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## Systems Reference Library

### Disk Utility Programs Operating Procedures IBM 1401 and 1460 (with 1301 and 1311)

Program 1401-UT-053

This reference publication contains the procedures to follow to operate the following IBM 1401, 1460 (with 1301 and 1311) programs:

- Clear-Disk-Storage Program
- Disk-to-Tape Program
- Tape-to-Disk Program
- Disk-to-Card Program
- Card-to-Disk Program
- Copy Disk Program
- Print Disk Program
- Disk-Record-Load Program
- Disk-Label Program

The reader should be familiar with the IBM 1401 publication: Disk Utility Programs Specifications, IBM 1401, 1440, 1460 (with 1301 and 1311), Form C24-1484. That publication describes the function of each of the programs, and contains detailed control-card formats.

For a list of related publications and abstracts, see the IBM 1401 Bibliography, Form A24-1495.

Fourth Edition

This is a reprint of C24-3105-2 incorporating changes released in the following Technical Newsletter:

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N24-0296	5, 6, 8, 9, 16, and 31	January 13, 1965

Significant Changes or additions to the specifications contained in this publication will be reported in subsequent revisions or Technical Newsletters.

Requests for copies of IBM publications should be made to your IBM representative or to the IBM branch office serving your locality.

Address comments concerning this manual to: IBM Corporation, Programming Publications, Dept. 425, Rochester, Minn. 55901.

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This publication gives the procedures to follow to operate the nine IBM 1401 and 1460 Disk Utility Programs. It supplements Disk Utility Programs Specifications for IBM 1401, 1460 (with 1301 and 1311), C24-1484, which describes the function of each of the programs, and outlines the control cards used.

Note: Information that applies to the disk-label program and the disk-header-label routines is not applicable to 1301 disk storage.

This reference publication includes:

- Machine Requirements
- Program Deck Makeup
- Control Card Insertion Points
- System Preparation
- Halts and Messages
- Restart Procedures

### Machine Requirements

A minimum of 4000 positions of core storage is required.

#### IBM 1401 or 1460 Processor

No special features are required for operation of these programs. The only feature that can be used on an optional basis is the track record feature. If this feature is used, 8000 positions of core-storage are required.

#### IBM 1402 Card Read-Punch

The card read-punch is used to:

1. Load the program deck.
2. Read control cards.
3. Punch and read data cards in the disk-to-card and card-to-disk programs.

#### IBM 1403 Printer Model 1 or 2

The printer is used by each of these programs to print:

1. Analyses of all control cards entered.
2. Messages indicating the completion of various stages of the program.
3. Disk header labels found, deleted, or entered.
4. Error messages.

Except in the print disk and tape programs for printing 120-character labels, only 100 print positions are used, regardless of whether the printer has 100 or 132 print positions. The print disk program can use the full print line of a Model, if available.

#### IBM 729 or 7330 Magnetic Tape Unit

The disk-to-tape and tape-to-disk programs can make use of two tape units for multiple-reel operations in a system with 8000 or more core-storage positions. In a 4K system, only one tape unit can be used.

#### IBM 1301 or 1311 Disk Storage

Each of the programs can operate on up to five disk storage drives and five modules during one run. The 1311 direct seek feature is not used.

### DESCRIPTION OF PROGRAM DECKS

Each of these programs is contained in a separate condensed-card deck. The disk-label program deck is described separately in the Disk-Label Program section. Each of the other eight program decks are made up of the sections shown in Figure 1.

The cards following the last card of the loader program have sequence numbers starting with 001 punched in columns 73-75 of each card.

#### Loader

The first six cards of each deck constitute a self-loading loader program. These cards clear core storage, and load the rest of the program deck.

#### Disk-Header-Label Routine

The disk-header-label routines perform disk-label operations on 1311 disk storage drives appropriate to the program that is being run. See the specifications publication for a description of these routines. If header labels are not used, this portion of the program decks can be removed for faster loading.

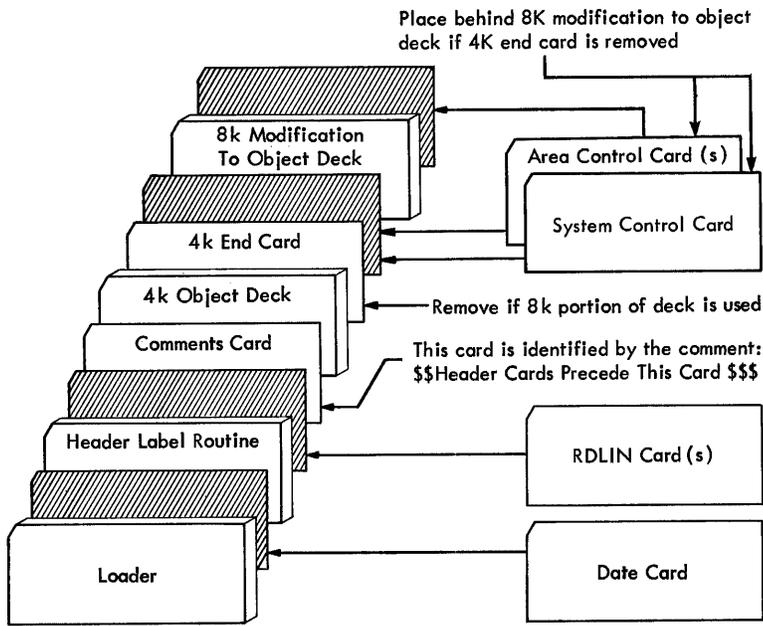
The last card of each of these routines is a comments card with the message:

\$\$\$HEADER CARDS PRECEDE THIS CARD\$\$\$

These cards should be specially marked to identify them easily.

#### 4K Object Program

These cards constitute the basic program deck, complete with end card. This section, with the loader, is enough for basic operation of the programs. A user with only 4000 positions of core storage must



Programs	Clear Disk	Disk to Tape	Tape to Disk	Disk to Card	Card to Disk	Copy Disk	Print Disk	Disk Record Load
ID Number (Columns 76-80)	53012	53022	53032	53042	53052	53062	53072	53082
Disk Header Label Routine	001 -	001 -	001 -	001 -	011 300	001 040	001 023	001 020
Comments Card	025	026	030	029	317	041	024	021
4K Object Deck	026 -	027 -	031 -	030 -	330 721	042 080	025 065	022 057
4K End Card	064	075	081	070	725	081	066	058
8K Modification to Object Deck	065 -	076 -	082 -	071 -	731 869	082 099	067 090	059 075

Figure 1. Program Deck Makeup

remove the cards that follow the 4K end card from the decks before loading the programs.

If this section is used, the 4K end card must be removed from each program deck.

### 8K Modification to Object Deck

This section contains the instructions necessary for these programs to:

1. Operate in both track-record and 20-sector formats.
2. Alternate tape units on multiple-reel jobs.
3. Process tape header labels on reels after the first of a multiple-reel job.

### CONTROL CARDS

These programs use three types of control cards. The first is the disk label (RDLIN) control card. These cards are used to supply information to the header label routines and to the disk-label program. The second type is a system control card that conveys information concerning halts, number of tape drives used, and the type of printer. The third is

the area control card, used to supply information to the main program. Programs that delete disk header labels also use a date card. Figure 2 shows the cards used with each of the programs.

The date card must be used if RDLIN cards are used. It should be inserted after the last card of the loader, and before the first card of the header-label routine.

### Insertion Points for Control Cards

#### RDLIN Cards

The insertion point for RDLIN cards used with the disk-label program depends on the operation being performed. See the Disk-Label Program section.

In each of the other eight programs, all RDLIN cards are placed after the header-label-routine portion of the deck, and before the card with the comment:

\$\$\$HEADER CARDS PRECEDE THIS CARD\$\$\$

If header labels are not to be operated upon during a particular run, RDLIN cards are not needed.

#### Date Card

The header label routines of the following programs make use of today's date as entered in a date card:

- Clear-Disk-Storage Program
- Tape-to-Disk Program
- Card-to-Disk Program
- Copy Disk Program
- Disk-Label Program

#### Area Control Cards

The disk-label program does not use area control cards. Every card used as input to the disk-record-load program contains the necessary area control information. In each of the other seven programs, as many area control cards as desired can be used. Each card can contain control information for from one to four areas without the restriction that full cards precede partially filled ones.

Place the area control cards at the end of the program deck, after the system control card. In the case of the card-to-disk program, each area control card must be followed by the cards to be read.

#### System-Control Cards

The system control card must be inserted after the end card. If the system control card is forgotten the program prints:

NO SYSTEM-CONTROL CARD - PLACE IN HOPPER - PRESS START

PROGRAM	RDLIN CARDS	AREA CARDS	SYSTEM CONTROL CARD	DATE CARD
Clear Disk Storage	Optional	Required	Required	Required if RDLIN cards are used.
Disk-to-Tape	Optional	Not required if disk label routine is used to generate area definitions	Required	Not used.
Tape-to-Disk	Optional	Required	Required	Required if RDLIN cards are used.
Disk-to-Card	Optional	Not required if disk label routine is used to generate area definitions	Required	Not used.
Card-to-Disk	Optional	Required	Required	Required if RDLIN cards are used.
Copy Disk	Optional	Not required if disk label routine is used to generate area definitions	Required	Required if RDLIN cards are used.
Print Disk	Optional	Not required if disk label routine is used to generate area definitions	Required	Not used.
Disk-Record-Load	Optional	Area-control information punched in each input card	Required	Not used.
Disk Label	Required	Not used.	Not Used	Used only with delete (DELT) and enter (ENTR).

Figure 2. Control Cards Used in Each Program

The operator must:

1. Press NPRO to remove the cards from the feed path.
2. Place the system control card in the hopper followed by the area definition cards.
3. Press START.

SYSTEM PREPARATION

1. Turn power on.
2. Ready the IBM 1311 Disk Drive(s), or 1301 Module(s).
  - a. Place the disk pack(s) to be operated upon on the proper disk drive(s), (1311 only).
  - b. Tighten the disk-pack cover until the PACK ON light is ON, and then remove the pack cover (1311 only).
  - c. Close the top cover, and press START on the disk drive. The ready light should now be on (1311 only).
  - d. The WRITE ADDRESS light is set as follows:

<u>Program</u>	<u>Setting</u>
Clear Disk Storage	OFF, if deleting header labels, then:  ON, when the first area control card is analyzed and the program halts.  ON, if no header labels are to be operated upon.
Disk-to-Tape	OFF
Disk-to-Card	OFF
Tape-to-Disk	OFF, if entering header labels, then:  ON, when the first area control card is analyzed and the program halts.  ON, if no header labels are to be entered.

<u>Program</u>	<u>Setting</u>
Card-to-Disk	OFF, if entering header labels, then:  ON, when the first area control card is analyzed and the program halts.  ON, if no header labels are to be entered.
Copy Disk	OFF, if operating on header labels, then:  ON, when the first area control card is analyzed and program halts.  ON, if no RDLIN cards are used.
Print Disk	OFF
Disk-Record Load	OFF, if printing header labels, then:  ON, if searching for duplicate addresses or altering addresses;  OFF, for all other operations.
Disk-Label Program	ON, when setting up initial label track (NEW) and when restoring normal addresses (RNA).  OFF, for all other operations.

3. If using Disk-to-Tape or Tape-to-Disk, ready the 729 or 7330:
  - a. Mount the tape.
  - b. Rewind to load point.
  - c. Press the start key.
4. Ready the IBM 1403 Printer:
  - a. Insert paper forms in the forms tractor.
  - b. Mount a carriage tape with channels 1 and 12 punched. (Other channels can be punched.)
  - c. Press CARRIAGE RESTORE.

5. Ready the IBM 1402 Card Read-Punch:
  - a. Press nonprocess run-out (NPRO) key to clear any cards that may have been left in the feed path.
  - b. Insert the program deck and control cards (9-edge first, face down) in read hopper.
  
6. Ready the 1401 or 1460 processor:
  - a. Set sense switch A ON.
  - b. Set mode switch to RUN.
  - c. Turn the disk write switch ON.
  - d. Turn the I/O check stop switch ON. When running the disk-to-card program, turn this switch OFF after the first area control card analysis.
  
7. Press the load key to begin operation.

## CLEAR-DISK-STORAGE PROGRAM

The clear-disk-storage program is used to set disk output areas to an initial condition. A disk area can be cleared to blanks or any other valid 1401 or 1460 character.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header-label routine, if no errors are encountered.

1. As each disk header-label (RDLIN) control card is entered, the program prints the message:  
DELETE XXXXXX-XXXXXX ON YYDDD  
This message gives the area limits within which all expired header labels are to be deleted, and the date.
2. Each expired label within the specified limits is printed, and then deleted. The label is printed following a message that includes the disk-drive number and the sector address of the expired label:  
DELETED. . . . .
3. After completing the search of all labels on the drive specified in the RDLIN card, the program prints:  
OK
4. After all RDLIN cards have been processed, the program prints:  
HDR ROUTINE COMPLETE

The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header-label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the header-label routine are accompanied by a printed message. Figure 4 lists the messages printed and the action that should be taken in the event of each of the possible halts.

### HALTS AND MESSAGES DURING MAIN PROGRAM

Before the program analyzes the first system control card, it prints:

SET WRITE ADDRESS MODE KEY ON

#### System Control Card Analysis

The system control card of a processing run is checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4, the program prints:

NO DISK ERROR HALTS

This message indicates that all programmed disk error halts except access inoperable errors are to be bypassed.

If the punch is present in column 5, the program prints:

NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted and the program continues.

#### Area Control Card Analysis

The analysis of the first area control card is preceded by the message:

CLEAR DISK

Each area definition is analyzed and printed in the following format:  
X XXXXXX-XXXXXX DR-X REF-X CHAR-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area to be cleared.
3. The disk drive or module that is being used (DR-X).
4. The disk drive or module to which the addresses on the pack or module are referenced, or a \$ (REF-X).
5. The character to be used in clearing (CHAR-X).
6. TR, if track-record format.
7. ERR, if there are any errors in the area definition.

Any of the following conditions are detected and indicated as control card errors:

- a. Lower limit not zero-sector of a track.
- b. Lower limit greater than upper limit.

If none of the area definition analyses are flagged with the ERR message, the program skips to channel 1 and halts. Pressing START causes the program to proceed to clear each of the areas defined in the control card. After clearing these areas, the program will read and analyze the next area control card if one is present.

If, upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to cause the program to skip these areas and proceed to the next card.

If any of the area definition analyses are flagged as in error, the program skips to channel 1 and halts. Pressing START causes the program to read the next card. The card that contains the incorrectly defined area can be repunched and replaced in the hopper.

When the program detects that the last card indicator is on, it prints the message:

EOJ

and halts. All areas specified in the area control card(s) have been processed.

This program can be followed by other program decks. If a card is read with a comma (set-word-mark instruction operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk error halts discussed in the Disk Operation Errors section are the only programmed halts in this program, other than the area-control-card analysis halt.

## DISK-TO-TAPE PROGRAM

The disk-to-tape program transfers the data from specified areas of disk storage to magnetic tape. Tape records are written in the format required by the tape-to-disk program.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header-label routine, if no errors are encountered.

1. Any header label the program finds by searching for the file identification field given in a RDLIN card is printed following the message:  
    FOUND  
    The print-out includes the seven high-order digits of the disk-control field used to read the sector.
2. Each header label the program finds by searching within the limits given in a RDLIN card is printed following the message:  
    LIMITS  
    The print-out includes the seven high-order digits of the disk control field used to read the sector.  
    Each disk label printed is also punched into a card in the standard RDLIN card format. These cards can be used to enter the header labels with the tape-to-disk program. The drive number is not punched. It can be punched by the operator when reloading.
3. The disk header-label routine can be used to supply area-control information to the main program for up to four files. See the specifications publication for a description of the RDLIN card for this operation. If this operation is performed, the program prints the message:  
    CTL. CARD 1 GENERATED
4. For each area definition supplied, the program prints:  
    AREAx GENERATED  
    x is a number (1 to 4) that indicates the first, second, third, or fourth area definition. This message is followed by a print-out of the area definition generated.

5. If no errors occur, the program will process all of the disk header-label control cards and then print the message:

HDR ROUTINE COMPLETE

The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header-label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the disk header-label routine are accompanied by a printed message. Figure 4 lists the messages printed and the action that should be taken in the event of each of the possible halts.

This program contains no punch-error routine. The I/O check stop switch should be ON. In the event of an error when RDLIN cards are punched, run out the cards in the punch-feed path, and press START to repunch.

### HALTS AND MESSAGES DURING MAIN PROGRAM

#### System-Control-Card Analysis

When the system control card is read, the program prints one of the two following messages:

USING TAPES 2 AND 3 or  
USING TAPE 2

Note: If the 8K portion of the deck is not used, only tape drive 2 is used.

The system control card is read and checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4 the program prints:

NO DISK ERROR HALTS

This message indicates that all programmed disk-error halts except access-inoperable are to be bypassed.

If the punch is present in column 5, the program prints:

NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted and the program continues.

## Tape Header Labels

The tape header labels used are the standard 120 character tape header labels. If only 80 positions of the header-label are used, only one header-label card is required. If all 120 positions of the tape header-label are used, two tape header-label cards must be used. The first card must contain the first 80 characters of the 120-character label. The second card (if present) must contain the last 40 positions of the 120-character label.

A 1 punched in column 10 of the system-control card indicates that only the first 80 positions of the header label contain information, and that a second card is not present. A 2 punched in column 10 indicates that all 120 positions contain information, and that two header label cards are present. If column 10 is left blank, a 2 punch is assumed.

If a tape header-label card is read the program checks the first tape record on the output tape to make certain that it is a standard 120-character tape header label, and that the retention cycle is past. If these conditions are met the program prints:

HEADER ACCEPTED

The header label card(s) is then copied onto the tape as the new header label.

If these conditions are not met, the program prints one of the following messages:

NOT STD. 120 CHAR. LABEL  
NOT EXPIRED

This is followed by:

TAPE READS . . . . (tape-record read)  
SHOULD BE . . . . (tape-header-card read)  
PRESS START IF TAPE CHANGED  
PRESS START RESET AND START TO  
IGNORE OUTPUT HEADER

As indicated by the messages, the user can either:

1. Change the tape reel, and press START to check the header label on the new tape, or
2. Press START RESET and START to ignore the header label

After writing the tape header label, the program reads the first area-control card.

## Area-Control-Card Analysis

The analysis of the first area-control card is preceded by:

DISK-TO-TAPE

Each area definition is analyzed and printed in the following format:

X XXXXXX-XXXXXX DR-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The disk drive or module being used (DR-X).
4. TR, if track-record format.
5. ERR, if there are any errors in the area definition.

Any of the following conditions are detected and indicated as control-card errors:

- a. Mode not punched as M or L.
- b. Lower limit not zero-sector of a track.
- c. Lower limit greater than upper limit.

If none of the area-definition analyses are flagged with the ERR message, the program skips to channel 1 and halts. Pressing START causes the program first to write the area-control card on tape. Each of the areas defined are then written.

If, upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to read the next card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts. The incorrectly punched card can be corrected and replaced in the hopper. Press START to read the next card.

After completing the areas defined in the first card (or generated by the disk header-label routine), the program checks for a second area-control card. If one is present, it is read and analyzed, and the process is repeated.

## Multiple Reel Jobs

If two tape drives are being used for a multiple-reel job, the program prints:

NOW USING TAPE X ( 2 or 3)

The program has filled a reel of tape and is proceeding automatically on the reel indicated in the message. A rewind-and-unload instruction has been given for the completed reel.

## Single Reel Jobs

If only one tape drive is being used, the program prints:

LOAD 2 AND GO

The program has filled a reel of tape, executed a re-wind-and-unload operation, and is attempting another tape operation on tape drive 2. The operator must either:

1. Load another tape reel on drive 2, or
2. Set the address selection dial of a loaded tape drive to 2.

The program has not halted. It will continue operation as soon as a tape drive set to 2 is in a ready condition.

When the program detects that the last-card indicator is on, it prints the message:

EOJ

and halts. All areas specified in the area-control cards have been processed.

This program can be followed by other program decks. The next program follows the last area-control card. If a card is read with a comma (set-word-mark operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk-error halts that can be encountered by this program are listed in Figure 5. In addition to

the disk errors, the program halts in the event of the following tape errors:

1. HEADER TRANSMISSION ERR. PRESS START TO RETRY

Cause. A tape transmission error occurred while the program was attempting to read or write a tape header-label.

Action. Press START to retry the operation.

2. BAD TAPE NOW USING TAPE x, or  
BAD TAPE LOAD 2 AND GO

Cause. The program has been unable to write a tape record successfully. The operation (try two writes, then skip and blank tape) was attempted 25 times.

Action. The program wrote double tape marks and rewound and unloaded the bad tape. The operation can be continued as in a normal end-of-reel condition (see Multiple Reel Jobs).

3. 30 TP ERR STAT BAD TAPE

Cause. Tape-transmission errors have occurred and have been corrected while the program was writing 30 different tape records.

Action. The operator can either press START to set the tape error statistics count to zero to continue processing, or restart the entire job from the beginning, using a new tape.

The tape-to-disk program reloads tape files produced by the disk-to-tape program.

**NORMAL MESSAGES DURING DISK-LABEL ROUTINE**

Under normal operation of the program, if no errors are encountered, the following messages are printed during the operation of the disk header-label routine.

1. Each disk header-label (RDLIN) control card is checked for validity when read. If no errors are detected in the RDLIN card or in the date card, the program prints:  
     DELETE XXXXXX-XXXXXX ON YYDDD  
     This message gives the area limits within which all expired disk header labels are to be deleted, and the date.
2. Each disk header-label deleted is printed with the message:  
     DELETED . . . . .
3. Each label entered on the output pack is printed with the message:  
     ENTERED . . . . .

These messages are followed by:

1. A scale line.
2. The 100-character disk label deleted or entered.
3. The disk control field used to write the label.

After all RDLIN cards have been processed, the program prints:

HDR ROUTINE COMPLETE

The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the disk header-label routine.

**ERROR HALTS DURING DISK-LABEL ROUTINE**

All programmed halts that can occur during the operation of the disk header-label routine are accompanied by a printed message. Figure 4 lists the messages printed, and the action that should be taken in the event of each of the possible halts.

**HALTS AND MESSAGES DURING MAIN PROGRAM**

System-Control-Card-Analysis

When the system control card is read the program prints one of the following messages:

    USING TAPES 2 AND 3, or  
    USING TAPE 2

Note: If the 8K portion of the deck is not used, only tape drive 2 is used.

The system control card is read and checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4, the program prints:

    NO DISK ERROR HALTS

This message indicates that all programmed disk-error halts except access-inoperable errors are to be bypassed.

If the punch is present in column 5, the program prints:

    NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted and the program continues.

Before reading the first tape-header-label card or area-control card the program prints:

    SET WRITE ADDRESS MODE KEY ON

Tape Header Labels

The tape header labels used are the standard 120-character tape header labels. If only 80 positions of the header-label are used only one header-label card is required. If all 120 positions of the tape header-label are to be used, two tape header-label cards must be used. The first card must contain the first 80 characters of the 120-character label. The second card (if present) must contain the last 40 positions of the 120-character label.

A 1 punched in column 10 of the system-control card indicates that only the first 80 positions of the header label contain information, and that a second card is not present. A 2 punched in column 10 indicates that all 120 positions contain information, and that two header label cards are present. If column 10 is left blank a 2-punch is assumed.

If a tape header-label card is read, the program checks the first tape label on the input tape for a standard header label. If the record is not a standard tape header label, the program prints:

    NOT STD. HEADER

If the record is a standard tape header label, the program compares it with the tape header-label card. If an equal-compare results the program prints:

HEADER ACCEPTED

If the label read does not match the card, or if the NOT STD. message was printed, the program prints:

TAPE READS ..... (tape-record-read)  
SHOULD BE ..... (tape-header-card read)  
PRESS START IF TAPE CHANGED OR  
PRESS START RESET AND START TO  
IGNORE INPUT HEADER

As indicated by the messages the user can either:

1. Change the tape reel, and press START to check the header label on the new tape, or
2. Press START RESET and START to ignore the input header label.

After checking the tape header label, the program reads the first area-control card.

#### Area Control Card Analysis

The analysis of the first area control card is preceded by:

TAPE-TO-DISK

Each area definition is analyzed and printed in the following format:

X XXXXXX-XXXXXX DR-X REF-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The disk drive or module being used (DR-X).
4. The disk drive or module to which the addresses on the pack or module are referenced (REF-X).
5. TR, if the track-record format.
6. ERR, if there are any errors in the area definition.

Any of the following conditions are detected and indicated as control card errors:

- a. Lower limit not zero-sector of a track.
- b. Lower limit greater than upper limit.

If none of the area definition analyses are flagged with the ERR message, the program skips to channel 1 and halts. Press START to write the area on disk. If upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to read the next card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts. The incorrectly punched card can be corrected and replaced in the hopper. Press START to read the next card.

After completing the area defined in the first card, the program checks for a second area-control card. If one is present, it is read and analyzed, and the process is repeated.

#### Multiple-Reel Jobs

If two tape drives are being used for a multiple-reel job, the program prints:

NOW USING TAPE X (2 or 3)

The program has finished a reel of tape and is proceeding automatically on the reel indicated in the message. A rewind-and-unload instruction has been given for the completed reel.

If only one tape drive is being used, the program prints:

LOAD 2 AND GO

The program has finished a reel of tape, executed a rewind-and-unload instruction, and is now attempting another tape operation on tape drive 2. The operator must either:

1. Load another tape reel on drive 2, or
2. Set the address-selection dial of a loaded tape drive to 2.

The program has not halted. It will continue operation as soon as a tape drive set to 2 is in a ready condition.

When the program detects that the last-card indicator is ON, it prints the message:

EOJ

and halts. All areas specified in the area-control cards have been processed.

This program can be followed by other program decks. The next program follows the last area-control card. If a card is read with a comma (set-word-mark operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk-error halts that can be encountered by this program are listed in Figure 5. In addition to the disk errors, the program halts in the event of the following tape errors:

1. BAD READ

Cause. A tape transmission error occurred while the program was attempting to read a tape header label.

Action. Press START to retry the operation.

2. ERR EOJ

Cause. The program has searched the entire remaining tape without finding the area requested. Either an area not on the tape was requested, or areas were requested in the area-control cards in an order different from that in which they appear on tape. The program has rewound and unloaded the tape.

Action. The program can be rerun to process any areas skipped.

3. TAPE ERR AREA

Cause. The program was unable to read a tape record that consisted of the image of an area-control card.

Action. Press START to retry the operation.

4. RESET, START TO ACCEPT TRACK XXXXXX

Cause. The program was unable to read a tape record. The data and addresses contained in the bad tape record were to be written on the disk track indicated in the message.

Action. The operator can either:

- a. Press START to retry the operation, or
- b. Press START RESET and START to accept the record and write it on the disk track indicated.

Note: If the erroneously read tape record is written on the disk track, it is possible for all the 20 addresses written to be invalid. If the disk-error halts are being bypassed, the track will be skipped after writing without completing a write-disk-check operation. The compare-disable switch must be used at a later time to operate on the track, if this happens. An IBM customer engineer should perform such an operation.

## DISK-TO-CARD PROGRAM

The disk-to-card program punches the data from specified areas of disk storage into cards. The cards are punched in the format required by the card-to-disk program.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header-label routine, if no errors are encountered.

1. Any header label the program finds by searching for the file identification field given in a RDLIN card is printed following the message:  
FOUND  
The print-out includes the seven high-order digits of the disk control field used to read the sector.
2. Each header label found by searching within the limits given in a RDLIN card is printed following the message:  
LIMITS  
The print-out includes the seven high-order digits of the disk control field used to read the sector.
3. Each label printed is also punched into a card in the standard RDLIN card format. The disk-drive number is not punched. These cards can be used to enter the header labels with the card-to-disk program.  
After successfully punching the RDLIN card, the program prints:  
PUNCHED
4. The header label routine can be used to supply area control information to the main program for up to four files. See the specifications publication for a description of the RDLIN card used for this operations.  
If this operation is performed, the program prints the message:  
CTL. CARD 1 GENERATED
5. For each area definition supplied, the program prints:  
AREAx GENERATED  
x is a number (1 to 4) that indicates the first, second, third, or fourth area definition. This

message is followed by a print-out of the area definition generated.

6. If no errors occur, the program will process all of the disk header-label control cards and then print the message:  
HDR ROUTINE COMPLETE  
The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the header label routine are accompanied by a printed message. Figure 4 lists the messages printed, and the action that should be taken in the event of each of the possible halts.

The I/O check-stop switch should be ON during the disk header-label routine. In the event of an error when RDLIN cards are punched, run out the cards in the punch-feed path, and press START to repunch.

### HALTS AND MESSAGES DURING MAIN PROGRAM

Before analyzing the first system control card, the program prints:

SET I/O CHECK STOP SWITCH OFF

The system control card of a processing run is checked for the presence of 1-punches in column 4 and 5. If the punch is present in column 4, the program prints:

NO DISK ERROR HALTS

This message indicates that all programmed disk-error halts except access-inoperable errors are to be bypassed.

If the punch is present in column 5, the program prints:

NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control card analysis. If an error is detected in an area definition, the area is automatically omitted and the program continues.

The analysis of the first area-control card is preceded by:

DISK-TO-CARD

Each area definition is analyzed and printed in the following format:

X XXXXXXX-XXXXXX DR-X REF-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The disk drive or module being used (DR-X).
4. The reference number to be used by card-to-disk, if punched.
5. TR, if track-record format.
6. ERR, if there are any errors in the area definition.

Any of the following conditions are detected and indicated as control card errors:

- a. Lower limit not zero-sector of a track.
- b. Lower limit greater than upper limit.

If none of the area definition analyses are flagged with the ERR message, the program skips to channel 1 and halts. Pressing START causes the program first to reproduce the area-control card. Each of the areas defined are then punched. These cards are selected into stacker 4. Any mispunched cards, or blank cards used to clear the feed path, are dropped into the NP pocket.

If upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to read the next card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts.

The incorrectly punched card can be corrected and replaced in the hopper. Press START to read the next card.

After completing the areas defined in the first card (or generated by the header-label routine) the program checks for a second area control card. If one is present, it is read and analyzed, and the process is repeated.

This program can be followed by other program decks. If a card is read with a comma (set-word-mark operation code) in column 1, the program branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk-error halts that can be encountered by this program are listed in Figure 5. In addition to the disk errors, the program halts in the event of an uncorrectable punch error.

When a punch error is detected, the program goes into a routine that attempts the operation four more times. All mispunched cards fall into the normal pocket. If the card is punched correctly, the program continues. If the card cannot be correctly punched after five attempts, the program halts after printing:

PUNCH ERR

The operator can press START to attempt the operation four more times.

## CARD-TO-DISK PROGRAM

The card-to-disk program reloads card files punched by the disk-to-card program, or loads data punched in the same format as produced by that program.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

Under normal operation of the program, if no errors are encountered, the following messages are printed during the operation of the disk header label routine.

1. Each disk header label (RDLIN) control card is checked for validity, when read. If no errors are detected in the RDLIN card or in the date card, the program prints:  
DELETE XXXXXX-XXXXXX ON YYDDD  
This message gives the area limits within which all expired header labels are to be deleted, and the date.
2. Each disk header label deleted is printed with the message:  
DELETED .....
3. Each label entered on the output pack is printed with the message:  
ENTERED .....
4. After all RDLIN cards have been processed, the program prints:  
HDR ROUTINE COMPLETE  
The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header-label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

If the operator fails to punch the drive number in a RDLIN card, the program will halt after printing:  
DRIVE NOT PUNCHED

The operator can run out the cards, punch the drive number, and replace the card in the read hopper. Press START to reread the card.

All other programmed halts that can occur during the operation of the header label routine are accompanied by a printed message. Figure 4 lists the messages printed, and the action that should be taken in the event of each of the possible halts.

### HALTS AND MESSAGES DURING MAIN PROGRAM

Before analyzing the system control card, the program prints:

SET WRITE ADDRESS MODE KEY ON

The system-control card is checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4 the program prints:  
NO DISK ERROR HALTS

This message indicates that all programmed disk-error halts except access-inoperable errors are to be bypassed.

If the punch is present in column 5, the program prints:

NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted, and the program continues.

The analysis of the first area-control card is preceded by the message:

CARD-TO-DISK

Each area definition is analyzed and printed in the following format:

X XXXXXX-XXXXXX DR-X REF-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The disk drive or module being used (DR-X).
4. The disk drive or module to which the addresses on the pack are referenced (REF-X).
5. TR, if track-record format.
6. ERR, if there are any errors in the area definition. Any of the following conditions are detected and indicated as control card errors:
  - a. Lower limit not zero-sector of a track
  - b. Lower limit greater than upper limit.

If none of the area definition analyses are flagged with the error message, the program skips to channel 1 and halts. Pressing the start key causes the program to proceed to load the cards for each of the areas defined in the control card. After loading these areas, the program will read and analyze the next area control card, if one is present.

If, upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can:

1. Remove the data cards from the hopper.
2. Press the nonprocess run-out key to remove the cards in the feed path.
3. Supply a new area-control card, and the correct data cards.
4. Press START RESET and START to process the new area control card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts. After running out the cards in the feed path, the card that contains the incorrectly defined area can be repunched and replaced in the hopper. Pressing START causes the program to read the next card.

When the program detects that the last card indicator is ON, it prints the message:

EOJ

and halts. All areas specified in the area control card(s) have been processed.

This program can be followed by other program decks. The next program follows the last data card to be loaded. If a card is read with a comma (set-word-mark instruction operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk error halts that can be encountered by this program are listed in Figure 5. With the exception of the control-card-analysis halt, all other programmed halts occur as a result of card errors. The messages printed with all errors except the no-control-card halt include the address of the disk track that was being assembled when the error occurred. In each case, the track indicated has not been written.

When a halt occurs, the operator must:

1. Remove the rest of the cards from the hopper (the card that caused the halt is the last card in the stacker).
2. Press the nonprocess run-out key to remove the cards from the card feed path.
3. Either place the correct cards for the entire track (starting with 001) in the hopper, or supply a new area-control card.
4. Press START, or START RESET and START as directed.

If a new area-control card is supplied, the program will print:

NOT PROCESSED

followed by the limits of each of the areas defined in the previous card that were not processed.

#### 1. NO CTL CARD

Cause. Either the first card read was not an area-control card, or the program has finished loading the last area defined and has read a card that is neither another area-control card nor the first card of a loader program.

Action. Supply the necessary area-control card and press START.

#### 2. WRONG DATA - CTL XXXXXX

Cause. The first five positions of the last card read do not contain the five low-order digits of the address of the disk track that is being assembled. The card may be either the wrong data card, or an area-control card in the wrong place.

Action. The operator can either:

- a. Supply the correct data cards for this track (starting with 001) and press START, or
- b. Supply a new area control card followed by the correct data cards, and press START.

#### 3. WRONG DATA CTL XXXXXX PRESS START RESET, START

Cause. The program has read either the last card or a card that has a comma in column 1 (load card), before completing the areas defined. The address printed is that of the first track not processed.

Action. The operator can:

- a. Supply the data cards for the remaining areas defined or a new area control card and press START RESET, and START to continue.

#### 4. SEQ XXXXXX

Cause. A data card is out of sequence.

Action. The operator can either:

- a. Supply the correctly sequenced data cards for this track, (starting with 001), and press START, or
- b. Supply a new area control card, and press START.

#### 5. EXCESS DATA XXXXXX

Cause. The count of the data characters in the cards for this track exceeds the correct amount for a track.

Action. The operator can either:

- a. Supply the correct data cards for this track (starting with 001), and press START, or
- b. Supply a new area control card, and press START.

## COPY DISK PROGRAM

The copy disk program is used to copy disk files:

1. From one pack or module to another while retaining the same addresses.
2. Into another area on another disk pack or module or on the same disk pack or module.
3. Back into the same area on the same pack or module while changing the address reference.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header-label routine, if no errors are encountered.

1. Any header label found on the input pack by searching for the file-identification field given in a RDLIN card is printed with the message:  
FOUND. . . . .  
The print-out includes the seven high-order digits of the disk control field used to read the sector.
2. Each header label the program finds on the input pack by searching within the limits given in a RDLIN card is printed with the message:  
LIMITS. . . . .  
The print-out includes the seven high-order digits of the disk control field used to read the sector.
3. Expired labels on the output pack are deleted, if they are within the limits given in either the input header label, or in a separate RDLIN card for the output pack. If no errors are detected in the RDLIN card or in the date, these limits and the date are printed in the message:  
DELETE XXXXXX-XXXXXX ON YYDDD
4. Each disk header label deleted is printed with the message:  
DELETED. . . . .
5. Each label entered on the output pack is printed with the message:  
ENTERED. . . . .  
The print-out of labels deleted and entered includes the seven high-order digits of the disk-control field used to write the sector.

6. The header label routine can be used to supply area-control information to the main program for up to four files (see the specifications publication for a description of the RDLIN card used for this operation). If this operation is performed, the program prints the message:  
CTL. CARD 1 GENERATED
7. For each area definition supplied, the program prints:  
AREAx GENERATED  
x is a number (1 to 4) that indicates the first, second, third, or fourth area definition. This message is followed by a print-out of the area definition generated.
8. After all RDLIN cards have been processed, the program prints:  
HDR ROUTINE COMPLETE  
The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header-label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the header-label routine are accompanied by a printed message. Figure 4 lists the messages printed, and the action that should be taken in the event of each of the possible halts.

### HALTS AND MESSAGES DURING MAIN PROGRAM

After the main program deck is read in, the program prints:

- SET WRITE ADDRESS MODE KEY ON  
The system control card is checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4 the program prints:  
NO DISK ERROR HALTS  
This message indicates that all programmed disk-error halts except access-inoperable errors are to be bypassed.  
If the punch is present in column 5, the program prints:  
NO ANALYSIS HALTS  
This message indicates that the program will not halt after it prints the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted, and the program continues.

The analysis of each area-control card is preceded by the message:

COPY DISK

The area control cards used with the copy disk program can be in two different formats. The program checks columns 18-20 for the presence of the entry: REL. The presence of this entry indicates that the file is to be relocated into a different relative range of addresses.

If the file is not to be relocated, the analysis of each area definition in the card is printed in the following format:

XXXXXXXX-XXXXXX DR-X TO DR-X REF-X TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The input disk drive or module.
4. The output disk drive or module.
5. The disk drive or module to which the addresses on the output pack or module refer at this time.
6. TR, if track-record format.
7. ERR, if any errors are detected.

If the file is to be relocated, the contents of the control card are printed in the same format, followed by:

RELOCATE TO XXXXXXX-XXXXXX (ERR)

The following conditions are detected and indicated as control card errors:

1. Mode not punched as M or L.
2. Lower limit not zero-sector of a track.
3. Lower limit greater than upper limit.
4. When relocating, output area not equal in size to input area.

If none of the area-definition analyses are flagged with the error message, the program skips

to channel 1 and halts. Pressing START causes the program to proceed to copy each of the areas defined in the control card. After copying these areas, the program will attempt to read the next area-control card. If one is present, it is analyzed and printed.

If, upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to cause the program to skip these areas, and proceed to the next card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts. The card that contains the incorrectly defined area can be repunched and replaced in the hopper. Pressing START causes the program to read the next card.

When the program detects that the last-card indicator is on, it prints the message:

EOJ

and halts. All areas specified in the area-control card(s) have been processed.

This program can be followed by other program decks. If a card is read with a comma (set-word-mark operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

Errors encountered while the program is attempting disk operations are the only conditions under which programmed error halts occur. Figure 5 lists the messages printed and the action that should be taken in the event of each of the possible halts.

## PRINT DISK PROGRAM

The print disk program is used to print the contents of any desired areas of disk storage.

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header label routine, if no errors are encountered.

1. Any header-label the program finds by searching for the file-identification field given in a RDLIN card is printed following the message:  
FOUND . . . . .  
The print-out includes the seven high-order digits of the disk-control field used to read the sector.
2. Each header label the program finds by searching within limits given in a RDLIN card is printed following the message:  
LIMITS . . . . .  
The print-out includes the seven high-order digits of the disk-control field used to read the sector.
3. The header label routine can be used to supply area control information to the main program for up to four files (see the specifications publication for a description of the RDLIN card used for this operation). If this operation is performed, the program prints the message:  
CTL. CARD 1 GENERATED
4. For each area definition supplied, the program prints:  
AREAx GENERATED  
x is a number (1 to 4) that indicates the first, second, third, or fourth area definition. This message is followed by a print-out of the area definition generated.
5. If no errors occur, the program will process all of the disk-label control cards, and print the message:  
HDR ROUTINE COMPLETE  
The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the header label routine are accompanied by a printed message. Figure 4 lists the messages printed and the action that should be taken in the event of each of the possible halts.

### HALTS AND MESSAGES DURING MAIN PROGRAM

Column 7 of the system-control card must contain a 1- or a 2-punch to indicate if a 100 or a 132 position printer is to be used. When the system-control card is read, the program prints one of the two following messages:

MODEL 1 PRINTER or  
MODEL 2 PRINTER

The first system control card is checked for the presence of 1-punches in columns 4 and 5. If the punch is present in column 4, the program prints:

NO DISK ERROR HALTS

This indicates that all programmed disk error halts, except access-inoperable errors, are to be bypassed.

If the punch is present in column 5, the program prints:

NO ANALYSIS HALTS

This message indicates that the program will not halt after printing the area-control-card analysis. If an error is detected in an area definition, the area is automatically omitted and the program continues.

The analysis of the first area control card is preceded by the message:

PRINT DISK

Each area definition is analyzed and printed in the following format:

X XXXXXX-XXXXXX DR-X SC-X WM TR ERR

This line contains:

1. An M or L to indicate move or load mode.
2. The lower and upper limits of the area.
3. The disk drive or module being used (DR-X).
4. The character to be substituted for unprintable characters (SC-X).
5. WM, if indication of word marks is to be printed.
6. TR, if track record format.
7. ERR, if there are any errors in the area definition.

Any of the following conditions are detected and indicated as control card errors:

- a. Mode not punched as M or L.
- b. Lower limit not zero-sector of a track.
- c. Lower limit greater than upper limit.

If none of the area-definition analyses are flagged with the ERR message, the program skips to channel 1 and halts. Pressing START causes the program to proceed to print each of the areas defined in the control card.

If, upon examining the analysis of the card, the operator realizes that the areas defined are not the areas desired, he can press START RESET and START to cause the program to skip these areas and read the next card.

If any of the area definitions are flagged as in error, the program skips to channel 1 and halts. The card that contains the incorrectly defined area can be repunched and replaced in the hopper. Pressing START causes the program to attempt to read the next card.

When the program senses that the last-card indicator is ON, it prints the message:

EOJ

and halts. All areas specified in the area control card(s) have been processed.

This program can be followed by other program decks. If a card is read with a comma (set-word-mark operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

Errors encountered while the program is attempting disk operations are the only conditions under which programmed error halts occur. Figure 5 lists the messages printed and the action that should be taken in the event of each of the possible halts.

## DISK-RECORD-LOAD PROGRAM

The disk-record-load program is used to make changes in either disk addresses or records. The input to the program consists of both control information and the data or address to be inserted (see specifications publication for the format of input cards).

### NORMAL MESSAGES DURING DISK-LABEL ROUTINE

The following messages are printed during the operation of the disk header label routine, if no errors are encountered.

1. Any header label the program finds by searching for the file-identification field given in a RDLIN card is printed following the message:  
    FOUND  
    The print-out includes the seven high-order digits of the disk-control field used to read the sector.
2. Each header label the program finds by searching within limits given in a RDLIN card is printed following the message:  
    LIMITS  
    The print-out includes the seven high-order digits of the disk-control field used to read the sector.
3. After all RDLIN cards have been processed, the program prints:  
    HDR ROUTINE COMPLETE  
    The program does not halt at this point. The rest of the program deck is loaded. The operator should check the printed results of the header label routine.

### ERROR HALTS DURING DISK-LABEL ROUTINE

All programmed halts that can occur during the operation of the header label routine are accompanied by a printed message. Figure 4 lists the messages printed and the action that should be taken in the event of each of the possible halts.

### HALTS AND MESSAGES DURING MAIN PROGRAM

At the beginning of each processing run, the program prints:

DISK RECORD LOAD

The program reads the system control card, and checks for the presence of a 1-punch in column 4. If the punch is present, the program prints the message:

NO DISK ERROR HALTS

Each input card is checked for valid control information. The user can specify (in column 15) for the program to:

1. Print an analysis of the input card and halt (blank).
2. Print an analysis of the input card, and continue unless an error is detected (1-punch).
3. Print and halt only if an error is detected (2-punch).

The input card analysis is printed in the following format:

X XXXXXX HO-XXXX LG-XX DR-X SC WM TR ADDR

This line contains:

1. An M or L to indicate move or load mode.
2. The address of the sector or the track record to be operated upon (XXXXXX).
3. The high-order position of the data field within the record (HO-XXXX).
4. The length of the data field (LG-XX).
5. The disk drive or module that is being used (DR-X).
6. SC, if the program is to scan for duplicate addresses, and to change all sectors on the track with the same address.
7. WM, if a word mark is to be written with the first character in the field.
8. TR, if track-record format.
9. ADDR, if an address is to be changed.
10. The data or address to be inserted.

The analysis is followed by the message:

WR ADDR KEY (ON or OFF)

This message gives the correct setting of the write-address key for the operation.

The program checks each input card for errors and, if any are detected, prints the message:

ERR OMIT ABOVE CARD

The following conditions are detected and indicated as errors:

1. Mode not punched as M or L.
2. The field that was to be entered is too long (high-order position of field plus length of field is greater than sector or track-record length).
3. The address that was to be entered is not one of the twenty valid addresses for the track.

The program halts in the event of any of these errors. The operator can press START to read the next card. The card in error can be corrected and replaced in the hopper.

If no errors are detected, press START to process the card.

If the user chooses to have the program print an analysis of every card and halt, he can inspect the analysis of the card before processing it. If he sees that incorrect information (other than that detected by the program) was punched, he can press START RESET and START to bypass the card. The program will print:

OMIT ABOVE CARD

and read the next card. This same message is printed, if a card is bypassed because of a disk error.

When the program detects that the last-card indicator is ON, it prints the message: EOJ and halts. This program can be followed by other program decks. If a card is read with a comma in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

#### ERROR HALTS DURING MAIN PROGRAM

The disk error halts discussed in the Disk Operation Errors section are the only programmed halts in this program other than the input-card analysis halt.

Note: When an operation is performed in the address mode (when the program is changing an address or scanning for duplicate addresses) the write-disk-check is performed with the address of the first sector on the track.

## DISK-LABEL PROGRAM

The disk-label program is used to set up the initial header labels on a disk pack, and to perform necessary maintenance operations on existing header labels.

### DESCRIPTION OF PROGRAM DECK

The program deck is made up of three sections (Figure 3). The entire deck is used for all operations. The cards that follow the last card of the loader program have sequence numbers that start with 001 punched in columns 73-75 of each card.

#### Loader

The first six cards constitute a self-loading loader program. These cards clear core storage and load the rest of the program deck.

#### Address-Mode Section

The operations of creating a label track (NEW) and restoring a label track to normal addresses (RNA) are performed in the address mode. The RDLIN cards used for these operations are inserted before card 024. This card contains the comment:

```
$$$ NEW AND RNA CTL CARDS PRECEDE  
THIS CARD $$$
```

This card should be specially marked for ease of identification.

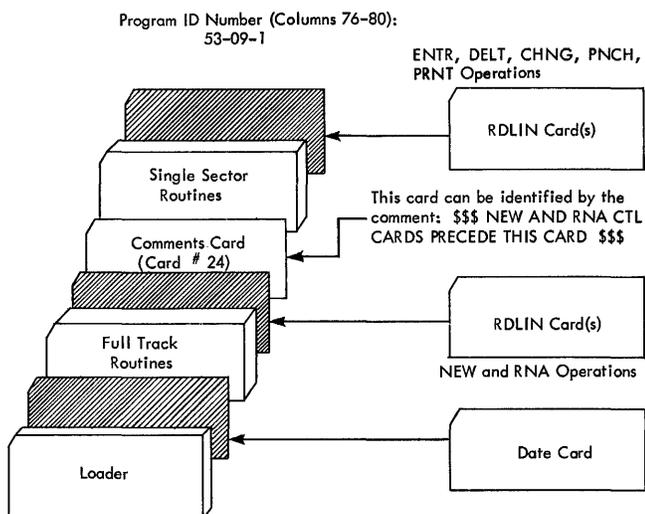


Figure 3. Disk-Label-Program Deck Makeup

#### Sector-Mode Section

The operations of printing, punching, entering, deleting, and changing labels are performed in the sector mode. Place the RDLIN cards for these operations after the last card of the program deck.

### NORMAL MESSAGES DURING OPERATION OF PROGRAM

#### Set Up Initial Header Label Track

When a RDLIN card is read with the entry NEW, the program prints:

```
CREATE LABEL TRACK ON DR-X - SERIAL#XXXXXX
```

If no errors are encountered when the program performs the operation, the program prints:

```
OK
```

**Note:** The last track of the pack must contain the address 0X9980 before the program creates the label track.

#### Restore Normal Addresses

When a RDLIN card is read with the entry RNA, the program prints:

```
REMOVE LABEL TRACK ON DR-X
```

If no errors are encountered when the program performs the operation, the program prints:

```
OK
```

After processing all RDLIN cards placed after the address-mode section, the program prints:

```
FULL TRACK OPS COMPLETE
```

The program reads in the remainder of the program for single sector operations. If a single sector operation is to be performed, the program prints:

```
TURN WRITE ADDRESS OFF
```

A halt occurs if a NEW or RNA operation has been performed.

#### Enter Labels

When a RDLIN card is read with the entry ENTR, the program prints:

```
ENTER (file identification) ON DR-X  
DELETING LABELS IN XXXXXXX-XXXXXXX  
EXP. BY YYYY
```

Each expired label is deleted and printed following the message:

DELETED . . . . .

This message contains the drive number and the address of the label deleted.

After deleting all expired labels, the program prints:

SEARCH COMPLETE

The new label is then written on disk, and printed following the message:

ENTERED . . . . .

This message contains the drive number and the address of the label entered.

### Print Labels

When a RDLIN card is read with the entry PRNT, the program prints:

DISPLAY (file identification)

if a specific header label is to be printed, or

DISPLAY ALL LABELS

if all labels are to be printed.

The print-out of each label is preceded by the seven high-order positions of the disk control field used to read the sector.

### Print And Punch Labels

When a RDLIN card is read with either of the entries PNCH or PNCX, the program prints a message indicating the labels to be printed and punched and the format (standard or expanded RDLIN) to be punched. One of the following messages is printed:

PUNCH (file identification) ON DR-X 1 CARD/  
LABEL

PUNCH (file identification) ON DR-X 2 CARD/  
LABEL

PUNCH ALL LABELS ON DR-X 1 CARD/  
LABEL

PUNCH ALL LABELS ON DR-X 2 CARD/  
LABEL

At the completion of the run, the last card punched will be the last card in the stacker.

The I/O check-stop switch should be ON during this operation. In the event of a punch error, run out the cards in the punch-feed path, and press START to repunch.

### Delete Labels

When a RDLIN card is read with the entry DELT, the program prints:

DELETE (file identification),

if a specific header label is to be deleted, or

DELETING LABELS IN XXXXXX-XXXXXX

EXP. BY YYDDD

if all expired labels within specified limits are to be deleted.

Each label found is then printed as read, along with the disk control field used to read the sector.

After deleting all labels specified, the program prints:

SEARCH COMPLETE

### Change Labels

When a RDLIN card is read with the entry CHNG, the program prints:

CHANGE (file identification)

The label is then printed as read, along with the disk-control field used to read the sector, and again as it appears after the change.

After processing the last RDLIN card, the program prints:

EOJ

and halts. This program can be followed by other program decks. If a card is read with a comma (set-word-mark instruction operation code) in column 1, the program prints EOJ and branches to 001. In this way, control is transferred to the first instruction of another loader program.

### ERROR HALTS

All of the halts listed in Figures 4 and 5 can occur in this program.

## ERRORS DETECTED IN PROCESSING DISK-HEADER LABELS

The disk-header-label program and the header-label routines of the other eight programs use similar diagnostic and checking procedures. The detection of any error causes the program to halt. One of the messages shown in Figure 4 is printed.

### DISK OPERATION ERRORS

In the event of a disk error, each of the eight programs try the operation three times before it prints the error message and halts. In all cases, pressing START causes the program to attempt the operation

again. Pressing START RESET and START causes a skip to the:

1. Next track (clear disk, tape-to-disk, card-to-disk, copy disk, and print disk programs).
2. Next area (disk-to-tape, and disk-to-card programs).
3. Next card (disk-record-load and disk-header-label programs).

In each case, the error message is followed by a print-out of the disk address and the contents of the disk input/output area. The track indicated by the address printed has not been processed.

Figure 5 lists the error messages printed in the event of each of the possible disk errors.

Message	Programs	Cause of Halt	Operator Action Required
INVALID CARD	All	One of the following errors was detected in a RDLIN card or date card: 1. RDLIN not punched in columns 16-20. 2. The lower limit is greater than the upper limit. 3. In the disk label program: a. The operation symbol (columns 2-5) is either not valid, or the RDLIN card is in the wrong place. b. The second card of an expanded RDLIN entry is missing. 4. The date entered in the date card: a. Is not numeric. b. Contains a year (YY) that is less than 64. c. Contains a day (DDD) that is greater than 365. 5. The creation-date field in the RDLIN card is not all-numeric. 6. The date card is missing.	Inspect the message preceding this one (RDLIN card, or limits and date) to determine the source of the error. The operator can either bypass the card, or correct the error and replace the card in the hopper. Press START to read the next card.
NOT HDR	All  (3rd option not available in: Disk-to-Tape Disk-to-Card Print Disk Disk-Record-Load)	This halt should not occur. It indicates that during a previous use of the disk pack, a program has written incorrect information in the label track. The last track does have addresses in the range: 000180-000199. Otherwise, an unequal-address-compare error would have resulted. The sector read does not have 1HDRb in the first five positions.	After checking the print-out of the sector, the operator should decide whether the operation should continue. There are three options: 1. Mount a new disk pack on the drive, and press START. The program will then completely check the new label track with the same card. 2. Press START RESET and START to read the next card. The same halt will occur if any additional RDLIN cards reference the same drive. 3. Restart at address 333, and press START. The program will enter the label-identifier field (1HDRb), blank the file-identification field, and write the label back onto the track. This option is available only in those programs that produce disk output.
NOT EXP	Clear Disk, Tape-to-Disk, Card-to-Disk, Copy Disk, Disk Label	The label routine has located the unexpired header label of a file that overlaps the area to be written.	The user has three options if this halt occurs: 1. Mount a new disk pack on the drive, and press START. The program will then completely check the new label track within the same limits. 2. Press START RESET and START to proceed to the next card. 3. Restart at address 334 for Clear Disk program and address 333 for Tape-to-Disk, Card-to-Disk, Copy Disk, and Disk Label Programs. Press START. The program will delete the unexpired label, and continue.
HDR NOT FOUND	Disk-to-Tape, Disk-to-Card, Print Disk, Disk-record-Load, Disk Label	This halt occurs if either: 1. A specific header label was requested, and none could be found with the same file-identification field. 2. No header label was found within the limits specified. If limits are given, the programs require that at least one header label fall within those limits.	The user has two options if this halt occurs: 1. Mount a new disk pack on the drive, and press START. The program will then completely check the new label track within the same limits, or for the same file-identification field. 2. Press START RESET and START to proceed to the next card.
NO ROOM ON DR	Tape-to-Disk, Card-to-Disk, Copy-Disk, Disk Label	A disk header label was to be entered in a label track that already contains 19 unexpired header labels.	The user has two options if this halt occurs: 1. Mount a new disk pack, and press START to begin the operation again for the new pack. 2. Press START RESET and START to proceed to the next card.
EXCESS - NOT DONE	Disk-to-Tape, Disk-to-Card, Print-Disk, Copy-Disk	This message is printed after the print-out of an area definition generated by the disk header-label routine. The area definition was not supplied to the main program because the maximum of four definitions has already been furnished.	The program does not halt. The operator should either supply area-control cards for the additional areas desired, or rerun the program with the excess cards.
N DSK ERR X DSK ERR W DSK ERR V DSK ERR B DSK ERR	All	These messages are printed in the event of a disk error during the disk-label program, or the header-label routines of the other programs. The print-out includes the disk address that is being used, and the contents of the disk input/output area. See Figure 5 for a list of possible causes and the action to be taken.	

Figure 4. Error Messages During Disk-Header Label Operations

MESSAGE	CAUSE
N ERR ADDR X XXXXXX	Indicates an Access-Inoperable error. Possible causes include: <ol style="list-style-type: none"> <li>1. Wrong disk-drive number specified.</li> <li>2. Disk pack not properly loaded, READY light not ON</li> <li>3. Write-Address key not set correctly.</li> </ol>
X ERR ADDR X XXXXXX	Indicates an Unequal-Address-Compare error. Possible causes include: <ol style="list-style-type: none"> <li>1. The wrong address reference was given</li> <li>2. Invalid address(es) on the track</li> <li>3. The upper limit given for an area in a labeled disk pack is greater than 0X9979. (The label track is written with addresses 000180-000199. The program would try to read or write this track with all addresses in the range: 0X9980-0X9999).</li> </ol>
W ERR ADDR X XXXXXX	Indicates a Wrong-Length-Record error. Possible causes include: <ol style="list-style-type: none"> <li>1. A group-mark was read from disk storage in the move mode. Its location in core-storage coincides with that of a word mark left from a previous load mode operation.</li> <li>2. During a previous run, a word-separator was read from disk, and written on tape in the load mode. If the tape is now read in the load mode, the word separator becomes a word mark, and the record is one character short. When the tape-to-disk program attempts to write this record on the disk, the group-mark with a word mark required to end the operation will not be present.</li> </ol>
V ERR ADDR X XXXXXX	Indicates a Parity error.
B ERR ADDR X XXXXXX	Indicates that a busy condition has existed for an excessive period of time.

Figure 5. Disk-Operation Error Halts



**International Business Machines Corporation**  
**Data Processing Division**  
 112 East Post Road, White Plains, N.Y. 10601  
 [USA Only]

**IBM World Trade Corporation**  
 821 United Nations Plaza, New York, New York 10017  
 [International]