



CX410

Desktop Printer



Programming

Reference

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CX410 PROGRAMMING GUIDE

INTRODUCTION

This section presents the commands that are used with the SATO CX410 printer to produce labels with logos, bar codes, and alphanumeric data. The commands listed include all revisions of firmware.

The following information is presented in this section:

- The SATO Programming Language
- Selecting Protocol Control Codes
- Using Basic
- The Print Area
- Printer Configuration
- Command Codes

THE SATO PROGRAMMING LANGUAGE

A programming language for a printer is a familiar concept to most programmers. It is a group of commands that are designed to use the internal intelligence of the printer. The commands, which are referred to as SATO Command Codes, contain non-printable ASCII characters (such as <STX>, <ETX>, <ESC>) and printable characters. These commands must be assembled into an organized block of code to be sent as one data stream to the printer, which in turn interprets the command codes and generate the desired label output. The programmer is free to use any programming language available to send the data to the printer.

The command codes used based upon “Escape” (1B hexadecimal) sequences. Typically there are four types of command sequences:

<ESC>{Command}

These commands generally tell the printer to perform a specific action, like “clear the memory”.

<ESC>{Command} {data}

Commands with this format tell the printer to perform a specific action which is dependent upon the following data, like “print X labels”, where the value for X is contained in the data.

<ESC>{Command} {Parameter}

These commands set the operational parameters of the printer, “set the print speed to 2.”

<ESC>{Command} {Parameter} {Data}

Some commands can contain both parameter and data elements, such as “print a code 39 symbol containing the data.”

SELECTING PROTOCOL CONTROL CODES

Protocol codes are special control characters that prepare the printer to receive instructions. For example, the <ESC> character tells the printer that a command code will follow.

The Protocol Control Code set is made up of six special characters. The Standard Protocol Codes are non-printable characters. They can be changed to printable characters using the Protocol Control code download command. This may be useful on host computers using protocol converters or in an application where non-printable ASCII characters cannot be sent from the host. The manual uses Standard Protocol Control Codes for all of the examples.

The Protocol Control codes must be downloaded from the host using the <ESC>LD command (see page 97). Once they are downloaded, the printer will not respond to standard protocol codes. The current protocol codes active in a printer can be determined by printing a Test Label (see CX410 User’s Guide).

| CONTROL CHARACTER | HEX VALUE | DESCRIPTION |
|-------------------|-----------|------------------------|
| STX | 02 | Start of Data |
| ETX | 03 | End of Data |
| ESC | 1B | Command code to follow |
| ENQ | 05 | Not used |
| CAN | 18 | Not used |
| Off-Line | 40 | Not used |

USING BASIC

It may be useful to test your printer using a BASIC program on a PC. You may also write your production program in BASIC. Whatever the reason, if you will be working in BASIC, some of the following hints may help you get started:

1. Set the WIDTH of the output device to 255 characters to avoid automatically sending <CR> and <LF>

characters after every line. The command string should be continuous and uninterrupted by <CR> and/or <LF> commands. The examples given in this manual are printed on separate lines because they will not fit on one line and do not contain any <CR> and/or <LF> characters. If these characters are needed, they are explicitly noted by the inclusion of <CR> and <LF> notations.

2. If you are using the printer's RS232 interface, it is necessary to set the COM port on the PC such that the CTS and DSR signals will be ignored. Send your OPEN "COM" statement in the following way:

```
OPEN "COM1:9600,N,8,1,CS,DS" AS #1
```

This sets the RS232 communication parameters of the host PC's COM1 port for 9600 baud, None parity, 8 Data bits, 1 Stop bit and directing the port to ignore the CTS and DSR control signals.

3. You may want to minimize keystrokes and program size by assigning the <ESC> character to a string variable since this character is used quite often.

The following two examples in BASIC show a typical example using these hints. Both of these examples use the Standard Protocol codes.

Printing with the Parallel Port

| | | |
|----|---|--|
| 5 | REM Parallel Example | Identifies the program as a parallel port print label. The "REM" prevents this data from being sent to the printer and displays it only on the screen. |
| 10 | E\$=CHR\$(27) | Sets the "E\$" string as an <ESC> character |
| 20 | WIDTH "LPT1:",255 | Sets the width of output to 255 characters |
| 30 | LPRINT E\$;"A"; | Sends an "<ESC>A" command code to the LPT1 parallel port |
| 40 | LPRINT E\$;"H400";E\$;"V100";E\$;"WL1SATO"; | Sends the data "SATO" to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the "WL" font. |
| 50 | LPRINT E\$;"Q1"; | Instructs the printer to print one label. |
| 60 | LPRINT E\$;"Z"; | Tells the printer that the last command has been sent. The printer can now create and print the job. |

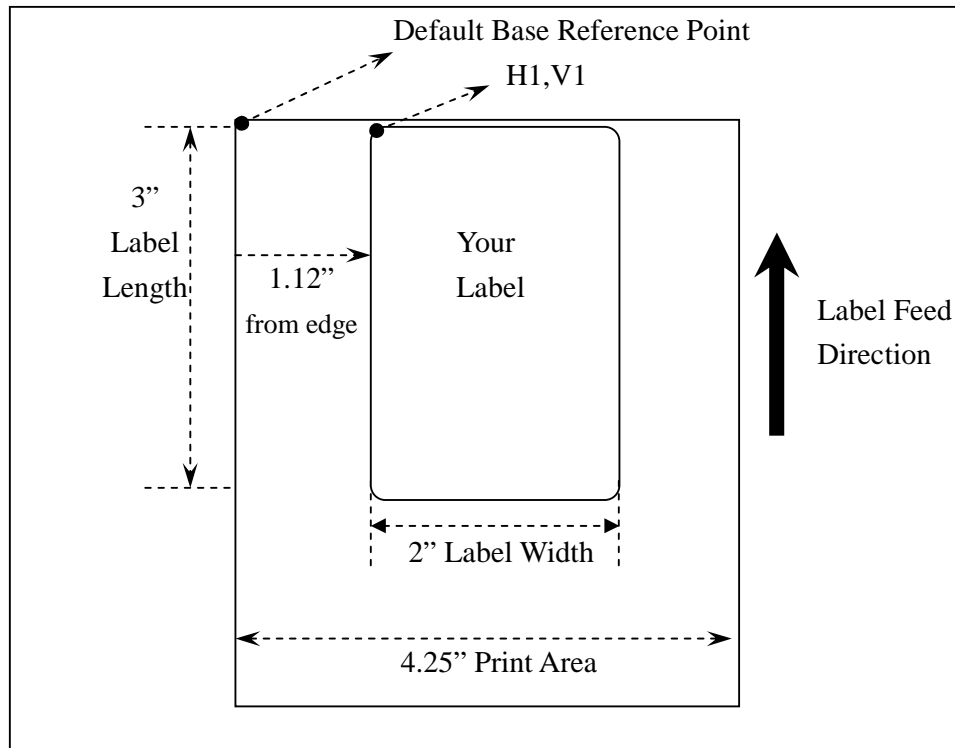
Printing with the RS232 Port

| | | |
|----|---|---|
| 5 | REM RS232 Example | Identifies the program as a RS232 port print label. The "REM" prevents this data from being sent to the printer and displays it only on the screen. |
| 10 | E\$=CHR\$(27) | Sets the "E\$" string as an <ESC> character |
| 20 | OPEN "COM1:9600,N,8,1,CS,DS" AS #1 | Opens the COM1 port for output and sets the parameters as 9600 baud, No parity, 8 Data bits, 1 Stop bit and instructs the port to ignore the CTS and DSR control signals. |
| 30 | PRINT #1,E\$;"A"; | Sends an "<ESC>A" command code to print port #1 opened by statement 20 above. |
| 40 | PRINT #1,E\$;"H400";E\$;"V100";E\$;"WL1SATO"; | Sends the data "SATO" to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the "WL" font. |
| 50 | PRINT #1,E\$;"Q1"; | Instructs the printer to print one label. |
| 60 | PRINT #1,E\$;"Z"; | Tells the printer that the last command has been sent. The printer can now create and print the job. |

THE PRINT AREA

The maximum print area is 25 inches long. Most of your label application will fit into this area, therefore, it is important to understand how to work with label that do not use the entire print area. The goal is to help you avoid printing where no label exists, which may lead to print head damage, not to mention the frustration when you cannot see the printed output.

The diagram below illustrates the print area for a sample 2 inch wide by 3 inch long label places within this area. As can be seen, your label will be oriented against the inside left edge of the printer as viewed from the front (label exit) of the printer. The normal reference point is located at the H1,V1 position of the print area in the normal print orientation (no rotation).



The base reference point is always on the right edge of the print head as you face the front (label exit) of the printer. Since the printer is centralized if you are using a label that is narrower than the maximum print width, you may have to adjust the base reference point of the Left-Hand printer to correctly position the print area. There are two methods available as follows:

1. Send the Base Reference Point command as part of your data to the printer to set a new base reference point for your label.

Calculate the distance (in dots) from the default base reference point to the closest edge of the label. If you wanted to move the print area to the left (as viewed from the front of label exit end of the printer) 2.1 inches:

$$\text{Label Width} = 2.0'' \times 25.4 \text{ mm/in} \times 12 \text{ dpmm} = 609 \text{ dots}$$

The new base reference point then becomes:

$$\begin{aligned} \text{New Base Reference Point} &= (\text{max print width} - \text{label width})/2 \\ &= (1280 - 609)/2 = 335 \end{aligned}$$

Issue the Base Reference Point command after the Start command in your data stream.

`<ESC>A3H0335V0001`

This resets the reference point for all the following data.

Note: After the reference point is moved, you can no longer print on the 335 dot “margin” each side unless the reference point is reset.

2. Use the normal reference point from the print area and use the horizontal position for each field to properly locate it on the label.

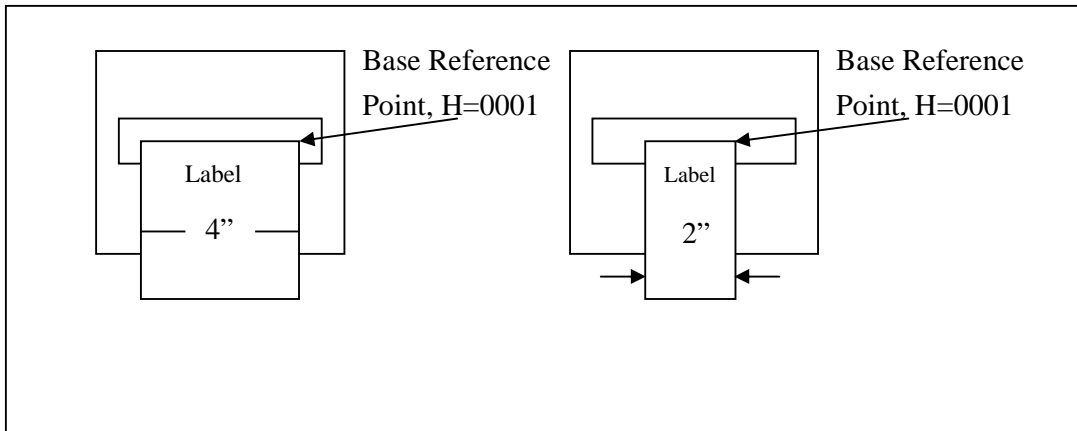
Calculate the distance (in dots) from the default normal reference point to the closest edge of the label.

$$\text{Shift Distance} = ((4.25-2)*300)/2 = 335 \text{ dots}$$

Each <ESC>H command would have the value “335” added to it to correctly position each field.

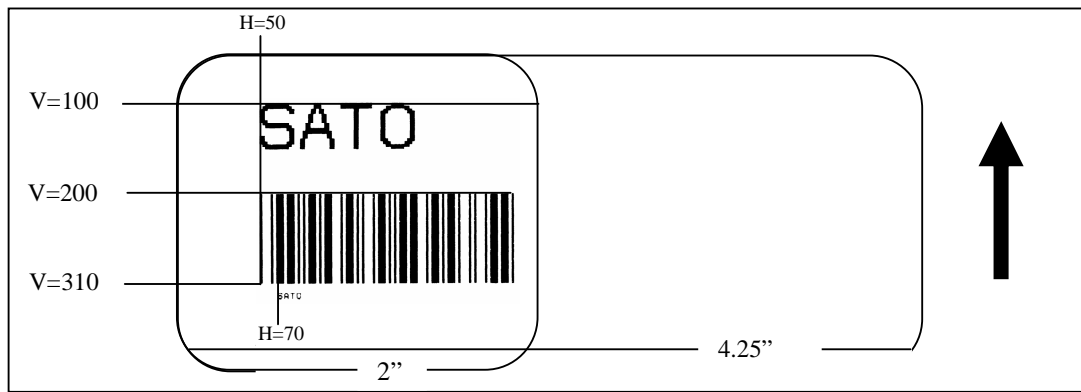
The Command Code Subsection contains a sample label output for each command code. These samples reflect how the printed information would appear on a four-inch wide label (see illustration). If you want to test the sample label outputs and are using labels less than 4 inches in width, you will have to adjust the positioning accordingly so that the printer does not try to print where there is no label.

You must be careful not to print off the label surface as the label provides a heat sink for the print head elements. Doing so will cause irreparable damage to the print head. This damage is not covered under the print head warranty.



For example, the following illustrates a sample data stream and the resulting label assuming a four-inch wide label:

```
<ESC>A
<ESC>H0050<ESC>V0100<ESC>L0303<ESC>MSATO
<ESC>H0050<ESC>V0200<ESC>B103100*SATO*
<ESC>H0070<ESC>V0310<ESC>L0101<ESC>USATO
<ESC>Q1<ESC>Z
```



Unshifted Print Area

If you are using a two-inch wide label, the entire image may not appear on your label. By adding the following Base Reference Point command to the second line of the data stream, the base reference point will be changed, causing the image to be shifted over toward the inside of the printer where it can be printed on the narrow label.

```
<ESC>A
<ESC>A3H0335V0001
<ESC>H0050<ESC>V0100<ESC>L0303<ESC>MSATO
<ESC>H0050<ESC>V0200<ESC>B103100*SATO*
<ESC>H0070<ESC>V0310<ESC>L0101<ESC>USATO
<ESC>Q1<ESC>Z
```



The image reference point is set at the left edge (facing the printer) of the label so that it can be printed on a 2-inch wide label.

Note: The printer will not “wrap” images that extend beyond the print area. If any part of a character or image extends beyond the print area, it will disappear.

For more information, see the Base Reference Point command description.

ROTATED FIELD

The printers can rotate each print field in 90° increments using the Rotate command. There are two variations of this command.

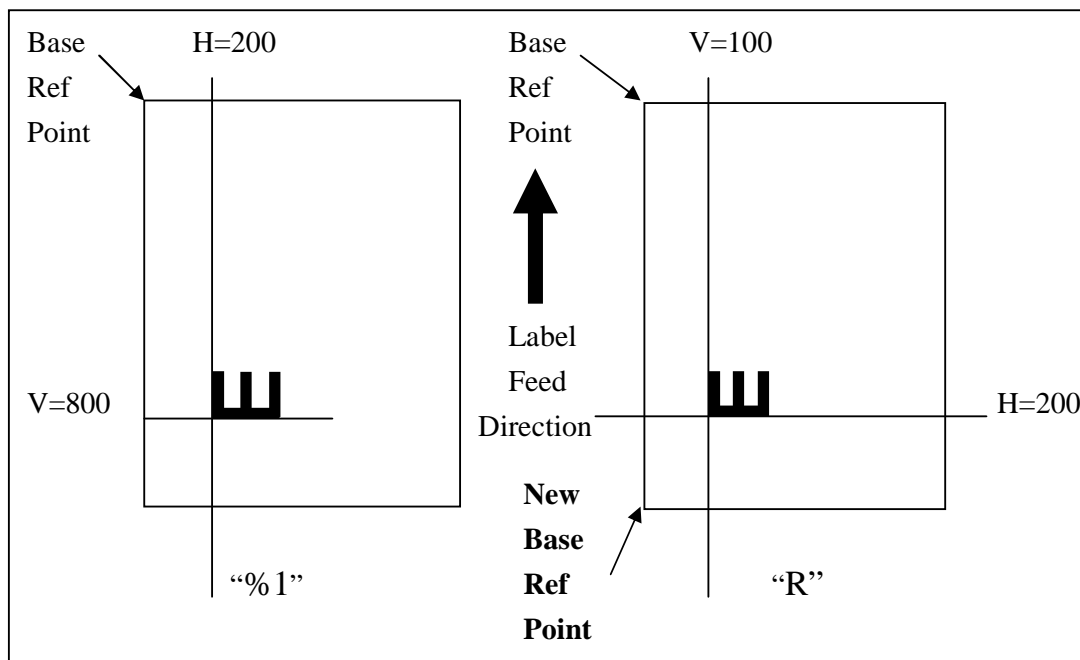
- <ESC>% - The field rotates, but the base reference point for the field remains the same.
- <ESC>R - The field and the base reference point rotate.

The following data stream will rotate the print field but will not change the base reference point of the field:

```
<ESC>A<ESC><ESC>A109001200<ESC>%1<ESC>V800<ESC>H200<ESC>L0202<ESC>WB1E  
<ESC>Q1<ESC>Z
```

The following data stream will rotate both the field and the base reference point for that field:

```
<ESC>A<ESC>A109001200<ESC>R<ESC>V100<ESC>H200<ESC>L0202<ESC>WB1E  
<ESC>Q1<ESC>Z
```



COMMAD DEFAULT SETTINGS

There are some types of commands that must have a value specified before a label can be printed. If the data stream does not contain these commands, a "default" value is assumed. The commands and the default values are:

| COMMAND | DEFAULT | NOTE |
|----------------------------|----------|------|
| Print Rotation | 0° | (1) |
| Vertical Reference Point | 0 | (1) |
| Horizontal Reference Point | 0 | (1) |
| Character Pitch | 2 | (1) |
| Base Reference Point | H=1, V=1 | (2) |
| Character Expansion | 1 | (1) |
| Print Darkness | 200 | (1) |
| Print Speed | 2 ips | (2) |

Notes:

- (1) *The settings for these commands will revert to the default values when the printer receives an <ESC>Z or an <ESC>*.*
- (2) *These values transmitted with these commands will remain in effect until a new command is received.*

PRINTER CONFIGURATION

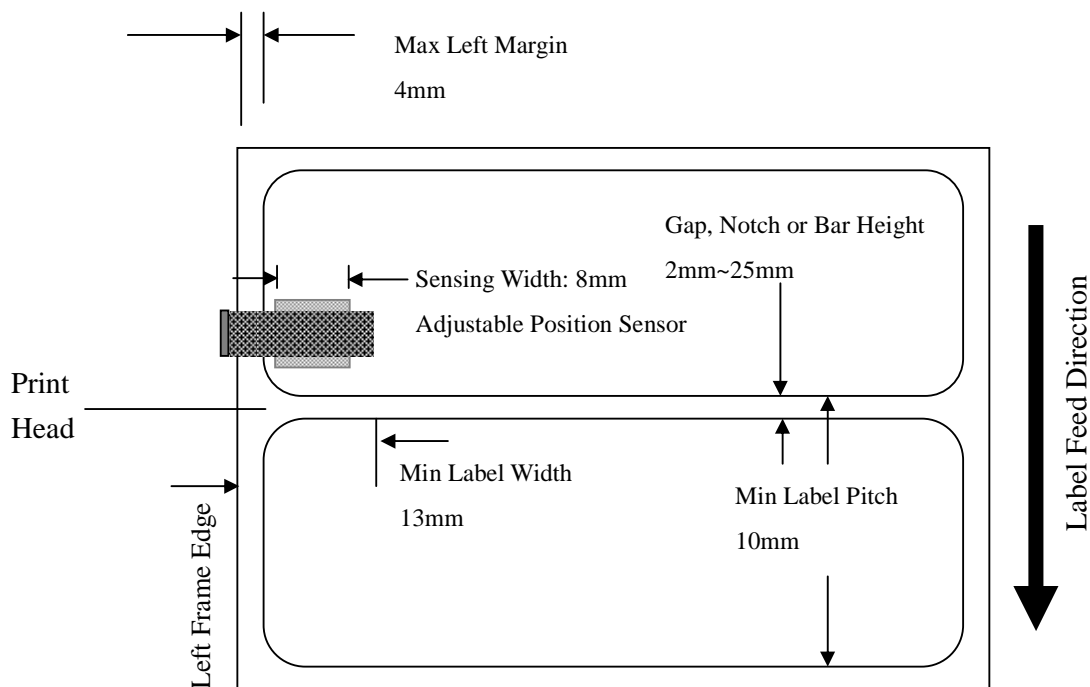
The CX410/CX400 printers are different from other SATO models in that they do not use DIP switches for printer configuration. Instead, all printer configurations are done via software commands. The parameters that can be configured are:

- Sensor Calibration
- Protocol Codes
- Print Darkness Range
- Sensor Type
- RS232 Parameters
- Label Tear-Off Position
- Backfeed Enable/Disable
- Form / Soft Font Status

Because there are no DIP switches to indicate the current printer settings, a Test Label can be printed that lists the active settings in the printer. This Test Label lists all of the information a user needs to ascertain the printer configuration. Test Labels can be printed out by sending a command by software (see page 100) or by using the FEED button (see User's Guide).

LABEL SENSING

The CX410 printers can use eye-mark (black bar), gap or notch label sensing. The gap and notch sensor is a transmissive or see-thru type with an infrared light source directed through the label from above and detected by a separate sensor underneath the label. A reflective sensor is used to detect eye-marks printed on the bottom of the label liner or tag. The eye-mark must not reflect more than 12% of the light. Since the same receiving sensor is used for all three types of sensing, it must be calibrated with the media that will be used. The ribbon must be installed while the calibration is being performed.



When calibrating the printer sensors, the gap or eye-mark sensor type must be selected first using the `<ESC>CI` command and then the Direct Thermal or Thermal Transfer print mode must be specified with an `<ESC>CP` command. These two commands are followed by an `<ESC>CA` Calibrate command to instruct the printer to perform the calibration procedure. The resulting calibration values are stored in the printer and used until the unit is recalibrated. A separated value is stored for direct thermal or thermal transfer modes because the settings will differ significantly because of the inclusion of the ribbon for thermal transfer. For example, the following command string will calibrate the printer in the thermal transfer mode for gap sensing:

```
<ESC>A<ESC>CP1<ESC>CI2<ESC>CA<ESC>Z
```

COMMAND CODE PAGE REFERENCE

This section contains all the printer Command Codes. The commands must be sent to the printer in an organized fashion in order for the label(s) to print.

The purposes of this section are to:

1. Explain the different commands and provide examples of their usage.
2. Provide a detailed reference for programming.

Each command begins on a separate page with its own heading. A uniform layout is used to help you find key information about each command. For each Command Code in this section, there will be a sample data input stream to the printer and the expected print output. By studying the examples, you can learn how to use the particular command within a whole block of printer code. Pay particular attention to the “Special Notes” with each command to learn other important information.

The subjected commands are highlighted in bold letters in the Reference Sheets. There are two parts of most, but not all, commands. The first is the command character, which immediately follows the <ESC> code. It is always an upper case alpha or a special character (such as an “&” or a “%”). It is never a lower case alpha character. If the command requires additional variable information, it is represented by a group of lower case alpha characters immediately following the command character. For example, if an **aaaabb** is listed following the basic command, the printer will look for six characters immediately following the command. The first four will represent the value of **aaaa** and the next two the value of **bb**.

The maximum number of characters defined in a parameter is represented by the number of characters shown in the command structure. For example, a command followed by an **aaaa** can have up to four characters. In general, commands with only one parameter following the command can be entered without leading zeros. In the above example, you could enter either “809” or “0809”. However, certain parameters following the command code, such as **aaaabbbb** require the exact number of digits to be entered. If the value of **aaaa** is “800” and the value of **bbbb** is “300”, then the parameters must be entered as “08000300”. It is recommended that you make it a practice to always enter leading zeros to prevent any mistakes.

Bar Codes

Command Structure 1:3 narrow/wide bar ratio: <ESC>Babbcccd
2:5 narrow/wide bar ratio: <ESC>BDabbcccd
1:2 narrow/wide bar ratio: <ESC>Dabbcccd

a = Bar code Symbol

- 0 Codabar
- 1 Code 39
- 2 Interleaved 2 of 5 (I25)
- 3 UPC-A/EAN-13
- 4 EAN-8
- 5 Industrial 2 of 5
- 6 Matrix 2 of 5
- A MSI
- C Code 93
- E UPC-E
- F Bookland
- G Code 128
- I UCC 128

bb = Number of dots (01-12) for narrow bar and narrow space

ccc = Bar height in dots (001-999)

d = UCC 128 only. Not used for other bar code types

- 0 No human readable text
- 1 Human readable text at top
- 2 Human readable text at bottom

Example: <ESC>BD103200

Placement: Immediately preceding data to be encoded.

Default: None

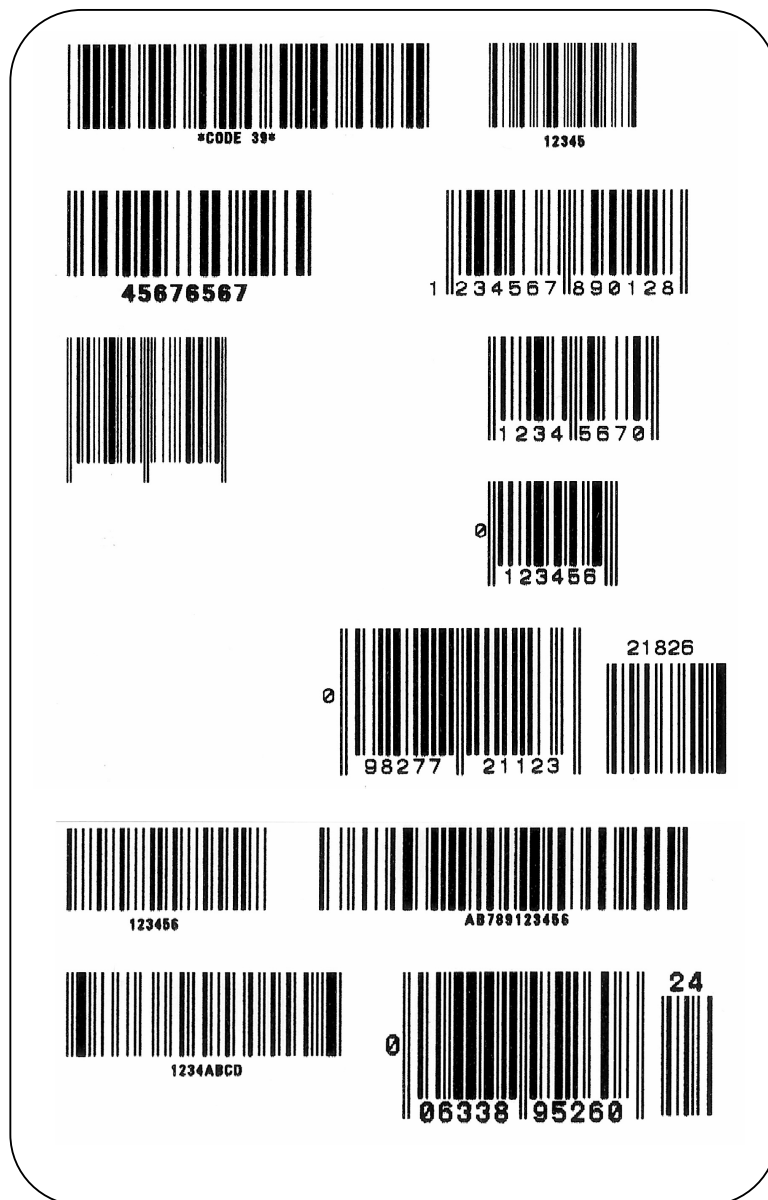
Command Function To print bar code images on a label. With this command, there are 13 standard bar code symbologies available to be printed and two two-dimensional symbols.

Input to Printer

<ESC>A
<ESC>H25<ESC>V25<ESC>B103100*CODE 39*
<ESC>H180<ESC>V130<ESC>XS*CODE 39*
<ESC>H25<ESC>V200<ESC>BD20210045676567
<ESC>H90<ESC>V310<ESC>XM45676567
<ESC>H25<ESC>V375<ESC>BD30215001234567890
<ESC>H25<ESC>V950<ESC>BA03100123456
<ESC>H100<ESC>V1060<ESC>XS123456
<ESC>H25<ESC>V1125<ESC>BC03100081234ABCD
<ESC>H150<ESC>V1235<ESC>XS1234ABCD
<ESC>H525<ESC>V25<ESC>B002100A12345B
<ESC>H590<ESC>V135<ESC>XS12345
<ESC>H475<ESC>V200<ESC>BD303100123456789012
<ESC>H525<ESC>V375<ESC>BD4031001234567
<ESC>H525<ESC>V550<ESC>DE03100123456
<ESC>H510<ESC>V600<ESC>M0
<ESC>H544<ESC>V655<ESC>L0101<ESC>P06<ESC>M123456
<ESC>H350<ESC>V725<ESC>D30315009827721123
<ESC>H330<ESC>V796<ESC>L0101<ESC>M0
<ESC>H380<ESC>V880<ESC>L0101<ESC>P06<ESC>M98277
<ESC>H520<ESC>V880<ESC>L0101<ESC>P06<ESC>M21123
<ESC>H665<ESC>V768<ESC>BF0313021826
<ESC>H690<ESC>V740<ESC>L0101<ESC>P06<ESC>M21826
<ESC>H425<ESC>V1125<ESC>D30315000633895260
<ESC>H425<ESC>V1200<ESC>L0202<ESC>S0
<ESC>H446<ESC>V1279<ESC>L0202<ESC>P03<ESC>S06338
<ESC>H580<ESC>V1279<ESC>L0202<ESC>P03<ESC>S95260
<ESC>H730<ESC>V1155<ESC>BF0314024
<ESC>H740<ESC>V1125<ESC>L0202<ESC>P03<ESC>S24
<ESC>H325<ESC>V950<ESC>BG03100>GAB>B789>C123456
<ESC>H498<ESC>V1055<ESC>XSAB789123456
<ESC>Q1<ESC>Z

Note: Carriage returns and Line Feeds have been added to the command listing for clarity and should not be included in the actual data stream.

Printer Output



<ESC>A

<ESC>H100<ESC>V200<ESC>BI04150101234567000000001

<ESC>Q2<ESC>Z



(00) 0 1234567 000000001 5



(00) 0 1234567 000000001 5



With Incrementing

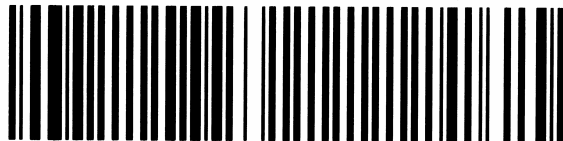
<ESC>A

<ESC>H100<ESC>V200<ESC>F001+001<ESC>BI04150101234567000000001

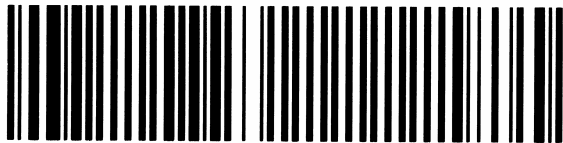
<ESC>Q2<ESC>Z



(00) 0 1234567 000000001 5



(00) 0 1234567 000000002 2



- Special Notes**
1. UPC and EAN bar codes are not affected by the different types of narrow to wide ratios. Instead, the <ESC>D command adds descender bar to these codes where needed to meet UPC specification. The <ESC>BD command puts descender bars and human readable text below the symbol.
 2. The Code 128, UCC 128, MSI, and Code 93 bar code are not affected by the narrow to wide ratios.
 3. The Codabar and Code 39 bar codes are affected by the Character Pitch command. The command must be placed before the Bar Code command.
 4. See Appendix B for more specific instructions and detailed information regarding individual bar code symbols.
 5. Because of their unique characteristics, two-dimensional symbols are covered separately.
 6. For UCC128, the FNC1 code is automatically inserted and the Mod 10 and Mod 103 check digits are automatically calculated.
 7. For the MSI bar code, the check digit is not automatically calculated.
 8. To select UPC-A, 11 digits of data are sent. The printer adds a "0" and automatically generates the check digit. If 12 digits of data are sent, the printer assumes an EAN-13 symbol and automatically generates the check digit. The last digit of bar code data is a modulo 10 check digit. If 13 digits of data are sent to the printer, the check digit is not created and must be supplied by the programmer. It must be the last character of the 13 digit string.

Bar Codes, Expansion

Command Structure <ESC>BWaabb

aa = Expansion factor by which the width of all bars and spaces will be increased (01-12)
bbb = Bar height by dot (004 - 999 dots)

Example: <ESC>BW02100

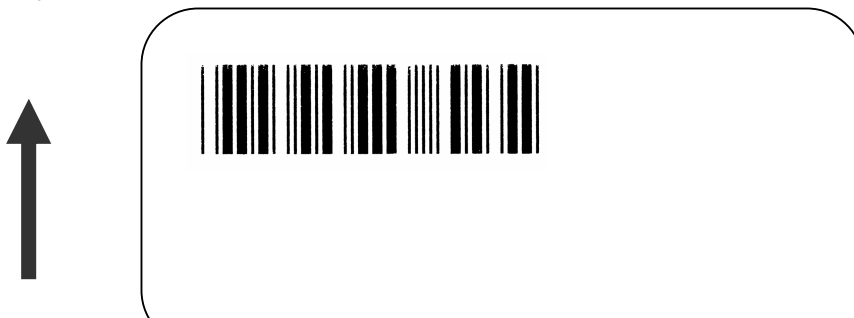
Placement: Immediately follows the <ESC>BT command and precedes data to be encoded.

Default: zero

Command Function This command works together with the <ESC>BT command to specify an expansion factor and the bar code height for the particular symbol being printed.

Input to Printer <ESC>A
<ESC>H50<ESC>V50<ESC>BT101030103
<ESC>BW04100*1234*
<ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. This command must be preceded by the Variable Ratio Bar Codes <ESC>BT command.
 2. The following bar codes will be affected by the Character Pitch command:
Codabar, Code 39 and Interleaved 2 of 5.

Bar Codes, Variable Ratio

Command Structure <ESC>BTabbccdde

| | | |
|----|---|------------------------------|
| a | = | Bar Code Symbol |
| 0 | | Codabar |
| 1 | | Code 39 |
| 2 | | Interleaved 2 of 5 |
| 5 | | Industrial 2 of 5 |
| 6 | | Matrix 2 of 5 |
| bb | = | Narrow space in dots (01-99) |
| cc | = | Wide space in dots (01-99) |
| dd | = | Narrow bar in dots (01-99) |
| ee | = | Wide bar in dot (01-99) |

Example: <ESC>BT101030103

Placement: Following print position commands and preceding the <ESC>BW command.

Default: Current setting

Command Function To print a bar code with a ratio rather than those specified through the standard bar code commands (B,BD, and D). This is done through individual control of each of the bar code elements (bars, spaces) as shown above. Remember that this command only applies to the three bar code types shown.

Input to Printer <ESC>A
<ESC>H50<ESC>V50<ESC>BT101030103
<ESC>BW03100*1234*
<ESC>Q1<ESC>Z

Printer Output



- Special Notes**
1. This command must be immediately followed by the <ESC>BW Bar Code Expansion command.
 2. You may use only one variable ratio bar code per label.
 3. If the data specified in this command is incorrect, the command is ignored and the ratio used will be based on the previous setting.

Base Reference Point

Command Structure <ESC>A3H-aaaaVbbbb

- = This character is optional. When present, it specifies that the horizontal offset is the negative direction. If it is left out the offset direction is positive.

aaaa = Horizontal Print Offset (-1280 to 1280)

bbbb = Vertical Print Offset (1 to 9999)

Example: <ESC>A3H100V50

Placement: Preceding all images that are based on the new base reference point.

Default: Current V and H offset settings in the printer configuration.

Command Function To establish a new reference point for the current label. The base reference point is the top left corner or “origin” from where all print position commands are based.

This command may be very helpful when using labels less than four inch wide to place images on the printable label surface. It may also be used to move images past preprinted fields on a label.

Input to Printer

<ESC>A<ESC>L0101

<ESC>H25<ESC>V25<ESC>WB0NORMAL REFERENCE POINT

<ESC>A3H300V75

<ESC>H25<ESC>V50<ESC>WB0NEW REFERENCE POINT

<ESC>Q1<ESC>Z

Printer Output



NORMAL REFERENCE POINT

NEW REFERENCE POINT

- Special Notes**
1. Use of this command will set the Vertical/Horizontal Offset setting of the printer configuration until a new Base Reference Point command is issued again.
 2. This command may be used more than once in a print job.
 3. An alternative to using this command is to make changes to your current Horizontal/Vertical Print Position commands.

Example:

Let's say the current base reference point is H=1, V=1 and you wish to move all the fields on your label downward vertically by 150 dots. You could either (1) add the Base Reference Point command or (2) change all the vertical position commands by an additional 150 dots.

4. For a more detailed example of the Base Reference Point command, see "Print Area" in this section.
5. The CX410 printers will not "wrap" (i.e. If any part of a character or image extends beyond the last print dot position. It will disappear and not be visible on any part of the label).

Character, Custom-Designed

Command Structure Store Command : <ESC>Tabcc
 Recall Command: <ESC>Kab90cc

a = 1 16x16 matrix
 2 24x24 matrix

b = Specifies the character encoding method for the data stream
 H hexadecimal characters
 B Binary characters
 If **B** is specified than both 90 and cc codes are represented by one
 byte code separately.

cc = Code to store/recall the character. Valid code ranges are 21H to
 52H in Hex or “!” to “R” in Binary.

(data)= Data to describe the character image either in Hex or Binary
 format.

Example: <ESC>T1H3F
 <ESC>K1H903F
 See Appendix C for a more detailed explanation.

Placement: The Store command is typically sent in its own data stream to the
 printer, between the Start/Stop commands. The Recall command is
 sent in a secondary data stream to print the character, and follows
 any necessary position or Size commands.

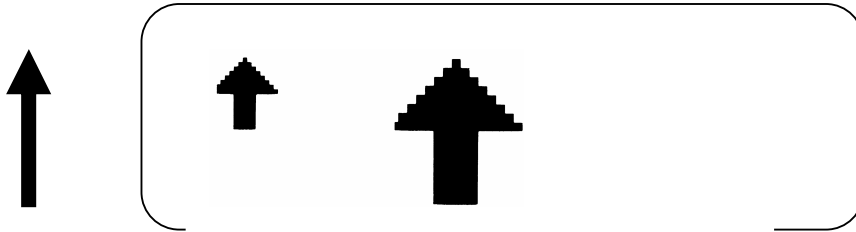
Default: None

Command Function To allow for the creation, storage, and printing of custom characters, such as
 special fonts or logos. Up to 50 individual characters may be stored in the cus-
 tom character volatile memory.

Input to Printer See Appendix C for a detailed explanation.
 <ESC>A
 <ESC>T1H3F0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C00
 7C007C007C007C0
 <ESC>Z

```
<ESC>A  
<ESC>H150<ESC>V100<ESC>L0505<ESC>K1H903F  
<ESC>H350<ESC>V100<ESC>L1010<ESC>K1H903F  
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes**
1. When printing the custom character using the <ESC>K Recall command, the character is affected by the following commands:

Character Expansion

Character Pitch

Line Feed

Rotate, Fixed Base Reference Point

Rotate, Moving Base Reference Point

2. The characters are stored in volatile memory and must be reloaded if the printer power is lost.
3. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.

Character Expansion

Command Structure <ESC>Laabb

aa = Multiple to expand horizontally (01~12)

bb = Multiple to expand vertically (01~12)

Example: <ESC>L0304

Placement: Preceding the data to be expanded

Default: L0101

Command Function To expand characters independently in both the horizontal and vertical directions. The command allows you to enlarge the base size of each font (except the vector font) up to 12 times in either direction. Expanded characters are typically used for added emphasis or for long distance readability.

Input to Printer <ESC>A
<ESC>H100<ESC>V100<ESC>XMSATO
<ESC>H100<ESC>V200<ESC>L0402<ESC>XMSATO
<ESC>H100<ESC>V300<ESC>L0204<ESC>XMSATO
<ESC>Q1<ESC>Z

Printer Output



Special Notes This command will expand the following fonts:

1. Fonts U, S, M XU, XS, XM, OA & OB and fonts WB, WL, XB, and XL.
2. This command will also affect the following commands:
 - Character Pitch
 - Characters, Custom-Designed
3. The Character Expansion value is in effect for the current print job until a new expansion command is specified.
4. The Line and Box command, if used within the data stream, may return all subsequent text to the default expansion of 1 x 1. Therefore, either send the Character Expansion command before all printed data, or send Line and Box Commands last, preceding the <ESC>Q Quantity command.

Character, Fixed Spacing

Command Structure <ESC>PR

Example: See above

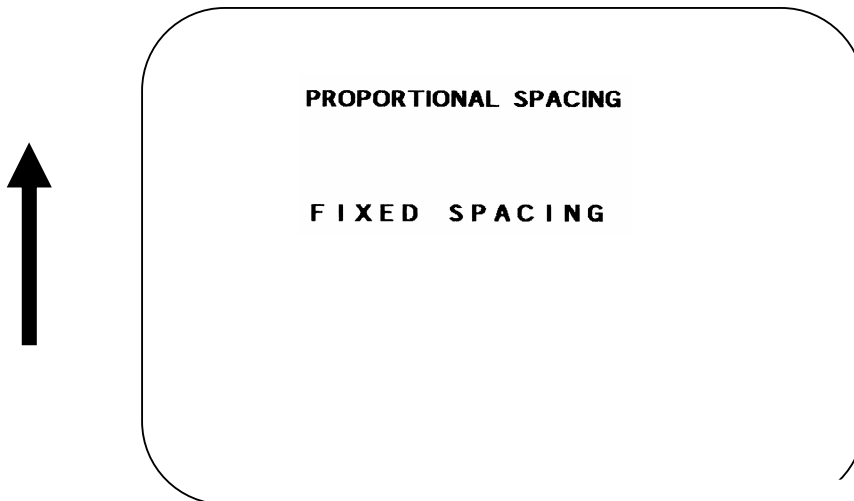
Placement: Preceding the data.

Default: The default is Proportional Spacing for proportional fonts.

Command Function To reset proportional spacing and place the printer to fixed spacing.

Input to Printer <ESC>A
<ESC>H100<ESC>V50<ESC>PS
<ESC>L0101<ESC>XMPROPORTIONAL SPACING
<ESC>H100<ESC>V180<ESC>PR
<ESC>L0101<ESC>XMFIXED SPACING
<ESC>Q1<ESC>Z

Printer Output



Special Note This command only works with the proportionally spaced fonts XU, XM, XS, XL, and XB.

Character Pitch

Command Structure <ESC>Paa

aa = Number of dots between characters (00 ~ 99).

Example: <ESC>P03

Placement: Preceding the text to be printed

Default: <ESC>P02

Command Function To designate the amount of spacing (in dots) between characters. This command provides a means of altering character spacing for label constraints or enhances readability.

Input to Printer <ESC>A

<ESC>H25<ESC>V25<ESC>L0202<ESC>XB1SATO

<ESC>H25<ESC>V125<ESC>L0202<ESC>P20<ESC>XB1SATO

<ESC>H25<ESC>V225<ESC>L0202<ESC>P40<ESC>XB1SATO

<ESC>Q1<ESC>Z

Printer Output



- Special Notes**
1. This command is affected by the <ESC>L Character Expansion command.
The Character Pitch is actually the product of the current horizontal expansion multiple and the designed pitch value.

Example:

<ESC>L0304

<ESC>P03

Pitch = (03) x (03) = 9 dots

2. To avoid confusion, you may want to include the <ESC>L Character Expansion command and this command together in your program.
3. This command affects fonts U, S, M, XU, XS, XM, OA & OB and fonts WB, XB, and XL.
4. Character Pitch will always revert to the default value unless it is specified before each new font command in the data stream.
5. This command also affects Codabar and code 39 bar codes.

Continuous Forms Printing

Command Structure None

The printer locates the end of adhesive label by sensing the backing between labels or through the use of an Eye-Mark (black rectangle on the reverse side of the backing). It locates the end of a tag from a notch, eye-mark, or a hole between tags. Both sensors should be disabled when printing continuous forms by sending the <ESC>CI0 command to disable the sensor (See page 104).

If you will be using continuous labels or tags, the printer must be told to stop feeding in another manner. The length is determined by the position of the last printed image on the label or tag. The printer will stop feeding when the field is finished printing. The length may be increased with printed spaces if necessary. There is no command code to control label length.

Character, Proportional Spacing

Command Structure <ESC>PS Sets to proportional spacing.
 <ESC>PR Resets to fixed spacing.

Example: See above

Placement: Preceding the data to be proportionally spaced.

Default: <ESC>PS

Command Function To specify the printing of proportional or fixed spacing for proportionally spaced fonts.

Input to Printer <ESC>A
 <ESC>H100<ESC>V50<ESC>PS
 <ESC>L0202<ESC>XMPROPORTIONAL SPACING
 <ESC>H100<ESC>V180<ESC>PR
 <ESC>L0202<ESC>XMFIXED SPACING
 <ESC>Q1<ESC>Z

Printer Output



Special Note Once this command is sent in the data stream, it is in effect until the end of the print job unless a reset command is sent.

Clear Print Job(s) & Memory

Command Structure <ESC>*a

| | | |
|---|---|--|
| a | = | Specifies the internal memory section to be cleared. |
| T | | To clear the custom character memory. |
| & | | To clear the form overlay memory. |
| X | | To clear all internal memory. |

Example: <ESC>*&

Placement: This command should be sent to the printer as an independent data stream.

Default: None

Command Function To clear individual memory or buffer areas of the printer.

Input to Printer <ESC>A
<ESC>*
<ESC>Z

Printer Output There is no printer output as a result of this command. The current print job in the buffer will be terminated and all other print jobs in the buffer cleared.

Special Notes

1. It is not necessary to clear the printer's memory between each print job.
2. When the "a" parameter is used, the section of memory specified will not be cleared until the label is printed.
3. When the "a" parameter is not included, all sections of memory will be cleared (same as <ESC>*X).

Clear Stand-alone Forms and Soft Fonts

Command Structure <ESC>*a[,id]

a = Specifies the stand-alone forms or soft fonts be cleared.
 F To clear the stand-alone forms
 O To clear the soft fonts
[.id] is optional. If no id is specified the all stand-alone forms or soft fonts will
 be cleared. If id is specified then only the stand-alone form or soft font with
 the id will be cleared.

Example: <ESC>*F,30

Default: None

Command Function To clear individual memory or buffer areas of the printer.

Input to Printer <ESC>A
 <ESC>*F,30
 <ESC>Z

Printer Output There is no printer output as a result of this command. The stand-alone form with id 30
 will be cleared.

Copy Image Area

Command Structure <ESC>WDHaaaaVbbbbXccccYdddd

aaaa = Horizontal position of the top left corner of the area to be copied
0001 to 1280.

bbbb = Vertical position of the top left corner of the area to be copied
0001 to 1424.

cccc = Horizontal length of the image area to be copied
0001 to 1280.

dddd = Vertical length of the image area to be copied
0001 to 1424.

Example: <ESC>WDH100V50X600Y400

Placement: Anywhere within the data stream, after specifying the location of the duplicate image.

Default: None

Command Function To copy an image from one location to another on the same label. This may be useful for duplicating individual fields or entire sections of the label with only one command.

Input to Printer <ESC>A
<ESC>H50<ESC>V50<ESC>E010<ESC>XM
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
<ESC>H180<ESC>V250<ESC>WDH130V50X400Y200
<ESC>Z

Printer Output



**SATOSATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATOSATO
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SATOSATOSATOSATOSATOSATOSATO**

**SATOSATOSATOSATOSATO
SATOSATOSATOSATOSATO
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SATOSATOSATOSATOSATO**

- Special Notes**
1. Use the Print Position command (V and H) to locate the new area for the duplicate image.
 2. Position of the new target area must not be inside the original image.
 3. If you use the Rotate command, V, H, X and Y axis will be reversed.
 4. If the reference area of the target image exceeds the print area, it will not be printed.

Cutter Command

Command Structure <ESC>CKa

| | | |
|---|---|------------------|
| a | = | Cutter control |
| 0 | | Disables cutter. |
| 1 | | Enables cutter. |

Example: <ESC>CK1

Placement: Following the <ESC>Q Print Quality command.

Default: Cutter is disabled

Command Function To control the cutting of labels when using a SATO cutter unit with the printer.

Input to Printer <ESC>A
<ESC>H20<ESC>V20<ESC>WB1TEST LABEL
<ESC>Q3
<ESC>CK1
<ESC>~1
<ESC>Z

- Special Notes
1. You must have the optional printer Cutter installed to use this function. Contact your SATO representative for more information.
 2. Sending a Cutter Enable command to a printer without a cutter installed will cause a cut error.

Peeler Command

Command Structure <ESC>CLa

a = Peeler control
 0 Disables Peeler.
 1 Enables Peeler.

Example: <ESC>CL1

Placement: Following the <ESC>Q Print Quality command.

Default: Peeler is disabled

Command Function To control the cutting of labels when using a SATO Peeler unit with the printer.

Input to Printer <ESC>A
 <ESC>H20<ESC>V20<ESC>WB1TEST LABEL
 <ESC>Q3
 <ESC>CL1
 <ESC>Z

- Special Notes
1. You must have the optional printer Peeler installed to use this function. Contact your SATO representative for more information.
 2. Sending a Peeler Enable command to a printer without a Peeler installed will halt the printer except you press the FEED button..

Fonts U, S, M, OA, OB, XU, XS & XM

| | | | | |
|-------------------|---------|---------|---------|---------|
| Command Structure | <ESC>XU | Font XU | <ESC>U | Font U |
| | <ESC>XS | Font XS | <ESC>S | Font S |
| | <ESC>XM | Font XM | <ESC>M | Font M |
| | <ESC>OA | Font OA | <ESC>OB | Font OB |

Example: See above

Placement: Preceding the data to be printed.

Default: None

Command Function To print text images on a label. These are eight of the built-in fonts available on the printer. All matrices include descenders.

| NON-PROPORTIONAL | PORPORTIONAL ⁽¹⁾ |
|-------------------------|-----------------------------|
| U 5W x 9H dot matrix | XU 5W x 9H dot matrix |
| S 8W x 15H dot matrix | XS 17W x 17H dot matrix |
| M 13W x 20H dot matrix | XM 24W x 24H dot matrix |
| OA OCR-A font 22W x 33H | OB OCR-B font 30W x 36H |

⁽¹⁾ These fonts will be printed with proportional spacing only if preceded by an <ESC>PS command.

Input to Printer

```

<ESC>A
<ESC>H50<ESC>V100<ESC>L0202<ESC>XUSATO
<ESC>H50<ESC>V175<ESC>L0202<ESC>XSSATO
<ESC>H50<ESC>V250<ESC>L0202<ESC>XMSATO
<ESC>H50<ESC>V325<ESC>L0101<ESC>OASATO
<ESC>H50<ESC>V400<ESC>L0101<ESC>OBSATO
<ESC>H300<ESC>V100<ESC>L0202<ESC>USATO
<ESC>H300<ESC>V175<ESC>L0202<ESC>SSATO
<ESC>H300<ESC>V250<ESC>L0202<ESC>MSATO
<ESC>Q1<ESC>Z

```

Printer Output



- Special Notes**
1. Characters may be enlarged through the use of Character Expansion command (see page 29).
 2. Character spacing may be altered through the use of the Character Pitch command (see page 32). The default is 2 dots between characters. It is recommended to use a spacing of 5 dots for OCR-A and 1 dot for OCR-B.
 3. You may also create characters or fonts. See the <ESC>T Custom-Designed Characters command (see page 27).
 4. A font must be defined for each field to be printed. There is no default font.
 5. The proportionally spaced fonts XU, XS, XM, XL and XA can be printed with fixed spacing using the <ESC>PR Fixed Space command.

Fonts WB, WL, XB & XL

Command Structure <ESC>WBa Font WB <ESC>XBa Font XB
 <ESC>WLa Font WL <ESC>XLa Font XL

a = Provided for compatibility with CL Printers.
 Can be either a 0 or 1.

Example: <ESC>WB1123456

Placement: Preceding the data to be printed.

Default: None

Command Function To print text images on a label. These are four auto-smoothing fonts available on the printer.

| | |
|---------------------------|-----------------------------|
| NON-PROPORTIONAL | PORPORTIONAL ⁽¹⁾ |
| WB 18W x 30H dot matrix | XB 48W x 48H dot matrix |
| WL 28W x 52H dot matrix | XL 48W x 48H dot matrix |

⁽¹⁾ These fonts will be printed with proportional spacing only if preceded by an <ESC>PS command.

Input to Printer <ESC>A<ESC>PS
 <ESC>H25<ESC>V100<ESC>WB0SATO
 <ESC>H25<ESC>V185<ESC>WB1SATO
 <ESC>H25<ESC>V270<ESC>WL0SATO
 <ESC>H25<ESC>V355<ESC>WL1SATO
 <ESC>H300<ESC>V100<ESC>XB0SATO
 <ESC>H300<ESC>V185<ESC>XB1SATO
 <ESC>H300<ESC>V270<ESC>XL0SATO
 <ESC>H300<ESC>V355<ESC>XL1SATO
 <ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. Characters may be enlarged through the use of Character Expansion command (see page 29).
 2. Character spacing may be altered through the use of the Character Pitch command (see page 32).
 3. A font must be defined for each field to be printed. There is no default font.
 4. The proportionally spaced fonts XU, XS, XM, XL and XB can be printed with fixed spacing using the <ESC>PR Fixed Space command.

Soft Font Selection

Command Structure <ESC>BJT,aa,bb,cc,dd,ee,ffff,gg..g

aa = Soft Font ID, 00 ~ 99.
bb = Horizontal expansion, 01 ~ 12.
cc = Vertical expansion, 01 ~ 12.
dd = Character pitch, 01 ~ 99.
ee = always 00.
ffff = Number of characters to print.
gg..g = Data to print.

Example: <ESC>BJT,5,1,1,1,00,4,DATA

Placement: Preceding the data to be printed.

Default: None

Command Function To print a soft font you should first download the soft font with a specified ID or it is already stored in the flash memory.

Soft Font Selection

Command Structure <ESC>RFaabb,gg..g

aa = Soft Font ID, 00 ~ 99.
bbbb = Number of characters to print.
gg..g = Data to print.

Example: <ESC>RF050008,<00>D<00>A<00>T<00>A

Placement: Preceding the data to be printed.

Default: None

Command Function To print a soft font you should first download the soft font with a specified ID or it is already stored in the flash memory. Similar to the <esc>BJT command, except the <ESC>RF takes the two-byte encoding.

Font, Vector

| | | |
|-------------------|----------------------|---|
| Command Structure | Specify Vector Font: | <ESC>\$a,b,c,d |
| | Data Vector Font: | <ESC>\$=(data) |
| a | = | A Helvetica Bold (proportional spacing). B Helvetica Bold (fixed spacing). |
| b | = | Font width (24~999 dots) |
| c | = | Font height (24~999 dots) |
| d | = | Font variation (0~9) as follows: 0 Standard 1 Standard open (outlined) 2 Gray (mesh) pattern 1 3 Gray (mesh) pattern 2 4 Gray (mesh) pattern 3 5 Standard open, shadow 1 6 Standard open, shadow 2 7 Standard mirror image 8 Italic 9 Italic open, shadow |

Example: <ESC>\$A,100,200,0<ESC>\$=123456

Placement: Immediately preceding data to be printed.

Default: None

Command Function To specify printing of the unique SATO vector font. The vector font allows large characters to be printed with smooth, round edges. Each character is made of a number of vectors (or outlines), and will require slightly more printer processing time.

Input to Printer <ESC>A
<ESC>H100<ESC>V100<ESC>\$A,100,100,0<ESC>\$=SATO
<ESC>H100<ESC>V200<ESC>\$=VECTOR FONT
<ESC>\$A,200,300,8<ESC>H100<ESC>V350<ESC>\$=SATO
<ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. The Pitch command can be used with Vector fonts.
 2. If the font size designation is out of the specified range, a default value of 50 is used.
 3. The font width and height values include ascenders, descenders and other space.
 4. A font must be defined for each field to be printed. There is no default font.

Form Feed

Command Structure <ESC>A(space)<ESC>Z

Example: See above

Placement: Separate data stream sent to printer.

Default: None

Command Function To feed a blank tag or label, which is the equivalent of a “form feed”.

Input to Printer <ESC>A(space)
<ESC>Z

Printer Output Blank label or tag.

Form Overlay, Recall

Command Structure <ESC>/

Example: See above

Placement: Must be preceded by all other data and placed just before the Print Quality command (<ESC>Q).

Default: None

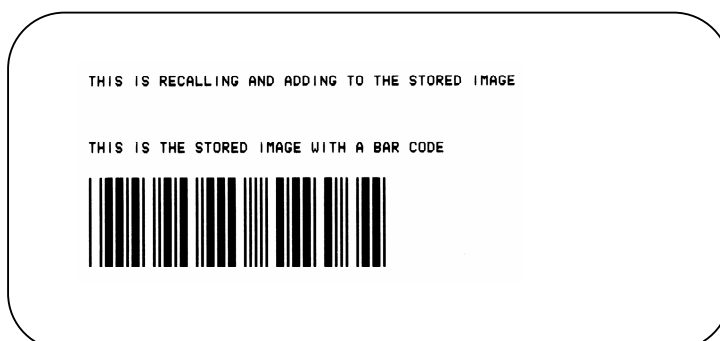
Command Function To recall the label image from the form overlay memory for printing. This command recalls a stored image from the overlay memory. Additional or different data can be printed with the recalled image.

Input to Printer

```
<ESC>A
<ESC>H100<ESC>V125
<ESC>STHIS IS THE STORED IMAGE WITH A BAR CODE
<ESC>H100<ESC>V165<ESC>B103100*12345*
<ESC>&<ESC>Z

<ESC>A
<ESC>H100<ESC>V50
<ESC>STHIS IS RECALLING AND ADDING TO THE STORED IMAGE<ESC>/
<ESC>Q1<ESC>Z
```

Printer Output



Special Note The overlay is stored using the <ESC>& Form Overlay Store command (see page 52).

Form Overlay, Store

Command Structure <ESC>&

Example: See above

Placement: Must be preceded by all other data and placed just before the Stop command (<ESC>Z).

Default: None

Command Function To store a label image in the volatile form overlay memory. Only one label image may be stored in this memory area at a time.

Input to Printer
<ESC>A
<ESC>H100<ESC>V125
<ESC>STHIS IS THE STORED IMAGE WITH A BAR CODE
<ESC>H100<ESC>V165<ESC>B103100*12345*
<ESC>&<ESC>Z

Printer Output There is no output from this command. It stores the label image in the overlay buffer.

- Special Notes
1. Remember that this storage is volatile. Therefore, if the printer loses power, the overlay must be sent again.
 2. The overlay is recalled using the <ESC>/ Form Overlay Recall command (see page 51).
 3. Form overlays do not have to be recompiled each time they are called to be printed and therefore may result in much faster print output.

Graphics, Custom

Command Structure <ESC>Gabbbcc(data)

a = Specifies format of data stream to follow
B binary format.
H Hexadecimal format.
bbb = Number of horizontal 8 x 8 blocks
001 to 104.
ccc = Number of vertical 8 x 8 blocks
001 to 356.
(data)= Data to describe the graphic image.

Example: <ESC>GH006006

See Appendix C for a detailed example

Placement: May be placed anywhere within the data stream after the necessary
Position commands.

Default: None

Command Function To create and print custom graphics (logos, pictures, etc.) on a label. The graphic image may be printed along with other print data to enhance label appearance or eliminate the need for preprinted label stock. Using a dot-addressable matrix, design the graphic image in 8 dot by 8 dot blocks, then send it in a binary format to the printer.

Input to Printer <ESC>A

```
<ESC>H100<ESC>V100<ESC>GH006006
FFFFFFFFFFFFFFFFFFFFFFFFC00000000003
C00000000003C000FFFFFFFF3C00080000013
C00080000013C0009FFFFF13C00080000013
C00080000013C0009FFFFF13C00080000013
C00080000013C000FFFFFFFF3C00000000003
C00000000003C00000000003C00000000003
C00000000003C00000000003C00003C00003
C00007E00003C0000FF00003C0000FF00003
C0000FF00003C0000FF00003C00007E00003
C00003C00003C00003C00003C00003C00003
C00003C00003C00003C00003C00003C00003
C00003C00003C00003C00003C00003C00003
C00000000003FFFFFFFFFFFFFFFFFFFFFFFF
0000000000000000000000000000000000
0000000000000000000000000000000000
```

```
<ESC>H300<ESC>V100<ESC>XSPLEASE PLACE YOUR DISK  
<ESC>H300<ESC>V150<ESC>XSIN A SAFE PLACE  
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes
1. Do not insert <CR> or <LF> codes (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.
 2. A custom graphic cannot be enlarged by the <ESC>L Character Expansion command (page29).
 3. A custom graphic is not affected by either of the Rotation commands. Therefore, always design and locate your graphic image to print in the appropriate orientation.
 4. The binary format reduces the transmission time by 50%.

Graphics, PCX

Command Structure <ESC>GPaaaa,(data)

aaaaa = Number of bytes to be downloaded.

Example: <ESC>GP32000,...data...

See Appendix C for a detailed example.

Placement: Anywhere within the job data stream.

Default: None

Command Function To allow the creation and printing of graphic images using a PCX file format.

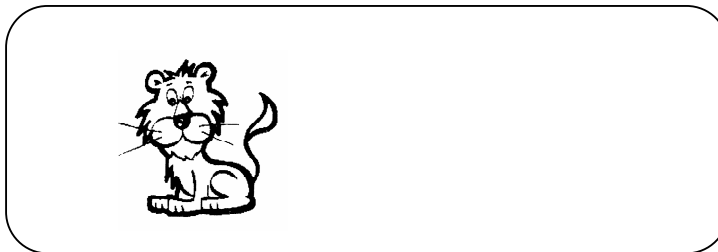
Input to Printer See Appendix C for a detailed example.

<ESC>A

<ESC>H100<ESC>V150<ESC>GP03800,...data...

<ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. The maximum number of bytes that can be downloaded is 32K (compressed). The number specified by this command includes the PCX header information. The maximum size of the uncompressed PCX file is 64K. If the uncompressed file exceeds 64K, the graphic will not print.
 2. Only black and white PCX files can be downloaded.
 3. The image created by this command cannot not be rotated.
 4. The file size specified by this command is the DOS file size in bytes.

Journal Print

Command Structure <ESC>J

Example: See above

Placement: Immediately following <ESC>A.

Default: None

Command Function To print text in a line by line format on a label. By specifying this command, you automatically select Font S with a Character Expansion of 2x2. You also establish a base reference point of H2, V2. The character pitch is 2 dots and the line gap is 16 dots. Simply issue an ASCII <CR> at the end of each text line.

Input to Printer <ESC>A
<ESC>JWITH THE JOURNAL
FEATURE YOU CAN PRINT
TEXT WITHOUT USING ANY
FONT COMMANDS OR
POSITION COMMANDS
<ESC>Q1<ESC>Z

Printer Output



WITH THE JOURNAL
FEATURE YOU CAN PRINT
TEXT WITHOUT USING ANY
FONT COMMANDS OR
POSITION COMMANDS

- Special Notes**
1. Journal mode assumes a maximum label width. Otherwise, you may print where there is no label and damage your print head.
 2. It is effective only for the current job.

Lines and Boxes

Command Structure **Line:** <ESC>FWaabc^{cccc}

aa = Width of horizontal line in dots (01 ~ 99).

b = Line orientation

 H Horizontal line.

 V Vertical line.

cccc = Length of line in dots.

Box: <ESC>FWaabbV^{cccc}H^{dddd}

aa = Width of horizontal side in dots (01 ~ 99).

bb = Width of vertical side in dots (01 ~ 99).

cccc = Length of vertical side in dots (00 ~ 1424).

dddd = Length of horizontal side in dots (01 ~ 1280).

Example: <ESC>FW02H0200

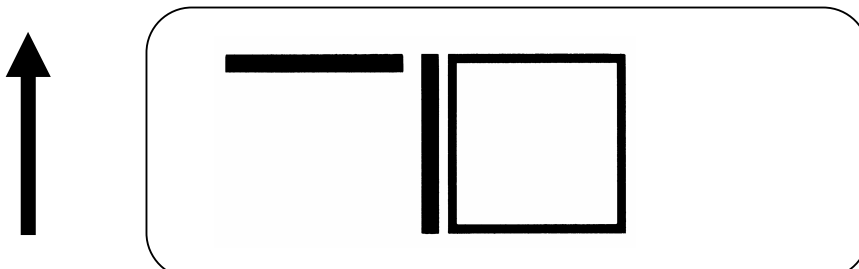
Placement: Following the necessary position commands.

Default: None

Command Function To print horizontal lines, vertical lines, and boxes as images on the label.

Input to Printer <ESC>A
 <ESC>H100<ESC>V100<ESC>FW20H0200
 <ESC>H320<ESC>V100<ESC>FW20V0200
 <ESC>H350<ESC>V100<ESC>FW1010H0200V0200
 <ESC>Q1<ESC>Z

Printer Output



Special Note It is recommended that all lines and boxes be specified in the normal print direction.

Print Darkness

Command Structure <ESC>#Ea

a = Print darkness value
a = 1,2,3,4 or 5

Example: <ESC>#E2

Placement: Must be placed immediately after <ESC>A and immediately before <ESC>Z in its own separate data stream.

Default: 2

Command Function To specify a new print darkness setting. This command allows software control of the darkness setting for unique media and ribbon combinations.

Input to Printer <ESC>A
<ESC>#E2
<ESC>Z

Printer Output There is no printer output for this command.

- Special Note
1. This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. This setting is stored in non-volatile memory and is not affected by cycling power.
 2. The lightest setting is the smallest value and the darkness setting is the largest value.
 3. This command adjusts the print darkness in discrete steps. The range of this command is set using the <ESC>CD Print Darkness Fine Adjustment command. Changing the Print Darkness Fine Adjustment setting will affect this command.

Print Length, Expanded

| | | |
|-------------------|----------|---|
| Command Structure | <ESC>AX | Sets the print length to 14"(356 mm) |
| | <ESC>AR | Resets the maximum print length to 7"(178 mm) |
| | <ESC>EX0 | Sets the print length to 25"(635 mm) |

Example: See above

Placement: Must follow the Start Code command and be in its separate data stream.

Default: <ESC>AR

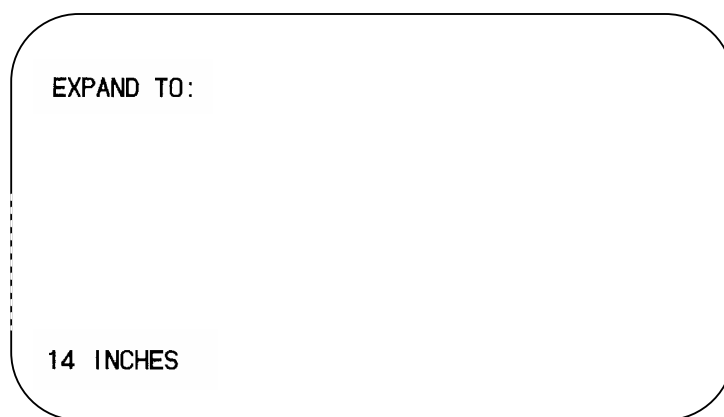
Command Function To enlarge the maximum print length (in feed direction) for a label.

Input to Printer

```
<ESC>A
<ESC>AX
<ESC>Z

<ESC>A
<ESC>H50<ESC>V100<ESC>WB1EXPAND TO:
<ESC>H50<ESC>V4100<ESC>WB114 INCHES
<ESC>Q1<ESC>Z
```

Printer Output



- Special Note
1. AX is effective until AR or EX0 is sent to reset the printer to its standard print length, or until the printer is repowered.
 2. It may be included in an independent data stream to specify the size of the maximum print area.
 3. This command cannot be used with the <ESC>& Store Form Overlay command.

Line Feed

Command Structure <ESC>Eaaa

aaa = Number of dots (001 ~ 999) between the bottom of the characters on one line to the top of the characters on the next line.

Example: <ESC>E010

Placement: Preceding the text that will use the line feed function.

Default: None

Command Function To print multiple lines of the same character size without specifying a new print position for each line. With the Line Feed command, specify the number of dots you want between each line. Then, send an ASCII <CR> at the end of each line of text. The printer automatically identifies the size of the last character, moves down the number of dots specified, and begins printing the next line.

Input to Printer

```
<ESC>A
<ESC>E010<ESC>H50<ESC>V50<ESC>L0202<ESC>S
THIS IS THE 1ST LINE
THIS IS THE 2ND LINE
THIS IS THE 3RD LINE
<ESC>Q1<ESC>Z
```

Printer Output



```
THIS IS THE 1ST LINE
THIS IS THE 2ND LINE
THIS IS THE 3RD LINE
```

- Special Notes
1. It is effective only for the current data stream.
 2. When printing lines or boxes in the same data stream with the Line Feed command, the Lines and Boxes command should be specified last, preceding <ESC>Q Quantity command.
 3. This command is invalid only if the value specified is zero.

4. Following this command with a <CR> character will allow you to print with auto line feed. The print position will be determined from the value specified and the H value set in the printer. If you specify several H values after this command, the print position will be determined by the H value last specified. You must redefine the font to be used after each H command.

Media Size

Command Structure <ESC>A1aaaabbbb

aaaa = Vertical Media Size in dots (0 to Vmax).

bbbb = Horizontal Media Size in dots (0 to Hmax).

Example: <ESC>A132000832

Placement: Separate data stream to the printer.

Default: <ESC>A136000832

Command Function To set the size of the media.

Input to Printer <ESC>A

<ESC>A108320812

<ESC>Z

Printer Output There is no printer output resulting from this command. It is used to automatically adjust the offset values for the size of label being used.

- Special Notes
1. The Base Reference point is always on the right (looking at the front of the printer) side of the print head. This command adjusts the Base Reference Point to correspond with the right edge of the loaded media.
 2. If the label size is changed, then this command must be respecified to centralize the print image on the label.
 3. All eight variables ("aaaa" and "bbbb") must be included in this command.

Postnet

Command Structure <ESC>BPn...n

n...n = 5 digits (Postnet-32 format)
 6 digits (Postnet-37 format)
 9 digits (Postnet-52 format)
 11 digits (Postnet-62 format, Delivery Point format).

Example: <ESC>BP123456789

Placement: Immediately preceding the data stream to be encoded.

Default: None

Command Function To print Postnet bar codes.

Input to Printer <ESC>A
 <ESC>H100<ESC>V120<ESC>BP94089
 <ESC>H100<ESC>V160<ESC>BP123456
 <ESC>H100<ESC>V200<ESC>BP123456789
 <ESC>H100<ESC>V240<ESC>BP12345678901
 <ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. If the number of data digits does not match the Postnet formats listed, the command is ignored.
 2. Only numeric data will be accepted.

Print Position

Command Structure Horizontal Position <ESC>Haaaa
 Vertical Position <ESC>Vbbbb
aaaa = Number of dots horizontally from the base reference point
 1 to 1280.
bbbb = Number of dots vertically from the base reference point
 1 to 7500.

Example: <ESC>H0020<ESC>V0150

Placement: Preceding any printed field description of lines/boxes, fonts, bar codes or graphics.

Default: <ESC>H0001
 <ESC>V0001

Command Function The Horizontal and Vertical commands specify the top left corner of a field or label, using the current base reference point as an origin. They also establish a reference point for subsequent fields until the next horizontal and/or vertical print position command is issued.

Input to Printer <ESC>A
 <ESC>H25<ESC>V50<ESC>L0303<ESC>MSATO
 <ESC>H100<ESC>V150<ESC>MSATO
 <ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. The print position of a field is affected by both the Rotate (<ESC>R) and <ESC>A3 commands.
 2. If any part of an image is placed past maximum allowable dots across the label, that part of the image will be lost.
 3. If you attempt to print where there is no paper, you may damage the print head.
 4. For these commands, the leading zeroes do not have to be entered. The command V1 is equivalent to V0001.

Print Quantity

Command Structure <ESC>Qaaaaaa

aaaaaa = Total number of labels to print (1 to 65535).

Placement: Just preceding <ESC>Z. This command must be present in every print job.

Default: <ESC>Q1

Command Function To specify the total number of labels to print for a given print job.

Input to Printer <ESC>A
<ESC>H100<ESC>V100<ESC>WB1SATO
<ESC>Q3<ESC>Z

Printer Output Three labels containing the data "SATO" will be printed.

- Special Notes
1. To cancel a print job, you must turn off the printer.
 2. When used with <ESC>F Sequential Numbering command (see page 77), the Print Quantity value should be equal to the total number of labels to be printed.
 3. If you do not specify a Print Quantity, one copy is assumed.
 4. For this commands, leading zeroes do not have to be entered. The command Q1 is equivalent to Q000001.

Print Speed

Command Structure <ESC>CSa

a = Designates the speed selection.

1 = 1 ips (25 mm/s)

2 = 2 ips (50 mm/s)

3 = 3 ips (75 mm/s)

Example: <ESC>CS3

Placement: Must be placed immediately after <ESC>A and immediately before <ESC>Z in its own data stream.

Default: As previously set in the printer configuration.

Command Function To specify a unique print speed through software for a particular label. This allows flexibility in finding the best performance and quality for the particular label format, media, and ribbon. All subsequent labels will print at this speed unless the speed is changed with this command.

Input to Printer <ESC>A
<ESC>CS2
<ESC>Z

Printer Output There is no printer output for this command. It sets the print speed of the printer to 2 inches per seconds.

Special Notes This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. The settings is stored in non-volatile memory and is not affected by cycling the power.

Repeat Label

Command Structure <ESC>C

Example: See above

Placement: Must be placed immediately after <ESC>A and immediately before <ESC>Z in its own data stream.

Default: None

Command Function To print duplicate of the last label printed.

Input to Printer
<ESC>A
<ESC>C
<ESC>Z

Printer Output A duplicate of the previous label will be printed.

Special Note This command will have no effect if the power to the printer was cycled off and back on since printing the previous label.

Replace Data (Partial Edit)

Command Structure <ESC>0

Example: See above

Placement: Must follow <ESC>A and precede all other print data.

Default: None

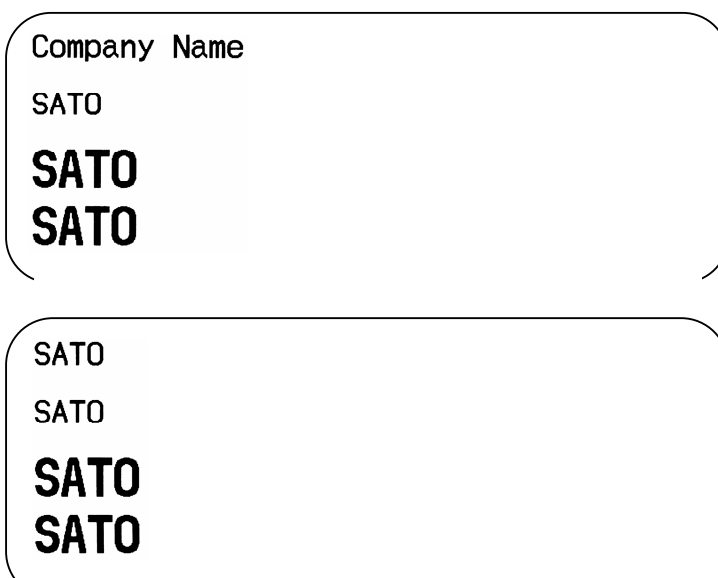
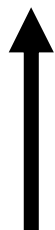
Command Function To replace a specified area of the previous label with new data. This command will cause the previous label to print along with any changes specified within the current data stream.

Input to Printer

```
<ESC>A
<ESC>H25<ESC>V20<ESC>WB0Company Name
<ESC>H25<ESC>V85<ESC>WB1SATO
<ESC>H25<ESC>V150<ESC>WL0SATO
<ESC>H25<ESC>V215<ESC>WL1SATO
<ESC>Q1<ESC>Z

<ESC>A
<ESC>0<ESC>H25<ESC>V20<ESC>WB0SATO
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes**
1. Specify the exact same parameters for the image to be replaced as were specified in the original data stream, including rotation, expansion, pitch, etc.. This will ensure that the new data will exactly replace the old image. If the replacement data contain fewer characters than the old data, then the characters not replaced will still be printed.
 2. This command will not function if the power has been cycled off and back on since the last label was printed.
 3. Proportional Pitch text cannot be used with this command.

Reverse Image

Command Structure <ESC>(aaaa,bbbb

aaaa = Horizontal length in dots of reverse image area
1 to 1280.

bbbb = Vertical height in dots of reverse image area
1 to 7500.

Example: <ESC>(100,50

Placement: This command must be preceded by all other data and be placed just before <ESC>Q.

Default: None

Command Function To reverse an image area from black to white and vice versa. Use the Print Position commands (<ESC>H and <ESC>V) to locate the top left corner of the Reverse image data.

Input to Printer <ESC>A
<ESC>H50<ESC>V120<ESC>L0202<ESC>WB1REVERSE
<ESC>H250<ESC>V300<ESC>L0202<ESC>WB1HALF
<ESC>H40<ESC>V110<ESC>(370,100
<ESC>H240<ESC>V290<ESC>(220,47
<ESC>Q1<ESC>Z

Printer Output



Special Notes 1. A reverse image area is affected by the rotate commands. Therefore, always assume the printer is in the normal print orientation when designing and sending the Reverse Image command.

2. If using reverse images with the form overlay, place this command before the Form Overlay command in the data stream.
3. If the Rotate commands are used with this command, the V and H parameters are reversed.
4. If the height and width to be reversed contain other than alphanumeric data, the area is not printed.
5. If the values specified exceed the maximum ranges, the reverse image is not created.

Rotate, Fixed Base Reference Point

Command Structure <ESC>%a

- | | | | |
|---|---|---|---------------------------------------|
| a | = | 0 | Sets print to normal direction. |
| | | 1 | Sets print to 90° CCW. |
| | | 2 | Sets print to 180° CCW (upside down). |
| | | 3 | Sets print to 270° CCW. |

Example: <ESC>%3

Placement: Preceding any printed data to be rotated.

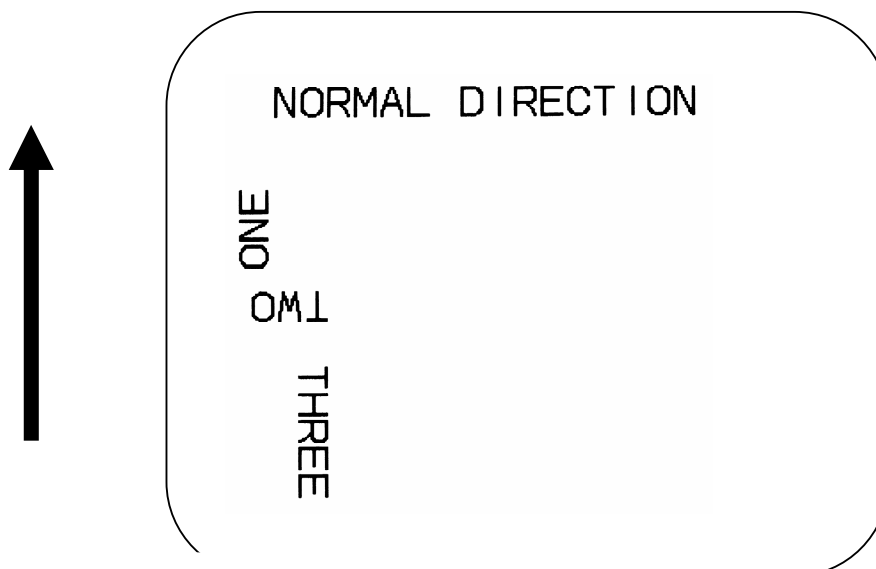
Default: <ESC>%0

Command Function To rotate the print direction in 90° increments without changing the location of the base reference point. The diagram below illustrates the use of the <ESC>% Rotate command. Note that the entire print area is shown, but your label will probably not be as large as the entire area.

Input to Printer

```
<ESC>A
<ESC>%0<ESC>L0202<ESC>H140<ESC>V100<ESC>MNORMAL DIRECTION
<ESC>%1<ESC>H100<ESC>V300<ESC>MONE
<ESC>%2<ESC>H200<ESC>V360<ESC>MTWO
<ESC>%3<ESC>H200<ESC>V410<ESC>MTHREE
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes**
1. Do not combine this command and the <ESC>R rotate command in the same data stream.
 2. The specified values are valid until another Rotate (<ESC>%) command is received.
 3. Receipt of a Stop Print (<ESC>Z) command will reset the setting to the default value.

Rotate, Moving Base Reference Point

Command Structure Normal Direction: <ESC>N
 Rotated Direction: <ESC>R

Example: See above

Placement: Preceding any printed data to be rotated.

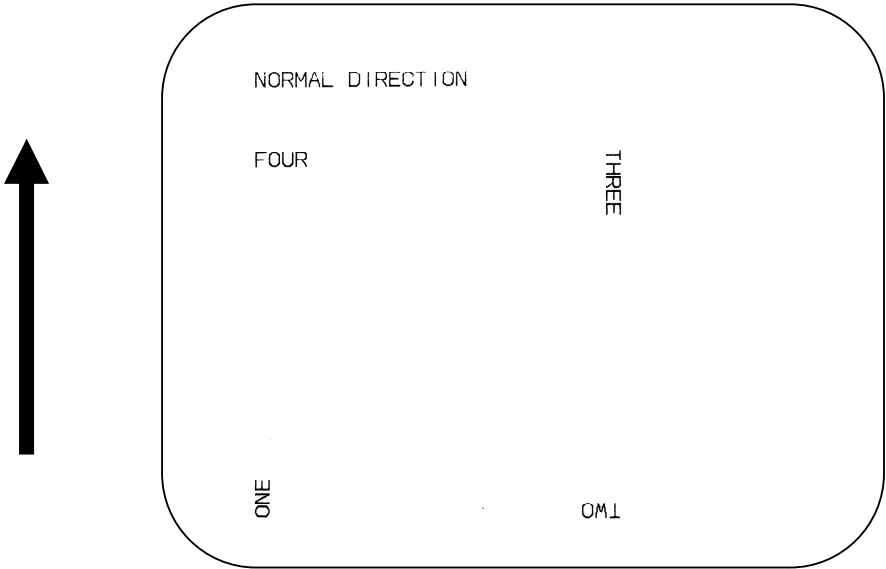
Default: <ESC>N

Command Function The <ESC>R command rotates the printing data of all subsequent images in a print job by 90° counterclockwise each time it is used. It also moves the base reference point to a different corner of the print area.

The <ESC>N command returns to the original base reference point and returns printing to the normal orientation.

Input to Printer <ESC>A<ESC>N<ESC>A106090609
 <ESC>L0101<ESC>H100<ESC>V10<ESC>MNORMAL DIRECTION
 <ESC>R<ESC>H100<ESC>V100<ESC>MONE
 <ESC>R<ESC>H100<ESC>V100<ESC>MTWO
 <ESC>R<ESC>H100<ESC>V100<ESC>MTHREE
 <ESC>R<ESC>H100<ESC>V100<ESC>MFOUR<ESC>Q1<ESC>Z

Printer Output



- Special Notes**
1. This command is provided for compatibility with other SATO printers. It is not recommended for new label designs and the <ESC>% rotate command should be used.
 2. Do not combine this command and the <ESC>% rotate command (see page 73) in the same data stream.
 3. A custom graphic is not affected by this command. Therefore, always design and locate your graphic image to print in the appropriate orientation.
 4. See Rotated Fields, page 8, for more information.
 5. The specified values are valid until another Rotate (<ESC>R) command is received.
 6. Receipt of a Stop Print (<ESC>Z) command will reset the setting to the default value.

Sequential Numbering

Command Structure <ESC>Faaaabcccc,dd,ee

- aaaa = Number of times to repeat the same data (0001 ~ 9999).
- b = Plus or minus symbol (+ for increments, – for decrements).
- cccc = Value of step for sequence (0001 ~ 9999).
- dd = Number of digits for sequential numbering (01 ~ 99). The first incrementing character position starts after the positions exempted from sequential numbering as specified in ee. If these digits are left out, the default is 8.
- ee = Number of digits free from sequential numbering (0 ~ 99) starting with the right most position. If these digits are left out the default is 0.

Example: <ESC>F001-001,4,3

Decrementing

004321321

Free from Decrementing

In this example, the right most (least significant) three digits would not decrement and the next four would decrement.

Placement: Preceding that start value to be incremented or decremented.

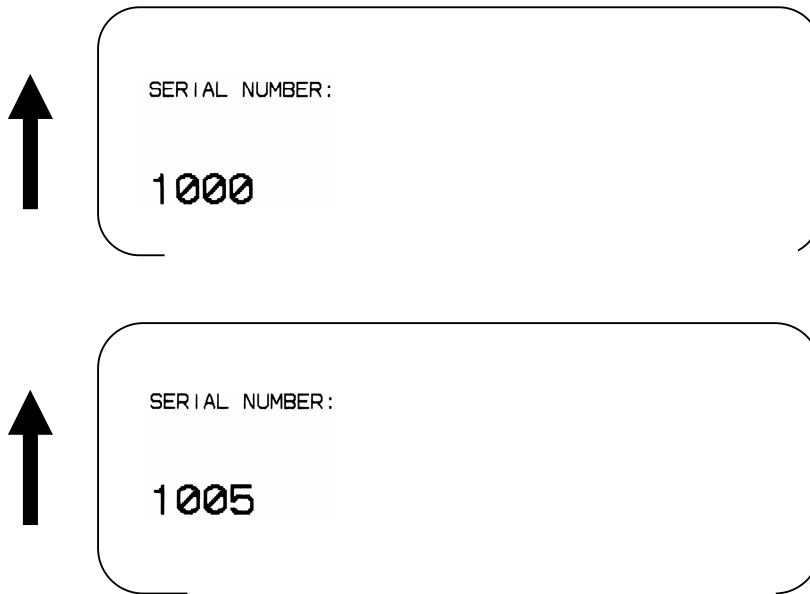
Default: None.

Command Function To allow the ability to print sequential fields (text, bar codes) where all incrementing is done within the printer. Up to eight different sequential fields can be specified per label. Sequencing is effective for up to 99-digit numeric data each field.

Input to Printer

```
<ESC>A
<ESC>H100<ESC>V100<ESC>MSERIAL NUMBER:
<ESC>H100<ESC>V200<ESC>F001+005
<ESC>L0202<ESC>M1000
<ESC>Q2<ESC>Z
```

Printer Output



- Special Notes**
1. The value specified for Print Quantity (see page 66) should be equal to the number of different sequential number desired multiplied by the number of repeats specified.

Example:

To print 2 sets each of the numbers 1001 ~ 1025 on separate labels, we need 50 total labels. The commands should be as follows:

```
<ESC>A  
<ESC>H100<ESC>V100<ESC>F002+001<ESC>XM1001  
<ESC>Q50<ESC>Z
```

2. It is necessary to specify the print position for each sequential field on a label.
3. Up to eight different sequential fields can be specified per label.
4. This command ignores alpha characters in the sequential number field.
5. This command can not be used with the following commands:
Copy Image,
Reverse Image,
Line Feed.

Start/Stop Label

Command Structure Start Command: <ESC>A
 Stop Command: <ESC>Z

Example: See above

Placement: <ESC>A must precede data.
 <ESC>Z must follow data.

Default: None.

Command Function For all print jobs, the Start command must precede the data, and the Stop command must follow. The print job will not run properly if these are not in place.

Input to Printer <ESC>A
 <ESC>H1<ESC>V100<ESC>WB1SATO
 <ESC>H130<ESC>V200<ESC>B103150*SATO*
 <ESC>H170<ESC>V360<ESC>L0202<ESC>S*SATO*
 <ESC>Q1<ESC>Z

Printer Output There is no output for these commands they are not accompanied by other label printing commands. However, these commands must precede and follow each print job sent to the printer.

Expanded Memory Option Commands

These commands require the Expanded Memory Option.

There are two types of Expanded Memory cards, 2MB and 4MB respectively.

Expanded Memory Function Graphics, Custom Store

Command Structure <ESC>GIabbbccddd{data}

- a = Specifies character format of the data.
 - H Hex data
 - B Binary data
- bbb = Number of horizontal 8x8 blocks (001 to 104).
- ccc = Number of vertical 8x8 blocks (001 to 178).
- ddd = Graphics storage number (001 to 999).
- data = Hex or binary data to describe the graphic image

Example: See Appendix C for detailed information on creating Hex and Binary graphic files.

Placement: Immediately following the <ESC>CC Memory Area Select command.

Default: None.

Command Function To provide similar functionality to the <ESC>G Custom Graphic command (see page 53), but allows for the graphic image to be stored in Expanded Memory. Use the Store command to send the graphic data to the printer, which is held in the optional Expanded Memory, even if printer power is lost.

Input to Printer <ESC>A
<ESC>CC1<ESC>GIH002002001
0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C
007C0
<ESC>Z

Note: See Appendix C for detailed explanation on how to format a graphics data stream.

Printer Output There is no printer output as a result of this command. See <ESC>GR Recall Custom Graphics command.

- Special Notes**
1. You must have the optional Expanded Memory to use this command. Call your SATO representative for details.
 2. The maximum storage capacity is 999 graphics, up to the capacity of the memory expansion.

3. Each graphic to be stored must be sent in its own data stream.

Example of correct data stream:

```
<ESC>A
<ESC>GIHaaabbb001(DATA)
<ESC>Z
<ESC>A
<ESC>GIHaaabbb002(DATA)
<ESC>Z
```

Example of incorrect data stream:

```
<ESC>A
<ESC>GIHaaabbb001(DATA)
<ESC>GIHaaabbb002(DATA)
<ESC>Z
```

4. Do not use ASCII <CR> or <LF> characters (carriage return or line feed) as line delimiters within the graphic data or the actual image will not be printed as specified.
5. The graphics storage number (ddd) must be specified with this command.

Expanded Memory Function Graphics, Custom Recall

Command Structure <ESC>GRaaa

aaa = Graphics storage number (1 ~ 999).

Example: <ESC>GR111

Placement: The Recall command is sent in a secondary data stream to print the graphic, and follows any necessary position or size commands.

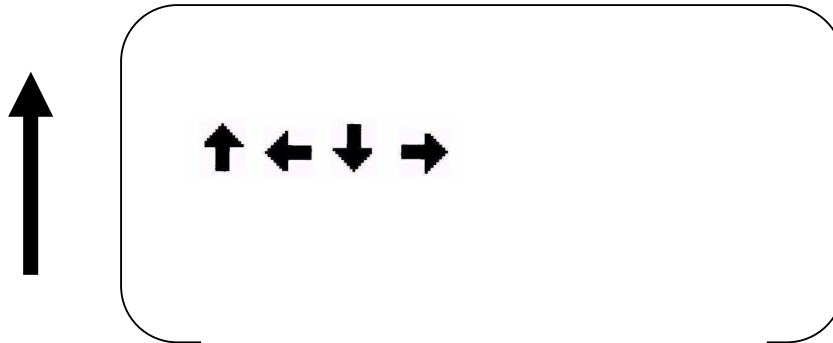
Default: None.

Command Function Use the Recall command any time you want to print a graphic image on a label along with other printed data.

Input to Printer

```
<ESC>A
<ESC>CC1
<ESC>H80<ESC>V100<ESC>L0505<ESC>GR001
<ESC>%1<ESC>H250<ESC>V180<ESC>L0505<ESC>GR001
<ESC>%2<ESC>H500<ESC>V180<ESC>L0505<ESC>GR001
<ESC>%3<ESC>H700<ESC>V100<ESC>L0505<ESC>GR001
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes
1. The graphic image to be stored cannot be rotated before it is stored. It can be rotated when it is recalled.
 2. Graphic image cannot be stored as part of a label format.
 3. See the <ESC>GI Custom Graphic Store command.

Expanded Memory Function Graphics, PCX Store

Command Structure <ESC>PIaaa,bbbb,{data}

aaa = Storage area number.
bbbb = Size of PCX file in bytes.
{data} = Data.

Example: <ESC>PI001,32000,{data}

Placement: This command must be placed within its own data stream.

Default: None.

Command Function To store for later printing a PCX graphic file in Expanded Memory.

Input to Printer BASIC Program to Download a PCX file to Expanded Memory (first 2MB or 4MB installed).

```
OPEN "WIZARD\GRAPHICS\LION.PCX" FOR INPUT AS #2
DA# = INPUT$(3800,#2)
C$=CHR$(27)
WIDTH "LPT1:",255
LPRINT C$;"A";C$;"CC1";
LPRINT C$;"PI011,03800,";DA$
LPRINT C$;"Z";
CLOSE #2
```

Printer Output There is no printer output as a result of this command. See <ESC>PY PCX Graphics Recall command.

- Special Notes**
1. This command requires Expanded Memory option. Call your SATO representative for details.
 2. Graphics cannot be stored as part of a format.
 3. Only black and white PCX files can be stored.
 4. The file size specified by this command is the DOS file size in bytes.

Expanded Memory Function Graphics, PCX Recall

Command Structure <ESC>PYaaa

aaa = Storage area number (1 ~ 999).

Example: <ESC>PY001

Placement: This command must be placed within its own data stream specifying the placement of the graphic.

Default: None.

Command Function To recall for printing a graphic file previously stored in a PCX format in the memory card.

Input to Printer

```
<ESC>A  
<ESC>CC1  
<ESC>H1<ESC>V100<ESC>PY011  
<ESC>%1<ESC>H176<ESC>V330<ESC>PY011  
<ESC>%2<ESC>H585<ESC>V330<ESC>PY011  
<ESC>%3<ESC>H760<ESC>V100<ESC>PY011  
<ESC>Q1<ESC>Z
```

Printer Output



- Special Notes
1. This command requires Expanded Memory option. See your SATO representative for details.
 2. See the <ESC>PI Store PCX Graphics command.

Expanded Memory Function Initialize

Command Structure <ESC>BJFaaaaaaa

aaaaaaa = Eight character alphanumeric user ID.

Example: <ESC>BJFsato

Placement: Immediately following the <ESC>CC Memory Area Select command.

Default: None.

Command Function This clears all of the data from the specified Memory Area and prepares the area to accept data.

Input to Printer <ESC>A
<ESC>CC1
<ESC>BJFsato
<ESC>Z

Printer Output There is no printer output as a result of this command.

- Special Notes**
1. You must have the optional Expanded Memory to use this command. Call your local SATO representative for information.
 2. All Expanded Memory must be initialized before they can be used for the first time.
 3. Care should be exercised when using this command as it destroys any data previously written the specified section of memory. It will clear all data from the Expanded Memory and assign the new ID ("sato" in the above example).

Expanded Memory Function Area Select

Command Structure <ESC>CC1 or <ESC>CC2

Example: <ESC>CC1

Placement: Immediately following the <ESC>A Start Code.

Default: Onboard flash memory is selected (CC1).

Command Function Selects the Expanded Memory to be used for the following command.

Input to Printer
<ESC>A
<ESC>CC1
{commands}
<ESC>Z

Printer Output There is no printer output as a result of this command.

- Special Notes
1. This command requires the Expanded Memory option. Call your local SATO representative for more information.
 2. The CX400/CX410 provide only one slot for the Expanded Memory option.
 3. For the CX400/CX410 printers, CC1 stands for onboard 512K byte flash memory and CC2 for the Optional flash memory (2M/4M bytes).

Expanded Memory Function Status

Command Structure <ESC>BJS

Example: <ESC>BJS

Placement: After the <ESC>CC Memory Area Select command.

Default: None

Command Function Causes the printer to print the card status.

Input to Printer
<ESC>A
<ESC>CC2
<ESC>BJS
<ESC>Z

Printer Output MYCARD : 2097152 Bytes

PCX GRAPHIC (0) 1234

CUSTOM GRAPHIC (1) 5678

2090240 Bytes Free

Special Note This command requires the Expanded Memory option. Call your local SATO representative for more information.

Two-Dimensional Symbols

The following commands are used to create the two-dimensional symbol supported by the printers.

Two-Dimensional Bar Codes

Maxicode

Command Structure <ESC>BVa,b,c,ddddddddd,eee,fff,gggg...<ESC>

- a = Position of Maxicode symbol within the set, when used in a structured append format 1~8.
- b = Total number of Maxicode symbols in the set, when used in a structured format 1~8.
- c =
 - 2 For Mode 2 Structured Carrier Message.
For Domestic US UPS shipments.
 - 3 For Mode 3 Structured Carrier Message.
For International UPS shipments.
 - 4 Standard symbol.
 - 5 Not currently supported.
 - 7 Reader programming.
- dd...dd 9 digit numeric Postal Code.
- eee = 3 digit numeric Country Code.
- fff = 3 digit Service Class.
- gg..g = Data, terminated by <ESC>.

Example: <ESC>BV1,2,3,123456789,222,333,MESSAGE<ESC>

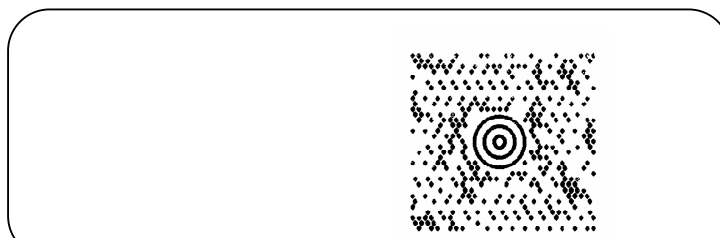
Placement: Immediately preceding data to be encoded.

Default: None

Command Function To print a Maxicode two-dimensional bar code image on a label. See Appendix B for specific information on using each individual bar code symbol.

Input to Printer <ESC>A
<ESC>V100<ESC>H100
<ESC>BV1,2,3,123456789,222,333,MESSAGE<ESC>Q1<ESC>Z

Printer Output



- Special Notes**
1. Please refer to UPS Publication “Guide to Bar Coding with UPS Online - Version 5” for the UPS secondary message data format requirements and the latest format requirements.
 2. This command implements Maxicode AIM I.S.S. (UPS version 3.1) symbol.
 3. The following modes are supported.

| MODE | POSTAL CODE | COUNTRY CODE | SERVICE CLASS | MESSAGE LENGTH |
|-------------|--------------------------------|------------------------------|------------------------------|-------------------------------|
| 2 | 9 digits max numeric only | 3 digits max numeric only | 3 digits max numeric only | 84 characters alphanumeric |
| 3 | 6 digits fixed alphanumeric | 3 digits max numeric only | 3 digits max numeric only | 84 characters alphanumeric |
| 4 | “000000” | “000” | “000” | 91 characters |
| 6 | fixed data | fixed data | fixed data | alphanumeric |

Two-Dimensional Bar Codes

PDF 417

Command Structure <ESC>BKaabbcddeefffn...n

- aa = Minimum module dimension (03~09 dots). Will not print if values of 01, 02 or greater than 10 are specified.
- bb = Minimum module pitch dimension (04 ~ 24 dots). Will not print if values of 01, 02, 03 or greater than 25 are specified.
- c = Security (error detection) level (0 ~ 8).
- dd = Code words per line (01 ~ 30). If 00 is specified for both dd and ee, the printer automatically optimizes the number of rows per symbol.
- ee = Rows per symbol (00 or 03 ~ 40). If 00 is specified for both dd and ee, then the printer automatically optimizes the number of row per symbol.
- ffff = Number of characters to be encoded (0001 ~ 27000).
- nn...n= Data to be printed.

Example: <ESC>BK0304400000021

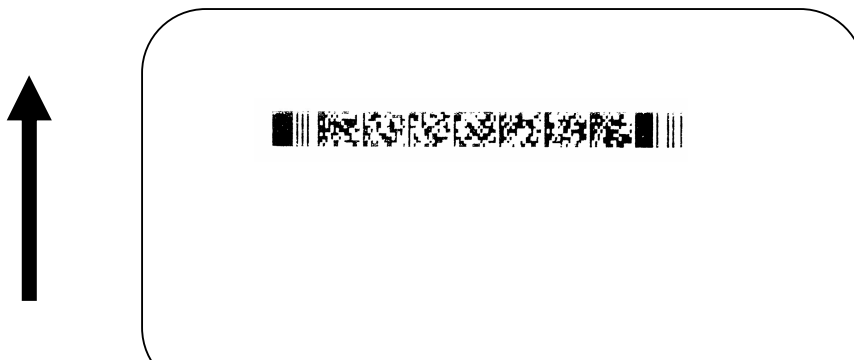
Placement: Immediately preceding data to be encoded.

Default: None

Command Function To print a PDF417 two-dimensional bar code image on a label.

Input to Printer
<ESC>A
<ESC>V100<ESC>H100
<ESC>BK0304400000021PDF417 PDF417 PDF417
<ESC>Q1<ESC>Z

Printer Output



- Special Notes
1. When the code words per line and the number of rows per symbol (“dd” and “ee”) are set to all zeroes, the printer will calculate the optimum configuration.
 2. The product of the values entered for “dd” and “ee” are not equal to or less than the value of “ffff” (i.e. “ffff” is greater than “dd” x “ee”), an error will occur and the symbol will not be printed. It is recommended that these values each be set to “000” and the printer be allowed to automatically calculate the optimum values.
 3. The values of “dd” and “ee” need to be made larger if the security level is increased.
 4. The maximum data length is 2700 characters, but may be less depending upon:
 - the minimum module dimension (“aa”)
 - the security level specified by “c”
 - the number of data characters
 5. The Reference Point of the PDF417 symbol is the upper-left corner.
 6. The <ESC>F Sequential Numbering command cannot be used with this command.
 7. The <ESC>E Line Feed command cannot be used with this command.
 8. The Macro and Truncated PDF417 symbols are not supported.
 9. The values 00H through 1FH can be specified as print data.
 10. This command can be stored in a format.
 11. The <ESC>R Rotate command can be used.
 12. The print height of the symbol will vary depending upon the data specified; numeric only, alpha only or alphanumeric.

CONFIGURATION COMMANDS

The following commands are used to set the operating parameters of the CX410 printers. The settings currently active in the printer can be determined by printing a Test Label, either by using the <ESC>CT Print Test Label command or by pressing the FEED button while turning on the printer. (See the CX410 User's Guide).

Backfeed Enable

Command Structure <ESC>CEa

| | | | |
|---|---|---|--------------------|
| a | = | 0 | Disables Backfeed. |
| | | 1 | Enables Backfeed. |

Example: <ESC>CE1

Placement: This command should be sent in a separate data stream.

Default: Last setting.

Command Function To select the top-of-label sensing method.

Input to Printer
<ESC>A
<ESC>CE1
<ESC>Z

Printer Output There is no printer output as a result of this command.

- Special Notes
1. When Backfeed is enabled, the printer will feed the last label of a print job forward to the dispense/cut position. Upon the receipt of the next print job, it will retract the label to the first print line position before printing.
 2. The setting can be saved to printer non-volatile memory.
 3. The setting becomes ineffective once cutter or dispenser is enabled.

Calibrate Sensor

Command Structure <ESC>CA

Example: <ESC>CA

Placement: This command should be sent after the sensor type has been selected with the <ESC>CI command. It should not be included with print job commands.

Default: There is no default for this command.

Command Function To adjust the label sensor for unique media and ribbon combinations.

Input to Printer
<ESC>A
<ESC>CI2
<ESC>CA
<ESC>Z

Printer Output
There is no printer output for of this command. It will cause the printer to feed about 6 inches while the characteristics of the label backing or eye-mark are measured.

- Special Notes
1. The sensor is calibrated for the currently selected sensor type (Eye-Mark or transmissive).
 2. The sensor must be recalibrated whenever the sensor type is changed or incorrect label detection occurs.
 3. When calibrating the sensor for the CX410 Thermal Transfer unit operating in the thermal transfer mode, the ribbon must be installed in the printer.

Custom Protocol Command Codes Download

Command Structure <ESC>LD,a,b,c,d,e,f,g,h,i

- a = Replacement character for STX in ASCII or hex format
- b = Replacement character for ETX in ASCII or hex format
- c = Replacement character for ESC in ASCII or hex format
- d = Replacement character for ENQ in ASCII or hex format
- e = Replacement character for CAN in ASCII or hex format
- f = Replacement character for NULL in ASCII or hex format
- g = Replacement character for OFFLINE in ASCII or hex format
- h, i = Reserved

Example: <ESC>LD,{,},%,#,&,*~,0,0

Placement: Immediately following the <ESC>A Start command and in an Independent data stream.

Default: Standard Protocol command Codes

Command Function Allows the user to define custom Protocol Command codes.

Input to Printer <ESC>A
<ESC>LD,{,},%,#,&,*~,0,0
<ESC>Z

Printer Output A Protocol Command code status label will be printed as a result of the successful download of a custom set of Protocol Command codes.



STX=7B ETX=7D ESC=25
enq=23 CAN=26 NULL=2A
OFFLINE=7E

Press the "FEED" to activate the User
Default or power the printer off to ignore them.

- Special Notes**
1. Commas must be used to separate the parameters. If a parameter is omitted between two commas, the default Non-Standard Protocol Command codes for that parameter will be used.
 2. This command must be sent as an independent data stream immediately following the <ESC>A Start code and immediately preceding the <ESC>Z Stop code. No other commands can be included in the data stream.
 3. If more or less than nine commas are included in the command, the entire command sequence will be ignored. The command must contain exactly nine commas.
 4. If two characters are specified for a parameter, it will be interpreted as a hex value. For example:

| Command Parameter | Resulting Command Code |
|-------------------|------------------------|
| 2B | + |
| + | + |

5. The current protocol command codes may be verified by printing a self-test label (<ESC>CT).

Label Tear-Off

Command Structure <ESC>CBabb

a = + to move the print line down from the top edge of the label
 - to move the print line toward the top of the label.
bb = Distance moved in millimeters (00 to 25)

Example: <ESC>CB+03

Placement: This command should be sent in a separate data stream.

Default: Last valid setting.

Command Function To adjust the location of the first print line on the label.

Input to Printer <ESC>A
 <ESC>C12<ESC>CB+03
 <ESC>Z

Printer Output There is no printer output for this command. The first print line on the next printed label will be adjusted after the receipt of this command.

- Special Notes
1. The effects of this command are cumulative, i.e. If an <ESC>CB+06 command is followed by an <ESC>CB-02, the resulting change in position is +4mm.
 2. The maximum range for the value stored in the printer is 98 mm. Any commands received that causes the value to exceed 00 or 98 will result in a setting of 00 or 98 respectively.
Stop code, No other commands can be included in the data stream.
 3. The value is stored in non-volatile memory and will be remained until it is modified by another valid <ESC>CBabb command, even if power is removed from the printer.
 4. The current setting is printed out on the "Pitch Offset" line on the test label.
 5. Separate offset settings are stored for gap and eye-mark sensing.

Print Test Label

Command Structure <ESC>CT

Example: <ESC>CT

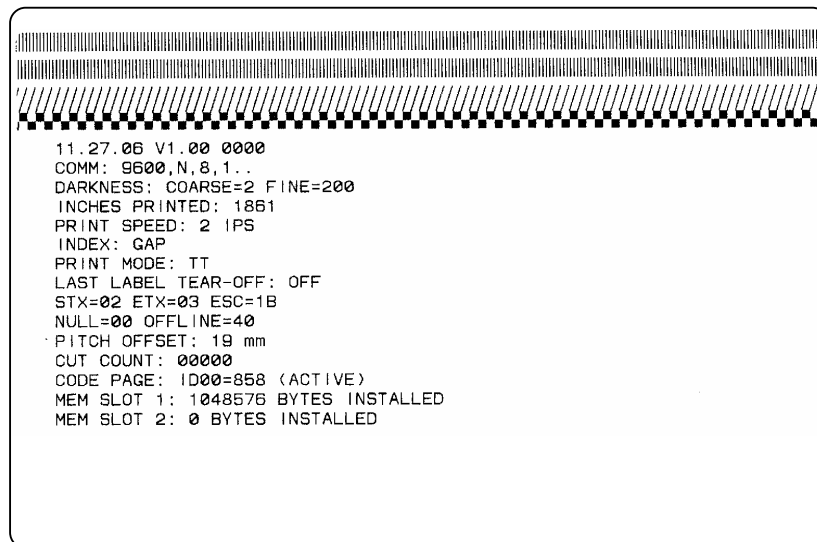
Placement: This command should be sent in a separate data stream.

Default: There is no default for this command.

Command Function To print a test label.

Input to Printer
<ESC>A
<ESC>CT
<ESC>Z

Printer Output



Special Note This mode is used for diagnostic troubleshooting and lists the current status of the printer configuration.

Print Darkness Fine Adjustment

Command Structure <ESC>CDaaa,bbb

aaa = Print Darkness Adjust (0 to 400)

bbb = Media Adjustment (0 to 6000).

Example: <ESC>CD250,3000

Placement: This command should be sent in a separate data stream.

Default: Print Darkness=200, Media=3300.

Command Function To make fine adjustments for best print quality for unique media and ribbon combinations.

Input to Printer
<ESC>A
<ESC>CD200,3300
<ESC>Z

Printer Output There is no printer output as a result of this command.

- Special Notes
1. This command covers the complete range of heat settings.
 2. In general the Media Adjust Setting is ignored by the CX410.
 3. The factory setting for these adjustments is set to provide the optimum results when using the SATO supplied media with the printer. It is recommended that any changes be made judiciously as they can have a significant impact on print quality and bar code readability.
 4. It is recommended that a bar code verifier be used when making adjustments with this command.

Set RS232 Parameters

Command Structure <ESC>CRaaaaa,b,c,d

aaaaa = Baud rate (9600, 19200 or 38400)

b = Parity (N for **N**one, O for **O**dd, E for **E**ven)

c = Number of data bits (7 or 8)

d = Number of stop bits (1 or 2)

Example: <ESC>CR9600,N,8,1

Placement: Must be sent in a separate data stream.

Default: 9600,N,8,1

Command Function To select the desired RS232 communication settings.

Input to Printer
<ESC>A
<ESC>CR9600,N,8,1
<ESC>Z

Printer Output There is no printer output as a result of this command.

- Special Notes
1. Any commands sent to the printer over the RS232 port within two seconds of receiving the command may be lost.
 2. The RS232 settings must match those of the host system. If the RS232 settings are unknown, printing a Self Test label will list the current settings.

Set Print Mode

Command Structure <ESC>CPa

a = 0 for Direct Thermal Printing (without ribbon)
 1 for Thermal Transfer Printing (with ribbon)

Example: <ESC>CP0

Placement: Must precede all other commands in the data stream.

Default: 1 for CX410 model.

Command Function To optimize the print head heat management algorithms.

Input to Printer <ESC>A
 <ESC>CP0
 <ESC>Z

Printer Output There is no printer output as a result of this command.

Special Notes The print mode setting is stored in nonvolatile memory and will not change until a new Set Print Mode command is received. The current print mode can be verified by printing a test label.

Set Sensor Type

Command Structure <ESC>CIa

- | | | |
|-----|---|--|
| a = | 0 | Disables Sensor. |
| | 1 | Reflective (Eye-Mark) Sensing. |
| | 2 | Transmissive (Label Gap or Notch) Sensing. |

Example: <ESC>CI0

Placement: This command should be sent in a separate data stream.

Default: <ESC>CI2 (Transmissive Sensing)

Command Function To select the top-of-label sensing method.

Input to Printer
<ESC>A
<ESC>CI2
<ESC>Z

Printer Output There is no printer output as a result of this command.

Special Note The reflective Eye-Mark, label gap or notch must be a minimum of 2 mm wide and extend 10 mm from the left (facing the printer) edge of the label backing.

APPENDIX A. COMMAND CODE QUICK REFERENCE

| INSTRUCTION | DESCRIPTION | PAGE |
|--------------------|--|---------|
| A | Start code. Begins all print jobs. | Page 79 |
| A1aaaabbbb | Media size. Specifies the label size. Used to automatically calculate the offset for center justified labels. aaaa = Vertical length. 0001 ~ 7500. bbbb = width. 0001 ~ 1280. | Page 62 |
| A3Habbbb Vcdddd | Base Reference Point. Establishes a new base reference point position in dots for the current label. Units of measurement are dots. a = - Shifts horizontal reference point in negative direction. + Shifts horizontal reference point in positive direction. bbbb = Amount of horizontal shift in dots. +/-1280. c = - Shifts vertical reference point in negative direction. + Shifts vertical reference point in positive direction. dddd = Amount of horizontal shift in dots. +/-7500. | Page 25 |
| AR AX | Print Length. AR- 7", AX-14". | Page 59 |
| Babbcccd | Bar Codes. Prints a 1:3 ratio bar code. a = 0 Codabar 1 Code 39 2 Interleaved 2 of 5 (I25) 3 UPC-A/EAN-13 4 EAN-8 5 Industrial 2 of 5 6 Matrix 2 of 5 A MSI C Code 93 E UPC-E F Bookland G Code 128 | Page 17 |

| | | | |
|-----------------------------|-----------------------------------|---|---------|
| | I | UCC 128 | |
| bb | = | Number of dots (01-12) for narrow bar and narrow space | |
| ccc | = | Bar height in dots (001-600) | |
| d | = | UCC 128 only. Not used for other bar code types. | |
| | 0 | No human readable text | |
| | 1 | Human readable text at top | |
| | 2 | Human readable text at bottom | |
| BDabbcccd | Bar Codes. | Prints a 2:5 ratio bar code, except for UPC, EAN, Code 93, Code 128, UCC128 symbols, which are fixed width bar codes. For values a, bb, ccc and d see instructions for Babbcccd. | Page 17 |
| BJFaaaaaaa | Expansion Memory Function. | Initializes the expansion memory in order to make use it. aaaaaaa = Eight character alphanumeric user ID. | Page 86 |
| BJTaa,bb,cc,dd,00,ffff,gg.g | Soft Font Selection. | Select a soft font with the specified ID. aa = Soft Font ID, 0 ~ 99. bb = Horizontal expansion, 1~12. cc = Vertical expansion, 1~12. dd = Character pitch, 1~99. ffff = Number of characters to print. gg..g = Data to print. | Page 46 |
| BJS | Expansion Memory Function. | Prints the status of expansion memory. | Page 88 |
| BKaabbcddeeffffnn...n | PDF417. | Prints PDF417 2-D symbols. aa = Minimum module dimension (03~09 dots). Will not print if values of 01, 02 or greater than 10 are specified. bb = Minimum module pitch dimension (04 ~ 24 dots). Will not print if values of 01, 02, 03 or greater than 25 are specified. c = Security (error detection) level (0 ~ 8). dd = Code words per line (01 ~ 30). If 00 is specified for both dd and ee, the printer automatically optimizes the number of rows per symbol. ee = Rows per symbol (00 or 03 ~ 40). If 00 is specified for both dd and ee, then the printer automatically optimizes the number of row per symbol. | Page 92 |

ffff = Number of characters to be encoded (0001 ~ 27000).
 nn...n= Data to be printed.

BPn...n **Postnet.** Prints Postnet bar codes. Page 63

n...n = 5 digits (Postnet-32 format)
 6 digits (Postnet-37 format)
 9 digits (Postnet-52 format)
 11 digits (Postnet-62 format, Delivery Point format).

BTabbccddee **Bar codes.** Variable ratio. Provides the ability to print a bar code Page 23
 with a ratio other than those specified through the standard bar code
 commands (B, BD and D).

a = Bar Code Symbol

 0 Codabar
 1 Code 39
 2 Interleaved 2 of 5
 5 Industrial 2 of 5
 6 Matrix 2 of 5

bb = Narrow space in dots (01-99)
 cc = Wide space in dots (01-99)
 dd = Narrow bar in dots (01-99)
 ee = Wide bar in dot (01-99)

BVa,b,c, dddddddd, **Maxicode.** Prints 2-D Maxicode symbols per AIM I.S.S. specification. Page 90
 eee, fff,gggg... a = Position of Maxicode symbol within the set, when used in a
 structured append format 1~8.

 b = Total number of Maxicode symbols in the set, when used in a
 structured format 1~8.

 c = 2 For Mode 2 Structured Carrier Message.
 For Domestic US UPS shipments.
 3 For Mode 3 Structured Carrier Message.
 For International UPS shipments.
 4 Standard symbol.
 5 Not currently supported.
 8 Reader programming.

 dd...dd 9 digit numeric Postal Code.

 eee = 3 digit numeric Country Code.

 fff = 3 digit Service Class.

gg..g = Data, terminated by <ESC>.

| | | |
|-----------|---|----------|
| BWaabbb | Bar Code Expansion. Works together with BT command to set the expansion factor and bar code height. aa = Expansion factor by which the width of all bars and spaces will be increased (01-12) bbb = Bar height by dot (004-600 dots) | Page 22 |
| C | Repeat Label. Prints a duplicate of the last label printed. | Page 68 |
| CA | Calibration. Calibrates the media so that the print can recognize the characteristics of the media used. | Page 96 |
| CBabb | Label Tear-Off. a = + to move the print line down from the top edge of the label - to move the print line toward the top of the label. bb = Distance moved in millimeters (00 to 25) | Page 99 |
| CCa | Expansion Memory Function. Defines the target expansion memory area to use later. a = 1 or 2 for expansion memory area. | Page 87 |
| CDaaa,bbb | Print Darkness. Specifies a new print darkness setting. aaa = Print Darkness Adjust (0 to 400) bbb = Media Adjustment (0 to 6000). | Page 101 |
| CEa | Backfeed Control. a = 0 Disables Backfeed. 1 Enables Backfeed. | Page 95 |
| CIa | Media Sensor Selection. Selects the sensor type for media. a = 0 Disables Sensor. 1 Reflective (Eye-Mark) Sensing. 2 Transmissive (Label Gap or Notch) Sensing. | Page 104 |
| CKa | Cutter Control. Controls the cut operation. a = Cutter control 0 Disables cutter. | Page 40 |

| | | | |
|------------------|-------------------------------|--|----------|
| | 1 | Enables cutter. | |
| CLa | Peeler Control. | Controls the Peeler operation. | Page 41 |
| | a | = Peeler control | |
| | 0 | Disables Peeler. | |
| | 1 | Enables Peeler. | |
| CPa | Print Type. | Sets the Print Type for the current job. | Page 103 |
| | a | = 0 for Direct Thermal Printing (without ribbon) | |
| | | 1 for Thermal Transfer Printing (with ribbon) | |
| CRaaaaa,b,c,d | RS232 Setting. | Sets the related parameters for the RS232 communication. | Page 102 |
| | aaaaa | = Baud rate (9600, 19200 or 38400) | |
| | b | = Parity (N for None, O for Odd, E for Even) | |
| | c | = Number of data bits (7 or 8) | |
| | d | = Number of stop bits (1 or 2) | |
| CSa | Print Speed Selection. | Specifies a unique print speed in in./sec. through software for a particular label. | Page 67 |
| | a | = 1 ~ 3. | |
| CT | Self Test. | Prints a test label. | Page 100 |
| Dabbcccd | Bar Codes. | Prints 1:2 ration bar code. For UPC and EAN bar codes, this will add descender bars. For values a, bb, ccc and d see instruction for Babbcccd. | Page 17 |
| Eaaa | Line Feed. | Provides the ability to print multiple lines of the same character size without specifying a new print position for each line. | Page 60 |
| | aaa | = Number of dots (1~999) between the bottom of the characters on one line to the top of characters on the next line. | |
| EX0 | Print Length. | 25". | Page 59 |
| Faaaabcccc,dd,ee | Sequential Numbering. | Allows the printing of sequencing fields (text, bar codes) where all incrementing is done within the printer. | Page 77 |

aaaa = Number of times to repeat the same data (0001 ~ 9999).
 b = Plus or minus symbol (+ for increments, – for decrements).
 cccc = Value of step for sequence (0001 ~ 9999).
 dd = Number of digits for sequential numbering (01 ~ 99). The first incrementing character position starts after the positions exempted from sequential numbering as specified in ee. If these digits are left out, the default is 8.
 ee = Number of digits free from sequential numbering (0 ~ 99) starting with the right most position. If these digits are left out the default is 0.

FWaaHbbbb **Horizontal Line.** Prints a horizontal line. Units of measurement are dots. Page 57

aa = Width of horizontal line, 1 ~ 99.
 bbbb = Length of horizontal line, 1 ~ 1280.

FWaabbVcccHdddd **Box.** Prints a box. For values aa, bbbb, cc and dddd, see instructions for horizontal and vertical lines. Units of measurement are dots. Page 57

aa = Width of horizontal side, 01 ~ 99.
 bb = Width of vertical side, 01 ~ 99.
 cccc = Length of vertical side, 1 ~ 2136.
 dddd = Length of horizontal side, 1 ~ 1280.

FWccVdddd **Vertical Line.** Prints a vertical line. Units of measurement are dots. Page 57

cc = Width of vertical line, 1 ~ 99.
 dddd = Length of vertical line, 1 ~ 4800.

Gabbbccc(data) **Custom Graphics.** Allows the creation and printing of graphic image using a dot-addressable matrix. Page 53

a = Specifies format of data stream to follow
 B binary format.
 H Hexadecimal format.
 bbb = Number of horizontal 8 x 8 blocks
 001 to 104.
 ccc = Number of vertical 8 x 8 blocks
 001 to 356.
 (data)= Data to describe the graphic image.

| | | |
|------------------|--|---------|
| Glabbccddd(data) | Expansion Memory Function. Stores custom designed character to expansion memory. a = Specifies character format of the data. H Hex data B Binary data bbb = Number of horizontal 8x8 blocks (001 to 104). ccc = Number of vertical 8x8 blocks (001 to 178). ddd = Graphics storage number (001 to 999). data = Hex or binary data to describe the graphic image | Page 81 |
| GPaaaa,(data) | PCX Graphics. Prints a graphic with standard PCX format. aaaa = Number of bytes to be downloaded. | Page 55 |
| GRaaa | Expansion Memory Function. Recalls custom designed character from expansion memory. aaa = Graphics storage number (1 ~ 999). | Page 83 |
| Haaaa | Horizontal Position. Specifies a field's horizontal location across the width of the label from the current base reference point. The units of measurement are dots. aaaa = Number of dots horizontally from the base reference point 1 to 1280 | Page 64 |
| J | Journal Print. Provides the ability to print text line by line. Fixed spacing between lines and characters. | Page 56 |
| Kab90cc | Recall Custom Designed Characters. Recalls for printing a custom character stored by the Tabcc(data) command. a = 1 16x16 matrix 2 24x24 matrix b = Specifies the character encoding method for the data stream H hexadecimal characters B Binary characters If B is specified than both 90 and cc codes are represented by one byte code separately. cc = Code to store/recall the character. Valid code ranges are 21H to 52H in Hex or “!” to “R” in Binary. | Page 27 |

| | | | |
|---------------------|--|--|---------|
| | (data)= | Data to describe the character image either in Hex or Binary format. | |
| Laabb | Character Expansion. | Expands character in both directions. | Page 29 |
| | aa | = Multiple to expand horizontally (01~12). | |
| | bb | = Multiple to expand vertically (01~12). | |
| LDa,b,c,d,e,f,g,h,i | Protocol Code Select. | Selects the hexadecimal protocol codes to be used. | Page 97 |
| M | Font Type. | Specifies the 13Wx20H dot matrix font (including descenders). | Page 42 |
| N | Normal Direction. | Returns to the original base reference point and returns printing to the normal orientation. | Page 75 |
| OA | Font Type. | Specifies the OCR-A font with dot matrix. OA Font Matrix: 22Wx33H. | Page 42 |
| OB | Font Type. | Specifies the OCR-B font with dot matrix. OB Font Matrix: 30Wx36H. | Page 42 |
| Paa | Character Pitch. | Designates the number of dots between characters. | Page 32 |
| | aa | = Number of dots between characters (01~99). | |
| PIaaa,bbbb,{data} | Expansion Memory Function. | Stores PCX graphic to expansion memory. | Page 84 |
| | aaa | = Storage area number. | |
| | bbbb | = Size of PCX file in bytes. | |
| | {data} | = Data. | |
| PR | Fixed Character Spacing. | Returns the printer to fixed character spacing mode. | Page 31 |
| PS | Proportional character Spacing. | Places the printer in the proportional character spacing mode. Will not work with U font. | Page 35 |
| PYaaa | Expansion Memory Function. | Recalls PCX graphic from expansion | Page 85 |

| | | |
|---------------|--|---------|
| | memory. | |
| | aaa = Storage area number (1 ~ 999). | |
| Qaaaaaa | Print Quantity. Specifies the total number of labels to print. | Page 66 |
| | aaaaaa = Total number of labels to print (1 to 65535). | |
| R | Rotate Orientation. Rotates the printing data of all subsequent images in a print job by 90° counterclockwise each time it is used. It also moves the base reference point to a different corner of the print area. | Page 75 |
| RFaabbbb,gg,g | Soft Font Selection. Select a soft font with the specified ID. | Page 47 |
| | aa = Soft Font ID, 0 ~ 99. | |
| | bbbb = Number of characters to print. | |
| | gg..g = Data to print. | |
| S | Font Type. Specifies the 8Wx15H dot matrix font (including descenders). | Page 42 |
| Tabcc(data) | Store Custom Designed Characters. To create and store custom characters or images in the printer's volatile memory. See Kab90cc to recall the character for printing. | Page 27 |
| | a = 1 16x16 matrix 2 24x24 matrix | |
| | b = Specifies the character encoding method for the data stream H hexadecimal characters B Binary characters If B is specified than both 90 and cc codes are represented by one byte code separately. | |
| | cc = Code to store/recall the character. Valid code ranges are 21H to 52H in Hex or “!” to “R” in Binary. | |
| | (data)= Data to describe the character image either in Hex or Binary format. | |
| U | Font Type. Specifies the 5Wx9H dot matrix font (including descenders). | Page 42 |
| Vbbbb | Vertical Position. Specifies a field's vertical location down the length of the label from the current base reference point. The units of | Page 64 |

measurement are dots.

bbbb = Number of dots vertically from the base reference point
1 to 7500.

| | | |
|-----|---|---------|
| WBa | Font Type. Specifies the 18Wx30H dot matrix font (including descenders). | Page 44 |
|-----|---|---------|

| | | |
|------------------------|--|---------|
| WDHaaaaVbbbbXccccYdddd | | Page 38 |
|------------------------|--|---------|

Copy Image Area. To copy an image to another location of the label.

aaaa = Horizontal position of the top left corner of the area to be copied
0001 to 832.

bbbb = Vertical position of the top left corner of the area to be copied
0001 to 1424.

cccc = Horizontal length of the image area to be copied
0001 to 832.

dddd = Vertical length of the image area to be copied
0001 to 1424.

| | | |
|-----|---|---------|
| WLa | Font Type. Specifies the 28Wx52H dot matrix font (including descenders). | Page 44 |
|-----|---|---------|

| | | |
|-----|---|---------|
| XBa | Font Type. Specifies the 48Wx48H dot matrix font (including descenders). | Page 44 |
|-----|---|---------|

| | | |
|-----|---|---------|
| XLa | Font Type. Specifies the 48Wx48H dot matrix font (including descenders). | Page 44 |
|-----|---|---------|

| | | |
|----|---|---------|
| XM | Font Type. Specifies the 24Wx24H dot matrix font (including descenders). | Page 42 |
|----|---|---------|

| | | |
|----|---|---------|
| XS | Font Type. Specifies the 17Wx17H dot matrix font (including descenders). | Page 42 |
|----|---|---------|

| | | |
|----|---|---------|
| XU | Font Type. Specifies the 5Wx9H dot matrix font (including descenders). | Page 42 |
|----|---|---------|

| | | |
|---|--|---------|
| Z | Stop Code. Ends all print jobs. | Page 79 |
|---|--|---------|

| | | |
|------------|--|---------|
| %a | <p>Rotation. Fixed Base Reference Point. Rotates printing in 90° increments without changing the base reference point.</p> <p>a = 0 Sets print to normal direction.</p> <p> 1 Sets print to 90° CCW.</p> <p> 2 Sets print to 180° CCW (upside down).</p> <p> 3 Sets print to 270° CCW.</p> | Page 73 |
| #Ea | Print Darkness. a = 1~5. | Page 58 |
| \$a,b,c,d | <p>Vector Font. Specifies printing of the unique SATO vector font.</p> <p>a = A Helvetica Bold (proportional spacing).</p> <p> B Helvetica Bold (fixed spacing).</p> <p>b = Font width (24~999 dots)</p> <p>c = Font height (24~999 dots)</p> <p>d = Font variation (0~9) as follows:</p> <p> 0 Standard</p> <p> 1 Standard open (outlined)</p> <p> 2 Gray (mesh) pattern 1</p> <p> 3 Gray (mesh) pattern 2</p> <p> 4 Gray (mesh) pattern 3</p> <p> 5 Standard open, shadow 1</p> <p> 6 Standard open, shadow 2</p> <p> 7 Standard mirror image</p> <p> 8 Italic</p> <p> 9 Italic open, shadow</p> | Page 48 |
| \$=(data) | Data for Vector Font. | Page 48 |
| (aaaa,bbbb | <p>Reverse Image. Reverse image from black to white and vice versa. Units of measurement are dots.</p> <p>aaaa = Horizontal length in dots of reverse image area</p> <p> 0 to 1280.</p> <p>bbbb = Vertical height in dots of reverse image area</p> <p> 0 to 1424.</p> | Page 71 |
| & | Store Form Overlay. Stores a specified label image in the printer's volatile form overlay memory. | Page 52 |

| | | |
|---------|---|---------|
| / | Recall Form Overlay. Recalls the label image from the printer's form overlay memory for printing. | Page 51 |
| 0 | Replace Data (Partial Edit). Provides the ability to replace a specified area of the previous label with new data. | Page 69 |
| *a | Clear Print Job(s) and Memory. Clears individual memory and buffer. a = Specifies the internal memory section to be cleared. T To clear the custom character memory. & To clear the form overlay memory. X To clear all internal memory. | Page 36 |
| *a[,id] | Clear Stand-alone forms or Soft Fonts. a = Specifies the stand-alone forms or soft fonts. E To clear the stand-alone forms. O To clear the soft fonts. id = Specifies the ID of a form or soft font. | Page 37 |

APPENDIX B. BAR CODE SPECIFICATION

BAR CODE SYMBOLOGIES

This section contains detailed information on the printing of bar codes on the CX410 printers. Information on printing the following bar code symbologies is provided:

- Codabar
- Code 39
- Interleaved 2 of 5
- UPC-A/EAN-13
- EAN-8
- Industrial 2 of 5
- Matrix 2 of 5
- Code 128
- MSI
- Code 93
- UPC-E
- UPC Supplements (Bookland)
- UCC-128
- Postnet

Codabar

Command Structure 1:3 ratio <ESC>B0bbcccd (data) d
 2:5 ratio <ESC>BD0bbcccd (data) d
 1:2 ratio <ESC>D0bbcccd (data) d

bb = Width of narrow element in dots (01~12)
 ccc = Bar height in dots (001~999)
 d = Required Start and Stop character (A,B,C, or D)
 (data)= Bar code data (alphanumeric)

Character Set 0-9, -, \$, :, /, +
 A, B, C, D (Start/Stop characters)

Density Table

| Narrow/Wide Ratio | Value of “bb” | “X” Dimension (mils) | Density (char/inch) |
|----------------------|---------------|-------------------------|------------------------|
| 1:3 | 01 | 5.0 | 16.9 |
| 1:3 | 02 | 10.0 | 8.5 |
| 2:5 | 01 | 10.0 | 9.2 |
| 1:2 | 02 | 5.0 | 10.2 |

Example <ESC>H400<ESC>V25<ESC>B002100A12345B
 <ESC>H440<ESC>V135<ESC>XS12345

Notes You must add the appropriate (A, B, C or D) Start and Stop characters to the
 data string. The printer does not automatically add them when printing.



Code 39

Command Structure 1:3 ratio <ESC>B1bbccc* (data) *
 2:5 ratio <ESC>BD1bbccc* (data) *
 1:2 ratio <ESC>D1bbccc* (data) *

bb = Width of narrow element in dots (01~12)
ccc = Bar height in dots (001~999)
* = Required Start and Stop character (asterisk)
(data)= Bar code data (alphanumeric)

Character Set 0-9, A-Z, Space, \$, %, +, -, ., /
 * (Start/Stop character)

Density Table

| Narrow/Wide Ratio | Value of “bb” | “X” Dimension (mils) | Density (char/inch) |
|----------------------|---------------|-------------------------|------------------------|
| 1:3 | 01 | 5.0 | 12.7 |
| 1:3 | 02 | 10.0 | 6.4 |
| 2:5 | 01 | 10.0 | 7.0 |
| 1:2 | 01 | 5.0 | 15.6 |
| 1:2 | 02 | 10.0 | 7.8 |

Example

<ESC>H100<ESC>V25<ESC>B103100*CODE 39*
<ESC>H230<ESC>V130<ESC>XS*CODE 39*

Notes

You must add the “*” Start/Stop characters to the data string. The printer does not automatically add them automatically.



Interleaved Two of Five

Command Structure 1:3 ratio <ESC>B2bbccc (data)
 2:5 ratio <ESC>BD2bbccc (data)
 1:2 ratio <ESC>D2bbccc (data)

bb = Width of narrow element in dots (01~12)
ccc = Bar height in dots (001~999)
(data)= Bar code data (numeric); must be an even number of digits or else
 the printer will add a leading zero; start and stop codes are
 provided by the printer.

Character Set 0-9 (numeric only)

Density Table

| Narrow/Wide Ratio | Value of "bb" | "X" Dimension (mils) | Density (char/inch) |
|----------------------|---------------|-------------------------|------------------------|
| 1:3 | 01 | 5.0 | 22.6 |
| 1:3 | 02 | 10.0 | 11.3 |
| 2:5 | 01 | 10.0 | 12.7 |
| 1:2 | 01 | 5.0 | 14.5 |
| 1:2 | 02 | 10.0 | 9.7 |

Example

<ESC>H100<ESC>V100<ESC>B20310045676567
<ESC>H140<ESC>V210<ESC>XM45676567

Notes

To add horizontal guard bars to the top and bottom of the bar code, use the Line
and Box commands.



UPC-A/EAN-13

Command Structure <ESC>B3bbccc (data)

<ESC>D3bbccc (data)

<ESC>BD3bbccc (data)

bb = Width of narrow element in dots (01~12)

ccc = Bar height in dots (001~999)

(data)= Bar code data (numeric); must be exactly 13 digits. For UPC-A, the first digit must be a zero and the last 11 digits are the actual UPC-A data followed by a check digit.

Character Set 0-9 (numeric only)

Density Table

| Value of “bb” | Narrow Bar Width (mils) | Magnification Factor |
|---------------|----------------------------|-------------------------|
| 02 | 10.0 | 75% |
| 03 | 15.0 | 112% |
| 04 | 20.0 | 150% |

Example

<ESC>H100<ESC>V100<ESC>BD30212001234567890



Notes

D3 provides guide bars that extend longer than the reset of the bar code. BD3

Provides guide bars and the human readable text below the symbol.

Calculating the Mod 10 Check Digit If you wish to encode the UPC-A data “01234567890”, follow these steps to find the correct check digit.

| | | | | | | | | | | | | |
|------|---|---|---|---|---|---|---|---|---|---|---|----|
| ODD | 0 | | 2 | | 4 | | 6 | | 8 | | 0 | |
| EVEN | | 1 | | 3 | | 5 | | 7 | | 9 | | CD |

1. First add all the numbers in the ODD positions.
i.e., $0+2+4+6+8+0 = 20$
2. Multiple the result of step 1 by 3.
i.e., $20 \times 3 = 60$
3. Add up all the numbers in the EVEN positions.
i.e., $1+3+5+7+9 = 25$
4. Add the result of step 2 to that of step 3.
i.e., $60 + 25 = 85$
5. Subtract the result of step 4 from the next highest increment of 10.
i.e., $90 - 85 = 5$
6. The correct Modulo 10 check digit for the 11 digit string "01234567890"
is 5.

EAN-8

Command Structure <ESC>B4bbccc (data)

<ESC>D4bbccc (data)

bb = Width of narrow element in dots (01~12)

ccc = Bar height in dots (001~999)

(data)= Bar code data (numeric); must be exactly 8 digits.

Character Set 0-9 (numeric only)

Density Table

| Value of “bb” | Narrow Bar Width (mils) | Magnification Factor |
|---------------|----------------------------|-------------------------|
| 02 | 10.0 | 75% |
| 03 | 15.0 | 112% |
| 04 | 20.0 | 150% |

Example

<ESC>H100<ESC>V100<ESC>BD4031001234567



Notes

1. D4 provides guide bars that extend longer than the rest of the bar code. and the human readable text below the symbol.
2. The check digit is automatically calculated for EAN-8.

Industrial Two of Five

Command Structure 1:3 ratio <ESC>B5bbccc (data)
 2:5 ratio <ESC>BD5bbccc (data)
 1:2 ratio <ESC>D5bbccc (data)

bb = Width of narrow element in dots (01~12)
ccc = Bar height in dots (001~999)
(data)= Bar code data (numeric); must be an even number of digits or else
 the printer will add a leading zero.

Character Set 0-9 (numeric only)

Example

<ESC>H100<ESC>V100<ESC>BD50310012345
<ESC>H200<ESC>V210<ESC>XM12345

Notes

To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box commands.



Matrix Two of Five

Command Structure 1:3 ratio <ESC>B6bbccc (data)
 2:5 ratio <ESC>BD6bbccc (data)
 1:2 ratio <ESC>D6bbccc (data)

bb = Width of narrow element in dots (01~12)
ccc = Bar height in dots (001~999)
(data)= Bar code data (numeric); must be an even number of digits or else
 the printer will add a leading zero.

Character Set 0-9 (numeric only)

Example

<ESC>H100<ESC>V100<ESC>BD60310012345
<ESC>H200<ESC>V210<ESC>XM12345

Notes

To add horizontal guard bars to the top and bottom of the bar code, use the Line and Box commands.



Code 128

Command Structure <ESC>BGbbccdd (data)

- bb = Width of narrow element in dots (01~12).
- ccc = Bar height in dots (001~999)
- dd = Start code to specify initial subset of bar code data.
 - >G Subset A Start code.
 - >H Subset B Start code.
 - >I Subset C Start code.
- (data)= Includes bar code data and subset shift codes; Shift codes are used to change the subset type within the bar code data. Shift codes:
 - >E Subset A Shift code.
 - >D Subset B Shift code.
 - >C Subset C Shift code.

Character Set All 128 codes.

Density Table

| Narrow/Wide Ratio | “X” Dimension (mils) | Density (char/inch) | |
|----------------------|-------------------------|---------------------|----------|
| | | Subsets A, B | Subset C |
| 1 | 5.0 | 18.2 | 36.5 |
| 1 | 10.0 | 9.1 | 18.3 |
| 3 | 15.0 | 13.8 | 12.2 |

Example The following will start in Subset A for the characters “AB”, shift to Subset B for “789”, then shift to Subset C for “123456”.

```
<ESC>H100<ESC>V100<ESC>BG03100>GAB>D789>C123456
<ESC>H220<ESC>V210<ESC>XSAB789123456
```



Character Table

The Code 128 table lists 105 data values for the three subsets: A, B and C. Each subset column displays either a single column of data or a double column of data.

- If the subset column displays a single column of data, this is the data to be entered to produce the result.
- If the subset column displays a double column of data, the first column contains the desired output, and the second column contains the actual characters to be entered.

For example, look at value 99 in the table:

If you are currently using Subset A or Subset B, you can change to Subset C by encoding “>C”.

| VALUE | SUBSET A | SUBSET B | SUBSET C |
|-------|-------------|-------------|-------------|
| 99 | Subset C >C | Subset C >C | 99 |
| 100 | Subset B >D | FNC4 >D | Subset B >D |
| 101 | FNC4 >E | Subset A >E | Subset A >E |
| 102 | FNC1 >F | FNC1 >F | FNC1 >F |

Note: When Subset C is chosen, you must specify an even number of data position because of the interleaved encodation method.

| VALUE | SUBSET A | SUBSET B | SUBSET C | VALUE | SUBSET A | SUBSET B | SUBSET C |
|-------|----------|----------|----------|-------|----------|----------|----------|
| 0 | SP | SP | 00 | 36 | D | D | 36 |
| 1 | ! | ! | 01 | 37 | E | E | 37 |
| 2 | “ | “ | 02 | 38 | F | F | 38 |
| 3 | # | # | 03 | 39 | G | G | 39 |
| 4 | \$ | \$ | 04 | 40 | H | H | 40 |
| 5 | % | % | 05 | 41 | I | I | 41 |
| 6 | & | & | 06 | 42 | J | J | 42 |
| 7 | ‘ | ‘ | 07 | 43 | K | K | 43 |
| 8 | (| (| 08 | 44 | L | L | 44 |
| 9 |) |) | 09 | 45 | M | M | 45 |
| 10 | * | * | 10 | 46 | N | N | 46 |
| 11 | + | + | 11 | 47 | O | O | 47 |
| 12 | , | , | 12 | 48 | P | P | 48 |
| 13 | - | - | 13 | 49 | Q | Q | 49 |
| 14 | . | . | 14 | 50 | R | R | 50 |
| 15 | / | / | 15 | 51 | S | S | 51 |
| 16 | 0 | 0 | 16 | 52 | T | T | 52 |
| 17 | 1 | 1 | 17 | 53 | U | U | 53 |
| 18 | 2 | 2 | 18 | 54 | V | V | 54 |
| 19 | 3 | 3 | 19 | 55 | W | W | 55 |
| 20 | 4 | 4 | 20 | 56 | X | X | 56 |
| 21 | 5 | 5 | 21 | 57 | Y | Y | 57 |
| 22 | 6 | 6 | 22 | 58 | Z | Z | 58 |
| 23 | 7 | 7 | 23 | 59 | [| [| 59 |
| 24 | 8 | 8 | 24 | 60 | \ | \ | 60 |
| 25 | 9 | 9 | 25 | 61 |] |] | 61 |
| 26 | : | : | 26 | 62 | ^ | ^ | 62 |
| 27 | ; | ; | 27 | 63 | _ | _ | 63 |
| 28 | < | < | 28 | 64 | NUL | ` | 64 |
| 29 | = | = | 29 | 65 | SOH | a | 65 |
| 30 | > | > | 30 | 66 | STX | b | 66 |
| 31 | ? | ? | 31 | 67 | ETX | c | 67 |
| 32 | @ | @ | 32 | 68 | EOT | d | 68 |
| 33 | A | A | 33 | 69 | ENQ | e | 69 |
| 34 | B | B | 34 | 70 | ACK | f | 70 |
| 35 | C | C | 35 | 71 | BEL | g | 71 |

| | | | | | | | |
|----|-----|---|----|-----|---------------------|----------|----------|
| 72 | BS | h | 72 | 89 | EM | y | 89 |
| 73 | HT | i | 73 | 90 | SUB | z | 90 |
| 74 | LF | j | 74 | 91 | ESC | { | 91 |
| 75 | VT | k | 75 | 92 | FS | | 92 |
| 76 | FF | l | 76 | 93 | GS | } | 93 |
| 77 | CR | m | 77 | 94 | RS | ~ | 94 |
| 78 | SO | n | 78 | 95 | US | DEL | 95 |
| 79 | SI | o | 79 | 96 | FNC3 | FNC3 | 96 |
| 80 | DLE | p | 80 | 97 | FNC2 | FNC2 | 97 |
| 81 | DC1 | q | 81 | 98 | SHIFT | SHIFT | 98 |
| 82 | DC2 | r | 82 | 99 | Subset C | Subset C | 99 |
| 83 | DC3 | s | 83 | 100 | Subset B | FNC4 | Subset B |
| 84 | DC4 | t | 84 | 101 | FNC4 | Subset A | Subset A |
| 85 | NAK | u | 85 | 102 | FNC1 | FNC1 | FNC1 |
| 86 | SYN | v | 86 | 103 | Subset A Start Code | | |
| 87 | ETB | w | 87 | 104 | Subset B Start Code | | |
| 88 | CAN | x | 88 | 105 | Subset C Start Code | | |

MSI

Command Structure 1:3 ratio <ESC>BAbbcc (data)^d
 2:5 ratio <ESC>BDAbbcc (data)^d
 1:2 ratio <ESC>DAbbcc (data)^d

bb = Width of narrow element in dots (01~12).
ccc = Bar height in dots (001~999)
(data)= Bar code data (numeric); maximum of 15 digits.
^d = Required check digit.

Character Set 0-9 (numeric only)

Example

<ESC>H100<ESC>V100<ESC>BA0310012345
<ESC>H180<ESC>V210<ESC>XS12345



Code 93

Command Structure 1:3 ratio <ESC>BCbbccdd (data)

bb = Width of narrow element in dots (01~12).
ccc = Bar height in dots (001~999)
dd = Length of data (number of digits, 00~99).
(data)= Bar code data (alphanumeric); length must match value of
parameter “dd”; check digit is supplied by the printer.

Character Set 0-9, A-Z, -, ., Space, \$, /, +, %

Density Table

| Narrow/Wide Ratio | Value of “bb” | “X” Dimension (mils) | Density (char/inch) |
|----------------------|---------------|-------------------------|------------------------|
| 1:3 | 01 | 5.0 | 22.5 |
| 1:3 | 02 | 10.0 | 11.3 |
| 1:3 | 03 | 15.0 | 7.5 |

Example

<ESC>H100<ESC>V100<ESC>BC03100081234ABCD
<ESC>H190<ESC>V210<ESC>XS1234ABCD



UPC-E

Command Structure <ESC>BEbbccc (data)

<ESC>DEbbccc (data)

bb = Width of narrow element in dots (01~12)

ccc = Bar height in dots (001~999)

(data)= Bar code data (numeric); must be exactly 6 digits.

Character Set 0-9 (numeric only)

Density Table

| Value of "bb" | Narrow Bar Width (mils) | Magnification Factor |
|---------------|----------------------------|-------------------------|
| 02 | 10.0 | 75% |
| 03 | 15.0 | 112% |
| 04 | 20.0 | 150% |

Example

<ESC>H100<ESC>V100<ESC>DE03100123456

<ESC>H75<ESC>V210<ESC>OB0

<ESC>H107<ESC>V210<ESC>OB123456



Notes

Command DE provides guide bars that extend longer than the rest of the bar code.

Bookland (UPC/EAN Supplement)

Command Structure <ESC>BFbbccc (data)

bb = Width of narrow element in dots (01~12)
ccc = Bar height in dots (001~999)
(data)= Bar code data (numeric); must be exactly 2 or 5 digits.

Character Set 0-9 (numeric only)

Density Table

| Value of "bb" | Narrow Bar Width (mils) | Magnification Factor |
|---------------|----------------------------|-------------------------|
| 02 | 10.0 | 75% |
| 03 | 15.0 | 112% |
| 04 | 20.0 | 150% |

Example

```
<ESC>H325<ESC>V125<ESC>D30315009827721123  
<ESC>H295<ESC>V200<ESC>OB0  
<ESC>H340<ESC>V278<ESC>OB98277  
<ESC>H480<ESC>V278<ESC>OB21123  
<ESC>H640<ESC>V160<ESC>BF0313021826  
<ESC>H655<ESC>V130<ESC>OB21826
```



UCC-128

Command Structure <ESC>Bibbccd (data)

- bb = Width of narrow element in dots (01~12)
- ccc = Bar height in dots (001~999)
- d = Placement of human readable text.
- 0 None
 - 1 Text at top of bar code
 - 2 Text at bottom of bar code
- (data)= 17 digits made up of the following:
- 1st digit = Container type
 - digits 2~8, Shipper identification
 - digits 9~17, Container sequential number
- Note: The Container Sequential number is not automatically sequenced by the printer.

Character Set See Code 128 Character Table.

Density Table See Code 128.

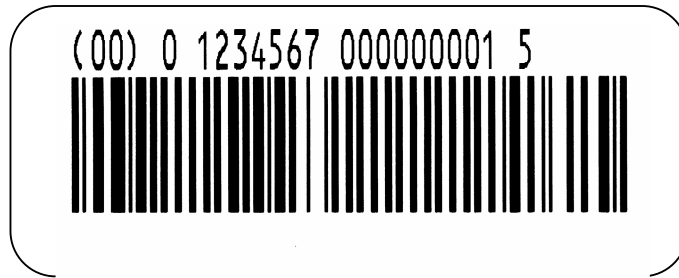
- Notes
1. The Start, Function, Stop and Extension codes will be created by the printer and added automatically.
 2. The internal Modulo 10 check character will be automatically created and added by the printer. The overall Code 128 symbol check character will be automatically created by the printer and checked.
 3. The automatically created human readable text will be generated according to the following rules:
 - The spacing between bar code and text is fixed at 10 dots (.0050 inches).
 - If the width of human readable text is wider than the bar code, it will start at the same position as the bar code and extend past the right of the bar code.
 - If the width of human readable text is less than the bar code, it will be centered on the bar code.
 - The automatically generated human readable text font is OCR-B.
 - If any part of the human readable text extends outside the printable area,

none of it will be printed. Care should be exercised when placing the bar code to allow for any automatically created human readable text.

Example

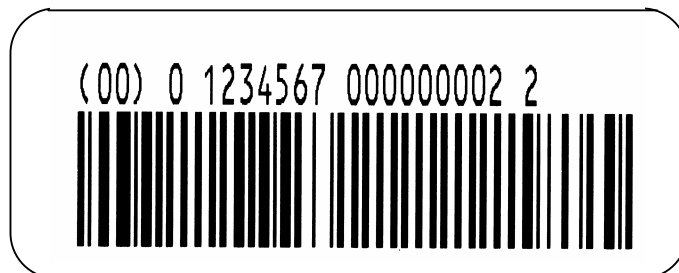
Without incrementing

```
<ESC>A  
<ESC>H100<ESC>V200<ESC>BI04150101234567000000001  
<ESC>Q2<ESC>Z
```



With incrementing

```
<ESC>A  
<ESC>H100<ESC>V200<ESC>F001+001  
<ESC>BI04150101234567000000001  
<ESC>Q2<ESC>Z
```



Postnet

Command Structure <ESC>BP (data)

(data)= 5 digit ZIP
= 6 digits for Postnet 37
= 9 digits for ZIP+4
= 11 digits for Delivery Point Bar Code

Character Set 1-9 (numeric only)

- Notes
1. Frame bits and check digits added automatically by printer.
 2. Bar code width and height are fixed and cannot be changed.
 3. If the number of digits sent to the printer as data does not match one of the formats specified above (i.e. 5,6,9 or 11), the command is ignored and nothing will be printed.
 4. If a “-“ is included in the data stream (i.e. 84093-1565), it is ignored.

Example

```
<ESC>H100<ESC>V120<ESC>BP94089  
<ESC>H100<ESC>V160<ESC>BP123456  
<ESC>H100<ESC>V200<ESC>BP123456789  
<ESC>H100<ESC>V240<ESC>BP12345678901
```



APPENDIX C. CUSTOM CHARACTERS AND GRAPHICS

CUSTOM-DESIGNED CHARACTER

The following example is presented to help understand the use of the Custom-Designed Characters command. It demonstrates the design and printing of an “arrow” in a 16x16 matrix.

1. Determine which matrix size to use.
 - 16 dot x 16 dots
 - 24 dot x 24 dots
2. Lay out a grid and draw the image on the grid.
 - Each square represents one dot
 - Blacken squares for each printed dot

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |

- Transfer the image into two bit map representations and then into hexadecimal or binary format.

| ROW | BIT MAP | | | | HEX |
|-----|---------|------|------|------|-------|
| 1 | 0000 | 0001 | 0000 | 0000 | 01 00 |
| 2 | 0000 | 0011 | 1000 | 0000 | 03 80 |
| 3 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 4 | 0000 | 1111 | 1110 | 0000 | 0F E0 |
| 5 | 0001 | 1111 | 1111 | 0000 | 1F F0 |
| 6 | 0011 | 1111 | 1111 | 1000 | 3F F8 |
| 7 | 0111 | 1111 | 1111 | 1100 | 7F FC |
| 8 | 1111 | 1111 | 1111 | 1110 | FF FE |
| 9 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 10 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 11 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 12 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 13 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 14 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 15 | 0000 | 0111 | 1100 | 0000 | 07 C0 |
| 16 | 0000 | 0111 | 1100 | 0000 | 07 C0 |

- To store the custom designed character in memory using a hexadecimal data stream, the command should be:

```
<ESC>A
<ESC>T1H3F0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C007C0
<ESC>Z
```

NOTE: This should be a continuous data string without CR or LF characters.

- To recall the custom character from memory, send the following code to the printer. Note that you can print other data as well. Also note how the character size was expanded using the <ESC>L command.

```
<ESC>A
<ESC>L0505<ESC>H150<ESC>V100<ESC>K1H903F
<ESC>L0505<ESC>H600<ESC>V100<ESC>K1H903F
<ESC>L0303<ESC>H125<ESC>V250<ESC>MTHIS SIDE UP !
<ESC>Q1<ESC>Z
```

6. To store the custom designed character in memory using a binary data stream, the command would be:

```
<ESC>A
<ESC>K1B3F 01H 00H 03H 80H 07H C0H 0FH E0H 1FH F0H 3FH F8H 7FH FCH FFH FEH 07H C0H
07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H 07H C0H
<ESC>Z
```

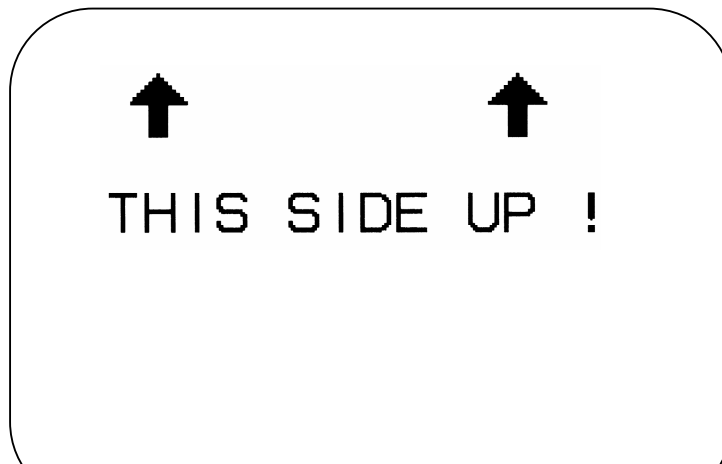
Note: Spaces are shown between hexadecimal values in the above example for clarity only and are not included in the data string.

Note that the data string is only half as long as the hexadecimal format. This is because we can send the binary equivalent of “11111111” (represented above in its hexadecimal value of FF_H), for example, using one eight bit word while it takes two eight bit words to transmit the hexadecimal equivalent “F” and “F”. To send binary characters using BASIC, the expression CHR(&HFF) will send the binary equivalent of FF (i.e. 11111111).

7. To recall the custom character from memory, send the following code to the printer:

```
<ESC>A
<ESC>L0505<ESC>H150<ESC>V100<ESC>K1H903F
<ESC>L0505<ESC>H600<ESC>V100<ESC>K1H903F
<ESC>L0303<ESC>H125<ESC>V250<ESC>MTHIS SIDE UP !
<ESC>Q1<ESC>Z
```

The printer output for both hexadecimal and binary format examples is:



CUSTOM GRAPHICS EXAMPLE

The following example is presented to help you understand the use of the Custom Graphics command. It demonstrates the design and printing of an “diskette” in a 48x48 matrix.

1. Determine the matrix size for the graphic. It must be in 8 dot by 8 dot blocks. The example here has six blocks horizontally and six blocks vertically (48x48).
2. Lay out a grid and draw the image on the grid.
 - Each square represents one dot
 - Blacken squares for each printed dot
3. Transfer the image into a bit map representation and then into hexadecimal format:

| BIT MAP | | | | | | HEXDECIMAL | | | | | |
|----------|----------|----------|----------|----------|----------|------------|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
| 11111111 | 11111111 | 11111111 | 11111111 | 11111111 | 11111111 | FF | FF | FF | FF | FF | FF |
| 11111111 | 11111111 | 11111111 | 11111111 | 11111111 | 11111111 | FF | FF | FF | FF | FF | FF |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 11111111 | 11111111 | 11111111 | 11110011 | C0 | 00 | FF | FF | FF | F3 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 10011111 | 11111111 | 11111111 | 00010011 | C0 | 00 | 9F | FF | FF | 13 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 10011111 | 11111111 | 11111111 | 00010011 | C0 | 00 | 9F | FF | FF | 13 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 10000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 80 | 00 | 00 | 13 |
| 11000000 | 00000000 | 11111111 | 11111111 | 11111111 | 11110011 | C0 | 00 | FF | FF | FF | F3 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000000 | 00000000 | 00000000 | 00000011 | C0 | 00 | 00 | 00 | 00 | 03 |
| 11000000 | 00000000 | 00000011 | 11000000 | 00000000 | 00000011 | C0 | 00 | 03 | C0 | 00 | 03 |

```

11000000 00000000 00000111 11100000 00000000 00000011 C0 00 07 E0 00 03
11000000 00000000 00001111 11110000 00000000 00000011 C0 00 0F F0 00 03
11000000 00000000 00001111 11110000 00000000 00000011 C0 00 0F F0 00 03
11000000 00000000 00001111 11110000 00000000 00000011 C0 00 0F F0 00 03
11000000 00000000 00001111 11110000 00000000 00000011 C0 00 0F F0 00 03
11000000 00000000 00000111 11100000 00000000 00000011 C0 00 07 E0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000011 11000000 00000000 00000011 C0 00 03 C0 00 03
11000000 00000000 00000001 10000000 00000000 00000011 C0 00 01 80 00 03
11000000 00000000 00000000 00000000 00000000 00000011 C0 00 00 00 00 03
11000000 00000000 00000000 00000000 00000000 00000011 C0 00 00 00 00 03
11111111 11111111 11111111 11111111 11111111 11111111 FF FF FF FF FF FF
11111111 11111111 11111111 11111111 11111111 11111111 FF FF FF FF FF FF
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00
00000000 00000000 00000000 00000000 00000000 00000000 00 00 00 00 00 00

```

4. Using the hexadecimal data, send the following code to print the graphic image as designed.

```

<ESC>A
<ESC>H100<ESC>V100<ESC>GH006006
FFFFFFFFFFFFFFFF C00000000003
C00000000003 C000FFFFFFFF3 C00080000013
C00080000013 C0009FFFFFFF13 C00080000013
C00080000013 C0009FFFFFFF13 C00080000013
C00080000013 C000FFFFFFFF3 C00000000003
C00000000003 C00000000003 C00000000003

```

```

C00000000003 C00000000003 C00003C00003
C00007E00003 C0000FF00003 C0000FF00003
C0000FF00003 C0000FF00003 C00007E00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00003C00003 C00003C00003
C00003C00003 C00001800003 C00000000003
C00000000003 FFFFFFFF FFFFFFFF
000000000000 000000000000 000000000000
000000000000 000000000000 000000000000
<ESC>H300<ESC>V100<ESC>XSPLEASE PLACE YOUR DISK
<ESC>H300<ESC>V150<ESC>XSIN A SAFE PLACE
<ESC>Q1<ESC>Z

```

Note: Spaces shown in the hexadecimal listing above are for emphasis only. Spaces must not be encoded within the graphic portion of the data stream to the printer. Also, CR and LF characters to separate the lines must not be encoded in the data stream.

5. To send the data in binary format, the software must convert the data into binary format before transmitting it to the printer. Using the BASIC programming language for example, this is done by notation “CHR\$(&HC0)” which sends the hexadecimal value of “C0” as binary data (11000000). The BASIC program listing for sending this graphic to the printer (using the RS232 port) in binary format is:

```

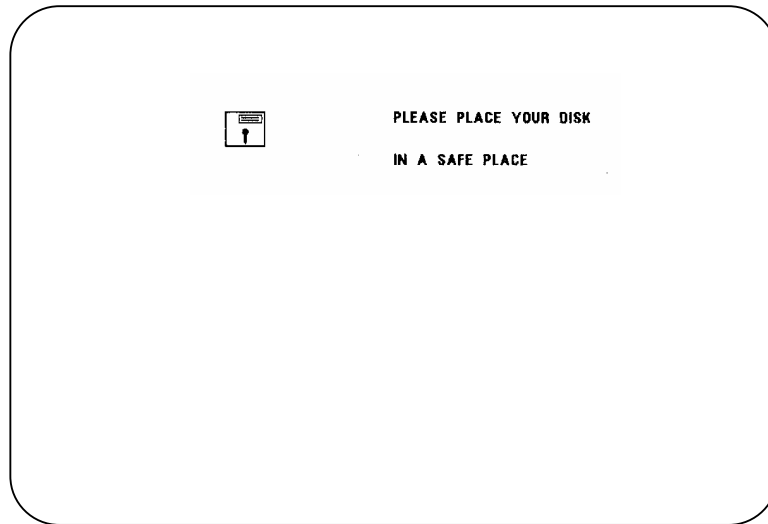
OPEN "COM2:9600,N,8,1,CD,DS" FOR OUTPUT AS #1
E$=CHR$( 27 )
PRINT #1,E$;"A";E$;"H100";E$;"V100";E$;"GB006006";
PRINT #1,CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );
PRINT #1,CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H03 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H03 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &HFF );CHR$( &HFF );CHR$( &HFF );CHR$( &HF3 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H9F );CHR$( &HFF );CHR$( &HFF );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H9F );CHR$( &HFF );CHR$( &HFF );CHR$( &H13 );
PRINT #1,CHR$( &HC0 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &H13 );

```



```
PRINT #1,E$;"Q1";E$;"Z"  
CLOSE #1
```

The printer output for both hexadecimal and binary format examples is:



APPENDIX D.

STAND-ALONE OPERATION AND RELEVANT COMMANDS

STAND-ALONE OPERATION

To run the stand-alone operation you need the following.

- A form stored at the CC1 or CC2 flash memory.
The form with a specified ID defines all the constants, variables and counters including location, type and length.
- A barcode scanner with the RS232 interface that is connected to the CX410.
In general, the host is not required during stand-alone operation. The default baud rate of the CX410 is 9600.

COMMAND SUMMARY

| Command | Parameters | Example | Description |
|--|--|------------------|---|
| <esc>YS,aa Form registration | aa : form ID, 1 ~ 99 | <esc>YS,10 | A form with ID 10 |
| <esc>YR,aa Form retrieval | aa : form ID, 1 ~ 99 | <esc>YR,10 | Retrieve a form with ID 10 |
| <esc>/N,n,bb Variable registration | n : field number, 1 ~99. bb : maximum length, 1 ~99. | <esc>/N,1,3 | Variable 1 with length 3 |
| <esc>/D,aa,n~n Variable print | aa : field number, 1 ~99. n~n: data to print. | <esc>/D,1,JIM | Fill variable 1 with data "JIM" |
| <esc>/FN,n,l[,aaaa bcccc,dd,ee,f] Counter registration | n : field number, 1 ~99. l : length, 1 ~99. aaaa : repeat count. b : a '+' or '-' symbol. cccc : step value. dd : digit # for counting ee : starting digit for counting f : 1 for decimal, 2 for hexadecimal. | <esc>/FN,1,5,1+2 | Set the attributes to counter 1 length: 5 repeat count: 1 step value: +2 |
| <esc>/FD,aa,n~n | aa : field number, 1 ~99. | <esc>/FD,1,00001 | Set the initial value of |

| | | | |
|--|-----------------------|--------------------------------|---|
| Counter print | n~n: data to print. | | counter 1 to 00001. |
| <esc>/Q | | | ** |
| Quantity registration | | | |
| <esc>@,nn Set the printer to stand-alone mode | n~n: form ID, 1 ~ 99. | <esc>A <esc>@, 11 <esc>Z | Set the printer to stand-alone mode with form 11. |
| <esc>OL Set the printer to online (normal) mode. | | <esc>A <esc>OL <esc>Z | Return to normal mode. |
| | | | |

Notes:

1. **: Once this is defined at a form, there should be a corresponding <esc>Q command to place the actual label count during a form execution.
2. Both variable(<esc>/N) and counter(<esc>/FN) registrations need a field number, the number increments from 1. For instance,
 <esc>/N,1,..
 <esc>/N,2..
 <esc>/FN,3,..
 <esc>/N,4,...

ALTERNATIVE COMMANDS TO CONTROL THE FORM AND MODE

Suppose the forms are already saved and only the scanner is connected to the CX410, it is difficult to send the <ESC> commands to the printer to enter/exit the stand-alone mode and execute a form. We have alternative commands to do this.

- Switch to stand-alone mode and select form 1
 -START- ; Enter switch mode
 -STANDALONE- ; Enter stand-alone mode
 1 ; Select form 1
 -END- ; Confirm and start executing a form
- Switch to online (normal) mode
 -START- ; Enter switch mode
 -ONLINE- ; Select online mode
 -END- ; Confirm and end of switch mode

LED PATTERN

The printer will blink the LEDs to indicate the current state.

| | Pattern | State Description |
|---|----------------------------|--|
| 1 | Green LED ON | Online (normal) mode |
| 2 | Green LED blinks 5 times | Stand-alone mode: <ol style="list-style-type: none"> 1. When power on 2. After input “-START-“, “-STANDALONE-“, ID and “-END-“ |
| 3 | Both Green and Red LEDs ON | Switch mode, between “-START-“ and “-END-“. |

EXAMPLES OF A STANDALONE FORM

The Form definition

| | |
|---|---|
| <pre> <ESC>A <ESC>CC1 <ESC>YS,50 <ESC>CI2<ESC>CD200,0 <ESC>/N,1,10 <ESC>V100<ESC>H200<ESC>P2<ESC>L0101<ESC>M <ESC>/FN,2,10,0002+1 <ESC>V200<ESC>H200<ESC>P2<ESC>L0101<ESC>M <ESC>/N,3,10 <ESC>V300<ESC>H200<ESC>P2<ESC>L0101<ESC>M <ESC>/FN,4,10,0002+2 <ESC>V400<ESC>H200<ESC>P2<ESC>L0101<ESC>M <ESC>/FN,5,10,0002-1 <ESC>V500<ESC>H200<ESC>P2<ESC>L0101<ESC>M <ESC>V050<ESC>H100<ESC>P2<ESC>L0101<ESC>MA FORM WITH COUNTERS (ID=50) <ESC>V100<ESC>H100<ESC>P2<ESC>L0101<ESC>MV1: <ESC>V200<ESC>H100<ESC>P2<ESC>L0101<ESC>MC2: <ESC>V300<ESC>H100<ESC>P2<ESC>L0101<ESC>MV3: <ESC>V400<ESC>H100<ESC>P2<ESC>L0101<ESC>MC4: </pre> | <p>Specifies onboard flash</p> <p>Specifies ID 50</p> <p>Variable 1 registration</p> <p>Counter 2 registration</p> <p>Variable 3 registration</p> <p>Counter 4 registration</p> <p>Counter 5 registration</p> |
|---|---|

| | |
|---|----------------------|
| <ESC>V500<ESC>H100<ESC>P2<ESC>L0101<ESC>MC5: <ESC>/Q<ESC>Z | Quantity declaration |
|---|----------------------|

Note: You may check the form by printing a self-test label.

<esc>A<esc>CT<esc>Z

You may see the form information as the following.

NUM OF FORMATS STORED: 1

FORMAT 50

Form Retrieval by the <ESC> Commands

| | |
|------------------|--|
| <ESC>A<ESC>CC1 | Specifies the source flash memory as onboard one |
| <ESC>YR,50 | Specifies the form ID |
| <ESC>/D,1,VV1 | Data for variable 1 |
| <ESC>/FD,2,20000 | Initial counter value for counter 2 |
| <ESC>/D,3,VV3 | Data for variable 3 |
| <ESC>/FD,4,40000 | Initial counter value for counter 4 |
| <ESC>/FD,5,50000 | Initial counter value for counter 5 |
| <ESC>Q3<ESC>Z | Specifies the label set no. as 3 |

As the form retrieval commands are sent you will get 6(2x3) labels. The printouts are shown as below.

| Label 1 | Label 2 |
|---|---|
| A FORM WITH COUNTERS (ID=50) V1: VV1 C2: 20000 V3: VV3 C4: 40000 C5: 50000 | A FORM WITH COUNTERS (ID=50) V1: VV1 C2: 20000 V3: VV3 C4: 40000 C5: 50000 |
| Label 3 | Label 4 |
| A FORM WITH COUNTERS (ID=50) V1: VV1 C2: 20001 V3: VV3 C4: 40002 C5: 49999 | A FORM WITH COUNTERS (ID=50) V1: VV1 C2: 20001 V3: VV3 C4: 40002 C5: 49999 |
| Label 5 | Label 6 |
| A FORM WITH COUNTERS (ID=50) V1: VV1 | A FORM WITH COUNTERS (ID=50) V1: VV1 |

| | |
|-----------|-----------|
| C2: 20002 | C2: 20002 |
| V3: VV3 | V3: VV3 |
| C4: 40004 | C4: 40004 |
| C5: 49998 | C5: 49998 |

Choosing the Form and Switching to Stand-alone Mode

We may input the following data by using a scanner.

| | |
|--------------|-----------------------|
| -START- | |
| -STANDALONE- | |
| 50 | Specifies the form ID |
| -END- | End of switching mode |

Input variable and counter data by using a scanner.

| | |
|-------|----------------------------------|
| VAR1 | Data for variable 1 |
| 22000 | Initial value for counter 2 |
| VAR3 | Data for variable 3 |
| 44000 | Initial value for counter 4 |
| 55000 | Initial value for counter 5 |
| 2 | Specifies the label set no. as 2 |

The printouts will be shown as below.

| Label 1 | Label 2 |
|------------------------------|------------------------------|
| A FORM WITH COUNTERS (ID=50) | A FORM WITH COUNTERS (ID=50) |
| V1: VAR1 | V1: VAR1 |
| C2: 22000 | C2: 22000 |
| V3: VAR3 | V3: VAR3 |
| C4: 44000 | C4: 44000 |
| C5: 55000 | C5: 55000 |
| Label 3 | Label 4 |
| A FORM WITH COUNTERS (ID=50) | A FORM WITH COUNTERS (ID=50) |
| V1: VAR1 | V1: VAR1 |
| C2: 22001 | C2: 22001 |
| V3: VAR3 | V3: VAR3 |
| C4: 44002 | C4: 44002 |
| C5: 54999 | C5: 54999 |