®

CX200
Desktop Printer

Programming Guide

Warning: This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instruction may cause harmful interference to radio communications.However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.

- Connect the equipment into an outlet or a circuit different from that to which the receiver is connected.

- Consult an experienced radio/TV technician for help.

Caution: The FCC warns the users that changes or modifications of the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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CX200 PROGRAMMING GUIDE

INTRODUCTION

This section presents the commands that are used with the SATO CX printers to produce labels with logos, bar codes and alphanumeric data.

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 generates the desired label output. The programmer is free to use any programming language available to send the desired data to the printer.

The command codes used are 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, like "set the print speed to 3."

<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 the 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 set is made up of six special characters. The Standard Protocol Control 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. This manual uses the 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 90). 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 CX200 User's Guide, Page 9).

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 on CX200
CAN	18	Not Used on CX200
Off-Line	40	Take printer Off-Line

USING BASIC

It may be useful to test your printer using a BASIC program on a PC. You may also write your actual production programs 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,E,8,1,CS,DS" AS #1

This sets the RS232 communication parameters of the host PC's COM1 port for 9600 baud, Even 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$" string as an <ESC> character
20 WIDTH "LPT1:",255	Sets the width of the output to 255 characters
30 LPRINT E$;"A";	Sends an "<ESC>A" command code to the LPT1 parallel port
40 LPRINT E$;"H400";E$;"V100";E$;"WL1SATO";	Sends the data "SATO" to be to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the "WL" font.
50 LPRINT E$;"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$" string as an <ESC> character.
20 OPEN "COM1:9600,N,8,1,CS,DS" AS #1	Opens the COM1 port for output and sets the parameters as 9600 baud, No parity, 8 Data bits, 1 Stop bit and instructs the port to ignore the CTS and DSR control signals.
30 PRINT #1,CHR$ (2);	Sends an <STX> (ASCII Code a decimal "2") to the printer instructing it to prepare to receive a message.
40 PRINT #1,E$;"A";	Sends an "<ESC>A" command code to Print Port #1 opened by statement 20 above.

50 PRINT #1, E$;"H400";E$;"V100";E$;"WL0SATO";	Sends the data "SATO" to be to be placed 400 dots horizontally and 100 dots vertically on the label and printed in the "WL" font.
60 PRINT #1, E$;"Q1";	Instructs the printer to print a quantity of one label.
70 PRINT #1, E$; "Z";	Tells the printer that the last command has been sent. The printer can now create and print the job.
80 PRINT #1,CHR$ (3);	Sends an <ETX> (ASCII Code decimal "3") to the printer telling it that this is the end of the message.

THE PRINT AREA

The maximum print area is 7 inches long in the standard mode and 14 inches long if the length is expanded with the Expanded Print Length command. Most of your label applications will fit into this area, therefore, it is important to understand how to work with labels 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 placed 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).

Normal Reference Point
H1, V1

3"
label
length

Your
Label

7"
Print
Area

2.1"
label Width

2.0"
from Edge

Label Feed
Direction

4.1"
Print Area
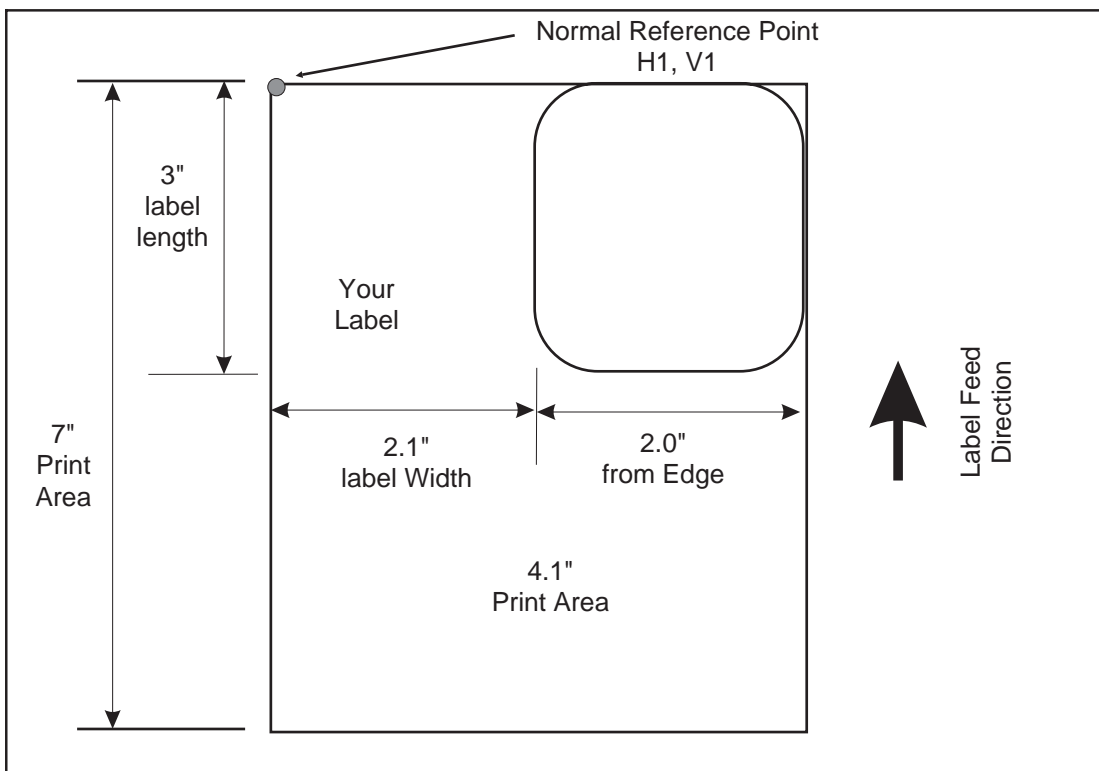
The base refernece point is always on the right edge of the print head as you face the front (label exit) of the printer. If you are using a label that is narrower than the maximum print width, you may have to adjust the base reference point of the Left-Hand printer to correctly position the print area. 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 normal base reference point to the closest edge of the label. If you wanted to move the print area over to the left (as viewed from the front or label exit end of the printer) 2.1 inches:

    > Label Width = 2.0" x 25.4 mm/in x 8 dpmm = 406 dots

    The new base reference point then becomes:

    > New Base Reference Point   = max print width - label width
    >   = 832 dots - 406 dots = 426

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

    > <ESC>A3H**0426**V0001

    This resets the reference point for all the following data.

    Note: After the reference point is moved, you can no longer print on the 426 dot "margin" unless the reference point is reset.

2. Use the normal base 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 normal base reference point to the closest edge of the label.

    > Shift Distance = 2.1" x 25.4 mm/in x 8 dpmm = 426 dots
    > New Base Reference Point = 832 dots - 426 dots = 406

    Each **<ESC>H** command would have the value "406" 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 five inch wide label (see illustration). If you want to test any of the sample label outputs and are using labels less than five 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 head. This damage is not covered under the print head warranty.
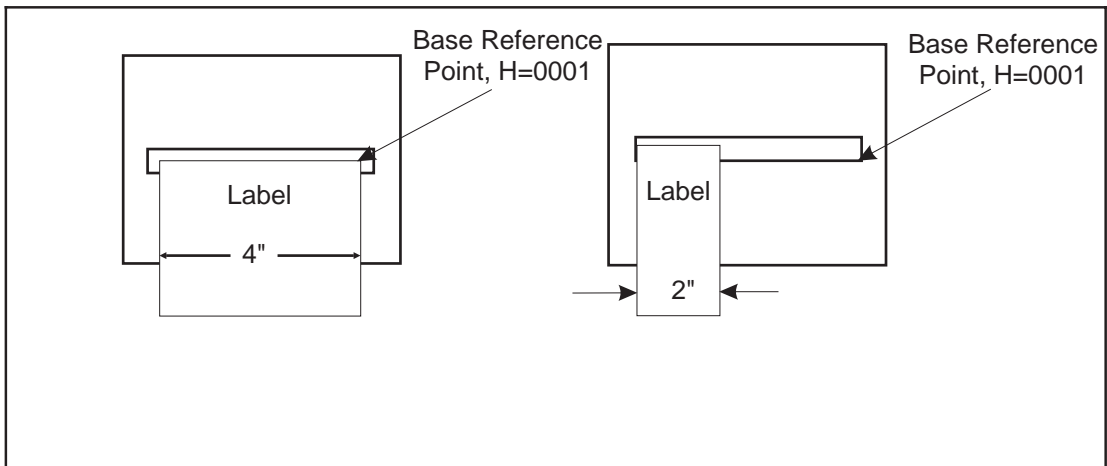
For example, the following illustrates a sample data stream and the resulting label assuming a four inch wide label:

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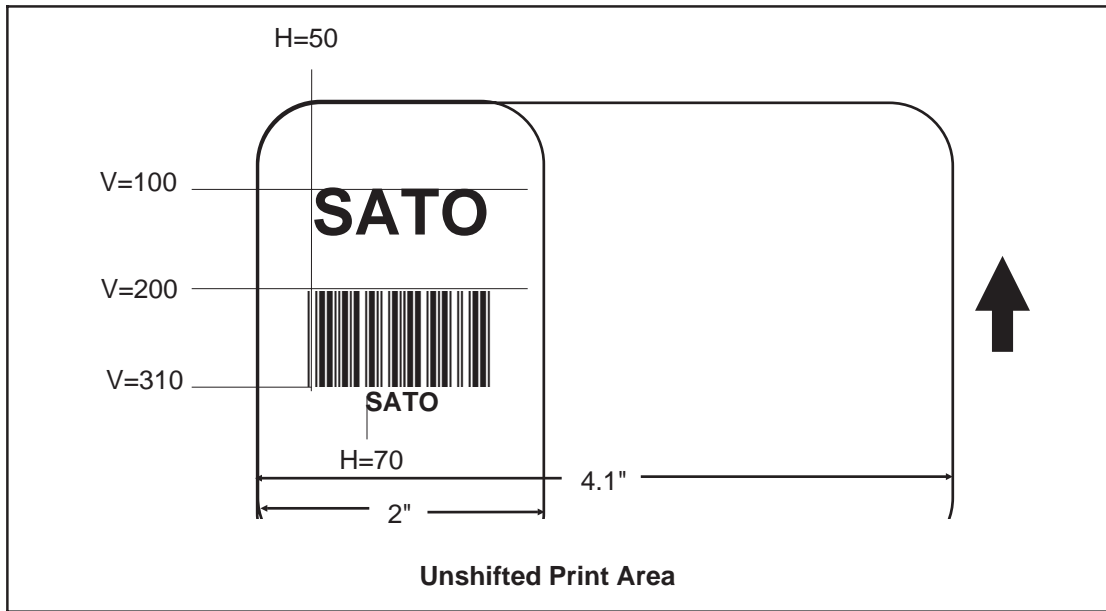
If you are using a two inch wide label, the entire image may not appear on your label. By adding the following Base Reference Point command to the second line of the data stream, the base reference point will be changed, causing the image to be shifted over toward the inside of the printer where it can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

```
<ESC>A
<ESC>A3H0406V0001
<ESC>H0050<ESC>V0100<ESC>L0303<ESC>MSATO
<ESC>H0050<ESC>V0200<ESC>B103100*SATO*
<ESC>H0170<ESC>V0310<ESC>L0101<ESC>USATO
<ESC>Q1<ESC>Z
```

Original image must be moved towards
the left (facing the printer) to make it
print on a 2" wide label.
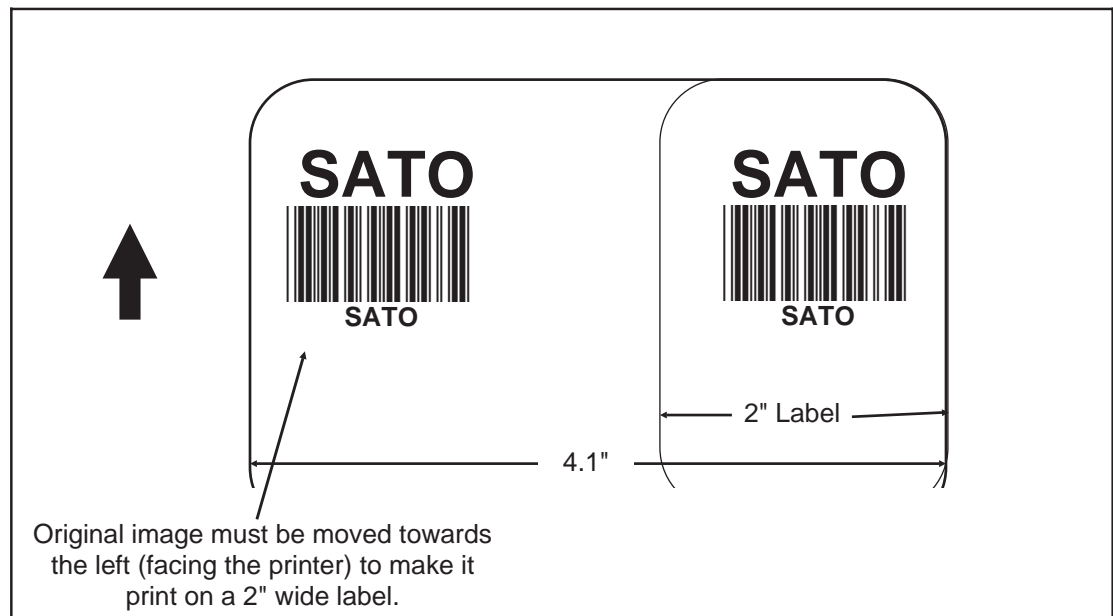
The image reference point is set at the left edge (facing the printer) of the label so that it can be printed on a 2 inch wide label.

Note: The printers 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 FIELDS

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>%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>R**<ESC>V0200<ESC>H0100<ESC>L0202<ESC>P02<ESC>WB1E<ESC>Q1<ESC>Z

Base Ref Point — H=200 — V=800 — "%1"

Base Ref Point — V=200 — Label Feed Direction — New Base Ref Point — H=100 — "R"
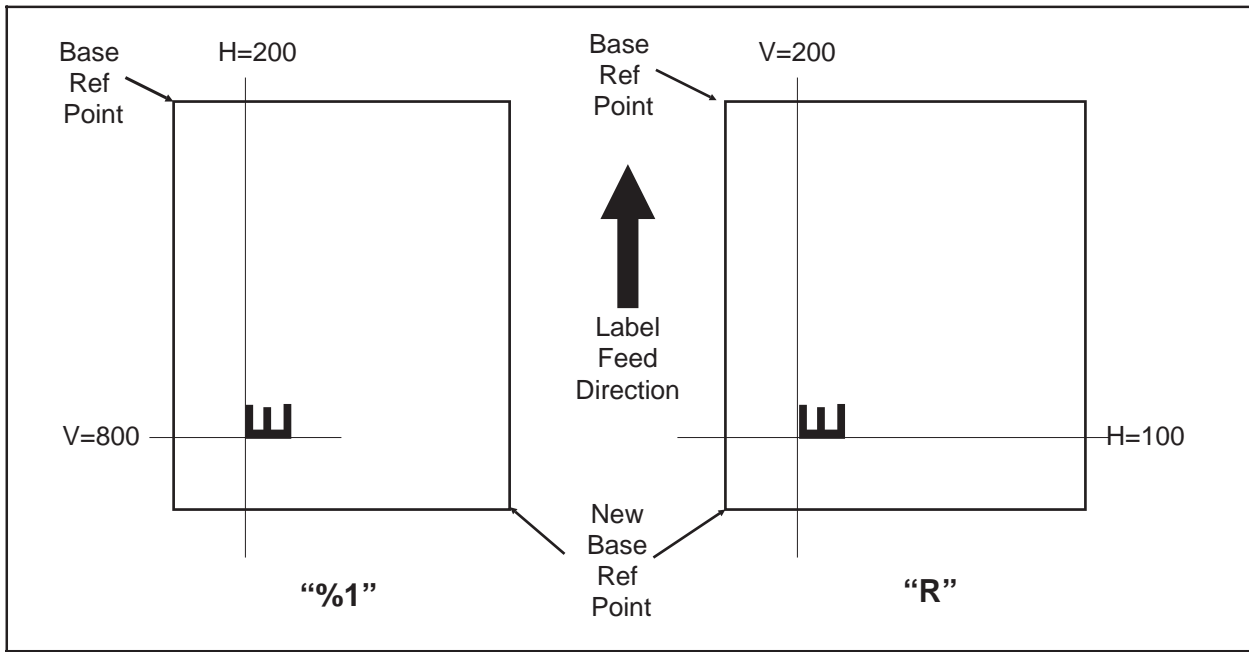
COMMAND DEFAULT SETTINGS

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 corresponding 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=0, V=0	(2)
Character Expansion	1	(1)
Print Darkness	3	(1)
Print Speed	3 ips	(2)

NOTES:

(1) The settings for these commands will revert to the default value 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 CX200 oprinters are different from other SATO models in that they do not use DIP switches for printer configuration. Instead, all printer configuration is 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

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 configurtation. Test Labels can be printed out by sending a command via software (see Page 93) or by using the FEED and On-Line/Off-Line Indicator buttons on the control panel (see Page 7 of the CX200 User's Guide).

LABEL SENSING

The CX200 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/ribbon combination 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.
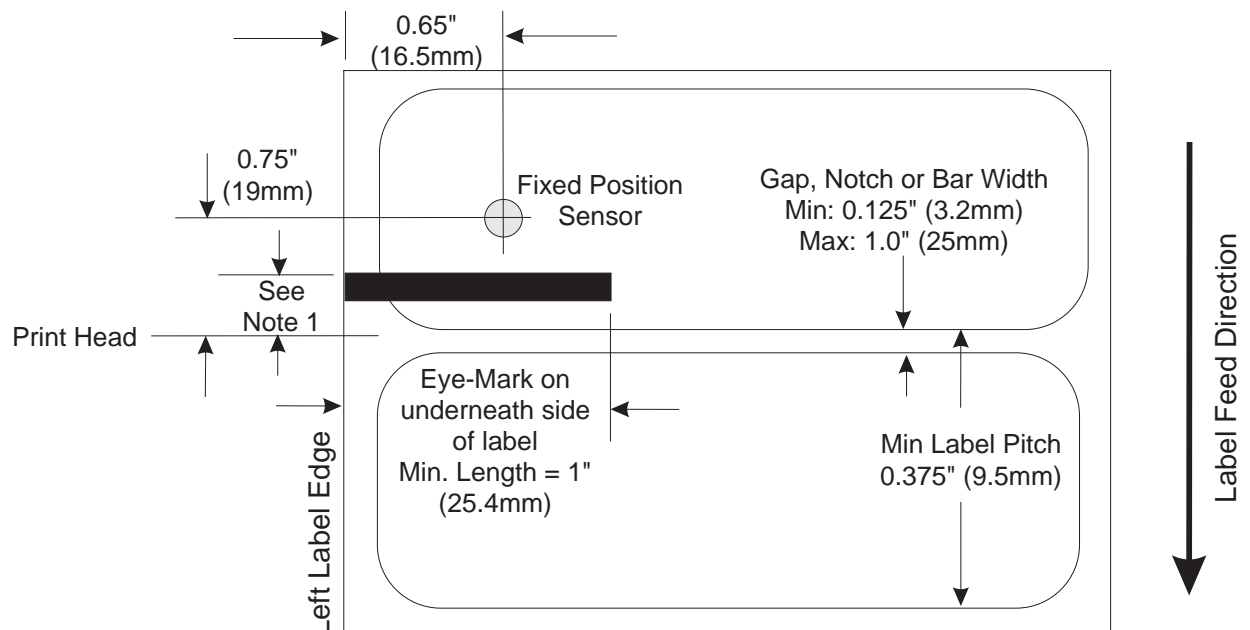
Note 1: The the trailing-edge of the black eye-mark can be positioned anywhere within the 0 to +98mm range of sensor offset adjustment and the first print line (V=000) can be adjusted to the desired position using the <ESC>CB Label Tear-Off command. If the pitch offset is 11mm (the factory setting), placing the eye-mark trailing edge at 8mm will place the first print position at the top edge of the label.

When calibrating the printer sensors, the gap or eye-mark sensor type must be selected first using the <ESC>CI command (see page 94) and then the Direct Thermal or Thermal Transfer print mode must be specified with an <ESC>CP command (see page 92). These two commands are followed by an <ESC>CA calibrate command (see page 86) to instruct the printer to preform the calibration procedure. The resulting calibration values are stored in the printer and used until the unit is recalibrated. A separate value is stored for direct thermal and thermal transfer modes because the settings will differ significantly because of the inclusion of the ribbon for thermal transfer. For example, the following command stream 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 purpose of this section is to:

1. Explain the different commands and provide examples of their usage.

2. To 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 subject 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 would 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 the leading zeroes. In the above example, you could enter either "809" or "0809". However, certain commands require the exact number of matching characters. A command with two parameters listed 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 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 (I 2/5)
         3   UPC-A / EAN-13
         4   EAN-8
         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 (001-600)

d   =   UCC 128 only. Not used for other bar code types
         0   No human readable text
         1   Human readable at top
         2   Human readable 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 three two dimensional symbols (see Two Dimensional bar code symbols starting on Page 80).

Input to Printer

```
<ESC>A
<ESC>H0025<ESC>V0025<ESC>B103100*CODE 39*
<ESC>H0155<ESC>V0130<ESC>XS*CODE 39*
<ESC>H0025<ESC>V0200<ESC>BD20210045676567
<ESC>H0075<ESC>V0310<ESC>XM45676567
<ESC>H0025<ESC>V0375<ESC>BD30215001234567890
<ESC>H0025<ESC>V0950<ESC>BA03100123455
<ESC>H0095<ESC>V1060<ESC>XS12345
<ESC>H0025<ESC>V1125<ESC>BC03100081234ABCD
<ESC>H0080<ESC>V1240<ESC>XS1234ABCD
<ESC>H0525<ESC>V0025<ESC>B002100A12345B
<ESC>H0565<ESC>V0135<ESC>XS12345
<ESC>H0475<ESC>V0200<ESC>BD303100123456789012
<ESC>H0525<ESC>V0375<ESC>BD4031001234567
<ESC>H0525<ESC>V0550<ESC>DE03100123456
<ESC>H0500<ESC>V0600<ESC>OB0
<ESC>H0533<ESC>V0655<ESC>OB123456
<ESC>H0350<ESC>V0725<ESC>D30315009827721123
<ESC>L0101<ESC>H0320<ESC>V0800<ESC>OB0
<ESC>H0365<ESC>V0878<ESC>OB98277
<ESC>H0505<ESC>V0878<ESC>OB21123
<ESC>H0665<ESC>V0760<ESC>BF0313021826
<ESC>H0680<ESC>V0730<ESC>OB21826
<ESC>H0425<ESC>V1125<ESC>D30315000633895260
<ESC>L0101<ESC>H0395<ESC>V1200<ESC>OB0
<ESC>H0440<ESC>V1278<ESC>OB06338
<ESC>H0580<ESC>V1278<ESC>OB95260
<ESC>H0730<ESC>V1155<ESC>BF0314024
<ESC>H0745<ESC>V1125<ESC>OB24
<ESC>H0325<ESC>V0950<ESC>BG03100>GAB>B789>C123456
<ESC>H0435<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

UCC-128   Without Incrementing

                                           <ESC>A
                                           <ESC>H0100<ESC>V0100<ESC>**BI07150101234567000000001**
                                           <ESC>Q2<ESC>Z

(00) 0 1234567 000000001 5

(00) 0 1234567 000000001 5

With Incrementing

                                           <ESC>A
                                           <ESC>H0100<ESC>V0100<ESC>**F001+001**<ESC>**BI07150101234567000000001**
                                           <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 bars to these codes where needed to meet UPC specifications. The <ESC>BD command puts decender bars and human readable text below the symbol.

2. The Code 128, UCC 128, MSI, and Code 93 bar codes are not affected by the narrow to wide ratios.

3. The Codabar and Code 39 bar codes are affected by the Character Pitch command. This 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 (see Page 80).

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 is sent. The printer adds a "0" and automatically generates the check digit. If 12 digits of data are sent, the printer asumes an EAN-13 symbol and automatically generates the check digit. The last digit of the 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>**BWaabbb**

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)

Example: <ESC>**BW02100**

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

Default: None

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>H0050<ESC>V0050<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 (see Page 17).

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>**BTabbccddee**

a	=	Bar Code Symbol:
		0 Codabar
		1 Code 39
		2 Interleaved 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 dots (01-99)

Example: <ESC>**BT**101030103

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

Default: Current setting

Command Function   To print a bar code with a ratio other 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>H0050<ESC>V0050<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 (see Page 16).

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 in the negative direction. If it is left out the offset direction is positive.

aaaa =   Horizontal Print Offset (-0832 to +0832)

bbbb =   Vertical Print Offset (0001 to 1424)

Example: <ESC>**A3H100V0050**

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

Default: Current V and H offset setting in the printer configuration

Command Function   To establish a new base 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 inches 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>L0202
<ESC>H0025<ESC>V0025<ESC>WB0MNORMAL REFERENCE POINT
<ESC>**A3H0300V0075**
<ESC>H0100<ESC>V0050<ESC>WB0MNEW REFERENCE POINT
<ESC>Q1<ESC>Z

Printer Output:
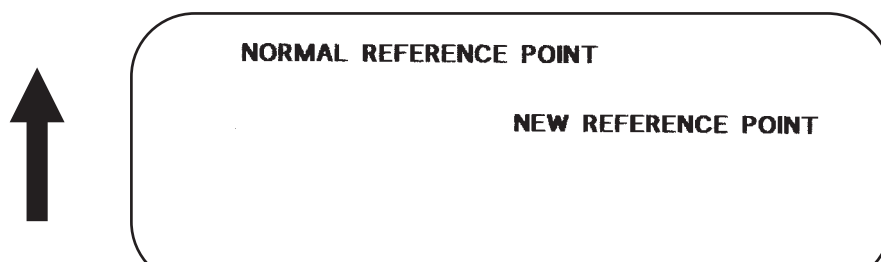
Special Notes

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.

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 and Vertical Print Position commands (see Page 53).

   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 (Page 4).

5. The CX200 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).

Characters, 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

cc   =   Memory location to store/recall the character. Valid memory
locations are 21 to 52 (counting in Hex) or "!" to "R" in Binary

(data)   =   Data to describe the character

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 custom character volatile memory.

Printer Input   See Appendix C for a detailed explanation.

```
<ESC>A
<ESC>T1H3F
0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C007C0
<ESC>Z

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

Printer Output
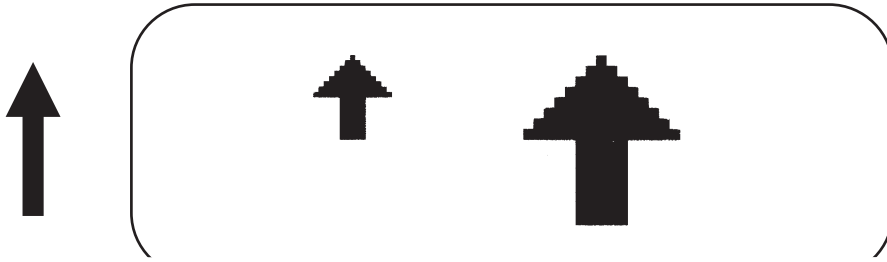
Special Notes

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

   Character Expansion (see Page 23)
   Character Pitch (see Page 26)
   Line Feed (see Page 47
   Rotate, Fixed Base Reference Point (see Page 62)
   Rotate, Moving Base Reference Point (see Page 64)

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>**L**0304

Placement: Preceding the data to be expanded

Default: <ESC>**L**0101

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>A<ESC>H0100<ESC>V0100<ESC>XMSATO
<ESC>H0100<ESC>V0200<ESC>**L0402**<ESC>XMSATO
<ESC>H0100<ESC>V0300<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 (see Page 34) and fonts WB, WL, XB and XL (see Page 36).

2. This command will also affect the following commands:
    Character Pitch (see Page 26)
    Characters, Custom-Designed (see Page 21)

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.

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

Printer Input
```
<ESC>A
<ESC>H0100<ESC>V0050<ESC>PS
<ESC>L0404<ESC>XMPROPORTIONAL SPACING
<ESC>H0100<ESC>V0180<ESC>PR
<ESC>L0404<ESC>XMFIXED SPACING
<ESC>Q1<ESC>Z
```

Printer Output

PROPORTIONAL SPACING

FIXED   SPACING

Special Notes   1. 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 to enhance readability.

Input to Printer:

```
<ESC>A
<ESC>A<ESC>H0025<ESC>V0025<ESC>L0202<ESC>XB1SATO
<ESC>H0025<ESC>V0125<ESC>L0202<ESC>P20<ESC>XB1SATO
<ESC>H0025<ESC>V0225<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 (see Page 23). The character pitch is actually the product of the current horizontal expansion multiple and the designated 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 (see Page 34) and fonts WB, WL, XB and XL (see Page 36)

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.

Character, Proportional Spacing

Command Structure   <ESC>**PS**   Set to proportional spacing
                          <ESC>**PR**   Reset to fixed spacing

                          Example: See above

                          Placement: Preceding the data to be proportional spaced

                          Default: <ESC>PS

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

Printer Input   <ESC>A
                          <ESC>H0025<ESC>V0050<ESC>**PS**
                          <ESC>L0202<ESC>XMPROPORTIONAL SPACING
                          <ESC>H0025<ESC>V0130<ESC>**PR**
                          <ESC>L0202<ESC>XMFIXED SPACING
                          <ESC>Q1<ESC>Z

Printer Output

Special Notes   1. 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>*
                        <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 Note

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 cleares (same as <ES>*X).

Continuous Forms Printing

Command Structure   None

The printer locates the end of an 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 93).

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 this last field is finished printing. The length may be increased with printed spaces (20 hexadecimal) if necessary. There is no command code to control label length.

Copy Image Area

Command Structure   <ESC>**WDHaaaaVbbbbXccccYdddd**

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 0832

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

Example: <ESC>**WDH0100V0050X0600Y0400**

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>H0050<ESC>V0050<ESC>E010<ESC>XM
SATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATO
SATOSATOSATOSATOSATOSATO
<ESC>H0180<ESC>V0250<ESC>**WDH0130V0050X0400Y0200**
<ESC>Q1<ESC>Z

Printer Output:

Special Notes

1. Use the Print Position commands (V and H) to locate the new area for the duplicate image (see Page 53).

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.

CutterCommand

Command Structure   <ESC>**~aaaa** or <ESC>**<NUL>aaaa**

aaaa =   Number of labels to print between each cut (0001 to 9999)

Example: <ES>~0002

Placement: Fllowing the <ESC>Q Print Quantity command

Default: Cut after each label if cutter installed

Command Function   To control the cutting of labels when using a SATO cutter unit with the printer. This command allows the cutting of multi-part tags or labels at a specified interval within a print job.

Input to Printer
<ESC>A
<ESC>H020<ESC>V020<ESC>WB1TEST LABEL
<ESC>Q3
<ESC>**~002**
<ESC>Z

Printer Output   This set of commands will print 6 labels, with 2 labels betweencuts.

Special Notes

1. You must have the optional printer Cutter installed to use this function. Contact your SATO representative for more information

2. To use this command, you must have the cutter enabled.

3. If the cut value is set at aaaa = 0000, the cutter is inactive.

4. When using the Cuttter command, the total number of labels printed is the product of the cut value times the print quantity. For example, if the cut value is 2 and the print quantity is 20, then 40 (20 sets of 2) labels will be printed.

5. Sending a Cutter command to a printer without a cutter installed will enable the Backfeed operation.

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

Command Structure

Font XU:	<ESC>**XU**	Font U:	<ESC>**U**
Font XS:	<ESC>**XS**	Font S:	<ESC>**S**
Font XM:	<ESC>**XM**	Font M:	<ESC>**M**
Font OA:	<ESC>**OA**	Font OB:	<ESC>**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		PROPORTIONAL[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 15W x 22H		
OB	OCR-B font 20W x 24H		

(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>H0001<ESC>V0100<ESC>L0202<ESC>XUSATO
<ESC>H0001<ESC>V0175<ESC>L0202<ESC>XSSATO
<ESC>H0001<ESC>V0250<ESC>L0202<ESC>XMSATO
<ESC>H0001<ESC>V0325<ESC>L0101<ESC>OASATO
<ESC>H0001<ESC>V0400<ESC>L0101<ESC>OBSATO
<ESC>H0300<ESC>V0100<ESC>L0202<ESC>USATO\
<ESC>H0300<ESC>V0175<ESC>L0202<ESC>SSATO
<ESC>H0300<ESC>V0250<ESC>L0202<ESC>MSATO
<ESC>Q1<ESC>Z
```

Printer Output

Special Notes

1. Characters may be enlarged through the use of the Character Expansion command (see Page 23).

2. Character spacing may be altered through the use of the Character Pitch command (see Page 26). 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 custom characters or fonts. See the <ESC>T Custom-Designed Characters command (Page 21).

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>PS Proportional Space command.

Fonts WB, WL, XB & XL

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

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

Example: <ESC>**WB1123456**

Placement: Preceding the data to be printed

Default: None

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

NON-PROPORTIONAL		**PROPORTIONAL**[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>H0001<ESC>V0100<ESC>**WB0SATO**
<ESC>H0001<ESC>V0185<ESC>**WB1SATO**
<ESC>H0001<ESC>V0270<ESC>**WL0SATO**
<ESC>H0001<ESC>V0355<ESC>**WL1SATO**
<ESC>H0300<ESC>V0100<ESC>**XB0SATO**
<ESC>H0300<ESC>V0185<ESC>**XB1SATO**
<ESC>H0300<ESC>V0270<ESC>**XL0SATO**
<ESC>H0300<ESC>V0355<ESC>**XL1SATO**
<ESC>Q1<ESC>Z

Printer Output:

Special Notes

1. Characters may be enlarged through the use of the <ESC>L Character Expansion command (see Page 23).

2. Character spacing may be altered through the use of the <ESC>A Character Pitch command (see Page 26).

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>PS Proportional Space command.

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 Quantity 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>H01000<ESC>V0125
<ESC>STHIS IS THE STORED IMAGE WITH A BARCODE
<ESC>H0100<ESC>V0165<ESC>B103100*12345*
<ESC>&<ESC>Z
```

```
<ESC>A<ESC>H0100<ESC>V0050
<ESC>STHIS IS RECALLING AND ADDING TO THE STORED IMAGE<ESC>/
<ESC>Q1<ESC>Z
```

Printer Output

Special Notes

1. The overlay is stored using the <ESC>& Form Overlay Store command (see Page 40).

2. The <ESC>AX Expanded Print Length command (see Page 51) cannot be used with Forms Overlay.

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)
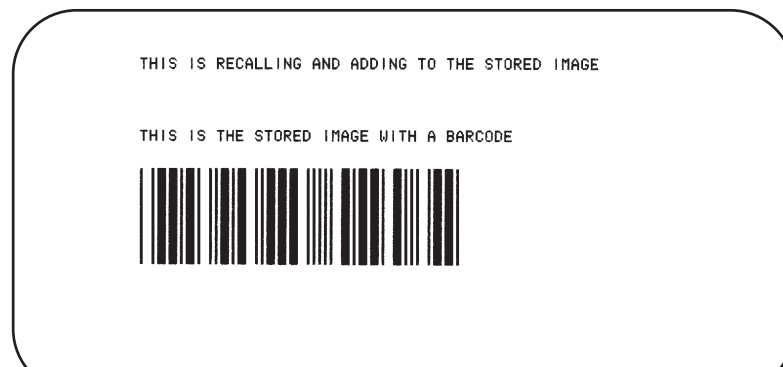
Default: None

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>H0100<ESC>V0125
<ESC>STHIS IS THE STORED IMAGE WITH A BARCODE
<ESC>H0100<ESC>V0165<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 39).

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.

4.   The Expanded Print Length <ESC>AX (see Page 51) cannot be used with this command. The maximum length label that can be used with Forms Overlay is 7".

Graphics, Custom

Command Structure   <ESC>**Gabbbccc(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 178 (001 to 356 for Expanded Length)

(data)=   Hex 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 printed 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.

Printer Input
```
<ESC>A
<ESC>H0100<ESC>V0100<ESC>GH006006
FFFFFFFFFFFFFFFFFFFFFFFFFC00000000003
C00000000003C000FFFFFFF3C00080000013
C00080000013C0009FFFFF13C00080000013
C00080000013C0009FFFFF13C00080000013
C00080000013C000FFFFFFF3C00000000003
C00000000003C00000000003C00000000003
C00000000003C00000000003C00003C00003
C00007E00003C0000FF00003C0000FF00003
C0000FF00003C0000FF00003C00007E00003
C00003C00003C00003C00003C00003C00003
C00003C00003C00003C00003C00003C00003
C00003C00003C00003C00003C00003C00003
C00003C00003C00001800003C00000000003
C00000000003FFFFFFFFFFFFFFFFFFFFFFFFF
<ESC>H0300<ESC>V0100<ESC>XSPLEASE PLACE YOUR DISK
<ESC>H0300<ESC>V0150<ESC>XSIN A SAFE PLACE
<ESC>Q1<ESC>Z
```

Printer Output

PLEASE PLACE YOUR DISK

IN A SAFE PLACE

Special Notes

1. 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.

2. A custom graphic cannot be enlarged by the <ESC>L Character Expansion command (Page 23).

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>**GPaaaaa,**(data)

aaaaa   =   Number of bytes to be downloaded

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

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.

Printer Input   See Appendix Appendix C for a detailed example

<ESC>A
<ESC>V0150<ESC>H0100<ESC>**GP03800,(...Data...)**
<ESC>Q1
<ESC>Z

Printer Output
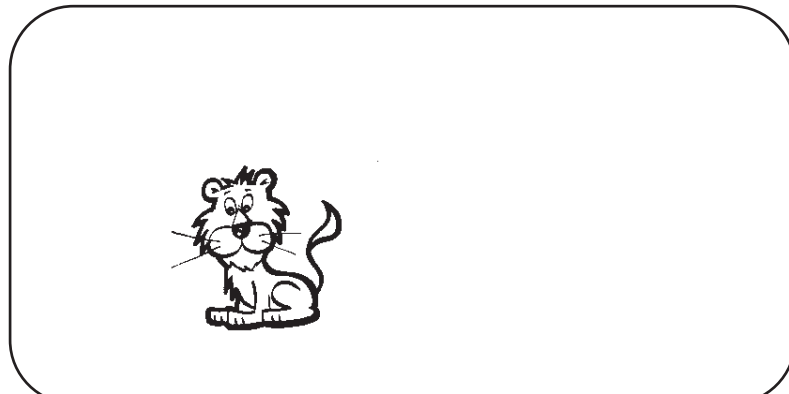
Special Notes

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 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>J WITH 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 print job.

Lines and Boxes

Command Structure   Line   <ESC>**FWaabcccc**

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

b   =   Line orientation
           H   Horizontal line
           V   Vertical Line

cccc =   Length of line in dots (see Note 2 for max length)

Box: <ESC>**FWaabbVccccHdddd**

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 (0001 to 1424)

dddd =   Length of horizontal side in dots (0001 to 0832)

Example: <ESC>**FW02H0200**

Placement: Following the necessary positioning commands

Default: None

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

Input to Printer   <ESC>A
<ESC>H0100<ESC>V0100<ESC>**FW20H0200**
<ESC>H0320<ESC>V0100<ESC>**FW20V0200**
<ESC>H0350<ESC>V0100<ESC>**FW1010H0200V0200**
<ESC>Q1<ESC>Z

Printer Output

Special Notes   1.   It is recommended that all lines and boxes be specified in the normal print direction.

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>H0050<ESC>V0050<ESC>L0202<ESC>S
THIS IS THE 1ST LINE<>CR>
THIS IS THE 2ND LINE>CR>
THIS IS THE 3RD LINE>CR>
<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. Tthe 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.

Off-Line/Pause

Command Structure   <ESC>**@**

  Example: See above

  Placement: Anywhere in the print job between the <ESC>A and
                   <ESC>Z

  Default: None

Command Function   To specify the printer to come to an off-line state. When used within a
print job, the printer goes off-line after finishing the print job.

Input to Printer   <ESC>A
<ESC>@...Job...
<ESC>Z

Printer Output   There is no printer output for this command. The printer is placed in
the Off-Line mode as soon as the current print job is finished.

Special Notes   1.   You must press the READY indicator key on the front panel to
return the printer to an On-Line status .

  2.   Remember, when using this command, that the print job specifies
<ESC>Q10, all ten labels will print before the printer goes off-line.

  3.   This command will clear the print buffer.

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, Delivery Point format)

Example: <ESC>**BP123456789**

Placement: Immediately preceding the data to be encoded

Default: None

Command Function To print Postnet bar codes

Printer Input
<ESC>A
<ESC>H0100<ESC>V0120<ESC>**BP94089**
<ESC>H0100<ESC>V0160<ESC>**BP123456**
<ESC>H0100<ESC>V0200<ESC>**BP123456789**
<ESC>H0100<ESC>V0240<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 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 Notes   1. This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. The setting is stored in non-volatile memory and is not affected by cycling power.

2. The lighest setting is the smallest value and the darkest 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 (Page 90). 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)

Example: See above

Placement: Must follow the Start Code command (see Page 68) and be in it's own separate data stream.

Default: <ESC>AR

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

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

<ESC>A
<ESC>H0050<ESC>V0100<ESC>WB1EXPAND TO:
<ESC>H0050<ESC>V2700<ESC>WB114 INCHES
<ESC>Q1<ESC>Z

<ESC>A
<ESC>**AR**
<ESC>Z

Printer Output:
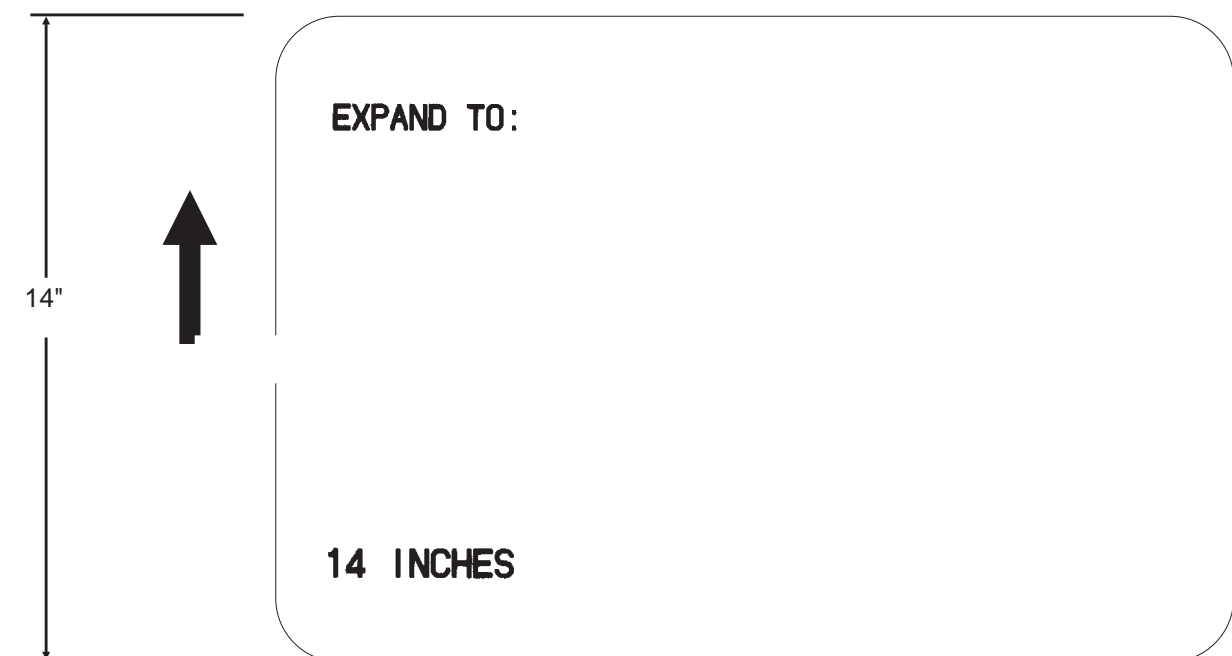
Special Notes

1. AX is effective until AR 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 is cannot be used with the <ESC>& Store Form Overlay command (see Page 40).

Print Position

Command Structure   Horizontal Position: <ESC>**Haaaa**

Vertical Position: <ESC>**Vbbbb**

aaaa =   Number of dots horizontally from the base reference point 0001 to 0832.

bbbb =   Number of dots vertically from the base reference point 0001 to 1424 (0001 to 2848 with Expanded Print Length).

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>**H0025<ESC>V0050**<ESC>L0303<ESC>MSATO
<ESC>**H0100<ESC>V0150**<ESC>MSATO
<ESC>Q2<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 the maximum number of dots for standard length.

3. If any part of an image is placed past maximum allowable dots across the label, that part of the image will be lost.

4. If you attempt to print where there is no paper, you may damage the print head.

5. 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)

Example: <ESC>Q500

Placement: Just preceding <ESC>Z, unless <ESC>~ Cutter
command exists, then preceding that. This command
must be present in every print job.

Default: None

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

Input to Printer   <ESC>A
<ESC>H0100<ESC>V0100<ESC>WB1SATO
<ESC>**Q3**
<ESC>Z

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

Special Notes   1.   To cancel a print job, you must turn off the printer.

3.   When used with the <ESC>F Sequential Numbering command (see
Page 66, the Print Quantity value should be equal to the total
number of labels to be printed.

4.   If you do not specify a Print Quantity, the printer will not print a label.

5.   For this command, 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
                                  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 separate 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>**CS3**
                <ESC>Z

Printer Output   There is no printer output for this command. It sets the print speed of the printer to 3 iinches per second..

Special Notes   1. This becomes the new setting in the printer configuration for all subsequent print jobs, unless changed. The setting 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 separate 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 Notes   1. 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** (<ESC>zero)

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>H0025<ESC>V0020<ESC>WB0Company Name
<ESC>H0025<ESC>V0085<ESC>WB1SATO
<ESC>H0025<ESC>V0150<ESC>WL0SATO
<ESC>H0025<ESC>V0215<ESC>WL1SATO
<ESC>Q1<ESC>Z

<ESC>A
<ESC>**0**<ESC>H0025<ESC>V0020<ESC>WB0SATO
<ESC>Q1<ESC>Z

Printer Output
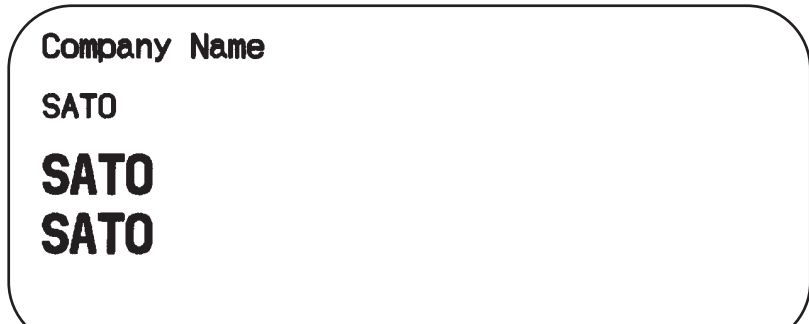
Special Notes

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 contains 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**

a   =   Horizontal length in dots of reverse image area
0000 to 0832
b   =   Vertical height in dots of reverse image area.
0000 to 1424

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 area.

Input to Printer   <ESC>A
<ESC>H0050<ESC>V0120<ESC>L0202<ESC>WB1REVERSE
<ESC>H0250<ESC>V0300<ES C>L0202<ESC>WB1HALF
<ESC>H0040<ESC>V0110<ESC>**(370,100**
<ESC>H0240<ESC>V0290<ESC>**(220,47**
<ESC>Q1<ESC>Z

Printer Output
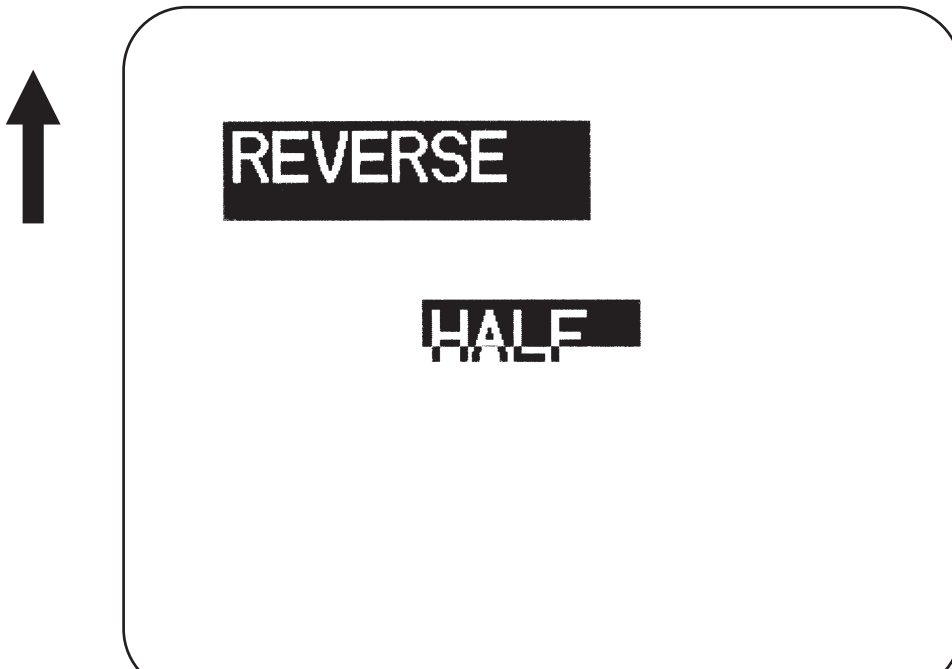
Special Notes

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° rotated (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>L202<ESC>H0200<ESC>V0100<ESC>MNORMAL DIRECTION
<ESC>**%1**<ESC>H0200<ESC>V0300<ESC>MONE
<ESC>**%2**<ESC>H0200<ESC>V0400<ESC>MTWO
<ESC>**%3**<ESC H0200<ESC>V0500<ESC>MTHREE
<ESC>Q1<ESC>Z

Printer Output
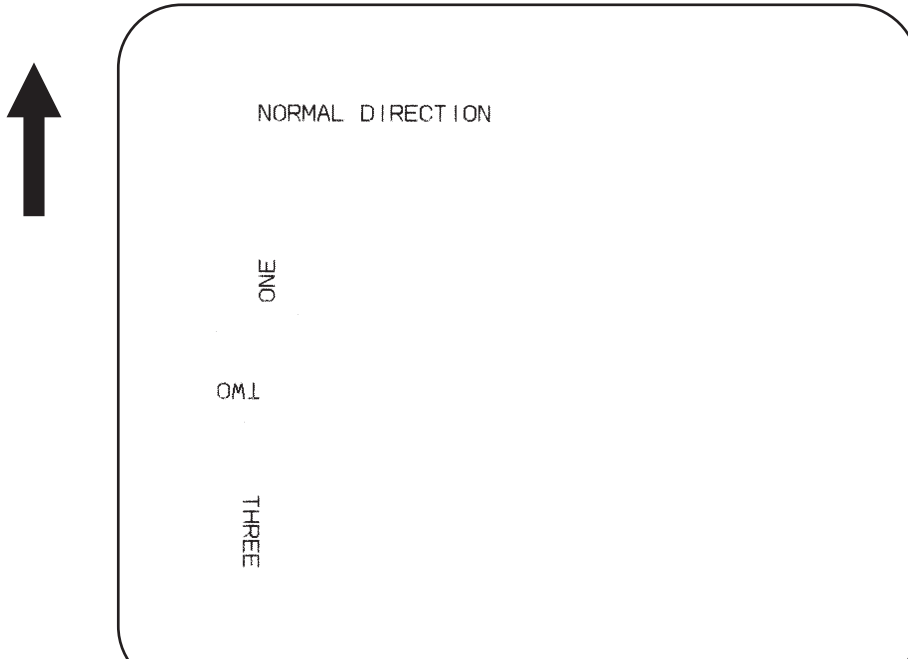
Special Notes

1. Do not combine this command and the <ESC>R Rotate command (see Page 64) 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 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>L202<ESC>H0100<ESC>V0010<ESC>MNORMAL DIRECTION
<ESC>**R**<ESC>H0100<ESC>V0100<ESC>MONE
<ESC>**R**<ESC>H0100<ESC>V0100<ESC >MTWO
<ESC>**R**<ESC>H0100<ESC>V0100<ESC>MTHREE
<ESC>**R**<ESC>H0100<ESC>V0100<ESC>MFOUR
<ESC>Q1<ESC>Z

Printer Output
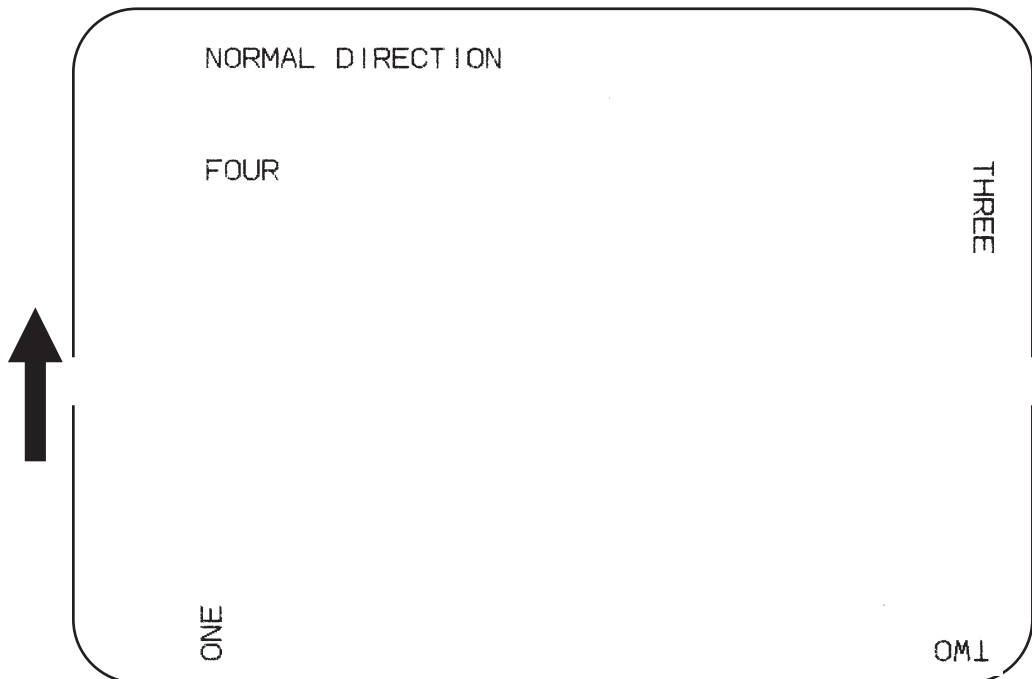
Special Notes

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 62) 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 7, 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 (00-99) starting with the right most position. If these digits are left out, the default is 0.

Example: <ESC>**F001-001,04,03**

                    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 the starting 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 within each field.

Input to Printer   <ESC>A<ESC>H0100<ESC>V0100<ESC>MSERIAL NUMBER:
<ESC>H0100<ESC>V0200<ESC>**F001+005**
<ESC>L0202<ESC>M1000
<ESC>Q2<ESC>Z

Printer Output

```
                SERIAL NUMBER:

                1000
```

```
                SERIAL NUMBER:

                1005
```
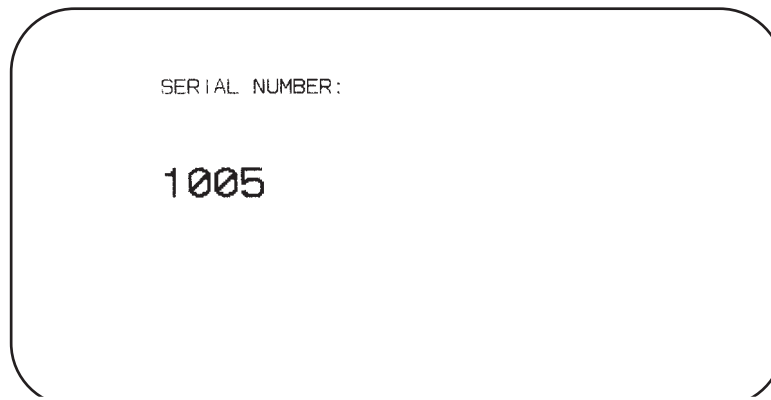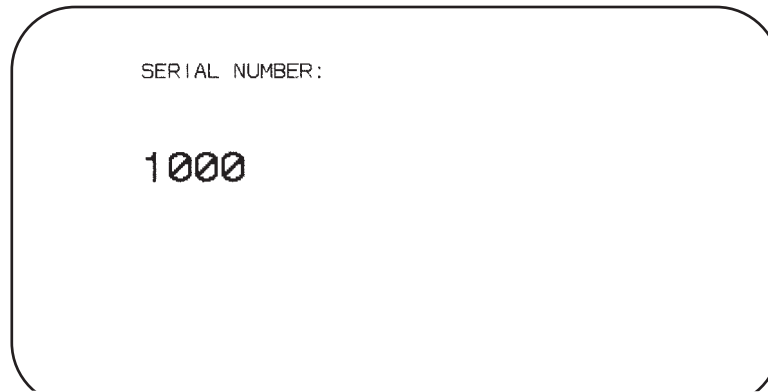
Special Notes

1. The value specified for Print Quantity (see Page 55) should be equal to the number of different sequential values 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 would be as follows:

   ```
   <ESC>A
   <ESC>H0100<ESC>V0100<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, Page 31
   Reverse Image, Page 60
   Line Feed, Page 47

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>H0001\<ESC>V0100\<ESC>WB1SATO
\<ESC>H0130\<ESC>V0200\<ESC>B103150*SATO*
\<ESC>H0170\<ESC>V0360\<ESC>L0202\<ESC>S*SATO*
\<ESC>Q1\<ESC>**Z**

Printer Output   There is not 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.

The first 2MB of Expanded Memory installed is designated as memory area CC1. If 4MB of Expanded Memory is installed, second 2MB (i.e. the area above the first 2 MB) is designated as memory area CC2.

Expanded Memory Function
Fonts, TrueType Recall

Command Structure <ESC>**BJRabbccddeeeeff...f**

a	=	Font ID (0 thru 9)
bb	=	Horizontal Expansion (01 thru 12)
cc	=	Vertical Expansion (01 thru 12)
dd	=	Character Pitch (01 thru 99)
eeee =		Number of characters to be printed using the font
f f f f =		Data to be printed

Example: **<ESC>BJR1020201000004SATO**

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

Default: None

Command Function This command recalls previously stored TrueType fonts from Expanded Memory.

Printer Input
<ESC>A
<ESC>V0100<ESC>H0100<ESC>CC1<ESC>**BJR1020201000004SATO**
<ESC>Q1<ESC>Z

Printer Output

Special Notes 1. This command requires the Expanded Memory option. See your SATO representative for details.

Expanded Memory Function
Fonts, TrueType Store

The conversion from a TrueType font to a format that can be downloaded to the printer is very complex and requires the use of a TrueType Download utility program. See your SATO representative for details. This process requires the Expanded Memory option.

Expanded Memory Function Graphics, Custom Recall

Command Structure   **<ESC>GRaaa**

aaa =   Graphics storage number (001-999)

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.

Printer Input

Non Rotated Graphic
<ESC>A<ESC>CC1
<ESC>V0100<ESC>H0080<ESC>L0505
<ESC>**GR001**
<ESC>Q1<ESC>Z

Graphic Rotated 90°
<ESC>A<ESC>CC1<ESC>%1
<ESC>V0180<ESC>H0250<ESC>L0505
<ESC>**GR001**
<ESC>Q1<ESC>Z

Graphic Rotated 180°
<ESC>A<ESC>CC1<ESC>%2
<ESC>V0180<ESC>H0500<ESC>L0505
<ESC>**GR001**
<ESC>Q1<ESC>Z

Graphic Rotated 270°
<ESC>A<ESC>CC1<ESC>%3
<ESC>V0100<ESC>H0700<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 images cannot be stored as part of a label format.

3. See the <ESC>GI Custom Graphic Store command.

Expanded Memory Function Graphics, Custom Store

Command Structure   <ESC>**GIabbbcccddd{data}**

a   =   Specifies character format of the data
           H   Hex data
           B   Binary data
bbb   =   Number of horizontal 8 x 8 blocks (001 to104)
ccc   =   Number of vertical 8 x 8 blocks (001 to178)
ddd   =   Graphics storage number (001 to 099)
{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 41), but allows for the graphic image to be
stored in a 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.

Printer Input   <ESC>A
<ESC>CC1<ESC>**GIH002002001**
0100038007C00FE01FF03FF87FFCFFFE07C007C007C007C007C007C007C007C0
<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

5. 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.

6. The graphics storage number (ddd) must be specified with this command.

Expanded Memory Function Graphics, PCX Recall

Command Structure   <ESC>**PY**aaa

aa   =   Storage area number (001 thru 099)

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.

Printer Input

Normal Rotation
<ESC>A<ESC>CC1
<ESC>V0100<ESC>H0001<ESC>**PY001**
<ESC>Q1<ESC>Z

Rotate Base Reference Point
<ESC>A<ESC>CC1<ESC>%1
<ESC>V0330<ESC>H0110<ESC>**PY001**
<ESC>Q1<ESC>Z

2nd Rotation, Base Reference Point
<ESC>A<ESC>CC1<ESC>%2
<ESC>V0330<ESC>H0550<ESC>**PY001**
<ESC>Q1<ESC>Z

3rd Rotation, Base Reference Point
<ESC>A<ESC>CC1<ESC>%3
<ESC>V0100<ESC>H0750<ESC>**PY001**
<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
Graphics, PCX Store

Command Structure   **<ESC>PI**aaa,bbbbb,{data}

        aaa   =   Storage area number (001 thru 999)
        bbbbb =   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.

Printer Input   BASIC Program to Download a PCX file to Expanded Memory
Section #1 (first 2MB installed).

```
OPEN "C:\WIZARD\GRAPHICS\LION.PCX" FOR INPUT AS #2
DA$ = INPUT$(3800,#2)
C$ = CHR$(27)
WIDTH "LPT1:",255
LPRINT C$;"A";C$;"CC1";
LPRINT C$; "PI001,03800,";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. See 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 Initialize

Command Structure   <ESC>**BJFaaaaaaaa**

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>CC2<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>**CCa**

a   =   Section Select
1   Section1, first 2MB of Expanded Memory
2   Section 2, second 2MB of Expanded Memory

Example: <ESC>**CC1**

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

Default: Last selected Memory Area.

Command Function   Selects the section of Expanded Memory to be used for following commands.

Printer Input
<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. See your SATO representative for more information.

Expanded Memory Function Status

Command Structure   <ESC>**BJS**

                                Example: <ESC>**BJS**

                                Placement: After the <ESC>CC Memory AreaSelect command.

                                Default: None

Command Function   Casues the printer to print the card status.

Printer Input

                              <ESC>A
                              <ESC>CC1<ESC>**BJS**
                              <ESC>Z

Printer Output

Special Notes   1.   This command requires the Expanded Memory option. See your SATO representative for more information

Two-Dimensional Symbols

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

Two-Dimensional Bar Codes
Maxicode

Command Structure   <ESC>**BUaaa,bbb,cccccc,dddd,ee...e**

            aaa   =   Service class, numeric only (001-999)
            bbb   =   Country code, numeric only (001-999)
            cccccc =   ZIP code, alphanumeric (000000-999999)
            dddd   =   Extended ZIP code, numeric only (0001-9999)
            ee...e   =   Low priority message, alphanumeric, 84 digits.

            Example: <ESC>**BU001,840,94089,0000**

            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.

Command Function   To print a UPS Maxicode symbol.

```
<ESC>A<ESC>V0100<ESC>H0100
<ESC>BU001,840,94089,0000
[)><Rs>
01<Gs>96
1Z12345675
<Gs>UPSN<Gs>12345E<Gs>089
<Gs><Gs>1/1<Gs>10.1<Gs>Y
<Gs><Gs><Gs>UT
<Rs><Eot>
!!!!!!!!!!!!!!!!!!!!!!!!!!!
<ESC>Q1<ESC>Z
```

Printer Output
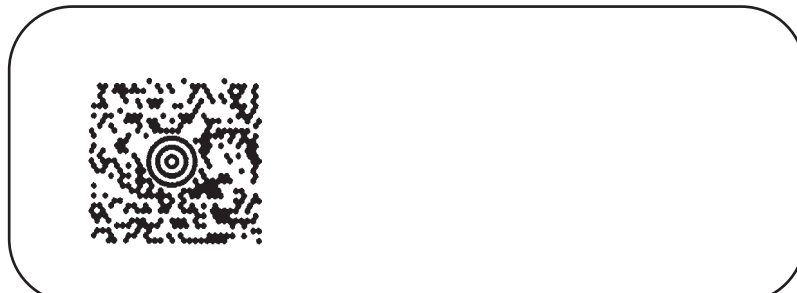
Special Notes

1. The Secondary Message field (ee...e) must contain exactly 84 characters. If a smaller message is specified, the field must be padded with "exclamation point" character(s).

2. <Rs> represents Hex 1E, <Gs> represents Hex 1D, <Eot> represents Hex 04, <ESC> represents Hex 1B and <Sp> represents Hex 20.

Two-Dimensional Bar Codes
PDF417

Command Structure   <ESC>**BK**aabbcddeeffffnn...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 (1-8).

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, the printer automatically optimizes the number of rows per symbol.

ffff   =   Number of characters to be encoded (0001-2700).

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.

Printer Input
<ESC>A
<ESC>V0100<ESC>H0100<ESC>**BK0607400000021PDF417 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. If the product of the values entered for "dd" and "ee" are not equal to or less than the value of "fff" (i.e.,"ffff" is greater that "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 for "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 00_H thru $1F_H$ 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 CX200 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 READY Indicator and FEED buttons on the front panel (see Page 9 of the CX200 User's Guide).

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 this command. It will cause the printer to feed a label 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. If the Sensor is disabled with a <ESC>CI0 command, no calibration is performed.

3. The sensor must be recalibrated whenever the sensor type is changed.

4. When calibrating the sensor for the CX200TT 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 or ~ in ASCII or hex format
g	=	Replacement character for OFFLINE in ASCII or hex format

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 defines custom Protocol Command codes.

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

Printer Output   A Protocol Command code status label will be printed as a result of the a 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" key 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	+
+	+

If a combination of characters are outside the hexadecimal range, the entire command sequence will be ignored.

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

Label Tear-Off

Command Structure   <ESC>**CBabb**

            Example: <ESC>**CB+03**
                        a   =   + to move the print line down from the top edge of the label
                                      - to move the print line toward thetop of the label
                        bb =   Distance moved in millimeters (00 to 25)

            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>CI2<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 98mm. Any commands received that cause the value to exceed 00 or 98 will result in a setting of 00 or 98 respectively.

3. The value is stored in flash memory and will remain 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. This setting is referenced to the sensor position which is located 0.75" (19mm) from the first print line (V=000)

5. Separate offset settings are stored for gap and eye-mark sensing.

Print Darkness Fine Adjustment

Command Structure   <ESC>**CDaaa,bbbb**
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:　　　Prink 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. After the printer has been adjusted using the Print Darkness Adjust setting, the <ESC>#E Print Darkness Command can be used to adjust the heat setting in discrete steps referenced to the Adjust setting.

2. The Media Adjust setting is used to optimize the "dot history" algorithm which tracks the activity of each print dot from one dot row to another. This can improve the readability of rotated bar codes.

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.

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

```
60100584  P2.041
S/N:  80400620
COMM: 9600,N,8,1
DARKNESS: COARSE=3 FINE=200
MEDIA ADJUSTMENT: 3300
INCHES PRINTED: 000004153
PRINT SPEED: NORMAL
INDEX: BAR,0,3,31,29,0144,200,218
PRINT MODE: TT
LAST LABEL TEAR-OFF: OFF
STX = 02  ETX = 03  ESC = 1B
NULL = 00  OFFLINE = 40
COMMAND GROUP: 1 1111
MEM SLOT 1: 0 BYTES INSTALLED
MEM SLOT 2: 0 BYTES INSTALLED
PITCH OFFSET: 6 mm
```

Special Notes   1.   When the printer finishes printing the Test Label, it is in the hexadecimal print mode. This mode is used for diagnostic troubleshooting and lists the current status of the printer configuration,

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: 0 for CT200DT Models
	1 for CT200TT Models

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

1. 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.

2. This command is ignored for direct thermal (DT) models. These units are automatically set in the DT mode.

Set RS232 Parameters

Command Structure
<ESC>**CRaaaaa,b,c,d**
aaaaa =   Baud Rate (2400, 4800, 9600 or 19200)
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 communications 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 this 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 printer settings.

Set Sensor Type

Command Structure   <ESC>**CIa**

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

        Example: <ESC>**CI1**

        Placement: This command should be sendt 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   Theres is no printer output as a result of this command.

Special Notes   1.   The reflective Eye-Mark, label gap or notch must be a minimum of .125" wide and extend 0.85" from the left (facing the printer) edge of the label backing.

Backfeed Enable

Command Structure   <ESC>**CEa**
a   =   0   Disable Backfeed
              1   Enable 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   Theres 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.