2200
Model 2245/160 Matrix Printer
User's Guide
2200
Model 2245/160 Matrix Printer
User's Guide

1st Edition — January 1985
Copyright © Wang Laboratories, Inc., 1985
700-8742
DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITIES

The staff of Wang Laboratories, Inc., has taken due care in preparing this manual. However, nothing contained herein modifies or alters in any way the standard terms and conditions of the Wang purchase, lease, or license agreement by which the product was acquired, nor increases in any way Wang's liability to the customer. In no event shall Wang or its subsidiaries be liable for incidental or consequential damages in connection with or arising from the use of the product, the accompanying manual, or any related materials.

SOFTWARE NOTICE

All Wang Program Products (software) are licensed to customers in accordance with the terms and conditions of the Wang Standard Software License. No title or ownership of Wang software is transferred, and any use of the software beyond the terms of the aforesaid license, without the written authorization of Wang, is prohibited.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device, pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.
This manual is your guide to operating the Wang Model 2245/160 Matrix Printer, which is an option for Wang 2200 series systems.

Chapter 1 contains a general description of the printer and its features. Chapter 2 contains descriptions of the printer operating controls and indicators. Chapter 3 contains a printer operation summary and procedures for loading paper and replacing the ribbon cartridge. Chapter 4 contains device selection codes. Chapter 5 contains descriptions and sample programs for Text Mode control codes. Chapter 6 contains descriptions and sample programs for Download mode control codes. Chapter 7 contains descriptions and sample programs for Bit Image mode control codes.

Appendix A contains printer specifications. Appendix B contains printer maintenance procedures. Appendix C contains a listing of the mixed printing modes. Appendix D contains a summary of the printer control codes. Appendix E contains a table that lists the printer characters and their corresponding hex codes. It also contains a table of the names of the printer characters. Appendix F contains procedures for loading printer character tables and function tables.

For information about printer-related utilities and functions, refer to the following sources:

- 2200 Word Processing Operator's Guide (700-6937)
- 2200 LVP Introductory Manual (700-6164)
- 2200 MVP Introductory Manual (700-4693)
- 2200 SVP Introductory Manual (700-6163)
- 2200 BASIC-2 Multiuser Operating System Software Bulletin Release 2.6 (700-0097)
- Basic-2 Language Reference Manual (700-4080)
## CONTENTS

### CHAPTER 1  GENERAL INFORMATION

1.1 Overview .......................................................... 1-1
1.2 General Description ............................................. 1-1
1.3 Ordering Supplies ............................................... 1-2
1.4 Wang Maintenance Agreement ................................ 1-3
1.5 Installation ...................................................... 1-3

### CHAPTER 2  CONTROLS AND INDICATORS

2.1 Introduction ..................................................... 2-1
2.2 ON/OFF Switch .................................................. 2-1
2.3 Control Panel .................................................... 2-2
2.4 Paper Handling Controls ....................................... 2-4
2.5 Self-Test ........................................................ 2-4
2.6 Setting DIP Switches .......................................... 2-4
2.7 Hex Dump Mode ................................................. 2-8

### CHAPTER 3  PRINTER OPERATION

3.1 Introduction ..................................................... 3-1
3.2 Printer Operation Summary .................................... 3-1
3.3 Printer Initialization ......................................... 3-2
3.4 Paper Tractor Unit .............................................. 3-3
   Removing the Paper-Tractor Unit and Paper Separator ...... 3-3
   Installing the Paper-Tractor Unit and Paper Separator ... 3-4
3.5 Loading Pin-Feed Paper ....................................... 3-7
   Removing Pin-Feed Paper ....................................... 3-10
3.6 Loading Cut-Sheet Paper ...................................... 3-10
   Removing Cut-Sheet Paper ..................................... 3-12
3.7 Adjusting for Paper Thickness ............................... 3-12
3.8 Ribbon Cartridge Installation ............................... 3-14
3.9 Preventive Maintenance ....................................... 3-16
3.10 Generalized Printer Driver .................................. 3-17

### CHAPTER 4  DEVICE SELECTION

4.1 The Select Statement .......................................... 4-1
   Device Type .................................................. 4-1
   Line Length .................................................. 4-3
   Unit Address ................................................ 4-3
4.2 Select Print ................................................... 4-5
4.3 Select List .................................................... 4-6
CONTENTS (continued)

4.4 Console Output ........................................ 4–6
4.5 Combining Select Parameters ............................. 4–7
4.6 Deselecting the Printer .................................... 4–7
4.7 Summary of Select Statements ......................... 4–8

CHAPTER 5 TEXT MODE CONTROL CODES

5.1 Introduction .............................................. 5–1
   Decimal and Hexadecimal Notation ...................... 5–1
   Sending Control Codes ..................................... 5–2
5.2 Control Codes in Text Mode .............................. 5–2

CHAPTER 6 DOWNLOAD MODE CONTROL CODES

6.1 Introduction .............................................. 6–1
6.2 How to Create Download Characters ................... 6–1
6.3 Control Codes in Download Mode ....................... 6–3
   Obtaining Attribute "a" ..................................... 6–4
   Creating Download Characters in
   Proportional Mode ......................................... 6–5
6.4 Download Mode Sample Programs ....................... 6–8
   Creating a Download Character ......................... 6–8
   Specifying Descender Data ................................ 6–9
   Specifying Proportional Data ......................... 6–11

CHAPTER 7 BIT IMAGE MODE CONTROL CODES

7.1 Introduction .............................................. 7–1
7.2 Relationship between Bit-Image Data and Dot Wires .. 7–1
7.3 Control Codes in Bit-Image Mode ....................... 7–3
7.4 Printing Text and Bit-Image Data on the Same Line ... 7–12

APPENDIX A SPECIFICATIONS ................................... A–1

APPENDIX B MAINTENANCE

B.1 Printer Servicing ........................................ B–1
B.2 Print Head Replacement .................................. B–1

APPENDIX C MIXED PRINTING MODES ......................... C–1

APPENDIX D CONTROL CODES SUMMARY ...................... D–1

APPENDIX E PRINTER CHARACTER SET ....................... E–1
FIGURES

Figure 1-1  Model 2245/160 Matrix Printer ........................................... 1-1
Figure 1-2  Printer and Accessories .................................................. 1-2
Figure 2-1  Printer Switches and Indicators ....................................... 2-1
Figure 2-2  Removing the Switch Access Cover ..................................... 2-5
Figure 2-3  Location of DIP Switches .................................................. 2-5
Figure 2-4  Replacing the Switch Cover .............................................. 2-8
Figure 3-1  Removal of Shipping Lock .................................................. 3-3
Figure 3-2  Location of Printer Cover and Printer Lid ......................... 3-4
Figure 3-3  Installation of Paper Tractor .......................................... 3-5
Figure 3-4  Paper Separator Installation ......................................... 3-5
Figure 3-5  Printer Cover Installation .............................................. 3-6
Figure 3-6  Printer Cover Installed .................................................. 3-6
Figure 3-7  Paper-Holding Covers in Open Position ............................. 3-7
Figure 3-8  Inserting Pin Feed Paper ............................................... 3-8
Figure 3-9  Print Area ................................................................. 3-9
Figure 3-10 Arrangement of Paper Supply and Take-up ........................ 3-9
Figure 3-11 Preparing Printer for Loading Cut-Sheet Paper ................ 3-10
Figure 3-12 Inserting Paper into Printer ........................................ 3-11
Figure 3-13 Alignment of Paper Side Edges ...................................... 3-11
Figure 3-14 Print Area for Cut-Sheet Paper ...................................... 3-12
Figure 3-15 Gap Adjustment Control .............................................. 3-13
Figure 3-16 Gap Adjustment Settings .............................................. 3-13
Figure 3-17 Ribbon Cartridge Installation ..................................... 3-14
Figure 3-18 Adjusting the Ribbon Tension ....................................... 3-15
Figure 3-19 Examples of Correct and Incorrect Ribbon Position .......... 3-16
Figure B-1  Replacing the Print Head .............................................. B-2

TABLES

Table 2-1  Functions and Conditions of DIP Switch No. 1 ...................... 2-6
Table 2-2  Functions and Conditions of DIP Switch No. 2 ...................... 2-7
Table 3-1  Types of Printed Information ........................................ 3-1
Table 4-1  Summary of Select Statements ....................................... 4-8
Table 5-1  Mixed Print Modes ...................................................... 5-13
Table C-1  Mixed Printing Modes .................................................. C-1
Table E-1  Printer Character Set .................................................. E-2
Table E-2  Character Names ........................................................ E-3
CHAPTER 1
GENERAL INFORMATION

1.1 OVERVIEW

The Wang Model 2245/160 Dot Matrix Printer, shown in Figure 1-1, is an ideal system or terminal printer for use with WANG 2200 Series Systems, Models 2200 SVP, 2200 LVPC, 2200 MVP, and 2200 MVPC. This chapter describes many of the advanced features of the printer. For detailed specifications, see Appendix A.

1.2 GENERAL DESCRIPTION

The 2245/160 is a bidirectional, parallel matrix printer that operates at 160 characters per second (CPS), and uses a quick change black ink ribbon cartridge that has a life expectancy of three million characters. The unit comes with friction feed, for printing on cut sheet paper, and tractor feed for printing on pin-feed (continuous forms) paper up to 16 inches (40.6 cm) wide. An original and two copies can be printed. Two switches located under a removable cover also enable operator control of several printer functions. The printer also contains provision for printing download characters and bit-image data.

Figure 1-1. Model 2245/160 Matrix Printer
Printer Driver

The 2200 generalized printer driver program located on the 2200 system contains character tables and printer function tables for use with the 2245/160. The printer driver character set and control codes are described in the 2200 Basic-2 Multiuser Operating System Software Bulletin Release 2.6.

Transparent mode

In the transparent mode the printer driver is bypassed, and the Wang International Standard Code for Information Interchange (WISCII) character set shown in Appendix E is used for printing. WISCII is an extended version of the ASCII code set. It contains 96 ASCII characters, a wide selection of symbols, plus special characters that enable the printing of Latin alphabet languages. Printer control codes for use in the transparent mode are contained in Chapters 5, 6, and 7.

![Printer and Accessories](image)

Figure 1-2. Printer and Accessories

1.3 ORDERING SUPPLIES

The use of WLC (Wang Laboratories Certified) ribbon cartridges and replacement print heads is recommended to ensure superior performance of your printer. These and other printer supplies are listed in the WLC Supplies Direct-Order Catalog. You may obtain a copy by calling 1-800-225-0234 between 8:00 am and 8:00 pm Eastern Standard Time (in Massachusetts, Alaska, and Hawaii, call [617] 256-1400). Discount information, instant order entry, and fast delivery can be obtained by calling these numbers.

NOTE

Be sure to specify Wang Model 2245/160 when ordering ribbon cartridges and print heads.
1.4 WANG MAINTENANCE AGREEMENT

Your Wang equipment requires periodic servicing to maintain its peak efficiency. The purchase of a Wang maintenance agreement is a convenient, cost-effective way to ensure that your equipment continues to perform reliably. A Wang maintenance agreement includes the following benefits:

1. Preventive Maintenance. Depending on the requirements of your particular device, a Wang service representative periodically lubricates and cleans your equipment and inspects it for worn parts. In addition, the service representative incorporates any engineering changes that are released for your device. Preventive maintenance maximizes up-time by reducing breakdowns.

2. Fixed Annual Cost. When you buy a maintenance agreement, you issue only one purchase order for service for the entire year, and you receive one annual bill. Budget billing is also available.

If you do not purchase a Wang maintenance agreement, you may obtain service from Wang on a per call (time-plus-materials) basis. Your local Wang Sales/Service Office can provide further information about maintenance agreements.

NOTE

Wang maintenance agreements do not include service necessitated by modifications made by persons other than authorized Wang personnel. If you modify equipment, you are financially responsible for any service required by such modification.

1.5 INSTALLATION

The Model 2245/160 must be unpacked, inspected, and installed by a Wang service representative. Upon delivery of the unit, call the Wang Service office and request that this service be performed. Failure to follow this procedure will void the warranty.
CHAPTER 2
CONTROLS AND INDICATORS

2.1 INTRODUCTION

This chapter contains a description of the printer power switch, the control panel buttons and indicators, and the dual in-line pin (DIP) switch.

2.2 ON/OFF SWITCH

The printer power switch located on the left side of the printer case is shown in Figure 2-1. Press ON (marked with a white dot) to power-up the printer. Press OFF to power-down the printer. With paper loaded in the printer, and the printer POWER switch set to ON, the POWER, READY, and ON LINE indicators light and the printer is ready to accept data from the 2200 system.

Figure 2-1. Printer Switches and Indicators
NOTE

The Top-of-Form position for continuous form paper (the line on the paper where printing begins) is automatically set when the printer POWER switch is turned on. Before turning the POWER switch ON, install paper in the printer (refer to Sections 3.5 and 3.6) and rotate the platen knob to advance the paper to the desired Top-of-Form position.

2.3 CONTROL PANEL

The control panel, shown in Figure 2-1, contains three control buttons and four indicators.

ON LINE Button

After paper has been loaded and the POWER switch is turned ON, the green LED located next to the ON LINE button illuminates, indicating that the printer is in the On-Line mode. Printing can begin only when the printer is on-line. Pressing the ON LINE button again sets the printer in the Off-Line mode and causes the green LED to go out. This button does not function during printing. The printer is automatically placed off-line if the paper supply is exhausted or if a mechanical error occurs in the printer. The Line Feed (LF) and Form Feed (FF) buttons function only when the printer is off-line.

FF (Form Feed) Button

When the FF button is pressed once, the paper is advanced to the next Top-of-Form position. This button functions only when the printer is off-line.

LF (Line Feed) Button

When the LF button is pressed, the paper advances one line at a time. This button functions only when the printer is off-line.

Indicators

The following list describes the printer indicators:

- POWER -- Illuminates while the printer is receiving AC power.
- READY -- Illuminates when the printer is ready to receive data.
- ON LINE -- Illuminates when the printer is in the On-Line mode.
- PAPER OUT -- Illuminates when the supply of pin-feed paper is near its end.
Paper-Out Detector

The paper-out detector is a switch that is located on the paper guide. When the paper supply is near the end of the last sheet of paper, the printer stops, the PAPER OUT indicator is illuminated, a beep tone sounds, and the printer is placed off-line.

Remove the paper from the printer by pressing the LF or FF switch. If you want to continue printing up to the last line of cut-sheet paper, disable the paper-end detector by setting the DIP Switch Pin 1-3 to the ON position (refer to Section 2.6).

Beeper

A beeper located inside the printer sounds for approximately 0.1 second to indicate a problem. The signal and problems are as follows:

- Four long beeps indicates a short circuit in the print head drive circuit.
- Three short and one long beep indicates abnormally high voltage.
- Three short beeps repeated twice indicates an error in the Wang 2200 system.
- Four short beeps repeated five times indicates a paper-end status.

NOTE

To correct any of the first three conditions, contact your Wang service representative. For the last condition, load a new supply of paper. Disable the paper-end status beep when using cut-sheet paper by setting DIP Switch 1-3 to the OFF position (refer to Section 2.6).
2.4 PAPER HANDLING CONTROLS

Paper-Release Lever

The paper-release lever is located on the left side of the printer, to the left of the platen. Set the lever to the forward position (toward the front of the printer) to use pin-feed paper. Set the lever to the rear position to use cut-sheet paper.

Paper-Feed Knob

Use the paper-feed knob at the right end of the printer to load paper into the printer.

CAUTION

Do not attempt to rotate the knob when the printer power is on. Do not pull out the paper in the backward direction. Damage to the printer may result.

Paper Bail

The paper bail holds paper against the platen for optimum print quality and quietness. Move the paper bail away from the platen when printing on pin-feed paper. Move the paper bail against the platen when printing on cut-sheet paper.

2.5 SELF-TEST

The printer has a self-test function that you can use to check printing quality. To perform this test, load paper into the printer, press and hold the LF button, and turn the POWER switch ON. Characters will be printed until you set the POWER switch to OFF.

2.6 SETTING DIP SWITCHES

You can select several control modes by using two Dual In-Line Package (DIP) switches located inside the printer. These switches have been set for normal operation with the Wang 2200 system prior to shipment. The following section describes how to access the switches.

CAUTION

Static electricity may damage the electronic components in the printer. Do not touch any components on the printer circuit boards other than the two DIP switches.
Removing the Switch Cover

To remove the switch cover, perform the following steps:

1. Set the POWER switch to OFF, and then unplug the power cord from the outlet.

2. Use a Phillips screwdriver to remove the screw on the switch access cover (refer to Figure 2-2).

![Switch access cover]

Figure 2-2. Removing the Switch Access Cover

3. Push the outer edge of the cover down as shown in Figure 2-2, and then lift it from the printer. The two DIP switches located under the access cover are shown in Figure 2-3.

![Location of DIP switches and Setting DIP switches]

Figure 2-3. Location of DIP Switches
DIP Switch No. 1

DIP Switch No. 1 consists of eight sections (1-1 through 1-8). The function of each switch section and the preset conditions at the time of shipment are shown in Table 2-1.

Table 2-1. Functions and Conditions of DIP Switch No. 1

<table>
<thead>
<tr>
<th>Switch Section</th>
<th>Function</th>
<th>OFF</th>
<th>ON</th>
<th>Factory-set Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Print mode at POWER ON</td>
<td>Pica</td>
<td>Condensed</td>
<td>OFF</td>
</tr>
<tr>
<td>1-2</td>
<td>ZERO font</td>
<td>0</td>
<td>Ø</td>
<td>OFF</td>
</tr>
<tr>
<td>1-3</td>
<td>Paper-end detector</td>
<td>Enabled</td>
<td>Disabled</td>
<td>OFF</td>
</tr>
<tr>
<td>1-4</td>
<td>Input buffer</td>
<td>Disabled</td>
<td>Enabled</td>
<td>OFF</td>
</tr>
<tr>
<td>1-5</td>
<td>Print mode at POWER ON</td>
<td>Pica</td>
<td>Emphasized</td>
<td>OFF</td>
</tr>
<tr>
<td>1-6</td>
<td>WISCII character set</td>
<td>--</td>
<td>--</td>
<td>ON</td>
</tr>
<tr>
<td>1-7</td>
<td>WISCII character set</td>
<td>--</td>
<td>--</td>
<td>ON</td>
</tr>
<tr>
<td>1-8</td>
<td>WISCII character set</td>
<td>--</td>
<td>--</td>
<td>ON</td>
</tr>
</tbody>
</table>

SW1-1 -- When this switch is ON, the printer mode is set to the Condensed mode; when the switch is OFF, the printer mode is set to the Pica mode.

SW1-2 -- When this switch is ON, the character Ø (zero with a slash) is printed.

SW1-3 -- Use this switch to activate or deactivate the paper-end detector. When this switch is ON, the paper-end detection function becomes invalid and the printer operates even if it is out of paper. Inputting Control Code ESC 9 reactivates the paper-end detector.

SW1-4 -- When this switch is OFF, you can download characters. Refer to Chapter 6 for information on downloading characters.

SW1-5 -- When this switch is ON, the printer is set to the Emphasized mode; when the switch is OFF, the printer is set to the Pica mode.

SW1-6, SW1-7, SW1-8 -- Use these switches to select the WISCII character set for printer operation.
DIP Switch No. 2

DIP Switch No. 2 consists of four sections (2-1 through 2-4). The function of each switch section and the preset conditions at the time of shipment are shown in Table 2-2.

Table 2-2. Functions and Conditions of DIP Switch No. 2

<table>
<thead>
<tr>
<th>Switch Section</th>
<th>Function</th>
<th>OFF</th>
<th>ON</th>
<th>Factory-set Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Select</td>
<td>Ext. Select</td>
<td>Auto Select</td>
<td>ON</td>
</tr>
<tr>
<td>2-2</td>
<td>Beeper</td>
<td>Disabled</td>
<td>Enabled</td>
<td>ON</td>
</tr>
<tr>
<td>2-3</td>
<td>1-inch skip-over perforation</td>
<td>Disabled</td>
<td>Enabled</td>
<td>OFF</td>
</tr>
<tr>
<td>2-4</td>
<td>Automatic line feed</td>
<td>LF from Wang 2200 system</td>
<td>Auto LF with CR</td>
<td>OFF</td>
</tr>
</tbody>
</table>

SW2-1 -- When this switch is ON, the printer is in the Selected mode and no external command can deselect it.

SW2-2 -- When this switch is ON, the beeper sounds for paper out or other conditions; when this switch is OFF, the beeper does not sound.

SW2-3 -- Use this switch to set the automatic skip-over perforation function. When this switch is ON, the paper automatically advances to the first line of the next page when the remaining page length is one inch. When this switch is OFF, there will not be an automatic skip-over perforation.

SW2-4 -- When this switch is ON, a line feed is performed automatically with the receipt of each CR command. When this switch is OFF, the line feed is supplied separately by the Wang 2200 system.

Replacing the Switch Cover

Replace the switch access cover by putting the projection of the cover inside the lower case. Gently slide the cover back into place, and then use a Phillips screwdriver to reinstall the cover mounting screw (refer to Figure 2-4).
2.7 HEX DUMP MODE

In the Hex Dump mode, all program output or program listings are printed in hexadecimal code. For example, when the following print program is entered,

```
10 SELECT PRINT 004
20 PRINT HEX(00);HEX(1B);"ABCD";HEX(46)
```

the printer output (in Hex code) is as follows:

```
00 1B 41 42 43 44 46 0D 0A
```

To enter the Hex Dump Print mode, turn the printer power ON while holding down both the LF and FF buttons. Hex Dump mode cannot be cancelled during a printing operation.

Printing in the Hex Dump mode is performed only when the printer is in the buffer-full state. The data remaining in the print buffer is printed when the printer is set to the Off-Line mode.
CHAPTER 3
PRINTER OPERATION

3.1 INTRODUCTION

This chapter contains a summary of instructions for operating the printer, as well as detailed procedures for loading paper, changing the ribbon cartridge, and for preventive maintenance.

3.2 PRINTER OPERATION SUMMARY

Printer operations are summarized in the following five steps:

1. For printing on pin-feed paper, install the paper tractor. For printing on cut-sheet paper, remove the paper tractor (refer to Section 3.4).

2. Load paper into the printer (refer to Sections 3.5 and 3.6).

3. Set the printer POWER switch to ON. The printer POWER, READY, and ON LINE indicators light up.

4. Send information to the printer from the Wang 2200 system. Some types of information that can be printed are listed in Table 3-1.

Table 3-1. Types of Printed Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Comments/References</th>
</tr>
</thead>
</table>
5. After printing is completed, remove the printed page(s) by first pressing the ON LINE button (the indicator will go out), then pressing the LF or FF button to advance the paper.

NOTE

You can also remove paper by setting the power switch to OFF and rotating the paper feed knob to advance the paper. Do not rotate the paper-feed knob while the power is ON or attempt to pull out paper in a backward direction because you can damage the printer.

3.3 PRINTER INITIALIZATION

Each time the primary AC power source is interrupted and re-applied (i.e., by turning the POWER switch OFF and ON), printer initialization occurs. During initialization, the following sequence of events occur in the printer:

- The print head returns to its home position.
- The printer is automatically placed on-line, unless it is out of paper.
- The printer buffer is cleared; downloaded characters are cleared.
- The line spacing is set at 1/6 inch.
- The form length per page is set to 11 inches.
- The Operation mode reverts to Text mode, Pica type (10 characters/inch).

Initialization also occurs at the top of each page of a WP document.
3.4 PAPER-TRACTOR UNIT

The paper-tractor unit and paper separator must be installed on the printer when you use pin-feed paper. They should be removed from the printer when you use cut-sheet paper. Installation and removal procedures are described in the following paragraphs.

NOTE

The printer is shipped from Wang Laboratories with the paper tractor installed in the printer.

Removing the Paper-Tractor Unit and Paper Separator

To remove the paper-tractor unit and the paper separator, perform the following steps:

1. Remove the paper separator by lifting it up and back. Remove the printer cover and pull the paper bail forward, away from the platen.

2. Remove the plastic tractor unit shipping locks, located on the right and left ends of the tractor, if they are installed on the printer. The right-end lock is shown in Figure 3-1.

![Shipping lock]

Figure 3-1. Removal of Shipping Lock
NOTE

Save the shipping locks. They prevent movement of the tractor-lock levers during shipment, and must be re-installed on the tractor before you ship the printer. You do not have to remove the shipping locks to operate the printer.

3. Push the tractor-lock levers (shown in Figure 3-3) back, then move the tractor unit back and up out of the printer.

4. Install the printer lid (refer to Figure 3-2) by fitting the lid projections into the openings on one end of the printer case. Then bend the middle of the lid up slightly and fit the other end of the lid into place. Install the printer cover (refer to Figure 3-2) by holding the cover in the vertical position, then lowering it onto the projections on the right end of the printer case, then the left end. The printer is now ready for use with cut-sheet paper.

Installing the Paper-Tractor Unit and Paper Separator

Perform the following steps to install the paper-tractor unit and the paper separator:

1. Remove the printer cover and printer lid (refer to Figure 3-2). Bend the center of the lid upward slightly to free it from the printer.

![Figure 3-2. Location of Printer Cover and Printer Lid](image)

2. Fit the notches on the end plates of the tractor frame onto the shaft located about 1 1/2 inches to the rear of the platen shaft (refer to Figure 3-3).
3. Push both tractor-lock levers and lower the front of the tractor unit into place.

4. Install the paper separator. Insert the projections on the separator into the two holes located at the rear of the tractor frame (refer to Figure 3-4).
5. Install the printer cover (refer to Figure 3-5). The printer with paper tractor, paper separator, and cover installed is shown in Figure 3-6.

Figure 3-5. Printer Cover Installation

Figure 3-6. Printer Cover Installed
3.5 LOADING PIN-FEED PAPER

The printer accepts pin-feed paper from 4 inches to 16 inches wide. The tractor unit must be installed on the printer before you load pin-feed paper. Refer to Section 3.4 for instructions on installing the tractor. Perform the following steps to load paper:

1. Set the printer POWER switch to OFF, and then raise the printer cover.

2. Open the paper-holding covers, shown in Figure 3-7.

![Figure 3-7. Paper-Holding Covers in Open Position](image)

3. Pull the paper bail forward, away from the platen.

4. Pull the paper-release lever, shown in Figure 3-7, to the forward (released) position.

5. Fold the first sheet of pin-feed paper in half so that it feeds easily into the printer. Insert the paper under the paper separator and into the slot behind the paper tractor (refer to Figure 3-8).
6. Push the paper-release lever back. Turn the paper-feed knob clockwise until about half a sheet of paper feeds through the printer. Pull the paper-release lever forward.

7. Press the paper-feed holes of the paper onto the feeding pins, and then close the paper-holding covers. Push the paper bail back into position and adjust the tension of the paper.

NOTE

If the pins on the tractors are set too wide or too narrow to allow the paper to be pressed onto the pins, pull the right sprocket-lock lever (shown in Figure 3-7) forward, move the right sprocket to the left or right as necessary, and then push the lever back to the locked position. To align the first printed column on the paper with the first column position on the left of the paper bail, adjust the positions of both sprockets to the left or right.

9. Using the paper-feed knob, advance the paper so that a perforation between sheets is positioned just below the top of the ribbon. This sets the Top-of-Form position.

10. Close the printer cover and set the printer POWER switch to ON. The printer is now ready for use. The print area on the paper must be within the range indicated in Figure 3-9.
11. To enable the printer output to fold properly, arrange the paper supply and take-up as shown in Figure 3-10.
Removing Pin-Feed Paper

To remove pin-feed paper from the printer, use one of the following two methods:

- With the printer power ON and with the printer in the Off-Line mode, press the LF or FF button. Do not turn the paper-feed knob while the power is on. Do not attempt to pull out paper in a backward direction because you can damage the printer.
- Set the printer POWER switch to OFF, and then advance the paper through the printer by turning the paper-feed knob.

3.6 LOADING CUT-SHEET PAPER

The printer accommodates cut-sheet paper measuring from 7.25 to 14.4 inches wide by 12 inches long (18.4 cm to 36.6 cm by 30.5 cm). To simplify the paper-loading procedure, remove the paper-tractor unit and the paper separator if they are installed (refer to Section 3.4). Load paper into the printer the same as into a typewriter. Perform the following steps to load cut-sheet paper:

1. Set the POWER switch to OFF and raise the printer cover.

2. Pull the paper bail toward the front of the printer, away from the platen. Push the paper-release lever back (refer to Figure 3-11).

![Figure 3-11. Preparing Printer for Loading Cut-Sheet Paper](image)

3. Insert the paper into the slot behind the platen (refer to Figure 3-12). The left edge of the paper should be in line with the number 1 on the paper bail. Rotate the paper-feed knob to feed the paper to the position where you want the printing to begin.
NOTE

If you insert the paper so that it is centered on the platen, the paper-out indicator will light when the power is switched ON. Remove the paper, and then reinset it into the printer in the correct position. You may damage the left edge of the paper if you simply slide the paper to the left.

Figure 3-12. Inserting Paper into the Printer

4. Check to see that the paper is feeding properly. If it is not, remove the paper and reload it; or, you can unlock the release lever by pulling it forward, align the edges of the paper as shown in Figure 3-13, and then push the release lever back.

Figure 3-13. Alignment of Paper Side Edges
5. Push the paper bail back against the platen and close the printer cover.

6. The printer is now ready for use. Set the printer's POWER switch to ON. The print area on the paper must be within the limits shown in Figure 3-14.

![Figure 3-14. Print Area for Cut-Sheet Paper](image)

**Removing Cut-Sheet Paper**

To remove cut-sheet paper from the printer, use one of the methods described in Section 3.5.

**3.7 ADJUSTING FOR PAPER THICKNESS**

The printer can print on single-sheet paper or multiple-sheet forms. The head-adjusting lever, shown in Figure 3-15, sets the distance between the print head and the platen. Move the lever forward to widen the gap.
Set the head-adjusting lever to accommodate the type of paper you are using. For single-sheet paper, set the lever to Position 4 (refer to Figure 3-16). When using thick single-sheet paper, set the lever to Position 5. For multipart forms, set the lever to Position 7.
NOTE

If the printer is operated for an extended period, printed characters may become light. If this occurs, move the head adjusting lever backward (in the \ direction) by one step (refer to Figure 3-16). When using carbon sheets in multipart forms, be sure that no characters are printed two lines above or below the perforation.

3.8 RIBBON CARTRIDGE INSTALLATION

Use the following procedure to remove a ribbon cartridge from the printer and to install a replacement cartridge.

1. Set the printer POWER switch to OFF. To reduce the risk of damaging the printer cover, and to install the ribbon cartridge more easily, remove the cover from the printer.

2. Check to see that the paper bail is positioned against the platen. If it is in the forward position, push it back against the platen.

3. Use the handles at the ends of the cartridge to lift and remove the ribbon cartridge.

4. Remove a new ribbon cartridge from its box. Pull the ribbon outward slightly so that it is not taut.

5. Locate the projections on the ends of the ribbon cartridge. Holding the cartridge by the two top handles, lower it into the printer so that the projections enter the slots on both sides of the printer (refer to Figure 3-17A). Press both ends of the cartridge down until it is firmly seated.

Figure 3-17. Ribbon Cartridge Installation
CAUTION

Avoid touching the print head during installation of the ribbon cartridge. If the printer has been in use for several minutes prior to the ribbon installation, the print head may be hot and may burn your fingers.

6. Use the point of a pen or pencil to lift the ribbon over the front of the print head (refer to Figure 3-17B). Rotate the ribbon-feed knob counterclockwise (as shown in Figure 3-18) to pull the ribbon down into place. If necessary, use the pen to guide the ribbon into position.

![Figure 3-18. Adjusting the Ribbon Tension](image)

7. Be sure that the ribbon is not twisted or creased, and that the cartridge is firmly seated in the slots at the ends of the cartridge. Examples of correct and incorrect ribbon position are shown in Figure 3-19.

8. Reinstall the printer cover.
3.9 **PREVENTIVE MAINTENANCE**

Cleaning your printer periodically helps to keep it printing properly. Follow the instructions in this section to wipe clean the outside of the printer and to remove dust from the inside of the printer. Perform the following preventive maintenance steps every three months:

**Cleaning the Outside**

1. Turn the printer power OFF, and then unplug the printer from its electric outlet.

2. Dampen a soft cloth with a mild detergent and water solution, and wipe the exterior surfaces of the printer. Wipe dry.

**Cleaning the Inside**

1. Turn the printer power OFF, and then unplug the printer from its electric outlet.

2. Open the printer top cover. Move the paper bail away from the platen.

3. Remove any large debris, such as torn paper, that may have fallen inside the printer. Wipe away any accumulations of paper dust using a soft brush.

4. Do not attempt to clean the printing mechanism on the printer carriage. The mechanism is delicate and you can damage it. If it is excessively dirty, have it cleaned by your Wang field support representative.
5. To properly clean the platen, Wang Laboratories, Inc. recommends that you refer this task to a Wang field support representative. Should you decide to clean the platen yourself, apply a commercial platen-cleaning solution to a cloth and wipe the platen clean. Allow the platen to dry before using the printer.

CAUTION

Use only a platen-cleaning solution. Do not use water, which is ineffective, or alcohol, which hardens rubber surfaces, or any other solvent not expressly made and sold for the purpose of cleaning printer or typewriter platens.

3.10 GENERALIZED PRINTER DRIVER

The default mode of the printer uses the 2200 generalized printer driver character set and control codes described in the 2200 BASIC-2 Multiuser operating System Software Bulletin Release 2.6. The Reverse Line feed standard control code listed in the software bulletin does not apply for the 2245/160. In addition, the Select character font, Clear Platen, and Select paper tray standard escape sequences listed in the software bulletin do not apply for the 2245/160.

A transparent mode feature bypasses the printer driver and enables you to enter WISCII characters listed in Table E-1 in BASIC programs. The transparent mode also enables you to enter control codes contained in Chapters 5, 6 and 7 in BASIC programs.

The SELECT DRIVER command enables you to establish transparent mode permanently. The following is the general form of the SELECT DRIVER command:

SELECT DRIVER device address [OFF]

Where device-address = [/taa,

{< alpha-variable >}

ON is the default state for the driver. OFF turns the driver off for the specified address until the system is reinitialized or you issue another SELECT DRIVER command for the same address without the OFF.

You can also enter the transparent mode for a specified number of bytes by using the escape sequence OD 01 cc dd...dd.

cc = number of bytes to pass transparently
dd...dd = the bytes to be passed
CHAPTER 4
DEVICE SELECTION

4.1 THE SELECT STATEMENT

The 2200 BASIC-2 language SELECT statement selects the Model 2245/160 Matrix Printer as the output device. The SELECT PRINT statement directs program mode output and immediate mode statements to the printer. The SELECT LIST statement directs program listings to the printer. Other uses for the SELECT statement are described in the Wang 2200 BASIC-2 Language Reference Manual. You can use a SELECT statement either in the Immediate mode or as a statement within a program.

When used to select the Model 2245/160 Matrix Printer, the SELECT statement requires a PRINT or LIST parameter and a 3-digit device address (xyy) consisting of a device type (x) and a unit address (yy). Line width can also be specified in the SELECT statement. Each of the parameters of the SELECT statement is shown in the following example.

Example: SELECT Statement

    100 SELECT PRINT 215 (132)
    Device Type
    Unit Address
    Line Width

Device Type

The system uses the Device Type digit in the Device Address to identify the I/O class for a device and to specify control procedures for communicating with that device. Since the various peripheral devices used in a system often require different control procedures to perform an input/output operation, the programmer must indicate to the system which type of I/O device is being used.
When Device-Type 0 is specified, the system issues a line-feed character (hex 0A) after each carriage return character (hex 0D) is output. Output is single spaced.

Example: 2245/160 as Device Type 0

10 SELECT PRINT 004 (132)
20 FOR R = 1 TO 5
30 PRINT "MODEL 2245/160 OUTPUT AS DEVICE TYPE 0"
40 NEXT R
MODEL 2245/160 OUTPUT AS DEVICE TYPE 0
MODEL 2245/160 OUTPUT AS DEVICE TYPE 0
MODEL 2245/160 OUTPUT AS DEVICE TYPE 0
MODEL 2245/160 OUTPUT AS DEVICE TYPE 0
MODEL 2245/160 OUTPUT AS DEVICE TYPE 0

When Device-Type 2 is specified, the system issues a null character (hex 00) after each carriage return character (hex 0D) is output. Each PRINT statement must be terminated by a line feed character (hex 0A) to obtain single-spaced printing.

Example: 2245/160 as Device Type 2

10 SELECT PRINT 204 (132)
20 FOR R = 1 TO 5
30 PRINT "MODEL 2245/160 OUTPUT AS DEVICE TYPE 2";HEX (0A)
40 NEXT R
MODEL 2245/160 OUTPUT AS DEVICE TYPE 2
MODEL 2245/160 OUTPUT AS DEVICE TYPE 2
MODEL 2245/160 OUTPUT AS DEVICE TYPE 2
MODEL 2245/160 OUTPUT AS DEVICE TYPE 2
MODEL 2245/160 OUTPUT AS DEVICE TYPE 2

Device Type 4 usually addresses a device without an automatic carriage return: for example, a plotter. When a printer is selected as Device Type 4, the automatic carriage return issued by the CPU at the end of a line is suppressed. Normally when the number of characters in the buffer equals the line width in a SELECT statement, a carriage return is executed. Device Type 4, however, suppresses this feature by not executing a carriage return when the number of characters equals the line width. The carriage return is not executed until the print buffer is full (and a line is printed) or when the carriage return character (hex 0D) is encountered in the data stream.
Unit Address

When the Model 2245/160 is used as a system printer, it is attached to the printer controller board installed in the system CPU, and usually assigned Unit Address 15. If a second Wang printer is used as a system printer on the same CPU, it is usually assigned Unit Address 16 by the Wang service representative who installs the system.

If the Model 2245/160 is used as the terminal printer, it is attached directly to the rear panel of the terminal and must be accessed at Unit Address 04 (for example, SELECT PRINT 204).

Line Width

The Line Width is an optional parameter in a SELECT PRINT, SELECT LIST, or SELECT CO statement. This parameter specifies the number of characters to be sent to the printer before the system issues a carriage return and updates the internal line count. The user normally varies the line width to accommodate the width of the paper.

The maximum number of characters per line that can be printed on the Model 2245/160 is 136 (Pica mode), 163 (Elite mode), 233 characters (Condensed mode). In the SELECT statement, line width is indicated in the parentheses following the 3-digit Device Address code. For example:

```
10 SELECT PRINT 004(42)
20 PRINT "THIS IS AN EXAMPLE OF PRINTING WITH A LINE LENGTH OF 42 CHARACTERS IS SPECIFIED IN THE SELECT PRINT STATEMENT"

THIS IS AN EXAMPLE OF PRINTING WHEN A LINE LENGTH OF 42 CHARACTERS IS SPECIFIED IN THE SELECT PRINT STATEMENT
```

If a line width is not specified for PRINT, LIST, or CO operations, either the default line width or the last line width selected for each of these operations is used. Note that the default line width set during master initialization is 80 characters, the standard width of the terminal screen. In a system with a 64-column screen, the line width defaults to 64 characters.

The maximum line width that can be specified in a SELECT statement is 255. However, the use of a line width greater than 136 (Pica mode), 163 characters Elite mode), or 233 characters (Condensed mode) is not recommended. A longer line count typically produces two carriage returns: one performed automatically by the printer when a full line of characters has been printed, and another issued by the system when the line count specified in the SELECT PRINT statement is exceeded.
The CPU uses the Line Width parameter to generate an automatic carriage return when a line exceeds the specified line width and no carriage return has been supplied by the program. The CPU maintains a tally of the number of characters sent to the printer. If the character count equals the current value of the line width before the output line is complete, the CPU issues a carriage return command to the printer and resets the character count to zero. It also increments the line count by 1 except at the end of a page, when the line count is reset to 0.

When the system receives a PRINT statement with no trailing comma or semicolon, it executes a carriage return after the contents of the print buffer are printed. If the character count has not yet reached the count specified in the SELECT statement, the system automatically resets the character count to zero for the start of a new line.

Example: PRINT Statement with No Punctuation
10 SELECT PRINT 004 (30)
20 REM EXAMPLE OF A PRINT STATEMENT
25 WITH NO TRAILING COMMA OR SEMICOLON
30 PRINT "LINE A"
40 PRINT "LINE B"
50 PRINT "LINE C"

Output:
LINE A
LINE B
LINE C

The character count is reset to zero under any one of the following conditions.

- The character count equals the line width.
- A SELECT PRINT statement is executed.
- A CLEAR command is executed.
- A PRINT, PRINTUSING, or HEXPRINT statement is executed.
- The system is reset.
- The system is master initialized.

NOTE

If a PRINT statement ends with a semicolon, no carriage return is issued. The character count is updated by the number of characters sent to the printer.
4.2 **SELECT PRINT**

The SELECT PRINT statement can be entered as a Program mode statement or independently as an Immediate mode statement.

**Example: Program Mode SELECT PRINT**

```
10 SELECT PRINT 004
20 PRINT "X"","2X"
30 FOR X = 1 TO 50 STEP 10
40 PRINT X,X*2
50 NEXT X
```

**Example: Immediate Mode SELECT PRINT**

```
SELECT PRINT 004
10 PRINT "X","2X"
20 FOR X = 1 TO 50 STEP 10
30 PRINT X, X*2
40 NEXT X
```

When either of these programs is executed, the printed output is:

<table>
<thead>
<tr>
<th>X</th>
<th>2X</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>21</td>
<td>42</td>
</tr>
<tr>
<td>31</td>
<td>62</td>
</tr>
<tr>
<td>41</td>
<td>82</td>
</tr>
</tbody>
</table>

**NOTE**

When the printer is selected for printed output using SELECT PRINT command, printout resulting from PRINT or PRINT USING statements entered in the Immediate mode will also appear on the CRT.
4.3 SELECT LIST

The default address for LIST operations is 005, the CRT. In the following example the LIST statement (which can be entered in Immediate mode or Program mode) selects the terminal printer for program listing.

Example: Selecting the Printer for Listing

```
SELECT LIST 004
  5  DIM A$55
 17  REM AN EXAMPLE USING THE PRINTER FOR LISTING
 20  A$="THE MODEL 2245/160 PRINTER CAN BE SELECTED FOR LISTING."
 30  PRINT A$
LIST
```

Output:

```
5  DIM A$55
17  REM AN EXAMPLE OF USING THE PRINTER FOR LISTING
20  A$ = "THE MODEL 2245/160 PRINTER CAN BE SELECTED FOR LISTING"
 30  PRINT A$
```

4.4 CONSOLE OUTPUT

The SELECT CO statement can be used to select the printer for all console output (CO) operations. The following statement directs console output to address 215:

```
SELECT CO 215
```

Console Output includes output of Immediate Mode PRINT and PRINT USING statements, plus output from several other operations described in the Wang 2200 BASIC-2 Language Reference Manual.

NOTE

On 2200 multi-user systems such as the 2200MVP and 2200LVP, all Console Output (CO) operations are always directed to the CRT (Device Address 005). On these systems, when the printer is selected for Console Output, TRACE output alone is sent; all other CO operations remain directed to the CRT.
As an example, enter the following command in Immediate mode.

SELECT CO 215

Press the RETURN key, then the RESET key. The following appears on the printer.

:READY

Subsequently, all information entered into the CPU via the keyboard will be printed on the printer.

4.5 COMBINING SELECT PARAMETERS

It is possible to combine parameters in a SELECT statement.

Example:

SELECT PRINT 215 (100), LIST 215 (80), CO 215 (112)

However, it is not possible to select two output devices for the same operation. For example, the following statement produces listing of programs on the CRT (Device Address 005) only:

SELECT LIST 215, LIST 005

4.6 DESELECTING THE PRINTER

To deselect the printer, use one of the following methods, listed in order of preference.

1. Select another device for PRINT, LIST, or CO, by using the SELECT statement.

2. Press the ON LINE button on the printer. The printer will print the contents of its buffer before deselecting. This is the only method of deselecting that does not lose the data in the print buffer. This method should be used when temporary deselecting is required, for example, when changing the paper or ribbon cartridge. The printer ON LINE indicator will be extinguished, and the printer can then be reselected by pressing the ON LINE button again.

3. Enter the CLEAR command and press the RETURN key. This returns PRINT and LIST operations to the device currently selected for CO. If the printer is the current CO device, either Step 1 or 5 must be used to deselect it.

4. If the printer has been selected using a SELECT CO statement, press RESET at the terminal. This will reset CO to 005.

5. Master initialize the system. Master Initialization selects the CRT for all LIST, PRINT, and CO operations.
4.7 **SUMMARY OF SELECT STATEMENTS**

A summary of the SELECT statements used with the 2245/160 printer is contained in Table 4-1.

<table>
<thead>
<tr>
<th>Local Printer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT PRINT 004</td>
<td>Single line spacing occurs in program output and program listing.</td>
</tr>
<tr>
<td>SELECT LIST 004</td>
<td>Line feed command HEX(0A) must be included in print statements.</td>
</tr>
<tr>
<td>SELECT PRINT 204</td>
<td>Line feed does not occur in program listing (refer to the following note).</td>
</tr>
<tr>
<td>SELECT LIST 204</td>
<td>Line feed does not occur in program listing (refer to the following note).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System Printer</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT PRINT 015</td>
<td>Single line spacing occurs in program output and program listing.</td>
</tr>
<tr>
<td>SELECT LIST 015</td>
<td>Line feed command HEX(0A) must be included in print statements.</td>
</tr>
<tr>
<td>SELECT PRINT 215</td>
<td>Line feed does not occur in program listing (refer to the following note).</td>
</tr>
<tr>
<td>SELECT LIST 215</td>
<td>Line feed does not occur in program listing (refer to the following note).</td>
</tr>
</tbody>
</table>

**NOTE**

Printer operation listed in Table 4-1 applies with DIP switch 2 pin 4 set to OFF (this is the normal setting for this switch). DIP switch 2 is fully described in Section 3.6. With SW2 pin 4 set to ON, double line spacing occurs for SELECT PRINT 004 and SELECT LIST 004. In addition, single line spacing occurs for SELECT PRINT 204 and 215, and SELECT LIST 204 and 215.
CHAPTER 5  
TEXT MODE CONTROL CODES

5.1 INTRODUCTION

You can use the Text mode control codes described in this chapter to specify print modes, margins, vertical spacing, and other printer functions in BASIC or other programs. However, these codes control the printer only when the Wang 2200 system printer driver is in Transparent mode, a feature described in 2200 BASIC-2 Multiuser Operating System Software Bulletin Release 2.6. With Transparent mode ON, the printer driver is bypassed so that all input data is passed directly to the printer. With Transparent mode OFF (the default operating mode), the printer is controlled by the printer driver, and only the matrix printer character set, control codes and escape sequences listed in the software bulletin can be added to your programs.

NOTE

The default mode for the printer is the Text mode. You can enter the Download mode using the control codes listed in Chapter 6. You can enter the Bit Image mode using the control codes listed in Chapter 7.

Decimal and Hexadecimal Notation

Printer control codes shown in parentheses in the program examples in this chapter are in hexadecimal form. The printer is provided with a set of control codes called ESC sequences. ESC Code HEX(1B) is followed by a hexadecimal number, an alphanumeric character, or a symbol that represents the particular escape function.
Sending Control Codes

Printing and other functions are controlled by entering control codes. Control codes may be broadly divided into two categories.

- 1-byte control codes
- Control codes expanded by an ESC code

In BASIC, control codes can be sent to the printer as shown in the following two examples:

To send BEL code,

```
PRINT HEX(07);
```

To send ESC l code,

```
PRINT HEX(1B);HEX(01);
```

5.2 CONTROL CODES IN TEXT MODE

This section contains Text mode control codes that can be entered in a BASIC or other program. The control codes are listed in numerically ascending order.

**BEL**

Name: BEL - Bell  
Expression: HEX(07);  
Function: Sounds the tone.

When the BEL code is input, the tone sounds for approximately 0.1 second.

Example: PRINT HEX(07);  
(beep)

---

**NOTE**

To disable the tone, set DIP Switch 2-2 to OFF.
BS

Name:       BS - Backspace  
Expression: HEX(08);  
Function:   Prints and backspaces by one character.

With the BS code, all the data stored in the print buffer is printed and the next print start position returns to the left by one column. In the Enlarged Print mode, the print position backspaces by two Pica characters. BS is not guaranteed when the print mode has been changed.

See also DEL.

Example:  
10 SELECT PRINT 004  
20 REM BACKSPACE  
30 PRINT "YYYYY";  
40 PRINT HEX(08);HEX(08);  
50 PRINT "========"  

YYYYYYYYYYY
YYYYYYYYYYY

HT

Name:       HT - Horizontal TAB  
Expression: HEX(09);  
Function:   Executes horizontal TAB.

The HT code carries out the horizontal TAB to a predetermined position set by ESC D code. The HT code is ignored if no TAB position has been set previously by the ESC D code. In Enlarged Print mode, an HT code executes the TAB in twice the width as that of Pica Print mode.

Since the TAB set position is stored as an absolute position, this position will not change even if you change the print mode. Horizontal TAB is cancelled with an ESC 1.

See also ESC D, ESC Q, and ESC 1.

Example:  
01234567890123456789012345678901234567890123456789  
TAB TAB TAB TAB TAB

10 SELECT PRINT 004  
20 REM HORIZONTAL TAB  
30 PRINT "012345678901234567890123456789012345678901234567890"  
40 FOR I = 1 TO 5  
50 PRINT HEX(09);"TAB";  
60 NEXT I  
70 PRINT
LF

Name: LF - Line Feed
Expression: HEX(0A);
Function: Advances the paper one line.

With the LF code, all the data stored in the print buffer is printed and then a line feed occurs. If no data precedes the LF code, or if all preceding data is SPACE, only a line feed is performed. The amount of line spacing can be set by ESC 0, ESC 1, ESC 2, ESC 3, or ESC A. LF cancels the Enlarged Print mode set by SC code.

See also SO, ESC 0, ESC 1, ESC 2, ESC 3, ESC A, and ESC W.

VT

Name: VT - Vertical TAB
Expression: HEX(0B);
Function: Executes vertical TAB.

With the VT code, all the data stored in the print buffer is printed and then a rapid line feed occurs at the predetermined vertical TAB position set by ESC B or ESC b. If the vertical TAB position is not predetermined, this code functions the same as the LF code. VT cancels the Enlarged Print mode set by the SO code.

TAB is always executed from the Top-of-Form position. Therefore, if another TAB is input after TAB has been executed, the print head moves to the next Top-of-Form position.

See also SO, ESC B, ESC b, ESC /, and ESC W.

Example:

10 SELECT PRINT 004
20 REM VERTICAL TAB
30 PRINT HEX(1B);HEX(42);
40 PRINT HEX(01);HEX(03);HEX(06);HEX(0A);HEX(00);
50 FOR I = 1 TO 4
60 PRINT HEX(0B);"TAB";
70 NEXT I
80 PRINT

TAB

TAB

TAB

TAB
FF

Name: FF - Form Feed
Expression: HEX(0C);
Function: Advances paper to the next Top-of-Form position.

With the FF code, all the data stored in the print buffer is printed and then the paper is advanced to the next Top-of-Form position. FF cancels the Enlarged Print mode set by the SO code.

See also ESC C and ESC CO.

CR

Name: CR - Carriage Return
Expression: HEX(0D);
Function: Starts printing.

The CR code causes all data stored in the print buffer to be printed and a carriage return to be executed.

The CR code with a line feed cancels the Enlarged Print mode set by the SO code.

See also LF.

Example: 10 SELECT PRINT 004  
20 REM UNDERSCORE BY CR  
30 PRINT "UNDERSCORE BY CR";HEX(0D);  
40 PRINT HEX(5FS5F5F5F5F5F5F5F5F5F5F5F5F)

UNDERSCORE BY CR
Name: SO - Shift Out
Expression: HEX(0E);
Function: Selects the Enlarged Print mode.

With the SO code, all the data that follows this code on the same line is printed in enlarged characters. SO is cancelled by line feed or by the DC4, ESC ! or ESC W codes. Pica and enlarged characters can be mixed on the same line.

See also DC4, ESC !, and ESC W.

Example:

10 SELECT PRINT 004
20 REM ENLARGED PRINT MODE WITH AUTO RESET
30 PRINT HEX(0E);"ENLARGED PRINT MODE"
40 PRINT "PICA-SIZED PRINT MODE"
SI

Name: SI - Shift In
Expression: HEX(0F);
Function: Selects the Condensed Print mode.

With the SI code, all the data stored in the buffer is printed and subsequent data is printed in condensed characters (17 characters per inch). SI code is cancelled by DC2 or ESC ! codes. The SI code followed by the SO code enables printing of condensed enlarged characters.

See also DC2, ESC M, and ESC !.

Example 1:

10 SELECT PRINT 004
20 REM CONDENSED MODE
30 PRINT HEX(0F); "CONDENSED MODE"
40 PRINT "STILL IN CONDENSED MODE"

Example 2:

10 SELECT PRINT 004
20 PRINT HEX(0F); "CONDENSED MODE"
30 PRINT HEX(0E); "NOW IN CONDENSED ENLARGED MODE"

CONDENSED MODE
NOW IN CONDENSED ENLARGED MODE
DC1

Name: DC1 - Selection of the Printer
Expression: HEX(11);  
Function: Selects the printer.

The DC1 code places the printer in the selected state, enabling the printer to receive data. Code DC1 is effective only when DIP switch 2-1 is OFF.

If you enter the DC1 code during data transfer with the printer in the selected state, all the data stored before the DC1 code is ignored.

See also DC3.

Example 1:
10 SELECT PRINT 004  
20 REM DEVICE CONTROL 1  
30 PRINT HEX(11);"AAAAA";HEX(13);  
40 PRINT "BBBBB";HEX(11);"CCCCC"

AAAAACCCCC

Example 2:
10 SELECT PRINT 004  
20 REM DEVICE CONTROL 1  
30 PRINT "AAAAA";HEX(11)  
40 PRINT "BBBBB";HEX(13);"CCCCC";HEX(11)

BBBBB

NOTE

DC1 cable is effective only when DIP Switch 2-1 is OFF.
DC2

Name: DC2 - Condensed Mode Cancel
Expression: HEX(12);
Function: Cancels Condensed Print mode.

The DC2 code cancels the Condensed Print mode set by the SI code.

See also S1 and ESC M.

Example:
10 SELECT PRINT 004
20 REM DEVICE CONTROL 2
30 PRINT HEX(OF):"CONDENSED MODE";
40 PRINT HEX(12):"====> NOW IN PICA-SIZED MODE"

CONDENSED MODE====> NOW IN PICA-SIZED MODE

NOTE

Although the Enlarged Print mode set by the SO code can be cancelled by a line feed, the Condensed Print mode set by the SI code cannot.

DC3

Name: DC3 - Deselection of the Printer
Expression: HEX(13);
Function: Deselects the printer.

The DC3 code places the printer in the deselected state. In other words, it disables the printer to receive data. When the DC1 and DC3 codes are used, DIP Switch 2-1 must be OFF.

See also DC1.
DC4

Name: DC4 - Enlarged Print Mode Cancel
Expression: HEX(14);
Function: Cancels Enlarged Print mode.

The DC4 code cancels the Enlarged Print mode set by the SO code.

See also SO, ESC W, and ESC !.

Example:
10 SELECT PRINT 004
20 REM DEVICE CONTROL 4
30 PRINT HEX(0E);"ENLARGED MODE";
40 PRINT HEX(14);" NOW IN PICA-SIZED MODE"

ENLARGED MODE NOW IN PICA-SIZED MODE

NOTE

The Enlarged Print mode set by the ESC W or ESC ! code cannot be cancelled by the DC4 code.

CAN

Name: CAN - Cancel
Expression: HEX(1B);
Function: Cancels the data stored in the print buffer.

With the CAN code, all the data previously stored in the print buffer on the same line is cancelled.

See also DEL and BS.

Example:
10 SELECT PRINT 004
20 REM CANCEL
30 PRINT "ABCD"
40 PRINT "EFGH";HEX(18);
50 PRINT "IJKL"

ABCD
IJKL

5-10
ESC SO

Name: ESC SO - Shift Out
Expression: \texttt{HEX(1B);HEX(0E)};
Function: Selects the Enlarged Print mode.

Same as the SO code.

Example:  
\begin{verbatim}
10 SELECT PRINT 004 
20 REM ENLARGED MODE BY ESC SO 
30 PRINT HEX(1B);HEX(0E);"ENLARGED MODE";
40 PRINT HEX(14);" NOW IN PICA-SIZED MODE"
\end{verbatim}

\textbf{ENLARGED MODE} \hspace{1cm} \textbf{NOW IN PICA-SIZED MODE}

ESC SI

Name: ESC SI - Shift In
Expression: \texttt{HEX(1B);HEX(0F)};
Function: Selects the Condensed Print mode.

Same as the SI code.

Example:  
\begin{verbatim}
10 SELECT PRINT 004 
20 REM CONDENSED MODE 
30 PRINT HEX(1B);HEX(0F);"CONDENSED MODE";
40 PRINT HEX(12);" NOW IN PICA-SIZED MODE"
\end{verbatim}

\textbf{CONDENSED MODE} \hspace{1cm} \textbf{NOW IN PICA-SIZED MODE}
ESC !

Name: ESC ! - Print Mode Selection
Expression: \text{HEX(1B);"!";HEX(n);}
\text{(n = 00H to 3FH)}
Function: Selects a print mode.

The value of n determines each print mode (refer to Table 5-1). The
ESC ! code takes precedence over other commands such as ESC E that set
the print mode.

The precedence of print modes is as follows:
Emphasized $>$ Condensed $>$ Pica
Superscript/Subscript $>$ Double-strike

See also SI, SO, DC2, DC4, ESC E, ESC F, ESC G, ESC H, ESC M, ESC P
and ESC W.

\underline{NOTE}

In Proportional Print mode, characters are always
emphasized. In Elite Print mode, Emphasized and Condensed
Print mode settings are ignored. ESC ! can be mixed with
other ESC sequences.
<table>
<thead>
<tr>
<th>n(HEX)</th>
<th>En</th>
<th>D</th>
<th>Em</th>
<th>C</th>
<th>El</th>
<th>n(HEX)</th>
<th>En</th>
<th>D</th>
<th>Em</th>
<th>C</th>
<th>El</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0A</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

En: Enlarged mode
D: Doublestrike mode
Em: Emphasized mode
C: Condensed mode
El: Elite mode
10 SELECT PRINT 004(132)
20 PRINT HEX(1B);"D";HEX(14);HEX(00);
25 DIM A$1
30 A$ = HEX(00)
40 FOR M = 0 TO 63
50 PRINT HEX(1B);"!";HEX(00);
60 PRINT "MODE";M;HEX(09);
70 PRINT HEX(1B);"!";A$;
80 PRINT "ABCDE"
90 A$=A$ ADD HEX(01)
100 NEXT M
110 END

MODE 0
MODE 1
MODE 2
MODE 3
MODE 4
MODE 5
MODE 6
MODE 7
MODE 8
MODE 9
MODE 10
MODE 11
MODE 12
MODE 13
MODE 14
MODE 15
MODE 16
MODE 17
MODE 18
MODE 19
MODE 20
MODE 21
MODE 22
MODE 23
MODE 24
MODE 25
MODE 26
MODE 27
MODE 28
MODE 29
MODE 30
MODE 31
MODE 32
MODE 33
MODE 34
MODE 35
MODE 36
MODE 37
MODE 38
ESC-(minus)

Name: ESC-(minus) - Underlined Print Mode
Expression: HEX(1B);"-";HEX(n);
   n=01H or 31H: Sets Underlined Print mode.
   n=00H or 30H: Cancels Underlined Print mode.
Function: Selects/Cancels Underlined Print mode.

The ESC-01H or ESC-31H code places the printer in the Underlined Print mode. All the data following this code prints with an underline.

The ESC-00H or the ESC-30H code cancels the Underlined Print mode.

Example:
10 SELECT PRINT 004
20 REM UNDERLINED PRINT
30 PRINT HEX(1B);"-";HEX(01)
40 PRINT "THIS TEXT IS UNDERLINED"
50 PRINT HEX(1B);"-";HEX(00);
60 PRINT "THIS TEXT IS NOT UNDERLINED"

THIS TEXT IS UNDERLINED
THIS TEXT IS NOT UNDERLINED

ESC/

Name: ESC/ - VFU Channel Selection
Expression: HEX(1B);"/";HEX(n);
   (n = 01H to 07H)
Function: Selects Vertical Format Unit (VFU) channel.

The ESC/ code causes the printer to execute subsequent vertical TABs using the format specified by the Channel n of VFU. Under VFU control, a page can be divided into channels within which vertical TABs can be independently set. For example, Channel 1 can be set for vertical TABs at the 3rd, 5th, and 15th lines, and Channel 2 can be set for vertical TABs at the 6th, 10th, and 30th lines.

See also VT, ESC b and ESC B.

<table>
<thead>
<tr>
<th>Format of channel 1</th>
<th>Format of channel 2</th>
<th>Mixed format</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>VT 1</td>
<td>VT 1</td>
</tr>
<tr>
<td></td>
<td>VT 1</td>
<td>VT 1</td>
</tr>
<tr>
<td></td>
<td>VT 1</td>
<td>VT 1</td>
</tr>
<tr>
<td></td>
<td>VT 2</td>
<td>VT 2</td>
</tr>
<tr>
<td></td>
<td>VT 2</td>
<td>VT 2</td>
</tr>
<tr>
<td></td>
<td>VT 2</td>
<td>VT 2</td>
</tr>
</tbody>
</table>
Example:
10 SELECT PRINT 004
20 REM VERTICAL FORMAT
30 PRINT HEX(1B);"C";HEX(10);
40 PRINT "*--- THE FIRST TOP OF FORM ---*"
50 REM VFU CHANNEL 1
60 PRINT HEX(1B);HEX(62);HEX(01);
70 PRINT HEX(02);HEX(05);HEX(09);HEX(00);
80 REM VFU CHANNEL 2
90 PRINT HEX(1B);HEX(62);HEX(02);
100 PRINT HEX(03);HEX(07);HEX(0A);HEX(00);
110 REM SELICTS VFU CHANNEL
120 PRINT HEX(1B);"/";HEX(01);
130 GOSUB 1000
140 REM SELICTS VFU CHANNEL 2
150 PRINT HEX(1B);"/";HEX(02);
160 GOSUB 1000
170 END
1000 REM SUB-ROUTINE
1010 PRINT HEX(0C);
1020 PRINT "* --- THE NEXT TOP OF FORM --- *
1030 FOR I = 1 TO 3
1040 PRINT HEX(0B); "THIS IS TAB ";I
1050 NEXT I
1060 RETURN
6060 PRINT HEX(1B);HEX(62);HEX(01);
* ---- THE NEXT TOP OF FORM ---- *

THIS IS TAB 1

THIS IS TAB 2

THIS IS TAB 3

* ---- THE NEXT TOP OF FORM ---- *

THIS IS TAB 1

THIS IS TAB 2

THIS IS TAB 3
ESC 0 (zero)

Name: ESC 0(zero) - 1/8-inch Line Spacing
Expression: HEX(1B);"0";
Function: Selects 1/8-inch line spacing.

The ESC 0 code causes subsequent line spacing to be set at 1/8 inch.

See also ESC 1, ESC 2, ESC 3, and ESC A.

Example:
10 SELECT PRINT 004
20 REM 1/8" LINE SPACING
30 PRINT HEX(1B);HEX(30);
40 FOR I = 1 TO 4
50 PRINT "1/8 INCH LINE SPACING"
60 NEXT I
70 END

1/8 INCH LINE SPACING
1/8 INCH LINE SPACING
1/8 INCH LINE SPACING
1/8 INCH LINE SPACING

ESC 1

Name: ESC 1 - 7/72-inch Line Spacing
Expression: HEX(1B);"1";
Function: Selects 7/72-inch line spacing.

The ESC 1 code causes subsequent line spacing to be set at 7/72 inch.

See also ESC 0, ESC 2, ESC 3, and ESC A.

Example:
10 SELECT PRINT 004
20 REM 7/72" LINE SPACING
30 PRINT HEX(1B);"1";
40 FOR I = 1 TO 5
50 PRINT "7/72 INCH LINE SPACING"
60 NEXT I
70 END

7/72 INCH LINE SPACING
7/72 INCH LINE SPACING
7/72 INCH LINE SPACING

5-19
ESC 2

Name: ESC 2 - 1/6-inch Line Spacing
Expression: HEX(1B);"2";
Function: Selects 1/6-inch line spacing.

The ESC 2 code causes subsequent line spacing to be set at 1/6 inch.

See also ESC 0, ESC 1, ESC 3, and ESC A.

Example:
10 SELECT PRINT 004
20 REM 1/6 INCH LINE SPACING
30 PRINT HEX(1B);"2";
40 FOR I = 1 TO 4
50 PRINT "1/6 INCH LINE SPACING"
60 NEXT I
70 END

1/6 INCH LINE SPACING
1/6 INCH LINE SPACING
1/6 INCH LINE SPACING
1/6 INCH LINE SPACING
ESC 3

Name: ESC 3 - n/216-inch Line Spacing
Expression: HEX(1B);"3";HEX(n);
Function: Selects n/216-inch line spacing.
(n = 00H to FFH)

The ESC 3 (n) code causes subsequent line spacing to be set at n/216 inch. 1/216 inch corresponds to 1/3 dots.

See also ESC 0, ESC 1, ESC 2, and ESC A.

Example: Set 5/54-inch line spacing.
10 SELECT PRINT 004
20 REM N/216 INCH LINE SPACING
30 PRINT HEX(1B);"3";HEX(14);
40 FOR I = 1 TO 4
50 PRINT "APPROXIMATELY 20/216 INCH LINE SPACING"
60 NEXT I
70 END

APPROXIMATELY 20/216 INCH LINE SPACING
APPROXIMATELY 20/216 INCH LINE SPACING

NOTE

When n=01H or 02H, paper feeding accuracy is not guaranteed.
ESC 8

Name: ESC 8 - Paper-end Detector Disable
Expression: HEX(1B);"8";
Function: Disables paper-end signal.

The ESC 8 code enables the printer to print data to the last line of cut-sheet paper. With DIP Switch 1-3 on the control circuit board set to ON, the printer is placed in the ESC 8 condition when powered on. This switch is normally set to the OFF position.

See also ESC 9.

ESC 9

Name: ESC 9 - Paper-end Detector Enable
Expression: HEX(1B);"9";
Function: Enables paper-end signal.

The ESC 9 code cancels the ESC 8 condition. The printer cannot continue printing and enters Off-Line mode when nearing the bottom edge of cut-sheet paper. With DIP Switch Pin 1-3 set to OFF, the printer is placed in the ESC 9 condition when powered on.

See also ESC 8.
**ESC <**

Name: ESC < - One Line Unidirectional Printing  
Expression: `HEX(1B);"<";`  
Function: Prints from left to right for one line.

With the ESC < code, the print head returns to its leftmost position and data is printed unidirectionally from left to right for one line.

See also ESC U.

Example:  
10 SELECT PRINT 004  
20 REM HOME HEAD  
30 PRINT HEX(1B);"<";  
40 PRINT "THIS LINE IS PRINTED UNIDIRECTIONALLY"  
50 END  

THIS LINE IS PRINTED UNIDIRECTIONALLY

---

**NOTE**

The ESC < code minimizes horizontal dot displacement, which may be caused by the printing mechanism. The ESC < code causes the print head to return to its leftmost position only once, while ESC U causes all the following data to be printed unidirectionally. Although bidirectional printing usually causes little horizontal dot aberration, use these two commands when utmost precision is required.

---

**ESC @**

Name: ESC @ - Printer Initialization  
Expression: `HEX(1B);"@";`  
Function: Initializes the printer.

The ESC @ initializes the printer, and causes all the data in the print buffer to be cleared, including any download characters.

Example:  
10 SELECT PRINT 004  
20 PRINT HEX(0F);"BEFORE PRINTER IS INITIALIZED"  
30 PRINT  
40 PRINT HEX(1B);"@";  
50 PRINT "AFTER PRINTER IS INITIALIZED"  
60 END

BEFORE PRINTER IS INITIALIZED

AFTER PRINTER IS INITIALIZED

5-23
**ESC A**

**Name:** ESC A - n/72-inch Line Spacing  
**Expression:** HEX(1B);"A";HEX(n);  
(n = 00H to 55H)  
**Function:** Sets n/72-inch line spacing

The ESC A code sets the amount of line feed spacing to n/72 inch. When n = 01H (i.e., 1/72 inch), the amount of line spacing equals the space between two adjacent dot wires in the print head.

See also ESC 0, ESC 1, ESC 2, and ESC 3.

**Example:**

```
10 SELECT PRINT 004
20 REM LINE SPACING BY DOTS
30 DIM A$:1
40 A$ = HEX(01)
50 FOR I = 1 TO 8
60 PRINT HEX(1B);"A";A$;
70 PRINT "LINE SPACING ---------"
80 A$ = A$ ADD HEX(01)
90 NEXT I
100 END
```

**NOTE**

The ESC A (n) code may be used at any position on a line. However, once the code is entered, the specified amount of line spacing will remain unchanged until another line spacing code is entered.
ESC B

Name: ESC B - Vertical TAB
Expression: \text{HEX(1B)};"B";\text{HEX}(n_1);\text{HEX}(n_2); \ldots ;\text{HEX}(n_k);\text{HEX}(00);
(n = 01H to FEH, k = 01H to 10H)
Function: Sets the vertical TAB positions on the specified lines.

Since the current line spacing multiplied by the number of lines is stored as an absolute value for the TAB stop position, the vertical TAB setting will be performed as it has been set by this code -- even if the amount of the line spacing is changed. The maximum number of vertical tabs that can be set is $16 \times (10)_{10}$. Vertical TAB setting is terminated by the \text{HEX(00)} code.

See also VT, ESC /, and ESC b.

Example:

10 SELECT PRINT 004
20 REM VERTICAL TAB
30 PRINT \text{HEX(1B)};"B";\text{HEX}(01);\text{HEX}(05);\text{HEX}(09);
40 PRINT \text{HEX}(00);
50 FOR J = 1 TO 3
60 PRINT \text{HEX(0B)};"VERTICAL TAB";
70 NEXT J
80 PRINT
90 END

\text{VERTICAL TAB}

\text{VERTICAL TAB}

\text{VERTICAL TAB}

\underline{NOTE}

If TAB positions are not set in a numerically ascending order, the TAB execution is terminated. TAB positions set by ESC B are the same as those set by ESC b channel 0.
**ESC C**

Name: ESC C - Form Length Setting by Number of Lines
Expression: HEX(1B);"C";HEX(n);
            (n = 01H to 7FH)
Function: Sets form length by number of lines.

Form feed, skip-over perforation, etc., are carried out in accordance with the form length specified by the ESC C code. The form length is stored as an absolute length with the amount of line spacing multiplied by the specified number of lines. Therefore, the specified form length does not change after it has once been set — even if the amount of line spacing is changed.

See also ESC C0.

Example: Set the form length to 50 lines.
          
          LPRINT HEX(1B);"C";HEX(32);

**ESC C0**

Name: ESC C0 - Form Length Setting in Inches
Expression: HEX(1B);"C";HEX(00);HEX(n);
            (n = 01H to 16H)
Function: Sets form length in inches.

With the ESC C0 code, the form length specified in inches is set. Form feed, skip-over perforation, etc., are carried out according to the form length set by this code.

See also ESC C.

Example: The following program shows how to set a form length to 1 inch:

```
10 SELECT PRINT 004
20 PRINT HEX(1B);"C";HEX(00);HEX(01);
30 PRINT "FIRST LINE OF FORM";
40 PRINT HEX(0C);
50 PRINT "LAST LINE OF FORM"
```

```
FIRST LINE OF FORM

LAST LINE OF FORM
```
ESC D

Name: ESC D - Horizontal TAB
Expression: HEX(1B);"D";HEX(n_1);HEX(n_2); ... ;HEX(n_k);HEX(00);
(n = 01H to E9H, k = 01H to 20H)
Function: Sets horizontal TAB.

The ESC D code specifies the horizontal TAB stop positions.

The horizontal TAB position is stored as a value of the current character width multiplied by the specified number of columns; n denotes column position. The HT code causes the horizontal TAB position to skip to the next position and printing restarts from the next column on that line. The TAB stop positions can be specified up to 136 columns in Pica Print mode and 233 columns in Condensed Print mode.

The excess TAB positions set by ESC D are ignored. HEX(00) terminates the TAB setting(s). Omitting this code results in an incorrect printout.

See also HT.

Example:

10 SELECT PRINT 004
20 REM HORIZONTAL TAB
30 PRINT "0123456789012345678901234567890123456789"
40 PRINT HEX(1B);"D";HEX(05);HEX(0A);HEX(0F);HEX(00);
50 FOR I = 1 TO 3
60 PRINT HEX(09);"TAB";
70 NEXT I
80 END

0123456789012345678901234567890123456789
TAB TAB TAB

NOTE

The default TAB setting is every eight columns. If TAB positions are not set in numerically ascending order, ESC D is not executed.
ESC E

Name: ESC E - Emphasized Mode Setting
Expression: HEX(1B);"E";
Function: Sets Emphasized Print mode.

With the ESC E mode, all the data stored in the print buffer is printed and then the data following this code is printed in emphasized characters. Emphasized printing gives each character a stronger impression.

ESC E can be input at any column position on a line. The speed of the head carriage is reduced to 80 CPS while printing emphasized characters. This print mode can be cancelled by the ESC C or ESC ! code.

See also ESC F, ESC M, and ESC !.

ESC F

Name: ESC F - Emphasized Mode Cancel
Expression: HEX(1B);"F";
Function: Cancels Emphasized Print mode.

The ESC F code cancels the Emphasized Print mode set by the ESC E code.

See also ESC E, ESC M, and ESC !.

Example:
10 SELECT PRINT 004
20 REM EMPHASIZED MODE
30 PRINT HEX(1B);"E";
40 PRINT "EMPHASIZED";
50 PRINT HEX(1B);"F";
60 PRINT " PICA-SIZED"
70 END

EMPHASIZED PICA-SIZED
ESC G

Name: ESC G - Doublestrike Mode Setting
Expression: HEX(1B);"G";
Function: Sets Doublestrike Print mode.

With the ESC G code, all the data stored in the print buffer is printed and then the data following this code is printed in Doublestrike Print mode. This feature eliminates the vertical gap between dots, thereby enhancing the print quality.

In this mode, the printer completes one line of printing with two passes of the print head, advancing the paper by about 1/216 inch between the first pass and the second pass. For this reason, the printer adjusts paper feeding to maintain the absolute length and number of lines on a page.

See also ESC H.

ESC H

Name: ESC H - Doublestrike Mode Cancel
Expression: HEX(1B);"H";
Function: Cancels Doublestrike Print mode.

The ESC H code cancels the Doublestrike Print mode set by the ESC G code.

See also ESC G.

Example:

10 SELECT PRINT 004
20 REM DOUBLE-STRIKE MODE CANCEL
30 PRINT HEX(1B);"G";
40 PRINT "DOUBLE PRINT"
50 PRINT HEX(1B);"H";
60 PRINT "NORMAL PRINT"
70 END

DOUBLE PRINT
NORMAL PRINT
ESC J

Name: ESC J – Single Line n/216-inch Line Spacing
Expression: HEX(1B);"J";HEX(n);
(n = 01H to FFH)
Function: Feeds n/216-inch line spacing for one line.

The ESC J code causes the data in the print buffer to be printed and executes n/216-inch paper feed. The set value of n is cancelled by a line feed.

See also ESC J and ESC 3.

Example: To execute 113/216-inch line spacing,

10 SELECT PRINT 004
20 PRINT "FIRST LINE";HEX(0D);
30 PRINT HEX(1B);"J";HEX(71);
40 PRINT "SECOND LINE (PRINTED 113/216 INCHES BELOW FIRST LINE)"
50 PRINT "THIRD LINE (WITH STANDARD LINE SPACING"
60 END

FIRST LINE

SECOND LINE (PRINTED 113/216 INCHES BELOW FIRST LINE)
THIRD LINE (WITH STANDARD LINE SPACING)

NOTE

With n=01H and n=02H, paper-feeding accuracy is not guaranteed. If the value of n is set to 00H, no paper feeding occurs. The ESC 3 code sets the same n/216-inch line spacing as the ESC J code. However, in the case of the ESC 3 code, the line spacing is not cancelled by a line feed but is retained in memory.
ESC M

Name: ESC M - Elite Character Setting
Expression: HEX(1B);"M";
Function: Sets Elite characters.

The ESC M code causes the data following this code to be printed in Elite characters (12 characters per inch).

In this mode, input of the emphasized or condensed printing code does not change the print mode.

See also ESC P, SI, DC2, ESC E, and ESC F.

Example:
10 SELECT PRINT 004
20 REM ELITE-SIZED PRINT
30 PRINT "PICA-SIZED";
40 PRINT HEX(1B);"M";
50 PRINT " ELITE-SIZED"
60 PRINT HEX(1B);"!";HEX(00)
70 END

PICA-SIZED   ELITE-SIZED
ESC N

Name: ESC N - Skip-Over Perforation Setting
Expression: \text{HEX}(1B)\text{"N"}; \text{HEX}(n);
\quad (n = \text{01H to 7FH})
Function: Sets skip-over perforation.

The ESC N code is used to set the skip-over perforation function, which specifies the number of lines "n" to be skipped at the bottom of a form. For example, if the last three lines of a form are to be skipped, the value of "n" must be entered as 03H.

When the current form length is changed by the ESC C code, the specified amount of skip-over perforation is cancelled. In this case, therefore, the ESC N code must be input again to set the amount of skip-over perforation.

A skip-over perforation value that exceeds the length of the form is ignored. For example, if you are using 11-inch paper and you set a skip-over perforation of six lines, the printer prints 60 lines from the Top-of-Form position, feed for six lines, and then continue printing from the 61st line of data at the Top-of-Form position of the next page.

When DIP Switch 2-3 is ON, 1-inch skip-over perforation is executed.

See also ESC O and ESC C.

Example:

10 SELECT PRINT 004
20 REM SKIP-OVER PERFORATION
30 PRINT \text{HEX}(1B)\text{"C"}; \text{HEX}(05);
40 PRINT \text{HEX}(1B)\text{"N"}; \text{HEX}(02);
50 \text{FOR } I = 1 \text{ TO 9}
60 PRINT "LINE"; I
70 NEXT I
80 END

\text{LINE 1}
\text{LINE 2}
\text{LINE 3}

\text{LINE 4}
\text{LINE 5}
\text{LINE 6}

\text{LINE 7}
\text{LINE 8}
\text{LINE 9}
**ESC 0**

**Name:** ESC 0 - Skip-Over Perforation Cancel  
**Expression:** HEX(1B);"0";  
**Function:** Cancels skip-over perforation.

The ESC 0 code cancels the skip-over perforation set by the ESC N code.

See also ESC N.

**Example:**

```
10 SELECT PRINT 004  
20 REM SKIP-OVER PERFORATION  
30 PRINT HEX(1B);"C";HEX(04);  
40 PRINT HEX(1B);"N";HEX(02);  
50 PRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ"  
60 PRINT "01234567890123456789012345"  
70 PRINT HEX(1B);"0";  
80 FOR I = 1 TO 2  
90 PRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ"  
100 PRINT "01234567890123456789012345"  
110 NEXT I  
120 END
```

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
01234567890123456789012345
```

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
01234567890123456789012345
ABCDEFGHIJKLMNOPQRSTUVWXYZ  
01234567890123456789012345
```
ESC P

Name: ESC P - Pica Character Setting
Expression: HEX(1B);"P";
Function: Cancels ESC M code.

With the ESC P code, the Elite Print mode set by the ESC M code is cancelled and the printer returns to Pica Print mode. Note, however, that ESC P is effective only when cancelling the ESC M code and does not cancel such modes as Enlarged or Condensed Print.

See also ESC A.

Example:
10 SELECT PRINT 004
20 REM PICA-SIZED PRINTING
30 PRINT HEX(1B);"P";
40 PRINT "PICA-SIZED CHARACTERS"
50 PRINT
60 PRINT HEX(1B);"M";
70 PRINT "ELITE-SIZED CHARACTERS"
80 PRINT
90 PRINT HEX(1B);"P";
100 PRINT "PICA-SIZED CHARACTERS"
110 END

PICA-SIZED CHARACTERS

ELITE-SIZED CHARACTERS

PICA-SIZED CHARACTERS
**ESC Q**

**Name:** ESC Q - Right Margin  
**Expression:** HEX(1B);"Q";HEX(n);  
**Function:** Sets right margin.

The ESC Q code specifies the right margin, i.e., the right end of the print line.

With the ESC Q code, the number of printed characters between the left margin and the right margin is fixed by the value of n. This code must be specified at the head of a line. If the value for n is above or below the limits, the command is ignored and the previous setting remains in effect. The limits for n are as follows:

- Pica mode: n = 02H to 88H
- Emphasized mode: n = 02H to 88H
- Condensed mode: n = 04H to E9H
- Elite mode: n = 03H to A3H

In Proportional Print mode, the print column width is set in Pica character size. The values for the right margin in the Enlarged Print mode will be one half of the respective values shown. If the result is a fraction, the value will be rounded down.

See also ESC 1.

**Example:**

```
10 SELECT PRINT 004
20 PRINT HEX(1B);"Q";HEX(0F);
30 PRINT "123456789012345678901234567890"
40 END
```

```
123456789012345
678901234567890
```

**NOTE**

If ESC Q is not specified at the head of a line, the print data prior to this code may be lost.
ESC S

Name: ESC S - Superscript/Subscript Mode Setting
Expression: HEX(1B);"S";HEX(n);
   n=00H or 30H: Sets Superscript Print mode.
   n=01H or 31H: Sets Subscript Print mode.
Function: Sets Superscript/Subscript mode.

With the ESC S HEX(00) or ESC S HEX(30) code, all the data following this code is printed in Superscript Print mode. In this mode, a character measuring 1.6 mm high prints on the upper half of the line.
ESC S can be cancelled with the ESC T code.

See also ESC T.

Example 1:
10 SELECT PRINT 004
20 REM SUPERSCRIPT MODE
30 PRINT HEX(1B);"E";
40 PRINT "Y = 5X";HEX(1B);"F";
50 PRINT HEX(1B);"S";HEX(00);
60 PRINT HEX(0F);"3"
70 PRINT HEX(1B);"T";HEX(12);
80 PRINT HEX(1B);"F";
90 END

\[ Y = 5X^3 \]
When ESC S HEX(01) or ESC S HEX(31) is input, the data following this code is printed in Subscript Print mode. In this mode, characters measuring 1.6 mm high are printed on the lower half of a line.

ESC S code can be cancelled with the ESC T code.

See also ESC T.

Example 2:

10 SELECT PRINT 004
20 REM SUBSCRIPT MODE
30 PRINT HEX(1B);"E";
40 PRINT "Y = 5X";HEX(1B);"F";
50 PRINT HEX(1B);"S";HEX(01);
60 PRINT HEX(0F);"2";
70 PRINT HEX(1B);"T";HEX(12);
80 PRINT HEX(1B);"F"
90 END

Y = 5X₂

NOTE

In both the Superscript and Subscript Print modes, the printer performs unidirectional, doublestrike printing. After the first pass of the print head, the paper advances by 1/216 inch and a character is formed on completion of the second pass. The printer adjusts paper feeding to maintain the absolute length and number of lines of a page. Because of this adjustment, superscript or subscript characters may, in the worst case, be printed improperly.

ESC T

Name: ESC T - Superscript/Subscript Mode Cancel
Expression: HEX(1B);"T";
Function: Cancels Superscript/Subscript Print mode.

The ESC T code cancels the Superscript or Subscript Print mode set by the ESC S code.

See also ESC S.
ESC U

Name: ESC U - Unidirectional Printing
Expression: HEX(1B);"U";HEX(n);
    n=01H or 31H Unidirectional printing
    n=00H or 30H Bidirectional printing (except in Bit-Image mode)
Function: Sets/cancels unidirectional printing.

When ESC U HEX(01) or ESC U HEX(31) is input, all data following this code is printed only when the print head is moving from left to right. Unidirectional printing is effective to further improve the precision of vertical character alignment.

When the ESC U HEX(00) or ESC U HEX(30) code is input, the Unidirectional Print mode is cancelled and the printer returns to the normal Bidirectional Print mode.

See also ESC <.

Example:

10 SELECT PRINT 004
20 PRINT "THIS TEXT IS"
30 PRINT "PRINTED BIDIRECTIONALLY"
40 PRINT
50 PRINT HEX(1B);"U";HEX(01);
60 PRINT "THIS TEXT IS"
70 PRINT "PRINTED UNIDIRECTIONALLY"
80 PRINT HEX(1B);"U";HEX(00);
90 END

THIS TEXT IS
PRINTED BIDIRECTIONALLY

THIS TEXT IS
PRINTED UNIDIRECTIONALLY
ESC W

Name: ESC W - Enlarged Mode
Expression: \text{HEX}(1B); ^{W} ; \text{HEX}(n);
        n=01H or 31H: Sets Enlarged Print mode
        n=00H or 30H: Cancels Enlarged Print mode
Function: Sets/cancels Enlarged Print mode.

When ESC W \text{HEX}(01) or ESC W \text{HEX}(31) code is input, all the data following this code is printed in enlarged characters.

The ESC W \text{HEX}(00) or ESC W \text{HEX}(30) code causes the Enlarged Print mode set by ESC W \text{HEX}(01), ESC W \text{HEX}(31), or SO code to be cancelled. ESC W is not cancelled by a line feed.

See also SO and DC4.

Example:
10 SELECT PRINT 004
20 REM ENLARGED MODE
30 PRINT \text{HEX}(1B); ^{W} ; \text{HEX}(01)
40 PRINT "ENLARGED MODE"
50 PRINT \text{HEX}(1B); ^{W} ; \text{HEX}(00);
60 PRINT "PICA-SIZED MODE"
70 END

ENLARGED MODE
PICA-SIZED MODE
ESC b

Name: ESC b – VFU Position Setting
Expression: HEX(1B);"b";HEX(n);HEX(m);...HEX(m_k);HEX(00);
(n = 00H to 07H, k = 01H to 10H)
Function: Sets VFU position.

The ESC b code sets the Vertical Format Unit (VFU) position for Channel n. For details about the VFU, refer to the ESC / code. The VFU has eight channels (0 to 7). For each channel, up to 16 positions can be set within the page length. The channel is set to 0 at power ON.

The specified TAB positions must be terminated with HEX(00).

See also ESC B, VT, and ESC /.

NOTE

TAB positions in Channel 0 can also be set by ESC B.

Example: To set the vertical TABs at the 5th, 10th, and 13th lines in Channel 2.

10 SELECT PRINT 004
20 REM SET VERTICAL TABS
30 PRINT HEX(1B);HEX(62);
40 PRINT HEX(02);HEX(05);HEX(0A);HEX(0D);
50 PRINT HEX(00);
60 REM SELECTS CHANNEL 2
70 PRINT HEX(1B);"/";HEX(02);
80 PRINT "START";HEX(0B);"BB";HEX(0B);
90 PRINT "CC";HEX(0B);"DD"
100 END

START

BB

CC

DD
**ESC 1**

Name: ESC 1 - Left Margin
Expression: HEX(1B);HEX(6C);HEX(n);
Function: Sets column head.

The ESC 1 code sets the position of the column head in the current character size. ESC Q sets the column end and ESC 1 sets the column head.

ESC 1 is performed in Proportional Print mode the same as it is in Pica Print mode. The maximum value of n is determined by the current mode. Illegal settings are ignored. The range of values for each print mode are as follows:

- **Pica mode**  \( n = \text{00H to 86H} \)
- **Emphasized mode**  \( n = \text{00H to 86H} \)
- **Condensed mode**  \( n = \text{00H to E5H} \)
- **Elite mode**  \( n = \text{00H to A0H} \)

The values for the left margin in the Enlarged Print mode are one half of the respective values shown above. If the result is a fraction, the value will be rounded down.

See also ESC Q.

**Example 1:** To set the left margin to the 8th column,

```plaintext
10 SELECT PRINT 004
20 REM SETS LEFT MARGIN
30 PRINT "012345678901234567890"
40 PRINT HEX(1B);HEX(6C);HEX(08);
50 PRINT
60 PRINT "THE LEFT MARGIN IS SET TO COLUMN 8"
```

012345678901234567890

**THE LEFT MARGIN IS SET TO COLUMN 8**
Example 2:

10 SELECT PRINT 004
20 REM HORIZ TAB, LEFT MARGIN, HORIZ TAB SEQUENCE
30 PRINT "012345678901234567890"
40 PRINT HEX(1B);"D";HEX(02);HEX(08);HEX(0F);
50 PRINT HEX(00);
60 PRINT "A";HEX(09);"B";HEX(09);"C";HEX(09);"D"
70 PRINT HEX(1B);HEX(6C);HEX(0F);
80 PRINT "012345678901234567890"
90 PRINT HEX(00);
100 PRINT "E";HEX(09);"F";HEX(09);"G";HEX(09);"H"
110 END

012345678901234567890
A B C D
012345678901234567890
 E  F  G  H

NOTE

ESC 1 causes the horizontal TAB positions previously set to be cleared. The subsequent horizontal TAB setting is carried out assuming the start column position set by ESC 1 is position 0.
**ESC p**

**Name:** ESC p - Proportional Spacing Mode

**Expression:**

```
HEX(1B);"p";HEX(n);
n = 01H or 31H proportional spacing
n = 00H or 30H normal spacing
```

**Function:** Selects Proportional Spacing mode.

To print in the Proportional Spacing mode, each character is assigned a width value (unit = 1/2 dot). Proportional printing is used to obtain an easier-to-read, more esthetically pleasing print-out. In Proportional Spacing mode, BS and DEL are not accepted. Also, printing is always performed in Emphasized mode.

**Example:**

```
10 SELECT PRINT 004
20 REM PROPORTIONAL SPACING MODE
30 PRINT " NORMAL PRINT MODE"
40 GOSUB 1000
50 PRINT
60 PRINT
70 PRINT HEX(1B);HEX(70);HEX(01);
80 PRINT " PROPORTIONAL SPACING MODE"
90 GOSUB 1000
100 PRINT HEX(1B);HEX(70);HEX(00);
110 END
1000 REM SUBROUTINE
1010 PRINT "THE PRINTER IS CAPABLE OF PRINTING"
1020 PRINT "IN NORMAL PRINT MODE, OR IN"
1030 PRINT "PROPORTIONAL SPACING PRINT MODE"
1040 RETURN
```

**NORMAL PRINT MODE**

THE PRINTER IS CAPABLE OF PRINTING
IN NORMAL PRINT MODE, OR IN
PROPORTIONAL SPACING PRINT MODE

**PROPORTIONAL SPACING MODE**

THE PRINTER IS CAPABLE OF PRINTING
IN NORMAL PRINT MODE, OR IN
PROPORTIONAL SPACING PRINT MODE
**ESC s**

**Name:** ESC s - Half Speed Printing  
**Expression:** HEX(1B);"s";HEX(n);  
  - n = 01H or 31H: Sets half-speed printing.  
  - n = 00H or 30H: Cancels half-speed printing.  
**Function:** Sets/cancels half-speed printing.

When ESC s 01H or ESC s 31H code is input, the print speed decreases from the normal 16 inch/sec. to 8 inch/sec. This feature reduces the level of printer noise.

When ESC s 00H or ESC s 30H code is input, the print speed returns to the normal 16 inch/sec.

**Example:**
```
10 SELECT PRINT 004  
20 REM HALF SPEED PRINTING  
30 PRINT "THIS LINE IS PRINTED AT STANDARD SPEED"  
40 PRINT HEX(1B);HEX(73);HEX(01);  
50 PRINT "THIS LINE IS PRINTED AT HALF SPEED"  
60 END
```

THIS LINE IS PRINTED AT STANDARD SPEED  
THIS LINE IS PRINTED AT HALF SPEED
**DEL**

**Name:** DEL - Delete  
**Expression:** HEX(1B);  
**Function:** Cancels last printable data.

The DEL code causes the last printable data stored in the print buffer to be deleted. This code is ignored in the Bit-Image mode.

**See also BS.**

**Example 1:**
```
10 SELECT PRINT 004  
20 REM DELETE LAST CHARACTER  
30 PRINT "DELETE";  
40 PRINT HEX(7F);"ING";  
50 PRINT  
```

```
DELETING
```

**Example 2:**
```
10 SELECT PRINT 004  
20 REM DELETE THREE CHARACTERS  
30 PRINT "DELETE";  
40 PRINT HEX(7F);HEX(7F);HEX(7F);  
50 PRINT  
```

```
DEL
```
CHAPTER 6
DOWNLOAD MODE CONTROL CODES

6.1 INTRODUCTION

You can use Download mode control codes described in this chapter to create and print a maximum of 256 symbols or other special characters which are stored in the printer random access memory (RAM). Normally the printer uses the internal character set stored in the read only memory (ROM), which contains all of the WISCII characters listed in Table E-1. The characters in both character sets are referenced by addresses 00H to FFH.

You can enter the Download mode control codes in your own programs. However, these codes control the printer only when the Wang 2200 system printer driver is in the Transparent mode, a feature described in the 2200 BASIC-2 Multiuser Operating System Software Bulletin Release 2.6. Download characters are lost when the printer is turned off and must be re-entered when power is turned on. However, programs for creating download characters can be copied to disk and re-run when needed. Download characters cannot be printed in a WP document because the printer is initialized when you enter WP, erasing all download characters.

To create download characters you must be familiar with the binary numbering system. The following section describes how a download character is created and printed.

6.2 HOW TO CREATE DOWNLOAD CHARACTERS

To write a download character to the RAM, use ESC & to specify the location of the character to be written and to send the character pattern data to the RAM.

Two additional codes are used when you write programs for printing download characters. The ESC % code specifies whether the printer uses the download (RAM) character set or the WISCII (ROM) character set to print characters. The ESC: code enables you to copy characters from the ROM character set to the RAM character set, so that you can print both WISCII and download characters directly from the download character set.
Creating and Printing Download Characters

NOTE

DIP SW 1-4 must be OFF. The factory-set condition of SW 1-4 is OFF.
6.3 CONTROL CODES IN DOWNLOAD MODE

This section describes Download mode codes that can be entered in BASIC or other programs.

ESC &

**Name:** ESC & - Create Download Characters  
**Expression:** HEX(1B);"&";HEX(00);HEX(n);HEX(m);  
HEX(a);HEX(p1);HEX(p2);HEX(p3); . . . HEX(p11);

n is equal to, or greater than 00H  
m is equal to, or less than FFH

**Function:** Creates and copies user-defined download characters into RAM.

ESC & assigns download characters to WISCII codes n to m using character data p1, p2, p3 . . . p11.

The dot wires fired in printing are represented as hexadecimal character data where the dot wires correspond to the bit positions as shown. To obtain the decimal value for a dot position, first determine the binary value of the dot pattern you want, and then convert it to hexadecimal.

```
\[
\begin{array}{cccc}
2^7 & (128) \\
2^6 & (64) \\
2^5 & (32) \\
2^4 & (16) \\
2^3 & (8) \\
2^2 & (4) \\
2^1 & (2) \\
2^0 & (1) \\
\end{array}
\]
\[
2^7 + 2^6 + 2^5 + 2^3 + 2^1 = 128 + 64 + 32 + 8 + 2 = 202_{10}
\]
```

You can define a maximum of 12 horizontal positions in a download character. However, the 12th position is automatically set to 0. The minimum width of a download character is five positions.

If a download character is to be assigned to only one WISCII character, then n=m. For example,

```
HEX(1B);"&";HEX(00);HEX(n);HEX(n);  
HEX(a);HEX(p1);HEX(p2); . . . HEX(p11)
```

The term "a" is an Attribute that consists of descender data and proportional data. For details, refer to the following section on obtaining Attribute "a".

See also ESC : and ESC %.

6-3
Example: A download character such as $\&$ is created by entering the following values for P1 through P11.

Obtaining Attribute "a"

Attribute "a" consists of descender data and proportional data. The descender data determines whether the 9th dot will be used and the character shifted down one dot. The proportional data determines the starting and ending positions of the print area. The following diagram shows how eight binary bits are used to specify descender data and the starting and ending print positions for proportional data.

The high-order three bits of the 7-bit proportional data represent the starting print position and the remaining four bits indicate the ending print position. In the example, attribute "a" is:

$$(10001011)_2=(139)_{10}=(8B)_{16}$$
Creating Download Characters in Proportional Mode

In proportional printing, all data is printed in emphasized characters. Compare the following printout for Pica mode and enlarged or emphasized characters for data in print positions 0 and 10. If the print area for the proportional data is specified as 0th to 10th positions, a dot at the 11th position cannot be printed.

Therefore, when creating a download character in Proportional mode, set the ending print position for the download character so that the position value is one greater than the actual position of the last data.

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 \\
\cdot & o & o & o & o & o & o & o & o & o & o & o & o \\
\end{array}
\]

Pica mode

\[
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 \\
\cdot & \cdot & o & o & o & o & o & o & o & o & o & o \\
\end{array}
\]

Enlarged or Emphasized mode

Note that all of download character data P1 to P11 must be sent to the printer. Also, if horizontally adjacent dots are specified, they are automatically ignored.

ESC %

Name: ESC % – CG (Character Generator) Selection
Expression: HEX(1B); "%"; HEX(n); HEX(00);
\[ n = 00H \text{ selects ROM CG} \]
\[ n = 01H \text{ selects Download CG} \]
Function: Selects the ROM CG or the download CG.

ESC % can be entered in a program before or after the ESC & code.

See also ESC &.
Example:
10 SELECT PRINT 004
20 PRINT HEX(1B); "&"; HEX(00); HEX(40); HEX(40); HEX(0B);
30 PRINT HEX(8B);
40 PRINT HEX(26); HEX(0B); HEX(40); HEX(49);
50 PRINT HEX(F0); HEX(89); HEX(40); HEX(49);
60 PRINT HEX(26); HEX(00); HEX(00);
70 PRINT "@@@@@"
80 PRINT HEX(1B); "%"; HEX(01); HEX(00);
90 PRINT "@@@@@"
100 PRINT HEX(1B); "%"; HEX(00); HEX(00);
110 PRINT "@@@@@"
120 END

@@@@@
$6666$
@@@@@

NOTE
In lines 20 to 60 of the example, the & character is created (see ESC & for additional information on creating this character). In lines 80 and 100 the RAM and ROM character sets are selected.
ESC :

Name: ESC : (0) - ROM Character Generator (CG) Set Copy
Expression: HEX(1B);";";HEX(00);HEX(00);HEX(00);
Function: Copies ROM CG set.

With the ESC : code, characters in the ROM CG set are copied into the Download CG set.

With the ESC : code, the WISCII characters in the ROM CG can be printed while in the Download Character mode. In this case, you do not need to input ESC % 0 and ESC % 1 to select the CG.

Example:

```
10 SELECT PRINT 004
20 PRINT HEX(1B);";";HEX(00);HEX(00);HEX(00)
30 PRINT HEX(1B);"&";HEX(00);"##";
40 PRINT HEX(88);
50 PRINT HEX(26);HEX(0B);HEX(40);HEX(49);HEX(49);
60 PRINT HEX(EO);HEX(89);HEX(40);HEX(49);
70 PRINT HEX(26);HEX(00);HEX(00);
80 PRINT HEX(1B);"%";HEX(01);HEX(00);
90 DIM A$1
100 A$ = HEX(20)
110 FOR I = 1 TO 15
120 A$ = A$ ADD HEX(01)
130 PRINT A$;
140 NEXT I
150 PRINT HEX(1B);"&";HEX(00);HEX(00);
160 PRINT HEX(0D);HEX(0A)
170 END
```

!"&%&'()**+,-./
6.4 DOWNLOAD MODE SAMPLE PROGRAMS

The following examples demonstrate how to create a download character, how to specify descender data, and how to specify the proportional data.

Creating a Download Character

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSB</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>LSB</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Explanation of the Program

This program creates a box pattern and assigns it to character @. The result is that when @ is input, the box pattern is printed.

Line No.

60-80 Copies the fonts in the ROM into the RAM area.
90-100 Moves the character pattern from the RAM when it is to be printed.
120-130 Inputs the character defining command.
150 Defines the character into @.
170 8BH is an "attribute".
180-210 Defines the box pattern.

Example:

10 SELECT PRINT 004
20 PRINT
30 REM COPY ROM CHARACTER SET INTO DOWNLOAD CHARACTER SET
40 PRINT HEX(1B);"";HEX(00);HEX(00);HEX(00);
50 REM SELECTS DOWNLOAD CHARACTER SET
60 PRINT HEX(1B);"X";HEX(01);HEX(00);
70 REM SPECIFIES THAT A SPECIAL CHARACTER WILL PRINT IN PLACE OF "@"
80 PRINT HEX(1B);"&";HEX(00);"@@";HEX(8B);
90 REM CREATES A BOX PATTERN
100 PRINT HEX(FF);HEX(00);HEX(B1);HEX(00);
110 PRINT HEX(B1);HEX(00);HEX(B1);HEX(00);
120 PRINT HEX(B1);HEX(00);HEX(FF);
130 PRINT "ONE BOX ----> @"
140 PRINT "FIVE BOXES ----> @@@@@"

ONE BOX ----> []
FIVE BOXES ----> [[][][]]
Specifying Descender Data

The attribute data contains not only the descender data that determines whether or not the character is to be shifted down one dot at the time of printing, but also the proportional data that determines the size of the print area. Shifting the character down one dot at printing is accomplished by firing the 9th pin of the printer head. Therefore, a character made up of an 8-dot (vertical) pattern will be shifted down one dot and printed. The descender data is used when printing such characters as lowercase "p" and "g" of the internal character set.

The figures above show the box pattern created in the previous sample program. A is the result of printing without descender (9th dot wire not used) and B is the result of printing with descender (9th dot wire used).

When specifying the descender data in the attribute, note that the descender is specified by the most significant bit (MSB) of the attribute. When the MSB of the attribute is 0, the descender is specified and when the MSB of the attribute data is 1, the descender is not specified. For example, attribute data (8B) _H does not specify the descender. In the binary equivalent of (8B) _H, which is 10001011, the MSB is 1. The lower 7 bits of this data are used to specify the proportional data.
Explanation of the Program

In this program, a box pattern with descender is created in the place of "A" and a box pattern without descender is created in the place of "@".

Line No.
30             Copies the ROM character set into RAM.
50             Selects the RAM character set.
90             Specifies the two keyboard characters that will be used to print the downloadable characters.
100-150        Creates box patterns.

Example:

10 SELECT PRINT 004
20 REM COPIES ROM CHARACTERS INTO DOWNLOAD CHARACTER SET
30 PRINT HEX(1B);"":HEX(00);HEX(00);HEX(00);
40 REM SELECTS THE DOWNLOAD CHARACTER SET
50 PRINT HEX(1B);"%":HEX(01);HEX(00);
60 REM CREATES A BOX PATTERN
70 PRINT HEX(1B);"&":HEX(00);
80 REM SPECIFIES THAT SPECIAL CHARACTERS WILL PRINT IN PLACE OF @ AND A.
90 PRINT "@A";
100 REM CREATES A BOX PATTERN WITH NO DESCENDER ATTRIBUTE
110 PRINT HEX(8B);HEX(FF);HEX(00);HEX(B1);HEX(00);HEX(B1);
120 PRINT HEX(00);HEX(B1);HEX(00);HEX(B1);HEX(00);HEX(B1);
130 REM CREATES A BOX PATTERN WITH A DESCENDER ATTRIBUTE
140 PRINT HEX(0B);HEX(FF);HEX(00);HEX(B1);HEX(00);HEX(B1);
150 PRINT HEX(00);HEX(B1);HEX(00);HEX(B1);HEX(00);HEX(B1);
160 PRINT "ONE BOX ------@"
170 PRINT "FIVE BOXES, TWO WITH DESCENDERS ------@A@A"
180 END

ONE BOX ------@
FIVE BOXES, TWO WITH DESCENDERS ------@@@@@@
### Specifying Proportional Data

The proportional data of the attribute is used during proportional printing and specifies the starting and ending positions of the print area. This data is effective only during proportional printing.

The proportional data is all of the bits of the attribute with the exception of the MSB. Of these seven bits, the high-order 3 bits specify the starting position of the print area. The low-order 4 bits specify the ending position of the print area.

<table>
<thead>
<tr>
<th>MSB</th>
<th>Attribute data</th>
<th>Proportional data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>000011</td>
<td>Descender</td>
</tr>
<tr>
<td></td>
<td></td>
<td>{</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0: with descender</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: without descender</td>
</tr>
<tr>
<td></td>
<td></td>
<td>i</td>
</tr>
<tr>
<td></td>
<td></td>
<td>j</td>
</tr>
<tr>
<td></td>
<td></td>
<td>i: Starting position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>j: ending position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 ≤ i ≤ 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The maximum decimal value of the low-order 4 bits is 11 and the minimum width for a character is 5. If the setting of the proportional data is not within this range, the data is ignored and the width of the character is automatically set at 11.

To specify attribute a of the following box pattern, first determine if the MSB is 1 or 0. If the descender is specified (MSB = 0), the proportional data becomes the attribute. If the descender is not specified, 128₀ is added to the proportional data. The binary value of i is 001 because the starting print position is 1. The binary value of j is 0101 because the ending print position is 5. The combination of i and j is 0010101, or 21 decimal.

**Proportional data with descender:** \( 21₀ = 15₁ \) = attribute a  
**Proportional data without descender:** \( 149₀ = 95₁ \) = attribute a

The print area that can be defined by the proportional data is dot positions 0 to 11. Of these, however, the user can define a maximum of 11 dot positions. The last dot position is always left blank.
The program on the following page creates a box pattern in the proportional and non-proportional print modes.

Explanation of the Program

Line No. | Description
--- | ---
30 | Copies ROM character set into RAM (download) character set.
70 | Selects the RAM character set.
130-160 | Creates box pattern without a proportional attribute.
180-210 | Creates a box pattern with a proportional attribute.
270 | Specifies non-proportional print mode.
340 | Specifies proportional print mode.

In Line 130, HEX(8B) specifies the print area as the 0 to 11th positions. In line 180, HEX(86) specifies the print area as the 0 to 6th positions. Proportional data is valid only in Proportional print mode (ESC p).

![Diagram of attribute values and print areas](image)
Example:

10 SELECT PRINT 004
20 REM CREATES BOXES IN PROPORTIONAL AND NON-PROPORTIONAL MODES
30 REM
40 REM COPY FROM ROM CHARACTER SET INTO DOWNLOAD CHARACTER SET
50 PRINT HEX(1B);"\";HEX(00);HEX(00);HEX(00);
60 REM SELECTS DOWNLOAD CHARACTER SET
70 PRINT HEX(1B);"%";HEX(01);HEX(00);
80 REM CREATES A BOX PATTERN
90 PRINT HEX(1B);"&";HEX(00);
100 REM SPECIFIES DOWNLOAD CHARACTERS TO BE ASSIGNED TO # AND $
110 PRINT "##";
120 REM CREATES A BOX PATTERN WITHOUT PROPORTIONAL ATTRIBUTE
130 PRINT HEX(BB);
140 PRINT HEX(FF);HEX(00);HEX(B1);HEX(00);HEX(FF);
150 PRINT HEX(00);HEX(00);HEX(00);HEX(00);HEX(00);
160 PRINT HEX(00);HEX(00);
170 REM CREATES A BOX GRAPHIC WITH PROPORTIONAL ATTRIBUTE
180 PRINT HEX(86);
190 PRINT HEX(FF);HEX(00);HEX(B1);HEX(00);HEX(FF);
200 PRINT HEX(00);HEX(00);HEX(00);HEX(00);
210 PRINT HEX(00);HEX(00);
220 PRINT "NON-PROPORTIONAL MODE"
230 PRINT "A BOX ---> #"
240 PRINT "FIVE BOXES ---> ###" #
250 PRINT
260 PRINT "TWO OF THESE HAVE PROPORTIONAL ATTRIBUTES"
270 PRINT HEX(1B);HEX(70);HEX(01)
280 PRINT
290 PRINT "PROPORTIONAL MODE"
300 PRINT "A BOX ---> #"
310 PRINT "FIVE BOXES ---> ###"
320 PRINT
330 PRINT "TWO OF THEM HAVE PROPORTIONAL ATTRIBUTES."
340 PRINT HEX(1B);HEX(70);HEX(00);
350 END

NON-PROPORTIONAL MODE
A BOX ---> #
FIVE BOXES ---> ###

TWO OF THESE HAVE PROPORTIONAL ATTRIBUTES

PROPORTIONAL MODE
A BOX ---> #
FIVE BOXES ---> ###

TWO OF THEM HAVE PROPORTIONAL ATTRIBUTES.
CHAPTER 7
BIT–IMAGE MODE CONTROL CODES

7.1. INTRODUCTION

You can use the Bit–Image mode control codes described in this chapter to print images in dot configurations from binary data contained in BASIC or other programs. The Text and Bit–Image modes are not fully independent of each other, in that parameters set in the Text mode are also effective in the Bit–Image mode.

The Bit–Image codes control the printer only when the PC printer driver is in the Transparent mode, a feature described in the Wang 2200 BASIC–2 Multiuser Operating System Software Bulletin Release 2.6.

7.2 RELATIONSHIP BETWEEN BIT–IMAGE DATA AND DOT WIRES

The following illustration shows the relationship between the bit–image data and the dot wires in the print head. You can print using any combination of the eight dot wires in the print head. In the Bit–Image mode, the 9th dot wire cannot be used.
If a bit is 1, the print head fires. If a bit is 0, the print head does not fire. For example, assume that data are given as follows:

A box with "●" denotes the bit 1 and a blank box denotes the bit 0. Using Table E-1, you can convert (00100010)₂ from the example on the left to (22)₁₆, and (01010000)₂ to (50)₁₆. The hex value for each bit of image data is entered as the term d in the control codes that follow.

Example: To create the following graphic pattern, the value of d must be determined for each bit of image data. In this example, the first bit of image data d₁ is (22)₁₆, and the 10th bit d₁₀ is (00)₁₆.

NOTE

The most significant bit (MSB) of the bit-image data corresponds to the dot wire at the uppermost position.

For each mode of printing, the user enters the bit-image data in the control code (d₁, d₂ etc.), and the number of dot positions (n₁, n₂) to be printed on a line. The number of dot positions occupied by the bit image data must equal n₁, n₂. The printer stops if they are not equal. See Esc K for the method of calculating n₁ and n₂.

7-2
7.3 CONTROL CODES IN BIT-IMAGE MODE

This section describes Bit-Image codes that can be entered in a BASIC or other program.

ESC K

Name: ESC K - Normal-density Bit-Image Mode
Expression: HEX(1B);"K";HEX(n1);HEX(n2);
           HEX(d1);HEX(d2);... HEX(Dn1,n2) ≅ bit-image data
Function: Sets normal-density Bit-Image mode. When this code is input, the data following ESC K code is printed in dot pattern(s). The maximum number of bit-image data per line is 816.

See also ESC L, ESC Y, ESC Z, ESC *, and ESC ?.

You can enter the graphics mode by sending the ESC K sequence and terms n1 and n2, which specify the number of dot positions to be printed per line. Dot positions in excess of 816 are ignored. Values n1 and n2 can be entered directly as integers, or can be calculated by the program.

HEX(d1), HEX(d2) are the bit-image data. HEX(Dn1,n2) is the last dot position of bit image data, which corresponds to n1,n2.

The values for n1 and n2 can be calculated as follows. In this example, the number of bit image data is 300.

$$n_1 = \text{(Number of data)} \mod 256$$
$$= 300 \mod 256$$
$$= (44)_{D} = (2C)_{H}$$

$$n_2 = \text{INT} \left( \frac{\text{Number of data}}{256} \right)$$
$$= \text{INT} \left( \frac{300}{256} \right)$$
$$= (1)_{D} = (01)_{H}$$

n1 is the remainder of an integer value (i.e., number of data) divided by 256, and n2 is the quotient of an integer value (i.e., number of data) divided by 256.
Execute the following program to see an example of normal-density bit-image printing. To print 80 columns of dots n₁ is (50)_H, and n₂ is (00)_H (line 40). Since the number of dot positions to be printed must agree with n₁, n₂, line 45 specifies 80 columns to be printed. The data to be printed is HEX(FF), causing eight pins to fire. The resulting output is a vertical bar, repeated until the line length is 80 vertical bars.

```
10 SELECT PRINT 004
20 REM BIT IMAGE PRINT (NORMAL DENSITY)
30 FOR I = 1 TO 5
40 PRINT HEX(1B);"K";HEX(50);HEX(00);
45 FOR N = 1 TO 80
50 PRINT HEX(FF);
60 NEXT N
70 PRINT
80 NEXT I
```
ESC L

Name: ESC L - Dual-Density Bit-Image Mode
Expression: \text{HEX}(1B); "L"; \text{HEX}(n_1); \text{HEX}(n_2);
\text{HEX}(d_1); \text{HEX}(d_2); \ldots \text{HEX}(Dn_1, n_2) \leftarrow \text{Bit-image data}
Function: ESC L sets Dual-Density Bit-Image mode. The maximum number of bit-image data per line is 1,632.

This code sets the Dual-Density Bit-Image mode. The dot pattern indicated by the bit-image data \((n_1\) and \(n_2\)) following ESC L is printed in dual-density. After the completion of the bit-image printing, the printer automatically returns to Text mode. For the procedure to obtain values for \(n_1\) and \(n_2\), refer to the description of the ESC K code.

The transfer sequence of bit-image data is the same as with ESC K (normal-density bit-image printing), except that bit-image printing can be performed in twice the dot density in the horizontal direction as compared to ESC K. In other words, bit-image data can be printed in 1,632 dot positions per line, thus producing denser graphic output. If you specify data exceeding 1,632 dot positions, the excess is ignored.

You can mix normal-density bit-image printing with dual-density bit-image printing on a line. You can also mix bit-image data with Text mode characters.

When you mix the characters in the Text mode and Dual-Density Bit-Image mode on a line, the amount by which the bit-image data decreases per character of Text data is twice that of normal-density bit-image (ESC K). The print speed decreases from the normal 16 inches per second (ips) to 8.

See also ESC K, ESC Y, ESC Z, ESC *, and ESC ?.
Example 1:
10 SELECT PRINT 004
20 REM BIT IMAGE PRINT (DUAL DENSITY)
30 FOR I = 1 TO 5
40 PRINT HEX (1B); "L"; HEX (50); HEX (00);
50 FOR N = 1 TO 80
60 PRINT HEX (FF);
70 NEXT N
80 PRINT
90 NEXT I
100 END

Example 2:
10 SELECT PRINT 004
20 PRINT HEX (1B); "L"; HEX (0A); HEX (00);
30 FOR J = 1 TO 10
40 READ A$
50 PRINT A$;
60 NEXT J
70 DATA HEX (22), HEX (50), HEX (8A), HEX (00),
    HEX (8F), HEX (00), HEX (BA), HEX (50), HEX (22),
    HEX (00)
80 END
ESC Y

Name: ESC Y - Double-Speed, Dual-Density Bit-Image Mode
Expression: \text{HEX}(1B); "Y"; \text{HEX}(n_1); \text{HEX}(n_2);
\text{HEX}(d_1); \text{HEX}(d_2); \ldots \text{HEX}(Dn_1, n_2) \triangleq \text{bit-image data}
Function: Sets Double-Speed, Dual-Density Bit-Image mode. The maximum number of bit-image data per line is 1,632.

When you enter Dual-Density Bit-Image mode (ESC L), the print speed decreases from the normal 16 ips to 8 ips. If you use ESC Y code, however, normal print speed is enabled and bit-image data of 1,632-positions/line is printed. For the procedure to obtain values for \(n_1\) and \(n_2\), refer to the description of the ESC K code. Horizontally adjacent dots cannot be printed in this mode.

See also ESC K, ESC L, ESC Z, ESC *, and ESC ?.

ESC Z

Name: ESC Z - Quadruple-Density Bit-Image Mode
Expression: \text{HEX}(1B); "Z"; \text{HEX}(n_1); \text{HEX}(n_2);
\text{HEX}(d_1); \text{HEX}(d_2); \ldots \text{HEX}(Dn_1, n_2) \triangleq \text{bit-image data}
Function: Sets Quadruple-Density Bit-Image mode. The maximum number of bit-image data per line is 3,264.

When you enter ESC Z code, the printer performs quadruple-density bit-image printing. For the procedure to obtain values for \(n_1\) and \(n_2\), refer to the description of the ESC K code. Horizontally adjacent dots cannot be printed in this mode.

The print speed is 8 ips, the same as that of Dual-Density Bit-Image mode (ESC L).

See also ESC K, ESC L, ESC Y, ESC *, and ESC ?
ESC *

Name: ESC * - Bit-Image Mode Selection
Expression: HEX(1B);"*";HEX(m);HEX(n1);HEX(n2);
            HEX(d1);HEX(d2); . . . HEX(Dn1,n2) ← bit-image data
Function: ESC * selects a Bit-Image mode.

<table>
<thead>
<tr>
<th>m</th>
<th>Mode</th>
<th>Dots/inch</th>
<th>Head Speed (inch/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00H</td>
<td>Normal Density</td>
<td>60</td>
<td>16</td>
</tr>
<tr>
<td>01H</td>
<td>Dual-Density</td>
<td>120</td>
<td>8</td>
</tr>
<tr>
<td>02H</td>
<td>Double-Speed,</td>
<td>120</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Dual-Density</td>
<td></td>
<td></td>
</tr>
<tr>
<td>03H</td>
<td>Quadruple-Density</td>
<td>240</td>
<td>8</td>
</tr>
<tr>
<td>04H</td>
<td>CRT Graphics</td>
<td>80</td>
<td>8</td>
</tr>
<tr>
<td>05H</td>
<td>Plotter Graphics (X Y=1:1)</td>
<td>72</td>
<td>12</td>
</tr>
<tr>
<td>06H</td>
<td>CRT Graphics II</td>
<td>90</td>
<td>8</td>
</tr>
</tbody>
</table>

For the procedure to obtain values for \( n_1 \) and \( n_2 \), refer to the description of the ESC K code.

If the value specified for \( m \) is not in the range 00H to 06H, the specified number of data is ignored. When \( m \) is 02H or 03H, the horizontally adjacent dots cannot be printed.

10 LPRINT HEX(1B);"*";HEX(00);HEX(00);HEX(01);
20 FOR I=1 TO 256: LPRINT "x";: NEXT
30 LPRINT "END"

This is the same as the following:
10 LPRINT HEX(1B);"K";HEX(00);HEX(01);
20 FOR I=1 TO 256: LPRINT "x";:NEXT
30 LPRINT "END"

See also ESC K, ESC L, ESC Y, ESC Z, and ESC ?.

NOTE

ESC K is the same as mode 0.
ESC L is the same as mode 1.
ESC Y is the same as mode 2.
ESC Z is the same as mode 3.
Example 1:
10 SELECT PRINT 004
20 REM MODE 0 TO MODE 6
30 DIM A$1
40 A$ = HEX(00)
50 FOR I = 1 TO 7
60 PRINT HEX(1B);"*";A$;HEX(0C);HEX(00);
70 A$ = A$ ADD HEX(01)
80 FOR J = 1 TO 12
90 READ R$
100 PRINT R$
110 NEXT J
120 DATA HEX(01),HEX(03),HEX(07),HEX(0F)
,HEX(1F),HEX(3F),HEX(3F),HEX(1F),HEX(0F)
,HEX(07),HEX(03),HEX(01)
130 RESTORE
140 NEXT I
150 END

Example 2:
10 SELECT PRINT 004
20 DIM A$1
30 PRINT HEX(1B);"*";HEX(00);
40 PRINT HEX(02);HEX(01);
50 A$ = HEX(01)
60 FOR I = 1 TO 258
70 PRINT A$
80 A$ = A$ ADD HEX(01)
90 NEXT I
100 PRINT HEX(0A);HEX(0D);HEX(0A)
110 END
ESC ?

Name: ESC ? - Bit-Image Mode Assignment
Expression: HEX(1B);"?";"n";HEX(m);
N=K, L, Y or Z. (n corresponds to K, L, Y or Z in Bit-Image mode.)
m = 00H to 06H (m is the equivalent of m used in the ESC * code.)
Function: Assigns the Bit-Image modes.

The printer has seven different 8-pin Bit-Image modes. The mode assigned at power ON is specified by ESC K, ESC L, ESC Y, ESC Z, or ESC *. However, you can change the assignment of the Bit-Image mode. For example, 1:1 row:column dot printing (Plotter Graphics) can be assigned and used as ESC K.

Example: To use ESC K as the Plotter Graphics mode,

PRINT HEX(1B);"?";"K";HEX(05);

ESC/}

Name: ESC - 9-pin Bit-Image mode
Expression: HEX(1B);" ";HEX(a);HEX(n1);HEX(n2);
HEX(d1F);HEX(d1S);HEX(d2F);HEX(d2S) ... (a=00H or 01H) (F: First byte, S: Second byte)
Function: Sets 9-pin Bit-Image mode.

a dots/inch
00H 60 (normal density)
01H 120 (dual-density)
As shown in the following illustration, the nine pins in the print head are divided into the upper eight pins and the lowest pin, which print in the order of the first and second bytes. These two bytes together control the pattern for a single dot position.

Data is sent in the following order:

`HEX(AA);HEX(80);HEX(55);HEX(00);`

Because two bytes of data are required to print one dot position, the number of dot positions printed is half of the total number of data sent \( (n_1 \text{ and } n_2) \).

For the procedure to obtain \( n_1 \) and \( n_2 \), refer to ESC K.

Example:

```
10 SELECT PRINT 004
20 FOR B = 1 TO 4
30 DIM A$1
40 A$ = HEX(00)
50 PRINT HEX(1B);HEX(5E);A$;HEX(0A);HEX(00);
60 PRINT HEX(00);HEX(80);HEX(01);HEX(80);
70 PRINT HEX(02);HEX(80);HEX(04);HEX(80);
80 PRINT HEX(08);HEX(80);HEX(10);HEX(80);
90 PRINT HEX(20);HEX(80);HEX(40);HEX(80);HEX(80);
100 PRINT HEX(80);HEX(00);HEX(00);
110 A$ = HEX(01)
120 PRINT HEX(1B);HEX(5E);A$;HEX(0A);HEX(00);
130 PRINT HEX(00);HEX(80);HEX(01);HEX(80);
140 PRINT HEX(02);HEX(80);HEX(04);HEX(80);
150 PRINT HEX(08);HEX(80);HEX(10);HEX(80);
160 PRINT HEX(20);HEX(80);HEX(40);HEX(80);HEX(80);
170 PRINT HEX(80);HEX(00);HEX(00);
180 NEXT B
```
7.4 PRINTING TEXT AND BIT-IMAGE DATA ON THE SAME LINE

When you mix text data and bit-image data on a line, note that the amount of printable bit-image data decreases due to print in Text mode.

<table>
<thead>
<tr>
<th>Print mode</th>
<th>No. of bit-image data decrease per 1 character</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pica, Emphasized</td>
<td>6</td>
</tr>
<tr>
<td>Condensed</td>
<td>3.5</td>
</tr>
<tr>
<td>Elite</td>
<td>5</td>
</tr>
</tbody>
</table>

When you set the Enlarged Print mode, the decrease in the amount of bit-image data printable per character of Text mode is twice that listed for each print mode.

Example 1:
The number of bit-image data printable on a line by the ESC K (normal-density) code after 3 condensed and 1 Pica characters have been printed is as follows:

\[ 816 - (3.5 \times 3) + (6 \times 1) = 799 \]

(Fractions are rounded off)

<table>
<thead>
<tr>
<th>3 cond. char.</th>
<th>1 pica character</th>
<th>ESC K</th>
<th>Bit-image data</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 \times 3</td>
<td>6 \times 1</td>
<td></td>
<td>799 max.</td>
</tr>
</tbody>
</table>

Tot. 816

Example 2:
The following operation is possible in mixed use of Text mode and Bit-Image mode on a line.

Data A | ESC K | n₁ | n₂ | Data B | Data C | ESC K | n₁ | n₂ | Data D

| Text data | Bit-image Text data | Bit-image data |

816 bit-image positions

Example 3:
The number of bit-image data printable on a line by the ESC L (dual-density) code after 3 condensed and 1 Pica characters are printed is:

\[ 1,599 = 1,632 - 2 \times (3.5 \times 3 + 6 \times 1) \]
APPENDIX A
SPECIFICATIONS

SPECIFICATIONS

Physical
Height
5.9 inches (15 cm)
Base Width (with paper
feed knob)
24.5 inches (62.2 cm)
Depth
14.0 inches (35.6 cm)
Net Weight
23 pounds (10.5 kg)

Speed (Maximum)
160-cps single-line burst speed

Character Set
192-character Wang International Standard Character Set for Information
Interchange (WISCI), which contains 96 ASCII characters and 96
international language characters and symbols.

Character Size
2.1 mm (W) X 3.1 mm (H)
(Pica-sized)
1.05 mm (W) X 3.1 mm (H)
(Pica-sized Condensed)
4.2 mm (W) X 3.1 mm (H)
(Pica-sized Enlarged)
1.4 mm (W) X 3.1 mm (H)
(Elite-sized)
2.8 mm (W) X 3.1 mm (H)
(Elite-sized Enlarged)
1.6 mm (H) (Superscript/Subscript)

Print Format
Horizontal (columns per line)
Pica-sized Emphasized 136
Enlarged 68
Condensed 233
Condensed Enlarged 116
Elite-sized 163
Elite-sized Enlarged 81
Line Spacing
Six lines per inch or programmable.

Print Direction
Bidirectional, with logic seeking in the text mode; unidirectional in the
bit-image mode or when programmed.

Print method
Impact dot matrix

Matrix Print Head
9-pin

Paper Specifications
Continuous form
4" to 16" wide - tractor feed
Cut sheet
7.25" to 14.4" wide - friction feed
Copies
One original plus two carbon copies, total thickness not to exceed 0.012"
(0.3 mm)

Paper path
Rear

Switches
POWER-OFF/ON, ON LINE, FF (Form Feed), LF (Line Feed)

Indicators
POWER, READY, PAPER OUT, ON LINE

Interface
Standard, Centronics-style 8-bit Parallel

Ribbon Cartridge
WLC black ribbon cartridge, life expectancy 3 million characters

Printer MTBF
5x10⁶ lines (excluding print head)

Power Requirements
Maximum Input Power
70 volt-amperes
Voltage
120VAC +10%
230VAC +10%
Frequency
49.5 to 60.5 Hz

Cable Lengths
Power 8 ft (2.4 m)
Data 12 ft (3.6 m)
Operating Environment

Temperature
41° to 95°F (5° to 35°C)

Humidity
10 to 80%, noncondensing

Available Accessories
None
B.1 PRINTER SERVICING

If a printer malfunction occurs, contact a Wang service representative. The only user-replaceable part in the printer is the matrix print head. Refer to Section B.2 for information on replacing the print head.

Procedures for periodic cleaning of the exterior and interior surfaces of your printer are described in Section 4.9.

B.2 PRINT HEAD REPLACEMENT

If one or more dot wires in the print head do not print satisfactorily, you can purchase a replacement print head from the Wang Supplies Division. The part number for the print head is listed in Appendix A. Use the following procedure to remove the defective print head and install a replacement.

1. Set the printer POWER switch to OFF, and then disconnect the printer power cord from the power outlet.

2. If the printer has been used in the past hour, the print head may be hot. Wait until the print head is cool before proceeding.

3. Remove the printer lid, printer cover, and ribbon cartridge.

4. Turn the head-lock lever clockwise, and then lift the print head upward a few inches (refer to Figure B-1).

5. Disconnect the print-head cable from the terminal board by supporting the terminal board with one hand and pulling the head cable straight out as shown in Figure B-1. Do not move the carriage assembly when there is no print head mounted on it. Discard the defective print head.

6. Place the new head in position on the carriage assembly and move the print-head lock lever clockwise, locking the head onto the carriage assembly.
7. Carefully insert the head cable into the connector on the terminal board.

NOTE

If the head is not firmly locked onto the carriage or if the head cable is not firmly attached to the terminal board, the print head may malfunction.

Figure B-1. Replacing the Print Head
APPENDIX C
MIXED PRINTING MODES

Table C-1 shows the print modes that can be used in combination with Pica and Elite print. The • symbol indicates that Mixed Print mode is available.

Table C-1. Mixed Printing Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Pitch</th>
<th>Enlarged</th>
<th>Emphasized</th>
<th>Super/Subscript</th>
<th>Condensed</th>
<th>Doubled</th>
<th>Underlined</th>
<th>Proportional</th>
<th>Italic</th>
<th>Unidirectional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pica</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Elite</td>
<td>•</td>
<td>•</td>
<td>×</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

Print mode choices are subject to the following conditions:

• X indicates that pitch takes priority and Mixed Print mode is not available.

• Emphasized characters are always printed in Proportional Print mode.

• Emphasized Print mode takes priority over Condensed Print mode.

• Characters are always double-struck in Superscript/Subscript Print mode.

• Proportional mode takes priority over Superscript/Subscript Print mode. Therefore, superscript/subscript characters cannot be printed in Proportional mode.
# APPENDIX D
## CONTROL CODES SUMMARY

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>FUNCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>Carriage Return</td>
<td>Starts printing</td>
<td>5-5</td>
</tr>
<tr>
<td>LF</td>
<td>Line Feed</td>
<td>Advances paper one line</td>
<td>5-4</td>
</tr>
<tr>
<td>ESC J</td>
<td>Single-Line n/216&quot; Line Spacing</td>
<td>Selects n/216&quot; line spacing for one print line</td>
<td>5-30</td>
</tr>
<tr>
<td>FF</td>
<td>Form Feed</td>
<td>Advances paper to next Top-of-Form position</td>
<td>5-5</td>
</tr>
</tbody>
</table>

## Print Mode

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>Function</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC M</td>
<td>Elite Print</td>
<td>Prints Elite characters</td>
<td>5-31</td>
</tr>
<tr>
<td>ESC P</td>
<td>Pica Print</td>
<td>Cancels ESC M code</td>
<td>5-34</td>
</tr>
<tr>
<td>SO</td>
<td>Shift Out</td>
<td>Prints enlarged characters</td>
<td>5-6</td>
</tr>
<tr>
<td>DC4</td>
<td>Enlarged Print Cancel</td>
<td>Cancels enlarged print</td>
<td>5-10</td>
</tr>
<tr>
<td>ESC W</td>
<td>Enlarged Print</td>
<td>Selects/cancels enlarged print</td>
<td>5-39</td>
</tr>
<tr>
<td>SI</td>
<td>Shift In</td>
<td>Prints condensed characters</td>
<td>5-7</td>
</tr>
<tr>
<td>DC2</td>
<td>Condensed Print Cancel</td>
<td>Cancels condensed print</td>
<td>5-9</td>
</tr>
<tr>
<td>ESC SO</td>
<td>Shift Out</td>
<td>Same as SO code</td>
<td>5-11</td>
</tr>
<tr>
<td>ESC SI</td>
<td>Shift In</td>
<td>Same as SI code</td>
<td>5-11</td>
</tr>
<tr>
<td>ESC -</td>
<td>Underlined Print</td>
<td>Selects/cancels underlined print</td>
<td>5-16</td>
</tr>
<tr>
<td>ESC E</td>
<td>Emphasized Print</td>
<td>Prints emphasized characters</td>
<td>5-28</td>
</tr>
<tr>
<td>ESC F</td>
<td>Emphasized Print</td>
<td>Cancels emphasized print</td>
<td>5-28</td>
</tr>
<tr>
<td>ESC G</td>
<td>Doublestrike Print</td>
<td>Prints doublestrike characters</td>
<td>5-29</td>
</tr>
<tr>
<td>ESC H</td>
<td>Doublestrike Print Cancel</td>
<td>Cancels doublestrike print</td>
<td>5-29</td>
</tr>
<tr>
<td>ESC S</td>
<td>Superscript/Subscript Print</td>
<td>Prints superscript/subscript characters</td>
<td>5-36</td>
</tr>
<tr>
<td>ESC T</td>
<td>Superscript/Subscript Print Cancel</td>
<td>Cancels superscript/subscript print</td>
<td>5-37</td>
</tr>
<tr>
<td>CODE</td>
<td>NAME</td>
<td>FUNCTION</td>
<td>PAGE</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
<td>-----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>ESC !</td>
<td>Print Mode</td>
<td>Selects print mode</td>
<td>5-12</td>
</tr>
<tr>
<td>ESC p</td>
<td>Proportional Spaced Print</td>
<td>Prints proportional spaced characters</td>
<td>5-43</td>
</tr>
<tr>
<td>BS</td>
<td>Backspace</td>
<td>Prints and backspaces by one character</td>
<td>5-3</td>
</tr>
</tbody>
</table>

**Line Spacing**

| ESC 0 | 1/8" Line Spacing   | Selects 1/8" line spacing                    | 5-19 |
| ESC 1 | 7/72" Line Spacing  | Selects 7/72" line spacing                   | 5-19 |
| ESC 2 | 1/6" Line Spacing    | Selects 1/6" line spacing                    | 5-20 |
| ESC 3 | n/216" Line Spacing  | Selects n/216" line spacing                  | 5-21 |
| ESC A | n/72" Line Spacing   | Selects n/72" line spacing                   | 5-24 |

**Format Control**

| HT   | Horizontal TAB         | Executes horizontal TAB                       | 5-3  |
| ESC D| Horizontal TAB         | Sets TAB positions                           | 5-27 |
| VT   | Vertical TAB           | Executes vertical TAB                         | 5-4  |
| ESC/ | VFU Channel Selection  | Selects VFU channel                          | 5-16 |
| ESC B| Vertical TAB           | Sets TAB positions                           | 5-25 |
| ESC b| VFU Position Setting   | Sets VFU TAB positions                       | 5-40 |
| ESC C| Form Length Setting    | Sets form length                             | 5-26 |
| ESC CO| Form Length Setting    | Sets form length in inch increments          | 5-26 |
| ESC N| Skip-over Perforation  | Sets skip-over perforation                   | 5-32 |
|      | Setting                |                                               |      |
| ESC O| Skip-over Perforation  | Cancels skip-over perforation                | 5-33 |
|      | Cancel                 |                                               |      |
| ESC Q| Right Margin           | Sets right margin                            | 5-35 |
| ESC L| Left Margin            | Sets left margin                             | 5-41 |

**Input Data Control**

<p>| DC1  | Selection of Printer   | Selects printer                              | 5-8  |
| DC3  | Deselection of Printer | Deselects printer                            | 5-9  |
| DEL  | Delete                  | Cancels last printable data                  | 5-45 |
| CAN  | Cancel                  | Cancels data stored in the print buffer      | 5-10 |</p>
<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>FUNCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Download Mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Bit Image Mode</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Non-command Sequence</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Download Mode

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>FUNCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC &amp;</td>
<td>Create Download Characters</td>
<td>Creates and loads characters</td>
<td>6-3</td>
</tr>
<tr>
<td>ESC %</td>
<td>CG Selection</td>
<td>Selects ROM CG or Download CG</td>
<td>6-5</td>
</tr>
<tr>
<td>ESC :</td>
<td>ROM CG Set Copy</td>
<td>Copies ROM CG set</td>
<td>6-6</td>
</tr>
</tbody>
</table>

### Miscellaneous

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>FUNCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEL</td>
<td>Bell</td>
<td>Sounds the tone</td>
<td>5-2</td>
</tr>
<tr>
<td>ESC 8</td>
<td>Paper-end Detector Disable</td>
<td>Disables paper-end signal</td>
<td>5-22</td>
</tr>
<tr>
<td>ESC 9</td>
<td>Paper-end Detector Enable</td>
<td>Enables paper-end signal</td>
<td>5-22</td>
</tr>
<tr>
<td>ESC &lt;</td>
<td>One-Line Unidirection Printing</td>
<td>Prints from left most to right for one line</td>
<td>5-23</td>
</tr>
<tr>
<td>ESC U</td>
<td>Unidirectional Printing</td>
<td>Sets/cancels unidirectional printing</td>
<td>5-38</td>
</tr>
<tr>
<td>ESC s</td>
<td>Half Speed Printing</td>
<td>Sets/cancels half speed printing</td>
<td>5-44</td>
</tr>
<tr>
<td>ESC @</td>
<td>Printer Initialization</td>
<td>Initializes the printer</td>
<td>5-23</td>
</tr>
</tbody>
</table>

### Bit Image Mode

<table>
<thead>
<tr>
<th>CODE</th>
<th>NAME</th>
<th>FUNCTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC K</td>
<td>Normal-Density Bit-Image Mode</td>
<td>Selects Normal-Density Bit-Image mode</td>
<td>7-3</td>
</tr>
<tr>
<td>ESC L</td>
<td>Dual-Density Bit-Image Mode</td>
<td>Selects Dual-Density Bit-Image mode</td>
<td>7-5</td>
</tr>
<tr>
<td>ESC Y</td>
<td>Double-Speed Dual-Density Bit-Image Mode</td>
<td>Selects Double-Speed Dual-density Bit-Image mode</td>
<td>7-7</td>
</tr>
<tr>
<td>ESC Z</td>
<td>Quadruple-Density Bit-Image</td>
<td>Selects Quadruple-density Bit-Image mode</td>
<td>7-7</td>
</tr>
<tr>
<td>ESC *</td>
<td>Bit-Image Mode Selection</td>
<td>Selects Bit-Image mode</td>
<td>7-8</td>
</tr>
<tr>
<td>ESC ?</td>
<td>Bit-Image Mode Assignment</td>
<td>Assigns Bit-Image mode</td>
<td>7-10</td>
</tr>
<tr>
<td>ESC 9</td>
<td>9-pin Bit-Image Mode</td>
<td>Selects 9-pin Bit-Image mode</td>
<td>7-10</td>
</tr>
</tbody>
</table>

### Non-command Sequence

<table>
<thead>
<tr>
<th>NAME</th>
<th>Function</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Test</td>
<td>Power ON while pressing LF button</td>
<td></td>
</tr>
<tr>
<td>Hex Dump</td>
<td>Power ON while pressing LF and FF buttons</td>
<td></td>
</tr>
</tbody>
</table>

D-3
APPENDIX E
PRINTER CHARACTER SET

The WISCII character set contained in the printer is shown in Table E-1, together with the decimal, hexadecimal, and binary code for each character. Table E-2 contains a listing of the names of the characters.

Decimal Value

The decimal value associated with each character in Table E-1 is shown in the box in the lower right corner of each character. For example, the decimal value for A is 65.

Hexadecimal (HEX) Value

A two-digit hex code for each character is shown in table E-1. The first digit is located at the top of each column (0 through F). The second digit is located in the rows on the left side of the table. To find the hex code for any character, look for the first hex digit at the top of the column for that character; then look for the second hex digit located at the left, in the same row as the character. For example, the hex code for character A is 41.

Binary Value

The four low-order bits of the binary number for each character are listed in the column at the left side of Table E-1. The four high-order bits are listed in the row at the top of the table. For example, the binary value of A is 01000001.
Table E-1. Printer Character Set

<table>
<thead>
<tr>
<th>Hex. No.</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary No.</td>
<td>0000</td>
<td>0001</td>
<td>0010</td>
<td>0011</td>
<td>0100</td>
<td>0101</td>
<td>0110</td>
<td>0111</td>
<td>1000</td>
<td>1001</td>
<td>1010</td>
<td>1011</td>
<td>1100</td>
<td>1101</td>
<td>1110</td>
<td>1111</td>
</tr>
<tr>
<td>0</td>
<td>0000</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
<td>0100</td>
<td>0101</td>
</tr>
<tr>
<td>1</td>
<td>DC1</td>
<td>DC2</td>
<td>DC3</td>
<td>DC4</td>
<td>DC5</td>
<td>DC6</td>
<td>DC7</td>
<td>DC8</td>
<td>DC9</td>
<td>DCA</td>
<td>DCB</td>
<td>DCC</td>
<td>DCD</td>
<td>DCE</td>
<td>DCF</td>
<td>DCG</td>
</tr>
<tr>
<td>2</td>
<td>0100</td>
<td>0101</td>
<td>0110</td>
<td>0111</td>
<td>1000</td>
<td>1001</td>
<td>1010</td>
<td>1011</td>
<td>1100</td>
<td>1101</td>
<td>1110</td>
<td>1111</td>
<td>1000</td>
<td>1001</td>
<td>1010</td>
<td>1011</td>
</tr>
<tr>
<td>3</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
<td>BS</td>
</tr>
<tr>
<td>4</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
<td>HT</td>
</tr>
<tr>
<td>5</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
<td>LF</td>
</tr>
<tr>
<td>6</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
<td>VT</td>
</tr>
<tr>
<td>7</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
<td>FF</td>
</tr>
<tr>
<td>9</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
<td>SO</td>
</tr>
<tr>
<td>Hex Character Name</td>
<td>Hex Character Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 SPACE</td>
<td>4F O</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 EXCLAMATION</td>
<td>50 P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 DOUBLE QUOTE</td>
<td>51 Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23 NUMBER SIGN</td>
<td>52 R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 DOLLAR SIGN</td>
<td>53 S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 PERCENT</td>
<td>54 T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26 AMPERSAND</td>
<td>55 U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27 SINGLE QUOTE</td>
<td>56 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 LEFT PARENTHESIS</td>
<td>57 W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 RIGHT PARENTHESIS</td>
<td>58 X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A ASTERISK</td>
<td>59 Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B PLUS SIGN</td>
<td>5A Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2C COMMA</td>
<td>5B LEFT BRACKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D MINUS SIGN</td>
<td>5C SLASH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2E PERIOD</td>
<td>5D RIGHT BRACKET</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2F SLASH</td>
<td>5E UP ARROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 ZERO</td>
<td>5F UNDERSCORE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 ONE</td>
<td>60 OPEN QUOTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 TWO</td>
<td>61 a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 THREE</td>
<td>62 b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 FOUR</td>
<td>63 c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 FIVE</td>
<td>64 d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 SIX</td>
<td>65 e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37 SEVEN</td>
<td>66 f</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 EIGHT</td>
<td>67 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39 NINE</td>
<td>68 h</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B COLON</td>
<td>69 i</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B SEMICOLON</td>
<td>6A j</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C LESS THAN SIGN</td>
<td>6B k</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3D EQUAL SIGN</td>
<td>6C l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3E GREATER THAN SIGN</td>
<td>6D m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3F QUESTION MARK</td>
<td>6E n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 AT SIGN</td>
<td>6F o</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 A</td>
<td>70 p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 B</td>
<td>71 q</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 C</td>
<td>72 r</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 D</td>
<td>73 s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 E</td>
<td>74 t</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46 F</td>
<td>75 u</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47 G</td>
<td>76 v</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 H</td>
<td>77 w</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49 I</td>
<td>78 x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4A J</td>
<td>79 y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4B K</td>
<td>7A z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4C L</td>
<td>7B LEFT BRACE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4D M</td>
<td>7C RIGHT BRACE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4E N</td>
<td>7E APPROXIMATE SYMBOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hex Character Name</td>
<td>Hex Character Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7F DELETE</td>
<td>D0 ICELANDIC THORN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A0 BLANK</td>
<td>D1 ICELANDIC ETH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1 a GRAVE</td>
<td>D2 Y ACUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2 a ACUTE</td>
<td>D3 S CEDILLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3 a UMLAUT</td>
<td>D4 a ACUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4 a TILDE</td>
<td>D5 U CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A5 E UMLAUT</td>
<td>D6 U GRAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A6 a ANGSTROM</td>
<td>D7 U ACUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A7 PLUS MINUS SIGN</td>
<td>D8 U UMLAUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A8 LIGATURE a-e</td>
<td>D9 a TILDE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A9 c CEDILLA</td>
<td>DA DEGREE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA INVERTED EXCLAM</td>
<td>DB CENT SIGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB INVERTED QUESTION</td>
<td>DC a SUPERIOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC e CIRCUMFLEX</td>
<td>DD BULLET</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD e GRAVE</td>
<td>DE SECTION SYMBOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE E ACUTE</td>
<td>DF PARAGRAPH SYMBOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AF E UMLAUT</td>
<td>E0 ICELANDIC THORN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B0 G HACEK</td>
<td>E1 ICELANDIC ETH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1 IJ LIGATURE</td>
<td>E2 y ACUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2 DOTTED I</td>
<td>E3 s CEDILLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3 I CIRCUMFLEX</td>
<td>E4 DOWN ARROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4 I GRAVE</td>
<td>E5 u CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B5 I ACUTE</td>
<td>E6 u GRAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B6 I UMLAUT</td>
<td>E7 u ACUTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B7 LL LIGATURE</td>
<td>E8 u UMLAUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B8 N TILDE</td>
<td>E9 LEFT ARROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B9 O CIRCUMFLEX</td>
<td>EA MONETARY SYMBOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BA O GRAVE</td>
<td>EB RIGHT ARROW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BB O ACUTE</td>
<td>EC o SUPERIOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC O UMLAUT</td>
<td>ED a CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BD O TILDE</td>
<td>EE BETA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BE O E LIGATURE</td>
<td>EF DOT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BF SLASHED O</td>
<td>F0 POUND STERLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C0 g HACEK</td>
<td>F1 FLORIN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 ij LIGATURE</td>
<td>F2 YEN SYMBOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2 DOT-LESS i</td>
<td>F3 1/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3 i CIRCUMFLEX</td>
<td>F4 1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4 i GRAVE</td>
<td>F5 3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5 i ACUTE</td>
<td>F6 a CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C6 I UMLAUT</td>
<td>F7 a GRAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7 ll LIGATURE</td>
<td>F8 a UMLAUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C8 n TILDE</td>
<td>F9 a ANGSTROM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C9 o CIRCUMFLEX</td>
<td>FA a E LIGATURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA o GRAVE</td>
<td>FB C CEDILLA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CB o ACUTE</td>
<td>FC E CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC o UMLAUT</td>
<td>FD E GRAVE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD o TILDE</td>
<td>FE E CIRCUMFLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE oe LIGATURE</td>
<td>FF DELETE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
INDEX

A

Adjusting for paper thickness, 3-12

B

Beeper, 2-3
Bit-image mode, 7-1 to 7-12
Bit-image mode control codes, 7-3 to 7-11

C

Character names, E-3
Character set, E-1, E-2
Combining select parameters, 4-7
Console output, 4-6
Control codes summary D-1 to D-3
Control panel, 2-2

D

Deselecting the printer, 4-7
DIP switch, 2-5 to 2-8
DIP switch cover, 2-4, 2-8
Download mode, 6-1 to 6-13
Download mode control codes, 6-3 to 6-7

F

Form Feed (FF) button, 2-2

H

Hex Dump mode, 2-8

I

Indicators, 2-2
Initialization, 3-2
Installation, 1-3

L

Line Feed (LF) button 2-2

M

Maintenance, B-1
Maintenance agreement, 1-3
Mixed printing modes, C-1

O

ON LINE button, 2-2
ON/OFF switch, 2-1
Ordering supplies, 1-2

P

Paper Loading, 3-7 to 3-12
pin-feed paper, 3-7 to 3-9
cut-sheet paper, 3-10 to 3-12
Paper out detector, 2-3
Paper specifications, A-2
Paper-feed knob 2-4
Paper-handling controls, 2-4
Paper-release lever, 2-4
Paper-tractor installation 3-4 to 3-6
Paper-tractor removal 3-3
Preventive maintenance, 3-16
Print head replacement, B-1, B-2
Printer description, 1-1, 1-2
Printer operation summary, 3-1, 3-2
Printer self-test, 2-4

R

Removing paper 3-10, 3-12
Ribbon cartridge installation, 3-14
INDEX (continued)

S
Select List, 4-6
Select Print, 4-5
Select statement, 4-1 to 4-5
Sending control codes, 5-2
Shipping lock, 3-3, 3-4
Specifications, A-1
Summary of select statements, 4-8

T
Testing the printer, 2-4
Text mode, 5-1 to 5-45
Text mode control codes, 5-2 to 5-45
Customer Comment Form

Help Us Help You . . .

We've worked hard to make this document useful, readable, and technically accurate. Did we succeed? Only you can tell us! Your comments and suggestions will help us improve our technical communications. Please take a few minutes to let us know how you feel.

<table>
<thead>
<tr>
<th>How did you receive this publication?</th>
<th>How did you use this Publication?</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Support or Sales Rep</td>
<td>□ Introduction to the subject</td>
</tr>
<tr>
<td>□ Wang Supplies Division</td>
<td>□ Aid to advanced knowledge</td>
</tr>
<tr>
<td>□ From another user</td>
<td>□ Classroom text (student)</td>
</tr>
<tr>
<td>□ Enclosed with equipment</td>
<td>□ Classroom text (teacher)</td>
</tr>
<tr>
<td></td>
<td>□ As a reference manual</td>
</tr>
<tr>
<td></td>
<td>□ Self-study text</td>
</tr>
<tr>
<td></td>
<td>□ Other _________________________</td>
</tr>
</tbody>
</table>
WANG LABORATORIES, INC.
PUBLICATIONS DEVELOPMENT
ONE INDUSTRIAL AVENUE
LOWELL, MASSACHUSETTS 01851
Order Form for Wang Manuals and Documentation

1. Customer Number (If Known)

2. Bill To: 
   
3. Ship To: 
   
4. Customer Contact: 
   Phone: ( )
   Name: 

5. Taxable or Tax Exempt Number
   Yes □
   No □

6. Credit This Order to
   Salesperson's Name: 
   Employee No.: 
   RDB No.: 

7. Document Number Description Quantity Unit Price Total Price
   
8. Authorized Signature 
   Date: 

☐ Check this box if you would like a free copy of the 
Corporate Publications Literature Catalog (700-5294)

Ordering Instructions

1. If you have purchased supplies from Wang before, 
   and know your Customer Number, please write it here.
2. Provide appropriate Billing Address and Shipping Address.
3. Please provide a phone number and name, should it be 
   necessary for WANG to contact you about your order.
4. Your purchase order number and date.
5. Show whether your order is taxable or not.
6. If tax exempt, please provide your exemption number.
7. If you wish credit for this order to be given to a WANG 
   salesperson, please complete.
8. Show part numbers, description and quantity for each 
   product ordered.
9. Pricing extensions and totaling can be completed at your 
   option, Wang will refigure these prices and add freight on 
   your invoice.
10. Signature of authorized buyer and date.

Wang Supplies Division Terms and Conditions

1. TAXES — Prices are exclusive of all sales, use, and like 
   taxes.
2. DELIVERY — Delivery will be F.O.B. Wang's plant. 
   Customer will be billed for freight charges; and unless 
   customer specifies otherwise, all shipments will go best 
   way surface as determined by Wang. Wang shall not 
   assume any liability in connection with the shipment nor 
   shall the carrier be construed to be an agent of Wang. 
   If the customer requests that Wang arrange for insurance 
   the customer will be billed for the insurance charges.
3. PAYMENT — Terms are net 30 days from date of invoice. 
   Unless otherwise stated by customer, partial shipments 
   will generate partial invoices.
4. PRICES — The prices shown are subject to change without 
   notice. Individual document prices may be found in the 
   Corporate Publications Literature Catalog (700-5294)
5. LIMITATION OF LIABILITY — In no event shall Wang be liable 
   for loss of data or for special, incidental or consequential 
   damages in connection with or arising out of the use of or 
   information contained in any manuals or documentation 
   furnished hereunder.
WANG LABORATORIES, INC.
Supplies Division
c/o Order Entry Dept.
M/S 1711
800 Chelmsford Street
Lowell, MA 01851