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**Multiple Tape Utility Program
(Incorporating 120-Character Labels) Specifications
IBM 1401 and 1460**

This publication contains the program specifications for the IBM 1401/1460 Multiple Tape Utility Program with 120-Character Label Capability. Included are a description of the program, the operations it performs, the user's file requirements (card and tape), and necessary program-control information.

Tape labels are discussed throughout the publication; however, a special section for tape labels is also included.

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MULTIPLE TAPE UTILITY PROGRAM
(INCORPORATING 120-CHARACTER LABELS) SPECIFICATIONS
IBM 1401 AND 1460

This multiple tape utility program performs any combination of the following three tape operations in one operation: card-to-tape, tape-to-card, and tape-to-printer operations. In each case the program has the facility to read or write (as the case indicates) unlabeled tape files or tape files with standard 120-character tape labels.

MACHINE REQUIREMENTS

The minimum machine requirements to operate the program on an IBM 1401 or 1460 tape system are:

1401:

8,000 positions of core storage

High-Low-Equal Compare Feature

Advanced Programming Feature

Sense Switches Feature

Column Binary Feature (if binary operations are performed)

One IBM 1402 Card Read-Punch with the Read Punch Release Feature

Either one IBM 1403 Printer, Model 2 or 3, or one IBM 1404 Printer

Either the IBM 729 Magnetic Tape Unit, or the IBM 7330 Magnetic Tape Unit. (One tape unit is required for each tape operation performed concurrently.)

1460:

8,000 positions of core storage

Indexing and Store-Address-Register Feature

Binary Transfer Feature (if binary operations are performed)

One IBM 1402 Card Read-Punch with the Read Punch Release Feature

One IBM 1403 Printer, Model 2 or 3

Either the IBM 729 Magnetic Tape Unit, or the IBM 7330 Magnetic Tape Unit. (One tape unit is required for each tape operation performed concurrently.)

PROGRAM DESCRIPTION

This multiple tape-utility program for the IBM 1401 and 1460 tape systems transfers information from:

1. Card to tape.
2. Tape to card.
3. Tape to printer.

The program can perform any of the operations singly, or any combination concurrently, depending on the user's specification.

Card Files

The program can read or punch (as the operation indicates) three kinds of card files: (1) column binary cards, (2) cards punched in standard card code, and (3) a mixed file (in card-to-tape operations only) containing column binary cards and cards punched in standard code.

Tape Files

The program can read or create (as the operation indicates) three kinds of tape files: (1) binary, (2) BCD, and (3) mixed binary and BCD tape files (card-to-tape operations only). (In the case of tape-to-printer operations, only BCD tapes can be read.)

End-of-File Processing

The program discontinues processing in the tape-to-card and tape-to-printer operations when it encounters the end of the tape file. A single tape mark terminates an unlabeled file; however, a tape mark followed by an end-of-file (IEOF) trailer tape label and another tape mark terminates a labeled tape file. (See Tape Labels.)

The program discontinues processing in a card-to-tape operation when the last card in the read hopper is read and recognized as an end-of-file card. (See End-of-File Cards under the section Card to Tape.)

End-of-Reel Processing

An end-of-reel trailer label or an end-of-reel condition respectively will be encountered when:

1. a tape reel that is not the last reel of a multi-reel, labeled tape file is processed in a tape-to-card or tape-to-printer operation.
2. a card file requires more than one tape reel in a card-to-tape operation.

In tape-to-card and tape-to-printer operations, the program temporarily discontinues processing when the tape mark following an end-of-reel (1EOR) trailer tape label is encountered. This allows the user time to mount a new tape. The program checks the header label of the new tape.

In a card-to-tape operation, the program writes a standard 120-character end-of-reel (1EOR) trailer tape label (or a single tape mark if no labels are to be written) and temporarily discontinues processing when an end-of-reel (no end of card file) condition occurs. This gives the user time to install a new tape. The program writes a standard 120-character header tape label on the new tape, if labels are to be written.

Note: The program processes unlabeled tape files on a one-tape-reel-per-file basis in the tape-to-card or tape-to-printer operations. It has no way of distinguishing between end-of-file and end-of-reel for multi-reel files.

Noise Records

The program tests for noise records, that is, those records of twelve characters or less that are read in error. Noise records are bypassed by the program.

Labels

The program can process labeled and unlabeled tape files; however, only the IBM standard 120-character (type A) tape labels may be used. (See the publication IBM Standard Label, Form C28-8142.) The program performs label checking (as specified by the user in the control card).

OPERATIONS

The program performs the operation(s) according to information supplied by the user in a control card. The information supplied by the user concerns mainly the tape files that the program must read or create (depending on the operations used;) however other information may be supplied, as for example, in the case of the tape-to-printer operation. (See Control Card.)

Each operation has certain requirements concerning the tape files that are read or created, or in the case of tape-to-printer, concerning the printer.

Card to Tape

Only one card-to-tape operation can be operating at one time.

The user may use any of the three kinds of card files as input for this operation; that is, files containing: (1) cards punched in standard card code, (2) cards punched in column binary, or (3) cards of both codes (mixed).

Tape unit number 1 must be used for any card-to-tape operation. The corresponding tape files created are: (1) BCD files, (2) binary files, or (3) mixed binary and BCD files.

BCD Tape Files

The following are the specifications for BCD tape files:

Records:

1. must be fixed-length.
2. may be either blocked or unblocked.
3. may not exceed 80 characters, unless record marks are inserted in record blocks. In this case the maximum length is 81 characters. The record marks do not have to be punched on the cards.

Blocks can not exceed 405 characters in length. If there are not enough records to complete the last block of a file, the program pads the remaining portion of the block (with a character designated in the control card by the user).

Binary Tape Files

The program creates binary tapes from column-binary cards on a single-record-per-block basis

only. It uses all 80 columns of the card to produce a record of 160 characters.

Mixed Binary and BCD Tape Files

The program creates mixed binary and BCD tapes on a single-record-per-block basis only. It uses all 80 columns of the card to produce a tape record of either (1) 84 characters, or (2) 168 characters, where the first is produced from a card punched in standard card code and the second is produced from a column-binary card.

The extra positions on tape (four and eight respectively) are for look-ahead characters. These characters are produced by the program to indicate the form of the next tape record (either BCD or binary). (This is necessary for processing the tape at a later date.)

End-of-File Cards

The program recognizes a card with only a 7-8 punch (tape mark) in column one as being the end of a card file in card-to-tape operations. Such cards must be the last card of each of the user's card files. (This is to ensure the card-to-tape operation will not be terminated before all the cards of a file have been read.)

When the program encounters this card it:

1. (for unlabeled tape files) writes a tape mark to complete the tape file. (Padding of incomplete blocks is performed where necessary.)
2. (for labeled tape files) writes a tape mark and creates a standard 120-character end-of-file trailer label followed by another tape mark.

Batching Files

When a number of similar tape files are to be created through the card-to-tape operation, they may be batched or processed together in one card-to-tape operation. (The user must make sure that each file contains an end-of-file card as the last card of each file.)

Tape to Card

Tape unit number 3 must be specified for any tape-to-card operation. The user may use a (1) BCD, or (2) binary-tape-file as input for this operation.

However, the program can perform only one tape-to-card operation (either of the two) at a time.

The corresponding card output will be a card file containing either: (1) cards punched in standard card code, or (2) column binary cards.

Tape Files

Records:

1. may be fixed length or variable length. If they are variable length, they must be unblocked.
2. may be blocked or unblocked, if they are fixed-length records.
3. may contain up to a maximum of:
 - a. 80 characters on a BCD tape file (81 characters if the last character is a record mark and is to be suppressed when punching).
 - b. 160 characters on a binary tape file.

Blocks may contain up to a maximum of 405 characters. (Record marks, as the last character of fixed-length BCD records will not be punched if the user specifies this in the control card.) A wrong-length-record check is made for all fixed-length BCD tape-records.

Tape to Printer

The tape unit number must always be 2 for any tape-to-printer operation. Only BCD tape files can be used as input for the tape-to-printer operation.

Records may be:

1. either fixed length or variable length.
2. blocked or unblocked, and blocked records may have a fixed or variable blocking factor. All blocked records must contain record marks between records. All variable-length blocked records must have the block character count in the first four positions of the block. (This will be suppressed when printed.) (Unblocked records do not need record marks.)
3. Up to a maximum of 132 characters in length.

Blocks may contain up to:

1. 1001 characters if no binary (card-to-tape or tape-to-card) operation is being performed, and

if no tape-to-card operation is being performed using blocked tape files.

2. 666 characters if a binary operation or tape-to-card operation using blocked tape files is being performed.

Forms Control

Spacing or skipping between printed records can be controlled by the control card, or by the first character of each record.

The following characters may be used in the first record position to control the printing forms being printed:

<u>Character</u>	<u>Operation</u>
ε	Suppress spacing (if the space suppression feature is used)
(blank)	Single space
0	Double space
- (minus)	Triple space
1 through 9 or J through R	Skip to channels 1-9.

Printing

The program prints one logical record per line. (If a forms-control character is present, it is not printed.) Record marks between blocked records are not printed.

Space Suppression

Spacing after printing can be suppressed only when the space suppression feature is present and specified.

The user has three options for space suppression. If he does not have the space suppression feature he may (1) print the record whose first character calls for space suppression, or (2) bypass the record. If the user has the space suppression feature, he may (3) space-suppress when printing the record.

Note: Item 3 does not exactly simulate the 720 off-line printer. The IBM 720 spaces and then prints. As a consequence, for two successive tape records, of which record two contains the space

suppress character, record two would overprint record one. If the program is to duplicate this action on the 1403 printer (which prints and then spaces), record one must contain the space-suppress character.

CONTROL INFORMATION

The user must supply a control card to the program. The program tests sense switches to determine what operations it will perform; however, the control card is needed to supply specific information about the operation(s). If labeled tape files are used or created, the user must supply RDLIN cards where necessary and (if necessary) a user-information card.

Control Card

The control card is always necessary when:

1. the program is being loaded into the machine.
2. the operator interrupts the program to start a new operation.

Note: The operator, by setting a specific sense switch, can interrupt the program to restart completed operations, start additional new operations or delete current operations, without affecting (other than interrupting) the operations already being performed. (If the operator interrupts the program to delete a current operation, a new control card is not needed.)

The information the user specifies in the control card may be divided into four sections:

1. Positioning tapes (skipping files on a tape reel before processing begins).
2. Card-to-tape operations.
3. Tape-to-card operations.
4. Tape-to-printer operations.

(The program also performs control-card diagnostics.)

Punch the control card as follows:

Columns

Contents

Positioning: (entered at program-load time only). The program skips past the data file and a tape mark for each unlabeled tape file to be skipped, or past the header label, a tape mark, the data file, a tape mark, the trailer label, and a final tape mark for each labeled tape file to be skipped.

1-2

Leave them blank

<u>Columns</u>	<u>Contents</u>	<u>Columns</u>	<u>Contents</u>
3-4	Punch the number of files to be skipped on tape unit 2; otherwise leave them blank	21	Punch a 1 if it is desired to convert the 705 group mark (12-5-8) to a 1401 group mark (12-7-8); otherwise leave blank.
5-6	Punch the number of files to be skipped on tape unit 3; otherwise leave them blank	22	<u>Tape density:</u> Punch: 1 for high density 2 for low
<u>Card-to-tape:</u> If no card-to-tape operation is performed, columns 7-23 must be left blank.		23	<u>Tape drive:</u> Punch a: 1 for 729 IV 2 for 729 II, V 3 for 7330
7	<u>Label information:</u> Punch an N if no tape labels are used. Punch a 1 if standard 120-character tape labels are used.		
8	<u>Retention Check:</u> (labeled files only) Punch an N if the tape does not contain a standard label and thus a retention check is not to be performed. Otherwise leave it blank.		
9-10	<u>Record Length:</u> (BCD only) Punch the number of characters in a logical record (including the record mark, if any). Leave it blank if the tape is not to be BCD.	<u>Tape to-card:</u> If no tape-to-card operation is performed, leave columns 24-33 blank.	
11-13	<u>Blocking factor:</u> (BCD only) Punch the number of records per block in a BCD tape. Leave it blank if the tape is not BCD.	24	<u>Label information:</u> Punch: N for no labels 3 for label bypass 2 for file-identification check only 1 for standard 120-character label, checked completely
14	<u>Record Marks:</u> (BCD only) Punch a 1 if a record mark is to be inserted as the last character of each record on a BCD tape (including padded records); otherwise leave blank.	25-26	<u>Record length:</u> (BCD only) Punch a VV if records are variable-length (unblocked); otherwise punch the record length (including terminal record mark, if present)
15	<u>Padding character:</u> Punch whatever padding character is desired. (Group marks (≠), record marks (≠), tape marks (√), word-separator characters (√), and substitute blanks (≠) must not be used as padding characters.)	27-29	<u>Blocking factor:</u> (BCD only) Punch the number of records per block; otherwise leave it blank.
16-20	<u>Date:</u> Punch the date to be used for the retention check and header creation when tape labels are used. Leave them blank if tape labels are not used.	30	<u>Record marks:</u> Punch a 1 if the last character of each fixed-length record is a record mark and is to be suppressed; otherwise leave it blank.
		31	Punch a 1 if 705 group marks are to be converted to 1401 group marks; otherwise leave it blank.
		32	<u>Tape density:</u> Punch: 1 for high density 2 for low density

<u>Columns</u>	<u>Contents</u>
33	<u>Tape drive:</u> Punch: 1 for 729 IV 2 for 729 II, V 3 for 7330
<u>Tape-to-print:</u> If no tape-to-print operation is performed, leave columns 34-38 blank.	

When a value for reel serial number is needed for the card-to-tape operation, the entry from these columns is used.

RDLIN Cards

If unlabeled files are to be processed, or if labels are to be bypassed, no RDLIN cards are required. A RDLIN card must be supplied for each labeled file that is to be checked. (Multi-reel, labeled files require only one RDLIN card.)

If only the file-identification field is to be checked, the RDLIN card need be punched only in columns 16-20 and 30-39. If the entire label is to be checked, all fields present in the first 100 positions of the label except the label identifier and reel serial number are compared against the corresponding fields in the RDLIN card.

The format of the RDLIN card is as follows:

34	<u>Label information:</u> (same as column 24)
35	<u>Forms Control:</u> Punch: 2 for double spacing 3 for triple spacing If spacing and skipping is to be done using first-character forms control, punch: 4 for first-character control and single spacing when space suppression is designated. 5 for first-character control and bypassing the record when space suppression is designated. 6 for first-character control if the space suppression feature is present. Otherwise leave blank.
36	<u>Print storage feature:</u> Punch an N if the print storage feature is not present; otherwise leave blank.
37	<u>Tape drive:</u> Punch a 3 if 7330 is used; otherwise leave blank.
38	<u>Block length:</u> Punch a 1 if the tape block length is greater than 666; otherwise leave blank.
39	<u>File form:</u> Punch a 1 if the file contains blocked, variable-length records. The block character count in the first four positions of each block will be suppressed when printing. Otherwise leave blank.
40-44	<u>Reel Serial Number</u> (these columns are used when column 7 contains a 1, and column 8 contains an N):

<u>Columns</u>	<u>Contents</u>
1-15	Not used
16-20	RDLIN
20-24	Retention period
25-29	Creation date
30-39	File identification
40-44	File serial number
45-48	Reel sequence number
49-52	(blank)
53	Density
54	Checksum
55	Block sequence
56	Tape checking/interpreting
57	Tape-data-recording technique
58	Tape-data-processing technique
59-62	Creating system
63	Record format
64-68	Record length
69-73	Blocking factor/size
74	Checkpoint

<u>Columns</u>	<u>Contents</u>
75	Not used
76	Indication of whether user-information card is supplied. If label positions 101-120 contain anything other than blanks, supply a user-information card and punch a 1 in this column.
77-78	Not used

User-Information Card

The user supplies a user-information card for a file if information is to be written in or compared against positions 101-120 of the header label. The card is punched as follows:

<u>Columns</u>	<u>Contents</u>
1-20	Contents of header-label positions 101-120
21-80	Not used

TAPE LABELS

The program can process labeled tape files with IBM standard 120-character tape labels (type A) only. Tape marks must appear in labeled tape files: (1) after the header label, and (2) before and after the trailer label.

Output Labels

If tape labels are to be written and the output tape contains the standard 120-character tape label, the card-to-tape routine checks the retention cycle in the first label on the output tape and retrieves the reel serial number from this label. (The date in the control card is used for the retention check.)

There are two instances when the retention check cannot be made. Specify no retention check in the control card when: (1) the output tape has no label, or (2) the output tape has a nonstandard label.

If no retention check is specified (an N in column 8 of the control card), the reel serial number will be taken from positions 40-44 of the control card. (For multi-reel files, the reel serial number is placed in the first reel only. Additional reels will be blank in this field.) If it is desired to retain the reel serial number of the output tape when the retention cycle is not expired, but the operator knows that the contents of the reel can be destroyed, allow the retention check to be performed. When

the error halt for the retention-check failure is encountered, bypass the retention check and continue processing.

The program writes the new tape header label using the information supplied in a RDLIN card and, if used, a user-information card. The file-creation date is taken from the control card.

At end-of-file or end-of-reel, the card-to-tape program writes a standard 120-character trailer label consisting of: (1) the label identifier (1EOFb or 1EORb), (2) the block count (positions 67-72), and (3) the user information, if furnished, (positions 101-120 of the header label).

Input Labels

The program checks input tape header-labels against the information supplied by a RDLIN card and, if needed, a user-information card. The control card specifies whether header-label fields 1-19 are to be checked, or only the file-identification field.

The user can bypass the labels, however, they still must be 120-character labels, with the label identifier in positions 1-5. The trailer-label identifier field is checked to determine whether an end-of-file or end-of-reel condition exists (even when bypassing labels).

A RDLIN card is supplied for each file to be processed. If positions 101-120 of the label contain anything but blanks, the user must supply a user-information card also. (Columns 1-20 of the user-information card are compared against positions 101-120 of the header label.)

If labels are processed (full check or file-identification only), the block count is accumulated and checked against the trailer label.

IBM Technical Newsletter

File No. 1401/1460-32

Re: Form No. C24-3273-0

This Newsletter No. N24-0215

Date: June 19, 1964

Previous Newsletter Nos. None

Replacement pages for Multiple Tape Utility Program (Incorporating 120-Character Labels) Specifications for IBM 1401 and 1460, Form C24-3273-0

To bring your publication up to date, please replace the pages indicated with the corresponding pages attached to this newsletter. Changes are indicated by a vertical line at the left of the affected text. Add the pages indicated as a separate section at the end of your publication.

Replace pages

1 and 2
3 (contents) and 4 (blank)

Add pages

11 (reprint) and 12 (added)
13 and 14
15 and 16

Please insert this page to indicate that your publication now includes the modified pages issued with this newsletter:

<u>Form</u>	<u>Pages</u>	<u>Date</u>
N24-0215	1, 3, 12, 13, 14, 15, 16	June 19, 1964

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Multiple Tape Utility Program (Incorporating 120-Character Labels) Specifications and Operating Procedures IBM 1401 and 1460

Program Number 1401-UT-019

This publication contains the program specifications and operating procedures for the IBM 1401/1460 Multiple Tape Utility Program with 120-Character Label Capability. Included in the specifications is a description of the program, the operations it performs, the user's file requirements (card and tape), and necessary program-control information.

Tape labels are discussed throughout the specifications. A special section for tape labels is also included.

The operating procedures contain a description of the program deck, the procedures for running the program, and the program halts.

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<u>Columns</u>	<u>Contents</u>
75	Not used
76	Indication of whether user-information card is supplied. If label positions 101-120 contain anything other than blanks, supply a user-information card and punch a 1 in this column.
77-78	Not used

User-Information Card

The user supplies a user-information card for a file if information is to be written in or compared against positions 101-120 of the header label. The card is punched as follows:

<u>Columns</u>	<u>Contents</u>
1-20	Contents of header-label positions 101-120
21-80	Not used

TAPE LABELS

The program can process labeled tape files with IBM standard 120-character tape labels (type A) only. Tape marks must appear in labeled tape files: (1) after the header label, and (2) before and after the trailer label.

Output Labels

If tape labels are to be written and the output tape contains the standard 120-character tape label, the card-to-tape routine checks the retention cycle in the first label on the output tape and retrieves the reel serial number from this label. (The date in the control card is used for the retention check.)

There are two instances when the retention check cannot be made. Specify no retention check in the control card when: (1) the output tape has no label, or (2) the output tape has a nonstandard label.

If no retention check is specified (an N in column 8 of the control card), the reel serial number will be taken from positions 40-44 of the control card. (For multi-reel files, the reel serial number is placed in the first reel only. Additional reels will be blank in this field.) If it is desired to retain the reel serial number of the output tape when the retention cycle is not expired, but the operator knows that the contents of the reel can be destroyed, allow the retention check to be performed. When

the error halt for the retention-check failure is encountered, bypass the retention check and continue processing.

The program writes the new tape header label using the information supplied in a RDLIN card and, if used, a user-information card. The file-creation date is taken from the control card.

At end-of-file or end-of-reel, the card-to-tape program writes a standard 120-character trailer label consisting of: (1) the label identifier (1EOFb or 1EORb), (2) the block count (positions 67-72), and (3) the user information, if furnished, (positions 101-120 of the header label).

Input Labels

The program checks input tape header-labels against the information supplied by a RDLIN card and, if needed, a user-information card. The control card specifies whether header-label fields 1-19 are to be checked, or only the file-identification field.

The user can bypass the labels, however, they still must be 120-character labels, with the label identifier in positions 1-5. The trailer-label identifier field is checked to determine whether an end-of-file or end-of-reel condition exists (even when bypassing labels).

A RDLIN card is supplied for each file to be processed. If positions 101-120 of the label contain anything but blanks, the user must supply a user-information card also. (Columns 1-20 of the user-information card are compared against positions 101-120 of the header label.)

If labels are processed (full check or file-identification only), the block count is accumulated and checked against the trailer label.

MULTIPLE TAPE UTILITY PROGRAM (INCORPORATING 120-CHARACTER
TAPE LABELS) OPERATING PROCEDURES
IBM 1401 AND 1460

PROGRAM DECK DESCRIPTION

The 1401/1460 Multiple Tape Utility Program with 120-Character Label Capability is supplied in the form of an assembled, condensed card deck (Figure 1) ready for execution. This condensed deck contains 198 cards, including the clear-storage and bootstrap cards.

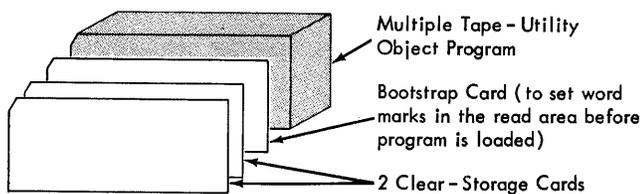


Figure 1. Condensed Card Deck Description

The condensed deck was produced from a 1401 tape Autocoder assembly. Therefore, the object-program card format is the same as for any 1401 tape Autocoder assembly. Each card in the condensed card deck, beginning with the first clear-storage card, contains a card number in columns 72-75. Columns 76-80 contain the program identification 19UT1.

RUNNING THE PROGRAM

Use the following procedure to run the program:

1. Ready any tape units required. One tape unit is required for each operation to be performed. Use the following procedure to ready a tape unit:
 - a. Load the magnetic-tape reel on the tape unit.
 - b. Press Load-Rewind (IBM 729) or Low-SPD-Rewind (IBM 7330).
 - c. Set the address-selection dial to the appropriate number:
 - Card-to-tape operation: set to 1
 - Tape-to-printer operation: set to 2
 - Tape-to-card operation: set to 3
 - d. Press START on the tape unit to ready the unit for operation.

2. Insert forms and a carriage tape in the 1403 printer if a tape-to-printer operation is to be performed.
3. Set the I/O check stop switch on.
4. Set the mode switch to RUN.
5. Set the tape-select switch to N.
6. Set the appropriate sense switches on to indicate the operations the program is to perform. The operations and the corresponding sense switches are:
 - a. Card-to-tape operation:
 - Set sense switch B on if a BCD (Binary Coded Decimal) tape file is to be written. (The input card file can contain only cards punched in standard IBM punched-card code.)
 - Set sense switch G on if a binary tape file is to be written. (The input card file will be treated as a column binary card file.)
 - Set both sense switches B and G on if a mixed BCD and binary tape file is to be written. (The input card file can contain both column binary cards and cards punched in standard IBM punched-card code. Column binary cards are identified by a 7-9 punch in column 1.)
 - b. Tape-to-card operation:
 - Set sense switch D on if the cards are to be punched in standard IBM punched-card code. (The input tape file can contain only BCD records.)
 - Set sense switch F on if column binary cards are to be punched. (The input tape file can contain only binary records.)
 - Note: An input tape file containing both BCD and binary records cannot be used in a tape-to-card operation.
 - c. Tape-to-printer operation:
 - Set sense switch C on.
7. Place program deck, followed by the control card, in the read hopper of the 1402.
8. If a RDLIN card for a tape-to-card operation is to be used, place it, followed by the corresponding user-information card (if any), in the read hopper.

9. If a RDLIN card for a tape-to-printer operation is to be used, place it, followed by the corresponding user-information card (if any), in the read hopper.
 10. If a RDLIN card for a card-to-tape operation is to be used, place it, followed by the corresponding user-information card (if any), in the read hopper.
 11. Place the data card file in the 1402 read hopper if a card to tape operation is to be performed. If card files are to be batched in a card-to-tape operation, follow steps 10 and 11 for each file.
 12. Place blank cards in the 1402 punch hopper if a tape-to-card operation is to be performed.
 13. Press START-RESET on the console.
 14. Press CHECK-RESET on the 1402 to insure that no 1402 error indications are on.
 15. Press LOAD on the 1402. The program is loaded and execution begins.
2. Set sense switch E on. This causes the program to halt.
 3. Set sense switches:
 - a. Turn off the sense switches corresponding to the operations to be discontinued, if any.
 - b. Turn on the sense switches corresponding to the operations to be added, if any.

Note: The sense switches corresponding to each operation are described under Running the Program.
 4. Turn sense switch E off.
 5. A new control card must be added. This control card must contain information for all operations that are to be performed when execution resumes, regardless of whether they are new operations or operations that were only temporarily interrupted. Use the following procedure to add the new control card:
 - a. Place the new control card as the first card in the 1402 read hopper. If part of a card file from a card-to-tape operation currently being performed is in the read hopper, first remove the file from the read hopper and press the reader nonprocess runout-key to clear the feed path.
 - b. If RDLIN and user-information cards are necessary for operations that are added, place them in the read hopper following the control card. (The order is as implied in steps 8, 9, and 10 under Running the Program.)
 - c. Place the card file in read hopper if a card-to-tape operation is to be added or resumed. (If a card-to-tape operation was interrupted and the remaining portion of the card file removed from the reader, replace the two cards that were run out followed by the remaining portion of the card file.)
 6. Press START. The program will test the sense switches to determine the operations it is to perform, read the control card, and resume operations.

ADDING AND DELETING OPERATIONS

By setting sense switch E on, the user can temporarily halt the program operation in order to:

1. Discontinue an operation currently being performed, and
2. Add a new operation to be performed.

(Either one or both can be done during an interruption.)

Note: In a card-to-tape operation, the program tests sense switch E after each card is read. In the tape-to-card operation, the program tests sense switch E after each card is punched. However, in the tape-to-printer operation, the program tests sense switch E only after a complete block of records has been printed. In each case the program halts immediately if sense switch E is on when tested.

The procedure for discontinuing and adding an operation follows:

1. Ready the appropriate input and output units if an operation is to be added. (Readying input and output units is described under Running the Program.)

PROGRAM HALTS

The following halts may occur during the execution of the program. Each halt is identified by the contents of the B-address register at the time of the

halt. Listed below are the halts (as identified by the contents of the B-address register), the reason for the halt, and the corresponding restart procedure. When a program halt occurs, check the contents of the B-address register for the number of the halt by pressing the B-address register key. Follow the appropriate restart procedure, as listed below for each halt.

<u>Halt</u>	<u>Reason</u>	<u>Restart Procedure</u>
b1bb	Interrupt switch, sense switch E, has been set on.	Follow steps 4, 5, and 6 under <u>Adding and Deleting Operations</u> . If the interrupt is for deletions only, reinsert the original control card.
b3bb	Control card error in a record-length field or a blocking-factor field. Record-length fields: columns 9-10 and 25-26. Blocking-factor fields: columns 11-13 and 27-29.	Find the error and punch a new control card. If a card file from a card-to-tape operation is in the read hopper, remove the file from the read hopper, and press the nonprocess-runout key on the 1402 to clear the feed path. Place the new control card as the first card in the reader. Place the card file (including the two cards that were run out) for card-to-tape operation (if any) in read hopper.
b4bb	Control card error in a label information field or the date field. Label-information fields: columns 7, 8, 24, and 34. Date field: columns 16-20.	Same as for halt b3bb.
b5bb	Control card error in a group-mark conversion field, a tape-drive field, a tape-density field, the forms-control field, or the block-size field for the tape-to-printer operation. Group-mark conversion fields: columns 21 and 31. Tape-drive fields: columns 23, 33, and 37.	Same as for halt b3bb.

<u>Halt</u>	<u>Reason</u>	<u>Restart Procedure</u>
	Tape-density fields: columns 22 and 32	
	Forms-control field: column 35.	
	Block-size field for tape-to-printer operation: column 38	
b6bb	Control card error in a record-mark field, the padding-character field, the expanded print-storage field, or the file-form field. Record-mark fields: columns 14 and 30.	Same as for <u>Halt b3bb</u>
	Padding-character field: column 15.	
	Print-storage field: column 36.	
	File-form field: column 39.	
10bb	Sense switch setting indicate two tape-to-card operations (sense switches D and F both on).	Correct sense switch settings to allow only <u>one</u> tape-to-card operation. Press START.
11bb	Control card error in a positioning field (file skipping) Tape-to-printer operation: columns 3-4	Same as for <u>Halt b3bb</u>

<u>Halt</u>	<u>Reason</u>	<u>Restart Procedure</u>	<u>Halt</u>	<u>Reason</u>	<u>Restart Procedure</u>
	Tape-to-card operation: columns 5-6			completion of an operation if any of the remaining tape operations are not yet completed.)	
15bb	Failure to read tape record correctly after 100 attempts	<u>To bypass the record</u> , press START. <u>To go directly to Halt 16bb</u> , press START-RESET and START (see <u>Halt 16bb</u>). <u>To investigate the error</u> , use the following procedure:	30bb	Tape header-label read with file identification other than that specified in RDLIN card.	If the present tape reel is not to be processed, mount a new tape reel and press START. If the present tape reel is to be processed, press START-RESET and START to accept the file identification as read.
	<u>Note:</u> If a record is read in error, the program attempts to reread the record. If after a maximum of 99 read attempts the record is still in error, the program halts.	1. Set the tape-select switch to D (diagnostic). 2. Press START-RESET and START to reread the error block. This stores the characters as they are written on tape, without internally correcting any parity error. (If an invalid character enters core storage, the CHECK-RESET light is turned on.) The program then branches to halt 16bb. 3. Scan storage to locate the invalid character. (The scanning operation procedure is given in detail in the <u>IBM 1401 Data Processing System Operator's Guide Form A24-3144.</u>) 4. Correct the invalid character in core storage, if possible. (This procedure is also in the 1401 operator's guide.) 5. Reset the tape-select switch to N and press the check-reset key. 6. Press START-RESET and START to process a corrected block. 7. If the block is still to be bypassed, press only START.	31bb	File identification field in header label corresponds to that in RDLIN card, but remainder of header-label fields (1-19) and/or user-information field (positions 101-120 of header label) do not correspond.	If the present tape reel is not to be processed, mount the correct tape and press START. If the present tape reel is to be processed, press START-RESET and START to accept the labels as read.
			32bb	The last card read should have been a RDLIN card, but does not have RDLIN in columns 16-20.	Place the correct RDLIN card as the first card in the read hopper. Press START.
			33bb	Tape error occurred while attempting to read header label, or trailer label.	To attempt to reread the label, press START. To bypass the label, press START-RESET and START.
			34bb	The retention period for the output tape has not expired.	If the present tape reel is not to be processed, mount a new tape reel and press START. If the present tape reel is to be processed, press START-RESET and START to bypass the header label.
			35bb	Tape error occurred while attempting to write header label or trailer label.	To attempt to rewrite the label, press START. If the label is to be bypassed, press START-RESET and START.
16bb	Tape-error record was reread after halt 15bb, or a wrong-length record (WLR) was read (WLR applies to tape-to-card operation only).	To bypass the record, press START. To accept the record as read, press START-RESET and START.	37bb	Thirty attempts to write a tape record correctly have failed. <u>Note:</u> In the event of a tape write error, the program attempts to write the record two more times on the same section of tape. If still unsuccessful,	Press START to rewrite the record.
29bb	End of job. (When more than one tape operation is being performed, the program will not halt after the	To start new operation, turn on sense switch E and press START. Halt b2bb will be reached (see <u>Halt b2bb</u>).			

<u>Halt</u>	<u>Reason</u>	<u>Restart Procedure</u>
	the program blanks that tape section and attempts to write on a new section. After a total of thirty attempts to write the record (10 sections of tape), the program halts.	
38bb	End of Reel	Mount a new tape reel. Press START to continue processing.
39bb	Block-count check failed when checking trailer label. (This will occur if any records are bypassed when restarting after Halts 13 and 15.)	Press START to continue processing. Display core storage positions: 390-395 for tape 1 block count 668-673 for tape 2 block count. 762-767 for tape 3 block count. The tape numbers in each case correspond to the tape unit.

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