

UNISYS e-@ction
SLIP, VALIDATION, AND RECEIPT
PRINTER

EFP9800 Series
Owner's Guide

UNISYS

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Page Status

Page	Issue
iii	-002
iv	Blank
v through xv	-002
xvi	Blank
1-1 through 1-6	-002
2-1 through 2-16	-002
3-1 through 3-33	-002
3-34	Blank
4-1 through 4-7	-002
4-8	Blank
5-1 through 5-10	-002
6-1 through 6-78	-002
7-1 through 7-20	-002
8-1 through 8-15	-002
8-16	Blank
9-1 through 9-24	-002
10-1 through 10-11	-002
10-12	Blank
11-1 through 11-13	-002
11-14	Blank
A-1 through A-14	-002

Contents

Section 1 About the EFP9800 Printer

Features and Options	1-3
Receipt Station Features	1-3
Journal Station Features	1-3
Slip/Validation Station Features	1-3
General Features	1-4
Options.....	1-4
Maintaining and Cleaning the Printer	1-4
Ordering Paper and Supplies	1-5
Receipt/Journal Paper	1-5
Slips and Forms	1-5
Other Supplies.....	1-6
Documentation	1-6

Section 2 Operating the Printer

Using the Controls	2-1
Changing Paper	2-2
Changing Receipt Paper	2-3
Removing the Old Receipt Paper Roll	2-4
Loading the New Receipt Paper Roll.....	2-5
Changing Receipt/Journal Paper.....	2-6
Removing the Printed Journal	2-6
Loading the New Receipt/Journal Paper Roll.....	2-7
Verifying Checks	2-8
Printing on Slips and Checks	2-11
Validating Slips and Checks	2-13
Changing the Ribbon Cassette	2-14
Replacing the Printhead	2-16
Adjusting the Paper Low Sensor	2-16
Procedure.....	2-17

Section 3 Diagnostics and Print Tests

Level 0 Diagnostics	3-1
Level 1 Diagnostics	3-2
Information About DIP Switch Settings	3-2
Switch Entry Mode	3-4
Choose a Printer Emulation	3-5
Set Internal Switch Pack Values in NVRAM	3-7
EFP9800 ESC/POS Internal Switch Pack Settings (Includes Epson ESC/POS).....	3-9
Ithaca Peripherals Proprinter Internal Switch Pack Settings	3-11
NCR 5021 Internal Switch Pack Settings (Serial Interface Units Only)	3-12
EF4270 Internal Switch Pack Settings	3-13
Flash Download Mode	3-17
Data Scope Mode	3-19
Enter Data Scope Mode.....	3-19
Exit Data Scope Mode	3-21
Enabling or Disabling the Cover Open Switch	3-21
Verifying Read of MICR Characters	3-23
Checking MICR Noise Level.....	3-25
Selecting the Font for the MICR Check Reader	3-26
Diagnostic Print Tests	3-28
Print Configuration Information	3-28
Continuous Slip Printing.....	3-29
Print Each Character in the ASCII Character Set.....	3-30
General Print Test.....	3-31
Sample of Configuration Printout.....	3-32
Adjusting the Printhead Gap.....	3-33

Section 4 When Something Goes Wrong

Printer Not Operating	4-2
Indicators Showing a Problem	4-3
Printer Does Not Feed Receipt/Journal Paper	4-3
Carriage and Paper Jams	4-4
Slips, Forms, or Checks Not Feeding Properly	4-4
Slips, Forms, or Checks Skew When Feeding into the Printer	4-5
Some Dots are Missing	4-5
Ribbon Tears or Frays More Quickly Than Expected	4-5
Overall Print is Light or Smudged	4-6
Other Serious Problems	4-7

Getting Service4-7

Section 5 Communication

Interfaces5-1
Sending Commands5-1
 Using DOS to Send Commands.....5-1
 Using BASIC to Send Commands5-2
RS-232C Interface5-2
 RS-232C Interface Protocols.....5-2
 XON/XOFF Protocol5-3
 DTR/DSR Protocol5-4
 RS-232C Interface Connectors.....5-4
 RS-232C Communication Connector Pin
 Assignments5-4
 RS-232C 9-Pin to 9-Pin Communication Connector
 Pin Assignments5-4
 RS-232C 25-Pin (Host Computer) to 9-Pin
 Communication Connector Pin Assignments .5-5
 Power Cable Connector Pin Assignments5-6
 Cash Drawer Connector Pin Assignments5-6
Parallel Interface5-7
 Parallel Interface Connectors5-7
 Parallel Communication Connector Pin
 Assignments5-7
 Power Cable Connector Pin Assignments5-8
 Cash Drawer Connector Pin Assignments5-9
Setting Switches5-10

Section 6 EFP9800 ESC/POS Commands

List of EFP9800 ESC/POS Commands6-1
EFP9800 ESC/POS Command Descriptions6-4
 Printer Function Commands.....6-4
 Horizontal Tabs: Skip to Next Tab Stop.....6-5
 Standard Mode6-5
 Page Mode6-5
 Line Feed6-5
 Standard Mode6-5
 Page Mode6-5
 Eject Slip6-6
 Standard Mode6-6
 Page Mode6-6

Contents

Carriage Return	6-6
Standard Mode	6-6
Page Mode	6-6
Cancel Print Data in Page Mode.....	6-7
Set Right-Side Character Spacing	6-7
Standard Mode	6-7
Page Mode	6-8
Select Print Mode(s).....	6-8
Select Print Mode(s) (for Windows™ Printer Drivers).....	6-10
Set Absolute Starting Position	6-10
Standard Mode	6-11
Page Mode	6-11
Set Line Spacing to Default Spacing	6-11
Standard Mode	6-11
Page Mode	6-11
Set Line Spacing.....	6-12
Standard Mode	6-12
Page Mode	6-12
Return Home	6-12
Select Peripheral Device	6-13
Initialize Printer	6-13
Set Slip Eject Length	6-14
Set Horizontal Tab Positions	6-14
Print and Feed Paper	6-15
Standard Mode	6-15
Page Mode	6-15
Select Page Mode.....	6-16
Select Print Direction in Page Mode	6-17
Set/Cancel Uni-Directional Printing.....	6-18
Standard Mode	6-19
Page Mode	6-19
Set Printing Area in Page Mode	6-19
Set Relative Print Position	6-21
Standard Mode	6-21
Page Mode	6-21
Select Justification	6-22
Select Print Paper(s).....	6-22
Select Paper(s) For Setting Line Spacing	6-23
Select Paper Sensor(s) to Stop Printing.....	6-24
Enable/Disable Paper Feed Button.....	6-25
Print and Feed <i>n</i> Lines	6-25
Standard Mode	6-25
Page Mode	6-25

Set Slip Waiting Time	6-25
Generate Pulse	6-26
Release	6-26
Select Head Energizing Time.....	6-27
Set Left Margin.....	6-27
Set Fundamental Calculation Pitch	6-28
Set Printable Area Width	6-28
Print Characteristics Commands	6-29
Select/Cancel User-Defined Character Set.....	6-29
Define User-Defined Characters	6-30
Set/Cancel Underline	6-34
Cancel User-Defined Characters	6-35
Set/Cancel Emphasized Mode.....	6-35
Set/Cancel Double-Strike Mode	6-36
International Character Set.....	6-36
Set/Cancel 90 Degree Clockwise Rotation.....	6-39
Select Character Code Table	6-39
Set/Cancel Upside Down Printing	6-39
Graphics Commands.....	6-40
Select Bit Image Mode	6-40
Define Downloaded Bit Image.....	6-42
Print Downloaded Bit Image	6-43
Printer Status Commands.....	6-44
Transmit Peripheral Device Status	6-45
Transmit Paper Sensor Status.....	6-46
Transmit Printer ID.....	6-47
Enable/Disable Automatic Status Back (ASB)	6-48
Identifying Auto Status Back Bytes Transmitted by the Printer.....	6-53
Transmit Status	6-54
Real Time Commands	6-57
Real Time Status Transmission.....	6-58
Real Time Request to Printer.....	6-62
Bar Code Commands.....	6-64
Select Printing Position of HRI Characters (Receipt Station).....	6-64
Select Pitch of HRI Characters (Receipt Station) ...	6-64
Select Height of Bar Code (Receipt Station)	6-64
Print Bar Code (Receipt Station)	6-65
First Variation: String terminated with NULL Character	6-66
Second Variation: Length of Byte Specified at Beginning of String	6-67

Select Horizontal Size of Bar Code (Receipt Station).....	6-68
Page Mode	6-69
Overview	6-69
Limitations	6-70
Command Settings in Both Modes	6-71
Processing the Data in the Page.....	6-71
Examples of Printing in Page Mode.....	6-74
Flash Memory Commands	6-76
Copy Downloaded Object to Flash Memory.....	6-76
Disable Loading the Object to RAM When Powering on the Printer	6-77
Enable Loading the Object When Powering on the Printer	6-78
Copy the Object from Flash Memory to External RAM.....	6-78

Section 7 Ithaca Peripherals Proprinter Emulation Commands

List of Ithaca Peripherals Proprinter Emulation

Commands	7-1
Ithaca Peripherals Proprinter Emulation Command Descriptions	7-4
Printer Function Commands.....	7-4
Open Cash Drawer 1	7-4
Open Cash Drawer 2	7-5
Horizontal Tab	7-5
Line Feed	7-5
Vertical Tab.....	7-5
Advance to Top of Next Form.....	7-6
Carriage Return	7-6
Clear Printer.....	7-6
Perform Validation: Open Forms Compensation Assembly	7-6
Perform Validation: Close Forms Compensation Assembly	7-7
Perform Validation: Close Forms Compensation Assembly When Slip Sensed	7-7
Set Line Spacing to 1/8 Inch.....	7-7
Set Fine Line Spacing (n/216 Inch)	7-7
Set Fine Line Spacing (n/72 Inch)	7-7
Set Line Spacing to 1/6 Inch.....	7-8
Set Form Length in Inches	7-8
Set Form Length in Lines	7-8
Set Horizontal Tab Positions	7-9

Fine Line Feed	7-9
Uni-Directional/Bi-Directional Print	7-10
Print Characteristics Commands	7-10
Set Single Line Double-Wide	7-11
Original Character Size	7-11
Doubled Character Size	7-11
Set 17.2 Characters/Inch	7-11
Set 10 Characters/Inch	7-12
Cancel Single Line Double-Wide	7-12
Cancel Underlining	7-12
Set Underlining	7-13
Select Alternative Character Set	7-13
Select Character Set (Code Page 437).....	7-13
Set 12 Characters/Inch	7-13
Set Emphasized Printing.....	7-14
Cancel Emphasized Printing	7-14
Set Enhanced Printing	7-14
Cancel Enhanced Printing	7-14
Set Superscript	7-15
Set Subscript	7-15
Cancel Subscript/Superscript	7-15
Cancel Double-Wide for Current Font.....	7-15
Set Double-Wide for Current Font.....	7-16
Graphics Commands.....	7-16
Format of the Data Stream for Graphics.....	7-16
Single-Density Graphics	7-18
Double-Density, Half-Speed Graphics.....	7-18
Double-Density, Normal Speed Graphics.....	7-18
Quadruple Density Graphics	7-19
Cash Drawer Status Commands.....	7-20
Cash Drawer Status	7-20

Section 8 NCR 5021 Printer Emulation Commands

List of NCR 5021 Emulation Commands.....	8-1
NCR 5021 Emulation Command Descriptions.....	8-3
Printer Function Commands.....	8-3
Line Feed.....	8-3
Carriage Return	8-3
Reset	8-4
Open	8-4
Close	8-5
Reset Character RAM.....	8-6
Read Slip Sensor	8-6

Contents

Open Forms Compensation Assembly	8-6
Close Forms Compensation Assembly.....	8-7
Reprint After Media Jam.....	8-7
Echo	8-8
Write Device Control Memory	8-8
Print Characteristics Commands	8-12
Cancel Double-Wide.....	8-13
Set Double-Wide.....	8-13
Set Interline Spacing	8-13
Printer Status Commands.....	8-13
Read Status	8-13
Read Tallies.....	8-14
Read and Clear Tallies	8-15

Section 9 EF4270 Emulation Commands

List of EF4270 Emulation Commands	9-1
EF4270 Command Descriptions.....	9-4
Printer Function Commands.....	9-4
End of Text	9-4
Line Feed	9-5
Vertical Tab.....	9-5
Eject Slip	9-5
Carriage Return	9-5
Setup Parameters	9-6
Reset Printer	9-7
Cash Drawer 1	9-7
Cash Drawer 2	9-7
Document Clamp Open.....	9-8
Self Test	9-8
Document Validation.....	9-8
Receipt/Journal Print.....	9-8
Document Clamp Close	9-9
Form Eject	9-9
Download.....	9-9
Form In	9-9
Select9-10	
Either Form-In Sensor	9-10
Both Form-In Sensors	9-10
Busy Until Buffer Empty	9-10
Clamp Delay.....	9-11
Print Speed	9-11
Buffered Validate	9-11
Buffer Clear.....	9-12

Repeat Character.....	9-12
Wait for Slip	9-12
Cancel Slip Waiting.....	9-13
Print Characteristics Commands	9-13
Double-Wide Font	9-13
Double-Wide Off	9-13
Character Set.....	9-14
Underline Print.....	9-16
Underline Off	9-16
Double-High Off.....	9-16
Double-High Font.....	9-16
Pitch Selection	9-17
Upside-Down Off.....	9-18
Upside-Down Print.....	9-18
Rotate Font 90 Degrees Clockwise or Cancel Rotated Print	9-18
Graphics Commands.....	9-19
Graphics	9-19
Graphics: 5 Dot.....	9-21
Printer Status Commands.....	9-22
Status: 3 Bit.....	9-22
Status: 6 Bit.....	9-23
Status: 7 Bit.....	9-24
Status-Firmware.....	9-24

Section 10 Flash Download Commands

List of Flash Download Commands	10-2
Flash Download Command Descriptions	10-3
Put the Printer in Flash Download Mode.....	10-3
Request Printer Identification.....	10-3
Request Flash Identifier	10-4
Select Sector to Download	10-4
Request Retransmission of Last Response	10-4
Check CRC	10-4
Return Microprocessor CRC.....	10-5
Set Emulation	10-5
Request Current Emulation	10-5
Write EEROM Switches	10-6
Read EEROM switches.....	10-7
Write EEROM Parameter	10-8
Read EEROM Parameter	10-9
Erase the Flash ROM	10-9
Return CRC of Selected Flash Sector	10-9

Erase Selected Sector.....	10-10
Download Sector	10-10
Reboot the printer.....	10-11

Section 11 MICR Commands and Parsing

MICR Commands.....	11-1
Read MICR Data and Transmit	11-1
Define Parsing Format, Save in NVRAM	11-1
Reread MICR Data.....	11-2
Define Parsing Format, Do Not Save Permanently	11-2
MICR Parsing	11-2
Parsing Parameter String Options.....	11-3
Variable Length Fields.....	11-3
Other Parameters	11-4
Sample Parsing Formats.....	11-5
ESC w p 18 A <CR>	11-5
ESC w p 18 X A <CR>	11-5
ESC w p 18 x A <CR>.....	11-5
ESC w p 018 A <CR>	11-6
ESC w p 018 X A <CR>	11-6
ESC w p 018 x A <CR>.....	11-6
ESC w p T 18 X A 04C <CR>	11-6
ESC w p K9 X T 18 X A 04C <CR>.....	11-6
ESC w p T '/A '/C '/S <CR>	11-7
Notes	11-8
Check Serial Number	11-9
Parsing the Check Serial Number	11-9
Exceptions	11-10
Loading the Exception Table	11-11
Exception Table Entry Format	11-11
Example 1	11-12
Example 2.....	11-13
Maintaining the Exception Table.....	11-13

Appendix A Specifications

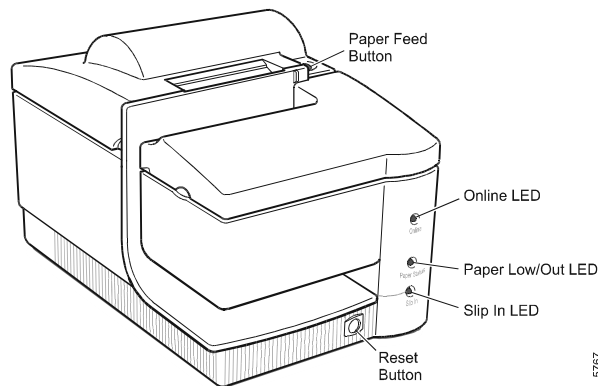
Printing Specifications.....	1
EFP9800 ESC/POS (Includes Epson ESC/POS Emulation). 2	
Ithaca Peripherals Proprinter Emulation	2
NCR 5021 Emulation	3
EF4270 Emulation	3
Print Zones.....	4

Receipt and Journal Print Zones	4
Validation Print Zone	5
Slip Print Zone.....	8
MICR Read Zone	8
Dimensions	9
Power Requirements.....	10
Environmental Requirements	10
Reliability	10
Character Sets	11
Code Page 437 (PC US)	11
Code Page 850 (PC Multilingual).....	12
Code Page 852 (Eastern European).....	13
Code Page 865 (Nordic Languages)	14

Contents

Section 1

About the EFP9800 Printer



The EFP9800 printer is a fast, quiet, reliable, and very compact multiple-function printer. It prints receipts and a journal, validates and prints checks, and prints on a variety of single- or multiple-part slips. An additional option is the Magnetic Ink Character Recognition (MICR) check reader with parsing which reads account numbers on checks for easy verification.

The industry-standard RS-232C and IEEE 1284 bi-directional parallel communication interfaces allow the EFP9800 to be connected to any host computer. The EFP9800 provides the following emulations: Epson 370/375 printers (included in the EFP9800 ESC/POS commands), Ithaca Peripherals Proprinter emulation, NCR 5021 printer, (Serial Interface Only) and the EF4270 printer. These emulations provide easy integration into applications written for these printers and emulations.

About the EFP9800 Printer

Note: *A Running Change acoustic noise reduction enhancement was released for the EFP9840 and EFP9841 serial interface units. This Running Change incorporates a new solenoid clamp assembly and a revised controller PCBA to further reduce acoustical noise. The change was incorporated into factory production starting at serial number 5108 67054. All EFP9840 and EFP9841 units with serial numbers 5108 67054 and above will have the acoustic enhancements.*

The new solenoid assembly has a bumper added to the plunger to reduce noise. This new solenoid requires a new lower case and therefore cannot be installed in The EFP9840 and EFP9841 units below serial number 5108 67054.

The revised PCBA incorporates a modified print head pin firing scheme. The PCBA fires the pins in staggered pairs to reduce acoustical noise. This new PCBA is fully backward compatible with previous style EFP9800's.

Features and Options

The EFP9800 printer comes with a variety of standard features, and can be configured with several options.

Receipt Station Features

- Standard/compressed pitch (host computer selectable): 11.6 to 16.8 characters per inch, 33-51 columns (ESC/POS)
- Drop in paper loading, requires no spindle
- Paper Status indicator light (LED) (adjustable)

Journal Station Features

- Standard/compressed pitch (host computer selectable): 11.6 to 16.8 characters per inch, 33-51 columns (ESC/POS)
- Automatic paper loading, requires no spindle or threading
- Autograph table

Slip/Validation Station Features

- Standard/compressed pitch (host computer selectable): 11.6 to 16.8 characters per inch, 33-51 columns (ESC/POS)
- Up to 14 lines of validation printing (at 7.2 lines per inch) (ESC/POS)
- Printing of slips up to five-parts thick, up to a total thickness of .014 inches (the receipt is included as one or two of the parts depending if it is one-ply or two-ply)
- Top insertion of validation forms with slip stop
- Side insertion of slips with override of slip stop and automatic alignment of slip
- Front insertion of slips with override of slip stop and automatic alignment of slip
- Slip In indicator light (LED)

General Features

- Industry standard RS-232C communication interface or IEEE 1284 parallel bi-directional communication interface
- NVRAM (Non-Volatile memory) to store customer configuration and historic data
- Cash drawer connector
- Online LED
- Cover open switch

Options

- Magnetic Ink Character Recognition (MICR) check reader built into the slip station for verifying checks (includes custom MICR field parsing)
- Remote power supply
- EFP9800-SW1 software utilities

Maintaining and Cleaning the Printer

There is no customer maintenance required for the EFP9800 printer. However, you may occasionally clean the cabinet as needed to remove dust and finger marks. Use any household cleaner designed for plastics, but test it first on a small, unseen area. The cabinet finish and materials are durable and are resistant to cleaning solutions, lubricants, fuels, cooking oils, and ultraviolet light.

If the receipt paper bucket is dirty, wipe it with a clean, damp cloth.

Caution

Do not spray or try to clean the printhead or the inside of the printer with any kind of cleaner as this may damage the printhead or the electronics.

Ordering Paper and Supplies

The following section lists the paper, supplies, and documentation available for order.

Receipt/Journal Paper

Item	Type	Number
One-Ply	Receipt or journal 150 feet	40-1004-874
Two-Plies	Receipt/journal 95 feet	40-1005-871

Slips and Forms

The EFP9800 printer prints on single- or multiple-part slips in the slip station. Slips must meet the following requirements (the receipt is included as one or two of the parts depending if it is one-ply or two-ply):

Minimum Slip Size	2.75 inches (69.8 mm) wide by 5.0 inches (127 mm) long Or 5.0 inches (127 mm) wide by 2.75 inches (69.8 mm) long
Maximum Slip Size	8.5 inches (215.9 mm) wide by 11.69 inches (297 mm) long
Total thickness	Single-part slips: 0.003 inches (0.076 mm) (minimum) Multiple parts: 0.014 inches (0.355 mm) (maximum—includes the receipt)
Number of parts	Up to a maximum of five parts (the receipt is included as one or two parts)

Note: *If card stock is present, it should be the bottom part. If multiple-part slips are used, the double-strike mode must be used to ensure that all parts are printed on clearly. Contact your sales representative to order slips and forms.*

About the EFP9800 Printer

Other Supplies

Contact your sales representative to order the supplies listed below.

Item	Type	Number
Ribbon Cassettes	Purple ribbon cassette	04-9815-988
	Black ribbon cassette	04-9816-986
Power Supply		75-2087-908

Documentation

Contact your sales representative to order the following documentation:

Title	Unisys Number
<i>Unisys e@ction Slip, Validation, and Receipt EFP9800 Series Owner's Guide</i>	3255 4073
<i>Unisys e@ction Slip, Validation, and Receipt EFP9800 Series Installation and Operation Guide</i>	3255 4065
<i>Unisys e@ction Slip, Validation, and Receipt EFP9800 Series Servicing Guide</i>	3255 4081

Section 2

Operating the Printer

This section includes information about operating the printer controls, loading paper and ribbon cassettes, replacing the printhead, and working with slips, forms, and checks.

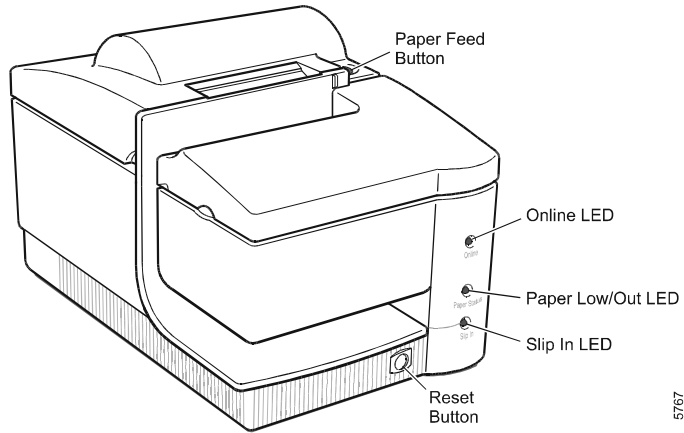
Using the Controls

The EFP9800 printer includes the following buttons:

- Paper Feed button used to advance paper.
- Reset button used to initialize the printer.

Caution

Pressing the Reset button initializes the printer, causing any downloaded fonts to be lost.



Changing Paper

The EFP980 features simple paper loading that is quick and efficient, saving both time and paper.

Caution

Do not operate the printer if it runs out of paper. The printer will continue to operate, but data may be lost and the printhead may be damaged.

Changing Receipt Paper

Note: *Use these instructions if you are printing receipts only. If you are printing both receipts and a journal (record of transactions), or a journal only, see “Changing Receipt/Journal Paper” later in this section.*

Note: *All EFP9800 Series printers have a receipt journal take up spool assembly factory installed that is not always required or utilized by the client.*

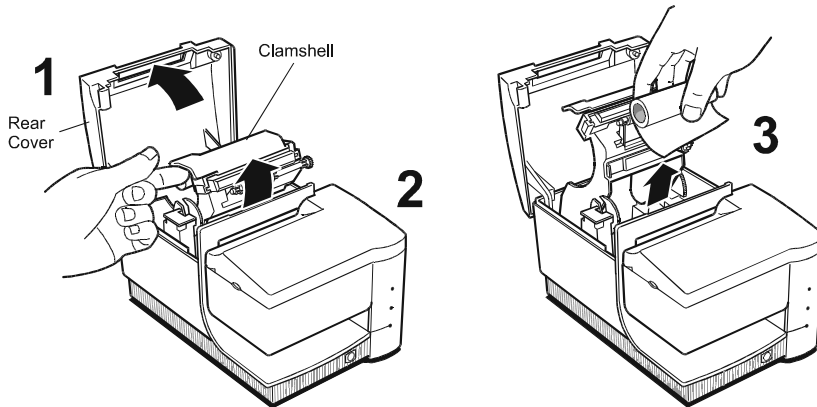
If the receipt take up assembly is not used, an occasional noise will occur as the take up roller assembly rotates.

The receipt take up spool has a spring-loaded roller that allows easy loading. However, if the receipt take up capability is not being used the spring loaded roller shaft will spring upwards and hit the printer top cover once per revolution.

In cases where the receipt take up assembly is not being used it can be secured in a closed position so that it will not hit the top cover during printing to eliminate the occasional nuisance noise.

A small piece of tape or a rubber band can be used to keep the take up roller assembly in a closed position at all times.

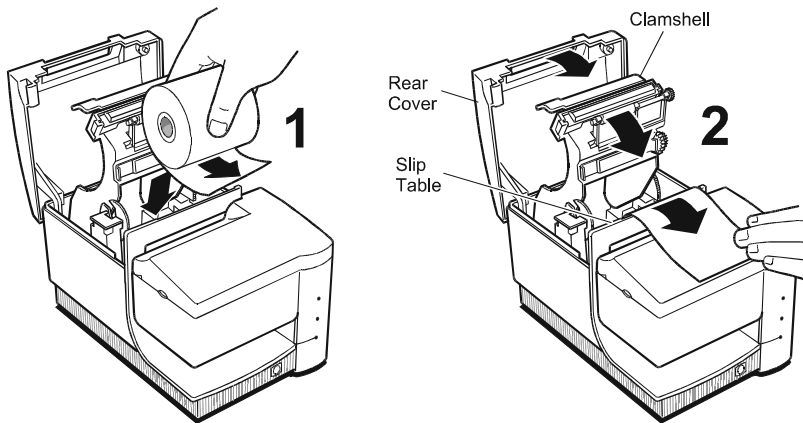
Removing the Old Receipt Paper Roll



1. Open the rear cover.
2. Open the clamshell.
3. Remove the used receipt paper roll.

5812

Loading the New Receipt Paper Roll



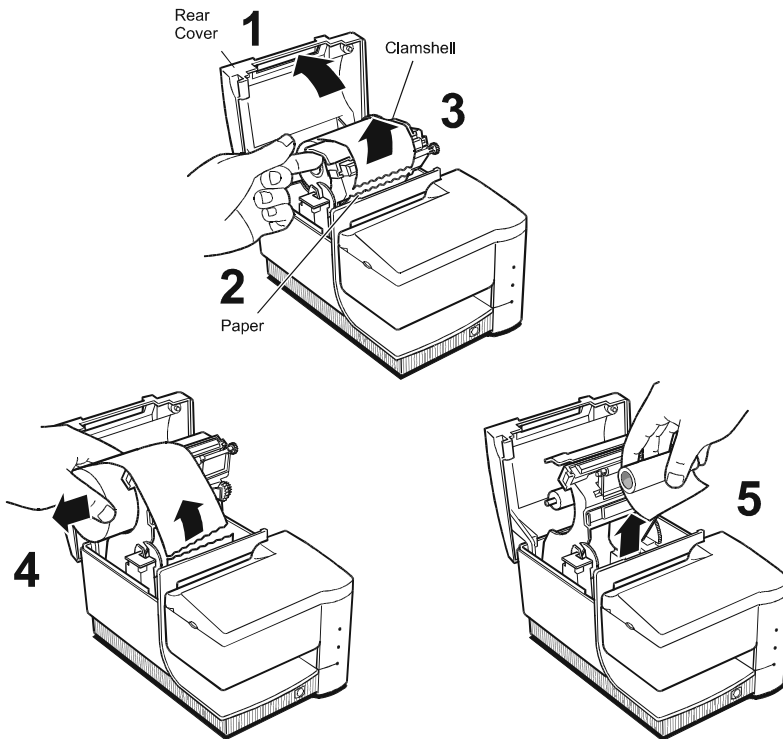
1. Drop the new roll into the bucket and pull out several inches.
2. Lay the end of the paper out over the top of the slip table, then close the rear cover and the clamshell.

5810

Changing Receipt/Journal Paper

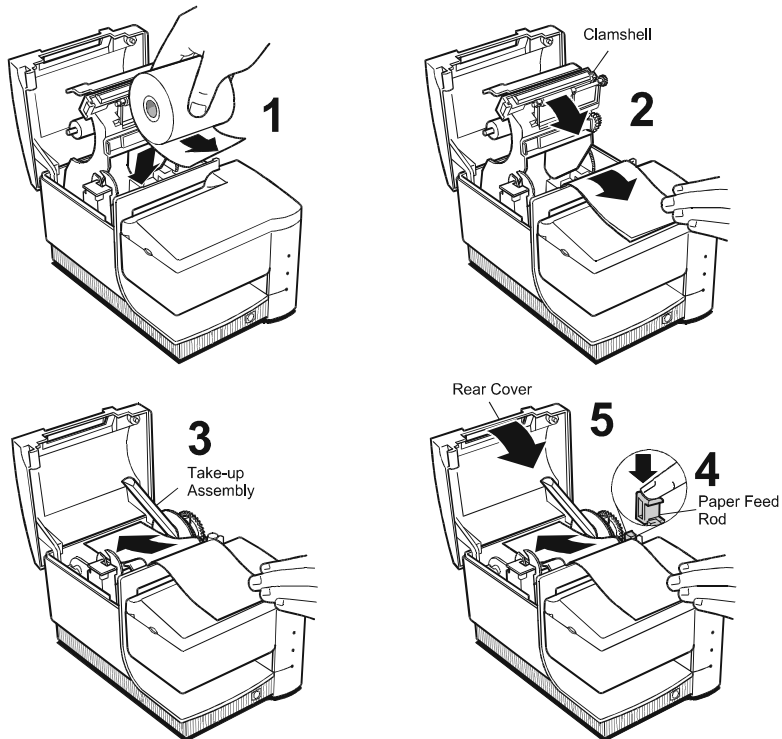
Note: Use these instructions if you are printing both receipts and a journal (record of transactions) or a journal only. If you are printing receipts only, see “Changing Receipt Paper” earlier in this section.

Removing the Printed Journal



1. Open the rear cover.
2. Tear the paper off below the last journal entry.
3. Open the clamshell.
4. Slide the printed journal off the take-up core and set it in a safe place.
5. Remove the paper core or remainder of the roll.

Loading the New Receipt/Journal Paper Roll

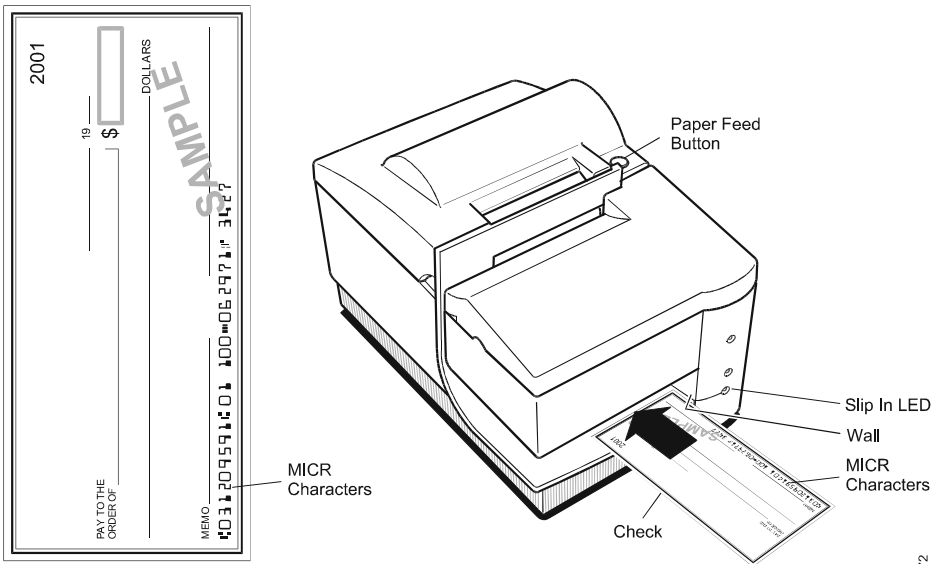


1. Drop the new receipt/journal roll into the bucket and pull out about 10 inches (25 cm) of paper.
The paper should not extend farther than the back of the printer cabinet.
2. Close the clamshell.
3. Place the end of the journal ply between the halves of the take-up assembly.
If you are printing a journal only, continue with step 4.
If you are printing both receipts and a journal, position the top paper ply so that it extends over the top of the slip table.
4. Press the paper feed button to wind the paper onto the take-up assembly.
5. Close the rear cover.

Verifying Checks

Follow this procedure to verify checks on printers with the MICR check reader option. The printer's Magnetic Ink Character Reader (MICR) check reader reads the magnetic ink characters on the check in order for the host computer to verify that the check is good.

Note: *Verify the check before you validate it. For more information, see "Validating Slips and Checks" later in this section.*



Check Orientation

5772

1. Insert the check from the front, face up, with the MICR characters to the right, as shown.
2. Slide the check toward the back of the printer along the right side until it covers both sensors.

The Slip In LED turns on when both sensors are covered, indicating that the check is inserted properly. The printer reads the magnetic characters on the check.

***Note:** Do not hold or keep the check from moving during the MICR check reader transaction or the check numbers will not be read accurately.*

3. Follow any instructions from the host computer.

Once the check has been verified, the printer may then print the date, payee, and amount on the check, depending on the host computer software. For more information, see “Printing on Slips and Checks” on the next page.

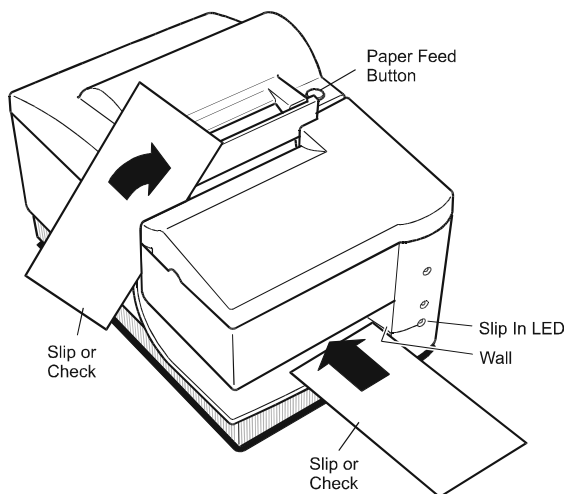
4. Remove the check after it has been fed all the way back out.
5. Follow the instructions from the host computer to finish the transaction, if provided.
6. To validate the check, follow the procedures in “Validating Slips and Checks” later in this section.

Printing on Slips and Checks

There are several types of transactions for which you may print on a slip or check. These include some credit card transactions, merchandise return forms, electronic funds transfers and check printing (printing the date, payee, and amount on the check).

The EFP9800 can print on slips and forms up to five-parts thick (the receipt is included as one or two of the parts depending if it is one-ply or two-ply). For more information on the types of slips and forms you can use, see “Ordering Paper and Supplies” in section 1.

Note: *Do not use this procedure for validation or check verification. See “Verifying Checks” on the previous page, and “Validating Slips and Checks” on the next page.*



1. Insert the slip/check from the front, placing it on the slip table first, with the side to be printed face up.
2. See the illustration for an example of how to insert a check. Use the same procedure for any type of slip.

You may also insert the slip/check from the side. In this case, insert the slip/check at an angle with the side to be printed facing you, and then rotate it until it is vertical. See the illustration.

3. Slide the slip/check to the right until it lines up against the wall.

4. Position the slip/check so that the top is protruding from the top of the printer.

The Slip In LED flashes green. When the slip/check is inserted properly, the Slip In LED is lit steadily.

Depending on your printer setup, the printer may automatically begin printing, or you may have to perform the action programmed for your printer, such as pressing a particular keyboard key. Follow the instructions from the host computer.

5. Remove the slip/check once it is fed back out and then follow the instructions from the host computer to finish the transaction.

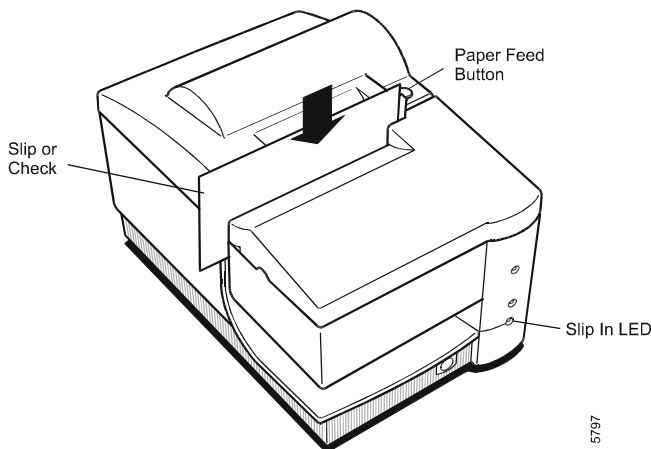
Validating Slips and Checks

The EFP9800 can print on slips and forms up to five-parts thick (the receipt is included as one or two of the parts depending if it is one-ply or two-ply). For more information on the types of slips and forms you can use, see “Ordering Paper and Supplies” in section 1.

Follow this procedure to validate slips and checks.

Note: *Do not use this procedure for check verification. See “Verifying Checks” earlier in this section.*

Be sure to insert the slip or check properly to ensure printing in the correct locations. Insert standard size slips and checks from the top, using the slip stop to position them correctly.



1. Insert the slip/check from the top, with the side to be printed facing you as shown in the illustration.
2. Slide the slip/check into the printer until it meets the slip stop and to the right until it lines up against the wall.

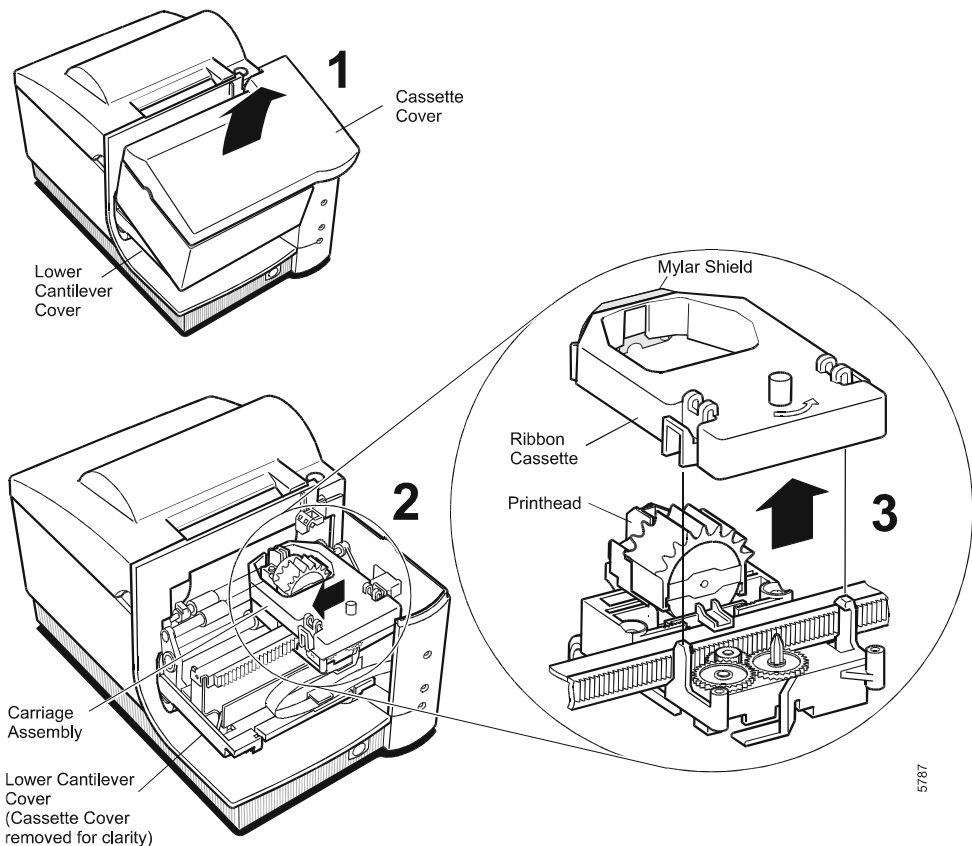
The Slip In LED flashes green. When the slip/check is inserted properly, the Slip In LED is lit steadily.

3. Depending on your printer setup, the printer may automatically begin printing, or you may have to perform the action programmed for your printer, such as pressing a particular keyboard key. Follow the instructions from the host computer.

4. Remove the slip/check once it is fed back out and then follow the instructions from the host computer to finish the transaction.

Changing the Ribbon Cassette

Change the ribbon cassette when the print is too light or the ribbon is frayed.



1. Open the cassette cover.
2. Slide the carriage assembly (assembly that holds the printhead) to the center of the printer.

Operating the Printer

3. Pull the used ribbon cassette out of the printer and discard it.

Be careful not to bump or damage the Form Out sensor while you remove the ribbon cassette.

4. Snap in the new ribbon cassette, and close the cassette cover.

Caution

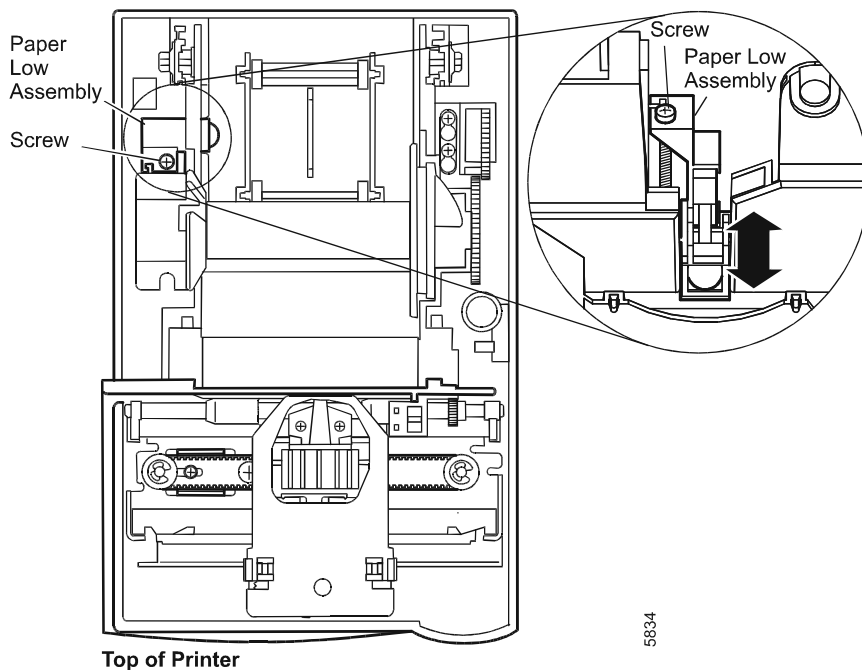
Do not remove the mylar shield on the ribbon cassette. It protects against smudging. The ribbon cassette will be ruined if it is removed.

Replacing the Printhead

The impact printhead is extremely reliable. However, it may need to be changed depending on the use of the printer. Printhead replacement is required if it is tearing or fraying the ribbon, or if some dots print lighter than others. Call a service representative for printhead replacement.

Adjusting the Paper Low Sensor

Before adjusting the paper low sensor, make sure the power is off. Place the printer on a level surface or adjust it while mounted on the host computer. Do not apply pressure to the top of the printer while making adjustments.



Procedure

The paper low sensor lights the paper low/out LED when the paper roll is almost empty.

You can raise or lower the paper low sensor assembly to change the amount of paper left on the roll when the sensor lights the paper low/out LED. Raise the assembly by turning the screw counterclockwise to signal paper low earlier (more paper left on the roll). Lower the assembly by turning the screw clockwise to signal paper low later (less paper left on the roll).

You need a Phillips head screwdriver to make this adjustment.

1. Open the rear cover.
2. Turn the screw on the paper low assembly to raise or lower the sensor, changing the amount of paper that will be left on the roll when the sensor activates the paper status LED.
3. See the table for more information.
4. Close the cover.

Paper Low Sensor Setting	Amount of Paper Left
Factory Setting	8 ± 5 feet
Screw turned 1 revolution clockwise	5.5 feet less paper (before sensor is activated)
Screw turned 1 revolution counterclockwise	5.5 feet more paper (before sensor is activated)
Screw turned all the way down (clockwise)	Paper Low Sensor disabled

Note: *These settings are based on the Receipt-Journal printer using two-ply paper and the Receipt printer using one-ply paper. If paper is used with different number of plies than specified, the information in the table will not be accurate.*

Section 3

Diagnostics and Print Tests

The following diagnostic tests are available for the EFP9800:

- Level 0 Diagnostics: Performed during the startup cycle and each time the printer is reset.
- Level 1 Diagnostics: Performed using DIP switches or the Paper Feed button.
- Diagnostic Print Tests.

Level 0 Diagnostics

The printer automatically performs Level 0 diagnostics each time it is turned on. Level 0 diagnostics include the following:

- All motors and solenoids are turned off.
- Microprocessor timing is checked.
- Firmware ROM is tested.
- On board and external RAM are checked.
- If this test succeeds, the green Online LED flashes once.
- If this test fails, Level 0 diagnostics stop. The printer becomes inactive: the printhead does not home, the red Paper Status and the green Slip In LED's turn on, and the printer is unable to communicate with the host computer.
- Printhead is homed. If this action fails, a fault condition occurs.
- Status of all sensors is checked and status bytes are updated.

If this is the first time that the printer is turned on, or if a new NVRAM has been installed, the default values for the printer functions and tests are loaded into NVRAM during Level 0 diagnostics. To change the printer functions and tests, use Level 1 diagnostics. For more information, see “Level 1 Diagnostics” on the next page.

Diagnostics and Print Tests

If both the red Paper Status and the green Slip In LED's are steadily illuminated, it is an indication that the NVRAM has failed.

When the last step of the Level 0 diagnostics is complete, the Paper Feed button is enabled and the printer is ready for normal operation.

If the printer does not complete Level 0 diagnostics, the LED's flash to indicate the problem. See "Getting Service" in section 4.

Level 1 Diagnostics

Level 1 diagnostics are selected using the DIP switches or the Paper Feed button. During Level 1 diagnostics, the printer is not communicating with the host computer. The diagnostics are described in this order:

- Switch Entry Mode
- Internal Switch Pack Values in NVRAM
- Flash Download Mode
- Data Scope Mode
- Verifying Read of MICR Characters
- Checking MICR Noise Level
- Selecting the Font for the MICR Check Reader
- Diagnostic Print Tests

Information About DIP Switch Settings

To run Level 1 diagnostics, use the DIP switches to change settings. See the following illustration for the location of the switches on the EFP9800 printer. Keep these points in mind when using the DIP switches:

To turn a DIP switch on, push it down. To turn a DIP switch off, push it up.

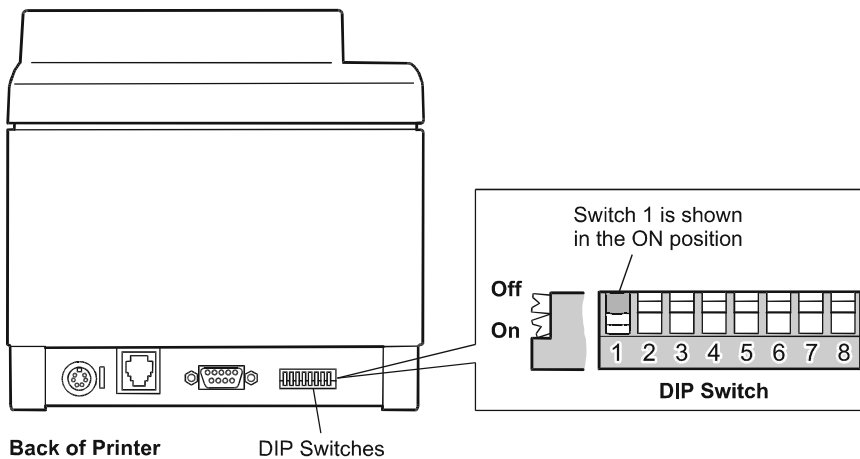
The settings can only be changed when the printer is about to enter Level 1 diagnostics. Switch 1 must be set to On, and switch 2 set to Off.

The default options are set at the factory and are stored in non-volatile memory or NVRAM (also called EEROM). After the settings have been changed and stored in NVRAM, the DIP switches must be set back to the normal settings for the printer to operate. For a list of normal settings, see "Setting Switches" in section 5.

After changing the DIP switch settings, cycle the printer by pressing the Reset button off and then on again. The green Online LED flashes when the printer cycles.

Caution

If you are changing the switch settings for a function or test, be sure you choose the correct settings to avoid accidentally changing the settings for another function or test. If you do accidentally change the settings, use the switch settings shown in the tables throughout this section to change those settings back, or return to the normal settings. For a list of normal settings, see “Setting Switches” in section 5. If you need assistance, contact a service representative. For more information, see “Getting Service” in section 4.



Switch Entry Mode

Use Switch Entry mode to set the printer emulation or the internal switch pack values in NVRAM.

Note: For an alternate method to set the emulation and switch settings, see “Section 10: Flash Download Commands.”

The EFP9800 printer can emulate the following printers and emulations:

- Epson ESC/POS (370/5) printer

Note: This emulation is included in the EFP9800 ESC/POS commands.

- Ithaca Peripherals Proprinter emulation
- NCR 5021 printer (EFP984x Serial Interface Units Only)
- EF4270 printer

Note: The EFP9800 FLASHADMIN software utility can also be used for emulation and internal DIP switch configuration. This utility is included in the EFP9800-SW1 style package.

The EFP9800 printer has one set of DIP switches, while some of the emulated printers have two or more sets. You can enter values for the extra switch packs into “internal switch packs” stored in NVRAM.

Note: Secure the roller assembly in a closed position to eliminate the nuisance noise from occurring when the take-up assembly is not being used.

All procedures completed in Switch Entry mode include two steps:

- First, tell the printer what you want to do—either choose an emulation or choose an internal switch pack value. (For example, choose the Ithaca Peripherals Proprinter emulation or internal switch pack 2.)
- Second, enter the value for the operation—either the specific printer emulation or the values for the internal switch pack.

Both steps are completed by setting the DIP switches. During the first step, the Slip In LED is on. During the second step, the Slip In LED is off.

Once you’ve finished setting options in Switch Entry mode, turn off the printer and set the DIP switches back to the settings for the appropriate communication protocol. The options you set in Switch Entry mode are stored in “internal switch packs” in NVRAM until you change them.

Use the diagnostics print tests to print the name of the emulation which is currently active and the settings of the NVRAM switch packs. See “Diagnostics Print Tests” later in this section for information about running the tests.

Choose a Printer Emulation

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions. Run the Diagnostic Print Tests to see what emulation the printer is set for. For more information, see “Diagnostic Print Tests” later in this section.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. To put the printer into Switch Entry mode, set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF

4. Turn the printer back on.

The printer is now in Switch Entry Mode as indicated by the green Online LED and the red Paper Status LED flashing. The green Slip In LED may be on or off, depending on your input at the time.
5. To indicate to the printer that you are choosing a printer emulation, set all of the DIP switches to Off.
6. Press the Paper Feed button.

The green Slip In LED turns off.

Diagnostics and Print Tests

7. Set the DIP switches to the settings for the printer or emulation you want to emulate:

Emulation	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
EFP9800 ESC/POS*	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
IPI Proprinter Emulation	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
NCR 5021†	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
EF4270	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON

* The EFP9800 ESC/POS includes Epson ESC/POS (in order to emulate the Epson 370/5 printer).

† For use with EFP984x Serial Interface Units Only

8. Press the Paper Feed button.

The green Slip In LED turns on. The printer emulation you selected is stored in NVRAM.

9. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Switch Settings” in section 5.

10. Turn the printer back on.

Use the print test to print the name of the emulation which is currently active and the settings of the NVRAM switch packs. See “Diagnostics Print Tests” later in this section for information about running the tests.

Set Internal Switch Pack Values in NVRAM

Once you've chosen the emulation (in the previous section), you can specify various printer functions by setting the switches on "internal switch packs."

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. To put the printer into Switch Entry mode, set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF

4. Turn the printer back on.

The printer is now in Switch Entry Mode as indicated by the green Online LED and the red Paper Status LED flashing. The green Slip In LED may be on or off, depending on your input at the time.
5. Set the DIP switches according to the following table to select the internal switch pack you want to use.

See the tables in the following four sections to determine the switch pack you need for the emulation you have already chosen:

- "EFP9800 ESC/POS Internal Switch Pack Settings"
- "Ithaca Peripherals Proprinter Internal Switch Pack Settings"
- "NCR 5021 Internal Switch Pack Settings"
- "EF4270 Internal Switch Pack Settings"

Diagnostics and Print Tests

Switch Pack	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF

6. Press the Paper Feed button.

The green Slip In LED turns off.

7. Set the DIP switches to the settings on the switch pack for the emulation you have already chosen.

8. Use the tables in the following four sections (as listed under number five above).

9. Press the Paper Feed button.

The green Slip In LED turns on. The internal switch pack and switch settings you chose are stored in NVRAM.

10. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Setting Switches” in Section 5.

11. Turn the printer back on.

12. Repeat this procedure to select settings on a different switch pack.

You can print out a listing of the settings you’ve chosen using the diagnostic print tests. For more information, see “Diagnostic Print Tests” later in this section.

Use the print test to print the name of the emulation which is currently active and the settings of the NVRAM switch packs. See “Diagnostic Print Tests” later in this section for information about running the tests.

EFP9800 ESC/POS Internal Switch Pack Settings (Includes Epson ESC/POS)

EFP9800 ESC/POS Emulation: Internal Switch Pack 1

Switch	Settings	Description
1	OFF ON	Print "?" for data error. Ignore data error.
2	OFF ON	4K byte communication data buffer. 40 byte data buffer.
3-8		Unused.

EFP9800 ESC/POS Emulation: Internal Switch Pack 2

Switch	Settings	Description
1	OFF ON	No display module connected (default). No display module connected (same as ON).
2		Unused.
3	OFF ON	Busy on buffer full or offline (default). Busy on buffer full.
4-8		Unused.

EFP9800 ESC/POS Emulation: Internal Switch Pack 3, Switch 1

Switch	Settings	Description
1	OFF ON	Set default Epson line spacing to 7.2 lines per inch (paper saving mode). Set default line spacing to 6 lines per inch.

Diagnostics and Print Tests

EFP9800 ESC/POS Emulation: Internal Switch Pack 3, Switches 2 and 3

Switch 2	Switch 3	Description
OFF	OFF	Epson 40/33 character print zone (2.506 inches wide).
OFF	ON	Epson 42/35 character print zone (2.506 inches wide).
ON	OFF	Unisys 42/35 character print zone (3.024 inches wide).
ON	ON	Unisys 51/42 character print zone (3.024 inches wide).

EFP9800 ESC/POS Emulation: Internal Switch Pack 3, Switches 4 and 5

Switch	Settings	Description
4	OFF	Set the standard mode slip/validation right margin to 0.53 inches (Epson Compatible). This only applies if switch 2 is OFF (2.506 inch print zone). Center the print zone for standard mode. Right margin set to 0.113 for 3.024 inch print zone or to 0.372 for 2.506 inch print zone.
	ON	
5	OFF	Set the page mode slip/validation right margin to 0.53 inches (Epson compatible).
	ON	Center the print zone for page mode. Right margin set to 0.372 inches.

EFP9800 ESC/POS Emulation: Internal Switch Pack 3, Switches 6 and 7

Switch 6	Switch 7	Description
OFF	OFF	Selects 14 lines (7.2 lines per inch) available when validation is selected.
OFF	ON	Selects 10 lines (7.2 lines per inch) available when validation is selected.
ON	OFF	Selects 6 lines (7.2 lines per inch) available when validation is selected.
ON	ON	Selects 4 lines (7.2 lines per inch) available when validation is selected.

EFP9800 ESC/POS Emulation: Internal Switch Pack 3, Switch 8

Switch	Settings	Description
8		Unused.

Ithaca Peripherals Proprinter Internal Switch Pack Settings

Ithaca Peripherals Proprinter Emulation: Internal Switch Pack 1, Switches 1, 2, 3, and 6

Switch	Settings	Description
1	OFF ON	If slip is detected, both slip feed and receipt/journal feed advance. If slip is detected, only the slip feed advances. Note: If slip is not detected, then only the receipt/journal feed advances.
2		Unused.
3	OFF ON	No automatic line feed. Printer automatically inserts line feed.
6	OFF ON	10 Characters/Inch character pitch permitted. 10 Characters/Inch character pitch not permitted.

Diagnostics and Print Tests

Ithaca Peripherals Proprinter Emulation: Internal Switch Pack 1, Switches 4 and 5, 7 and 8

Switch 4	Switch 5	Sets Receipt Paper Length
OFF	OFF	5.5 inches.
OFF	ON	8.5 inches (default).
ON	OFF	11 inches.
ON	ON	14 inches.
Switch 7	Switch 8	Selects Code Page
OFF	OFF	ESC 6 selects Code Page 850, PC Multilingual. ESC 7 selects Code Page 437, PC US.
OFF	ON	ESC 6 selects Code Page 852, Eastern European. ESC 7 selects Code Page 437, PC US.
ON	OFF	ESC 6 selects Code Page 865, Nordic Languages. ESC 7 selects Code Page 437, PC US.
ON	ON	Unused.

NCR 5021 Internal Switch Pack Settings (Serial Interface Units Only)

NCR 5021 Emulation: Internal Switch Pack 1

Switch	Settings	Description
1	OFF	Selects three lines of validation.
	ON	Selects six lines of validation.
2	OFF	If slip is detected, both slip feed and receipt/journal feed advance.
	ON	If slip is detected, only the slip feed advances.

Note: If slip is not detected, then only the receipt/journal feed advances.

EF4270 Internal Switch Pack Settings

EF4270 Emulation: Internal Switch Pack 1, Switches 1 and 2

Switch	Settings	Description
1	OFF ON	Auto Line Feed OFF. Auto Line Feed ON.
2		Unused.

EF4270 Emulation: Internal Switch Pack 1, Switches 3 and 4

Switch 3	Switch 4	Description
OFF	OFF	Set Receipt (Journal) line spacing to 8.0 lines/inch.
ON	OFF	Set Receipt (Journal) line spacing to 6.9 lines/inch.
OFF	ON	Set Receipt (Journal) line spacing to 6.0 lines/inch.
ON	ON	Set Receipt (Journal) line spacing to 5.3 lines/inch.

EF4270 Emulation: Internal Switch Pack 1, Switches 5 and 6

Switch 5	Switch 6	Description
OFF	OFF	Set Slip (Validation) line spacing to 8.0 lines/inch.
ON	OFF	Set Slip (Validation) line spacing to 6.9 lines/inch.
OFF	ON	Set Slip (Validation) line spacing to 6.0 lines/inch.
ON	ON	Set Slip (Validation) line spacing to 5.3 lines/inch.

EF4270 Emulation: Internal Switch Pack 1, Switches 7 and 8

Switch	Settings	Description
7		Unused.
8	OFF ON	Set RTS (Request to Send) Polarity to -12v (MARK). Set RTS Polarity to +12v (SPACE).

Diagnostics and Print Tests

EF4270 Emulation: Internal Switch Pack 2, Switches 1, 2, and 3

Switch 1	Switch 2	Switch 3	Description
OFF	OFF	OFF	Set pitch to 33 characters/line.
ON	OFF	OFF	Set pitch to 36 characters/line.
OFF	ON	OFF	Set pitch to 40 characters/line.
ON	ON	OFF	Set pitch to 44 characters/line.
OFF	OFF	ON	Set pitch to 50 characters/line.
ON	OFF	ON	Set pitch to 57 characters/line.
OFF	ON	ON	Set pitch to 66 characters/line.
ON	ON	ON	Unused.

EF4270 Emulation: Internal Switch Pack 2, Switches 4, 5, and 6

Switch 4	Switch 5	Switch 6	Description
OFF	OFF	OFF	Set character set to USA.
ON	OFF	OFF	Set character set to UK.
OFF	ON	OFF	Set character set to German.
ON	ON	OFF	Set character set to French.
OFF	OFF	ON	Set character set to Italian.
ON	OFF	ON	Set character set to Spanish.
OFF	ON	ON	Set character set to Hebrew.
ON	ON	ON	Unused.

EF4270 Emulation: Internal Switch Pack 2, Switches 7 and 8

Switch	Settings	Description
7	OFF ON	Validation clamp open. Validation clamp closed.
8		Unused.

EF4270 Emulation: Internal Switch Pack 3, Switches 1, 2, and 3

Switch	Settings	Description
1	OFF	Concurrent print disabled. (When the slip feeds, the paper roll does not necessarily also feed.)
	ON	Concurrent print enabled. (When the slip feeds, the paper roll also feeds.)
2		Unused.
3		Unused.

EF4270 Emulation: Internal Switch Pack 3, Switches 4, 5, and 6

Switch	Settings	Description
4*	OFF	Enables two cash drawers when activate command is received.
	ON	Printer assumes a single cash drawer is connected and checks status of drawer before activating it. If the drawer is open or missing, the drawer solenoid is not activated.
5**	OFF	Assumes only cash drawer 1 is attached.
	ON	Assumes only cash drawer 2 is attached.
6**	OFF	Low signal (0) on pin 3 of cash drawer connector indicates cash drawer closed.
	ON	High signal (1) on pin 3 of cash drawer connector indicates cash drawer closed.

*The EFP9800 has one cash drawer connector for two drawers. If two drawers are connected, it is not possible to read drawer status. If a single drawer is connected, a status check is possible.

**Ignored unless switch 4 is ON.

Diagnostics and Print Tests

EF4270 Emulation: Internal Switch Pack 3, Switches 7 and 8

Switch	Settings	Description
7		Unused.
8		(Printers with parallel interface only.)
	OFF	Pin 13 of the communication cable connector functions as the select line output.
	ON	Pin 13 of the communication cable connector equals 1 when a form is present.

EF4270 Emulation: Internal Switch Pack 4, Switches 1, 2, 3, and 4

Switch 1	Switch 2	Switch 3	Switch 4	Description
OFF	OFF	OFF	OFF	2.63 inches (66.8 mm)
ON	OFF	OFF	OFF	2.51 inches (63.7 mm)
OFF	ON	OFF	OFF	2.42 inches (61.46 mm)
ON	ON	OFF	OFF	2.33 inches (59.18 mm)
OFF	OFF	ON	OFF	2.22 inches (56.38 mm)
ON	OFF	ON	OFF	2.12 inches (53.84 mm)
OFF	ON	ON	OFF	2.00 inches (50.8 mm)
ON	ON	ON	OFF	1.91 inches (48.51 mm)
OFF	OFF	OFF	ON	1.80 inches (45.72 mm)
ON	OFF	OFF	ON	1.67 inches (42.41 mm)
OFF	ON	OFF	ON	1.59 inches (40.38 mm)
ON	ON	OFF	ON	1.50 inches (38.1 mm)
OFF	OFF	ON	ON	1.39 inches (35.30 mm)
ON	OFF	ON	ON	1.29 inches (32.76 mm)
OFF	ON	ON	ON	1.20 inches (30.48 mm)
ON	ON	ON	ON	1.00 inches (25.4 mm)

*Distance measured from top of the topmost line to lower edge of cut sheet. The printer prints to within 0.6 inches of the bottom of the cut sheet.

Flash Download Mode

This section describes the protocol used to download firmware to the printer from an application through the communication connector. Requests are provided to query the state of the firmware and to check the CRC of a given flash sector. All downloading must be done with 8 bit communications.

Note: *An alternate method of putting the printer into flash download mode is to send the Put the Printer in Flash Download Mode command (1B 5B 7D) during normal operation. See “Section 10: Flash Download Commands” for more information.*

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions. Run the Diagnostic Print Tests to see what emulation the printer is set for. For more information, see “Diagnostic Print Tests” later in this section.

Note: *The EFP9800 FLASHLOAD software utility can also be used for downloading firmware to the unit. This utility is included in the EFP9800-SW1 style package.*

Before putting the printer into the flash download mode, install the program that implements the download protocol onto the host computer (or any IBM-compatible computer that can be connected to the printer for diagnostic purposes). This program is available from Unisys. Contact your Unisys sales representative for more information.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. To put the printer into flash download mode, set the DIP switches to the appropriate settings for the interface you are using.

Diagnostics and Print Tests

RS-232C Switch Settings

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	Setting
ON	ON	ON	N/A	OFF	N/A	N/A	N/A	DTR/DSR control
ON	ON	ON	N/A	ON	N/A	N/A	N/A	XON/XOFF control
ON	ON	ON	N/A	N/A	OFF	N/A	N/A	Without parity
ON	ON	ON	N/A	N/A	ON	N/A	N/A	Odd parity
ON	ON	ON	N/A	N/A	N/A	OFF	OFF	19,200 Baud rate
ON	ON	ON	N/A	N/A	N/A	ON	OFF	9,600 Baud rate
ON	ON	ON	N/A	N/A	N/A	OFF	ON	4,800 Baud rate
ON	ON	ON	N/A	N/A	N/A	ON	ON	1,200 Baud rate

Parallel Switch Settings

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	Setting
ON	ON	ON	N/A	N/A	N/A	N/A	N/A	Parallel Printers Only

Note: When switches 1, 2, and 3 are all turned on during power up, the printer enters the flash download mode. The other switches determine the communication parameters.

4. Turn the printer back on.

The printer is now in flash download mode.

5. Run the program that implements the download protocol.

The program leads you through the download process.

Note: *This program must be installed on the host computer or to a computer that is connected to the printer for diagnostic purposes.*

6. Turn the printer off and reset the DIP switches to what they were when you started.
7. For normal operation settings, see “Switch Settings” in section 5.
Turn the printer back on.

Data Scope Mode

Data scope mode is used to check communication between the printer and the host computer. When in data scope mode, the printer is configured for normal operations and receives all communication from the host computer. Instead of performing the commands however, the printer prints them in hexadecimal format on the receipt in the order they are received. For example, “1” prints as hexadecimal 31, “A” prints as hexadecimal 41, and so on.

Enter Data Scope Mode

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions. Run the Diagnostic Print Tests to see if the Data Scope mode is on or off. For more information, see “Diagnostic Print Tests” later in this section.

Note: *Secure the roller assembly in a closed position to eliminate the nuisance noise from occurring when the receipt take-up assembly is not being used.*

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.

Diagnostics and Print Tests

3. Set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	OFF	ON	OFF	ON	OFF	OFF

4. Turn the printer back on to put the printer in Data Scope mode.
The red Paper Status LED blinks once to indicate that the printer is in Data Scope mode.
5. Turn the printer off and reset the DIP switches to what they were when you started.
For normal operation settings, see “Switch Settings” in section 5.
6. Turn the printer back on.
7. Run a transaction from the host computer.
All commands and data sent from the host computer are printed as hexadecimal characters as shown.

You can check that the Data Scope mode parameters have been stored in NVRAM by printing out the configuration information. For more information, see “Diagnostic Print Tests” later in this section.

Exit Data Scope Mode

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	OFF	OFF	OFF	ON	OFF	OFF

4. Turn the printer back on to take the printer out of Data Scope mode.
The red Paper Status LED blinks once to indicate that the printer is out of Data Scope mode.
5. Turn the printer off and reset the DIP switches to what they were when you started.
6. For normal operation settings, see “Switch Settings” in section 5.
7. Turn the printer back on.

Enabling or Disabling the Cover Open Switch

Use this procedure to enable or disable the cover open switch. The cover open switch is optional, and may not be available on all printers.

***Note:** The EFP9800 FLASHADMIN software utility can also be used for enabling or disabling the cover open switch. This utility is included in the EFP9800-SW1 style package.*

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions.

***Note:** Secure the roller assembly in a closed position to eliminate the nuisance noise form occurring when the receipt assembly is not being used.*

Diagnostics and Print Tests

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to enable or disable the cover open switch:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	
ON	OFF	N/A	OFF	OFF	OFF	ON	N/A	Enable Cover Open Switch
ON	OFF	N/A	ON	OFF	OFF	ON	N/A	Disable Cover Open Switch

4. Turn the printer back on.
5. Turn the printer off and reset the DIP switches to what they were when you started.
6. For normal operation settings, see “Switch Settings” in section 5.
7. Turn the printer back on.

Verifying Read of MICR Characters

This test reads the characters on a check and prints a hexadecimal dump of the characters on the receipt. It is also referred to as the MICR Read and Print Loop test. This is a continuous test.

Note: *The MICR check reader feature has been factory adjusted for a normal operating environment with a host computer. However, additional devices, such as CRT monitors or large metal surfaces near the printer, can affect the printer's magnetic field, causing intermittent reading errors when the MICR check reader is in operation.*

This condition can be easily diagnosed by checking the noise level of the MICR check reader. See the next section, "Checking MICR Noise Level" for more information.

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.

Diagnostics and Print Tests

3. Set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	E13B Font Test
ON	OFF	ON	OFF	OFF	OFF	OFF	ON	CMC7 Font Test

4. Turn the printer back on to begin the test.

The green Slip In LED blinks, indicating that the printer is ready for the check to be inserted.

5. Insert the check into the printer from the front, face up, with the MICR characters to the right.

See “Verifying Checks” in “Section 2: Operating the Printer” for more information about inserting checks to be read by the MICR check reader.

Note: *Do not hold or keep the check from moving during the MICR check reader transaction or the check numbers will not be read accurately.*

6. Slide the check toward the back of the printer along the right side until it covers both sensors.

The green Slip In LED turns on continuously when both sensors are covered, indicating that the check is inserted properly. The printer reads the magnetic characters on the check and feeds the check back out.

The printer prints the decoded data on the receipt, and then prepares the printer to receive another check to continue the test.

7. To stop the test, wait until the printer completes a cycle and is waiting until a new check is inserted.

8. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Switch Settings” in section 5.

9. Turn the printer back on.

Checking MICR Noise Level

This test checks the extraneous signals picked up by the MICR check reader and prints a reading indicating the relative level of the noise. If the noise level is printed as a letter lower than F (A-E), then the MICR check reader will generally read the MICR characters without problems. However, if the letter printed is the letter F or above, there may be problems when reading the MICR characters, and you may need to call a service representative.

Note: *The MICR check reader feature has been factory adjusted for a normal operating environment with a host computer. However, additional devices, such as CRT monitors or large metal surfaces near the printer, can affect the printer's magnetic field, causing intermittent reading errors when the MICR check reader is in operation.*

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to the following settings:

Switch	Switch	Switch	Switch	Switch	Switch	Switch	Switch
1	2	3	4	5	6	7	8
ON	OFF	ON	OFF	OFF	OFF	ON	OFF

4. Turn the printer back on to begin the test.

Diagnostics and Print Tests

5. Press the Paper Feed button.

The printer prints the letter indicating the relative noise level on the receipt.

6. Repeat by pressing the Paper Feed button again.

When finished, turn the printer off and reset the DIP switches to what they were when you started.

7. For normal operation settings, see “Switch Settings” in section 5.
8. Turn the printer back on.

Selecting the Font for the MICR Check Reader

Use this procedure to select the font for the MICR check reader to read. There are two fonts that the EFP9800 printer is able to recognize. However, the switches must be set to the font that will be read.

Note: *The EFP9800 FLASHADMIN software utility can also be used for MICR font selection. This utility is included in the EFP9800-SW1 style package.*

Note: *Secure the roller assembly in a closed position to eliminate the nuisance noise from occurring when the receipt take-up assembly is not being used.*

Caution

The DIP switches are set at the factory to predetermined settings. Change the settings carefully to avoid changing other functions.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.

3. Set the DIP switches to setting for the font you wish:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	MICR Font
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	CMC-7
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	E13b (default)

4. Turn the printer back on.
5. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Switch Settings” in section 5.

6. Turn the printer back on.

Diagnostic Print Tests

Three diagnostic print tests and a general print test are available:

- Print configuration, ROM CRC, and internal switch packs information.
- Continuous slip printing.
- Print each character in the ASCII character set.
- General print test

The following procedures describe how to run each of these tests.

Print Configuration Information

This test produces a printout of all ROM CRC, internal switch pack, and configuration information. See the sample printout later in this section.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	N/A	ON	ON	ON	N/A	N/A

4. Turn the printer back on to begin printing the test.
5. Turn the printer off to stop the test.
6. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Setting Switches” in section 5.

7. Turn the printer back on to begin normal operation.

Continuous Slip Printing

This test prints a slip, stopping each time the end of the slip is sensed and continuing when a new slip is inserted. The printout includes all ROM CRC, internal switch pack, and configuration information (same as the Print Configuration Information test). See the sample printout later in this section.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to the following settings:

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	N/A	ON	ON	OFF	N/A	N/A

4. Turn the printer back on.

The Slip In LED flashes until a slip is inserted. When the slip is positioned correctly, the Slip In LED is on steady.

5. Press the Paper Feed button.

The printer prints the slip. When the printer senses the end of the slip, printing stops.

6. Remove the slip and insert a new one to continue the test.

OR

Turn the printer off to stop the test.

7. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Setting Switches” in section 5.

8. Turn the printer back on to begin normal operation.

Print Each Character in the ASCII Character Set

This test produces a printout of each character in the ASCII character set, including all code pages, emulations, and character types (single-wide, double-wide, and so forth). You can set the test to cycle continuously, or to restart when you press the Paper Feed button.

1. Turn the printer off.
2. Turn the printer to the back to access the DIP switches and write down the current switch settings.
3. Set the DIP switches to one of the following settings:

To print each character in the ASCII character set (continuous printing):

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	N/A	OFF	ON	ON	N/A	N/A

To print each character in the ASCII character set (Restart test by pressing the Paper Feed button):

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
ON	OFF	N/A	OFF	ON	OFF	N/A	N/A

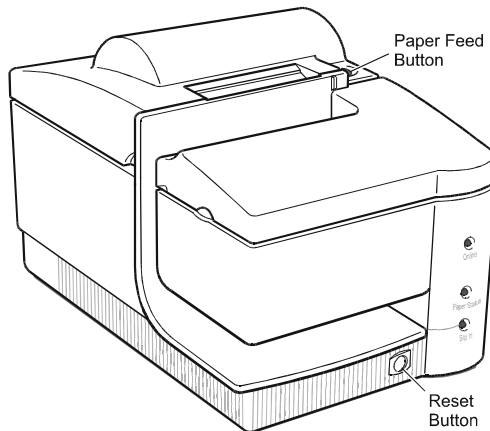
4. Turn the printer back on to begin printing the test.
5. Turn the printer off to stop the test.
6. Turn the printer off and reset the DIP switches to what they were when you started.

For normal operation settings, see “Setting Switches” in section 5.

7. Turn the printer back on to begin normal operation.

General Print Test

This test produces a printout of all ROM CRC, internal switch pack, and configuration information (see the sample printout on the next page). In addition, it prints each character in the ASCII character set including all code pages and character types (single-wide, double-wide, and so forth).



5766

With the unit powered on the Online LED on:

1. Press the Reset button (Online LED goes off).
2. Press the Reset button (Online LED goes on).
3. Press the Paper Feed button and continue to hold it down until the printer begins to prints.
4. Press the Paper Feed button to stop the test.

Note: After running the Print Test, it is recommended that the unit be reset again prior to being returned to normal operation.

Sample of Configuration Printout

The following sample shows a configuration printout, including ROM CRC and internal switch pack.

```
CRC on CPU is      C4BD
Sector 0 CRC is    90F3
Sector 1 CRC is    792D

External Switches
 1  2  3  4  5  6  7  8
OFF ON OFF OFF ON OFF OFF OFF

MICR DC offset is  7E
MICR parsing is   E13B

Datascope Mode  OFF

Lines Printed                25,231
Hours on                  1,741

Slip hold                   3

CURRENT EMULATION IS
ESC/POS(TM)

NVRAM SWITCHES:
PACK #1
 1  2  3  4  5  6  7  8
OFF OFF OFF OFF OFF OFF OFF OFF

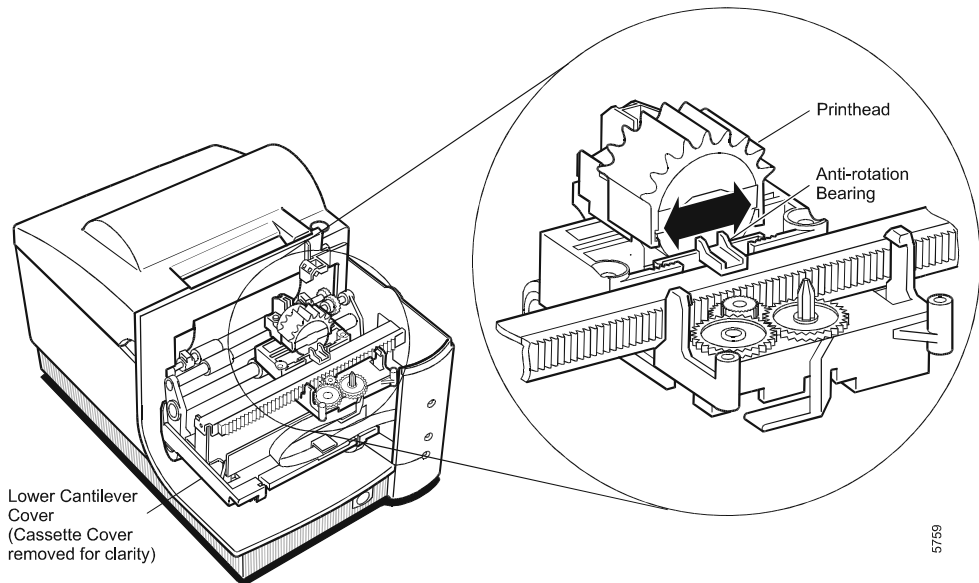
PACK #2
 1  2  3  4  5  6  7  8
OFF OFF OFF OFF OFF OFF OFF OFF

PACK #3
 1  2  3  4  5  6  7  8
OFF OFF OFF OFF OFF OFF OFF OFF

PACK #4
 1  2  3  4  5  6  7  8
OFF OFF OFF OFF OFF OFF OFF OFF
```

Adjusting the Printhead Gap

If the print from the test is light, the gap between the printhead and the paper may be too large. If the print is smudged, the gap may be too small. You can easily adjust the printhead gap.



1. Open the cassette cover and remove the ribbon cassette.
2. Move the anti-rotation bearing to the right to decrease the gap, or move it to the left to increase the gap.
3. Put the ribbon cassette back in the printer and place the cassette cover back on the printer.
4. Run the general print test again to be sure that the adjustment is correct. Repeat steps 1-3 if necessary.

See “General Print Test” earlier in this section.

Section 4

When Something Goes Wrong

The EFP9800 printer is a simple, generally trouble-free printer, but from time to time minor problems may occur. For example, the power supply may be interrupted or the paper may jam.

For some problems, the printer communicates the information to the host computer and relies on the application to indicate the problem.

You'll be able to fix most problems easily. For some problems, you will need to contact a Unisys-authorized service representative. Any time a problem persists, contact a service representative.

Following is a list of problems you may encounter and the page on which they are described.

Problem	Page
Printer Not Operating	4-2
Indicators Showing a Problem	4-3
Printer Does Not Feed Receipt/Journal Paper	4-3
Carriage and Paper Jams	4-4
Slips, Forms, or Checks Not Feeding Through Properly	4-4
Slips, Forms, or Checks Skew When Feeding Into the Printer	4-5
Some Dots are Missing	4-5
Ribbon Tears or Frays More Quickly Than Expected	4-5
Overall Print is Light or Smudged	4-6
Some Dots are Printing Light	4-6
Other Serious Problems	4-7

Printer Not Operating

Cause	Action
Power cable not connected properly	Check all cable connections. Check that the host computer and power supply are both on. The power supply is turned on by plugging it into an outlet.
Paper jam in receipt/journal or slip station	Open the cover and the clamshell. Push the carriage away from the paper jam. Remove any jammed paper or other obstructions. Press the Reset button to remove error status. Press the Paper Feed button to make sure the paper is no longer jammed. For step-by-step instructions for loading paper, see section 2.
Receipt/Journal paper empty	Check paper roll and add a new roll if necessary. For step-by-step instructions, see section 2.

Indicators Showing a Problem

Cause	Action
Paper Status LED blinks red	A blinking Paper Status LED indicates that paper is low or out. Check receipt/journal paper and replace when necessary. For more information see, section 2.
Paper Status LED steady red	<p>A steady lit Paper Status LED indicates a carriage or paper jam.</p> <p>Open the cover and the clamshell. Push the carriage away from the paper jam. Remove any jammed paper or other obstructions.</p> <p>Press the Reset button to remove error status.</p> <p>Reload the paper if necessary, and then close the cover.</p> <p>Press the Paper Feed button to make sure the paper is no longer jammed.</p> <p>For step-by-step instructions for loading paper, see section 2.</p>
Slip In LED steady green	Indicates that the slip or form is positioned properly (detected by both sensors). No action necessary.
Paper Status LED steady red and Slip In LED steady green	The NVRAM has failed. The PC Board needs to be replaced. Contact a Unisys-authorized service representative.
Online LED not lit	Check all cable connections. Check that the host computer and power supply are both on. The power supply is turned on by plugging it into an outlet.

Printer Does Not Feed Receipt/Journal Paper

Cause	Action
Clamshell not completely latched	Open the cover and then open the clamshell. Close the clamshell and make sure that it is latched properly. Close the cover.

Carriage and Paper Jams

Cause	Action
Jam in receipt/journal or slip station	<p>Open the cover and the clamshell. Push the carriage away from the jam. Remove any jammed paper or other obstructions.</p> <p>Press the Reset button to remove error status.</p> <p>Reload the paper if necessary, and then close the cover.</p> <p>Press the Paper Feed button to make sure the paper is no longer jammed.</p> <p>For step-by-step paper loading instructions, see section 2.</p> <p>If this does not solve the problem, contact a Unisys-authorized service representative.</p>

Slips, Forms, or Checks Not Feeding Properly

Cause	Action
Slip, form, or check not inserted properly	<p>Slips, forms, and checks must be inserted properly. For step-by-step instructions see "Validating Slips and Checks" in section 2.</p> <p>When the form or slip is inserted properly, the Slip In LED is on.</p> <p>If reinserting the slip, form, or check does not resolve the problem, contact a Unisys-authorized service representative.</p>
Slip, form, or check skewing or catching in slip station due to a paper jam or obstruction	<p>Open the cover and the clamshell. Push the carriage away from the jam. Remove any jammed paper or other obstructions.</p> <p>Press the Reset button to remove error status.</p> <p>Reload the paper and then close the cover.</p> <p>Press the Paper Feed button.</p> <p>For step-by-step paper loading instructions, see section 2.</p>

Slips, Forms, or Checks Skew When Feeding into the Printer

Cause	Action
Paper path jammed	<p>Open the cover and the clamshell. Push the carriage away from the jam. Remove any jammed paper or other obstructions.</p> <p>Press the Reset button to remove error status.</p> <p>Reload the paper if necessary, and then close the cover.</p> <p>Press the Paper Feed button to make sure the paper is no longer jammed.</p> <p>For step-by-step paper loading instructions, see section 2.</p>
Ribbon cassette not installed properly	<p>Check that the ribbon cassette is properly installed. For more information, see “Changing the Ribbon Cassette” in section 2.</p>

Some Dots are Missing

Cause	Action
A print wire in the printhead is not working. That dot is missing from all characters that require it.	<p>The printhead must be replaced. Contact a Unisys-authorized service representative.</p>
Flex cable broken or badly worn	<p>The flex cable must be replaced. Contact a Unisys-authorized service representative.</p>

Ribbon Tears or Frays More Quickly Than Expected

Cause	Action
Ribbon out of specification	<p>Check that the ribbon you are using meets the specifications for the EFP9800 printer. For more information see, “Ordering Paper and Supplies” in section 1.</p>
Printhead worn; causing it to tear or fray the ribbon. Some dots may be printing light.	<p>The printhead must be replaced. Contact a Unisys-authorized service representative.</p>

Overall Print is Light or Smudged

Cause	Action
Ribbon cassette worn	Replace the ribbon cassette. For step-by-step instructions, see “Changing the Ribbon Cassette” in section 2.
Slip out of specification	Check that the slip you are using meets the specifications for the EFP9800 printer. For more information see, “Ordering Paper and Supplies” in section 1. Slips should not be more than five parts thick. Total thickness should be no greater than 0.014 inches (0.355 mm). Note: The receipt is included as one or two of the parts depending if it is one-ply or two-ply. Five-part slips should be double-printed by the host computer program. Some slips may have poor quality carbons or chemicals that don't react properly, causing poor print quality.
Printhead gap too large or small	If the print is light, the gap between the printhead and the paper may be too large; if print is smudged, the gap may be too small. Adjust the printhead gap. Open the cover and the clamshell. Move the anti-rotation bearing one click to the back to decrease the printhead gap or one click to the front to increase the printhead gap. See “Adjusting the Printhead Gap” in section 3 for an illustration and instructions.
Some Dots are Printing Light	
Printhead worn; causing some dots to print light on a consistent basis	The printhead must be replaced. Contact a Unisys-authorized service representative..
Ribbon worn	Check for wear in the ribbon and replace the cassette if necessary. For more information, see “Changing the Ribbon Cassette” in section 2.

Other Serious Problems

The following problems all need to be corrected by a qualified service representative. For more information on contacting a representative, see the next section.

- Printer does not cycle or stop when required.
- Illegible characters or light print.
- Paper does not feed.
- Platen does not open or close.
- Printer does not communicate
- MICR check reader not reading characters on checks

Note: *The MICR check reader feature has been factory adjusted for a normal operating environment with a host computer. However, additional devices, such as CRT monitors or large metal surfaces near the printer, can affect the printer's magnetic field, causing intermittent reading errors when the MICR check reader is in operation.*

This condition can be easily diagnosed by checking the noise level of the MICR check reader. See "Checking MICR Noise Level" in section 3 for more information.

Getting Service

For serious problems, such as the printer not printing or not communicating with the host computer, contact a Unisys-authorized service representative to arrange a service call.

When Something Goes Wrong

Section 5

Communication

In order for a receipt or slip to be printed, a program must be in place that translates the data from the host computer into a language the printer can understand. This program must tell the printer exactly how to print each character. This section describes how to create such a program or modify an existing one.

Interfaces

In order for the printer to communicate with the host computer, a communication link must be set up. The EFP9800 supports the following industry standard interfaces:

- RS-232C interface
- IEEE 1284 parallel interface

Sending Commands

Once the communication link is established, commands can be sent to the printer. This section describes how to send commands to the printer using DOS and BASIC. This section does not take into account the necessary protocol— it is meant as a general introduction to how the printer functions.

Using DOS to Send Commands

One way of getting commands to the printer is to send them directly from DOS. For example, the command:

```
COPY CON: COM1 :
```

means that the hexadecimal code corresponding to any key that is pressed is sent to the RS-232C communication port COM1 when the COPY mode is exited. If the printer is connected to COM1 and the communications modes match, then the data will go to the printer.

Communication

Exit the COPY mode by typing:

```
CTRL Z
```

```
[Enter]
```

Once the computer knows to direct data from any print command to the proper port, commands can be sent from any software program.

Using BASIC to Send Commands

In BASIC, printer commands are sent as a string of characters preceded by the PRINT command. For example,

```
PRINT#1, CHR$( &H0A)
```

(where #1 is the file number of a communication line opened by the OPEN "COM1:" command. For more information, see your BASIC documentation.)

sends the hexadecimal number 0A to the printer, which causes the printer to print the contents of its print buffer. Previously sent commands tell the printer exactly how this data should appear on the paper. For example,

```
PRINT#1, CHR$( &H1b) + CHR$( &H21) + CHR$( &H021) ; "ABC" ;  
CHR$( &H0A)
```

sends the hexadecimal numbers 12 41 42 43 0A to the printer. This causes the printer to set itself to double-wide mode, load the print buffer with "ABC" (41 42 43), and finally, to print (0A). The communication link the BASIC program sends must be matched to that of the printer.

RS-232C Interface

The following sections explain the interface protocols and connectors for the RS-232C interface. For information on the parallel interface and connectors, see "Parallel Interface" later in this section.

RS-232C Interface Protocols

The RS-232C interface has a protocol associated with it that the host computer must understand and adhere to.

Only when the interface parameters are matched and the proper protocol is used will the host computer and the printer be able to communicate.

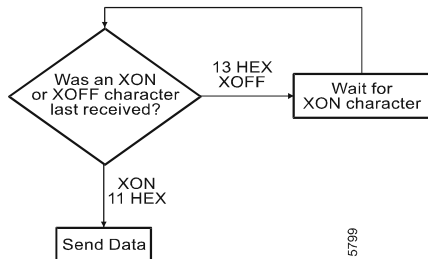
The RS-232C interface uses either XON/XOFF or DTR/DSR protocol.

- For XON/XOFF, a particular character is sent back and forth between the host computer and the printer to regulate the communication.
- For DTR/DSR, changes in the DTR/DSR signal coordinate the information flow.

The RS-232C version of the EFP9800 offers the standard options which are selected with the DIP switches. For more information on these settings, see “Setting Switches” later in this section.

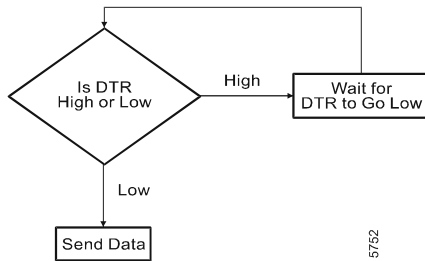
XON/XOFF Protocol

The XON/XOFF characters coordinate the information transfer between the printer and the host computer. The printer sends an XON character when it is ready to receive data and it sends an XOFF character when it cannot accept any more data. The software on the host computer must monitor the communication link as shown in the following flowchart in order to send data at appropriate times.



DTR/DSR Protocol

The DTR signal is used to control data transmission to the printer. It is driven low when the printer is ready to receive data and driven high when it cannot accept any more data. Data is transmitted from the printer after it confirms that the DSR signal is low.



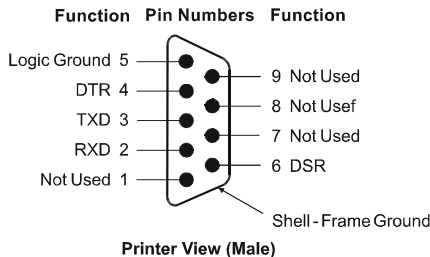
RS-232C Interface Connectors

This section describes the pin settings for the RS-232C connectors and interface parameters. The RS-232C parameters are selected by setting the DIP switches on the PC board. For more information, see “Setting Switches” later in this section. The RS-232C parameters must match those of the host computer.

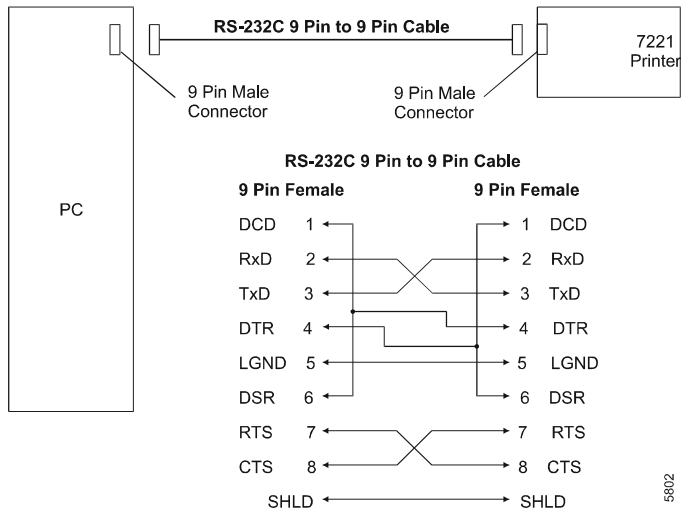
RS-232C Communication Connector Pin Assignments

The following illustrations show the RS-232C communication connector and pin assignments. The connector is a 9-pin male D-shell connector and is located at the rear of the printer.

RS-232C 9-Pin to 9-Pin Communication Connector Pin Assignments



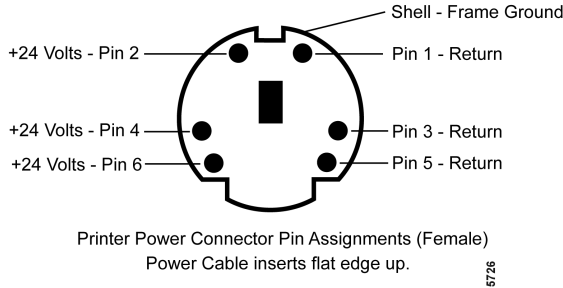
RS-232C 25-Pin (Host Computer) to 9-Pin Communication Connector Pin Assignments



5802

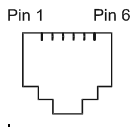
Power Cable Connector Pin Assignments

The following illustration shows the power cable connector and pin assignments. The power cable connector is a 6-pin mini-DIN plug and is located at the rear of the printer.



Cash Drawer Connector Pin Assignments

The following illustration shows the cash drawer connector and pin assignments. The cash drawer connector is 6-pin modular jack and is located at the rear of the printer. You may use one or two cash drawers. If you use two, connect a split cable (y-cable) to use the same connector for both.



Pin Number	Signal	Direction	Note
1	Frame Ground		
2	Drawer Drive 1	Output	Drawer Solenoid 1-
3	Drawer Status	Input	Drawer Switch
4	+24 V +/- 5%	Output	Drawer Solenoid +
5	Drawer Drive 2	Output	Drawer Solenoid 2-
6	Logic Ground		Drawer Switch

Parallel Interface

The parallel interface is an industry standard IEEE 1284 bi-directional interface. It communicates in the following modes: compatibility, nibble, and byte.

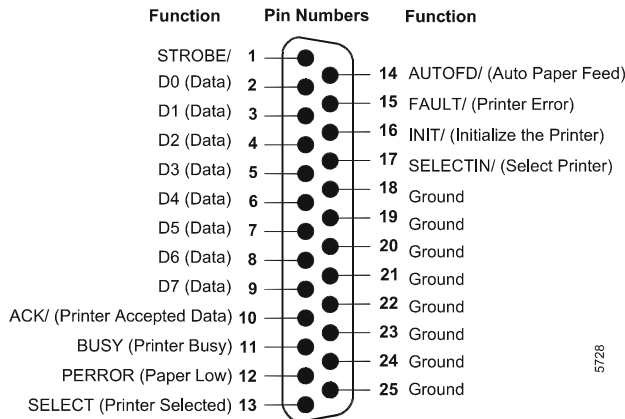
The following sections explain the interface protocols and connectors for the parallel interface. For information on the RS-232C interface protocols and connectors, see “RS-232C Interface” earlier in this section.

Parallel Interface Connectors

This section describes the pin settings for the parallel connectors and interface parameters. The parallel parameters are selected by setting the DIP switches on the PC board. For more information, see “Setting Switches” later in this section. The parallel parameters must match those of the host computer.

Parallel Communication Connector Pin Assignments

The following illustrations show the parallel communication connector and pin assignments. The connector is designated as a IEEE 1284-A receptacle and is commonly known as a D-subminiature 25 pin connector. It is located at the rear of the printer.

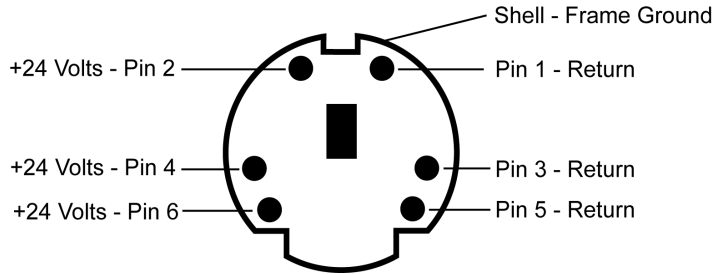


Power Cable Connector Pin Assignments

The following illustration shows the power cable connector and pin assignments. The power cable connector is a 6-pin mini-DIN plug which mates

Communication

with an integral shielded cable on the external power supply. It is located at the rear of the printer.

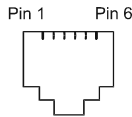


Printer Power Connector Pin Assignments (Female)
Power Cable inserts flat edge up.

5726

Cash Drawer Connector Pin Assignments

The following illustration shows the cash drawer connector and pin assignments. The cash drawer connector is 6-pin modular jack and is located at the rear of the printer. You may use one or two cash drawers. If you use two, connect a split cable (y-cable) to use the same connector for both.



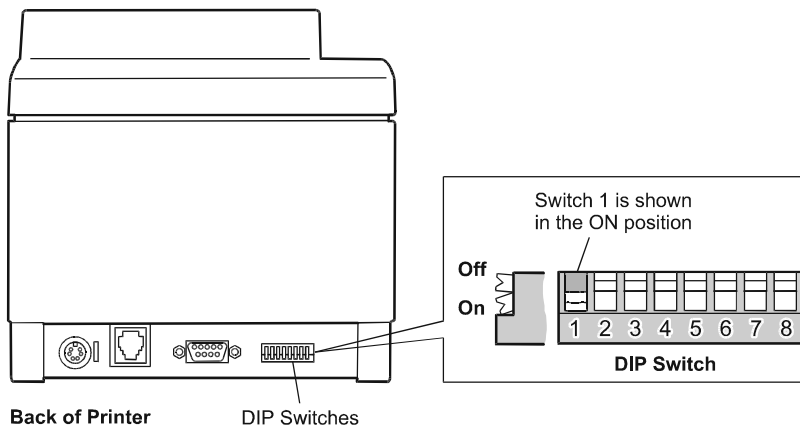
5729

Pin Number	Signal	Direction	Note
1	Frame Ground		
2	Drawer Drive 1	Output	Drawer Solenoid 1-
3	Drawer Status	Input	Drawer Switch
4	+24 V +/- 5%	Output	Drawer Solenoid +
5	Drawer Drive 2	Output	Drawer Solenoid 2-
6	Logic Ground		Drawer Switch

Setting Switches

The DIP switches are located at the rear of the printer as shown in the illustration. They are used to set the communication parameters as outlined in the table. These parameters must match those of the host computer in order for the host computer and the printer to communicate.

Note: *The switches are also used for setting other functions and tests. Be careful not to accidentally change the settings for the other functions. For more information, see “Level 1 Diagnostics” in section 3.*



Back of Printer DIP Switches

Use a straightened paper clip or other pointed object to set the switches.

1. Turn the printer to the back to access the DIP switches.
2. Set the switches to the settings you want, using the options in the tables below.

There is one table for RS-232C interface settings and one for parallel interface settings.

Caution

Do not set switch 1 to On. Setting switch 1 to On puts the printer in Level 1 diagnostics (setup mode) where other functions and tests can be changed. Set switch 1 to Off when setting switches for the interface settings. This puts the printer in the Online mode so it can communicate with the host computer.

Communication

DIP Switch Settings for RS-232C Parameters

Switch	Settings		Description
1	OFF ON		On-line Mode. Use to set RS-232C options (default) Offline. Level 1 Diagnostics (setup mode)
2	OFF ON		DTR/DSR Protocol (default) XON/XOFF Protocol
3	OFF ON		Without Parity (default) With Parity
4*	OFF ON		Odd Parity Even Parity
5, 6	5 OFF ON OFF ON	6 OFF OFF ON ON	19,200 Baud 9600 Baud (default) 4800 Baud 1200 Baud

*Switch 4 is not used if the parity is disabled (switch 3 OFF). Switches 7, 8 are not used.

DIP Switch Settings for Parallel Printers

Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	Description
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Online

Section 6

EFP9800 ESC/POS Commands

Commands control all operations and functions of the EFP9800 printer. The commands in this section include the commands for the Epson 370/375 printer, allowing the EFP9800 printer to emulate the Epson printers.

List of EFP9800 ESC/POS Commands

This table lists the EFP9800 ESC/POS commands in numerical order according to their hexadecimal codes. The page number indicates where a complete description of the command can be found in the next section.

Hexadecimal Code	Command Name	Page
09	Horizontal Tabs: Skip to Next Tab Stop	6-5
0A	Line Feed	6-5
0C	Eject Slip	6-6
0D	Carriage Return	6-6
10 04	Real Time Status Transmission	6-58
10 05	Real Time Request to Printer	6-62
18	Cancel Print Data in Page Mode	6-7
1B 20	Set Right-Side Character Spacing	6-7
1B 21	Select Print Mode(s)	6-8
1B 22	Select Print Mode(s) (for Windows [®] Printer Drivers)	6-9
1B 24	Set Absolute Starting Position	6-10
1B 25	Select/Cancel User-Defined Character Set	6-29
1B 26	Define User-Defined Characters	6-30

EFP9800 ESC/POS Commands

Hexadecimal Code	Command Name	Page
1B 2A	Select Bit Image Mode	6-40
1B 2D	Set/Cancel Underline	6-34
1B 32	Set Line Spacing to Default Spacing	6-11
1B 33	Set Line Spacing	6-12
1B 3C	Return Home	6-12
1B 3D	Select Peripheral Device	6-13
1B 3F	Cancel User-Defined Characters	6-35
1B 40	Initialize Printer	6-13
1B 43	Set Slip Eject Length	6-14
1B 44	Set Horizontal Tab Positions	6-14
1B 45	Set/Cancel Emphasized Mode	6-35
1B 47	Set/Cancel Double-Strike Mode	6-36
1B 4A	Print and Feed Paper	6-15
1B 4C	Select Page Mode	6-16
1B 52	International Character Set	6-36
1B 54	Select Print Direction in Page Mode	6-17
1B 55	Set/Cancel Uni-Printing	6-18
1B 56	Set/Cancel 90 Degree Clockwise Rotation	6-39
1B 57	Set Printing Area in Page Mode	6-19
1B 5C	Set Relative Print Position	6-21
1B 61	Select Justification	6-21
1B 63 30	Select Print Paper(s)	6-22
1B 63 31	Select Paper(s) for Setting Line Spacing	6-23
1B 63 34	Select Paper Sensor(s) to Stop Printing	6-24
1B 63 35	Enable/Disable Paper Feed Button	6-25
1B 64	Print and Feed <i>n</i> Lines	6-25
1B 66	Set Slip Waiting Time	6-25
1B 70	Generate Pulse	6-26

Hexadecimal Code	Command Name	Page
1B 71	Release	6-26
1B 74	Select Character Code Table	6-39
1B 75	Transmit Peripheral Device Status	6-45
1B 76	Transmit Paper Sensor Status	6-46
1B 7B	Set/Cancel Upside Down Printing	6-39
1B 7D 00	Copy Downloaded Object to Flash Memory	6-76
1B 7D 01	Disable Loading the Object to RAM When Powering on the Printer	6-77
1B 7D 02	Enable Loading the Object When Powering on the Printer	6-78
1B 7D 03	Copy the Object from Flash Memory to External RAM	6-78
1D 2A	Define Downloaded Bit Image	6-42
1D 2F	Print Downloaded Bit Image	6-43
1D 45	Select Head Energizing Time	6-27
1D 48	Select Printing Position of HRI Characters (Receipt Station)	6-64
1D 49	Transmit Printer ID	6-47
1D 4C	Set Left Margin	6-27
1D 50	Set Fundamental Calculation Pitch	6-28
1D 57	Set Printable Area Width	6-28
1D 61	Enable/Disable Automatic Status Back (ASB)	6-48
1D 66	Select Pitch of HRI Characters (Receipt Station)	6-64
1D 68	Select Height of Bar Code (Receipt Station)	6-64
1D 6B	Print Bar Code (Receipt Station)	6-65
1D 72	Transmit Status	6-54
1D 77	Select Horizontal Size of Bar Code (Receipt Station)	6-68

EFP9800 ESC/POS Command Descriptions

These commands include the commands for the Epson 370/375 printer. The command descriptions in this section are grouped in the following categories:

- Printer Function Commands
- Print Characteristics Commands
- Graphics Commands
- Printer Status Commands
- Real-time Commands
- Bar Code Commands
- Page Mode (Overview only. Many commands throughout this section include page mode functions.)
- Flash Memory Commands (to copy user-defined logos or character sets into flash memory)

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
- Cutting paper

The commands are listed numerically by hexadecimal code.

Horizontal Tabs: Skip to Next Tab Stop

Skips to the next horizontal tab stop. The command is ignored unless the next horizontal tab position has been defined. Default tab stops are every 8 columns.

Hexadecimal	Decimal	ASCII
09	9	HT

Standard Mode

If there are no more tab stops before the end of a line when this command is received, the print starting position will be set to the beginning of the next line. In other words, a line feed will be performed.

Page Mode

If there are no more tab stops before the end of a line when this command is received, the print starting position will be set to the end of the current line. Any subsequent character received will cause an auto-line feed to be performed. For more information see "Page Mode" later in this section.

Line Feed

Hexadecimal	Decimal	ASCII
0A	10	LF

Standard Mode

Prints the data in the buffer and feeds the paper one line.

Page Mode

Sets the print starting position to the beginning of the next line. For more information see "Page Mode" later in this section.

Eject Slip

Prints the data in the buffer and ejects the slip.

Hexadecimal	Decimal	ASCII
0C	12	FF

Standard Mode

- Enabled only when slip is selected for printing.
- Slip is ejected to the length set by the Set Slip Eject Length command (1B 43). If this length is not set, the slip is completely ejected.
- Receipt or journal paper from the paper roll is not ejected even if it is also selected.
- After the slip is ejected, the receipt or journal paper is selected for printing.
- Slips are ejected forward only.

Page Mode

The processed data is printed and the printer returns to standard mode. The developed data is deleted after being printed. For more information see “Page Mode” later in this section.

Carriage Return

Hexadecimal	Decimal	ASCII
0D	13	CR

Standard Mode

Prints one line and sets the print starting position to the beginning of the line. Does not feed the paper.

Page Mode

Sets the print starting position to the beginning of the line. For more information see “Page Mode” later in this section.

Cancel Print Data in Page Mode

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 is only used in page mode. For more information see “Page Mode” later in this section.

Hexadecimal	Decimal	ASCII
18	24	CAN

Set Right-Side Character Spacing

Sets the right-side character spacing to $n \times$ (fundamental calculation pitch). See the Set Fundamental Calculation Pitch command (1D 50). The default value is $n = 0$. The command is only available for the paper selected using the Select Paper for Setting Line Spacing command (1B 63 31).

Hexadecimal	Decimal	ASCII
1B 20 n	27 32 n	ESC SP n

- For double-wide mode, the right-side character spacing is twice the normal value.
- When the result of the fundamental calculation pitch is more than 32/160 inches, the command is ignored.

Standard Mode

The horizontal direction of the fundamental calculation pitch is used to set the right-side character spacing.

Page Mode

Two types of fundamental calculation pitch are used to set the right-side character spacing, depending on the value of the Select Print Direction in Page Mode command (1B 54 *n*). For more information see “Page Mode” later in this section.

- If 1B 54 *n* = 0 or 2, the horizontal direction of the fundamental calculation pitch is used.
- If 1B 54 *n* = 1 or 3, the vertical direction of the fundamental calculation pitch is used.

Select Print Mode(s)

Selects the print mode(s) specified by the value of *n* as outlined below. The default is 1.

Hexadecimal	Decimal	ASCII
1B 21 <i>n</i>	27 33 <i>n</i>	ESC ! <i>n</i>

Print Mode	Value of <i>n</i> in Hexadecimal	
	33/35/42 Characters per Line (5 x 9)	40/42/51 Characters per Line (7 x 7)
Standard	00	01
Double-Strike	08	09
Double-High	10	11
Double-Wide	20	21
Double-Strike and Double-High	18	19
Double-Strike and Double-Wide	28	29
Double-High and Double-Wide	30	31
Double-Strike, Double-High, and Double-Wide	38	39
Underlined	80	81
Underlined and Double-Strike	88	89
Underlined and Double-High	90	91
Underlined, Double-Strike, and Double-High	98	99

Underlined and Double-Wide	A0	A1
Underlined, Double-Strike, and Double-Wide	A8	A9
Underlined, Double-High, and Double-Wide	B0	B1
Underlined, Double-Strike, Double-High, and Double-Wide	B8	B9

Note: *Underlines cannot be printed for 90 degree clockwise rotated characters or for spaces set by the Horizontal Tab, Set Absolute Starting Position, or Set Relative Print Position commands.*

Note: *In page mode, the 7 x 7 font (40/42/51 characters/line) and double-strike print mode cannot be used.*

Select Print Mode(s) (for Windows™Printer Drivers)

Selects the print mode(s) specified by the value of n as outlined below. The default is 1. This command is intended for use with Windows printer drivers developed with the Windows unitool. This command is nearly identical to Select Print Mode(s) (1B 21) except that the bits for Double-Strike and Underline are ignored.

Hexadecimal	Decimal	ASCII	Value of n in Hexadecimal	
1B 22 n	27 34 n	ESC " n	33/35/42 Characters per Line (5 x 9)	40/42/51 Characters per Line (7 x 7)
			00	01
			10	11
			20	21
			30	31

Note: *Undertines cannot be printed for 90 degree clockwise rotated characters or for spaces set by the Horizontal Tab, Set Absolute Starting Position, or Set Relative Print Position commands.*

Note: *In page mode, the 7 x 7 font (40/42/51 characters/line) cannot be used.*

Set Absolute Starting Position

Sets the print starting position from the beginning of the line, in the fundamental calculation pitch. The distance (in inches) from the start of the line is calculated as: $[(n1 + n2 \times 256) \times (\text{fundamental calculation pitch})]$. See the Set Fundamental Calculation Pitch command (1D 50).

Hexadecimal	Decimal	ASCII	Value of $n1$	Value of $n2$
1B 24 $n1 n2$	27 36 $n1 n2$	ESC \$ $n1 n2$	0-255	0-255

Standard Mode

The horizontal direction of the fundamental calculation pitch is used to set the print starting position from the beginning of the line.

Page Mode

Two types of fundamental calculation pitch are used to set the print starting position from the beginning of the line, depending on the value of the Select Print Direction in Page Mode command (1B 54 *n*). For more information see “Page Mode” later in this section.

- If 1B 54 *n* = 0 or 2, the horizontal direction of the fundamental calculation pitch is used.
- If 1B 54 *n* = 1 or 3, the vertical direction of the fundamental calculation pitch is used.

Set Line Spacing to Default Spacing

Sets the default spacing in either standard or page mode.

Hexadecimal	Decimal	ASCII
1B 32	27 50	ESC 2

Standard Mode

This command sets the line spacing to the default spacing as set in internal switch 2 (either 6 lines per inch or 7.2 lines per inch). The command is only available for the paper selected using the Select Paper for Setting Line Spacing command (1B 63 31).

Page Mode

This command always sets the line spacing to 6 lines per inch, regardless of the setting of internal switch 2. For more information see “Page Mode” later in this section.

Set Line Spacing

Sets the line spacing to n x (fundamental calculation pitch). The default value is $n = 24$. The command is only available for the paper selected using the Select Paper for Setting Line Spacing command (1B 63 31). See the Set Fundamental Calculation Pitch command (1D 50).

Hexadecimal	Decimal	ASCII	Value of n
1B 33 n	27 51 n	ESC 3 n	0-255

Standard Mode

The vertical direction of the fundamental calculation pitch is used to set the line spacing.

Page Mode

Two types of fundamental calculation pitch are used to set the line spacing, depending on the value of the Select Print Direction in Page Mode command (1B 54 n). For more information see “Page Mode” later in this section.

- If 1B 54 $n = 0$ or 2, the vertical direction of the fundamental calculation pitch is used.
- If 1B 54 $n = 1$ or 3, the horizontal direction of the fundamental calculation pitch is used.

Return Home

Returns the printhead to the standby position.

Hexadecimal	Decimal	ASCII
1B 3C	27 60	ESC <

Select Peripheral Device

Selects or cancels a peripheral device designated by the value of n . When the printer is not selected, it reads all data but performs nothing except the Real Time Status Transmission or Real Time Request to Printer commands. Even though the printer is not selected, it may go offline through manual printer operation.

Use internal switch pack settings to determine which value of n is selected. For more information, see “Switch Entry Mode” in section 3.

Hexadecimal	Decimal	ASCII	Value of n
1B 3D n	27 61 n	ESC = n	1-3 2 = printer not selected 1 or 3 = printer selected

Initialize Printer

Clears the buffer and resets the printer to the default settings as follows:

- Resets the printer mode to the mode that was in effect when the power was turned on.
- DIP switches are not read again.
- Data in the receive buffer is not cleared.
- If slip printing is currently selected, the printer ejects the slip and switches to receipt/journal printing.

Hexadecimal	Decimal	ASCII
1B 40	27 64	ESC @

Set Slip Eject Length

Sets the slip eject length to n lines. (When $n = 0$, no length is set.) Changes in line spacing do not affect the slip eject length. The length set by this command is used only when the Eject Slip command (0C) is performed. This command is only effective in the standard mode.

Hexadecimal	Decimal	ASCII	Value of n
1B 43 n	27 67 n	ESC C n	0 - 255

The maximum slip eject length is 40 inches. When the value of n x line spacing is greater than 40, the slip eject length is set to 40 inches.

Set Horizontal Tab Positions

Sets up to 32 tab positions as specified by the value of n and k . Default tabs are set at intervals of eight characters (columns 9, 17, 25). The tab is positioned using the calculation (character width) x n . Character width includes the right-side space of the character and is doubled when double-wide characters are used.

Hexadecimal	Decimal	ASCII	Value of n	Value of k
1B 44 [n] k 00	27 68 [n] k 00	ESC D [n] k NUL	1 - 255	0 - 32

Horizontal tab positions are not affected by changes in character width.

- n = (column number where a tab is to be set) - 1. For example, to set a tab in column 6, $n = 5$.
- k = the total number of horizontal tabs to be set.

When $\langle n \rangle k$ is less than or equal to the preceding value $\langle n \rangle k - 1$, tab setting is finished. All following data is processed as normal. Data exceeding 32 tab stops is also processed as normal. When $\langle n \rangle k$ exceeds the number of characters printable on a line, the tab position = (maximum printable column) + 1. Enter $\langle n \rangle k$ in ascending order and be sure to enter a NUL code at the end. To clear all tab positions, enter 1B 44 00.

Print and Feed Paper

Prints the data in the buffer and feeds the paper a distance of n x (fundamental calculation pitch). The maximum feed amount is 40 inches; if a greater number is entered, the paper is fed 40 inches. See the Set Fundamental Calculation Pitch command (1D 50).

Hexadecimal	Decimal	ASCII	Value of n
1B 4A n	27 74 n	ESC J n	0 - 255

Standard Mode

The vertical direction of the fundamental calculation pitch is used to calculate the distance the paper is fed.

Page Mode

This command sets the print starting position to the beginning of the line n times (fundamental calculation pitch) down from the current line. Two types of fundamental calculation pitch are used to calculate the distance the paper is fed, depending on the value of the Select Print Direction in Page Mode command (1B 54 n). For more information see “Page Mode” later in this section.

- If 1B 54 $n = 0$ or 2, the vertical direction of the fundamental calculation pitch is used.
- If 1B 54 $n = 1$ or 3, the horizontal direction of the fundamental calculation pitch is used.

Select Page Mode

Changes mode from standard to page.

Hexadecimal	Decimal	ASCII
1B 4C	27 76	ESC L

This command collects and processes the data intended for printing on a specific area of the paper. When the Eject Slip command (0C) is received, the data is printed in the specified area and the printer returns to standard mode. For more information see “Page Mode” later in this section.

- This command is valid only when input at the beginning of the line.
- Half dots are not used in page mode.
- The settings controlled by the following commands do not apply in page mode (however, the settings are still valid when the printer returns to standard mode):

Command	Setting(s) Not Used in Page Mode
Select Print Modes (1B 21)	Double-Strike, All 7 x 7 fonts
Select Print Modes (1B 22)	All 7 x 7 fonts
Select Bit Image Mode (1B 2A)	Double Density
Set/Cancel Emphasized Mode (1B 45)	All
Set/Cancel Double-Strike Mode (1B 47)	All
Set/Cancel 90 Degree Clockwise Rotation (1B 56)	All
Select Justification (1B 61)	All
Set/Cancel Upside Down Printing (1B 7B)	All
Print Downloaded Bit Image (1D 2F 00)	Double Density
Set Left Margin (1D 4C)	All
Set Printable Area Width (1D 57)	All
Select Printing Position of HRI Characters (1D 48)	All
Select Pitch of HRI Characters (1D 66)	All
Select Height of Bar Code (1D 68)	All
Print Bar Code (1D 6B)	All
Select Horizontal Size of Bar Code (1D 77)	All

Select Print Direction in Page Mode

Selects the printing direction and start position in page mode. See the illustration. Default for n is 0. For more information see “Page Mode” later in this section.

- The command is valid only in page mode.
- The command is ignored if the value of n is out of the specified range.
- 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 by the Eject Slip command (0C).

EFP9800 ESC/POS Commands

Hexadecimal	Decimal	ASCII	Value of <i>n</i> (Start Position)
1B 54 <i>n</i>	27 84 <i>n</i>	ESC T <i>n</i>	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)

Set/Cancel Uni-Directional Printing

Starts or stops uni-directional printing. In uni-directional printing, the printer prints from right to left. Use uni-directional printing to avoid horizontal misalignment for the following types of printing:

- Double-height characters
- Ruled lines
- Downloaded bit images

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 55 <i>n</i>	27 85 <i>n</i>	ESC U <i>n</i>	0-255

Standard Mode

The default value of n is 0.

Page Mode

The default value of n is 1. For more information see “Page Mode” later in this section.

***Note:** Only the lowest bit of n is effective. When n is even, uni-directional printing is turned off and when n is odd, uni-directional printing is turned on.*

Set Printing Area in Page Mode

Sets the position and size of the printing area in page mode. For more information see “Page Mode” later in this section.

Hexadecimal	Decimal	ASCII	Value of n
1B 57 $n1, n2 \dots n8$	27 87 $n1, n2 \dots n8$	ESC W $n1, n2 \dots n8$	0-255

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 . See the illustration for a graphic representation of the printing area. For more information about the fundamental calculation pitch, see the Set Fundamental Calculation Pitch command (1D 50).

- $x0 = [(n1 + n2 \times 256) \times (\text{horizontal direction of the fundamental calculation pitch})]$
- $y0 = [(n3 + n4 \times 256) \times (\text{vertical direction of the fundamental calculation pitch})]$
- $dx = [(n5 + n6 \times 256) \times (\text{horizontal direction of the fundamental calculation pitch})]$
- $dy = [(n7 + n8 \times 256) \times (\text{vertical direction of the fundamental calculation pitch})]$

EFP9800 ESC/POS Commands

Keep the following notes in mind for this command.

- The fundamental calculation pitch depends on the vertical or horizontal direction.
- The maximum printable area in the x direction is 400/160 inches.
- The maximum printable area in the y direction is 1408/144 inches.
- 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 by the Eject Slip command (0C).
- The default for $n1-4 = 0$; for $n5 = 144$; for $n6 = 1$; for $n7 = 128$; for $n8 = 5$.

Set Relative Print Position

Sets the print starting position based on the current position, in the fundamental calculation pitch. The distance (in inches) from the current position is calculated as: [$N \times$ (fundamental calculation pitch)]. See the Set Fundamental Calculation Pitch command (1D 50).

Pitch N to the right is calculated as: $(n1 + n2 \times 256)$. Pitch N to the left is calculated as:

$$(n1 + n2 \times 256) = 65535 - N.$$

The print position moves right when the result is a positive number, and left when the result is a negative number.

Hexadecimal	Decimal	ASCII	Value of $n1$	Value of $n2$
1B 5C $n1$ $n2$	27 92 $n1$ $n2$	ESC \ $n1$ $n2$	0-255	0-255

Standard Mode

The horizontal direction of the fundamental calculation pitch is used to calculate the print starting position.

Page Mode

Two types of fundamental calculation pitch are used to calculate the print starting position, depending on the value of the Select Print Direction in Page Mode command (1B 54 n). For more information see “Page Mode” later in this section.

- If 1B 54 $n = 0$ or 2, the horizontal direction of the fundamental calculation pitch is used.
- If 1B 54 $n = 1$ or 3, the vertical direction of the fundamental calculation pitch is used.

The command is ignored when the start position specified is beyond the beginning or end of the line or outside the printing area width or the left margin.

Select Justification

Begins justification as specified by the value of n . Any blank space (for example as a result of setting the relative or absolute print position or a tab) is also justified.

EFP9800 ESC/POS Commands

The command is effective only at the beginning of a line. It is ignored when n is out of range.

Hexadecimal	Decimal	ASCII	Value of n
1B 61 n	27 97 n	ESC a n	0 = Left Justify (default) 1 = Center 2 = Right Justify

The settings do not apply in page mode.

Select Print Paper(s)

Selects the paper for printing. (See the following table.) The command is effective only at the beginning of a line. It is ignored when n is out of range. The default is $n = 1$.

Hexadecimal	Decimal	ASCII
1B 63 30 n	27 99 48 n	ESC c 0 n

Bit	Paper Type	Paper Type Status	
		0	1
0	Receipt/Journal Paper	Disabled	Enabled
1	Receipt/Journal Paper	Disabled	Enabled
2	Slip	Disabled	Enabled
3	Validation	Disabled	Enabled
4-7	Undefined		

Notes:

- When the paper selection changes, if slip or validation was previously selected, the slip or validation paper is ejected.
- When either slip or validation is selected, the printer waits for the paper to be inserted.
- When both slip and receipt/journal paper are selected at once, printing on the pressure roll is possible only when pressure-sensitive paper is used.
- If the previously selected paper is re-selected, no action takes place.

Select Paper(s) For Setting Line Spacing

Selects paper for use with the following commands:

- Select Default Line Spacing (1B 32)
- Set Line Spacing (1B 33)
- Set Slip Eject Length (1B 43)

The command is ignored if n is out of range. The default is $n = 15$.

Hexadecimal	Decimal	ASCII
1B 63 31 n	27 99 49 n	ESC c 1 n

Bit	Paper Type	Paper Type Status	
		0	1
0	Receipt/Journal Paper	Not Selected	Selected
1	Receipt/Journal Paper	Not Selected	Selected
2	Slip	Not Selected	Selected
3	Validation	Not Selected	Selected
4-7	Undefined		

Note: *If a different line spacing is set for the receipt/journal paper and slip, and both are selected for printing, then using the Paper Feed button to print and feed paper causes the line spacing to be set for the slip.*

Select Paper Sensor(s) to Stop Printing

Selects the paper sensor(s) used to stop printing when the paper-end is detected. The printer finishes printing the current line and feeds the paper before stopping. After a paper sensor is enabled, printing is stopped only when the corresponding paper is currently selected. If multiple sensors are enabled, printing stops when any one detects a paper end.

When the DSW2-3 (DIP switch) is set to Off and the journal paper sensor signals a paper end, the printer goes offline after printing stops. When the slip sensor is enabled and there is not enough paper for the next print instruction, the printer ejects the paper and enters the paper waiting state.

Hexadecimal	Decimal	ASCII
1B 63 34 <i>n</i>	27 99 52 <i>n</i>	ESC c 4 <i>n</i>

Bit	Sensor	Sensor Status	
		0	1
0	Receipt/Journal Paper Near-End	Disabled	Enabled
1	Receipt/Journal Paper Near-End	Disabled	Enabled
2-4	Undefined		
5	Slip (Detects Slip Ejection)	Disabled	Enabled
6	Undefined		
7	Validation (Detects Validation Ejection)	Disabled	Enabled

Enable/Disable Paper Feed Button

Enables or disables the Paper Feed button.

Hexadecimal	Decimal	ASCII
1B 63 35 <i>n</i>	27 99 53 <i>n</i>	ESC c 5 <i>n</i>

Note: Only the lowest bit of *n* is effective. When *n* is even, the paper feed button is enabled and when *n* is odd, the paper feed button is disabled.

Print and Feed *n* Lines

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 64 <i>n</i>	27 100 <i>n</i>	ESC d <i>n</i>	0 - 255

The maximum paper feed length is 40 inches. When the value of *n* x line spacing is greater than 40, the paper feed length is set to 40 inches.

Standard Mode

Prints the data in the print buffer and feeds *n* lines. Sets the print starting position to the beginning of the line. Line spacing is not affected by this command.

Page Mode

Sets the print starting position to the beginning of the *n*th line down from the current line (equivalent to doing *n* line feeds). For more information see “Page Mode” later in this section.

Set Slip Waiting Time

Sets the time (in *m* minutes) that the printer waits for a slip to be inserted into the slip station and the time (*n* x 0.1 seconds) for the printer to close the platen and start printing once the slip has been inserted.

If a slip is not inserted in the time specified, the receipt/journal paper is selected for the next function. If *m* = 0, the printer waits forever for a slip to be inserted.

EFP9800 ESC/POS Commands

When either n or m is out of range, the settings that were in effect before this command remain unchanged.

Hexadecimal	Decimal	ASCII	Value of n	Value of m
1B 66 $m n$	27 102 $m n$	ESC f $m n$	0 - 64	0 - 15

Generate Pulse

Outputs a pulse defined by $n1$ and $n2$ to open a cash drawer. The drawer connector solenoid should have a resistance of 24 ohms or more to avoid excessive current flow. Use the printer power supply (drawer connector pin 4) to power the drawer.

Hexadecimal	Decimal	ASCII	Value of n	Value of m
1B 70 $m n1 n2$	27 112 $m n1 n2$	ESC p $m n1 n2$	0 - 255	0, 48 = Drawer connector pin 2 1, 49 = Drawer connector pin 5

If $n1 > n2$, the printer performs the command as $n1 = n2$

The command is ignored if m is out of range.

$n1 \times 2$ milliseconds = Pulse Ontime
 $n2 \times 2$ milliseconds = Pulse Offtime
Pulse is 2 milliseconds $\times n$ (1 or 2).

Release

Releases the paper as follows:

- If receipt/journal paper was selected, the next operation begins after the paper is released.
- If slip was selected, the printer enters the paper removal waiting state after releasing the paper. After 2 seconds, it enters receipt/journal paper mode.

Hexadecimal	Decimal	ASCII
1B 71	27 113	ESC q

Select Head Energizing Time

Selects the head energizing time as specified by n . The head energizing time is set for the paper type selected using the Select Print Paper(s) command (1B 63 30). (When both receipt/journal paper and slip are selected, the head energizing mode for slip is enabled.)

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

Hexadecimal	Decimal	ASCII	Value of n
1D 45 n	29 69 n	GS E n	0 = Slip/Validation 1 = Receipt/Journal Paper

Bit	Function	Function Status	
		0	1
0	Head Energizing Time	Slip	Receipt/Journal Paper
1-7	Undefined		

Set Left Margin

Sets the left margin as specified by $n1$ and $n2$. The left margin is calculated by $[(n1 + 256 \times n2) \times \text{horizontal direction of the fundamental calculation pitch}]$. See the Set Fundamental Calculation Pitch command (1D 50).

Hexadecimal	Decimal	ASCII	Value of n
1D 4C $n1$ $n2$	29 76 $n1$ $n2$	GS L $n1$ $n2$	$n1 = 0-255$ $n2 = 0-255$

The settings do not apply in page mode.

- The command is valid only at the beginning of a line.
- The left margin is set for the paper that was selected by the Select Paper(s) for Settings command (1B 63 31).
- If a fraction is part of the result from calculating the left margin, it is corrected with the remainder being truncated.
- The maximum value of the printable area is used if any setting is greater than that area.

EFP9800 ESC/POS Commands

- Any printable area that is less than one character wide will be extended to the right enough to print one character. If the area cannot be extended to the right, the left margin will then be reduced. See “Set Printable Area Width” for more information.

Set Fundamental Calculation Pitch

Sets the fundamental calculation pitch.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>	Default
1D 50 <i>n1 n2</i>	29 80 <i>n1 n2</i>	GS P <i>n1 n2</i>	<i>n1</i> = 0-255 <i>n2</i> = 0-255	<i>n1</i> = 160 <i>n2</i> = 144

- The fundamental calculation pitch is set to the following values:
 - $1/n1$ inches (horizontal direction)
 - $1/n2$ inches (vertical direction)
- The pitches are restored to their default values when $n1 = 0$ and $n2 = 0$
- This command will not affect the values set by other commands
- When the command is combined with others, the calculation is truncated to the minimum pitch:
1/160 inch (horizontal), 1/144 inch (vertical)

Set Printable Area Width

Sets the width of the printable area as specified by $n1$ and $n2$. The default for $n1 = 144$; for $n2 = 1$. See the illustrations.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1D 57 <i>n1 n2</i>	29 87 <i>n1 n2</i>	GS W <i>n1 n2</i>	<i>n1</i> = 0-255 <i>n2</i> = 0-255

The settings do not apply in page mode.

- The following calculation is used to set the width of the printable area: $[(n1 + 256 \times n2) \times (\text{horizontal direction of the fundamental calculation pitch})]$. See the Set Fundamental Calculation Pitch command (1D 50).
- The command is valid only at the beginning of a line.

- The width of the printable area is set for the paper that was selected by the Select Paper(s) for Settings command (1B 63 31).
- If a fraction is part of the result from calculating the width of the printable area, it is corrected with the remainder being truncated.
- If the width of the printable area is less than one character wide (or the equivalent of one character wide for a bit image), the width will be extended to the right enough to print one character. If the area cannot be extended to the right, the left margin will then be reduced.

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.

Select/Cancel User-Defined Character Set

Selects or cancels the user-defined character set, specified by n . A user-defined character set and a downloaded bit image cannot be defined simultaneously. Only the lowest bit of n is effective. The default is $n = 1$.

Hexadecimal	Decimal	ASCII	Value of n
1B 25 n	27 37 n	ESC % n	0 - 255

Note: *When n is even, the internal character set is selected. When n is odd, the user-defined character set is selected.*

Define User-Defined Characters

Defines user-defined alphanumeric characters for the specified character codes. The character codes may be any between ASCII code 20-7E (95 characters possible). User-defined characters remain in effect until:

- A different user-defined character is defined.
- The printer is initialized, reset, or turned off.
- A downloaded bit image is defined.

A user-defined character set and a downloaded bit image cannot be defined simultaneously. When the Define User-Defined Characters command (1B 26) is performed, the downloaded bit image is cleared.

The command is ignored if the value of v , b , f , or h is out of range. Any following data is processed as normal data.

Hexadecimal	Decimal	ASCII
1B 26 v b f [h u1, l1, u2, l2 . . . uh, lh]*	27 38 v b f [h u1, l1, u2, l2 . . . uh, lh]*	ESC & v b f [h u1, l1, u2, l2 . . . uh, lh]*

*The data in [] is repeated $f - b + 1$ times, once for each character to be defined.

Value	Range (in decimal)	Description
v	2	Fixed to 2
b	32 - 126	Beginning character code in range. (To define only 1 character, make $b = f$) b must be $\leq f$.
f	32 - 126	Final character code. (To define only 1 character, make $b = f$) b must be $\leq f$.

EFP9800 ESC/POS Commands

The following table describes the format of the character data as expressed by h , u_i , and l_i .

Value	Range (in decimal)	Description
h	0-10 (7 x 7) 0-6 (5 x 9)	Number of u_i , l_i pairs (columns)
u_i	$u_i = 0-255$	Data for column i pins. u_i = the upper 8 pins. Bit 7 of u_i corresponds to pin 1, bit 6 of u_i corresponds to pin 7, and so on. Bit 0 of u_i corresponds to pin 8. The illustration on the following page shows graphically the character data format.
l_i	$l_i = 0-255$	Data for column i pin 9. l_i = the lowest pin. Bit 7 of l_i corresponds to pin 9. The illustration on the following page shows graphically the character data format.

Notes:

- Each u_i , l_i defines data for a 9-pin column of data.
- Each 1 bit specifies that a pin is printed in the column.
- Each 0 bit specifies that a pin is not printed in the column. Each 0 bit specifies that a pin is not printed in the column.

Both 7 x 7 and 5 x 9 character sets are downloaded using the same format. They differ in the range of h and in their use of the downloaded data.

7 x 7 (40/42/51) character print zone (compressed)

- Range of h : 0-10.
- Half dot character. Width is 10 columns.
- Data in the upper bytes (u_i) only are stored. Data in the lower byte (l_i) is treated as 0.
- If $h < 10$, the remaining columns are taken to be 0.

5 x 9 (33/35/42) character print zone (uncompressed)

- Range of h : 0-6.
- Full dot character: the printer prints a column of 0's after each data column (defined by u_i , l_i)
- Data in the upper and lower bytes are stored and printed.
- If $h < 6$, the remaining columns are taken to be 0.

The following example redefines the character 20 (H) for 5 x 9:

1B 21 00 (selects 5 x 9 characters)

1B 26 02 20 20 05 FE 00 10 00 10 00 10 00 FE 00

u_1				u_5
FE	10	10	10	FE
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
1	1	1	1	1
1	0	0	0	1
1	0	0	0	1
1	0	0	0	1
0	0	0	0	0

h_1				h_5
00	00	00	00	00
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	1	1	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

The result is the character H as shown in the illustration.

In order to define characters for either 7 x 7 or 5 x 9, the character set must be selected by the Select Print Mode(s) command (1B 21). The characters downloaded are stored as the defined character set. Columns are stored in the following order: first received in the leftmost column. Any undefined columns are set to 0. In the example, 5 of 6 possible columns are downloaded with the remainder set to 0.

Set/Cancel Underline

Turns underline mode on or off. The default value is $n = 0$. Underlines cannot be printed for 90 degree clockwise rotated characters or 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. This command is ignored if n is out of the specified range.

Hexadecimal	Decimal	ASCII	Value of n
1B 2D n	27 45 n	ESC - n	0, 48 = Underline off 1, 49 = Underline on

Cancel User-Defined Characters

Cancels the user-defined character designated by character code n of the selected font size. After a particular character is canceled, the corresponding built-in character is printed. The printer ignores this command if a user-defined character is not defined for the character code n or if n is out of range.

Hexadecimal	Decimal	ASCII	Value of n
1B 3F n	27 63 n	ESC ? n	32 - 126

Set/Cancel Emphasized Mode

Starts or stops emphasized printing. In emphasized mode, each line is printed twice to improve penetration of multiple 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.) Emphasized printing cannot be used with bit-images or downloaded bit-images.

This command and the Select Print Mode(s) command (1B 21) function identically. They should have the same setting when used together.

Hexadecimal	Decimal	ASCII	Value of n
1B 45 n	27 69 n	ESC E n	0 - 255

The settings do not apply in page mode.

Note: *Only the lowest bit of n is effective. When n is even, emphasized mode is turned off and when n is odd, emphasized mode is turned on.*

Set/Cancel Double-Strike Mode

Starts or stops double-strike printing. Printer output is the same as in emphasized mode. Double-strike printing cannot be used with bit-images or downloaded bit-images.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 47 <i>n</i>	27 71 <i>n</i>	ESC G <i>n</i>	0-255

The settings do not apply in page mode.

Note: *Only the lowest bit of n is effective. When n is even, double-strike mode is turned off and when n is odd, double-strike mode is turned on.*

International Character Set

Selects an international character set as defined by *n*. The character sets are described in the International Character Code table and Hebrew Code table that follow.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 52 <i>n</i>	27 82 <i>n</i>	ESC R <i>n</i>	0 = USA 1 = France 2 = Germany 3 = UK 4 = Denmark I 5 = Sweden 6 = Italy 7 = Spain 8 = Japan 9 = Norway 10 = Denmark II 11 = Hebrew

International Character Code Table

Language	Code	23 35	24 36	40 64	5B 91	5C 92	5D 93	5E 94	60 96	7B 123	7C 124	7D 125	7E 126
USA	0	#	\$	@	[	\	\]	^	`	{	|	}	~
France	1	#	\$	à	°	ç	§	^	`	é	ù	è	¨
Germany	2	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
UK	3	£	\$	@	[	\	\]	^	`	{	|	}	~
Denmark I	4	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	5	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	6	#	\$	@	°	\	é	^	ù	à	ò	è	ì
Spain	7	•	\$	@	ı	Ñ	ı	^	`	¨	ñ	}	~
Japan	8	#	\$	@	[	¥	]	^	`	{	|	}	~
Norway	9	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	10	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

5823

International Character Code Table
Language: Hebrew Code: 11

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

5821

Set/Cancel 90 Degree Clockwise Rotation

Starts or stops 90 degree clockwise rotated printing. Underlining may be on in rotated mode, but characters are not underlined.

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

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 56 <i>n</i>	27 86 <i>n</i>	ESC V <i>n</i>	0 = Cancel 90 degree clockwise rotation (Default) 1 = Start 90 degree clockwise rotation (1-dot character spacing)

The settings do not apply in page mode.

Select Character Code Table

Selects the character code table specified by the value of *n*. The command is ignored if *n* is out of range.

Hexadecimal	Decimal	ASCII
1B 74 <i>n</i>	27 116 <i>n</i>	ESC t <i>n</i>
Value of <i>n</i>	Character Code Table	
0 (default)	Code Page 437 (PC US)	
1	Code Page 850 (PC Multilingual)	
2	Code Page 852 (Eastern European)	
3	Code Page 865 (Nordic Languages)	
254	Space Page	
255	Space Page	

Set/Cancel Upside Down Printing

Starts or stops upside down printing. In upside down printing, the printer rotates the print line 180 degrees and then prints it.

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

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 7B <i>n</i>	27 123 <i>n</i>	ESC { <i>n</i>	0-255

The settings do not apply in page mode.

Note: *Only the lowest bit of n is effective. When n is even, upside down printing is turned off and when n is odd, upside down printing is turned on.*

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.

Select Bit Image Mode

Selects the bit image mode using m . The number of dots is specified by $n1$ and $n2$. The number of horizontal dots is calculated as: $n1 + 256 \times n2$.

After printing a bit image, the printer returns to normal mode.

If the bit image data exceeds the number of dots that can be printed on a line, the excess data is ignored. The command is ignored if m or $n2$ is out of range.

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

Hexadecimal	Decimal	ASCII
1B 2A <i>m</i> <i>n1</i> <i>n2</i> [<i>d</i>] (<i>n1</i> + 256 x <i>n2</i>)*	27 58 <i>m</i> <i>n1</i> <i>n2</i> [<i>d</i>] (<i>n1</i> + 256 x <i>n2</i>)*	ESC * <i>m</i> <i>n1</i> <i>n2</i> [<i>d</i>] (<i>n1</i> + 256 x <i>n2</i>)*

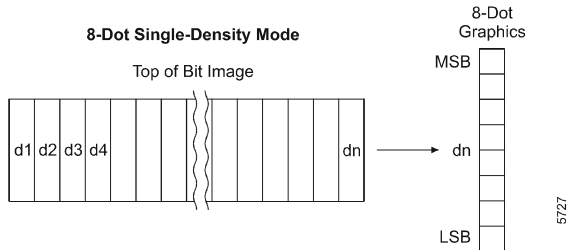
*There are $n1 + 256 \times n2$ data columns (the value [*d*]).
The value $n1 + 256 \times n2$ does not appear in the data stream.

Value of	Range	Description
<i>m</i>	0,1	Selects the bit image mode.
<i>n1</i>	0 - 255	Parameter used to calculate number of horizontal dots is $n1 + 256 \times n2$.
<i>n2</i>	0 - 3	Parameter used to calculate number of horizontal dots is: $n1 + 256 \times n2$.
<i>d</i>	0 - 255	Bit image data. Set a corresponding bit to 1 to print a dot or 0 to not print a dot.

Horizontal Direction (Standard Mode)

<i>m</i>	Vertical Dots	Dot Density	Adjacent Dot Specification	Total Dots
0	8	Single-Density	Permitted	200
1	8	*Double-Density	Prohibited	400

*Not applicable in page mode.



Define Downloaded Bit Image

Defines a downloaded bit image as specified by $n1$ and $n2$.

Hexadecimal	Decimal	ASCII
1D 2A $n1$ $n2$ [d] ($n1 \times n2 \times 8$)*	29 42 $n1$ $n2$ [d] ($n1 \times n2 \times 8$)*	GS * $n1$ $n2$ [d] ($n1 \times n2 \times 8$)*

*There are $n1 \times n2 \times 8$ data columns (the value [d]). The value $n1 \times n2 \times 8$ does not appear in the data stream.

Value of $n1$	Value of $n2$	Value of $n1 \times n2$
1 - 255	1 - 255	1 - 512

The bit image data is represented by d . The number of dots is:

- $n1 \times 8$ in the horizontal direction
- $n2 \times 8$ in the vertical direction

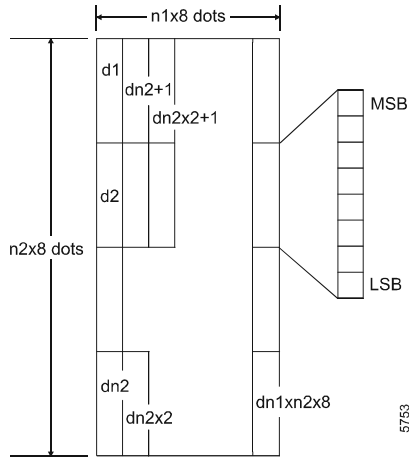
The downloaded bit image remains in effect until:

- A different downloaded bit image is defined.
- The printer is initialized, reset, or turned off.
- A user-defined character set is defined.

A user-defined character set and a downloaded bit image cannot be defined simultaneously. When the Define Downloaded Bit Image command (1D 2A) is performed, the user-defined character set is cleared.

The relationship between the bit image data and the defined dots is shown below.

The command is ignored if $n1 \times n2$ is out of range.



Print Downloaded Bit Image

Prints a downloaded bit image in the mode specified by m . If a downloaded bit image exceeds one line, the excess data is not printed. Downloaded bit images and user-defined character sets cannot be used simultaneously.

Any dots outside the selected print area are discarded.

Note: In page mode Double density print is disabled.

The command is ignored if:

- Data is present in the print buffer.
- A downloaded bit image is not defined.
- The value of m is out of range.

Hexadecimal	Decimal	ASCII	Value of m
1D 2F m	29 47 m	GS / m	(See table below)

m	Horizontal Direction		
	Dot Density	Adjacent Dot Specification	Max. Dots
0	Double-Density	Prohibited	400
1	Single-Density	Permitted	200

Printer Status Commands

These commands enable the printer to communicate with the host computer following the selected handshaking protocol, DTR/DSR, XON/XOFF, or bi-directional parallel. 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 were received.

When a fault occurs, the printer goes busy at the RS-232C interface and does not respond to the Printer Status commands. If the fault causing the busy condition can be cleared, such as by loading paper the printer will resume processing the data in its receive buffer.

If a paper jam caused the busy condition and the application is not using Real Time commands for status and recovery, clear the jam and press the reset button to cycle the printer. See the following section, "Real Time Commands" for details about the Real Time commands.

The commands are listed numerically by hexadecimal code.

Transmit Peripheral Device Status

Transmits the status of drawer connector pin 3.

Hexadecimal	Decimal	ASCII	Value of n
1B 75 n	27 117 n	ESC u n	0, 48 = Drawer connector pin 3

Bit	Function	0	1
0	Pin Level 3	Low	High
1-3	Undefined		
4	Not Used	Always 0	
5-6	Undefined		
7	Not Used	Always 0	

Note: When the connector is not used, bit 0 = 1.

When DTR/DSR control is selected, the printer confirms that the host computer is ready to receive data (DSR signal is SPACE) and then transmits only one byte. If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host computer is ready.

When XON/XOFF control is selected, the printer transmits only 1 byte before checking the DSR signal.

Because status is transmitted when this command is buffered, there may be a lag between command reception and status transmission, depending on the receive buffer state.

Note: When the Enable/Disable Automatic Status Back (ASB) command (1D 61) is enabled, the status transmitted by ASB and by this command must be distinguished.

The command is ignored if n is out of range.

EFP9800 ESC/POS Commands

Transmit Paper Sensor Status

Transmits the status of a paper sensor.

Hexadecimal	Decimal	ASCII
1B 76	27 118	ESC v

Bit	Receipt/Journal Paper Out Switch Sensor	Receipt/Journal Paper Out Switch Status	
		0	1
0	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
1	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
2-3	Undefined		
4	Not Used	Always 0	
5	Slip/Validation	Slip Present	Slip Not Present
6	Slip/Validation	Slip Present	Slip Not Present
7	Not Used	Always 0	

Note: *Slip status may not be accurate for paper with holes.*

When this command is performed during printing, status is transmitted after the current line is printed and fed. (This timing differs from that for the Transmit Peripheral Device Status, Transmit Printer ID, and Transmit Printer Status commands.)

When DTR/DSR control is selected, the printer confirms that the host computer is ready to receive data (DSR signal is SPACE) and then transmits only one byte. If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host computer is ready.

When XON/XOFF control is selected, the printer transmits only 1 byte before checking the DSR signal.

Because status is transmitted when this command is buffered, there may be a lag between command reception and status transmission, depending on the receive buffer state.

Note: When the Enable/Disable Automatic Status Back (ASB) command is enabled, the status transmitted by ASB and by this command must be distinguished.

Transmit Printer ID

Transmits the printer's ID to the host computer.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1D 49 <i>n</i>	29 73 <i>n</i>	GS | <i>n</i>	1-3

The following table shows the printer ID as specified by *n*.

<i>n</i>	Printer ID	Specification	ID
1	Model ID	Unisys EFP9800	0A (Hex)
2	Type ID	See the next table	
3	ROM Version	Indicates the version of ROM installed	

Type ID (from previous table); *n* = 2

Bit	Function	Type ID Status	
		0	1
0	Two-Byte Code Correspondence	Always 0 No correspondence	Correspondence
1	Not Used	Always 0	
2	DSW2-1 Setting	Off	On
3	Undefined		
4	Not Used	Always 0	
5-6	Undefined		
7	Not Used	Always 0	

EFP9800 ESC/POS Commands

- The printer transmits only one byte after confirming that the host computer is ready when DTR/DSR protocol is selected. One byte is transmitted without confirming the signal when XON/XOFF protocol is selected.
- When the command is buffered, a status is sent causing a possible delay between when the command is received by the host computer and the status sent. This is dependent on the state of the receive buffer.
- When the Enable/Disable Automatic Status Back command (1D 61) is used to enable Auto Status Back, the status transmitted by this command (Transmit Printer ID) and the Auto Status Back must be differentiated.
- The ROM version may depend on releases of the product.
- The command is ignored if n is out of the specified range.

Enable/Disable Automatic Status Back (ASB)

Enables or disables automatic status back (ASB) and specifies the status items to include.

Hexadecimal	Decimal	ASCII
1D 61 n	29 97 n	GS a n

The bits of n are defined as follows:

Bit	Function	Function Status	
		0	1
0	Cash Drawer Connector Pin 3	Disabled	Enabled
1	Online/Offline	Disabled	Enabled
2	Error	Disabled	Enabled
3	Receipt/Journal Paper Out Switch	Disabled	Enabled
4	Undefined		
5	Slip Sensor/Slip Status	Disabled	Enabled
6-7	Undefined		

Note: *Status information may not be accurate when using paper with holes.*

If any of the status items listed above are selected, ASB is enabled and the printer automatically transmits 4 status bytes whenever the selected status changes. If no status is selected, ASB is disabled.

In RS-232C communications, all four status bytes are transmitted without checking DSR. The four bytes must be consecutive, except for XOFF code.

Because status is transmitted when this command is buffered, there may be a lag between command reception and status transmission, depending on the receive buffer state.

Note: *When this command is enabled, the status transmitted by ASB and by the Real Time Status Transmission, Transmit Peripheral Device Status, Transmit Paper Sensor Status, Transmit Printer ID, and Transmit Status commands must be distinguished.*

EFP9800 ESC/POS Commands

The transmitted status is shown in the following tables:

First Byte (printer information)		Printer Status	
Bit	Printer Function	0	1
0-1	Not Used	Always 0	
2	Cash Drawer Connector, Pin 3	Low	High
3	Online/Offline State	Online	Offline
4	Not Used	Always 1	
5	Cover State	Closed	Closed
6	Paper Feed using Paper Feed Button	Not Feeding	Feeding
7	Not Used	Always 0	

Second Byte (error information)		Error Status	
Bit	Error Type	0	1
0-1	Undefined		
2	Mechanical Error	No Error	Error
3	Undefined		
4	Not Used	Always 0	
5	Unrecoverable Error	No Error	Error
6-7	Not Used	Always 0	

Third Byte (paper sensor information)

Bit	Receipt/Journal Paper Out Switch	Receipt/Journal Paper Out Switch Status	
		0	1
0	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
1	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
2-3	Undefined		
4	Not Used	Always 0	
5	Slip	Slip Present	Slip Not Present
6	Slip	Slip Present	Slip Not Present
7	Not Used	Always 0	

Fourth Byte (slip sensor information)

Bit	Slip Sensor	Slip Sensor Status	
		0	1
0	Slip Paper	Selected	Not Selected
1	Slip Paper Status	Printable	Not Printable
2	Validation Paper	Selected	Not Selected
3	Validation Paper Status	Printable	Not Printable
4	Not Used	Always 0	
5	Slip	Slip Present	Slip Not Present
6	Slip	Slip Present	Slip Not Present
7	Not Used	Always 0	

Notes for Bit 1:

- The slip paper status becomes 0 (Printable) after paper is loaded and becomes 1 (Not Printable) when the paper is ejected or the printer times out.
- When the slip paper is selected and the printer goes into the slip waiting state, bits 5 and 6 of the third byte become 1 (No Paper) and bits 0 and 1 of the fourth byte become 0 (Slip Selected) and 1 (Not Printable) respectively.
- When the paper sensor for slip paper is disabled using the Select Paper Sensor(s) to Stop Printing command (1B 63 34), the slip status does not become 1 (Not Printable) even when there is no printable area. To avoid this, confirm the printable area using the Transmit Status command (1D 72).

Notes for Bit 3:

- The validation paper state becomes 0 (Printable) after paper is loaded and becomes 1 (Not Printable) when the paper is ejected or the printer times out.
- When the validation paper is selected and the printer goes into the validation waiting state, bits 5 and 6 of the third byte become 1 (No Paper) and bits 2 and 3 of the fourth byte become 0 (Validation Selected) and 1 (Not Printable) respectively.
- When the paper sensor for validation paper is disabled using the Select Paper Sensor(s) to Stop Printing command (1B 63 34), the validation status does not become 1 (Not Printable) even when there is no printable area. To avoid this, confirm the printable area using the Transmit Status command (1D 72).

The default values for *n* are:

- when DIP switch 2-3 are Off.
- when DIP switch 2-3 are On.

Identifying Auto Status Back Bytes Transmitted by the Printer

The printer transmits status to the host computer in several ways as shown in the following table:

Printer response to a status request from host computer	Pattern of status bytes sent by printer
Transmit Peripheral Device Status (1B 75)	0**0****
Transmit Paper Sensor Status (1B 76)	0**0****
Transmit Printer ID (1D 49)	0**0****
Transmit Status (1D 72)	0**0****
Real Time Status Transmission	0**1**10
Auto Status Back (1D 61)	
First Byte	0**1**00
Following Bytes	0**0****
XON (Communication Protocol)	00010001
XOFF (Communication Protocol)	00010011

Note that the pattern of the second, third, and fourth bytes of the Auto Status Back command is identical to the Transmit Status commands (first four commands listed in the table). This can be confusing. When using the Auto Status Back command, look for the pattern of the first byte. It will always precede the following three bytes. Do not confuse the last three bytes of the Auto Status command with the Transmit Status commands.

Transmit Status

Transmits the status specified by the value of n .

In RS-232C communications, when DTR/DSR control is selected, the printer confirms that the host computer is ready to receive data (DSR signal is SPACE) and then transmits only one byte. If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host computer is ready. When XON/XOFF control is selected, the printer transmits only 1 byte before checking the DSR signal.

Because status is transmitted when this command is buffered, there may be a lag between command reception and status transmission, depending on the receive buffer state.

Note: *When the Enable/Disable Automatic Status Back (ASB) command (1D 61) is enabled, the status transmitted by ASB and by this command must be distinguished.*

Paper sensor status and slip status may not be accurate for paper with holes.

The command is ignored if n is out of range.

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

The transmitted status is shown in the tables below:

$n = 1$: Receipt/Journal Paper Out Switch Status

Bit	Receipt/Journal Paper Out Switch Sensor	Receipt/Journal Paper Out Switch Status	
		0	1
0	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
1	Receipt/Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
2-3	Undefined		
4	Not Used	Always 0	
5	Slip	Slip Present	Slip Not Present
6	Slip	Slip Present	Slip Not Present
7	Not Used	Always 0	

$n = 2$: Cash Drawer Connector Status

Bit	Cash Drawer Connector	Cash Drawer Connector Status	
		0	1
0	Pin 3 Level	Low	High
1-3	Undefined		
4	Not Used	Always 0	
5-6	Undefined		
7	Not Used	Always 0	

EFP9800 ESC/POS Commands

n = 3: Slip Status

(Transmits the values 00H - 0FH, indicating the remaining printable area)

Number of Remaining Dots	Slip Status (Hexadecimal)
0 - 8	00 (Transmitted when there is not enough paper for the next instruction)
9 - 17	01
18 -26	02
:	:
117 - 125	0D
126 -134	0E
135 -	0F

Real Time Commands

The following three situations must be understood when using real time commands.

1. First, the printer performs the real time command upon receiving it and will transmit status regardless of the condition of the DSR signal.
2. Second, the printer transmits status whenever it receives the real time status transmission command sequence, even if that sequence happens to occur within the data of another command, such as graphics data.

In this case, the sequence is handled correctly for its intended use.

3. Care must be taken not to send a real time command within 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 bytes when finally performing that other command from the buffer. The other command will not be performed correctly.

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

If RS-232C communications, another consideration is that an application should take care not to 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 DLE EOT 1. The reason for a particular busy condition can be determined by other responses to DLE EOT *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 out of 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 sequences are being used, the last byte stored when the buffer fills up could be the DLE code, with no room for the subsequent EOT or ENQ.

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

The commands are listed numerically by hexadecimal code.

Real Time Status Transmission

Transmits the printer status in real time. In RS-232C communications, the printer transmits only one status byte before checking the DSR state. The command is ignored if n is out of the specified range. Slip status may be incorrect for paper with holes.

Hexadecimal	Decimal	ASCII	Value of n
10 04 n	16 4 n	DLE EOT	1 = Transmit Printer Status 2 = Transmit Offline Status 3 = Transmit Error Status 4 = Transmit Receipt/Journal Paper Low Switch Status 5 = Transmit Slip Paper Status 6 = Transmit Validation Paper Status

The printer performs this command even when it is offline, receive buffer is full, or in an error state. Do not use this command within the data sequence of another command that consists of two or more bytes. The Real Time Status Transmission command is transmitted any time the command sequence 10 04 ($n = 1-6$) is received, even if the sequence is part of another command.

n = 1: Printer Status

Bit	Printer Function	Printer Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Cash Drawer Connector, Pin 3	Low	High
3	Online/Offline State	Online	Offline
4	Not Used	Always 1	
5-6	Undefined		
7	Not Used	Always 0	

n = 2: Offline Status

Bit	Description	Offline Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Not Used	Always 0	
3	Paper Feeding with Feed Button	Except During Paper Feeding	During Paper Feeding
4	Not Used	Always 1	
5	Printing Stop Due to Paper End	No Paper End Stop	Stop at Paper End
6	Error	No Error	Error
7	Not Used	Always 0	

Note: When printing has stopped because the paper sensor(s) did not detect paper, Bit 5 is 1 (otherwise 0).

EFP9800 ESC/POS Commands

n = 3: Error Status

Bit	Description	Error Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Mechanical Error	No Error	Error
3	Undefined		
4	Not Used	Always 1	
5	Unrecoverable Error	No Error	Error
6-7	Not Used	Always 0	

Note: For Bit 2, mechanical errors include home position detection, carriage detection, and slip ejection errors. If the error is due to a paper jam or similar condition, the printer can be recovered with DLE ENQ *n* ($1 \leq n \leq 2$) after the jam is cleared. If the error is due to a circuit failure (i.e., a wire break), the printer cannot be recovered.

n = 4: Receipt/Journal Paper Out Switch Status

Bit	Receipt/Journal Paper Out Switch	Receipt/Journal Paper Out Switch Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
3	Journal Paper Near End	Paper Low Not Detected	Paper Low Detected
4	Not Used	Always 1	
5-6	Undefined		
7	Not Used	Always 0	

n = 5: Slip Paper Status

Bit	Slip Paper Function	Slip Paper Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Slip Paper Selection	Selected	Not Selected
3	Slip Insertion Waiting	Not Waiting	Waiting
4	Not Used	Always 1	
5	Slip/Validation Sensor	Slip Present	Slip Not Present
6	Slip/Validation Sensor	Slip Present	Slip Not Present
7	Not Used	Always 0	

Notes:

- For Bit 2, there is a lag between receipt of the *Select Print Paper(s)* command (1B 63 30) and the slip selection. During this time, Bit 2 remains 1 (slip paper not selected).
- Bit 3 switches to 0 (not waiting) immediately after a slip is detected.
- Bits 5 and 6 transmit the current state of the slip when the paper is clamped.

EFP9800 ESC/POS Commands

n = 6: Validation Paper Status

Bit	Validation Paper Function	Validation Paper Status	
		0	1
0	Not Used	Always 0	
1	Not Used	Always 1	
2	Validation Paper Selection	Selected	Not Selected
3	Validation Insertion Waiting	Not Waiting	Waiting
4	Not Used	Always 1	
5	Validation Sensor	Validation Present	Validation Not Present
6	Slip/Validation Sensor	Validation Present	Validation Not Present
7	Not Used	Always 0	

Note: For Bit 2, there is a lag between receipt of the Select Print Paper(s) (1B 63 30) and bits 5 and 6 (transmit the current state of the slip/validation sensor).

Real Time Request to Printer

Responds to a request from the host computer. The request is specified by the value of *n*. (See table below.) The printer performs the command upon receipt. The command is ignored if *n* is out of the specified range.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
10 05 <i>n</i>	16 5 <i>n</i>	DLE ENQ <i>n</i>	1 = Recover and restart printing at line where error occurred. 2 = Recover and clear buffers. 3 = Cancel slip waiting.

The printer performs this command even when it is offline, in an error state, or the receive buffer is full.

Do not use this command within the data sequence of another command that consists of two or more bytes. For example, if you send the Set Line Spacing (ASCII code ESC 3 n) to the printer, and a Real Time Request to Printer command (10 05 n) interrupts before n is received, the code 10 for 10 05 n is processed as the value of n for ESC 3 n .

The Real Time Request to Printer command is transmitted any time the command sequence 10 05 ($1 \leq n \leq 3$) is received, even if the sequence is part of another command.

$n = 1$ is available for errors.

$n = 2$ is available for errors. The printer retains settings, such as Line Spacing and Print Mode, that were in effect when the error occurred. Use the Initialize Printer command (1B 40) together with this command to completely initialize the printer. This command is enabled even if the printer is unselected using the Select Peripheral Device Status command (1B 3D).

$n = 3$ is available only when the printer is waiting for the insertion of a slip. It is ignored in all other states. Before performing this command, use the Real Time Status Transmission command (10 04 n) to ensure that slip is selected and that the printer is in the slip waiting state. After the printer is released from the slip waiting state, journal paper is selected. After the slip waiting state is canceled, the receive and print buffers are cleared. This command is enabled even if the printer is unselected using the Select Peripheral Device Status command (1B 3D).

Bar Code Commands

These commands format and print bar codes on the receipt station.

Select Printing Position of HRI Characters (Receipt Station)

Prints HRI characters (Human Readable Interface) above or below the bar code.

Hexadecimal	Decimal	ASCII	Value of <i>n</i> (Printing Position)	Default
1D 48 <i>n</i>	29 72 <i>n</i>	GS H <i>n</i>	0 = Not Printed 1 = Above the Bar Code 2 = Below the Bar Code 3 = Both Above and Below the Bar Code	0

Select Pitch of HRI Characters (Receipt Station)

This command is not implemented and is ignored if received.

Hexadecimal	Decimal	ASCII	Value of <i>n</i> (Pitch)	Default
1D 66 <i>n</i>	29 102 <i>n</i>	GS f <i>n</i>	0 = Standard Pitch at CPI 1 = Compressed Pitch at 19 CPI	0

Select Height of Bar Code (Receipt Station)

Sets the bar code height to *n* dots or *n*/144 inch. *n* is rounded up to the nearest multiple of 16.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>	Default
1D 68 <i>n</i>	29 104 <i>n</i>	GS H <i>n</i>	1-255	112

Print Bar Code (Receipt Station)

Selects the bar code type and prints a bar code for the ASCII characters entered. The command is only valid at the beginning of a line. If the width of the bar code exceeds one line, the excess data is not printed. Illegal data cancels the command.

There are two variations to this command: the first uses a NULL character to terminate the string; the second uses a length byte at the beginning of the string to compensate for the Code 128 bar code which can accept a NULL character as part of the data.

Note: *Fixed-length codes can be aligned left, center, or right using the Align Positions command (1B 61). Variable-length codes are always center aligned.*

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.

EFP9800 ESC/POS Commands

First Variation: String terminated with NULL Character

Hexadecimal	Decimal	ASCII
1D 6B m [d]n 00	29 107 m [d]n 0	GS k m [d]n NUL

0 = End of command.

m = 0-6 (see the table)

d = 32-126 (see the table)

n = 1-255 (see the table)

<i>m</i>	Bar Code	<i>d</i>	<i>n</i> , Length
0	UPC-A	48- 57 (ASCII numerals)	Fixed Length: 11, 12
1	UPC-E	48- 57	Fixed Length: 11, 12
2	JAN13 (EAN)	48- 57	Fixed Length: 12, 13
3	JAN8 (EAN)	48- 57	Fixed Length: 7,8
4	Code 39	48- 57, 65- 90 (ASCII alphabet), 32, 36, 37, 43, 45, 46, 47 (ASCII special characters) d1 = dk = 42 (start/stop code is supplied by printer if necessary)	Variable Length
5	Interleaved 2 of 5	48- 57	Variable Length (Even Number)
6	Codabar	65- 68, start code 48- 57, 36, 43, 45, 46, 47, 58	Variable Length

Second Variation: Length of Byte Specified at Beginning of String

Hexadecimal	Decimal	ASCII
1D 6B m [d]n	29 107 m [d]n	GS k m [d]n

$m = 65-71, 73$ (see the table)

$d = 0-127$ (see the table)

$n = 1-255$ (see the table)

The value of m selects the bar code system as described in the table. When data is 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.

EFP9800 ESC/POS Commands

<i>m</i>	Bar Code	<i>d</i>	<i>n</i> , Length
65	UPC-A	48- 57 (ASCII numerals)	Fixed Length: 11, 12
66	UPC-E	48- 57	Fixed Length: 11, 12
67	JAN13 (EAN)	48- 57	Fixed Length: 12, 13
68	JAN8 (EAN)	48- 57	Fixed Length: 7, 8
69	CODE39	48- 57, 65- 90 (ASCII alphabet), 32, 36, 37, 43, 45, 46, 47 (ASCII special characters) d1 = dk = 42 (start/stop code is supplied by printer if necessary)	Variable
70	Interleaved 2 of 5 (ITF)	48- 57	Variable (Even Number)
71	CODABAR (NW-7)	65- 68, start code 48- 57, 36, 43, 45, 46, 47, 58	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

Select Horizontal Size of Bar Code (Receipt Station)

Sets the bar code width to *n* full dots or *n*/152 inch (*n*/6 mm).

Hexadecimal	Decimal	ASCII	Value of <i>n</i>	Default
1D 77 <i>n</i>	29 119 <i>n</i>	GS w <i>n</i>	2, 3, 4	3

Page Mode

Overview

Page mode is one of two modes which the EFP9800 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 Eject Slip command (0C), 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 EFP9800 commands react differently when in standard mode and page mode. The descriptions of these individual commands in this section indicate the differences in how they operate in the two modes.

Limitations

Be aware of the following limitations in page mode:

- Bi-directional printing may cause problems and should be avoided.

Use Set/Cancel Uni-Directional Printing (1B 55) to set uni-directional printing.

- Half dots cannot be used.

Page mode requires full dots for 5 x 9 dot font characters (user defined) and bit images. Convert any half-dot values referenced in the following commands to full dot values:

Set Right-Side Character Spacing (1B 20)	Set Absolute Starting Position (1B 24)
Set Relative Print Position (1B 5C)	Set Line Spacing (1B 33)
Set Horizontal Tab Positions (1B 44)	Print and Feed Paper (1B 4A)
Set Printing Area in Page Mode (1B 57)	

- Because of the need to use full dot values only, the following commands are limited in how they are used in page mode:
 - Select Print Modes (1B 21): Double-strike and all 7 x 7 selections are not valid. Double-high, double-wide, and underlined selections can be used.
 - Select Bit Image Mode (1B 2A): Double-Density bit images cannot be used. Single-density can be used.
 - Print Downloaded Bit Image (1D 2F): Double-Density bit images cannot be used. Single-density can be used.
- Set/Cancel Double-Strike Mode (1B 47) cannot be used to double-strike characters in page mode.

Command Settings in Both Modes

The command settings are treated the same in page mode as they are in standard mode. However, there are some differences:

- The settings for the following commands are set independently in both modes:

Set Right-Side Character Spacing (1B 20)	Set Line Spacing to Default Spacing (1B 32)
Set Line Spacing (1B 33)	Set/Cancel Uni-Directional Printing (1B 55)

- Horizontal tabs are treated somewhat differently in both modes. In standard mode, if the command, Horizontal Tabs: Skip to Next Tab Stop (09), is received when there are no more tab stops before the end of a line, the print starting position will be set to the beginning of the next line. In other words, a line feed will be performed. However, under the same circumstances in page mode, the print starting position will be set to the end of the current line. Any subsequent character received will cause an auto-line feed to be performed.
- The Select Bit Image Mode command (1B 2A) can print up to 704 full dots in the y direction in page mode, as opposed to only 200 full dots (400 half dots) in standard mode under the following circumstances: the printable dots in the y direction are set to 704 for the Set Printing Area in Page Mode command (1B 57), and the printing direction is set to 1 or 3 for the Select Print Direction in Page Mode command (1B 54).

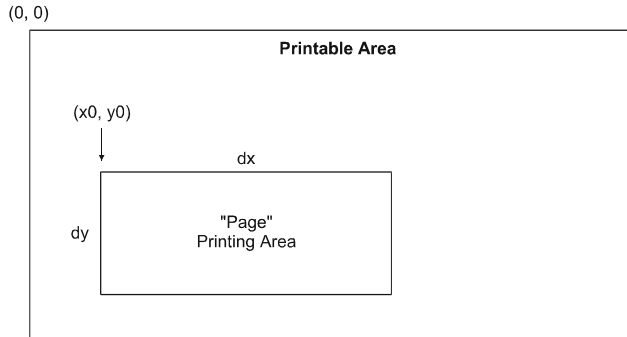
Processing the Data in the Page

The following information describes how to process the data in page mode:

- Use the Set Printing Area in Page Mode command (1B 57) to set the “page” or printing area. For more information, see “Set Printing Area in Page Mode.”

The illustration shows a sample of the “page” area and its origin points (x0, y0). The area of the page is defined by dx, including the origin and extends in the x direction, and by dy in the y direction.

The total number of dots for dx is 200 (400 half dots) at 160 half dots per inch. The total number of dots for dy is 704 (1408 half dots) at 144 half dots per inch.



58857

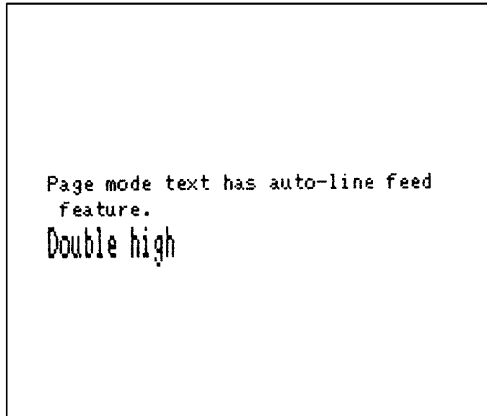
- The print starting position for standard height characters is determined by the first line of the page and the direction. Depending on the direction, the print starting position will be in one of the four following positions. See the illustration for a graphic representation. For more information about setting the direction of the page in page mode, see "Select Print Direction in Page Mode."
 - = Upper left corner proceeding across page to the right (A)
 - = Lower left corner proceeding up the page (B)
 - = Lower right corner proceeding across page to the left (upside down) C)
 - = Upper right corner proceeding down page (D)

- A line feed is automatically performed any time the number of characters is greater than the specified width of the page (assuming no commands including a line feed are present). This moves the print starting position to the next line.
- Increase the amount of line feeding for any lines that match the following circumstances: the line that follows a line with default line spacing (1/6 inch—12 vertical dots) contains double-high or quadruple-size characters or bit images that are two or more lines. If the line spacing is not increased, the higher order dots of the character or bit image will overlap with the previous line.

***Note:** Do not print double-high characters on the first line of the printable area. Perform a line feed to print the characters on the second line.*

Examples of Printing in Page Mode

The first example is text on two lines at 9 dots per line with an auto-line feed. The text on the third line is double-high. See the sample printout and the sample code.



```
1B 4C  
1B 57 00 00 00 00 90 01 90 01  
"Page mode text has auto-line feed feature."  
1B 33 2A  
0A  
1B 21 10  
"Double high"  
0C
```

In this example, you enter page mode and select a print area of 400 x 400 half-dots (200 x 200 full dots). The printer enters the text on the first line of the selected print area until it reaches the right edge of that print area, at which point a line feed is automatically inserted (in this case, before the space following "feed").

Before doing a line feed and entering double-high, change the line feed spacing to 42 half dots (21 full dots). This will ensure that the double-high line does not overlap the line above it. The Eject Slip command (0C) prints the page.

```
1B 63 30 04
1B 4C
1B 54 03
1B 44 0C 2D 38 00
09
09
"OCT 15"
09
"96"
0A
0A
0A
09
"YOUR NAME HERE"
09
09
"*12.67"
0A
0A
09
"TWELVE AND 67/100"
0A
0C
```

In this example, begin by selecting slip insertion paper. Then enter page mode and select the print direction to start at the upper right corner and proceed sideways down the page. Set three tab positions at 12, 45, and 56 columns from the left margin. Enter text using tabs and line feeds to position the text on the proper fields of the check. The Eject Slip command (0C) prints the entire image on the inserted check.

Flash Memory Commands

These commands copy user-defined character sets or logos to the printer's flash memory. Depending on the command chosen, the object stored in flash memory is then copied to RAM when the printer is powered up, or kept in flash memory for later use. Either way, it is available from the flash memory whenever needed.

These commands are only available for the EFP9800 ESC POS emulation.

Copy Downloaded Object to Flash Memory

Copies the current downloaded object to flash memory. The object can either be a user-defined logo as defined by the Define Downloaded Bit Image command (1D 2A), or a user-defined character set as defined by the Define User-Defined Characters command (1B 26).

When the printer is powered up, or reset with the Initialize Printer command (1B 40), the object is restored to RAM from the flash memory. This function of the command is the same as the Copy the Object from Flash Memory to External Ram command (1B 7D 03), described later in this section.

Anything previously copied to flash memory is lost. If no object has been downloaded, nothing is copied to flash memory or enabled.

After the application sends 1B 7D 00, it must wait for the printer to return hexadecimal 0D before sending any more data. Any data sent by the application before it receives this response will likely be lost. If the application is unable to receive a response from the printer, it must wait for five seconds after sending 1B 7D 00 before sending any more data.

Hexadecimal	Decimal	ASCII
1B 7D 00	27 125 0	ESC } NUL

When user-defined characters (not logos) are copied to flash memory, the following occurs:

- If no user-defined characters have been downloaded to the printer with the Define User-Defined Characters command (1B 26), nothing is copied to flash memory.

- If a character set is being copied to flash memory, both the 7x7 and 5x9 versions of the character set are copied. The character set must have at least one user-defined character defined to be copied.
- The current state of the user-defined characters is preserved when the command is performed. For example, if the user-defined characters have been selected (by the Select/Cancel User-Defined Character Set command—1B 25 01) then, when the character set is restored from flash memory, those user-defined characters will still be selected. If the user-defined characters have been canceled by the same command, they will remain canceled when the character set is restored from flash memory.
- The current code page (not a user-defined character set) is saved, and restored to RAM when the characters are read from flash memory.

Disable Loading the Object to RAM When Powering on the Printer

Retains the downloaded object in flash memory and does not copy it to RAM when the printer is powered up. The object remains in flash memory and is available to be copied to RAM later. The object will be lost if a new object is copied into flash memory.

Hexadecimal	Decimal	ASCII
1B 7D 01	27 125 1	ESC } SOH

Enable Loading the Object When Powering on the Printer

Enables the object in flash memory to be copied to RAM when the printer is powered up or the Initialize Printer command (1B 40) is received. This command reverses the previous command, “Disable Loading the Object to RAM When Powering on the Printer” (1B 7C 01). The command is ignored if nothing has been copied to flash memory.

Hexadecimal	Decimal	ASCII
1B 7D 02	27 125 2	ESC } STX

Copy the Object from Flash Memory to External RAM

Copies the object stored in flash memory directly to RAM. The printer does not need to be rebooted, either by powering it off and on, or by sending the Initialize Printer command (1B 40). The command is ignored if nothing has been copied to flash memory.

The command performs whether the object has been enabled or disabled with the two previous commands.

This command is similar to the Define Downloaded Bit Image command (1D 2A) and the Define User-Defined Characters command (1B 26), except that the object comes from flash memory.

Hexadecimal	Decimal	ASCII
1B 7D 03	27 125 3	ESC } ETX

Section 7

Ithaca Peripherals Proprinter Emulation Commands

Commands control all operations and functions of the EFP9800 printer. The commands in this section emulate the Ithaca Peripherals Proprinter emulation.

List of Ithaca Peripherals Proprinter 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 in the next section.

Hexadecimal Code	Command Name	Page
05	Cash Drawer Status	7-20
07	Open Cash Drawer 1	7-4
08	Open Cash Drawer 2	7-5
09	Horizontal Tab	7-5
0A	Line Feed	7-5
0B	Vertical Tab	7-5
0C	Advance To Top Of Next Form	7-6
0D	Carriage Return	7-6
0E	Set Single Line Double-Wide	7-11
0F	Set 17.2 Characters/Inch	7-11
12	Set 10 Characters/Inch	7-12
14	Cancel Single Line Double-Wide	7-12

Ithaca Peripherals Proprinter Emulation Commands

Hexadecimal Code	Command Name	Page
18	Clear Printer	7-6
1B 11	Perform Validation: Open Forms Compensation Assembly	7-6
1B 13	Perform Validation: Close Forms Compensation Assembly	7-7
1B 14	Perform Validation: Close Forms Compensation Assembly When Slip Sensed	7-7
1B 2D 30	Cancel Underlining	7-12
1B 2D 31	Set Underlining	7-13
1B 30	Set Line Spacing to 1/8 Inch	7-7
1B 33 <i>n</i>	Set Fine Line Spacing (<i>n</i> /216 Inch)	7-7
1B 36	Select Alternative Character Set	7-13
1B 37	Select Character Set (Code Page 437)	7-13
1B 41 <i>n</i> 1B 32	Set Fine Line Spacing (<i>n</i> /72 Inch)	7-7
1B 3A	Set 12 Characters/Inch	7-13
1B 41 0C 1B 32	Set Line Spacing to 1/6 Inch	7-8
1B 43 00 N	Set Form Length in Inches	7-8
1B 43 <i>n n</i>	Set Form Length in Lines	7-8
1B 44 <i>nl...nk</i>	Set Horizontal Tab Positions	7-9
1B 45	Set Emphasized Printing	7-14
1B 46	Cancel Emphasized Printing	7-14
1B 47	Set Enhanced Printing	7-14
1B 48	Cancel Enhanced Printing	7-14
1B 4A <i>n</i>	Fine Line Feed	7-9
1B 4B <i>n1 n2</i>	Single-Density Graphics	7-18

Ithaca Peripherals Proprinter Emulation Commands

Hexadecimal Code	Command Name	Page
1B 4C <i>n1 n2</i>	Double-Density, Half-Speed Graphics	7-18
1B 53 30	Set Superscript	7-15
1B 53 31	Set Subscript	7-15
1B 54	Cancel Subscript/Superscript	7-15
1B 55 <i>n</i>	Uni-Directional/Bi-Directional Print	7-10
1B 57 30	Cancel Double-Wide for Current Font	7-15
1B 57 31	Set Double-Wide for Current Font	7-16
1B 59 <i>n1 n2</i>	Double-Density, Normal Speed Graphics	7-18
1B 5A <i>n1 n2</i>	Quadruple Density Graphics	7-19

Ithaca Peripherals Proprinter Emulation 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
- Cutting paper

The commands are listed in numerical order of their hexadecimal codes.

Open Cash Drawer 1

Opens cash drawer number 1. A default pulse is sent which is 120 ms high and 480 ms low.

Hexadecimal	Decimal	ASCII
07	7	BEL

Open Cash Drawer 2

Opens cash drawer number 2. A default pulse is sent which is 120 ms high and 480 ms low.

Hexadecimal	Decimal	ASCII
08	8	BS

Horizontal Tab

Moves the print position to the next horizontal tab stop set by the Set Horizontal Tab Positions (1B 44) command. The command is ignored if it exceeds the right margin or the maximum number of tab stop settings.

Hexadecimal	Decimal	ASCII
09	9	HT

Line Feed

Prints and feeds the paper one line. The line spacing set by the following commands is used: Set Line Spacing to 1/6 Inch (1B 41 0C 1B 32), Set Line Spacing to 1/8 Inch (1B 30), Set Fine Line Spacing ($n/216$ Inch) (1B 33 n), Set Fine Line Spacing ($n/72$ Inch) (1B 41 n 1B 32).

Hexadecimal	Decimal	ASCII
0A	10	LF

Vertical Tab

Advances to the next vertical tab stop. Feeds a fixed length of paper from the current print line to the knife cut point (approximately 1 inch). Line spacing does not affect the distance to the knife cut point.

Hexadecimal	Decimal	ASCII
0B	11	VT

Ithaca Peripherals Proprinter Emulation Commands

Advance to Top of Next Form

Prints the data in the data buffer and advances the paper to the top of the next receipt. The length of the advance can be set by NVRAM switches in switch pack #1. See “Set Internal Switch Pack Values in NVRAM” in section 3.

Hexadecimal	Decimal	ASCII
0C	12	FF

Carriage Return

Prints one line. Does not feed the paper unless DIP switch 3 is On. For more information, see “Switch Entry Mode” in section 3.

Hexadecimal	Decimal	ASCII
0D	13	CR

Clear Printer

Clears the print buffer and cancels the Set Single Line Double-Wide (0E) command. All other commands remain in effect.

Hexadecimal	Decimal	ASCII
18	24	CAN

Perform Validation: Open Forms Compensation Assembly

Opens the forms compensation assembly and turns on the Slip In LED. A form can now be inserted for up to 14 lines of validation printing. Before a form can be printed, the forms compensation assembly must be closed using the Perform Validation: Forms Compensation Close Assembly (1B 13) command.

When the printer senses that the form is correctly inserted (sensed by both sensors), it turns off the Slip In LED. Pressing the feed button closes the forms compensation assembly with or without the slip present.

Hexadecimal	Decimal	ASCII
1B 11	27 17	ESC DC1

Perform Validation: Close Forms Compensation Assembly

Closes the forms compensation assembly. The command is ignored if the forms compensation assembly is already closed.

Hexadecimal	Decimal	ASCII
1B 13	27 19	ESC DC3

Perform Validation: Close Forms Compensation Assembly When Slip Sensed

Closes the forms compensation assembly only when a form is detected. The Slip In LED flashes until the form is inserted correctly, when it is turned off. Press the Paper Feed button to override the command and close the forms compensation assembly.

Hexadecimal	Decimal	ASCII
1B 14	27 20	ESC DC4

Set Line Spacing to 1/8 Inch

Sets the line spacing to 1/8 inch or 8 lines/inch.

Hexadecimal	Decimal	ASCII
1B 30	27 48	ESC 0

Set Fine Line Spacing ($n/216$ Inch)

Sets the line spacing to $n/216$ inches.

Note: *The printer rounds down the value to the closest multiple of 1/72 inches.*

Hexadecimal	Decimal	ASCII	Value of n
1B 33 n	27 51 n	ESC 3 n	1-255

Set Fine Line Spacing ($n/72$ Inch)

Sets the line spacing to $n/72$ inches.

Hexadecimal	Decimal	ASCII	Value of n
1B 41 n 1B 32	27 65 n 27 50	ESC A n ESC 2	1-85

Ithaca Peripherals Proprinter Emulation Commands

Set Line Spacing to 1/6 Inch

Sets the line spacing to 1/6 inch or 6 lines/inch.

Hexadecimal	Decimal	ASCII
1B 41 0C 1B	27 65 12 27	ESC A 12
32	50	ESC 2

Set Form Length in Inches

Sets the length of the page until the printer is powered up again or until another command setting the length of the page is received. Also sets the top margin and the top line for the 1-inch vertical tab settings. For more information see "Vertical Tab." The form length at power on is determined by the internal switch pack settings. For more information, see "Set Internal Switch Pack Values in NVRAM" in section 3.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 43 00 <i>n</i>	27 67 0 <i>n</i>	ESC C 0 <i>n</i>	1-22 inches per page

Set Form Length in Lines

Sets the length of the page until the printer is powered up again or until another command setting the length of the page is received. Also sets the top margin and the top line for the 1-inch vertical tab settings. For more information see "Vertical Tab." The form length at power on is determined by the internal switch pack settings (switch pack 1, switches 4 and 5), or you can leave it at the default setting. For more information, see "Switch Entry Mode" in section 3.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 43 <i>nn</i>	27 67 <i>nn</i>	ESC C <i>nn</i>	1-99 lines per page

Set Horizontal Tab Positions

Sets the horizontal tab stops. If no horizontal tabs command is given, tab stops are set at every 8th column.

Keep the following in mind:

- You can specify up to 32 tabs stops.
- Specify tab settings in ascending order.
- Column 1 is the home position.
- Tabs can be at different intervals throughout the width of a column.
- Tab functions can be performed in all character sizes and print modes, including double-wide.
- Do not set tabs beyond the maximum column width.
- Include a 0 at the end of each horizontal tab statement.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 44	27 68	ESC D	<i>n</i> = horizontal tab
<i>n1...n2</i>	<i>n1...n2</i>	<i>n1...n2</i>	specification

Fine Line Feed

Prints and advances the paper the specified distance. Line spacing returns to the normal setting. The value, *n*, is equivalent to $n/216$ inches: for example $23/216$ inches or $255/216$ inches.

Note: *The printer rounds down the value to the closest multiple of 1/72 inches.*

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 4A <i>n</i>	24 74 <i>n</i>	ESC J <i>n</i>	1-255

Ithaca Peripherals Proprinter Emulation Commands

Uni-Directional/Bi-Directional Print

In uni-directional printing, the printer prints from left to right only. Uni-directional printing increases the accuracy of the left margin.

In bi-directional printing, the printer prints in both directions. Bi-directional printing increases the speed of the printer.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 55 <i>n</i>	27 85 <i>n</i>	ESC U <i>n</i>	<i>n</i> = 49: Uni-Directional Print <i>n</i> = 48: Bi-Directional Print

Print Characteristics Commands

These commands affect the appearance of printed information. They control the following:

- Character set selection
- Character formatting

The commands are listed in numerical order of their hexadecimal codes.

Set Single Line Double-Wide

Doubles the width of the currently selected character size. The table below shows the available character sizes. You can change character size in the middle of a line. The command stays in effect until it is canceled with the Cancel Single Line Double-Wide command (14) or until the line is printed.

To return to single-wide characters, use the Cancel Single Line Double-Wide (14) command.

Hexadecimal	Decimal	ASCII
0E	14	SO

Original Character Size	Doubled Character Size
10 characters/inch	5 characters/inch
12 characters/inch	12 characters/inch
17.2 characters/inch	8.5 characters/inch

Original Character Size	Maximum Characters/Line
10 characters/inch	24 characters/line
12 characters/inch	28 characters/line
17.2 characters/inch	40 characters/line
5 characters/inch	12 characters/line
6 characters/inch	14 characters/line
8.5 characters/inch	20 characters/line

Set 17.2 Characters/Inch

Sets the character size to 17.2 characters/inch. You can change character size in the middle of a line.

To double the width from 17.2 characters/inch to 8.5 characters/inch, use the Set Single Line Double-Wide (0E) command. To return to single-wide characters, use the Cancel Single Line Double-Wide (14) command.

Hexadecimal	Decimal	ASCII
0F	15	SI

Ithaca Peripherals Proprinter Emulation Commands

Set 10 Characters/Inch

Sets the character size to 10 characters/inch. You can change character size in the middle of a line.

To double the width from 10 characters/inch to 5 characters/inch, use the Set Single Line Double-Wide (0E) command. To return to single-wide characters, use the Cancel Single Line Double-Wide (14) command.

Hexadecimal	Decimal	ASCII
12	18	DC2

Cancel Single Line Double-Wide

Only cancels double-wide characters set by the Set Single Line Double-Wide command (0E). This command will not cancel double-wide characters set with the Set Double-Wide command (1B 57 31).

You can change the character size in the middle of a line.

Hexadecimal	Decimal	ASCII
14	20	DC4

Cancel Underlining

Stops underlining.

Hexadecimal	Decimal	ASCII
1B 2D 30	27 68 48	ESC - 0

Set Underlining

Begins underlining. The printer continues to underline until the Cancel Underlining (1B 2D 0) command is received.

The underline is drawn by the ninth dot.

Hexadecimal	Decimal	ASCII
1B 2D 31	27 45 49	ESC - 1

Select Alternative Character Set

Selects one of the following alternate character sets:

- Code Page 850 (PC Multilingual)
- Code Page 852 (Eastern European)
- Code Page 865 (Nordic Languages)

You can decide which set is selected using the internal switch pack settings. For more information, see “Switch Entry Mode” in section 3.

Hexadecimal	Decimal	ASCII
1B 36	27 54	ESC 6

Select Character Set (Code Page 437)

Selects Code Page 437 (PC US).

Hexadecimal	Decimal	ASCII
1B 37	27 55	ESC 7

Set 12 Characters/Inch

Sets the character size to 12 characters/inch. You can change character size in the middle of a line.

To double the width from 12 characters/inch to 6 characters/inch, use the Set Single Line Double-Wide (0E) command. To return to single-wide characters, use the Cancel Single Line Double-Wide (14) command.

Hexadecimal	Decimal	ASCII
1B 3A	27 58	ESC :

Ithaca Peripherals Proprinter Emulation Commands

Set Emphasized Printing

Starts emphasized printing. Each line is printed twice to improve penetration of multiple-part forms and to increase print contrast. Emphasized printing cannot be used with the following:

- Superscript or subscript characters
- Block graphics mode

To return to normal print mode, use the Cancel Emphasized Printing (1B 46) command.

Hexadecimal	Decimal	ASCII
1B 45	27 69	ESC E

Cancel Emphasized Printing

Returns to normal print mode after emphasized printing.

Hexadecimal	Decimal	ASCII
1B 46	27 70	ESC F

Set Enhanced Printing

Starts enhanced printing. Each line is printed twice to improve penetration of multiple-part forms and to increase print contrast. Enhanced printing cannot be used with the following:

- Superscript or subscript characters
- Block graphics mode

To return to normal print mode, use the Cancel Enhanced Printing (1B 48) command.

Hexadecimal	Decimal	ASCII
1B 47	27 71	ESC G

Cancel Enhanced Printing

Returns to normal print mode.

Hexadecimal	Decimal	ASCII
1B 48	27 72	ESC H

Set Superscript

Starts superscript printing. (Superscript characters print above the normal print line.) The Set Superscript command must be sent before the characters to be printed in superscript.

To return to printing on the normal print line, use the Cancel Superscript (1B 54) command.

Hexadecimal	Decimal	ASCII
1B 53 30	27 83 48	ESC S 0

Set Subscript

Starts subscript printing. (Subscript prints characters below the normal print line.) The Set Subscript command must be sent before the characters to be printed in subscript.

To return to printing on the normal print line, use the Cancel Subscript command (1B 54).

Hexadecimal	Decimal	ASCII
1B 53 31	27 83 49	ESC S 1

Cancel Subscript/Superscript

Stops subscript/superscript printing. Characters are printed on the normal print line at the normal height.

Hexadecimal	Decimal	ASCII
1B 54	27 84	ESC T

Cancel Double-Wide for Current Font

Cancels double-wide characters set by any command that sets double-wide characters.

Hexadecimal	Decimal	ASCII
1B 57 30	27 87 1	ESC w 0

Set Double-Wide for Current Font

Doubles the width of the currently selected character size. Double-wide can begin in the middle of a line, but cannot be canceled before the end of a line by the Cancel Single Line Double-Wide command (14).

To return to single-wide characters, use the Cancel Double-Wide for Current Font command (1B 57 30).

Hexadecimal	Decimal	ASCII
1B 57 31	27 87 49	ESC W 1

Graphics Commands

These commands control graphics printing. The commands are listed in numerical order of their hexadecimal codes. You can create a graphic image using a graphics software program or by doing the encoding yourself.

Format of the Data Stream for Graphics

The graphics sequences recognized by the IPI Proprinter emulation have the following format:

1b GG $n1$ $n2$ $d1$ $d2$ $d3$. . . $d(n2*256)+n1$

1b GG introduces the graphics sequence.

GG can be either 4B, 4C, 59, or 5A.

$n1$ and $n2$ are values between 0 and 255.

The total number of data bytes, d_i , which follow $n1$ and $n2$ is given by the formula, $n1+(256*n2)$.

The data bytes, d_i , are in sequence based upon the order of their printing from left to right. $d1$ is the leftmost byte in the graphics image and $d(n2*256)+n1$ is the rightmost byte. Both single density printing and double density printing are available. In single density printing, after data byte d_i is printed, a byte of zero bits is printed, and then byte $d(I+1)$ is printed. In double density printing, no zero byte is inserted by the printer.

The printhead has 9 print wires, numbered from 1 to 9 with 1 being the topmost print wire and 9 being the bottom most. Each data byte directs the activation of the topmost 8 wires. Each data byte contains 8 data bits, numbered 0 to 7. Each bit directs the activation of a single print wire, as shown in the following table:

Data Bit	Print Wire	
7	1	Top
6	2	
5	3	
:	:	
0	8	Bottom

If a data bit contains a 1, the corresponding print wire is activated when the data byte is printed. If a data bit contains a 0, the corresponding print wire is not activated when the data byte is printed. The same print wire must not be activated by successive data bytes, unless the printing is single density. The inserted byte of 0 between data bytes, in the single density case, ensures that the same wire is not activated by successive bytes. When programming double density graphics, you must ensure that successive data bytes do not activate the same print wire.

Density, or horizontal resolution, is measured in dots/inch. All modes have a vertical resolution of 72 dots/inch.

The second component of the graphics statement, number of columns, is defined by two values, $n1$ and $n2$. To find the value of these numbers, divide the number of columns you want to print by 256.

$n1$ = Remainder after dividing n by 256.

$n2$ = Integer after dividing n by 256.

For example to print 400 columns of graphics:

$400/256 = 1$ remainder 144

$n1 = 144, n2 = 1$

Ithaca Peripherals Proprinter Emulation Commands

Single-Density Graphics

Prints graphics in single-density format, in a 60 dots/inch by 72 dots/inch image pattern.

Maximum dots/line = 144

Maximum dot resolution = 144

Maximum columns/line = 144

Hexadecimal	Decimal	ASCII
1B 4B	27 75	ESC K
<i>n1...n2</i>	<i>n1...n2</i>	<i>n1...n2</i>

Double-Density, Half-Speed Graphics

Prints graphics in double-density format, at a slower rate of speed in a 120 dots/inch by 72 dots/inch image pattern. Because of the slow speed, dot columns can overlap by 1/2 dot width.

Maximum dots/line = 288

Maximum dot resolution = 288

Maximum columns/line = 288

Hexadecimal	Decimal	ASCII
1B 4C	27 76	ESC L
<i>n1...n2</i>	<i>n1...n2</i>	<i>n1...n2</i>

Double-Density, Normal Speed Graphics

Prints graphics in double-density format, at normal speed in a 120 dots/inch by 72 dots/inch image pattern. Dots can not be printed in adjacent columns of the same row.

Maximum dots/line = 144

Maximum dot resolution = 288

Maximum columns/line = 288

Hexadecimal	Decimal	ASCII
1B 59	27 89	ESC Y
<i>n1...n2</i>	<i>n1...n2</i>	<i>n1...n2</i>

Quadruple Density Graphics

Prints graphics in quadruple-density format in a 240 dots/inch by 72 dots/inch image pattern. Dot columns can overlap by $\frac{3}{4}$ dot width. Dots can not be printed in adjacent columns of the same row.

Maximum dots/line = 192

Maximum dot resolution = 576

Maximum columns/line = 576

Hexadecimal	Decimal	ASCII
1B 59	27 89	ESC Y
<i>n1...n2</i>	<i>n1...n2</i>	<i>n1...n2</i>

Cash Drawer Status Commands

Cash Drawer Status

Elicits status response from printer. The printer returns a single byte containing the status of the paper roll and the cash drawer. Each bit is described in the table.

The command is processed following any preceding commands in the buffer.

Bit	Meaning	0 Signifies	1 Signifies
0	Always 0		
1	Always 0		
2	Roll Paper Status	Paper Available	Paper Low
3	Always 1		
4	Always 0		
5	Always 0		
6	Cash Drawer Status	Pin 3 Low	Pin 3 High
7	Always 0		

Hexadecimal	Decimal	ASCII
05	5	ENQ

Section 8

NCR 5021 Printer Emulation Commands

Commands control all operations and functions of the EFP9800 printer. The commands in this section emulate the NCR 5021 printer.

Note: The NCR 5021 emulation is for use only with EFP984x serial interface units. This emulation is NOT resident in the EFP9850 and EFP9851 parallel interface units.

List of NCR 5021 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 in the next section.

Hexadecimal Code	Command Name	Page
0A	Line feed	8-3
0D	Carriage return	8-3
10	Cancel Double-Wide	8-13
12	Set Double-Wide	8-13
1B 5B 30	Reset	8-4
1B 5B 31	Read Status	8-13
1B 5B 32	Open	8-4
1B 5B 33	Close	8-5
1B 5B 34	Read Tallies	8-14
1B 5B 35	Read and Clear Tallies	8-15
1B 5B 70	Reset Character RAM	8-6
1B 5B 72 <i>n</i>	Set Interline Spacing	8-13
1B 5B 77 01 11	Read Slip Sensor	8-6

NCR 5021 Printer Emulation Commands

Hexadecimal Code	Command Name	Page
1B 5B 77 01 13	Open Forms Compensation Assembly	8-6
1B 5B 77 01 14	Close Forms Compensation Assembly	8-7
1B 5B 77 01 16	Reprint After Media Jam	8-7
1B 5B 7A vv yy yy...yy	Echo	8-8
1B 5B 7F vv xx xx yy...yy	Write Device Control Memory	8-8

NCR 5021 Emulation Command Descriptions

The command descriptions in this section are grouped in the following categories:

- Printer Function Commands
- Print Characteristics 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

Line Feed

Performs a line feed. Printing on the following line begins at the column in which the previous line ended.

Hexadecimal	Decimal	ASCII
0A	10	LF

Carriage Return

Fills the remainder of the line currently being formed with spaces and prints the line. After this line is printed, the printer starts in column position one.

Hexadecimal	Decimal	ASCII
0D	13	CR

NCR 5021 Printer Emulation Commands

Reset

This command does the following:

- Stops printing
- Flushes data buffers
- Initializes parameters
- Resets I/O ports
- Takes the printer offline

It does not reload the character set from NVRAM, affect the interline spacing, clear the tallies, or flush the communication buffers. The command is executed immediately, regardless of the state of the printer.

Hexadecimal	Decimal	ASCII
1B 5B 30	27 91 48	ESC [0

The printer sends the following in reply to this command: 1BH, 5BH, 35H, 30H, 32H, 31H, 2CH, 31H, 30H, 30H, 32H, 2CH, 30H, 31H, 30H, 30H, 2CH, *vvH**, *vvH**, 70H

*The value of *vvH* may be 30H-39H.

Open

Puts the printer online. The printer accepts all commands except Set Interline Spacing (1B 5B 72) and Write Device Control Memory (1B 5B 7F) when it is online. The printer accepts printable data only when it is online.

If the open command is received while the printer is already online, the open command is ignored.

The printer is offline when it powers up.

Hexadecimal	Decimal	ASCII
1B 5B 32	27 91 50	ESC [2

Close

Takes the printer offline. When the printer is offline, it accepts only the following commands:

- Set Interline Spacing (1B 5B 72)
- Reset (1B 5B 30)
- Read Status (1B 5B 31)
- Open (1B 5B 32)
- Read Tallies (1B 5B 34)
- Write Device Control Memory (1B 5B 7F)
- Reset Character RAM (1B 5B 70)

The printer does not accept printable data when it is offline.

The Close command is ignored if it is received when:

- The printer is processing data.
- Data remains in the print buffer.
- The forms compensation assembly is open.
- A paper jam has occurred.

The Read Status (1B 5B 31) command should be sent by the host after the Close command to verify that the printer is offline. Any data received after the Close command is processed after the printer is offline.

If the Close command is received while the printer is already offline, the Close command is ignored.

The printer is offline when it powers up.

Hexadecimal	Decimal	ASCII
1B 5B 33	27 91 51	ESC [3

NCR 5021 Printer Emulation Commands

Reset Character RAM

Reinitializes the character memory. The original dot patterns are copied from ROM into RAM, eliminating any changes made by the user.

This command is processed only when the printer is offline.

Hexadecimal	Decimal	ASCII
1B 5B 70	27 91 112	ESC [p

Read Slip Sensor

Returns the state of the slip sensor in the forms compensation assembly of the printer.

This command is processed only when the printer is online.

Hexadecimal	Decimal	ASCII
1B 5B 77 01 11	27 91 119 01 17	ESC [w 01 11

The printer sends the following in reply to the message: 1BH, 5BH, *xx*H, 70H.

x = slip sensor status

30H	Form Present
31H	Form Not Present
32H	Forms Compensation Assembly Closed

Open Forms Compensation Assembly

Opens the forms compensation assembly. This command is ignored when:

- The printer is printing.
- The printer holds a partially formed line.
- The printer is processing data.
- A paper jam has occurred.

The printer does not accept print data when the forms compensation assembly is open. Only commands are accepted and processed when the forms compensation assembly is open.

The state of the forms compensation assembly can be checked with the Read Status (1B 5B 31) command.

This command is processed only when the printer is online.

Hexadecimal	Decimal	ASCII
1B 5B 77 01 13	27 91 119 01 19	ESC [w 01 13

Close Forms Compensation Assembly

Closes the forms compensation assembly.

The printer does not accept print data when the forms compensation assembly is open. Only commands are accepted and processed when the forms compensation assembly is open.

The state of the forms compensation assembly can be checked with the Read Status (1B 5B 31) command.

This command is processed only when the printer is online.

Hexadecimal	Decimal	ASCII
1B 5B 77 01 14	27 91 119 01 20	ESC [w 01 14

Reprint After Media Jam

Informs the printer that printing may continue after a paper jam has occurred. The printer detects a paper jam when the jam detect sensor does not detect movement.

The printer accepts print data, even when a paper jam occurs. If a paper jam occurs, the printer accepts data until the print data buffer is filled. Once the print data buffer is full, the printer goes busy.

A paper jam status is passed to the application in the response of the Read Status (1B 5B 31) command.

Resetting the printer clears the paper jam flag, but does not clear the cause of the paper jam.

This command is processed only when the printer is online.

Hexadecimal	Decimal	ASCII
1B 5B 77 01 16	27 91 119 1 22	ESC] w 01 16

NCR 5021 Printer Emulation Commands

Echo

When the printer receives this command, it takes the data following 1B 5B 7A *vv* *yy*, converts the data to unpacked ASCII, and returns the converted data to the host computer. This is useful when performing diagnostics on the printer.

This command is executed immediately, regardless of the state of the printer.

Hexadecimal	Decimal	ASCII
1B 5B 7A <i>vv</i> <i>yy</i> <i>yy...yy</i>	27 91 122 <i>vv</i> <i>yy</i> <i>yy...yy</i>	ESC] z <i>vv</i> <i>yy</i> <i>yy...yy</i>
Value of <i>vv</i>	Value of <i>yy</i>	
0-80H	0-FFH	

The printer sends the following in reply to the message: 1BH, 5BH, *vv*H, *vv*H, *yy*H, ... *yy*H, 70H.

The value of *vv* is the number of bytes sent (in unpacked ASCII).

The value of *yyyy...yy* is the data sent in the ECHO message (in unpacked ASCII).

Write Device Control Memory

This command modifies the character set loaded in memory. Each character in the character set consists of seven 12-bit dot patterns.

Data that is forced outside the range of the character set by an incorrect address is ignored. There are 224 characters in the character set and each character consists of seven 12-bit patterns.

This command is processed only when the printer is offline.

The 5021 J/V printer's character field is 9 dots wide and 7 dots high (9x7). When SPI 5021 prints a line, it automatically inserts space between characters equivalent to three dot positions which are inaccessible to the user. Countries that use the Arabic language require that this area be accessible. As a result, the 5021 RS-232C J/V printer implements a 12x7 character field and does not insert space between characters.

There are 224 characters in the printer's character set. The range of hex values for the characters is 20-FF. Hexadecimal values in the range of 00-1F that are not control characters are printed as ASCII spaces (20).

WARNING

Due to the electrical characteristics of the printer, neighboring dots cannot both be fired within a horizontal row. Damage to the print mechanism may result. It is the responsibility of the character set creator to insure that this can not occur.

Altering a character in the character set is a two step procedure. The first step is to define the new character and the second step is to download the new character to the printer.

Define a Character

Each character in the character set is defined by seven 12-bit dot patterns. Dots in a horizontal row are really half dots, otherwise, characters would be grossly disproportionate.

First, map a 12x7 grid and place dots on the grid to form the desired character. Care must be taken so that two neighboring dots within a row of dots are not both fired. This rule applies to both intra-character and inter-character dots.

NCR 5021 Printer Emulation Commands

The dot pattern for the character “A” (ASCII 41H) is:

```

. . . . 0 . . . . . .
. . . 0 . 0 . . . . .
. . 0 . . . 0 . . . .
. 0 . . . . . 0 . . .
0 . 0 . 0 . 0 . 0 . . .
0 . . . . . . . 0 . . .
0 . . . . . . . 0 . . .
```

Next, convert each row of dots into a 16-bit value. Assign logical one (1) to every position that does not contain a “fired” dot and assign a logical zero (0) to every position that contains a “fired” dot. Pad the resultant 12-bit value on the left with four zeros.

The values for the dot patterns are:

. . . . 0	0F7FH
. . . 0 . 0	0EBFH
. . 0 0	0DDFH
. 0 0	0BEFH
0 . 0 . 0 . 0 . 0	0557H
0 0	07F7H
0 0	07F7H

Finally, assign a hex value to the new character. For demonstration purposes, the hex value 41H will be assigned to the character “A.”

The codes are then downloaded into the printer.

Download a Character

Once a character has been defined, the associated codes can be downloaded into the printer. Use the Write Device Control Memory command.

First, calculate the offset (in words) within the character RAM where the set of seven 16-bit values derived from creating the character are to be placed. Since the demonstration character has been assigned the value 41H (65 decimal), and the character at offset zero within the character RAM is the ASCII space (20H), and there are 7 words (dot rows) per character, the offset is:

$$(41H - 20H) * 7 = 00E7H$$

Next, format a Write Device Control Memory command. The fourth byte in the message is a VLI. The fifth and sixth bytes are the calculated offset. The remaining 14 bytes are the codes derived when creating the character.

1BH,5BH,7EH,10H,00H,E7H,0FH,7FH,0EH,BFH,0DH,DFH,0BH,EFH,05H,57H,07H,F7H,07H,F7H

Finally, send the command to the printer. The printer must be offline before it can accept the command.

NCR 5021 Printer Emulation Commands

The calculated offset does not have to fall on a character boundary and the number of codes does not have to be a whole multiple of seven (7). For example, the following command would alter the lower portion of the character assigned the value 41H and the top portion of the character assigned the value 42H:

1BH,5BH,7EH,12H,00H,EAH,0FH,7FH,0EH,BFH,0DH,DFH,0BH,EFH,05H,57H,07H,F7H,07H, F7H,07H,F7H,OFH,FFH

Hexadecimal	Decimal	ASCII
1B 5B 7F <i>vv, yy, yy, xx, xx, xx, xx</i>	27 91 127 <i>vv, yy, yy, xx, xx, xx, xx</i>	ESC [~ <i>vv, yy, yy, xx, xx, xx, xx</i>
	<u>Value of <i>vv</i></u>	<u>Value of <i>yy</i></u>
	0-80H	0000-061FH

The value of *vv* is the VLI(in binary).

The value of *yy* is a binary address of the location within the character set to write the first twelve-bit dot pattern.

The value of *xx* is a word. Each word contains a twelve-bit dot pattern representing one row of dots of a 12 x 7 character matrix (in binary). Maximum number of words is 63. The twelve least significant bits of each word make up the dot pattern.

Print Characteristics Commands

These commands affect the appearance of printed information. They control the following:

- Character formatting
- Line spacing

The commands are listed in numerical order of their hexadecimal codes.

Cancel Double-Wide

Ends double-wide printing.

Hexadecimal	Decimal	ASCII
10	16	DLE

Set Double-Wide

Starts double-wide printing. The printer returns to single-wide mode when it receives the Cancel Double-Wide (10) command or when the end of the current line is reached.

Hexadecimal	Decimal	ASCII
12	18	DC2

Set Interline Spacing

Sets the number of dot rows that are printed between lines. The default number of dot rows is 2. The valid range is from 1 to 7 dot rows.

This command is processed only when the printer is Offline.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 5B 72 <i>n</i>		ESC [<i>r n</i>	31-37

Printer Status Commands

Read Status

Returns the status of the printer.

Printable data sent to the printer immediately after this command is not included in the print process or data buffer status.

If the printer is not processing data, but data is buffered, then the printer is holding a partially formed line and is waiting for the user to complete the line before it is printed. The forms compensation assembly is not opened while the printer holds a partial line of data.

The data buffer status reflects the state of the data buffers only, not the communication buffers.

NCR 5021 Printer Emulation Commands

If a paper jam has occurred, the print mechanism must be cleared. If more printable data than the print data buffer can accommodate is sent, the printer discards all data after the data buffer is filled.

This command is executed immediately, regardless of the state of the printer.

Hexadecimal	Decimal	ASCII
1B 5B 31	27 91 49	ESC [1

The printer sends the following in reply to the message: 1BH, 5BH, *ww*H, *xx*H, *yy*H, *zz*H, 70H

	Value	Indicates
<i>ww</i>	30H	Offline
	31H	Online
<i>xx</i>	30H	Idle
	31H	Busy
	32H	Jam
<i>yy</i>	30H	Buffer Empty
	31H	Buffer Not Empty
<i>zz</i>	30H	Forms Compensation Assembly Closed
	31H	Forms Compensation Assembly Open

Read Tallies

Returns printer tallies for hours on and lines printed. The tallies are not cleared by the Reset (1B 5B 30) command.

Hexadecimal	Decimal	ASCII
1B 5B 34	1B 5B 52	ESC [4

The printer sends the following in reply to the message: 1BH, 5BH, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, 2CH, 30H, 30H, 30H, 30H, 2CH, 30H, 30H, 30H, 30H, 70H.

The value of *xxxxxxxx* is the count of lines printed (in unpacked ASCII).

Read and Clear Tallies

Returns printer tallies for hours on and lines printed and then clears the tallies. The tallies are not cleared by the Reset (1B 5B 30) command.

Hexadecimal	Decimal	ASCII
1B 5B 35	27 91 53	ESC [5

The printer sends the following in reply to the message: 1BH, 5BH, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, *xx*H, 2CH, 30H, 30H, 30H, 30H, 2CH, 30H, 30H, 30H, 30H, 70H.

The value of *xxxxxxxx* is the count of lines printed (in unpacked ASCII). *xx*H may be 30H-39H.

NCR 5021 Printer Emulation Commands

Section 9

EF4270 Emulation Commands

Commands control all operations and functions of the EFP9800 printer. The commands in this chapter emulate the EF4270 printer.

List of EF4270 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 in the next section.

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.

Hexadecimal Code	Command Name	Page
03	End of Text	9-4
05 03	Status: 3 Bit	9-22
0A	Line Feed	9-5
0B	Vertical Tab	9-5
0C	Eject Slip	9-5
0D	Carriage Return	9-5
0E	Double-Wide Font	9-13
0F	Double-Wide Off	9-13
19	Setup Parameters	9-6
1B 00	Reset Printer	9-7
1B 05	Status: 6 Bit	9-23
1B 06	Status: 7 Bit	9-24
1B 07	Cash Drawer 1	9-7

EF4270 Emulation Commands

Hexadecimal Code	Command Name	Page
1B 08	Cash Drawer 2	9-7
1B 0C	Document Clamp Open	9-8
1B 13	Self Test	9-8
1B 17	Document Validation	9-8
1B 1A 1B 5A	Receipt/Journal Print	9-8
1B 1C	Document Clamp Close	9-9
1B 1D	Graphics: 5 Dot	9-21
1B 21	Character Set	9-14
1B 41	Form Eject	9-9
1B 42 75	Download (Not Implemented)	9-9
1B 43	Underline Print	9-15
1B 44	Underline Off	9-16
1B 45	Double-High Off	9-16
1B 46	Form In (Parallel Printers Only)	9-9
1B 47	Select (Parallel Printers Only)	9-10
1B 48	Double-High Font	9-16
1B 49	Either Form-In Sensor (Not Implemented)	9-10
1B 4A	Both Form-In Sensors (Not Implemented)	9-10
1B 4B	Busy Until Buffer Empty	9-10
1B 4C	Clamp Delay	9-11
1B 50	Pitch Selection	9-17
1B 52	Upside-Down Off	9-18
1B 53	Print Speed (Not Implemented)	9-11
1B 55	Upside-Down Print	9-18
1B 56	Status-Firmware	9-24
1B 57	Buffered Validate	9-11
1B 60	Buffer Clear	9-12
1B 7C	Wait for Slip	9-12

EF4270 Emulation Commands

Hexadecimal Code	Command Name	Page
1B 7D <i>n n</i>	Rotate Font 90 Degrees Clockwise or Cancel Rotated Print	9-18
1B 7E	Cancel Slip Waiting	9-13
1E	Graphics	9-19
1F <i>c n n n</i> 1F	Repeat Character	9-12

EF4270 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.

Hexadecimal	Decimal	ASCII
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*). See “Chapter 3: Diagnostics and Print Test” for more information.

Hexadecimal	Decimal	ASCII
0A	10	LF

Vertical Tab

Prints any data in the buffer and then advances the paper .02083 inches (0.523mm).

Hexadecimal	Decimal	ASCII
0B	11	VT

Eject Slip

Feeds the slip until the lower sensor is uncovered. The printer enters roll mode. Even if the printer is selected for concurrent feed, only the cut sheet is ejected. After the command is executed, the rolls remain closed until an Document Clamp Open (1B 0C) command is received.

Hexadecimal	Decimal	ASCII
0C	12	FF

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.

Hexadecimal	Decimal	ASCII
0D	13	CR

EF4270 Emulation Commands

Setup Parameters

Sets temporary values for default printer parameters. *N* is the sum of the values for each parameter.

Hexadecimal	Decimal	ASCII		
19 <i>n</i>	25 <i>n</i>	EM <i>n</i>		
Value of <i>n</i>				
Hexadecimal	Decimal	ASCII	Parameter	Setting
00	0	NUL	Auto Line Feed	ON
01	1	SOH		OFF
00	0	NUL	Characters per Line	40
02	2	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, whether it is defined by the internal DIP switch settings, or by the Pitch Selection command (1B 50 *n*).

Reset Printer

This command is processed immediately and causes the printer to reset and initialize as if the power had been interrupted. All data in the buffer will be lost. The printer sends an XOFF if XON/XOFF handshaking is selected.

No additional data should be sent to the printer following the reset command until one of the following:

- The BUSY line toggles (parallel interface).
- The RTS line toggles (RS-232 serial interface with RTS/CTS hardware handshaking selected).
- The printer sends an XON (RS-232 serial interface with XON/XOFF handshaking selected).

If the unit is configured for XON/XOFF serial interface handshaking, the printer also toggles the RTS line in addition to sending the XOFF/XON.

The printer reinitializes with the default DIP switch settings.

Hexadecimal	Decimal	ASCII
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. See “Chapter 5: Communication” for more information.

Hexadecimal	Decimal	ASCII
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. See “Chapter 5: Communication” for more information.

Hexadecimal	Decimal	ASCII
1B 08	27 8	ESC BS

EF4270 Emulation Commands

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.

Hexadecimal	Decimal	ASCII
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 See “General Print Test” in “Chapter 3: Diagnostics” for more information.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII
1B 1A	27 26	ESC SUB
1B 5A	27 90	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.

Hexadecimal	Decimal	ASCII
1B 1C	27 28	ESC FS

Form Eject

Ejects the form from the validation station after it has been printed.

Hexadecimal	Decimal	ASCII
1B 41	27 65	ESC A

Download

This command is not supported and is ignored if received.

Hexadecimal	Decimal	ASCII
1B 42 75	27 66 117	ESC B u

Form In

Used for parallel printers only. This command is NOT supported in a standard IEEE 1284 interface, however, and should not be used. This command may be used with a non-standard parallel interface with no bi-directionality, but it is recommended that you use other status commands (Status: 3 Bit and Status: 6 Bit) to detect form presence instead.

Causes pin 13 on the 25-pin communication cable connector to indicate the status of the Form-In sensor. 1 = form not present. Internal switch pack #3, switch 8 must be set to ON.

Hexadecimal	Decimal	ASCII
1B 46	27 70	ESC F

EF4270 Emulation Commands

Select

Used for parallel printers only. Causes pin 13 on the 25-pin communication cable connector to function as the SELECT line. Internal switch pack #3, switch 8 must be set to OFF.

Hexadecimal	Decimal	ASCII
1B 47	27 71	ESC G

Either Form-In Sensor

This command is not supported and is ignored if received.

Hexadecimal	Decimal	ASCII
1B 49	27 73	ESC I

Both Form-In Sensors

This command is not supported and is ignored if received.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 4C <i>n</i>	27 76 <i>n</i>	ESC L <i>n</i>	See table

Value of <i>n</i>			
Hexadecimal	Decimal	ASCII	Time of Clamp Delay
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.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII
1B 57	27 87	ESC W

EF4270 Emulation Commands

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.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII	Value of <i>c</i>	Value of <i>n</i>
1F <i>c n n n</i> 1F	31 <i>c n n n</i> 31	US <i>c n n n</i> 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.

Wait for Slip

Puts the printer into slip waiting mode. The Slip In LED blinks until a slip is inserted or the waiting is cancelled. When a slip is detected by both sensors, the printer delays for a few seconds, and then closes the forms assembly. The delay is determined by the Clamp Delay (1B 4C) command. Printing begins 0.18 inches from the top of the form. If concurrent feed is selected, both the cut sheet and the paper roll feed.

Hexadecimal	Decimal	ASCII
1B 7C	27 124	ESC |

Cancel Slip Waiting

Cancels slip waiting. The communication buffer is cleared and the printer returns to roll mode. The command is executed immediately after it is received.

Hexadecimal	Decimal	ASCII
1B 7E	27 126	ESC ~

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.

Hexadecimal	Decimal	ASCII
0E	14	SO

Double-Wide Off

Turns off double-wide printing.

Hexadecimal	Decimal	ASCII
0F	15	SI

EF4270 Emulation Commands

Character Set

Selects the character set. The default character set is defined by the internal DIP switch settings. See “Chapter 3: Diagnostics and Print Test” for more information.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 21 <i>n</i>	27 33 <i>n</i>	ESC ! <i>n</i>	See table

Value of <i>n</i>			
Hexadecimal	Decimal	ASCII	Character Set
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	35	64	91	92	93	94	96	123	124	125	126
	Hexadecimal	23	40	5B	5C	5D	5E	60	7B	7C	7D	7E
PC US (Code Page 437)		#	@	[	\	\]	^	`	{	|	}	~
United Kingdom English		£	@	[	\	\]	^	`	{	|	}	~
German		#	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
French		£	à	°	ç	§	^	`	é	ù	è	ê
Italian		£	§	°	ç	é	^	ù	à	ò	è	ì
Spanish		!	¡	Ñ	ñ	¿	ü	á	é	í	ó	ú

5820

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

5822

EF4270 Emulation Commands

Underline Print

Activates the 9th wire on all character cells to underline all printable characters, including a space (blank) character.

Hexadecimal	Decimal	ASCII
1B 43	27 67	ESC C

Underline Off

Turns off underline printing.

Hexadecimal	Decimal	ASCII
1B 44	27 68	ESC D

Double-High Off

Turns off double-high printing.

Hexadecimal	Decimal	ASCII
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 (0E).

Hexadecimal	Decimal	ASCII
1B 48	27 72	ESC H

Pitch Selection

Selects the character pitch, from 33 to 66 characters per line.

The default character set is defined by the internal DIP switch settings. For more information, see “Chapter 3: Diagnostics and Print Test.” The Double Wide command may be used with any pitch to provide a total of 6 combinations of pitch and font.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1B 50 <i>n</i>	27 80 <i>n</i>	ESC P <i>n</i>	See table

Value of <i>n</i>				
Hexadecimal	Decimal	ASCII	Pitch	Characters per Line
00	0	NUL	11.5	33
01	1	SOH	12.5	36
02	2	STX	13.9	40
03	3	ETX	15.3	44
04	4	EOT	17.4	50
05	5	ENQ	19.8	57
06	6	ACK	23	66

EF4270 Emulation Commands

Upside-Down Off

Turns off upside-down printing.

Hexadecimal	Decimal	ASCII
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.

Hexadecimal	Decimal	ASCII
1B 55	27 85	ESC U

Rotate Font 90 Degrees Clockwise or Cancel Rotated Print

Enables printing with characters rotated 90 degrees clockwise. Keep the following in mind when working with rotated characters

- When the line buffer is empty, rotated font can be set or cancelled. When the print buffer is not empty, the command has no effect.
- The print zone width is 3.024 inches for rotated characters (2.88 inches for upright characters).
- Rotated and upright characters cannot be mixed on the same line.
- Double-high/wide characters can be used in any combination with rotated print.

The following commands have no effect while rotated print is enabled.

- Pitch Selection(1B 50 *n*)
- Character Set (1B 21 *n*)
- Setup Parameters (19 *n*)

For print to be rotated clockwise, the characters must be inverted as well as rotated.

Hexadecimal	Decimal	ASCII	Value of <i>n n</i>
1B 7D <i>n n</i>	27 123	ESC }	Odd = rotation enabled. Even = rotation cancelled.

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.

Hexadecimal	Decimal	ASCII
1E	30	RS

EF4270 Emulation Commands

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	0	0	0	0	0	0	0
2nd Byte	0	0	0	0	0	0	0
3rd Byte	0	0	0	0	0	0	0
4th Byte	0	0	0	0	0	0	0
5th Byte	0	0	0	0	0	0	0
6th Byte	0	0	0	0	0	0	0
7th Byte	0	0	0	0	0	0	0
8th Byte	0	0	0	0	0	0	0
9th Byte	0	0	0	0	0	0	0

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

Hexadecimal	Decimal	ASCII
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 command provides compatibility with earlier 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.

Hexadecimal	Decimal	ASCII
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 command provides compatibility with earlier 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.

Hexadecimal	Decimal	ASCII
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
6	Not used (Always 0)	
7	Not used (Always 1)	

EF4270 Emulation Commands

Status: 7 Bit

Transmits the status of the paper sensors, cash drawers, forms clamp, and the condition of the printer, including paper jam status. This command is processed immediately. The transmitted status is shown in the table below.

Hexadecimal	Decimal	ASCII
1B 06	27 6	ESC ACK

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
6	No Paper Jam	Paper Jam

Status-Firmware

Used for RS-232C printers only. Causes the printer to return 3 bytes (000).

Hexadecimal	Decimal	ASCII
1B 56	27 86	ESC V

Section 10

Flash Download Commands

These commands are used to load firmware into the printer and to configure the printer. With the exception of the Put the Printer in Flash Download Mode command (1B 5B 7D), these commands are available only when the printer is in download mode. No other commands are available in download mode.

Download mode can be entered in one of two ways:

- Set the external switches to a special diagnostic setting and power on the printer.

See “Flash Download Mode” in section 3 for more information

- Send the command (available in all emulations), Put the Printer in Flash Download Mode (1B 5B 7D) when the printer is in normal operating mode.

This command is described in this section.

Note: *The EFP9800 FLASHLOAD software utility can also be used for downloading firmware to the unit. The utility is included in the EFP9800-SW1 style package.*

List of Flash Download 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 in the next section.

Hexadecimal Code	Command Name	Page
1B 5B 7D	Put the Printer in Flash Download Mode	10-3
1D 00	Request Printer Identification	10-3
1D 01	Request Flash Identifier	10-4
1D 02	Select Sector to Download	10-4
1D 05	Request Retransmission of Last Response	10-4
1D 06	Check CRC	10-4
1D 07	Return Microprocessor CRC	10-5
1D 08	Set Emulation	10-5
1D 09	Request Current Emulation	10-5
1D 0A	Write EEROM Switches	10-6
1D 0B	Read EEROM Switches	10-7
1D 0C	Write EEROM Parameter	10-8
1D 0D	Read EEROM Parameter	10-9
1D 0E	Erase the Flash ROM	10-9
1D 0F	Return CRC of Selected Flash Sector	10-9
1D 10	Erase Selected Sector	10-10
1D 11	Download Sector	10-10
1D FF	Reboot the Printer	10-11

Flash Download Command Descriptions

These commands control downloading of flash memory. 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.

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.

Put the Printer in Flash Download Mode

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. It is available in all emulations. Once the printer is in flash download mode, this command is no longer available.

Note: See “Entering Flash Download Mode” in section 3 to put the printer in flash download mode using the DIP switches.

Hexadecimal	Decimal	ASCII
1B 5B 7D	27 91 125	ESC [}

Request Printer Identification

Requests string containing printer identification. This command is not implemented and is ignored if received.

Hexadecimal	Decimal	ASCII
1D 00	29 0	GS NUL

Flash Download Commands

Request Flash Identifier

Returns the size of the flash used. There may be 4, 8, or 16 sectors (64K each) in flash memory. The numbers returned are the number of sectors minus one (3, 7, or 15 respectively). This command assures that the firmware to be downloaded is the appropriate size for flash memory.

Hexadecimal	Decimal	ASCII
1D 01	29 1	GS SOH

Select Sector to Download

Selects the flash sector for which the next download operation applies.

The printer transmits ACK if the sector number is acceptable; NAK if unsuccessful.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1D 02 <i>n</i>	29 2 <i>n</i>	GS STX <i>n</i>	00, 01* (hexadecimal)

***Note:** Send 00 or 01 only.

Request Retransmission of Last Response

Requests the printer to retransmit the last byte of the last response.

Hexadecimal	Decimal	ASCII
1D 05	29 5	GS ENQ

Check CRC

Causes the printer to calculate the CRC for the currently selected sector. 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.

Hexadecimal	Decimal	ASCII
1D 06	29 6	GS ACK

Return Microprocessor CRC

Causes the printer to transmit ACK followed by the CRC of the microprocessor: ACK (CRC low, CRC high).

Hexadecimal	Decimal	ASCII
1D 07	29 7	GS BEL

Set Emulation

Sets the printer to the emulation requested. The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK. The printer returns ACK if the command is performed successfully.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>
1D 08 <i>n</i>	29 8 <i>n</i>	GS BS <i>n</i>	See Table

<i>n</i>	Emulation
0	EFP9800 ESC POS
1	NCR 5021 (Serial Interface Units Only)
2	IPI Proprinter
3	EF4270

Request Current Emulation

The printer transmits ACK followed by the current emulation (see the Set Emulation command—1D 08). The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK. The printer returns ACK if the command is performed successfully.

Hexadecimal	Decimal	ASCII
1D 09	29 9	GS HT

Flash Download Commands

Write EEROM Switches

Sets the emulation EEROM switches. The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK. The printer returns ACK if the command is performed successfully.

Hexadecimal	Decimal	ASCII
1D 0A <i>d1, d2, d3, d4</i>	29 10 <i>d1, d2, d3, d4</i>	GS LF <i>d1, d2, d3, d4</i>

The first data byte is the settings for switch pack #1, the second for #2 and so on. Each internal switch pack is considered to have eight switches and the correspondence between the data bits (*di*) and switches is as follows:

<i>di</i> (i = 1, 2, 3, 4)	Bit	Internal Switch Pack
<i>di</i>	0	Switch 1
<i>di</i>	1	Switch 2
<i>di</i>	2	Switch 3
<i>di</i>	3	Switch 4
<i>di</i>	4	Switch 5
<i>di</i>	5	Switch 6
<i>di</i>	6	Switch 7
<i>di</i>	7	Switch 8

Read EEROM switches

Returns the settings of the EEROM switches. This command is used to verify that the EEROM switches are set correctly. The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK. The printer returns ACK, followed by switch data. The data is returned in the following form:

ACK, d_1 , d_2 , d_3 , d_4

Hexadecimal	Decimal	ASCII
1D 0B	29 11	GS VT

Not all switch packs may apply to a specific emulation. However, the printer always returns data equivalent to four switch packs. Each switch pack is considered to have eight switches and the correspondence between the data bits (d_i) and switches is as follows:

d_i ($i = 1, 2, 3, 4$)	Bit	Internal Switch Pack
d_1	0	Switch 1
d_1	1	Switch 2
d_1	2	Switch 3
d_1	3	Switch 4
d_1	4	Switch 5
d_1	5	Switch 6
d_1	6	Switch 7
d_1	7	Switch 8

Flash Download Commands

Write EEROM Parameter

Turns data scope mode on or off, and selects the MICR type (CMC7 or E13B). The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK.

Hexadecimal	Decimal	ASCII	Value of <i>n</i>	Value of <i>d</i>
1D 0C <i>n d</i>	29 12 <i>n d</i>	GS FF <i>n d</i>	0, 1, 2	0, 1

<i>n</i>	<i>d</i>	Function
0	0	Data Scope Mode OFF
0	1	Data Scope Mode ON
1	0	E13B MICR Type
1	1	CMC7 MICR Type
2	0	Cover Open Switch Enabled
2	1	Cover Open Switch Disabled

Read EEROM Parameter

Returns the setting of the requested parameter. The command assumes that the printer flash program memory (sectors 0, 1) have been correctly programmed. If these sectors have been erased, the printer returns NAK. The printer transmits ACK, followed by the value of the request parameter.

Hexadecimal	Decimal	ASCII
1D 0D <i>n</i>	29 13 <i>n</i>	GS CR <i>n</i>

<i>n</i>	<i>d</i>	Function
0	0	Data Scope Mode OFF
0	1	Data Scope Mode ON
1	0	E13B MICR Type
1	1	CMC7 MICR Type
2	0	Cover Open Switch Enabled
2	1	Cover Open Switch Disabled

Erase the Flash ROM

Causes the entire Flash ROM to be erased.

The printer returns ACK if the command is successful; otherwise, NAK is returned.

Hexadecimal	Decimal	ASCII
1D 0E	29 14	GS SO

Return CRC of Selected Flash Sector

Causes the printer to return the CRC of the flash sector (only from sector 0 or 1) selected by the Select Sector to Download command (1D 02): ACK (CRC low, CRC high).

Hexadecimal	Decimal	ASCII
1D 0F	29 15	GS SI

Flash Download Commands

Erase Selected Sector

Erases the sector that was selected previously.

The printer transmits ACK if the sector is erased successfully, NAK if no sector was selected previously.

Hexadecimal	Decimal	ASCII
1D 10 <i>nn</i>	29 16 <i>nn</i>	GS DLE <i>nn</i>

Download Sector

Contains a start address ($ah*256 + al$) and count ($ch*256 + cl$) of binary bytes to load into the selected sector, followed by that many data bytes. The start address is relative to the start of the sector.

Hexadecimal	Decimal	ASCII
1D 11 <i>al ah cl ch d1 . . . dn</i>	29 17 <i>al ah cl ch d1 . . . dn</i>	GS DC1 <i>al ah cl ch d1 . . . dn</i>

Value of <i>n</i> (for number of data bytes)	Range of Address (<i>al ah</i>)	Range of Count (<i>cl ch</i>)
$((ch * 256) + cl)$	2000-FFFF (hexadecimal)	0001-0400 (hexadecimal)

- *al* = low byte of the address (it is sent before the high byte)
- *ah* = high byte of the address (it is sent after the low byte)
- *cl* = low byte of the count (it is sent before the high byte)
- *ch* = high byte of the count (it is sent after the low byte)
- *d* = data bytes, from 1 to *n*

The printer may return one of the following responses:

- ACK means that the data was written correctly and the host should transmit the next block.
- NAK means that the data was not written correctly, either because communication failed or because the write to flash failed. The alternatives are to retry the block or halt loading and assume a hardware failure.

Reboot the printer

Ends the load process and reboots the printer. Before executing this command, the printer should have firmware loaded, emulation set, EEROM switches set 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 reenter download state unless the external switches are changed.

Hexadecimal	Decimal	ASCII
1D FF	29 255	GS Space

Flash Download Commands

Section 11

MICR Commands and Parsing

These commands control the Magnetic Ink Character Recognition (MICR) check reader, including how it parses the character strings on checks. This section explains these commands.

The section that follows, “MICR Parsing,” describes how to create a parsing format and how to create and maintain an exception table. If you would like a copy of a software utility that performs these functions rather than developing your own program using the command codes described in this section, please contact Unisys. The software utility can be used as provided or can be incorporated into your own application.

MICR Commands

Read MICR Data and Transmit

Reads the MICR data and either ejects the check or positions the check for printing, depending on the value of *n*.

Hexadecimal	Decimal	ASCII	Value of <i>n</i> (hexadecimal)
1B 77 <i>n</i>	27 119 <i>n</i>	ESC w <i>n</i>	01 (Read MICR and Eject Check) 02 (Read MICR and Position Check for Printing)

Define Parsing Format, Save in NVRAM

Defines and saves parsing format. See “Parsing Parameter String Options” on the next page. Send this command at the start of day or use in the setup application. If no parameters are selected, parsing is not performed.

Hexadecimal	Decimal	ASCII
1B 77 50 parameters	27 119 80 parameters	ESC w P parameters

MICR Commands and Parsing

Reread MICR Data

Resends the unparsed MICR data (as if the parsing has not been defined) from the previous MICR sequence.

Hexadecimal	Decimal	ASCII
1B 77 52	27 119 80	ESC w P

Define Parsing Format, Do Not Save Permanently

Defines, but does not save parsing format. See “Parsing Parameter String Options” on the next page. Send this command at the start of day or use in the setup application. If no parameters are selected, parsing is not performed.

Hexadecimal	Decimal	ASCII
1B 77 70	27 119 112	ESC w p
parameters	parameters	parameters

MICR Parsing

This section describes the MICR parsing in more 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.

If you would like a copy of a software utility that performs these functions rather than developing your own program using the command codes described in this section, please contact Unisys. The software utility can be used as provided or can be incorporated into your own application.

Parsing Parameter String Options

The parsing options apply only to the E13B MICR font only, not to the CMC7 MICR font.

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

MICR Commands and Parsing

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 US check
	Km	m Canadian check
Check Type	L	One Digit Returned
		1 Personal check
		2 Business or commercial check

Ten parameters are more than enough to specify all variable length fields with a field separator each and other status information that may be helpful to an application. More than 10 parameters are not recommended because they use up space in non-volatile memory (NVRAM) available for the exception table.

The parsing parameter string is stored packed in NVRAM starting at word 10, with the total byte length stored in the high order byte of word 10. While most parameters take two bytes of NVRAM, the following parameters take only one byte: B, D, E, S, L. None of the parsing examples in the following section take more than 14 bytes (seven words) of NVRAM.

The exception table starts at word 20. If the parsing parameter string extends into word 20, then the first exception table entry is unavailable.

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

MICR Commands and Parsing

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>

- 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

MICR Commands and Parsing

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, ESC wP <CR> or ESC wp <CR>) parsing is not selected. One status byte, followed by all decoded MICR characters will be returned. See the descriptions of the commands. This 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

With RS-232C communication, the printer adds a final carriage return to the MICR data sent to the application.

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.

occccco txxxxxxxxxt xxxxxxxxo

MICR Commands and Parsing

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.

```
tXXXXXXXXXXt XXXXXXXXo cccc  
tXXXXXXXXXXt XXXXXXXXo cccc $XXXXXX$
```

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.

```
tXXXXXXXXXXt cccc XXXXXXXXo  
tXXXXXXXXXXt cccc-XXXXXXXXXo  
tXXXXXXXXXXt cccc XXXXXXXXo xx
```

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 which 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:

```
tXXXXXXXXXXt ccc-XXXXXXXXXXoXXXX  
tXXXXXXXXXXt xxx-XXXXXXXXXXoCCCC
```

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:

```
txxxxxxxxxt cccccccccccccxo
```

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:

```
txxxxxxxxxt xxx-ccc-xxxxxxxxxox
```

Loading the Exception Table

The exception table begins at word 20 in NVRAM. Each entry takes five words. There is room for eight exceptions with a sumcheck written in the last word. 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 which 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.

MICR Commands and Parsing

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.

Appendix A

Specifications

Printing Specifications

Table 1: Speed and Print Modes

	Receipt/Journal Station	Slip Station
Speed	290 lines/minute (40 columns at 13.9 CPI, with 10 x 7 character cell, in 3.024 inch print zone)	290 lines/minute (40 columns at 13.9 CPI, with 10 x 7 character cell, in 3.024 inch print zone)
Printhead	9 Wire Impact	
Line Spacing	7.2, 6.0, 5.0 LPI (ESC/POS) 8, 6.9, 6.0, 5.3 LPI (EF4270) 9, 8, 7.2, 6.5, 6, 5.5, 5.1 LPI (NCR 5021) 8, 6 LPI (Ithaca Peripherals Proprinter)**	7.2, 6.0, 5.0 LPI (ESC/POS) 8, 6.9, 6.0, 5.3 LPI (EF4270) 9, 8, 7.2, 6.5, 6, 5.5, 5.1 LPI (NCR 5021) 8, 6 LPI (Ithaca Peripherals Proprinter)**
Enhanced Print	Standard, Bold, Underline, Double-Wide, Double-High, Double-Strike, Rotated, Upside-Down	Standard, Bold, Underline, Double-Wide, Double-High, Double-Strike, Rotated, Upside-Down
*Character Sets	Code Page 437 PC US Code Page 850 PC Multilingual Code Page 852 Eastern European Code Page 865 Nordic Languages	Code Page 437 PC US Code Page 850 PC Multilingual Code Page 852 Eastern European Code Page 865 Nordic Languages

*Extended character sets are available for both the ESC/POS and EF4270 emulations. For more information, see Chapter 6 or Chapter 9.

**For finer line spacing, see Chapter 7.

Specifications

Table 3: Character and Line Specifications

EFP9800 ESC/POS (Includes Epson ESC/POS Emulation)

Characters/ Line (Columns)	Character Cell Size	Print Line Width Inches (mm)	Slip Right Margin Inches (mm)	Receipt Right Margin Inches (mm)	Characters /Inch (Pitch)
40	10 x 7 ¹	2.506 (63.65)	0.53 (13.46) ³ Or 0.3720 (9.45) ³	0.3720 (9.45)	15.9
33	5 x 9 ²	2.506 (63.65)	0.53 (13.46) ³ Or 0.3720 (9.45) ³	0.3720 (9.45)	13.2
42	10 x 7 ¹	2.506 (63.65)	0.53 (13.46) ³ Or 0.3720 (9.45) ³	0.3720 (9.45)	16.8
35	5 x 9 ²	2.506 (63.65)	0.53 (13.46) ³ Or 0.3720 (9.45) ³	0.3720 (9.45)	13.9
51	10 x 7 ¹	3.024 (76.80)	0.1130 (2.87)	.1130 (2.87)	16.5
42	5 x 9 ²	3.024 (76.80)	0.1130 (2.87)	.1130 (2.87)	13.9
42	10 x 7 ¹	3.024 (76.80)	0.1130 (2.87)	.1130 (2.87)	13.9
35	5 x 9 ²	3.024 (76.80)	0.1130 (2.87)	.1130 (2.87)	11.6

¹10 half dots wide by 7 dots high.

²5 full dots wide by 9 dots high.

³The right margin for the slip/validation may be set with internal switch pack values in NVRAM using Switch Pack 3, switch 4. See "Set Internal Switch Values in NVRAM" in chapter 3 for more information about setting the character and line specifications.

Ithaca Peripherals Proprinter Emulation

Characters/ Line (Columns)	Character Cell Size	Print Line Width Inches (mm)	Slip Right Margin Inches (mm)	Receipt Right Margin Inches (mm)	Characters/Inch (Pitch)
24	10 x 7 ¹	2.338 (59.38)	0.343 (8.71)	0.343 (8.71)	10
28	10 x 7 ¹	2.338 (59.38)	0.343 (8.71)	0.343 (8.71)	12
40	10 x 7 ¹	2.338 (59.38)	0.343 (8.71)	0.343 (8.71)	17

¹10 half dots wide by 7 dots high.

NCR 5021 Emulation (Serial Interface Units only)

Characters /Line (Columns)	Character Cell Size	Print Line Width Inches (mm)	Slip Right Margin Inches (mm)	Receipt Right Margin Inches (mm)	Characters/Inch (Pitch)
40	12 x 7 ¹	3.024 (76.80)	0.1130 (2.87)	0.1130 (2.87)	13.2

¹12 half dots wide by 7 dots high.

EF4270 Emulation

Characters /Line (Columns)	Character Cell Size	Print Line Width Inches (mm)	Slip Right Margin Inches (mm)	Receipt Right Margin Inches (mm)	Characters /Inch (Pitch)
33	8 x 7 ¹	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	11.5
36	8 x 7 ¹	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	12.5
40	8 x 7 ¹	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	13.9
44	8 x 7 ¹	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	15.3
50	6 x 9 ²	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	17.4
57	6 x 9 ²	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	19.8
66	6 x 9 ²	2.88 (73.15)	0.200 (5.08)	0.200 (5.08)	23.0

¹8 half dots wide by 7 dots high

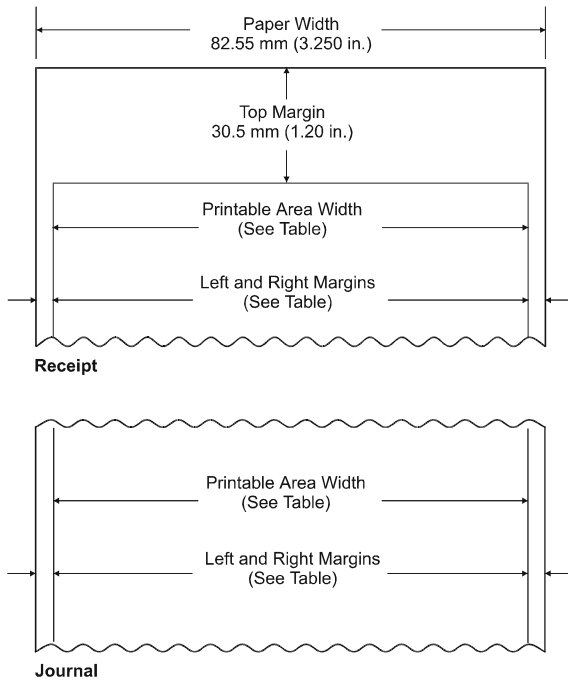
²6 half dots wide by 9 dots high.

Print Zones

The illustrations in this section show the printable area for the receipt, journal, slip, and validation stations. The illustrations are not to scale. References to a table are for Table 3: Character and Line Specifications on the previous page.

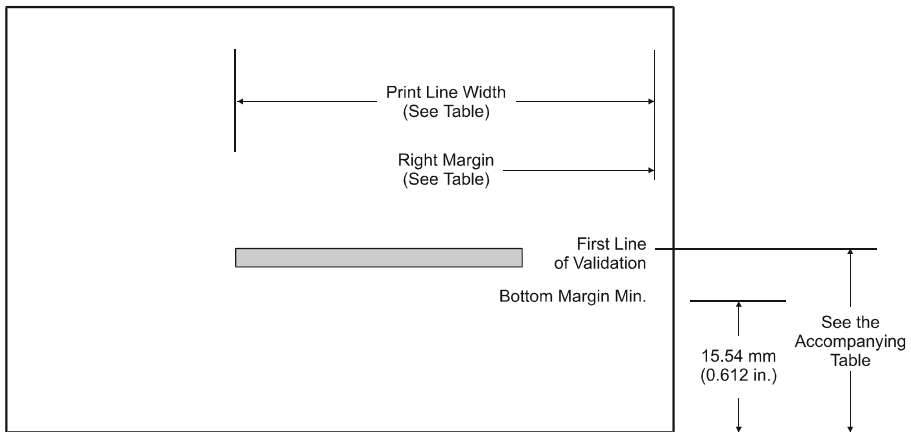
Receipt and Journal Print Zones

The table referenced in the illustration is Table 3: Character and Line Specifications, on the previous page.



Validation Print Zone

The table referenced in the illustration is Table 3: Character and Line Specifications, earlier in this appendix.



5814

The following tables specify the location of the first line of validation from the bottom of the form for each emulation.

Specifications

Emulation	Number of Validation Lines*	Location of First Line of Validation from Bottom of Form
EFP9800 ESC/POS	4	1.17 inches (29.7 mm)
EFP9800 ESC/POS	6	1.525 inches (38.7 mm)
EFP9800 ESC/POS	10	2.00 inches (50.8 mm)
EFP9800 ESC/POS	14	2.67 inches (67.82 mm)
IPI Proprinter	14	2.6 inches (66.04 mm)
NCR 5021	3	1.02 inches (25.91 mm)
NCR 5021	6	1.52 inches (38.61 mm)

*See “Set Internal Switch Pack Values in NVRAM” in chapter 3 for more information about setting the number of lines of validation.

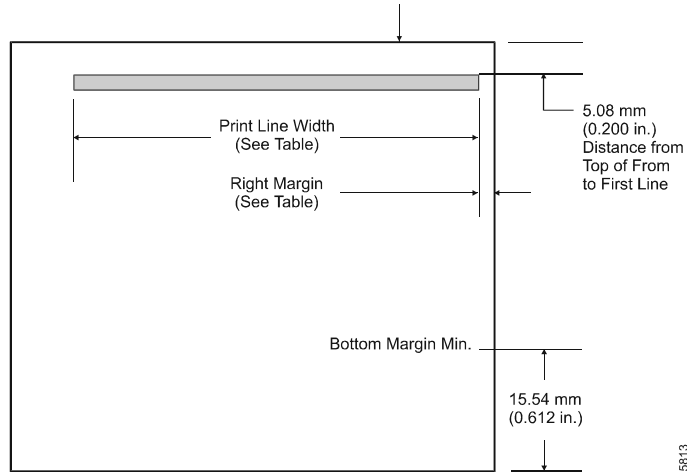
Using the EF4270 emulation, the EFP9800 can print up to 16 lines of validation at 8 lines/inch. Use internal switch pack 4 to change the settings.

Emulation	Location of First Line of Validation from Bottom of Form
EF4270	2.63 inches (66.80 mm)
	2.51 inches (63.75 mm)
	2.42 inches (61.46 mm)
	2.33 inches (59.18 mm)
	2.22 inches (56.38 mm)
	2.12 inches (53.84 mm)
	2.00 inches (50.8 mm)
	1.91 inches (48.51 mm)
	1.80 inches (45.72 mm)
	1.67 inches (42.41 mm)
	1.59 inches (40.38 mm)
	1.50 inches (38.1 mm)
	1.39 inches (35.30 mm)
	1.29 inches (32.76 mm)
	1.20 inches (30.48 mm)
	1.00 inches (25.40 mm)

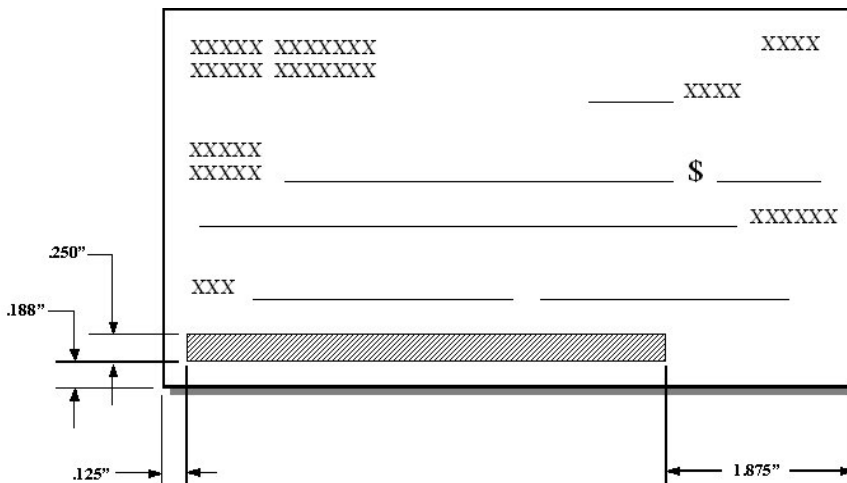
Specifications

Slip Print Zone

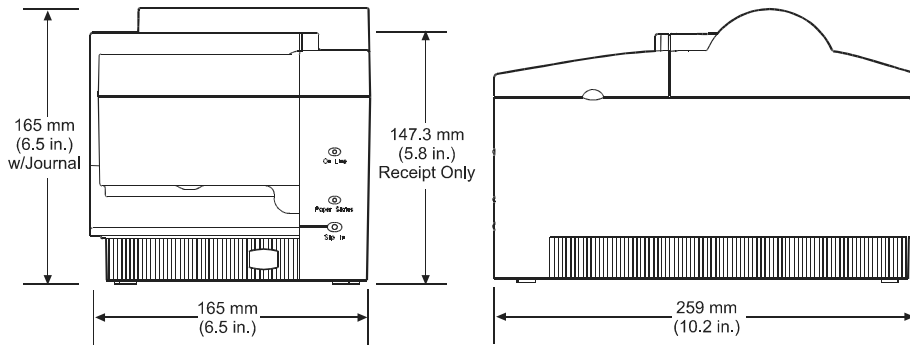
The table referenced in the illustration is Table 3: Character and Line Specifications on page 2.



MICR Read Zone



Dimensions



57749

Specifications

Power Requirements

The EFP9800 printer can receive power from a remote power supply. The voltage requirements are listed below:

Voltage	Maximum Short Term Current	Maximum Long Term Current
24 V +/- 5%	2.4 Amps	1.4 Amps

Environmental Requirements

Following are the environmental requirements for the EFP9800 printer:

- Operating Temperature: 41° F to 120° F (5° C to 50° C)
- Operating Humidity: 5% to 90%

Condensation may occur when the printer is transferred from cold to warm areas after shipment. The printer's design permits operation after drying out and stabilizing at room temperature.

This printer was designed to operate in the environment outlined in this section. Operation outside these ranges as defined may lead to degradation of the printer functionality and reliability, and may result in higher than specified service call rates. In environments which contain a high level of contaminants, dirt, airborne debris or particles, preventative maintenance will be required.

Reliability

Impact Printer	15 Million Print Lines
Impact Printhead	200 Million Characters
Ribbon Cassette	5 Million Characters
Power Supply	150 Thousand On-time Hours
MICR Check Reader	500,000 Reads

Character Sets

Code Page 437 (PC US)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	16	SP	0	@	P	,	p	Ç	É	á	⋮	⌞	⌚	∞	≡
01	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	±
02	12	22	32	42	52	62	72	82	92	A2	B2	C2	D2	E2	F2
2	18	"	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	#	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	\$	4	D	T	d	t	ä	ö	ñ	⌞	⌞	⌞	Σ	∫
05	15	25	35	45	55	65	75	85	95	A5	B5	C5	D5	E5	F5
5	21	%	5	E	U	e	u	à	ò	Ñ	⌞	⌞	⌞	σ	∫
06	16	26	36	46	56	66	76	86	96	A6	B6	C6	D6	E6	F6
6	22	&	6	F	V	f	v	á	û	ª	⌞	⌞	⌞	μ	÷
07	17	27	37	47	57	67	77	87	97	A7	B7	C7	D7	E7	F7
7	23	'	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	(	8	H	X	h	x	ê	ÿ	¿	⌞	⌞	⌞	φ	°
09	19	29	39	49	59	69	79	89	99	A9	B9	C9	D9	E9	F9
9	25	)	9	I	Y	i	y	ë	Ö	¸	⌞	⌞	⌞	Θ	•
0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	AA	BA	CA	DA	EA	FA
10	26	*	:	J	Z	j	z	è	Ü	¸	⌞	⌞	⌞	Ω	•
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	AB	BB	CB	DB	EB	FB
11	27	+	;	K	[	k	{	ï	ç	½	⌞	⌞	⌞	δ	√
0C	1C	2C	3C	4C	5C	6C	7C	8C	9C	AC	BC	CC	DC	EC	FC
12	28	,	<	L	\	|	|	î	£	¼	⌞	⌞	⌞	∞	ñ
0D	1D	2D	3D	4D	5D	6D	7D	8D	9D	AD	BD	CD	DD	ED	FD
13	29	-	=	M	]	m	}	ì	¥	ì	⌞	⌞	⌞	∅	²
0E	1E	2E	3E	4E	5E	6E	7E	8E	9E	AE	BE	CE	DE	EE	FE
14	30	.	>	N	^	n	~	À	Pt	«	⌞	⌞	⌞	ε	■
0F	1F	2F	3F	4F	5F	6F	7F	8F	9F	AF	BF	CF	DF	EF	FF
15	31	/	?	O	-	o	△	À	f	»	⌞	⌞	⌞	◌	BLANK

CRT Character Set Code Page 437

5816

Code Page 852 (Eastern European)

00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
			0	@	P	`	p	Ç	É	á	⋮	⌞	ð	Ó	-
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	A	Q	a	q	ü	Í	í	⋮	⌞	Đ	ß	”
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	B	R	b	r	é	Í	ó	⋮	⌞	Đ	Ô	€
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	C	S	c	s	â	ô	ú	|	⌞	Ě	Ň	ˇ
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	D	T	d	t	ä	ö	À	⌞	⌞	ď	ń	^
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	E	U	e	u	ű	Ľ	ą	À	+	Ń	ñ	§
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	F	V	f	v	ć	ĩ	Ž	À	À	í	Š	÷
6	22	38	54	70	86	103	119	135	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	ç	Ś	ž	Ě	ă	Î	š	
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	H	X	h	x	ł	ś	Ę	Ş	⌞	ě	Ř	°
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	I	Y	i	y	ë	Ö	ę	⌞	⌞	ǃ	Ú	..
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
		*	:	J	Z	j	z	Ő	Ü		⌞	⌞	⌞	ř	.
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
		+	;	K	[	k	{	ó	Ť	ž	⌞	⌞	■	Ú	ú
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
		,	<	L	\	l	|	î	ť	Č	⌞	⌞	■	ý	Ř
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
		-	=	M	]	m	}	Ž	Ł	ś	Ž	=	Ť	Ý	ř
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
		.	>	N	^	n	~	À	x	«	ž	⌞	Ů	t	■
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
		/	?	O	_	o	△	Ć	č	»	⌞	α	■	'	
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

5818

CRT Character Set Code Page 852

Specifications

Code Page 865 (Nordic Languages)

0	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240
		!	1	A	Q	a	q	ü	æ	í	☒	⊥	⊥	β	±
1	17	33	49	65	81	97	113	129	145	161	177	193	209	225	241
		"	2	B	R	b	r	é	Æ	ó	☒	⊥	⊥	Γ	≥
2	18	34	50	66	82	98	114	130	146	162	178	194	210	226	242
		#	3	C	S	c	s	â	ô	ú	|	|	⊥	π	≤
3	19	35	51	67	83	99	115	131	147	163	179	195	211	227	243
		\$	4	D	T	d	t	ä	ö	ñ	⊥	—	⊥	Σ	∫
4	20	36	52	68	84	100	116	132	148	164	180	196	212	228	244
		%	5	E	U	e	u	à	ò	Ñ	⊥	+	⊥	σ	J
5	21	37	53	69	85	101	117	133	149	165	181	197	213	229	245
		&	6	F	V	f	v	å	û	a	⊥	⊥	⊥	μ	÷
6	22	38	54	70	86	103	118	134	150	166	182	198	214	230	246
		'	7	G	W	g	w	ç	ù	ø	⊥	|	⊥	τ	≈
7	23	39	55	71	87	103	119	135	151	167	183	199	215	231	247
		(	8	H	X	h	x	ê	ÿ	¿	⊥	⊥	⊥	φ	°
8	24	40	56	72	88	104	120	136	152	168	184	200	216	232	248
		)	9	I	Y	i	y	ë	Ö	⊥	⊥	⊥	⊥	Θ	•
9	25	41	57	73	89	105	121	137	153	169	185	201	217	233	249
		*	:	J	Z	j	z	è	Ü	⊥	⊥	⊥	⊥	Ω	•
10	26	42	58	74	90	106	122	138	154	170	186	202	218	234	250
		+	;	K	[	k	{	ï	ø	½	⊥	⊥	■	δ	√
11	27	43	59	75	91	107	123	139	155	171	187	203	219	235	251
		,	<	L	\	l	|	î	£	¼	⊥	⊥	■	∞	η
12	28	44	60	76	92	108	124	140	156	172	188	204	220	236	252
		-	=	M	]	m	}	ì	Ø	ì	⊥	=	■	∅	z
13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253
		.	>	N	^	n	~	Ä	Pt	«	⊥	⊥	■	ε	■
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254
		/	?	O	_	o	△	Å	f	α	⊥	⊥	■	∩	∩
15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255

CRT Character Set Code Page 865

5819

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