SPERRY UNIVAC
COMPUTER SYSTEMS

#

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General

0776 Printer

Reference

UP-8441 Rev. 3

This Library Memo announces the release and availability of "SPERRY UNIVAC® 0776 Printer Reference", UP-8441 Rev. 3.

This revision provides information on six additional print cartridges and print bands that are included with the printer optional features.

Reference" UP-8441 Rev. 2, released on Library Memo dated May, 1981. Please destroy all copies of UP-8441 Rev. 2 and/or its Library Memo.

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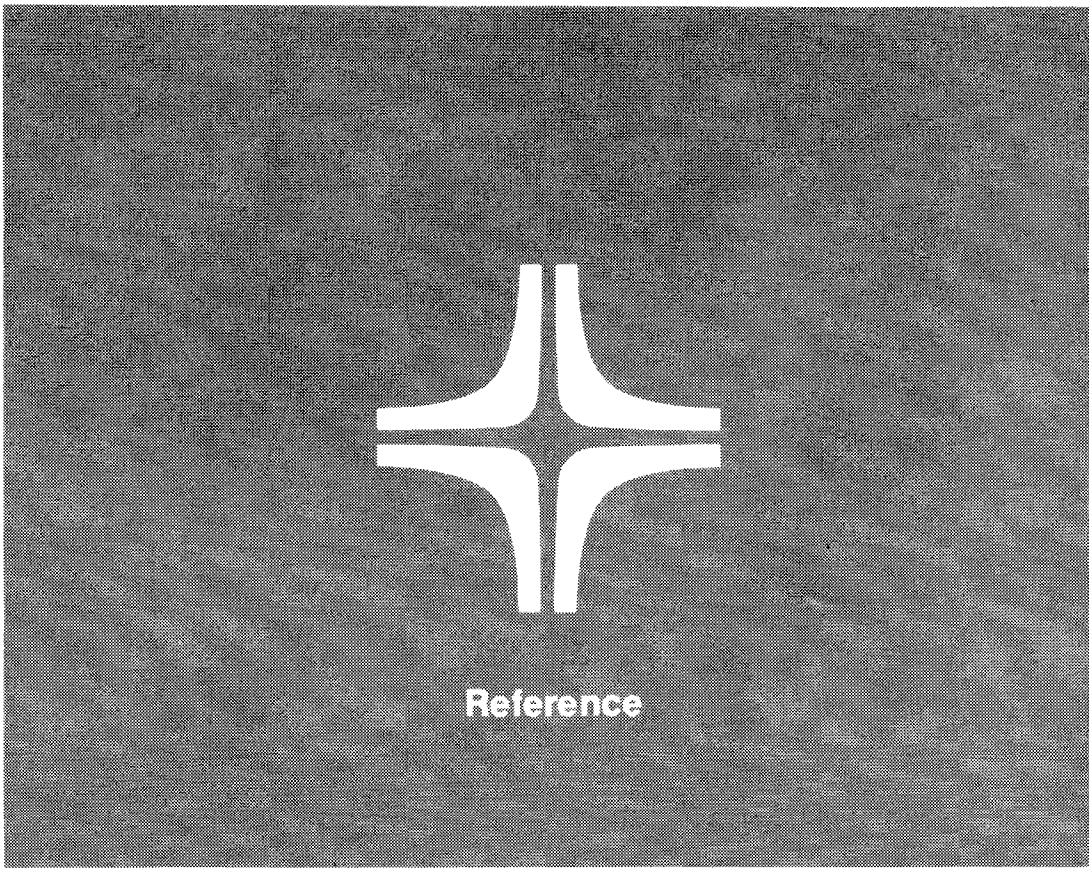
0776 Printer



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1. Introduction

This document provides information to program the SPERRY UNIVAC 0776 Printer Subsystem (Figure 1-1). The description of the hardware includes the printer characteristics and configurations, subsystem components, and operating sequences. Programming information, which is limited to control and diagnostic byte structures, includes a description of all commands and status and sense data bytes, in addition to recovery procedures required for operation and diagnostic purposes.

The 0776 printer is a freestanding impact printer. It employs a horizontal-moving print band in a print cartridge assembly which permits easy interchangeability by the operator. The print characters are etched on the print band and arranged in arrays (type fonts) which are repeated around the periphery of the print band.

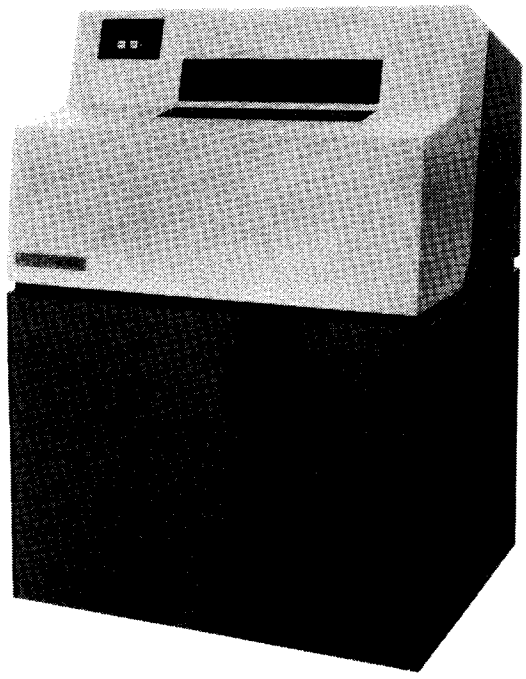


Figure 1—1. SPERRY UNIVAC 0776 Printer Subsystem

The printer has a full 136-position print line buffer (PLB) used to store characters during the printing operation. A vertical format buffer (VFB) is provided which permits the retention of program loaded vertical stop codes. A load code buffer (LCB) also is provided to permit loading 6-, 7-, or 8-bit codes for each character on the print band.

Printing of a line begins as soon as the print line buffer has been filled and form advance is complete. Printing occurs asynchronously; that is, not dependent on the initial position of the moving print band, but when a selected character aligns with a selected column position.

The printer contains a print mechanism, actuator drive electronics, power supplies, form feed control, control unit logic, power control, operator control panel, and frame and casework.

2. Subsystem Description

2.1. CHARACTERISTICS

The 0776 printer, a freestanding line printer, contains the necessary hardware and control for direct connection to a selector or multiplexer type I/O channel.

2.1.1. Print Rate

The 0776 printer operates at a throughput rate of 760, 940/900, or 1200 lines per minute (lpm) using a 48-character set print band. The print throughput depends on the number of lines spaced or skipped and the arrangement of characters in the arrays on the print band. For the 760-lpm printer, for example, a print band containing 1 array of 384 characters prints at 115 lpm while a print band of 16 arrays with 24 nonrepeated characters in each array prints at 1090 lpm. The time between starts of consecutive print operations or line feed is limited to a minimum of 55 milliseconds (ms). The 115/1090 lpm rates are the minimum/maximum for single line spacing at 6 lines per inch (lpi).

Table 2-1 shows the relationship between print rates and character fonts with single line spacing (for spacing at 6 lpi) for the 760, 940/900, and 1200-lpm printers.

To ensure minimum maintenance requirements, if no print or form feed operation occurs after a period of approximately seven minutes, the printer control shuts off power to the print band drive motor. After such an interruption and after power reapplication to the print band drive motor, an interval of five seconds elapses before printing begins. This is to ensure the print band has reached its operating speed.

Table 2—1. Print Rates for 0776 Printer (6 lpi)

Length of Array (Characters)	Number of Arrays Per Band	Specified Print Rate (lpm)				Time to Print and Advance One Line (milliseconds maximum)			
		760-lpm Printer (50/60 Hz)	940-lpm Printer (60 Hz)	900-lpm Printer (50 Hz)	1200-lpm Printer (50/60 Hz)	760-lpm Printer (50/60 Hz)	940-lpm Printer (60 Hz)	900-lpm Printer (50 Hz)	1200-lpm Printer (50/60 Hz)
384	1	115	150	145	210	520	400	414	288
192	2	225	290	280	395	266	207	215	152
128	3	325	420	400	560	184	142	148	107
96	4	420	540	520	710	143	111	115	84
64	6	600	750	730	980	100	80	82	61
48	8	760	940	900	1200**	79	64	66	50
32	12	1030	1250**	1220	1250**	58	48**	49	48**
24	16	1090*	1250**	1250**	1250**	55*	48**	48**	48**

*As result of the duty cycle, time between starts of consecutive line feeds is limited to 55 milliseconds minimum.

**As result of the duty cycle, time between starts of consecutive line feeds is limited to 48 milliseconds minimum.

2.1.2. Line Spacing

Line spacing is either 6 or 8 lpi and is selected by the software with the following specifications:

6 lpi = 0.167 inch (0.424 centimeter (cm)) spacing
8 lpi = 0.125 inch (0.318 cm) spacing

2.1.3. Forms Advance Time

Table 2-2 lists the maximum time required to advance a form the indicated number of lines. (The time includes form stabilization.)

Table 2—2. Forms Advance Time (Part 1 of 2)

Printer Speed (lpm)	Advance Distance (lines)	Time (milliseconds)	
		6 lpi	8 lpi
760 and 940/900	1	16.0	14.2
	2	23.6	19.9
	3	31.2	25.6
	4	38.8	31.3
	5	46.4	37.0
	(n+1)	16.0 + 7.6n	14.2 + 5.7n

Table 2—2. Forms Advance Time (Part 2 of 2)

Printer Speed (lpm)	Advance Distance (lines)	Time (milliseconds)	
		6 lpi	8 lpi
1200	1	16.7	14.1
	2	24.6	20.9
	3	30.9	25.9
	4	35.0	30.9
	5	38.9	34.1
	6	42.6	37.1
	7	45.9	39.9
	8	49.3	42.6
	Each additional line (t)*	3.33	2.50

*For form advances in excess of 8 lines on the 1200 lpm printer, use the formula:

T=T8+t(n-8)

where:

T8
: Is the time required to advance 8 lines

t
: Is the additional line time for one line

n
: Is the number of lines advanced

2.1.4. Forms Advance Rate (Slew Rate)

The forms advance rate for the 760-lpm and the 940/900-lpm printer is 22 inches (55.88 cm) per second (+15,-0%). For the 1200-lpm printer, the forms advance rate is 50 inches (127 cm) per second (+10,-5%). Forms advance for any one command is limited to a maximum of 1.2 seconds of slew.

2.1.5. Character Specifications

A line of print consists of 136 columns, one print character for each column. Each character has a horizontal pitch of 0.10 inch (0.25 cm) with an average height of 0.108 inch (0.27 cm) and an average width of 0.069 inch (0.175 cm). Printed character size varies slightly, depending on the ink ribbon and form pack thickness.

2.1.6. Data Codes and Arrays

The data code can be EBCDIC, ASCII, or any code of 6, 7, or 8 bits. Any number of characters up to 384 can be provided in a set or array. Duplicated character array sets make up the total number of characters on any print band having fewer than 384 characters in an array.

2.1.7. Vertical Format Control

Vertical format control consists of:

- home position;
- intermediate stop positions;
- form overflow; and
- end-of-form (established by software).

2.1.8. Supply Requirements

Supplies required for the operation of the 0776 printer consist of forms, ink ribbon, and print bands.

2.1.8.1. Forms

The 0776 printer accepts 136 print-position forms and is capable of accepting multipart forms up to six parts with a total pack thickness up to 0.018 inch (0.046 cm). Multipart forms exceeding six parts may be printed with slight print degradation beyond six parts.

Optimum performance is produced on single-part 20-pound bond stock. Satisfactory performance can be realized on 18-pound bond, provided the relative humidity does not drop below 40 percent, and the forms tension lever (located in the stacker) has been properly set. Forms handling problems may increase when forms are made of less than 18-pound paper or recycled paper is used. These problems can be minimized by avoiding multiline skips or paper advances whenever possible.

Form width can range from 4 to 18.75 inches (10.16 to 47.63 cm). Maximum form length for the 760 and the 940/900-lpm printers is 24 inches (60.96 cm); however, the printer casework can accommodate only forms 17 inches (43.18 cm) or less in length. If forms longer than 17 inches are used, the paper well door must be left open. The maximum form length for the 1200-lpm printer is 18 inches (45.72 cm), due to limitations of the forms stacker.

The printer accepts continually sprocketed, card stock forms of weights typically used for punch cards, post cards, or offset masters. The printer will accommodate *no-carbon-required* forms, but customer print tests on form construction beyond four parts are recommended. The use of forms other than those recommended may result in some degradation of print quality. Forms must have sprocket holes on 0.50-inch (1.27 cm) centers.

2.1.8.2. Ink Ribbon

Two types of ink ribbons are used: fabric ribbons and plastic film ribbons. Plastic film ribbons generally provide better character definition on single part forms, but are of much shorter life and are not normally used. The ribbon is either 13.4 inches (34.0 cm) wide for 120 columns or 15.0 inches (38.1 cm) for 136 columns with a reversing bar attached to each end. Ribbon replacement is easily accomplished, and does not require that the ribbon in the printer be fully wound onto one of the two spools. A fabric ribbon 4 mils thick and 25 yards long is recommended for most customer applications. Thicknesses of 3 mils and 5 mils are available also. The 3-mil ribbon is provided for applications requiring improved print quality at a sacrifice of shorter ribbon life. The 5-mil ribbon has an increased ribbon life, but a degradation in character definition can be expected. A life of 750,000 print lines is projected for these ribbons after initial wear-in of the print band.

2.1.8.3. Print Bands

Print bands (see Figure 2–1) are mounted in individual print cartridge assemblies for easy interchangeability by the operator. Various print bands are available with the provision that the user select special print bands which best suit his applications. Print bands contain an identification code to ensure that the proper print cartridge assembly is mounted in the printer. Appendix B specifies the character symbols which appear on each available print cartridge assembly, the loading sequence, and number of characters in each array.

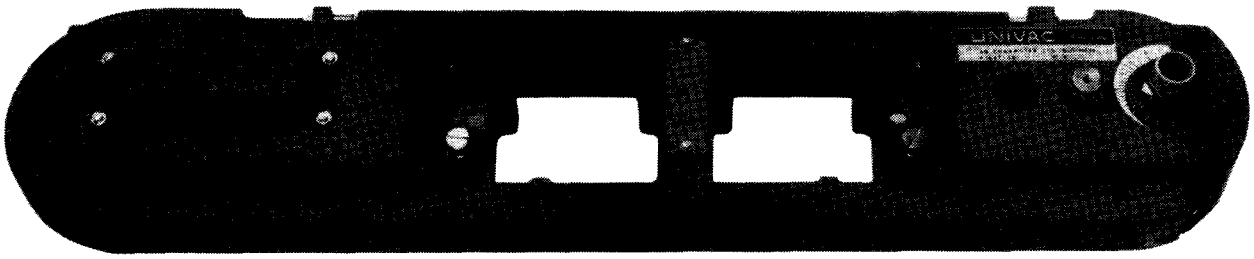


Figure 2—1. Print Cartridge Assembly

2.1.8.4. Cartridge Identification Code

A unique machine-readable code is located along the top front surface of each array included on a print band to identify the array and verify that the print cartridge assembly installed by the operator corresponds with the load code sequence used by the programmer. Verification occurs when the print cartridge identification code is read from the print band and compared with the cartridge verification code (2.3.6.5, Table 2-5).

There is a possibility of 127 combinations of hexadecimal codes. They are arranged on the print band in the form of sprockets (timing marks) in 10 locations as shown in Figure 2-2. The first and last positions (bit 1 and bit 10) are always present; the eight other bits (bits 2-9) vary, depending on code count.

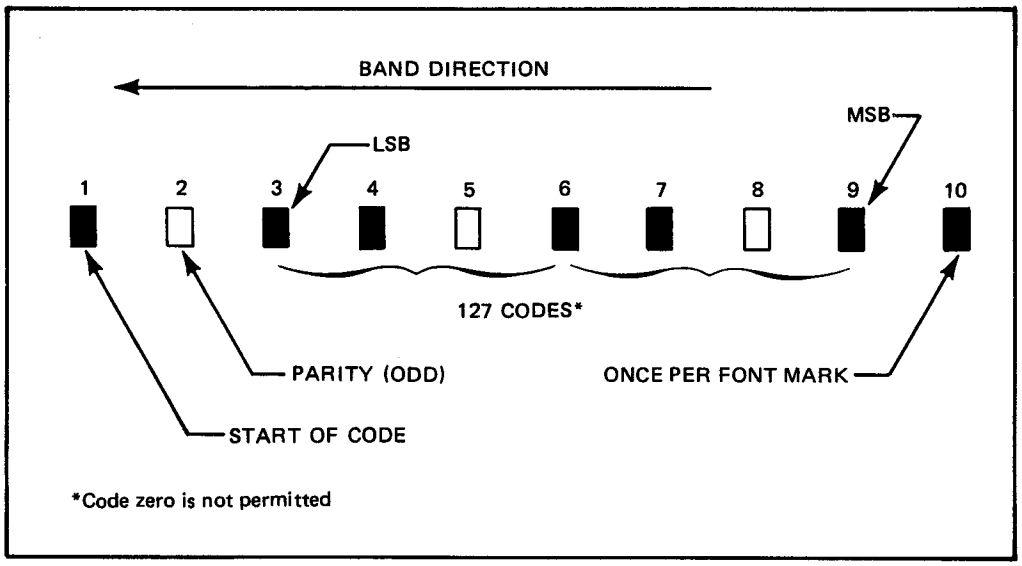


Figure 2—2. Print Cartridge Identification Codes

2.2. CONFIGURATION

The 0776 printer can be connected to any byte-oriented processing system containing an industry compatible interface. Figure 2-3 shows the functional arrangement of the printer and processing system. Table 2-3 lists and describes the printer with its optional features. The print cartridges shown are offered as standard features, but special print bands can be configured for your individual requirements.

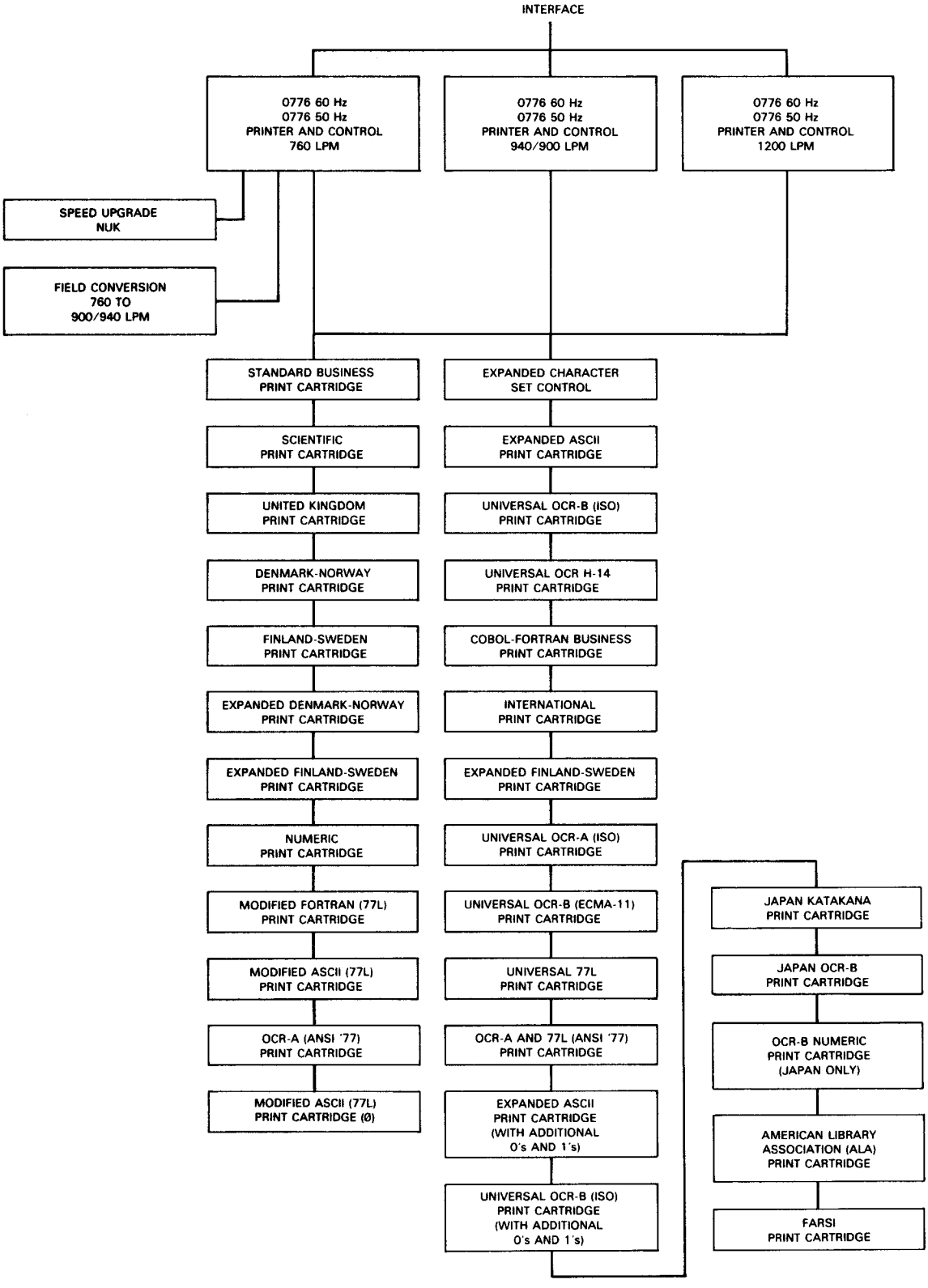


Figure 2—3. 0776 Printer Subsystem Configuration with Optional Features

Table 2—3. Printers and Optional Features (Part 1 of 2)

Name	Description
0776 Printer and Control (760 lpm)	Prints a 48-character set at 760 lpm using an operator changeable type cartridge, and spaces paper at 22 in./s (55.8 cm/s). Provides 136 print positions per line, vertical spacing of either 6 or 8 lpi. Contains one type cartridge with additional type cartridges available as optional features. Provides a powered forms pull-out roller assembly to facilitate movement of forms through the printer.
0776 Printer and Control (900 lpm)	Prints a 48-character set at 900 lpm using an operator changeable type cartridge, and spaces paper at 22 in./s (55.8 cm/s). Provides 136 print positions per line, vertical spacing of either 6 or 8 lpi. Contains one type cartridge with additional cartridges available as optional features. Provides a powered forms pull-out roller assembly to facilitate movement of forms through the printer.
0776 Printer and Control (940 lpm)	Prints a 48-character set at 940 lpm, using an operator changeable type cartridge, and spaces paper at 22 in./s (55.8 cm/s). Provides 136 print positions per line, vertical spacing of either 6 or 8 lpi. Contains one type cartridge with additional cartridges available as optional features. Provides a powered forms pull-out roller assembly to facilitate movement of forms through the printer.
0776 Printer and Control (1200 lpm)	Prints a 48-character set at 1200 lpm, using an operator changeable type cartridge, and spaces paper at 50 in./s (127 cm/s). Provides 136 print positions per line, vertical spacing of either 6 or 8 lpi. Contains one type cartridge, with additional cartridges available as optional features. Provides a powered forms stacker to facilitate stacking of forms at the rear of the printer.
Expanded Character Set Control	Provides expanded storage capability to handle type cartridge that contain character set arrays greater than 64.
Print Cartridges (Arrays ≤ 64 characters)	Print cartridges containing type bands with character sets equal to or less than 64 characters. (See Appendix B for complete details of print cartridge character sets available.) Business 48 characters Scientific 48 characters United Kingdom 48 characters Denmark-Norway 48 characters Finland-Sweden 48 characters OCR-A (ANSI '77) 48 characters Denmark-Norway (Expanded) 64 characters Finland-Sweden (Expanded) 64 characters Numeric 24 characters Modified FORTRAN (77L) 64 characters Modified ASCII (77L) 64 characters Modified ASCII (77L) 64 characters (Ø)

Table 2—3. Printers and Optional Features (Part 2 of 2)

Name	Description
Print Cartridges (Arrays > 64 characters)	Print cartridges containing type bands with character sets greater than 64 characters. (See Appendix B for complete details of the print cartridge character sets available.)
	ASCII 96 characters
	Finland-Sweden 96 characters
	Universal OCR-B (ISO) 128 characters
	Universal OCR-H-14 128 characters
	Universal OCR-A 128 characters
	Universal OCR-B (ECMA-11) 128 characters
	Universal 77L 128 characters
	COBOL-FORTRAN Business 192 characters
	International 384 characters
	OCR-A 77L 128 characters
	Expanded ASCII ECMA-11 192 characters
	Universal OCR-B (ISO) 128 characters
	Japan Katakana 128 characters
	Japan OCR-B 128 characters
	OCR-B Numeric 24 characters
	American Library Association (ALA) 384 characters
	Farsi 192 characters

2.3. FUNCTIONAL ELEMENTS

The functional elements of the 0776 printer are those components required to obtain a hard copy of data resulting from the output of a system processor. The print and ribbon mechanisms, buffers, control electronics, parity, character coding, print sequence, motor control, and forms control are examples of printer functional elements.

2.3.1. Printing Mechanism

The printing mechanism includes the hammer/actuator assembly and the printer carriage.

2.3.1.1. Print Hammer/Actuator Assembly

This assembly is located behind the print form and contains 136 electromechanical actuators/hammers, one for each print position column. The hammers strike the back of the form.

2.3.1.2. Printer Carriage

The printer carriage is located immediately in front of the print form. The carriage contains both the interchangeable print band and the ink ribbon feeding mechanism. The printer carriage can be swung out from its normal locked position to permit the operator to change the form and ribbon.

2.3.2. Ribbon Feed Mechanism

The ribbon feed mechanism, located in the printer carriage, provides a means for mounting and driving the ink ribbon. Automatic control is provided to ensure the ribbon is wound evenly on the spools. Ribbon replacement is accomplished without requiring it to be completely wound onto one spool.

2.3.3. Forms Handling

Access to the forms area of the printer is by swinging out the printer carriage. A form is supported and driven by four pin feed tractors – two above and two below the print line. The tractors are manually adjustable to accommodate forms ranging from 4 inches (10.16 cm) to 18.75 inches (47.63 cm) in width. It is possible to position the tractors to print a full line of 136 characters (13.6 inches, 34.54 cm) anywhere within the print area of a form 17.2 inches (43.69 cm) wide. When using a form 18.75 inches (47.63 cm) wide, a 0.25 inch (0.63 cm) line adjustment to the left and 0.5 inch (1.27 cm) adjustment to the right at the central mark (13.6 inches, 34.54 cm) of the form is provided. Manual control is provided to move the tractor up and down to align the form to the first print line.

A forms alignment guide is provided on the ribbon shield assembly. This device aids the operator in aligning the form for printing in proper column and line position. A horizontal line located on the print head baffle plate is provided to aid the operator in adjusting the tractor location to locate the bottom of the printed character on the form.

Forms with a maximum width of 18.75 inches (47.63 cm) and a maximum length of 17 inches (43.18 cm) can be contained within the subsystem casework. Operation of the subsystem is permissible with forms up to 24 inches → (60.96 cm) long for the 760 and 940/900-lpm printers and 18 inches (45.72 cm) for the 1200-lpm printer if the casework paper well access door is open.

During the printing operation, the form is advanced by means of the form tractors and driving motor. Print commands contain either line spacing instructions or may indicate a skip to a specific line position on the form. The vertical format control provides the capability of skipping to program-selected line positions. Included is an end-of-form detection device that indicates that the form supply is low when approximately 8 inches (20.32 cm) of the form remains below the print line.

Form associated controls located internally and under the top hood of the printer include:

- Forms thickness gap adjustment
- Line positioning (forms position) control
- Tractor adjustment
- Forms tension
- → Line phasing (± 1/2 line of print)

2.3.4. Forms Pull-Out Rollers and Forms Stacker

A powered forms pull-out roller assembly for the 760 and 940/900-lpm printers facilitates movement of forms through the printer to accommodate unusual form characteristics. A powered forms stacker is provided for the → 1200-lpm printer to facilitate stacking of forms at the rear of the printer. The top of the stack is maintained at a constant height under the stacker power rollers to ensure uniform stacking. The stacker accommodates a maximum form length of 18 inches (45.72 cm).

2.3.5. Control Electronics

The electronics required for controlling and interfacing a 0776 printer is contained on pluggable printed circuit boards located for the most part in the card module. The electronics consists of the following general groups:

- Intimate electronics includes actuator power drivers and sensor amplifiers.
- Mechanism control logic provides sequencing, control, and fault detection.
- Interface logic handles channel operation requirements and staticizing.

2.3.5.1. Print Hammer Control

The timing of print hammer firing resulting in the printing of correct characters in desired print locations is accommodated in the mechanism control logic. The print band contains raised timing marks. The timing signals generated provide the information to determine the position of the print band at any point in time. This section of logic contains a load code buffer into which the character codes are program-loaded in the sequence appearing on the print band. The load code buffer permits any code of 6, 7, or 8 bits to be assigned to the graphic characters. Additionally, this section of logic contains a print line buffer into which are loaded character codes for the line to be printed. The load code buffer codes, representing the characters positioned for printing, are compared to the print line buffer to ascertain when a hammer is to be actuated. When positive comparisons have been made for all of the 136 positions of the print line buffer containing printable character codes or spaces, printing of the line is terminated.

2.3.5.2. Vertical Format Control

This section of logic controls the advance of a form. A form may be advanced up to 15 lines or may skip to a line position specified in the program-loaded vertical format buffer. Selected codes are loaded in the buffer in positions corresponding to stop positions desired on the form. The vertical format buffer accommodates 192 stop positions, which is equivalent to 8 lpi on a 24-inch (60.96-cm) form. An end-of-forms code is entered in the position to indicate the length of the form being run. When a command is received containing a skip code, the form is advanced until the first line position containing that code is reached. The vertical format buffer is incremented in synchronization with the movement of the form. The initial position in the buffer (home position) corresponds to the setup line on the form.

The vertical format buffer is initialized to the HOME position under the following conditions:

1. While the STOP switch has been pressed and is being held, the HOME switch is pressed (no form motion is initiated).
2. The printer is in the stop mode, and the HOME switch (but not the STOP switch) is pressed.
3. A load-vertical-format-buffer command or a read-vertical-format-buffer command is received, and no vertical format buffer parity check exists.

NOTE:

When condition 2 prevails, the form also is moved to correspond to the HOME position in the buffer. The operator ensures proper setup by noting that the HOME switch/indicator is lit (vertical format buffer HOME) when the form is in set up or in the HOME position.

2.3.5.3. Parity

The printer checks odd parity on all transfers involving the print line buffer, vertical format buffer, and the load code buffer.

2.3.6. Printer Control

The 0776 printer control (controller) contains the hardware necessary for direct connection to a selector or multiplexer type I/O channel. Printer control provides storage (buffers) for printing and form control and transfers data to and from the buffers on command. The channel sends command codes and data to printer control. Printer control sends status, sense, and data (buffer contents) to the channel. Printer control provides buffer storage for use as follows:

- Load code buffer (64 locations expandable to 384 locations)
- Print line buffer (136 locations)
- Vertical format buffer (192 locations)

All buffers are the semiconductor type that lose all stored information when power to the printer is removed.

2.3.6.1. Load Code Buffer

The load code buffer must be loaded with the character codes in sequence corresponding to the character codes in the array(s) of the print band. A print band with an array containing up to 384 characters can be accommodated by the load code buffer. Since the maximum capacity of a print band is 384 characters, an array containing a 48-character set is repeated eight times around the print band; an array containing a 64-character set is repeated six times around the band. A print band can contain a character set which is repeated any number of times in identical arrays providing 384 characters are not exceeded. High-usage characters can be repeated within an array.

The relationship between the sequence of characters on a print band (or within an array) and the loading of the appropriate buffer by the load code buffer command is as follows:

1. Byte 1

   The first byte loaded must be the cartridge verification code. If no load code buffer command is issued after initial power turn on and a print advance or diagnostic write command is issued, the printer control sets unit check status and load code request notifying the program that the identifier code has not been loaded and rejecting the command.

NOTE:

Items 2 through 7 apply if dualing is NOT enabled.

2. Byte 2

   The second byte loaded is the nonprint space (blank) code.

3. Byte 3

   The third byte loaded must be the first character of the load code sequence (65th character, counting left to right from the band weld).

4. Bytes 4–50

   The 4th through 50th bytes loaded correspond to the remaining 47 characters of a 48-character array. The character array is repeated eight times with eight font marks on the print band.

5. Bytes 4–66

   The 4th through 66th bytes correspond to the remaining 63 characters of a 64-character array. The 64-character array is repeated six times with six font marks on the print band.

6. Bytes 4–130

   The 4th through 130th bytes correspond to the remaining 127 characters of a 128-character array.

7. Additional Font Sizes

   Other font sizes are handled in a corresponding fashion.

NOTE:

Items 8 through 12 apply if dualing is enabled.

8. Bytes 2–9

   The second through ninth bytes are the four dualing pairs.

9. Byte 10

   The 10th byte loaded is the data check dual.

10. Byte 11

    The 11th byte is the nonprinting space code.

11. Byte 12

    The 12th byte must be equivalent to the byte listed in item 3.

12. Remaining Bytes

    The remainder of the bytes are loaded as in steps 4 through 7 (the 13th byte is the equivalent of the fourth byte). ←

The relationship between the buffer codes and character code sequences on a print band allows printer control to execute print commands in a similar manner regardless of the print band installed. (Appendix B lists the character sequences for the available print band selections.)

2.3.6.2. Print Line Buffer

The print line buffer is loaded by the print advance or diagnostic write command with the appropriate data to be printed. An entire print line is loaded before printing.

Each buffer location contains 10 bits: a parity bit, a printed bit, and an 8-bit character code. The print line buffer codes are compared to the load code buffer codes for match conditions. When a match occurs, a print operation takes place.

Printing a line begins as soon as the print line buffer has been loaded with data and an outstanding forms advance is completed. The print operation is independent of the position of the moving print band. The band moves continuously in a horizontal direction scanning the print positions. The timing of the print hammer, firing to result in the printing of the correct character in the desired column, is synchronized by printer control. The band contains raised timing marks for each character position which provides information to determine the position of the print band in relation to the selected print position. Printing a selected character occurs when that character on the print band arrives at the selected print position (relative to the position in the print line buffer).

A printed bit is reserved within the print line buffer for each character. This bit is set once the character has been printed and inhibits further comparisons of this print line buffer location against the load code buffer. The nonprinting characters (spaces) loaded in the print line buffer sets the printed bit in the corresponding buffer position prior to print scans. A space is therefore not required on a print band as all space codes are automatically skipped. When the print advance or diagnostic write command transfers data for less than the maximum print line, a hardware space-fill sequence clears; that is, loads the balance of the print line buffer with space codes. This ensures that the remaining positions in the line contains space codes.

When comparison has been made for all print line buffer positions (the printed bit set in each position in the print line buffer), printing of the line is terminated. Provision is made to detect if a print cycle is not completed in the maximum allowable time.

2.3.6.3. Vertical Format Buffer

A printer form can be advanced up to 15 lines or can be moved to line positions specified in the program-loaded vertical format buffer (VFB) using the form advance or print advance commands. Selected codes are loaded in the VFB locations corresponding to the stop positions desired on the form. (The vertical format buffer accommodates 192 stop positions.) Any form size up to 24 inches (60.96 cm) in length for the 760 and 940/900-lpm printers and 18 inches (45.72 cm) in length for 1200-lpm printer can be accommodated by the VFB.

The VFB is initially synchronized with the HOME position of the form by the operator. The VFB location corresponding to the current print line is kept in synchronism with the movement of the form by the VFB address register. Once synchronized, the VFB must be loaded using the LOAD VFB command with the appropriate print form information. Print form information in the VFB consists of the home and end-of-form codes and also can contain form overflow and stop along with skip codes. If a command is received specifying print advance or form advance and the VFB is not loaded, the command is rejected with unit check status and the vertical format request sense bit is set.

The 4-bit code that is loaded using the LOAD VFB command contains the four least significant bits (LSB) of each byte transferred using the commands (Table 2–4). The data byte sequence required to load the VFB and the data byte sequence transferred to main storage using the channel when a READ VFB command is executed also are included in Table 2–4. The description of the C, D, E, F modifier bits specified in Table 2–4 are:

Modifier Bits CDEF	Description
0000	Filler code
0001 through 1111	Program selectable stop codes. They are compared to the C, D, E, F bits specified in the form advance and print advance commands. Home form, end-of-form, and form overflow codes are set by the software.

The first position of the VFB is reserved for the home paper code. The end-of-form code designates the end of the VFB. The number of contiguous positions between home paper and end-of-form codes is determined by the software and normally corresponds to the length of the form being printed. When printer control detects the end-of-form code in the VFB or the last location is reached without detecting the end-of-form code, the VFB address register is cleared to the HOME paper position.

2.3.6.4. Character Dualing and Folding

Character dualing provides a means of assigning more than one code to a character. The use of any of the dual assigned codes as print line data causes the character to be printed. Dualing also permits a character to be selected for printing in positions where data check characters occur.

The dualing mode is enabled when sending the cartridge verification code (CVC) in the load code command. The most significant bit (MSB) of the CVC is used to enable or disable dualing as following:

- Dualing disabled = CVC MSB set to 0
- Dualing enabled = CVC MSB set to 1

NOTE:

This bit of the CVC is not used for comparison with the cartridge identification code (CIC) of the print band.

When dualing is disabled, the load code command functions as specified in 2.3.6.1. A load code command that loads a CVC that enabled dualing must send nine bytes immediately following the CVC. After these, the nonprinting code and the codes assigned to the character set are sent as described in 2.3.6.1.

Eight of the nine bytes that must be sent after the CVC are four dualing pairs. A dualing pair consists of a code that is assigned to the character set followed by a code dual that is not assigned to the character set. The use of either code as print data causes the character assigned to the first code to be printed.

The ninth byte (data check dual) contains a space code or a code that is assigned to the character set. The character represented by that code is printed in positions where data check characters occur. The use of the data check dual does not affect the data check condition.

Table 2—4. VFB Bit Sequences

VFB Location	Command																Notes
	Load VFB								Read VFB								
	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	
1	X	X	X	A	C	D	E	F	0	0	0	A	C	D	E	F	1
2	X	X	X	0	C	D	E	F	0	0	0	0	C	D	E	F	2
3	X	X	X	0	C	D	E	F	0	0	0	0	C	D	E	F	2
n	X	X	X	1	C	D	E	F	0	0	0	1	C	D	E	F	3
n+1	X	X	X	0	C	D	E	F	0	0	0	0	C	D	E	F	2,4
191	X	X	X	0	C	D	E	F	0	0	0	0	C	D	E	F	2,4
192	X	X	X	0	C	D	E	F	0	0	0	0	C	D	E	F	4,5

LEGEND:

A = lines/inch selection
0 = 6 lpi
1 = 8 lpi
C, D, E, F = detail bits
X = bit ignored

NOTES:

1. The CDEF code loaded in the first position in the VFB is the HOME paper code used to synchronize the VFB with the operator loaded print form.

2. These bits are compared with the CDEF bits of the print advance, or form advance command when program controlled line skip is specified. The form advance stops when the bits compare.

3. End-of-form code is specified by bit 3 set to 1. When detected before the last location in the VFB is reached, it clears the VFB address register to the HOME paper position and advances the form to corresponding position.

4. If end-of-form code is present before maximum VFB location (192), all codes are ignored by the hardware.

5. Last location in VFB. After this last location is reached, the VFB address register is cleared to the HOME paper position to the next form advance.

If a dualing pair is not to be used, each dualing pair is loaded with identical codes from the character set.

If the data check dual is not to be used, the ninth byte is loaded with the code assigned to a space code.

More than one dual can be assigned to a code. To do this, the first position of each dualing pair is loaded with the code from the normal code array and the second position of each pair is loaded with different dual codes.

In the following example, the data check dual is not used; therefore, the ninth byte is loaded with a space code.

Example:

Load Code

F3 } CVC

02 }
42 }
12 }
52 }
22 }
62 }
22 }
72 }
Dualing Pairs

Dualing Codes

00 } Data Check Dual

00 } Space Code

01 to 30 } Normal Code Array (48 characters)

Print data sent in form-advance command:

(42) 12 12 17 (6E) 02 22 (62) (72) (52)

Print data used for actual printing:

02 12 12 17 00 02 22 22 22 12

NOTE:

A read-LCB-command will read back the CIC, CVC, 9 dualing codes, and the nonprinting space code if dualing is in effect. Dualing cannot be in effect unless the load code has been properly loaded and the most significant bit of the CVC was set to 1.

Folding affects only the comparison of the normal code array to the print line data. When folding is performed in conjunction with dualing, a 6-bit comparison, rather than the usual 8-bit comparison, is made between the print line buffer characters and characters in the duals. Bits 0 and 1 (MSB) are ignored.

Example:

Load Code

F3 } CVC

02 }
32 }
12 }
82 }
22 }
62 }
22 }
92 }
Dualing Pairs
Dualing Codes

17 } Data Check Dual

00 } Space Code

01 to 30 } Normal Code Array (48 characters)

Print data sent in form-advance command:

02 C2 42 82 32 F2 72 B2

02 02 02 02 32 32 32 32 ← (Folded Characters)

Print data used for actual printing in fold mode:

02 02 02 02 02 00 00 00

Data Check Positions

2.3.6.5. Print Cartridge Verification

Print character codes (Appendix B) are loaded into the load code buffer in the sequence in which the print characters appear on the print band. To ensure that the program loaded code corresponds to the print cartridge installed by the operator, the program also loads a verification code that is compared against a band identification code magnetically read from the print band. Cartridge verification codes (in hexadecimal) are listed in Table 2-5 for standard print cartridges.

Table 2—5. Print Cartridge Verification Codes

Character Font	Cartridge Verification Code (Hexadecimal)
Standard Business	18
Scientific	02
United Kingdom	09
Denmark-Norway	0A
Finland-Sweden	0B
Expanded Denmark-Norway	0D
Expanded Finland-Sweden	0E
Numeric	1A
Modified FORTRAN (77L)	06
Modified ASCII (77L)	14
ASCII (77L)	3F
Expanded ASCII	05
Universal OCR-B (ISO)	17
Universal OCR H-14	1C
COBOL-FORTRAN	11
International	08
Expanded Finland-Sweden	10
Universal OCR-A	0F
Universal OCR-B	04
Universal 77L	1D
OCR-A 77L	47
OCR-A (48 characters)	48
Expanded ASCII (with additional 0's and 1's)	78
Universal OCR-B (ISO) (with additional 0's and 1's)	4C
Modified ASCII (77L) (numeric zero with slash)	3E
Japan Katakana	07
Japan OCR-B	0C
OCR-B Numeric	63
American Library Association	71
Farsi	20

2.3.7. Data Transfer Rate

The 760, 940/900, or 1200-lpm print rate is based on printing 48-character sets and spaces with a single line advance using successive print advance commands. The actual throughput rate is dependent on the mode of operation of the printer (print advance and form advance commands or only print advance command) and on the number of different characters to be printed on a print line. The print rate, therefore, is controlled by the following parameters:

- Character content of the array(s) selected
- Selection of printing at 6 or 8 lpi and the number of lines advanced for each command.
- The frequency of print advance and form advance commands. To achieve the specified rates, the commands must be issued and the print line buffer loaded prior to the end of the previous line advance. Two restrictions apply to the printer control. They are effective only if the time for printing is significantly less than the worst case as previously stated: (1) start of consecutive print operations does not occur in less than 48 milliseconds (940/900 and 1200 lpm) or 55 milliseconds (760 lpm); and (2) start of consecutive line advance does not occur in less than 48 milliseconds (940/900, and 1200 lpm) or 55 milliseconds (760 lpm).

  This delay does not apply for advance commands with zero line advance since the execution of an advance command leaving detail bits ACDEF all set to 0 is not affected by the delay.

  Commands are accepted and held in the printer control but are not executed until the above delays have elapsed. The delays permit rated line-per-minute speed to be achieved and conform to the duty cycle safety limitations required for the print head and paper and paper feeding motor.
- The loading of the print line buffer. Printing cannot start until loading of the print line buffer has been completed. The data requests for the loading of the buffer are limited by the buffer cycle time, internal printer control timing and activity on the channel due to other subsystems. Optimum conditions permit this rate to approach the maximum data rate attainable by the printer control.

2.3.8. Print Sequences

Printer control performs the following typical sequence of operations when printing a line of information:

1. Decodes the print-advance command (command n).
2. Loads the print line buffer. Space fill is used if less than the maximum number of characters is specified.
3. Scans to print all columns (1 to 63 ms at 760 lpm rate).
4. Initiates a request to the channel to store status and await the next command (command n + 1).
5. Simultaneously performs the form advance for command n and the delay for hammer recovery of 15.1 ± 0.1 milliseconds.

The first print advance command (command n) loads the print line buffer, prints the line, and advances the form. The status is presented after printing is completed. It is assumed the software responds and issues the next print advance command (command n+1). Printer control loads the print line buffer for command n+1 before the advance for command n is completed and is ready to start the next print cycle. All subsequent cycles are overlapped similarily.

overlapped similarily.

Printer control is considered busy from the time a command is accepted until status is stored (at the completion of the print operation before form advance). Once status is accepted by the channel, the printer control can accept the next command.

2.3.9. Printer Motor Control

Printer motor control removes power from the print band motor when the printer is not being used. If a print advance command is given and the print band motor is not running, a 5-second delay is initiated to inhibit printing until the print band motor is up to speed. During this time, the cartridge identification code is read from the print band into a register. If the interlock (printer carriage assembly) or print band check is set, power to the print band motor is removed.

Issuing a print advance command initiates a delay of approximately 7 minutes. If the delay recovers before another print advance command is issued, power is removed from the print band motor.

2.3.10. Printer Line Feed/Form Advance

Forms are advanced during this operation by means of the form tractors and driving motor. Printer commands contain either line feed information (detail bit A set to 0 in print advance or advance command) or indicate a skip to a specific line position on the form (detail bit A set to 1).

2.3.10.1. Manual Form Advance

A manual form advance capability is provided by the HOME and LINE SPACE switches.

2.3.10.2. Program Controlled Paper Advance

To initiate form advance under program control, the operator must synchronize the form with the VFB using the following procedure (this procedure is performed when the printer is in the stop state):

1. Load form into printer and advance to HOME position using SPACE switch.

2. Initialize the VFB to the HOME position by pressing and holding STOP switch; then press HOME switch. No form advance is initiated.

3. Press RUN switch to enter the RUN state if no error condition exists. Attention status is presented to the channel, and software must respond with the LOAD VFB command before initiating an advance operation. Completion of the LOAD VFB command sets the VFB address register to the HOME position, thus synchronizing the program with the form.

   The VFB provides the capability of skipping to program selected line positions. There is no mechanical indication that the form is or is not in proper position. All program-initiated skips are relative to the VFB only. Once an error or advance occurs (initial synchronization, or during printing operations), the error can only be detected by visual inspection of the form and manually intervening.

2.3.10.3. Form Advance Using Skip Codes

When a form advance or print advance command specifies form advance using skip codes, the printer control steps through the VFB and searches for the next VFB position containing the code (excluding the current position). If a match exists between the C, D, E, F bits of the command and the C, D, E, F bits of the VFB, the advance is initiated when all printing is completed. If a match does not exist, the printing is completed but no form advance takes place. Unit check and device end status is presented to the channel. The sense bytes specifiy the particular error condition. Therefore, a forms runaway condition caused by software is not possible.

2.3.10.4. Form Advance Using Line Count

When the form advance or print advance command specifies form advance using line count, the printer control steps through the VFB searching for the form overflow code while decrementing the line count. If the form overflow is not detected before the line count is decremented to zero, the specified form advance is initiated at the completion of the printing operation. The vertical format buffer address register is kept in synchronization with the movement of the form.

If a form overflow is detected before the count is depleted or if the count is depeleted at the form overflow position in the VFB, the form is not advanced, but the line is printed if the command was print-advance. Unit exception and device end status are then presented to the channel.

2.3.10.5. Forms Low/Out-of-Forms Detection and Recovery

End-of-forms detection capability is provided by the printer generating a forms-low indication (sense byte 2, bit 1) (SB2,1) when approximately 8 inches (20.3 cm) of paper remains before the end of the form. If paper is advanced approximately 2 ½ inches (6.3 cm) beyond forms-low, the bottom tractors of the device do not contain paper, and print quality may be degraded. This condition occurs only if the form is advancing, and therefore status and sense cannot be presented until completion of the operation. If a long skip is specified, it is possible to advance the form past the upper tractors. This condition requires operator recovery and resynchronization of the form with the vertical format buffer (VFB).

If the form stops advancing before the detection of the home position in the VFB and a forms-low condition is detected by the switch, the printer control lights the FORMS OUT indicator. The indicator remain lit until the condition is cleared by the operator. Sense data indicates forms-low (SB2,1). Since overlapping of commands is allowed, it is possible that the next command may have been issued to the printer control. Unit check and device end status is presented to the channel. The following conditions apply for forms-low:

- If a command has not been issued when the forms-low is detected, the next command (other than a sense) will be rejected with unit check status.
- After a command has been issued, the detection of a forms-low (due to a previous command) will generate unit check and device end status when the condition is initially detected.
- The operator may overlay the form with a new supply to clear the forms-low condition. Pressing the RUN switch after loading new forms resumes normal operation. However, if prenumbered forms are used and printing to the end of the form must be accomplished, the operator may resume without loading new forms. Subsequent commands are executed normally until the VFB address register is cleared to the home paper position. The printer enters the stop state when the command that caused the advance to or past the home paper position has been executed. Sense data include forms-low (SB2,1) and intervention required (SB0,1). No further commands to print or advance are accepted until the forms supply is replenished.

If a command is issued that may advance the form past the forms-low indication, the following conditions may apply:

- If the advance is past the end-of-form (as specified by the ACDEF), the form advance is performed as specified and the stop state will be entered. Since this indicates a new sheet is to be printed on, there is no harm done in feeding out the old form.
- Since overlapping of commands is allowed, it is possible that the next command may have been issued to the printer control. This command is not executed. Unit check and device end is presented to the channel. The command must be reissued by the software when the error condition has been cleared.
- When the sense command is issued, the sense data includes forms-low (SB2,1) and intervention required (SB0,1).
- If the advance has moved the form out of the upper tractors, no overlay is possible and resynchronization of the form and VFB must be performed by the operator.

3. Control and Diagnostic Byte Structure

3.1. INTERFACE AND ADDRESSING

The 0776 printer contains an electrical signal interface that is compatible with the 8-bit industry-wide standard for direct connection to a selector or multiplexer type I/O channel. The 0776 printer responds to a single device address that is hardwired on the address printed circuit plug-in patch card. Printer priority patching can be altered by changing jumper wires on the patch card.

3.2. PRINTER SUBSYSTEM CONTROL COMMANDS

The following are examples of commands that provide format information, initiate form movement, transfer data, and inform printer control of printer status conditions. Table 3-1 lists these commands and their codes. Command codes not listed are rejected by printer control and result in a unit check status being presented to the channel with the command reject bit being set to 1 in sense byte 0. The control does not go active. Printer control is considered busy from the time a command is accepted until the status byte is presented and stored by the channel.

3.2.1. Load Vertical Format Buffer

The load vertical format buffer command loads the vertical format buffer (VFB) with the stop codes for the required line positions. Eight-bit bytes are loaded with bit positions 4 through 7 (least significant bits) containing the detail bits C, D, E, F (see Table 2-4). One code must be loaded for each line of the form. Code 0 is usually assigned to those lines having no particular significance. A maximum of 192 code positions (lines) are accepted. The initial code loaded corresponds to the setup line of the form home position. The value of bit 3 in the initial code indicates whether the form advance control operates at 6 lpi (bit 3=0) or 8 lpi (bit 3=1). Bit 3 set to 1 in any code other than the initial code ends the code transfer sequence and signifies end-of-form. End-of-form corresponds to the line before the home position of the form (bits 0, 1, and 2 are ignored). Channel end status and device end status are returned after successful completion of the load operation.

3.2.2. Load Code

The load code command is used to load the load code buffer with the code assigned to each character on the print band and the nonprinting code (space). Channel end status and device end status are returned after successful completion of the load operation. The program must load the appropriate codes for the print band used.

Table 3—1. Printer Commands

Command	Bit Position and Setting							
	0	1	2	3	4	5	6	7
Load Vertical Format Buffer ①	0	1	1	0	0	0	1	1
Load Code ①	1	1	1	1	1	0	1	1
Print Advance ①	A	C	D	E	F	0	0	1
Advance ①	A	C	D	E	F	1	1	1
Diagnostic Write ① ②	1	1	1	0	0	0	1	1
Read Print Line Buffer ① ②	X	X	X	0	0	0	1	0
Read Load Code Buffer ① ②	X	X	X	0	1	0	1	0
Read Vertical Format Buffer ①	X	X	X	1	0	0	1	0
Sense I/O	0	0	0	0	0	1	0	0
Test I/O	X	X	1	1	0	0	0	0
Test I/O	X	X	0	0	0	0	0	0
Set Inhibit Status	X	X	0	1	0	0	0	0
Reset Inhibit Status	X	X	1	0	0	0	0	0
Fold	0	1	0	0	0	0	1	1
Unfold	0	0	1	0	0	0	1	1
Inhibit Data Check	0	1	1	1	0	0	1	1
Allow Data Check	0	1	1	1	1	0	1	1
No-Op	0	0	0	0	0	0	1	1

LEGEND:

X bits are ignored by printer control.
A, C, D, E, F are modifier/detail bits.

NOTES:

① Channel cannot initiate command when printer is in stop state. Intervention is required. (Sense byte 0, bit 1 is set to 1.) All other commands can be sent by the channel and are executed normally.

② Diagnostic use only.

3.2.3. Print Advance

The print advance command initiates the transfer of data characters for one print line into the print line buffer. The print line buffer can be loaded while the form advance initiated by a previous command is in progress. The maximum byte count transferred corresponds to the number of print positions available. Loading of the print line buffer continues sequentially until 136 characters have been transferred, or early termination occurs. When early termination occurs, the print control presents channel end status, and space fills the remaining print line buffer locations. If all 136 print positions of the print line buffer are loaded and no termination through the channel occurs, the printer control terminates data requests, presents channel end status, and initiates the printing of the data.

Printing of the data transferred by the print advance command (command n+1) occurs when form advance from the previous command (command n) is completed. Successful completion of printing is indicated when device end status is presented to the channel for command n. An error detected during form advance from command n inhibits printing of the data loaded in the print line buffer and is indicated by unit check status and device end status for command (n+1). The device then enters the stop state.

Form advancing specified by the print advance command is initiated after completion of printing and transfer of device end status, provided no errors occur. The A, C, D, E, and F detail bits of the print advance command specify two modes of form advance. If A is set to 0, the C, D, E, and F bits specify a line advance from 0 to 15 lines. If A is set to 1, the C, D, E, and F bits are interpreted as skip codes that are compared with the stop codes in the vertical format buffer. Table 3-2 lists the detail bits and their interpretations.

3.2.4. Advance

This command is used to initiate form advance operations on the device with no print operation. The A, C, D, E, and F detail bits of the form advance command specify the mode of form advance. (See Table 3-2 and 3.2.3.) Channel end status and device end status are presented by the printer control after the VFB scan and prior to the initiation of a form advance to allow overlapping of the next command. An error detected during form advance from command n inhibits printing of the data loaded in the print line buffer and is indicated by unit check status and device end status for command n+1. The device then enters the stop state.

3.2.5. Diagnostic Write

The diagnostic write command loads the print line buffer as in a print advance command; however, the command is finished at the end of the data transfer sequence. This permits the print line buffer to be loaded without firing the actuator and advancing the form which permits diagnostic routines to be performed. Successful completion of the command is indicated by channel end status and device end status. If the command is executed during form advance from a previous command, and an error is detected on the form advance, unit check status, channel end status, and device end status are presented.

3.2.6. Read Print Line Buffer

The read print line buffer command initiates the transfer of the contents of the print line buffer to main storage. Unloading the buffer continues sequentially until 136 bytes have been transferred or until the channel indicates end of data transfers (early termination). Channel end status and device end status are returned after successful completion of the command. If the command is executed during form advance from a previous command, and an error is detected on the advance, channel end status, unit check status, and device end status are presented.

Table 3—2. Print Advance and Advance Command Detail Bit Information

A = 0 Interpretation	A = 1 Interpretation	C	D	E	F
Space 0 lines	Advance Repeat	0	0	0	0*
Space 1 lines	Skip to Code 1	0	0	0	1
Space 2 lines	Skip to Code 2	0	0	1	0
Space 3 lines	Skip to Code 3	0	0	1	1
Space 4 lines	Skip to Code 4	0	1	0	0
Space 5 lines	Skip to Code 5	0	1	0	1
Space 6 lines	Skip to Code 6	0	1	1	0
Space 7 lines	Skip to Code 7	0	1	1	1
Space 8 lines	Skip to Code 8	1	0	0	0
Space 9 lines	Skip to Code 9	1	0	0	1
Space 10 lines	Skip to Code A	1	0	1	0
Space 11 lines	Skip to Code B	1	0	1	1
Space 12 lines	Skip to Code C	1	1	0	0**
Space 13 lines	Skip to Code D	1	1	0	1
Space 14 lines	Skip to Code E	1	1	1	0
Space 15 lines	Skip to Code F	1	1	1	1

*Code ACDEF = 10000 causes an advance in accordance with the ACDEF detail bits of the last ACDEF ≠ 10000 advance or print advance command.

** Code CDEF = 1100 causes unit exception status when detected in the vertical format buffer during form advancing that has detail bit A=0 (advance by spacing). See 3.3.9.

3.2.7. Read Load Code Buffer

The read load code buffer command transfers the contents of the load code buffer to main storage for use in diagnostic and error recovery routines. The buffer is unloaded sequentially until 67 bytes (76 bytes with dualing) have been transferred or until the channel indicates end of data transfer (early termination). The transfer sequence is as follows: the cartridge identification code, the cartridge verification code from the load code, the nine dualing codes (if dualing is enabled), the nonprinting code, and the contents of the load code buffer.

If the print band is not in motion when the read load buffer command is received, the cartridge identification code byte is transferred as all zeros. Channel end status and device end status are returned on successful completion of the command. If the command is executed during form advance from a previous command, and an error is detected on the form advance, channel end status, unit check status, and device end status are presented.

3.2.8. Read Vertical Format Buffer

The read vertical format buffer initiates the transfer of the contents of the vertical format buffer (VFB) to main storage. The buffer is unloaded sequentially beginning at the home paper location. Unloading continues until 192 bytes have been transferred or the channel indicates end of data transfers (early termination). The read VFB sequences are listed in Table 2-4. Channel end status and device end status are returned on successful completion of form advance from a previous command. If an error is detected on form advance, unit check status, channel end status, and device end status are presented.

3.2.9. Sense I/O

The sense I/O command is used to interrogate the printer control and store data in main storage. This interrogation indicates unusual conditions detected during the last operation and the current state of the device. The command is executed regardless of the state of the device and may be issued independently or as a response to unit check status. The sense bytes are not altered by the sense I/O command. However, when the device is in the run state, some sense indications may be cleared upon acceptance of a command other than the sense I/O command. Therefore, failure to issue the sense I/O command as a response to a status indication may result in the loss of the condition.

The printer control transfers up to six sense bytes to main storage as a result of the sense I/O command. The first sense bytes may contain summary information with detailed information of the device and control indicated in the second, third, fourth, and sixth sense bytes. The control terminates and presents channel end status and device end status to the channel upon successful transfer of the sense bytes.

3.2.10. Test I/O

The test I/O command transmits status byte to the channel and, upon receiving the SERVICE OUT signal, clears the status.

3.2.11. Set Inhibit Status

The set inhibit status command is processed as a test I/O command. If accepted, it does not generate new status. Status is presented to the channel and the inhibit status in flip-flop is set to 1. When inhibit status is set to 1, the printer does not initiate sequences to present status. The set inhibit status command should not be issued if the printer subsystem is connected by a selector channel.

3.2.12. Reset Inhibit Status

The reset inhibit status command is processed as a test I/O command. If accepted, it does not generate new status. Status is presented to the channel, and the inhibit status in flip-flop is reset.

3.2.13. Fold

The fold command modifies the print compare sequence between the print line buffer and the load code buffer so that the two most significant bits (bits 0 and 1) of the data and the codes are ignored. This mode of operation permits usage of these bits in the data bytes by the processor. For the EBCDIC code, the resultant code is a printable subset of the EBCDIC code. This command may not be suitable for use with other coding schemes. When folding is performed in conjunction with dualing, a 6-bit comparison, instead of the usual 8-bit comparison, is made between the print line buffer characters and characters in the duals. Bits 0 and 1 (MSB) are ignored. Folding continues until the unfold command is received, until the power to the unit is turned off, or until a system clear is received.

3.2.14. Unfold

The unfold command stops folding operations and returns the printer to normal 8-bit code operation.

3.2.15. Inhibit Data Check

The inhibit data check command blocks the setting of data check, bit 4, sense byte 0. Inhibit data check remains set until reset by an allow data check command, until power to the unit is turned off, or until a system clear is received.

3.2.16. Allow Data Check

This command resets the inhibit data check condition and permits the printer to operate normally.

3.2.17. No-Op

The No-Op command allows initial selection to occur, and channel end status and device end status to be returned; otherwise, no function is performed.

3.3. STATUS BYTE

The status byte contains information on the status of the printer and some data on the condition of the last printer operation performed. The status byte is presented to the channel:

- At end of initial selection sequence
- At end of data transfers for reads and loads
- At the completion of printing a line (before form advance) for the print advance command
- At the start of the form advance for advance command
- At initial selection of the following commands:
  - Test I/O
  - Unfold
  - Set inhibit status
  - Inhibit data check
  - Reset inhibit status
  - Allow data check
  - Fold
  - No-Op
- Following an interface disconnect selective reset sequence that occurred during data transfers
- At the detection of error condition causing premature termination of a command
- With the attention bit, when the RUN switch is pressed providing the STOP indicator was lit and all conditions in the printer subsystem are normal.

The status register in the printer is cleared when the channel responds to the STATUS IN signal with SERVICE OUT signal, when a selective reset or system clear sequence is received, or when power to the printer is turned off. Figure 3-1 shows the printer status byte with its bit designations.

ODD PARITY	ATTENTION	STATUS MODIFIER	CONTROL UNIT END	BUSY	CHANNEL END	DEVICE END	UNIT CHECK	UNIT EXCEPTION
P	0	1	2 NOT USED	3	4	5	6	7

Figure 3—1. Printer Status Byte

Individual status bits are discussed in 3.3.1 through 3.3.9.

3.3.1. Odd Parity

This bit provides odd parity for the status byte, P bit.

3.3.2. Attention

Bit 0, attention bit, is set whenever the printer goes from stop state to run state (mode). It is an operator controlled interrupt indicating that the printer has gone from an inactive to an active state.

3.3.3. Status Modifier

Bit 1, status modifier, is presented with busy bit, bit 3, to indicate the printer is busy executing a previously initiated operation (immediate busy sequence).

3.3.4. Control Unit End

Bit 2, control unit end, is not used by the 0776 printer and the bit is always set to 0.

3.3.5. Busy

Bit 3, busy bit, indicates the printer cannot accept a command because one of two conditions exist:

- The printer is executing a previously initiated command (bit 1, status modifier also present).
- The printer is on hold pending status conditions from a previous command (not applicable to test I/O, reset, or set inhibit status).

3.3.6. Channel End

Bit 4, channel end, is presented as follows:

- At the end of the data transfer sequence for the following commands:
  - Print advance
  - Read print line buffer
  - Read load code buffer
  - Read vertical format buffer
  - Load code buffer
  - Load vertical format buffer
  - Diagnostic write
  - Sense I/O

- At initiation of the following commands:
  - Fold
  - Unfold
  - Inhibit data check
  - Allow data check
  - No-Op
- After the VFB scan and before form advance for the advance command
- Upon error termination of a command after initial selection (along with unit check bit, bit 6). Not set for a command reject condition (bit 0 of sense byte 0).

3.3.7. Device End

Bit 5, device end, indicates:

- Printer control can accept another command and is sent simultaneously with channel end for all commands except print advance. Device end is sent upon completion of the print line but before form advance.
- An error termination of a command after initial selection. It is set with unit check (bit 6). It is not set for a command reject condition (bit 0, sense byte 0).
- A stop to run state (mode) transition following a power turn-on sequence or an offline to online transition. Presented with attention bit (bit 0) and indicates that the load code buffer and vertical format buffer are not loaded.

3.3.8. Unit Check

Bit 6, unit check is set:

- When any sense bit (except bits 1, 2, or 3 of sense byte 1) is set
- If an error condition exists at initial selection
- With ending status if an error condition occurred during execution of the last command

3.3.9. Unit Exception

Bit 7, unit exception, is presented with device end status of a print-advance or advance-only command and indicates a form overflow condition. The form is not advanced, but the line is printed if the command was print advance.

3.4. SENSE DATA BYTES

The sense bytes indicate the state of the printer during execution of the last command issued. Certain sense bits, when set, cause unit check status to be set the next time device end status is presented.

When a sense command is issued, the printer transfers as many as six bytes of sense information to the channel. The sense bits (except SB0,1; SB1,1; SB1,2; and SB1,3*) are reset when any command except test I/O, sense, or No-Op is received by the printer (provided busy status is not indicated in the initial selection).

Sense indications presented by printer control are one of the following categories:

- Device Condition

  A condition that may result in the stop state. Presented each time a sense command is issued until the condition is cleared by the operator. No other command is executed under these conditions. Examples of device conditions are *intervention required* and *equipment check.*

- Error Indication

  Indications that may be cleared if a command other than sense is issued as a response to unit check status. An example of an error indication is *command reject.*

- Operating Mode

  An indication such as *inhibit data check, inhibit status in,* and *fold data.*

Table 3-3 lists the name and position of the bits in each sense byte and in the status byte. Figure 3-2 also summarizes the status and sense bits and associated indicators and switches. Tables 3-4 through 3-7 define the bits of sense data bytes 0 through 5.

SB0,1 = sense byte 0, bit 1 = intervention required
SB1,1 = sense byte 1, bit 1 = inhibit data check
SB1,2 = sense byte 1, bit 2 = inhibit status in
SB1,3 = sense byte 1, bit 3 = fold data

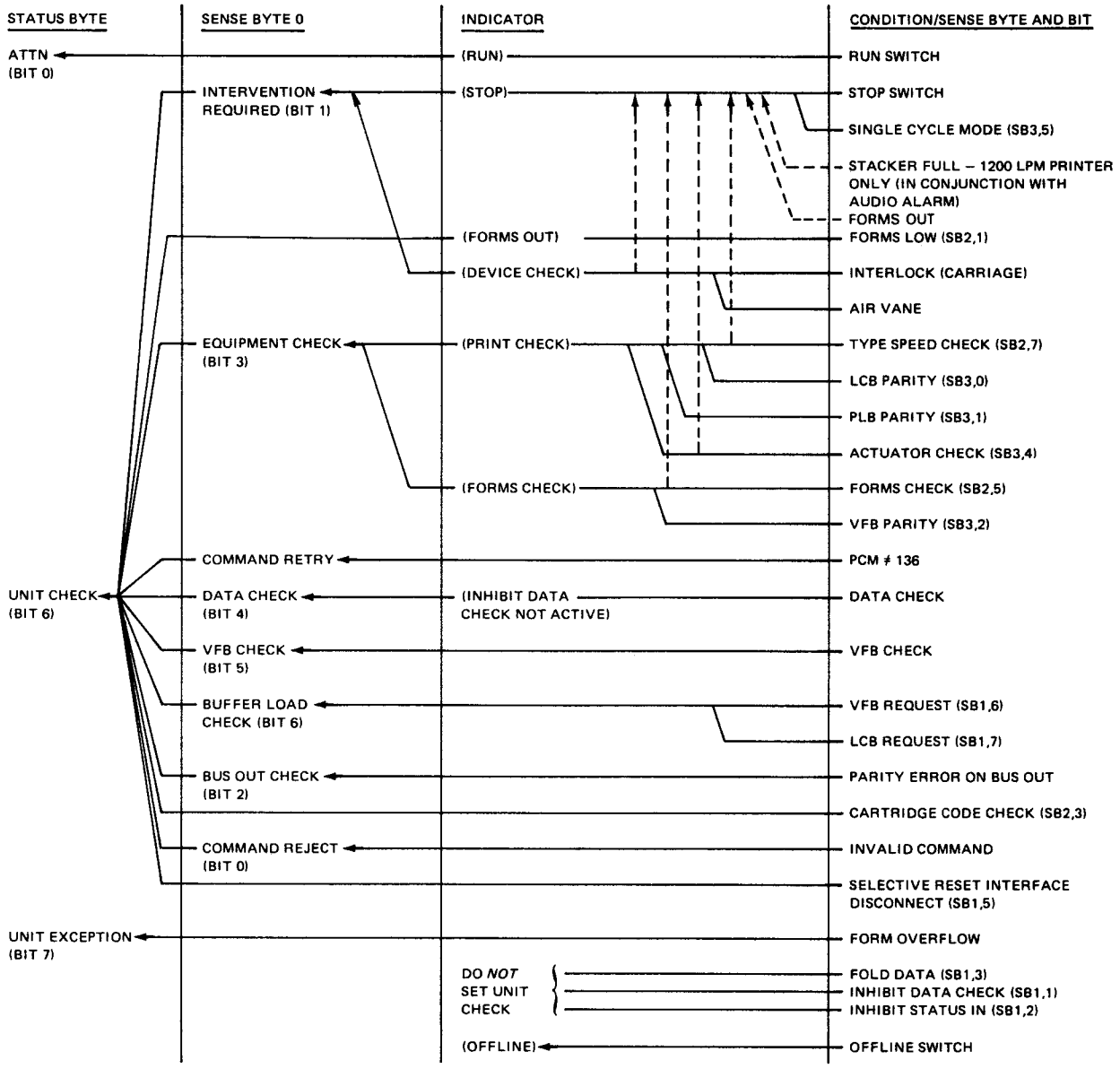
Table 3—3. Status and Sense Bytes

Byte Designation	Bit 0 MSB	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7 LSB
Status Byte	Attention	Status Modifier	Not Used (0)	Busy	Channel End	Device End	Unit Check	Unit Exception
Sense Byte 0	Command Reject	Intervention Required	Bus Out Check	Equipment Check	Data Check	Vertical Format Buffer	Buffer Load Check	Command Retry
Sense Byte 1	Unassigned	Inhibit Data Check*	Inhibit Status In*	Fold Data*	Unassigned	Interface Disconnect and Selective Reset	Vertical Format Buffer Request	Load Code Buffer Request
Sense Byte 2	Unassigned	Forms Low	Unassigned	Cartridge Code Check	Unassigned	Forms Check	Unassigned	Type Speed Check
Sense Byte 3	Load Code Buffer Parity Check	Print Line Buffer Parity Check	Vertical Format Buffer Parity Check	Unassigned	Actuator Check	Single Cycle Mode	Unassigned	Unassigned
Sense Byte 4	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned
Sense Byte 5	Expanded Font	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned	Unassigned

*Bit does not cause unit check status when set.

NOTES:

1. An area without an entry indicates an unassigned bit position, always reset to 0.
2. Parity bit not listed but is included in Table 3—4.



NOTE:

Forms low (SB2,1) sets FORMS OUT indicator and sets unit check during initial selection of next command.

Figure 3—2. Summary of Printer Status and Sense Bytes

Table 3—4. Sense Data Byte 0, Bit Definitions

Bit Position	Designation	Definition
P	Parity	Odd parity bit
0 (SB0,0)	Command Reject	Set if an invalid command is issued, and causes unit check status to be set. (Invalid command codes are any codes not listed in Table 3—1.)
1 (SB0,1)	Intervention Required	Set if a condition is detected requiring manual intervention (see Figure 3—2).
2 (SB0,2)	Bus Out Check	Set if a parity error is detected during a transfer from the channel to the printer. A parity error on a command code causes an immediate termination. A parity error on a data transfer causes termination of the command following the data transfer sequence.
3 (SB0,3)	Equipment Check	Set when any of the following occur: ■ Actuator check (byte 3, bit 4) ■ Parity error in: — Load code buffer (byte 3, bit 0) — Print line buffer (byte 3, bit 1) — Vertical format buffer (byte 3, bit 2) ■ Type speed check ■ Forms check
4 (SB0,4)	Data Check	Can be set during the loading of data for a print advance command. Signifies that one or more character codes in print line buffer have no corresponding code in the load code buffer. The setting of data check may be inhibited by use of inhibit data check command. When this bit is set, the print advance command or the diagnostic write command is completely executed. Printed positions with data check characters appear on the printed line as spaces.
5 (SB0,5)	VFB Check	Set when a noncompare is detected between the skip code (A=1), in a print advance, an advance only command, and the codes in the vertical format buffer. When set, advance is not executed.
6 (SB0,6)	Buffer Load Check	Set with either of the following: ■ Vertical format request (SB1,6) ■ Load code request (SB1,7)
7 (SB0,7)	Command Retry	Set during the print-compare sequence of a print advance command if two once-per-font signals have occurred and either of the following conditions are present: ■ Not all printed bits are set (2.3.6.2) ■ Print-compare-match counter has not counted up to full count (136). Unit check is set and the advance portion of the command is not executed. Reset if the print advance command is reissued and is successful. May also be reset by an advance only command.

Table 3—5. Sense Data Byte 1, Bit Definitions

Bit Position	Designation	Definition
P	Parity	Odd parity bit
0 (SB1,0)	Unassigned	Always reset to 0
1 (SB1,1)	Inhibit Data Check	When set, indicates inhibit data check is active
2 (SB1,2)	Inhibit Status In	When set, indicates inhibit status in is active
3 (SB1,3)	Fold Data	When set, indicates fold data is active
4 (SB1,4)	Unassigned	Always reset to 0
5 (SB1,5)	Selective Reset/ Interface Disconnect	When set, indicates interface disconnect or selective reset occurred during the data transfer sequence and command was not executed.
6 (SB1,6)	VFB Request	When set, indicates vertical format buffer is not properly loaded. Unit check is sent to the channel and a print-advance or advance only command is issued to the printer. Command is not executed.
7 (SB1,7)	LCB Request	When set, indicates the load code buffer is not properly loaded. Unit check is sent to the channel and a print-advance or diagnostic write command is issued to the printer. Command is not executed.

Table 3—6. Sense Data Byte 2, Bit Definitions

Bit Position	Designation	Definition
P	Parity	Odd parity bit
0 (SB2,0)	Unassigned	Always reset to 0
1 (SB2,1)	Forms Low	Set if less than 8 inches (20.32 cm) of form remain below the bottom tractor of the printer. Causes unit check to be set only once.
2 (SB2,2)	Unassigned	Always reset to 0
3 (SB2,3)	Cartridge Code Check	When set, indicates the print cartridge identification code does not agree with the cartridge verification code issued with the load command. Causes immediate termination of a load code command. Causes immediate termination of a print advance command if the stored verification code does not agree with the identification code when the command is initiated.
4 (SB2,4)	Unassigned	Always reset to 0
5 (SB2,5)	Forms Check	Set if any individual paper advance exceeds 1.2 seconds, or if a paper feed system failure has been detected. This condition causes the current print advance, or advance only command not to be executed.
6 (SB2,6)	Unassigned	Always reset to 0
7 (SB2,7)	Type Speed Check	Set if one or more of the following conditions are detected: ■ No timing marks detected within a 1 millisecond time period any time the front band is up to speed. ■ Timing marks signals from tractor sprockets are received out of tolerance.

Table 3—7. Sense Data Bytes 3, 4, and 5, Bit Definitions

Bit Position	Designation	Definition
Sense Data Byte 3		
P	Parity	Odd parity bit
0 (SB3,0)	LCB Parity Check	Set when a parity error is detected when reading the load code buffer.
1 (SB3,1)	PLB Parity Check	Set when a parity error is detected when reading the print line buffer.
2 (SB3,2)	VFB Parity Check	Set when a parity error is detected when reading the VFB. If the error is detected with a print-advance command, the line is printed but the form is not advanced. If the parity error is detected with an advance only command, the command is not executed.
3 (SB3,3)	Unassigned	Always reset to 0
4 (SB3,4)	Actuator Check	Set when an actuator circuit malfunction is detected. All columns are printed except those with a malfunction. Actuator power may be removed.
5 (SB3,5)	Single Cycle Mode	When set, indicates operation is in single cycle mode
6 (SB3,6)	Unassigned	Always reset to 0
7 (SB3,6)	Unassigned	Always reset to 0
Sense Data Byte 4		
P	Parity	Odd parity bit
0—7	Unassigned	Always reset to 0
Sense Data Byte 5		
P	Parity	Odd parity bit
0 (SB5,0)	Expanded Font	When set, indicates the printer contains expanded character set control feature to handle print cartridges that contain character set arrays greater than 64.
1—7	Unassigned	Always reset to 0

3.5. INTERFACE SEQUENCE

3.5.1. Initial Selection Sequence

The channel places the device address of the desired printer on the bus out line and then activates the address out line. The ADDRESS OUT signal causes printer control to compare the device address on the bus out line with its own assigned device address. After comparison has been made, the channel activates select out line. If the printer control selected is operational and ready to accept instructions, the printer control responds to the channel with an OPERATION IN signal. The channel then places a COMMAND byte on bus out and after a series of internal operations and a command code examination, the printer control responds to the channel with a status byte. After the channel examines the status byte, it responds to the printer control with a SERVICE OUT signal, thus accepting the status byte presented. Then a series of signals are transmitted between the printer control and the channel, ending the initial selection sequence. This is in preparation to hold the channel active for data transmission until a status byte containing an END condition, or the channel, initiates a selective reset or disconnect sequence to complete the data transfer operation.

3.5.2. Control Unit Busy

The printer is defined as busy:

- from the time a command code is accepted until device end status for the command is present in the control unit status register (immediate busy sequence); and
- while holding pending status for presentation to the channel.

3.5.3. Status and Data Transfer Sequence Initiation

The printer initiates a REQUEST IN signal to transfer data to and from the channel, or status to the channel, when the device address patch card is properly wired. If the device address patch card is not wired in this manner, then the printer control must wait for the channel to activate the SELECT OUT interface signal line without activating the ADDRESS OUT interface signal line.

3.5.4. Data Transfer Sequence

The printer initiates a data transfer sequence from the channel to the control unit buffer during the following commands:

- Print advance — 136 bytes
- Diagnostic write — 136 bytes
- Load code — 66 bytes (without dualing)
75 bytes (with dualing)
386 bytes (with expanded font)
395 bytes (with expanded font and dualing)
- Load vertical format — 192 bytes

The printer initiates a data transfer sequence from its control to the channel during following commands:

- Sense I/O — 6 bytes
- Read print line buffer — 136 bytes
- Read load code buffer — 67 bytes
76 bytes (with dualing)
387 bytes (with expanded font)
396 bytes (with dualing)
- Read vertical format buffer — 192 bytes

Each data byte is transferred on a request-acknowledge basis (SERVICE IN/SERVICE OUT). The channel may terminate a data transfer sequence by activating the COMMAND OUT interface line in response to a SERVICE IN signal. In any case, printer control terminates the data transfer sequence after the number of bytes listed for each command has been satisfied. The load vertical format command data transfer sequence ends prior to 192 transferred bytes if a 1 is detected in end-of-forms bit 3.

3.5.5. Terminated Sequences

An operation may be terminated by either the channel or the control for the printer. At time of termination, the printer control transmits a status byte to the channel and, after an exchange of various signals between the channel and printer, the printer disconnects from the interface as soon as possible. The printer does not request a data transfer after the indicated number of bytes for the corresponding command specified in 3.5.4 is satisfied. Also, the printer does not request a data transfer following a terminate data transfer signal from the processor channel.

3.5.6. Selective Reset Sequence

When the selective reset sequence is presented to the printer, the printer clears the status register, ceases any data transfer sequence in progess, and immediately disconnects from the interface. The printer control completes any command in progress if the SELECTIVE RESET signal occurs after channel end status conditions are stored in the status register. If the selective reset sequence is received during a data transfer sequence, the printer initiates a status request to the channel immediately following the selective reset sequences. This results in CHANNEL END, DEVICE END, and UNIT CHECK signals which cause bits of the interface disconnect/selective reset sense byte to be set.

3.5.7. Interface Disconnect Sequence

This sequence is the same as selective reset sequence (3.5.6) except that the status register is not cleared.

3.5.8. System Reset

System reset causes the printer to enter a cleared state in which the printer is ready (not busy) to accept any valid command and is not connected to the interface.

3.5.9. Diagnostics

Certain error conditions are sensed in the printer to facilitate troubleshooting. Errors are displayed on the operator control panel in the form of indicators to aid in identification of the error by the operator or by Sperry Univac customer engineering personnel. In addition to the indicators on the operator control panel, the control section of the printer contains a set of maintenance switches and indicators that enables offline operation of the printer for maintenance and troubleshooting purposes. The switches permit any printer command, data, or code to be manually entered in the control. The indicators specify the state of various registers and error conditions in the printer subsystem.

3.5.10. I/O Error Detection and Recovery

The printer contains I/O error detection and recovery features falling into two general categories: recoverable and nonrecoverable. For recoverable errors, the software has provisions for retry. Nonrecoverable errors are displayed on the operator control panel and require manual intervention by either the operator or Sperry Univac customer engineering personnel. In addition, the software can determine the cause of a problem by means of the status byte and the six sense bytes.

3.6. SPLIT INTERRUPTS

The printer sends CHANNEL END and DEVICE END signals separately for print advance commands that are executed without a unit check. If UNIT CHECK is set, then the interrupt may or may not be split. Note that the absence or presence of split interrupts with a unit check set does not indicate how much of the line was printed. Individual sense bits must be consulted for this information.

3.7. ASSOCIATIVE DATA CHECK

Associated data check techniques require no additional programming. The printer hardware automatically detects data check characters and allows printing to be sustained at the same rate that would exist if the data check characters were not present.

Note that a print advance command or diagnostic write command that receives data check characters as data sends unit check status when sending device end status. Data check bit is set in the sense byte. The inhibit data check command prevents the setting of sense status and unit check status for a data check but does not affect the associative technique.

The advance position of a print advance command is performed regardless of a data check condition.

3.8. LOAD CODE CONSIDERATIONS

There are two load code considerations – loading and reading.

In loading, the load code must contain:

- The cartridge verification code
- Dualing codes and data check dual code if the most significant bit of the CVC is set to 1
- The space code

- The codes for one complete character array (up to 64 characters for printers without the expanded font feature or up to 384 characters for printers with the expanded font feature).

In reading, the printer sends to the processor:

- The cartridge identification code
- The codes received during the load code command (CVC; nine duals, if applicable; space code; and codes for the print band which were loaded)
- Space codes which the printer used to fill the rest of the LCB up to the 64 or 384 characters of the LCB

3.9. ERROR RECOVERY

Operating status of the printer is supplied to the processor to permit monitoring at the printer and to take proper action to either terminate the operation, continue with other operations, or recover from erroneous programming or faulty operation. Figure 3-3 shows the areas affected by set bits of the status bytes and the procedures to be followed if recovery operation is required. The recovery procedure flowcharts (error recovery and equipment check) are described in Figure 3-4.

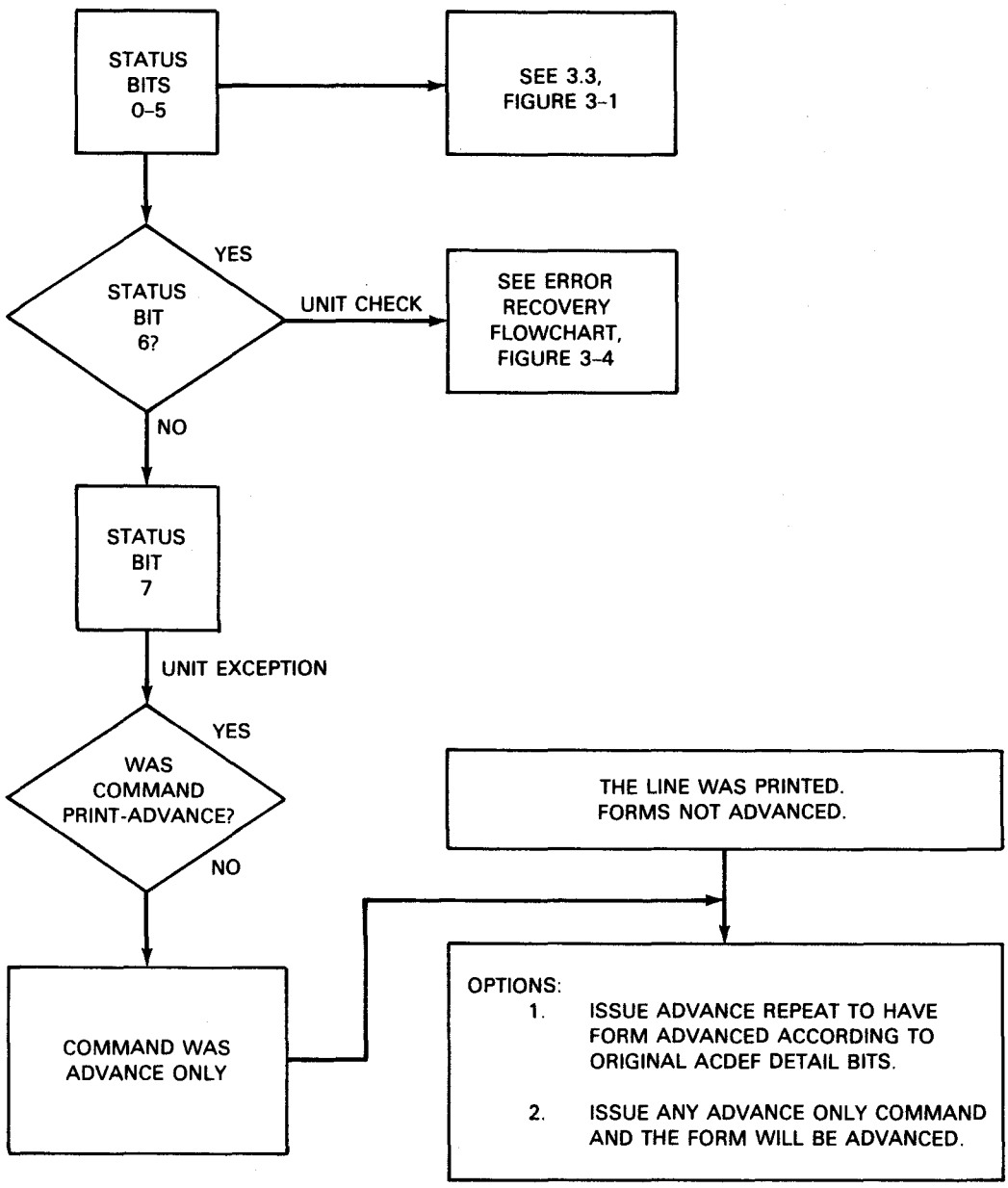


Figure 3—3. Status Byte Conditions

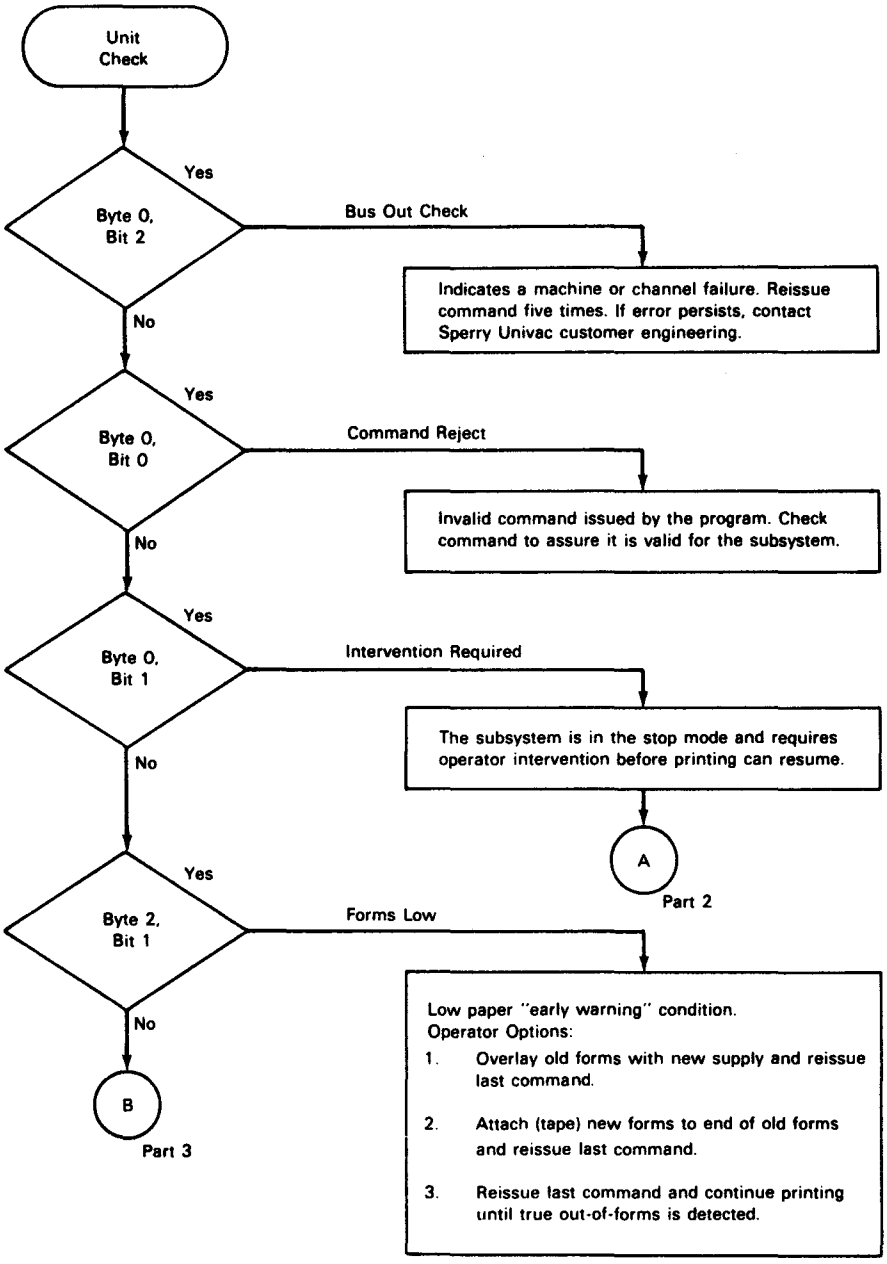


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 1 of 7)

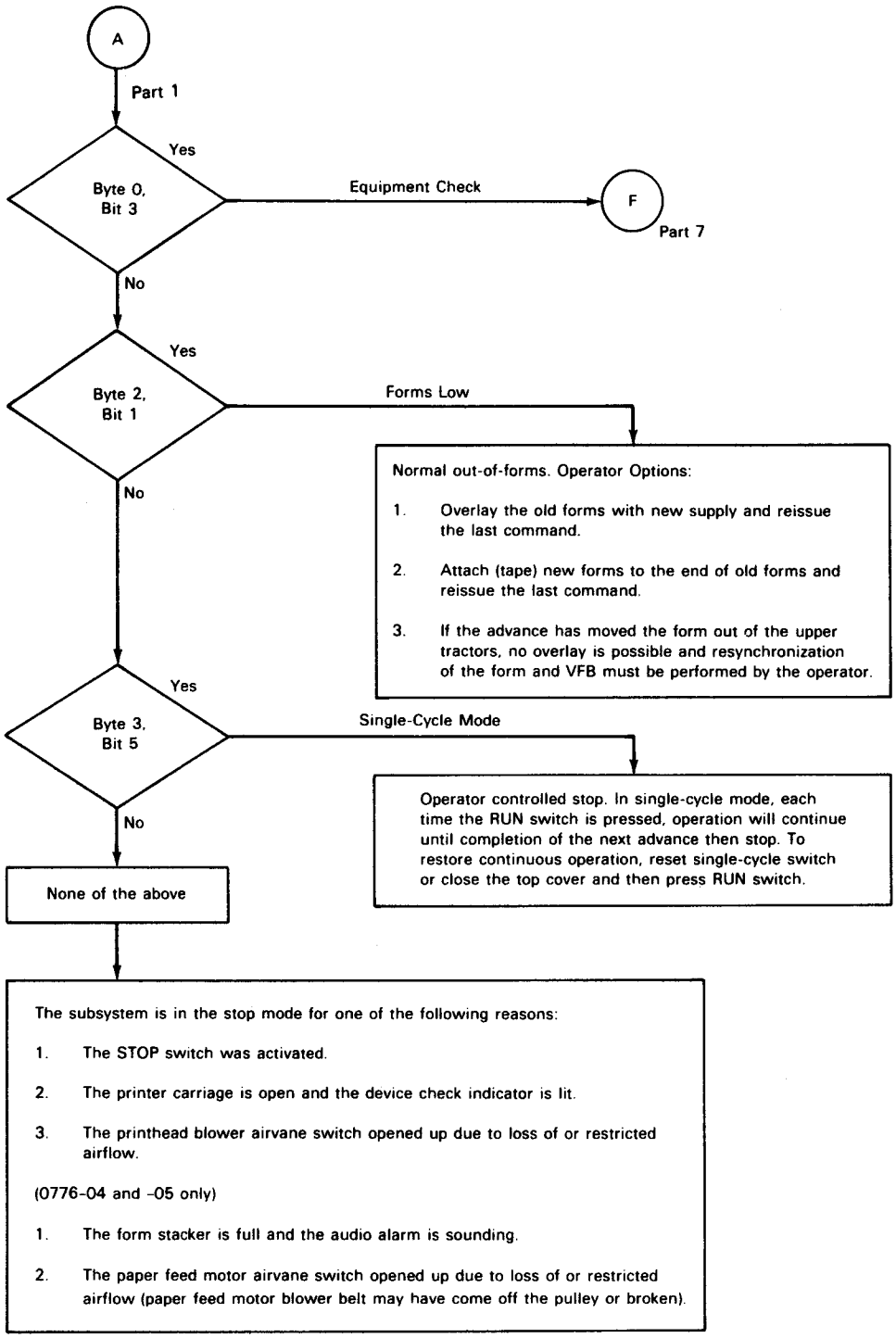


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 2 of 7)

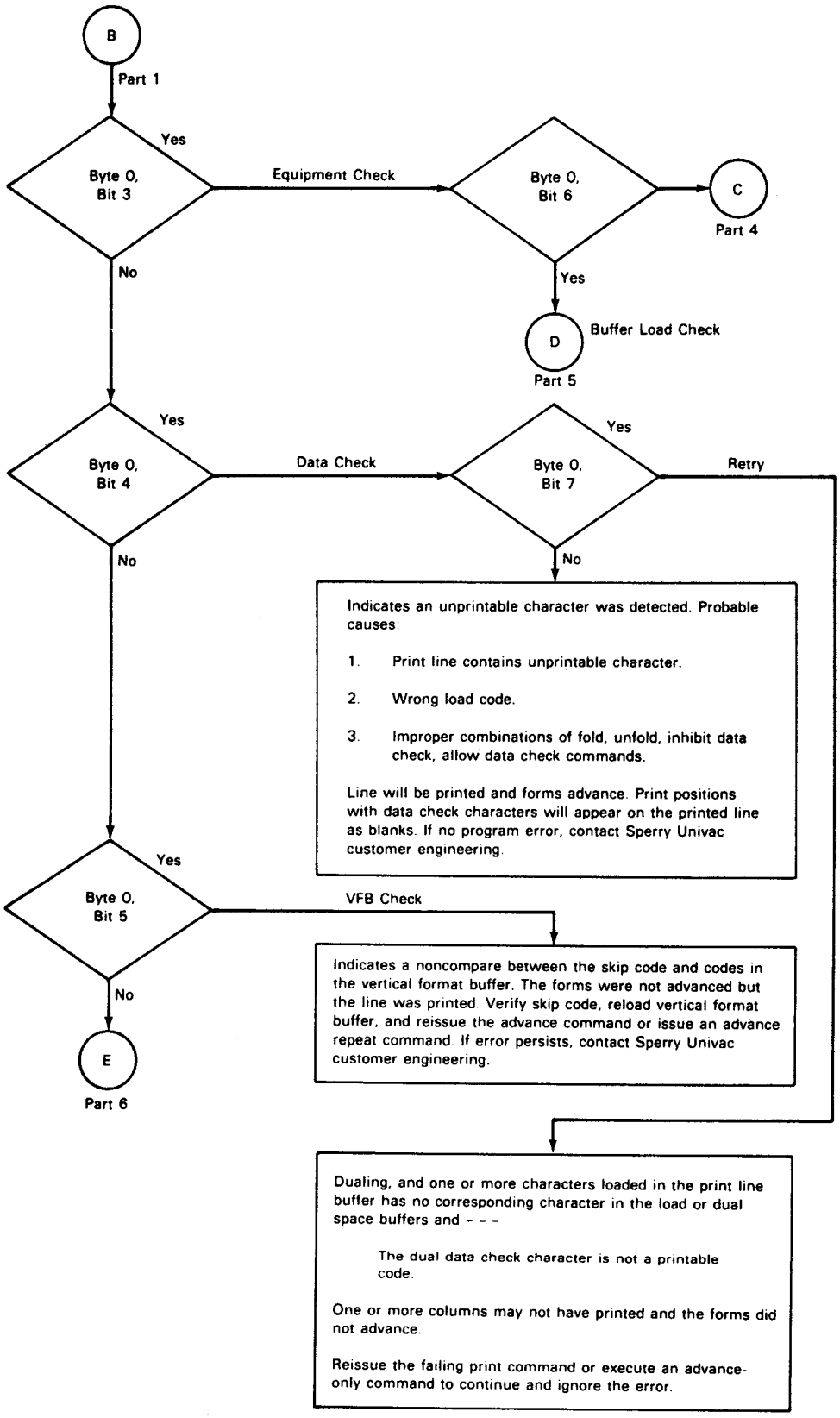


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 3 of 7)

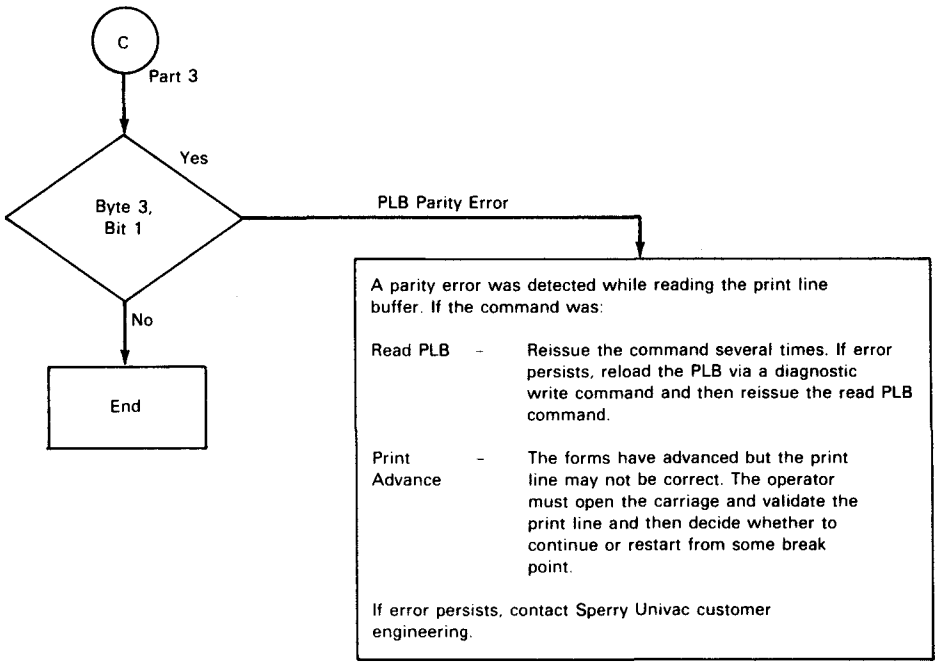


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 4 of 7)

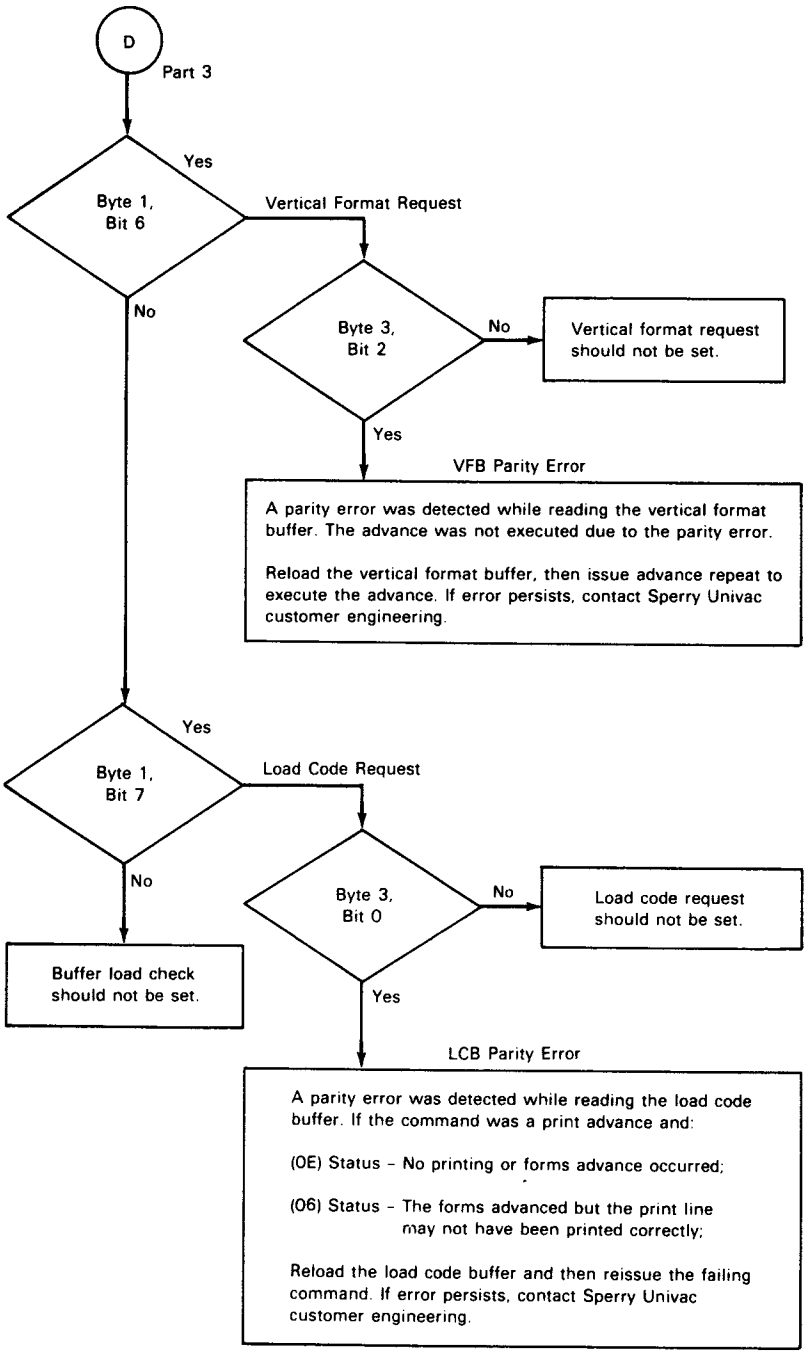


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 5 of 7)

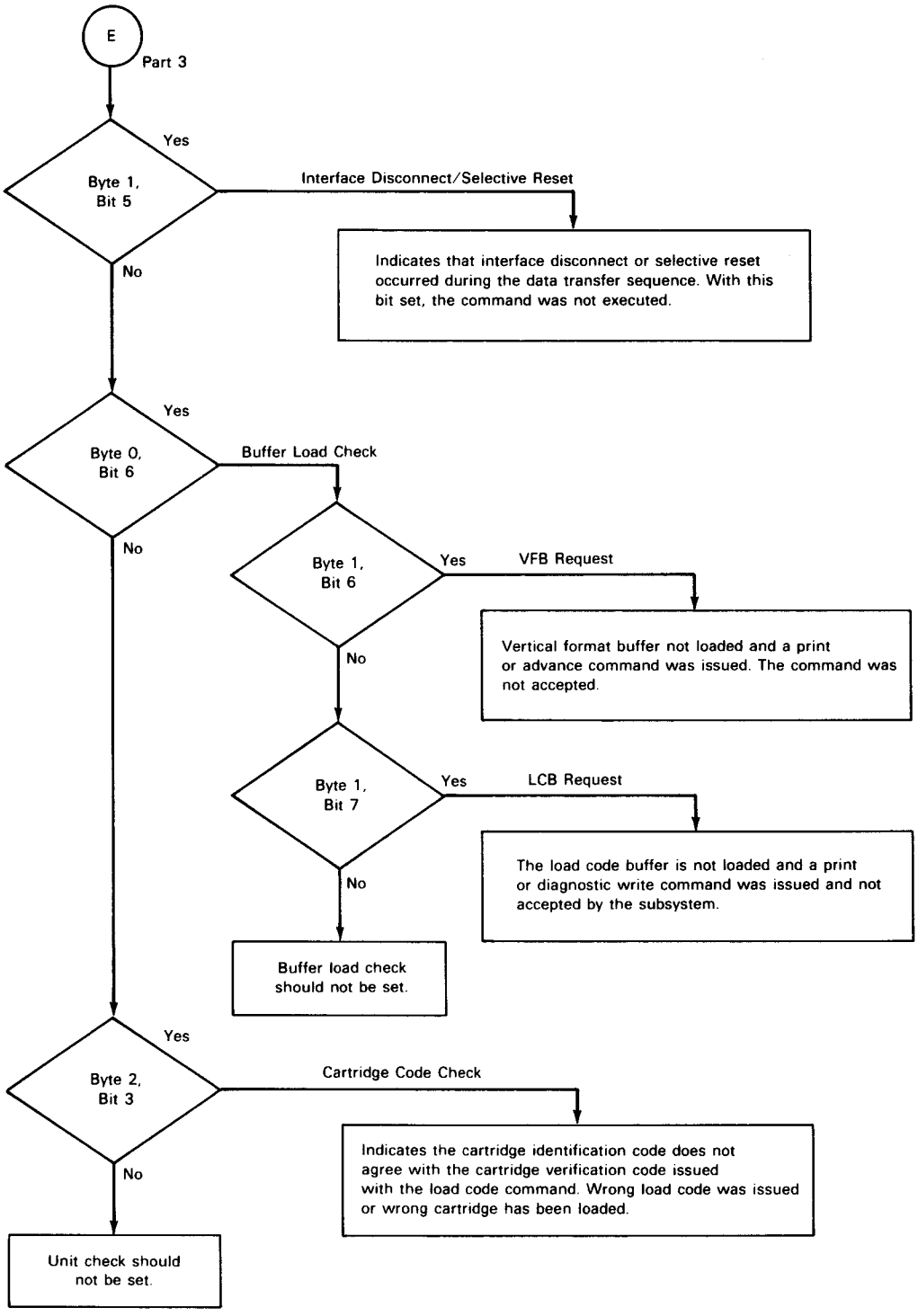


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 6 of 7)

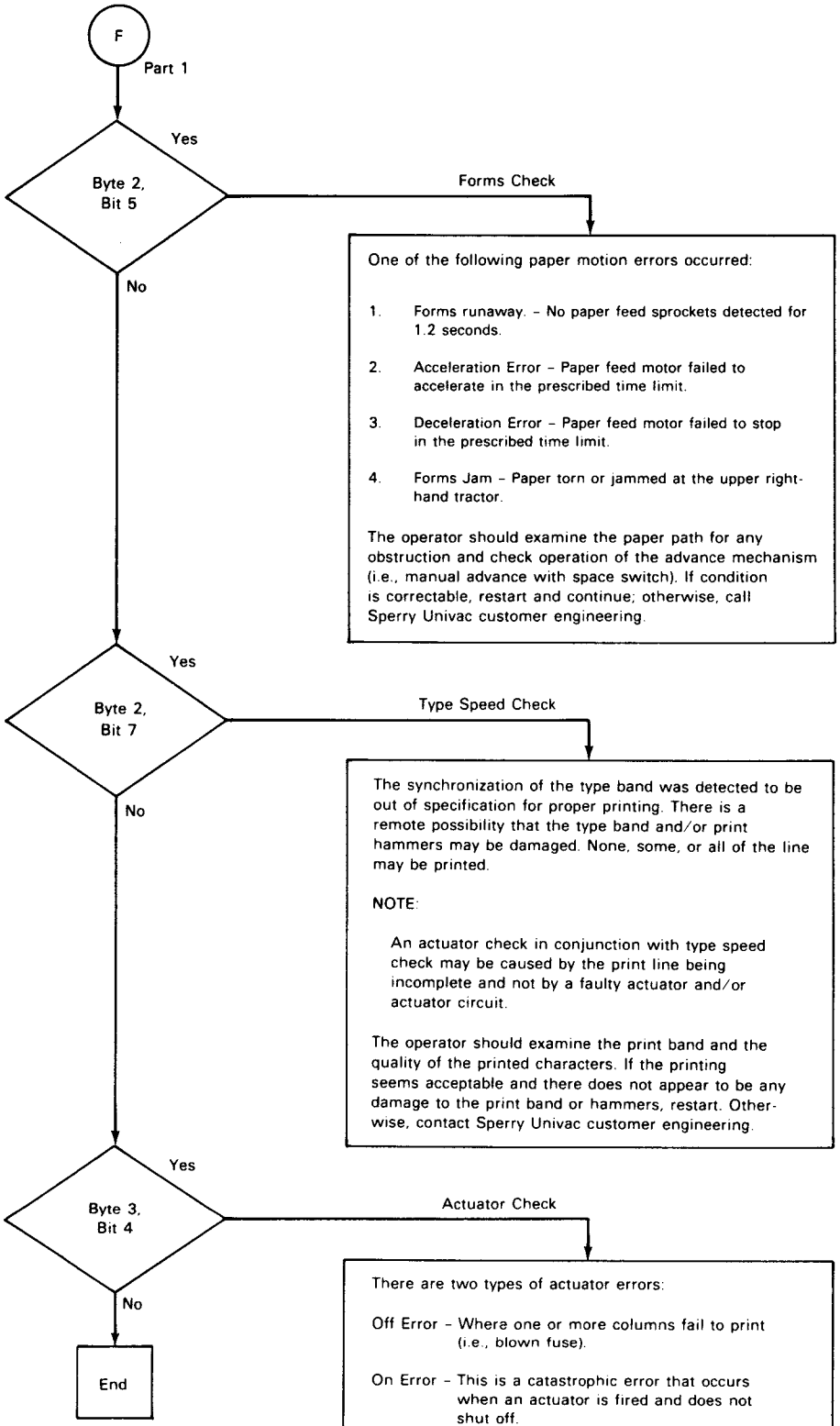
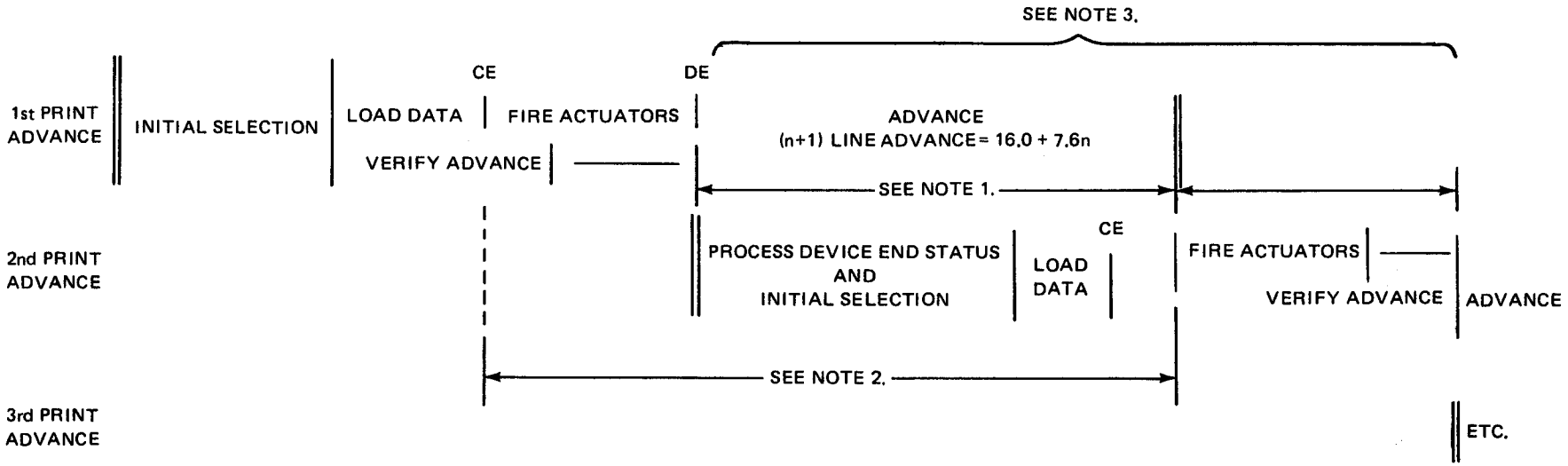


Figure 3—4. Error Recovery and Equipment Check Flowchart (Part 7 of 7)

Appendix A. Timing

Figures A-1 and A-2 show timing for the print-advance and advance-only commands for the 0776 printer. Note that the print-advance commands can be performed with the advance portion overlapping the processor handling of device end status, initial selection for the next command, and data loading.



LEGEND:

CE = Channel end
DE = Device end

NOTES:

1. Actuator recovery advance

   a. 760 and 940/900 lpm printers:

   Space 1 line (6 lpi) = 16.0 ms
   Space 2 lines (6 lpi) = 16.0 + 7.6 = 23.6 ms
   Space 3 lines (6 lpi) = 16.0 + (7.6 x 2) = 31.2 ms

   b. 1200 lpm printer:

   Space 1 line (6 lpi) = 16.7 ms
   Space 2 lines (6 lpi) = 24.6 ms
   Space 3 lines (6 lpi) = 30.9 ms

   c. Where actuator recovery delay is 15.1 ± 0.1 ms and space 1 line at 6 lpi is 16.0 ms

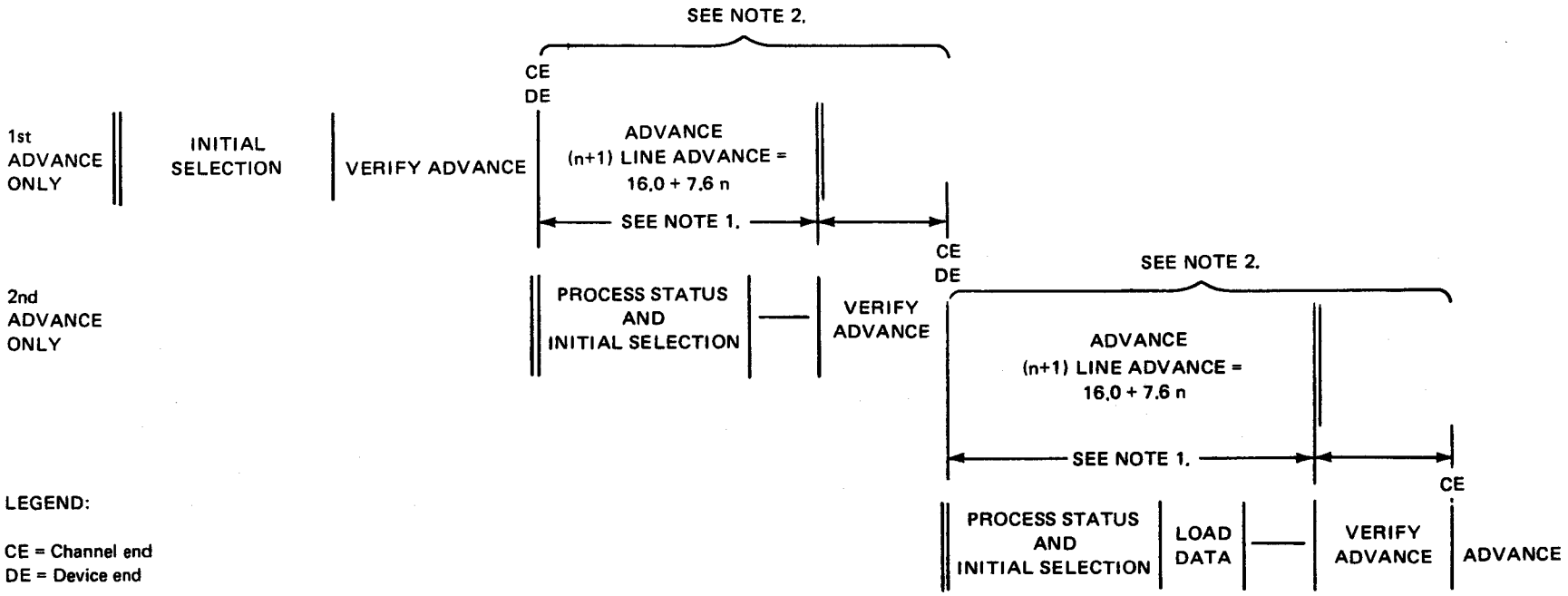
2. 55 ms minimum and 1090 lpm limit for 760 lpm printer

   48 ms minimum and 1250 lpm limit for 940/900/1200 lpm printers

3. Advance motor duty cycle:

   55 ms for 760 lpm printer
   48 ms for 940/900/1200 lpm printers

Figure A—1. Timing, Print-Advance Command



LEGEND:

CE = Channel end
DE = Device end

NOTES:

1. Actuator recovery advance

   a. 760 and 940/900 lpm printers:

      Space 1 line (6 lpi) = 16.0 ms
      Space 2 lines (6 lpi) = 16.0 + 7.6 = 23.6 ms
      Space 3 lines (6 lpi) = 16.0 + (7.6 x 2) = 31.2 ms

   b. 1200 lpm printer:

      Space 1 line (6 lpi) = 16.7 ms
      Space 2 lines (lpi) = 24.6 ms
      Space 3 lines (6 lpi) = 30.9 ms

   c. Where actuator recovery delay is 15.1 ± 0.1 ms and space 1 line at 6 lpi is 16.0 ms

2. 55 ms minimum and 1090 lpm limit for 760 lpm printer

   48 ms minimum and 1250 lpm limit for 940/900/1200 lpm printers

Figure A—2. Timing, Advance-Only Command

Appendix B. Print Cartridge Character Sets

Tables B-1 through B-29 list the character symbols which appear in each print band for the 0776 printer. Characters are listed in loading sequence; that is, the sequence in which the associated character codes must be entered into the load code buffer by the program.

NOTE:

Any code of 6, 7, or 8 bits may be assigned to the graphic characters on the print bands. Suggested hexadecimal character codes are included in the tables in this appendix; however, different codes may be assigned if the user wishes.

Array size and symbols for each array also are provided. Refer to 2.3.6.5 and Table 2-5 for print cartridge verification codes.

NOTE:

The character symbol shapes shown in the print character set tables are for information purposes only and may not conform with actual shapes printed by the 0776 printer.

Table B—1. Standard Business Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	1	P	Uppercase P	1
4F	D6	2	O	Uppercase O	1
4E	D5	3	N	Uppercase N	1
4D	D4	4	M	Uppercase M	1
4C	D3	5	L	Uppercase L	1
4B	D2	6	K	Uppercase K	1
4A	D1	7	J	Uppercase J	1
49	C9	8	I	Uppercase I	1
48	C8	9	H	Uppercase H	1
47	C7	10	G	Uppercase G	1
46	C6	11	F	Uppercase F	1
45	C5	12	E	Uppercase E	1
44	C4	13	D	Uppercase D	1
43	C3	14	C	Uppercase C	1
42	C2	15	B	Uppercase B	1
41	C1	16	A	Uppercase A	1
39	F9	17	9	Numeric nine	1
38	F8	18	8	Numeric eight	1
37	F7	19	7	Numeric seven	1
36	F6	20	6	Numeric six	1
35	F5	21	5	Numeric five	1
34	F4	22	4	Numeric four	1
33	F3	23	3	Numeric three	1
32	F2	24	2	Numeric two	1
31	F1	25	1	Numeric one	1
30	F0	26	0	Numeric zero	1
2D	60	27	-	Hyphen (minus)	1
2F	61	28	/	Slant (solidus)	1
40	7C	29	@	Commercial at	1
23	7B	30	#	Number sign	1
24	5B	31	$	Dollar sign	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
3C	4C	34	<	Less than	1
2A	5C	35	*	Asterisk	1
25	6C	36	%	Percent	1
26	50	37	&	Ampersand	1
2E	4B	38	.	Period (full stop)	1
5A	E9	39	Z	Uppercase Z	1
59	E8	40	Y	Uppercase Y	1
58	E7	41	X	Uppercase X	1
57	E6	42	W	Uppercase W	1
56	E5	43	V	Uppercase V	1
55	E4	44	U	Uppercase U	1
54	E3	45	T	Uppercase T	1
53	E2	46	S	Uppercase S	1
52	D9	47	R	Uppercase R	1
51	D8	48	Q	Uppercase Q	1
				Array size	48

Table B—2. Scientific Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	1	P	Uppercase P	1
4F	D6	2	O	Uppercase O	1
4E	D5	3	N	Uppercase N	1
4D	D4	4	M	Uppercase M	1
4C	D3	5	L	Uppercase L	1
4B	D2	6	K	Uppercase K	1
4A	D1	7	J	Uppercase J	1
49	C9	8	I	Uppercase I	1
48	C8	9	H	Uppercase H	1
47	C7	10	G	Uppercase G	1
46	C6	11	F	Uppercase F	1
45	C5	12	E	Uppercase E	1
44	C4	13	D	Uppercase D	1
43	C3	14	C	Uppercase C	1
42	C2	15	B	Uppercase B	1
41	C1	16	A	Uppercase A	1
39	F9	17	9	Numeric nine	1
38	F8	18	8	Numeric eight	1
37	F7	19	7	Numeric seven	1
36	F6	20	6	Numeric six	1
35	F5	21	5	Numeric five	1
34	F4	22	4	Numeric four	1
33	F3	23	3	Numeric three	1
32	F2	24	2	Numeric two	1
31	F1	25	1	Numeric one	1
30	F0	26	0	Numeric zero	1
2D	60	27	-	Hyphen (minus)	1
28	4D	28	(	Left parenthesis	1
29	5D	29	)	Right parenthesis	1
26	50	30	&	Ampersand	1
24	5B	31	$	Dollar sign	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
27	7D	34	'	Apostrophe	1
2A	5C	35	*	Asterisk	1
3D	7E	36	=	Equals	1
2E	4B	37	.	Period (full stop)	1
2F	61	38	/	Slant (solidus)	1
5A	E9	39	Z	Uppercase Z	1
59	E8	40	Y	Uppercase Y	1
58	E7	41	X	Uppercase X	1
57	E6	42	W	Uppercase W	1
56	E5	43	V	Uppercase V	1
55	E4	44	U	Uppercase U	1
54	E3	45	T	Uppercase T	1
53	E2	46	S	Uppercase S	1
52	D9	47	R	Uppercase R	1
51	D8	48	Q	Uppercase Q	1
				Array size	48

Table B—3. United Kingdom Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	1	P	Uppercase P	1
4F	D6	2	O	Uppercase O	1
4E	D5	3	N	Uppercase N	1
4D	D4	4	M	Uppercase M	1
4C	D3	5	L	Uppercase L	1
4B	D2	6	K	Uppercase K	1
4A	D1	7	J	Uppercase J	1
49	C9	8	I	Uppercase I	1
48	C8	9	H	Uppercase H	1
47	C7	10	G	Uppercase G	1
46	C6	11	F	Uppercase F	1
45	C5	12	E	Uppercase E	1
44	C4	13	D	Uppercase D	1
43	C3	14	C	Uppercase C	1
42	C2	15	B	Uppercase B	1
41	C1	16	A	Uppercase A	1
39	F9	17	9	Numeric nine	1
38	F8	18	8	Numeric eight	1
37	F7	19	7	Numeric seven	1
36	F6	20	6	Numeric six	1
35	F5	21	5	Numeric five	1
34	F4	22	4	Numeric four	1
33	F3	23	3	Numeric three	1
32	F2	24	2	Numeric two	1
31	F1	25	1	Numeric one	1
30	F0	26	0	Numeric zero	1
2D	60	27	-	Hyphen (minus)	1
2F	61	28	/	Slant (solidus)	1
40	7C	29	@	Commercial at	1
23	7B	30	£	Pound sterling sign	1
24	5B	31	$	Dollar sign	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
27	7D	34	'	Apostrophe	1
2A	5C	35	*	Asterisk	1
25	6C	36	%	Percent	1
26	50	37	&	Ampersand	1
2E	4B	38	.	Period (full stop)	1
5A	E9	39	Z	Uppercase Z	1
59	E8	40	Y	Uppercase Y	1
58	E7	41	X	Uppercase X	1
57	E6	42	W	Uppercase W	1
56	E5	43	V	Uppercase V	1
55	E4	44	U	Uppercase U	1
54	E3	45	T	Uppercase T	1
53	E2	46	S	Uppercase S	1
52	D9	47	R	Uppercase R	1
51	D8	48	Q	Uppercase Q	1
				Array size	48

Table B—4. Denmark-Norway Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4D	D4	1	M	Uppercase M	1
4C	D3	2	L	Uppercase L	1
4B	D2	3	K	Uppercase K	1
4A	D1	4	J	Uppercase J	1
49	C9	5	I	Uppercase I	1
48	C8	6	H	Uppercase H	1
47	C7	7	G	Uppercase G	1
46	C6	8	F	Uppercase F	1
45	C5	9	E	Uppercase E	1
44	C4	10	D	Uppercase D	1
43	C3	11	C	Uppercase C	1
42	C2	12	B	Uppercase B	1
41	C1	13	A	Uppercase A	1
E5	BD	14	É	Uppercase E with acute accent	1
5B	4A	15	AE	Uppercase AE diphthong	1
5C	E0	16	Ø	Uppercase O with slant	1
5D	5A	17	Å	Uppercase A with circle	1
D9	B1	18	Ü	Uppercase U diaeresis	1
39	F9	19	9	Numeric nine	1
38	F8	20	8	Numeric eight	1
37	F7	21	7	Numeric seven	1
36	F6	22	6	Numeric six	1
35	F5	23	5	Numeric five	1
34	F4	24	4	Numeric four	1
33	F3	25	3	Numeric three	1
32	F2	26	2	Numeric two	1
31	F1	27	1	Numeric one	1
30	F0	28	0	Numeric zero	1
2E	4B	29	.	Period (full stop)	1
2F	61	30	/	Slant	1
26	50	31	&	Ampersand	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
2A	5C	34	*	Asterisk	1
2D	60	35	-	Hyphen (minus)	1
5A	E9	36	Z	Uppercase Z	1
59	E8	37	Y	Uppercase Y	1
58	E7	38	X	Uppercase X	1
57	E6	39	W	Uppercase W	1
56	E5	40	V	Uppercase V	1
55	E4	41	U	Uppercase U	1
54	E3	42	T	Uppercase T	1
53	E2	43	S	Uppercase S	1
52	D9	44	R	Uppercase R	1
51	D8	45	Q	Uppercase Q	1
50	D7	46	P	Uppercase P	1
4F	D6	47	O	Uppercase O	1
4E	D5	48	N	Uppercase N	1
				Array size	48

Table B—5. Finland-Sweden Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4D	D4	1	M	Uppercase M	1
4C	D3	2	L	Uppercase L	1
4B	D2	3	K	Uppercase K	1
4A	D1	4	J	Uppercase J	1
49	C9	5	I	Uppercase I	1
48	C8	6	H	Uppercase H	1
47	C7	7	G	Uppercase G	1
46	C6	8	F	Uppercase F	1
45	C5	9	E	Uppercase E	1
44	C4	10	D	Uppercase D	1
43	C3	11	C	Uppercase C	1
42	C2	12	B	Uppercase B	1
41	C1	13	A	Uppercase A	1
E5	BD	14	É	Uppercase E with acute accent	1
5B	4A	15	Ä	Uppercase A with diaeresis	1
5C	E0	16	Ö	Uppercase O with diaeresis	1
5D	5A	17	Å	Uppercase A with circle	1
5E	5F	18	Ü	Uppercase U with diaeresis	1
39	F9	19	9	Numeric nine	1
38	F8	20	8	Numeric eight	1
37	F7	21	7	Numeric seven	1
36	F6	22	6	Numeric six	1
35	F5	23	5	Numeric five	1
34	F4	24	4	Numeric four	1
33	F3	25	3	Numeric three	1
32	F2	26	2	Numeric two	1
31	F1	27	1	Numeric one	1
30	F0	28	0	Numeric zero	1
2E	4B	29	.	Period (full stop)	1
2F	61	30	/	Slant (solidus)	1
26	50	31	&	Ampersand	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
2A	5C	34	=	Asterisk	1
2D	60	35	-	Hyphen (minus)	1
5A	E9	36	Z	Uppercase Z	1
59	E8	37	Y	Uppercase Y	1
58	E7	38	X	Uppercase X	1
57	E6	39	W	Uppercase W	1
56	E5	40	V	Uppercase V	1
55	E4	41	U	Uppercase U	1
54	E3	42	T	Uppercase T	1
53	E2	43	S	Uppercase S	1
52	D9	44	R	Uppercase E	1
51	D8	45	Q	Uppercase Q	1
50	D7	46	P	Uppercase P	1
4F	D6	47	O	Uppercase O	1
4E	D5	48	N	Uppercase N	1
				Array size	48

Table B—6. Expanded Denmark-Norway Print Cartridge, 64 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	1	+	Plus	1
28	4D	2	(	Left parenthesis	1
29	5D	3	)	Right parenthesis	1
23	7B	4	#	Number sign	1
3D	7E	5	=	Equals	1
25	6C	6	%	Percent	1
2A	5C	7	*	Asterisk	1
3E	6E	8	>	Greater than	1
3C	4C	9	<	Less than	1
5A	E9	10	Z	Uppercase Z	1
59	E8	11	Y	Uppercase Y	1
58	E7	12	X	Uppercase X	1
57	E6	13	W	Uppercase W	1
56	E5	14	V	Uppercase V	1
55	E4	15	U	Uppercase U	1
54	E3	16	T	Uppercase T	1
53	E2	17	S	Uppercase S	1
52	D9	18	R	Uppercase R	1
30	F0	19	0	Numeric zero	2
51	D8	20	Q	Uppercase Q	1
50	D7	21	P	Uppercase P	1
4F	D6	22	O	Uppercase O	1
4E	D5	23	N	Uppercase N	1
4D	D4	24	M	Uppercase M	1
4C	D3	25	L	Uppercase L	1
4B	D2	26	K	Uppercase K	1
4A	D1	27	J	Uppercase J	1
49	C9	28	I	Uppercase I	1
48	C8	29	H	Uppercase H	1
47	C7	30	G	Uppercase G	1
46	C6	31	F	Uppercase F	1
45	C5	32	E	Uppercase E	1
44	C4	33	D	Uppercase D	1
43	C3	34	C	Uppercase C	1
42	C2	35	B	Uppercase B	1
41	C1	36	A	Uppercase A	1
E5	BD	37	É	Uppercase E with acute accent	1
5B	4A	38	Æ	Uppercase AE diphthong	1
5C	ED	39	Ø	Uppercase O with slant	1
5D	5A	40	Å	Uppercase A with circle	1
D9	B1	41	Ü	Uppercase U with diaeresis	1
39	F9	42	9	Numeric nine	1
38	F8	43	8	Numeric eight	1
37	F7	44	7	Numeric seven	1
36	F6	45	6	Numeric six	1
35	F5	46	5	Numeric five	1
34	F4	47	4	Numeric four	1
33	F3	48	3	Numeric three	1
32	F2	49	2	Numeric two	1
31	F1	50	1	Numeric one	1
30	F0	51	0	Numeric zero	2
2E	4B	52	.	Period (full stop)	1
2D	60	53	-	Hyphen (minus)	1
2F	61	54	/	Slant (solidus)	1
24	5B	55	$	Dollar sign	1
3B	5E	56	;	Semicolon	1
3A	7A	57	:	Colon	1
3F	6F	58	?	Question	1
26	50	59	&	Ampersand	1
5F	6D	60	—	Discontinuous underline	1
21	4F	61	!	Exclamation	1
27	7D	62	'	Apostrophe	1
22	7F	63	"	Quotation	1
2C	6B	64	,	Comma	1
				Array size	64

Table B—7. Expanded Finland-Sweden Print Cartridge, 64 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	1	+	Plus	1
28	4D	2	(	Left parenthesis	1
29	5D	3	)	Right parenthesis	1
23	7B	4	#	Number sign	1
3D	7E	5	=	Equals	1
25	6C	6	%	Percent	1
2A	5C	7	*	Asterisk	1
3E	6E	8	>	Greater than	1
3C	4C	9	<	Less than	1
5A	E9	10	Z	Uppercase Z	1
59	E8	11	Y	Uppercase Y	1
58	E7	12	X	Uppercase X	1
57	E6	13	W	Uppercase W	1
56	E5	14	V	Uppercase V	1
55	E4	15	U	Uppercase U	1
54	E3	16	T	Uppercase T	1
53	E2	17	S	Uppercase S	1
52	D9	18	R	Uppercase R	1
30	F0	19	0	Numeric zero	1
51	D8	20	Q	Uppercase Q	1
50	D7	21	P	Uppercase P	1
4F	D6	22	O	Uppercase O	1
4E	D5	23	N	Uppercase N	1
4D	D4	24	M	Uppercase M	1
4C	D3	25	L	Uppercase L	1
4B	D2	26	K	Uppercase K	1
4A	D1	27	J	Uppercase J	1
49	C9	28	I	Uppercase I	1
48	C8	29	H	Uppercase H	1
47	C7	30	G	Uppercase G	1
46	C6	31	F	Uppercase F	1
45	C5	32	E	Uppercase E	1
44	C4	33	D	Uppercase D	1
43	C3	34	C	Uppercase C	1
42	C2	35	B	Uppercase B	1
41	C1	36	A	Uppercase A	1
40	7C	37	É	Uppercase E with acute accent	1
5B	4A	38	Ä	Uppercase A with diaeresis	1
5C	E0	39	Ö	Uppercase O with diaeresis	1
5D	5A	40	Å	Uppercase A with circle	1
5E	5F	41	Ü	Uppercase U with diaeresis	1
39	F9	42	9	Numeric nine	1
38	F8	43	8	Numeric eight	1
37	F7	44	7	Numeric seven	1
36	F6	45	6	Numeric six	1
35	F5	46	5	Numeric five	1
34	F4	47	4	Numeric four	1
33	F3	48	3	Numeric three	1
32	F2	49	2	Numeric two	1
31	F1	50	1	Numeric one	1
30	F0	51	0	Numeric zero	2
2E	4B	52	.	Period (full stop)	1
2D	60	53	-	Hyphen (minus)	1
2F	61	54	/	Slant (solidus)	1
24	5B	55	$	Dollar sign	1
3B	5E	56	;	Semicolon	1
3A	7A	57	:	Colon	1
3F	6F	58	?	Question	1
26	50	59	&	Ampersand	1
5F	6D	60	—	Discontinuous underline	1
21	4F	61	!	Exclamation	1
27	7D	62	'	Apostrophe	1
22	7F	63	"	Quotation	1
2C	6B	64	,	Comma	1
				Array size	64

Table B—8. Numeric Print Cartridge, 24 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2D	60	1	-	Hyphen (minus)	1
2F	61	2	/	Slant (solidus)	1
3E	6E	3	>	Greater than	1
3C	4C	4	<	Less than	1
3D	7E	5	=	Equals	1
23	7B	6	#	Number sign	1
24	5B	7	$	Dollar sign	1
2C	6B	8	,	Comma	1
2B	4E	9	+	Plus	1
28	4D	10	(	Left parenthesis	1
29	5D	11	)	Right parenthesis	1
2A	5C	12	*	Asterisk	1
25	6C	13	%	Percent	1
2E	4B	14	.	Period (full stop)	1
39	F9	15	9	Numeric nine	1
38	F8	16	8	Numeric eight	1
37	F7	17	7	Numeric seven	1
36	F6	18	6	Numeric six	1
35	F5	19	5	Numeric five	1
34	F4	20	4	Numeric four	1
33	F3	21	3	Numeric three	1
32	F2	22	2	Numeric two	1
31	F1	23	1	Numeric one	1
30	F0	24	0	Numeric zero	1
				Array size	24

Table B—9. Modified FORTRAN (77L) Print Cartridge, 64 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	1	+	Plus	1
28	4D	2	(	Left parenthesis	1
29	5D	3	)	Right parenthesis	1
23	7B	4	#	Number sign	1
32	7E	5	=	Equals	1
25	6C	6	%	Percent	1
2A	5C	7	*	Asterisk	1
3E	6E	8	>	Greater than	1
3C	4C	9	<	Less than	1
5A	E9	10	Z	Uppercase Z	1
59	E8	11	Y	Uppercase Y	1
58	E7	12	X	Uppercase X	1
57	E6	13	W	Uppercase W	1
56	E5	14	V	Uppercase V	1
55	E4	15	U	Uppercase U	1
54	E3	16	T	Uppercase T	1
53	E2	17	S	Uppercase S	1
52	D9	18	R	Uppercase R	1
30	F0	19	0	Numeric zero	2
51	D8	20	Q	Uppercase Q	1
50	D7	21	P	Uppercase P	1
4F	D6	22	O	Uppercase O	1
4E	D5	23	N	Uppercase N	1
4D	D4	24	M	Uppercase M	1
4C	D3	25	L	Uppercase L	1
4B	D2	26	K	Uppercase K	1
4A	D1	27	J	Uppercase J	1
49	C9	28	I	Uppercase I	1
48	C8	29	H	Uppercase H	1
47	C7	30	G	Uppercase G	1
46	C6	31	F	Uppercase F	1
45	C5	32	E	Uppercase E	1
44	C4	33	D	Uppercase D	1
43	C3	34	C	Uppercase C	1
42	C2	35	B	Uppercase B	1
41	C1	36	A	Uppercase A	1
5B	4A	37	[	Left square bracket	1
5D	5A	38	]	Right square bracket	1
5E	5F	39	△	Delta	1
5C	E0	40	\	Reverse slant (reverse solidus)	1
5F	6D	41	≠	Unequal sign	1
39	F9	42	9	Numeric nine	1
38	F8	43	8	Numeric eight	1
37	F7	44	7	Numeric seven	1
36	F6	45	6	Numeric six	1
35	F5	46	5	Numeric five	1
34	F4	47	4	Numeric four	1
33	F3	48	3	Numeric three	1
32	F2	49	2	Numeric two	1
31	F1	50	1	Numeric one	1
30	F0	51	0	Numeric zero	2
2E	4B	52	.	Period (full stop)	1
2D	60	53	-	Hyphen (minus	1
2F	61	54	/	Slant (solidus)	1
24	5B	55	$	Dollar sign	1
3B	5E	56	;	Semicolon	1
3A	7A	57	:	Colon	1
3F	6F	58	?	Question	1
26	50	59	&	Ampersand	1
A4	45	60	¤	Lozenge	1
7C	6A	61	|	Vertical line	1
27	7D	62	'	Apostrophe	1
40	7C	63	@	Commercial at	1
2C	6B	64	,	Comma	1
				Array size	64

Table B—10. Modified ASCII (77L) Print Cartridge, 64 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	1	+	Plus	1
28	4D	2	(	Left parenthesis	1
29	5D	3	)	Right parenthesis	1
23	7B	4	#	Number sign	1
3D	7E	5	=	Equals	1
25	6C	6	%	Percent	1
2A	5C	7	*	Asterisk	1
3E	6E	8	>	Greater than	1
3C	4C	9	<	Less than	1
5A	E9	10	Z	Uppercase Z	1
59	E8	11	Y	Uppercase Y	1
58	E7	12	X	Uppercase X	1
57	E6	13	W	Uppercase W	1
56	E5	14	V	Uppercase V	1
55	E4	15	U	Uppercase U	1
54	E3	16	T	Uppercase T	1
53	E2	17	S	Uppercase S	1
52	D9	18	R	Uppercase R	1
30	F0	19	0	Numeric zero	2
51	D8	20	Q	Uppercase Q	1
50	D7	21	P	Uppercase P	1
4F	D6	22	O	Uppercase O	1
4E	D5	23	N	Uppercase N	1
4D	D4	24	M	Uppercase M	1
4C	D3	25	L	Uppercase L	1
4B	D2	26	K	Uppercase K	1
40	D1	27	J	Uppercase J	1
49	C9	28	I	Uppercase I	1
48	C8	29	H	Uppercase H	1
47	C7	30	G	Uppercase G	1
46	C6	31	F	Uppercase F	1
45	C5	32	E	Uppercase E	1
44	C4	33	D	Uppercase D	1
43	C3	34	C	Uppercase C	1
42	C2	35	B	Uppercase B	1
41	C1	36	A	Uppercase A	1
5B	4A	37	[	Left square bracket	1
5D	5A	38	]	Right square bracket	1
21	4F	39	|	Vertical line	1
5E	5F	40	¬	Logical not	1
5C	E0	41	\	Reverse slant (reverse solidus)	1
39	F9	42	9	Numeric nine	1
38	F8	43	8	Numeric eight	1
37	F7	44	7	Numeric seven	1
36	F6	45	6	Numeric six	1
35	F5	46	5	Numeric five	1
34	F4	47	4	Numeric four	1
33	F3	48	3	Numeric three	1
32	F2	49	2	Numeric two	1
31	F1	50	1	Numeric one	1
30	F0	51	0	Numeric zero	2
2E	4B	52	.	Period (full stop)	1
2D	60	53	-	Hyphen (minus)	1
2F	61	54	/	Slant (solidus)	1
24	5B	55	$	Dollar sign	1
3B	5E	56	;	Semicolon	1
3A	7A	57	:	Colon	1
3F	6F	58	?	Question	1
26	50	59	&	Ampersand	1
5F	6D	60	_	Underline (discontinuous)	1
40	7C	61	@	Commercial at	1
27	7D	62	'	Apostrophe	1
22	7F	63	"	Quotation	1
2C	6B	64	,	Comma	1
				Array size	64

Table B—11. Expanded ASCII Print Cartridge, 96 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
63	83	1	c	Lowercase c	1
62	82	2	b	Lowercase b	1
61	81	3	a	Lowercase a	1
39	F9	4	9	Numeric nine	1
38	F8	5	8	Numeric eight	1
37	F7	6	7	Numeric seven	1
36	F6	7	6	Numeric six	1
35	F5	8	5	Numeric five	1
34	F4	9	4	Numeric four	1
33	F3	10	3	Numeric three	1
32	F2	11	2	Numeric two	1
31	F1	12	1	Numeric one	1
30	F0	13	0	Numeric zero	2
A4	45	14	¤	International currency sign	1
7C	6A	15	|	Vertical line	1
5B	4A	16	[	Left square bracket	1
5D	5A	17	]	Right square bracket	1
7B	C0	18	{	Left brace bracket	1
7D	D0	19	}	Right brace bracket	1
2E	4B	20	.	Period (full stop)	1
2D	60	21	-	Hyphen (minus)	1
2F	61	22	/	Slant (solidus)	1
24	5B	23	$	Dollar sign	1
3B	5E	24	;	Semicolon	1
3A	7A	25	:	Colon	1
3F	6F	26	?	Question	1
26	50	27	&	Ampersand	1
5F	6D	28	_	Discontinuous underline	1
21	4F	29	!	Exclamation	1
27	7D	30	'	Acute accent (apostrophe)	1
22	7F	31	"	Quotation	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
28	4D	34	(	Left parenthesis	1
29	5D	35	)	Right parenthesis	1
23	7B	36	#	Number sign	1
3D	7E	37	=	Equals	1
25	6C	38	%	Percent	1
2A	5C	39	*	Asterisk	1
3E	6E	40	>	Greater than	1
3C	4C	41	<	Less than	1
5E	5F	42	^	Circumflex	1
5C	E0	43	\	Reverse slant (reverse solidus)	1
7E	A1	44	~	Tilde (overline)	1
60	79	45	`	Grave accent	1
40	7C	46	@	Commercial at	1

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
5A	E9	47	Z	Uppercase Z	1
59	E8	48	Y	Uppercase Y	1
58	E7	49	X	Uppercase X	1
57	E6	50	W	Uppercase W	1
30	F0	51	0	Numeric zero	2
56	E5	52	V	Uppercase V	1
55	E4	53	U	Uppercase U	1
54	E3	54	T	Uppercase T	1
53	E2	55	S	Uppercase S	1
52	D9	56	R	Uppercase R	1
51	D8	57	Q	Uppercase Q	1
50	D7	58	P	Uppercase P	1
4F	D6	59	O	Uppercase O	1
4E	D5	60	N	Uppercase N	1
4D	D4	61	M	Uppercase M	1
4C	D3	62	L	Uppercase L	1
4B	D2	63	K	Uppercase K	1
4A	D1	64	J	Uppercase J	1
49	C9	65	I	Uppercase I	1
48	C8	66	H	Uppercase H	1
47	C7	67	G	Uppercase G	1

Table B—11. Expanded ASCII Print Cartridge, 96 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
46	C6	68	F	Uppercase F	1
45	C5	69	E	Uppercase E	1
44	C4	70	D	Uppercase D	1
43	C3	71	C	Uppercase C	1
42	C2	72	B	Uppercase B	1
41	C1	73	A	Uppercase A	1
7A	A9	74	z	Lowercase z	1
79	A8	75	y	Lowercase y	1
78	A7	76	x	Lowercase x	1
77	A6	77	w	Lowercase w	1
76	A5	78	v	Lowercase v	1
75	A4	79	u	Lowercase u	1
74	A3	80	t	Lowercase t	1
73	A2	81	s	Lowercase s	1
72	99	82	r	Lowercase r	1
71	98	83	q	Lowercase q	1
70	97	84	p	Lowercase p	1
6F	96	85	o	Lowercase o	1
6E	95	86	n	Lowercase n	1
6D	94	87	m	Lowercase m	1
6C	93	88	l	Lowercase l	1
6B	92	89	k	Lowercase k	1
6A	91	90	j	Lowercase j	1
69	89	91	i	Lowercase i	1
68	88	92	h	Lowercase h	1
67	87	93	g	Lowercase g	1
66	86	94	f	Lowercase f	1
65	85	95	e	Lowercase e	1
64	84	96	d	Lowercase d	1
				Array size	96

Table B—12. Expanded Finland-Sweden Print Cartridge, 96 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
63	83	1	c	Lowercase c	1
62	82	2	b	Lowercase b	1
61	81	3	a	Lowercase a	1
39	F9	4	9	Numeric nine	1
38	F8	5	8	Numeric eight	1
37	F7	6	7	Numeric seven	1
36	F6	7	6	Numeric six	1
35	F5	8	5	Numeric five	1
34	F4	9	4	Numeric four	1
33	F3	10	3	Numeric three	1
32	F2	11	2	Numeric two	1
31	F1	12	1	Numeric one	1
30	F0	13	0	Numeric zero	2
A4	45	14	¤	International currency sign	1
60	79	15	é	Lowercase e with acute accent	1
7B	C0	16	ä	Lowercase a with diaeresis	1
7C	6A	17	ö	Lowercase o with diaeresis	1
7D	D0	18	å	Lowercase a with circle	1
7E	A1	19	ü	Lowercase u with diaeresis	1
2E	48	20	.	Period (full stop)	1
2D	60	21	-	Hyphen (minus)	1
2F	61	22	/	Slant (solidus)	1
24	5B	23	$	Dollar sign	1
3B	5E	24	;	Semicolon	1
3A	7A	25	:	Colon	1
3F	6F	26	?	Question	1
26	50	27	&	Ampersand	1
5F	6D	28	_	Discontinuous underline	1
21	4F	29	!	Exclamation	1
27	7D	30	'	Apostrophe	1
22	7F	31	"	Quotation	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
28	4D	34	(	Left parenthesis	1
29	5D	35	)	Right parenthesis	1
23	7B	36	#	Number sign	1
3D	7E	37	=	Equals	1
25	6C	38	%	Percent	1
2A	5C	39	*	Asterisk	1
3E	6E	40	>	Greater than	1
3C	4C	41	<	Less than	1
40	7C	42	É	Uppercase E with acute accent	1
5B	E2	43	Ä	Uppercase A with diaeresis	1
5C	E0	44	Ö	Uppercase O with diaeresis	1
5D	5A	45	Å	Uppercase A with circle	1
5E	5F	46	Ü	Uppercase U with diaeresis	1
5A	E9	47	Z	Uppercase Z	1
59	E8	48	Y	Uppercase Y	1
58	E7	49	X	Uppercase X	1
57	E6	50	W	Uppercase W	1
30	F0	51	0	Numeric zero	2
56	E5	52	V	Uppercase V	1
55	E4	53	U	Uppercase U	1
54	E3	54	T	Uppercase T	1
53	E2	55	S	Uppercase S	1
52	D9	56	R	Uppercase R	1
51	D8	57	Q	Uppercase Q	1
50	D7	58	P	Uppercase P	1
4F	D6	59	O	Uppercase O	1
4E	D5	60	N	Uppercase N	1
4D	D4	61	M	Uppercase M	1
4C	D3	62	L	Uppercase L	1
4B	D2	63	K	Uppercase K	1
4A	D1	64	J	Uppercase J	1
49	C9	65	I	Uppercase I	1
48	C8	66	H	Uppercase H	1
47	C7	67	G	Uppercase G	1
46	C6	68	F	Uppercase F	1
45	C5	69	E	Uppercase E	1
44	C4	70	D	Uppercase D	1
43	C3	71	C	Uppercase C	1
42	C2	72	B	Uppercase B	1
41	C1	73	A	Uppercase A	1
7A	A9	74	z	Lowercase z	1
79	A8	75	y	Lowercase y	1
78	A7	76	x	Lowercase x	1
77	A6	77	w	Lowercase w	1
76	A5	78	v	Lowercase v	1
75	A4	79	u	Lowercase u	1
74	A3	80	t	Lowercase t	1
73	A2	81	s	Lowercase s	1
72	99	82	r	Lowercase r	1
71	98	83	q	Lowercase q	1
70	97	84	p	Lowercase p	1
6F	96	85	o	Lowercase o	1
6E	95	86	n	Lowercase n	1
6D	94	87	m	Lowercase m	1
6C	93	88	l	Lowercase l	1
6B	92	89	k	Lowercase k	1
6A	91	90	j	Lowercase j	1
69	89	91	i	Lowercase ı	1
68	88	92	h	Lowercase h	1
67	87	93	g	Lowercase g	1
66	86	94	f	Lowercase f	1
65	85	95	e	Lowercase e	1
64	84	96	d	Lowercase d	1
				Array size	96

Table B—13. Universal OCR-B (ISO) Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	1	2	Numeric two	3
31	F1	2	1	Numeric one	3
30	F0	3	0	Numeric zero	3
27	7D	4	'	Apostrophe	2
28	4D	5	(	Left parenthesis	2
29	5D	6	)	Right parenthesis	2
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	2
25	6C	9	%	Percent	2
2F	61	10	/	Slant (solidus)	2
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	.	Period (full stop)	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	,	Comma	3
5F	6D	19	_	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	Left square bracket	1
5D	5A	23	]	Right square bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	9	Numeric nine	3
38	F8	38	8	Numeric eight	3
37	F7	39	7	Numeric seven	3
36	F6	40	6	Numeric six	3
35	F5	41	5	Numeric five	3
34	F4	42	4	Numeric four	3
33	F3	43	3	Numeric three	3
32	F2	44	2	Numeric two	3
31	F1	45	1	Numeric one	3
30	F0	46	0	Numeric zero	3
4B	D2	47	K	Uppercase K	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	.	Period (full stop)	3
2D	60	59	-	Hyphen (minus)	3
2A	5C	60	*	Asterisk	3
2C	6B	61	,	Comma	3
40	7C	62	@	Commercial at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	Colon	1
3B	5E	65	;	Semicolon	1
3E	6E	66	>	Greater than	1
3C	4C	67	<	Less than	1
27	7D	68	'	Apostrophe	2
28	4D	69	(	Left parenthesis	2
29	5D	70	)	Right parenthesis	2
23	7B	71	#	Number sign	2
3D	7E	72	=	Equals	2
25	6C	73	%	Percent	2
2F	61	74	/	Slant (solidus)	2
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2

Table B—13. Universal OCR-B (ISO) Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	.	Period (full stop)	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	,	Comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	"	Quotation	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

Table B—14. Universal OCR H-14 Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	1	2	Numeric two	3
31	F1	2	1	Numeric one	3
30	F0	3	0	Numeric zero	3
27	7D	4	'	Apostrophe	2
28	4D	5	(	Left parenthesis	2
29	5D	6	)	Right parenthesis	2
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	2
25	6C	9	%	Percent	2
2F	61	10	/	Slant (solidus)	2
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	.	Period (full stop)	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	,	Comma	3
5F	6D	19	_	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	Left square bracket	1
5D	5A	23	]	Right square bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	9	Numeric nine	3
38	F8	38	8	Numeric eight	3
37	F7	39	7	Numeric seven	3
36	F6	40	6	Numeric six	3
35	F5	41	5	Numeric five	3
34	F4	42	4	Numeric four	3
33	F3	43	3	Numeric three	3
32	F2	44	2	Numeric two	3
31	F1	45	1	Numeric one	3
30	F0	46	0	Numeric zero	3

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4B	D2	47	K	Uppercase K	2
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	.	Period (full stop)	3
2D	60	59	-	Hyphen (minus	3
2A	5C	60	*	Asterisk	3
2C	6B	61	,	Comma	3
40	7C	62	@	Commercial at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	Colon	1
3B	5E	65	;	Semicolon	1
3E	6E	66	>	Greater than	1
2C	4C	67	<	Less than	1
27	7D	68	'	Apostrophe	2
28	4D	69	(	Left parenthesis	2
29	5D	70	)	Right parenthesis	2
23	7B	71	#	Number sign	2
3D	7E	72	=	Equals	2
25	6C	73	%	Percent	2
2F	61	74	/	Slant (solidus)	2
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2

Table B—14. Universal OCR H-14 Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	.	Period (full stop)	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	,	Comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	"	Quotation	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

NOTE:

The Universal OCR H-14 print cartridge (Table A—14) uses the same character types as the Universal OCR-B (ISO) print cartridge (Table A—13), except that character sizes are smaller on the OCR H-14 print cartridge, as required for printing at 8 lpi (3.17 mm per line).

Table B—15. Universal OCR-A (ISO) Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	1	ᒉ	Numeric two	3
31	F1	2	ᒐ	Numeric one	3
30	F0	3	ᑐ	Numeric zero	3
27	7D	4	'	Apostrophe	2
28	4D	5	(	Left parenthesis	2
29	5D	6	)	Right parenthesis	2
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	1
25	6C	9	%	Percent	1
2F	61	10	/	Slant (solidus)	1
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	.	Period (full stop)	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	,	Comma	3
5F	6D	19	_	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	Left square bracket	1
5D	5A	23	]	Right square bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	ᒣ	Numeric nine	3
38	F8	38	ᒡ	Numeric eight	3
37	F7	39	ᒉ	Numeric seven	3
36	F6	40	ᒦ	Numeric six	3
35	F5	41	ᒪ	Numeric five	3
34	F4	42	ᒧ	Numeric four	3
33	F3	43	ᒣ	Numeric three	3
32	F2	44	ᒉ	Numeric two	3
31	F1	45	ᒐ	Numeric one	3
30	F0	46	ᑐ	Numeric zero	3
4B	D2	47	K	Uppercase K	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	.	Period (full stop)	3
2D	60	59	-	Hyphen (minus	3
2A	5C	60	*	Asterisk	3
2C	6B	61	,	Comma	3
40	7C	62	@	Commercial at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	Colon	1
3B	5E	65	;	Semicolon	1
3E	6E	66	>	Greater than	1
3C	4C	67	<	Less than	1
27	7D	68	'	Apostrophe	2
28	4D	69	(	Left parenthesis	2
29	5D	70	)	Right parenthesis	2
23	7B	71	#	Number sign	2
DF	B7	72	ᒣ	Fork	2
FE	FE	73	ᒪ	Hook	1
E0	B8	74	ᒧ	Chair	1
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2

Table B—15. Universal OCR-A (ISO) Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	.	Period (full stop)	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	,	Comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	"	Quotation	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

Table B—16. Universal OCR-B (ECMA-11) Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	1	2	Numeric two	3
31	F1	2	1	Numeric one	3
30	F0	3	0	Numeric zero	3
27	7D	4	'	Apostrophe	2
28	4D	5	(	Left parenthesis	2
29	5D	6	)	Right parenthesis	2
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	2
25	6C	9	%	Percent	2
2F	61	10	/	Slant (solidus)	2
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	.	Period (full stop)	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	,	Comma	3
5F	6D	19	_	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	Left square bracket	1
5D	5A	23	]	Right square bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	9	Numeric nine	3
38	F8	38	8	Numeric eight	3
37	F7	39	7	Numeric seven	3
36	F6	40	6	Numeric six	3
35	F5	41	5	Numeric five	3
34	F4	42	4	Numeric four	3
33	F3	43	3	Numeric three	3
32	F2	44	2	Numeric two	3
31	F1	45	1	Numeric one	3
30	F0	46	0	Numeric zero	3
4B	D2	47	K	Uppercase K	2
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	.	Period (full stop)	3
2D	60	59	-	Hyphen (minus)	3
2A	5C	60	*	Asterisk	3
2C	6B	61	,	Comma	3
40	7C	62	@	Commercial at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	Colon	1
3B	5E	65	;	Semicolon	1
3E	6E	66	>	Greater than	1
3C	4C	67	<	Less than	1
27	7D	68	'	Apostrophe	2
28	4D	69	(	Left parenthesis	2
29	5D	70	)	Right parenthesis	2
23	7B	71	#	Number sign	2
3D	7E	72	=	Equals	2
25	6C	73	%	Percent	2
2F	61	74	/	Slant (solidus)	2
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2

Table B—16. Universal OCR-B (ECMA-11) Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	.	Period (full stop)	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	,	Comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	"	Quotation	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

Table B—17. Universal 77L Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	1	2	Numeric two	3
31	F1	2	1	Numeric one	3
30	F0	3	0	Numeric zero	3
27	7D	4	'	Apostrophe	2
28	4D	5	(	Left parenthesis	2
29	5D	6	)	Right parenthesis	2
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	2
25	6C	9	%	Percent	2
2F	61	10	/	Slant (solidus)	2
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	.	Period (full stop)	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	,	Comma	3
5F	6D	19	—	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	Left square bracket	1
5D	5A	23	]	Right square bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	9	Numeric nine	3
38	F8	38	8	Numeric eight	3
37	F7	39	7	Numeric seven	3
36	F6	40	6	Numeric six	3
35	F5	41	5	Numeric five	3
34	F4	42	4	Numeric four	3
33	F3	43	3	Numeric three	3
32	F2	44	2	Numeric two	3
31	F1	45	1	Numeric one	3
30	F0	46	0	Numeric zero	3
4B	D2	47	K	Uppercase K	2
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	.	Period (full stop)	3
2D	60	59	-	Hyphen (minus)	3
2A	5C	60	*	Asterisk	3
2C	6B	61	,	Comma	3
40	7C	62	@	Commercial at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	Colon	1
3B	5E	65	;	Semicolon	1
3E	6E	66	>	Greater than	1
3C	4C	67	<	Less than	1
27	7D	68	'	Apostrophe	2
28	4D	69	(	Left parenthesis	2
29	5D	70	)	Right parenthesis	2
23	7B	71	#	Number sign	2
3D	7E	72	=	Equals	2
25	6C	73	%	Percent	2
2F	61	74	/	Slant (solidus)	2
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2

Table B—17. Universal 77L Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	.	Period (full stop)	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	,	Comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	"	Quotation	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

Table B—18. COBOL-FORTRAN Business Print Cartridge, 192 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
55	E4	1	U	Uppercase U	4
54	E3	2	T	Uppercase T	4
53	E2	3	S	Uppercase S	4
51	D8	4	Q	Uppercase Q	3
2E	4B	5	.	Period (full stop)	3
2C	6B	6	,	Comma	3
2A	5C	7	*	Asterisk	3
40	7C	8	@	Commercial at	3
52	D9	9	R	Uppercase R	4
50	D7	10	P	Uppercase P	4
4F	D6	11	O	Uppercase O	4
4E	D5	12	N	Uppercase N	4
4D	D4	13	M	Uppercase M	4
4C	D3	14	L	Uppercase L	4
4B	D2	15	K	Uppercase K	4
4A	D1	16	J	Uppercase J	4
28	4D	17	(	Left parenthesis	2
29	5D	18	)	Right parenthesis	2
49	C9	19	I	Uppercase I	4
48	C8	20	H	Uppercase H	4
47	C7	21	G	Uppercase G	4
46	C6	22	F	Uppercase F	4
45	C5	23	E	Uppercase E	4
44	C4	24	D	Uppercase D	4
43	C3	25	C	Uppercase C	4
42	C2	26	B	Uppercase B	4
41	C1	27	A	Uppercase A	4
3E	6E	28	>	Greater than	2
3C	4C	29	<	Less than	2
27	7D	30	'	Apostrophe	2
3B	5E	31	;	Semicolon	2
2F	61	32	/	Slant (solidus)	3
2B	4E	33	+	Plus	3
24	5B	34	$	Dollar sign	3
22	7F	35	"	Quotation	2
3D	7E	36	=	Equals	3
A3	44	37	£	Pound sterling	3
39	F9	38	9	Numeric nine	4
38	F8	39	8	Numeric eight	4
37	F7	40	7	Numeric seven	4
36	F6	41	6	Numeric six	4
35	F5	42	5	Numeric five	4
34	F4	43	4	Numeric four	4
33	F3	44	3	Numeric three	4
32	F2	45	2	Numeric two	4
31	F1	46	1	Numeric one	4
30	F0	47	0	Numeric zero	4
59	E8	48	Y	Uppercase Y	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
58	E7	49	X	Uppercase X	4
26	50	50	&	Ampersand	1
5C	E0	51	¥	Yen sign	3
2D	60	52	-	Hyphen (minus)	3
5A	E9	53	Z	Uppercase Z	2
57	E6	54	W	Uppercase W	4
56	E5	55	V	Uppercase V	4
55	E4	56	U	Uppercase U	4
54	E3	57	T	Uppercase T	4
53	E2	58	S	Uppercase S	4
52	D9	59	R	Uppercase R	4
50	D7	60	P	Uppercase P	4
4F	D6	61	O	Uppercase O	4
4E	D5	62	N	Uppercase N	4
4D	D4	63	M	Uppercase M	4
4C	D3	64	L	Uppercase L	4
4B	D2	65	K	Uppercase K	4
4A	D1	66	J	Uppercase J	4
49	C9	67	I	Uppercase I	4
48	C8	68	H	Uppercase H	4
51	D8	69	Q	Uppercase Q	3
2E	4B	70	.	Period (full stop)	3
2C	6B	71	,	Comma	3
2A	5C	72	*	Asterisk	3
40	7C	73	@	Commerical at	3
47	C7	74	G	Uppercase G	4
46	C6	75	F	Uppercase F	4
45	C5	76	E	Uppercase E	4
44	C4	77	D	Uppercase D	4
43	C3	78	C	Uppercase C	4
42	C2	79	B	Uppercase B	4
41	C1	80	A	Uppercase A	4
39	F9	81	9	Numeric nine	4
38	F8	82	8	Numeric eight	4
37	F7	83	7	Numeric seven	4
36	F6	84	6	Numeric six	4
35	F5	85	5	Numeric five	4
34	F4	86	4	Numeric four	4
33	F3	87	3	Numeric three	4
32	F2	88	2	Numeric two	4
31	F1	89	1	Numeric one	4
30	F0	90	0	Numeric zero	4
59	E8	91	Y	Uppercase Y	4
58	E7	92	X	Uppercase X	4
57	E6	93	W	Uppercase W	4
56	E5	94	V	Uppercase V	4
55	E4	95	U	Uppercase U	4
2F	61	96	/	Slant (solidus)	3

Table B—18. COBOL-FORTRAN Business Print Cartridge, 192 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	97	+	Plus	3
24	5B	98	$	Dollar sign	3
3D	7E	99	=	Equals	3
A3	44	100	£	Pound sterling	3
54	E6	101	T	Uppercase T	4
53	E2	102	S	Uppercase S	4
52	D9	103	R	Uppercase R	4
50	D7	104	P	Uppercase P	4
4F	D6	105	O	Uppercase O	4
4E	D5	106	N	Uppercase N	4
4D	D4	107	M	Uppercase M	4
4C	D3	108	L	Uppercase L	4
4B	D2	109	K	Uppercase K	4
4A	D1	110	J	Uppercase J	4
49	C9	111	I	Uppercase I	4
48	C8	112	H	Uppercase H	4
28	4D	113	(	Left parenthesis	2
29	5D	114	)	Right parenthesis	2
5C	E0	115	¥	Yen sign	3
2D	60	116	-	Hyphen (minus)	3
47	C7	117	G	Uppercase G	4
46	C6	118	F	Uppercase F	4
45	C5	119	E	Uppercase E	4
44	C4	120	D	Uppercase D	4
43	C3	121	C	Uppercase C	4
42	C2	122	B	Uppercase B	4
41	C1	123	A	Uppercase A	4
3E	6E	124	>	Greater than	2
3C	4C	125	<	Less than	2
23	7B	126	#	Number sign	1
25	6C	127	%	Percent sign	1
27	7D	128	'	Apostrophe	2
3B	5E	129	;	Semicolon	2
A4	45	130	¤	International currency sign	1
22	7F	131	"	Quotation	2
51	D8	132	Q	Uppercase Q	3
2E	4B	133	.	Period (full stop)	3
2C	6B	134	,	Comma	3
2A	5C	135	*	Asterisk	3
40	7C	136	@	Commercial at	3
39	F9	137	9	Numeric nine	4
38	F8	138	8	Numeric eight	4
37	F7	139	7	Numeric seven	4
36	F6	140	6	Numeric six	4
35	F5	141	5	Numeric five	4
34	F4	142	4	Numeric four	4
33	F3	143	3	Numeric three	4
32	F2	144	2	Numeric two	4
31	F1	145	1	Numeric one	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
30	F0	146	0	Numeric zero	4
5A	E9	147	Z	Uppercase Z	2
59	E8	148	Y	Uppercase Y	4
58	E7	149	X	Uppercase X	4
57	E6	150	W	Uppercase W	4
56	E5	151	V	Uppercase V	4
55	E4	152	U	Uppercase U	4
54	E3	153	T	Uppercase T	4
53	E2	154	S	Uppercase S	4
52	D9	155	R	Uppercase R	4
50	D7	156	P	Uppercase P	4
4F	D6	157	O	Uppercase O	4
4E	D5	158	N	Uppercase N	4
4D	D4	159	M	Uppercase M	4
4C	D3	160	L	Uppercase L	4
2F	61	161	/	Slant (solidus)	3
2B	4E	162	+	Plus	3
24	5B	163	$	Dollar sign	3
3D	7E	164	=	Equals	3
A3	44	165	£	Pound sterling sign	3
4B	D2	166	K	Uppercase K	4
4A	D1	167	J	Uppercase J	4
49	C9	168	I	Uppercase I	4
48	C8	169	H	Uppercase H	4
47	C7	170	G	Uppercase G	4
46	C6	171	F	Uppercase F	4
45	C5	172	E	Uppercase E	4
44	C4	173	D	Uppercase D	4
43	C3	174	C	Uppercase C	4
42	C2	175	B	Uppercase B	4
41	C1	176	A	Uppercase A	4
5C	E0	177	¥	Yen sign	3
2D	60	178	-	Hyphen (minus)	3
39	F9	179	9	Numeric nine	4
38	F8	180	8	Numeric eight	4
37	F7	181	7	Numeric seven	4
36	F6	182	6	Numeric six	4
35	F5	183	5	Numeric five	4
34	F4	184	4	Numeric four	4
33	F3	185	3	Numeric three	4
32	F2	186	2	Numeric two	4
31	F1	187	1	Numeric one	4
30	F0	188	0	Numeric zero	4
59	E8	189	Y	Uppercase Y	4
58	E7	190	X	Uppercase X	4
57	E6	191	W	Uppercase W	4
56	E5	192	V	Uppercase V	4
				Array size	192

Table B—19. International Print Cartridge, 384 Characters (Part 1 of 4)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
79	A8	1	y	Lowercase y	2
78	A7	2	x	Lowercase x	2
77	A6	3	w	Lowercase w	2
76	A5	4	v	Lowercase v	2
75	A4	5	u	Lowercase u	2
74	A3	6	t	Lowercase t	2
73	A2	7	s	Lowercase s	2
72	99	8	r	Lowercase r	2
71	98	9	q	Lowercase q	2
70	97	10	p	Lowercase p	2
6F	96	11	o	Lowercase o	2
6E	95	12	n	Lowercase n	2
6D	94	13	m	Lowercase m	2
6C	93	14	l	Lowercase l	2
6B	92	15	k	Lowercase k	2
6A	91	16	j	Lowercase j	2
69	89	17	i	Lowercase i	2
68	88	18	h	Lowercase h	2
67	87	19	g	Lowercase g	2
66	86	20	f	Lowercase f	2
65	85	21	e	Lowercase e	2
64	84	22	d	Lowercase d	2
63	83	23	c	Lowercase c	2
62	82	24	b	Lowercase b	2
61	81	25	a	Lowercase a	2
40	7C	26	@	Commercial at	2
E8	CA	27	ö	Lowercase o with diaeresis	2
F9	EF	28	ü	Lowercase u with diaeresis	2
A3	44	29	£	Pound sterling sign	4
D3	AB	30	Ć	Uppercase C with acute accent	1
D4	AC	31	Č	Uppercase C with hacek	1
3A	7A	32	:	Colon	4
BB	71	33	°	Angstrom	1
D6	AE	34	İ	Uppercase I with dot	1
3F	6F	35	?	Question	2
24	5B	36	$	Dollar sign	4
23	7B	37	#	Number sign	4
3D	7E	38	=	Equals	4
39	F9	39	9	Numeric nine	4
38	F8	40	8	Numeric eight	4
37	F7	41	7	Numeric seven	4
36	F6	42	6	Numeric six	4
35	F5	43	5	Numeric five	4
34	F4	44	4	Numeric four	4
33	F3	45	3	Numeric three	4
32	F2	46	2	Numeric two	4
31	F1	47	1	Numeric one	4
30	F0	48	0	Numeric zero	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
BF	75	49	¿	Inverted question mark	1
2C	6B	50	,	Comma	4
2D	60	51	-	Hyphen (minus)	4
59	E8	52	Y	Uppercase Y	4
58	E7	53	X	Uppercase X	4
57	E6	54	W	Uppercase W	4
56	E5	55	V	Uppercase V	4
55	E4	56	U	Uppercase U	4
54	E3	57	T	Uppercase T	4
53	E2	58	S	Uppercase S	4
52	D9	59	R	Uppercase R	4
50	D7	60	P	Uppercase P	4
4F	D6	61	O	Uppercase O	4
4E	D5	62	N	Uppercase N	4
4D	D4	63	M	Uppercase M	4
4C	D3	64	L	Uppercase L	4
3B	5E	65	;	Semicolon	3
4B	D2	66	K	Uppercase K	4
25	6C	67	%	Percent	3
4A	D1	68	J	Uppercase J	4
49	C9	69	I	Uppercase I	4
48	C8	70	H	Uppercase H	4
47	C7	71	G	Uppercase G	4
46	C6	72	F	Uppercase F	4
45	C5	73	E	Uppercase E	4
44	C4	74	D	Uppercase D	4
43	C3	75	C	Uppercase C	4
42	C2	76	B	Uppercase B	4
41	C1	77	A	Uppercase A	4
2A	5C	78	*	Asterisk	4
2E	4B	79	.	Period (full stop)	4
2B	4E	80	+	Plus	4
2F	61	81	/	Slant (solidus)	4
28	4D	82	(	Left parenthesis	4
29	5D	83	)	Right parenthesis	4
26	50	84	&	Ampersand	3
D5	AD	85	ì	Lowercase i with grave accent	1
3E	6E	86	>	Greater than	4
3C	4C	87	<	Less than	4
27	7D	88	'	Acute accent (apostrophe)	4
BE	74	89	ʾ	Alif	1
5F	6D	90	—	Discontinuous underline	4
21	4F	91	!	Exclamation	4
22	7F	92	"	Quotation	4
D0	9F	93	Á	Uppercase A with acute accent	1
D1	A0	94	À	Uppercase A with grave accent	1
C2	78	95	Ã	Uppercase A with tilde	1

Table B—19. International Print Cartridge, 384 Characters (Part 2 of 4)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
C3	80	96	Ç	Uppercase C with cedilla	1
C4	8A	97	Đ	Uppercase D with cross	1
CC	9B	98	Ł	Uppercase L with slant (Poland)	1
A7	48	99	˝	Double acute accent	1
CD	9C	100	M̃	Uppercase M with tilde	1
EA	CC	101	ù	Lowercase u with grave accent	1
C7	8D	102	Ø	Uppercase O with slant	1
C9	8F	103	Œ	Uppercase OE diphthong	1
F0	DC	104	á	Lowercase a with acute accent	1
F1	DD	105	à	Lowercase a with grave accent	1
F2	DE	106	æ	Lowercase ae diphthong	1
E4	BC	107	đ	Lowercase d with cross	1
E5	BD	108	é	Lowercase e with acute accent	1
AC	54	109	'	High comma (centered)	1
B3	63	110	®	Registration mark	1
A1	42	111	¡	Inverted exclamation	1
E6	BE	112	ij	Lowercase ij (Holland)	1
F8	EE	113	ò	Lowercase o with grave accent	1
F7	ED	114	õ	Lowercase o with tilde	1
E7	BF	115	ø	Lowercase o with slant	1
51	D8	116	Q	Uppercase Q	3
5A	E9	117	Z	Uppercase Z	3
E9	CB	118	œ	Lowercase oe diphthong	1
EF	DB	119	þ	Lowercase thorn (Iceland)	1
5E	5F	120	^	Circumflex	1
D9	B1	121	Ü	Uppercase U with diaeresis	2
C8	8E	122	Ö	Uppercase O with diaeresis	2
60	79	123	`	Grave accent	2
DA	B2	124	Ž	Uppercase Z with hacek	1
A3	44	125	£	Pound sterling sign	4
5B	4A	126	[	Left square bracket	2
5D	5A	127	]	Right square bracket	2
3A	7A	128	:	Colon	4
E0	B8	129	¦	Vertical line—broken	1
A4	45	130	¤	International currency sign	2
AB	53	131	±	Plus or minus	1
24	5B	132	$	Dollar sign	4
23	7B	133	#	Number sign	4
3D	7E	134	=	Equals	4
39	F9	135	9	Numeric nine	4
38	F8	136	8	Numeric eight	4
37	F7	137	7	Numeric seven	4
36	F6	138	6	Numeric six	4
35	F5	139	5	Numeric five	4
34	F4	140	4	Numeric four	4
33	F3	141	3	Numeric three	4
32	F2	142	2	Numeric two	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
31	F1	143	1	Numeric one	4
30	F0	144	0	Numeric zero	4
FB	FB	145	š	Lowercase s with hacek	1
2C	6B	146	,	Comma	4
2D	60	147	-	Hyphen (minus)	4
A5	46	148	¥	Yen sign	1
59	E8	149	Y	Uppercase Y	4
58	E7	150	X	Uppercase X	4
57	E6	151	W	Uppercase W	4
56	E5	152	V	Uppercase V	4
55	E4	153	U	Uppercase U	4
54	E3	154	T	Uppercase T	4
53	E2	155	S	Uppercase S	4
52	D9	156	R	Uppercase R	4
50	D7	157	P	Uppercase P	4
4F	D6	158	O	Uppercase O	4
4E	D5	159	N	Uppercase N	4
4D	D4	160	M	Uppercase M	4
4C	D3	161	L	Uppercase L	4
4B	D2	162	K	Uppercase K	4
3F	6F	163	?	Question	2
4A	D1	164	J	Uppercase J	4
49	C9	165	I	Uppercase I	4
48	C8	166	H	Uppercase H	4
47	C7	167	G	Uppercase G	4
46	C6	168	F	Uppercase F	4
45	C5	169	E	Uppercase E	4
44	C4	170	D	Uppercase D	4
43	C3	171	C	Uppercase C	4
42	C2	172	B	Uppercase B	4
41	C1	173	A	Uppercase A	4
2A	5C	174	*	Asterisk	4
2E	4B	175	.	Period (full stop)	4
2B	4E	176	+	Plus	4
2F	61	177	/	Slant (solidus)	4
28	4D	178	(	Left parenthesis	4
29	5D	179	)	Right parenthesis	4
DE	B6	180	¬	Logical not	1
BC	72	181	˘	Breve	1
3E	6E	182	>	Greater than	4
3C	4C	183	<	Less than	4
27	7D	184	'	Acute accent (apostrophe)	4
5F	6D	185	—	Discontinuous underline	4
21	4F	186	!	Exclamation	4
22	7F	187	"	Quotation	4
CB	9A	188	Ş	Uppercase S with cedilla	1
DB	B3	189	Š	Uppercase S with hacek	1

Table B—19. International Print Cartridge, 384 Characters (Part 3 of 4)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
7A	A9	190	z	Lowercase z	2
79	A8	191	y	Lowercase y	2
78	A7	192	x	Lowercase x	2
3B	5E	193	;	Semicolon	3
77	A6	194	w	Lowercase w	2
25	6C	195	%	Percent	3
76	A5	196	v	Lowercase v	2
75	A4	197	u	Lowercase u	2
74	A3	198	t	Lowercase t	2
73	A2	199	s	Lowercase s	2
72	99	200	r	Lowercase r	2
71	98	201	q	Lowercase q	2
70	97	202	p	Lowercase p	2
6F	96	203	o	Lowercase o	2
6E	95	204	n	Lowercase n	2
6D	94	205	m	Lowercase m	2
6C	93	206	l	Lowercase l	2
6B	92	207	k	Lowercase k	2
6A	91	208	j	Lowercase j	2
69	89	209	i	Lowercase i	2
68	88	210	h	Lowercase h	2
67	87	211	g	Lowercase g	2
26	50	212	&	Ampersand	3
66	86	213	f	Lowercase f	2
65	85	214	e	Lowercase e	2
64	84	215	d	Lowercase d	2
63	83	216	c	Lowercase c	2
62	82	217	b	Lowercase b	2
61	81	218	a	Lowercase a	2
40	7C	219	@	Commercial at	2
E8	CA	220	ö	Lowercase o with diaeresis	2
F9	EF	221	ü	Lowercase u with diaeresis	2
A3	44	222	£	Pound sterling sign	4
F4	EA	223	č	Lowercase c with hacek	1
E3	BB	224	ç	Lowercase c with cedilla	1
3A	7A	225	:	Colon	4
0F	0F	226	ć	Lowercase c with acute accent	1
DD	B5	227	ğ	Lowercase g with hacek	1
24	5B	228	$	Dollar sign	4
23	7B	229	#	Number sign	4
3D	7E	230	=	Equals	4
39	F9	231	9	Numeric nine	4
38	F8	232	8	Numeric eight	4
37	F7	233	7	Numeric seven	4
36	F6	234	6	Numeric six	4
35	F5	235	5	Numeric five	4
34	F4	236	4	Numeric four	4
33	F3	237	3	Numeric three	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	238	2	Numeric two	4
31	F1	239	1	Numeric one	4
30	F0	240	0	Numeric zero	4
EB	CD	241	ş	Lowercase s with cedilla	1
2C	6B	242	,	Comma	4
2D	60	243	-	Hyphen (minus)	4
51	D8	244	Q	Uppercase Q	3
5A	E9	245	Z	Uppercase Z	3
59	E8	246	Y	Uppercase Y	4
58	E7	247	X	Uppercase X	4
57	E6	248	W	Uppercase W	4
56	E5	249	V	Uppercase V	4
55	E4	250	U	Uppercase U	4
54	E3	251	T	Uppercase T	4
53	E2	252	S	Uppercase S	4
52	D9	253	R	Uppercase R	4
50	D7	254	P	Uppercase P	4
4F	D6	255	O	Uppercase O	4
4E	D5	256	N	Uppercase N	4
4D	D4	257	M	Uppercase M	4
4C	D3	258	L	Uppercase L	4
4B	D2	259	K	Uppercase K	4
4A	D1	260	J	Uppercase J	4
49	C9	261	I	Uppercase I	4
48	C8	262	H	Uppercase H	4
47	C7	263	G	Uppercase G	4
46	C6	264	F	Uppercase F	4
45	C5	265	E	Uppercase E	4
44	C4	266	D	Uppercase D	4
43	C3	267	C	Uppercase C	4
42	C2	268	B	Uppercase B	4
41	C1	269	A	Uppercase A	4
2A	5C	270	*	Asterisk	4
2E	4B	271	.	Period (full stop)	4
2B	4E	272	+	Plus	4
2F	61	273	/	Slant (solidus)	4
28	4D	274	(	Left parenthesis	4
29	5D	275	)	Right parenthesis	4
FE	FE	276	—	Discontinuous overline	1
AA	52	277	‡	Double dagger	1
3E	6E	278	>	Greater than	4
3C	4C	279	<	Less than	4
27	7D	280	'	Acute accent (apostrophe)	4
FA	FA	281	ž	Lowercase z with hacek	1
5F	6D	282	—	Discontinuous underline	4
21	4F	283	!	Exclamation	4
22	7F	284	"	Quotation	4
C0	76	285	Ä	Uppercase A with diaeresis	2
C1	77	286	Å	Uppercase A with circle	2

Table B—19. International Print Cartridge, 384 Characters (Part 4 of 4)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
D2	AA	287	AE	Uppercase AE diphthong	1
C5	8B	288	É	Uppercase E with acute accent	1
C6	8C	289	IJ	Uppercase IJ (Holland)	1
CE	9D	290	Ñ	Uppercase N with tilde	1
3F	6F	291	?	Question	1
D8	B0	292	Ó	Uppercase O with acute accent	1
D7	AF	293	Õ	Uppercase O with tilde	1
DC	B4	294	ß	Double S (German)	1
B3	63	295	"	Left double quotes	1
B2	62	296	"	Right double quotes	1
F5	EB	297	è	Lowercase e with grave accent	1
CF	9E	298	Þ	Uppercase thorn (Iceland)	1
AE	56	299	▭	Conjunctive symbol	1
BD	73	300	©	Copyright	1
B4	64	301	ʿ	Ayn	1
E2	BA	302	ã	Lowercase a with tilde	1
9F	E1	303	ä	Lowercase a with diaeresis	1
E1	B9	304	å	Lowercase a with a circle	1
DF	B7	305	ð	ETH (Iceland)	1
B0	58	306	§	Section	1
EA	CC	307	ı	Lowercase ı (Turkey)	1
ED	CF	308	m̃	Lowercase m with tilde	1
BA	70	309	¨	Diaeresis (umlaut)	1
EE	DA	310	ñ	Lowercase n with tilde	1
EC	CE	311	ł	Lowercase l with cross (Poland)	1
7C	6A	312	|	Vertical line	1
D9	B1	313	Ü	Uppercase U with diaeresis	2
C8	8E	314	Ö	Uppercase O with diaeresis	2
60	79	315	`	Grave accent	2
5C	E0	316	\	Reverse slant (reverse solidus)	1
A3	44	317	£	Pound sterling sign	4
5B	4A	318	[	Left square bracket	2
5D	5A	319	]	Right square bracket	2
3A	7A	320	:	Colon	4
3B	5E	321	;	Semicolon	3
A4	45	322	¤	International currency sign	2
25	6C	323	%	Percent	3
24	5B	324	$	Dollar sign	4
23	7B	325	#	Number sign	4
3D	7E	326	=	Equals	4
39	F9	327	9	Numeric nine	4
38	F8	328	8	Numeric eight	4
37	F7	329	7	Numeric seven	4
36	F6	330	6	Numeric six	4
35	F5	331	5	Numeric five	4
34	F4	332	4	Numeric four	4
33	F3	333	3	Numeric three	4
32	F2	334	2	Numeric two	4
31	F1	335	1	Numeric one	4

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
30	F0	336	0	Numeric zero	4
A8	49	337	<<	Quote (France)	1
2C	6B	338	,	Comma	4
2D	60	339	-	Hyphen (minus)	4
26	50	340	&	Ampersand	3
7E	A1	341	~	Tilde	1
59	E8	342	Y	Uppercase Y	4
58	E7	343	X	Uppercase X	4
57	E6	344	W	Uppercase W	4
56	E5	345	V	Uppercase V	4
55	E4	346	U	Uppercase U	4
54	E3	347	T	Uppercase T	4
53	E2	348	S	Uppercase S	4
52	D9	349	R	Uppercase R	4
50	D7	350	P	Uppercase P	4
4F	D6	351	O	Uppercase O	4
4E	D5	352	N	Uppercase N	4
4D	D4	353	M	Uppercase M	4
4C	D3	354	L	Uppercase L	4
4B	D2	355	K	Uppercase K	4
4A	D1	356	J	Uppercase J	4
49	C9	357	I	Uppercase I	4
48	C8	358	H	Uppercase H	4
47	C7	359	G	Uppercase G	4
46	C6	360	F	Uppercase F	4
45	C5	361	E	Uppercase E	4
44	C4	362	D	Uppercase D	4
43	C3	363	C	Uppercase C	4
42	C2	364	B	Uppercase B	4
41	C1	365	A	Uppercase A	4
2A	5C	366	*	Asterisk	4
2E	4B	367	.	Period (full stop)	4
2B	4E	368	+	Plus	4
2F	61	369	/	Slant (solidus)	4
28	4D	370	(	Left parenthesis	4
29	5D	371	)	Right parenthesis	4
51	D8	372	Q	Uppercase Q	3
5A	E9	373	Z	Uppercase Z	3
3E	6E	374	>	Greater than	4
3C	4C	375	<	Less than	4
27	7D	376	'	Acute accent (apostrophe)	4
A9	51	377	>>	Unquote (France)	1
5F	6D	378	—	Discontinuous underline	4
21	4F	379	!	Exclamation	4
22	7F	380	"	Quotation	4
7B	C0	381	{	Left brace bracket	1
7D	D0	382	}	Right brace bracket	1
DB	B3	383	♭	Musical flat	1
7A	A9	384	z	Lowercase z	2
				Array size	384

Table B—20. OCR-A and 77L (ANSI '77) Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
32	F2	,1	2	Numeric two	3
31	F1	2	1	Numeric one	3
30	F0	3	0	Numeric zero	3
27	7D	4	'	OCR-A apostrophe	2
7B	C0	5	{	Left brace bracket	1
7D	D0	6	}	Right brace bracket	1
23	7B	7	#	Number sign	2
3D	7E	8	=	Equals	1
25	6C	9	%	Percent	1
2F	61	10	/	Slant (solidus)	1
5A	E9	11	Z	Uppercase Z	1
59	E8	12	Y	Uppercase Y	2
58	E7	13	X	Uppercase X	2
57	E6	14	W	Uppercase W	2
2E	4B	15	■	OCR-A period	3
2D	60	16	-	Hyphen (minus)	3
2A	5C	17	*	Asterisk	3
2C	6B	18	┐	OCR-A comma	3
5F	6D	19	_	Discontinuous underline	1
A3	44	20	£	Pound sterling sign	1
7C	6A	21	|	Vertical line	1
5B	4A	22	[	OCR-A left bracket	1
5D	5A	23	]	OCR-A right bracket	1
DC	B4	24	¥	Yen sign	1
56	E5	25	V	Uppercase V	2
55	E4	26	U	Uppercase U	2
54	E3	27	T	Uppercase T	2
53	E2	28	S	Uppercase S	2
52	D9	29	R	Uppercase R	2
51	D8	30	Q	Uppercase Q	2
50	D7	31	P	Uppercase P	2
4F	D6	32	O	Uppercase O	2
4E	D5	33	N	Uppercase N	2
4D	D4	34	M	Uppercase M	2
4C	D3	35	L	Uppercase L	2
DE	B6	36	¬	Logical not	1
39	F9	37	9	Numeric nine	3
38	F8	38	8	Numeric eight	3
37	F7	39	7	Numeric seven	3
36	F6	40	6	Numeric six	3
35	F5	41	5	Numeric five	3
34	F4	42	4	Numeric four	3
33	F3	43	3	Numeric three	3
32	F2	44	2	Numeric two	3
31	F1	45	1	Numeric one	3
30	F0	46	0	Numeric zero	3
4B	D2	47	K	Uppercase K	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4A	D1	48	J	Uppercase J	2
49	C9	49	I	Uppercase I	2
48	C8	50	H	Uppercase H	2
47	C7	51	G	Uppercase G	2
46	C6	52	F	Uppercase F	2
45	C5	53	E	Uppercase E	2
44	C4	54	D	Uppercase D	2
43	C3	55	C	Uppercase C	2
42	C2	56	B	Uppercase B	2
41	C1	57	A	Uppercase A	2
2E	4B	58	■	OCR-A period	3
2D	60	59	-	Hyphen (minus)	3
2A	5C	60	*	Asterisk	3
2C	6B	61	┐	OCR-A comma	3
40	7C	62	@	Commerical at	1
26	50	63	&	Ampersand	1
3A	7A	64	:	OCR-A colon	1
3B	5E	65	;	OCR-A semicolon	1
3E	6E	66	>	Greater than	1
3C	4C	67	<	Less than	1
27	7D	68	'	OCR-A apostrophe	2
28	4D	69	(	OCR-A left parenthesis	1
29	5D	70	)	OCR-A right parenthesis	1
23	7B	71	#	Number sign	2
DF	B7	72	Ψ	Fork	1
FE	FE	73	∫	Hook	1
E0	B8	74	⊣	Chair	1
3F	6F	75	?	Question	1
59	E8	76	Y	Uppercase Y	2
58	E7	77	X	Uppercase X	2
57	E6	78	W	Uppercase W	2
39	F9	79	9	Numeric nine	3
38	F8	80	8	Numeric eight	3
37	F7	81	7	Numeric seven	3
36	F6	82	6	Numeric six	3
35	F5	83	5	Numeric five	3
34	F4	84	4	Numeric four	3
33	F3	85	3	Numeric three	3
32	F2	86	2	Numeric two	3
31	F1	87	1	Numeric one	3
30	F0	88	0	Numeric zero	3
56	E5	89	V	Uppercase V	2
55	E4	90	U	Uppercase U	2
54	E3	91	T	Uppercase T	2
53	E2	92	S	Uppercase S	2
52	D9	93	R	Uppercase R	2
51	D8	94	Q	Uppercase Q	2

Table B—20. OCR-A and 77L (ANSI '77) Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	95	P	Uppercase P	2
4F	D6	96	O	Uppercase O	2
4E	D5	97	N	Uppercase N	2
4D	D4	98	M	Uppercase M	2
4C	D3	99	L	Uppercase L	2
2E	4B	100	▪	OCR-A period	3
2D	60	101	-	Hyphen (minus)	3
2A	5C	102	*	Asterisk	3
2C	6B	103	┐	OCR-A comma	3
A4	45	104	¤	International currency sign	1
21	4F	105	!	Exclamation	1
2B	4E	106	+	Plus	1
24	5B	107	$	Dollar sign	1
5E	5F	108	^	Circumflex	1
22	7F	109	▪▪	OCR-A quotation mark	1
5C	E0	110	\	Reverse slant (reverse solidus)	1
4B	D2	111	K	Uppercase K	2
4A	D1	112	J	Uppercase J	2
49	C9	113	I	Uppercase I	2
48	C8	114	H	Uppercase H	2
47	C7	115	G	Uppercase G	2
46	C6	116	F	Uppercase F	2
45	C5	117	E	Uppercase E	2
44	C4	118	D	Uppercase D	2
43	C3	119	C	Uppercase C	2
42	C2	120	B	Uppercase B	2
41	C1	121	A	Uppercase A	2
39	F9	122	9	Numeric nine	3
38	F8	123	8	Numeric eight	3
37	F7	124	7	Numeric seven	3
36	F6	125	6	Numeric six	3
35	F5	126	5	Numeric five	3
34	F4	127	4	Numeric four	3
33	F3	128	3	Numeric three	3
				Array size	128

Table B—21. Expanded ASCII Print Cartridge (with additional 0's and 1's), 192 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
41	C1	1	A	Uppercase A	2
42	C2	2	B	Uppercase B	2
43	C3	3	C	Uppercase C	2
44	C4	4	D	Uppercase D	2
46	C6	5	F	Uppercase F	2
47	C7	6	G	Uppercase G	2
48	C8	7	H	Uppercase H	2
49	C9	8	I	Uppercase I	2
4B	D2	9	K	Uppercase K	2
4C	D3	10	L	Uppercase L	2
4D	D4	11	M	Uppercase M	2
4E	D5	12	N	Uppercase N	2
4F	D6	13	O	Uppercase O	2
30	F0	14	0	Numeric zero	9
50	D7	15	P	Uppercase P	2
52	D9	16	R	Uppercase R	2
53	E2	17	S	Uppercase S	2
54	E3	18	T	Uppercase T	2
55	E4	19	U	Uppercase U	2
56	E5	20	V	Uppercase V	2
57	E6	21	W	Uppercase W	2
58	E7	22	X	Uppercase X	2
59	E8	23	Y	Uppercase Y	2
32	F2	24	2	Numeric two	3
31	F1	25	1	Numeric one	7
33	F3	26	3	Numeric three	3
34	F4	27	4	Numeric four	3
35	F5	28	5	Numeric five	3
36	F6	29	6	Numeric six	3
37	F7	30	7	Numeric seven	3
38	F8	31	8	Numeric eight	3
39	F9	32	9	Numeric nine	3
2D	60	33	-	Hyphen (minus)	3
2E	4B	34	.	Period (full stop)	3
2A	5C	35	*	Asterisk	3
30	F0	36	0	Numeric zero	9
45	C5	37	E	Uppercase E	3
4A	D1	38	J	Uppercase J	2
51	D8	39	Q	Uppercase Q	2
5A	E9	40	Z	Uppercase Z	1
28	4D	41	(	Left parenthesis	2
2C	6B	42	,	Comma	2
29	5D	43	)	Right parenthesis	2
24	5B	44	$	Dollar sign	2
40	7C	45	@	Commercial at	2
2B	4E	46	+	Plus	2
2F	61	47	/	Slant (solidus)	2
3D	7E	48	=	Equals	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
3B	5E	49	;	Semicolon	2
3A	7A	50	:	Colon	2
27	7D	51	'	Acute accent (apostrophe)	2
31	F1	52	1	Numeric one	7
5B	4A	53	[	Left square bracket	1
7C	6A	54	|	Vertical line	1
5D	5A	55	]	Right square bracket	1
7B	C0	56	{	Left brace bracket	1
30	F0	57	0	Numeric zero	7
7D	D0	58	}	Right brace bracket	1
6A	91	59	j	Lowercase j	1
71	98	60	q	Lowercase q	1
7A	A9	61	z	Lowercase z	2
61	81	62	a	Lowercase a	2
62	82	63	b	Lowercase b	2
63	83	64	c	Lowercase c	2
64	84	65	d	Lowercase d	2
65	85	66	e	Lowercase e	2
66	86	67	f	Lowercase f	2
67	87	68	g	Lowercase g	2
68	88	69	h	Lowercase h	2
69	89	70	i	Lowercase i	2
6B	92	71	k	Lowercase k	2
6C	93	72	l	Lowercase l	2
6D	94	73	m	Lowercase m	2
6E	95	74	n	Lowercase n	2
6F	96	75	o	Lowercase o	2
70	97	76	p	Lowercase p	2
72	99	77	r	Lowercase r	2
30	F0	78	0	Numeric zero	9
31	F1	79	1	Numeric one	7
73	A2	80	s	Lowercase s	2
74	A3	81	t	Lowercase t	2
75	A4	82	u	Lowercase u	2
76	A5	83	v	Lowercase v	2
77	A6	84	w	Lowercase w	2
78	A7	85	x	Lowercase x	2
79	A8	86	y	Lowercase y	2
32	F2	87	2	Numeric two	3
33	F3	88	3	Numeric three	3
34	F4	89	4	Numeric four	3
35	F5	90	5	Numeric five	3
36	F6	91	6	Numeric six	3
37	F7	92	7	Numeric seven	3
38	F8	93	8	Numeric eight	3
39	F9	94	9	Numeric nine	3
2D	60	95	-	Hyphen (minus)	3
2E	4B	96	.	Period (full stop)	3

Table B—21. Expanded ASCII Print Cartridge (with additional 0's and 1's), 192 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2A	5C	97	*	Asterisk	3
45	C5	98	E	Uppercase E	3
30	F0	99	0	Numeric zero	9
41	C1	100	A	Uppercase A	2
42	C2	101	B	Uppercase B	2
43	C3	102	C	Uppercase C	2
44	C4	103	D	Uppercase D	2
46	C6	104	F	Uppercase F	2
47	C7	105	G	Uppercase G	2
31	F1	106	1	Numeric one	7
48	C8	107	H	Uppercase H	2
49	C9	108	I	Uppercase I	2
4B	D2	109	K	Uppercase K	2
4C	D3	110	L	Uppercase L	2
4D	D4	111	M	Uppercase M	2
4E	D5	112	N	Uppercase N	2
4F	D6	113	O	Uppercase O	2
50	D7	114	P	Uppercase P	2
52	D9	115	R	Uppercase R	2
53	E2	116	S	Uppercase S	2
54	E3	117	T	Uppercase T	2
55	E4	118	U	Uppercase U	2
56	E5	119	V	Uppercase V	2
57	E6	120	W	Uppercase W	2
30	F0	121	0	Numeric zero	9
58	E7	122	X	Uppercase X	2
59	E8	123	Y	Uppercase Y	2
23	7B	124	#	Number sign	1
21	4F	125	!	Exclamation	1
3C	4C	126	<	Less than	1
22	7F	127	"	Quotation	1
7E	A1	128	~	Tilde (overline)	1
60	79	129	`	Grave accent	1
5E	5F	130	^	Circumflex	1
25	6C	131	%	Percent	1
3E	6E	132	>	Greater than	1
26	50	133	&	Ampersand	1
31	F1	134	1	Numeric one	7
4A	D1	135	J	Uppercase J	2
51	D8	136	Q	Uppercase Q	2
7A	A9	137	z	Lowercase z	2
28	4D	138	(	Left parenthesis	2
2C	6B	139	,	Comma	2
29	5D	140	)	Right parenthesis	2
24	5B	141	$	Dollar sign	2
30	F0	142	0	Numeric zero	9
40	7C	143	@	Commercial at	2
2B	4E	144	+	Plus	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2F	61	145	/	Slant (solidus)	2
3D	7E	146	=	Equals	2
3B	5E	147	;	Semicolon	2
3A	7A	148	:	Colon	2
27	7D	149	'	Acute accent (apostrophe)	2
A4	45	150	¤	International currency sign	1
32	F2	151	2	Numeric two	3
33	F3	152	3	Numeric three	3
34	F4	153	4	Numeric four	3
35	F5	154	5	Numeric five	3
36	F6	155	6	Numeric six	3
37	F7	156	7	Numeric seven	3
38	F8	157	8	Numeric eight	3
39	F9	158	9	Numeric nine	3
2D	60	159	-	Hyphen (minus)	3
2E	4B	160	.	Period (full stop)	3
2A	5C	161	*	Asterisk	3
31	F1	162	1	Numeric one	7
45	C5	163	E	Uppercase E	3
30	F0	164	0	Numeric zero	9
5C	E0	165	\	Reverse slant (reverse solidus)	1
61	81	166	a	Lowercase a	2
62	82	167	b	Lowercase b	2
63	83	168	c	Lowercase c	2
64	84	169	d	Lowercase d	2
65	85	170	e	Lowercase e	2
66	86	171	f	Lowercase f	2
67	87	172	g	Lowercase g	2
68	88	173	h	Lowercase h	2
69	89	174	i	Lowercase i	2
6B	92	175	k	Lowercase k	2
6C	93	176	l	Lowercase l	2
6D	94	177	m	Lowercase m	2
6E	95	178	n	Lowercase n	2
6F	96	179	o	Lowercase o	2
70	97	180	p	Lowercase p	2
72	99	181	r	Lowercase r	2
73	A2	182	s	Lowercase s	2
74	A3	183	t	Lowercase t	2
75	A4	184	u	Lowercase u	2
30	F0	185	0	Numeric zero	9
76	A5	186	v	Lowercase v	2
77	A6	187	w	Lowercase w	2
78	A7	188	x	Lowercase x	2
79	A8	189	y	Lowercase y	2
31	F1	190	1	Numeric one	7
5F	6D	191	_	Discontinuous underline	1
3F	6F	192	?	Question	1
				Array size	192

Table B—22. Universal OCR-B (ISO) Print Cartridge (with additional 0's and 1's), 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
3C	4C	1	<	Less than	1
3E	6E	2	>	Greater than	1
3B	5E	3	;	Semicolon	1
26	50	4	&	Ampersand	1
24	5B	5	$	Dollar sign	2
2F	61	6	/	Slant (solidus)	2
2B	4E	7	+	Plus	2
3D	7E	8	=	Equals	2
28	4D	9	(	Left parenthesis	2
2C	6B	10	,	Comma	2
29	5D	11	)	Right parenthesis	2
30	F0	12	0	Numeric zero	8
5A	E9	13	Z	Uppercase Z	2
51	D8	14	Q	Uppercase Q	2
4A	D1	15	J	Uppercase J	2
31	F1	16	1	Numeric one	4
3F	6F	17	?	Question	1
40	7C	18	@	Commercial at	1
23	7B	19	#	Number sign	1
27	7D	20	'	Acute accent (apostrophe)	2
5F	6D	21	_	Discontinuous underline	1
32	F2	22	2	Numeric two	2
33	F3	23	3	Numeric three	2
34	F4	24	4	Numeric four	2
35	F5	25	4	Numeric five	2
36	F6	26	6	Numeric six	2
37	F7	27	7	Numeric seven	2
30	F0	28	0	Numeric zero	8
38	F8	29	8	Numeric eight	2
39	F9	30	9	Numeric nine	2
3A	7A	31	:	Colon	2
41	C1	32	A	Uppercase A	2
42	C2	33	B	Uppercase B	2
43	C3	34	C	Uppercase C	2
44	C4	35	D	Uppercase D	2
46	C6	36	F	Uppercase F	2
47	C7	37	G	Uppercase G	2
2A	5C	38	*	Asterisk	3
2D	60	39	-	Hyphen (minus)	3
2E	4B	40	.	Period (full stop)	3
48	C8	41	H	Uppercase H	2
45	C5	42	E	Uppercase E	3
49	C9	43	I	Uppercase I	2
30	F0	44	0	Numeric zero	8
4C	D3	45	L	Uppercase L	2
4D	D4	46	M	Uppercase M	2
4B	D2	47	K	Uppercase K	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
31	F1	48	1	Numeric one	4
4E	D5	49	N	Uppercase N	2
4F	D6	50	O	Uppercase O	2
50	D7	51	P	Uppercase P	2
52	D9	52	R	Uppercase R	2
53	E2	53	S	Uppercase S	2
54	E3	54	T	Uppercase T	2
55	E4	55	U	Uppercase U	2
56	E5	56	V	Uppercase V	2
57	E6	57	W	Uppercase W	2
58	E7	58	X	Uppercase X	2
59	E8	59	Y	Uppercase Y	2
30	F0	60	0	Numeric zero	8
7C	6A	61	|	Vertical line	1
A3	44	62	£	Pound sterling sign	1
DE	B6	63	¬	Logical not	1
22	7F	64	"	Quotation	1
5E	5F	65	^	Circumflex	1
DC	B4	66	¥	Yen sign	1
A4	45	67	¤	International currency sign	1
5C	E0	68	\	Reverse slant (reverse solidus)	1
24	5B	69	$	Dollar sign	2
2F	61	70	/	Slant (solidus)	2
2B	4E	71	+	Plus	2
3D	7E	72	=	Equals	2
28	4D	73	(	Left parenthesis	2
2C	6B	74	,	Comma	2
29	5D	75	)	Right parenthesis	2
30	F0	76	0	Numeric zero	8
5A	E9	77	Z	Uppercase Z	2
51	D8	78	Q	Uppercase Q	2
4A	D1	79	J	Uppercase J	2
31	F1	80	1	Numeric one	4
2A	5C	81	*	Asterisk	3
2D	60	82	-	Hyphen (minus)	3
2E	4B	83	.	Period (full stop)	3
27	7D	84	'	Acute accent (apostrophe)	2
45	C5	85	E	Uppercase E	3
32	F2	86	2	Numeric two	2
33	F3	87	3	Numeric three	2
34	F4	88	4	Numeric four	2
35	F5	89	5	Numeric five	2
36	F6	90	6	Numeric six	2
37	F7	91	7	Numeric seven	2
30	F0	92	0	Numeric zero	8
38	F8	93	8	Numeric eight	2
39	F9	94	9	Numeric nine	2

Table B—22. Universal OCR-B (ISO) Print Cartridge (with additional 0's and 1's), 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
3A	7A	95	:	Colon	2
41	C1	96	A	Uppercase A	2
42	C2	97	B	Uppercase B	2
43	C3	98	C	Uppercase C	2
44	C4	99	D	Uppercase D	2
46	C6	100	F	Uppercase F	2
47	C7	101	G	Uppercase G	2
21	4F	102	!	Exclamation	1
5B	4A	103	[	Left square bracket	1
5D	5A	104	]	Right square bracket	1
48	C8	105	H	Uppercase H	2
25	6C	106	%	Percent	1
49	C9	107	I	Uppercase I	2
30	F0	108	0	Numeric zero	8
4C	D3	109	L	Uppercase L	2
4D	D4	110	M	Uppercase M	2
4B	D2	111	K	Uppercase K	2
31	F1	112	1	Numeric one	4
4E	D5	113	N	Uppercase N	2
4F	D6	114	O	Uppercase O	2
50	D7	115	P	Uppercase P	2
52	D9	116	R	Uppercase R	2
53	E2	117	S	Uppercase S	2
54	E3	118	T	Uppercase T	2
55	E4	119	U	Uppercase U	2
56	E5	120	V	Uppercase V	2
57	E6	121	W	Uppercase W	2
58	E7	122	X	Uppercase X	2
59	E8	123	Y	Uppercase Y	2
30	F0	124	0	Numeric zero	8
2D	60	125	-	Hyphen (minus)	3
2E	4B	126	.	Period (full stop)	3
2A	5C	127	*	Asterisk	3
45	C5	128	E	Uppercase E	3
				Array size	128

Table B—23. OCR-A (ANS '77) Print Cartridge, 48 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
50	D7	1	P	Uppercase P	1
4F	D6	2	O	Uppercase O	1
4E	D5	3	N	Uppercase N	1
4D	D4	4	M	Uppercase M	1
4C	D3	5	L	Uppercase L	1
4B	D2	6	K	Uppercase K	1
4A	D1	7	J	Uppercase J	1
49	C9	8	I	Uppercase I	1
48	C8	9	H	Uppercase H	1
47	C7	10	G	Uppercase G	1
46	C6	11	F	Uppercase F	1
45	C5	12	E	Uppercase E	1
44	C4	13	D	Uppercase D	1
43	C3	14	C	Uppercase C	1
42	C2	15	B	Uppercase B	1
41	C1	16	A	Uppercase A	1
39	F9	17	9	Numeric nine	1
38	F8	18	8	Numeric eight	1
37	F7	19	7	Numeric seven	1
36	F6	20	6	Numeric six	1
35	F5	21	5	Numeric five	1
34	F4	22	4	Numeric four	1
33	F3	23	3	Numeric three	1
32	F2	24	2	Numeric two	1
31	F1	25	1	Numeric one	1
30	F0	26	0	Numeric zero	1
2D	60	27	-	Hyphen (minus)	1
2F	61	28	/	Slant (solidus)	1
22	7F	29	▼▼	OCR-A quotation mark	1
3A	7A	30	▪ ▪	OCR-A colon	1
24	5B	31	$	Dollar sign	1
2C	6B	32	,	Comma	1
2B	4E	33	+	Plus	1
3E	6E	34	>	Greater than	1
2A	5C	35	*	Asterisk	1
3D	7E	36	=	Equals	1
26	50	37	&	Ampersand	1
2E	4B	38	▪	OCR-A period	1
5A	E9	39	Z	Uppercase Z	1
59	E8	40	Y	Uppercase Y	1
58	E7	41	X	Uppercase X	1
57	E6	42	W	Uppercase W	1
56	E5	43	V	Uppercase V	1
55	E4	44	U	Uppercase U	1
54	E3	45	T	Uppercase T	1
53	E2	46	S	Uppercase S	1
52	D9	47	R	Uppercase R	1
51	D8	48	Q	Uppercase Q	1
				Array size	48

Table B—24. Modified ASCII (77L) Print Cartridge, 64 Characters (Ø)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2B	4E	1	+	Plus	1
28	4D	2	(	Left parenthesis	1
29	5D	3	)	Right parenthesis	1
23	7B	4	#	Number sign	1
3D	7E	5	=	Equals	1
25	6C	6	%	Percent	1
2A	5C	7	*	Asterisk	1
3E	6E	8	>	Greater than	1
3C	4C	9	<	Less than	1
5A	E9	10	Z	Uppercase Z	1
59	E8	11	Y	Uppercase Y	1
58	E7	12	X	Uppercase X	1
57	E6	13	W	Uppercase W	1
56	E5	14	V	Uppercase V	1
55	E4	15	U	Uppercase U	1
54	E3	16	T	Uppercase T	1
53	E2	17	S	Uppercase S	1
52	D9	18	R	Uppercase R	1
30	F0	19	Ø	Numeric zero with slash	2
51	D8	20	Q	Uppercase Q	1
50	D7	21	P	Uppercase P	1
4F	D6	22	O	Uppercase O	1
4E	D5	23	N	Uppercase N	1
4D	D4	24	M	Uppercase M	1
4C	D3	25	L	Uppercase L	1
4B	D2	26	K	Uppercase K	1
40	D1	27	J	Uppercase J	1
49	C9	28	I	Uppercase I	1
48	C8	29	H	Uppercase H	1
47	C7	30	G	Uppercase G	1
46	C6	31	F	Uppercase F	1
45	C5	32	E	Uppercase E	1
44	C4	33	D	Uppercase D	1
43	C3	34	C	Uppercase C	1
42	C2	35	B	Uppercase B	1
41	C1	36	A	Uppercase A	1
5B	4A	37	[	Left square bracket	1
5D	5A	38	]	Right square bracket	1
21	4F	39	!	Exclamation point	1
5E	5F	40	^	Circumflex	1
5C	E0	41	\	Reverse slant (reverse solidus)	1
39	F9	42	9	Numeric nine	1
38	F8	43	8	Numeric eight	1
37	F7	44	7	Numeric seven	1
36	F6	45	6	Numeric six	1
35	F5	46	5	Numeric five	1
34	F4	47	4	Numeric four	1
33	F3	48	3	Numeric three	1
32	F2	49	2	Numeric two	1
31	F1	50	1	Numeric one	1
30	F0	51	Ø	Numeric zero with slash	2
2E	4B	52	.	Period (full stop)	1
2D	60	53	-	Hyphen (minus)	1
2F	61	54	/	Slant (solidus)	1
24	5B	55	$	Dollar sign	1
3B	5E	56	;	Semicolon	1
3A	7A	57	:	Colon	1
3F	6F	58	?	Question	1
26	50	59	&	Ampersand	1
5F	6D	60	_	Underline (discontinuous)	1
40	7C	61	@	Commercial at	1
27	7D	62	'	Apostrophe	1
22	7F	63	"	Quotation	1
2C	6B	64	,	Comma	1
				Array size	64

Table B—25. Japan Katakana Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
—	81	1	ｱ	Katakana (A)	1
—	82	2	ｲ	Katakana (I)	1
—	83	3	ｳ	Katakana (U)	1
—	84	4	ｴ	Katakana (E)	1
—	85	5	ｵ	Katakana (O)	1
—	86	6	ｶ	Katakana (KA)	1
—	87	7	ｷ	Katakana (KI)	1
—	88	8	ｸ	Katakana (KU)	1
—	89	9	ｹ	Katakana (KE)	1
—	8A	10	ｺ	Katakana (KO)	1
—	8C	11	ｻ	Katakana (SA)	1
—	8D	12	ｼ	Katakana (SHI)	1
31	F1	13	1	Numeric One	6
30	F0	14	0	Numeric Zero	6
—	90	15	ｿ	Katakana (SO)	1
—	91	16	ﾀ	Katakana (TA)	1
—	92	17	ﾁ	Katakana (CHI)	1
—	93	18	ﾂ	Katakana (TSII)	1
—	94	19	ﾃ	Katakana (TE)	1
—	95	20	ﾄ	Katakana (TO)	1
—	96	21	ﾅ	Katakana (NA)	1
—	97	22	ﾆ	Katakana (NI)	1
—	98	23	ﾇ	Katakana (NU)	1
—	99	24	ﾈ	Katakana (NE)	1
—	9A	25	ﾉ	Katakana (NO)	1
—	9D	26	ﾊ	Katakana (HA)	1
—	9E	27	ﾋ	Katakana (HI)	1
—	9F	28	ﾌ	Katakana (FU)	1
—	A2	29	ﾍ	Katakana (HE)	1
—	A3	30	ﾎ	Katakana (HO)	1
—	A4	31	ﾏ	Katakana (MA)	1
—	A5	32	ﾐ	Katakana (MI)	1
—	A6	33	ﾑ	Katakana (MU)	1
—	A7	34	ﾒ	Katakana (ME)	1
31	F1	35	1	Numeric one	6
30	F0	36	0	Numeric Zero	6
—	AA	37	ｯ	Katakana (TU)	1
—	AC	38	ｬ	Katakana (YO)	1
—	AD	39	ﾗ	Katakana (RA)	1
—	AE	40	ﾘ	Katakana (RI)	1
—	AF	41	ﾙ	Katakana (RU)	1
—	BA	42	ﾚ	Katakana (RE)	1
—	BB	43	ﾛ	Katakana (RO)	1
—	BC	44	ﾜ	Katakana (WA)	1
—	BD	45	ﾝ	Katakana (N)	1
—	BE	46	ﾞ	Vorced Sound Symbol	1

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
—	BF	47	ﾟ	Semivorced Sound Symbol	1
39	F9	48	9	Numeric nine	2
38	F8	49	8	Numeric eight	2
37	F7	50	7	Numeric seven	2
36	F6	51	6	Numeric six	2
35	F5	52	5	Numeric five	2
34	F4	53	4	Numeric four	2
33	F3	54	3	Numeric three	2
32	F2	55	2	Numeric two	2
31	F1	56	1	Numeric one	6
30	F0	57	0	Numeric zero	6
2E	4B	58	.	Period	2
—	A8	59	ﾓ	Katakana (MO)	1
—	A9	60	ﾔ	Katakana (YA)	1
57	E6	61	W	Uppercase W	1
26	50	62	&	Ampersand	1
56	E5	63	V	Uppercase V	1
2C	6B	64	,	Comma	2
2B	4E	65	+	Plus sign	1
28	4D	66	(	Left parenthesis	1
29	5D	67	)	Right parenthesis	1
3D	7E	68	=	Equal sign	1
21	4F	69	!	Exclamation point	1
2F	61	70	/	Slant (solidus)	1
5C	E0	71	\	Reverse slant (reverse solidus)	1
3E	6E	72	>	Greater than	1
3C	4C	73	<	Less than	1
5A	E9	74	Z	Uppercase Z	1
59	EB	75	Y	Uppercase Y	1
58	E7	76	X	Uppercase X	1
31	F1	77	1	Numeric one	6
30	F0	78	0	Numeric zero	6
55	E4	79	U	Uppercase U	1
54	E3	80	T	Uppercase T	1
53	E2	81	S	Uppercase S	1
52	D9	82	R	Uppercase R	1
51	D8	83	Q	Uppercase Q	1
50	D7	84	P	Uppercase P	1
4F	D6	85	O	Uppercase O	1
4E	D5	86	N	Uppercase N	1
4D	D4	87	M	Uppercase M	1
4C	D3	88	L	Uppercase L	1
4B	D2	89	K	Uppercase K	1
4A	D1	90	J	Uppercase J	1
49	C9	91	I	Uppercase I	1
48	C8	92	H	Uppercase H	1

Table B—25. Japan Katakana Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
47	C7	93	G	Uppercase G	1
46	C6	94	F	Uppercase F	1
45	C5	95	E	Uppercase E	1
44	C4	96	D	Uppercase D	1
43	C3	97	C	Uppercase C	1
42	C2	98	B	Uppercase B	1
31	F1	99	1	Numeric one	6
30	F0	100	0	Numeric zero	6
25	6C	101	%	Percent	1
40	7C	102	@	Commercial at symbol	1
5F	6D	103	_	Underline	1
27	7D	104	'	Apostrophe	1
3A	7A	105	:	Colon	1
3B	5E	106	;	Semicolon	1
3F	6F	107	?	Question mark	1
7C	6A	108	|	Vertical line	1
23	7B	109	#	Number sign	1
41	C1	110	A	Uppercase A	1
DC	B4	111	¥	Yen sign	1
39	F9	112	9	Numeric nine	2
38	F8	113	8	Numeric eight	2
37	F7	114	7	Numeric seven	2
36	F6	115	6	Numeric six	2
35	F5	116	5	Numeric five	2
34	F4	117	4	Numeric four	2
33	F3	118	3	Numeric three	2
32	F2	119	2	Numeric two	2
31	F1	120	1	Numeric one	6
30	F0	121	0	Numeric zero	6
2E	4B	122	.	Period	2
2D	60	123	-	Hyphen (minus)	1
2A	5C	124	*	Asterisk	1
22	7F	125	"	Quotation mark	1
—	8E	126	ｽ	Katakana (SU)	1
—	8F	127	ｾ	Katakana (SE)	1
—	6B	128	､	Katakana comma	1
				Array size	128

Table B—26. Japan OCR-B Print Cartridge, 128 Characters (Part 1 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2A	5C	1	*	Asterisk	3
2C	6B	2	,	Comma	3
26	50	3	&	Ampersand	1
2B	4E	4	+	Plus sign	2
DC	B4	5	¥	Yen sign	2
5A	E9	6	Z	Uppercase Z	2
59	E8	7	Y	Uppercase Y	2
31	F1	8	1	Numeric one	9
30	F0	9	0	Numeric zero	8
58	E7	10	X	Uppercase X	2
57	E6	11	W	Uppercase W	2
56	E5	12	V	Uppercase V	2
55	E4	13	U	Uppercase U	2
54	E3	14	T	Uppercase T	2
53	E2	15	S	Uppercase S	2
52	D9	16	R	Uppercase R	2
51	D8	17	Q	Uppercase Q	2
50	D7	18	P	Uppercase P	2
4F	D6	19	O	Uppercase O	2
5C	E0	20	\	Reverse slant (reverse solidus)	1
5F	6D	21	_	Underline	1
31	F1	22	1	Numeric one	9
3A	7A	23	:	Colon	1
31	F1	24	1	Numeric one	9
30	F0	25	0	Numeric zero	8
4E	D5	26	N	Uppercase N	2
4D	D4	27	M	Uppercase M	2
4C	D3	28	L	Uppercase L	2
4B	D2	29	K	Uppercase K	2
4A	D1	30	J	Uppercase J	2
49	C9	31	I	Uppercase I	2
48	C8	32	H	Uppercase H	2
47	C7	33	G	Uppercase G	2
46	C6	34	F	Uppercase F	2
45	C5	35	E	Uppercase E	2
44	C4	36	D	Uppercase D	2
43	C3	37	C	Uppercase C	2
42	C2	38	B	Uppercase B	2
41	C1	39	A	Uppercase A	2
31	F1	40	1	Numeric one	9
30	F0	41	0	Numeric zero	8
2E	4B	42	.	Period	3
2D	60	43	-	Hyphen (minus)	3
2A	5C	44	*	Asterisk	3
2C	6B	45	,	Comma	3

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
27	7D	46	'	Apostrophe	2
29	5D	47	)	Right parenthesis	2
39	F9	48	9	Numeric nine	2
38	F8	49	8	Numeric eight	2
37	F7	50	7	Numeric seven	2
36	F6	51	6	Numeric six	2
35	F5	52	5	Numeric five	2
34	74	53	4	Numeric four	2
33	F3	54	3	Numeric three	2
32	F2	55	2	Numeric two	2
31	F1	56	1	Numeric one	9
30	F0	57	0	Numeric zero	8
28	4D	58	(	Left parenthesis	2
23	7B	59	#	Number sign	2
3D	7E	60	=	Equal sign	2
40	7C	61	@	Commercial at symbol	2
2F	61	62	/	Slant (solidus)	2
3E	6E	63	>	Greater than	1
DE	B6	64	¬	Logical NOT	1
		65	c	Cent sign	1
3C	4C	66	<	Less than	1
25	6C	67	%	Percent sign	1
2B	4E	68	+	Plus sign	2
DC	B4	69	¥	Yen sign	2
5A	E9	70	Z	Uppercase Z	2
59	E8	71	Y	Uppercase Y	2
31	F1	72	1	Numeric one	9
30	F0	73	0	Numeric zero	8
58	E7	74	X	Uppercase X	2
57	E6	75	W	Uppercase W	2
56	E5	76	V	Uppercase V	2
55	E4	77	U	Uppercase U	2
54	E3	78	T	Uppercase T	2
53	E2	79	S	Uppercase S	2
52	D9	80	R	Uppercase R	2
51	D8	81	Q	Uppercase Q	2
50	D7	82	P	Uppercase P	2
4F	D6	83	O	Uppercase O	2
2E	4B	84	.	Period	3
2D	60	85	-	Hyphen (minus)	3
2A	5C	86	*	Asterisk	3
2C	6B	87	,	Comma	3
31	F1	88	1	Numeric one	9
30	F0	89	0	Numeric zero	8
4E	D5	90	N	Uppercase N	2

Table B—26. Japan OCR-B Print Cartridge, 128 Characters (Part 2 of 2)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
4D	D4	91	M	Uppercase M	2
4C	D3	92	L	Uppercase L	2
4B	DC	93	K	Uppercase K	2
4A	D1	94	J	Uppercase J	2
49	C9	95	I	Uppercase I	2
48	C8	96	H	Uppercase H	2
47	C7	97	G	Uppercase G	2
46	36	98	F	Uppercase F	2
45	C5	99	E	Uppercase E	2
44	C4	100	D	Uppercase D	2
43	C3	101	C	Uppercase C	2
42	C2	102	B	Uppercase B	2
41	C1	103	A	Uppercase A	2
31	F1	104	1	Numeric one	9
30	F0	105	0	Numeric zero	8
3B	5E	106	;	Semi colon	1
3F	6F	107	?	Question mark	1
21	4F	108	!	Exclamation point	1
22	7F	109	"	Quotation mark	1
27	7D	110	'	Apostrophe	2
29	5D	111	)	Right parenthesis	2
39	F9	112	9	Numeric nine	2
38	F8	113	8	Numeric eight	2
37	F7	114	7	Numeric seven	2
36	F6	115	6	Numeric six	2
35	F5	116	5	Numeric five	2
34	74	117	4	Numeric four	2
33	F3	118	3	Numeric three	2
32	F2	119	2	Numeric two	2
31	F1	120	1	Numeric one	9
30	F0	121	0	Numeric zero	8
28	4D	122	(	Left parenthesis	2
23	7B	123	#	Number sign	2
3D	7E	124	=	Equal sign	2
40	7C	125	@	Commercial at sign	2
2F	61	126	/	Slant (solidus)	2
2E	4B	127	.	Period	3
2D	60	128	—	Hyphen (minus)	3
				Array size	128

Table B—27. OCR-B Numeric Print Cartridge, 24 Characters

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
2D	60	1	-	Hyphen (minus)	1
2F	61	2	/	Slant (solidus)	1
3E	6E	3	>	Greater than	1
2C	4C	4	<	Less than	1
3D	7E	5	=	Equals	1
23	7B	6	#	Number sign	1
24	5B	7	$	Dollar sign	1
2C	6B	8	,	Comma	1
2B	4E	9	+	Plus	1
28	4D	10	(	Left parenthesis	1
29	5D	11	)	Right parenthesis	1
2A	5C	12	*	Asterisk	1
25	6C	13	%	Percent	1
2E	4B	14	.	Period	1
39	F9	15	9	Numeric nine	1
38	F8	16	8	Numeric eight	1
37	F7	17	7	Numeric seven	1
36	F6	18	6	Numeric six	1
35	F5	19	5	Numeric five	1
34	F5	20	4	Numeric four	1
33	F3	21	3	Numeric three	1
32	F2	22	2	Numeric two	1
31	F1	23	1	Numeric one	1
30	F0	24	0	Numeric zero	1
				Array size	24

Table B—28. American Library Association Print Cartridge, 384 Characters (Part 1 of 5)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
E9	C8	1	œ	Lowercase digraph oe	2
F2	DE	2	æ	Lowercase digraph ae	2
7A	A9	3	z	Lowercase z	2
79	A8	4	y	Lowercase y	2
78	A7	5	x	Lowercase x	2
77	A6	6	w	Lowercase w	2
76	A5	7	v	Lowercase v	2
75	A4	8	u	Lowercase u	2
74	A3	9	t	Lowercase t	2
73	A2	10	s	Lowercase s	2
3F	6F	11	?	Question mark	2
72	99	12	r	Lowercase r	2
71	78	13	q	Lowercase q	2
70	97	14	p	Lowercase p	2
6F	96	15	o	Lowercase o	2
6E	95	16	n	Lowercase n	2
6D	94	17	m	Lowercase m	2
6C	93	18	l	Lowercase l	2
5B	92	19	k	Lowercase k	2
6A	91	20	j	Lowercase j	2
69	89	21	i	Lowercase i	2
68	88	22	h	Lowercase h	2
67	87	23	g	Lowercase g	2
66	86	24	f	Lowercase f	2
65	85	25	e	Lowercase e	2
64	84	26	d	Lowercase d	2
63	83	27	c	Lowercase c	2
62	82	28	b	Lowercase b	2
61	81	29	a	Lowercase a	2
		30	ʕ	Ayn	2
		31	✓	Left hook	2
		32	˝	Double acute	2
		33	˘	Breve	2
BA	7O	34	¨	Diaeresis	2
27	7D	35	´	Acute	2
		36	ȷ	Tail	1
		37	ʔ	Pseudo question mark	2
		38	·	Dot in middle of A·L·A·	2
AA	52	39	‡	Double dagger	2
5C	EO	40	\	Reverse slant (reverse solidus)	2
30	FO	41	0	Numeric zero	3
39	F9	42	9	Numeric nine	3
38	F8	43	8	Numeric eight	3
37	F7	44	7	Numeric seven	3
36	F6	45	6	Numeric six	3
35	F5	46	5	Numeric five	3

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
34	F4	47	4	Numeric four	3
27	7D	48	'	Apostrophe	2
2C	6B	49	,	Comma	3
2E	4B	50	.	Period	3
3A	7A	51	:	Colon	2
22	7F	52	"	Quotation	2
2D	60	53	-	Hyphen (minus)	2
21	4F	54	!	Exclamation	2
5D	5A	55	]	Right square bracket	2
5B	4A	56	[	Left square bracket	2
CF	9E	57	Þ	Upper case thorn	2
C9	8F	58	Œ	Uppercase digraph OE	2
D2	AA	59	Æ	Uppercase digraph AE	2
5A	E9	60	Z	Uppercase Z	2
59	E8	61	Y	Uppercase Y	3
58	E7	62	X	Uppercase X	3
57	E6	63	W	Uppercase W	3
56	E5	64	V	Uppercase V	3
55	E4	65	U	Uppercase U	3
54	E3	66	T	Uppercase T	3
53	E2	67	S	Uppercase S	3
2F	61	68	/	Slant (solidus)	2
52	D9	69	R	Uppercase R	3
51	D8	70	Q	Uppercase Q	2
50	D7	71	P	Uppercase P	3
4F	D6	72	O	Uppercase O	3
4E	D5	73	N	Uppercase N	3
4D	D4	74	M	Uppercase M	3
4C	D3	75	L	Uppercase L	3
4B	D2	76	K	Uppercase K	3
4A	D1	77	J	Uppercase J	3
49	C9	78	I	Uppercase I	3
48	C8	79	H	Uppercase H	3
47	C7	80	G	Uppercase G	3
46	C6	81	F	Uppercase F	3
45	C5	82	E	Uppercase E	3
44	C4	83	D	Uppercase D	3
43	C3	84	C	Uppercase C	3
42	C2	85	B	Uppercase B	3
41	C1	86	A	Uppercase A	3
33	F3	87	3	Numeric three	3
32	F2	88	2	Numeric two	3
31	F1	89	1	Numeric one	3
79	A8	90	y	Lowercase y	1
78	A7	91	x	Lowercase x	1
77	A6	92	w	Lowercase w	1

Table B—28. American Library Association Print Cartridge, 384 Characters (Part 2 of 5)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
76	A5	93	v	Lowercase v	1
75	A4	94	u	Lowercase u	1
74	A3	95	t	Lowercase t	1
73	A2	96	s	Lowercase s	1
72	99	97	r	Lowercase r	1
70	97	98	p	Lowercase p	1
6F	96	99	o	Lowercase o	1
6E	95	100	n	Lowercase n	1
6D	94	101	m	Lowercase m	1
6C	93	102	l	Lowercase l	1
6B	92	103	k	Lowercase k	1
6A	91	104	j	Lowercase j	1
69	89	105	i	Lowercase i	1
68	88	106	h	Lowercase h	1
67	87	107	g	Lowercase g	1
66	86	108	f	Lowercase f	1
65	85	109	e	Lowercase e	1
64	84	110	d	Lowercase d	1
63	83	111	c	Lowercase c	1
62	82	112	b	Lowercase b	1
61	81	113	a	Lowercase a	1
7E	A1	114	~	Tilde	2
		115	°	Circle above	2
		116	•	Dot above	2
2B	4E	117	+	Plus sign	2
3C	4C	118	<	Less than	2
3E	6E	119	>	Greater than	2
		120	(	Superscript left parenthesis	2
		121	)	Superscript right parenthesis	2
		122	J	Tail	1
		123	+	Superscript plus sign	2
		124	−	Superscript minus sign	2
		125	0	Superscript numeric zero	2
		126	9	Superscript numeric nine	2
		127	8	Superscript numeric eight	2
		128	7	Superscript numeric seven	2
		129	6	Superscript numeric six	2
		130	5	Superscript numeric five	2
		131	4	Superscript numeric four	2
		132	3	Superscript numeric three	2
		133	2	Superscript numeric two	2
		134	1	Superscript numeric one	2
24	5B	135	$	Dollar sign	2
40	7C	136	@	Commercial at sign	2
24	5C	137	*	Asterisk	2
A3	44	138	£	Pound sterling sign	2

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
DB	B3	139	b	Musical flat	2
		140	®	Subscript patent sign	2
		141	x	Lowercase Polish L	2
		142	ø	Lowercase Scandinavian O	2
E4	BC	143	đ	Lowercase D crossbar	2
3D	7E	144	=	Equals	2
		145	ı	Turkish I	2
		146	¬	Right ligature	2
		147	⌐	Left ligature	2
		148	¯	Macron	2
		149	√	Hacek	2
5E	5F	150	^	Circumflex	2
60	79	151	`	Grave	2
23	7B	152	#	Number sign	2
		153	ł	Uppercase Polish L	2
		154	Ø	Uppercase Scandinavian O	2
C4	8A	155	Đ	Uppercase D crossbar	2
		156	‗	Double underscore	2
		157	◌̑	Candrabindu	2
		158	_	Underline	2
		159	◌̥	Circle below	2
		160	¨	Double dot below	2
		161	◌̣	Dot below	2
		162	(	Subscript left parenthesis	2
		163	)	Subscript right parenthesis	2
		164	◌̩	Right hook	2
		165	.	Subscript plus sign	2
		166	−	Subscript minus sign	2
		167	0	Subscript numeric zero	2
		168	9	Subscript numeric nine	2
		169	8	Subscript numeric eight	2
		170	7	Subscript numeric seven	2
		171	6	Subscript numeric six	2
		172	5	Subscript numeric five	2
		173	4	Subscript numeric four	2
		174	3	Subscript numeric three	2
		175	2	Subscript numeric two	2
		176	1	Subscript numeric one	2
3B	5E	177	;	Semicolon	2
28	4D	178	(	Left parenthesis	2
29	5D	179	)	Right parenthesis	2
26	50	180	&	Ampersand	2
AB	53	181	±	Plus or minus sign	2
25	6C	182	%	Percent sign	2
		183	γ	Gamma	2
		184	β	Beta	2

Table B—28. American Library Association Print Cartridge, 384 Characters (Part 3 of 5)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		185	ɑ	Alpha	2
EF	DB	186	þ	Lowercase thorn	2
E9	C8	187	œ	Lowercase digraph oe	2
F2	DE	188	æ	Lowercase digraph ae	2
7A	A9	189	z	Lowercase z	2
79	A8	190	y	Lowercase y	2
78	A7	191	x	Lowercase x	2
77	A6	192	w	Lowercase w	2
76	A5	193	v	Lowercase v	2
75	A4	194	u	Lowercase u	2
74	A3	195	t	Lowercase t	2
73	A2	196	s	Lowercase s	2
3F	6F	197	?	Question mark	2
72	99	198	r	Lowercase r	2
71	98	199	q	Lowercase q	2
70	97	200	p	Lowercase p	2
6F	96	201	o	Lowercase o	2
6E	95	202	n	Lowercase n	2
6D	94	203	m	Lowercase m	2
6C	93	204	l	Lowercase l	2
5B	92	205	k	Lowercase k	2
6A	91	206	j	Lowercase j	2
69	89	207	i	Lowercase i	2
68	88	208	h	Lowercase h	2
67	87	209	g	Lowercase g	2
66	86	210	f	Lowercase f	2
65	85	211	e	Lowercase e	2
64	84	212	d	Lowercase d	2
63	83	213	c	Lowercase c	2
62	82	214	b	Lowercase b	2
61	81	215	a	Lowercase a	2
		216	ʿ	Ayn	2
		217	˅	Left hook	2
		218	˝	Double acute	2
		219	˘	Breve	2
BA	70	220	¨	Diaeresis	2
27	7D	221	´	Acute	2
		222	ʻ	Alif high comma	2
		223	ʔ	Pseudo question mark	2
		224	·	Dot in middle A·L·A	2
AA	52	225	‡	Double dagger	2
5C	E0	226	\	Reverse slant (reverse solidus)	2
30	F0	227	0	Numeric zero	3
39	F9	228	9	Numeric nine	3
38	F8	229	8	Numeric eight	3
37	F7	230	7	Numeric seven	3

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
36	F6	231	6	Numeric six	3
35	F5	232	5	Numeric five	3
34	F4	233	4	Numeric four	3
27	7D	234	'	Apostrophe	2
2C	6B	235	,	Comma	3
2E	4B	236	.	Period	3
3A	7A	237	:	Colon	2
22	7F	238	"	Quotation	2
2D	60	239	-	Hyphen (minus)	2
21	4F	240	!	Exclamation	2
5D	5A	241	]	Right square bracket	2
5B	4A	242	[	Left square bracket	2
CF	9E	243	Þ	Uppercase thorn	2
C9	8F	244	Œ	Uppercase digraph OE	2
D2	AA	245	Æ	Uppercase digraph AE	2
5A	E9	246	Z	Uppercase Z	2
59	E8	247	Y	Uppercase Y	3
58	E7	248	X	Uppercase X	3
57	E6	249	W	Uppercase W	3
56	E5	250	V	Uppercase V	3
55	E4	251	U	Uppercase U	3
54	E3	252	T	Uppercase T	3
53	E2	253	S	Uppercase S	3
2F	61	254	/	Slant (solidus)	2
52	D9	255	R	Uppercase R	3
51	D8	256	Q	Uppercase Q	2
50	D7	257	P	Uppercase P	3
4F	D6	258	O	Uppercase O	3
4E	D5	259	N	Uppercase N	3
4D	D4	260	M	Uppercase M	3
4C	D3	261	L	Uppercase L	3
4B	D2	262	K	Uppercase K	3
4A	D1	263	J	Uppercase J	3
49	C9	264	I	Uppercase I	3
48	C8	265	H	Uppercase H	3
47	C7	266	G	Uppercase G	3
46	C6	267	F	Uppercase F	3
45	C5	268	E	Uppercase E	3
44	C4	269	D	Uppercase D	3
43	C3	270	C	Uppercase C	3
42	C2	271	B	Uppercase B	3
41	C1	272	A	Uppercase A	3
33	F3	273	3	Numeric three	3
32	F2	274	2	Numeric two	3
31	F1	275	1	Numeric one	3
59	E8	276	Y	Uppercase Y	3

Table B—28. American Library Association Print Cartridge, 384 Characters (Part 4 of 5)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
58	E7	277	X	Uppercase X	3
57	E6	278	W	Uppercase W	3
56	E5	279	V	Uppercase V	3
55	E4	280	U	Uppercase U	3
54	E3	281	T	Uppercase T	3
53	E2	282	S	Uppercase S	3
52	D9	283	R	Uppercase R	3
50	D7	284	P	Uppercase P	3
4F	D6	285	O	Uppercase O	3
4E	D5	286	N	Uppercase N	3
4D	D4	287	M	Uppercase M	3
4C	D3	288	L	Uppercase L	3
4B	D2	289	K	Uppercase K	3
4A	D1	290	J	Uppercase J	3
49	C9	291	I	Uppercase I	3
48	C8	292	H	Uppercase H	3
47	C7	293	G	Uppercase G	3
46	C6	294	F	Uppercase F	3
45	C5	295	E	Uppercase E	3
44	C4	296	D	Uppercase D	3
43	C3	297	C	Uppercase C	3
42	C2	298	B	Uppercase B	3
41	C1	299	A	Uppercase A	3
2C	6B	300	,	Comma	3
2E	4B	301	.	Period	3
30	F0	302	0	Numeric zero	3
39	F9	303	9	Numeric nine	3
38	F8	304	8	Numeric eight	3
37	F7	305	7	Numeric seven	3
36	F6	306	6	Numeric six	3
35	F5	307	5	Numeric five	3
34	F4	308	4	Numeric four	3
33	F3	309	3	Numeric three	3
32	F2	310	2	Numeric two	3
31	F1	311	1	Numeric one	3
7E	A1	312	~	Tilde	2
		313	°	Circle above	2
		314	˙	Dot above	2
2B	4E	315	+	Plus sign	2
3C	4C	316	<	Less than	2
3E	6E	317	>	Greater than	2
		318	(	Subscript left parenthesis	2
		319	)	Subscript right parenthesis	2
		320	'	Alif high comma	2
		321	+	Superscript plus sign	2
		322	-	Superscript minus sign	2
		323	°	Superscript numeric zero	2
		324	9	Superscript numeric nine	2
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		339	ł	Lowercase Polish L	2
		340	ø	Lowercase Scandinavian O	2
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		343	ı	Turkish I	2
		344	‿	Right ligature	2
		345	‿	Left ligature	2
		346	-	Macron	2
		347	ˇ	Hacek	2
5E	5F	348	^	Circumflex	2
60	79	349	`	Grave	2
23	7B	350	#	Number sign	2
		351	Ł	Uppercase Polish L	2
		352	Ø	Uppercase Scandinavian O	2
C4	8A	353	Đ	Uppercase D crossbar	2
		354	‗	Double underscore	2
		355	◌ँ	Candrabindu	2
		356	_	Underline	2
		357	°	Circle below	2
		358	¨	Double dot below	2
		359	.	Dot below	2
		360	(	Subscript left parenthesis	2
		361	)	Subscript right parenthesis	2
		362	↘	Right hook	2
		363	+	Subscript plus sign	2
		364	-	Subscript minus sign	2
		365	0	Subscript numeric zero	2
		366	9	Subscript numeric nine	2

Table B—28. American Library Association Print Cartridge, 384 Characters (Part 5 of 5)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		367	$_8$	Subscript numeric eight	2
		368	$_7$	Subscript numeric seven	2
		369	$_6$	Subscript numeric six	2
		370	$_5$	Subscript numeric five	2
		371	$_4$	Subscript numeric four	2
		372	$_3$	Subscript numeric three	2
		373	$_2$	Subscript numeric two	2
		374	$_1$	Subscript numeric one	2
3B	5E	375	;	Semicolon	2
28	4D	376	(	Left parenthesis	2
29	5D	377	)	Right parenthesis	2
26	50	378	&	Ampersand	2
AB	53	379	±	Plus or minus sign	2
25	6C	380	%	Percent sign	2
		381	γ	Gamma	2
		382	β	Beta	2
		383	α	Alpha	2
EF	DB	384	þ	Lowercase thorn	2
				Array size	384

Table B—29. Farsi Print Cartridge, 192 Characters (Part 1 of 3)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		1	ا	Farsi	1
		2	آ	Farsi	1
		3	ت	Farsi	1
		4	ب	Farsi	1
		5	ث	Farsi	1
		6	ج	Farsi	1
		7	چ	Farsi	1
		8	ح	Farsi	1
		9	ج	Farsi	1
		10	خ	Farsi	1
		11	چ	Farsi	1
		12	خ	Farsi	1
		13	د	Farsi	1
		14	ذ	Farsi	1
		15	خ	Farsi	1
		16	ر	Farsi	1
		17	ء	Farsi	1
		18	ئ	Farsi	1
		19	ش	Farsi	1
		20	ط	Farsi	1
		21	د	Farsi	1
		22	س	Farsi	1
		23	ب	Farsi	1
		24	ر	Farsi	1
		25	ط	Farsi	1
		26	ظ	Farsi	1
		27	ظ	Farsi	1
		28	ع	Farsi	1
		29	ع	Farsi	1
		30	غ	Farsi	1
		31	غ	Farsi	1
		32	ق	Farsi	1
		33	ف	Farsi	1
		34	ل	Farsi	1
		35	ق	Farsi	1
		36	م	Farsi	1
		37	گ	Farsi	1
		38	ن	Farsi	1
		39	ل	Farsi	1
		40	لا	Farsi	1
		41	ه	Farsi	1
		42	ب	Farsi	1
		43	پ	Farsi	1
		44	ت	Farsi	1
		45	ث	Farsi	1
		46	ئ	Farsi	1

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		47	ج	Farsi	1
		48	چ	Farsi	1
		49	ح	Farsi	1
		50	خ	Farsi	1
		51	س	Farsi	1
		52	ش	Farsi	1
		53	ص	Farsi	1
		54	ص	Farsi	1
		55	ط	Farsi	1
		56	ظ	Farsi	1
		57	ع	Farsi	1
		58	غ	Farsi	1
		59	ف	Farsi	1
		60	ق	Farsi	1
		61	ک	Farsi	1
		62	گ	Farsi	1
		63	ـ	Farsi	1
		64	ل	Farsi	1
		65	ه	Farsi	1
		66	ه	Farsi	1
		67	س	Farsi	1
		68	ی	Farsi	1
		69	ا	Farsi	1
		70	ه	Farsi	1
		71	ح	Farsi	1
		72	ص	Farsi	1
		73	ه	Farsi	1
		74	خ	Farsi	1
		75	ض	Farsi	1
		76	ش	Farsi	1
		77	ذ	Farsi	1
		78	س	Farsi	1
		79	ز	Farsi	1
		80	ش	Farsi	1
		81	ء	Farsi	1
		82	ه	Farsi	1
		83	ض	Farsi	1
		84	ئ	Farsi	1
		85	ء	Farsi	1
		86	ب	Farsi	1
		87	ی	Farsi	1
		88	و	Farsi	1
		89	ن	Farsi	1
		90	و	Farsi	1
		91	ئ	Farsi	1
		92	ل	Farsi	1

Table B—29. Farsi Print Cartridge, 192 Characters (Part 2 of 3)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		93	۰	Farsi	1
		94	ظ	Farsi	1
		95	ر	Farsi	1
		96	ب	Farsi	1
		97	ل	Farsi	1
		98	ا	Farsi	1
		99	ل	Farsi	1
		100	ت	Farsi	1
		101	ر	Farsi	1
		102	و	Farsi	1
		103	ک	Farsi	1
		104	ﻫ	Farsi	1
		105	ق	Farsi	1
49	C9	106	I	Uppercase I	1
48	C8	107	H	Uppercase H	1
47	C7	108	G	Uppercase G	1
46	C6	109	F	Uppercase F	1
45	C5	110	E	Uppercase E	1
44	C4	111	D	Uppercase D	1
43	C3	112	C	Uppercase C	1
42	C2	113	B	Uppercase B	1
41	C1	114	A	Uppercase A	1
39	F9	115	9	Numeric nine	1
38	F8	116	8	Numeric eight	1
37	F7	117	7	Numeric seven	1
36	F6	118	6	Numeric six	1
35	F5	119	5	Numeric five	1
34	F4	120	4	Numeric four	1
33	F3	121	3	Numeric three	1
32	F2	122	2	Numeric two	1
31	F1	123	1	Numeric one	1
30	F0	124	0	Numeric zero	1
2D	60	125	-	Hyphen (minus)	1
28	4D	126	(	Left parenthesis	1
29	5D	127	)	Right parenthesis	1
2C	6B	128	,	Comma	1
2B	4E	129	+	Plus sign	1
2A	5C	130	*	Asterisk	1
3D	7E	131	=	Equal sign	1
2F	61	132	/	Slant (solidus)	1
		133	•	Farsi	1
5A	E9	134	Z	Uppercase Z	1
59	E8	135	Y	Uppercase Y	1
58	E7	136	X	Uppercase X	1
57	E6	137	W	Uppercase W	1

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
56	E5	138	V	Uppercase V	1
55	E4	139	U	Uppercase U	1
54	E3	140	T	Uppercase T	1
53	E2	141	S	Uppercase S	1
52	D9	142	R	Uppercase R	1
51	D8	143	Q	Uppercase Q	1
50	D7	144	P	Uppercase P	1
4F	D6	145	O	Uppercase O	1
4E	D5	146	N	Uppercase N	1
4D	D4	147	M	Uppercase M	1
4C	D3	148	L	Uppercase L	1
4B	DC	149	K	Uppercase K	1
4A	D1	150	J	Uppercase J	1
		151	ل	Farsi	1
		152	ت	Farsi	1
		153	ر	Farsi	1
		154	د	Farsi	1
		155	ﺍ	Farsi	1
		156	•	Farsi	1
		157	و	Farsi	1
		158	ب	Farsi	1
		159	ل	Farsi	1
		160	ر	Farsi	1
		161	ک	Farsi	1
		162	ز	Farsi	1
		163	ن	Farsi	1
		164	و	Farsi	1
		165	ن	Farsi	1
		166	ه	Farsi	1
		167	ه	Farsi	1
		168	ی	Farsi	1
		169	ب	Farsi	1
		170	چ	Farsi	1
		171	ج	Farsi	1
		172	آ	Farsi	1
		173	ز	Farsi	1
		174	ط	Farsi	1
		175	ع	Farsi	1
		176	غ	Farsi	1
		177	ل	Farsi	1
		178	م	Farsi	1
		179	ن	Farsi	1
		180	ه	Farsi	1
		181	ی	Farsi	1
		182	لا	Farsi	1

Table B—29. Farsi Print Cartridge, 192 Characters (Part 3 of 3)

ASCII (Hex)	EBCDIC (Hex)	Loading Sequence	Symbol	Symbol Description	Symbols per Array
		183	۱	Farsi	1
		184	۲	Farsi	1
		185	۳	Farsi	1
		186	۴	Farsi	1
		187	۵	Farsi	1
		188	۶	Farsi	1
		189	۷	Farsi	1
		190	۹	Farsi	1
		191	؟	Farsi	1
		192	ب	Farsi	1
				Array size	192

Appendix C. Printer Hexadecimal Code

Hexadecimal codes for control commands and hexadecimal space, skip, and advance repeat codes for print advance and advance only are presented in this appendix. In addition, the hexadecimal binary equivalents are included.

COMMAND CODES

Function	Hexadecimal	Function	Hexadecimal
Sense I/O	04	Load Code	FB
No-op	03	Read LCB	0A
Fold	43	Load VFB	63
Unfold	23	Read VFB	12
Inhibit Data Check	73	Diagnostic Write	E3
Allow Data Check	7B	Read PLB	02

PRINT ADVANCE/ADVANCE ONLY CODES

	Print Advance	Advance Only
Space 0 Lines	01	07
Space 1 Lines	09	0F
Space 2 Lines	11	17
Space 3 Lines	19	1F
Space 4 Lines	21	27
Space 5 Lines	29	2F
Space 6 Lines	31	37
Space 7 Lines	39	3F
Space 8 Lines	41	47
Space 9 Lines	49	4F
Space 10 Lines	51	57
Space 11 Lines	59	5F
Space 12 Lines	61	67
Space 13 Lines	69	6F
Space 14 Lines	71	77
Space 15 Lines	79	7F
Advance Repeat	81	87
Skip to Code 1	89	8F
Skip to Code 2	91	97
Skip to Code 3	99	9F
Skip to Code 4	A1	A7
Skip to Code 5	A9	AF
Skip to Code 6	B1	B7
Skip to Code 7	B9	BF
Skip to Code 8	C1	C7
Skip to Code 9	C9	CF
Skip to Code A	D1	D7
Skip to Code B	D9	DF
Skip to Code C	E1	E7
Skip to Code D	E9	EF
Skip to Code E	F1	F7
Skip to Code F	F9	FF

Hexadecimal-Binary Equivalents

0 = 0000	9 = 1001
1 = 0001	A = 1010
2 = 0010	B = 1011
3 = 0011	C = 1100
4 = 0100	D = 1101
5 = 0101	E = 1110
6 = 0110	F = 1111
7 = 0111	
8 = 1000	

Examples: FB = 11111011
0E = 00001110

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