CDL

Programmer Manual

rel. - 001

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1. CONTENTS

2. THE PROGRAMMING LANGUAGE

In order to work, thermal printers require some commands that use a specific syntax.
The CDL language comprises a series of commands formed by printable characters (with the exception of *SOH* and *STX*): this means that they can be used with any kind of computer.
The print file to be sent to the printer may be a text file (written using any editor); alternatively the instructions may be sent by programming language (e.g. Basic) or the label may be prepared on screen using WYSIWIG[1] software or a word processor that, using a driver, converts the label into instructions that can be understood by the printer. In the latter case, the user does not need to know the programming language and can ignore sections 2.1 (page 4) and 2.3 (page 36) which serve only to fully explain the functions and potentials of the machine.
This kind of software[2] is very powerful and permits even users who are not very expert to create labels using only a mouse and a keyboard. On the other hand, if you wish to optimise machine performance, it may be more efficient to program the printer using the CDL language described below.

2.1 The commands

In particular, the software commands can be classed as follows (see fig. 1).

[1] What You See Is What You Get.

[2] See the respective installation and operating manuals.

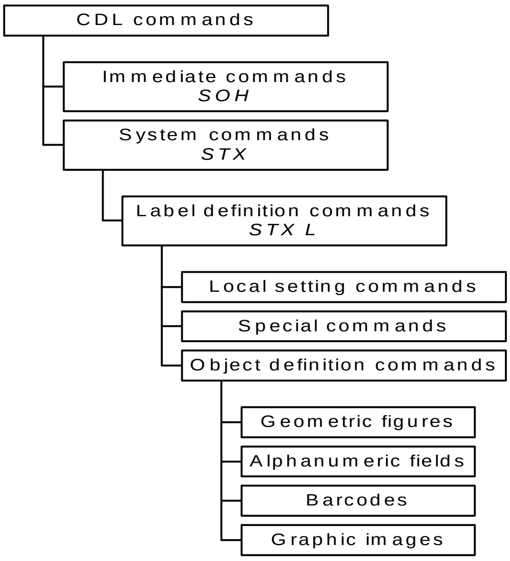


fig. 1 – Command hierarchy

Immediate commands (SOH)

These commands, preceded by the ASCII characters *SOH* (*01_{10}*, *01_H*), are *immediate* that is they are executed as soon as they are received, and take priority over other commands.
They act "at high level" e.g. to reset the printer, to request its status or to disable the interpreter.

System Commands (STX)

These commands are preceded by the ASCII characters *STX* (*02_{10}*, *02_H*) and are executed in the order in which they are received: only immediate commands (*SOH*) can "queue jump".

Label definition commands (STX L)

STX L is an "opening" command (you close with *E*, *X* or *s(A/B/C/D/E)nn...n*) for the label "building" operations. That is the instructions that permit you to create the label are enclosed within *STX L* and *E* (*X* or *s(A/B/C/D/E)nn...n*).
In particular, the commands defining the label parameters can be classified as follows:

Local setting commands

For each label it is possible to set local parameters such as the temperature of the head, the print speed or the number of labels to be printed. These parameters are, precisely, *local* that is valid only for the current label or job.

Special commands

These commands, despite the *STX* prefix, are not system commands.

Object definition commands

The actual label is made up of a group of objects, the nature of which may differ:

Geometric figures (lines and boxes)
Alphanumeric fields (characters or numbers)
Bar codes
Graphic images

The object definition commands must respect a well defined syntax (see sect. 2.1.2.1.3 on page 19) with which the desired characteristics are defined (e.g. orientation, position, size etc.).

2.1.1 Immediate (SOH) commands

SOH # - Reset

Resets the printer just as if it had been turned off and on again: it empties the buffers and initialises the memory. The effect is that all the variables are reset to their default values and any data stored in the registers are cancelled. Obviously, the images and labels stored in the flash memory remain, since it is not volatile.
After the command it is advisable to wait for the response[3] (*CR T*) from the printer if it is connected in series, or 3-4 sec, before entering other commands.

SOH A – Printer status (alphanumeric string)

The printer sends the computer[4] a sequence of 8 characters indicating its status. Each position has an exact meaning as shown in the table below:

[3] Only the RS 232 serial interface is two-way, therefore this command is effective only when the printer is connected to the computer by means of a serial interface.
[4] Only the RS 232 serial interface is two-way, therefore this command is effective only when the printer is connected to the computer by means of a serial interface.

Position	*Query*
1	Is the command interpreter busy?
2	Is the paper feed empty?
3	Is the ribbon out (if thermal transfer printing is enabled)?
4	Is a job being printed?
5	Is it busy?
6	Is it *off-line*?
7	Is the label present?
8	Always N

The reply character is *Y* if the result of the query is positive, *N* if it is negative.

SOH B - On-line

Switches the printer status from *on-line* to *off-line* and back. It behaves exactly like the ON-LINE button on the control panel.

SOH C - Cancel

This has the same effect as the CANCEL button on the front panel: the machine finishes printing the current label and cancels the remaining labels (in the current job).

SOH D – Disabling the immediate command interpreter

After this command the printer will ignore all immediate commands.
Logos and graphic images are likely to contain *SOH* characters that could be erroneously interpreted by the printer. Before loading logos, you therefore need to enter this command to inhibit the immediate command interpreter; when loading ends it will be automatically enabled again.

SOH E – Number of labels still to be printed

The four digits that the printer transmits[5] to the computer indicate the number of labels that still have to be printed.

SOH F – Printer status (1 hexadecimal byte)

The printer sends the computer[6] a byte, giving the status, in which each bit has the following meaning:

[5] Only the RS 232 serial interface is two-way, therefore this command is effective only when the printer is connected to the computer by means of a serial interface.

[6] Only the RS 232 serial interface is two-way, therefore this command is effective only when the printer is connected to the computer by means of a serial interface.

Position	*Query*
1	Is the command interpreter busy?
2	Is the paper feed empty?
3	Is the ribbon out (if thermal transfer printing is enabled)?
4	Is a job being printed?
5	Is it busy?
6	Is it *off-line*?
7	Is the label present?
8	Always *0*

Bit *1* is a positive answer, bit *0* is a negative answer.

2.1.2 System (STX) commands

Some of these commands set parameters that can also be changed from the configuration menu: in any case the software commands overwrite the configuration parameters and are valid until the next reset or until the machine is switched off.

STX a – Enabling of reply characters

This command enables the printer to send the computer *RS* (30_{10}, $1E_{H}$) and *US* (31_{10}, $1F_{H}$) reply characters.
The RS character is sent[7] in reply after each label is printed, the US character is sent in reply after each batch of labels has been printed.

STX cnnnn – Form length

When labels without references are used (without gaps, black tick marks or holes) the printer has to be told how long the label to be printed is. Before starting to print the labels, you need to enter this command, where *nnnn* is the form length expressed in hundredths of an inch. From that moment, at each feed, the paper will advance by *nnnn* hundredths of an inch[8].
When the form length differs from *0*, it is implicitly assumed that labels without references are being used and therefore the paper sensor is enabled only to signal whether or not there is paper (it does not detect any gaps or black tick marks).
e.g. *STX c0250* sets the form length at 2.5 inches.

STX Ennnn – Number of labels still to be printed

After saving the label to be printed, use the *STX G* command that follows to stamp the number of labels indicated by the current *STX Ennnn* command where *nnnn* is the number indicating the desired quantity.
e.g. with *STX E0020*, 20 labels are printed.

[7] Only the RS 232 serial interface is two-way, therefore this command is effective only when the printer is connected to the computer by means of a serial interface.
[8] After an *STX m* (see relevant paragraph), *nnnn* is read as tenths of a millimetre.

STX e – Paper sensor in transmission mode

After receiving this command, the sensor works in transmission mode (for paper sensor use and operating modes see the user's manual for the printer).

STX F - Form feed

It advances the paper of a label just as the FEED button on the control panel does: if a job is being printed, the form feed is queued and executed at the end of it.

STX fnnn - Back feed

To tear the label off at the gap or cut it with the automatic cutter, once printing is completed, the paper must advance just enough to reach the right position, and must then return before the next label is printed.
With this command, the last label printed is made to advance beyond the print head by *nnn* hundredths of an inch[9], then before the next one is printed the paper returns the same distance to keep the printing aligned with the label itself.
The amount by which the paper advances depends on the kind of emulation used (for this, see the user's manual for the printer used): that is the actual back feed is the difference between *nnn* and the *REFERENCE OFFSET* of the emulation that is being used.

STX G – Print label

The label "closed" by the *X* command (see sect. 2.1.2.1.1 on page 13) is not printed immediately but is held in the memory until the *STX G* command arrives. *STX Ennnn* indicates the number of labels remaining to be printed (if it is missing, only one label is printed).

STX Isfnn...n – Load graphic images

Graphic images must be loaded into the RAM (volatile) or flash (non-volatile) memory before they can be printed. To do this, use the *STX Isfnn...n* command where
s is the drive where the image is to be loaded. It may be

A: RAM[10] (volatile) drive
B: Flash (non-volatile) drive of the base machine
C: Current[11] drive
D: Flash drive of expander card n° 1 (see the user's manual for the printer used)
E: Flash drive of expander card n° 2

f is the image format. It may be

P: PCX format
p: "flipped" PCX format (mirror image)
B: BMP format

[9] After a *STX m* command (see relevent paragraph), *nnn* is read as tenths of a millimetre.

[10] Drive A of volatile memory (RAM) is available only when it is present (in an expander card) (for this, see the user's manual for the printer that is used).

[11] The current default drive is B (flash) and A (RAM) when it is present (in an expander card). It is possible to change the current drive using the *STX Xa* command, see relevant paragraph.

b: “flipped” BMP format
I: IMG format
i: “flipped” IMG format
F: FRG format

nn...n is the name you want to give to the image and by which it can be recalled in the label definition (it can be different from the original name of the graphic file). It is an alphanumeric string of no more than 8 capital characters ending with the character *CR*.

Immediately after entering this command, you must send the graphic file to be loaded to the printer. This file may contain characters that could be misinterpreted by the immediate command interpreter and for this reason the command must be preceded by *SOH D* (see sect. 2.1.1 on page 6) to temporarily disable the interpreter.
e.g.

SOH D	disables the immediate command interpreter
STX IAPxxx1	the graphic file that follows is in PCX (*P*) format and is loaded in RAM (*A*) with the name xxx1.

STX J - Off-line after a label

After this command, the printer goes *off-line* after printing each label.

STX L – Label definition mode

This command “opens” the label definition mode (see sect. 2.1.2.1 on page 13). That is, all the instructions included within the commands *STX L* and *E* (*X* or *s(A/B/C/D/E)nn...n*) are used to “build” the label, or define which fields must be included, their size and where they must be placed.

STX Mnnnn – Maximum label length

If, after the paper has advanced by *nnnn* hundredths of an inch[12], the machine does not find gap (a black tick mark or a hole), it will signal an error. The default value for this advance is 10 inches but it can be changed so that the printer will signal an error earlier.
e.g. with *STX M0255* and a label height of 2.5 inches, an error will be signalled if there is no gap within 2.55 inches (that is there is no label).

STX m – Metric system

After this command, all numerical parameters are read as tenths of a millimetre and no longer in hundredths of an inch. To return to hundredths of an inch you must enter *STX n*.

STX n – Imperial system

After a *STX m* command, you can return to the default system in which all numerical parameters are read as hundredths of an inch by entering *STX n*.

[12] After an *STX m* command (see relevant paragraph), *nnnn* is read as tenths of a millimetre.

STX Onnnn – Vertical offset

To move the whole label lengthwise with respect to the direction of the printing, you can enter a vertical offset. The four digit number *nnnn* gives the offset in hundredths of an inch[13] "according" to the emulation used (for this, see the user's manual for the printer used).
e.g. *STX O0225* (if you use the *REFERENCE* OFFSET *210*) gives an offset of 15 hundredths of an inch, that is the printer, before starting to print, will advance the paper by 15 hundredths of an inch and the printing will appear 15 hundredths of an inch "higher up" than "normal".
If the offset is positive, it will take effect from the first label, if it is negative, from the second onwards.

STX o – Immediate cut

When the automatic cutter is fitted and enabled, this command activates an immediate cut.

STX P – Dump mode

After this command, the printer goes into *dump* mode. This means that the command interpreter is disabled and all characters received by the printer are printer as hexadecimals: to exit this mode the printer must be switched off and on again. The command is equivalent to pressing both the ON-LINE and FEED buttons when it is switched on (for further information, see the user's manual for the printer used) except that it does not print a test label.

STX p - Off-line after a batch of labels

This command causes the printer to go *off-line*, unlike with the *STX J* command, see relevant paragraph, after each batch of labels it prints.

STX Q – Cancel all

This is equivalent to the commands *STX qA* + *STX qB* + *STX qD* + *STX qE*: it cancels all the drives including RAM and flash memories.

STX q(A/B/C/D/E) - Cancel drive

This command "cleans" drives A, B, C, D, E[14] respectively. The result is that all the images or labels previously saved are cancelled. Cancelling the non-volatile flash memory may take several seconds.
e.g. *STX qB* cancels the non-volatile flash memory of the base machine.

STX r – Paper sensor in reflection mode

After receiving this command, the sensor will operate in reflection mode (for the use of sensor operating modes, see the user's manual for the printer used).

[13] After an *STX m* command (see relevant paragraph), *nnnn* is read as tenths of a millimetre.

[14] Volatile memory drive A (RAM), and flash memory drives D and E (non-volatile) are only available when present (in an expander card) (for further information, see the user's manual for the printer used).

STX Sn – Feed speed

The paper advance speed can be selected by pressing the FEED button. The *n* (from A to O) corresponds to the following table:

n	*Speed (ips*[15]*)*
A	2
B	2
C	2
D	2,5
E	3
F	3,5
G[16]	4
H	4,5
I	5
J	5,5
K[17]	6
L	6,5
M	7
N	7,5
O[18]	8

e.g. After entering *STX SG*, the feed speed is 4 inches per second.

STX T – Print test

It prints a test label like the one printed by pressing the ON-LINE and FEED buttons when the printer is switched on (for further information, see the user's manual for the printer used) without going into dump mode and without printing the configuration.

STX Unnss...s – Fill register

It fills register *nn* (two-digit number) with the alphanumerical string *ss...s* (which must end with *CR*). The string *ss...s* may differ in length from the one previously saved in register *nn*.

STX Vn – Enable cutter and present sensor

According to the number given at *n* the cutter or the present sensor are enabled/disabled as in the following table:

[15] Inches per second.
[16] Default and max. speed.
[17] Default speed for models with expander card .
[18] Max. speed for models with expander card .

n	*Present sensor*	*Cutter*
0	Disabled	Disabled
1	Disabled	Enabled
4	Enabled	Disabled
5	Enabled	Enabled

e.g. *STX V4* enables the present sensor and disables the cutter.

STX v - RS 232 port configuration

It prints the configuration of the RS 232 port as it appears on the test label.

STX Xa – Current drive

With this command you can select the current drive C (see i commands *STX Iafnn...n* and s(A/B/C/D/E)nn...n) as the volatile RAM memory (*a*=*A*) or as the non-volatile flash memory (*a*=*B*, *D* o *E*)[19].
e.g. *STX XA* selects drive C as the volatile RAM memory.

STX Z – Print test and configuration

It prints the configuration and the test label in the same way as when you press the ON-LINE and FEED buttons when the printer is switched on (for further information, see the user's manual for the printer used) without, however, going into dump mode..

2.1.2.1 Label definition commands (STX L)

They are included between the *STX L* and the *E* (or *X* or *s(A/B/C/D/E)nn...n*) commands. They are not generally preceded by any particular character (neither *STX* or *SOH*) and "end" with the *CR*[20] character.

2.1.2.1.1 Local setting commands

These commands permit you to set a number of local label parameters like temperature, print speed and label quantity.

:nnnn – Cut command

Like the *cnn* command below (see), *nnnn* is the number of labels printed before the cutter operates (if it is fitted and enabled). Unlike the *cnn* command which can contain only two digits, this command accepts up to four digits.

[19] The default current drive is B. The A when the RAM is installed (in an expander card). Drives A, D and E are available only on expander cards.

[20]The line terminator can be replaced, in label definition mode, by another character with the command *T* (see sect. 2.1.2.1.1 on page 13) which is a local command and therefore is valid only for the current label.

An - XOR mode/transparent mode

When two objects are superimposed on the label, if the printer is in *XOR mode* the superimposed part appears white, while if it is in *transparent mode* this part appears black. If *n=1*[21] the printer is set in *XOR mode*, if *n=2* in *transparent mode*.
When you want to obtain "reverse" text, you must use *XOR mode*.

Cnnnn – Horizontal offset (of columns)

When you want to move the whole label to the right (positive offset) without having to recalculate all the column co-ordinates you can use the *Cnnnn* command in which *nnnn* are the four digits indicating the column from which printing must begin.
e.g. *C0015* adds *15* to all the column co-ordinates and the labels appears transversally offset by 15 hundredths of an inch[22] to the right.

cnn – Cut command

Like the command *:nnnn*, here too *nn* indicates the number of labels to be printed before the printer automatically cuts the paper with the optional cutter (which must be enabled). Unlike *:nnnn*, this command accepts only two digits.
e.g. with *c02* the cutter operates every two labels that are printed.

Dhv – Dot size

The dots (the smallest points that the printer can print) can be "grouped" in couples to form a larger dot. That is, you can enlarge each dot horizontally (h) and/or vertically (v) as in fig. 2.

[21] Default setting.

[22] After an *m* (see relevant paragraph), 15 tenths of a millimetre.

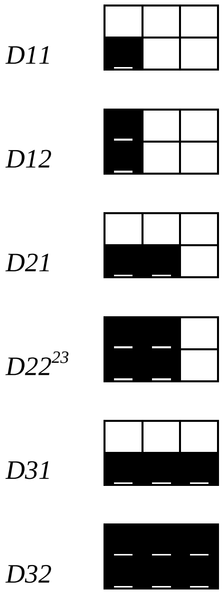


fig. 2 – Dot sizes

The effect is that all the objects on the label can be expanded horizontally and/or vertically using only one command.
D11 gives the highest resolution (on this subject, see the user's manual for the printer used).

E – Label definition mode terminator

On receiving this command, the printer prints the current label and exits the label definition mode.

G – Register memory

The field preceded by this command is saved in the first free register. The registers are filled in succession from *A* to *Z* and their value is retrieved with the command *STX Sn*, see relevant paragraph.
In practice each field is saved in registers *A-Z* even without using the command *G*: the registers are filled in succession starting from the first alphanumerical field of the label definition commands. The current *G* command only makes the memorisation explicit, highlighting it.

Hnn – Head temperature

To achieve optimum print quality, it may be necessary to modify the default temperature set with the *HEAD TEMPER. SELECTION* parameter (on this subject, see the user manual for the printer used) using this command *Hnn*. For this purpose, *nn* may vary from *00* to *20*. The optimum temperature depends on the type of ribbon and on the type of surface: as an indication, you should start with a temperature of *10* increasing it until you find the one that gives the best results.

[23] Default setting.

This command, since it is a *label definition command*, is a local command that is effective only on the current label: the default value is the one set by the *HEAD TEMPER. SELECTION* parameter mentioned above.

m – Metric system

After this command, the co-ordinates are read as tenths of a millimetre instead of hundredths of an inch. To return to hundredths of an inch, you need to enter a subsequent command *n*.

n – Imperial system

After an *m* command, with a current *n* command the printer returns to the imperial system in which all numerical parameters are read in hundredths of an inch (this is the default setting).

Pa – Printing speed

You can select the label printing speed with this command.
Since it is a *label definition command*, it is local.
a may be set at the following speeds:

a	*Speed (ips[24])*
A	2
B	2
C	2
D	2,5
E	3
F	3,5
G[25]	4
H	4,5
I	5
J	5,5
K[26]	6
L	6,5
M	7
N	7,5
O[27]	8

e.g. with command *PG* the printer prints the current label at a speed of 4 ips.

pa – Backfeed speed

With this command you can select the label backfeed speed (see command *STX fnnn*).
Since it is a *label definition command*, it is local.
a may be set at the following speeds:

[24] Inches per second.
[25] Default and max. speed.
[26] Default speed for models with expander card.
[27] Max. speed for models with expander card.

a	*Speed (ips[28])*
A	2
B	2
C	2
D	2,5
E	3
F	3,5
G[29]	4
H	4,5
I	5
J	5,5
K[30]	6
L	6,5
M	7
N	7,5
O[31]	8

e.g. with command *pG,* the paper returns, if a backfeed has been set (see command *STX fnnn*), at a speed of 4 ips.

Qnnnn – Quantity of labels to be printed

nnnn indicates the number of times you wish to repeat the current label.
e.g. with *Q0030,* the current label is printed 30 times.

Rnnnn – Vertical offset (of lines)

Just as you can set a "local" horizontal offset (see command *Cnnnn*), you can also set a vertical one (positive) in which *nnnn* are the four digits that quantify the amount of the offset.
e.g. *R0015* adds *15* to all the line co-ordinates and the label appears longitudinally offset 15 hundredths of an inch[32] higher.

rnn...n – Retrieve saved label

You can save the current label using the command *s(A/B/C/D/E)nn...n* and later retrieve it with this command.
nn...n is the name of the label to be retrieved.

Sa – Select paper advance speed

With this command you can select the label advance speed during the "not printing" phase: that is the speed at which the paper advances once the actual printing has been done.
Since this is a *label definition command*, it is local.
a can be set at the following speeds:

[28] Inches per second.
[29] Default and max. speed.
[30] Default speed for models with expander card .
[31] Max. speed for models with expander card.
[32] After an *m* (see relevant paragraph), 15 tenths of a millimetre.

a	*Speed (ips[33])*
A	2
B	2
C	2
D	2,5
E	3
F	3,5
G[34]	4
H	4,5
I	5
J	5,5
K[35]	6
L	6,5
M	7
N	7,5
O[36]	8

e.g. with command *SG* the paper advances at a speed of 4 ips.

s(A/B/C/D/E)nn...n – Save the current label

You can save the current label in the RAM[37] (*A*) or in the flash memory (*B*, *D*, or *E*) with the name *nn...n* and later retrieve it using the command *rnn...n*

Tnn – Set the line terminator

For label definition commands and some system commands it is essential to end the line with the character *CR*: otherwise the command interpreter cannot distinguish between the end of the previous command and the beginning of the next one. Some computers do not allow you to send the line end character *CR* and it must be replaced by another using this command. The two digit number *nn* is the hexadecimal code of the replacement line terminator.
e.g. after the command *T00*, the character *NULL* (00_{10}, 00_{H}) becomes the line terminator and all the lines must "end" with this character.

X – Label definition mode terminator

On receiving this command, the printer exits the label definition mode and can once again receive immediate and system commands. Unlike command *E*, with this command the label that is stored in the memory is not printed until the command *STX G* is received, see relevant paragraph.

[33] Inches per second.
[34] Default and max. speed.
[35] Default speed for models with expander card.
[36] Max. speed for models with expander card.
[37] Volatile memory drive A (RAM) is available only when installed (in an expander card) (on this subject, see the user's manual for the printer used).

+pii – Increase the previous field

It increases the immediately preceding field by *ii* with the exclusion of the letters. The empty spaces are filled with the character *p*.
e.g. *+01* increases the previous field by *1* and “fills” digits that are not significant with *0*.

-pii – Decreases the previous field

It decreases the immediately preceding field by *ii* with the exclusion of the letters. The empty spaces are filled with the character *p*.
e.g. *-01* decreases the previous field by *1* and “fills” digits that are not significant with *0*.

>pii – Increase the previous field

It increases the immediately preceding field by *ii* including the letters. The empty spaces are filled with the character *p*.
e.g. *> 1* increases the previous field by *1* and “fills” the digits that are not significant with a space character.

<pii – Decreases the previous field

It decreases the immediately preceding field by *ii* including the letters. The empty spaces are filled with the character *p*..
e.g. *> 1* decreases the previous field by *1* and “fills” the digits that are not significant with a space character.

2.1.2.1.2 Special commands

Despite the fact that they are preceded by the character *STX*, these commands (in effect there is only one) are label definition commands and not system commands.

STX Sn – Retrieve the register

With command *G*, see relevant paragraph, the fields are progressively saved (from *A* to *Z*) in the registers. To retrieve them you must use this command in which *n* is the register to be retrieved. Since the registers are in any case filled, whether or not you use command *G*, when they are retrieved you must bear in mind that the first field of the label is saved (regardless of the fact that it is followed by *G*, or not) in register *A*, the second in *B* and so on.
e.g. *STX SC* retrieves the setting saved in register C, that is the third field of the label.

2.1.2.1.3 Object definition commands

These commands are used to “build” the actual label. You can define the properties and the position of geometric figures, alphanumerical fields (strings), bar codes and graphic images.
Generally, the syntax of the commands is as follows:

a b cd eee ffff gggg nn...n

a is the rotation of the object. It may be

1: rotation by *0°*[38]
2: rotation by *90°* clockwise
3: rotation by *180°* clockwise
4: rotation by *270°* clockwise

b indicates the type of object. It may be
X: geometric figures
0-9: alphanumerical fields (see sect. 2.2.1 on page 21)
A-O (a-p[39]): bar codes (see sect. 2.2.2 on page 28)
Y: graphic images

cd are the horizontal (*c*) and vertical (*d*) expansion coefficients; for bar codes it is the ratio.
They may be:
11: for the geometric figures
1-9 and A-O: for the alphanumerical fields
1-9 and A-O: for the bar codes[40]
1-9 and A-O: for the graphic images

eee have the following meaning
000: for the geometric figures
000: for alphanumerical fields from 0 to 8 (*b=0-8*)
001-010: for the alphanumerical field 9 (*b=9*)
000-999: for bar codes (this is the height in hundredths of an inch[41])
000: for the graphic images

ffff is the line co-ordinate in hundredths of an inch[42] for the bottom left corner of the object (starting from the lower edge of the label).

gggg is the column co-ordinate in hundredths of an inch[43] for the bottom left corner of the object (starting from the left edge of the label). The bottom left corner of the label is identified by co-ordinate *0000*, *0000*.

nn...n is the contents of the object.
For geometric figures it may be:
L hhh iii: *L* indicates that it is a line, *hhh* is the width in hundredths of an inch[44], *iii* is the height
l hhhh iiii: *hhhh* is the line width, *iiii* is the height

[38] For geometric figures and graphic images, it is assumed that the rotation is always *1* whatever value is set.
[39] When the bar code type is identified with an upper-case letter, whatever is coded in it appears decoded below it; when the letter is lower-case no decoding appears under the bar code.
[40] For specific bar codes (see sect. 2.2.2 on page 28) large and small bars must be in precise ratio so that the code may be reliably read.
[41] After an *m* (see sect. 2.1.2.1.1 on page 13), this is the height in tenths of a millimetre.
[42] After an *m* (see sect. 2.1.2.1.1 on page 13), this is the line co-ordinate in tenths of a millimetre.
[43] After an *m* (see sect. 2.1.2.1.1 on page 13), this is the column co-ordinate in tenths of a millimetre.
[44] After an *m* (see sect. 2.1.2.1.1 on page 13), this is the line width in tenths of a millimetre.

B hhh iii jjj kkk: *B* indicates that it is a box, *hhh* is the width in tenths of an inch[45], *iii* is the height, *jjj* is the width of the lower and upper outlines, *kkk* is the width of the left and right outlines

b hhhh iiii jjjj kkkk: *hhhh* is the width of the box, *iiii* is the height, *jjjj* is the width of the lower and upper outlines, *kkkk* is the width of the left and right outlines.

For alphanumerical fields it is the string to be printed.

For bar codes it is the information to be coded.

For graphic images it is the name of the image itself.

2.2 Fonts and bar codes

As stated in sect. 2.1.2.1.3 (page 19) the second character of the command string (given as *b*) identifies the type of object used. For alphanumerical fields, it identifies the font, for bar codes it identifies the type.

In particular, in the first case it will be a number between *0* and *9*, in the second a letter from *A* to *O* and from *a* to *p*.

The characteristics of the fonts and of the bar codes that can be printed with the CDL emulation are described below.

2.2.1 Fonts

Not all the characters in the ASCII tab. (see sect. 3 on page 50) can be printed with all the fonts. tab. 1 below gives the valid ASCII characters for each of the fonts.

Font	*Valid ASCII characters*
0	32-127
1	32-168, 171, 172, 225
2	32-168, 171, 172, 225
3	32, 35-38, 40-58, 65-90, 128, 142-144, 146, 153, 154, 156, 157, 165, 168, 225
4	32, 35-38, 40-58, 65-90, 128, 142-144, 146, 153, 154, 156, 157, 165, 168, 225
5	32, 35-38, 40-58, 65-90, 128, 142-144, 146, 153, 154, 156, 157, 165, 168, 225
6	32, 35-38, 40-58, 65-90, 128, 142-144, 146, 153, 154, 156, 157, 165, 168, 225
7	32-126
8	32, 48-57, 60, 62, 67, 69, 78, 83, 84, 88, 90
9	32-126, 128-169, 171-173, 181-184, 189, 190, 198, 199, 208-216, 222, 224-237, 241, 243, 246-250

tab. 1 - Valid ASCII characters for fonts 0-9

[45] After an *m* (see sect. 2.1.2.1.1 on page 13), this is the width of the box in tenths of a millimetre.

Font 0

In addition to all the upper and lower case letters, the space and numbers, the following characters can also be printed with this font:
!Ò#$%&Ô()*+,-./:;<=>?@[\]^_`{|}~

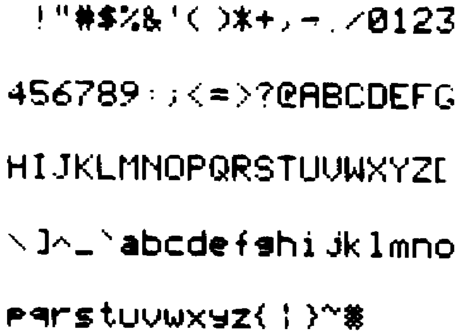


fig. 3 - Font 0

Font 1

In addition to all the upper and lower case letters, the space and numbers, the following characters can also be printed with this font:
!Ò#$%&Ô()*+,-./:;<=>?@[\]^_`{|}~ÇüéâäàåçêëèïîìÄÅÉœÆôöòûùÿÖÜø£Ø×ƒáíóúñÑªº¿½¼ß

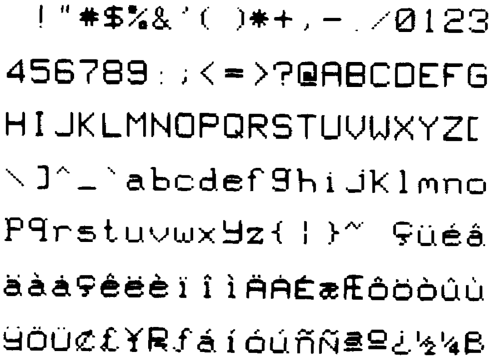
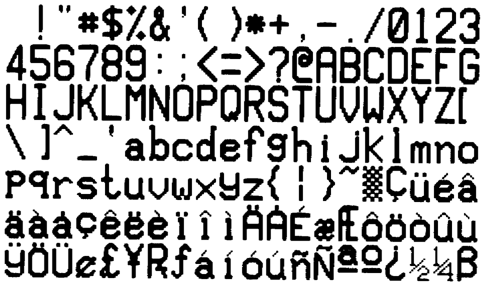


fig. 4 - Font 1

Font 2

In addition to all the upper and lower case letters, the space and numbers, the following characters can also be printed with this font:
!Ò#$%&Ô()*+,-./:;<=>?@[\]^_`{|}~ÇüéâäàåçêëèïîìÄÅÉœÆôöòûùÿÖÜø£Ø×ƒáíóúñÑªº¿½¼ß

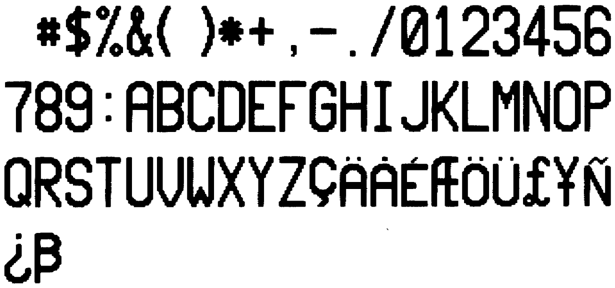


```
 !"#$%&'()*+,-./0123
456789:;<=>?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[
\]^_'abcdefghijklmno
pqrstuvwxyz{¦}~▓Çüéâ
äàåçêëèïîìÄÅÉæÆôöòûù
ÿÖÜ¢£¥₧ƒáíóúñÑªº¿½¼ß
```

fig. 5 - Font 2

Font 3

In addition to the upper case letters, the space and numbers, the following characters can also be printed with this font:
#$%&()*+,-./:ÇÄÅÉÆÖÜ£ØÑ¿ß



```
 #$%&()*+,-./0123456
789:ABCDEFGHIJKLMNOP
QRSTUVWXYZÇÄÅÉÆÖÜ£¥Ñ
¿ß
```

fig. 6 - Font 3

Font 4

In addition to the upper case letters, the space and numbers, the following characters can also be printed with this font:
#$%&()+,-./:ÇÄÅÉÆÖÜ£ØÑ¿ß*

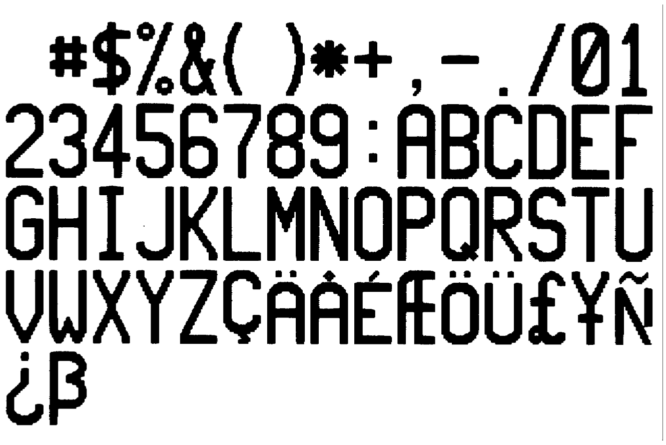
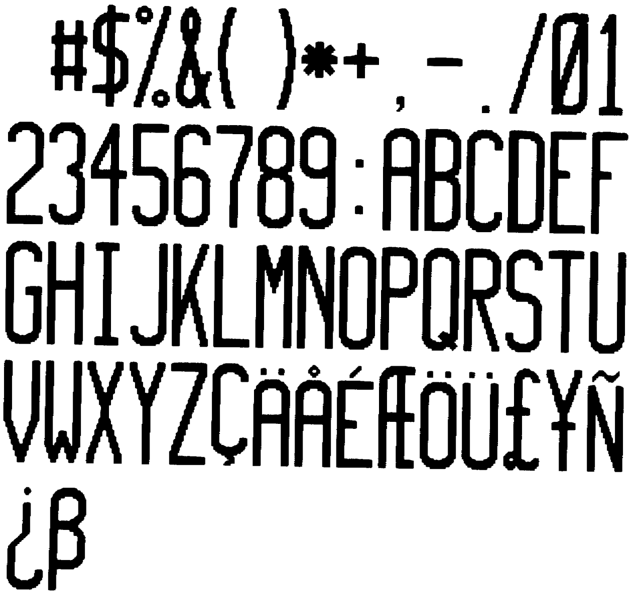


fig. 7 - Font 4

Font 5

In addition to the upper case letters, the space and numbers, the following characters can also be printed with this font:
#$%&()+,-./:ÇÄÅÉÆÖÜ£ØÑ¿ß*



#$%&( )*+,-./Ø1
23456789:ABCDEF
GHIJKLMNOPQRSTU
VWXYZÇÄÅÉÆÖÜ£¥Ñ
¿ß

fig. 8 - Font 5

Font 6

In addition to the upper case letters, the space and numbers, the following characters can also be printed with this font:
#$%&()+,-./:ÇÄÅÉÆÖÜ£ØÑ¿ß*

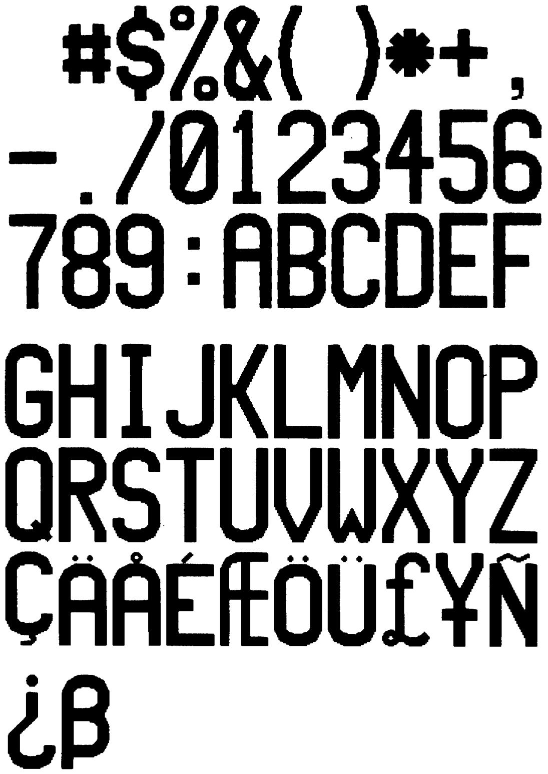


fig. 9 - Font 6

Font 7

In addition to all the upper and lower case letters, the space and numbers, the following characters can also be printed with this font:

!Ò#$%&Ô()*+,-./:;<=>?@[\]^_`{|}~

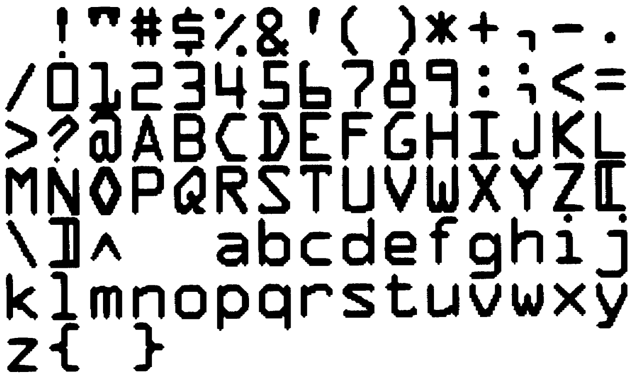


fig. 10 - Font 7

Font 8

In addition to numbers and the space, the following characters can also be printed with this font:
<>CENSTXZ

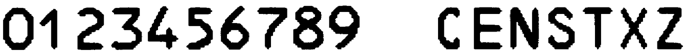


fig. 11 - Font 8

Font 9

In addition to all the upper and lower case letters, the space and numbers, the following characters can also be printed with this font:
!Ò#$%&Ô()*+,-./:;<=>?@[\]^_`{|}~ÇüéâäàåçêëèïîìÄÅÉœÆôöòûùÿÖÜø£Ø×ƒáíóúñÑªº¿®
½¼¡ÁÂÀ©¢¥ãÃðÐÊËÈıÍÎÏÌÓßÔÒõÕµþÞÚÛÙýÝ±¾÷¸°¨·

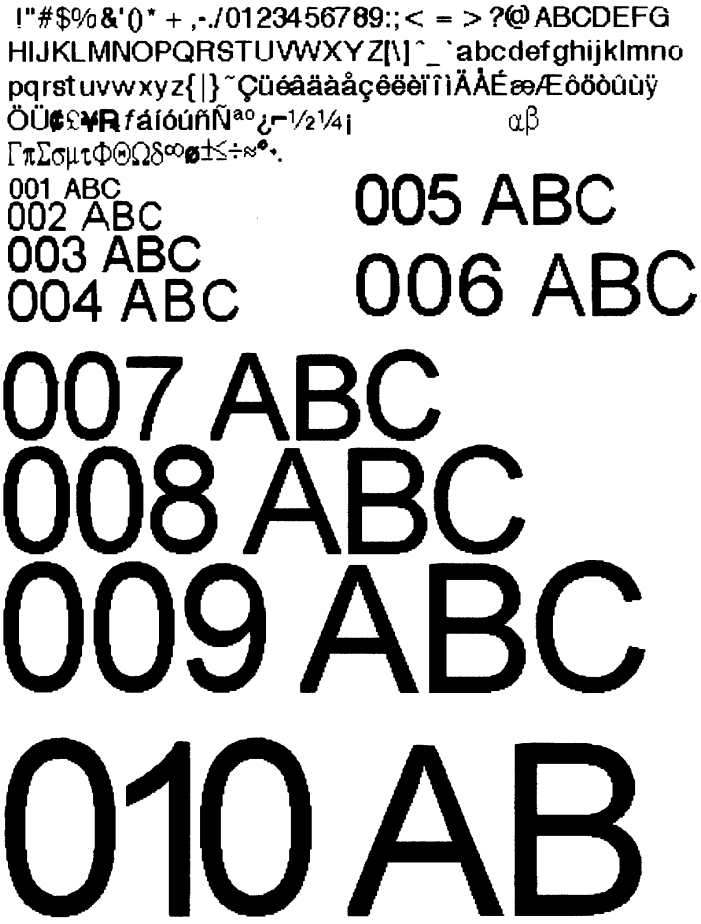

!"#$%&'()* + ,-./0123456789:;< = > ?@ABCDEFG
HIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
pqrstuvwxyz{|}~ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿ
ÖÜ¢£¥₧ƒáíóúñÑªº¿⌐½¼¡ αβ
ΓπΣσµτΦΘΩδ∞ø±≤÷≈°·.
001 ABC
002 ABC
003 ABC
004 ABC
005 ABC
006 ABC
007 ABC
008 ABC
009 ABC
010 AB

fig. 12 - Font 9

2.2.2 Bar codes

Each bar code has specific characteristics that distinguish it from others. In particular some codes have limits to their length (a higher or lower number of characters cannot be used), others have a checksum character to make their decoding reliable, others still have limitations to the valid ASCII characters (letters and certain “special” characters cannot be used).
All bar codes have a nominal ratio[46] that guarantees reliable decoding.
In tab. 2 below, the characteristics of each of the bar codes are summarised.

[46] The ratio is the relationship between the large and small bars (see positions *c* and *d* in the command syntax in sect. 2.1.2.1.3 on page 19).

Type[47]	*Description*	*Length*	*Checksum*	*Valid ASCII characters*	*Ratio*[48]
A	3 of 9	Variable	No	32, 36, 37, 42, 43, 45-57, 65-90	From 2:1 to 3:1
B	UPC A	11	Yes	48-57	
C	UPC E	6	Yes	48-57	
D	2 of 5 Interleaved	Variable	No	48-57	From 2:1 to 3:1
E	128	Variable	Yes	32-126	
F	EAN 13	12	Yes	48-57	
G	EAN 8	7	Yes	48-57	
H	HIBC	Variable	Yes	32, 36-39, 42, 43, 45-57, 65-90	From 2:1 to 3:1
I	Codabar	Variable	No	36, 43, 45-58, 65-90	From 2:1 to 3:1
J	2 of 5 Interleaved with checksum	Variable	Yes	48-57	From 2:1 to 3:1
K	Plessey	<= 14	Yes	48-57	From 2:1 to 3:1
L	2 of 5 Interleaved with checksum and horizontal bars	13	Yes	48-57	From 2:1 to 3:1
M	2-digit addendum for UPC	2	Yes	48-57	
N	5-digit addendum for UPC	5	Yes	48-57	
O	93	Variable	No	35-38, 42-58, 65-90, 97-122	
p[49]	Postnet	Variable	Yes	48-57	

tab. 2 – Bar code characteristics

A - 3 of 9

This variable length code without a checksum, in addition to upper case letters, the space and numbers, also accepts the following characters:
$%+-./*
The nominal ratio may vary from 2:1 to 3:1.

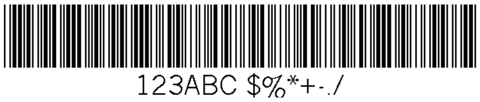


fig. 13 - 3 of 9 bar code

[47] When the bar code is identified by the upper case letter, whatever is coded appears beneath it in decoded form; when the letter is lower case no decoding appears beneath the bar code.

[48] If no specific ratio is given for the bar code, the ratio between the horizontal and vertical expansion must be 1:1. This does not mean, however, that the ratio between narrow and wide bars is 1:1.

[49] No decoding is given beneath *Postnet*, and it is therefore defined only with a lower case letter.

B - UPC A

This code accepts 11 characters (only numbers): in this case it calculates and adds the twelfth checksum character. If there are already 12 characters, the printer will check that the twelfth corresponds to the correct checksum: if it does not it will print 11 zeros and the expected checksum.

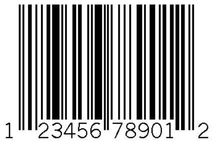


fig. 14 - UPC A bar code

C - UPC E

This code accepts 6 characters (only numbers): in this case it calculates and adds the seventh checksum character. If there are already 7 characters, the printer will check that the seventh corresponds to the correct checksum: if it does not it will print 6 zeros and the expected checksum.

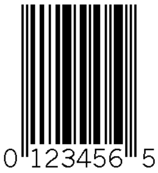


fig. 15 - UPC E bar code

D – 2 of 5 Interleaved

This variable length code, with no checksum, accepts only numbers and its nominal ratio may vary from 2:1 to 3:1.

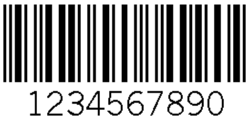


fig. 16 – 2 of 5 Interleaved bar code

E - 128

This variable length code, with checksum, in addition to all the lower and upper case letters, the space and numbers, accepts the following characters:
!Ò#$%&Ö()*+,-./:;<=>?@[\]^_`{|}~

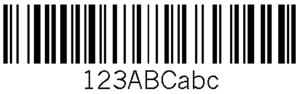


fig. 17 – 128 bar code

In this bar code there are 3 *subsets* of characters (*A*, *B* and *C*) which are selected by preceding the string to be coded by the letter *A*, *B*[50] or *C*.
Subset A includes all upper case letters plus special and control characters.
Subset B includes all upper and lower case letters plus special characters.
Subset C includes only the numbers (in even number).
To code the special characters, you need to send the printer a copy of the characters shown in the column headed '*CHAR'* in tab. 3.

ASCII	*CHAR*	*A*	*B*	*C*
96	&A	FNC3	FNC3	not accepted
97	&B	FNC2	FNC2	not accepted
98	&C	SHIFT	SHIFT	not accepted
99	&D	CODE C	CODE C	not accepted
100	&E	CODE B	FNC4	CODE B
101	&F	FNC4	CODE A	CODE A
102	&G	FNC1	FNC1	FNC1

tab. 3 – Special characters for code 128 C

[50] If no character is included, the default setting is *subset B*.

F - EAN 13

This code accepts 12 characters (only numbers): in this case it calculates and adds the thirteenth checksum character. If there are already 13 characters, the printer will check that the thirteenth corresponds to the correct checksum: if it does not, it will print 12 zeros and the expected checksum.

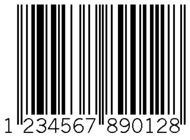


fig. 18 - EAN 13 bar code

G - EAN 8

This code accepts 7 characters (only numbers): in this case it calculates and adds the eight checksum character. If there are already 8 characters, the printer will check that the eighth corresponds to the correct checksum: if it does not, it will print 7 zeros and the expected checksum.

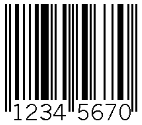


fig. 19 - EAN 8 bar code

H - HBIC

This code is like the *3 of 9* with a checksum character: it has a variable length and, in addition to upper case letters, the space and numbers, it accepts the following characters:
$%&Ö+-./*
The nominal ratio may vary from 2:1 to 3:1.
You need to add a + before the data to be coded. For example, if you need to print a bar code *with* the data *0123456789* the command string must be *1 H 21 050 0010 0010 +0123456789* (see command syntax in sect. 2.1.2.1.3 on page 19).

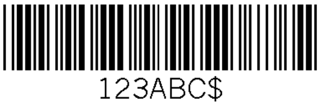


fig. 20 – HIBC bar code

I - Codabar

This code has a variable length but must contain at least 3 characters, it has no checksum and the valid characters, in addition to upper case letters and numbers, are as follows:
$+-./:
The nominal ratio varies from 2:1 to 3:1.

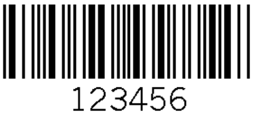


fig. 21 – Codabar bar code

J – 2 of 5 Interleaved with checksum

This code is similar to the *2 out of 5 Interleaved* code described above except that it includes a checksum character: it has a variable length and accepts only numbers.
The nominal ratio varies from 2:1 to 3:1.

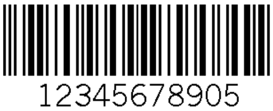


fig. 22 - 2 out of 5 Interleaved bar code with checksum

K - Plessey

This code accepts up to a maximum of 14 characters (only numbers) and a checksum character is added only if the last character to be coded is a +: in this case it is substituted with the checksum.

The nominal ratio varies from 2:1 to 3:1.

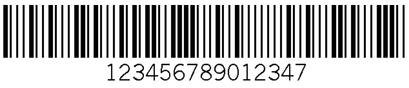


fig. 23 – Plessey bar code

L - 2 of 5 Interleaved with checksum and horizontal bars

This is a variable length code but, to have horizontal bars, it must be 13 characters long (the fourteenth is added as a checksum). It accepts only numbers and the nominal ration varies from 2:1 to 3:1.

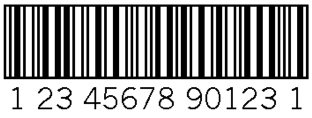


fig. 24 - 2 of 5 Interleaved bar code with checksum and horizontal bars

M – 2-digit addendum for UPC

This code is used to extend the *UPC* which is a fixed length code: it too accepts only a limited number of characters (2 and only numbers), and includes a checksum character.

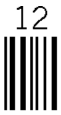


fig. 25 – 2-digit addendum bar code for UPC

N – 5-digit addendum for UPC

This code is used to extend the *UPC* which is a fixed length code: it too accepts only a limited number of characters (5 and only numbers), and includes a checksum character.

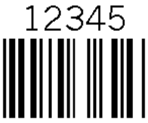


fig. 26 - 5-digit addendum bar code for UPC

O - 93

This variable length code, without checksum, in addition to upper and lower case letters, and numbers, accepts the following characters:
#$%&+,-./:*

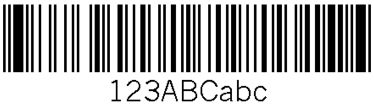


fig. 27 – 93 bar code

p - Postnet

No decoding is envisaged beneath this code and it is therefore identified only by a lower case letter. It has a variable length, with checksum and accepts only numbers.

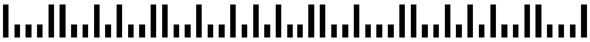


fig. 28 – Postnet bar code

2.3 Examples

Examples are given below as text files and in Basic so that they may be understood and tried out by any user: this does not subtract from the general nature of these examples which could be written in any other language and/or on any kind of computer.

To check the effect of each of them, you must in the first case send the printer the text file, and in the second "run" the Basic program.

In the examples given as text files, the convention of showing characters that cannot be printed from the ASCII table (that is the first 32 of tab. 4 on page 50) between the symbols < and > has been used so that they are not taken as ordinary character strings.

To write these characters with the keyboard you need to refer to the editor you are using. Generally, you need to use a combination of the keys *CTRL* and/or *ALT* followed by the decimal code of the character in question.

Character *CR* (13_{10}, $0D_H$), required to end each line of instructions[51], is automatically added by the editor, together with *LF* (10_{10}, $0A_H$), when you start a new line: in the examples it is in any case made explicit for greater clarity.

In the same way, the *PRINT* instruction in Basic automatically adds the *CR* and *LF* characters at the end of the line that, even though they do not appear, permit the machine to work correctly in accordance with what is stated above.

To better understand the examples, we advise you to refer frequently to the syntax of each of the commands used (see sect. 2.1 on page 3).

2.3.1 Geometric figures

The following examples print the label shown in fig. 29: the first example is a text file and the second is a Basic program.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
1X1100000000010B390230002004<CR>
1X1100000400014L382004<CR>
E<CR>
```

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1 'open serial port number 1

PRINT #1, CHR$(2); "L"  'STX L switch to label definition mode
PRINT #1, "D11"         'select the dot size (h=1; v=1)
PRINT #1, "PC"          'select the print speed (C=2 ips)
PRINT #1, "H15"         'select the temperature of the head

'box
```

[51] The line end may be replaced, in label definition mode, by another character using command *T* (see sect. 2.1.2.1.1 on page 13) which is a local command and therefore applies only to the current label.

```
PRINT #1, "1"; "X"; "11"; "000"; "0000"; "0010"; "B"; "390"; "230"; "002"; "004"
'    1 = compulsory for geometric figures
'    X = define an object as a geometric figure
'   11 = horizontal and vertical expansion
'  000 = compulsory for geometric figures
' 0000 = line co-ordinate
' 0010 = column co-ordinate
'    B = define the box
'  390 = box width
'  230 = box height
'  002 = width of upper and lower outlines
'  004 = width of left and right outlines

'line
PRINT #1, "1"; "X"; "11"; "000"; "0040"; "0014"; "L"; "382"; "004"
'    1 = compulsory for geometric figures
'    X = define an object as a geometric figure
'   11 = horizontal and vertical expansion
'  000 = compulsory for geometric figures
' 0040 = line co-ordinate
' 0024 = column co-ordinate
'    L = define the line
'  382 = line width (length)
'  004 = line height (thickness)

PRINT #1, "E"    'exit label definition mode and prints
CLOSE #1         'close the serial port
```

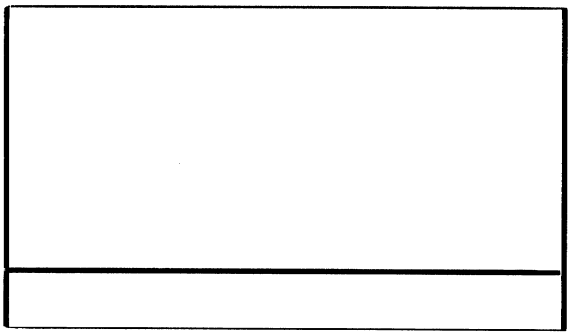


fig. 29 – Example with geometric figures

2.3.2 Alphanumerical fields

For alphanumerical fields you need to define the type of font to be used. There are 9 fixed space fonts plus 10 proportional space fonts: for the first group *b=0-8* and *eee=000* (for the syntax, see sect. 2.1.2.1.3 on page 19), for the second group *b=9* and *eee=001-010.* For the characteristics of each font, see sect. 2.2.1 on page 21.

Both of the following examples produce the label shown in fig. 30: the first is a text file while the second is a Basic program.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
1X1100000000010B390230002004<CR>
1X1100000400014L382004<CR>
103300000200140PRINT TEST<CR>
E<CR>
```

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

'box
PRINT #1, "1"; "X"; "11"; "000"; "0000"; "0010"; "B"; "390"; "230"; "002"; "004"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0040"; "0014"; "L"; "382"; "004"

'alphanumerical field
PRINT #1, "1"; "0"; "33"; "000"; "0020"; "0140"; "PROVA DI STAMPA"
'      1 = rotation by 0 degrees
'      0 = font no. 0
'     33 = horizontal and vertical expansion
'    000 = ignored the font used is between 0 and 8
'   0020 = line co-ordinate
'   0140 = column co-ordinate
' PR...A = string to be printed

PRINT #1, "E"

CLOSE #1
```

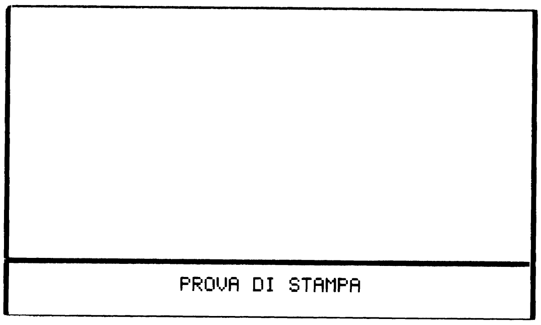


fig. 30 – Example of alphanumerical fields

2.3.3 Bar codes

There are 16 bar code types available: *b=A-O* and *a-p* (for the syntax, see sect. 2.1.2.1.3 on page 19) the detailed description of which can be seen in sect. 2.2.2 on page 28. The section mentioned gives the characteristics of each of them and their *ratio*. The ratio is the relationship between the width of the large bars and that of the small ones: it cannot be random, but depends on the code type.
Both of the following examples product the label shown in fig. 31: the first is a text file and the second is a Basic program.

```
<STX>L
D11<CR>
PC<CR>
H15<CR>
1X1100000000010B390230002004<CR>
1X1100000400014L382004<CR>
103300000200140PRINT TEST<CR>
1X1100000180135L050015<CR>
225500002000040TEST<CR>
1A5205000500100ABC123<CR>
1C2205001500120123456<CR>
E<CR>
```

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

'box
PRINT #1, "1"; "X"; "11"; "000"; "0000"; "0010"; "B"; "390"; "230"; "002"; "004"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0040"; "0014"; "L"; "382"; "004"

'alphanumerical field
PRINT #1, "1"; "0"; "33"; "000"; "0020"; "0140"; "PRINT TEST"

'To obtain reverse print (i.e. white wording on black background) you
'must superimpose a line of suitable width over the alphanumerical field

'line
PRINT #1, "1"; "X"; "11"; "000"; "0018"; "0135"; "L"; "050"; "015"
'    1 = compulsory for geometric figures
'    X = define an object as a geometric figure
'   11 = horizontal and vertical expansion
'  000 = compulsory for geometric figures
' 0018 = line co-ordinate
' 0135 = column co-ordinate
'    L = define the line
'  050 = line width (length)
'  015 = line height (thickness)

'alphanumerical field
PRINT #1, "2"; "2"; "55"; "000"; "0200"; "0040"; "TEST"
'    2 = rotation by 90 degrees
'    2 = font n. 2
'   55 = horizontal and vertical expansion
'  000 = ignored when the font used is between 0 and 8
' 0200 = line co-ordinate
' 0040 = column co-ordinate
' TEST = string to be printed

'bar code
PRINT #1, "1"; "A"; "52"; "050"; "0050"; "0100"; "ABC123"
'      1 = rotation by 0 degrees
'      A = bar code A
'     52 = ratio 5:2
'    050 = bar code height
'   0050 = line co-ordinate
'   0100 = column co-ordinate
' AB...3 = string to be printed

'bar code
PRINT #1, "1"; "C"; "22"; "050"; "0150"; "0120"; "123456"
'      1 = rotation by 0 degrees
'      C = bar code C
'     22 = ratio between horizontal and vertical expansion 1:1
'    050 = bar code height
'   0150 = line co-ordinate
'   0120 = column co-ordinate
' 12...6 = string to be printed

PRINT #1, "E"

CLOSE #1
```

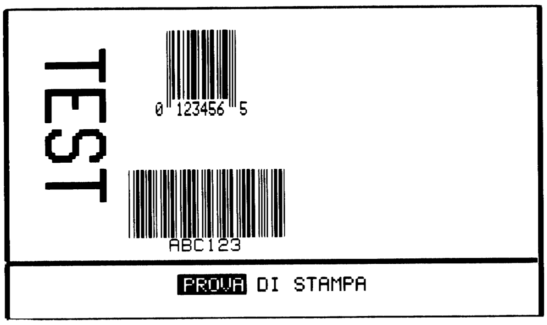


fig. 31 – Example with bar codes

2.3.4 Graphic images

In order to print graphic images, they must first be loaded in the flash (non-volatile) or in the RAM (volatile) memory. To do this, loading of the graphic file must precede the actual printing.
In the first of the examples below, the printer is prepared to receive the graphic file in PCX (*P*) format in the flash memory (*B*) calling it *LOGO*.

The graphic image is then sent to the printer: since it is stored in the flash memory, it will remain available after the machine has been switched off too and it will be possible to use it on the label, even repeated several times, when the label itself is defined.
The two lines below prepare the printer to receive the logo.

```
<SOH>D<CR>
<STX>IBPLOGO<CR>
```

At this point, the PCX format file can be sent to the printer, for example using the DOS command *COPY /B RECYCLE.PCX COM1:*
The following commands are those that actually define the label.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
1X1100000000010B390230002004<CR>
1X1100000400014L382004<CR>
103300000200140PRINT TEST<CR>
1X1100000180135L050015<CR>
225500002000040TEST<CR>
1A5205000500100ABC123<CR>
1C2205001500120123456<CR>
1Y1100000650250LOGO<CR>
E<CR>
```

In the second example (written in Basic) loading and “placing” of the graphic image take place at the same time, even though this is not strictly necessary. In particular, the file is copied in the printer with a DOS command, then positioned and printed.

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

'SOH D disables the immediate command interpreter
PRINT #1, CHR$(1); "D"

'STX IAPLOGO prepares the printer to load
'the graphic image (in PCX format) in FLASH (drive B) and
'calls it LOGO
PRINT #1, CHR$(2); "IBPLOGO"

'copies the graphic file in the printer memory
SHELL "COPY /B RECYCLE.PCX COM1:"

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

'box
PRINT #1, "1"; "X"; "11"; "000"; "0000"; "0010"; "B"; "390"; "230"; "002"; "004"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0040"; "0014"; "L"; "382"; "004"

'alphanumerical field
PRINT #1, "1"; "0"; "33"; "000"; "0020"; "0140"; "PRINT TEST"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0018"; "0135"; "L"; "050"; "015"
```

```
'alphanumerical field
PRINT #1, "2"; "2"; "55"; "000"; "0200"; "0040"; "TEST"

'bar code
PRINT #1, "1"; "A"; "52"; "050"; "0050"; "0100"; "ABC123"

'bar code
PRINT #1, "1"; "C"; "22"; "050"; "0150"; "0120"; "123456"

'graphic image
PRINT #1, "1"; "Y"; "11"; "000"; "0065"; "0250"; "LOGO"
'    1 = rotation by 0 degrees
'    Y = defines the object as a graphic image
'   11 = horizontal and vertical expansion
'  000 = compulsory for graphic images
' 0065 = line co-ordinate
' 0250 = column co-ordinate
' LOGO = name of the logo to be printed

PRINT #1, "E"

CLOSE #1
```

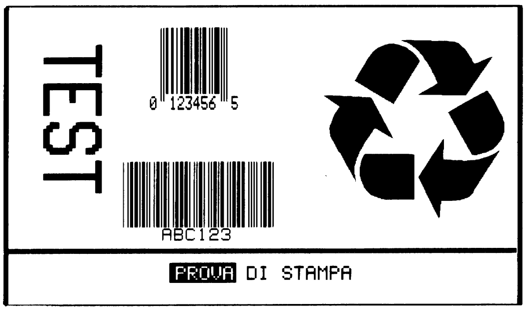


fig. 32 – Example of graphic images

2.3.5 Dynamic fields

Fields are called dynamic when their contents cannot be determined a priori when the label is defined but vary when it is printed: e.g. when the printed is fitted to scales and one of the fields is the weight, it is reasonable to decide to build the label once and for all and update the variable fields when the label is printed. By doing so printing is more efficient and faster.

To manage dynamic fields you need to:

- provide sufficient space so that the field can contain the maximum number of characters possible. To do this it is useful to fill the field with substitute characters such as *X*;
- end the label definition mode with the command *X* (instead of *E*);

- when printing is carried out, which may be some time afterwards, fill the fields involved using the command *STX Unnss...s*: since the fields are filled in succession, *nn=01* corresponds to the first field, *02* to the second and so on up to *99*;
- enter command *STX G* to print the label.

The following lines define the label without printing it.

```
<STX>L<CR>
PC<CR>
H15<CR>
131100001550200xxxxxx<CR>
131100001100200xxxxxx<CR>
131100000650200xxxxxx<CR>
131100000200200xxxxxx<CR>
X<CR>
```

At a later time, you can print the label defined as above with the current field values as follows.

```
<STX>U011234567<CR>
<STX>U0212345<CR>
<STX>U03123456<CR>
<STX>G<CR>
```

The following Basic program gives the same result (the one shown in fig. 33).

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1
PRINT #1, CHR$(2); "L"
PRINT #1, "PC"
PRINT #1, "H15"

PRINT #1, "1"; "3"; "11"; "000"; "0155"; "0200"; "xxxxxx"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     33 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0155 = line co-ordinate
'   0200 = column co-ordinate
' xx...x = space reserved for the field to be filled

PRINT #1, "1"; "3"; "11"; "000"; "0110"; "0200"; "xxxxxx"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     11 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0110 = line co-ordinate
'   0200 = column co-ordinate
' xx...x = space reserved for the field to be filled

PRINT #1, "1"; "3"; "11"; "000"; "0065"; "0200"; "xxxxxx"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     11 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0065 = line co-ordinate
'   0200 = column co-ordinate
' xx...x = space reserved for the field to be filled

PRINT #1, "1"; "3"; "11"; "000"; "0020"; "0200"; "xxxxxx"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     11 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0020 = line co-ordinate
'   0200 = column co-ordinate
' xx...x = space reserved for the field to be filled

PRINT #1, "X"    'end label definition mode

'the following instructions fill in the dynamic fields defined
'during label definition and can be
'sent later

'assign value 1234567 to the first field
PRINT #1, CHR$(2); "U"; "01"; "1234567"

'assign value 12345 to the second field
PRINT #1, CHR$(2); "U"; "02"; "12345"

'assign value 123456 to the third field
PRINT #1, CHR$(2); "U"; "03"; "123456"

PRINT #1, CHR$(2); "G"  'print the label using the data just sent

CLOSE #1
```

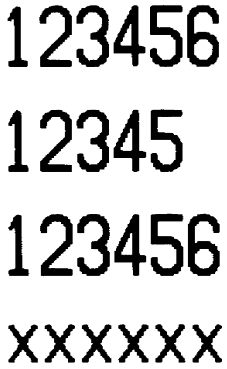


fig. 33 – Example with dynamic fields

2.3.6 Repeating the same field on the label

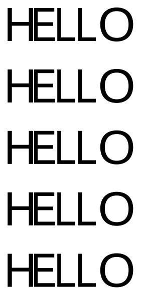
When the same field is repeated more than once (e. g. an article code first as a bar code and then “decoded”), you can use command *STX Sn* to make the processing more effective and ensure that any changes to the first field are repeated in the subsequent fields without errors.

Each field defined during label definition mode is saved in a register. This is done explicitly with command *G* (see sect. 2.1.2.1.1 on page 13) or automatically in progressive order: the first field is saved in register *A*, the second in *B* and so on up to *Z*. The contents of these registers can be retrieved using command *STX Sn* in which *n* indicates the register to be retrieved.

The following examples, the first in *text* format, the second in Basic, give the result shown in fig. 34.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
133300000200200HELLO<CR>
G<CR>
133300000650200<STX>SA<CR>
133300001100200<STX>SA<CR>
133300001550200<STX>SA<CR>
E<CR>
```

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

PRINT #1, "1"; "3"; "33"; "000"; "0020"; "0200"; "HELLO"

'save the previous field in register A
PRINT #1, "G"

PRINT #1, "1"; "3"; "33"; "000"; "0065"; "0200"; CHR$(2); "SA"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     33 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0065 = line co-ordinate
'   0200 = column co-ordinate
' STX SA = enters the memorised field in register A

PRINT #1, "1"; "3"; "33"; "000"; "0110"; "0200"; CHR$(2); "SA"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     33 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0110 = line co-ordinate
'   0200 = column co-ordinate
' STX SA = enters the memorised field in register A

PRINT #1, "1"; "3"; "33"; "000"; "0155"; "0200"; CHR$(2); "SA"
'      1 = rotation by 0 degrees
'      3 = font no. 3
'     33 = horizontal and vertical expansion
'    000 = ignored when the font is not 9
'   0155 = line co-ordinate
'   0200 = column co-ordinate
' STX SA = enters the memorised field in register A

PRINT #1, "E"

CLOSE #1
```



HELLO
HELLO
HELLO
HELLO
HELLO

fig. 34 – Example with repeated fields

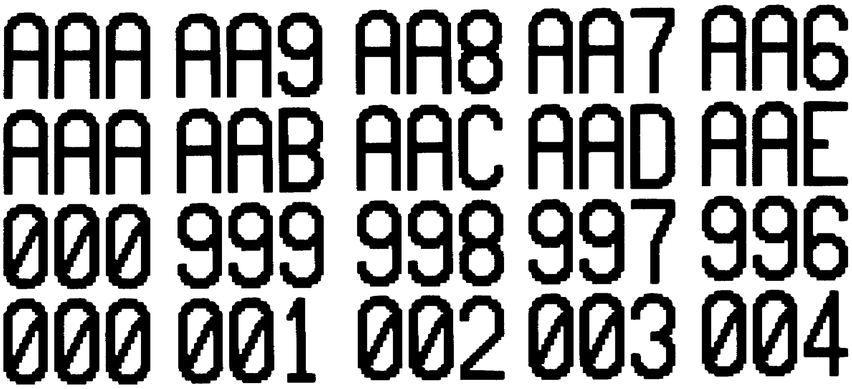
2.3.7 Incremental fields

It is often necessary to print a series of labels with a progressive number or letter. You can do this by using the commands *+pii* (*-pii*) and *>pii* (*<pii*) (see sect. 2.1.2.1.1 on page 13). The *p* is used as a *filler character* that is the most significant positions are filled with the character *p*.
The following examples, the first in *text* format, the second in Basic, give the result shown in fig. 35.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
133300001550200AAA<CR>
<01<CR>
133300001100200AAA<CR>
>01<CR>
133300000650200000<CR>
-01<CR>
133300000200200000<CR>
+01<CR>
Q0005<CR>
E<CR>
```

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

PRINT #1, "1"; "3"; "33"; "000"; "0155"; "0200"; "AAA"

'decreases the previous field by 1 (alphanumerical fields)
PRINT #1, "<01"

PRINT #1, "1"; "3"; "33"; "000"; "0110"; "0200"; "AAA"
```

```
'increases the previous field by 1 (alphanumerical fields)
PRINT #1, ">01"

PRINT #1, "1"; "3"; "33"; "000"; "0065"; "0200"; "000"

'decreases the previous field by 1 (numerical fields)
PRINT #1, "-01"

PRINT #1, "1"; "3"; "33"; "000"; "0020"; "0200"; "000"  'defines a field

'increases the previous field by 1 (numerical fields)
PRINT #1, "+01"

PRINT #1, "Q0005"       'to print 5 labels

PRINT #1, "E"

CLOSE #1
```



```
AAA AA9 AA8 AA7 AA6
AAA AAB AAC AAD AAE
000 999 998 997 996
000 001 002 003 004
```

fig. 35 – Example with incremental fields

2.3.8 *Saving the label*

To avoid having to "load" the labels each time they need to printed, when, for example they are complex, you can save them in RAM (volatile) or in flash (non-volatile) memory and retrieve them for printing later. To do this, you can use commands *s(A/B/C/D/E)nn...n* and *rnn...n* respectively. For information on these see sect. 2.1.2.1.1 on page 13.
The example below, in *text* format, saves the label in flash (*B*) with the name *ETIC1*.

```
<STX>L<CR>
D11<CR>
PC<CR>
H15<CR>
1X1100000000010B390230002004<CR>
1X1100000400014L382004<CR>
```

```
103300000200140PRINT TEST<CR>
1X1100000180135L050015<CR>
225500002000040TEST<CR>
1A5205000500100ABC123<CR>
1C2205001500120123456<CR>
1Y1100000650250LOGO<CR>
sBETIC1<CR>
```

The following lines retrieve label *ETIC1* and print it: since it has been saved in the flash memory, it can be printed some time later even after the machine has been switched off.

```
<STX>L<CR>
rETIC1<CR>
E<CR>
```

The result shown in fig. 36 can also be achieved with the following Basic program.

```
OPEN "com1:9600,n,8,1" FOR OUTPUT AS #1

PRINT #1, CHR$(2); "L"
PRINT #1, "D11"
PRINT #1, "PC"
PRINT #1, "H15"

'box
PRINT #1, "1"; "X"; "11"; "000"; "0000"; "0010"; "B"; "390"; "230"; "002"; "004"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0040"; "0014"; "L"; "382"; "004"

'alphanumerical field
PRINT #1, "1"; "0"; "33"; "000"; "0020"; "0140"; "PROVA DI STAMPA"

'line
PRINT #1, "1"; "X"; "11"; "000"; "0018"; "0135"; "L"; "050"; "015"

'alphanumerical field
PRINT #1, "2"; "2"; "55"; "000"; "0200"; "0040"; "TEST"

'bar code
PRINT #1, "1"; "A"; "52"; "050"; "0050"; "0100"; "ABC123"

'bar code
PRINT #1, "1"; "C"; "22"; "050"; "0150"; "0120"; "123456"

'graphic image
PRINT #1, "1"; "Y"; "11"; "000"; "0065"; "0250"; "LOGO"

'saves the current label in flash (drive B) calling it ETIC1
PRINT #1, "sBETIC1"

'The following lines retrieve from flash (drive B) the label called
'ETIC1
'N. B.: you can retrieve the label at any time: if it has been
'saved in flash, even after the machine has been switched off

PRINT #1, CHR$(2); "L"
PRINT #1, "rETIC1"
PRINT #1, "E"

CLOSE #1
```

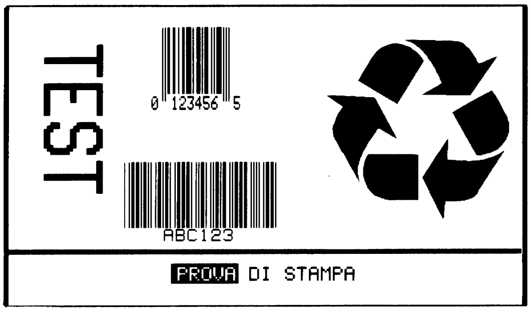


fig. 36 – Example of label saving

3. ASCII TABLES

Char	*Dec*	*Hex*	*Char*	*Dec*	*Hex*	*Char*	*Dec*	*Hex*	*Char*	*Dec*	*Hex*
NULL	0	00		32	20	@	64	40	`	96	60
SOH	1	01	!	33	21	A	65	41	a	97	61
STX	2	02	Ò	34	22	B	66	42	b	98	62
EXT	3	03	#	35	23	C	67	43	c	99	63
EOT	4	04	$	36	24	D	68	44	d	100	64
ENQ	5	05	%	37	25	E	69	45	e	101	65
ACK	6	06	&	38	26	F	70	46	f	102	66
BEL	7	07	Ö	39	27	G	71	47	g	103	67
BS	8	08	(	40	28	H	72	48	h	104	68
HT	9	09	)	41	29	I	73	49	i	105	69
LF	10	0A	*	42	2A	J	74	4A	j	106	6A
VT	11	0B	+	43	2B	K	75	4B	k	107	6B
FF	12	0C	,	44	2C	L	76	4C	l	108	6C
CR	13	0D	-	45	2D	M	77	4D	m	109	6D
SO	14	0E	.	46	2E	N	78	4E	n	110	6E
SI	15	0F	/	47	2F	O	79	4F	o	111	6F
DLE	16	00	0	48	30	P	80	50	p	112	70
DC1	17	11	1	49	31	Q	81	51	q	113	71
DC2	18	12	2	50	32	R	82	52	r	114	72
DC3	19	13	3	51	33	S	83	53	s	115	73
DC4	20	14	4	52	34	T	84	54	t	116	74
NAK	21	15	5	53	35	U	85	55	u	117	75
SYN	22	16	6	54	36	V	86	56	v	118	76
ETB	23	17	7	55	37	W	87	57	w	119	77
CAN	24	18	8	56	38	X	88	58	x	120	78
EM	25	19	9	57	39	Y	89	59	y	121	79
SUB	26	1A	:	58	3A	Z	90	5A	z	122	7A
ESC	27	1B	;	59	3B	[	91	5B	{	123	7B
FS	28	1C	<	60	3C	\	92	5C	|	124	7C
GS	29	1D	=	61	3D	]	93	5D	}	125	7D
RS	30	1E	>	62	3E	^	94	5E	~	126	7E
US	31	1F	?	63	3F	_	95	5F		127	7F

tab. 4 - ASCII tab. (0-127)

Char	*Dec*	*Hex*	*Char*	*Dec*	*Hex*	*Char*	*Dec*	*Hex*	*Char*	*Dec*	*Hex*
Ç	128	80	á	160	A0		192	C0	Ó	224	E0
ü	129	81	í	161	A1		193	C1	β	225	E1
é	130	82	ó	162	A2		194	C2	Ô	226	E2
â	131	83	ú	163	A3		195	C3	Ò	227	E3
ä	132	84	ñ	164	A4		196	C4	õ	228	E4
à	133	85	Ñ	165	A5		197	C5	Õ	229	E5
å	134	86	ª	166	A6	ã	198	C6	µ	230	E6
ç	135	87	º	167	A7	Ã	199	C7	þ	231	E7
ê	136	88	¿	168	A8		200	C8	Þ	232	E8
ë	137	89	®	169	A9		201	C9	Ú	233	E9
è	138	8A		170	AA		202	CA	Û	234	EA
ï	139	8B	½	171	AB		203	CB	Ù	235	EB
î	140	8C	¼	172	AC		204	CC	ý	236	EC
ì	141	8D	¡	173	AD		205	CD	Ý	237	ED
Ä	142	8E		174	AE		206	CE		238	EE
Å	143	8F	¯	175	AF		207	CF		239	EF
É	144	90		176	B0	ð	208	D0		240	F0
æ	145	91		177	B1	Ð	209	D1	±	241	F1
Æ	146	92	²	178	B2	Ê	210	D2		242	F2
ô	147	93	³	179	B3	Ë	211	D3	¾	243	F3
ö	148	94	´	180	B4	È	212	D4		244	F4
ò	149	95	Á	181	B5	i	213	D5		245	F5
û	150	96	Â	182	B6	Í	214	D6	÷	246	F6
ù	151	97	À	183	B7	Î	215	D7	¸	247	F7
ÿ	152	98	©	184	B8	Ï	216	D8	°	248	F8
Ö	153	99	¹	185	B9		217	D9	¨	249	F9
Ü	154	9A		186	BA		218	DA	·	250	FA
ø	155	9B	»	187	BB		219	DB		251	FB
£	156	9C		188	BC		220	DC		252	FC
Ø	157	9D	¢	189	BD		221	DD		253	FD
×	158	9E	¥	190	BE	Ì	222	DE		254	FE
ƒ	159	9F		191	BF		223	DF		255	FF

tab. 5 - ASCII tab. (128-255)

4. INDEX OF FIGURES

5. INDEX OF TABLES