



LabelWriter 400 Series Printers Technical Reference Manual

Includes LabelWriter 400, LabelWriter 400 Turbo, LabelWriter Twin Turbo, and LabelWriter Duo Printers



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NOTE: The purpose of this manual is to serve as a reference to knowledgeable developers wishing to communicate directly with the LabelWriter printer without the use of printer drivers. Because the printer is a raster-based printer, this is not a simple task, and Sanford, L.P. reserves the right to limit development support for such implementations.

About the LabelWriter 400 Series Printers

The LabelWriter 400 series printers (LabelWriter 400, 400 Turbo, Twin Turbo, and Duo) are high-performance, low-cost printers used for printing mailing labels, postage, file folder labels, bar code labels, and more. The printers have a 57 mm wide, 300-dpi print head and a 63 mm wide paper path. The LabelWriter Twin Turbo printer has two side-by-side label printing mechanisms in a single printer. The LabelWriter Duo printer has a label printing mechanism as well as a tape-printing mechanism that can print continuous-length labels in several different widths (6 mm, 9 mm, 12 mm, 19 mm, or 24 mm), using a 96-dot or 128-dot, 180-dpi print head¹.

The 57 mm wide thermal print head uses 672 individually addressable dots to form individual raster lines of data at 300 dpi. Because they use specially treated, heat-activated paper, the printers require no ink, toner, or other refills.

All 400 series printer models connect to a host computer through a standard full-speed USB 2.0-compatible interface. When used as raster-only printers, 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.

The Print Head

The print head prints the image onto the label by heating a row of resistive elements; this blackens the thermally sensitive label material. These 672 resistive elements are .085 mm square and are spaced at 300 per inch on the print head. To print a line, the control electronics load the desired data into a serial shift register. This shift register has one register for each print element. A "1" in a register causes the corresponding dot to be printed; a "0" leaves the dot blank.

The darkness or density of the image depends upon the amount of heat applied to the label material. The heat depends upon both the temperature of the print head and the amount of energy applied to the resistive elements. The energy applied to the resistive elements depends upon the voltage applied and the length of time that the voltage is applied. In order to maintain a constant density, the control electronics measure the print voltage and the head temperature before each print cycle, and then calculate the required print strobe time.

The power supply is designed to handle printing an average of 37% of the total dots per line at full speed. If the voltage drops below 19.3 volts at the print head, printing is suspended until the power supply recovers to 21 volts.

In order to protect the print head from excessive heat, the control electronics halt printing if the print head temperature exceeds 80° C. Printing resumes when the print head cools to 55° C.

¹ The DYMO LabelWriter Duo printer initially shipped with a 96-dot print head for the tape-printing mechanism. This has been replaced with a 128-dot print head.

Printer Commands and Control

The printers support two types of commands through the USB interface: data commands and USB interface commands. As with all USB printers, data commands for imaging a page are provided to the printer through the Bulk OUT endpoint. For information on USB interface commands, refer to the *Universal Serial Bus Device Class Definition for Printing Devices* document.

Data commands for printing consist of print data and ESC commands. Print data is used to define the dot pattern to print for each raster line. ESC commands (commands preceded by an ASCII <esc> character, 0x1b) are commands that change printer parameters, such as margins and raster line offsets. All printer parameters are set to specific default values by a power-on reset or software reset command from the host computer. Parameters can be modified by the host computer at any time and will take effect as soon as the modifications are sent.

Print Data

Print data is encoded in strings of 8-bit bytes, preceded by a single synchronization character. Two print line commands specify whether the data format is uncompressed or compressed. Uncompressed data is preceded by an ASCII <syn> character (0x16), and compressed data is preceded by an ASCII <etb> character (0x17). Appendix A describes the compressed data format.

The Bytes-per-Line variable controls the number of bytes required for each line of print data. The default value for all 400 series printers is 84 bytes per line ($84 * 8 = 672$, the number of dots in the print head). The host computer can send fewer bytes than the maximum by preceding the print data with the Set Bytes per Line command (<esc> D n, where n is the number of bytes). 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.

In addition to sending fewer bytes per line, the host computer also has the ability to adjust the starting point on a line by using the Set Dot Tab command (<esc> B n, where n is the starting byte number; valid values are 0-83). If the host computer modifies the starting byte, the number of bytes per line must be adjusted downward by a corresponding amount. The control electronics do not check the validity of the dot tab against the bytes per line. Therefore, it is the responsibility of the host software to send correct combinations of these two variables.

Both the dot tab variable and the bytes-per-line variable are held by the control electronics until they are changed by a new command sequence or are reset to default values by a power-on reset or a software reset command.

Data Synchronization

After the printer receives a <syn> or <etb> character, it takes the following n value and puts it into the RAM buffer. The value for n is determined by the number of bytes required to specify a full line of data. This value is affected by the setting for Bytes per Line and, in the case of <etb>, the data compression of the bit pattern. It is important to note that the n values which follow <syn> or <etb> characters are interpreted only as graphical data. This means that

additional <syn>, <etb>, or <esc> characters will be treated as print line data, representing pixels to print, until the required number of bytes for the print line are received.

The character received by the printer after the last data character should be an <esc> character, denoting a command sequence, or a <syn> or <etb> character, denoting another line of raster data. Any other characters are ignored.

To reset the printer after a synchronization error or to recover from an unknown state, the host computer needs to send at least 85 continuous <esc> characters to the printer. This 85-character sequence is required in case the printer is in a mode in which it expects a raster line of data. The 85 <esc> characters exceed the default number of bytes required for a full line of raster data (84); this ensures that the printer looks for an ESC command.

Note: A minimum of 85 <esc> characters are required, as this is one more than the longest possible string of data bytes that the printer could encounter.

Label Positioning

A motor-driven platen, which acts as a pinch roller, controls label movement within the printer. The control electronics track the logical position on a label by counting motor steps. An infrared LED photocell detects the top-of-form sense hole that is located between labels. The sense hole re-syncs the logical counter to a known value that corresponds to the number of motor steps between the sensor and the cutter bar. Top-of-form position (the inter-label gap under the cutter bar) is reached when the logical counter decrements to zero. The first motor step after top-of-form position reloads the down counter with a value representing the hole-to-hole length of the current label stock.

Top-of-Form Sync

The logical position counter is not initialized at power up. Label position is always assumed to be correct due to the self re-syncing described above. If an Out of Paper condition is detected at power up, an Advance to Top-of-Form command is issued and the stepper motor will advance until either a top-of-form sense hole is detected, causing a re-sync, or until the counter has advanced the equivalent of one full label. This Load Paper condition also causes the stepper motor to step at a slower rate to help overcome the frictional drag caused by the print head rubbing directly on the rubber platen.

Label Length

At power up, the label length variable is set to a default value of 3058 (in 300ths of an inch units), which corresponds to approximately 10.2 inches. The Set Label Length command sequence (<esc> L n1 n2) allows the host software to change the label length variable to accommodate longer lengths. If longer length labels are used, it is the responsibility of the host computer to load (and/or re-load) the required label length variable every time the printer is reset by a power-on reset or a software reset.

When the label length variable is set to any negative 2 byte integer value (0x8000-0xFFFF), it allows for the use of continuous form paper. In the continuous form mode, 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 400 series printers do not compare the label length variables sent by the host with the actual length of the currently loaded label stock. The printers only use the information provided to maintain the logical position counter. In addition, the printer does not check for inter-label gap when printing. It is the responsibility of the host computer to avoid overrunning the label area.

Label-Movement Commands

There are three label-movement commands implemented in the LabelWriter: Form Feed, Short Form Feed and Skip “n” Lines. These commands operate as follows.

Form Feed Command (<esc> E)

This command causes the control electronics to skip lines until the logical position counter has decremented to zero, or the printer electronics sense the top-of-form hole or mark. The printer then advances the label just beyond the tear-bar. This command can be used after every label or combined with the Short Form Feed command (see below) to optimize printing by executing the Form Feed command only at the end of a multi-label print job.

Short Form Feed Command (<esc> G)

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).

Skip “n” Lines Command (<esc> f 1 n)

Use this command to force the LabelWriter printer to advance the number of lines corresponding to the variable n (0 to 255 lines). This command is put into the data buffer along with the print data so that it will take effect at the appropriate point in the data stream. The Skip “n” Lines command is executed only one time per instance and must be re-issued each time a skip is desired.

The Status Byte

The LabelWriter printer reports a status byte with several bits dedicated to reporting its current state.

The host requests the status byte from the printer by issuing an ESC A command. The bits in the returned status byte are described below:

Bit 0 (Ready Bit)

This bit is always returned as a 1.

Bit 1 (Top-of-Form)

This bit is returned as a 1 if the printer is in top-of-form position. Otherwise, this bit is returned as a 0.

Bit 2 (reserved)

Bit 3 (reserved)

Bit 4 (reserved)

Bit 5 (Out of Paper)

This bit is returned as a 1 if the printer is out of paper. Otherwise, this bit is returned as a 0.

Bit 6 (Paper Jam)

Bit 7 (Error)

This bit is also sent when an out of paper condition is detected.

Optimization of Throughput

To achieve optimal performance, the data transfer from the host to the printer should be kept as short as possible. The communication protocol was designed to allow the data to be transferred with only one overhead byte per dot line. Command sequences, such as Set Dot Tabs or Set Bytes per Line, should be sent only when a change is desired. The Dot Tab and Bytes per Line commands should be used to reduce the number of bytes transmitted. The Form Feed command should be used after transmitting the last dot line to be printed.

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 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.

Barcode and Graphics Print Mode

For better accuracy of dot placement and sizing, the LabelWriter 400 series printers incorporate a feature which allows the host computer to specify a slower, Barcode and Graphics print mode. This mode may improve print quality of smaller barcodes and some graphic images.

Power Requirements

The LabelWriter 400 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 ratings below are based on normal printer usage, except where specified.

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

AC Adapter

DYMO part number	93447 (60 W)
Input voltage	100 – 240 VAC, 50/60 Hz, 1.6 Amps
Output voltage	24 VDC, 2.5Amps

PCB Input Power

All LabelWriter 400 series printers have an input voltage of 24 VDC, +/- 5%. Their power requirements are as follows.

LabelWriter 400 and 400 Turbo Printers

Input current (idle)	0.040 Amps
Input current (typical)	1.75 Amps
Input current (max.)	3.3 Amps based on printing a shipping label (30256) with a maximum-size filled rectangle, after print head temperature increases above ambient temperature. At nominal print head temperature: 2.7 A In graphics mode: 1.6 A

LabelWriter Twin Turbo Printer

Input current (idle)	0.026 Amps
Input current (typical)	0.975 Amps (text only)
Input current (max.)	3.3 Amps based on printing a shipping label (30256) with a maximum-size filled rectangle, after print head temperature increases above ambient temperature. At nominal print head temperature: 2.9 A In graphics mode: 1.6 A

LabelWriter Duo Printer

Input current (idle)	0.052 Amps
Input current (typical)	1.1 Amps (text only)
Input current (max.)	3.3 Amps based on printing a shipping label (30256) with a maximum-size filled rectangle, after print head temperature increases above ambient temperature. At nominal print head temperature: 3.0 A

Note: The input current is ramped up as the 24 V is applied to the input to limit in-rush current (there is a 2200 μ F filter capacitor at the input). After power is removed, allow seven seconds for this circuit to reset before re-applying the input voltage.

Connector (JP2)

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

USB Printer Interface

The LabelWriter 400 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/>).

The LabelWriter Duo printer is implemented as a Composite USB interface. As such, it will enumerate twice, as two different printers: once for the label printing portion and once for the tape printing portion.

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 DUO-96 ²	0x0017
DYMO LabelWriter Twin Turbo	0x0018
DYMO LabelWriter 400	0x0019
DYMO LabelWriter 400 Turbo	0x001A
DYMO LabelWriter Duo - 128 ¹	0x001D

² The DYMO LabelWriter Duo printer initially shipped with a 96-dot print head for the tape-printing mechanism. This has been replaced with a 128-dot print head. Thus, there are two different Product IDs for these two printer versions.

Printer Commands

All LabelWriter 400 series printers implement the same basic commands. The LabelWriter Twin Turbo printer implements one additional command, the Roll Selection command, and the LabelWriter Duo printer implements an additional, but similar, set of commands that are specific to printing on continuous-length tapes (see Appendix B).

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> B) as well as its hexadecimal representation (1B 42). Parameter values are specified as "n" for single byte values or "n1 n2" for two byte values.

<esc> B n Set Dot Tab

1B 42 ? n = starting byte number per line (binary), where:
 0 <= n <= 83
 default value = 0

This command shifts the starting dot position on the print head towards the right, effectively introducing an increased left margin. Each byte represents 8 dots, so a value of four for n would shift an image over 32 dots, or 32/300ths of an inch.

<esc> D n Set Bytes per Line

1B 44 ? n = number bytes per line, where:
 1 <= n <= 84
 default value = 84

This command reduces the number of bytes sent for each line if the right side of the label is to be left blank.

<esc> L n1 n2 Set Label Length

IB 4C ? ? n1, n2 = number of dot lines from sense hole to sense hole (binary), where:
 n1 = msb (binary)
 n2 = lsb (binary)
 default value = 3058 (10.2")

This command indicates the maximum distance the printer should travel while searching for the top-of-form hole or mark. Print lines and lines fed both count towards this total so that a value related to the length of the label to be printed can be used.

For normal labels with top-of-form marks, the actual distance fed is adjusted once the top-of-form mark is detected. As a result this command is usually set to a value slightly longer than the true label length to ensure that the top-of-form mark is reached before feeding is terminated.

This command can also be used to put the printer into continuous feed mode. Any negative value (0x8000 - 0xFFFF) will place the printer in continuous feed mode.

In continuous feed mode the printer will respond to Form Feed (<esc> E) and Short Form Feed (<esc> G) commands by feeding a few lines out from the current print position. An ESC E command causes the print position to feed to the tear bar and an ESC G causes it to feed far enough so that a reverse feed will not cause lines to overlap.

<esc> E Form Feed

IB 45

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 on the next label. To optimize print speed and eliminate this reverse feeding when printing multiple labels, use the Short Form Feed command (see below) between labels, and the Form Feed command after the last label.

<esc> G Short Form Feed

IB 47

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

<esc> q n Select Roll (Twin Turbo printer Only)

IB 71 ? n specifies the roll to print on, where:
 30 (ASCII '0') = Automatic selection
 31 (ASCII '1') = Left roll
 32 (ASCII '2') = Right roll

This command specifies the roll on which the printer output should be imaged. In Automatic Selection mode, the printer assumes that both rolls have the same media, and it will toggle back and forth as rolls become empty.

<esc> A Get Printer Status

Returns a single byte with the following bit meanings (1 = true).

Bit	Meaning
0	Ready (paper in, no jam)
1	Top of form
2	Not used
3	Not used
4	Not used
5	No paper
6	Paper jam
7	Printer error (jam, invalid sequence, and so on)

Note that printer ready is returned as 03h (Ready and Top of form).

<esc> @ Reset Printer

IB 40

This command resets all parameters (Dot Tabs, Line Tabs, Bytes per Line, and so on) to their default values and sets top-of-form as true.

Note: This command is acted upon immediately; any data still in the print buffer will be lost.

<esc> * Restore Default Settings

IB 2A

This command resets all internal parameters to their default values.

Note: This command is acted upon when it is received.

<esc> f 1 n Skip "n" Lines

1B 66 1 ? n = the number of lines to skip

This command skips over the next “n” lines on the label.

Note: This command is unusual because it requires the “1” prior to the value for the number of lines to skip.

<esc> V Return Revision Letter/Number

1B 56

This command returns the printer model and firmware version number as an ASCII string. The information is returned as an 8-character ASCII string in the following format.

Bytes 0-4: the 5-digit model number (e.g. “93089”)
Byte 5: a lowercase letter (commonly “v”)
Bytes 6-7: the two-digit firmware version (e.g. “0N”)

Example: 98039v0K

<syn> nl..nx Transfer Print Data

16 ? ?

Where:

nl = first 8 data bits

nx = last 8 data bits

This command sends a raster line of print data to the printer. For further details, see “Print Data” on page 8.

<etb> nl..nx Transfer Compressed Print Data

17 ? ?

Where:

nl = first compressed data byte

nx = last compressed data byte

This command sends compressed raster line images. This command is generally not needed due to the high bandwidth of USB communications, but it might provide some nominal increase in performance.

<esc> h Text Speed Mode

This command instructs the printer to print in Text Quality mode. This is the default, high speed printing mode.

<esc> i Barcode and Graphics Mode

This command instructs the printer to print in Barcode and Graphics mode. This results in lower speed but greater positional and sizing accuracy of the print elements.

<esc> c Set Print Density Light

This command sets the strobe time of the printer to 75% of its standard duty cycle.

<esc> d Set Print Density Medium

This command sets the strobe time of the printer to 87.5% of its standard duty cycle.

<esc> e Set Print Density Normal

This command sets the strobe time of the printer to 100% of its standard duty cycle.

<esc> g Set Print Density Dark

This command sets the strobe time of the printer to 112.5% of its standard duty cycle.

<esc> y Set print resolution to 300x300

This command sets the step resolution of the printer to match its print element resolution, giving 300 x 300 dpi printing.

<esc> z Set print resolution to 203x300

This command changes the step resolution of the printer to 203 dpi giving a printing resolution of 203 x 300 dpi.

Appendix A Data Compression

Data compression is done using a form of run length encoding. Bit seven, the sign bit, of a compressed character represents the value to be printed: 0 = white space, 1 = printed pixel. Bits 0 through 6 represent the number of consecutive bits of the selected value minus one, as shown in the table below.

Compressed Data Byte Layout								
Bit	7	6	5	4	3	2	1	0
Function	Pixel color	(Number of pixels to print)-1						
Value	White = 0 Black = 1	0..127						

Examples:

00h = 1 white pixel

80h = 1 printed pixel

0Fh = 16 white pixels

FFh = 128 printed pixels

The data is handled by the printers on a line-by-line basis, so compressed lines may be intermixed with normal lines. In addition, compressed mode also uses the Bytes-per-Line variable to determine how much data to expect from the host for each line. However, the sum of the pixels must be equal to the Bytes-per-Line variable multiplied by 8. No error checking is done on the incoming data and unexpected results will occur if the above caution is not observed.

Appendix B Printing to the LabelWriter Duo Tape Printer

Command Language

The DYMO tape printers use a subset of the LabelWriter command language described earlier in this manual. Due to the nature of printing on tapes, some tape-specific commands have been added.

The LabelWriter Duo printer has either a 96-dot or 128-dot print head (newer models have 128-dot print heads). All LabelWriter Duo printers support 6-mm, 9-mm, 12-mm, 19-mm and 24-mm tape cartridges.

<esc> B – Dot Tab

The Dot Tab command operates the same way that the equivalent command in the LabelWriter command set operates. The dot tab value is specified as the number of pixels to skip from the left print edge. A dot tab value of 3, for example, will cause data to begin printing 24 pixels from the left edge of the print head.

For any particular print head, the maximum value is defined to be:

$$(\text{number of dots} / 8) - 1$$

For a 96-dot print head, the maximum value is 11. For a 128-dot print head, the maximum value is 15. Dot tab values greater than the maximum allowed value will revert to the defined maximum. For example, if a value higher than 11 is specified for the Dot Tab command on a 96-dot print head, the dot tab value is reduced to 11 at print time. The minimum value for the Dot Tab command is 0.

<esc> D – Bytes per Line

The Bytes per Line command operates the same way that the equivalent command in the LabelWriter command set operates. The bytes-per-line value specifies how many bytes of data the printer can expect to receive for the current dot line.

The maximum value for bytes per line for the 96-dot print head is 12; the maximum value for the 128-dot print head is 16. Additionally, the total of the dot tab setting and bytes per line cannot exceed 12 (or 16 for the 128-dot print head). If the total exceeds 12 (or 16), the total number of bytes per line is reduced at print time to 12 (or 16).

The minimum value for bytes per line is 0. If the bytes per line are set to 0, the printer will print one blank line every time it receives a <syn> character.

<syn> – Print Data

Uncompressed print data is handled identically to the LabelWriter command set. Each dot line must begin with an ASCII <syn> character (hex 0x16, decimal 22) and consist of enough bytes to fill the current bytes-per-line setting.

The LabelWriter Duo tape printer only supports SYN print data. Compressed printing, using the ETB command, is not supported.

<esc> C – Set Tape Type

This command sets the heat sensitivity for the tape type in the printer. The following are the defined tape types.

Selection number	Tape Description
0	Black on white or clear
1	Black on blue
2	Black on red
3	Black on silver
4	Black on yellow
5	Black on gold
6	Black on green
7	Black on fluorescent green
8	Black on fluorescent red
9	White on clear
10	White on black
11	Blue on white or clear
12	Red on white or clear

<esc> E – Cut Tape

This command causes the printer to cut the tape using the automatic cutter. This command must be sent at the end of every label.

<esc> A – Get Status

This command obtains the current printer status, such as the tape size inserted, the error bits, and other bits. This command returns eight status bytes (the LabelWriter Duo printer only uses the first byte).

Status Bytes Format

The ESC A command returns 8 bytes of status. Byte 0 returns the status of the tape printer in the LabelWriter Duo printer. Bytes 2-7 are reserved for future use.

The bit assignments and their definitions are as follows.

7	6	5	4	3	2	1	0
Ignore	CASSETTE	Ignore	CJ	Ignore	GE	Ignore	

GE - General Error Bit

This bit reports any sort of general error. It usually means that the motor is stalled or a tape is jammed. Printing is unable to continue without user interaction. A value of 1 indicates an error; a value of 0 indicates no error.

CJ - Cutter Jammed Bit

This bit indicates that either the automatic cutter or the spitter is jammed. A value of 1 indicates an error.

CAUTION: In this condition, the cutter blade is not retracted and may present a very sharp, dangerous edge. Use caution when clearing any sort of printer jam.

CASSETTE – Cassette Presence Bit

This bit detects if a tape cassette is inserted. It will return a value of 1 if a cassette is inserted, and a 0 if no cassette is inserted.

Appendix C Debugging Printer Output

To effectively use the ESC commands to communicate with LabelWriter printers, you must understand the commands themselves. While DYMO cannot offer regular support for those wishing to communicate directly with the printer, there is a simple way to learn about and understand the commands – study what the DYMO printer drivers do with known data patterns. To do this:

1. Install the label printer on a Windows PC according to the instructions. Use the DYMO Label Software application to verify that the printer works.
2. From the **Start** menu, choose **Settings**, and then choose **Printers**.
3. Right-click on the LabelWriter icon, and then choose **Properties** from the menu.
4. Click on the **Ports** tab. In the list of ports, choose **File**.
5. Click **OK**.

After performing these steps, whenever you print, you will be prompted to enter a file name and the output will be redirected to this file. Use the DYMO Label Software to print a variety of labels and examine the resulting files using a hex editor; use this manual to decrypt the data.