EPCL Programmer's Guide

Zebra

Card Printer Solutions

Basic Models:

RFID Models:

RFID Plus Log-On Security Models:

980415-001B

FOREWORD

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INTRODUCTION

This manual describes programming commands that control operations and deliver data for the following card printer models:

Models	Features				
	RFID	**Color Printing**	**Duplex Printing**	**Duplex Lamination**	**Log-On Security**
P205	•				
P210	•	•			
P310F					
P310C		•			
P310*i*	•	•			
P320*i*	•	•			•
P420		•	•		
P420*i*	•	•	•		
P520		•	•	•*	
P520*i*	•	•	•	•*	
P720*i*	•	•	•	•†	

* Model that laminates duplex using same lamination patch type for both card sides
† Model capable of applying different upper and lower lamination patch types onto cards

All models employ a Common Command Set plus additional Command Sets for any model-specific features. All models ship with Windows drivers. Associated programming for use in the Windows environment is not necessary.

Common Features

All covered models can print bar-codes in several formats and have resident scalable font descriptions. Also, all models can include a Smart-Card Docking Station. P310 and P420 variants can have a Proximity Card docking Station. All models are offered with or without a Magnetic Stripe Encoder. A Serial Host Interface is optional on the P205, P210, P310, and P420 variants, where an associated RS-232C Setup Command exists. All models can have USB Ports, either standard or as an option.

The programming commands control the printing process by color and by ribbon material, allowing overprinting and separate control of various protective coverings.

Programming Objectives

The Escape Commands allow printer setups, many of which determine how a Printer Module Element reacts upon receiving an incoming card. For example, a data download must occur before the Printer Module can print a card or encode a magnetic stripe.

Except for the Card Feeder, each module has an Input Sensor that triggers the responses determined previously by setup commands.

Card Sensors also allow the Firmware to keep track of the position of the card in the Card Path. Therefore, the need for card positioning occurs as an automatic response to related commands. For example, with no card in the Card Path, a Print Command produces a Card Feed. Similarly, if a Print Command occurs after a card has passed beyond the Print Head, the card first returns to the Print Head.

Ribbons come in different panel configurations, and how the printer responds to a Print Command varies according to the Ribbon Type Command Parameters specified. For each ribbon type, a related print sequence exists. However, all models equipped with the RFID feature sense the ribbon type, and firmware takes care of this parameter.

While some commands affect just one printer module, others can produce responses from more than one. Also, some commands serve as setups for a particular printer and, therefore, need not be reestablished for each print job. Notably, all command parameters end up in Flash memory.

Ribbons Ribbon types exist in the following configurations:

- **Continuously Coated Monochrome Ribbons** are Thermal Transfer Ribbons having a resin coating and no panel separations. Zebra offers these in several ribbon colors along with a Scratch-Off Gray, usable in all models but an obvious choice for use in Monochrome Printers.
- **Black Sublimination Dye alternated with Varnish Panels** that image black and white gray-scale elements. An excellant choice for imaging black-and-white photo images, followed by an application of a UV protective coating.
- **Black Resin alternated with Varnish Panels** that image fully saturated black and apply a protective coating. Ideal for imaging solid graphic elements such as Text and Bar Codes.
- **Yellow, Magenta, and Cyan Panels** for imaging only Dye Sublimination Color. Typically used in printers with no requirement for Resin or Varnish. Notably, Yellow, Magenta, and Cyan Panels can combine to produce Black, and a Laminator removes a need for Varnish.
- **Yellow, Magenta, and Cyan Panels for imaging Dye Sublimination Color followed by Black Resin and Varnish Panels**. Dye Sublimination Images should have a protective coating, and Black Resin serves as an excellent choice for Text and Bar Codes. Thus, Color Printers without Laminators typically use these ribbons.
- **Yellow, Magenta, and Cyan Panels for imaging Dye Sublimination Color followed by a single Black Resin Panel**. While a Laminator precludes the need for varnish, a solid resin black produces the best Bar Codes and offers another, sometimes better, way to image Black Text and other black graphic elements.
- **Yellow, Magenta, and Cyan Panels for imaging Dye Sublimination Color followed by a two Black Resin Panels**. This ribbon offers imaging for color plus resin on one card side and only resin on the other side while using single set of ribbon panels.

Printer Ribbons	*Panel Count	Models				
		P205 P210	P310 P320	P420	P520	P720
K_{resin} (all monochrome colors)	1	•	•	•	•	•
Scratch-off Gray	1		•	•	•	•
$K_{resin}O$	2		•	•	•	
$K_{dye}O$	2		•	•	•	
YMC	3				•	•
YMCK	4				•	•
$YMCK_{resin}O$	5	•	•	•		
$YMCK_{resin}K_{resin}$	5				•	•
$YMCK_{resin}OK_{resin}$	6			•		
* P310 monochrome and P205 printers only use 1-panel ribbons.						

Modular Elements:

- **Print Engine**—Being the primary controlling element in all printer models, the Print Engine CPU receives Host Commands. Received commands can encompass operations that directly control the Print Engine and operations that draw on other Printer Elements for execution. Whereas some elements have their own CPUs, the Print Engine CPU exercises complete control over other elements. Only in P520s and P720s can a command be directed to another element (the Laminator CPU). An associated Element-Specificing Command Prefix exists for this purpose. Besides its print function, Print Engines have Options that include a Magnetic Stripe Encoder and/or a Smart Card Docking Station. Some Models also offer Proximity (Contactless) Card Docking as an alternative to Smart Card Docking.
- **Card Feeder**—This element delivers cards placed in the Card Input Hopper to the Card Path inside the Printer under control of the Print Engine CPU.
- **Card Flip**—Printers with this element can flip cards in preparation for duplex printing or, in the case of a P520, Second Side Lamination. Card Flip Stations can also deliver cards with sensed flaws to the Rejected Card Box. This element has its own CPU that carries out the details of instructions received.
- **Single Side Laminator**—P520 Printers can place a protective transparent patch on one card surface at a time. This element also has its own CPU that carries out the details of instructions received.

- **Duplex Laminator**—Printers with this element laminate both card surfaces in a single lamination pass. This element also has its own CPU that carries out the details of instructions received.
- **Operator LCD Control Panel**—Printers with this element convey messages to operators via a 2-line by 16-character LCD screen and allow operator responses and Printer Control. Power and Alert LEDs also appear. This element also has its own CPU that carries out the details of instructions received.

Significant model/configuration differences related to programming include the following:

- **P310 Monochrome** card printers have a smaller command set along with an image buffer sufficient for a one-bit image mapping depth. Imaging using Thermal Transfer Methodology occurs, supported by Thermal Transfer Printer Ribbons. (Only fully-saturated dots image in a single print pass.) Any gray-scale imaging requires host data mapped into multiple-dot matrixes, sized for the desired gray-scale range (e.g., a four-by-four dot pixel matrix can produce 16 levels of gray plus white, $[(4 \times 4)^2/16 + \text{white}]$). Gray Levels derive from the number of dots imaged inside the matrix.
- **P310 Color** card printers employ dye sublimation methodology for color imaging and thermal transfer methodology for imaging from Resin Monochrome Ribbons or Ribbon Panels. A yellow, magenta, and cyan imaging sequence occurs. Each ribbon panel produces images from five-bit-per-dot data.

  The black panels on Zebra-supplied ribbons with color panels have a resin coating that particularly suits bar-code and other solid image printing (i.e., no gray scale). However, resin responds poorly as a dye sublimation print medium. Therefore, the black used for gray-scale imaging comes from formulations of yellow, magenta, and cyan (YMC), which means dye-sublimation black also has a five-bit-per-dot range (32 levels of gray). If the need for a resin-panel-generated gray scale should ever become necessary, associated host data must be mapped into multiple-dot pixel matrixes as noted in the P310 Monochrome description.

- **P310 Color Card Printers** have five image buffers—three for color and another for two for monochrome. The color buffer receives downloads of Cyan, Magenta, and Yellow image data, each five bits deep. The Monochrome Buffer receives black and/or varnish data one bit deep. Separate data for Resin Black and Overlay Varnish can often be avoided. Because of its durability, card areas with resin images may not require varnish for the associated ultraviolet protection. Therefore, by using a reverse imaging for varnish, the same bit-map used for resin produces a varnish overlay that omits the areas with resin. Also, through reverse imaging, a Clear Command can prepare Monochrome Memory for a full-coverage varnish.
- **P420s** employ the same Print Engines as the P310 Color described above. Because P420s also have a Card-Flip assembly and a Rejected Card Box, these models have some additional related commands. P420s also have an interface that supports the programming of Proximity Cards (also called Contactless Cards). Memory size is doubled to support two-sided printing.
- **P520s** have all the same implementations as a P420, including Smart Card stations, and Magnetic Encoders as options. However, P520s also have a Card Laminator Station. Laminators serve as heat-transfer devices for material or panels contained on Lamination Ribbons. A variety of these kinds of ribbons exist, as follows:
  - Ribbons with transparent die-cut patches that offer near edge-to-edge card coverage
  - Die cuts with cutouts for Smart Card Contacts, and smaller die cuts that serve to avoid Magnetic Stripes
  - Preprinted Patches that contain security devices such as graphics, holograms, or other optically-encoded safeguards

  P520 Laminators can also serve a heat-transfer function for ribbons containing a coating instead of die-cut panels. However, only a total card application can occur. Because the Print Station can have a Dye Sublimation Ribbon with Varnish Panels, many choices exist for selection of protective coatings. Additional commands exist to implement Laminator use.

- Instead of just an <Esc>, a P520 Command meant for the Laminator needs a preceeding:

  <Esc>#<Space>1<Space>

- **P720s** have P420 elements plus a Laminator module that fully implements simultaneous near edge-to-edge patch applications from above and below the Card Path. Integral sensors assure accurate patch placements and signal the Ribbon Types in use and the amount remaining on their cores.

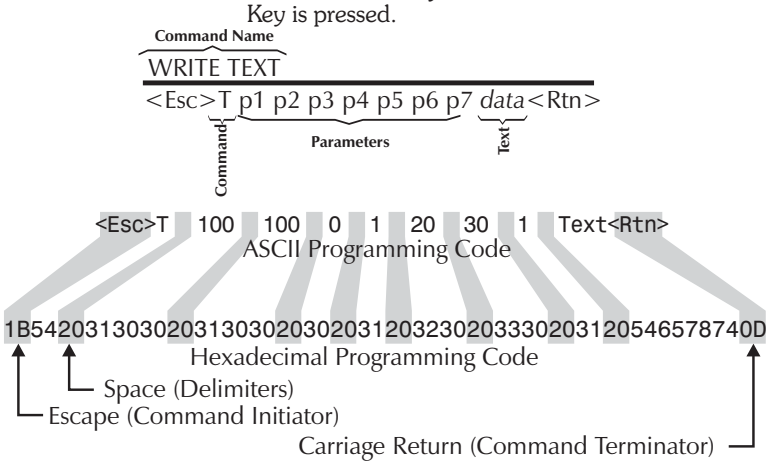
Basic Command Syntax

Each command begins with a Command Initiator (the Escape Character). For P520s, directing characters can follow the Escape Character.

The Command Initiator serves to mark the character(s) immediately following as command characters. Command characters vary between one and seven characters (or up to seven bytes of hexadecimal data).

Some Commands then have one or more Parameters to supply the printer with information necessary to complete the command. A Space Character delineates individual Command Control Parameters. The following Text Command shows a typical example.

Each Command Line requires a Carriage Return Character (13 dec. or 0D hex.). The Printer ignores a single Line Feed (LF) character (Dec. 10 or 0A Hex.) when it immediately follows the command terminating Carriage Return. Most PC Based Systems send a CR/LF when the Enter Key is pressed.



Command Editor

Any ASCII based Text Editor can serve to create simple command files. In the DOS environment, MS-DOS EDIT offers a good choice. To execute the file, use the Print Command from the editor, or from DOS, the COPY Command, to send the file to the printer. Examples using the COPY Command are:

```
COPY file name.ext LPT1
```

For more information on the use of the COPY command, refer to a DOS Software Manual.

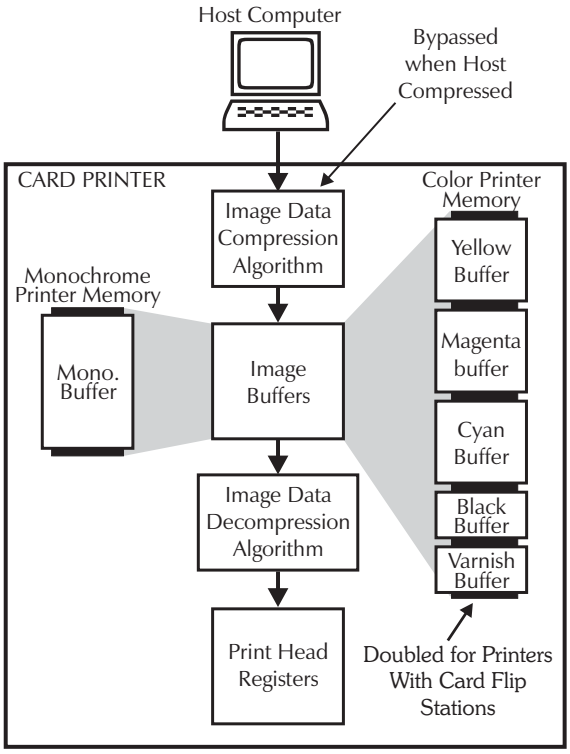
Some text editing programs can cause printer errors by adding extra characters or by changing existing characters when generating a near ASCII formatted file.

Example: A common ASCII editor, BRIEF, changes all NUL characters to the SPACE or TAB characters with a File Save. The graphic data for print intensity level "0" is the NUL character. This causes the resulting file to print with horizontal lines in all graphics with solid white (i.e., no-print) areas. Other editors may add a SUB character (Dec. 26 or 1A Hex.), which causes the printer to error.

Image Memory Arrangements

Figure 1-1 shows elements involved in image data flow. Note that two Image Memory Configurations exist and that Image Memory always contains compressed data. Ideally, hosts should send compressed data, which requires a compatible compression algorithm. This can substantially reduce the data transfer times of most image files.

Figure 1-1
Image Memory Arrangements



Monochrome Printers need no Color Buffers and offer less memory capacity. Color Printers may need as many as five buffers and, therefore, have a greater memory capacity. In most cases, compressed data for an entire card image fits into available memory in a single download sequence.

Color-separated data enters related buffers due to a buffer-specifying parameter in the Color Data Command.

Bit-Map Compression Algorithm

Characteristically, a Bit-Map Compression Algorithm flags data segments as either repeating or non-repeating, specifies the bytes repeated, and the number of repeats. For these card printers, compression applies to byte-wide bit-map segments, which the host sends with the PS, GS, Z, and vZ commands. The PS and GS commands include parameters specifying a buffer (YMCK). Monochrome commands Z and vZ send associated bit-map data to the Black (K) and Varnish Buffers, respectively. All of these commands include parameters that specify whether or not the command applies to compressed data. For recognition by the card printer, compressed data must conform to the following rules:

Rule 1. When high, the most significant bit (the Flag Bit) of a two-byte sequence indicates that the second byte repeats. The remaining seven bits of the first byte specify the number of repeats, allowing a field-specification range of from zero to 127 repeats.

Rule 2. When low, the Flag Bit of a data sequence indicates that the remaining seven bits of the byte specify the number of following bytes that represent non-repeating image data. Here, however, the range allows a specification of from zero to 31 bytes of data.

Rule 3. The first byte in the Data Field of any command specifying a Compressed Bit-Map must have the Compression Flag high, even if a one must be entered as the number of bytes repeated.

Rule 4. No other algorithm can be used to compress image data for this card printer.

Figure 1-2 includes examples of data strings employing compression.

Figure 1-2
Bit-Map
Compression

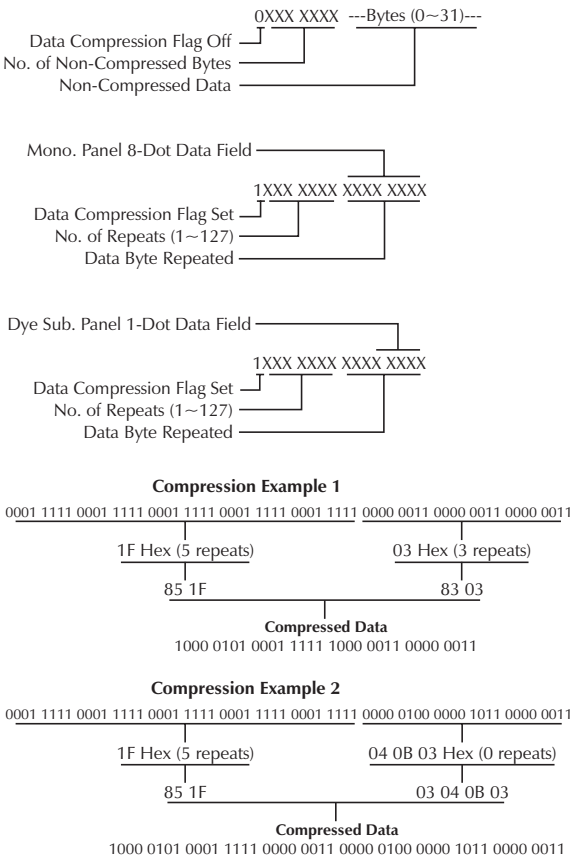


Figure 1-3 shows how a bit-map relates to associated non-compressed data. Figure 1-4 shows the same bit-map in association with compressed data.

Figure 1-3 Non-Compressed Bit-Map

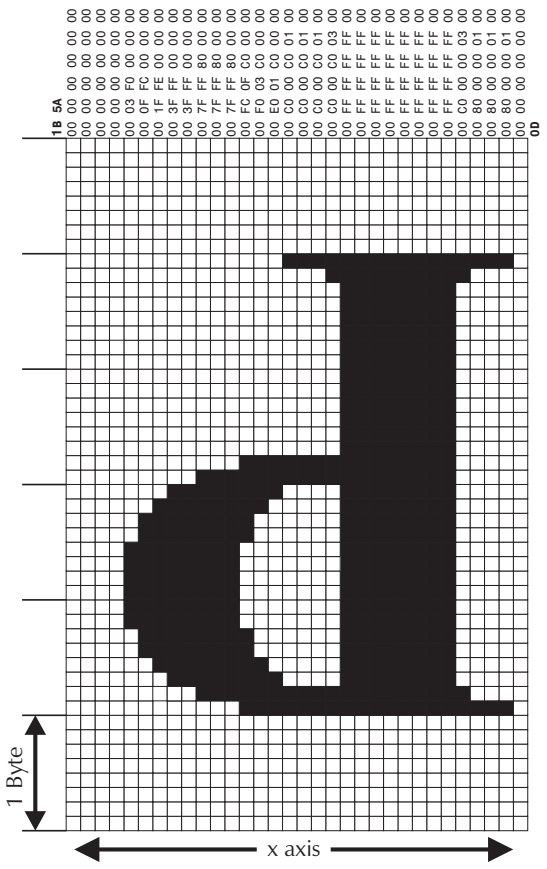
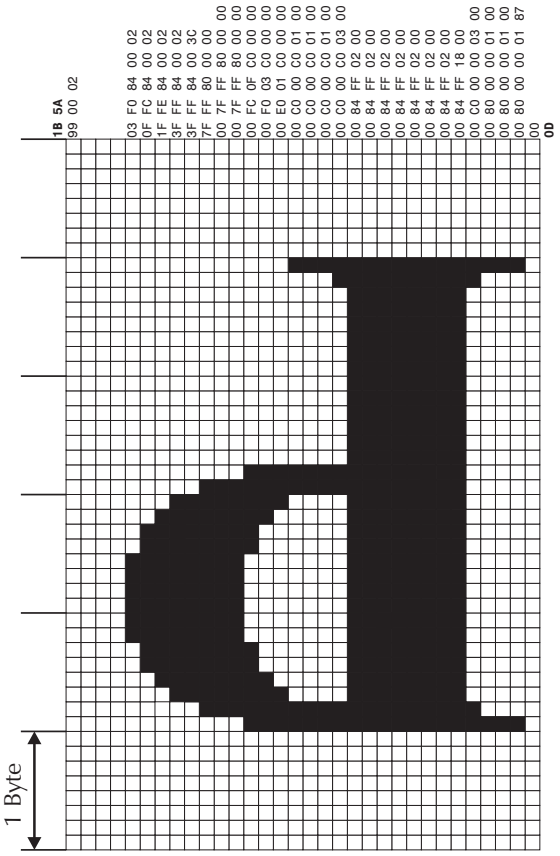


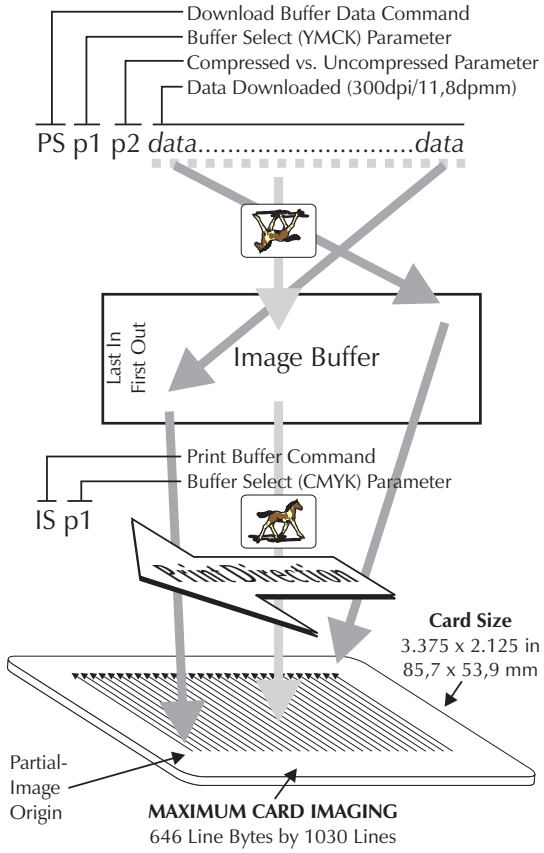
Figure 1-4 Compressed Bit-Map



Data-to-Card Mapping

Figure 1-5 shows a card consistent with the orientation of a card traveling right to left in the Card Path of a printer. From this perspective, the data field of the PS, GS, Z, and vZ commands first becomes a memory-resident image in a designated image buffer. The Image Buffer, as shown, fills from top to bottom and from right to left. Because the Image Buffer has a last-in-first-out (LIFO) arrangement, card images build from bottom to top and from left to right.This suits the front-to-back loading of Print Head Registers and the right-to-left card movement during print cycles. As noted in the figure, an object mirrored in both axis in the data sent to the buffer would print normally on the card.

Figure 1-5
Data Sent verses
Card Mapping



ASSOCIATED COMMANDS

Monochrome	Overlay	Color
G	IH	PS
O	IV	GS
Z	vZ	IS
P	vP	
L*	vL*	
C*	vC*	
D*	vD*	
T	vT	
B	vB	
I		

* Objects drawn with these commands have an upper-left origin.

Color Printer Data Considerations

When converting from another color system to CMY, the best possible results occur when a table maps each source color to a visually equivalent CMY printer color. Such a table must convert all possible printer colors. Also, the conversions must be fine-tuned to produce optimum results. However, for RGB data, a simple conversion can occur via the following:

Y = 255 - B

M = 255 - G

C = 255 - R.

Color data always enters a color image buffer, either as Yellow, Magenta, or Cyan. This is also true for $K_{dye}O$ ribbon, which images with black dye. The command designates the buffer differently according to the Buffer Specification Parameter in the command. Note that the specification for Dye Sublimation only applies to images produced using a Dye Sublimation Black Ribbon. All data associated with these commands represent imaging consisting of five-bits-per-dot.

Whether downloading data for a partial image (GS command) or for a complete card image (PS command) the data must match the associated card area. For partial images (sometimes called logos because of a typical application) the GS Command Parameters specify the area imaged. This assures proper line breaks. Any either over- or under-flow produces an error. For proper appearance, color images should not overprint other card printing.

Laminator Data Considerations

Associated printers have no need to print varnish. However, the Varnish Buffer stores monochrome data. Therefore, all data commands for monochrome data require the "v" preface. A subsequent "I" command prints data stored in the Varnish Buffer. Note that the IV Command serves to indicate the presence of a ribbon with varnish panels that then get bypassed.

Monochrome Data Considerations

P-Series Printers always download monochrome data into a Monochrome Image Buffer. In printers without Laminators, monochrome data commands prefaced with a "v" designate the Varnish Buffer. Commands without the "v" preface designate the buffer used for resin printing. If only one Monochrome Image Buffer exists, the command designates the buffer differently depending on the associated data.

However, most color imaging does not need a pre-established Varnish Buffer to apply the varnish coat-

ing. If no Varnish Buffer is downloaded, the printer defaults to the Resin Buffer for the application of varnish. This works for three reasons. First, color ribbons have resin black followed by varnish panels, both limited to monochrome data. Second, the primary use of varnish is to protect the dye sublimation imaging from ultraviolet radiation. Third, because resin may need no varnish protection, an inverted-resin bit-map can apply varnish. The IV command has a parameter setting to produce an inverted data print. Therefore, when suitable, leave the Resin Buffer unchanged after printing resin. Then, issue an IV command to print the varnish.

Note that full-coverage varnish, as required for ultraviolet protection using dye-sublimation black ribbons, requires only a buffer clear command (F) followed by the inverted print command (IV).

A watermark simulation can result by, in effect, punching holes in the varnish image. Similarly, suitable holes in the varnish application are necessary to prevent coverage over Magnetic Stripes or Smart Card Contacts. However, this concern can be avoided by limiting images requiring varnish to the card sides without contacts or stripes.

A hologram transfer from an associated ribbon occurs by printing a Varnish Buffer that images the area of the ribbon containing the hologram. Both of these images require data previously downloaded into the Varnish Buffer.

Monochrome graphic objects can download into either a Resin or Varnish Buffer. As with the preceding, a "v" preface designates a buffer that prints with the "IV" Command, and commands without the "v" preface designate a buffer that prints with the "I" Command. Commands exist for downloads of the following graphic objects:

P/vP	Write Dot
L/vL	Write Line
C/vC	Write Box
D/vD	Write Diagonal Line
T/vT	Write Text
B/vB	Write Bar-Code

The following Gaphic Commands have Rotational Parameters (clockwise):

D/vD (Diagonal Line)	0, 90, or 180°
Center of Rotation	lower-left
T/vT (Text)	90° Increments (0~270)
Center of Rotation	lower-left or object center
B/vB (Bar Code)	90° Increments (0~270)
Center of Rotation	lower-left or object center

Monochrome bit-maps require entry of two commands—first an initializing command (G) and then an associated data command. The "G" Command specifies image placements associated with the following commands:

O/vO	Download Single Line
Z/vZ	Download Multiple Lines

Figure 1-5 shows the relationship between data sent by "O" or "Z" commands and an area previously established by a "G" command. The "G" command can also define data as single bits (i.e., image dots).

With dots selected as the Data Mode in the G Command, data sent to the printer must, nevertheless, finish on an even byte boundary. When necessary, fill in zero bits to bytes that do not reach the boundary specified in the G Command.

Data is handled in bytes decimal (0~255) or hexadecimal (00~FF) by the printer.

Bar Codes

Bar Codes vary in capacity, size, character sets, and density. Several industries have adopted specific coding and bar code formats. A selected Bar Code must match a code supported by the scanning equipment.

All the Bar Codes offered by the card printers have the data characters, 2 quiet zones, and Start and Stop Characters. The Bar Codes can include Text as part of the Printed Bar Code. Some of the Bar Codes include a printer-generated Check Digit (or Data Check Sum) Character automatically or as an option.

A command error condition occurs when Image Data extends beyond the addressable range of the Image Buffer. The Bar Code and Text Fields must remain within the addressable area of the Image Buffer. Each of the Bar Codes, in the Command B and Appendix-A Descriptions have a formula to determine a Bar Code Length.

Selecting a larger Bar Code Width Multiplier and a higher ratio of the narrow to wide bars (and spaces, where applicable) improves the general readability of a Bar Code. Also, wider bars and spaces increase the depth of field for improved performance with Moving-Beam Lasers and other non-contact scanning devices.

Control Commands

The card printers can perform a variety of print, card, ribbon, head movement, and other control command operations.

Print Controls

Intensity—Adjusts the amount of heat used to transfer Maximum Intensity Color or Monochrome Dots.

Contrast (Color Only)—Adjusts the minimum amount of heat used to print dots at the lowest color setting.

Image Positioning—Locates the printable image on the card.

Head—Raises the Print Head for card moves and lowers the head to print. These commands are nested within Print Commands and typically only support testing.

Print Test Cards—Initiates a print sequence using printer-resident data.

Card Movement

Print Ready Position—The card moves to a position just prior to the Card Edge Sensor.

Exit Card—The printer sends the card to the Output Hopper. For printers with multiple stations, cards exit to the next station.

Duplex—Flips cards using the Card-Flip Station, initiated by the MF command.

Ready Smart Card—Positions a Smart Card under the Smart Card Docking Station, where Smart Card Chip Contacts make contact and become available at a rear-mounted printer connector.

Encode Ready position—The card moves to a position just prior to the Read Write Head of the Magnetic Encoding Station.

Reject Card—Sends a card to the Rejected Card Box

Ribbon

Reset Ribbon—Advances ribbon to prepare for the first imaging pass (for color, Yellow) or cycles a continuous color Monochrome Ribbon.

Select Panel—Resets, then advances ribbon to a command-specified panel.

Card Handling Process

The following outlines a recommended card handling sequence:

1. Smart Card Programming - Option
2. Magnetically Encode Card - Option
3. Print Card
   For color, print:
   - Yellow
   - Magenta
   - Cyan
   - Black
   - Clear Varnish or Hologram Transfer
4. Duplex - Flip Card - Option
5. Print Card Backside - Option
   For color, print:
   - Yellow
   - Magenta
   - Cyan
   - Black
   - Clear Varnish
   - Hologram Lamination
6. Eject Card

Never image or laminate over magnetic stripes or Smart Card Contacts. Encoding and/or Smart Card Programming Errors can result. Those with lamination capabilities can order patches that leave these areas uncovered.

Command Linking

The "M" and "m" Commands serve as Command Linking Operators. A string of linked commands may execute one or multiple times. The "[" character serves as the delimiter for Linked Commands in the associated syntax.

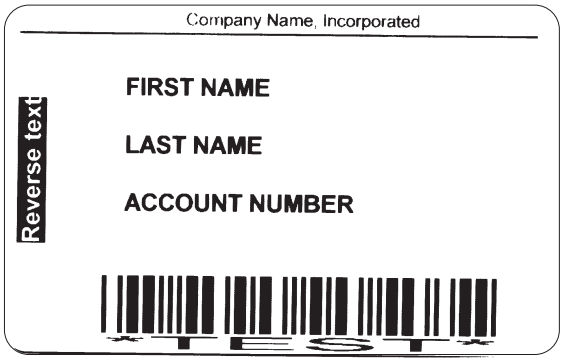
For the complete "M" Command Syntax, and an example, see M/m in the Command Reference.

Sample Card

Figure 5-6 shows a printed card along with the commands used.

Figure 1-6 Sample Monochrome Card

Commands	Descriptions
+RIB	Ribbon Type
+C 3	Thermal Intensity
F	Clear Mono. Buffer
B 512 600 4 0 2 4 100 1 TEST	Write Bar Code
T 512 75 4 0 0 35 1 Company Name, Incorporated	Write Text
T 200 200 0 1 0 50 1 FIRST NAME	Write Text
T 200 300 0 1 0 50 1 LAST NAME	Write Text
T 200 400 0 1 0 50 1 ACCOUNT NUMBER	Write Text
T 65 320 7 1 0 50 0 Reverse text	Write Text
L 15 80 970 4 1	Write Line
M 1 1	Print Monochrome



Parallel Port Signals

P205, P210, P310 and P420 Printers have a Serial Port Option. Serial equipped printers communicate with the host over an RS-232C interface using ACK/NAK flow control. Parallel Ports are standard. The other card printer models have no Serial Port Option.

Card printers *with* Parallel Ports communicate with the host using the following signal lines:

DATA (0~7) Eight bits of parallel data.

STROBE (Pin 1) A host signal that indicates stable data.

ACK/ (Pin 10) A printer signal that indicates data received. The host drops the STROBE signal in response.

BUSY (Pin 11) A printer signal that indicates an inability to accept commands due to ongoing processing. In printers with more than one processor, a BUSY response from one processor does not imply a BUSY at the another processor.

READY (Pin 13) A printer signal that indicates its availability to receive Host Commands.

PAPER ERROR (Pin 12)
Card printers report errors to the host by encoding the PAPER ERROR and ERROR lines (see Error Line Coding below).

ERROR/ (Pin 15) Card printers report errors to the host by encoding the PAPER ERROR and ERROR lines (see Error Line Coding below).

INIT (Pin 14) Not used.

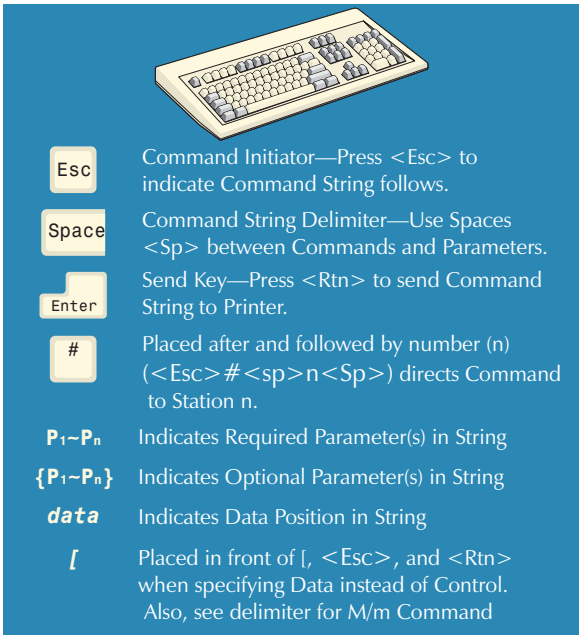
Error Line Coding

Paper Error	Error	Description
0	1	No Error
0	0	Syntax Error
1	1	Ribbon End/Empty Feeder
1	0	Mechanical Error
NOTE: To clear an Error, Send: <Esc>.<Enter> (1B 2E 0D Hex)		

COMMAND REFERENCE

This section contains individual command descriptions for data downloads, printing, lamination, magnetic encodes, and card movement control. An included Command List groups commands by function and shows the associated applicable Printer Models.

Figure 2-1
Command Entry



COMMAND	DESCRIPTION	P205	P210	P310 Mono.	P310(i)/P320i Color	P420(i)	P/S520(i)	P/S720(i)	PAGE
	Setup Commands								
!FF	Set Ribbon Color Sequence		•		•	•	•	•	2-30
!R	Print Head Resistance	•	•	•	•	•	•	•	2-39
+$C	Adjust Independent Color Contrast Level		•		•	•	•	•	2-52
+$L	Adjust Specified Color Intensity Level		•		•	•	•	•	2-53
+BS	Set Black Speed	•	•	•	•	•	•	•	2-55
+C	Adjust Thermal Transfer Intensity Level	•	•	•	•	•	•	•	2-56
+CCLN	Set Cleaning Parameters							•	2-57
+CDOTS	Set Image Quality Compensation Factor	•	•	•	•	•	•	•	2-58
+CH	Adjust Hologram Intensity		•	•	•	•			2-59
+CT	Set Cooling Time							•	2-60
+CV	Adjust Clear Varnish Intensity		•		•	•			2-61
+EC	Print Length (X-axis)	•	•	•	•	•	•	•	2-67
+LC	Set Lamination Counter							•	2-68
+LT	Set Lamination Roller Temperatures							•	2-69
+LTI	Set Lamination Time							•	2-70
+O	Offset Start Print Position (X-axis)	•	•	•	•	•	•	•	2-71
+OCL	Offset Contactless (Proximity) Card			•	•	•			2-72
+OFP	Adjust X-Axis Patch Offset							•	2-37
+OLP	Offset Overlaminate Patch						•		2-74
+OP	Offset Patch X and Y Offset (P720)							•	2-75
+OS	Offset (X-axis) Smart Card			•	•	•	•	•	2-76
+OY	Offset Start Print Position (Y-axis)	•	•	•	•	•	•	•	2-77
+RB	Hopper Selection for Rejected Cards					•	•	•	2-78
+RIB	Ribbon Type (Non RFID only)		•		•	•	•	•	2-79
+RIBBON	Set Lamination Ribbon Type							•	2-81
+RO	Set X-Axis Offset, Relative	•	•	•	•	•	•	•	2-82
+ROY	Set Y-Axis Offset, Relative	•	•	•	•	•	•	•	2-83
+SB	Set Stand-By Mode							•	2-84
+SIDE	Set Lamination Mode							•	2-85

COMMAND	DESCRIPTION	P205	P210	P310 Mono.	P310(i)/P320i Color	P420(i)	P/S520(i)	P/S720(i)	PAGE
+V	Set Black Print Speed	•	•	•	•	•	•	•	2-87
CRB	Card Rejects for REJECTED BOX FULL Error					•	•	•	2-97
MCL	Move Contactless (±1-Step)			•	•	•			2-116
SXY	Center Image Maps	•	•	•	•	•	•	•	2-132
	Tests								
A	Print Test Card	•	•	•	•	•	•	•	2-90
IM	Print Color Test Card		•		•	•	•	•	2-107
IMB	Print Test Card	•	•	•	•	•	•	•	2-108
	Initialize Commands								
.	Clears Error Status Lines	•	•	•	•	•	•	•	2-7
&C	Set Encoder Coercivity	•	•	•	•	•	•	•	2-9
&CDER	Custom Encoder Read Density	•	•	•	•	•	•	•	2-10
&CDEW	Custom Encoder Write Density	•	•	•	•	•	•	•	2-12
&D	Change Encoder Track Write Density	•	•	•	•	•	•	•	2-14
&R	Reset Encoder	•	•	•	•	•	•	•	2-19
&SVM	Disable/Enable Mag. Encoder Verifications	•	•	•	•	•	•	•	2-20
&W	Change Encoding Direction	•	•	•	•	•	•	•	2-22
$F	Clear Color Bit-maps		•		•	•	•	•	2-23
$FP	Clear Specified Bit Map		•		•	•	•	•	2-24
+B	Serial Interface Rate (Serial I/O)			•	•	•			2-54
+DLAMI	Set Lamination Configuration (P520)						•		2-62
+TC	Set Temperature (Laminator)						•	•	2-86
+VC	Reduce Color Print Speed		•		•	•	•	•	2-84
+VL	Set Lamination Speed						•	•	2-88
+X	Change Control Character (Serial I/O)			•	•	•			2-89
F/vF	Clear Monochrome Image Buffers	•	•	•	•	•	•	•	2-102
R	Reset Printer	•	•	•	•	•	•	•	2-128
RCBC	Reset Rejected Card Box Counter					•	•	•	2-129
SF	Synchronize Film (P520 use)						•		2-131
TF	Film Type (Laminator)						•		2-135

COMMAND	DESCRIPTION	P205	P210	P310 Mono.	P310(i)/P320i Color	P420(i)	P/S520(i)	P/S720(i)	PAGE
	Printer Query Commands								
&P	Check Card Presence - Encoder (Serial I/O)			•	•				2-18
!AO	Check P720 Patch Sensors							•	2-25
!AT	Check P720 Laminator Heat Offset							•	2-26
!CCLN	Check P720 Cleaning Parameters							•	2-27
!CT	Check P720 Cooling Time							•	2-28
!L	Check P720 Laminator Sensor Levels							•	2-31
!LC	Check P720 Lamination Counter							•	2-32
!LT	Check P720 Lamination Temperatures							•	2-33
!LTI	Check P720 Lamination Time							•	2-34
!O	Check P720 Laminator Card Offset							•	2-36
!OFP	Check P720 X-Axis Patch Offset							•	2-37
!OP	Check P720 Patch Offsets							•	2-38
!RIBBON	Check Ribbon Type							•	2-40
!RLEVEL	Check Patches Remaining							•	2-41
!SERIE	Check P720 Laminator Serial Number							•	2-43
!SIDE	Check P720 Lamination Mode							•	2-44
!SB	Check Stand-By Mode Settings							•	2-45
!V	Return Operational Parameter	•	•	•	•	•	•	•	2-46
!X	Check Command Initiator (Serial I/O)			•	•				2-47
%CLN	Check Due-for-Cleaning Set	•	•	•	•	•	•	•	2-48
%F	Return Installed Fonts	•	•						2-49
%N	Return Number of Fonts Saved	•	•	•	•	•	•	•	2-50
%NLOGO	Return Name of Saved Logo	•	•						2-51
CHECK	Return Checksum							•	2-94
E	Retransmit Last Response (Serial I/O)			•	•				2-101
V	Check Printer Type/Version	•	•	•	•	•	•	•	2-136
	Image Data Download Commands								
B/vB	Write Bar Code	•	•	•	•	•	•	•	2-91
C/vC	Write Box	•	•	•	•	•	•	•	2-93
D/vD	Write Diagonal Line	•	•	•	•	•	•	•	2-98

COMMAND	DESCRIPTION	P205	P210	P310 Mono.	P310(i)/P320i Color	P420(i)	P/S520(i)	P/S720(i)	PAGE
DFONT	Download Font	•	•						2-99
DLOGO	Download Logo	•	•						2-100
G/vG	Initialize Monochrome Graphic	•	•	•	•	•	•	•	2-103
GS	Download Color Graphic		•		•	•	•	•	2-104
L/vL	Write Line	•	•	•	•	•	•	•	2-112
O/vO	Load Single Line Graphic Dots Download	•	•	•	•	•	•	•	2-124
P/vP	Write Dot	•	•	•	•	•	•	•	2-126
PS	Download Color Image Data		•		•	•	•	•	2-127
RLOGO	Retrieve Logo	•	•						2-130
T/vT	Write Text	•	•	•	•	•	•	•	2-133
Z/vZ	Multiple Line of Graphic Dots Download	•	•	•	•	•	•	•	2-137
	Card Positioning Commands								
&T	Eject Card with Magnetic Encoder Option	•	•	•	•	•	•	•	2-21
MB	Back Card into Feeder	•	•	•	•	•	•	•	2-114
MC	Clear Media Path	•	•	•	•	•	•	•	2-115
MCL	Move Contactless			•	•	•	•	•	2-116
ME	Exit Card to Output (Hopper)	•	•	•	•	•	•	•	2-117
MF	Flip Card					•	•	•	2-118
MI	Input Card to Print Position	•	•	•	•	•	•	•	2-119
MIB	Reverse Card to Print Position	•	•	•	•	•	•	•	2-120
MO	Exit Loaded Card to Output	•	•	•	•	•	•	•	2-121
MRB	Move Card to Reject Box					•	•	•	2-122
MS	Move Smart Card to Docking Station	•	•	•	•	•	•	•	2-123
SF	Stop FC Command Feed (P720 use)							•	2-131
	Print Commands								
I	Print Card Monochrome Panel	•	•	•	•	•	•	•	2-105
IH	Print Hologram Overlay					•	•		2-106
IS	Print Card Panel (YMC)		•		•	•	•	•	2-109
IV	Print Varnish Overlay		•		•	•			2-110
J	Print Multiple Cards “N” Times	•	•	•	•	•	•	•	2-111

COMMAND	DESCRIPTION	P205	P210	P310 Mono.	P310(i)/P320i Color	P420(i)	P/S520(i)	P/S720(i)	PAGE
	Magnetic Stripe Encoder Commands								
&B	Buffer Track Data	•	•	•	•	•	•	•	2-8
&E	Encode Single Data Track	•	•	•	•	•	•	•	2-15
&E*	Encode All Data Tracks	•	•	•	•	•	•	•	2-16
&L	Read Single Track Data	•	•	•	•	•	•	•	2-17
	Miscellaneous Commands								
!D	Move Print Head Down	•	•	•	•	•	•	•	2-29
!M	Move Print Head Up	•	•	•	•	•	•	•	2-35
!SA	Self Adjust			•	•	•	•	•	2-42
CLEAN	Start Cleaning Card Sequence			•	•	•	•	•	2-95
CLNCARD	Set Cleaning Card Sequence			•	•	•	•	•	2-96
M/m	Multiple Command Strings	•	•	•	•	•	•	•	2-113

. Command - Clear Error Status Lines

Description Clears the Paper Error (Paper Fault) and Error (Fault) printer return signal status lines. Note that this command does not execute when sent via the Driver. Send the command directly to the printer port.

Syntax <Esc>. (period character)

Parameters None

&B Command - Write Buffer Single Track

Description Load data into the Write Buffer for a single selected track of encoding

Syntax `<Esc>&B` p_1 *data*

Parameters p_1 = Track Number and data format

Where:
1 = Track 1 Decimal data
2 = Track 2 Decimal data
3 = Track 3 Decimal data
11= Track 1 Hexadecimal data*
12= Track 2 Hexadecimal data*
13= Track 3 Hexadecimal data*

data =
Each track has unique character and length limitations due to formatting. For p_1 values of 1~3, the printer automatically inserts the required ISO Control Characters (start and stop sentinel, longitudinal redundancy check character, etc.) into the data.

Track	Characters (Default ANSI/ISO)	Field Separator	Length
1	<Sp> $ ( ) - . / 0 through 9 A through Z (All Caps)	^	76
2	0 through 9	=	37
3	0 through 9	=	104
11*	Hexadecimal	N/A	*
12*	Hexadecimal	N/A	*
13*	Hexadecimal	N/A	*
* - See Appendix C for Extended Encoder Command Set and Custom Track Data and Control Parameters.			

The actual data encoded onto the card is converted from ASCII to an ISO track-specified encoding format. See Appendix C for default ANSI/ISO data formats and custom data encoding commands.

&C Command - Set Coercivity

Description This command sets the Encoder for High- or Low-Coercivity magnetic stripe recording.

Syntax <Esc>&C p_1

Parameters p_1 = Coercivity

Where:
0 = Low
1 = High

&CDER Command - Read Custom Track Data

The card printer responds to commands (with data or error codes) via the Bi-directional Serial Interface only. The card printer cannot respond to this command, (other than flagging an error), through a parallel interface. In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description Set the Encoder to read a selected data format

The &CDER Command in conjunction with the &CDEW Command resets the Encoder to the default ISO track density and data format settings.

Syntax `<Esc>&CDER` p_1 p_2 *ISO Data*
`<Esc>&CDER` p_1 p_2 p_3 *Raw Data*

Parameters p_1 = Track Select: (values 1, 2, 3, or 0 (zero)

Where:
0 = Reset of ALL tracks to ISO default configuration parameters

p_2 = Custom Data Select, as follows:

Value	Description - ISO Format Data
0	Resets ALL tracks to ISO default configuration parameters.
Default Format Select	
Q	ISO Track 1 Data Format to Track 1
R	ISO Track 2 Data Format to Track 2
S	ISO Track 3 Data Format to Track 3
Custom ISO Track Format Location	
qX	Track 1 with ISO Track “X” Format
rX	Track 2 with ISO Track “X” Format
sX	Track 3 with ISO Track “X” Format
X = 1, 2, or 3 as the ISO default track format applied to the selected track (e.g., Q=q1, R=r2, and S=s3.	

p_2 = Custom Data Select, as follows:

Value	Description - Raw Data Format
Read Forward - "Raw" Data	
U	Track 1
U_	Track 1 read data with NULs in data string
V	Track 2
V_	Track 2 read data with NULs in data string
W	Track 3
W_	Track 3 read data with NULs in data string
Read Reverse - "Raw" Data	
u	Track 1
u_	Track 1 read data with NULs in data string
v	Track 2
v_	Track 2 read data with NULs in data string
w	Track 3
w_	Track 3 read data with NULs in data string

p_3 = Data Block Size Select in Bits

Where:
Acceptable values = 3, 4, 5, 6, and 7

The Encoder cannot decode and convert Raw Data into ASCII data. The Encoder only reports data read after the process has completed.

&CDEW Command - Write Custom Track Data

The card printer responds to commands (with data or error codes) via the Bi-directional Serial Interface only. The card printer cannot respond to this command (other than flagging an error) through a parallel interface. In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description

Configure the write data to encode a single, selected track of data

The &CDEW command in conjunction with the &CDER command resets the Encoder to the default ISO track density and data format settings.

Syntax

`<Esc>&CDEW` p_1 p_2 *ISO Data*
`<Esc>&CDEW` p_1 p_2 p_3 *Raw Data*

Parameters

p_1 = Track Select: (values 1, 2, 3 or 0 (zero)

Where:
0 = Reset of ALL tracks to ISO default configuration parameters

p_2 = Data Format Select, as follows:

Value	Description - ISO Format Data
0	Reset ALL tracks to ISO default configuration parameters.
Default Format Select	
A	ISO Track 1 Data Format to Track 1
B	ISO Track 2 Data Format to Track 2
C	ISO Track 3 Data Format to Track 3
Custom ISO Track Format Select	
aX	Track 1 with ISO Track “X” Format
bX	Track 2 with ISO Track “X” Format
cX	Track 3 with ISO Track “X” Format
X = ISO default track format applied to the selected track (e.g., A=a1, B=b2, and C=c3.	

p_2 = Custom Data Select, as follows:

Value	Description - Raw Data Format
Read Forward - "Raw" Data	
E	Track 1
E_	Track 1 read data with NULs in data string
F	Track 2
F_	Track 2 read data with NULs in data string
G	Track 3
G_	Track 3 read data with NULs in data string

p_3 = Data Block Size Select in Bits

Where:
Acceptable values = 3, 4, 5, 6, and 7

The encoder cannot encode and convert ASCII data into Raw Data. The Encoder only reports that a data write process has completed.

&D Command - Change Track Density

The card printer responds to commands (with data or error codes) via the bi-directional Serial Interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description Changes the data encoding and decoding density of an individual track

Syntax `<Esc>&D` p_1 p_2

Parameters p_1 = Track Select, as follows:

Where:
1 = Tracks 1 and 3
2 = Track 2
3 = Track 3

p_2 = Density Select, as follows:

Where:
75 = 75 bpi
210 = 210 bpi

&E Command - Write Single Track

Description Encode, Write and Read (verify) a single track of data.

The printer feeds a card (if a card is not loaded) and magnetically writes data to the selected ISO Track. The card automatically read-verifies the encoded data. The card then moves to the Print-Ready Position.

Syntax <Esc>&Ep_1 *data*

Parameters p_1 = Encoding Track Number (1~3)

data = ISO track

The actual data encoded onto the card is converted from ASCII to the encoding format previously specified for the associated ISO Card Track. See Appendix C for default ANSI/ISO data formats and custom encoding commands.

&E* Command - Write Track Buffers

Description Encodes, Writes, and Reads (verifies) for all tracks of data stored in Printer Memory.

The printer positions a card at the Encoder Station and magnetically writes data (previously entered in memory) to the pre-selected ISO track(s). If no card is present in the Card Path, a card is sent from the Card Feeder. Following the Encoder Write Operation, the card returns to the Write-Ready Position, and a read-verification of Encoded Card Data follows. The card then travels to the Print-Ready Position, and an Encoder Data Buffer Clear occurs in preperation for the next operation.

Syntax `<Esc>&E*`

Parameters None

&L Command - Read Single Track

Description Reads data for a single track from a magnetic card

Syntax <Esc>&Lp_1

Parameters p_1 = Track Number

Where:
1 = Track 1 Decimal data per following table
2 = Track 2 Decimal data per following table
3 = Track 3 Decimal data per following table

NOTE: Only p_1 values of 11, 12, and 13, require a preceding space.

11= Track 1 Hexadecimal data
12= Track 2 Hexadecimal data
13= Track 3 Hexadecimal data

Track	Characters (Default)	Field Separator	Length
1	<Sp>$ ( ) - . / 0 through 9 A through Z (All Caps)	^	76
2	0 through 9	=	37
3	0 through 9	=	104
<Sp>11	Hexadecimal*	N/A	*
<Sp>12	Hexadecimal*	N/A	*
<Sp>13	Hexadecimal*	N/A	*
* - See Appendix C.			

The actual data encoded onto the card is converted automatically from an ISO-track-specified encoding format to ASCII. See Appendix C for default ANSI/ISO data formats and custom data encoding commands.

&P Command - Check Card Present - Encoder

The card printer responds to commands (with data or error codes) via the Bi-directional Serial Interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description This command is used to check for the presence of a card in the Magnetic Encoder Station.

Syntax `<Esc>&P`

Parameters None

Response Typical status responses:
(NACK)05(EOT) - Card in Magnetic Encoder
(NACK)06(EOT) - Card not in Magnetic Encoder

&R Command - Reset Magnetic Encoder

Description Clears Magnetic Encoder Command and Data Buffers

NOTE: This command does not return the track data format or density to default values.

Syntax `<Esc>&R`

Parameters None

&SVM Command - Disable/Enable Magnetic Encoding Verifications

Description Disables or enables read-after-write checking of magnetic stripe encodes

Syntax `<Esc>&SVM` p_1

Parameters p_1 = Disable/Enable

Where:
0 = Disable
1 = Enable (Default)

&T Command - Mag. Encoder Card Eject

Description Sends any single card in the Card Path positioned between the Card Feeder and the Output Hopper to the Output Hopper

Syntax `<Esc>&T`

Parameters None

&W Command - Change Encoding Direction

Description Change the direction that the Encoder starts writing and reading operations.

Syntax <Esc>&W p_1

Parameters p_1 = Direction Select:

Where:
0 = Forward
1 = Reverse

P205
P210
P310Mono
P310Color
P320
P420
P520
P720
RFID

$F Command - Clear Color Image Buffers

Description Clears the Color Image Buffers

This command can be used in conjunction with the “IS” print command to advance the ribbon without printing any data.

Syntax `<Esc>$F`

Parameters None

P205
• P210
• P310Mono
• P310Color
• P320
• P420
• P520
• P720
• RFID

$FP Command - Clear Specified Bit-Maps

Description Allows Memory Clears of areas reserved for specified colors

Syntax <Esc>$FP p_1

Parameters p_1 = Buffer Area Cleared

Where:
0 = Yellow
1 = Magenta
2 = Cyan
3 = Dye Black (Using K_{dye}O Ribbon)

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!AO Command- Check Patch Sensors

Description Returns values for selected Patch Position Sensor

Syntax `<Esc>!AO p1{ p2}`

Parameters p_1 = Card Side

Where:
0 = Upper Patch Sensors
1 = Lower Patch Sensors

p_2 = Patch Sensor Selection

Where:
None = Default settings
0 = X-Axis Sensor
1 = Y-Axis Sensor

P205
P210
P310Mono
P310Color
P320
P420
P520
*P720
*RFID

Command !AT - Check Heat Offset

Description Returns any variation from the Factory Set Laminator Roller Heat. For example, for a Factory Setting of 180° and a Roller Heat of 190°, the !AT Command returns a +10.

Syntax `<Esc>!AT` p_1

Parameters p_1 = Roller Selection

Where:
0 = Top Heat Roller
1 = Bottom Heat Roller

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!CCLN Command - Check Cleaning Parameters

Description Returns Card Count and Maximum Heat Values set by the +CCLN Command

Syntax `<Esc>!CCLN`

Parameters None

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!CT Command - Check Cooling Time

Description Returns the Transition Time Setting for cards passing between the Lamination Rollers and the Output Hopper

Syntax `<Esc>!CT{ p1}`

Parameters p_1 = Default, if p_1 is other than 0

!D Command - Move Print Head Down

Description Moves the Print Head assembly down to the card (and platen roller)

Syntax `<Esc>!D`

Parameters None

P205
• P210
• P310Mono
• P310Color
• P320
• P420
• P520
• P720
• RFID

!FF Command - Set Ribbon Color Sequence

Description Resets and moves the ribbon to a selected panel

The printer first aligns on the Cyan (and Black) Panels and then counts ribbon panel positions from the Yellow "0" Panel.

Syntax `<Esc>!FF` p_1

Parameters p_1 = Panel detection number

Where:

p_1 = 0 Moves ribbon to Sync Position, as follows:

Ribbon	Sync Position
YMC	Yellow Panel
$YMCK_{resin}$	Yellow Panel
$YMCK_{resin}O$	Yellow Panel
$YMCK_{resin}OK_{resin}$	Yellow Panel
$K_{dye}O$	Mid Overlay Varnish
$K_{resin}O$	Mid Overlay Varnish

p_1 = 1 Moves ribbon to next Transparent Panel, unless already there. For P210, moves ribbon to next panel.

p_1 = 2 Moves ribbon to next Non-transparent Panel, unless already there. For P210, moves ribbon to next panel.

p_1 = 3 Moves ribbon to beginning of Black (for $YMCK_{resin}O$ ribbons only)

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!L Command - Check Sensor Levels

Description Allows a P720 Laminator Sensor Level Check

Syntax `<Esc># 1 !L{ p1}`

Parameters p_1 = Sensor

Where:
None = All sensors
0 = Ribbon Top (0~255)
1 = Ribbon Bottom (0~255)
2 = Temperature Top (0~255)
3 = Temperature Bottom (0~255)
4 = Decurling (0~255)
5 = Entry (0~255)
6 = X Top (0~255)
7 = Y Top (0~255)
8 = X Bottom (0~255)
9 = Y Bottom (0~255)
10 = Top Ribbon Detect (0~7)
11 = Bottom Ribbon Detect (0~7)

For Patch Ribbon, Color Sense Values are:
0 ~6 = Cassette Seen
7 = No Cassette Seen

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!LC Command - Check Lamination Counter

Description Checks the number of laminations since the last counter reset. See +LC Command.

Syntax `<Esc># 1 !LC`

Parameters None

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!LT Command - Check Lamination Temperature

Description Checks temperature of Lamination Rollers

Syntex `<Esc># 1 !LT p1{ p2}`

Parameters p_1 = Roller Select

Where:
0 = Top
1 = Bottom

p_2 = If not 0, returns Default Value

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!LTI Command - Check Lamination Time

Description Returns setting for time spent passing through the Lamination Rollers

Syntax `<Esc># 1 !LTI` p_1

Parameters p_1 = If other than 0, returns Default Value

!M Command - Move Print Head Up

Description Moves the Print Head Assembly up from the card (and platen roller)

Syntax `<Esc># 1 !M`

Parameters None

P205
P210
P310Mono
P310Color
P320
P420
P520
*P720
*RFID

!O Command - Check Card Offset

Description Checks Offset from Laminator Card Sense to Laminator Rollers

Syntax `<Esc># 1 !O{ p1}`

p_1 = Offset (Query)

Where:
If p_1 is not 0, Printer returns default value.

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!OFP Command - Check X-Axis Patch Offset

Description Checks X-Axis Offset setup for upper or lower patch applications

NOTE: See +OFP Command to change offset(s).

Syntax `<Esc># 1 !OFP` p_1

Parameters p_1 = patch selection

Where:
0 = upper
1 = lower

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!OP Command - Check Patch Offsets

Description Returns Patch Offset Values

Syntax <Esc># 1 !OP p_1 p_2{ p_3}

Parameters p_1 = Patch Selection

Where:
0 = Top
1 = Bottom

P_2 = Axis Selection

Where
0 = X Axis
1 = Y Axis

p_3 = If different than 0, returns default value

!R Command - Print Head Resistance

Description Enters Manufacture's Average Resistance that appears on the Print Head Label. Note that replacements to Print Heads with 10-micron glass can produce faint printing if not offset (typically with increases of between 180 and 225 ohms). An offset that optimizes print quality should be found.

NOTE: This setting interacts with the following commands:

+C	Thermal Transfer Intensity
+$L	Color Intensity
+$C	Color Contrast

Syntax `<Esc>!R` p_1

Parameters p_1 = Resistance

Where:

For P310, P320, P420, P520, P720:
p_1 = 1400~2350

For P205, P210:
P_1 = 1400~5000

Example In the following example, 1567 ohms is entered, based on the Print Head Label.

```
<Esc>!R 1567
```

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!RIBBON Command - Check Ribbon Type

Description Returns information for the type of lamination ribbon installed

Syntax `<Esc># 1 !RIBBON p1{ p2}`

Parameters p_1 = Ribbon Selection

Where:
0 = Upper
1 = Lower

p_2 = Ribbon Information (Optional)

Where:
None =
Current ribbon type setting
0 = Default Temperature for Ribbon Type
1 = Temperature Setting for installed
2 = X Offset Setting for installed
3 = Y Offset Setting for installed
4 = Cassette available (Upper or Lower)
5 = Color Signature for installed
6 = Part Number for installed

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!RLEVEL Command - Check Patches Remaining

Description Returns number of Patches left in selected Cassette

Syntax `<Esc># 1 !RLEVEL` p_1

Parameters p_1 = Cassette Selection

Where:
0 = Top Cassette
1 = Bottom Cassette

!SA Command - Self Adjust

Description Initiates a printer Self-Adjust Sequence or a returns potentiometer values

NOTE: Except for P205 and P210 printers, this command requires the prior installation of a 5-panel ribbon and works best with 10-mil cards. P205 and P210 printers Self Adjust without a ribbon installed. Successful completion results in adjustment of all sensors and voltages, confirmed by no errors indicated.

Syntax `<Esc>!SA{ p1}`

Parameters p_1
Where:

None = Perform Adjustment Sequence

1 = Return Potentiometer Values

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!SERIE Command - Get Serial Number

Description Returns Serial Number of P720 Laminator

Syntax `<Esc># 1 !SERIE`

Parameters None

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

!SIDE Command - Check Lamination Mode

Description Returns current setting for card side(s) laminated

Syntax `<Esc># 1 !SIDE`

Parameters None

Responses 0 = Single Side Top
1 = Double Side
2 = Single Side Bottom

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

!SB Command - Check Stand-By Mode Settings

Description Returns Delay and Temperature Values established by the +SB Command

Syntax `<Esc># 1 !SB`

Parameters None

!V Command - Return Operational Parameter

Description Returns value for a selected parameter

Syntax <Esc>!V{ p_1}

Parameters p_1 = Requested Parameter

Where for Printer Module:
None =
Black Printing Parameters
0 = Black Printing Parameters
1 = X Offset
2 = Y Offset
3 = Black Contrast
4 = Varnish Contrast
5 = Hologram Contrast
6 = Yellow Contrast
7 = Magenta Contrast
8 = Cyan Contrast
9 = K_{dye} Intensity
10 = Yellow Intensity
11 = Magenta Intensity
12 = Cyan Intensity
13 = K_{dye} Intensity
14 = p_1 setting for SXY Command
0 = Origin Offset
1 = No Origin Offset
15 = Print Head Resistance
16 = Black Speed
17 = Varnish Speed
18 = p_1 setting for +EC Command
19 = Smart Card Offset
20 = Magnetic Encoder:
0 = Not Connected
1 = Connected
21 = Coercivity Setting:
0 = LOCO
1 = HICO
22 = Magnetic Encoding Format:
0 = JIS2
1 = ISO
23 = Encoder Head Placement:
0 = Below Card Path
1 = Above Card Path

!X Command - Check Command Initiator

The card printer responds to commands (with Data or Error Codes) via the Bi-directional Serial Interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description This command checks for an Alternate Command Initiator. The printer either reports the Alternate Command Initiation Character or nothing.

Syntax `<Esc>!X`

Parameters None

%CLN Command - Check Due-for-Cleaning Parameters

Description Reports current values for the Printing, Cleaning and Cleaning Pass counters

Syntax (sent) `<Esc>%CLN`

Syntax (received) `Cpt imp:`p_1 `next clean Prn:`p_2 `nb pass:`p_3

Where:

p_1 = Total number of Head-down Image Passes made by printer since new (note that each ribbon panel used counts as a pass)

p_2 = Current setting for image passes that trigger a cleaning alert (default = 00005000—see CLNCARD Command)

p_3 = Current setting for passes performed using Cleaning Card (default = 5—see CLNCARD Command)

Example `Cpt imp:00025000 next clean Prn:00005000 nb pass:5`

%F Command - Return Font Names

Description Returns names of Fonts saved in the printer, including those downloaded.

Syntax `<Esc>%F`

Parameters None

Example (Resident)
```
0 :aria100 1 :aria100b >ACK
```

Example (w/Download)
```
0 :aria100 1 :aria100b 2 :aria 100b
>ACK
```

%N Command - Return Number of Loaded Fonts

Description Returns descriptions of both resident and downloaded fonts loaded in printer

Syntax `<Esc>%N`

Parameters None

%NLOGO Command - Return Name of Logo

Description Returns name of Logo saved using the DLOGO Command. If no Logo exists, the response is just ACK.

Syntax <Esc>%NLOGO

Parameters None

P205
• P210
• P310Mono
• P310Color
• P320
• P420
• P520
• P720
• RFID

+$C Command - Adjust Color Contrast

Description Sets the range from the Maximum to Minimum Color Intensity (heat) Level applied to a selected dye sublimation ribbon panel

Syntax `<Esc>+$C` p_1 p_2

Parameters p_1 = Color Image Buffer

Where:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (K_{dye})

p_2 = Contrast:

Where:
5 = Printer Default
0~10 = p_2 Range

P205
P210
P310Mono
P310Color
P320
P420
P520
P720
RFID

+$L Command - Adjust Specified Color Intensity

Description Sets the Maximum Color Intensity (heat) Level applied to a selected dye sublimation ribbon panel.

Syntax `<Esc>+$L` p_1 p_2

Parameters p_1 = Color Image Buffer Number:

Where:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (K_{dye})

p_2 = Intensity

Where:
5 = Printer Default
0~10 = p_2 Range

+B Command - Serial Interface Rate

The card printer responds to commands (with data or error codes) via the Bi-directional Serial Interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description This command changes the bit rate (Baud) of printers with RS232 serial interfaces. RFID-equipped models may not offer the RS232 option.

NOTE: Baud setting remains in effect until power is cycled, after which printer returns to default.

Syntax `<Esc>+B p1{ p2}`

Parameters p_1 = Serial Interface Baud Rate Options

Where:
0 = 9600 (Default)
1 = 19200
2 = 38400
3 = 57600

p_2 = Command reply time

Where:
None = ACK after Baud switch
1 = ACK before Baud switch

+BS Command - Set Black Speed

Description Optimizes Thermal Transfer Resin printing for either quality or print speed

Syntax <Esc>+BS p_1

Parameters p_1 = Speed

Where:
0 = High Speed Printing
1 = High Quality Printing

+C Command - Adjusts Monochrome Intensity

Description Sets the Monochrome Ribbon Transfer Intensity (heat) level. Varying the intensity level affects the Dot Gain, or the size of the dot and the density (opaqueness) of the transferred material. Note that higher values raise the Transfer Heat.

Syntax <Esc>+C p_1

Parameters p_1 = Intensity

Where:
5 = Printer Default
0~10 = Range

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+CCLN Command - Set Cleaning Parameters

Description Establishes Lamination Count and Maximum Temperature Value for Laminator Cleanings

Syntax `<Esc>+CCLN` p_1 p_2

Parameters p_1 = Number of Cards Laminated

p_2 = Temperature below which Cleaning is allowed

Default `+CCLN 1000 60`

+CDOTS Command - Image Print Quality Compensation Factor

Description Card design elements that run the length of a card side can sometimes appear with density variations. An ID badge containing a portrait and a solid, card length, bar at a side can exhibit these variations.

Any changes should occur in small increments followed by card prints using trial-and-error as a basis. Zebra Technical Support guidance is recommended.

Syntax `<Esc>CDOTS p1{ p2}`

Parameters p_1 = Compensation Factor (0 ~ 50)

Where:
0 = No change
1 ~ 50 = Compensation Factor

p_2 = 1 = Return Current Compensation Factor

+CH Command - Adjust Hologram Intensity

Description Sets the Hologram Material Transfer Intensity (heat) Level. Varying the intensity level affects the Dot Gain or size of the dot and the density (opaqueness) of the transferred material.

Syntax <Esc>+CH p_1

Parameters p_1 = Intensity

Where:
5 = Printer Default
0~10= Range

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

+CT Command - Set Cooling Time

Description Adjusts the transition time for cards passing between the Lamination Rollers and the Output Hopper

Syntax `<Esc># 1 +CT` p_1

Parameters p_1 = Cooling Time in Seconds

Where:
Default = 0

P205
P210
P310Mono
P310Color
P320
P420
*P520
P720
*RFID

+CV Command - Adjust Clear Varnish Intensity

Description Sets the Clear Veneer Ribbon Transfer Intensity (heat) Level. Varying the intensity level affects the density (amount) of the transferred material.

Syntax <Esc>+CV p_1

Parameters p_1 = Intensity

Where:
3 = Default
0~10 = Range

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

+DLAMI Command - Set Lamination Configuration

Description Enables or disables Print Station Varnish or Laminator Station Lamination. The associated application occurs with issuance of an IV command, or in some instances, an I command (In the following Examples, look for the +DLAMI that precedes an I or IV)

NOTE 1: This command applies to Printer and, therefore, requires no <Esc>#<Sp>1 preface.

NOTE 2: For P520s, only one card surface can receive lamination material.

Syntax `<Esc>+DLAMI` p_1 p_2

Parameters p_1 = Print Station Varnish

Where:
0 = Disable
1 = Enable

p_2 = Laminator Station Application

Where:
0 = Disable
1 = Enable
2 = Enable and flip to laminate (applies to YMCKO and YMCK ribbons to laminate the color side after imaging K_{resin} on the monochrome side)

+DLAMI Command - Set Lamination Configuration (Continued)

Examples Using YMCKO Ribbon

Print YMCK on both sides then laminate first side:

+DLAMI 0 1	Laminate enabled (side-1 default)
IS 0	Print Y (side 1)
IS 1	Print M (side 1)
IS 2	Print C (side 1)
I	Print K (side 1)
IV 10	No varnish, just a return
MF	Flip Card & return
+DLAMI 0 0	Disable both varnish & lamination
IS 0	Print Y (side 2)
IS 1	Print M (side 2)
IS 2	Print C (side 2)
I	Print K (side 2)
IV	Flip card, laminate, eject (no varnish)

On first side, print YMCK then laminate. On second side, print YMCKO panels (no laminate):

+DLAMI 0 1	Laminate enabled (side-1 default)
IS 0	Print Y (side 1)
IS 1	Print M (side 1)
IS 2	Print C (side 1)
I	Print K (side 1)
IV 10	No varnish, just a return
MF	Flip Card & return
+DLAMI 1 0	Varnish enabled
IS 0	Print Y (side 2)
IS 1	Print M (side 2)
IS 2	Print C (side 2)
I	Print K (side 2)
IV	Print O (side 2), flip, laminate, & eject

Print all ribbon panels on both sides without lamination:

```
+DLAMI 1 0   Varnish enabled
IS 0         Print Y (side 1)
IS 1         Print M (side 1)
IS 2         Print C (side 1)
I            Print K (side 1)
IV 10        Print O (side 1) & return
MF           Flip Card & return
+DLAMI 1 0   Varnish enabled
IS 0         Print Y (side 2)
IS 1         Print M (side 2)
IS 2         Print C (side 2)
I            Print K (side 2)
IV           Print O (side 2) & eject)
```

Examples Using YMCKOK Ribbon

On first side, print YMCK panels then laminate. On second side, print last K panel then laminate:

```
+RIB 10      YMCKOK ribbon in use
+DLAMI 0 1   Laminate enabled (side-1 default)
IS 0         Print Y (side 1)
IS 1         Print M (side 1)
IS 2         Print C (side 1)
I            Print K (side 1)
IV 10        No varnish, just a return
MF           Flip Card
+DLAMI 0 0   Laminate enabled
I 20         Print K (side 2)
MO           Flip Card, Laminate, & Eject
```

On first side, print YMCK panels then laminate. On second side, print just last K panel:

```
+RIB 10      YMCKOK ribbon in use
+DLAMI 1 0   Laminate enabled (side-1 default)
IS 0         Print Y (side 1)
IS 1         Print M (side 1)
IS 2         Print C (side 1)
I            Print K (side 1)
IV 10        No varnish, just a return
MF           Flip Card & return
+DLAMI 0 0   Varnish enabled
I 20         Print K (side 2) & return
MO           Flip card, laminate, & eject
```

On first side, print YMCKO panels (no lamination). On second side, print just last K panel (No lamination):

+RIB 10	YMCKOK ribbon in use
+DLAMI 1 0	Varnish enabled
IS 0	Print Y (side 1)
IS 1	Print M (side 1)
IS 2	Print C (side 1)
I	Print K (side 1)
IV 10	Print O & return
MF	Flip Card & return
+DLAMI 1 0	Varnish enabled
I 20	Print K (side 2) & return
MO	Eject card

Examples Using K_{dye}O Ribbon

Print K_{dye} and laminate K_{dye} on side two:

+DLAMI 0 1	Laminate enabled (side-1 default)
IS 3	Print K (side 1)
IV 10	No varnish, just a return
MF	Flip Card & return
+DLAMI 0 0	Disable both varnish & laminate
IS 3	Print K (side 2)
IV	Flip card, laminate, & eject

On first side, print K and laminate. On second side, print K and varnish:

+DLAMI 0 1	Laminate enabled (side-1 default)
IS 3	Print K (side 1)
IV 10	No varnish, just a return
MF	Flip Card & return
+DLAMI 1 0	Varnish enabled
IS 3	Print K (side 2)
IV	Print O, flip card, & laminate

Print $K_{dye}O$ on both sides without lamination:

```
+DLAMI 1 0   Varnish enabled
IS 3         Print K (side 1)
IV 10        Print O (side 2) & return
MF           Flip Card & return
+DLAMI 1 0   Varnish enabled
IS 3         Print K (side 2)
IV           Print O (side 2) & eject
```

Examples Using Monochrome Ribbon

Print K and laminate side one:

```
+DLAMI 0 1   Laminate enabled (side-1 default)
I 10         Place at print ready
MF           Flip Card & return
+DLAMI 0 0   Disable both varnish & laminate
I            Print K, flip card, laminate eject
```

On first side, print K and laminate. On second side just print K:

```
+DLAMI 0 1   Laminate enabled (side-1default)
I 10         Print K (side 1),  & return
MF           Flip Card & return
+DLAMI 0 1   Varnish enabled
I            Print K, flip card, & eject
```

Print K on both sides without lamination:

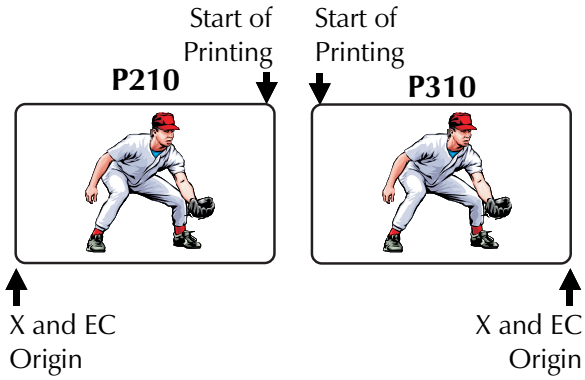
```
+DLAMI 1 0   Varnish enabled
I 10         Print K & return
MF           Flip Card & return
+DLAMI 0 0   Disable both varnish & laminate
I            Print K & eject card
```

+EC Command - End of Print

Description Specifies a point, beyond which, no card printing occurs. Print Stations have storage for 1030 lines of imaging, which exceeds the x-axis image area on the cards.

The parameter for End of Print causes the Print Head to raise at the end-of-card point, not the end of data. If left down beyond the end of card, the print head can shear the ribbon as the print head abruptly drops below the surface of the card. Note that higher values of p_1 result in shortened line counts.

Note that the print direction of P205/P210 engines is the opposite of other engines. In all engines, EC offsets shorten the bitmap at the end of the printed area. Therefore, EC increases shorten the left side of P205/P210 images and the right side of other printer images.



Syntax `<Esc>+EC` p_1

Parameters p_1 = line count for end-of-print

Where:

10 = default (standard)

0~48 = range

Example The following example sets the End of Print to 10 (the default value).

```
<Esc>+EC 10
```

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

+LC Command - Set Lamination Counter

Description Enters Count into Lamination Counter

Syntax `<Esc># 1 +LC` p_1

Parameters p_1 = Counter Value

Where:
0 = Default

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+LT Command - Set Lamination Temperature

Description Sets the temperatures for Upper and Lower Lamination Rollers

Syntax `<Esc># 1 +LT` p_1 p_2

Parameters p_1 = Roller Select

Where:
0 = Upper
1 = Lower

p_2 = Temperature

P205
P210
P310Mono
P310Color
P320
P420
P520
*P720
*RFID

+LTI Command - Set Lamination Time

Description Sets time it takes for cards to pass between the Lamination Rollers

Syntax `<Esc># 1 +LTI` p_1

Paramterers p_1 = Time in tenths of seconds (Default of 100 specifies 10 seconds)

+O Command - Print Offset X-Axis

Description Alters the Horizontal (X-axis) Start Print Offset Point, in dots

Syntax <Esc>+O p_1

Parameters p_1 = Horizontal (X-axis) Start Print Offset, in dots:

Where:
8 = Default
0~20 = Range

+OCL Command - Offset Contactless

Description P310 and P420 Printers offer a means to program Proximity Cards (also called Contactless Cards). This command includes a parameter that specifies the steps from the Card Sensor to a card position suitable for Proximity Card Programming.

Syntax `<Esc>+OCL` p_1

Parameters p_1 = Steps past Card Sensor (Defaults to 2000)

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+OFP Command - Adjust X-Axis Patch Offset

Description Establishes X-Axis patch positioning setup

NOTE: See !OFP Command for check of current offset.

Syntax `<Esc># 1 +OFP` p_1 p_2

Parameters p_1 = Patch Selection

Where:
0 = upper
1 = lower

p_2 = Offset

Where:
Range = 100~800

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

+OLP Command - Offset Overlaminate Patch

Description Specifies the relationship between card positions and Ribbon Sync Markers used to place Lamination Patches on cards

Note that except for the first patch, the firmware can use Ribbon Sync Marker sensing in concert with Flag Sensor Increment sensing to determine Ribbon Advance Step requirements for patch applications. However, a Ribbon Initialization leaves the firmware without an associated history for Ribbon Step requirements. Because of this, the firmware needs a beginning step value for use only to position the ribbon after an Initialization.

NOTE: This command only applies to P520 Laminator Stations and ribbons with Sync. Markers.

Syntax `<Esc># 1 +OLP` p_1 p_2 p_3

Parameters

p_1 = Card Offset Count from Ribbon Sync. Marker sense to the point p_2 takes effect. Only used to synchronize lamination patches that follow Initializations

p_2 = Offset between where patch applications start

p_3 = Count where patch applications end

Default Settings `<Esc># 1 +OLP 110 140 90`

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+OP Command - Adjust Patch X and Y Offset

Description Allows centering of Patch Applications

Syntax `<Esc># 1 +OP` p_1 p_2 p_3

Parameters p_1 = Patch Selection

Where:
0 = Top
1 = Bottom

p_2 = Card Axis Selection

Where:
0 = X Axis
1 = Y Axis

p_3 = Offset (0~10 millimeters)

+OS Command - Smart Card Y-axis Offset

Description Offsets the horizontal (X-axis) Smart Card Programmer Location in dots

Syntax `<Esc>+OS` p_1

Parameters p_1 = Horizontal Start Position (X) in dots

Where:
112 = Default
0~192 = Range

+OY Command - Print Offset Y-axis

Description Offsets the Vertical (Y-axis) Start Print Location in dots

Syntax <Esc>+0Y p_1

Parameters p_1 = Vertical (Y-axis) Offset, in dots

Where:
18 = Default

+RB Command - Set Rejected Box

In P420s, P520s, and P720s, this command determines the hopper used to collect cards rejected because of printing or encoding errors. Unless changed, the printer sends Encoding Rejects to the Reject Hopper and Printing Rejects to the Output Hopper.

Syntax `<Esc>+RB` p_1 p_2

Parameters p_1 = Error Type

Where:
0 = Encoding & Printing
1 = Encoding only
2 = Printing only

p_2 = Hopper Used

Where:
0 = Exit Hopper
1 = Reject Hopper

+RIB Command - Set Ribbon Type

Description For non RFID printers, sets printer operation for either a Standard or one of the nonstandard ribbons, as follows:

- Standard Ribbons:
  K_{resin} (Monochrome—except P310)
  $YMCK_{resin}O$
  $K_{dye}O$
  $K_{resin}O$
- Nonstandard Ribbons:
  $YMCK_{resin}OK_{resin}$
  YMC
  $YMCK_{resin}$
  $YMCK_{resin}\_K_{resin}$

NOTE: All models synchronize ribbons automatically after an unlatch and latch of the Print Head, but require a p_1 setting of 4 to avoid attempted ribbon synchronization with monochrome ribbons installed. Without this setting, some ribbon waste occurs in an attempted synchronization.

Syntax `<Esc>+RIB` p_1

Parameters p_1 = Ribbon Type

Where:
0 = Standard Ribbon
4 = Monochrome Ribbon
10 = 6-Panel Ribbon ($YMCK_{resin}OK_{resin}$)
11 = 3-Panel Ribbon (YMC)
13 = 4-Panel Ribbon ($YMCK_{resin}$)
21 = 5-Panel Ribbon w/two K_{resin} ($YMCK_{resin}\_K_{resin}$)

+RIB Command - Set Ribbon Type (Continued)

Note: Card imaging using the YMCKOK ribbon requires the following command sequence:

IS 0	Image Yellow
IS 1	Image Magenta
IS 2	Image Cyan
I	Image Black & Return (YMCKOK only)
IV 10	Image Varnish and Return
I 20	Image Black and Return
MO	Eject Card

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+RIBBON Command - Set Ribbon Type

Description Specifies a Lamination Ribbon

Syntax `<Esc># 1 +RIBBON` p_1 p_2

Parameters p_1 = Ribbon Selection

Where:
0 = Top
1 = Bottom

p_2 = Ribbon Type

Where:
0 = No Ribbon
1 = Unknown Ribbon
2 = Single Side Lamination Top
3 = Single Side Lamination Bottom
4 = 800015-714
5 = 800015- 712
6 = 800015-713
7 = 800015-715
8 = 800015-716
9 = 800015-717
10 = 800015-718

+RO Command - X-Axis Offset, Relative

Description Offsets X-axis Print Origin plus or minus dot values from current setting

NOTE: For entry of exact X-Axis offsets, see the +O Command.

Syntax <Esc>+RO p_1{ p_2}

Parameters p_1 = Direction

Where:
0 = increase
1 = decrease

p_2 = Offset (default = 1)

+ROY Command - Y-Axis Offet, Relative

Description Offsets Y-axis Print Origin plus or minus dot values from current setting

NOTE: For entry of exact Y-Axis offsets, see the +OY Command.

Syntax `<Esc>+ROY` p_1{ p_2}

Parameters p_1 = Direction

Where:
0 = increase
1 = decrease

p_2 = Offset (default = 1)

P205
P210
P310Mono
P310Color
P320
P420
P520
•P720
•RFID

+SB Command - Set Stand-By Mode

Description Establishes Time Until and Roller Heat Parameters for Stand-By Mode

Syntax `<Esc># 1 +SB` p_1 p_2

Parameters p_1 = Idle Period (seconds) before Laminator enters Stand-By Mode.

Where:
p_1 = 0 disables Stand By Mode

p_2 = Laminator Roller Temperatures (°C) during Stand-By Mode

Default `<Esc># 1 +SB 1800 100`

P205
P210
P310Mono
P310Color
P320
P420
P520
:P720
:RFID

+SIDE Command - Set Lamination Mode

Description Chooses between double- and single-side lamination

Syntax `<Esc># 1 +SIDE` p_1{ p_2}

Parameters p_1 = Mode

Where:
0 = Single Side
1 = Double Side

p_2 = Laminated Side (Only needed for p_1 = 0)

Where:
0 = Single side laminated faces up
1 = Single side laminated faces down
None =
Same as 0's for both parameters

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

+TC Command - Set Temperature

Description For P520s, sets amount of heat applied in transferring material or die-cut panels from the Laminator Ribbon to the cards.

P520 Syntax `<Esc># 1 +TC` p_1

Parameters p_1 = Temperature (degrees C)

Where:
165 ≅ P520 Overlaminate
155 ≅ P520 Varnish

+V Command - Black Print Speed

Description Allows a reduction in Print Speed for black printing, which affects print quality and throughput

Syntax <Esc>+V p_1

Parameters p_1 = Speed Value

Where:
p1 = 1 ~ 25 (Default = 4)

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

+VL Command - Set Lamination Speed

Description This command determines the speed that cards pass through the Lamination Rollers. An attempt to enhance performance by increasing speed here in concert with a higher Lamination Temperature can result in heat-distorted cards. Card distortion can produce errors when reading Encoded Magnetic Stripes.

Syntax `<Esc># 1 +VL` p_1

Parameters p_1 = Speed

Where:

For 1-mil overlaminate ribbon:
p_1 = 4500 (default — 4.8mm/s)

For 0.6-mil overlaminate ribbon:
p_1 = 2000 (11mm/s)

+X Command - Change Command Initiator

The card printer responds to commands (with data or error codes) via the Bi-directional Serial Interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description This command adds an alternate Command Initiation Character. Some host systems cannot transmit an Escape Command Character. The printer responds to both the Escape Character and the Added Command Initiation Character.

NOTE: Never use X as a Command Initiator.

Syntax `<Esc>+X` p_1

Parameters p_1 = A single ASCII character

Where:
p_1 = 33~255 Decimal
p_1 = 21~FF Hexadecimal

NOTE: To remove an alternate command initiation character, send +X with p_1 < 20Hex (except for 0DHex). A NACK response results, with error code 10 (Syntax Error). Then, Escape remains as the only command initiation character.

A Command - Print Test Card

Description Prints a Standard Test Card with Printer Parameters, Version Number, and Test Pattern. Systems with Laminators print two cards—one for the Printer the other for the Laminator (if connected).

Syntax `<Esc>A{ p1}`

Parameters p_1 = Test Card

Where:
None =
Standard Test Card(s)
1 = Printer Test Card
2 = Magnetic Encoder Test Card
3 = Lamination Test Card

Figure 2-2 Standard Monochrome Test Cards

Figure 2-3 Standard Color Test Cards

Figure 2-4 Printer and Laminator Card Sides

B/vB Command - Write Bar Code

Description This command downloads Standard Bar Codes. See Appendix A for character maps and unique parameter settings for each Bar Code type.

Syntax `<Esc>B` p_1 p_2 p_3 p_4 p_5 p_6 p_7 p_8 *data*

Parameters p_1 = Horizontal (X-axis) Start Position, in dots

p_2 = Vertical (Y-axis) start position, in dots

p_3 = Rotation:

Where:

Value	Description	Origin
0	No rotation	Lower Left
1	90 degrees	Lower Left
2	180 degrees	Lower Left
3	270 degrees	Lower Left
4	No rotation	Centered
5	90 degrees	Centered
6	180 degrees	Centered
7	270 degrees	Centered

Figure 2-5 Bar Code Rotation Samples

p_4 = Bar Code selection - See Appendix A

Where:

0 = Code 39 (3 of 9—Alphanumeric)
1 = 2/5 Interleaved (Numeric, Even No Count
2 = 2/5 Industrial (Numeric) no Check Digit
3 = EAN8 (Numeric, 12 digits encoded)
4 = EAN13 (Numeric, 12 digits encoded)
5 = UPC - A (Numeric, 12 digits encoded)
6 = Reserved for MONARCH
7 = Code 128 C w/o Check Digits* (Numeric only, Even Number Printed)
8 = Code 128 B w/o Check Digits* (Alphanumeric)
107 = Code 128 C w/Check Digits* (Numeric only, Even Number printed)
108 = Code 128 B w/Check Digits* (Alphanumeric)

* Not supported in some Monochrome Printers

p_5 = Bar Width Ratio

Where:

Value	Narrow Bar	Wide Bar	Ratio
0	1 dot	2 dots	2:1
1	1 dot	3 dots	3:1
2	2 dots	5 dots	2.5:1 or 2:5

NOTE: Some bar code types have a selectable bar code width ratio. See Appendix A for supported ratio and settings.

p_6 = Bar Code Bar Width Multiplier. Range 3~9 for all Zebra card bar codes except UPC-A, EAN-8 and EAN-13 which have a range of 4~7. For a selected bar width ratio of 2:5, the range is 2~4.

Note: Each bar code type has a specified standard for the width range of a narrow bar width. See Appendix A for optimal values.

p_7 = Bar Code Height in dots

Note: Each Bar Code Type has an industry specified minimum height standard. See Appendix A for optimal values.

p_8 = Print Text version of Bar Code under Bar Code

Where:
1 = yes
0 = no.

data =
Represents a fixed data field. Each bar code type has a differing data field length and allowable character requirements. See Appendix A.

A printer error occurs when a Bar Code extends beyond the addressable area of the Image Buffer. See Appendix A for field size calculations for total bar code length and height.

C/vC Command - Write Box (Monochrome)

Description Writes a hollow-box rectangle graphic to a Monochrome Image Buffer by defining the height, width, line thickness (width) and origin. The "C" Command writes to the buffer used for Resin printing. The "vC" command writes to a buffer used for Varnish printing.

Syntax

```
<Esc>C p1 p2 p3 p4 p5 p6
<Esc>vC p1 p2 p3 p4 p5 p6
```

Parameters

p_1 = Horizontal (X-axis) start position in dots

p_2 = Vertical (Y-axis) start position in dots

p_3 = Horizontal (X-axis) width of graphic line in dots (i.e. horizontal lines)

p_4 = Vertical (Y-axis) height of graphic line in dots

p_5 = Thickness/width of diagonal graphic line in dots

p_6 = Graphic Mode

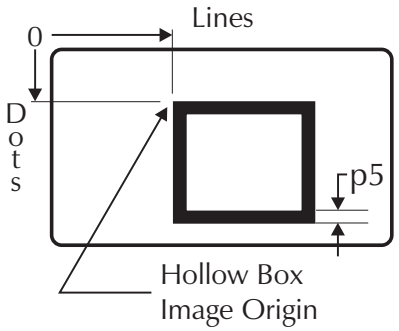
Where:

0 = Reverse Bit Map—Clear Print Area and load Reverse Bit Map Image

1 = Standard Bit Map—Clear Print Area and load Bit Map Image

2 = Merge Bit Map—Overwrite Background Bit Map Image with Printable Dot Locations, leaving Non-printing Dot Locations alone

Figure 2-6 Hollow Box Image Positioning



CHECK Command - Return Checksum

Description Returns Selected Checksum Value

Syntax <Esc>CHECK{ p_1}

Parameters p_1 = Checksum Selection

Where:
None = Firmware Checksum
Any character = Boot Checksum

CLEAN Command - Start Cleaning Card Sequence

Description This command requires the prior removal of any ribbon and all cards except for a single Cleaning Card. The following occurs:

- Raise Print Head
- Feed a card to a position under Print Head
- Lower Print Head
- Move card back and forth the number of times specified by CLNCARD Command
- Raise Print Head
- Exit card

Non P720 Syntax `<Esc>CLEAN`

Non P720 Parameters None

P720 Syntax `<Esc>CLEAN` p_1

P720 Parameters p_1 = Station Cleaned

Where:

1 = Printer
2 = Magnetic Encoder Head
3 = Printer and Laminator
4 = Laminator

CLNCARD Command - Establish Cleaning Card Sequence

Description Allows settings for a Time-to-Clean Alert and the cycling of cleaning card in Card Path

Syntax `<Esc>CLNCARD` p_1 p_2

Parameters p_1 = Ribbon Panel Count to Cleaning Notification (Default = 5000)

p_2 = Number of Cleaning Card Passes Through Printer (Default = 5)

CRB Command - Set Counter for Rejected Box

P420, P520, and P720 Printers have a counter that keeps track of the number of cards sent to the Rejected Card Box. This command allows selection of a card count that produces the REJECTED BOX FULL message on the LCD. Note that, after removing the cards, users press the Panel Button. For this command, release of the Panel Button resets the counter. The box can safely hold twenty 30-mil cards, and P420, P520, and P720 Printers ship with this setting. Users of less thick cards may wish to increase the count.

Syntax `<Esc>CRB` p_1

Parameters p_1 = Card Count

Where:
20 = Default

D/vD Commands - Write Diagonal (Monochrome)

Description Write a monochrome diagonal line graphic by defining the total height, total width, line thickness (width) and position in the Monochrome Image Buffer. The "D" Command writes to the Resin buffer, and the "vD" command writes to the Varnish buffer. The actual image placed is a rectangle.

Syntax `<Esc>D` p_1 p_2 p_3 p_4 p_5 p_6 p_7

Parameters

p_1 = Horizontal (X-axis) Start Position, in dots
p_2 = Vertical (Y-axis) Start Position, in dots
p_3 = Horizontal (X-axis) Width of Graphic, in dots
p_4 = Vertical (Y-axis) Height of Graphic, in dots
p_5 = Thickness/width of the Line, in dots
p_6 = Rotation & Origin

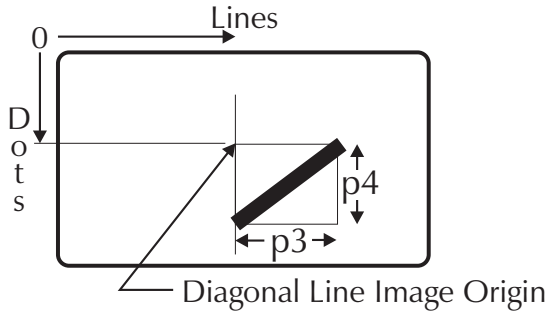
Where:

Value	Description	Origin
1	90 degrees	Lower Left
2	180 degrees	Lower Left

p_7 = Graphic Mode:

Where:
0 = Reverse Bit Map—Clear Print Area and load Reverse Bit Map Image
1 = Standard Bit Map—Clear Print Area and load Bit Map Image
2 = Merge Bit Map—Overwrite Background Bit Map Image with Printable Dot Locations, leaving Non-printing Dot Locations alone

Figure 2-7 Diagonal Line Values



DFONT Command - Download Font

Description Downloads a Font into the printer. Once there, the font becomes available just like the two Resident Fonts. Any font can be downloaded, but firmware creats the description placed in Flash.

Syntax `<Esc>DFONT` p_1 p_2

Parameters p_1 = Font Size in points
p_2 = Font Data

DLOGO Command - Download Logo

Description Downloads to Flash image data for a Logo-like image. Once printer resident, the Logo can be used as card image data using the RLOGO Command. Acrobat (.prn) files can serve as Logo files.

Syntax `<Esc>DLOGO` p_1 p_2 p_3

Parameters p_1 = Logo Size (in bytes)

p_2 = Logo Name (8 characters required)

p_3 = Logo Image Data

E Command - Retransmit Last Response

The card printer responds to commands (with data or error codes) via the bi-directional serial interface only. Printers with parallel interfaces cannot respond to this command, (other than flagging an error). In a Test Environment, card printers can operate with both interfaces attached and communicating with the printer. The Printer CPU Board has associated connectors.

Description This command directs the printer to repeat the last Status Message.

Syntax `<Esc>E{ p1}`

Parameters p_1 = Port selection/mode

Where:

1 = Parallel Port in Reverse Serial mode (allows host to pull serialized data from printer over the Parallel Port—please contact Technical Support for related information).

2= Use USB Port. Update Printer Output Buffer with response to commands received.

F/vF Command - Clear Monochrome Image Buffers

Description Clears Monochrome Image Buffers of bit-maps and printable data (lines, text, bar codes, etc.)

Syntax `<Esc>F`

Parameters None

G/vG Command - Initialize Monochrome Graphic (B/W)

Description Initializes Monochrome Graphic Area using height, width and position

Syntax `<Esc>G` p_1 p_2 p_3 p_4 p_5 p_6

Parameters

p_1 = Horizontal (X-axis) Start Position (X) in dots

p_2 = Vertical (Y-axis) Start Position (Y) in dots

p_3 = Download Mode for Graphic (Bit-map):
When using bytes, the byte count must be rounded upward to the next nearest whole byte.

Example:
25 dots = 3 bytes + 1 dot = 4 bytes

Value	Data	Description
0	Byte	Standard
1	Byte	Standard with Checksum
2	Byte	Compressed
3	Byte	Compressed with Checksum
10	Dot	Standard
11	Dot	Standard with Checksum
12	Dot	Compressed
13	Dot	Compressed with Checksum

p_4 = Vertical (Y-axis) Height of graphic in bytes.
Round up the number of bytes loading in multiples of 8 bits (i.e. Monochrome Dots)

p_5 = Horizontal (X-axis) Width of graphic in dots (i.e. horizontal lines)

p_6 = Graphic Mode:

Where:
0 = Reverse Bit Map—Clear Print Area and load Reverse Bit Map Image
1 = Standard Bit Map—Clear Print Area and load Bit Map Image
2 = Merge Bit Map—Overwrite Background Bit Map Image with Printable Dot Locations, leaving Non-printing Dot Locations alone

P205
• P210
• P310Mono
• P310Color
• P320
• P420
• P520
• P720
• RFID

GS Command - Download Color Graphic

Description Initializes, downloads, and positions individual color-separated data (C,M,Y, or K) for a partial image. Defines the height, width and position of the graphic.

Syntax <Esc>GS p_1 p_2 p_3 p_4 p_5 p_6 *data*

Parameters p_1 = Color Image Buffer Number

Where:

0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (Ks)

p_2 = Data Mode:

Where:

32 = Uncompressed Data - 256 levels (00~FF Hex.)
30 = Compressed Data - 32 levels (00-1F Hex.)

p_3 = Horizontal (X-axis) Start Position, in dots

p_4 = Vertical (Y-axis) Start Position, in dots

p_5 = Horizontal (X-axis) Width of graphic, in dots (i.e. horizontal lines)

p_6 = Vertical (Y-axis) Height of graphic, in bytes

data =
Uncompressed or compressed color bit-map data for a single separated color

I Command - Print Monochrome Panel

Description This command serves to print a Monochrome Graphic Panel from a card image previously stored in the buffer designated for Resin images.

After print completion, the card may be ejected to the Output Hopper or repositioned to print another image (ribbon panel). Typically the Clear Varnish, or for some models, the Hologram Lamination prints next. Then, a duplex printer may produce additional printing after flipping the card to the opposite side.

Ribbon panels advance during printing, making the installed ribbon the overriding factor in choosing buffers for imaging.

Syntax `<Esc>I{ p1}`

Parameters p_1 = Optional Command Parameter

Where:

None =
Monochrome Buffer Print and card eject
10 = Card Print and return to Print Ready Position
20 = For Kr or Ks Ribbons—Prints card and returns card to Print Ready Position. When appropriate, synchronizes ribbon
For P520s using YMCKrOKr Ribbon—Ejects card after last application of either Kr or laminate. A prior +DLAMI Command determines when the I 20 Command invokes lamination.
30 = Print card but leave in place—used when next Station is BUSY.

P520 with KrO Ribbon Example:

```
I 20
IV
MF
I 20
IV
MO
```

P205
•P210
•P310Mono
•P310Color
•P320
•P420
•P520
•P720
•RFID

IH Command - Print Hologram Overlay

Description This command serves to print the entire addressable Varnish Image Buffer or to reverse print any image data (line, rectangles, graphics, text, etc.) previously stored in the Resin Image Buffer.

After printing is complete, the card may be ejected to the Output Hopper or repositioned to print form subsequent ribbon panels for models that support the duplex printing.

The ribbon advances position a panel for printing after completion of printing from the previous panel.

Syntax `<Esc>IH{ p1}`

Parameters p_1 = Optional Print Parameter

Where:

None =
Prints 100% of Image Buffer as Hologram Lamination and ejects card

1 = Prints inverse of Image Data to card and ejects card

10 = Prints card and returns card to Print-Ready Position

P205
• P210
• P310Mono
• P310Color
• P320
• P420
• P520
• P720
• RFID

IM Command - Print Color Test Card

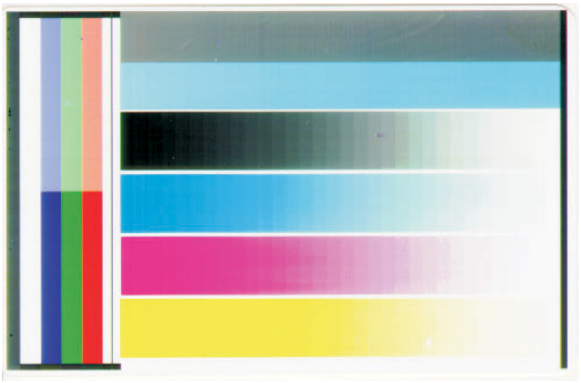
Description Prints a card with a Color Test Pattern

NOTE: The K_{resin} panel is not used in this image.

Syntax `<Esc>IM`

Parameters None

Figure 2-8
Color Test Card



IMB Command - Print Gray Test Card

Description Prints an all gray card. Typically this card serves as a basis for Print Head Adjustments. Note that a black ribbon is required (PVC-L BLK preferred—Zebra Part Number 800015-001).

Syntax `<Esc>IMB`

Parameters None

Figure 2-9
Print Black Test Card

P205
•P210
•P310Mono
•P310Color
•P320
•P420
•P520
•P720
•RFID

IS Command - Print Card Panel

Description This command serves to print from a selected color dye sublimation ribbon panel using data from an associated image buffer.

After completing a printing pass, the card is repositioned to print the next ribbon panel.

The ribbon panel advances during printing such that completion of one panel leaves the ribbon ready to print the next panel.

NOTE: Printing for Dye Sublimation Black occurs using data from a color buffer in conjunction with a $K_{dye}O$ ribbon.

Syntax `<Esc>IS` p_1

Parameters p_1 = Color image buffer number:

Where:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (K_{dye})

NOTE: Card imaging using the YMCKOK ribbon requires the following command sequence:

IS 0	Image Yellow
IS 1	Image Magenta
IS 2	Image Cyan
I	Image Black and Return (YMCKOK only)
IV 10	Image Varnish and Return
I 20	Image Black and Return
MO	Eject Card

P205
•P210
•P310Mono
•P310Color
•P320
•P420
•P520
•P720
•RFID

IV Command - Print Clear Varnish

Description This command serves either to print the entire addressable image buffer or to reverse print with the clear varnish or any image data (line, rectangles, graphics, text, etc.) previously stored in a Monochrome Image Buffer.

After printing is complete, the card may be ejected to the Output Hopper or repositioned to print more ribbon panels for models that support the Hologram, Lamination, or Duplex Operations.

The ribbon panels advance during printing such that completion of printing from one ribbon panel leaves the ribbon ready to print the next panel.

Syntax `<Esc>IV{ p1}`

Parameters p_1 = Optional Print Parameter

Where:

None =
Print Varnish from all of Image Buffer and eject card

1 = Print Varnish using Inverted Image Buffer data and eject card

10 = Print card and return card to Print Ready Position

11 = Print Varnish using Inverted Image Buffer data and return card to Print Ready Position

30 = Print card but leave in place (used when next Station is BUSY

31 = Similar to 30, but inverts Image data

J Command - Print Multiple Monochrome Cards

Description *NOTE: This command only applies to monochrome printing using a Monochrome Ribbon having a single continuos color and material; i.e., all black, all red, all green, etc.*

This command serves to print several monochrome cards from an image previously stored in the Resin Image Buffer.

NOTE: Error recovery is not possible from this command.

Syntax `<Esc>J` p_1

Parameters p_1 = Number of cards to print

L/vL Command - Write Line (Monochrome)

Description Downloads a Monochrome Graphic line using parameters to specify origin, height, and width. The resulting line overwrites any existing graphics data. The "L" command writes to the buffer used for Resin Printing. The "vL" command writes to a buffer used for Varnish Printing.

Syntax `<Esc>L` p_1 p_2 p_3 p_4 p_5

Parameters

p_1 = Horizontal (X-axis) Start Position (X) in dots

p_2 = Vertical (Y-axis) Start Position (Y) in dots

p_3 = Horizontal (X-axis) Width of graphic in dots (i.e. horizontal lines)

p_4 = Vertical (Y-axis) Height of graphic in dots

p_5 = Graphic Mode

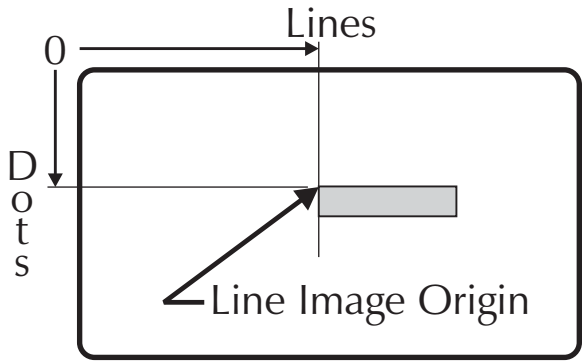
Where:

0 = Clear Print Area and load Reverse Bit Map Image

1 = Clear Print Area and load Standard Bit Map Image

2 = Overwrite Background Bit Map Image in Printable Dot Locations, leaving Non-Printing Dot Locations alone

Figure 2-10 Line /Rectangle Image Positioning



M/m Commands - Multiple Command

Description Groups and repeats a string of Commands a specified number of times. "M" differs from "m" only regarding the response to errors. Errors encountered during commands linked by "m" commands abort any remaining commands, while M-linked commands resume after an appriopriate error response.

Syntax `<Esc>M` p_1 c_1`[`c_2`[`c_3`...[`c_n

Parameters p_1 = Number of times to repeat following command string

$c_1 \sim c_n$ = Series of linked commands repeated p_1 times. Note the square bracket ([) delimiters.

Example This example shows an "M" command used to group and repeat four commands.

```
<Esc>M 3 MI[!D[!M[MO
```

The "M" Command groups a Command String. A card loads to the Print-Ready Position with the "MI" Command. "!D" lowers the Print Head; "!M" raises the Print Head, and "MO" sends the card to the Output Hopper.

The "M" Command specifies three repeats of this sequence. If an error occurs (e.g., the Input Hopper runs out of cards) a command sequence linked by the "M" Command terminates. In contrast, after error correction and an associated pressing of the Panel Button, a command sequence linked by the "m" Command resumes.

MB Command - Return Card To Card Feeder

Description Moves the card in the reverse direction and returns the card to the Card Feed Point (just inside the card printer) from any position between the Card Feeder and the Output Hopper.

Sent to P520 Laminator:

Returns a card in Laminator to Card Flip Station.

Syntax `<Esc>MB`

Parameters None

MC Command - Clear Media Path

Description Sends any card in the Media Path of the printer to the Output Hopper

NOTE: A Ribbon Error can leave a card in the printer. If issued at Power-On, this command assures a clear media path for subsequent operations.

Syntax `<Esc>MC`

Parameters None

MCL Command - Move Contactless

P310 and P420 Printers offer a means to step Proximity Cards (also called Contactless Cards) forward or backward relative to the Card Sensor.

Syntax `<Esc>MCL p1 p2`

Parameters p_1 = Steps Moved

p_2 = Direction

Where:
0 = Forward
1 = Backward

Example `<Esc>MCL 200 1`

This example places a card 1800 steps past the Card Sensor. (i.e., +OCL Command Default (2000) minus MCL Command p_1 (200) = 1800)

ME Command - Exit Card To Output Hopper

Description Moves and exits a single card from any position to the Output Hopper.

Sent to a P520 Laminator Station, sends a card in the Laminator to the the Output Hopper.

Syntax `<Esc>ME{ p1}`

Parameters p_1 = Number of cards to pass through printer (p_1 omitted specifies a single card)

MF Command - Flip Card

Description Flips a card to opposite side for Duplex Printing

NOTE: For user safety, a card flip requires a closed cover.

For P420:

Card remains in the Card-Flip Assembly.

For P520:

If a card is in the printer, places card in Card-Flip, flips card, and returns card to Print-Ready position.

If no card is in the printer, feeds a card prior to placing a card in Card Flip, flipping card, and returning card to Print-Ready position.

For P720:

If a card is anywhere in Module 2, places the card in Card-Flip and flips card.

If a card is in Module 1, waits for card to arrive in Module 2 and then flips card.

Syntax `<Esc>MF`

Parameters None

Example See +DLAMI Command

MI Command - Input Card To Print Ready Position

Description Moves a card from the Card Input Hopper to the Print Ready position

Syntax `<Esc>MI{ p1}`

Parameters p_1 = None (Moves card to First Station)

p_1 = 1 (Moves card to Laminator Station—P520 and P720 only)

MIB Command - Reverse Card To Print Ready

Description For P310/P320/P420:

Moves a card from beyond the Print Position back to the Print Ready position

For P520:

Sent to Printer, returns a card from beyond the Print Ready position of Printer (not yet in Laminator) to the Print Ready position of Printer

Sent to Laminator, returns a card to Laminate Ready position from beyond Laminator Rollers

Syntax `<Esc>MIB`

Parameters None

MO Command - Exit Card To Output Hopper

Description For P310, P320, and P420:

Moves and exits a single card from any position except the Input Hopper to the Output Hopper.

For P520:

Sent to Printer, ejects a card from anywhere in printer except the Input Hopper to the Output Hopper.

Sent to Laminator, ejects a card in Laminator to the Output Hopper. If no card is present, printer responds ACK.

For S720:

Moves card from the Printer Station to the Laminator Station.

Syntax `<Esc>MO`

Parameters None

MRB Command - Move Card to Rejected Box

P420, P520, and P720 Printers have a Hopper used to collect rejected cards. This command places the card being processed into this box.

Syntax `<Esc>MRB`

Parameters None

MS Command - Move To Smart Card Programmer

Description Moves a card to the Smart Card Docking Station. Card remains in Smart Card Docking Station until a card movement command is sent.

NOTE: Pins 5 and 9 of the DB-9 connector briefly interconnect to signal an external programming device that the card is ready to program.

Syntax `<Esc>MS`

Parameters None

O/vO Commands - Load Single Line Bit-map (Mono.)

Description Downloads a single line of Monochrome Bit-Map Data into a Monochrome Image Buffer. The printer uses a proceeding "G" Command to specify and control the Line Bit-Map placement. An "O" Command specifies the Monochrome Buffer used for Resin Printing, and a "vO" Command specifies a Monochrome Buffer used for Varnish Printing.

Syntax

```
<Esc>Odata{ CHECKSUM}
<Esc>vOdata{ CHECKSUM}
```

NOTE: No space (20 Hex.) exists between the "O" and the "data."

Parameters

data =
Uncompressed or compressed monochrome bit-map data. Data length must match the line length specified in the proceeding "G" command.

See Chapter 1 for the relationship of Monochrome Bit-maps to data.

CHECKSUM =
Single byte of XOR data generated from image data. If CHECKSUM is specified by the related G/vG Command, a Checksum must be included here.

Example Preceding Command is:

```
<Esc>G 200 200 0 2 15 1
```

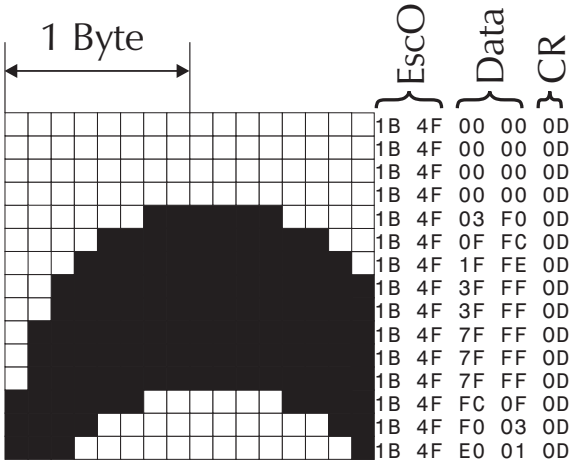
(This "G" Command specifies 15 lines of 2-byte Bit-Map Data)

Remember, any chance Control Characters that appear among the data require a preceding open bracket ([) character. Control Characters include Escape (1B hex), Enter (OD hex), and the Open Bracket (5B hex).

The 15 “O” command lines immediately follow the “G” command as:

“Odata Line1
“Odata Line2
“Odata Line3
etc.

Figure 2-11 Line by Line Image Object & Hexadecimal Code



P/vP Commands - Write Dot (Monochrome)

Description Writes a single monochrome dot to a Monochrome Image Buffer. The " P"command writes to the buffer used for Resin printing. The vP command writes to a buffer used for Varnish printing.

Syntax `<Esc>P` p_1 p_2 p_3
`vP` p_1 p_2 p_3

Parameters p_1 = Horizontal (X-axis) Start Position (X) in dots
p_2 = Vertical (Y-axis) Start Position (Y) in dots
p_3 = Graphic Mode:

Where:

0 = Clear Print Area and load Reverse Bit Map Image

1 = Clear Print Area and load Standard Bit Map Image

2 = Overwrite Previous Bit Map Image in prescribed Dot Locations, without clearing Non-Printing Locations

P205
P210
P310Mono
P310Color
P320
P420
P520
P720
RFID

PS Command - Download Color Image Buffer

Description Initializes and downloads Separated Color Data (C, M, Y, or K) for an associated complete Single-Color Image Buffer.

Syntax <Esc>PS p_1 p_2 *data*

Parameters p_1 = Color image buffer number

Where:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (K_{dye})

p_2 = Data Mode:

Where:
32 = Uncompressed Data - 256 levels (00~FF Hex.)
30 = Compressed Data - 32 levels (00~1F Hex.)

data =
Uncompressed or compressed Color Bit-Map Data for a single separated color.

Where the Color Buffer Maximum is:
655,360 Compressed Bytes

R Command - Reset

Description Reinitializes printer

NOTE: P520 Laminators can be reset by using the <Esc#<Sp>1<sp> Command Direction Sequence.

Syntax `<Esc>R`

Syntax (P520 Laminator) `<Esc># 1 R`

Parameters None

RCBC Command - Reset Rejected Card Box Counter

Description In P420s, P520s and P720s this command resets the counter that keeps track of the number of cards placed in the Rejected Card Box.

Syntax `<Esc>RCBC`

Parameters None

RLOGO Command - Retrieve Logo

Description Allows Logo saved with the DLOGO Command to be used as Card Image Data. Only one Logo can exist, and a new Logo download replaces an old.

Syntax `<Esc>RLOGO {p1}`

Parameters p1 = Optional Logo Name. However, a space <Sp> must follow the command.

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

SF Command - Synchronize Film (Overlaminate)

Description Positions P520 Overlaminate Lamination Ribbon with its black index mark at sensor. This is a first-time ribbon synchronization used to position a die-cut panel a known offset from the Laminator Station of P520 card printers. The command is only required for an initialization just after installing an Overlaminate Ribbon. Subsequent applications of die-cut Overlaminate panels occur via offsets from the previous panel application.

NOTE: A Laminator previously set for the application of Varnish (see TF Command) does not respond to this command.

P520 Syntax `<Esc># 1 SF`

Parameters None

SXY Command - Center Image Maps

Printers without Extended Memory can place images in an area 624-by-1008 dots, which measures slightly smaller than full-card dimensions. In contrast, Extended Memory equips the printers for 646-by-1030 dot images, an area sufficient for full-card images. If one placed a 624-by-1008 dot image using extended memory and no compensation, an off center card image would result. This command serves as a means to center a 624-by-1008 dot image on a card imaged using Extended Memory.

Syntax `<Esc>SXY` p_1

Parameters p_1 = Offset ON or OFF

Where:
0 = Origin Offset of 6 Dots in Both X and Y
1 = No Origin Offset

T/vT Commands - ASCII Text (Monochrome)

Description Downloads a single line of modified ANSI Windows characters as text. See Appendix A for Character Map. The "T" command downloads to the Resin Buffer, and the "vT" command downloads to the Varnish Buffer.

A printer error occurs when text extends beyond the addressable buffer area. The resident fonts derive from proportionally-spaced 100-point Bold and 100-point Normal. Font kerning minimizes characters spacing.

Syntax `<Esc>T` p_1 p_2 p_3 p_4 p_5 p_6 p_7 *data*
`vT` p_1 p_2 p_3 p_4 p_5 p_6 p_7 *data*

Parameters p_1 = Horizontal (X) Start Position in dots

p_2 = Vertical (Y) Start Position in dots (position of lower case descender, if used)

p_3 = Rotation & Origin

Where:

Value	Description	Origin
0	No rotation	Lower Left
1	90 degrees	Lower Left
2	180 degrees	Lower Left
3	270 degrees	Lower Left
4	No rotation	Centered
5	90 degrees	Centered
6	180 degrees	Centered
7	270 degrees	Centered

p_4 = Font selection

Where:
0 = 100 points Normal
1 = 100 points Bold

p_5 = Horizontal (X-axis) Width (before rotation) of Text (data string) Graphic in dots. If the value is zero the text maintains normal font proportions and scales according to the value of the Y-axis (p_6) value.

p_6 = Vertical (Y-axis) Height (before rotation) of Text (data string) Graphic in dots as measured from top of ascender to bottom of decender

Examples:
For 28-point normal, p_6 = 104
For 28-point bold, p_6 = 140

NOTE: With p_5 a "0," fonts maintain normal proportions, and just p_6 determines font size.

p_7 = Graphic Mode:

Where:
0 = Clear Print Area and load Reverse Bit Map Image

1 = Clear Print Area and load Standard Bit Map Image

2 = Overwrite Background Bit Map Image in Printable Dot Locations, leaving Non-Printing Dot Locations alone

data =
A single line of Modified ANSI Text Data. See Appendix A for the font characters supported.

The printer interprets the <Space> Character as a Command Field Delimiter and the <Enter> character as a Command Terminator. However, except as the first character, the <Space> character may be used within a Text Data String without invoking its Delimiter Function.

To use the <Space> character at the beginning of a Text Data Field, the Leading Bracket character ("**[**" Dec. 91 or 5B Hex.) must be added as the first character of the Text String. Also, to print a Leading Bracket Character two Leading Bracket Characters must be entered.

P205
P210
P310Mono
P310Color
P320
P420
•P520
P720
•RFID

TF Command - Film Type

Description Specifies either Overlaminate or Varnish as the type of Ribbon installed in the Laminator Station of P520s

Syntax `<Esc># 1 TF` p_1

Parameters p_1 = Type of Laminator Ribbon

Where:
0 = Varnish
1 = 1-mil Clear Overlaminate
10 = Hologram Varnish
12 = 0.6-mil Hologram Patch
13 = 1-mil Hologram Patch
19 = Full Alternated with Mag. Patches

V Command - Check Printer Type/Version

Description This command serves to check the model (and options) of a printer. Serial Port connected printers respond with a Model Number (all designators included) and Firmware Version.

Parallel Port Connected printers respond via the PAPER ERROR and ERROR/ lines of the Centronics Port.

Syntax `<Esc>V{ p1}`

Parameters p_1 = Optional Configuration Parameter (for Parallel I/O) P310/P320, P420, P520, and P720 Printers)

Where:

None = Returns Printer Type and Firmware Version.
10 = No error if P310/P320
12 = No error if Magnetic Encoder
13 = No error if Smart Card Docking
14 = No error if Card Flip
20 = No error if Edge-to-Edge Printing
50 = No error if Monochrome Printert
70 = No error if P520
80 = No error if P600
81 = No error if P720
90 = No error if printer also has USB Interface

Z/vZ Commands - Load Bit-map (Monochrome)

Description Downloads a Monochrome Bit Map into a Monochrome Image Buffer. The printer uses a preceding "G" Command to specify and control bit-map placement.

The Z command places the bit-map in a buffer used for Resin Printing, and the vZ command places the bit-map in a buffer used for Varnish Printing.

Syntax

```
<Esc>Zdata{ CHECKSUM}
<Esc>vZdata{ CHECKSUM}
```

NOTE: No space (20 Hex.) exists between the "Z/vZ" and the "data."

Parameters

data =
Uncompressed or Compressed Monochrome Bit-Map data. The Bit-Map data must match the size and dimensions specified in the proceeding "G" command.

See Section 1 for the relationship on how Monochrome Bit-Maps relate to data.

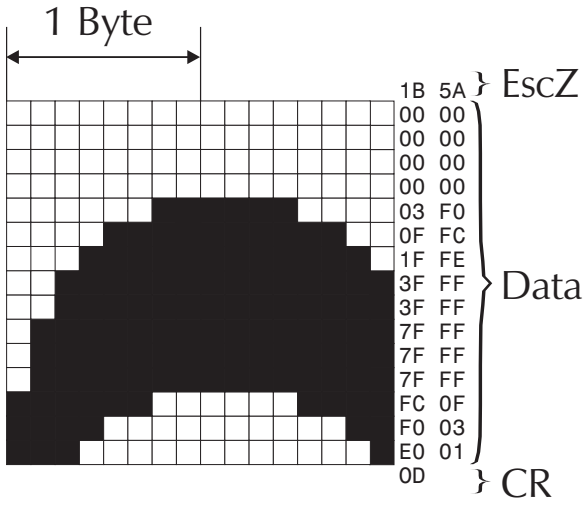
CHECKSUM =
Single byte of XOR data generated from the Image Data. If CHECKSUM is specified by the related G/vG Command, a Checksum must be included here.

Remember, any chance Control Characters that appear among the data require a preceding Open Bracket ([) Character. Control characters include Escape (1B hex), Return (OD hex), and the Open Bracket (5B hex).

Example The following commands and figure shows a "G" Command followed by an associated "Z" Command containing data for the Image Buffer.

```
<Esc>G 200 200 0 2 15 1
<Esc>Z data
```

Figure 2-12 Image Object & Hexadecimal Code



Appendix A

This section contains a listing of all fonts, bar codes, and their respective character sets supported by the EPCL Card Printer Programming Language.

Resident Fonts The Programming Language supports 2 different fonts based on Normal and Bold. The Fonts are proportionally generated by the printer from 100 Point Normal and 100 Point Bold font descriptions.

Hexadecimal - Least Significant Digit	Hexadecimal - Most Significant Digit															
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**A**	**B**	**C**	**D**	**E**	**F**
0	0	16	32	0 48	@ 64	P 80	` 96	p 112	€ 128	144	160	176	À 192	Ð 208	à 224	ð 240
1	1	17	! 33	1 49	A 65	Q 81	a 97	q 113	129	145	161	177	Á 193	Ñ 209	á 225	ñ 241
2	2	18	" 34	2 50	B 62	R 82	b 98	r 114	130	146	162	178	Â 194	Ò 210	â 226	ò 242
3	3	19	# 35	3 51	C 63	S 83	c 99	s 115	131	147	£ 163	179	Ã 195	Ó 211	ã 227	ó 243
4	4	20	$ 36	4 52	D 64	T 84	d 100	t 116	132	148	164	180	Ä 196	Ô 212	ä 228	ô 244
5	5	21	% 37	5 53	E 69	U 85	e 101	u 117	133	149	165	181	Å 197	Õ 213	å 229	õ 245
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118	134	150	166	182	Æ 198	Ö 214	æ 230	ö 246
7	7	23	' 39	7 55	G 71	W 87	g 103	w 119	135	151	167	183	Ç 199	× 215	ç 231	÷ 247
8	8	24	(40	8 56	H 72	X 88	h 104	x 120	136	152	168	184	È 200	Ø 216	è 232	ø 248
9	9	25	) 41	9 57	I 73	Y 89	i 106	y 121	137	153	169	185	É 201	Ù 217	é 233	ù 349
A	10	26	* 42	: 58	J 74	Z 90	j 107	z 122	Š 138	š 154	170	º 186	Ê 202	Ú 218	ê 234	ú 250
B	11	27	+ 43	; 59	K 75	[91	k 108	123	139	155	171	187	Ë 203	Û 219	ë 235	û 251
C	12	28	, 44	< 60	L 76	\ 92	l 109	124	Œ 140	œ 156	172	188	Ì 204	Ü 220	ì 236	ü 252
D	13	29	- 45	= 61	M 77	] 93	m 110	125	141	157	173	189	Í 205	Ý 221	í 237	ý 253
E	14	30	. 46	> 62	N 78	^ 94	n 111	126	142	158	174	190	Î 206	Þ 222	î 238	þ 254
F	15	31	/ 47	? 63	O 79	_ 95	o 112	127	143	Ÿ 159	175	¿ 191	Ï 207	ß 223	ï 239	ÿ 255

Code 39 (Code 3 of 9)

Code 39 encodes Alphanumeric Characters using five bars and four spaces. Of the nine, three are wide. The Ratio (R) determines wide-to-narrow bar and space widths. The minimum for a Narrow Bar or Space is three dots or 0.010 inch (0.254 mm).

Supported Ratios of narrow bar to wide bar widths are:

2:1, 5:2 (2.5:1), and 3:1.

To calculate the full length of a Code 39 Bar Code:

$L = [(C+2) (3R + 7) - 1] X$

Where:

L = Length of Bar Code
C = Number of Characters
R = Ratio of wide to narrow bars
X = Number of Dots times 0.0033 inches per dot (0.0847 mm per dot)
For the 5:2 ratio, the X = Dots times 2

The specified minimum recommended height is 0.25 inches (6.35 mm) or 75 dots. The recommend Quiet Zone is 0.25 inches (6.35mm or 75 dots) or, when larger, 10 times X.

The set of Characters (49) for Code 39 are as follows:

	Hexadecimal - Most Significant Digit								
Hexadecimal - Least Significant Digit		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
	0	0	16	32	0 48	64	P 80	96	112
	1	1	17	33	1 49	A 65	Q 81	97	113
	2	2	18	34	2 50	B 62	R 82	98	114
	3	3	19	35	3 51	C 63	S 83	99	115
	4	4	20	36	4 52	D 64	T 84	100	116
	5	5	21	% 37	5 53	E 69	U 85	101	117
	6	6	22	38	6 54	F 70	V 86	102	118
	7	7	23	39	7 55	G 71	W 87	103	119
	8	8	24	40	8 56	H 72	X 88	104	120
	9	9	25	41	9 57	I 73	Y 89	106	121
	A	10	26	* 42	58	J 74	Z 90	107	122
	B	11	27	+ 43	59	K 75	91	108	123
	C	12	28	44	60	L 76	92	109	124
	D	13	29	- 45	61	M 77	93	110	125
	E	14	30	. 46	62	N 78	94	111	126
	F	15	31	/ 47	63	O 79	95	112	127

Standard 2 of 5 (Code 2/5)

The 2 of 5 Code Symbology encodes all information in the width of the bars. Spaces carry no information . Bars are wide or narrow and the Wide Bars are set by the Ratio (R). Spaces are the same width as the narrow bars.

2 of 5 Code supports the numeric characters:

0 through 9

The supported ratio of narrow bar to wide bar widths are: 2:1, 5:2 (2.5:1), and 3:1.

To calculate the full length of a 2 of 5 Bar Code:

$$L = [C (2R + 8) + 14] X$$

Where:

- L = Length of bar code
- C = Number of characters
- R = Ratio of wide to narrow bars
  (For 5:2, R = 2.5)
- X = Number of Dots times 0.0033 inches per dot
  (0.08847 mm per dot)

For 5:2 ratio, the X = Dots times 2

The specified minimum recommended height of a Code 2/5 Bar Code is 0.25 inches (6.35 mm) or 75 dots. The recommend “Quiet Zone” is 0.25" (6.35mm or 75 dots) or, when larger, 10 times X.

Interleaved 2 of 5 (Code I 2/5)

The name Interleaved 2 of 5 derives from the method used to encode two characters. The Bar Code Symbol pairs two characters, using bars to represent the first character and the interleaved spaces to represent the second character. Therefore, each character has two definitions, one for bars and the other for spaces. Each consists of two wide elements and three narrow elements. Bars and spaces are wide or narrow and the wide bars are set by the Ratio (R).

Interleaved Two of Five Code supports the numeric characters:

0 through 9

The printer automatically adds a leading Zero (0) Character) to Code I 2/5 Bar Codes with an odd number of Bar Code Data Characters.

The supported ratio of narrow bar to wide bar widths are: 2:1, 2:5 (2.5:1), and 3:1.

To calculate the full length of an I 2/5 Bar Code:

$$L = [\ C\ (2R + 3) + 6 + R\ ]\ X$$

Where:

L = Length of bar code
C = Number of characters
R = Ratio of wide to narrow bars (5:2=2.5)
X = Number of Dots times 0.0033 inches per dot (0.08847 mm per dot)

Where:

The minimum recommended height of a Code I 2/5 Bar Code is 0.25 inches (6.35 mm) or 75 dots. Ideally the Bar Code Height should be 15% of the Bar Code Length. The recommend “Quiet Zone” is 0.25" (6.35mm or 75 dots) or, when larger, 10 times X.

UPC-A UPC (Universal Product Code version A) is the basic version of UPC and is usually the version seen on grocery store items in the United States. The symbology encodes 10-digit Universal Product Code numbers. An eleventh digit, at the beginning, indicates the Type of Product, and a twelfth digit is a Module Check Digit.

The UPC Code Number and check digit are assigned by:

Uniform Code Council (UCC)
8163 Old Yankee Rd., Ste. J, Dayton, OH 45458 Phone (513) 435-3870; Fax: (513) 435-4749

UPC-A code supports the numeric characters:

0 through 9

The printer ignores the Ratio Command Parameter (narrow bar to wide bar width).

The equation to calculate the UPC-A Bar Code length is:

$L = (91) X$

Where:
L = Length of bar code
X = Number of Dots times 0.0033 inches per dot (0.08847 mm per dot)

UPC-A Bar Code Height, by specification, is six individual UPC-A bar code characters high. The following equation can be used to calculate the Industry Specified Height in dots.

$H = (42) X$

Where:
H = Height of Bar Code in dots
X = Bar Code Multiplier

Multiply the height of the bar code in dots by 0.0033 inches per dot (0.08847 mm per dot) to get the actual height of the Bar Code .

EAN-8 European Article Numbering, now also called IAN (International Article Numbering), is the International Standard Bar Code for retail food packages, corresponding to the Universal Product Code (UPC) in the United States. The symbology encodes a seven-digit EAN-8 number. The printer automatically generates an eighth Check Digit.

Numerous international agencies assign EAN Code Numbers and Check Digits. See the list at the end of this appendix.

EAN-8 Code supports the numeric characters:

0 through 9

The printer ignores the Ratio Command Parameter (narrow bar to wide bar width).

The equation to calculate the EAN-8 Bar Code Length is:

L = (67) X

Where:
L = Length of bar code
X = Number of Dots times 0.0033 inches per dot (0.08847 mm per dot)

EAN-8 Bar Code Height, by specification, is six (6) individual EAN-8 bar code characters high. The following equation can be used to calculate the Industry Specified Height in dots.

H = (42) X

Where:
H = Height of Bar Code in Dots
X = Bar Code Multiplier

Multiply the height of the Bar Code in dots by 0.0033 inches per dot (0.08847 mm per dot) to get the actual Bar Code Height.

EAN-13 EAN-13 is one of two versions of the European Article Numbering system (EAN) and is a super set of UPC. EAN-13 has the same number of bars as UPC Version A, but encodes a 13th digit. The 12th and 13th digits define the Country Code. The codes 00-04 and 06-09 are assigned to the United States.

Numerous international agencies assign the EAN-13 Code Numbers. See the list at the end of this appendix.

EAN-13 Code supports the numeric characters:

0 through 9

The printer ignores the Ratio Command Parameter (narrow bar to wide bar width).

The equation to calculate the EAN-13 bar code length is:

L = (98) X

Where:
L = Length of Bar Code
X = Number of dots times 0.0033 inches per dot (0.08847 mm per dot)

EAN-13 Bar Code Height, by specification, equals six individual EAN-13 Bar Code Characters. The following equation can be used to calculate the Industry Specified Height in dots.

H = (42) X

Where:
H = Height of Bar Code in dots
X = Bar Code Multiplier

Multiply the height of the Bar Code in dots by 0.0033 inches per dot (0.08847 mm per dot) to get the actual Bar Code Height.

Code 128 Subsets B & C

Code 128 is a high density Alphanumeric Bar Code. Zebra printers in Code 128 B Mode encode single digit alphanumerics as single Bar Code Characters. The printer in Code 128 C Mode encodes two numeric digits as a Single Bar Code Character.

The printer accepts ASCII input data and encodes with a Code 128 Bar Code Value (or digit). The following table shows the Code 128 B Encoded Value and corresponding ASCII Characters supported by the printers. Code 128 C encodes numeric ASCII pairs (i.e., 0 & 5 would encode to the single Code 128 C digit 05. The printers automatically add a leading zero character to data specifying an odd number of Code 128 C Bar Code Characters.

The percentile (%) character must preceed another percentile character to encode.
Example: %% = %

Encoded Value	Code A	Code B	Code C
0	SP	SP	00
1	!	!	01
2	"	"	02
3	#	#	03
4	$	$	04
5	%	%	05
6	&	&	06
7	'	'	07
8	(	(	08
9	)	)	09
10	*	*	10
11	+	+	11
12	,	,	12
13	-	-	13
14	.	.	14
15	/	/	15
16	0	0	16
17	1	1	17
18	2	2	18
19	3	3	19
20	4	4	20
21	5	5	21
22	6	6	22
23	7	7	23
24	8	8	24
25	9	9	25
26	:	:	26
27	;	;	27
28	<	<	28
29	=	=	29
30	>	>	30
31	?	?	31
32	@	@	32
33	A	A	33
34	B	B	34
35	C	C	35
36	D	D	36
37	E	E	37
38	F	F	38
39	G	G	39
40	H	H	40
41	I	I	41
42	J	J	42
43	K	K	43
44	L	L	44
45	M	M	45
46	N	N	46
47	O	O	47
48	P	P	48
49	Q	Q	49
50	R	R	50
51	S	S	51
52	T	T	52
53	U	U	53
54	V	V	54
55	W	W	55
56	X	X	56
57	Y	Y	57
58	Z	Z	58
59	[	[	59
60	\	\	60
61	]	]	61
62	^	^	62
63	_	_	63
64	NUL	`	64
65	SOH	a	65
66	STX	b	66
67	ETX	c	67
68	EOT	d	68
69	ENQ	e	69
70	ACK	f	70
71	BEL	g	71
72	BS	h	72
73	HT	i	73
74	LF	j	74
75	VT	k	75
76	FF	l	76
77	CR	m	77
78	SO	n	78
79	SI	o	79
80	DLE	p	80
81	DC1	q	81
82	DC2	r	82
83	DC3	s	83
84	DC4	t	84
85	NAK	u	85
86	SYN	v	86
87	ETB	w	87
88	CAN	x	88
89	EM	y	89
90	SUB	z	90
91	ESC	{	91
92	FS	|	92
93	GS	}	93
94	RS	~	94
95	US	DEL	95
96	FNC3	FNC3	96
97	FNC2	FNC2	97
98	SHIFT	SHIFT	98
99	CodeC	CodeC	99
100	CodeB	FNC4	CodeB
101	FNC4	CodeA	CodeA
102	FNC1	FNC1	FNC1
103	Start A	Start A	Start A
104	Start B	Start B	Start B
105	Start C	Start C	Start C

The printer ignors the Ratio Command Parameter (narrow bar to wide bar width).

The equation to calculate the Code 128 B Bar Code length is:

$L = [C (11) + 24] X$

Where:

L = Length of bar code
C = Number of characters & checksum character
X = Number of Dots times 0.0033 inches per dot (0.08847 mm per dot)

The equation to calculate the Code 128 C Bar Code Length is:

$L = [(11 C) / 2) + 24] X$

Where:

L = Length of Bar Code
C = Number of characters (rounded up to the next even digit) & checksum character
X = Number of dots times 0.0033 inches per dot (0.08847 mm per dot)

The minimum recommended height of a Code 128 bar code is 0.25 inches (6.35 mm) or 75 dots. Ideally the Bar Code Height should be 15% of the Bar Code Length. The recommend "Quiet Zone" is 0.25 inches (6.35mm or 75 dots) or, when larger, 10 times X.

EAN International Regulation Agencies

General Specifications for the Article Symbol Marking (1987), EAN Prefix List
EAN International (EAN)
Rue Royale 29, B-1000 Bruxelles (Belgium)

Reinhold Van Lennep, Secretary General

prEN 797 Bar coding - Symbology specifications - EAN/UPC
NNI
P.O. Box 5059, NL-2600 GB DELFT
THE NETHERLANDS

ANSI
11 West 42nd Street, 13th floor
New York, N.Y. 10036, USA

Australian EAN Coding Authority
Australian Product Numbering Association, Ltd. (APNA),
Unit 8, 417 Femtree Gully Rd.
Mount Waverlet, Vidoria 3149, Australia

England EAN Coding Authority
Article Numbering Assoc. (UK) Ltd. (ANA)
11 Kingsway
London WC2B 6AR, England

Japan EAN Coding Authority
Distribution Code Center (DCC)
No. 3 TOC-Bldg.7-23-1
Nishigotanda, Shinagawaku, Tokyo 141, Japan

Mexico EAN Coding Authority
Asociacion Mexicana del Codigo de Producto (AMECOP)
Horatio,1855-6O, Col. Polanco, DFCP 11570, Mexico

New Zealand EAN Coding Authority
New Zealand Product Number Association, Ltd.
PO Box 11-110, Wellington, New Zealand

South Africa EAN Coding Authority
South Africa Numbering Association
PO Box 41417, Craighall, 2024, Johannesburg, South Africa

Appendix B

This section contains Status and Error Reporting information for Color and Monochrome Card Printers.

Parallel Port Printer Data Handshake Signal Lines

The Busy and Acknowledge signal lines transfer data to the printer only.

Parallel Port Printer Error Response

The Color Card Printers respond to Error Conditions with combinations of the Error and Paper Error signals at the Parallel Interface. Detailed Error Responses are sent via the Serial Port only.

Paper Error	Error	Description
0	1	No Error
0	0	Syntax Error
1	1	Ribbon End or Empty Feeder
1	0	Mechanical Error
NOTE: To clear an Error, Send: <Esc>.<Enter> (1B 2E 0D Hex)		

Serial Port Printer Data Handshake

Some programs use Acknowledge (ACK) and Not Acknowledge (NACK) to display these communication protocol responses. The ACK response signals Command Accepted, Waiting for Command. The NACK response signals an Error or Check Status condition exists and typically includes a corresponding error or status code. The NACK can also signify an Input Buffer Full condition.

Serial Port Printer Error Response

The printers respond, via the Serial Port, to various conditions with Status and Error Codes.

Status and Error Responses have the following format:

(NACK)05(EOT) - Card in Magnetic Encoder.

Code	Error	Status	Condition
-1	•		Mechanical Error - Printer
01	•		Ribbon Broken/Missing
02	•		Temperature
03	•		Mechanical
04	•		Feeder Empty
05		•	Card In Encoder
06		•	Card Not In Encoder
10	•		Invalid Command or Parameter
11	•		Invalid Coordinates (Image placement)
12	•		Unknown Bar Code Reference
13	•		Unknown Text/Font Reference
14	•		Unknown Command
20	•		Bar Code Data Syntax
21	•		Text Data Syntax
22	•		Graphic Data Syntax
30	•		Graphic Image Initialization - Failed
31	•		Graphic Image Maximum Width Exceeded
32	•		Graphic Image Maximum Height Exceeded
33	•		Graphic Image Data Checksum Error
34		•	Data Transfer Time-out
40	•		Parameter/Syntax
41	•		Mag. Encoder Write
42	•		Mag. Encoder Read/Verify
43	•		Mag. Encoder Mechanical
44	•		Mag. Encoder Not Responding
45	•		1) Magnetic Stripe Missing 2) Card Jam

Appendix C

This section contains information for operation and formatting for the Magnetic Stripe Encoder.

Magnetic Encoders

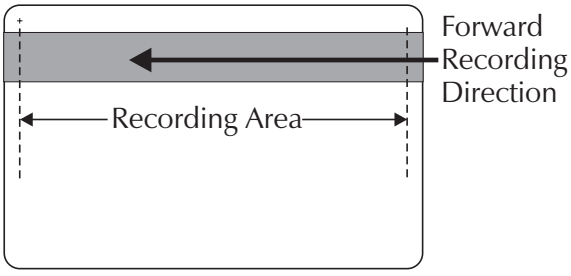
All printers with Encoders write and read ANSI 4.16 and ISO 7811/2/3. Encoder Track Positions are fixed and cannot be modified.

Two Encoder Read Write Head Mounting Options exist:

Below the Card Path—The Standard Mounting that supports down-facing Magnetic Stripes when loading cards

Above the Card Path—An Optional Mounting that supports up-facing Magnetic Stripes when loading cards.

The Read Write Heads are positioned just beyond the Print Head for both options



Encoder Operation

The Encoder executes commands received one at a time. When the encoder receives a command, it performs the requested action and reports the result. The printer cannot execute a new Encoder Command prior to completion of the previous Encoder Command. Detailed Encoder (and general printer) Status Information is reported to the host via an Optional Serial Interface Port only. See Appendix B for a detailed listing of printer and encoder responses.

Write

The Encoder, in default configuration, can write in the forward or reverse directions and then automatically perform a write-verifying data read. The printer then repositions the card to the Print-Ready Position. Note that for ISO encoding, the Encoder attaches the Start, Stop, and LRC characters, which should not be included in data downloads.

Read

The encoder can only read (back to the host) a single track of data at a time. The &L Command performs read-only operations, see Command Reference, page 2-17.

However, the "M or m" Commands can serve as linking operators for several Read Commands. The Encoder performs each command in the string until completion of the Command String. An Error terminates an "M" Command String, while command execution resumes with Error Correction for an "m" Command String. The "M" command concatenates the read data into a single response to the host.

Example of Multiple Read Command String
(Escape and Carriage Returns not shown)

Track 1 *data* = 1111
Track 2 *data* = 2222
Track 3 *data* = 3333

Multiple read command string is:

```
<Esc>M 1 &L1[&L2[&L3
```

Data sent to the host, in a single response:

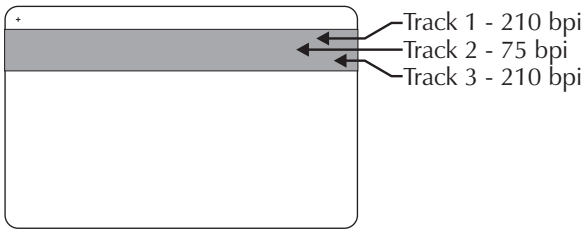
111122223333

Data Errors

The Encoder retries, up to six times, any Read or Write (Write-Verify Read) Operation, before reporting an error.

Encoder Default Configuration

The Encoder reads and writes standard ANSI/ISO Track Data formats in the standard ANSI/ISO Track Locations. The following shows the three standard ANSI/ISO tracks.



Each track can be encoded and decoded with ASCII characters in the standard default ANSI/ISO data formats.

Encoder ANSI/ISO (Default) Track Data Formats

Track	Density	Data Format	Data Characters	Data Separator
1	210 BPI	7 Bit (6 data, 1 parity)	Space $ ( ) - / Enter 0 through 9 A through Z (All Caps)	^
2	75 BPI	5 Bit (4 data, 1 parity)	0 through 9	=
3	210 BPI	5 Bit (4 data, 1 parity)	0 through 9	=

The ANSI/ISO Data Formats include a Preamble (all zeros), a Start Character, Data (7-bit or 5-bit as specified by ANSI/ISO), a Stop character, and a Longitudinal Redundancy Check Character. The 7-bit Data Format has 6 bits of encoded data and a Parity Bit. The 5-bit Data Format has 4 bits of encoded data and a Parity Bit.

The ANSI/ISO Data Formats include a Data Field Separator (or delimiter) that allows parcing of the encoded track data. An example of separate data fields would be the American Bankers Association (ABA) Data Format (normally located on track 2) that includes a Primary Account Number (PAN) Field and an Account Information Field (for Expiration Date, Country Code, etc.).

The Encoder reports a Data Error when the total number of Data Characters exceeds the maximum allowed by physical encoding (bit density) and the data format in any read or write data function.

Basic Commands

All card printers with Encoders, perform the basic functions of reading and writing to ANSI/ISO Track and Data Formats. The commands for these Basic Encoder Functions are as follows:

Basic Encoder Commands		Page
&E	Encode Single Data Track	2-15
&B	Buffer Single Track Data	2-8
&E*	Encode All Data Tracks	2-16
&L	Read Single Track Data	2-17

Advanced Encoder Commands

Printers with Magnetic Stripe Encoders have an Expanded Encoder Command Set. These commands allow programmers to create Custom Data and Track Formats.

The Encoder can be programmed to read and write Custom Data and Formats. The Encoder can be programmed to use Standard ANSI/ISO Data Formats on one or other ANSI/ISO Track Locations. For example, the Encoder can be programmed to read and write ANSI/ISO Track 3 Data Format on Track 1. When in this mode, the Advanced Encoder Commands support encoding of and decoding to host with ASCII Character Data. The Encode automatically adds the selected ANSI/ISO Data Formating. The Encoder reports errors when reading and writing in this mode.

The Encoder does not accept ASCII characters that are not part of the selected ANSI/ISO Data Character Set. See Page C-3 for a table containing the character sets.

The following lists the Advanced Encoder Commands:

Advanced Encoder Commands		
&R	Reset Encoder	2-19
&B	Buffer Track Data	2-8
&L	Read Single Track Data	2-17
&W	Change Encoding Direction	2-22
&D	Change Track Density	2-14
&CDEW	Custom Write Format	2-12
&CDER	Custom Read Format	2-10

The encoder does not write data unless the Read Buffer is programmed to read Identical Data Parameters. Otherwise, an error occurs.

Resetting The Encoder To ANSI/ISO Track Defaults

To ensure a proper Encoder Configuration, the programmer should reset the Encoder to ANSI/ISO Track Data, Format, Density and Location.

Reset the Encoder to ANSI/ISO defaults with the following command sequence.

Example: (Escape and Carriage Returns not shown)

```
<Esc>&R
&CDEW 0 0
&CDER 0 0
```

The encoder stores the Track Settings in Flash Memory. If the Encoder is powered down, the printer retains the last Encoder Read, Write, and Track Density settings.

Change Track Density

The &D Command allows changes in the density of a track. &D Command changes occur to a given track density without changing the related data format or character set. See Command Reference &D, page 2-14, for command details.

Changing Read Configuration

The &CDER command serves to change the Read Data Format Configuration. This command can configure a given track to:

- Its ANSI/ISO Data Format.
- Change it to another ANSI/ISO Track Format.
- Allow Forward or Reverse Data Reads.
- Change to Raw Data format, which has Custom Track Data Formating and Data Block Encoding.

The &L Read Command needs to be configured to read Raw (or hexadecimal) Custom Data.

Changing Write Configurations

The &CDEW Command allows changes to the Read Data Format Configuration. This command can configure a given track to:

- Its ANSI/ISO Data Format.
- Change to another ANSI/ISO track format.
- Change to Raw Data Format having Custom Track Data Format and Data Block Encoding.

The &B Read Command needs to be configured to store to Write Raw (or hexadecimal) Custom Data.

Custom ISO Data

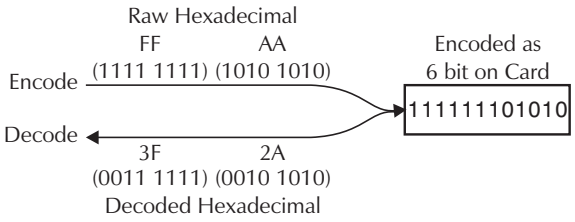
The Encoder can be configured to process ISO Track Data in non-ISO track locations. The printer interprets and processes the ASCII data normally. The Custom Data Control Commands are &D (track density), &CDER (Read Data Format) and the &CDEW (Write Data Format).

The printer automatically read-verifies after a write, so all three commands (&D, &CDER, and &CDEW) must be properly configured to function without reporting a Data Error.

Unique Custom Data Formats

The Encoder is capable of reading and writing non-ANSI/ISO Data. The Data Block and the Track Data String Formatting is "stripped away" and "passed through" the Encoder (and printer) without Error Checking, Encoding, or Decoding. The Host sends and receives Raw Hexadecimal Data Strings.

Each hexadecimal block sent to the Encoder represents a block of Magnetic Card Encoded Data. The Encoder stripes the Most Significant Bits of the Data Blocks off of each Hexadecimal Block.



Raw Hexadecimal Data, when encoded, requires the following elements in the Final Binary Data String:

- **Preamble data**—The minimum number of leading binary "0" bits (i.e., NUL characters). Note: the NUL (00 hexadecimal) is normally sent to the printer with a character like the @ symbol (40 hexadecimal) and is encoded as all zero bits in 6 (or lower) Bit Data Mode.
  75bpi - 20 min., 24 nominal, 1024 max.
  210bpi - 40 min., 68 nominal, 1024 max.
- **Start Bit**—The first binary "1" bit detected starts Data Block Grouping. The LSB (least significant bit) of the first character sited in a data block is the Start Bit.
- **NUL Data Block**—Without NULs enabled, the Encoder terminates the Data String or causes the Data String to restart with a new Start Bit, a Data Block with a "1's" bit.
- **NUL Data Block with NULs enabled**—Allows the inclusion of NUL Data Character Blocks within the data string.
- **Postamble**—binary "0" bits, (i.e., NUL characters) fill remainder of track.

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