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System 480
Input/Output Operations

ENTREX

PREFACE

System 480 Input/Output Operations is one volume in a set of publications describing System 480. Other publications include the following:

- System 480 Concepts (Order No. S-2) -- A general description of System 480 operation and use.
- System 480 Formatting Techniques (Order No. S-8) -- A detailed description of the creation and use of the record format, output formats, and standard job definitions used to control data entry and output.
- Supervisor's Quick Reference Information (Order No. S-3).
- Operator's Quick Reference Information (Order No. S-6).

This manual supersedes Sections V and VI (Batch Operations and Utility Operations) of the System 480 Supervisor's Reference Manual (Order No. S-4).

In order to derive full benefit from this manual, the reader should be familiar with the operation of the system and understand the basic concepts of System 480 operation, as described in the publication System 480 Concepts.

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SECTION I INTRODUCTION

The supervisor's HELP list, illustrated in Figure 1-1, is used to start all functions restricted to the supervisor. It can be obtained from any keystation by selecting the Supervisor option from the operator's HELP list and entering a nondisplayed password, which is requested by the system. This page, or screen of information, lists the categories for different types of operations that can be requested by the supervisor.

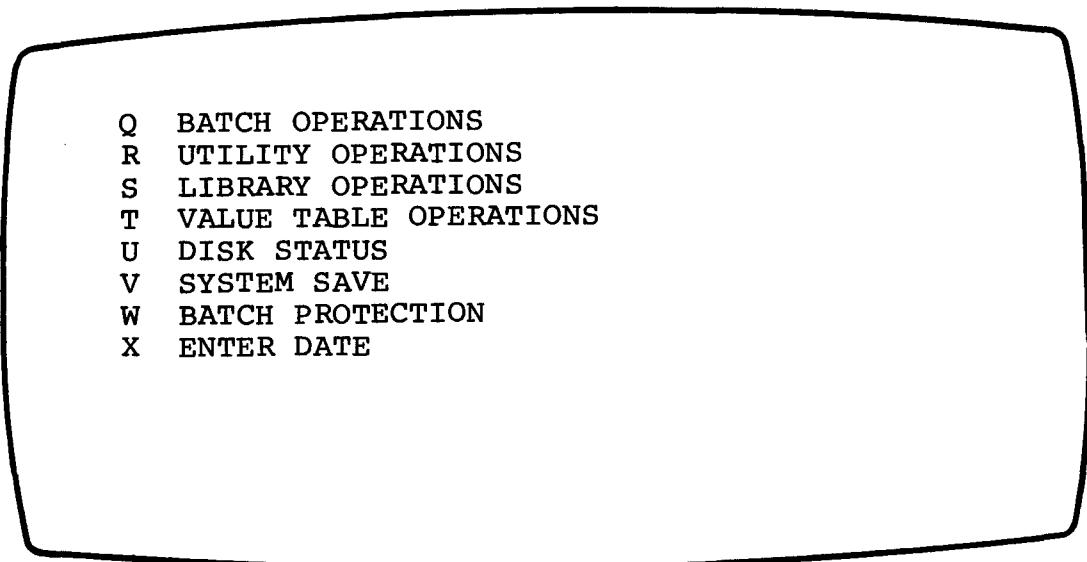
- 
- Q BATCH OPERATIONS
 - R UTILITY OPERATIONS
 - S LIBRARY OPERATIONS
 - T VALUE TABLE OPERATIONS
 - U DISK STATUS
 - V SYSTEM SAVE
 - W BATCH PROTECTION
 - X ENTER DATE

Figure 1-1. Supervisor's HELP List

When the letter preceding any of the categories except Disk Status and System Save is selected, a second more detailed list is displayed. The second list contains all the functions for the selected category.

All of the categories used to write data onto magnetic tape and to print it and the features used to control the input and output operations are detailed in this manual. These features are

as follows:

1. Batch Operations,
2. Utility Operations,
3. Disk Status,
4. System Save,
5. Batch Protection,
6. Enter Date.

SECTION II

UTILITY OPERATIONS

The primary function of System 480 is to produce reels of magnetic tape containing accurate data in a format that can be processed immediately by a business computer. The formatting of data records during output is controlled by output formats. However, the conventions used to handle files on tape are controlled by the supervisor. System 480 Utility Operations provide the supervisor with the capabilities required to write files on tape and to manipulate them as desired after they are written.

In order to understand the use of Utility Operations, it is necessary to understand the conventions used by System 480 in writing files on tape and the conventions used by the computer applications that process them.

MAGNETIC TAPE CONVENTIONS

Output from System 480 is written on magnetic tape. Each reel of tape has a beginning-of-tape marker just before the start of the recording area and an end-of-tape marker at the end of the recording area. See Figure 2-1.

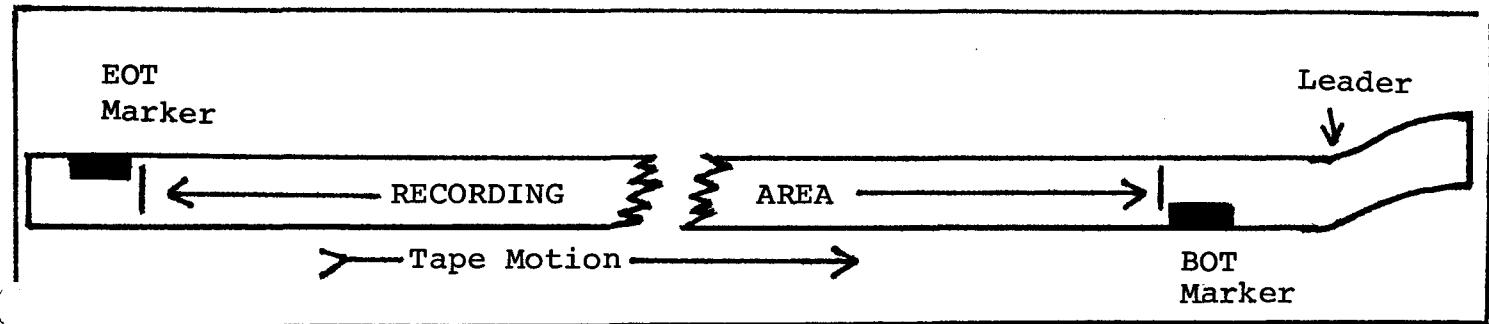


Figure 2-1. Magnetic Tape

Each marker is a small piece of aluminum foil attached to the edge of the tape. This marker can be seen when loading a tape.

Data is written to tape in a unit called a record. When the system writes records on tape, each record is separated from the next by an interrecord gap (IRG) of approximately 3/4 inch as illustrated in Figure 2-2.

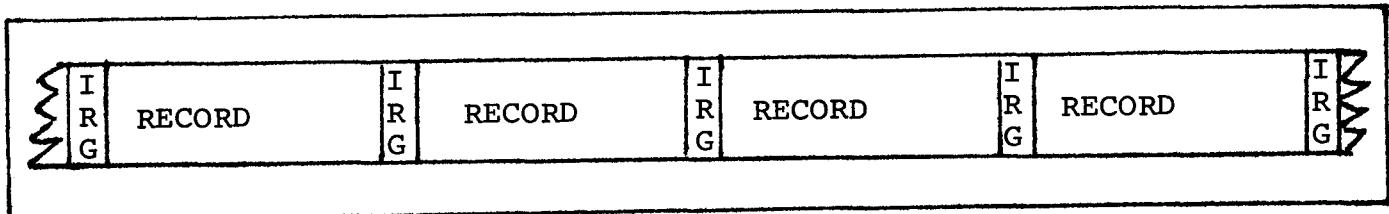


Figure 2-2. Physical Records on Magnetic Tape

To speed the processing of data by a business computer, a blocking factor is often specified. When a blocking factor is specified, a number of data records are grouped together to form one physical record that is called a block on magnetic tape, as illustrated in Figure 2-3.

Physical Tape Record (Block)

Physical Tape Record (Block)

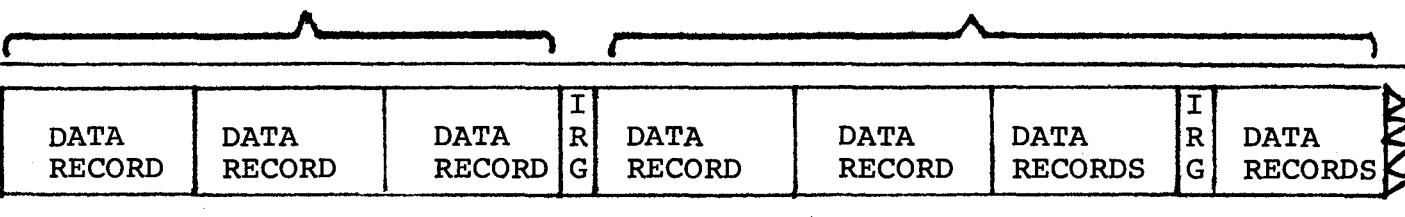


Figure 2-3. Data Records Blocked by Three to Form Tape Blocks

When the business application of the main computer processes the tape blocks, it subdivides them back into the smaller data records.

Each file on tape consists of one or more batches. Each batch contains a series of records that were created from the data entered into System 480 and then, optionally, restructured by output formats when written to magnetic tape.

If more than one file is to be contained on a tape, the files are separated from each other by tape marks. During input, a tape mark tells the computer that it has reached the end of the file it was reading. Two tape marks together indicate the end of recorded information on that tape.

UTILITY OPERATIONS

When Utility Operations is selected from the supervisor's HELP list, the following list of options are displayed:

1. Write a tape mark,
2. Write a tape mark and rewind,
3. Position tape at a tape mark,
4. Rewind the tape without writing a tape mark,
5. Backspace the tape one record,
6. Select a tape unit for output,
7. Print data records as they are read from tape.

Figure 2-4 illustrates the functions on the Utility Operation list.

- 1 WRITE A TAPE MARK
- 2 WRITE A TAPE MARK AND REWIND
- 3 POSITION TAPE AT TAPE MARK
- 4 REWIND TAPE
- 5 BACKSPACE TAPE
- 6 SELECT TAPE UNIT
- 7 TAPE TO PRINT DUMP

Figure 2-4. Utility Operations

When any of the Utility Operations is selected, the system displays the following message:

HIT REL TO PROCEED; OTHERWISE HIT HELP

Depressing REL allows the selected operation to proceed. Depressing HELP causes the supervisor's HELP list to be displayed; the system is ready for the next operation to be specified.

WRITE A TAPE MARK

Select Write A Tape Mark to indicate on the portion of the tape that is currently under the read/write head that the file just written on the tape is complete. When blocking records during output, Write A Tape Mark must be used to insure that all records are written to tape and that the proper padding of short blocks is accomplished.

It is always possible to reposition the tape at the tape mark to add more data onto the end of the file by using Position Tape At Tape Mark, described below.

WRITE A TAPE MARK AND REWIND

Select Write A Tape Mark And Rewind to perform all the functions of Write A Tape Mark, to rewind the tape, and to reset the system-generated record count. This function can be used instead of Write A Tape Mark to insure that all records are written to tape and that proper blocking is accomplished.

System 480 maintains a count of the number of physical records (blocks) that have been written to tape or printed. The number is displayed on the righthand side of the status line at the end of each of the following operations:

1. Writing data to tape or printing it,
2. Positioning to a tape mark.

The system continues to count records, adding the count of one file to that of the previous until it receives an indication to reset the count to zero. Write A Tape Mark And Rewind and Rewind Tape, described below, are the two commands that reset the record count automatically.

POSITION TAPE AT TAPE MARK

Select Position Tape At Tape Mark to move the tape forward so that the read/write head is positioned at the end of the current file. Figure 2-5 illustrates the position of the tape after this feature is used.

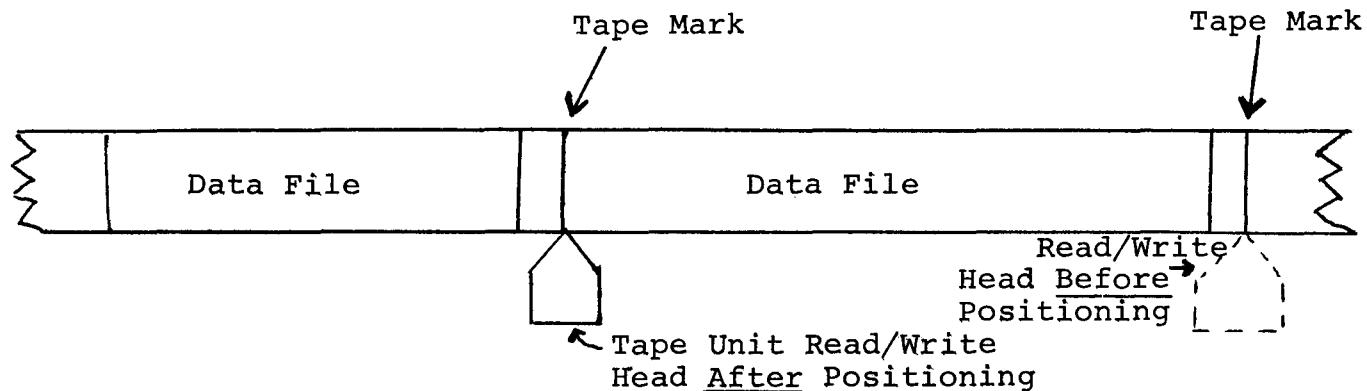


Figure 2-5. Position Tape At Tape Mark

A running count of the number of physical records (blocks) bypassed is displayed on the righthand side of the status line.

Position Tape At Tape Mark is used to position an output tape for subsequent writing or to position a tape that contains more than one file for a tape-to-disk operation.

To position a tape for writing, use the following procedures:

1. Use Position Tape At Tape Mark once for each file on the tape.
2. Use Write A Tape Mark if the file to be written is to be separated from the last file on the tape. If the file is to be added onto the last file, do not write a tape mark.
3. Follow the procedures for output to tape as described in Section III, "Batch Operations."

To position a tape for reading, use the following procedures:

1. Use Position Tape At Tape Mark once for each file to be bypassed. For example, to position the tape at the beginning of the third file, use Position Tape At Tape Mark twice.
2. Follow the procedures for Read A Batch as described in

Section III, "Batch Operations."

To interrupt or terminate a positioning operation before reaching a tape mark, depress the HELP key. The system displays the number of records positioned past in the status line and the following message on the line below.

HIT REL TO PROCEED; OTHERWISE HIT HELP

Depressing the REL key allows the positioning operation to continue. Depressing HELP causes the operation to be terminated and the supervisor's HELP list to be redisplayed.

By controlling the positioning of a file in this manner, it is possible to read a portion of a large file onto the disk. The procedure for reading a portion of a file onto the disk is detailed in Section V, "System Procedures."

Position Tape At Tape Mark also can be used when reading libraries from tape onto the disk. When all libraries are written onto one tape, the system automatically separates them with tape marks. Therefore, Position Tape At Tape Mark is used to locate the desired library for reading onto the disk, if not starting with the first library on the tape.

REWIND TAPE

Select Rewind Tape to rewind a tape without writing a tape mark. Normally Rewind Tape is used with a tape that does not contain a write ring, e.g., a file that was just read onto the disk or a tape containing libraries. Write A Tape Mark And Rewind requires a write ring in the tape reel to allow the tape mark to be written.

Rewind Tape also resets the physical record (block) count.

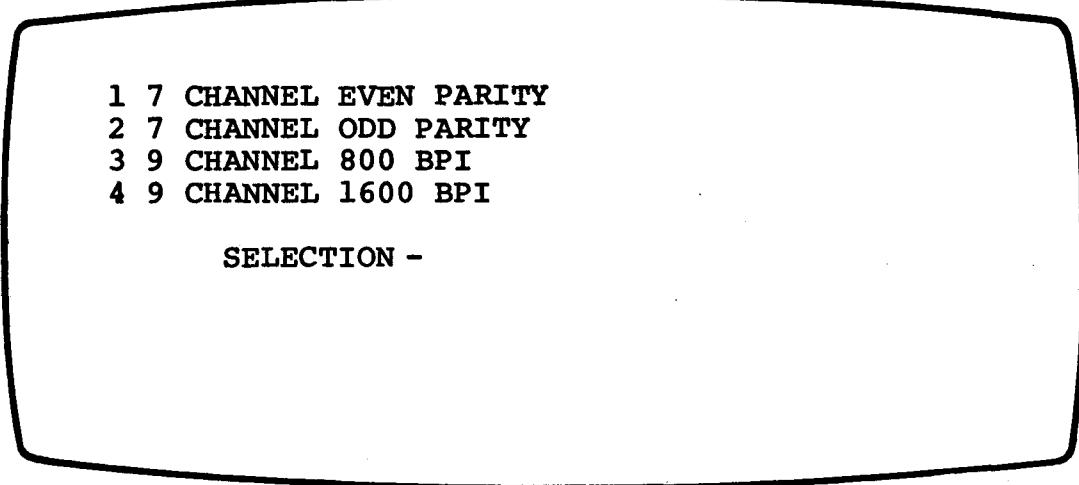
BACKSPACE TAPE

Select Backspace Tape to position the tape in a backward direction. Each time it is selected, the tape is backspaced one record. The physical record (block) number of the current record is displayed in the status line. The number is decreased by one for each record spaced over. When backspacing over a tape mark, the count is not altered; tape marks are not included in any System 480 record counts.

Backspace Tape is normally used in conjunction with Position Tape At Tape Mark; this use is detailed in Section V, "System Procedures."

SELECT TAPE UNIT

Select Tape Unit is used only for systems with two tape drives, e.g., one 7-channel drive and one 9-channel drive. When Select Tape Unit is chosen, the system displays the possible choices for the type of drive. See Figure 2-6.



- 1 7 CHANNEL EVEN PARITY
- 2 7 CHANNEL ODD PARITY
- 3 9 CHANNEL 800 BPI
- 4 9 CHANNEL 1600 BPI

SELECTION -

Figure 2-6. Select Tape Unit

Enter the number that specifies the desired device. The specified drive is used for all tape operations, including System Save, until another drive is specified. If an incorrect selection is made (i.e., a drive that is not present in the system), it is ignored.

TAPE TO PRINT DUMP

Select Tape To Print Dump to read data records into the System 480 computer and then to print them directly; no tape-to-disk operation is required. If the data records are longer than the printer carriage width, excess characters are printed on the next line.

To interrupt or terminate the operation, depress HELP. The system displays the following message.

HIT REL TO PROCEED; OTHERWISE HIT HELP

Depressing REL allows the operation to continue. Depressing HELP terminates the print operation and causes the Supervisor's HELP list to be displayed.

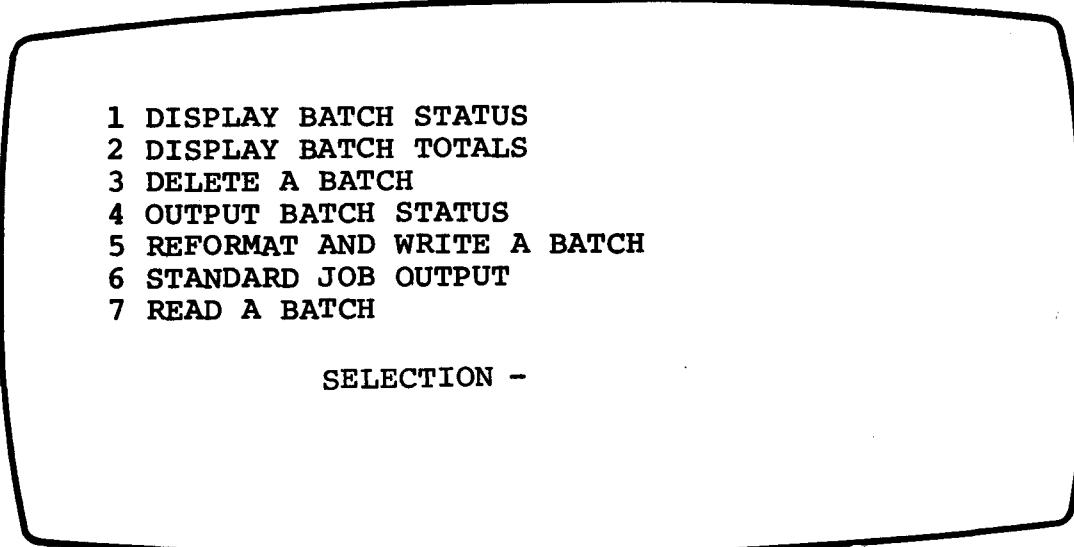
SECTION III

BATCH OPERATIONS

System 480 Batch Operations are all those supervisory functions used to control a batch while it is on the disk. Batch Operations provide the supervisor with the capability to do the following:

1. Display the status of batches,
2. Display the batch totals associated with a specified batch,
3. Delete batches from the disk,
4. Write the status of one or more batches to tape or print it,
5. Reformat and write batches to tape or print them,
6. Write a standard job,
7. Read a batch from tape onto the disk.

Each of the options is obtained by displaying the supervisor's HELP list, selecting Batch Operations, and then keying the appropriate number for the desired function. See Figure 3-1 for an illustration of the Batch Operations list.



- 1 DISPLAY BATCH STATUS
- 2 DISPLAY BATCH TOTALS
- 3 DELETE A BATCH
- 4 OUTPUT BATCH STATUS
- 5 REFORMAT AND WRITE A BATCH
- 6 STANDARD JOB OUTPUT
- 7 READ A BATCH

SELECTION -

Figure 3-1. Batch Operations

In addition to the batch operations, this section also contains a discussion of the asterisk convention and batch protection, both

of which are used during batch operations.

ASTERISK CONVENTION

The following batch operations are designed to affect one batch:

1. Display Batch Status,
2. Delete A Batch,
3. Output Batch Status,
4. Reformat And Write A Batch,
5. Write Standard Job.

However, by using the asterisk convention, it is possible for any of the above statements to affect more than one batch.

For example, a file of nine batches named PAYROLL1 through PAYROLL9 can be written to tape with one Reformat And Write A Batch request, or all batches with a name beginning PA can be deleted from the disk with one Delete A Batch request.

Regardless of which function is being used, when the BATCH NAME request associated with each function is displayed, enter asterisks (*) in the nonsignificant positions of the name. For example, to write the batch status of all batches on the disk that have an 8-character name starting with TR1 and ending with 5, enter TR1****5 in response to the batch name request. Asterisks can be intermixed with significant characters as desired. To refer to all batches on the disk, a name of ***** (eight asterisks) is used. Before using the eight asterisks, check the batch protection requirements, described below, to insure that only the desired batches are affected.

When the asterisk convention is used, batches are handled in alphanumeric order; i.e., A through Z, 0 through 9.

NOTE: The asterisk convention can also be used to delete record formats, output formats, and standard job definitions from their respective libraries and to display the names of entries in the libraries.

Features using the asterisk convention can be used by only one keystation at a time. If a second keystation attempts to use the asterisk convention, the message FILE ALREADY IN USE is displayed. When RESET is depressed, the supervisor's HELP list is redisplayed.

BATCH PROTECTION

Because the asterisk convention provides the ability to affect many batches at a time, System 480 includes a feature called Batch Protection.

The batch protection feature gives the supervisor a means of insuring that batches are not inadvertently written to tape or deleted. The supervisor specifies two sets of batch requirements: one for output and the other for deletion. Any or all of the following requirements can be specified for batch output.

1. The batch must not be interrupted; it must have been terminated by the operator.
2. The batch must be completely verified.
3. The batch must not contain error flags.
4. The batch must not be out of balance.
5. The batch must not have been written to tape previously.

The requirements for batch deletion are the same as for output with the following exception: The batch must have been written to tape before it can be deleted. Batches that are active cannot be written or deleted.

To specify the batch output and deletion requirements, use the following procedures:

1. From the supervisor's HELP list, key the appropriate letter to select Batch Protection. The system displays the output requirements in Examine Mode.
2. Move the cursor to each desired requirement. Use the COR key and enter an X before each requirement to be used. Use the COR key to place a space before any requirements that are not to be applied.
3. Depress REL. The system displays the deletion requirements.
4. Place an X before each desired deletion requirement and a space before those that are not to be applied.
5. Depress HELP to redisplay the supervisor's HELP list.

Figures 3-2 and 3-3 illustrate the output and deletion requirements pages.

NOTE: When a cold start is executed, the requirements for batch protection must be redesignated.

BATCH OUTPUT REQUIREMENTS

- BATCH MUST NOT BE INTERRUPTED
- BATCH MUST BE VERIFIED
- BATCH MUST NOT CONTAIN ERROR FLAGS
- BATCH MUST NOT BE OUT OF BALANCE
- BATCH MUST NOT HAVE BEEN WRITTEN

(KEY X BEFORE ALL REQUIREMENTS)

Figure 3-2. Batch Output Requirements

BATCH DELETE REQUIREMENTS

- BATCH MUST NOT BE INTERRUPTED
- BATCH MUST BE VERIFIED
- BATCH MUST NOT CONTAIN ERROR FLAGS
- BATCH MUST NOT BE OUT OF BALANCE
- BATCH MUST HAVE BEEN WRITTEN

(KEY X BEFORE ALL REQUIREMENTS)

Figure 3-3. Batch Delete Requirements

BATCH OPERATIONS

The entries in the Batch Operations list are detailed below.

DISPLAY BATCH STATUS

To display the status of any batch on the disk, select Display Batch Status. Enter the name of the batch for which status information is desired in response to the following request.

DISPLAY STATUS FOR BATCH NAME -----

The asterisk convention can be used to display the status of more than one batch. When the asterisk convention is used, the system displays the status information in alphanumeric order by batch name. Depressing HELP at any point causes the supervisor's HELP list to be displayed.

The system displays the following information for each batch.

1. The name of the batch.
2. Operator identification -- An identification of the last entry and verify operators for the batch. It is available only in systems using Operator Statistics, an optional System 480 feature.

3. The date that the batch was started in Entry Mode.
4. Status of the batch -- A indicates active; I indicates interrupted; and T indicates terminated.
5. The number of records that have been entered for the batch.
6. The number of records in that batch that have been verified.
7. The number of times the correction (COR) key was used during verification.
8. The number of error flags remaining.
9. An out-of-balance indicator.
10. An indication of whether the batch has been written to tape (MT).

The system displays the status information for up to three batches at a time. Depressing REL displays the next page of batch status information. Depressing HELP redisplays the Supervisor's HELP list. Figure 3-4 illustrates the layout of batch status information.

batchname	E-OP	----	V-OP	----	mm/dd/yy
STAT	#RCDS	#VRFD	#COR	#FLAGS	BAL OUTPUT
-	-----	-----	-----	-----	- --
batchname	E-OP	----	V-OP	----	mm/dd/yy
STAT	#RCDS	#VRFD	#COR	#FLAGS	BAL OUTPUT
-	-----	-----	-----	-----	- --
batchname	E-OP	----	V-OP	----	mm/dd/yy
STAT	#RCDS	#VRFD	#COR	#FLAGS	BAL OUTPUT
-	-----	-----	-----	-----	- --

Figure 3-4. Batch Status Display

DISPLAY BATCH TOTALS

Select Display Batch Totals to display the batch total and zero

balance results for a batch that has been terminated by the entry operator. The system requests the name of the batch as follows:

DISPLAY TOTALS FOR BATCH NAME -----

Once the batch name is specified, the system displays the batch totals and balance results, as illustrated in Figure 3-5.

TOTAL #	TOTAL	DIFFERENCE
1	6734900	
2	534279481	+381
3		
4		
5		
6		
7		
8		
9		
10		

Figure 3-5. Batch Totals Display

The asterisk convention is not used for display batch totals because of the nature of the batch totals display. If the asterisk convention is used inadvertently, the message NAME NOT FOUND IN LIBRARY is displayed.

For batch total fields, the total is displayed under the heading TOTAL and there is no entry in the DIFFERENCE column. For zero balance fields, the actual total for the fields (not the predetermined total) is displayed in the TOTAL column and the difference between the total and the predetermined total is displayed in the DIFFERENCE column.

When subtotaling is used, the total of the subtotals is also displayed. If batch balancing of subtotals is specified, there may be an entry in the DIFFERENCE column, depending on whether the

the subtotals are in or out of balance.

DELETE A BATCH

When Delete A Batch is selected from the Batch Operations list, the system requests the name of the batch to be deleted, as follows:

DELETE BATCH NAME -----

The asterisk convention can be used to delete more than one batch.

Once the batch name is specified, depress FIELD RELEASE.

Regardless of whether one batch or several batches to be deleted, the system displays the name(s) of batches affected by the delete statement. Depress REL to proceed with the batch deletion after the names are displayed or depress HELP to discontinue the operation.

After the system has deleted the appropriate batches, it displays the names of any batches that were not deleted. Batches that do not meet the Batch Protection requirements for deletion and value table batches that are assigned a value table number are not deleted. Use Display Batch Status to determine why the batches were not deleted.

OUTPUT BATCH STATUS

Select Output Batch Status to produce a magnetic tape file containing the batch status information or to print the status information. This is the same information that can be displayed by using Display Batch Status. When Output Batch Status is specified, the system displays the SELECT DEVICE request. Enter M to indicate that the status information is to be written onto magnetic tape or enter P to indicate that it is to be printed.

The system then requests the name of the batch for which status information is desired.

STATUS OF BATCH NAME -----

Enter the name of a single batch or use the asterisk convention to indicate that the status of many batches is desired.

When status information is written to tape, the information for each batch is contained in an 80-character record. Records are not blocked. Figure 3-6 illustrates the layout of the data within the status record.

FIELD CONTENTS	Batchname	Entry Operator identification	Verify Operator identification	Date	Status	# Records Entered	# Records Verified	
RECORD POSITIONS	1	8	9 12	13 16	17 21	22	23 26	27 30
	# Corrections in Verify Mode	# Error Flags	Balance Indicate	Batch Output Indicate	42	Spaces		
	31	34	35 38	39	40 41			

Figure 3-6. Layout of Status Information in Magnetic Tape Record

When the status information is printed, the data is in the same order as when written to tape, but three spaces are placed between each item. Status information for each batch is printed on a separate line.

REFORMAT AND WRITE A BATCH

Select Reformat And Write A Batch to write data onto magnetic tape or to print it. The system displays the following question

SELECT DEVICE

M = MAG TAPE
P = PRINTER

SLECTION: -

Enter M if batches are to be written onto magnetic tape. Enter P if they are to be printed.

If an output operation is in progress at another keystation, the message I/O BUFFER BUSY is displayed. This message indicates that another supervisor function that uses either a tape drive or a printer is in progress. When RESET is depressed the supervisor's HELP list is displayed.

If no other output operation is in progress, which is the normal situation, the system displays a request for the names of the output formats that are to be used. Usually one output format is specified for each record format used to enter the batch. However, if records entered under a particular format are neither written as part of the output file nor used in a copy buffer, they can be bypassed by depressing FIELD RELEASE instead of naming an output format for the corresponding record format.

The system requests the output format names as illustrated in 3-7.

OUTPUT FORMAT NAMES

PROG 1 - - - - -	PROG 2 - - - - -
PROG 3 - - - - -	PROG 4 - - - - -
PROG 5 - - - - -	PROG 6 - - - - -
PROG 7 - - - - -	PROG 8 - - - - -
PROG 9 - - - - -	PROG 0 - - - - -

BLOCKING FACTOR --

Figure 3-7. Specifying Output Formats

PROG 1 is input record format 1, PROG 2 is input record format 2, etc. Enter each output format name directly after the PROG # of the corresponding input record format.

After the output formats are specified, the system requests the blocking factor, as follows.

BLOCKING FACTOR --

If records are to be blocked on magnetic tape, enter the number of records created by output formats that are to be written as one block on magnetic tape. Depressing REL indicates that records are not to be blocked (one output record per tape block).

When printing data, the blocking factor can be used to indicate the number of lines that are to be printed on each page.

Depress REL to continue with the batch output operation. The system requests the name of the output batch, as follows.

OUTPUT BATCH NAME -----

Enter the batch name. If desired, use the asterisk convention to write a series of batches as one file.

Once the batch name is entered, depress REL. The system displays the names of all the batches specified in response to the OUTPUT BATCH NAME request in alphanumeric order. Depress REL to write the listed batches or depress HELP to terminate the operation without output.

After the batches have been written, the system displays the names of any batches that did not meet the Batch Protection requirements and that were not written to tape or printed. Use Display Batch Status to determine why a batch was excluded from the output operation.

NOTE: Batches that are assigned a value table number and batches that are active are also excluded from the output.

If the batch just written is the last batch in the file, either of the utility functions Write A Tape Mark or Write A Tape Mark And Rewind must be used at the end of the batch output operation to insure that all records are written to tape and properly padded when blocking is used.

STANDARD JOB OUTPUT

Standard Job Output performs the same functions as Reformat And Write Write A Batch. The only difference is that Standard Job Output uses the output information stored in a standard job definition in the standard job library rather than requesting the information from the supervisor.

When Standard Job Output is selected from the Batch Operations list, the system displays the SELECT DEVICE question. Enter either M (magnetic tape) or P (printer) to specify the desired output device. If an input or output operation is taking place at another keystation, the message I/O BUFFER BUSY is displayed. If the I/O buffer is not being used, the system requests the name of the standard job definition to be used, as follows:

STANDARD JOB NAME -----

Enter the name of the standard job definition. Normally, it is the same name as that used by the entry operator when the batch, or batches, were started. However, any standard job that names the desired output formats in the correct sequence can be used.

After the standard job name is entered, the system displays the names of the output formats to be used for the job and the blocking factor, as illustrated in Figure 3-8.

OUTPUT FORMAT NAMES

PROG 1	OUTHDR	PROG 2	RCV1
PROG 3	RCV2	PROG 4	
PROG 5		PROG 6	
PROG 7		PROG 8	
PROG 9		PROG 0	

BLOCKING FACTOR 04

Figure 3-8. Standard Job Output

Although the output format names displayed are normally the ones required, the cursor can be moved to change any of the entries on the display for a job that deviates from the standard. However, any changes made are for the current output operation only; the standard job definition stored in the library is not affected.

The cursor is positioned in the rightmost position of the BLOCKING FACTOR question.

BLOCKING FACTOR 0⁴

If blocking of output records is desired, rekey the blocking factor and depress REL. If blocking is not desired, depress REL twice.

The final step is to name the batches for output. Either enter the name of a single batch or use the asterisk convention.

The output operation is identical with Reformat And Write A Batch from this point.

READ A BATCH

Read A Batch is selected 1) to read files contained on magnetic tape onto the disk and, 2) to associate each record with a format. Once the batch is on the disk, records in it can be corrected, new records can be added, the batch can be examined or reformatted, or any other System 480 function can be performed. Physical tape records (blocks) for input can be up to 1000 characters on the standard system; however, logical data records (unblocked) and associated formatting must not exceed the screen size.

A record coming in from tape consists of a string of characters. A format is necessary for each record to divide blocks into records and records into fields. Then each record can be displayed with tags and spacing as any other batch on the disk.

The sequence of assigning formats to incoming tape records can be specified by the supervisor, or the system can select record formats based on the first character of each record as described below.

Before selecting Read A Batch, use the following procedures to define a batch to accept the data to be read from tape. Starting the batch also indicates the record formats that are to be used for input.

1. Display the operator's HELP list and select Start Batch. Name the batch that is to receive the data read from tape. Then name the record formats to be associated with the data during input and subsequent operations and indicate the linking among formats.

If the supervisor is to specify the order in which record formats are to be used (i.e., the order in which records are read from magnetic tape), the formats must be named and linked in that precise order during the current Start Batch operation. See Figure 3-9 for a sample of record sequence and the corresponding Start Batch operation.

If the system is to select the formats according to the first character in each data record, the program number assigned each format during batch start must correspond to the digit in the first position of each record that is to use the format. The records on tape, however, need not be in any special order. See Figure 3-10 for an example.

A standard job can be defined to contain the record format information. Then, Start Standard Job is used instead of Start Batch.

2. Once the formats have been specified or the standard job has been called, depress REL in response to HIT REL TO PROCEED; OTHERWISE HIT HELP. Before entering any data in the newly started batch, depress HELP and interrupt the batch.
3. Load the tape containing the file and position the tape to the desired batch, if necessary. Position Tape At Tape Mark, used to position the tape, is described in Section III, "Utility Operations." The procedures used to read a portion of a file are detailed in Section V, "System Procedures."

Interrecord Gap	PGM 3 RECORD (IN3)	Interrecord Gap	PGM 2 RECORD (IN2)	Interrecord Gap	PGM 1 RECORD (IN1)	Interrecord Gap	PGM 3 RECORD (IN3)	Interrecord Gap	PGM 2 RECORD (IN2)	Interrecord Gap	PGM 1 RECORD (IN1)	Interrecord Gap	PGM 3 RECORD (IN3)	Interrecord Gap	PGM 2 RECORD (IN2)	Interrecord Gap	PGM 1 RECORD (IN1)
-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------	-----------------	--------------------------

RECORDS ON TAPE IN SPECIFIED SEQUENCE

(Record formats are selected in the sequence
specified by the supervisor at
batch start.)

L1-3

The diagram illustrates the sequence of records on magnetic tape. The records are represented as horizontal lines with vertical tick marks indicating tape positions. The records are:

- START
- BATCH TOTAL (Y/N)?
- RECORD FORMAT NAMES
- # NAME LINKS TO # NAME LINKS TO
- IN1
- IN2
- IN3
- IN1
- IN2
- IN3

Figure 3-9. Records On Magnetic Tape -- Supervisor-Specified Input Order

Display the supervisor's HELP list and select Batch Operations and Read A Batch. The system displays the request HIT REL TO PROCEED; OTHERWISE HIT HELP. If another input or output operation is in progress, the system displays the message I/O BUFFER BUSY. Otherwise, it requests the name of the input batch as follows:

TAPE INPUT BATCH NAME -----

Enter the name used when the batch was started as described in 1, above.

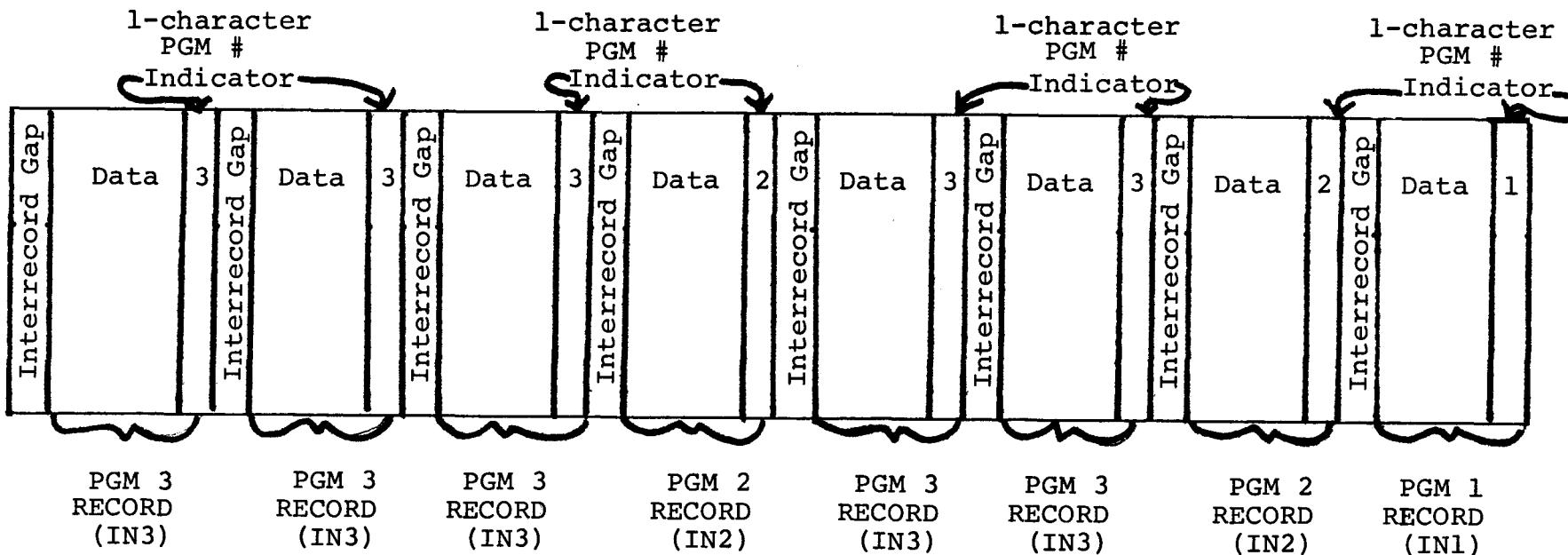
The system asks whether the input file is to be divided into more than one batch on the disk. If it is, enter the number of physical records (blocks) that are to be read from tape into the batch named for this input operation in response to the following request:

LIMIT # RECORDS ----

If the file is not to be subdivided, depress FIELD RELEASE.

The next request by the system determines the method for selecting record formats:

CONDITIONAL FORMATS (Y/N/P) ? -



RECORDS ON TAPE IN RANDOM SEQUENCE

(The system selects record formats according to the 1-character PGM Indicator.)

S T A R T	B A T C H	N A M E	T O D I S K					
B A T C H	T O T A L	(Y / N) ?	-					
R E C	F M T	N A M E S						
# N A M E	L I N K S	T D	# N A M E	L I N K S	T O			
1 I N 1	1		2 I N 2	2				
3 I N 3	3							

Figure 3-10. Records On Magnetic Tape - Random Input Order

Y = Yes, conditional format selection is to be used. The system uses the first digit of each input record to determine the number of the record format that is to control the input record. The first position of each record must contain a digit that corresponds to one of the format numbers assigned when the batch was started in 1, as above.

N = No, conditional format selection is not desired. The records in the input file must be in a fixed order and this order must correspond to the linkages specified when the batch was started.

P = Partial, the first position of each record contains a digit equal to the PGM number of the record format to control it. After selection, the first character is discarded. This feature allows a program selection character to be added at output, and then deleted during input.

The next question displayed by the system concerns the automatic functions of skipping and emitting.

ENABLE SKIP/EMIT (Y/N) ? -

Y = Yes, enable any skip or emit fields encountered in the record format during input. Enabling skip and emit causes the appropriate number of spaces or the specified constant to be inserted in the record at the indicated position in the record. Consequently, the record length is increased.

N = No, read the records into the disk without inserting any additional data. If the record was not reformatted when written to tape, the same record format used by the operator to enter the records originally can be used for the tape input process.

Depress REL to start the input operation. While a batch is being read onto the disk, the status line displays the logical record number of each record as it is processed.

HELP can be depressed at any point to interrupt the tape-to-disk operation. The message HIT REL TO PROCEED; OTHERWISE HIT HELP is displayed. Depressing REL allows the operation to continue. Depressing HELP terminates the operation after the record number displayed in the status line and re-displays the supervisor's HELP list.

An error message is displayed if the tape unit is not ready or if a tape read error occurs. If a tape read error occurs, the record in error is still processed, but an error flag is placed in the first position of the record. Seek Error Flag can be used to locate the record. After the input operation ends, an operator or supervisor can start or resume the batch and perform the desired operations.

If one input file is to be divided into several batches on the disk, a batch start operation is required for each of the batches. After selecting Read A Batch from the list of Batch Operations and entering the batch name, the supervisor indicates the number of records that are to be read onto the disk for that batch. This process is repeated for each batch in the file.

It is also possible to read more than one file into a batch or to read a file from tape into a batch that already contains data. In either case, additional data read into a batch is appended to the data already in the batch.

If the tape records are blocked, the number of records to be transferred to the disk for a batch always is a multiple of the blocking factor; a full block is always read by the system to insure that unprocessed records are not left in the tape buffer. Once the specified number of records are on the disk, the tape remains positioned after the last block read so that the next batch can be processed.

If the system reads a record that is too short (i.e., that contains fewer characters than the cumulative field length in the format used to read that record onto the disk), the system fills all remaining character positions with spaces.

If a record is encountered that is longer than the length indicated in the record format, the system assumes that another record is in the buffer. If there are less than 10, the remaining characters are treated as noise and disregarded. This feature is used to unblock input records.

SECTION IV

SYSTEM MANAGEMENT FEATURES

System 480 management features provide the supervisor with a means of controlling data flow and system operations. The management features include the following:

1. Batch status information,
2. Batch protection for output and deletion,
3. Operator statistics,
4. Capability to write the entire system, including data and libraries, to tape,
5. Capability to display the percent of the disk that is full,
6. Capability to enter the date which is associated with batch status.

Batch status information and batch protection are detailed in Section III, "Batch Operations." Operator Statistics, an optional System 480 feature, is detailed in System 480 Bulletin #26. This section details the use of the remaining system management features:

1. System Save,
2. Disk Status,
3. Enter Date.

SYSTEM SAVE

A system save is a "snapshot" of the system at a given time. When System Save is selected from the supervisor's HELP list the system software program in the computer memory and the contents

of the disk, both data and libraries, are written to tape. When a system save is reloaded into memory and onto the disk, the system is exactly as it was when the save was taken.

Because system saves can be reloaded if needed, they provide excellent backup in the event of a system malfunction. As a result, it is good operating practice to take system saves at regular intervals during the day. For example, the supervisor may want to take a system save at the following intervals:

1. Mid-morning break,
2. Lunch break,
3. Mid-afternoon break,
4. End of the day.

Taking a system save requires only three to four minutes and may prevent the loss of many hours of work. The normal procedure is to maintain a library of three system saves and always recycle the oldest save when it is time to take a new one.

The supervisor should insure that an up-to-date version of the record format, output.format, and standard job libraries is also maintained.

DISK STATUS

By selecting Disk Status from the supervisor's HELP list, the supervisor can display the percentage of the disk that is full. Using this feature, it is possible to determine when to

write data to tape and delete it to prevent the disk from filling.

However, should the disk start to become full, the following occurs at each terminal that is being used:

1. When the disk becomes 98% full, the message DISK 98% FULL is displayed every time data for that batch is stored on the disk. Each time the message is displayed, the error tones sounds and RESET must be depressed. The operator must notify the supervisor.
2. When the disk becomes 99% full, the message DISK 99% FULL is displayed every time data for that batch is stored on the disk. When RESET is depressed, the message PLEASE TAKE ACTION is displayed with an error tone; RESET must be depressed again. The operator must notify the supervisor.
3. If no action is taken and data entry is continued, the system eventually displays the message DISK IS FULL. The system ignores all subsequent keystrokes. The most recent system save must be loaded.

ENTER DATE

Select Enter Date to set the date that is used in the batch status display. The system displays the following request:

ENTER DATE --/--/--

The date entered is associated with all batches that are started while that date is in effect.

SECTION V

SYSTEM PROCEDURES

Because of the flexibility of System 480, it is possible to combine system operations to achieve a variety of results. The following is a discussion of the procedures that can be used to 1) add data to a blocked file on tape, 2) read a portion of a file from tape to disk, and 3) write standard header and trailer records.

ADDING DATA TO A BLOCKED TAPE FILE

When data accumulated over a period of time is to be processed as one large file on tape, it may be desirable to write the data to tape as a smaller file and then to add onto it at specified intervals. For example, if a file is processed only once a month, but is continuously being entered and verified on System 480, the data for the file can be written to tape once a week. Disk space is saved by storing data on magnetic tape.

If data records on tape are not blocked, the file can be added to by selecting Position Tape At Tape Mark from the supervisor's HELP display and then writing the data that is to be added. If data records are blocked on tape, the following procedures are used to insure correct blocking when adding new data.

1. Select Position Tape At Tape Mark from the supervisor's HELP list.
2. Select Backspace Tape twice. The first selection backs over the tape mark at the end of the file, and the second backspaces over the last block on tape.

3. Start a batch using a record format that is the same length as the logical records in the data blocks on tape. If the records are 80-characters in length, PGM 0 can be used; i.e., no record format names are specified during the batch start operation.
 4. Select Read A Batch from the supervisor's HELP display. Enter 0001 in response to the LIMIT # RECORDS question. Enter N in response to the CONDITIONAL and ENABLE SKIP/EMIT questions.
- At this point, a batch exists on the disk containing the record or records from the last block on tape.
5. Write the batch created in the tape-to-disk operation to tape specifying the desired blocking factor, and then write any batches that are to be added to the file to tape.

The file has now had data appended to it and correct blocking of records has been maintained. The number of blocks in the file is displayed on the screen.

The procedures outlined above assume that padding of short blocks has not been specified for the file. If padding is required, an output format that specifies the desired padding must be used the last time that data is added to the file; the format is not used when initially writing the data to tape or for any add-on operations except the last.

However, should it become necessary to add on to a file that has already been padded, use the procedures outlined above with the following addition to item number 4: Once the block has been read from tape onto the disk, start the batch in Examine Mode and delete all records that contain only pad characters. After the records that contain pad characters have been deleted, continue with item number 5.

SELECTIVE TAPE-TO-DISK OPERATIONS

System 480 provides the ability to read portions of a tape file onto the disk for corrective action or further entry and verification. If, for example, a file on tape consists of nine batches, the third one of which requires correction, it is possible to read only the third batch onto the disk. This process reduces the time required to read data onto the disk by restricting the number of records in the file that must be read and also conserves disk space.

To read a portion of the file (e.g., a batch) onto the disk, use the following procedures.

1. Determine the physical record number (Block number) of the first record in the batch to be read onto the disk. System 480 displays the physical record count at the end of each output operation; the supervisor can note record numbers at that time. Alternatively, a business computer program could supply the required record numbers.
2. Mount the tape from which the batch is to be read and select Position Tape At Tape Mark. The status line on the DATA/SCOPE displays the count of the number of records it has positioned past. As soon as the number of the desired record is displayed in the status line, depress HELP to halt the positioning operation.
3. Select Backspace Tape from the supervisor's HELP functions to backspace the tape to the first record of the desired batch. Select this operation as many times as needed to space to the desired record. For example, if record number 145 is desired as the first record in the tape to disk operation, 145 must be displayed in the status line after the tape backspacing is completed.
4. Select Start Batch and specify the information required for the batch to be read from tape. Then select Read A Batch from the Batch Operations display on the Supervisor's HELP list. Use LIMIT # RECORDS to indicate the number of records on tape that are to be read into the batch on disk.

WRITING STANDARD HEADER AND TRAILER LABELS

System 480 provides flexible handling of standard header and trailer labels by allowing the supervisor to maintain non-standard label entries as a batch on disk, while using output formats to insert standard information (constant data) when the labels are written to tape. Because changing information is stored on the disk as a batch, the supervisor can easily make the necessary changes before writing labels to tape.

The following paragraphs describe one approach that can be taken to handle header and trailer labels. The first step is to classify each field in the labels (both header and trailer) as one of the following:

- Data that varies from file to file or job to job,
- Data that is always constant,
- Variable data that is contained in a set of labels more than once; i.e., trailer label data that repeats header information.

Figure 1 illustrates a sample classification for a volume label (VOLL), two header labels (HDR1 and HDR2), and two trailer labels (EOF1 and EOF2).

Data that varies from job to job or file to file must be entered as a batch by the supervisor. Therefore, the second step is to create a record format to contain the variable information. Any fields that appear in more than one label need to be entered only once; output formats can insert duplicate information as needed. Figure 2 illustrates a sample screen layout for the fields that must be entered by the supervisor as indicated in Figure 1. The supervisor uses the record format to enter the variable label information as a batch.

VOL1	Volume	0	spaces
	Set	#	
1	5	11	

80

HDR1	Data Set Identifier	Data Set Ser #	Vol Seq #	Data Set Seq #	Gen #	Ver #	Create Date	space	space	Expire Date	security	zeros	System Id	spaces
1	5		22	28	32	36	40	43	48	54	61		73	80

80

The diagram illustrates a file record structure. It consists of several fields separated by vertical lines. On the far left is a field labeled "HDR2". To its right is a field with two sub-labels: "Block Length" and "Rec Len", both of which are crossed out with diagonal lines. Following these is a large empty space labeled "spaces". To the right of this space is another vertical line, followed by a small "ET" label above a short vertical line. The next section is a large empty space labeled "spaces". On the far right is a final vertical line.

80

NOTE: EOF1 and EOF2 are identical with HDR1 and HDR2 respectively except for the label identification in columns 1 through 4 and the block count in columns 55 through 60 of EOF1.

None of the information required for EOF1 or EOF2 is entered by the supervisor. Instead, it is taken from the header records and inserted by the output formats associated with the trailer labels.

KEY:  =nonstandard (changing) information to be entered by the supervisor.

Figure 5-1. Tape Header Labels

(VOL SERIAL #)	- - -	<u>1</u>	-	<u>2</u>	- - - - -
(DATA SET ID)	- - -	<u>3</u>	-	<u>4</u>	-
(CREATION DATE)	- - -	<u>5</u>	/	<u>6</u>	-
(EXPIRATION DATE)	- - -	<u>7</u>	/	<u>6</u>	-
(BLOCK LENGTH)	- - -	<u>8</u>	-	-	-
(RECORD LENGTH)	- - -				

= field number as used in output format.

Figure 2. Sample Label Record Format Layout

The third step is to create two output formats: one to produce the required header information (VOLL, HDR1, and HDR2) and the second to produce the required trailer information (EOF1 and EOF2). Figures 3 and 4 are the coded output formats used to produce VOLL, HDR1, HDR2, EOF1, and EOF2.

ENTREX SYSTEM 480 OUTPUT FORMAT LAYOUT

Originator _____

Date _____

Format Name HEADERS

SAVE THIS RECORD AS COPY BUFFER NO. _____

(1-9, FIELD RELEASE if the record is not being saved as the first function of the format.)

 \emptyset = zero

(1) Output Field No.	(2) O P C D E	(3) N U M B E R	NOTES	(4) FLD Length
VOLL	E	V		1
	E	Q		1
	E	L	{ VOL1	1
	E	1		1
	Q	1	Volume serial #	6
	E	0	0	1
	S	6 9	69 spaces	69
HDRI	E	H		1
	E	D	{ HDRI	1
	E	R		1
	E	I		1
	O	2	data set identif.	17
	O	1	data set serial #	6
	Z	3	{ vol sequence #	3
	E	1		1
	Z	3	{ data set seq. #	3
	E	1		1
	Z	3	{ generation #	3
	E	1		1
	Z	1	{ version #	1
	E	1		1
			TOTAL	

(1) Output Field No.	(2) O P C D E	(3) N U M B E R	NOTES	(4) FLD Length
	S	1		1
	Q	3	{ creation date	5
	O	4		
	S	1	{ expiration date	1
	F	5		
	Z	7	security & 6 zeros	7
	E	D		
	E	B		
	E	L		
	E	T		
	E	O	System code	
	E	S		
	E	L		
	E	B		
	E	6		
	E	O		
	E	9		13
	S	9		7
	R			
			TOTAL	

1 OUTPUT FIELD NO.Sequential field number in the output record being defined.
For reference only.2 OPERATION CODE

E = Emit a character.

F = Insert a sequence of fields from the current record or insert the entire record without reformatting.

H = Insert a special character.

I = Initialize the record counter.

M = Place a minus oversign on the low-order digit of the previous field.

N = Insert the field containing the record count.

O = Insert a field from the disk record currently being reformatted.

S = Insert spaces.

Z = Insert zeros.

1-9 = Number of the copy buffer from which a field is to be copied.

C = Place the current record in a copy buffer.

P = Padding is to be used during output.

R = Record boundary for magnetic tape and carriage return and line feed for printing.

T = Top of form. T is used only for printing.

3 NUMBER

Key the character to be emitted.

Key the number of the last field in the sequence of fields or depress FIELD RELEASE to insert the entire record.

Key the two hexadecimal characters that form the special character.

Enter the length of the field that contains the record count.

Enter the number of the current record in the disk record that is to be inserted in the output record.

Enter the number of spaces to be inserted.

Enter the number of zeros to be inserted.

Enter the number of the field that is to be copied from the specified buffer.

Enter the number of the buffer in which the current record is to be stored.

Enter the two hexadecimal characters that form the special character that is to be used for padding or enter a minus sign and one of the System 480 keyboard characters to indicate that a standard pad character is to be used.

ENTREX SYSTEM 480 OUTPUT FORMAT LAYOUT

Page 2 of 2

Originator

Date

Format Name HEADERS

SAVE THIS RECORD AS COPY BUFFER NO. _____

(1-9, FIELD RELEASE if the record is not being saved as the first function of the format.)

NOTE: This format does not count header records in the block count.

1 OUTPUT FIELD NO.

Sequential field number in the output record being defined.
For reference only.

2 OPERATION CODE	3 NUMBER
E = Emit a character.	Key the character to be emitted.
F = Insert a sequence of fields from the current record or insert the entire record without reformatting.	Key the number of the last field in the sequence of fields or depress FIELD RELEASE to insert the entire record.
H = Insert a special character.	Key the two hexadecimal characters that form the special character.
I = Initialize the record counter.	
M = Place a minus oversign on the low-order digit of the previous field.	
N = Insert the field containing the record count.	Enter the length of the field that contains the record count.
O = Insert a field from the disk record currently being reformatted.	Enter the number of the current record in the disk record that is to be inserted in the output record.
S = Insert spaces.	Enter the number of spaces to be inserted.
Z = Insert zeros.	Enter the number of zeros to be inserted.
1-9 = Number of the copy buffer from which a field is to be copied.	Enter the number of the field that is to be copied from the specified buffer.
C = Place the current record in a copy buffer.	Enter the number of the buffer in which the current record is to be stored.
P = Padding is to be used during output.	Enter the two hexadecimal characters that form the special character that is to be used for padding or enter a minus sign and one of the System 480 keyboard characters to indicate that a standard pad character is to be used.
R = Record boundary for magnetic tape and carriage return and line feed for printing.	/
T = Top of form. T is used only for printing.	

ENTREX SYSTEM 480 OUTPUT FORMAT LAYOUT

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Originator _____

Date _____

Format Name **TRAILERS**

SAVE THIS RECORD AS COPY BUFFER NO. _____

(1-9, FIELD RELEASE if the record is not being saved as the first function of the format.)

(1) Output Field No.	(2) O P C O D E	(3) N U M B E R	NOTES	(4) FLD Length
	E	E		
	E	O		
	E	F		
	E	1		
	O	2		
	O	1		
	Z	3		
	E	1		
	Z	3		
	E	1		
	Z	3		
	E	1		
	E	1		
	Z	1		
	R	1		
	S	1		
	O	3		
	O	4		
	S	1		
	F	6		
	Z	1		
V	6	Inserts block count		
TOTAL				

(1) Output Field No.	(2) O P C O D E	(3) N U M B E R	NOTES	(4) FLD Length
	E	O		
	E	O		
	E	S		
	E	1		
	E	T		
	E	O		
	E	S		
	E	1		
	E	3		
	E	6		
	E	0		
	S	9		
	R			
	E	E		
	E	G		
	E	E		
	E	2		
	E	E		
	O	7		
	O	8		
	S	1		
	1	9		
	E	E		
TOTAL				

1. OUTPUT FIELD NO.

Sequential field number in the output record being defined.
For reference only.

2 OPERATION CODE

E = Emit a character.

F = Insert a sequence of fields from the current record or insert the entire record without reformatting.

H = Insert a special character.

I = Initialize the record counter.

M = Place a minus oversign on the low-order digit of the previous field.

N = Insert the field containing the record count.

O = Insert a field from the disk record currently being reformatted.

S = Insert spaces.

Z = Insert zeros.

1-9 = Number of the copy buffer from which a field is to be copied.

C = Place the current record in a copy buffer.

P = Padding is to be used during output.

R = Record boundary for magnetic tape and carriage return and line feed for printing.

T = Top of form. T is used only for printing.

3 NUMBER

Key the character to be emitted.

Key the number of the last field in the sequence of fields or depress FIELD RELEASE to insert the entire record.

Key the two hexadecimal characters that form the special character.

Enter the length of the field that contains the record count.

Enter the number of the current record in the disk record that is to be inserted in the output record.

Enter the number of spaces to be inserted.

Enter the number of zeros to be inserted.

Enter the number of the field that is to be copied from the specified buffer.

Enter the number of the buffer in which the current record is to be stored.

Enter the two hexadecimal characters that form the special character that is to be used for padding or enter a minus sign and one of the System 480 keyboard characters to indicate that a standard pad character is to be used.

Originator

Date

Format Name TRAILERS

SAVE THIS RECORD AS COPY BUFFER NO. _____

(I - 9, FIELD RELEASE if the record is not being saved as the first function of the format.)

1 OUTPUT FIELD NO.

**Sequential field number in the output record being defined.
For reference only.**

2 OPERATION CODE	3 NUMBER
E = Emit a character.	Key the character to be emitted.
F = Insert a sequence of fields from the current record or insert the entire record without reformatting.	Key the number of the last field in the sequence of fields or depress FIELD RELEASE to insert the entire record.
H = Insert a special character.	Key the two hexadecimal characters that form the special character.
I = Initialize the record counter.	
M = Place a minus oversign on the low-order digit of the previous field.	
N = Insert the field containing the record count.	Enter the length of the field that contains the record count.
O = Insert a field from the disk record currently being reformatted.	Enter the number of the current record in the disk record that is to be inserted in the output record.
S = Insert spaces.	Enter the number of spaces to be inserted.
Z = Insert zeros.	Enter the number of zeros to be inserted.
1-9 = Number of the copy buffer from which a field is to be copied.	Enter the number of the field that is to be copied from the specified buffer.
C = Place the current record in a copy buffer.	Enter the number of the buffer in which the current record is to be stored.
P = Padding is to be used during output.	Enter the two hexadecimal characters that form the special character that is to be used for padding or enter a minus sign and one of the System 480 keyboard characters to indicate that a standard pad character is to be used.
R = Record boundary for magnetic tape and carriage return and line feed for printing.	
T = Top of form. T is used only for printing.	

When data is ready to be written to magnetic tape, the supervisor uses the following procedures.

1. Start the batch containing the variable label information in Examine Mode and make any changes required for the particular job that is about to be written; e.g., change the file identification.
2. Write the label batch to tape using the output format named **HEADERS**. This places the VOL1, HDR1, and HDR2 labels on the tape.
3. Select Write A Tape Mark to place a tape mark between the label records and the data records.
4. Write the data records to tape.
5. Write a tape mark to separate the data from the trailer records.
6. Write the label batch to tape using the output format named **TRAILERS**. This places EOF1 and EOF2 on the tape.
7. Write two tape marks to indicate the end of the file.

The tape now contains the labels, data and tape marks as indicated in Figure 5.

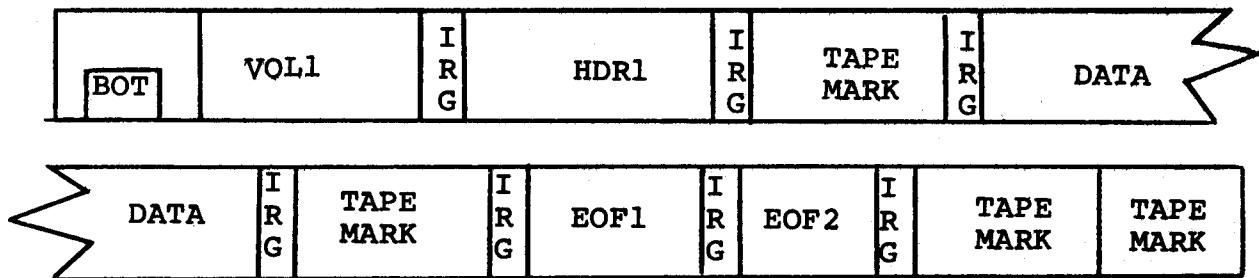


Figure 5-5. Labeled Tape

NOTE: If tape marks are required between labels, they can be inserted by the output format hexadecimal emit function (H).

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