SYSTEM/32

IBM System/32 1255 Magnetic Character Reader Reference and Logic Manual

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IBM System/32
1255 Magnetic Character Reader
Programming Information

GC21-7692-1

Program Number
5725-SC1

IBM System/32 1255
Magnetic Character Reader
Reference and Logic Manual

Preface

This publication is intended primarily for users of the System/32 with an IBM 1255 Magnetic Character Reader attached. The reference portion is intended for programmers, systems analysts and, occasionally, the operator. The program logic portion is intended for program support representatives and customer engineers.

The reader should be familiar with System/32, with the 1255 Magnetic Character Reader, and with RPG II (Program Number 5725-RG1) or basic assembler programming (Program Number 5725-AS1). If more information is required, refer to:

- *IBM System/32 Functions Reference Manual,* GA21-9176
- *IBM System/32 RPG II Reference Manual,* SC21-7595
- *IBM System/32 Basic Assembler and Macro Processor Reference Manual,* SC21-7673
- *IBM 1255 Magnetic Character Reader Component Description,* GA24-3542
- *IBM System/32 Displayed Messages Guide* GC21-7704
- *IBM System/32 1255 Attachment Feature Theory-Diagrams,* SY31-0468

Second Edition (November 1977)

This is a major revision of, and obsoletes GC21-7692. Changes have been made throughout the entire manual, and the following enhancements have been added: geometric modulus checking of the account number, allowance of greater than four field comparison tests per stacker selection, and the account number field to be greater than 10 digits and the process control field to be greater than 6 digits in length on an input document.

This edition applies to version 02 modification 00 of the IBM System/32 System Control Program 5725-SC1, and to all subsequent versions and modifications until otherwise indicated in new editions or technical newsletters. Changes are continually made to the specifications herein; before using this publication in connection with the operation of IBM systems, refer to the latest *IBM System/32 Bibliography*, GC20-0032, for the editions that are applicable and current.

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A form for readers' comment is at the back of this publication. If the form is missing, address your comments to IBM Corporation, Publications, Department 245, Rochester, Minnesota 55901.

Part 1. 1255 Reference and Operating Procedures

Part 1 includes the following chapters:

Chapter 1. Introduction to 1255 Reference and Operating Procedures: Describes the 1255 Models 1, 2, and 3 and the characteristics of the input document.

Chapter 2. How to Complete System and Stacker Specifications: Contains column description of the entries necessary to complete the system and stacker specifications.

Chapter 3. Operating Procedures and Considerations: Tells how to start and operate the 1255 including 1255 stop conditions.

Chapter 4. Error Detection and Checking: Describes error conditions that can occur while System/32 is operated with a 1255 attached.

Chapter 5. Considerations for Writing an RPG II Program That Contains SUBR08: Tells how to code the RPG II specification sheets and example programs.

Chapter 6. Coding Necessary to Write and Assembler Language Program Containing SUBR08: Coding example of an assembler program using SUBR08.

Chapter 7. 1255 Functions: Machine code level instructions for System/32 to interface with a 1255.

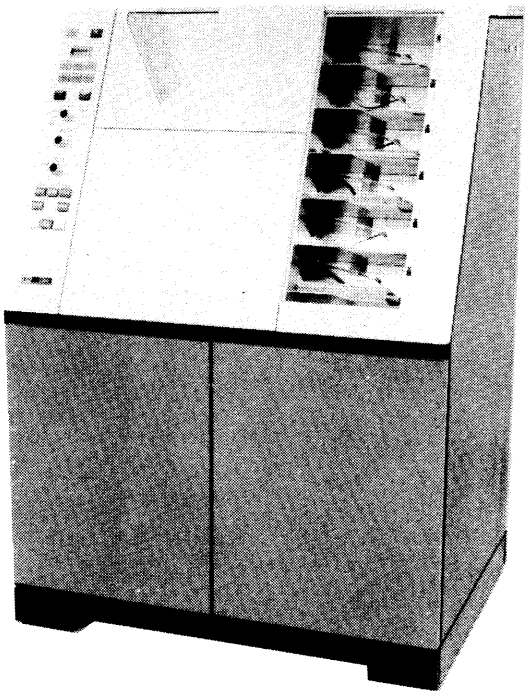
Chapter 1. Introduction to 1255 Reference and Operation Procedures

The 1255 Models 1, 2, and 3 are designed for demand deposit banking applications. They read documents that are printed with magnetic ink characters. Refer to *Characteristics of Input Documents* in this chapter for more information.

System and stacker specifications (see Chapter 2) are included with a user-written RPG II or assembler language program. The resulting program enables the System/32 to read documents from the 1255 and route them to the specified stackers.

DEVICE CHARACTERISTICS

The 1255 Model 1 reads and/or sorts up to 500 6-inch documents per minute into six stackers. Model 2 reads and/or sorts up to 750 6-inch documents per minute into six stackers.



1255 Models 1 and 2 Magnetic Character Reader

Model 3 reads and/or sorts up to 750 6-inch documents per minute into 12 stackers.

1255 Model 3 Magnetic Character Reader

Figure 1-1 summarizes the stacker configuration and the rated throughput (for documents 6 inches in length) for the 1255 Models 1, 2, and 3.

Device	Stackers	Stacker Capacity	Maximum Throughput (dpm)
1255-1	6	2.5-inch stack	500
1255-2	6	2.5-inch stack	750
1255-3	12	2.5-inch stack	750

Figure 1-1. Summary of Rated Throughput for 1255

Both devices perform at maximum speed if the feed clutch does not disengage. SUBR08 is designed to permit the 1255 to perform without disengaging. However, the rest of the program must be written so that the other devices can keep up.

1255 OPTIONAL FEATURE

The Dash Symbol Transmission feature (Feature Number 3215) is available for use with the 1255. This feature transmits a dash symbol from the transit-routing field to storage.

CHARACTERISTICS OF INPUT DOCUMENTS

The 1255 reads MICR (magnetic ink character recognition)-encoded documents. The information read from these documents must be printed with the MICR E-13B font in magnetic ink, near the bottom edge. Each document can contain a maximum of 53 characters (45 digits plus 8 special symbols) in five fields. With the dash symbol transmission feature installed, each document can contain 45 digits plus 9 special symbols for a maximum of 54 characters.

The E-13B font must be printed as recommended by the American Bankers Association (ABA) Technical Committee on the Mechanization of Check Handling. Symbols available on the E-13B font are shown in Figure 1-2. A typical document is shown in Figure 1-3.

E-13B	Graphic
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
(amount)	$
(on-us)	,
(transit)	<
(dash)	–

Figure 1-2. E-13B Font Symbols

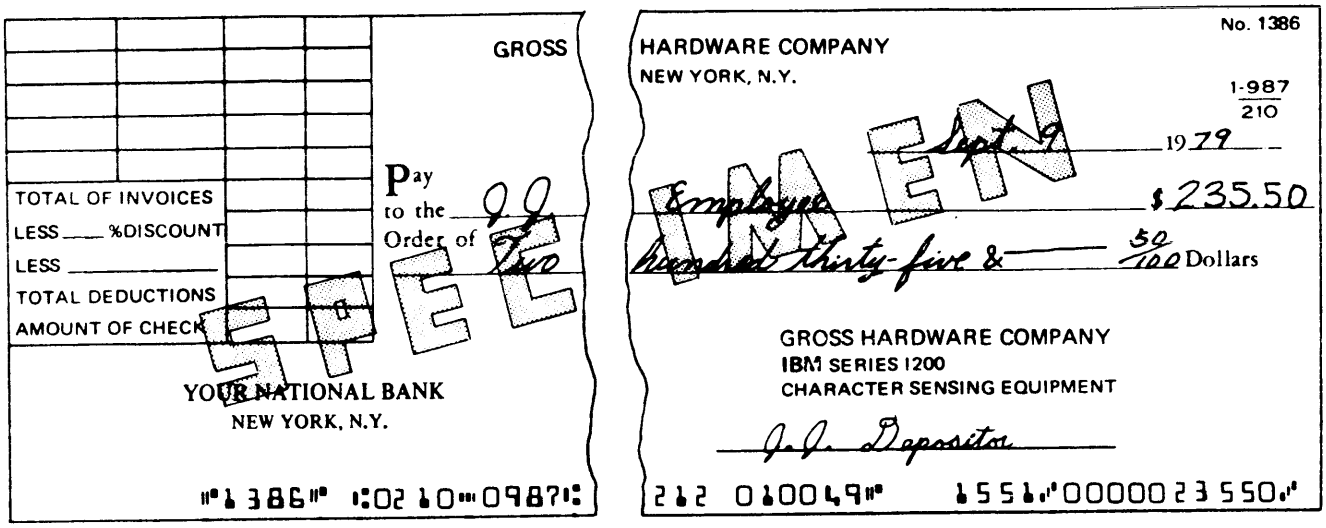
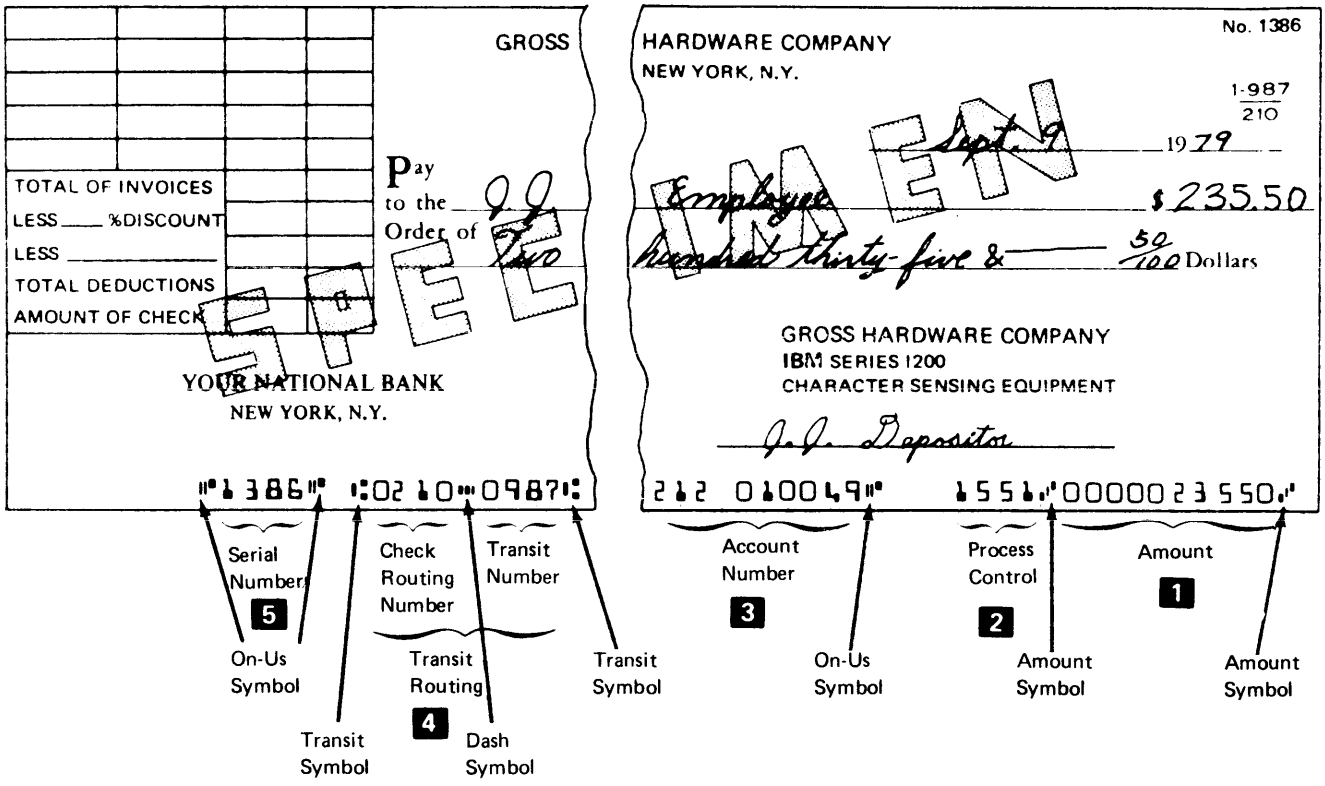


Figure 1-3. Typical Document Containing Magnetic Ink Printing

The number of characters in each field varies according to the type of field. Dashes and spaces can be included, but are not counted as character positions, unless the Dash Symbol Transmission feature is used. Then a dash can be indicated in the transit-routing field and counted as a character position.

Dashes and spaces are ignored when the 1255 determines the digit portion of a number for sorting. For example, in a right-to-left reading, the 1 in 0210-0987 is in sort position 6.

Documents are loaded into the hopper face down with the MICR edge against the backguide. The MICR-encoded ink characters are read from right to left as a document passes through the read head station. The fields are described in the same sequence as they are read (see Figure 1-4).



The fields on a document are read serially from right to left and are described in that manner in the following paragraphs. The special symbols for designating a field are not restricted to a specific location for a field. That is, a 10-digit variable-length field that has an entry of 6 digits can have the special symbol positioned immediately following the leftmost digit.

1 *Amount* is a fixed-length field of 10 or 11 digits. A 10-digit amount field is standard in the United States, but 11 digits can be used. The amount field must be enclosed by amount (⑈) symbols.

2 *Process Control* is a variable-length field of from 0 to 15 digits located to the left of the amount field. It must be followed on the left by the on-us (⑈) symbol. (See note.)

3 *Account-Number* can be a fixed-length field of 5 to 10 digits, or a variable-length field of 15 or fewer digits. The account number field must follow the first on-us symbol and contain, to the left of the field, the on-us or the transit (⑆) symbol. (See note.)

Note: If the process control field specified is larger than 6 digits or the account number field specified is larger than 10 digits, the total size of both fields accumulated cannot be greater than 16 digits.

4 *Transit-Routing* is an 8-digit, fixed length field. It must be enclosed by transit (⑆) symbols and can contain either two 4-digit numbers separated by a dash or a 3-digit and a 5-digit number separated by a dash. A 9-digit transit-routing field is permitted if the 1255 is equipped with the Dash Symbol Transmission feature.

5 *Serial Number* is a variable field of 10 or fewer digits. The field must be enclosed by on-us (⑈) symbols.

Documents vary in thickness and outside dimensions. Figure 1-5 summarizes document characteristics.

	1255 Model 1, 2, or 3
Width	2.5 inches (63.5 mm) up to 4.25 inches (108 mm)
Length	5.75 inches (146 mm) up to 8.88 inches (225.6 mm)
Thickness	0.003 inch (0.08 mm) up to 0.007 inch (0.18 mm)
Maximum Number Characters	45 plus 9 special symbols if the Dash Symbol Transmission feature is installed
Maximum Number Fields	5

Figure 1-5. Document Size Limits and Characteristics

SUBR08

SUBR08 is part of the System/32 system control programming and controls processing done by the 1255. The subroutine performs the following input/output functions:

- Read selected information from documents.
- Check account number for validity (using modulus checking).
- Create an input record for each document read that can be used as input to the user's application program. This record contains the contents of all fields present in the document; the stacker into which the document is to be routed; and indicators that tell whether fields in the document are valid or invalid, and whether the document is a normal, a control, or an EOF document.
- Sort documents into selected stackers.

SYSTEM AND STACKER SPECIFICATIONS

System and stacker specifications tell the subroutine what to do. System specifications describe the input record and the processing to be done. Stacker specifications define which documents are to be routed to specific stackers.

The information on the specifications defines:

- Which fields to read
- How to verify the account number
- The stackers into which documents are to be routed
- How the stackers are to be numbered
- The document count condition
- The control and end-of-file documents

The next chapter describes how to complete the system and stacker specifications.

The information from the system and stacker specifications is an array that is complied with the source program or loaded at execution time.

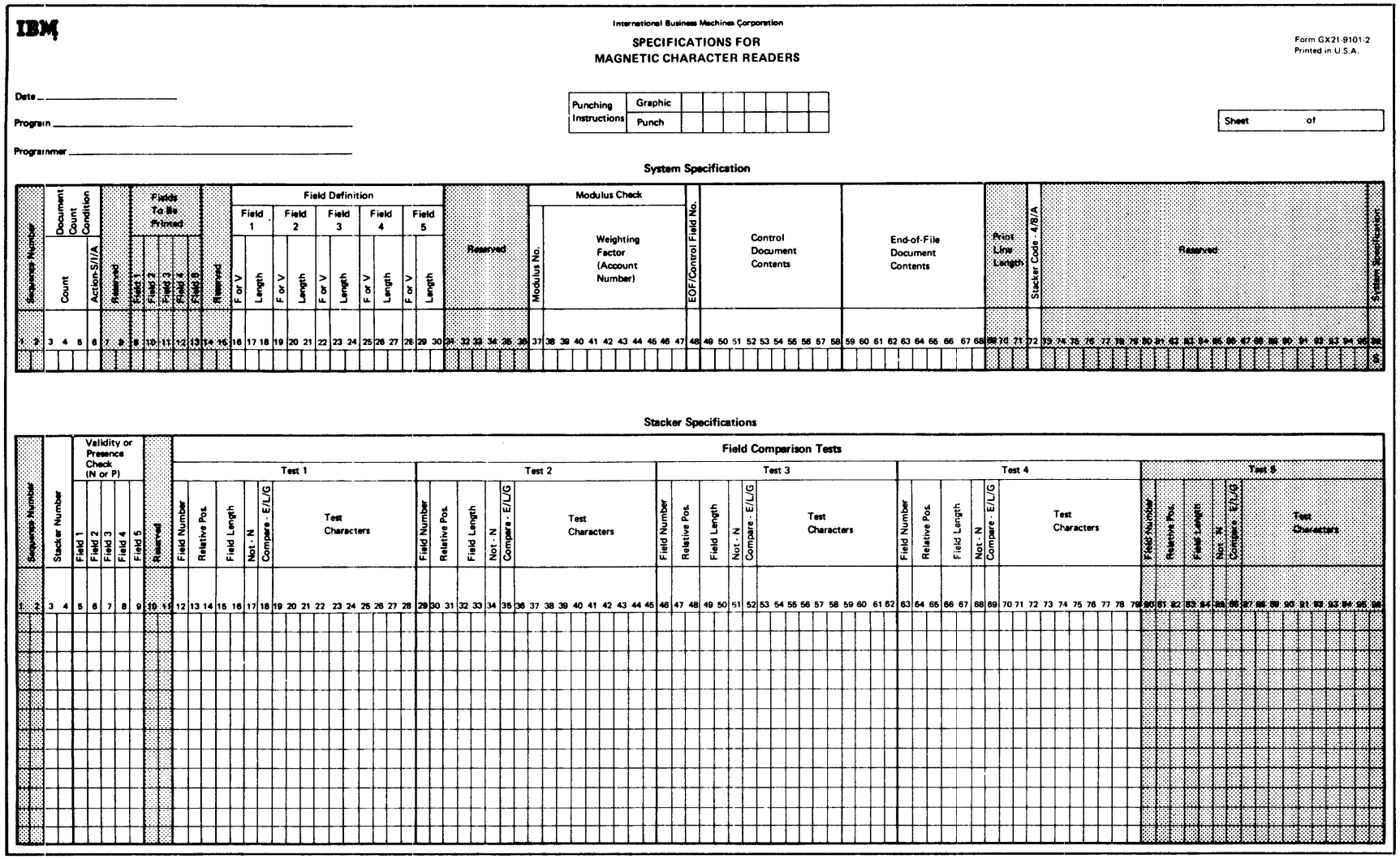
During compilation of the RPG II or assembler program, the overlay linkage editor places the subroutine in the object program. More detailed information on how this array is created is in Chapters 5 and 6.

Chapter 2. How to Complete System and Stacker Specifications

System and stacker specifications describe each job to be done by SUBR08.

Use the *Specifications For Magnetic Character Readers* form, GX21-9101, Figure 2-1. This form may be obtained from your IBM representative or local IBM branch office, or the form on the following page may be duplicated and used.

All multicolumn entries should be right-justified. For example, the entry in columns 3 through 5 may be one, two, or three digits long. If the entry is 65, the 5 must be placed in column 5 and the 6 must be placed in column 4. Column 3 must contain a 0 or be blank. The columns that are shaded on the form on the following page are not used. If there is an entry in any one of these columns, the program ignores it.



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SPECIFICATIONS FOR
MAGNETIC CHARACTER READERS

Form GX21-9101-2
Printed in U.S.A.

Date _____

Program _____

Programmer _____

Punching Instructions	Graphic							
	Punch							

Sheet of

System Specification

Sequence Number	Document Count Condition: Count	Document Count Condition: Action-S/I/A	Reserved	Fields To Be Printed: Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Definition: Field 1 F or V	Field 1 Length	Field 2 F or V	Field 2 Length	Field 3 F or V	Field 3 Length	Field 4 F or V	Field 4 Length	Field 5 F or V	Field 5 Length	Reserved	Modulus Check: Modulus No.	Weighting Factor (Account Number)	EOF/Control Field No.	Control Document Contents	End-of-File Document Contents	Print Line Length	Stacker Code - 4/8/A	Reserved	System Specification
1 2	3 4 5	6	7 8	9	10	11	12	13	14 15	16	17 18	19	20 21	22	23 24	25	26 27	28	29 30	31 32 33 34 35	36	37 38 39 40 41 42 43 44 45 46 47	48	49 50 51 52 53 54 55 56 57 58	59 60 61 62 63 64 65 66 67 68	69 70 71 72	73	74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96	97 98

Stacker Specifications

Sequence Number	Stacker Number	Validity or Presence Check (N or P): Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Comparison Tests: Test 1 Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 2 Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 3 Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 4 Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 5 Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters
1 2	3 4	5	6	7	8	9	10 11	12 13 14	15 16	17	18	19	20 21 22 23 24 25 26 27 28	29 30 31	32 33	34	35	36	37 38 39 40 41 42 43 44 45	46 47 48	49 50	51	52	53 54 55 56 57 58 59 60 61 62	63 64 65	66 67	68	69	70 71 72 73 74 75 76 77 78	79 80	81 82	83 84	85	86	87 88 89 90 91 92 93 94 95 96

Figure 2-1. System Specifications for 1255 Utility

SYSTEM SPECIFICATION

The information on the system specification describes the fields that will be read, the control documents, valid stackers, the end-of-file (EOF) document, and the weighting factor for modulus checking.

One system specification is required for each job and it must precede all stacker specifications.

Document Count Condition (Columns 3-6)

The number entered in columns 3 through 5 (count entry) can be from 001 through 999; it indicates the maximum number of documents that the machine should route to any stacker.

For example, if the entry is 090, the document count condition is met when 90 documents have been routed to any stacker. Because there are up to two documents in transit at the time the document count condition is met, the total number of documents in a given stacker may exceed by two the number specified.

The entry in column 6 (action entry) indicates what should be done when the maximum number of documents has been routed to a stacker. This entry can be S (stop), I (indicate), or A (alternate).

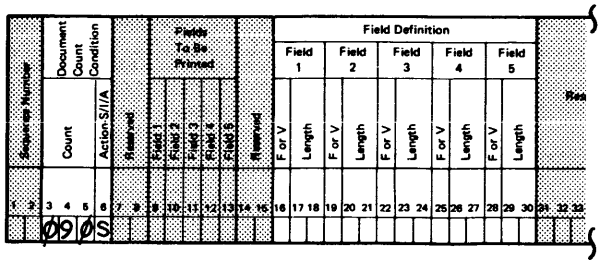
If one or both of these entries are blank, the entire entry is ignored.

S (Stop) (Column 6)

When S is indicated in column 6 and the document count condition is met, the machine stops; the program issues a message to inform the operator that the machine has stopped; and the document count condition is reset to 0.

If there are one or two documents that have been fed but not analyzed, they are processed and routed to the appropriate stacker before the machine stops, even if that stacker has met the document count condition. Therefore, it is possible for a stacker to contain a few more documents than indicated in the count subentry.

The following example indicates that the machine will stop when 90 documents, plus those in transit, have been routed to a stacker:



I (Indicate) (Column 6)

When I is indicated in column 6, and the document count is met, the next *control document* is routed to the stacker that met the document count condition, the document count is reset to 0, and processing continues.

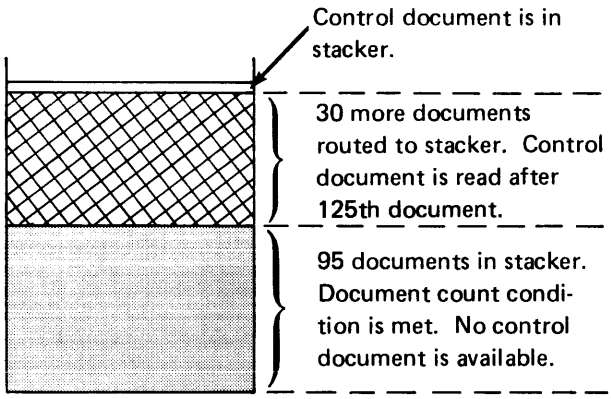
Control Document

The control document separates documents that have been routed to stackers. This is the sole function of the control document; control documents are not included in the stacker document count and modulus checking is not performed on them. However, the subroutine creates an input record for each control document read. Extra control documents are routed to the reject stacker.

Refer to *EOF/Control Field Number (Column 48)* for more information about control documents.

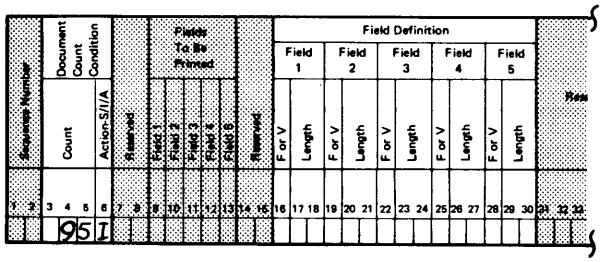
If a control document is not read immediately after a document count condition has been met, the subroutine continues to read and route documents until a control document is available. Then the control document is routed to the stacker that has met the document count condition. Thus, the control document in a stacker indicates that at least the number of documents specified in columns 3 through 5 have been routed to that stacker.

If several stackers meet the document count condition before a control document is read, the first control document read is routed to the first stacker that met the condition; the second control document is routed to the second stacker that met the condition, and so forth. Extra control documents are routed to the reject stacker.



The subroutine can route control documents into every stacker at a certain point in a job and thus separate documents into batches. To define this on the specifications, enter a 1 in column 5 (columns 3 and 4 are blank or contain 0) and an I in column 6. Then insert a stack of control documents (at least one for each stacker) among the input documents at the point where the batch is to be separated.

The following example indicates that a control document should be routed to a stacker when 95 documents have been routed to a stacker.

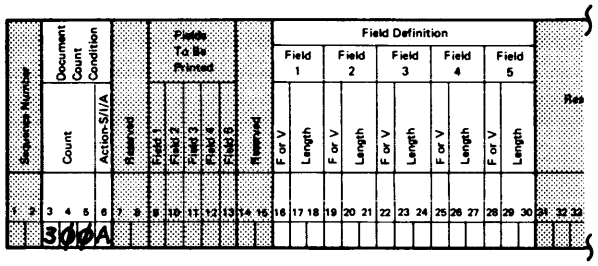


A (Alternate) (Column 6)

When A is indicated in column 6, documents that are not routed to one of the stackers specified on the stacker specifications are routed to every other (alternate) stacker (0, 2, and 4). Documents are routed to stacker 0 until the document count condition is met, then routed to stacker 2 until the document count condition is met, and so forth, until the document count condition is met in the last stacker. The cycle then begins again in stacker 0 and continues until all documents are read.

No stacker specifications are required for alternate stackers, but if documents are routed to an alternate stacker, they are not counted; therefore, the stacker can contain more documents than are indicated in columns 3 through 5 when the document count condition occurs.

The following example indicates that documents not routed to specific stackers by the stacker specifications are to be routed to stacker 0 until there are 300 documents in the stacker, then to stacker 2 until there are 300 documents in the stacker, and so forth, until all the documents are read.



Field Definition (Columns 16-30)

The field definition entry is divided into five 3-column subentries that refer to the five fields that can be contained on a document:

Subentry Name	Columns	Field Name	Allowable Length in Digits	Length
Field 1	16-18	Amount	10 or 11	Fixed
Field 2	19-21	Process Control	6 or less[1]	Variable
Field 3	22-24	Account Number	10 or less[1]	Either fixed or variable
Field 4	25-27	Transit-Routing	8[2]	Fixed
Field 5	28-30	Serial Number	10 or less	Variable

[1] If a modified data format (greater than 10-digit account number or greater than 6-digit process control field) is specified, either of the fields may be up to 15 digits in length. However, the total of both fields cannot exceed 16 digits.

[2] If the Dash Symbol Transmission feature is used, nine digits must be allowed.

The entry in the first column of each subentry indicates whether the field is a fixed length (F) on every document read or whether the length varies (V) from one document to another.

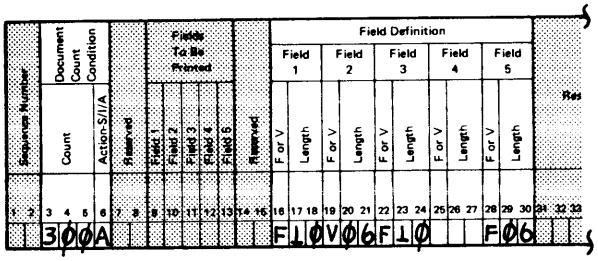
The entry in the second and third columns indicates the length of the field. If the length of the field varies from one document to another, these columns must contain the maximum length of the field; otherwise, the field can be invalid. Special symbols, such as dashes and blanks in a field, should not be included as part of the defined length.

A dash is to be considered part of the field length for the transit-routing fields only when the Dash Symbol Transmission feature is used.

If a field is not to be read, the subentry corresponding to that field must be blank. If invalid information is placed in the columns for a subentry, the subentry is ignored.

The following example indicates that:

- The amount field is a 10-digit fixed-length field.
- The process control field is a variable-length field of from one to six digits.
- The account number field is a 10-digit fixed-length field.
- The transit-routing field should not be read.
- The serial number field is a 6-digit fixed-length field.

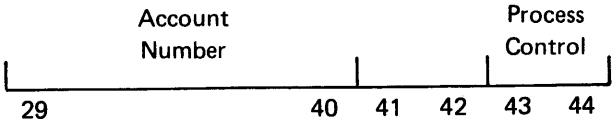


Modified Data Format

Modified data format is variable for each user program. It allows the user to specify the account number greater than 10 digits (maximum 15) or the process control field greater than 6 digits (maximum 15). However, the accumulated total of the two fields cannot exceed 16 digits. Modulus checking and field comparison tests are performed only on the 10 rightmost digits of the specified fields.

The following example shows an account number field of 12 digits and the process control field specified as 2 digits.

If the process control field on a document has more than two digits encoded, as many digits as possible will be returned in the formatted record until all available positions are filled. The field validity indicator is turned off for field 2 (process control) because it is greater than the 2-digit positions specified on the system specification sheet. If the account number is less than 12 digits on the document, and the field is described as variable on the system specification sheet, the account number field is right-justified to position 40 with the unused positions filled with blanks. If the account number is specified as fixed length 12, the account number field is marked as valid if the 1255 successfully read the document (no misreads), and there are exactly 12 characters on the document. If a field on the document is longer than the digit positions specified on the system specification sheet, the leftmost digits are truncated and the field validity indicator for that field is turned off.



Modulus Check (Columns 37-47)

A practice in business that provides a certain amount of protection against clerical, keying, and fraud errors is devising numbers that are self-checking. Self-check provides a method of verifying a field at the same time it is entered. Also, unless the person attempting the fraud knows the system, the chance of an invented number matching a valid one is minimal.

The entries in columns 37 through 47 indicate the modulus (10 or 11) used to verify the account number and the weighting factor that is used to compute the self-check digit.

When online with a System/32, a document found to have an incorrect account number prevents setting of the account number field-validity indicator.

Modulus 11 checks a number up to 10 digits with any weighting factor, summing the products and checking for an even multiple of 11; or modulus 11 checks a number with a fixed weighting factor, summing the products and checks for a multiple of 11 with a remainder of 4. In modulus 10 and 11, the weighting factor of the check digit is 1 regardless of its position, and the digit must be other than zero.

In modulus 11 with a remainder of 4, the check digit is always in the first position and the weighting factor is always alternate 1's and 10's with 1 in the first position. For example; 10,1,10,1,10,1.

Figure 2-2 shows how the self-check digit is calculated by modulus 10 and modulus 11.

The subroutine calculates a self-check digit and compares it to the self-check digit on the document. (Any digit in the account number can be the self-check digit.) When the self-check digits are not equal, the account number is invalid and the account number validity indicator in the input record is blank.

Modulus Number (Column 37)

When a 0 is indicated in column 37, modulus 10 checking is used to verify the account number. When a 1 is indicated in column 37, arithmetic modulus 11 or geometric modulus 11 with a remainder of zero checking is used to verify the account number. If column 37 contains a 4, geometric modulus 11 with a remainder of 4 is specified.

Note: If column 37 has an entry, columns 38 through 47 must contain a valid entry.

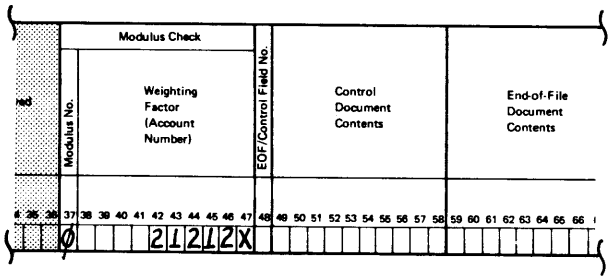
Weighting Factor (Columns 38–47)

The entry in columns 38 through 47 is the weighting factor used to generate the self-check digit for modulus checking. One number, (0 through 9 for modulus checking 10 or 11; 0 through 10 for geometric modulus 11) must be entered for each digit in the account number (right-justified), and an X must be entered in the position corresponding to the self-check digit. The digit 10 is coded A on the system specification sheet.

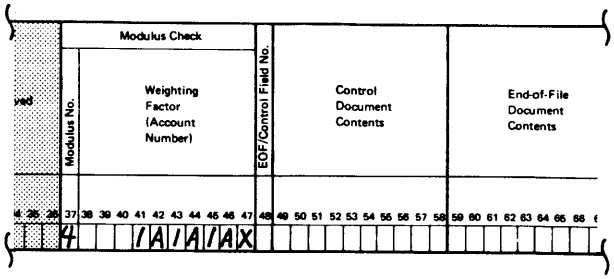
For geometric modulus 11 with a remainder of 4, the check digit position (X) is assigned the value of 1 and is included in the multiplying of the account number by the weighting factor. However, it is coded as X on the system specification sheet (columns 38 through 47). See Figure 2-2 for calculating the self-check digits.

If one of these entries is blank or invalid, modulus checking is not performed.

The first example indicates that modulus 10 checking should be performed on a 6-digit account number. The weighting factor 21212, and the account number's self-check digit is the rightmost digit.



The second example indicates that geometric modulus 11 with a remainder of 4 should be performed on a 7-digit account number. The weighting factor is 1 A1A1A and the account number self-check digit is the rightmost digit.



Using Modulus 10 To Calculate Self-Check Digit

The subroutine:

1. Multiplies each digit of the account number by its corresponding digit of the weighting factor.

Account number	5	2	0	5	6	3
Weighting factor	2	1	2	X	1	2
	10,	2,	0,	,	6,	6

2. Adds each digit of the products:

   1 + 0 + 2 + 0 + 6 + 6 = 15

3. Determines the next number divisible by 10 that is higher than the sum computed in step 2.

   From the sum 15, 20 is the next higher multiple of 10.

4. Subtracts the sum computed in step 2 from the number determined by step 3. The difference is the self-check digit.

   20 - 15 = 5

   The number 5 is the self-check digit.

Using Modulus 11 To Calculate Self-Check Digit

The subroutine:

1. Multiplies each digit of the account number by its corresponding digit of the weighting factor.

Account number	5	2	0	6	3	2
Weighting factor	6	5	4	3	2	X
	30,	10,	0,	18,	6,	

2. Adds the products:

   30 + 10 + 0 + 18 + 6 = 64

3. Determines the next number divisible by 11 that is higher than the sum computed in step 2.

   From the number 64, 66 is the next higher multiple of 11.

4. Subtracts the sum computed in step 2 from the number determined by step 3. The difference is the self-check digit.

   66 - 64 = 2

   The number 2 is the self-check digit.

Figure 2-2 (Part 1 of 2). Calculating the Self-Check Digit

Using Geometric Modulus 11 with a Remainder of Zero to Calculate Self-Check Digit

The subroutine:

1. Multiplies each digit of the account number by its corresponding digit of the weighting factor.

Account number	6	3	8	8	2	4	
Weighting factor	A	4	3	X	0	7	
	60,	12,	24,		0,	28	

2. Adds the products:

   60 + 12 + 24 + 0 + 28 = 124

3. Determines the next number divisible by 11 that is higher than the sum computed in step 2.

   From the number 124, the next higher multiple of 11 is 132.

4. Subtracts the sum computed in step 2 from the number determined in step 3. The difference is the self-check digit.

   Next highest multiple of 11 = 132

   Sum of products = 124

   Check digit = 8

   The number 8 is the self-check digit.

Using Geometric Modulus 11 with a Remainder of Four to Calculate Self-Check Digit

The subroutine:

1. Multiplies each digit of the account number by its corresponding digit of the weighting factor.

Account number	5	1	8	1	8	1	8
Weighting factor	1	A	1	A	1	A	X
	5,	10,	8,	10,	8,	10,	8

2. Adds the products:

   5 + 10 + 8 + 10 + 8 +10 + 8 = 59

3. Divides the sum computed in step 2 by 11. There must be a remainder of 4.

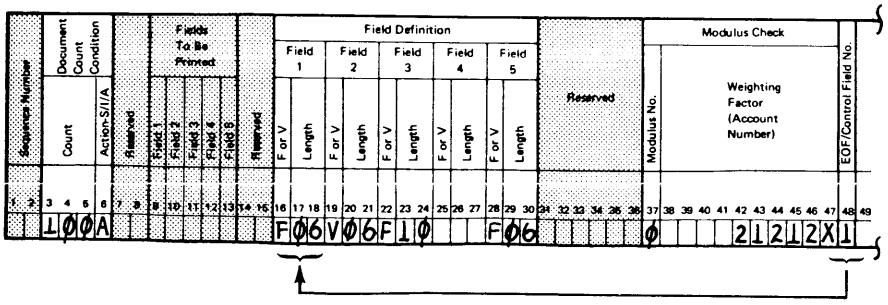
   59 ÷ 11 = 5 with a remainder of 4

   The number 8 is the self-check digit.

Figure 2-2 (Part 2 of 2). Calculating the Self-Check Digit

EOF/Control Field Number (Column 48)

The entry in column 48 is the number of the field (1-5) that will contain the digits (specified in columns 49 through 58 or 59 through 68) that identify a document as an *EOF* or control document. An entry of a field definition 1 through 5 in column 48 is required.



Control Document Contents (Columns 49-58)

The entry in columns 49 through 58 is the actual digits contained in the control field (indicated in column 48) that identify the document as a control document. The entry must be right-justified.

If the control field is a fixed-length field, the entry in columns 49 through 58 must be the same length as the control field.

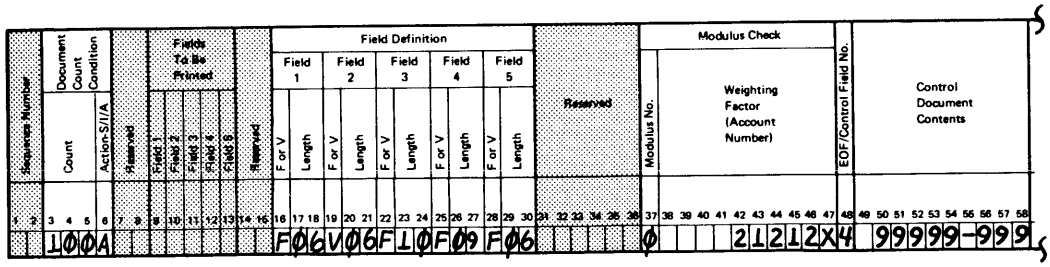
For example, if the amount field is defined in columns 16 through 18 as a six-digit fixed-length field, and is designated in column 48 as the control field, the entry in columns 49 through 58 must also be six digits.

If the control field is a variable-length field, the entry in columns 49 through 58 can be the same length as, or shorter than, the control field.

If columns 49 through 58 are blank, the subroutine assumes that control documents are not being used.

When the Dash Symbol Transmission feature is used and the transit-routing field (field 4) has been specified as the control field (a 4 in column 48), the dash must be included in the field length and in the contents of the actual control digits.

The following example indicates that the control document has eight 9s in the transit-routing field (field 4).



EOF Document Contents (Columns 59-68)

The end-of-file document tells the program that all documents have been read and that the job should be ended. Modulus checking is not performed on this document, but the subroutine creates an input record for each EOF document processed.

An entry in column 48 indicates the field that contains the digits identifying the document as a control document (columns 49 through 58) or EOF (columns 59 through 68).

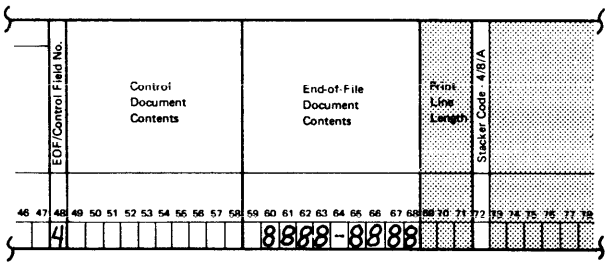
The entry in columns 59 through 68 is the actual digits contained in the control field (indicated in column 48) that identify a document as an end-of-file document. Columns 59 through 68 must have an entry, and it must be right-justified.

If the control field is a fixed-length field, the entry in columns 59 through 68 must be the same length as the control field (columns 49 through 58).

If the control field is a variable-length field, the entry in columns 59 through 68 can be the same length as, or shorter than, the control field.

When the Dash Symbol Transmission feature is used and the transit-routing field (field 4) has been specified as the control field (a 4 in column 48), the dash must be included in the field length and in the contents of the actual control digits.

The following example indicates that the EOF document has eight 8s in the transit-routing field (field 4) and the Dash Symbol Transmission feature specified.

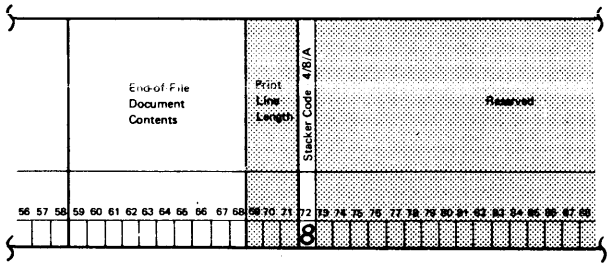


Stacker Code (Column 72)

The entry in column 72 indicates how the stackers are numbered. The entry can be 4, 8, or A.

Entry	Model	How 1255 Stackers are Numbered
4	1 or 2	0, 1, 2, 3, 4, and R
8	1 or 2	0, 2, 4, 6, 8, and R
A	3	0, 1, 2, 3, 4, 5, 6, 7, 8, A, and R
b	3	Default is A

The following example indicates that there are six stackers numbered 0, 2, 4, 6, 8, and R:



STACKER SPECIFICATIONS

The information in the stacker specifications identifies the stacker to which a document is routed and describes the tests that must be performed on the document before it is routed to that stacker.

One or more stacker specifications must be entered for each stacker used, unless A is indicated in column 6 of the system specification. In this case, no stacker specifications are required for stackers 0, 2, and 4. See A (alternate) (column 6) of *System Specification* in this chapter.

Stacker specifications are processed in the order they are entered.

Stacker Number (Column 4)

The entry in column 4 indicates the stacker to which a document is routed if it meets the criteria described in columns 5 through 79. This number must be one of the numbers of the stackers on the machine being used, which is indicated in column 72 of the system specifications.

For example, if there is an 8 in column 72 of the system specification, the entry in column 4 of the stacker specifications must be 0, 2, 4, 6, 8, or R. If, for example, 1 is specified, the document that caused this specification to be chosen is routed to the reject stacker, and the machine stops.

An asterisk (*) in column 4 indicates a continuation line for additional field comparison tests (columns 12 through 79). A maximum of two continuation lines can be entered on the stacker specification sheet, allowing up to 12 field comparison tests to be performed.

Note: The first stacker specification cannot be a continuation line.

Validity or Presence Check (N/P or Blank) Columns 5 through 9

The entry in columns 5 through 9 indicates whether the specified field must be (P) present and valid or (N) not present and valid. If columns 5 through 9 are blank, no checking is performed.

Note: Continuation lines (asterisk in column 4) must not have an entry in columns 5 through 9.

N (Not Present)

An N in columns 5 through 9 indicates that the corresponding field must *not* be present or valid before further testing is done.

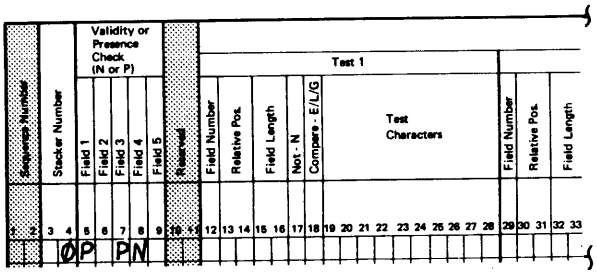
P (Present)

A P in columns 5 through 9 indicates that the corresponding field must be present and valid before further testing is done.

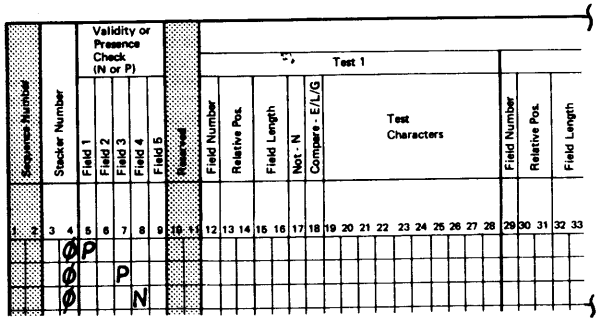
Blank

If column 5, 6, 7, 8, or 9 is blank, the field associated with the blank column is not checked. The blank field can be present, absent, valid, or invalid.

The following example indicates that documents are to be routed to stacker 0 when fields 1 (amount) and 3 (account number) are valid, and field 4 (transit-routing) is invalid or missing. The contents of the remaining fields in the document are of no concern. (In this example, field comparison tests are not to be done on documents meeting the criteria established above.)



Notice that all of the conditions specified must be met before the document is routed to stacker 0. If documents are to be routed to stacker 0 when any one of the conditions is met (either field 1 or field 3 is valid or field 4 is invalid or missing), the following stacker specifications are required:



If a document meets the specified conditions (columns 5 through 9), and no field comparison tests are specified, the document is routed to the stacker specified; or if specified in columns 12 through 79, further testing can be performed on the document.

(If the document does not meet the conditions specified in columns 5 through 9, the document is checked against the next stacker specification. If there are no other stacker specifications, the document is routed to the reject stacker.)

Field Comparison Tests (Columns 12 through 79)

The entry in columns 12 through 79 indicates that the specified document fields should be compared to the specified test characters and, based on the results, documents should be routed to the specified stacker.

The test can determine whether a field is equal to, not equal to, greater than, not greater than, less than, or not less than the test character.

The test can also determine whether a variable-length field is long enough to permit additional comparison tests to be performed. (See *Field Length Validity Check* in this chapter.)

Up to 12 tests can be performed on one or more fields by specifying continuation lines (column 4). Each field can contain 10 or fewer digits.

Tests are performed sequentially. If test 1 is successful, test 2 is performed, and so forth, until either a test is unsuccessful or until the last test specified is successfully completed.

A document is routed to the specified stacker only if all the tests are completed successfully. Testing is complete when:

- The specified number of tests have been performed successfully.
- The next field number (columns 12, 29, 46, 63) entry, including continuation line tests, is blank, and all preceding tests have been completed successfully.
- A document fails the test.

If a document does not meet the criteria specified in one of the tests, the document is tested against the next stacker specification. If there are no other stacker specifications, the document is routed to the reject stacker.

If a field comparison test is to be performed on the transit-routing field and the Dash Symbol Transmission feature is used, the dash must be considered in the field length size and must be considered as a valid character in the field being tested.

Since spaces or blanks are not counted as character positions on documents, a field containing all blanks has a field length of 0. The only test that can determine whether a field contains all blanks is a field length validity check. (See *Field Length Validity Check* in this chapter.)

Field comparison tests 1, 2, 3, and 4 are in columns 12 through 28, 29 through 45, 46 through 62, and 63 through 79 respectively. Each has the same format. Each entry is explained in the following section. If continuation lines are specified, the field comparison tests are performed sequentially as they are entered on the stacker specification sheet. Test 5 (continuation line 1 test 1) follows test 4, test 6 follows test 5, and so on.

Field Number (Column 12, also 29, 46, and 63)

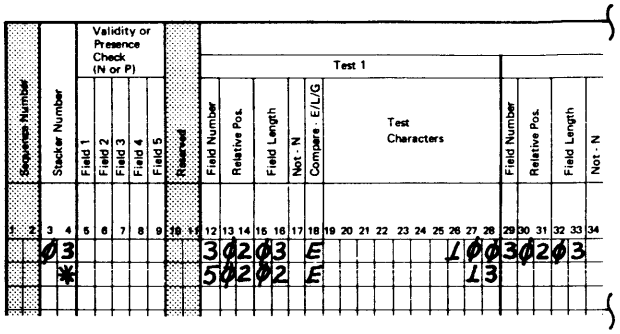
The entry in column 12 is the number of the field that will be tested. The entry may be:

1 – Amount field
2 – Process control field
3 – Account number field
4 – Transit-routing field
5 – Serial number field

Up to 12 field tests can be specified. Each field can contain 10 or fewer digits.

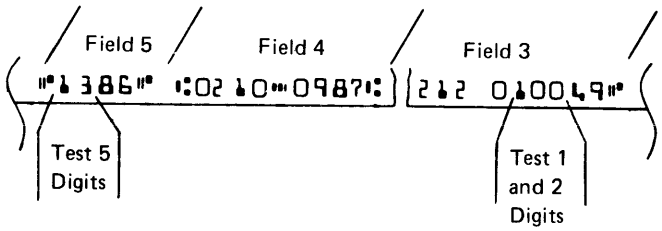
Relative Pos. (Columns 13 and 14, also 30 and 31, 47 and 48, and 64 and 65)

In the following example, the entries in columns 13 and 14 indicate the location of the rightmost digit to be tested, and that additional testing is to be performed (asterisk in column 4) on field 5 following field test 4.



If columns 13 and 14 are blank, default is 0. (For field length tests, this entry is the length to which the field is compared.)

In the following example the number that is to be tested is 100. The rightmost digit that will be tested is 0. If this 0 is in the third position from the right in the field on the document, the number in columns 13 and 14 will be 02. (The rightmost digit in the field is position 0.)



Field Length (Columns 15 and 16, also 32 and 33, 49 and 50, and 66 and 67)

The entry in columns 15 and 16 indicates the number of positions being tested. At least one position must be tested. (The entry must be 1 for a field test.)

Not – N (Column 17, also 34, 51, and 68)

The entry in column 17 is used in conjunction with the E/L/G entry in column 18 (also 35, 52, 69) to indicate NE (not equal), NL (not less than), or NG (not greater than).

If the column is blank or contains a character other than N, the subroutine ignores it.

Compare – E/L/G (Column 18, also 35, 52, and 69)

The entry in column 18 indicates the condition being tested:

E indicates that the contents of the specified field are equal to the value of the test characters. (This is also specified in field length tests.)

L indicates that the contents of the specified field are less than the value of the test characters.

G indicates that the contents of the specified field are greater than the value of the test characters.

If the column is blank or contains a character other than E, L, or G, default is E.

Test Characters (Columns 19 through 28, also 36 through 45, 53 through 62, and 70 through 79)

The entry in columns 19 through 28 indicates the 10 (or fewer) test characters against which the specified field will be compared to.

This entry must be blank if the field length will be tested. Refer to *Field Length Validity Check* in this chapter.

When the Dash Symbol Transmission feature is used and the transit-routing field is specified as the test field, the dash must be considered a valid character in the field. For example, to indicate transit-routing field 0912-0069 in test 1, a dash must be placed in column 24 of the stacker specifications as shown below:

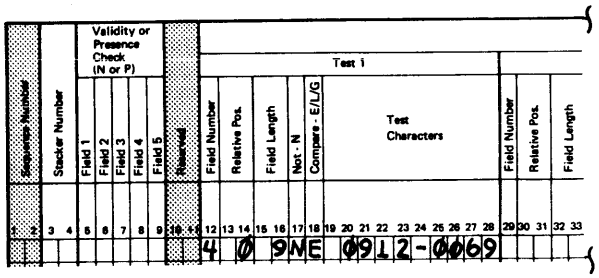


Figure 2-3 is an example of a stacker specification that routes documents to stackers 1, 2, and 3.

Field Length Validity Check

The field comparison tests can be used to determine whether a variable-length field is long enough or shorter than the length specified to permit additional comparison tests to be performed on that field.

To do this, enter:

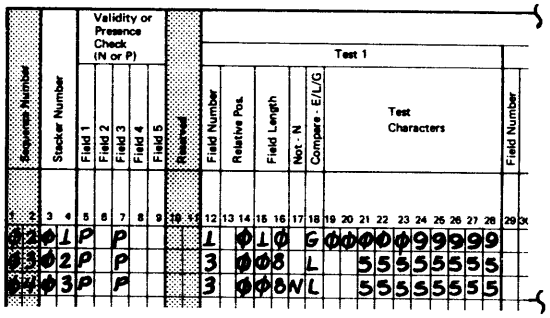
- The number of the field to be tested in the Field Number column 12 (also 29, 46, or 63)
- A 1 in Field Length column 16 (also 33, 50, or 67)
- Nothing in column 17 (also column 34, 51, and 68) checks for a length equal to or greater than the length specified (an N in these columns checks for a length less than the length specified)
- An E in Compare column 18 (also 35, 52, or 69)
- Nothing in the Test Character columns 19 through 28 (also 36 through 45, 53 through 62, and 70 through 79

See Figure 2-4 for an example of Field Length Validity check.

If the field is at least as long as the length specified in columns 13 and 14 (also 30 and 31, 47 and 48, or 64 and 65), the test is satisfied and further tests on that stacker specification are performed. If the field is not long enough, the test is not satisfied and the document is tested against the next stacker specification.

Example of Field Length Validity Check. Test 3 in the field comparison area of Figure 2-4 shows the test for a field containing all blanks. Note that column 8 can either be blank (as in the example) or contain an N.

Figure 2-4 also shows the use of field comparison tests to check the serial number of a document. All documents with a serial number whose last five digits are less than 33333 are routed to stacker 2.



Sequence Number

02 This specification determines whether a document has an amount field of $1000.00 or greater. If so, the document is routed to stacker 1 (columns 3 and 4). If not, the document is tested against the stacker specification identified by sequence number 03.

Before the amount field is tested, the document is checked to determine whether it contains both a valid amount field and a valid account number (designated by P in columns 5 and 7).

The test against the contents of the amount field is designated by columns 12 through 28. Column 12 indicates that field 1 (the amount field) is to be tested. The first character to be tested is at relative position 0 (column 14), which is the rightmost position of the field. Ten characters are to be tested (columns 15 and 16). The test is to determine whether the amount is greater than (column 18) $999.99 (columns 19 through 28).

03 This specification determines whether a document has an account number less than 55555555. If so, the document is routed to stacker 2 (columns 3 and 4). If not, the document is tested against the stacker specification identified by sequence number 04. As a result of stacker specification 02, documents with an amount field of $1000.00 or greater would have already been routed to stacker 1.

Before the account number is tested, the document is checked to determine whether it contains both a valid amount field and a valid account number (designated by P in columns 5 and 7).

The test against the contents of the account number field is designated by columns 12 through 28. Column 12 indicates that field 3 (the account number field) is to be tested. The first character to be tested is at relative position 0 (column 14), which is the rightmost position of the field. Eight characters are to be tested (columns 15 and 16). The test is to determine whether the account number is less than (column 18) 55555555 (columns 19 through 28).

04 This specification determines whether a document has an account number equal to or greater than 55555555. If so, the document is routed to stacker 3 (columns 3 and 4).

Before the account number is tested, the document is checked to determine whether it contains both a valid amount field and a valid account number (designated by P in columns 5 and 7).

The test against the contents of the account number field is designated by columns 12 through 28. Column 12 indicates that field 3 (the account number field) is to be tested. The first character to be tested is at relative position 0 (column 14), which is the rightmost position of the field. Eight characters are to be tested (columns 15 and 16). The test is to determine whether the account number is *not* less than (columns 17 and 18) 55555555 (columns 19 through 28).

Figure 2-3. Sample Stacker Specifications

The system specification for this job has identified the serial number field as a variable-length field containing from one to six digits. Therefore, to save time in locating the desired documents, two preliminary tests are performed before the actual test on the five digits of the serial number:

- Validity or presence checks (columns 5 through 9) are performed to ensure that the document contains a valid amount field (field 1), a valid process control field (field 2), a valid account number (field 3), and a valid serial number (field 5).

- A field length validity check test (test 1, columns 12 through 18) is performed to determine whether the serial number field contains at least five digits.

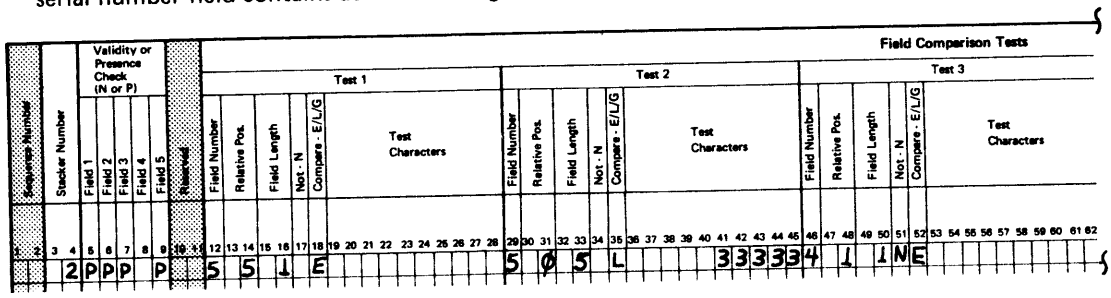


Figure 2-4. Field Length Validity Check

If test 1 indicates that the field is less than five digits long, the document is routed to the reject stacker (because there are no more stacker specifications).

If test 1 indicates that the serial number has five or more digits, comparison test 2 is performed.

Comparison test 2 determines whether the document contains a serial number whose last five digits are less than 33333; that is, the serial number is between 00000 and 33332. If the document contains such a serial number, it is routed to stacker 2 provided it meets test 3. If it does not contain such a serial number, it is routed to the reject stacker (because there are no more stacker specifications). Refer to *A (Alternate) (Column 4)* under *Document Count Condition (Columns 1 through 4).*

Comparison Test 3 is a field length test. If field 4 is not blank the document is routed to the reject stacker (R).

SUMMARY CHART OF SYSTEM SPECIFICATION ENTRIES

System Specification		
Column	**Descriptive Name**	**Entries/Explanation**
3-5	Document Count	One to three digits denote the number of document to be routed to a stacker before the document count condition is met.
6	Action	The action to be performed after the document count condition is met for a stacker is: S – Stop the 1255. I – Indicate document count condition by means of control documents. A – Alternate stackers.
16-30	Field Definition	Five 3-column subentries describe the fields to be read from a document. The first column of each subentry must contain either: F – Field is fixed length. V – Field is variable length. The second and third columns of each subentry must contain a number designating the length of a fixed-length field, or the maximum length of a variable-length field.
37	Modulus Number	0 or 1 designates the modulus checking (10 or 11) used in verifying account number: 0 – Modulus 10 is used. 1 – Modulus 11 is used.
38-47	Weighting Factor	This weighting factor of 10 or fewer characters is used in generating the self-check digit for modulus checking. A character may be any digit from 0 through 9, or the letter X.
48	EOF/Control Field	A number from 1 through 5 identifies the field used to define end-of-file and control documents.
49-58	Control Document Contents	These numbers in a field identify a control document.
59-68	End-of-File Document Contents	These numbers in a field identify an end-of-file document.
72	Stacker Code	A number designates how stackers numbered on the 1255 are being used: 4 – Six stackers numbered 0, 1, 2, 3, 4, and R. 8 – Six stackers numbered 0, 2, 4, 6, 8, and R. A – 12 stackers numbered 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, and R.

SUMMARY CHART OF STACKER SPECIFICATION ENTRIES

Stacker Specification		
Column	**Descriptive Name**	**Entries/Explanation**
4	Stacker Number or Continuation Line	A number or a letter (A or R) identifies the stacker associated with this stacker specification. An asterisk (*) indicates a continuation line for more field comparison tests (maximum of two continuation lines).
5-9	Validity or Presence Check	P indicates that the field must be present and valid before further processing is done on the document. N indicates that the field must not be present or valid before further processing is done on the document. Ø in columns 5 through 9 indicates that the field is not checked. These columns must be Ø if column 4 contains an asterisk (*).
12-28	Field Test 1	The contents of any field in a document or a digit of any variable-length field is tested to determine whether the field is long enough to allow more tests to be performed.
12	Field Number	A number from 1 through 5 indicates the number of the field to be tested.
13-14	Relative Position	This number corresponds to the relative location of the rightmost digit to be tested or the number of digits needed in a field to satisfy a length test.
15-16	Field Length	This number designates the number of positions being tested.
17	Not – N	The letter N is used in conjunction with column 18 to indicate that tests are to be performed for a not-equal, not-less-than, or a not-greater-than condition.
18	Compare – E,L,G	The type of condition being tested is: E – Field contents equal test characters, or a length test is to be performed. L – Field contents less than test characters. G – Field contents greater than test characters.
19-28	Test Characters	Ten or less numeric characters are to be compared with the contents of the designated field. Entry must be blank if the length of a field is being tested.
29-79	Field Tests 2,3,4	These entries indicate the same type of information as the entries for Field Test 1.

SAMPLE OF A COMPLETED SYSTEM AND STACKER SPECIFICATION

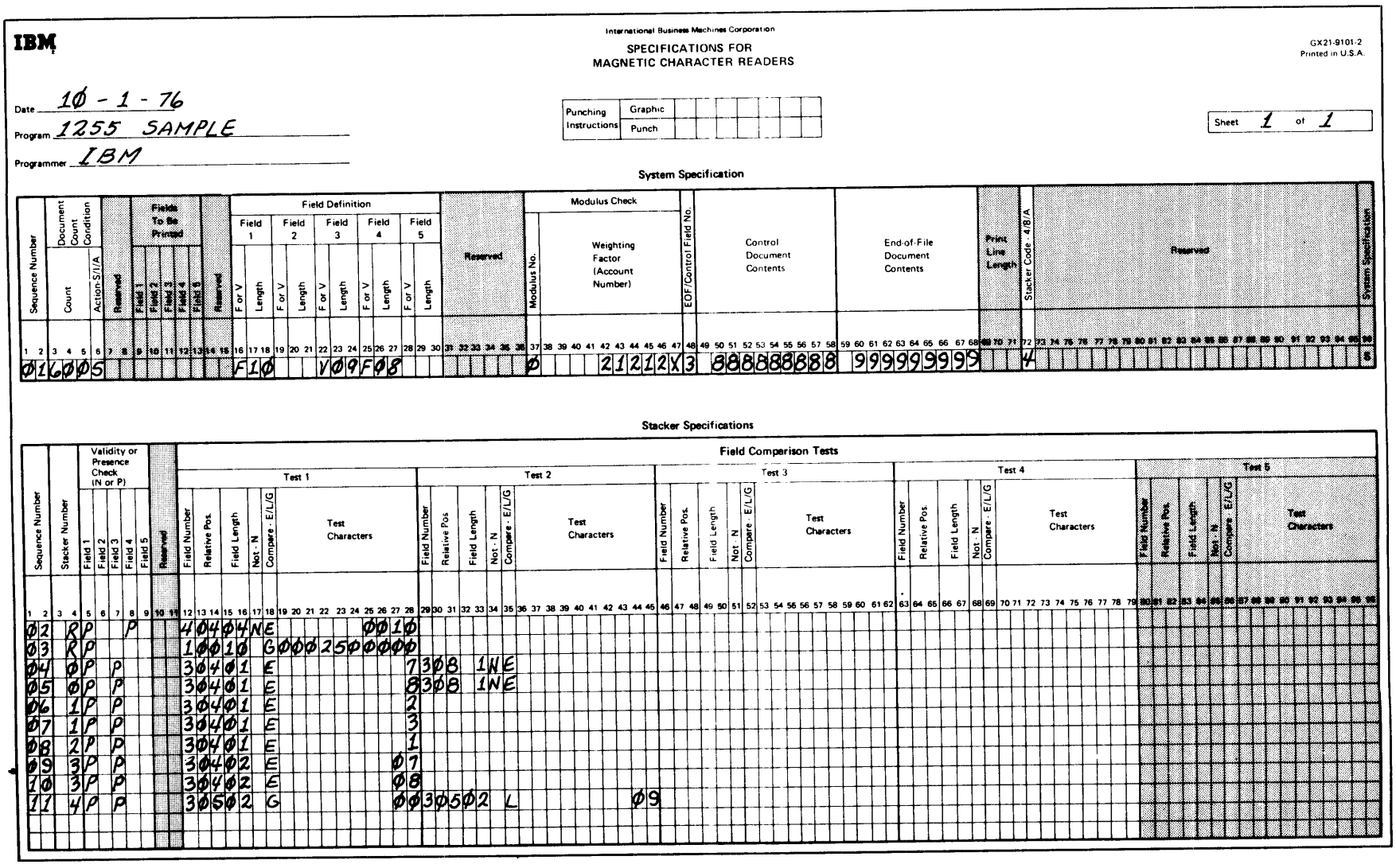
Figure 2-5 contains a set of sample specifications for sorting bank documents. The types and formats of input documents expected and the stackers to which these documents are to be routed are:

Type of Input Document	Account Number Formats	Stacker To Be Selected
Regular checking account checks	xx7-xxx-x xx8-xxx-x	0
Special checking account checks	xx2-xxx-x xx3-xxx-x	1
Business checks	xx1-xxx-x	2
Special handling documents	xxx-07xxxx xxx-08xxxx	3
Special handling documents	01x-xxx-x 02x-xxx-x 03x-xxx-x 04x-xxx-x 05x-xxx-x 06x-xxx-x 07x-xxx-x 08x-xxx-x	4
Checks from other banks		R
Checks over $25,000		R
Documents rejected by 1255		R
Documents with account numbers other than above		R

Figure 2-6 describes the entries on the system specification shown in Figure 2-5. The system specification must precede all stacker specifications in the job.

Figure 2-7 describes the entries on the stacker specification shown in Figure 2-5. These specifications define the criteria for routing a document to stackers. The stacker specifications are processed against a document in the order of their sequence numbers. If a document does not satisfy all of the conditions on a particular stacker specification, that document is tested against the next stacker specification in the sequence. If the document has not satisfied any of the conditions on any of the stacker specifications, that document is routed to the reject stacker.

Refer to *System Generation* in Chapter 8 for more information on how these specifications are compiled.



IBM

International Business Machines Corporation

SPECIFICATIONS FOR
MAGNETIC CHARACTER READERS

GX21-9101-2
Printed in U.S.A.

Date 10-1-76

Program 1255 SAMPLE

Programmer IBM

Punching Instructions: Graphic / Punch

Sheet 1 of 1

System Specification

Sequence Number	Document Count Condition: Count	Action-S/I/A	Reserved	Fields To Be Printed: Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Definition: Field 1 F or V	Field 1 Length	Field 2 F or V	Field 2 Length	Field 3 F or V	Field 3 Length	Field 4 F or V	Field 4 Length	Field 5 F or V	Field 5 Length	Reserved	Modulus Check: Modulus No.	Weighting Factor (Account Number)	EOF/Control Field No.	Control Document Contents	End-of-File Document Contents	Print Line Length	Stacker Code - 4/8/A	Reserved	System Specification
1 2	3 4 5	6	7 8	9	10	11	12	13	14 15	16	17 18	19	20 21	22	23 24	25	26 27	28	29 30	31 32 33 34 35 36	37	38 39 40 41 42 43 44 45 46 47	48	49 50 51 52 53 54 55 56 57 58	59 60 61 62 63 64 65 66 67 68	69 70 71	72	73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95	96
Ø1	600	Ø	5							F	1Ø			V	Ø9	F	Ø8			Ø		2121212X	3	88888888	99999999	99		4	

Stacker Specifications

Sequence Number	Stacker Number	Validity or Presence Check (N or P): Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Comparison Tests: Test 1 Field Number	Test 1 Relative Pos.	Test 1 Field Length	Test 1 Not - N	Test 1 Compare - E/L/G	Test 1 Test Characters	Test 2 Field Number	Test 2 Relative Pos.	Test 2 Field Length	Test 2 Not - N	Test 2 Compare - E/L/G	Test 2 Test Characters	Test 3 Field Number	Test 3 Relative Pos.	Test 3 Field Length	Test 3 Not - N	Test 3 Compare - E/L/G	Test 3 Test Characters	Test 4 Field Number	Test 4 Relative Pos.	Test 4 Field Length	Test 4 Not - N	Test 4 Compare - E/L/G	Test 4 Test Characters	Test 5 Field Number	Test 5 Relative Pos.	Test 5 Field Length	Test 5 Not - N	Test 5 Compare - E/L/G	Test 5 Test Characters
1 2	3 4	5	6	7	8	9	10 11	12 13	14 15	16	17	18	19 20 21 22 23 24 25 26 27 28	29	30 31	32 33	34	35	36 37 38 39 40 41 42 43 44 45	46	47 48	49 50	51	52	53 54 55 56 57 58 59 60 61 62	63	64 65	66 67	68	69	70 71 72 73 74 75 76 77 78 79	80	81 82	83 84	85	86	87 88 89 90 91 92 93 94 95 96
Ø2	RP			P				4Ø4Ø4	N	E			ØØØ1Ø																									
Ø3	RP							1ØØ1Ø		G	ØØØ25		ØØØØ																									
Ø4	ØP	P						3Ø4Ø1		E				73Ø8		1	N	E																				
Ø5	ØP	P						3Ø4Ø1		E				83Ø8		1	N	E																				
Ø6	1P	P						3Ø4Ø1		E				2																									
Ø7	1P	P						3Ø4Ø1		E				3																									
Ø8	2P	P						3Ø4Ø1		E				1																									
Ø9	3P	P						3Ø4Ø2		E				Ø7																									
1Ø	3P	P						3Ø4Ø2		E				Ø8																									
11	4P	P						3Ø5Ø2		G				ØØ	3Ø	5Ø	2		L		Ø9																		

Figure 2-5. System and Stacker Specifications Example

Columns	Meaning
3-6	When 600 documents are routed to any stacker, the machine stops.
16-30	The size of the amount, account number, and transit-routing fields are as follows: *Columns* — *Field* — *Size* 16-18 — Amount (field 1) — Fixed length, 10 positions 20-22 — Account Number (field 3) — Variable length, 1 through 9 positions 22-25 — Transit-Routing[1] (field 4) — Fixed length, 8 positions
37-47	Modulus 10 check is performed on a six-digit account number. The weighting factor is 21212, and the account number's self-check digit is the rightmost digit.
48-68	In addition to identifying the account number, field 3 is used to identify control and end-of-file documents. If field 3 contains nine 8s, the document is considered to be a control document. If field 3 contains nine 9s, the document is considered to be an end-of-file document.
72	Stackers are numbered 0, 1, 2, 3, 4, and R.

[1]The Dash Symbol Transmission feature is not present.

Figure 2-6. Description of Entries on System Specification Example

Sequence Number	Purpose	Conditions to be Satisfied
02	Route all documents from other banks to the reject stacker (R in column 4)	1. Validity or Presence Check – Amount field (column 5) and transit-routing field (column 8) are present and valid. 2. Field Comparison Test 1 – First four positions or transit-routing field are not 0010 (columns 24 through 28). (It is assumed for this example that the Dash Symbol Transmission feature is not present.) XXXX XXXX 7654 3210 ← Relative position Positions being tested for 0010 The last digit to be tested occupies the fifth position from the right end of the field, or relative position 04 (columns 13 and 14). Thus, since the field is eight positions long, the first four positions from the beginning of it are to be tested.
03	Route all checks for amounts greater than $25,000 to the reject stacker (R in column 4)	1. Validity or Presence Check – Amount field is present (column 5). 2. Field Comparison Test 1 – Amount field contains a value greater than $25,000 (columns 19 through 28). This test is made for all 10 positions of the field. If only seven positions are tested, the utility program will not be able to recognize many of the amount fields greater than $25,000; this is because the utility program will not test the eighth, ninth, and tenth positions of the field. For example, if only seven positions are to be tested, an account field of $625,000.00 will be considered to be not greater than $25,000 and will thus satisfy the test; the digit 6 in the eighth position will not be tested.
04	Route all regular account checks (account number format xx7-xxx-x) to stacker 0 (00 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth position from right in account number field contains a 7; this is relative position 04 (columns 13 and 14). bXX8 XXXX 7654 3210 ← Relative position If satisfied, this test indicates that the check is either a regular account check (xx7-xxx-x) or a special handling document (xxx-07xxxx). Another test is needed to distinguish between the documents. 3. Field Comparison Test 2 – Eighth position from right in account number does not contain a digit; this is relative position 07 (columns 13 and 14). By design, the eighth position of a special handling document contains a digit, but the eighth position of a regular account check is blank. If the digit is missing, this test is satisfied.

Figure 2-7 (Part 1 of 3). Description of Entries on Stacker Specification Example

Sequence Number	Purpose	Conditions to be Satisfied
05	Route all regular account checks (account number format xx8-xxx-x) to stacker 0 (00 in columns 3 and 4)	Same conditions as for sequence specification 04, except for condition 2. Here the fifth position from right in account number field must contain an 8, rather than a 7.
06	Route special account checks (account number format xx2-xxx-x) to stacker 1 (01 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth position from right in account number field contains a 2; this is relative position 04 (columns 12 through 28).
07	Route special account checks (account number format xx3-xxx-x) to stacker 1 (01 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth position from right in account number field contains a 3; this is relative position 04 (columns 12 through 28).
08	Route business checks (account number format xx1-xxx-x) to stacker 2 (02 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth position from right in account number field contains a 1; this is relative position 04 (columns 12 through 28).
09	Route special handling documents (account number format xxx-07xxxx) to stacker 3 (03 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth and sixth positions from right in account number field contain a 07 (columns 12 through 28).
10	Route special handling documents (account number format xxx-08xxxx) to stacker 3 (03 in columns 3 and 4)	1. Validity or Presence Check – Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 – Fifth and sixth positions from right in account number field contain a 07 (columns 12 through 28).

Figure 2-7 (Part 2 of 3). Description of Entries on Stacker Specification Example

Sequence Number	Purpose	Conditions to be Satisfied
11	Route special handling documents (account number formats 01x-xxx-x, 02x-xxx-x, 03x-xxx-x, 04x-xxx-x, 05x-xxx-x, 06x-xxx-x, 07x-xxx-x, 08x-xxx-x) to stacker 4 (04 in columns 3 and 4)	1. Validity or Presence Check — Amount field (column 5) and account number field (column 7) are present. 2. Field Comparison Test 1 — Sixth and seventh positions from right in account number field contain a value greater than 00 but less than 09 (columns 29 through 45); these positions are relative positions 05 and 06. This type of specification is called a range check. These conditions could have been specified by separate stacker specifications that would test the sixth and seventh positions for 01, 02, 03, 04, 05, 06, 07, and 08 respectively. In that case, eight separate stacker specifications would be necessary to do the same thing done by this one specification.

Figure 2-7 (Part 3 of 3). Description of Entries on Stacker Specification Example

STARTING THE 1255

To prepare the 1255 to begin processing documents, the operator must:

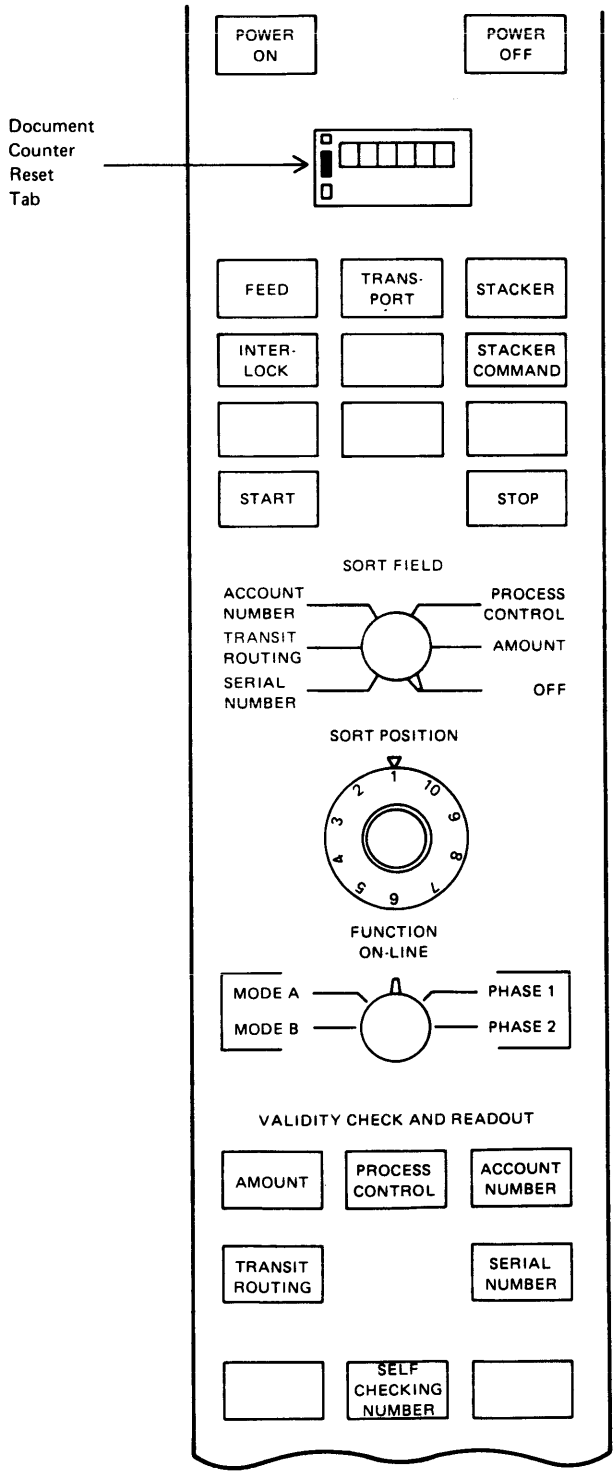
1. Press POWER ON.
2. Press the document counter reset tab (if required).
3. Turn the FUNCTION switch to ON-LINE.
4. Press VALIDITY CHECK AND READOUT for only those fields specified on the system specification.
5. Press SELF-CHECKING NUMBER (if required).
6. Joggle documents and place them in the hopper with the MICR-encoded area facing downward.
7. Press START. The 1255 is ready to read documents when SUBR08 issues a read command.

For more detailed operation information, refer to *IBM 1255 Magnetic Character Reader Component Description,* GA24-3542.

Transport

Offline, documents begin feeding continuously, when the operator presses START.

Documents are loaded face down and to the left side in the hopper, with the MICR edge against the backguide. A document is fed from the bottom of the stack via a separator wheel and aligned in the correct position for magnetizing and reading. The gap between documents is also set as the documents are being aligned. After alignment, the MICR-encoded ink in the document is passed through a magnetic field. Then the document is passed over a read head that generates a signal characteristic of the printed image. Recognition of the image takes place through an electronic analysis of the signal. From the read station the document moves to a selector area, where the vertical stacker transport moves the document to its designated stacker. See the Introduction to the *IBM 1255 Magnetic Character Reader Component Description Manual,* GA24-3542, for a graphic illustration of the document flow.



Models 1 and 2 — 1255 Control Panel

Documents continue feeding until:

- A stacker becomes full (full-stacker stop).
- STOP is pressed (operator stop).
- A feed failure or jam occurs (feed-failure or jam stop).
- The hopper becomes empty (empty-hopper stop).
- The subroutine takes too long to select a stacker for a document (stacker command stop).
- The subroutine indicates that feeding is to stop.

Full Stacker Stop

When the stacker(s) becomes full, the document feeding stops and the STACKER light turns on. Documents that have left the hopper continue and are stacked. Remove documents from the full stacker(s), and press START. The STACKER light turns off, and documents are fed and sorted again.

Operator Stop

When STOP is pressed, document feeding stops, but the main motor continues to run until all in-process documents are stacked. Press START to resume operation.

Feed Failure or Jam Stop

See the procedures in *IBM 1255 Magnetic Character Reader Component Description,* GA24-3542.

Empty-Hopper Stop

When all documents have been fed from the hopper, the FEED light turns on and the 1255 stops after all documents are stacked. Reload the hopper and press START to continue.

Stacker Command Stop

The stacker-select command directs, to the specified stacker, the document just read. On Model 1, documents selected to stackers other than the first must be selected within 50 milliseconds of the time the trailing edge of a maximum-length document leaves the read station. Documents selected to the first pocket must be selected within 24 milliseconds. On Models 2 and 3 all stacker-select commands must be issued within 24 milliseconds.

When the stacker select command is issued too late to route the document to a stacker, the STACKER COMMAND light turns on and the 1255 stops feeding documents. When this occurs, one or two documents may have been fed into the 1255 but not yet read. These in-process documents, and the documents that caused the stop, are routed to the reject stacker. Data from the document that caused the stop is included in the input record for the job. Data from in-process documents is not included in the input record.

To resume processing, determine which document caused the stop. In-process documents are automatically rejected. They are prefixed by the letters AR (auto-reject) on the input record. The document that caused the stop precedes the in-process document(s) and is prefixed by the number of the stacker that it should have gone to.

An auto-reject occurs for any document that is rejected by the reader/sorter. Auto-reject occurs if:

- A read command has not been issued by the time a document reaches the read station.
- If an over-length document is detected.
- If a document-spacing condition exists.
- If a short document is detected.

After determining which document caused the stop, remove it from the reject stacker. The in-process documents are on top of the document that caused the stop. Remove them and place them in the feed hopper. Place the document that caused the stop into the appropriate stacker and press START.

The document count is set back to 0, and the operator must respond to the condition.

PERFORMANCE CONSIDERATIONS

The 1255 when attached to the System/32 operates in a time independent mode. The RPG II or Assembler source program interfaces to the 1255 via SUBR08. Figure 3-1 indicates approximate throughput rates (±10 percent) based on the following system configuration, document specifications, and user program parameters.

- Audit trail record lengths are blocked to maximum.
- Headings are not printed except for the first page.
- Only batch totals are printed.
- Printing is from a 48-character print belt.
- The documents being read are 6 inches long.
- The 51-column feature is not installed.
- Only one disk file is created.
- Only the essential document capture functions are performed.

Audit Trail Record Length	Model 1 155 lpm Printer (dpm)	Models 2 and 3 155 lpm Printer (dpm)
15-16	500	750
17-18	500	750
19-22	500	750
23-26	500	750
27-33	500	615
34-44	465	465
45-54	305	305

lpm—lines per minute
dpm—documents per minute

Figure 3-1. Document Throughput for 1255 Models

When SUBR08 is used for the 1255, up to 80 stacker decisions can be made without causing excessive auto-rejects or late stacker commands.

A stacker decision is defined as a field validity or presence test, or a field comparison test, as defined on a stacker specification. The limit of 80 decisions does not refer to the number of stacker specifications, but rather to the number of decisions described by these specifications (multiple decisions can be made on a single specification).

Maintaining the rated speed of the device also depends on the amount of printing. If printing is done while documents are being read, it may be necessary to print information from more than one document per line.

SPECIFICATION ERRORS DETECTED BY THE PROGRAM

System and stacker specifications are checked by the subroutine for errors. If an error is found in a specification, or while the system is operating with the 1255 attached, the identifying MIC and message are displayed on the display screen.

Only messages pertaining to the attachment of the 1255 are listed in this manual. Other system messages and RPG II program messages are listed in the appropriate manual; *IBM System/32 Displayed Messages Guide System,* GC21-7704.

MESSAGE CODES

Message identification codes (MICs) indicate incorrect program operation, machine errors or, in some cases, information or instructions. The following messages may be displayed as a result of 1255 intervention.

Note: Because a number of different specification errors can be detected, a Type 2 message is issued following a list of all MIC numbers displayed for errors detected. The Type 2 message is:

SCP–4975 DMMI OPTIONS (0 3) ?
ABOVE ERROR (S) INDICATE SPEC ERROR (S)

Message 4975 is issued in conjunction with error messages 4952 through 4967.

With option 0, the specification entries in error revert to the specification default for that entry and the job continues. For option 3, refer to the associated MIC number in this chapter, make the necessary corrections, and resubmit the job. Normally, only service representatives doing diagnostic tests use option 0.

SCP–4950 READER/SORTER IS STOPPED

Cause

Operator: Run time error. This message is issued as a result of an error or warning detected during the 1255 processing run.

The device is stopped due to one of the following conditions:

- Jam stop
- Stacker command stop
- Empty hopper stop
- Stacker full stop
- Operator stop
- Device not ready
- Device not attached to the system

Make the necessary corrections and continue.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.

Option 0: Continue the job. The error condition is ignored.
Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.
Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4951 DOCUMENT COUNT CONDITION HAS BEEN MET

Cause

Operator: Attention required. This is an informational message. A 1255 stacker has met the document count condition. An S (indicating stop) has been entered in column 6 of the system specification. A stacker indicated in columns 3 and 4 of a stacker specification has met the document count condition.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.

4952 DOC COUNT CONDITION INVALID

Cause

Programmer: System specification error. The document count condition (columns 3 through 6) is incorrectly specified. Any of the following conditions may have caused this error:

- Action entry (column 6) is not S, A, I, or blank.
- Count entry (columns 3 through 5) contains invalid digits.
- Action entry specified with no count entry. Both of these entries must be provided or both must be omitted.
- Count entry specified without action entry.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4953 INVALID FIELD DEF

Cause

Programmer: System specification error. An invalid entry in columns 16 through 30 of the system specification caused this error.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4954 INVALID MODULUS CHECK ENTRY

Cause

Programmer: System specification error. Either columns 37 through 47 of the system specification contain invalid entries, or field 3 (columns 22 through 24 of the system specification) is not properly defined.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4955 CONTROL FIELD ENTRY INVALID

Cause

Programmer: System specification error. Columns 49 through 58 identify a field formatted differently than that defined by the field definition, or the entry contains characters that are not numeric, or the entry is a dash if the Dash Symbol Transmission feature is used.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4956 EOF FIELD ENTRY INVALID

Cause

Programmer: System specification error. This error is caused by either column 48 or columns 59 through 68 of the system specification. Column 48 must contain a number (1 through 5) that defines one of the fields specified by the field definition entry (columns 16 through 30). Columns 59 through 68 can only identify a field with the same format as the field defined by the field definition entry (columns 16 through 30).

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4957 STACKER CODE INVALID

Cause

Programmer: System specification error. System specification column 72 does not contain a 4, 8, A, or blank.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4958 INVALID STACKER NO.

Cause

Programmer: Stacker specification error. Columns 3 and 4 of a stacker specification are blank, invalid, or identify a stacker number that does not coincide with the stacker code in column 72 of the system specification. Column 4 can contain an asterisk (*) if continuation lines are specified.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

Option 0: Continue the job. The error condition is ignored.
Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.
Option 3: The job is canceled. Any new data created by this job is lost.

4959 VALIDITY TEST ENTRY INVALID

Cause

Programmer: Stacker specification error. A validity or presence check entry (columns 5 through 9) of a stacker specification does not contain P, N, or blank. Columns 5 through 9 must be blank for continuation lines (asterisk in column 4).

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4960 FIELD NO. SUBENTRY INVALID

Cause

Programmer: Stacker specification error. The field number (columns 12, 29, 46, or 63) of a field comparison test entry contains an invalid number.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4961 INVALID COMPARISON CONDITION ENTRY

Cause

Programmer: Stacker specification error. The compare entry (columns 18, 35, 52, or 69) is invalid for a field comparison test on a stacker specification entry. The entry must be E, L, G, or blank.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4962 NEGATIVE ENTRY INVALID

Cause

Programmer: Stacker specification error. A *not* entry (columns 17, 34, 51, or 68) is invalid for a field comparison test on a stacker specification entry. The entry must be N or blank.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4963 FIELD LENGTH SUBENTRY INVALID

Cause

Programmer: Stacker specification error. The field length entry (columns 15 and 16, 32 and 33, 49 and 50, or 66 and 67) is invalid for a field comparison test on a stacker specification entry. The entry is not a value within the limits defined for that field on the system specification.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4964 RELATIVE POS SUBENTRY INVALID

Cause

Programmer: Stacker specification error. The relative position entry (columns 13 and 14, 30 and 31, 47 and 48, or 64 and 65) contains an invalid character. The entry must be numeric.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4965 REL POS PLUS FLD LEN GT FLD LEN DEF

Cause

Programmer: Stacker specification error. The sum of the relative position and field length entries on a stacker specification is greater than the length defined on the system specification for the field to be tested. As a result, the field comparison test entry indicates that a test is to be done on a character that is not within the field to be tested.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4966 FLD LEN SUBENT NE TEST CHAR LEN

Cause

Programmer: Stacker specification error. The field length entry (columns 15 and 16, 32 and 33, 49 and 50, 66 and 67) specified in a stacker specification entry for a field comparison test does not equal the number of test characters designated in the test characters entry.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

4967 TEST CHARACTERS INVALID

Cause

Programmer: Stacker specification error. The test characters entry (columns 19 through 28, 36 through 45, 53 through 62, 70 through 79) for a field comparison test on a stacker specification contains a character that is not a numeral or a dash (dash is valid in field 4 only).

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4968 INCORRECT RECORD LENGTH

Cause

Programmer: File description specification error. Record length (columns 24 through 27) of the file description specification must be 0055 or ⊬⊬55.

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4969 INCORRECT BLOCK LENGTH

Cause

Programmer: File description specification error. Block length (columns 20 through 23) of the file description specification must be greater than, or equal to, 550 but not greater than 4070. The entry must be a multiple of 55.

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

Option 0: Continue the job. The error condition is ignored.
Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.
Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4970 INSUFFICIENT MAIN STORAGE TO RUN JOB

Cause

Programmer: Control specification error. There is insufficient main storage at execution time. At least 2-1/2K of main storage must be available between the last main storage address of SUBR08 and the program level end address (NPEND) in the system communication area (SCA).

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4971 1255 CONTROLLER ERROR

Cause

Operator: Hardware error. Either a controller malfunction, or a microcode diagnostic failing to run successfully caused this terminal hardware error. Contact your local service representative.

Recovery

Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.

SCP–4972 INQUIRY REQUESTED

Cause

Operator: The inquiry key was pressed while the 1255 was running.

Recovery

Option 0: Continue the job. The error condition is ignored.

Option 2: The job is ended. Any new data created up to this point is preserved and the job is canceled.

SCP–4977 INSUFFICIENT CONTROLLER STORAGE

Cause

Programmer: Stacker specifications in this application program exceeds the maximum controller storage size. The program must be recompiled with fewer stacker specifications.

Note: The maximum number of stacker specifications is limited to approximately 80 decisions, although more than one decision can be included on each stacker specification line.

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4978 UNABLE TO LOAD 1255 DIAGNOSTIC MICROCODE

Cause

Programmer: The attachment controller is unable to retrieve the 1255 diagnostic microcode. Contact your IBM service representative.

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

SCP–4979 UNABLE TO LOAD 1255 RUN MICROCODE

Cause

Programmer: The attachment controller is unable to retrieve the 1255 run microcode. Contact your IBM service representative.

Recovery

Option 3: The job is canceled. Any new data created by this job is lost.

Chapter 5. Considerations for Writing an RPG II Program That Contains SUBR08

SUBR08 is part of the system control programming for the System/32. System and stacker specifications become part of these subroutines by means of an array, associated with the SPECIAL device name by a continuation card that follows the file description specifications. (Refer to the *IBM System/32 RPG II Reference Manual,* SC21-7595, for more information about SPECIAL.)

Each column in the system and stacker specifications represents a 1-byte entry in the array. Therefore, the format of the array is also 80 bytes and is in the same format as the system and stacker specifications.

The array can be loaded at compile time or at execution time. It must never be referenced by the RPG II program. Such references are not diagnosed by the RPG II compiler.

The following is a description of the information that is unique to writing a program that contains SUBR08. Examples and detailed information on how to complete the other parts of the specifications are in the *IBM System/32 RPG II Reference Manual,* SC21-7595. The reader should be familiar with the information in that manual before reading this chapter.

CONTROL CARD SPECIFICATIONS COLUMNS 12-14

Approximately 1,000 bytes of main storage in addition to the I/O buffer areas must be available for the subroutine. I/O buffer areas are described on the file description specifications as record length and block length.

FILE DESCRIPTION SPECIFICATIONS

Two file description statements specify information that is required to interface with the 1255. The first describes the file to be read, and the second describes the continuation statement that describes the array containing system and stacker specifications.

The following entries are required on the first file description specification statement:

Columns	Entry
6	F
7-14	Valid RPG II filename
15	I
16	P, S, or D
17	Blank or E if P or S specified in column 16
18	Blank, A, or D
19	F
20-23	Buffer size must be a multiple of 55 (minimum of 550 and a maximum of 4070). The larger the buffer size, the less chance of the 1255 disengaging. This entry determines the document storage size
24-27	0055 of ⌀⌀55 (record length)
28-39	Blank
40-46	SPECIAL
47-53	Blank
54-59	SUBR08
60-70	Blank
71-72	Blank or U1-U8
73-74	Blank
75-80	Program identification

The following entries are required for the second file description specification to describe the continuation statement.

Columns	Entry
6	F
7-52	Blank
53	K
54-59	Valid array name associated with the 1255
60-74	Blank

EXTENSION SPECIFICATIONS

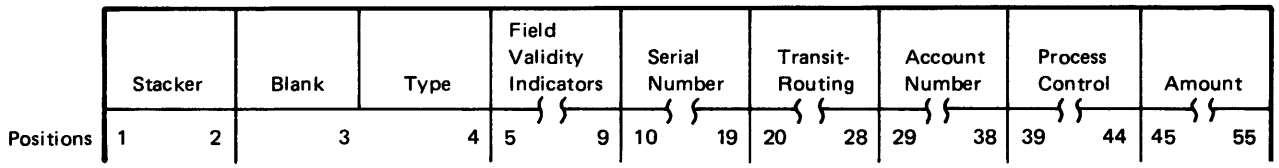
Extension specifications describe the array. The following entries are required on the extension specification sheet:

Columns	Entry
6	E
7-10	Blank
11-18	Blank, or filename if this is a pre-execution time array
19-26	Blank
27-32	Valid array name
33-35	80 (this is the number of entries per record)
36-39	Number of entries per array. This entry must be 80 times the number of system and stacker specifications for the job
40-42	Length of entry. Must be 001 or ØØ1
43-74	Blank

INPUT RECORD FORMAT

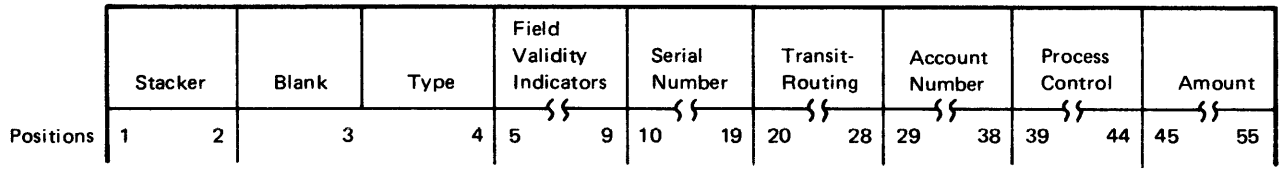
The input record is a fixed format, no matter which fields of the document are specified to be read. The amount field is always positions 45 through 55, the transit-routing field is always positions 20 through 28, and so forth. Refer to Figure 5-1 for the format and contents of the input record, as seen by the application program.

Note: See *Modified Data Format* for the variations in account number and process control field size when the modified data format is specified.



Position	Contents
1-2	A number or a letter that identifies the stacker into which the document was routed, or one of the following error indicators: AR – The document was autorejected by the device. PR – A parity error occurred when this document was transmittted from the device. If one of these error indicators appears here, the remainder of positions 3 through 55 of the input record for this document is blank.
3	Blank
4	Document type code, set as follows: P – Normal document. C – Control document. E – EOF document. I – Control document that caused the indicate condition to be met (I is entered in column 6 of the system specification.) A – MICR document that caused the alternate condition to be met. (A is entered in column 6 of the system specification.) S – MICR document that caused the stop condition to be met. (S is entered in column 6 of the system specification.)
5	Serial number (field 5) validity indicator, set as follows: 5 – The field was read and is valid. Blank – The field is not present or is invalid.

Figure 5-1 (Part 1 of 2). Format and Contents of the Input Record as Seen by the Application Program



Position	Contents
6	Transit-routing (field 4) validity indicator, set as follows: 4 – The field was read and is valid. Blank – The field is not present or is invalid.
7	Account number (field 3) validity indicator, set as follows: 3 – The field was read and is valid. Blank – The field is not present or is invalid.
8	Process control (field 2) validity indicator, set as follows: 2 – The field was read and is valid, or the field was missing and the account number and amount field are present. Blank – The field is invalid, or either or both the account number and amount fields are not present.
9	Amount (field 1) validity indicator, set as follows: 1 – The field was read and is valid. Blank – The field is not present or is invalid.
10-19	The serial number from the document, right-justified.
20-28	The transit-routing field from the document, right-justified.
29-38	The account number from the document, right-justified.
39-44	The process control field from the document, right-justified.
45-55	The amount field from the document, right-justified.

Blanks will occupy the unused portion of these fields when the fields are shorter than the maximum allowable length. If the field is not read, its corresponding entry in the input record is blank.

If modified data format is specified, the account number field (positions 29 through 38) or the process control field (positions 39 through 44) may have up to 15 digits in either of the fields. However, the accumulated total of both fields cannot exceed 16 digits.

Figure 5-1 (Part 2 of 2). Format and Contents of the Input Record as Seen by the Application Program

Examples

Following are examples of two RPG II programs using SUBR08. These programs show the necessary fields to code on the RPG II specification sheets and the entries for the 1255 system and stacker specifications.

Program 1 (Sample 1)

SAMPL1 (Figure 5-2) reads five fields, routes all valid documents read, totals the amount fields, totals the number of documents, and rejects all documents that have fields 1, 3, or 4 invalid. The Control Card Specification entry (columns 12 through 14) describes the size of storage required to execute this program. MICR is the name of the input file as described on line 2 of the file description specification sheet. Line 3 describes the compile time array called ARRAY. PRINT is the name of the output file for this program.

Extension specifications further describe the compile time array. Columns 33 through 35 must contain 80. Columns 36 through 39 must be 80 times the number of stacker specifications, and columns 40 through 42 must be 1. The input specification sheet indicates the filename and describes the format of the input document. See Figure 5-1 for the format and relation of the input specification sheet entries to the input record. The calculation and output specification sheet entries are common RPG II entries. Refer to the *IBM System/32 RPG II Reference Manual,* SC21-7595, for a description of the specification sheet entries.

The system and stacker specifications describe the entries used to create the compile time array named ARRAY. Refer to Chapter 2 for a description of the entries for these specifications.

RPG CONTROL CARD AND FILE DESCRIPTION SPECIFICATIONS

IBM International Business Machine Corporation

GX21-9092-4 UM/050 Printed in U.S.A.

Program | Punching Instruction | Graphic / Punch | Card Electro Number

Programmer | Date

Page 01 of 6 | Program Identification SAMPL1

Control Card Specifications

H

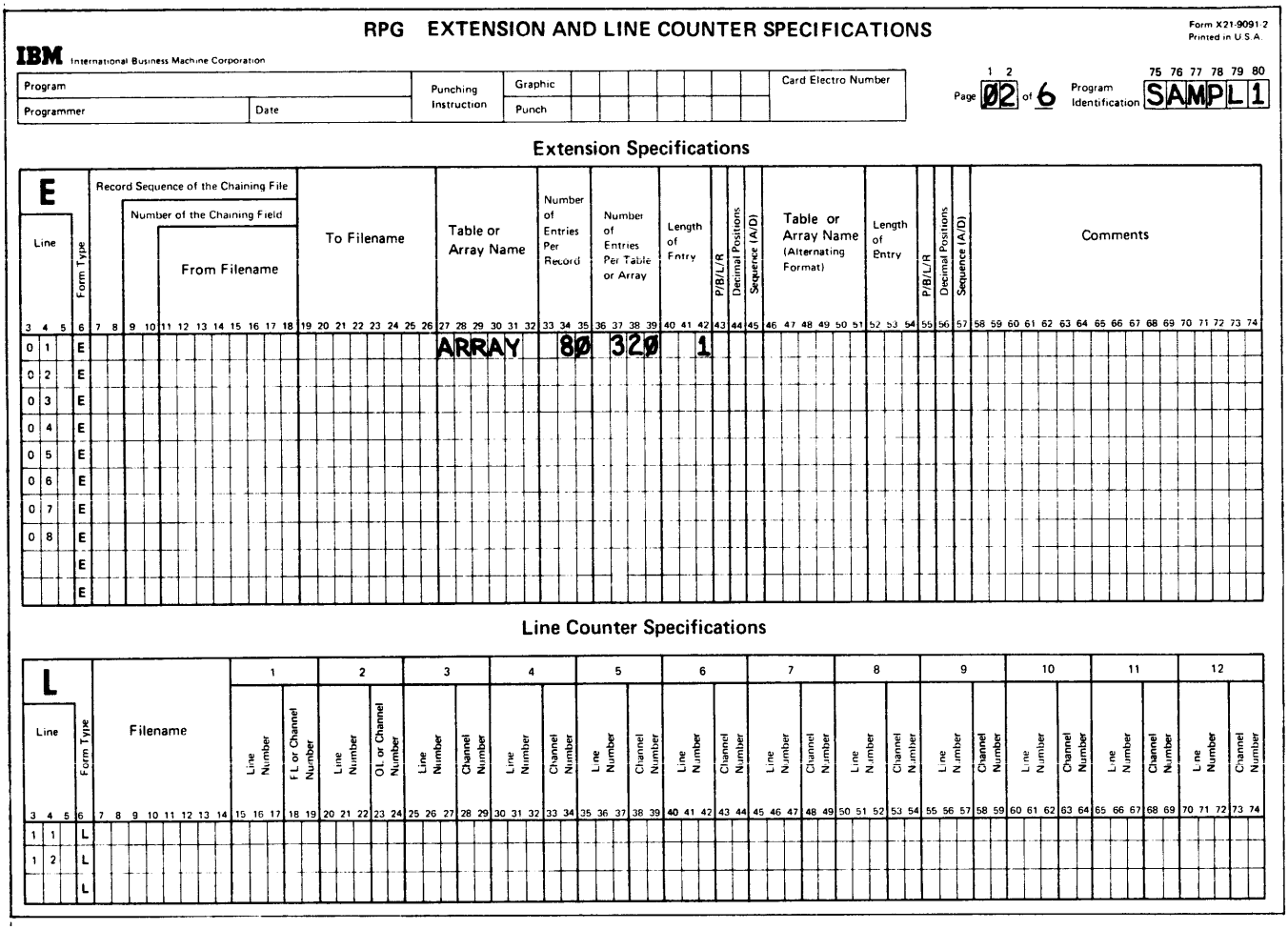
Line	Form Type	Size to Compile	Object Output	Listing Options	Size to Execute	Debug	MFCM Stacking Sequence	Date Format	Date Edit	Inverted Print	360/20 2501 Buffer	Number Of Print Positions	Alternate Collating Sequence	Model 20: Address to Start	Model 20: Work Tapes	Overlay Open	Overlap Printer	Binary Search	Tape Error	2152 Checking	Model 20: Inquiry	Read/Write/Compute	Keyboard Output	Sign Handling	1P Forms Position	Indicator Setting	File Translation	Punch MFCU Zeros	Nonprint Characters	Table Load Halt	Shared I/O	Field Print	Formatted Dump	RPG II Conversion	Refer to the specific System Reference Library manual for actual entries.
01	H				012																													

File Description Specification

F

Line	Form Type	Filename	File Type	File Designation	End of File	Sequence	File Format	Block Length	Record Length	Mode of Processing	Length of Key Field or of Record Address Field	Record Address Type	Type of File Organization or Additional Area	Overflow Indicator	Key Field Starting Location	Extension Code	Device	Symbolic Device	Labels S/N/E/M	Name of Label Exit	Extent Exit for DAM	Storage Index	Continuation Lines: K	Continuation Lines: Option	Continuation Lines: Entry	File Addition/Unordered	Number of Tracks for Cylinder Overflow	Number of Extents	Tape Rewind	File Condition U1-U8
02	F	MICR	I	P	E		F	550	55								SPECIAL			SUBR08										
03	F																			KARRAY										
04	F	PRINT	O			F		132	132				0	F			PRINTER														
05	F																													
06	F																													
07	F																													
08	F																													
09	F																													
10	F																													
	F																													
	F																													

Figure 5-2 (Part 1 of 6). RPG II Programming Using SUBR08 (SAMPL1)



RPG EXTENSION AND LINE COUNTER SPECIFICATIONS

Form X21-9091-2
Printed in U.S.A.

IBM International Business Machine Corporation

Program | Punching Instruction: Graphic / Punch | Card Electro Number

Programmer | Date

Page 02 of 6 | Program Identification: SAMPL1

Extension Specifications

Line	Form Type	Record Sequence of the Chaining File	Number of the Chaining Field	From Filename	To Filename	Table or Array Name	Number of Entries Per Record	Number of Entries Per Table or Array	Length of Entry	P/B/L/R	Decimal Positions	Sequence (A/D)	Table or Array Name (Alternating Format)	Length of Entry	P/B/L/R	Decimal Positions	Sequence (A/D)	Comments
01	E					ARRAY	80	320	1									
02	E																	
03	E																	
04	E																	
05	E																	
06	E																	
07	E																	
08	E																	
	E																	
	E																	

Line Counter Specifications

Line	Form Type	Filename	1 Line Number	1 F L or Channel Number	2 Line Number	2 OI or Channel Number	3 Line Number	3 Channel Number	4 Line Number	4 Channel Number	5 Line Number	5 Channel Number	6 Line Number	6 Channel Number	7 Line Number	7 Channel Number	8 Line Number	8 Channel Number	9 Line Number	9 Channel Number	10 Line Number	10 Channel Number	11 Line Number	11 Channel Number	12 Line Number	12 Channel Number
11	L																									
12	L																									
	L																									

Figure 5-2 (Part 2 of 6). RPG II Programming Using SUBR08 (SAMPL1)

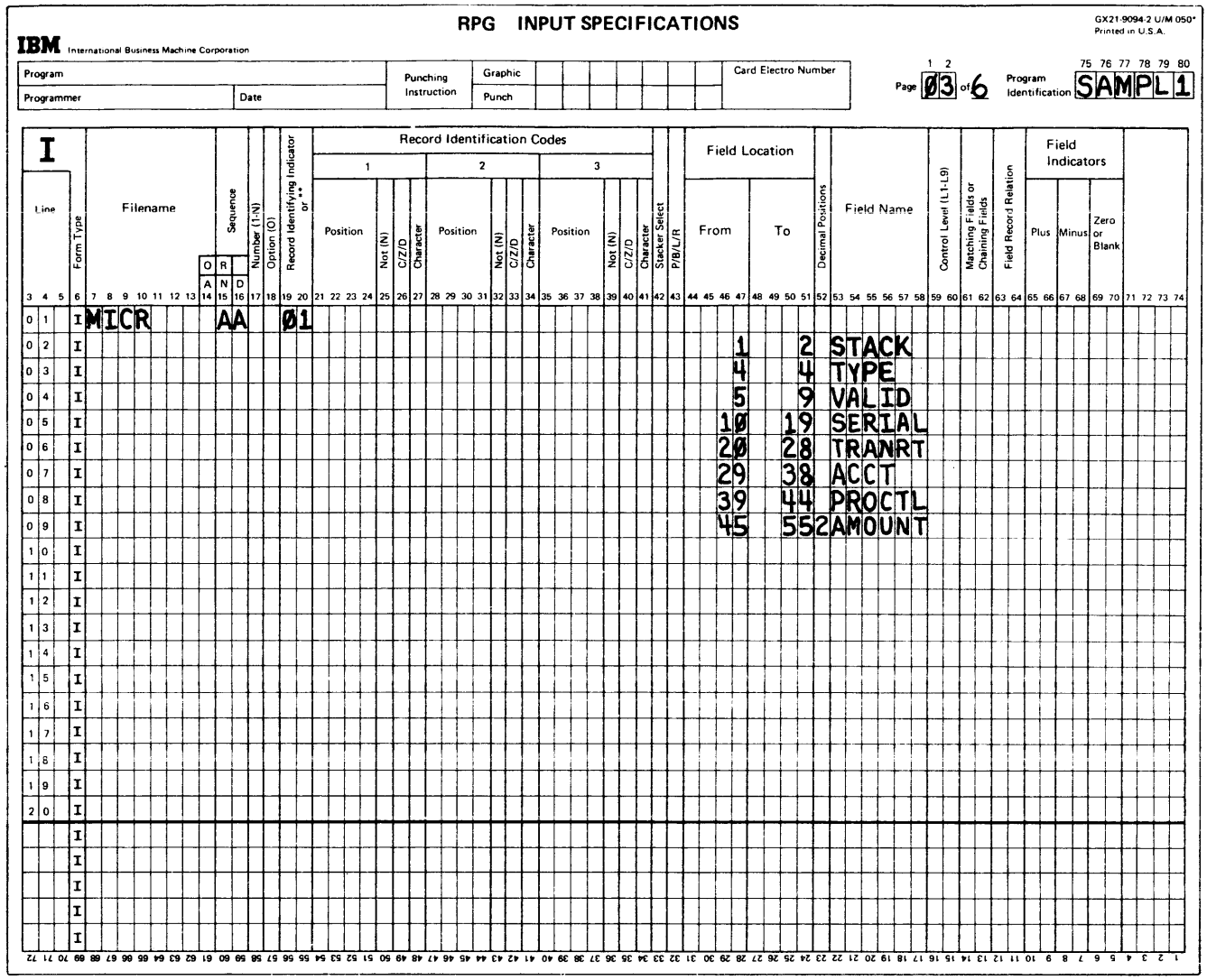


Figure 5-2 (Part 3 of 6). RPG II Programming Using SUBR08 (SAMPL1)

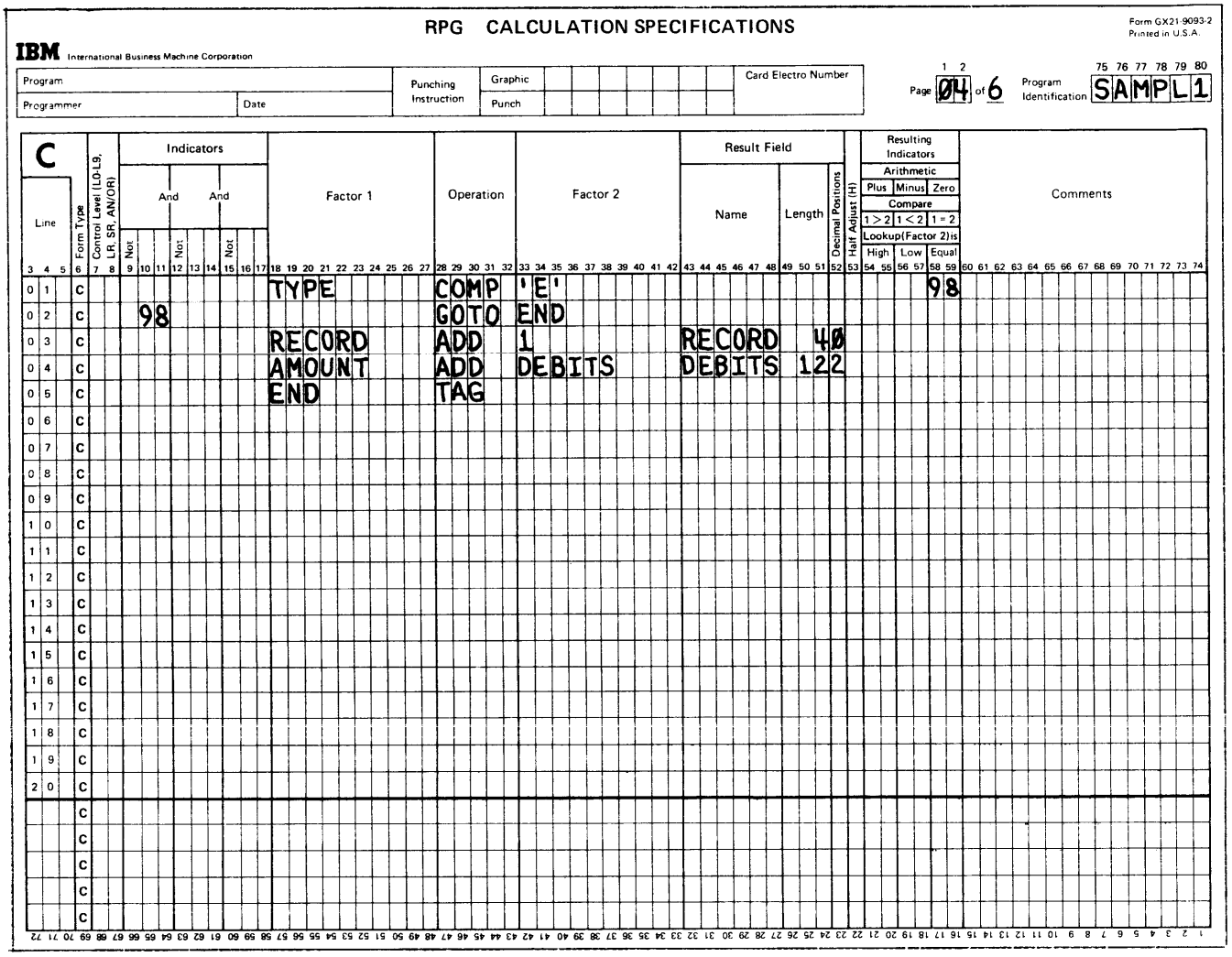


Figure 5-2 (Part 4 of 6). RPG II Programming Using SUBR08 (SAMPL1)

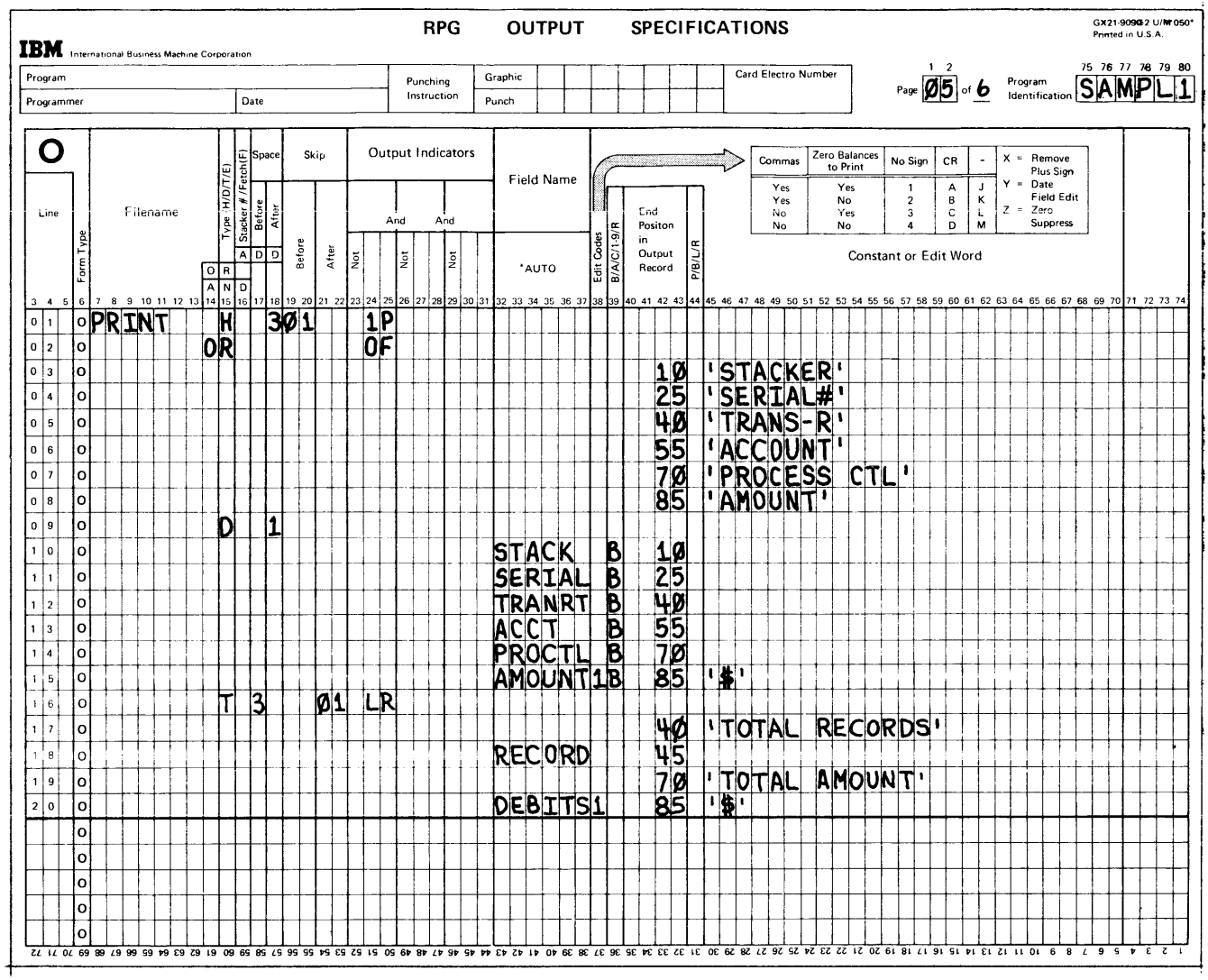
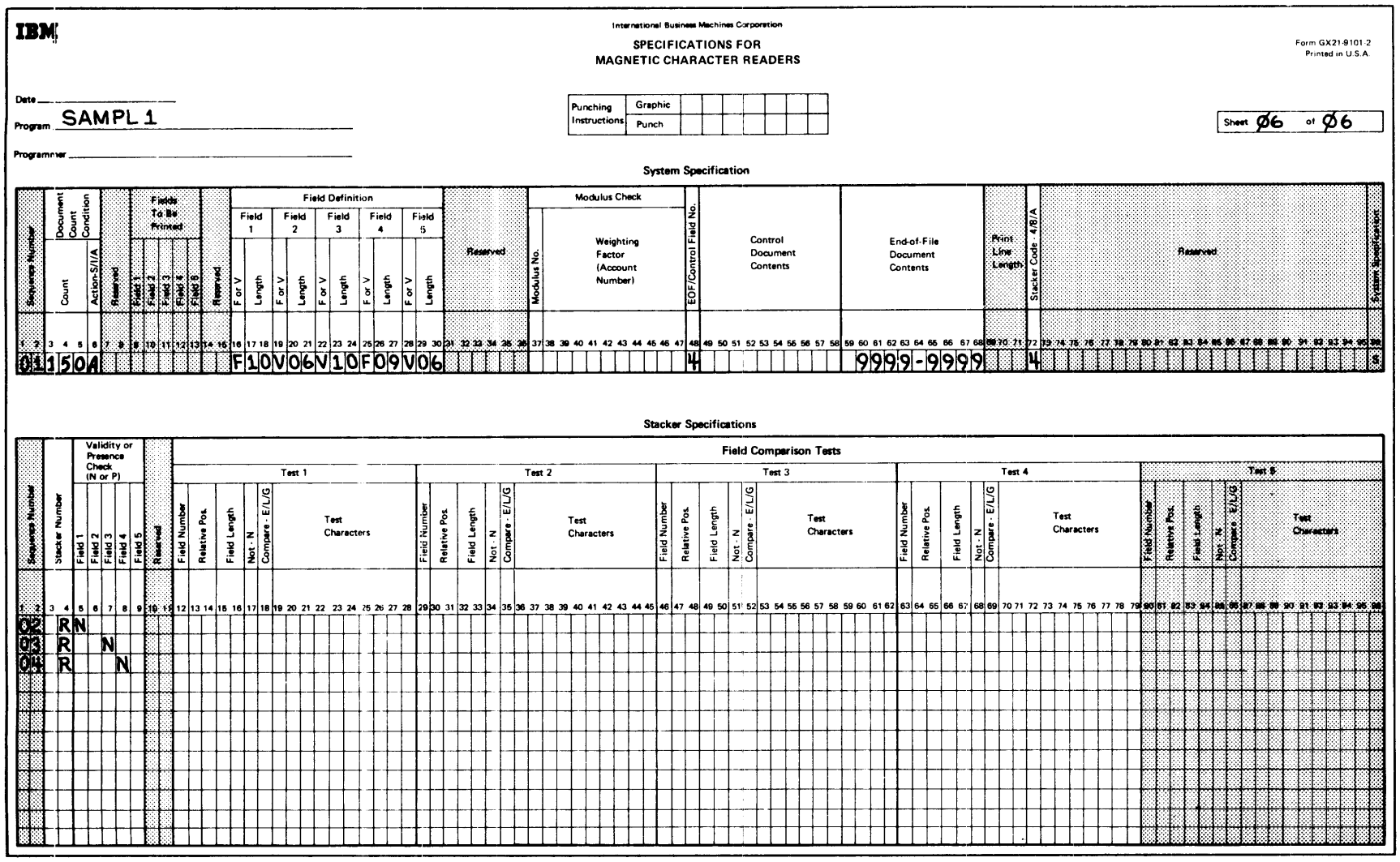


Figure 5-2 (Part 5 of 6). RPG II Programming Using SUBR08 (SAMPL1)



IBM

International Business Machines Corporation

SPECIFICATIONS FOR
MAGNETIC CHARACTER READERS

Form GX21-9101-2
Printed in U.S.A.

Date
Program SAMPL 1
Programmer

Punching Instructions: Graphic | Punch

Sheet 06 of 06

System Specification

Sequence Number	Document Count Condition: Count	Document Count Condition: Action-S/I/A	Reserved	Fields To Be Printed: Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Definition: Field 1 F or V	Field 1 Length	Field 2 F or V	Field 2 Length	Field 3 F or V	Field 3 Length	Field 4 F or V	Field 4 Length	Field 5 F or V	Field 5 Length	Reserved	Modulus Check: Modulus No.	Modulus Check: Weighting Factor (Account Number)	EOF/Control Field No.	Control Document Contents	End-of-File Document Contents	Print Line Length	Stacker Code - 4/8/A	Reserved	System Specification
01	1	50A								F	10	V	06	V	10	F	09	V	06				4		9999-9999		4		

Stacker Specifications

Field Comparison Tests

Sequence Number	Stacker Number	Validity or Presence Check (N or P): Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Test 1: Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 2: Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 3: Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 4: Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters	Test 5: Field Number	Relative Pos.	Field Length	Not - N	Compare - E/L/G	Test Characters
02	R	N																																			
03	R		N																																		
04	R			N																																	

Figure 5-2 (Part 6 of 6). RPG II Programming Using SUBR08 (SAMPL1)

Program 2 (SAMPL2)

SAMPL2 (Figure 5-3) reads documents from the 1255 and directs them to stacker number 2 if the amount field is greater than $99,999.99. All documents with field 1, 3, or 4 invalid are rejected. All valid documents are directed to stacker 0.

The transit-routing, account number, and amount field are printed. Each print line contains data from four input documents. Each batch control document is directed to the reject stacker and causes a batch total to be printed. All valid documents are written to the disk file called DISKOUT.

The following assumptions apply to this program:

- A batch control document follows each batch, including the last batch preceding the end-of-file document.
- A 1255 Model 1 is the device attached to the system.
- The Dash Symbol Transmission feature is on the 1255.

MICR is the name of the input file using the RPG II SPECIAL device. Output is to the printer file PRINT for batch totals and to the disk file DISKOUT for all valid documents. The extension specification sheet describes the array and the array fields that are to be printed.

Refer to the *IBM System/32 RPG II Reference Manual,* SC21-7595, for a description of the entries for the input, calculation, and output specification sheets. The system and stacker specifications define the fields and specify the tests to be performed on each document.

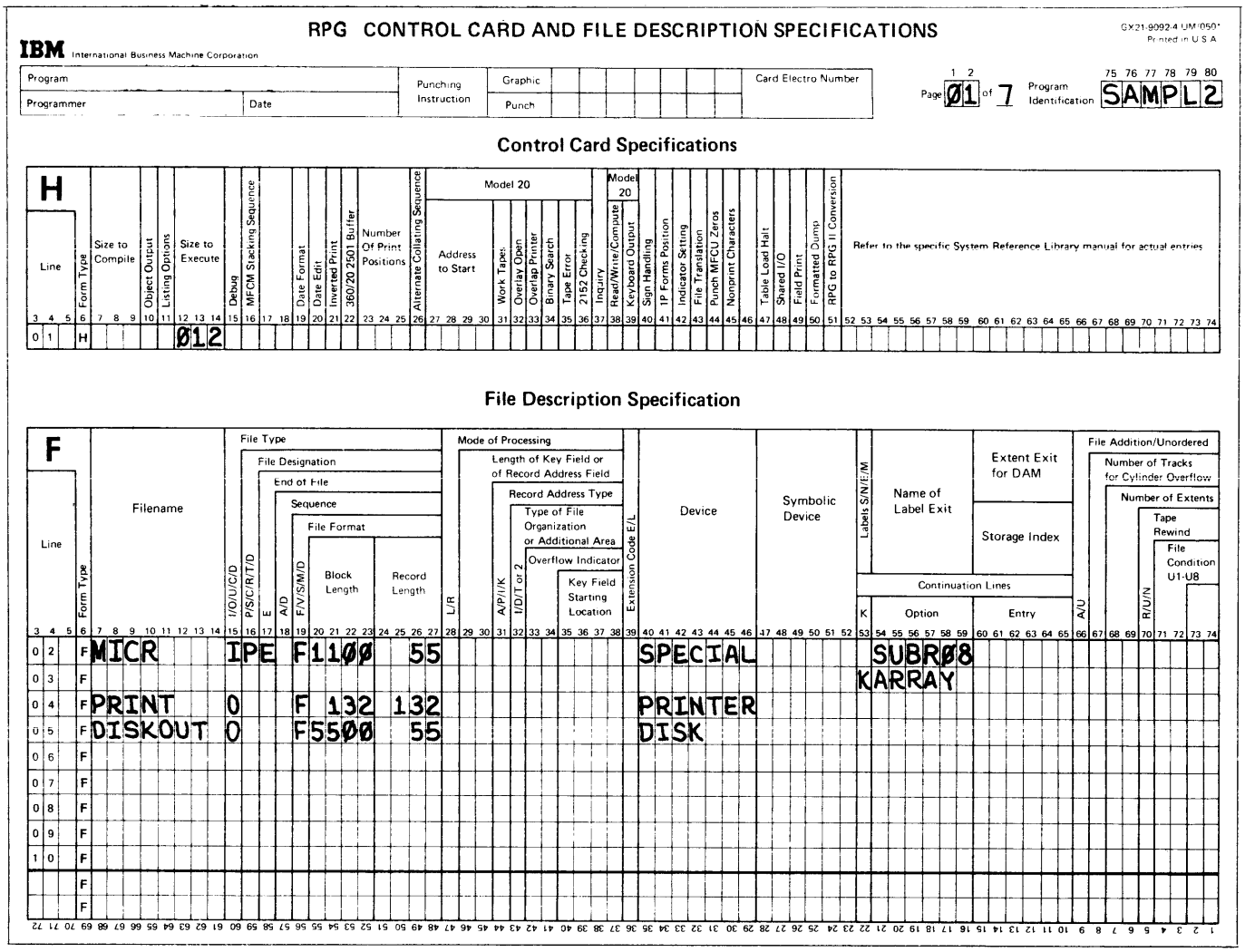
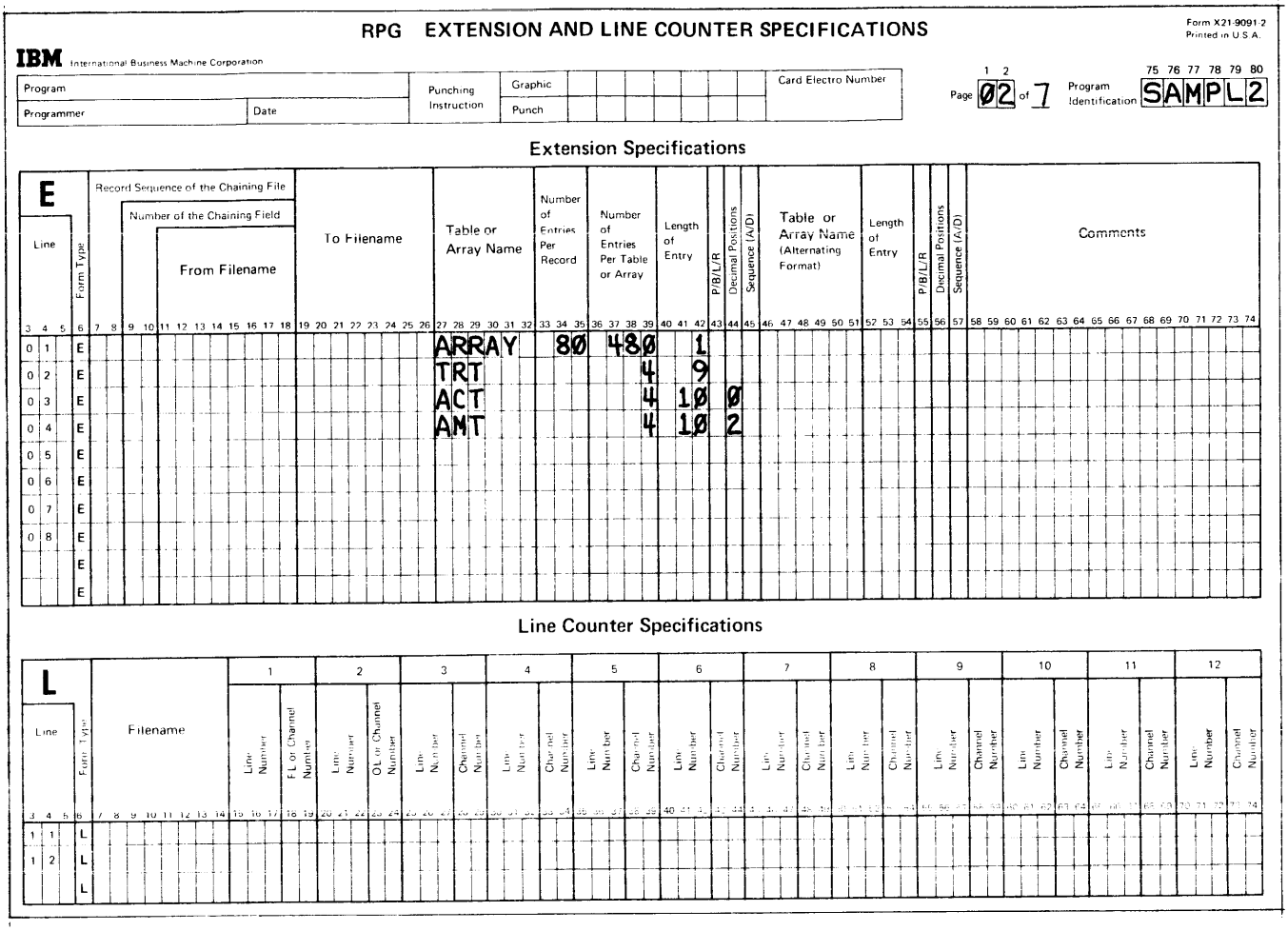


Figure 5-3 (Part 1 of 7). RPG II Programming Using SUBR08 (SAMPL2)



RPG EXTENSION AND LINE COUNTER SPECIFICATIONS

Form X21-9091-2
Printed in U.S.A.

IBM International Business Machine Corporation

Program | Programmer | Date | Punching Instruction | Graphic | Punch | Card Electro Number

Page 02 of 7 | Program Identification SAMPL2

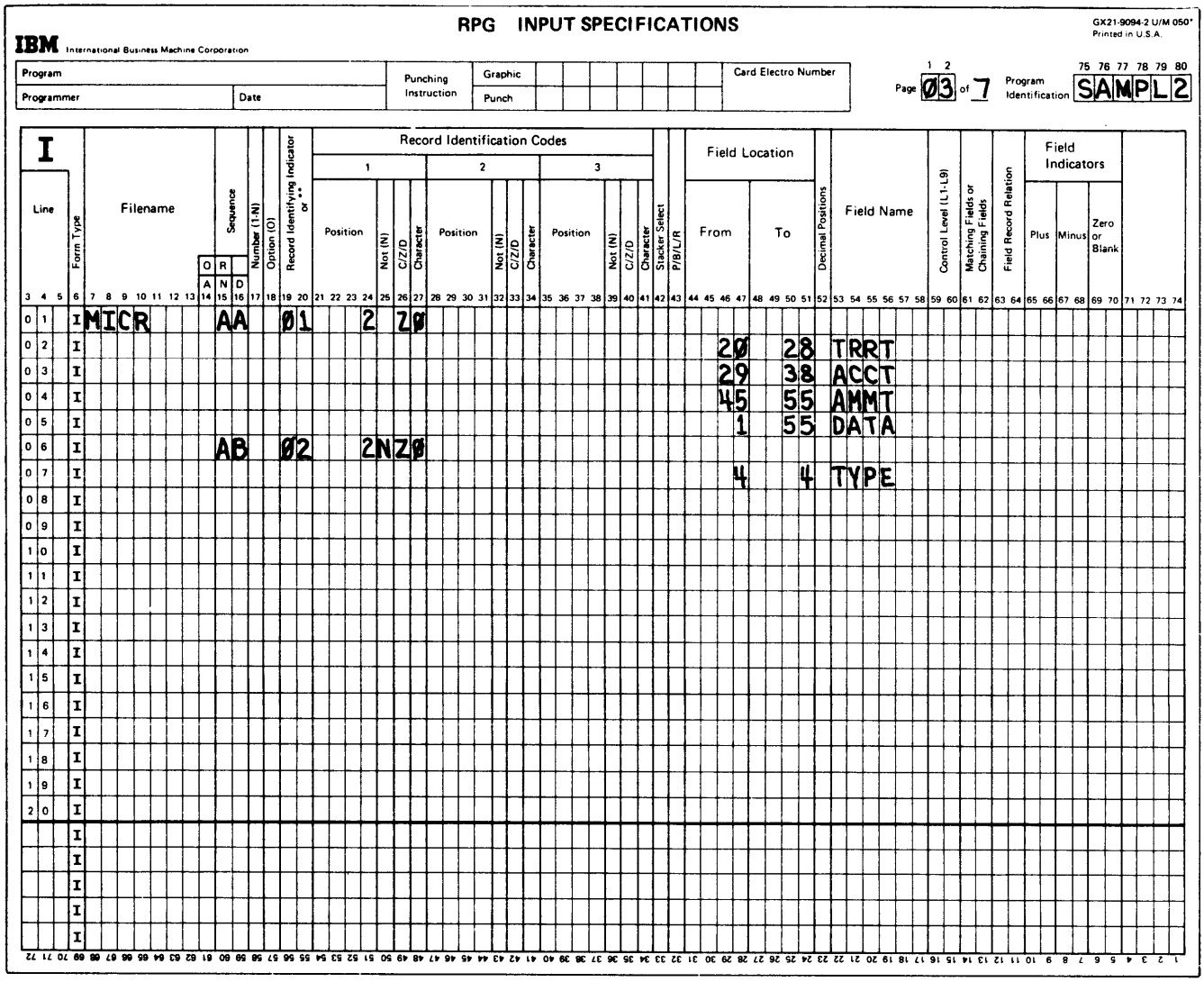
Extension Specifications

Line	Form Type	Record Sequence of the Chaining File	Number of the Chaining Field	From Filename	To Filename	Table or Array Name	Number of Entries Per Record	Number of Entries Per Table or Array	Length of Entry	P/B/L/R	Decimal Positions	Sequence (A/D)	Table or Array Name (Alternating Format)	Length of Entry	P/B/L/R	Decimal Positions	Sequence (A/D)	Comments
01	E					ARRAY	80	480	1									
02	E					TRT		4	9									
03	E					ACT		4	10		0							
04	E					AMT		4	10		2							
05	E																	
06	E																	
07	E																	
08	E																	
	E																	
	E																	

Line Counter Specifications

Line	Form Type	Filename	1 Line Number	1 FL or Channel Number	2 Line Number	2 OL or Channel Number	3 Line Number	3 Channel Number	4 Line Number	4 Channel Number	5 Line Number	5 Channel Number	6 Line Number	6 Channel Number	7 Line Number	7 Channel Number	8 Line Number	8 Channel Number	9 Line Number	9 Channel Number	10 Line Number	10 Channel Number	11 Line Number	11 Channel Number	12 Line Number	12 Channel Number
11	L																									
12	L																									
	L																									

Figure 5-3 (Part 2 of 7). RPG II Programming Using SUBR08 (SAMPL2)



RPG INPUT SPECIFICATIONS

IBM International Business Machine Corporation

GX21-9094-2 U/M 050* Printed in U.S.A.

Program | Punching Instruction | Graphic / Punch | Card Electro Number

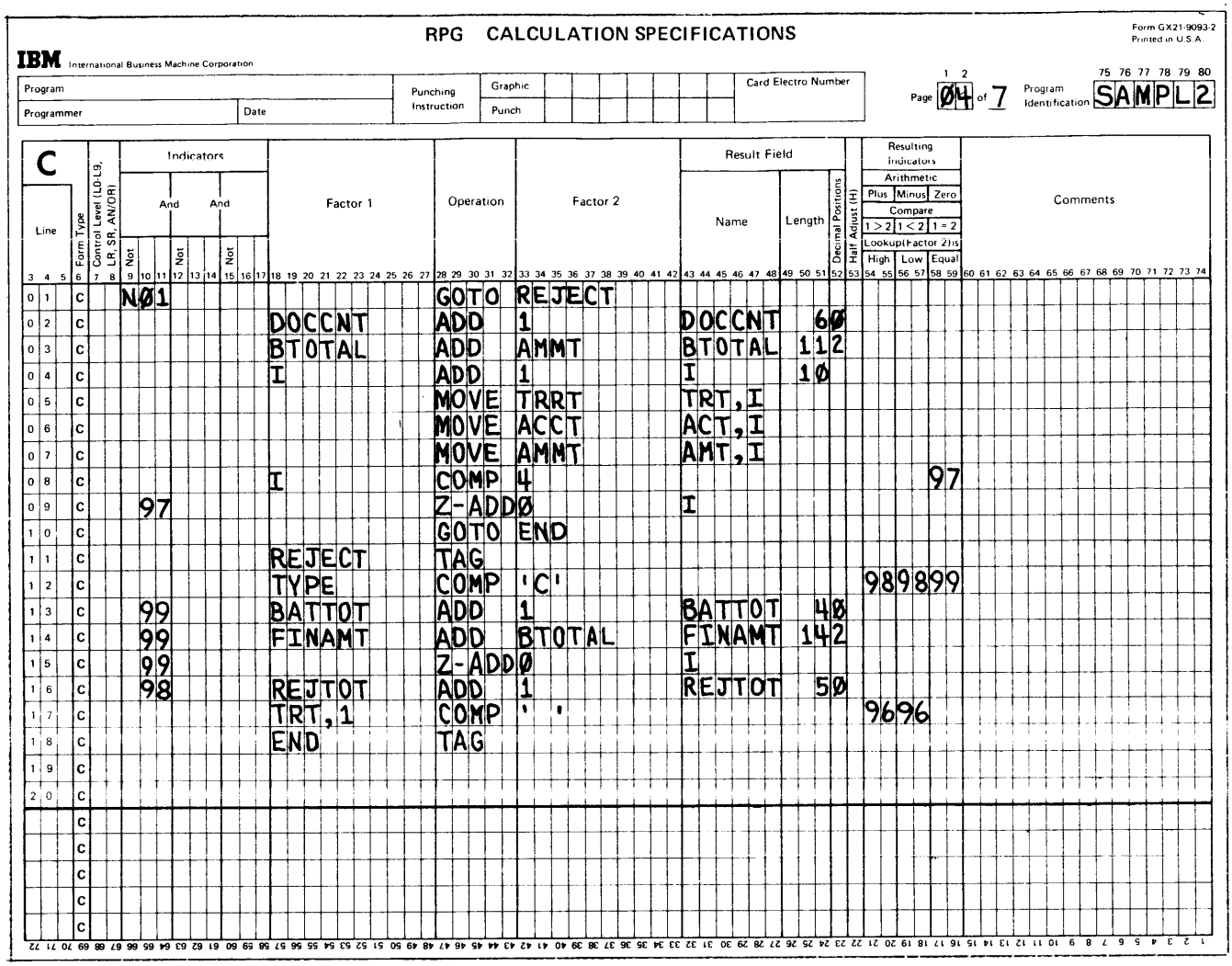
Programmer | Date

Page 03 of 7 | Program Identification SAMPL2

I

Line	Form Type	Filename	Sequence (O A / R N / D)	Number (1-N)	Option (O)	Record Identifying Indicator or **	Record Identification Codes 1: Position	1: Not (N)	1: C/Z/D	1: Character	2: Position	2: Not (N)	2: C/Z/D	2: Character	3: Position	3: Not (N)	3: C/Z/D	3: Character	Stacker Select	P/B/L/R	Field Location From	Field Location To	Decimal Positions	Field Name	Control Level (L1-L9)	Matching Fields or Chaining Fields	Field Record Relation	Field Indicators Plus	Minus	Zero or Blank
01	I	MICR	AA			01		2		20																				
02	I																				20	28		TRRT						
03	I																				29	38		ACCT						
04	I																				45	55		AMMT						
05	I																				1	55		DATA						
06	I		AB			02		2NZ0																						
07	I																				4	4		TYPE						
08	I																													
09	I																													
10	I																													
11	I																													
12	I																													
13	I																													
14	I																													
15	I																													
16	I																													
17	I																													
18	I																													
19	I																													
20	I																													
	I																													
	I																													
	I																													
	I																													
	I																													

Figure 5-3 (Part 3 of 7). RPG II Programming Using SUBR08 (SAMPL2)



RPG CALCULATION SPECIFICATIONS

Form GX21-9093-2
Printed in U.S.A.

IBM International Business Machine Corporation

Program		Punching Instruction	Graphic		Card Electro Number
Programmer	Date		Punch		

Page 04 of 7 — Program Identification SAMPL2

Line	Form Type	Control Level (L0-L9, LR, SR, AN/OR)	Indicators: And / And / Not	Factor 1	Operation	Factor 2	Result Field: Name	Length	Decimal Positions	Half Adjust (H)	Resulting Indicators: Arithmetic Plus / Minus / Zero; Compare 1>2 / 1<2 / 1=2; Lookup(Factor 2)is High / Low / Equal	Comments
01	C		NØ1		GOTO	REJECT						
02	C			DOCCNT	ADD	1	DOCCNT	6Ø				
03	C			BTOTAL	ADD	AMMT	BTOTAL	112				
04	C			I	ADD	1	I	1Ø				
05	C				MOVE	TRRT	TRT,I					
06	C				MOVE	ACCT	ACT,I					
07	C				MOVE	AMMT	AMT,I					
08	C			I	COMP	4					97	
09	C		97		Z-ADD	Ø	I					
10	C				GOTO	END						
11	C			REJECT	TAG							
12	C			TYPE	COMP	'C'					989899	
13	C		99	BATTOT	ADD	1	BATTOT	4Ø				
14	C		99	FINAMT	ADD	BTOTAL	FINAMT	142				
15	C		99		Z-ADD	Ø	I					
16	C		98	REJTOT	ADD	1	REJTOT	5Ø				
17	C			TRT,1	COMP	' '					9696	
18	C			END	TAG							
19	C											
20	C											
	C											
	C											
	C											
	C											
	C											

Figure 5-3 (Part 4 of 7). RPG II Programming Using SUBR08 (SAMPL2)

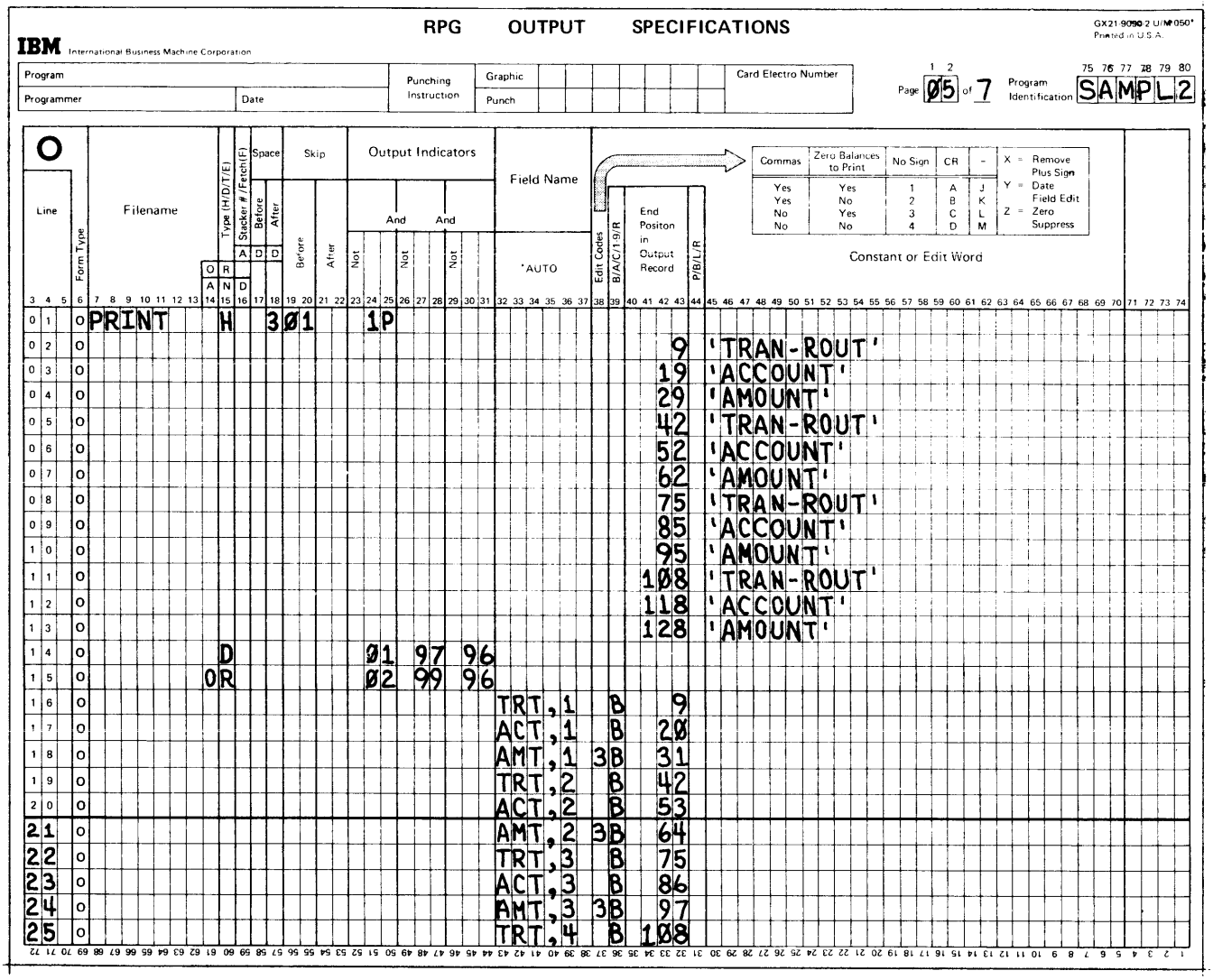
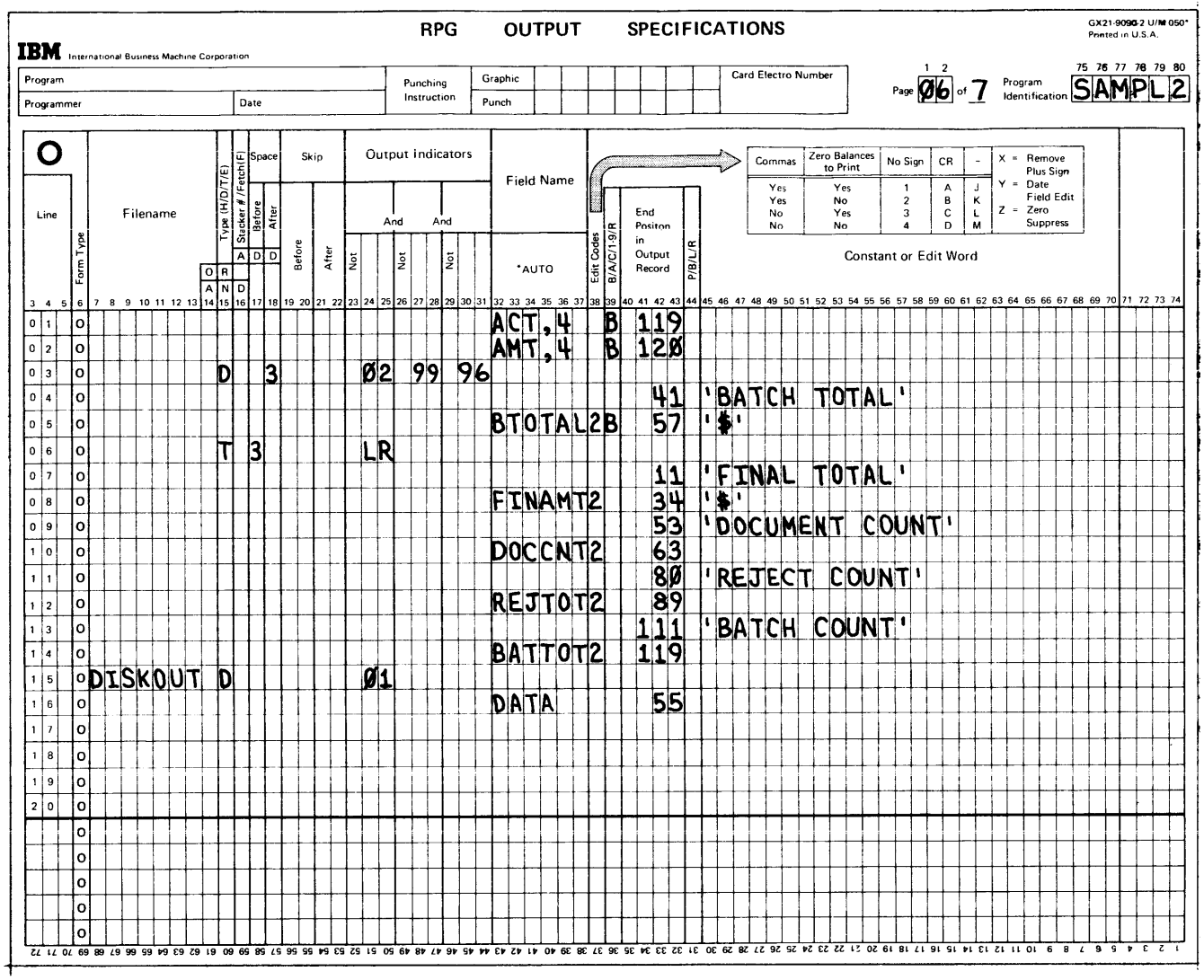


Figure 5-3 (Part 5 of 7). RPG II Programming Using SUBR08 (SAMPL2)



RPG OUTPUT SPECIFICATIONS

GX21-9090-2 U/M 050* Printed in U.S.A.

IBM International Business Machine Corporation

Program | Programmer | Date | Punching Instruction | Graphic | Punch | Card Electro Number

Page 06 of 7 | Program Identification SAMPL2

Line	Form Type	Filename	Type (H/D/T/E)	Stacker # / Fetch (F)	Space Before	Space After	Skip Before	Skip After	Output indicators And/Not	Field Name	Edit Codes	B/A/C/1-9/R	End Position in Output Record	P/B/L/R	Constant or Edit Word
01	O									ACT,4		B	119		
02	O									AMT,4		B	120		
03	O		D		3				02 99 96						
04	O												41		'BATCH TOTAL'
05	O									BTOTAL	2	B	57		'$'
06	O		T	3					LR						
07	O												11		'FINAL TOTAL'
08	O									FINAMT	2		34		'$'
09	O												53		'DOCUMENT COUNT'
10	O									DOCCNT	2		63		
11	O												80		'REJECT COUNT'
12	O									REJTOT	2		89		
13	O												111		'BATCH COUNT'
14	O									BATTOT	2		119		
15	O	DISKOUT	D						01						
16	O									DATA			55		
17	O														
18	O														
19	O														
20	O														

Commas	Zero Balances to Print	No Sign	CR	-
Yes	Yes	1	A	J
Yes	No	2	B	K
No	Yes	3	C	L
No	No	4	D	M

X = Remove Plus Sign
Y = Date Field Edit
Z = Zero Suppress

Figure 5-3 (Part 6 of 7). RPG II Programming Using SUBR08 (SAMPL2)

Figure 5-3 (Part 7 of 7). RPG II Programming Using SUBR08 (SAMPL2)

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SPECIFICATION FOR
MAGNETIC CHARACTER READERS

Form GX21-9101-2
Printed in U.S.A.

Date _____

Program _____

Programmer _____

Punching Instructions	Graphic							
	Punch							

Sheet 07 of 7

System Specification

Sequence Number	Document Count Condition: Count	Document Count Condition: Action-S/I/A	Reserved	Fields To Be Printed: Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Definition: Field 1 F or V	Field 1 Length	Field 2 F or V	Field 2 Length	Field 3 F or V	Field 3 Length	Field 4 F or V	Field 4 Length	Field 5 F or V	Field 5 Length	Reserved	Modulus Check: Modulus No.	Modulus Check: Weighting Factor (Account Number)	EOF/Control Field No.	Control Document Contents	End-of-File Document Contents	Print Line Length	Stacker Code - 4/8/A	Reserved	System Specification
01										F	10	V	06	V	10	F	09	V	06				4	8888-8888	9999-9999		8		

Stacker Specifications

Sequence Number	Stacker Number	Validity or Presence Check (N or P): Field 1	Field 2	Field 3	Field 4	Field 5	Reserved	Field Comparison Tests: Test 1 Field Number	Test 1 Relative Pos.	Test 1 Field Length	Test 1 Not - N	Test 1 Compare - E/L/G	Test 1 Test Characters	Test 2 Field Number	Test 2 Relative Pos.	Test 2 Field Length	Test 2 Not - N	Test 2 Compare - E/L/G	Test 2 Test Characters	Test 3 Field Number	Test 3 Relative Pos.	Test 3 Field Length	Test 3 Not - N	Test 3 Compare - E/L/G	Test 3 Test Characters	Test 4 Field Number	Test 4 Relative Pos.	Test 4 Field Length	Test 4 Not - N	Test 4 Compare - E/L/G	Test 4 Test Characters	Test 5 Field Number	Test 5 Relative Pos.	Test 5 Field Length	Test 5 Not - N	Test 5 Compare - E/L/G	Test 5 Test Characters
02	R	N																																		
03	R		N																																	
04	R			N																																
05	2							10	01	0		G	00009999999																								
06	0	P		P	P																															

Chapter 6. Coding Necessary to Write an Assembler Language Program Containing SUBR08

You should be familiar with the information in the *IBM System/32 Basic Assembler and Macro Processor Reference Manual,* SC21-7673, before reading this sample program.

The following code illustrates the techniques required to use SUBR08 in an assembler language program:

```
        START
        .
        .
        .
        EXTRN SUBR08
        .
        .
        .
*****************************************************************
*       MAKE A READ REQUEST TO THE 1255 ROUTINE - SUBR08        *
*****************************************************************
        LA    DTF,XR2                 1255 DTF
        MVI   15(,XR2),X'80'          READ REQUEST
        B     SUBR08                  REQUEST A RECORD
        .
        .
        .
*****************************************************************
*       TEST COMPLETION CODE RETURNED FROM SUBR08                *
*****************************************************************
        CLI   14(,XR2),X'40'          TEST FOR SUCCESSFUL READ
        BE    PR100                   GO PROCESS RECORD
        CLI   14(,XR2),X'42'          TEST FOR END OF FILE
        BE    ENDOJ                   GO CLOSE FILES
        .
        .
        .
*****************************************************************
*       PROCESS THE RECORD RECEIVED FROM THE 1255 ROUTINE       *
*****************************************************************
PR100   EQU   *
        L     13(,XR2),XR1            LOAD ADDRESS OF THE INPUT RECORD
        .
        .
        .
*****************************************************************
*       END OF JOB  -  CLOSE 1255 FILE                          *
*****************************************************************
ENDOJ   EQU   *
        LA    DTF,XR2                 1255 DTF
        MVI   15(,XR2),X'10'          CLOSE REQUEST
        B     SUBR08                  GO CLOSE FILE
        .
```

IBM

IBM System/32 Basic Assembler Coding Form

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PROGRAM | KEYING | GRAPHIC | PAGE 1 OF 4
PROGRAMMER | DATE | INSTRUCTIONS | CHARACTER | CARD ELECTRO NUMBER

Name	Operation	Operand	Remarks
DTF	EQU	*	
	DC	XL8'ØØ'	RESERVED
	DC	AL2(Ø)	INITIAL RETURN ADDRESS
	DC	AL2(Ø)	INITIAL XR1 VALUE
	DC	AL2(Ø)	LOGICAL RECORD ADDRESS
*			RETURNED BY #MIØ8
	DC	AL2(Ø)	RESERVED
	DC	AL2(Ø)	INPUT BUFFER ADDRESS FOR #MIØ8
	DC	AL2(Ø)	RESERVED
	DC	AL2(Ø)	INPUT BUFFER LENGTH (MIN = 55Ø)
	DC	AL2(55)	INPUT RECORD LENGTH (MUST = 55)
	DC	AL2(DTT)	ADDRESS OF THE DTT
*			
*			
DTT	EQU	*	
	DC	AL2(ARRAY)	ADDRESS OF THE SYSTEM AND STACKER
*			SPECIFICATION ARRAY
	DC	AL2(Ø)	END ADDRESS OF SYSTEM AND STACKER
*			SPECIFICATION ARRAY
	DC	AL2(Ø)	RESERVED.
	DC	XL2'ØØØ1'	LENGTH OF EACH ARRAY ELEMENT

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PROGRAM | DATE | KEYING INSTRUCTIONS | GRAPHIC | CHARACTER | PAGE 2 OF 4 | CARD ELECTRO NUMBER

STATEMENT

Name	Operation	Operand	Remarks	Identification Sequence
ARRAY	EQU	*		
	DC	CL2' '	SEQUENCE NUMBER	
	DC	CL3' '	DOCUMENT COUNT FOR DOCUMENT COUNT	
*			CONDITION	
	DC	CL1' '	ACTION FOR DOCUMENT COUNT CONDITION	
	DC	CL9' '	RESERVED	
	DC	CL3' '	FIELD 1 DEFINITION	
	DC	CL3' '	FIELD 2 DEFINITION	
	DC	CL3' '	FIELD 3 DEFINITION	
	DC	CL3' '	FIELD 4 DEFINITION	
	DC	CL3' '	FIELD 5 DEFINITION	
	DC	CL6' '	RESERVED	
	DC	CL1' '	MODULUS CHECK NUMBER	
	DC	CL1Ø' '	MODULUS CHECK WEIGHTING FACTOR	
	DC	CL1' '	END OF FILE AND CONTROL FIELD NUMBER	
	DC	CL1Ø' '	CONTROL DOCUMENT CONTENTS	
	DC	CL1Ø' '	END OF FILE DOCUMENT CONTENTS	
	DC	CL3' '	RESERVED	
	DC	CL1' '	1255 MODEL CODE	
	DC	CL8' '	RESERVED	
* THE FOLLOWING 8Ø BYTES MAY BE REPEATED FOR AS MANY STACKER				
* SPECIFICATIONS AS REQUIRED.				
	DC	CL2' '	SEQUENCE NUMBER	
	DC	CL2' '	STACKER NUMBER	

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PROGRAM | PROGRAMMER | DATE | KEYING INSTRUCTIONS | GRAPHIC | CHARACTER | PAGE 3 OF 4 | CARD ELECTRO NUMBER

STATEMENT

Name	Operation	Operand	Remarks	Identification Sequence
	DC	CL1' '	FIELD 1 VALIDITY	
	DC	CL1' '	FIELD 2 VALIDITY	
	DC	CL1' '	FIELD 3 VALIDITY	
	DC	CL1' '	FIELD 4 VALIDITY	
	DC	CL1' '	FIELD 5 VALIDITY	
* TEST 1				
	DC	CL1' '	FIELD NUMBER	
	DC	CL2' '	RELATIVE POSITION	
	DC	CL2' '	FIELD LENGTH	
	DC	CL1' '	NOT INDICATOR FOR E/L/G IN NEXT COL.	
	DC	CL1' '	FIELD COMPARE	
	DC	CL10' '	TEST CHARACTERS	
* TEST 2				
	DC	CL1' '	FIELD NUMBER	
	DC	CL2' '	RELATIVE POSITION	
	DC	CL2' '	FIELD LENGTH	
	DC	CL1' '	NOT INDICATOR FOR E/L/G IN NEXT COL.	
	DC	CL1' '	FIELD COMPARE	
	DC	CL10' '	TEST CHARACTERS	
* TEST 3				
	DC	CL1' '	FIELD NUMBER	
	DC	CL2' '	RELATIVE POSITION	
	DC	CL2' '	FIELD LENGTH	
	DC	CL1' '	NOT INDICATOR FOR E/L/G IN NEXT COL.	

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PROGRAM		KEYING	GRAPHIC								PAGE 4 OF 4
PROGRAMMER	DATE	INSTRUCTIONS	CHARACTER								CARD ELECTRO NUMBER

STATEMENT				Identification Sequence
Name	Operation	Operand	Remarks	
	DC	CL1' '	FIELD COMPARE	
	DC	CL10' '	TEST CHARACTERS	
* TEST 4				
	DC	CL1' '	FIELD NUMBER	
	DC	CL2' '	RELATIVE POSITION	
	DC	CL2' '	FIELD LENGTH	
	DC	CL1' '	NOT INDICATOR FOR E/L/G IN NEXT COL.	
	DC	CL1' '	FIELD COMPARE	
	DC	CL10' '	TEST CHARACTERS	
*				
	DC	CL1' '	RESERVED	

Chapter 7. 1255 Functions

This chapter is intended for persons interested in the operation and characteristics at the machine code level of the IBM System/32 with a 1255 attached. Included are the instructions, formats, and 1255 check conditions required for interfacing with the IBM 1255 Magnetic Character Reader. See the *IBM System/32 Functions Reference Manual,* GA21-9176, for a complete description and explanation of all functional characteristics of the System/32.

An array is built from information entered on the system and stacker specification sheets. The system specifications describe the fields that are to be read: the control document, valid stackers, the EOF document, and the weighting factor for modulus check.

The stacker specification identifies the stacker to which a document is routed and describes the tests to be performed on the document before it is routed to that stacker. See Chapter 9 for a description of the column entries in the system and stacker specification sheets.

Note: When coding is done at the microcode level to interface with a 1255, the data management module specified must not allow inquiry when the 1255 IOBs are active. Inquiry must wait until the 1255 is stopped or unpredictable results can occur. When inquiry is acted upon, only the 0 or 2 option is allowed.

INSTRUCTION FORMATS

Instruction formats are distinguished by their ability to address storage. The length of each instruction is determined by the type of addressing being performed. All instruction formats have two elements in common: the op code and the Q code. Each element is one byte long. The op code determines the type of addressing (thereby the length of the instruction) and the operation to be performed. The function of the Q code is determined by the instruction and therefore, is discussed with each individual instruction.

The following instructions are required for interfacing System/32 with the 1255 Magnetic Character Reader. See Chapter 12 for the format of the 1255 IOB.

START MAGNETIC CHARACTER READER IOB

Op Code (hex)	Q Byte[1] (hex)	R Byte[2] (hex)
Byte 1	**Byte 2**	**Byte 3**
F3	50	xx

[1] Address within the system queue header table for the 1255 IOB is hex 508. The Q code for loading the 1255 IOCH (input/output control handler) control storage transient is 02; the Q code for loading the 1255 diagnostic control storage transient is 03.

[2] 00 specifies a normal SIO request. 01 indicates a specification to reset a 1255 error and continue processing IOBs. FF is a request to disable the 1255.

Operation

This instruction starts the operation specified by the Magnetic Character Reader IOB. When the operation is complete, the system branches back to the next sequential instruction of the program.

The start I/O instructions are invoked in the following sequential steps:

Sequence	Q Code (hex)	R Code (hex)
Load diagnostic code	52	Note 1
Load microcode	54	Note 1
Load compressed specifications	56	00
Load work area	56	02
Get document request (note 2)	51	Note 3

Notes:

1. The R code represents the actual number (in hex) of sectors of code on disk.
2. At completion of a get document request (IOB Q code = hex 51) the IOBs must be chained on the queue.
3. The R code represents the number of documents required to complete the input area associated with this IOB (the input area associated with this IOB divided by 55).

Program Note

If the Q code is hex 51 (get document request) or hex 53 (get single document request), the IOB, after it has been processed, is dequeued and the next IOB is processed, if there are any on the chain.

Resulting Program Status Byte Settings

This instruction does not affect the program status register.

INITIALIZE MAGNETIC CHARACTER READER

Op Code[1] (hex)	Q Byte[1] (hex)	Operand 1 Address[1] (hex)		Control Code[2] (hex)			
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
C0	87	00	04	0F	00	xx	00

[1] The op code, Q byte, and operand address specify a branch to a general entry location in control storage.
[2] The control code is also called a request indicator byte (RIB); it specifies the system operation. 02 in byte 7 specifies loading 1255 IOCH microcode control storage transient; 03 specifies loading 1255 diagnostic control storage transient.

Operation

This instruction establishes the system control codes needed for the 1255 device operations. When the initialize operation is complete, the system branches back to the next sequential instruction of the program.

Program Note

The program must issue this instruction once per interface with the 1255.

Resulting Program Status Byte Settings

This instruction does not affect the program status register.

QUEUE/DEQUEUE MAGNETIC CHARACTER READER

Op Code[1] (hex)	Q Byte[1] (hex)	Operand 1 Address[1] (hex)		Control Code[2] (hex)			
Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte 5**	**Byte 6**	**Byte 7**	**Byte 8**
C0	87	00	04	0E	xx[3]	10[4]	00

[1] The op code, Q byte, and operand address specify a branch to a general entry location in control storage.
[2] The control code is also called a request indicator byte (RIB); it specifies the system operation.
[3] Byte 6 (in control code) specifies what the system does with the 1255 IOB:
00 loads the IOB in the last position on the system IOB queue.
10 loads the IOB in the first position in the system IOB queue.
01 removes the IOB from the system IOB queue.
[4] Byte 7 specifies the Q-header displacement.

Operation

This instruction loads the 1255 IOB into the system IOB queue or removes the IOB from the queue as specified in byte 6. When the queue/dequeue instruction is complete, the system branches back to the next sequential instruction of the program.

Program Note

XR1 must contain the address of the Magnetic Character Reader IOB when the program issues the queue/dequeue instruction.

Resulting Program Status Byte Settings

This instruction does not affect the program status register.

1255 CHECK CONDITIONS AND STATUS

These bits show the conditions that result after execution, or attempted execution, of an operation requested by the 1255 IOB.

Byte 0

Bit	*Meaning*
0	*Diagnostic microcode failed* when the 1255 adapter or the attachment controller diagnostic microcode was being diagnosed (Q code 52).
1	*Document count condition reached* for a specified stacker. An S (indicating stop) in column 6 of the system stacker specification caused this bit to be set on.
2	This bit is not used.
3	*Attachment controller DBO/DBI parity check* set when an error occurs during data transfer between the 1255 adapter and the attachment controller.
4	*External I/O light* set on due to a normal stop condition in the 1255 (hopper empty, stacker full, or operator stop).
5	*Attachment controller memory parity check* caused by a hardware malfunction in the attachment controller memory.
6	*Attachment controller long timeout* set when the attachment controller stops or loops longer than 3 seconds.
7	*Sorter is stopped* due to one of the following conditions: – Jam stop – Stacker command stop – Empty hopper stop – Stacker full stop – Operator stop – Device not ready – Device not attached to the system

Byte 1

Bit	*Meaning*
0	*Document auto-reject* set at end of transmission time because a read command had not been issued when a document reached the read head, a document exceeds length specifications, a short document is encountered, or a document spacing condition exists.
1	This bit is not used.
2	*Misread with reject* caused when a misread is detected on a field that is specified as a field test.
3	*Misread without reject* caused when a misread is detected on a field that is not specified as a test field.
4	This bit is not used.
5	This bit is not used.
6	This bit is not used.
7	This bit is not used.

Part 2. 1255 Program Logic

Part 2 includes the following chapters:

Chapter 8. Introduction to 1255 Program Logic: General information about the functions and characteristics of the 1255 Magnetic Character Reader.

Chapter 9. Method of Operation: Functional diagrams to present the operation of the MICR attachment. References to the modules and routines called to perform the functions.

Chapter 10. Program Organization: The organization of each module of the MICR attachment.

Chapter 11. Directory: Routine names, their associated diagram number, and functions of the routines.

Chapter 12. Data Areas: Data areas unique to the MICR attachment. See *IBM System/32 System Data Areas and Diagnostic Aids,* SY21-0532, for a description of data areas used systemwide.

Chapter 13. Diagnostic Aids: Diagnostic aids for the DUMP facility, nonoverlay mode, trace buffer, and an attachment controller dump. For information regarding other System/32 diagnostic aids, see *IBM System/32 System Data Areas and Diagnostic Aids,* SY21-0532.

Chapter 8. Introduction to 1255 Program Logic

DIAGRAM TECHNIQUES

Diagrams in this manual graphically explain the functions of the program. These diagrams are structured from general to detailed levels; namely, the table of contents, one or more overview diagrams, and one or more lower-level diagrams for each overview diagram.

TABLE OF CONTENTS

The table of contents (diagrams 0.x) shows:

- The structural relationship of all the diagrams
- The descriptive title of each diagram
- The assigned number for each diagram

OVERVIEW DIAGRAMS

The input-process-output format is used for both the overview and lower-level diagrams.

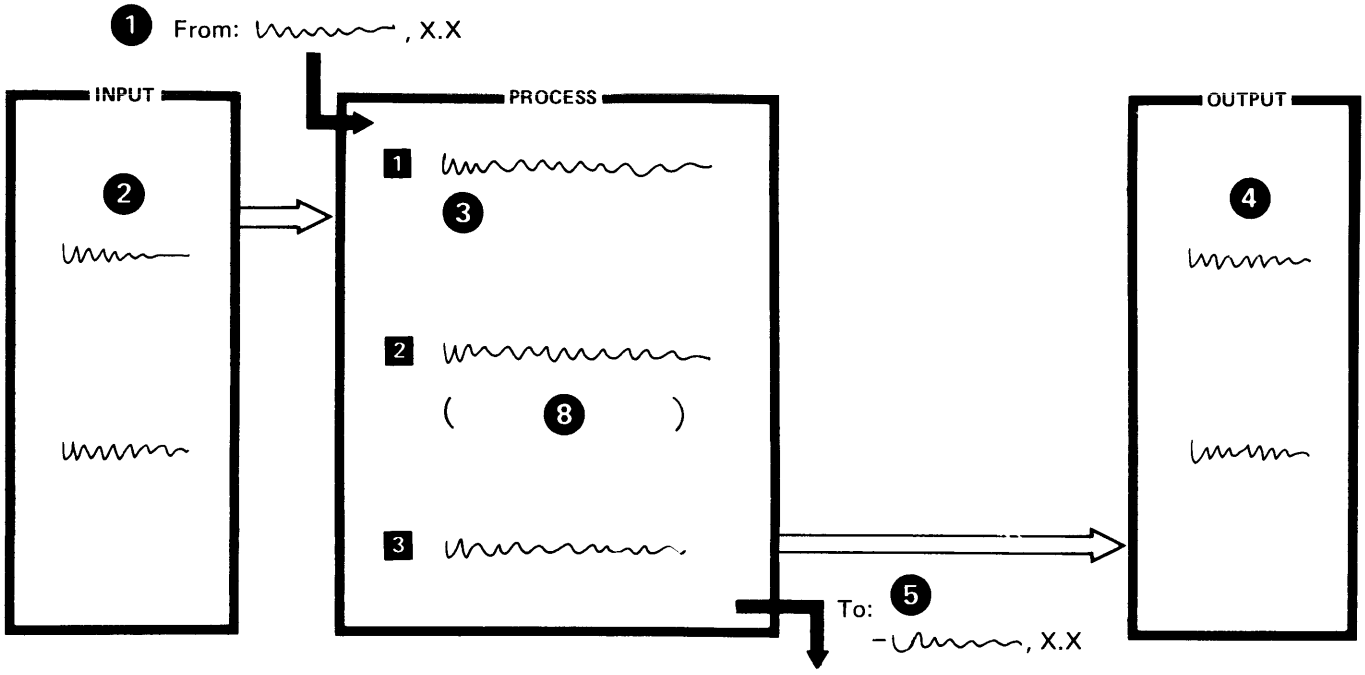
An overview summarizes the functions of a group of related lower-level diagrams and is included in the appropriate *Method of Operation* section. Overview diagrams show:

- Main input items
- Main output items
- A brief description of functions; included are references to lower-level diagrams for each of the functions

LOWER-LEVEL DIAGRAMS

Lower-level diagrams are included in the appropriate *Method of Operation* section and are arranged to show (refer to example below):

1. Name of each function that passes control to this diagram
2. Requirements for processing (INPUT)
3. A sequential listing of PROCESS steps
4. Results of processing (OUTPUT)
5. Name of each function (diagram) that receives control
6. Extended description (boxed numbers match those in the process area)
7. Module or routine where each step takes place
8. Module or routine called to perform a function



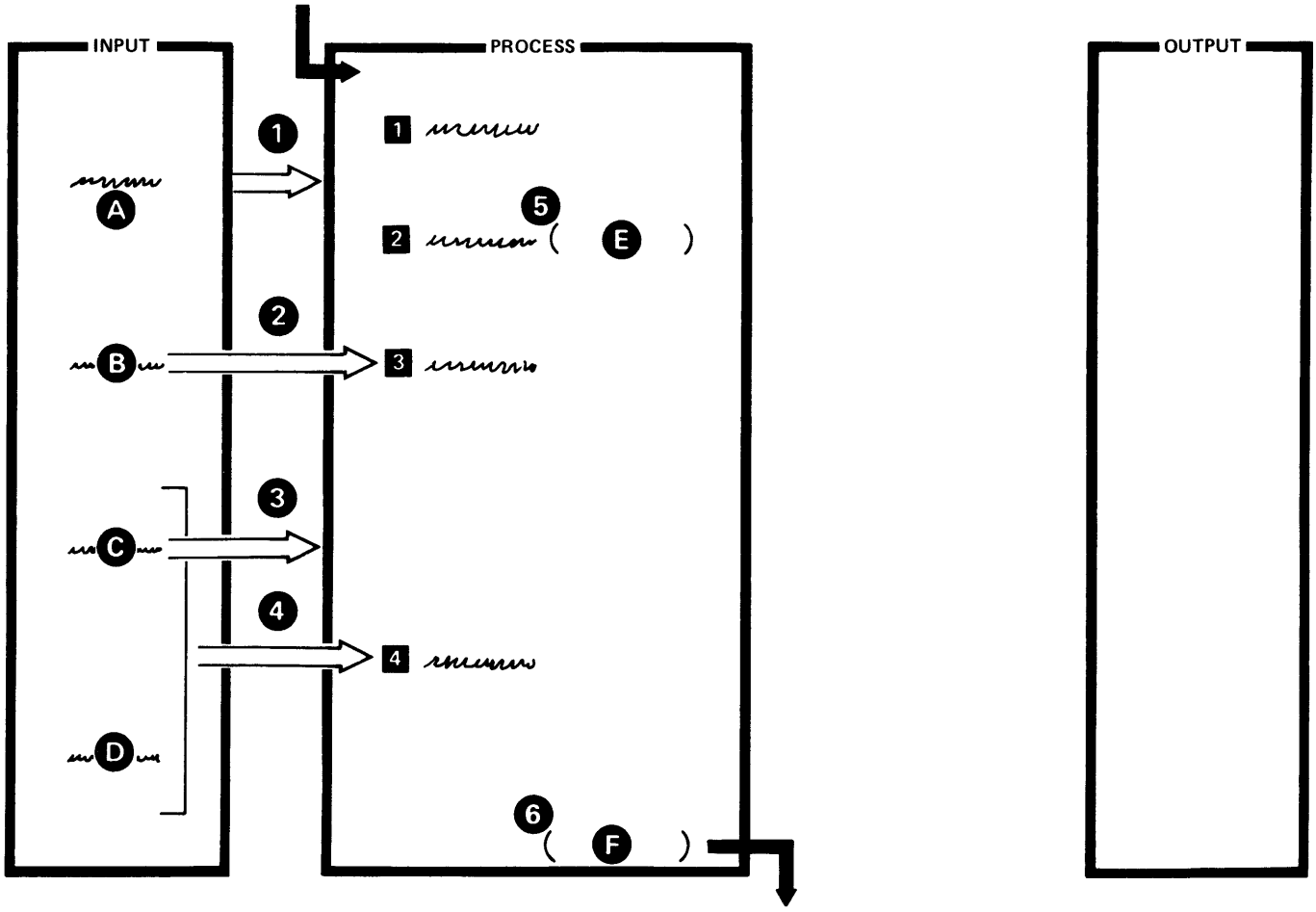
DESCRIPTION	MODULE/ ROUTINE
1 6	7
2	
3	

Arrows and boxes (in example below) show relationships by their positions:

1. All items in INPUT apply to all numbers in PROCESS.
2. Item B applies only to number 3.
3. Item C applies to any number in PROCESS.
4. Items C and D apply to number 4.
5. Routine E is used only in step 2.
6. Routine F is used in two or more steps in the process block. The extended description indicates the steps that use the routine.

LEGEND

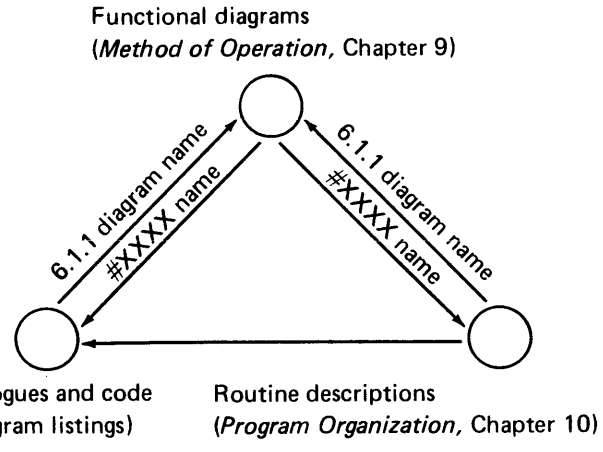
- Control flow (closed arrows)
- Data flow (open arrows)
- 3 — Reference numbers
- Address pointer
- (Diag. #) Diagram number of a routine that is called by the process step it appears in. If parentheses are located near the exit pointer, the called routine pertains to two or more steps in the PROCESS block.



Note that the above drawing is for explanation purposes only.

USING FUNCTIONAL DIAGRAMS

You have available three related sources of information as shown:



All three are cross-referenced by means of the diagram number and the routine name.

You can also find a particular routine in the manual by referring to the directory (Chapter 11) or the index entry.

SYSTEM CONFIGURATION

The 1255 attachment is supported on all models of System/32; however, the 1255 cannot operate asynchronously in a data communication environment.

SYSTEM GENERATION

The customer interfaces with SUBR08 on System/32 through either the RPG II SPECIAL device support or the assembler. To achieve maximum throughput on System/32, an attachment controller is used to interface with the 1255. The attachment controller also handles the stacker select and modulus checking routines. The array containing the system and stacker specifications is the same as any other array, except that it cannot be referenced by the user program.

SUBR08 is included in the object program during link editing. Refer to the *IBM System/32 RPG II Reference Manual,* SC21-7595, for information about SPECIAL.

SUBR08 and its associated modules #MI08 and #MICR are functionally identical. #MI08 is an overlay that is fetched on top of SUBR08. #MICR is fetched into a 2.5K area of storage. This area is rolled out to allow #MICR to be fetched. Upon #MICR completion, the area is rolled back into main storage. #MICR performs diagnostics on specifications, builds entries in the COMMON area, and builds compressions for the stacker specifications. Figure 8-1 shows the logic flow for SUBR08. These routines are divided into two sections: document processing and stacker select.

Document Processing

The document processing section passes records, as they are requested, to the RPG II or assembler object program.

Stacker Select

Based on stacker specifications, the stacker select section determines the stacker for each document being read from the 1255.

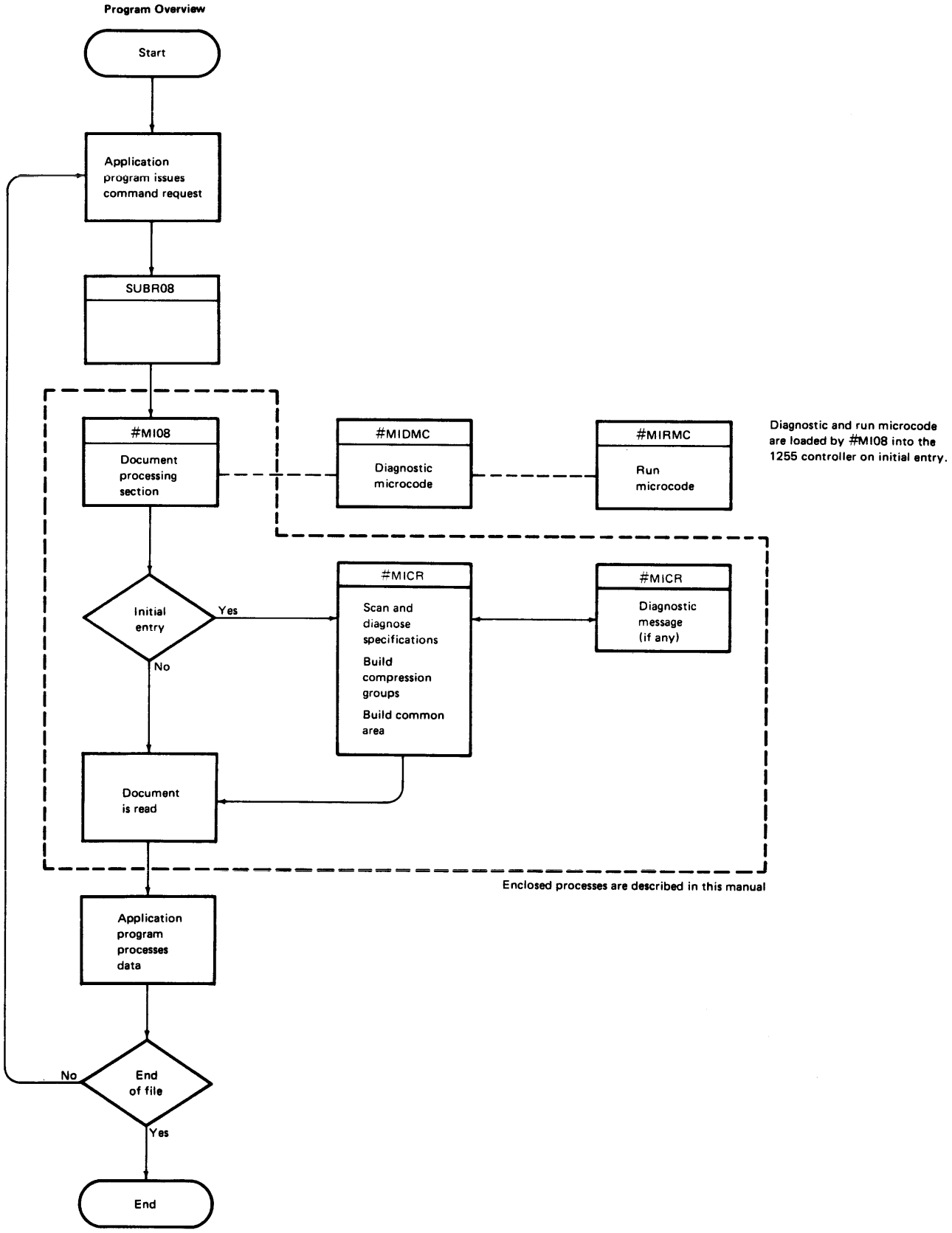


Figure 8-1. Logic Flow When SUBR08 is Called

Chapter 9. Method of Operation

The 1255 MICR support on System/32 is provided via SUBR08, which is the RPG II or assembler interface to the 1255. The subroutine provides the 1255 device allocation and deallocation, buffer management, error handling, and the passing of formatted data to the main program. It also provides, through the #MICR routine, for the analysis and compression of the user-provided system and stacker specifications. Control for the stacker select and modulus check routines is provided by the attachment controller. The following HIPO diagrams show the logic flow of SUBR08.

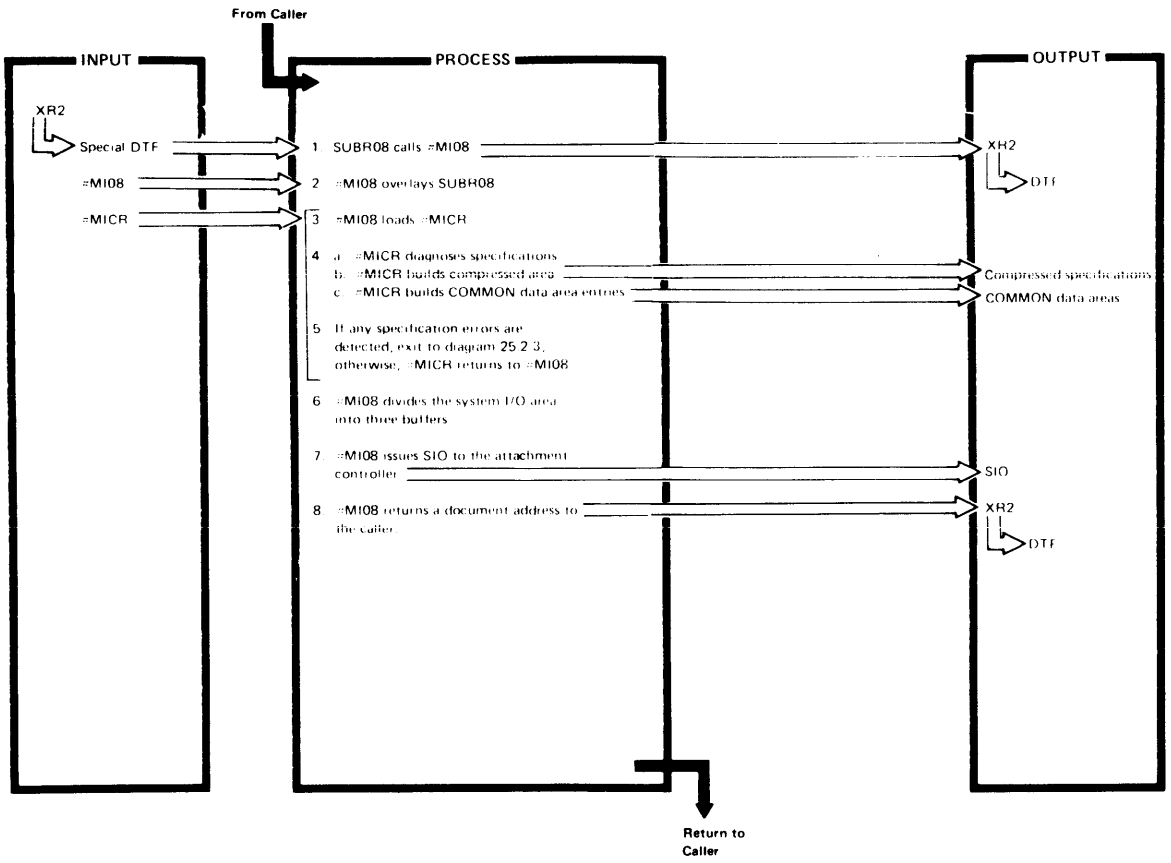
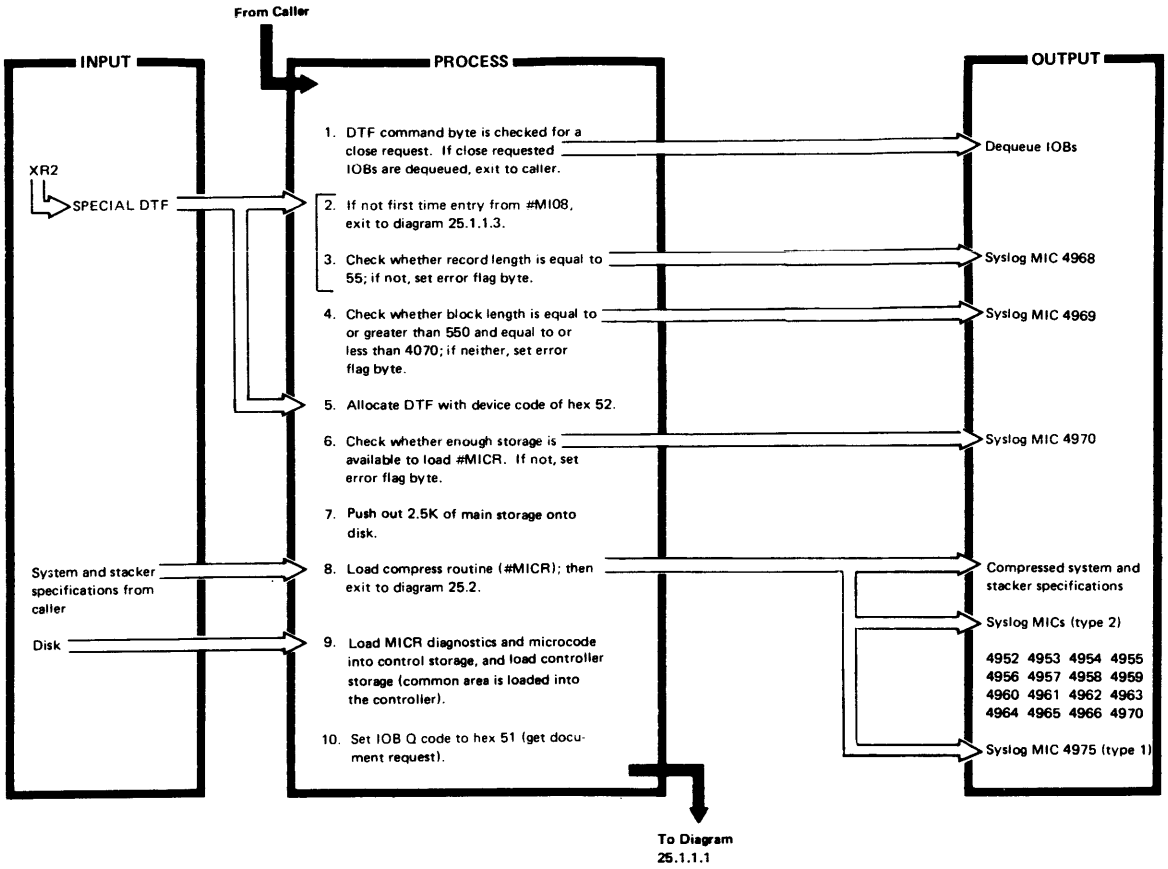


Diagram 25.1. SUBR08 Data Management Overview



DESCRIPTION	MODULE/ ROUTINE
1. –	
2. –	
3. –	
4. –	
5. –	
6. –	
7. –	
8. After compression routine is loaded into main storage, exit to diagram 25.2 for system and stacker specifications analysis.	
9. –	
10. –	

Diagram 25.1.1. #MI08 Data Management Initialization

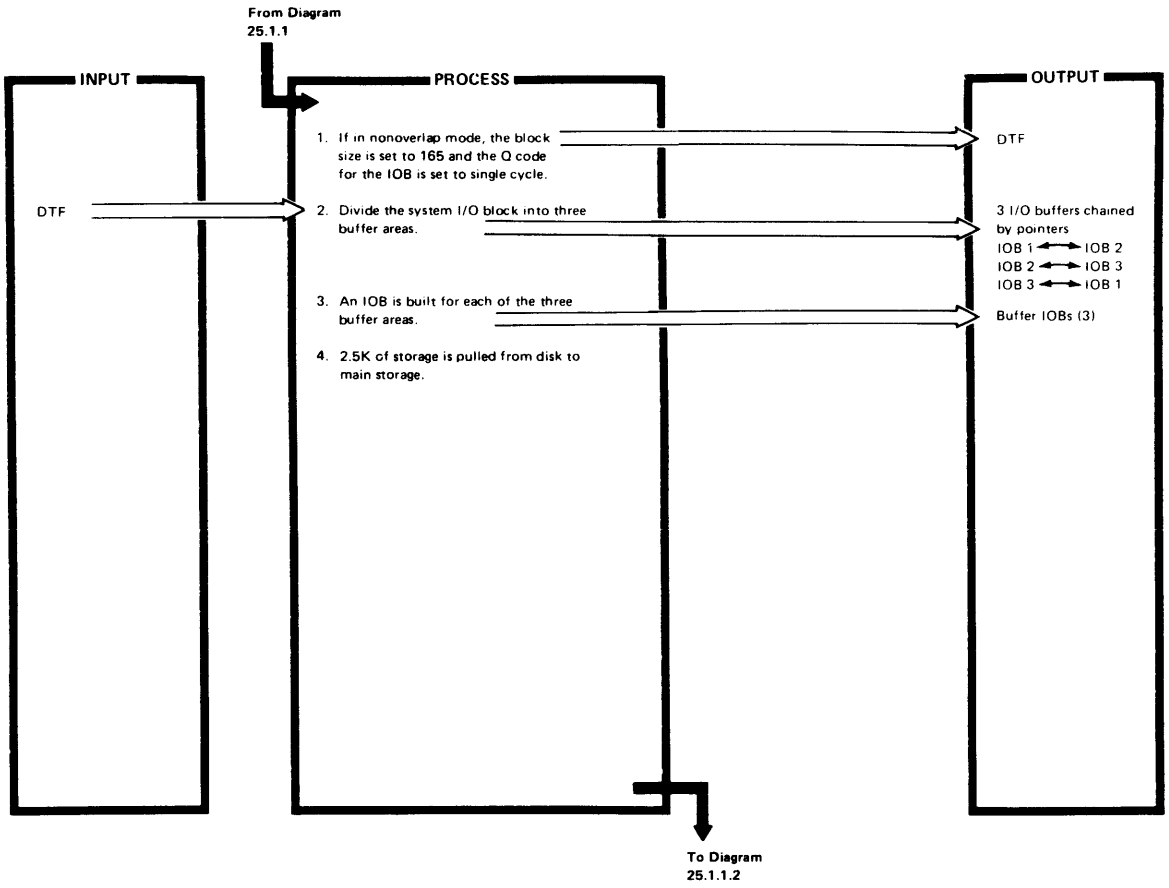


Diagram 25.1.1.1. #MI08 Data Management Buffer Initialization

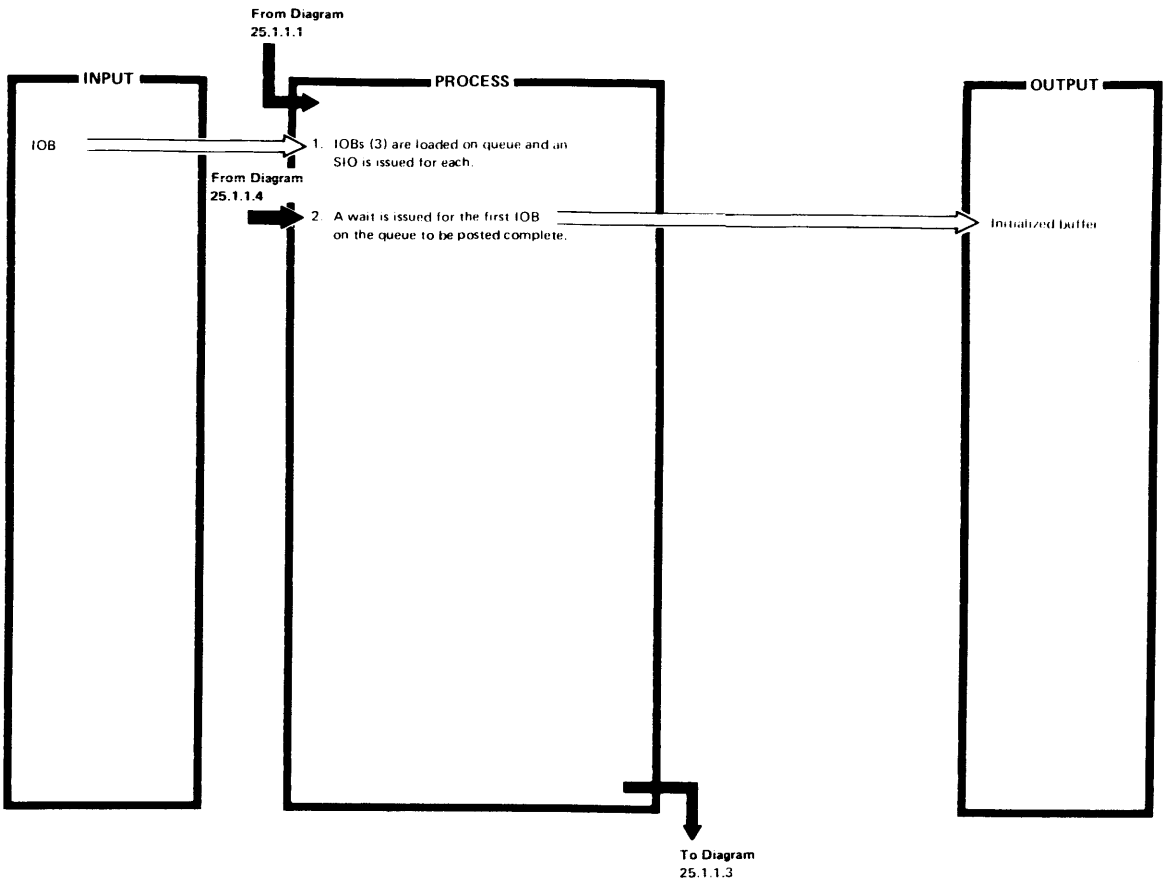


Diagram 25.1.1.2. #MI08 Data Management Buffer Management

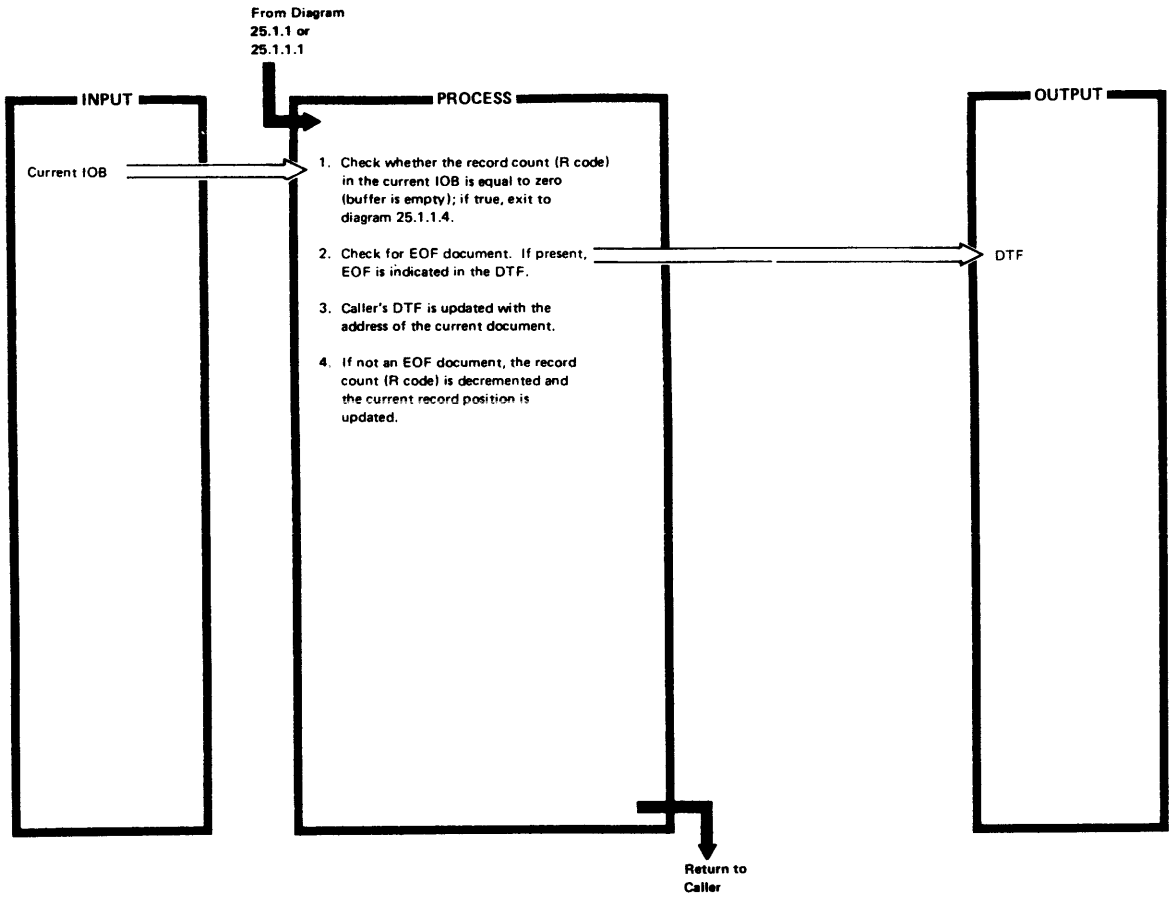


Diagram 25.1.1.3. #MI08 Data Management Data Control

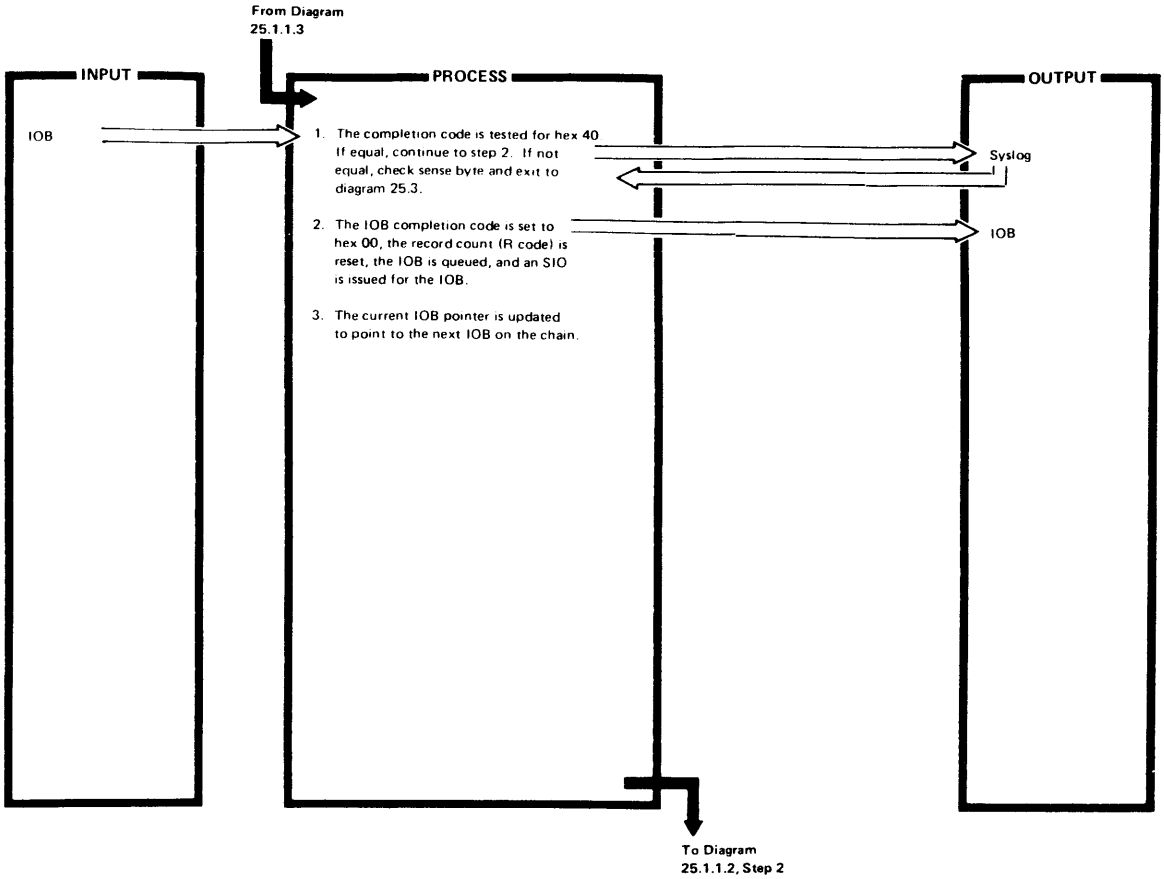
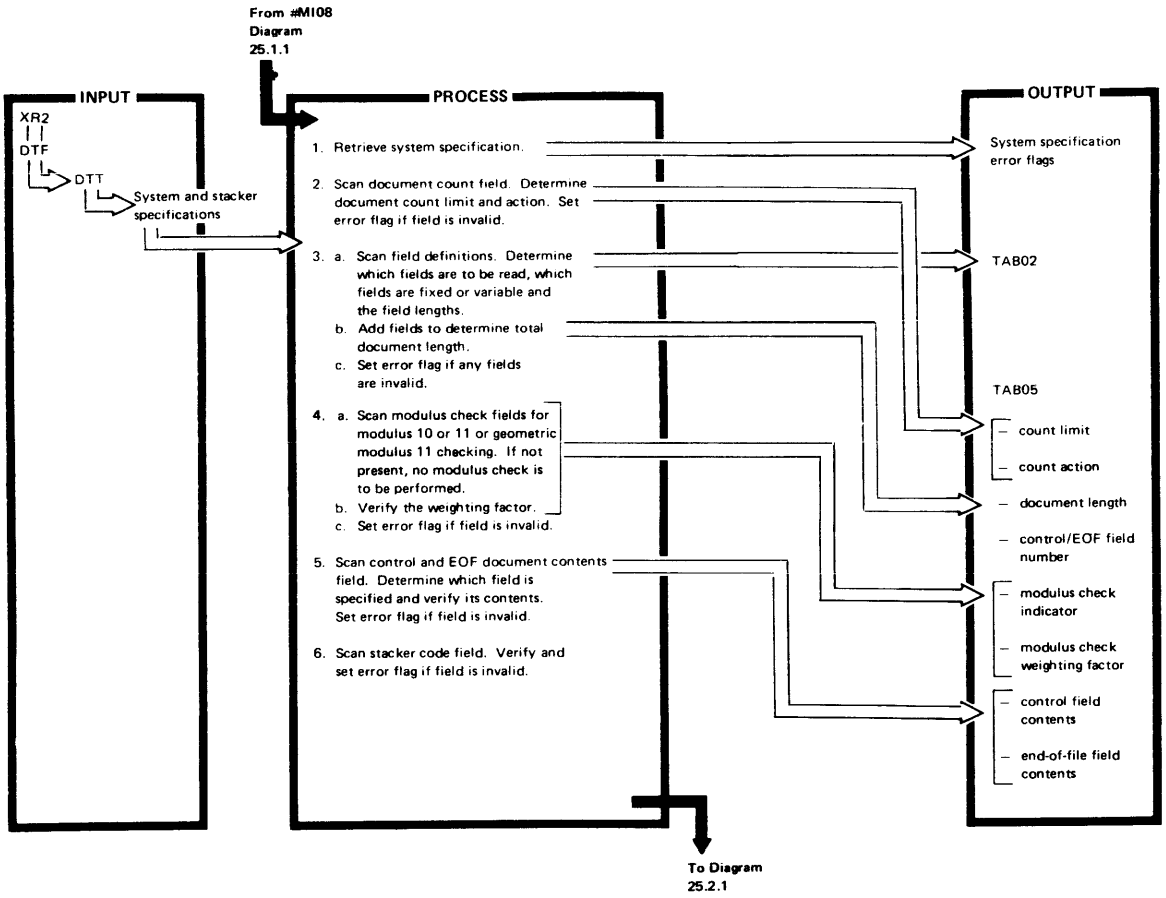


Diagram 25.1.1.4. #MI08 Data Management Error Check and Buffer Management



DESCRIPTION	MODULE/ ROUTINE
1. –	
2. As many as six error flags are set in a 2-byte indicator field. #MICR interrogates the error flag bytes after analysis of system and stacker specifications, and issues the appropriate error messages.	#MICR
3. –	
4. –	
5. –	
6. –	

Diagram 25.2. #MICR Specifications Analysis, System Specifications

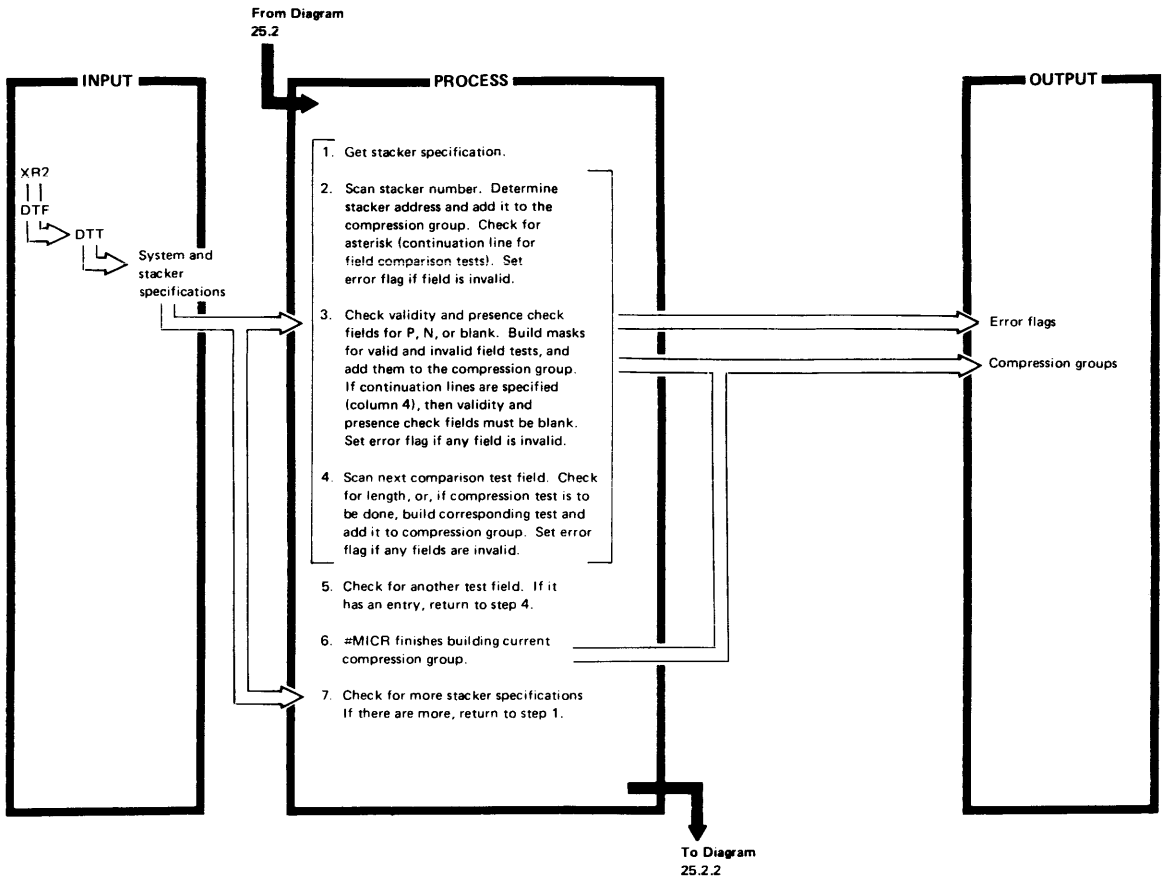


Diagram 25.2.1. #MICR Specification Analysis, Stacker Specifications

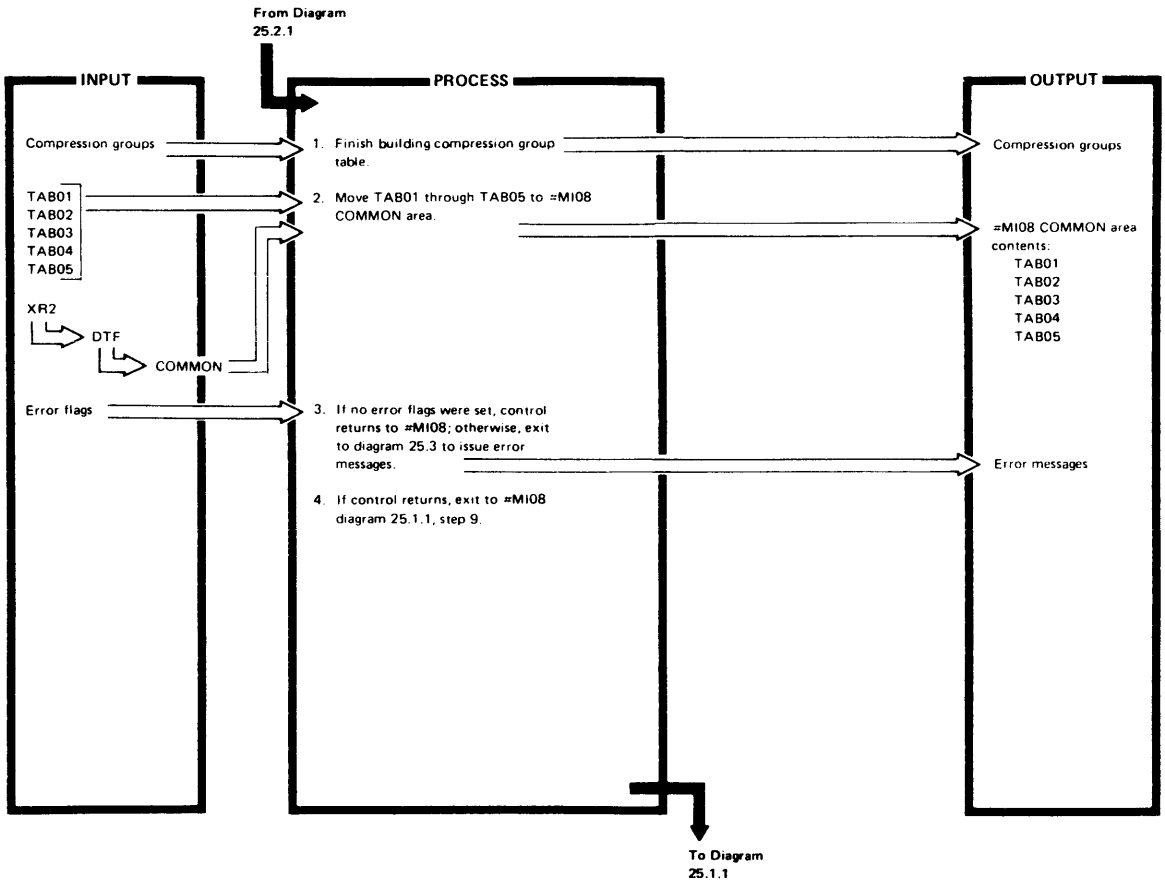


Diagram 25.2.2. #MICR Specification Analysis, Cleanup and Error Logging

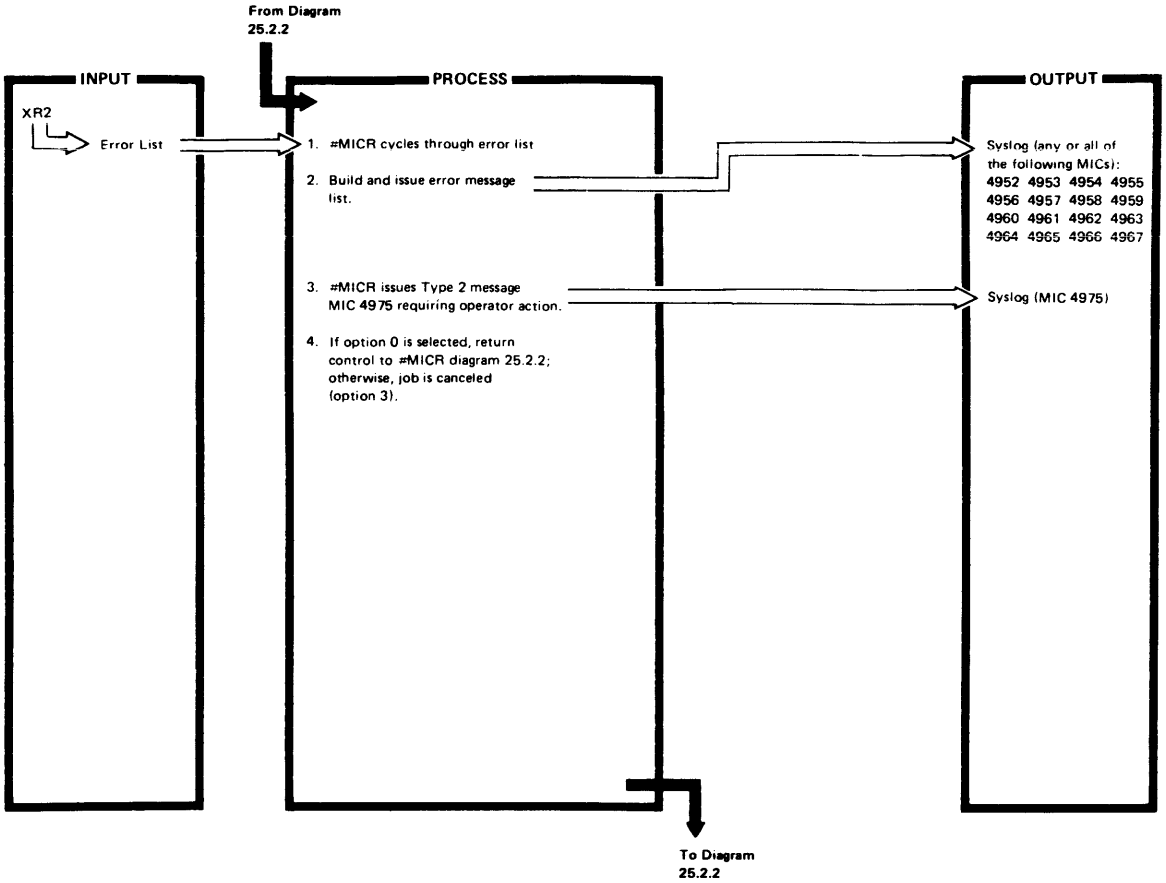


Figure 25.3. #MICR Specification Error Message Handler

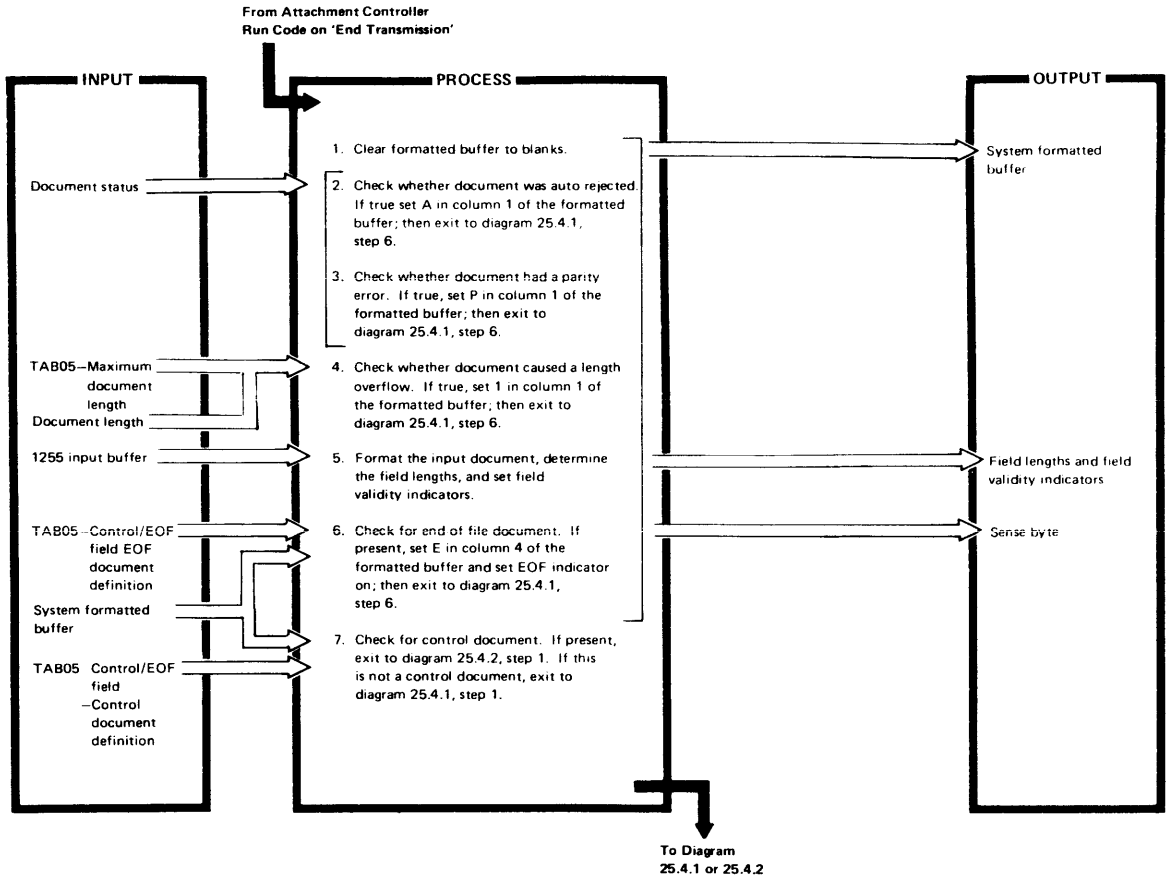
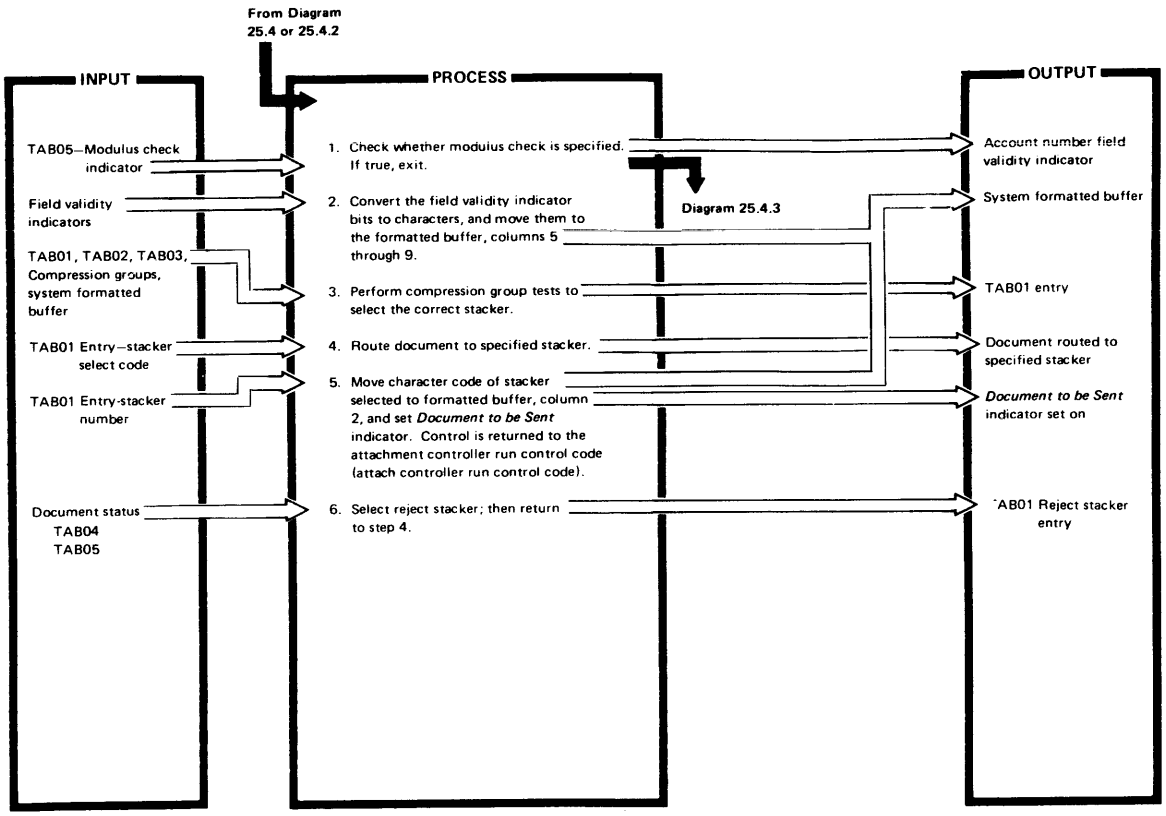


Diagram 25.4. Stacker Select Routine, Document Formatting and Status Analysis



DESCRIPTION	MODULE/ ROUTINE
1. –	
2. –	
3. The compression group tests include validity and presence check, length test, comparison test, and alternate and stop on document count condition tests.	
4. –	
5. –	
6. –	

Diagram 25.4.1. Stacker Select Routine, Stacker Selection

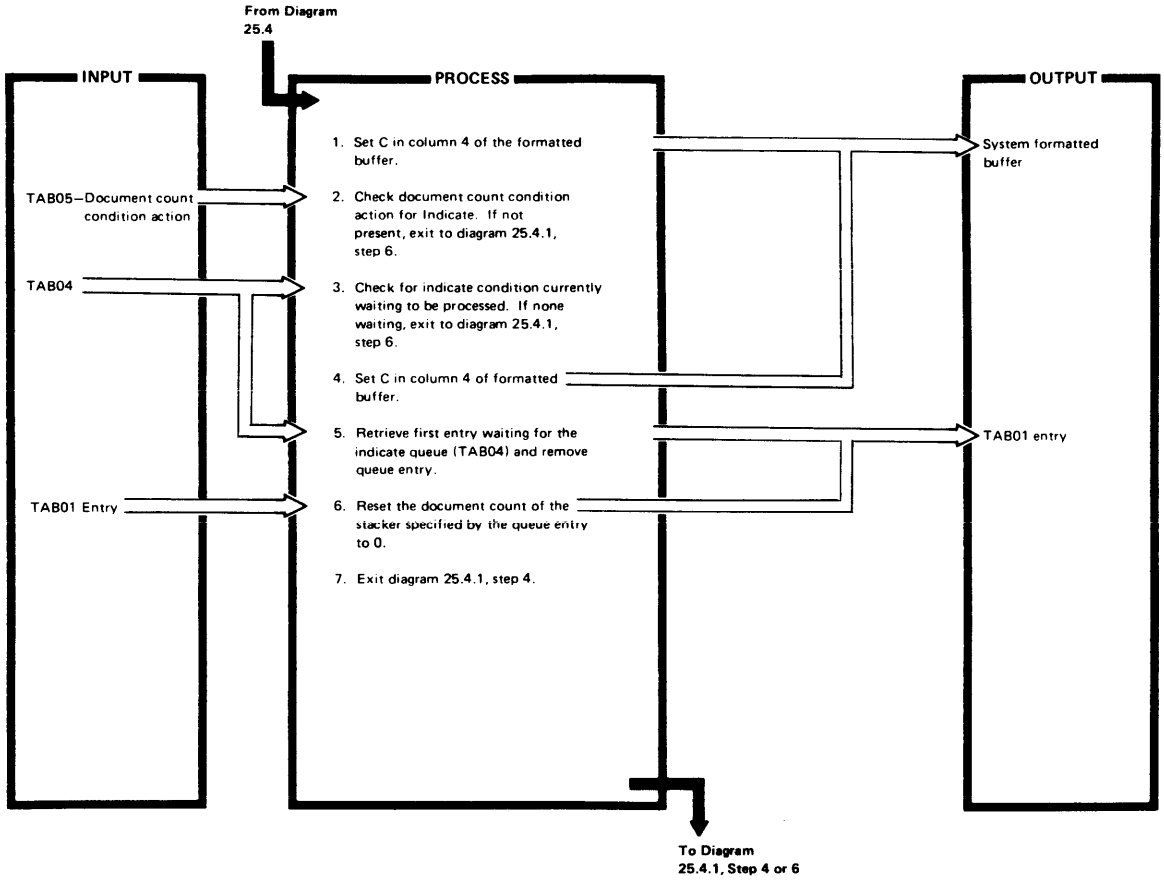


Diagram 25.4.2. Stacker Select Routine, Control Document Processing

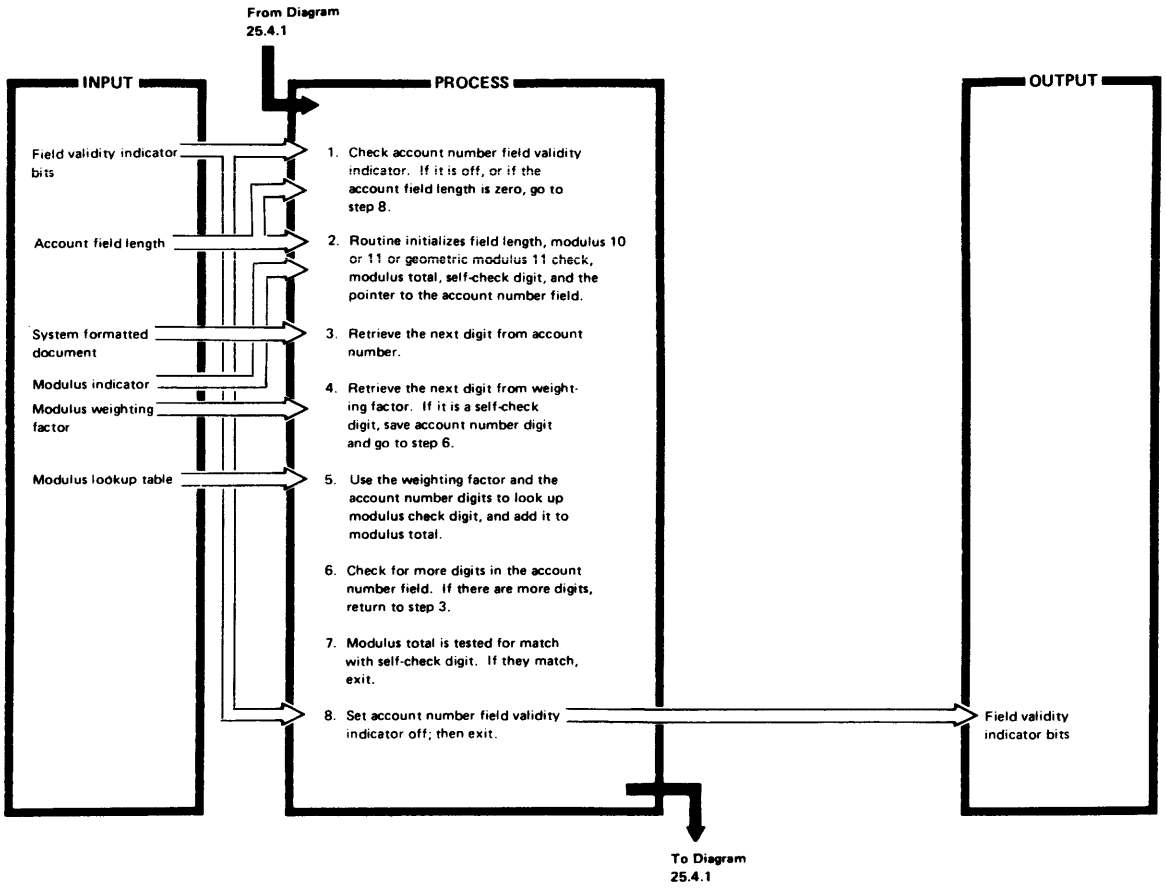


Diagram 25.4.3. Modulus Check Routine

The following routines comprise SUBR08.

#MICR

DIAGRAM: 25-2
ENTRY POINT: #MICR
FUNCTIONS:
- Scans the 1255 array for the system and stacker specifications.
- Builds tables that control SUBR08 from the information on the specifications.
- Checks for possible errors.

INPUT:
- Array pointed to by the 1255 DTF
- Fields being read
- Modulus and weighting factor if the account number is to be verified
- Document count condition
- Control and end-of-file documents

OUTPUT:
- Compressed version of the system and stacker specifications
- Set of pointers and indicators passed in the 1255 array to SUBR08
- SYSLOG list of system and stacker specification errors detected

ROUTINES USED:
- The EXIT routine is entered through the EXIT SVC.
- If no errors are detected, control is returned to #MI08.
- If errors are detected, #MICR logs the diagnostic warning message.

EXITS:
- Normal: To caller
- Error: To #MICR (SYSLOG list)

#MI08

DIAGRAM: 25-1.1
ENTRY POINT: #MI08
- BEGIN: Entry point from RPG II input routines

FUNCTIONS: The module contains two subroutines:
- *Processing Section* subroutine passes 55-byte records containing information from documents read from the 1255.
- *Stacker Select Section* subroutine performs the calculations needed to stacker select the document at interrupt level 4 (end of read or sorter stopped).

INPUT:
- Compressed version of the system and stacker specifications
- Set of pointers and indicators are received in storage from the transient #MICR of the 1255

OUTPUT: To the RPG II or assembler input routine, 55-byte records containing the fields read, the stacker selected for the document, the type of document, and the number of each valid field (each field is present in the same order as on the document itself, and takes up the maximum space allowed on the document)

ROUTINES USED: #STDDA (to load transient #MICR):
- The #STDDA routine is entered through the SPECIAL device code
- The address of the parameter list is passed in XR2
- Parameter list contains an O to indicate the object library (6 bytes of library entry name (#MICR) and 5 bytes unused)

EXIT: Return to the next sequential instruction of the object program

Error Routine (Included as Part of #MICR)

DIAGRAM: 25.3
ENTRY POINT: #MICR – specification analysis
FUNCTION: Issues the error message for SUBR08.
INPUT: XR2 contains the buffer address and the first 2 bytes of the buffer contain the error flags
OUTPUT: The following message:

SCP 4975 DMMI OPTIONS (0 3) ?
ABOVE ERROR (S) INDICATE SPEC ERROR (S)

ROUTINES USED:

- SYSLOG – The parameter list and message is placed in the buffer
- #MICR – Control is returned to #MI08

EXIT: To SUBR08

Modulus Check Subroutine #MICR

DIAGRAM: 25.4.3
ENTRY POINT: #MICR
FUNCTION: Performs modulus checking as indicated on the system specification. If the self-check digit of the account number field does not compare, turns off the account number field validity bit in the document buffer.
INPUT:

- Index register 1 points to the leftmost byte of the document in the document buffer area
- Index register 2 points to the rightmost byte

OUTPUT:

- If the modulus check is successful, the account number validity bit is left on
- If the modulus check is unsuccessful, the validity bit is turned off

EXIT: To the next sequential instruction in SUBR08 stacker select section

Chapter 11. Directory

Module

Name	Diagram	Descriptive Name	Entry Point	Function
#MICR	25.2.1	Build transient for SUBR08	#MI08	Scans the 1255 array for the system specification and the stacker specification
#MICR	25.2.2	Stacker select section (1255)	–	Performs the calculations needed to stacker-select the document
#MI08	25.1.1	Process section (1255)	–	Passes 55-byte records containing information taken from documents read from the 1255.
		Data management	SUBR08	Interfaces between user program and the 1255 attachment

Chapter 12. Data Areas

The DTF and IOB generated for the Magnetic Character Reader are the interface between the user program and MICR. The MICR work area, consisting of the constants, table and work area, and the input and output buffer formats, are located in the attachment controller. See Figures 12-3 and 12-4 for an overview layout of the attachment controller area. For a description of the system communications area, program level communications area, MICR error history table, system trace area, syslog parameter list, and MICR error counter and SIO counter tables, see *IBM System/32 System Data Areas and Diagnostic Aids,* SY21-0532.

DTF

The MICR DTF is the primary interface between the user's program and MICR. The user's program generates a DTF for each MICR file (Figure 12-1). Field NPDTF@ (hex 0B and 0C) in the program level communications area contains the address of the first DTF on the chain. To find the next DTF in the chain, refer to the chain field in the appropriate DTF. End of chain is indicated by hex FFFF. XR2 points to the specified DTF when a data management function is invoked.

Disp of Leftmost Byte in Hex	Label	Lng in Bytes in Dec	Description
00	SPCDEVC	1	Device code. Caller assigns an X'00', internally assigned an X'52'
01	SPCUPSI	1	External switches (UPSI) checked by open routine
02	SPCATTR1	2	File attributes: Byte 0: X'80' = input file X'08' = dual I/O buffer X'01' = file opened Byte 1: Reserved
04	SPCRSV1	2	DTF chain pointer A: Backward address of previous DTF in chain (X'FFFF' if first in chain)
06	SPCCHAIN	2	DTF chain pointer B: Forward address of next DTF in chain (X'FFFF' if end of chain)
08	SPCRSV2	2	ARR save area
0A	SPCRSV3	2	XR1 save area
0C	SPCLRADD	2	The leftmost byte address of the current record passed to the caller
0E	SPCCODE	1	Completion code. Set by subroutine before returning to caller: X'40' = normal completion X'41' = controlled cancel X'42' = end of file
0F	SPCCOMMD	1	Command byte issued by caller: X'80' = read record X'10' = close file
10	SPCINADD	2	Input I/O address of the I/O buffer to be used by the subroutine
12	SPCOUTAD	2	Reserved
14	SPCBLGTH	2	Block length: Multiple of record length (minimum 550, maximum 4070)
16	SPCRLGTH	2	Record length: Must be 55
18	SPCARRAY	2	Address of array DTT

Figure 12-1. Format of Magnetic Character Reader DTF

IOB

MICR IOBs are input control blocks used for controlling data sent to the System/32 from the Magnetic Ink Character Reader. The user's program allocates, via SUBR08, space for the IOBs and an I/O buffer area. MICR formats the allocated area into three identical IOBs, each 12 bytes long (Figure 12-2).

If data management is the caller, the DTF normally points to the IOB. Active IOBs (indicated by the system queue headers starting at main storage location hex 500) can be chained; bytes 0 and 1 of the IOB point to the next IOB on the chain. When IOS or wait is called, XR1 must contain the IOB address.

Note: When coding an assembler program it is the responsibility of the programmer to ensure that main storage address 2 in the IOB (IOBM@2) is large enough to contain the end address of the buffer. That is, the R code (IOBMRC) times 55 must fit between address 1 and address 2. This is specified by hex 53 (a single document request) and hex 51 (get document request).

Disp of Leftmost Byte in Hex	Label	Lng in Bytes in Dec	Description
00	IOBMCH@	2	Chain address of next IOB in queue
02	IOBMCC	1	Completion code; posted by caller microcode X'80' = IOB active X'41' = Error in processing IOB request X'40' = IOB processing complete X'10' = Count flag (indicates R code has been added to the running total)
03	IOBMQC	1	Q Byte: X'56' = Load compressed specifications in work area X'54' = Load device run, stacker select, and modulus check code X'53' = Single document request X'52' = Load diagnostic code X'51' = Get document request
04	IOBMRC	1	R Byte: contents of this byte corresponds to status of field IOBMQC X'56' = '00'—compression group '02'—work area X'54' = Number of sectors of microcode to load X'53' = Number of documents to be read X'52' = Number of sectors of microcode to load X'51' = Number of documents to be read

Figure 12-2 (Part 1 of 2). Format of Magnetic Character Reader IOB

Disp of Leftmost Byte in Hex	Label	Lng in Bytes in Dec	Description
05	IOBMSB	1	Sense byte 1: X'80' = Bring up diagnostic error *Note:* The rightmost byte of control store location X'004B' contains the number of the failing diagnostic. The leftmost byte is X'80'. X'40' = Document count condition reached X'20' = Reserved X'10' = Attachment controller DBO/DBI parity check X'08' = External I/O light X'04' = Attachment controller memory parity check X'02' = Attachment controller long timeout X'01' = Sorter stopped
06	IOBM@1	2	Data buffer; address contents description corresponds to field IOBMQC: X'56' = Start of compression or work area in main storage X'54' = Main storage address to use as I/O buffer in loading microcode into attachment controller X'53' = Main storage address of area to read document into X'52' = Main storage address to use as I/O buffer in loading microcode into attachment controller X'51' = Main storage address of area to read document into
08	IOBM@2	2	Data buffer; address contents description corresponds to field IOBMQC: X'56' = End of compression or work area in main storage X'54' = Disk address of microcode to be loaded into attachment controller X'53' = End address of buffer X'52' = Disk address of microcode to be loaded into attachment controller X'51' = End address of buffer
0A	IOBMSB2	1	Sense byte 2: X'80' = Document auto rejected X'40' = Reserved X'20' = Misread with reject X'10' = Misread without reject X'08' = Reserved X'04' = Reserved X'02' = Reserved X'01' = Reserved
0B	IOBMRSVD	1	Reserved

Figure 12-2 (Part 2 of 2). Format of Magnetic Character Reader IOB

Direct Area

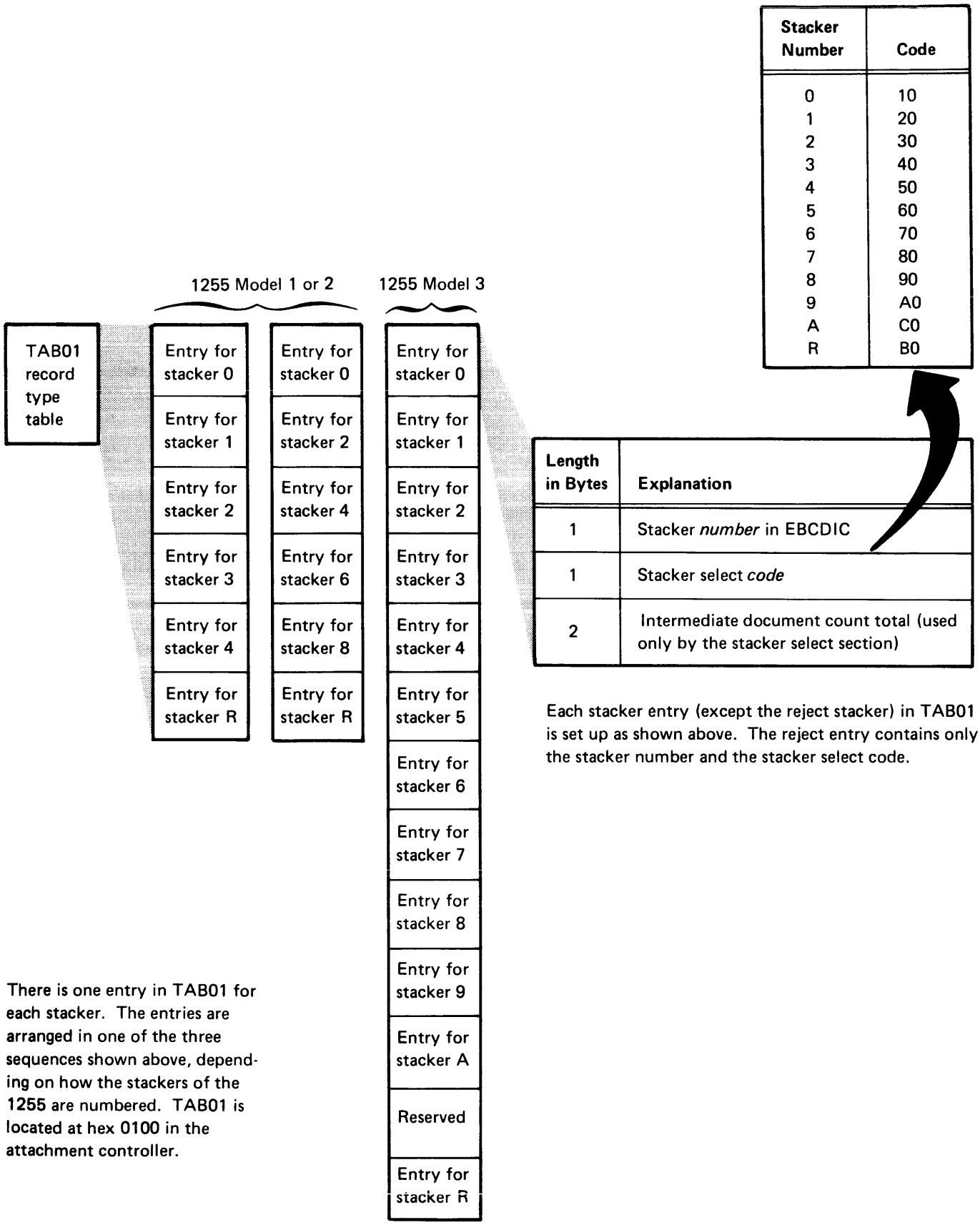
Address of Leftmost Byte in Hex	Contents
0000	Start/restart routine
0004	Link to interrupt handler, reserved direct area
0100	Attachment controller constants, table and work area, Figure 12-4
0200	System/32 output buffers, Figure 12-10
0300	1255 input buffers, Figure 12-11
0337	Stacker decision compression groups, Figure 12-12
0900	Modulus check code
	Stacker select code
1000	MICR run code interrupt handler
17FF	

Dump Area (2K)

Figure 12-3. Overview of Attachment Controller Storage Organization

Address of Leftmost Byte in Hex	Contents
0100	Stacker type table (TAB01), Figure 12-5
0134	Field description table (TAB02), Figure 12-6
0139	Alternate count condition table (TAB03), Figure 12-7
013C	Unused
013F	Indicate count condition table (TAB04), Figure 12-8
0150	System specification constants (TAB05), Figure 12-9
017A	Programming and engineering constant and work area
01FF	End of constant and work area

Figure 12-4. Overview of Attachment Controller Constants, Tables, and Work Area



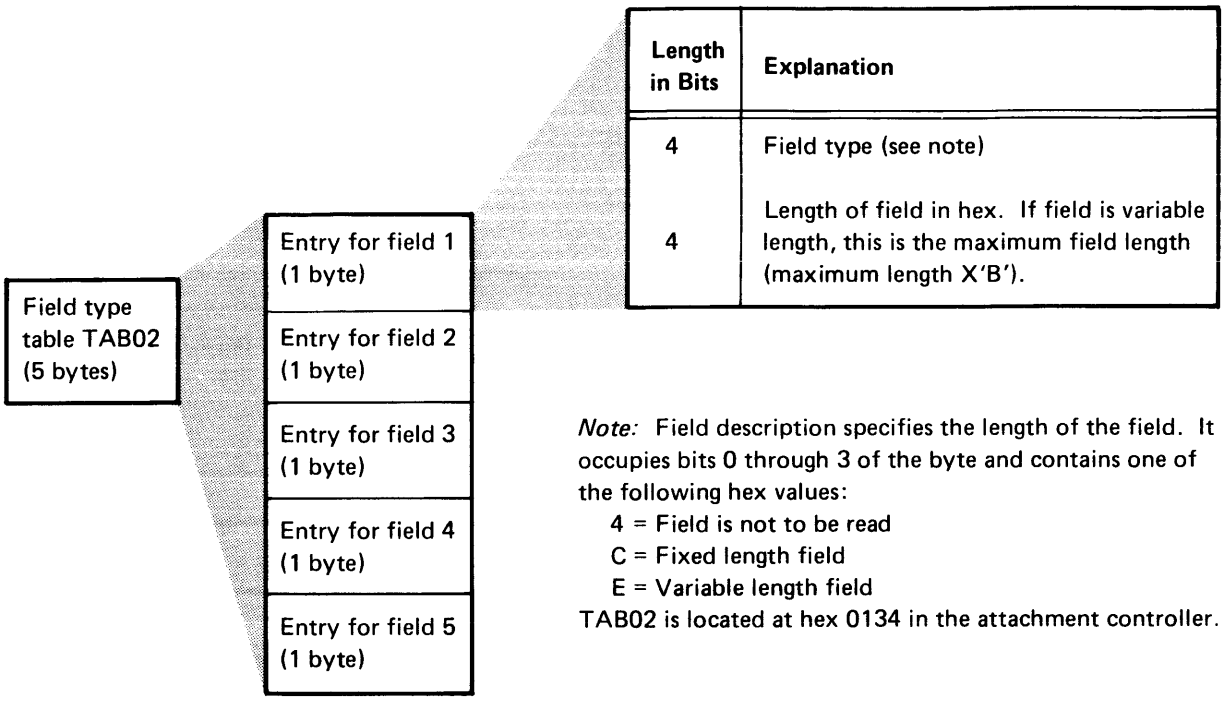
Stacker Number	Code
0	10
1	20
2	30
3	40
4	50
5	60
6	70
7	80
8	90
9	A0
A	C0
R	B0

Length in Bytes	Explanation
1	Stacker *number* in EBCDIC
1	Stacker select *code*
2	Intermediate document count total (used only by the stacker select section)

Each stacker entry (except the reject stacker) in TAB01 is set up as shown above. The reject entry contains only the stacker number and the stacker select code.

There is one entry in TAB01 for each stacker. The entries are arranged in one of the three sequences shown above, depending on how the stackers of the 1255 are numbered. TAB01 is located at hex 0100 in the attachment controller.

Figure 12-5. Common Data — Stacker Type Table (TAB01)



Note: Field description specifies the length of the field. It occupies bits 0 through 3 of the byte and contains one of the following hex values:

4 = Field is not to be read
C = Fixed length field
E = Variable length field

TAB02 is located at hex 0134 in the attachment controller.

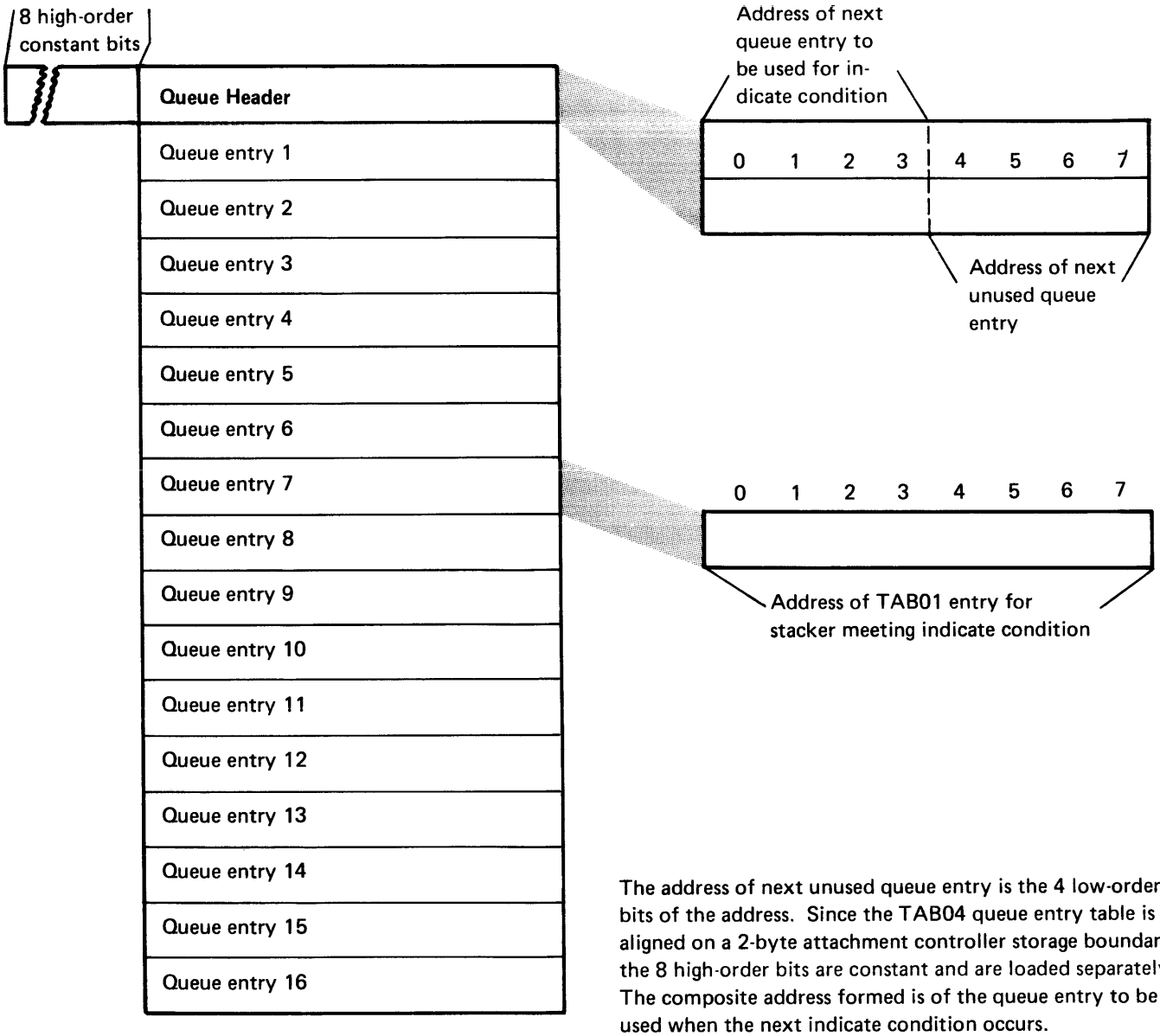
Figure 12-6. Common Data — Field Description Table (TAB02)

Byte	Explanation
1	Address (low-order byte) of the TAB01 entry of the stacker currently being used (see Note)
2-3	Intermediate document count used by the stacker select section

Note: The address of the TAB01 entry is the low-order byte of the address. All TAB01 entries are on the same attachment controller storage page boundary and are loaded with a constant high-order byte.

Figure 12-7. Common Data — Alternate Document Count Condition Table (TAB03)

When the *alternate* action is specified on a document count condition, this table is used to route the document to the proper stacker in the alternate sequence. The intermediate document count is used to determine when the next stacker in the alternate sequence should be used. TAB03 is located at hex 0139 in the attachment controller.



The TAB04 table is used only if the action for the document count condition is specified as *indicate.* TAB04 is located at hex 013F in the attachment controller.

Figure 12-8. Common Data — Indicate Document Count Condition Table (TAB04)

The address of next unused queue entry is the 4 low-order bits of the address. Since the TAB04 queue entry table is aligned on a 2-byte attachment controller storage boundary, the 8 high-order bits are constant and are loaded separately. The composite address formed is of the queue entry to be used when the next indicate condition occurs.

The address of next indicate condition queue entry is identical to the above address in format. The combined address formed points to the queue entry to be used to stacker select the next control document.

The address of the TAB01 entry has the same format as the similar field in the TAB03 control block. The composite address formed points to the TAB01 entry for a stacker that has met the document count condition.

The TAB04 queue header is initialized to hex 00 to indicate an empty queue. If both halves of the TAB04 queue header are equal, the queue is empty; otherwise at least one queue entry is waiting to be processed.

Queue overflow can never occur because there are fewer stackers than queue entries.

The document count condition action, control/EOF document field length, modulus check indicator and weighting factor, and the control and end-of-file document definition fields are the same fields that appear on the system specifications. The fields marked in hexadecimal are converted from character to binary.

The 6 reserved bytes are present to prevent the control and end-of-file document definition fields from crossing any attachment controller 2-byte storage boundary. TAB05 is located at hex 0150 in the attachment controller.

Address of Leftmost Byte in Hex	Lng in Bytes in Dec	Description
0150	2	Document count condition limit (in hex)
0152	1	Document count condition action
0153	1	Displacement to control/EOF fields
0154	1	Control/EOF document field length (in hex)
0155	1	Modulus check indicator
0156	10	Modulus check weighting factor
0160	6	Reserved
0166	10	Control document definition field
0170	10	End-of-file document definition field
017A	1	Account number end position
017B	1	Account number field length
017C	1	Process control field length

Figure 12-9. Common Data — System Specification Constants (TAB05)

The 256-byte output buffer area is formatted to four 64-byte buffers, each of which contains a 55-byte formatted document to be sent to the caller.

The data delimiter is used to separate the data from the sense-byte information when the document is being transmitted to the caller. The attachment controller sense byte contains values describing the state of the 1255 and/or the document being sent to the caller. The output buffers start at location hex 0200 in the attachment controller.

Address of Leftmost Byte in Hex	Lng in Bytes in Dec	Description
0200	55	Formatted document to be sent to the caller
0237	1	Data delimiter (constant X'00')
0238	1	Attachment controller sense byte 1: X'80' = Reserved X'40' = Document count limit reached X'20' = End-of-file X'10' = Attachment controller DBO/DBI parity check X'08' = External I/O light X'04' = Reserved X'02' = Reserved X'01' = Sorter is stopped
0239	1	Attachment controller sense byte 2: X'80' = Document autorejected X'40' = Reserved X'20' = Misread with reject X'10' = Misread without reject X'08' = Reserved X'04' = Reserved X'02' = Reserved X'01' = Reserved
023A	6	Unused

Figure 12-10. Caller's Output Buffers

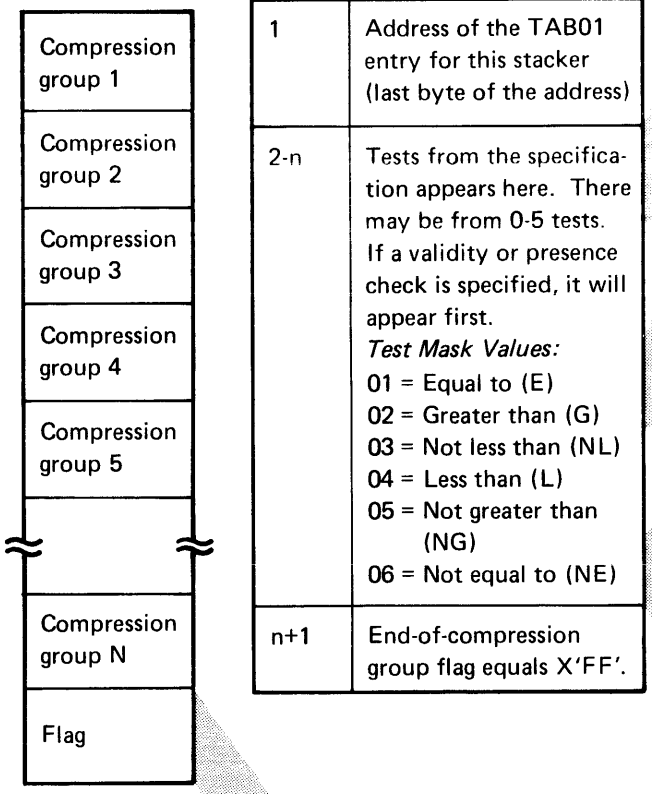
The buffer length is equal to the maximum number of characters it is possible to receive from the 1255 for a single document (45 digits plus 8 delimiters). The input buffer is located at hex 0300 in the attachment controller.

Address of Left-most Byte in Hex	Lng in Bytes in Dec	Description
0300	55	Contains the characters (digits and delimiters) received from the 1255 during the transmission of a document

Figure 12-11. 1255 Input Buffer

Compression Group Format

Compression is composed of compression groups. One compression group is created for each stacker specification. Compression groups are in the same order as the corresponding stacker specifications. These compressions overlay the array. Compression groups start at location hex 0337 in the attachment controller.



Byte	Explanation
0	Length of this compression group in hex
1	Address of the TAB01 entry for this stacker (last byte of the address)
2-n	Tests from the specification appears here. There may be from 0-5 tests. If a validity or presence check is specified, it will appear first. *Test Mask Values:* 01 = Equal to (E) 02 = Greater than (G) 03 = Not less than (NL) 04 = Less than (L) 05 = Not greater than (NG) 06 = Not equal to (NE)
n+1	End-of-compression group flag equals X'FF'.

A 1-byte flag equal to X'FE' marks the end of compression. If the *alternate* document count condition action is specified, this flag is X'AA'.

Validity presence check

Byte	Bit	Explanation
0	0-3	Displacement = X'0' (for branching table)
1	0-7	Mask byte for field indicators of fields required to be invalid or not present
2	0-7	Mask byte for field indicators of fields required to be valid and present

Field length test

Byte	Bit	Explanation
0	0-3	Displacement = X'2' (for branching table)
0	4-7	Field number (number of the field on a document, 0 through 5)
1	0-3	Required length of the field
1	4-7	Mask byte indicating what condition will satisfy the test (equal to, greater than, etc)

Field comparison test

Byte	Bit	Explanation
0	0-3	Displacement = X'4' (for branching table)
0	4-7	Field number (number of the field on a document, 0 through 5)
1	0-3	Field position of the first (leftmost) digit that is compared (rightmost digit of field is 0)
1	4-7	Mask byte indicating what condition will satisfy the test (equal to, greater than, etc)
2	0-7	Length of test field
3-m		Test field (comparison characters from the specifications)

Figure 12-12. Compression

The 1255 Magnetic Character Reader has an attachment controller dump and nonoverlap mode capability. Refer to the *IBM System/32 Data Areas and Diagnostic Aids,* SY21-0532, for detailed information on the system dump facility and other diagnostic aids.

ATTACHMENT CONTROLLER DUMP

When errors occur, system information can be saved on the CE cylinder. When the system diagnoses an abnormal termination error (invalid address, invalid op code, or invalid Q code), the contents of all of main storage, all of control storage, and the last 20 sectors of the scheduler work area (SWA) history file are automatically written to the CE cylinder. The 1255 attachment controller (9 sectors) is also dumped to the additional main storage area following the SWA. See Figure 13-1 for attachment controller contents that are dumped. This is the same area used for the additional control storage and the additional main storage.

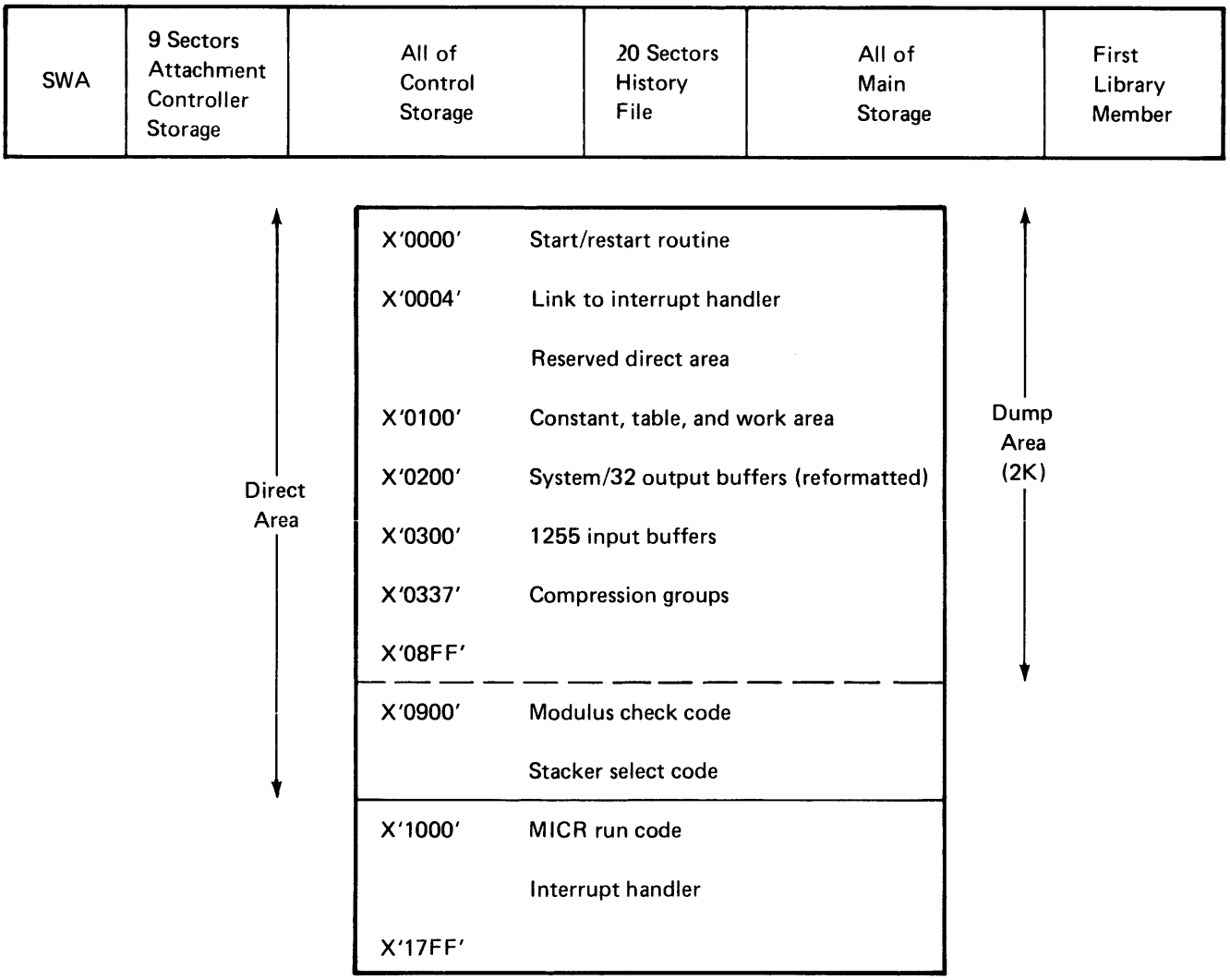


Figure 13-1. Attachment Controller Content That is Dumped

The attachment controller dump is invoked the same three ways that a System/32 control and main storage dump is requested:

- Branch to main storage address hex 0000
- Press RESET and then CE START on the CE console
- Take a D option to a formatted message display

You can specify a dump for the attachment controller by specifying MICR as the list option following the // DUMP LIST control statement. The following OCL statements load a dump:

```
// LOAD $FEDMP

// RUN
```

The // DUMP control statement then requests the dump options:

```
                  { main    }                 { printer }
// DUMP LIST - { control }  , OUTPUT - { crt     }
                  { disk    }
                  { ptf     }
                  { config  }
                  { history }
                  { MICR    }

INPUT - { F1 }
        { I1 }
```

Example of Attachment Controller Dump

Figure 13-2 shows the contents of an attachment controller dump with pertinent locations indicated.

System Status Byte 2

A hex FF in byte 00 (location hex 0000) indicates an error occurred during the attachment controller dump. If byte 00 contains a hex FF, the next byte (hex 0001) contains the attachment status byte 2. The attachment controller dump error is indicated by the status of bit 5 in status byte 2. If bit 5 is on, the dump error was caused by an attachment controller memory parity check, and if bit 5 is off, the dump error was caused by an attachment long time-out check. Following are the bit offsets that are indicated by the attachment status byte 2:

Offset	Meaning
X'80'	Attachment controller busy
X'40'	Transfer mode
X'20'	Command pending
X'10'	Attachment controller DBO/DBI parity check
X'08'	Set system micro-interrupt request
X'04'	On – Attachment controller memory parity check Off – Attachment controller long time-out check
X'02'	Enable long timeout
X'01'	Service required

Note: If an attachment controller dump error is indicated (bit 5), run hardware diagnostics for the MICR attachment to determine the malfunction.

Input Buffer Delimiter

A delimiter of hex 00 is inserted by the controller to indicate the end of document data for the 1255 input buffers. The buffer is loaded from right to left starting at location hex 0336.

Address Table

The first 2 bytes of the 16-byte address table (location hex 01D0) contains the address to the stacker compression groups. The next 2 bytes (location hex 01D2) point to the stacker work area (table 02). The remainder of the table is not used.

Release Number

The release number (location hex 01FE) is the current release level of the attachment controller microcode.

Work Registers

The attachment controller registers (location hex 01E0) are used by the attachment controller as a work area and save area. They are dumped to the controller storage (location hex 01E0) during a controller dump.

Attachment Controller Status Indicators

The eleven 1-byte attachment controller status indicators are located in the attachment controller at location hex 019A. Following are the values and offsets for the indicators:

Address of Leftmost Byte in Hex	Label	Lng in Bytes in Dec	Description
019A	RUNSTAT	1	Run status byte: X'80' = Sorter is stopped X'40' = Record to transfer X'20' = End-of-file flag X'10' = Stop flag X'08' = Dump flag X'04' = Not used X'02' = Not used X'01' = Not used
019B	INTBYTE	1	Interrupt status byte: X'80' = End transmission flag X'40' = Interrupt flag X'20' = Not used X'10' = Not used X'08' = 1255 data parity check X'04' = DBO/DBI parity check X'02' = Not used X'01' = Not used

Address of Leftmost Byte in Hex	Label	Lng in Bytes in Dec	Description
019C	CURCMD	1	Current command byte: X'80' = Not used X'40' = Dump command X'22' = Load work area X'20' = Load compression area X'12' = Normal read request X'11' = Single document request X'08' = Not used X'04' = Not used X'02' = Not used X'01' = Not used X'00' = Wait command
019D	DEVCMD	1	Device command byte: X'80' = CPU is stopped X'40' = Read call X'20' = I/O disconnect X'10' = Engage X'08' = Disengage X'04' = Not used X'02' = Not used X'01' = Not used
019E	INBUF@LO	1	1255 input buffer address (low)
019F	NRS@LO	1	Next record to send address (low)
01A0	NRF@LO	1	Next record to format address (low)
01A1	DOCINFO	1	Document status byte: X'80' = Auto select X'40' = Amount control field valid X'20' = Process control field valid X'10' = Account field valid X'08' = Transit routing field valid X'04' = Serial number field valid X'02' = Field 6 valid X'01' = Field 7 valid
01A2	DOCLEN	1	Document length
01A3	TAB01PTR	1	Table 01 pointer
01A4	MISREADS	1	Misread flag save byte

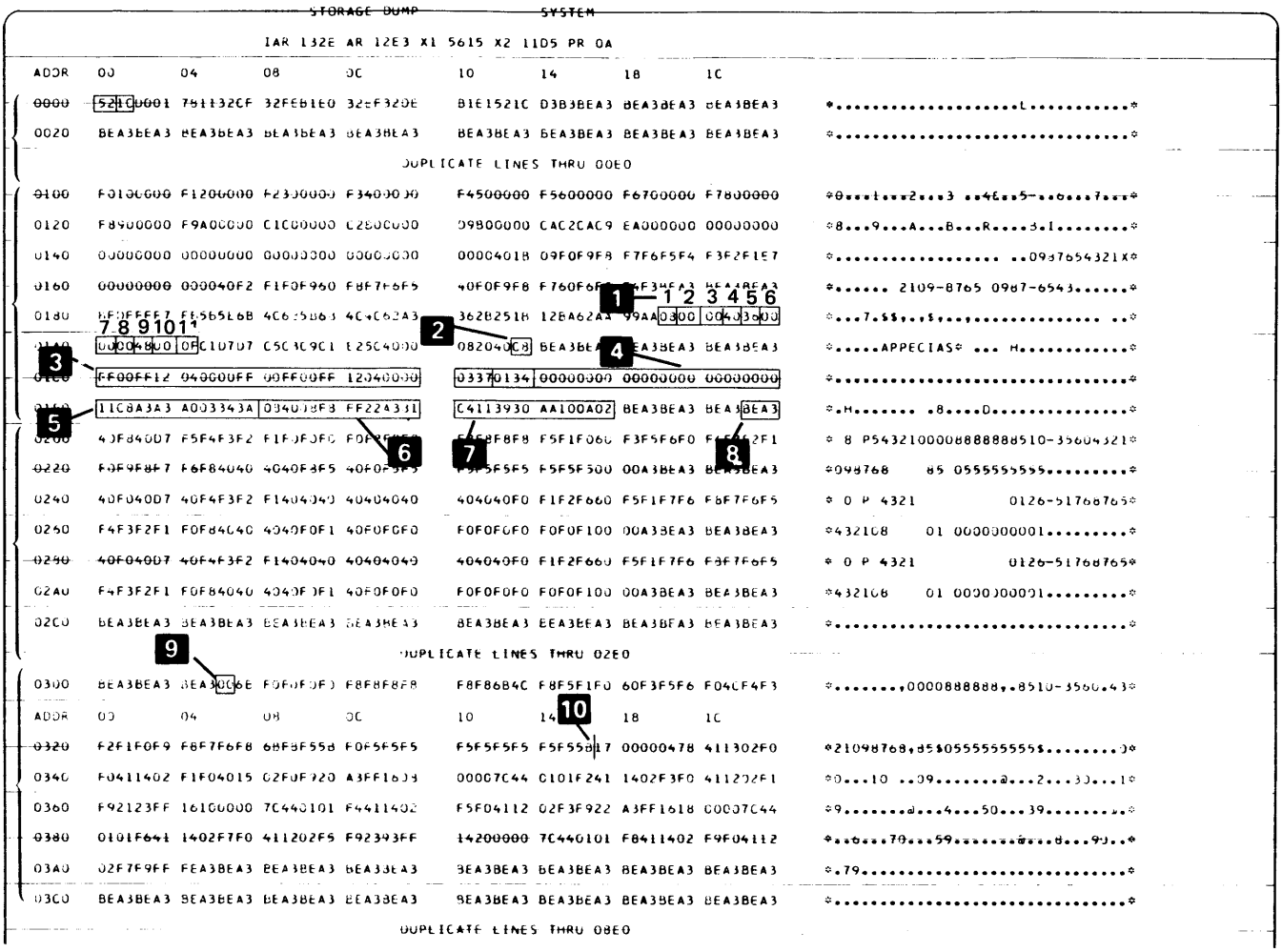


Figure 13-2. Contents of an Attachment Controller Dump

Attachment Controller Trace Buffer

The 16-byte attachment controller trace buffer maintains a history log of all commands issued to the attachment controller by the system. The number of commands saved depends on the type of command issued and the sense byte status that is logged. Each logged command is preceded by a 1-byte command identifier (hex FF). When searching the trace buffer, reference location hex 01B3 in the attachment controller dump for the pointer to the latest entry in the trace buffer. Starting from the last entry logged, continue backward to the first command identifier (hex FF). This is the start of the latest entry logged. To find the next latest entry, continue backward through the trace buffer to the next command identifier. Continue this process until a complete wraparound to the byte pointed to from the last entry pointer is reached. The trace function is always active.

FF	Command identifier
00	Wait command
FF	Command identifier
12	Read command (normal)
04	No data sense (acknowledge)
00	Sense byte 1
00	Sense byte 2
FF	Command modifier
00	Wait command
FF	Command modifier
12	Read command (normal)
04	No data sense (acknowledge)
00	Sense byte 1
00	Sense byte 2
FF	Command modifier
00	Wait command

Figure 13-3. Explanation of Attachment Controller Trace Buffer Entries

Figure 13-2 shows the location, and last entry pointer, for the attachment controller trace buffer. Figure 13-3 is an explanation of the entries in the attachment controller trace buffer.

NONOVERLAP MODE

In conjunction with the dump facility, it is possible to read documents one at a time from the 1255. This capability allows the service representative to:

- See a document as read from the 1255
- See a document as it is reformatted by the stacker select routine within the attachment controller
- See the document in System/32 main storage as received from the attachment controller

To invoke the nonoverlap mode, use the SETMICR procedure and specify the CYCLE-Y/N parameter. The SETMICR command statement format is:

SETMICR CYCLE - {Y / N}

Cycle-Y The 1255 Magnetic Character Reader disengages after reading each document.

Cycle-N The 1255 Magnetic Character Reader does not disengage after reading each document.

See the *IBM System/32 System Control Programming Reference Manual,* GC21-7593, for additional information about procedures and OCL statements.

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System/32 1255 Magnetic Character Reader Reference and Logic Manual (Program Number: 5725-SC1) Printed in USA GC21-7692-1