

GA09-1605-0

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IBM Series/1
4974 Printer
Extended Character Attachment
(RPQ 8T1066)
Feature Description

Preface

This publication contains reference material about the IBM Series/1 Extended character Attachment for the 4974 Printer. It supplies information on generating a wire image table (WIT) for character sets ranging from 97 to 192 characters. This manual is supplementary to the *IBM Series/1, 4974 Printer, Description* manual, GA 34-0025, which describes the basic 4974 Attachment and contains flowcharts for creating wire image tables of character sets up to 96 characters.

Prerequisite Knowledge

This document assumes that the reader has a background in data processing and is familiar with the hexadecimal numbering system as used in IBM systems. It is assumed that the reader has a basic understanding of printers and their relationship to a processor as well as an understanding of stored program concepts.

Prerequisite Publications

IBM Series/1 Model 5, 4955 Processor and Processor Features, Description, GA34-0021.

IBM Series/1 Model 3, 4953 Processor and Processor Features, Description, GA34-0022.

IBM Series/1, System Summary, GA34-0035.

Related Publications

IBM Series/1, 4974 Printer, Description, GA34-0025.

IBM Series/1, Installation Manual-Physical Planning, GA34-0029.

IBM Series/1, Configurator, GA34-0042.

IBM Series/1, Operator's Guide, GA34-0039.

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Changes are periodically made to the information herein; any such changes will be reported in subsequent revisions or Technical Newsletters.

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IBM 4974 Extended Character Attachment

The difference between the basic 4974 Attachment and the 4974 Extended Character Attachment RPQ (request for price quotation) is the increased capacity of the wire image table buffer of the Extended Character Attachment. This permits an extension of character sets to 192 characters. Operations of the Extended Character Attachment and all programming for it remain the same as for the basic Attachment.

Wire Image Table: Purpose

The wire image table (WIT) provides for conversion of an 8-bit code into a wire image pattern. Since the wire image table is loaded from the using system, special characters can be added to the table, or new tables can be generated.

Wire Image Character Pattern Generation

The printer uses an 8 x 7 dot-matrix pattern to print its characters. Seven bytes of data are used to represent the wire image pattern for each character. Each byte corresponds to one column of the matrix, starting with byte 1 as the leftmost column and bit 0 as the uppermost bit. For example, an *E* is shown in Figure 1.

		Bytes						
		1	2	3	4	5	6	7
Bits	0	X		X		X		X
	1	X						
	2	X						
	3	X		X		X		
	4	X						
	5	X						
	6	X		X		X		X
	7							

(Character dots are represented here by X's.)

Figure 1. Matrix Pattern for the Letter E.

Column 1 has bits 0 through 6 on, making its hexadecimal value FE. Column 2 has no bits on; therefore, its value is 00. Column 3 is represented by a 92, column 4 by a 00, column 5 by a 92, column 6 by a 00, and column 7 by an 82. The location representing an *E* within the wire image table would contain hexadecimal FE 0092 0092 0082 as the wire image pattern.

Two rules must be considered when creating characters:

1. Adjacent dots within a row may not be used. (Adjacent dots within a column are permissible.) Attempting to use adjacent dots results in an invalid-wire-image check.
2. Not more than 25 dots may be used within any one character.

Wire Image Table Structure

The wire image table must consist of not more than 1536 bytes (192 characters). If less than 97 characters are desired, refer to "Appendix C, Wire Image Table" in the *IBM Series/1, 4974 Printer, Description* manual, GA34-0025.

Each character to be printed requires eight bytes of data, using the following format:

Bits 0, 1 check bits
 Bits 2-7 displacement field
 Bits 8-63 wire image pattern

When a character is to be printed, the user supplies the 8-bit character code. The 4974 uses these eight bits to access the correct wire image pattern in the wire image table.

The following formula determines the entry point into the wire image table:

Entry point = 8 x (value of bits 2 through 7 of the specified character code)

The check bits at this address are compared to bits 0 and 1 of the specified character code. If they agree, the correct point in the table has been reached, and the character is printed using the wire image pattern in bits 8 through 63. If the check bits do not agree, a new address is generated using the displacement field located at the entry point:

Next address = entry point address + 8 x (displacement field + 3)

The check bits at the new address are compared to bits 0 and 1 of the requested character. If they still do not agree, the indexing procedure is repeated using the new displacement field:

Next address = previous address + 8 x (displacement field + 3)

Four accesses into the table are allowed. Exceeding this limit causes an invalid-wire-image check. A zero in the displacement field indicates that no indexing is to occur. The minimum index possible is four character positions.

As an example, consider the standard EBCDIC dash character (Figure 2); the EBCDIC code for a dash is hexadecimal 60 or binary 0110 0000. Therefore, the check bits would be 01, and the table would be accessed at a hexadecimal (20 x 8), or hexadecimal 0100.

Wire Image Table

Location	Data
0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0
Entry Point 0 1 0 0	D F 8 0 4 0 2 0 1 0 0 8 0 4 0 2

Figure 2. Accessing the WIT for an EBCDIC dash (Part 1 of 2)

Bits 0 and 1 at location 0100 are 11, which does not agree with the 01 check bits of the character to be printed. This indicates that you must index to a new location using bits 2 through 7 as your displacement.

Next address = 0100 + [8 x (1F + 3)] = 0210

Wire Image Table

Location	Data
0 0 0 0	3 D 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0	D F 8 0 4 0 2 0 1 0 0 8 0 4 0 2
0 2 1 0	4 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0

Figure 2. Accessing the WIT for an EBCDIC dash (Part 2 of 2)

Bits 0 and 1 at location 0210 are 01, indicating that this is the desired character. The wire image pattern 10 0010 0010 0010, corresponding to a dash, is printed.

Wire Image Table Generation

Follow these steps when generating a wire image table:

1. Define the character set.

Each character must be assigned an 8-bit character code and a 7-byte wire image pattern. Only printable characters should be included in the character set; a space should not be included.

2. Place the character set into a properly ordered table. Figure 3 is a flowcharted procedure for putting the character set into a usable order.
3. Calculate the check bits and displacement field for each character in the table. The check bits for each character are simply bits 0 and 1 of the character code. Figure 4 is a flowcharted procedure for calculating the displacement fields for the character set arranged in step 2.

Note: If a table-overflow error occurs while following the procedure in Figure 2, the table should be rearranged to eliminate any indexes of less than four table positions.

Example: Position 191 indexes to position 192.

The table should be reordered as shown below, and the displacement fields should be recalculated.

<i>Old Sequence</i>		<i>New Sequence</i>
Table Entry	187	Table Entry 187
	188	191
	189	188
	190	189
	191	190
	192	192

Place the Character Set into an Ordered Table:

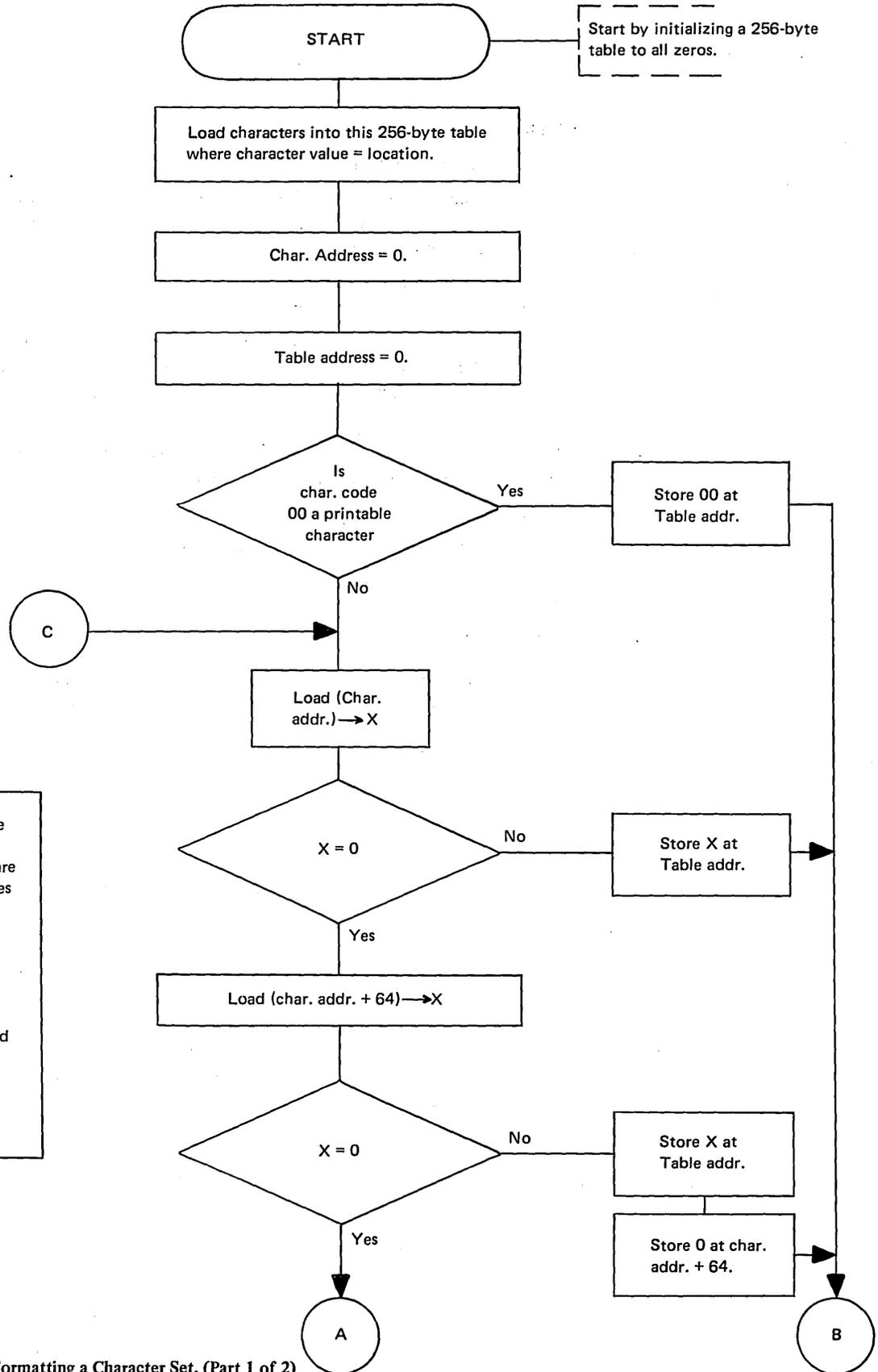


Figure 3. Procedure for Formatting a Character Set, (Part 1 of 2)

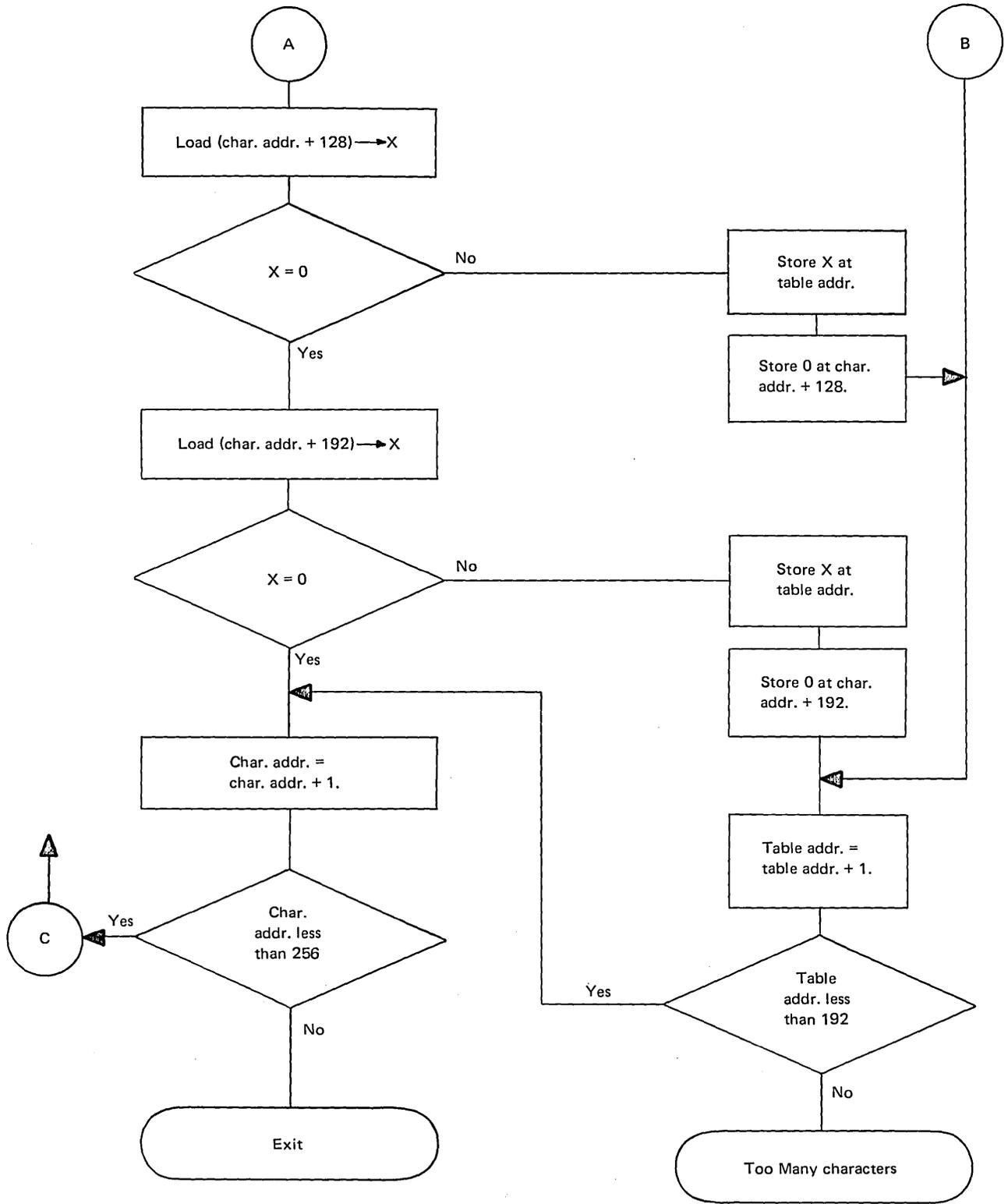


Figure 3. Procedure for Formatting a Character Set, (Part 2 of 2)

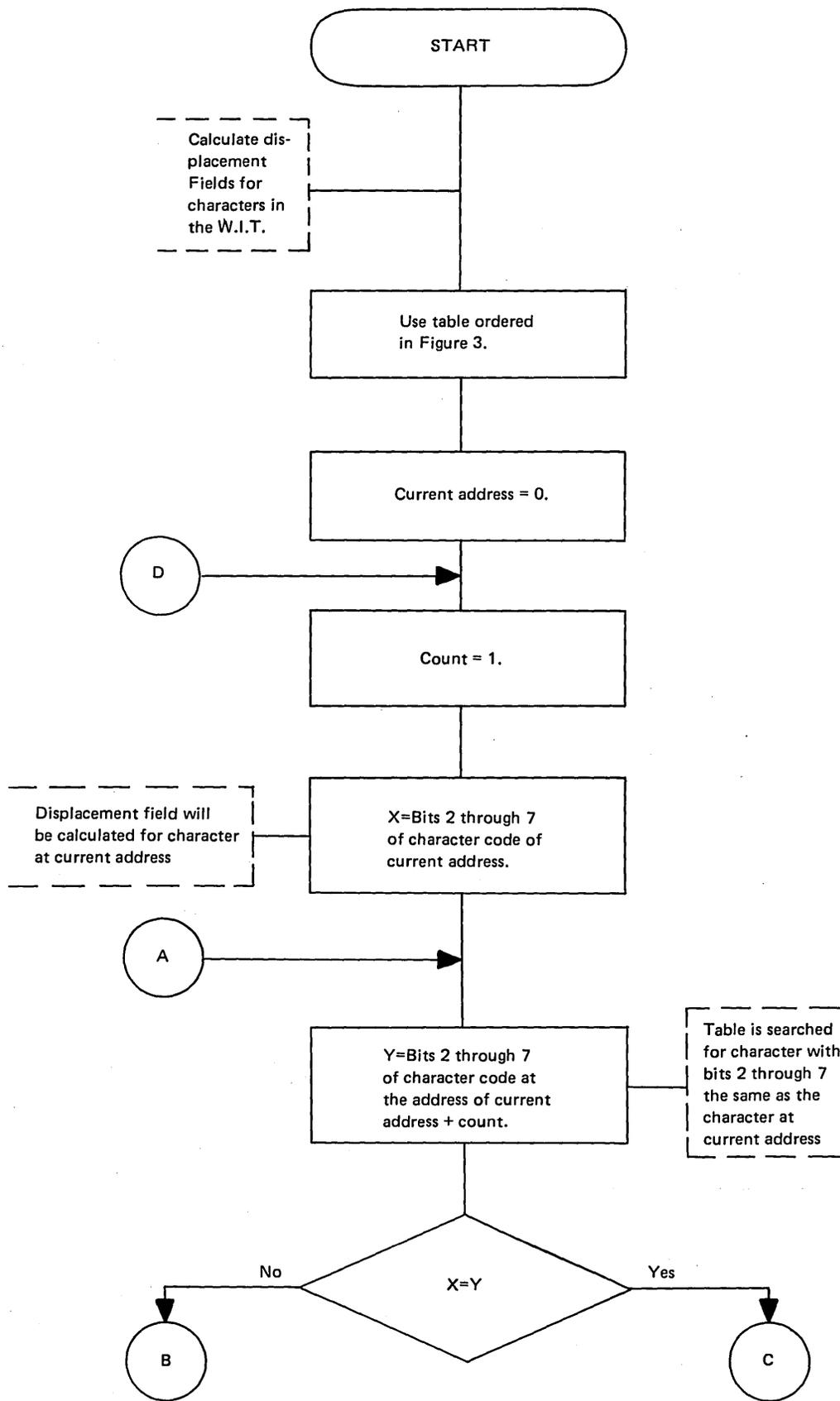


Figure 4. Flowchart for Calculating Displacement Fields for Characters in the Wire Image Table, (Part 1 of 3)

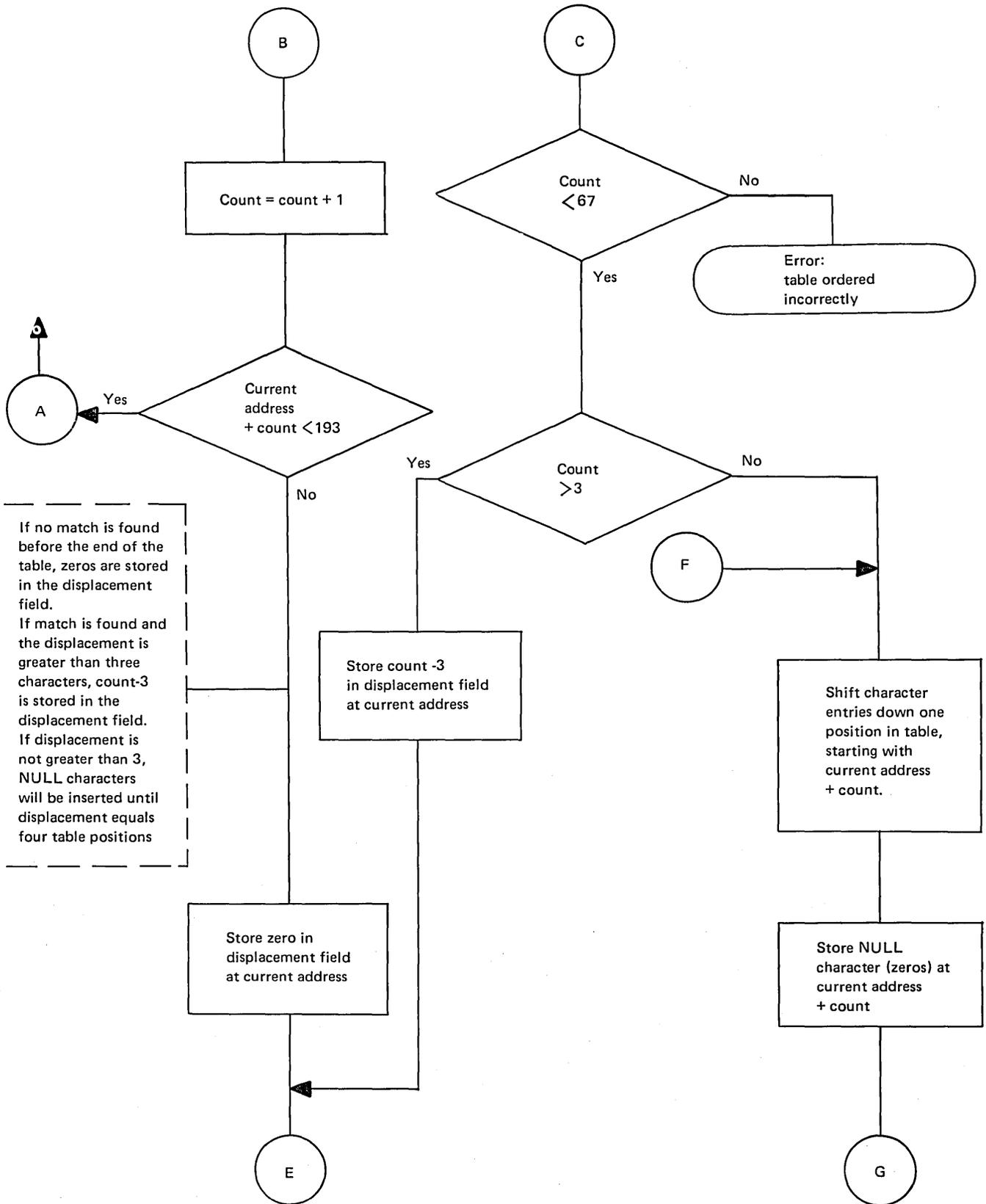


Figure 4. Flowchart for Calculating Displacement Fields for Characters in the Wire Image Table, (Part 2 of 3)

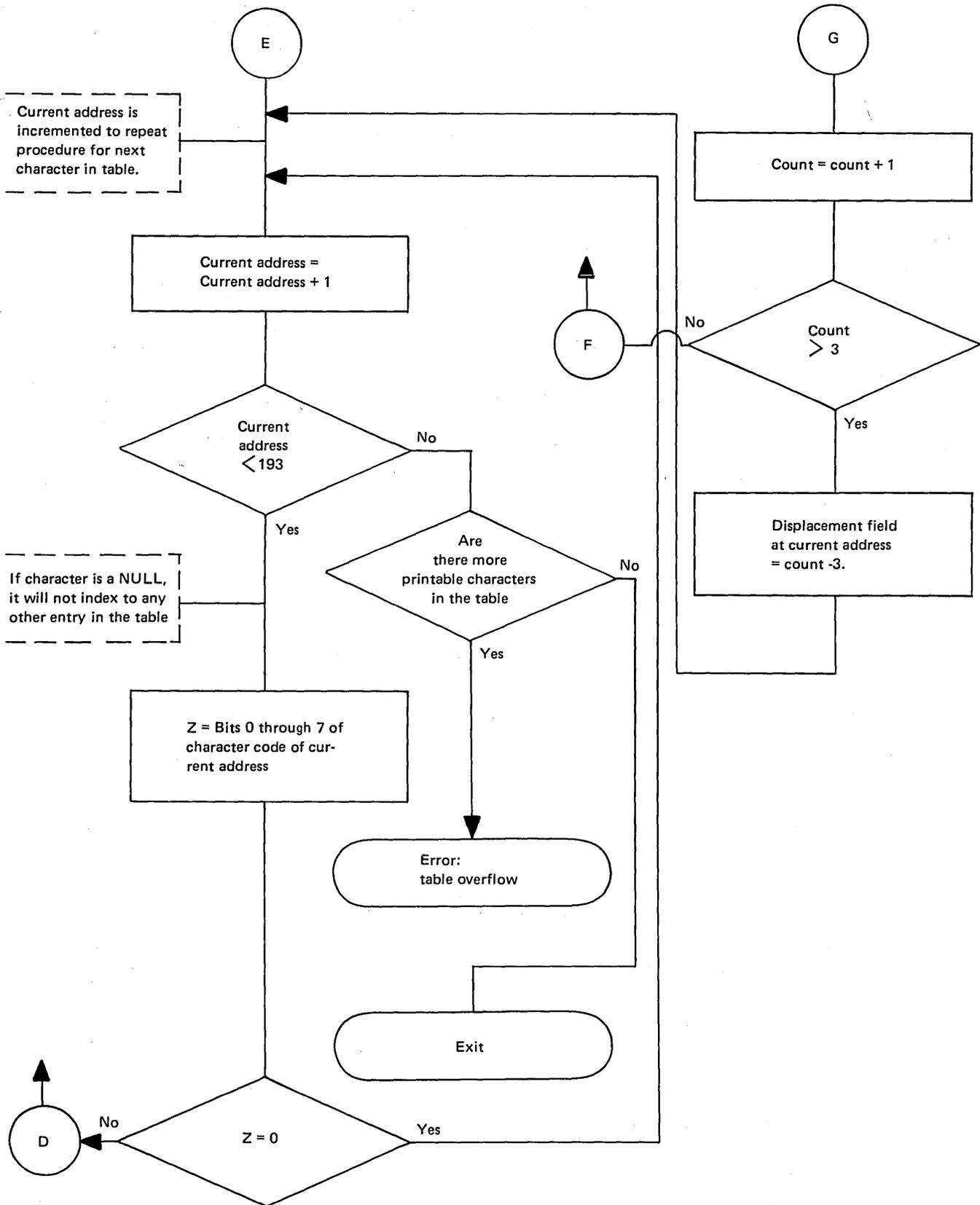


Figure 4. Flowchart for Calculating Displacement Fields for Characters in the Wire Image Table, (Part 3 of 3)

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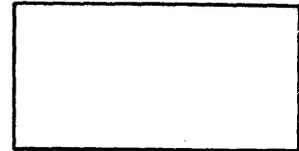
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