Worldwide Ticketcraft
Direct Thermal
Desk-Top™ Printer

WORLDWIDE
TICKETCRAFT

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Chapter 1

Introduction

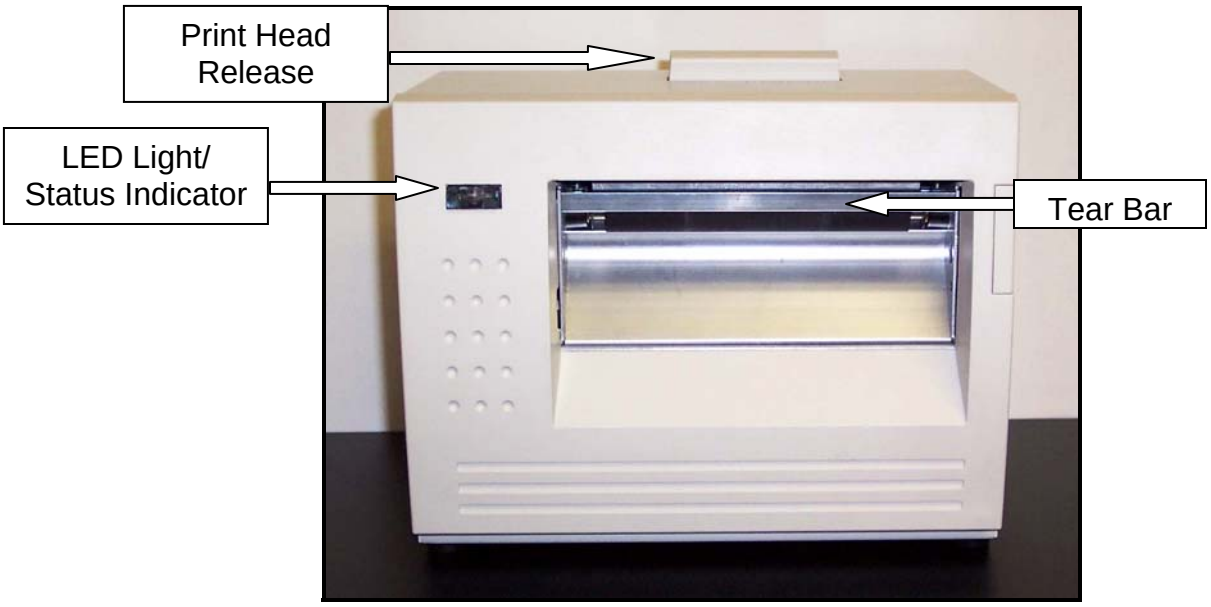
This manual covers the Worldwide Ticketcraft Desk-Top™ Printer and provides general information regarding installation, setup and troubleshooting. The Desk-Top™ Printer is the ideal printer for thermal tickets, labels, parking hangtags, wristbands, and many other thermal products. The printer uses a 4.1 inch (104mm) print head. This printer is offered with a standard resolution of either 203 dpi (8 dots/mm) or an optional 300 dpi (12 dots/mm). The printer's industrial quality design delivers continuous reliable printing at true high volume throughput. The printer offers these standard features:

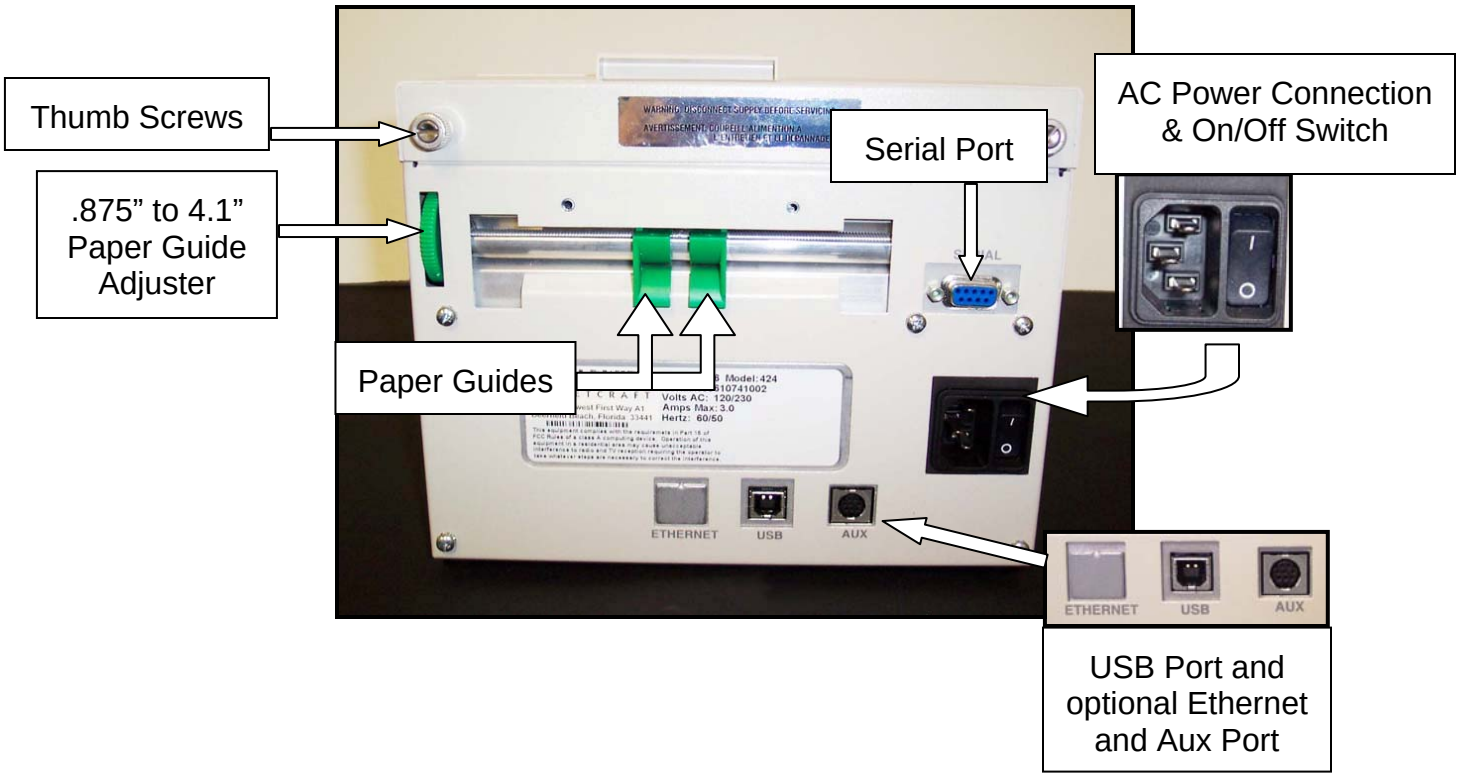
- Print speeds up to 8 inches per second
- Minimum maintenance downtime
- Easy-to-load media
- Use fanfold or rolled stock, up to 8" in diameter
- Internal power supply
- USB connectivity
- Adjustable black mark sensor
- Internal character sets
- Flash memory

Worldwide Ticketcraft sells various sizes and colors of custom and generic thermal tickets, labels, parking hangtags, wristbands, and many other thermal products. To order replacement stock, please call 877-426-5754 or visit:

www.worldwideticketcraft.com/productline.htm

Worldwide Ticketcraft Desk-Top™ Printer





SPECIFICATIONS

FEATURES

- Direct thermal
- Resolution: 203 dpi (8 dots/mm) Optional 300 dpi (12 dots/mm)
- Maximum print speed: 8”/sec (203mm/sec)
- Maximum print width: 4.1” (104mm)
- Print length: 50” with 203 dpi
- Software controlled print contrast adjustment
- Lift up print head for easy cleaning
- Adjustable media guides for easy label centering
- Rated for 100% Duty Cycle Usage
- Rigid Steel Construction

BARCODES

- One dimensional: Code 39, Interleaved 2 of 5, Code 128 (A,B,C), Code 93, Codabar, Modified Plessey, UPC-A, UPC-E, EAN-8, EAN-13, UCC/EAN Code 128, Postnet
- Two dimensional: PDF-417, RSS-14, Maxicode

FONTS

- 7 residential fonts including OCR-A and OCR-B
- Downloadable font support
- All fonts expandable in height and width
- Rotated fonts and barcodes: 0, 90, 180, and 270

MEMORY

- Up to 8MB Flash for non-volatile font, graphic and label data storage
- Up to 512K SRAM for volatile font, graphic and label data storage

ELECTRICAL

- Voltage: Auto-sensing 100-240 VAC 50-60Hz
- Current: 4 AMPS maximum

PHYSICAL

- Height: 6.9” (175mm)
- Width: 8.5” (216mm)
- Depth: 4.8” (122mm)
- Weight: 7.8 pounds (3.5kg)

ENVIRONMENT

- Temperature: 40F-104F, 5C-40C Operating
- Humidity: 10-85% - Non-Condensing

INTERFACE COMMUNICATIONS

- Serial Port: RS-232D, 9 pin female D-Sub connector (DCE), Hardware Flow Control, 1200 to 115,200 BPS user selectable
- USB
- Ethernet (optional)

OPTIONS AND ACCESSORIES

- Label Present Detector (For self-peel function)
- 300 dpi
- Cutter & Catch Tray
- Ethernet Connectivity
- External Label Roll Rack (8” o.d. max)

APPROVALS

- Designed to meet CUL, CE and FCC Class A
- RoHS Compliant

Specifications subject to change without notice.

Getting Started

Unpacking and Inspection

The printer has been packaged in protective foam to help prevent damage during shipment.

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 items on the packing list are present and in good condition. The picture below (See Figure A1) shows a Desk-Top™ printer and power cord. Your shipment may contain different items.

The foam and shipping container(s) should be kept and used if the printer is to be shipped at a later time. Additional shipping materials can be ordered by contacting Worldwide Ticketcraft.

Figure A1

Connecting the Printer

The printers may be interfaced to PC's, mini-computers, main frames, and special purpose machines using the available communications ports described in the following sections.

Printer Power

The Desk-Top™ printer has a universal auto-sensing internal power supply that operates in the 100-240 VAC; 50-60 Hertz range. The three-prong female end of the power cord plugs into the mating connector located on the back of the printer.

AC Power Connection & On/Off Switch on back of printer

Figure A2

Note: Verify that printer's ON/OFF switch is switched to OFF before the power cord is plugged into an electrical outlet. See Figure A2. Plug the printer in and turn the power switch to "ON." Once powered up, the Front Panel LED should be solid green. See Figure A4.

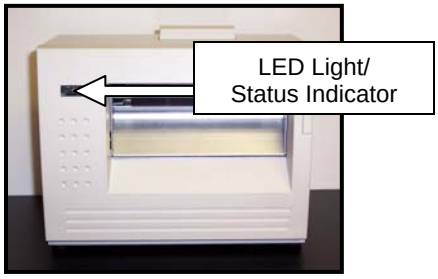


Figure A3

USB Communication Interface

A standard USB 1.1 connector is provided on the rear panel of the printer. See Figure A4. The USB port operates as a virtual serial communications port and requires the installation of the Desk-Top™ supplied USB driver for proper operation. See Chapter 2 for driver installation instructions. The USB cable must be connected to a host PC that is already powered on before the printer is turned on.

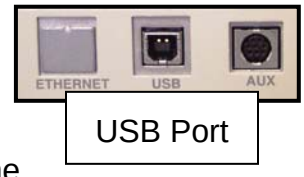


Figure A4

Black Mark Setup

The Worldwide Ticketcraft printer comes customized for your specific printing needs bases upon the requirements of your software and ticket stock. It is not generally necessary to adjust the black mark sensor. However, should it be necessary to change the black mark setting, the sensor for the detection of the black mark is located on the inside of the printer. This sensor is adjustable within 4 inches. Please follow the instruction below to adjust the sensor.

1. Use green dial to adjust paper guides to width of ticket. The paper guides adjust to the center of the path. See Figure A5.

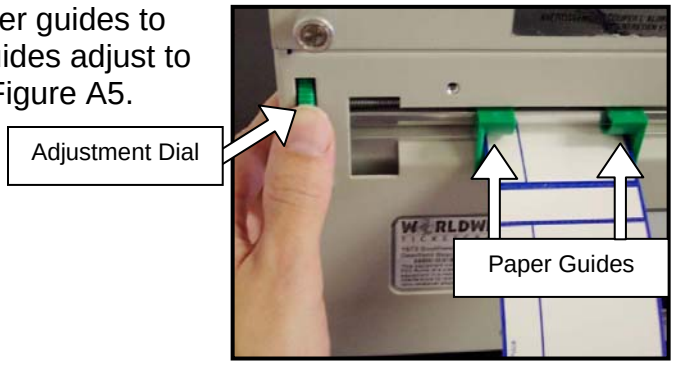


Figure A5

2. Loosen thumb screws until they pop out slightly.
3. Lift up on the screws to remove the cover. See Figure A6.

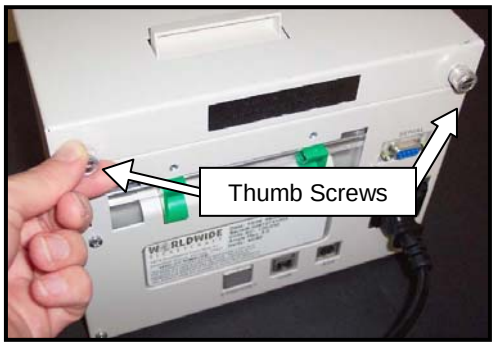


Figure A6

4. Press black tabs inward to release side latches and raise the print head. See Figure A7.

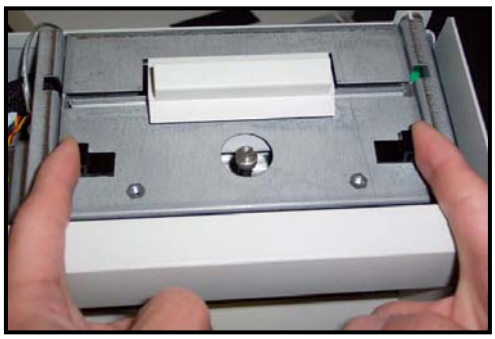


Figure A7

Note: The sensor does not move freely and takes effort to adjust.

5. **Move both top and bottom** sensor to adjust sensor location for black mark. See Figure A8.
6. Replace cover and press black tabs inward to close. Press top down to lock in place.

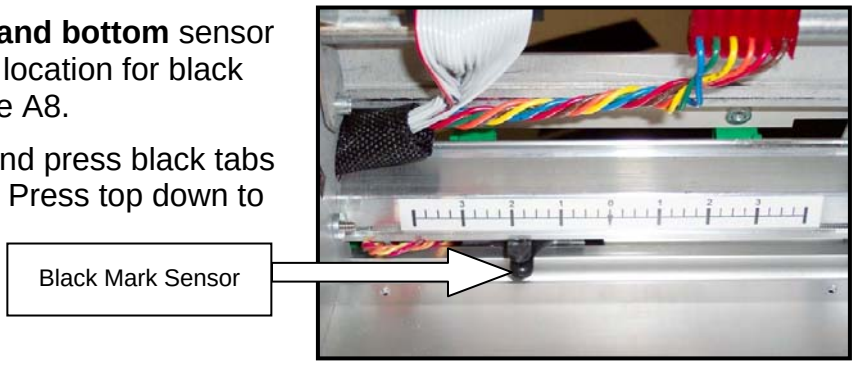


Figure A8

7. Replace printer top cover by inserting front edge until flush with front plate and ensuring that the cable is completely inside. Press down until all edges are flush and tighten thumb screws.

Loading Media

The easy-to-release print head makes loading media into the Desk-Top™ printer an easy process. Follow the instructions below to properly load the media.

1. Feed the media into the paper path, 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 Print Button.

The printer is also equipped with an AutoLoad feature. This feature allows the printer to automatically sense new media as it is inserted into the printer, and automatically feed the media to provide proper registration of the first ticket to either the leading edge or a registration mark.

Print Button and Status Indicator Light

The Print Button and the Status Indicator Light are used to identify and perform many functions. This section provides a description to familiarize you with the basic function of the Print Button and the Status Indicator Light. See Figure A9

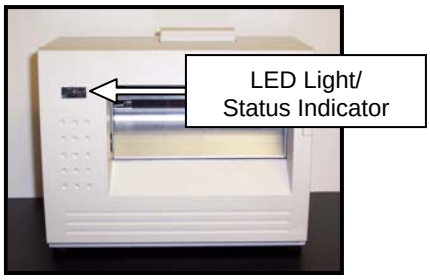


Figure A9

Print Button

Operation	Description
Printing a ticket	Press the Print Button while the printer is IDLE or PAUSED to reprint the last ticket. A power up ticket will print after a power ON cycle when the Print Button is pressed.
Pause printing	Press the Print Button briefly while the printer is printing to enter the PAUSED mode. Press the Print Button again to continue printing.
Feeding tickets (Line feed)	Press & hold the Print Button while the printer is IDLE to advance ticket media. The printer will continue advancing ticket media until the Print Button is released.

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.
Solid Amber	The printer is in the Tag/Tear or Peel-and-Dispense mode and is waiting for the ticket to be taken. OR Indicates that the printer is in the Boot Loader mode (MCB) and is not running the printer application program.
Flashing Red	A cutter error has occurred. OR A memory download operation was not successful. OR Power Spike or low voltage on the AC line. (The printer will remain in this mode until the condition is removed and the printer power is cycled.)
Flashing Amber	Printer is PAUSED

Status Indicator Light Description

Printer Modes

The printer has four primary modes of operation. The different types of modes have an impact on how the Print Button and the Status Indicator Light operate. This section is intended to provide the user with an explanation of these different modes.

Idle Mode: GREEN

The printer is in the IDLE Mode when it is not printing and/or has no pending activity. The indicator light is GREEN, which indicates that the printer is ready to receive ticket formats and/or commands.

In IDLE Mode the Print Button has several different functions:

a) Pressing the button quickly will reprint the last ticket.
b) If the printer was just turned ON and no formats were sent to the printer, pressing quickly will print the power-up ticket.
c) Holding the button depressed: Form Feed tickets until the button is released.

Halted Mode: RED

The printer is in the HALTED Mode when it has stopped due to an error condition. The Status 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 cleared. Once the error has been cleared, the printer will attempt to execute the previous format and/or commands.

Steps to clear the >STOCK OUT< error

a) Load new ticket media.
b) Press the Print Button quickly to start printing.
c) Press the Print Button until ticket is properly registering on media.
d) Press the Print Button again during printing to resume batch printing.

Steps to clear the >STOCK OUT< error with “E-Z Out Function”

If Soft Switch #5, Bit #1 is set to “1”, then a single quick press of the Print Button will clear the >STOCK OUT< error once the printer has more ticket media loaded.

Automatic Stock Eject on >STOCK OUT<

The printer performs an Automatic Stock Eject operation whenever it runs out of ticket media. As soon as the >STOCK OUT< condition is detected, the printer feeds the ticket media forward to clear the drive roller.

The feed distance is just enough to eject the last of the ticket media past the drive roller and then stop. This happens automatically…the user doesn't have to hit the Print Button.

Pause Mode: Solid or Flashing AMBER

There are several ways that the operator can control the output of the printer. The printer will display either solid or flashing AMBER depending upon the mode of operation. Also, the printer will display a solid AMBER during a FLASH operation.

Solid AMBER	A printed ticket is waiting to be taken by the operator when the printer is in a Tag/Tear (^D97) or Peel-and-Dispense (^D98) mode.
	The printer is in the FLASH mode.
Flashing AMBER	Pressing the Print Button during ticket printing will pause printing. It will resume printing by pressing the Print Button again.

Chapter 2

Driver Installation

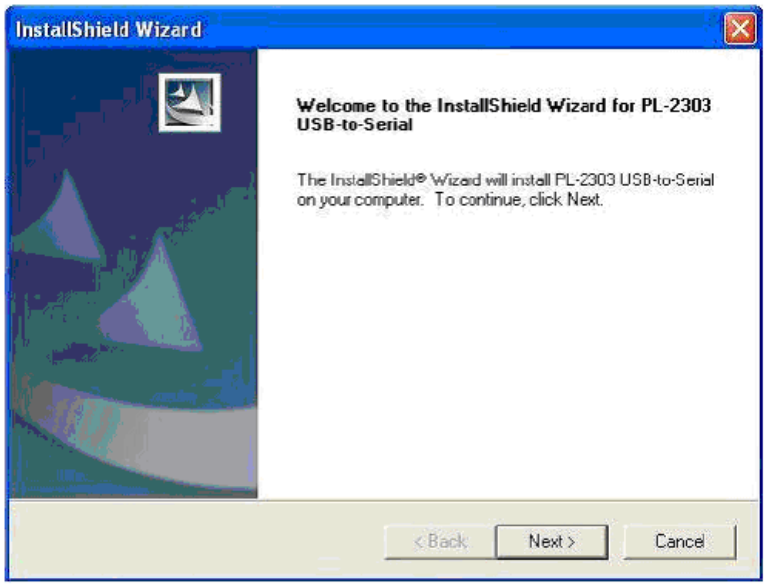
PL-2303 USB to Serial Adapter Installation with InstallShield

This section will guide you on how to install the PL-2303 USB to Serial adapter under Windows XP, Windows 2000, Windows ME, and Windows 98 operating systems.

Note: Please take notice of the installation order. First, run the InstallShield Wizard, and then plug in the USB to Serial Adapter.

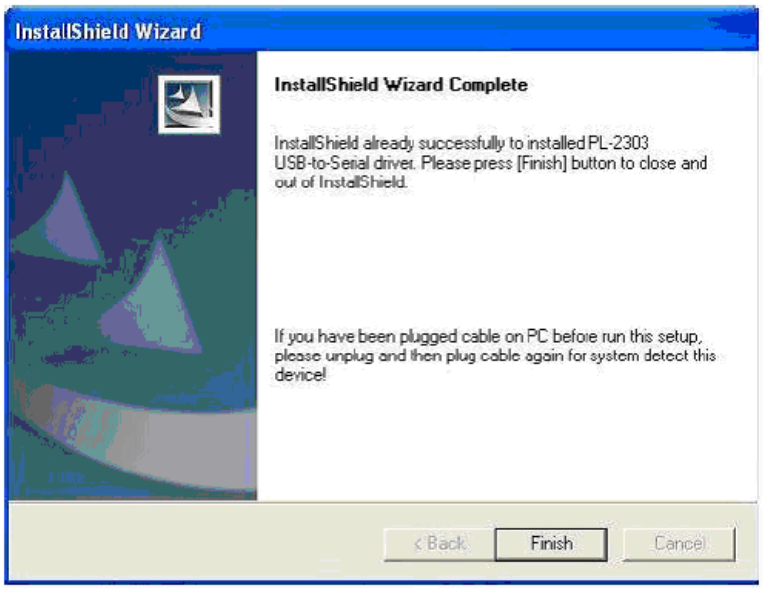
The following steps will show how to install the device under Windows XP. Basically, the procedures are also somewhat the same for other Windows operating systems.

1. Power on your computer and boot to Windows.
2. Insert the Desk-Top Drivers CD. The Desk-Top Drivers folder will automatically open.
3. Double-click on the PL-2303 Driver Installer.exe file. A window will open that says “The publisher could not be verified. Are you sure you want to run this software?” Click Run.
4. The InstallShield Wizard will be displayed on your screen to inform you that the PL-2303 USB-to-Serial driver will be installed on your computer. Click Next to continue and start the installation.

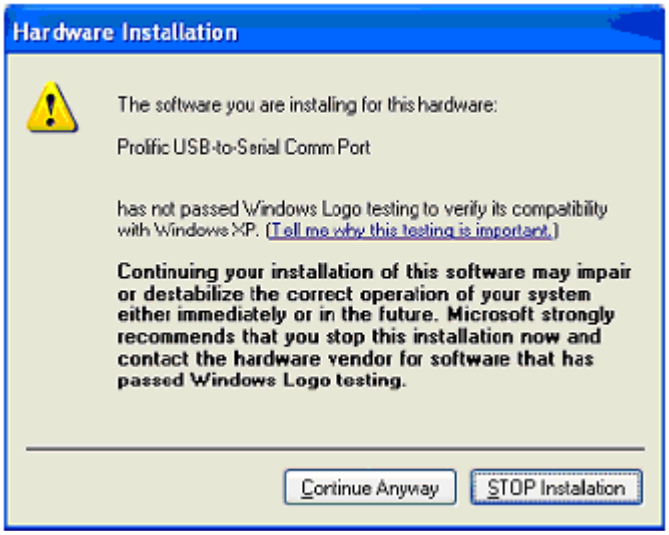


5. Wait until the InstallShield Wizard informs you that driver installation is successfully installed. Click the Finish button to close the InstallShield

program. If you have plugged the cable into the PC while running the setup installation, please unplug and replug the cable for the system to detect the device.



6. Locate the USB port of your computer and plug in the USB cable and connect to printer. See Figure A4. Windows should detect the driver as Prolific USB-to-Serial Comm Port. Before Windows installs this, it may prompt you that this device driver has not yet passed Windows XP Logo compatibility. Click Continue Anyway. Windows will then start to install the driver for the USB-to-Serial Comm Port.

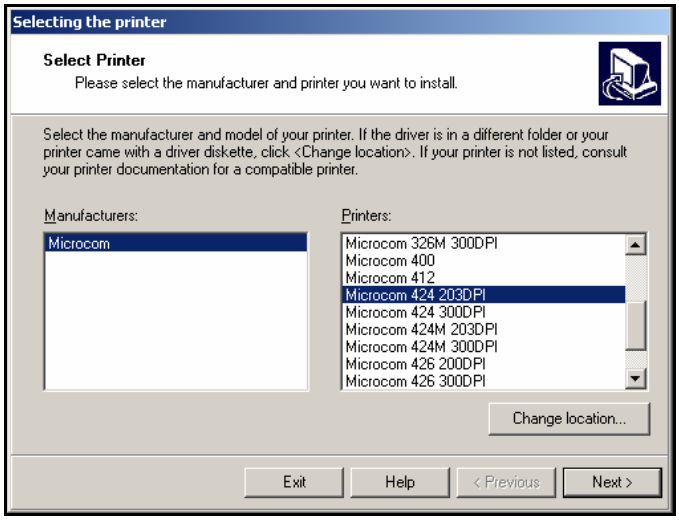


Printer Driver Installation

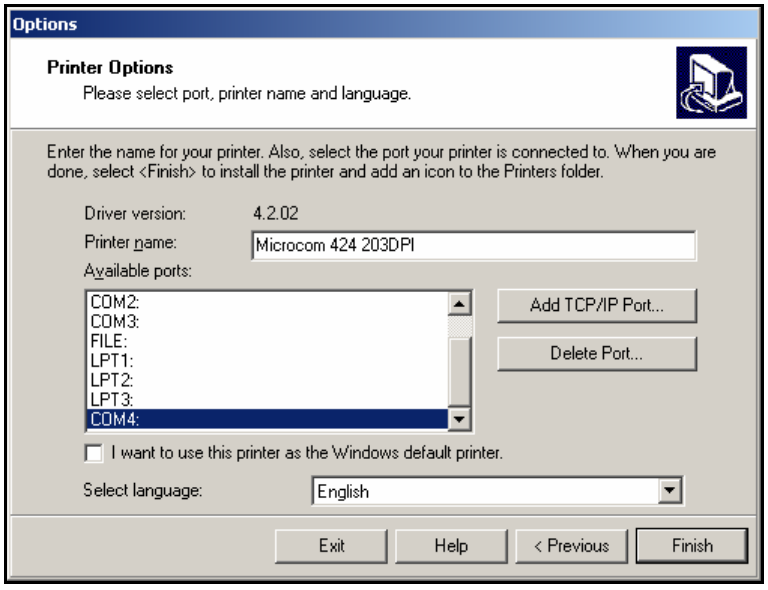
The driver installation will begin when you click on Prninst.exe in the DeskTop Drivers folder.

1. On the “Welcome” window click “Next” to start the Printer Installation Wizard.
2. The License Agreement window will open. Check “Accept the License Agreement” and click “Next”.

3. In the “Select Printer” window select Microcom 424 203DPI and click “Next”.



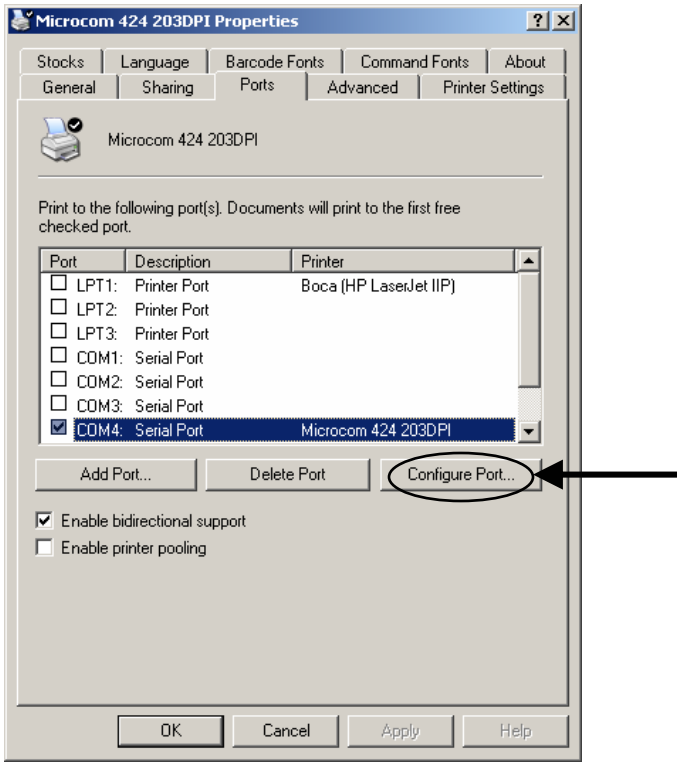
4. In the “Options” window the printer name will appear, select port COM 4 under available ports and click on “Finish”.



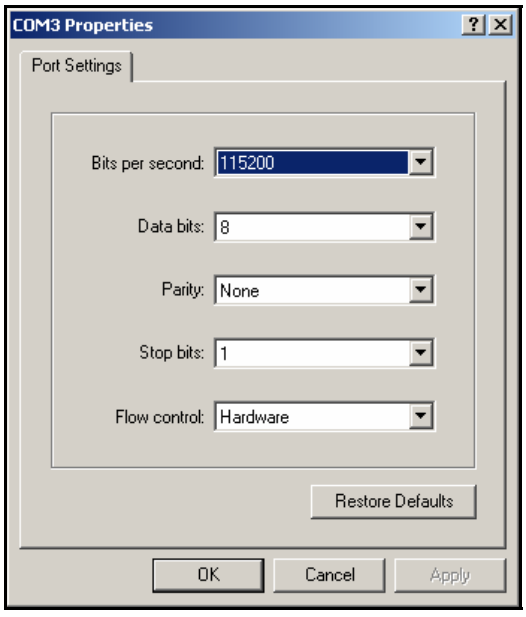
Port Settings

1. On the task bar, go to Start, Settings, Printers and Faxes. Click on Printer and Faxes, right-click on Microcom 424 203DPI and open properties.

2. Select the “Ports” tab, then select the serial port that the printer will be connected to if not already selected.
3. Go to “Configure Port…” located below the serial port window.

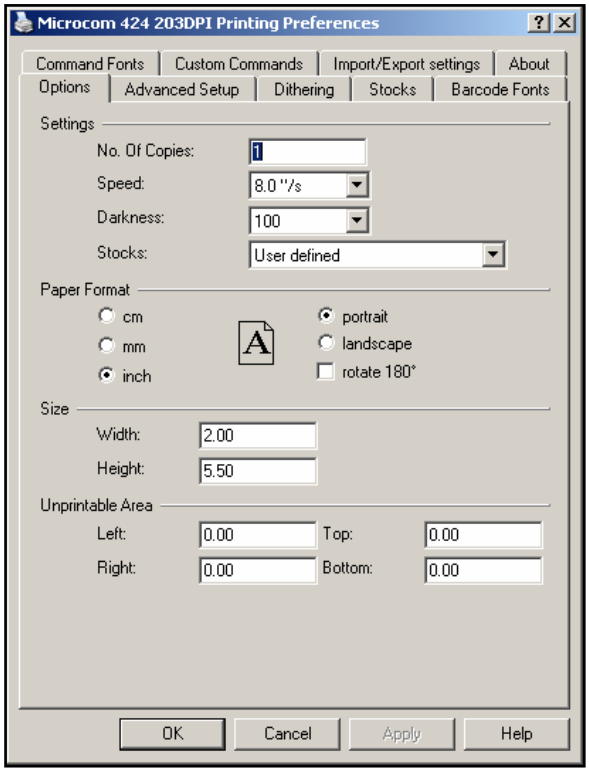


4. In “Port Settings” change the Bit per second setting to 115200, Data bits to 8, Parity to None, Stop bits to 1, and Flow control to Hardware.

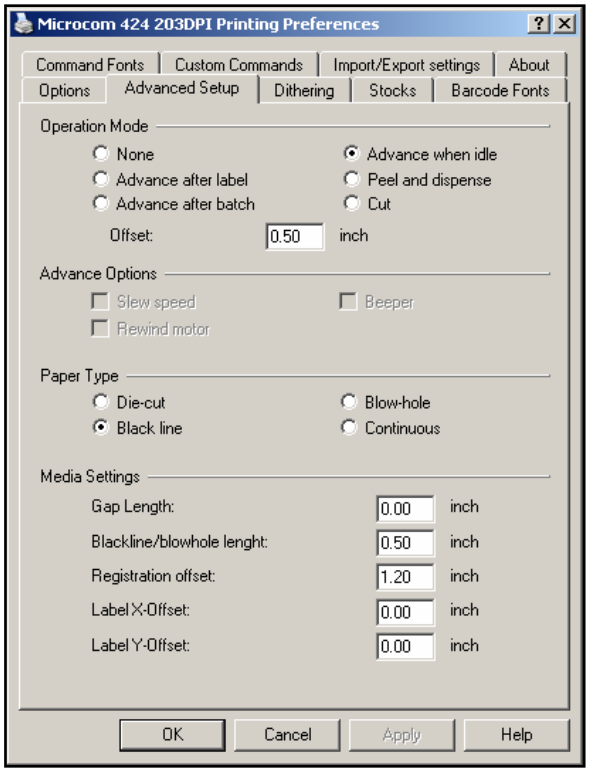


Printer Settings

1. In the options tab, change the printer speed to 8.0 and change the size to the size of the media you have.



2. In advance setup under operation mode, check “Advance when idle” and change the “Offset” to .50 inches. Under “Paper Type” check Black line if you have a black mark on the back of your media. Under Media Settings in Blackline/blowhole length insert the size of the black mark.



Note: Listed settings are based on 2 x 5.5” ticket.

Congratulations, your printer is now installed and ready to use from any Windows application.

Chapter 3

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 Worldwide Ticketcraft 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.	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.	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.	As Needed.
Interior Cleaning	Compressed air, static protected vacuum cleaner, soft-bristle brush, and/or lint-free cloth dampened with Isopropyl Alcohol.	As Needed.
Exterior Cleaning	Lint-free cloth dampened with a mild, non-abrasive general purpose cleaner.	As Needed.

Recommended Maintenance Schedule

CAUTION: Worldwide Ticketcraft 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.

Chapter 4

Designing Tickets Using LDS

Label Design Software (LDS) refers to the control language resident in the printer used to create tickets. 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 ticket format is produced by a series of 5 steps:

1. Control commands to define printer operation.
2. A format header to define the ticket 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.

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).

Note: Control codes are ignored when the printer is configured to accept binary compressed files (^D23).

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.
- A VT-100 terminal emulation program such as HyperTerminal™.
- A text editor that does not add formatting characters such as Microsoft® Notepad.

PC Connection (Serial)

The printer is shipped with serial communication parameters set to 115200 bits per second, no parity, 8 data bits, and 1 stop bit (115200-N-8-1). This means that for proper communication, the PC's communication port must 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.

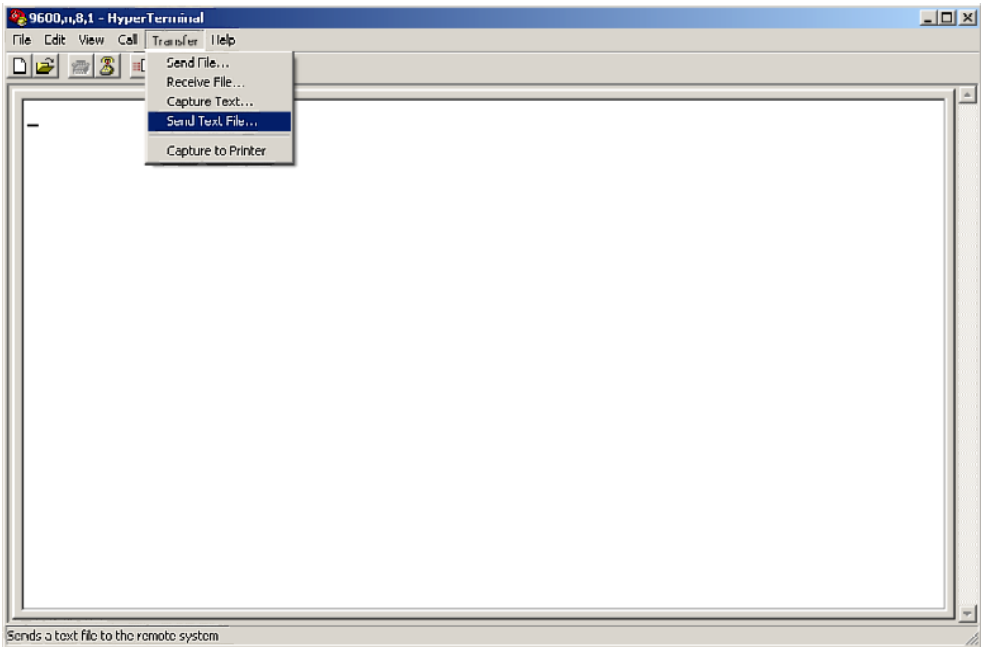


Figure 4-1 HyperTerminal™ Window Example

Format Creation

Special Control code functions (see Chapter 5, Special Control Codes) and/or ticket formats may be entered directly through the keyboard but this 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 been used for the creation of ticket designs in this manual because it is simple to use and does not add formatting characters.

The LDS programming language uses thermal dots as the unit of measure. All commands and parameters, unless noted otherwise, should be entered using dots. The 324M and 424M printers may be fitted with either a standard density 203dpi head, or a higher density 300dpi print head.

These are the conversion values for each print head:

Print head	*Dots/mm*	*Dots/inch*	*Inch/Dot*
203	8	203	0.0049
300	12	300	0.0033

EXAMPLE: To enter the width of a ticket that is 2" wide when using a 203dpi head, the value entered would be 406 (2" x 203 dots/in. = 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 ticket 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 ticket 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 has been achieved, use the Quick Reference Guide in Appendix C for expedient ticket design.

Ticket Design: An Overview

A ticket format consists of a header record and field records, followed by the text data to be printed. The records describe how the ticket is to be printed. The header contains information about the ticket itself such as ticket 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 ticket format created for the Model 424 with a 300 DPI print head. We will refer to this format as we break down the steps and components to produce the format. Refer to Figure 4-2 for a printed representation.

^D57 <CR>	A ticket format is coming.
5,1280,900,20,40,7,0,1,405,0,0 <CR>	Header Information.
1,640,650,8,1,5,0,4,2,2,,,,,0 <CR>	Field #1 format information.
2,640,591,11,1,5,0,4,2,2,,,,,0 <CR>	Field #2 format information.
3,640,443,26,1,5,0,4 <CR>	Field #3 format information.
4,640,296,6,1,5,0,4 <CR>	Field #4 format information.
4,640,148,6,16,3,,4,3,75 <CR>	Field #4 format information.
^D56 <CR>	Signals the end of the ticket field definition.
^D2 <CR>	Text data is coming.
Worldwide <CR>	Text data string #1.
Ticketcraft <CR>	Text data string #2.
Thermal Printing <CR>	Text data string #3.
012345 <CR>	Text data string #4.
^D3 <CR>	Print ticket.

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 ticket 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 ticket is printed from the bottom left corner to the top of the ticket.

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 ticket and then is accessed again placing a Code39 symbol representing "012345" on the ticket.

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

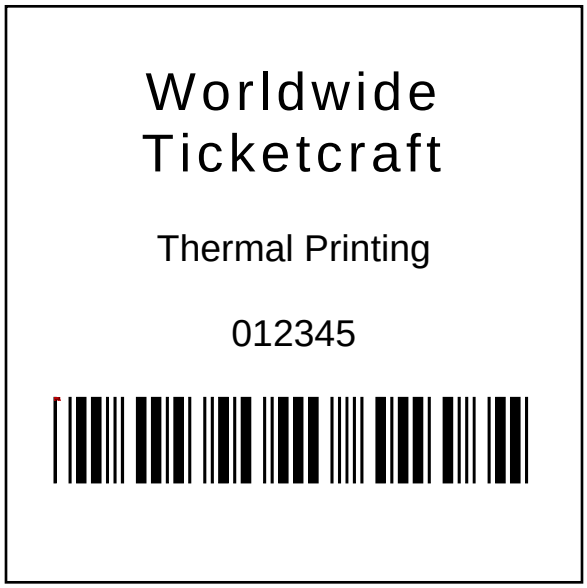


Figure 4-2 3x3 Sample Ticket

Ticket Header

The ticket header consists of eleven parameters that control the media layout as well as printer configuration. A comma (,) delimiter is used to separate the parameters and a carriage return is required to terminate the header.

The values for header elements requiring measurements are expressed as thermal dots or pixels. Dot or pixel size varies depending upon the print resolution of the print head. Two print resolutions are currently available for the 224 and 424 printers (203 DPI and 300 DPI). The dot size of a 203 dots per inch head (8 dots/mm) is 0.0049". The dot size of a 300 dots per inch head (12 dots/mm) is 0.0032". The dot size is the same in both the horizontal and vertical direction. For example, a 4" X 6" ticket printed with a 203 DPI print head would be 812 (4 X 203) dots in the horizontal or "X" direction, and 1218 (6 X 203) dots in the "Y" direction.

While the maximum number of dots in the horizontal or "X" direction is limited by print head size, it is virtually unlimited in the vertical or "Y" direction. Vertical dot rows are "stepped" by the drive roller motor.

This is a list of the header element mnemonics for the sample ticket in Figure 4-2:

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY

5 1280 900 20 40 7 0 1 730 0 0

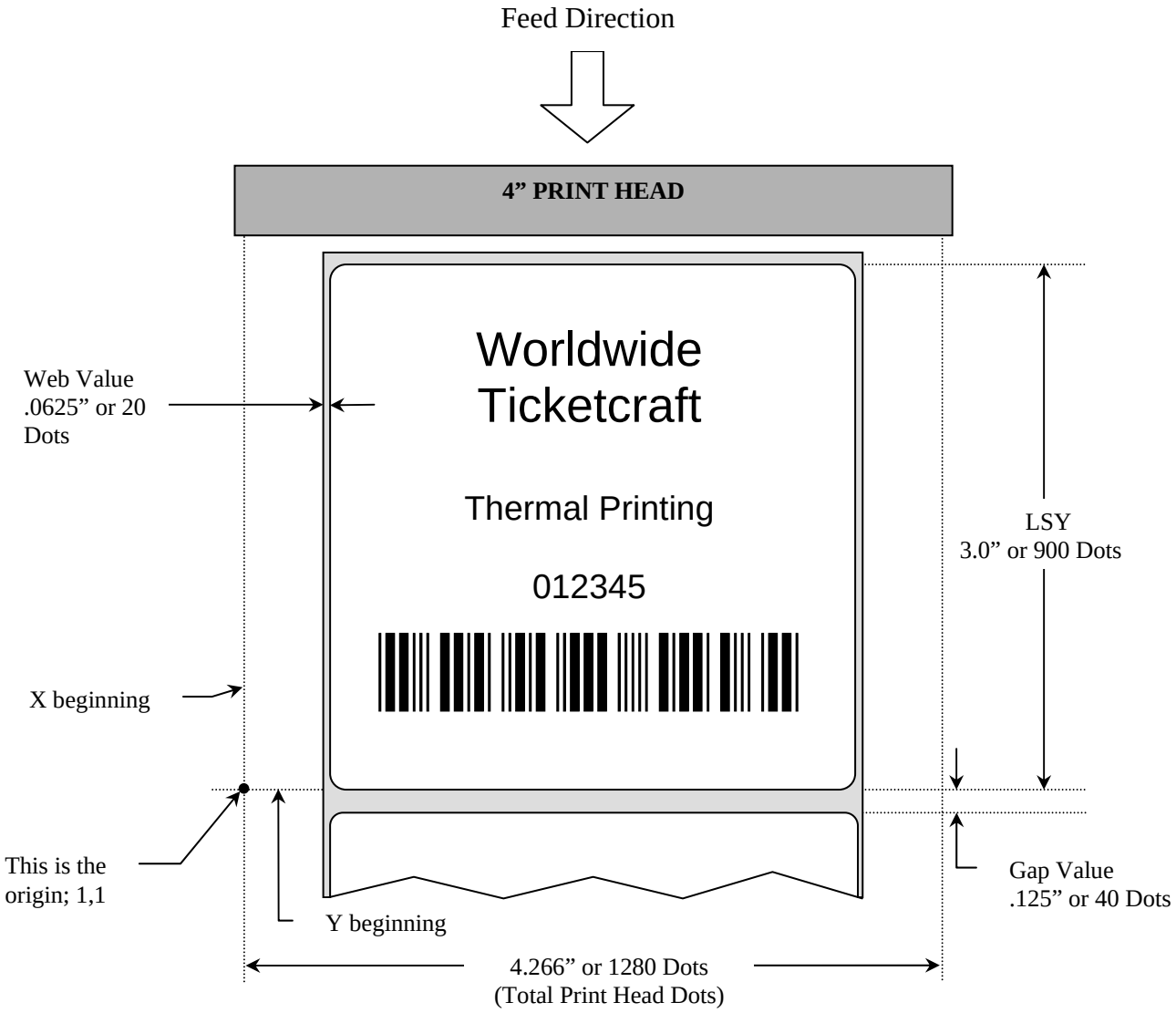


Figure 4-3 Header Elements

HFM (Number of Fields in Layout)

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY

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 4-2. This means that a total of five format fields are to be generated. If the HFM were changed to 4, only the first four format fields would be generated.

LSX (Print Head Size X)

HFM, **LSX**, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY

This parameter is used to specify the width of the print head using dots as the unit of measure. The maximum width of the LSX parameter is determined by the width of the print head. LDS has been specifically designed to accommodate a variety of print head widths. These are the LSX values that should be used for proper print registration with various print heads:

Print Width	Dots/Inch	# of Dots (LSX Value)
2.207” (56.05 mm)	203	448
2.133” (54.186 mm)	300	640
4.095” (104.00 mm)	203	832
4.110” (108.416 mm)	300	1280

Table 4-1 Valid LSX Values

LSY (Label Size Y)

HFM, LSX, **LSY**, WEB, GAP, DPS, LCB, AGD, SPG, OFX, OFY

This parameter is used to specify the height of the ticket using dots as the unit of measure. The maximum height is virtually unlimited and is dependant only with available printer memory. The ticket sample (Figure 4-2) LSY measures 3” or 900 dots.

WEB (Web Size)

HFM, LSX, LSY, **WEB**, GAP, DPS, LCB, AGD, SPG, OFX, OFY

The WEB parameter is the width, measured in dots, of the webbing or backing material that is found on the left side of a die-cut ticket. This parameter is used to introduce an offset to accommodate the backing of die-cut media. The ticket sample (Figure 4-2) WEB measures .0625” or 20 dots.

GAP (GAP Size)

HFM, LSX, LSY, WEB, **GAP**, DPS, LCB, AGD, SPG, OFX, OFY

This parameter is the height, measured in dots, of the registration mark used to identify the beginning of a ticket. The ticket sample (Figure 4-2) GAP measures 0.123” or 40 dots.

DPS (Print Speed)

HFM, LSX, LSY, WEB, GAP, **DPS**, LCB, AGD, SPG, OFX, OFY

The DPS parameter is used to set the printing speed for the printer. Refer to Table 4-2 for the list of print speeds, DPS values, and corresponding inches per second values. The printer has a default speed of 3.5 inches per second (IPS), which is a DPS value of 7. To print at greater speeds, change the DPS value to a lower setting as shown on Table 4-2. Generally, better print quality is achieved by printing at lower speeds, however this is also dependent on the media and contrast settings as well.

The same speed table is used for both. The printer automatically adjusts its stepper motor rate to compensate for different dot densities. In this way, printing a

6” long ticket at 6”/sec will take 1 second whether it is printed on a 203dpi or a 300 dpi head.

Tickets per minute can be calculated by the equation below:

$$\text{Tickets per Minute} = \frac{\text{IPS x 60 seconds}}{\text{Ticket Height}}$$

PRINT SPEED			
DPS VALUE	MM PER SECOND	INCHES PER SECOND	INCHES PER MINUTE
00	203.2	8.0	480
01	190.5	7.5	450
02	177.8	7.0	420
03	165.1	6.5	390
04	152.4	6.0	360
05	139.7	5.5	330
06	127.0	5.0	300
07	114.3	4.5	270
08	101.6	4.0	240
09	88.9	3.5	210
10	76.2	3.0	180
11	63.5	2.5	150
12	50.8	2.0	120
13	38.1	1.5	90

Table 4-2 DPS Values

LCB (Label Control Byte)

HFM, LSX, LSY, WEB, GAP, DPS, **LCB**, AGD, SPG, OFX, OFY

This parameter selects the method the printer uses for detecting registration marks on the different media types. The Model 324M and 424M printers have both upper (transmissive) and lower (reflective) gap detectors as standard equipment. The following sections discuss the LCB settings for the different media types.

Die-Cut and Blow-Hole Media (setting = 0)

A selection of “0” in the LCB parameter instructs the printer to detect the leading edge of a die-cut ticket or a “blow-hole” to identify the start of the next ticket. In this method light from the lower sensor passes through the stock to the detector in the upper sensor. This is referred to as “transmissive” sensing. The ticket sample (Figure 4-2) is die-cut, therefore, the LCB is set to “0”.

Continuous Media (setting = 2)

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 an 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).

Black Line Media (Reflective) (setting = 3)

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 sensor only. The light from the emitter in the lower sensor is reflected down to the detector in the lower sensor. This method is the preferred method for detecting media containing a black line and should be used whenever possible.

Note: The detector in the upper sensor is still used to detect a “paper out” condition.

AGD (Activate Gap Detector)

HFM, LSX, LSY, WEB, GAP, **DPS**, LCB, **AGD**, SPG, OFX, OFY

This parameter selects the number of step (dot rows) that the printer should skip before gap sensing is activated. This value is usually set to “1”. It is a good idea to set it to a value to ignore areas of pre-printed or perforated stock that might cause incorrect gap detection.

SPG (Steps Past Gap)

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, **SPG**, OFX, OFY

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 register print on each ticket. The table below lists proper SPG settings for particular printer configurations when the LSY is greater than the parameter value.

Model/Print Head DPI	Code 2.17 and earlier	Code 2.18 and later
224/424 – 203 DPI	454	472
224/424 – 300 DPI	712	730

Table 4-3 SPG Parameters

For media that has a LSY value less than the parameter value, the SPG will need to be calculated. If the ticket height is less than the parameter value, subtract (LSY+GAP) from the parameter value until the sum 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.

The SPG can be fine adjusted by temporarily adding a line at dot row #1 using Line Draw (See Page 4-18) and adjusting the SPG number up and down to get desirable registration.

OFX (Offset X Direction)

HFM, LSX, LSY, WEB, GAP, **DPS**, LCB, AGD, SPG, **OFX**, OFY

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

OFY (Offset Y Direction)

HFM, LSX, LSY, WEB, GAP, DPS, LCB, AGD, SPG, OFX, **OFY**

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

Sample Header

This is the header for the format used to generate the printed sample in Figure 4-2 followed by a summary of the header values.

5, 640, 609, ,25 ,35 ,0 ,1 ,285, 0, 0 <CR>

5	=	5 format fields are following the header.
1280	=	LSX (total print head dots) is 832 dots.
900	=	LSY (ticket height) measures 3” or 609 dots.
20	=	WEB measures 0.0625” or 12 dots.
40	=	GAP measures 0.123” or 25 dots.
7	=	Print speed (DPS) of 35 = 2 inches per second.
0	=	LCB of 0 for die-cut tickets.
1	=	AGD of 1 step.
405	=	SPG of 285 for proper placement of the next ticket.
0	=	No X offset.
0	=	No Y offset.
<CR>	=	A carriage return must follow the header.

Ticket Format Fields

The Ticket 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.

This is a list of the first ticket format field element mnemonics for the sample ticket in Figure 4-2:

TSN, XB, YB, CC, TCI, CGN, FO, FJ, CMX, CMY, CS, TSP, , , AN
1, 640, 650, 8, 1, 5, 0, 4, 2, 2, 1, 1, , , 0

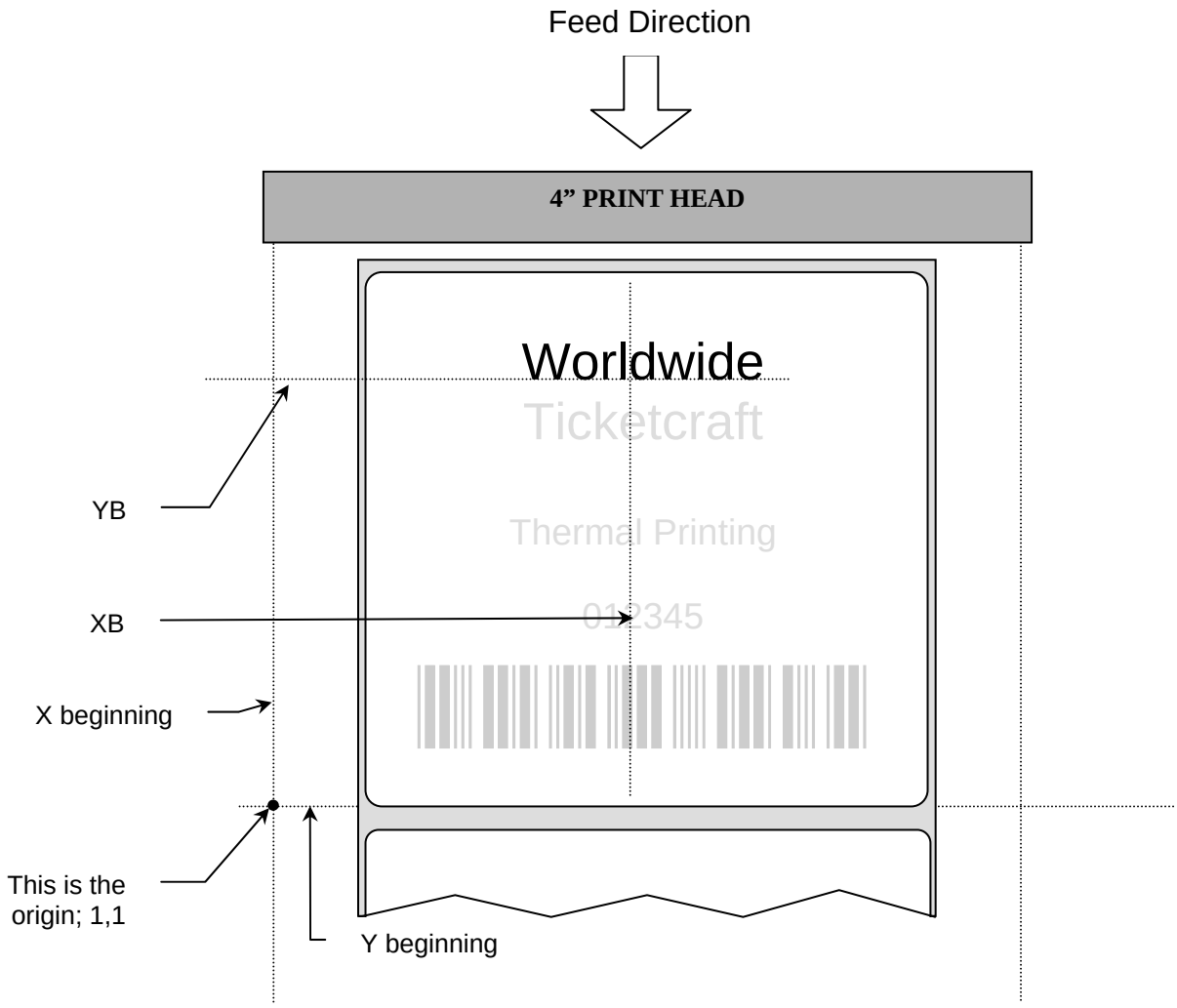


Figure 4-4 Ticket Format Field Elements

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 ticket'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.

XB (X Beginning Coordinate)

The X coordinate of the field is measured in thermal dots. The far left edge of the ticket, 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 300 would place the field one inch from the left side of the ticket.

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 ticket as viewed front the front of the printer. The Y coordinates increase in size from the bottom to the top of the ticket. A YB of 300 would place the insertion point one inch from the bottom of the ticket.

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.

TCI (Text Conversion Identifier)

The TCI parameter determines how the text string will be printed. The TCI is used to select text, bar codes, lines, downloadable font, or graphics. All of the TCI values used by the 224/424 printer are listed in Table 4-4 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 “Interleaved 2 of 5 symbol”.

TCI VALUE	TCI DESCRIPTION
0	Regular Text (standard embedded fonts, no barcode)
1	Regular Text (standard embedded fonts, no barcode)
2	Text Surrounded by Asterisks
3*	Text with UPC-A / UPC-E Checksum Digit Added
6	Line Draw
7	FLASH Fonts and Graphics
8	RAM 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 Barcode
16	Code 39 Symbol
17*	Text with UPC-E Checksum and Extended Bars Added
20	EAN-13 Symbol
21	EAN-8 Symbol

TCI VALUE	TCI DESCRIPTION
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
35	RSS14 Barcode
36	Postnet Symbol (Zip+4)
37	Postnet Symbol (Zip+6)
38	MaxiCode Symbol
39	Or Mode MaxiCode Symbol
40	Code 128 Symbol (Automatic Compression)
41	Code 128 Symbol (Full Implementation)
42	Codabar Symbol
43	Code 93 Symbol
44	AS-10 Symbol
46	PDF-417 Symbol
50	UCC/EAN 128 Symbol
51*	Text with EAN 128 Information

* Human Readable - Refer to Chapter 8

Table 4-4 TCI Values

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.

Embedded Fonts

The Model 224 and 424 printers provide 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	ABCDEFGHIJKLMNOPQRSTUVWXYZ
8	12	OCR-B	ABCDEFGHIJKLMNOPQRSTUVWXYZ

Table 4-5 CGN—Embedded Fonts

Downloadable Fonts and Graphics

When selecting downloadable fonts and graphics using TCI value of “7” or “8”, the CGN denotes the memory slot (1-255) where the font or graphic has been stored. See Chapters 6 and 7 for additional information regarding downloadable fonts and graphics.

For example: If a graphic had been stored into RAM (volatile) memory slot 1 (see Chapter 5 for additional information), the proper TCI would be “8” and the CGN value would be “1”.

Embedded Bar Codes

Certain bar codes can be printed using various ratios and character spacing options. The following table illustrates these options. See Chapter 8 for more detailed information on designing ticket formats using bar code symbols. 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 Symbologies					
SYMBOL	CGN VALUE	RATIO	HEIGHT	SPACING	FO **
Code 39	2 3 5 8	2:1 3:1 5:2 8:3	1 1 1 1	2 2 2 3	0123 0123 0123 0123
I 2 of 5	2 3 5	2:1 3:1 5:2	1 1 1	- - -	0123 0123 0123
UPC / EAN *	-	40 %	1	-	0123
UPC Readable *	-	40 %	1	-	0123
Code 128 & UCC / EAN 128 *	-	40 %	1	-	0123
Codabar	2 3 5	2:1 3:1 5:2	1 1 1	- - -	0123 0123 0123
Code 93	-	2:1	1	-	0123
AS-10	-	2:1	1	-	0123
Maxicode (CGN = Mode)	2 3 4 5 6	- - - - -	- - - - -	- - - - -	0123 0123 0123 0123 0123
MSI (Modified Plessey)	-	1:1	1	-	0123

Table 4-6 CGN—Bar Code Symbologies

* These Symbols must use the CMX or CMY multipliers by 2 to produce an 80% ratio.
** The “FO” field represents the available Field Orientation or print rotation.

FO (Field Orientation)

This parameter defines the rotation of the format field on the ticket. 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)

FJ (Field Justification)

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

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 4-7 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 4-7 FO & FJ Character Starting Positions

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.

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.

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.

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.

,,, (Reserved Spaces)

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

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 parameter 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
8	True Reverse Video: Character cell = BLACK, Character = WHITE

Line Draw

It is possible to design lines into a ticket utilizing some of the elements of ticket format fields. Specifically, a TCI value of “6” enables the line draw function. XB and XY provide a starting position for a line draw. CMX and CMY provide length and thickness to a line. Other elements not necessary to draw a line such as CC, CGN, FO, FJ, CS, and AN are ignored by simply adding delimiters (commas) without values.

An example of two lines drawn on a ticket is shown in Figure 4-5. This 3 x 3” ticket was designed for a 424 printer with a 300 DPI print head.

```
^D57 <CR>
2,1280,900,20,40,7,0,1,405,0,0 <CR>
1,340,712,,6,,,,600,25,,,,,0 <CR>
1,286,127,,6,,,,25,600,,,,,0 <CR>
^D56 <CR>
^D2 <CR>
Line <CR>
^D3 <CR>
```

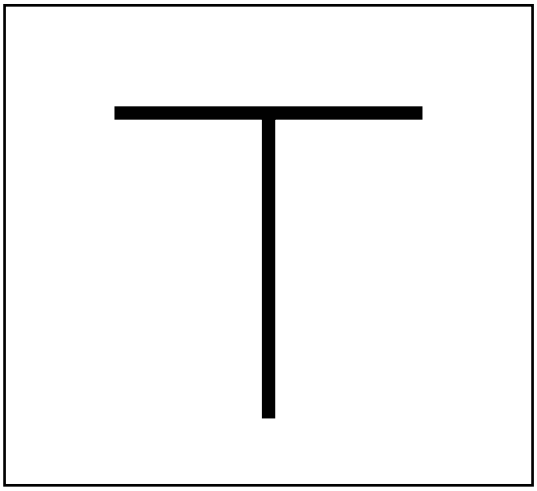


Figure 4-5 Line Draw Sample

This is a list of the first ticket format field element mnemonics for the sample ticket in Figure 4-5:

TSN, XB, YB, CC, TCI, CGN, FO, FJ, CMX, CMY, CS, TSP, , , AN
1, 340, 712, , 6, , , , 600, 25, , , , , 0

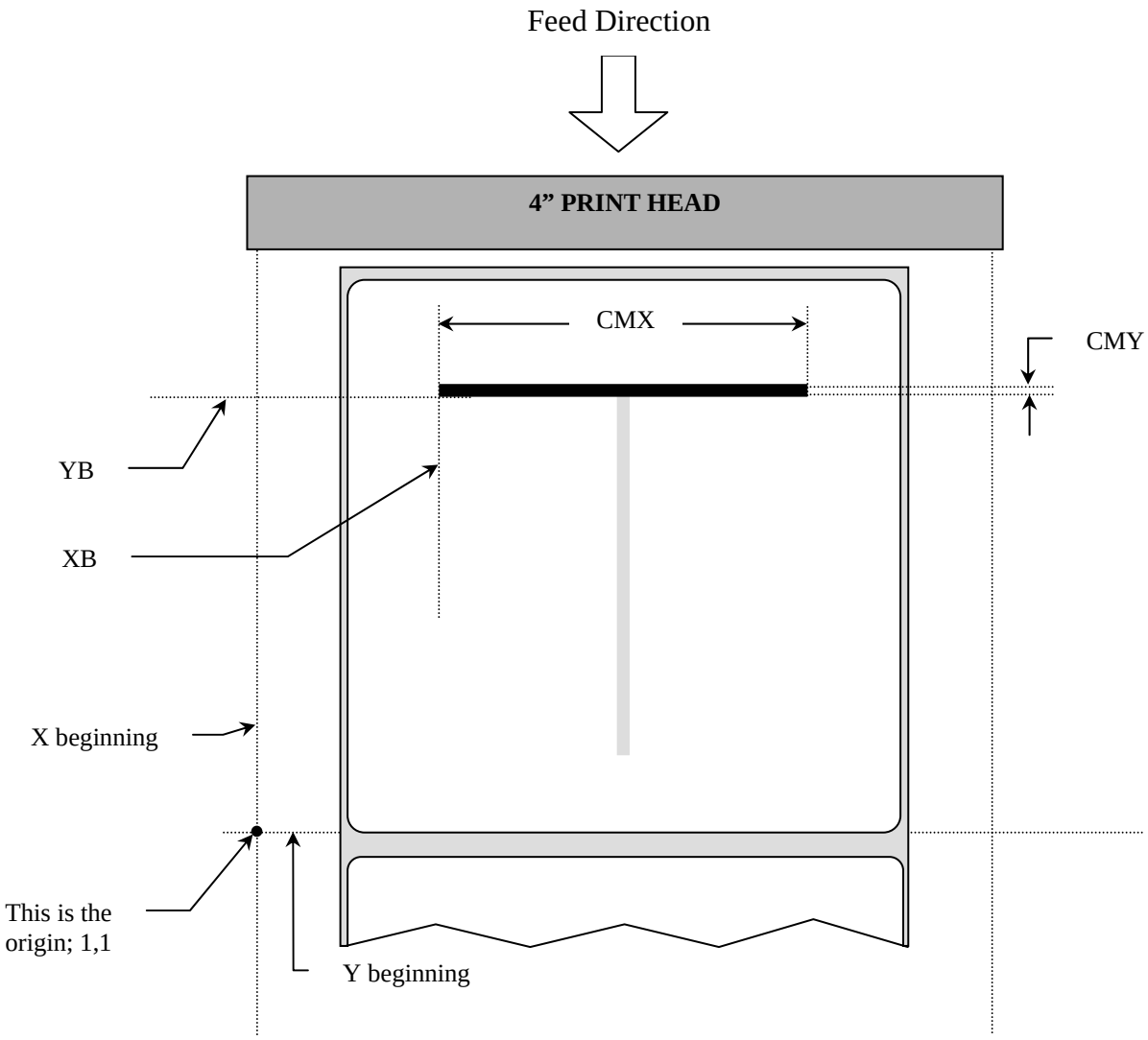


Figure 4-6 Ticket Format Line Draw

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 referencing must contain at least one character in order for a line to print properly. “Line” was used in the example to clearly define the ticket format fields that contain line values. However, it could have simply been one character such as a period “.”

XB (X Beginning Coordinate) The X and Y coordinates determine the start of the line draw.

YB (Y Beginning Coordinate) The X and Y coordinates determine the start of the line draw.

CC (Character Count) This element is not used in line draw. No value is necessary, however, a comma needs to be entered to acknowledge the position.

TCI (Text Conversion Identifier) The TCI is always set to a “6” for line draw.

CGN (Character Generator Number) This element is not used in line draw. No value is necessary, however, a comma needs to be entered to acknowledge the position.

FO (Field Orientation) This element is not used in line draw. No value is necessary, however, a comma needs to be entered to acknowledge the position.

CMX (Character Multiplier X Direction) This element sets the length of a horizontal line or the thickness of a vertical line.

CMY (Character Multiplier Y Direction) This element sets the length of a vertical line or the thickness of a horizontal line.

CS (Character Spacing) This element is not used in line draw. No value is necessary, however, a comma needs to be entered to acknowledge the position.

TSP (Text Starting Position) This element is not used in line draw. No value is necessary, however, a comma needs to be entered to acknowledge the position.

,,, (Reserved Spaces) These are reserved for future use and no values should be added between the commas.

AN (Attribute Number) This element should be set to “0” for line draw.

Reverse Video

The printer has the ability to produce Reverse Video by printing white text over a black background. Two methods are used to produce this effect. The advantages and disadvantages are covered in greater detail in the following two sections.

Reverse Video

The first method (Reverse Video) is to place text over a black box created with line draw. When the ticket format defines print at the same coordinate twice the printer will not print creating a reverse print effect when the Attribute Number (AN) is set to “1” for the Ticket Format Fields defining the line draw and the text fields. The size of the box is not defined by the text. Adjustment to the size of the box must be made by adjusting the line draw coordinates.

```
^D57
6,1280,900,20,40,7,0,1,405,0,0
1,300,300,,6,,,,700,550,,,,,1
2,640,700,8,3,5,0,4,2,2,,,,,1
3,640,591,11,1,5,0,4,2,2,,,,,1
4,640,443,26,1,5,0,4,,,,,,,1
5,640,296,6,1,50,4,,,,,,,1
5,640,148,6,16,3,,4,3,75,,,,,0
^D56
^D2
Line
Worldwide
Ticketcraft
Thermal Printing
012345
^D3
```

Figure 4-7 Reverse Video Sample

True Reverse Video

The second method (True Reverse Video) will create a white character in a black character cell. The size of the black box surrounding the character will be determined by the character cell. Adjusting the size of the box is surrounding text is limited using this method.

It is possible to create a reverse video effect with barcodes using this method.

```
^D57
5,1280,900,20,40,7,0,1,405,0,0
1,640,700,8,1,5,0,4,2,2,,,,,8
2,640,591,11,1,5,0,4,2,2,,,,,8
3,640,443,26,1,5,0,4,,,,,,,8
4,640,296,6,1,5,0,4,,,,,,,8
4,640,148,6,16,3,,4,3,75,,,,,0
^D56
^D2
Worldwide
Ticketcraft
Thermal Printing
012345
^D3
```

Chapter 5

Printer Commands

The 224 and 424 printers have a large and versatile collection of control commands to meet the special needs of ticketing 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).

Unless specified otherwise, 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.

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 using the ^D93 command or by using the ^D21 command to setup Soft Switch #1 Bits #1 & #2 (See 0).

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.

Special Printer Control Codes

To perform special functions, the printer 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 (^B text 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:** 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. Five NULL characters (HEX 00) followed by a SOH (Hex 01) are required to get the printer's status. (00 00 00 00 00 01) See 0for additional information regarding the Printer Enquiries.

^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 **Delete:** 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 "^D11 <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.

Enquiry Responses

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

The printer returns enquiry responses to the host in two different modes depending on how Software DIP Switch#1 is configured. (See Page 5-5)

Text Mode: The response is sent to the host as text as shown in Table 5-1. The strings are sent out the active communication port with a CR LF separating each one. The end of the response is terminated with an extra CR LF.

Byte Mode: The response is sent to the host as a hexadecimal number (byte) as shown in Table 5-1. Each string is represented by a single byte with nothing separating them. The end of the response is terminated with a FFh character.

Text Mode Response	Byte Mode Response	Definition
>RESTARTED<	1A	Printer has been reset
>READY<	06	Normal condition
>CUTTER ERROR<	07	Cutter cannot rotate
>TAKE TICKET<	16	Printer is waiting for ticket to be taken
>LOW STOCK<	19	Media supply is low or out
>INPUT 1<	0E	Input sensor #1 active
>INPUT 2<	21	Input sensor #2 active
>TRAY FULL<	09	Printed ticket tray is full
>PRINTER PAUSED<	10	Printer is paused
>TOF ERROR<	1F	Top of Form is not sensed properly
>OVER TEMP<	1D	Print Head is too hot
>DATA ERROR<	15	Communication error

Table 5-1 Enquiry Responses

Basic Printer Configuration Commands

The following commands are used to set up basic printer configuration. Most of these commands are non-volatile and, therefore, do not need to be resent unless changes are desired. Changes made with these commands will not take effect until the printer's power is cycled "OFF" and "ON," or a "soft reset " command (^D32 command) is sent to the printer.

Note: When the printer is in the DEFAULT MODE, factory settings control printer operation. This provides a starting point for re-establishing communication (factory default baud rate is 115,200) with the printer so that user settings can be reset should settings become scrambled.
The statistics ticket printed when the printer is entered into the DEFAULT MODE reflects current user settings, not factory default settings.

Baud Rate

This non-volatile command changes the serial port communication speed.

Note: Unless otherwise noted, the factory default baud setting is 115,200. The baud rate will be temporarily set to 115,200 when the printer is in the Diagnostic Mode if the user setting is different. The user set baud rate will resume after a "soft reset" (^D32) or cycling the power to the printer.

^A	^D 20	COMMAND
0		110 bps
1		150 bps
2		300 bps
3		600 bps
4		1,200 bps
5		2,400 bps
6		4,800 bps
7		9,600 bps
8		19,200 bps
9		38,400 bps
10		57,600 bps
11		115,200 bps

Software DIP Switches

The Software DIP Switch settings are non-volatile. The DIP Switch commands may use either ^A (decimal) or ^AB (binary) values. Since each bit represents a setting for the printer, the soft switches are always reported as binary.

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)

Software DIP Switch #1

^AB	**^D**	**COMMAND**
XX	**21**	**Change SW1:** Software DIP Switch #1.

^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

3 **Control Codes:** This position sets how the printer handles incoming control codes.

1 = Ignore Incoming Control Codes
0 = Accept Incoming 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:** Turns printer port #1 parity ON or OFF for serial communication.

1 = Disable Parity (NONE)
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 **Number of Data Bits:** Sets the printer's serial port to use either 7 or 8 data bits.

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

Software DIP Switch #2

^A	^D	COMMAND
XX	22	**Change SW2:** Software DIP Switch #2.

^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 ONLY, to denote the reset condition and then >READY< with following enquiries.

1 = Enable (>RESTARTED< on first inquiry then >READY<)
0 = Disable (Always responds with >READY<)

3 **Button Use:** If set to a "1", the printer will disable the Print Button.

1 = Disable
0 = Enable

4 **Print Button:** Defines the function of the Print Button. If set to a "0", the button can be used for feeding tickets but the print function is disabled.

1 = Ticket FEED & PRINT
0 = Ticket FEED only

5 **Power-ON Format Type:** Determines whether to use a saved format file or a standard ROM format. User downloaded Ticket FORMAT files are saved in non-volatile FLASH memory. Any of these FORMATs may be used for the Power-ON ticket. When SW2:5=1, the format is selected by SW2 switch positions 6, 7, and 8.

1 = Power-ON ticket is selected by SW2: 6,7,8
0 = Power-ON ticket is standard format

6,7,8 **Power-up Format:** These switches work in conjunction with switch location 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.

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

Software DIP Switch #3

^A	^D	COMMAND
XX	23	**Change SW3:** Software DIP Switch #3

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

Position:

1 **Extended ASCII:** Controls whether characters over HEX 7F will be processed.
1 = Don't process input characters greater than 7F
0 = Process input characters greater than 7F

2 **INPUT 1 Active State:** This bit determines whether the INPUT 1 sensor must see an object or not to send back the >INPUT 1< response.
1 = Send >INPUT 1< for NO reflection (yellow LED is OFF)
0 = Send >INPUT 1< for reflection (yellow LED is ON)

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 **INPUT 2 Active State:** This bit determines whether the INPUT 2 sensor must see an object or not to send back the >INPUT 2< response.
1 = Send >INPUT 2< for NO reflection (green LED is OFF)
0 = Send >INPUT 2< for reflection (green LED is ON)

5 **Accept "|" for Ctrl:** Sets whether the "pipe" character will be interpreted the same as the "Ctrl" key. The "pipe" character is the <SHIFT> + \ key.
1 = Disable
0 = Enable (<|> key functions as <Ctrl> key)

6 **Accept "^" for Ctrl:** Sets whether the "caret" character will be interpreted the same as the "Ctrl" key. The "caret" character is the <SHIFT> + 6 key.

1 = Disable
0 = Enable (^ key functions as <Ctrl> key)

7 **Binary Compression:** If enabled, the printer will accept downloaded binary compressed font and/or graphic files. ^E and ^D commands will not function. (See 0)

1 = Enable Binary Mode
0 = Disable Binary Mode

8 **Detect Black Line on Power-up:** If enabled, the printer automatically feeds tickets on Power-up to determine the proper ^D91 value.

1 = Enable
0 = Disable

Software DIP Switch #4

^A	^D	COMMAND
XX	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 ticket format. Printing will continue until the signal on Pin 7 goes high.

1 = Enable
0 = Disable

3 **Paper Out function:** Enable this function to get a >LOW STOCK< message when the printer runs out of paper.

1 = Disable
0 = Enable (PAPER-OUT detection gives >LOW STOCK<)

4 **Auto-size on Power-up:** When enabled, the printer automatically sizes the ticket to determine the appropriate format header values

on power-up. The printer will then use these values on all subsequent ticket 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.
See Chapter 9 for more details

0000 = Not Decoded (Default)	**0111 = Swiss**
	1000 = 852
0001 = Danish	**1001 = French**
0010 = 860	**1010 = 863**
0011 = Spanish	**1011 = Swedish**
0100 = 850	**1100 = 437**
0101 = German	**1101 = Italian**
0110 = 865	**1110 = English - UK**
	1111 = English – US

Software DIP Switch #5

^A	**^D**	**COMMAND**
XX	**25**	**Change SW5:** Software DIP Switch #5.

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

Position:

1 **E-Z Stock Out Clear:** If enabled, then a >STOCK OUT< error condition can be cleared by a single press of the rear panel GREEN button after reloading the printer with more stock.

If this function is Disabled, then the rear panel GREEN button assumes its normal function of PRINT each time it is pushed.

1 = Enable E-Z Clear
0 = Disable E-Z Clear

2 ***Always "0"*****.**

3 **Type of Top Of Form Sensor:** The leading edge of the ticket stock can be sensed using either a reflective sensor or a transmissive sensor.

1 = TOF is TRANSMISSIVE
0 = TOF is REFLECTIVE

4 **Enable Power ON TOF:** This bit controls whether or not the printer will do an automatic Top Of Form (TOF) when it is turned ON.

1 = Enable Power-ON TOF
0 = Disable

5 **Enable Button TOF:** This bit determines whether the rear panel GREEN button functions as a Top Of Form or as a PRINT.
1 = Button is TOF
0 = Button is PRINT

6 **Enable AutoLoad:** This bit determines whether the AutoLoad function is ON or OFF.
1 = AutoLoad is ON
0 = AutoLoad is OFF

7 **Type of AutoLoad:** This bit determines whether the AutoLoad function uses the Top Of Form sensor (TOF), or if it uses the Form Feed technique.
1 = AutoLoad is TOF
0 = AutoLoad is FF

8 **General Purpose Mode:** If enabled, the printer will enter a special mode of communications using the Ethernet port.
1 = Enable General Purpose Mode
0 = Disable General Purpose Mode

Software DIP Switch #6

^A	**^D**	**COMMAND**
XX	**26**	**Change SW6:** Software DIP Switch #6.

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

Position:

1 **Active Level of Pin 4 of P17:** This bit determines the printer's response when pin 4 of P17 is active.
1 = >TRAY FULL< condition.
0 = A test pattern is printed.

2 **Always 0**

3 **Always 0**

4 **Always 0**

5 **Always 0**

6 **Always 0**

7 Always 0

8 Always 0

Set Communication Port Selection Commands

The 224 and 424 printers have 3 different serial communication ports on the rear panel:

1) RS-232D 115,200 bits/sec, max.
2) USB 12Mbits/sec
3) Ethernet (option) 10Mbits/sec or 100Mbits/sec

Only one of the 3 serial ports can be active at any time, but all 3 cables can be connected to the printer at the same time. In cases where more than 1 cable is connected, the printer follows specific rules to determine which serial port is the active port when power is applied.

Set Serial Port Source Command (Non-volatile- ^D108)

This command sets which serial port will be used the next time the printer is turned ON. The 224/424 printer has three serial data ports on the rear panel: RS-232, USB, or Ethernet. Only 1 port can be active at any given time. The D108 command sets how the printer selects the active serial port the next time the printer is powered ON. Settings made with D108 are saved in the printer's system parameters and are used to select the serial port on power-up.

^A	^D	Command
X	**108**	**Serial Port Source (Non-volatile)**
0		**AutoScan:** When the printer powers up, it will scan the USB and RS-232 ports and select the "HOT" port. The USB port will be the HOT port if the USB cable is connected between the printer and a PC that is powered "ON." The RS-232 port will be the HOT port if the USB cable is not plugged in and a character comes in on the RS-232 port. The printer will continue to scan both ports until one or the other condition is satisfied.
1		**Ethernet:** This command tells the printer to use the Ethernet port the next time it powers up.

Set Serial Port Source Command (Volatile - ^D109)

This command is similar to the ^D108 command, except the ^D109 command immediately switches between the 3 serial ports without the need to cycle power. Settings made with ^D109 command are NOT saved on power-down. The printer returns to the original port setting on the next power-ON.

Note: The AutoScan option is not available with the ^D109 command.

^A	^D	Command
X	**109**	**Serial Port Source (volatile)**
0		RS-232
1		USB

2 Ethernet

Contrast Adjustment Commands

These commands are used to adjust the darkness of the ticket print. Print quality will vary not only with different ticket stocks, sometimes even in different batches of the same ticket stock. It is highly recommended that contrast adjustments be maintained at minimum settings to achieve desired print quality. Higher contrast settings will reduce the life of the print head.

Adjust Contrast Window (Volatile - ^D35)

This command is useful for adjusting contrast for specific ticket formats where different ticket media is used on a single printer. The command can be entered into specific ticket formats rather than affecting print contrast on all ticket formats.

^A	^D	COMMAND
XX	35	**Adjust Contrast Window:** This is a volatile command used to adjust the contrast window. The range is 1 to 9 of the base (^D36).

Adjust Contrast Base (Non-volatile - ^D36)

This command is used to adjust overall contrast on all formats.

^A	^D	COMMAND
XX	36	**Adjust Contrast Base:** This non-volatile command is used to skew the entire contrast window (^D35). This command has a ^A range of 10 to 200%.

Load Value to See Valid Gap

While the printer is designed to work with a wide variety of ticket media, it is sometimes necessary to adjust gap sensing in order to obtain proper registration. The numerical value in which the printer senses a registration mark is referred as the Threshold Value.

The Threshold Value may be obtained by using the Auto-Size Ticket Command (^D39). A more in-depth explanation of gap sensing and adjusting the Threshold Value is found in the 224/424 Service Manual.

^A	^D	COMMAND
XX	91	**Gap Detection Sensitivity:** This non-volatile command is used to set the Threshold Value (0-255) at which the printer detects gap, blow-hole, and/or black line registration marks.

Advanced Printer Configuration Commands

These commands are not commonly used.

Print Head Size Commands

The 224 and 424 printers can use a variety of different print head sizes and densities. The ^D78 and ^D79 commands (non-volatile) allow the printer to be setup thru software to drive different print head sizes and densities. Power cycle or ^D32 required before command settings take affect.

Note: When using these commands, the ^D79 command MUST be sent prior to the ^D78.

Head style	*Dots/Inch*	*# of Dots*	*Print Width*
Medium resolution	203	448	2.207" (56.05mm)
High resolution edge	300	640	2.133" (54.186mm)
Medium resolution	203	640	3.153" (80.08mm)
High resolution	300	960	3.200" (81.28mm)
Medium resolution	203	832	4.095" (104.00mm)
High resolution	300	1280	4.110" (108.416mm)

^A	^D	COMMAND
X	79	**Set print head dots/inch (dpi).** This command sets the dot density of the print head. This command MUST be sent BEFORE the # of Dots (^D78) is set with the ^D78 command. The only valid entries are ^A0 for 203dpi and ^A1 for 300dpi as shown in the "Dots/Inch" column in the table above.

^A	^D	COMMAND
XX	78	**Set print head number of dots.** This command sets # of dots in the print head. This command MUST be sent AFTER the dot density (dpi) is set with the ^D79 command. The only valid entries for XX are the numbers in the "# of Dots" column in the table above.

These are examples of how to use the ^D78 and ^D79 commands:

EXAMPLE #1: How to set the printer for a 640 dot, 300 dpi print head:

^A1^D79<CR> (Sets 300 dpi)
^A640^D78<CR> (Sets 640 dots)

EXAMPLE #2: How to set the printer for a 1280 dot, 203 dpi print head:

^A0^D79<CR> (Sets 203 dpi)
^A1280^D78<CR> (Sets 1280 dots)

General Purpose I/O

^A	^D	Command
XX	110	**General Purpose Command.** The printer has a special mode of communication for General Purpose control environments. Communication is over the Ethernet port and uses the following protocol.

The host sends a command byte to the Ethernet port every few milliseconds. The printer's Ethernet interface will pass the command byte on to the printer only when there is a change, i.e., when there is a new command.

The printer sends a byte of status data to its Ethernet interface using the same data format, and will only send the data when there is a change in status. The printer's Ethernet interface will send the printer status byte to the HOST every few milliseconds.

This is the command byte configuration:

Command Byte From Host to Printer:

Bit #	*Function when = "1"*	*Function when = "0"*
0	PRINT	DON'T PRINT
1	PRINT TEST PATTERN	DON'T PRINT TEST PATTERN
2	RESET	DON'T RESET
3	not used	
4	not used	
5	not used	
6	not used	
7	not used	

The HOST only sends the command byte to the printer. The printer's Ethernet interface receives this command byte from the HOST and tests it to see if it is different from the previous command byte. If there is a change, then the command byte is put into the "xx" of a ^Axx^D110 command and sent to the printer. Valid values for "xx" are determined from the "Host to Printer" table above.

The printer sends a status byte to the host every few milliseconds thru its Ethernet interface. This status byte is sent whether there is a change of status or not.

Status Byte From Printer to Host:

Bit #	*Function when = "1"*	*Function when = "0"*
0 (LSB)	IN RESET or PRINTING	NOT BUSY
1	ERROR	NO ERROR
2	DOWNLOADING A FORMAT	FINISHED DOWNLOAD
3	FORMAT LOADED	NO FORMAT LOADED
4	not used	
5	not used	
6	not used	
7 (MSB)	not used	

The General Purpose mode of operation is enabled by Soft Switch #5, Bit #8. These are the specific commands:

^ABxxxxxxx1^D25 Enable General Purpose Mode

^ABxxxxxxx0^D25 Disable General Purpose Mode

Note that the binary data entry mode is shown in these 2 commands. The user must set the "xxxxxxx" values to agree with current settings in order to avoid changing any of the other settings in Softswitch #5.

Entering General Purpose Mode

Sending the "Enable General Purpose Mode" command will set the printer up to go into General Purpose mode. The printer will NOT go into General Purpose Mode until a power cycle occurs to cause the data to be stored in FLASH memory. This command is nonvolatile, so once the General Purpose Mode is entered the printer will stay in General Purpose Mode thru subsequent power cycles.

Exiting General Purpose Mode

A printer that is in General Purpose Mode will stay in General Purpose mode thru power cycles until the "Disable General Purpose Mode" command (^A0^D25) is issued. The next power-ON after a "Disable General Purpose Mode" command will cause the printer to leave General Purpose Mode.

Note: A default power-ON will also take the printer out of General Purpose Mode.

Synchronous Print Mode

This mode allows the printer to be synchronized to external equipment thru an external PRINT control line. A second input control line ABORT allows a pending print job to be terminated. Using this mode allows any ticket, no matter what size to begin printing IMMEDIATELY using the print input signal. Printing begins 11 microseconds after the rising edge of the PRINT control line.

Two control signals are required:

1) PRINT input line (connector P17, Pin #2),
2) ABORT input line (connector P17, Pin #8)

Signal logic levels:

The signals are active high and must be between +15Vdc and +24Vdc to be "1".

The signals must drop below +10Vdc to be "0".

To use this mode, follow these steps:

a) Download a ticket format to the printer. This format should not have the normal ^D3 (PRINT command) in the format. If the ^D3 is left in the format, an initial ticket will be printed regardless of the special input line settings.
b) Send the printer a ^D116<CR> command. This will force the printer to process the ticket to the point that the ticket bitmap is ready to be sent to the print head. After this command is sent

no communications will be possible with the printer until the next step is completed.

c) To start the print, send a high-going pulse on the PRINT input line. To ABORT the job, whether printing or not, send a high-going pulse on the ABORT input line.
d) After the ticket prints or aborts, the printer will return to its normal non-sync mode of operation.

The PRINT pulse should go back to "0" before the print ends to avoid a second ticket being printed. A 10 millisecond pulse works fine.

Continuous sync mode works like single sync mode except after the ticket is printed it will immediately be reprocessed (like the printer received another print command) and will wait for another print signal on the General Purpose print input. This will be repeated until the printer gets a paper-out error, which exits all sync modes. This mode provides the fastest way to reprint a ticket when the slice buffer and starting slice are set properly (^D94 and ^D92).

The main difference between the two modes is single sync mode prints one ticket and exits sync mode. Continuous sync mode allows a user to print as many tickets as they want using the print signal until the abort is received or a paper-out occurs.

^A	^D	Command
	116	**Synchronous Print Mode**
0		Exit all sync. modes.
1		Enter single sync. mode.
2		Enter continuous sync. mode.

WARNING! There is NO time-out on this command! Once the printer receives the ^D116 command and is waiting for the PRINT or ABORT pulse, it will wait forever!

Cutter Configuration Commands

Cutter Type

The ^D115 command will assure that the proper type of cutter is reported to the statistics ticket. It should be used prior to enabling the cutter with the ^D99 command (volatile).

^A	^D	Command
X	**115**	**Set Cutter Type:** A non-volatile command to set cutter type.
0		No Cutter
1		Guillotine
2		Rotary

Kiosk Cutter Commands

Kiosk Cutter Mode

This is a special mode that can be used to avoid media "curling" when left under the drive roller for extended time. The printer feeds the media forward a programmable amount (See ^D112) so that the leading edge of the media is out from under the drive roller. This helps prevent the leading edge of the ticket being curled up by the drive roller, which leads to paper jams going into the cutter.

These are the steps the printer takes when media is to be printed:

1. Media is retracted from the "Idle" position into the printer,
2. Media is printed,
3. Media is advanced to the cutter & cut.

This mode is useful in Kiosk applications where the media may normally rest under the driver roller for long times and become curled.

^A	^D	Command
XX	**111**	**Kiosk Cutter Mode.**
0		Disable Kiosk Cutter Mode.
1		Enable Kiosk Cutter Mode.
2		Enable partial kiosk cut mode.

Kiosk Cutter Advance Distance Command

This command sets the advance/retract distance for the Kiosk Cutter Mode. The printer has normal "default" values that it uses when it is fitted with a standard Microcom cutter. But in custom applications, the distance between the print head dot row and the cutter blades may be totally different. The ^D112 command is used to accommodate a non-standard distance.

The distance is measured between the print head dot row and the cutting point on the cutter. Dimensions are in dot rows, so the count will be dependent on the Dots/Inch (dpi) of the print head.

Print Head Resolution	*Dots/Inch*
203 dpi	.0049"
300 dpi	.0033"

Table 22 gives the default values that the printer uses to advance the media to the cutter blades. If these values are not appropriate for a custom application, then the ^D112 command may be used to set new advance/retract distances. This command is non-volatile.

Print head DPI	*Rotary Cutter*	*Guillotine Cutter*
203dpi	175 (0.8575”)	155 (0.7595”)
300dpi	263 (0.8679”)	233 (0.7689”)

Table 5-2 Kiosk Cutter Advance Distances

^A	^D	Command
XX	**112**	**Kiosk Cutter Advance Distance Command.** ^Axx Advance the ticket xx dot rows to the cutter blades. The range is 0 – 1000 (dot rows).

Cutter Holdoff

This command is used to avoid cutting “air” or the leading edge of the first ticket when printing and cutting without advancing the ticket stock. This command is used with the Full or Partial Cut Mode (^D99), but not the Kiosk Cut Mode. This function will skip a pre-set number of cuts following a Top of Form. Count resets and begins count at TOF or following the point where the command is given.

Note: Advance distance must be set at “0” for this command to function.

^A	^D	COMMAND
X	**117**	**Cutter Holdoff:** X represents the number of cuts to skip on the first X tickets following a Top of Form.

Reset Machine (Soft Reset)

Restores the printer to power-up settings. Also used to set the non-volatile fields in memory. Serves as the same function cycling the power “OFF” and “ON” (Hard Reset).

^A	^D	Command
	32	**Reset Printer (Soft Reset).**

View Printer Configuration and Statistics

These commands display or print configuration settings. The user may reset the Printed Tickets and Inches if they wish to track ticket usage, print head life, etc. Total Tickets and Inches cannot be reset by the user.

^A	^D	Command
XX	**29**	**Printer Statistics:**
0		Print Statistics to the serial port
1		Print Statistics on a ticket
2		Clear the **Printed Tickets** variable in the statistics

3	Clear the **Printed Inches** variable in the statistics

^A	**^D**	**Command**
	33	**Display Model and Revision Number**

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.

Tag/Tear Operation

This command controls a method of dispensing the media so that the perforation between tickets is positioned on the tear bar or peel edge. Once the ticket is taken, the ticket media retracts and allows proper registration of the next ticket print. Once the ticket is taken, the ticket media retracts and allows proper registration of the next ticket print.

^A	**^D**	**COMMAND**
X	**97**	**Tag/Tear Operation:**
0		Disable Tag/Tear operation.
1		Advance after every print.
2		Advance after copies count.
3		Advance when idle. (Does not use LPD - retracts stock at next sent ticket format.)
4		

Peel-and-Dispense Operation

This command is used when the tickets are to be peeled from the backing material. Once the ticket is taken, the ticket media retracts and allows proper registration of the next ticket print. It requires the optional Ticket Present Detector (LPD) and Printed Media Presenter (PMP).

^A	**^D**	**COMMAND**
X	**98**	**Peel-and-Dispense Operation:**
0		Disable Peel-and-Dispense operation.
1		Enable Peel-and-Dispense operation.

Cutter Operation

^A	**^D**	**COMMAND**
X	**99**	**Cutter Control:** This command enables full and/or partial cut operation. 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.
Note: When doing partial cuts with a LPD, the printer will not proceed until the LPD sees that the ticket has been taken. Then after a programmable delay, the printer will retract and print the next ticket.

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 partial 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. A Partial Cut leaves a thin piece of media in the center after the cut cycle is finished. This small piece of uncut stock holds the media together and the printer waits until the media is removed before printing the next ticket. 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.

Note: 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 tickets 1 through 4 and full cut after ticket 5.

Load Advance/Retract Distance and Load Advance Delay

^A	^D	COMMAND
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 advance further than

one ticket size. This may create a paper jam when the ticket 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.

Slice Buffer Size and Set Starting Slice Number Commands

^A ^D Command

XX 92 Set Starting Slice Number: This command adjusts the number of slices (dot rows) generated before the printer starts moving the ticket stock. The default is set to 67% of the slice buffer size. Anytime the size of the slice buffer is changed (ref. ^D94 command), the Starting Slice # is also changed automatically to a value that is 67% of the new slice buffer size.

"XX" can be any integer value up to a maximum of the number of slices in the Slice Buffer (See). If a value for "xx" is entered that is too large for the print head, the printer will respond with the correct maximum value for the head size currently in use.

Table 21 below lists the default Starting Slice Number for various heads and buffer sizes.

This command is used together with the ^D94 command to fully set up the slice buffer function.

Print head	*^A2^D94*	*^A3^D94*	*^A4^D94*	*^A5^D94*	*^A6^D94*
2.21" 448dot 203dpi	978	1660	2342	3026	3708
4.10" 832dot 203dpi	558	948	1338	1728	2118
2.10" 640dot 300dpi	782	1328	1874	2420	2966
4.26"1280dot 300dpi	390	662	936	1210	1482

Table 5-3 Starting Slice Number (dot row #)

EXAMPLE: Print head size: 4"
Print head DPI: 300
Slice Buffer Size: 3 (= 3x64KB = 192KB)

Bytes/slice = 4" x (300 dots/inch) x (1 byte/8dots) = 150 bytes
So a Slice Buffer size of 192,000 bytes can store 192,000/150 = 1,280 slices.
At 300 slices/inch, the buffer can hold 1,280/300 = 4.267" of printing.

Default setting for "Starting Slice #" is 100 slices.

^A ^D Command

X 94 Set Slice Buffer Size:

2 88Kbytes (default size)

3 192Kbytes
4 256KBytes
5 320KBytes
6 384KBytes

This command sets the size of the slice buffer in increments of 64Kbytes. The default size of the slice buffer is 88Kbytes.

NOTE: Any change to the slice buffer size will also automatically change the starting slice to a default, which will be 67% of the new buffer size.

Because the printer can be fitted with a variety of different head widths and dot densities, the actual number of slices that the buffer can hold will be determined by the number of dots in the print head.

This command is used together with the ^D92 command to fully set up the slice buffer function. The range of Ax is A(2-6). Table 22 gives the number of slices in the Slice Buffer for all Ax values for various head sizes.

Print head	*^A2^D94*	*^A3^D94*	*^A4^D94*	*^A5^D94*	*^A6^D94*
2.21" 448dot 203dpi	1466	2490	3514	4538	5562
4.10" 832dot 203dpi	837	1422	2007	2592	3177
2.10" 640dot 300dpi	1172	1991	2810	3630	4449
4.26"1280dot 300dpi	585	994	1404	1814	2223

Table 5-4 Slice Buffer Size (dot rows)

AutoLoad Media

The 224 and 424 printers provide an easy way for new media to be loaded into the printer thru the use of the AutoLoad function. When this feature is turned ON, the printer will sense the presence of new media as the operator is pushing it into the printer, automatically feed the media into the printer, and then register the media using either the TOF sensor or a Form Feed operation.

There are two types of AutoLoad:

a) AutoLoad with Form Feed
b) AutoLoad with Top Of Form.

Refer to Page 5-9 for details on how Soft Switch #5 controls the AutoLoad function.

AutoLoad with Form Feed

This command is useful to load media without having to press the Print Button to start printing again. The operator must insert the ticket stock into the printer until it stops against the drive roller. The printer will automatically begin to turn the drive roller after the stock is sensed by the gap sensor. A delay may be set from when the stock is first sensed and when the drive roller starts to turn (See AutoLoad Command on page 5-24).

The printer will advance a blank ticket before starting to print properly registered tickets.

These are the steps for AutoLoad with FF:

1. With the head mechanism latched in its normal print position, the user inserts new media until it stops at the drive roller,
2. The printer senses the new media and waits a programmable amount of time set by the ^D120 command (default is 2 seconds),
3. After the time delay (if set), the printer advances the media until the first registration mark is sensed.
4. Ticket printing will resume if a job is pending.

Set up the printer to use AutoLoad with Form Feed by setting Softswitch #5, bit #6 to “1”.

^AB00000100^D25<CR>

This command must be used if the printer is not equipped with a TOF sensor.

AutoLoad with Top Of Form

This command is used on printers that are fitted with a “Top Of Form” (TOF) sensor that can detect the leading edge of the media. AutoLoad with a TOF sensor prevents the loss of the first ticket as in AutoLoad with Form Feed.

Softswitch #5, bit #3 selects the type of TOF sensor. The TOF may be the standard REFLECTIVE style, or it may use a TRANSMISSIVE sensor for more accurate sensing. The TRANSMISSIVE style must be used with certain equipment configurations such as a Cutter Catch Tray.

These are the steps for AutoLoad with TOF:

1. With the head mechanism latched in its normal print position, the operator inserts new media until it stops at the drive roller,
2. The printer waits a programmable amount of time as set by the ^D120 command (default is 1.5 seconds) after it senses the new media to make it easier for the operator to align the paper,
3. After the time delay, the printer feeds the paper forward until the leading edge of the media is seen by the TOF sensor,
4. The feed forward stops and then the printer retracts the media a programmable distance as set by the ^D123 command and stops.

Softswitch #5, bits #6 & #7 must be set to enter AutoLoad with TOF mode.

^AB00000110^D25<CR>

Note: TOF Error—When the printer cannot complete a TOF, it will stop, the LED will turn "RED," and if the queried, the printer will say ">TOF ERROR<." To clear the error, just hit the print button once. Another TOF can then be attempted.

AutoLoad Commands

^A	^D	COMMAND
XX	120	**AutoLoad Delay Selection.**

AutoLoad Delay = xx milliseconds (up to a maximum of 5000 milliseconds or 5 seconds.

The AutoLoad Delay is the amount of time that the printer waits after detecting that media has been put into the printer before it starts feeding it in. A small amount of delay makes it easier for the operator to get the paper fully inserted into the printer and properly oriented before paper motion begins.

The default value for AutoLoad delay is 1500 milliseconds (1.5 seconds). The operator may use this command to adjust the delay to suit individual preferences. ^A0 turns the delay OFF so that the driver roller is activated as soon as media is detected. Since this is a volatile command the default setting will be restored every time the printer's power is cycled "OFF" and "ON."

Refer to Page 5-22 for more details on the AutoLoad function.

Example: Have the printer wait 1.25 seconds before feeding paper on AutoLoad.
^A1250^D120

121 **Top Of Form Command.**

This command initiates a Top Of Form operation:

a) Media is advanced until the leading edge is detected by the reflective "Top Of Form" sensor,
b) Media is retracted to place the leading edge of stock under the print head.

This command is useful when using the AutoLoad with Top of Form command.

^A	^D	COMMAND
XX	123	**Set TOF Retract Distance.**
0		Sets the DEFAULT value of 1.084" (203 dpi = 220 steps; 300 dpi = 325 steps).
1 →	900	Valid retract distances, measured in dot rows.

When a Top Of Form operation is in process, the paper moves forward until its leading edge is seen by the TOF sensor. As soon as the sensor sees the paper, the printer stops the forward motion of the paper and begins to move the paper in reverse toward the print head. This command sets how far the media is moved back into the printer after the leading edge is seen by the Top Of Form (TOF) sensor.

Example: ^A223^D123 would increase the retract distance on a 203 dpi printer to 1.099."

Printing Commands

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

Basic Printing Commands

^A	^D	COMMAND
	3	**Print Command: (Equivalent ^C)** Informs the printer to print a single ticket or start printing a batch of tickets. Since commands are processed in the order they are received, this is typically the last command in the format file. This command is equivalent to the "^C" control code.
	5	**Send Printer Status: (Equivalent ^E)**
	8	**Cycle Cutter:** If a cutter is installed on the printer, this command will cause the cutter to be cycled. The cutter's operation will be determined by the D99 command. If the cutter is a rotary cutter, it will always cycle in the forward direction to make a full cut. If the cutter is a guillotine cutter, the cycle direction will be determined by the last setting given with a D99 command.
	11	**Print Test Pattern: (Equivalent ^K)** Prints a ticket 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: (Equivqlent ^L)** 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.

^A	^D	Command
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 Ticket Count) to allow duplicate copies to be made within a batch of tickets. For example, the following command string will print a total of 150 tickets; three copies of each serial number for the 50 different tickets. (^A3^D73^A50^D75^D3<CR>)

1	**74**	**Infinity Print:** Prints a batch of tickets 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 Ticket Count:** Instructs the printer to print a batch of tickets 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 ticket) 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 tickets 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.

^A	**^D**	**COMMAND**
XXX	**76**	**Load Delay Time Between Printed Tickets:** Delays the printing between tickets 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 tickets. This command is typically used in conjunction with the Peel-n-Dispense mode and applicators.

Auto-sizing and Valid GAP Commands

The auto-size command attempts to automatically calculate important format values for the ticket header including LSY, GAP, AGD, SPG and the ^D91 value. The printer feeds a sample of tickets 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.

^A	**^D**	**COMMAND**
	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 ticket 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.

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 ticket 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 the Basic Printing Commands section on page 5-25 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:

^A	^D	COMMAND
	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:

^A	^D	COMMAND
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:** The single serial number functions increment or decrement by this value. ^Axx is the amount of increment or decrement.
XX	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:

^A	^D	COMMAND
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.
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 tickets (^A3^D75). The printed result would be "20" for the first ticket, "15" for the second ticket, and "10" for the third or last ticket.

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 tickets (^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”.

Ticket Header Parameter Override Commands

It is possible to override ticket header parameters by adding one or more of the following commands after the ticket format.

^A	^D	COMMAND
	40	**Clears Commands 41 through 51**
XX	**41**	**Load Number of Fields in Layout (HFM):** The ^Axx specifies the value.
XX	**42**	**Load Ticket Width in dots (LXS):** The ^Axx specifies the value.
XX	**43**	**Load Ticket 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 Ticket 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 in Dot Rows.
XX	**49**	**Load the Number of Steps Past Gap (SPG):** The ^Axx specifies the value in Dot Rows.
XX	**50**	**Load X Direction Offset (OFX):** The ^Axx specifies the value.
XX	**51**	**Load Y Direction Offset (OFY):** The ^Axx specifies the value.

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.

^A	^D	COMMAND
	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.

^A	^D	COMMAND
	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 ticket with “Aline 1”, “Bline2”, and “Cline 3” printed on the ticket.

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 ticket 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 of other limited host that is capable of generating and sending carriage return characters.
2		Clear Previous Text Upon Receiving New Data. When one of 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).

2 Enable modes 2 and 3.

^A	^D	COMMAND
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 ticket 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)
```

Memory Commands

These commands offer special functions related to clearing, storing, and processing data in the RAM and FLASH memory.

The printer can store up to 128 FORMAT files into the printer's RAM memory and another 128 files into FLASH memory. Once stored, these files can be loaded from memory rather than having to be sent down thru the serial port. Formats are retained

even after power has been cycled when stored in FLASH memory. Formats stored in RAM will be lost when the printer is turned "OFF."

The printer can be configured through software switch #2 (^D22 command) to automatically process a specific format from the FLASH memory when the printer is turned "ON." The printer treats the stored formats as if they were sent through the serial port.

^A	^D	
XX	54	**Send Format from RAM to Serial Port:** The ^Axx specifies the slot number (1-128) where the format file is stored in RAM.

^A	^D	COMMAND
XX	58	**Process Format Saved in RAM:** The ^Axx selects which stored format to process (1-128).

XX 59 Save Formats to RAM. (volatile)

The ^Axx selects the memory slot (1- 128) into which the format is to be saved. A format file must be terminated by an ESC (HEX 1B) or "[" (left bracket) character to save the format.

Sample format saved to RAM slot #1:

```
^A1^D59
^D57
5,1280,900,20,40,7,0,1,405,0,0
1,640,650,12,1,5,0,4,2,2,,,,,0
^D56
^D2
Saved Format
^D3
^[
```

Send file using standard communications program.

XX 66 Clear Single FORMAT Stored in RAM: The ^Axx specifies which memory slot to clear (1-128). This command only functions with FORMAT files and not with downloadable fonts and/or graphics.

100 Clear User RAM: This command clears all the downloaded fonts and graphics that have been stored in RAM. This command does not affect fonts and graphics that have been downloaded and stored into the FONT flash memory. Use the ^D17 to erase FONT flash memory.

101 Send User RAM Available: The printer will send the number of free or available bytes to the serial port (i.e. >192480<).

Use the D119 command for more detailed reporting.

XX 104 Save ASCII Fonts to RAM: The ^Axx specifies which memory file # (CGN #)

the FONT will use (1-255). This command should be used with an ASCII-HEX file that contains only printable characters less than 80 HEX. These FONTS are “extended non-compressed”, meaning that they can be greater than 64KB. This command supports fonts greater than 64KB.

XX 105 Delete Graphics from RAM
^A0 deletes ALL graphics from RAM.
^Ax deletes the graphics in slot #x.

xxyy 107 Save Compressed GRAPHICS to RAM.
(See Chapter 6, Downloadable Graphics)

^A ^D COMMAND
119 Display Memory Allocation.
This command shows how all of the RAM and FLASH memory is being used

Example display from the ^D119 command:

Ram Based Fonts/Graphics(TCI=8) - [file number(CGN), size, type]
[2,4625, Font set] ←Slot #2 in RAM has a FONT that is 4,625 bytes.

Ram Based Formats - [file number, size]
[2,176] ←Slot #2 in FORMAT RAM has a FORMAT that is 176 bytes.
Total Ram Memory Available - 258335 ←There are 258,335 bytes of RAM available.

Flash Based Fonts/Graphics(TCI=7) - [file number(CGN), banks used, type]
[1,1, Graphic] ←Slot #1 of FONT flash has a GRAPHIC that takes up 1 bank (64Kbyte)
Font/Graphic Flash Memory Banks Available - 119 ***←There are 119 banks of 64KB open.***

Flash Based Formats - [file number, size]
[1,176] ***←Slot #1 of FORMAT flash has a FORMAT file that is 176 bytes.***
Format Flash Memory Available - 65359 ***←There are 65,359bytes of FORMAT flash open.***

Ticket Memory - [size, available]
[43231,41618] ***←The difference is the amount of memory to process current format.***

NOTES: RAM GRAPHICS can extend beyond the starting slot # into sequential ones.
RAM formats are numbered #1 to #128 (RAM FONTS are limited to 64K in size.)

122 Display Available FONT/GRAPHICS FLASH memory.
This command is used to display the amount of FONT/GRAPHICS FLASH memory available in bytes in the form >xxxxxxx< where xxxxxxx is the number of available bytes.

xxyy 127 Save FONTS to RAM.
(See Chapter 7, Downloadable Fonts)

^A ^D COMMAND

XX 130 Save a FORMAT to FLASH. (non-volatile memory)

The ^Axx selects the memory slot (1- 128) into which the format is to be saved. A format file must be terminated by an ESC (HEX 1B) or "[" (left bracket) character to save the format.

How to Save a Ticket FORMAT to FLASH:

1) Create the FORMAT file with ^Axx^D130 at the top to tell the printer to store into FLASH Slot #xx,
2) Send the file to the printer using a standard communications program.

Sample format saved to RAM slot #1:

```
^A1^D130
^D57
5,1280,900,20,40,7,0,1,405,0,0
1,640,650,12,1,5,0,4,2,2,,,,,0
^D56
^D2
Saved Format
^D3
^[
```

Send file using standard communications program.

XX 131 Delete a FORMAT from FLASH.

^A0 deletes all FORMAT files in FLASH ^Axx deletes the FORMAT file stored in FLASH slot (1 – 128)

This command deletes the Ticket FORMAT stored in Slot #xx of the FORMAT storage bank in FLASH memory (See Table 22). Use this command to clear a FORMAT Slot in FLASH before storing a new FORMAT into the Slot.

xxyy 133 Save Compressed GRAPHICS to FLASH.

(See Chapter 6, Downloadable Graphics)

XX 134 Delete a GRAPHIC from FLASH.

^A0 deletes all GRAPHIC files in FLASH

^Axx deletes the GRAPHIC stored in FLASH Slot #xx

Valid values for Axx are A1 ⇒ A255. The user selects the CGN #xx that will be cleared.

Hint: After the GRAPHIC file has been deleted, the ^D119 command may be used to verify that Slot #xx is now available in FLASH. The GRAPHIC may

extend over several slots and the ^D119 will indicate how many slots are used by the GRAPHIC.

^A	^D	COMMAND
xxyy	135	**Save FONTS to FLASH. (See Chapter 7)**

This command is not normally seen by the user. It is put into a FONT file by the FONT converter program which generates a special ^Axxyy^D135 code which is placed at the beginning of the FONT download file. The ^Axxyy tells the printer the overall size of the file according to this format:

xx = the number of additional 64KB sectors in the FONT file set
yy = CGN # (1-255)

If xx = 00, then the FONT fits into one 64Kbyte sector of memory and there are no additional sectors required for the FONT.

If xx > 00, then the FONT is larger than one 64KB sector, and xx is the number of ADDITIONAL 64KB sectors needed for the FONT. The xx field > 00 signals the printer to get ready for a multi-sector FONT download. Each subsequent download contains a header with the xx field decremented by 1. The last download file has a header field xx = 00.

EXAMPLE: ^A0124^D135 This command tells the printer that an extended FONT download for FLASH memory is coming. The download will be 2 sectors long, and the printer will access the FONT in FLASH memory using CGN #24 and TCI #7. The ^A0124^D135 command will be right at the beginning of the file. So the ^D135 command is never sent by itself, it's always in a FONT download file, and the user never really sees it.

The FONT download file may be larger than 64Kbyte. The only limit on the file size is the amount of memory available to hold the file. When the FONT file is created, a specific reference number, called a CGN # is assigned to the file by the user. After the FONT file has been downloaded and stored in FLASH, the printer retrieves the FONT from FLASH by using its CGN # and TCI #7(for FLASH). The FONT may be stored anywhere in the printer's FLASH memory; it is NOT restricted to a specific FLASH memory location. The printer maintains a address table that tells where each FONT CGN # is stored in FLASH.

The CGN # is established by the user when the FONT download file is created using the font converter program. Since this is an arbitrary number picked by the user, it is possible to create two separate FONT files with the same CGN #. In fact, many FONT files could be created using the same CGN #. For the printer to function properly, each FONT in FLASH must have a unique CGN #. If a FONT is downloaded that has the same CGN # as a FONT that is already stored in FLASH, then an error message is sent back indicating a Duplicate CGN error.

The printer's FLASH is nonvolatile, so FONTS that are downloaded using the ^D135 will be stored in FLASH memory until specifically erased by the user. The following 3 parameters are included in the FONT file when it is created:

1. Memory destination: RAM or FLASH
2. Memory File #: 1→255 (this is the CGN #)
3. Rotation: 0°, 90°, 180°, or 270°

How to save a FONT to FLASH:

1. Create the special FONT download file with FLASH set as the memory destination,
2. Send the file to the printer using a standard communications program set for 8 data bits, no parity, 1 stop bit.

Hint: After the FONT file has been sent, the ^D119 command may be used to verify that the new FONT is now available in FLASH.

^A	^D	COMMAND
XX	136	**Delete a FONT from RAM.**

^A0 deletes all FONTS from RAM
^Axx deletes the FONT stored in RAM Slot #xx
Valid values for Axx are A1 ⇒ A255. The user selects the RAM memory Slot #xx that will be cleared.

Hint: After the FONT file has been deleted, the ^D119 command may be used to verify that Slot #xx is now available in RAM. The FONT may extend over several slots and the ^D119 will indicate how many slots are used.

XX	137	**Delete a FONT from FLASH.**

^A0 deletes all FONTS from FLASH
^Ax deletes the FONT stored in FLASH Slot #x
Valid values for Axx are A1 ⇒ A255. The user selects the FLASH memory Slot #xx that will be cleared.

Hint: After the FONT file has been deleted, the ^D119 command may be used to verify that Slot #xx is now available in FLASH. The FONT may extend over several slots and the ^D119 will indicate how many slots are used.

XX	138	**Process a FLASH FORMAT.**

^Axx references the FORMAT file stored in Slot #xx
Valid values for Axx are A1 ⇒ A128.

Ticket FORMATS are saved into FLASH Slots #1 thru #128. Each of these FORMAT slots specifies how to build the dot rows that are used to print a ticket on the 324M and 424M printers.

This command tells the printer to take the Ticket FORMAT file in Slot #xx and build up its image in the printer's slice buffer. After this command is finished, the ticket may be printed by sending the ^C print command (See 1).

NOTE: If the FORMAT file contains a print command, then the ticket will be printed at the end of this command.

^A	^D	COMMAND
XX	139	**Send a FLASH FORMAT to the host.**

^Axx references the FORMAT file stored in Slot #xx

Valid values for Axx are A1 ⇒ A128.

Ticket FORMATS are saved into FLASH Slots #1 thru #128. This command causes the printer to send a previously loaded FORMAT file out the communications port to the HOST.

Use this command to view ticket FORMATs that have been saved in the printer's non-volatile FLASH memory.

140 Clear all User GRAPHIC and FONT FLASH.

This command erases the user FONTS and GRAPHICS in FLASH memory. This command is equivalent to sending:

1) ^A0^D134 (clears all GRAPHICS),
2) ^A0^D137 (clears all FONTS).

Ticket FORMATS stored in user FLASH memory are NOT erased by this command. Use the ^D131 command to erase ticket FORMATS stored in FLASH memory.

IMPORTANT NOTE!!! Embedded FONTS and ticket FORMATS are NOT erased. However, any custom FONTS and GRAPHICS loaded into user FLASH memory at the factory WILL be erased. Please contact Worldwide Ticketcraft if you have any doubts about custom GRAPHICS and/or FONTS that may be stored in FLASH memory.

Hint: After the user FLASH has been deleted, the ^D119 command may be used to verify that Slots #1 thru #255 are now available in FLASH.

141 Clear User GRAPHIC and FONT FLASH & RAM memory.

This command clears all user FONTS and GRAPHICS in FLASH memory, and all the downloaded FONTS and GRAPHICS in RAM. This command is the equivalent to sending:

1) ^D100 (clears all downloaded FORMATS, FONTS and GRAPHICS in RAM,
2) ^A0^D140 (clears all user FONTS and GRAPHICS in FLASH).

Ticket FORMATS stored in user FLASH memory are NOT erased by this command. Use the ^D131 command to erase ticket FORMATS stored in FLASH memory.

Please note that this command may take some time (depending on how much is stored). During this time the printer will not respond to commands. The printer may appear to be locked up until the command finishes.

Hint: Use command ^D119 to confirm that FONTS and GRAPHICS were erased in user FLASH memory, and that all downloaded FORMATS, FONTS, and GRAPHICS were erased in RAM.

Miscellaneous Commands

^A	^D	Command
	93	**Load Control Code Recognition Status:**
0		Enable control code recognition
1		Disable control code recognition
	113	**Verbose Mode:**
0		Disable Verbose Mode
1		Enable Verbose Mode

Chapter 6

Downloadable Graphics

The 224 and 424 printers allow the user to download their own GRAPHICS and store the GRAPHICS in either non-volatile FLASH memory, or in volatile RAM memory.

FLASH Data Types

The printer's FLASH memory provides non-volatile storage for several types of data:

1) 120 FLASH memory banks are 64Kbyte sectors for storing downloadable FONTS and GRAPHICS.
2) 128 slots for ticket FORMATS.
3) 7 "embedded" FONTS. These FONTS are downloaded at the factory.

NOTE: The printer's FLASH memory retains data after power is turned OFF. So data that is downloaded to the printer's FLASH memory will be available until erased by the user. FONTS & GRAPHICS stored in FLASH memory are accessed using TCI #7 and the appropriate slot # (CGN #).

RAM Data Types

The printer's RAM memory provides volatile storage for several types of downloadable data:

1) RAM memory slots #1 thru #255 are used to store downloadable FONTS and GRAPHICS using TCI #8.
2) 128 slots for ticket FORMATS.

NOTE: The printer's RAM memory is NOT battery backed-up. So when the printer is turned OFF any data stored in the RAM memory is lost. The downloaded data that is stored in RAM is temporary.

Using the BMP2MIC.exe GRAPHIC Conversion Utility

Bitmap graphic image files (*.bmp) may be converted to a LDS compatible format by using the BMP2MIC.exe Graphic Conversion Utility. This and other conversion utilities may be downloaded at http://www.worldwideticketcraft.com.

The conversion utility is a DOS-base program and will require access to a DOS prompt. Before starting the conversion utility, it would be helpful to gather the following information:

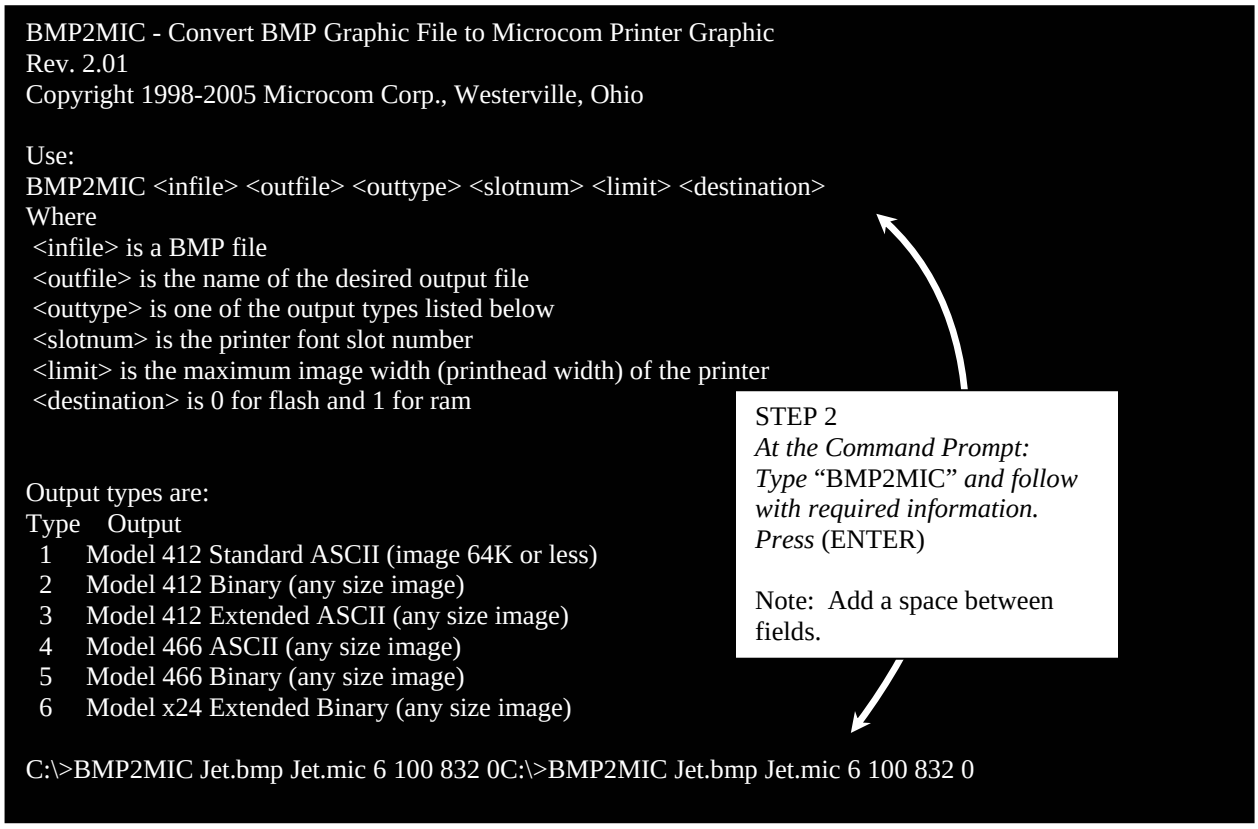
1) In File This is the *.bmp file to be converted. (Limit the file name to 8 characters and locate file in the same directory as the conversion utility to simplify data entry into the program.)
2) Out File Create a name for the converted GRAPHIC File. (Limit the file name to 8 characters. An extension is not necessary.)

3) Out Type See Graphic Download Methods Page 6-3.
4) Slot Number Select an open slot number for storage. Use ^D119 to determine which slots are open.
5) Limit The maximum print width (in dots). Use ^D29 to determine print head size.
6) Destination Use "0" for FLASH and "1" for RAM.

BMP2MIC.exe GRAPHIC Conversion Utility Procedure

1. Execute the conversion utility from a DOS prompt.

2. Type the conversion utility name and required information at the command prompt. Press [ENTER].



Note: Jet.bmp is used as an example for the <infile>. Enter your own GRAPHIC name in its place. You may name the <outfile> anything you wish as long it is less than 8 characters. An extension is not necessary.

3. Conversion is complete. Converted GRAPHIC file is ready to download to printer.

```
BMP format data:
Windows 3.X format.
dimensions: 74 wide, 31 high.
8 bits per pixel

Input file: Jet.bmp
Output file: Jet.mic
Output type: Model x24 Extended Binary (any size image) using font slot 100
Destination is ^D133 - for saving to flash (0)
Image width = 74 dots.  Image height = 31 rows.

Image occupies 332 bytes of space in printer memory.
Decompressed file contains 1 FFs and 295 00s.
```

Graphic Download Methods

The printer supports both compressed and uncompressed graphic downloads. The compressed 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.

Uncompressed Graphic Downloads

The uncompressed converted GRAHIC file can be sent on either 7 or 8-bit connections, is more flexible, and encodes using ASCII-HEX, but this method results in a much larger file size than a compressed format.

The converted GRAPHIC file can be sent to the printer via any active printer port. A terminal emulation program such as Hyper Terminal, ProComm, Tera Term, etc is commonly used.

Note: It is highly recommended to use hardware flow control.

Compressed Binary GRAPHIC Downloads

The compressed format shortens the download time by reducing the number of bytes sent to the printer. Data compression is accomplished 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. A compressed binary converted GRAPHIC file must be sent on a 8-bit data connection.

The printer must be setup to accept downloaded binary compressed files by setting Software Switch #3, position 7 to “1”. Otherwise, the file may be sent to the printer through any active printer port.

Advanced GRAPHIC Format Conversion for Programmers

The following sections are provided to developers who wish to create usable GRAPHIC images within their own applications. Commands in the following section are not typically seen for users using Microcom GRAPHIC utilities.

Save Compressed Graphics to RAM (D107)

The following is the format of the ^D107 command when used to store a compressed GRAPHIC image file into RAM.

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

Where:
<*RAM Memory Slot Number*> is the memory slot location (1-255) where the GRAPHIC will be saved in the printer's RAM 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 GRAPHIC and 1 for a GRAPHIC rotated 90-degrees counter-clockwise.

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

Save Compressed Graphics to FLASH (D133)

The following is the format of the ^D133 command when used to store a compressed GRAPHIC image file into FLASH.

^A<FLASH Memory Slot Number>^D133<CR>
<Rotation> <Count> <Image Data>

Where:
<FLASH Memory Slot Number> is the memory slot location (1-120) where the GRAPHIC will be saved in the printer's FLASH memory. The printer uses the same TCI of "7" 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 GRAPHIC and 1 for a GRAPHIC rotated 90-degrees counter-clockwise.

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

Binary Compression Algorithm

The binary data that make up the image file is a run-length compressed version of the image data described in RAM Data Types on Page 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 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 X 256)+1+107 = 1132

Uncompressed FONT to RAM (^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 usable 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 "ORing" 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.

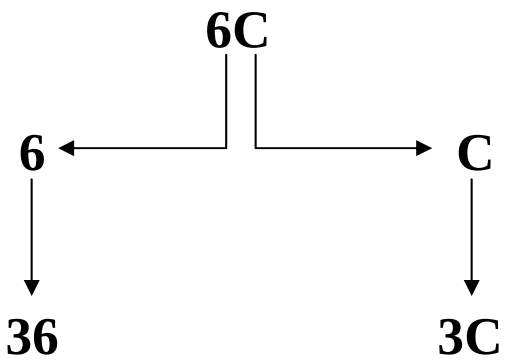


Figure 6-1 ASCII-HEX Conversions

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 ticket 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 Ticket is a location within the file)

Ticket 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
Ticket 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.
Ticket 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.

Downloadable Graphics Commands

The following commands refer to the use of downloadable graphics:

^A ^D COMMAND

100 **Clear User RAM:** This command clears all downloadable fonts, graphics, and stored ticket formats.

101 **List RAM 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* **Save GRAPHICs or FONTs into RAM 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 105 **Delete Graphics from RAM:**
0 Deletes ALL graphics from RAM
XX Deletes the graphics in slot #XX

XX 106* Save GRAPHICs or FONTs into RAM Memory without Compression:
This command is intended for legacy support only and Worldwide Ticketcraft recommends either the ^D104 or ^D107 commands. Fonts must be less than 64KB for this command to function.

XX 107* Save GRAPHICs or FONTs into RAM Memory using Binary Compression:

XX 133* Save Compressed GRAPHIC to FLASH.

**Note: These are commands are for Program*

Chapter 7

Downloadable Fonts

The 224 and 424 printers allow the user to download their own fonts and store the fonts in either volatile RAM memory, or non-volatile FLASH memory.

FLASH Data Types

The printer's FLASH memory provides non-volatile storage for several types of data:

1) 120 FLASH memory banks are 64Kbyte sectors for storing downloadable FONTS and GRAPHICS, using TCI #7.
   These FONTS are downloaded using the ^D135 command.
   These GRAPHICS are downloaded using the ^D133 command.
   (See Chapter 6, Downloadable GRAPHICS.)
2) 128 slots for ticket FORMATS.
   These FORMATS are downloaded using the ^D130 command.
3) 7 "embedded" FONTS. These FONTS are downloaded at the factory.

NOTE: The printer's FLASH memory retains data after power is turned OFF. So data that is downloaded to the printer's FLASH memory will be available until erased by the user. FONTS & GRAPHICS stored in FLASH memory are accessed using TCI #7 and the appropriate slot # (CGN #).

RAM Data Types

The printer's RAM memory provides volatile storage for several types of downloadable data:

1) RAM memory slots #1 thru #255 are used to store downloadable FONTS and GRAPHICS using TCI #8.
   These FONTS are downloaded using the ^D127 command.
   These GRAPHICS are downloaded using the ^D107 command.
   (See Chapter 7, Downloadable GRAPHICS.)
2) 128 slots for ticket FORMATS.
   These FORMATS are downloaded using the ^D59 command.

NOTE: The printer's RAM memory is NOT battery backed-up. So when the printer is turned OFF any data stored in the RAM memory is lost. The downloaded data that is stored in RAM is temporary.

Using the Font Conversion Utilities

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 volatile downloadable fonts and the CGN refers to the memory slot location of the downloaded font. Nonvolatile fonts are accessed thru TCI “7”.

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.

SFP2MIC.exe Program

4. Run the SFP2MIC program from a DOS prompt.

5. Follow the on screen instructions and note the slot number where the image is saved. The 224 and 424 printers use the same font structure as the Model 412 printer. Select the Model 412 printer when converting fonts for the 224 and 424M printers.

6. Make sure the destination memory slot is clear. The ^D100 command can be used to clear the printer’s memory.

7. Download the resulting file (filename N12 (normal rotation) or R12 (rotated)) file to the printer.

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 224 and 424 printers use the same font structure as the Model 412 printer. Select the Model 412 printer when converting fonts for the 224 and 424 printers.

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.

Font Download Methods

The printer supports both compressed and uncompressed graphic and font downloads. The compressed 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. Worldwide Ticketcraft recommends the use of the compressed format when possible.

Compressed Binary Commands

These commands allow graphic images or fonts to be transmitted in binary, thereby reducing the number of bytes sent to the printer. Furthermore, the commands allow 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. These commands are only usable on data connections that support 8-bit data. So the serial port MUST be configured for 8 Data Bits and no parity. These commands will NOT function correctly with a serial port configured to 7-bit data bits.

Save Compressed FONT to RAM (D127)

The following is the format of the ^D127 command when used to store a compressed FONT file into RAM.

^A<RAM Memory Slot Number>^D127<CR>
<Rotation> <Count> <Image Data>

Where:
<RAM Memory Slot Number> is the memory slot location (1-255) where the FONT will be saved in the printer's RAM memory. The printer uses the same TCI of "8" to select downloadable fonts or graphics for storage into RAM. 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 FONT rotated 90-degrees counter-clockwise.

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

Save Compressed FONT to FLASH (D135)

The following is the format of the ^D135 command when used to store a compressed FONT file into FLASH.

^A<FLASH Memory Slot Number>^D135<CR>
<Rotation> <Count> <Image Data>

Where:
<FLASH Memory Slot Number> is the memory slot location (1-120) where the FONT will be saved in the printer's FLASH memory. The printer uses the same TCI of "7" to select downloadable fonts or graphics for storage into FLASH memory. 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 FONT rotated 90-degrees counter-clockwise.

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

Uncompressed FONT to RAM (^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 usable 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:
<RAM Memory Slot Number> is the memory slot location (1-255) where the GRAPHIC will be saved in the printer's volatile RAM 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 ORing 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.

Save FONTS to FLASH (^D135)

xxyy 135 Save FONTS to FLASH.

This command is not normally seen by the user. It is put into a FONT file by the FONT converter program which generates a special ^Axxyy^D135 code which is placed at the beginning of the FONT download file. The ^Axxyy tells the printer the overall size of the file according to this format:

xx = the number of additional 64KB sectors in the FONT file set

yy = CGN # (1-255)

If xx = 00, then the FONT fits into one 64Kbyte sector of memory and there are no additional sectors required for the FONT.

If xx > 00, then the FONT is larger than one 64KB sector, and xx is the number of ADDITIONAL 64KB sectors needed for the FONT. The xx field > 00 signals the printer to get ready for a multi-sector FONT download. Each subsequent download contains a header with the xx field decremented by 1. The last download file has a header field xx = 00.

EXAMPLE: ^A0124^D135 This command tells the printer that an extended FONT download for FLASH memory is coming. The download will be 2 sectors long, and the printer will access the FONT in FLASH memory using CGN #24 and TCI #7. The ^A0124^D135 command will be right at the beginning of the file. So the ^D135 command is never sent by itself, it's always in a FONT download file, and the user never really sees it.

The FONT download file may be larger than 64Kbyte. The only limit on the file size is the amount of memory available to hold the file. When the FONT file is created, a specific reference number, called a CGN # is assigned to the file by the user. After the FONT file has been downloaded and stored in FLASH, the printer retrieves the FONT from FLASH by using its CGN # and TCI #7(for FLASH). The FONT may be stored anywhere in the printer's FLASH memory; it is NOT restricted to a specific FLASH memory location. The printer maintains a address table that tells where each FONT CGN # is stored in FLASH.

The CGN # is established by the user when the FONT download file is created using the font converter program. Since this is an arbitrary number picked by the user, it is possible to create two separate FONT files with the same CGN #. In fact, many FONT files could be created using the same CGN #. For the printer to function properly, each FONT in FLASH must have a unique CGN #. If a FONT is downloaded that has the same CGN # as a FONT that is already stored in FLASH, then an error message is sent back indicating a Duplicate CGN error.

The printer's FLASH is nonvolatile, so FONTS that are downloaded using the ^D135 will be stored in FLASH memory until specifically erased by the user. The following 4 parameters are included in the FONT file when it is created:

1. Memory destination: RAM or FLASH
2. Memory File #: (this is the CGN #)
3. Rotation: 0°, 90°, 180°, or 270°
4. Compressed or Non-compressed.

How to save a FONT to FLASH:

1. Create the special FONT download file with FLASH set as the memory destination,
2. Send the file to the printer using a standard communications program set for 8 data bits, no parity, 1 stop bit.

Hint: After the FONT file has been sent, the ^D119 command may be used to verify that the new FONT is now available in FLASH.

Font Structure

The following font structure is offered to programmers 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 Ticket is a location within the file)

Ticket 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
Ticket 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.

Ticket 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.

Downloadable Font Command Summary

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

^A ^D COMMAND

100 Clear User RAM:

This command clears all downloadable fonts, graphics, and stored ticket 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 or FONT into RAM 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 or FONT into RAM Memory without Compression:

This command is intended for legacy support only and Worldwide Ticketcraft recommends either the ^D104 or ^D107 commands.

Fonts must be less than 64KB for this command to function.

XX 127 Save FONTS to RAM.

(See Page 7-3)

XX 135 Save a FONT to FLASH.

(See Page 7-3)

Chapter 8

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.

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 symbols are described in numerical order based on the TCI number.

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.

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 Counsel (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 Manufacture'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.

SYMBOLOGY	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 8-1 UPC-E Zero Reduction Format

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.

Interleaved 2 of 5 (I2 of 5), TCI 15

The I2of 5 is a variable length, paired, numerical symbology that is typically used in the industrial and distribution industries. The I2 of 5 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 I2 of 5 symbology actually encodes characters in the spaces as well as the bars. Therefore, the character spacing (CS) parameter must be defaulted.

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.

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.

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.

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.

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.

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.

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.

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.

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

Where:

#1e is the ASCII RS character

#1d id the ASCII GS character

#04 is the ASCII EOT character

YY is the two digit numeric year

PPPPPPPPP is the 9-digit numeric US Postal Code. if using a 5-digit Postal Code, the last 4 digits must be 0.
CCC is the 3-digit numeric Country Code (840 in the US).

SSS is the 3-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

PPPPPPPPP#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 3-digit numeric Country Code
SSS is the 3-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 any string up to 93 characters. Control characters are specified in Table 15 on the next page, 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 8-2 MaxiCode Control Code Equivalents

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 8-3 Code128 Special Function Access

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.

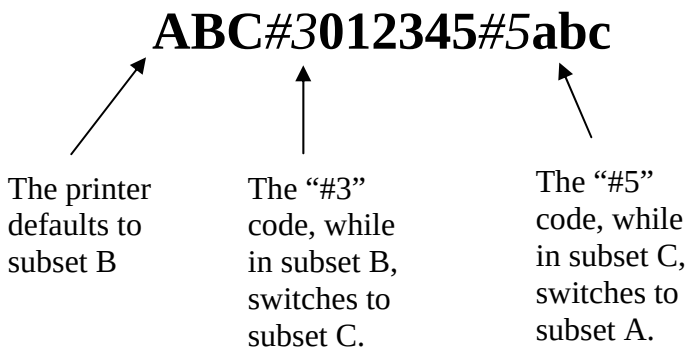


Figure 8-2 Code 128 Subset Switching

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 16.

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 16. 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 16. 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.

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.

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.

AS-10, TCI 44

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

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 code words. 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 8-4 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>
```

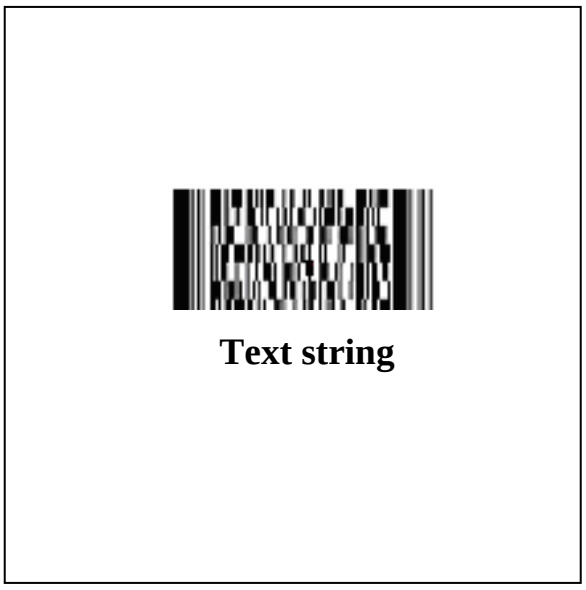


Figure 8-3 PDF-417 Sample Format #1

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>
```

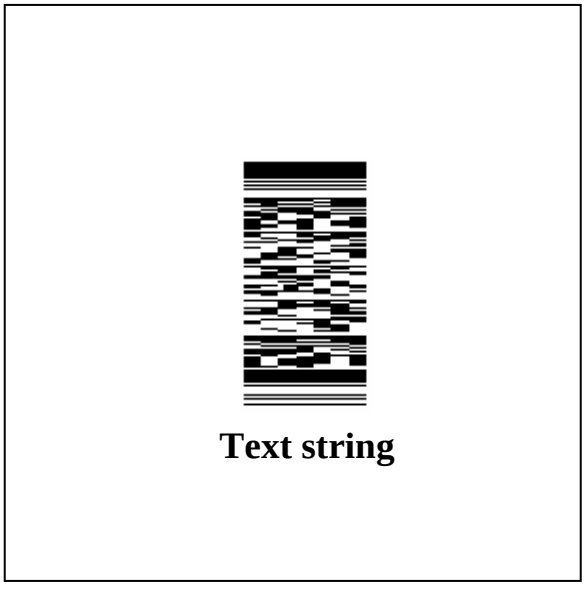


Figure 8-4 PDF-417 Sample Format #2

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

UCC/EAN 128 Application Identifiers (AI)

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
250	Secondary Serial Number	n3+an..30
30	Quantity	n2+n..8
310(***)	Net Weight, Kilograms	n4+n6
311(***)	Length or 1st Dimension, Meters	n4+n6
312(***)	Width Diameter, or 2nd Dimension, Meters	n4+n6
313(***)	Depth Thickness, Height or 3rd 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 1st Dimension, Inches	n4+n6
324(***)	Length or 1st Dimension, Feet	n4+n6
323(***)	Length or 1st Dimension, Yards	n4+n6
324(***)	Width Diameter, or 2nd Dimension, Inches	n4+n6
325(***)	Width, Diameter, or 2nd Dimension, Feet	n4+n6
326(***)	Width, Diameter, or 2nd Dimension, Yards	n4+n6
327(***)	Depth Thickness, Height or 3rd Dimension, Inches	n4+n6
328(***)	Depth Thickness, Height or 3rd Dimension, Feet	n4+n6

329(***)	Depth Thickness, Height or 3rd Dimension, Yards	n4+n6
330(***)	Gross Weight, Kilograms	n4+n6
AI	**Content**	**Format**
331(***)	Length or 1st Dimension, Meters, Logistics	n4+n6
332(***)	Width Diameter, or 2nd Dimension, Meters, Logistics	n4+n6
333(***)	Depth Thickness, Height or 3rd 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 1st Dimension, Inches, Logistics	n4+n6
342(***)	Length or 1st Dimension, Feet, Logistics	n4+n6
343(***)	Length or 1st Dimension, Yards, Logistics	n4+n6
344(***)	Width Diameter, or 2nd Dimension, Inches, Logistics	n4+n6
345(***)	Width Diameter, or 2nd Dimension, Feet, Logistics	n4+n6
346(***)	Width Diameter, or 2nd Dimension, Yards, Logistics	n4+n6
347(***)	Depth Thickness, Height or 3rd Dimension, Inches, Logistics	n4+n6
348(***)	Depth Thickness, Height or 3rd Dimension, Feet, Logistics	n4+n6
349(***)	Depth Thickness, Height or 3rd 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
AI	**Content**	**Format**
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
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 8-5 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.

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.

RSS-14, TCI 35

RSS-14 Reduced Space Symbologies are the latest barcode types for space-constrained identification from EAN International and the Uniform Code Council, Inc. (UCC). RSS barcodes have been identified to solve problems in the grocery industry and in healthcare, where items are too small to allow for older barcode symbologies.

The Model 224 and 424 printers support all six different RSS-14 symbologies:

1) RSS-14
2) RSS-14 Truncated
3) RSS-14 Stacked
4) RSS-14 Stacked Omni-directional
5) RSS-14 Limited
6) RSS-14 Expanded.

RSS-14 Standard

RSS-14 is capable of encoding up to 20 trillion values. There are actually 15 characters that make up the barcode, but only 13 data characters and 1 check are encoded. The first character is a flag, which determines if there is a Composite 2D barcode associated

with the barcode. This is the first character encoded and it should not be included in the "Data To Encode" field.

The next 14 characters are the 13 data characters plus an implied check digit. The check digit is not actually encoded in the barcode, but should be included as part of the "Data To Encode" field.

If less than 14 characters are entered in the "Data To Encode" field, zeroes are padded to the front after the linkage flag. Non-numeric characters are stripped from the "Data To Encode" field.

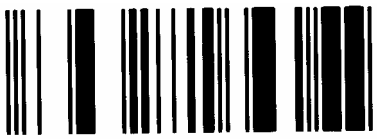


Figure 8-5 RSS-14 Standard Sample

RSS-14 Truncated

RSS-14 Truncated has the exact same data characteristics as the RSS-14 Standard barcode, except the bar height is set to the RSS standard of 13 times the X dimension. This symbology may be scanned omni-directionally.

The sample below is encoding this data string: 00012345678905

Figure 8-6 RSS-14 Truncated Sample

RSS-14 Stacked

RSS-14 Stacked has the exact same data characteristics as the Standard RSS-14 barcode. The data to encode is split in half and encoded as a split level barcode. This format is used if the width of the barcode will be an issue. The height of the top row of the RSS-14 Stacked barcode is 5 time the X dimension and height of the bottom row is 7 times the X dimension. The barcode contains a separator pattern, containing no data, which has a height equal to one X dimension. This symbology can not be scanned omni-directionally. This symbology does not allow for human readable test with the barcode.

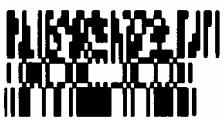


Figure 8-7 RSS-14 Stacked Sample

RSS-14 Stacked Omni-directional

RSS-14 Stacked Omni-directional has the exact same data characteristics as the Standard RSS-14 barcode. The data to encode is separated to create a split level barcode. The height of each row is ascertained from the bar height property of the control. The barcode contains a separator pattern, containing no data, which has a height equal to 3 times the X dimension. This symbology may be scanned omni-directionally. This symbology does not allow for human readable text with the barcode.

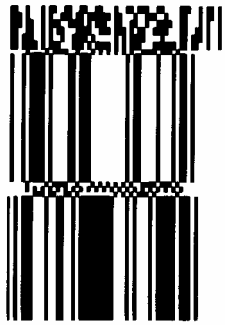


Figure 8-8 RSS-14 Stacked Omni-directional Sample

RSS-14 Limited

RSS-14 Limited has the same data characteristics as the Standard RSS-14 barcode, except that it may only include values up to 4 trillion. This symbology is specifically designed to be read by wands and handheld laser scanners. Omni-directional scanners can not read it efficiently.

Figure 8-9 RSS-14 Limited Sample

RSS-14 Expanded

RSS-14 Expanded is a variable length symbology capable of encoding up to 74 numeric or 41 alphabetic characters. This symbology does allow for the linkage flag, which determines if there is a 2D composite barcode associated with the linear barcode. Despite the possible length of the symbol, it can still be omni directionally read by suitably programmed laser point-of-sale scanners because the symbol can be decode in up to 22 segments and then reconstructed.

Figure

8-10 RSS-12 Expanded Sample

How to Print an RSS-14 Barcode

There are two steps to printing an RSS-14 barcode:

4) Send the ^D114 command and the 7 setup parameters
5) Send a ticket format that calls the RSS-14 barcode TCI #35.

These are the 7 RSS-14 parameters that MUST follow the ^D114 command:

3) Type of RSS-14 barcode
4) Multiplier
5) Segments per row
6) X undercut
7) Y undercut
8) Separator Height
9) Data to be encoded

Valid values for parameters

Type of RSS-14 barcode:

1) 0 = RSS-14 (this is the Standard RSS-14 barcode)
2) 1 = RSS-14 Truncated
3) 2 = RSS-14 Stacked
4) 3 = RSS-14 Stacked Omnidirectional
5) 4 = RSS-14 Limited
6) 5 = RSS-14 Expanded

Multiplier:

1 to 100. This specifies how big to make the symbol. Multiplies both X & Y.

Segments per ROW:

2 to 22. EVEN number ONLY!

X Undercut:

0 to (MULTIPLIER-1)

Y Undercut:

0 to (MULTIPLIER-1)

Separator Height:

MULTIPLIER < = Separator Height < = 2 * MULTIPLIER.
Specifies the vertical separation between the linear data and the 2D data.

Data:

Always 13 digits for the linear data unless using RSS Expanded which can be up to 74 numeric or 41 alphabetic characters.
The “pipe” character (|) is used to separate the linear data from the 2D data.

Sample RSS-14 FORMAT: This sample uses the standard RSS-14 symbology

```
^D114<CR>  ← Here comes RSS-14 data
0<CR>      ← Use standard RSS-14 symbol
5<CR>      ← Multiply size by 5
22<CR>     ← Use 22 segments/row
0<CR>      ← X undercut = 0
0<CR>      ← Y undercut = 0
5<CR>      ← Set vertical separator = 5
0012345612345  ← 13 digits of data
^D57<CR>   ← START of Ticket FORMAT
2,575,609,,25,35,0,1,285<CR>  ← TCI=35 calls for a RSS-14 barcode
1,190,300,1,46<CR>
2,190,200,11,1,5<CR>
^D56<CR>   ← END of Ticket FORMAT
^D2<CR>    ← START of Text String
x          ← any character will do… this is just a placeholder
^D3<CR>    ← PRINT command
```

Figure 8-11 RSS-14 Sample Ticket FORMAT

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 using a 203dpi print head, 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 using a 203 dpi print head, 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 8-12:

```
^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>
```

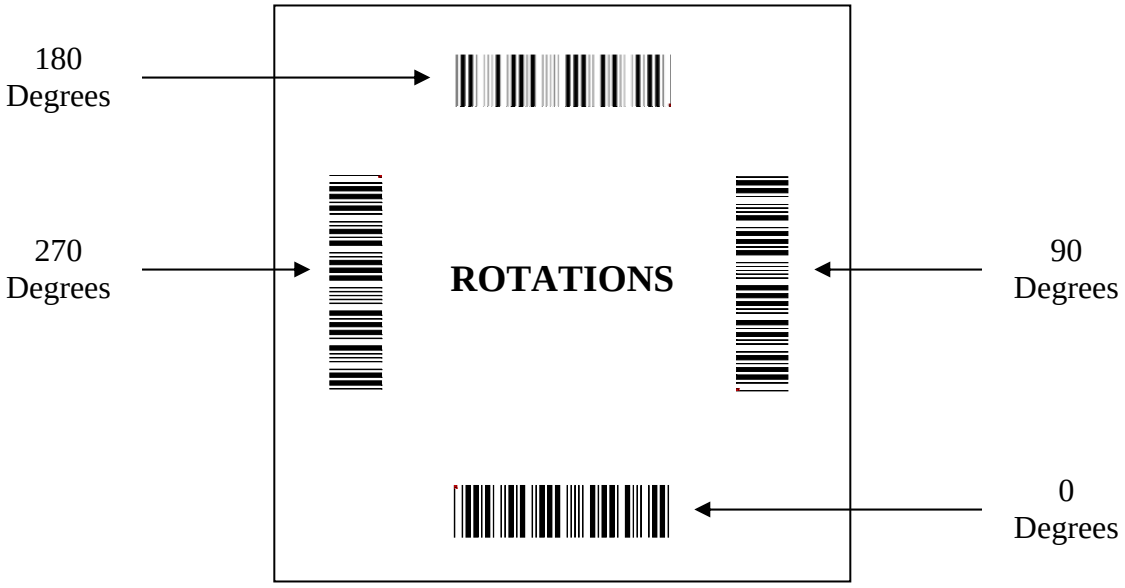


Figure 8-12 Bar Code Rotations

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, 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
51	EAN128

Table 8-6 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 19.

Figure 8-13 UPC-A Text/Extended Bars

The TCI 32 text/extended code shown in Figure 8-13 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 27 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 9

Troubleshooting

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 to 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 to be 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.
- After pressing the print button, the indicator 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 Chapter 5 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.

Worldwide Ticketcraft Technical Support

Worldwide Ticketcraft provides technical assistance through telephone services from 8:00 am to 6:00 pm Eastern Standard Time. To speak to a technical support representative, dial:

U.S.: (954) 426-5754

Toll or long distance charges may apply.

Before you call, please have the following information ready:

Product name (Worldwide Ticketcraft Desk-Top™)

Product serial number

Computer configuration

Description of the problem

Fax: 954-426-5761

Mail: 3606 Quantum Blvd.

Boynton Beach, FL 33426

Website: www.worldwideticketcraft.com

Appendix A: Limited Warranty

Worldwide Ticketcraft 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 Worldwide Ticketcraft. 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 Worldwide Ticketcraft brand supplies, to the extent it is determined that the use of other supplies (such as non-approved ticket 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 Worldwide Ticketcraft's customary charges for labor and materials to repair such defects.

WORLDWIDE TICKETCRAFT'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, Worldwide Ticketcraft 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 Worldwide Ticketcraft 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.

WORLDWIDE TICKETCRAFT 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, WORLDWIDE TICKETCRAFT'S LIABILITY FOR WARRANTY CLAIMS SHALL NOT, IN ANY EVENT, EXCEED THE INVOICE PRICE OF THE PRODUCT CLAIMED TO BE DEFECTIVE. NOR SHALL WORLDWIDE TICKETCRAFT BE LIABLE FOR DELAYS IN THE REPLACEMENT OR REPAIR OF PRODUCTS.

Appendix B: 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 ticket.

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

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

CTS (Clear to Send) - A status signal from the printer to the host PC indicating when it is OK to send data to the printer. This signal is used in conjunction with RTS (Ready To Send). The PC (DTE) will only transmit to the printer (DCE) when it sees CTS up. CTS leaves the printer on pin #8 of the RS-232 connector.

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

DCD (Data Carrier Detect) - A status signal from the printer to the host PC that tells the PC (DTE) that the printer is powered up. This signal is +5Vdc when the printer is turned ON. DCD leaves the printer on pin #1 of the RS-232 connector.

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 tickets that have a start and stop point. Typically the excess material surrounding the ticket 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 status signal from the printer (DCE) to the host PC (DTE) telling the PC that the printer is powered up. Used in conjunction with DTR. DSR leaves the printer on pin #6 of the RS-232 connector.

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 status 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. DTR comes into the printer on pin #4 of the RS-232 connector.

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 ticket formats for faster access. This is a non-volatile type of memory, which means that the information stored in the memory chip is retained even when the printer power is turned off. The 224/424 printers use two FLASH memory chips: a CODE flash (256K x 16), and a FONT flash (4M x 16).

Gap - The space between labels.

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. GND comes into the printer on pin #5 of the RS-232 connector.

Guillotine Cutter - A cutter that has a blade that cuts perpendicular to the media path. This type of cutter can be setup to make "partial cuts" which leave a small piece of ticket uncut in the center of the ticket. Not all Guillotine cutters can make partial cuts … a special blade is required. Cuts paper weights in the range of 60 – 100 gm/m2.

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

LPI (Label Present Indicator) - This sensor, when enabled, detects when media is present. Also referred to as LTS (Label Taken Sensor). This sensor is a reflective type sensor that is normally mounted above the paper stock looking down at the paper just past the print head.

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

RI (Ring Indicator) – An RS-232 handshaking signal that is NOT used on the 224/424 printers. RI would leave the printer on pin #9 of the RS-232 connector if it were used.

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. This cutter only cuts in one direction and cannot make "partial cuts". The rotary cutter is typically used when heavy ticket stock must be cut because it has higher cutting force than the Guillotine cutter. Cuts paper weights in the range of 60 – 200g/m2.

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

RTS (Request To Send) - A status signal from the host PC (DTE) to the printer (DCE) indicating when the PC has data to send to the printer. The printer (DCE) will only transmit data to the PC (DTE) when it sees RTS up. RTS comes into the printer on pin #7 of the RS-232 connector.

RXD (Receive Data) - An essential signal that carries data from the printer (DCE) to the host PC (DTE) for 2-way RS-232 serial communication. Also known as RX and RD. RXD leaves the printer on pin #2 of the RS-232 connector.

SDRAM (Synchronous Dynamic Random Access Memory) – High density random access memory that is commonly used to store application code. The 324M & 424M printers do NOT use this type of memory.

SRAM (Static Random Access Memory) – High speed random access memory that is used to store ticket formats, graphics, and fonts temporarily. The slice buffer and serial buffer (10Kbyte) are also in SRAM. This is volatile memory, which means that the information is lost when the printer powers down. The 224/424 printers use a 512Kbyte SRAM configured as 256K x 16.

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 host PC (DTE) to the printer (DCE) for 2-way RS-232 serial communication. Also known as TX and TD. This signal comes into the printer on pin #3 of the RS-232 connector.

USB (Universal Serial Bus) - A high-speed asynchronous serial interface that connects a PC to a peripheral, such as a printer. There are 3 versions of USB: 1) USB 1.0 transfers at 1M bits/second. (Hardly used at all anymore). 2) USB 1.1 transfers at 12M bits/second. (The Worldwide Ticketcraft printers use this.) 3) USB 2.0 transfers at 480M bits/second. (All newer PC's use this.)