



LabelWriter® 550 Series Printers Technical Reference Manual

for LabelWriter 550, LabelWriter 550 Turbo, and LabelWriter 5XL



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Contents

About the LabelWriter 550 Series Printers	4
Print Data	4
Print Job Structure	4
Data Synchronization	7
Label Positioning	7
Top-of-Form Sync.....	7
Label Length	7
Label-Movement Commands.....	7
Print Status Response	8
Self-Test Capability.....	8
Print Mode	8
Low Power Mode	9
Power Requirements	9
AC Adapter	9
Connectors	9
USB Printer Interface	9
USB Vendor ID.....	10
USB Product IDs	10
LAN Printer Interface	10
IP Address	10
mDNS	10
Printer Commands	10
Commands Sent to the Printer	10

About the LabelWriter 550 Series Printers

The LabelWriter 550 series printers (LabelWriter 550, 550 Turbo, 5XL) are high-performance, low-cost printers used for printing mailing labels, postage, file folder labels, barcode labels, and more. The LabelWriter 550 and LabelWriter 550 Turbo printers have a 57 mm wide print head. The LabelWriter 5XL has a 101 mm wide print head. All printers have 300-dpi print head.

The 57 mm wide thermal print head uses 672 individually addressable dots to form individual raster lines of data at 300 dots per inch across the print head—the 101 mm wide print head uses 1248 dots. Both use 300 dots per inch in the travel direction as directed by the print control data. Because they use specially treated, heat-activated paper, the printers require no ink, toner, or other refills.

All 550 series printer models connect to a host computer through a standard full-speed USB 2.0-compatible interface. There are no built-in fonts. The host computer is responsible for sending commands and data to the printer to form each individual raster line of data. This is generally performed by printer drivers in the host computer that convert the image of the label into the proper command and data stream required by the printers.

LabelWriter 550 Turbo and 5XL printers can connect to a host through a 10M/100M Ethernet LAN connection.

Print Data

Print data is encoded in strings of 8-bit bytes.

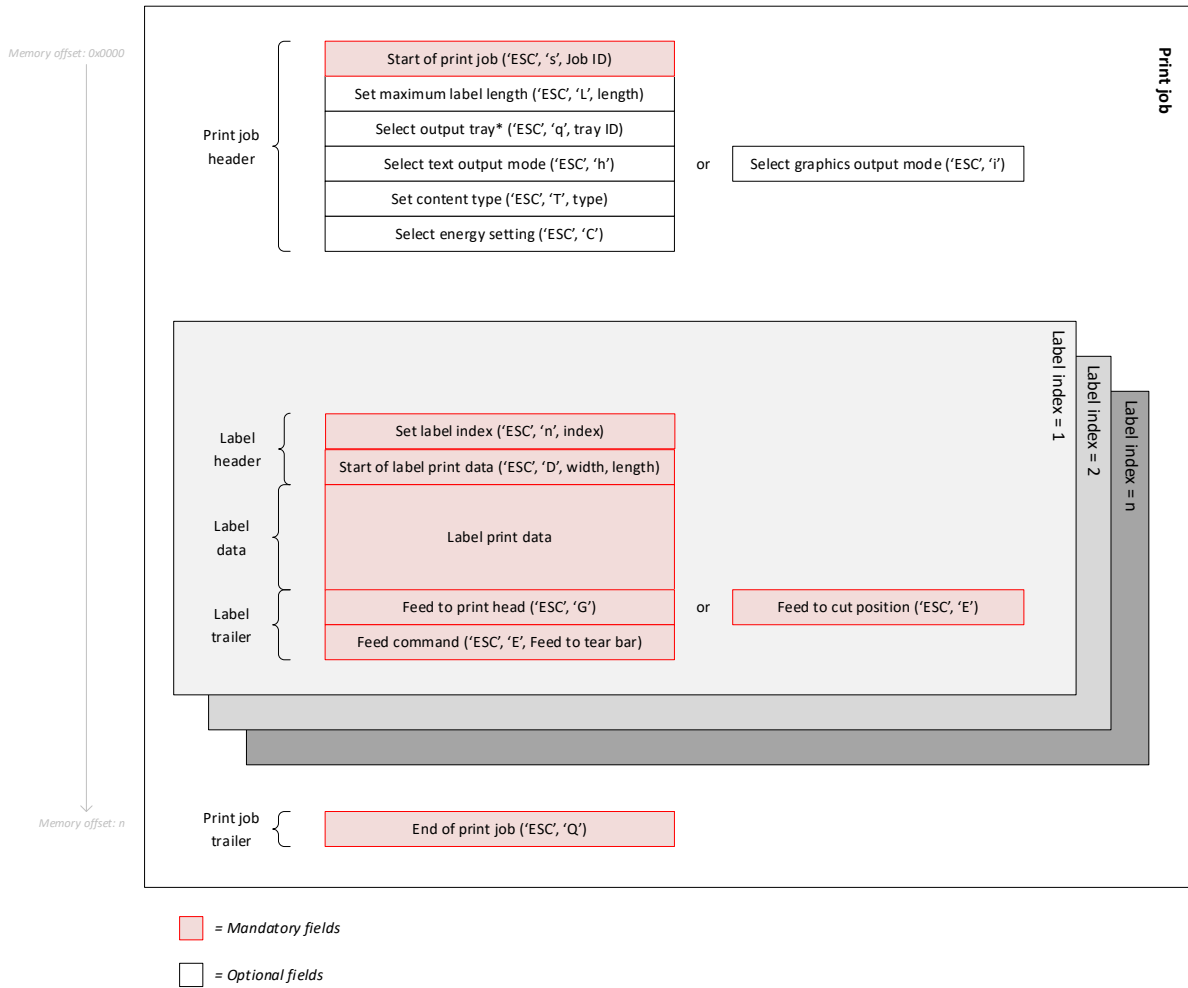
The default value for LabelWriter 550 and LabelWriter 550 Turbo printers is 84 bytes per line ($84 * 8 = 672$, the number of dots in the print head)—for LabelWriter 5XL, 156 bytes ($156 * 8 = 1248$, the number of dots in the print head). The host-computer can send fewer bytes than the maximum within the <esc> D command. The control electronics do not check the validity of the new value. Therefore, it is the responsibility of the host-software to send only those values which are valid for the width of the print head.

The Bytes-Per-Line variable is held by the control electronics until they are changed by a new command sequence, is reset to default values by a power-on reset, a software reset command, or after the end of a print job.

Print Job Structure

The print job structure consists of the following parts:

1. Print Job Header
2. Label Structure
 - a. Label Header
 - b. Label Data
 - c. Label Trailer
3. Print Job Trailer



Print Job Header

The Print Job Header is the beginning of a print job structure. It is mandatory to have <ESC s> to let the printer know the start of the print job.

The table below shows the mandatory command for the header section along with optional commands that can be placed in this section.

Mandatory Commands	
Start of Print Job	<ESC s>
Optional Commands	
Set Maximum Label Length	<ESC L>
Select Text Output Mode or Select Graphics Output Mode	<ESC h> or <ESC i>
Select Energy Setting	<ESC C>
Set Output Tray * (will be supported by LW550 Twin Turbo)	<ESC q>
Select Content Type	<ESC T>

Label Structure

The Label structure has the following 3 parts:

1. Label Header
2. Label Data
3. Label Trailer

The structure must be present for each label that is to be printed in a single print job.

Label Header

The Label Header is the beginning of the label structure. It is mandatory to have <ESC n> to indicate the label index and <ESC D> to indicate the start of the label print data. See the “Printer Commands” later in this document for more details.

The table below shows the mandatory command for the header section along with optional commands that can be placed in this section.

Mandatory Commands	
Set Label Index	<ESC n>
Start of Label Print Data & Label Print Data	<ESC D>

Label Data

The Label Data is the data that will be printed out onto the labels. It is an array of binary data bytes. It's size equals width*height. '0' means a dot is not printed; '1' means a dot is printed. The most significant bit of the first print data byte represents the lower pixel of the first line. See the <ESC D> command in the “Printer Commands” section later in this document for more details.

Bytes per line= **roundup**(height * Bytes Per Pixel) / 8)

Label Trailer

The Label Trailer is end of the label structure. It moves the label to either the print head of the next label or to the tear position. It is mandatory that <ESC G> (Feed to Print Head) or <ESC E> (Feed to Tear Position) be used in this section.

Mandatory Commands	
Feed to Print Head	<ESC G>
Feed to Tear Position	<ESC E>

Print Job Trailer

The print Job Trailer is the final part of the print job structure. It is mandatory to use the <ESC Q> command to end the print job.

Data Synchronization

After the printer receives a Lock Request from the host, the printer will respond. (See Print Status Response section for details.) The host (Host-A) will be granted a lock only if the printer is not printing. Once the lock is granted, the Host-A will begin to send the print data for the current print job with the <ESC s> command. (See “Print Job Structure” section above for additional details). If another host (Host-B) requests the printer’s status, the printer will respond that it is printing. No other host can interrupt the print job of Host-A.

The data goes into a buffer and the printer sorts through the various commands applying the print job settings.

The data between the height value in the <ESC D> command and before <ESC G> or <ESC E> is the data that will be printed, also referred to as print data.

Label Positioning

A motor-driven platen, which acts as a pinch roller, controls label movement within the printer. The control electronics track label travelling positions. An infrared LED photocell detects the top-of-form sense hole that is located between labels. The absolute positions of the label and the tear bar are calculated based up the reading of an infrared LED photocell sensor.

Top-of-Form Sync

At power up, label position is always assumed to be correct. If an Out of Paper condition is detected at power up, user requires to press form feed button and the stepper motor will advance until label load to Top-of-Form tear bar position.

Label Length

The label length is determined by the SKU data found on the NFC Tag.

If the roll has continuous form paper the Form Feed command (<esc> E) is changed to feed enough dot lines to allow for the last line of print data to extend past the printer tear-bar.

The host can use <esc> L to Set Length to Continuous Stock. See more details in the “Printer Commands” section later in this document. Only authentic Dymo labels with a valid NFC Tag can be used for printing.

Label-Movement Commands

There are two label-movement commands implemented in the LabelWriter 550 Series: Form Feed, Short Form Feed. These commands operate as follows.

Form Feed Command (<esc> E)

This command advances the most recently printed label to a position where it can be torn off. This positioning places the next label beyond the starting print position. Therefore, a reverse-feed will be automatically invoked when printing the next label. Use Feed to Print Head (Short Form Feed) to optimize print speed and to eliminate the reverse feeding when printing multiple labels.

Short Form Feed Command (<esc> G)

This command feeds the next label into print position (die-cut labels). The most recently printed label might still be partially inside the printer and cannot be torn off or cut. This command is meant to be used between labels on a multiple label print job.

Use this command when printing multiple labels. The normal Form Feed command also works for this purpose. However, using the Short Form Feed command optimizes the printer and minimizes print time by eliminating the need to reverse feed after advancing the top-of-form mark to the tear bar, as the normal Form Feed command does. The Short Form Feed command advances the printed label just far enough to place the next label in position for printing. Because of the mechanics of the printer, the preceding label will still be partially within the label exit slot. For a label to be in tear-off position, you must use the normal Form Feed command (<esc> E).

Print Status Response

The LabelWriter 550 series responds to status request with 32 bytes dedicated to reporting its current state.

The host requests the status from the printer by issuing an <ESC A> command (See the “Printer Command” section later in the document for more details).

Self-Test Capability

The printers include a self-test capability in the form of canned print patterns. To activate the self-test, press the form-feed button and power button together and hold it down for approximately 10 seconds. The self-test will start printing a repeating series of test patterns. To stop the self-test, press the form-feed button a second time.

Print Mode

The LabelWriter 550 series features the following print modes:

- Text
- Barcode and Graphics

The LabelWriter 550 and LabelWriter 550 Turbo has the additional print mode:

- High Speed ***NOTE: Not all label rolls have the high-speed feature***

Printer Model	Print Mode		
	Text	Barcode and Graphics	High Speed
DYMO LabelWriter 550	✓	✓	✓
DYMO LabelWriter 550 Turbo	✓	✓	✓
DYMO LabelWriter 5XL	✓	✓	N/A

For better accuracy of dot placement and sizing, the LabelWriter 550 series printers incorporate a feature which allows the host computer to specify a 300 x 300 dpi Barcode and Graphics print mode. In Barcode and Graphics mode, the print quality is improved by a reduction in print speed which provides smooth and even printing, resulting in greater regularity of dot darkness and size. This mode may improve print quality of smaller barcodes and some graphic images. This creates more precise dots for better image quality.

Low Power Mode

The LabelWriter 550 series includes an automatic power saving feature. After 30 seconds of inactivity the printer will shut down its unused internal peripherals and dim its LEDs. Pressing the power button while the printer is in this state will cause it to resume normal operation rather than feeding a label. If print data is sent to the printer while it is in Low Power mode it will automatically resume full operation.

Power Requirements

The LabelWriter 550 series printers are normally supplied with an external, universal (100 – 240 VAC) AC power adapter. For OEM applications, a DC voltage can also be supplied to the main printed circuit board (PCB) of the printer using the JP2 connector.

Note: The printers have been tested and certified for EMC and safety requirements using the supplied AC adapter. Supplying a non-DYMO power source may change the EMC and safety certifications.

Input power is variable based on the amount of information printed and the duty cycle of the label printing.

The printer driver (print commands from the host computer) controls some printing parameters and will change maximum power usage.

AC Adapter

LabelWriter 550	
Model	DSA-42PFC-24 2 240175 (42.0W)
Input voltage	100 – 240 VAC, 50/60 Hz, 1.2 Amps
Output voltage	24 VDC, 1.75Amps
LabelWriter 550 Turbo	
DYMO part number	DYS865-240250W (60.0W)
Input voltage	100 – 240 VAC, 50/60 Hz, 1.5 Amps
Output voltage	24 VDC, 2.5Amps
LabelWriter 5XL	
DYMO part number	DSA-96PFB-24 2 240375 (90.0W)
Input voltage	100 – 240 VAC, 50/60 Hz, 1.5 Amps
Output voltage	24 VDC, 3.75Amps

Connectors

JP2:

DC jack, 5.5 mm O.D. x 2.5 mm I.D. Center Positive

USB Printer Interface

The LabelWriter 550 series printers all communicate with the host computer using a full-speed USB 2.0 interface. This interface also operates with USB Version 1.1 or later. The printers implement the standard USB Printer Class Device interface for communications (see <http://www.usb.org/developers/devclass/>).

While it is not the purpose of this section to define how to write a USB driver for a printer device, this section provides some product specific information that is required for any USB device.

Each USB device provides plug-and-play information when it is connected to a host computer. This information includes a manufacturer specific, or Vendor, ID (VID) and a product specific ID (PID). These identifiers, when combined with the class type provided during USB enumeration, are sufficient to identify the driver to load.

USB Vendor ID

The USB Vendor ID (VID) assigned to DYMO by the USB Implementers Forum is 0x0922h (2338 Decimal).

USB Product IDs

Each printer has a unique Product ID, as shown in the table below.

Printer Model	Product ID (Hex)
DYMO LabelWriter 550	0x0028
DYMO LabelWriter 550 Turbo	0x0029
DYMO LabelWriter 5XL	0x002A

LAN Printer Interface

The LabelWriter 550 Turbo and LabelWriter 5XL printers are also able to communicate with the host computer using 10M/100M Ethernet LAN connection.

The printer will auto-connect upon ethernet cable plugin into the RJ45 connector.

IP Address

IPv4 protocol is supported.

By default, IP address of the LabelWriter 550 Turbo and LabelWriter 5XL printers will be obtained by DHCP. Communication will be enabled upon successful assignment of IP address.

mDNS

The mDNS protocol is used to discover printer on the network and conforms with mDNS protocol (RFC 6762/6763) specifications. The port used for this service is 5353.

Below are the mDNS strings used for printers with a LAN interface:

Printer	Supported Profiles & protocols
DYMO LabelWriter 550 Turbo	DYMO LabelWriter 550 Turbo on DYMO LW550T<6 digit MAC Address>E
DYMO LabelWriter 5XL	DYMO LabelWriter 5XL on DYMO LW5XL<6 digit MAC Address>E

Printer Commands

All LabelWriter 550 series printers implement the same basic commands.

Commands Sent to the Printer

The commands implemented by the LabelWriter printer are as follows. Note that each command is listed with its mnemonic (<ESC> s as well as its hexadecimal representation (1B 73). Parameter values are specified as "n" for single byte values or "n1 n2" for two-byte values.

ESC s Start of Print Job

1B 73

Indicates a new print job. A unique job ID is passed along with this command.

Format:

Byte	0	1	2	3	4	5
	'ESC'	's'	Job ID			

ESC L Set Maximum Label Length

1B 4C

Sets the print engine mode between normal label stock and continuous label stock. Normal label stock is the default mode for the print engine.

ESC h Select Text Output Mode

1B 68

Tells the print engine that the label shall be printed with the print settings which are ideal for text. Text mode is the default printer setting.

ESC i Select Graphics Output Mode

1B 69

Tells the print engine that the label shall be printed with the print settings which are ideal for graphics and barcodes. The print speed might be reduced in this mode.

ESC T Content Type

1B 74

Byte	0	1	2
	'ESC'	'T'	Speed Mode

Sets the speed of the printer. Default is Normal Speed (0x10).

Byte Value	Meaning
0x10	Normal Speed
0x20	High Speed

ESC n Set Label Index

1B 6E

Sets the label index. The same label index is returned in the print status providing the host the possibility to track which label is being printed. Default value is 0.

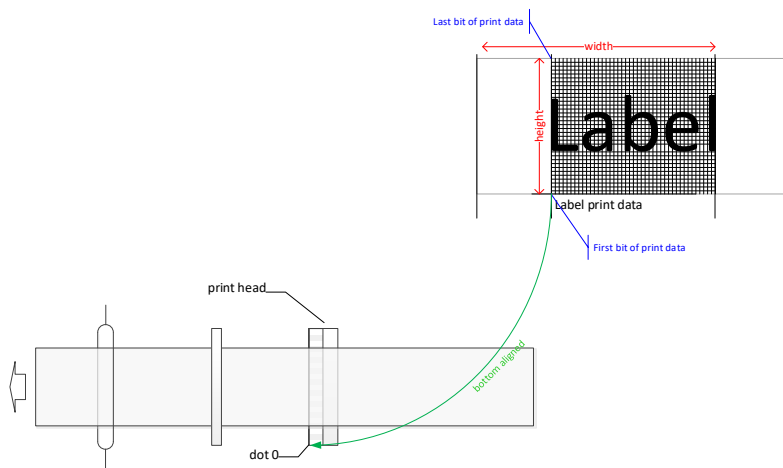
Byte	0	1	2	3
	'ESC'	'n'	Label Index	

ESC D Start of Label Print Data & Label Print Data
1B 44

Indicates the start of the label print data and notifies the print engine about the label's height and width. The height is defined in dots while the width specifies the number of lines. The width does not include the leader and trailer.

Format:

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	...	n
	'ESC'	'D'	BPP	Align	Width			Height			Print Data						



Byte	Name	Description
2	BPP	Default value is 1.
3	Alignment	Print Alignment 2: Bottom
Byte 4 to Byte 7	Width	Number of lines Range: 0 to 2 ³²
Byte 8 to Byte 11	Height	Number of dots Range: 0 to 2 ³²
Byte 12 to Byte n	Print Data	The data that will be printed onto the label(s)

ESC G Feed to Print Head (Short Form Feed)
1B 47

Feeds the next label into print position. The most recently printed label might still be partially inside the printer and cannot be torn off. This command is meant to be used between labels on a multiple label print job.

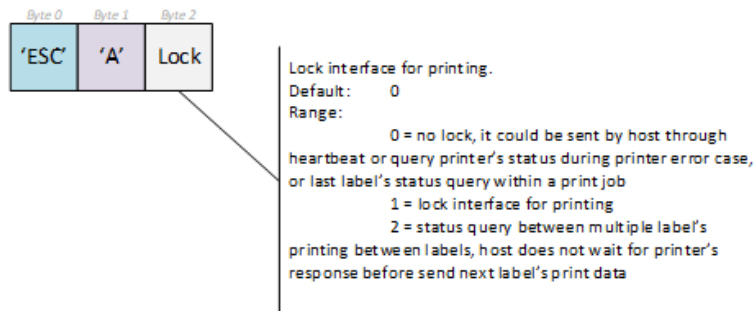
ESC E Feed to Tear Position (Long Form Feed)
1B 45

Advances the most recently printed label to a position where it can be torn off by the automatic cutter. This positioning places the next label beyond the starting print position. Reverse-feed will be automatically invoked when printing the next label.

ESC Q End of Print Job
1B 51

Indicates the end of a print job. Upon reception of this command the print engine will release the connection and start accepting other print jobs.

ESC A Request Print Engine Status
1B 41



Print Status Response:

Byte	Bits	Name	Description
Byte 0	b7...b0	Print status	<p>The actual print engine status.</p> <p>Type: predefined values Default value: 0 Range: 0 = idle 1 = printing 2 = error 3 = cancel 4 = busy 5 = Unlock</p>

Byte	Bits	Name	Description
			0-3: Once lock is granted to active host, status replies by active host 4: after printer wakes up from standby 5: Status reply before lock is granted to active host
Byte 4... Byte 1	b31...b0	Print job ID	The Job ID of the ongoing print process. Type: u32 Default value: 0 Range: 0 = printer idle 1...2 ³² = Job ID
Byte 6... Byte 5	b15...b0	Label index	The index of the label/page currently being printed. Type: u16 Default value: 0 Range: 0...2 ¹⁶ = index
Byte 7	b7...b0	Reserved	Default value: 0
Byte 8	b7...b0	Print head status	The actual thermal print head status. Type: predefined values Default value: 2 Range: 0 = ok 1 = overheated 2 = status unknown
Byte 9	b7...b0	Print density	The actual print density setting in %. Type: u8 Default value: 100 Range: 0 = disable printing 1...200 = density in %
Byte 10	b7...b0	Main bay status	The status of the main bay. Type: predefined values Default value: 0 Range: 0 = bay status unknown 1 = bay open; media presence unknown 2 = no media present 3 = media not inserted properly 4 = media present – media status unknown 5 = media present – empty

Byte	Bits	Name	Description
			6 = media present – critically low 7 = media present – low 8 = media present – ok 9 = media present – jammed 10 = media present – counterfeit media
Byte 22... Byte 11	B95...b0	SKU Info	The SKU of the inserted consumable Type: char Default value: 0 (empty) XXXXXXXXX = SKU
Byte 26... Byte 23	b31...b0	Error ID	The ID of the present error. Type: u32 Default value: 0 Range: 0 = no error present 1...2 ³² = error codes
Byte 28 Byte 27	B15...b0	Label count	Remaining count of inserted consumable Type: u16 Default value: 0 (empty)
Byte 29	b3...b0	EPS Status	The status of the external power supply. 1 = EPS present
	b7...b4	Reserved	Default value: 0
Byte 30	b3...b0	Print Head Voltage	Print Head Voltage Type: predefined values Default value: 0 Range: 0 = unknown 1 = ok 2 = low 3 = critically low 4 = too low for printing
	b7...b4	Reserved	Default value: 0
Byte 31	b7...b0	Reserved	Default value: -1

ESC C Set Print Density

1B 43

Sets the strobe time of the printer to a given percentage of its standard duty cycle. A lower value results in lighter printouts while a higher value leads to darker printouts. Default value is 100. Duty range is 0-200%.

Byte	0	1	2
	'ESC'	'C'	Duty

ESC e Reset Print Density to Default

1B 65

Resets the print density to default value of 100%.

ESC U Get SKU Information

1B 55

Used to retrieve the inserted LW550 Consumable SKU information from NFC.

The following is the 63-Byte response to ESC U:

Byte	Bits	Name	Description
Byte 1... Byte 0	b15...b0	Magic number	0xCAB6
Byte 2	b7...b0	Version	Current version is '0'
Byte 3	b7...b0	Length	
Byte 7... Byte 4	b15...b0	CRC	
Byte 19... Byte 8	b95...b0	SKU #	The SKU # of inserted Type: char Default value: 0 Range: 1...12 = SKU #
Byte 20	b7...b0	Brand ID	Type: predefined values Default value: 0x00 0x00 = DYMO 0x01-0xFF = Undefined
Byte 21	b7...b0	Region	Type: predefined values Default value: 0xFF 0xFF = Global

Byte	Bits	Name	Description
			0x00-0xFE = Undefined
Byte 22	b7...b0	Material Type	<p>The type of label material</p> <p>Type: predefined values</p> <p>Range:</p> <p>0x00 = Card 0x01 = Clear 0x02 = Durable 0x03 = Paper 0x04 = Permanent 0x05 = Plastic 0x06 = Removable 0x07 = Time exp. 0x08 – 0xFF = Undefined</p>
Byte 23	b7...b0	Label Type	<p>Label Type</p> <p>Type: predefined values</p> <p>Range:</p> <p>0x00 = Continuous 0x01 = Die 0x02 = Card 0x03 – 0xFF = Undefined</p>
Byte 24	b7...b0	Label Color	<p>Label Color</p> <p>Type: predefined values</p> <p>Range:</p> <p>0x00 = Clear 0x01 = White 0x02 = Pink 0x03 = Yellow 0x04 = Green 0x05 = Blue 0x06 – 0xFF = Undefined</p>
Byte 25	b7...b0	Content Color	<p>Content Color</p> <p>Type: predefined values</p> <p>Range:</p> <p>0x00 = Black 0x01 = Red/Black 0x02 – 0xFF = Undefined</p>

Byte	Bits	Name	Description
Byte 26	b7...b0	Marker Type	<p>Marker Type</p> <p>Type: predefined values</p> <p>Range:</p> <p>0x00 = Marker 1 front edge indicates offset to cut location and offset to start of label</p> <p>0x01 = Marker 1 front edge indicates offset to cut location and Marker 1 rear edge indicates offset to start of label</p> <p>0x02 = Marker 1 front edge indicates offset to start of label and Marker 1 rear edge indicates offset to cut location</p> <p>0x03 = Marker 1 front edge indicates cut location and Marker 2 front edge indicates offset to start of label</p> <p>0x04 – 0xFF = Undefined</p>
Byte 27	b7...b0	Reserved	
Byte 29 ... Byte 28	b15...b0	Marker Pitch	<p>Marker Pitch</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>
Byte 31 ... Byte 30	b15...b0	Marker1 width	<p>Marker1 width</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>
Byte 33 ... Byte 32	b15...b0	Marker1 to start of label	<p>Marker1 to start of label</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>
Byte 35 ... Byte 34	b15...b0	Marker2 width	<p>Marker2 width</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>
Byte 37 ... Byte 36	b15...b0	Marker2 offset	<p>Marker2 offset</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>
Byte 39 ... Byte 38	b15...b0	Vertical offset	<p>Vertical offset</p> <p>Type: u16</p> <p>$1 - 2^{16} = \text{length in mm}$</p>

Byte	Bits	Name	Description
Byte 41 ... Byte 40	b15...b0	Label length	Label length Type: u16 1 – 2 ¹⁶ = length in mm
Byte 43 ... Byte 42	b15...b0	Label width	Label width Type: u16 1 – 2 ¹⁶ = length in mm
Byte 45 ... Byte 44	b15...b0	Printable area horizontal offset	Printable area horizontal offset Type: u16 1 – 2 ¹⁶ = length in mm
Byte 47 ... Byte 46	b15...b0	Printable area vertical offset	Printable area vertical offset Type: u16 1 – 2 ¹⁶ = length in mm
Byte 49 ... Byte 48	b15...b0	Liner width	Liner width Type: u16 1 – 2 ¹⁶ = length in mm
Byte 51 ... Byte 50	b15...b0	Total label count	
Byte 53... Byte 52	b15...b0	Total Length	Length of roll Type: u16 1 – 2 ¹⁶ = length in mm
Byte 55 ... Byte 54	b15...b0	Counter Margin	Used to determine remaining labels on roll or limit usage
Byte 56	b7...b0	Counter Strategy	Type: predefined values Range: 0x00 = Counting up from 0x0000 to “amount of labels” + “counter margin” 0x01 = Counting up from 0xFFFF – “amount of labels” – “Counter margin” to 0xFFFF 0x02 – 0xFF = Undefined
Byte 59, Byte 57	b23...b0	Reserved	
Byte 61, Byte 60	b15...b0	Production date	DDYY format
Byte 63, Byte 62	b15...b0	Production time	HHMM format

ESC V Request Print Engine Version

1B 56

Used to retrieve version information of the print engine.

Format:

Byte	0	...	15	16	...	31	32	33
	HW Version			FW Version			Product ID	

HW Version:

Byte 0 to 15

This is the hardware version as a 16-character UTF-8 encoded string.

FW Version:

Byte 16 to 31

This is the firmware version as a 16-character UTF-8 encoded string.

Byte	Meaning
16 to 19	Application FW Version: "FWAP" Boot Loader FW Version: "FWBL"
20 to 23	Major Release Version
24 to 27	Minor Release Version
28 to 31	Release Date Format: MMY

PID:

Byte 32 to 33

Two bytes of USB PID

ESC @ Restart Print Engine

1B 40

Reboots the print engine.

ESC * Restore Print Engine Factory Settings

1B 24

Restores all the factory settings of the printer.

ESC o Set Label Count

Sets label count.

Byte	0	1	2
	'ESC'	'o'	Count