (EEPROM). This command can only be used with the serial port as it is bi-directional. The communication protocol is defined by the dip-switches on the serial interface.

ASCII (aadd) ESC w Hex $1B $77

Writes a piece of data (dd) in an address (aa)

The command makes it possible to save a piece of data in a non-volatile memory. There are 256 locations in which to write, starting from $00 to $FF. The piece of data too cannot exceed $FF (255) and both the addresses and the data must be expressed in ASCII on two byte.

ASCII ESC W (n) Hex $1b $57 (n)

Starts saving block (n)

This command followed by a number (from 1 to 3) activates the function for saving a file in one of the three blocks defined by the number (n). These blocks are contained in a non-volatile memory which stores the data even when the power is switched off. The length of the files which can be memorised is of 300 bytes for the first block and 700 bytes for the second and third blocks. At the end of each block will be recommended to terminate the operations with "ESC Z" command. The three blocks stored will be printed or send to serial line.

ASCII ESC V (n) Hex $1b $56 (n)

Prints block (n)

The command followed by a number (from 1 to 3) prints block (n). the file continues printing until it reaches the terminating command "ESC Z". Obviously, if the block is clear, or if all the characters are $20, the printer will not print anything.

ASCII ESC E (n) Hex $1B $45 (n)

Transmits block (n) in serial

The command followed by a number (from 1 to 3), transmits in serial the memory block define by n. If the printer is using the parallel port this command will, of course, produce no effect. The file will be transmitted in its entirety, the first block will contain 300 bytes and the second and third blocks 700 bytes each.

ASCII ESC Z Hex $1B $5A

Block saving completed

The command acts as a terminator for the three memory blocks. When the line buffer reads this terminating command during printing, it stops printing the block and reverts to normal functioning. In absence of the terminating command, the entire block will be printed.

ASCII ESC m Hex $1B $6D

Transmits the printing mode in serial

The command transmits the byte containing the printing mode by default to the serial port of the printer. Obviously if the printer is using the parallel protocol, the command will produce no effect.

ASCII - Hex $17,...,$1F

Prints a programmable character (n)

It is possible to store settled character and easiness printed, writing the address where the character is located.

1°	2°	3°	4°	5°	6°	7°	8°
$17	$18	$19	$1A	$1C	$1D	$1E	$1F

The characters would be saved not by model, but by means on volatiles memory. With volatiles memory will be supplied the software to insert on memory the characters.
If the printer is not never used, as default the characters are the simbols | | | ; each time the printer is switched on, the above mentioned codes will contain the last characters programmed in the non volatile memory.

ASCII ESC J (n) Hex : $1B $4A (n)

Loads programmable character (n)

The command followed by a number (1 or 2 for 4.3 software and 1-8 for 5.3 software) is used to generate the programmable characters. The programmable characters go from code $1E to code $1F(4.3) or from code $17 to code $1F (5.3). A programmable character consists of 10 lines of 6 dots each ; to form a character which corresponds to code $1E, therefore, you must transmit 10 bytes preceded by "ESC" J1. The bytes must have the same characteristics as the graphic mode.

GRAPHIC MODE

The size of graphic point and the number of points per line vary depending on the number of columns.

Graphic point dimension

Printing format	24 columns	40 columns
Graphic Point	0.33 x 0.38	0.19 x 0.38
Point for line	144	240

To obtain a graphic printout, enter the command $11 at the beginning of each line. The graphic configuration byte format is as follows :

X	R	P6	P5	P4	P3	P2	P1
D7	D6	D5	D4	D3	D2	D1	D0

where :

X is not utilized
R must be set at 1
P1,...,P6 are the data of the graphic points (1 prints,0 does not print)

The P6 bit of the string of points transmitted is printed on the left and the others (P5,P4,P3,P2,P1) follow from left to right, as shown :

1° byte					
P6	P5	P4	P3	P2	P1
2° byte					
P6	P5	P4	P3	P2	P1
3° byte					
P6	P5	P4	P3	P2	P1

OPTIONAL INTERFACE

RS232 SERIAL

The printer has an RS232 serial interface and current loop to be installed on the Pcb190 controller. The connection is made with a 25-pin rectangular female connector. The signals on the connector pins are indicated in table. The pins which are not indicated are not connected.

PIN 1,...7	GND output signal, indicate the signal ground
PIN 2	TXD output signal, to be connect with RXD and is the serial output (from Host)
PIN 3	RXD input signal, to be connect with TXD and is the serial input (towards Host)
PIN 4	DTR output signal, and Printer on and operating
PIN 9	LOOP RD+ input signal, used for data reception in current loop
PIN 10	LOOP RD- is the RD LOOP return
PIN 11	LOOP RTS+ output signal, indicate that is ready to receive data
PIN 12	LOOP RTS- is the RTS LOOP return
PIN 13	LOOP DTR+ output signal, indicates that the printer is ON
PIN 14	LOOP DTR- is the DTR LOOP return
PIN 15	LOOP TD+ output signal, Current loop : positive level data transmission
PIN 16	LOOP TD- is the TD LOOP return
PIN 20	RTS output signal, indicate that is ready to receive data

CONNECTOR PIN TABLE

The following personalizations may be obtained, relative to transmission format and the PRINT key on the Pcb190's front panel, by using the dip-switch on the RS232 card

DIP 1	DIP 2	DIP 3	BAUD Rate
ON	ON	OFF	300
OFF	ON	OFF	600
OFF	OFF	OFF	1200
ON	OFF	OFF	2400
ON	ON	ON	4800
OFF	ON	ON	9600

DIP 6	DIP 7	DIP 8	Protocol
OFF	OFF	OFF	N,8,1
OFF	OFF	ON	E,8,1
ON	OFF	ON	O,8,1
ON	OFF	OFF	N,7,1
OFF	ON	OFF	E,7,1
ON	ON	OFF	O,7,1

where N indicate none, E indicate even and O indicate odd (on parity type used) ; 8 or 7 is the bits number transmits and 1 is the number of bit's stop. Alls this parameters defined the communication protocol trough card and printer.

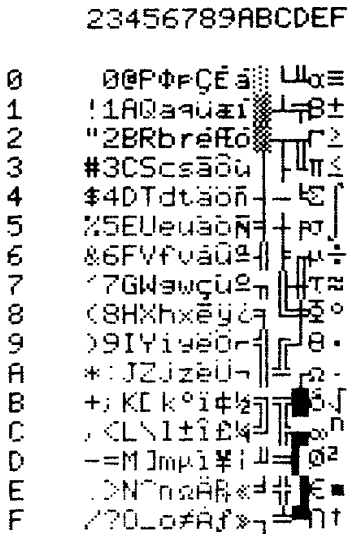
DIP 4	Description
OFF	RTS/CTS Protocol
ON	XON/XOFF Protocol
DIP 5	Description
OFF	Disable transmission
ON	Enable transmission on holding PRINT key

CENTRONICS PARALLEL

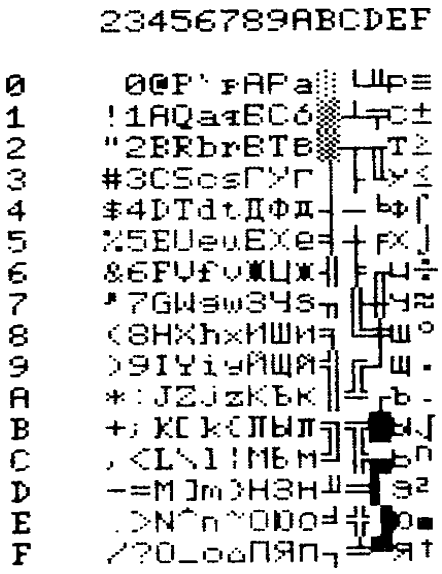
The connection is made with a 25-pin rectangular female connector. The signal layout is exactly the same as that used by personal computer which use the same connector, as shown in table. The pins which are not indicated are not connected.

PIN 1	STROBE, input signal, an low level impulse on this pin indicate data ready to be read by the printer
PIN 2,...9	Input signals there are the 8 data (DATA1, DATA2,..., DATA8) and a low level indicate the binary number 1
PIN 10	ACK, output signal, if the signal is low level indicate that the printer is ready to receive further data
PIN 11	BUSY output signal, data detection.
PIN 13	SELECT, output signal, the signal is connected to Vcc with 4.7 Ohm resistance
PIN 18,...25	Pins connected to GND

CHARACTER SET :

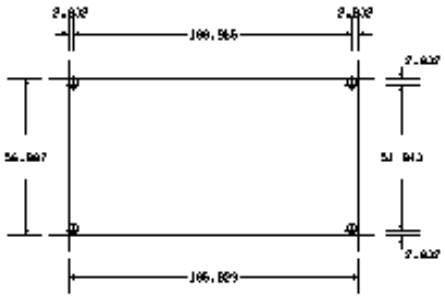


FONT 1



FONT 2

Board's mechanical outline



HOW TO ORDER THE PRODUCT

Product	Code
Printers	
B190	B190-xx(1)
Options	
RS232 serial interface	RS232
Centronics parallel interface	CENTR
Real Time Clock	RTCK
Accessories	
Power supply 220 Vac - 5 Vdc	ALI150
Power supply 110/220 Vac - 5 Vdc	A150SW
Power supply 9/40 Vac - 5 Vdc	ALI9/40
Paper winding device	AV1
Consumable materials	
Paper roll 57,5 mm x Ø 50 mm	RP58
Blue ink ribbon	ERC 09 purple
Black ink ribbon	ERC 09 Black
"Long life" ribbon	ERC 22
Note (1)	
xx= connector pin number of signal	
20	20 pin flat connector
26	26 pin flat connector

The format used for this manual improves use of natural resource reducing the quantity of necessary paper to print this copy.

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Custom Engineering designs and manufactures for specific "Custom made" application in a wide variety of sector.

Custom Engineering is a national distributor of EPSON® OEM products, in particular of printing mechanism, printers, FDD, LCD graphic and modular screens, oscillators, RTCK, PC Cards

Custom Engineering directs and manages each project from its initial planning stages to the accomplishment of the final product ; it can provide the technical back up, kits and accessories required to improve and facilitate the application of the products. We place our qualified personal, know-how, equipment, test laboratory and CE certification at the complete disposal of our clientele

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