PANEL PRINTER WITH LCD
PD190
User's Manual

GENERAL INFORMATION REGARDING SAFETY

- Read and keep the following instructions.
- Observe all warnings and follow all instructions attached to the printer.
- Before cleaning the printer, disconnect the feed cable.
- Clean the printer with a damp cloth. Do not use liquid or spray products.
- Do not operate the printer near to water.
- Do not place the printer on unsteady surfaces. It could fall and get seriously damaged.
- Use the type of electricity supply marked on the printer label. In the event of uncertainty, contact the seller.
- Position the printer in such a way as to ensure that the cables connected to it will not be damaged.
- Ensure that the maximum absorbed current of the printer does not exceed the maximum acceptable current for the type of feed cable used.
- Do not put objects of any kind inside the printer as they could cause a short circuit or damage parts which could affect its performance.
- Do not spill liquids on the printer.
- Do not carry out technical operations on the printer with the exception of the scheduled maintenance operations specifically indicated in the user's manual.
- Disconnect the printer from the electricity supply and have it repaired by a specialized technician should any of the following conditions occur:
  - A. The feed connector has been damaged.
  - B. Liquid has penetrated to the inside of the printer;
  - C. The printer has been exposed to rain or water;
  - D. The printer is not operating normally despite the instructions in the user's manual having been followed.
  - E. The printer has been dropped and its case damaged.
  - F. The performance of the printer is poor.
  - G. The printer does not work.

GENERAL FEATURES

The PD190 (Fig. 1) is the ideal solution for applications which require data to be instantly displayed on a screen or printed on a ticket, whether the said data be of an industrial, professional and laboratory nature. It is suitable for POS, weighing systems, receipts (not for tax purposes) as well as for security, controlling and diagnostics purposes.

It has an 8-needle, rapid impact printing mechanism and uses 57.5 mm wide paper rolls. It also has a 16-character x 2-line LCD.

The PD190 printer is so lightweight and compact that it can be easily fitted on any kind of machinery. It can be personally programmed and is thus able to meet all possible requirements. It has a 150 byte print buffer and, as an option, can be equipped with a 256-byte EEPROM or, at the customer's request with a 2-Kbyte EEPROM. It has RS232 serial and CENTRONICS parallel interfaces as standard. It can, in addition, be equipped with a Real Time Clock.

Figure 1
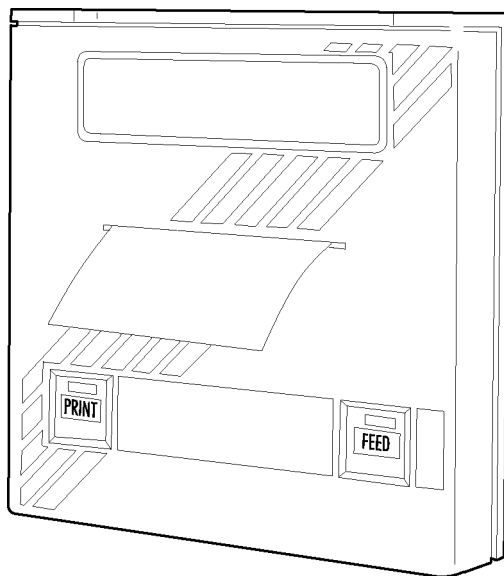
PRODUCT DESCRIPTION

The PD190 printer has an ABS casing with a top covering the paper roll and print head.
The dimensions of the printer are shown in Figure 2.
The keyboard, located on the front of the printer, consists of the PRINT and FEED keys with their respective LEDs and the LCD.

Figure 2
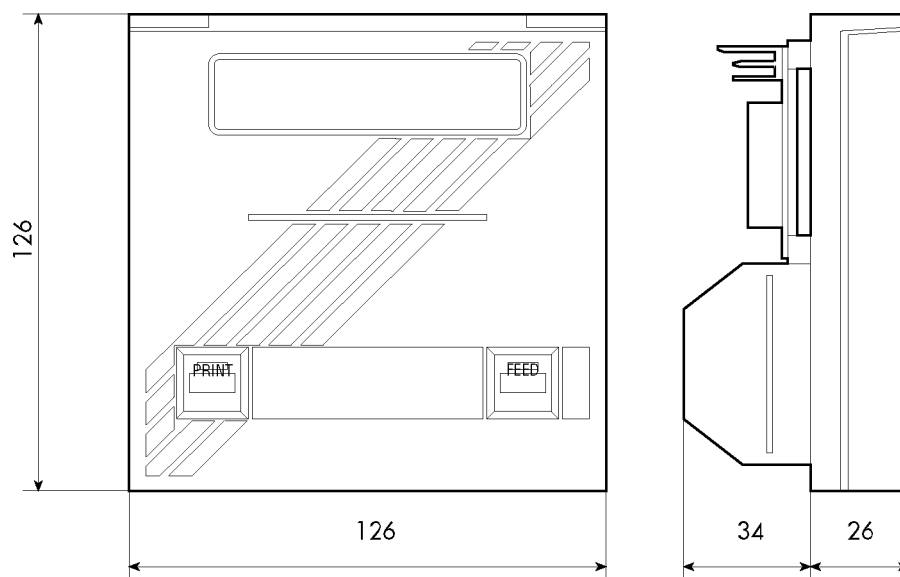
- PRINT key. When this key is pressed the printer transmits in serial the control character "$0D"; this only happens if it has been enabled by DATA4 to logic "0" or if switch 5 of the RS232 option is in the ON position. If, in the configuration of the keyboard, key setting has been selected, the transmitting of the character "$0D" can be enabled or disabled. If the printer has a 2-Kbyte EEPROM (option), the contents of the memorized blocks are transmitted.

- FEED key. This enables the manual paper feed. If pressed briefly, when the RTCK option is installed, the time and date are printed. When the FEED key LED lights up, it is to indicate that the logic card power supply is correct, i.e. that it is over 3.7 V (minimum threshold below which the printer is reset and the LED goes out).

Technical Specifications

Columns	24	40
Character (L x H)		
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 dot	0.33 x 0.38	0.19 x 0.38
Dots per line	144	240
Printing speed		
Lines / sec	2.5	1.5
Characters / sec	60	60
Feed (lines / sec)	6	3.6
Line buffer	24 bytes	40 bytes
Print buffer	150 bytes	
Print method	Impact or dot matrix	
Character matrix	6 x 10 dots	
Print direction	Normal or reverse	
Character set	Normal and extended	
Paper roll dimensions	57.5 $\pm$ 0.5 mm x $\varnothing$50 mm max	
Display	16 characters by 2 lines	
Standard interfaces	Serial and parallel TTL	
Optional interfaces	RS232 serial current loop and Parallel Centronics	
Power supply	Double or single 5 Vdc $\pm$ 10%	
Absorption		
Medium on standby	50 mA	
Medium when printing	880 mA	
Impulse when printing	3.5 A (600μSec)	
Backlighted display	300 mA	
Environmental conditions		
Operating temperature	0°C - +50°C	
Operating humidity	35% - 85%	
Storage temperature /humidity	-20°C - +70°C / 10%-90%	
Options	Real time clock, Power supply, EEPROM 2 Kbyte	

REMOVING THE PRINTER FROM ITS PACKAGING

Open the package and check that:

a) none of the parts have been damaged during transportation;
b) that the ink cartridge is fitted on the printing mechanism and the paper roll is in place;
c) the two brass screws and washers necessary for installing the printer are, in fact fitted on it

Figure 3
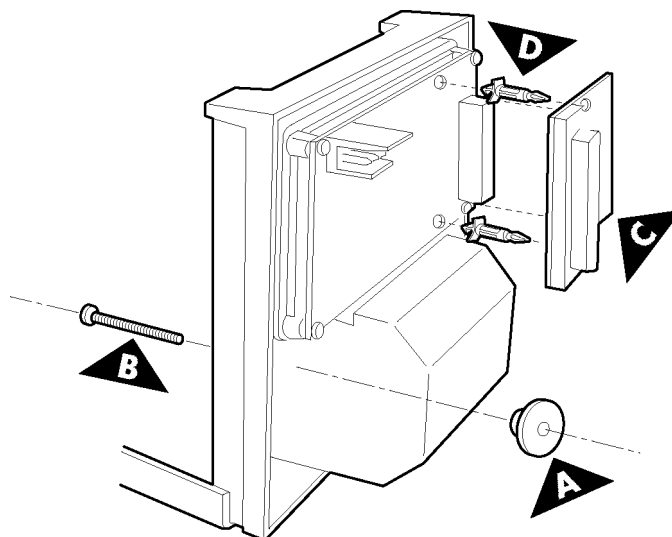
INSTALLATION PROCEDURE

Make a 112 mm x 112 mm square hole in the wall where the printer is to be installed (see Figure 3). Unscrew the two brass washers "A", leaving the screws "B" in their holes. Insert the printer into the hole on the wall, open the front panel and, from the back, manually screw in the two brass washers, until the printer is firmly in place.
Insert the interface and the power supply connectors, located on the logic card.
If possible, protect the machine from direct light sources.

CONNECTIONS

Power supply
With regard to power supply, the PD190 printer has a standard AMPMODU1 4-pin male connector (J3). The power supply connector pins are marked as follows:

1	GND
2	GND
3	+VT :5 Vdc $\pm$ 15% (printer head power supply)
4	+VDC : 5 Vdc $\pm$ 7% (logic card power supply)

Connecting with the power supply connector (J3) can be avoided by using the flat 20-pin logic connector (J1), thus connecting the power supply and the printer signals with a single cable. The maximum length of the flat cable must not, however, exceed 30 cm for the 20-pin version. The reason for this is that current running along inside narrow wires can lead to power failures, which could interfere with the correct functioning of the printer.

If the printer has the RS232 or CENTRONICS options, it must be supplied by means of the J1 connector. For the pin pattern required for supplying power through the logic flat cable, please refer to the following paragraph.

Logic

In the J1 a 20-pin connector, the signals are arranged as follows:

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[1]	16	RESET
17	S-EN	18	READY/RTS
19	FEED	20	STB/RD

(1) The D7 signal is not taken into consideration in cases of 7-bit programming of the parallel port.
In order to configure the PD190 with the extended character set, 8-bit programming of the parallel interface is required.

The signals indicated have the following functions:

GND : signal ground and power supply ;

+VT : printer head power supply ;

+VDC: logic card power supply ;

S-EN: serial/parallel interface selection. If short-circuited to ground (0), it enables serial communication ; if free (1), it enables parallel communication;

D0,...,D7: data bus. In parallel configuration, these correspond to the printer input data bus (the high level indicates the binary digit 1). In serial communication, these are utilized to determine speed of communication and transmission protocol ; normally the data bus is at logic level 1 : in order to obtain logic level 0, it has to be short-circuited to ground (GND).

The serial baud rate can be set by the user as shown in the following table :

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**

All other combinations select a speed of 1200 bauds.

D3=1: flag-type transmission protocol. When the buffer is full, the printer sends a low level on the RTS signal, which interrupts transmission; when the buffer is able to receive further data, the level of the RTS signal is then changed to 1.

D3=0: XON/XOFF type transmission protocol. When the buffer is full, the printer sends an XON$13 (DC3) which interrupts transmission; when the buffer is able to receive further data, the command XON$11(DC1) is transmitted.

D4=1: when the PRINT key is pressed, nothing happens.

D4=0: when the PRINT key is pressed, the signal $0D (CR) is transmitted to the TD pin, if the serial interface has been configured.

D5,D6 e D7: the selection of these bits results in the serial being configured with the transmission format listed in the table below :

D7	D6	D5	Format
1	1	1	8 bits without parity and 1 stop bit
0	1	1	8 EVEN parity bits and 1 stop bit
0	1	0	8 ODD parity bits and 1 stop bit
1	1	0	7 bits without parity and 1 stop bit
1	0	1	7 EVEN parity bits and 1 stop bit
1	0	0	7 ODD parity bits and 1 stop bit

Remember that, to configure the printer in serial mode, the S-EN signal has to be short-circuited to ground on connector J1.

RESET Card controller reset, active at a low level. Resetting initializes the printer's parameters and has the following effects:
- Erasure of line buffer and print buffer;
- Selection of print format according to programming ;
- Reading of the S-EN pin of J1 for serial or parallel configuration;
- Printing of the self-test if the PRINT key is pressed ;
- Functionality check of the option cards installed, if any.

READY/RTS   in parallel configuration the high level indicates that the printer is ready to receive data. The low level indicates that it is on standby (bus Y).
In serial communication, if the CTS/RTS protocol is enabled the high logic state (1) indicates that the printer is ready to receive data; the low logic state (0) indicates that the print buffer is full and cannot receive data. If the serial protocol XON/OFF is enabled, the signal is always high.

FEED   paper feed key, active at low level. This signal is in parallel with the contacts of the FEED key on the front panel of the printer.

STR/RD   in parallel configuration a low level tells the printer that there is valid data on the data bus (D0, ..., D7). In serial configuration this corresponds to the data reception pin.

CONFIGURATION

With the PD190 printer default parameters may be configured.
The parameters affected by configuration are:

- enabling of Real Time Clock setting;
- print directions;
- no. of bits in parallel communication;
- enabling of seconds display;
- CRLF mode;
- enabling of printing of block 1;
- character sets;
- enabling of lapsed time meter.

The settings made are saved on the 256-byte EEPROM. As an option, a 2 Kbyte EEPROM (non-volatile memory) containing 3 blocks - one of 300 bytes and two of 700 bytes - is available, in which information of any kind can be stored. For details on memory block management, please read the paragraph "Control Characters" in the section "Printer Functions".
The printer can either be configured through the PC or by using the front keys on the printer.

Configuration through PC

This can be done by using an IBM or IBM-compatible computer with a serial output, or else by using a programme which can be supplied on request. This programme, with its pull-down menus is user-friendly and prompts the operator at each stage of the input procedure.

Configuration using the PRINT and FEED keys

Configuration through the keyboard is usually disabled. To enable it, short-circuit the JP1 jumper on the printed circuit board.

JP1 SETTING	SETTING THROUGH FRONT KEYS OPTION
OPEN	DISABLED
CLOSED	ENABLED

If, when the printer is switched on, both keys are held down simultaneously, the printer enters configuration mode and prints the first modifiable parameter. Each time the PRINT key is pressed subsequent to this, the variation of the parameter is shown and the its current value is printed. After entering the desired parameter, press the FEED key to go on to the next parameter, and so on. Once all the parameters have been entered, the printer prints a message to indicate that setting procedure has been completed.

SELF-TEST

To enable the self-test, hold down the FEED key (paragraph 1.2) while switching on the printer. The self-test consists of the printing of the printer's currently set data, a memory check and the printing of the entire set of ASCII characters.

Figure 4

```
* AUTOTEST *
MOD. P190 LCD - 24

ROM OK
ROM RELEASE 6.0 LCD
EEPROM 16 DETECTED
SERIAL NUMBER = 00000001
TEST DATE = 29/09/93
*
 SETUP  DEFAULT
PRINT MODE = NORMAL
MODE =    LITTLE
FONT 1 SELECTED
ENABLE SET RTCK
ENABLE SECONDS
CR-LF HONOR CR
8 BITS PER CHAR.
TEXT = DISABLE
*
EXTERNAL DEVICE :
REAL TIME BOARD PRESENT
PARALLEL PORT SELECTED
*
```

PRECAUTIONS

- Do not print when there is no paper and/or ribbon: this leads to rapid deterioration of the print heads.
- Do not put objects inside the printer.
- Do not pull the printer carriage manually when the printer is ON.
- Before connecting the printer to the mains, check that the power supply or system ON/OFF switch is in the OFF position.
- Avoid blows to any part of the printer, both during and after installation.

MAINTENANCE

Changing the paper roll

To change the paper roll, proceed as follows:

A. open the top of the printer and place the paper roll in position, following the arrow, as indicated in figure 5;
B. insert the end of the roll in the slit (A) of the print mechanism;
C. press the FEED key (B) so that a few centimetres of paper come out of the printer;
D. insert the end into the slit on the top of the printer and close it.

Figure 5
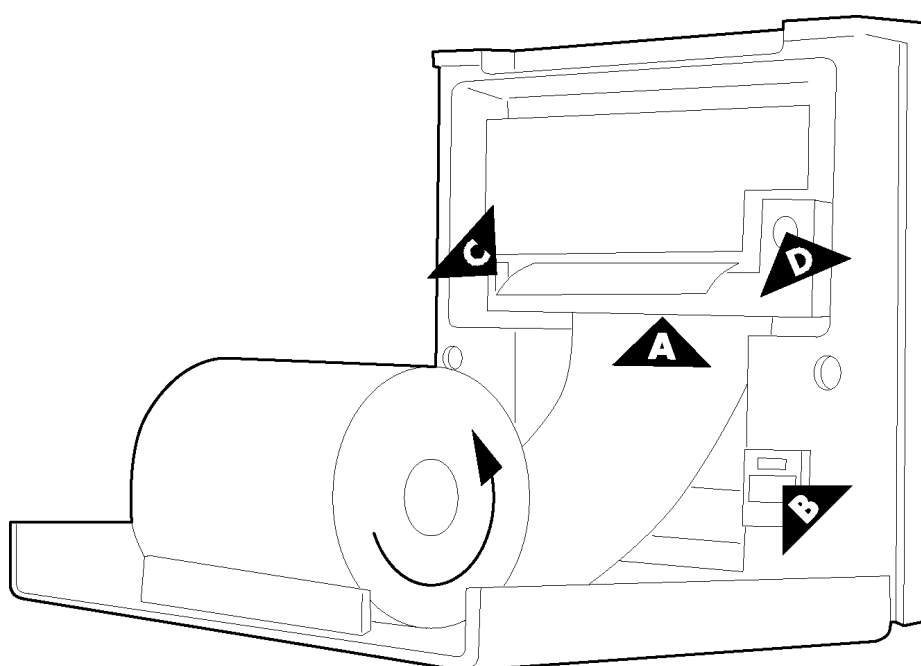
Changing the ribbon

To change the ribbon, proceed as follows:

A. open the top of the printer and remove the old ribbon cartridge, by pressing down at point (C), as shown in figure 5;
B. insert the new ribbon, making sure that it is correctly positioned;
C. pull the ribbon tight by turning the knurled knob (D) and close the top down again.

N.B. : Before performing any kind of operation with the printer top open, switch the printer off. If this is not possible, take all the usual safety precautions to ensure against electric shock.

The selection of the standard interfaces, serial and parallel TTL, is given by the status of the S-EN pin of J1.

TTL SERIAL

In the serial protocol, the signals which characterize communication are TD, RD and RTS if the RTS/CTS protocol has been selected; alternatively, if the XON/OFF protocol has been selected, the signals are TD and RD.

Transmission Format
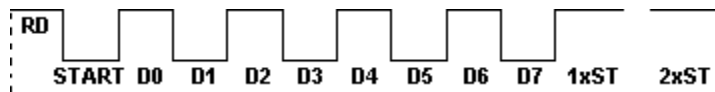
RTS/CTS Protocol
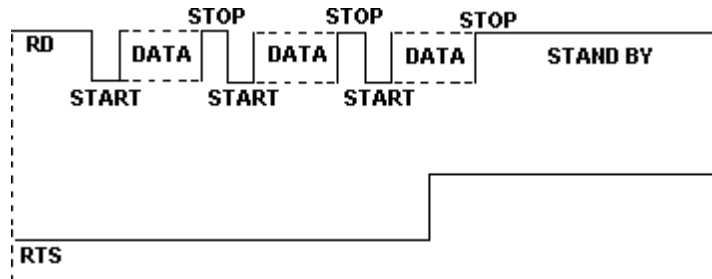
XON/OFF Protocol
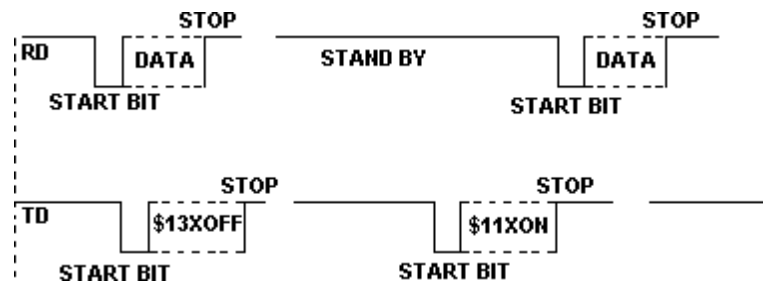
TTL PARALLEL

In parallel communication the useable signals are :

- 7 or 8 bit data bus (D0,...D7) ;
- STROBE (STB) signal indicating data validity ;
- READY signal indicating that the printer is ready to receive data.

Transmission Format
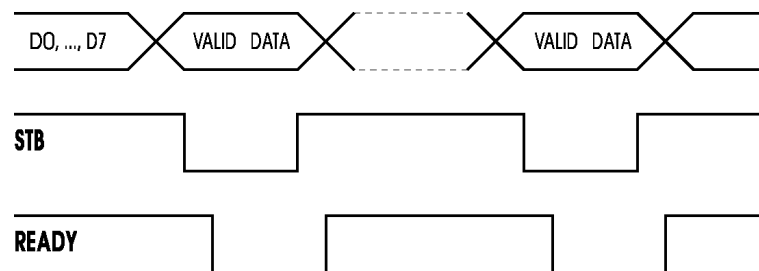
Flow diagram
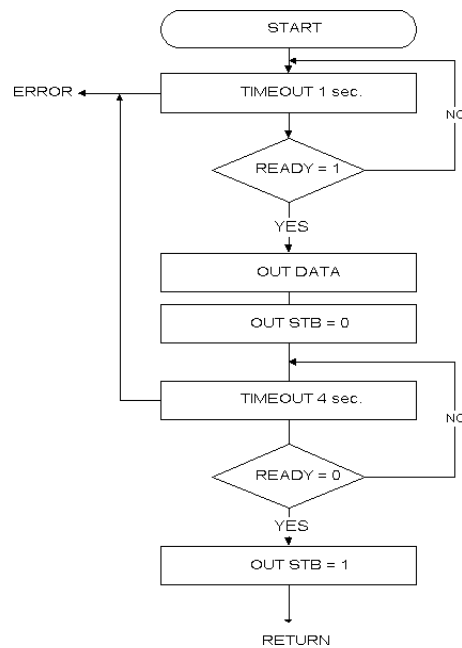
RS232 SERIAL (option)

The printer has an RS232 serial interface and current loop to be installed on the PD190 controller.
The connection is made with a 25-pin rectangular female connector.
The signals on the connector pins are indicated in Table 2.
The pins which are not indicated are not connected. Figure 6 shows how to select the operating modes.

Connector Pin Table

| Pin	Signal	Direction	Connection	Description
1,..,7	GND	OUT	GND	Signal ground
2	TXD	OUT	RXD	Receive data. Serial output
3	RXD	IN	TXD	Trasmit data. Serial data input
4	DTR	OUT	DSR / DCD	Data set ready.Printer on and operating
9	LOOP RD+	IN		Data reception in current loop
10	LOOP RD-			RD LOOP return
11	LOOP RTS+	OUT		Current loop: printer ready to receive data
12	LOOP RTS-			RTS LOOP return
13	LOOP DTR+	OUT		Current loop : indicates that the printer is on
14	LOOP DTR-			DTR LOOP return
15	LOOP TD+	OUT		Current loop: high level data transmission
16	LOOP TD-			TD LOOP return
20	RTS OUT	CTS		Clear to send. Ready to receive data

The following personalizations may be obtained, relative to transmission format and the PRINT key on the PD190's front panel, by using the dip-switch on the RS232 card:

DIP 1	DIP 2	DIP 3	BAUD speed
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 4	Description
OFF	Transmission protocol RTS/CTS
ON	Transmission protocol XON/XOFF

DIP 5	Description
OFF	Disables transmission of $0D
ON	Enables transmission of $0D

DIP 6	DIP 7	DIP 8	Format di trasmissione
OFF	OFF	OFF	8 bits without parity and one stop bit
OFF	OFF	ON	8 EVEN parity bits and 1 stop bit
ON	OFF	ON	8 ODD parity bits and 1 stop bit
ON	OFF	OFF	7 bit without parity and one stop bit
OFF	ON	OFF	7 EVEN parity bits and 1 stop bit
ON	ON	OFF	7 ODD parity bits and 1 stop bit
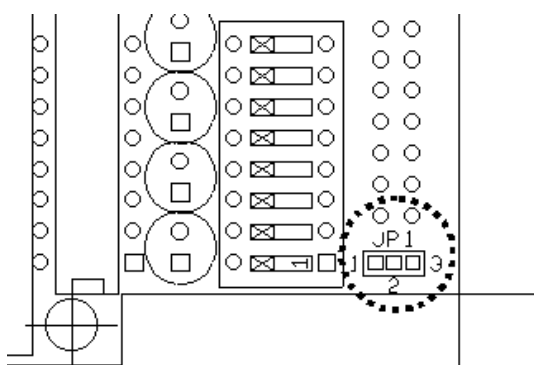
Figure 6

For functioning in Current Loop, solder together points 1 and 2.

For functioning in RS232 mode, solder together points 2 and 3.

CENTRONICS PARALLEL (option)

The printer can be equipped with a CENTRONICS parallel interface to be installed on the PD190 controller. The connection is made with a 25-pin rectangular female connector.
The signal layout is exactly the same as that used by personal computers which use the same connector, as shown in Table 3.

PIN	SIGNAL	DIRECTION	DESCRIPTION
1	STROBE	IN	A low level impulse on this line indicates that there is data ready to be read by the printer
2	DATA1	IN	Data transmitted to the printer: the low level indicates binary digit 1.
3	DATA2	IN	
4	DATA3	IN	
5	DATA4	IN	
6	DATA5	IN	
7	DATA6	IN	
8	DATA7	IN	
9	DATA8	IN	
10	ACK	OUT	A low level impulse indicates that the printer is ready to receive fur ther data
11	BUSY	OUT	High level active signal : indicates that the printer cnnot receive data.
12	PE	OUT	Paper out (always to GND).
13	SELECT	OUT	Connection toVdc with 4.7 Ohm resistance
18	GND		Pins connected to GND
19	GND		
20	GND		
21	GND		
22	GND		
23	GND		
24	GND		
25	GND		

REAL TIME CLOCK (option)

The Real Time Clock is available as an option. Printing and adjustment of the clock are managed by a series of control characters :

$12	Prints clock
$13	Sets clock
$14	RTCK transmission in serial
ESC T	Enters the time in the print buffer
ESC D	Enters the date in the print buffer
ESC U	Enters the date (American style) in the print buffer

Adjusting the clock using the keyboard

The time and date can be adjusted by using the PRINT and FEED keys on the front panel of the printer. Setting procedure is as follows:

- hold down the FEED key and simultaneously press the PRINT key.
  The printer will print the time and date with an arrow indicating a digit to be changed;
- each time the PRINT key is pressed, the digit by the arrow will increase and the updated version will be printed;
- to select the next digit which requires adjusting press the FEED key again. On completion of each operation, the printer will print the updated time and date, highlighting by means of an arrow the digit currently being selected;
- to terminate setting, press PRINT and FEED at the same time, or run through all the parameters.

Lapsed time meter

By means of this function, implemented in the Real Time Clock, the total operating hours of the printer can be memorized. It is managed by three control characters (only if the RTCK is installed) :

ESC O	Transmits total operating hours in serial.
ESC o	Inserts total operating hours in the line buffer, thus enabling this to be printed in any string.
ESC M	Zero-sets total operating hours.

INSTALLATION OPTIONS

To install the CENTRONICS parallel and RS232 serial options:

- • insert the plastic spacers (D) provided with the option into the holes on the interface card;

- • insert the option (C) into the connector and its spacers, taking care to centre the pins correctly.
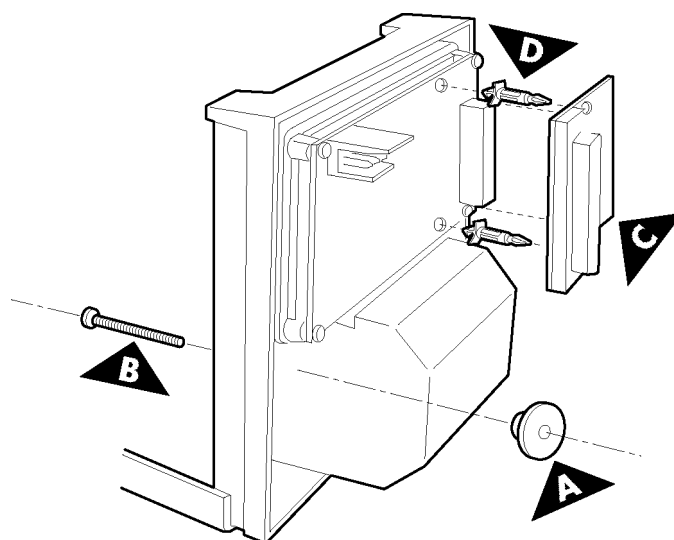
PRINT DIRECTION

The PD190 printer has two print directions which can be selected by means of control characters : normal and reverse.

Figure 7
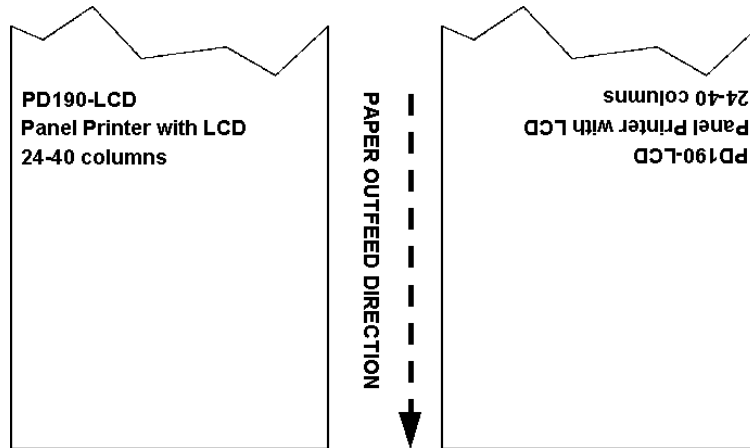
GRAPHICS

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

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

where :
X is not used ;
R must be set at level 1 ;
P1,..,P6 are the data of the graphic dots (1 prints, 0 does not print).

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

1st byte						2nd byte						3rd byte					
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
P6	P5	P4	P3	P2	P1	P6	P5	P4	P3	P2	P1	P6	P5	P4	P3	P2	P1

To print a line of dots, transmit :
$11, N x $7F (where N is the number of characters per line), $0D.

To print an empty line, transmit :
$11, $40, $0D.

CONTROL CHARACTERS

The table below lists all the commands for function management of the PD190 printer. These commands can be transmitted to the printer with either the serial or parallel interface; if, however, the parallel interface is used, the user will not be able to receive the data required, since this interface is unidirectional. The commands can be transmitted to the printer at any moment, but they will only be carried out when the characters previously transmitted have been printed or the commands previously transmitted have been carried out. There are no commands with priority status; all the commands are carried out when the circular buffer is free to do so. They can be 1-, 2- or 3-byte commands.

TABLE OF PD190 COMMANDS

Com.	ASCII Com.	HEX Description
	$00[1]	Prints in small characters
	$01[1]	Prints in double height
	$02[1]	Prints in double width
	$03[1]	Expanded printing
	$04[1]	Restores small character printing
	$05	Sets printer mode
	$06	Sets LCD mode
	$07	Sets printer mode +LCD
	$0A	Forward feeds one line
	(n) $0B[1]	Forward feeds (n) lines
	$0B	Vertical tab
	$0D	Prints line buffer
	$0F	Sets CRLF mode
	$11	Graphic mode
	$12	Prints time and date
	$13	Sets time and date in serial in serial
	$14	Transmits time and date in serial
ESC R	$1B $52	Sets print direction in reverse mode
ESC N	$1B $4E	Sets print direction in normal mode
ESC @	$1B $40	Resets printer
ESC D	$1B $44	Enters date in print buffer
ESC T	$1B $54	Enters time in print buffer
ESC U	$1B $55	Enters date (mm :dd :yy) in print buffer
ESC S	$1B $53	Enables printing of seconds
ESC O	$1B $4F	Transmits operating hours in serial
ESC H	$1B $48	Zero-sets total operating hours
ESC o	$1B $6F	Prints total operating hours
(aa) ESC r	(aa) $1B $72	Reads a piece of data at an address (aa)
(aadd) ESC w	(aadd) $1B $77	Writes a piece of data (dd) at an address (dd)
(dd) ESC G	(dd) $1B $47	Writes value (dd) in option register

(dd) ESC M	(dd) $1B $4D	Writes value (dd) in printing mode
ESC p	$1B $70	Transmits theoption register in serial
ESC m	$1B $6D	Transmits printing mode in serial
ESC s	$1B $73	Transmits the next character in serial
ESC W (n)	$1B $57 (n)	Starts saving block (n)
ESC V (n)	$1B $56 (n)	Prints block (n)
ESC E (n)	$1B $45 (n)	Transmits block in serial (n)
ESC Z	$1B $5A	Ends block saving
ESC B	$1B $42	Sets Font 1
ESC b	$1B $62	Sets Font 2
ESC J (n)	$1B $4A	Loads programmable character
(dd) ESC a	(dd) $1B $61	Changes the number of Dot spaces
ESC c	$1B $63	Cancels display LCD
ESC l	$1B $6C	Displays next character
ESC d (nn)	$1B $64 (nn)	Sets cursor position
ESC h (nn)	$1B $68 (nn)	Displays time in position x on LCD
ESC t	$1B $74	Stops display of time
ESC u	$1B $75	Displays cursor on LCD
ESC i	$1B $69	Displays cursor in Blinker mode on LCD
ESC f	$1B $66	Removes cursor display on LCD
ESC e	$1B $65	Returns cursor to original position (0,0)
ESC g	$1B $67	LCD backlighting ON
ESC n	$1B $6E	LCD backlighting OFF

Notes : (1) This command clears the print buffer, erasing all the data which was stored in it.

A detailed description of each control character follows.

$0A

Name	Line feed
Format	$0A
Description	The printer feeds forward by one line and if there are any characters in the buffer, these will be printed.
Notes	The space covered by a line feed is equivalent to 10 normal print dots

$0D

Name	Carriage return
Format	$0D
Description	When this command is transmitted all the data in the line buffer is printed and the printer forward feeds one line

$00

Name	Small characters
Format	$00
Description	This command is used to revert to printing in small characters. It also clears the printer buffer
Notes	A small character is 6 dots wide and 10 dots tall.

$01

Name	Double height characters
Format	$01
Description	This command is used to activate double height printing. It also clears the line buffer.

$02

Name	Double width characters
Format	$02
Description	This command is used to activate double width printing. It also clears the line buffer.
Notes	A double width character is 12 dots wide and 10 dots tall

$03

Name	Expanded characters
Format	$03
Description	This command is used to activate expanded printing. It also clears the line buffer.
Notes	An expanded character is 12 dots wide and 20 dots tall.

$11

Name	Graphic mode
Format	$11
Description	This command enables the printer PD190 in graphic mode, i.e. to print in graphic mode, transmit the commande $11 at the beginning of each line.
Notes	For byte format in graphic configuration, see the relevant paragraph (page 19).

$0B

Name	Vertical tab
Format	$0B
Description	When this command is transmitted, the paper forward feeds by n lines (4 by default) the number of which can be modified.

$0F

Name	CRLF mode
Format	$0F
Description	This command enables the CRLF option, which inhibits the action of command $0D, maintaining only the command $0A active for printing purposes. To disable this option, reset the printer, by switching it off and on again, or by transmitting the software reset command.

$12

Name	Normal clock printing
Format	$12
Description	When this command is transmitted, the time and date are printed. The seconds, if enabled, will also be printed. In both cases the command resets the line.
Notes	If expanded or double width characters are enabled, only the time will be printed.

$13

Name	Clock setting
Format	$13
Description	This command is used to set the time and date of the clock installed inside the printer. There are two ways of setting the time : 24hrs and 12hrs. In the first case, the 10 ASCII characters corresponding to the time and date have to be transmitted, followed by the terminating code $13. In the second case, the 10 ASCII characters will be transmitted preceded by A or P to indicate ante- or post-meridian.
Notes	It is advisable to send the command $00 to erase any old characters still in the buffer

$14

Name	Out RTCK serial
Format	$14
Description	This command transmits the contentns of the Real Time Clock to the printer's serial port in the format of 11 ASCII characters : hours/minutes/dd/mm/yy + (CR)$0D
Notes	If the seconds option is enabled, the seconds will be transmitted after the minutes. If the parallel interface is being used, this command will be ignored.

ESC 'R

Name	Reverse mode printing
Format	$1B $82
Description	This command selects reverse mode printing. In reverse mode printing, the ticket comes out of the printer with the writing upside down and running from right to left. When the printer is switched on, the default value is selected by the flag of a location called the "option register"; this flag can be manipulated by programming, using the the two keys on the front panel of the printer with which the default value can be changed and it can be decided whether the printer is to be in reverse or normal mode when it is switched on.

ESC 'N

Name	Normal mode printing
Format	$1B $78
Description	This command selects normal mode printing. In normal mode printing, the ticket comes out of the printer with the writing right way up and running from left to right. When the printer is switched on, the default value is selected by the flag of a location called the "option register"; this flag can be manipulated by programming, using the the two keys on the front panel of the printer with which the default value can be changed and it can be decided whether the printer is to be in reverse or normal mode when it is switched on.

ESC '@

Name	Resetting
Format	$1B $64
Description	This command resets the printer software. This command is identical to the hardware reset command and can be used for re-initializing the printer's parameters.
Notes	Once the command has been transmitted, approximately 1.5 seconds pass before the printer becomes active again.

ESC 'D

Name	Entering the date in the print buffer
Format	$1B $44
Description	This 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. This command can be used for entering the date in the context of a sentence without zero-setting the line buffer. If, for example, you wish to write:

<div align="center">DATA : 11-09-93 TEST OK</div>

you will send: DATA : $1B$44 TEST OK $0D

If you only wish to print the date, it is enough to transmit $1B $44 $0D. The date is transmitted in 8 characters and, if there is not sufficient space left in the line buffer, it is not printed.

ESC 'T

Name	Entering the time in the print buffer
Format	$1B $54
Description	This 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. This command can be used for entering the time in the context of a sentence without zero-setting the line buffer. If, for example, you wish to write:

<div align="center">TIME : 16.45 TEST OK</div>

you will send: TIME : $1B $54 TEST OK $0D

If you only wish to print the time, it is enough to transmit $1B $54 $0D. The time is transmitted in 5 characters and, if the seconds option is enabled in 8 characters; if there is not sufficient space left in the line buffer, it is not printed.

ESC 'U

Name	Entering the date in the print buffer
Format	$1B $55
Description	This command is used for entering the date, American.style mm-dd-yy, in the line buffer. This command can be used for entering the date in the context of a sentence without zero-setting the line buffer. If, for example, you wish to write:

<div align="center">DATE : 09-11-93 TEST OK</div>

You will send: DATE : $1B $55 TEST OK $0D

If you only wish to print the date, it is enough to transmit $1B $55 $0D.   The date is transmitted in 8 characters; if there is not sufficient space left in the line buffer, it is not printed.

ESC 'S

Name	Enabling seconds printing
Format	$1B $53
Description	This command enables the printing of seconds when the time is requested with command "ESC" T. When the printer is switched on the default value, which determines whether or not the seconds are to be printed, is contained in the flag of a byte called the "option register"; this flag can be manipulated by programming, using the keys on the front panel of the printer.

ESC 'O

Name	Transmitting operating hours in serial
Format	$1B $4F
Description	This 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. If, therefore, there is no Real Time Clock, this command will produce no effect. In addition, if the user utilizes the parallel port, the operating hours will not be transmitted since the parallel port is unidirectional. The hours begin to increase as soon as the printer is switched on. The transmission format is in ASCII standard and four characters are transmitted: in order of importance. The transmission protocol is the same as that set by by the user on the serial interface. As there are four characters it can reach a maximum of 9999 operating hours; it then automatically zero-sets and continues counting.

ESC 'H

Name	Zero-setting total operating hours
Format	$1B $48
Description	This command zero-sets the printer's total operating hours. If you are using the total hours option, it is advisable to use this command immediately after switching on the printer so as to synchronize the operating hours of the printer itself with those of the master device.

ESC 'o

Name	Printing total operating hours
Format	$1B $6F
Description	This 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. The hours begin to increase as soon as the printer is switched on. As there are four characters it can reach a maximum of 9999 operating hours; it then automatically zero-sets and continues counting. If, for example, you wish to write:

                TOTAL HOURS: 0123 TEST OK

you will send: TOTAL HOURS: $1B$6F TEST OK

The hours are printed in four characters and if there is not enough space in the line buffer, they will not be printed.

ESC 'B

Name	Setting character font 1
Format	$1B $42
Description	This command selects the first character font. The complete font is printed during the self-test. Some codes are not standard and are as follows:

                $60, $7B, $7C, $7D, $7E, $7F, $8D, $ED, $FA & $FF

These characters are compatible with earlier printer models. The font may be selected at any time, keeping in mind that the printer cannot print a line containing two different fonts and will print, therefore, the last font selected. When the printer is switched on the default value, which establishes which printing font is to be used, is selected by a flag in a location called the "option register"; this flag can be manipulated by programming, using the the two keys on the front panel of the printer, by means of which the default values can be changed.

ESC 'b

Name	Setting character font 2
Format	$1B $62
Description	This command selects the second character font. The complete font is printed during the self-test. This font contains Cyrillic characters. It may be selected at any time, keeping in mind that the printer cannot print a line containing two different fonts and will print, therefore, the last font selected. When the printer is switched on the default value, which establishes which printing font is to be used, is selected by a flag in a location called the "option register"; this flag can be manipulated by programming, using the the two keys on the front panel of the printer, by means of which the default values can be changed.

(aa) ESC 'r

Name	Reading a piece of data at an address (aa)
Format	(aa) $1B $72
Description	This command makes it possible to read in a location of the non volatile memory (EEPROM). It can only be used with the serial port, which is bi-directional.

The communication protocol is defined by the dip-switches on the serial interface. There are 256 legible locations, starting from the $00 location up to the $FF location. The address of the location to be read must be defined before the "ESC" r command is transmitted, i.e. if we wish to read address $01, we have to transmit in ASCII:

> 0 1 "ESC" r or $30 $31 $1B $72

In reply to this reading, the printer transmits the data of address $01. The reply also is given in ASCII; thus if, for example, address $01 contains $A5, we will receive:

> A 5 or $ 41 $35

The entire memory bank contains the value $20 by default. Since it is a non volatile memory, the user can save the data without losing it when the power is switched off.

(aadd) ESC 'w

Name	Writing a piece of data (dd) in an address (aa)
Format	(aadd) $1B $77
Description	This command makes it possible to save a piece of data in a non volatile memory bank. There are 256 locations in which to write, starting from $00 to $FF. The pieces of data cannot exceed $FF (255)and both the addresses and the data must be expressed in ASCII on two bytes. To save a piece of data, first transmit the address, then the data followed by the command "ESC" w. If, for example, you wish to save the data $A5 in address $01, you will transmit:

> 0 1 A 5 " ESC" w   or $30 $31 $41 $35 $1B $77

The entire memory bank contains the value $20 by default. Since it is a non volatile memory, the user can save the data without losing it when the power is switched off.

ESC 'h (nn)

Name	Displaying the time on the LCD in position (nn)
Format	$1B $68 (nn)
Description	Displays the time of day, including the seconds if these have been previously enabled by the command ESC S, in position (nn) of the LCD. If you wish to position the time in one of the 16 positions available on the first line (nn) it can vary from 1 to 16. As regards the second line (nn), it can vary from 41 to 56. E.g. : to position the time in position 5 of the 1st line, transmit: ESC d $30$35

(dd) ESC 'G

Name   Writing a piece of data (dd) in the option register

Format   (dd) $1B $47

Description   By means of this command, the printer configuration can be manipulated. To do so, a byte in ASCII containing the configuration must be transmitted to the printer, followed by "ESC" G. The setting byte contains the following bits:

          d7   d6   d5   d4   d3   d2   d1   d0

where:

- d0 is used to enable the setting of the Real Time Clock using the keys on the front of the printer. If this bit is 0, it disables setting; if it is 1 it enables it. If the user disables this function the clock will not be affected by variations made either accidentally or deliberately by persons not qualified to do so.
- d1 is used for setting the print direction: normal or reverse. If this bit is 0 printing is in normal mode; if it is 1 it is in reverse mode.
- d2 is used in parallel communication and enables the 7 or 8 data bit protocol. If this bit is 0 the parallel port accepts 8 bit data; if it is 1 the port accepts 7 bit data. If the 7-bit protocol is enabled, the printer will only be able to print non extended characters, i.e. those from code $0E to code $7F.
- d3: its purpose is to enable the printing of seconds in the clock commands. If the bit is 0 the seconds will not be printed; otherwise during the printing phase of the time the seconds will be printed too.
- d4: if the bit is 0 command $0D is carried out; if it is 1 the printer ignores the carriage return command.
- d5: this bit enables the printing of the first block (heading) as soon as the printer is switched on. If the bit is 0 this function is disabled; if it is 1 the function is enabled.
- d6 selects the character fonts during printing. A logic state 0 selects font 1, while a logic state 1 selects font 2.
- d7: this bit has no effect on the working of the printer.

Once the printer has been configured, the above described byte in ASCII is transmitted; for example byte = 00001001 corresponds to $09, the whole string would therefore be: 0 9 "ESC" G or in Hex $30 $39 $1B $47

All these bits can be manipulated by programming using the front keys of the printer.

ESC 't

Name   Cancelling display of time on LCD.

Format $1B $74

Description   This command cancels the display on the LCD of the time, including that of the seconds if enabled, with command ESC S.

(dd) ESC M

Name	Writing value (dd) in printing mode
Format	(dd) $1B $4D
Description	Using the command "ESC" M it is possible to manipulate the printing mode by default. To do this a byte in ASCII containing the printing mode must be transmitted followed by "ESC" M. The type of writing which can be defined is described in the following table:

        $00   small character printing
        $01   double width printing
        $02   double height printing
        $03   expanded printing

If, for example, you wish to print in double height characters, you will send:
    0 2 "ESC" M (or $30 $32 $1B $4D)
Automatically the printing mode is changed to the one selected and is stored in the non volatile memory.

ESC p

Name	Transmitting the option register in serial
Format	$1B $70
Description	This command 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. If, for example, we receive:

    0 9 (or $30 $39)
this means that the configuration will be 00001001.

ESC m

Name	Transmitting the printing mode in serial
Format	$1B $6D
Description	This command transmits the byte containing the printing mode 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 printing mode value. If, for example, we receive:

    0 2 (or $30 $32)
this means that the printer is in double height printing mode.

ESC s

Name	Transmitting the next character in serial
Format	$1B $73
Description	This command sets the printer to transmit the next character it receives. If, for example, we transmit "ESC" s A, the last character, A, will not be printed but will immediately be transmitted in serial. If we use this function in memorizing blocks of text, we can simulate a password which would be transmitted, for example, when the printer is switched on.

ESC W (n)

Name	Starting saving block (n)
Format	$1B $57
Description	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 memorized is of 300 bytes for the first block and 700 bytes for the second and third blocks. The files can contain all kinds of codes; it is therefore possible to store text, data, executive commands to the printer, auto-headings, graphic files etc. If files exceeding the memory bank capacity are transmitted, the extra characters will be printed directly without being saved. Loading can be done in either serial or parallel. When you have finished loading a block, it is advisable to enter the terminating command "ESC" Z. The three blocks stored in this way can either be printed or transmitted in serial. If printer commands have been saved, these will be carried out as they would normally.

ESC V (n)

Name	Printing block (n)
Format	$1B $56 (n)
Description	This 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. The first block, also called heading, will automatically be printed when the printer is switched on, if the auto-heading flag is set. The user's logo or the name of his company can, therefore, be printed each time the printer is switched on. The three blocks can also be printed one after the other, there being a total memory bank of 1700 bytes. To recall a block, you must enter the command "ESC" V and the number of the block you wish to recall.

ESC E (n)

Name	Transmitting block (n) in serial
Format	$1B $45 (n)
Description	This command followed by a number (from 1 to 3), transmits in serial the memory block defined 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.

ESC Z

Name	Ending block saving
Format	$1B $5A
Description	This 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 the absence of the terminating command, the entire block will be printed.

PRINTER COMMANDS

ESC J (n)

Name Loading programmable character (n)
Format $1B $4A (n)
Description This command followed by a number n (from 1-8) is used to generate the eight programmable characters. The first programmable character corresponds to the code $17 and the last to the code $1F. A programmable character consists of 10 lines of 6 dots each; to form a character which corresponds to code $17, therefore, you must transmit 10 bytes preceded by "ESC" J1. The bytes must have the same characteristics as the graphic mode, i.e.:

x	P7	P6	P5	P4	P3	P2	P1
d7	d6	d5	d4	d3	d2	d1	d0

where: x is not used;
P7 must be fixed at 1;
P1 to P6 = the graphic dot data; if it is at 1 it prints and if it is at 0 it does not print.

The P6 bit of the string of dots transmitted is printed or displaaaayed on the left with the other dots running from left to right (P6, P5, P4, P3, P2, P1) as illustrated:

P6	P5	P4	P3	P2	P1	1st byte
P6	P5	P4	P3	P2	P1	2nd byte
P6	P5	P4	P3	P2	P1	3rd byte
P6	P5	P4	P3	P2	P1	4th byte
P6	P5	P4	P3	P2	P1	5th byte
P6	P5	P4	P3	P2	P1	6th byte
P6	P5	P4	P3	P2	P1	7th byte
P6	P5	P4	P3	P2	P1	8th byte
P6	P5	P4	P3	P2	P1	9th byte
P6	P5	P4	P3	P2	P1	10th byte.

After the tenth byte the function "ESC" J finishes. If, for example, we wish the symbol of code $1F to be #, we must transmit:
"ESC" J 2 pieces of data, i.e.:
$1B $4A $32 $52 $52 $52 $7F $52 $52 $7F $52 $52 $52
All the data must be transmitted consecutively. This type of loading is allocated to the volatile memory; thus, when the power is switched off the character is zero-set.

(dd) ESC 'a

Name Changing the number of dot spaces
Format (dd) $1B $61
Description Inserts between two consecutive lines of printing a number of dot spaces equivalent to the value (dd), which are two bytes in ASCII saved in Ram; hence when the printer is switched on, the default value is loaded.
E.g. : if you wish to insert 10 dot spaces between one line and the next, transmit the command $31 $30

$05

Name	Setting print mode
Format	$05
Description	When this command is transmitted, the characters are not displayed on the LCD

$06

Name	Setting LCD mode
Format	$06
Description	When this command is transmitted, character printing is disabled.

$07

Name	Setting print mode with LCD
Format	$07
Description	When this command is transmitted, the characters are not displayed on the LCD, neither can they be printed.

ESC 'n

Name	Backlighting OFF
Format	$1B $6E
Description	Switches off the LCD backlighting

ESC 'g

Name	Backlighting ON
Format	$1B $67
Description	Switches on the LCD backlighting

ESC 'e

Name	Return home
Format	$1B $65
Description	Positions the cursor of the LCD on the first character of the first line.

ESC 'f

Name	Cursor OFF
Format	$1B $66
Description	Switches the LCD cursor off

ESC 'u

Name	Cursor ON
Format	$1B $75
Description	Switches the LCD cursor on

ESC 'i

Name	Cursor ON Blinker
Format	$1B $69
Description	Switches the cursor on, in Blinker mode (flashing)

ESC 'c

Name	Erasing the LCD
Format	$1B $63
Description	Erases all the characters on the LCD

ESC 'l

Name	Displaying next character
Format	$1B $6C
Description	This command pre-sets the printer to display the next character it receives without printing it. E.g. if we transmit ESC l A, the last character, A, will not be printed but will be immediately displayed.

ESC 'd (nn)

Name	Moves cursor to position (nn) on the LCD
Format	$1B $64 (nn)
Description	Positions the cursor at the point shown by (nn). This value consists of two bytes expressed in ASCII. If you wish to position the time in one of the 16 positions available on the first line (nn) it can vary from 1 to 16. As regards the second line (nn), it can vary from 41 to 56. E.g. : to position the time in position 5 of the 1st line, transmit: ESC d $34$35

CHARACTER SETS

The printer has 2 character fonts.

FONT 1

FONT 2