HORIZON H80A
USERS MANUAL

CENTRONICS®

CENTRONICS®

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MODEL H80-1A, H80-2A
PRINTER

37401801-9B00   REV B   APRIL 1984

USERS MANUAL

WARNING

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

JANUARY 1, 1981   APPROVED, CLASS B

PREFACE

Horizon H80A Printer

The following describes briefly the basic character of the Centronics Model H80A dot-matrix printer. Some of the highlights of this versatile, compact printer are summarized below.

QUALITY—The Centronics Model H80A is a high-quality printer, designed for operation with popular computer software and word processors.

RELIABILITY—This newly-designed printer has a reputation for very high reliability among those who have tested and used it extensively. It is ruggedly built and runs cool hour after hour. MTBF is conservatively rated at 2000 hours.

HIGH SPEED—The fast, smooth paper feed system increases the overall (throughput) speed, which equals and exceeds that of competitive printers.

EPSON COMPATIBILITY—The Model H80A is Epson FX-80 control sequence compatible. The parallel interface communicates through a 36-pin Amphenol connector using the Centronics data transfer format.

NLQ CHARACTERS—The near-letter quality character set prints correspondence-quality "typed" materials without interruption such as replacing a font wheel for style changes on a daisy-wheel printer. Italic NLQ is also available as an option.

EASY PAPER HANDLING—This printer uses the three standard styles of paper (sheet, roll, fanfold) with self-contained hardware. Paper loading is fast, easy and positive.

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SECTION 4—PREVENTIVE MAINTENANCE

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APPENDIX A—GENERAL SPECIFICATIONS

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APPENDIX C—DATA TABLES

APPENDIX D—CHARACTER SETS

SECTION 1

PRINTER SETUP

1.1 PURPOSE

This section provides instructions for preparing the printer for operation. Please follow the guidelines in this section to ensure a successful installation.

CAUTION

Do not attempt to operate the printer without first removing the print head restraint (and shipping screws). To do so may cause damage to the printer and void the warranty.

1.2 UNPACKING

1. Carefully remove the printer (with foam endcaps) from the carton.

2. Remove the foam end-caps from the printer and place the printer (in its plastic bag) on a safe surface, such as a rug or table top.

3. Remove the printer from the plastic bag and place upside down on a rug or newspaper to prevent scratching.

4. Refer to Figure 1-1. Remove (2) phillips-head screws from the bottom front of the printer. These are shipping screws. The printer runs quieter with these screws removed.

5. Place the printer upright in the normal position and open the front hinged cover.

6. Refer to Figure 1-2. Remove the elastic band restraining the print head.

—RESTRAINT REMOVAL IS COMPLETE—
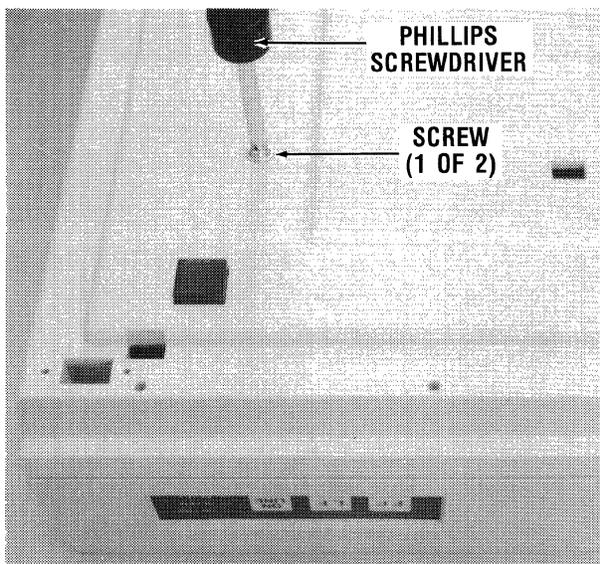
Figure 1-1 Remove Bottom Screws (2)
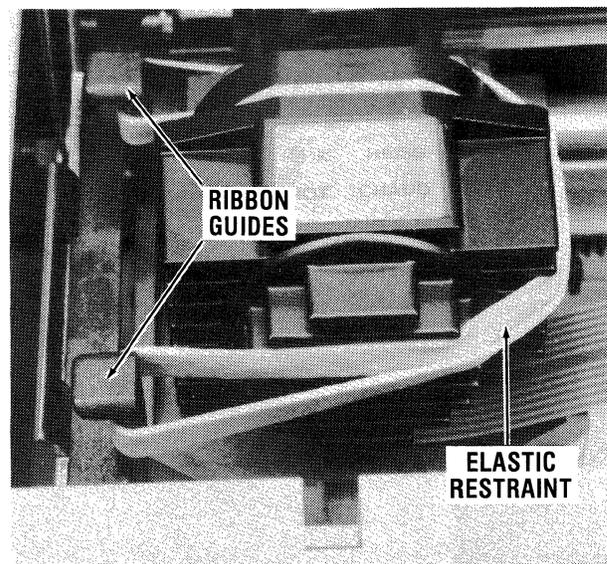
Figure 1-2 Remove Head Restraint

1.3 SITE SELECTION, GENERAL

Computer-operated equipment such as this printer should be installed in a clean, relatively cool environment (normal room temperature is suitable). The electrical service should be free of electrical noise spikes that are caused by industrial equipment, refrigerators, air conditioners, etc. Computer equipment operates most reliably on its own separate outlet, isolated from other noise-generating lines. For most reliable operation, connect printer to ground (Figure 1-3).

1.4 PRINTER PLACEMENT

The printer should be stationed on a safe, flat surface, preferably on a typewriter pad to ensure quietest operation. If operating with fan-fold paper, locate the supply and the catch basket (if used) for smooth paper feed.

1.5 ELECTRICAL SUPPLY

This printer should be plugged into the following electrical supply:

- Model H80-1 (domestic, standard unit) 115 VAC, 60 Hz

- Model H80-2 (overseas unit) 230 VAC, 50 Hz

Printer power consumed is 120 watts maximum for either model.

--- CAUTION ---
Check the electrical supply to ensure that it is proper for the printer model described above. Improper electrical power may cause damage to the printer.

1.6 DIP SWITCH SETTINGS

Some special functions of the printer are enabled by setting switches before placing the printer into service. Once the switches are set, they are normally left in that position. Refer to paragraph 2.10 for details.

1.7 INTERFACE TO COMPUTER

The printer uses a 36-pin Amphenol #57-40360 female connector. Make connection to computer with power OFF at the computer and printer. Refer to Appendix B for Interface Specifications and signal descriptions.

1.8 OPERATING INSTRUCTIONS

Instructions on use of control panel switches, ribbon loading, paper loading, and setting of DIP switches (for special functions) are contained in Section 2 Printer Operation.

(BOTTOM VIEW OF PRINTER)
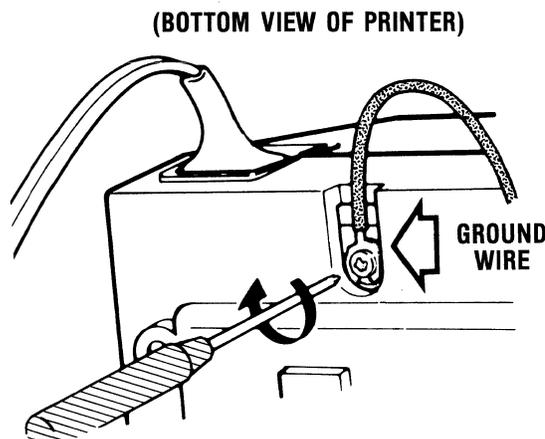
GROUND
WIRE

Figure 1-3 Ground Connection

SECTION 2
PRINTER OPERATION

(SERIOUS STUFF BELOW)
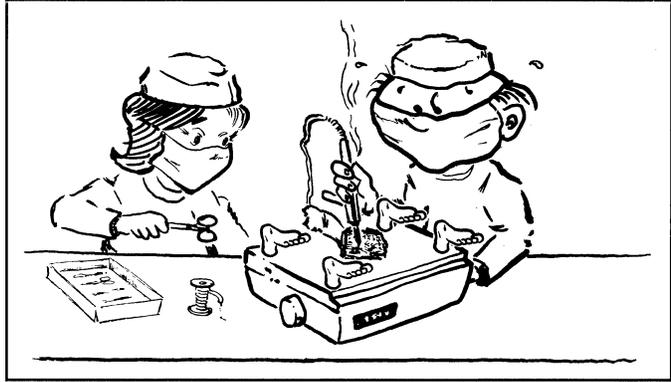
2.1 BEFORE YOU OPERATE THE PRINTER

Please be certain that you have prepared the printer as outlined in Section 1 before you operate it. This could prevent damage to the mechanism and avoid operating problems.

CAUTION

No attempt should be made to operate the printer without first removing the mechanism restraint (used for shipping) and taking other preparatory action. Refer to Section 1 for directions.

2.2 CONTROLS, SWITCHES AND INDICATORS

Figure 2-1 shows the printer ready to operate. The main external controls and indicators are numbered and described as follows:

1. POWER SWITCH (behind platen knob)—The Power Switch is a rocker type that turns the electrical power ON and OFF as indicated by the READY lamp.

2. PLATEN KNOB—This knob turns the platen (rubber roller) which feeds the paper manually.

3. CONTROL LEVER—This 3-position lever works as follows:
   - PAPER SET—The bail is moved toward the front of the printer to allow the paper to be moved up and around the front of the platen.
   - FRICTION—Cut sheet paper is pressed against the platen for positive paper feed.
   - PIN FEED—The pressure is released from the platen for fanfold (pinfeed) paper and the tractors drive the paper.
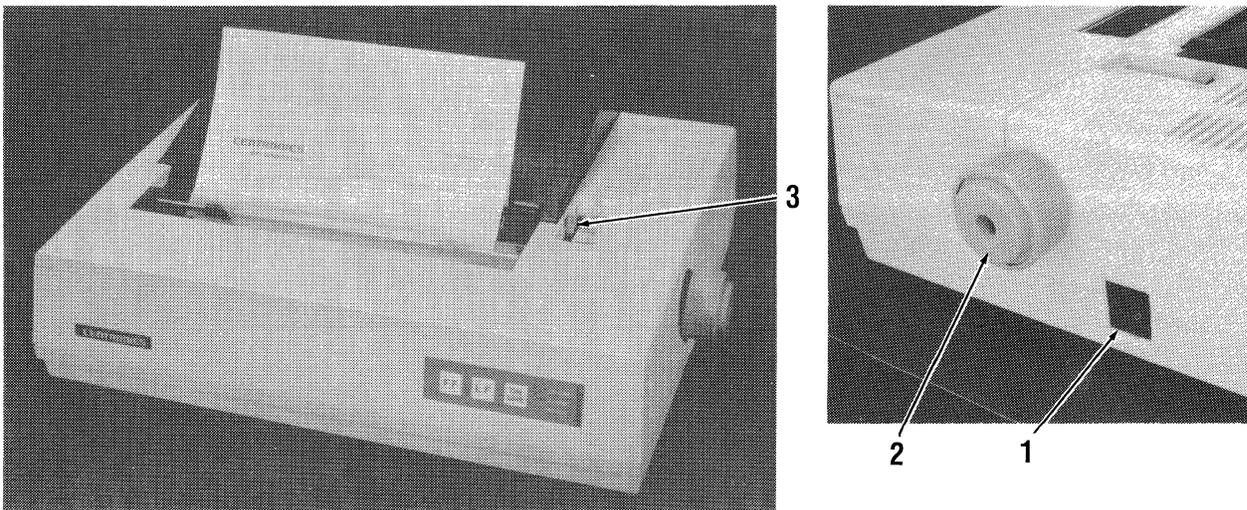
Figure 2-1A Main External Controls

4. FF (Form Feed) Switch—This button advances the paper to the next top of form when the printer is OFF LINE. If held in when power is turned on, enables Near Letter Quality print.

5. LF Switch—When the printer is OFF LINE, this button advances the paper by one line if pressed momentarily, and feeds paper continuously if held when the printer is OFF LINE. If held in when power is turned on, starts self-test.

6. ON LINE Switch—This button controls the interface connection to the computer. When power is turned ON, the printer goes ON LINE automatically (ready to receive data). Pressing this button places the printer OFF LINE, allowing local paper control (LF & FF). Pressing it once more places the printer ON LINE again.

7. ON LINE Lamp—This light indicates that the printer is ready to receive data. It is controlled by the ON LINE switch.

8. ALARM Lamp—This light indicates that the paper supply is exhausted. The slide switch behind the tractor must be in the "OTHERS" position to enable the ALARM lamp. The beeper alarm may also sound depending on DIP Switch settings.

9. READY Lamp—This light indicates that power is applied to the printer and the POWER switch is on.
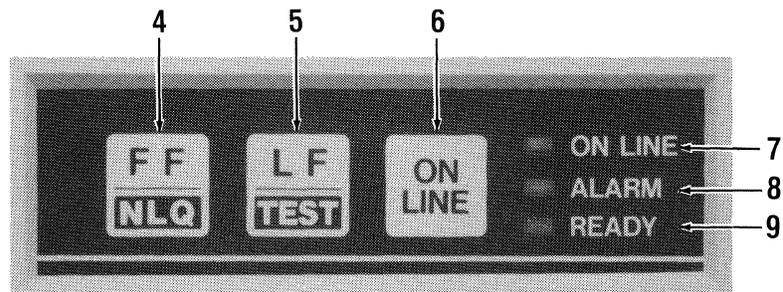
Figure 2-1B Control Panel Switches and Indicators

2.3 INTERNAL CONTROLS (Refer to Figure 2-2)

The Control Lever (3) is shown in the PAPER SET position thus the bail (10) is moved forward to allow paper to be fed around to the front of the platen. When the Control Lever is moved to FRICTION, the bail springs back onto the platen.
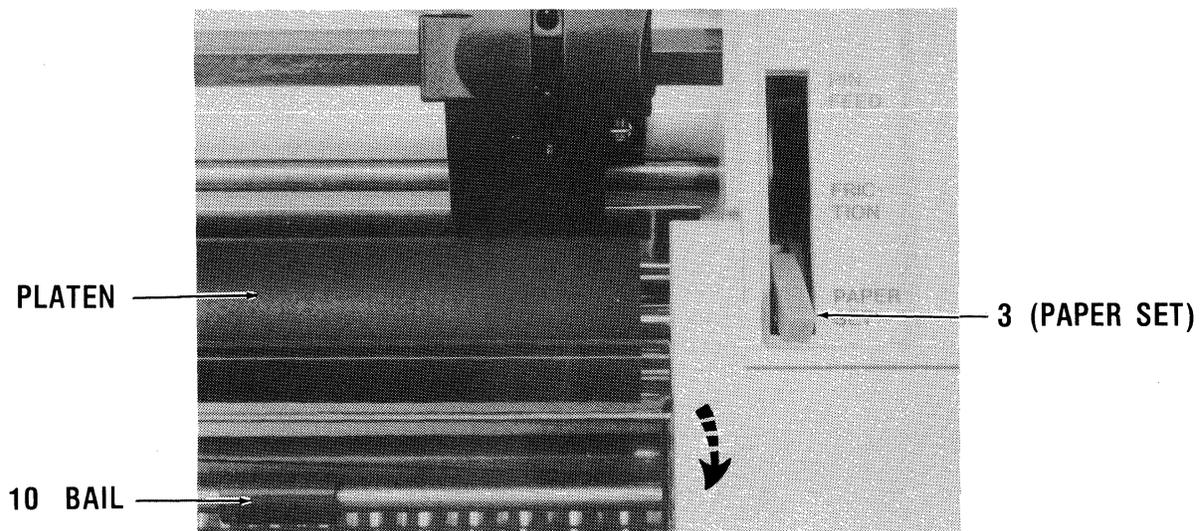
Figure 2-2A Internal Controls

The CUT SHEET/OTHERS Switch (11) works as follows:

CUT SHEET—When single sheets of paper are used, this switch should be in the CUT SHEET position; otherwise, the Paper End alarm will beep and the printer will go OFF LINE. This is because the sensor switch is in the (left) tractor which is used for roll and fanfold paper only.

OTHERS—When roll or fanfold paper is used, the switch may be placed in the OTHERS position if desired. This enables the Paper End alarm and OFF LINE condition when the paper runs out. This informs the computer and no data is lost.
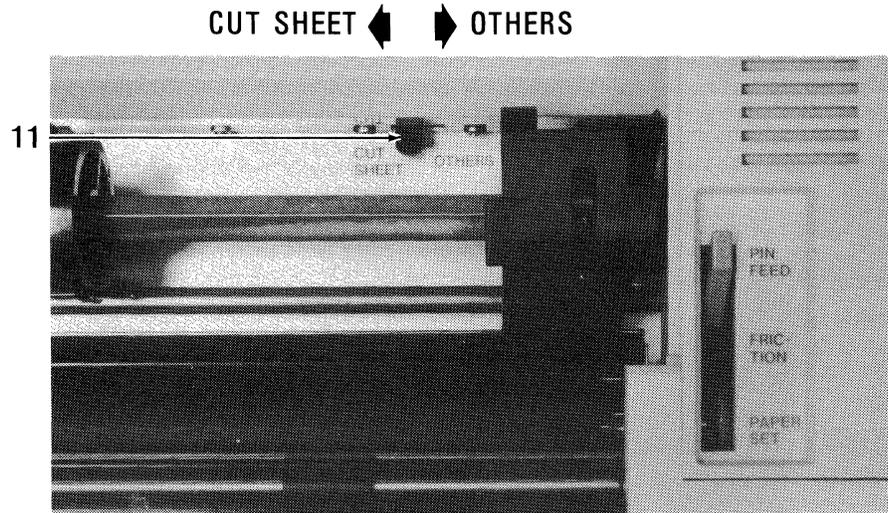
CUT SHEET ◀   ▶ OTHERS

Figure 2-2B Cut Sheet/Others Switch (Paper End Alarm Control)

PRINT HEAD POSITION—The five-position lever (Figure 2-3C) moves the print head forward and backward to accommodate single or multipart forms. The #2 position is for single sheet and the #4 position is for multipart forms of one original and up to two copies. Place this switch in the position that produces best printing.

Print Head Position Lever—Shown in position #2 (normal position for single sheets).
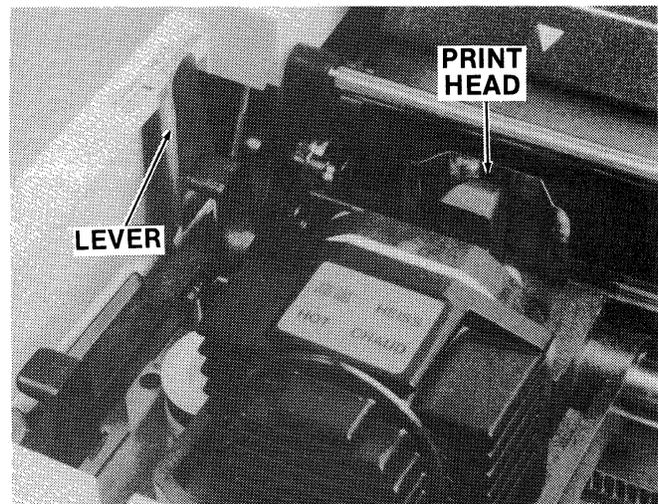
Figure 2-3C Print Head Position Control Lever

2.4 RIBBON INSTALLATION (Clean Hands Technique)

The following procedure allows the operator to install (or change) the ribbon without soiling the hands. However, using the pencil (Figure 2-3C) may be omitted if desired. Refer to Figures 2-3A, B, C, D.

1. With power OFF, lift the front hinged cover and move the print head to the middle of the carriage.

2. Holding the ribbon cassette by the ridge as shown in Figure 2-3A, loop the ribbon onto the two left ribbon guides.

3. Draw the cassette to the right end of the printer and seat the right end of the cassette as shown in Figure 2-3B.

4. Now press the cassette downward and seat the left end of the cassette. It should snap into place.
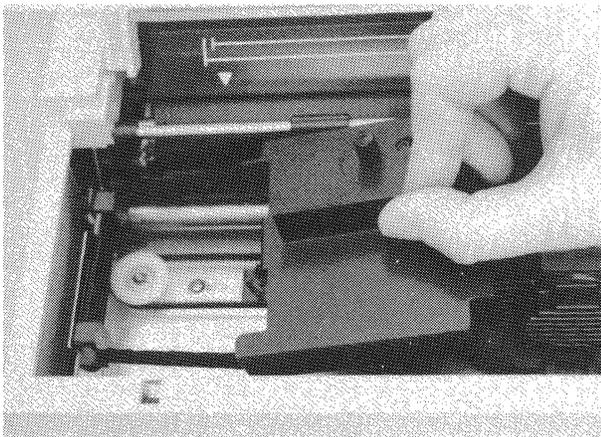
Figure 2-3A Looping the Ribbon onto the Left Ribbon Guides
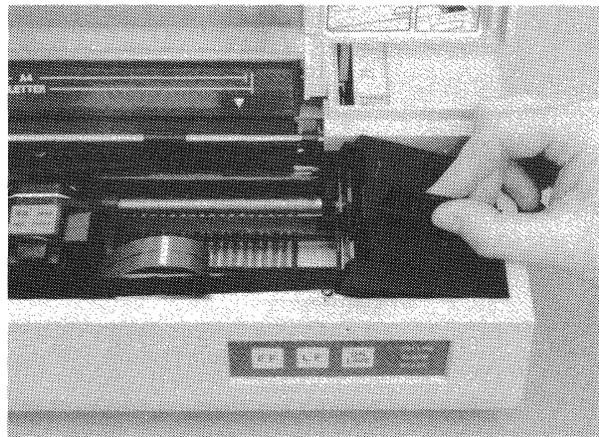
Figure 2-3B Seating the Ribbon Cassette into the Right End of the Printer

5. Using a pencil as shown in Figure 2-3C, place the ribbon between the print head and the shiny ribbon guide. The ribbon should **NOT** be on the platen side of the guide.

6. Return the print head to the left side of the printer, then tighten the ribbon by turning the small knob on the cassette (Figure 2-3D).
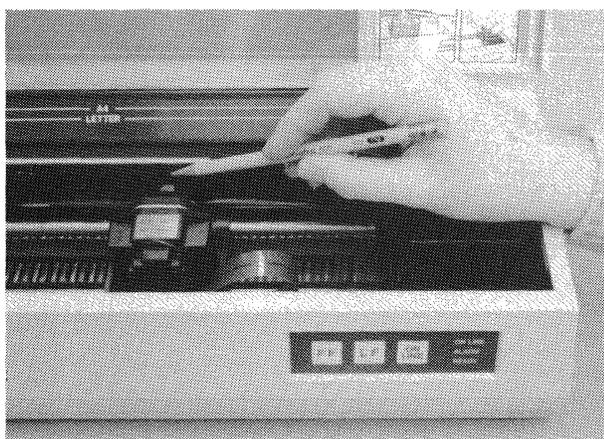
Figure 2-3C Inserting Ribbon at Print Head
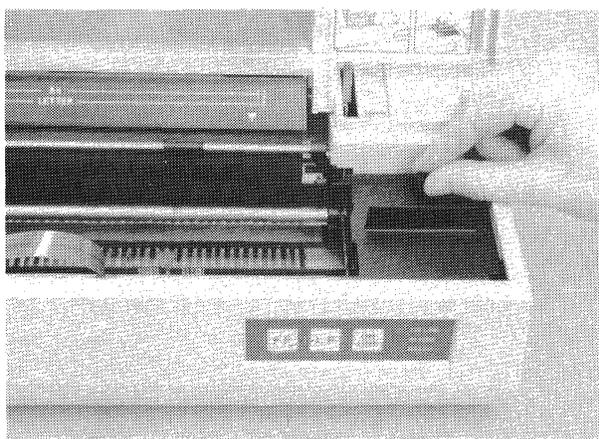
Figure 2-3D Tightening the Ribbon (Knob)

2.5 LOADING SHEET PAPER
Single sheets of paper are loaded into the printer exactly as loading a typewriter.

─────────── **NOTE** ───────────
The CUT SHEET/OTHERS switch must be in the CUT SHEET position (Figure 2-2B). Otherwise the alarm will sound and the printer will go OFF LINE.

1. Place the control lever in the PAPER SET position (Figure 2-4A).
2. Insert the sheet paper into the paper slot (Figure 2-4B). Standard 8½ x 11″ paper should line up with the LETTER lines. A4 is the European (210 mm wide) paper.
3. Guide the paper downward until it seats squarely on the platen, then advance the paper up to the front of the platen, using the platen knob.
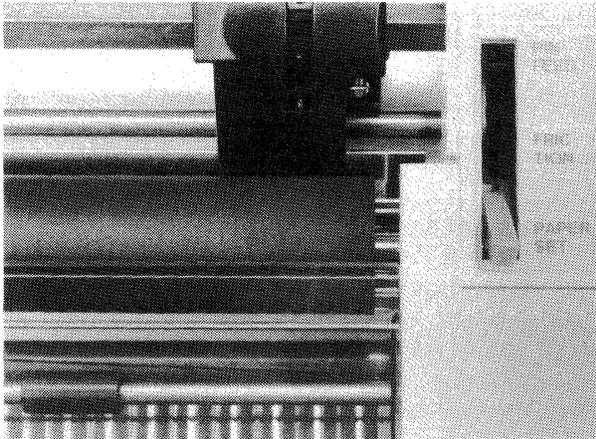
Figure 2-4A Paper Set Position
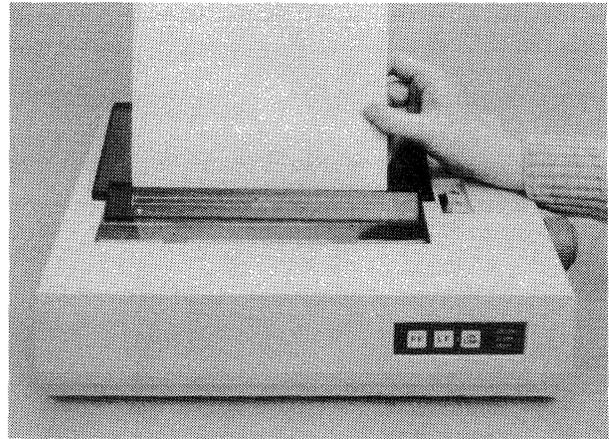
Figure 2-4B Inserting Sheet Paper

4. Move the control lever to FRICTION (Figure 2-4C). The bail should press the paper against the platen.
5. Advance the paper with the platen knob until both ends of the paper meet, then square the sides of the paper.
6. Move the leading edge of the paper down to the clear plastic tear-off edge (Figure 2-4D). This is the normal top of form position.
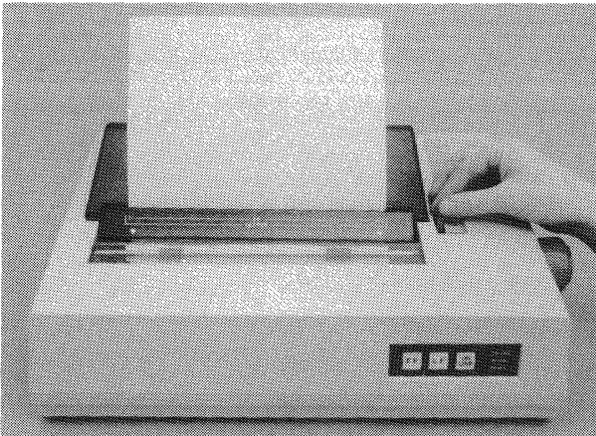
Figure 2-4C Lever to Friction Position
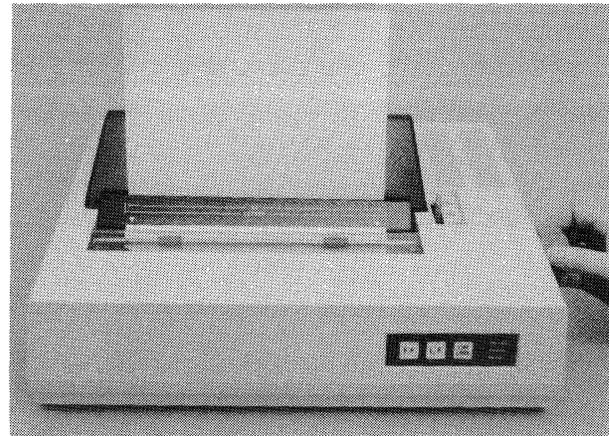
Figure 2-4D Paper at Top of Form

2.6 LOADING FANFOLD PAPER

Fanfold paper has pinfeed holes on each side that engage with the tractor sprocket (pins). Fanfold paper is loaded as follows:

1. Place the control lever in the PAPER SET position (see Figure 2-4A). Place the alarm control switch in OTHERS position if desired (see Figure 2-2B).

2. Open the paper cover and unlock the left tractor by pushing the lever rearward (Figure 2-5A). Note the Paper End switch.

3. Align the sprocket pins with the full-headed arrow (Figure 2-5B) (the half-headed arrow is for roll paper). Lock the tractor lever.
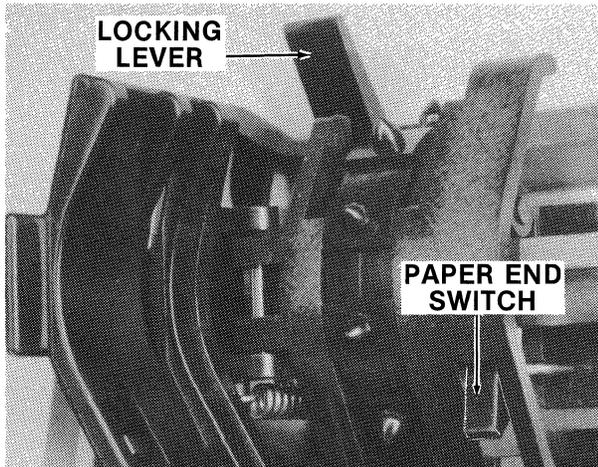
Figure 2-5A Left Tractor Controls
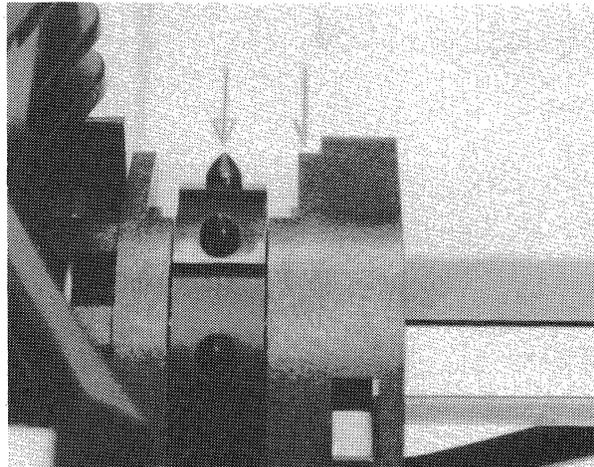
Figure 2-5B Left Tractor Alignment

4. Feed the fanfold paper through the rear slot and engage two or three holes in the sprocket (Figure 2-5C) then close the tractor.

5. Similarly, engage the fanfold paper with the right sprocket pins. Use the locking lever to position the sprocket for a snug fit, but do not elongate the holes.

6. Move the paper around to the platen with the platen knob and place the control lever in the PIN FEED position (Figure 2-5D).
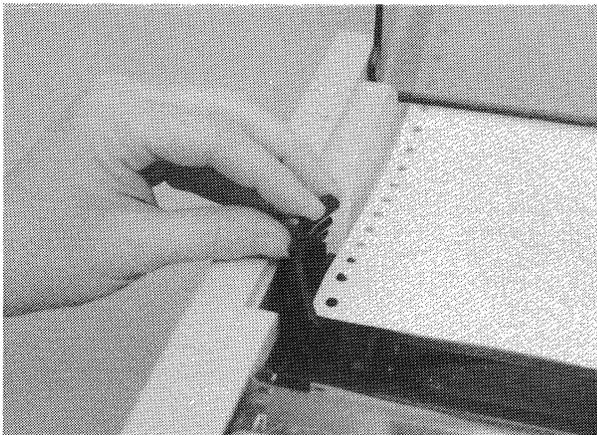
Figure 2-5C Engaging Left Sprocket
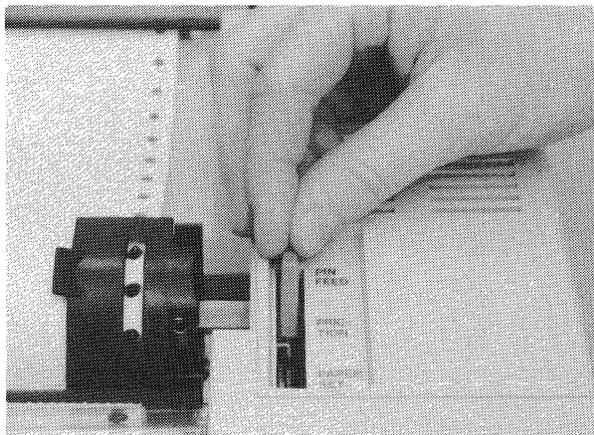
Figure 2-5D Lever To PIN FEED Position

2.7 LOADING ROLL PAPER

Roll paper is loaded similar to fanfold, but the sprocket pins do not contact the paper. Only single part roll paper is recommended.

1. Place the control lever in the PAPER SET position (see Figure 2-4A). Place the alarm control switch in OTHERS position if desired (see Figure 2-2B).

2. Open the paper cover and position the sprocket pins to align with the half-headed arrow (see Figure 2-5B for details). Figure 2-6A shows proper alignment.

3. Set the paper roll into the roll tray, with the paper going under the roll and forward (Figure 2-6A). Now feed the paper over the mid-roller and tractors, down into the rear of the platen, just like sheet paper.

4. Advance the paper to the front of the platen using the platen knob. Close the tractors (Figure 2-6B).
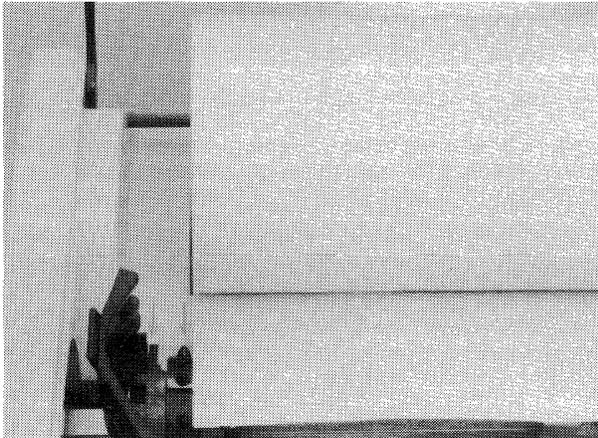
Figure 2-6A Roll Paper Through Tractor
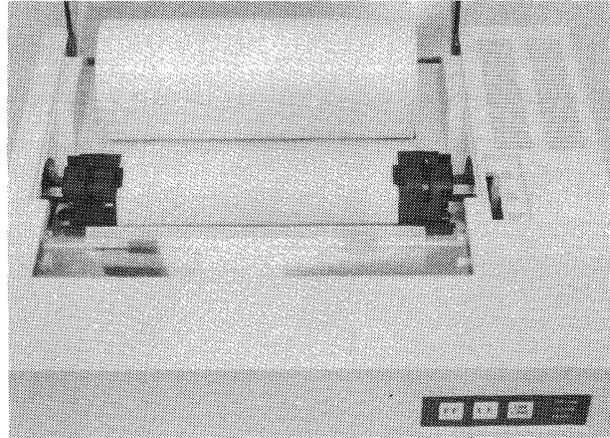
Figure 2-6B Tractors Closed on Roll Paper

5. Place the control lever in the FRICTION position (Figure 2-6C).

6. The paper cover cannot be closed with a full roll of paper. If desired, the cover can be easily removed (Figure 2-6D).
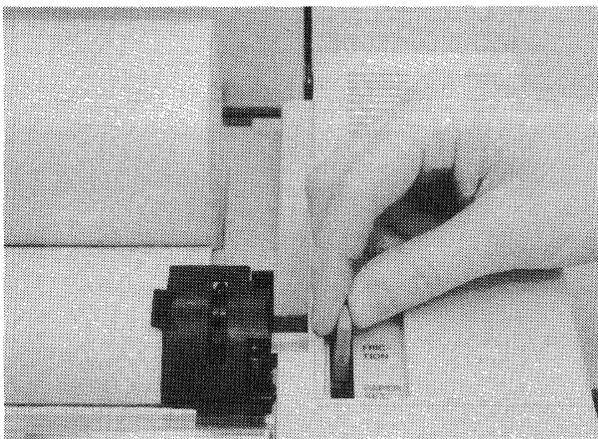
Figure 2-6C Control Lever to FRICTION
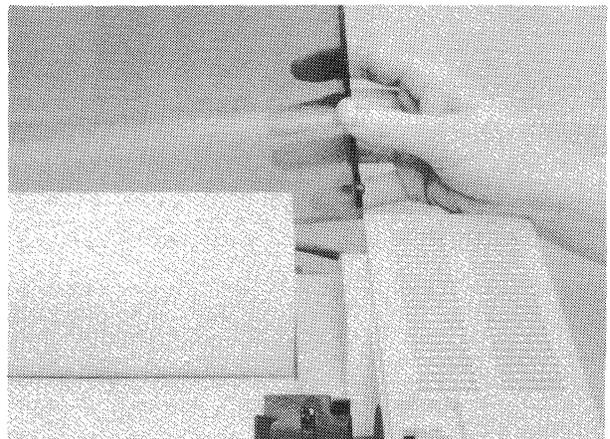
Figure 2-6D Removing Paper Cover

1801-9A00

2.8 PRINTER SELF-TEST

PURPOSE—Self-test exercises all electrical and mechanical functions of the printer. The only area not tested is the communication with the computer. Thus, self-test verifies correct printer operation with a high degree of certainty.

DESCRIPTION—The self test printout is a "rolling ASCII", beginning with the SPACE character (20 Hex, 32 Decimal), continuing in ascending ASCII order (!"#$%&) etc. Each new line printed omits the first character of the previous line, thus the pattern appears to "roll".

On the 17th line, the last character is normally an italic, accented, "a", and each new line includes another italic character. Eventually, every printable character is printed in 10 cpi (pica) monospaced and then the pattern repeats itself. There are two different fonts in this italic area, determined by DIP switch settings (see note).

> **NOTE**
>
> If graphic blocks appear beginning at the end of the 17th line, this means that DIP switch SW1-7 is OFF. If italic printing is desired when using the printer, SW1-7 must be ON. Refer to paragraph 2.10 for DIP switch settings.

SELF-TEST PROCEDURE—The self-test is activated as follows:

1. Make certain that ribbon and paper are installed as detailed in this section.

2. If sheet paper is used, the alarm control switch must be in the CUT SHEET position (Figure 2-2B).

3. Press the LF switch on the control panel (Figure 2-1B) and hold it in for a few seconds after the power switch is turned ON (Figure 2-1A).

The self-test should start, printing bidirectionally at maximum speed. The test continues until power is turned OFF or when paper runs out (with alarm control switch in the OTHERS position).

> **NOTE**
>
> Self-test will print in the style selected by DIP switch SW2. Refer to paragraph 2.10. Normally, all switches on SW2 are OFF, thus Pica 10 cpi is the active style when power is turned ON.

```
Ver1.01  AM
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
 "#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
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 3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~àèùò
 456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~àèùòì
 56789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~àèùòì°
```

Figure 2-7 Self-Test Sample

2.9 COMPUTER-PRINTER COMMUNICATION TEST

PURPOSE—The following program (in Microsoft BASIC) tests some of the commands from the computer to the printer. It may be keyed into the computer and saved on disk for future use. This program contains "download" commands which allow the computer to change printer operation (in addition to sending text).

NOTE

For this test, it is assumed that all switches are OFF except SW1-7, which should be ON for italic characters. However, the test should verify that the printer is responding to the computer's commands regardless of DIP switch settings.

PREPARATION—Load ribbon and paper as required. With power OFF at the printer and computer, make proper connections with the interface cable as detailed in Section 1. Next, turn power ON to the computer, then the printer. The printer will go ON LINE automatically.

CAUTION

Always remove power from the computer and printer before making connections with the interface cable. In this manner, electrical damage to the equipment is avoided.

Assuming that the program below is keyed in and accepted as proper syntax by the computer, key RUN then hit ENTER (or RETURN as appropriate). The printer should respond per "RESULT".

PROGRAM:

```
10 LPRINT CHR$(27);"@";:REM PRINTER INITIALIZE
20 LPRINT "This is Pica 10 cpi Monospaced"
30 LPRINT CHR$(27);"(";"Near Letter Quality Characters"
40 LPRINT CHR$(27);"P";:REM CANCEL NLQ, TURN ON PICA
50 LPRINT CHR$(27);"4";"Let's Print Italic Characters"
60 LPRINT CHR$(27);"5";"Now We Have Pica 10 cpi Again"
70 LPRINT CHR$(27);CHR$(15);:REM TURN ON CONDENSED
80 LPRINT "This is Condensed (17.14 Characters/inch)"
90 LPRINT CHR$(27);"!";CHR$(32);"ENLARGED TYPE"
100 LPRINT CHR$(27);"!";CHR$(0);:REM TURN ON PICA
110 LPRINT "Back to Pica 10 cpi Monospaced"
```

RESULT:

```
This is Pica 10 cpi Monospaced
Near Letter Quality Characters
Let's Print Italic Characters
Now We Have Pica 10 cpi Again
This is Condensed (17.14 Characters/inch)
ENLARGED   TYPE
Back to Pica 10 cpi Monospaced
```

2.10 DIP SWITCH SETTINGS

Three DIP (Dual Inline Package) switches on the logic PCB control some of the characteristics of the printer. Normally, once the mode of operation is set, the switches remain in the positions set initially. The functions controlled by these switches become active when power is turned ON. Refer to Figures 2-8, 2-9 and 2-10 (see CAUTION).

SKINNY DIP
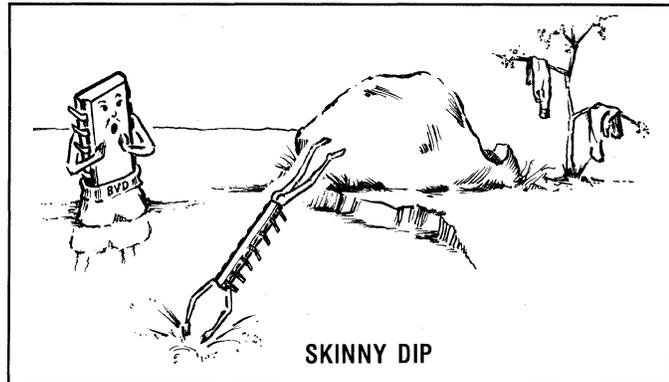
CAUTION

The top cover must be removed in order to set the switches. This must be performed by a qualified service person, with power removed from the printer. Take care not to damage front control panel.

INSTRUCTIONS FOR COVER REMOVAL

1. Remove power plug from outlet.

2. Lift the front hinged cover and remove ribbon cassette.

3. Remove bracket screw (see photo, right).

4. Remove platen knob by pulling straight outward. Note flat keyway for shaft.

5. Loosen 2 screws at rear of printer (Figures 2-8, 2-9).

6. Lift top cover at rear of printer, then carefully continue until front latching tabs disengage (they will make a snapping sound).

BRACKET SCREW

7. Set switches according to functions desired (Figure 2-10; tables).

8. Reinstall cover, starting at rear. Align and index the power plug spacer and serial I/F spacer as covers are fit together. Finally, press downward at the front until the latching tabs engage. Fasten rear screws. Insert and fasten front bracket screw.

9. Replace platen knob and ribbon cassette, indexing it properly and pressing down firmly. Take up slack with small cassette knob.

POWER CORD SPACER

SCREW
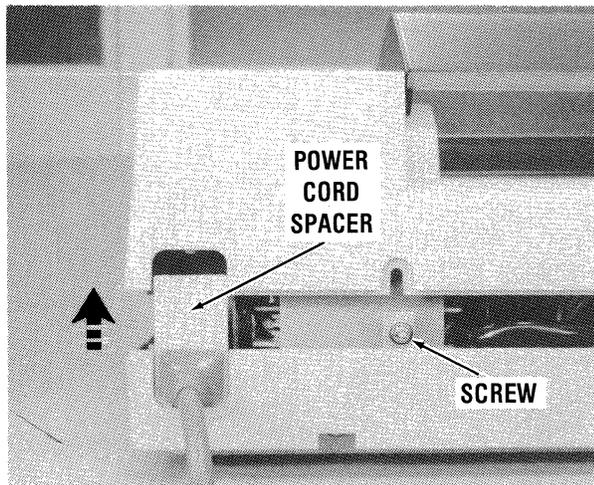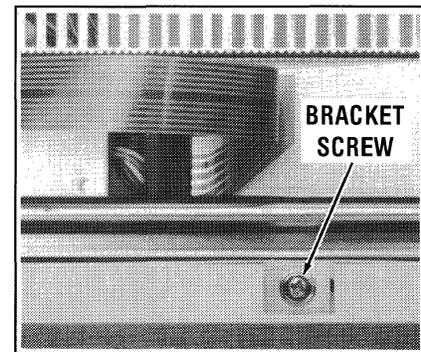
Figure 2-8 Left Rear View of Printer

SERIAL I/F SPACER

SCREW
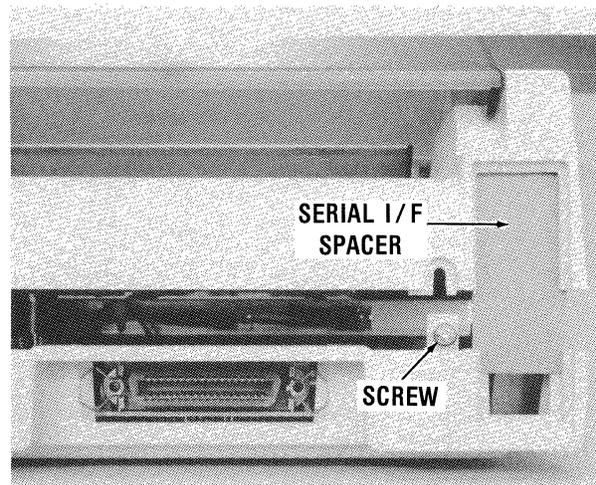
Figure 2-9 Right Rear View of Printer

LOGIC BOARD   **ON ▶**

DIP SW1

1 ⎤ POWER-ON
2 ⎥ INTERNATIONAL
3 ⎥ CHARACTER SETS
4 ⎦ (SEE SW1 TABLE)
5 8K ROM/RAM OPTION (ON = ACTIVE)
6 ZERO MARKER (ON = SLASHED ZERO)
7 ON = *ITALICS*
8 (NOT USED)

DIP SW2

1 ON = PAPER END SELECT/DESELECT
2 PRINTER ALARM (OFF = ACTIVE)
3 OFF = DOWNLOAD CG, ON = INBUF (3K)
4 ⎤ POWER-ON
5 ⎥ PRINT
6 ⎥ STYLE
7 ⎦ (SEE SW2 TABLE)
8 RT MARGIN (OFF = 80 COL, ON = 64)

DIP SW3

1 SLCT IN (OFF = SELECT/DESELECT)
2 FORM LENGTH (OFF = 11″, ON = 12″)
3 PERF SKIP (ON = ACTIVE, 1″ SKIP)
4 AUTO LINEFEED (ON = LF AFTER CR)

Figure 2-10 DIP Switch Settings on Logic Board

COUNTRY	DIP SW 1			
	1	2	3	4
USA	OFF	OFF	OFF	OFF
FRANCE	ON	OFF	OFF	OFF
GERMANY	OFF	ON	OFF	OFF
U.K.	ON	ON	OFF	OFF
DENMARK	OFF	OFF	ON	OFF
SWEDEN	ON	OFF	ON	OFF
ITALY	OFF	ON	ON	OFF
SPAIN	ON	ON	ON	OFF
JAPAN	ON	ON	ON	ON

STYLE	DIP SW2			
	4	5	6	7
PICA (10 CPI)	OFF	OFF	OFF	OFF
PICA ENLARG	OFF	OFF	OFF	ON
CONDENSED	ON	OFF	OFF	OFF
COND-ENLARG	ON	OFF	OFF	ON
PICA-EMPH	OFF	ON	OFF	OFF
ENLARG-EMPH	OFF	ON	OFF	ON
NLQ	ON	ON	OFF	OFF
ENLARG-NLQ	ON	ON	OFF	ON
ELITE (12 CPI)	OFF	OFF	ON	OFF
ELITE-ENLARG	OFF	OFF	ON	ON

2.11 HELPFUL HINTS ON OPERATION

PURPOSE—This paragraph provides helpful hints in the operation of the printer.

- Place a typewriter pad under the printer to reduce vibration and provide quieter operation.

- When power is turned ON, the print head jogs back and forth twice to find the left margin, then it goes ON LINE and beeps once.

- NLQ (Near Letter Quality) characters are selected by holding the FF button while turning printer power ON.

- Normal DIP switch settings are: all switches OFF except SW1-7 ON (for italics). Switches can be set by qualified service personnel (see Figure 2-10).

- DIP switch settings become active as power is turned ON.

- Printer will self-test in the style selected by DIP switch SW2.

- Printer must be ON LINE to receive data from the computer.

- Printer will NOT go ON LINE when in the alarm condition. This occurs when paper supply is exhausted with switch in OTHERS position.

- Paper End alarm is 5 beeps (about .1 second each).

- Paper End alarm is disabled with switch in CUT SHEET position.

- DIP switch SW3-4 ON causes a line feed (LF) after a carriage return (CR). Most computers and word processors provide a LF after CR; thus, to prevent a double line feed, DIP switch SW3-4 should be OFF. Refer to helpful hint illustrations below for Carriage Return and Line Feed.

- Some Centronics parallel interfaces may force pin 14 to ground, causing a fixed condition of AUTO LF (Automatic Line Feed). In this case, the cable would require modification to disconnect the wire at pin 14 (see Appendix B.1).

- When printing on fanfold paper, the specification is that no printing should be performed within ½" before and after the perforation.

- Section 3 contains reference data and programs for the Programmer. With this information, the Programmer will be able to control all the special functions of the printer using download commands.
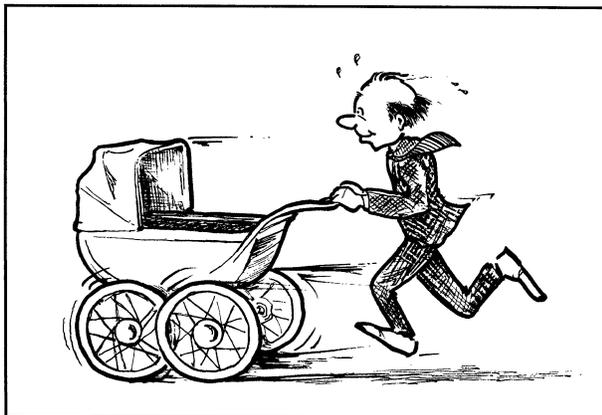
Figure 2-11 Carriage Return

Figure 2-12 Line Feed

SECTION 3
PROGRAMMER'S REFERENCE

3.1 PURPOSE OF THIS SECTION
This section provides samples of actual BASIC programs that exercise the functions of the printer. There are control codes and sequences that change character styles, spacing, tabbing, etc. These commands normally originate at the keyboard and are sent from the computer to the printer.

IMPORTANT

In order to control all of the functions of this powerful printer, your computer or word processor must be able to generate and send the 8th bit (128 decimal). However, most important functions do NOT require bit 8. For example, all character styles can be programmed with any computer that operates in BASIC.

3.2 COMPUTERS USED TO GENERATE THE PROGRAMS
The programs in this section were generated using an Apple® IIe, IBM PC and a COMPAQ™ Portable computer. Those programs with PRINT statements were generated on the Apple® IIe. Those with LPRINT statements (and those requiring bit 8) were generated on the IBM PC and COMPAQ™ Portable. Refer to your computer's reference documentation to determine whether your computer sends bit 8 to the printer, or try the program below.

SIMPLE CHECK FOR BIT 8—Run this program to see if bit 8 is being sent to the printer. Note that DIP switch SW1-7 must be ON to get the italic, accented character i.

```
10 REM CHECK FOR BIT 8
20 LPRINT CHR$(27);"I";CHR$(1);
30 LPRINT CHR$(132);:LPRINT:END
```

The printer should respond with an *italic*, accented letter i (*i*). If the i is not *italic*, the printer did not receive the 8th bit.

3.3 DIP SWITCH SETTINGS
Some printer functions are affected by the setting of DIP switches on the logic board. Look for the NOTE included with the programs for any DIP switch settings required. The functions of the DIP switches are described in Section 2.

3.4 DECIMAL AND HEXADECIMAL NUMBERS
The programs listed in this section are written in BASIC (Beginner's All-purpose Symbolic Instruction Code), and the number system is the familiar decimal (0-9). For the programmer's convenience, the control sequence is also expressed in hexadecimal (0-9 + ABCDEF) for each function.

3.5 ASCII CODES AND CHARACTERS
ASCII (American Standard Code for Information Interchange) control codes and characters are assigned numbers 0 (NUL) thru 127 (DEL) decimal. Printable characters are codes 33 thru 126. A complete ASCII table (including numerical cross-reference) is included in the Appendix.

3.6 CONTROL CODES AND ESCAPE SEQUENCES
The control codes and ESC sequences are summarized on the next two pages. The summary is listed in ascending ASCII code sequence as a general rule. Following the summary, programs are listed for each function where appropriate and the result is included for comparison.

CONTROL CODE SUMMARY

ASCII	FUNCTION	PAGE
N/A	Self-Test Function: (hold LF button, turn power ON)	3-4
N/A	Hex Code Dump Function: (hold FF + LF buttons, turn power ON)	3-4
BEL	Sound Printer Alarm (beep!)—DIP Switch SW2-2 OFF	3-5
BS	Backspace Width of One Character	3-5
HT	Horizontal Tab Execution (used with ESC D)	3-6
LF	Line Feed Execution (value set by ESC 0, 1, 2, 3, A)	3-6
VT	Vertical Tab Execution (positions set by ESC B, ESC b)	3-7
FF	Form Feed Execution (values set by ESC C, ESC C 0)	3-8
CR	Carriage Return (automatic LF if DIP Switch SW3-4 is ON)	3-8
SO	Select Enlarged Characters (one line; cancelled by LF)	3-9
SI	Select Condensed Characters (effective until cancelled by DC2)	3-9
DC1	Remote Printer Select (DIP Switch SW3-1 OFF)	3-10
DC2	Cancel Condensed Characters	3-10
DC3	Remote Printer Deselect (DIP Switch SW3-1 OFF)	3-11
DC4	Cancel Enlarged Characters	3-11
CAN	Cancel Printer Buffer Data (on same line as CAN code)	3-12
DEL	Delete Last Character in Printer Buffer	3-12
ESC SO	Select Enlarged Characters (cancelled by LF)	3-13
ESC SI	Select Condensed Characters (cancelled by DC2)	3-13
ESC !	Select Print Mode (Modes 0-63)	3-14
ESC #	Cancel MSB Sequence (cancel bit 8 being forced to 1 or 0)	3-16
ESC % 0	Select Internal CG (Character Generator) ROM	3-17
ESC % 1	Select Download Character RAM/ROM	3-17
ESC &	Define Download Character (ASCII code, attribute)	3-18
ESC (	Select NLQ (Near Letter Quality) Characters	3-21
ESC *	Selectable Density Graphics Mode	3-22
ESC −	Print Underline Function (1 = ON, 0 = OFF)	3-24
ESC /	Select VFU (Vertical Format Unit) Channel 0 to 7	3-25
ESC 0	1/8 Inch Line Spacing (8 lines per inch)	3-27
ESC 1	8 Pin Graphics (7/72") Line Spacing	3-27
ESC 2	1/6 Inch Line Spacing (6 lines per inch)	3-28
ESC 3	N/216" Line Spacing (⅓ Dot Diameter)	3-28
ESC 4	Select Alternate Character Set (italics)	3-29
ESC 5	Cancel Alternate Character Set (italics)	3-29
ESC 6	Printable Area Code Expansion (International Characters)	3-30
ESC 7	Cancel Printable Area Code Expansion	3-30
ESC 8	Disable Paper Out—Remote	3-31
ESC 9	Enable Paper Out—Remote	3-31

table 4 (horizon1) 1-19-84

(Continued on next page)

CONTROL CODE SUMMARY (CONT.)

ASCII	FUNCTION	PAGE
ESC :	Copy ROM CG to Download CG	3-32
ESC <	Left-to-Right Printing (home print head)	3-33
ESC =	Set MSB to 0 (force bit 8 to 0, cancelled by ESC #)	3-34
ESC >	Set MSB to 1 (force bit 8 to 1, cancelled by ESC #)	3-34
ESC ?	Multiple Function Graphics (Mode)	3-35
ESC @	Printer Initialization Command—Remote	3-37
ESC A	N/72″ Line Spacing (1 dot diameter)	3-37
ESC B	Vertical Tab Setting, 16 Positions	3-38
ESC C	Set Form Length, # of Lines (n = 1 to 127)	3-39
ESC C 0	Set Form Length, # of Inches (n = 1 to 22)	3-39
ESC D	Horizontal Tab Setting, 32 Positions	3-40
ESC E	Select Emphasized Print	3-41
ESC F	Cancel Emphasized Print	3-41
ESC G	Select Double Strike Print Mode (1 = ON, 0 = OFF)	3-42
ESC H	Cancel Double Strike Print Mode	3-42
ESC I	Enable Printable Control Codes (1 = ON, 0 = OFF)	3-43
ESC J	N/216″ Paper Feed (1/3 Dot Increment)	3-44
ESC K	Normal Density Graphic Mode	3-45
ESC L	Double Density Graphic Mode	3-47
ESC M	Select Elite Characters (12 characters per inch)	3-48
ESC N	Enable Skip-Over Perforation (DIP switch 3-3 OFF)	3-49
ESC O	Disable Skip-Over Perforation	3-49
ESC P	Select Pica Characters (10 characters per inch)	3-48
ESC Q	Right Margin Setting (n = 1 to 255)	3-50
ESC R	Select International Character Set Mode (n = 0 to 8)	3-51
ESC S 0	Select Superscript Character Set (cancelled by ESC T)	3-53
ESC S 1	Select Subscript Character Set (cancelled by ESC T)	3-53
ESC T	Cancel Subscript, Superscript Character Sets	3-54
ESC U	Select Unidirectional Print Mode (1 = ON, 0 = OFF)	3-33
ESC W	Select Enlarged Print Mode (1 = ON, 0 = OFF)	3-54
ESC Y	Double Speed, Dual Density Graphics Mode	3-55
ESC Z	Quadruple Density Graphics Mode	3-56
ESC ^	Select 9-Bit & 16-Bit Graphics Mode	3-57
ESC b	VFU Tab Position Setting (8 channels, 16 positions)	3-61
ESC i	Incremental Typewriter Mode	3-62
ESC j	N/216″ Reverse Paper Feed (1/3 Dot Increment)	3-44
ESC l	Left Margin Setting (n = 0 to 255)	3-50
ESC p	Proportional Spacing Mode (1 = ON, 0 = OFF)	3-63
ESC s	Half-Speed (quiet) Print Mode (1 = ON, 0 = OFF)	3-63

table4 (horizon1) 1-19-84

SELF TEST   (Hold LF button in, turn power ON)

DESCRIPTION: The self-test feature prints all the 10 cpi (pica size) characters in ascending ASCII code order, beginning with SPACE (32 decimal). The V-XXX number before the characters signifies the ROM version.

PROCEDURE: Ensure that paper is loaded and power is OFF. Hold in the LF button for a few seconds as the power switch is turned ON. The printer will then begin self test.

```
┌───────────────────────── NOTE ─────────────────────────┐
│ Self test continues until power is turned OFF or if paper runs out with paper end detector │
│ active. Printout below is reduced for the manual.       │
└─────────────────────────────────────────────────────────┘
```

RESULT:

```
Ver1.01   AM
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
```

BEL   (Sound Printer Alarm)   BEL

BASIC: CHR$(7);   **HEX: 07**

NAME: BEL (Bell)

FUNCTION: Sound Printer Alarm (beep)

PROGRAM: LPRINT CHR$(7);
               LPRINT CHR$(13);

RESULT: ◄beep► (sounds for approximately 0.5 second)

```
┌───────────────────────── NOTE ─────────────────────────┐
│ For BEL to be executed, omit semicolon (;) or include CR code following LPRINT CHR$(7); │
│ as shown. Also, DIP switch SW2-2 must be OFF for this function. │
└─────────────────────────────────────────────────────────┘
```

BASIC: CHR$(8);   **HEX: 08**

NAME: BS (Backspace)

FUNCTION: When BS is received, all codes in the printer buffer are printed, then the next print position is moved to the left (in the same line) by the width of one character. Multiple BS commands move the position one character width for each BS command. Subsequent characters will then be printed starting at the new position. In enlarged print mode, the new position is two character widths for each BS.

NOTE

BS function is most accurate in unidirectional print mode (ESC "U"). Also, BS is active only on the same line, thus characters following BS must be entered on the same line as previous characters.

PROGRAM:

```
10   REM   BACKSPACE 10
20   PRINT   CHR$ (27);"U"; CHR$ (1);
30   PRINT "12345678901234567890";
40   FOR X = 1 TO 10
50   PRINT   CHR$ (8);
60   NEXT X
70   PRINT "123456789/BACKSPACE"
80   END
```

RESULT:

```
]RUN
12345678901234567890BACKSPACE
```

HT   (Horizontal Tab Execution)   HT

BASIC: CHR$(9);   **HEX: 09**

NAME: HT (Horizontal Tab)

FUNCTION: Executes Horizontal Tab function. Values of horizontal tab position are determined by ESC D (N_1) (N_2). . .(N_K) ; otherwise, tabs are automatically set every 8 characters when power is turned on. In enlarged mode, HT executes the tabs in twice the normal width value.

> ——— **NOTE** ———
> Some Microsoft BASIC programs cannot use CHR$(9). In this case, use CHR$(137). This is established by 9 + 128 = 137.

PROGRAM:
```
5   REM HTAB POWER UP (8)
10   PRINT "012345678901234567890 1
      234567890"
20   FOR X = 1 TO 3
25   PRINT  CHR$ (9);"TAB";
30   NEXT
```

RESULT:
```
012345678901234567890 1234567890
       TAB       TAB       TAB
```

LF   (Line Feed Execution)   LF

BASIC: CHR$(10);   **HEX: 0A**

NAME: LF (Line Feed)

FUNCTION: Receipt of LF causes the printing of all data in printer buffer, then paper is moved the effective line feed value. At power ON, line feed value is 1/6″ (six lines per inch). Other values are established by ESC "A", ESC 0, ESC 1, ESC 3.

> ——— **NOTE** ———
> When in OFF LINE mode, the LF button executes paper movement by the value established at power ON (six lines per inch) or by the above codes.

PROGRAM:
```
10   REM LINE FEED 3
12   PRINT "*********";
15   FOR X = 1 TO 3
20   PRINT  CHR$ (10);: REM    LF
25   NEXT
30   PRINT "*********"
```

RESULT:
```
*********



*********
```

(Vertical Tab Execution)

BASIC: CHR$(11);   **HEX: 0B**

NAME: Vertical Tab Execution

FUNCTION: Receipt of VT causes the printing of all data in the print buffer, then a line feed to the position established by ESC B or ESC b. VT cancels enlarged characters set by SO. If no vertical tab has been set, VT simply performs a line feed.

PROGRAM:

```
10 REM ESC B VERT TAB
20 FOR X= 0 TO 11
30 LPRINT X:NEXT
40 LPRINT CHR$(27);"B";CHR$(2);
45 LPRINT CHR$(6);CHR$(10);CHR$(0);
50 FOR X = 1 TO 2
60 LPRINT CHR$(27);"j";CHR$(180);
70 NEXT
80 FOR Z = 1 TO 3
90 LPRINT CHR$(11);"     VTAB";:NEXT
95 LPRINT :END
```

RESULT:

```
0
1
2   VTAB
3
4
5
6   VTAB
7
8
9
10 VTAB
11
```

FF   (Form Feed Execution)   FF

BASIC: CHR$(12);   **HEX: 0C**

NAME: FF (Form Feed)

FUNCTION: When the FF code is received, all data in the printer buffer is printed, then paper is fed the number of lines or inches in effect, established by ESC C, ESC C 0 or by SW3-2. The normal Form Feed is 11 inches (SW3-2 OFF).

```
┌──────────────────── NOTE ────────────────────┐
│ Top of form is established by the position of the paper prior to execution of any line feeds. │
│ Whenever FF is received, (or when FF button is pressed when OFF LINE) the paper is ad- │
│ vanced the appropriate amount relative to the top of form position. │
└───────────────────────────────────────────────┘
```

PROGRAM:
```
10   REM FF 3 LINES=1/2"
20   PRINT "**********";
30   PRINT  CHR$ (27);"C"; CHR$ (3);
40   PRINT  CHR$ (12);: REM  FF
50   PRINT "**********"
```

RESULT:
```
**********


**********
```

CR   (Carriage Return)   CR

BASIC: CHR$(13);   **HEX: 0D**

NAME: CR (Carriage Return)

FUNCTION: When the CR code is received, all data in the printer buffer is printed. If Auto Linefeed is active (SW3-4 ON) paper will be fed one line automatically; otherwise the next print position is at the first character on the same line.

```
┌──────────────────── NOTE ────────────────────┐
│ Some word processing programs and interfaces force a linefeed after a CR. In this case │
│ CR without a linefeed is not functional unless the program/interface can be modified to │
│ not issue the linefeed. │
└───────────────────────────────────────────────┘
```

PROGRAM:
```
10   REM CR OVERPRINT
15   PRINT  CHR$ (27);"U"; CHR$ (1);
20   PRINT "0000000000";
30   PRINT  CHR$ (13);: REM  CR
40   PRINT "//////////"
```

RESULT:
```
0000000000
```

SO (Select Enlarged Characters) SO

BASIC: CHR$(14); **HEX: 0E**

NAME: SO (Shift Out)

FUNCTION: When SO code is received, all subsequent characters and spaces are printed double-width on the same line. This function is cancelled by a linefeed, DC4, ESC ! or ESC W.

```
┌───────────────────────── NOTE ─────────────────────────┐
│ All character styles can be enlarged, and this function can be mixed within a line. ESC SO │
│ is functionally identical to SO. However, ESC W 1 selects enlarged characters until can- │
│ celled by ESC W 0. │
└─────────────────────────────────────────────────────────┘
```

PROGRAM:
```
10   REM   ENLARGED
20   PRINT "JACK SPRAT COULD EAT NO ";
30   PRINT  CHR$ (14);"FAT"
```

RESULT: JACK SPRAT COULD EAT NO FAT

SI (Select Condensed Characters) SI

BASIC: CHR$(15); **HEX: 0F**

NAME: SI (Shift In)

FUNCTION: When SI code is received, all data in the printer buffer is printed, then all subsequent characters will be condensed until cancelled by the DC2 code.

```
┌───────────────────────── NOTE ─────────────────────────┐
│ The Elite and NLQ character styles cannot be condensed. Also, ESC SI is functionally iden- │
│ tical to SI. │
└─────────────────────────────────────────────────────────┘
```

PROGRAM:
```
10   REM CONDENSED
20   PRINT "HIS WIFE COULD EAT NO";
30   PRINT  CHR$ (15);"LEAN"
40   PRINT  CHR$ (18);: REM   DC2
50   PRINT "AND SO BETWEEN THE TWO
         OF THEM"
60   PRINT "THEY LICKED THE PLATTER CLEAN"
```

RESULT:
```
HIS WIFE COULD EAT NO LEAN
AND SO BETWEEN THE TWO OF THEM
THEY LICKED THE PLATTER CLEAN
```

DC1   (Remote Printer Select)   DC1

BASIC: CHR$(17);   **HEX: 11**

NAME: DC1 (Device Control 1)

FUNCTION: The DC1 code selects the printer, enabling data reception. DC1 is normally used to cancel DC3, which de-selects the printer.

NOTE

In order for DC1 to function as described here, the printer must be ON LINE and DIP switch SW3-1 must be OFF. If the DC1 code is received along with data, all data stored in the printer buffer before DC1 will be ignored (not printed).

PROGRAM:

```
10   REM  PRINTER SELECT
20   PRINT "$$$$$$$$$$$$$$$"
30   PRINT  CHR$ (19);
40   PRINT "###############"
50   PRINT  CHR$ (17);
60   PRINT "$$$$$$$$$$$$$$$"
```

RESULT:

```
$$$$$$$$$$$$$$$
$$$$$$$$$$$$$$$
```

DC2   (Cancel Condensed Mode)   DC2

BASIC: CHR$(18);   **HEX: 12**

NAME: DC2 (Device Control 2)

FUNCTION: The DC2 code is used to cancel condensed characters as selected by SI or ESC SI.

NOTE

The condensed character mode is not affected by linefeed as with SO and ESC SO (enlarged). Elite and NLQ characters cannot be condensed.

PROGRAM:

```
10   REM  DC2 CANCEL CONDENSED
20   PRINT "NORMAL "; CHR$ (15);
30   PRINT "CONDENSED";
40   PRINT  CHR$ (18);" NORMAL"
```

RESULT:

NORMAL CONDENSED NORMAL

DC3   (Remote Printer Deselect)   DC3

BASIC: CHR$(19);   **HEX: 13**

NAME: DC3 (Device Control 3)

FUNCTION: The DC3 code de-selects the printer, inhibiting data reception. DC3 is used to cancel DC1, which selects the printer.

```
─────────────────── NOTE ───────────────────
In order for DC3 to function as described here, the printer must be ON LINE and DIP switch
SW3-1 must be OFF.
```

PROGRAM:
```
10   REM    PRINTER DE-SELECT
20   PRINT "PRINT THIS LINE"
30   PRINT  CHR$ (19);
40   PRINT "IGNORE THIS LINE"
50   PRINT  CHR$ (17);
60   PRINT "SELECTED ONCE AGAIN"
```

RESULT:
```
PRINT THIS LINE
SELECTED ONCE AGAIN
```

DC4   (Cancel Enlarged Characters)   DC4

BASIC: CHR$(20);   **HEX: 14**

NAME: DC4 (Device Control 4)

FUNCTION: The DC4 code is used to cancel enlarged characters selected by SO and ESC SO.

```
─────────────────── NOTE ───────────────────
Enlarged characters selected by ESC W1 or ESC! are not affected by the DC4 code.
```

PROGRAM:
```
10   REM   CANCEL ENLARGED
20   PRINT "ACROSS THE "; CHR$ (14);
30   PRINT "WIDE"; CHR$ (20);: REM
        DC4
40   PRINT " MISSOURI"
```

RESULT: ACROSS THE W I D E MISSOURI

CAN   (Cancel Printer Buffer Data)   CAN

BASIC: CHR$(24);   **HEX: 18**

NAME: CAN (Cancel)

FUNCTION: When the CAN code is received, all prior data stored in the printer buffer on the same line is cancelled (not printed).

NOTE

The DEL (Delete) code performs a similar function, but affects only the last character stored in the printer buffer.

PROGRAM:

```
10   REM   CANCEL CHR$(24)
20   PRINT "THAT"
30   PRINT "@#!*$#!!"; CHR$ (24);"
     CAT!"
```

RESULT:

```
THAT
CAT!
```

DEL   (Delete Last Printer Buffer Character)   DEL

BASIC: CHR$(127);   **HEX: 7F**

NAME: DEL (Delete)

FUNCTION: When the DEL code is received, the last character in the printer buffer on the same line is deleted (not printed).

NOTE

The CAN (Cancel) code performs a similar function, but it affects all prior data on the same line.

PROGRAM:

```
10   REM   DEL LAST CHAR
20   PRINT "BEAUTY IS ONLY SKINY";
30   PRINT  CHR$ (127);" DEEP"
```

RESULT:

```
BEAUTY IS ONLY SKIN DEEP
```

ESC SO   (Select Enlarged Characters)   ESC SO

BASIC: CHR$(27);CHR$(14);   **HEX: 1B 0E**

NAME: ESC SO (Escape Shift Out)

FUNCTION: Same as SO. When ESC SO code is received, all subsequent characters and spaces are printed double-width on the same line. This function is cancelled by a linefeed, DC4, ESC ! or ESC W.

```
──────────────────── NOTE ────────────────────
All character styles can be enlarged and mixed within a line. Note that ESC W 1 selects
enlarged characters until cancelled by ESC W 0.
```

PROGRAM:
```
10   REM ENLARGED ESC SO
20   PRINT "UNDER THE ";
30   PRINT  CHR$ (27); CHR$ (14);
40   PRINT "BIG"; CHR$ (20);" TOP!"
```

RESULT: UNDER THE B I G TOP!

ESC SI   (Select Condensed Characters)   ESC SI

BASIC: CHR$(27);CHR$(15);   **HEX: 1B 0F**

NAME: ESC SI (Escape Shift In)

FUNCTION: Same as SI. When ESC SI code is received, all subsequent characters will be condensed until cancelled by the DC2 code.

```
──────────────────── NOTE ────────────────────
The Elite and NLQ character styles cannot be condensed.
```

PROGRAM:
```
10   REM  CONDENSED ESC SI
20   PRINT "FOR ONLY ONE ";
30   PRINT  CHR$ (27); CHR$ (15);"
     THIN"; CHR$ (18);" DIME!"
```

RESULT: FOR ONLY ONE THIN DIME!

BASIC: CHR$(27);"!";CHR$(n);   **HEX: 1B 21 (n)**

NAME: Print Mode (n = 0 to 63)

FUNCTION: Print Mode selects one of 16 different print styles/combinations. The ESC !(n) sequence takes precedence over any prior print style command such as SO, SI etc. See Table D-1 in Appendix D for typestyle combinations that are possible.

NOTE

Whenever leaving Print Mode to select NLQ (near letter quality) characters, always send ESC ! 0 to cancel Print Mode styles in effect, otherwise, NLQ could be enlarged or other styles could be affected. IMPORTANT—If proportional (ESC p 1) is set when entering an ESC ! (n) to obtain a condensed style, the ESC ! (n) for condensed is ignored because proportional is emphasized and cannot be condensed. Also, the elite style cannot be emphasized nor condensed.

PROGRAM:
(TYPICAL)

```
20   PRINT "MODE 24   ";
30   PRINT  CHR$ (27);"!"; CHR$ (24);
40   PRINT "ABCabc123"
```

RESULT:
(TYPICAL)

MODE	0	ABCabc123
MODE	1	ABCabc123
MODE	4	ABCabc123
MODE	8	ABCabc123
MODE	16	ABCabc123
MODE	17	ABCabc123
MODE	20	ABCabc123
MODE	24	ABCabc123
MODE	32	ABCabc123
MODE	33	ABCabc123
MODE	36	ABCabc123
MODE	40	ABCabc123
MODE	48	ABCabc123
MODE	49	ABCabc123
MODE	52	ABCabc123
MODE	56	ABCabc123

NOTE: Refer to table for Print Modes 0 to 63

PRINT MODE BYTE (n = 0-63)

n	ENLG	DBLS	EMPH	COND	ELIT
0*					
1					•
2*					
3					•
4				•	
5					•
6				•	
7					•
8			•		
9					•
10			•		
11					•
12				•	
13					•
14				•	
15					•
16		•			
17		•			•
18		•			
19		•			•
20		•		•	
21		•			•
22		•		•	
23		•			•
24		•	•		
25		•			•
26		•	•		
27		•			•
28		•		•	
29		•			•
30		•		•	
31		•			•

n	ENLG	DBLS	EMPH	COND	ELIT
32	•				
33	•				•
34	•				
35	•				•
36	•			•	
37	•				•
38	•			•	
39	•				•
40	•		•		
41	•				•
42	•		•		
43	•				•
44	•			•	
45	•				•
46	•			•	
47	•				•
48	•	•			
49	•	•			•
50	•	•			
51	•	•			•
52	•	•		•	
53	•	•			•
54	•	•		•	
55	•	•			•
56	•	•	•		
57	•	•			•
58	•	•	•		
59	•	•			•
60	•	•		•	
61	•	•			•
62	•	•		•	
63	•	•			•

*Modes 0 and 2 are Pica 10 cpi

ENGL = Enlarged; DBLS = Double Strike; EMPH = Emphasized; COND = Condensed; ELIT = Elite (12 cpi)

BASIC: CHR$(27)"#";   **HEX: 1B 23**

NAME: Cancel MSB Sequence (MSB = 0, MSB = 1)

FUNCTION: ESC # cancels control of MSB (8th bit) as set by ESC = (MSB = 0) and ESC > (MSB = 1). Thus, ESC # releases the 8th bit from forced condition and allows it to change with data.

PROGRAM:

```
10 REM ESC # CANCEL MSB SEQUENCE
15 LPRINT "          (NORMAL)"
20 LPRINT "If you wish to go nowhere..."
25 LPRINT "Any road will take you there!"
30 LPRINT:LPRINT CHR$(27);">";
35 LPRINT "          (ITALIC)"
40 LPRINT "When in Rome do as the Italics do"
45 LPRINT:LPRINT CHR$(27);"#";:REM CANCEL MSB
50 LPRINT "          (NORMAL)"
55 LPRINT "Doe... a deer, a female deer..."
```

RESULT:

```
          (NORMAL)
If you wish to go nowhere...
Any road will take you there!

          (ITALIC)
When in Rome do as the Italics do

          (NORMAL)
Doe... a deer, a female deer...
```

ESC % 0   (Select Internal CG ROM)   ESC % 0

BASIC: (CHR$(27);"%";CHR$(0);CHR$(0);   **HEX: 1B 25 30 30**

NAME: ROM Character Generator selection

FUNCTION: This code sequence selects the character generator in the Internal ROM and is normally used to cancel the Download CG as selected by ESC % 1.

PROGRAM: (See example in ESC &)

PROGRAM: (See example in ESC &)

ESC % 1   (Select Download CG RAM/ROM)   ESC % 1

BASIC: (CHR$(27);"%";CHR$(1);CHR$(0);   **HEX: 1B 25 31 30**

NAME: Download Character Generator Selection

FUNCTION: This code sequence selects the Download Character set previously defined by ESC & code (see Note 1). If an optional NLQ character ROM or 8K RAM is installed, this sequence selects that RAM/ROM (see Note 2).

NOTE 1 STANDARD

DIP switch SW2-3 must be OFF to enable 2K Download Buffer for this function (standard 11 × 9 matrix download characters).

NOTE 2 OPTION

To access optional 8K RAM or optional NLQ ROM, DIP switch SW1-5 must be ON. Also, ESC"(" must be sent to select NLQ before sending ESC%1.

PROGRAM: (See example in ESC &)

BASIC: CHR$(27);"&";CHR$(0);CHR$(n);CHR$(n);CHR$(a);CHR$(p₁)...CHR$(p₁₁);   **HEX: 1B 26**

NAME: Define Download Character

FUNCTION: ESC & (etc.) defines the dot pattern of a download character, assigns an ASCII code to it so it can be accessed (CHR$(n)) and defines an attribute (CHR$(a)) that contains starting and ending column data, plus descender information (if MSB = 1, no descender). In the example below, ESC & defines the Greek letter omega and assigns the ASCII character "#"to it.

NOTE

DIP switch SW2-3 must be OFF in order for this function to work properly.

PROGRAM:

```
10 REM # = OMEGA
20 LPRINT CHR$(27);"&";CHR$(0);"##";
30 LPRINT CHR$(139);:REM ATTRIBUTE
32 LPRINT CHR$(50);CHR$(72);CHR$(6);CHR$(64);
33 LPRINT CHR$(0);CHR$(64);CHR$(6);CHR$(72);
34 LPRINT CHR$(50);CHR$(0);CHR$(0);
45 LPRINT "# # # # # # # # #"
47 LPRINT "The resistance = 7";
50 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
55 LPRINT "#"
70 LPRINT "# # # # # # # # #"
85 LPRINT CHR$(27);"%";CHR$(0);CHR$(0);
90 LPRINT "# # # # # # # # #"
95 LPRINT:END
```

RESULT:

```
# # # # # # # # #
The resistance = 7Ω
Ω Ω Ω Ω Ω Ω Ω Ω Ω Ω
# # # # # # # # #
```

PIN 1 MSB	0	1	2	3	4	5	6	7	8	9	10	PIN 9 DATA (DOT=NO) A	0	1	2	3	4	5	6	7	8	9	10
128												●											
64		●		●		●		●						●		●		●		●			
32	●							●				COLUMN 0 (START)		●							●		
16	●							●						●							●		
8			●				●							●		●				●			
4				●								COLUMN 11 (END)			●				●				
2	●		●			●		●						●	●				●		●		
1												●											
PIN 8 LSB												DECIMAL (139)	(50)	(72)	(6)	(64)	(0)	(64)	(6)	(72)	(50)	(0)	(0)
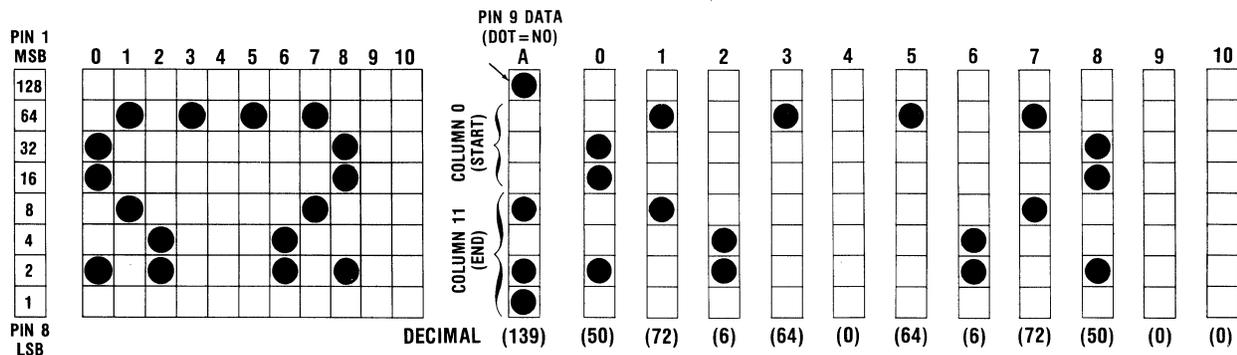
(Continued on next page)

ADJACENT PINS—When defining a half-dot column pattern for a download character, be certain **NOT** to define adjacent dots; that is, if a pin is fired, it cannot be fired again in the next half-dot column. To do so could cause damage to the printhead or associated circuitry (See illustration).

HALF-DOT COLUMNS

HALF-DOT COLUMNS

—OK—

—NOT OK—
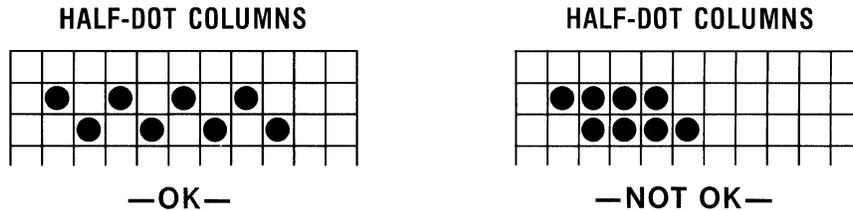
DESCENDER—The attribute (A) defines descender data (for pin 9). If the MSB is zero (no dot), there is a descender (A = 11 decimal). Refer to the illustration of lower case letter "g". The character is defined in the standard 11 × 8 pattern, attribute (A) shifts the pattern down one dot and it is printed with a descender.

HALF-DOT COLUMNS

0 1 2 3 4 5 6 7 8 9 10

MSB 128
64
32
16
8
4
2
LSB 1

(56) (62) (1) (68) (1) (68) (1) (126) (0) (0) (0)

A

(11)

WHOLE-DOT COLUMNS (ACTUAL APPEARANCE)

PIN 1
2
3
4
5
6
7
8
9

ATTRIBUTE (A)
SHIFTS DATA
DOWN 1 DOT
TO PRINT
DESCENDER
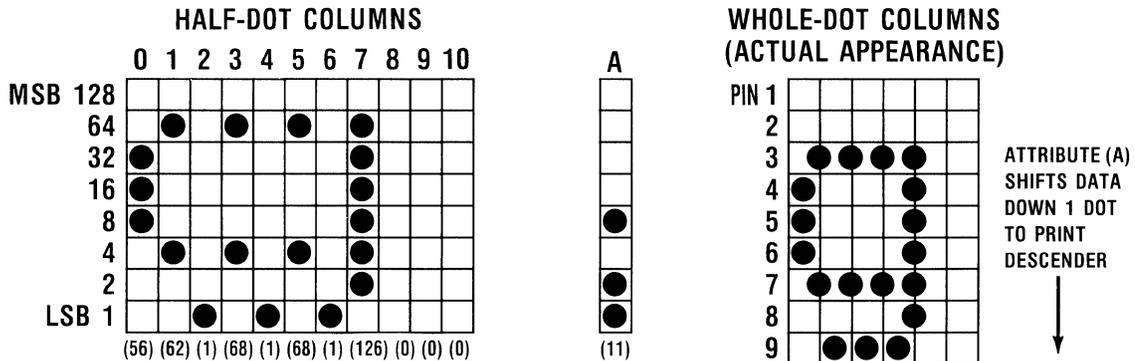
PROGRAM:

```
10 REM ESC & (* = LOWER CASE g)
15 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
20 LPRINT CHR$(27);"&";CHR$(0);"**";
30 LPRINT CHR$(11);:REM ATTRIBUTE FOR DESCENDER
35 REM HERE COMES LOWER CASE "G" DATA
40 LPRINT CHR$(56);CHR$(68);CHR$(1);CHR$(68);
45 LPRINT CHR$(1);CHR$(68);CHR$(1);CHR$(126);
50 LPRINT CHR$(0);CHR$(0);CHR$(0);
55 LPRINT "* * * * * * * * *"
60 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
65 LPRINT "U*U*U*U*U*U*U*U*U"
70 LPRINT CHR$(27);"%";CHR$(0);CHR$(0);
75 LPRINT "* * * * * * * * *"
80 END
```

RESULT:

```
* * * * * * * * *
UgUgUgUgUgUgUgUgU
* * * * * * * * *
```

(Continued on next page)

PROPORTIONAL: Attribute (A) defines the start and end columns of the character. If the attribute is 11 decimal (descender) or 139 decimal (no descender) for all characters, the character set is monospaced at 10 cpi. However, if the end column is less than those values, the character has a proportional attribute and this will be evident in the Proportional Spacing Mode (ESC p). If ESC p is not active, the attribute defaults to monospace. A program for a simple proportional character is provided below.

NOTE

Proportional characters are printed in Emphasized Mode. In this mode, all dots are fired twice in the horizontal plane. If space is desired between characters, the end column should be defined as at least two half-dot columns greater than the last data column (dots) of the character. Trailing non-data columns must be filled with zeroes so that eleven (11) columns are defined.

PROGRAM:
```
10 REM ESC & PROPORTIONAL SPACING
15 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
20 LPRINT CHR$(27);"&";CHR$(0);"**";
25 LPRINT CHR$(132);:REM PROPORTIONAL ATTRIBUTE
30 REM HERE DEFINE SIMPLE DOWNLOAD CHARACTER
35 LPRINT CHR$(254);CHR$(0);CHR$(0);CHR$(0);
40 LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(0);
45 LPRINT CHR$(0);CHR$(0);CHR$(0);
50 GOSUB 70
55 LPRINT CHR$(27);"p";CHR$(1);:REM PROPORTIONAL
60 GOSUB 70
65 LPRINT CHR$(27);"p";CHR$(0);:END
70 LPRINT "* * * * * * * * *"
75 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
80 LPRINT "U*U*U*U*U*U*U*U*U"
85 LPRINT CHR$(27);"%";CHR$(0);CHR$(0);
90 RETURN
```

RESULT:
```
* * * * * * * * *
UI UI UI UI UI UI UI UI UI U
* * * * * * * * * *
UIUIUIUIUIUIUIUIUIU
```

BASIC: CHR$(27);"(";   **HEX: IB 28**

NAME: NLQ (Near Letter Quality)

FUNCTION: When ESC "(" is received, all subsequent characters will be printed in near-letter quality. NLQ is produced by two passes of the print head.

NOTE

NLQ is automatically selected by holding the FF button as power is turned ON. Also, NLQ is selected at power ON using DIP switch SW2 settings. Refer to power-up Print Mode chart below.

Also, NLQ characters can be set to proportional spacing by ESC p and enlarged by SO and ESC W codes. However, NLQ cannot be condensed or italicized.

PROGRAM:

```
10  REM  SELECT NLQ
20  PRINT  CHR$ (27);"(";
30  PRINT "THIS IS NLQ (Near Lett
    er Quality)"
40  PRINT "ABCDEFGHIJKLMNOPQRSTUV
    WXYZ"
50  PRINT "abcdefghijklmnopqrstuv
    wxyz"
60  PRINT "1234567890!@#$%^&*()_+
    {}<>"
70  PRINT  CHR$ (27);"P";: REM  P
    ICA
```

RESULT:

```
THIS IS NLQ (Near Letter Quality)
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890!@#$%^&*()_+{}<>
```

Power-On NLQ Character Selection

DIP Switch SW2	7	6	5	4
NLQ (10 cpi)	OFF	OFF	ON	ON
Enlarged NLQ	ON	OFF	ON	ON

ESC * (Selectable Density Graphics Mode) ESC *

BASIC: CHR$(27);"*";CHR$(M);CHR$(n1);CHR$(n2); **HEX: 1B 2A**

NAME: Selectable Density Graphics Mode
(M = 0 to 6) (n1 = remainder) (n2 = # ÷ 256)

FUNCTION: This code sequence selects 1 of 7 graphics densities based on the value of M (M = 0 to 6) and is defined below. Values n1 and n2 specify the number of graphic characters to be printed.

n1 and n2 are calculated as follows:

- n2 is an integer (whole number) = # of characters to print ÷ 256
- n1 is the remainder of the division in n2

Example: # of characters to print = 680
$$n2 = 680 \div 256 = 2$$
$$n1 = 680 - (2 \times 256) = 168$$

Thus, to print 680 graphic characters, the BASIC code sequence is:

CHR$(27);"*";CHR$(M);CHR$(168);CHR$(2);

MODE SELECTIONS

MODE (M)	DENSITY	SAME AS	DESCRIPTION
0	SINGLE	ESC K	60 DOTS/INCH; 480 CHARACTERS/LINE
1	LO-SPEED DOUBLE	ESC L	120 DOTS/INCH; 960 CHARACTER/LINE.
2	HI-SPEED DOUBLE	ESC Y	SAME AS 1, BUT FASTER. CONSECUTIVE DOTS IN SAME ROW NOT PRINTED.
3	QUADRUPLE	ESC Z	240 DOTS/INCH; 1920 CHARACTER/LINE. CONSECUTIVE DOTS IN SAME ROW NOT PRINTED.
4	N/A	N/A	80 DOTS/INCH; 640 CHARACTERS/LINE.
5	1 TO 1 RATIO	N/A	72 DOTS/INCH; 576 CHARACTERS/LINE.
6	N/A	N/A	90 DOTS/INCH; 720 CHARACTERS/LINE.

PROGRAM:

```
560 REM SAMPLE PROGRAM OF GRAPHICS DENSITY SELECT
570 FOR M = 0 TO 6
580  LPRINT CHR$(27);"1";CHR$(5);
590  LPRINT "SAMPLE OF DENSITY SELECT ";M :  LPRINT
600 LPRINT CHR$(27);"3";CHR$(13);
610 WIDTH "lpt1:",255
620 G$=CHR$(27)+"*"+CHR$(M)+CHR$(55)+CHR$(2)
625 LPRINT CHR$(27);"1";CHR$(25);
630 FOR D=1 TO 3
640 LPRINT G$;
650 READ H,L
660 IF H < 0 THEN 700
670 FOR X = 1 TO H : LPRINT CHR$(L); : NEXT X
680 GOTO 650
700 LPRINT  : NEXT D
710 LPRINT CHR$(27);"2"; :  RESTORE :  LPRINT : NEXT M
720  LPRINT CHR$(12); : END
2000 DATA 21,127,21,0,21,127,21,0,63,127,21,0,63,127,21,0,63,127,21,0,63,127,21,
0,63,127,21,0,21,127,8,127,1,63,1,31,1,15,1,7,1,3,1,1,7,0,21,127,-1,0
2100 DATA 63,127,21,0,21,127,21,0,21,127,21,0,21,127,21,3,21,127,42,0,21,127,42,
0,15,3,6,7,15,28,6,120,21,96,21,0,21,127,21,0,21,127,21,0,21,127,7,0,8,127,6,0,2
1,127,-1,0
2200 DATA 21,127,21,0,21,127,21,0,63,127,21,0,21,127,13,0,1,64,1,96,1,112,1,120,
1,124,1,126,16,127,1,63,1,31,1,15,1,7,1,3,1,1,22,0,63,127,21,0,63,127,21,0,63,12
7,21,0,21,127,7,0,1,96,1,112,1,120,1,124,1,126,9,127,21,127,-1,0
```

RESULT:

```
SAMPLE OF DENSITY SELECT  0
```



```
SAMPLE OF DENSITY SELECT  1
```



```
SAMPLE OF DENSITY SELECT  2
```



```
SAMPLE OF DENSITY SELECT  3
```



```
SAMPLE OF DENSITY SELECT  4
```



```
SAMPLE OF DENSITY SELECT  5
```



```
SAMPLE OF DENSITY SELECT  6
```

BASIC: CHR$(27);" – ";CHR$(1);   **HEX: 1B 2D 31**

NAME: Print Underline

FUNCTION: When ESC – 1 is received, subsequent characters and spaces are underlined by the 9th pin at the "10th" pin position as one continuous underline. Underline continues line to line until cancelled by ESC – 0. Individual words or characters may be underlined, as the underline can be turned on and off anywhere in a line.

NOTE

The underline is printed as a separate, continuous line after the text is completed. However, if character styles are changed, the underline is drawn after each change. To draw the underline, paper is moved up one dot width to clear descenders.

PROGRAM:

```
10   REM   UNDERLINE
20   PRINT "Let's underline an entire
       line!"
25   PRINT
30   PRINT  CHR$ (27);"-"; CHR$ (1);
40   PRINT "An entire line!"
50   PRINT  CHR$ (27);"-"; CHR$ (0);
60   PRINT : PRINT "No underline here"
70   PRINT : PRINT "Let's underline ";
80   PRINT  CHR$ (27);"-"; CHR$ (1);
       "one";
90   PRINT  CHR$ (27);"-"; CHR$ (0);
       " word"
```

RESULT:

Let's underline an entire line!

An entire line!

No underline here

Let's underline one word

BASIC: CHR$(27);"/";CHR$(n);   **HEX: 1B 2F (n)**

NAME: Select VFU Channel (n = 0 to 7)

FUNCTION: ESC / (n) selects one of eight channels for vertical tab format (called VFU; Vertical Format Unit). This function is used with ESC b, which establishes the vertical tab stops within each channel. The basic purpose of this function is to divide a page into two or more channels with independent tab stops and independent Top of Form.

PROGRAM:

```
10 REM ESC / VFU CHANNEL 0-7
15 LPRINT CHR$(27);"C";CHR$(10);:REM FORM LENGTH 10
20 FOR Z = 0 TO 47: LPRINT Z:NEXT
25 FOR X = 1 TO 8: LPRINT CHR$(27);"j";CHR$(216);
30 NEXT X: LPRINT "    <--- TOP OF FORM #1"
35 LPRINT CHR$(27);"b";CHR$(1);:REM CHANNEL 1
40 LPRINT CHR$(2);CHR$(6);CHR$(9);CHR$(0);:REM CH1 TABS
45 LPRINT CHR$(27);"/";CHR$(1);:REM SELECT CH1
50 LPRINT CHR$(12);:REM TOP OF FORM COMMAND
55 LPRINT "    <--- VFU 1 TOP OF FORM"
60 FOR Y = 1 TO 3: LPRINT CHR$(11);:REM VERT TAB
65 LPRINT "    <--- VFU 1; TAB ";Y:NEXT Y
70 LPRINT CHR$(27);"b";CHR$(2);:REM CHANNEL 2
75 LPRINT CHR$(3);CHR$(5);CHR$(8);CHR$(0);:REM CH2 TABS
80 LPRINT CHR$(27);"/";CHR$(2);:REM SELECT CH2
85 LPRINT CHR$(12);:REM TOP OF FORM COMMAND
90 LPRINT "    <--- VFU 2 TOP OF FORM"
95 FOR N = 1 TO 3: LPRINT CHR$(11);:REM VERT TAB
100 LPRINT "    <--- VFU 2; TAB ";N:NEXT
105 END
```

RESULT: (See result of program on next page)

```
0 <--- TOP OF FORM #1
1
2
3
4
5
6
7
8
9
10 <--- VFU 1 TOP OF FORM
11
12 <--- VFU 1; TAB   1
13
14
15
16 <--- VFU 1; TAB   2
17
18
19 <--- VFU 1; TAB   3
20
21
22
23
24
25
26
27
28
29
30 <--- VFU 2 TOP OF FORM
31
32
33 <--- VFU 2; TAB   1
34
35 <--- VFU 2; TAB   2
36
37
38 <--- VFU 2; TAB   3
39
40
41
42
43
44
45
46
47
```

(program on previous page)

ESC 0   (1/8-Inch Line Spacing)   ESC 0

BASIC: CHR$(27);"0";   **HEX: 1B 30**

NAME: 1/8-Inch Line Spacing (8 lpi)

FUNCTION: When ESC 0 is received, line spacing is set at 1/8 inch. This spacing corresponds with 8 lines per inch. This spacing is in effect until cancelled by ESC 2 (normal 1/6 inch spacing) or by ESC A, ESC 1, ESC 2, or ESC 3. ESC J is in effect for one line only, so does not cancel ESC 0.

PROGRAM:

```
10  REM  1/8 INCH LINE SPACE
20  PRINT  CHR$ (27);"0";
30  FOR X = 1 TO 4
40  PRINT "--------": NEXT
50  PRINT  CHR$ (27);"2";
60  FOR Z = 1 TO 4
70  PRINT "--------": NEXT
```

RESULT:

```
--------
--------
--------
--------
--------
--------
--------
--------
```

ESC 1   (8-Pin Graphics Line Spacing 7/72")   ESC 1

BASIC: CHR$(27);"1";   **HEX: 1B 31**

NAME: 8-Pin Graphics Line Spacing (7/72")

FUNCTION: When ESC 1 is received, the line-spacing value is set at 7/72". This is the spacing normally used between 8-pin graphic lines. This spacing is cancelled by ESC A, ESC 0, ESC 2 or ESC 3. ESC J is in effect for only line only, so does not cancel ESC 1.

PROGRAM:

```
10  REM 8-PIN GRAF 7/72
20  PRINT  CHR$ (27);"1";
30  FOR X = 1 TO 4
40  PRINT "-----------": NEXT
50  PRINT  CHR$ (27);"2";
60  FOR Z = 1 TO 4
70  PRINT "-----------": NEXT
```

RESULT:

```
--------
--------
--------
--------
--------
--------
--------
--------
```

ESC 2   (1/6-Inch Line Spacing)   ESC 2

BASIC: CHR$(27);"2";   **HEX: 1B 32**

NAME: Normal (1/6 Inch) Line Spacing

FUNCTION: ESC 2 sets the normal line spacing (6 lpi) and is normally used to cancel special line spacing functions such as ESC A, ESC 0, ESC 1, and ESC 3.

PROGRAM:
```
10   REM   1/6 INCH LF
20   PRINT   CHR$ (27);"A"; CHR$ (5);
30   FOR X = 1 TO 6
40   PRINT "---------": NEXT
50   PRINT   CHR$ (27);"2";: REM 1/6"
60   FOR Z = 1 TO 4
70   PRINT "---------": NEXT
```

RESULT:

ESC 3   (N/216-Inch Line Spacing)   ESC 3

BASIC: CHR$(27);"3";(n);   **HEX: IB 33 (n)**

NAME: N/216-Inch Line Spacing (n = 1 to 216)

FUNCTION: This function allows the setting of line spacing in increments of 1/3 dot diameter. This function is in effect until cancelled by ESC A, ESC 0, ESC 1 or ESC 2.

```
┌─────────────────────────── NOTE ───────────────────────────┐
│ ESC J is similar in function to ESC 3 but is effective for one line only. │
└─────────────────────────────────────────────────────────────┘
```

PROGRAM:
```
10 REM ESC 3 - 1/3 DOT LINE SPACING
20 LPRINT CHR$(27);"3";CHR$(72);
30 FOR X = 1 TO 4
40 LPRINT "---------":NEXT X
50 LPRINT CHR$(27);"2";:REM 1/6" LINE SPACE
```

RESULT:

ESC 4   (Select Alternate *Italic* Characters)   ESC 4

BASIC: CHR$(27);"4";   **HEX: IB 34**

NAME: Select Alternate (Italic) Characters

FUNCTION: When ESC 4 is received, subsequent characters are italicized until cancelled by ESC 5.

```
───────────────────────── NOTE ─────────────────────────
All characters styles except NLQ (Near Letter Quality) can be italicized.
```

PROGRAM:
```
10   REM ITALICS
20   PRINT "This is Normal"
30   PRINT  CHR$ (27);"4";
40   PRINT "This is Italic"
50   PRINT  CHR$ (27);"5";
60   PRINT "Back to Normal"
```

RESULT:
```
This is Normal
This is Italic
Back to Normal
```

ESC 5   (Cancel Alternate *Italic* Characters)   ESC 5

BASIC: CHR$(27);"5";   **HEX: 1B 35**

NAME: Cancel Alternate (Italic) Characters

FUNCTION: When ESC 5 is received, italicized characters are cancelled and subsequent characters are printed in the normal style.

PROGRAM: (see above)

ESC 6   (Printable Area Code Expansion)   ESC 6

BASIC: CHR$(27);"6";   **HEX: 1B 36**

NAME: Printable Area Code Expansion

FUNCTION: ESC 6 enables the printer to print international characters in the code area of 128 to 159 (plus 255). ESC 6 is cancelled by ESC 7.

PROGRAM:
```
10 REM ESC 6 PRINT AREA EXPANSION
20 LPRINT CHR$(27);"6";CHR$(27);"(";
30 FOR Z= 128 TO 159
40 LPRINT CHR$(Z);" ";:NEXT
50 LPRINT CHR$(255);: LPRINT
60 LPRINT CHR$(27);"7";:REM CANCEL
70 LPRINT CHR$(128);:REM WON'T PRINT
```

RESULT:

à è ù ò ì ° £ ¡ ¿ Ñ ñ ¤ Pt Å å ç § ß Æ æ Ø ø ¨ Ä Ö Ü ä ö ü É é ¥ Ø

NOTE: Characters are italicized when in Pica style per this sample.

à è ù ò ì ° £ ¡ ¿ Ñ ñ ¤ Pt Å å ç § ß Æ æ Ø ø ¨ Ä Ö Ü ä ö ü É é ¥ Ø

CODE CHART (DECIMAL)

128	129	130	131	132	133	134	135	136	137	138
à	è	ù	ò	ì	°	£	¡	¿	Ñ	ñ

139	140	141	142	143	144	145	146	147	148	149
¤	Pt	Å	å	ç	§	ß	Æ	æ	Ø	ø

150	151	152	153	154	155	156	157	158	159	255
¨	Ä	Ö	Ü	ä	ö	ü	É	é	¥	Ø

ESC 7   (Cancel Printable Area Code Expansion)   ESC 7

BASIC: CHR$(27); "7";   **HEX: 1B 37**

NAME: Cancel Printable Area Code Expansion

FUNCTION: ESC 7 cancels the printing of codes in the 128 to 159 area (plus 255). Control codes such as BEL (7 + 128 = 135) will respond, but not as printable characters.

PROGRAM: (see above)

ESC 8   (Disable Paper Out—Remote)   ESC 8

BASIC: CHR$(27);"8";   **HEX: 1B 38**

NAME: Disable Paper Out Function (Remote)

FUNCTION: When ESC 8 is received, the Paper End condition does not result in the printer going OFF LINE as in the normal case. In this manner, printing can continue to within the last few lines of a form. This function is cancelled by ESC 9.

NOTE

DIP switch SW2-1 must be OFF in order for this code sequence to perform as described. Make certain that a CR code follows this command. Also, the slide switch under the tractors must be in the "OTHERS" position.

PROGRAM: LPRINT CHR$(27);"8";
                   LPRINT CHR$(13);

RESULT: Paper End alarm and OFF LINE condition are bypassed. ALARM light goes ON when paper is out to alert operator.

ESC 9   (Enable Paper Out—Remote)   ESC 9

BASIC: CHR$(27);"9";   **HEX: 1B 39**

NAME: Enable Paper Out Function (Remote)

FUNCTION: ESC 9 cancels the bypass of the Paper End condition set by ESC 8. In this manner, the Paper End switch functions normally, setting the printer OFF LINE and sounding the alarm when the paper supply is exhausted.

NOTE

DIP switch SW2-1 must be OFF in order for this code sequence to perform as described. Make certain that a CR code follows this command. Also, the slide switch under the tractors must be in the "OTHERS" position.

PROGRAM: LPRINT CHR$(27);"9";
                   LPRINT CHR$(13);

RESULT: Paper End alarm and OFF LINE condition return to normal function.

BASIC: CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);   **HEX: 1B 3A 30 30 30**

NAME: Copy ROM CG to Download CG Set

FUNCTION: ESC : 0 0 0 causes the fonts in the standard ROM Character Generator to be copied into the download area. The basic purpose of this function is to provide most of the standard characters for use with special characters defined by ESC &, which would replace some of the standard characters.

In the program example below, the character "!" is replaced by the Greek letter omega, the symbol for ohms in electronics.

PROGRAM:

```
10 REM ESC : COPY CG ROM TO DOWNLOAD AREA
15 LPRINT CHR$(27);":";CHR$(0);CHR$(0);CHR$(0);
20 REM NOW DEFINE OMEGA AS "!"
25 LPRINT CHR$(27);"&";CHR$(0);"!!";:REM ! = OMEGA
30 LPRINT CHR$(139);:REM ATTRIBUTE FOR OMEGA
35 REM HERE COMES OMEGA
40 LPRINT CHR$(50);CHR$(72);CHR$(6);CHR$(64);
45 LPRINT CHR$(0);CHR$(64);CHR$(6);CHR$(72);
50 LPRINT CHR$(50);CHR$(0);CHR$(0);
55 REM NOW SELECT DOWNLOAD CG
60 LPRINT CHR$(27);"%";CHR$(1);CHR$(0);
65 FOR X = 33 TO 57
70 LPRINT CHR$(X);: NEXT X: LPRINT
75 REM NOW SELECT ROM CG
80 LPRINT CHR$(27);"%";CHR$(0);CHR$(0);
85 FOR X = 33 TO 57
90 LPRINT CHR$(X);: NEXT X: LPRINT
95 END
```

RESULT:

```
Ω"#$%&'()*+,-./0123456789
!"#$%&'()*+,-./0123456789
```

NOTE

For details on the definition of download characters, their attributes etc. refer to ESC &.

ESC <   (Unidirectional Print, One Line)   ESC <

BASIC: CHR$(27);"<";   **HEX: 1B 3C**

NAME: Unidirectional Print, one line only

FUNCTION: Receipt of ESC < moves the print head to the left-most position and prints subsequent characters left to right for one line, then resumes bi-directional printing.

NOTE

Unidirectional printing is used when positional accuracy is more important than speed. The line to line positional indexing is best in unidirectional print mode. See ESC U.

PROGRAM:
```
10  REM  UNIDIRECTIONAL 1 LINE
20  PRINT  CHR$ (27);"<";
30  PRINT "UNIDIRECTIONAL -->"
35  PRINT  CHR$ (27);"<";
40  PRINT "UNIDIRECTIONAL -->"
50  PRINT "BI-DIRECTIONAL <--"
60  PRINT "BI-DIRECTIONAL -->"
```

RESULT:
```
UNIDIRECTIONAL -->
UNIDIRECTIONAL -->
BI-DIRECTIONAL <--
BI-DIRECTIONAL -->
```

ESC U   (Unidirectional Print Mode)   ESC U

BASIC: CHR$(27);"U";CHR$(1);   **HEX: 1B 55 01**

NAME: Unidirectional Print Mode

FUNCTION: Receipt of ESC U 1 moves the print head to the leftmost position and prints subsequent characters left to right, line after line until cancelled by ESC U 0. See note above.

PROGRAM:
```
10  REM  UNIDIRECTIONAL MODE
20  PRINT  CHR$ (27);"U"; CHR$ (1);
30  PRINT "UNIDIRECTIONAL -->"
40  PRINT "UNIDIRECTIONAL -->"
50  PRINT  CHR$ (27);"U"; CHR$ (0);
60  PRINT "BI-DIRECTIONAL <--"
70  PRINT "BI-DIRECTIONAL -->"
```

RESULT:
```
UNIDIRECTIONAL -->
UNIDIRECTIONAL -->
BI-DIRECTIONAL <--
BI-DIRECTIONAL -->
```

ESC =　　　　(Set MSB to 0)　　　　# ESC =

BASIC: CHR$(27);" = ";　　　　　　　　　　　　　　　　　　　**HEX: 1B 3D**

NAME: Set MSB to 0 (force 8th bit to zero)

FUNCTION: ESC = forces the MSB to a 'zero' condition, thus codes 128 and above are not accessible (do not print). ESC = is changed by ESC > (MSB = 1) or cancelled by ESC #.

PROGRAM:
```
10 REM ESC = SET MSB TO 0
20 LPRINT CHR$(27);">";:REM MSB = 1
25 LPRINT "This is italic (MSB = 1)"
30 LPRINT CHR$(27);"=";:REM MSB = 0
35 LPRINT "This is normal (MSB = 0)
40 LPRINT CHR$(27);"#";:REM CANCEL
```

RESULT:
```
This is italic (MSB = 1)
This is normal (MSB = 0)
```

ESC >　　　　(Set MSB to 1)　　　　# ESC>

BASIC: CHR$(27);" > ";　　　　　　　　　　　　　　　　　　　**HEX: 1B 3E**

NAME: Set MSB to 1 (force 8th bit to one)

FUNCTION: ESC > forces the MSB to a 'one' condition, thus codes lower than 128 are not accessible (do not print). ESC > is changed by ESC = (MSB = 0) or cancelled by ESC #.

PROGRAM:
```
10 REM ESC > SET MSB TO 1
20 LPRINT "These are Standard Characters"
40 LPRINT CHR$(27);">";:REM MSB = 1
50 LPRINT "These are Alternate Characters"
60 LPRINT CHR$(27);"#";:REM CANCEL MSB = 1
70 LPRINT "Standard Characters Again!"
```

RESULT:
```
These are Standard Characters
These are Alternate Characters
Standard Characters Again!
```

ESC ?　(Multiple Function Graphics Mode)　ESC ?

BASIC: CHR$(27);"?";"n";CHR$(M);　　　　　　　　　　　**HEX: 1B 3F**

NAME: Multiple Function Graphics (n = K, L ,Y or Z)(M = 0 to 6)

FUNCTION: This special code sequence allows the changing of pitch (density) to 1 of 6 other pitches without changing the current program. In addition, this code sequence allows sequences ESC K, ESC L, ESC Y or ESC Z to function as any of the following:

MODE	DENSITY	TOTAL (MAXIMUM) 8" LINE
0	• 60 DOTS/INCH	480 GRAPHIC CHAR/LINE
1	• 120 DOTS/INCH	960 GRAPHIC CHAR/LINE
2	• 60 DOTS/INCH	960 GRAPHIC CHAR/LINE
3	• 240 DOTS/INCH	1920 GRAPHIC CHAR/LINE
4	• 80 DOTS/INCH	640 GRAPHIC CHAR/LINE
5	• 72 DOTS/INCH	576 GRAPHIC CHAR/LINE
6	• 90 DOTS/INCH	720 GRAPHIC CHAR/LINE

PROGRAM:

```
10 REM CHANGING PITCH OF GRAPHICS MODE
15 WIDTH "LPT1:",255
20 A = 1 : B = 480 : J = 1
30 IF J = 1 THEN LPRINT "SINGLE DENSITY GRAPHICS MODE" : C$="K"
40 IF J = 2 THEN LPRINT "DOUBLE DENSITY GRAPHICS MODE" : C$="L"
50 IF J = 3 THEN LPRINT "DOUBLE DENSITY, DOUBLE SPEED GRAPHICS MODE" : C$="Y"
60 IF J = 4 THEN LPRINT "QUADRUPLE DENSITY GRAPHICS MODE" : C$="Z"
70 FOR M = 0 TO 6
75 LPRINT CHR$(27);"?";C$;CHR$(M);
80 LPRINT CHR$(27);C$;CHR$(B MOD 256);CHR$(INT(B/256));
90 FOR K = 1 TO B
100 LPRINT CHR$(&H99);
110 NEXT K
120 LPRINT
125 LPRINT CHR$(27);C$;CHR$(B MOD 256);CHR$(INT(B/256));
130 FOR K = 1 TO B
140 LPRINT CHR$(A);
150 A = A +1
155 IF A > 128 THEN A = 1
160 NEXT K
170 LPRINT
180 A = 1
190 NEXT M
195 J = J + 1
200 IF J < 5 THEN GOTO 30 ELSE LPRINT CHR$(12); : END
```

RESULT:

SINGLE DENSITY GRAPHICS MODE
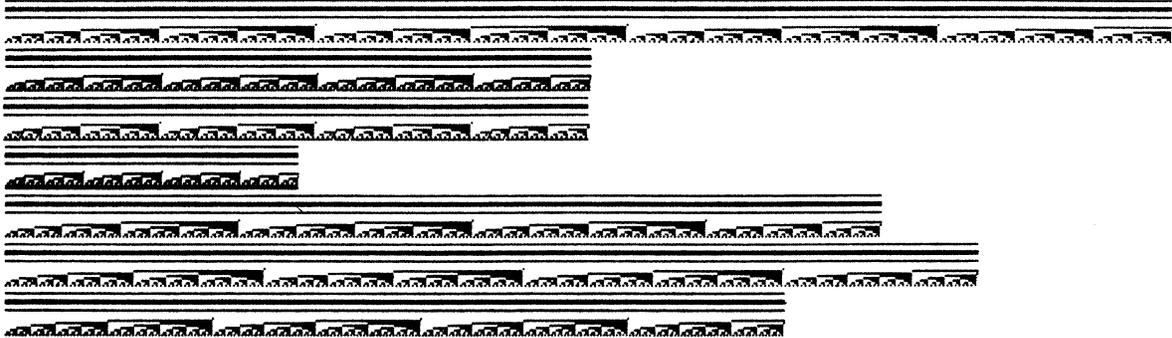
DOUBLE DENSITY GRAPHICS MODE
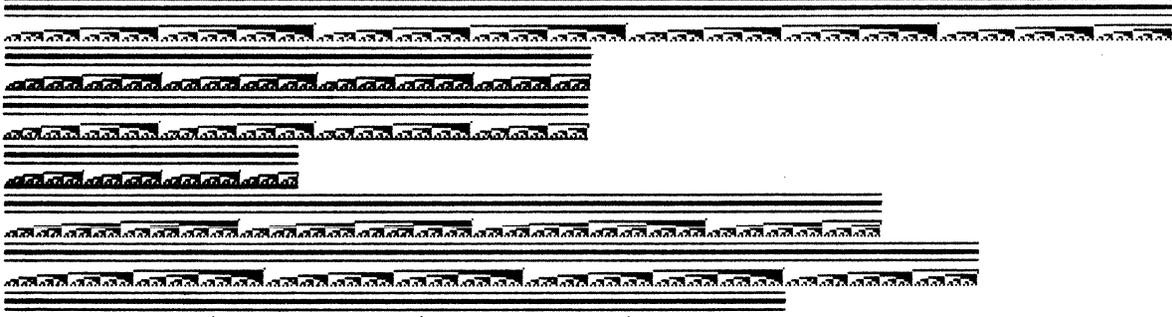
DOUBLE DENSITY, DOUBLE SPEED GRAPHICS MODE
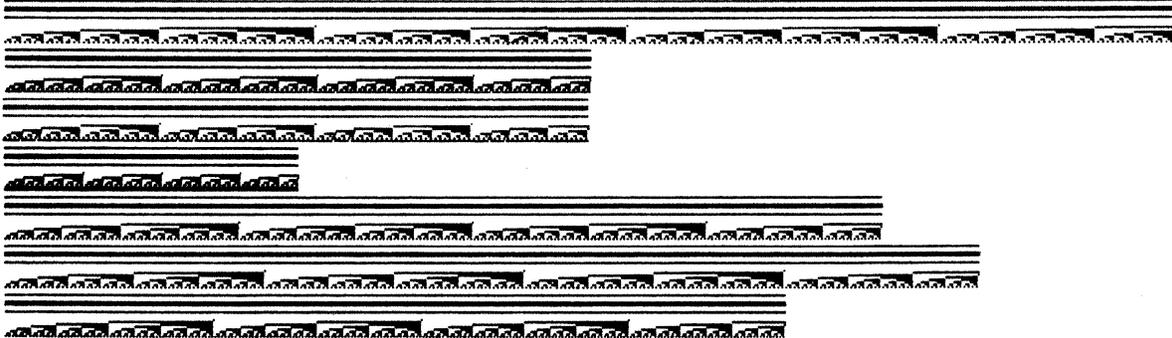
QUADRUPLE DENSITY GRAPHICS MODE
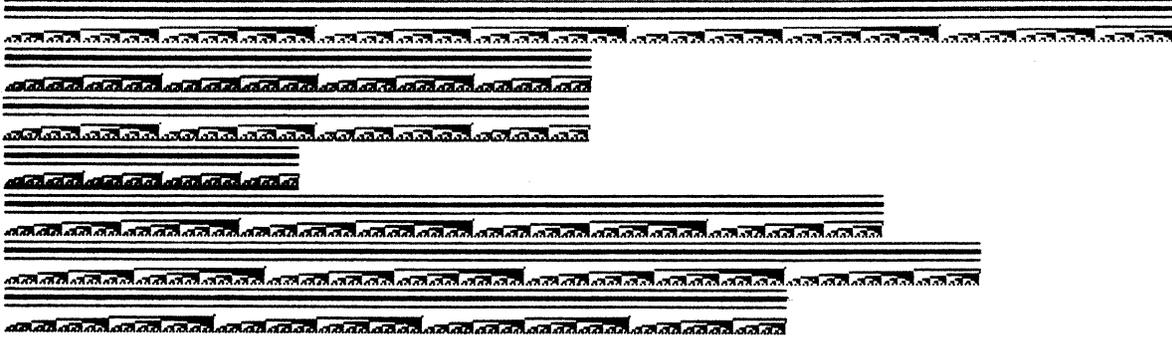
NOTE: Ink reproduction may not show actual density.

ESC @ (Printer Initialization) ESC @

NAME: Printer Initialization

FUNCTION: ESC @ initializes the printer, clears data in the print buffer and cancels any special print style, line spacing, etc.

PROGRAM:
```
10   REM  PRINTER INITIALIZATION
20   PRINT  CHR$ (27);"!"; CHR$ (32);
30   PRINT "A STITCH IN TIME"
40   PRINT "SAVES NINE";
50   PRINT "A ROLLING STONE";
60   PRINT  CHR$ (27);"@";
70   PRINT  CHR$ (27);"!"; CHR$ (32);
80   PRINT "GATHERS NO MOSS!"
```

RESULT:
```
A STITCH IN TIME
GATHERS NO MOSS!
```

ESC A (1 Dot Line Spacing) ESC A

NAME: One Dot Line Spacing (n = 1 to 72)

FUNCTION: ESC A (n) establishes the line feed value in one dot increments for fine control of line spacing.

---- NOTE ----

The line spacing value established by this function will also be executed when the LF button is pressed while OFF LINE.

PROGRAM:
```
10   REM N/72 LINE SPACING
20   FOR X = 2 TO 12 STEP 2
30   PRINT  CHR$ (27);"A"; CHR$ (X);
40   PRINT "----------"
50   NEXT X
60   PRINT "----------"
```

RESULT:
```
==========
----------
----------
----------
----------
```

BASIC: CHR$(27);"B";CHR$(n₁)...CHR$(n₁₆);CHR$(0);   **HEX: 1B 42 (n) 30**

NAME: Vertical Tab Setting (up to 16 positions)

FUNCTION: ESC B establishes the vertical tab stops that are executed sequentially with each VT code received. The tab settings are terminated by CHR$(0);. This function will track the original top of form and tab stops even if the line spacing is changed between stops, as the original line measure is stored and executed with VT.

NOTE

Tab positions in ESC B must be entered in numerical ascending order and terminated with CHR$(0);. Also, if no tab positions are established, VT performs a line feed. The maximum tab value is 66 for normal (1/6″) line spacing. Larger values default to 66. The largest number accepted is 254.

PROGRAM:

```
10 REM ESC B VERTICAL TAB
15 FOR Z = 0 TO 17
20 LPRINT Z:NEXT
25 FOR X = 1 TO 3
30 LPRINT CHR$(27);"j";CHR$(216);:NEXT
35 LPRINT CHR$(27);"B";CHR$(1);CHR$(6);
40 LPRINT CHR$(11);CHR$(17);CHR$(0);
45 LPRINT CHR$(11);"     <--VTAB @ 1"
50 LPRINT CHR$(27);"A";CHR$(5);
55 FOR I = 1 TO 3
60 LPRINT "     -----------":NEXT
65 LPRINT CHR$(11);"     <--VTAB @ 6"
70 LPRINT CHR$(11);"     <--VTAB @ 11"
75 LPRINT CHR$(11);"     <--VTAB @ 17"
80 LPRINT CHR$(27);"A";CHR$(10);
```

RESULT:

```
0
1  <--VTAB @ 1
2  -----------
3  -----------
4
5
6  <--VTAB @ 6
7
8
9
10
11 <--VTAB @ 11
12
13
14
15
16
17 <--VTAB @ 17
```

ESC C (Set Form Length # of Lines) ESC C

BASIC: CHR$(27);"C";CHR$(n);   **HEX: 1B 43 (n)**

NAME: Set Form Length by # of lines (n = 1 to 127)

FUNCTION: ESC C (n) sets the absolute number of lines that will be fed when a FF (Form Feed) code is received. If the line spacing is the normal 1/6", then 66 lines would be standard Form Length (11"). If the line spacing value is changed by ESC A (n) etc. a FF will still result in feeding paper the **number of lines** established by ESC C (n).

PROGRAM:
```
10  REM  ESC C FORM # LINES
20  PRINT  CHR$ (27);"C"; CHR$ (6);
30  PRINT "******************";
40  PRINT  CHR$ (12);: REM  FF
50  PRINT "SIX LINES FORM FEED"
```

RESULT: ******************

                    SIX LINES FORM FEED

ESC C 0 (Set Form Length # of Inches) ESC C 0

BASIC: CHR$(27);"C";CHR$(0);CHR$(n);   **HEX: 1B 43 00 (n)**

NAME: Set Form Length by # of inches (n = 1 to 22)

FUNCTION: ESC C 0 (n) sets the number of inches that will be fed when a FF (Form Feed) code is recived. 11 inches is a standard Form Length.

PROGRAM:
```
10  REM  ESC C 0 FORM # INCHES
20  PRINT  CHR$ (27);"C"; CHR$ (0
    ); CHR$ (1);
30  PRINT "******************";
40  PRINT  CHR$ (12);: REM  FF
50  PRINT "ONE INCH  FORM FEED"
```

RESULT: ******************

                    ONE INCH FORM FEED

ESC D (Horizontal Tab Setting, 32 Positions) ESC D

BASIC: CHR$(27);"D";CHR$(n₁)...CHR$(n₃₂);CHR$(0);

HEX: 1B 44 (n) 30

NAME: Horizontal Tab Setting (32 positions maximum)

FUNCTION: ESC D establishes the horizontal tab stops that are executed with each HT code received. Tab settings are entered in ascending numerical order and are terminated with CHR$ (0);. Tab stops can be specified to 80 columns in 10 cpi and to 132 columns in condensed mode.

NOTE
The tab stops are established by the character width at time of tab entry. This function stores these positions and executes proper positioning regardless of type style changes. Tab stops greater than the effective column width are executed at tab position zero on the next line.

PROGRAM:
```
10 REM ESC D HORIZONTAL TAB SETTING @ PICA 10 CPI
15 LPRINT "01234567890123456789012345678901234567890123456789"
20 LPRINT CHR$(27);"D";CHR$(5);CHR$(15);CHR$(25);
25 LPRINT CHR$(30);CHR$(35);CHR$(0);:REM END TABS
30 LPRINT CHR$(27);"W";CHR$(1);:REM ENLARGED
35 FOR Z = 1 TO 2: LPRINT CHR$(9);"TAB";:NEXT Z
40 LPRINT CHR$(27);"W";CHR$(0);:REM CANCEL ENLARGED
45 LPRINT CHR$(15);:REM CONDENSED CHARACTERS
50 LPRINT CHR$(9);"TAB";
55 LPRINT CHR$(18);:REM CANCEL CONDENSED
60 LPRINT CHR$(27);"M";:REM ELITE 12 CPI CHARACTERS
65 LPRINT CHR$(9);"TAB";
70 LPRINT CHR$(27);"P";:REM BACK TO PICA 10 CPI
75 LPRINT CHR$(9);"TAB";:LPRINT :END
```

RESULT:
```
01234567890123456789012345678901234567890123456789
   TAB      TAB     TAB    TAB    TAB
```

ESC E   (Select Emphasized Print)   ESC E

BASIC: CHR$(27);"E";   **HEX: 1B 45**

NAME: Select Emphasized Print

FUNCTION: When ESC E is received, all subsequent characters are emphasized by firing adjacent pins in one pass of the printhead. Emphasized characters are printed at reduced speed. This function is cancelled by ESC F or ESC !.

PROGRAM:
```
10   REM   EMPHASIZED
20   PRINT  "(NORMAL) LOOK JANE LOOK!!!"
30   PRINT
40   PRINT  "(EMPHASIZED) ";
50   PRINT  CHR$ (27);"E";
60   PRINT  "SEE SPOT RUN!!!"
70   PRINT : PRINT   CHR$ (27);"F";
80   PRINT  "(NORMAL) RUN DICK RUN!!!"
```

RESULT:

(NORMAL) LOOK JANE LOOK!!!

(EMPHASIZED) **SEE SPOT RUN!!!**

(NORMAL) RUN DICK RUN!!!

ESC F   (Cancel Emphasized Print)   ESC F

BASIC: CHR$(27);"F";   **HEX: 1B 46**

NAME: Cancel Emphasized Print

FUNCTION: When ESC F is received, emphasized print is cancelled.

PROGRAM: (see above)

ESC G   (Double Strike Print Mode)   ESC G

BASIC: CHR$(27);"G";   **HEX: 1B 47**

NAME: Double Strike Print Mode

FUNCTION: When ESC G is received, all subsequent characters are printed in double strike. This print style is printed in two passes of the print head, the second pass a fraction of a dot lower. This fills the vertical strokes of the characters to improve quality. This function is cancelled by ESC H.

PROGRAM:

```
10  REM  ESC G DOUBLE STRIKE
20  PRINT  CHR$ (27);"G";
30  PRINT "DOUBLE STRIKE!"
40  PRINT  CHR$ (27);"H";
50  PRINT
60  PRINT "WHILE THE IRON IS HOT"
```

RESULT: DOUBLE STRIKE!

WHILE THE IRON IS HOT

ESC H   (Cancel Double Strike Mode)   ESC H

BASIC: CHR$(27);"H";   **HEX: 1B 48**

NAME: Cancel Double Strike Mode

FUNCTION: Receipt of ESC H cancels the Double Strike print mode.

PROGRAM: (see above)

ESC I   (Enable Printable Control Codes)   ESC I

NAME: Enable Printable Control Codes

FUNCTION: ESC I 1 enables the printer to print characters using ASCII codes in the control code area (ASCII 0 to 31 and 128 to 159). Note that standard control codes such as BEL (7 decimal) and CR (13 decimal) do not produce characters, but continue to function as normal. This function is cancelled by ESC I 0.

PROGRAM:
```
10 REM ESC I PRINTABLE CONTROL CODES
20 LPRINT CHR$(0);CHR$(1);CHR$(128);CHR$(129);
30 LPRINT "LINE 20 UNPRINTABLE CONTROL CODES"
40 LPRINT CHR$(27);"I";CHR$(1);:REM OK TO PRINT
50 LPRINT CHR$(0);CHR$(1);CHR$(128);CHR$(129);
60 LPRINT " <-- LINE 50 PRINTABLE CONTROL CODES"
70 LPRINT CHR$(27);"I";CHR$(0);:REM CANCEL
80 LPRINT CHR$(0);CHR$(1);CHR$(128);CHR$(129);
90 LPRINT "LINE 80 UNPRINTABLE CONTROL CODES"
95 END
```

RESULT:
```
LINE 20 UNPRINTABLE CONTROL CODES
àèàè <-- LINE 50 PRINTABLE CONTROL CODES
LINE 80 UNPRINTABLE CONTROL CODES
```

PRINTABLE CODES WITHIN CONTROL CODE AREA

DEC/CHAR	DEC/CHAR	DEC/CHAR	DEC/CHAR	DEC/CHAR	DEC/CHAR	DEC/CHAR	DEC/CHAR
0	8 BS	16	24	128	136 BS	144	152
1	9 HT	17	25	129	137 HT	145	153
2	10 LF	18 DC2	26	130	138 LF	146 DC2	154
3	11 VT	19 DC3	27 ESC	131	139 VT	147 DC3	155 ESC
4	12 FF	20 DC4	28	132	140 FF	148 DC4	156
5	13 CR	21	29	133	141 CR	149	157
6	14 SO	22	30	134	142 SO	150	158
7 BEL	15 SI	23	31	135 BEL	143 SI	151	159

ESC J   (Paper Feed, ⅓ Dot Increment)   ESC J

BASIC: (CHR$(27);"J";CHR$(n);   **HEX: 1B 4A (n)**

NAME: Paper Feed Execution, ⅓ dot increment (n = 1 to 216)

FUNCTION: ESC J (n) causes all data in the print buffer to be printed, then paper is fed the amount indicated by (n). ESC J (n) is cancelled by a line feed.

PROGRAM:
```
10 REM ESC J PAPER FEED 1/3 DOT
20 LPRINT "----------------------"
30 FOR X = 1 TO 20
40 LPRINT CHR$(8);:NEXT
50 LPRINT CHR$(27);"J";CHR$(108);
60 LPRINT "----------------------"
70 LPRINT "----------------------"
```

RESULT:
```
----------------------

----------------------
----------------------
```

ESC j   (Reverse Paper Feed, ⅓ Dot Increment)   ESC j

BASIC: (CHR$(27);"j";CHR$(n);   **HEX: 1B 6A (n)**

NAME: Reverse Paper Feed Execution, ⅓ dot increment (n = 1 to 216)

FUNCTION: ESC j (n) causes all data in the print buffer to be printed, then paper is fed (in reverse) the amount indicated by (n). ESC j (n) is cancelled by a line feed.

PROGRAM:
```
10 REM ESC j REVERSE PAPER
20 FOR X = 6 TO 1 STEP -1
40 LPRINT X:NEXT X
45 LPRINT " 0 (REF)";
50 LPRINT CHR$(27);"j";CHR$(216);
60 LPRINT "<---"
```

RESULT:
```
6          <---
5
4
3
2
1
0 (REF)
```

+-------------------- NOTE --------------------+
| To perform one standard (1/6") linefeed in reverse, |
| n = 36. |
+--+

BASIC: CHR$(27);"K";CHR$(N1);CHR$(N2);   **HEX: 1B 4B**

NAME: Graphics Mode—Single Density

FUNCTION: When the above code sequence is received, the printer is placed into Single Density Graphics Mode and waits to receive the total number of graphic characters in the line designated by (N1) and (N2).

(N1) and (N2) are defined as follows:

(N2) is a whole number = total number of graphic characters ÷ 256

(N1) is the remainder of the above equation

Example: total number of graphic characters = 750

$$N2 = 750 \div 256 = 2$$
$$N1 = 750 - (256 \times N2) = 238$$

In Single Density Graphics the maximum number of graphic characters that can be printed per line is 480 (60 dots/inch). If the number of graphic characters exceeds this maximum, the excess graphic characters are ignored.

Graphic Character—A graphic character corresponds on a one-to-one basis with the print head wires as illustrated. This relationship is sometimes referred to as "bit image" graphics.

The ninth print head wire is used for underline and nine pin graphics only.


```
PRINT HEAD                    GRAPHIC
  WIRES                         BITS

    ①───────────────────────── 8   MSB
    ②───────────────────────── 7
    ③───────────────────────── 6
    ④───────────────────────── 5
    ⑤───────────────────────── 4
    ⑥───────────────────────── 3
    ⑦───────────────────────── 2
    ⑧───────────────────────── 1   LSB
    ⑨        PIN 9 NOT USED
```
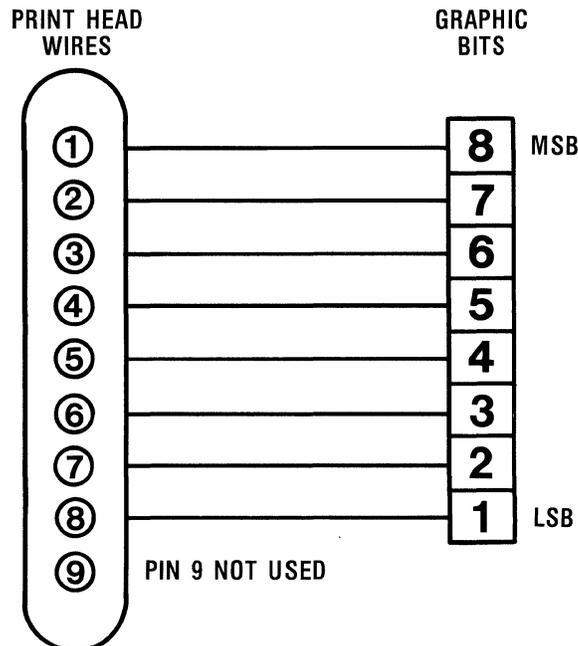
(Continued on the next page)

The following are examples:

Pin	Value
8	1
7	1
6	0
5	0
4	1
3	1
2	0
1	0

12_{10} / 12_{10} $= CC_{16} = 204_{10} =$ character "L"

Pin	Value
8	0
7	0
6	1
5	0
4	0
3	1
2	0
1	1

2_{10} / 5_{10} $= 25_{16} = 37_{10} =$ character "%"
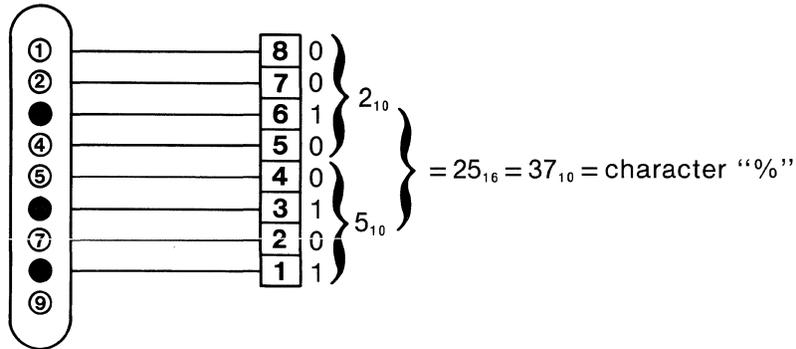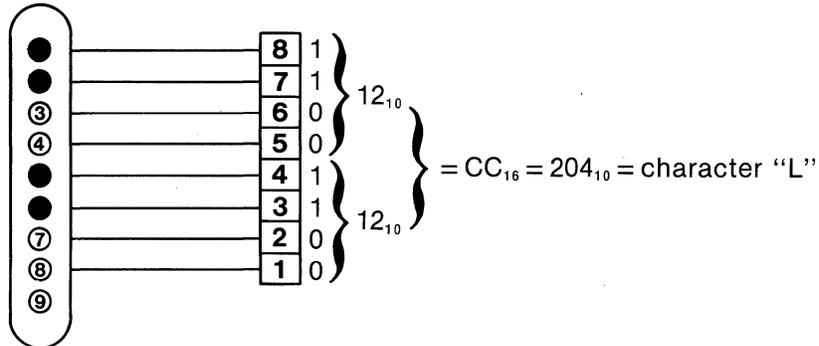
PROGRAM:

```
10 REM SINGLE DENSITY GRAPHICS MODE
15 WIDTH "LPT1:",255
20 A = 1 : B = 320
30 FOR I = 1 TO 8
40 LPRINT "START";
50 LPRINT CHR$(27);"K";CHR$(B MOD 256);CHR$(INT(B/256));
60 FOR J = 1 TO B
70 LPRINT CHR$(A);
80 NEXT J
90 A = A * 2
100 LPRINT "END"
110 NEXT I
120 LPRINT CHR$(12); : END
```

RESULT:

```
START_____END
START_____END
START_____END
START_____END
START_____END
START_____END
START_____END
START_____END
```

NOTE: Ink reproduction may not show actual density.

BASIC: CHR$(27);"L";CHR$(N1);CHR$(N2);   **HEX: 1B 49**

NAME: Graphics Mode (Double Density)

FUNCTION: When the above code sequence is received, the printer is placed into Double Density Graphics Mode and waits to receive the total number of graphics characters as designated by (N1) and (N2). (Refer to ESC K for definition of (N1) and (N2) values).

In Double Density Graphics Mode the total number graphic characters that can be printed per line is 960 (120 dots/in). If the number of graphics characters to be received exceed this maximum, the excess are ignored.

Graphic Characters—(Refer to ESC K)

PROGRAM:

```
10 REM DOUBLE DENSITY GRAPHICS MODE
15 WIDTH "LPT1:",255
20 FOR I = 1 TO 8
30 A = 1 : B = 700
40 LPRINT "START";
50 LPRINT CHR$(27);"L";CHR$(B MOD 256);CHR$(INT(B/256));
60 FOR J = 1 TO B
70 LPRINT CHR$(A);
80 A = A + 1
90 IF A > 128 THEN A = 1
95 NEXT J
100 LPRINT "END"
110 NEXT I
120 LPRINT CHR$(12); : END
```

RESULT:

START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END
START⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛⬛END

NOTE: Ink reproduction may not show actual density.

ESC M (Select Elite Characters) ESC M

BASIC: CHR$(27);"M";   **HEX: 1B 4D**

NAME: Select Elite (12 cpi) Characters

FUNCTION: ESC M selects elite characters which are 12 characters per inch. This function is cancelled by ESC P, ESC ! and ESC (.

PROGRAM:
```
10   REM   ESC M ELITE CHARACTERS
20   PRINT "PICA 10 CPI-20 H'S"
30   PRINT "HHHHHHHHHHHHHHHHHHHH"
40   PRINT  CHR$ (27);"M";
50   PRINT "ELITE 12 CPI-20 H'S"
60   PRINT "HHHHHHHHHHHHHHHHHHHH"
70   PRINT  CHR$ (27);"P";
80   PRINT "PICA 10 CPI-20 H'S"
90   PRINT "HHHHHHHHHHHHHHHHHHHH"
```

RESULT:
```
PICA 10 CPI-20 H'S
HHHHHHHHHHHHHHHHHHHH
ELITE 12 CPI-20 H'S
HHHHHHHHHHHHHHHHHHHH
PICA 10 CPI-20 H'S
HHHHHHHHHHHHHHHHHHHH
```

ESC P (Select Pica Characters) ESC P

BASIC: CHR$(27);"P";   **HEX: 1B 50**

NAME: Select Pica (10 cpi) characters

FUNCTION: ESC P selects standard pica characters, which are 10 characters per inch. ESC P can be used to cancel Elite, NLQ, and Condensed characters.

PROGRAM: (see above)

ESC N   (Enable Skip-Over Perforation Setting)   ESC N

BASIC: CHR$(27);"N";CHR$(n);   **HEX: 1B 4E (n)**

NAME: Enable Skip-Over Perforation Setting (n = 1 to 127)

FUNCTION: ESC N (n) specifies the number of lines to be skipped at the bottom of the fanfold page. In this example, the form length is set at 8 lines by ESC C (8) and the skip-over is set at 3 lines by ESC N (3). Thus, the skip-over begins after line 5 (8 − 3 = 5). This function is in effect for each form length until cancelled by ESC O. Note that if DIP switch 3-3 is ON, the skip-over will always be 1 inch (6 lines at 1/6 inch) for a standard form length (11″ or 12″) with DIP switch 3-3 ON.

PROGRAM:
```
10 REM ESC N SKIP OVER PERF
20 FOR X= 1 TO 18: LPRINT X:NEXT
30 FOR Z = 1 TO 3
40 LPRINT CHR$(27);"j";CHR$(216);:NEXT
50 LPRINT CHR$(27);"C"CHR$(8);:REM FORM LENGTH
60 LPRINT CHR$(27);"N";CHR$(3);:REM SKIP 3
70 FOR Z = 1 TO 6
80 LPRINT "    SKIP OVER ";Z:NEXT
90 LPRINT CHR$(27);"O";:REM CANCEL SKIP OVER
100 FOR I = 1 TO 9
110 LPRINT "    NO SKIP OVER ";I:NEXT
```

RESULT:
```
 1  SKIP OVER   1
 2  SKIP OVER   2
 3  SKIP OVER   3
 4  SKIP OVER   4
 5  SKIP OVER   5
 6
 7
 8
 9  SKIP OVER   6
10 NO SKIP OVER   1
11 NO SKIP OVER   2
12 NO SKIP OVER   3
13 NO SKIP OVER   4
14 NO SKIP OVER   5
15 NO SKIP OVER   6
16 NO SKIP OVER   7
17 NO SKIP OVER   8
18 NO SKIP OVER   9
```

ESC O   (Cancel Skip-Over Perforation Setting)   ESC O

BASIC: CHR$(27);"O";   **HEX: 1B 4F**

FUNCTION: ESC O cancels the skip-over perforation setting established by ESC N (n).

PROGRAM: (see above)

ESC ℓ (Left Margin Setting)   ESC ℓ

BASIC: CHR$(27);"$\ell$";CHR$(n);   **HEX: 1B 6C (n)**

NAME: Left Margin Setting (n = 0 to 255)

FUNCTION: ESC ℓ (n) establishes the column setting for the left margin, and is entered before any characters for that line. The character size in effect at the time establishes the left margin column position. Column zero (0) is the normal first column, thus ESC 1 0 cancels this function.

PROGRAM:
```
10 REM ESC 1 LEFT MARGIN SETTING
15 LPRINT "0123456789"
20 FOR Z = 1 TO 5
30 LPRINT CHR$(27);"1";CHR$(Z);"MOVE -->"
40 NEXT Z: LPRINT CHR$(27);"1";CHR$(0);
```

RESULT:
```
0123456789
  MOVE -->
   MOVE -->
    MOVE -->
     MOVE -->
      MOVE -->
```

ESC Q   (Right Margin Setting)   ESC Q

BASIC: CHR$(27);"Q";CHR$(n);   **HEX: 1B 51 (n)**

NAME: Right Margin Setting (n = 1 to 255)

FUNCTION: ESC Q (n) establishes the column setting for the right margin, and is entered before any characters for that line. The maximum value for (n) is 132 in condensed mode, 80 in 10 cpi and 40 in enlarged mode. Excessive value for (n) is ignored and previous setting is in effect. The right margin setting must be greater than the left margin setting.

PROGRAM:
```
10 REM ESC Q RIGHT MARGIN SETTING
20 LPRINT "12345678901234567890123456789012345 67890"
30 LPRINT CHR$(27);"Q";CHR$(20);
40 LPRINT "12345678901234567890123456789012345 67890"
50 LPRINT CHR$(27);"Q";CHR$(40);
60 LPRINT "12345678901234567890123456789012345 67890"
```

RESULT:
```
12345678901234567890123456789012345 67890
12345678901234567890
12345678901234567890
12345678901234567890123456789012345 67890
```

BASIC: CHR$(27);"R";CHR$(n);   **HEX:** 1B 52 (n)

NAME: International Character Set Mode (n = 0 to 8)

FUNCTION: ESC R (n) selects one of nine international character sets. Refer to table on next page for decimal codes.

PROGRAM:
```
10 REM ESC R INTERNATIONAL CHARACTERS
15 LPRINT CHR$(27);"(";
20 X = O:REM USA
25 LPRINT CHR$(27);"R";CHR$(X);
30 LPRINT "MODE ";X;" ";
35 X = X + 1
40 FOR Z = 33 TO 79:LPRINT CHR$(Z);
45 NEXT Z:LPRINT
50 LPRINT "          ";
55 FOR J = 80 TO 126: LPRINT CHR$(J);
60 NEXT J:LPRINT : LPRINT
65 IF X = 9 THEN END
70 GOTO 25
```

RESULTS:

MODE   0   !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{¦}˜

MODE   1   !"#$%&'()*+,-./0123456789:;<=>?àABCDEFGHIJKLMNO
           PQRSTUVWXYZ°ç§^_`abcdefghijklmnopqrstuvwxyzéùè¨

MODE   2   !"#$%&'()*+,-./0123456789:;<=>?§ABCDEFGHIJKLMNO
           PQRSTUVWXYZÄÖÜ^_`abcdefghijklmnopqrstuvwxyzäöüß

MODE   3   !"£$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{¦}˜

MODE   4   !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZÆØÅ^_`abcdefghijklmnopqrstuvwxyzæøå˜

MODE   5   !"#¤%&'()*+,-./0123456789:;<=>?ÉABCDEFGHIJKLMNO
           PQRSTUVWXYZÄÖÅÜ_éabcdefghijklmnopqrstuvwxyzäöåü

MODE   6   !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZ°\é^_ùabcdefghijklmnopqrstuvwxyzàôèì

MODE   7   !"₧$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZ¡Ñ¿^_`abcdefghijklmnopqrstuvwxyz¨ñ}˜

MODE   8   !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNO
           PQRSTUVWXYZ[¥]^_`abcdefghijklmnopqrstuvwxyz{¦}˜

(See chart, next page)

INTERNATIONAL CHARACTERS

	0	1	2	3	4	5	6	7	8
DEC	U.S.A.	FRANCE	GERMANY	U.K.	DENMARK	SWEDEN	ITALY	SPAIN	JAPAN
35	#	#	#	£	#	#	#	Pt	#
36	$	$	$	$	$	¤	$	$	$
64	@	à	§	@	@	É	@	@	@
91	[	°	Ä	[	Æ	Ä	°	¡	[
92	\	ç	Ö	\	Ø	Ö	\	Ñ	¥
93	]	§	Ü	]	Å	Å	é	¿	]
94	^	^	^	^	^	Ü	^	^	^
96	`	`	`	`	`	é	ù	`	`
123	{	é	ä	{	æ	ä	à	¨	{
124	|	ù	ö	|	ø	ö	ò	ñ	|
125	}	è	ü	}	å	å	è	}	}
126	~	¨	ß	~	~	ü	ì	~	~

ESC S 0   (Select Superscript Characters)   ESC S 0

BASIC: CHR$(27);"S";CHR$(0);   **HEX: 1B 53 30**

NAME: Select Superscript Characters

FUNCTION: ESC S 0 selects superscript characters, which are half-size and printed in two passes of the print head. This function is cancelled by ESC T.

PROGRAM:

```
10  REM  ESC S0 SUPERSCRIPT
20  PRINT "HERE IS SUPERSCRIPT";
30  PRINT  CHR$ (27);"S"; CHR$ (0);
40  PRINT "1234567890"
50  PRINT : PRINT  CHR$ (27);"T";
60  PRINT "EINSTEIN'S FAMOUS FORM
       ULA: ";
70  PRINT "E=MC";
80  PRINT  CHR$ (27);"S"; CHR$ (0);
90  PRINT "2";: REM  SUPERSCRIPT
95  PRINT  CHR$ (27);"T";
```

RESULT: HERE IS SUPERSCRIPT^{1234567890}

EINSTEIN'S FAMOUS FORMULA: $E=MC^2$

ESC S 1   (Select Subscript Characters)   ESC S 1

BASIC: CHR$(27);"S";CHR$(1);   **HEX: 1B 53 31**

NAME: Select Subscript Characters

FUNCTION: ESC S 1 selects subscript characters, which are half-size and printed in two passes of the print head. This function is cancelled by ESC T.

PROGRAM:

```
10  REM  ESC S1 SUBSCRIPT
20  PRINT "HERE IS SUBSCRIPT";
30  PRINT  CHR$ (27);"S"; CHR$ (1);
40  PRINT "1234567890"
50  PRINT : PRINT  CHR$ (27);"T";
60  PRINT "FORMULA FOR WATER = H";
70  PRINT  CHR$ (27);"S"; CHR$ (1);
80  PRINT "2"; CHR$ (27);"T";"0"
```

RESULT: HERE IS SUBSCRIPT$_{1234567890}$

FORMULA FOR WATER = H_2O

ESC T   (Cancel Super/Sub Script)   ESC T

BASIC: CHR$(27);"T";   **HEX: 1B 54**

NAME: Cancel Superscript/Subscript

FUNCTION: ESC T cancels superscript (ESC S 0) and subscript (ESC S 1) characters.

PROGRAM:
```
10 REM ESC T CANCEL SUPER/SUBSCRIPT
20 LPRINT "THIS IS SUPER";
30 LPRINT CHR$(27);"S";CHR$(0);
40 LPRINT "SCRIPT";CHR$(27);"T"
50 LPRINT "NORMAL PICA STYLE"
60 LPRINT "THIS IS SUB";
70 LPRINT CHR$(27);"S";CHR$(1);
80 LPRINT "SCRIPT";CHR$(27);"T"
90 LPRINT "NORMAL PICA STYLE"
```

RESULT:
```
THIS IS SUPERSCRIPT
NORMAL PICA STYLE
THIS IS SUBSCRIPT
NORMAL PICA STYLE
```

ESC W   (Enlarged Character Mode)   ESC W

BASIC: CHR$(27);"W";CHR$(1);   **HEX: 1B 57 01**

NAME: Enlarged Character Mode

FUNCTION: ESC W 1 causes any print style to be enlarged and is in effect until cancelled by ESC W 0 or ESC !.

PROGRAM:
```
10 REM ESC W ENLARGED PRINT MODE
20 LPRINT CHR$(27);"(";:REM NLQ
30 LPRINT CHR$(27);"W";CHR$(1);
40 LPRINT "THIS IS ENLARGED NLQ"
50 LPRINT "AND SO IS THIS LINE!"
60 LPRINT CHR$(27);"W";CHR$(0);
70 LPRINT "NOW WE ARE PRINTING NLQ AT 10 CPI"
```

RESULT:
```
THIS IS ENLARGED NLQ
AND SO IS THIS LINE!
NOW WE ARE PRINTING NLQ AT 10 CPI
```

ESC Y (Graphics Mode—Double Speed, Double Density) ESC Y

BASIC: CHR$(27);"Y";CHR$(N1);CHR$(N2);   **HEX: 1B 59**

NAME: Graphics Mode—Double Speed, Double Density

FUNCTION: When the above code sequence is received, the printer is placed into Double Speed, Double Density Graphics Mode and waits to receive the total number of graphic characters designated by (N1) and (N2). (Refer to ESC K for definition of (N1) and (N2) values).

In Double Speed, Double Density Graphics Mode the total number of graphic characters that can be printed per line is 480 (60 Dots/in). The total number of graphic characters that can be sent to the printer in this mode is 960. In this mode adjacent dot columns are not printed, which increases printing time. If the number of graphic characters to be received exceed the 960 character maximum the excess are ignored.

Graphic Characters (Refer to ESC K)

PROGRAM:

```
10 REM DOUBLE DENSITY GRAPHICS MODE
15 WIDTH "LPT1:",255
18 LPRINT "DOUBLE DENSITY GRAPHICS MODE"
19 L$="L"
20 FOR I = 1 TO 4
30 A = 1 : B = 700
40 LPRINT "START";
50 LPRINT CHR$(27);L$;CHR$(B MOD 256);CHR$(INT(B/256));
60 FOR J = 1 TO B
70 LPRINT CHR$(A);
80 A = A + 1
90 IF A > 128 THEN A = 1
95 NEXT J
100 LPRINT "END"
110 NEXT I
120 IF L$="Y" GOTO 160
130 IF L$="L" THEN L$="Y"
140 IF L$="Y" THEN LPRINT "DOUBLE SPEED, DOUBLE DENSITY GRAPHICS MODE"
150 IF L$="Y" THEN GOTO 20
160 LPRINT CHR$(12); : END
```

RESULT:

```
DOUBLE DENSITY GRAPHICS MODE
START................................................END
START................................................END
START................................................END
START................................................END
DOUBLE SPEED, DOUBLE DENSITY GRAPHICS MODE
START................................................END
START................................................END
START................................................END
START................................................END
```

NOTE: Ink reproduction may not show actual density.

ESC Z   (Graphics Mode—Quadruple Density)   ESC Z

BASIC: CHR$(27);"Z";CHR$(N1);CHR$(N2);   **HEX: 1B 5A**

NAME: Graphics Mode—Quadruple Density

FUNCTION: When the above code sequence is received, the printer is placed into Quadruple Density Graphics Mode and waits to receive the total number of graphics characters for the line designated by (N1) and (N2). (Refer to ESC K for definition of (N1) and (N2) values).

In Quadruple Density Graphics Mode the maximum number of graphic characters per line is 1920 (240 Dots/in). If the number of graphic characters to be received exceeds this maximum, the excess is ignored.

Graphic Characters (Refer to ESC K)

PROGRAM:

```
10 REM QUADRUPLE DENSITY GRAPHICS MODE
15 WIDTH "LPT1:",255
20 A = 1 : B = 700
30 FOR J = 1 TO 4
40 IF J = 1 THEN LPRINT "SINGLE DENSITY GRAPHICS MODE" : C$="K"
50 IF J = 2 THEN LPRINT "DOUBLE DENSITY GRAPHICS MODE" : C$="L"
60 IF J = 3 THEN LPRINT "DOUBLE DENSITY, DOUBLE SPEED GRAPHICS MODE" : C$="Y"
70 IF J = 4 THEN LPRINT "QUADRUPLE DENSITY GRAPHICS MODE" : C$="Z"
80 LPRINT CHR$(27);C$;CHR$(B MOD 256);CHR$(INT(B/256));
90 FOR K = 1 TO B
100 LPRINT CHR$(&H99);
110 NEXT K
120 LPRINT
125 LPRINT CHR$(27);C$;CHR$(B MOD 256);CHR$(INT(B/256));
130 FOR K = 1 TO B
140 LPRINT CHR$(A);
150 A = A +1
155 IF A > 128 THEN A = 1
160 NEXT K
170 LPRINT
180 A = 1
190 NEXT J
200 LPRINT CHR$(12); : END
```
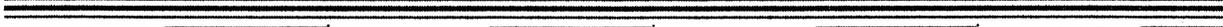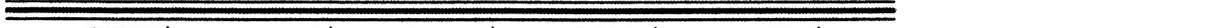
RESULT:

SINGLE DENSITY GRAPHICS MODE

DOUBLE DENSITY GRAPHICS MODE

DOUBLE DENSITY, DOUBLE SPEED GRAPHICS MODE
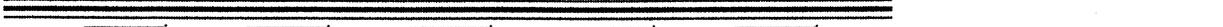
QUADRUPLE DENSITY GRAPHICS MODE

NOTE: Ink reproduction may not show actual density.

BASIC: CHR$(27);"^";CHR$(M);CHR$(N1);CHR$(N2);   **HEX: 1B 5E**

NAME: Graphic Mode (9 Dot and 16 Dot Graphics)

FUNCTION: When the above code sequence is received, the printer enters 9 dot or 16 dot graphic mode and waits to receive the total number of graphic characters for the line designated by (N1) and (N2). Refer to ESC K for the definition of (N1) and (N2) values. The value of (M) is defined as follows.

M	MODE
0	9 Dot Graphics, 480 Dots/Line, Single Density
1	9 Dot Graphics, 960 Dots/Line, Double Density
17	16 Dot Graphics, 960 Dots/Line, Double Density

If the number of graphic characters exceeds the above maximum, the excess graphic characters are ignored.

Data Byte Structure—In 9 Dot and 16 Dot Graphic Modes, each graphic character consists of two 8-bit data bytes as illustrated.

9 Dot Graphics—Pin to Data Bit Relationship
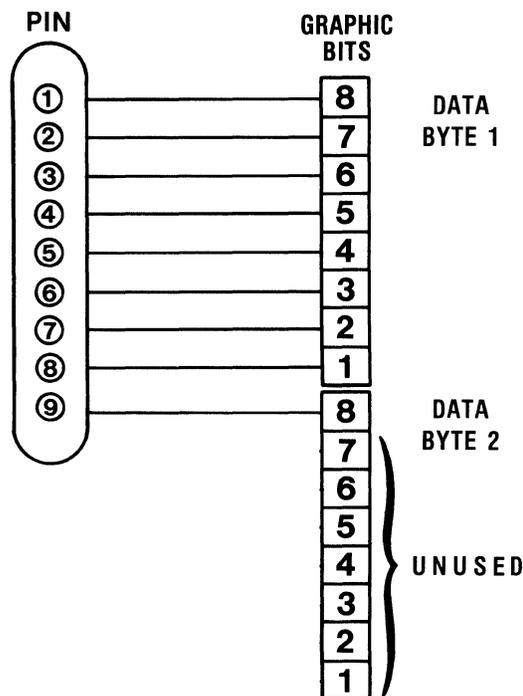
Example

Data Byte 1 = AA_{16}

UNUSED

Data Byte 2 = 80_{16}
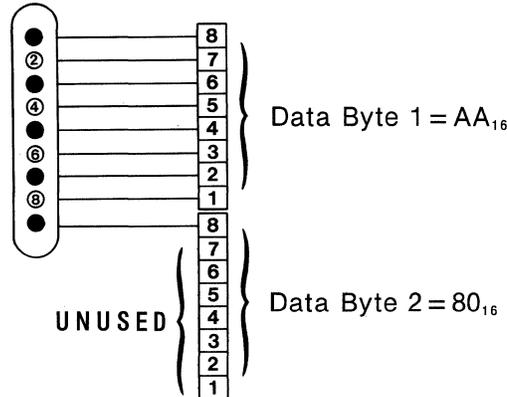
PROGRAM:

```
10 REM 9-DOT GRAPHICS MODE
20 A = 0 : B = 400
25 LPRINT "9-DOT GRAPHICS, SINGLE DENSITY
30 FOR J = 1 TO 4
40 LPRINT "START";
50 LPRINT CHR$(27);"^";CHR$(A);CHR$(B MOD 256);CHR$(INT(B/256));
60 FOR I = 1 TO B
70 LPRINT CHR$(&HAA);CHR$(&H80);
80 NEXT I
81 LPRINT "END"
85 LPRINT  : NEXT J
90 IF A = 1 THEN LPRINT CHR$(12); : END
100 A = 1 : B = 700
110 LPRINT "9-DOT GRAPHICS, DOUBLE DENSITY"
120 GOTO 30
```

RESULT:

9-DOT GRAPHICS, SINGLE DENSITY
START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

9-DOT GRAPHICS, DOUBLE DENSITY
START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

START▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆▆END

NOTE: Ink reproduction may not show actual density.

16 Dot Graphics Pin to Data Bit Relationship

```
PASS PIN
 1st  P1  ○─────────────8  ⎫
 2nd  P1  ○─────────────7  ⎪
 1st  P2  ○─────────────6  ⎪
 2nd  P2  ○─────────────5  ⎬ DATA BYTE 1
 1st  P3  ○─────────────4  ⎪
 2nd  P3  ○─────────────3  ⎪
 1st  P4  ○─────────────2  ⎪
 2nd  P4  ○─────────────1  ⎭

 1st  P5  ○─────────────8  ⎫
 2nd  P5  ○─────────────7  ⎪
 1st  P6  ○─────────────6  ⎪
 2nd  P6  ○─────────────5  ⎬ DATA BYTE 2
 1st  P7  ○─────────────4  ⎪
 2nd  P7  ○─────────────3  ⎪
 1st  P8  ○─────────────2  ⎪
 2nd  P8  ○─────────────1  ⎭
```
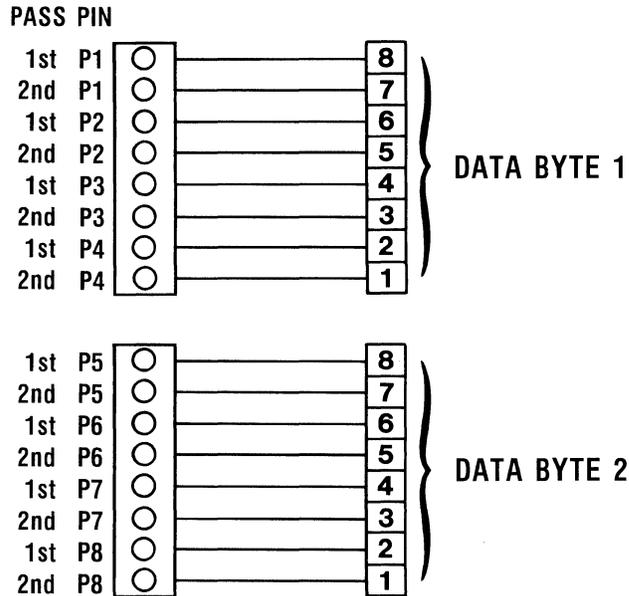
Note—16 Dot Graphics is a two-pass function with pin firing as shown above. Between first and second pass there is a ⅓ dot line feed then a ⅓ dot reverse line feed after the second pass.

Example
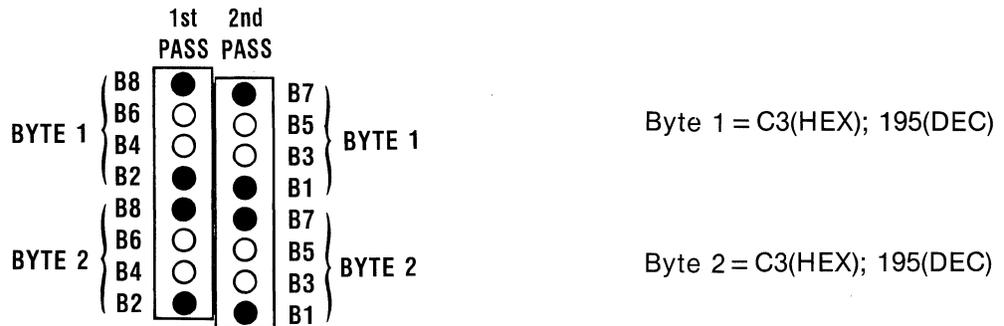
```
              1st    2nd
             PASS   PASS
         ⎧ B8   ●     ●   B7 ⎫
         ⎪ B6   ○     ○   B5 ⎪
BYTE 1  ⎨ B4   ○     ○   B3 ⎬ BYTE 1       Byte 1 = C3(HEX); 195(DEC)
         ⎩ B2   ●     ●   B1 ⎭
         ⎧ B8   ●     ●   B7 ⎫
         ⎪ B6   ○     ○   B5 ⎪
BYTE 2  ⎨ B4   ○     ○   B3 ⎬ BYTE 2       Byte 2 = C3(HEX); 195(DEC)
         ⎩ B2   ●     ●   B1 ⎭
```

PROGRAM:

```
10 REM 9-DOT GRAPHICS MODE
20 A = 0 : B = 400
25 LPRINT "9-DOT GRAPHICS, SINGLE DENSITY
30 FOR J = 1 TO 4
40 LPRINT "START";
50 LPRINT CHR$(27);"^";CHR$(A);CHR$(B MOD 256);CHR$(INT(B/256));
60 FOR I = 1 TO B
70 LPRINT CHR$(&HAA);CHR$(&H80);
80 NEXT I
81 LPRINT "END"
85 LPRINT  : NEXT J
90 IF A = 1 THEN GOTO 130
100 A = 1 : B = 700
110 LPRINT "9-DOT GRAPHICS, DOUBLE DENSITY"
120 GOTO 30
130 A = 17 : B = 800
140 LPRINT "16-DOT GRAPHICS, DOUBLE DENSITY"
150 FOR J = 1 TO 4
160 LPRINT "START";
170 LPRINT CHR$(27);"^";CHR$(A);CHR$(B MOD 256);CHR$(INT(B/256));
180 FOR I = 1 TO B
190 LPRINT CHR$(&H90);CHR$(&H9);
200 NEXT I
210 LPRINT "END"
220 LPRINT  : NEXT J
230 LPRINT CHR$(12); : END
```

RESULT:

9-DOT GRAPHICS, SINGLE DENSITY
START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

9-DOT GRAPHICS, DOUBLE DENSITY
START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

16-DOT GRAPHICS, DOUBLE DENSITY
START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

START▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨END

NOTE: Ink reproduction may not show actual density.

BASIC: CHR$(27);"b";CHR$(n);CHR$(m₁);...CHR$(m₁₆);CHR$(0)   **HEX: 1B 62**

NAME: VFU Tab Position Setting (n = 0 to 7) (m = 1 to 16)

FUNCTION: ESC b (n) (m) specifies the vertical tab stops (m_1 to m_{16}) within one of eight channels (n_0 to n_7). ESC / (n) selects the channel and VT activates the tab stops in sequence. See ESC / for additional programming.

PROGRAM:
```
10 REM ESC b VFU POSITION SETTING
15 LPRINT CHR$(27);"C";CHR$(10);:REM FORM LENGTH 10
20 FOR Z = 0 TO 23: LPRINT Z:NEXT
25 FOR X = 1 TO 4: LPRINT CHR$(27);"j";CHR$(216);
30 NEXT X: LPRINT "   <--- TOP OF FORM
35 LPRINT CHR$(27);"b";CHR$(3);:REM CHANNEL 3
40 LPRINT CHR$(3);CHR$(7);CHR$(9);CHR$(0);:REM CH3 TABS
45 LPRINT CHR$(27);"/";CHR$(3);:REM SELECT CH3
50 LPRINT CHR$(12);:REM TOP OF FORM COMMAND
55 LPRINT "    <--- CHAN 3 TOP OF FORM"
60 FOR Y = 1 TO 3: LPRINT CHR$(11);:REM VERT TAB
65 LPRINT "    <--- CHAN 3; TAB ";Y:NEXT Y
70 END
```

RESULT:
```
0 <--- TOP OF FORM
1
2
3
4
5
6
7
8
9
10 <--- CHAN 3 TOP OF FORM
11
12
13 <--- CHAN 3; TAB  1
14
15
16
17 <--- CHAN 3; TAB  2
18
19 <--- CHAN 3; TAB  3
20
21
22
23
```

ESC i   (Incremental Typewriter Mode)   ESC i

BASIC: CHR$(27);"i";CHR$(1);   **HEX: 1B 69 01**

NAME: Incremental (Typewriter) Mode

FUNCTION: ESC i 1 sets the typewriter mode. The function is similar to the old tele-type printer where a view of the printed character is provided by reverse-feeding the paper after printing. The program below requires that a CR (Carriage Return) be sent whenever printing and viewing is desired. To exit the program, send "XXX (CR)". This mode is cancelled by ESC i 0.

```
┌──────────────────── NOTE ────────────────────┐
│ Some computers ignore trailing spaces and lone spaces sent in this mode. If a space is │
│ to be recognized, there must be a character before and after the space prior to the CR. │
└────────────────────────────────────────────────┘
```

PROGRAM:
```
10 REM ESC i TYPEWRITER MODE
20 LPRINT CHR$(27);"i";CHR$(1);
30 INPUT A$:IF A$= "XXX" THEN 50
40 LPRINT A$;:GOTO 30
50 LPRINT CHR$(27);"i";CHR$(0);:END
```

```
          |------------VIEWING AREA------------  ↑
          |                                      |
          |                                      |
          |                                      |
          ▼                                      |
```

RESULT: THIS IS TYPEWRITER MODE.
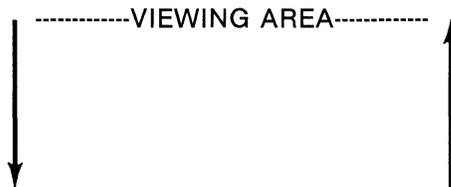
ESC p   (Proportional Spacing Mode)   ESC p

BASIC: CHR$(27);"p";CHR$(1)   **HEX: 1B 70 31**

NAME: Proportional Spacing Print Mode

FUNCTION: ESC p 1 causes subsequent printing to be spaced in proportion to the width of the characters; that is, they are not monospaced at 10 cpi. This results in more characters per line. Also, proportional printing is always emphasized to improve the quality of print. Proportional spacing is cancelled by ESC p 0. The BS and DEL functions are not valid with this function.

PROGRAM:

```
10 REM ESC p PROPORTIONAL PRINT
20  LPRINT "NORMAL PRINT"
30 LPRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
40 LPRINT "abcdefghijklmnopqrstuvwxyz"
50 LPRINT CHR$(27);"p";CHR$(1);
60 LPRINT : LPRINT "PROPORTIONAL"
70 LPRINT "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
80 LPRINT "abcdefghijklmnopqrstuvwxyz"
90 LPRINT CHR$(27);"p";CHR$(0);
```

RESULT:

```
NORMAL PRINT
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz


PROPORTIONAL
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
```

ESC s   (Half Speed Print Mode)   ESC s

BASIC: CHR$(27);"s";CHR$(1);   **HEX: 1B 73 31**

NAME: Half-Speed (Quiet) Print Mode

FUNCTION: ESC s 1 causes the printer to operate at half normal speed, resulting in quieter operation. This function is cancelled by ESC s 0.

PROGRAM:

```
10 REM ESC s HALF SPEED MODE
20 LPRINT "THIS IS NORMAL SPEED"
30 LPRINT CHR$(27);"s";CHR$(1);
40 LPRINT "THIS IS HALF SPEED"
50 LPRINT CHR$(27);"s";CHR$(0);
60 LPRINT "BACK TO NORMAL SPEED"
```

RESULT:

```
THIS IS NORMAL SPEED
THIS IS HALF SPEED
BACK TO NORMAL SPEED
```

SECTION 4
PREVENTIVE
MAINTENANCE
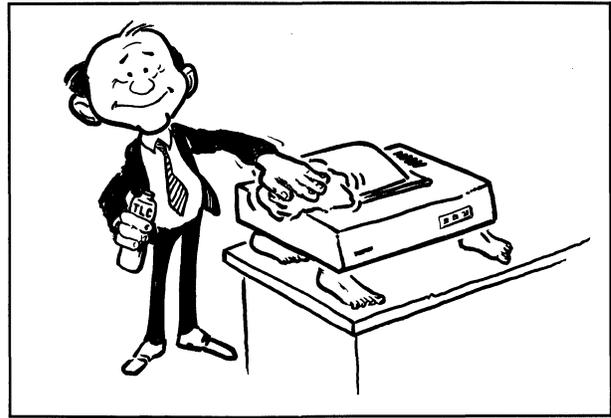
4.1 GENERAL

Preventive maintenance can be performed by the operator. This printer requires very little attention except for cleaning when necessary. Follow the safety guidelines below.

```
───────────────────── WARNING ─────────────────────
Always remove power plug from outlet before performing preventive maintenance. Liquid cleaners should
NOT be used on any appliance that is plugged into the outlet.
```

4.2 CLEANING THE EXTERIOR

The external surfaces of the printer may be cleaned using a cotton cloth or industrial wiper dampened with a mild detergent solution. Limit the amount of liquid used; do not allow to drip inside cabinet. Dry the surfaces with an industrial wiper before restoring power.

```
───────────────────── CAUTION ─────────────────────
Do not use solvents to clean any part of the printer, as these fluids may attack and permanently mar the
plastic finish. Use a mild detergent solution as described above.
```

4.3 CLEANING THE PLATEN (RUBBER ROLLER)

The platen may become soiled with ink or bits of paper after extended use. Remove the power plug from the outlet and clean the platen with mild detergent and cotton cloth turning the platen as required. Let platen dry before restoring power.

4.4 LUBRICATION

This printer is lubricated for extended service. If the carriage rods become dry after lengthy service, remove the power plug, remove the ribbon cassette and wipe the carriage rods with a clean cotton cloth, then rub a thin film of light grease on the (2) carriage rods. Move the print head back and forth along the full length of travel, then remove any excess grease. Allow a thin film of grease to remain on carriage rods. Replace ribbon cassette per paragraph 2.4.

```
────────────────────── NOTE ──────────────────────
For a more complete maintenance program refer to the Service Manual.
```

SECTION 5
PRINT HEAD REPLACEMENT

5.1 PURPOSE

This section provides instructions for replacement of the print head by a handy operator or technician in the event it fails to perform properly after extended operation.

NOTE

Before considering replacing the print head, make certain that the head position lever (Figure 2-3C) is toward the platen. A worn ribbon also results in light print. It is not likely that the print head would need replacement except after very extensive operation (100 million characters). Note that sometimes the 8th and 9th pins produce light dots because they are seldom used. This can be remedied by sending lines of lower case "y" (8th pin descender) and lower case "g" (9th pin descender) until dots are darker.

5.2 PRINT HEAD REPLACEMENT

The print head may be replaced in a few minutes by a handy person as follows:

1. Remove power plug from power outlet. Lift front cover and remove ribbon cassette (see Figure 2-3).

2. Loosen 2 phillips-head screws on print head mounting bracket (Figure 5-1). No need to remove the screws completely.

3. Pull the print head out, toward the front of the printer (stop to avoid tension on the flex cable shown in Figure 5-2).

4. Unplug the flex cable from the connector by pulling the tab to the right.

5. Plug the new ribbon cable into the black connector. The tab goes under the ribbon cable. Hold the ribbon and tab together to get more stiffness if required (Figure 5-2).

6. Install the new print head, slipping the mounting bracket under the screws. Wiggle the print head to make certain that it seats properly.

7. Tighten the 2 screws and replace the ribbon cassette.

5.3 PRINTER REPAIR/MAINTENANCE

If the printer needs repair or replacement parts, contact the company that supplied the printer. The Service Manual contains procedures for replacement.
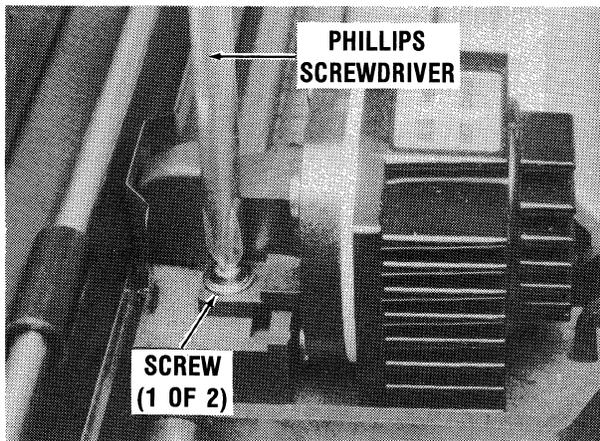
Figure 5-1 Print Head Mounting Screws (2)
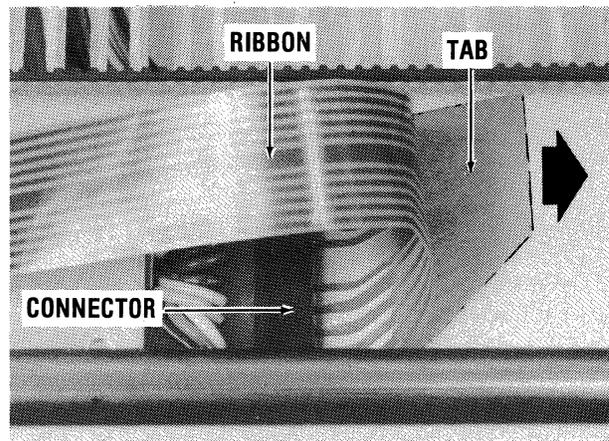
Figure 5-2 Flexible Ribbon Connector

APPENDIX A
GENERAL SPECIFICATIONS

PRINTING
- 160 CPS, Bidirectional, Logic-Seeking
- Unidirectional; NLQ, Super/Subscript, Graphics
- 9-Pin, Impact, Dot-Matrix Printhead
- Printhead Life: 100 Million Characters
- 8-Pin, 9-Pin, 16-Pin Graphics
- Matrix: 11 × 9 Standard; 23 × 16 NLQ (2 passes)
- Noise Level: 60 dbA

CHARACTER SETS
- Standard; 96 ASCII Characters (Hex 20-7F)
- Italic; 96 ASCII Characters (Hex A0-FF)
- Proportional; 96 Characters (Hex 20-7F)
- NLQ; 96 ASCII Characters (Hex 20-7F)
- Download 11 × 9 Capability
- Optional Download NLQ 23 × 16 (8K RAM)
- Character Widths: 5, 6, 8.57, 10, 12, 17.14 cpi
- NLQ Character Width: 5 cpi Enlarged; 10 cpi Normal

COLUMN WIDTH
- Pica Size—80
- Enlarged—40
- Condensed—137
- Condensed Enlarged—68
- Elite—96
- Elite Enlarged—48

PAPER HANDLING (All Hardware Self-Contained)
- Roll, Cut-Sheet, Fanfold
- Copies: One Original, Two Carbons
- Width: Adjustable to 10 inches (25.4 cm)

PHYSICAL
- Size: 15.75"W, 12.5"D, 5.6"H (400 × 320 × 142 mm)
- Weight: 17.5 lbs (8 kg) approximately

ELECTRICAL
- Voltage: H80-1, 115V@60Hz; H80-2, 230V@50Hz
- Power Consumption: 120 Watts Maximum

APPENDIX B
INTERFACE SPECIFICATIONS

B.1 PARALLEL INTERFACE

The Models H80-1A and H80-2A interface to the computer through a 36-pin female connector (Amphenol 57-40360 or equivalent). The data transfer is 8 bits parallel with strobe in the Centronics configuration. The 36-pin connector pin-out is summarized in the table below.

Parallel Interface Connector Pin-out

PIN NO.	SIGNAL NAME	PIN NO.	SIGNAL NAME
1	$\overline{\text{STB}}$	19	$\overline{\text{STB}}$ RET
2	DATA 1	20	DATA 1 RET
3	DATA 2	21	DATA 2 RET
4	DATA 3	22	DATA 3 RET
5	DATA 4	23	DATA 4 RET
6	DATA 5	24	DATA 5 RET
7	DATA 6	25	DATA 6 RET
8	DATA 7	26	DATA 7 RET
9	DATA 8	27	DATA 8 RET
10	$\overline{\text{ACKNLG}}$	28	$\overline{\text{ACKNLG}}$ RET
11	BUSY	29	BUSY RET
12	PE (Paper End)	30	PE RET
13	SLCT	31	$\overline{\text{INPRM}}$
14	$\overline{\text{AUTO LF}}$	32	$\overline{\text{FAULT}}$
15	(NC)	33	GND
16	GND (0V)	34	(NC)
17	FG (Protective Ground)	35	+5V
18	(NC)	36	$\overline{\text{SLCT IN}}$

*Connector is female Amphenol #57-40360; 36 Pin
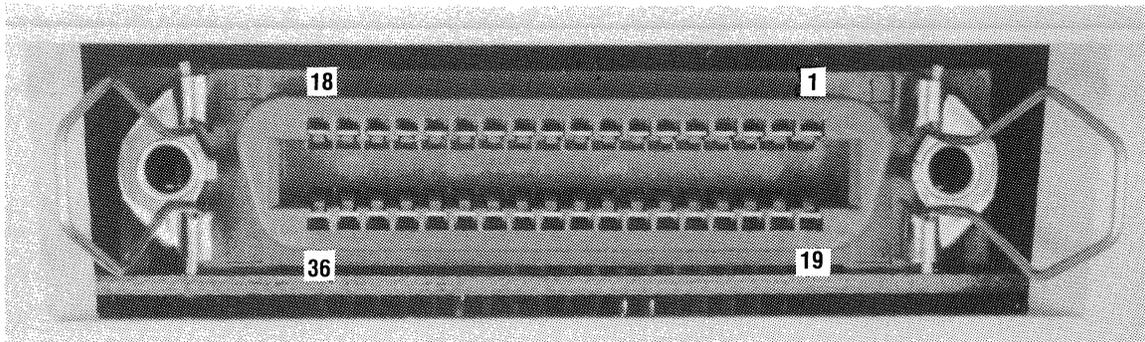
Figure B-1 36-Pin Female Connector (Centronics P/N 31310012-1016)

B.2 INTERFACE SIGNAL DESCRIPTIONS

DATA 1–DATA 8 (Host Generated) [PINS 2–9]
Data lines 1 thru 8 carry ASCII character and control code information, plus graphic image data. Data is true when high (logic 1).

DATA STROBE ($\overline{STB}$) (Host Generated) [PIN 1]
This negative-going pulse transfers data (from the host) into the electronics of the printer. Pulse duration of the strobe must be 0.5 microseconds, minimum.

ACKNOWLEDGE ($\overline{ACKNLG}$) (Printer Generated) [PIN 10]
This negative-going pulse (18 microseconds) indicates that the printer has processed the latest byte of data. Also, Acknowledge is sent to the host under these conditions: after power-up and ON LINE; after Input Prime input. Next Strobe from host must be held until Acknowledge times out.

BUSY (Printer Generated) [PIN 11]
This positive-going signal indicates that the printer cannot accept new data. Busy is active under these conditions: Printer deselected (OFF LINE); leading edge of Input Prime signal; buffer full condition.

SELECT (SLCT) (Printer Generated) [PIN 13]
This positive signal indicates that the printer is ON LINE and ready to accept data (if not busy). Select is inactive under these conditions: printer OFF LINE; printer remotely deselected (DC3 code); Input Prime signal; Paper End condition (out of paper).

PAPER END (PE) (Printer Generated) [PIN 12]
This positive-going signal indicates an out-of-paper condition which deselects the printer (unless switch is in CUT-SHEET position). After replenishing paper, the printer must be selected by pressing ON LINE.

FAULT ($\overline{FAULT}$) (Printer Generated) [PIN 32]
This is a negative-going signal which indicates printer OFF LINE or out of paper (PE).

SELECT IN ($\overline{SLCT\ IN}$) (Host Generated) [PIN 36]
This low level (with DIP SW3-1 OFF) allows remote select and deselect of the printer (low = select, high = deselect). With DIP SW3-1 ON, remote select and deselect is disabled.

AUTO LINE FEED ($\overline{AUTO\ LF}$) (Host Generated) [PIN 14]
This low level (with DIP SW3-4 ON) causes an automatic line feed after each CR (carriage return). Note that most computers and word processors force an LF after a CR; thus DIP SW3-4 is normally left OFF; otherwise, double linespacing may occur.

INPUT PRIME ($\overline{INPRM}$) (Host Generated) [PIN 31]
This negative-going signal (50 microseconds) resets (initializes) the printer circuitry and clears the print buffer.

APPENDIX C
DATA TABLES

C.1 DECIMAL TO HEXADECIMAL CONVERSION

The table below may be used by the programmer to convert from decimal (0–9) to hexadecimal (0–9 plus A, B, C, D, E, F).

Decimal to Hexadecimal Conversion Chart

DE = HX	DE = HX	DE = HX	DE = HX	DE = HX	DE = HX	DE = HX	DE = HX
0 = 00	32 = 20	64 = 40	96 = 60	128 = 80	160 = A0	192 = C0	224 = E0
1 = 01	33 = 21	65 = 41	97 = 61	129 = 81	161 = A1	193 = C1	225 = E1
2 = 02	34 = 22	66 = 42	98 = 62	130 = 82	162 = A2	194 = C2	226 = E2
3 = 03	35 = 23	67 = 43	99 = 63	131 = 83	163 = A3	195 = C3	227 = E3
4 = 04	36 = 24	68 = 44	100 = 64	132 = 84	164 = A4	196 = C4	228 = E4
5 = 05	37 = 25	69 = 45	101 = 65	133 = 85	165 = A5	197 = C5	229 = E5
6 = 06	38 = 26	70 = 46	102 = 66	134 = 86	166 = A6	198 = C6	230 = E6
7 = 07	39 = 27	71 = 47	103 = 67	135 = 87	167 = A7	199 = C7	231 = E7
8 = 08	40 = 28	72 = 48	104 = 68	136 = 88	168 = A8	200 = C8	232 = E8
9 = 09	41 = 29	73 = 49	105 = 69	137 = 89	169 = A9	201 = C9	233 = E9
10 = 0A	42 = 2A	74 = 4A	106 = 6A	138 = 8A	170 = AA	202 = CA	234 = EA
11 = 0B	43 = 2B	75 = 4B	107 = 6B	139 = 8B	171 = AB	203 = CB	235 = EB
12 = 0C	44 = 2C	76 = 4C	108 = 6C	140 = 8C	172 = AC	204 = CC	236 = EC
13 = 0D	45 = 2D	77 = 4D	109 = 6D	141 = 8D	173 = AD	205 = CD	237 = ED
14 = 0E	46 = 2E	78 = 4E	110 = 6E	142 = 8E	174 = AE	206 = CE	238 = EE
15 = 0F	47 = 2F	79 = 4F	111 = 6F	143 = 8F	175 = AF	207 = CF	239 = EF
16 = 10	48 = 30	80 = 50	112 = 70	144 = 90	176 = B0	208 = D0	240 = F0
17 = 11	49 = 31	81 = 51	113 = 71	145 = 91	177 = B1	209 = D1	241 = F1
18 = 12	50 = 32	82 = 52	114 = 72	146 = 92	178 = B2	210 = D2	242 = F2
19 = 13	51 = 33	83 = 53	115 = 73	147 = 93	179 = B3	211 = D3	243 = F3
20 = 14	52 = 34	84 = 54	116 = 74	148 = 94	180 = B4	212 = D4	244 = F4
21 = 15	53 = 35	85 = 55	117 = 75	149 = 95	181 = B5	213 = D5	245 = F5
22 = 16	54 = 36	86 = 56	118 = 76	150 = 96	182 = B6	214 = D6	246 = F6
23 = 17	55 = 37	87 = 57	119 = 77	151 = 97	183 = B7	215 = D7	247 = F7
24 = 18	56 = 38	88 = 58	120 = 78	152 = 98	184 = B8	216 = D8	248 = F8
25 = 19	57 = 39	89 = 59	121 = 79	153 = 99	185 = B9	217 = D9	249 = F9
26 = 1A	58 = 3A	90 = 5A	122 = 7A	154 = 9A	186 = BA	218 = DA	250 = FA
27 = 1B	59 = 3B	91 = 5B	123 = 7B	155 = 9B	187 = BB	219 = DB	251 = FB
28 = 1C	60 = 3C	92 = 5C	124 = 7C	156 = 9C	188 = BC	220 = DC	252 = FC
29 = 1D	61 = 3D	93 = 5D	125 = 7D	157 = 9D	189 = BD	221 = DD	253 = FD
30 = 1E	62 = 3E	94 = 5E	126 = 7E	158 = 9E	190 = BE	222 = DE	254 = FE
31 = 1F	63 = 3F	95 = 5F	127 = 7F	159 = 9F	191 = BF	223 = DF	255 = FF

C.2 ASCII CODE CONVERSION CHART

This chart provides a numeric cross-reference of the 128 ASCII codes. ASCII is the American Standard Code for Information Interchange. The basic ASCII characters are included. Note that some characters will vary, depending on the printer or country character sets. Refer to other tables as appropriate for specific characters.

HX	DEC	OCT	BINARY	ASCII	HX	DEC	OCT	BINARY	ASCII	HX	DEC	OCT	BINARY	ASCII
00	0	000	0000000	NULL	2B	43	053	0101011	+ plus	56	86	126	1010110	V (UC)
01	1	001	0000001	SOH	2C	44	054	0101100	, comma	57	87	127	1010111	W (UC)
02	2	002	0000010	STX	2D	45	055	0101101	− minus	58	88	130	1011000	X (UC)
03	3	003	0000011	ETX	2E	46	056	0101110	. period	59	89	131	1011001	Y (UC)
04	4	004	0000100	EOT	2F	47	057	0101111	/ slash	5A	90	132	1011010	Z (UC)
05	5	005	0000101	ENQ	30	48	060	0110000	0 zero	5B	91	133	1011011	[open brkt
06	6	006	0000110	ACK	31	49	061	0110001	1 one	5C	92	134	1011100	\ left slash
07	7	007	0000111	BEL	32	50	062	0110010	2 two	5D	93	135	1011101	] close brkt
08	8	010	0001000	BS	33	51	063	0110011	3 three	5E	94	136	1011110	^ circumflex
09	9	011	0001001	HT	34	52	064	0110100	4 four	5F	95	137	1011111	_ underline
0A	10	012	0001010	LF	35	53	065	0110101	5 five	60	96	140	1100000	` grave
0B	11	013	0001011	VT	36	54	066	0110110	6 six	61	97	141	1100001	a (lc)
0C	12	014	0001100	FF	37	55	067	0110111	7 seven	62	98	142	1100010	b (lc)
0D	13	015	0001101	CR	38	56	070	0111000	8 eight	63	99	143	1100011	c (lc)
0E	14	016	0001110	SO	39	57	071	0111001	9 nine	64	100	144	1100100	d (lc)
0F	15	017	0001111	SI	3A	58	072	0111010	: colon	65	101	145	1100101	e (lc)
10	16	020	0010000	DLE	3B	59	073	0111011	; semicolon	66	102	146	1100110	f (lc)
11	17	021	0010001	DC1	3C	60	074	0111100	< less than	67	103	147	1100111	g (lc)
12	18	022	0010010	DC2	3D	61	075	0111101	= equals	68	104	150	1101000	h (lc)
13	19	023	0010011	DC3	3E	62	076	0111110	> gr than	69	105	151	1101001	i (lc)
14	20	024	0010100	DC4	3F	63	077	0111111	? question	6A	106	152	1101010	j (lc)
15	21	025	0010101	NAK	40	64	100	1000000	@ at sign	6B	107	153	1101011	k (lc)
16	22	026	0010110	SYN	41	65	101	1000001	A (UC)	6C	108	154	1101100	l (lc)
17	23	027	0010111	ETB	42	66	102	1000010	B (UC)	6D	109	155	1101101	m (lc)
18	24	030	0011000	CAN	43	67	103	1000011	C (UC)	6E	110	156	1101110	n (lc)
19	25	031	0011001	EM	44	68	104	1000100	D (UC)	6F	111	157	1101111	o (lc)
1A	26	032	0011010	SUB	45	69	105	1000101	E (UC)	70	112	160	1110000	p (lc)
1B	27	033	0011011	ESC	46	70	106	1000110	F (UC)	71	113	161	1110001	q (lc)
1C	28	034	0011100	FS	47	71	107	1000111	G (UC)	72	114	162	1110010	r (lc)
1D	29	035	0011101	GS	48	72	110	1001000	H (UC)	73	115	163	1110011	s (lc)
1E	30	036	0011110	RS	49	73	111	1001001	I (UC)	74	116	164	1110100	t (lc)
1F	31	037	0011111	US	4A	74	112	1001010	J (UC)	75	117	165	1110101	u (lc)
20	32	040	0100000	SP space	4B	75	113	1001011	K (UC)	76	118	166	1110110	v (lc)
21	33	041	0100001	! exclam	4C	76	114	1001100	L (UC)	77	119	167	1110111	w (lc)
22	34	042	0100010	" quotes	4D	77	115	1001101	M (UC)	78	120	170	1111000	x (lc)
23	35	043	0100011	# number	4E	78	116	1001110	N (UC)	79	121	171	1111001	y (lc)
24	36	044	0100100	$ dollar	4F	79	117	1001111	O (UC)	7A	122	172	1111010	z (lc)
25	37	045	0100101	% percent	50	80	120	1010000	P (UC)	7B	123	173	1111011	{ op brace
26	38	046	0100110	& amprsnd	51	81	121	1010001	Q (UC)	7C	124	174	1111100		vert rule
27	39	047	0100111	' acute	52	82	122	1010010	R (UC)	7D	125	175	1111101	} cl brace
28	40	050	0101000	(op paren	53	83	123	1010011	S (UC)	7E	126	176	1111110	‾ overscore
29	41	051	0101001	) cl paren	54	84	124	1010100	T (UC)	7F	127	177	1111111	DEL
2A	42	052	0101010	* asterisk	55	85	125	1010101	U (UC)					
HX	DEC	OCT	BINARY	ASCII	HX	DEC	OCT	BINARY	ASCII	HX	DEC	OCT	BINARY	ASCII

APPENDIX D
CHARACTER SETS

D.1 GENERAL
This printer produces the various character styles from three different dot-matrix formats:

- STANDARD 11 (horizontal) × 9 (vertical)
- ITALICS 11 (horizontal) × 9 (vertical)
- NLQ 23 (horizontal) × 16 (vertical)

D.2 STANDARD 11×9 MATRIX
In the 11×9 matrix, the "11" in the horizontal plane consists of six whole-dot positions and five half-dot positions between. This results in 11 half-dot positions in which pin firing is possible (see illustration). Note that adjacent half-dot pin positions cannot be fired due to the speed of the print head in the draft (pica 10 cpi) mode.

The 11×9 matrix is the basis for the high-speed draft set pica (10 cpi), elite (12 cpi), condensed (17.14 cpi), enlarged (5 cpi), emphasized (10 cpi), double-strike two pass (10 cpi), super/subscript, plus combinations of the above.

The various widths (xx cpi) are generated using the standard matrix data and changing print head speed and pin fire timing in the horizontal plane. The super/subscript set is created in two passes, each one using one-half the pin data, resulting in characters one-half normal height, but normal width. The second pass is printed ⅓ dot lower than the first pass. This set can be condensed to 17.14 cpi for the smallest set available.

ITALICS—The italic characters exist as a separate 11×9 matrix character set. It is not the standard set manipulated. These italic characters are accessible with DIP switch SW1–7 ON and with ESC 4 active. The character codes are the standard ASCII codes plus 128 (equivalent to bit 8 set).
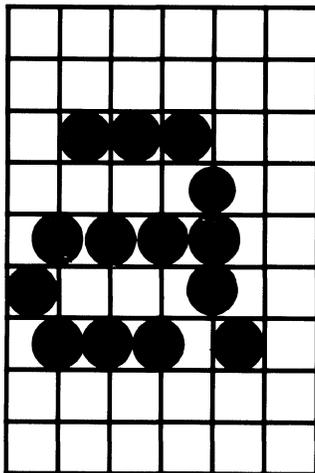
Figure D-1 Normal Appearance, "a"
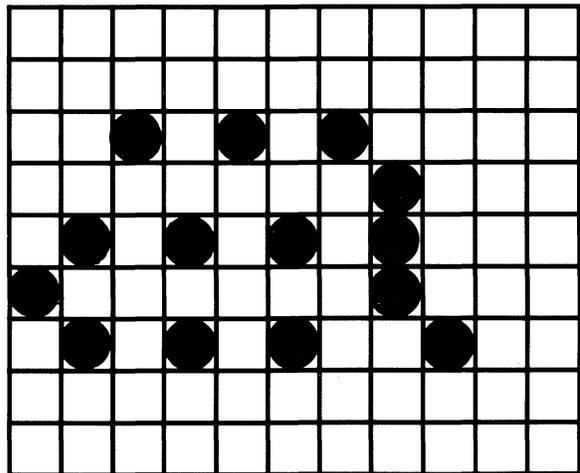
Figure D-2 Letter "a", Half-Dot Matrix

D.3 NEAR LETTER QUALITY 23 × 16 MATRIX

The NLQ 23 × 16 matrix provides near-letter quality characters in 10 cpi and 5 cpi (enlarged). NLQ cannot be italicized nor condensed, and does not produce super/subscript (NLQ italics is an option). If commands such as these are received, they are simply ignored in NLQ mode.

NLQ is created in two passes of the print head, filling in gaps between dots, thus forming a high-quality character. The second pass is ⅓ dot lower than the first pass. Since the print head is slowed down for NLQ, dots can be fired on ¼-dot centers for increased resolution in the horizontal plane. Adjacent ¼-dot positions cannot be fired, but adjacent ½-dot positions can. The horizontal plane for one character consists of twelve ½-dot positions with eleven ¼-dot positions between (23 total).

RESIDENT NLQ SET — Refer to Figure D-3. The vertical printing consists of two passes of eight pins each, the total vertical size being 8⅓ dots maximum. There are no descender data for this set, thus the 9th pin is not used to print NLQ characters. The 9th pin is used only to underline in a separate (3rd) pass. This underline clears the (8th-pin) descenders, because there is a one-dot paper feed followed by the underline printed in the "10th" pin position.

Figure D-3 shows each dot isolated from the others for clarity. The actual printed character is much more fully-formed than the illustration. In the horizontal plane, dots shown adjacent to each other actually overlap at ½-dot centers. In the vertical plane, dots in the second pass actually are only ⅓ dot lower than the first pass rather than a whole dot as shown.
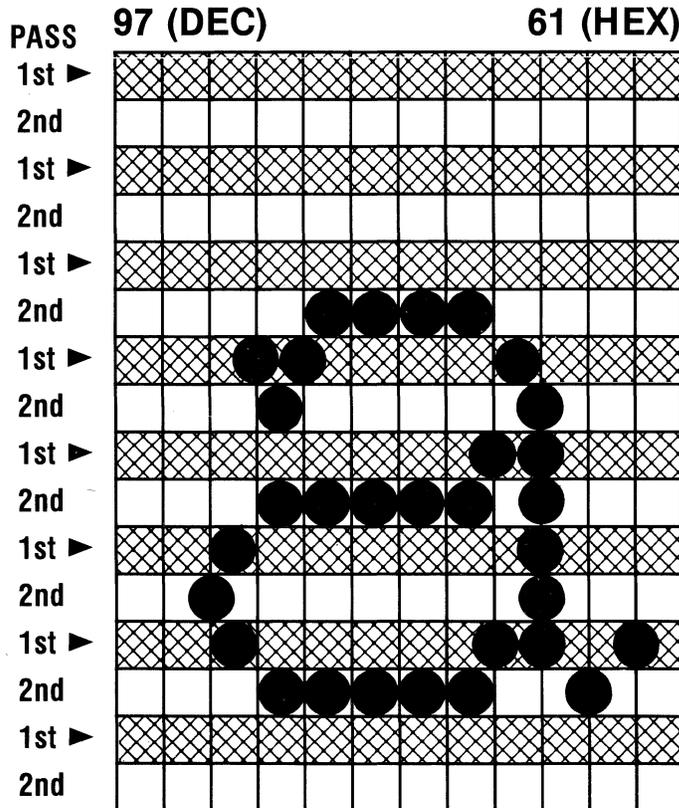
Figure D-3 NLQ Character "a"

D.4 CHARACTER STYLE COMBINATIONS

There are many combinations of character styles that are available to the programmer. Table D-1 summarizes the combinations possible in the standard printer model.

ITALICS—Every combination of styles in the standard printer model can be italicized except NLQ. Italics is turned on by ESC 4, or in BASIC, PRINT CHR$(27);"4".

PRINT MODE COMBINATIONS—The Print Mode is turned on by ESC ! (n) or in BASIC, PRINT CHR$(27);"!";CHR$(0-63);. Refer to page 3-14 for a summary of character styles in this mode. Not included in the styles selected by the Print Mode are NLQ (ESC ( ) and superscript (ESC S 0). These are included in Table D-1.

SUPERSCRIPT—Although not intended as a separate character set for text, superscript is excellent for footnotes and can be totally modified (italics, condensed, enlarged, double-struck, emphasized). Elite superscript is a fine small character set. The smallest set possible is pica (10 cpi) superscript condensed. Line feed values can be reduced by ESC 1 (8 lpi) and ESC 3 (n) to accommodate the small sets.

NLQ—Near Letter Quality can be enlarged and set to proportional spacing with ESC p 1 or in BASIC, LPRINT CHR$(27); "p"; CHR$ (1);. The top line of the sample below is proportionally spaced.

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

Table D-1 Typestyle Combinations (● =YES)

CHARACTER STYLE	ENABLE CODE	CANCEL CODE	ENABLE BY ► CANCEL BY ► MODIFIER ►	ESC 4 ESC 5 ITAL	ESC SI DC1 COND	ESC W 1 ESC W 0 ENLG	ESC S 0 ESC T SUPER	ESC E ESC F EMPH	ESC G ESC H DBLSTRK	# OF COMB (2^n)
NEAR LETTER QUALITY (NLQ)	ESC (	ESC P				●				2
PICA 10 CPI	ESC P	ESC M		●	●	●	●	●	●	64
ELITE 12 CPI	ESC M	ESC P		●		●	●		●	16
CONDENSED 17.14 CPI	ESC SI	DC2		●		●	●		●	16
SUPERSCRIPT 10 CPI	ESC S 0	ESC T		●	●	●		●	●	32
PROPORTIONAL (EMPHASIZED)	ESC p 1	ESC p 0		●		●	●		●	16

D.5 STANDARD CHARACTER MATRICES (11×9)

The following samples comprise the standard 11 × 9 set which produces pica (10 cpi), elite (12 cpi), condensed (17.14 cpi), enlarged (5 cpi), and super/subscript. Proportional spacing is the standard set with unused spaces omitted from the rightmost columns. Refer to paragraph D.2 for format.

| 64 | 40H | 65 | 41H | 66 | 42H | 67 | 43H | 68 | 44H | 69 | 45H | 70 | 46H | 71 | 47H |

D.6 ITALIC CHARACTER MATRICES (11×9)

The following samples comprise the alternate (italic) 11 × 9 set which produces the italicized versions of pica (10 cpi), elite (12 cpi), condensed (17.14 cpi), enlarged (5 cpi), and super/subscript. Italicized proportional spacing is the alternate set with unused spaces omitted from the rightmost columns. Refer to paragraph D.2 for format.
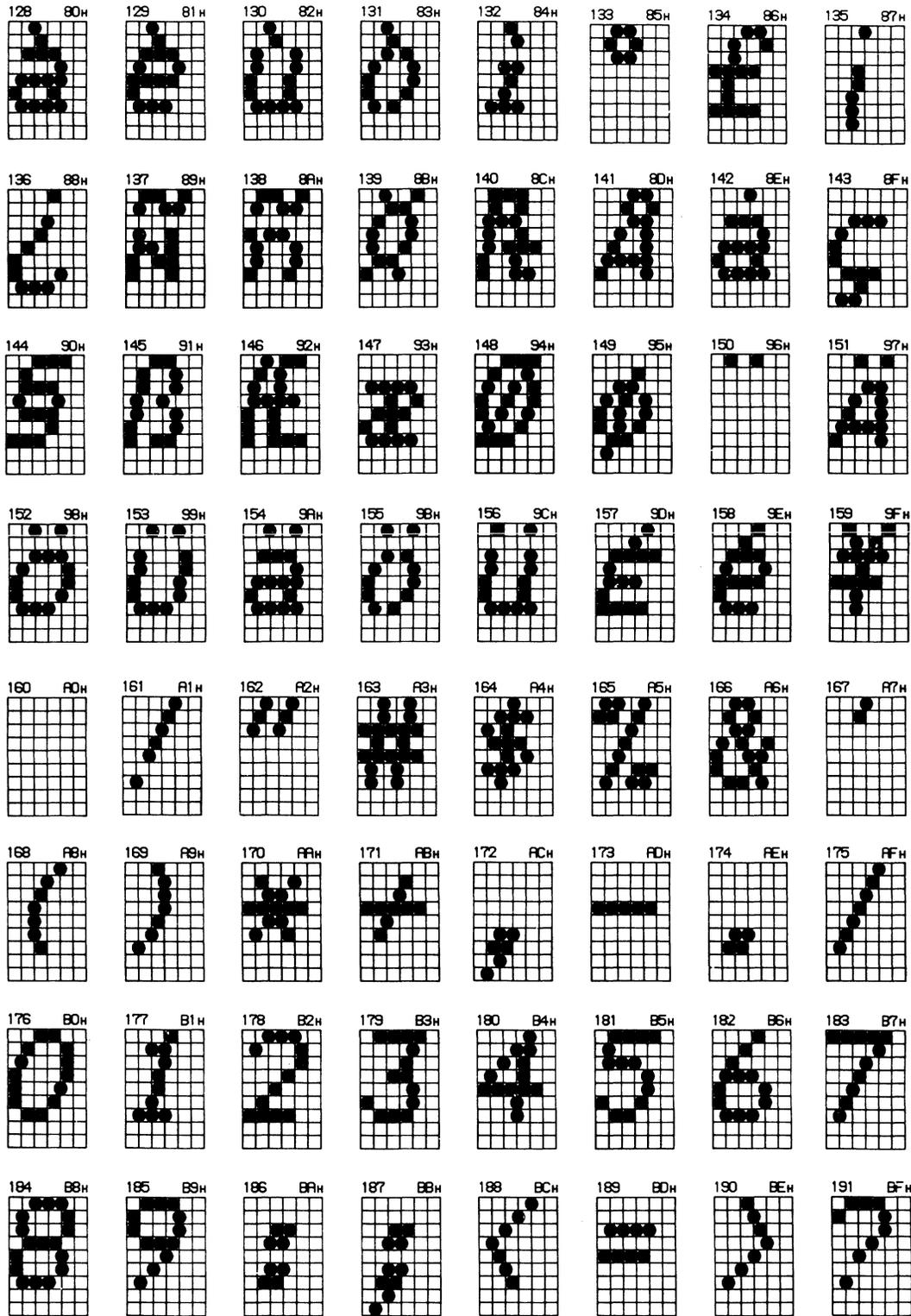
ITALIC CHARACTER MATRICES (11 × 9) (Continued)
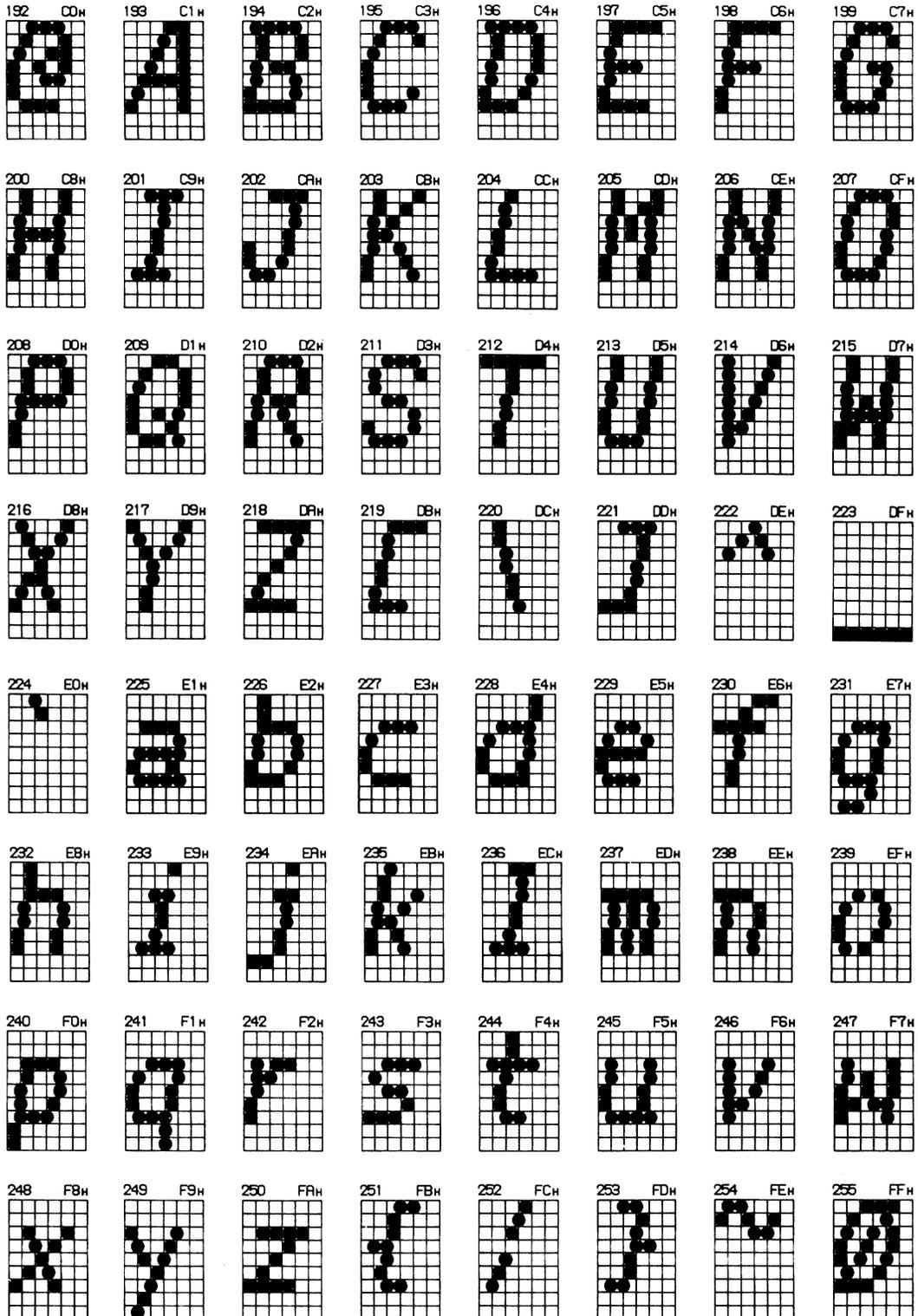
D.7 NLQ CHARACTER MATRICES (23×16)

The following samples comprise the Near Letter Quality 23 × 16 set which is 10 cpi (normal) and 5 cpi (enlarged). Refer to paragraph D.3 for NLQ format.

Character matrices for ASCII codes 64 (40H) through 127 (7FH):

64 40H @	65 41H A	66 42H B	67 43H C	68 44H D	69 45H E	70 46H F	71 47H G
72 48H H	73 49H I	74 4AH J	75 4BH K	76 4CH L	77 4DH M	78 4EH N	79 4FH O
80 50H P	81 51H Q	82 52H R	83 53H S	84 54H T	85 55H U	86 56H V	87 57H W
88 58H X	89 59H Y	90 5AH Z	91 5BH [	92 5CH \	93 5DH]	94 5EH ^	95 5FH _
96 60H `	97 61H a	98 62H b	99 63H c	100 64H d	101 65H e	102 66H f	103 67H g
104 68H h	105 69H i	106 6AH j	107 6BH k	108 6CH l	109 6DH m	110 6EH n	111 6FH o
112 70H p	113 71H q	114 72H r	115 73H s	116 74H t	117 75H u	118 76H v	119 77H w
120 78H x	121 79H y	122 7AH z	123 7BH {	124 7CH |	125 7DH }	126 7EH ~	127 7FH ∅

D.8 STANDARD 11×9 PROPORTIONAL SPACING TABLE

Table D-2 contains proportional spacing data for the standard 11×9 matrix character set.

Table D-2 Proportional Data—Standard Characters

CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)	CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)
00	8B	1	0	11	12	30	8B	1	0	11	12
01	8B	1	0	11	12	31	A9	1	2	9	8
02	9B	1	1	11	11	32	8B	1	0	11	12
03	9A	1	1	10	10	33	8B	1	0	11	12
04	98	1	1	8	8	34	8B	1	0	11	12
05	A9	1	2	9	8	35	8B	1	0	11	12
06	8B	1	0	11	12	36	8B	1	0	11	12
07	C8	1	4	8	5	37	8B	1	0	11	12
08	8B	1	0	11	12	38	8B	1	0	11	12
09	8B	1	0	11	12	39	8B	1	0	11	12
0A	9B	1	1	11	11	3A	A7	1	2	7	6
0B	8B	1	0	11	12	3B	27	0	2	7	6
0C	8B	1	0	11	12	3C	89	1	0	9	10
0D	8B	1	0	11	12	3D	8B	1	0	11	12
0E	8B	1	0	11	12	3E	AB	1	2	11	10
0F	0A	0	0	10	11	3F	8B	1	0	11	12
10	9A	1	1	10	10	40	8B	1	0	11	12
11	8A	1	0	10	11	41	8B	1	0	11	12
12	8B	1	0	11	12	42	8B	1	0	11	12
13	8B	1	0	11	12	43	8B	1	0	11	12
14	8B	1	0	11	12	44	8B	1	0	11	12
15	8B	1	0	11	12	45	8B	1	0	11	12
16	A9	1	2	9	8	46	8B	1	0	11	12
17	8B	1	0	11	12	47	8B	1	0	11	12
18	8B	1	0	11	12	48	8B	1	0	11	12
19	8B	1	0	11	12	49	A9	1	2	9	8
1A	8B	1	0	11	12	4A	8A	1	0	10	11
1B	9A	1	1	10	10	4B	8B	1	0	11	12
1C	9B	1	1	11	11	4C	8B	1	0	11	12
1D	8B	1	0	11	12	4D	8B	1	0	11	12
1E	8B	1	0	11	12	4E	8B	1	0	11	12
1F	8B	1	0	11	12	4F	8B	1	0	11	12
20	8B	1	0	11	12	50	8B	1	0	11	12
21	C8	1	4	8	5	51	8B	1	0	11	12
22	A9	1	2	9	8	52	8B	1	0	11	12
23	8B	1	0	11	12	53	8B	1	0	11	12
24	8B	1	0	11	12	54	8B	1	0	11	12
25	8B	1	0	11	12	55	8B	1	0	11	12
26	8B	1	0	11	12	56	8B	1	0	11	12
27	C8	1	4	8	5	57	8B	1	0	11	12
28	C9	1	4	9	6	58	9A	1	1	10	10
29	A7	1	2	7	6	59	8B	1	0	11	12
2A	8B	1	0	11	12	5A	9A	1	1	10	10
2B	8B	1	0	11	12	5B	A9	1	2	9	8
2C	27	0	2	7	6	5C	89	1	0	9	10
2D	8B	1	0	11	12	5D	A9	1	2	9	8
2E	A7	1	2	7	6	5E	8B	1	0	11	12
2F	9A	1	1	10	10	5F	0B	0	0	11	12

Table D-2 Proportional Data—Standard Characters (Cont.)

CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)	CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)
60	B7	1	3	7	5	90	8B	1	0	11	12
61	8B	1	0	11	12	91	8B	1	0	11	12
62	8A	1	0	10	11	92	8B	1	0	11	12
63	8A	1	0	10	11	93	8B	1	0	11	12
64	8A	1	0	10	11	94	8B	1	0	11	12
65	8B	1	0	11	12	95	8B	1	0	11	12
66	89	1	0	9	10	96	8B	1	0	11	12
67	0A	0	0	10	11	97	8B	1	0	11	12
68	8A	1	0	10	11	98	8B	1	0	11	12
69	98	1	1	8	8	99	8B	1	0	11	12
6A	88	1	0	8	9	9A	8B	1	0	11	12
6B	9A	1	1	10	10	9B	8B	1	0	11	12
6C	98	1	1	8	8	9C	8B	1	0	11	12
6D	8B	1	0	11	12	9D	8B	1	0	11	12
6E	8A	1	0	10	11	9E	8B	1	0	11	12
6F	8B	1	0	11	12	9F	8B	1	0	11	12
70	0A	0	0	10	11	A0	8B	1	0	11	12
71	1B	0	1	11	11	A1	87	1	0	7	8
72	8A	1	0	10	11	A2	CB	1	4	11	8
73	8B	1	0	11	12	A3	87	1	0	7	8
74	8A	1	0	10	11	A4	86	1	0	6	7
75	8B	1	0	11	12	A5	B8	1	3	8	6
76	8B	1	0	11	12	A6	8B	1	0	11	12
77	8B	1	0	11	10	A7	89	1	0	9	10
78	89	1	0	9	10	A8	89	1	0	9	10
79	0B	0	0	11	12	A9	89	1	0	9	10
7A	89	1	0	9	10	AA	89	1	0	9	10
7B	AA	1	2	10	9	AB	89	1	0	9	10
7C	C8	1	4	8	5	AC	89	1	0	9	10
7D	99	1	1	9	9	AD	89	1	0	9	10
7E	8B	1	0	11	12	AE	89	1	0	9	10
7F	8B	1	0	11	12	AF	89	1	0	9	10
80	8B	1	0	11	12	B0	8B	1	0	11	12
81	8B	1	0	11	12	B1	8B	1	0	11	12
82	8B	1	0	11	12	B2	8A	1	0	10	11
83	8B	1	0	11	12	B3	8A	1	0	10	11
84	8B	1	0	11	12	BA	8B	1	0	11	12
85	8B	1	0	11	12	B5	8B	1	0	11	12
86	8B	1	0	11	12	B6	8B	1	0	11	12
87	8B	1	0	11	12	B7	8B	1	0	11	12
88	8B	1	0	11	12	B8	8B	1	0	11	12
89	8B	1	0	11	12	B9	8B	1	0	11	12
8A	8B	1	0	11	12	BA	8B	1	0	11	12
8B	8B	1	0	11	12	BB	8B	1	0	11	12
8C	8B	1	0	11	12	BC	8B	1	0	11	12
8D	8B	1	0	11	12	BD	8B	1	0	11	12
8E	8B	1	0	11	12	BE	8B	1	0	11	12
8F	8B	1	0	11	12	BF	8B	1	0	11	12

Table D-2 Proportional Data—Standard Characters (Cont.)

CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)	CODE (HEX)	ATRBUT. DATA (HEX)	DSCNDR DATA	START POS.	END POS.	WIDTH (½ DOT)
C0	8B	1	0	11	12	F0	8B	1	0	11	12
C1	8B	1	0	11	12	F1	8B	1	0	11	12
C2	8B	1	0	11	12	F2	8B	1	0	11	12
C3	8B	1	0	11	12	F3	8B	1	0	11	12
C4	AA	1	2	10	9	F4	8B	1	0	11	12
C5	8B	1	0	11	12	F5	8B	1	0	11	12
C6	8B	1	0	11	12	F6	8B	1	0	11	12
C7	8B	1	0	11	12	F7	8B	1	0	11	12
C8	8B	1	0	11	12	F8	8B	1	0	11	12
C9	8A	1	0	10	11	F9	8B	1	0	11	12
CA	8B	1	0	11	12	FA	8B	1	0	11	12
CB	8B	1	0	11	12	FB	8B	1	0	11	12
CC	8B	1	0	11	12	FC	8B	1	0	11	12
CD	8B	1	0	11	12	FD	8B	1	0	11	12
CE	8B	1	0	11	12	FE	8B	1	0	11	12
CF	8B	1	0	11	12	FF	8B	1	0	11	12
D0	8A	1	0	10	11						
D1	8B	1	0	11	12						
D2	8A	1	0	10	11						
D3	8B	1	0	11	12						
D4	8B	1	0	11	12						
D5	8B	1	0	11	12						
D6	8B	1	0	11	12						
D7	8B	1	0	11	12						
D8	9A	1	1	10	10						
D9	8B	1	0	11	12						
DA	9B	1	1	11	11						
DB	8B	1	0	11	12						
DC	8B	1	0	11	12						
DD	8B	1	0	11	12						
DE	87	1	0	7	8						
DF	87	1	0	7	8						
E0	8B	1	0	11	12						
E1	8B	1	0	11	12						
E2	8B	1	0	11	12						
E3	8B	1	0	11	12						
E4	8B	1	0	11	12						
E5	8B	1	0	11	12						
E6	8B	1	0	11	12						
E7	8B	1	0	11	12						
E8	8B	1	0	11	12						
E9	8B	1	0	11	12						
EA	8B	1	0	11	12						
EB	8B	1	0	11	12						
EC	8B	1	0	11	12						
ED	8B	1	0	11	12						
EE	8B	1	0	11	12						
EF	8B	1	0	11	12						

D.9 NLQ PROPORTIONAL SPACING DATA

The proportional spacing data for the NLQ 23 × 16 matrix character set consists of two bytes of attribute data. The attribute contains descender information plus start and stop column information. Refer to the sample below:

Example: ATTRIBUTE DATA = 8017 (HEX)

```
                    START
                     POS
                      |
                      v
            8    0    1  7
            ^        \    /
            |         \  /
            |          \/
        DESCENDER      END
        DATA = NO      POS
```

```
               DESCENDER
MSB [ 1 ]}    1 = NO DESC ──→  [ 1 ]
    [ 0 ]}                     [ 0 ]
    [ 0 ]} 8      BYTE 1       [ 0 ]
    [ 0 ]}       (80 HEX)      [ 0 ]
    [ 0 ]}                     [ 0 ]  }
    [ 0 ]}                     [ 0 ]  } START POSITION
    [ 0 ]} 0                   [ 0 ]  } = COLUMN ZERO
LSB [ 0 ]}                     [ 0 ]  }

MSB [ 0 ]}                     [ 0 ] }
    [ 0 ]} 1                    [ 0 ] }
    [ 0 ]}        BYTE 2        [ 0 ] }
    [ 1 ]}       (17 HEX)       [ 1 ] } END POSITION
    [ 0 ]}                      [ 0 ] } = COLUMN 23 (DEC)
    [ 1 ]}                      [ 1 ] }
    [ 1 ]} 7                    [ 1 ] }
LSB [ 1 ]}                      [ 1 ] }
```
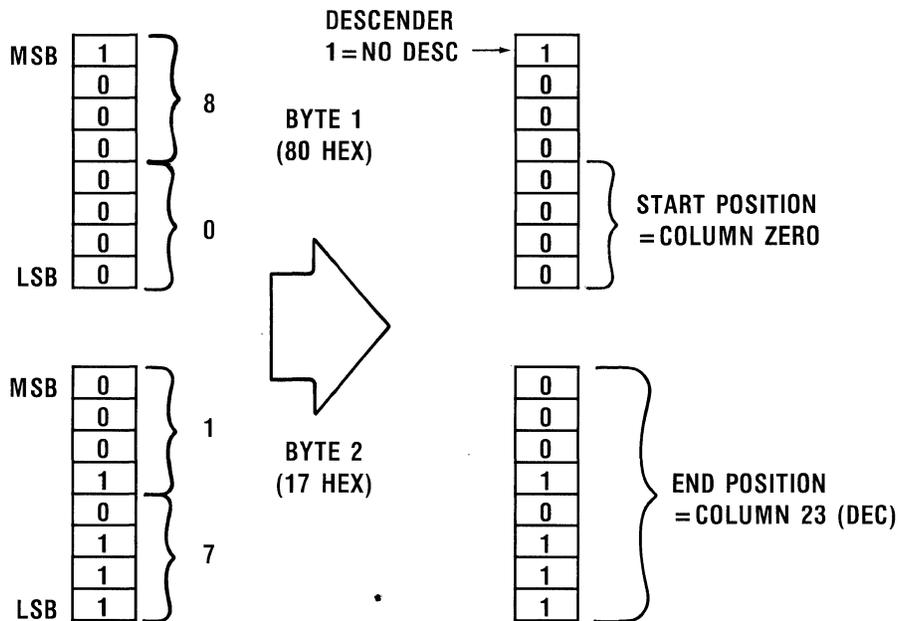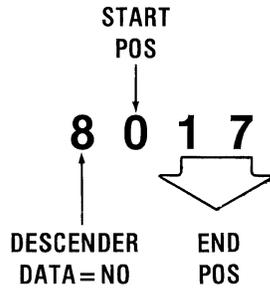
D.10 NLQ PROPORTIONAL SPACING TABLES

Table D-3 contains the data for the resident NLQ character set in proportional mode (ESC p 1). Note that the space character (20 HEX) remains at maximum width (24 quarter dots).

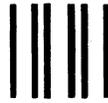## Table D-3 Proportional Data Table for NLQ Characters

CHAR	CODE (HEX)	ATRBUT (HEX)	DSCNDR DATA	START POS	END POS	WIDTH (¼ DOT)	CHAR	CODE (HEX)	ATRBUT (HEX)	DSCNDR DATA	START POS	END POS	WIDTH (¼ DOT)
à	00	8117	1	1	23	23	0	30	8215	1	2	21	20
è	01	8116	1	1	22	22	1	31	8215	1	2	21	20
ù	02	8116	1	1	22	22	2	32	8215	1	2	21	20
ò	03	8116	1	1	22	22	3	33	8215	1	2	21	20
ì	04	8215	1	2	21	20	4	34	8215	1	2	21	20
°	05	8611	1	6	17	12	5	35	8215	1	2	21	20
£	06	8216	1	2	22	21	6	36	8215	1	2	21	20
¡	07	8710	1	7	16	10	7	37	8215	1	2	21	20
¿	08	8316	1	3	22	20	8	38	8215	1	2	21	20
Ñ	09	8116	1	1	22	22	9	39	8215	1	2	21	20
ñ	0A	8116	1	1	22	22	:	3A	850E	1	5	14	10
¤	0B	8215	1	2	21	20	;	3B	850E	1	5	14	10
Pt	0C	8017	1	0	23	24	<	3C	8016	1	0	22	23
Å	0D	8017	1	0	23	24	=	3D	8215	1	2	21	20
å	0E	8117	1	1	23	23	>	3E	8117	1	1	23	23
ç	0F	8215	1	2	21	20	?	3F	8215	1	2	21	20
§	10	8315	1	3	21	19	@	40	8215	1	2	21	20
ß	11	8116	1	1	22	22	A	41	8017	1	0	23	24
Æ	12	8017	1	0	23	24	B	42	8116	1	1	22	22
æ	13	8016	1	0	22	23	C	43	8116	1	1	22	22
Ø	14	8017	1	0	23	24	D	44	8116	1	1	22	22
ø	15	8116	1	1	22	22	E	45	8116	1	1	22	22
¨	16	8314	1	3	20	18	F	46	8217	1	2	23	22
Ä	17	8017	1	0	23	24	G	47	8017	1	0	23	24
Ö	18	8017	1	0	23	24	H	48	8017	1	0	23	24
Ü	19	8017	1	0	23	24	I	49	8215	1	2	21	20
ä	1A	8117	1	1	23	23	J	4A	8114	1	1	20	20
ö	1B	8116	1	1	22	22	K	4B	8117	1	1	23	23
ü	1C	8116	1	1	22	22	L	4C	8217	1	2	23	22
É	1D	8116	1	1	22	22	M	4D	8017	1	0	23	24
é	1E	8116	1	1	22	22	N	4E	8116	1	1	22	22
¥	1F	8017	1	0	23	24	O	4F	8017	1	0	23	24
	20	8215	1	2	21	20	P	50	8217	1	2	23	22
!	21	8710	1	7	16	10	Q	51	8017	1	0	23	24
"	22	8215	1	2	21	20	R	52	8017	1	0	23	24
#	23	8017	1	0	23	24	S	53	8116	1	1	22	22
$	24	8215	1	2	21	20	T	54	8116	1	1	22	22
%	25	8017	1	0	23	24	U	55	8017	1	0	23	24
&	26	8117	1	1	23	23	V	56	8017	1	0	23	24
'	27	8710	1	7	16	10	W	57	8017	1	0	23	24
(	28	8611	1	6	17	12	X	58	8017	1	0	23	24
)	29	8611	1	6	17	12	Y	59	8017	1	0	23	24
*	2A	8116	1	1	22	22	Z	5A	8116	1	1	22	22
+	2B	8215	1	2	21	20	[	5B	8813	1	8	19	12
,	2C	850E	1	5	14	10	\	5C	8017	1	0	23	24
-	2D	8215	1	2	21	20	]	5D	840F	1	4	15	12
.	2E	850E	1	5	14	10	^	5E	8413	1	4	19	16
/	2F	8017	1	0	23	24	_	5F	8017	1	0	23	24

Table D-3 Proportional Data Table for NLQ Characters (cont'd)

CHAR	CODE (HEX)	ATRBUT (HEX)	DSCNDR DATA	START POS	END POS	WIDTH (¼ DOT)
`	60	8611	1	6	17	12
a	61	8117	1	1	23	23
b	62	8116	1	1	22	22
c	63	8215	1	2	21	20
d	64	8116	1	1	22	22
e	65	8116	1	1	22	22
f	66	8216	1	2	22	21
g	67	8117	1	1	23	23
h	68	8116	1	1	22	22
i	69	8215	1	2	21	20
j	6A	8212	1	2	18	17
k	6B	8117	1	1	23	23
l	6C	8215	1	2	21	20
m	6D	8017	1	0	23	24
n	6E	8116	1	1	22	22
o	6F	8116	1	1	22	22
p	70	8116	1	1	22	22
q	71	8116	1	1	22	22
r	72	8117	1	1	23	23
s	73	8215	1	2	21	20
t	74	8215	1	2	21	20
u	75	8116	1	1	22	22
v	76	8017	1	0	23	24
w	77	8017	1	0	23	24
x	78	8017	1	0	23	24
y	79	8017	1	0	23	24
z	7A	8215	1	2	21	20
{	7B	8411	1	4	17	14
¦	7C	890E	1	9	14	6
}	7D	8613	1	6	19	14
~	7E	8413	1	4	19	16
Ø	7F	8215	1	2	21	20

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