AN Eltron COMPANY

Card Printer Programmer's Manual

Eltron

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INTRODUCTION

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

- P300 Monochrome
- P300 Color
- P400 Duplex Color
- P500 Duplex Color with Laminator
- P600 Multiple-Station Duplex Color
- Max3000 Secure Card System

Features All models can print bar-codes in several formats and have resident scaleable font descriptions. Also, except for the Max3000, all models can include a Smart-Card Docking Station. All models are offered with or without a Magnetic Stripe Encoder. A Serial host interface is an option on the P300 and P400 series, where an associated RS-232C setup Command exists. Max3000s all have parallel host ports.

The programming commands control the printing process by color and by ribbon material, allowing overprinting and separate control of various multiple-overlay finishes.

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

P300 Monochrome card printers have a limited command set along with an image buffer sufficient for a one-bit image mapping depth. Only imaging using the thermal transfer methodology can occur. For gray-scale images, host software must produce multiple-dot pixel 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, [$(4 \times 4)^2/16$ + white]).

P300 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 using five-bit-per-dot data for imaging with three associated ribbon panels.

The black panels on Eltron-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, host software must generate multiple-dot pixel matrixes as with the P300 Monochrome.

Standard P300 Color Card Printers have two image buffers—one used for color and another used for monochrome. The single color buffer requires print passes following each of the three downloads associated with full-color dye sublimation imaging. The single monochrome buffer requires print passes following separate downloads for resin black and for overlay varnish in situations that require different bit-maps. However, card areas with resin images not

only require no varnish for the associated ultraviolet protection, but also varnish does not adhere well to resin. 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. Reverse imaging also means that a full-coverage varnish can result from a clear command sent to the monochrome buffer.

P300 Color Printers with Extended Memory installed have the potential for three color buffers and two monochrome buffers. These buffers have the same uses as described for the P300 Color above. However, more buffers means that a high probability exists that data for a complete card image can download in a single host access. With a complete image resident in the printer, multiple card prints can occur at a much faster rate.

P400s have all the same implementations as the P300 Color, including Extended Memory as an option. Because P400s have a Card-Flip assembly, these models respond to commands related to duplex printing.

P500s have all the same implementations as a P400, including Extended Memory, Smart Card stations, and Magnetic Encoders as options. However, P500s also have a Card Laminator station. Laminators serve as heat-transfer devices for material or panels contained on Laminator Ribbons. A variety of these kinds of ribbons exist:

Ribbons with die-cut panels can carry die-cut panel sizes that substantially cover the card, die cuts with cutouts for Smart card contacts, and smaller die cuts that serve to avoid magnetic stripes. Preprinted die cuts can contain security devices such as graphics, holograms, or optically-encoded patches.

Laminators also serve a thermal-transfer function of ribbon coated material instead of the die-cut panels. However, only a total card application can occur. Because the print station can have a dye sublimation ribbon with a varnish panel, many choices exist for selection of protective coatings. Additional commands exist to implement Laminator use.

Whereas P300s and P400s have single CPU boards, P500s employ two—one controls printing and card

feeds (Module 1 operations); the other controls card flips and lamination (Module 2 operations). Because of a master-slave arrangement, Module 1 also receives Laminator commands. However, all commands destined for the Module 2 require a #1 preface, for example:

P600s have two complete Print Station modules (including associated CPU Boards) separated by a Card-Flip assembly. Although controlled by a common parallel host interface, both Print Stations respond to the same command set (with some additional positioning parameters and some differing responses to positioning commands). To simplify memory management, both Print Stations have Extended Memory as a standard feature.

Overall, the same commands apply, but the Card Feed command applies only to the print station attached to the Card Feed assembly (Module 1). Similarly, the Card Flip commands apply only to the Print Station closest to the Card Output (Module 2). A communication protocol serves to direct commands through the common parallel interface lines to either Module.

While not being designed around a master-slave arrangement, Module 2 commands can nevertheless be sent to Module 1. As with P500s, Module 2 commands sent to Module 1 require a #1 preface. Either module can have a Smart-Card Station and/or a Magnetic Stripe Encoder, with an associated command set. However, Eltron recommends Module 1 as the best place to locate these options. Also, the faster path for commands is the direct route.

Max3000 Printer Modules all have Extended Memory Max3000 Systems can include the following:

- Print Station Module
- Laminator and Die Cutter Module
- Magnetic Encoder Module

None of the media used in the other printer models is intended for use in this model. Instead, the following are used:

Cards

The cards placed in the Input Hopper are oversized White Chip Cards, either with or without a Magnetic Stripe and with or without a printable surface.

An additional card material is used. This clear material feeds from a roll, and the printer has a Shear that delivers card-sized sections to the Print Head.

Ribbons

Three imaging ribbons are offered: A YMC ribbon for die sublimation only printing , a YMCKr ribbon for those that need Kr (black resin) imaging on one surface only, and a YMCKrKr ribbon for those that need Kr images to appear on two surfaces.

Also, command destinations can be controlled, as follows:

- ^s_c#SPACE21SPACE*command* directs an associated command to the Magnetic Encoder.
- ^s_c#SPACE11SPACE*command* directs an associated command to the Print Station.

The following describes a typical operation:

A Clear Card feeds first. This card receives color imaging associated with the YMC ribbon panels, and if desired, also from a Kr panel. After imaging, the Clear Card goes to the output of the Print Station.

A White Card feeds next. Any image placed on this card normally depends on the availability of an unused Kr ribbon panel. A YMCKr ribbon used to place black resin image on the Clear Card would not have a Kr panel left for imaging on the White Card without first skipping over a whole set of color panels. For Kr on both cards, a YMCKrKr ribbon should be used.

After receiving any images, the White Card also travels to the output of the Print Station and comes to rest on top of the Clear Card.

The combined cards next travel to the Laminator and Die Cutter assembly. Here the cards get aligned, laminated, and trimmed to the standard card size. The card passes through a heat sink between the Laminator and the Die Cutter. During this transition, a speed setting for card cooling takes effect.

Notably, only up-facing surfaces have received images. After lamination, an inside surface has the image placed on the Clear Card. Viewing from the backside produces a mirrored picture of the Clear Card image.

After lamination and die cutting, the card travels to the Magnetic Stripe Encoder. Except for the command initiator, Encoder commands for this printer duplicate those used for the other printer models. For configurations without the Magnetic Encoder, cards exit the printer after the die cut.

Related Publications:

User's Guide for P300 and P400, (Available in French, German, Italian, Spanish, Chinese, and English versions).

User's Guide for Max3000

Maintenance Manual for P300 and P400 (Available in English Only)

Maintenance Manual for Max3000 (Available in English Only)

Conventions

In this manual, the following conventions apply:

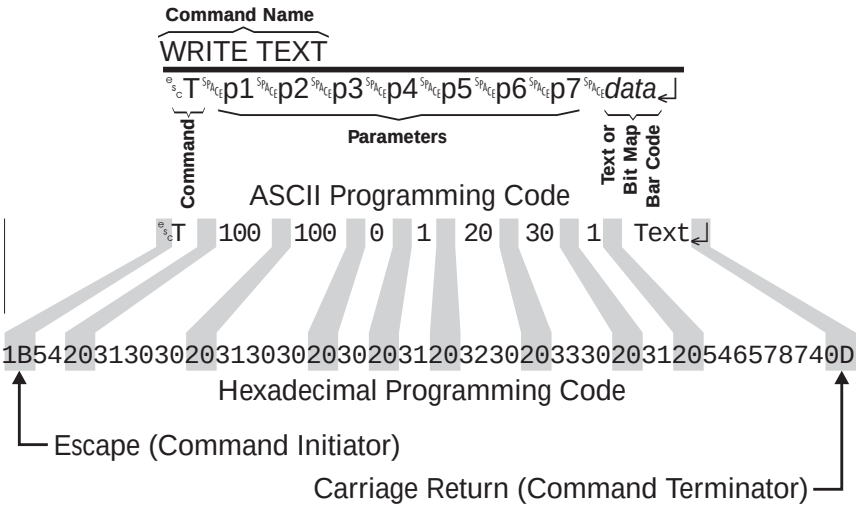
$^{e}{}_{s_c}$	Escape Key (Indicates command characters follow)
$^{Space}{}_{KEY}$	Space Key (Delimiter used to separate commands from parameters and parameters from other parameters)
$p_1 \sim p_n$	Required parameters that follow some commands, separated by space delimiters
$\{p_1 \sim p_n\}$	Optional Parameters
↵	Enter Key (Indicates the end of a Command and Parameter string
→	Command string continues on next line (no line feed at this text wrap)
data	Specifies where to place data in an associated Command String
[	Linking delimiter when used with "M" and "m" commands, which see; Also, placed in front of [, $^{e}{}_{s_c}$, and ↵ to specify data instead of control characters
#	Placed after $^{e}{}_{s_c}$ and followed by number to direct command to other than module receiving command.

Basic Command Syntax

Each command begins with a Command Initiator (the “Escape” character). For some models, directing characters follow the Escape character.

The Command Initiator serves to mark the character(s) immediately following as command characters. Command characters vary between one (1) and five (5) characters (or up to five (5) bytes of hexadecimal data).

Some commands then have one or more additional 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 (13dec. or 0Dhex.). A single Line Feed (LF) character (Dec. 10 or 0A Hex.) is ignored by the printer 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↵
or
COPY *file name.ext* COM1↵

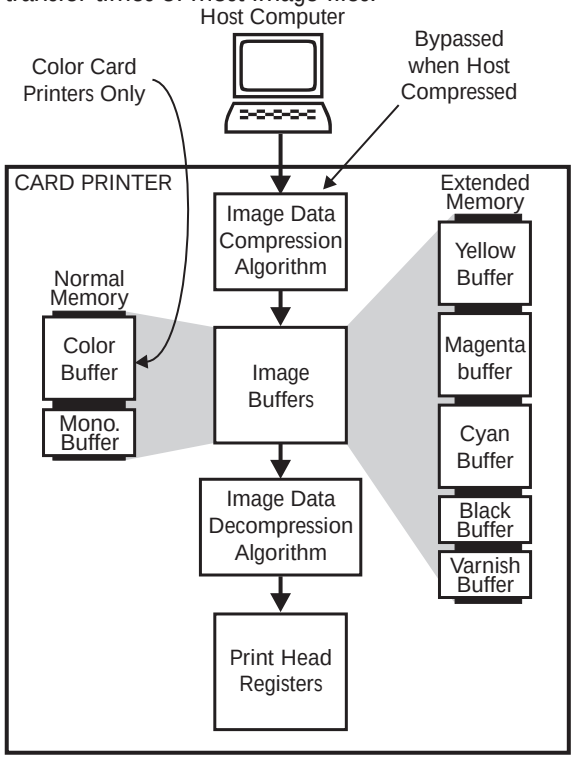
For more information on the use of the COPY command, refer to a DOS software manual.

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.*

Memory Arrangements

Figure 1-1 shows elements involved in image data flow. Note that three 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 Memory Arrangements



Monochrome printers have no color buffers. Color printers without Expanded Memory have single color and monochrome buffers, requiring a print pass after each color download for yellow, magenta, and cyan data, and as stated previously, the same operation for monochrome when black and varnish require different bit-maps. In contrast, Extended Memory makes possible a single download containing commands that specify the contents of all five buffers. For Max3000 printers, which have no varnish requirements, the varnish buffer supplies the bit map for the White Card image.

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 of from zero to 127 repeats.

Rule 2. When low, the most significant bit of a data sequence indicates that the remaining seven bits of the byte specify the number of the following bytes that represent non-repeating image data. However, only from zero to 31 repeats can occur.

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

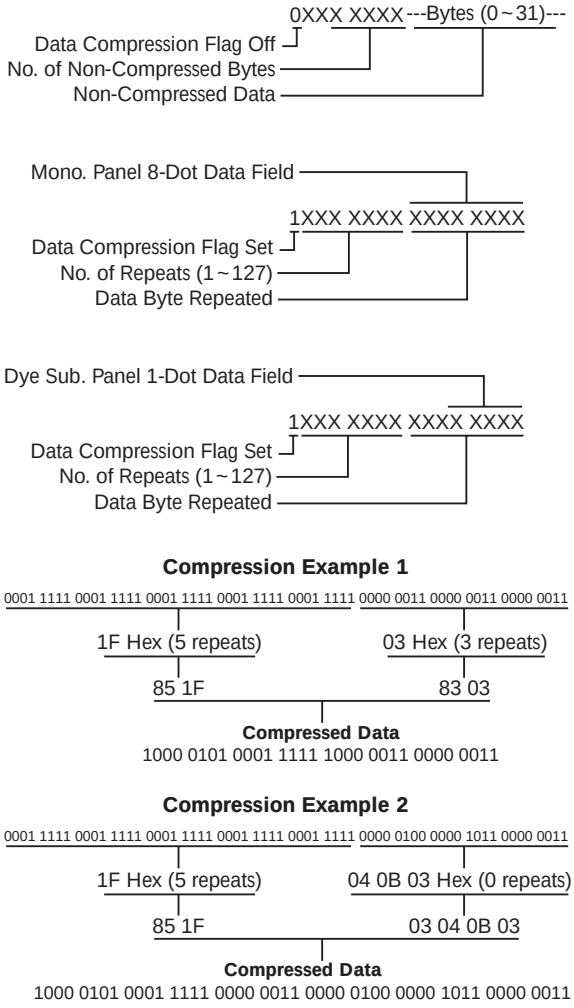


Figure 1-3 shows how a bit-map relates to associated non-compressed data. Figure 1-4 shows the same bit-map in association with compressed data

.

Figure 1-3
Non-Compressed
Bit-Map

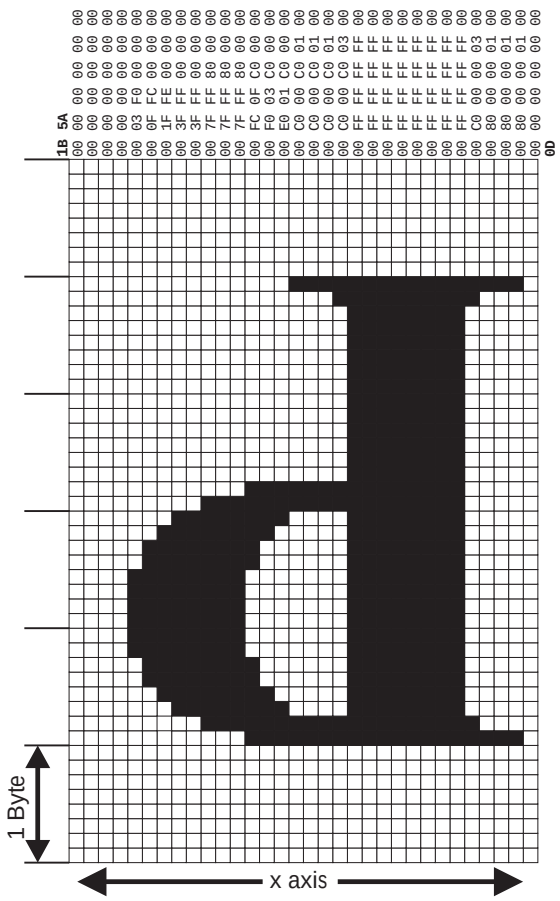
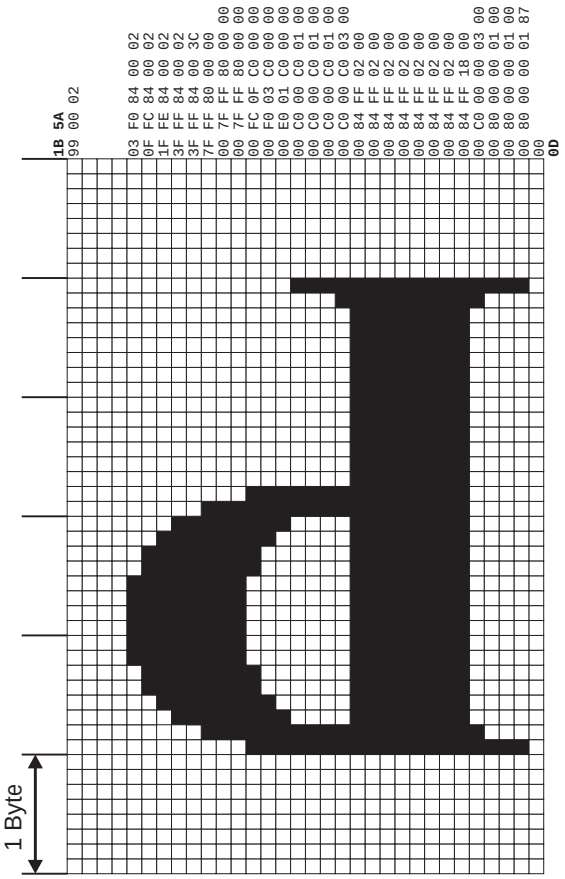


Figure 1-4. Compressed Bit-Map

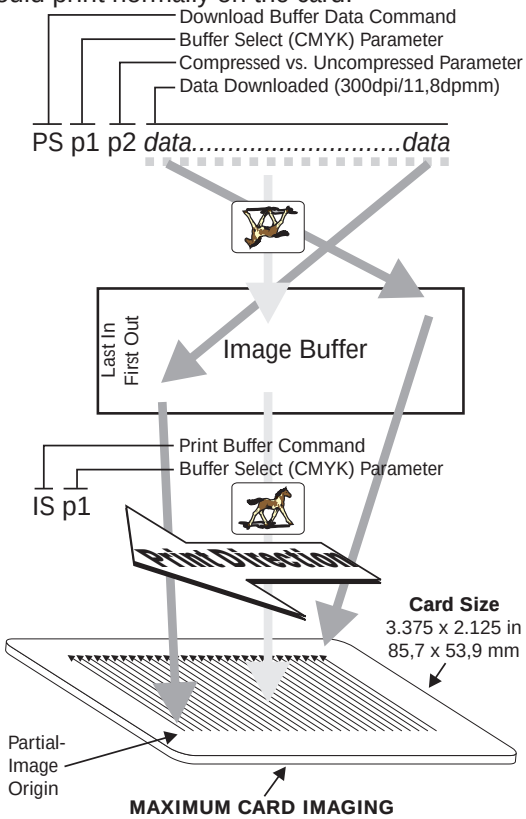


Data-to Card Mapping

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 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



MAXIMUM CARD IMAGING

624 Line Bytes by 1008 Lines (Standard Memory)
640 Line Bytes by 1024 Lines (Extended Memory)

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 Data Considerations

Color data always enters a color image buffer, either as yellow, magenta, cyan, or dye sublimation black. If only one color image buffer exists, 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 five-bit-per-dot imaging.

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. Note that the previous figure shows different full-card image areas for Standard and Extended memory. For proper appearance, color images should not overprint other card printing.

Max3000 Monochrome Data Considerations

Max3000 printers have no need to print varnish. However, the varnish buffer is used for 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.

P300~P600 Monochrome Data Considerations

P300~P600 printers always download monochrome data to a monochrome image buffer. 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 preestablished varnish buffer to apply the varnish coating. 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 proper use of varnish is to protect just the dye sublimation imaging from ultraviolet radiation. Third, because resin needs no varnish protection and resists adhesion to varnish, an inverted-resin bit-map can apply varnish.

The IV command has a parameter setting to produce an inverted data print. In summary, leave the resin buffer unchanged after printing resin. Then, issue an IV command for inverted data 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.

A watermark simulation can result by, in effect, punching holes in the varnish image. 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 the 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

Rotational parameters (clockwise) exist for the following:

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

Monochrome bit-maps require entry of two commands—first an initializing command (G) and then the 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, add zeros where byte bits extend past the boundary specified in the "G" command.

Data is handled in bytes (0~255 decimal 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. Verify that the selected bar code matches a code supported by the scanning equipment.

All the bar codes supported by the card printers have the data characters, 2 quiet zones, and a start and stop character. The bar codes can include human readable font characters 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 human readable text fields must remain within the addressable area of the image buffer. Each one of the bar codes, described in the Command B and Appendix A, 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 given bar code. Additionally, wider bars and spaces increase the depth of field for improved performance with moving-beam lasers and other non-contact scanning devices for a given bar code.

Control Commands

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

Print Controls

1. **Intensity** - Adjusts the amount of heat applied to transfer a maximum intensity color or Monochrome dot.

2. **Contrast** (Color Only) - Adjusts the minimum amount of heat applied when printing the dots at the lowest color setting.

3. **Image Positioning** - Locates the printable image on the card.

4. **Head** - Raises the print head to move the card and lowers it to print. *Not normally required.*

5. **Print Test Cards**

Card Movement

1. **Print Ready** position - The card moves to a position just prior to the card edge sensor.

2. **Exit Card** - The printer exits the card to the Output Hopper or tray. Printers with multiple stations, exit the card to the next station.

3. **Duplex** - Flips the card over using the Card-Flip Assembly, initiated by the 'MF' command.

4. **Ready Smart Card** - Positions the Smart Card under the Smart Card programming station with the contacts on the Smart Card engaged.

5. **Encode Ready** position - The card moves to a position just prior to the magnetic encoding station read/write head.

Ribbon

1. **Reset Ribbon** - Sets the ribbon panel to the first panel (color - yellow panel) or cycles the continuous color Monochrome ribbon.

2. **Select Panel** - Resets, then selects a specific ribbon 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 printing:
   Yellow
   Magenta
   Cyan
   Black
   Clear Varnish or Hologram Transfer
4. Duplex - Flip Card - Option

5. Print Card Backside - Option

   For color printing:
   Yellow
   Magenta
   Cyan
   Black
   Clear Veneer
   Hologram Lamination

6. Eject Card

DO NOT print, veneer or laminate over the magnetic stripe or Smart Card contacts. This can impair subsequent associated read and write operations and must be controlled by the programming.

Batch Processing

The "M" and "m" commands serve as command linking operators. A string of linked commands may execute one (1) time or multiple times. The "[" character acts as delimiter for linked commands in the associated syntax.

For the complete "M" command syntax, and an example, see M/m in the Command Reference,

Port Signals

P300 and P400 printers have a serial port as an option. When so equipped, these printers communicate with the host over an RS-232C interface using ACK/NAK flow control. Parallel ports are the standard configuration. P500, P600, and Max3000 card printers only come with Parallel Ports.

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 signal that the host activates to indicates stable data on the DATA lines

ACK/ (Pin 10) A signal that the printer activates to indicate reception of data. The host drops the STROBE signal in response.

BUSY (Pin 11) A signal that the printer activates to indicate an inability to accept commands due to ongoing processing associated with a previously received command. Note that P500 and P600 card printers have two processors. A BUSY response from one processor does not automatically imply a BUSY at the other processor.

READY (Pin 13) A signal that the printer activates to indicate its availability for reception of 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) Only used by P600 card printers, where a high (1) directs commands to Module 1 (Master) and a low (0) directs commands to Module 2 (Slave).

Error Line Coding

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 . CR (1B 2E 0D Hex)		

COMMAND REFERENCE

This section contains a listing of printer commands required to print, magnetically encode, position to program a Smart Card, and control card movements. The commands are grouped by function. Note that individual commands may not apply to all versions of the printer.

COMMAND	DESCRIPTION	P300 Monochrome	P300 Color	P400 Duplex Color	P500 Laminate	P600 Dual Print	Max3000 Secure	PAGE
Setup Commands								
+O	Offset Start Print Position (X-axis)	•	•	•	•	•	•	2-9
+OY	Offset Start Print Position (Y-axis)	•	•	•	•	•	•	2-10
+EC	Print Length (X-axis)	•	•	•	•	•	•	2-11
!R	Print Head Resistance	•	•	•	•	•	•	2-12
!FF	Set Ribbon Color Sequence		•	•	•	•	•	2-19
+RIB	Ribbon Type		•	•	•	•	•	2-20
+BS	Set Black Speed	•	•	•	•	•	•	2-23
+C	Adjust Thermal Transfer Intensity Level	•	•	•	•	•	•	2-43
+CV	Adjust Overlay Application Intensity Level		•	•	•	•		2-45
+$L	Adjust Independent Color Intensity Level		•	•	•	•	•	2-49
+CH	Adjust Hologram Application Intensity		•	•	•	•		2-53
+$C	Adjust Independent Color Contrast Level		•	•	•	•	•	2-50
+OS	Offset (X-axis) Smart Card	•	•	•	•	•		2-69
Tests								
A	Print Test Card	•	•	•	•	•	•	2-26
IM	Print Color Test Card		•	•	•	•	•	2-24
IMB	Print Test Card	•	•	•	•	•	•	2-25
Initialize Commands								
.	Clears Error Status Lines	•	•	•	•	•		2-5
R	Reset Printer	•	•	•	•	•	•	2-6
F	Clear Monochrome Image Buffers	•	•	•	•	•	•	2-27
$F	Clear Color Bit-maps		•	•	•	•	•	2-46
&R	Reset Encoder	•	•	•	•	•	•	2-55
&W	Change Encoding Direction	•	•	•	•	•	•	2-60
&D	Change Encoder Track Write Density	•	•	•	•	•	•	2-61
&CDER	Custom Encoder Read Density	•	•	•	•	•	•	2-62
&CDEW	Custom Encoder Write Density	•	•	•	•	•	•	2-64
&C	Set Encoder Coercivity	•	•	•	•	•	•	2-67
+B	Serial Interface Rate (Serial I/O)	•	•	•			•	2-70
+X	Change Control Character (Serial I/O)	•	•	•			•	2-72
SF	Synchronize Film (P500 Overlaminate Only)				•			2-75
TF	Film Type (P500 Laminator)				•			2-76

COMMAND	DESCRIPTION	P300 Monochrome	P300 Color	P400 Duplex Color	P500 Laminate	P600 Dual Print	Max3000 Secure	PAGE
+TC	Set Temperature (P500 Laminator)				•		•	2-77
+DLAMI	Set Lamination Configuration (P500)				•			2-78
+VL	Set Lamination Speed (Max3000)						•	2-82
Printer Query Commands								
V	Check Printer Type/Version	•	•	•	•	•	•	2-8
E	Retransmit Last Response (Serial I/O)	•	•	•				2-71
!X	Check Command Initiator (Serial I/O)	•	•	•				2-73
&P	Check Card Present - Encoder (Serial I/O)	•	•	•				2-74
Image Data Download Commands								
G	Initialize Monochrome Graphic	•	•	•	•	•	•	2-28
O/vO	Load Single Line Graphic Dots Download	•	•	•	•	•	•	2-29
Z/vZ	Multiple Line of Graphic Dots Download	•	•	•	•	•	•	2-31
P/vP	Write Dot	•	•	•	•	•	•	2-33
L/vL	Write Line	•	•	•	•	•	•	2-34
C/vC	Write Box	•	•	•	•	•	•	2-35
D/vD	Write Diagonal Line	•	•	•	•	•	•	2-36
T/vT	Write Text	•	•	•	•	•	•	2-37
B/vB	Write Bar Code	•	•	•	•	•	•	2-39
PS	Download Color Image Data		•	•	•	•	•	2-47
GS	Download Color Graphic		•	•	•	•	•	2-48
Card Positioning Commands								
MC	Clear Media Path	•	•	•	•	•	•	2-7
MI	Input Card To Print Position	•	•	•	•	•	•	2-14
MIB	Reverse Card to Print Position	•	•	•	•	•	•	2-15
ME	Exit Card To Output (Hopper)	•	•	•	•	•		2-16
MB	Back Card Into Feeder	•	•	•	•	•	•	2-17
MO	Exit Loaded Card To Output	•	•	•	•	•	•	2-18
MF	Flip-over the card 180° (P400, P500)			•	•	•		2-54
MF	Switch to White Card (Max3000)						•	2-54
&T	Eject Card with Magnetic Encoder Option	•	•	•	•	•	•	2-66
MS	Move Smart Card to Programming Station	•	•	•	•	•		2-68
Print Commands								
IS	Print Card Panel (YMC)		•	•	•	•	•	2-51
I	Print Card Monochrome Panel	•	•	•	•	•	•	2-41
IV	Print Varnish Overlay		•	•	•	•		2-44
IH	Print Hologram Overlay		•	•	•	•		2-52

COMMAND	DESCRIPTION	P300 Monochrome	P300 Color	P400 Duplex Color	P500 Laminate	P600 Dual Print	Max3000 Secure	PAGE
J	Print Multiple Cards “N” times	•	•	•	•	•	•	2-42
Magnetic Stripe Encoder Commands								
&E	Encode Single Data Track	•	•	•	•	•	•	2-56
&B	Buffer Track Data	•	•	•	•	•	•	2-57
&E*	Encode All Data Tracks	•	•	•	•	•	•	2-58
&L	Read Single Track Data	•	•	•	•	•	•	2-59
Miscellaneous Commands								
M/m	Multiple Command Strings	•	•	•	•	•	•	2-13
!M	Move Print Head Up	•	•	•	•	•	•	2-21
!D	Move Print Head Down	•	•	•	•	•	•	2-22

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	

. Command - Clear Error Status

Description Clears the Paper Error (Paper Fault) and Error (Fault) printer return signal status lines.

Syntax ESC . CR

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

R Command - Reset

Description Reinitializes printer—also the Max3000 Printer module.

To reset another Max3000 module, direct the command to the Laminator/Die Cutter Station, or Encoder.

Syntax ^esc R↵

Syntax (Max3000 Laminator) ^esc # SPACE 11 SPACE R↵

Syntax (Max3000 Encoder) ^esc # SPACE 21 SPACE R↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

MC Command - Clear Media Path

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

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 c MC ↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 and firmware version.

Parallel port connected printers respond with NACK when the 'V' command parameter received does not match the configuration. A matching printer parameter code produces an ACK response.

Note that parallel-connected color printers do not report firmware and model. For this information, use the "A" command.

Syntax

p1 = Optional Configuration Parameter (for Parallel I/O)

P300, P400, P500, and P600 Printers

None	SN < 7000 Monochrome printers only.
10	P300CF
12	Magnetic Encoder Installed
13	Smart-Card Docking Installed
14	P400CF
20	Extended Memory Option Installed
30	Magnetic Encoder with expanded encoder command set. (Serial numbers > 5000)
50	Monochrome printer with Parallel or Serial Port (Serial numbers > 7000).
70	P500 Printer
80	P600 Printer

Max3000 Printers

80	Encoder and Laminator
81	Laminator only
82	Encoder only
83	Printer

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+O Command - Print Offset X-axis

Description Alters the horizontal (X-axis) start print offset point, in dots.

Syntax ESC + O p1 ↵

Parameters p1 = Horizontal (X-axis) start print offset, in dots:

Where:

Default (Std Memory) = 10
Default (Max3000) = 10
Default (Expanded Memory = 8
Range = 0 ~ 20

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+OY Command - Print Offset Y-axis

Description Offsets the vertical (Y-axis) start print location in dots.

Syntax ESC + OY SPACE p1 ↵

Parameters p1 = Vertical (Y-axis) offset, in dots

Where:

Default (Standard Memory) = 15
Default (Expanded Memory) = 6
Default (Max3000) = 6

P300 M • P300 C • P400 • P500 • P600 • Max3000

+EC Command - End of Print

Description Specifies a point, beyond which, no card printing occurs. Print stations with associated Extended Memory installed have storage for 1024 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.

Syntax $^{e}{}_{s}{}_{c}$ + EC ^{SPACE}p1↵

Parameters p1 = line count for end-of-print

Where:

default (standard) = 8
default (Max3000) = 0
range = 0 ~ 24

Example The following example sets the End of Print to 8 (the default value).

$^{e}{}_{s}{}_{c}$ + EC ^{SPACE}8↵

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

!R Command - Print Head Resistance

Description Enters manufacture's average resistance that appears on the print head label. Note that replacement to a print head with 10-micron glass can produce faint printing if not offset (typically from 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 ^c:!R SP p1↵

Parameters p1 = Resistance

Where:

p1 range = 1400 ~ 2350

Example In the following example, 1567 ohms is entered based on the print head label.

^c:**!R** SP 1567↵

M/m Commands - Multiple Command

Description Groups and repeats a string of commands "N" 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 error removal.

Note that Max3000s require this kind of command linking for the print-related commands (see Appendix E).

Syntax ESC M SPACE p1 SPACE C1[C2[C3...[Cn↵

Parameters p1 = Number of times to repeat following command string.

C1~Cn = Series of linked commands repeated p1 times. *Note the square bracket ([) delimiters.*

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

ESC M SPACE 3 SPACE 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 tray.

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.

P300 M • P300 C • P400 • P500 • P600 • Max3000

MI Command - Input Card To Print

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

For P600:

Moves card to the Print Ready position of Module 1.

Syntax $^{e}{}_{s}{}_{c}$MI↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

MIB Command - Reverse Card To Card Feeder

Description For P300/P400:

Moves a card from beyond the print position back to the Print Ready position.

For P500/P600:

Sent to Module 1, returns a card from beyond the Print Ready position of Module 1 (not yet in Card Flip of Module 2) to the Print Ready position of Module 1.

Sent to Module 2, returns a card to Laminate Ready position from beyond Laminator of Module 2.

Syntax ESC c MIB ↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	

ME Command - Exit Card To Output Tray

Description Moves and exits a single card from the card feeder or any position to the output tray.

For P500 and P600:

Sent to Module 1, ejects a card anywhere in the card printer.

Sent to Module 2, ejects any card present in Module 2. If no card is present, a Ribbon End or Card-Feed error occurs.

Syntax ESC ME { STX p1 } CR

Parameters p1 = Number of cards to pass through printer.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 tray.

Sent to Module 2 of P500 and P600:

Returns a card in Module 2 to the Module 1 exit point.

Syntax ESC c MB ↵

Parameters None

P300 M • P300 C • P400 • P500 • P600 • Max3000

MO Command - Exit Card To Output Tray

Description For P300 and P400:

Moves and exits a single card from any position including the Input Hopper to the output tray.

For P500:

Sent to Module 1, ejects a card from anywhere in printer including the Input Hopper to the Output Tray.

Sent to Module 2, ejects a card in Module 2 to the Output Tray. If no card is present, printer responds ACK.

For P600:

Sent to Module 1, moves card to Module 2 from any position in Module 1, including Input Hopper.

Sent to Module 2, moves card to Output Tray from any position in Module 2. If no card is present, printer responds ACK.

For Max3000:

Sent before an MF command, sends Clear Card to the Card Assembly Station. Sent after an MF command, sends a White Card to the Card Assembly Station, and if needed, sends the assembled cards to the Laminator and Die Cutter module.

Syntax esc MO↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

!FF Command - Set Ribbon 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!FFSPp1↵

Parameters p1 = Panel detection number where:

Where:

For P300, P400, P500, P600 Printers:

p1 = 0 = Move ribbon to Sync Position, as follows:

Ribbon	Sync Position
YMC	Yellow Panel
YMCKr	Yellow Panel
YMCKrO	Yellow Panel
YMCKrOKr	Yellow Panel
KsO	Mid Overlay
KrO	Mid Overlay

p1 = 1 = Move to next transparent panel, unless already there

p1 = 2 = Move to next non-transparent panel, unless already there

p1 = 3 = Move to beginning of Black (for YMCKrO ribbons only)

For Max3000 Printers:

p1 = 20 = Move to yellow panel (for YMCKrKr ribbons)

p1 = 21 = Move to Yellow panel (for YMCKr_Kr ribbons)

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

+RIB Command - Set Ribbon Type

Description Sets printer operation for either a Standard or one of the nonstandard ribbons, as follows:

- Standard Ribbons:
  Kr (Monochrome)
  YMCKrO
  KsO
  KrO
- nonstandard Ribbons:
  YMCKrOKr
  YMC
  YMCKr
  YMCKrKr
  YMCKr_Kr

Note: Parameter settings associated with this command establish the ribbon positioning that occurs following a long press of the Panel Button.

Syntax ESC + RIB SP p1 CR

Parameters p_1 = Ribbon Type

Where:

0 = Standard Ribbon
10 = 6-Panel Ribbon (YMCKrOKr)
11 = 3-Panel Ribbon (YMC)
13 = 4-Panel Ribbon (YMCKr)
20 = 5-Panel Ribbon (YMCKrKr)
21 = 5-Panel Ribbon w/spaced Kr (YMCKr_Kr)

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

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

!M Command - Move Print Head Up

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

Syntax ESC!M↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

!D Command - Move Print Head Down

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

Syntax ESC!D↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+BS Command - Set Black Speed

Description Optimizes Resin printing for either quality or print speed.

Syntax ESC + BS SPACE p1 ↵

Parameters p1 = Speed

Where:

0 = High Speed Printing
1 = High Quality Printing

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

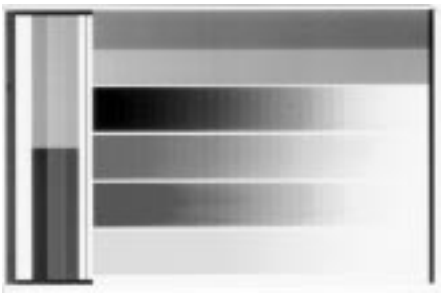
IM Command - Print Color Test Card

Description Prints a card with a color test pattern.

Syntax ESC IM ↵

Parameters None

Figure 2-1
Color Test Card



P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

IMB Command - Print Black Test Card

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

Syntax ESC c IMB ↵

Parameters None

Figure 2-2 Print Black Test Card

• P300 M
• P300 C
• P400
• P500
• P600
• Max3000

A Command - Print Test Card

Description Prints a standard test card with printer parameters, version number, and test pattern. Max3000s print two cards—one for the Printer the other for the Laminator (if connected).

Syntax $^{e}{}_{s}{}_{c}$A{$^{S}{}_{PACE}$p1}↵

Parameters p1 = Test Card
Where:
None = Standard Test Card(s) (Includes a Test Card for each Max3000 Module connected)
1 = Printer Test Card
2 = Magnetic Encoder Test Card
3 = Lamination Test Card

Figure 2-3 Standard Monochrome Test Card

Figure 2-4 Standard Color Test Card

Figure 2-5 Max3000 Printer and Laminator Card Pair

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

F 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

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

G Command - Initialize Monochrome Graphic (B/W)

Description Initializes Monochrome graphic area by defining the height, width and position of the graphic.

Syntax ESC G SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 ↵

Parameters

p1 = Horizontal (X-axis) start position (X) in dots.

p2 = Vertical (Y-axis) start position (Y) in dots.

p3 = 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

p4 = Vertical (Y-axis) height of graphic in bytes.
Round up the number of bytes loading in multiples of 8 bits (i.e. Monochrome dots).

p5 = Horizontal (X-axis) width of graphic in dots (i.e. horizontal lines).

p6 = Graphic Mode:

Value	Description
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.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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

Description Loads a single line of Monochrome bit-map data into a monochrome image buffer. The printer uses the proceeding "G" command to specify and control the line bit-map placement. The "O" command specifies the Monochrome Buffer used for Resin printing, and the vO command specifies the Monochrome Buffer used for Varnish printing.

Syntax ^[c]O*data*{SPACE}CHECKSUM}↵
^[c]vO*data*{SPACE}CHECKSUM}↵

Note: NO space (20 Hex.) exists between the "O" and the "data."

Parameters *data* = Uncompressed or compressed Monochrome bit-map data. Data length should match the line length as 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*.

Example Proceeding Command is:

^[c]G SPACE 200 SPACE 200 SPACE 0 SPACE 6 SPACE 32 SPACE 1↵

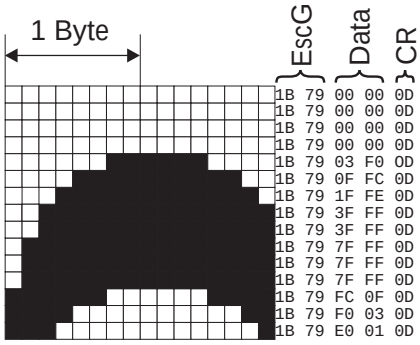
(This "G" command specifies 32 lines of 6-byte bit-map data)

Remember, any chance control characters that appear among the data require a preceding open bracket ([) character. Control characters include Escape (1Bhex), Return (ODhex), and the Open Bracket (5Bhex).

The 32 “O” command lines immediately follow the “G” command as:

“O*data*Line1↵
“O*data*Line2↵
“O*data*Line3↵
etc.

Figure 2-6 Line by Line Image Object & Hexadecimal Code



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

Description Loads a monochrome bit-map into a monochrome image buffer. The printer uses the proceeding "G" command to specify and control the 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

$^{e}{}_{s}{}_{c}$Z*data*{CHECKSUM}↵
$^{e}{}_{s}{}_{c}$vZ*data*{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 dimension 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.

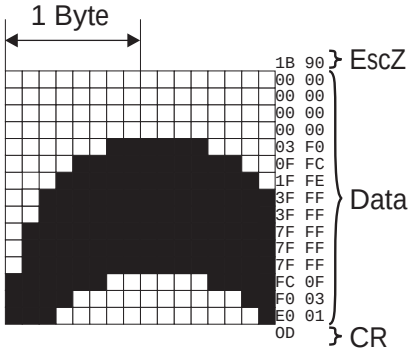
Remember, any chance control characters that appear among the data require a preceding open bracket ([) character. Control characters include Escape (1Bhex), Return (ODhex), and the Open Bracket (5Bhex).

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

Example The following command and figure show a “G” command with an associated “Z” command containing data for the image buffer.

```
esc G SPACE 200 SPACE 200 SPACE 0 SPACE 6 SPACE 32 ↵
esc Zdata ↵
```

Figure 2-7 Image Object & Hexadecimal Code



P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 SPACE p1 SPACE p2 SPACE p3 ↵

Parameters p1 = Horizontal (X-axis) start position (X) in dots.

p2 = Vertical (Y-axis) start position (Y) in dots.

p3 = Graphic Mode:

Value	Description
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.

• P300 M
• P300 C
• P400
• P500
• P600
• Max3000

L/vL Command - Write Line (Monochrome)

Description Writes 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 $^{e}{}_{s}{}_{c}L^{SPACE}\ p1^{SPACE}\ p2^{SPACE}\ p3^{SPACE}\ p4^{SPACE}\ p5\hookleftarrow$

Parameters

p1 = Horizontal (X-axis) start position (X) in dots.

p2 = Vertical (Y-axis) start position (Y) in dots.

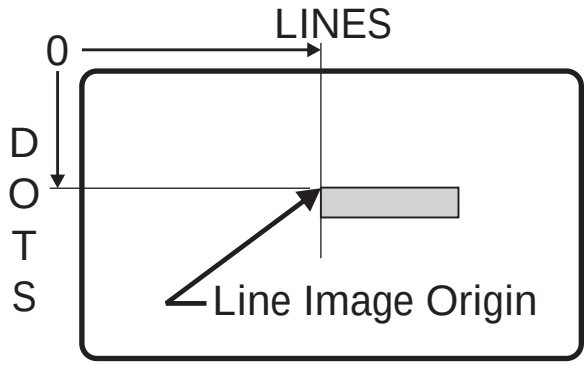
p3 = Horizontal (X-axis) width of graphic in dots (i.e. horizontal lines).

p4 = Vertical (Y-axis) height of graphic in dots.

p5 = Graphic Mode

Value	Description
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 2-8 Line /Rectangle Image Positioning



P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 ↵
ESC vC SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 ↵

Parameters

p1 = Horizontal (X-axis) start position in dots.

p2 = Vertical (Y-axis) start position in dots.

p3 = Horizontal (X-axis) width of graphic line in dots (i.e. horizontal lines).

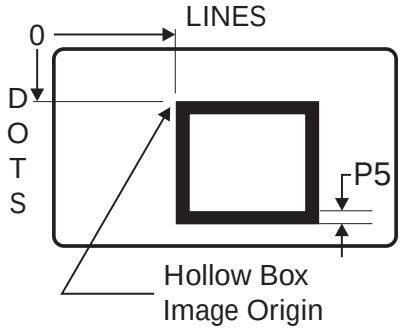
p4 = Vertical (Y-axis) height of graphic line in dots.

p5 = Thickness/width of diagonal graphic line in dots.

p6 = Graphic Mode

Value	Description
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 2-9 Hollow Box Image Positioning



• P300 M
• P300 C
• P400
• P500
• P600
• Max3000

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 $^{e}{}_{s}{}_{c}$D ^{SPACE}p1 ^{SPACE} p2 ^{SPACE} p3 ^{SPACE} p4 ^{SPACE} p5 ^{SPACE} p6 ^{SPACE} p7↵

Parameters

p1 = Horizontal (X-axis) start position, in dots.

p2 = Vertical (Y-axis) start position, in dots.

p3 = Horizontal (X-axis) width of graphic, in dots.

p4 = Vertical (Y-axis) height of graphic, in dots.

p5 = Thickness/width of the line, in dots.

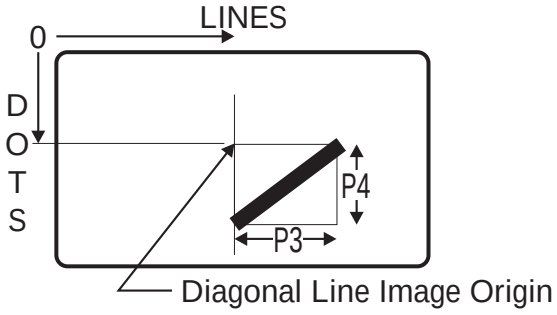
p6 = Rotation & Origin:

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

p7 = Graphic Mode:

Value	Description
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 2-10 Diagonal Line Values



P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 Arial Bold and 100-point Arial Normal. Because of kerning, characters spacing is minimized.

Syntax ^{esc}T^{SPACE} p1^{SPACE} p2^{SPACE} p3^{SPACE} p4^{SPACE} p5^{SPACE} p6^{SPACE} p7^{SPACE}*data*$_{\hookleftarrow}$

^{esc}vT^{SPACE} p1^{SPACE} p2^{SPACE} p3^{SPACE} p4^{SPACE} p5^{SPACE} p6^{SPACE} p7^{SPACE}*data*$_{\hookleftarrow}$

Parameters p1 = Horizontal start position (X) in dots.

p2 = Vertical start position (Y) in dots.

p3 = Rotation & Origin

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

p4 = Font selection

Value	Description
0	Arial, 100 points “Normal”
1	Arial, 100 points “Bold”

p5 = Horizontal (X-axis) width (before rotation) of text (data string) graphic in dots. If the value is zero (0) the text maintains normal font proportions and scales according to the value of the Y-axis (p_6) value.

p6 = Vertical (Y-axis) height (before rotation) of text (data string) graphic in dots.

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.

p7 = Graphic Mode:

Value	Description
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.

data = Represents a single line modified ANSI text data field. See Appendix A for a supported character font map.

The printer interprets the **Space** character as a command field delimiter and the **Carriage Return** character as a command terminator. However, except as the first character, the **Space** character may be used within a text data string.

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.

B/vB Command - Write Bar Code

Description This command is used to print standard bar codes. See Appendix A for character maps and unique parameter settings for each bar code type.

Syntax $^{e}{}_{s}{}_{c}$B ^{SPACE} p1 ^{SPACE} p2 ^{SPACE} p3 ^{SPACE} p4 ^{SPACE} p5 ^{SPACE} p6 ^{SPACE} p7 ^{SPACE} p8 ^{SPACE}*data*↵

Parameters p1 = Horizontal (X-axis) start position, in dots

p2 = Vertical (Y-axis) start position, in dots.

p3 = Rotation:

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

p4 = Bar Code selection - *See Appendix A*

Value	Bar Code Type
0	Code 39 (3 of 9) (alphanumeric)
1	2/5 Interleaved (Numeric, Even No.)
2	2/5 Standard (Numeric)
3	EAN8 (Numeric, 7 digits encoded)
4	EAN13 (Numeric, 12 digits encoded)
5	UPC - A (Numeric, 12 digits encoded)
6	Reserved for MONARCH
7	Code 128 C without check digits ***** (Numeric Only, Even Number Printed)
107	Code 128 C with check digits ***** (Numeric Only, Even Number Printed)
8	Code 128 B without check digits * (**alphanumeric)**
108	Code 128 B with check digits * (**alphanumeric)**
* -Not supported by some Monochrome printer models	

p5 = Bar width ratio:

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.

p6 = Bar code bar width multiplier. Range 3 ~ 9 for all Privilege 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.

p7 = Bar code height in dots.

Note: Each bar code type has an industry specified minimum height standard. See Appendix A for optimal values.

p8 = Print human readable code. Acceptable values are 1 = yes or 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.

I Command - Print Monochrome Graphics

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 tray (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

Parameters p1 = *Optional Command Parameter*

Print Options

Value	Description
None	Prints Monochrome image buffer and Ejects card.
10	Prints card and returns the card to the print ready position.
20	*For Ribbons with Monochrome (1 panel) and clear veneer (1 panel) with printer firmware versions 2.00 and above* - Prints card and returns the card to the print ready position. Also, if appropriate, synchronizes multiple-panel ribbon for the next print pass. For P500's using YMCKOK ribbon, the card ejects after the last application of either Kr or laminate, and a prior +DLAMI command determines whether or not the I 20 command invokes lamination.
30	Print Card but leave in place (Allows preparation for Module 2 with Module 2 BUSY in P600s.

P300 M
P300 C
P400
P500
P600
Max3000

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.

P600:

P600 Printers do not respond to this command.

Syntax $^{e}{}_{s}{}_{c}J^{S}{}_{P}{}_{A}{}_{C}{}_{E}p1\hookleftarrow$

Parameters p1 = Number of cards to print.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+C Command - Adjusts Monochrome Intensity

Description Sets the Monochrome ribbon 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 + C SPACE p1 ↵

Parameters p1 = Intensity

Where:

Printer Default = 3
Range = 0 ~ 10

P300 M
• P300 C
• P400
• P500
• P600
Max3000

IV Command - Print Clear Veneer

Description This command serves either to print the entire addressable image buffer or to reverse print with the clear veneer 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 tray (hopper) or repositioned to print more ribbon panels for models that support the hologram, lamination, or the 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 $^{e}{}_{s}{}_{c}$IV{$^{S}{}_{P}{}_{A}{}_{C}{}_{E}$p1}↵

Parameters p1 = *Optional Command Parameter*

Print Options

Value	Description
None	Prints 100% of image buffer with the clear veneer material and ejects card.
1	Prints the inverse of the image buffer data and ejects card.
10	Prints card and returns the card to the print ready position.
11	Print inverse of image buffer and return card to print ready position.
30	Print card, but leave in place (facilitates advancing card in Module 1 in preparation for not BUSY in Module 2 (P500s and P600s).
31	Similar to 30, but print inverse image.

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

+CV Command - Adjust Clear Veneer 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 SP p1 ↵

Parameters p1 = Intensity

Where:

Default = 3
Range = 0 ~ 10

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

$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

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

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 SPACE p1 SPACE p2 SPACE *data* ↵

Parameters

p1 = Color image buffer number:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Thermal Transfer Black (K)

p2 = Data Mode:
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 maximums are:
628,992 Compressed Bytes (Standard Printer)
655,360 Compressed Bytes (Extended. Memory)

P300 M
• P300 C
• P400
• P500
• P600
• Max3000

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 $^{e}{}_{s}{}_{c}$GS^{SPACE} p1^{SPACE} p2^{SPACE} p3^{SPACE} p4^{SPACE} p5^{SPACE} p6^{SPACE} *data*↵

Parameters

p1 = Color image buffer number:
0 = Yellow (Y)
1 = Magenta (M)
2 = Cyan (C)
3 = Dye Sublimation Black (K)

p2 = Data Mode:
32 = Uncompressed Data - 256 levels (00-FF Hex.)
30 = Compressed Data - 32 levels (00-1F Hex.)

p3 = Horizontal (X-axis) start position, in dots.

p4 = Vertical (Y-axis) start position, in dots.

p5 = Horizontal (X-axis) width of graphic, in dots (i.e. horizontal lines).

p6 = Vertical (Y-axis) height of graphic, in bytes.

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

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

+$L Command - Adjust Color Intensity

Description Sets the maximum color intensity (heat) level applied to a selected dye sublimation ribbon panel.

Syntax ESC + $L SPACE p1 SPACE p2 ↵

Parameters

p1 = Color image buffer number:

Where:

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

p2 = Intensity

Where:

Printer Default = 5
Range = 0 ~ 10

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+$C Command - Adjust Color Contrast

Description Sets the range from the maximum to the minimum color intensity (heat) level applied to a selected dye sublimation ribbon panel.

Syntax

Parameters p1 = Color image buffer

Where:

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

p2 = Contrast:

Where:

Printer Default = 5
Range = 0 ~ 10

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	•

IS Command - Print Color Graphic

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 KsO ribbon.

Syntax ESC IS SP p1 ↵

Parameters p1 = Color image buffer number:

Where:

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

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

P300 M
• P300 C
• P400
• P500
• P600
Max3000

IH Command - Print Hologram

Description This command serves to print the entire address able 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 tray (hopper) or repositioned to print more ribbon panels for models that support the duplex option.

The ribbon panel advances during printing such that the next panel is ready to print.

Syntax $^{e}{}_{s_c}$IH{^{SPACE}p1}↵

Parameters p1 = *Optional Command Parameter, as follows:*

Print Options

Value	Description
None	Prints 100% of image buffer as hologram lamination and ejects card.
1	Prints the inverse of the image data to card and ejects card.
10	Prints card and returns the card to the print-ready position.

P300 M	P300 C	P400	P500	P600	Max3000
	•	•	•	•	

+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 SPACE p1 ↵

Parameters p1 = Intensity

Where:

Printer Default = 5
Range = 0-10

P300 M
P300 C
P400
P500
P600
Max3000
• • •

MF Command - Rotate Card To Duplex

Description Flips the card 180° for duplex printing.

Note that for user safety, a card-flip requires a closed cover.

For P400:

Card remains in the Card-Flip Assembly.

For P500:

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 P600:

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.

For Max3000:

No flip occurs. Instead, white card printing is initiated.

Syntax <esc>MF↵

Parameters None

Example See +DLAMI Command (Omit +DLAMI for P400)

P300 M • P300 C • P400 • P500 • P600 • Max3000

&R Command - Reset Magnetic Encoder

Description Clears the magnetic encoder command and data buffers.

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

Note: To send this command directly to the Max3000 Encoder, use an $^{e}{}_{s}{}_{c}$*#21*$^{S}{}_{P}{}_{A}{}_{C}{}_{E}$*&R*↵ *instead of just an Escape.*

Syntax $^{e}{}_{s}{}_{c}$&R↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&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.

Note: To send this command directly to the Max3000 Encoder, use an ^{esc}*#*^{SP}*21*^{SP} *Initiation instead of just an Escape.*

Syntax ^{esc}&Ep1^{SP}*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.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&B Command - Write Buffer Single Track

Description Load data into the write buffer for a single selected track of encoding.

Note: To send this command directly to the Max3000 Encoder use an ESC # SPACE *21* SPACE *Initiation instead of just an Escape.*

Syntax ESC &B SPACE p1 SPACE *data* ↵

Parameters p1 = Encoding Physical Track Number.
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 p1 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	SPACE $ ( ) - . / 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	*

* - For encoders with printer serial number 5000 and greater, see Appendix C for extended encoder command set and custom track data and control parameters.

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

P300 M • P300 C • P400 • P500 • P600 • Max3000

&E* Command - Write Track Buffers

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

The printer feeds a card (if a card is not loaded) and magnetically writes data (stored in memory) to the pre-selected ISO track(s). The card automatically repositions and read-verifies the encoded data. The card then is repositioned to the print ready position. The encoder data buffer is cleared for the next operation.

Note: To send this command directly to the Max3000 printer use an esc # SPACE 21 SPACE *Initiation instead of just an Escape.*

Syntax esc&E*↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&L Command - Read Single Track

Description Reads data for a single track from a magnetic card.

Note: To send this command directly to the Max3000 Encoder use an ESC # SPACE 21 SPACE Initiation instead of just an Escape.

Syntax ESC&Lp1

Parameters p1 = Track Number.
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: p1 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	SPACE $ ( ) - . / 0 through 9 A through Z (All Caps)	^	76
2	0 through 9	=	37
3	0 through 9	=	104
SPACE11	Hexadecimal*	N/A	*
SPACE12	Hexacedimal*	N/A	*
SPACE13	Hexadecimal*	N/A	*
* - For encoders with printer serial numbers 5000 and greater, see Appendix C.			

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

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&W Command - Change Encoding Direction

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

Note: To send this command directly to the Max3000 Encoder, use an ESC#SPACE21SPACE *Initiation instead of just an Escape.*

Syntax ESC&WSPACEp1↵

Parameters p1 = Direction Select, as follows:

Value	Description
0	Forward
1	Reverse

&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). The card printer can operate with both interfaces attached and communicating with the printer.

Description Change an individual track data encoding and decoding density.

Note: To send this command directly to the Max3000 Encoder, use an esc#SPACE21SPACE Initiation instead of an Escape.

Syntax esc&DSPACEp1SPACEp2↵

Parameters p1 = Track Select, as follows:

Value	Description
1	Track 1
2	Track 2
3	Track 3

p2 = Density Select, as follows:

Value	Description
75	75 bpi
210	210 bpi

&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. The card printer can operate with both interfaces attached and communicating with the printer.

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.

Note: To send this command directly to the Max3000 Encoder, use an $^{e}{}_{s}{}_{c}$*#* ^{SPACE}*21* ^{SPACE} *Initiation instead of just an Escape.*

Syntax

$^{e}{}_{s}{}_{c}$&CDER ^{SPACE}p1 ^{SPACE}p2↵ ←ISO Data
$^{e}{}_{s}{}_{c}$&CDER ^{SPACE}p1 ^{SPACE}p2 ^{SPACE}p3↵ ←Raw Data

Parameters

p1 = Track Select: (values 1, 2, 3, or 0 (zero)).
where:
0 resets ALL tracks to ISO default configuration parameters.

p2 = 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.	

p2 = 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

p3 = 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.

P300 M • P300 C • P400 • P500 • P600 • Max3000

&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. The card printer can operate with both interfaces attached and communicating with the printer.

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.

Note: To send this command directly to the Max3000 Endoder, use an $^{e}{}_{s}{}_{c}$*#* ^{SPACE}*21* ^{SPACE} *Initiation instead of just an Escape.*

Syntax

$^{e}{}_{s}{}_{c}$&CDEW^{SPACE}p1^{SPACE}p2↵ ←ISO Data
$^{e}{}_{s}{}_{c}$&CDEW^{SPACE}p1^{SPACE}p2^{SPACE}p3↵ ←Raw Data

Parameters

p1 = Track Select: (values 1, 2, 3 or 0 (zero))
Where:
0 resets ALL tracks to ISO default configuration parameters.

p2 = 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.	

p2 = 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

p3 = 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 data write process has completed.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&T Command - Mag. Encoder - Eject Card

Moves and exits a single card from any position between the card feeder to the output tray.

Note: To send this command directly to the Max3000 Encoder, use an ESC # SPACE 21 SPACE Initiation instead of just an Escape.

Syntax ESC &T ↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

&C Command - Set Coercivity

Description This command sets the Encoder to record on either High- or Low-Coercivity magnetic stripes.

Note: Recognition of this command requires an Encoder board that can change between high and low coercivity.

Note: To send this dommand directly to the Max3000 Encoder, use an ESC#SYN21SYN Initiation instead of just an Escape.

Syntax ESC&CSYNp1

Parameters p1 = Coercivity
Where:
0 = Low
1 = High

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	

MS Command - Move To Smart Card Programmer

Description Moves a card to the Smart Card programming station.

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

Syntax ^esMS↵

Parameters None

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•	•	•	•

+OS Command - Smart Card Y-axis Offset

Description Offsets the horizontal (X-axis) Smart Card programmer location in dots.

Syntax ESC + OS SPACE p1 ↵

Parameters p1 = Horizontal start position (X) in dots

Where:

Default = 96
Range = 0 ~ 192

• P300 M
• P300 C
• P400
P500
P600
• Max3000

+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). The card printer can operate with both interfaces attached and communicating with the printer.

Description This command changes the baud rate of printers with serial interfaces.

Syntax $^{e}s_{c}$ +B{ ^{SPACE}p1}↵

Parameters p1 = Serial Interface Baud Rate Options, as follows:

Select	Baud Rate
0	9600 (Default)
1	19200
2	38400

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•			•

E Command - Retransmit Last Response

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 the printer's parallel interface. The card printer can operate with both interfaces attached and communicating with the printer.

Description This command directs the printer to repeat the last status message.

Syntax ^cE↵

Parameters None

• P300 M
• P300 C
• P400
P500
P600
• Max3000

+X Command - Change Command Initiator

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 the printer's parallel interface. The card printer can operate with both interfaces attached and communicating with the printer.

Description This command adds an alternate command initiation character. Some host systems cannot transmit an Escape command character. The printer then responds to both the Escape character and the added command initiation character.

Syntax $^{e}{}_{s_c}$ +X $^{SP_{A_{CE}}}$p1↵

Parameters p1 = A single ASCII character

Where:

Decimal = 33 ~ 255
Hexadecimal = 21 ~ FF

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.

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•			•

!X Command - Check Command Initiator

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 the printer's parallel interface. The card printer can operate with both interfaces attached and communicating with the printer.

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

P300 M	P300 C	P400	P500	P600	Max3000
•	•	•			•

&P Command - Check Card Present - Encoder

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 the printer's parallel interface. The card printer can operate with both interfaces attached and communicating with the printer.

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 response:

(NACK)05(EOT) - *Card in magnetic encoder.*

(NACK)06(EOT) - *Card not in magnetic encoder.*

SF Command - Synchronize Film (Overlaminate)

Description Positions Overlaminate Lamination Ribbon with 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 P500 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.

Syntax

Parameters None

P300 M
P300 C
P400
P500
•
P600
Max3000

TF Command - Film Type

Description Specifies either Overlaminate or Varnish as the type of Ribbon installed in the Laminator Station of P500s.

Syntax ESC # SPACE 1 SPACE TF SPACE p1 ↵

Parameters p1 = Type of Laminator Ribbon

Where:

0 = Varnish
1 = Overlaminate

P300 M	P300 C	P400	P500	P600	Max3000
			•		•

+TC Command - Set Temperature

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

P500 Syntax ESC # SPACE 1 SPACE + TC SPACE p1 ↵

Max3000 Syntax ESC # SPACE 11 SPACE + TC SPACE p1 ↵

Parameters p1 = Temperature (degrees C)

Where:

P500 Overlaminate ≅ 165
P500 Varnish ≅ 155
Max3000 Laminate ≅ 185

P300 M
P300 C
P400
• P500
P600
Max3000

+DLAMI Command - Set Lamination Configuration

Description Allows enabling or disabling of Print Station varnish or Laminator 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 Module-1 and, therefore, requires no #SPACE1 preface.

Note 2: Only one card surface can receive lamination material.

Syntax esc +DLAMI SPACE p1 SPACE p2 ↵

Parameters

p1 = Print Station Varnish
0 = Disable
1 = Enable

p2 = Laminator Station Application
0 = Disable
1 = Enable
2 = Enable and flip to laminate (applies to YMCKO and YMCK ribbons to laminate the color side after imaging Kr on the monochrome side)

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 1      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 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
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 KsO Ribbon

Print Ks and laminate side one and print Ks 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 KsO 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-1 default)
I 10	Print K (side 1), & return
MF	Flip Card & return
+DLAMI 1 0	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

P300 M
P300 C
P400
P500
P600
• Max3000

+VL Command - Set Lamination Speed

Description This command determines the speed that cards pass through the Lamination Rollers. Although users typically wish to attempt to achieve increased speed by setting a higher temperature, too much heat can distort cards. Card distortion produces increases in encoding errors.

Syntax $^{e}{}_{s_C}\#\,^{SPACE}11\,^{SPACE}+VL\,^{SPACE}p1$

Parameters p1 = Speed (in inches per second)

Appendix A

This section contains a listing of all fonts, bar codes, and their respective character sets supported by the Privilege Card Printer programming language.

Resident Fonts

The Eltron Privilege programming language supports 2 different fonts based on Arial “Normal” and Arial “Bold.” The fonts are proportionally generated by the printer from Arial 100 point “Normal” and Arial 100 point “Bold” font descriptions.

Hexidecimal - Most Significant Digit

Hexidecimal - Least 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 66	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 67	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 68	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 105	y 121	137	153	169	185	É 201	Ù 217	é 233	ù 249
A	10	26	* 42	: 58	J 74	Z 90	j 106	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 107	123	139	155	171	187	Ë 203	Û 219	ë 235	û 251
C	12	28	, 44	< 60	L 76	\ 92	l 108	124	Œ 140	œ 156	172	188	Ì 204	Ü 220	ì 236	ü 252
D	13	29	- 45	= 61	M 77	] 93	m 109	125	141	157	173	189	Í 205	Ý 221	í 237	ý 253
E	14	30	. 46	> 62	N 78	^ 94	n 110	126	142	158	174	190	Î 206	Þ 222	î 238	þ 254
F	15	31	/ 47	? 63	O 79	_ 95	o 111	127	143	Ÿ 159	175	¿ 191	Ï 207	ß 223	ï 239	ÿ 255

Code 39
(Code 3 of 9)

Code 39 is an alphanumeric bar code. Each character consists of 5 bars and 4 spaces. 3 of the 9 bars or spaces are wide. The wide to narrow bar and space width is set by the ratio. **The minimum narrow bar or space is 3 dots or 0.010 inch (0.254 mm).**

The supported ratio of narrow bar to wide bar widths are: **2:1, 5:2 (2.5:1), and 3:1**. The equation to calculate the Code 39 bar code length is:

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

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 of a Code 39 bar code is **0.25 inches (6.35 mm) or 75 dots.** The recommend "Quite Zone" is **0.25" (6.35mm or 75 dots) or 10 times X** if larger.

Privilege card printers support Code 39 with the following 43 data characters, shown below:

Hexidecimal - Most Significant Digit

Hexidecimal - Least Significant Digit	0	1	2	3	4	5	6	7
0	0 0	16	32	0 48	64	P 80	96	112
1	1 1	17	33	1 49	A 65	Q 81	97	113
2	2 2	18	34	2 50	B 66	R 82	98	114
3	3 3	19	35	3 51	C 67	S 83	99	115
4	4 4	20	36	4 52	D 68	T 84	100	116
5	5 5	21	% 37	5 53	E 69	U 85	101	117
6	6 6	22	38	6 54	F 70	V 86	102	118
7	7 7	23	39	7 55	G 71	W 87	103	119
8	8 8	24	40	8 56	H 72	X 88	104	120
9	9 9	25	41	9 57	I 73	Y 89	105	121
A	10 10	26	* 42	58	J 74	Z 90	106	122
B	11 11	27	+ 43	59	K 75	91	107	123
C	12 12	28	44	60	L 76	92	108	124
D	13 13	29	- 45	61	M 77	93	109	125
E	14 14	30	. 46	62	N 78	94	110	126
F	15 15	31	/ 47	63	O 79	95	111	127

Standard 2 of 5
(Code 2/5)

The Two of Five code symbology encodes all information in the width of the bars. None of the information is carried by the spaces. Bars are wide or narrow and the wide bars are set by the ratio. Spaces are the same width as the narrow bars.

Two of Five code supports the numeric characters:

0123456789

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

The equation to calculate the Code 2/5 bar code length is:

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

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)
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 "Quite Zone" is **0.25" (6.35mm or 75 dots) or 10 times X** if larger.

Interleaved 2 Of 5 (Code I 2/5)

The name Interleaved 2 of 5 is derived from the method used to encode two characters. In the symbol, two characters are paired, using bars to represent the first character and the interleaved spaces to represent the second character. Each character has two sets, one bars and one spaces. Each consisting of two wide elements and three narrow elements. Bars and spaces are wide or narrow and the wide bars are set by the ratio.

Interleaved Two of Five code support the numeric characters:

0123456789

The printer will automatically add a leading zero ('0') to the 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**.

The equation to calculate the Code 2/5 bar code length is:

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

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)

The minimum recommended height of a Code 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 "Quite Zone" is **0.25" (6.35mm or 75 dots) or 10 times X** if larger.

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 is used to encode the ten-digit Universal Product Code number. 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 support the numeric characters:

0123456789

The ratio command parameter (narrow bar to wide bar width) is ignored by the printer.

The equation to calculate the UPC-A bar code length is:

L = (91) X
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 (6) individual UPC-A bar code characters high. The following equation can be used to calculate the industry specified height in Dots.

H = (42) X
H = Height of bar code in Dot
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-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 is used to encode a seven-digit EAN-8 number. An eight digit is a check digit that is automatically generated by the printer.

The EAN code number and check digit are assigned by numerous international agencies. See the list at the end of this appendix.

EAN-8 code support the numeric characters:

0123456789

The ratio command parameter (narrow bar to wide bar width) is ignored by the printer.

The equation to calculate the EAN-8 bar code length is:

L = (67) X

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

H = Height of bar code in Dot

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 superset of UPC. EAN-13 has the same number of bar as UPC version A, but encodes a 13th digit. The 12th and 13th digit define the country code. The codes 00-04 and 06-09 are assigned to the United States.

The EAN-13 code numbers are assigned by numerous international agencies. See the list at the end of this appendix.

EAN-13 code support the numeric characters:

0123456789

The ratio command parameter (narrow bar to wide bar width) is ignored by the printer.

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

L = (98) X

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, is six (6) individual EAN-13 bar code characters high. The following equation can be used to calculate the industry specified height in Dots.

H = (42) X

H = Height of bar code in Dot

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. The Privilege printer in Code 128 B mode encodes single digit alphanumeric as a single bar code character. The printer in Code 128 C mode encodes two (2) 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 represents the Code 128 B encoded value and the corresponding ASCII characters supported by the Privilege card printer. Code 128 C encodes numeric ASCII pairs, i.e. 0 & 5 would encode to a single Code 128 C digit 05. The printer will automatically add a leading zero ('0') to the odd number of Code 128 C bar code data characters.

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

Encoded Value	Code A	Code B	Code C
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

Encoded Value	Code A	Code B	Code C
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 percentile (%) character must be preceded by another percentile character to encode.
Example: %% = %

The ratio command parameter (narrow bar to wide bar width) is ignored by the printer.

The equation to calculate the Code 128 B bar-code length is:

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

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

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 "Quite Zone" is **0.25" (6.35mm or 75 dots) or 10 times X** if larger.

EAN International Regulation Agencies

General Specifications for the Article Symbol Marking (1987), EAN Prefix List
EAN International (EAN)
Rue Royale 29, B-1000 Bnuxelles (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 Privilege card printers.

Parallel Port Printer Data Handshake Signal Lines

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

Parallel Port Printer Error Response

The color card printers will respond to error conditions with combinations of the Error and Paper Error signals at the printer's 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 . CR (1B 2E 0D Hex)		

Serial Port Printer Data Handshake

Some programs, like WindCard Mono, use Acknowledge (ACK) and Not Acknowledge (NACK) to display these communication protocol responses. The ACK response signifies 'Command Accepted, Waiting for Command'. The NACK response signifies an 'Error" or 'Check Status' condition exists and typically includes a corresponding error/status code. The NACK can also signify that the printer input buffer is full.

Serial Port Printer Error Response

The printers will respond, via the serial port, to various conditions with status and error codes.

Status/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

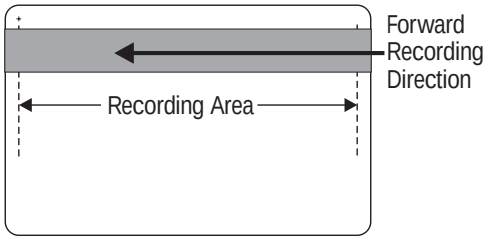
This section contains information on the magnetic stripe card encoder operation and formatting.

Magnetic Encoders

All Privilege printers with encoders write and read ANSI 4.16 and ISO 7811/2/3. The encoder track positions are fixed and cannot be modified.

The current units with serial numbers 5000 and above, have two (2) possible encoder mounting options:
Forward - mounting the encoder to read the magnetic stripe up and:
Reverse - mounting the encoder to read the card with the magnetic stripe down.

Both current encoder options mount the encoder after the print head. *Older printers with serial numbers less than 5000, have the encoder mounted before the print head*.



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 until the previous encoder command has been completed. Detailed encoder (and general printer) status information is reported to the host via optional serial interface ports 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-verify data read. The printer then repositions the card to the print-ready position.

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 2-59.

The "M or m" multiple commands can serve to group several read commands. The encoder performs each command in the string until command string is completed. 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. (The "M" command was implemented in firmware version _____ and above).

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:

M 1 &L1[&L2[&L3

Data sent to the host, in a single response:

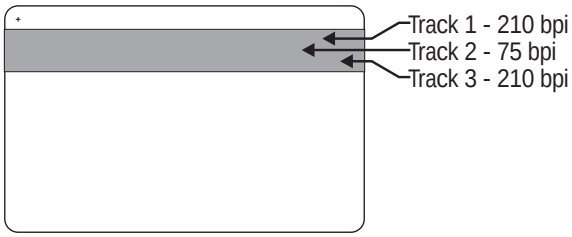
111122223333

Data Errors

The encoder will retry, up to three (3) times, any read or write (write-verify read) operation, before reporting an error.

Encoder Default Configuration

The printer's encoder will read and write the standard ANSI/ISO track data formats in the standard ANSI/ISO track locations. See the simple diagram below for 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 $ ( ) - . / 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 the encoded data on a track to be parsed. 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 has exceeded the maximum allowed by physical encoding (bit density) and the data format in any read or write data function.

Basic Commands

All Privilege 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 listed below.

Basic Encoder Commands		Page
&E	Encode Single Data Track	2-56
&B	Buffer Single Track Data	2-57
&E*	Encode All Data Tracks	2-58
&L	Read Single Track Data	2-59

Advanced Encoder Commands

Printers with magnetic stripe encoders, that have serial numbers 5000 or greater, have an expanded encoder command set. These commands allow the programmer 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 a standard ANSI/ISO data formats on one of 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 format. The encoder will report errors when reading and writing in this mode.

The encoder will not accept ASCII characters that are not part of the selected ANSI/ISO data character set. See C-3 for table of character sets.

The advanced encoder command set is listed below.

Advanced Encoder Commands		
&R	Reset Encoder	2-55
&B	Buffer Track Data	2-57
&L	Read Single Track Data	2-59
&W	Change Encoding Direction	2-60
&D	Change Track Density	2-61
&CDEW	Custom Write Format	2-64
&CDER	Custom Read Format	2-62

The encoder will not write data unless the read buffer is programmed to read identical data parameters. An error will result.

Resetting The Encoder To ANSI/ISO Track Defaults

To ensure that the encoder is in the proper configuration, the programmer should reset the encoder to ANSI/ISO track data, format, density and location. Reset the encoder to ANSI/SIO defaults with the following command sequence.

Example: *(Escape and Carriage Returns not shown)*

```
&R
&CDEW 0 0
&CDER 0 0
```

The encoder stores the track settings in flash memory. If the encoder is powered down, the printer will retain the encoder's last read, write and track density settings.

Change Track Density

A track's density is changed with the &D command. The &D command changes a given track's density without changing the tracks data format or character set. See Command Reference &D, page 2-61 for command details.

Changing Read Configuration

The &CDER command is used to change the read data format configuration. This command can configure a given track to:

- It's ANSI/ISO data format.
- Change it to another ANSI/ISO track format.
- Allows data to be read forward and reverse.
- Change it to "Raw" data format that has custom track data format 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 is used to change the read data format configuration. This command can configure a given track to:

- It's ANSI/ISO data format.
- Change it to another ANSI/ISO track format.
- Change it to "Raw" data format that has 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

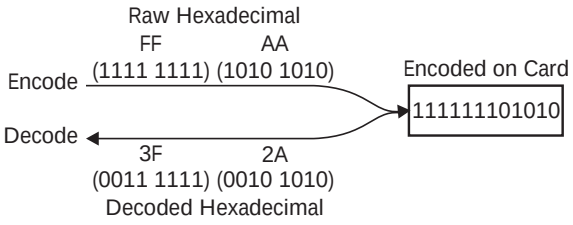
The encoder can be configured to process ISO track data in non-ISO track locations. The printer interprets and processes the ASCII data normally. The custom data control commands; &D (track density), &CDER (read data format) and the &CDEW (write data format).

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's data string formatting is "stripped" 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 represent 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** - 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 will start the data block grouping. The LSB of the data block (or character) is
- **NUL Data Block** - Without NULs enabled, the encoder will terminate the data string or cause the data string to "restart" when a new "start bit", a data block with a "1"s bit.
- **NUL Data Block with NULs enabled -** Allow the inclusion of NUL data character blocks within the data string.
- **Postamble** - binary "0" bits, i.e. NUL characters, fill remainder of track.

Appendix D

This Appendix includes an example of a P600 command sequence that offers both optimization and loopback features for duplex printing.

Sample P600 Command Sequence

Start

At host, prepare an image for side-one of the card.

Before sending the image, check Module 1 for Error-Free and Ready status.

Select Module 1 (INIT = 1)

Wait for Module-1 ACK + Error-Free Status

If necessary, correct error.

Download Yellow Buffer data to Module 1 and wait for Ready + Error-Free status, for example:

^esc GS SPACE 0 SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 SPACE *data* ↵

Download Magenta Buffer data to Module 1 and wait for Ready + Error-Free status, for example:

^esc GS SPACE 1 SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 SPACE *data* ↵

Download Cyan Buffer data to Module 1 and wait for Ready + Error-Free status, for example:

^esc GS SPACE 2 SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 SPACE *data* ↵

Download Black Buffer data to Module 1 and wait for Ready + Error-Free status, for example:

^esc G SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 SPACE p6 SPACE *data* ↵

If different from inverted black, download Varnish buffer data to Module 1, and wait for Ready + Error-Free status, for example:

^esc vL SPACE p1 SPACE p2 SPACE p3 SPACE p4 SPACE p5 ↵

Print Image Buffers using Link command, and **do not** wait for Module 1 Ready + Error-Free status, for example:

^esc m SPACE 1 SPACE IS SPACE 0 [IS SPACE 1 [IS SPACE 2 [I [IV SPACE xx ↵
Where:

xx = 30 (do not move after varnish)
xx = 31 (invert K for varnish and do not move after)
xx = 10 (return to print-ready after varnish)
xx = 11 (invert K for varnish, and return to print-ready)

At host, prepare an image for side-two of the card.

Before sending the image, check Module 2 for Error-Free and Ready status.

Select Module 2 (INIT = 0)

Wait for Module-2 ACK + Error-Free Status

If necessary, correct error.

Download Yellow Buffer data to Module 2 and wait for Ready + Error-Free status, for example:

<ESC>GS<SP>0<SP>p1<SP>p2<SP>p3<SP>p4<SP>p5<SP>p6<SP>*data*<CR>

Download Magenta Buffer data to Module 2 and wait for Ready + Error-Free status, for example:

<ESC>GS<SP>1<SP>p1<SP>p2<SP>p3<SP>p4<SP>p5<SP>p6<SP>*data*<CR>

Download Cyan Buffer data to Module 2 and wait for Ready + Error-Free status, for example:

<ESC>GS<SP>2<SP>p1<SP>p2<SP>p3<SP>p4<SP>p5<SP>p6<SP>*data*<CR>

Download Black Buffer data to Module 2 and wait for Ready + Error-Free status, for example:

<ESC>G<SP>p1<SP>p2<SP>p3<SP>p4<SP>p5<SP>p6<SP>*data*<CR>

If different from inverted black, download Varnish buffer data to Module 2, and wait for Ready + Error-Free status, for example:

<ESC>vL<SP>p1<SP>p2<SP>p3<SP>p4<SP>p5<CR>

Before exiting the card from Module 1, check Module 1 for Error-Free and Ready status.

Select Module 1 (INIT = 1)

Wait for Module-1 ACK + Error-Free Status

If necessary, correct error.

Select Module 2 (INIT = 0)

Wait for Module-2 ACK + Error-Free Status

If necessary, correct error.

Make a Card Flip pending in Module 2, and **do not** wait for Ready + Error-Free status:

^esc;MF↵

Select Module 1 (INIT = 1)

Exit card from Module 1, and check for Ready + Error-Free status:

^esc;MO↵

Select Module 2 (INIT = 0)

Wait for Module-2 ACK + Error-Free Status

Print Image Buffers using Link command, and **do not** wait for Module 2 Ready + Error-Free status, for example:

^esc;m^SPA^CE1^SPA^CEIS^SPA^CE0[IS^SPA^CE1[IS^SPA^CE2[I[IV^SPA^CExx↵

Where:

xx = 30 (do not move after varnish)
xx = 31 (invert K for varnish and do not move after)
xx = 10 (return to print-ready after varnish)
xx = 11 (invert K for varnish, and return to print-ready)

Loop to Start

Appendix E

This Appendix offers examples of Max3000 command sequences for the various ribbon types.

Note that the examples all end with a series linked by the "M" command. The firmware maintains two buffers. The data and command series to print are maintained in a respective buffer until an associated card assembly passes through all the Max3000 modules error free. If an error occurs someware during the process, the command and associated data remain available, and the firmware initiates another card printing automatically.

Imagin, for example, an error that occurs in the Laminator while the Printer has begun another card. Data associated with the error-producing card would remain in place while printing continued on the card next begun. Following print competion on this card, another printing begins using the data retained in case of errors.

Note that proper operations require an M-linked command series for printing.

Sample Max3000 Command Sequences

YMCKrO Ribbon

Setup and Data Download Series:

+ RIB 0	Specifies ribbon type
$F	Erases color buffer
F	Erases monochrome buffer used for Clear Card imaging
vF	Erases monochrome buffer used for White Card imaging
GS...	Sends color buffer data
G ...	Sends monochrome buffer data for Clear Card
vG	Sends monochrome buffer data for White Card
...	Send configuration commands (Contrast, Speed, etc.)

Card Print Series:

M # IS 0[IS 1[IS 2[MO[MF[I[IV[MO

YMCKr Ribbon

Setup and Download Series:

+ RIB 13	Specifies ribbon type
$F	Erases color buffer
F	Erases monochrome buffer used for Clear Card imaging
vF	Erases monochrome buffer used for White Card imaging
GS...	Sends color buffer data
G ...	Sends monochrome buffer data for Clear Card
vG	Sends monochrome buffer data for White Card
...	Send configuration commands (Contrast, Speed, etc.)

Card Print Series:

M # IS 0[IS 1[IS 2[MO[MF[I[MO

YMCKrKr Ribbon

Setup and Download Series:

+RIB 20	Specifies ribbon type
$F	Erases color buffer
F	Erases monochrome buffer used for Clear Card imaging
vF	Erases monochrome buffer used for White Card imaging
GS...	Sends color buffer data
G ...	Sends monochrome buffer data for Clear Card
vG	Sends monochrome buffer data for White Card
...	Send configuration commands (Contrast, Speed, etc.)

Card Print Series:

M # IS 0[IS 1[IS 2[I[MO[MF[I[MO

YMCKr_Kr Ribbon

Setup and Download Series:

+RIB 21	Specifies ribbon type
$F	Erases color buffer
F	Erases monochrome buffer used for Clear Card imaging
vF	Erases monochrome buffer used for White Card imaging
GS...	Sends color buffer data
G ...	Sends monochrome buffer data for Clear Card
vG	Sends monochrome buffer data for White Card
...	Send configuration commands (Contrast, Speed, etc.)

Card Print Series:

M # IS 0[IS 1[IS 2[I[MO[MF[I[MO

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