

MODEL 322M

DIRECT THERMAL PRINTER

OPERATOR'S MANUAL

PART NUMBER 880022-0106

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Figure 1 322M Front Angled View

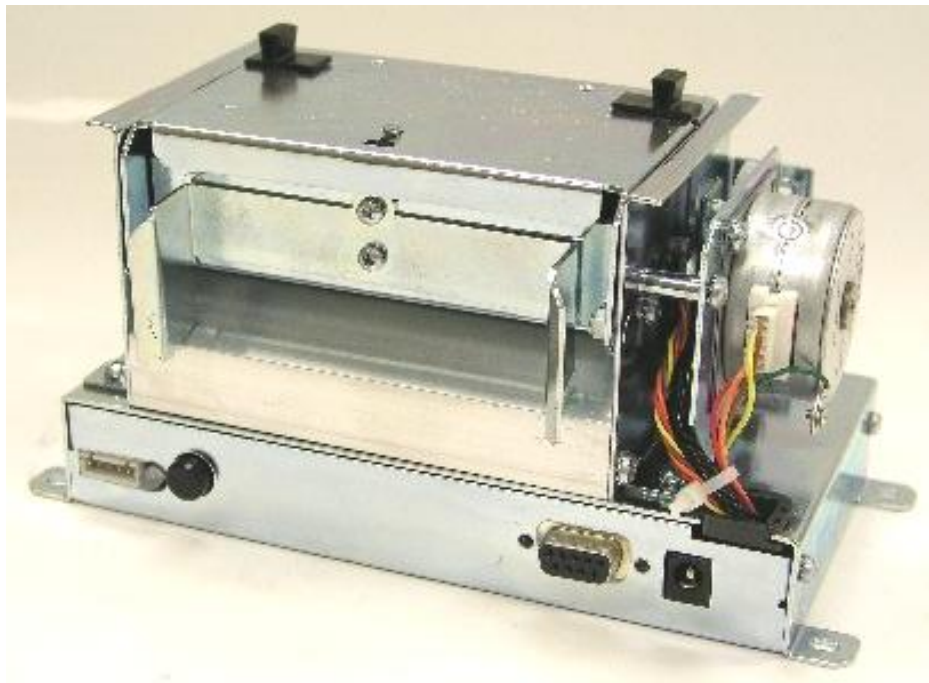


Figure 2 322M Rear Angled View

Introduction

The Model 322M is a high performance Direct Thermal open frame printer that is economically sized and priced to fit everyone's budget. The extensive list of standard features combined with an easy to operate and maintain design provides continuous and reliable printing at true high volume throughput. The Model 322M comes equipped with a high resolution (575 dots, 8-dots/mm) thermal printhead with a print width of 2.83".

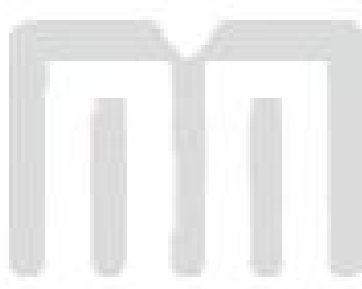
The resident Label Design Software (LDS) is a powerful and easy-to-use control language that allows the creation of custom label formats. The software is ASCII text based and can be interfaced to PC's, mini-computers, main frames and other special purpose machines. The LDS uses thermal dots as the unit of measure. All commands and parameters, unless noted otherwise, should be entered using dots. The conversion values for the printer are 8 dots per millimeter, 203 dots per inch or 0.0049" per dot. For example: To enter the width of a label that is 2" wide, the value entered would be 406 (2" X 203 = 406).

Among many other features, LDS supports downloadable graphics and fonts, serial numbering, flexible character spacing, reverse video, resident fonts and many of the most popular bar code symbologies. Bitmapped fonts, bar codes, and graphic images can be multiplied in size in the X and Y directions while being printed in 0, 90, 180, and 270 degree rotations. Graphic images and custom designed label formats can also be stored in the printer's memory for high-speed access and greater throughput performance.

The Model 322M is capable of printing on most types of labels, pre-print tickets, fax papers, and tag stocks. The printer is also capable of detecting many registration marks such as: media that contain die-cut, blow-hole, black-line sense marks and continuous rolled stock as well. The printer also provides three different cutter types, which include a full guillotine, full/partial guillotine and rotary cutter. These cutter options provide a means of cutting media of varying thickness to handle even the most demanding applications.

Many printer applications use the same label format, but change the data on every label. This is not a problem for the 322M printer. Data may be changed without downloading the same fixed format or fixed data field, time after time. This, along with the available serial communication speeds, increases data access time and productivity providing the user with high performance for a low cost.

Contact Microcom Corporation regarding the availability of Windows® drivers and WYSIWYG (**What You See Is What You Get**) software packages that allow quick and easy on-screen label designing.



Chapter 1: Printer Specifications

1.1 General Specifications

Width	7.63" (194mm)
Height	4.0" (102mm)
Depth	3.63" (92mm)
Weight	3.5 lbs. (1.6 kg)
Electrical	Universal +24 VDC
Current	3 Amps maximum
Temperature	40° F – 104° F (5° C – 40° C) Operating
Humidity	10% – 85%, non-condensing
SRAM Memory	512K bytes
Flash Memory	512K bytes
Agency Approvals	CUL, CE, and complies with FCC Class A.
RS-232D Serial	RS-232D, 9 pin D-Sub connector (DCE)
Flow Control:	XON, XOFF, and CTS
Baud Rates:	110 to 115200
Parity:	Odd, Even, and None
Data Bits:	7 or 8

Table 1 General Specifications

1.2 Printing Specifications

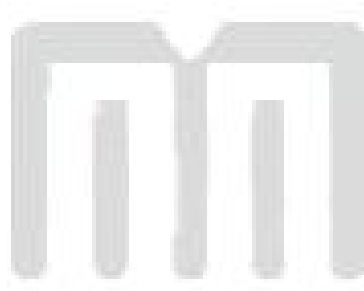
Print Type	Direct Thermal
Print Resolution	203 DPI (8 dots/mm or 0.0049" per dot)
Maximum Print Speed	6"/sec. (152mm/sec.)
Maximum Print Width	2.83 inches or 575 dots (72mm) 3.15" or 640 dots (80mm) – When used with the Heavy Media Printing Option
Print Length	50" (1270mm) using standard memory

Table 2 Printing Specifications

1.3 Media Specifications

Media Types	Continuous, die-cut, preprinted and tag stock either rolled or fanfold.
Maximum Media Thickness	.006" (.15mm)
Maximum Media Width	3.5" (89mm)

Table 3 Media Specifications



Chapter 2: Features and Options

2.1 Fonts

- 7 smooth bitmapped alpha-numeric fonts from 6pt to 14pt including OCR-A and OCR-B.
- Converted HP LaserJet™ and/or TrueType® font capability.
- All bitmapped fonts expandable in height and width.
- Reverse image printing.
- Rotated: 0 °, 90 °, 180 °, and 270 °.

2.2 Graphics

- Resident Lines feature.
- Storage of fonts, label formats and/or graphics in battery backed memory.
- Converted PCX and BMP images.
- Rotated: 0 °, 90 °, 180 °, and 270 °.

2.3 Bar codes

- *One-dimensional:* Code 39, Interleaved 2 of 5, Code 128 (A, B, C and Auto), Code 93, Codabar, Modified Plessey, UPC-A, UPC-E, EAN 8, EAN 13, UCC/EAN 128, and Postnet.
- *Two-dimensional:* PDF-417 and Maxicode.
- Rotated: 0 °, 90 °, 180 °, and 270 °.
- Expandable in height and width.

2.4 Special Features

- High performance for a Low cost.
- Rotating head mechanism for easy print head cleaning.
- Adjustable media guides for easy label centering or custom fixed guide brackets.
- Software controlled contrast adjustment.
- Detects label gap, blackline, and blowhole using reflective and transmissive sensors.
- Field incrementing, decrementing and serialization.
- Downloadable fonts and graphics (with data compression).
- Internal statistical counters for inches and labels printed.
- Remote printer interrogation.
- Automatic detection for optional cutter types
- Two types of mounting methods for kiosk installation flexibility.

2.5 Options

- 3" (76.2 mm) Full or Full/Partial Guillotine cutter available.
- 3" (76.2 mm) Rotary cutter available.
- +24 VDC Universal Power Supply.
- User configurable sensor (Input 1).
- Label Present Sensor (LPS)
- Heavy Media Printing.
- Printed Media Presenter (PMP).
- Cleaning kit.

Chapter 3: Getting Started

3.1 Unpacking and Inspection

The printer has been packaged to help reduce the damage that may occur during the shipment of product.

Inspect the shipping container(s) for signs of damage. If damage is evident, contact the shipping company immediately to file a damage claim.

After the printer is removed from the container(s), verify that all the parts purchased are present and in good condition (see Figure 3).

The packaging material and shipping container(s) should be kept and used if the printer is to be shipped. Additional shipping materials can be ordered by contacting the Microcom Corporation Service Department.

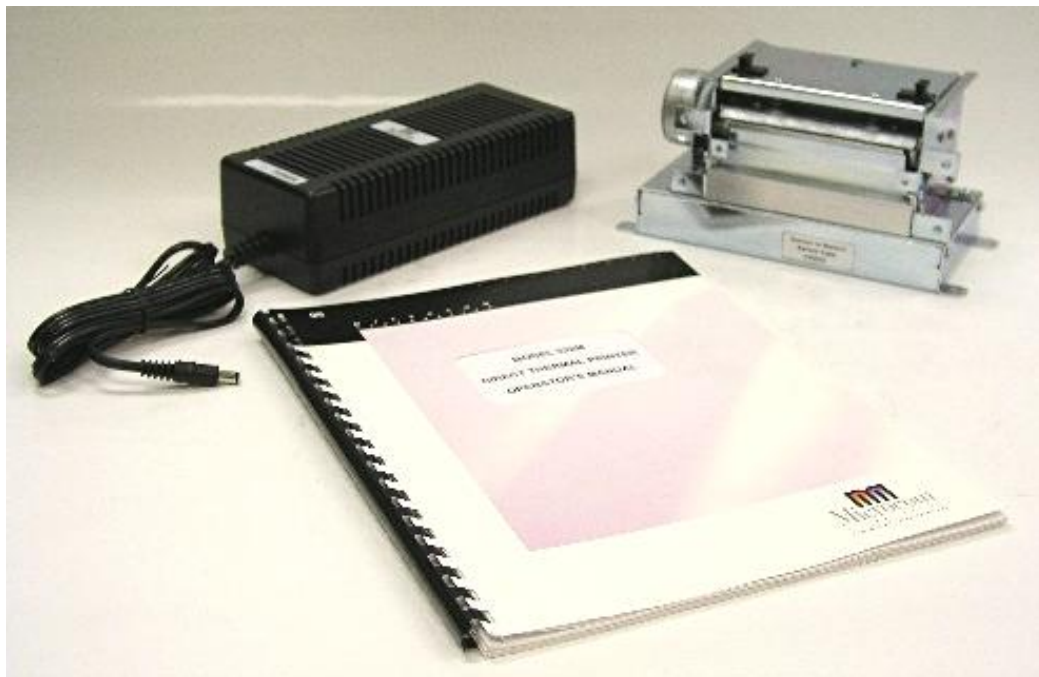


Figure 3 Typical Printer Accessories

3.2 Connecting the Printer

Refer to Figure 4 for proper connections.

3.2.1 Printer Power

Microcom Corporation offers a universal power adapter as an option for the Model 322M. Any power adapter that conforms to the necessary specifications, listed below, may be used. The printer requires a universal +24VDC power supply that operates in the 100-240 VAC; 50-60 Hertz range; 2 Amps. The power adapter should operate in an “output foldback mode” during an overload situation rather than a shutdown and restart attempt; sometimes referred to as a “hiccup” mode. Contact your Microcom Corporation representative for any questions regarding power adapter requirements and/or specifications.

AC Input:	100-240 VAC, 50/60HZ, 2A
DC Output:	+24V @ 0.2 ~4.16A +/- 5%
Power Rating:	45 to 60 Watts
Overload Protection:	Output Voltage Foldback Mode
Maximum Transient Load:	12 cycles @ 2.1ms rep. rate; 35A, 650µs pulse
Printer Power Connector:	Standard 2.5mm Barrel Jack

Table 4 Power Adapter Specifications

Note: Verify that the power adapter jack is plugged into the printer before plugging the power cord into an electrical outlet.

3.2.2 RS232 Serial Communication Interface

The 322M can be interfaced to PC's, mini-computers, main frames, and special purpose machines. This printer offers a standard serial RS-232D port. The factory serial port configuration is set to 9600 bits per second, no parity, 8 data bits, and 1 stop bit with both hardware and software flow control hand-shaking enabled. Refer to Chapter 4 for additional information.

3.2.3 Optional Cutter Interface

The 322M also provides a connector on the rear panel for the optional cutter interface. Use this connector (see Figure 4) when a cutter is installed on the printer. To prevent damage to the printer and/or cutter, connect the cutter when the printer power is off.

3.3 Loading Media

The easy to release printhead makes loading media into the Model 322M printer an easy process. Follow the instructions below to properly load the media.

1. Feed the media into the paper path (see Figure 4), located on the back of the printer, until you feel resistance.
2. Push and hold the Print Button to feed the media through the printer.
3. Once the media exits the front of the printer, release the button.

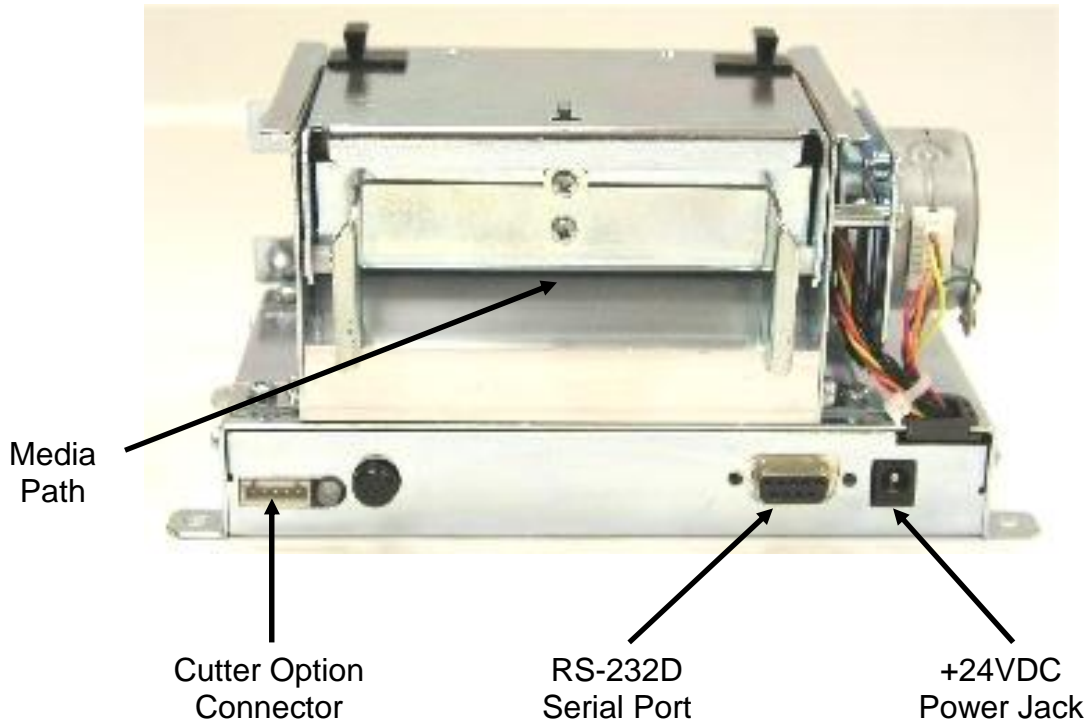


Figure 4 Connecting the Printer

3.4 Print Button and Status Indicator Light

The print button and the status indicator light (see Figure 5) are used to identify and perform many functions. This section provides a description to familiarize you with the basic function of the button and light.

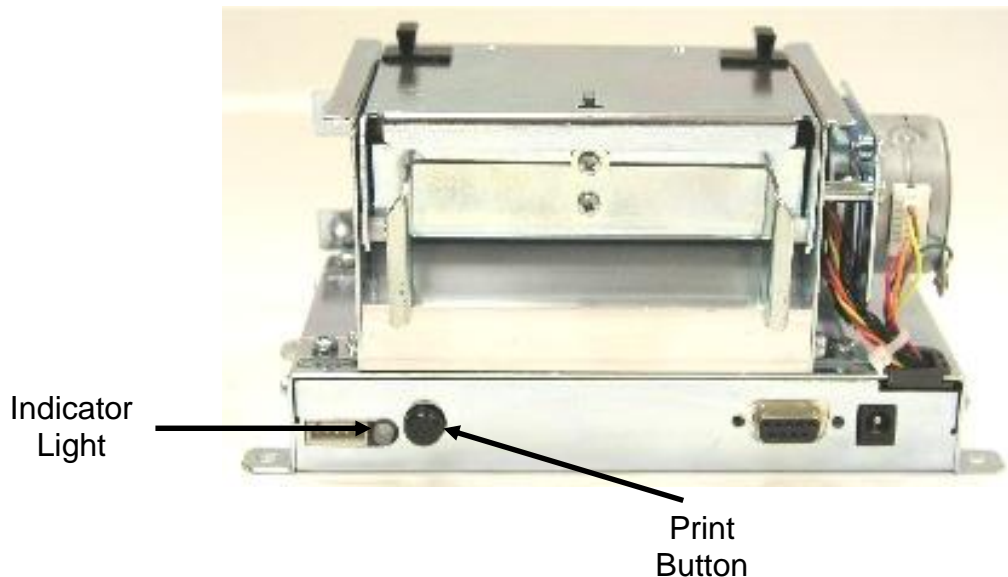


Figure 5 Print Button and Status Indicator Light

3.4.1 Print Button

Operation	Description
Printing a label	Press the print button while the printer is idle or paused will reprint the last label or after a cold start, a power up label will print.
Printer Pause	Press the print button while the printer is printing will cause the printer to enter the paused mode. Note: Press the print button again to continue printing.
Feeding Labels	Hold the print button down while the printer is idle to feed labels. The printer will continue feeding labels until the button is released.

Table 5 Print Button Description

3.4.2 Status Indicator Light

Light Color	Description
Solid Green.	Indicates that the power is on and the printer is in a ready state.
Solid Red.	Indicates an error has occurred. The printer will remain in this state until the condition is removed. If an unexplained error persists, contact your Service Representative. Note: Refer to Chapter 11: Troubleshooting for helpful hints.
Solid Amber.	Indicates that the printer has been paused, or a tag/tear mode has been enabled.
Flashing Red.	LED Flashes Red during a download indicates that the memory operation was not successful. Power Spike or low voltage on the AC line. The unit will remain in this mode until the condition is removed and the printer power is cycled.

Table 6 Status Indicator Light Description

3.5 Printer Modes

The printer has four primary modes of operation. The different types of modes have an impact on how the rear panel print button and indicator lights are treated. This section is intended to provide the user with an explanation of these different modes.

3.5.1 Idle Mode

Idle Mode is when the printer is not printing and has no pending activity. The indicator light is green, which indicates that the printer is ready to receive label formats and/or commands. The Print Button has a couple of different functions while in the *Idle Mode*. Pressing the button will reprint the last label or the power-up label if the printer was recently turned on and no formats were sent to the printer. Pressing and holding the button in, causes the printer to feed labels until the button is released.

3.5.2 Halted Mode

Halted Mode is when the printer has stopped due to an error condition that needs to be corrected. The indicator light will be solid red in color when the printer has entered the *Halted Mode*. The printer will remain in this mode until the error has been corrected and then cleared. Once the error has been cleared, the printer will attempt to execute the previous format and/or commands.

3.5.3 Paused Mode

Paused Mode is when the printer has pending activity and has stopped, but is not in an error condition. The indicator light is a solid amber color when the printer is in *Paused Mode*. The printer enters this mode when the rear panel button is pressed while the printer is printing. Pressing the button again causes the printer to resume. Another situation that causes the printer to enter the *Paused Mode* is when a Dispense command (^D97 and/or ^D98) has been enabled and the label is present. See these commands for additional information.

3.5.4 Diagnostic Mode

Diagnostic Mode temporarily powers up using factory default parameters while printing out the printer's current configuration on what is called the *Status Label*. This provides useful information that can be used to help diagnose and troubleshoot problems. The printer will use the factory default parameters until the printer has been reset using a soft reset or by cycling power. The printer will then return to the previous configuration that was in use before entering the *Diagnostic Mode*.

3.5.4.1 Entering Diagnostic Mode

To enter Diagnostic Mode, press and hold the rear panel button in while turning on the printer. Release the button after three seconds and the printer will enter Diagnostic Mode and print the Statistics label and print head test pattern.

3.5.4.2 Statistics Label

The printer prints the statistics label once the printer enters the Diagnostics Mode. When the statistics label is generated, the printer temporarily powers-up using factory default parameters. The statistical and configuration information represents the previous setup of the printer. The printer will return to the previous setup after a power cycle or upon receiving a soft reset command (^D32).

The Printed Labels field represents the number of labels printed to date and can be reset by the user. The Printed inches can also be reset by the user while the Total Inches field is set at the factory and is not user adjustable. The Printed Labels and Printed Inches are reset using the ^D29 command. Other useful information on the statistics label include the printer's serial number, power-on hours, serial parameters, soft switch bank configurations, firmware revision, and cutter information if installed. Refer to Chapter 6 for additional information regarding the soft switch bank settings.

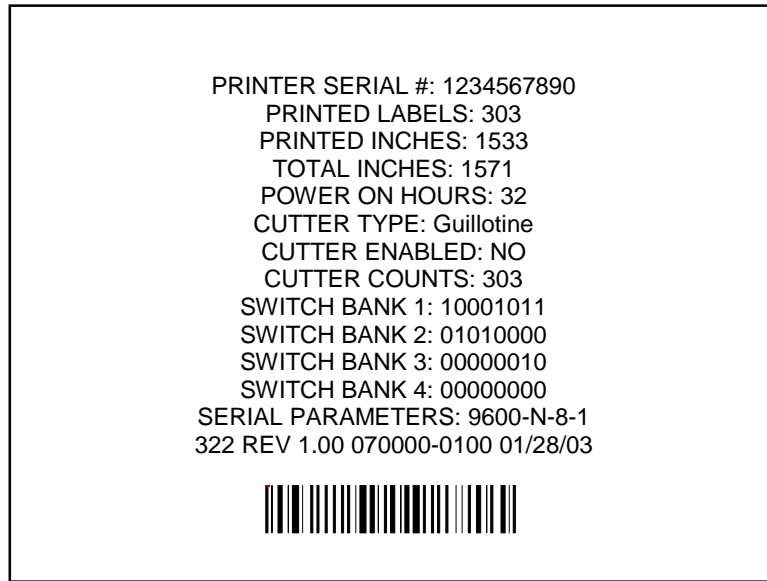


Figure 6 Statistics Label

Chapter 4: Communication

4.1 RS-232D Serial

The printer provides a 9 pin female D-Sub connector, on the rear panel, for RS-232D serial communication. The printer is configured as DCE (Data Circuit-terminating Equipment) so a NULL modem cable is not necessary. A serial data cable is required to use serial communications, refer to Table 7 below for correct cable configurations.

The factory settings, unless otherwise requested, are set at 9600 baud, 8 data bits, 1 stop bit and no parity with both hardware and software handshaking enabled. The baud rate is user selectable from 1200 to 115,200 and uses software XON/XOFF flow control and/or hardware CTS handshaking.

9 to 9 Pin Cable				9 to 25 Pin Cable			
State	322M DE-9 Pin #	Signals / Direction	PC DE-9 Pin #	State	322M DE-9 Pin #	Signals / Directions	PC DB-25 Pin #
XX	1	DCD → DCD	1	HI	1	DCD → DCD	8
XX	2	TXD → RXD	2	XX	2	TXD → RXD	3
XX	3	RXD ← TXD	3	XX	3	RXD ← TXD	2
HI	4	DTR → DSR	4	HI	4	DTR → DSR	20
LO	5	GND ↔ GND	5	LO	5	GND ↔ GND	7
HI	6	DSR → DTR	6	HI	6	DSR → DTR	6
DC	7	RTS ← CTS	7	DC	7	RTS ← CTS	4
XX	8	CTS → RTS	8	XX	8	CTS → RTS	5
HI	9	+5V ↔ +5V	9	HI	9	+5V	-
DC = DO NOT CARE				XX = INDETERMINATE			

Table 7 RS-232 Cable Configurations

If XON/XOFF handshaking is used, the only signals that the printer requires are the RXD, TXD, and GND signals. If the hardware handshaking is used the CTS and RTS signals are required. The other signals are offered in the event that the host computer would require them.

4.1.1 RS-232 Printer Cables

The printer uses a standard through serial cable, typically referred to as a modem cable, which may be purchased through Microcom Corporation or a local computer supply company. A NULL-modem cable is not required because the printer is configured as DCE.

For a 25-pin serial communication port – Use a 25-pin female to 9-pin male cable.

For a 9-pin serial communication port – Use a 9-pin female to 9-pin male cable.



CAUTION: Connection of a serial port to a parallel port may result in damage to the printer and / or computer.

Chapter 5: Designing Labels Using LDS

Label Design Software (LDS) refers to the control language resident in the printer used to create labels. All bitmapped fonts, character sets and bar codes are resident in the printer. Additional fonts and graphic images may be sent from a host and stored in the printer's memory.

A label format is produced by a series of 5 steps:

1. Control commands to define printer operation.
2. A format header to define the label height, width, print speed, etc...
3. Field data that defines the placement of text, bar codes, graphics or lines.
4. Actual text data to place in the Field data strings.
5. Control commands to initiate printing.

5.1 Control Characters

Throughout this manual there are references to control characters. In order to print them in this manual, they have been written using standard characters and icons. Escape characters are represented by <ESC> and a carriage return is represented by <CR>. It is important to note that all printer functions, unless otherwise noted, must be followed or terminated with a carriage return (<CR> or HEX OD).

5.2 LDS Design Exercises

There are many different machines capable of sending information to the printer including main frames, mini-computers, special purpose computers and PC's. For the purpose of simplicity, the design exercises contained in this manual will use one of the easiest methods by using an IBM compatible PC and a VT-100 terminal emulation software program. This method of connection will allow two-way, serial communication with the printer.

Items required:

- A computer with at least one unused serial communication port (COM1, COM2...).
- A serial interface cable (see section 4.1.1).
- A VT-100 terminal emulation program such as HyperTerminal™.
- A text editor that does not add formatting characters such as Microsoft® Notepad.

5.2.1 PC Connection (Serial)

The printer ships with serial communication parameters set to 9600 bits per second, no parity, 8 data bits, and 1 stop bit (9600-N-8-1). This means that for proper communication, the PC's communication port will have to be set to these parameters. If a terminal program is not available, it is possible to send files to the printer using the DOS COPY (for example: C:\>COPY FILENAME COM1) command. When using DOS, it is a good idea to set the communications port up using the DOS MODE (for example: C:\>MODE COM1:9600,n,8,1,p) command before copying the files to the port. Create a text file, enter “^D3” <CR> (carriage return) and save it as “D3.txt”. Send the file to the printer by either

using the DOS COPY (C:\>copy d3.txt com1) command or by using a terminal program (see Figure 7).

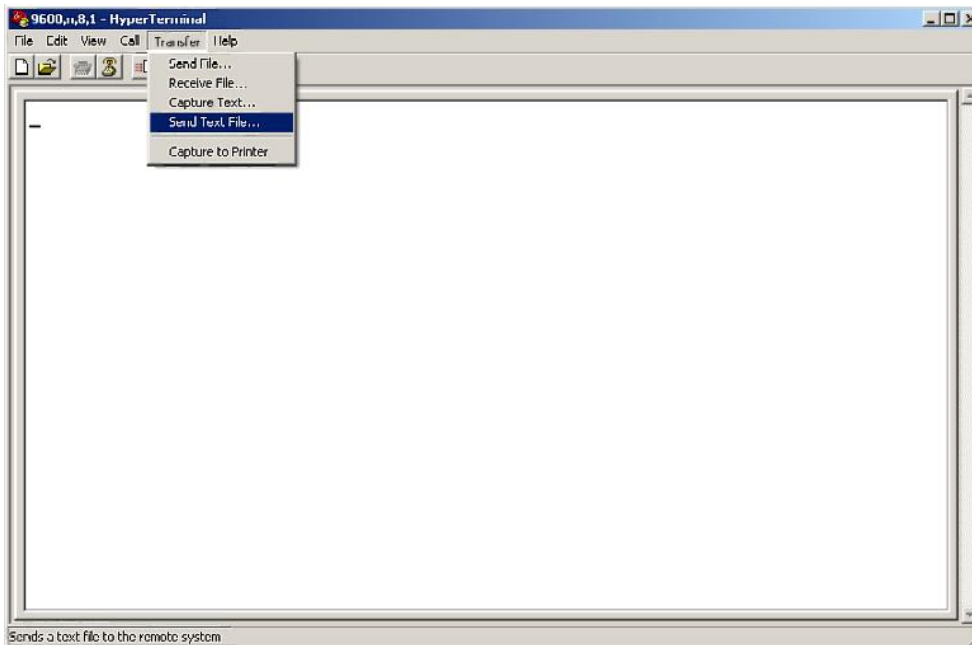


Figure 7 HyperTerminal™ Window Example

5.2.2 Format Creation

Special Control code functions (see section 6.1) and/or label formats may be entered directly through the keyboard but is not the most efficient method if entering a large amount of data or numerous commands. Large formats and/or numerous commands should be entered in an ASCII text editor and then uploaded to the printer. Microsoft® Notepad has is used for the creation of label designs contained within this manual because it is simple to use and does not add formatting characters.

The LDS uses thermal dots as the unit of measure. All commands and parameters, unless noted otherwise, should be entered using dots. The conversion values for the printer are 8 dots per millimeter, 203 dots per inch, or 0.0049" per dot. For example: To enter the width of a label that is 2" wide, the value entered would be 406 (2" X 203 = 406).

The printer can accept either the one-character control code ("Ctrl + E" (HEX05)) or the two-character caret (^) plus alpha character ("^E"). In other words, for a PC keyboard, the same command can be generated either by holding down the "Ctrl" key and pressing the alpha character or by entering the two characters; the "^" (the character generated when you press the "Shift" key and the "6") plus the alpha character. See Chapter 5 for additional information regarding control codes and printer commands.

There are some special features offered by the printer that assist in label design. For example, the auto-size command (^A2^D39 <CR>) provides most of the header format information needed to define the different properties of the media being used. The current state of the printer is accessed through the enquiry command (^D5 <CR>, Ctrl E, or 5 NULL characters (HEX 00) if binary compression has been enabled). The statistical

information of the printer is made available through the use of the `^A0^D29 <CR>` or more simply `^D29 <CR>` command.

The following sections of this chapter are intended to provide the user an overview of the LDS language. The overview will include information regarding the label format, header definition, and list the different types of field information available. The combination of these sections and Chapter 5 should provide the user with the information required for easy format creation and printing. Once some understanding of these basis concepts are achieved, use the Quick Reference Guide in Appendix C for expedient label design.

5.3 Label Design: An Overview

A label format consists of a header record and field records, followed by the text data to be printed. The records describe how the label is to be printed. The header contains information about the label itself such as label height, width, print speed, etc. The field records refer to the data section and contain information about positioning coordinates, and the type of character generation such as text, graphics, bar codes, etc. The number of fields is limited only by the amount of free memory available.

Below is a sample label format. We will refer to this format as we break down the steps and components to produce the format. Refer to Figure 8 for a printed representation.

<code>^D57 <CR></code>	A label format is coming.
<code>5,575,609,,25,35,0,1,285,0,0 <CR></code>	Header Information.
<code>1,300,500,8,1,5,0,4,2,2,,,,,0 <CR></code>	Field #1 format information.
<code>2,300,400,11,1,5,0,4,2,2,,,,,0 <CR></code>	Field #2 format information.
<code>3,300,300,26,1,5,0,4 <CR></code>	Field #3 format information.
<code>4,300,200,6,1,5,0,4 <CR></code>	Field #4 format information.
<code>4,300,100,6,16,3,,4,3,75 <CR></code>	Field #4 format information.
<code>^D56 <CR></code>	Select RAM format.
<code>^D2 <CR></code>	Text data is coming.
<code>Microcom <CR></code>	Text data string #1.
<code>Corporation <CR></code>	Text data string #2.
<code>Thermal Printing Solutions <CR></code>	Text data string #3.
<code>012345 <CR></code>	Text data string #4.
<code>^D3 <CR></code>	Print label.

The command `^D57<CR>` on the first line informs the printer that a format is coming and causes the printer to enter the format entry mode.

The next line is the header information that sets the label size and other pertinent information.

The next five lines are layout and configuration for each data field in the format.

The command `^D56<CR>` selects the user's layout or more simply the end of the formatting information.

The command `^D2<CR>` instructs the printer to start accepting data for each of the defined field's strings that are entered into the previous format received (between the `^D57` and

^D56 commands). Field #1 defines the placement and configuration for Text Data String #1; Field #2 defines the placement and configuration for Text Data String #2, etc... The label is printed from the bottom left corner to the top of the label.

The next three lines are the text data for the associated field format lines.

Text Data String #4 is being accessed twice. The format places the Text "012345" on the label and then is accessed again placing a Code39 symbol representing "012345" on the label.

The command ^D3<CR> instructs the printer to print.

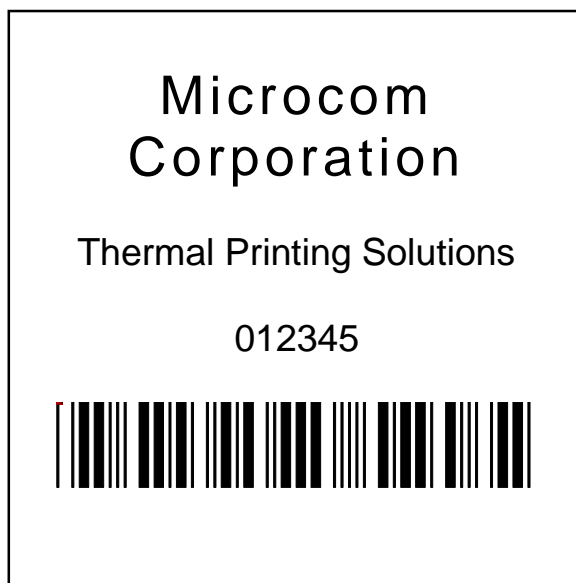


Figure 8 3x3 Sample Label

The sample label design (Figure 8) is based on a label that is 3" x 3". You will notice that the header value that determines the LSX (Label Size X direction) or width is set to "575" (or 2.83"), this is the maximum print head size of the Model 322M printer and should always be used for the LSX size. The following chapters will go into greater detail about the header and field format parameters as well as a more in-depth description on their functionality.

5.4 Label Header

The label header consists of eleven parameters that control the media layout as well as printer configuration. A comma (,) delimiter is used to separate the different parameters and a carriage return is required to terminate the header. If a parameter is left blank, then a default value will be used. Some parameters, for the Model 322M, are required for proper operation and should always be included in the script header. These required parameters are listed in the individual descriptions below.

The value of measurement for many of the header elements is a thermal dot or pixel. The conversion values for the printer are 8 dots per millimeter, 203 dots per inch, or 0.0049" per dot. For example: To enter the width of a label that is 2" wide, the value entered would be

406 (2" X 203 = 406). There is a maximum of 575 dots in the X direction (width), while the Y direction (height) is virtually unlimited with the standard print head. The auto-size command (^A2^D39 <CR>) provides most of the header format information needed to define the different properties of the media being used. This provides a good starting point in determining the proper values.

Below is a list of the header element mnemonics and their default values:

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY
0, 832, 614, 13, 24, 35, 0, 1, 285, 0, 0

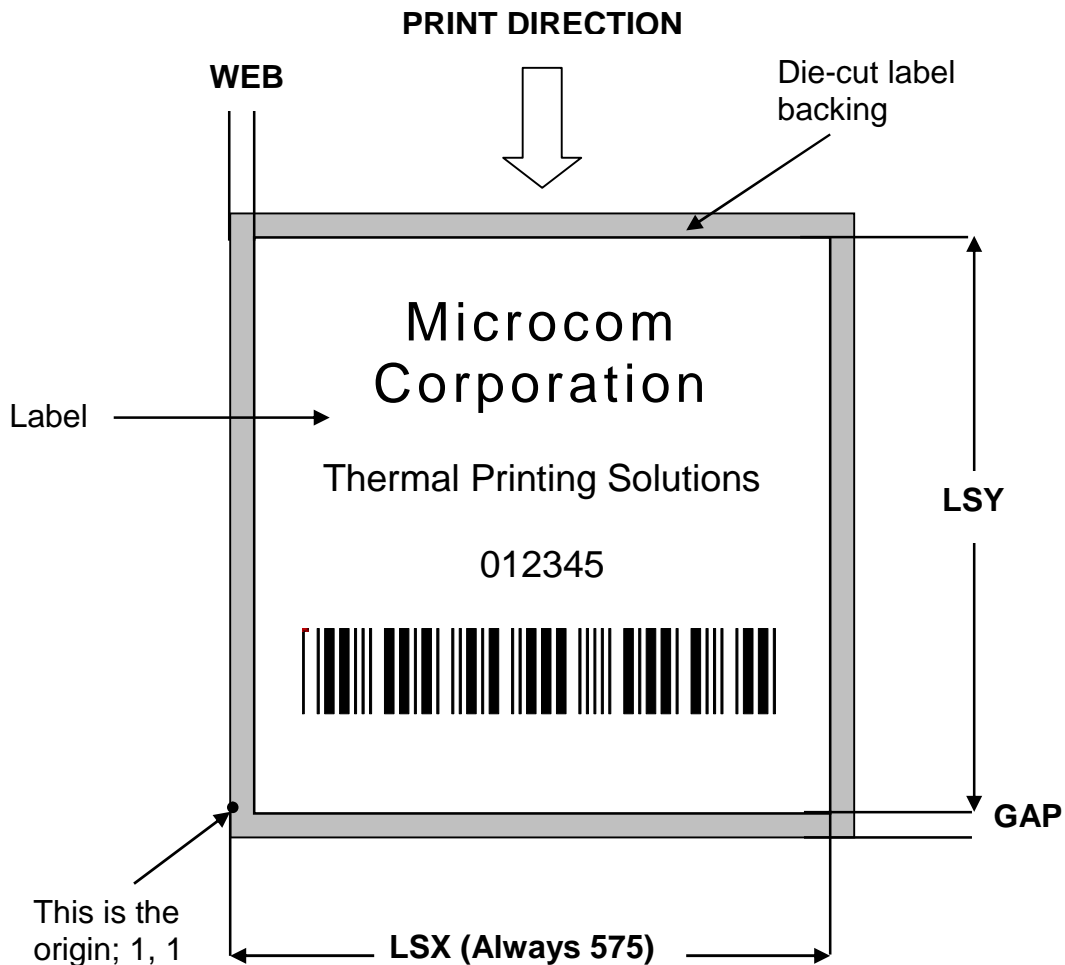


Figure 9 Header Elements

5.4.1 HFM (Number of Fields in Layout)

This parameter is used to specify the number of fields in the layout. If more format fields are defined than specified in the HFM parameter, they will be ignored and will not print. The HFM was set to a value of 5 in the format used to create the sample in Figure 8. This means that a total of five format fields are to be generated. If the HFM was changed to 4, only the first four format fields would be generated.

5.4.2 LSX (Label Size X)

This parameter is used to specify the width of the label using dots as the unit of measure. The maximum width of the LSX parameter is the width of the printhead. LDS has been specifically designed for use with a print head that is 4" in width. The Model 322M printer has a print head width of 2.83" or 575 dots. For proper print registration the LSX should always be 575 when using the Model 322M printer.

5.4.3 LSY (Label Size Y)

This parameter is used to specify the height of the label using dots as the unit of measure. The maximum height is virtually unlimited and is dependant on the memory available in the printer as well as the intensity of the label design. The sample used to generate Figure 8 has the LSY set to 609 or 3" (609/203 = 3).

5.4.4 WEB (Web Size)

The WEB parameter is the width, measured in dots, of the webbing or backing material that is found on the left side of the label. This parameter is used to introduce an offset to accommodate the backing of die-cut media. The Figure 8 sample does not have a value for the WEB parameter so the default of 13 would be used.

5.4.5 GAP (GAP Size)

This parameter is the height distance, measured in dots, of the registration mark used to identify the media size. This is the backing material found between die-cut labels, blowhole sense mark, and/or blackline height. The default value of 24 will be used if a value is not entered in the GAP parameter. The Figure 8 sample has a value of 25 or 0.123" (25/203 = 0.123).

5.4.6 DPS (Print Speed)

This parameter is used to set the speed the printer will print, referred to as print speed. Refer to Table 8 for the list of print speeds, DPS values, and inches per second values. The printer has a default speed of 2 inches per second (IPS) which is a DPS value of 35. To print at greater speeds, change the DPS value to a lower setting as shown on Table 8. Generally, better print quality is achieved by printing at lower speeds, however this is also dependant on the media and contrast settings as well.

Labels per minute can be calculated by the equation below:

$$\text{Labels per Minute} = \frac{\text{IPS} \times 60 \text{ seconds}}{\text{Label Height}}$$

PRINT SPEED			
DPS VALUE	MM PER SECOND	INCHES PER SECOND	INCHES PER MINUTE
25	76.8	3.0	180
26	74.2	2.9	174
27	71.7	2.8	168
28	69.1	2.7	162
29	66.6	2.6	156
30	64.0	2.5	150
31	61.4	2.4	144
32	58.9	2.3	138
33	56.3	2.2	132
34	53.8	2.1	126
35	51.2	2.0	120
36	48.6	1.9	114
37	46.1	1.8	108
38	43.5	1.7	102
39	41.0	1.6	96
40	38.4	1.5	90

Table 8 DPS Values

5.4.7 LCB (Label Control Byte)

This parameter selects the method the printer uses for detecting registration marks on the different media types. The Model 322M has both upper (transmissive) and lower (reflective) gap detectors as standard equipment. The following sections discuss the LCB settings for the different media types.

5.4.7.1 Die-Cut and Blow-Hole Media

A selection of “0” in the LCB parameter instructs the printer to detect the leading edge of the label or Blow-Hole to identify the start of the next label. This method uses both the upper and lower sensors for a type of detection referred to as transmissive. When using media that contains a blow-hole, the software switch 4 (^D24 command) will have to enable “Blow-hole Sensing” for proper stock out detection.

5.4.7.2 Black Line Media (Transmissive)

The Transmissive Black Line method is used when media using a black line for a registration mark and transmissive detection is desired; a “1” should be entered in the LCB parameter. This setting will detect the leading edge of the black line by using both upper

and lower sensors. This method may be used, it is however not the preferred method for detecting media containing a black line. See Black Line Media (Reflective) below.

5.4.7.3 Continuous Media

If the LCB parameter is set to a value of “2”, the printer will not search for a registration mark. The gap detectors are only used for stock out conditions when set for continuous media types. The printer will print all fields that contain data and then advance the media by the amount specified in the SPG parameter of the header when the default AGD of “1” is entered in the header. This means that fields that are left blank or text data for the associating format fields are left empty will not print.

For example: Imagine a receipt format that contains 100 lines. If data is provided for the first 50 lines, the printer will not advance for the remaining 50 lines that have been left blank. The printer would stop immediately after printing the 50th line and then advance the media by the amount specified in the SPG header parameter.

When the AGD header parameter is set to “0”, the printer will advance the same amount of media even when text data fields are left blank. In this case, the advance distance is determined by adding the SPG parameter and LSY parameter values.

For example: Imagine the same format as mentioned above that has a LSY value of 609 (3” x 203 = 609), an SPG value of 285, and an AGD value of “0” that contains 100 format lines. If text data is provided for the first 50 lines and the remaining 50 lines are left empty, then the printer will print the first 50 lines, advance the next 50 lines, advance the remaining LSY value, and then finally advance the SPG or 285 dots. Regardless of the format fields, if the LSY is set to 609 and the SPG is set to 285 the printer will advance a total of 881 dots (609+285=881).

5.4.7.4 Black Line Media (Reflective)

The Reflective Black Line method is used when media using a black line for a registration mark and reflective detection is desired; a “3” should be entered in the LCB parameter. This setting will detect the leading edge of the black line by using the lower reflective sensor. This method is the preferred method for detecting media containing a black line and should be used when possible.

5.4.8 AGD (Activate Gap Detector)

This parameter sets the number of steps (dots) that the printer will advance with detection of registration marks or gaps disabled. This value has a default of “1” and is generally used. It should not be defaulted when the LCB is set to continuous media and the form or label size is desired to stop after the last printed data (see section 5.3.7.3 Continuous Media).

Another situation where the AGD should not be defaulted is when using media that contains a heavy concentration of pre-print or gaps that may cause false detection of a registration mark. If this is the case, the value entered for the AGD parameter should be the distance from the registration mark to the trailing edge of the pre-print or gap that could cause false detection.

5.4.9 SPG (Steps Past Gap)

This parameter is used to specify the number of steps (thermal dots) to advance the media after a registration mark has been detected. This parameter is required to properly position the next label to the dot row. The proper SPG setting for the Model 322M printer is “285” for

media that contains an LSY value greater than “285”. For media that has a LSY value less than “285”, the SPG will need to be calculated.

If the label height is greater than or equal to 285 then the SPG = 285.

If the label height is less than 285, subtract (LSY+GAP) from 285 until the answer is negative, then add (LSY+GAP) until the result is positive again. Subtract the AGD value and the result will be the proper SPG value.

5.4.10 OFX (Offset X Direction)

This parameter is used to move or offset all format fields in the X direction without altering the format fields coordinates themselves.

5.4.11 OFY (Offset Y Direction)

This parameter is used to move or offset all format fields in the Y direction without altering the format fields coordinates themselves.

5.5 Sample Header

This is the header for the format used to generate the printed sample in Figure 8 followed by a summary of the header values.

5, 575, 609, ,25 ,35 ,0 ,1 ,285, 0, 0 <CR>

5	=	5 format fields are following the header.
575	=	Label width (LSX) of 575 ($575 / 203 = 2.83$ ”).
609	=	Label height (LSY) of 609 ($609 / 203 = 3$ ”).
, ,	=	Default WEB value of 13 will be used.
25	=	GAP between labels of 25 ($25 / 203 = .123$ ”).
35	=	Print speed (DPS) of 35 = 2 inches per second.
0	=	LCB of 0 for die-cut labels.
1	=	AGD of 1 step.
285	=	SPG of 285 for proper placement of the next label.
0	=	No X offset.
0	=	No Y offset.
<CR>	=	A carriage return must follow the header.

5.6 Label Format Fields

The Label Format Fields are used to define the characteristics, placement and representation of the corresponding text data of the individual fields. A format field is broken down into many different parameters. It is not necessary to enter values for all of the parameters (default value will be used if a parameter is left blank) but each parameter must be separated with the comma delimiter (“,”). A carriage return must follow each format field for proper operation to occur. The values entered must be positive integers for all of the parameters of the format field.

Below is a list of the format field element mnemonics and their default values:

TSN, XB, YB, CC, TCI, CGN, FO, FJ, CMX, CMY, CS, TSP, , , AN
1, 0, 0, *, 1, **, 0, 0, 1, 1, *, 1, , , 0

* The default value depends on the character generator (CGN) used.

** The default value depends on the text conversion identifier (TCI) used.

5.6.1 TSN (Text String Number)

The parameter determines which line of text data will be used for formatting. This allows for more than one field to use the same text data. A TSN of “1” accesses the first line of data. A TSN of “2” accesses the second line of data, and so forth. The text data is the text that follows the “^D2<CR>” command in the label’s layout. A graphic image field must point to a text string that contains at least one character. The maximum value for a TSN is 65536.

5.6.2 XB (X Beginning Coordinate)

The X coordinate of the field is measured in thermal dots. The far left edge of the label, as viewed from the front of the printer, is X coordinate “1”. There is no X coordinate of “0”. The X coordinates increase in size from the left to right. An XB of 203 would place the field one inch ($203/203 = 1$) from the left side of the label.

5.6.3 YB (Y Beginning Coordinate)

The Y coordinate of the field is measured in thermal dots. A YB of 1 would be the bottom edge of the label as viewed front the front of the printer. The Y coordinates increase in size from the bottom to the top of the label. A YB of 203 would place the insertion point one inch from the bottom of the label.

5.6.4 CC (Character Count)

This parameter determines the number of characters that will be used by the format field. If the number of characters in the selected text string is greater than the quantity specified by the CC, the remainder of the text string will be ignored. If the text string has less than the number specified by the CC, then only those characters defined by the text string will be printed. For example, the text string “character count” should have a CC of “15” including the space character. This parameter should be set to a value of “1” if the field is a graphic image.

5.6.5 TCI (Text Conversion Identifier)

The TCI parameter determines how the text string will be generated. The TCI is used to select text, bar codes, lines, downloadable font and graphics. The TCI values can be determined using Table 9 below. For example, a TCI of “1” for the text string data “012345” would print the text “012345” while a TCI of “15” would produce an I 2 of 5 symbology.

TCI VALUE	TCI DESCRIPTION
1	Regular Text (standard embedded fonts)
2	Text Surrounded by Asterisks
3*	Text with UPC-A / UPC-E Checksum Digit Added
6	Line Draw
8	Downloadable Fonts and Graphics
12	UPC-A Symbol
13	UPC-E Symbol (Send 11 Digits)
14	UPC-E Symbol (Send 7 Digits)
15	Interleaved 2 of 5 Symbol
16	Code 39 Symbol
17*	Text with UPC-E Checksum and Extended Bars Added
20	EAN-13 Symbol
21	EAN-8 Symbol
22*	Text with EAN-13 Checksum and Extended Bars Added
23*	Text with EAN-8 Checksum and Extended Bars Added
24	MSI 1 Symbol (Modified Plessey)
25	MSI 2 Symbol (Modified Plessey)
26	MSI 3 Symbol (Modified Plessey)
28*	Text with MSI Checksum Added – Type 1
29*	Text with MSI Checksum Added – Type 2
32*	Text with UPC-A Checksum and Extended Bars Added
33*	Text with UPC-A with Extended Bars Added
36	Postnet Symbol (Zip+4)
37	Postnet Symbol (Zip+6)
38	MaxiCode Symbol
40	Code 128 Symbol (Automatic Compression)
42	Codabar Symbol
43	Code 93 Symbol
44	AS-10 Symbol
50	UCC/EAN 128 Symbol
51	Text with EAN 128 Information

Table 9 TCI Values

* Refer to Section 9.3

5.6.6 CGN (Character Generator Number)

The CGN parameter is a numeric entry that determines the representation and size of embedded font and bar codes as well as the memory location of graphic images that have been selected by the TCI parameter.

5.6.6.1 Embedded Fonts

The Model 322M has seven resident Helvetica style embedded fonts that can be selected using the CGN when text is selected by the appropriate TCI value.

Embedded Bitmapped Fonts			
CGN VALUE	POINT SIZE	FONT TYPE	FONT SAMPLE
1	6	Swiss™721 Bold	6pt ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
2	8	Swiss™721 Normal	8pt ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
3	10	Swiss™721 Normal	10pt ABCDEFGHIJKLMNOPQRSTUVWXYZ
4	12	Swiss™721 Normal	12pt ABCDEFGHIJKLMNOPQRSTU
5	14	Swiss™721 Normal	14pt ABCDEFGHIJKLMNOPQR
7	12	OCR-A	ABCDEFGHIJKLMN O P Q R S T U V W X Y Z
8	12	OCR-B	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Table 10 CGN – Embedded Fonts

5.6.6.2 Downloadable Fonts and Graphics

When selecting downloadable fonts and graphics using TCI value of “8”, the CGN denotes the memory slot (1-255) where the font or graphic has been stored. See Chapters 7 and 8 for additional information regarding downloadable fonts and graphics.

For example: If you had stored a graphic into memory slot 1 (see Chapter 7 for additional information), the proper TCI would be “8” and the CGN value would be “1”.

5.6.6.3 Embedded Bar Codes

Certain bar codes can be printed using various ratios and character spacing options. The following table (Table 11) illustrates these options. See Chapter 9 for more detailed information on designing label formats using bar code symbologies. Some bar codes do not require a CGN value and should be omitted by entering the comma delimiter.

For Example: If a TCI of 40 is selected the CGN will be omitted by entering nothing for the CGN and surrounding the parameter with the comma delimiter.

1,200,200,10,**40**,,0,0,100,1

Bar Code Symbolologies					
SYMBOL	CGN VALUE	RATIO	HEIGHT	SPACING	FO **
Code 39	2	2:1	1	2	0123
	3	3:1	1	2	0123
	5	5:2	1	2	0123
	8	8:3	1	3	0123
I 2 of 5	2	2:1	1	-	0123
	3	3:1	1	-	0123
	5	5:2	1	-	0123
UPC / EAN *	-	40 %	1	-	0123
UPC Readable *	-	40 %	1	-	0123
Code 128 & UCC / EAN 128 *	-	40 %	1	-	0123
Codabar	2	2:1	1	-	0123
	3	3:1	1	-	0123
	5	5:2	1	-	0123
Code 93	-	2:1	1	-	0123
AS-10	-	2:1	1	-	0123
Maxicode (CGN = Mode)	2	-	-	-	0123
	3	-	-	-	0123
	4	-	-	-	0123
	5	-	-	-	0123
	6	-	-	-	0123
MSI (Modified Plessey)	-	1:1	1	-	0123

Table 11 CGN – Bar Code Symbolologies

* These Symbolologies must use the CMX or CMY multipliers by 2 to produce a 80% ratio.

** The “FO” field represents the available Field Orientation or print rotation. See section 5.6.7.

5.6.7 FO (Field Orientation)

This parameter defines the rotation of the format field on the label. The point of rotation is determined from the Field Justification parameter.

- 0 0 degrees (normal rotation)
- 1 180 degrees (upside-down rotation)
- 2 90 degrees (left rotation)
- 3 270 degrees (right rotation)

5.6.8 FJ (Field Justification)

This parameter defines the justification of the format field on the label.

- 0 Left Justified above the base-line
- 1 Right Justified above the base-line
- 2 Left Justified below the base-line
- 3 Right Justified below the base-line
- 4 Centered above the base-line
- 5 Centered below the base-line

Table 12 shows how to obtain the proper character placement or starting positions relative to the format field's orientations and justifications.

ROTATION	FIELD ORIENTATION and JUSTIFICATION
0 & 180 Degrees	0 – Left justified above the base-line 1 – Right justified above the base-line 2 – Left justified below the base-line 3 – Right justified below the base-line 4 – Centered above the base-line 5 – Centered below the base-line
90 & 270 Degrees	0 – Left justified above the base-line 1 – Right justified above the base-line 2 – Left justified below the base-line 3 – Right justified below the base-line 4 – Centered on the Y axis, right of X coordinate 5 – Centered on the Y axis, left of the X coordinate

Table 12 FO & FJ Character Starting Positions

5.6.9 CMX (Character Multiplier X Direction)

The CMX parameter multiplies each character in the X direction. The valid range is 1 to 65536. For bar codes with a FO of 0 & 180 degree rotation, the CMX would be the multiplier while the CMY would be the actual height in thermal dots. For bar codes with a

FO of 90 & 270 degree rotation, the CMX would be the actual height in thermal dots while the CMY parameter would be the multiplier.

5.6.10 CMY (Character Multiplier Y Direction)

The CMY parameter multiplies each character in the Y direction. The valid range is 1 to 65536. For bar codes with a FO of 90 & 270 degree rotation, the CMY would be the multiplier while the CMX would be the actual height in thermal dots. For bar codes with a FO of 0 & 180 degree rotation, the CMY would be the actual height in thermal dots while the CMX parameter would be the multiplier.

5.6.11 CS (Character Spacing)

This parameter adjusts the spacing between each character. If this parameter is omitted, then the default for the selected character generator (CGN) is used. The values (0-127) add dots while (128-255) subtract dots. For example, a value of 4 would insert 4 dots between the characters while a value of 131 would subtract 4 dots between the characters. Bar codes have default spacing according to the indicated multiplier. Multiplying a text string will not multiply the spacing between characters. This element may be used to properly space the characters to create the desired printed effect.

5.6.12 TSP (Text Starting Position)

This parameter marks the starting position of the character in the text string to be used as data. This is useful for allowing several fields to use sections of the same text string, minimizing the amount of data transmitted. For example, for the text string **0123456789**, a TSP of 5 and a CC (Character Count) of 2 would print **45**.

5.6.13 ,, (Reserved Spaces)

These are spaces reserved for future use and nothing should be entered between the comma delimiters.

5.6.14 AN (Attribute Number)

The AN parameter has four different effects. If set to a value of "0" the character spacing is proportional. Reverse Text (white on black) is created by setting the AN to a value of "1" and printing a black box on top of the text using the Line Draw function. (Special Note: The AN of the line field should also be set to a "1" for proper reverse imaging.) If the AN parameter is set to a value of "2", the character spacing will be fixed / non-proportional. A setting of "3" will print both fixed/non-proportional character spacing and reversed text.

0	Proportional Character Spacing
1	Reverse Video
2	Fixed / Non-proportional Character Spacing
3	Fixed / Non-proportional Character Spacing and Reverse Video

5.7 Line Draw

The Line Draw function uses ten different parameters to generate lines. The first position may point to any valid text string but it is a good idea to always use "1" to make troubleshooting formats easier. The next positions are the XB and YB or placement coordinates for the line. The following parameter is always left blank but is still surrounded by the comma delimiter. The next parameter is a TCI of 6 (Line Draw) followed by three blank or

empty positions. Then the XS and YS parameters are used to specify the x and y size of the line. Finally there is the AN or Attribute Number position. All fields defaulted must be separated by the comma delimiter and a carriage return must follow each Line Draw format field. All values for the Line Draw format line must be entered as positive integers.

The following is a list of the Line Draw field mnemonics and their default values:

TSN, XB, YB, ,, TCI, ,, , XS, YS, ,, , , AN
1, 1, 1, , 6, ,, , 1, 1, ,, , , 0

5.7.1 TSN (Text String Number)

The TSN parameter may point to any valid text string but it is a good idea to always use “1” to make trouble-shooting formats easier. The text string that the TSN is pointing to must contain at least one character in order for a line to print properly. A line will not print if the TSN is pointing to a blank text string.

5.7.2 XB (X Beginning Coordinate)

The X coordinate of the field is measured in thermal dots. The far left edge of the label, as viewed from the front of the printer, is X coordinate “1”. There is no X coordinate of “0”. The X coordinates increase in size from the left to right. An XB of 203 would place the field one inch ($203/203 = 1$) from the left side of the label.

5.7.3 YB (Y Beginning Coordinate)

The Y coordinate of the field is measured in thermal dots. A YB of 1 would be the bottom or first edge of the label as viewed front the front of the printer. The Y coordinates increase in size from the bottom to the top of the label. A YB of 203 would place the insertion point one inch from the bottom of the label.

5.7.4 ,, (CONSTANT FIELD)

This field is always defaulted (two commas) when printing lines.

5.7.5 TCI (Text Conversion Identifier)

The TCI is always set to a “6” when printing lines.

5.7.6 ,,,, (CONSTANT FIELDS)

The next three fields (four commas) are always defaulted when printing lines.

5.7.7 XS (X Size)

The parameter is used to set the X size of the line. The valid range is 1 to 575.

5.7.8 YS (Y Size)

The parameter is used to set the Y size of the line. The valid range is 1 to 65536.

5.7.9 ,,,,, (CONSTANT FIELDS)

The next four fields (five commas) are always defaulted when printing lines.

5.7.10 AN (Attribute Number)

The AN parameter has four different effects. If set to a value of “0” the character spacing is proportional if available. Reverse Text (white on black) is created by setting the AN to a value of “1” and printing a black box on top of the text using the Line Draw function. (Special Note: The AN of the line field should also be set to a “1” for proper reverse imaging.) If the AN parameter is set to a value of “2”, the character spacing will be fixed / non-proportional. A setting of “3” will print both fixed/non-proportional character spacing and reversed text.

- 0 Proportional Character Spacing
- 1 Reverse Video
- 2 Fixed / Non-proportional Character Spacing
- 3 Fixed / Non-proportional Character Spacing and Reverse Video

5.7.11 Line Draw Sample

Enter the following format to produce the sample shown in Figure 10.

```

^D57 <CR>
2,575,609,,25,35,0,1,285,0,0 <CR>
1,110,482,,6,,,355,5,,,,,0 <CR>
1,286,127,,6,,,5,355,,,,,0 <CR>
^D56 <CR>
^D2 <CR>
line <CR>
^D3 <CR>

```

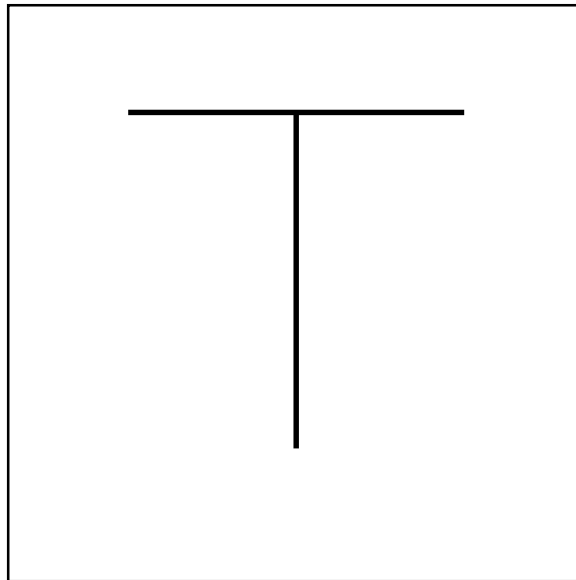


Figure 10 Line Draw Sample

5.8 Reverse Video

The printer has the ability to produce Reverse Video by printing white text over a user defined black background. Reverse Video can also be produced by manually placing a black box on top of an existing image by using the Line Draw feature and setting the Attribute Number (AN) to a value of "1". It should be noted that the black background is fixed and does not automatically adjust with the text. To produce large black backgrounds, simply increase the line size.

Reverse Text (white on black) is created by setting the AN to a value of "1" and printing a black box on top of the text using the Line Draw function. (Special Note: The AN of the line field should also be set to a "1" for proper reverse imaging.) If the AN parameter is set to a value of "2", the character spacing will be fixed / non-proportional. A setting of "3" will print both fixed/non-proportional character spacing and reversed text.

The following is a sample format demonstrating the reverse video function:

```
^D57
2,575,609,,25,35,0,1,285,0,0
1,125,300,13,1,5,,,,,,,,,1
1,110,285,,6,,,350,80,,,,,1
^D56
^D2
REVERSE VIDEO
^D3
```

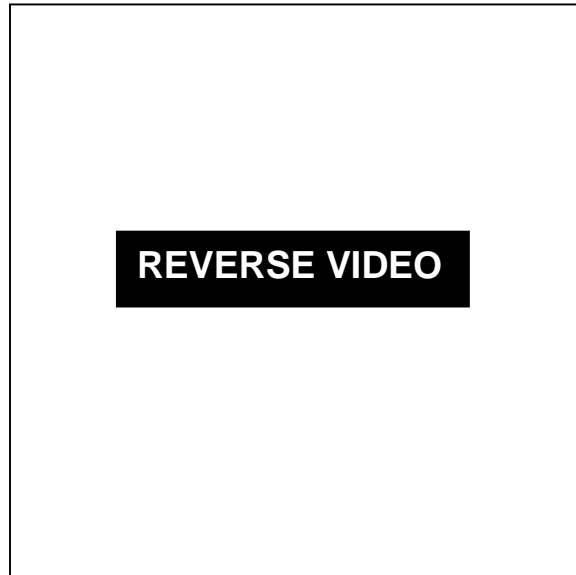


Figure 11 Reverse Video Sample

Chapter 6: Printer Commands

The model 322M printer has a large and versatile collection of control codes to meet the special needs of labeling applications. Most of the commands use the “^D” control sequence, however the printer also recognizes a selected number of other control sequences.

For all commands listed in this manual, the printer will recognize the one character control code (“Ctrl+D”) or the two-character caret plus alpha character (“^D+<CR>”) sequence. In other words, the same command may be generated by either holding the control (Ctrl) key down and pressing the alpha character or by entering the two characters – the ^ (caret, generated when the “Shift” key is pressed and then the “6” key) and then the appropriate alpha key (upper and/or lower case).

To protect against errors, in situations where the two-character caret and alpha sequences are used exclusively as printer commands, the control character recognition may be disabled. This is accomplished by either the “^D93” command or through software dip switch #1 (^D21).

Some mainframe and mini-computers cannot use the ASCII “^” character. In these cases, substitute the ASCII pipe symbol (“|”) or use the one-character control code representation.

6.1 Special Printer Control Codes

The printer to perform special functions uses the following control characters. All other control characters will be ignored. Some of these instructions are also accessible through a “^D” command sequence and will be noted as such.

- ^A Accumulator Mode:** Used to supply the parameters for the ^D commands. These parameters must be positive integers and are generally decimal numbers but may be entered as binary if the ASCII B precedes the value or parameter. For example, “^AB00000001^D21 <CR>” may also be entered as “^A1^D21 <CR>” as well.
- ^B Text Entry Mode:** Instructs the printer to enter printable text entry mode. This command (or the preferred “^D <CR>”) must be sent before the text string information. This command is the equivalent of the “^D<CR>” sequence but does not require the carriage return (^Btext string data). Because the “control B” is shorter it is easier to use in direct terminal mode. In general it is better to use the ^D2 command sequence inside a file or program to assist in trouble-shooting the format.
- ^C Print:** Starts the print cycle or batch. This command is the equivalent of the “^D3<CR>” command sequence but does not require the carriage return. Because the “control C” is shorter than the ^D3 command sequence it is easier to use in direct terminal mode. In general the ^D3 sequence is better to use inside a format and/or program to assist in trouble-shooting the format.

- ^D Command Mode:** Used to issue commands to the printer. This command is normally preceded by the ^A sequence. The ^D commands must be terminated with a carriage return or another command sequence (^A9^D73^D3<CR> is the same as ^A9^D73<CR> and ^D3<CR>).
- ^E Printer Enquiry:** When issued, this command is used to attain the current status or operational state of the printer. The “^E” does not require a carriage return and is the equivalent to the “^D5<CR>” command sequence. If Binary Compression is enabled (default setting) the ^E and ^D5 commands will not function and five NULL characters (HEX 00) are required to get the printer’s status. See section 6.2 for additional information regarding the printer enquires.
- ^M Terminate Text or Data String:** This command is the equivalent of the carriage return character and is used to terminate commands and format lines.
- ^H DEL:** This control code is used to delete the last printable character when communicating to the printer through a keyboard via a terminal. The ^H is the equivalent of the “Backspace” key on the keyboard.
- ^K Print Test Pattern:** Used to generate a test pattern which consists of a series of diagonal lines. The pattern is helpful in determining the condition of the thermal dots on the print head. The ^K code is the equivalent of the “^D12 <CR>” command sequence.
- ^L Form Feed:** Used to feed one blank form based on the previous format configuration parameters. This command is the equivalent of the “^D12 <CR>” command sequence.
- ^Q XON:** Instructs the printer to send data or resume sending data.
- ^S XOFF:** Instructs the printer to stop sending data.

6.2 Printer Enquires

It is important for the host computer to know the status of the printer as labels are being produced. This facilitates security in the system and flags electrical, mechanical, and functional error conditions. Enquires also aid the system designer in adjusting the pace of the printer with that of the operator.

The printer is capable of returning responses to enquires in three different ways depending on how the machine is programmed (see software dip switch #1, ^D21 command). The text equivalent response returns a defining word, giving the current stat of the printer. The “^” equivalent returns the ASCII “^” response followed by the defining alpha character. The control code equivalent returns the actual control code.

The printer will send to the host one of the following responses listed in Table 13 in response to a series of 5 NULL characters or the “Ctrl+E” and/or “^D5<CR>” if binary compression is disabled (refer to soft switch #3 position 7, ^D23 command).

TEXT RESPONSE	^ALPHA or CONTROL CODE	DEFINITION
>READY<	^F	Normal Condition
>CUTTER ERROR<	^G	Cutter cannot rotate
>INPUT 1<	^N	Auxiliary Input #1 triggered
>COUNT DONE<	^O	Count has finished
>PRINTER PAUSED<	^P	Printer is paused
>PAPER JAM<	^R	Paper not feeding properly
>VOLTAGE ERROR<	^T	Voltage is out of operation range
>DATA ERROR<	^U	Communication error
>TAKE LABEL<	^V	Printer is waiting for a label to be taken
>NO LABEL FORMAT<	^W	A label format has not been loaded
>LOW STOCK<	^Y	Media supply is low or out
>RESTARTED<	^Z	Printer has been reset
>UNDER VDD<	^\ (backslash)	Head voltage is low
>OVER TEMP<	^] (closing bracket)	Print head is too hot
>OVER VDD<	^^	Head voltage is out of operational range

Table 13 Enquiry Responses

6.3 Sending ^D Printer Commands

Unless specified otherwise, these commands are entered by sending the ^Dxx command where xx is the command number. The ^D commands are terminated by either issuing a carriage return after the command or by issuing another command and/or control code. Some commands load data or control numbers and are preceded by the ^Axx command. The xx specifies the value and/or control number for the associating ^D command. The ^D commands should precede or follow the actual format layout. They should be placed before the ^D57 or just before the ^D3 print command.

All commands not listed in section 6.3.1 (Software DIP switches and non-volatile commands) are not retained when the printer is turned off. These commands will be required to send to the printer again after a power cycle.

When possible, the following commands are grouped by the intended function and not by command number. Refer to the Quick Reference Command Summary listed in Appendix C for a listing of command in numerical order.

6.3.1 Software DIP Switches and Non-Volatile Commands

The following commands are different from the other printer commands in that they are stored in non-volatile memory and configure the printer upon power up. Once sent to the printer they are not required to be resent unless changes are desired.

The following commands are loaded on power-up. Although they can be set, they will not take effect until the printer has been restarted by either a soft reset (^D32 command) or by cycling power or hard reset. The printer will not use the new settings until this has been performed.

^A ^D COMMAND

21 Change SW1: Software DIP Switch #1. The DIP switch commands may use either the ^A(decimal) or ^AB(binary) value. Since each bit represents a setting for the printer, the soft switches are always reported in binary.

For example: ^AB10100001^D21<CR> configures serial port #1 for text equivalent enquiry responses, accept control codes, disables echo, and enables XON/XOFF flow control.

^AB12345678 (each bit is represented by a numeric position number)

Position:

- 1,2 Enquiry Response:** This determines what the printer will send back in response to an enquiry command.
- 00 = Control Codes**
 - 10 = Text Equivalent**
 - 11 = ^ Equivalent**
- 3 Control Codes:** This position is used to set the printer's handling of control codes.
- 1 = Ignore Control Codes**
 - 0 = Accept Control Codes**
- 4 Port #1 Parity Selection:** Sets the printer port #1 parity for serial communication.
- 1 = Odd Parity**
 - 0 = Even Parity**
- 5 Port #1 Parity Enable:** Sets the printer's port #1 parity enable for serial communication.
- 1 = No Parity**
 - 0 = Enable Parity**
- 6 Echo:** If this feature is enabled, the printer will echo all received characters to the serial port.
- 1 = Enable**
 - 0 = Disable**
- 7 Port #1 Data Bits:** Sets the printer's port #1 data bits for serial communication.
- 1 = 8 Data Bits**
 - 0 = 7 Data Bits**
- 8 XON/XOFF Flow Control:** Sets software flow control handshaking. CTS/RTS hardware handshaking is always enabled.
- 1 = Enable**
 - 0 = Disable**

^A ^D COMMAND

22 Change SW2: Software DIP Switch #2. The DIP switch commands may use either the ^A(decimal) or ^AB(binary) value. Since each bit represents a setting for the printer, the soft switches are always reported in binary.

^AB12345678 (each bit is represented by a numeric position number)

Position:

- 1 Clear Text Function:** If enabled, all variable text strings will be erased when the ^D<CR> is processed.
1 = Enable
0 = Disable
- 2 >RESTARTED< Response:** If the printer has been reset and this switch has been enabled, the printer will respond with the >RESTARTED< message for the first enquiry to denote the reset condition and then >READY< with following enquiries.
1 = Enable
0 = Disable
- 3 Button Use:** If set to a "1", the printer will disable the button function.
1 = Disable
0 = Enable
- 4 Print Button:** Defines the print button. If set to a "0", the button can be used for feeding labels but the print function is disabled.
1 = Enable
0 = Disable
- 5 Power-up Format Type:** Determines whether to use a saved format file (1) or a ROM format. The printer must have battery backed memory in order to save format files. The format is selected by switch positions 6, 7, and 8.
1 = Saved Format File
0 = ROM Format File
- 6,7,8 Power-up Format:** These switches are used in conjunction with switch 5 above. They determine which stored format is loaded at power-up. The printer can be instructed not to load a format at power-up by setting all three switches to 0. (Please note: The printer will not print unless a valid format has been loaded. A format may be loaded by using these switches to automatically load a previously stored format or by simply sending non-stored format to the printer.)

000 = No Power-up Format
001 = ROM or Saved Format File 1
010 = ROM or Saved Format File 2
011 = ROM or Saved Format File 3
100 = ROM or Saved Format File 4
101 = ROM or Saved Format File 5

110 = Rom or Saved Format File 6

111 = ROM of Saved Format File 7

^A ^D COMMAND

23 Change SW3: Software DIP Switch #3. The DIP switch commands may use either the ^A(decimal) or ^AB(binary) value. Since each bit represents a setting for the printer, the soft switches are always reported in binary.

^AB12345678 (each bit is represented by a numeric position number)

Position:

- 1 Extended ASCII:** If enabled, characters over HEX 7F will be processed.
 1 = Disable
 0 = Enable
- 2 Invert >INPUT 1< Polarity:** The >INPUT 1< message is normally returned when the associated reflective sensor detects a signal. The polarity of this signal should be inverted when used as a stock level sensor.
- 3 Response After Print:** If enabled, an enquiry response will be sent through the serial communications port #1 (COM1) after every print.
 1 = Enable
 0 = Disable
- 4 Head Up Switch:** Sets the state of the Head Up Switch. Not available on the Model 322M printer.
 1 = Enable
 0 = Disable
- 5 ALWAYS 0**
- 6 ALWAYS 0**
- 7 Binary Compression:** If enabled, the printer will accept downloaded binary compressed font and/or graphic files. Enquiry responses are generated by sending 5 NULL characters when binary compression is enabled
 1 = Enable
 0 = Disable
- 8 Detect Black Line on Power-up:** If enabled, the printer automatically feeds labels on power-up to determine the proper ^D91 value.
 1 = Enable
 0 = Disable

^A **^D** **COMMAND**
24 **Change SW4:** Software DIP Switch #4.

^AB12345678 (each bit is represented by a numeric position number)

Position:

- 1** **Slashed Zeros:** If enabled, the printer will print a slash through the embedded zero (“0”) characters.
1 = Enable
0 = Disable
- 2** **External Print Request:** If enabled, the printer will check Pin 7 of the 9 pin serial connector located at the rear of the printer. If Pin 7 is low, the printer will begin printing the last loaded label format. Printing will continue until the signal on Pin 7 goes high.
1 = Enable
0 = Disable
- 3** **Blow-Hole Media:** Enable this position when using media that contains a blow-hole or cut-slot registration mark used to identify the label size. The Stock Out condition will not function properly if this position is not enabled and this type of media is being used.
1 = Enable
0 = Disable
- 4** **Auto-size on Power-up:** When enabled, the printer automatically sizes the label to determine the appropriate format header values on power-up. The printer will then use these values on all subsequent label formats. Refer to the ^D39 command for additional information.
1 = Enable
0 = Disable
- 5,6,7,8** **Code Page Selection:** Positions 5 through 8 are used to select from the available code pages stored within the printer..
0000 = Not Decoded (Default)
0001 = Danish
0010 = 860
0011 = Spanish
0100 = 850
0101 = German
0110 = 865
0111 = Swiss
1000 = 852
1001 = French
1010 = 863
1011 = Swedish
1100 = 437
1101 = Italian
1110 = English - UK
1111 = English – US

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	36	Adjust Contrast Base: Used to adjust the contrast base of the printer to achieve quality print images. The command is stored in non-volatile memory and skews the entire contrast window (^D35 command). This command has a ^A range of 10 to 200%. Print head life is greatly reduced when using high contrast settings (150 and greater) so using the lowest possible setting is highly recommended.

6.3.2 Printing Commands

The following commands initiate printing or define the number of labels to be printed. All of these commands are terminated by either a carriage return or by issuing another command or control code.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	3	Print Command: Informs the printer to print a single label or start printing a batch of labels. Since commands are processed in the order they are received, this is typically the last command in the format file.
	11	Print Test Pattern: Prints a label with diagonal lines that is used in determining the condition of the thermal dots of the print head. This command is equivalent to the “^K” control code.
	12	Form Feed: Prints or scrolls a blank form based upon the previous format definitions. This command is equivalent to the “^L” control code.
	70	Clear Commands 73-76: Resets the ^D73 through ^D76 commands to their default values.
XX	73	Load Copies Count: Instructs the printer to print multiple copies without incrementing serial numbers. This command can be used in conjunction with the ^D75 (Load Label Count) to allow duplicate copies to be made within a batch of labels. For example, the following command string will print a total of 150 labels; three copies of each serial number for the 50 different labels. (^A3^D73^A50^D75^D3<CR>)
1	74	Infinity Print: Prints a batch of labels until the printer is turned off. This command is most effective when used in conjunction with the Tag/Tear and Peel-n-Dispense modes. The “^A1” enables the Infinity Print while a “^A0” will disable this function.
XX	75	Load Label Count: Instructs the printer to print a batch of labels using the serial number function if enabled. If the serial number function is disabled, the ^D75 command will print the number of copies (the same label) specified by the “^Axx” sequence just like the ^D73 command. This command may also be used in conjunction with the ^D73 command. The batch of labels is printed once a ^D3 command is executed; therefore the ^D75 command must be issued before the ^D3 command. The only difference between this command and the ^D73 is the ability to increment and/or decrement sequential numbers in a batch.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XXX	76	Load Delay Time Between Printed Labels: Delays the printing between labels in a batch. The “^Axxx” specifies the delay time in tenths of a second with a maximum value of 650. For example, “^A10^D76<CR>” would introduce a one second delay between printed labels. This command is typically used in conjunction with the Peel-n-Dispense mode and applicators.

6.3.3 Auto-sizing and Valid GAP Commands

The auto-size command attempts to automatically calculate important format values for the label header including LSY, GAP, AGD, SPG and the ^D91 value. The printer feeds a sample of labels through the GAP sensors and takes an average of the values it receives. The auto-size command uses the appropriate sensors to detect the registration marks set by the ^D47 command. Before issuing the auto-size command, verify that the ^D47 is set to the proper setting for the media being used.

When using media that contains a blackline for the registration mark, first execute the ^A1^D47<CR> command sequence before issuing the auto-size command or the results may be invalid.

When using media that contains a blow-hole, set software switch #4 (^D24 command) for blow-hole detection and then issue the desired auto-size command before issuing the auto-size command or the results may be invalid.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	39	Auto-size:
0		Clears the use of auto-size values set by issuing the ^A1^D39<CR>.
1		Uses the values obtained for header variables instead of what is specified in the format file’s header.
2		Automatically sizes the label and displays to the terminal screen the values for the format header.
3		Same as ^A2^D39<CR>, but the values will be printed on the media.
5		Diagnostic Mode that steps the motor while displaying the readings from the GAP detectors to determine the media’s proper ^D91 setting. This is also referred to as “tick-tick” mode.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	91	Gap Detection Sensitivity: The proper value is obtained by using the ^D39 auto-size commands. The ^Axx value sets the point (0-255) at which the printer detects a gap, blow-hole and/or blackline. When the printer is powered-up or reset, this command defaults to a value of 30 if using the transmissive sensor and 120 if using the reflective sensor. Although the default value should work properly with most media types, it is a good idea to place this command at the beginning of all format files in order to guarantee that the printer will properly detect your media’s registration mark. If this value

is not set correctly, the printer may not detect a GAP properly or report an invalid >LOW STOCK< error. This value can be obtained by issue the ^D39 command as stated above.

6.3.4 Serial Number Commands

The following commands, ^D80 through ^D89, are used for the serial number function commands of the printer. The printer can increment or decrement any single serial number on the label by any amount. If the format contains more than one serial number, then all serial number fields can only increment or decrement by a value of one. Single and Multiple serial number commands cannot be used on the same format. Please note that the ^D57 command clears most of the serial number commands. Therefore, all serial number commands should be placed after the ^D56 command or just prior to the ^D3 command. Refer to section 6.3.2 for additional information regarding the use of the ^D75 command and the serial number functions.

The following two commands are valid for both single and multiple serial number functions:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	80	Clears Commands 86, 88, 89.
	81	Disable Serial Number Function: This command disables both single and multiple serial number functions.

The next three commands deal with the single serial number functions:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	84	Load Text String Number to Increment/Decrement: Instructs the printer which text string number to increment or decrement. The ^Axx value determines which of the text strings will be used for incrementing or decrementing.
XX	85	Load Increment/Decrement Step Value: This is the value that the single serial number functions is incremented or decremented. The ^Axx is the value that specifies the step value used to increment or decrement.
X	86	Single Serial Number Status:
0		Disable increment and decrement
1		Enable increment. The serial number will be incremented by the step value specified by the ^D85 command.
2		Enable decrement. The serial number will be decremented by the step value specified by the ^D85 command.

The next three commands determine the status of multiple serial numbers:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	87	Load Field Number to Clear Increment/Decrement: This command is used to clear the status of one or more fields that are using the serial number increment/decrement function. Example: A “^A1^D87<CR>” instructs the

printer to clear the increment/decrement function of text string number 1 or the first text string.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	88	Load Field Number to Increment by 1: The ^Axx specifies which field to increment by one.
XX	89	Load Field Number to Decrement by 1: The ^Axx specifies which text string field that will be decremented by one.

A sample format using the single serial number function:

```

^D57 <CR>
1,575,609,,25,35,0,1,285,0,0 <CR>
1,280,300,2,1,5 <CR>
^D56 <CR>
^A2^D86 <CR>
^A1^D84 <CR>
^A5^D85 <CR>
^A3^D75 <CR>
^D2 <CR>
20 <CR>
^D3 <CR>

```

This format would enable the decrement function (^A2^D86). Select text string #1 to decrement (^A1^D84), load the step value of 5 (^A5^D85) and then print three serialized labels (^A3^D75). The printed result would be “20” for the first label, “15” for the second label, and “10” for the third or last label.

A sample format using the multiple serial number function:

```

^D57 <CR>
2,575,609,,25,35,0,1,285,0,0 <CR>
1,280,300,3,1,5 <CR>
2,280,100,3,1,5 <CR>
^D56 <CR>
^A1^D88 <CR>
^A2^D89 <CR>
^A3^D75 <CR>
^D2 <CR>
100 <CR>
200 <CR>
^D3 <CR>

```

This format would enable the multiple serial number function and select the first text string to increment by one (^A1^D88), the second field to decrement by one (^A2^D89), and print

three serialized labels (^A3^D75). The first text string would be printed as “100”, “101”, and “102” while the second text string is printed as “200”, “199”, and then finally “198”.

6.3.5 Saving Format Commands

The printer can store up to 128 format files into the printer’s RAM. Once stored, these files can be loaded from memory increasing throughput. With the use of the battery backed RAM option, the printer will retain these stored formats even after power has been cycled. The printer can also be configured through software switch #2 (^D22 command) to automatically process the format once the printer has powered-up. The printer treats the stored formats as if they were sent through the serial port.

The maximum number of stored files depends on the size of the files and the amount of memory available. The model 322M provides 512K of RAM, which offers about 448K of memory available for file storage.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	54	Send Saved Format to Serial Port: The ^Axx selects the memory slot (1-128) that is sent to the serial port. This command is typically used at a terminal to interrogate what formats have been stored in the printer’s memory.
XX	58	Process Saved Format: The ^Axx selects which memory slot (1-128) to process from the printer’s memory.
XX	59	Save Format File: The ^Axx selects which memory slot (1-128) that the format is to be saved in the printer’s memory. The format file must be terminated by an ESC (HEX 1B) character in order to save formats.
	100	Clear User RAM: This command will clear all contents of the printer’s RAM including saved formats, downloadable fonts, and graphics. This command must be issued before saving format files to an occupied memory slot. It is a good idea that the ^D100 command is sent before saving the first file into the printer’s memory to be sure that an existing memory slot is not occupied. There is currently no way to erase or change individual memory slots.

Before sending the first downloadable font, graphic, or format file the RAM must be initiated by sending the ^D100 <CR> command. This command will erase all files stored in the printer’s user memory. Only use this command before sending the first file or when a total RAM memory clear is desired.

After memory is cleared, formats may be saved into the printer’s memory by using the ^Ax^D59 <CR> command sequence where, “x” is the desired memory slot to save the format. The format file must be terminated with an ESC (HEX 1B) or “^[" (left bracket) character. This instructs the printer that the complete file has been received. Anything entered between the ^D59 command to the ESC character will be saved into the selected memory slot.

The saved format may be recalled or processed by entering the ^Ax^D58 <CR> command, where “x” is the memory slot where the format was saved. Once this command is issued, the format will be processed as if sent to the serial port.

It is important to note that the saved format file function works extremely well with variable text and greatly improves throughput. Simply configure the format file with the label header, format field data, fixed text, and terminate the file with the ESC character. The format may then be accessed by using the ^Ax^D58<CR> command to process the format and then text may be entered followed by the ^D3 print command.

To list a saved format that has been previously stored in the printer's memory, use the ^Ax^D54 <CR> command sequence to list the format to the serial port. This is helpful in determining if a memory slot has been taken and not available.

The sample formats below demonstrate how to use the memory commands. File #1 Initiates memory clear, and then saves a format into slot #1. File #2 recalls the format stored in slot #1, enters text and then prints. Refer to Figure 11 for the printed representation of File #2 below.

File #3 shows the format that is saved in File #1 being accessed a second time with different text string data. Notice that the CC (Character Count) stored in the format of File#1 is set to the highest number of characters that is allowed to print. The second text string only has a CC of 6, so only the first 6 characters (Inform) will print on the second line of format File#3, see Figure 12.

File #1

```

^D100 <CR>
^A1^D59^D57 <CR>
2,575,609,,25,35,0,1,285,0,0 <CR>
1,300,500,9,1,5,0,4,2,2,,,,,0 <CR>
2,300,400,6,1,5,0,4,2,2,,,,,0 <CR>
^D56 <CR>
^D2 <CR>
Saved <CR>
<CR>
<ESC> Character (HEX 1B or “^[")

```

File #2

```

^A1^D58<CR>
<CR>
Format <CR>
^D3 <CR>

```

File #3

```

^A1^D58<CR>
Different<CR>
Information <CR>
^D3 <CR>

```

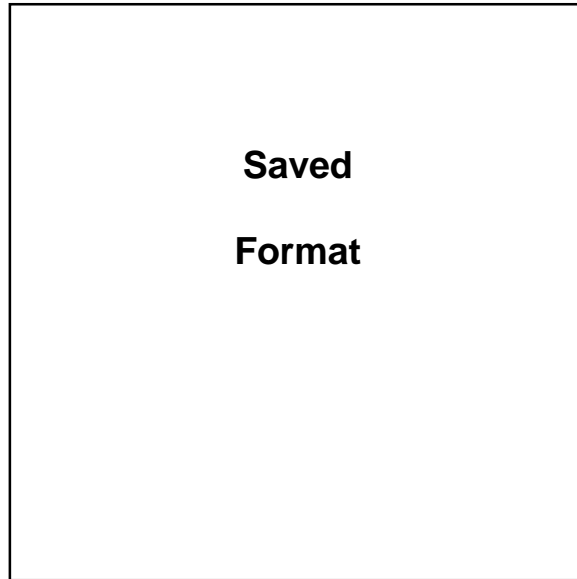


Figure 12 ^D58 - File #2 Print Sample

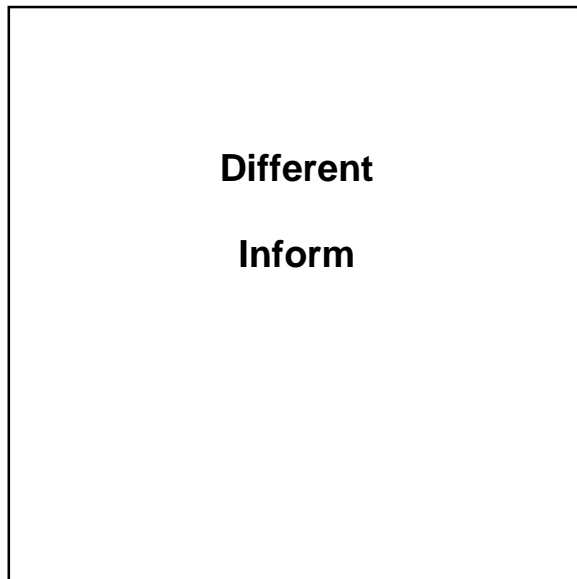


Figure 13 ^D58 - File#3 Print Sample

6.3.6 Dispensing Commands

Dispensing commands are commands that advance the media for cutting, tear off, or presenting and then retract the media to a home position so that media is not wasted. These dispense commands include Peel-n-Dispense, Tag/Tear, Cutter commands, and

optional media handling commands as well. The following commands define these types of operations.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	95	Advance/Retract Distance: This command is used in conjunction with the tag/tear (^D97), peel-n-dispense (^D98), and cutter (^D99) commands. It is used to adjust the number of steps the printer will advance the media after printing has stopped and then retract the same distance so that media is not wasted. While the maximum value is 64,000 steps, it is not recommended that the printer advances further than one label size. This may create a paper jam when the label is retracted back into the printer.
XX	96	Load Advance Delay: The ^Axx specifies the amount time, in milliseconds, that the printer will delay the repositioning or retraction of the media. For Example, “^A1000^D96 <CR>” would delay for a period of one second.
X	97	Tag/Tear Operation: This command controls a method of dispensing the media so that the perforation between labels is positioned on the tear bar or peel edge. The peel edge assists in tearing the media after printing has occurred. The distance that the printer advances is defined by the ^D95 command.
0		Disable Tag/Tear operation.
1		Advance after every print. This command is typically used in conjunction with an optional LPS (Label Present Sensor) installed on the printer. This command instructs the printer to advance the media by the amount specified by the ^D95 command to the tear edge. Once the media has been advanced, the printer will wait for the media to be removed before retraction occurs and printing continues. This command will assume a ^D95 value of 162 if one is not specified and uses the optional LPS.
2		Advance after copies count. This command is typically used in conjunction with an optional LPS (Label Present Sensor) installed on the printer. This command instructs the printer to advance the media by the amount specified by the ^D95 command to the tear edge after printing the number of labels specified by the copies count (^D73) or labels count (^D75) commands. Once the media has been advanced, the printer will wait for the media to be removed before retraction occurs and printing continues. This command will assume a ^D95 value of 162 if one is not specified and uses the optional LPS.
3		Advance when idle. This command does not use the optional LPS. After printing a label, if no other label is being processed or idle, the command instructs the printer to advance the media by the amount specified by the ^D95 command. When the printer receives the next print request, it retracts the media and prints the next label. This command will assume a ^D95 value of 162 if one is not specified and does not use the optional LPS.

- X 98 Peel-N-Dispense:** This command is used when the labels are to be peeled from the backing material, and is typically used in conjunction with an optional LPS (Label Present Sensor) installed on the printer. This command instructs the printer to advance the media by the amount specified by the ^D95 command to the tear edge. Once the media is advanced, the printer will wait for the media to be removed before retraction occurs and printing continues. This command is very similar to the ^A1^D97 command but will assume a ^D95 value of 83 so that the media is advanced just short of the tear bar. The proper value for the ^D95 command should allow the label to be peeled from the backing material and then remain hanging from the peel edge. This command uses the LPS and Peel-n-Dispense options. The ^A3^D98 command is used in conjunction with the Printed Media Presenter (PMP) option. The ^A3^D98 mode will allow the cutter to operate in conjunction with the ^A1^D98 command operation.
- 0** Disable peel-n-dispense operation.
 - 1** Enable peel-n-dispense operation.
 - 2** Custom Applicator Mode (Peel-n-Dispense without a delay).
 - 3** Enable PMP Mode with LPS sensor.
- X 99 Cutter Control:** This command controls the enablement of full and/or partial optional cutters. This command works in conjunction with the ^D102 and ^D103 Cut Interval commands. The ^D95 command is also used with the ^D99 command to adjust the advance distance to the cutter blades and then retract to the home position (dot row one). The ^D99 command will assume a default ^D95 value of 155.
- 0** Disable Cutter operation.
 - 1** Enable Full Cut.
 - 2** Enable Partial Cut.
 - 3** Enable Full and Partial Cut.
- XX 102 Full Cut Interval:** Instructs the printer when to issue a Full Cut. The default value is 1. A value of "1" results in a full cut whenever the copies count is reached, or after each format if a copies count has not been specified. If this command is set higher than "1" (maximum of 65536), the printer will full cut when that quantity is reached. This command will not operate if the Cutter Control (^D99) command is set to full cut.
- XX 103 Partial Cut Interval:** This command instructs the printer when to issue a Partial Cut. A partial cut requires the use of a Cutter that is capable of Partial cuts. Partial Cut is when a thin piece of media, in the center, holds the media together and the printer waits until the media is removed before printing the

next label. The default Partial Cut Interval is set to 1. The printer will issue a partial cut, if set to a 1, whenever the copies count is reached. If set to a value greater than 1, the printer will partial cut when that quantity is reached. This command only functions when the Cutter Control (^D99) command is set to allow partial cuts.

Please note that a full cut will override a partial cut. The following examples assume that the ^D99 command has been set to 3. Example #1: If the Full Cut Interval is set to a value of 5 and the Partial Cut Interval is also set to a value of 5, the printer will issue a Full Cut. Example #2: If the Full Cut Interval is set to a value of 5 and the Partial Cut Interval is set to a value of 1, the printer will partial cut after labels 1 through 4 and full cut after label 5.

6.3.7 Text String Commands

These commands offer special functions pertaining to the text strings. Some of the special functions would include Pre-padded text and auto-print.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	60	Clears Command ^D61

XX 61 Mark Text Starting Position: The ^Axx specifies which text field to start entering new data. This is useful for creating variable text fields after a string of fixed text fields. If set to a value of 2, the first line of new text entered following the ^D2 will overwrite line two. If two new text strings are entered, the existing text lines two and three will be overwritten. This command is used when fixed data is used much like a template and only the variable data is to change.

62 Pre-padded Text: This command is used to pre-pad text data. Any data already loaded into a field will be retained if the ^D62 command is sent. The following is an example of Pre=padded text:

```

^D57<CR>
3,575,609,,25,35,0,1,285,0,0 <CR>
1,300,500,7,1,5<CR>
2,300,400,7,1,5<CR>
3,300,300,7,1,5<CR>
^D56 <CR>
^D2 <CR>
A<CR>
B<CR>
C<CR>
^D62<CR>
^D2<CR>
line 1<CR>
line 2<CR>
line 3<CR>
^D3<CR>

```

This format would produce a label with "Aline 1", "Bline2", and "Cline 3" printed on the label.

- X 63 Text Control Mode:** Allows the entry of new text without the ^D2 command and/or clears all previous text when new text is added.
- 0** Disable modes 1 and 2.
- 1** Enable Auto-Print mode. If this mode is selected, the printer will accept new text strings without requiring the ^D2 command. The printer can also auto-print a label when the number of received text strings (carriage returns) equal the number specified by the ^D64 command. This mode is useful when interfacing to a scale, bar code wand or other limited host that is capable of generating and sending carriage return characters.
- 2** Clear Previous Text Upon Receiving New Data. When one or more characters of new text is entered, the all-existing text data will be erased. The printer may be programmed to enter the mode automatically upon power-up by position 1 of software switch #2 (^D22 command).
- 3** Enable modes 2 and 3.
- XX 64 Auto-Print String Count:** This command is used in conjunction with the ^A1^D63 auto -print command. The ^Axx specifies the number of text strings (carriage returns) to accept before issuing the print command. When the printer is in the auto-print mode, it is not necessary to send the ^D2 command to enter text or the ^D3 command to initiate printing. The printer will accept incoming text strings and print the label as soon as the number of strings equal the amount specified by the ^D64 command.

The following is an example of the ^D61, ^D63, and ^D64 commands:

```

^A0^D64<CR>                (Clears any old settings)
^D57<CR>
6,575,609,,25,35,0,1,285,0,0 <CR>
1,300,300,20,1,4<CR>
2,300,250,20,1,4<CR>
3,300,200,20,1,4<CR>
4,300,150,20,1,4<CR>
5,300,100,20,1,4<CR>
6,300,50,20,1,4<CR>
^D56 <CR>
^D2 <CR>
Protected Field<CR>
Protected Field<CR>
Protected Field<CR>
Variable Field<CR>
Variable Field<CR>
Variable Field<CR>
^A3^D63<CR>                (Enables Auto-Print and Clears text)
^A3^D64<CR>                (Instructs printer to print after 3 <CR>)
^A3^D61<CR>                (Instructs printer to start text entry at line 3
                             instead of line 1)

```

Chapter 7: Downloadable Graphics

The printer has 255 memory slots available for storing downloadable fonts and/or graphics. Existing graphic images may be converted to the proper format for the printer by using either converter “PCX2MIC.exe” for PCX images or “BMP2MIC.exe” for BMP images. The graphic image format sections are provided to support developers that wish to create graphic images within their own applications.

7.1 Using the Graphic Conversion Utilities

The following section details the process required to convert and download graphic images to the printer. The conversion utilities “PCX2MIC.exe” and “BMP2MIC.exe” may be downloaded at <http://www.microocmcorp.com>. These 16 bit DOS utilities convert PCX and BMP monochrome type graphic images to a format that is suitable for downloading to the printer.

7.1.1 PCX2MIC.exe Program

1. Run the PCX2MIC program from a DOS prompt.
2. Follow the on screen instructions and note the slot number where the image is saved (use the model 412 printer).
3. Make sure the destination memory slot is clear. The ^D100 command can be used to clear the printer’s memory.
4. Download the resulting file (filename N12 (normal rotation) or R12 (rotated)) file to the printer.
5. Refer to section 6.3.5 for detailed information on printing images.

7.1.2 BMP2MIC.exe Program

1. Run the BMP2MIC program from a DOS prompt.
2. Follow the on screen instructions and note the slot number where the image is saved (use the model 412 printer).
3. Make sure the destination memory slot is clear. The ^D100 command can be used to clear the printer’s memory.
4. Download the resulting file (filename N12 (normal rotation) or R12 (rotated)) file to the printer.
5. Refer to section 6.3.5 for detailed information on printing images.

7.2 Graphic Image Download Methods

The printer supports both compressed and uncompressed graphic and font downloads. The compressed (^D107) format shortens the download time by reducing the number of bytes sent to the printer. Please note that the compressed format is only usable on 8-bit data connections and will not function on 7-bit data connections. The uncompressed (^D104) is usable on either 7 or 8-bit connections, is more flexible, and encodes using ASCII-HEX. This results in a much larger file size. Microcom Corporation recommends the use of the compressed format when possible.

7.2.1 Compressed Binary Image (^D107)

This command allows graphic images or fonts (fonts must be less than 64KB uncompressed) to be transmitted in binary, reducing the number of bytes sent to the printer. Furthermore, this command allows for data compression by converting strings of 0 HEX or FF HEX to shorter byte-plus-count sequences. These sequences are then expanded to the original number of bytes inside the printer. This command is only useable on data connections that support 8-bit data such as a serial port configured for 8 Data Bits and no parity or a parallel port. This command will not function correctly with a serial port configured to 7-bit data bits.

The following is the format of the ^D107 command when used with a graphic image file.

```
^A<Memory Slot Number>^D107<CR>
<Rotation> <Count> <Image Data>
```

Where:

<Memory Slot Number> is the memory slot location (1-255) where the graphic will be saved in the printer's memory. The printer uses the same TCI of "8" to select downloadable fonts or graphics. Therefore a font and a graphic cannot have the same Slot Number or CGN number.

<Rotation> is an 8-bit integer, 0 for an upright font and 1 for a 90-degree rotated image.

<Count> is a 32-bit integer, least significant byte first. This is the number of uncompressed bytes that the image uses, not the number of bytes that will actually be transmitted. Due to compression, the number of bytes transmitted will normally be less than this number.

<Image Data> is the compressed binary image.

Compressed Algorithm

The binary data that make up the image file is a run-length compressed version of the image data described in section 7.2. Bytes with a value of 0 HEX or FF HEX are followed by another byte indicating the number of times that value is repeated.

For example: Suppose the original (uncompressed) image file has a sequence of bytes like: (All values are listed in Hexadecimal)

```
"00 01 02 03 04 00 00 00 00 00 00 00 FF FD FF FF FF FF FF 00 FF"
```

The encoded result would like this:

“00 00 01 02 03 04 00 05 FF 00 FD FF 04 00 00 FF 00”

Result interpretation:

00 - the first byte is 00

00 - count of 0 (the previous 00 byte is not repeated or repeated zero times)

01 - a 01 byte

02 - a 02 byte

03 - a 03 byte

04 - a 04 byte

00 - another 00 byte in the file

05 - the 00 byte is repeated 5 times for a total of 6 “00” bytes (00+05=6 “00” bytes)

FF - a FF byte

00 - count of 0 (the previous FF byte is not repeated or repeated zero times)

FD - a FD byte

FF - another FF byte

04 - the FF byte is repeated 4 times for a total of 5 “FF” bytes (FF+04 = 5 “FF” bytes)

00 - another 00 byte

00 - repeat count = 0

FF - another FF byte

00 - repeat count = 0

The compression scheme is slightly inefficient for single 00 HEX and FF HEX occurrences by entering two for each of these occurrences but most image bitmaps include large areas of either blank space (00 HEX) or black space (FF HEX).

If a string of more than 255 00 HEX or FF HEX occurs, the byte-plus-count sequence may be repeated as often as necessary to incorporate all occurrences of the byte. For example, a string of 1132 “FF” HEX bytes in sequence may be encoded as:

“FF FF FF FF FF FF FF FF FF 6B”

The first four pairs of FF HEX each encode 256 bytes of FF HEX (one for the first FF byte and 255 copies) totaling 1024 bytes of FF HEX. The next FF HEX byte adds another and the 6B HEX adds 107 additional copies for a total of 1132 FF HEX bytes.

$(4 \times 256) + 1 + 107 = 1132$

7.2.2 Uncompressed Image (^D104)

This command allows graphic and/or font images (fonts must be less than 64KB uncompressed) to be transmitted in ASCII-HEX, thereby allowing all data to pass over 7 or 8-bit data connections. This command is useable on data connections that support either 7 or 8-bit data.

The following is the format of the ^D104 command when used for a graphic image file:

^A<Slot Number>^D104<CR>
<Rotation> <Count> <Image Data>

Where:

<Memory Slot Number> is the memory slot location (1-255) where the graphic will be saved in the printer’s memory. The printer uses the same TCI of “8” to select downloadable fonts

or graphics. Therefore a font and a graphic cannot have the same Slot Number or CGN number.

<Rotation> is an 8-bit integer, 0 for an upright font, and 1 for a 90-degree rotated image.

<Count> is a 32-bit integer, least significant byte first. This is the number of bytes that the image uses.

<Image Data> is the graphic image data that has been converted to ASCII-HEX.

ASCII-HEX Conversion

The ASCII-HEX conversion is performed by “OR’ing” the most significant and least significant nibbles of every byte with “30” HEX.

For Example: To convert the byte “6C” to ASCII-HEX, simply OR the first and second nibbles with “30” HEX. This results in the two bytes “36” HEX and “3C” HEX. This conversion results in a file size that is twice as big as the source, the data can now be transmitted over a 7-bit data connection.

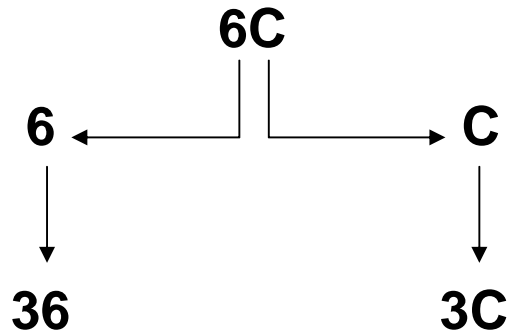


Figure 14 ASCII-HEX Conversions

7.3 Graphic Image Data Format

The image data consists of a set of data structures and location offsets to those structures. All data is stored in binary form. Multi-byte values are stored least-significant-byte first.

The method illustrated below allows graphic images to span 64KB memory segments. When using graphics over 64KB, the printer will determine the number of 64KB slots required to store the entire graphic and will split the large file into the correct number of smaller files internally. The printer stores these smaller files sequentially in the slots following the one specified in the appropriate load or save graphic command. Therefore, before sending a graphic file that is 64KB or more (uncompressed size), make sure that the specified font slot has enough following empty slots to store the file properly.

Graphics that are stored in multiple slots in this way may still be printed as if they are one large graphic. In the label format, refer to the first slot (the one specified in the download command) regardless of how many slots that may be required for large graphics. The printer will automatically append the additional graphic files seamlessly without additional user intervention.

(Word is a 16-bit value, Byte is an 8-bit value, and Label is a location within the file)

Label start:	the beginning of the file
Word, Word, lookup_table_offset	distance in bytes from start to beginning of lookup_table (4 bytes)
Word tallest_char	height of graphic image in dots
Word widest_char	Width of graphic image in dots
Byte default_spacing	Default spacing, usually 0
Byte byte_width	Width of graphic image in bytes
Byte first_char	20 HEX
Byte last_char	20 HEX
Byte default_char	20 HEX
Label lookup_table	beginning of lookup table
Word char_offset [last_char-first_char]	an array of offsets, one for each character in font. Each offset is the distance, in bytes, from the start to the beginning of the corresponding character's data structure. The first word in this array is the offset to the first character's data; the last word is the offset to the last character's data.
Label first_char_data	the beginning of the graphic image data
Word char_height	height of this character's bitmap in dots
Word char_width	width of the graphic image in dots
Byte bitmap_data[char_height][byte_width]	bitmap of character, 2d array. The most significant bit of the first byte in each row, prints as the right most dot of the character, and the first row is the bottom row when printed.

7.4 Downloadable Graphics Command Summary

The following commands refer to the use of downloadable fonts and graphics:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	100	Clear User RAM: This command clears all downloadable fonts, graphics, and stored label formats.
	101	List Memory Bytes Available: The printer will send the ">" character followed by the amount of available bytes and then finally a "<" character. (i.e. >192690<)
XX	104	Load Graphic Images or Fonts into User Memory without Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command should be used with an ASCII-HEX file that contains only printable characters less than 80 HEX. This command supports graphics over 64KB.
XX	106	Load Graphic Images or Fonts into User Memory without Compression: This command is intended for legacy support only and Microcom Corporation recommends either the ^D104 or ^D107 commands. Fonts must be less than 64KB for this command to function.
XX	107	Load Graphic Images or Fonts into User Memory using Binary Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command will greatly reduce the image download time and should be used whenever possible. This command may only be used with 8-bit data connections and will not function on 7-bit data connections.

Chapter 8: Downloadable Fonts

The printer has 255 memory slots available for storing downloadable fonts and/or graphics. The printer treats downloadable fonts just like the standard bitmapped font mentioned in Chapter 5. Both LaserJet™ and TrueType® fonts can be converted using the “SFP2MIC.exe” or “TTF2MIC.exe” software utilities. Note: The “SFP2MIC.exe” program uses the Portrait or 0 degree source rotation for both normal and rotated fonts. Downloadable font fields use the same structure as the bit mapped fields with the only difference being that the TCI must be set to an “8” for downloadable fonts and the CGN refers to the memory slot location of the downloaded font.

8.1 Using the Font Conversion Utilities

The following section details the process required to convert and download fonts to the printer. The conversion utilities “SFP2MIC.exe” and “TTF2MIC.exe” may be downloaded at <http://www.microcomcorp.com>. These 16 bit DOS utilities convert LaserJet™ SFP or TrueType® TTF fonts into a format that is suitable for downloading to the printer.

8.1.1 SFP2MIC.exe Program

1. Run the SFP2MIC program from a DOS prompt.
2. Follow the on screen instructions and note the slot number where the image is saved. The 322M uses the same font structure as the Model 412 printer. Select the Model 412 printer when converting fonts for the 322M printer.
3. Make sure the destination memory slot is clear. The ^D100 command can be used to clear the printer’s memory.
4. Download the resulting file (filename N12 (normal rotation) or R12 (rotated)) file to the printer.
5. Refer to section 6.3.5 for detailed information on printing images.

8.1.2 TTF2MIC.exe Program

1. Run the TTF2MIC program from a DOS prompt.
2. Follow the on screen instructions and note the slot number the image is saved. The 322M uses the same font structure as the Model 412 printer. Select the Model 412 printer when converting fonts for the 322M printer.
3. Make sure the destination memory slot is clear. The ^D100 command can be used to clear the printer’s memory.
4. Download the resulting file (filename N12 (normal rotation) or R12 (rotated)) file to the printer.
5. Refer to section 6.3.5 for detailed information on printing images.

8.2 Font Download Methods

The printer supports both compressed and uncompressed graphic and font downloads. The compressed (^D107) format shortens the download time by reducing the number of bytes sent to the printer. Please note that the compressed format is only usable on 8-bit data connections and will not function on 7-bit data connections. The uncompressed (^D104) is usable on either 7 or 8-bit connections and is more flexible but encodes using ASCII-HEX. This results in a much larger file size. Microcom Corporation recommends the use of the compressed format when possible.

8.2.1 Compressed Binary Image (^D107)

This command allows graphic images or fonts (fonts must be less than 64KB uncompressed) to be transmitted in binary, thereby reducing the number of bytes sent to the printer. Furthermore, this command allows for data compression by converting strings of 0 HEX or FF HEX to shorter byte-plus-count sequences. These sequences are then expanded to the original number of bytes inside the printer. This command is only useable on data connections that support 8-bit data such as a serial port configured for 8 Data Bits and no parity or a parallel port. This command will not function correctly with a serial port configured to 7-bit data bits.

The following is the format of the ^D107 command when used with a graphic image file.

```
^A<Memory Slot Number>^D107<CR>
<Rotation> <Count> <Image Data>
```

Where:

<Memory Slot Number> is the memory slot location (1-255) where the graphic will be saved in the printer's memory. The printer uses the same TCI of "8" to select downloadable fonts or graphics. Therefore a font and a graphic cannot have the same Slot Number or CGN number.

<Rotation> is an 8-bit integer, 0 for an upright font and 1 for a 90-degree rotated image.

<Count> is a 32-bit integer, least significant byte first. This is the number of uncompressed bytes that the image uses, not the number of bytes that will actually be transmitted. Due to compression, the number of bytes transmitted will normally be less than this number.

<Image Data> is the compressed binary image.

Compressed Algorithm

The binary data that makes up the image file is a run-length compressed version of the image data described in section 7.2. Bytes with a value of 0 HEX or FF HEX are followed by another byte indicating the number of times that value is repeated.

For example: Suppose the original (uncompressed) image file has a sequence of bytes like: (All values are listed in Hexadecimal)

```
"00 01 02 03 04 00 00 00 00 00 00 00 FF FD FF FF FF FF FF 00 FF"
```

The encoded result would like this:

“00 00 01 02 03 04 00 05 FF 00 FD FF 04 00 00 FF 00”

Result interpretation:

00 - the first byte is 00

00 - count of 0 (the previous 00 byte is not repeated or repeated zero times)

01 - a 01 byte

02 - a 02 byte

03 - a 03 byte

04 - a 04 byte

00 - another 00 byte in the file

05 - the 00 byte is repeated 5 times for a total of 6 “00” bytes (00+05=6 “00” bytes)

FF - a FF byte

00 - count of 0 (the previous FF byte is not repeated or repeated zero times)

FD - a FD byte

FF - another FF byte

04 - the FF byte is repeated 4 times for a total of 5 “FF” bytes (FF+04 = 5 “FF” bytes)

00 - another 00 byte

00 - repeat count = 0

FF - another FF byte

00 - repeat count = 0

This compression scheme is slightly inefficient for single 00 HEX and FF HEX occurrences but most image bitmaps include large areas of either blank space (00 HEX) or black space (FF HEX).

If a string of more than 255 00 HEX or FF HEX occurs, the byte-plus-count sequence may be repeated as often as necessary to incorporate all occurrences of the byte. For example, a string of 1132 “FF” HEX bytes in sequence may be encoded as:

“FF FF FF FF FF FF FF FF FF 6B”

The first four pairs of FF HEX each encode 256 bytes of FF HEX (one for the first FF byte and 255 copies) totaling 1024 bytes of FF HEX. The next FF HEX byte adds another byte and the 6B HEX adds 107 additional bytes for a total of 1132 FF HEX bytes.

$(4 \times 256) + 1 + 107 = 1132$

8.2.2 Uncompressed Image (^D104)

This command allows graphic and/or font images (fonts must be less than 64KB uncompressed) to be transmitted in ASCII-HEX, thereby allowing all data to pass over 7 or 8-bit data connections. This command is useable on data connections that support either 7 or 8-bit data.

The following is the format of the ^D104 command when used for a graphic image file:

*^A<Slot Number>^D104<CR>
<Rotation> <Count> <Image Data>*

Where:

<Memory Slot Number> is the memory slot location (1-255) where the graphic will be saved in the printer's memory. The printer uses the same TCI of "8" to select downloadable fonts or graphics. Therefore a font and a graphic cannot have the same Slot Number or CGN number.

<Rotation> is an 8-bit integer, 0 for an upright font and 1 for a 90-degree rotated image.

<Count> is a 32-bit integer, least significant byte first. This is the number of bytes that the image uses.

<Image Data> is the graphic image data that has been converted to ASCII-HEX.

ASCII-HEX Conversion

The ASCII-HEX conversion is performed by OR'ing the most significant and least significant nibbles of every byte with "30" HEX.

For Example: To convert the byte "6C" to ASCII-HEX, simply OR the first and second nibbles with "30" HEX. This results in the two bytes "36" HEX and "3C" HEX. This conversion results in a file size that is twice as big as the source but the data can now be transmitted over a 7-bit data connection. Refer to Figure 13.

8.3 Font Structure

The following font structure is offered to programmer's who wish to use their own programs to convert fonts. The font structure consists of a set of data structures and location offsets to those structures. All data is stored in binary form. Multi-byte values are stored "least significant byte" first. The printer can store a font of approximately 64KB or less in any one memory slot location.

(Word is a 16-bit value, Byte is an 8-bit value, and Label is a location within the file)

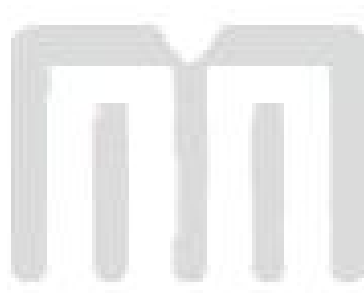
Label start:	the beginning of the file
Word, Word, lookup_table_offset	distance in bytes from start to beginning of lookup_table (4 bytes)
Word tallest_char	height of graphic image in dots
Word widest_char	Width of graphic image in dots
Byte default_spacing	Default spacing, usually 0
Byte byte_width	Width of graphic image in bytes
Byte first_char	20 HEX
Byte last_char	20 HEX
Byte default_char	20 HEX
Label lookup_table	beginning of lookup table

Word char_offset [last_char-first_char]	an array of offsets, one for each character in font. Each offset is the distance, in bytes, from the start to the beginning of the corresponding character's data structure. The first word in this array is the offset to the first character's data; the last word is the offset to the last character's data.
Label first_char_data	the beginning of the graphic image data
Word char_height	height of this character's bitmap in dots
Word char_width	width of the graphic image in dots
Byte bitmap_data[char_height][byte_width]	bitmap of character, 2d array. The most significant bit of the first byte in each row, prints as the right most dot of the character, and the first row is the bottom row when printed.

8.4 Downloadable Font Command Summary

The following commands refer to the use of downloadable fonts and graphics:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	100	Clear User RAM: This command clears all downloadable fonts, graphics, and stored label formats.
	101	List Memory Bytes Available: The printer will send the ">" character followed by the amount of available bytes and then finally a "<" character. (i.e. >192690<)
XX	104	Load Graphic Images or Fonts into User Memory without Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command should be used with an ASCII-HEX file that contains only printable characters less than 80 HEX. This command supports graphics over 64KB.
XX	106	Load Graphic Images or Fonts into User Memory without Compression: This command is intended for legacy support only and Microcom Corporation recommends either the ^D104 or ^D107 commands. Fonts must be less than 64KB for this command to function.
XX	107	Load Graphic Images or Fonts into User Memory using Binary Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command will greatly reduce the image download time and should be used whenever possible. This command may only be used with 8-bit data connections and will not function on 7-bit data connections.



Chapter 9: Bar Codes

The purpose of this chapter is to provide information pertaining to the unique requirements of the individual symbologies that are resident in the printer. Bar codes are accessed by selecting the appropriate TCI number.

9.1 Types of Bar Codes

This section provides information regarding the different requirements of the available resident bar codes. Unless stated otherwise in the descriptions below, the printer will automatically generate the necessary check digits when required. The following symbologies are described in numerical order based on the TCI number.

9.1.1 Universal Product Code – Version A (UPC-A), TCI 12

The Uniform Product Code version A or UPC-A symbology is used in the retail industry. It is capable of encoding numerical characters 0 through 9 and consists of eleven data digits followed by a check digit that the printer calculates. The first six data digits consist of a number system digit followed by manufacturer's identification digits that are assigned by the Uniform Code Council (UCC). The next five data digits are assigned by the manufacturers and typically represent product identification. The 12th digit is the checksum and should be omitted because the printer will automatically insert the correct value if a checksum is not included with the data. The printer will accept and print an invalid check digit if an incorrect check digit is provided. UPC-A bar codes do not use inter-character spacing and therefore the character spacing (CS) element must be defaulted. The UPC symbology defaults to an X dimension of 40% or 5.2 mils. To produce a symbology that is within the specification, a minimum multiplier of 2 should be entered in the appropriate multiplier parameters (CMX or CMY depending on the field orientation) to produce an 80% or 10.4 mils symbology.

9.1.2 Universal Product Code – Version E (UPC-E), TCI 13

The UPC-E symbology is used in the retail industry and is capable of encoding numerical characters 0 through 9 and consists of eleven data digits followed by a check digit that the printer calculates. The first six data digits consist of a number system digit followed by manufacturer's identification digits that are assigned by the Uniform Code Council (UCC). The next five data digits are assigned by the manufacturers and typically represent product identification. This bar code applies the "zero suppression" compression method to reduce certain 11 digit UPC-A bar codes to only 6 numeric digits and a conversion type numeric digit. Certain rules apply for this type of compression method to function properly. These rules may be obtained from the Uniform Code Council (UCC). The digits must be valid data for the proper bar code to print. Failure to use valid data may result in an incorrect bar code. The UPC symbology defaults to an X dimension of 40% or 5.2 mils. To produce a symbology that is within the specification, a minimum multiplier of 2 should be entered in the appropriate multiplier parameters (CMX or CMY depending on the field orientation) to produce an 80% or 10.4 mil symbology. When using the TCI 13 (UPC-E), the printer requires the unconverted 11 digits and the Manufacturer's ID number must begin with "0" for proper use. UPC-E bar codes do not use inter-character spacing, therefore the character spacing (CS) element must be defaulted. The chart listed in Table 14 illustrates how the 11 digits are reduced to only 6 using the "zero suppression" compression.

SYMBOLGY	DECODED NUMBER
X1 X2 X3 X4 X5 0	NS X1 X2 0 0 0 0 0 X3 X4 X5
X1 X2 X3 X4 X5 1	NS X1 X2 1 0 0 0 0 X3 X4 X5
X1 X2 X3 X4 X5 2	NS X1 X2 2 0 0 0 0 X3 X4 X5
X1 X2 X3 X4 X5 3	NS X1 X2 X3 0 0 0 0 0 X4 X5
X1 X2 X3 X4 X5 4	NS X1 X2 X3 X4 0 0 0 0 0 X5
X1 X2 X3 X4 X5 5	NS X1 X2 X3 X4 X5 0 0 0 0 5
X1 X2 X3 X4 X5 6	NS X1 X2 X3 X4 X5 0 0 0 0 6
X1 X2 X3 X4 X5 7	NS X1 X2 X3 X4 X5 0 0 0 0 7
X1 X2 X3 X4 X5 8	NS X1 X2 X3 X4 X5 0 0 0 0 8
X1 X2 X3 X4 X5 9	NS X1 X2 X3 X4 X5 0 0 0 0 9

Table 14 UPC-E Zero Reduction Format

9.1.3 Universal Product Code (UPC-E, send 6 digits), TCI 14

The UPC-E symbology is used in the retail industry and is capable of encoding numerical numbers 0 through 9 and consists of six digits followed by a check digit that the printer calculates. This symbology is the same as the UPC-E (TCI 13) with the only exception being that only the actual 7 numeric digits are used to produce the bar code. The digits must be valid data for the proper bar code to print. Failure to use valid data may result in an incorrect bar code. The UPC symbology defaults to an X dimension of 40% or 5.2 mils. To produce a symbology that is within the specification, a minimum multiplier of 2 should be entered in the appropriate multiplier parameters (CMX or CMY depending on the field orientation) to produce an 80% or 10.4 mils symbology.

9.1.4 Interleaved 2 of 5 (I2of5), TCI 15

The I2of5 is a variable length, paired, numerical symbology that is typically used in the industrial and distribution industries. The I2of5 is a paired symbology, which means that the data string being sent must always be an even number amount. If the desired data to be sent is an odd amount, simply pad the beginning with "0" to achieve an even amount of digits. This symbology uses 2:1, 3:1, 4:2, 5:2, and 8:3 ratios, which may be selected by the CGN parameter. The I2of5 symbology actually encodes characters in the spaces as well as the bars. Therefore, the character spacing (CS) parameter must be defaulted.

9.1.5 Code 3 of 9 (Code39), TCI 16

Code 39 is a variable length, alphanumeric symbology that is very popular and is extensively used in the non-retail, military, manufacturing and medical industries. Code 39 is capable of encoding numerical characters 0 through 9, the English Alphabet (uppercase only), characters -, *\$/% along with the "space" character. The Code 39 is framed with a start/stop character represented by the asterisk ("*") character, which is reserved for this purpose. This symbology uses 2:1, 3:1, 4:2, 5:2, and 8:3 ratios, which may be selected using the CGN parameter. Although most specifications require a specific inter-character spacing, Code39 will allow custom inter-character spacing as long as the maximum does not exceed the timeout zone of the intended scanning equipment.

9.1.6 European Article Numbering System 13 (EAN-13), TCI 20

The European Article Numbering system (EAN) is a European version of the UPC symbology that is used in the retail industry. It is also referred to JAN or Japanese Article Numbering system in Japan. The EAN-13 is a fixed length symbology that encodes up to 13 numeric digits consisting of two country code digits, ten data digits, and one check digit that the printer will automatically calculate. The EAN symbology defaults to an X dimension of 40% or 5.2 mils. To produce a symbology that is within the specification, a minimum multiplier of 2 should be entered in the appropriate multiplier parameters (CMX or CMY depending on the field orientation) to produce an 80% or 10.4 mils symbology.

9.1.7 European Article Numbering System 8 (EAN-8), TCI 21

The European Article Numbering system (EAN) is a European version of the UPC symbology that is used in the retail industry. It is also referred to JAN or Japanese Article Numbering system in Japan. The EAN-8 encodes up to 8 numeric digits consisting of two country code digits, five data digits, and one check digit that the printer will automatically calculate. While very similar to the UPC-E symbology, the EAN-8 does not compress the data digits and is not a condensed version of the EAN-13 symbology. The EAN symbology defaults to an X dimension of 40% or 5.2 mils. To produce a symbology that is within the specification, a minimum multiplier of 2 should be entered in the appropriate multiplier parameters (CMX or CMY depending on the field orientation) to produce an 80% or 10.4 mils symbology.

9.1.8 Modified Plessey (MSI 1), TCI 24

The MSI is a modified version of the Plessey symbology which is a variable length, numeric only symbology used for retail shelf labeling. When using MSI 1, the user does not have to provide either check digit; the printer will calculate and insert the check digits automatically.

9.1.9 Modified Plessey (MSI 2), TCI 25

The MSI is a modified version of the Plessey symbology which is a variable length, numeric only symbology used for retail shelf labeling. When using the MSI 2 bar code, the user provides one check digit and the printer will calculate the second check digit.

9.1.10 Modified Plessey (MSI 3), TCI 26

The MSI is a modified version of the Plessey symbology which is a variable length, numeric only symbology used for retail shelf labeling. When using the MSI 3 bar code, the user provides both check digits.

9.1.11 Postnet (ZIP+4), TCI 36

Postnet is a numeric only symbology that is commonly used in postal application to sort mail. The five digit zip or five digit zip plus four digit extension may be used to generate this Postnet (TCI 36) bar code. Example: 12345 or 12345-1234.

9.1.12 Postnet (ZIP+6), TCI 37

Postnet is a numeric only symbology that is commonly used in postal application to sort mail. The five digit zip plus six digit extension may be used to generate this Postnet (TCI 37) bar code. Example: 12345-123456.

9.1.13 MaxiCode, TCI 38

MaxiCode is a fixed-size, 2-D matrix symbology that is capable of encoding the entire ASCII character set (0 to 255) and up to 93 characters per symbology. Modes 2 through 6 of the AIM Internal MaxiCode specification are supported. Modes 0 and 1 are obsolete and are not supported. The CGN parameter is used to select the desired mode (2-6) of the symbology.

MaxiCode may encode non-printable characters, and Modes 2 and 3 require certain control characters for compatibility with transport industry standards. In order to properly specify a control character in a MaxiCode data string, use the pound symbol (“#”) followed by the two digits Hexadecimal value of the control code. For example, “#01” specifies “Control-A” (ASCII SOH) and “#1D” specifies “Control-]” (ASCII GS). Enter “##” in order to include an actual pound symbol in the data string. Refer to Table 15 for the “#” equivalents that may be used.

The data string associated with a MaxiCode field shall be formatted according to the Mode selected (2-6).

Mode 2:

Mode 2 may have either of the following formats:

Format 1

```
[>#1e01#dYYPPPPPPPP#1dCCC#1dSSS#1dA..A#1dB..B#1dC..C#1e#04
```

Where:

#1e is the ASCII RS character

#1d is the ASCII GS character

#04 is the ASCII EOT character

YY is the two digit numeric year

PPPPPPPP is the nine digit numeric US Postal Code. If using a 5-digit Postal Code, the last 4 digits must be 0.

CCC is the three digit numeric Country Code (840 in the US).

SSS is the three digit numeric Class of Service.

A..A, B..B, C..C, etc. are variable-length alphanumeric fields separated by #1d. These fields are optional according to the MaxiCode specification, but may be required by some applications.

Format 2

PPPPPPPP#1dCCC#1dSSS#1dA..A#1dB..B#1dC..C#04

The individual fields are the same as previously described in Format 1.

Mode 3:

Mode 3 may have either of the following formats:

Format 1

[]>#1e01#1dYYPPPPPP#1dCCC#1dA..A#1dB..B#1dC..C#1e#04

Format 2

PPPPPP#1dCCC#1dSSS#1dA..A#1dB..B#1dC..C#04

Where:

#1e is the ASCII RS character

#1d is the ASCII GS character

#04 is the ASCII EOT character

YY is the two digit numeric year

PPPPPP is the six character alphanumeric Postal Code.

CCC is the three digit numeric Country Code

SSS is the three digit numeric Class of Service

A..A, B..B, C..C, etc. are variable length alphanumeric field separated by the #1d. These fields are optional according to the MaxiCode specification, but may be required in certain application.

Mode 4:

Mode 4 may encode any string of up to 93 characters. Control characters are specified in Table 15, and occupy only one character in the encoded string.

Mode 5:

Mode 5 may encode any string of up to 77 characters. Control characters are specified in Table 15, and occupy only one character in the encoded string.

Mode 6:

Mode 6 may encode ant string up to 93 characters. Control characters are specified in Table 15, and occupy only one character in the encoded string.

DATA STRING	CONTROL CODE	ASCII NAME	HEX VALUE
#00	Control @	NUL	00
#01	Control A	SOH	01
#02	Control B	STX	02
#03	Control C	ETX	03
#04	Control D	EOT	04
#05	Control E	ENQ	05
#06	Control F	ACK	06
#07	Control G	BEL	07
#08	Control H	BS	08
#09	Control I	HT	09
#0A	Control J	LF	0A
#0B	Control K	VT	0B
#0C	Control L	FF	0C
#0D	Control M	CR	0D
#0E	Control N	SO	0E
#0F	Control O	SI	0F
#10	Control P	DLE	10
#11	Control Q	DC1	11
#12	Control R	DC2	12
#13	Control S	DC3	13
#14	Control T	DC4	14
#15	Control U	NAK	15
#16	Control V	SYN	16
#17	Control W	ETB	17
#18	Control X	CAN	18
#19	Control Y	EM	19
#1A	Control Z	SUB	1A
#1B	Control [ESC	1B
#1C	Control \	FS	1C
#1D	Control]	GS	1D
#1E	Control ^	RS	1E
#1F	Control _	US	1F
##	n/a	# (pound)	23

Table 15 **MaxiCode Control Code Equivalents**

9.1.14 Code 128 (Automatic Compression), TCI 40

The Code 128 bar code is a variable length, high density, alphanumeric symbology that is extensively used worldwide. This bar code uses three subsets (A, B, and C) which allows for the encoding of the full 128 ASCII character set along with special control codes. This bar code uses automatic compression. The printer will automatically choose the most efficient subset and insert the appropriate special function code listed in Table 16. It is possible to force a subset change by inserting the appropriate code while in automatic compression, however it is not recommended. Please note that if a subset is forced while using automatic compression the printer will automatically switch to subset C if 6 or more numeric characters are contained in the data string. Once the even number of characters has been processed, the printer will then switch to subset B. This could create problems if a user sent 6 numeric characters while forcing subset A (“#7123456”). The printer would automatically switch to subset C and then back to subset B resulting in an undesired bar code due to the extra function codes. If specific control of the subsets is a requirement, then the manual compression bar code should be used.

Code	SUBSET A	SUBSET B	SUBSET C
#0	FNC3	FNC3	N/A
#1	FNC2	FNC2	N/A
#2	SHIFT	SHIFT	N/A
#3	CODE C	CODE C	N/A
#4	CODE B	FNC4	CODE B
#5	FNC4	CODE A	CODE A
#6	FNC1	FNC1	FNC1
#7	START	N/A	N/A
#8	N/A	START	N/A
#9	N/A	N/A	START
##	#	#	N/A

Table 16 Code128 Special Function Access

9.1.15 Code 128 (Manual Compression), TCI 41

The Code 128 bar code is a variable length, high density, alphanumeric symbology that is extensively used worldwide. This bar code uses three subsets (A, B, and C) which allows for the encoding of the full 128 ASCII character set along with special control codes. This bar code uses manual compression, which provides full control by manually shifting between the available subsets using the special function access codes. The codes (#n) are placed within the data string to access the desired functions listed in the table below. When using manual compression the printer defaults to subset B if no start code is defined. The printer will also not attempt to compress the data unless subset C is used. Once in subset C the user must send the appropriate code (#n) to return to either subset A or B.

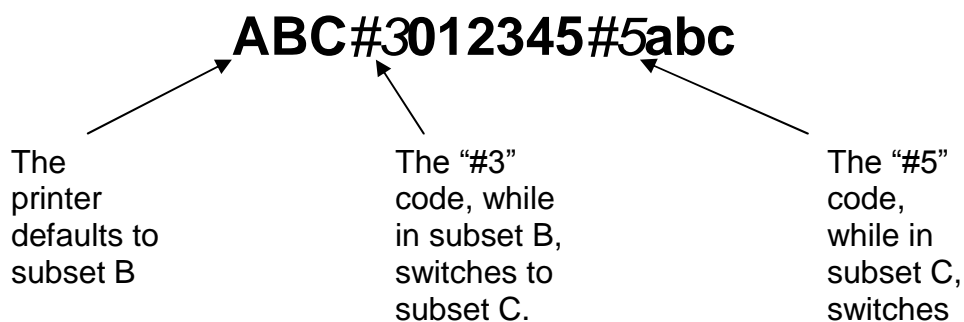


Figure 15 Code 128 Subset Switching

Subset A

This subset contains 106 unique characters, which includes numbers 0 through 9, the English alphabet (uppercase only), punctuation marks, ASCII control codes, and the special function codes listed in table 6.

Subset B

This subset contains 106 unique characters, which includes numbers 0 through 9, the English alphabet (both uppercase and lower case), punctuation marks, and the special function codes listed in table 6. This is the default if a subset is not defined when using manual compression.

Subset C

This subset contains 106 unique characters, which includes matched pair numbers 00 through 99 and the special function codes listed in table 6. Subset C requires that an even amount of digits to be sent because the matched pairs are encoded as a single character. This allows for a greater amount of compression than subsets A and B. If an odd amount of digits and/or non-numeric characters were sent while using subset C, the resulting bar code produced would be invalid.

9.1.16 Codabar (Rationalized), TCI 42

Codabar is a variable length linear symbology that is commonly used in libraries, blood banks, and in the air parcel business. Codabar is capable of encoding the 16 following characters: 0123456789-\$/+. and the four start/stop characters ABCD. This symbology uses 2:1, 3:1, 4:2, 5:2, and 8:3 ratios, which may be selected using the CGN parameter.

9.1.17 Code 93, TCI 43

Code 93 is a variable length, alphanumeric symbology that is capable of encoding 48 different characters and through the use of control characters can encode the full 128 ASCII character set. The 48 characters include the “space”, numerical characters 0 through 9, the English alphabet (uppercase only), characters \$%+-. / along with five special characters including the start/stop character.

9.1.18 AS-10, TCI 44

The AS-10 symbology is not widely used. It is a variable length and encodes the numeric values 1234567890.

9.1.19 PDF-417, TCI 46

The Portable Data File 417 or PDF-417 is a two-dimensional stacked symbology that is capable of encoding the entire ASCII character set, 2710 digits, and up to 1108 bytes in a single bar code. The requirements for generating a PDF-417 symbology are the text data, placement information, size configuration, rotation, aspect ratio, and Error Correcting Code or ECC. The character count (CC) parameter only has to be set to one character that will be used as a placeholder and not printed. The PDF-417 format command (^D77) is used to load the data as well as formatting instructions for the bar code and is placed on the first line of the format.

The following format is used to generate a PDF-417 bar code:

```
^D77<CR>
:Text Data^[
Number_of_Rows<CR>
Number_of_Columns<CR>
Rotation<CR>
ECC_Percent<CR>
ECC_Level<CR>
Aspect_Ratio<CR>
```

This format is then followed by the placement instructions and text placeholder.

:Text Data^[

This parameter is where the desired data is placed and must be terminated with the “^[“ control code. The text data may include carriage returns and other control codes.

Number_of_Rows<CR>

This parameter specifies the number of rows used for rendering the PDF-417 symbology. The PDF-417 symbology may have as few as 3 or as many as 90 rows with a default setting of 90. A carriage return character must be used to terminate this field.

Number_of_Columns<CR>

This parameter specifies the number of columns used for rendering the PDF-417 symbology. The PDF-417 symbology may have 1 to 30 columns with a default setting of 30. A carriage return character must be used to terminate this field.

Rotation<CR>

This parameter controls the rotation of the rendered PDF-417 symbology in 90-degree increments. The valid arguments for this parameter would be 0, 90, 180 or 270 with the default being set to 0. A carriage return character must be used to terminate this field.

ECC_Percent<CR>

The ECC_Percent parameter is used to set the percentage of overall data dedicated to the Error Correction Control (ECC) of the PDF-417 symbology. This parameter has to be set to 0 if the ECC# method is desired. The default ECC% is set to 0. A carriage return character must be used to terminate this field.

ECC_Level<CR>

The ECC_Level parameter is used to set the level of error correction of the PDF-417 symbology with a default value set to 0. This parameter can only be used if the ECC% parameter is set to 0. Refer to Table 17 for the valid ECC_Level values and their equivalent correction codewords. A carriage return character must be used to terminate this field.

Aspect_Ratio<CR>

This parameter is used to adjust the aspect ratio of the PDF-417 symbology. The value is entered in ratio format (height: width) and has a default value of 2:1. A carriage return character must be used to terminate this field.

ECC#	Number of Error Correction Codewords
0	2
1	4
2	8
3	16
4	32
5	64
6	128
7	256
8	512

Table 17 PDF-417 Error Correction Level

The following format samples show how to generate a PDF-417 bar code:

Sample Format #1:

```

^D77<CR>
:PDF-417 bar code data^[
3<CR>
30<CR>
0<CR>
0<CR>
0<CR>
2:1<CR>
^D57<CR>
2,575,609,,25,35,0,1,285<CR>
1,190,300,1,46<CR>
2,190,200,11,1,5<CR>
^D56<CR>
^D2<CR>
P<CR>
Text string<CR>
^D3<CR>

```

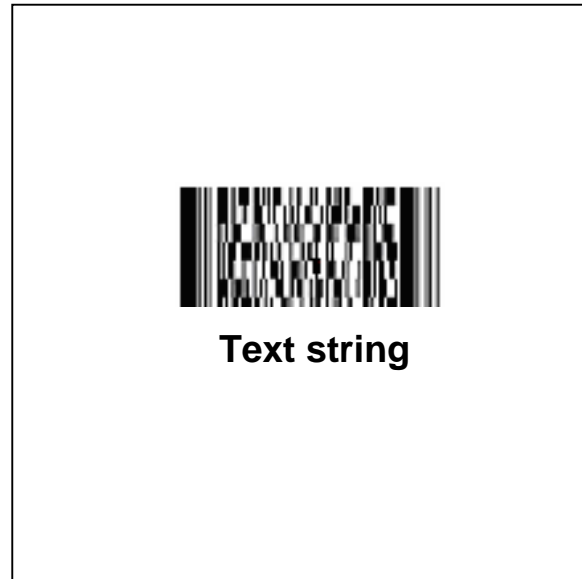


Figure 16 PDF-417 Sample Format #1

Sample Format #2:

```

^D77<CR>
:PDF-417 bar code data<CR>
entered on two separate lines^[
3<CR>
30<CR>
90<CR>
0<CR>
0<CR>
2:1<CR>
^D57<CR>
2,575,609,,25,35,0,1,285<CR>
1,190,300,1,46<CR>
2,190,200,11,1,5<CR>
^D56<CR>
^D2<CR>
placeholder<CR>
Text string<CR>
^D3<CR>

```

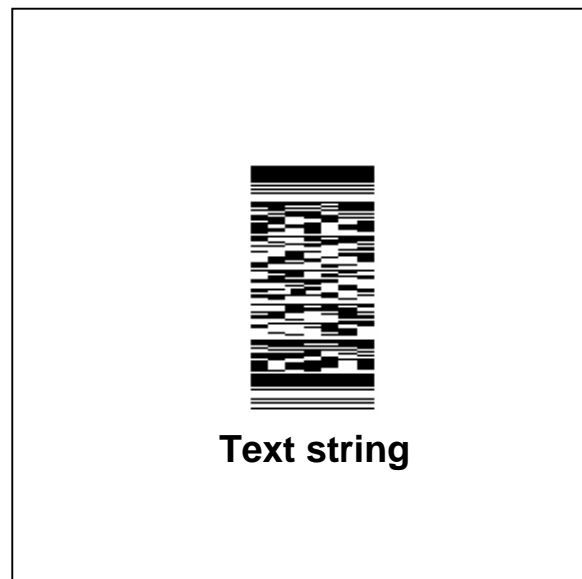


Figure 17 PDF-417 Sample Format #2

9.1.20 UCC/EAN 128, TCI 50

UCC/EAN 128 symbologies are actually code 128 bar codes that have specific data format guidelines for multiple data subfields. The subfields are identified by application identifiers that are specified in the “UCC/EAN Application Identifier Standard” available from the Uniform Code Council, Inc.®.

Data strings can contain one or more substrings appended onto one line. Each substring can consist of a 2, 3 or 4 digit Application Identifier immediately followed by a data string meeting the formatting requirements for that specific Application Identifier.

The following table is a list of the supported Application Identifiers and their specific data format requirements.

Use the legend below when interpreting the data format requirements listed in the table below:

- a alphabetic character
- n numeric number
- an alphanumeric character
- a3 3 alphabetic characters (fixed length)
- n3 3 numeric characters (fixed length)
- an3 3 alphanumeric characters (fixed length)
- a..3 3 alphabetic characters (variable length)
- n..3 3 numeric characters (variable length)
- an..3 3 alphanumeric characters (variable length)
- (*) Indicates only year and month, DD must be filled with “00”
- (**) Plus one digit for length indication
- (***) Plus one digit for decimal point indication

AI	Content	Format
00	SCC-18	n2+n18
01	SCC-14	n2+n14
10	Batch or Lot Number	n2+an..20
11(*)	Production Date (YYMMDD)	n2+n6
13(*)	Packaging Date (YYMMDD)	n2+n6
15(*)	Sell By Date (Quality) (YYMMDD)	n2+n6
17(*)	Expiration Date (Safety) (YYMMDD)	n2+n6
20	Product Variant	n2+n2
21	Serial Number	n2+an..20
22	HIBCC – Quantity, Date, Batch, and Link	n2+an..29
23(**)	Lot Number (Transitional Use)	n3+n..19
240	Additional Product Identification assigned by the Manufacturer	n3+an..30

AI	Content	Format
250	Secondary Serial Number	n3+an..30
30	Quantity	n2+n..8
310(***)	Net Weight, Kilograms	n4+n6
311(***)	Length or 1 st Dimension, Meters	n4+n6
312(***)	Width Diameter, or 2 nd Dimension, Meters	n4+n6
313(***)	Depth Thickness, Height or 3 rd Dimension, Meters	n4+n6
314(***)	Area, Square Meters	n4+n6
315(***)	Volume, Liters	n4+n6
316(***)	Volume, Cubic Meters	n4+n6
320(***)	Net Weight, Pounds	n4+n6
321(***)	Length or 1 st Dimension, Inches	n4+n6
322(***)	Length or 1 st Dimension, Feet	n4+n6
323(***)	Length or 1 st Dimension, Yards	n4+n6
324(***)	Width Diameter, or 2 nd Dimension, Inches	n4+n6
325(***)	Width, Diameter, or 2 nd Dimension, Feet	n4+n6
326(***)	Width, Diameter, or 2 nd Dimension, Yards	n4+n6
327(***)	Depth Thickness, Height or 3 rd Dimension, Inches	n4+n6
328(***)	Depth Thickness, Height or 3 rd Dimension, Feet	n4+n6
329(***)	Depth Thickness, Height or 3 rd Dimension, Yards	n4+n6
330(***)	Gross Weight, Kilograms	n4+n6
331(***)	Length or 1 st Dimension, Meters, Logistics	n4+n6
332(***)	Width Diameter, or 2 nd Dimension, Meters, Logistics	n4+n6
333(***)	Depth Thickness, Height or 3 rd Dimension, Meters, Logistics	n4+n6
334(***)	Area, Square Meters, Logistics	n4+n6
335(***)	Gross Volume, Liters	n4+n6
336(***)	Gross Volume, Cubic Meters	n4+n6
340(***)	Gross Weight, Pounds	n4+n6
341(***)	Length or 1 st Dimension, Inches, Logistics	n4+n6
342(***)	Length or 1 st Dimension, Feet, Logistics	n4+n6
343(***)	Length or 1 st Dimension, Yards, Logistics	n4+n6
344(***)	Width Diameter, or 2 nd Dimension, Inches, Logistics	n4+n6

AI	Content	Format
345(***)	Width Diameter, or 2 nd Dimension, Feet, Logistics	n4+n6
346(***)	Width Diameter, or 2 nd Dimension, Yards, Logistics	n4+n6
347(***)	Depth Thickness, Height or 3 rd Dimension, Inches, Logistics	n4+n6
348(***)	Depth Thickness, Height or 3 rd Dimension, Feet, Logistics	n4+n6
349(***)	Depth Thickness, Height or 3 rd Dimension, Yards, Logistics	n4+n6
350(***)	Area, Square Inches	n4+n6
351(***)	Area, Square Feet	n4+n6
352(***)	Area, Square Yards	n4+n6
353(***)	Area, Square Inches, Logistics	n4+n6
354(***)	Area, Square Feet, Logistics	n4+n6
355(***)	Area, Square Yards, Logistics	n4+n6
356(***)	Net Weight, Troy Ounce	n4+n6
360(***)	Volume, Quarts	n4+n6
361(***)	Volume, Gallons	n4+n6
362(***)	Gross Volume, Quarts	n4+n6
363(***)	Gross Volume, Gallons	n4+n6
364(***)	Volume, Cubic Inches	n4+n6
365(***)	Volume, Cubic Feet	n4+n6
366(***)	Volume, Cubic Yards	n4+n6
367(***)	Gross Volume, Cubic Inches	n4+n6
368(***)	Gross Volume, Cubic Feet	n4+n6
369(***)	Gross Volume, Cubic Yards	n4+n6
400	Customer's Purchase Order Number	n3+an..30
410	Ship To (Deliver To) Location Code Using EAN-13	n3+n13
411	Bill To (Invoice To) Location Code Using EAN-13	n3+n13
412	Purchase From (Location Code of Party from Whom Goods are Purchased)	n3+n13
414	EAN Location Code for Physical Identification	n3+n13
420	Ship To (Deliver To) Postal Code Within a Single Postal Authority	n3+an..9
421	Ship To (Deliver To) Postal Code with 3 Digit ISO Country Code Prefix	n3+n3+an..9

AI	Content	Format
8001	Roll Products – Width Length, Core Diameter, Direction, and Splices	n4+n14
8002	Electronic Serial Number for Cellular Mobile Telephones	n4+an..20
8003	UPC/EAN Number and Serial Number of Returnable Asset	n4+n14+an..16
8100	Coupon Extended Code – Number System Character and Offer	n4+n1+n5
8101	Coupon Extended Code – Number System Character , Offer, and End of Offer	n4+n1+n5+n4
8102	Coupon Extended Code – Number System Character preceded by zero	n4+n1+n1
90	Mutually Agreed, Between Trading Partners or FACT Dis	n2+an..30
91	Intra-Company (Internal)	n2+an..30
92	Intra-Company (Internal)	n2+an..30
93	Intra-Company (Internal)	n2+an..30
94	Intra-Company (Internal)	n2+an..30
95	Internal-Carriers	n2+an..30
96	Internal-Carriers	n2+an..30
97	Intra-Company (Internal)	n2+an..30
98	Intra-Company (Internal)	n2+an..30
99	Internal	n2+an..30

Table 18 UCC/EAN Application Identifiers

Each subfield's format is expressed as the format of the Application Identifier number + the format of the associated data. Each subfield must adhere to the format specified or else the printer will be unable to locate following subfields, causing errors generating the bar code.

Any variable length subfield, unless it is the last subfield in the field, must be terminated by the two characters "#6" (pound+6). These characters are translated as the Code 128 "FNC1" character, which is specified by the UCC/EAN 128 symbologies variable-length field terminator. The characters "#6" are only used internally and are not printed.

Several Application Identifiers (00, 01, 22, and 8003) specify fields that will have a check digit as part of their data. A character must be included in the check digit place (although it need not be the correct check digit). This character is used as a placeholder and will not be printed. The printer will calculate the correct check digit and replace the character already there.

9.1.21 UCC/EAN Text Information, TCI 51

The TCI 51 generates the UCC/EAN information as text. This TCI uses the same criteria for formatting as the TCI 50 bar code. The CGN selects the desired resident font that will be used to generate this string. The printer will automatically surround each application identifier with parentheses and add a space character in front of the data when using a TCI of 51. Do not use the parentheses or spaces when entering the data for an application identifier field.

9.2 Bar Code Rotation

When 0 and 180 degree bar codes are X multiplied (CMX), the space between characters is also multiplied by the printer internally to maintain the correct ratio. When multiplying bar codes use the default value for the spacing element (SP) in the field format parameters. On some bar codes that allow spacing to be adjusted, spacing may be increased from the default and not reduced to a smaller spacing.

When 0 and 180 degree bar codes are Y multiplied (CMY), the result is the actual height of the bar code in thermal dots. If the Y multiplier (CMY) is not multiplied, a bar code with a vertical length of one dot would be produced. For example: If a one inch high bar code is desired, 203 should be inserted for the CMY value.

When 90 and 270 degree, ladder or vertical, bar codes are X multiplied (CMX), the result is the actual width of the bar code in thermal dots. If the X multiplier (CMX) is not multiplied, a bar code with a horizontal length of one dot would be produced. For example: If a one inch wide bar code is desired, 203 should be inserted for the CMX value.

When 90 and 270 degree bar codes are Y multiplied (CMY), the space between characters is also multiplied by the printer internally to maintain the correct ratio. When multiplying bar codes use the default value for the spacing element (SP) in the field format parameters. On some bar codes that allow spacing to be adjusted, spacing may be increased from the default and not reduced to a smaller spacing.

Rotated Bar Code Program Sample, see Figure 17:

```

^D57<CR>
5,575,609,,25,35,0,1,285,0,0 <CR>
1,300,500,5,16,2,0,,2,100<CR>
1,300,400,5,16,2,1,,2,100<CR>
1,300,300,5,16,2,2,,100,2<CR>
1,300,300,5,16,2,3,,100,100<CR>
2,288,300,9,1,5,0,4<CR>
^D56 <CR>
^D2 <CR>
12345<CR>
ROTATIONS<CR>
^D3<CR>

```

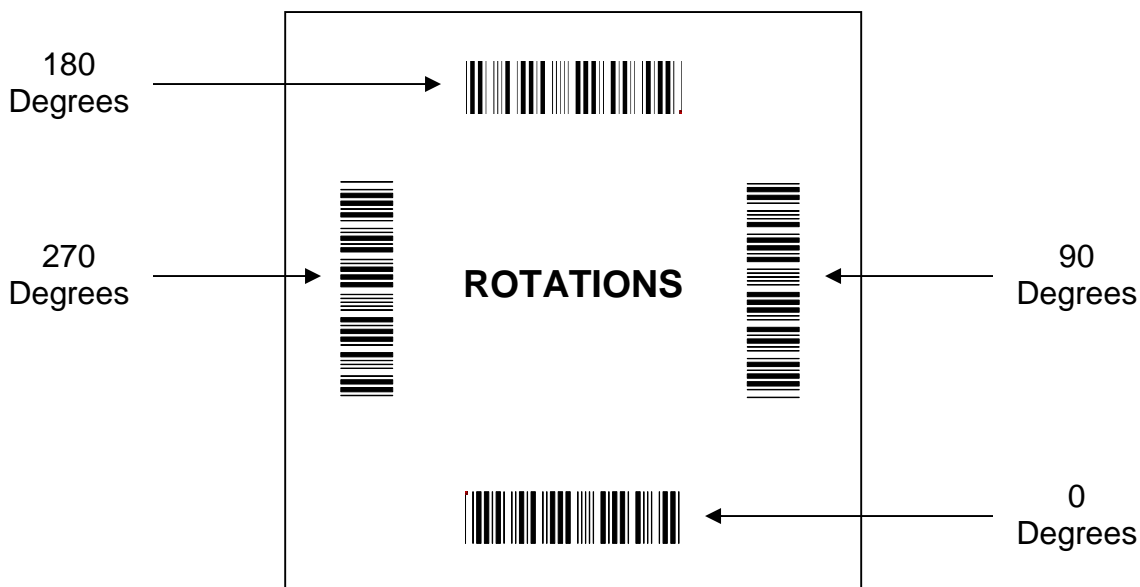


Figure 18 Bar Code Rotations

9.3 Bar Code Human Readable Text

Certain bar codes require human readable text and/or extended bars to conform to specifications. This is accomplished by using specially created TCI's (refer to section 5.6.5 or table 19) which add the human readable text and extended bars. This section will provide the necessary information to successfully add these items. This should not be confused with simply making all bar codes human readable. For bar codes that do not require extended bars, simply access the data that the bar code is using with a second field that generates a text representation of the data and insert in the desired position.

TCI VALUE	TCI DESCRIPTION
3	Text with UPC-A/UPC-E Checksum Digit added.
17	Text with UPC-E Checksum and Extended Bars added
22	Text with EAN-13 Checksum and Extended Bars added
23	Text with EAN-8 Checksum and Extended Bars added
28	Text with MSI 1 Checksum added
29	Text with MSI 2 Checksum added
32	Text with UPC-A Checksum and Extended Bars added
33	Text with UPC-A with Extended Bars added

Table 19 Human Readable/Extended Bars TCI's

The Text/Extended Bar TCI's generate the human readable text and extended bars that are aligned with the original bar code to create the complete bar code, see Figure 18.

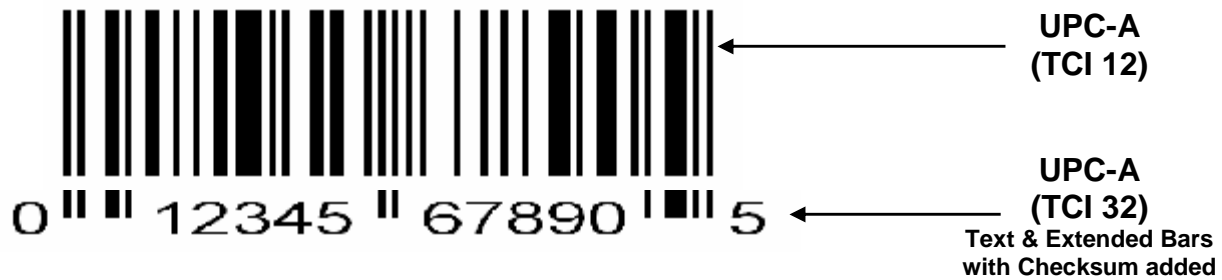


Figure 19 UPC-A Text/Extended Bars

The TCI 32 text/extended code shown in Figure 18, is aligned with the TCI 12 code so that there is no space between the two. This creates one bar code. TCI's (17, 22, 23, 32, and 33) that add the extended bars should default the CGN parameter or enter a value of "1". The fields may then be multiplied using the CMX and CMY parameters to generate the proper size to match the bar code that the human readable code is intended. The data used to generate the human readable code should be the same data used to generate the bar code.

TCI's (3, 28, and 29) that only add the human readable portion may select any CGN for the font size and multiply it normally. The main purpose of these codes is to add the automatically calculated check digit character to the human readable code. The data used to generate the human readable code should be the same data used to generate the bar code.

The following is a sample format is used to illustrate the proper use of the human readable code. This format contains the data used in Figure 18 and will print out two bar codes. The first bar code is a complete version while the second bar code illustrates the text/extended code before aligning to the original bar code.

Sample Format:

```

^D57<CR>
4,575,609,,25,35,0,1,285,0,0<CR>
1,200,418,11,12,,,,2,50<CR>
1,178,400,11,32,,,,2,2<CR>
1,200,150,11,12,,,,2,50<CR>
1,178,125,11,32,,,,2,2<CR>
^D56<CR>
^D2<CR>
01234567890<CR>
^D3<CR>

```

Chapter 10: Printer Maintenance

10.1 Maintenance Schedule

It is important to note that the optimum print quality and print head life is achieved by maintaining a clean printer and print head. A Microcom Corporation approved cleaning kit (*part # 040005-0000*) is available; contact your sales representative for purchasing information.

AREA	METHOD	INTERVAL
Print head	Foam tipped swab, cotton tipped swab, or thermal printer cleaning card dampened with Isopropyl Alcohol. <i>See section 10.4</i>	After every roll of media or every 512 feet of tag stock or fanfold media.
Drive Roller	Foam tipped swab, cotton tipped swab, thermal printer cleaning card, or lint-free cloth dampened with Isopropyl Alcohol <i>See Section 10.5</i>	After every roll of media or every 512 feet of tag stock or fanfold media.
Peel Edge	Foam tipped swab, cotton tipped swab, thermal printer cleaning card, or lint-free cloth dampened with Isopropyl Alcohol <i>See section 10.3</i>	As Needed.
Interior Cleaning	Compressed air, soft-bristle brush, and/or lint-free cloth dampened with Isopropyl Alcohol. <i>See section 10.3</i>	As Needed.
Exterior Cleaning	Lint-free cloth dampened with a mild, non-abrasive general purpose cleaner. <i>See section 10.6</i>	As Needed.

Table 20 Recommended Maintenance Schedule



CAUTION: Microcom Corporation will not be held responsible for damage caused by any non-approved solvent, cleaning material and/or method. The use of such non-approved materials and/or methods may void appropriate expressed or implied warranties.

10.2 Thermal Printer Card

Decline in print quality, voids or drop out areas in bar codes and/or graphics may indicate that the print head is dirty and needs to be cleaned. The necessary cleaning materials can be purchased through Microcom Corporation by contacting your sales representative and ordering the *Cleaning Kit, part # 040005-0000*. The print head should be cleaned after every roll of media or after every 512 feet (3200 tag which is a typical stack of tag or fanfold media).

A thermal printer card is the quickest and easiest way to clean the print head, drive roller, and peel edge all at the same time. Follow the steps below for the proper cleaning procedure.

1. Remove any installed media.
2. Dampen both sides on one end, of the cleaning card with isopropyl alcohol.
3. Push the *Head Release Levers* towards the center of the printer and insert the card into the front of the printer between the print head and the drive roller (See Figure 20).
4. Continue inserting the card until you feel resistance; close the head assembly so that it latches in place.
5. Using both hands, slowly pull the card out of the printer at a 45° down angle (See Figure 21).
6. Repeat as necessary
7. Reinstall media.

Thermal cleaning cards should not be used more than three times each. Extremely dirty cards should be disposed of immediately.



CAUTION: Never touch or clean the print head with any abrasive solvents and/or with any metal or sharp object.

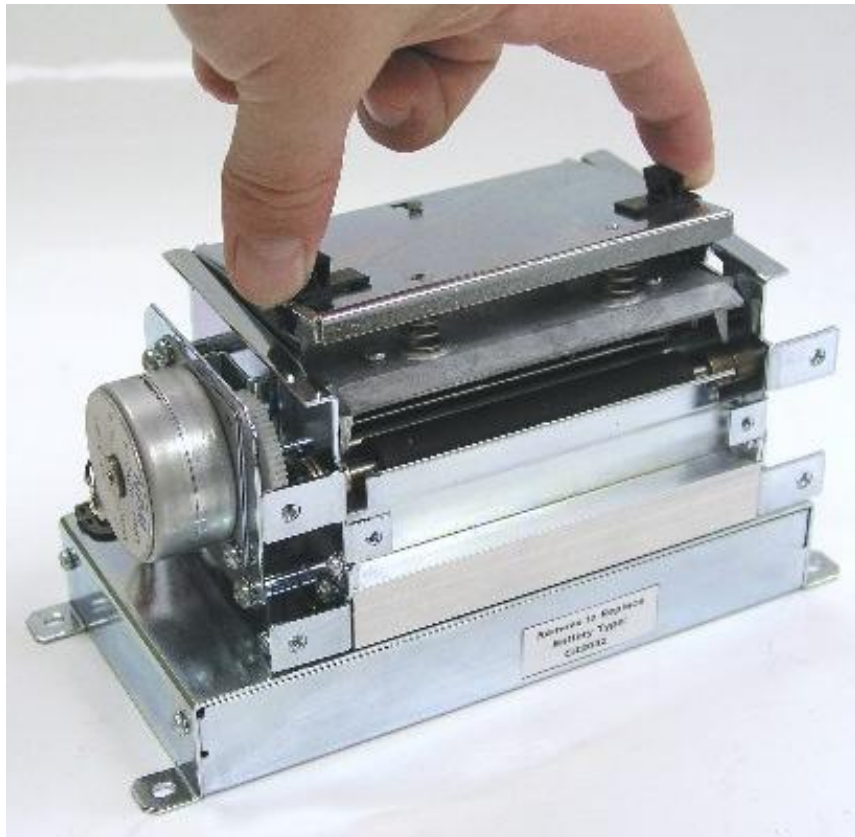


Figure 20 Unlatching the Print head

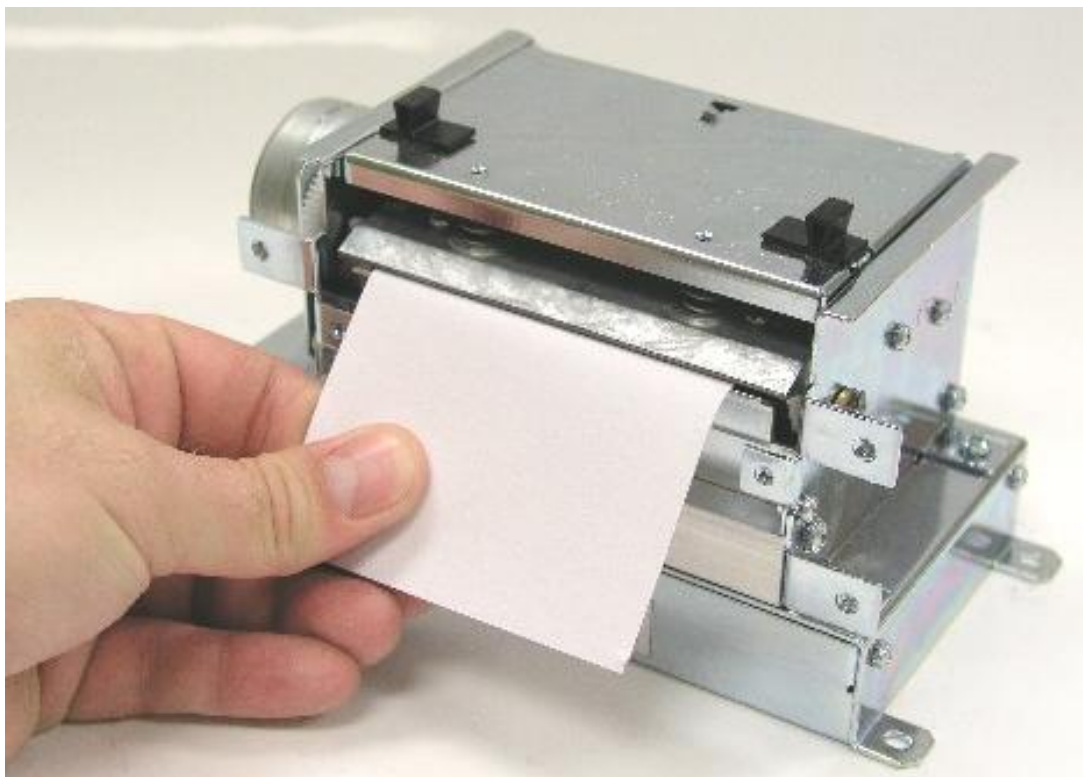


Figure 21 Removal of Thermal Card

10.3 Internal Cleaning

The overall internal cleaning of the printer is important to help reduce the dust and other contaminants residing in the printer that may attach to the print head or drive roller and affect the printer's performance. Refer to Figure 22 for common areas needing cleaned.

1. Remove any installed media.
2. Turn the printer power OFF.
3. Using the two *Head Release Levers* (See Figure 20), unlatch and raise the print head.
4. Basic internal cleaning can be done using a combination of compressed air, soft-bristle brushes, foam/cotton tipped swabs, and/or lint-free cloths dampened in alcohol. Use any combination of these materials to remove dust or other contaminants from the printer. See section 10.4 for the proper print head maintenance procedure.
5. When finished, close the print head assembly so that it is latched into place and reinstall media.
6. Turn the printer power ON

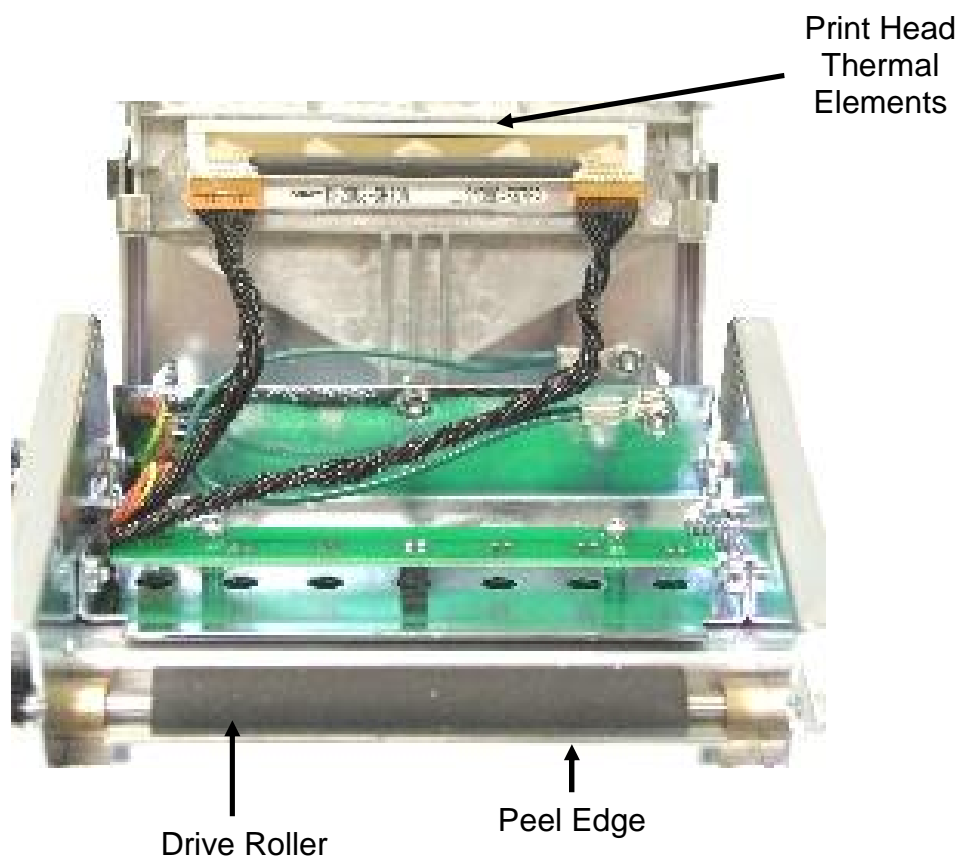


Figure 22 Internal Cleaning

10.4 Print head Maintenance

If print quality has not improved after cleaning (using a thermal cleaning card, or if one is not available) foam or cotton tipped swabs dampened in isopropyl alcohol may be used. Refer to Figures 20 and 23 and follow the steps below for the proper cleaning procedure.

1. Remove any installed media.
2. Turn the printer power OFF.
3. Using the two *Head Release Levers* (Figure 20), unlatch and raise the print head.
4. With a foam or cotton tipped swab dampened in isopropyl alcohol, clean the thermal elements by gently rubbing the swab down the length of the print head. Allow for the alcohol to evaporate then repeat if necessary. See Figure 23.
5. The Drive Roller, Peel Edge, and other basic internal cleaning may also be performed at this time. See the appropriate sections for more information.
6. Latch the print head completely and reinstall the media.
7. Turn the power to the printer ON.



Figure 23 Print head Thermal Elements



CAUTION: When performing maintenance inside the printer, always make sure that the print head is latched completely before installing the top cover. Failure to do so may result in damage to the print head.

10.5 Cleaning the Drive Roller

Maintaining a clean drive roller not only helps extend the life of the roller but also helps reduce print quality issues and media slips that may occur due to dust, label adhesive, and other forms of contamination. The drive roller should be cleaned after every roll of media or after every 512 feet (3200 tag which is a typical stack of tag or fanfold media). See the previous section, *Thermal Printer Card*, for a quick and easy way to clean the drive roller or follow the steps below.

1. Remove any installed media.
2. Turn the printer power OFF.
3. Using the two *Head Release Levers* (Figure 20), unlatch and raise the print head.
4. Clean the drive roller with a lint-free cloth dampened in alcohol. Manually rotate the drive roller by the drive gear located to the left (from the front of the printer) or by manually rotating the drive roller itself to clean the entire drive roller surface.
5. Print head, Peel Edge, and Internal cleaning may also be performed at this time. See the appropriate sections for more information.
6. Latch the print head completely and reinstall the media.
7. Turn the printer power ON.

10.6 Exterior Cleaning

Although cleaning the exterior surfaces has no effect on the printer's performance, it will help the overall appearance of the printer. The use of any mild, non-abrasive general purpose cleaner with a lint-free cloth may be used to clean the exterior surfaces. This cleaning should be performed on an as needed basis.

10.7 Gap Detector Adjustment

The gap detector assembly is centered in the media path at the factory and should work for almost every type of media. The Gap detectors may be custom configured and placed in a different position upon request. The printers contain fixed gap detection locations every half inch to provide flexibility for custom applications.



CAUTION: Isopropyl Alcohol should be used to clean the drive roller. The use of other cleaning solvents or materials is not recommended and may degrade the performance of the drive roller.

Chapter 11: Troubleshooting

11.1 Troubleshooting Tips

The printer fails to turn “ON” and the status indicator light fails to light:

- ✓ Verify that the power cord is connected to the printer as well as the AC outlet.
- ✓ Verify that the printer power switch is in the “ON” position.
- ✓ Verify that the AC outlet is functioning properly.
- ✓ Contact your Service Representative.

The printer has no serial communication:

- ✓ Verify that the serial cable is properly connected to the printer and an available serial port on the host computer.
- ✓ Verify that the host serial port is functioning properly.
- ✓ Verify that the printer and the host serial port parameters are set exactly the same.
- ✓ Contact your Service Representative.

Vertical blank or light lines appear on printed areas:

- ✓ Clean the print head.
- ✓ Print head may need replaced.
- ✓ Contact your Service Representative.

The status indicator light is solid amber in color:

- ✓ Indicates that the printer has been paused or a tag/tear mode is being used.
- ✓ Press the print button, light should turn green and resume printing if the printer has been paused.
- ✓ Remove the tag, the light should turn green if a tag/tear mode is enabled
- ✓ Contact your Service Representative.

The status indicator light is solid red in color:

- ✓ The printer has an error and requires service before printing will continue.
- ✓ Verify that media has been loaded in the printer properly.
- ✓ Press the print button to attempt to clear the error.
- ✓ Refer to section 6.2 for information regarding the Enquiry Command to help identify the error condition.
- ✓ Cycle power to reset the printer.

The status indicator light is flashing red in color:

- ✓ Generally due to a power fail error.
- ✓ Verify that the AC line-voltage is present at the AC outlet.
- ✓ Cycle power.

During download the status indicator light flashes red in color:

- ✓ The file contains an illegal operation / command.
- ✓ The graphic or font is not valid or has errors.
- ✓ The intended memory slot is already occupied.
- ✓ Verify that the printer is properly configured for the type of download being sent.
- ✓ Clear memory and attempt download again.
- ✓ Verify that the format has been created properly.

Appendix A: Limited Warranty

Limited Warranty

Microcom Corporation printers, excluding thermal print heads, which are warranted separately below, are warranted against defects in material and workmanship for twelve (12) months from the date of original shipment by Microcom Corporation. This warranty does not cover normal wear and tear and shall be null and void if the printer is modified, improperly installed or used, damaged by accident or neglect, or in the event any parts are improperly installed or replaced by the user.

The thermal print head is covered by a limited warranty of three (3) months or 500,000 linear inches to be free from defects in material and workmanship. The length of media run through the printer may be verified using the printer's internal statistical counter. Although the user is not required to purchase Microcom Corporation brand supplies, to the extent it is determined that the use of other supplies (such as non-approved label stock, ribbons, and cleaning solutions) shall have caused any defects in the thermal print head for which the warranty claim has been made, the user shall be responsible for Microcom Corporation's customary charges for labor and materials to repair such defects.

MICROCOM CORPORATION'S SOLE OBLIGATION UNDER THIS WARRANTY SHALL BE TO FURNISH PARTS AND LABOR FOR THE REPAIR OR REPLACEMENT OF PRODUCTS FOUND TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP DURING THE WARRANTY PERIOD.

Except for the express warranties stated, Microcom Corporation disclaims all warranties on products, including all implied warranties of merchantability and fitness for a particular purpose. The stated warranties and remedies are in lieu of all other warranties, obligations or liabilities on the part of Microcom Corporation for any damages, including, but not limited to, special, indirect, or consequential damages arising out of or in conjunction with the sale, use, or performance of these products.

MICROCOM CORPORATION SHALL NOT, UNDER ANY CIRCUMSTANCES WHATSOEVER, BE LIABLE TO THE BUYER OR ANY OTHER PARTY FOR LOST PROFITS, DIMINUTION OF GOODWILL OR ANY OTHER SPECIAL OR CONSEQUENTIAL DAMAGES WHATSOEVER WITH RESPECT TO ANY CLAIM HEREUNDER. IN ADDITION, MICROCOM CORPORATION'S LIABILITY FOR WARRANTY CLAIMS SHALL NOT, IN ANY EVENT, EXCEED THE INVOICE PRICE OF THE PRODUCT CLAIMED TO BE DEFECTIVE, NOR SHALL MICROCOM CORPORATION BE LIABLE FOR DELAYS IN THE REPLACEMENT OR REPAIR OF PRODUCTS.

Appendix B: RMA Procedure

Return Material Authorization (RMA) Procedure

A Return Material Authorization (RMA) number must be obtained prior to the return of printer's and/or materials to the Microcom Corporation Service Department. The purpose of the RMA number is to provide effective tracking and control of returned printers and/or materials. Microcom Corporation will not be responsible or held accountable for printers and/or materials returned without proper authorization.

Shipping Charges:

The return of printers and/or materials to Microcom Corporation for repair should be returned freight and insurance prepaid. Microcom Corporation will pay the return shipping charges (standard ground service) on all warranty repairs; expedited services will be paid at the customer's expense. The return of non-warranty repairs to printers and/or materials will be shipped by a shipping carrier and service determined by the customer.

Receiving a Return Material Authorization (RMA) number:

1. To receive an RMA number, either complete the online RMA request form located on the World Wide Web (www.microcomcorp.com) or contact the Microcom Corporation Service Department and provide the representative with the following information.
 - Company name.
 - Contact name and phone number.
 - Model number.
 - Printer serial number.
 - A detailed description of the problem.
 - Service option requested (1 Day, 3 Day, 5 Day, or Standard turnaround).
 - Purchase Order Number.
2. The shipping label should contain the following information:

Microcom Corporation
Attn: Service Dept. RMA# <place RMA number here>
8220 Green Meadows Dr. N.
Lewis Center, Oh 43035 USA
3. Return the defective item(s) for repair to the address listed above, freight and insurance prepaid.
4. Upon receipt of an RMA number, the customer contact will be notified by a Microcom Corporation representative regarding repair charges, at which time the ship method will be determined. Items returned for repair with inadequate packaging material will be returned to the customer in Microcom Corporation approved packaging at the customer's expense.

Appendix C: Quick Reference Command Summary

The following is a list of the header element mnemonics and their default values:

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY
0, 832, 614, 13, 24, 35, 0, 1, 285, 0, 0

The following is a list of the format field element mnemonics and their default values:

TSN, XB, YB, CC, TCI, CGN, FO, FJ, CMX, CMY, CS, TSP, , , AN
1, 0, 0, *, 1, **, 0, 0, 1, 1, *, 1, , , 0

* The default value depends on the character generator (CGN) used.

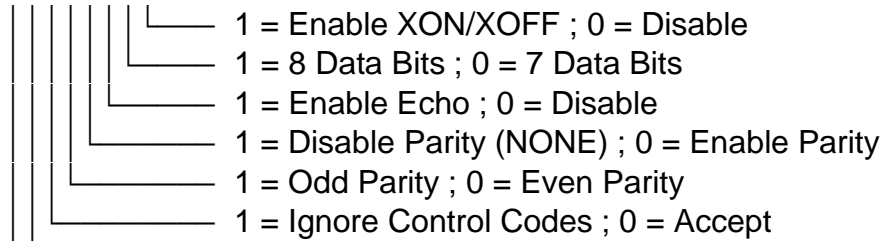
** The default value depends on the text conversion identifier (TCI) used.

The following is a list of the Line Draw field mnemonics and their default values:

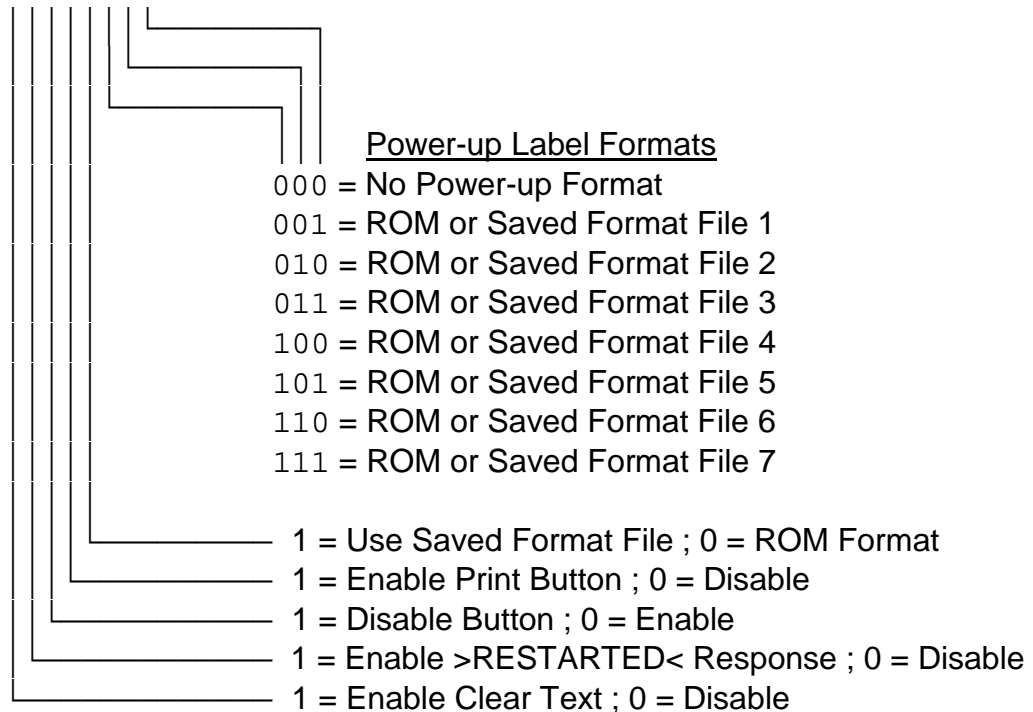
TSN, XB, YB, , TCI, , , , XS, YS, , , , AN
1, 1, 1, , 6, , , , 1, 1, , , , 0

The following is the list of commands in numeric order:

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
	2	Text String Entry Mode: Precedes the text strings that are supplied to the various fields in the format (Equivalent to ^B).
	3	Print Command: Prints a single label or starts the printing of a batch of labels (Equivalent to ^C).
	5	Send Printer Status: (Equivalent to ^E).
	11	Print Test Pattern: (Equivalent to ^K).
	12	Print Blank Label: (Equivalent to ^L).
	20	Bits Per Second: This command changes the serial port communication speed or Baud rate. Speeds over 38400 bps will cause the printer to utilize flow control during the print routine.
	2	300 bps
	3	600 bps
	4	1200 bps
	5	2400 bps
	6	4800 bps
	7	9600 bps
	8	19200 bps
	9	38400 bps
	10	57600 bps
	11	115200 bps

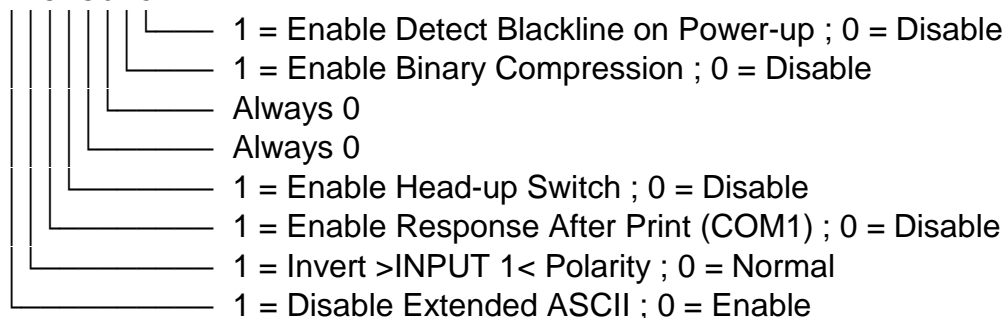
^A**^D**
21**COMMAND****Software Switch #1:** A non-volatile command used to set the various functions identified below.**^AB12345678****Enquiry Responses**

00 = Control Codes
 10 = Text Equivalent
 11 = ^ Equivalent

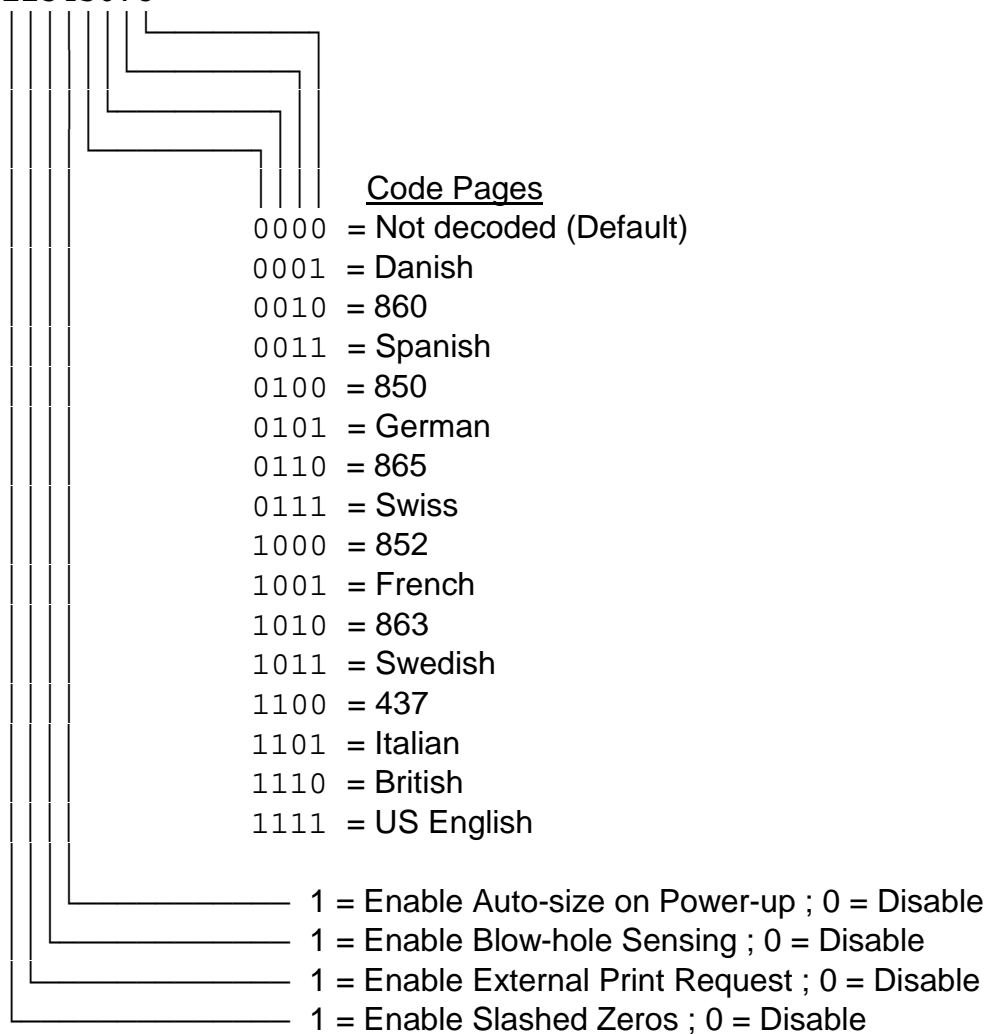
22**Software Switch #2:** A non-volatile command used to set the various functions identified below.**^AB12345678**

^A**^D**
23**COMMAND**

Software Switch #3: A non-volatile command used to set the various functions identified below.

^AB12345678

24 **Software Switch #4:** A non-volatile command used to set the various functions identified below.

^AB12345678

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
X	29	Printer Statistics:
0		Print Statistics to the serial port.
1		Print Statistics on a label.
2		Clear the printed labels variable in the statistics.
3		Clear the Printed inches variable in the statistics.
	32	Reset Printer: Restores the printer to power-up settings. Also used to set the non-volatile fields in memory.
	33	Display Model and Revision Number
XX	35	Adjust Contrast Window: This is the temporary contrast adjustment. The ^Axx range is from 60% to 140%.
XX	36	Adjust Contrast Base: This is a non-volatile command that adjusts the contrast base value. The ^Axx specifies a value from 10% to 200%.
X	39	Auto-Size Label:
0		Clears the auto-size values determined by the ^A1^D39 command.
1		Uses values obtained for the variables instead of what the user supplies in the header of the format file.
2		Automatically sizes the label and displays on the screen the values for the header variables.
3		Same as ^A2^D39, but prints the values on a label, instead of on the screen.
5		Diagnostic Mode (Tick-Tick)
	40	Clears Commands 41 through 51
XX	41	Load Number of Fields in Layout (HFM): The ^Axx specifies the value.
XX	42	Load Label Width in dots (LXS): The ^Axx specifies the value.
XX	43	Load Label Height in dots (LSY): The ^Axx specifies the value.
XX	44	Load the Web Size in dots (WEB): The ^Axx specifies the value.
XX	45	Load the Gap Size in dots (GAP): The ^Axx specifies the value.
XX	46	Load Print Speed: The ^Axx specifies the value.
XX	47	Load the Label Control Byte (LCB): The ^Axx specifies the value.
XX	48	Load the Number of Steps to Activate Gap Detector (AGD): The ^Axx specifies the value.
XX	49	Load the Number of Steps Past Gap (SPG): The ^Axx specifies the value.
XX	50	Load X Direction Offset (OFX): The ^Axx specifies the value.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	51	Load Y Direction Offset (OFY): The ^Axx specifies the value.
XX	54	Send Saved Format File to Serial Port: The ^Axx specifies the slot number where the format file is stored (1-128).
XX	55	Select Default Power-up Format: Selects the ROM power-up format. The ^Axx selects from the available formats 1 through 8.
	56	Select User Defined Layout: Signals the end of the label field definition.
	57	Enter Label Format Mode: Instructs the printer that information for a format is following the command.
XX	58	Process Saved Format: The ^Axx selects which stored format to process (1-128).
XX	59	Save Format File: The ^Axx specifies the memory location or slot to save the format following the command.
	60	Clears Command 61
XX	61	Mark Text Starting Position: The ^Axx designates which text field to start entering new data.
	62	Pre-Padded Text: This command is sent after the text that is to appear at the beginning of each field.
X	63	Text Mode Control: Allows the entry of new text without the ^D2 command and/or clears all previous text when new text is added.
0		Disable 1 and 2
1		Enable Auto-Print Mode
2		Clear all previous text upon receiving new data.
3		Enable 1 and 2
XX	64	Auto-Print String Count: The ^Axx instructs the printer how many text strings to accept before printing.
XX	66	Clear Single Stored Format File: The ^Axx specifies which memory slot to clear (1-128). This command only functions with format files and not will downloadable fonts and/or graphics.
	70	Clear Commands 73 through 76
	71	Load MaxiCode Bar Code Data
XX	73	Load Copies Count: Instructs the printer to print a group of labels. This command will not increment/decrement serial numbers.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
X	74	Infinity Print: Continues to print copies of a format until the power is shut off. The valid ^Ax values are "1" to enable and "0" to disable this command.
XX	75	Load Label Count: Instructs the printer to print a batch of labels using the serial number functions if enabled.
XX	76	Load Delay Time Between Labels: The ^Axx specifies the delay time in 1/10ths of a second. Maximum value is 650.
	77	Load PDF-417 Bar Code Data
	80	Clears Command 86, 88, and 89
	81	Disable Serial Number Function: This command disables the serial number function for either single or multiple serial numbers.
XX	84	Load Text String Number to Increment/Decrement: Instructs the printer which text string to increment/decrement. Only used in conjunction with single serial numbers.
XX	85	Load Increment/Decrement Step Value: The ^Axx specifies the value that the serial number will be incremented or decremented.
X	86	Single Serial Number Status:
0		Disable Increment/Decrement
1		Enable Increment. The serial number will be increased by the ^D85 value.
2		Enable Decrement. The serial number will be decreased by the ^D85 value.
XX	87	Load Field Number to Clear Increment/Decrement Status: Clears the status of one or more serial numbers.
XX	88	Load Field Number to Increment by 1: The ^Axx specifies which field to increment when using the multiple serial number function.
XX	89	Load Field Number to Decrement by 1: The ^Axx specifies which field to decrement when using the multiple serial number function.
XX	91	Gap Detection Sensitivity: The proper value can generally be obtained by using the ^D39 auto-size commands. The ^Axx value sets the point (0-255) at which the printer detects a gap, blow-hole and/or blackline. When the printer is powered-up or reset, this command defaults to a value of 30 if using the transmissive sensor and 120 if using the reflective sensor. Although the default value should work properly with most media types, it is a good idea to place this command at the beginning of all format files in order to guarantee that the printer will properly detect your media's registration mark. If this value is not set correctly the printer may false sense a GAP or report an invalid >LOW STOCK< error.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	92	Load Value for Slices to Process: This command adjusts the number of slices (dot rows) generated before the motor drive starts moving. The default is set to a value of 256 and has a range of 1 to 366.
X	93	Load Control Code Recognition Status:
0		Enable control code recognition
1		Disable control code recognition
XX	95	Load Advance/Retract Distance: Used in conjunction with cutter and dispense command. The ^Axx specifies the amount to advance after printing and then retract to dot row.
XX	96	Load Advance Delay: The ^Axx specifies the amount of delay, in milliseconds, the printer waits before retracting to dot row in cutter and dispense modes.
X	97	Tag/Tear Dispense Mode
0		Disables Tag/Tear Mode
1		Advance after every label.
2		Advance after copies count.
3		Advance when idle.
X	98	Peel-n-Dispense Mode
0		Disable Peel-n-Dispense
1		Enable Peel-n-Dispense
2		Enable Custom Applicator Mode (Peel-n-Dispense with no delay)
X	99	Cutter Control: This command will enable full and/or partial cuts. Commands 102 and 103 can be used to set the cut intervals. Partial cuts are only available on printers that have a partial/full cutter installed. If this command is set to a value of 2 (Partial Cut), the printer will pause until the label is removed before retracting and printing again.
0		Disable Cutter Control
1		Enable Full Cut
2		Enable Partial Cut
3		Enable Full and Partial Cut
	100	Clear User RAM: This command clears all downloaded font, graphics and stored format files.
	101	Send User RAM Available: The printer will send the number of free or available bytes to the serial port (i.e. >192480<).
XX	102	Full Cut Interval: Instructs the printer when to issue a Full Cut. The default value is 1. If it is set to a value of "1" the printer will full cut whenever the copies count has been reached or after each format if a copies count has not been specified. If this command is set higher than "1" (maximum of 65536), the printer will full cut when that quantity has been reached. This command will not operate if the Cutter Control (^D99) command is set to full cut.

<u>^A</u>	<u>^D</u>	<u>COMMAND</u>
XX	103	Partial Cut Interval: This command instructs the printer when to issue a Partial Cut. A partial cut requires the use of a Cutter that is capable of Partial cuts. Partial Cut is when a thin piece of the media, in the center, holds the media together and the printer waits until the media is removed before printing the next label. The default Partial Cut Interval is set to 1. The printer will issue a partial cut, if set to a 1, whenever the copies count is reached. If set to a value greater than 1, the printer will partial cut when that quantity has been reached. This command only functions when the Cutter Control (^D99) command is set to allow partial cuts.
XX	104	Load Graphic Image of Font into User Memory without Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command should be used with an ASCII-HEX file that contains only printable characters less than 80 HEX. This command supports graphics over 64KB and fonts less than 64KB.
XX	106	Load Graphic Images or Fonts into User Memory without Compression: This command is intended for legacy support only. Microcom Corporation recommends either the ^D104 or ^D107 commands. Fonts must be less than 64KB for this command to function.
XX	107	Load Graphic Images or Fonts into User Memory using Binary Compression: The ^Axx specifies which memory slot to place the image/font (1-255). This command greatly reduces the image download time and should be used whenever possible. Only use this command with 8-bit data connections. It will not function on 7-bit data connections.

Glossary

Alphanumeric - A term used to identify characters consisting of letters, numbers, and other symbols (such as punctuation marks and mathematical symbols).

Bar code - Alphanumeric characters that are represented using a system of printed lines and can be read by a computer.

Black-line - A registration mark, typically a black line on the underside of certain media used to identify the starting position of a label.

Blow-hole - A registration mark, typically a notched or cutout in certain media used to identify the starting position of a label.

Continuous media - Media that contains no gap and continues as one piece of media.

CTS (Clear to Send) - A handshaking signal used to provide information when a DCE or modem is ready to receive data in an RS-232 communication link. Used in conjunction with RTS.

Cutter - An optional device, mounted on the printer, which is used to cut media into custom sized labels after printing

DCE (Data-Circuit-terminating Equipment) - The modem or printer end of an RS-232 serial communication link. Modem serial ports and other peripherals are typically configured as DCE.

Die-cut media - Media that is cut using a die to form individual labels that have a start and stop point. Typically the excess material surrounding the label is removed from the backing material.

Direct thermal - Method of printing with a special heat-sensitive media that directly contacts heat elements of a thermal print head. (See *Thermal print head*)

DPI (Dots Per Inch) - A unit of measure term used to identify the print resolution capability.

Drive roller - Platen roller that is located below the print head that is used to drive media through the printer.

DSR (Data Set Ready) - A handshaking signal used to provide information about the status of an RS-232 communication link. Used in conjunction with DTR.

DTE (Data Terminal Equipment) - The terminal or computer end of an RS-232 serial communication link. Serial ports on computers are typically configured as DTE.

DTR (Data Terminal Ready) - A handshaking signal used to provide information about the status of the communication line connected to the DCE end of an RS-232 link. Used in conjunction with DSR.

Ethernet - A fast and capable serial interface used by many networks for connecting host computers to various peripherals.

Fanfold media - Die-cut or tag media that is folded into stacks.

Flash memory - Memory that is used to store font, graphics and label formats for faster access. This is a non-volatile type of memory, which means that the information stored is saved even when the printer power is turned off.

GND (Signal Ground) - The ground terminal of a power supply's output, and all points that connect to it. This is an essential signal in an RS-232 communication link that is used to reduce noise spikes that can cause a receiver to misread logic levels. Also known as SG and SGND.

Guillotine Cutter – A cutter that has a blade that cuts perpendicular to the media path.

LDSII (Label Design Software II) - This is the resident control software language that is used to develop label formats and controls the full function of the printer.

LPS (Label Present Sensor) - This sensor, when enabled, detects when media is present. Also referred to as LTS (Label Taken Sensor).

Platen - Roller that is located below the print head, which the media rests upon. (See *Drive roller*)

Rolled media - Media that has been rolled onto a core, typically cardboard in nature.

Rotary Cutter – A cutter that has multiple angled blades mounted to a shaft that cut media by rotating the shaft.

RS-232 - A popular and inexpensive asynchronous serial interface used for connecting host computers to various peripherals.

RTS (Request To Send) - A handshaking signal used to provide information when a DTE or terminal has data to send in an RS-232 communication link. Used in conjunction with CTS.

RXD (Receive Data) - An essential signal that carries data from the DCE to the DTE for 2-way RS-232 serial communication. Also known as RX and RD.

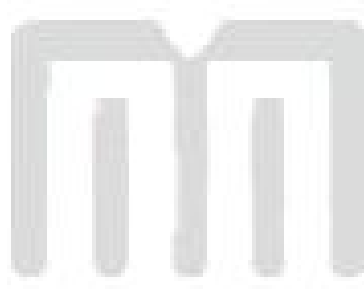
SDRAM (Synchronous Dynamic Random Access Memory) - Memory that is used to store formats while printing. This is volatile memory, which means that the information stored in this memory is not saved when the printer power is turned off.

Tag stock - Media that typically has no adhesive backing, thicker in nature, and generally is a fanfold type media.

Thermal print head - A print head that uses thermal technology, to heat individual elements or dots to produce images. Also referred to as print head in this manual.

TXD (Transmit Data) - An essential signal that carries data from the DTE to the DCE for 2-way RS-232 serial communication. Also known as TX and TD.

USB (Universal Serial Bus) - A high-speed asynchronous serial interface, typically transfers up to 12M bits/second, used for connecting host computers to various peripherals.



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