



## Systems Reference Library

### IBM 7040/7044 Utility Programs

This publication provides programmers and operators with complete instructions for using the utility programs available for the IBM 7040/7044 Data Processing System. The utility programs that are described are the IBM 7040/7044:

- Absolute Binary Load Program
- Basic Core Dump Program
- Core and Tape Dump Program
- Tape File Generator Program
- IBM Disk/Drum Storage Utility Programs
  - Format Track Generator
  - Home Address and Record Address Generator
  - Load Disk/Drum
  - Dump Disk/Drum
  - Restore Disk/Drum
  - Clear Disk/Drum

## PREFACE

The purpose of this publication is to describe utility programs that are available for the IBM 7040/7044 Data Processing System and to provide programmers and operators with complete instructions for using these utility programs.

The reader is assumed to have completed a basic course in programming the IBM 7040/7044 and/or to be familiar with the contents of the following IBM publications:

IBM 7040/7044 Systems Summary, Form A28-6289.

IBM 7040/7044 Data Processing Systems, Form D22-6645.

IBM 1301 Disk Storage with 7000 Series Data Processing Systems, Form D22-6576-2.

IBM 7320 Drum Storage with IBM 7040/7044 Systems, Form A22-6793.

The following information applies to the utility programs discussed in this publication:

1. A tape unit is defined as an IBM 729 Magnetic Tape Unit (II, IV, V, or VI), or an IBM 7330 Magnetic Tape Unit.

2. Unless otherwise stated, a printer is defined as a 132-character printer.

3. With the addition of an IBM Serial I/O Adapter (#7080), an IBM 1401 Processing Unit can be used to replace an IBM 1414-4 Input/Output Synchronizer on Channel A.

4. All programs require an IBM 7106 or 7107 Processing Unit with the Extended Performance Instruction Set option. The Absolute Binary Load and Basic Core Dump programs assume a minimum of 4,096 words of core storage, whereas all other programs assume a minimum of 8,192 words.

5. Disk/drum programs require an IBM 7904 Model 1 or 2 Data Channel with an IBM 7631 Model 2, 3, or 4 File Control for IBM 1301 Disk Storage. IBM 7320 Drum Storage requires an IBM 7631 File Control, Model 2, Serial No. 12000 and above, and Drum Storage Adapter #3451.

### MAJOR REVISION (February, 1964)

This publication, Form C28-6317-1, obsoletes Form C28-6317. Changes have been made to reflect the IBM 7320 capability that has been added to the Disk Storage Utility Programs.

Copies of this and other IBM publications can be obtained through IBM Branch Offices.

Address comments concerning the content of this publication to:

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## GENERAL CONCEPTS

The general classification -- utility program -- is applied to three broad types of programs. The first type is concerned with the housekeeping function, i. e., routines which do not contribute directly to the solution of a problem, but which do contribute directly to the operation of the computer. Programs to set storage to an initial condition, usually zeros or blanks, and routines which facilitate the loading of a program or data into storage are examples of the housekeeping function.

The second type is composed of utility programs which perform the file conversion function. In many computer installations, it is often more convenient to retain a file of records, or a program itself, in a form of storage other than that in which it was originally contained. If an installation is tape-oriented, most of its records, if not all, will be contained on tape. But before records can be written on tape, they must be introduced into the computer by another form of storage, e. g., cards. To transform these card records into tape records, a card to tape utility program is necessary. File conversion programs are used with any form of external storage. Other examples of this type of utility program are the disk/drum storage dump and restore disk/drum programs. The contents of all or part of disk or drum storage may be written onto tape by the dump program. The restore program may then be used to return the data to disk or drum storage.

The last type of utility program deals with storage printouts. A storage printout, or dump, as it is commonly called, is a display of all or part of a particular storage device. Storage printouts are either static or dynamic, depending on how storage is to be dumped. If the dump program is not part of the sequential operation of the program in core storage, and is used either after a successful machine run or in order to locate an error in the routine in core storage, it is a static printout. A core storage dump of this type is also referred to as a "post mortem" dump.

If, however, the storage printout is taken at checkpoints during the computing operation, it is called a dynamic storage dump. In both the static and dynamic dump, either all of storage or only selected data in storage can be printed. A dynamic dump of selected data is often referred to as a "snapshot."

The primary use of utility programs is in program testing. The testing of certain programs only requires the use of a load program and a storage print

program. Program testing for a tape-oriented installation might also include a tape dump and a tape file generator. The function of the tape file generator is to create test data on tape, taking data in the form of cards, or card-images on tape, and creating blocked records from them. Test data can also be generated internally by a technique called pseudo-random number generation. Using a mathematical equation to select data, a sequence of words is "randomly" generated onto tape. Data of this type is very useful in testing a sort program.

For disk or drum-oriented systems, it is necessary to generate format tracks, home addresses, and record addresses for the cylinders that are to be used for the test. Then it may be necessary to load the data to be used during the test onto disk or drum storage. At the end of the test, a dump of certain portions onto tape may be desired for subsequent tape print. The utility operations necessary for this test run are provided by a format track generation routine, a home address and record address generation routine, a load disk/drum routine, and a dump disk/drum routine.

Since utility routines are used as generalized programs to remove many of the burdens of programming, they must be flexible enough to allow the user to assign specifications that fit the requirements of his particular problem. The flexibility is supplied through the use of control cards.

Control cards contain parameters that specify a portion or portions of the utility program needed to fulfill the requirements of the user. The control card format often allows liberal use of English language statements.

## IBM 7040/7044 UTILITY PROGRAMS

The following utility programs are discussed in this publication:

7040/7044 Absolute Binary Load Program: This program loads absolute column binary program cards from either cards or tape.

7040/7044 Basic Core Dump Program: This program produces a listing of the contents of core storage. Each location is represented by an octal word with or without mnemonics. The output is produced on the on-line printer.

7040/7044 Core and Tape Dump Program: The contents of tapes written in either BCD mode or binary mode and mounted on either a 729 Magnetic Tape

Unit or a 7330 Magnetic Tape Unit or the contents of core storage are written as output by this program. The output is written on-line by a printer, or on tape, or both on-line and on tape. The program has provisions for dumping selected portions of core storage or tape, and then restoring core storage.

7040/7044 Tape File Generator Program: This program is used either to build files or to generate files on magnetic tape in a variety of formats. The program is capable of producing fixed-length or variable-length logical records in BCD mode or binary mode. These records can be written as separate or blocked tape records. The input to build these records is in the form of cards or card-images on tape, or the records are generated by internal pseudo-random generation techniques.

7040/7044 Format Track Generator Program: This program generates and writes one or more format tracks on disk or drum storage. The generated information can be written on a single track, on two nonsequential tracks, or on a series of sequential tracks by using one control card. The Format Track Generator program can be used, and often is used, with the Home and Record Address Generator within the same machine run.

7040/7044 Home Address and Record Address Generator Program: This program generates the home address identifiers and record addresses for one or more tracks on disk or drum storage. However, provision is made for inclusion of the user's own home address identifiers and record addresses. Both the Format Track Generator and the Home Address and Record Address Generator occupy core storage at the same time, and either one or both can be executed in the same machine run.

7040/7044 Dump Disk/Drum Program: This program dumps the contents of disk or drum storage onto tapes mounted on either a 729 Magnetic Tape Unit or a 7330 Magnetic Tape Unit. A single track, two nonsequential tracks, or a series of tracks can be dumped by using a control card to specify the dump parameters. The dump tape contains control card information necessary to restore disk or drum storage.

7040/7044 Restore Disk/Drum Program: This program takes all, or sections, of the output from the Dump Disk/Drum program and places it back on the disk or drum in its original form in the same area from which it was dumped.

7040/7044 Load Disk/Drum Program: This program loads tape records onto a designated area of disk or drum storage by one of two methods. One method, the Single Record Method of operation, permits the user to load one or more records sequentially onto each specified track. The other method, the Full Track Method of operation, permits the user to load one or more records onto each specified track. The records are, however, first blocked in core storage and then written in the Full Track Method.

7040/7044 Clear Disk/Drum Program: This program clears designated areas of disk or drum storage by one of two methods. One method, the Single Record Method of operation, permits the user to clear one or more records on each specified track. The other method, the Full Track Method of operation, permits the user to clear all record areas on each specified track. The tracks to be cleared and the character to which they are cleared is specified on control cards.

## DESCRIPTION

Only absolute binary decks can be loaded with this program. However, if a self-loading card is encountered, the loader simulates the machine load sequence. A self-loading card, in this case, is defined as a binary card in which the first word decrement is greater than  $(00526)_8$ . A 7-9 punch in column 1 is required to indicate that the card is column binary. Once loading is initiated, it continues until the loader encounters a binary transfer card, a self-loading card, and end of file, or an error condition. The last two conditions cause a recognizable program halt. A blank check sum field in the binary card causes the incorrect check sum condition to be ignored. In case of an end-of-file halt, the operator may make the required correction in the deck, e.g., add a transfer card. On card read errors, a specific restart procedure is specified. In the event of a storage parity error, the loading procedure must be repeated. When a transfer card is encountered, control is transferred to the specified location.

The loader is read into core storage beginning at  $(100)_8$ , and occupies core storage up to, and including  $(212)_8$ . Programs to be loaded must, therefore, originate above  $(212)_8$ .

When a transfer card is read, the loader releases control and remains intact, thus making multiphase loading possible. Loading is reinitialized by the execution of a transfer to location  $(00122)_8$ , provided Index Register 2 contains less than  $(77660)_8$ .

If a memory protect trap or an interval timer trap occurs during loading, the loader may lose control.

It is necessary, therefore, for the programmer to make sure that these traps do not occur during multiphase loading.

## MACHINE REQUIREMENTS

A tape unit or a 1402 Card Read Punch with the column binary feature.

## OPERATION

The procedure for loading the load program is as follows:

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.

## HALTS

| <u>Instruction Counter</u> | <u>Explanation</u>   |
|----------------------------|--|
| $(42)_8$                   | A core storage parity error has occurred. There is no recovery. The run must be restarted.   |
| $(122)_8$                  | An end of file has been encountered, or a check sum error has occurred. Press the START button to read the next record or to accept the incorrect check sum. |

## 7040/7044 BASIC CORE DUMP PROGRAM

### DESCRIPTION

This program produces a listing of the contents of all of core storage, and is designed for use by an installation having no tape units.

All necessary control information, such as machine storage capacity and type of dump format desired, is entered through the sense switches. The sense switch settings are indicated in the section entitled "Operation."

This program is loaded by a special loading or "sneak-on" procedure that destroys only 27 core storage locations, this being the area occupied by one card record. The locations affected are  $(100)_8$  through  $(132)_8$ . The second card of the binary deck causes the upper 480 locations of core storage to be punched into 20 cards. This area is then occupied by the Basic Core Dump program.

The output appears as either six or eight octal words per line, depending upon whether a 100-character or a 132-character printer is being used. Each line is preceded by the octal location of the first word of the line. The deck produced by the assembly is for a 100-character printer, and may be modified for a 132-character printer by following the procedure described in the section entitled "Operation."

Under sense switch control, the mnemonic operation code representing each octal word is printed directly beneath the word. The format of the dump is shown in Figure 1.

When the dump is completed, the cards that were punched out at the beginning of the program can be fed into the card reader, and the binary information on them is edited and printed out to conform to the format of the rest of the dump.

Restoration of the upper portion of core storage is effected by loading cards 32 and 33 of the binary deck followed by the 20 cards which were punched out to preserve the original contents of upper storage. With the exception of the 27 locations destroyed by the "sneak-on" procedure, the index registers, the Divide Check Indicator, the I/O Check Indicator and the Overflow Indicator, and all of core storage are restored.

If the upper 480 locations are not critical to the program to be dumped, or if the restoration of this portion of core storage is not required, time can be saved by deleting the card that causes the contents of this area to be punched out, i. e., the second card in the binary deck.

The Basic Core Dump handles the occurrence of a storage parity trap or interval timer trap. When the dump program is in control, a storage parity

trap causes an identifiable halt. If the Memory Protect Indicator is on, the operator must manually reset the console before loading the Basic Core Dump program so that a trap does not occur. In this case, all indicators and registers are destroyed.

### MACHINE REQUIREMENTS

1. A 1403 Printer.
2. A 1402 Card Read Punch with the column binary feature.

### OPERATION

#### Assembly of the Symbolic Deck

The Basic Core Dump deck is produced in two stages. In the first stage, the symbolic deck is assembled, using any 7040/7044 assembly program. This assembly produces a binary deck of 50 cards. The second stage is effected by placing this deck in the 1402 Card Read Punch and pressing the LOAD button. This operation produces the final Basic Core Dump deck of 33 binary cards. This deck is composed of the following:

- Cards 1-3 are "sneak-on" cards.
- Cards 4-23 are main program cards.
- Cards 24-28 are "sneak-on" cards.
- Cards 29-31 are dump overlay cards.
- Cards 32-33 are restore cards.

Successful completion of the second stage is indicated by a halt with the Instruction Counter equal to  $(332)_8$ . Any other halt indicates an error in either reading or punching, and the job should be restarted.

The program, as distributed, is assembled to use a 100-character printer that has a capacity of six words per line. In order to use a 132-character printer, the relevant "sneak-on" card should be removed. This is card 26 in the binary deck, and it may be identified by blanks in columns 31 through 51.

#### Operating Instructions

1. After removing cards 32 and 33 (restore cards), place the final binary deck in the 1402 Card Read Punch.
2. Ready the printer and the 1402 Card Read Punch. The punch should have at least 20 cards in the hopper.
3. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.

# HALTS

| <u>Instruction Counter</u>  | <u>Explanation</u>   | <u>Instruction Counter</u>  | <u>Explanation</u>  |
|---|--|---|---|
| (103) <sub>8</sub>  | The contents of 480 locations of upper core storage have been punched out, and the program has been entered. Sense switch settings must now be made as follows:  |   | are placed in the reader, preceded by cards 32 and 33 (restore cards); then press the LOAD button.  |
|   | Switch 1 ON designates mnemonics.  | (122) <sub>8</sub>  | Restoration is complete.  |
|   | Switches 3 ON and 4 ON indicate a core storage size of 32,768 words (32K).   | (42) <sub>8</sub>   | A core storage parity error has occurred. There is no recovery.   |
|   | Switches 3 ON and 4 OFF indicate a core storage size of 16,384 words (16K).  | (111) <sub>8</sub>  | A parity error has been detected during the initial storage scan. HPR 70707 is stored in the error locations. The operator may display the contents of location (40) <sub>8</sub> , the decrement of which contains the address of the word in error. Press the START button. |
|   | Switches 3 OFF and 4 ON indicate a core storage size of 8,192 words (8K).  | (126) <sub>8</sub>  | A read error has occurred during restoration. Reload beginning with the second restore card and press the LOAD button.  |
|   | Switches 3 OFF and 4 OFF indicate a core storage size of 4,096 words (4K).   |   |   |
|   | Press the START button.  |   |   |
|   | The cards that were punched out at the beginning of the program may now be placed in the reader in preparation for dumping upper core storage. The user should make certain that there are 20 cards by running any excessive cards in the punch hopper into the stacker and by removing any blank cards from the beginning or end of the deck. | (127) <sub>8</sub>  | An error has occurred while reading the program into upper core storage. Reload beginning with the third card and press the LOAD button.  |
|   | If the program is run on a machine that has a larger core storage than is designated by the sense switch settings, the dump of the upper 480 locations of storage lists these locations as upper core storage in the designated machine rather than in the larger machine.   | (131) <sub>8</sub>  | An error has occurred either while reading the first two "sneak-on" cards, or while punching out the contents of upper core storage. Reload the deck and press the LOAD button.   |
|   | The lower core storage dump is complete. When the cards that were punched out have been placed in the reader, press the START button.  | (132) <sub>8</sub>  | A parity error has occurred while reading a card. Reload the reader from the card in error and press the LOAD button.   |
|   | The upper core storage dump is complete. The dump is ended, unless restoration is desired.   | (133) <sub>8</sub>  | A hole-count error has occurred while reading a card. Reload from the card in error and press the LOAD button.  |
| (104) <sub>8</sub>  |  | (7125) <sub>8</sub> for 4K<br>(17125) <sub>8</sub> for 8K<br>(37125) <sub>8</sub> for 16K<br>(77125) <sub>8</sub> for 32K | A read error has occurred while dumping upper core storage. Reload from the card in error and press the START button.   |
| (7043) <sub>8</sub> for 4K<br>(17043) <sub>8</sub> for 8K<br>(37043) <sub>8</sub> for 16K<br>(77043) <sub>8</sub> for 32K | To restore core storage, the cards that were punched out   | (7351) <sub>8</sub> for 4K<br>(17351) <sub>8</sub> for 8K<br>(37351) <sub>8</sub> for 16K<br>(77351) <sub>8</sub> for 32K | A printer error has occurred. There is no recovery. Press the START button to continue dumping.   |

|       |               |               |               |               |               |               |               |               |
|-------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 76450 | 00000076014   | 00000076026   | 00000076103   | 000000000060  | 00000076140   | 00000076137   | -043163474363 | -046244446247 |
| 76460 | 000000000001  | 000000000002  | 000000000003  | 000000000004  | 000000000005  | 000000000006  | 000000000102  | 000000000104  |
| 76470 | 000000000106  | 305020000000  | -072263432263 | -226663233062 | -206060626247 | -206060254542 | -206060314663 | -206060234644 |
| 76500 | -206060242363 | 312363512363  | -112423256363 | -150505076331 | 002000076522  | -150501075726 | 002000076522  | -050000076444 |
| 76510 | 077400150505  | -063400176521 | -134101075127 | 002000076515  | 002000076503  | -032000076426 | -134105076411 | 002000076505  |
| 76520 | 002000076521  | -150500076444 | -076500000006 | -350500176525 | 177777176511  | -134106075530 | 002000075537  | -050000076440 |
| 76530 | 077400100010  | 060200277536  | -060000277537 | -134107075604 | 002000076540  | -134106075767 | -012000076540 | 060000177546  |
| 76540 | 177776276541  | -134106076612 | 200001175574  | -134106075463 | 002000076552  | 053400175550  | -300000176552 | -050000077503 |
| 76550 | 060200177536  | 200001176550  | 077400100020  | 077400200024  | 056000077503  | -076300000022 | 056000177536  | -076300000022 |
| 76560 | 060200277536  | -076300000022 | 056000177537  | -076300000022 | 060200277537  | -076300000022 | 056000077503  | -076300000022 |
| 76570 | 060200277540  | -050000177540 | 060200277541  | -050000177541 | 060200277542  | 177774176576  | 200005276555  | 077400200010  |
| 76600 | -150505076443 | 077400100024  | -134107277546 | -162302177536 | -134107277547 | -162305177540 | 177776276607  | 200005176602  |
| 76610 | -134106076616 | -162700076640 | -300000076616 | 050000076653  | -170400000024 | 002000076624  | -300000076622 | 050000076655  |
| 76620 | -170400000003 | 002000076624  | 050000076654  | -170400000011 | 007400476676  | -300000076632 | -162306076625 | -162307075604 |
| 76630 | -162307076616 | 002000075572  | -162306076616 | -134106075463 | 002000075360  | -134106074405 | 002000074060  | 002000074733  |
| 76640 | 000000074062  | 077400100025  | 050000077503  | 060100177503  | 200001176643  | 002060076640  | 000000074060  | 000000074060  |
| 76650 | 000000000010  | 000000077760  | 000000100000  | 077512077457  | 077504077462  | 077512077470  | 000000003720  | 000000070140  |
| 76660 | 000000074060  | 000000077777  | -076060606060 | -116060606060 | -062112006351 | 232222205125  | -232332064760 | 262442156300  |
| 76670 | 252552110000  | -202600010000 | 247300074241  | 222451074232  | -224526074221 | 000000000020  | -300000076703 | 300000076724  |
| 76700 | -162700074755 | 300003076773  | 002000074061  | 076603001212  | 054000076772  | 002200076706  | 077400100061  | -134106076625 |
| 76710 | 100001176721  | 100002176712  | -176613001212 | -300071176717 | 054000076777  | 077400100001  | 002000076720  | 054000076776  |
| 76720 | 002200076721  | 063400176706  | -134106076677 | 002000400001  | 050000076770  | -170400000026 | 062100076770  | 073700100000  |
| 76730 | 077400200072  | 100002276732  | -134106076625 | 002000076737  | -300000076740 | -162306076734 | 177777276745  | -162307076734 |
| 76740 | 075400000000  | -300071276744 | 040000076460  | 077400200001  | -162300177752 | 063400276730  | 177545176747  | -377545176755 |
| 76750 | -150501075127 | -162305177544 | -300000076767 | 050000076453  | -162305177544 | -075400100000 | 076000000006  | 062200076771  |
| 76760 | 063400476766  | 050000076771  | 062100076770  | 007400477172  | 076600001203  | 054000076771  | 077400400000  | 002000400001  |
| 76770 | 077456077546  | 300232077546  | 300025077456  | -054660466463 | -076463606445 | 316360606060  | 300001076352  | 300001076255  |
| 77000 | 000000075323  | 053500176770  | 300231177006  | -162307076752 | 007400476730  | -162306076752 | 002060077000  | -134107076677 |
| 77010 | -162700077166 | 053400177400  | 002000077014  | 076400001206  | 200001177013  | 063400177400  | -053400177452 | 300000000104  |

Figure 1A

|       |                       |                       |                        |                       |                        |                        |                      |                        |
|-------|-----------------------|-----------------------|------------------------|-----------------------|------------------------|------------------------|----------------------|------------------------|
| 77130 | 200001177120<br>FIX   | 002000077110<br>TRA   | 077400100000<br>AXT    | 002060077044<br>TRA * | 077457077424<br>AXT    | 300001077136<br>TXH    | 000000000000         | -066463214725<br>PSLB* |
| 77140 | -204546636051<br>FIX  | 252124706060<br>FIX   | -066463214725<br>PSLB* | -203145652143<br>TNX  | 312460606060<br>TXH    | -066463214725<br>PSLB* | -204321222543<br>TNX | -202551514651<br>TNX   |
| 77150 | 000000000000          | 007400477172<br>TSX   | 077000001203<br>WEF    | 300024077457<br>TXH   | 007400477172<br>TSX    | 076600001203<br>WRS    | 054000077161<br>RCHA | 007400477172<br>TSX    |
| 77160 | 077000001203<br>WEF   | 300024077424<br>TXH   | 076400001203<br>BSR    | 076400001203<br>BSR   | 076400001203<br>BSR    | 002060077150<br>TRA *  | 000000000000         | -162700077000<br>TSL   |
| 77170 | -162700077150<br>TSL  | 002060077166<br>TRA * | 077400100031<br>AXT    | -162307077204<br>MSP  | 052200400001<br>XEC    | 052200400002<br>XEC    | 006000077176<br>TCOA | 002200077203<br>TRCA   |
| 77200 | -076000001000<br>ETTA | 002000077226<br>TRA   | 002000400003<br>TRA    | 076400001203<br>BSR   | 300000077213<br>TXH    | 050000077243<br>CLA    | 040200076460<br>SUB  | 060100077243<br>STO    |
| 77210 | 010000077220<br>TZE   | -162306077204<br>MSM  | 002000077174<br>TRA    | 076610001203<br>WRS   | 200001177174<br>TIX    | -162700074755<br>TSL   | 300003077244<br>TXH  | 002000077224<br>TRA    |
| 77220 | -162700074755<br>TSL  | 300003077247<br>TXH   | 100005177223<br>TIX    | 063400177243<br>SXA   | -162700077044<br>TSL   | 002000077172<br>TRA    | 050000075172<br>CLA  | 060100077424<br>STO    |
| 77230 | 063400477241<br>SXA   | 053400477150<br>LXA   | 063400477234<br>SXA    | -162700077150<br>TSL  | 077400400000<br>AXT    | 063400477150<br>SXA    | -162700074755<br>TSL | 300003077252<br>TXH    |
| 77240 | -162700077044<br>TSL  | 077400400000<br>AXT   | 002000400003<br>TRA    | 000000000036          | -066463214725<br>PSLB* | -206651316325<br>TNX   | -202551514651<br>TNX | 030060466463<br>FAD *  |
| 77250 | 214725602551<br>TIX   | -114651626060         | -066463214725<br>PSLB* | -202545246046<br>TNX  | 266051252543<br>TIX    | 063400177265<br>SXA    | -162307077270<br>MSP | 076600001226<br>WRS    |
| 77260 | 054000400001<br>RCHA  | 006000077261<br>TCOA  | 002200077267<br>TRCA   | -076000001000<br>ETTA | 042000000000<br>HPR    | 077400164030<br>AXT    | 002000400002<br>TRA  | 076400001206<br>BSR    |
| 77270 | 300000077274<br>TXH   | -162306077270<br>MSM  | 077400100031<br>AXT    | 002000077257<br>TRA   | 076610001206<br>WRS    | 200001177257<br>TIX    | -162700074755<br>TSL | 300003077301<br>TXH    |
| 77300 | 002000077265<br>TRA   | -222351216323<br>TNX  | 306066516325<br>TXH    | -202551514651<br>TNX  | 063400177313<br>SXA    | 077400100144<br>AXT    | 076200001226<br>RDS  | 054000400001<br>RCHA   |
| 77310 | 006000077310<br>TCOA  | 002200077315<br>TRCA  | 003000400002<br>TEFA   | 077400164030<br>AXT   | 002000400003<br>TRA    | 076400001206<br>BSR    | 003000077317<br>TEFA | 200001177306<br>TIX    |
| 77320 | -162700074755<br>TSL  | 300003077323<br>TXH   | 002000077313<br>TRA    | -222351216323<br>TNX  | 306051252124<br>TXH    | -202551514651<br>TNX   | 063400477346<br>SXA  | 077400400002<br>AXT    |
| 77330 | -162700077360<br>TSL  | 077400477546<br>AXT   | 002000077342<br>TRA    | 063400477346<br>SXA   | 077400400001<br>AXT    | 002000077340<br>TRA    | 063400477346<br>SXA  | 077400400003<br>AXT    |
| 77340 | -162700077360<br>TSL  | 053400476657<br>LXA   | 063400477344<br>SXA    | 007400477304<br>TSX   | 303720070140<br>TXH    | 042000000000<br>HPR    | 077400402377<br>AXT  | 002000400001<br>TRA    |
| 77350 | 063400477346<br>SXA   | -162306075377<br>MSM  | -162307075417<br>MSP   | 077400400003<br>AXT   | -162700077360<br>TSL   | 007400477255<br>TSX    | 303720070140<br>TXH  | 002000077346<br>TRA    |

Figure 1B

## 7040/7044 CORE AND TAPE DUMP PROGRAM

### DESCRIPTION

The contents of tapes written in either BCD mode or binary mode and mounted on either a 729 Magnetic Tape Unit or a 7330 Magnetic Tape Unit or the contents of core storage are written as output by this program. The output is written on-line by a printer, or on tape, or both on-line and on tape.

The program handles the occurrence of a storage parity trap or an interval timer trap. When the Core and Tape Dump program is in control, a storage parity trap causes an identifiable halt. If the Memory Protect Indicator is on, the operator must manually reset the console before loading the Core and Tape Dump program so that a trap does not occur. In this case, all indicators and registers are destroyed.

### MACHINE REQUIREMENTS

1. A 1402 Card Read Punch with the column binary feature or a tape unit, for program input.
2. A printer or another tape unit for output.
3. A tape unit for intermediate use.
4. If a tape dump is requested, a tape unit is required for the tape to be dumped.

### CONTROL CARDS

The following notation is used in the control card formats in this program:

1. Lower case letters indicate that a substitution must be made.
2. Upper case letters must be present in the form given, if used.
3. Material in brackets [ ] represents an option which may be omitted or included at the user's choice.
4. Material in braces { } indicates that a choice of the contents is to be made.
5. A number over the first letter of a field indicates the initial card column of the field.

#### OUTPUT Card

|   |        |                                  |
|---|--------|----------------------------------|
| 1 | 8      | 16                               |
|   | OUTPUT | { TAPE<br>PRINT<br>TAPE, PRINT } |

This card designates the type of unit on which the output is written. An OUTPUT card must be included in the first logical control card file and must

appear before any PRINT or REM cards. The options available for output are:

|                                  |
|----------------------------------|
| { TAPE<br>PRINT<br>TAPE, PRINT } |
|----------------------------------|

TAPE -- The storage that is dumped is written on the assembly-defined output tape in an off-line printing format.

PRINT -- The output is listed on the on-line printer.

TAPE, PRINT -- The output is both listed and written on tape.

#### CORE Card

|   |      |                      |
|---|------|----------------------|
| 1 | 8    | 16                   |
|   | CORE | [ address, address ] |

This card specifies that core storage is to be dumped. If column 16 is blank, all of core storage is dumped. When only a partial dump is desired, that section of core storage is defined by its upper and lower address in octal. The order of the addresses in the field is interchangeable.

Example: CORE 1132,300

#### TAPE Card

|            |      |                                       |
|------------|------|---------------------------------------|
| 1          | 8    | 16                                    |
| [ L<br>N ] | TAPE | Unit Specification, { BINARY<br>BCD } |

There are two types of TAPE control cards. The first type defines the tape unit to be dumped, the mode in which the tape is written, the manner of dumping, and initialization procedures. The second type of TAPE card is used only to specify a change in the mode. It is used when a tape has previously been defined by a TAPE card of the first type, but the files on the tape are written in different modes. No rewinding or other initialization is effected by the second type of TAPE card. The format of the second type of TAPE card is:

|   |      |                   |
|---|------|-------------------|
| 1 | 8    | 16                |
|   | TAPE | { BINARY<br>BCD } |

The use of the column 1 control character is restricted to the first type of TAPE card in which a tape is defined. The second type of TAPE card simply facilitates switching of mode from binary to BCD or vice versa and ignores column 1.

A TAPE card must always be followed by a DUMP card, a BACK card, or a SKIP card.

```
[
L
N
]
```

L -- designates a labeled tape dump. Files on the tape, however, do not necessarily have to be labeled. If a file has a label, the checkpoint character is examined. If this character is greater than zero, the checkpoint records that follow the header label are spaced over until a tape mark is detected. If this character is equal to zero, spacing does not take place. Labels are not counted as files and are written without modification. If a trailer label is not encountered following a labeled file, this is indicated in the output listing by the message -- END FILE, NO TRAILER. Unlabeled files are dumped as though column 1 were blank. Before dumping, the specified tape is rewind.

N -- specifies an unlabeled tape dump. The tape is not rewind before it is dumped. Operations are restricted to record count control. If the DUMP card, the BACK card, or the SKIP card designates file count control after a TAPE card that contains the control character N, an error message is typed and the control card is ignored. Since there is no rewind, the tape might be positioned in the middle of the reel. Because of this, the record count is set at 1000 and the file count is set to zero. Backspacing is restricted to 1,000 records; so the presence of negative record counts listed in the dump is impossible. Tape file marks are counted as records under N control.

If this field is omitted, an unlabeled tape dump is assumed. No search is made for labels, and any labels on the tape will be counted as files. A count is kept of files and records within the files. The presence of tape marks is indicated during the dump. Before dumping, the tape is rewind.

```
{
BINARY
BCD
}
```

BINARY -- The file(s) or record(s) to be dumped from tape are in binary mode.

BCD -- The file(s) or record(s) are in BCD mode.

#### DUMP Card

```
1      8      16
      DUMP   Numeric Quantity, {FILES
                                RECORDS}
```

This card causes the dump. It specifies in decimal numbers how many files or records on the tape are to be dumped.

#### BACK Card

```
1      8      16
      BACK   Numeric Quantity, {FILES
                                RECORDS}
```

This card causes the tape to backspace the specified number of files or records. The numeric quantity is a decimal number.

#### SKIP Card

```
1      8      16
      SKIP   Numeric Quantity, {FILES
                                RECORDS}
```

This card causes the tape to skip over the specified number of files or records. The numeric quantity is a decimal number.

#### FORMAT Card

```
1      8      16
      FORMAT Format Letter
```

The format of the dump is determined by this card. The following six formats are available, and each is referred to by a format letter from A-F (see Figure 2).

- A -- Octal, eight words per line.
- B -- BCD, sixteen words per line.
- C -- Octal or mnemonic (SQUEZY).
- D -- Octal and SQUEZY. If SQUEZY would normally appear as octal, it is not listed twice, but is suppressed. Otherwise, both octal and SQUEZY are listed in Format D.
- E -- Octal and mnemonics.
- F -- Octal, mnemonics, and BCD. A BCD interpretation of the word is listed to the right of the mnemonic.

#### END Card

```
1      8      16
      END    [EOJ
              RESTORE]
```

This card serves as a delimiter for logical control card files and initiates processing defined by the cards in the file.

```
[EOJ
RESTORE]
```

EOJ -- Terminates control card reading.

RESTORE -- Restores core storage, indicators, and registers to their original values.

If this field is omitted, it is assumed that another control card file is to follow.

|       |               |               |               |               |               |               |               |               |
|-------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 77020 | -300000000111 | -134106075417 | 007400477336  | -053400277453 | -053400477454 | -050000077455 | 073400100000  | 014000077030  |
| 77030 | -300377177033 | 076700000002  | 177400177033  | -300177177036 | 022100077034  | 177600177036  | -300077177040 | 054000000000  |
| 77040 | -162306077017 | 002000077011  | -162700074755 | 300003077137  | 300000000000  | 300000077044  | -176210001203 | -077300000154 |
| 77050 | 054000077135  | 006000077051  | 050000077136  | -012000077042 | 010060077044  | 063400177132  | 077400100024  | 076200001203  |
| 77060 | 054000077153  | 006000077061  | 002200077105  | 003000077110  | 050000077457  | 040200075170  | -010000077110 | -050000077460 |
| 77070 | 056000077461  | -076300000006 | -162700077401 | -050000077460 | -076500000060 | -162700075134 | 040000077421  | 040200077422  |
| 77100 | -012000077113 | 077200001203  | -162700074755 | 300003077142  | 002000077046  | 052200077063  | 076400001203  | 200001177057  |
| 77110 | -162700074755 | 300003077145  | 002000077046  | 077400100012  | -050000077134 | -170400000024 | 050000075171  | 060100077424  |
| 77120 | 076200001203  | 054000077153  | 006000077122  | 002200077126  | 003000077132  | 002000077110  | 003000077127  | 076400001203  |
| 77130 | 200001177120  | 002000077110  | 077400100000  | 002060077044  | 077457077424  | 300001077136  | 000000000000  | -066463214725 |
| 77140 | -204546636051 | 252124706060  | -066463214725 | -203145652143 | 312460606060  | -066463214725 | -204321222543 | -202551514651 |
| 77150 | 000000000000  | 007400477172  | 077000001203  | 300024077457  | 007400477172  | 076600001203  | 054000077161  | 007400477172  |
| 77160 | 077000001203  | 300024077424  | 076400001203  | 076400001203  | 076400001203  | 002060077150  | 000000000000  | -162700077000 |
| 77170 | -162700077150 | 002060077166  | 077400100031  | -162307077204 | 052200400001  | 052200400002  | 006000077176  | 002200077203  |
| 77200 | -076000001000 | 002000077226  | 002000400003  | 076400001203  | 300000077213  | 050000077243  | 040200076460  | 060100077243  |
| 77210 | 010000077220  | -162306077204 | 002000077174  | 076610001203  | 200001177174  | -162700074755 | 300003077244  | 002000077224  |
| 77220 | -162700074755 | 300003077247  | 100005177223  | 053400177243  | -162700077044 | 002000077172  | 050000075172  | 060100077424  |
| 77230 | 063400477244  | 053400477150  | 063400477234  | -162700077150 | 077400400000  | 063400477150  | -162700074755 | 300003077252  |
| 77240 | -162700077044 | 077400400000  | 002000400003  | 000000000036  | -066463214725 | -206651316325 | -202551514651 | 030060466463  |
| 77250 | 214725602551  | -114651626060 | -066463214725 | -202545246046 | 266051252543  | 063400177265  | -162307077270 | 076600001226  |
| 77260 | 054000400001  | 006000077261  | 002200077267  | -076000001000 | 042000000000  | 077400164030  | 002000400002  | 076400001206  |
| 77270 | 300000077274  | -162306077270 | 077400100031  | 002000077257  | 076610001206  | 200001177257  | -162700074755 | 300003077301  |
| 77300 | 002000077265  | -222351216323 | 306066516325  | -202551514651 | 063400177313  | 077400100144  | 076200001226  | 054000400001  |
| 77310 | 006000077310  | 002200077315  | 003000400002  | 077400164030  | 002000400003  | 076400001206  | 003000077317  | 200001177306  |
| 77320 | -162700074755 | 300003077323  | 002000077313  | -222351216323 | 306051252124  | -202551514651 | 053400477346  | 077400400002  |
| 77330 | -162700077360 | 077400477546  | 002000077342  | 063400477346  | 077400400001  | 002000077340  | 063400477346  | 077400400003  |
| 77340 | -162700077360 | 053400476657  | 063400477344  | 007400477304  | 303720070140  | 042000000000  | 077400402377  | 002000400001  |
| 77350 | 063400477346  | -162306075377 | -162307075417 | 077400400003  | -162700077360 | 007400477255  | 303720070140  | 002000077346  |
| 77360 | 000000077341  | -063400477365 | 177717477363  | -063400477366 | 053400477400  | 300001477374  | -300000477376 | 100001477370  |

Figure 2A

```

74320 *C67JJ*C77M5*507WZ$J37(/O+07J+60C7W05007W/5)0*W03-07W00+07L*0+07L*7)08005007W04007U 6107WP6)0*W0
74340 0+07- 7(0806PV0006P,0003+01*LKPTG00R3-07W/0+07K8H047K*H007LG6107W05007M*6107JI*C67LR7(0800802GL
74360 H05GLT***LS806GLFN00*(/5 0*(SY06GJGPV0006***GLV7(0+03*537(/$J5GWX0+07L*0+0GM5+01GL=0+07K8*G07P*
74400 H057N70+07- *C77Y+*C67- *C77*=H0F7N=0+07-LH007-**C67M7N007(/5 07(S*G07(1N007(A6207(B0+07- 0007-Q
74420 7(0+0=6)0GXH$J67W*0+ 7M**W=0005-07X*0B07MG6)07X60+ 7M**537(/*C27M50+07- $J77W**G07W*C77W**C77W*
74440 *537(/$J47WX0+07MM*C67W*$J47W0+07MP*C67W**537(S$J47WU0+07M*$C67W*$J47WV0+07M**C67W*$J77W**G07YM
74460 0+07- 0007P,0007P=0007P(0007P*0007P5 -BH-0/-BH-0SJD1J01JDIJOUKF+K0*G07P*H027N50+07- $J17W=$J07WZ
74500 BCD BINARYOPERATION ERRQR READER ERRORREADER END FILE. RELOAD H007NB6007(Q7(08*Q6)0*(R$J67J*
74520 *G07RF*C67N=5)0G(R5)0*-KY0070DY007NWH007NP5)0G(QY00*NN5007(RJ007N)0(OPP*0(OPPT7R,7R(7N-7P*0+07N)
74540 *C670B0(OPP*6007(R801GNM***NH6)0G(Q0+07- H00GNRO(OPP*Y00*NU801GN$0(OPPT7R,7R(7N*7P*****NR$J77J*
74560 ***NR5B070A***GNTY00G0=6)0G(R0+07- $J77NF0+07055007-K4207(QJ+07N**G07RF0+07- Y00G01H01*025)0*(R
74600 0+070540C7U 7)0800*G07RF0+07NGY00G- 801*07 01*NU5B070A***G00H00G07$J67Q0$J67Q40+07NU7(0-02Y0070A
74620 800POA7U00G0+01POA0+07NU6)0*PU$J67$=0(OP,QH00G0I0(OPP**C770M7(0+020+070*5B070A*C77P*0(OPPT7,*7R(
74640 70S70K0+07P55B07P**+01G0)Y0070*7(0+085B070A0(OPPT7,*7R*70S70**C67P*0+07P5*C67P)0+C7P55B07P**+01G00
74660 *C670M809G0)*C67Q80(OPP*5)0*PO$J77J*0+07P15007(Q4007U 6107(Q6007(R$J77NF0+07- ***0*6)0*PDH00*0H
74700 0+07- 5007(R4007U 6107(R***P-6007(*5007(R4007U 6107(R0(OPRL6207-HN007(*6A07WPP*0800N007-'Y00*PC
74720 8***PA7*08000(OPRL6207-+5007,*6A07W06007W-*C67**=C67R5*G07Q*0+07$**G07W-H007PKN007-0H007P-N007-=
74740 *400040+07PN*C77P)N007-9*400020(OPW*7(0800$J67NF0+0701***P-6)0*PDH00*0I0+07- 0007M0*W40805- 7P*
74760 0B07P/4+00000+ 7P*500-017Z000B6A07P=500-027Z000B6A07P*5B -015000000007P,00 -020000000+0-036)0PQ9
75000 Y007Q57(0-05$J67QB0+07Q*Y007Q*$J77ND$J67QB0+07Q9*G07Q*7(0-00*C77QB0+0-015B070A6)0PQV0(OPPT7Z$7R*
75020 7QX7Q05007(*H007QF4207RYJ007Q,0+07Q.4207RZ1007Q.5007(*4207R=J007QZ7(0-056)0PQL0(OPPT7Z$7R(7QR7QK
75040 5B070A0+07Q05B07P*7(0-005B070A+01PQ)$J67QB0+07Q,0+07QZ$J77QB0+07Q/*C67Q4*C670**557(Z$J57U 0+07Q/
75060 0+07-0$J77ND0(OPW*0+07Q95B07P*7(0-00+01PQ*$J67QB0+07Q,$J77ND*G07Q**C77Q45B070A0+07Q9000000N007IQ
75100 0(OPRL6207-E*G07W-5007-8*40006Y007R*5007RA*40002$J67Q0$J67Q40+07R**400020+07R**C77R5*400060(OPW*
75120 0+ 7Q*7RB7(V, END FILE, NO TRAILER0000007=00206007(R5007U 6107(Q0+ 7RF0000007408007*0000-46*RX
75140 H03*RK801*R*0+ 7R)6)OPR/7(0-052E6PRY+01PRNPT0006*507*37(0-05PT0006$J27R-0+07R *507*3+01PR-PT0006
75160 +01PR*7(0-000+0-01002)+000*00001M0000000001000001HDR 1E0F 1E0R H010107S00007S00007S00007S0000
75200 *C770*7(0-010)0PO+0(OPPT7R,7R*7Q/7P*N)0PO+801P-27-+7(*7-)7(*7-*7(*7-*7(*EXCESS RECORD IN
75220 TAPE FILE , RECORD , WORDSREUNDANCY RECORD PROB

```

Figure 2B

|       |               |               |               |               |               |               |               |               |               |         |               |               |               |              |       |         |
|-------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------|---------------|---------------|---------------|--------------|-------|---------|
| 76510 | AXT           | 50505,1       | SXD           | 76521,1       | CCS1          | 75127         | TRA           | 76515         | TRA           | 76503   | ANA           | 76426         | CCS5          | 76411        | TRA   | 76505   |
| 76520 | TRA           | 76521         | PCSO          | 76444         | LGR           | 6             | -350500176525 | 177777176511  | MIT           | 75530   | TRA           | 75537         | CAL           | 76440        |       |         |
| 76530 | AXT           | 10,1          | SLW           | 77536,2       | STQ           | 77537,2       | PLT           | 75604         | TRA           | 76540   | MIT           | 75767         | IMI           | 76540        | STZ   | 77546,1 |
| 76540 | 177776276541  | MIT           | 76612         | 200001175574  | MIT           | 75463         | TRA           | 76552         | LXA           | 75550,1 | -300000176552 | CAL           | 77503         |              |       |         |
| 76550 | SLW           | 77536,1       | 200001176550  | AXI           | 20,1          | AXI           | 24,2          | LDQ           | 77503         | LGL     | 22            | LDQ           | 77536,1       | LGL          | 22    |         |
| 76560 | SLW           | 77536,2       | LGL           | 22            | LDQ           | 77537,1       | LGL           | 22            | SLW           | 77537,2 | LGL           | 22            | LDQ           | 77503        | LGL   | 22      |
| 76570 | SLW           | 77540,2       | CAL           | 77540,1       | SLW           | 77541,2       | CAL           | 77541,1       | SLW           | 77542,2 | 177774176576  | 200005276555  | AXT           | 10,2         |       |         |
| 76600 | PCS5          | 76443         | AXI           | 24,1          | PLI           | 77546,2       | SAC2          | 77536,1       | PLI           | 77547,2 | SAC5          | 77540,1       | 177776276607  | 200005176602 |       |         |
| 76610 | MIT           | 76616         | ISL           | 76640         | -300000076616 | CLA           | 76653         | TMT           | 24            | TRA     | 76624         | -300000076622 | CLA           | 76655        |       |         |
| 76620 | TMT           | 3             | TRA           | 76624         | CLA           | 76654         | TMT           | 11            | TSX           | 76676,4 | -300000076632 | MSM           | 76625         | MSP          | 75604 |         |
| 76630 | MSP           | 76616         | TRA           | 75572         | MSM           | 76616         | MIT           | 75463         | TRA           | 75360   | MIT           | 74405         | TRA           | 74060        | TRA   | 74733   |
| 76640 | 000000074062  | AXT           | 25,1          | CLA           | 77503         | STD           | 77503,1       | 200001176643  | TRA           | *76640  | 000000074060  | 000000074060  |               |              |       |         |
| 76650 | 000000000010  | 000000077760  | 000000100000  | 077512077457  | 077504077462  | 077512077470  | 000000003720  | 000000070140  |               |         |               |               |               |              |       |         |
| 76660 | 000000074060  | 000000077771  | -076060606060 | SPM           | * 6060,6      | -062112006351 | 232222205125  | -232332064760 | 262442156300  |         |               |               |               |              |       |         |
| 76670 | 252552110000  | -202600010000 | 247300074241  | 222451074232  | -224526074221 | 000000000020  | -300000076703 | 300000076724  |               |         |               |               |               |              |       |         |
| 76700 | ISL           | 74755         | 300003076773  | TRA           | 74061         | WRS3          | 212           | RCHA          | 76772         | TRCA    | 76706         | AXT           | 61,1          | MIT          | 76625 |         |
| 76710 | 100001176721  | 100002176712  | CTR3          | 212           | -300071176717 | RCHA          | 76777         | AXI           | 1,1           | TRA     | 76720         | RCHA          | 76776         |              |       |         |
| 76720 | TRCA          | 76721         | SXA           | 76706,1       | MIT           | 76677         | TRA           | 1,4           | CLA           | 76770   | TMT           | 26            | STA           | 76770        | PAC   | ,1      |
| 76730 | AXT           | 72,2          | 100002276732  | MIT           | 76625         | TRA           | 76737         | -300000076740 | MSM           | 76734   | 177777276745  | MSP           | 76734         |              |       |         |
| 76740 | PXA           |               | -300071276744 | ADD           | 76460         | AXI           | 1,2           | SAC0          | 77752,1       | SXA     | 76730,2       | 177545176747  | -377545176755 |              |       |         |
| 76750 | PCS1          | 75127         | SAC5          | 77544,1       | -300000076767 | CLA           | 76453         | SAC5          | 77544,1       | PXD     | ,1            | CUM           |               | STD          | 76771 |         |
| 76760 | SXA           | 76766,4       | CLA           | 76771         | STA           | 76770         | TSX           | 77172,4       | WRS4          | 203     | RCHA          | 76771         | AXT           | ,4           | TRA   | 1,4     |
| 76770 | 077456077546  | 300232077546  | 300025077456  | -054660466463 | -076463606445 | 316360606060  | 300001076352  | 300001076255  |               |         |               |               |               |              |       |         |
| 77000 | 000000075323  | LAC           | 76770,1       | 300231177006  | MSP           | 76752         | TSX           | 76730,4       | MSM           | 76752   | TRA           | *77000        | PLT           | 76677        |       |         |
| 77010 | ISL           | 77166         | LXA           | 77400,1       | TRA           | 77014         | BSRA          | 206           | 200001177013  | SXA     | 77400,1       | LXD           | 77452,1       | 300000000104 |       |         |
| 77020 | -300000000111 | MIT           | 75417         | ISX           | 77336,4       | LXD           | 77453,2       | LXD           | 77454,4       | CAL     | 77455         | PAX           | ,1            | TOV          | 77030 |         |
| 77030 | -300377177033 | ALS           | 2             | 177400177033  | -300177177036 | DVP           | 77034         | 177600177036  | -300077177040 | RCHA    |               |               |               |              |       |         |
| 77040 | MSM           | 77017         | TRA           | 77011         | ISL           | 74755         | 300003077137  | 300000000000  | 300000077044  | SENA    | 203           | RQL           | 154           |              |       |         |
| 77050 | RCHA          | 77135         | TCOA          | 77051         | CLA           | 77136         | IMI           | 77042         | IZE           | *77044  | SXA           | 77132,1       | AXT           | 24,1         | RDSA  | 203     |

Figure 2C

|       |                             |                              |                              |                               |                              |                               |                             |                             |
|-------|-----------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|-----------------------------|-----------------------------|
| 76430 | -262263606060               | -222545606060                | -236743636731                | -234567633167                 | -206060636730                | 000000000000                  | 000000000000                | 000000000000                |
| 76440 | -206060606060               | -206060606060                | 000000000000                 | 076336000040                  | 000000000000                 | 000000000000                  | 000000075725                | 000000075766                |
| 76450 | 000000076014                | 000000076026                 | 000000076103                 | 000000000060                  | 000000076140                 | 000000076137                  | -043163474363               | -046244446247               |
| 76460 | 000000000001                | 000000000002                 | 000000000003                 | 000000000004                  | 000000000005                 | 000000000006                  | 000000000102                | 000000000104                |
| 76470 | 000000000106                | 305020000000                 | -072263432263                | -226663233062                 | -206060626247                | -206060254542                 | -206060314663               | -206060234644               |
| 76500 | -206060242363               | 312363512363                 | -112423256363                | -150505076331<br>PCS5 76331   | 002000076522<br>TRA 76522    | -150501075726<br>PCS1 75726   | 002000076522<br>TRA 76522   | -050000076444<br>CAL 76444  |
| 76510 | 077400150505<br>AXT 50505,1 | -063400176521<br>SXD 76521,1 | -134101075127<br>CCS1 75127  | 002000076515<br>TRA 76515     | 002000076503<br>TRA 76503    | -032000076426<br>ANA 76426    | -134105076411<br>CCS5 76411 | 002000076505<br>TRA 76505   |
| 76520 | 002000076521<br>TRA 76521   | -150500076444<br>PCSO 76444  | -076500000006<br>LGR 6       | -350500176525                 | 177777176511                 | -134106075530<br>MIT 75530    | 002000075537<br>TRA 75537   | -050000076440<br>CAL 76440  |
| 76530 | 077400100010<br>AXT 10,1    | 060200277536<br>SLW 77536,2  | -06000277537<br>STQ 77537,2  | -134107075604<br>PLT 75604    | 002000076540<br>TRA 76540    | -134106075767<br>MIT 75767    | -012000076540<br>IMI 76540  | 060000177546<br>STZ 77546,1 |
| 76540 | 177776276541                | -134106076612<br>MIT 76612   | 200001175574                 | -134106075463<br>MIT 75463    | 002000076552<br>TRA 76552    | 053400175550<br>LXA 75550,1   | -300000176552               | -050000077503<br>CAL 77503  |
| 76550 | 060200177536<br>SLW 77536,1 | 200001176550                 | 077400100020<br>AXT 20,1     | 077400200024<br>AXT 24,2      | 056000077503<br>LDQ 77503    | -076300000022<br>LGL 22       | 056000177536<br>LDQ 77536,1 | -076300000022<br>LGL 22     |
| 76560 | 060200277536<br>SLW 77536,2 | -076300000022<br>LGL 22      | 056000177537<br>LDQ 77537,1  | -076300000022<br>LGL 22       | 060200277537<br>SLW 77537,2  | -076300000022<br>LGL 22       | 056000077503<br>LDQ 77503   | -076300000022<br>LGL 22     |
| 76570 | 060200277540<br>SLW 77540,2 | -050000177540<br>CAL 77540,1 | 060200277541<br>SLW 77541,2  | -050000177541<br>CAL 77541,1  | 060200277542<br>SLW 77542,2  | 177774176576                  | 200005276555                | 077400200010<br>AXT 10,2    |
| 76600 | -150505076443<br>PCS5 76443 | 077400100024<br>AXT 24,1     | -134107277546<br>PLT 77546,2 | -162302177536<br>SAC2 77536,1 | -134107277547<br>PLT 77547,2 | -162305177540<br>SAC5 77540,1 | 177776276607                | 200005176602                |
| 76610 | -134106076616<br>MIT 76616  | -162700076640<br>TSL 76640   | -300000076616                | 050000076653<br>CLA 76653     | -170400000024<br>IMT 24      | 002000076624<br>TRA 76624     | -300000076622               | 050000076655<br>CLA 76655   |
| 76620 | -170400000003<br>TMT 3      | 002000076624<br>TRA 76624    | 050000076654<br>CLA 76654    | -170400000011<br>TMT 11       | 007400476676<br>ISX 76676,4  | -300000076632                 | -162306076625<br>MSM 76625  | -162307075604<br>MSP 75604  |
| 76630 | -162307076616<br>MSP 76616  | 002000075572<br>TRA 75572    | -162306076616<br>MSM 76616   | -134106075463<br>MIT 75463    | 002000075360<br>TRA 75360    | -134106074405<br>MIT 74405    | 002000074060<br>TRA 74060   | 002000074733<br>TRA 74733   |
| 76640 | 000000074002                | 077400100025<br>AXT 25,1     | 050000077503<br>CLA 77503    | 060100177503<br>STD 77503,1   | 200001176643                 | 002060076640<br>TRA *76640    | 000000074060                | 000000074060                |
| 76650 | 000000000010                | 000000077760                 | 000000100000                 | 077512077457                  | 077504077462                 | 077512077470                  | 000000003720                | 000000070140                |

Figure 2D

|       |                       |                       |                      |                      |                       |                      |                       |                      |
|-------|-----------------------|-----------------------|----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| 76700 | -162700074755<br>TSL  | 300003076773<br>TXH   | 002000074061<br>TRA  | 076603001212<br>WRS  | 054000076772<br>RCHA  | 002200076706<br>TRCA | 077400100061<br>AXT   | -134106076625<br>MIT |
| 76710 | 100001176721<br>TXI   | 100002176712<br>TXI   | -176613001212<br>PWR | -300071176717<br>TXL | 054000076777<br>RCHA  | 077400100001<br>AXT  | 002000076720<br>TRA   | 054000076776<br>RCHA |
| 76720 | 002200076721<br>TRCA  | 063400176706<br>SXA   | -134106076677<br>MIT | 002000400001<br>TRA  | 050000076770<br>CLA   | -170400000026<br>TMT | 062100076770<br>STA   | 073700100000<br>PAC  |
| 76730 | 077400200072<br>AXT   | 100002276732<br>TXI   | -134106076625<br>MIT | 002000076737<br>TRA  | -300000076740<br>TXL  | -162306076734<br>MSM | 177777276745<br>TXI   | -162307076734<br>MSP |
| 76740 | 075400000000<br>PXA   | -300071276744<br>TXL  | 040000076460<br>ADD  | 077400200001<br>AXT  | -162300177752<br>SACO | 063400276730<br>SXA  | 177545176747<br>TXI   | -377545176755<br>TXL |
| 76750 | -150501075127<br>PCSI | -162305177544<br>SAC5 | -300000076767<br>TXL | 050000076453<br>CLA  | -162305177544<br>SAC5 | -075400100000<br>PXD | 076000000006<br>COM   | 062200076771<br>STD  |
| 76760 | 063400476766<br>SXA   | 050000076771<br>CLA   | 062100076770<br>STA  | 007400477172<br>TSX  | 076600001203<br>WRS   | 054000076771<br>RCHA | 077400400000<br>AXT   | 002000400001<br>TRA  |
| 76770 | 077456077546<br>AXT   | 300232077546<br>TXH   | 300025077456<br>TXH  | -054660466463<br>TXH | -076463606445<br>TXH  | 316360606060<br>TXH  | 300001076352<br>TXH   | 300001076255<br>TXH  |
| 77000 | 000000075323<br>LAC   | 053500176770<br>LAC   | 300231177006<br>TXH  | -162307076752<br>MSP | 007400476730<br>TSX   | -162306076752<br>MSM | 002060077000<br>TRA * | -134107076677<br>PLT |
| 77010 | -162700077166<br>TSL  | 053400177400<br>LXA   | 002000077014<br>TRA  | 076400001206<br>BSR  | 200001177013<br>TIX   | 063400177400<br>SXA  | -053400177452<br>LXD  | 300000000104<br>TXH  |
| 77020 | -300000000111<br>TXL  | -134106075417<br>MIT  | 007400477336<br>TSX  | -053400277453<br>LXD | -053400477454<br>LXD  | -050000077455<br>CAL | 073400100000<br>PAX   | 014000077030<br>TOV  |
| 77030 | -300377177033<br>TXL  | 076700000002<br>ALS   | 177400177033<br>TXI  | -300177177036<br>TXL | 022100077034<br>DVP   | 177600177036<br>TXI  | -300077177040<br>TXL  | 054000000000<br>RCHA |
| 77040 | -162306077017<br>MSM  | 002000077011<br>TRA   | -162700074755<br>TSL | 300003077137<br>TXH  | 300000000000<br>TXH   | 300000077044<br>TXH  | -176210001203<br>PRD  | -077300000154<br>RQL |
| 77050 | 054000077135<br>RCHA  | 006000077051<br>TCOA  | 050000077136<br>CLA  | -012000077042<br>TMI | 010060077044<br>TZE * | 063400177132<br>SXA  | 077400100024<br>AXT   | 076200001203<br>RDS  |
| 77060 | 054000077153<br>RCHA  | 006000077061<br>TCOA  | 002200077105<br>TRCA | 003000077110<br>TEFA | 050000077457<br>CLA   | 040200075170<br>SUB  | -010000077110<br>TNZ  | -050000077460<br>CAL |
| 77070 | 056000077461<br>LDQ   | -076300000006<br>LGL  | -162700077401<br>TSL | -050000077460<br>CAL | -076500000060<br>LGR  | -162700075134<br>TSL | 040000077421<br>ADD   | 040200077422<br>SUB  |
| 77100 | -012000077113<br>TMI  | 077200001203<br>REW   | -162700074755<br>TSL | 300003077142<br>TXH  | 002000077046<br>TRA   | 052200077063<br>XEC  | 076400001203<br>BSR   | 200001177057<br>TIX  |
| 77110 | -162700074755<br>TSL  | 300003077145<br>TXH   | 002000077046<br>TRA  | 077400100012<br>AXT  | -050000077134<br>CAL  | -170400000024<br>TMT | 050000075171<br>CLA   | 060100077424<br>STO  |
| 77120 | 076200001203<br>RDS   | 054000077153<br>RCHA  | 006000077122<br>TCOA | 002200077126<br>TRCA | 003000077132<br>TEFA  | 002000077110<br>TRA  | 003000077127<br>TEFA  | 076400001203<br>BSR  |

Figure 2E

|       |                              |                               |                               |                              |                               |                               |                              |                               |
|-------|------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|-------------------------------|------------------------------|-------------------------------|
| 76720 | 002200076721<br>TRCA 0B07XA  | 063400176706<br>SXA 6)0*X6    | -134106076677<br>MIT \$J67W*  | 002000400001<br>TRA 0+0-01   | 050000076770<br>CLA 5007XY    | -170400000026<br>TMT *4000F   | 062100076770<br>STA 6A07XY   | 073700100000<br>PAC 7*0800    |
| 76730 | 077400200072<br>AXT 7(0+0=   | 1G0002276732<br>TXI 802GX+    | -134106076625<br>MIT \$J67WE  | 002000076737<br>TRA 0+07X*   | -300000076740<br>TXL Y007X-   | -162306076734<br>MSM *C67X)   | 177777276745<br>TXI ***GXN   | -162307076734<br>MSP *C77X)   |
| 76740 | 075400000000<br>PXA 7*0000   | -300071276744<br>TXL Y0ZGXM   | 040000076460<br>ADD 4007U     | 077400200001<br>AXT 7(0+01   | -162300177752<br>SACC *C0***- | 063400276730<br>SXA 6)0GXH    | 177545176747<br>TXI **N*XP   | -377545176755<br>TXL **N*X*   |
| 76750 | -150501075127<br>PCS1 *517RG | -162305177544<br>SAC5 *C5***M | -300000076767<br>TXL Y007XX   | 050000076453<br>CLA 5007U\$  | -162305177544<br>SAC5 *C5***M | -075400100000<br>PXD P*0800   | 076000000006<br>COM 7 0006   | 062200076771<br>STD 6B07XZ    |
| 76760 | 063400476766<br>SXA 6)0PXW   | 050000076771<br>CLA 5007XZ    | 062100076770<br>STA 6A07XY    | 007400477172<br>TSX 010PZ=   | 076600001203<br>WRS 7W00C3    | 054000076771<br>RCHA 5-07XZ   | 077400400000<br>AXT 7(0-00   | 002000400001<br>TRA 0+0-01    |
| 76770 | 077456077546<br>AXT 7(*7*0   | 300232077546<br>TXH H2+7*0    | 300025077456<br>TXH H0E7(1*   | -054660466463<br>NO OUT      | -076463606445<br>PUT UN       | 316360606060<br>TXH IT        | 300001076352<br>TXH H017T-   | 300001076255<br>TXH H017S*    |
| 77000 | 000000075323<br>0007\$C      | 053500176770<br>LAC 5*0*XY    | 300231177006<br>TXH H21*Y6    | -162307076752<br>MSP *C77X-  | 007400476730<br>TSX 010PXH    | -162306076752<br>MSM *C67X-   | 002060077000<br>TRA * 0+ 7Y0 | -134107076677<br>PLT \$J77W*  |
| 77010 | -162700077166<br>TSL *G07ZW  | 053400177400<br>LXA 5)0*(0    | 002000077014<br>TRA 0+07Y*    | 076400001206<br>BSR 7U0006   | 200001177013<br>TIX +01*Y=    | 063400177400<br>SXA 6)0*(0    | -053400177452<br>LXD N)0*(-  | 300000000104<br>TXH H00014    |
| 77020 | -300000000111<br>TXL Y00019  | -134106075417<br>MIT \$J67**  | 007400477336<br>TSX 01CP,*    | -053400277453<br>LXD N)0G(\$ | -053400477454<br>LXD N)0P(*   | -050000077455<br>CAL N007(*   | 073400100000<br>PAX 7)0800   | 014000077030<br>TOV 1-07YH    |
| 77030 | -300377177033<br>TXL Y3**Y.  | 076700000002<br>ALS 7X0002    | 177400177033<br>TXI *(0*Y.    | -300177177036<br>TXL Y1**Y*  | 022100077034<br>DVP 2A07Y)    | 177600177036<br>TXI **0*Y*    | -300077177040<br>TXL Y0**Y-  | 054000000000<br>RCHA 5-0000   |
| 77040 | -162306077017<br>MSM *C67Y*  | 002000077011<br>TRA 0+07Y9    | -162700074755<br>TSL *G07P*   | 300003077137<br>TXH H037Z*   | 300000000000<br>TXH H00000    | 300000077044<br>TXH H007YM    | -176210001203<br>PRD *S8003  | -077300000154<br>RQL P*001*   |
| 77050 | 054000077135<br>RCHA 5-07Z*  | 006000077051<br>TCOA 0 07YR   | 050000077136<br>CLA 5007Z*    | -012000077042<br>TMI J+07YK  | 010060077044<br>TZE * 10 7YM  | 063400177132<br>SXA 6)0*Z+    | 077400100024<br>AXT 7(0800   | 076200001203<br>RDS 7S0003    |
| 77060 | 054000077153<br>RCHA 5-07Z\$ | 006000077061<br>TCOA 0 07Y/   | 002200077105<br>TRCA 0B07Z5   | 003000077110<br>TEFA 0H07Z8  | 050000077457<br>CLA 5007(*    | 040200075170<br>SUB 4207RY    | -010000077110<br>TNZ J007Z8  | -050000077460<br>CAL N007(    |
| 77070 | 056000077461<br>LDQ 5 07(/   | -076300000006<br>LGL PT0006   | -162700077401<br>TSL *G07(11  | -050000077460<br>CAL N007(   | -076500000060<br>LGR PV000    | -162700075134<br>TSL *G07R)   | 040000077421<br>ADD 4007(A   | 040200077422<br>SUB 4207(B    |
| 77100 | -012000077113<br>TMI J+07Z=  | 077200001203<br>REW 7=0003    | -162700074755<br>TSL *G07P*   | 300003077142<br>TXH H037ZK   | 002000077046<br>TRA 0+07Y0    | 052200077063<br>XEC 5B07YT    | 076400001203<br>BSR 7U0003   | 200001177057<br>TIX +01*Y*    |
| 77110 | -162700074755<br>TSL *G07P*  | 300003077145<br>TXH H037ZN    | 002000077046<br>TRA 0+07Y0    | 077400100012<br>AXT 7(0800   | -050000077134<br>CAL N007Z)   | -170400000024<br>TMT *4000D   | 050000075171<br>CLA 5007RZ   | 060100077424<br>STD 6107(D    |
| 77120 | 076200001203<br>RDS 7S0003   | 054000077153<br>RCHA 5-07Z\$  | 006000077122<br>TCOA 0 07ZB   | 002200077126<br>TRCA 0B07ZF  | 003000077132<br>TEFA 0H07Z+   | 002000077110<br>TRA 0+07Z8    | 003000077127<br>TEFA 0H07ZG  | 076400001203<br>BSR 7U0003    |
| 77130 | 200001177120<br>TIX +01*Z+   | 002000077110<br>TRA 0+07Z8    | 077400100000<br>AXT 7(0800    | 002060077044<br>TRA * 0+ 7YM | 077457077424<br>AXT 7(*7(D    | 300001077136<br>TXH H017Z*    | 000000000000<br>000000       | -066463214725<br>PSLB* OUTAPE |
| 77140 | -204546636051<br>TNX NOT R   | 252124706060<br>FIX EADY      | -066463214725<br>PSLB* OUTAPE | -203145652143<br>TNX INVAL   | 312460606060<br>TXH ID        | -066463214725<br>PSLB* OUTAPE | -204321222543<br>TNX LABEL   | -202551514651<br>TNX ERROR    |

Figure 2F

PRINT Card

|   |       |        |
|---|-------|--------|
| 1 | 8     | 14     |
|   | PRINT | Remark |

This card lists and types any remarks contained in columns 14 through 72. A halt occurs after the typing, enabling the programmer to specify operator intervention during any stage of the dump.

REM Card

|   |     |        |
|---|-----|--------|
| 1 | 8   | 14     |
|   | REM | Remark |

This card lists any remarks contained in columns 14 through 72. No halt occurs, and the REM is not printed as part of the remark.

Date Card

|   |   |      |
|---|---|------|
| 1 | 8 | 16   |
|   |   | Date |

The date card is used only when the program has been assembled for use in a labeled installation.

Use of this card in a nonlabeled installation causes the error message, OPERATION ERROR, to be typed. The format of the date is yyddd, where yy is the year and ddd is the day of the year.

USE OF CONTROL CARDS

The control card deck is divided by END cards into logical files, each of which initiates one function of the Core and Tape Dump program. Control information entered in one file continues through succeeding files until specifically changed, e.g., a FORMAT card in one file defines the format for all succeeding files unless another FORMAT card is encountered. All REM cards in a file are listed in sequence before execution of the function defined by that file. Core storage dumps and tape dumps can be requested in any sequence. (See Figure 3.)

Machine Status after Dump

The dump is terminated by an END card that has either EOJ or RESTORE in the variable field. In the latter case, index registers, indicators, and all of core storage except the "sneak-on" area are restored. If an output tape has been requested, a trailer label is written on the output tape and the

```

        62253          DATE CARD. THIS CARD INITIATES LABEL CHECKING.
OUTPUT  TAPE          OUTPUT IS TO BE WRITTEN ON THE
                          ASSEMBLY-DEFINED OUTPUT TAPE.

CORE
FORMAT  F            DUMP ALL OF CORE STORAGE IN FORMAT F.
END
REM     FIRST THREE FILE OF A1
L  TAPE  A1,BCD      DUMP THE FIRST THREE LOGICAL FILES OF TAPE A1
DUMP    3,FILES
FORMAT  B
END
CORE    207,3521     DUMP LOCATIONS 207 THROUGH 3521 IN FORMAT B.
REM     BCD INFORMATION IN CORE
END
TAPE    BINARY
DUMP    6,RECORDS
FORMAT  A
END
SKIP    2,RECORDS   SKIP TWO RECORDS ON TAPE A1.
END
N  TAPE  B6,BINARY
BACK    10,RECORDS  BACKSPACE TEN RECORDS ON THE TAPE ON B6
                          WITHOUT FIRST REWINDING

END
DUMP    10,RECORDS
REM     LAST 10 RECORDS WRITTEN ON B6
END
CORE
FORMAT  C            DUMP ALL OF CORE STORAGE IN FORMAT C.
END     RESTORE      RESTORE CORE STORAGE.

```

Figure 3. Example of Control Card Usage

tape is backspaced past the trailer label. The work tape is returned to its position before loading, except in the case of a labeled installation assembly. In this case, if the work tape was at load point, it is positioned after the header label tape mark. It should be noted that, since the work tape must be used during the "sneak-on," no checking of the retention cycle is possible for this tape.

### Core Storage Dump

The core storage dump indicates the status of the machine before the dump program was loaded, with the exception of the area that was destroyed by the "sneak-on" records. If any parity errors are detected in core storage, the first core storage dump requested lists them with the heading, PARITY ERRORS AT. When a change is made from tape dump to core storage dump, or when a core storage dump is initially requested, the listing skips to a new page and prints out registers and indicators. Successive requests for sections of core storage list only the contents of the locations and do not cause a skip to a new page.

## OPERATION

### Assembly of the Symbolic Deck

The program, as distributed, is assembled as a nonlabeled installation having 32,767 words of core storage. The assembly-defined work tape is A5; the output tape is B5; the printer is on interface 3. If these assembly parameters are to be altered, certain cards in the symbolic deck must be changed. They are as follows:

|        |      |                    |  |
|--------|------|--------------------|--|
| IOCS   | MZE  | **                 | Designates a nonlabeled installation, or   |
| IOCS   | PZE  | **                 | Designates a labeled installation. This card initiates label checking. (The card number is CTD00280.)  |
| MEMORY | EQU  |                    | Designates the maximum core storage address, e. g., 32767 for 32K core storage. (The card number is CTD21420.)                                       |
| S      | BOOL | (BCD mode address) | Designates the work tape. (The card number is CTD21490.)   |
| 0      | BOOL | (BCD mode address) | Designates the output tape. This must be defined for assembly purposes even when all output is to be printed on-line. (The card number is CTD21500.) |
| PRINFC | EQU  |                    | Designates a printer on an interface other than 3. (The card number is CTD21320.)  |

### Operation Procedure

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. If a tape is to be dumped, ready that tape unit.
3. Ready the work tape unit.
4. Ready the appropriate output unit(s).
5. If control cards are used, place the control card deck in the 1402 Card Read Punch, following the program deck if this is also in card form.
6. Depress the LOAD button.

### HALTS

All halts will be accompanied by a typewriter message, except for the end-of-job halt (Instruction Counter =  $(00122)_8$ ), occurrence of a parity trap (Instruction Counter =  $(00042)_8$ ), and halts which occur while the program is being entered into core storage.

### Instruction Counter

### Explanation

$(116)_8$

A redundancy has occurred while entering the program into core storage. If the program is being read from the card reader and the upper 3,200 locations of core storage are not critical to the original contents of core storage, the program can be reloaded. If the locations mentioned above are critical to the original program, the following steps should be taken:

1. Correct the card in error.
2. Place the corrected card in front of the cards not yet processed.
3. Key-in and execute a transfer to  $(126)_8$ .
4. Ready the cards and press the START button.

If the program is on tape, press the START button to attempt a reread.

$(121)_8$

The work tape is not ready. Ready the tape and press the START button. The address portion of the word in  $(121)_8$  contains  $(57)_8$ .

$(121)_8$

A redundancy has occurred while writing out parity errors. Press the START button to attempt a rewrite. If the redundancy persists, press the

Instruction Counter

Explanation

|                    |   |
|--------------------|---|
| (121) <sub>8</sub> | <p>LOAD button. The address portion of the word in (121)<sub>8</sub> contains (57)<sub>8</sub>.</p> <p>A redundancy has occurred while writing out upper core storage onto the work tape. Press the START button to attempt a rewrite. If the redundancy persists, transfer to location (122)<sub>8</sub> unless a core storage dump is required, in which case, the run should be restarted. The address portion of the word in location (121)<sub>8</sub> contains (75163)<sub>8</sub>.</p> |
|--------------------|---|

## DESCRIPTION

This program is used to build or generate files on magnetic tape in a variety of formats. The program is capable of producing fixed-length or variable-length logical records in BCD or binary mode. These records can be written as separate or blocked tape records. The records can be built from input in the form of cards or card images on tape, or the records can be generated by means of internal pseudo-random generation techniques.

The Tape File Generator program can be loaded from binary cards or from magnetic tape. Instructions are given to the program through control cards which are read either from a card reader or in card-image form from tape.

The program reads a control card and generates the desired tape record or performs a tape control function. Upon completion of the requested action, another control card is read, and the procedure continues until the control card deck is exhausted. In this way, a number of different tape files may be generated in one run. On-line typewriter messages inform the operator of any required intervention and serve as a history of the run for the programmer, since every control card is printed on the typewriter before it is executed.

## MACHINE REQUIREMENTS

1. A tape unit for output.
2. A 1402 Card Read Punch with the column binary feature or a tape unit, for program loading and for input data.
3. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

## RECORD DESCRIPTION

Internally Generated Records

The program contains routines capable of generating pseudo-random binary words, signed or unsigned BCD numbers, or alphameric characters. Generation is performed by means of the following algorithm:

$$R_{i+1} = (2^{18} + 3) (R_i) \text{ modulo } 2^{35}$$

The first number to be substituted for  $R_i$  may be specified by the user. The resulting  $R_{i+1}$  is used as initial data for the generated file and as the  $R_i$  for

the next iteration. The initial value of  $R_i$  should be an odd integer. If an initial value is not specified, a one is used. If an even number is specified, one is added to it. Up to 30 bits of this word can be used to create BCD numbers or other characters, or part of a binary word. The extreme high-order and low-order bits are always discarded.

Externally Read Records

In order to build tape records, the program reads data cards on-line, or card images from tape. Cards may be in 80-character alphameric or column binary form. A card-image tape may be in binary mode or BCD mode.

Fixed-Length Records

The length of fixed-length logical records is determined by the number of words and/or the number of characters specified in a control card (see the section, "FIXED or F Card"). If the specified data does not fill an integral number of 36-bit words, the last word of a binary record is padded with zeros and the last word of a BCD record is padded with blank characters. If the record is formed from card or card-image input, the remaining columns on the card are ignored when the requested number of words or characters are read. If the specified number of words or characters is greater than those contained in one card, cards are read until the requirements of the logical record are satisfied. Each physical record is written when the number of logical records specified by the blocking factor is assembled in the output buffer. When an end of file is encountered, the output buffer is padded if necessary.

Variable-Length Records

When producing variable-length logical records from card records, the VARIABLE control card gives the maximum number of words for each physical record and the BUILD card gives the number of columns to extract from each card record. Another control card (the \*\*\* END RECORD \*\*\* card) gives the number of columns to be extracted from the last card. It is placed behind the last card of each logical record. If necessary, padding is used to fill out the record to an integral number of words. The control card at the end of the record can force the writing of a tape block, if a block shorter than the maximum is desired. When producing variable-length records by pseudo-random generation techniques,

the individual logical record lengths are randomly generated. A range, in number of words, is specified for the logical record length, and a maximum number of words is specified for the physical record. A logical record which would cause the physical record to exceed the maximum is used to begin the next physical record. This process continues until the requested number of physical records has been produced.

### Record Format

#### Binary Mode Tape

Each binary logical record is preceded by a control word containing the length of the record in words, in the decrement. The length does not, however, include the control word. The format for this word is:

|     |               |    |             |
|-----|---------------|----|-------------|
| 5   | Record Length | 2  | 0000        |
| S-2 | 3             | 17 | 18-20 21 35 |

#### BCD Mode Tape

BCD logical records produced by random generation contain, as the first word of the record, a control word containing the number of characters in the record. Included in this number are the six characters of the control word. The record length is expressed as a BCD number, right-justified within the first five characters of the control word. Any characters to the left of the BCD number that are not used are zeros. The sixth character in the control word is a blank.

Example: 0 0 0 3 6 b

The record length must be a multiple of six.

### OUTPUT TAPE FORMAT

The output tape may contain a portion of a logical file, or one or more complete files. Logical files may contain physical records produced by internal generation as well as physical records built from card records. Each file may have a header label and a trailer label, or it may be unlabeled. When a logical file extends beyond one physical tape, an end-of-reel label is written at the end of the tape reel and tape changing is requested.

### CONTROL CARDS

Each control card is defined by the first nonblank character appearing on the card. Subsequent fields must be placed in their proper sequence, with significant information immediately followed by a comma

or a period. Control information is terminated on all control cards when a period is encountered (a period is necessary to terminate every card). Any number of characters of explanatory information, including blank characters, may precede the significant portion of any field with the exception of the first nonblank character on the card.

Control cards are treated as 72-character cards, columns 73-80 being disregarded by the Tape File Generator program. All blank control cards are ignored by the program. All numeric fields in control cards are decimal notation.

There are parameters that must be specified in control cards, and others that may be omitted. If a parameter is optional, a standard exists for that field, and is supplied when the field is omitted.

The two ways to omit optional fields on control cards are as follows:

1. If a comma is placed immediately following the comma used to terminate a previous field, the standard is supplied for the omitted field.

2. If a period is used instead of a comma to terminate a field, the remaining fields are ignored and the standards are supplied for the omitted fields.

### CONTROL CARD FORMATS

#### REWIND or R Card

Any number of tapes can be rewound using this card. The format of this card is as follows:

REWIND A0-E9, A0-E9, ..., A0-E9.

where:

A0-E9 Designates the tapes to be rewound.

Example: REWIND A1, B2. or  
R A1, B2.

#### WRITE TAPE MARK or W Card

This card causes a tape mark to be written on the tapes designated. The format of this card is as follows:

WRITE TAPE MARK A0-E9, A0-E9, ..., A0-E9.

where:

A0-E9 Designates the tapes on which the tape mark is to be written.

Example: WRITE TAPE MARK B3, C2. or  
W B3, C2.

#### SKIP TAPE or S Card

This card effects the skipping of a designated number of physical records or files on tape. The format of this card is as follows:

SKIP TAPE A0-E9, x, y.

where:

- A0-E9 Designates the tape unit.
- x Designates the number of files to skip. If this field is omitted, the standard is a zero.
- y Designates the number of tape records to skip. If this field is omitted, the standard is a zero.

MOVE BACK or M Card

This card causes the backspacing of a designated number of records on tape. The format of this card is as follows:

MOVE BACK A0-E9, y.

where:

- A0-E9 Designates the tape unit.
- y Designates the number of tape records to backspace.

UNLOAD or U Card

This card causes any number of units to be rewound and unloaded. Caution must be used when the tape unit is a 7330 Magnetic Tape Unit. If the tape is positioned at load point when the UNLOAD card is executed, the tape unit becomes inoperative. The format of this card is as follows:

UNLOAD A0-E9, A0-E9, . . . . ., A0-E9.

where:

- A0-E9 Designates the tapes to be rewound and unloaded.

HEADER or H Card

This card causes a standard or nonstandard header label to be written on the tapes that are built or generated. HEADER cards must be immediately followed by a BUILD card or a GENERATE card. The format of the HEADER card is as follows:

HEADER S, ch<sub>1</sub>, n<sub>1</sub>, text<sub>1</sub>, . . . . ., ch<sub>i</sub>, n<sub>i</sub>, text<sub>i</sub>.

where:

- S Designates a standard label.
- ch Designates the character at which the insertion is to begin.
- n Designates the number of characters to be inserted.
- text This is the actual information to be inserted.
- Example: HEADER S, 7, 4, 0030, 16, 10  
TESTbFILE 1.

The actual text of the insertion must follow immediately after the comma that ends the field designating the number of characters to be inserted. If a blank occurs after the comma, it is considered part of the insertion. Commas and periods may be used within the body of the text.

If a standard header label is designated, a standard trailer label must also be designated. Similarly, if a nonstandard header label is designated, a nonstandard trailer label must be designated.

The following fields are supplied by the Tape File Generator program when the standard label is designated (see "Appendix C"). Fields 1, 2, and 5 may be overlaid by the user, although this is not advisable. Fields 3, 4, 6, 7, and 8 are always supplied by the program when a standard label is designated.

| <u>Field No.</u> | <u>Field Name</u>   | <u>Position(s)</u> |
|------------------|---|--------------------|
| 1                | Label Identifier--1HDRb   | 1-5                |
| 7                | Reel Sequence Number--is always 1 unless other reels are used during the run; it is then incremented by one for each additional reel. | 37-40              |
| 10               | Check Sum Indicator   | 46                 |
| 12               | Mode Indicator  | 48                 |
| 15               | Creating System   | 51-54              |
| 16               | Record Format   | 55                 |
| 17               | Record Length   | 56-60              |
| 18               | Block Size  | 61-65              |

All other fields can be filled in by the HEADER control card.

If a standard header label is written and more than one reel is required for the run, the header label is duplicated on the subsequent reels, with the exception of the Reel Sequence Number, which is incremented by one. If a new Serial Number is desired, press Sense Switch 1 and enter the Serial Number as five BCD characters, left-justified in the entry keys.

HEADER N, n, text.

where:

- N Designates a nonstandard label.
- n Designates the number of characters to be inserted.
- text This is the actual information to be inserted.

Example: HEADER N, 26, ALU**b**CARD**bb**  
TESTbFILE**1bb**RUN2.

Insertion of the text always begins at the first character of the header label. The maximum number of characters allowable is 120.

If a nonstandard header label is written and more than one reel is required for the run, the header label is duplicated on the subsequent reels.

## TRAILER or T Card

Either a standard or a nonstandard trailer label can be written using this card. This card also causes a tape mark to be written before and after the label. TRAILER cards must immediately follow a FIXED card or a VARIABLE card. The format of the TRAILER card is as follows:

TRAILER S, ch<sub>1</sub>, n<sub>1</sub>, text<sub>1</sub>, . . . . ch<sub>i</sub>, n<sub>i</sub>, text<sub>i</sub>.

where:

S Designates a standard label.  
 ch Designates the character at which the insertion is to begin.  
 n Designates the number of characters to be inserted.  
 text This is the actual information to be inserted.

Example: TRAILER S, 16, 10, TESTbFILE1.

The actual text of the insertion must follow immediately after the comma which ends the field designating the number of characters to be inserted. If a blank occurs after the comma, it is considered part of the insertion.

If a standard header label is designated, a standard trailer label must also be designated. Similarly, if a nonstandard header label is designated, a nonstandard trailer label must be designated.

The following fields are supplied by the Tape File Generator program when the standard label is designated:

| Field No. | Field Name  | Position(s) |
|-----------|---|-------------|
| 1         | Label Identifier--1EOFb or 1EORb  | 1-5         |
| 7         | Reel Sequence Number--is always 1 unless other reels are used during the run; it is then incremented by one for each additional reel. | 37-40       |
| 10        | Check Sum Indicator   | 46          |
| 12        | Mode Indicator  | 48          |
| 15        | Creating System   | 51-54       |
| 16        | Record Format   | 55          |
| 17        | Record Length   | 56-60       |
| 18        | Block Size  | 61-65       |
| 20        | Block Count   | 67-72       |

All other fields can be filled in by the TRAILER control card.

TRAILER N, n, text.

where:

N Designates a nonstandard label.  
 n Designates the number of characters to be inserted.

text This is the actual information to be inserted.

Example: TRAILER N, 26, ALUbCARDbbTESTb  
 FILE1bbRUN2.

Insertion of the text always begins at the first character of the trailer label. The maximum number of characters allowable is 120.

## BUILD or B Card

This card is used when records are to be built from input in the form of cards or card images on tape. BUILD cards must be immediately followed by a FIXED card or a VARIABLE card. The format of the BUILD card is as follows:

BUILD [A0-E9] B or D, A0-E9, B or D, cols,  
 [1402 N or Y.  
 [1622 ]

where:

[A0-E9] Designates the input unit.  
 [1402  
 [1622 ] Designates the input mode when it immediately follows the input unit designation; B indicates binary mode and D indicates BCD mode. If the output mode is not specified, it is assumed to be the same as the input mode.  
 A0-E9 Designates the output unit.  
 cols Designates the number of columns to be read from either the card or the card images on tape. If this field is omitted, 80 columns are read.  
 N or Y Determines whether or not a check sum is taken. N indicates that a check sum is not desired. Y indicates that a check sum is to be taken. If this field is omitted, no check sum is supplied.

## GENERATE or G Card

This card is used when records are to be generated internally by pseudo-random techniques. GENERATE cards must be immediately followed by a FIXED card or a VARIABLE card. The format of this card is as follows:

GENERATE A, D, S, or B, A0-E9, B or D, y, R, Y or N.

where:

A, D, S, or B Designates the type of data to be generated.  
 A Specifies any alphameric (BCD) characters.

D Specifies BCD numbers.  
 S Specifies signed BCD numbers. The rightmost character is a standard alphameric character designating a signed BCD number.  
 B Specifies binary information.  
 A0-E9 Designates the output unit.  
 B or D Designates the output mode; B for binary mode and D for BCD mode. By using this field, BCD information that was generated can be written onto tape in binary mode. If this field is omitted, binary information is written in binary and all other information is written in BCD mode.  
 y Designates the number of blocks to be generated. If the field is omitted, one block is generated.  
 R Specifies the initial value of the number R in the generation algorithm. This number must be odd; if an even number is specified, one is added to it. Since the same algorithm is always used, the initial values should be varied to avoid identical files. If this field is omitted, the number one is used.  
 Y or N Determines whether or not a check sum is taken.  
 N indicates that a check sum is not desired.  
 Y indicates that a check sum is to be taken. If this field is omitted, no check sum is supplied.

#### FIXED or F Card

The FIXED card must immediately follow a BUILD card or a GENERATE card. The format of this card is as follows:

FIXED b f, w/rcd, cols.

where:

b f Designates the blocking factor, i. e., the number of logical records in each tape record. If this field is omitted, it is computed from the words per logical record. This is explained under "Standards for the FIXED Card."  
 w/rcd Designates the number of words per logical record. If only this field is omitted, the columns field is interrogated. If both this field and the field designating columns are omitted, the number of words per logical record is computed from the blocking factor.

This is explained under "Standards for the FIXED Card."

cols Designates the number of card columns per logical record. If the data is BCD, six columns are required for each word; if the data is binary, three columns are required for each word.

#### Standards for the FIXED Card

The FIXED card is used to describe the desired tape record as a number of logical records (blocking factor), each one having a specific length. This length may be specified in three different ways:

1. As the integral number of words in each logical record. The columns field is omitted.
2. As the number of columns. The field designating the number of words per logical record is omitted.
3. As the integral number of words plus the number of extra columns which make up one additional incomplete word. Both the columns field and the field designating the number of words per logical record are used.

A blocking factor may not be specified which, when multiplied by the number of words per logical record, produces a physical record exceeding 2,000 words. Should the largest possible blocking factor be desired, this field can be omitted. The blocking factor is then computed by the program.

Should the length of the logical record be omitted (by omitting the columns field and the field designating the number of logical records), it is assumed that the largest possible physical record is desired.

If no fields are specified, the following standards are supplied:

blocking factor = 1.  
 words per logical record = 2000.  
 columns = 0.

#### VARIABLE or V Card

The VARIABLE card must immediately follow a GENERATE card or a BUILD card. The format for the VARIABLE card differs, depending upon which card it follows.

When a VARIABLE card follows a BUILD card, the format is:

VARIABLE max w/b.

where:

max w/b Designates the maximum number of words per block. If this field is omitted, 2000 is supplied.

When a VARIABLE card follows a GENERATE card, the format is:

VARIABLE max w/b, min w/rcd, max w/rcd, Y or N.

where:

max w/b Designates the maximum number of words per block. If this field is omitted, 2000 is supplied.

min w/rcd Designates the minimum number of words per logical record. If this field is omitted, 1 is supplied.

max w/rcd Designates the maximum number of words per logical record. This field must be at least the minimum number of words per logical record, plus one. If this field is omitted, the number which was specified or supplied for the maximum size of the block is used.

Y or N Designates whether or not padding is desired. If padding is desired (Y), the last word of each logical record is randomly padded. If in BCD mode, from zero to five blanks are used; if in binary mode, zero, six, or twelve zeros are used. If this field is omitted, padding is not supplied.

#### CONTINUATION or C Card

If this card is being used to complete text from a HEADER or TRAILER card, a comma must appear on the CONTINUATION card before the text can be continued.

Example: CONTINUATION, Company New York, N. Y. or C, Company New York, N. Y.

If the CONTINUATION card is being used to continue the specification of fields from another card, a comma is not used. A field and its subsequent comma cannot be separated when using the CONTINUATION card.

#### Comments Card

The Comments card causes no action other than being printed on the typewriter. It may be placed anywhere in the control card deck, and is distinguished as a Comments card by having an asterisk as its first nonblank character. The Comments card may not be placed in the data deck. If control cards and data are being read from the same unit, the Comments card may not immediately precede the data.

#### \*\*\* END RECORD \*\*\*Card

This control card is used to signify the end of a variable-length record in an input data deck. The first 18 columns of the card must be

\*\*\*bENDbRECORDb\*\*\*

so that it is not confused with the input data. The complete format is

\*\*\* END RECORD \*\*\* cols, Y or N.

where:

cols Designates the number of columns to be used from the last data card. If this field is omitted, the number of columns designated in the BUILD card is assumed.

Y or N Designates whether the tape record should be written. Y designates an immediate write, and N designates that the tape record should not be written until the buffer is filled.

#### \*\*\*\* END FILE \*\*\*\* Card

This card defines a data file. It will be recognized as an end of file on tape, but its primary purpose is for the card-oriented system. The card must have as its first 18 columns

\*\*\*\*bENDbFILEb\*\*\*\*

so that it is not confused with input data. The \*\*\*\* END FILE \*\*\*\* card allows the stacking of cards in the card reader so that several jobs can be done without refilling the card hopper each time. In effect, this card supplies a logical end of file, but does not cause a tape mark to be written.

#### OPERATION

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.
3. After the message 20432 PLACE CONTROL CARD READ SELECT IN WORD BANK AND PRESS START is printed out, a Read Select instruction (RDS) that contains the BCD address of the input unit from which the control cards are to be read is entered in the word bank of the entry keys.
4. Press the START button.

MACHINE REQUIREMENTS

1. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
2. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

DESCRIPTION

The Format Track Generator program generates format track characters in core storage and writes them on the specified format tracks. There is one format track for each drum storage module, and one format track for each cylinder of a disk storage module. The format track for a cylinder indicates the arrangement of the home address identifier, the record addresses, and the disk record areas on a data track, and it must be written before any of the data tracks in the cylinder can be used. After a format track is written, a write check operation is performed to insure that all fields on the track are written correctly.

FORMAT TRACK LAYOUT

A format track contains a series of fields (see Figure 4). Some of the fields are of constant length and cannot be changed by the user. Other fields are variable in length and number and are under the user's control. The variable-length fields are the home address identifier (HA2), the record addresses, and the record areas.

Field Length Modifications

The lengths of the home address identifier and the record addresses can be varied by changing constants in the Format Track Generator program deck. If the home address identifier is to be lengthened to accommodate an address greater than six characters, the address portion of the

HOME2 PZE 10  
card is increased by six for every word needed in excess of the standard six characters (one word). If

|                              |                          |                              |                          |                              |                                   |                              |                  |  |
|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------|-----------------------------------|------------------------------|------------------|--|
| Gap <sup>1</sup>             | Home Address (HA1)       | Gap                          | HA2 <sup>2,3</sup>       | X Gap <sup>4</sup>           | First Record Address <sup>5</sup> | Y Gap <sup>4</sup>           |                  | First Record Area <sup>6</sup>               |
| 444                          | 333333333                | 43333333334                  | 1111111111<br>3333333333 | 222222222222<br>444444444444 | 1111111111<br>3333333333          | 211111111112<br>433333333334 | 111111<br>333333 | 11111111111111111111<br>33333333333333333333 |
| X Gap                        | Second Record Address    | Y Gap                        | Second Record Area       | X Gap                        | Next Record Address               | Last Record Area             | Gap              |  |
| 222222222222<br>444444444444 | 1111111111<br>3333333333 | 211111111112<br>433333333334 | 111111<br>333333         | 1111111111<br>444444444444   | 222222222222<br>3333333333        | 1111111111<br>333333         | 2<br>4           |  |

<sup>1</sup> Shaded fields are constant-length fields.

<sup>2</sup> Where two rows of figures appear, the upper row is for six-bit mode and the lower row is for eight-bit mode.

<sup>3</sup> HA2 field is always eight characters plus one character for each character in the HA2. In the case shown, HA2 is the minimum length of two characters.

<sup>4</sup> X gaps and Y gaps precede and follow each record address, respectively.

<sup>5</sup> Record address field is always four characters plus one character for each character in the record address. In the examples shown, the record address is the minimum length of six characters.

<sup>6</sup> Record area field is always four characters plus one character for each position in the record area.

Figure 4. Organization of Format Track Fields

the record addresses are to be lengthened, the address portion of the

RECAD PZE 10

card is increased by six for every word needed in excess of the standard six characters (one word).

### Record Areas

Information about the record areas must be supplied to the Format Track Generator by the user. Specifically, the D4044FH or F4044FH and D4044F or F4044F Master control cards must indicate the number of record areas and their lengths.

The number of record areas that can be defined for one format track depends on the mode of operation (6-bit or 8-bit) and the number of words per record. (See "Appendix B.")

If the specified number of record areas and record area lengths exceeds the capacity of the format track, a message indicating this condition is typed on the console typewriter and the format track is not generated.

### CONTROL CARDS

Four types of control cards are used to furnish information to the Format Track Generator.

1. If only format tracks are desired, a D4044F or F4044F Master control card is used (see Figure 5).

2. If format tracks, home address identifiers, and record addresses are desired, a D4044FH or F4044FH Master control card is used (see Figure 6) followed by a D4044H or F4044H Master control card (a Home Address and Record Address Generator control card).

3. The other two cards are extension cards for the above Master control cards (see Figures 7 and 8).

### OPERATION

#### Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE. If IOUNIT is not assembled as an MZE, a binary patch can be used to alter this location. Other changes to be made at assembly time have been discussed previously (see the section "Field Length Modifications").

#### Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.

3. After the message, 20472 FORMAT GENERATOR - TURN SWITCH TO (WRITE) - S, is printed out, press the START button.
4. If the control cards are not on the same input device as the program deck, a Read Select instruction that contains the address of the input unit from which the control cards are to be read is entered in the word bank of the entry keys before the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

| Card Cols | Contents                           | Explanation   |
|-----------|------------------------------------|---|
| 1-6       | D4044F (disk)<br>F4044F (drum)     | Control card identification.  |
| 7         | /                                  | Field separator.  |
| 8         | 0                                  | Access mechanism number.  |
| 9         | /                                  | Field separator.  |
| 10        | 0-9                                | Module number.  |
| 11        | /                                  | Field separator.  |
| 12        | B-E                                | Channel to which the disk or drum is attached.  |
| 13        | /                                  | Field separator.  |
| 14        | 6 or 8                             | Designates 6-bit or 8-bit mode.   |
| 15        | /                                  | Field separator.  |
| 16-71     | 0-249<br>(disk)<br>0-9<br>(drum)   | Designates the number of the cylinders to be arranged on the format track. Each number is separated either by a comma to specify single cylinders or by a dash to specify a sequential series of cylinders. A field separator (/) follows the last cylinder number. |
|           | 01-xx                              | A two digit number which designates the number of data areas to be placed in the format tracks follows the separator character. A field separator also follows this field.  |
|           | 1-466<br>(disk)<br>1-530<br>(drum) | A series of numbers separated by commas follows the last field separator; the numbers are used to specify the word length of each data area. If the length of the data areas is fixed, only one number need be specified.   |
| 72        | b                                  | Must be blank.  |
| 73-78     | aaaaaa                             | Set identification. It consists of a six-character alphanumeric name (including blanks) assigned by the user to the set of control cards.   |
| 79-80     |                                    | Not used.   |

Figure 5. The D4044F or F4044F Master Control Card

| Card Cols   | Contents                           | Explanation  |
|---|------------------------------------|--|
| D4044FH(disk)<br>1-7 F4044FH(drum) Control card identification. |                                    |  |
| 8   | /                                  | Field separator.   |
| 9   | 0                                  | Access mechanism number.   |
| 10  | /                                  | Field separator.   |
| 11  | 0-9                                | Module number.   |
| 12  | /                                  | Field separator.   |
| 13  | B-E                                | Channel to which the disk or drum is attached.   |
| 14  | /                                  | Field separator.   |
| 15  | 6 or 8                             | Designates 6-bit or 8-bit mode.  |
| 16  | /                                  | Field separator.   |
| 17-71   | 0-249<br>(disk)<br>0-9<br>(drum)   | Designates the numbers of the cylinders to be arranged on the format track. Each number is separated either by a comma to specify single cylinders or by a dash to specify a sequential series of cylinders. A field separator (/) follows the last cylinder number. |
|   | 01-xx                              | A two digit number which designates the number of data areas to be placed in the format tracks follows the separator character. A field separator also follows this field.   |
|   | 1-466<br>(disk)<br>1-530<br>(drum) | A series of numbers separated by commas follows the last field separator, and is used to specify the word length of each data area. If the length of the data areas is fixed, only one number need be specified.   |
| 72  | b                                  | Must be blank.   |
| 73-78   | aaaaaa                             | Set identification. It consists of a six-character alphameric name (including blanks) assigned by the user to the set of control cards.  |
| 79-80   |                                    | Not used.  |

Figure 6. The D4044FH or F4044FH Master Control Card

| Card Cols   | Contents | Explanation  |
|---|----------|--|
| D4044F*(disk)<br>1-7 F4044F*(drum) Control card identification. |          |  |
| 8-71  | y-yyyy   | A series of numbers separated by commas which continues the specification of data area lengths.                              |
| 72  | b        | Must be blank.   |
| 73-78   | aaaaaa   | Set identification. It must correspond with the set identification field in the master control card that is being continued. |
| 79-80   |          | Not used.  |

Figure 7. The Extension Card for the D4044F or F4044F Master Control Card

| Card Cols   | Contents | Explanation  |
|---|----------|--|
| D4044FH*(disk)<br>1-8 F4044FH*(drum) Control card identification. |          |  |
| 9-71  | y-yyyy   | A series of numbers separated by commas which continues the specification of data area lengths.                              |
| 72  | b        | Must be blank.   |
| 73-78   | aaaaaa   | Set identification. It must correspond with the set identification field in the master control card that is being continued. |
| 79-80   |          | Not used.  |

Figure 8. The Extension Card for the D4044FH or F4044FH Master Control Card

## MACHINE REQUIREMENTS

1. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
2. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

## DESCRIPTION

The Home Address and Record Address Generator program generates and writes the home address identifier and the record addresses on one or more specified data tracks having an identical format track. Any previously written home address identifiers and record addresses are changed, and the record areas are filled with the character specified in column 8 of the D4044H or F4044H Master control card.

### Standard Fields

The Home Address and Record Address Generator generates and writes home address identifiers and record addresses of standard length and contents. The standard home address identifier consists of two zeros. The standard record address is a six-character field of the form xxxxyy, where xxxx is the track number (0-9999 for disk; 0-399 for drum) and yy is the number of the record on the track. All records on a track are numbered consecutively, beginning with 01.

The home address identifier and record address fields written on the data track always correspond to the length defined for them by the format track. If either or both of these fields are longer than is required by the standard contents, the excess rightmost positions of the field(s) are filled with zeros. This feature, however, is operative only if the standard contents are being used.

### Field Content Modifications

The contents of the home address identifier and the record addresses can be other than the standard previously explained. However, to generate non-standard contents, the user must provide modification routines to perform the generation.

When changing the contents of one or both addresses, the user should be aware that not all the characters in the address are compared during address verification. For the home address identifier, only the two leftmost characters are compared. For the record address, only the six leftmost characters are significant.

An exit is provided in the Home Address and Record Address Generator to allow the user to alter the home address identifier and record addresses during object time. Location HAEXIT must be assembled as follows:

TSX Exitname, 4

where Exitname is the name of the user's routine that alters the address contents. The user's routine can alter the contents of the home address identifier stored in location FMTK and the contents of the record addresses stored in the table beginning at location RA. The word lengths of the home address identifier and of the record addresses, found in locations HOME2 and RECAD, respectively, should be checked by the user's routine. If the contents desired are greater than the length, the characters in excess are truncated.

## CONTROL CARDS

Two types of control cards are used to provide information to the Home Address and Record Address Generator.

1. The D4044H or F4044H Master control card specifies the filler character and the data track addresses. The format of this card is shown in Figure 9. It can never be used without a D4044F or F4044F Master control card or a D4044FH or F4044FH Master control card. If only home address identifiers and record addresses are desired, the D4044H or F4044H Master control card precedes the Format Track Generator control card.

2. An Extension card for the above Master control card. (See Figure 10).

## OPERATION

### Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from either a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE. If IOUNIT is not assembled as an MZE, a binary patch can be used to alter this location.

### Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.

3. After the message, 20473 ADDRESS GENERATOR - PUT HAO SWITCH UP - S., is printed out, press the START button.
4. If the control cards are not on the same input device as the program deck, a Read Select instruction that contains the address of the input

unit from which the control cards are to be read is entered in the word bank of the entry keys before the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

| Card Cols | Contents                      | Explanation   |
|-----------|-------------------------------|---|
| 1-6       | D4044H(disk)<br>F4044H (drum) | Control card identification.  |
| 7         | /                             | Field separator.  |
| 8         | c                             | Filler character for data areas; c is any valid character.  |
| 9         | /                             | Field separator.  |
| 10-71     | tttc<br>tttc<br>ttc<br>tc     | Data track address(es). Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address.<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks or a comma to indicate individual tracks or sequences of tracks.<br>All tracks should be specified in ascending order. |
| 72        | b                             | Must be blank.  |
| 73-78     | aaaaaa                        | Set identification. It consists of a six-character alphameric name (including blanks) assigned by the user to the set of control cards.   |
| 79-80     |                               | Not used.   |

Figure 9. The D4044H or F4044H Master Control Card

| Card Cols | Contents                         | Explanation   |
|-----------|----------------------------------|---|
| 1-7       | D4044H* (disk)<br>F4044H* (drum) | Control card identification.  |
| 8-71      | tttc<br>tttc<br>ttc<br>tc        | Data track address(es). Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it, t-tttt is a track address.<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks or a comma to indicate individual tracks or sequence of tracks.<br>All tracks should be specified in ascending order. |
| 72        | b                                | Must be blank.  |
| 73-78     | aaaaaa                           | Set identification. It consists of a six-character alphameric name (including blanks) assigned by the user to the set of control cards.   |
| 79-80     |                                  | Not used.   |

Figure 10. The Extension Card for the D4044H or F4044H Master Control Card.

MACHINE REQUIREMENTS

1. One tape unit.
2. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
3. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

DESCRIPTION

The Dump Disk/Drum program writes all the information contained on one or more specified data tracks onto magnetic tape. The tape is created in a form that permits the information on it to be returned to disk or drum storage by the Restore Disk/Drum program.

The tracks are read from disk or drum storage by a Read Full Track with Addresses instruction. Consequently, only the home address (HA1 and HA2) is required for verification purposes. The home address identifier (HA2) is assumed to be the system standard, i. e., two zeros. If nonstandard home address identifiers are on the tracks, the Dump Disk/Drum program must be modified (see "Home Address Identifier Modification").

The information from all the tracks that are specified in the Dump Disk/Drum control cards is referred to as a "set" of information. An output tape can be used for more than one set of information, provided all sets are written consecutively; consecutive groups of Dump Disk/Drum control cards selecting the same tape unit are read from the control card unit.

Output Tape Format

The Dump Disk/Drum program writes a standard header label and a tape mark as the first two tape records. The control cards for the first set constitute the next tape record. The function of this record is to provide information to Restore Disk/Drum program. Each set is preceded by the control card defining that set.

The remaining tape records consist of the information contained on the tracks specified. The tracks are written on tape in groups of three, with each group forming one tape record. The tracks appear on tape in ascending order. This makes it possible to read a track on every revolution of the disk or drum except when a seek is required. As a result, running time is minimized. At end of job or end of reel a standard trailer label is written on the tape.

If label checking is desired, a PREDAT control card must precede all other control cards. The output tape is checked for a standard header label and a proper retention period.

Home Address Identifier Modification

The home address identifier, contained in location HATWO, is assembled as 00. The user can modify the home address identifier prior to each read by assembling HAEXIT as follows:

HAEXIT TSX Exitname, 4

Exitname is the name of the user's subroutine which modifies the home address identifier.

CONTROL CARDS

Three types of control cards are used to furnish information to the Dump Disk/Drum program.

1. The D4044D or F4044D Master control card specifies data track addresses, the output unit and the set identification. (See Figure 11.)
2. The Extension card for the above Master control card. (See Figure 12.)
3. The PREDAT control card is used only with labeled systems and, when used, must be the first control card read by the program. The purpose of the PREDAT control card is to update the label on the output tape(s). (See Figure 13.)

OPERATION

Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from either a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE.

If IOUNIT is not assembled as an MZE, a binary patch can be used to alter the location, or the location can be altered through the entry keys after the initial halt in the program.

Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.
3. After the message, 20406 7040-44 DUMP

| Card Cols                          | Contents                                | Explanation  |
|------------------------------------|---|--|
| 1-6                                | D4044D(disk)<br>F4044D(drum)            | Control card identification.   |
| 7                                  | /                                       | Field separator.   |
| 8                                  | 0                                       | Access mechanism number.   |
| 9                                  | /                                       | Field separator.   |
| 10                                 | 0-9                                     | Module number.   |
| 11                                 | /                                       | Field separator.   |
| 12                                 | B-E                                     | Channel to which the disk or drum is attached.   |
| 13                                 | /                                       | Field separator.   |
| 14                                 | 6 or 8                                  | Designates 6-bit or 8-bit mode.  |
| 15                                 | /                                       | Field separator.   |
| 16                                 | 1                                       | Indicates that the output tape is written in binary mode.  |
| 17                                 | /                                       | Field separator.   |
| 18-19                              | A0-E9                                   | Designates the primary output unit.  |
| 20                                 | /                                       | Field separator.   |
| either<br>21-22<br><br>or<br>21-71 | A0-E9<br><br>tttcc<br>tttc<br>ttc<br>tc | Designates the alternate output unit if one is desired.<br><br>Data track address(es). Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address.<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks, or<br>a comma to indicate individual tracks or sequences of tracks.<br>All tracks should be specified in ascending order. |
| 72                                 | b                                       | Must be blank.   |
| 73-78                              | aaaann                                  | Set identification. It consists of a six-character alphameric name assigned by the user to the set of tracks to be dumped.<br>aaaa are four alphameric characters, and<br>nn are two numeric digits assigned in ascending sequence.  |
| 79-80                              |   | Not used.  |

Figure 11. The D4044D or F4044D Master Control Card

DISK -PRESS START, is printed out, press the START button.

- If the control cards are not on the same input device as the program deck, a Read Select instruction (RDS) that contains the address of the input unit from which the control cards are to be read is entered in the word bank of the entry keys after the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

| Card Cols | Contents                       | Explanation  |
|-----------|--------------------------------|--|
| 1-7       | D4044D*(disk)<br>F4044D*(drum) | Control card identification.   |
| 8-71      |                                | These columns continue the specification of track addresses that was begun in the Master control card. |
| 72        | b                              | Must be blank.   |
| 73-78     | aaaann                         | Set identification as assigned in the Master control card.   |
| 79-80     | bb                             | Not used.  |

Figure 12. The Extension Card for the D4044D or F4044D Master Control Card

| Card Cols | Contents | Explanation   |
|-----------|----------|---|
| 1-6       | PREDAT   | Control card identification.  |
| 7-11      | yyddd    | Designates the present date. The first two digits (yy) are the year and the last three (ddd) are the day of the year. |
| 12-15     | xxxx     | Retention period for the created tape.<br>xxxx is the number of days (0000-9999).                                     |
| 16-80     |          | Not used.   |

Figure 13. The PREDAT Control Card

7040/7044 RESTORE DISK/DRUM PROGRAM

**MACHINE REQUIREMENTS**

1. One tape unit.
2. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
3. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

**DESCRIPTION**

The Restore Disk/Drum program reads either all of the data placed on tape by the Dump Disk/Drum program, or selected portions (sets) of the data, and returns it to its original area in disk or drum storage. The Restore Disk/Drum program can only be used to return information that was placed on tape by the Dump Disk/Drum program. If it is necessary to write other information, the Load Disk/Drum program must be used.

Since the information is written with the Write Full Track with Addresses instruction, only the home address (HA1 and HA2) is required for verification. The home address identifier and the format track must be the same as they were when the tracks were dumped.

The same channels and modules that were specified when the sets of information were dumped must be available when these sets are restored.

**CONTROL CARD**

The only control card required by the Restore Disk/Drum program is the D4044R or F4044R Master control card. It permits specification of a primary input tape, an alternate input tape, and the sets to be restored. (See Figure 14.)

**OPERATION**

Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from either a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE.

Write checking is an optional feature with this program, since the write checking procedure doubles the running time of the program. If write checking is desired, location WRCK must be assembled as an MZE.

| Card Cols | Contents                     | Explanation  |
|-----------|------------------------------|--|
| 1-6       | D4044R(disk)<br>F4044R(drum) | Control card identification.   |
| 7         | A or b                       | If an A is specified, all of the data on the input tape is restored. If a blank appears in this column, the program restores only those sets listed in columns 13-72.  |
| 8         | b                            | Must be blank.   |
| 9-10      | A0-E9                        | Designates the primary input tape.   |
| 11-12     | A0-E9 or b                   | Designates the alternate input tape. If there is more than one reel of input, the first reel is mounted on the primary input tape drive and the second reel is mounted on the alternate input tape drive.  |
| 13-72     | aaaann                       | Designates the set selections. The sets consist of six-character alphanumeric names,<br>aaaa are four alphameric characters, and<br>nn are two numeric digits designated in ascending order.<br><br>The numeric position is the only part of the set identification used.<br><br>If the All option (column 7) is designated, this field should be omitted. |
| 73-80     |                              | Not used.  |

Figure 14. The D4044R or F4044R Master Control Card

If either of these locations is not assembled as an MZE, a binary patch can be used to alter the location, or the location can be altered through the entry keys after the initial halt in the program.

Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.
3. After the message, 20479 7040-44 RESTORE DISK. START TO BEGIN, is printed out, press the START button.
4. If the control cards are not on the same input device as the program deck, a Read Select in-

struction that contains the address of the input unit from which the control cards are to be read is entered in the word bank of the entry keys after the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

## MACHINE REQUIREMENTS

1. One tape unit.
2. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
3. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

## DESCRIPTION

The Load Disk/Drum program writes data contained in tape records into designated record areas of specified disk or drum storage data tracks. The home address identifiers and record addresses must have been written on the tracks before the Load Disk/Drum program is executed. Two methods of loading are provided.

### First Method of Loading

This method enables users to load data contained in tape records into one or more consecutive record areas on specified tracks. There must be a tape record for each record area to be loaded. The excess characters or bits of tape records that are longer than the record area provided on the format track are truncated; tape records that are shorter than the provided record area are padded with zeros to fill out the area. Neither of these conditions is considered an error.

The user must specify the number of record areas to be loaded per track and the number of the record area at which the loading of each track is to begin.

All tracks designated on the Master control card and its Extension cards are affected by the specified number of tape records and the track record at which loading begins. A new Master control card must be used to change these variables if the way in which they affect loading is to be changed.

Loading continues until either all designated track numbers are exhausted or all files have been loaded. An appropriate message is then typed.

The Single Record Method permits the writing of only one record for each revolution of the disk or drum. The loading time of Method 1, therefore, is contingent on the number of tracks specified and on the number of records specified for each track.

### Second Method of Loading

This method enables users to load data contained in tape records into all the record areas on one or

more specified tracks. Tape records to be loaded on each track are read into core storage and are blocked. This block is written and is distributed over the data areas according to the format of the track being loaded. If short tape records are used, the remainder of the track is filled with zeros; if long tape records are used, the excess data is truncated. Neither of these cases is considered an error.

All records in a block must be from the same file. Only one file can be written on any one track. Information which follows an end-of-file mark is written on the next track designated in the control card.

Since the tracks are loaded with a Write Full Track without Addresses instruction, only the home address (HA1 and HA2) is required for verification. If nonstandard home address identifiers (HA2) are on the tracks, the Load Disk/Drum program must be modified (see "Modification Routines").

The advantage of Method 2 is that only one revolution of the disk is necessary to load an entire track. Maximum efficiency is obtained by loading only one record per track.

### Tape Labels

Provision has been made to load tapes that have standard header labels and trailer labels. Label checking is done automatically by the Load Disk/Drum program.

### Modification Routines

The Load Disk/Drum program assumes that the home address identifier and record addresses are standard, as generated by the Home Address and Record Address Generator programs. If nonstandard addresses have been written, the user must insert his own routine to alter the addresses used in the Load Disk/Drum program. The exit provided, HAEXIT, must be assembled as follows:

```
HAEXIT   TSX   Exitname, 4
```

#### Method 1

The user's routine is executed for every record and for every track loaded. The track number being loaded is stored, in binary, in location MINTRK. The record number of the record being loaded is stored, in BCD, in location EMM. Before returning from the user's routine, the accumulator register should contain the first four BCD characters of the

nonstandard home address, right-adjusted, and location EMM should contain the last two BCD characters of the nonstandard record address.

#### Method 2

If the Full Track Method is being used, location EMM, which contains the home address identifier of the track, must be altered in the user's routine to conform with the nonstandard home address identifier.

#### CONTROL CARDS

Three types of control cards are used to provide information to the Load Disk/Drum program.

1. The D4044L or F4044L Master control card for Method 1 (see Figure 15).
2. The D4044L or F4044L Master control card for Method 2 (see Figure 16).
3. An Extension card for the above Master control cards (see Figure 17).

#### OPERATION

##### Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from either a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE.

Write checking is an optional feature with this program, since the write checking procedure doubles the running time of the program. If write checking is desired, location WRCK must be assembled as an MZE.

If either of these locations is not assembled as an MZE, a binary patch can be used to alter the location, or the location can be altered through the entry keys after the initial halt in the program.

##### Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.
3. After the message, 20434 LOAD DISK is printed out, press the START button.
4. If the control cards are not on the same input device as the program deck, a Read Select instruction that contains the address of the input

| Card Cols | Contents                       | Explanation  |
|-----------|--------------------------------|--|
| 1-6       | D4044L (disk)<br>F4044L (drum) | Control card identification.   |
| 7         | /                              | Field separator.   |
| 8         | 0                              | Access mechanism number.   |
| 9         | /                              | Field separator.   |
| 10        | 0-9                            | Module number.   |
| 11        | /                              | Field separator.   |
| 12        | B-E                            | Channel to which the disk or drum is attached.   |
| 13        | /                              | Field separator.   |
| 14-15     | A0-E9                          | Designates tape channel and drive.   |
| 16        | /                              | Field separator.   |
| 17        | 6 or 8                         | Designates 6-bit or 8-bit mode.  |
| 18        | /                              | Field separator.   |
| 19        | 0 or 1                         | Input tape mode.<br>0 = BCD<br>1 = binary  |
| 20        | /                              | Field separator.   |
| 21        | 1                              | Method of loading.   |
| 22        | /                              | Field separator.   |
| 23-24     | 01-xx                          | Number of records to be loaded on each track.  |
| 25        | /                              | Field separator.   |
| 26-27     | 01-xx                          | Number of the record area at which loading is to begin.  |
| 28        | /                              | Field separator.   |
| 29-30     | 00-99                          | Number of files to skip before loading.  |
| 31        | /                              | Field separator.   |
| 32-33     | 01-99                          | Number of files to be loaded.  |
| 34        | /                              | Field separator.   |
| 35-79     | tttcc<br>tttc<br>ttc<br>tc     | Data track addresses. Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address.<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks or a comma to indicate individual tracks or sequence of tracks.<br>All tracks should be specified in ascending order. |
| 80        | b                              | Must be blank.   |

Figure 15. The D4044L or F4044L Master Control Card for Method 1

| Card Cols | Contents                       | Explanation   |
|-----------|--------------------------------|---|
| 1-6       | D4044L (disk)<br>F4044L (drum) | Control card identification.  |
| 7         | /                              | Field separator.  |
| 8         | 0                              | Access mechanism number.  |
| 9         | /                              | Field separator.  |
| 10        | 0 - 9                          | Module number.  |
| 11        | /                              | Field separator.  |
| 12        | B - E                          | Channel to which the disk or drum is attached.  |
| 13        | /                              | Field separator.  |
| 14-15     | A0 - E9                        | Designates tape channel and drive.  |
| 16        | /                              | Field separator.  |
| 17        | 6 or 8                         | Designates 6-bit or 8-bit mode.   |
| 18        | /                              | Field separator.  |
| 19        | 0 or 1                         | Input tape mode.<br>0 = BCD<br>1 = binary   |
| 20        | /                              | Field separator.  |
| 21        | 2                              | Method of loading.  |
| 22        | /                              | Field separator.  |
| 23-24     | 01 - xx                        | Number of records to be loaded on each track.   |
| 25        | /                              | Field separator.  |
| 26-27     | 00 - 99                        | Number of files to skip before loading.   |
| 28        | /                              | Field separator.  |
| 29-30     | 01 - 99                        | Number of files to be loaded.   |
| 31        | /                              | Field separator.  |
| 32-79     | tttc<br>tttc<br>ttc<br>tc      | Data track addresses. Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address (0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks, or<br>a comma to indicate individual tracks or sequences of tracks.<br>All tracks should be specified in ascending order. |
| 80        | b                              | Must be blank.  |

Figure 16. The D4044L or F4044L Master Control Card for Method 2

unit from which the control cards are to be read is entered in the word bank of the entry keys after the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

| Card Cols | Contents           | Explanation                                     |
|-----------|--------------------|---|
| 1-7       | D4044L*<br>F4044L* | Control card identification.                    |
| 8-80      |                    | Track addresses are continued in these columns. |

Figure 17. The Extension Card for the D4044L or F4044L Master Control Card

## MACHINE REQUIREMENTS

1. A 1402 Card Read Punch with the column binary feature or a tape unit, for loading the program.
2. A 1402 Card Read Punch, a 1622 Card Read Punch, or a tape unit, for reading control cards.

## DESCRIPTION

The Clear Disk/Drum program clears record areas of designated data tracks by filling the areas with a specified character. Home address identifiers and record addresses are not disturbed. Two methods of clearing are provided.

### First Method of Clearing

This method enables users to fill one or more consecutive record areas on specified tracks with a designated character. The user must specify the number of record areas per track to be cleared and the number of the record area at which clearing is to begin. For example, if the second and third record areas of a multi-record area track are to be cleared, the beginning record area is specified as 02 and the number of record areas is 02.

Because this method clears record areas with the Write Single Record instruction, record addresses are required for verification. If nonstandard record addresses are on the tracks, the Clear Disk/Drum program must be modified (see "Modification Routines").

### Second Method of Clearing

This method enables users to fill all record areas on one or more specified tracks with a designated character. Since the tracks are cleared with a Write Full Track without Addresses instruction, only the home address (HA1 and HA2) is required for verification. If nonstandard home address identifiers (HA2) are on the tracks, the Clear Disk/Drum program must be modified (see "Modification Routines").

### Modification Routines

The Clear Disk/Drum program assumes that the home address identifiers and record addresses are standard, as generated by the Home Address and Record Address Generator program. If nonstandard addresses have been written, the user must insert his own routine to alter the addresses used in Clear

Disk/Drum program. The exit provided, HAEXIT, must be assembled as follows:

```
HAEXIT   TSX   Exitname, 4
```

### Method 1

The user's routine is executed for every record and for every track cleared. The track number being cleared is stored, in BCD, in location EMM. Before returning from the user's routine, the accumulator register should contain the first four BCD characters of the nonstandard home address, right-adjusted, and location EMM should contain the last two BCD characters of the nonstandard record address.

### Method 2

If the Full Track Method is being used, location EMM, which contains the home address identifier of the track, must be altered in the user's routine to conform to the nonstandard home address identifier.

## CONTROL CARDS

Three types of control cards are used to provide information to the Clear Disk/Drum program.

1. The D4044C or F4044C Master control card for Method 1 (see Figure 18).
2. The D4044C or F4044C Master control card for Method 2 (see Figure 19).
3. An Extension card for the above Master control cards (see Figure 20).

## OPERATION

### Assembly of the Symbolic Deck

The program, as distributed, is set up to read control cards from either a 1402 Card Read Punch or a 1622 Card Read Punch. If control cards are to be read from tape, location IOUNIT must be assembled as an MZE.

Write checking is an optional feature with this program, since the write checking procedure doubles the running time of the program. If write checking is desired, location WRCK must be assembled as an MZE.

If either of these locations is not assembled as an MZE, a binary patch can be used to alter the location or the location can be altered through the entry keys after the initial halt in the program.

## Operating Instructions

1. A Read Select instruction (RDS) that contains the address of the input unit from which the program is to be read is entered in the word bank of the entry keys.
2. Press the LOAD button.
3. After the message, 20457 CLEAR DISK, is printed out, press the START button.
4. If the control cards are not on the same input

| Card Cols | Contents                       | Explanation   |
|-----------|--------------------------------|---|
| 1-6       | D4044C (disk)<br>F4044C (drum) | Control card identification.  |
| 7         | /                              | Field separator.  |
| 8         | 0                              | Access mechanism number.  |
| 9         | /                              | Field separator.  |
| 10        | 0-9                            | Module number.  |
| 11        | /                              | Field separator.  |
| 12        | B-E                            | Channel to which the disk or drum is attached.  |
| 13        | /                              | Field separator.  |
| 14        | 6 or 8                         | Designates 6-bit or 8-bit mode.   |
| 15        | /                              | Field separator.  |
| 16        | 1                              | Designates the method used in clearing.   |
| 17        | /                              | Field separator.  |
| 18-19     | 01-99                          | Designates the number of data areas to be cleared on each track.  |
| 20        | /                              | Field separator.  |
| 21-22     | 01-99                          | Designates the number of the data area at which clearing is to begin.   |
| 23        | /                              | Field separator.  |
| 24        | c                              | Designates the filler character. It may be any alphameric character.  |
| 25        | /                              | Field separator.  |
| 26-79     | tttc<br>ttc<br>ttc<br>tc       | Data track addresses. Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address .<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks or a comma to indicate individual tracks or sequence of tracks.<br>All tracks should be specified in ascending order.<br>The last track on the card must be followed by a blank. If it is followed by a comma, an extension card is needed. |
| 80        | b                              | Must be blank.  |

Figure 18. The D4044C or F4044C Master Control Card for Method 1

device as the program deck, a Read Select instruction that contains the address of the input unit from which the control cards are to be read is entered in the work bank of the entry keys after the initial message in the program is typed.

Control cards may be stacked, and each job is processed in turn. At any point during execution or at a program halt, the program can be reinitialized by pressing the RESET button and then pressing the START button. Another control card deck is read as a result of this process.

| Card Cols | Contents                       | Explanation  |
|-----------|--------------------------------|--|
| 1-6       | D4044C (disk)<br>F4044C (drum) | Control card identification.   |
| 7         | /                              | Field separator.   |
| 8         | 0                              | Access mechanism number.   |
| 9         | /                              | Field separator.   |
| 10        | 0-9                            | Module number.   |
| 11        | /                              | Field separator.   |
| 12        | B-E                            | Channel to which the disk or drum is attached.   |
| 13        | /                              | Field separator.   |
| 14        | 6 or 8                         | Designates 6-bit or 8-bit mode.  |
| 15        | /                              | Field separator.   |
| 16        | 2                              | Designates the method used in clearing.  |
| 17        | /                              | Field separator.   |
| 18        | c                              | Designates the filler character. It may be any alphameric character.   |
| 19        | /                              | Field separator.   |
| 20-79     | tttc<br>tttc<br>ttc<br>tc      | Data track addresses. Each address is followed by a connector which indicates the relationship of the track address preceding the connector to the address following it.<br>t-tttt is a track address.<br>(0-9999 for disk; 0-399 for drum)<br>c is a connector and is:<br>a hyphen to indicate a sequence of tracks or a comma to indicate individual tracks or sequence of tracks. |
| 80        | b                              | Must be blank.   |

Figure 19. The D4044C or F4044C Master Control Card for Method 2

| Card Cols | Contents                         | Explanation                        |
|-----------|----------------------------------|------------------------------------|
| 1-7       | D4044C* (disk)<br>F4044C* (drum) | Control card identification.       |
| 8-79      |                                  | Continue the track addresses here. |
| 80        | b                                | Must be blank.                     |

Figure 20. The Extension Card for the D4044C or F4044C Master Control Card

| <u>Number</u> | <u>Message and Explanation</u>   | <u>Number</u> | <u>Message and Explanation</u>   |
|---------------|--|---------------|--|
| 00400         | INV SEQ-RELOAD-S<br>An invalid sequence trap has occurred. Reload the program and press the START button.  | 20409         | EOR, MOUNT NEW TAPE & PRESS START<br>The end of reel has been encountered and no alternate tape unit is specified. Mount a new tape and press the START button.  |
| 00401         | INV CD-RELOAD<br>An invalid code trap has occurred. Press the RESET and START buttons to read the next control card.   | 20412         | RED ATTN-S<br>An attention trap has occurred, but no bit was set in the sense data. Press the START button to continue.  |
| 00402         | No message is printed.<br>This number is typed if the rewind option is used at the end of job.   | 20413         | INVAL CTRL CD-S<br>The control card has an invalid identification. Press the START button to read another card.  |
| 00404         | EOJ<br>An end of file has occurred while reading control cards. To read additional control cards, ready the appropriate unit from which the control cards are to be read and press the RESET and START buttons.                                      | 20414         | INVAL INTAP-S<br>The identification on the input tape is not correct. Change the tape and press the START button.  |
| 00405         | SET NOT ON INTAP. R-S READ NEXT CTL CD<br>A set of data for restoration to disk is not on the input tape, or the control card calls for the set incorrectly. Discontinue the job or press the RESET and START buttons to read the next control card. | 20416         | ILL CONN<br>The control card contains an illegal connector character. Correct the control card and press the START button.   |
| 10401         | ALTERNATE TAPE UNIT NOW IN USE<br>The end-of-reel mark has been encountered and the alternate tape unit is now being used.   | 20417         | IO CHK<br>The I/O Check Indicator is on indicating an erroneous input/output operation. Press the START button to read the next control card.  |
| 20401         | INVAL ADDRXXXXX -S RETRY<br>An invalid address trap has occurred at the indicated address. Press the START button to retry the operation.  | 20418         | END OF REEL. MOUNT NEW REEL AND PRESS START.<br>The reflective mark has been encountered on the output tape. The output tape is rewound and unloaded. Mount a new tape and press the START button to continue. If the tape has standard labels and a new Reel Serial Number is desired on the new tape, press Sense Switch 1 and place the BCD characters, left-justified, in the keys. If this is not done, the Reel Serial Number on the second tape is the same as the Reel Serial Number on the original tape. |
| 20402         | RESP CHK-S, RETRY<br>A response check trap has occurred on the disk. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.   | 20419         | FORMAT CARD MISSING. JOB DISCONTINUED. TO READ NEXT CONTROL CARD PRESS START.<br>This message occurs when a FIXED card or a VARIABLE card does not follow a BUILD card or a GENERATE card. The BUILD or GENERATE control card is disregarded. Press the START button to read the next control card.  |
| 20403         | END OF JOB, PRESS START TO REWIND<br>The job is completed. If tape rewinding is desired, press the START button.   | 20420         | UNCORRECTABLE ERROR ON CONTROL CARD TAPE. TO TRY NEW UNIT, PLACE CONTROL CARD READ SELECT IN WORD BANK AND PRESS START.<br>This message occurs when a permanent read error is encountered on the tape containing the control cards. To attempt a reread, mount the tape on another tape unit. Place the address of the new unit in the keys, reposition the tape, and press the START button.  |
| 20404         | ACES INOP ADDRXXXXX -S, RETRY<br>An access inoperative trap has occurred at the indicated address. Press the START button to retry the operation.  | 20421         | END OF FILE. IF MORE CONTROL CARDS, READY AND PRESS START.<br>This message is printed when an end of file occurs in the reading of control cards from the card reader or a   |
| 20405         | ACES NOT RDY -S, RETRY<br>An access not ready trap has occurred. Press the START button to retry the operation.  |               |  |
| 20406         | 7040-44 DUMP DISK - PRESS START<br>Program identification. Press the START button to execute.  |               |  |
| 20407         | READER REDUNDANCY, RELOAD CARDS, R&S - RESTART<br>A redundancy has occurred while reading control cards from the reader. Reload the control cards and press the RESET and START buttons to restart.  |               |  |

| <u>Number</u> | <u>Message and Explanation</u>   | <u>Number</u> | <u>Message and Explanation</u>  |
|---------------|--|---------------|---|
|               | tape mark is encountered on the control card input tape. To read additional control cards, ready the appropriate unit and press the START button.  | 20431         | UNATTACHED FORMAT CARD READ. TO READ THE NEXT CONTROL CARD PRESS START.<br>This message is printed when a FIXED card or a VARIABLE card is not preceded by a BUILD card or a GENERATE card. Press the START button to read the next control card.   |
| 20422         | CONTROL CARD FIELD MISSING. JOB DISCONTINUED. TO PROCESS FOLLOWING CARD PRESS START.<br>This message is printed when a control card field is missing for which no standard is supplied by the program. Press the START button to process the next control card; this card has already been read and typed on-line. | 20432         | PLACE CONTROL CARD READ SELECT IN WORD BANK AND PRESS START.<br>Initial halt for the Tape File Generator program.   |
| 20423         | END RECORD CARD MISSING. TO PROCESS LAST RECORD PRESS START.<br>This message is printed when an *** END RECORD *** card is missing after the last logical record in a data file. To process the last record, press the START button.   | 20433         | RD TAPE UNUSUAL END, R&S - RESTART<br>An unusual end trap has occurred while reading tape. To restart, ready a new tape unit and press the RESET and START buttons.   |
| 20424         | INPUT IN WRONG MODE. JOB DISCONTINUED. TO READ NEXT CONTROL CARD, PRESS START.<br>The mode of the input tape does not agree with the designated mode on the BUILD control card. Press the START button to read the next control card.  | 20434         | LOAD DISK<br>Program identification. Press the START button to execute.   |
| 20425         | EOF FIRST DATA READ. READY DATA AND PRESS START.<br>An end-of-file mark has been encountered on tape on the first data read, or the card feed hopper in the card reader is empty. Ready the appropriate unit and press the START button.   | 20435         | END OF FILE<br>An end of file has been encountered in the card reader. Load the control cards and press the START button to continue.   |
| 20426         | UNREADABLE DATA TAPE, JOB DISCONTINUED. TO READ NEXT CONTROL CARD PRESS START.<br>There is a permanent read error on the data tape. To read and process the next control card, press the START button.   | 20436         | CARD READER ERROR<br>A read error has occurred while reading the control cards. Reload the cards and press the START button to reread.  |
| 20427         | REDUNDANT CARD READ REPLACE AND PRESS START.<br>A card read error has occurred. Replace the control card with a corrected card and press START.  | 20437         | ALL TRACKS LOADED. LAST TRACK XXXX<br>All tracks specified on the control card have been loaded. The tape remains positioned after the last record loaded. The track number of the last record loaded is inserted in the above message. Press the START button to read the next control card. |
| 20428         | CAN NO LONGER WRITE ON OUTPUT TAPE. TO CONTINUE JOB, MOUNT NEW TAPE AND PRESS START.<br>This message is printed when tape is skipped 29 consecutive times while trying to write a record. The job is continued on a new tape; there is no tape mark on the first output tape.                                      | 20438         | INT TIM-S<br>An interval timer blast trap has occurred. Press the START button to continue.   |
| 20429         | ERROR IN ABOVE CONTROL CARD. TO READ THE NEXT, PRESS START.<br>There is an error in the format of the control card just typed. Replace the card with a corrected control card and press the START button or press the START button to read the next control card.  | 20439         | STG PAR-S-LOCATION XXXXX<br>A storage parity trap has occurred at the indicated location. Press the START button to continue, if desired. Press the RESET and START buttons to read the next control card.  |
| 20430         | LOGICAL RECORD OVERFILLS BUFFER. JOB DISCONTINUED. TO READ NEXT CONTROL CARD, PRESS START.<br>A logical record is too large for the buffer area (2,000 words) or too large for the specified blocksize. Press the START button to read and process the next card.  | 20440         | INT TIM OV -S<br>An interval timer overflow trap has occurred. Press the START button to reset the trap and to continue the job.  |
|               |  | 20441         | OUTPUT NOT READY<br>Tape output requested, but the unit is not ready. Ready the output tape and press the START button.   |
|               |  | 20442         | OUTAPE LABEL ERR<br>The output tape is at load point and does not have a header label and a tape mark. Mount a new tape and press the START button.   |
|               |  | 20443         | OUTAPE INVALID<br>The retention cycle has not expired. Mount a new tape and press the START button.   |

| <u>Number</u> | <u>Message and Explanation</u>   | <u>Number</u> | <u>Message and Explanation</u>  |
|---------------|--|---------------|---|
| 20444         | OUTAPE END OF REEL<br>The reflective mark has been encountered on the output tape, and a trailer label has been written. Mount a new tape and press the START button. In a labeled installation, the retention cycle of the new tape is checked.   | 20456         | TK ERR<br>A track sequence has been improperly punched.   |
| 20445         | READER ERR<br>A redundancy has occurred while reading control cards. Reload the reader from the control card in error and press the START button.  | 20457         | CLEAR DISK<br>Program identification. Press the START button to execute.  |
| 20446         | READER EOF, READER CARDS-START.<br>All control cards have been read, but an END card with EOJ or RESTORE in the variable field has not been read. Press the START button to enter the control information in the entry keys.   | 20460         | SEQUENCE ERROR<br>The card sequence is incorrect. Resequence the control cards and press the START button.  |
| 20447         | OPERATION ERROR<br>There is an error in the operation field of a control card, or a TAPE card is not followed by a SPACE card or a DUMP card, or an attempt is made to initiate file operations in a nonrewind tape dump. Correct the error and reload the reader from the card in error. Press the START button. If the keys option is being used, correct the keys and press the START button. | 20463         | No message is printed.<br>The designated disk channel is invalid.   |
| 20448         | CONTROL CARD FIELD ERROR<br>There is an error in a control card field. Correct the error, reload the reader from the card in error, and press the START button. If the keys option is being used, correct the keys and press the START button.   | 20464         | No message is printed.<br>The designated disk module number is invalid.   |
| 20449         | NO OUTPUT UNIT<br>There is no OUTPUT card in the control card deck. Insert this card and reload the reader from the beginning of the current logical file (excluding any Date card which has been read) and press the START button. If the keys option is being used, correct the keys and press the START button.   | 20465         | No message is printed.<br>The designated disk access number is invalid.   |
| 20450         | SEQ ERR<br>A card is out of sequence. An Extension card is probably out of order.  | 20466         | No message is printed.<br>The designated tape unit is incorrect.  |
| 20451         | CHAN ERR<br>An invalid channel has been specified.   | 20467         | No message is printed.<br>The designated tape channel is incorrect.   |
| 20452         | MODL ERR<br>An invalid module has been specified.  | 20468         | ALL TRACKS CLEARED. LAST TRACK XXXX<br>All specified tracks have been cleared. Press the START button to read the next control card.  |
| 20453         | ACS ERR<br>An invalid access mechanism has been specified.   | 20469         | ILL CTL CRD-S<br>An invalid control card has been encountered. Correct the control card, reload the cards from the card in error, and press the START button.   |
| 20454         | MODE ERR<br>An invalid mode has been specified. Change to 6- or 8-bit mode.  | 20470         | TRK SEQ ERR<br>A series of tracks are specified which are in descending rather than ascending order.  |
| 20455         | NON NUM TK<br>A nonnumeric character has been punched as a track number.   | 20471         | TRK OVFL0<br>The number of words specified for data areas exceeds the length of the format track.   |
|               |  | 20472         | FORMAT GENERATOR TURN SWITCH TO (WRITE) -S<br>Program identification. Press the START button to execute.  |
|               |  | 20473         | ADDRESS GENERATOR PUT HAO SWITCH UP - S<br>Program identification. Press the START button to execute.   |
|               |  | 20474         | ILL CTL CRD-S<br>An invalid control card has been read. This message accompanies another message which specifies the particular type of error encountered. The program prints the incorrect control card and halts. Press the START button to read the next control card. |
|               |  | 20476         | BOTH TAPES FULL MOUNT NEW TAPES, S-CONT<br>Both the primary and alternate tapes are full. Mount new tapes and press the START button to continue.   |

| <u>Number</u> | <u>Message and Explanation</u>  | <u>Number</u> | <u>Message and Explanation</u>  |
|---------------|---|---------------|---|
| 20477         | CARD OUT OF SEQUENCE<br>The control cards have not been read as complete sets. Permissible combinations are:<br>x4044FH      x4044H      x4044H      x4044F<br>x4044H      x4044F      x4044FH<br>Where x = D or F.                                 |               | indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.  |
| 20478         | FORMAT AND ADDRESS GENERATION COMPLETE -<br>TURN OFF FORMAT AND HAO SWITCHES<br>An end of file has occurred in the card reader. To read additional control cards, place the cards in the reader and press the START button.                         | 30405         | DSK CIRC CHK ADDR XXXXX -S, RETRY-R&S, CONT<br>A disk circuit check trap has occurred at the indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.   |
| 20479         | 7040-44 RESTORE DISK. START TO BEGIN.<br>Program identification. Press the START button to execute.   | 30406         | FILE ADAPT CIRC CHK ADDRXXXXX -S, RETRY-R&S, CONT<br>A file adapter circuit check trap has occurred at the indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.   |
| 20481         | READY CARDS OR KEYS<br>This message occurs after the "sneak-on" and the writing out of upper core storage onto tape. The user has the choice of using keys or cards to control the program. Ready the cards or the keys and press the START button. | 30408         | DATE CRD MISSING, S-TO CONT, R&S-RESTART<br>There is a label on the output tape, but no PREDAT card was included with the control cards. Press the START button to continue. To restart, insert a PREDAT card in front of the control card deck and reload the deck. Press the RESET and START buttons. |
| 20482         | READY KEYS<br>This message occurs when the keys option is taken by the user. Press the START button.  | 30409         | PERM. READ REDUND, START-RETRY, R&S-RESTART<br>One hundred attempts have been made to read a header label or a trailer label. To attempt a hundred more reads, press the START button. To restart the program, mount a new tape and press the RESET and START buttons.                                  |
| 20483         | CARD READER ERROR - RELOAD AND PRESS START<br>An error has occurred while reading a control card. Correct the card, reload it, and press the START button.  | 30410         | 25 WBTS ATTEMPTED, S-CONT, R&S-RESTART<br>Twenty-five blank tape writes have been executed after unsuccessful write operations. To attempt a rewrite, press the START button. To restart the program, mount a new tape and press the RESET and START buttons.   |
| 20484         | TP EOF ON FIRST READ<br>The first record read was an end-of-file mark. This indicates that the preceding file has been loaded, but the tape was not positioned after the end-of-file mark. Press the START button to load the next file.            | 30411         | ERROR CORRECTION ENTERED FOR THE 29TH TIME, S-CONT, R&S-RESTART<br>Twenty-nine write errors have occurred while writing this tape. To continue, press the START button. To restart, mount a new tape and press the RESET and START buttons.   |
| 30400         | F MT CHK ADDR XXXXX S, RETRY - R&S, CONT<br>A format check trap has occurred at the indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.                              | 30412         | WD. PAR. S-RETRY R&S - RESTART<br>This message is printed when a word parity trap occurs while writing tape. The location of the invalid word is printed on-line. To attempt to rewrite tape, press the START button. To restart the program, press the RESET and START buttons.                        |
| 30401         | NO REC FND ADDRXXXXX -S, RETRY - R&S, CONT<br>A record is not found at the indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.                                       | 30413         | 30 REDUND INTAP. S, CONT<br>Thirty permanent read redundancies have occurred while reading the input tape. Discontinue the job or press the START button to ignore the redundancy.  |
| 30402         | S-RETRY, R&S-RESTART. UNLOADED TRKXXXX<br>A permanent read redundancy on tape has occurred. Press the START button to attempt 10 rereads. Press the RESET and START buttons to read the next control card.  | 30414         | TPE UNEND. LAST TK LOAD XXXX, S<br>A tape read has been tried five times. To reread five times, press the START button.   |
| 30403         | DATA CMP CHK ADDR XXXXX -S, RETRY -R&S, CONT<br>A data compare check trap has occurred at the indicated address. Press the START button to retry the operation. Press the RESET and START buttons to read the next control card.                    | 30415         | PERM. RED. ON SET LAST TRACK LOADEDXXXX<br>A redundancy has occurred 99 times while reading tape. Press the START button to ignore the redundancy.  |
| 30404         | PAR OR CYC CD ADDR XXXXX S, RETRY-R&S,CONT<br>A parity or cyclic code check trap has occurred at the  |               |   |

| <u>Number</u> | <u>Message and Explanation</u>  | <u>Number</u> | <u>Message and Explanation</u>  |
|---------------|---|---------------|---|
| 30416         | WD PAR. S-ENTRY. R&S-RESTART<br>A word parity trap has occurred during an input/output operation. Press the START button to retry the operation. To restart, press the RESET and START buttons.   | 30428         | MST CTL CRD MISSING, S-RETRY, R&S-CONT<br>A Master control card is missing that was called for by the previous control card. Insert the missing Master card, reload all the control cards not yet processed, and press the START button. To skip the set associated with the missing card, press the RESET and START buttons.   |
| 30417         | ALL FILES LOADED. LAST TRACK XXXX<br>All files specified on the control cards have been loaded. The track number of the last record loaded is inserted in the message. Press the START button to read the next control card.  | 30429         | EXT CARD MISSING, S-RETRY, R&S-CONT<br>An Extension card is missing that was called for by the previous control card. Insert the missing Extension card, reload all the control cards not yet processed, and press the START button. To skip the set associated with the missing card, press the RESET and START buttons.   |
| 30418         | NO LABEL, S-CONT, R&S-RESTART<br>There is a PREDAT card indicating label checking, but no header label appears on the output tape. Press the START button to continue. To restart, mount a labeled tape, reload the control card, and press the RESET and START buttons.              | 30430         | OUTAPE WRT ERR<br>There is a persistent write redundancy on the output tape. The procedure is the same as for the following message.  |
| 30419         | WD. PAR. S-TO RE-READ-R&S-TO RESTART<br>This message is printed when there is a word parity trap while reading disk. To reread the disk five times, press the START button. To restart the program, press the RESET and START buttons.  | 30431         | 30 OUTAPE WRT ERR<br>Thirty entries have been made into the output tape write error routine. A new tape may be mounted or the present tape may be left on for further attempts at writing. In the case of the labeled installation, label checking is effected on the new tape. No trailer label is written on the rejected tape, and no output records are lost. Press the START button to continue. |
| 30420         | WD. PAR. S-TO RE-READ R&S TO RESTART<br>This message is printed when a word parity trap occurs while reading tape. To reread the tape 100 times, press the START button. To restart the program, press the RESET and START buttons.   | 30432         | SCRATCH WRT ERR<br>There is a persistent write error on the work tape. It may be ignored if only a tape dump is required. Otherwise, there is no recovery for this error. Press the START button to continue.   |
| 30421         | UNSEQUENCED SET -S TO SCAN TAPE<br>During the search of a tape for a set number, a lower set number has been found. Press the START button to rewind the tape and to repeat the search, or press the RESET and START buttons to read the next control card.                           | 30433         | SCRATCH READ ERR<br>There is a persistent read error on the work tape. There is no recovery. Press the START button to continue.  |
| 30423         | TAPE UNUSUAL END. S-RETRY, R&S-RESTART<br>An unusual end trap has occurred while writing tape. To retry the operation, press the START button. To restart, ready a new tape drive and press the RESET and START buttons.  | 30434         | No message printed.<br>An I/O Check has occurred while sensing a channel for an Attention. Press the START button to read the next control card.  |
| 30424         | CTL CRD READ REDUN, S-RETRY, R&S-RESTART<br>A permanent read redundancy has been encountered while reading control cards from tape. To reread 100 times, press the START button. To read the next control card, press the RESET and START buttons.                                    | 30435         | No message printed.<br>An I/O Check has occurred while sensing a channel for an unusual end. The error cannot be corrected. Press the START button to read the next control card.   |
| 30425         | CONTROL CARD ERROR, PRINT OF ERROR CARD<br>NEXT S-RETRY, R&S-CONT<br>A control card is either mispunched or out of sequence. Correct the error, replace all control cards not yet processed, and press the START button. To skip the set in error, press the RESET and START buttons. | 30436         | TAPE UNEND S RETRY R&S RESTART<br>An unusual end of tape has occurred. Press the START button to retry. To restart, press the RESET and START buttons.  |
| 30426         | INVALID TP UNIT<br>An incorrect tape unit has been specified. Press the START button to read another card.  | 30437         | TAPE REDUNDANCY<br>A read error has occurred on the control card tape. Press the START button to attempt a reread. Press the RESET and START buttons to read the next control card.   |
| 30427         | INVALID CHANNEL (CTL. CARD)<br>An incorrect channel has been specified. Press the START button to read another card.  | 30438         | END OF SET, S-CONT, R&S-REWIND TAPE<br>A set of control cards has been read and executed. Press   |

| <u>Number</u> | <u>Message and Explanation</u>   |
|---------------|--|
|               | the START button to read the next set. Press the RESET and START buttons to end the job and rewind the tape.   |
| 30481         | <p>ENTER KEYS</p> <p>Control cards are to be read from tape. Enter the proper Read Select instruction in the entry keys and press the START button.</p>  |
| 30484         | <p>INPUT BUFFER OVFL0-S</p> <p>This message is printed if, in blocking the input tape records, the size of the block exceeds the size of the input buffer in Method 2. Press the START button to continue.</p>                           |
| 40400         | <p>LST SET INCOMP, S-RETRY, R&amp;S - SKIP</p> <p>The last set of control cards is incomplete. Insert the missing card(s), reload the control cards, and press the START button. To skip the set, press the RESET and START buttons.</p> |

APPENDIX A: USE OF THE ENTRY KEYS AND SENSE SWITCHES

**KEYBOARD**

| Starting address<br>for a core dump |   |   |   |   |   | Final address<br>for a core dump |   |   |   |   |   | SENSE<br>SWITCHES |  |
|-------------------------------------|---|---|---|---|---|----------------------------------|---|---|---|---|---|-------------------|--|
| 0                                   | 0 | 0 | 0 | 0 | 0 | 0                                | 0 | 0 | 0 | 0 | 0 | 6                 | ON -- printer output<br>OFF -- no printer output                     |
| 1                                   | 1 | 1 | 1 | 1 | 1 | 1                                | 1 | 1 | 1 | 1 | 1 | 5                 | ON -- tape output<br>OFF -- no tape output                           |
| 2                                   | 2 | 2 | 2 | 2 | 2 | 2                                | 2 | 2 | 2 | 2 | 2 | 4                 | ON -- tape dump<br>OFF -- core dump                                  |
| 3                                   | 3 | 3 | 3 | 3 | 3 | 3                                | 3 | 3 | 3 | 3 | 3 | 3                 | ON -- BCD mode<br>OFF -- binary mode                                 |
| 4                                   | 4 | 4 | 4 | 4 | 4 | 4                                | 4 | 4 | 4 | 4 | 4 | 2                 | ON -- restore the program<br>OFF -- do not restore program           |
| 5                                   | 5 | 5 | 5 | 5 | 5 | 5                                | 5 | 5 | 5 | 5 | 5 | 1                 | ON -- full core dump in Format F<br>OFF -- core dump not in Format F |
| 6                                   | 6 | 6 | 6 | 6 | 6 | 6                                | 6 | 6 | 6 | 6 | 6 |                   |  |

  

|                            |                            |   |                                 |  |
|----------------------------|----------------------------|---|---------------------------------|--|
| F<br>O<br>R<br>M<br>A<br>T | Type<br>of<br>Tape<br>Dump | Tape unit designa-<br>tion (in BCD mode)<br>for a tape dump | Type<br>of<br>Tape<br>Operation | The number of records or<br>files designated for the<br>tape operation |
|----------------------------|----------------------------|---|---------------------------------|--|

  

|  |   |   |
|--|---|---|
| <b>FORMAT</b><br>0 F<br>1 A<br>2 B<br>3 C<br>4 D<br>5 E<br>6 F | <b>TYPE OF TAPE DUMP</b><br>N ON -- tape is not rewind<br>OFF -- rewind tape before dump<br><br>L ON -- labeled tape dump<br>OFF -- unlabeled tape dump | <b>TYPE OF TAPE OPERATION</b><br>0 -- ON -- skip file(s)<br>1 -- ON -- backspace file(s)<br>2 -- ON -- dump file(s)<br>4 -- ON -- skip record(s)<br>5 -- ON -- backspace record(s)<br>6 -- ON -- dump record(s) |
|--|---|---|

APPENDIX B: COMPUTING THE DATA WORDS PER TRACK

The maximum number of words available for recording information on the track depends on the number of record areas that can be defined for one data track and on the number of words per record area.

The formulas for computing the maximum number of words available for recording data on the tracks are given below. The length of the home address identifier (contained in HOME2) and the length of the record address (contained in RECAD) are assumed to be of standard length.

Where

M = the maximum number of words available for recording information on the track, and

N = the number of record areas per track.

Then, for the 6-bit mode, the maximum number of words available for recording data on the track is computed as follows:

For 1301 Disk Storage-- $M=466-[19(N-1)/3]$

For 7320 Drum Storage-- $M=530-[19(N-1)/3]$

and for the 8-bit mode,

For 1301 Disk Storage-- $M=360-[19(N-1)/3]$

For 7320 Drum Storage-- $M=395-[19(N-1)/3]$

Any fractional part of M should be disregarded.

Although it is possible to write a format track with a greater number of data words than is allowed by these formulas, missed disk or drum revolutions and consequent program inefficiency can result.

APPENDIX C: FORMAT OF STANDARD LABELS

The IBM standard label is 120 characters long. The format of the label and the information it contains are shown below.

| Field No. | Position  | Field Name          | Description  |
|-----------|-----------|---------------------|--|
| 1         | 1-5       | Label Identifier    | 1HDRb to indicate a header label; or 1EORb to indicate an end-of-reel trailer label; or 1EOFb to indicate an end-of-file trailer label.<br>blank   |
| 2         | 6<br>7-10 | Retention Period    | The number of days after the creation date (0001-9998) for which this file is to be retained. The figure 9999 indicates indefinite retention.  |
| 3         | 11-15     | Creation Date       | The year and day of the year on which the file was created. The year occupies the first two positions (00-99) and the day of the year occupies the last three positions; e.g., January 31, 1963 would be entered as 63031. |
| 4         | 16-25     | File Identification | A ten-character name or number identifying the file.   |

| Field No. | Position    | Field Name                          | Description  |
|-----------|-------------|-------------------------------------|--|
| 5         | 26-30       | File Serial Number                  | This field is the same as the Reel Serial Number of the first or only reel of the file.  |
| 6         | 31-35       | Reel Serial Number                  | A five-character identification code which is assigned to the reel when it enters the installation. This number normally appears on the outer surface of the cartridge for visual identification.<br>blank         |
| 7         | 36<br>37-40 | Reel Sequence Number                | A four-digit number (0001-9999) which is the order of this reel within the file.<br>blank  |
| 8         | 41<br>42-44 | Reserved                            | This field is reserved for future Programming Systems use.   |
| 9         | 45          | Density Indicator                   | This field specifies the density change which is necessary before the file is read:<br>0--The body of the file is in the same density as the label.  |
| 10        | 46          | Check Sum Indicator                 | This character indicates the presence (1) or absence (0) of check sums.  |
| 11        | 47          | Block Sequence Indicator            | This character indicates the presence (1) or absence (0) of block sequencing.  |
| 12        | 48          | Recording Mode Indicator            | A character which indicates whether the file is in BCD (2) or binary (1) mode.   |
| 13        | 49          | Recording Technique Indicator       | This field specifies the number of bits recorded as one byte:<br>6--729/7330 Magnetic Tape   |
| 14        | 50          | Data Processing Technique Indicator | This field specifies the number of bits to be processed as one byte: 6.  |
| 15        | 51-54       | Creating System                     | A field specifying the system which created the file, e.g., 7040.  |
| 16        | 55          | Record Format                       | This character indicates the record format of the file.  |
| 17        | 56-60       | Record Length                       | For fixed-length records, this field specifies the number of characters in each logical data record; for variable-length records, it specifies the number of characters in the largest possible block in the file. |
| 18        | 61-65       | Block Size                          | For fixed-length records, this field specifies the number of logical data records in each block; for variable-length records, it specifies the number of characters in the largest possible block in the file.     |
| 19        | 66          | Checkpoint Indicator                | This character indicates the presence (1) or absence (0) of checkpoints.   |
| 20        | 67-72       | Block Count                         | This field specifies the number of physical records written on this  |

| Field No. | Position | Field Name       | Description   |
|-----------|----------|------------------|---|
|           |          |                  | reel of the file (excluding labels and end-of-file marks). The block count is given only in trailer labels. |
| 21-26     | 73-100   | Reserved         | These five fields are reserved for future Programming Systems use.  |
| 27        | 101-120  | For Optional Use | Positions 101 through 120 may be employed as an area for additional label data, at the option of the user.  |

## APPENDIX D: READ AND WRITE STATISTICS

### Tape Statistics

Read and write statistics for tapes are typed out following most error messages associated with tape and after each run has been completed. The statistics consist of the following:

#### Tape Reading

1. The channel and number of the tape unit
2. The number of tape records read
3. The number of entries into the read error routine
4. The number of permanent read errors
5. The number of noise records

Example: RDSTAT A1 111 000000 000000 000000

### Tape Writing

1. The channel and number of the tape unit
2. The number of tape records written
3. The number of entries into the write error routine
4. The number of times blank tape was written

Example: WRSTAT B2 00072 000000 000000

### Disk Statistics

Read and write statistics for disk are typed out following most error messages associated with the disk. The statistics consist of the following:

#### Disk Reading and Writing

1. The channel to which the disk is attached
2. The track number, access number, and module number of the unit involved
3. The File Control Status Word (see the section entitled "Sense" in the publication IBM 1301 Disk Storage with IBM 7000 Series Data Processing Systems, Form D22-6576-3)
4. The type of operation involved, either read or write

Example: (B) (0038) ACC (0) MD (0) (4100400000) (W)

channel                      track #                      access #                      module #                      operation

status characters



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