



A776 (B780) Two-Color Thermal/Impact Hybrid Printer



Programming Guide



Printer without Imaging



Printer with Imaging



Includes TPG, Inc. LogoEZ[®] colorization information

Made under one or more of the following U. S. patents: 4886381, 5579043, 5613787, 5651624, 5713678, 5752779, 5789916, 5800080, 5879090, 5887999, 5975776, 6027266, 6085973, 6089450, 6129465, 6155483, 6404452, 6486902, 6504331, 5749277, 6722754, 6739773, 6784909.



A776-PG00001 B

Federal Communications Commission (FCC) Radio Frequency Interference Statement Warning

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Information to the User

This equipment must be installed and used in strict accordance with the manufacturer's instructions. However, there is no guarantee that interference to radio communications will not occur in a particular commercial installation. If this equipment does cause interference, which can be determined by turning the equipment off and on, the user is encouraged to contact Transaction Printer Group, Inc. (TPG, Inc.) immediately.

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WARNING! In order to ensure compliance with the Product Safety, FCC and CE marking requirements, you must use the power supply, power cord, and interface cable which are sold for use with this product or which meet the following parameters:

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UL Listed (QQGQ), NEC Class 2 power supply with SELV (Secondary Extra Low Voltage), non-energy hazard output, limited energy source, input rated 100-240 Vac, 1.5/0.8 A, 50/60 Hz, output rated 24 Vdc, 2.3 A for 55-watt unit; 100-200 Vac, 2.0 A, 50/60 Hz, output rated 24 Vdc, 3.125 A for 75-watt unit.

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Use of a cable other than described here will require that you test the cable with the TPG, Inc. printer and your system for FCC and CE mark certification.

Power Cord

A UL listed, detachable 3-wire power cord must be used; where the third wire is the protective earthing conductor. For applications where the power supply module may be mounted on the floor, a power cord with Type SJT marking must be used. For applications outside the US, power cords which meet the particular country's certification and application requirements should be used.

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Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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Web Site

<http://www.tgpprinter.com>

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Chapter 1: About this Guide

How to use this Guide

This guide provides programming information on TPG, Inc.'s A776 (and B780) printer.

It is written for tech-savvy users who are interested in customizing or adjusting printer functionality and is meant to be used with the **A776/B780 ColorPOS®**

Two-Color Thermal Receipt/Impact Hybrid Printer User Guide.

If you experience any difficulties during the programming process or feel unsure of adjustments you have made, contact your TPG, Inc. representative for further assistance.

Where to find the basics

If you are looking for information on setup or basic operation, refer to the **A776** (or B780) **ColorPOS® User Guide**. This guide assumes that you have the **A776/B780 ColorPOS® User Guide** handy for reference or are already familiar with the printer.

Where to find advanced technical information

This guide contains the most complete information available on programming the printer. If you cannot find what you need here or would like further guidance on how to program the printer, contact an TPG, Inc. representative for assistance.

If you are having problems with the physical operation of the printer the **A776 /B780 ColorPOS® Service Guide** provides in-depth information on diagnostics and service. The **A776/B780 ColorPOS® Service Guide** is available to qualified service technicians who have been certified by TPG, Inc. to perform advanced procedures.

Support

For more advanced procedures and troubleshooting, you may need to refer to the printer's service guide or speak to an TPG, Inc. technical professional. Your representative is able to provide you with necessary information.

For on-line service, refer to the Web site at www.TPGprinters.com or e-mail to: support@TPGprinters.com.

Chapter 2: Printer Status and Indicators

The A776/B780 printer performs a number of diagnostics that provide useful information about the operating status of the printer. The following diagnostic tests are available.

- Startup diagnostics, performed during startup cycle.
- Runtime diagnostics, performed during normal printer operation.
- Remote diagnostics, run during normal operation and reported in the print test.

The printer can be configured with the following settings and functions through the configuration menu that is printed on the receipt. To learn more see the section called “Configuring the Printer” in the A776/B780 User Guide, page 26.

Startup Diagnostics

When the printer receives power or performs a hardware reset, it automatically performs the startup diagnostics (also known as level 0 diagnostics) during the startup cycle. The following diagnostics are performed:

- Turn off motors and solenoids
- Perform boot CRC check of the firmware ROM, test external SRAM, test EEPROM, and test main program CRC
 - Failure causes Startup Diagnostics to stop; the printer beeps and the light flashes a set number of times, indicating the nature of the failure. The table in the “Indicators” section (page 16) describes the specific tone and light sequences.
- Check if paper is present
- Return the knife to the home position
 - Failure causes a fault condition. The table in the “Indicators” section (page 16) describes the specific tone and light sequences.
- Check if receipt cover is closed
 - Failure does not interrupt the startup cycle.

When the startup diagnostics are complete, the printer makes a two-tone beep (low then high frequency), the paper feed button is enabled, and the printer is ready for normal operation.

If the printer has not been turned on before, or a new EEPROM has been installed, the default values for the printer functions will be loaded into the EEPROM during startup diagnostics.

Communication interfaces (except Ethernet)
 Diagnostic modes
 RS-232C settings
 Printer emulations/software options
 Hardware options

Runtime diagnostics

Runtime diagnostics (sometimes called level 2 diagnostics) run during normal printer operation. When the following conditions occur, the printer automatically turns off the appropriate motors and disables printing to prevent damage to the printer:

- Paper out
- Receipt cover open
- Knife unable to home
- Printhead too hot
- Voltages out of range

The light on the operator panel will signal when these conditions occur as well as indicate what state or mode the printer is in.

Remote diagnostics

Remote diagnostics (sometimes called level 3 diagnostics) keeps track of the following tallies and prints them on the receipt during the print test. See the sample test printout on the next page. These tallies can be used to determine the printer’s state of health.

- Model number
- Serial number
- CRC number
- Number of lines printed
- Number of knife cuts
- Number of hours the printer has been on
- Number of flash cycles
- Number of cutter jams
- Number of times the cover is opened
- Maximum temperature reached

(See tallies note on the following page.)

For more information about	See this section
Accessing the remote diagnostic tallies	"Command descriptions" in <i>Chapter 5: Programming commands</i> (Status commands: Transmit printer ID, remote diagnostics extension, Hexadecimal 1D 49 40 n)

Ethernet terms and default setup

For the printer to operate with Ethernet, a series of commands must be set within the printer. These commands can only be set through the host computer and are not configurable through the printer configuration menu. See page 30 for the Ethernet setup commands list and page 113 for command descriptions.

Default setup instructions and sample Ethernet diagnostic printout are on the following page. Note the differences between an Ethernet and a standard RS-232C printout.

Ethernet Terminology

MAC address	a unique hexadecimal serial number assigned to each Ethernet network device to identify it on the network. Each communication board has a unique number from TPG, Inc.'s assigned range of numbers. TPG, Inc. numbers start with: 00:E0:70.
IP address	a unique number that identifies each node on a network and to specify routing information. Each node must be assigned a unique IP address. The address is made up of two distinct parts: a network ID, which identifies the network; and a host ID, which is typically assigned by the administrator. These addresses are typically represented in dotted-decimal notation, such as 138.58.11.27. The default setting is: 192.0.0.192
Net mask	a series of bits designed to "mask" certain portions of an IP address and is used primarily for subnetting. The standard netmask for a Class C network is 255.255.255.0, with the last octet (.0) directing the host to look there for the machine number. The rest (225) is the network number. The default setting is 0.0.0.0. This will use the standard mask of the selected IP's class.
Gateway	a hardware or software set-up that translates between two dissimilar protocols. A gateway, even when the printer is on another subnet, is not always needed. The printer initiates no connection and obtains the gateway address from the host packets. The default setting is 0.0.0.0 (none)
LP Daemon	an Ethernet protocol. The LP Daemon listens on port 515. Default is LP Daemon disabled.
Telnet Daemon	a protocol for remote computing on the Internet. It allows a computer to act as a remote terminal on another machine, anywhere on the Internet. This means that when you telnet to a particular host and port, the remote computer (which must have a telnet server) accepts input directly from your computer (which must have a telnet client) and output for your session is directed to your screen. The telnet server listens on port 23. The default setting is enabled.
Raw TCP/IP Port	enables the printer to listen for raw tcpip communications. Specifying this to zero will disable raw tcpip connections. Default value is 9001 enabled.
BootP	a TCP/IP network protocol that lets network nodes request configuration information from a BOOTP "server" node. Use BootP to obtain the IP address at power-up. Default setting is disabled.
DHCP	allows "leasing" of IP address for a limited time. If no IP address is found at start-up, the printer waits for two more minutes. If no address is found after two minutes DHCP will automatically set the default IP address. Default setting is enabled.

Indicators

The printer communicates various conditions both visually, with two green lights or audibly, with a series of tones or beeps. The following table lists these indicators.

Green on-line, paper status,error light (to the rear of the paper feed button)

Indicator	Sequence	Condition
Light	Continuous, flashing quickly	Paper out Cover open Knife unable to home
Light	Continuous, flashing slowly	Paper is low (if paper low sensor is installed) Printhead too hot Voltages out of range
Tone	Two-tone beep	Startup diagnostics completed successfully
Repeating Tone	Single beep	Boot CRC test failure
Repeating Tone	Double beep	SRAM test failure
Repeating Tone	Triple beep	EEPROM test failure
Repeating Tone	Four beeps	Dynamic memory initialization failure
Light and Tone	Two-Tone beep Continuous flashing of light	Main program CRC test failure Or DIP switch is in on position indicating flash download mode

Green slip-in light (in front of the paper feed button)

Indicator	Sequence	Condition
Light	Off	No check or form inserted or are incorrectly inserted
Light	On (continuous)	Check or form properly inserted

For more information about See this section

Error conditions and correcting them Troubleshooting
Chapter 5 of the User Guide

The printer is also able to communicate its status to the host application if the application has been programmed to receive this information.

Chapter 3: Migrating to A776 and B780

Migrating from existing TPG, Inc. printers

The A776 printer is the fourth generation two station hybrid thermal/impact printer with feature enhancements designed to provide the most desirable options to the customer. This section is provided for those customers who would like to migrate from their existing TPG, Inc. printers to the A776 printer, while maintaining as much continuity as possible in the new application. This includes migration from the A756, A758 and the A760 printers. Several commands exist to support such a migration. The primary differences are described below:

A756 to A776:

A756: 6 dots/mm thermal printhead	A776: 8 dots/mm printhead
A756: wide slip station (66 columns)	A776: narrow (42 columns) slip station
A756: no top validation of forms	A776: top validation of forms
A756: monochromatic printing	A776: two-color printing

A758 to A776:

A758: wide slip station (66 columns)	A776: narrow (42 columns) slip station
A758: no top validation of forms	A776: top validation of forms
A758: monochromatic printing	A776: two-color printing

A760 to A776:

A760: wide slip station (66 columns)	A776: narrow (42 columns) slip station
A760: no top validation of forms	A776: top validation of forms

A721 to B780

A721: monochrome printing	B780: two color printing
A721: journal printing	B780: electronic journal
A721: impact receipt	B780: thermal receipt

Moving from the A756 to the A776 (Thermal printhead differences)

The following table details the list of commands whose behavior differs between the A756 printer and the A758, A760, and A776 printers. This is due to the physical differences of the 6 dots/mm head in the A756 and the 8 dots/mm head in the A758, A760 and A776.

Command	Description	Difference between the A756 and the A776.
15 n	Feed n dot rows	This command will move the paper on the receipt in n/203 inch steps instead of n/152 inch steps.
16 n	Add n extra dot rows	The dot rows will be measured in n/203 inches versus n/152 inches.
1B 20 n	Set right-side character spacing	This command sets the right side spacing to “n” horizontal motion units. By default, these units are in terms of 1/203 inches versus 1/152 inches.
1B 24 n1 n2	Set absolute starting position	For graphics commands, the position is scaled to best match A756. In text mode, the equivalent character position is calculated.
1B 26 s c1 c2 n1 d1...nn dn]	Define user-defined character set	Since the dots on the A776 printhead are smaller, user defined characters that were used on the A756 printers will appear smaller on the A776 printer.
1B 2A m n1 n2 d1...dn	Select bit image mode	In A756 emulation mode, graphics are scaled to best match the size of the graphic in the A756 printer.
1B 33 n	Set line spacing	This command uses n in terms of n/360 inches. Since the A756 had a fundamental step of 1/152 inch and the A776 has a fundamental step of 1/203 inch, the actual line spacing will not exactly match the requested spacing.
1B 4A n	Print and feed paper	This command uses n in terms of n/360 inches. Since the A756 had a fundamental step of 1/152 inch and the A776 has a fundamental step of 1/203 inch, the actual line spacing will not exactly match the requested spacing.
1B 59 n1 n2 d1...dn	Select double-density graphics	In A756 emulation mode, the printer scales the graphics to provide the best match.
1B 5C n1 n2	Set relative print position	The parameter to this command is in units of dots. However, the command moves and aligns to character positions. In A756 emulation mode, this command calculates how many character positions to move based on the A756 character width in dots (10) versus the A776 (13).
1B 61 n	Select justification	This command does true dot resolution alignment for centering versus character-aligned centering.
1D 2A n1 n2 d1...dn]	Define downloaded bit image	In A756 emulation mode, this command scales the incoming data to provide a best match to the size of the image as it printed on A756.
1D 2F m	Print downloaded bit image	In A756 emulation mode, this command scales the incoming data to provide a best match to the size of the image as it printed on A756.

Moving from the A756 to the A776 (Emulation commands)

These commands are handled differently when the A776 is in A756 emulation mode.

1B 47	enable double strike (the difference is no parameter byte req'd)
1B 48	disable double strike
1B 4C...	double density graphics command sequence

Moving from the A756, A758, or A760 to the A776 (Slip differences)

The impact station print zone on the A760 is 4.7 inches wide and the print zone on the A776 is 3.0 inches. To compensate for the narrower print zone on the A776 the firmware will provide the following functionality:

1. For applications that currently use narrow forms with 42 or fewer columns, an option is provided to delete x leading spaces. No application or form changes should be required.
2. For applications that use narrow forms with 51 or fewer columns, an option is provided to default to compressed mode. No application or form changes should be required.
3. For applications using wide forms that print on less than 51 columns, options 1 and 2 above are combined with the option to delete trailing spaces. There should be no changes required to the application but a new form will be required.
4. For applications using wide forms that print on more than 51 columns, the data will wrap to the next line. If you don't want data to wrap you will need to change the application and the form.

	<u>A756, A758, A760</u>	<u>A776</u>
Impact Station Print Zone	4.7 inches	3 inches
Characters/row – Normal Mode	66	42
Characters/row – Compressed Mode	80	51

See Chapter 4: Programming the Printer for more details about the slip print zones.

Some commands have new functions for the slip and can be configured to be enabled or disabled on the slip. Existing applications that use these functions on the receipt but **not** on the slip may need to be disabled manually for the slip. The default is disabled for the slip.

- 1B 21 10 double high slip character print
- 1B 20 n slip character right side spacing
- 1D 50 XY set minimum units for the slip station
- 1D 4C nL nH set left margin on the slip station
- 1D 57 nL nH set print width on the slip station
- 1B 61 n print justification on the slip station

A776 Emulation Commands

Set Printer ID ModeCode (Hexadecimal)

1F 03 0C n

This command is ignored

Set A776 Printer IDCode (Hexadecimal)

1F 03 25 0F n

This command sets the printer ID response to the Printer ID command (1D 49 01)

<u>n</u>	<u>Printer ID</u>
00	A776
01	A760
02	A758
03	A756

Set A776 Printer EmulationCode (Hexadecimal)

1F 03 25 02 n

<u>n</u>	<u>Emulation</u>
00	Native
01	A756 limited emulation (See list of comments earlier in this chapter)

A776 Configuration Commands

Select Slip Lines per InchCode (Hexadecimal)

1F 03 25 04 n

This command sets the slip station lines per inch setting.

<u>n</u>	<u>Line spacing</u>
00	7.2 LPI
01	6.0 LPI

Select Number of Lines of ValidationCode (Hexadecimal)

1F 03 25 06 n

Command

Select number of lines of validation

This command sets the number of lines of validation that can be printed.

<u>n</u>	<u>Number of validation lines</u>
00	15
01-04	4 (default)
05-0F	actual number (5 - 15 decimal)

Select A776 Narrow Slip Configuration Option to Ignore n Leading SpacesCode (Hexadecimal)

1F 03 25 08 n

This command is available so A760 applications can ignore n leading spaces in a 42-column line of text.

Range of n

0x00 < n < 0x20 hexadecimal

0 < n < 32 decimal

- n = 24 decimal is equivalent to printing the rightmost 42 columns of the A760 printzone (24 + 42 = 66).
- The first non-space in columns 1-n will stop ignoring leading spaces.
- Text over 42 columns will wrap to the next line.
- Tab (0x09), set column (0x1B 0x14 n), set absolute position (0x1b 0x24 NL NH), and set relative position (0x1B 0x5C NL NH) commands are handled within the range of ignored leading spaces.

Select A776 Narrow Slip Configuration Option to Ignore n Leading SpacesCode (Hexadecimal)

1F 03 25 09 n

This command is available so A760 applications can ignore n leading spaces in a 51-column line of compressed text.

Range of n

0x00 < n < 0x20 hexadecimal

0 < n < 32 decimal

- n = 29 decimal is equivalent to printing the rightmost 51 compressed columns of the A760 printzone (29 + 51 = 80).
- The first non-space in columns 1-n will stop ignoring leading spaces.
- Text over 51 columns will wrap to the next line.
- Tab (0x09), set column (0x1B 0x14 n), set absolute position (0x1b 0x24 NL NH), and set relative position (0x1B 0x5C NL NH) commands are handled within the range of ignored leading spaces.

Select A776 Narrow Slip 51-column Compressed Print OptionCode (Hexadecimal)

1F 03 25 0A n

When enabled, all normal text is printed in 51-column compressed print.

- This accommodates existing applications printing up to 51 columns on the slip station.
- The format will not match the A756/A758/A760 exactly.
- This will not affect rotated print mode (see below).

n	<u>51-column compressed print option</u>
00	Disable (default)
01	Enable

Select A776 Delete Slip Trailing Spaces OptionCode (Hexadecimal)

1F 03 25 0B n

When enabled, all trailing spaces on the slip will be deleted.

- This accommodates existing applications that send trailing spaces to the slip by not wrapping the blank text to the next line.
- The format will match the A756/A758/A760 exactly, but a narrower form will be required.
- This command will not work for an application that relies on wrapping text to print a line. A print command is required.

n	<u>Delete slip trailing spaces option</u>
00	Disable (default)
01	Enable

Select A776 (21 and 25-line) Rotated Slip Print Options

Code (Hexadecimal)

1F 03 25 0C n

- 21-line rotated text print accommodates existing applications, which print 21 or fewer rotated lines (as read). The format will match the A756/A758/A760 exactly.
- 25-line rotated text print accommodates existing applications, which print between 22 and 25 rotated lines (as read). The format will not match the A756/A758/A760 exactly.
- An A756/A758/A760 can print up to 33 rotated lines (as read), so those printing 26 or higher rotated lines, cannot be emulated on the A776 printer.

n Rotated Print Options

00 21-line (default)

01 25-line

Select A776 First Line of Print Option in Text and Page Mode

Code (Hexadecimal)

1F 03 25 0D n

- The A760/A758/A756 mechanism has a positive slip stop for positioning a form at its top right corner. Some applications rely on a form inserted to this slip stop in order to print on specific areas of the form. When the top right corner of the form is positioned at the slip stop, the first print line is 0.7" below the top of form. Some applications rely on the operator manually positioning a form in order to print on specific areas of the form. The A760/A758/A756 firmware does not automatically reposition an inserted form.
- The A776 slip stop override option does not reposition an inserted form.
- The A776 slip stop distance option is triggered at the slip selection command (0x1B 0x63 0x30 0x04) and positions an inserted form prior to print so that the first line of print will match an A760/A758/A756.
- New configuration option to position to top of form implemented in October 2006.
- There is a temporary run time command to override this configuration option:

1F 7E 01 00	operator positioning for first print line
1F 7E 01 01	position form to A760 slip stop distance for first print line
1F 7E 01 02	position form to top of form for first print line

n	<u>First Line of Text</u>	<u>Beginning of Page Mode Print</u>
00	Operator position	Top of form
01	A760 Slip stop	Top of form (default)
02	Top of form	Top of form
03	A760 Slip stop	A760 Slip stop

Select Cover Open Option

Code (Hexadecimal)

1F 03 25 11 n

- When the cassette cover open option is enabled and the operator opens the cassette cover, the printer will stop printing and enter an error state.
- When the option is disabled, the printer will ignore the state of the cassette cover.

n Cassette Cover Option

00 Disabled

01 Enabled (default)

Set Page Mode Margin Mechanical AdjustmentCode (Hexadecimal)

1F 03 25 16 n

Command

Set page mode margin mechanical adjustment

- This command applies to both the A776 and the B780, although it is primarily implemented for B780 printers replacing existing A721 printers to match cashier check printing.
- Default is 0.
- Value is printed on the second diagnostic page.
- Ranges for margin configurations:

<u>Margin Setting</u>	<u>Maximum mechanical adjustment</u>
.5"	30 half dots
.3"	56 half dots
.1"	84 half dots

- Mechanical adjustment does not apply when page size is defined to be greater than the default of 200 full dots wide.
-

Select A776 Slip Eject OptionCode (Hexadecimal)

1F 03 25 17 n

Command

Select A776 slip eject option

<u>n</u>	<u>Slip Eject</u>
00	disabled
01	enabled (default)

- When enabled, the A776 will eject slip and validation transactions out the top of the printer, like the B780. The slip LED will blink to remove the form, also like the B780.
 - Option can be disabled for applications that rely on the A760/A758/A756 slip eject out the bottom front position.
-

Select 45/60 Column Slip OptionCode (Hexadecimal)

1F 03 25 18 n

Command

Select 45/60 column slip option

<u>n</u>	<u>45/60 Column Slip Option</u>
00	disabled (default)
01	enabled

Set Page Mode Option to Trim Full DotsCode (Hexadecimal)

1F 03 2F n

Command

Set page mode option to trim full dots

n < 128 # of full dots trimmed from right side
n = 255 compress to fit in 3.024"

- This command applies to both the A776 and the B780, although it is primarily implemented for applications specifying a page size greater than 242 full dots wide.
- Default is no trim.
- Maximum width that can be compressed to fit in 3.024" is 270 full dots.
- Value is printed on second diagnostic page.

A776 Configurable Slip Commands

A776 Double High Slip Character Print

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 26 01 n	Enables or disables the 1B 21 10 command

n	<u>Double high slip character print command (1B 21 10)</u>
00	Disabled
01	Enabled

A776 Slip Character Spacing

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 26 02 n	Enables or disables the 1B 20 n command

n	<u>Slip character right side spacing command (1B 20 n)</u>
00	Disabled
01	Enabled

A776 Slip Minimum Units

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 26 03 n	Enables or disables the 1D 50 x y command

n	<u>Set minimum units for the slip station command (1D 50 x y)</u>
00	Disabled
01	Enabled

A776 Slip Left Margin and Print Width

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 26 04 n	Enables or disables the 1D 4C nL nH and 1D 57 nL nH commands

n	<u>Set left margin(1D 4C nL nH) and print width(1D 57 nL nH) on the slip station commands</u>
00	Disabled
01	Enabled

A776 Slip Print Justification

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 26 05 n	Enables or disables the 1B 61 n command

n	<u>Print justification on the slip station command(1B 61 n)</u>
00	Disabled
01	Enabled

Moving from A756/A758 to A776

Two-color Commands

The following table details the list of commands related to two-color printing and ColorPOS® functionality that was not available on the A756 or the A758.

TPG, Inc. ColorPOS® two-color and color interpreted commands

Hexadecimal	ASCII	Description	Page
1B 72 m	ESC r m	Set current color	40
1D A0 n	GS 0xA0	Set temporary maximum target speed	71
1D 23 n	GS # n	Select current logo	63
1D 42 n	GS B n	Select or cancel white/black reverse print mode	60
1D 2A n1 n2 d1 – dm	GS * n1 n2 d1 – dm	Define downloaded bit image	64
1D 2F m	GS / m	Print downloaded bit image	64
1D 81 m n	GS 0x81 m n	Set paper type (ColorPOS®)	41
1D 82 n1–n72/n80	GS 0x82 n1–n72/n80	Print raster monochrome graphics (ColorPOS®)	65
1D 83 n1–n144/n160	GS 0x83 n1–n144/n160	Print raster color graphics (ColorPOS®)	65
1D 84 n m n1 n2 d1 dx	GS 0x84 n m n1 n2 d1 dx	Download logo image (ColorPOS®)	65
1D 85 m n	GS 0x85 m n	Reverse color text mode (ColorPOS®)	61
1D 86 m	GS 0x86 m	Monochrome shade mode (ColorPOS®)	67
1D 87 m	GS 0x87 m	Color shade mode (ColorPOS®)	67
1D 89 n m	GS 0x89 n m	Logo print with color plane swap (ColorPOS®)	68
1D 8B n m o	GS 0x8B n m o	Apply shading to logo (ColorPOS®)	66
1D 8C n m	GS 0x8C n m	Merge watermark mode (ColorPOS®)	66
1D 8D n m	GS 0x8D n m	Text strike-through mode (ColorPOS®)	61
1D 90 m x y o p q	GS 0x8A m x y o p q	Form and merge real-time surround graphic (ColorPOS®)	68
1D 91 n	GS 0x91 n	Save graphics buffer as logo (ColorPOS®)	69
1D 92 n	GS 0x92 n	Background logo print mode (ColorPOS®)	69
1D 97 m n	GS 0x87 m n	User storage status (ColorPOS®)	115
1D 9A n m o	GS 0x9A n m o	Shade and store logo (ColorPOS®)	69
1D 9B m n	1D GS	Logo print with knife cut	70
1D 99 l n m o	GS 0x9B l n m o	Apply margin message mode (ColorPOS®)	70
1F 03 16 05 n	US	Set interpretation of “Set current color” command	42

LogoEZ® colorization commands

Hexadecimal	ASCII	Description	Page
1F 03 16 f s p/r t	US ETX SYN f s p/r t	Set colorization	67
1F 03 17 a m s	US ETX ETB a m s	Set attribute mapping	69

Note: The new TPG, Inc. LogoEZ® colorization utility provides you a fast and easy way to get basic two-color and logos on your receipt without having to enter commands. Check out the TPG, Inc. Web site at www.TPGprinters.com.

Migrating from the A721 (7221) printer to the B780

The B780 printer is a two station hybrid thermal/impact printer with feature enhancements designed to provide the most desirable options to the customer. This section is provided for those customers who would like to migrate from their existing TPG, Inc. printers to the B780 printer, while maintaining as much continuity as possible in the new application. Several commands exist to support such a migration. The primary differences are described below:

A721 (7221) to B780:

A721: impact receipt	B780: thermal receipt
A721: no paper cutter (knife)	B780: paper cutter (knife)
A721: monochromatic printing	B780: two-color printing on receipt
A721: no audible tone	B780: audible tone

B780 Emulation Commands

Set Printer ID Mode

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 0Ch	Set printer ID mode

This command sets the printer ID response to the printer ID command (1D 49 01)

n = 00h : Native printer ID
n = 01h : Emulated printer ID

The Native printer ID returned from the printer is 2C.
The Emulated printer ID returned from the printer is 0A.

Set B780 Printer Emulation

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 25 02 n	Set B780 printer emulation

This command sets the type of printer emulation

<u>n</u>	<u>Emulation</u>
00	Native
01	DH emulation

B780 Configuration Commands

Note: These B780 configuration commands apply only to A721 emulation of the slip and validations stations.

Select B780 Slip Right Text Margin and Text Column Options

<u>Code (Hexadecimal)</u>	<u>Command</u>
1F 03 25 03 n (Native Mode)	Select B780 slip right margin and text columns options

<u>n</u>	<u>Right Margin Text</u>	<u>Text Columns</u>	<u># Lines Rotated</u>
00	.1"	42/51 (B780 default)	28
01	.1"	35/42	23
02	.3"	35/42	23
03	.3"	33/40	22
04	.5"	35/42	23
05	.5"	33/40 (A721 default)	22

- This command corresponds to A721 internal dip switches 3.2, 3.3, and 3.4.

- For text printing, these are the A721 internal dip switch settings:

3.2	3.3	3.4	Right Margin Text	Text Columns
OFF	OFF	OFF	.5"	33/40
OFF	OFF	ON	.3"	33/40
OFF	ON	OFF	.5"	35/42
OFF	ON	ON	.3"	35/42
ON	OFF	--	.1"	35/42
ON	ON	--	.1"	42/51

- A721 internal dip switch 3.5 applies to the right margin in Page Mode printing. That is handled with another B780 configuration command.
- The right margin and text columns options cannot be changed separately because some combinations are not reasonable.
- The B780 (emulating the A721 emulating the Epson 375) powers up with compressed print selected.

Select DH Pitch and Rotated Text Columns

Code (Hexadecimal)

1F 03 25 03 n (DH emulation)

Command

Select DH pitch and rotated text columns

<u>n</u>	<u>DH Pitch</u>	<u>Receipt</u>	<u>Slip</u>	<u># Lines Rotated</u>
00	33	44	42	19 (default)
01	36	44	42	20
02	40	44	42	21
03	44	44	51	22
04	50	56	51	21
05	57	56	51	22
06	66	56	51	23

- This command corresponds to A721 internal dip switches 2.1, 2.2, and 2.3.
- For rotated text printing on the slip the B780 matches the A721.
- For standard text printing the B780 receipt will print in 44-column mode or 56-column mode. When DH pitch of 57 columns or 66 columns is selected, text will wrap.
- For standard text printing the B780 slip will print in 42-column mode or 51-column mode. When DH pitch of 57 columns or 66 columns is selected, text will wrap.
- The run-time command for pitch selection (1B 50 n) overrides this configuration setting.
- These are the A721 internal dip switch settings:

<u>2.1</u>	<u>2.2</u>	<u>2.3</u>	<u>DH Pitch</u>	<u># Lines Rotated</u>
Off	Off	Off	33	19
On	Off	Off	36	20
Off	On	Off	40	21
On	On	Off	44	22
Off	Off	On	50	21
On	Off	On	57	22
Off	On	On	66	23

Select Slip Lines per Inch

Code (Hexadecimal)

1F 03 25 04 n

Command

Select slip station lines per inch

This command sets the slip station lines per inch setting.

<u>n</u>	<u>Line spacing</u>
00	7.2 LPI (default)
01	6.0 LPI

This corresponds to the A721 internal dip switch 3.1

Select Two - Sensor Option for B780Code (Hexadecimal)

1F 03 25 05 n

Command

Select B780 two-sensor option

This command sets the two-sensor option for the B780 mode. When enabled, two distinct slip sensor statuses are reported.

<u>n</u>	<u>Two-Sensor Option</u>
00	Disable two-sensor option
01	Enable two-sensor option (default)

Select Number of Lines of Validation for B780Code (Hexadecimal)

1F 03 25 06 n

Command

Select B780 number of lines of validation

This command sets the number of lines of validation that can be printed in B780 mode.

<u>n</u>	<u>Number of validation lines</u>
00	15
01-04	4 (default)
05-0F	actual number (5 – 15 decimal)

This corresponds to A721 internal dip switch 3.6 and 3.7.

Select B780 Map User Character Option for B780Code (Hexadecimal)

1F 03 25 07 n

Command

Disable B780 map user characters option

This command selects the B780 map user characters option. This is available for A721 applications that rely on printing user-defined characters and have not made the necessary changes for thermal character definitions. If this command is enabled, then the characters as defined by the **Define User-Defined Character Set** command (1B 26 s c1 c2 etc.) will be modified by the printer firmware such that they print in an acceptable manner on the thermal receipt station. The best print quality will be obtained by incorporating User Defined Characters which meet the thermal receipt station requirements.

<u>n</u>	<u>Map user character option</u>
00	Disable (default)
01	Enable

Select Slip Right Margin in Page ModeCode (Hexadecimal)

1F 03 25 0E n

Command

Select right margin for slip in page mode

This command sets the number of lines of validation that can be printed in B780 mode.

<u>n</u>	<u>Right margin</u>	<u>Number of lines in page mode rotated orientation</u>
00	.1" (B780 default)	17 (not available on A721)
01	.3"	15
02	.5" (A721 default)	15

- This command corresponds to A721 internal dip switch 3.5.
- For Page Mode printing, these are the A721 internal dip switch settings:

<u>3.5</u>	<u>Right Margin Page Mode</u>
Off	.5"
On	.3"

- Default tabs emulate the A721 when A721 margin is configured: default tabs are at 5 dots/column instead of 6 dots/column.

Select B780 Map Logo Option for B780Code (Hexadecimal)

1F 03 25 10 n

Command

Disable B780 map logo option

This command selects the B780 map logo option. This is available for A721 applications that rely on printing logos on the receipt. If this command is enabled, then the logos will be modified by the printer firmware such that they print in an acceptable manner on the thermal receipt station. The best print quality will be obtained by incorporating logos which meet the thermal receipt station requirements.

<u>n</u>	<u>Map logo option</u>
00	Disabled (default)
01	Enabled

Select Cover Open Option for B780Code (Hexadecimal)

1F 03 25 11 n

- When the cassette cover open option is enabled, and the operator opens the cassette cover, the printer will stop printing and enter an error state.
- When the option is disabled, the printer will ignore the state of the cassette cover.

<u>n</u>	<u>Cassette Cover Option</u>
00	Disabled
01	Enabled (default)

Select Concurrent Print to Receipt for B780Code (Hexadecimal)

1F 03 25 12 n

Command

Select concurrent print to receipt

When enabled, A721 concurrent print is emulated. Whatever is printed on the cut sheet will be printed on the receipt after the cut sheet is ejected.

<u>n</u>	<u>Number of validation lines</u>
00	Disabled
01	Enabled

Select B780 with A776 Slip FunctionsCode (Hexadecimal)

1F 03 25 13 n

Command

B780 with A776 slip functions

When enabled, B780 operates like A776 on the slip station. Provided for applications which control both A776 and B780.

<u>n</u>	<u>A776 Slip functions</u>
00	disabled (default)
01	enabled

Select B780 Concurrent Print to Electronic JournalCode (Hexadecimal)

1F 03 25 14 n

Command

Concurrent print to electronic journal

When enabled, A721 concurrent print is emulated. Whatever is printed on the cut sheet is saved in the electronic journal buffer.

<u>n</u>	<u>Concurrent print to electronic journal</u>
00	disabled
01	enabled

Select Cover Open Option for B780

Set Page Mode Margin Mechanical Adjustment

Code (Hexadecimal)

1F 03 25 16 n

Command

Set page mode margin mechanical adjustment

- This command applies to both the A776 and the B780, although it is primarily implemented for B780 printers replacing existing A721 printers to match cashier check printing.
- Default is 0.
- Value is printed on the second diagnostic page.
- Ranges for margin configurations:

<u>Margin Setting</u>	<u>Maximum mechanical adjustment</u>
.5"	30 half dots
.3"	56 half dots
.1"	84 half dots

- Mechanical adjustment does not apply when page size is defined to be greater than the default of 200 full dots wide.
-

Set Page Mode Option to Trim Full Dots

Code (Hexadecimal)

1F 03 2F n

Command

Set page mode option to trim full dots

n < 128 # of full dots trimmed from right side
n = 255 compress to fit in 3.024"

- This command applies to both the A776 and the B780, although it is primarily implemented for applications specifying a page size greater than 242 full dots wide.
- Default is no trim.
- Maximum width that can be compressed to fit in 3.024" is 270 full dots.
- Value is printed on second diagnostic page.

Chapter 4: Programming the Printer

Overview of Printing Characteristics

Commands control all operations and functions of the printer. This includes selecting the size and placement of characters and graphics on the receipt or the slip and feeding and cutting the paper. The programming commands have been organized, in order of hexadecimal code within functional groups. For this reason, “related” commands may not be listed adjacent to one another.

The A776 (B780) standard command set allows it to work with software written for TPG, Inc. or other POS compliant printers.

Any of the commands may be used in any combination to program a host computer to communicate with the printer (unless otherwise noted).

For the printer to operate properly within an Ethernet environment, a specific set of commands must be set.

Some commands listed and described here may not be implemented and are identified as “not implemented.” If received, they are ignored and not sent to the print buffer as data.

Any non-legal commands have their parameter sent to the print buffer as data.

Character appearance

The appearance of text can be changed using the following print modes:

- Standard
- Compressed
- Double-high
- Double-wide
- Upside-down
- Rotated
- Underlined
- Bold
- Reverse
- Italic
- Strike-through
- Scaled
- Shading

Receipt character specification

Standard

- Characters per inch: 15.6
- Characters per line: 44
- Cell size: 13 × 24 dots

Compressed

- Characters per inch: 20.3
- Characters per line: 56
- Cell Size: 10 × 24 dots

Print zones

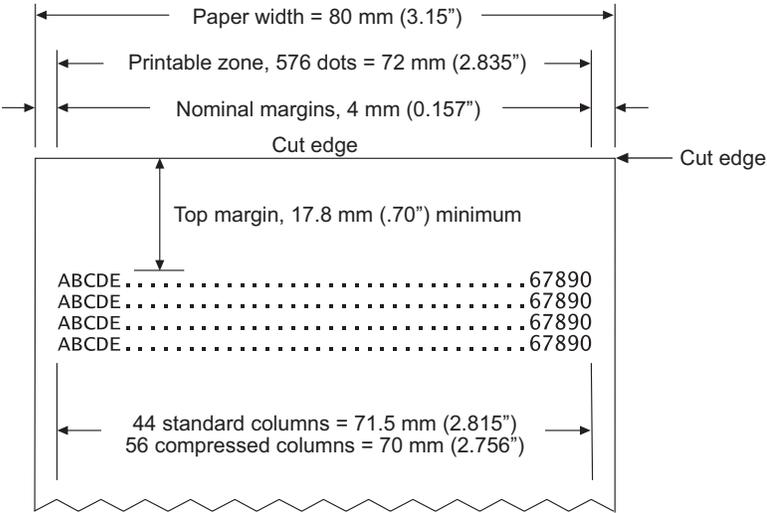
Print zones for receipt station 80 mm paper

Specifications of print zone for receipt station 80 mm paper:

- 576 dots (addressable) @ 8 dots/mm, centered on 80 mm
- Minimum margins for standard print: 2.0 mm (.079 inches)
- Top margin to manual tear-off: 17.8 mm (0.70 inches)
- Top margin to knife cut: 19.0 mm (0.75 inches)

Note: The application centers 44 standard character cells (13 × 24 dots), or 56 compressed character cells (10 × 24 dots), or 576 addressable bits of graphics across an 80 mm wide receipt. Minimum print line height is 24 dots for text or graphics. Standard print line spacing is 27 dots (i.e., 3 extra row dots).

The A776 adds a 27 dot high font, so standard print spacing is 30 dots.

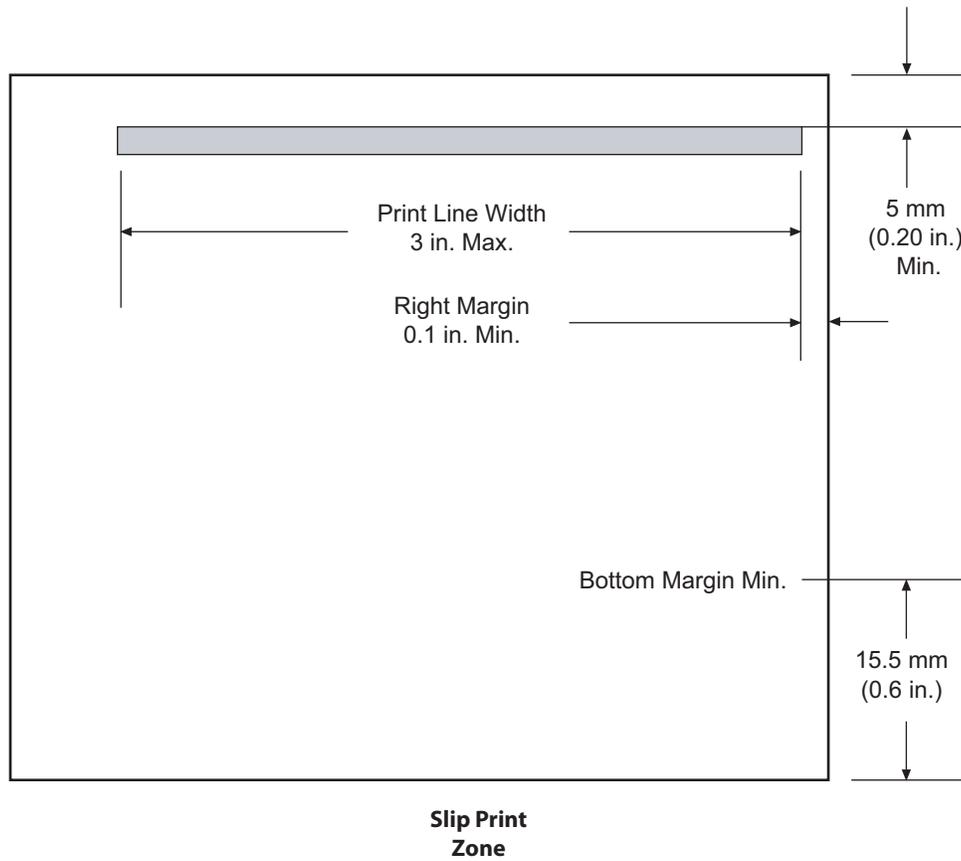


Print zones for slip station

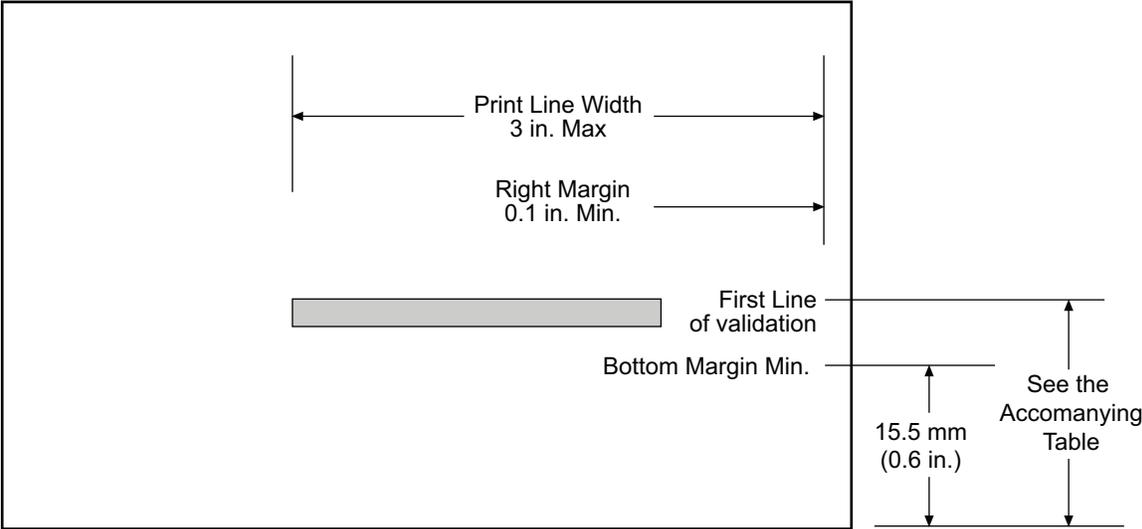
The slip station prints characters (standard and compressed pitch) and graphics in a print zone of 77mm (3.0") wide on a slip or form.

- Standard pitch: 42 characters (columns) per line
- Compressed pitch: 51 characters (columns) per line
- 21 rotated characters
- 210 adjacent bits of graphics
- 420 addressable positions

The print line height of 7x7 dot characters is 2.46mm (.097"). With three-dot spacing, the print line height is 3.53mm (.139"). See the following illustration (not to scale). To print as close to the bottom of the slip as possible without the slip leaving the feed rollers, use the "Print and feed n lines" (1B 64 n) command, with $n = 0$.



Print Zones for Slip, Validation



Validation Format

The A776 has drop validation printing. The location of the first line of validation varies based on the table below:

<u>Number of lines of validation @ 7.2 lpi</u>	<u>Distance from bottom of form to top of first print line</u>
14 lines	2.7 inches
10 lines	2.0 inches
6 lines	1.5 inches
4 lines	1.2 inches

Rotated printing commands

Three commands control the rotation of printing. The table shows the combinations of set/cancel upside down print, set/cancel rotated print (clockwise), and rotated print (counterclockwise).

Rotated clockwise and *rotated counterclockwise* print commands are mutually exclusive: the setting of the last received command is effective. Unintended consequences may result when *rotated clockwise* is mixed with other commands.

The samples of the print show only the normal-size characters. Double-wide and double-high characters are printed in the same orientation. They may also be mixed on the same line.

Upside down (1B 7B n)	Rotated CW (1B 56 n)	Rotated CCW (1B 12)	Resulting output
Canceled	Canceled	Cleared	A B C
Canceled	Set	X	└─┘ A B C
Set	Canceled	X	┌─┐ A B C
Set	Set	X	└─┘ └─┘ A B C
X	X	Set	┌─┐ ┌─┐ A B C

Note: The following print modes cannot be mixed on the same line:

- Standard and compressed pitch
- Vertical (normal) and rotated
- Right-side up and upside-down
- Single-high (normal) and double-high

Chapter 5: Programming Commands

Commands listed by function

Commands in bold are ColorPOS® commands.

Printer actions

Code (hexadecimal)	Command	Page
10	Clear printer	36
11	Close form	36
18	Open form	36
1A	Perform partial knife cut (or code 1B 6D)	36
1B 07	Generate tone	37
1B 3C	Return home	37
1B 3D <i>n</i>	Select peripheral device (for multi-drop)	37
1B 40	Initialize printer	37
1B 43 <i>n</i>	Set slip paper eject length	37
1B 55 <i>n</i>	Set unidirectional print on impact station	38
1B 63 30 <i>n</i>	Select receipt or slip for printing; slip for MICR read	38
1B 63 31 <i>n</i>	Select receipt or slip for setting line spacing	38
1B 63 33 <i>n</i>	Select paper sensors to output paper end signals (parallel only)	38
1B 63 34 <i>n</i>	Select sensors to stop printing	39
1B 63 35 <i>n</i>	Enable or disable panel button	39
1B 66 <i>m n</i>	Set slip paper waiting time	39
1B 6D	Perform partial knife cut (or code 1A)	36
1B 70 <i>n p1 p2</i>	Generate pulse to open cash drawer	39
1B 71	Release paper	42
1B 72 <i>m</i>	Set current color	40
1C	Select slip station	40
1E	Select receipt station	40
1D 56 <i>m</i>	Select cut mode and cut paper (or code 1D 56 <i>m n</i>)	41
1D 56 <i>m n</i>	Select cut mode and cut paper (or code 1D 56 <i>m</i>)	41
1D 81 <i>m n</i>	Set paper type (ColorPOS®)	41
1F 03 16 05 <i>n</i>	Set interpretation of "Set current color" command	42
1F 74	Print test form	42

Print and paper feed

Code (hexadecimal)	Command	Page
0A	Print and feed paper one line	42
0C	Print and eject slip	43
0D	Print and carriage return	43
14 <i>n</i>	Feed <i>n</i> print lines	43
15 <i>n</i>	Feed <i>n</i> dot rows	43
17	Print	45
1B 4A <i>n</i>	Print and feed paper	45
1B 4B <i>n</i>	Print and reverse feed paper	45
1B 64 <i>n</i>	Print and feed <i>n</i> lines	45
1B 65 <i>n</i>	Print and reverse feed <i>n</i> lines	46
1D 14 <i>n</i>	Reverse feed <i>n</i> lines	46
1D 15 <i>n</i>	Reverse feed <i>n</i> dots	46

Vertical and horizontal positioning

Code (hexadecimal)	Command	Page
09	Horizontal tab	46
16 <i>n</i>	Add <i>n</i> extra dot rows	44
1B 14 <i>n</i>	Set column	47
1B 24 <i>nL nH</i>	Set absolute starting position	47
1B 32	Set vertical line spacing to 1/6 inch	47
1B 33 <i>n</i>	Set vertical line spacing	48
1B 44 [<i>n</i>] <i>k</i> 00	Set horizontal tab positions	48
1B 5C <i>n1 n2</i>	Set relative print position	49
1B 61 <i>n</i>	Select justification	50
1D 4C <i>nL nH</i>	Set left margin	50
1D 50 <i>x y</i>	Set horizontal and vertical minimum motion units	51
1D 57 <i>nL nH</i>	Set printing area width	51

Text characteristics

Code (hexadecimal)	Command	Page
12	Select double-wide characters	52
13	Select single-wide characters	52
1B 12	Select 90 degree counter-clockwise rotated print	52
1B 16 <i>n</i>	Select pitch (column width)	53
1B 20 <i>n</i>	Set right-side character spacing	53
1B 21 <i>n</i>	Select print mode	53
1B 25 <i>n</i>	Select or cancel user-defined character set	54
1B 26 <i>s c1 c2 n1 d1...nn dn</i>	Define user-defined character sets	54

1B 2D <i>n</i>	Select or cancel underline mode	56
1B 3A 30 30 30	Copy character set from ROM to RAM	56
1B 3F <i>n</i>	Cancel user-defined character	56
1B 45 <i>n</i>	Select or cancel emphasized mode	57
1B 47 <i>n</i>	Select double-strike	57
1B 48	Cancel double-strike	58
1B 49 <i>n</i>	Select or cancel italic print	58
1B 52 <i>n</i>	Select international character set	58
1B 56 <i>n</i>	Select or cancel 90 degree clockwise rotated print	59
1B 74 <i>n</i>	Select international character table	58
1B 7B <i>n</i>	Select or cancel upside-down print mode	59
1D 21 <i>n</i>	Select character size	59
1D 42 <i>n</i>	Select or cancel white/black reverse print mode	60
1D 85 <i>m n</i>	Reverse color text mode (ColorPOS [®])	61
1D 8D <i>n m</i>	Text strike-through mode (ColorPOS [®])	61
1F 05 <i>n</i>	Select superscript or subscript modes	61

Graphics

Code (hexadecimal)	Command	Page
1B (+*.BMP file)	Download BMP logo	62
1B 2A <i>m n1 n2 d1...dn</i>	Select bit image mode	62
1B 4C <i>n1 n2 d1...dn</i>	Select double-density graphics (A756 emulation)	63
1B 59 <i>n1 n2 d1...dn</i>	Select double-density graphics	63
1D 23 <i>n</i>	Select the current logo (downloaded bit image)	63
1D 2A <i>n1 n2 d1...dn</i>	Define downloaded bit image	64
1D 2F <i>m</i>	Print downloaded bit image	64
1D 82 <i>n1...n72</i> or ... <i>n80</i>	Print raster monochrome graphics (ColorPOS [®])	65
1D 83 <i>n1...n144</i> or ... <i>n160</i>	Print raster color graphics (ColorPOS [®])	65
1D 84 <i>m n1 n2 d1...dx</i>	Download logo image (ColorPOS [®])	65
1D 8B <i>n m o</i>	Apply shading to logo (ColorPOS [®])	66
1D 8C <i>n m</i>	Merge watermark mode (ColorPOS [®])	66
1D 86 <i>m</i>	Monochrome shade mode (ColorPOS [®])	67
1D 87 <i>m</i>	Color shade mode (ColorPOS [®])	67
1D 89 <i>n m</i>	Logo print with color plane swap (ColorPOS [®])	68
1D 90 <i>m x y o p q</i>	Form and merge real-time surround graphic (ColorPOS [®])	68
1D 91 <i>n</i>	Save graphics buffer as logo (ColorPOS [®])	69
1D 92 <i>n</i>	Background logo print mode (ColorPOS [®])	69
1D 9A <i>n m o</i>	Shade and store logo (ColorPOS [®])	69

1D 9B <i>m n</i>	Logo print with knife cut	70
1D 99 <i>l m n o</i>	Apply margin message mode (ColorPOS®)	70
1D A0 <i>n l n h</i>	Set temporary max target speed	71
1F 03 16 <i>f s p / r t</i>	Set LogoEZ® colorization (ColorPOS®)	71
1F 03 17 <i>a m s</i>	Set LogoEZ® attribute mapping (ColorPOS®)	74
1F 04 <i>n</i>	Convert 6-dots/mm bitmap to 8-dots/mm bitmap	75
1F 7B <i>n</i>	Enable constant speed logos	75

Status

Batch mode

Code (hexadecimal)	Command	Page
1B 75 0	Transmit peripheral device status	76
1B 76	Transmit paper sensor status	77
1D 49 <i>n</i>	Transmit printer ID	77
1D 49 40 <i>n</i>	Transmit printer ID, remote diagnostics extension	79
1D 72 <i>n</i>	Transmit status	81
1F 56	Send printer software version	83

Real-time

Code (hexadecimal)	Command	Page
10 04 <i>n</i>	Real-time status transmission	85
10 05 <i>n</i>	Real-time request to printer (DLE sequence)	88
1D 03 <i>n</i>	Real-time request to printer (GS sequence)	88
1D 05	Real-time printer status transmission	89
1F 7A <i>n</i>	Real-time commands disable	89

Unsolicited status mode

Code (hexadecimal)	Command	Page
1D 61 <i>n</i>	Select or cancel unsolicited status mode	90

Bar codes

Code (hexadecimal)	Command	Page
1D 48 <i>n</i>	Select printing position for HRI characters	93
1D 66 <i>n</i>	Select pitch for HRI characters	93
1D 68 <i>n</i>	Select bar code height	94
1D 6B <i>m d1...dk 00</i> or 1D 6B <i>m n d1...dn</i>	Print bar code	94
1D 70 <i>a b c d e f</i>	Select PDF 417 parameters	95
1D 77 <i>n</i>	Select bar code width	97

Page mode

Code (hexadecimal)	Command	Page
0C	Print and return to standard mode/print and eject slip	99
18	Cancel print data in page mode	99
1B 0C	Print data in page mode	99
1B 4C	Select page mode	100
1B 53	Select standard mode	101
1B 54 <i>n</i>	Select print direction in page mode	101
1B 57 <i>n1, n2...n8</i>	Set print area in page mode	101
1D 24 <i>nL nH</i>	Set absolute vertical print position in page mode	102
1D 5C <i>nL nH</i>	Set relative vertical print position in page mode	103

Macros

Code (hexadecimal)	Command	Page
1D 3A	Select or cancel macro definition	104
1D 5E <i>r t m</i>	Execute macro	104

MICR check reader commands**MICR Reading**

Code (Hexadecimal)	Command	Page
1B 77 01	Read MICR data and transmit	105
1B 77 02	Read MICR data and transmit (B780 only)	105
1B 77 52	Transmit last MICR read	105

MICR Parsing

Code (Hexadecimal)	Command	Page
1B 77 50	Define parsing format, save in NVRAM	106
1B 77 70	Define parsing format, do not save permanently	106

User data storage

Code (hexadecimal)	Command	Page
1B 27 <i>m a0 a1 a2 d1 ...dm</i>	Write to user data storage	112
1B 34 <i>m a0 a1 a2</i>	Read from user data storage	112
1B 6A <i>k</i>	Read from non-volatile memory	113
1B 73 <i>n1 n2 k</i>	Write to non-volatile memory (NVRAM)	113
1D 22 <i>n</i>	Select memory type (SRAM/flash)	113
1D 22 55 <i>n1 n2</i>	Flash memory user sectors allocation	114
1D 40 <i>n</i>	Erase user flash sector	114
1D 97 <i>m n</i>	User storage status (ColorPOS [®])	115

Flash download

Code (hexadecimal)	Command	Page
1B 5B 7D	Switch to flash download (boot) mode	116
1D 00	Return boot sector firmware part number	116
1D 01	Return segment number status of flash memory	117
1D 02 <i>n</i>	Select flash memory sector to download	117
1D 06	Get firmware CRC	117
1D 07	Return microprocessor CRC	117
1D 0E	Erase all flash contents except boot sector	117
1D 0F	Return main program flash CRC	118
1D 10 <i>n</i>	Erase selected flash sector	118
1D 11 <i>aL aH cL cH d1...dn</i>	Download to active flash sector	118
1D FF	Reset firmware	119

Ethernet setup commands

Code (hexadecimal)	Command	Page
1B 5B 7D	Switch to flash download (boot mode)	116
1B 08 00	Restore default settings	119
1B 08 01 <i>n1 n2 n3 n4</i>	Set IP address	119
1B 08 02 <i>n1 n2 n3 n4</i>	Set net mask	119
1B 08 03 <i>n1 n2 n3 n4</i>	Set gateway	119
1B 08 04 <i>n1 n2 n3 n4</i>	Set raw TCPIP port	120
1B 08 05 <i>n1</i>	LP Daemon	120
1B 08 06 <i>n1</i>	Telnet Daemon	120
1B 08 07 <i>n1</i>	BootP	120
1B 08 08 <i>n1</i>	DHCP (auto-configuration)	120
1B 08 09 <i>n1</i>	Inactivity timeout	121
1B 08 0A <i>n1</i>	Keep-alive pings (arps)	121

Image Commands

Code (hexadecimal)	Command	Page
1D B0	Calibrate Scanner	122
1D B1 <i>m n</i>	Configure/Change Image Transmission Port	123
1D B2 <i>n</i>	Set Top Entry Startup Delay	123
1D B3 <i>m p r</i>	Set Image Format Properties	123
1D C5 <i>nL nH m d1-dn-1</i>	Configure Binarization Methods and Attributes	124
1D B4 <i>nL nH t0...tm</i>	Define/Update Application Tag Values	125
1D B6	Attach Scan Application Tags	126
1D B7	Return Imager Status	126
10 04 07	Real Time Imager Status	127

10 04 03	Real Time Error Status	128
10 05 06	Real Time Cancel Image Transmission	128
1D B8 <i>m p r</i>	Wait for Scan & Optionally Transmit	128
1D B9 <i>s t m nL nHpL pH</i>	Transmit Image	130
1D BA <i>p</i>	Eject from Scanner	132
1D BB <i>nL nH</i>	Free Image	133
1D BC <i>m</i>	Free Imager Buffering	133
1D BD	Get Buffered Image List	133
1D BB <i>nL nH</i>	Get Buffered Image Attributes	133
1D C6 <i>m n</i>	Configure Scan Options	134
1D C7 <i>wL wH lenL lenH</i>	Configure Max Scan Width & Height	134
1D 49 02	Transmit Printer Type (Extended Existing Command)	134

Command conventions

The following information describes how each command is organized:

Name:	Name of command.
ASCII:	The ASCII control code.
Hexadecimal:	The hexadecimal control code.
Decimal:	The decimal control code.
Value:	A description of the command operands.
Range:	The upper and lower limits of the command operand.
Default:	The command operand default after printer reset.
Description:	Brief description and summary of the command.
Formulas:	Any formulas used for this command.
Exceptions:	Describes any exceptions to this command; for example, incompatible commands.
Related information:	Describes related information for this command; for example, bit information.

Command descriptions

Printer actions

The printer function commands control the following basic printer functions and are described in order of their hexadecimal codes:

- Station select
- Platen control
- Resetting the printer
- Cutting the paper
- Opening the cash drawers

Clear printer

ASCII	DLE
Hexadecimal	10
Decimal	16

Clears the print line buffer without printing and sets the printer to the following condition:

- Receipt station is selected
- Double-wide command (0x12) is canceled
- Line spacing, pitch, and user-defined character sets are maintained at current selections (RAM is not affected)
- Single-wide, single-high, non-rotated, and left-aligned characters are set
- Printer is restarted and error status is cleared in a fault condition
- Printing position is set to column one
- Slip platen is opened
- Slip printhead is homed
- Knife is homed

Exceptions

The DLE command followed by a 04 or 05 is interpreted as a “Real-time command.” See Real-time status transmission and Real-time request commands (DLE sequences).

Close form

ASCII:	DC1
Hexadecimal:	11
Decimal:	17

Closes the feed roller and platen (forms compensation arm assembly). If the printer is reset or the Clear (0x10) is received, the feed roller and platen are opened.

This command executes if the platen is already closed. This command is processed regardless of which station is selected.

Open form

ASCII:	CAN
Hexadecimal	18
Decimal:	24

Opens the feed roller and platen (forms compensation arm assembly) so that a form may be inserted (default position).

This command has the same code as the Cancel print data in page mode command, which is only executed in page mode.

This command executes if the platen is already open. This command is processed regardless of which station is selected.

Perform partial knife cut

ASCII	SUB	ESC m
Hexadecimal	1A	1B 6D
Decimal	26	27 109

Partially cuts the receipt, leaving 5 mm (0.20”) of paper. This command is implemented the same as Full knife cut (19 and 1B 69).

There are two codes (Hex 1A or 1B 6D) for this command and both codes perform the same function.

Exceptions

Line feed is executed first if print buffer is not empty.

This command is processed regardless of which station is selected.

Generate tone

ASCII ESC BEL
Hexadecimal 1B 07
Decimal 27 7

Generates an audible tone. Performed by the printer to signal certain conditions.

Return home

ASCII ESC <
Hexadecimal 1B 3C
Decimal 27 60

Moves the impact printhead (unless already there) to the home position.

Related Information

The printer is able to detect carriage motor jams, eliminating the need to home the printhead after each slip transaction.

Select peripheral device (for multi-drop)

ASCII ESC = *n*
Hexadecimal 1B 3D *n*
Decimal 27 61 *n*

Value of *n*: 0 (bit 0), device not selected
 1 (bit 0), device selected

Default: 1 (bit 0), device selected

Selects the device to which the host computer sends data.

Exception

This command is ignored.

Initialize printer

ASCII ESC @
Hexadecimal 1B 40
Decimal 27 64

Default: Character pitch: 15.6 CPI
 Column width: 44 characters
 Extra dot rows: 3
 Character set: Code Page 437
 Printing position: Column One

Clears the print line buffer and resets the printer to the default settings for the start-up configuration (refer to Default settings above).

Single-wide, single-high, non-rotated, and left-aligned characters are set, and user-defined characters or logo graphics are cleared. (Flash memory is not affected.) Tabs reset to default. Receipt selection state is selected.

A776: Slip set to 42 column pitch
 B780: Slip set to compressed pitch

Set slip paper eject length

ASCII ESC C *n*
Hexadecimal 1B 43 *n*
Decimal 27 67 *n*

Value of *n*: 0 to 255

Exception

This command is ignored.

Set unidirectional print on impact station**ASCII** ESC U *n***Hexadecimal** 1B 55 *n***Decimal** 27 85 *n*

Value of n: Only the lowest bit of *n* is used

0	Unidirectional printing is turned off
1	Unidirectional printing is turned on

Default of n: 0 For text printing
1 For Page Mode printing

Select receipt or slip for printing; slip for MICR read**ASCII** ESC c 0 *n***Hexadecimal** 1B 63 30 *n***Decimal** 27 99 48 *n*

Value of n: 1, 2, 3 Receipt selected
4 Slip selected
8 Validation station selected

Default of n: 1

Selects the station for printing. When slip is selected, the printer waits for the paper to be inserted. When slip has already been selected and the selection is changed, the form is opened.

If the station has already been selected and it is re-selected, no action takes place.

Slip waiting time is configurable using the configuration menu and the wait time appears on the Diagnostic menu printout

Exceptions

Receiving the command discards unprinted data in the buffer, forcing a "beginning of line" state.

When *n* is out of range this command is ignored.

Select receipt or slip for setting line spacing**ASCII** ESC c 1 *n***Hexadecimal** 1B 63 31 *n***Decimal** 27 99 49 *n*

Value of n: 1, 2, 3 Select receipt
4 Select Slip
8 Select validation

Default of n: 1

Selects which station receives the effects of the following commands:

1. Select Default Line Spacing (1B 32)
2. Set Line Spacing (1B 33)
3. Add *n* extra dot rows (16 *n*)

Exceptions

This command is ignored if *n* is out of range.

Select paper sensors to output paper end signals**ASCII** ESC c 3 *n***Hexadecimal** 1B 63 33 *n***Decimal** 27 99 51 *n*

This command is ignored.

Select sensors to stop printing

ASCII ESC c 4 *n*
Hexadecimal 1B 63 34 *n*
Decimal 27 99 52 *n*

Value of *n*: Sensor status

Default: 0

Bit of *n*

Bit	Function
0,1	Stop receipt on receipt low
4	Stop slip if trailing edge uncovered
5	Stop slip if leading edge uncover
7	Stop validation print if trailing edge uncovered (B780 only)

Determines which sensor stops printing on the respective station. The command does not affect the paper out status on the receipt station, which will automatically stop the printer when the paper is depleted.

Enable or disable panel button

ASCII ESC c 5 *n*
Hexadecimal 1B 63 35 *n*
Decimal 27 99 53 *n*

Value of *n*: 0 = Enable
1 = Disable

Default: 0 (Enable)

Enables or disables the paper feed button. If the last bit is 0, the paper feed button is enabled. If the last bit is 1, the paper feed button is disabled.

Related information

Functions that require the paper feed button (except for the execute macro [1D 5E *r t m*] command) cannot be used when it has been disabled with this command.

Set slip paper waiting time

ASCII ESC f *m n*
Hexadecimal 1B 66 *m n*
Decimal 27 102 *m n*

Value of *m*: Not used
Value of *n*: Tenths of seconds

The time that the printer waits for a slip to be inserted is set using the configuration menu. The default is forever, but it can be set to 1, 3, or 5 minutes.

The value “*n*” sets the time (*n* x 0.1 seconds) that the printer waits to close the platen and start printing after the slip has been inserted. The printer reads that a slip is inserted when the leading edge and trailing edge sensors are covered. The slip-in light is lit (green) when both sensors are covered.

If a slip is not inserted in the time specified, the receipt station is selected for the next function.

Generate pulse to open cash drawer

ASCII ESC p *n p1 p2*
Hexadecimal 1B 70 *n p1 p2*
Decimal 27 112 *n p1 p2*

Value of *n*: 00, 48 (Decimal) = Drawer 1;
01, 49 (Decimal) = Drawer 2

Value of *p1*: 0–255

Value of *p2*: 0–255

Sends a pulse to open the cash drawer.

Formulas

The value for either *p1* or *p2* is the hexadecimal number multiplied by 2 msec to equal the total time.

- On-time = *p1* (Hex) x 2 msec
- Off-time = *p2* (Hex) x 2 msec

Related information

Off-time is the delay before the printer performs the next operation. Refer to cash drawer specifications for required on and off-time.

Set current color

ASCII ESC r *m*
Hexadecimal 1B 72 *m*
Decimal 27 114 *m*

Default of *m*: 0 (monochrome)

This command will set the current color to the *color m* for all character data that may follow this command and all graphic objects (bit images) that have not been explicitly loaded as two-color.

m = 0 (monochrome) is the initial value
m = 1 (two-color paper "primary color", usually black)
m = 2 (second color available from two-color paper)

The *m* values 0 and 1 will not have a distinguishable effect; 0 is the initial value and provides parameter value consistency with other commands.

Description

When the monochrome paper type command (00) is set, this command is recognized and retained but has no effect. The monochrome paper selection (usually black) controls the output.

When two-color paper is loaded and the two-color paper type command set, this command will designate which of the two colors will be used for everything not specified as having (an) explicit color parameter(s) such as color logos, side bars, surround graphics, background watermarks or color raster graphics.

Exception

After a power loss or reset the default value *m*=0 is reset.

Select slip station

ASCII FS
Hexadecimal 1C
Decimal 28

Selects the slip station for printing or MICR

Select receipt station

ASCII RS
Hexadecimal 1E
Decimal 30

Selects the receipt slip station for all functions. The receipt station is default setting after the printer is initialized or the clear printer (0x10) command is received.

Select cut mode and cut paper

ASCII	GS V <i>m</i>	GS V <i>m n</i>
Hexadecimal	1D 56 <i>m</i>	1D 56 <i>m n</i>
Decimal	29 86 <i>m</i>	29 86 <i>m n</i>

Value of *m*: Selects the mode as shown in the table.

Value of *n*: Determines cutting position only if *m* is 65 or 66.

m* Feed and cut mode*0, 48 Full cut (no extra feed). Partial cut on the A776.**

1, 49 Partial cut (no extra feed).

65 Feeds paper to cutting position + (*n* times vertical motion unit), and cuts the paper.

66 Feeds paper to cutting position + (*n* times vertical motion unit), and performs a partial cut.

Range of *m*: 0, 48; 1, 49; 65, 66 (when used with *n*)

Range of *n*: 0 – 255

Default of *m, n*: 0

Selects a mode for cutting paper and cuts the paper. There are two formats for this command, one requiring one parameter *m*, the other requiring two parameters *m* and *n*. The format is indicated by the parameter *m*.

Formulas

n times the vertical motion unit is used to determine the cutting position to which the paper is fed.

Exceptions

If *m* is out of the specified range, the command is ignored.

Set paper type (ColorPOS')

ASCII	GS 0x81 <i>m n</i>
Hexadecimal	1D 81 <i>m n</i>
Decimal	29 129 <i>m n</i>

Value of *m*:

- 0 = monochrome (black) paper (Kanzaki P-310)
- 1 = Two-color (red/black) papers (Kanzaki P-310RB)
- 4 = Two-color (blue/black) papers (Kanzaki P-320BB)
- 5 = Two-color (red/black) papers (Kanzaki P-320PB)

Default: 0 (monochrome paper)

This command will set the optimum parameter values in the thermal print engine control hardware for any defined monochrome or two-color paper chemistry. The *m n* parameters select paper category and formulation version, respectively.

(*m n* = 0 0) defines the default monochrome (black category, initial version) paper, out-of-box printers will also have factory pre-set descriptions for customer selected color types; initial release consists of two defined color types: (*m n* = 1 0) Kanzaki P-310RB red/black paper, (*m n* = 4 0) Kanzaki P-320BB blue/black paper, and (*m n* = 5 0) Kanzaki P-320RB red/black paper.

When issuing this command a value of *n* = 0xFF can always be used; that is interpreted as requesting the setting of the highest version defined in the printer of that category. This is a safe way for an application to always select the latest of a manufacturer's paper category, thus choosing "latest standard red/black".

An incorrect setting of *m n* for a two-color paper or non-standard monochrome paper, or failure to set *m n* when a color paper is inserted will result in poor print quality printing.

The last set paper type choice is stored in non-volatile memory and is retained after a power loss and across reset commands. The initial value at first boot after firmware load (or reload) is $m n = 0 0$.

Related information

An incorrect setting of n for a two-color paper or failure to set n when a two-color paper is loaded will result in poor output quality.

Set Interpretation of “Set current color”

ASCII US ETX SYN ENQ n

Decimal 31 03 22 05 n

Hexadecimal 1F 03 16 05 n

Value of n : 0-FF (Hex) $n = 01$ will cause 1B 72 01 to print red. Any other value for 1B 72 will print black.
 $n = 00$ will cause 1B 72 00 to print red and all other values to print black.

This command defines how to interpret the 1B 72 command for legacy environments. It provides a method to resolve any differences in the definition of command 1B72 between the A776 native mode and earlier implementations in other printers.

In A776 native mode, the standard “Set current color” command should be used.

Related information

The 1F 03 16 00 command disables this and all other LogoEZ[®] features.

To disable one LogoEZ[®] feature when multiple LogoEZ[®] features are set, first disable all LogoEZ[®] features and then re-enable only those you desire.

Print test form

ASCII AX t

Hexadecimal 1F 74

Decimal 31 116

Prints the current printer configuration settings on the receipt.

Disabled in page mode.

Print and paper feed

The print and feed commands control printing on the receipt and paper feed by the printer.

Print and feed paper one line

ASCII LF

Hexadecimal 0A

Decimal 10

Prints one line from the buffer and feeds paper one line.

Carriage return/line feed pair prints and feeds only one line.

Release Paper

ASCII ESC q

Hexadecimal 1B 71

Decimal 27 113

Description

Releases the slip paper as follows:

If receipt paper was selected, this command opens the platen to allow slip removal.

If the slip was selected, the printer enters the paper removal waiting state after releasing the paper. After 2 seconds, it enters receipt paper mode.

Print and eject slip

ASCII	FF
Hexadecimal	0C
Decimal	12

Prints data from the buffer to the slip station and if the paper sensor is covered, reverses the slip out the front of the printer far enough to be accessible to the operator. The impact station opens the platen in all cases.

This command has the same code as the print and return to standard mode command, which is executed only when the printer is in page mode. When the printer is not in page mode this command executes the print and eject slip function.

Exception

This command is ignored if the receipt station is the current station.

Print and carriage return

ASCII	CR
Hexadecimal	0D
Decimal	13

Prints one line from the buffer and feeds paper one line. The printer can be set through the configuration menu to ignore or use this command. Some applications expect the command to be ignored while others use it as print command.

Related information

See ignoring/using the carriage return in *Diagnostics* for more information.

Carriage return/line feed pair prints and feeds only one line.

Feed *n* print lines

ASCII	DC4 <i>n</i>
Hexadecimal	14 <i>n</i>
Decimal	20 <i>n</i>

Value of *n*: The number of lines to feed at current line height setting.

Range of *n*: 0–127 in A756 emulation
0–255 in A756 emulation and
A776 native mode

Feeds the paper *n* lines at the current line height without printing. Ignored on receipt if current line is not empty.

Feed *n* dot rows

ASCII	NAK <i>n</i>
Hexadecimal	15 <i>n</i>
Decimal	21 <i>n</i>

Value of *n*: Receipt - *n*/203 inch
Slip - *n*/72 inch

Range of *n*: 0–127 in A756 emulation
0–255 in A758 emulation and
A776 native mode

Feeds paper *n* dot rows without printing. Receipt moves *n* rows if the print buffer is empty.

Add n extra dot rows**ASCII** SYN n **Hexadecimal** 16 n **Decimal** 22 n **Value of n :** Receipt - $n/203$ inch
Slip - $n/72$ inch**Range of n :** 0–12**Default:** Receipt - 3 extra dot rows
Slip - 3 extra dot rows

Adds n extra dot rows to the character height to increase space between print lines or decrease the number of lines per inch.

Line spacing is set for the station or stations selected by the command 1B 63 31 n .

Formulas

This table shows the relationship between the number of lines per inch and each dot row added:

Receipt Station

Extra rows	Lines per inch	Dot rows
0	8.47	24
1	8.13	25
2	7.81	26
3	7.52	27
4	7.25	28
5	7.00	29
6	6.77	30
7	6.55	31
8	6.35	32
9	6.16	33

Receipt Station

Extra rows	Lines per inch	Dot rows
10	5.98	34
11	5.81	35
12	5.64	36

Slip Station

Extra rows	Lines per inch	Dot rows
0	10.29	7
1	9.00	8
2	8.00	9
3	7.20	10
4	6.55	11
5	6.00	12
6	5.54	13
7	5.14	14
8	4.80	15

9	4.50	16
10	4.24	17
11	4.00	18
12	3.79	19

Print

ASCII	ETB
Hexadecimal	17
Decimal	23

Prints one line from the buffer and feeds paper one line.

Print and feed paper

ASCII	ESC J <i>n</i>
Hexadecimal	1B 4A <i>n</i>
Decimal	27 74 <i>n</i>

Value of *n*: Receipt - $n/203$ inch
Slip - $n/144$ inch

Range of *n*: 0–255

Prints one line from the buffer and feeds the paper.

On the receipt station, the line height equals the character height when *n* is too small. This does not apply to the slip station. Use $n = 0$ to print a line without feeding the paper. This allows the printer to print on the last line of the slip (at 0.59 inch from the trailing edge) and still retain the slip in the feed rollers for reverse feeding the paper back out of the slip station.

Related information

For more information, see the description of the set horizontal and vertical minimum motion units command in this document.

Print and reverse feed paper

ASCII	ESC K <i>n</i>
Hexadecimal	1B 4B <i>n</i>
Decimal	27 75 <i>n</i>

Value of *n*: Slip - $n/144$ of an inch

Range of *n*: 0–255

Prints one line from the buffer and reverse feeds the paper $n/144$ of an inch on the slip station.

Exceptions

The receipt station cannot be reverse fed.

Print and feed *n* lines

ASCII	ESC d <i>n</i>
Hexadecimal	1B 64 <i>n</i>
Decimal	27 100 <i>n</i>

Value of *n*: Number of lines to be printed and fed.

Range of *n*: 1–255 (0 is interpreted as 1 on the receipt station)

Prints one line from the buffer and feeds paper *n* lines at the current line height.

Print and reverse feed *n* lines

ASCII ESC e *n*
Hexadecimal 1B 65 *n*
Decimal 27 101 *n*

Value of *n*: The number of lines on the slip station to be reverse fed.

Range of *n*: 0 – 255

Prints one line from the buffer and reverse feeds the paper *n* lines on the slip station. The receipt station cannot be reverse fed.

Reverse feed *n* lines

ASCII GS DC4 *n*
Hexadecimal 1D 14 *n*
Decimal 29 20 *n*

Range of *n*: 0 – 127 A756 emulation mode
 0 – 255 A776 native mode

Reverses the paper feed in the slip station by *n* lines at the current spacing. The next character feed command returns the paper feed back to the normal feed direction. This command is ignored if slip is not the selected station. Current spacing is not a factor.

Reverse feed *n* dots

ASCII GS NAK *n*
Hexadecimal 1D 15 *n*
Decimal 29 21 *n*

Value of *n*: *n* dots at 1/72 inch

Range of *n*: 0 – 127 A756 emulation mode
 0 – 255 A776 native mode

Reverses the paper feed in the slip station by *n* dots at 1/72 inch (TPG, Inc. 7150™ command). This command is ignored if receipt station is selected.

Vertical and horizontal positioning

The horizontal positioning commands control the horizontal print positions of characters on the receipt and slip.

Horizontal tab

ASCII HT
Hexadecimal 09
Decimal 9

Moves the print position to the next tab position set by the set horizontal tab positions (1B 44 *n*1 *n*2 ... 00) command. The print position is reset to column one after each line.

Tab treats the left margin as column one, therefore changes to the left margin will move the tab positions.

When no tabs are defined to the right of the current position, or if the next tab is past the right margin, line feed is executed. HT has no effect in page mode.

Print initialization sets 32 tabs at column 9, 17, 25...

Set column

ASCII ESC DC4 *n*
Hexadecimal 1B 14 *n*
Decimal 27 20 *n*

Value of *n*: Receipt - 1–44 = Standard pitch
 1–56 = Compressed pitch
 Slip - 1–66 = Standard pitch
 1–80 = Compressed pitch

Default of *n*: 1

Prints the first character of the next print line in column *n*. It must be sent for each line not printed at column one. The value of *n* is set to one after each line.

Exceptions

This command cannot be used with single- or double-density graphics.

Set absolute starting position

ASCII ESC \$ *n1 n2*
Hexadecimal 1B 24 *n1 n2*
Decimal 27 36 *n1 n2*

Value of *n*: *n* = Number of dots to be moved from the beginning of the line.
n1 = Remainder after dividing *n* by 256.
n2 = Integer after dividing *n* by 256.

The values for *n1* and *n2* are two bytes in low byte, high byte word orientation.

Sets the print starting position to the specified number of dots (up to the right margin) from the beginning of the line. The print starting position is reset to the first column after each line.

Formulas

Determine the value of *n* by multiplying the column for the absolute starting position by 10 (slip, or receipt standard pitch) or 8 (receipt compressed pitch). The example shows how to calculate column 29 (10 dots per column) as the absolute starting position.

$28 \times 10 = 280$ dots (beginning of column 29)
 $280/256 = 1$, remainder of 24
 $n1 = 24$ $n2 = 1$

Related information

This command is also used in the graphics mode on the receipt. See graphic commands in this chapter for more information.

If the set horizontal and vertical motion units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (set relative print position) will be interpreted accordingly. For more information, see the description of the command set horizontal and vertical minimum motion units command (1D 50) in this document.

Set vertical line spacing to 1/6 inch

ASCII ESC 2
Hexadecimal 1B 32
Decimal 27 50

Default: 3.33 mm (0.13")

Sets the default line spacing to 4.25 mm (1/6 of an inch).

Line spacing is set for the station or stations selected by the command 1B 63 31 *n*.

Set vertical line spacing

ASCII	ESC 3 <i>n</i>
Hexadecimal	1B 33 <i>n</i>
Decimal	27 51 <i>n</i>
Value of <i>n</i>:	Receipt - $n/406$ inch Slip - $n/144$ inch
Range of <i>n</i>:	0 – 255
Default:	Receipt - 0.13 inch (3.37 mm or 7.52 lines per inch, 3 extra dot rows) Slip - 0.14 inch (7.20 lines per inch, 3 extra dot rows)

Sets the line spacing for the receipt and for the slip. For the receipt, the space is set to $n/406$ inches. For the slip, the line spacing is set to $n/144$ inches. The line spacing equals the character height when *n* is too small.

Line spacing is set for the station or stations selected by the command 1B 63 31 *n*.

If the set horizontal and vertical minimum motion units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (set line spacing) will be interpreted accordingly.

Related information

For more information, see the description of the set horizontal and vertical minimum motion units command in this document.

Set horizontal tab positions

ASCII	ESC D [<i>n</i>] <i>k</i> NUL
Hexadecimal	1B 44 [<i>n</i>] <i>k</i> 00
Decimal	27 68 [<i>n</i>] <i>k</i> 0
Value of <i>n</i>:	Column number for tab minus one. (<i>n</i> is always less than or equal to the current selected column width)
Value of <i>k</i>:	0–32 (decimal)
Default:	Every 8 characters from column 1 (9, 17, 25, etc.) for normal print.

Sets up to 32 horizontal tab positions *n* columns from column one, but does not move the print position. See the horizontal tab command (09).

The tab positions remain unchanged if the character widths are changed after the tabs are set. The command ends with hexadecimal 00; hexadecimal 1B 44 00 clears all tabs.

Tabs assumed to be in strictly ascending order. A tab out of order terminates the command string as if it were 00, and remaining tab values are taken as normal data.

Formulas

Set the tab positions in ascending order and put Hex 00 at the end.

Hex 1B 44 00 (number of tabs not specified) clears all tab positions.

Exceptions

The tabs cannot be set higher than the column width of the current pitch.

Set relative print position

ASCII ESC \ $n1\ n2$
Hexadecimal 1B 5C $n1\ n2$
Decimal 27 92 $n1\ n2$

Value of n :

To move the relative starting position right of the current position by n dots:

$n1$ = Remainder after dividing n by 256
 $n2$ = Integer after dividing n by 256

The values for $n1$ and $n2$ are two bytes in low byte, high byte word orientation.

To move the relative starting position left of the current position by n dots:

$n1$ = Remainder after dividing $(65,536-n)$ by 256
 $n2$ = Integer after dividing $(65,536-n)$ by 256

The values for $n1$ and $n2$ are two bytes in low byte, high byte word orientation.

Moves the print starting position the specified number of dots either right (up to the right margin) or left (up to the left margin) of the current position. The print starting position is reset to the first column after each line.

Formulas

To move to the left:

Determine the value of n by multiplying the number of columns to move left of the current position by 10 (slip or receipt standard pitch) or 8 (receipt compressed pitch). The example shows how to set the relative position two columns in standard pitch (10 dots per column) to the left of the current position.

$2 \times 10 =$ 20 dots (two columns to be moved left of the current position)
 $65,536-20 =$ 65516
 $65,516/256 =$ 255, remainder of 236
 $n1 = 236, n2 =$ 255

To move to the right:

Determine the value of n by multiplying the number of columns to move right of the current position by 10 (slip or receipt standard pitch) or 8 (receipt compressed pitch). The example shows how to set the relative position two columns in standard pitch (10 dots per column) to the right of the current position.

$2 \times 10 =$ 20 dots (two columns to be moved left of the current position)
 $20/256 =$ 0, remainder of 20
 $n1 =$ 20, $n2 =$ 0

Related information

If the set horizontal and vertical minimum motion units command (1D 50) is used to change the horizontal and vertical minimum motion unit, the parameters of this command (set relative print position) will be interpreted accordingly. For more information, see the description of the set horizontal and vertical minimum motion units command (1D 50) in this document.

Compatibility information (A776 receipt vs. A756 receipt)

There is a difference in the normal behavior of this command as compared to the original A756. The difference exists when the command is used to move to the left. The A756 processes the whole print string prior to putting it in the buffer for the printhead. This method of processing allows the A756 to backup in the print string and replace characters and their associated attributes when a "Set relative print position" command instructs the printer to move the print position to the left.

In order to improve the speed of printing, the A776 moves the data into a buffer for the printhead when it receives it. When the "Set relative print position" command contains a move to the left, this causes the new data to overstrike the previous data. This behavior can be used to an application's advantage to provide the ability to create compound characters on the receipt station.

Select justification

ASCII ESC a *n*
Hexadecimal 1B 61 *n*
Decimal 27 97 *n*

Value of *n*: 0, 48 = Left aligned
 1, 49 = Center aligned
 2, 50 = Right aligned

Range of *n*: 0–2, 48–50

Default: 0 (Left aligned)

Specifies the alignment of characters, graphics, logos, and bar codes.

The command can be enabled or disabled for the slip. Default is disabled for the slip on A776, and enabled on B780.

Exception

This command is valid only when input at the beginning of a line.

Set left margin

ASCII GS L *nL nH*
Hexadecimal 1D 4C *nL nH*
Decimal 29 76 *nL nH*

Range of *nL*: 0–255

Range of *nH*: 0–255

Default: 576 dots (the maximum printable area)

Values of *n*:

nL = low byte = Remainder after dividing *n* by 256

nH = high byte = Integer after dividing *n* by 256

The command can be enabled or disabled for the slip. Default is disabled for the slip on A776, and enabled on B780.

Formulas

Sets the left margin of the printing area. The left margin is set to $((nH \times 256) + nL)$ times horizontal motion unit) inches. The horizontal motion units are set by the set horizontal and vertical minimum motion units command (1D 50), described in this manual.

The width of the printing area is set by the set printing area width command (1D 57), which follows this command.

If the setting exceeds the printable area, the maximum value of the printable area is used. The maximum printable receipt area is 576 dots on the receipt and 420 addressable dots on the slip. See the illustration on the next page.

To set the *Receipt* left margin to one inch at the default horizontal motion unit of 1/203 inches, send the four-byte string:

```
GS L 203 0
```

Or, to set the left margin to two inches at the default horizontal motion unit of 1/203 units per inch, send the four-byte string:

```
GS L 150 1
```

Where 2 inches = $406/203$, and $406 = (1 \times 256) + 150$, derived from decimal to hexadecimal conversion:

$$406/256 = 1 (nH) \text{ with remainder } 150 (nL)$$

To set the *Slip* left margin to one inch at the default horizontal motion unit of 1/140 inches, send the four-byte string:

```
GS L 140 0
```

Or, to set the left margin to two inches at the default horizontal motion unit of 1/140 units per inch, send the four-byte string:

```
GS L 24 1
```

Exceptions:

The command is effective only at the beginning of a line. This command is ignored if the line buffer is not empty.

Set horizontal and vertical minimum motion units

ASCII GS P *x y*

Hexadecimal 1D 50 *x y*

Decimal 29 80 *x y*

Value of x: Horizontal

Value of y: Vertical

Range of x: 0 – 255

Range of y: 0 – 255

Default of x: Receipt: 203 Slip: 140

Default of y: Receipt: 203 Slip: 144

Sets the horizontal and vertical motion units to 1/*x* inch and 1/*y* inch respectively.

When *x* or *y* is set to 0, the default setting for that motion unit is used.

The command can be enabled or disabled for the slip. Default is disabled for the slip on A776, and enabled on B780.

Set printing area width

ASCII GS W *nL nH*

Hexadecimal 1D 57 *nL nH*

Decimal 29 87 *nL nH*

Range of *nL*: 0–255

Range of *nH*: 0–255

Default: 576 dots (the maximum printable area)

Sets the width of the printing area. If the setting exceeds the printable area, the maximum value of the printable area is used. The width of the printing area is set to $((nH \times 256) + nL)$ times horizontal motion unit) inches. The horizontal motion units are set by the set horizontal and vertical minimum motion units command (1D 50).

The width of the printing area follows the set left margin command (1D 4C). See the set left margin command (1D 4C ...) earlier in this document for a description.

The command can be enabled or disabled for the slip. Default is disabled for the slip on A776, and enabled on B780.

Formulas

To set the width of the receipt printing area to one inch at the default horizontal motion unit of 1/203 inches, send the four-byte string:

```
GS W 203 0
```

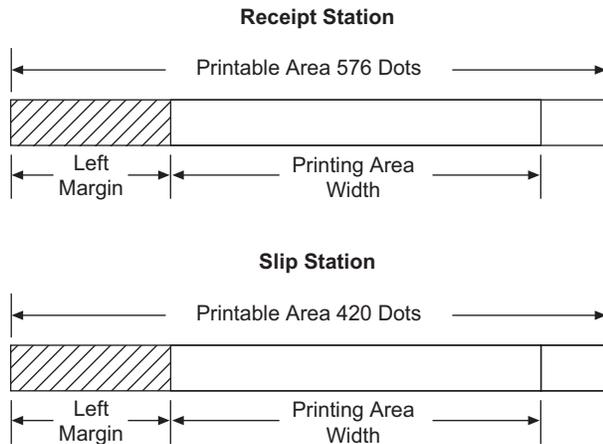
Or, to set the width of the printing area to two inches at the default horizontal motion unit of 1/203 units per inch, send the four-byte string:

```
GS W 150 1
```

Where 2 inches = 406/203, and 406 = (1 X 256) + 150.

Exceptions

This command is effective only at the beginning of a line. If the setting exceeds the printable area, the maximum value of the printable area is used. The maximum printable area is 576 dots on the receipt and 420 dots on the slip.

**Text characteristics commands**

These commands control what the printed information looks like, selection of character sets, definition of custom-defined characters, and setting of margins. The commands are described in order of their hexadecimal codes.

Select double-wide characters

ASCII DC2
Hexadecimal 12
Decimal 18

Prints double-wide characters. The printer is reset to single-wide mode after a line has been printed or the clear printer (0x10) command is received. Double-wide characters may be used in the same line with single-wide characters.

Select single-wide characters

ASCII DC3
Hexadecimal 13
Decimal 19

Prints single-wide characters. Single-wide characters may be used in the same line with double-wide characters.

Select 90 degree counter-clockwise rotated print

ASCII ESC DC2
Hexadecimal 1B 12
Decimal 27 18

Rotates characters 90 degrees counter-clockwise. The command remains in effect until the printer is reset or until a clear printer (0x10), select or cancel upside down print (1B 7B) or cancel rotated print (1B 56) command is received.

Exceptions

This command is valid only at the beginning of a line.

Rotated print and non-rotated print characters cannot be used together in the same line.

Related information

See "Summary of rotated printing" in this document.

Select pitch (column width)**ASCII** ESC SYN *n***Hexadecimal** 1B 16 *n***Decimal** 27 22 *n***Value of *n*:** 0 = Standard pitch
1 = Compressed pitch**Default:** 0 (Standard pitch)

Selects the character pitch for a print line.

Formulas

The following table provides the print characteristics for both pitches on the receipt and slip station.

Pitch	Receipt Columns	Receipt CPI	Slip Columns	Slip CPI
Standard	44	15.6	42	13.9
Compressed	56	20.3	51	17.1

Related information

Look in Chapter 4: Programming the Printer, "Character appearance" for a description of both pitches.

Set right-side character spacing**ASCII** ESC SP *n***Hexadecimal** 1B 20 *n***Decimal** 27 32 *n***Range of *n*:** 0 – 32 (decimal)**Default:** 0Sets the right side character spacing to [*n* x horizontal or vertical motion units]. Values for this command are set independently in standard and paper mode.

The units of horizontal and vertical motion are specified by the set horizontal and vertical minimum motion units (1D 50 ...) command. Changes in the horizontal or vertical units do not affect the current right side character spacing.

When the horizontal or vertical motion unit is changed by the set horizontal and vertical minimum motion units (1D 50 ...) command the value must be in even units and not less than the minimum amount of horizontal movement.

In standard mode the horizontal motion unit is used.

In page mode the horizontal or vertical motion unit differs and depends on the starting position of the printable area.

When the starting printing position is the upper left or lower right of the printable area (set by select print direction in page mode, 1B 54 *n*) the horizontal motion unit (*x*) is used. When the starting printing position is the upper right or lower left of the printable area (set by select print direction in page mode, 1B 54 *n*) the vertical motion unit (*y*) is used.**Select print mode****ASCII** ESC ! *n***Hexadecimal** 1B 21 *n***Decimal** 27 33 *n***Value of *n*:** Pitch selection (standard, compressed, double-high, or double-wide.)**Value of *n***

Bit	Function	0	1
Bit 0	Pitch (See chart below)	Standard ¹ pitch	Compressed pitch
Bit 3	Emphasized mode	Canceled	Set

Bit 4	Double-high ²	Canceled	Set
Bit 5	Double-wide	Canceled	Set
Bit 7	Underlined mode	Canceled	Set

Bits 1, 2 and 6 are not used.

Standard and compressed pitch cannot be used together in the same line.

Slip Default is standard pitch on A776 and compressed pitch on B780.

Selects the print mode: standard, compressed, double-high, or double-wide.

Default: 00

Pitch	Receipt Station	Receipt CPI	Slip Station	Slip CPI
Standard	44	15.6	42	13.9
Compressed	56	20.3	51	17.1

Related information

The bits in this command perform the same function as the stand-alone functions:

1B 16 <i>n</i>	Select pitch
1B 45 <i>n</i>	Emphasized
1B 47 <i>n</i>	Double-strike
12	Double-wide
13	Single-wide
1B 2D <i>n</i>	Underline

Select or cancel user-defined character set

ASCII ESC % *n*

Hexadecimal 1B 25 *n*

Decimal 27 37 *n*

Value of *n*:
 0 = Code Page 437
 1 = User Defined (RAM)
 2 = Code Page 850

Range of *n*: 0–2

Default: 0 (Code Page 437)

Selects the character set. When an undefined RAM character is selected, the code page 437 character is used. Look in Appendix B for the character sets.

Exception:

The character sets cannot be used together on the same line.

Define user-defined character set

ASCII ESC & *s c1 c2 n1(d1 .. dn) n2(d1 ...dn)...*

Hexadecimal 1B 26 *s c1 c2 n1(d1 .. dn) n2(d1 ...dn)...*

Decimal 27 38 *s c1 c2 n1(d1 .. dn) n2(d1 ...dn)...*

Values and ranges:

Receipt:

s = 3, number of bytes (vertically) in the character cell

c = the ASCII codes of the first (*c1*) and last (*c2*) characters respectively

c1 = Hex 20–FF (20 is always printed as a space)

c2 = Hex 20–FF (20 is always printed as a space)

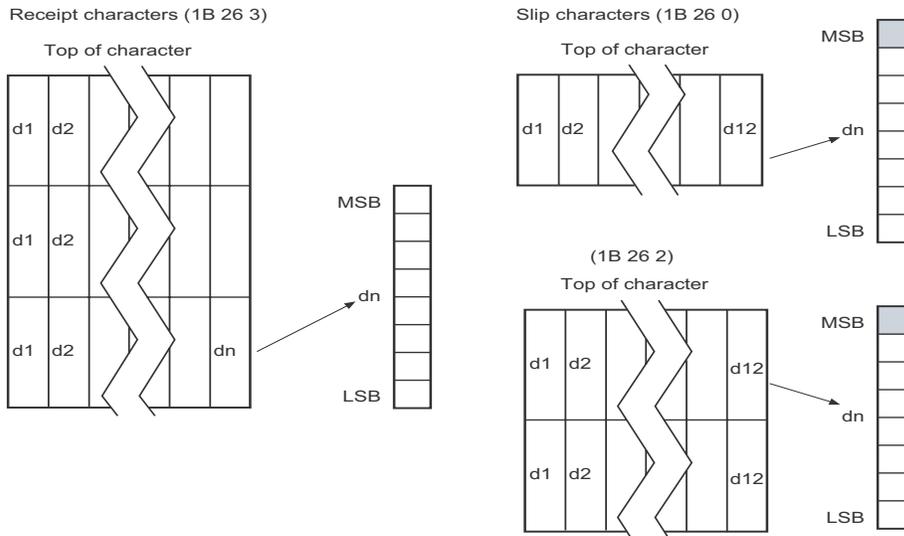
To define only one character, use the same code for both *c1* and *c2*.

n = the number of dot columns for the n th character as specified by $n1 \dots nn$

$n = 1-16$

d = the column data for the n th character as specified by $d1 \dots dn$

The number of bytes for a character cell is $s \times n1$. The bytes are printed down and across each cell.



Defines and enters downloaded characters into RAM. The command may be used to overwrite single characters. User-defined characters are available until power is turned off or the Initialize Printer command (1B 40) is received.

Any invalid byte ($s, c1, c2, n1$) aborts the command.

Slip:

$s = 0$ ESC & $s c1 c2(d1,1 \dots d1,12)(d2,1 \dots d2,12) \dots etc.$

c = the ASCII codes of the first ($c1$) and last ($c2$) characters respectively

$c1$ = Hex 20–FF

$c2$ = Hex 20–FF

To define only one character, use the same code for both $c1$ and $c2$

d = the column data for the n th character as specified by $d1 \dots dn$

Each character is defined by 12 bytes (only bytes 2–11 are printed.) See $s = 0$ definition above.

Each byte is one 7-dot high column (full- or half-dot column.)

Overlapped dots are not printed.

The data must contain $[(c2 - c1 + 1) \times 12]$ bytes. (See illustration.)

Defines and enters downloaded characters into RAM or flash. The command may be used to overwrite single characters. User-defined characters are available until power is turned off or the initialize printer command (1B 40) is received.

Any invalid byte ($s, c1, c2, n1$) aborts the command.

User-defined character sets for both slip and receipt may be used at the same time. The command clears bit image logo data from RAM. The illustration on the next page provides a sample of a character cell.

$s = 2$ ESC & $s c1 c2(d1,1 \dots d1,12)(d2,1 \dots d2,12) \dots etc.$

$c =$ the ASCII codes of the first ($c1$) and last ($c2$) characters respectively

$c1 =$ Hex 20–FF

$c2 =$ Hex 20–FF

To define only one character, use the same code for both $c1$ and $c2$

$d =$ the column data for the n th character as specified

by $d1 \dots dn$

Each character is defined by 24 bytes (only columns 2–11 are printed.) See $s = 2$ definition above.

The data must contain $[(c2 - c1 + 1) \times 24]$ bytes. (See illustration.)

Related information

See 1D 22 n (select memory type where to save user-defined fonts.)

Select or cancel underline mode

ASCII ESC - n

Hexadecimal 1B 2D n

Decimal 27 45 n

	<u>Decimal</u>	<u>Hex</u>
Value of n:	0, 48	30 = Cancel underline mode
	1, 49	31 = Select underline mode
	2, 50	32 = Select double thickness underline mode

Default: 0 (Cancel underline mode)

Turns underline mode on or off. Underlines cannot be printed for spaces set by the horizontal tab, set absolute start position, or set relative print position commands.

This command and the select print mode(s) command (1B 21) turn underline on and off in the same way.

Exceptions

This command is ignored if n is out of the specified range.

Copy character set from ROM to RAM

ASCII ESC : 0 0 0

Hexadecimal 1B 3A 30 30 30

Decimal 27 58 48 48 48

Default: Code page 437

Copies characters in the active ROM set to RAM. Use this command to re-initialize the user-defined character set. Code page 437 is copied by default at initialization. This command is ignored if current font is the user font.

Related information

To modify characters in one of the character set variations, such as rotated print, select one of the rotated print commands, copy to RAM, then use the define user-defined character set command (1B 26).

Cancel user-defined character

ASCII ESC ? n

Hexadecimal 1B 3F n

Decimal 27 63 n

Value of n : Specified character code.

Range of n : 32–255

Cancels the pattern defined for the character code specified by n . After the user-defined character is canceled, the corresponding pattern from code page 437 is printed.

Exceptions

This command is ignored if n is out of range or if the user-defined character is not defined.

Select or cancel emphasized mode

ASCII	ESC E <i>n</i>
Hexadecimal	1B 45 <i>n</i>
Decimal	27 69 <i>n</i>
Value of <i>n</i>:	0 (bit 0) not selected 1 (bit 0) selected (When 0 and 1 are the least significant bit, LSB)
Range of <i>n</i>:	0–255
Default:	0 (bit 0)

Starts or stops emphasized printing on slip and receipt.

In emphasized mode on the slip, each line is printed twice to improve penetration of multi-part forms and increase print contrast. The second pass is printed the same direction as the first to ensure accuracy of the overprint. Printing speed decreases due to the second printing pass.

Exceptions

Only the lowest bit of *n* is effective.

Emphasized printing cannot be used with bit-images or downloaded bit-images.

Related information

This command and the select print mode(s) command (1B 21) function identically.

Select double-strike

	A756 emulation	A776 native mode
ASCII	ESC G	ESC G <i>n</i>
Hexadecimal	1B 47	1B 47 <i>n</i>
Decimal	27 71	27 71 <i>n</i>
Value of <i>n</i>:	0 = Off 1 = On (When 0 and 1 are the least significant bit, LSB)	
Default:	0 (Off)	

Turns double-strike mode on for the slip station. Overprints a second pass of the print line on the slip station to improve penetration of multi-part forms and increase print contract. The second pass is printed the same direction as the first to ensure accuracy of the overprint. The printer is reset to the standard print mode after a clear printer (0×10) command is received.

Exceptions

The settings do not apply in page mode, However they can be set or cleared in page mode.

Double-strike printing cannot be used with bit-images or downloaded bit-images.

This command functions the same as A756 when the printer is in A756 emulation mode. In A776 native mode, the command takes a parameter to enable and disable it.

Related information

Printer output is the same as in emphasized mode.

Cancel double-strike

ASCII ESC H
Hexadecimal 1B 48
Decimal 27 72

Turn off double-strike mode on the slip station in A756 emulation mode.

Select or cancel italic print

ASCII ESC I *n*
Hexadecimal 1B 49 *n*
Decimal 27 73 *n*

Value of *n*: 0 = Off
 1 = On

(When 0 and 1 are the least significant bit, LSB)

Default: 0 (Off)

Turns italic print mode on or off.

Italic print mode is available for built-in, user-defined characters. This command only works on the receipt station.

Select international character set

ASCII ESC R *n* or ESC t *n*
Hexadecimal 1B 52 *n* or 1B 74 *n*
Decimal 27 82 *n* or 27 116 *n*

Value of *n*:

A776 native mode	A756 emulation
0 = Code Page 437	0 = Code Page 437
1 = Code Page 850	Not 0 = Code Page 850
2 = Code Page 852	
3 = Code Page 860	
4 = Code Page 863	
5 = Code Page 865	
6 = Code Page 858	
7 = Code Page 866	
8 = Code Page 1252	
9 = Code Page 862	
10 = Code Page 737	

Default: 0 (Code Page 437)

Selects the character set to be used. Look in "Appendix B: Resident Character Sets" for the character sets.

There are two codes for this command (see select international character set, 1B 74 *n*). Both codes perform the same function.

Exception

The character sets cannot be mixed on the same line.

Related information

This command may also be known as select character code table.

Select character code table

See the previous command, select international character set, 1B 52 *n*.

Select or cancel 90 degree clockwise rotated print

ASCII ESC *V n*
Hexadecimal 1B 56 *n*
Decimal 27 86 *n*

Value of *n*: 0 = Cancel
 1 = Set

Default: 0 (Cancel)

Rotates characters 90 degrees clockwise. The command remains in effect until the printer is reset or until a clear printer (0x10) or rotated print (1B 12) command is received. See summary of rotated printing in this document.

Select or cancel upside-down print mode

ASCII ESC { *n*
Hexadecimal 1B 7B *n*
Decimal 27 123 *n*

Value of *n*: 0 = Cancel
 1 = Set

Default: 0 (Cancel)

Prints upside-down characters. The character order is inverted in the buffer so text is readable. The command remains in effect until the rotated print (1B 12) command is received. Only bit 0 is used. Bits 1–7 are not used. See summary of rotated printing in this document for more information.

Exceptions

The command is valid only at the beginning of a line.

The rotated print command (1B 12) cancels this command.

Select character size

ASCII GS ! *n*
Hexadecimal 1D 21 *n*
Decimal 29 33 *n*

Value of *n*: 1–8 = vertical number of times normal font
 1–8 = horizontal number of times normal font

Range of *n*: 00–07, 10–17, ...70–77

Default of *n*: 0

Selects the character height for receipt printing using bits 0 to 2 and selects the character width using bits 4 to 7, as follows:

Character width selection

Hex	Decimal	Width
00	0	1 (normal)
10	16	2 (two times width)
20	32	3 (three times width)
30	48	4 (four times width)
40	64	5 (five times width)
50	80	6 (six times width)
60	96	7 (seven times width)
70	112	8 (eight times width)

Character height selection

Hex	Decimal	Height
00	0	1 (normal)
01	1	2 (two times height)
02	2	3 (three times height)
03	3	4 (four times height)
04	4	5 (five times height)
05	5	6 (six times height)
06	6	7 (seven times height)
07	7	8 (eight times height)

This command is effective for all characters (except for HRI characters).

In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction. However, when character orientation changes in 90 degree clockwise-rotation mode, the relationship between vertical and horizontal directions is reversed.

In page mode, vertical and horizontal directions are based on the character orientation. When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.

The select print mode (1B 21 *n*) command can also select or cancel double-width and double-height modes. However, the setting of the last received command is effective.

Exceptions

If *n* is out of the defined range, this command is ignored. This command is only valid for the receipt station.

Select or cancel white/black reverse print mode

ASCII	GS B <i>n</i>
Hexadecimal	1D 42 <i>n</i>
Decimal	29 66 <i>n</i>

Value of *n*:
0 = Off
1 = On

(When 0 and 1 are the least significant bit, LSB)

Range of *n*: 0–255

Default: 0 (Off)

Turns on white/black reverse print mode. In white/black reverse print mode, print dots and non-print dots are reversed, which means that white characters are printed on a black background. When the white/black reverse print mode is selected it is also applied to character spacing which is set by right-side character spacing (1B 20).

This command can be used with built-in characters and user-defined characters, but does not affect the space between lines.

White/black reverse print mode does not affect bit image, downloaded bit image, bar code, HRI characters, and spacing skipped by horizontal tab (09), set absolute starting position (1B 24 ...), and set relative print position (1B 5C).

White/black reverse print mode has a higher priority than underline mode. When underline mode is on and white/black reverse print mode is selected, underline mode is disabled, but not canceled.

Bar codes, logos, and bit images are not affected by this command.

Exceptions

This command is only valid for the receipt station.

Reverse color text mode (ColorPOS')**ASCII** GS 0x85 *m n***Hexadecimal** 1D 85 *m n***Decimal** 29 133 *m n***Value of *m*:**
0 = white
1 = black
2 = paper color**Value of *n*:**
0 = white
1 = black
2 = paper color**Default:** *m* = 0 (off)

Sets a mode for reverse printing effects on text. The background color is specified by *m*, while the text color is specified by *n*. Setting *m* = 0 turns off the mode.

If *m* = *n* but not zero, the printer produces solid printing in the given color. This tactic can be used to minimize the firmware busy work.

The value of current color and white/black reserve print mode is superseded by the value of *n* whenever this mode is on (*m*>0). Bar codes, logos, and bit images are not affected by this command.

Text strike-through mode (ColorPOS')**ASCII** GS 0x85 *m n***Hexadecimal** 1D 8D *n m***Decimal** 29 141 *n m***Value of *m*:**
0 = retain same color as the character itself
1 = black
2 = paper color**Value of *n*:** standard cell height**Default:** *n* = 0 (off)

Prints a strike-through over characters. If the strike-through is as wide as the cell height, this will produce a cell that will be printed as a solid current color.

When characters are greater than normal size, such as double-high, the number of character rows claimed by *n* also increases proportionally, such as doubling for double-high cells. Location of the strike-through on a cell is on a cell-by-cell basis, so mixing cell sizes on the same print row will give uneven results.

Select superscript or subscript modes**ASCII** AX ENQ *n***Hexadecimal** 1F 05 *n***Decimal** 31 05 *n***Value of *n*:**
0 = Normal character size
1 = Select subscript size
2 = Select superscript size**Default:** 0 (normal size)

Turns superscript or subscript modes on or off. This attribute may be combined with other characters size settings commands (12, 13, 1B 21 *n*, 1D 21 *n*,...)

This command is available only on the receipt station.

Exceptions

This command is ignored if *n* is out of the specified range.

Graphics

These commands are used to enter and print graphics data and are described in order of their hexadecimal codes.

Download BMP logo

ASCII: ESC (+*.BMP file)
Hexadecimal: 1B (+*.BMP file)
Decimal: 27 66 77 (+*.BMP file)
Value: Maximum width = 576
 (640 for 8.5 mm paper)
 Maximum height = 512

Enters a downloaded BMP logo into RAM or flash.

The downloaded BMP logo can be printed by using the print downloaded bit image (1D 2F *m*) command.

To download a BMP file to save it as a logo, send the hexadecimal code 1B followed by the whole BMP file.

The printer decodes the BMP file header and will save the image data after checking important parameters, such as width, height, and the number of colors (only monochrome images are accepted).

BMPs and bit images are definable for the receipt station. However, there is no longer an automatic erasure whenever the user downloads a character set (as happened previously) as well as in the case where the current logo was never set > 0, (the automatic erasure if user flash memory had filled up with inactive logo 0 definitions upon next power cycle). Warnings about the effect of running out of defined logo space during a download apply (i.e. the command is ignored). The application is required to manage user data space, downloaded font space, and logo space.

After downloading a logo to the printer, wait 100 ms to allow the printer time to write the logo to flash.

The downloaded BMP file can be printed by using the print downloaded bit image (1D 2F *m*) command.

Exceptions

This command is valid only for the receipt station. This command is valid only for monochrome logos.

Related information

Microsoft BMP bitmap file format.

See *Select the Current Logo* (1D 23 *xx*) for additional information.

See *Download Logo Image* (1D 84) for information concerning color logos.

Select bit image mode

ASCII ESC * *m n1 n2 d1 ... dn*
Hexadecimal 1B 2A *m n1 n2 d1 ... dn*
Decimal 27 42 *m n1 n2 d1 ... dn*

Value of *m*:

Receipt Station

Value of <i>m</i>	Mode	No. of dots (vertical)	No. of dots (horizontal)
0	8-Dot single-density	8 (68 DPI)	0–288 (101 DPI)
1	8-Dot double-density	8 (68 DPI)	0–576 (203 DPI)
32	24-Dot single-density	24 (203 DPI)	0–288 (101 DPI)
33	24-Dot double-density	24 (203 DPI)	0–576 (203 DPI)

Slip Station			
Value of <i>m</i>	Mode	No. of dots (vertical)	No. of dots (horizontal)
0	8-Dot single-density	8 (72 DPI)	210 (70 DPI)
1	8-Dot double-density	8 (72 DPI)	420 (140 DPI)
32, 33	Not available on slip		

In single density, one byte (8-dots) is printed in each full dot column. In double-density, one byte is printed in each half/full dot column, but adjacent horizontal dots (overlapping dots) are not printed.

Value of *n*:

Value of <i>n</i> (8-dot single-density mode)	Value of <i>n</i> (24-dot single-density mode)	Value of <i>d</i>
$n1 + (256 \times n2)$	$3 \times [n1 + (256 \times n2)]$	Number of bytes of data*

*Printed left to right (8-dot mode); Printed down then across (24-dot mode).

Formulas

8-dot single-density	$n1 + (256 \times n2)$
24-dot single-density	$3 \times [n1 + (256 \times n2)]$

Sets the print resolution and enters one line of graphics data into the print buffer. Excess data is accepted but ignored. Any print command is required to print the data, after which the printer returns to normal processing mode.

See the illustration for graphic representations of the bit image on next page.

In A756 emulation mode, slip graphics are only seven dots high.

Select double-density graphics

ASCII	ESC Y <i>n1 n2 d1 ... dn</i>
or	ESC L <i>n1 n2 d1 ... dn</i>
Hexadecimal	1B 59 <i>n1 n2 d1 ... dn</i>
or	1B 4C <i>n1 n2 d1 ... dn</i>
Decimal	27 89 <i>n1 n2 d1 ... dn</i>
or	27 76 <i>n1 n2 d1 ... dn</i>

Equivalent to **1B 2A m=1** *n1 n2 d1 ... dn*

Exception

1B 4C *n1 n2 d1 ... dn* is only valid in A756 emulation mode.

Select the current logo (downloaded bit image)

ASCII	GS # <i>n</i>
Hexadecimal	1D 23 <i>n</i>
Decimal	29 35 <i>n</i>

Range of *n*: 0 – 255

Default: 0

Selects a color or monochrome logo to be defined or printed. The active logo *n* remains in use until this command is sent again with a different logo *n*.

When this command precedes a logo definition, that definition is stored in flash memory as logo *n*. If there is already a different definition in flash memory for logo *n*, the first is inactivated and the new definition is used. The inactive definition is not erased from flash and continues to take up space in flash memory.

When this command precedes a logo print command and *n* is different from the previously active logo selected, the printer retrieves the logo definition for *n* from flash memory and prints it. If there is no definition for logo *n*, then no logo is printed.

In the case of a previously existing application that expects only one possible logo, the printer will not receive the select current logo (1D 23 *n*) command. In this case, the printer assigns 0 as the active logo identifier. It automatically stores any new logo definition in flash memory as logo 0, inactivating any previous logo 0 definition. If the flash memory space available for logos fills up with inactive logo 0 definitions, the firmware erases the old definitions at the next power cycle. This is the only case in which the printer erases flash memory without an application command.

In the case of a new application using multiple logos, the select current logo (1D 23 *n*) command is used. After that, the printer no longer automatically erases the logo definition flash memory page when it fills with multiple definitions. A new application using multiple logos, writing a user-defined character set into flash memory, or both, is responsible for erasing the logo and user-defined character set flash memory page when the logo area is full or before a new character set is defined.

Exception

This command is only valid for the receipt station, However, it will processed correctly, regardless of whether the receipt station is currently selected.

Define downloaded bit image

ASCII GS * *n1 n2 d1 ... dn*
Hexadecimal 1D 2A *n1 n2 d1 ... dn*
Decimal 29 42 *n1 n2 d1 ... dn*

Value of *n1*: See the following table

Value of *n2*: See the following table

Value of *d*: See the following table

Value of <i>n1</i>	Value of <i>n2</i>	Value of <i>d</i>
1–56 (8 x <i>n1</i> = number of horizontal dot columns)	1–64 (number of vertical bytes)	Bytes of data (printed down, then across)

*The number of bytes sent is represented by the following formula:
 $n = 8 \times n1 \times n2$ ($n1 \times n2$ must be less than or equal to 4608).

Enters a downloaded bit image (such as a logo) into RAM or flash with the number of dots specified by *n1* and *n2*. If in RAM, the downloaded bit image is available until power is turned off, another bit image is defined, or initialize printer (1B 40) command is received.

See the illustration below for a graphic representation of the downloaded bit image.

Related Information

See 1D 22 *n* (select memory type to store logos and 1D 23 *n* (select the current logo.)

Print downloaded bit image

ASCII GS / *m*
Hexadecimal 1D 2F *m*
Decimal 29 47 *m*

Value and range of *m*:

This command is used to print a previously stored monochrome or color logo from printer memory on the receipt station. The logo is identified as the one indicated by the most recent select current logo command or 0 if a select current logo command has not yet been given. Parameter *m* is interpreted as follows:

Value of <i>m</i>	Print mode	Vertical DPI	Horizontal DPI
0	Normal	203	203
1	Double-wide	203	101
2	Double-high	101	203
3	Quadruple	101	101

The indexed downloaded bit image from RAM or flash will be printed on the receipt station at a size specified by *m*. If the bit image is a monochrome one, it is printed in the current color; otherwise it is printed as a two-color image. If doubling or quadrupling exceeds the print paper width maximums (576 or 640 with 82.5 mm paper) the left side of the image is printed and the bits to the right of the maximum column are discarded. If the available width is greater than the bit image, its printing will adhere to any currently set right, left, or center justification. This command is ignored if the index refers to an undefined logo/ bit image.

Print raster monochrome graphics (ColorPOS[®])

ASCII GS 0x82 *n1*.....*n72* (576 dots) for 80 mm paper, or *n80* (640 dots) for 82.5 mm paper
Hexadecimal 1D 82 *n1*.....*n72* (576 dots) for 80 mm paper, or *n80* (640 dots) for 82.5 mm paper
Decimal 29 130 *n1*.....*n72* (576 dots) for 80 mm paper, or *n80* (640 dots) for 82.5 mm paper

Value and range of *n*: *n1* to *n72/n80* corresponds to one dot row data for a thermal receipt printer.

Each bit defines whether or not a dot of the current color will be printed. This command is used for printing a monochrome graphic in real-time. Offsets, page and any other modes or overlays, including watermark do not apply and are overridden by this command. A complete rendering of the intended final image should have been done by the application before sending the dot rows.

If two-color paper is indicated by the set paper type command, then the raster will be printed in the color that is defined by the set current color command.

Print raster color graphics (ColorPOS[®])

ASCII GS 0x83 *n1*.....*n144* (576 dots 80 mm paper) / *n160* (640 dots, 82.5 mm paper)
Hexadecimal 1D 83 *n1*.....*n144* (576 dots 80 mm paper) / *n160* (640 dots, 82.5 mm paper)
Decimal 29 13 *n1*.....*n144* (576 dots 80 mm paper) / *n160* (640 dots, 82.5 mm paper)

Value and range of *n*: *n1* to *n144/n160* corresponds to one dot row data.

For each printed dot row starting at the top left, two-part bit strings are used to define (in the first half), all dots that are of either color (i.e. not white). The second half string defines only the dots where the color = black. Thus all dots which are on in the first half string but not on in the second half string, select the secondary color. The parameter of this command is thus a string of bytes for one dot row with the same structure as defined for the thermal color format file given in the download color logo command.

This command is used for printing a single raster of color graphics in real-time. Offsets, page and any other modes or overlays, including watermark, and current color do not apply to this command. A complete rendering of the intended final image has to be done by the application before sending the dot rows.

Download logo image (ColorPOS[®])

ASCII GS 0x84 *m n1 n2 d1*.....*dx*, *x* = (*n1* * *n2**8) * *m*
Hexadecimal 1D 84 *m n1 n2 d1*.....*dx*, *x* = (*n1* * *n2**8) * *m*
Decimal 29 132 *m n1 n2 d1*.....*dx*, *x* = (*n1* * *n2**8) * *m*

Value of *m*: 1 = monochrome
2 = two-color

Max *n1* = 576/8 for 80 mm paper or
640/8 for 82.5 mm paper

The latest value from the set current logo command will be the logo index to be used to store the downloaded graphic.

m identifies whether the image is monochrome (which requires one parameter bit row description) or two-color, which requires a pairing of bit descriptions for each row.

n1 * *n2* define a rectangular image *n1* bytes wide and *n2* bytes long. *n1**8 specifies the number of dot columns, and *n2**8 the number of dot rows. That is, each row is defined by an integral number of bytes and the number of rows is also an integral number of bytes. Note that *n2* can be any length, subject to memory space availability.

For each color dot row starting at the top left, a two part parameter byte string is used to define first, all dots that are not white, and the second half defines all dots where the color = black. Thus all dots that are on (=1) in the first half but not on in the second half select the paper-color. A sequence of these raster row strings is used to specify the complete logo. In the monochrome case, only one bit is needed per row. This is the same structure as used for the definitions of print raster monochrome graphics and print raster color graphics.

This command is used for storing a logo of $n1$ by $n2$ size indexed by the current logo value.

After downloading a logo to the printer, wait 100 ms to allow the printer time to write the logo to flash.

Apply shading to logo (ColorPOS[®])

ASCII GS 0x8B $n m o$
Hexadecimal 1D 8B $n m o$
Decimal 29 139 $n m o$

This command will apply shading effect m to logo n and store it at index o , also extending width to full horizontal size if logo n is not at full paper width.

n must be the index value of an existing logo

$0 \leq m \leq 100$, possibly resulting in a logo suitable for background watermark mode use

o can be any value, and the logo will be placed according to the current setting of user storage into RAM or flash memory.

An application might use a high value of m to shade out the logo if the original image has a significant number of "on" dots to allow for future foreground print readability.

Note: *The old logo size and current justification mode are used to create a new logo image at full paper width size by filling in white space at either or both sides if needed. This new logo will provide for minimal performance impacts when it is selected for use in watermark mode.*

After sending the shading command, wait 5 seconds to allow the printer to apply the shading and write the results to flash.

Merge watermark mode (ColorPOS[®])

ASCII GS 0x8C $n m$
Hexadecimal 1D 8C $n m$
Decimal 29 140 $n m$
Default 0 (off)

This command will insert the logo m as a repeated background image, similar to printing a visible watermark, into the print stream. The space between repetitions of this usually shaded logo will be every $n*8$ dot rows.

$n > 0$ = number of dot rows x8 to skip before repeating the merge action

m specifies the index value of the logo. If no logo has been defined with this index then the command is ignored.

Note: *Horizontal placement of a watermark logo was fixed at the time the logo was Shaded or when it was downloaded as a full width logo for watermark use. This command will be ignored if the current logo is not at full paper width size (see the apply shading to logo command for preparing logos for watermark use).*

The merge process is performed after all other image formation and takes whatever print raster data is ready to be put on paper. It "adds" (computer logic OR) the mono or color bits to the print row. Generally, if the print dot was to be white or same color as the watermark dot, the print dot will be the color of the watermark; otherwise it will be black.

Monochrome shade mode (ColorPOS®)

ASCII GS 0x86 *m*
Hexadecimal 1D 86 *m*
Decimal 29 134 *m*

This applies a selected shade density to all monochrome objects such as text and monochrome logos. The parameter *m* specifies the shading effect and has an initial value of 0 which signifies no effect.

m specifies the percentage of shading, $0 \leq m \leq 100$.

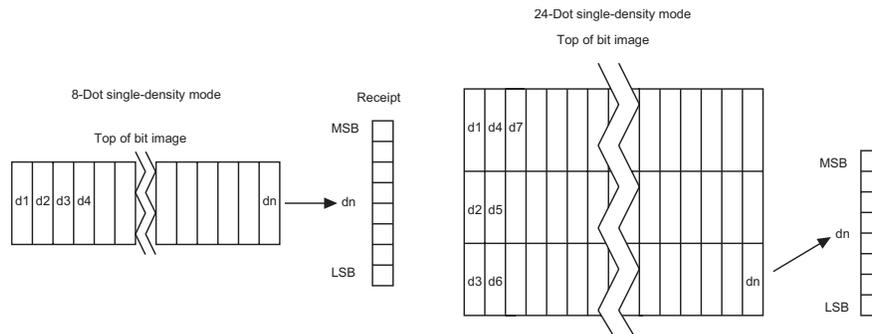
m = 0 is the initial value and turns this mode off.

Note: *that only a few gradations will be perceptible, so large increments of *m*, such as 20, should be used. If a reverse print mode is on, the shade effect will be applied to the background only.*

When the current color mode is set to black, increasing values of *m* relate to the relative amount of (white) paper that replaces black dots. Analogously, when the paper-color is the current color, *m* defines the relative amount of color dots being “erased” by white originals of the paper.

Both text and monochrome graphics are affected by this command.

Turning monochrome shade mode on, turns color shade mode off.

**Color shade mode (ColorPOS®)**

ASCII GS 0x87 *m*
Hexadecimal 1D 87 *m*
Decimal 29 135 *m*

This applies a mixing of color into any monochrome objects such as text and monochrome logos. Rather than fading away, this mode transitions a character or logo from the current color in which it would normally be printed to the other color. The parameter *m* specifies the shading effect and has an initial value of 0 which signifies no effect. *m* specifies the percentage of shading, $0 \leq m \leq 100$.

m specifies the percentage of shading, $0 \leq m \leq 100$.

m = 0 is the initial value and turns this mode off.

Note: *Only a few gradations will be perceptible, so large increments of *m*, such as 20, should be used. If a reverse print mode is on, the shade effect will be applied to the background only.*

When the current color mode is set to black, increasing values of *m* relate to the relative amount of paper-color that replaces black dots. Analogously, when the paper-color is the current color, *m* defines the relative amount of black color dots replacing the paper-color ones.

Both text and monochrome graphics are affected by this command.

Turning color shade mode on, turns monochrome shade mode off.

Logo print with color plane swap (ColorPOS[®])

ASCII GS 0x89 *n m*
Hexadecimal 1D 89 *n m*
Decimal 29 137 *n m*

This command will print logo *n*. The command is ignored if a logo with index *n* has not been defined. If *m* = 0 the color(s) as defined in the logo is (are) used; if *m* = 1 and if the logo is a color one, then the two color planes (black and paper-color) in the logo are swapped.

Form and merge real-time surround graphic (ColorPOS[®])

ASCII GS 0x90 *m x y o p q*
Hexadecimal 1D 90 *m x y o p q*
Decimal 29 144 *m x y o p q*

This command will print a real-time graphic style designated by *m*. *m* = 0 rectangle, *m* = 1 oval, *m* = 2 ellipse (if printed in a square area the ellipse becomes a circle), *m* = 3 is a 5 point star, *m* = 4 is a free hand underline, *m* = 5 is a free hand ellipse and other values of *m* reserved for future styles. This graphic is formed into a RAM based graphics buffer, and the buffer state is set to "graphic merge pending".

Whenever the buffer is in the pending merge state and print output is started, the state will be changed to frozen and a merge process started (logically OR-ed graphic data) into the print lines that follow. The application determines how close the graphic is to any printed character data by subsequent printing of blank lines or blank dot rows. The merge process stops when the buffer is exhausted or its state changed (by a save graphics buffer as logo or new form and merge real time surround graphics command). The form and merge real time surround graphics command can be given multiple consecutive times, allowing the application to set up a multi-polygon background before starting its printout with placed text or logo.

The geometric location points for this graphic are defined by a rectangular area start position of *x* bytes from the left edge and *y* bytes from the top of the new line and times *o* bytes wide times *p* bytes in length. For the case of *m* = 3 (star), the value passed for *o* is also used as the implicit *p* value (passed *value* is ignored), i.e. a square area. The thickness of the graphic is defined by *q* dots. This will form a bit image in a RAM graphics buffer. Subsequent surround graphic commands can be added into (logical OR process) with expanded size if needed) the graphics buffer until an output action is issued. It is expected that area left white will then be (usually) filled in with text or other data that is to be printed. Printing starts as soon as the first line of data or other printout arrives. After this printing is started, any new surround graphics commands will set the graphics buffer to a merge pending state. Example: *Create different size stars and an ellipse around a block of text.*

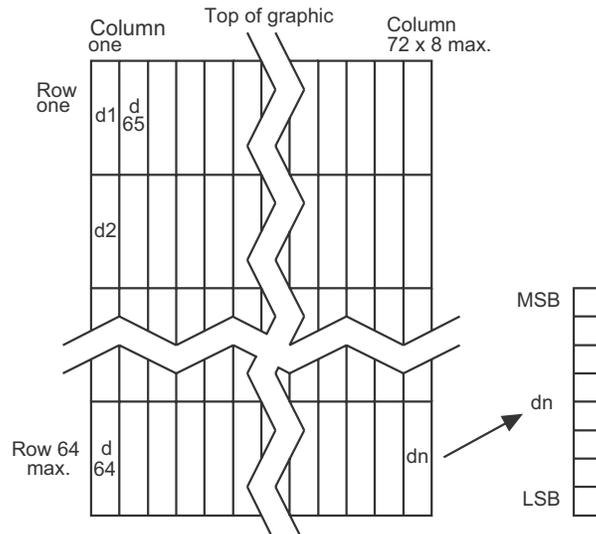
The graphics buffer is at a frozen state at printer initialization or reset, with blank data in it.

Each the time this command is given, the current color and shade mode values (if any) are used for the surround graphic, and may be changed before any subsequent surround graphics and/or printing output. This command may be used in page mode.

Save graphics buffer as logo (ColorPOS®)

ASCII GS 0x91 *n*
Hexadecimal 1D 91 *n*
Decimal 29 145 *n*

This command will save all the raster data that is in the working graphics buffer (where surround graphics are formed) as a logo with index value *n*. This logo can then be used repeatedly for inserting different text. See the background logo print command.



There is one working graphics buffer in the printer; its size (and that of the saved logo) is of maximum print width size, and of sufficient length to store the largest of the surround graphic styles defined since the last buffer “freeze” event. This command is ignored if the graphics buffer is not in a “merge pending” state. The graphics buffer state will be set to “frozen” by this command.

Related information

This command is ignored in page mode.

Background logo print mode (ColorPOS®)

ASCII GS 0x92 *n*
Hexadecimal 1D 92 *n*
Decimal 29 146 *n*

This command will place into the graphics buffer the logo designated by *n*. As soon as there is a print action command (such as text output) the graphics buffer will be merged (logical OR process) with print output.

This command sets the graphics buffer state to “merge pending”, functioning and performing the save as in the form and merge real time surround graphics command.

Related information

This command is ignored in page mode.

Shade and store logo (ColorPOS®)

ASCII GS 0x9A *n m o*
Hexadecimal 1D 9A *n m o*
Decimal 29 154 *n m o*

Value of *n*: *n* is ID (logo index value) of an existing logo in either flash or RAM memory

Value of *m*: *m* is the % of shading to be applied to the logo, $0 \leq m \leq 100$.

Value of *o*: *o* is the new ID (logo index value) to be used to store the shaded result, according to the current setting of user storage into flash or RAM.

This command applies shading to an existing logo of any size, storing the result in a new logo at index *o*. The new logo is thus better suited for use in a merging mode. The % of shading will have only a few perceptible gradations, so large increments (20 is suggested) should be used to achieve visibly distinct effects.

Logo print with knife cut

ASCII GS 0x9B *m n*

Hexadecimal 1D 9B *m n*

Decimal 29 155 *m n*

Value of *m*:

- 0 = Standard size
- 1 = Double wide
- 2 = Double high
- 3 = Double high/wide

Value of *n*: 01 - FF (Hex)
#dot rows = $n \times 24$, $n = 5$ is the recommended setting



Because the printhead and cutting knife are physically separated, it is necessary to advance the printed area of a receipt past the knife to avoid the last of the printing from being cut off. This advance of paper however, causes a blank space at the start of the next receipt that could be used. To utilize this space and reduce paper usage, this command starts to print a logo for the next receipt before initiating the cut at the end of the current receipt. At a set location during the printing of the logo, the corresponding paper advance is stopped and a paper cut performed.

The formula " $n \times 24$ " is used to determine the number of dot rows to move the paper from the start of the logo to the position of the cut.

If $n \times 24$ is greater than the height of the logo, the logo height is used to determine the cut position. If $n = 0$ the cut is eliminated.

In order for this command to function properly, all commands used by legacy applications to move the end of the current receipt past the knife should be removed.

Related information

See "Print downloaded bit image" command.

Apply margin message mode (ColorPOS[®])

ASCII US 0x99 *l m n o*

Hexadecimal 1D 99 *l m n o*

Decimal 29 153 *l m n o*

Value of *l*: *l* is a binary switch:

- 0 = disables margin message merging
- 1 = enable left margin message merging
- 2 = enable right margin message merging
- $l > 2$ ignore command

Value of *m*: *m* is the ID (index) of the logo to be used in the merging. If a logo with index *m* does not exist or is wider than the print raster width then this command is ignored.

Value of *n*: *n* is the number of raster rows to be empty (skipped) before repeating the designated margin message merge

Value of *o*: *o* is a right - left toggle switch:

- $o = 0$ no toggling of the margin message merge
- $o = 1$ enable toggling, starting with a left margin message first
- $o = 2$ enable toggling, starting with a right margin message first
- $o > 2$ ignore entire command

This command performs a dynamic merge of a designated logo/message (or logo/message pair, which can be the same) into each raster line to be printed after the character data has been placed and in conjunction with any other active merge modes. The parameter *l* specifies whether merging should take place from the left side or the right side. A left side merge followed by a right side merge (or vice-versa) must be issued, with the latter side merge command setting the toggle switch = 1 or 2 will create the desired left – right printing effect. Each merge side retains its *n* value of raster rows to be skipped. If toggling is not selected when both sides are defined, then if the *n* skip row values are different, or the logo height sizes are different, the side logos will not line up as printing progresses. If toggling is selected then both left and right sides merge margin message must be defined; otherwise toggling is ignored.

Each side logo can be $> \frac{1}{2}$ of the raster print line. In that case the printing process is additive in the overlap region. This command with the first parameter *l* = 0 turns all margin message merging to off.

Set temporary max target speed

ASCII GS 0xA0 *nl nh*

Hexadecimal 1D A0 *nl nh*

Decimal 29

Values: 15H - B4H monochrome
15H - 64H color

Default: 0 - normal speed

This command sets a specific speed for an operation, allowing the user more control of the print environment.

The speed is maintained as long as it is less than the speed automatically set by power management. A parameter of zero (0) restores the normal max speed.

Set LogoEZ® colorization (ColorPOS®)

ASCII US ETX SYN *fs p/t t*

Hexadecimal 1F 03 16 *fs p/t t*

Decimal 31 03 22 *fs p/t t*

Value of f: 0 = turn off all LogoEZ® colorization features
1 = link print logo after knife cut
2 = link watermark printing
3 = link margin message printing
4 = link logo print before cut

Default: 0 (Off)

This command configures into EEPROM (permanent configuration switch setting) a set of features that allows placement of a color logo in the header, full-time margin message printing, watermarking in the middle of the receipt and printing of a trailer color logo. These commands are triggered by any knife cut command (partial or full: 19, 1A, 1B 69, 1B 6D, 1D 56 *m n*). The printer when powered-up will (if set) activate the header, watermark, and margin message features and will be ready to print the body of a receipt. For selected features to print however, logos with defined index values of F0, F1, F2, F3 respectively must be saved in the flash memory.

Once logos have been loaded and enabled they can be used in any emulation mode. Skip distances remain constant.

Value descriptions:

f= function selector and defines which parameters are used :

s = dot row space before object distance

p = dot row past an object

r = repetition space distance in mm

t = margin message toggle mode

f= 0 turn off all LogoEZ® colorization functions (default). No other parameters are required.

f= 1 link print logo after knife cut – equivalent to printing a transaction header graphic.

Example:

Print logo (#F0) after a knife-cut with “s” dot row spacing before the logo and “a” dot row spacing after the logo (1F 03 16 01 s p). After executing a knife-cut command, if $s > 0$, execute the following:

- Stop background merging (1D 9B 1 command)
- Skip s (feed paper) dot rows (15 s command) – adds spacing in addition to any set by the application around a knife cut command
- Set centered justification (1B 61 1 command), saving the previous justification
- If the logo at F0h is currently defined, print logo by sending print downloaded bit image, normal size (1D 2F 0 command) without changing the value of current logo
- Reset justification to previous value (1B 61 [previous value])
- Skip (feed paper) “p” dot rows after logo (15 p command)

Since the normal space on the receipt paper after a knife cut is 18 mm (144 rows), no extra space is usually needed above the logo. The default value is $s = 0$ and turns off the $f = 1$ logo after knife-cut link.

f = 2 link watermark printing**Example:**

Activate watermark printing using logo #F1 (1F 03 16 02 s r) with “s” being the skip distance in dot rows before activation and “r” is the distance in mm between watermark repetitions.

After executing a knife-cut command and the $f = 1$ steps, if $s > 0$, execute the following:

- Skip “s” (feed paper) dot rows (15 s command)
- Set watermark printing to “on” using logo F1 (execute merge watermark mode -1D 8C r F1 command). Logo must be defined for F1 and comply with watermark mode requirements in order for this happen.
- Stop background merging mode (1D 9B 1 command). Clears background for logos, barcodes, and captured images.

The watermarks feature is now activated (following an optional F0 logo) to start after each knife cut. Note that when printing graphic objects, merging is turned off by each knife cut. The default value is $s = 0$ and turns off the $f = 2$ watermark link.

No correlation exists (when both are set) between watermark and logo skip distances.

If the $f = 4$ logo link is undefined, you should set a null trailer logo with $s = 1$ and $p = 144$ (1F 03 16 04 1 90, no logo at index F3). This will turn off watermarks at the position of a knife cut and leave a clear space at the top of the next receipt.

f = 3 link margin message printing**Example:**

Activate margin message printing using logo #F2 (1F 03 16 03 s r t) with “s” being the skip distance, “r” the distance between repetitions and “t” the toggle mode.

Toggle mode values for t:

- 0 = both left and right side
- 1 = toggle sides, starting with left side
- 2 = right side margin message only
- 3 = left margin message only

After executing a knife cut command and the $f=1$ steps, if $s > 0$, execute the following:

- skip “s” dot rows (=15 s command). When both watermark and margin message merging are defined, the respective “s” values are treated independently. The same value should be used to start watermark and margin message at the same place.

- Use the toggle mode values listed above to apply margin message for the left and/or right side. For a margin message on both sides, enter the 1D 99 1 F2 *p* 0 command followed by the 1D 99 *t*' F2 *r t*' (apply margin message) command with the logo at index F2 defined.
- suspend background merging mode (=1D 9B 1 command), so any logos, barcodes, and captured images will print in the clear

The margin message printing feature is activated after the header logo after a restart at each knife-cut. Note that when printing graphic objects, merging is turned off by each knife cut. No correlation exists (when both are set) between watermark and logo skip distances.

If the *f* = 4 logo link is undefined, you should set a null trailer logo with *s* = 1 and *p* = 144 (1F 03 16 04 1 90, no logo at index F3). This will turn off margin message at the position of a knife cut and leave a clear space at the top of the next receipt.

f = 4 link logo print before cut

Prints a logo after the skip distance of "*s*" before a logo and "*p*" past a logo and performs a knife cut (1F 03 16 04 *s p*).

Immediately before executing a knife-cut command, if *s* > 0, execute the following:

- skip (feed paper) "*s*" dot rows (15 *s* command)
- stop background merging (1D 9B 1 command). Save previous background merging value, so logo prints in the clear
- set centered justification (1B 61 1 command), saving the previous justification
- if a logo at index F3h is currently defined, print the logo by sending print downloaded bit image, normal size (1D 2F 0 command), without changing the value of current logo.
- reset justification to previous value (1B 61 [previous value])
- skip (feed paper) "*p*" dot rows (15 *p* command) a minimum value of 90h, to ensure knife cut occurs after the logo
- restore background merge suspension (1D 9B [previous value])

Related information

This command is utilized in the TPG, Inc. LogoEZ® utility. The utility can be used to pre-configure new printers with a default colorization set-up without requiring any application changes. The default set-up was designed to provide a general level of colorization features that would not affect the printer operation. You can expand beyond the default features of the utility by modifying the application at the host. However, do not attempt to modify the settings within the utility.

LogoEZ® utility default settings:

f = 1: *s* = 1H
a = 30H

f = 2: *s* = 32H
r = 19H

f = 3: *s* = 1H
r = 7H
t = 1H

f = 4: *s* = 30H
a = A0H

Set LogoEZ[®] attribute mapping (ColorPOS[®])**ASCII** US ETX ETB *a m s***Hexadecimal** 1F 03 17 *a m s***Decimal** 31 03 23 *a m s*

Values: *a* = attribute map selector *a*, *m*, *s* = 0, 0, 0 turn off attribute mapping (all 3 bytes required)

a = 1 selects first attribute mapping definition (of two available)

a = 2 selects second attribute mapping definition

a = 1 or 2, if *m* = 0 mapping 1 or 2, respectively, is turned off

A word (2 bytes) is used to identify the attribute mapping, with “*m*” bits 0 – 6 identifying which original attributes should be mapped:

Original attribute mapped table

<i>m</i> bit on	attribute mapped
0	Bold
1	Italic
2	Reverse
3	Underline
4	Double high
5	Double wide
6	Compressed print

The following “*s*” bits and “*m*” bit 7 set the attributes that substitute for the mapped set:

Attributes substituted table

<i>m</i> bit on	attributes substituted
7	Bold substituted
<i>s</i> bit on	attributes substituted
0	Italic
1	Reverse
2	Underline
3	Double high
4	Double wide
5	Compressed print
6	Alternate color
7	Color reverse

This command configures into EEPROM (permanent configuration switch setting) one or two combinations of character attribute mappings, including substitute attribute settings for color effects. The attributes of the character code are used to form the desired pixel character when the code is placed into the raster print buffer. An “*m*” bit value set to on in the “original attribute mapped table” above will have its attributes set to the corresponding bit value of “*s*” in the “attributes substituted table”. If *m* = 0 then no substitution takes place.

The command is available only in A776 native mode. Once attributes have been defined and enabled they can be used in any emulation mode. A776 native mode must be used to turn the feature off.

The operational theory of this command is that if (input character attributes) AND (original) = (original); then (output character attributes) = ([original] X OR [input character attributes]) OR (substituted). The input character's original attributes are mapped to the substituted attributes, but any attributes not specified for mapping are unchanged.

In the tables you will see that there are 7 input attributes and 9 outputs. It is expected that the alternate color attribute will be used most. For example, when the alternate color attribute is combined with the reverse substitution attribute, the result is white characters on a color background. The color reverse attribute without alternate color will print black text on a color background. Any mappings utilizing compressed and/or double-wide attributes will effect the length of a line and could cause unintended line wraps. Mappings containing double-high attributes could cause unintended receipt lengths.

When both attribute mappings are set, processing is perform in order sequence. When two text attribute substitutions contain conflicting dependent remappings, the result is undefined.

Related information

This command is utilized in the TPG, Inc. LogoEZ[®] utility. The utility can be used to pre-configure new printers with a default colorization set-up without requiring any application changes. The default set-up was designed to provide a general level of colorization features that would not affect the printer operation. You can expand beyond the default features of the utility by modifying the application at the host. However, do not attempt to modify the settings within the utility.

f = 1: *s* = 1H
a = 30H

f = 2: *s* = 32H
r = 19H

f = 3: *s* = 1H
r = 7H
t = 1H

f = 4: *s* = 30H
a = A0H

Convert 6-dots/mm bitmap to 8-dots/mm bitmap

ASCII AX EOT *n*

Hexadecimal 1F 04 *n*

Decimal 31 04 *n*

Value: 0 = Off
1 = On

(When 0 and 1 are the LSB)

Default: 0 (Off)

Selects or cancels 6-dot/mm to 8-dot/mm graphic emulation.

When the 6-dot/mm emulation is selected, logos and graphics are expanded horizontally and vertically during download to emulate their size on a 6-dot/mm printer. The horizontal positioning commands also emulate positioning on a 6-dot/mm printer.

Enable constant speed logos

ASCII US { *n*

Hexadecimal 1F 7B *n*

Decimal 31 123 *n*

Value: 0 = disabled
1 = enabled

This command allows the firmware to determine the optimal speed to print a logo. It is set prior to downloading the logo and reset after the logo has been downloaded.

In general, the "Set max target speed (1D A0 *nl nh*)" is the preferred command.

Status

Status command introduction

The A776 has three methods of providing status to the application. These methods are through batch status commands, real time status commands and unsolicited status mode. An application may use one or more of these methods to understand the current status of the printer. A brief description of each of these methods follows.

Batch status commands – These commands are sent to the printer and stored in the printer’s buffer. Once the printer has processed all the previous commands these commands are processed and the proper status is returned to the application. In the event a condition causes the printer to go BUSY, it stops processing commands from the printer buffer. If a batch status command remained in the buffer during this busy condition, it would not be processed. In fact, no batch commands are processed while the printer is in this state.

Real-time commands – These commands are sent to the printer and stored in the printer buffer. Periodically, when the printer has time, it scans the input buffer looking for these commands. When found by the printer, these commands are processed immediately. This gives the application the ability to query the printer when it is in a busy state in order to correct whatever fault has occurred.

Unsolicited status mode – This mechanism allows the application developer to program the printer to automatically respond with a four byte status when certain conditions in the printer change.

Please see the subsequent sections for a more detailed description of these status commands. At the end of this status commands section is a page entitled “Recognizing data from the printer”. This describes how to interpret what command or setting (in the case of unsolicited status mode) triggered a response from the printer.

Batch mode

For RS-232C printers, these commands enable the printer to communicate with the host computer following the selected handshaking protocol, either DTR/DSR or XON/XOFF. They are stored in the printer’s data buffer as they are received, and are handled by the firmware in the order in which they are received.

When a fault occurs, the printer will go busy at the RS-232C interface and not respond to any of the batch mode printer status commands. If the fault causing the busy condition can be cleared, such as by loading paper, or letting the thermal printhead cool down, the printer will resume processing the data in its receive buffer.

Transmit peripheral device status

ASCII ESC u 0
Hexadecimal 1B 75 0
Decimal 27 117 0

Value of returned byte:

Bit 0	Bit 1
1 = Drawer 1 Closed	1 = Drawer 2 Closed
0 = Drawer 1 Open	0 = Drawer 2 Open

Bits 2–7 are not used.

Transmits current status of the cash drawers. One byte is sent to the host computer. In DTR/DSR protocol, the printer waits for DSR = SPACE. If a drawer is not connected, the status will indicate it is closed.

Exceptions

Unlike the A756, that had a dedicated connector and resultant dedicated status reporting for each cash drawer, the A776 has a single connector that shares data reporting from either cash drawer. When either cash drawer is open, an open status for both drawers is reported by the printer.

Transmit paper sensor status

ASCII ESC v
Hexadecimal 1B 76
Decimal 27 118

Values:**Status Byte (A776 only)**

Bit	Function	0 Signifies	1 Signifies
0	Receipt paper	OK	Low (only if paper low sensor is enabled)
1	Receipt cover	Both closed	Either or both open or cassette cover
2	Receipt paper	OK	Out
3	Always zero		
4	Always zero		
5	Slip leading	Not covered	Covered edge sensor
6	Slip trailing	Not covered	Covered edge sensor
7	Always zero		

Status Byte (B780 only)

Bit	Function	0 Signifies	1 Signifies
0	Receipt paper	OK	Low (only if paper low sensor is enabled)
1	Receipt cover	Both closed	Either or both open or cassette cover
2	Receipt paper	OK	Out
3	Always zero		
4	Always zero		
5	Slip leading edge sensor	Covered	Not covered
6	Slip trailing edge sensor	Covered	Not covered
7	Always zero		

Sends status data to the host computer. The printer sends one byte to the host computer when it is not busy or in a fault condition. In DTS/DSR protocol, the printer waits for DSR = SPACE.

Related information

See real time commands, in this document for details about fault conditions reporting.

Transmit printer ID

ASCII GS I n
Hexadecimal 1D 49 n
Decimal 29 73 n

Value of n: 1, 49 = Printer model ID
 2, 50 = Type ID
 3, 51 = ROM version ID
 4, 52 = Logo Definition

Transmits the printer ID specified by *n* as follows:

n	Printer ID	Specification	ID (Hexadecimal)
1, 49	Printer model ID	TPG, Inc. A776	0x2B (A776) 0x2A (A760) 0x28 (A758) 0x26 (A756) 0x2C (B780) 0x0A (A721)
2, 50	Type ID	Installed options	Refer to the table below
3, 51	ROM version ID	ROM version	0x00
4, 52	Logo definition	Logo definition	Refer to table next column

***n* = 2 or 50: Type ID**

Type ID (*n* = 2)

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	No two-byte character code installed.
	On	01	1	Two-byte character code installed.
1	Off	00	0	No knife installed.
	On	02	2	Knife installed.
2	-	-	-	Undefined.
3	Off	00	0	No MICR installed.
	On	08	8	MICR installed.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	No imager installed.
	On	20	32	Imager installed.
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to Off.

***n* = 4 : Logo Definition**

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	No logo definition loaded by application.
	On	01	1	Logo loaded by application
1	-	-	-	Undefined
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	Not used, Fixed to Off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used, Fixed to Off.

Transmits the printer ID specified by *n*. This command is a batch mode command; that is, the response is transmitted after all prior data in the receive buffer has been processed. There may be a time lag between the printer receiving this command and transmitting the response, depending on the receive buffer status.

Transmit printer ID, remote diagnostics extension

ASCII GS I @ *n*
Hexadecimal 1D 49 40 *n*
Decimal 29 73 64 *n*

Values of *n*: Refer to table

Range of *n*: 32–255
(not all defined but reserved)

Performs the remote diagnostic function specified by *n*.

Eighteen remote diagnostic items are defined: eight printer ID items and ten printer tally items. Most of the diagnostic items are maintained in non-volatile memory (NVRAM), but some are maintained in read-only memory (ROM).

The table that follows describes the variables.

The first item group in the table includes an example of data to send and to receive, Data sent from the host to write to NVRAM must contain all digits required by the remote diagnostic item. All data must be ASCII. The printer returns all ASCII data. It is preceded by the parameter *n* to identify the diagnostic item and is followed by a carriage return (0D) to signify the end of the data.

The command performs the remote diagnostic function specified by *n* as described in the following table.

Value of <i>n</i>				
ASCII	Hex	Dec	Remote diagnostic item	Function
Space	20	32	Serial #, 10 digit ASCII	Write to NVRAM Example, send 14 bytes to printer: GS I @ 0x20 1234567890
!	21	33	Serial #	Write to NVRAM, and print on receipt to verify Example, send 14 bytes to printer: GS I @ ! 1234567890 This will print on receipt: Serial # written: 1234567890
"	22	34	Serial #	Not available, cannot clear serial # item
#	23	35	Serial #	Return Serial #, preceded by <i>n</i> to identify Printer returns 12 bytes in above example: #1234567890<CR>
\$	24	36	Class/model #, 15 digit ASCII	Write to NVRAM
%	25	37	Class/model #	Write to NVRAM, and print on receipt to verify
'	27	39	Class/model #	Return Class/model #, returns 17 bytes
+	2B	43	Boot firmware part #, 12 digit ASCII	Return Boot firmware part #, returns 14 bytes
/	2F	47	Boot firmware CRC, 4 digit ASCII	Return Boot firmware CRC, returns 6 bytes
3	33	51	Flash firmware part #, 12 digit ASCII	Return Flash firmware part #, returns 14 bytes
7	37	55	Flash firmware CRC, 4 digit ASCII	Return Flash firmware CRC, returns 6 bytes
Ç	80	128	Receipt lines tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM Example, send 12 bytes to printer: GS I @ Ç00010000 To set receipt lines tally to 10,000
ü	81	129	Receipt lines tally	Write to NVRAM, and print on receipt to verify Example, send 12 bytes to printer: GS I @ ü00010000 This will print on receipt: Receipt tally written: 10,000

Value of <i>n</i>				
ASCII	Hex	Dec	Remote diagnostic item	Function
é	82	130	Receipt lines tally	Clear receipt lines tally to 0
â	83	131	Receipt lines tally	Return receipt lines tally, preceded by <i>n</i> to identify Printer returns 10 bytes in above example: â00010000<CR>
ä	84	132	Knife cut tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
à	85	133	Knife cut tally	Write to NVRAM, and print on receipt to verify
å	86	134	Knife cut tally	Clear knife cut tally to 0
ç	87	135	Knife cut tally	Return knife cut tally, returns 10 bytes
ê	88	136	Slip Character tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
ë	89	137	Slip character tally	Write to NVRAM, and printed on receipt to verify
è	8A	138	Slip character tally	Clear slip tally to 0
ï	8B	139	Slip character tally	Return slip character tally, returns 10 bytes
î	8C	140	MICR read tally, 8 digit ASCII numeric 99,999,999	Write to NVRAM
ì	8D	141	MICR read tally	Write to NVRAM, and print on receipt to verify
Ä	8E	142	MICR read tally	Clear MICR read tally to 0
Å	8F	143	MICR read tally	Return MICR read tally, returns to 10 bytes
É	90	144	Hours on tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
æ	91	145	Hours on tally	Write to NVRAM, and print on receipt to verify
Æ	92	146	Hours on tally	Clear hours on tally to 0
ô	93	147	Hours on tally	Return hours on tally, returns 10 bytes
ù	97	151	Boot firmware version	Return boot firmware version, returns 6 bytes
ú	A3	163	Flash firmware version	Return flash firmware version, returns 6 bytes
ñ	A4	164	Flash cycles tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
Ñ	A5	165	Flash cycles tally	Write to NVRAM, and print on receipt to verify
a	A6	166	Flash cycles tally	Clear flash cycles cut tally to 0
o	A7	167	Flash cycles tally	Return flash cycles cut tally, returns 10 bytes
ı	A8	168	Knife jams tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
+	A9	169	Knife jams tally	Write to NVRAM, and print on receipt to verify
+	AA	170	Knife jams tally	Clear knife jams tally to 0
½	AB	171	Knife jams tally	Return knife jams tally, returns 10 bytes
¼	AC	172	Cover openings tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
j	AD	173	Cover openings tally	Write to NVRAM, and print on receipt to verify
«	AE	174	Cover openings tally	Clear cover openings tally to 0

Value of <i>n</i>				
ASCII	Hex	Dec	Remote diagnostic item	Function
»	AF	175	Cover openings tally	Return cover openings tally, returns 10 bytes
	B2	178	Max temperature tally	Reset max temperature reached value
|	B3	179	Max temperature tally	Return max temperature reached since it was reset, returns 10 bytes
	B4	180	Slip lines tally, 8 digit ASCII numeric, max 99,999,999	Write to NVRAM
	B5	181	Slip line tally	Write to NVRAM, and print on receipt to verify
	B6	182	Slip lines tally	Clear slip lines tally to 0
	B7	183	Slip lines tally	Return slip line tally, returns 10 bytes

Transmit status

ASCII GS r *n*
Hexadecimal 1D 72 *n*
Decimal 29 114 *n*

Value of *n*: 1, 49 = printer status
 2, 50 = cash drawer status
 3, 51 = slip paper status
 4, 52 = Flash memory user sector status

Range of *n*: 1–4
 49–52

Transmits the status specified by *n*. This is a batch mode command which transmits the response after all prior data in the receive buffer has been processed. There may be a time lag between the printer receiving this command and transmitting the response, depending on the receive buffer status.

When DTR/DSR RS-232C communications handshaking control is selected, the printer transmits the one byte response only when the host signal DSR indicates it is ready to receive data.

When XON/XOFF RS-232C communications handshaking control is selected, the printer transmits the one byte response regardless of the host signal DSR.

When unsolicited status mode (USM) is enabled using the enable/disable unsolicited status mode command (1D 61), the status transmitted by this command (transmit status) and the USM status must be differentiated according to the information found in recognizing data from the printer. This is found in the real time commands section of this document.

The status bytes to be transmitted are described in the following four tables.

Exceptions

When *n* is out of the specified range, the command is ignored.

Unlike the A756, that had a dedicated connector and resultant dedicated status reporting for each cash drawer, the A776 has a single connector that shares data reporting from either cash drawer. When either cash drawer is open, an open status is reported by the printer.

Printer status ($n = 1$ or $n = 49$)				
Bit	Off/On	Hex	Decimal	Status for transmit status
0	Off	00	0	Receipt paper adequate.
	On	01	1	Receipt paper low.
1	Off	00	0	Receipt paper adequate.
	On	02	2	Receipt paper low.
2	Off	00	0	Receipt paper present.
	On	04	4	Receipt paper exhausted.
3	Off	00	0	Receipt paper present.
	On	08	8	Receipt paper exhausted.
4	Off	00	0	Not used. Fixed to off.
5	Off	00	0	Slip leading edge sensor: paper present.
	On	20	32	Slip leading edge sensor: no paper.
6	Off	00	0	Slip trailing edge sensor: paper present.
	On	20	32	Slip trailing edge sensor: no paper.
7	Off	00	0	Not used. Fixed to off.

Cash drawer status ($n = 2$ or $n = 50$)

Bit	Off/On	Hex	Decimal	Status for transmit status
0	Off	00	0	One or both cash drawers open.
	On	01	1	Both cash drawers closed.
1	Off	00	0	One or both cash drawers open.
	On	02	2	Both cash drawers closed.
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to off.

Slip paper status ($n = 3$ or $n = 51$)

Value of byte returned	Slip Status
0	There is no more printing space on the current slip, or the slip paper is not selected.
1 to 8	Remaining print area on the current slip, in number of lines, at the currently set line spacing, when the trailing edge sensor has become uncovered. Until the trailing edge sensor becomes uncovered the value reported will be 6, because there are at least 9 lines remaining.

Flash memory user sector status (n = 4 or n = 52)				
Bit	Off/On	Hex	Decimal	Status for transmit status
0	–	–	–	Undefined. Fixed to off.
1	–	–	–	Undefined. Fixed to off.
2	Off	00	0	User data storage write successful
	On	04	4	User data storage write failed, specified area not erased.
3	Off	00	0	Flash logo area adequate, definition stored.
	On	08	8	Flash logo area not adequate for recent definition.
4	Off	00	0	Not used. Fixed to off.
5	Off	00	00	No thermal user-defined characters written to flash.
	On	20	32	Thermal user-defined characters written to flash.
6	Off	00	0	No impact user-defined characters written to flash.
	On	04	64	Impact user-defined characters written to flash.
7	–	–	–	Undefined.

Send printer software version

ASCII	AXV
Hexadecimal	1F 56
Decimal	31 86

The printer returns 8 bytes containing the boot and flash software version. The first 4 bytes returned are an ASCII string for the boot version.

The second 4 bytes are an ASCII string for the flash version. Example: For 1.234.56 (8 bytes), the boot version is 1.23 and the flash version is 4.56.

Real-time commands

The real time commands provide an application interface to the printer even when the printer is not handling other commands:

- Real-time status transmission: GS (Hex 1D) sequence and DLE (Hex 10) sequence
- Real-time request to printer: GS (Hex 1D) sequence and DLE (Hex 10) sequence
- Real-time printer status transmission

The batch mode printer status commands are placed in the printer's data buffer as they are received and handled by the firmware in the order in which they were received. If the paper exhausts while printing data that was in the buffer ahead of the status command, the printer goes busy at the RS-232C interface and suspends processing the data in the buffer until paper is reloaded. This is true for all error conditions: knife home error, thermal printhead overheat, etc. In addition, there is no way to restart the printer after a paper jam or to cancel a slip waiting condition when using the wait for slip command.

The real-time commands are implemented in two ways in order to overcome the limitations of batch mode status commands. Both implementations offer the same functionality; which one you choose depends on the current usage of your application.

Preferred implementation

For a new application the GS (1D) sequences are recommended to avoid possible misinterpretation of a DLE (0x10) sequence as a clear printer (0x10 0, ASCII DLE NUL) command.

An application using these GS (1D) sequences, does not need to distinguish for the printer between the new real time commands and the clear printer command. This implementation is ideal for an existing A756 application that already uses the clear printer command or for a new application being developed.

Alternate implementation

The alternate implementation uses the DLE (0x10) sequences as implemented on other printers. An application using these DLE (0x10) sequences and the original A756 clear printer command (0x10) must distinguish for the printer between the new real time commands and the clear printer command by adding a NUL (0x00) to the clear printer command.

An application using these DLE (0x10) sequences must also send the second byte of the sequence within 100 milliseconds of the first, to prevent the first byte being mistaken for a clear printer command.

Rules for using real-time commands

Three situations must be understood when using real time commands.

First, the printer executes the real time command within a few msec of detecting it in the input buffer and will transmit status regardless of the condition of the DSR signal.

Second, the printer transmits status whenever it recognizes a real time status transmission command sequence, even if that sequence happens to occur naturally within the data of another command, such as graphics data.

In this case the sequence will also be handled correctly as the graphics data it is intended to be when the graphics command is executed from the buffer.

Third, care must be taken not to insert a real time command into the data sequence of another command that consists of two or more bytes.

In this case the printer will use the real time command sequence bytes instead of the other command's parameter bytes when finally executing that other command from the buffer; the other command will NOT be executed correctly.

These three situations generally preclude use of standard DOS drivers for the serial communication ports when using real time commands.

Moving data through the buffer

Applications should not let the buffer fill up with real time commands when the printer is busy at the RS-232C interface. A busy condition at the RS-232C interface can be determined by bit 3 of the response to 1D 05, or 1D 04 1, or 10 04 1. The reason for a particular busy condition can be determined by other responses to 1D 04 *n* or 10 04 *n*.

Although the printer responds to real time commands when it is busy, it will place them into the buffer behind any other data there, and flush them out in the order in which they were received. When the printer is busy due simply to buffer full (that is, it can't print data as fast as it can receive it), then data continues to be processed out of the buffer at approximately print speed and the real time commands will eventually get flushed out.

When the printer is busy due to an error condition, then data stops being processed to the buffer until the condition clears one way or another. In either case, but more quickly in the case of an error condition, the buffer can fill with real time commands.

When the DLE (0x10) sequences are being used, the last byte stored when the buffer fills up could be the DLE (0x10) code, with no room for the subsequent EOT or ENQ. When this lone DLE (0x10) byte is finally processed out of the buffer it will be interpreted as a clear printer command.

Similarly, when the GS (1D) sequences are being used, the last byte stored when the buffer fills up could be the GS (1D) code, with no room for the subsequent EOT or ETX or ENQ. When this lone GS (1D) byte is finally processed out of the buffer it will use the next byte, whatever it is, as the second byte in its GS (1D) sequence.

To guard against this situation, the application must determine the cause of a busy condition and take appropriate action or pace the real time commands to avoid filling the buffer. There is a minimum of 256 bytes available in the printer's buffer when it goes busy.

Busy line and fault conditions

If the printer is in error condition (cover is open, paper is exhausted...), the printer will still accept data, respond to the batch mode status commands (1B 76 and 1B 75 0), handle the cash drawer commands, and not go busy until it actually tries to execute a print command. Then it will stay busy and stop processing data out of the receive buffer until the condition clears. It will respond to the real time commands as described below.

Real-time status transmission

	<u>GS sequence</u>	<u>DLE sequence</u>
ASCII	GS EOT <i>n</i>	DLE EOT <i>n</i>
Hexadecimal	1D 04 <i>n</i>	10 04 <i>n</i>
Decimal	29 4 <i>n</i>	16 4 <i>n</i>

Value of *n*: GS/DLE sequence

- 1 = Transmit printer status
- 2 = Transmit RS-232C busy status
- 3 = Transmit error status
- 4 = Transmit receipt paper status
- 5 = Slip paper status
- 6 = Validation paper status

Transmits the selected one byte printer status specified by *n* command within a few msec according to the following parameters. This command includes two sequences: GS (1D) and DLE (0×10).

Exceptions

The command is ignored if *n* is out of range.

An application using DLE (0×10) sequence must send EOT within 100 milliseconds of DLE or the printer will misinterpret the DLE and execute a clear printer command. Avoid this possibility by using the 1D 04 *n* sequence, which is handled exactly the same as 10 04 *n*.

Unlike the A756, that had a dedicated connector and resultant dedicated status reporting for each cash drawer, the A776 has a single connector that shares data reporting from either cash drawer. When either cash drawer is open, an open status is reported by the printer.

Related information

1 = Transmit printer status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off.
1	On	02	2	Fixed to On.
2	Off	00	0	One or both cash drawers open.
	On	04	4	Both cash drawers closed.
3	Off	00	0	Not busy at the RS-232C interface.
	On	08	8	Printer is busy at the RS-232C interface.
4	On	10	16	Fixed to on.
5				Undefined.
6				Undefined.
7	Off	00	0	Fixed to off.

Continued...

2 = Transmit RS-232C Busy Status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to off.
1	On	02	2	Fixed to on.
2	Off	00	0	Receipt and cassette cover closed.
	On	04	4	Receipt or cassette cover open.
3	Off	00	0	Paper feed button is not pressed.
	On	08	8	Paper feed button is pressed.
4	On	10	16	Fixed to on.
5	Off	00	0	Printing not stopped due to paper condition.
	On	20	32	Printing stopped due to paper condition.
6	Off	00	0	No error condition.
	On	40	64	Error condition exists in the printer.
7	Off	00	0	Fixed to off.

3 = Transmit error status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to off.
1	On	02	2	Fixed to on.
2	Off	00	0	Carriage or slip jam
3	Off	00	0	No knife error.
	On	08	8	Knife error occurred.
4	On	10	16	Fixed to on.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurred.
6	Off	00	0	Thermal printhead temp. and power supply voltage are in range.
	On	40	64	Thermal print head temp. or power supply voltage are out of range.
7	Off	00	0	Fixed to off

Continued...

4 = Transmit receipt paper status

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to off
1	On	02	2	Fixed to on
2	Off	00	0	Receipt Paper adequate
	On	04	4	Receipt Paper low
3	Off	00	0	Receipt Paper adequate
	On	08	8	Receipt Paper low
4	On	10	16	Fixed to on
5	Off	00	0	Receipt Paper present
	On	20	32	Receipt Paper exhausted
6	Off	00	0	Receipt Paper present
	On	40	64	Receipt Paper exhausted
7	Off	00	0	Fixed to off

5 = Transmit Slip Paper Status and**6 = Transmit Validation Paper Status**

Bit	Status	Hex	Decimal	Function
0	Off	00	0	Fixed to Off
1	On	02	2	Fixed to On
2	Off	00	0	Slip paper selected
	On	04	4	Slip not selected
3	Off	00	0	Not waiting for slip
	On	08	8	Waiting for slip
4	On	10	16	Fixed to On
5	Off	00	0	Slip leading edge sensor: paper present
	On	20	32	Slip leading edge sensor: no paper
6	Off	00	0	Slip trailing edge sensor: paper present
	On	40	64	Slip trailing edge sensor: no paper
7	Off	00	0	Fixed to Off

Real-time request to printer

	<u>GS sequence</u>	<u>DLE sequence</u>
ASCII	GS ETX <i>n</i>	DLE ENQ <i>n</i>
Hexadecimal	1D 03 <i>n</i>	10 05 <i>n</i>
	29 3 <i>n</i>	16 5 <i>n</i>
Value of <i>n</i>:	1 = recover and restart	
	2 = recover and clear buffers	
	3 = cancel slip wait	

The printer responds to a request from the host specified by *n*. This command includes two sequences: GS and DLE. The operations performed depend on the value of *n*, according to the following parameters.

***n* = 1**

Restarts printing from the beginning of the line where an error occurred, after recovering from the error. Print settings that are normally preserved from line to line, such as character height and width, are still preserved with this command. This sequence is ignored except when the printer is busy due to an error condition.

This command will attempt recovery from a knife error. Other errors associated with the receipt, such as paper out or printhead overheating, can be recovered from only by clearing the specific condition, such as loading paper or letting the printhead cool down.

***n* = 2**

Recovers from an error after clearing the receive and print buffers. Print settings that are normally preserved from line to line, such as character height and width, are still preserved with this command. This sequence is ignored except when the printer is busy due to an error condition.

The same error recovery possibilities exist as for *n* = 1.

***n* = 3**

Cancels the slip waiting status. This sequence is ignored except when the printer is waiting for a slip to be inserted.

When slip waiting is canceled, the receive and print buffers are cleared and the receipt is selected. When printing on the slip is to continue, the slip must be selected again.

Exceptions

The command is ignored if *n* is out of range

An application using the DLE sequence must send ENQ within 100 milliseconds of DLE or the printer will misinterpret the DLE and execute a Clear Printer command. Avoid this possibility by using the 1D 03 *n* sequence that is handled exactly the same as 10 05 *n*.

Real-time printer status transmission

ASCII GS ENQ
Hexadecimal 1D 05
Decimal 29 5

Transmits one byte status of the printer in real time.

0	Off	00	0	Paper adequate.
	On	01	1	Paper low (if paper low sensor enabled).
1	Off	00	0	Paper adequate.
	On	02	2	Paper low (if paper low sensor enabled).
2	Off	00	0	Both receipt and cassette door closed.
	On	04	4	Receipt or cassette door open.
3	Off	00	0	Not busy at the RS-232C interface.
	On	08	8	Printer is busy at the RS-232C interface.
4	Off	00	0	One or both cash drawers open.
	On	10	16	Both cash drawers closed.
5	Off	00	0	Paper present at both slip sensors.
	On	20	32	Paper not present at one or both sensors
6	Off	00	0	No error condition.
	On	40	64	Error condition exists in the printer.
7	On	80	128	Fixed to on.

Exceptions

Unlike the A756, that had a dedicated connector and resultant dedicated status reporting for each cash drawer, the A776 has a single connector that shares data reporting from either cash drawer. When either cash drawer is open, an open status is reported by the printer.

Real-time commands disable

ASCII US z n
Hexadecimal 1F 7A n
Decimal 31 122 n

Value of n: 0 = disable
 1 = enable

This command is used to disable real time commands. They are disabled prior to sending graphic or other data to the printer that may contain embedded real time commands.

The disable command (n=1) is acted on in real time. The re-enable command (n=0) is treated as a batch command and processed in the order received.

Unsolicited status mode

Select or cancel unsolicited status mode (USM)

ASCII: GS a *n*

Hexadecimal: 1D 61 *n*

Decimal: 29 97 *n*

Value of *n*: 0 turns mode off;
any non-zero value turns mode on

Default: 0 (USM disabled)

Enables or disables automatic return of 4 status bytes whenever one or more of the listed changes occurs. This command is a batch mode command; that is, it is processed after all prior data in the input buffer has been processed. There may be a time lag between the printer receiving this command and enabling unsolicited status mode (USM), depending on the pending input buffer contents.

If an immediate return of printer status is desired, then any of the other status commands should be issued following this command. Once this mode is activated, the printer automatically transmits 4 status bytes whenever any of the conditions change. If an RS-232C connection with hardware flow control is used, all four status bytes will be transmitted without checking DSR.

This command is a POS version of general printer unsolicited status functions; it uses the same command code as older versions of the POS command "automatic status back (ASB)" but has the following differences:

- The parameter *n* is an on/off switch; it does not select trigger subset.
- There is no immediate return when this mode is turned on.
- All 4 status bytes are always returned.

A change in any of the following conditions will trigger the USM response:

- Cash Drawer
- Receipt Cover
- Knife Error
- Out-of-Range Printhead Temperature
- Out-of-Range Voltage
- Paper Exhaust Status
- Slip Paper

Related information

When Unsolicited Status Mode is enabled using this command, the status transmitted by other commands and the USM status are differentiated according to the information found in Recognizing Data from the printer, which follows the USM return description.

The status bytes to be transmitted are described in the following four tables.

Byte 1 = printer information

Byte 2 = error information

Byte 3 = paper sensor information

Byte 4 = paper sensor information

First Byte (printer Information)

Bit	Off/On	Hex	Decimal	Status for USM
0	Off	00	0	Not used. Fixed to off.
1	Off	00	0	Not used. Fixed to off.
2	Off On	00 04	0 4	One or both cash drawers open. Both cash drawers closed.
3	Off On	00 08	0 8	Not busy at the RS-232C interface. Printer is busy at the RS-232C interface.
4	On	10	16	Not used. Fixed to on.
5	Off On	00 20	0 32	Receipt and cassette covers closed. Receipt or cassette cover open.
6	Off On	00 40	0 64	Paper feed button is not pressed. Paper feed button is pressed.
7	Off	00	0	Not used. Fixed to off.

Second byte (error information)

Bit	Off/On	Hex	Decimal	Status for USM
0	-	-	-	Undefined
1	-	-	-	Undefined
2	Off On	00 04	0 4	No mechanical error Mechanical error occurred
3	Off On	00 08	0 8	No knife error. Knife error occurred.
4	Off	00	0	Not used. Fixed to off.
5	Off On	00 20	0 32	No unrecoverable error. Unrecoverable error occurred.
6	Off On	00 40	0 64	No recoverable error. Recoverable error: Cover open, paper out, temperature or voltage error is out of range.
7	Off	00	0	Not used. Fixed to off.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for USM
0	Off On	00 01	0 1	Receipt paper adequate Receipt paper low (if paper low sensor enabled)
1	Off On	00 02	0 2	Receipt paper adequate Receipt paper low (if paper low sensor enabled)
2	Off On	00 04	0 4	Receipt paper present. Receipt paper exhausted.
3	Off On	00 08	0 8	Receipt paper present. Receipt paper exhausted.

4	Off	00	0	Not used. Fixed to off.
5	Off	00	0	Slip leading edge sensor: paper present
	On	20	32	Slip leading edge sensor: no paper
6	Off	00	0	Slip trailing edge sensor: paper present
	On	40	64	Slip trailing edge sensor: no paper
7	Off	00	0	Not used. Fixed to off.

Fourth byte (paper sensor information) -- A776

Bit	Off/On	Hex	Decimal	Status for USM
0	Off	00	0	Slip paper selected
	On	01	1	Receipt paper selected
1	Off	00	0	Possible to print on slip
	On	02	2	Not possible to print on slip because no form has been inserted
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	Not used. Fixed to off.
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to off

Fourth byte (paper sensor information) -- B780

Bit	Off/On	Hex	Decimal	Status for USM
0	Off	00	0	Slip paper selected
	On	01	1	Slip paper not selected
1	Off	00	0	Possible to print on slip
	On	02	2	Not possible to print on slip
2	On	00	0	Validation selected
	Off	01	1	Validation not selected
3	On	00	0	Validation paper printable
	Off	01	1	Validation paper not printable
4	Off	00	0	Not used. Fixed to off.
5	Off	00	0	Lead edge paper present
	On	01	1	Lead edge paper not present
6	Off	00	0	Trail edge paper present
	On	01	1	Trail edge paper not present
7	Off	00	0	Not used. Fixed to off

Recognizing data from the printer

An application sending various real time and non-real time commands to which the printer responds can determine which command a response belongs to by the table below.

Batch mode responses are non-real time responses and arrive in the order in which they were solicited.

Batch mode response		Response recognized by:								
ASCII	HEX									
ECS u 0	1B 75 0	0	0	0	0	0	0	x	x	Binary
ESC v	1B 76	0	x	x	0	0	x	x	x	Binary
GS l n	1D 49 n	0	x	x	0	x	x	x	x	Binary
GS r n	1D 72 n	0	x	x	0	x	x	x	x	Binary
Real time response		Response recognized by:								
ASCII	HEX									
GS EOT n	1D 04 n	0	x	x	1	x	x	1	0	Binary
DLE EOT n	10 04 n	0	x	x	1	x	x	1	0	Binary
GS ENQ	1D 05	1	x	x	x	x	x	x	x	Binary
XON		0	0	0	1	0	0	0	1	Binary
XOFF		0	0	0	1	0	0	1	1	Binary
Unsolicited status mode (USM)		Response recognized by:								
USM Byte 1		0	x	x	1	x	x	0	0	Binary
USM Byte 2–4		0	x	x	0	x	x	x	x	Binary

Bar codes

These commands format and print bar codes and are described in order of their hexadecimal codes.

Select printing position of HRI characters

ASCII GS H n
Hexadecimal 1D 48 n
Decimal 29 72 n

Value of n: Printing position
 0 = Not printed
 1 = Above the bar code
 2 = Below the bar code
 3 = Both above and below the bar code

Default: 0 (Not printed)

Prints HRI (human readable interface) characters above or below the bar code.

Select pitch of HRI characters

ASCII GS f n
Hexadecimal 1D 66 n
Decimal 29 102 n

Value of n: 0 = Standard pitch at 15.2 CPI
 1 = Compressed pitch at 19 CPI

Default: 0 (Not printed)

Selects standard and compressed font for printing bar code characters.

When slip is selected as the interface, HRI is always compressed.

Select bar code height

ASCII GS h n
Hexadecimal 1D 68 n
Decimal 29 104 n

Value of n: Number of dots

Range of n: 1–255 (decimal) 01-FF (hexadecimal)

Default: 162 (decimal) A2 (hexadecimal)

Sets the bar code height to (n/154") for receipt and (n/172") for slip.

Print bar code

	<u>First Variation</u>	<u>Second Variation</u>
ASCII	GS k m d1...dk NUL	GS k m n d1...dn
Hexadecimal	1D 6B m d1...dk 00	1D 6B m n d1...dn
Decimal	29 107 m d1 dk 0	29 107 m n d1...dn

(0 = End of command)

Selects the bar code type and prints a bar code for the ASCII characters entered. If the width of the bar code exceeds one line, the bar code is not printed.

There are two variations to this command. The first variation uses a NUL character to terminate the string; the second uses a length byte at the beginning of the string.

The check digit is calculated for UPC and JAN (EAN) codes if it is not sent from the host computer.

Six-character zero-suppressed UPC-E tags are generated from full 11 or 12 characters sent from the host computer according to standard UPC-E rules. Start/stop characters are added for code 39 if they are not included.

Rotated barcodes set with small modules (select bar code width command 1D 77 n , with n = 1 or 2) and PDF 417 barcodes in any orientation are printed at low speed, for better readability.

Exceptions

The command is only valid at the beginning of a line.

Illegal data cancels the command.

Values:

First variation: String terminated with NUL character

m	Bar code	d1...dk	n, length
0	UPC-A	48-57 (decimal) 30-39 (ASCII numerals)	Fixed length: 11,12
1	UPC-E	48-57 30-39	Fixed length: 11, 12
2	JAN13 (EAN)	48-57 30-39	Fixed length: 12, 13
3	JAN8 (EAN)	48-57 30-39	Fixed length: 7, 8
4	Code 39	48-57, 65- 90 (decimal), 32, 36, 37, 43, 45, 46, 47 (decimal) d1 = dk = 42 (start/stop code is supplied by printer if necessary) 30-39 (ASCII numerals), 41-5A (ASCII alphabet) 20, 24, 25, 2B, 2D, 2E, 2F (ASCII special characters) d1=dk=2A (start/stop code is supplied by printer if necessary)	Variable length

5	Interleaved 2 of 5	48–57 30-39	Variable length (even number)
6	Codabar	65–68, start code 48–57, 36, 43, 45, 46, 47, 58 41-44, start code 30-39, 24, 2B, 2D, 2E, 2F, 3A	Variable length
10	PDF 417	1–255 01-FF	Variable length

Second variation length of byte specified at beginning of string. The value of m selects the bar code system as described in the table. When details present in the print buffer, the printer processes the data following m as normal data. The variable d indicates the character code to be encoded into the specified bar code system. See the table. If character code d cannot be encoded, the printer prints the bar code data processed so far, and the following data is treated as normal data.

m	Bar code	$d1...dk$	n , length
65	UPC-A	48–57 (decimal) 30-39 (ASCII numerals)	Fixed length: 11, 12
66	UPC-E	48–57 30-39	Fixed length: 11, 12
67	JAN13 (EAN)	48–57 30-39	Fixed length: 12, 13
68	JAN8 (EAN)	48–57 30-39	Fixed length: 7, 8
69	CODE 39	48–57, 65–90 (decimal), 32, 36, 37, 43, 45, 46, 47 (decimal) $d1 = dk = 42$ (start/stop code is supplied by printer if necessary)	Variable
70	Interleaved 2 of 5 (ITF)	48–57 30-39	Variable (even number)
71	CODABAR (NW-7)	65–68, start code 48–57, 36, 43, 45, 46, 47, 58 41-44, start code 30-39, 24, 2B, 2D, 2E, 2F, 3A	Variable
72	Code 93	00–127 00-7F	Variable
73	Code 128	0–105 $d1 = 103–105$ (must be a start code) $d2 = 0–102$ (data bytes) (Stop code is provided by the printer)	Variable
75	PDF 417	0–255 00-FF	Variable -maximum 1000 characters

Exceptions

Illegal data cancels this command.

The command is Valid only at the beginning of a line.

PDF 417 format cannot be printed on the slip.

PDF 417 has a maximum of 1000 characters.

Select PDF 417 parameters

ASCII	G S p a b c d e f
Hexadecimal	1 D 7 0 a b c d e f
Decimal	2 9 1 1 2 a b c d e f

Value and Ranges:

Value:	Ranges:	Description:
$a, b =$		The ratio of bar height to symbol length.
$a =$ height	limit 1 to 10	
$b =$ width	limit 1 to 100	

c =	rows	limit 3 to 90	Number of rows in the matrix of code words.
d =	columns	limit 7 to 30	Number of columns in the matrix of code words.
e =	x dimension	limit 1 to 7	Width of a single module in dots.
f =	y dimension	limit 2 to 25	Height of the code word in dots.

Defaults:
a = 1
b = 2
c = 58
d = 7
e = 3
f = 10

PDF 417 is a multi-row, continuous, variable length symbology which has high data capacity. Each symbol has between 3 and 90 rows, with each row containing a start pattern, a left row indicator, 1 to 30 data characters, a right row indicator and a stop pattern. The number and length of the rows are selectable, which allows the aspect ratio to be adjusted to particular labeling applications. There are no separator bars between rows.

Each character has four bars and four spaces within 17 modules, and is assigned a value between 0 and 928. For this symbology, it is common to refer to these character values as "code words."

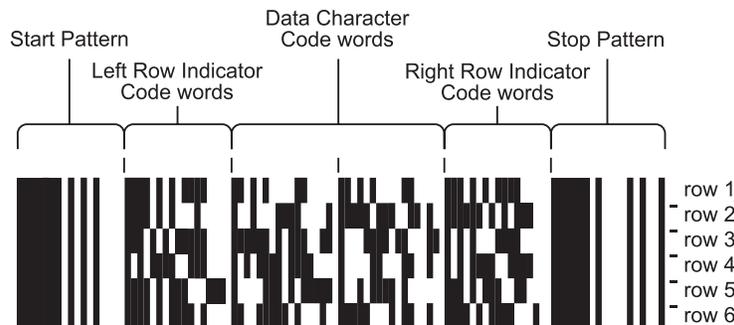
There are three mutually exclusive sets of symbol patterns, or clusters, each having 929 distinct patterns. Because different clusters are used for adjacent rows, it is possible for the decoder to tell if the scanning path is crossing row boundaries without the use of separator bars.

Sample symbol description:

Each PDF 417 symbol consists of 3 to 90 stacked rows surrounded on all four sides by a quiet zone. Each row contains:

- 1 Leading quiet zone
- 2 Start pattern
- 3 Left row indicator characters (code words)
- 4 One to thirty data characters (code words)
- 5 Right row indicator character (code words)
- 6 Stop pattern
- 7 Trailing quiet zone

The number of characters in a row and number of rows can be adjusted to vary the symbol's overall aspect ratio to best fit an available space.



Each row has a left and right row indicator with a data region between. The left-most character in the top row of the data region is the total number of characters in the data region, excluding error correction characters. Characters within the data region are designed to be read from left to right, starting on the top row, immediately after the length-defining character. The maximum characters in the data region are 928.

Related Information:

The “Set bar code width” command (1D 77 n) affects the x dimension and row height for PDF 417. See chart below.

n value	x dimension	row height
2	2	7
3	3	10
4	4	13
5	5	17
6	6	20

Select bar code width

ASCII GS w n

Hexadecimal 1D 77 n

Decimal 29 119 n

Value of n: 2, 3, 4, 5, 6

Default: 3 for receipt; 2 for slip

Sets the bar code width to *n* dots.

Formulas

$n/8$ mm ($n/203$ inch) for receipt.

$n/5.7$ mm ($n/144$ inch) for slip.

Page mode

Page mode is one of two modes that the A776 printer uses to operate. Standard mode is typical of how most printers operate by printing data as it is received and feeding paper as the various paper feed commands are received. Page mode is different in that it processes or prepares the data as a “page” in memory before it prints it. Think of this as a virtual page. The page can be any area within certain parameters that you define. Once the printer receives the (0 × 0C) command, it prints the page and returns the printer to standard mode.

The select page mode command (1B 4C) puts the printer into page mode. Any commands that are received are interpreted as page mode commands. Several commands react differently when in standard mode and page mode. The descriptions of these individual commands in this chapter indicate the differences in how they operate in the two modes.

Slip page mode considerations**Suggested command sequence to print bank check**

1B 40	reset to power-on parameters
1B 63 30 04	select the slip
1B 4C	select Page Mode
1B 54 03	select printing direction
1B 57 00 00 00 00 90 01 80 05	select page size (not necessary for default size)
Text and print commands	as required
0C	print the page and exit Page Mode
1B 63 30 01	eject the check and select receipt

When switching between Page Mode print on the receipt and Page Mode print on the slip, 1B 40 should precede the station selection command to ensure the correct Page Mode defaults are restored for each station.

What prints:

Slip Application Command Options

Slip Page Mode : Improved

To re-configure the original Page Mode on the slip station, send 1F 03 26 06 00 or use the configuration menu. What will print:

Slip Application Command Options

Slip Page Mode : Enabled

To disable Page Mode on the slip station, send 1F 03 21 00 or use the configuration menu. What will print:

Slip Application Command Options

Slip Page Mode : Disabled

Print and return to standard mode

ASCII	FF
Hexadecimal	0C
Decimal	12

The processed data is printed and the printer returns to standard mode. The developed data is deleted after being printed. This command has the same code as the print and eject slip command, which is executed when the printer is not in page mode.

Exceptions

This command is enabled only in page mode.

Cancel print data in page mode

ASCII	CAN
Hexadecimal	18
Decimal	24

Deletes all the data to be printed in the “page” area. Any data from the previously selected “page” area that is also part of the current data to be printed is deleted.

This command has the same code as the open form command, which is performed when the printer is not in page mode.

Exceptions

This command is only used in page mode.

Print data in page mode

ASCII	ESC FF
Hexadecimal	1B 0C
Decimal	27 12

Collectively prints all buffered page data in the printing area.

After printing, the printer does not clear the buffered page data.

Exceptions

This command is enabled only in page mode.

Select page mode

ASCII	ESC L
Hexadecimal	1B 4C
Decimal	27 76

Switches from standard mode to page mode. After printing has been completed either by the print and return to standard mode (FF) command or select standard mode (1B 53) the printer returns to standard mode. The developed data is deleted after being printed. For more information see page mode in this document.

This command sets the position where data is buffered to the position specified by select print direction in page mode (1B 54) within the printing area defined by set print area in page mode (1B 57).

This command switches the settings for the following commands (which values can be set independently in standard mode and page mode) to those for page mode.

- Set right-side character spacing (1B 20)
- Select 1/6-inch line spacing (1B 32)
- Set line spacing (1B 33)

It is possible only to set values for the following commands in page mode. These commands are not executed.

- Select or cancel 90 degree clockwise rotation (1B 56)
- Set counter-clockwise rotation (1B 12)
- Select justification (1B 61)
- Select or cancel upside-down printing (1B 7B)
- Set left margin (1D 4C)
- Set print area width (1D 57)

The table that follows shows the difference in memory allocation in page mode when using monochrome and two-color paper. Two-color paper mode requires extra memory in order to differentiate between non-black and black.

Paper type	Total memory allocated (kBytes)	Area of construction (mm)
Monochrome paper	40.5	72 wide × 72 high
Two-color paper	81.0	72 wide × 72 high (dots) 72 wide × 72 high (energy)
Slip paper	20	200 wide × 704 high (full dots)

Exceptions

The command is enabled only when input at the beginning of a line.

The command has no effect if page mode has previously been selected.

For the A756 emulation mode this command has a different definition. The select page mode function is not available in the A756 emulation mode.

Select standard mode

ASCII	ESC S
Hexadecimal	1B 53
Decimal	27 83

Switches from page mode to standard mode. In switching from page mode to standard mode, data buffered in page mode are cleared, the printing area set by set print area in page mode (1B 57) is initialized and the print position is set to the beginning of the line.

This command switches the settings for the following commands (the values for these commands can be set independently in standard mode and page mode) to those for standard mode:

- Set right-side character spacing (1B 20)
- Select 1/6 inch line spacing (1B 32)
- Set line spacing (1B 33)

Standard mode is automatically selected when power is turned on, the printer is reset, or the initialize printer command (1B 40) is used.

Exceptions

This command is effective only in page mode.

Select print direction in page mode

ASCII	ESC T <i>n</i>
Hexadecimal	1B 54 <i>n</i>
Decimal	27 84 <i>n</i>

Value of *n*: Start position

- 0 = Upper left corner proceeding across page to the right (A)
- 1 = Lower left corner proceeding up the page (B)
- 2 = Lower right corner proceeding across page to the left (upside down) (C)
- 3 = Upper right corner proceeding down page (D)

Default: 0

Selects the printing direction and start position in page mode.

The command can be sent multiple times so that several different print areas, aligned in different print directions, can be developed in the printer's page buffer before being printed using the print page mode commands (0C or 1B 0C).

Exceptions

The command is valid only in page mode.

The command is ignored if the value of *n* is out of the specified range.

Set print area in page mode

ASCII	ESC W <i>n1, n2 ...n8</i>
Hexadecimal	1B 57 <i>n1, n2 ...n8</i>
Decimal	27 87 <i>n1, n2 ...n8</i>

Range of *n*: 0–255

Default:		<u>Receipt</u>	<u>Slip</u>
<i>n1–4</i> =	0	0	
<i>n5</i> =	64	144	
<i>n6</i> =	2	1	
<i>n7</i> =	64	128	
<i>n8</i> =	2	5	

Sets the position and size of the printing area in page mode.

The command can be sent multiple times so that several different print areas, aligned in different print directions, can be developed in the printer's page buffer before being printed using the print page mode commands (0C or 1B 0C).

Formulas

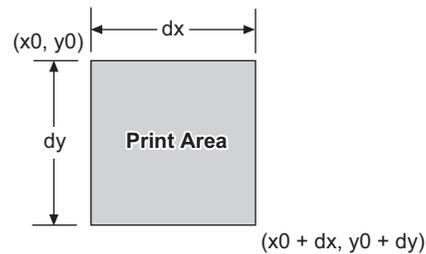
The starting position of the print area is the upper left of the area to be printed (x0, y0). The length of the area to be printed in the y direction is set to dy inches. The length of the area to be printed in the x direction is set to dx inches.

Use the equations to determine the Value of x0, y0, dx, and dy.

- $x0 = [(n1 + n2 \times 256) \times (\text{horizontal direction of the fundamental calculation pitch})]$
- $y0 = [(n3 + n4 \times 256) \times (\text{vertical direction of the fundamental calculation pitch})]$
- $dx = [(n5 + n6 \times 256) \times (\text{horizontal direction of the fundamental calculation pitch})]$
- $dy = [(n7 + n8 \times 256) \times (\text{vertical direction of the fundamental calculation pitch})]$

Default values:

	Receipt	Slip
x0 =	0	0
y0 =	0	0
dx =	576 2.8 in.	200 2.5 in.
dy =	576 2.8 in.	705 9.7 in.



Keep the following notes in mind for this command.

- The fundamental calculation pitch depends on the vertical or horizontal direction.

Receipt:

- The maximum printable area in the x direction is 576/203 inches.

Slip:

- The maximum printable area in the x direction is 3.024 inches. This can be set using $dx = 484$ half dots, for example 1B 57 00 00 00 00 E4 01 80 05.

Receipt and Slip:

- The maximum printable area in the y direction depends on the available memory.

See the illustration for a graphic representation of the printing area. For more information about the fundamental calculation pitch, see the set horizontal and vertical motion units command (1D 50).

Maximum area specification in page mode

Maximizing the possible area in page mode consumes almost all of free RAM. Without any free RAM, bitmap rotations and enlargements cannot be performed. Use the user storage status command (1D 97 *m n*) to determine the amount of free memory.

Exceptions

The command is effective only in page mode.

Set absolute vertical print position in page mode

ASCII	GS \$ <i>nL nH</i>
Hexadecimal	1D 24 <i>nL nH</i>
Decimal	29 36 <i>nL nH</i>

Sets the absolute vertical print starting position for buffer character data in page mode. The absolute print position is set to $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ inches.

The vertical or horizontal motion unit for the paper roll is used and the horizontal starting buffer position does not move.

The reference starting position is set by select print direction in page mode (1B 54). This sets the absolute position in the vertical direction when the starting position is set to the upper left or lower right; and sets the absolute position in the horizontal when the starting position is set to the upper right or lower left. The horizontal and vertical motion unit are specified by the set horizontal and vertical minimum motion units (1D 50) command.

The set horizontal and vertical minimum motion units (1D 50) command can be used to change the horizontal and vertical motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

Formulas

$[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ inches.

Exceptions

This command is effective only in page mode.

If the $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ exceeds the specified printing area, this command is ignored.

Set relative vertical print position in page mode

ASCII GS \ nL nH

Hexadecimal 1D 5C nL nH

Decimal 29 92 nL nH

Value:

The value for the horizontal and vertical movement cannot be less than the minimum horizontal movement amount, and must be in even units of the minimum horizontal movement amount.

Sets the relative vertical print starting position from the current position. This command can also change the horizontal and vertical motion unit. The unit of horizontal and vertical motion is specified by this command.

1. This command functions as follows, depending on the print starting position set by select print direction in page mode (1B 54):
2. When the starting position is set to the upper right or lower left of the printing area, the vertical motion unit (y) is used.
3. When the starting position is set to the upper left or lower right of the printing area, the horizontal motion unit (x) is used.

Formulas

The distance from the current position is set to

$[(nL + nH \times 256) \times \text{vertical or horizontal motion unit}]$ inches. The amount of movement is calculated only for the paper roll.

When pitch n is specified to the movement downward:

$$nL + nH \times 256 = n$$

When pitch n is specified to the movement upward (the negative direction), use the complement of 65536.

When pitch n is specified to the movement upward:

$$nL + nH \times 256 - 65536 = N$$

Exceptions

This command is used only in page mode, otherwise it is ignored.

Any setting that exceeds the specified printing area is ignored.

Macros

These commands are used to select and perform a user-defined sequence of printer operations.

Select or cancel macro definition

ASCII GS :
Hexadecimal 1D 3A
Decimal 29 58

Starts or ends macro definition. Macro definition begins when this command is received during normal operation and ends when this command is received during macro definition. The macro definition is cleared, during definition of the macro when the execute macro (1D 5E) command is received.

Normal printing occurs while the macro is defined. When the power is turned on the macro is not defined.

The defined contents of the macro are not cleared by the initialize printer (1B 40), thus, the initialize printer (1B 40) command may be used as part of the macro definition.

If the printer receives a second select or cancel macro definition (1D 3A) command immediately after previously receiving a select or cancel macro definition (1D 3A) the printer remains in the macro undefined state.

Formulas

The contents of the macro can be defined up to 2048 bytes.

Exceptions

If the macro definition exceeds 2048 bytes, excess data is not stored.

Execute macro

ASCII GS ^ *r t m*
Hexadecimal 1D 5E *r t m*
Decimal 29 94 *r t m*

Value of *r*: The number of times to execute the macro.

Value of *t*: The waiting time for executing the macro.

Executes a macro. After waiting for a specified period the printer waits for the paper feed button to be pressed. After the button is pressed, the printer executes the macro once. The printer repeats this operation the number of specified times.

When the macro is executed by pressing the paper feed button ($m = 1$), paper cannot be fed by using the paper feed button.

Formulas

The waiting time is $t \times 100$ ms for every macro execution.

m specifies macro executing mode when the LSB (least significant bit) $m = 0$

The macro executes r times continuously at the interval specified by t when the LSB (least significant bit) of $m = 1$.

Exceptions

If this command is received while a macro is being defined, the macro definition is aborted and the definition is cleared.

If the macro is not defined or if r is 0, nothing is executed.

MICR commands

MICR reading

These commands control the Magnetic Ink Character Recognition (MICR) check reader, including how it parses the character strings on checks.

The section, MICR parsing, describes how to create a parsing format and how to create and maintain an exceptions table.

Read MICR data and transmit

ASCII	ESC w 1		
Hexadecimal	1B 77 01	A776:	1B 77 01 = read & transmit MICR, position for endorsement
	1B 77 02 (B780 only)	B780:	1B 77 01 = wait for check, read & transmit MICR, eject check
		B780:	1B 77 02 = wait for check, read & transmit MICR, position for endorsement
Decimal	27 119 1		
Default:	All data returned		

Reads and transmits the MICR data and adds a carriage return (0x0D). One status byte precedes the MICR characters.

If no parsing format is selected with either of the define parsing format commands (see below), all data will be returned, which is the default.

Status	Status byte value
Good read, data follows	0x00
Bad read, data follows	0x01
No check present, no data	0x02
Paper jam, no data	0x03
No MICR characters, no data	0x04

MICR characters	ASCII	Hexadecimal
Numerics	0 ... 9	0x30 ... 0x39
Unrecognized character	?	0x3F
Space		0x20
Amount symbol	&	0x26
Dash symbol	'	0x27
"on us" symbol	(	0x28
Transit symbol	)	0x29

Transmit last MICR read

ASCII:	ESC w R
Hexadecimal:	1B 77 52
Decimal:	27 119 82

Resends the previously decoded MICR data (as if the parsing has not been defined) to the host. The return data is defined in the "Read MICR data and transmit" command (1B 77 01) without parsing and presents the data from the last MICR read since power-up or reset or indicates in the status that no read has yet occurred.

MICR parsing

This section describes MICR parsing in detail and includes several examples of useful parsing variations. It also describes how to create a parsing format and how to create and maintain an exception table.

Define parsing format, save in NVRAM

ASCII: ESC w P *d1 d2 ... dn* CR
Hexadecimal: 1B 77 50 *d1 d2 ... dn* 0D
Decimal: 27 119 80 *d1 d2 ... dn* 13

Defines and saves parsing format. See parsing parameter string options in this document. Send with this command the parse data that is to be the default parse string at printer power-up. If no parameters are selected, parsing is not performed.

d1 through *dn* are the parse string. The string must be CR terminated. If the string has invalid characters in it or is too long, the printer will store a null string, and unparsed MICR data will be returned.

Define parsing format, do not save permanently

ASCII ESC w p
Hexadecimal 1B 77 70
Decimal 27 119 112

Defines, but does not save parsing format. See parsing parameter string options in this document. Send as often as desired to change the previous parse format string.

If no parameters are selected, parsing is not performed.

Same parameters as 1B 77 50....

Parsing parameter string options

Variable length fields

Variable length field name	Selector	Comments
Transit number	T	Full 9-digit routing/transit number
Bank number	B	Digits 4–8 of transit number
Check digit	D	Digit 9 of transit number
Account number	A	
Check serial number	C	Separate from account number
Amount	\$	This field may not be present or readable

Variable length field optional modifiers	Selector	Comments
Zero fill to length	0	ASCII zero preceding maximum length
Maximum length	nn	1- or 2-digit ASCII number
Remove space/dash	X	
Replace space/dash with 0	x	

Examples of variable length field format specifications

Account #, all characters in the field, keep spaces and dashes	A
Account #, all characters in the field, replace spaces and dashes	xA
Account #, maximum 12 characters, keep spaces and dashes	12A
Account #, always 12 characters zero filled, remove spaces and dashes	012XA

Other parameters

Error number	E	One digit returned
	0	Read OK
	1	Read error: bad character, empty field invalid length, check digit invalid
Status	S	Two digits returned
	01	No MICR data
	09	Mexican check
	08	Canadian check
	05	Error in transit number
	07	Error in account number
	04	Error in check serial number
	10	Business or commercial check
	11	Amount field present
	00	No error
Field separator	'x	
	Field separator preceded by a single quote, so a field separator of the letter A would be sent as 'A (0x27 0x41).	
	If a carriage return is specified as a separator (0x27 0x0D), a final carriage return must still terminate the parsing parameter string.	
Country code	Un	One digit returned
	n	Returned if US check
	nothing	Returned if not US check
Country code	Km	One digit returned
	m	Returned if Canadian check
	nothing	Returned if not Canadian check
Check type	L	One digit returned
	1	Personal check
	2	Business or commercial check

Sample parsing formats

The following strings show various sample formats that you can use assuming they meet your parsing format needs. Included with the sample format is a description of the data that is returned to the application.

ESC w p 18 A <CR>

- Maximum 18 characters in the account number
- Final carriage return

ESC w p 18 X A <CR>

- Maximum 18 characters in the account number with spaces and dashes removed
- Final Carriage Return

ESC w p 18 x A <CR>

- Maximum 18 characters in the account number with spaces and dashes replaced with 0
- Final carriage return

ESC w p 018 A <CR>

- Always 18 characters in the account number (high order zero-filled if necessary)
- Final carriage return

ESC w p 018 X A <CR>

- Always 18 characters in the account number with spaces and dashes removed
- Final carriage return

ESC w p 018 x A <CR>

- Always 18 characters in the account number with spaces and dashes replaced with 0
- Final Carriage Return

ESC w p T 18 X A 04C <CR>

- All characters in the transit number
- All characters in the account number (up to 18) with spaces and dashes removed
- Always four characters in the check number (zero-filled if check number is only three characters long)
- Final carriage return

ESC w p K9 X T 18 X A 04C <CR>

- U.S. check: all nine characters in the transit number (because there are no dashes)
- Canadian check: dash in transit number removed; "9" inserted at beginning, resulting in a fully numeric nine character transit number
- All characters in the account number (up to 18) with spaces and dashes removed
- Always four characters in the check number (zero-filled if check number is only three characters long)
- Final carriage return

ESC w p T / A / C / S <CR>

- All characters in the transit number
- Field separator: /
- All characters in the account number
- Field separator: /
- All characters in the check number
- Field separator: /
- Two-digit status
- Final carriage return

Notes:

All parameters are ASCII characters, i.e. greater than or equal to 0x20, with the exception of a non-ASCII character enclosed in single quotes as a field separator. This applies both to parameter specifications sent from application to printer, and to MICR data returned from printer to application.

Parameters are positional; their order in the parameter string is the order in which the parsed MICR data will be returned. Unrecognized parameters will be ignored, and processing of the parsing parameters will stop. Any data remaining after the unrecognized parameter will be treated as normal input data.

If parameters are not defined (for example, 1B 77 50 <CR> or 1B 77 70 <CR>) parsing is not selected. One status byte followed by all decoded MICR characters will be returned. The chart on the next page is the default parsing format if no other is selected:

Status	Status byte value	
Good read, data follows	0x00	
Bad read, data follows	0x01	
No check present, no data	0x02	
Paper jam, no data	0x03	
No MICR characters, no data	0x04	

MICR characters	ASCII	Hexadecimal
Numerics	0 ... 9	0x30 ... 0x39
Unrecognized character	?	0x3F
Space		0x20
Amount symbol	&	0x26
Dash symbol	'	0x27
"on us" symbol	(	0x28
Transit symbol	)	0x29

Once a parsing format is specified, the following values are returned:

MICR characters	ASCII	Hexadecimal
Numerics	0 ... 9	0x30 ... 0x39
Space		0x20
Dash	-	0x2D
Field separator*		
Country code*		

*As specified in the parsing parameter string

Check serial number

Parsing the check serial number

Most banks print the check serial number in three easily recognizable spots. The printer firmware will look for the number in these spots, using the following ordered algorithm. The examples use letters to represent symbols on the check:

t	Transit symbol
o	“on us” symbol
\$	Amount symbol
-	Dash
c	Check serial number
x	Any other number

A number bracketed by “on us” symbols in the auxiliary “on us” field is the check serial number.

```
o c c c c c c o t x x x x x x x x t x x x x x x x x o
```

Otherwise, a three or more digit number to the right of the rightmost “on us” symbol, and to the left of the leftmost amount symbol if an amount field is present, is the check serial number.

```
t x x x x x x x x t x x x x x x x x o c c c c
t x x x x x x x x t x x x x x x x x o c c c c $ x x x x x x $
```

If both of these searches fail to produce the check serial number, extract the whole account number field from between the rightmost transit symbol and the rightmost “on us” symbol. A three, four, or five-digit number to the right of the rightmost transit symbol, separated by a space or a dash from the rest of the account number is the check serial number.

```
t x x x x x x x x t c c c c x x x x x x x x o
t x x x x x x x x t c c c c - x x x x x x x x o
t x x x x x x x x t c c c c x x x x x x x x o x x
```

If all of these searches fail to produce the distinct check serial number, and the check serial number field has been specified in the parsing parameter string options, no check serial number will be returned. If it is imbedded within the account number field, it will be returned as part of that variable length field.

Exceptions

Some banks print the check serial number in a location that cannot be electronically distinguished without specific exception information, although it can be visually distinguished because it is repeated in the upper right corner of the check. For these cases, the printer can hold up to nine exceptions for specific banks in its non-volatile memory (NVRAM), which is accessed by the read and write NVRAM commands. The specific bank is picked out by its transit number, and the firmware will look in the exception table for a transit number match before looking in the normal check serial number locations.

In this example, without an exception table entry, the firmware would always pick the rightmost four-digit number as the check serial number following rule two above. The bank with the three digit check serial number and the four digit extension after the “on us” symbol would need to be exceptionally recognized:

```
t x x x x x x x x t c c c - x x x x x x x x x o x x x x
t x x x x x x x x t x x x - x x x x x x x x x o c c c c
```

In this example, without an exception table entry, the firmware would not be able to pick out the check serial number because it is not separated from the rest of the account number:

```
t x x x x x x x x t c c c c x x x x x x x x x x o
```

In this example, without an exception table entry, the firmware would not be able to pick out the check serial number correctly, because it is imbedded within the rest of the account number:

```
t x x x x x x x x t x x x - c c c - x x x x x x x x x o
```

Loading the exception table

The exception table begins at word 20 in NVRAM. Each entry takes five words. There is room for eight exceptions. An application can load local exceptions into the printer using the write NVRAM command:

```
0x1B 0x73 n1 n2 k
```

which writes the two byte word n1:n2 to word k in NVRAM.

Exception table entry format

Each exception table entry consists of five words. The first two words contain the first eight characters of the transit number by packing the low order nibble of the numeric transit number characters. For Canadian checks, eliminate the dash and store the eight numerics.

The next three words are used as six individual bytes to tell the firmware how to interpret the MICR characters that fall to the right of the rightmost transit symbol. Each of the six bytes is positional and consists of two parts: character type and number.

The three high order bits of each byte mark the character type. The characters can be marked in three ways: check serial # character, account # character, or "skip this character or symbol."

The five low order bits of each byte contain the number of characters of that type to extract. Most exceptions will not need to use all six bytes; in that case clear the unused bytes to zero.

Bits within byte	7	6	5	4	3	2	1	0
Check serial # character string	0	0	1	n	n	n	n	n
Account # character string	0	1	0	n	n	n	n	n
Character string to ignore	1	0	0	n	n	n	n	n

Example 1

```
t123456780t12349876543210o
```

```
1234 is the check serial #
9876543210 is the account #
```

To load the second table entry, which starts at word 25, the transit number 123456780 would be stored in the first two words of its table entry using this string of commands:

```
0x1B 0x73 0x12 0x34 25
0x1B 0x73 0x56 0x78 26
```

After the right transit symbol are immediately the four characters of the check serial #, followed immediately by the ten characters of the account number. These would be bitwise encoded as:

```
0 0 1 0 0 1 0 0 (check #, four characters)
and 0 1 0 0 1 0 1 0 (account #, 10 characters)
```

then stored in the other three words of the table entry using:

```
0x1B 0x73 0x24 0x4A 27
0x1B 0x73 0x00 0x00 28
0x1B 0x73 0x00 0x00 29
```

Example 2

```
t22137-632t001 6042202o927540
```

```
2754 is the check serial #
6042202 is the account #
```

To load the third table entry, which starts at word 30, the transit number 2137-632 would be stored in the first two words of its table entry using this string of commands:

```
0x1B 0x73 0x22 0x13 30
0x1B 0x73 0x76 0x32 31
```

After the right transit symbol are four characters to skip, a seven digit account number, two characters to skip, and finally a four digit check serial #. The final character to skip need not be encoded. These would be bitwise encoded as:

```
1 0 0 0 0 1 0 0 (skip four characters)
0 1 0 0 0 1 1 1 (account #, seven characters)
1 0 0 0 0 0 1 0 (skip two characters)
0 0 1 0 0 1 0 0 (check #, four characters)
```

then stored in the other three words of the table entry using:

```
0x1B 0x73 0x84 0x47 32
0x1B 0x73 0x82 0x24 33
0x1B 0x73 0x00 0x00 34.
```

Maintaining the exception table

Present contents of the exception table can be examined using the read NVRAM command:

```
0x1B 0x6A k
```

which reads and returns word *k* in NVRAM. When the exception table is full, a new entry can replace an older, less frequently used entry, by merely rewriting the words for that table entry.

User data storage**Write to user data storage**

```
ASCII      ESC ' m a0 a1 a2 d1 ... dm
Hexadecimal 1B 27 m a0 a1 a2 d1 ... dm
Decimal    27 39 m a0 a1 a2 d1 ... dm
```

Value of *m*: 0 – 255

Writes *m* bytes of data to the user data storage flash page at the address specified. The printer waits for *m* bytes of data following the 3-byte address, *addr*.

If any of the memory locations addressed by this command are not currently erased, the command is not executed.

The printer disables interrupts while writing to flash. Any command that cause data to be written to flash should be followed by a 50 Msec delay to allow significant time for the write operation.

Read from user data storage

```
ASCII      ESC 4 m a0 a1 a2
Hexadecimal 1B 34 m a0 a1 a2
Decimal    27 52 m a0 a1 a2
```

Value of *m*: 0 – 255

Reads *m* bytes of data from the user data storage flash page at the address specified. Returns *m* bytes to the application, followed by a carriage return (0Dh).

The high order byte of the address (*a0*) ranges from 0 to *n2*-1, with *n2* specified in the flash allocation command. If the flash allocation command has been used, the *a0* = 0 always.

Read from non-volatile memory

ASCII ESC j *k*
Hexadecimal 1B 6A *k*
Decimal 27 106 *k*

Range of *k*: 20 – 63 (decimal)

Reads a two-byte word from location *k* in the history EEROM. The printer returns the word at the next available opportunity.

Write to non-volatile memory (NVRAM)

ASCII ESC *s n1 n2 k*
Hexadecimal 1B 73 *n1 n2 k*
Decimal 27 115 *n1 n2 k*

Value of *n1*: 1st Byte

Value of *n2*: 2nd Byte

Range of *k*: 20 – 63 (decimal locations)

Writes the two-byte word, *n1 n2*, to location *k* in history EEROM.

Select memory type (SRAM/flash)

Use this memory to save logos or user-defined fonts.

ASCII GS " *n*
Hexadecimal 1D 22 *n*
Decimal 29 34 *n*

Value of *n*: 48 – 51

***n* = 48 (ASCII *n* = 0)** Hex 30

Loads active logo to RAM only. This is used to print a special logo but not have it take up flash memory. A logo defined following this command is not preserved over a power cycle.

***n* = 49 (ASCII *n* = 1)** Hex 31

Loads active logo to flash memory. This is the default condition for logo flash storage. A logo defined following this command is stored in flash memory.

***n* = 50 (ASCII *n* = 2)** Hex 32

Loads user-defined characters to RAM only. This is the default condition for user-defined character storage. Any user-defined characters defined following this command are not preserved over a power cycle.

***n* = 51 (ASCII *n* = 3)** Hex 33

Loads user-defined characters to flash memory. An application must use this command to store user-defined characters in flash memory. Any user-defined characters defined following this command are stored in flash memory. A user-defined character cannot be redefined in flash memory. The flash memory page must be erased by an application before redefining user-defined characters. For more information, see the erase user flash sector (1D 40 *n*) command.

Specifies whether to load the logos or user-defined characters to flash memory or to RAM (volatile memory). The selection remains in effect until it is changed via this command or until the power cycles.

The printer disables interrupts while writing to flash. Any command that causes data to be written to flash should be followed by a 50 Msec delay to allow significant time for the write operation.

Flash memory user sectors allocation

ASCII GS " U n1 n
Hexadecimal 1D 22 55 n1 n2
Decimal 29 34 85 n1 n2

Default Value of n1: 1 (see below)

Default Value of n2: 1 (see below)

n1 is the number of 64k sectors used for logos and user-defined characters.

n2 is the number of 64k sectors used for user data storage.

This command sets the allocation of flash sectors among user data storage, logos/user-defined characters, and electronic journal. This allocation is saved in the EEPROM of the printer and is therefore saved across power cycles.

When n1 and n2 have been allocated to user data storage and to logos/user defined characters, the remaining available flash memory will be allocated to electronic journal storage

The printer will respond to the flash allocation command being sent with ACK (06H).

n1 + n2 <= 5 (dec) (1M)

n1 + n2 <= 21 (dec) 15 (hex) (2M)

The A776 has been configured at the factory with 2M of flash memory.

Note: Flash memory is made up of user and program code. Therefore, the available flash memory space will vary with the amount of program code utilized.

If n1 + n2 is greater than the maximum number of sectors available, the command is ignored. Reissuing this command with different parameters will erase all sectors.

Erase user flash sector

ASCII GS @ n
Hexadecimal 1D 40 n
Decimal 29 64 n

Value of n: 49 – 50

n = 49 (ASCII n = 1) Hex 31

This command erases all 64K flash memory sectors allocated to user-defined character and logos storage. Those sectors should be erased in two situations: when the logo definition area is full and an application is attempting to define new logos, and when an application wants to replace one user-defined character set with another. In both cases, all logos and character set definitions are erased and must be redefined.

n = 50 (ASCII n = 2) Hex 32

This command erases all sectors available for user data storage.

Erases a page of flash memory and sends a carriage return when the operation is complete.

Related information

See command "Flash memory user sectors allocation"
 (1D 22 55 n1 n2).

Important: While erasing flash memory, the printer disables all interrupts, including communications. To provide feedback to the application, the printer responds to the application when the erase is complete. After sending the erase user flash sector (1D 40 n) command, an application should wait for the response from the printer before sending data. Otherwise, data will be lost. If an application is unable to receive data, it should wait a minimum of ten seconds after sending the erase user flash sector (1D 40 n) command before sending data.

User storage status (ColorPOS®)**ASCII** GS 0x97 *m n***Hexadecimal** 1D 97 *m n***Decimal** 29 151 *m n***Value of m:** *m* specifies the type of stored object to be reported:*m* = 0 return the kilobytes (1024) of free user RAM,
n = 0 gets largest free block size
n = 1 gets the total size free*m* = 3 return the CRC of a logo indexed by *n**m* = 5 return the CRC of a macro that has been stored, *n* = 0*m* = 0 the value of *n* selects a return of either the largest free block or total free size, since contiguous allocation cannot be assumed as this area is completely under user control through address parameters.*n* = 0 if only one instance of an object type is allowed (macro, user data, user defined characters).*n* is the item index when more than one object of type *m* is possible*n* <= FE, see the comments about logo and character set indexes*n* = FF : return a list describing all the existing items of type *m*

Note: When a specific item request is made, a returned CRC value of 00 indicates that no item is stored at that index. There is a practically negligible possibility that a valid object will have a 00 CRC; if this is of concern, applications should check the object downloaded byte sequence to verify that this is not the case (as well as store the CRC as an "ID" for the object if needed later for return value comparisons).

Downloaded character sets are identified by integer extending the existing code page selection as enumerated in the select international character set (= select character code table) command. The firmware standard list is incrementally extended each time a new single or double byte set is downloaded.

Single byte downloaded fonts are selected by

m = 3 and 0x40 <= *n* < 0x80.

Since there are only three double-byte character sets supported, the value 0x80 / 0xA0 / 0xC0 selects the first, second, third downloaded double byte font respectively. In return, each downloaded double byte character band is reported individually as 0xC0, 0xC1, 0xC2 ...for as many bands as have been defined.

This command returns the state of occupancy of available flash storage and user RAM. The printer response for each item is a 4 byte header, 0x1D 0x97 *nL nH* (number of bytes that follow in the response) and for each item a 4 byte structure: 1st *m* (type) byte, 2nd *n* index byte followed by a 2 byte CRC in Lo Hi order of the data string in that storage space.

The return for *m* = 0–2 is the header and one 4-byte item giving remaining storage space in the CRC position in Lo Hi order: 1D 97 4 0 *m 0 fL fH*, where *f* is the kBytes of storage remaining. Note that RAM storage space is not content typed, while available flash is statically divided into logo, character set, and user data types. Change of the divisions is possible via flash erasure and flash allocation commands.

If the communication protocol is RS-232C – Xon/Xoff, then "X symbol substitution response" should be configured with the setting communications parameters command (US STX , 1F 02).

Flash download

These commands are used to load firmware into the printer.

The commands are listed in numerical order according to their hexadecimal codes. Each command is described and the hexadecimal, decimal, and ASCII codes are listed.

There are three ways to enter the download mode.

1. Powering the printer up with DIP Switch 1 up.
2. While the printer is running normally, send the command, "Switch to flash download mode" (1B 5B 7D) to leave normal operation and enter the download mode.
3. If the flash is found corrupted during level 0 diagnostics the download mode is automatically entered after the printer has reset.

The printer never goes directly from the download mode to normal printer operation. To return to normal printer operation either the operator must turn the power off and then on to reboot or the application must send a command to cancel download mode and reboot. **DIP switch 1 must in UP position during reboot to return to normal printer operation.**

When each flash download command is received, the printer returns either ACK or NAK to the host computer when each command is received:

- ACK (hexadecimal 06)
Sent when the printer has received a host transmission and has completed the request successfully.
- NAK (hexadecimal 15)
Sent when a request is unsuccessful.

Communicates to the printer information downloaded from applications. Data is downloaded to flash memory to query the state of the firmware, calculate the firmware CRC and other functions.

Switch to flash download mode

ASCII	ESC [}
Hexadecimal	1B 5B 7D
Decimal	27 91 125

Puts the printer in flash download mode in preparation to receive commands controlling the downloading of objects into flash memory. When this command is received, the printer leaves normal operation and can no longer print transactions until the reboot the printer command (1D FF) is received or the printer is rebooted.

This command does not affect the current communication parameters. Once the printer is in flash download mode, this command is no longer available.

Related information

See entering flash download mode elsewhere in this book to put the printer in flash download mode using the configuration menu.

Return boot sector firmware part number

ASCII	GS NULL
Hexadecimal	1D 00
Decimal	29 0

Returns ACK (Hex 06) + 12 bytes ASCII string describing the flash memory boot sector firmware part number.
Ex: 189-1234567A

Exceptions

Available only in download mode.

Return segment number status of flash memory

ASCII GS SOH
Hexadecimal 1D 01
Decimal 29 1

Returns the size of the flash used. There may be 16 (1 Meg) or 32 (2 Meg) sectors in flash memory. This command assures that the firmware to be downloaded is the appropriate size for flash memory. The value returned is the maximum sector number that can be accepted by the select sector to download (1D 02 *nn*) command.

Exceptions

Available only in download mode.

Select flash memory sector to download

ASCII GS STX *nn*
Hexadecimal 1D 02 *nn*
Decimal 29 2 *nn*

Value of *n*: The flash sector to which the next download operation applies

Range of *n*: 0

Selects the flash sector (*n*) for which the next download operation applies. The values of the possible sector are restricted, depending upon the flash part type. The printer transmits an ACK if the sector number is acceptable or an NAK if the sector number is not acceptable. Sector numbers start at 0.

Exceptions

Available only in download mode.

Get firmware CRC

ASCII GS ACK
Hexadecimal 1D 06
Decimal 29 6

Causes the printer to calculate the CRC for the currently selected sector and transmits the result. This is performed normally after downloading a sector to verify that the downloaded firmware is correct. The printer also calculates the CRC for each sector during power up and halts the program if any sector is erroneous.

The printer transmits ACK if the calculated CRC is correct for the selected sector; NAK if the CRC is incorrect or if no sector is selected.

Return microprocessor CRC

ASCII GS BEL
Hexadecimal 1D 07
Decimal 29 7

Returns the CRC calculated over the boot sector code space.

Formulas

ACK <low byte> <high byte>

Erase all flash contents except boot sector

ASCII GS SO
Hexadecimal 1D 0E
Decimal 29 14

Causes the entire flash memory to be erased.

The printer returns ACK if the command is successful; NAK if it is unsuccessful.

Exceptions

Available only in download mode.

Return main program flash CRC

ASCII GS SI
Hexadecimal 1D 0F
Decimal 29 15

Returns the CRC calculated over the flash firmware code space.

The format of the response is ACK <low byte> <high byte>.

Erase selected flash sector

ASCII GS DLE *n*
Hexadecimal 1D 10 *n*
Decimal 29 16 *n*

Value and range of *n*:
 0–7 = 512k bytes flash
 0–15 = 1M bytes flash
 0–31 = 2M bytes flash

Erases the previously selected sector. The printer transmits ACK when the sector has been erased. If the previous sector is not successfully erased, or if no sector was selected, the printer transmits NAK.

Exceptions

Available only in download mode.

Download to active flash sector

ASCII GS DC1 *aL aH cL cH d1... dn*
Hexadecimal 1D 11 *aL aH cL cH d1... dn*
Decimal 29 17 *aL aH cL cH d1... dn*

Value of *aL*: low byte of the address

Value of *aH*: high byte of the address

Value of *cL*: low byte of the count

Value of *cH*: high byte of the count

Value of *d*: data bytes, 0–255

Value of <i>n</i> (for number of data bytes)	Range of address (<i>aL aH</i>)	Range of count (<i>cL cH</i>)
$((cH * 256) + cL)$	0000–FFFF (hexadecimal)	0001–FFFF (hexadecimal)

Range: Addresses run from 0 to 64K.

Contains a start address ($aH \times 256 + aL$) and count ($cH \times 256 + cL$) of binary bytes to load into the selected sector, followed by that many bytes. The start address is relative to the start of the sector. Addresses run from 0 to 64K. The count must always be 256.

The printer may return one of several responses. ACK means that the data was written correctly and the host should transmit the next block. NAK means that, for some reason, the data was not written correctly. This could mean that communications failed or that the write to flash failed. The alternatives seem to be to retry the block or halt loading and assume a hardware failure.

Related information

Available only in download mode.

Reset firmware

ASCII GS (SPACE)
Hexadecimal 1D FF
Decimal 29 255

Ends the load process and reboots the printer. Before executing this command, the printer should have firmware loaded and external switches set to the runtime settings. Application software for downloading should prompt the user to set the external switches and confirm before sending this command. If the downloading was started from a diagnostic, the reboot will cause the printer to re-enter download state unless the external switches are changed.

Ethernet setup commands

The following commands are designed to set the required printer internal parameters for Ethernet operation. The commands can be used only in the Flash download (boot) mode. See Chapter 3 for default setup.

Restore default settings

ASCII US BS NUL
Hexadecimal 1F 08 00
Decimal 31 8 0

Restores the Ethernet settings to the preset values.

Default settings are:

IP address:	192.0.0.192	(in use after boot timeout of two minutes)
Net mask:	0.0.0.0	(default mask of selected IP is used)
Gateway:	none	
Raw TCPIP port 9001:	active	
Telnet Daemon:	enabled	
LP Daemon:	disabled	
Bootp:	disabled	
DHCP:	enabled	
Inactivity timeout:	enabled	
Keep alive pings:	disabled	

Setting IP address

ASCII US BS SOH *n1 n2 n3 n4*
Hexadecimal 1F 08 01 *n1 n2 n3 n4*
Decimal 31 8 1 *n1 n2 n3 n4*
Default: 192.0.0.192

Sets the IP address value specified by the values of *n1* to *n4*.

Setting Net Mask

ASCII US BS STX *n1 n2 n3 n4*
Hexadecimal 1F 08 02 *n1 n2 n3 n4*
Decimal 31 8 2 *n1 n2 n3 n4*
Default: 0.0.0.0

Sets the Net Mask value specified by the values *n1* to *n4*.

Setting the Gateway

ASCII US BS ETX *n1 n2 n3 n4*
Hexadecimal 1F 08 03 *n1 n2 n3 n4*
Decimal 31 8 3 *n1 n2 n3 n4*
Default: none

Sets the printer to the gateway having the IP address value specified by the values *n1* to *n4*. A gateway, even when the printer is on another subnet, is not always needed.

The printer initiates no connection and obtains the gateway address from the host packets.

Setting raw TCPIP port 9001

ASCII US BS EOT *n1 n2 n3 n4*
Hexadecimal 1F 08 04 *n1 n2 n3 n4*
Decimal 31 8 4 *n1 n2 n3 n4*

n1 = 0: disabled
n1 = 1: enabled

Default: enabled

Sets the port where the printer will look for raw tcpip communications.

LP Daemon

ASCII US BS ENQ *n1*
Hexadecimal 1F 08 05 *n1*
Decimal 31 8 5 *n1*

n1 = 0: disabled
n1 = 1: enabled

Default: disabled

Enables or disables the printer LP Daemon. The LP listens on port 515.

Telnet Daemon

ASCII US BS ACK *n1*
Hexadecimal 1F 08 06 *n1*
Decimal 31 8 6 *n1*

n1 = 0: disabled
n1 = 1: enabled

Default: enabled

Enables or disables the printer Telnet server. The Telnet server listens on port 23.

BootP

ASCII US BS BELL *n1*
Hexadecimal 1F 08 07 *n1*
Decimal 31 8 7 *n1*

n1 = 0: disabled
n1 = 1: enabled

Default: disabled

Enables or disables the use of BootP at power-up to obtain an IP address. BootP is a subset of DHCP.

DHCP (auto-configuration)

ASCII US BS BS *n1*
Hexadecimal 1F 08 08 *n1*
Decimal 31 8 8 *n1*

n1 = 0: disabled
n1 = 1: enabled

Default: enabled

Enables or disables the use of DHCP at power-up to obtain an IP address. If no address is found within two minutes, DHCP obtains the default IP address.

Inactivity timeout

ASCII US BS HT *n1*
Hexadecimal 1F 08 09 *n1*
Decimal 31 8 9 *n1*

n1 = 0: disabled

n1 = 1: enabled

Default: enabled

Enables or disables resetting of open TCP ports after five (5) minutes inactivity.

Keep-alive pings

ASCII US BS LF *n1*
Hexadecimal 1F 08 0A *n1*
Decimal 31 8 10 *n1*

n1 = 0: disabled

n1 = 1: enabled

Default: enabled

Imaging Commands

In these descriptions, the commands and parameters are given in hexadecimal unless otherwise noted.

Calibrate Scanner

Hexadecimal: ID B0

Parameters: None

Return: 1D 49 B0 s m n pL pH rL rH

Value	Definition	
1D	Command return indicator	
49	Image Scanner	
B0	Imaging function = calibrate	
s	Standard imaging status	
	Decimal	
	Meaning	
	0	OK
	1	Jam detected
	2	Wait for scan document cancelled
	3	Imager cover open
	7	Unrecoverable hardware error
	8	No stored document
	9	Bottom side only
	10	Top side only
	11	Internal interface timeout error
	12	Internal interface other error
	16	No bottom image
	17	No top image
	18	Unsupported format
	19	Tag block full
m	Active Scanning command entry points: 0 = no outstanding scan; 1 = slip entry; 2= top entry; 3 = waiting at both	
n	Sensors currently covered / closed: none = all bits off; bit0 = imager rear detect; bit1 = imager front detect; bit 2 = imager cover; bit 3 = cassette cover; bit5= upper slip detect; bit6= lower slip detect	
pLpH	The File Index to be used by the next scan	
rLrH	Remaining space count of typical document scans to fit in image buffer free space	

Description: This adjustment will be done originally at kit or factory install and should be done any time after cleaning both the top and bottom scan windows. Using the top entry point, a bright white document (new office paper, not recycled) is inserted, allowing the scanner to set the LED illumination current and individual range compensation for each pixel. These values will be used to get full-range readings on subsequent scans. A standard imager status structure is returned, with the Status byte indicating if all the imager hardware is OK or if the test document has jammed.

Configure/Change Image Transmission Port

Hexadecimal: 1D B1 *m n*

Parameters: *m* = 0 (default) after scanning, status + image file goes to the port issuing the scan or transmit function; = 1 all image transmissions go only to a 2nd channel Ethernet port. *N* = 0 indicate that this configuration is temporary (till powered off, default, or *n* = 1 selection is also retained in non-volatile memory.

Return: *None*

Description: This command specifies whether or not all image transmissions should only use a 2nd high-speed imaging channel. The physical port for this channel must be the Ethernet port. Irrespective of which of the two command streams issued an image transmission action, when *M* = 1 the #2 port will be used to transfer all image files. The *N* parameter indicates whether the choice is to be treated as a permanent setting at power-on time, or just a resetting of whatever the permanent setting was.

When MICR is configured to uses the top path head, a legacy MICR read command will not result in an image capture. But an image scan using the slip entry point will implicitly read MICR which will be placed in the imager buffer and will be available in the TIFF header of the next image transmission.

Set Top Entry Startup Delay

Hexadecimal: 1D B2 *n*

Parameters: *n* is interpreted the same as in the second parameter in the set slip waiting time command (1B 66 *m n*), i.e. the delay between front image sensor detect and motor start for movement along the path expressed in tenths of a second, with 9 (default) indicating 900 ms; maximum value is 50 (5 seconds) waiting. There is similar to the clamp action in the slip, except that document movement starts immediately after this delay. This command is ignored if the value of *n* is greater than 50.

Return: *None*

Description: This command sets the delay between detecting the presence of a document at the front sensor and starting the path rollers to scan the document. **Note:** If a document is being sent from the slip station to the imager (back sensor), that timing delay is automatically determined.

Set Image Format Properties

Hexadecimal: 1D B3 *m p r*

Parameters: *m* specifies if the image captured should be rotated 90 degrees to have the width size be the largest value (0 = no change from previous setting; 1 = no, default, 2 = yes). The rotation direction is such that documents inserted (at either opening) face up with the bottom edge on the right will be right side up. *p* specifies the image transmit format selection (default value = 7) as follows:

Value	Definition
0	No change from previous setting
1	LZW (lossless, also used in GIF) compressed grayscale (in TIFF Wrapper)
2	CCITT T.6 compression (G4 binary) (in TIFF Wrapper)
3	Reserved for JPEG (lossy) (in TIFF Wrapper) (Future)
4	Binarized, no compression (in TIFF Wrapper)
6	16 level (4 bit) packed bytes format (1/2 size of raw, ignores R parameter drop bits) (in TIFF Wrapper)
7	No compression, raw (256 level) grayscale (in TIFF Wrapper), default

r specifies the number of saved gray levels = scale resolution (default value = 0) as follows:

Value	Definition
0	No change from previous setting
1	Minimal noise cleaning preserving 128 gray levels
2	Low Standard noise cleaning preserving 64 gray levels
3	High Standard noise cleaning preserving 32 gray levels
4	Maximum noise cleaning preserving 16 gray levels
5	No noise cleaning and full 256 gray level as captured is preserved, default

Return: *None*

Description: The parameters set the image's internal orientation and number of scanned gray levels. The internal format of the image is always 256 level gray scale, one byte per pixel; when sending to the host a reformatting (if not raw) is then done when needed. Normally 16 – 32 gray levels are suggested for viewing on displays, thus allowing more effective LZW compression while preserving distinguishable artifacts of a gray scale image. A TIFF structure is used to return all formats. This structure holds height & width and other document identifying tags as well as images of both sides.

The newest configured values are retained in non-volatile memory, persisting across power cycles.

Configure Binarization Methods and Attributes

Hexadecimal: 1D C5 nL nH m d1 – dn-1

Parameters: *n* is the number of bytes that follow. *n* values of 1 indicate a choice of threshold method only without changing methods properties. *m* selects the threshold method and optional attributes that the application may choose to set: *m* = 0 reserved for future; a dynamic function threshold method based on experience lookup tables; *m* = 1 (default) selects the US banking average area threshold method, *m* = 2 selects fixed value thresholding, *m* > 2 reserved for future other method(s) that may be standardized by the industry. Any dx value = 0 sets the attribute at its default value. Any dx value not sent will remain unchanged.

Method	M	d1	d2	d3
Dynamic (Future)	0	Black bias cross point, 5 <= d1 <= 95; default = 50	NA	NA
Averaging	1	% difference from average, 5 <= % <= 95; default = 20%	Reflectance below which pix is always black; default = 51	Reflectance equal or above which pix is always white; default = 178
Fixed Threshold	2	The reflectance value to be used, 1 <= d1 <= 254, default = 96.	NA	NA

For *m* = 0, the bias cross point selects where favoring black pixels changes over to favoring white pixel.

The averaging method uses 20% as the default difference for a pixel to be judged different than an 1/8" square background average. Absolute values are also used to decide on a pixel's color (either black or white).

The fixed threshold method uses a simple comparison test against the value.

Return: *None*

Description: This allows for selection of threshold method and tweaking of any threshold method variables. These are used when TIFF G4 binary format for the transferred image is selected.

The newest configured values are retained in non-volatile memory (persist across power cycles).

Define/Update Application Tag Values

Hexadecimal: 1D B4 nL nH t0...tm

Parameters: *n* is the total byte count size of user TagData structures, each structure is similarly defined in the TIFF specification: 2 byte tag value, followed by a 2 byte type value, followed by a 2 byte count of byte length (note: this differs from TIFF directory entry), followed by the object. If the object is a string type, this would be the string itself; max length of each string is 127.

t0...tm are the tag structures. If the byte length is 0 then that non-reserved (Application) tag is eliminated from being set on future scanned images.

n is limited to 256 maximum parameter data length size, so if the total tag structures to be set exceed that, then they should be divided and sent as multiple commands; *n* = 0 is used to erase all application set Tags.

Return: None

Description: The application set image tag values are saved for use with any future documents scanned, which will also be identified by an automatically generated numerical File Index tag. If any non-automatically generated tags are application set, they will be copied into the TIFF header along with the automatically generated ones. All tags will be returned in the TIFF structure whenever one or both bottom and top scanner images are transmitted. While only the tags identified as “reserved” will be set by firmware, it is suggested that the application use tag numbers as specified in the TIFF standard which provides for privately defined usage of tags above 32,768.

Tags noted as “application initialized” can be sent and will be updated by the firmware, for example date-time.

Using the following suggested pertinent “application” tag numbers insures there will be no misuse of TIFF predefined numbers. Do not use any of the reserved, FW generated numbers – that data will be automatically overwritten at each scan by the firmware. Values are in decimal corresponding to those in the TIFF specification:

Decimal Value	Definition
254	Reserved for FW auto generated int: Subfile Type =0 one side, =2 both
256	Reserved for FW auto generated int: Image Width
257	Reserved for FW auto generated int: Image Length
258	Reserved for FW auto generated int: Bits Per Sample (either 1, 4, or 8)
259	Reserved for FW auto generated int: Image compression format
262	Reserved for FW auto generated int: Photometric Interpretation, 0=White is zero when format = T6.G4 binary, else 1=Black is Zero
269	Application supplied string: Document Name (= UPOS “FileID”)
270	Application supplied string: Image Description (= UPOS “UserTag”)
271	Application supplied string: printer Make description
272	Application supplied string: printer Model description
273	Reserved for FW auto generated int: Strip Offsets
278	Reserved for FW auto generated int: Rows Per Strip
279	Reserved for FW auto generated int: Strip Byte Counts
282	Reserved for FW auto generated rational: X Resolution (given as 200 / 1)
283	Reserved for FW auto generated rational: Y Resolution (given as 200 / 1)
285	Application supplied Page Name (repeated if have both top and bottom images; suggest use as Transaction ID)
293	Reserved for FW auto generated int: T6 Options (=0)
296	Reserved for FW auto generated int: = 2 (pixels expressed per inch)
297	Reserved for FW Page Number & Number of Pages p1= bottom scanner, p2= top scanner; these are saved as type = two short integers

Decimal Value	Definition
305	Application supplied string: Software = version description
306	FW supplied Date & 24 Hour Time of scan: 20 char YYYY:MM:DD:HH:MM:SS; must be application initialized to start FW time stamping
33432	Application supplied string: Copyright
65000	Reserved for FW auto generated int FileIndex value
65001	Reserved for FW auto saved int of set transmission format parameter (<i>m p r</i>) values
65002	Reserved for FW auto saved raw MICR read string, if MICR present
65003	Reserved for FW auto saved int of entry point: 1 = slip, 2 = front
65004	Reserved for future FW auto saved reporting
65005	Reserved for FW auto save of parsed MICR string (if parsing has been defined)
65007-534	Any other Application set descriptions, usually strings, but any TIFF type

A few tag values that are useful to TIFF readers always have the default values and thus are not repeated in the returned structure. These are 266, Fill Order = 1; 274, Orientation = 1 (top left is 0,0); and 277, Samples Per Pixel = 1.

Attach Scan Application Tags

Hexadecimal: 1D B6

Parameters: None

Return: 1D 49 B6 *m*. *M* is 0 if OK, 1 if the scanned image already has application set tags or there is no last scanned image.

Description: Attach the current set of application defined tags to the last scanned image. This can be done only once to each image and allows the application to define tags up to image file transmission time. Note that this action takes place automatically in the case of the scan command with its parameter set for immediate transmission.

Return Imager Status

Hexadecimal: 1D B7

Parameters: None

Return: 1D 49 B7 *s m n pL pH rL rH*

Value	Definition	
1D	Command return indicator	
49	Image Scanner	
B7	Imaging function = status	
s	Standard imaging status	
	Decimal	Meaning
	0	OK
	1	Jam detected
	2	Wait for scan document cancelled
	3	Imager cover open
	7	Unrecoverable hardware error
	8	No stored document
	9	Bottom side only

Value	Definition	
	Decimal	Meaning
	10	Top side only
	11	Internal interface timeout error
	12	Internal interface other error
	16	No bottom image
	17	No top image
	18	Unsupported format
	19	Tag block full
m	Active Scanning command entry points: 0=no outstanding scan; 1=slip entry; 2=top entry; 3=waiting at both	
n	Sensors currently covered / closed: none = all bits off; bit0 = imager rear detect; bit1 = imager front detect; bit 2 = imager cover; bit 3 = cassette cover; bit5= upper slip detect; bit6= lower slip detect	
pLpH	The File Index to be used by the next scan	
rLrH	Remaining space count of typical document scans to fit in image buffer free space	

Description: This returns the state of the imaging unit. The return byte definitions given above are used in several other command returns as well.

Real-Time Imager Status

Hexadecimal: 10 04 07

Parameters: *None*

Return: 1 byte to be interpreted as follows:

Bit	Meaning
0	Fixed to 0
1	Fixed to 1
3,2	00 not waiting for document to scan
	01 waiting for document slip entry point
	10 waiting for document at front entry point
	11 waiting for document at either entry point
4	Fixed to 1
5	1 = rear image sensor covered
6	1 = front image sensor covered
7	Fixed to 0

Description: This immediately returns one byte of imager status.

Real-Time Error Status**Hexadecimal:** 10 04 03**Parameters:** None**Return:** 1 byte to be interpreted as follows:

Bit	Meaning
0	Fixed to 0
1	Fixed to 1
2	1 = jam in path
3	1 = knife error
4	Fixed to 1
5	1 = unrecoverable error
6	1 = a/d out of range error
7	Fixed to 0

Description: This immediately returns one byte of imager status.

Real-Time Cancel Image Transmission**Hexadecimal:** 10 05 06**Parameters:** None**Return:** None**Description:** Use this command if a catastrophic error has occurred and prevents the image processor from completing a formatting and transmission operation. Issuing this command cancels any buffered or in-process image transmission command.

Wait for Scan & Optionally Transmit**Hexadecimal:** 1D B8 *m p r***Parameters:** *m* = 0 specifies scan only, *m* = 1 specifies scan and transmit using the configured image format properties and TIFF tags at the time of the scan ending. When *m*=0 the application is responsible to send the 1D B6 command to attach all tags before performing the next scan or transmitting the image. For *m*=1 the 1D B6 command is handled internally. *p* = 1 wait for a document at the back sip entry, *p* = 2 wait for a document at the top front entry, *p* = 3 wait for a document at either entry point. A special top entry option *p* = 6 is used to scan Cards and Other thick media. *r* specifies document sides to transmit, 0= both, 1= bottom, 2= top.**Return:** After a scan this command returns to the command port and if applicable to the configured imager port an imager status, followed by a 4 byte file length *nL nML nMH, nH* (little endian sequence = low to high byte), indicating the size of the optional TIFF that follows: 0 = no image appended.Note that *FileIndex p* is the value that will be used for the **next** bottom scanner image, so it should be decremented by 2 if the scan status *S* < 7 to retrieve document images that were captured.*1D 49 B8 s m n pL pH rL rH* reports the scanner state after scanning if the image is not attached.

Value	Definition
1D	Command return indicator
49	Image Scanner
B8	Imaging function = wait for scan
s	Standard imaging status
	Decimal
	Meaning
	0 OK
	1 Jam detected
	2 Wait for scan document cancelled
	3 Imager cover open
	7 Unrecoverable hardware error
	8 No stored document
	9 Bottom side only
	10 Top side only
	11 Internal interface timeout error
	12 Internal interface other error
	16 No bottom image
	17 No top image
	18 Unsupported format
	19 Tag block full
m	Scanning command entry point used: 0 = no outstanding scan, 1 = slip entry, 2 = top entry
n	Sensors currently covered: none = 0 value
	Bit 0 =1: rear image sensor covered
	Bit 1 =1: front image sensor covered
	Bit 2 =1: image cover open
	Bit 3=1: cassette cover open
	Bit 5=1: upper slip sensor covered
	Bit 6=1: lower slip sensor covered
pLpH	The File Index to be used by the next scan
rLrH	Remaining space count of typical document scans to fit in image buffer free space
4 bytes	0

The port that is receiving the image will get the equivalent status with the image attached:

Value	Definition
As above	1D 49 B8 s m n pL pH rL rH
4 bytes	TIFF length if attached
TIFF	TIFF containing tags and images if attached

If the image file return port is RS232, then the header and attached image file are transmitted under the settings of the Configure RS232 File Transmit parameters.

Description: If a document is present in the imager that has already been imaged, it is ejected out the imager back. When a document is presented at the appropriate entry point, scan and save the front and back image into the image buffer. Assign the next free FileIndex numbers so that both sides can be identified for subsequent image retrieval. This command waits for a document to be placed at an image source insertion position. A front entry will leave the document in a position ready for ejection; a back slip entry will be left ready for ejection or backup to a slip print position. Entry from the slip position will wait and clamp an inserted document (if not already clamped) and scan and also MICR read the document.

After scanning, possibly reorient then process into the current format and save all firmware set tags. If transmitting then also save the current application set identifying properties (tags) to the document TIFF image structure. Transmit status to the command issuing port, with the TIFF file optionally appended as specified by *m*. If transmission has been configured to use the 2nd port, then both status and the TIFF file will be sent to that port.

If a document is not already present at the designated imager insertion point, the capture operation will wait for the configured slip waiting time (only real-time commands are accepted while waiting; use the standard Cancel Slip Wait command 10 05 03 to cancel this wait). If a document is successfully captured, its storage updates the on-going average size for the capture modes used. This average is then used to determine the amount of free image storage.

Transmit Image

Hexadecimal: 1D B9 *s t m nL nH pL pH*

Parameters: *s* specifies the sides to transmit: 0 = both (default), 1 = bottom only, 2 = top only. *t* = 0 do not mark the buffer image space free upon successful transmission, default; *t* = 1 mark the buffer space free upon successful image transmission.

Transmission creates the image format specified by *m* as follows:

Value	Definition
0	Reserved, value is treated as no change from previous format
1	LZW (lossless, also used in GIF) compressed grayscale TIFF
2	CCITT T.6 compression (binary) TIFF
3	Reserved for JPEG (lossy)
4	Binarized, No Compression (in TIFF Wrapper)
6	16 level (4 bit) TIFF packed bytes format (1/2 size of raw, ignores R parameter drop bits)
7	No compression, raw (256 level) grayscale in TIFF format, default

n is the *FileIndex* of the image to be returned (if only one of the two images is desired, it corrects the supplied file index +- 1). *n* = 0 transmits the latest scan.

p is a 2-byte length of the blocking factor to use if transmitting on an RS232 port, and is ignored if imaging is configured (default) to use the high speed port. On RS232 the printer sends P bytes and waits for either an ACK byte = transmit next, a NAK byte = retransmit previous, CAN terminates transmission. *p* = 0 says use the default size of 1024 bytes, = FFFF use no blocking (i.e. transmit the M designated images in the configured formats). If blocking, the last block is transmitted at its actual remnant size.

Return: This uses the message structure/protocol transmission format that matches Scan & Transmit except for the command ID code:

Value	Definition	
1D	Command return indicator	
49	Image Scanner	
B9	Imaging function = transmit	
s	Standard imaging status	
	Decimal	Meaning
	0	OK
	1	Jam detected
	2	Wait for scan document cancelled
	3	Imager cover open
	7	Unrecoverable hardware error
	8	No stored document
	9	Bottom side only
	10	Top side only
	11	Internal interface timeout error
	12	Internal interface other error
	16	No bottom image
	17	No top image
	18	Unsupported format
	19	Tag block full
m	Scanning command entry point used: 0 = no outstanding scan, 1 = slip entry, 2 = top entry	
n	Sensors currently covered: none = 0 value	
	Bit 0 =1: rear image sensor covered	
	Bit 1 =1: front image sensor covered	
	Bit 2 =1: image cover open	
	Bit 3=1: cassette cover open	
	Bit 5=1: upper slip sensor covered	
	Bit 6=1: lower slip sensor covered	
pLpH	The File Index to be used by the next scan	
rLrH	Remaining space count of typical document scans to fit in image buffer free space	
4 bytes	Scanned image TIFF structure length	
TIFF	Structure containing the tags and images	

Description: This sends back the images at index n in a TIFF structure using the currently configured image format.

Transmission of the image follows the command return header. If only a top (or bottom) scan image is requested then its TIFF tags will contain the same application set tags as for the other side image, with the only difference being the 297 tag indicating side and tag 65000 will have its true File Index value.

The TIFF structure always returns all automatic Tags, and should usually include a UserTag and FileID that the host may have defined and later set to be associated with the image. If n is 0 (current image) and no Attach Scan Identifying Tags command was given after the scan, then the image file will be formed as if the attachment command had been given with 0 application set tags.

If the image file return port is RS232, then the header and attached image file are transmitted under the settings of the Configure RS232 File Transmit parameters.

XON-XOFF will not work for transmission of image.

Eject from Scanner

Hexadecimal: 1D BA *p*

Parameters: *p* specifies the action: 0 = eject from entry point, 1 = eject front, 2 = eject straight back, 3 = move down into slip print position

Return: Status is returned as follows using the standard status return:

Value	Definition	
1D	Command return indicator	
49	Image Scanner	
BA	Imaging function = eject	
s	Standard imaging status as described above in section 8.2.1	
s	Standard imaging status	
	Decimal	Meaning
	0	OK
	1	Jam detected
	2	Wait for scan document cancelled
	3	Imager cover open
	7	Unrecoverable hardware error
	8	No stored document
	9	Bottom side only
	10	Top side only
	11	Internal interface timeout error
	12	Internal interface other error
	16	No bottom image
	17	No top image
	18	Unsupported format
	19	Tag block full
m	m as in the Image Status Command return	
n	n as in the Image Status Command return	
pL pH	p as in the Image Status Command return	
rL rH	r as in the Image Status Command return	

Description: This command ejects the document or moves it into the slip printer for further processing. A request for moving a top inserted document down into slip print position will instead eject it out the back.

Free Image

Hexadecimal: 1D BB *nL nH*

Parameters: *nL nH* is the *FileIndex* of the image buffer space to be released.

Return: 1D 49 BB *s nL nH*, where *nL nH* is the count of typical images that can be stored in free space in circular buffer order. *S* = 0 means buffer space was marked free, *S* = 1 no buffered image at the specified index.

Description: This frees the space used by the image with *FileIndex* *n* for subsequent use in future image acquisition. The image at *FileIndex* *n* will no longer be available for attribute listing or transmitting. The host should free images that will never be retrieved; images that have been transmitted successfully will be automatically freed when their space is needed for a new image.

Free Imager Buffering

Hexadecimal: 1D BC *m*

Parameters: *m* = 0 free all buffered images and all application set scan identifying properties (TIFF tags), *m* = 1: only free buffered images, *m* = 2 only free application set TIFF tags.

Return: This command returns 1D 49 BC *s nL nH*, where *nL nH* is the maximum count of typical images that can be stored in free space in circular buffer order. *S* is a status byte, and it always returns as 0.

Description: This frees all the space used for image buffering and/or application set pending tags. A status is returned giving the image buffer size in number of typical documents that can fit.

Get Buffered Image List

Hexadecimal: 1D BD

Parameters: none

Return: 1D 49 BD *nL nH [FI-1 FI-2...]*

nL nH gives the size of the list in bytes, which is 3X the number of *FileIndex*'s currently stored. Each *Index* report *FI-X* is 3 bytes: *s* status = 0 image not transmitted, *s* = 1 transmitted, and a 2 byte *index* in *nL nH* form. For example if there were two scanned documents in the list, the return would be: 1D 49 BD 6 0 *s1 nL1 nH1 s2 nL2 nH2*. If there are no *FileIndexes* stored then *n* = 0 is returned without any *FileIndex* values.

Description: Content of the buffer is described by a *FileIndex* list for all transmittable images using the structure above.

Get Buffered Image Attributes

Hexadecimal: 1D BE *nL nH*

Parameters: *nL nH* is the *File Index* of the image for which to return all its TIFF attributes.

Return: 1D 49 BE *s* (1 byte status), *nL nH* (*index #*). This is followed by *mL mH*, a 2 byte count of return length in bytes and then all the TIFF tags are returned in the same structure used to set the tags via command Set Scan Identifying Properties.

The values of *s* are: 0 = OK, 1= not in buffer; this will also set the count of tags to 0.

Description: The attributes (Tiff tags) that were present at the time of scan for the given *file index* are returned, in the same format as used in the Set Scan Identifying Properties command.

Configure Scan Options

Hexadecimal: 1D C6 *m n*

Parameters:

m	n	Description
0	-	Configure Imager default settings. Parameter n is ignored.
1	0	Disable auto eject on top scan jam (default).
1	1	Enable auto eject on top scan jam.
2	n	Set maximum tag storage memory to n Kbytes. Default 4K. Range 2K to 64K. Out of range parameter defaults to 4K.

Return: None

Description: Configures scan options. Parameter *m*>2 reserved for future options This setting is retained across power cycles.

Configure Max Scan Width & Height

Hexadecimal: 1D C7 *wL wH lenL lenH*

Parameters: *wL wH* is the maximum width of a scan in pixels (<= physical maximum 832); *lenL lenH* is the maximum length in pixels (<= 2284 ~ 11.25"). The width should be values evenly divisible by 4 value will be truncated by zeroing out the lowest-most 2 bits.

Return: None

Description: This sets the maximum values for all scanned documents to within ½ mm (4 pixels). As the imager must be prepared for a maximum size, this allows the firmware to use optimum buffers and thus provide for retaining more image slots in a circular buffer arrangement.

This setting is retained across power cycles.

Transmit Printer Type (Extended Existing Command)

Hexadecimal: 1D 49 02

Parameters: None

Return: *M* a single byte, as specified in existing commands, with its undefined bit #5 now used to indicate imager installed. 0= not present (existing definition), 1= imager present (new)

Description: This is an additional definition that uses a previously undefined bit to tell applications whether or not an imager is present.

Chapter 6: DH emulation for B780

List of DH 4700 Emulation Commands

This table lists the commands in numerical order according to their hexadecimal codes. The page number indicates where a complete description of the command can be found. Some commands listed are not implemented (they are identified as not implemented). If received, they are ignored and not sent to the print buffer as data.

<u>Hexadecimal Code</u>	<u>Command Name</u>	<u>Page</u>
03	End of Text	137
05 03	Status: 3 Bit	145
0A	Line Feed	137
0B	Vertical Tab	137
0C	Eject Slip	
0D	Carriage Return	137
0E	Double-Wide Font	140
0F	Double-Wide Off	140
19	Setup Parameters	137
1B 00	Reset Printer	138
1B 05	Status: 6 Bit	145
1B 07	Cash Drawer 1	138
1B 08	Cash Drawer 2	138
1B 0C	Document Clamp Open	138
1B 13	Self Test	138
1B 17	Document Validation	138
1B 1A, 1B 5A	Receipt/Journal Print	138
1B 1C	Document Clamp Close	139
1B 1D	Graphics: 5 Dot	144
1B 21	Character Set	141
1B 41	Form Eject	139
1B 42 75	Download (Not Implemented)	139
1B 43	Underline Print	143
1B 44	Underline Off	143
1B 45	Double-High Off	143

List of DH emulation Commands *continued*:

Hexadecimal Code	Command Name	Page
1B 46	Form In (Not Implemented)	139
1B 47	Select (Not Implemented)	139
1B 48	Double-High Font	143
1B 49	Either Form-In Sensor (Not Implemented)	139
1B 4A	Both Form-In Sensors (Not Implemented)	139
1B 4B	Busy Until Buffer Empty	139
1B 4C	Clamp Delay	139
1B 50	Pitch Selection	143
1B 52	Upside-Down Off	143
1B 53	Print Speed (Not Implemented)	140
1B 55	Upside-Down Print	143
1B 56	Status-Firmware	145
1B 57	Buffered Validate	140
1B 60	Buffer Clear	140
1B 7C	Wait for Slip	
1B 7D n	Rotate Font 90 degrees	
1B 7E	Cancel Slip Waiting	
1E	Graphics	144
1F c n n n 1F	Repeat Character	140

List of DH 4700 Command Descriptions

The command descriptions in this section are grouped in the following categories:

- Printer Function Commands
- Print Characteristics Commands
- Graphics Commands
- Printer Status Commands

Within each group the commands are listed in numerical order according to their hexadecimal codes. Each command is described and the hexadecimal, decimal, and ASCII codes are listed.

Printer Function Commands

These commands control the following basic printer functions:

- Printing
- Feeding paper
- Moving the printhead
- Resetting the printer

The commands are listed numerically by hexadecimal code.

End of Text

Informs printer to send an acknowledge (Hexadecimal 06, Decimal 6, ASCII ACK) to the host computer after all characters have been printed and all commands performed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
03	3	ETX

Line Feed

Prints the data in the buffer and feeds the paper one line. The height of the line is determined by the internal DIP switch settings or by the Set Up Parameters command (19 n).

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
0A	10	LF

Vertical Tab

Prints any data in the buffer and then advances the paper .02083 inches (0.523mm).

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
0B	11	VT

Carriage Return

Prints the data in the buffer and advances the paper if Auto Line Feed is enabled either by the internal DIP switch settings or by the Set Up Parameters command (19 n). See "Chapter 3: Diagnostics and Print Test" for more information.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
0D	13	CR

Setup Parameters

Sets temporary values for default printer parameters. N is the sum of the values for each parameter.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
19 n	25 n	EM n

Value of n

Hexadecimal	Decimal	ASCII	Parameter	Setting
00	01	NUL	Auto Line Feed	ON
01		SOH		OFF
00	02	NUL	Characters per Line	40
02		STX		ALT
00	0	NUL	Journal Lines/Inch	8.0
04	4	EOT		6.9
08	8	BS		6.0
0C	12	FF		5.3

00	0	NUL	Validation Lines/Inch	8.0
10	16	DLE		6.9
20	32	SPACE		6.0
30	48	0		5.3
00	0	NUL	Print Self Test	NO
40	64	@	(After setting temporary parameters)	YES

ALT selects the previous pitch selection.

Reset Printer

Resets and initializes the printer. This command is processed immediately. All data in the buffer is lost. The printer reinitializes with the default DIP switch settings.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 00	27 0	ESC NUL

Cash Drawer 1

Opens the cash drawer. If a Y-cable is used to split the cash drawer connector so two cash drawers can be connected to the printer, the cash drawer connected to the first connector (labeled 1 or A) will be opened.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 07	27 7	ESC BEL

Cash Drawer 2

Opens the second cash drawer. If a Y-cable is used to split the cash drawer connector so two cash drawers can be connected to the printer, the cash drawer connected to the second connector (labeled 2 or B) will be opened.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 08	27 8	ESC BS

Document Clamp Open

Opens the platen. Any forms still in the printer may fall back into the validation station when the platen is opened. This command enables the Receipt/Journal paper feed and disables the Slip/Validation paper feed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 0C	27 12	ESC FF

Self Test

Clears all data in the print buffer and prints the current configuration parameters. This functions the same as the general print test

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 13	27 19	ESC DC3

Document Validation

Opens the platen. Once a form is detected, the platen will automatically close. This command enables the Slip/Validation paper feed and disables the Receipt/Journal paper feed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 17	27 23	ESC ETB

Receipt/Journal Print

Closes the platen. The 1B 5A version of the command closes the platen when no form has been detected. This command enables the Receipt/Journal paper feed and disables the Slip/Validation feed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 1A	27 90	ESC SUB
1B 5A	27 26	ESC Z

Note: The ASCII SUB character cannot be sent by some PC applications. In that case, use the following version of the Receipt/Journal Print command.

Document Clamp Close

Closes the platen when the form has been detected and the time for the clamp delay is up. This command enables the Slip/Validation paper feed and disables the Receipt/Journal paper feed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 1C	27 28	ESC FS

Form Eject

Ejects the form from the validation station after it has been printed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 41	27 65	ESC A

Download

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 42 75	27 66 117	ESC B u

Form In

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 46	27 70	ESC F

Select

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 47	27 71	ESC G

Either Form-In Sensor

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 49	27 73	ESC I

Both Form-In Sensors

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 4A	27 74	ESC J

Busy Until Buffer Empty

Changes the state of the RTS (Request to Send) line until the buffer is empty. This command is processed immediately.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 4B	27 75	ESC K

Clamp Delay

Sets the time that the printer waits from when it detects an inserted form to when it clamps the platen closed. This allows time for the form to be lined up correctly and held still.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Value of n</u>
1B 4C n	27 76 n	ESC L n	See table

Value of n

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Time of Clamp Delay</u>
00	0	NUL	No delay
01	1	SOH	0.250 seconds
02	2	STX	0.500 seconds (default)
03	3	ETX	1.00 seconds

Print Speed

This command is not supported and is ignored if received.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 53	27 83	ESC S

Buffered Validate

Opens the platen to allow a form to be inserted. Any data that is received after this command will not be printed until the form is detected. This command enables the Slip/Validation paper feed and disables the Receipt/Journal paper feed.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 57	27 87	ESC W

Buffer Clear

Clears all print characters and control codes from the buffer. All current settings are maintained. This command does not return the printer to its default condition. The command is processed immediately.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 60	27 96	ESC '

Repeat Character

Repeats any printable characters or control codes up to 255 times. This command is best used to send several Line Feed commands (0A), or to print a single character a certain number of times.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Value of c</u>	<u>Value of n</u>
1F c n n n 1F	31 c n n n 31	US c n n n US	Control Code or Character	30-39 Hexadecimal 48-57 Decimal 0-9 (ASCII)

To send 101 Line Feed commands, send the following string:

```
1F 0A 31 30 31 1F
```

where 1F starts the command, 0A indicates the Line Feed command, 31 (Hex) equals ASCII 1, 30 (Hex) equals ASCII 0, 31 (Hex) equals ASCII 1 (thus 101 indicates the number of times to repeat the Line Feed command), 1F stops the command.

Print Characteristics Commands

These commands affect the appearance of printed information. They control the following:

- Character set selection
- Character formatting
- Print orientation

The commands are listed numerically by hexadecimal code.

Double-Wide Font

Starts double-wide printing. The pitch of the double-wide font is half of the currently selected font. If the currently selected font is 40 characters per line (13.9 pitch), the double-wide characters will print at 20 characters per line (6.9 lines per inch).

This command may be used with the Double-High command 1B 48.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
0E	14	SO

Double-Wide Off

Turns off double-wide printing.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
0F	15	SI

Character Set

Selects the character set. The default character set is defined by the internal DIP switch.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Value of n</u>
1B 21 n	27 33 n	ESC ! n	See table

Value of n

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Character Set</u>
41	65	A	PC US (Code Page 437)
42	66	B	United Kingdom English
43	67	C	German
44	68	D	French
49	73	I	Italian
4B	75	K	Spanish
4C	76	L	Hebrew

If a character set other than PC US (Code Page 437) is selected, the unique characters will be substituted with characters in the PC US set. See the following tables for the substitutions.

Character Set	Decimal Hexadecimal	35 23	64 40	91 5B	92 5C	93 5D	94 5E	96 60	123 7B	124 7C	125 7D	125 7E
PC US (Code Page 437)		#	@	[	\	\]	^	`	{	|	}	~
United Kingdom English		£	@	[	\	\]	^	`	{	|	}	~
German		#	§		Ö	Ü	^	`	ä	ö	ü	ß
French		£	à	°	ç	§	^	`	é	ù	è	ê
Italian		£	§	°	ç	é	^	ù	à	ò	è	ì
Spanish		!	ı	Ñ	ñ	ı	ü	á	é	í	ó	ú

International Character Code Table

Hexadecimal	Decimal	Character
60	96	א
61	97	ב
62	98	ג
63	99	ד
64	100	ה
65	101	ו
66	102	ז
67	103	ח
68	104	ט
69	105	י
6A	106	ך
6B	107	כ
6C	108	ל
6D	109	ם
6E	110	ם
6F	111	ו
70	112	נ
71	113	ם
72	114	ע
73	115	ף
74	116	פ
75	117	ץ
76	118	צ
77	119	ק
78	120	ך
79	121	ש
7A	122	ת

Underline Print

Activates the 9th wire on all character cells to underline all printable characters, including a space (blank) character.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 43	27 67	ESC C

Underline Off

Turns off underline printing.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 44	27 68	ESC D

Double-High Off

Turns off double-high printing.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 45	27 69	ESC E

Double-High Font

Starts double-high printing. This command requires the printhead to make two passes to print one double-high line. The paper is automatically advanced between each pass. This command may be used with the Double-Wide Font command (OE).

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 48	27 72	ESC H

Pitch Selection

Selects the character pitch. The standard pitch on the receipt is 44 characters per line and compressed pitch is 56 characters per line. On the slip the number of characters per line is 42 or 51. When $n > 4$, text may wrap to the next line.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Value of n</u>
1B 50 n	27 80 n	ESC P n	See table

Value of n

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>	<u>Characters per line</u>		
			<u>DH</u>	<u>B780 Receipt</u>	<u>B780 Slip</u>
00	0	NUL	33	44	42
01	1	SOH	36	44	42
02	2	STX	40	44	42
03	3	ETX	44	44	51
04	4	EOT	50	56	51
05	5	ENQ	57	56	51
06	6	ACK	66	56	51

Upside-Down Off

Turns off upside-down printing.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 52	27 82	ESC R

Upside-Down Print

Starts upside-down printing. Available for both journal and validation printing. Lines are printed in the order they are received from the host. The first line of data is the last line of text after the slip is turned right-side up for reading.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 55	27 85	ESC U

Graphics Commands

These commands are used to control the way graphics are entered or printed. They are listed in numerical order of their hexadecimal codes.

Graphics

Enters graphics printing mode which prints all available dots (uses all wires in the printhead). Any combination of dots may be printed in a graphics cell. Each graphics cell is eight dots wide by nine dots high, with nine bytes of data needed to define the cell (each byte defines the row of eight dots). The command must precede the nine bytes that define the cell. Graphics and text may be printed on the same line.

Do not use the command again to turn off this graphics mode as the printer will expect another set of bytes to define a new cell.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1E	30	RS

The following representation of the graphics cell shows how the cell is defined and which bits define which dots in the cell (bit 0 is the least significant bit; bit 7 is the most significant bit).

	Bit Number						
	7	6	5	4	3	2	1
1st Byte	o	o	o	o	o	o	o
2nd Byte	o	o	o	o	o	o	o
3rd Byte	o	o	o	o	o	o	o
4th Byte	o	o	o	o	o	o	o
5th Byte	o	o	o	o	o	o	o
6th Byte	o	o	o	o	o	o	o
7th Byte	o	o	o	o	o	o	o
8th Byte	o	o	o	o	o	o	o
9th Byte	o	o	o	o	o	o	o

Each line may have up to 25 graphics cells (full-dot graphics). The print line is printed unidirectionally.

Use six Vertical Tab commands (0B) or one Line Feed command (0A) between each line (8 lines/inch).

Graphics: 5 Dot

Enters or exits graphics printing mode which prints only the top five dots of the column (corresponding to the top five wires of the printhead). These top five dots correspond to the least significant five bits (bits 0-4) of the data sent to the printer as shown in the table.

Dots (Top to Bottom)		Bit	
1st Dot (Top)	4	2^4	16
2nd Dot	3	2^3	8
3rd Dot	2	2^2	4
4th Dot	1	2^1	2
5th Dot (Bottom)	0	2^0	1

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 1D	27 29	ESC GS

Use the following characters to define the graphics (least significant five bits):

Hexadecimal: 20-3F
 Decimal: 32-63
 ASCII: SP-?

Each byte of data sent defines each column of the graphic to be printed. The first byte defines the column in the left margin, with the following bytes defining the columns to the right, for a total of up to 200 columns in the print line. The print line is printed unidirectionally. Graphics and text may be printed on the same line.

Use three Vertical Tab commands (0B) to overlap printing by half a dot with the next line. Each vertical tab advances the paper by 0.02083 inches, with three tabs advancing the paper by 0.062 inches.

Note: This DH printer command provides compatibility with earlier DH model printers. It is generally not used for new applications. See the Graphics command (1E) for the more generally used command.

Printer Status Commands

These commands enable the printer to communicate its status to the host computer.

The commands are listed numerically by hexadecimal code.

Status: 3 Bit

Transmits the status of the paper sensors and the condition of the printer. This command is processed immediately.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
05 03	5 3	ENQ ETX

The transmitted status is shown in the table:

Bit	0	1
0	Form Present	Form Not Present
1	Paper Present	Paper Not Present
2	Printer Is On-Line	Fault Condition

Note: This DH printer command provides compatibility with earlier DH model printers. It is generally not used for new applications. See the Status: 6 Bit command (1B 05) for the more generally used command.

Status: 6 Bit

Transmits the status of the paper sensors, cash drawers, forms clamp, and the condition of the printer. This command is processed immediately. The transmitted status is shown in the table below.

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 05	27 5	ESC ENQ

Bit	0	1
0	Form Present	Form Not Present
1	Paper Present	Paper Not Present
2	Printer Is On-Line	Fault Condition
3	Cash Drawer 1 Closed	Cash Drawer 1 Open
4	Cash Drawer 2 Closed	Cash Drawer 2 Open
5	Forms Clamp Closed	Forms Clamp Open

Status-Firmware

Used for RS-232C printers only. Causes the printer to return 3 bytes (000).

<u>Hexadecimal</u>	<u>Decimal</u>	<u>ASCII</u>
1B 56	27 86	ESC V

Appendix A: Commands listed by hexadecimal code

Code (hexadecimal)	Command	Page
09	Horizontal tab	46
0A	Print and feed paper one line	45
0C	Print and eject slip	43
0C	Print and return to standard mode/print and eject slip	99
0D	Print and carriage return	43
10	Clear printer	36
10 04 <i>n</i>	Real-time status transmission	85
10 05 <i>n</i>	Real-time request to printer (DLE sequence)	88
10 04 07	Real-time imager status	127
10 04 03	Real-time error status	128
10 05 06	Real-time cancel image transmission	128
11	Close form	36
12	Select double-wide characters	52
13	Select single-wide characters	52
14 <i>n</i>	Feed <i>n</i> print lines	43
15 <i>n</i>	Feed <i>n</i> dot rows	43
16 <i>n</i>	Add <i>n</i> extra dot rows	44
17	Print	45
18	Cancel print data in page mode	99
18	Open form	36
1A	Perform partial knife cut (or code 1B 6D)	36
1B (+*.BMP file)	Download BMP logo	62
1B 07	Generate tone	37
1B 08 00	Restore default settings	119
1B 08 01 <i>n1 n2 n3 n4</i>	Set IP address	119
1B 08 02 <i>n1 n2 n3 n4</i>	Set net mask	119
1B 08 03 <i>n1 n2 n3 n4</i>	Set gateway	119
1B 08 04 <i>n1 n2 n3 n4</i>	Set raw TCPIP port	120
1B 08 05 <i>n1</i>	LP Daemon	120
1B 08 06 <i>n1</i>	Telnet Daemon	120
1B 08 07 <i>n1</i>	BootP	120
1B 08 08 <i>n1</i>	DHCP (auto-configuration)	120
1B 08 09 <i>n1</i>	Inactivity timeout	121
1B 08 0A <i>n1</i>	Keep-alive pings (arps)	121

Code (hexadecimal)	Command	Page
1B 0C	Print data in page mode	99
1B 12	Select 90 degree counter-clockwise rotated print	52
1B 14 <i>n</i>	Set column	47
1B 16 <i>n</i>	Select pitch (column width)	53
1B 20 <i>n</i>	Set right-side character spacing	53
1B 21 <i>n</i>	Select print mode	53
1B 24 <i>nL nH</i>	Set absolute starting position	47
1B 25 <i>n</i>	Select or cancel user-defined character set	54
1B 26 <i>s c1 c2 n1 d1...nn dn</i>	Define user-defined character sets	54
1B 27 <i>m a0 a1 a2 d1...dm</i>	Write to user data storage	112
1B 2A <i>m n1 n2 d1...dn</i>	Select bit image mode	62
1B 2D <i>n</i>	Select or cancel underline mode	56
1B 32	Set vertical line spacing to 1/6 inch	47
1B 33 <i>n</i>	Set vertical line spacing	48
1B 34 <i>m a0 a1 a2</i>	Read from user data storage	112
1B 3A 30 30 30	Copy character set from ROM to RAM	56
1B 3C	Return home	37
1B 3D <i>n</i>	Select peripheral device (for multi-drop)	37
1B 3F <i>n</i>	Cancel user-defined character	56
1B 40	Initialize printer	37
1B 43 <i>n</i>	Set slip paper eject length	37
1B 44 [<i>n</i>] <i>k 00</i>	Set horizontal tab positions	48
1B 45 <i>n</i>	Select or cancel emphasized mode	57
1B 47 <i>n</i>	Select double-strike	57
1B 48	Cancel double-strike	58
1B 49 <i>n</i>	Select or cancel italic print	58
1B 4A <i>n</i>	Print and feed paper	45
1B 4B <i>n</i>	Print and reverse feed paper	45
1B 4C	Select page mode	100
1B 4C <i>n1 n2 d1...dn</i>	Select double-density graphics (A756 emulation)	63
1B 52 <i>n</i>	Select international character set	58
1B 53	Select standard mode	101
1B 54 <i>n</i>	Select print direction in page mode	101
1B 55 <i>n</i>	Select unidirectional print on impact station	38
1B 56 <i>n</i>	Select or cancel 90 degree clockwise rotated print	59
1B 57 <i>n1, n2...n8</i>	Set print area in page mode	101
1B 59 <i>n1 n2 d1...dn</i>	Select double-density graphics	63

Code (hexadecimal)	Command	Page
1B 5B 7D	Switch to flash download (boot mode)	116
1B 5C <i>n1 n2</i>	Set relative print position	49
1B 61 <i>n</i>	Select justification	50
1B 63 30 <i>n</i>	Select receipt or slip for printing; slip for MICR read	38
1B 63 31 <i>n</i>	Select receipt or slip for setting line spacing	38
1B 63 33 <i>n</i>	Select paper sensors to output paper end signals (parallel only)	38
1B 63 34 <i>n</i>	Select sensors to stop printing	39
1B 63 35 <i>n</i>	Enable or disable panel button	39
1B 64 <i>n</i>	Print and feed <i>n</i> lines	45
1B 65 <i>n</i>	Print and reverse feed <i>n</i> lines	46
1B 66 <i>m n</i>	Set slip paper waiting time	39
1B 6A <i>k</i>	Read from non-volatile memory (NVRAM)	113
1B 6D	Perform partial knife cut (or code 1A)	36
1B 70 <i>n p1 p2</i>	Generate pulse to open cash drawer	39
1B 71	Release paper	42
1B 72 <i>m</i>	Set current color	40
1B 73 <i>n1 n2 k</i>	Write to non-volatile memory (NVRAM)	113
1B 74 <i>n</i>	Select international character table	58
1B 75 0	Transmit peripheral device status	76
1B 76	Transmit paper sensor status	77
1B 77 01	Read MICR data and transmit	105
1B 77 02	Read MICR data and transmit (B780 only)	105
1B 77 50	Define parsing format, save in NVRAM	106
1B 77 52	Transmit last MICR read	105
1B 77 70	Define parsing format, do not save permanently	106
1B 7B <i>n</i>	Select or cancel upside-down print mode	59
1C	Select slip station	40
1D 00	Return boot sector firmware part number	116
1D 01	Return segment number status of flash memory	117
1D 02 <i>n</i>	Select flash memory sector to download	117
1D 03 <i>n</i>	Real-time request to printer (GS sequence)	88
1D 05	Real-time printer status transmission	89
1D 06	Get firmware CRC	117
1D 07	Return microprocessor CRC	117
1D 0E	Erase all flash contents except boot sector	117
1D 0F	Return main program flash CRC	118
1D 10 <i>n</i>	Erase selected flash sector	118

Code (hexadecimal)	Command	Page
1D 11 <i>aL aH cL cH d1...dn</i>	Download to active flash sector	118
1D 14 <i>n</i>	Reverse feed <i>n</i> lines	46
1D 15 <i>n</i>	Reverse feed <i>n</i> dots	46
1D 21 <i>n</i>	Select character size	59
1D 22 55 <i>n1 n2</i>	Flash memory user sectors allocation	114
1D 22 <i>n</i>	Select memory type (SRAM/flash)	113
1D 23 <i>n</i>	Select the current logo (downloaded bit image)	63
1D 24 <i>nL nH</i>	Set absolute vertical print position in page mode	102
1D 2A <i>n1 n2 d1...dn</i>	Define downloaded bit image	64
1D 2F <i>m</i>	Print downloaded bit image	64
1D 3A	Select or cancel macro definition	104
1D 40 <i>n</i>	Erase user flash sector	114
1D 42 <i>n</i>	Select or cancel white/black reverse print mode	60
1D 48 <i>n</i>	Select printing position for HRI characters	93
1D 49 02	Transmit Printer Type (Extended Existing Command)	134
1D 49 40 <i>n</i>	Transmit printer ID, remote diagnostics extension	79
1D 49 <i>n</i>	Transmit printer ID	77
1D 4C <i>nL nH</i>	Set left margin	50
1D 50 <i>x y</i>	Set horizontal and vertical minimum motion units	51
1D 56 <i>m</i>	Select cut mode and cut paper (or code 1D 56 <i>m n</i>)	41
1D 56 <i>m n</i>	Select cut mode and cut paper (or code 1D 56 <i>m</i>)	41
1D 57 <i>nL nH</i>	Set printing area width	51
1D 5C <i>nL nH</i>	Set relative vertical print position in page mode	103
1D 5E <i>r t m</i>	Execute macro	104
1D 61 <i>n</i>	Select or cancel unsolicited status mode	90
1D 66 <i>n</i>	Select pitch for HRI characters	93
1D 68 <i>n</i>	Select bar code height	94
1D 6B <i>m</i>	Print bar code	94
1D 70 <i>a b c d e f</i>	Select PDF 417 parameters	95
1D 72 <i>n</i>	Transmit status	81
1D 77 <i>n</i>	Select bar code width	97
1D 81 <i>m n</i>	Set paper type (ColorPOS [®])	41
1D 82 <i>n1...n72 or ...n80</i>	Print raster monochrome graphics (ColorPOS [®])	65
1D 83 <i>n1...n144 or ...n160</i>	Print raster color graphics (ColorPOS [®])	65
1D 84 <i>m n1 n2 d1...dx</i>	Download logo image (ColorPOS [®])	65
1D 85 <i>m n</i>	Reverse color text mode (ColorPOS [®])	61
1D 86 <i>m</i>	Monochrome shade mode (ColorPOS [®])	67

Code (hexadecimal)	Command	Page
1D 87 <i>m</i>	Color shade mode (ColorPOS®)	67
1D 89 <i>n m</i>	Logo print with color plane swap (ColorPOS®)	68
1D 8B <i>n m o</i>	Apply shading to logo (ColorPOS®)	66
1D 8C <i>n m</i>	Merge watermark mode (ColorPOS®)	66
1D 8D <i>n m</i>	Text strike-through mode (ColorPOS®)	61
1D 90 <i>m x y o p q</i>	Form and merge real-time surround graphic	68
1D 91 <i>n</i>	Save graphics buffer as logo	69
1D 92 <i>n</i>	Background logo print mode	69
1D 97 <i>m n</i>	User storage status	115
1D 99 <i>l m n o</i>	Apply margin message mode (ColorPOS®)	70
1D 9A <i>n m o</i>	Shade and store logo (ColorPOS®)	69
1D 9B <i>m n</i>	Logo print with knife cut	70
1D A0 <i>n l n h</i>	Set temporary max target speed	71
1D B0	Calibrate Scanner	122
1D BA <i>p</i>	Eject from Scanner	132
1D BB <i>nL nH</i>	Get Buffered Image Attributes	133
1D BB <i>nL nH</i>	Free Image	133
1D BC <i>m</i>	Free Imager Buffering	133
1D BD	Get Buffered Image List	133
1D B1 <i>m n</i>	Configure/Change Image Transmission Port	123
1D B2 <i>n</i>	Set Top Entry Startup Delay	123
1D B3 <i>m p r</i>	Set Image Format Properties	123
1D B4 <i>nL nH t0 . . tm</i>	Define/Update Application Tag Values	125
1D B6	Attach Scan Application Tags	126
1D B7	Return Integer Status	126
1D B8 <i>m p r</i>	Wait for Scan & Optionally Transmit	128
1D B9 <i>s t m nL nH pL pH</i>	Transmit Image	130
1D C5 <i>nL nH m d1-dn-1</i>	Configure Binarization Methods and Attributes	124
1D C6 <i>m n</i>	Configure Scan Options	134
1D C7 <i>wL wH lenL lenH</i>	Configure Max Scan Width & Height	134
1D FF	Reset firmware	119
1E	Select receipt station	40
1F 03 16 05 <i>n</i>	Set interpretation of "Set current color" command	42
1F 03 16 <i>f s p/r t</i>	Set LogoEZ® colorization	71
1F 03 17 <i>a m s</i>	Set LogoEZ® attribute mapping	74
1F 04 <i>n</i>	Convert 6-dots/mm bitmap to 8-dots/mm bitmap	75
1F 05 <i>n</i>	Select superscript or subscript modes	61

152 Appendix A: Commands by hexadecimal code

1F 56	Send printer software version	83
1F 74	Print test form	42
1F 7A <i>n</i>	Real-time disable	89
1F 7B <i>n</i>	Enable constant speed logos	75

Appendix B: Resident Character Sets

Code Page 437 (US)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0	
		SP	0	@	P	´	p	Ç	É	á	⋮		∥	∞	≡	
01	0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1	
1	17	!	1	A	Q	a	q	ü	æ	í	⋮	⊥	⊥	β	±	
		33	43	53	63	73	83	93	103	113	123	133	143	153	163	173
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2	
	7	18	28	38	48	58	68	78	88	98	108	118	128	138	148	158
		"	2	B	R	b	r	é	Æ	ó	⋮	|	∥	Γ	≥	
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3	
	3	19	29	39	49	59	69	79	89	99	109	119	129	139	149	159
		#	3	C	S	c	s	â	ô	ú		⊥	⊥	π	≤	
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4	
	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5	
	5	21	31	41	51	61	71	81	91	101	111	121	131	141	151	161
		\$	4	D	T	d	t	ä	ö	ñ	|	—	|	Σ	∫	
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6	
	6	22	32	42	52	62	72	82	92	102	112	122	132	142	152	162
		&	6	F	V	f	v	â	û	a	∥	⊥	∥	μ	÷	
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7	
	7	23	33	43	53	63	73	83	93	103	113	123	133	143	153	163
		'	7	G	W	g	w	ç	ù	o		⊥	⊥	τ	≈	
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8	
	8	24	34	44	54	64	74	84	94	104	114	124	134	144	154	164
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9	
	9	25	35	45	55	65	75	85	95	105	115	125	135	145	155	165
		(	8	H	X	h	x	ê	ÿ	¿	|	=	⊥	ø	°
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA	
	10	26	36	46	56	66	76	86	96	106	116	126	136	146	156	166
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	AB	BB	CB	DB	EB	FB	
	11	27	37	47	57	67	77	87	97	107	117	127	137	147	157	167
		+	8	J	Z	j	z	è	Ü	¬	∥	⊥	⊥	Ω	•	
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C	AC	BC	CC	DC	EC	FC	
	12	28	38	48	58	68	78	88	98	108	118	128	138	148	158	168
		,	<	L	\	|	|	î	£	¼	⊥	⊥	■	∞	∞	
0D	1D	2D	3D	4D	5D	6D	7D	8D	9D	AD	BD	CD	DD	ED	FD	
	13	29	39	49	59	69	79	89	99	109	119	129	139	149	159	169
		-	=	M	]	m	}	ì	¥	ı	⊥	=	■	∅	²
0E	1E	2E	3E	4E	5E	6E	7E	8E	9E	AE	BE	CE	DE	FE	FF	
	14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
0F	1	2F	3F	4F	5F	6F	7F	8F	9F	AF	BF	CF	DF	EF	FF	
	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
		/	?	O	-	o	△	Ä	f	»	|	⊥	■	∅	BLANK	

Code page 737 (Greek)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
		SP	0	@	P	`	p	A	P	ι	⋮	L	⌋	ω	Ω
	0	16	32	48	64	80	96	112	128	144	160	176	192	208	240
01	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1
		!	1	A	Q	a	q	B	Σ	κ	⋮	⌋	⌋	α	±
	1	17	33	49	65	81	97	113	129	145	161	177	193	209	241
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
		"	2	B	R	b	r	Γ	T	λ	⋮	⌋	⌋	ε	≥
	2	18	34	50	66	82	98	114	130	146	162	178	194	210	242
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3
		#	3	C	S	c	s	Δ	Υ	μ	|	⌋	⌋	η	≤
	3	19	35	51	67	83	99	115	131	147	163	179	195	211	243
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4
		\$	4	D	T	d	t	E	φ	v	⌋	—	⌋	ï	ï
	4	20	36	52	68	84	100	116	132	148	164	180	196	212	244
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
		%	5	E	U	e	u	Z	X	ξ	⌋	⌋	⌋	ι	ÿ
	5	21	37	53	69	85	101	117	133	149	165	181	197	213	245
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
		&	6	F	V	f	v	H	Ψ	ο	⌋	⌋	⌋	ο	÷
	6	22	38	54	70	86	103	118	134	150	166	182	198	214	246
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
		'	7	G	W	g	w	Θ	Ω	π	⌋	⌋	⌋	ù	≈
	7	23	39	55	71	87	103	119	135	151	167	183	199	215	247
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8
		(	8	H	X	h	x	Ι	α	ρ	⌋	⌋	⌋	ü	°
	8	24	40	56	72	88	104	120	136	152	168	184	200	216	248
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
		)	9	Ι	Υ	i	y	K	β	σ	⌋	⌋	⌋	ώ	•
	9	25	41	57	73	89	105	121	137	153	169	185	201	217	249
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA
		*	:	J	Z	j	z	Λ	γ	ς	⌋	⌋	⌋	Α	•
	10	26	42	58	74	90	106	122	138	154	170	186	202	218	250
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	AB	BB	CB	DB	EB	FB
		+	;	K	[	k	{	M	δ	τ	⌋	⌋	■	Ε	√
	11	27	43	59	75	91	107	123	139	155	171	187	203	219	251
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C	AC	BC	CC	DC	EC	FC
		,	<	L	\	l		N	ε	υ	⌋	⌋	■	Η	n
	12	28	44	60	76	92	108	124	140	156	172	188	204	220	252
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		-	=	M]	m	}	Ξ	ζ	φ	⌋	⌋	■	Ι	²
	13	29	45	61	77	93	109	125	141	157	173	189	205	221	253
0E	1E	2E	3E	4E	5E	6E	7E	8E	9E	AE	BE	CE	DE	EE	FE
		.	>	N	^	n	~	O	η	X	⌋	⌋	■	Ο	■
	14	30	46	62	78	94	110	126	142	158	174	190	206	222	254
0F	1F	2F	3F	4F	5F	6F	7F	8F	9F	AF	BF	CF	DF	EF	FF
		/	?	O	_	ο	Δ	Π	θ	ψ	⌋	⌋	■	Υ	BLANK
	15	31	47	63	79	95	111	127	143	159	175	191	207	223	255

Code page 850 (Multilingual)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
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01	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1
1	17	33	!	1	A	Q	a	q	ü	æ	í	⌞	Ð	ß	±
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
2	18	34	"	2	B	R	b	r	é	Æ	ó	⌞	Ê	Ô	=
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3
3	19	35	#	3	C	S	c	s	â	ô	ú	⌞	Ë	Ò	¾
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4
4	20	36	\$	4	D	T	d	t	ä	ö	ñ	⌞	È	õ	¶
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
5	21	37	%	5	E	U	e	u	à	ò	Ñ	+	Ì	Õ	§
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
6	22	38	&	6	F	V	f	v	â	û	ª	Â	ã	í	µ
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
7	23	39	'	7	G	W	g	w	ç	ù	º	À	Ã	î	þ
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8
8	24	40	(	8	H	X	h	x	ê	ÿ	¿	©	Ł	ï	º
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
9	25	41	)	9	I	Y	i	y	ë	Ö	®	⌞	Ɔ	Ú	…
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA
10	26	42	*	:	J	Z	j	z	è	Ü	¬	⌞	Ɔ	Û	.
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	AB	BB	CB	DB	EB	FB
11	27	43	+	;	K	[	k	{	ï	ø	½	⌞	⌞	Ü	¹
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C	AC	BC	CC	DC	EC	FC
12	28	44	,	<	L	\	l	|	î	£	¼	⌞	■	ý	³
0D	1D	2D	3D	4D	5D	6D	7D	8D	9D	AD	BD	CD	DD	ED	FD
13	29	45	-	=	M	]	m	}	ì	Ø	¡	⌞	⌞	Ý	²
0E	1E	2E	3E	4E	5E	6E	7E	8E	9E	AE	BE	CE	DE	EE	FE
14	30	46	.	>	N	^	n	~	Ä	×	«	¥	⌞	İ	■
0F	1F	2F	3F	4F	5F	6F	7F	8F	9F	AF	BF	CF	DF	EF	FF
15	31	47	/	?	O	_	o	△	Å	f	»	⌞	■	,	

Code Page 852 (Slavic)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
01	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	AB	BB	CB	DB	EB	FB
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C	AC	BC	CC	DC	EC	FC
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
0D	1D	2D	3D	4D	5D	6D	7D	8D	9D	AD	BD	CD	DD	ED	FD
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
0E	1E	2E	3E	4E	5E	6E	7E	8E	9E	AE	BE	CE	DE	EE	FE
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
0F	1F	2F	3F	4F	5F	6F	7F	8F	9F	AF	BF	CF	DF	EF	FF
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Code page 858 (with Eurosymbol)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
			0	@	P	`	p	Ç	É	á	⋮	Ⓛ	ð	Ó	-
01	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
		!	1	A	Q	a	q	ü	æ	í	⋮	⊥	Ð	ß	±
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
		"	2	B	R	b	r	é	Æ	ó	⋮	⊥	Ê	Ô	=
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
		#	3	C	S	c	s	â	ô	ú	|	⊥	Ë	Ò	¾
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
		\$	4	D	T	d	t	ä	ö	ñ	⊥	-	È	õ	¶
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
		%	5	E	U	e	u	à	ò	Ñ	Á	+	€	Õ	§
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
		&	6	F	V	f	v	â	û	a	Â	ã	Í	μ	÷
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
		'	7	G	W	g	w	ç	ù	°	À	Ã	Î	þ	¸
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
		(	8	H	X	h	x	ê	ÿ	¿	©	ℒ	Ï	ƒ	°
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
		)	9	I	Y	i	y	ë	Ö	®	⊥	⊥	⊥	Ú	¨
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
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11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
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12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
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14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
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15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
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Code page 860 (Portugese)

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02	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2	
	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
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04	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4	
	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
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05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5	
	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
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06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6	
	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
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07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7	
	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
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08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8	
	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
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	9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA	
LF	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
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Code page 862 (Hebrew)

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	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
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	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
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	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
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		\$	4	D	T	d	t	ה	פ	ñ	⌒	⌒	⌒	Σ	∫	
	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
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		%	5	E	U	e	u	ו	ץ	Ñ	⌒	⌒	⌒	σ	∫	
	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6	
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	6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7	
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	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
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	8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
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	10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
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	11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
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	12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
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	13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
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	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Code page 863 (French Canadian)

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02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
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2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3
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3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4
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4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
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5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
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6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
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7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
08	18	28	38	48	58	68	78	88	98	A8	B8	C8	D8	E8	F8
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8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
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9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
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10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
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11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
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12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
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13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
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15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

Code page 865 (Nordic)

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06	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
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07	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230	246
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08	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
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Code page 866 (Cyrillic)

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01	11	21	31	41	51	61	71	81	91	A1	B1	C1	D1	E1	F1	
		!	1	А	Q	а	q	Б	С	б	⋮	⌒	⌒	с	ё	
	1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2	
		"	2	В	R	в	r	В	Т	в	⋮	⌒	⌒	т	Є	
	2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
03	13	23	33	43	53	63	73	83	93	A3	B3	C3	D3	E3	F3	
		#	3	С	S	с	s	Г	У	г		⌒	⌒	у	є	
	3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
04	14	24	34	44	54	64	74	84	94	A4	B4	C4	D4	E4	F4	
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	4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
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	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6	
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	6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7	
		'	7	G	W	g	w	З	Ч	з	⌒	⌒	⌒	ч	ѹ	
	7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
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Appendix C: Electronic Journal

The Electronic Journal feature is for use with an application that does not support electronic journal. The printer can be used to store a variety of transactions.

Electronic Journal Storage

There are two methods for activating Electronic Journal:

1F 03 18 01 n Auto Journal Mode via Configuration Command:

<u>Value of n</u>	<u>Data saved in journal</u>
1	Receipt
2	Slip
3	Validation
4	Receipt and slip
5	Receipt and validation
6	Slip and validation
7	Receipt, slip, and validation

- The printer can be configured to power up in Auto Journal Mode using command 1F 03 18 01 n. Any combination of print stations can be configured. This configuration is saved over power cycle. The electronic journal configuration information is printed on the second diagnostic page.
- Most commands and data printed are saved in the journal flash buffer.
- Logos and graphics printed on the receipt are **not** saved in the journal flash buffer.
- Multiple line feeds are not saved in the journal flash buffer.
- A knife cut sent to the receipt is saved in the journal flash buffer as two print commands: 0x0A 0x0A.

Auto Journal Mode via Runtime Command:

1F 0A C1 - Enable

1F 0A C2 - Disable

Commands and data printed on the *receipt only* are stored in the Journal flash buffer.

Journal RAM buffer

Journal data is temporarily buffered in RAM until the printer is triggered to write it to flash. At power up 4K bytes of RAM will be dynamically allocated. In the unlikely event that 4K bytes are not available, 2K will be allocated. If for some reason 2K bytes are not available, the electronic journal feature cannot be used. Allocation success or failure information is available to the interface via commands described below.

Loss of power results in loss of any data currently in the journal RAM buffer.

Triggers that cause the journal data in RAM to be written to flash are:

- Knife Cut command
- Write Journal RAM Data to Flash command (described below)
- Printer is idle for 10 seconds
- Reset Printer command (0x1D 0xFF)
- Print To Journal command (described below)
- RAM becomes filled before one of these other triggers occurs.

The printer goes busy at the communication interface while writing to the journal flash buffer.

Journal Flash buffer

A portion of flash memory is available for the journal flash buffer. By using the Flash Memory User Sectors Allocation command (0x1D 0x22 0x 55 **n1 n2**), the user can allocate the number of 64Kbyte sectors used for logos, user storage, and journal flash buffer.

If there are **X** sectors available, the Flash Memory User Sectors Allocation command will allocate **n1** sectors to logos, **n2** sectors to user storage, and **(X – n1 – n2)** sectors for the journal flash buffer. If all available sectors are allocated for logos and user storage, there is no flash available for the journal.

The firmware default allocation is 1 sector for logos, 1 sector for user storage, and the rest for journal, but this may be changed at printer build time. Journal flash allocation and flash usage information is available via commands described below, and is printed on the diagnostics form.

Before erasing flash, check to see if there is journal data stored, and print it out if necessary.

Triggers that cause the journal flash buffer to be cleared are:

- Clear Journal command (described below)
- Flash Memory User Sectors Allocation command (0x1D 0x22 0x 55 **n1 n2**) reallocates flash memory.
- New Flash firmware is downloaded to the printer

Exception Conditions in Auto Journal Mode

When there isn't enough memory available in the journal flash buffer, the printer beeps at each receipt to signal the flash full condition. The printer will print a duplicate receipt and cut after it, instead of writing it to flash, and clear out the RAM buffer. When the trigger for writing to flash is a knife cut (which would be the usual case in Auto Journal Mode) the customer receipt is easily detached from the duplicate receipt by the operator.

If a receipt is over 4Kbytes in size, and there are less than 4Kbytes available in the journal flash buffer, the printer will **not** print a portion of the duplicate receipt in the middle of the original receipt. This portion of the duplicate receipt is lost.

Printing and Erasing the Journal Flash Buffer:

Operator Activation of Journal Print and Erase

Enabled via 1F 03 2E 01. Disabled via 1F 03 2E 00. Enabled and disabled also via the config menu under the Emulation/Software Options sub-menu. Default is disabled. Option prints on diagnostic Form II:

Journal print via Command Only (when disabled)

Journal print via Operator (when enabled)

Printing Journal via Operator (when enabled):

- 1) Open the receipt cover.
- 2) Press the paper feed button three times quickly, about a half second each. A short tone will sound each time. If you press the feed button too long, or wait too long between depressions, a longer tone will sound and the sequence is aborted; you have to start over.
- 3) Close the receipt cover.

If there is nothing in the journal, the message "No Flash journal" prints out on the receipt. If there is something in the journal, it prints on the receipt, followed by a query to the operator printed on the receipt:

Erase journal?

Yes --> Long click

No --> Short click

1F 0A C3 Clear Journal

Erases the journal flash buffer. Printer goes busy at the communication interface while the flash is being erased. Application should not send any further data or commands until printer goes not busy at the communication interface. Printer returns a 0x0D when the erase is complete. At this point the application can resume sending data to the printer.

1F 0A C4 Print Journal

Prints contents of journal data saved in flash. Printer goes busy at the communication interface. Application should not send any further data or commands until printer goes not busy at the communication interface. If paper runs out, printing will pause until a new roll is loaded, then resume where it left off.

Points to note when printing the journal:

- Receipt character attributes and bar code attributes are set to their default values before and after printing the journal.
- Receipt station is selected.
- Macro definitions are not cleared.
- If the macro execution command is in the journal, the macro definition should be in the journal also. If not, the printed journal might look OK before a power cycle when the macro definition is still in memory. After a power cycle the macro definition will be gone.
- If User Defined characters are printed, their definitions (0x1B 0x26 ...) should be stored in flash (via 0x1D 0x22 0x33) and their selection command (0x1B 0x25 0x01) should be in the journal buffer.

1F 0A C5 Return Journal Status

Returns one byte of status.

bit 0 = 0 >> Write to flash successful

bit 0 = 1 >> Write to flash fail

bit 1 = 0 >> RAM allocation for journal data successful

bit 1 = 1 >> RAM allocation for journal data fail

bit 2 = 0 >> Auto Journal Disabled

bit 2 = 1 >> Auto Journal Enabled

1F 0A C6 Return Journal Flash Size

Returns two 3-byte counts in hexadecimal notation, as **n1 n2 n3** and **m1 m2 m3**.

Journal flash buffer total size = (**n1** * 0x10000 + **n2** * 0x100 + **n3**)
= (**n1** * 65,536 + **n2** * 256 + **n3**) decimal

Journal flash buffer used = (**m1** * 0x10000 + **m2** * 0x100 + **m3**)
= (**m1** * 65,536 + **m2** * 256 + **m3**) decimal

Journal flash buffer total size corresponds directly to this line on the diagnostics form:

Flash Journal Size : nnnn kbytes

Journal flash buffer used corresponds inversely to this line on the diagnostics form:

Journal Unused : mmmm kbytes

1F 0A C7 Write Journal RAM Data to Flash

Writes the journal data in RAM to Flash and marks it as a complete journal entry with two print commands: 0x0A 0x0A. Printer goes busy at the communication interface while the flash is being written. Application should not send any further data or commands until printer goes not busy at the communication interface.

