MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963 A

SEMCOR

Moorestown, New Jersey — Warminster, Pennsylvania — Arlington, Virginia — San Diego, California

Neptune, New Jersey — Lexington Park, Maryland — Norfolk, Virginia

AD A109617

COMPUTER PROGRAM USER'S MANUAL

FOR

FIREFINDER

DIGITAL TOPOGRAPHIC DATA

VERIFICATION LIBRARY DUBBING SYSTEM

30 NOVEMBER 1981

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Contract Number:
DAAK20-79-D-0500

81 12 15 191

ACKNOWLEDGMENT

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INTRODUCTION

1.1 PURPOSE AND SCOPE

This manual describes the computer programs for the FIREFINDER Digital Topographic Data Verification-Library-Dubbing System (FFDTDVLDS), and will assist in the maintenance of these programs. The manual contains detailed flow diagrams and associated descriptions for each computer program routine and subroutine. Complete computer program listings are also included. This information should be used when changes are made in the computer programs. The operating system has been designed to minimize operator intervention.

1.2 SYSTEM OVERVIEW

The FFDTDVLDS is the central source of digitized topographic data for the fielded FIREFINDER Artillery and Mortar Locating Radar Systems. This facility is responsible for:

- Receiving data cells from the Defense Mapping Agency (DMA)

- Verifying that they contain reasonably accurate data in the prescribed format

- Accurately cataloging the data cells in the library so as to facilitate timely access when they are needed

- Converting the cataloged data cells to other optimal grid sizes for subsequent cataloging

- Transferring requested data cells to field cassettes

- Validating the cassette files before shipment to operational units

1.2.1 Verification

The incoming DMA tapes and accompanying documentation will be compared. The cell definition records containing critical data will be

dumped for crosscheck with the printed dump accompanying the tapes. Next the actual data is displayed on a color-coded master graphic CRT system. Radically inconsistent color mismatches indicate probable bad data items. Rough contouring routines are also utilized. Any doubt as to the accuracy and validity of a cell will render it unusable by FFDTDVLDS.

1.2.2 Library

The library operations will be software-determined, self-updating, and crosschecking. Operators will be instructed as to what tapes to mount, when to mount them, what switches to throw, and so forth. Operations will not proceed until the program is satisfied that the specific actions have been correctly performed. Routines will be available to aid operators in error recovery if bad library data is encountered.

Auxiliary routines will be available to periodically condense the catalog and data tapes, crosscheck the catalog against the data tapes to be sure no errors have been introduced, and reorder tapes and data files to make more efficient use of the existing tapes. These routines will be used infrequently. Auxiliary software will also include several utility and maintenance programs for various purposes.

1.2.3 Dubbing

This portion of the system will be responsible for receiving field user requests for data, locating it in the library, and transferring the data to the output medium and format (usually a cassette or 9-track tape) specified by the requester. Initially, only the FIREFINDER format will be available on 9-track tape and Raymond 6101 cassettes. Software reprogramming would allow other formats, and firmware-driven changes in Raymond interface could accommodate other output tape or disk subsystems.

Field user requests may be made in one or more of the following formats:

    a. Grid zone plus alphabetic cell designator, plus grid size option.

    b. Grid zone plus SW corner UTM coordinates, plus grid size option.

    c. Grid zone plus rectangular area SW, NE corner points, plus grid size option.

    d. Grid zone plus center point plus grid size option.

In most cases the grid size will not be specifiable by FIREFINDER field operators. Established policy will furnish the grid size selected for FIREFINDER systems. All transfers within the VLD will be error-checked as a standard procedure. Procedures will also be established to verify outgoing tapes using the verification program prior to shipment.

1.3 Library Process Overview

The library system creates a tape library for DMA maps. As each map is received from DMA, it is assigned a tape number based on its grid zone designator. The map is then copied onto the master, master backup, and field file tapes for that tape number. A catalog is kept so that all the maps can be readily accessed.

In addition to the specific task of entering maps into the library, the library system has several routines which allow the user to manipulate tapes, create headers, and address the catalog.

The user can get the location for a specific map or an entire readout from the catalog. Copy options allow entire tapes or specific files to be copied verbatim. Utility routines create catalog, working files and library tape headers.

The library system is designed to guide the user in processing tapes. Displayed instructions make the system easy to use.

When a DMA original is received for entry into the library, a CPYOBJ scratch tape is made using the COPY DMA TAPE function of the library. This CPYOBJ scratch tape protects the DMA original, allowing it to be returned as requested.

The verification system is then used to check the maps. Bad maps are returned to DMA with documented errors. Good maps are entered into the library.

The process of entering a map into the library consists of the following:

1. Copying the map onto master library (ML), master library back-up (MLBU), and field file (FF) tapes.

2. Cataloging the location of the map on each of these tapes.

3. Updating the working file tape to reflect the maps copied.

Figure 1-1 shows the processing of a DMA tape.
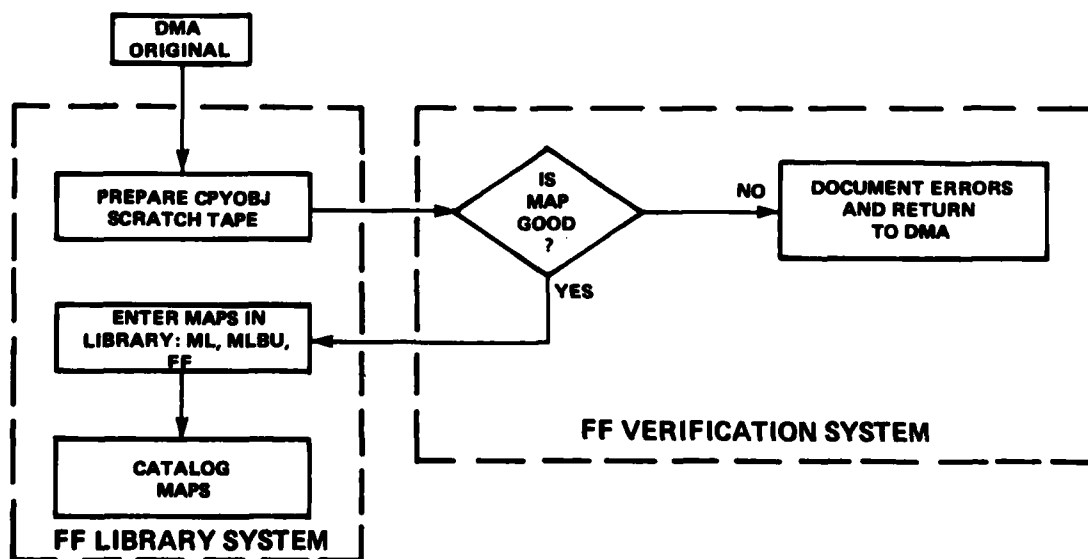
Figure 1-1. Processing of a DMA Tape

The ML and MLBU tapes contain the maps in 125m format (data taken at 125m intervals). The FF tapes contain three copies of each map: one in 250m, one in 500m, and one in 1,000m format. These formats are offered to optimize the map data. For example, while small areas such as hilly terrain may require fine definition (250m), large areas such as the mid-Pacific or Kansas can be adequately covered with the coarser format (1,000m).

All ML tapes are assigned 2000 numbers, MLBU tapes 3000 numbers, and FF tapes 4000 numbers. For example, if tape number 5 is assigned to a particular grid zone, the ML tape will be 2005, the MLBU tape will be 3005, and the FF tape will be 4005.

The library maintains a Pointer Table Reference (PTR) table which cross-references the grid zone designator to the tape assigned. The first two or three characters of the map's reference designator are used to calculate the PTR.

The system can accommodate a maximum of 999 tapes, assigned in numerical order. A maximum of five grid zones can be assigned to one tape. The number and grid zones assigned are up to the operator. Once the grid zones have been assigned, they will continue to be on the same tape. When a tape is filled, another tape is assigned, and the grid zones are automatically carried over to it.

As each map is copied onto the appropriate tapes, its location is noted and cataloged. After cataloging, the working file tape is updated to record whatever processing was done. The working file contains the PTR table and the number of files on each tape.

The library has a CATALOG FIND utility which retrieves the location of any map required.

When the library entry routine (ENTER VERIFIED CELL INTO LIBRARY) is selected, the operator is directed to enter the number of maps to be processed. At present, a maximum of 30 maps can be processed at one time. The operator is then directed to enter the maps using their UTM grid designator (15PKQ, 12STM). As each map is entered, it is checked for validity. An invalid entry prompts the operator to reenter the map. For valid entries, the PTR table is checked to see if a tape number has already been assigned to the grid zone designator (15P, 12S) for that map. If a tape number has been assigned, the ML, MLBU, and FF tape numbers are displayed. If a tape number has not yet been assigned, a tape utility is called to assign a tape number and to create the tape headers for the new ML, MLBU, and FF tapes. After the new tapes are created, the operator is prompted to continue entering the maps.

When all the maps to be processed are entered, the operator is directed to mount the CPYOBJ scratch tape containing the verified cells onto the appropriate tape drive. The program will search the CPYOBJ tape, and record the location of each map to be processed. The search continues until all maps are located or the end-of-tape mark is reached. Any maps not found, and those that could not be read, are identified. The operator is asked to mount the ML tape assigned to the first map. All the maps with the same grid zone will be entered on this tape. The CPYOBJ scratch tape is positioned to the appropriate file for each map and the maps with the same grid zone will be entered on the ML tape. The location of each map on the ML tape is recorded. When this operation

is finished, the operator is directed to dismount the ML tape and mount the MLBU tape for this grid zone. The same maps are then copied onto the MLBU tape, and their location recorded. Finally, the operator is asked to dismount the MLBU tape and mount the FF tape for this grid zone. This time, each map is copied three times (in 250m, 500m, and 1,000m format), and only the location of the 250m format is recorded. The operator is then directed to dismount the FF tape.

At this point, the program indicates the grid zone it has just processed, and gives the operator a choice of continuing or not. If the operator chooses to continue, the next grid zone in the order entered is processed. If the operator chooses not to continue, any remaining maps of a different grid zone are not processed. The results are then displayed. The location of each map on the ML, MLBU, and FF tapes is given, along with the date it was entered. Maps which were not entered because of bad copies or tape limitations are listed, along with the reason for nonentry. Any maps not processed by operator directive are also displayed.

The operator is then directed to mount the master catalog tape. The catalog is updated and a catalog backup tape is also written.

Finally, an end-of-day processing routine is performed, showing the updated files and making a new working tape to store the new information.

After the working tape and its backup are made, the library entry function is finished and the DMA option menu is again displayed.

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SECTION 2

LIBRARY TAPE DESCRIPTIONS

2.1 GENERAL

The library system uses three types of tapes:

- The working tape

- The library tape

- The catalog tape

The working tape contains the information on the working files. This tape is loaded prior to any processing. The initial working tape is created by the utility REBUILD WORKING FILE. After this tape is created, the system is reloaded using this tape. From then on, a new working tape is made every time a new map is added to the library. The working tapes are created on the son, father, grandfather principle. They are assigned working tape numbers of 5, 6, and 7. A backup of each working tape is also created.

The library tapes are created by the system. As described in Section 1.3, three library tapes are created at a time: master library (ML), master library backup, (MLBU), and field file (FF) tapes. These tapes are assigned numbers by the system: the grid zones assigned to each tape are operator-controlled. As new grid zones are added, new library tapes are created. The system can control up to 999 tapes.

The catalog tape contains information on each library entry: the map grid zone designator, its location (tape and file number), and the date it was entered. The catalog tape and its backup should be made before beginning the library. The catalog headers are made using the utility REBUILD CATALOG. Entries are made continuously until 40 replacement maps

are entered. At that point, the system creates a new catalog, deleting all the replaced maps.

A detailed explanation of each tape is given in the following paragraphs.

2.2 WORKING TAPE

The working tape stores all the working files. The records contained in these files hold PTR tape assignments, the number of files on each library tape, and the number of cells replaced due to updated information or bad copies.

The working tape is loaded into memory at the beginning of the program. After a day of processing, a new working tape is created so that all the updated files are recorded.

The working tape has four files:

● Header File

● Tape Pointer File

● Tape Usage File

● Replacement List File

Physically, the tape is set up as follows:

Header File:	Fixed Length Record (FLR)	FIXREC
	Designator Record	DESREC
	EOT	
Tape Pointer File:	FLR	FXRECP
	Designator Record	DSRECP
	Tape Pointer Record	PTRREC
	EOT	
Tape Usage File:	FLR	FXRECU
	Designator Record	DSRECU
	ML Usage Record	USGREC
	MLBU Usage Record	USGRC2
	FF Usage Record	USGRC3
	EOT	

```
Replacement List File:   FLR                          FXRECR
                         Global Replacement Record    GLBRPL
                         Local Replacement Record     LCLRPL
                         EOT
EOT                      End-of-Tape
```

A breakdown of each file is shown in Figures 2-1 through 2-4.

The header file consists of only an FLR and a tape designator record. The tape designator record has the tape number and the creation date.

The tape pointer file consists of an FLR, a file designator record, and the tape pointer record (PTRREC). Words 3 to 1203 of the tape pointer record comprise the PTRTBL. In the program, an equivalence is established between PTRREC(3) and PTRTBL(1).

The PTRTBL cross-references the PTR number of a given grid zone to the tape number assigned to that grid zone.

The PTR is calculated from the first two or three characters of a UTM grid zone designator (2K, 32U, 15P, 7V, etc.) according to the formula:

$$PTR = \left(20 \ (PRFX - 1)\right) + Value$$

where:

PRFX = one- or two-digit numeric prefix

Value = the numeric equivalent of the alphabetic character

$C = 1$, $D = 2$, $E = 3$, $F = 4$, $G = 5$, $H = 6$, $J = 7$, $K = 8$, $L = 9$, $M = 10$, $N = 11$, $P = 12$, $Q = 13$, $R = 14$, $S = 15$, $T = 16$, $U = 17$, $V = 18$, $W = 19$, $X = 20$

Based on the UTM grid assignments, a PTR can have a value of 1 through 1200. Accordingly, each position in the 1200-word PTRTBL corresponds to the PTR of a given grid zone. For example, PTR = 1 would correspond to the first position in the PTRTBL or PTRTBL(1).

WORKING TAPE – [TO BE LOADED INTO CORE MEMORY AT STARTUP]
HEADER FILE

FIXED LENGTH RECORD – FIXREC
(9 WORDS)

TAPE DESIGNATOR RECORD – DESREC
(10 WORDS)

*3 TAPE ROTATION
(GRANDFATHER, FATHER, SON)

152 152₈	0	1	10					-1	?

RECORD TYPE — RECORD COUNT — CELLS/FILE — LENGTH DES REC — UNUSED — EOR — CHECKSUM

11011₈	1	5(6,7)		MMDD	YY YY			-1	?

RECORD TYPE — RECORD COUNT — *WORKING TAPE # (BU, FF) — UNUSED — CREATION DATE — UNUSED — EOR — CHECKSUM

EOF

Figure 2-1. Working Tape - Header File

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WORKING TAPE
TAPE POINTER FILE-TPTRFL

FIXED LENGTH RECORD – FXRECP
(9 WORDS)

152152₈	9		19			EOR	?
RECORD TYPE	RECORD COUNT	UNUSED	LENGTH DES REC	UNUSED		-1	CHECKSUM

FILE DESIGNATOR RECORD – DSRECP
(10 WORDS)

118011₈	1	7	1205			EOR	?
RECORD TYPE	RECORD COUNT	FILE TYPE	LENGTH PTR TABLE	UNUSED		-1	CHECKSUM

TAPE POINTER RECORD PTRREC
(1205 WORDS)

075075₈					EOR	?
RECORD TYPE	UNUSED	1200 WORD ARRAY POINTER TO TAPE # ONE FOR EACH GRID ZONE (0 IF NO MAP IN GRID ZONE) PTRTBL		UNUSED	-1	CHECKSUM

EOF

Figure 2-2. Working Tape - Tape Pointer File

Figure 2-3. Working Tape – Tape Usage File

Figure 2-4. Usage Tape - Replacement List File

As tape numbers are assigned, they are placed in the PTRTBL position for the grid zone. As an example, say grid zone 32U has been assigned tape number 5. The PTR for 32U is: PTR = (20) (31) + 17 = 637. In the 637th position of the PRTTBL, the number 5 will be entered:

PTRTBL(637) = 5

From then on, every time a 32U cell is entered, tape number 5 will be retrieved by the program.

The tape usage file consists of an FLR, a file designator record and three tape usage records, one for each library tape: USGREC (ML), USGRC2 (MLBU), and USGRC3 (FF). Words 3 to 1003 of the usage records comprise the usage tables: USGTBL (ML), USGBU (MLBU), USGFF (FF). In the program, an equivalence is established between USGREC(3) and USGTBL(1); USGRC2(3) and USGBU(1); and USGRC3(3) and USGFF(1).

The usage tables record the number of files on each tape. (The header files are considered as one file.)

At any given time, the program may assign up to 999 tapes. Each tape corresponds to a position in the usage table. (Tape number 1 corresponds to USGTBL(1), USGBU(1), and USGFF(1).

Before a new cell is added to an ML tape, the usage table is checked to make sure the tape has room to accept the new cell, and to get the number of files that have to be spaced over before entering the new cell on any tape.

Only the USGTBL is checked to verify that there is enough room for the new cell. After 41 cells have been entered on the ML tape, a new tape will be created. Since there is a five-file variance between the

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ML and the MLBU, there should be enough room on the backup tape to accept any cells entered on the master. The FF tape has only condensed cells on it, so there is never any danger of running out of room.

When a cell has been copied onto a tape, its corresponding usage table is incremented. The ML and MLBU usage tables are incremented once for each copy. The FF usage table is incremented once for each of the three files copied onto the FF tape. Therefore, for each cell the FF usage table is incremented by three. In the catalog record, the exact file is recorded for the ML and the MLBU tapes. For the FF tape, only the 250m format file is cataloged.

When a cell is to be added to a library tape, the number of files already on the tape must be known so that the files can be spaced over. Since the first file on each tape is read for the header information, the program actually skips over the number of files in the usage table, minus one.

While a given grid zone is processed, the usage table is checked before each cell is entered. If a tape is filled and there are still cells to be entered, these remaining cells are flagged and no further processing is done on them. During end-of-day processing, these cells will be shown as not having been processed due to tape limitations.

The replacement list file consists of an FLR, a global replacement record, and a local replacement record. The global replacement record keeps track of all the cells replaced by new data; the local replacement record is not used at this time.

Words 3 to 83 of the global replacement record comprise the global replacement table (GLBTBL). In the program, an equivalence is established between GLBRPL(3) and GLBTBL(1). Space has been allocated for 40 entries. When cells are to be added to the catalog, the new cells are compared to the cells already cataloged. When a match occurs, meaning that the new cell is replacing a cell already in the catalog, the tape and file number of the replaced cell are entered into the GLBTBL. When the catalog is searched for a cell position, it will check the GLBTBL and ignore any cells listed there. Therefore, only the latest cell will be retrieved.

Words 3 to 83 of the local replacement record comprise the local replacement table (LCLTBL). In the program an equivalence is established betwen LCLRPL(3) and LCLTBL(1).

2.3 LIBRARY TAPES

The cells are stored on library tapes. The tape and file number for each cell are recorded so that the cell can be retrieved as required. See Section 1.3 for an explanation of library tapes.

Cells received from the DMA at this time are 100 by 100 kilometer cells. They contain 801 data records with 1 scan per record. In the 125m format, every data record is read, but the records are condensed to five scans per record. For the 250m format, every other DMA data record is read, and these are packed 10 scans per record. In the 500m format, every fourth data record is read, and these are packed 20 scans per record. Finally, the 1000m format reads every eighth record and packs them 25 scans per record. Because of this packing, the FF tapes require

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much less space than the ML and MLBU tapes. Also, because the amount
of data recorded is less, the information contained on them is cruder.

The number of files on any given library tape is recorded in the
usage tables. (Refer to Section 2.2, Working Tape.) The position in
which a cell is entered on a tape is recorded and later entered into
the catalog with the cell designator.

The library tapes are physically set up as follows:

Header File	Fixed Length Record (FLR)
	Designator Record
	EOT
Cell File	FLR
	Definition Record
	Data Record
	.
	.
	Data Record
	EOT
.	
.	
.	
Cell File	FLR
	Definition Record
	Data Record
	.
	.
	Data Record
	EOT
EOT	End-of-Tape
EOT	End-of-Tape

The breakdown of these files is shown in Figures 2-5 and 2-6. There is
one cell file for each UTM cell. The number of data records varies with
format: 125m has 161 records, 250m has 41 records, 500m has 11 records,
and 1000m has 4 records.

The header file consists of an FLR and a tape designator record.
The designator record contains the tape type (ML, MLBU, or FF), the

MASTER LIBRARY TAPE (BB, FF*) TAPE HEADER FILE

FIXED LENGTH RECORD (9 16-BIT WORDS)

| 152 152₈ | 0 | 1 | 20 | | | -1 | ? |

RECORD TYPE
RECORD COUNT
CELLS/FILE TYPE FILE
LENGTH DES REC
UNUSED
EOR
CHECKSUM

(MAXIMUM OF 5 DIFFERENT GRID ZONES/TAPE)

TAPE DESIGNATOR RECORD (20 WORDS)

| 11001₈ | 1 | 2(3,4) | XXXX | MMDD | YYYY | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | XX | -1 | ? |

RECORD TYPE
RECORD #
TAPE TYPE
TAPE
TAPE CREATION DATE
OF GRID ZONES ON TAPE
1ST GRID ZONE ON TAPE
IDENTIFICATION OF OTHER GRID ZONES ON TAPE
LAST GRID ZONE ON TAPE
UNUSED
EOR
CHECKSUM

EOF

(*LOOKS FOR ZERO-FILLED WORD WHEN CALCULATING)

Figure 2-5. Master Library Tape

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CELL FILE

FLR (9 WORDS)

DESIGNATOR
RCD
(29 WORDS)

DATAR RECORD

RECORD TYPE	RECORD COUNT	CELLS/FILE	LENGTH DES RCD	UNUSED	EOR	CHECKSUM

182 182₈ | 0 | 1 | 29

| RECORD TYPE | RECORD COUNT | CELLS/FILE | UTM GRID ZONE & CELL DESIGNATOR | S/W NORTHING COORD. | S/W EASTING COORD. | UTM CORRECTION CONSTANT | BASE HT | HT SCALE FACTOR | SM | # KM IN N/S DIR. | # KM IN E/W DIR. | NO. OF 1ST DATA RECORD | GRID NORTHING AZIMUTH | MAX HT. | # OF WORDS/ DATA RECORD | # OF SCAN PROFILES FOR EACH CELL | LENGTH OF LAST DATA RCD | SPHEROID REF. NUMBER | UNUSED (ASCII BLANKS) | EOR | CHECKSUM |

125 125₈ | 1 | 1

1, 2, 4 OR 8

| RECORD TYPE | RECORD COUNT | #SCANS IN RCD | CTR | HD VALUES FOR 1ST SCAN | HD VALUES FOR 2ND SCAN | VALUES FOR AS MANY SCANS AS REC'D | HD VALUES OF LAST SCAN | EOR | CHECKSUM |

182 083₈ | 2 + | BEGIN AT

Figure 2-6. Cell File

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tape number, and the date the library tape was created. It also gives the number of grid zones assigned to that tape, and what they are. (NOTE: A maximum of five different grid zones per tape is allowed.)

The cell files consist of an FLR, a definition record, and the required number of data records. Referring to Figure 2-6, you can see that the definition record contains information about the cell, such as the designator, the maximum elevation, the area it covers, etc. A breakdown of the entire definition record is as follows:

Word

1	Record Type	125125 (Octal)
2	Record Count	1
3	Number of Cells/File	1
4-6	UTM Grid Zone Designator	
7-8	S/W Corner Northing	
9-10	S/W Corner Easting	
11-12	UTM Scale Factor	
13	Lowest Elevation (Base Height in Meters)	
14	Height Scale Factor	
15	Spacing Multiple	8 (125m)
		4 (250m)
		2 (500m)
		1 (1000m)
16	Number of km in N/S Direction	100*
17	Number of km in E/W Direction	100*
18	Number of 1st Data Record	
19	Grid North Azimuth	
20	Maximum Elevation (in Meters)	
21	Number of Words/Data Record	
22	Number of Scan Profiles/Cell	
23	Length of Last Data Record	
24	Spheroid Reference Number	
25-27	Not Used	
28	End of Record	
29	Sum Check	

* Subject to change.

The spacing multiple, number of words/record, number of scan profiles/cell, and length of the last data record (words 15 and 21-23) vary according to the format. At this time, all cells contain 100 km; this may vary in the future.

The data records contain the scan profiles which make up the maps. The data records are broken out as follows:

<u>Word</u>

1	Record Type	102000 (Octal)
2	Record Count	
3	Number of Scans in Data Record	5 - 125m
		10 - 250m
		20 - 500m
		25 - 1000m
4 - 496	First Scan (402 words)	
	Second Scan (402 words)	
	Third Scan (402 words)	
	Final Scan (402 words)	
	End of Record	-1
	Sum Check	

A tape mark (EOF) is placed after the last data record. After the last cell has been placed on the tape, two EOF marks are placed for end-of-tape.

2.4 CATALOG TAPES

There are two catalog tapes, the Master Catalog and the Backup Catalog. They are identical except for the header information. The catalog records the UTM grid zone designator and the tapes and files where the ML, MLBU, and FF cells are stored. The date when the cell was entered into the library is also recorded.

The catalog tape is set up as follows:

Header File: Fixed Length Record (FLR)
                Designator Record
                EOT

Catalog File: Catalog Record
                     .
                     .
                     .

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```
                    Catalog Record
                    EOT
        EOT         End-of-Tape
        EOT         End-of-Tape
```

Figure 2-7 shows the layout for these files.

The header file contains an FLR and the tape designator record. The designator record contains the date when the catalog was created and identifies it as either a master or backup catalog.

The catalog file consists of catalog records. There is one catalog record for each cell entered into the library. New cells are added after the last catalog entry.

The catalog record contains the UTM grid designator, the northing and easting for the cell, and the tape number and file number where the cell is stored.

The catalog record is as follows:

<u>Word</u>

1	Record Type	101100 (Octal)
2	Record Count	
3-5	UTM Grid Designator	
6-7	S/W Corner Northing	
8-9	S/W Corner Easting	
10	Number of km in N/S direction	
11	Number of km in E/W direction	
12	ML Tape Number	
13	ML File Number	
14	BU Tape Number	
15	BU File Number	
16	FF Tape Number	
17	FF File Number	
18-19	Date Cell Was Entered Into Catalog	
20	Numeric Prefix of Grid Designator	

MASTER CATALOG TAPE
CATALOG FILE

FIXED LENGTH RECORD
(9 16-BIT WORDS)

CATALOG RECORD

TAPE DESIGNATOR RECORD
(10 WORDS)

RECORD TYPE | RECORD COUNT | UNUSED | LENGTH DES REC | EOR | CHECKSUM
102 102₈ | 0 | | 10 | ⁻1 | ?
| | | LDR | | UNUSED

RECORD TYPE | RECORD COUNT | TAPE TYPE ID = ML, 1 = MLBU | TAPE NUMBER | CREATION DATE | CELL RECORD LENGTH | UNUSED | EOR | CHECKSUM
11001₈ | 1 | 0 OR 1 | XX | MM DD YYYY | 25 | | ⁻1 | ?

EOR

RECORD TYPE | RECORD COUNT | UTM GRID DESIGNATION MH2 | SW CORNER NORTHING NO2 | SW CORNER EASTING EO2 | KM N/S (1-100) NR2 | KM E/W (1-100) NC2 | ML TAPE # | ML FILE # | MLBU TAPE # | MLBU FILE # | FF TAPE # | FF FILE # FOR 250 M | CREATION DATE | PRFX | INFX | POSITION ON CPYOBJ TAPE | STATUS OF COPY | EOR | CHECKSUM
101 100₈ | | XX XX | XXXXXX XXXXXX | XXXXXX XXXXXX | XXX | XXX | XXX | XXXX | XXXX | XXXX | XXXX | XXX | MM DD YYYY | | | | | ⁻1 | ?

EOF

Figure 2-7. Master Catalog Tape

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21	First Alpha Character of Grid Designator
22-24	For Program Usage*
25	Sum Check

* Words 22 through 24 are used by the program for the following:

Word

22	The File Location of the Cell Held on the CPYOBJ Scratch
23	0 = Cell Was Not Completed 1 = Cell Was Copied on All Tapes 2 = Tape Limitation Exceeded 3 = Cell Was Not Found on CPYOBJ Scratch 4 = Not Processed Due to Bad Copy
24	End of record

Replaced cells are maintained on the catalog until a maximum of 40 cells are replaced. As cells are replaced, they are added to the global replacement table. A catalog search will then ignore any cells listed in this table and retrieve only the latest cell. (Refer to Section 2.2, Working Tape.)

When the maximum number of replacements is reached, a new catalog is created, deleting all replaced cells and zeroing out the replacement table.

SECTION 3

COMMONS AREA DESCRIPTION

3.1 GENERAL

Many variables used in the library system are held in a common data base (commons). Each area in commons has a name and several variables held in that commons. The following paragraphs describe each variable held in the data base and the function it performs. Table 3-1 shows the common areas accessed by each subroutine.

In the following descriptions, the common variable names are given in capital letters; the subroutines are in capital letters and underlined.

3.2 COMMONS

/ALL/ IOBUFO (2048), IOBUF1 (2048), IOBUF2 (2048)

ALL contains three I/O buffers of 2048 words each. These buffers are involved in all I/O routines and computations.

/UNVRSL/ INPDEV, OUTDEV, CRT, PRINTR, IXRTN, STSVL, ISCS, FFCPYD, CCCPYD, TAPENO, NWMLTP, NWBUTP, NWFFTP, DMA, TPTOTP, RECTYP, RT, RTRY, WTRY, FLR(10), DESR(30)

UNVRSL contains assignments, flags, return conditions, etc.

```
INPDEV - input device          can be either 2 or 3
OUTDEV - output device         for tape drive 2 or 3, respectively
CRT = 5
PRINTR = 6
IXRTN = Status flag for various subroutines:

RSUMCK returns IXRTN = 1 for good read
                     = 2 for EOT encountered
                     = 3 for bad read
                     = 4 for sum check error
XFRFIL sets IXRTN    = 5 for wrong record count
                     = 6 for wrong record type
                     = 7 bad read after write
                     = 8 bad compare second time
                     = 9 bad sum check after write
```

TABLE 3-1. COMMON AREAS ACCESSED BY EACH SUBROUTINE

SUBROUTINES	ALL	UNVRSL	CATALG	DSRVL	FFILES	RDSMCK	FLAGR	DOC	DEFRVL	RING	TABLE 1	TABLE 2	FIND	FILCT	TAPPOS	WF	FUNCTN	TFIND	B
MASTER	√	√	√	√	√	√		√	√	√	√		√	√		√			
CPYDOC		√		√				√		√									
RDTAPE	√	√		√				√											
LIBCPY	√	√	√							√	√			√					
ENTTP		√	√		√		√	√		√									
CLLTP	√	√	√	√	√				√	√	√		√	√	√				
UTLCPY	√	√																	
XFRFIL	√	√		√	√	√			√					√					
CHOICE	√	√	√	√	√	√	√		√		√								
TPTP	√	√		√	√	√	√	√											
RSUMCK	√	√		√		√		√											
RDWR	√			√	√														
JMPSW	√	√	√	√	√		√								√				
RDWKTP	√	√								√	√	√				√			
EODPRC	√	√	√							√	√	√		√					
LBTPFD	√	√	√	√							√		√						
CATFND	√	√	√	√	√	√				√	√		√	√					
CRTCK	√	√		√							√			√					
CMPRCD	√	√		√	√														
BDCMP	√	√	√	√	√						√								
CATUTL	√	√	√							√				√					
TPUTL	√	√	√								√		√	√				√	
WFUTL		√								√				√					√
CATUPD	√	√	√	√	√			√	√					√					
WFUPD	√	√	√							√	√			√					
UNSRTD	√	√	√																
CATLST	√	√								√				√					
LOCFLS	√	√	√												√				
FOMPNU	√	√	√												√		√		
POSTAP	√	√	√												√		√		
DSPLAY		√	√							√				√					
WRRING		√																	
YESNO		√																	
SELECT																			
HOWMNY			√																
ZERO																			√
GBGRTN	√	√		√	√	√		√		√	√			√					
GRIDCK	√	√	√	√	√	√					√		√					√	
FLCPY	√	√			√					√									

TPTP sets the same values as above.

JMPSW tests IXRTN and takes appropriate action.

STSVL = status flag returned by JMPSW to UTLCPY

    STSVL = 1 OK, continue
             = 2 bad read first time, try again
             = 3 bad write first time, try again
             = 4 attempt entire file again
             = 5 end-of-tape encountered, continue

UTLCPY branches on STSVL and goes to appropriate step in program.

ISCS = status flag for compare routine CMPRCD

    ISCS = 0 for good compare
          = 1 for bad compare

FFCPYD = status flag for transfer file attempt.
    FFCPYD is set to "1" in JMPSW if the second file transfer failed.
    CLLTP checks FFCPYD after each file - if set to "1", no further
    processing is done for the failed cell.

CCCPYD = counter for number of bad files put on output library tape
         while a file transfer is attempted. CCCPYD is incremented
         by one every time JMPSW writes an EOT on a library tape for
         a bad file. Also incremented by BDCMP if it writes a bad
         file. CLLTP adds CCCPYD to the usage table for that libra-
         ry tape to update the usage table and track the number of
         files on the tape.

TAPENO = tape numbers assigned to a PTR. LBTPFD and TPUTL use this
         variable, retrieving the tape number from the PTRTBL.

NWMLTP = the new ML tape, calculated by LBTPFD by adding the tape
         number to 2000. NWMLTP is placed in CLINFO (, 12) as the
         ML tape assigned to the grid zone.

NWBUTP = the new MLBU tape, calculated by LBTPFD by adding the tape
         number to 3000. NWBUTP is placed in CLINFO (, 14) as the
         MLBU tape assigned to the grid zone.

NWFFTP = the new FF tape, calculated by LBTPFD by adding the tape
         number to 4000. NWFFTP is placed in CLINFO (, 16) as the
         FF tape assigned to the grid zone.

DMA = a logical set true for DMA tapes and straight tape-to-tape
         copies. Operator queried in ENTTP. When true, the entire
         tape is copied; when false, the first file (header) of a
         tape is skipped.

TPTOTP = a logical set true for tape-to-tape copies. Set in the program. Used in UTLCPY to select either XFRFIL or TPTP routine. If TPTOTP = .TRUE, TPTP selected.

RECTYP = record type. Used in various places as variable for record type in header FLR(1) or DESR(1).

RT = retry record flag. During the file transfer routines, XFRFIL is selected by UTLCPY. The file is transferred by first transferring the header (done by XFRFIL) and then transferring the rest of the data (done by CHOICE). When a bad record is read in the middle of the data, JMPSW will try to reread the same record. It goes back to UTLCPY, which again tries to call XFRFIL. RT is set equal to 1 as soon as the header is transferred. Then, on second read or write attempts, the header transfer logic is skipped, going immediately to CHOICE to retry the record. After the file is processed, JMPSW resets RT to zero.

RTRY = read try flag. RTRY is set equal to zero in UTLCPY prior to attempting a copy. If a bad read is detected, JMPSW sets RTRY equal to 1 and retries the record. On the second try, JMPSW tests RTRY and goes to the try file again logic. RTRY is reset to zero after JMPSW processes the file.

WTRY = write try flag. WTRY is set equal to zero in UTLCPY prior to attempting a copy. If a bad write is detected, JMPSW sets WTRY equal to 1 and retires the record. On the second try, JMPSW tests WTRY and goes to the try file again logic. WTRY is reset to zero after JMPSW processes the file.

FLR(10) = 10 words dimensioned for header FLR's. Only nine words are actually used by FLR.

DESR(30) = 30 words dimensioned for header designation records. Only 29 words are actually used by DESR.

/CATALG/ CLINFO (30, 25), INFOBF, NUMMPS (INC), LIBKEY

CATALG contains variables and arrays concerned with the catalog.

CLINFO (30, 25) - an array of 30 entries, 25 words each. Each entry

is a catalog record which will be transferred to the catalog in CATUPD.
The CLINFO words are assigned as follows:

|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15|16|17|18|19|20|21|22|23|24|25|

CLINFO (, 1) = Record Type 101100 (0)   (, 14) = MLBU Tape Number
       (, 2) = Record Number   (, 15) = MLBU File Number
       (, 3) = UTM Grid Designation   (, 16) = FF Tape Number
       (, 4) = UTM Grid Designation   (, 17) = FF File Number
       (, 5) = UTM Grid Designation   (, 18) = Month and Date
       (, 6) = S/W Corner Northing, High   (, 19) = Year
       (, 7) = S/W Corner Northing, Low   (, 20) = PRFX
       (, 8) = S/W Corner Easting, High   (, 21) = INFX
       (, 9) = S/W Corner Easting, Low   (, 22) = File Location
       (, 10) = Number of km in N/S Direction (, 23) = STATUS
       (, 11) = Number of km in E/W Direction (, 24) = -1
       (, 12) = ML Tape Number   (, 25) = -Sum
       (, 13) = ML File Number

INFOBF - Used twice in the program. Set in CLLTP to the number of the
cell being entered; not used in decisions. Also set in TPUTL if a header
file is wrong. If a header on either the ML, MLBU or FF tape is incorrect,
INFOBF is set equal to 999. TPUTL and the other routines involved all
test INFOBF. A 999 causes the entire program to be exited.

NUMMPS or INC - set in HOWMNY. The number of maps to be processed
or looked up.

LIBKEY - set to 1 if tape is to be copied verbatim, without breaking.
Set to zero for one file verbatim copy. Set in MASTER and FLCPY used
by ENTTP.

/DSRVL/SPR, XC, RTNVL, ILAST, GRDZN(3), FLCT, WDS, LDR, LDE, LLR, RPM,
SM, NC, NR

DSRVL contains variables used for the designator record. XFRFIL
recalculates many values when condensing FF cells.

SPR = number of scans of each output record

SPR = 5   for 125m
    = 10   250m
    = 20   500m
    = 25   1,000m

XC = number of data records transferred. Set equal to zero at begin-
     ning of CHOICE and incremented by XINCR after each read.

RTNVL = status flag set by CHOICE to indicate status. XFRFIL
        branches on RTNVL to set IXRTN.

CHOICE returns:

RTNVL = 1 For bad compare first time
      = 2 Improper record
      = 3 EOT encountered
      = 4 Bad read after write
      = 5 For bad read or sum check error on read
      = 6 Sum check error on output
      = 7 Bad compare second time

ILAST = passed parameter in some SIO calls. Tested in CMPRCD to
        verify that only 1 to 2048 words were passed.

GRDZN(3) = dimensioned area for grid zone designation. An equiva-
           lence is established between GRDZN and MAP in CRTCK.
           CRTCK computes GRDZN values from UTM grid designator en-
           tered. These values are then entered in CLINFO (, 3),
           CLINFO (, 4), and CLINFO (, 5), by LBTPFD.

FLCT = keeps track of number of file tries in FF transfer. Used in
       CLLTP.

WDS = passed parameter is some SIO calls. Not tested.

LDR = the number of words in designator record. In XFRFIL, desig-
      nator record length is taken from FLR (4) and used in the write
      designator call to SIO.

LDE = number of words per data record - computed in XFRFIL
      LDE1 = SPR1 and JINCR +5

LLR = length of last data record - computed in XFRFIL
      LLR1 = 5+ MOD (RPM1, SPR1) 7 JINCR

NOTE: LDE and LLR values are used by CHOICE when creating the out-
       put records.

3-6

RPM = number of scan profiles in each UTM cell computed in XFRFIL as:

RPM1 = (NCA * SM) + 1
RPM = 801 (125m)
    = 401 (250m)
    = 201 (500m)
    = 101 (1000m)

NOTE: LDE1, LLR1, and RPM1 are used in XFRFIL, but put into commons as LDE, LLR, and RPM.

SM = spacing multiple

SM = 8 for 125m
   = 4 for 250m
   = 2 for 500m
   = 1 for 1000m

NC = number of km in E/W direction

NR = number of km in N/S direction

/FFILES/FF, RC, RECCT, RECSM, CMPBAD, JINCR, EP, YOFFSET

FF = field file flag

FF = 0 for 125m
   = 1 for 250m
   = 2 for 500m
   = 3 for 1000m
   = 4 for straight copies

XFRFIL branches on FF to get correct spacing multiple.

FF is set in MASTER, and for file transfers, in CLLTP.

It is also set in ENTTP.

CHOICE also branches on FF to set the correct increments in the condensing process.

RC = record count. TPTP and CHOICE increment the count. JMPSW uses RC to identify which record is bad.

RECCT = also a record count. Although incremented separately in CHOICE, set equal to RC when returned to XFRFIL.

RECSM = number of output records for each format

RECSM = RPM1/SPR1+1 Set in XFRFIL.

3-7

CMPBAD = return flag from BDCMP.
     = 2 for first bad compare
     = 3 for second bad compare - try file again
     = 1 for second file failure

JINCR = used to compute the number of words per data record. Set in XFRFIL.

$$JINCR = (NRA * SM) / 2 + 2$$

402	125m
202	250m
102	500m
52	1,000m

EP = SIZE -1 where size is the number of words in the data record (LDE) or (for the last record) the number of words in the last record (LLR). EP is the number of words sum checked, and the sum check is put in the next word. Used in CHOICE.

YOFFSET = number of bytes to offset data packed into the output buffer. Used by RDWR. Initially set to 10 in CHOICE and incremented by one in RDWR. Initial offset for record type, count, etc.

/RDSMCK/IOBUF, LOGDEV

RDSMCK contains variables used by the RSUMCK subroutine.

IOBUF determines the input buffer RSUMCK will read into:

IOBUF = 0	for	IOBUF0
= 1	for	IOBUF1
= 2	for	IOBUF2

LOGDEV is the input device RSUMCK will read from:

LOGDEV = 2	for	tape drive 2
= 3	for	tape drive 3

/FLAGR/BUFFLG

BUFFLG is used to determine if a tape mark means end-of-file or end-of-tape. When an entire tape is being copied, an EOT is picked up and handled as the end-of-file. IXRTN is set to 1 for file copied and BUFFLG is set to 1. If it was an end-of-file, and another file is to be read, BUFFLG is reset to zero after the first word of the file is read. If it

is an end-of-tape, the next word read is another EOT. This time BUFFLG is 1, and TPTP then returns an IXRTN of 2 for END-OF-TAPE.

/DOC/ISTATN, FIFLG

ISTATN is the status return flag between CPYDOC and RDTAPE

ISTATN = 1 for bad read
       = 2 for EOT encountered

If ISTATN is not 1 or 2, CPYDOC continues. ISTATN is also used as the status parameter in many SIO calls. These may or may not be tested, depending on the routine.

FIFLG is a logical flag set in the DMA copy routine. When copying a DMA tape, CPYDOC will direct the operator to check the header information for the first file. After the first file, FIFLG is set to .TRUE, and the remaining files are copied without interruption.

FIFLG is also used in the same way in ENTTP. When first beginning a tape-to-tape copy, the operator is asked if the entire tape is to be copied. After the first file, FIFLG is set to TRUE, and this question is skipped for the remaining files.

/DEFRVL/NOHI, NOLO, EOHI, EOLO

DEFRVL contains northing and easting values. Because these values require two words to store, a high and low order word is used.

RDTAPE computes the northing high and low values, and the easting high and low values from the DMA definition record. XFRFIL also addresses this commons when transferring values.

/RING/ON, OFF

RING contains the values for one of the parameters used by WRRING.

ON = 0
OFF = 1

These values are initially set in MASTER.

/TABLE1/PTRREC (1205), USGREC (1005), GLPRPL (90), LCLRPL (85), USGRC2 (1005), USGRC3 (1005)

PTRREC (1205) - The PTR record, 1205 words - contains the tape assignments for each PTR. In the program, an equivalence is set up between PTRREC (3) and PTRTBL (1), the five extra words being used for record type and check sums.

Each word of the PTRTBL corresponds to a PTR number (1200 maximum). The tape number assigned to that PTR is placed in the appropriate PTRTBL location.

USGREC (1005)   These are the usage records, one for the ML
USGRC2 (1005)   tapes (USGREC), one for the MLBU tapes (US-
USGRC3 (1005)   GRC2), and one for the FF tapes (USGRC3).

Each word of the usage table corresponds to a tape number (999 maximum). The number of files on a tape is placed in the appropriate usage table location.

GLBRPL (90) - The global replacement record - records the tape numbers and file number of replaced cells. In the program, an equivalence is set up between GLBRPL(3) and GLBTBL. WFUPD adds to the GLBTBL every time a cell is replaced.

LCLRPL (85) - A local replacement table not used at this time. Originally intended to keep track of bad locations on tape.

3-10

/TABLE2/FIXREC (9), DESREC (10), FXRECR (9), FXRECP (9), DSRECP (10), FXRECU (9), DSRECU (10)

TABLE2 contains arrays for working file headers.

FIXREC, DESREC - FLR and DESR record for header file.
FXRECP, DSRECP - FLR and DESR for PTR file.
FXRECU, DSRECU - FLR and DESR for usage table file.
FXRECR   - FLR for replacement file.

/FIND/PRFX, INFX, SFFX1, SFFX2

FIND contains variables which describe the UTM grid designator.

CRTCK interprets the operator-input UTM grid zone and separates it into a PRFX, INFX, SFFX1 and SFFX2 as follows:

    2   K   P   Q   15   K   P   Q
    | | | | | | | |

  PRFX INFX SFFX1 SFFX2   PRFX INFX SFFX1 SFFX2

LBTPFD then enters the PRFX and INFX into CLINFO (, 20) and CLINFO (, 21).

/FILCT/XY, NWCAT, CLCTR, MMDD, YYYY, PRFLG, MM, DD, YY

XY - used to determine whether the Master Catalog is a new initial
     tape with only a catalog header and no catalog records on it.
     XY is set initially to zero in WFUPD. If a record is read, it
     is set to 1. If an EOT is encountered before any records are
     read, XY remains zero. CATUPD then tests the condition of XY
     to determine the record count on the next entry. For new tape
     (XY = 0) the record count begins at zero. If there are records
     already on the catalog (XY = 1), the record count of the last
     catalog record is incremented by one for the new entry.

3-11

NWCAT - flag for an update master catalog tape. CATUPD initially sets NWCAT = zero for normal catalog entries. If the replacement file becomes full while trying to enter the new maps, WFUPD calls in GBGRTN to make a new catalog tape, deleting all replaced cells. After a new catalog is made, WFUPD sets NWCAT to 1. CATUPD then tests NWCAT. If a new catalog was made, CATUPD returns to its beginning and tries to enter the new records again.

CLCTR - (cell counter) - initially set to zero in MASTER. As each map is entered into the library, CLLTP increments CLCTR by 1. The number of cells entered is printed out in the working files log. EODPRC resets it to zero.

PRFLG - used only to check for backup catalog tape header in TPTP. Redundant check - not used.

MMDD - month and day values   All set in MASTER,
YYYY - year   contain date infor-
MM   - month   mation.
DD   - day
YY   - year

/TAPPOS/MAPNO

MAPNO is the file to which the CPYOBJ scratch tape is presently positioned. Used by CLLTP, FDMPNU, POSTAP, and LOCFLS to keep track of position of tape.

/WF/GBGMSG

Flag for bad working tape read. Initially set to zero in MASTER. If RDWKTP has a bad read or unformatted tape, asks operator to mount backup,

and sets GBGMSG to 1. If it still has a bad read with the backup, it returns to <u>MASTER</u> and stops the program.

/FUNCTN/FILBCK, FILFOR, RECBCK, RECFOR, READ, WRITE

FUNCTN defines SIO functions. Used in <u>FDMPNU</u> and <u>POSTAP</u>.

FILBCK = 8   -   pass file backward

FILFOR = 5   -   pass file forward

RECBCK = 4   -   pass record backward

RECFOR = 3   -   pass record forward

READ   = 0   -   read

WRITE = 1   -   write

/TFIND/TRFX, TNFX

Similar to PRFX and INFX, only separate commons required when creating tape header. Used by <u>TPUTL</u> and <u>GRIDCK</u>. <u>GRIDCK</u> interprets operator-input grid zone and separates it into TRFX-TNFX.

```
       2     K               15       K
       |     |               |        |
     TRFX  TNFX            TRFX     TNFX
```

B

B is used only by <u>ZERO</u> and <u>WFUTL</u>. It defines an array used to zero out files required by <u>WFUTL</u>.

SECTION 4

SUBROUTINE DESCRIPTIONS

The subroutines that comprise the library system are described in this chapter. Each subroutine description is accompanied by a flow diagram.

Two subroutines, WRRING and YESNO, are used so often that calls to them are not shown on the flow diagrams. Instead, WRRING calls are shown as a write ring decision marked with one asterisk (*). Calls to YESNO are shown as yes/no responses and marked with two asterisks (**).

Subroutine names are underlined to distinguish them from variables.

4.1 MASTER

MASTER is the control program for the library system. It presents the functions available for the operator's selection, and controls the required processing.

In addition to initializing variables, MASTER calls the subroutine SETTRT to set system parameters so that a "1" is returned on a bad read. The last statement in MASTER is a call to SETSYS, which resets the system parameters.

MASTER directs the operator to set the tape density, load the working tape, and enter the date. When these steps are accomplished, the Master Menu is displayed, giving the operator a choice of functions.

When a selection has been made, MASTER calls the appropriate routines for processing. Table 4-1 lists all the functions available on the library system. For the MASTER flow diagram, refer to Figure 4-1.

TABLE 4-1.   LIBRARY FUNCTIONS

Process New DMA Tape

A. COPY DMA TAPE   makes verbatim copy of original
                                           DMA tape

B. ENTER VERIFIED CELL   enters map onto ML, MLBU, and FF
       INTO LIBRARY   tapes, catalogs entries, makes new
                                           working tape

Display Copy Options

A. COPY ENTIRE TAPE   makes a verbatim copy of a tape

B. COPY CELL ON TAPE   copies any specified file onto a
                                           tape

Display List Options

A. UNSORTED LISTING OF MASTER   gives a readout of every catalog
       CATALOG   entry

B. SORT AND LIST BY GRID   N/A (Not presently programmed)
       DESIGNATOR

C. SORT AND LIST BY NORTH-   N/A (Not presently programmed)
       ING/EASTING

Display Utilities

A. HELP   N/A (Not presently programmed)

B. REBUILD CATALOG   creates headers for master and back-
                                           up catalog tapes

C. BUILD TAPE WITH HEADER   creates headers for ML, MLBU, and FF
       FILE   tapes

D. CATALOG FIND UTILITY   searches catalog for a specific map

E. REPLACE BAD CELL   N/A (Not presently programmed)

F. REBUILD WORKING FILE   creates initial working tape - all
                                           files zeroed

TABLE 4-1. LIBRARY FUNCTIONS (Continued)

DISPLAY CELL GRAPHICS   N/A   (Not presently programmed)

END-OF-DAY PROCESSING   prints working file log and cre-
                                     ates new working tape

SHUT DOWN   resets system parameters
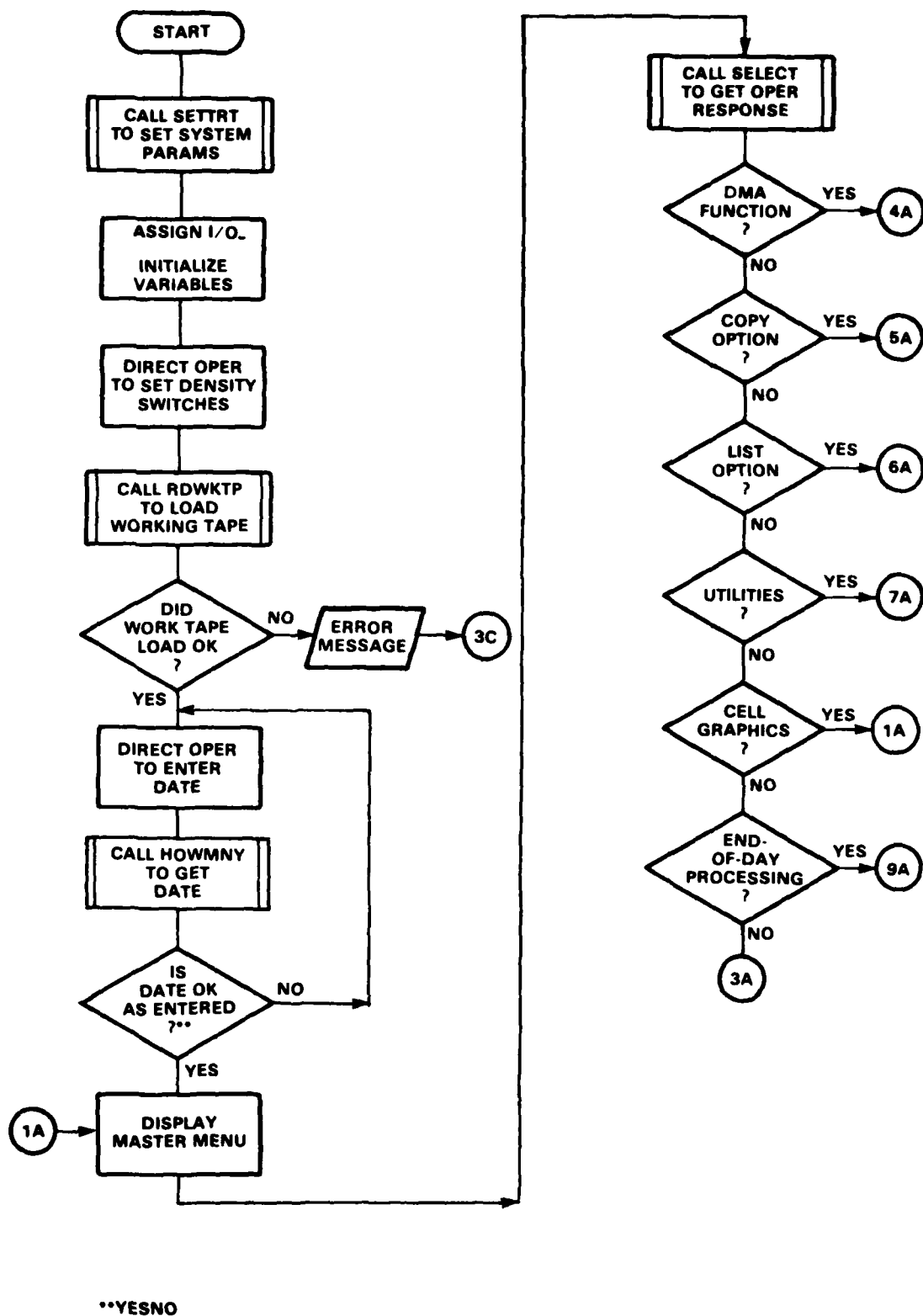
Figure 4-1. <u>MASTER</u> Flow Diagram (Sheet 1 of 7)
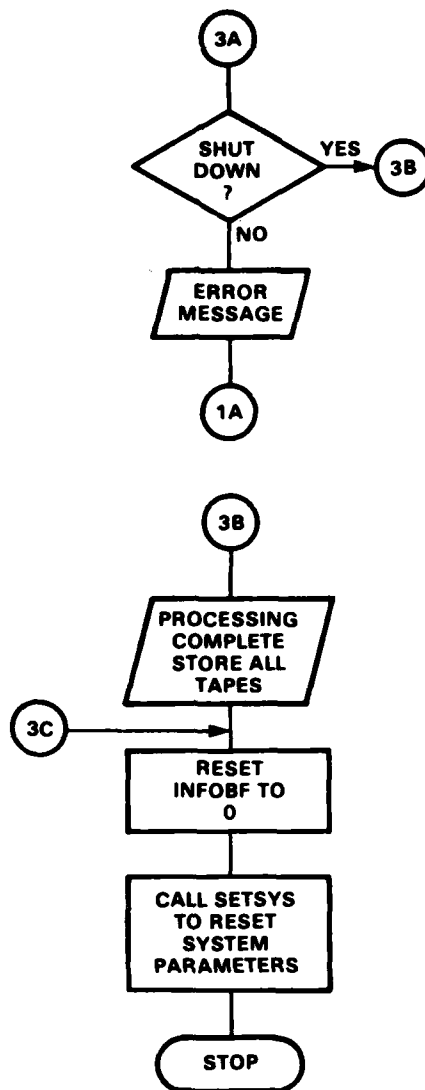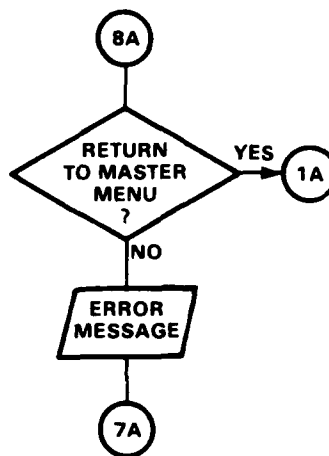
Figure 4-1. MASTER Flow Diagram (Sheet 2 of 7)

4-6
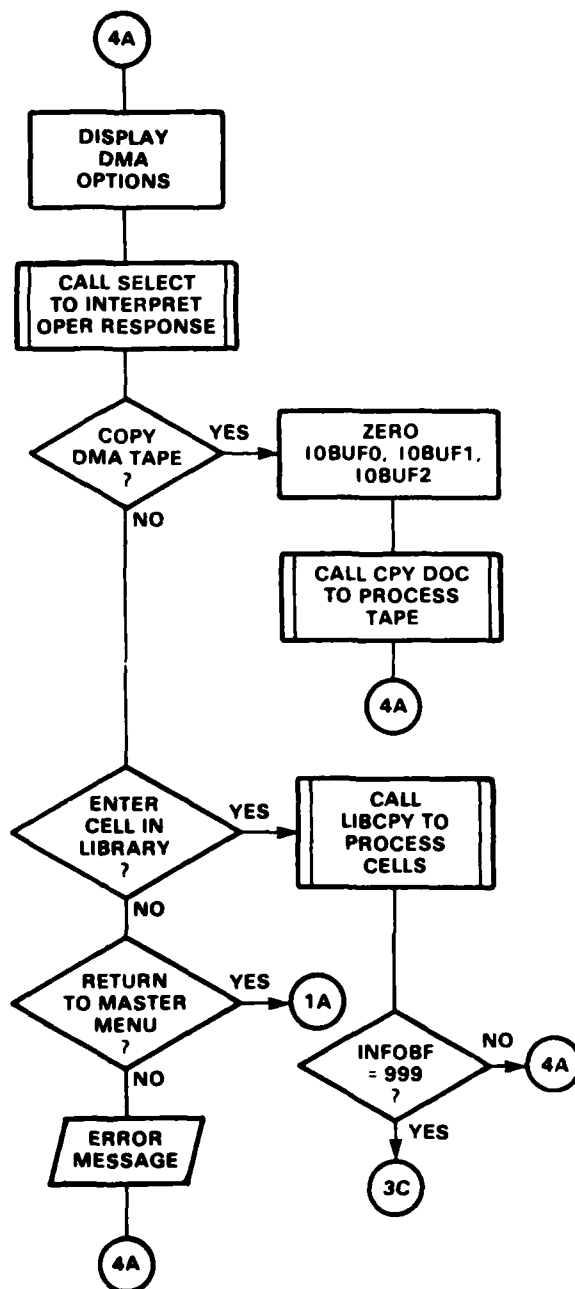
Figure 4-1. MASTER Flow Diagram (Sheet 3 of 7)

4-7
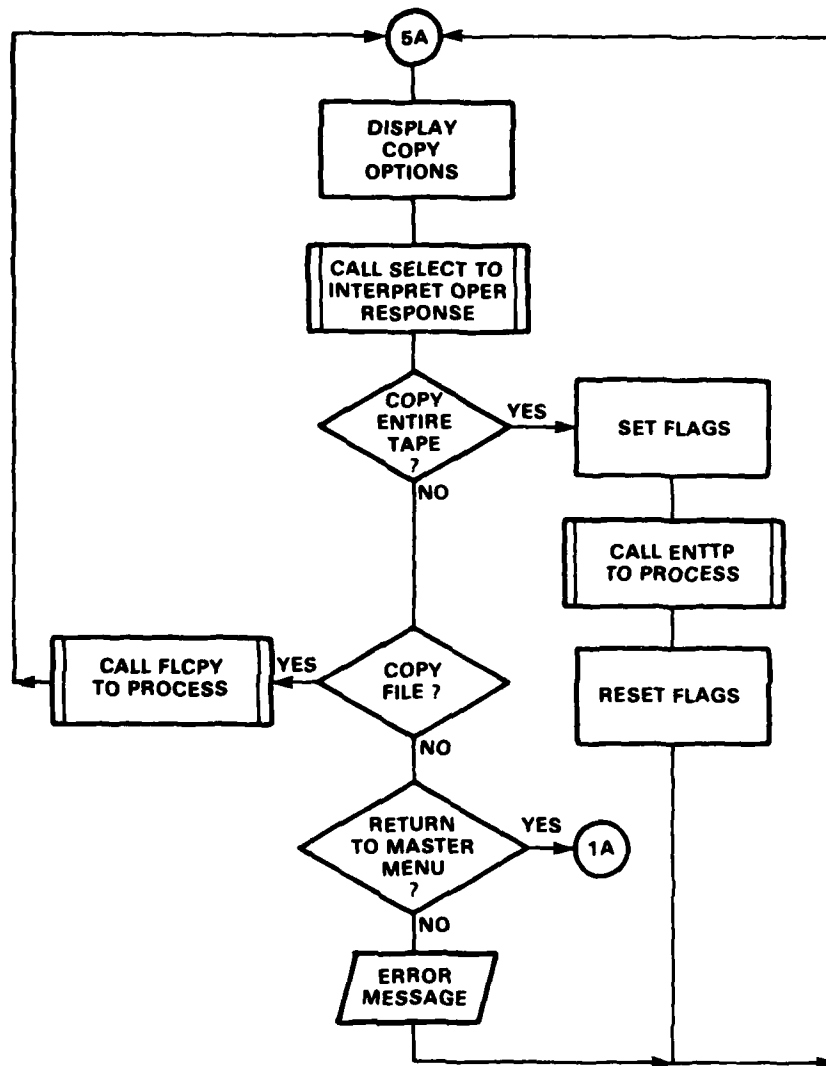
Figure 4-1. MASTER Flow Diagram (Sheet 4 of 7)
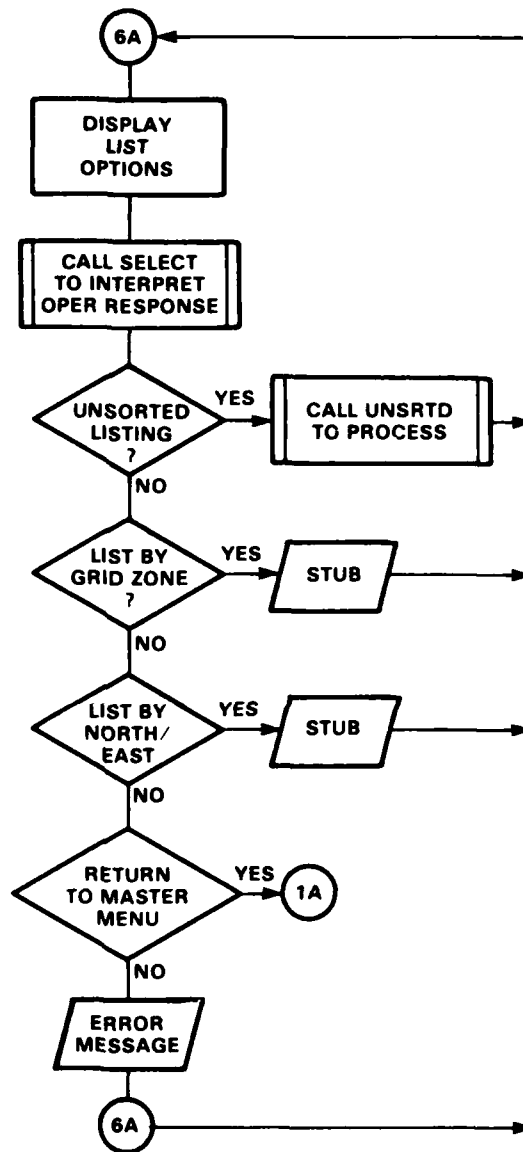
Figure 4-1. MASTER Flow Diagram (Sheet 5 of 7)
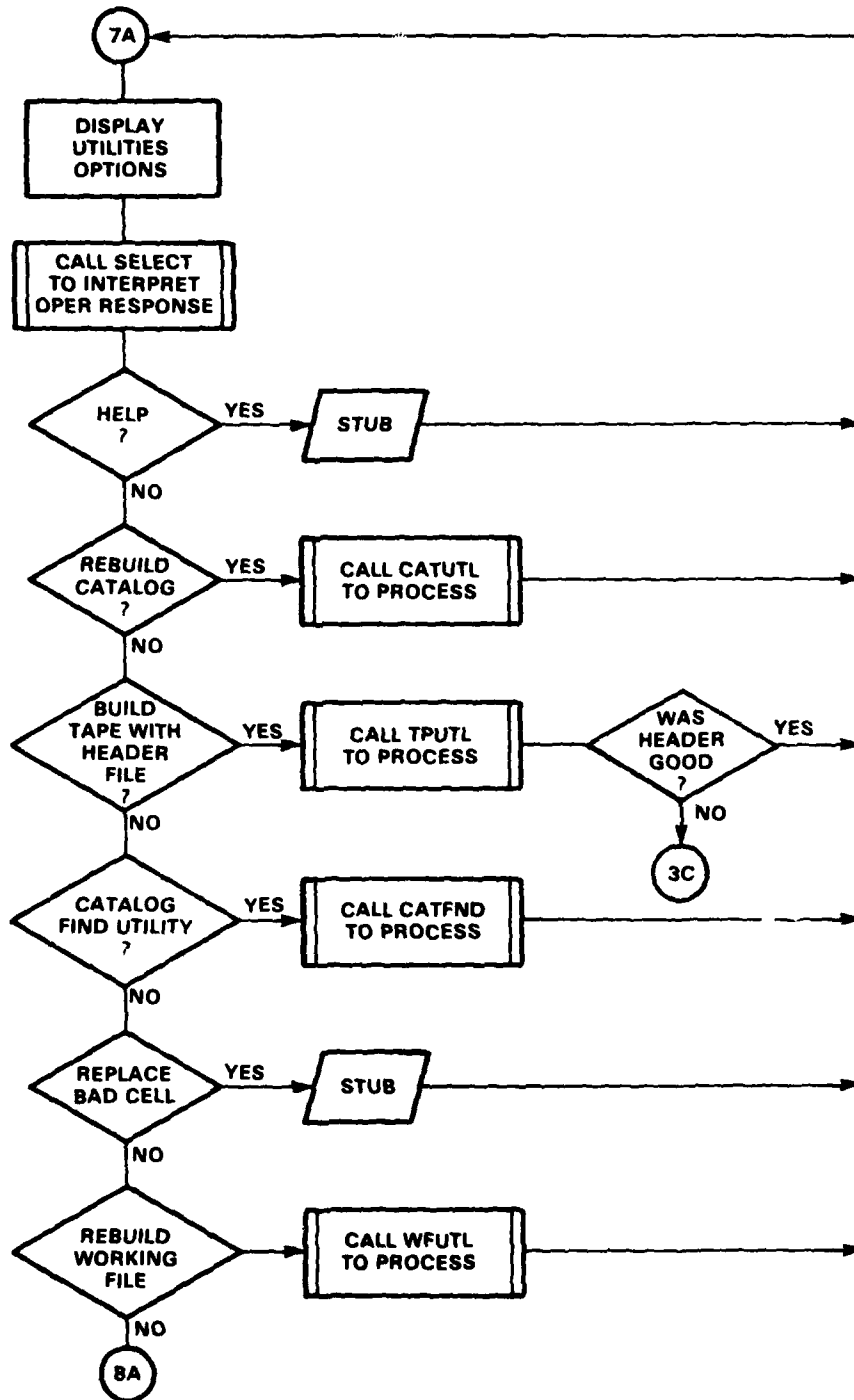
Figure 4-1. MASTER Flow Diagram (Sheet 6 of 7)

4-10
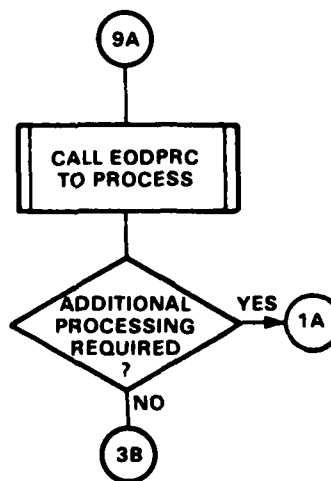
Figure 4-1. MASTER Flow Diagram (Sheet 7 of 7)

4.2 CPYDOC

CPYDOC is the control program for making a verbatim copy of the DMA original. It is called by MASTER when the DMA option COPY DMA TAPE is selected. The flow diagram for CPYDOC is shown in Figure 4-2.
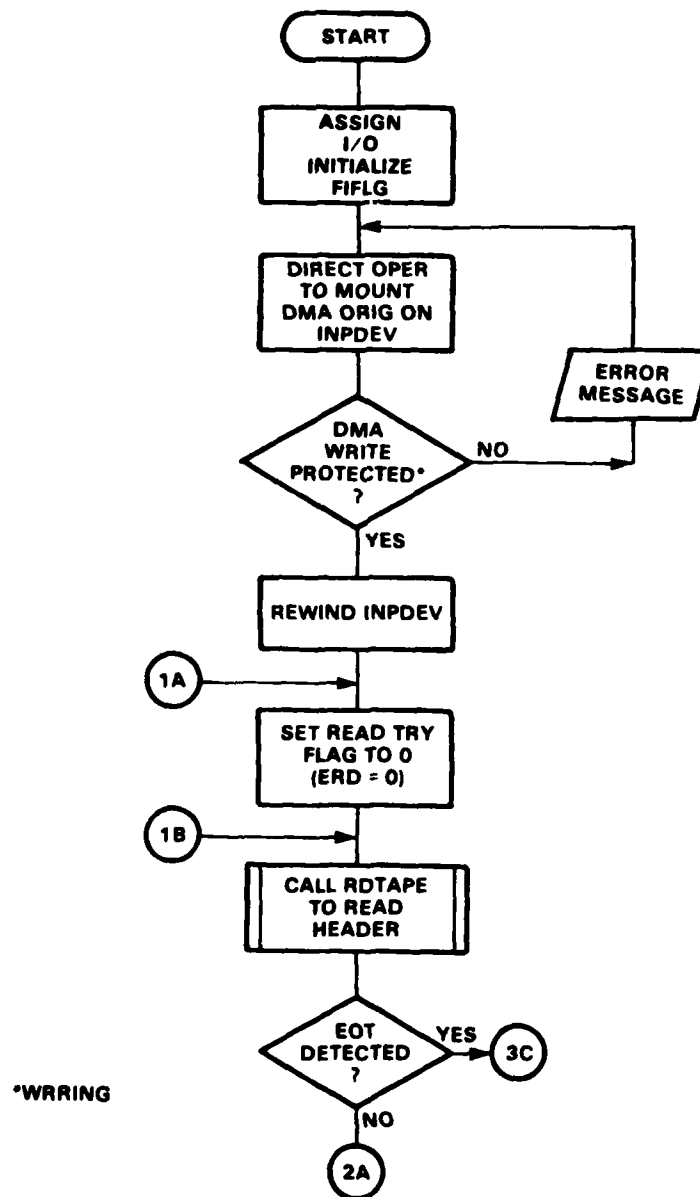
Figure 4-2. CPYDOC Flow Diagram (Sheet 1 of 3)
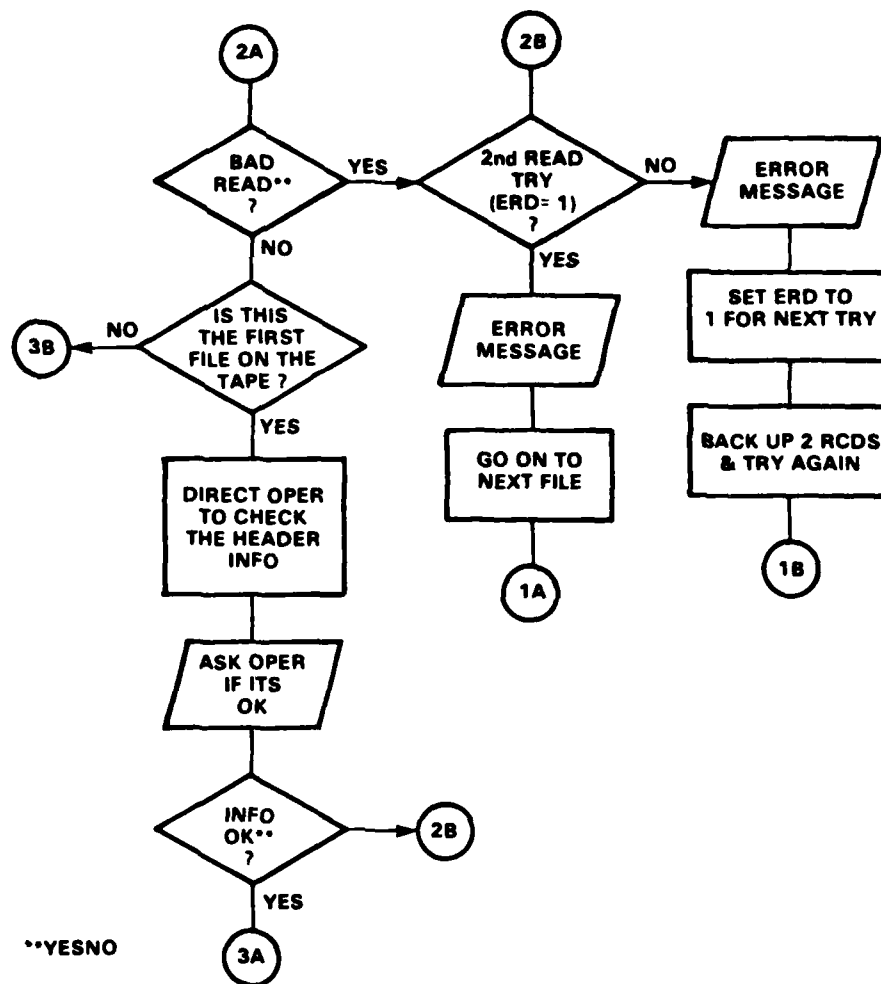
Figure 4-2. CPYDOC Flow Diagram (Sheet 2 of 3)
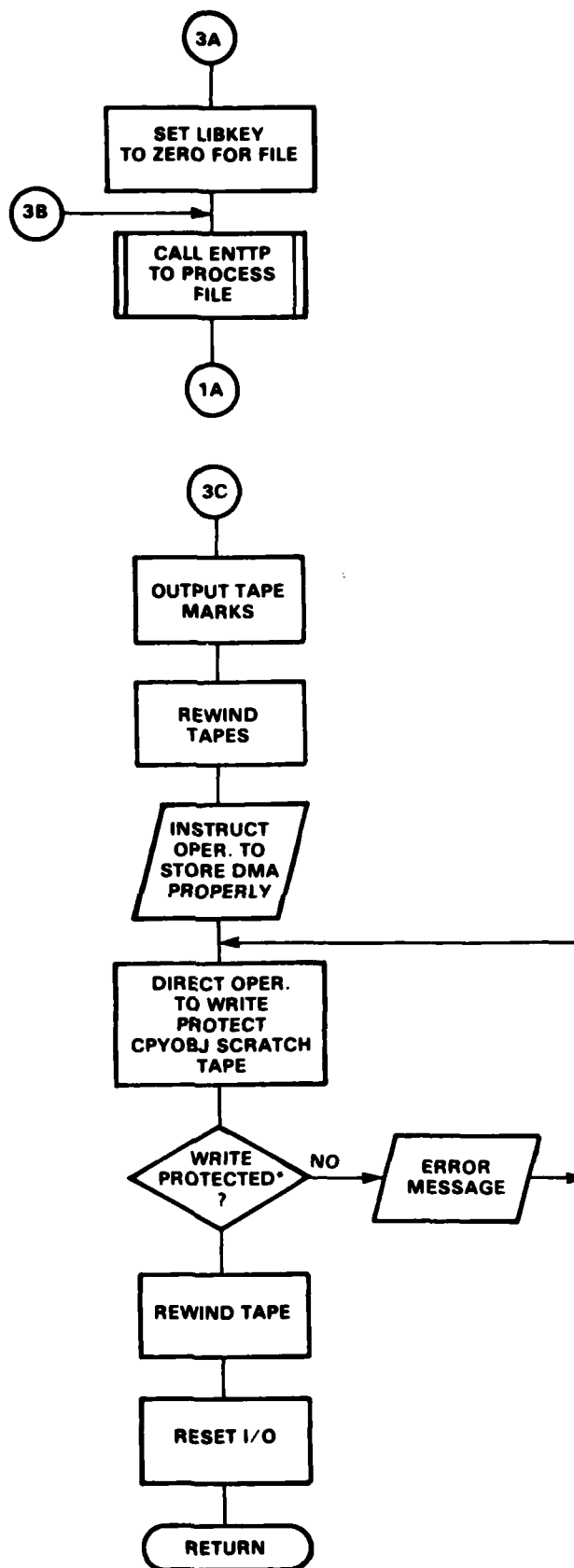
Figure 4-2. CPYDOC Flow Diagram (Sheet 3 of 3)

4.3 RDTAPE

RDTAPE reads, converts, and displays information from the header of a DMA file. It is called by CPYDOC before each file is copied. If the file cannot be read, it returns to CPYDOC with ISTATN equal to 1 (for a bad read) or 2 (for an EOT). If the read was good, it converts the northing/easting points and displays the information. It then backs up the DMA tape to the beginning of the file. The flow diagram for RDTAPE is given in Figure 4-3.
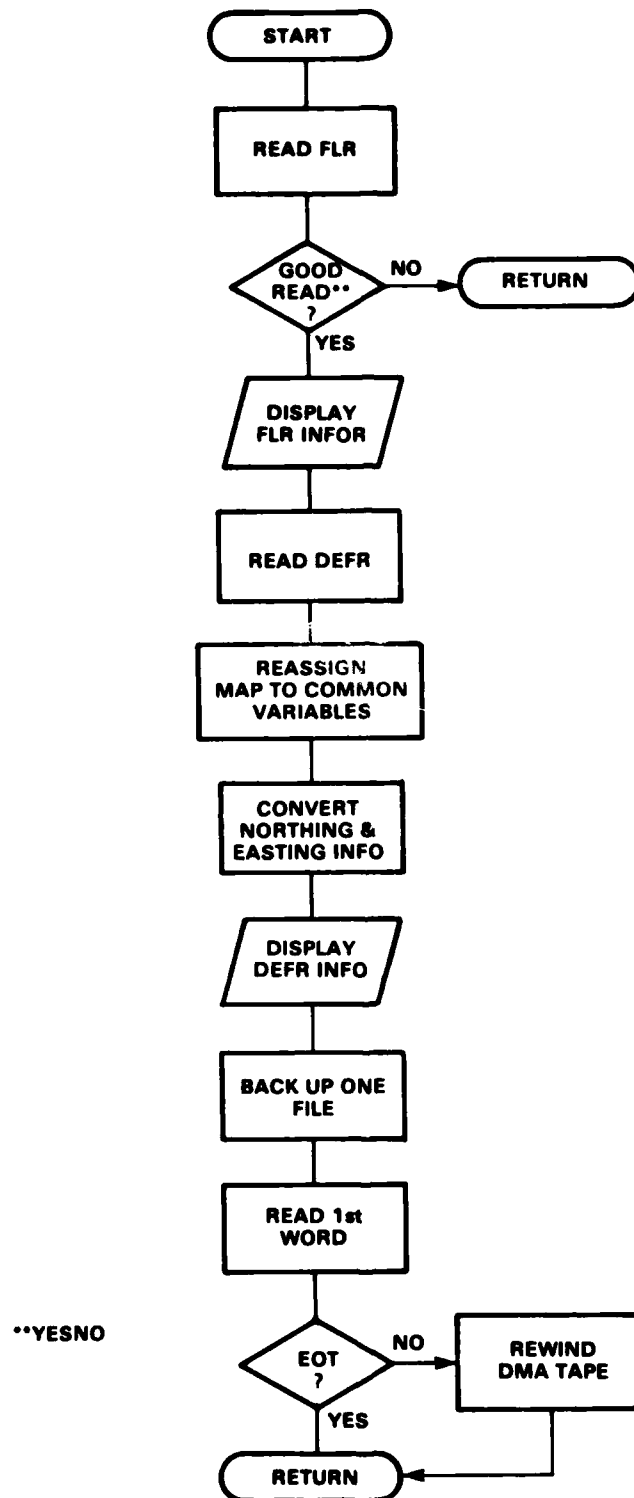
Figure 4-3. RDTAPE Flow Diagram

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4.4 LIBCPY

LIBCPY controls the entering of a map into the library. It is called by MASTER when the DMA option ENTER VERIFIED CELL INTO LIBRARY is selected. LIBCPY first zeros the CLINFO array in preparation, and then calls LBTPFD to get the numbers of maps being entered, their grid zone reference designators, and the tape numbers assigned to each map. CLLTP is then called to do the actual copying. When the copy is done, CATUPD is called to update the catalog. Finally, EODPRC is called to update and store the working files. Figure 4-4 shows the flow diagram for LIBCPY.

START

ASSIGN I/O

ZERO CLINFO ARRAY

CALL LBTPFD TO GET ENTRY INFO

INFOBF =999 (BAD HEADER) ? — YES

NO

CALL CLLTP TO COPY FILES

CELLS ADDED ? — NO

YES

CALL CATUPD TO UPDATE CATALOG

CALL EODPRC TO STORE WORKING FILES

RETURN
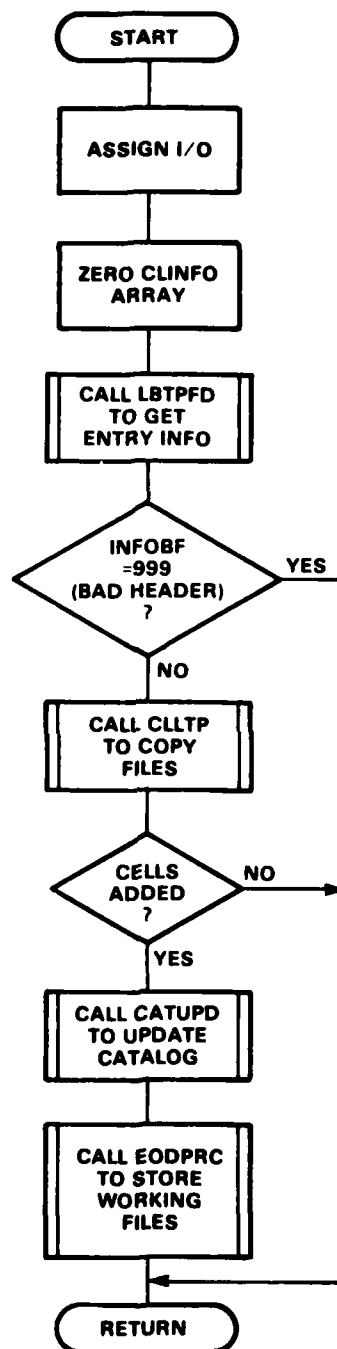
Figure 4-4. LIBCPY Flow Diagram

4.5 ENTTP

ENTTP interrogates the operator and sets the necessary parameters to produce a verbatim tape copy, a file copy, or a catalog backup. ENTTP can be called independently by the copy option COPY ENTIRE TAPE. It is also called by TPTP when a DMA copy is being made, or by EODPRC when a catalog backup is being made.

When called as a copy option, ENTTP copies the entire tape without interruption. For DMA copies, control is returned to TPTP after each file so RDTAPE can display the header information. For catalog backup copies, the header file of each tape is skipped and the remaining file is copied.

The flow diagram for ENTTP is shown in Figure 4-5.
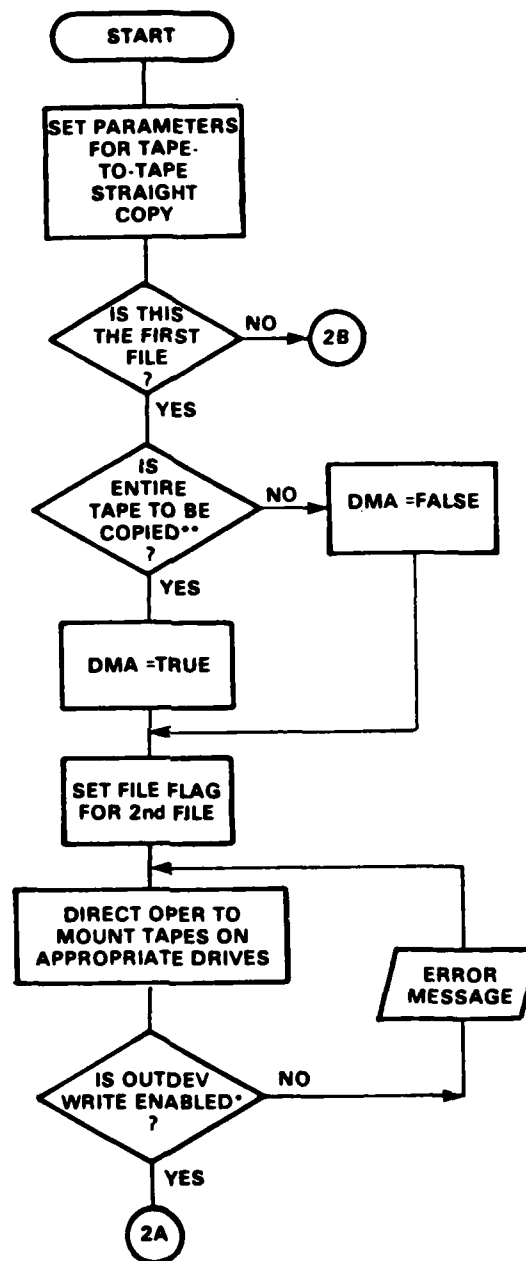
Figure 4-5. ENTTP Flow Diagram (Sheet 1 of 2)

Figure 4-5. ENTTP Flow Diagram (Sheet 2 of 2)

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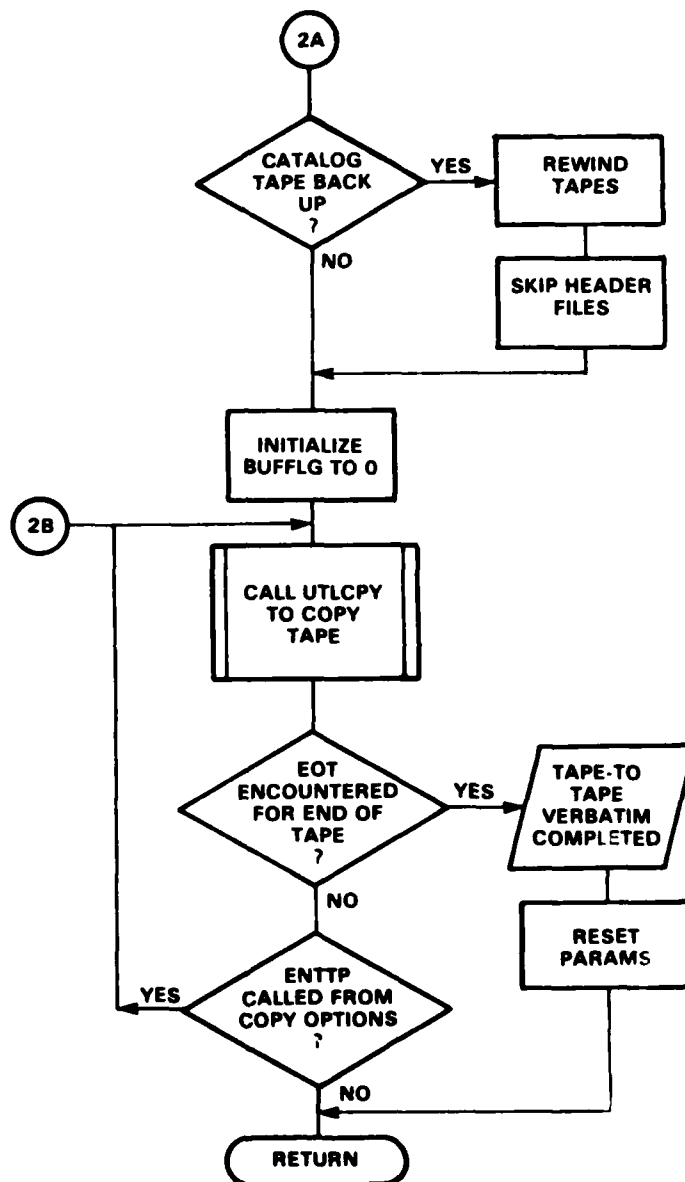
4.6 CLLTP

CLLTP controls the copying of the maps from the DMA CPYOBJ scratch tape onto the appropriate library tapes. It keeps track of the maps copied, the positioning of the scratch tape, the files added to the tapes, and the file numbers of the newly added maps.

When a CLLTP is called, the number of maps to be processed (NUMMPS) is known, and the grid zone designators of these maps are already in the CLINFO array. The tape numbers of the ML, MLBU, and FF tapes associated with the individual maps are also in the array.

The 23rd position of the CLINFO array (the status word) is initially set to zero for all the maps (indicating not done).

The operator is directed to mount the CPYOBJ scratch tape. The subroutine LOCFLS goes through the scratch tape and places the file position of a particular map on the scratch tape into the 22nd CLINFO position for that map. This establishes a reference between a given map and its location on the scratch tape.

LOCFLS will search the tape until all the maps to be processed are found. A message is output if the map is not found on the tape or if it could not be read. In this case, nothing will be done for that map.

At this point, all the information needed to process a map is stored in CLINFO: map designator and grid zone, the ML, MLBU, and FF tape numbers, and the location of the map on the CPYOBJ scratch tape. The program processes the maps by grid zones, in the order in which they were entered. All the maps of one grid zone are done first, then the second,

and so on. The grid zone of the first map is retrieved from CLINFO and compared with the grid zones of the remaining maps. All maps having the same grid zone (and therefore to be put on the same library tape) are flagged for processing by setting the corresponding position in the DOIT array to .TRUE.

The actual ML tape number for the map is retrieved from CLINFO, and the number of files already on the tape is retrieved from the ML usage table (USGTBL). The operator is directed to mount the appropriate tape on tape drive 3. The tape is checked to verify that it is the correct tape and that it is write enabled. If either condition is not met, an error message is displayed on the CRT and the operator prompt is displayed again. The files already put on the library tape are skipped and the new maps are added after the last file. Once the ML tape is positioned to the next available space, a loop is entered to copy the flagged maps. For each map, the DOIT array is checked and all maps flagged .TRUE. are copied. Any map not flagged is skipped and the next map is checked. When a map is to be copied, the usage table is again checked to make sure there is room on the tape. The usage table was originally checked when the map was entered, but is again checked before each map is entered in case the tape became full in the middle of processing.

If a map should be processed, but the tape is full (41 files are the maximum), a "2" is put into the 23rd position of the CLINFO array for that map, and its position in the DOIT array is set to .FALSE. There will be no further attempt to process the map.

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The map's location on the CPYOBJ scratch tape is retrieved from CLINFO and the POSTAP subroutine is called to position the scratch tape to the appropriate file. Once the scratch tape is in position, the UTLCPY subroutine is called to do the actual copying of the map in the required formats. Once the map is copied, the control transfers back to CLLTP.

If the file copied satisfactorily, the northing and easting points of the map are added to CLINFO, along with the number of kilometers covered by the map. The usage table is incremented by 1 for the file copied, and this number is put into the 13th position of the CLINFO array. This is the file number the map holds on the ML tape.

In the process of copying, the CCCPYD flag is incremented if a bad file has been written. If the file could not be copied after two tries, the FFCPYD flag is set to "1." CLLTP adds the number of bad files written to the usage table and the FFCPYD flag is checked to see if it is still "0." If it is not, this means that the file did not copy for some reason, and a "4" is put into the 23rd position of the CLINFO array for that map and its position in the DOIT array is set to .FALSE. No further attempts are made to copy or process this map.

The program now checks the remaining maps and copies all those to be copied on this tape. This continues until all the maps having this grid zone are copied onto the ML tape.

After all the maps are copied, two EOT's are placed on the ML tape and it is rewound.

At this point, the DOIT array is checked to see if at least one map requires further processing. If not (because processing was stopped due to bad copies or tape limitations), the program goes on to the next grid zone.

If the ML tapes have copied satisfactorily, the operator is directed to mount the MLBU tape. The same sequence is followed until all the maps are copied onto the backup tape. Two EOT's are output and the tape is rewound. The DOIT array is again checked to make sure further processing is required. If all is well, the operator is directed to mount the FF tape. The same sequence is followed, except that on the FF tapes each map is copied three times, in the 250m, 500m, and 1000m formats. Only the location of the first of these maps is put into CLINFO. If any copy is bad, processing is stopped.

As each individual map is completed, a "1" is placed in the 23rd position of CLINFO (indicating that processing has been completed). The CLCTR flag is incremented to keep track of the number of cells processed. After all the maps of this grid zone are done, the message:
    "GRID ZONE _____ COMPLETED"
    "CONINTUE PROCESSING (YES OR NO)"
is displayed. If the operator responds "YES," the next grid zone is processed. The procedure is identical except that different tapes are called for. If the operator answers "NO," or if all the maps have been completed or attempted, the results of the processing are displayed by the DSPLAY subroutine.

The maps are listed in five categories: completed, not yet processed, not found on the copy scratch, not processed due to bad copy,

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and not processed due to tape limitations. The operator is then directed to dismount the scratch tape and store it properly. The program now exits CLLTP.

The CLLTP flow diagram is shown in Figure 4-6.

Figure 4-6. CLLTP Flow Diagram (Sheet 1 of 10)

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2A

DO THE GRID ZONES MATCH ? — YES → SET CORRESPONDING POSITION OF DOIT ARRAY TRUE

NO

INTERMEDIATE LOOP COMPLETED # OF REQ TIMES ? — NO → 1A

YES

RETRIEVE, ML TAPE # FROM CLINFO

DIRECT OPER TO MOUNT APPROPRIATE ML TAPE

TAPE WRITE ENABLED* ? — NO → ERROR MESSAGE

YES

IS IT CORRECT TAPE ? — NO → ERROR MESSAGE

YES

RETRIEVE # FILES ALREAD ON THIS TAPE FROM USGTBL

SPACE OVER FILES USED

*WRRING

3A
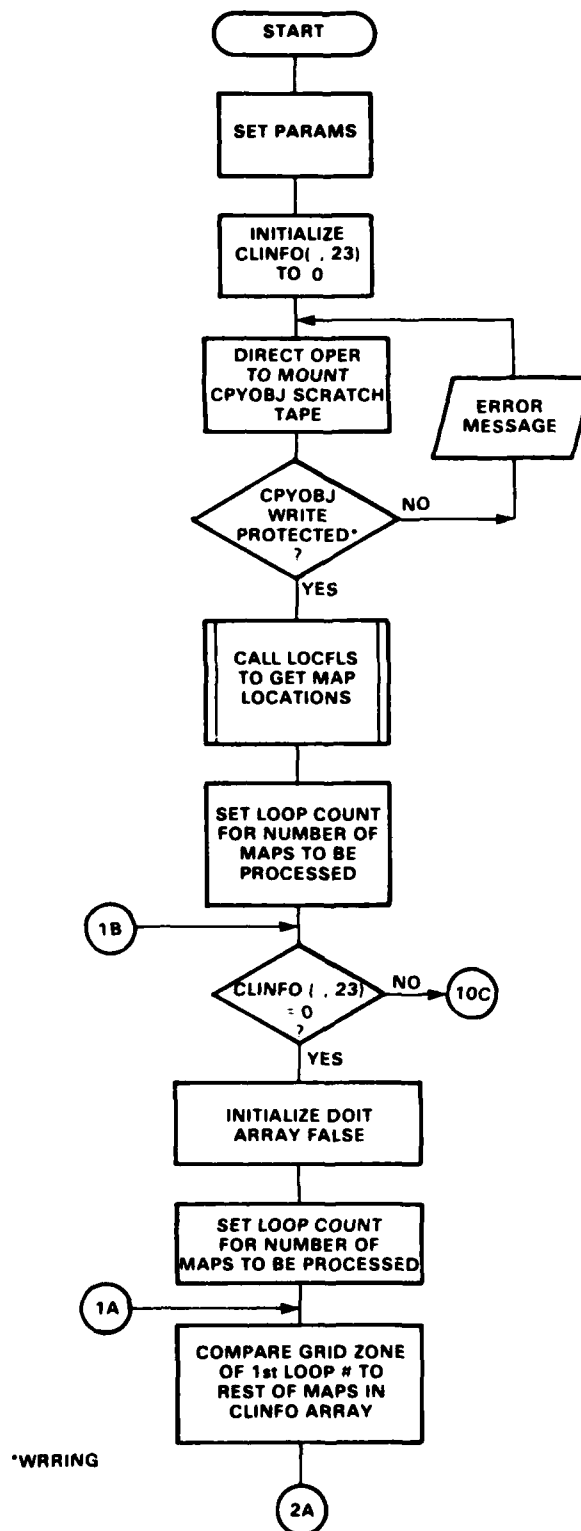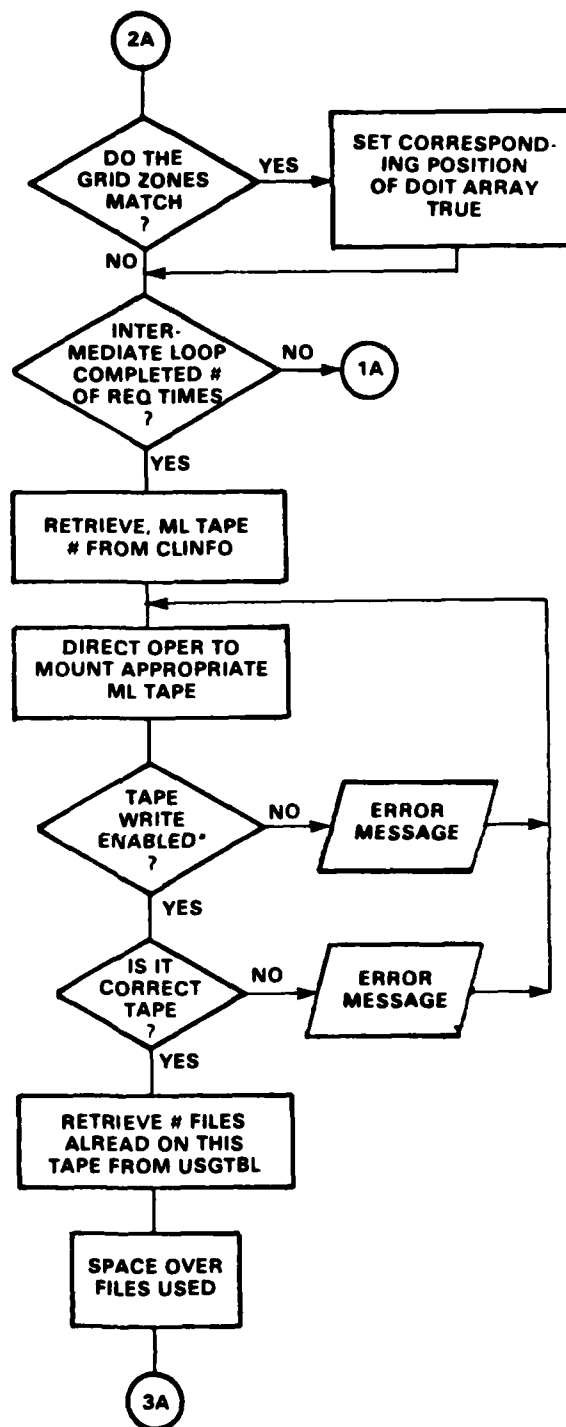
Figure 4-6. CLLTP Flow Diagram (Sheet 2 of 10)

4-28
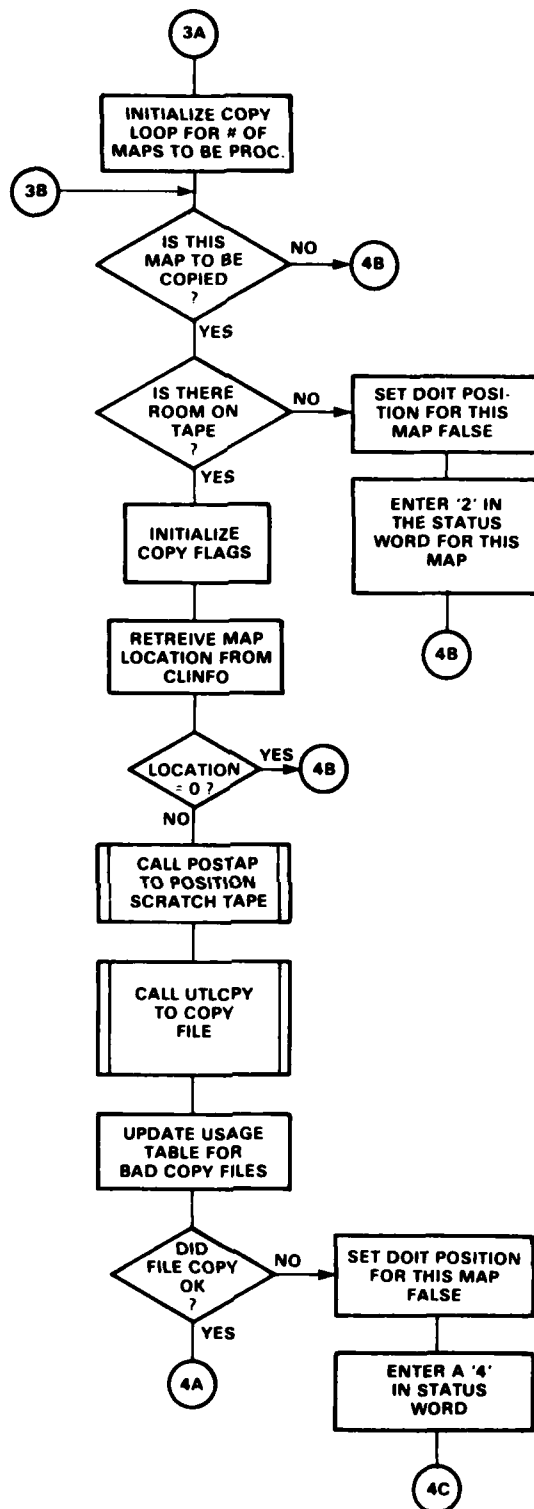
Figure 4-6. CLLTP Flow Diagram (Sheet 3 of 10)
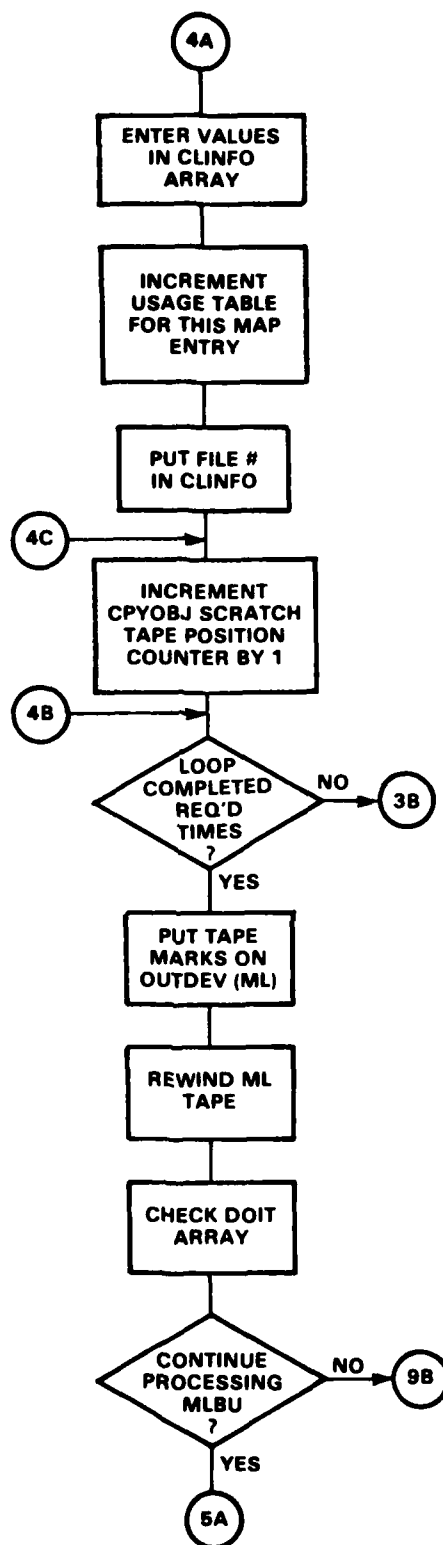
Figure 4-6. CLLTP Flow Diagram (Sheet 4 of 10)

4-30
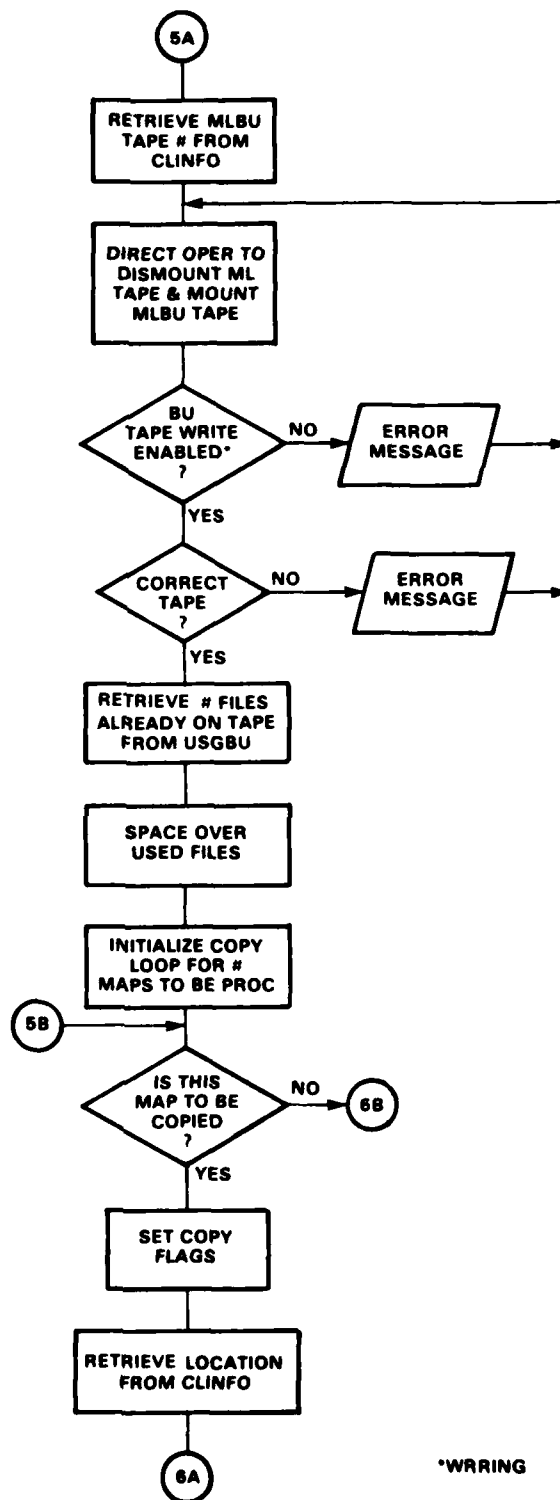
Figure 4-6. CLLTP Flow Diagram (Sheet 5 of 10)
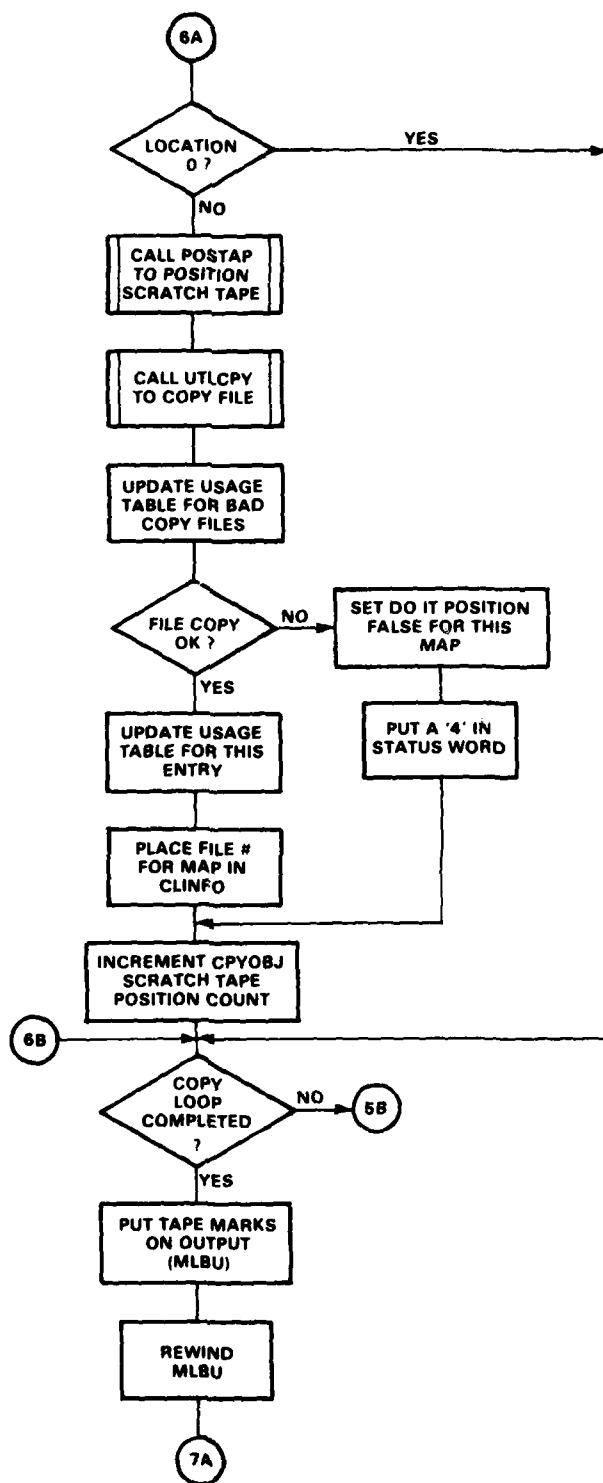
Figure 4-6. CLLTP Flow Diagram (Sheet 6 of 10)
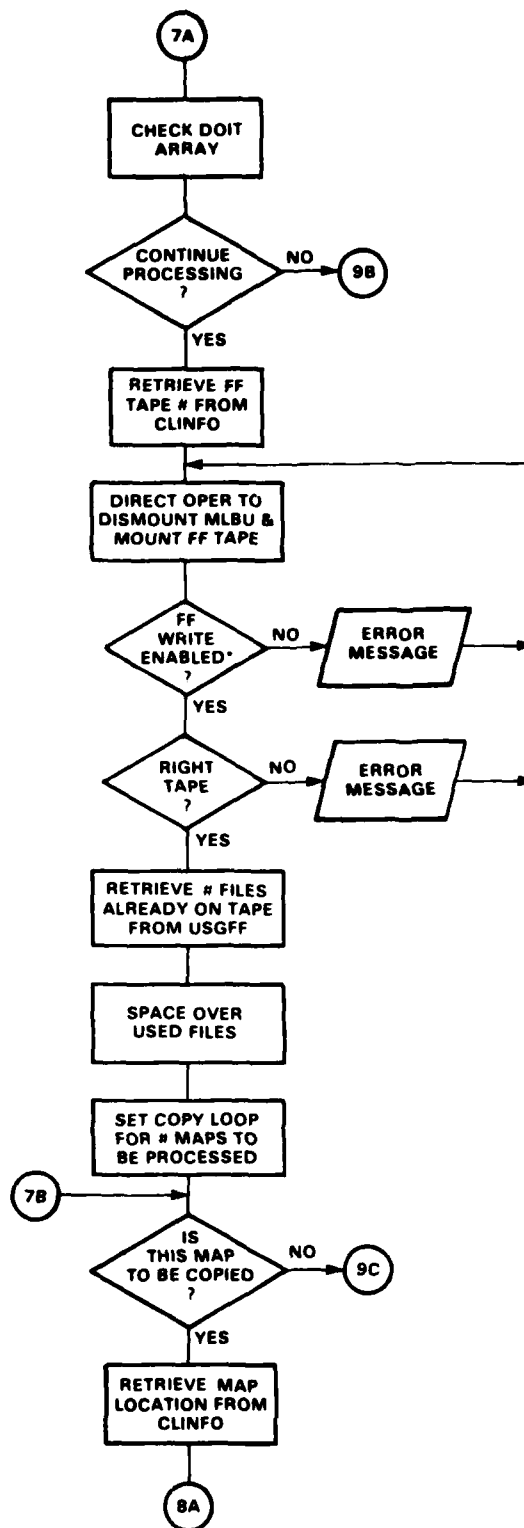
Figure 4-6. CLLTP Flow Diagram (Sheet 7 of 10)

4-33
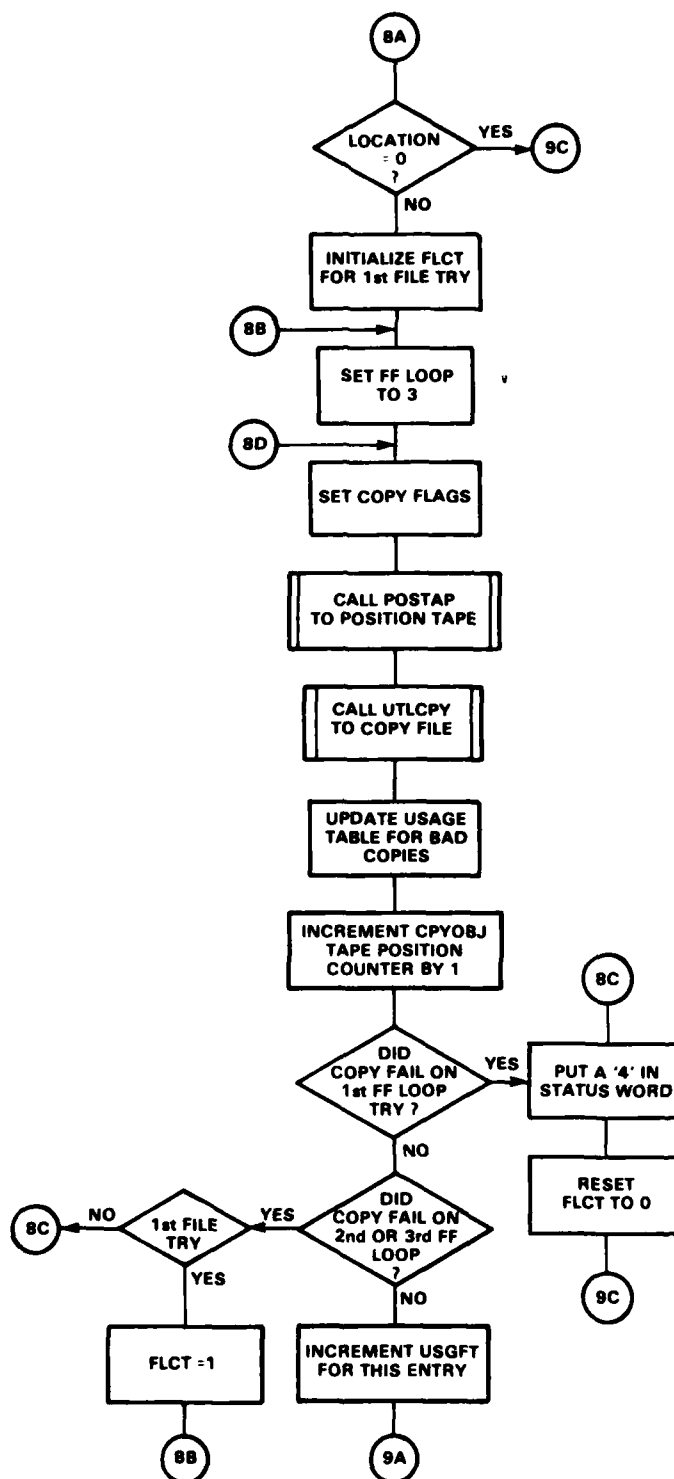
Figure 4-6. CLLTP Flow Diagram (Sheet 8 of 10)

4-34
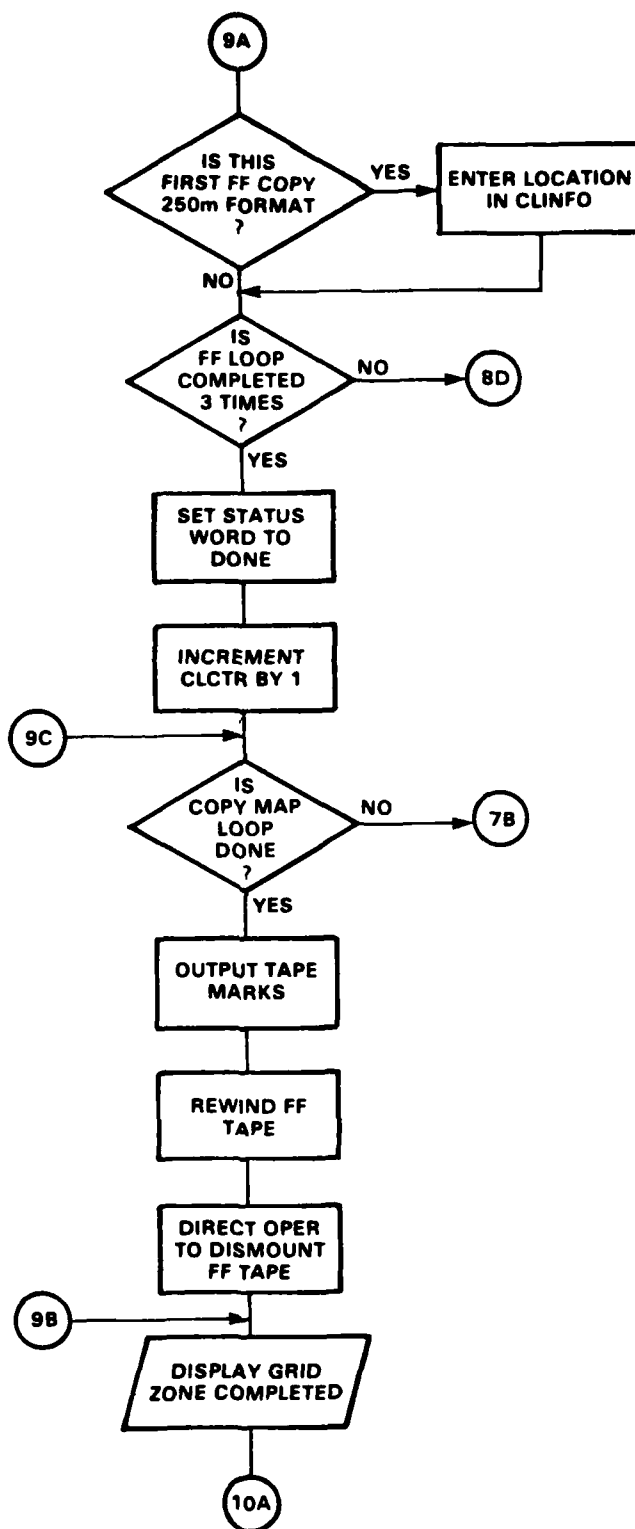
Figure 4-6. CLLTP Flow Diagram (Sheet 9 of 10)

4-35
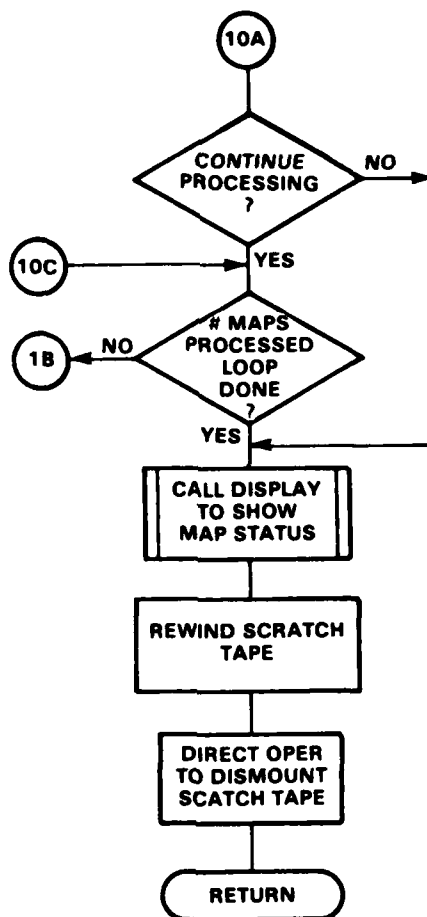
Figure 4-6.   CLLTP Flow Diagram (Sheet 10 of 10)

4.7 UTLCPY

UTLCPY controls the actual copying of files and tapes. It is called by ENTTP for entire tape copies, and by CLLTP for library entries. UTLCPY calls appropriate subroutines for each type of copy. When the copy is completed, it calls JMPSW to interpret the result of the copy and takes appropriate action. The flow diagram for UTLCPY is shown in Figure 4-7.
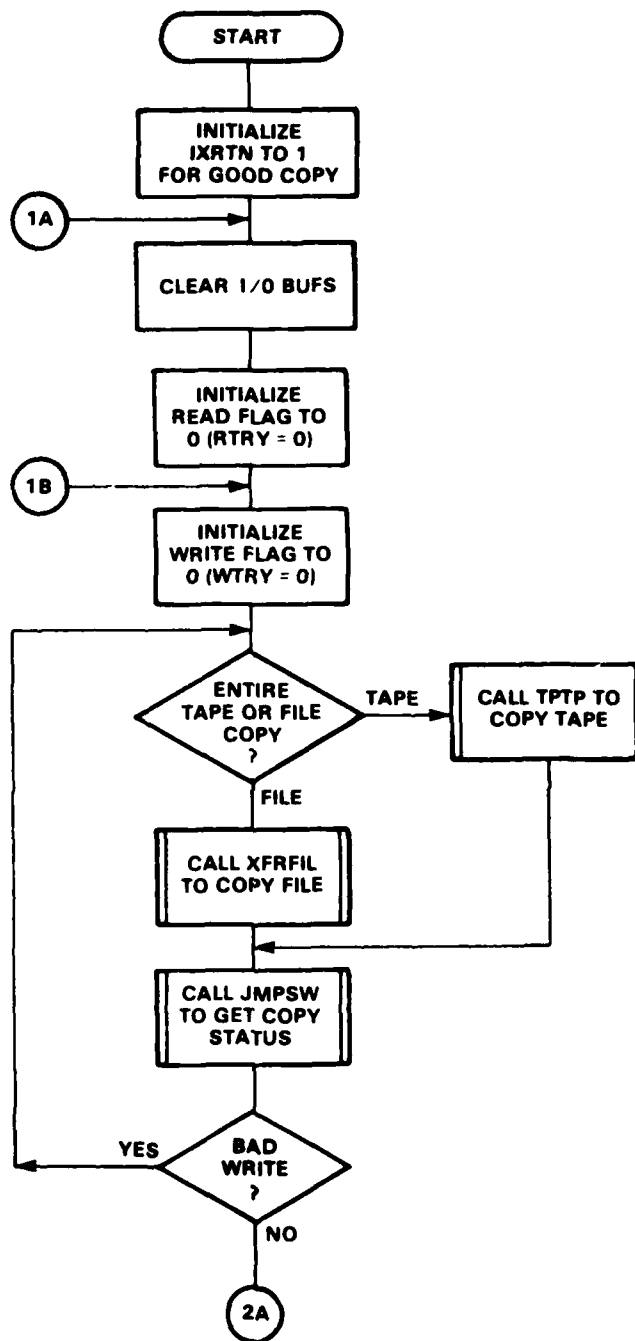
Figure 4-7. UTLCPY Flow Diagram (Sheet 1 of 2)

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Figure 4-7. <u>UTLCPY</u> Flow Diagram (Sheet 2 of 2)

4-39
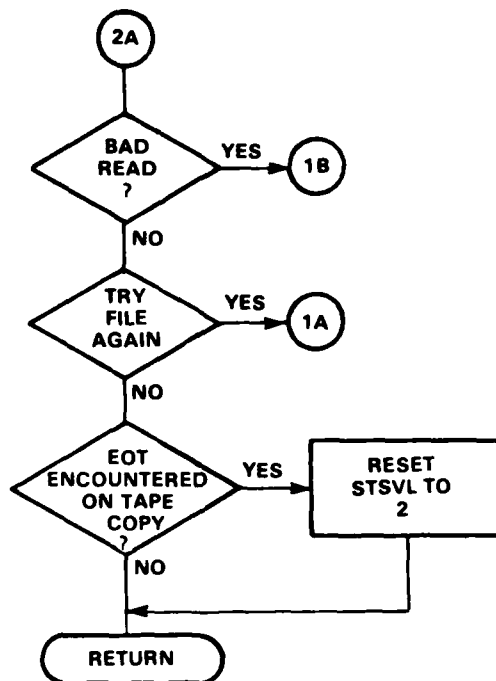
4.8 XFRFIL

XFRFIL controls the copying of files from the CPYOBJ scratch tape to the various library formats. It is called by UTLCPY when a verified map is to be entered into the library. XFRFIL transfers the header records and then calls the subroutine CHOICE to transfer the rest of the map file.

The FLR is transferred into IOBUF1 using the RSUMCK subroutine. RSUMCK will check the read for bad reads or sum check errors. If an EOT is detected, RSUMCK will flag it. Any error condition will be flagged and XFRFIL will be exited.

If the original read was good, the FLR is written out to the output (library) tape. The output tape is then backed up one record and read back onto IOBUF2. Again, RSUMCK is used and will flag any errors. If the read was good, IOBUF1 and IOBUF2 are compared. If the compare was good, the program continues. A bad compare causes the BDCMP subroutine to be called.

Next, XFRFIL reads the definition record from the CPYOBJ tape into IOBUF0 using RSUMCK. If the read was good, variables which depend on the library format are computed. These variables, along with the rest of the definition record, are transferred into IOBUF1. This record is then written out and reread into IOBUF2. The buffers are compared, and if the write was good, the program continues.

Control then switches to the CHOICE subroutine, where the data records are transferred into the library in the correct format. After

the entire file is copied, XFRFIL checks the IXRTN variable for the status. Any error encountered during the file transfer causes an error condition to be flagged and XFRFIL to be exited. If the file copied satisfactorily, the record count is checked. A wrong record count gives an error condition. If all is well, IXRTN = 1, and XFRFIL is exited. The flow diagram for XFRFIL is given in Figure 4-8.
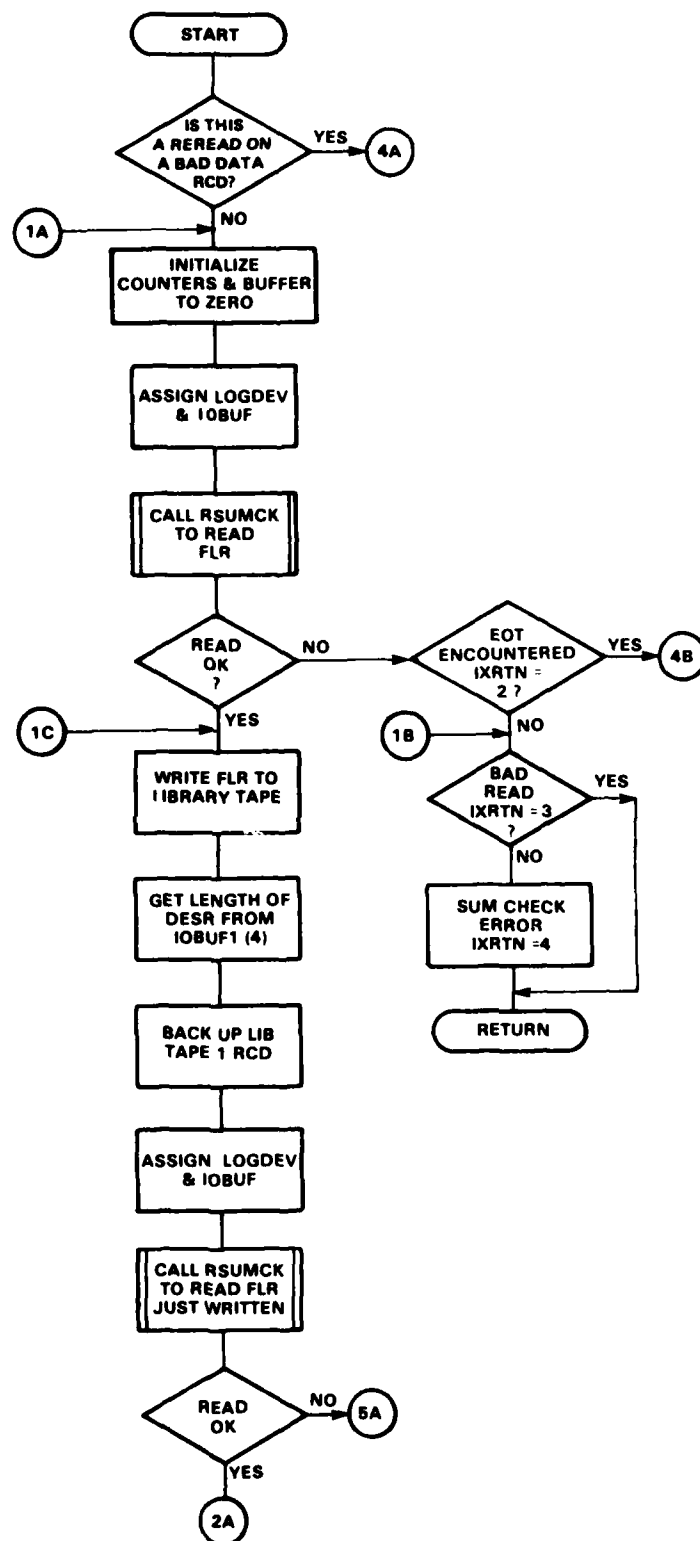
Figure 4-8. XFRFIL Flow Diagram (Sheet 1 of 6)
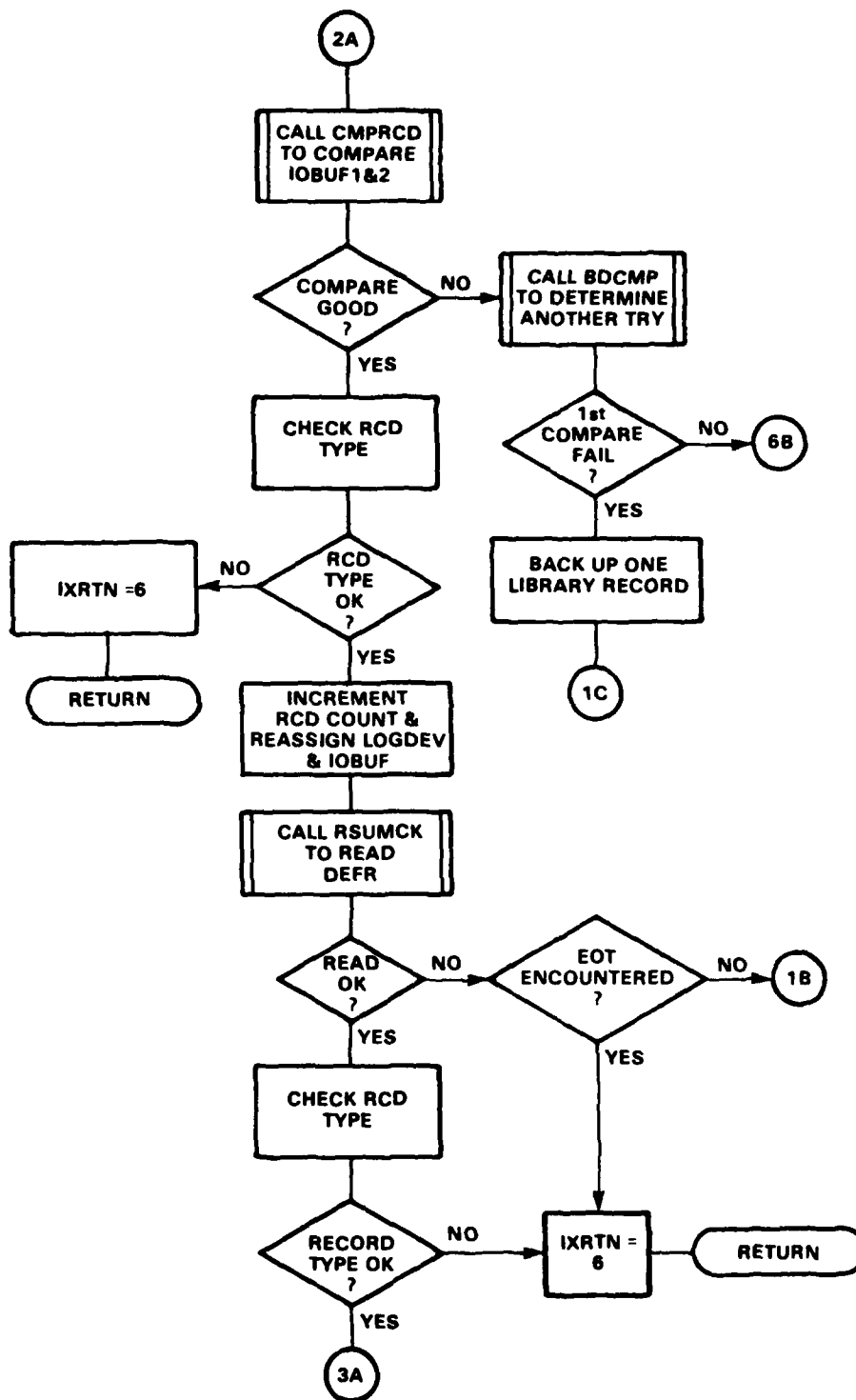
Figure 4-8. XFRFIL Flow Diagram (Sheet 2 of 6)

4-43
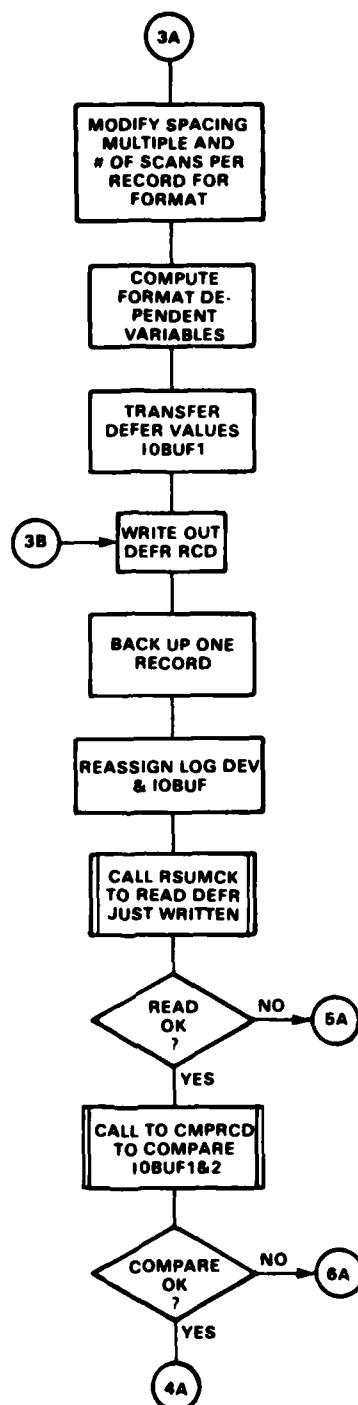
Figure 4-8. XFRFIL Flow Diagram (Sheet 3 of 6)
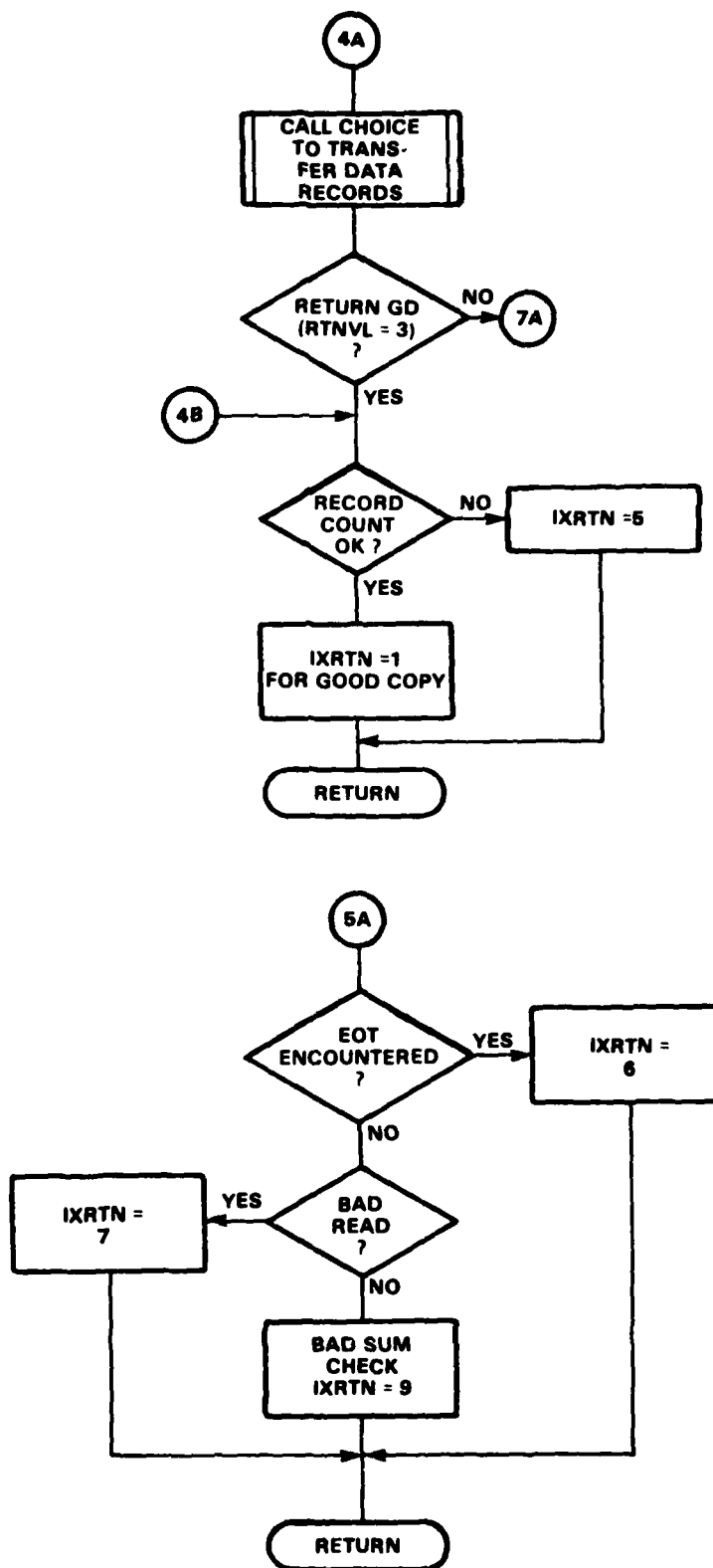
Figure 4-8. XFRFIL Flow Diagram (Sheet 4 of 6)

4-45
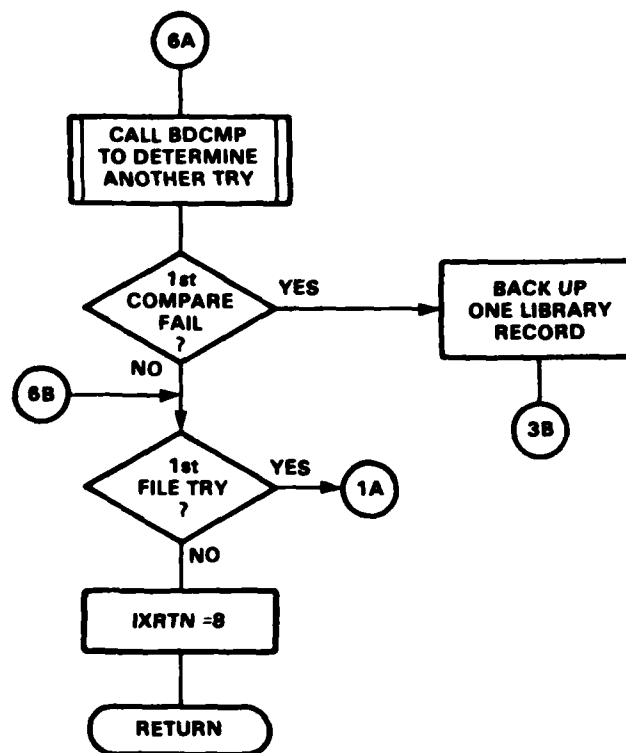
Figure 4-8. XFRFIL Flow Diagram (Sheet 5 of 6)

4-46
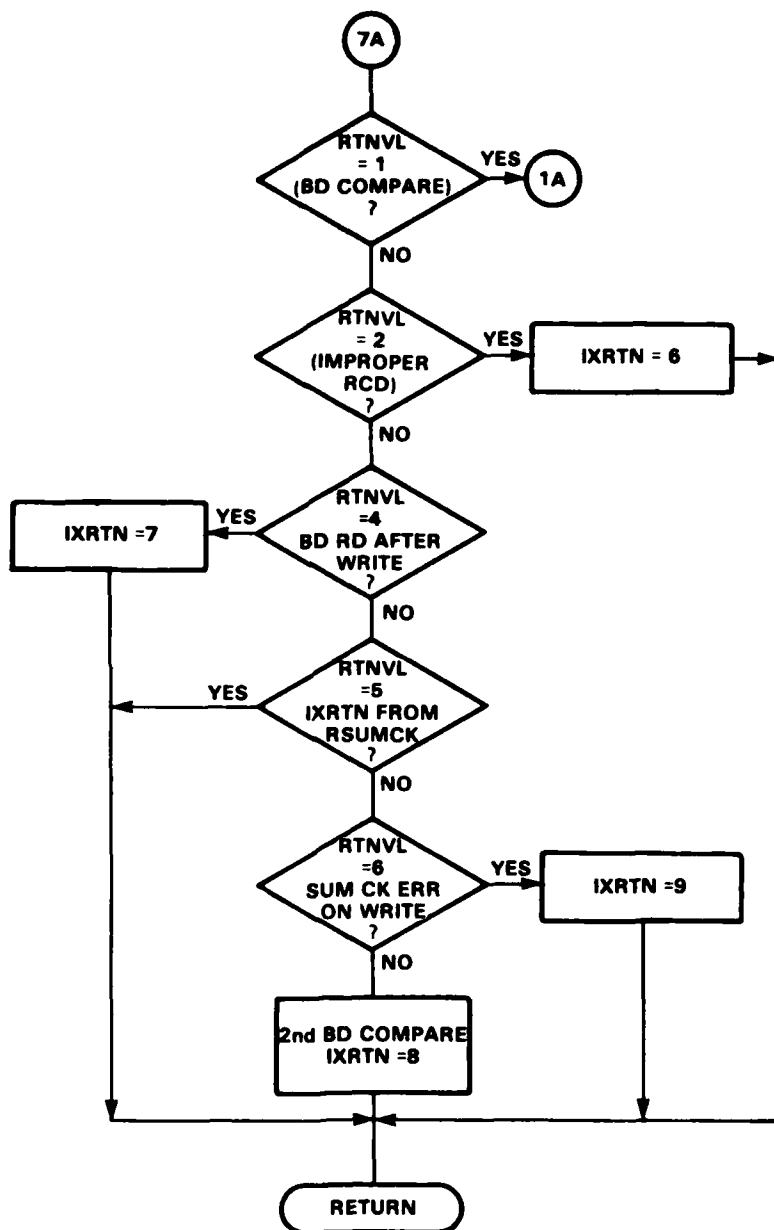
Figure 4-8. XFRFIL Flow Diagram (Sheet 6 of 6)

4.9 CHOICE

CHOICE transfers the data records (datars) from the CPYOBJ scratch tape to the specified library tape. It reads the datars, sets up appropriate parameters for conversion into the various formats, then writes and checks the modified data into the library.

XFRFIL calls CHOICE to read and reformat the datars. Each datar contains one scan. For 125m format (ML, MLBU), every datar is read. The output record is then packed so that it contains five scans. For the FF copies, the 250m format reads every other datar and packs it 10 scans per output record before outputting it to the FF tape. In the 500m format, every fourth datar is read and then packed 20 scans per output record. In the 1,000m format, every eighth datar is read and then packed 25 scans per output record.

The variables concerned with this reformatting are:

XC - the number of datars contained in the actual DMA cell (801 for a 100 X 100km cell)

X - the number of scans in the output record
   X = 5 for ML, MLBU
     = 10 for FF(250m)
     = 20 for FF(500m)
     = 25 for FF(1,000m)

CTR - number of scans already in output record

ZOFF - number of input records skipped for the FF copies
   ZOFF = 1 for 250m
        = 3 for 500m
        = 7 for 1,000m

IADDR, YOFFST, JADDR - all used offset increments for packing buffer IOBUF1. - The RDWR subroutine does the actual manipulation.

The process employed for the reformatting and transfer is as follows: RSUMCK is used to read the original datar into IOBUF0. If the read

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was good, the subroutine RDWR is called to pack the datars into IOBUF1. When the correct number of scans has been put into the buffer, the record type and count are set, and the SUMCK subroutine is called to set the sum check word. This modified record is then written out to the library tape. The tape is backed up one record, and RSUMCK is called to read it back into IOBUF2. If the read was good, the IOBUF's are compared. A bad compare calls the BDCMP subroutine. If the compare was good, the program continues.

The status of the transfer is given by the variable RTNVL - in the common /DSRVL/. Status is indicated as follows:

RTNVL = 1 Bad compare - first file try

= 2 Improper record type

= 3 EOT encountered on original record (end-of-file)

= 4 Bad read after write

= 5 Bad read on original record

= 6 Sum check error on write

= 7 Bad compare second time

Refer to Figure 4-9 for the CHOICE flow diagram.
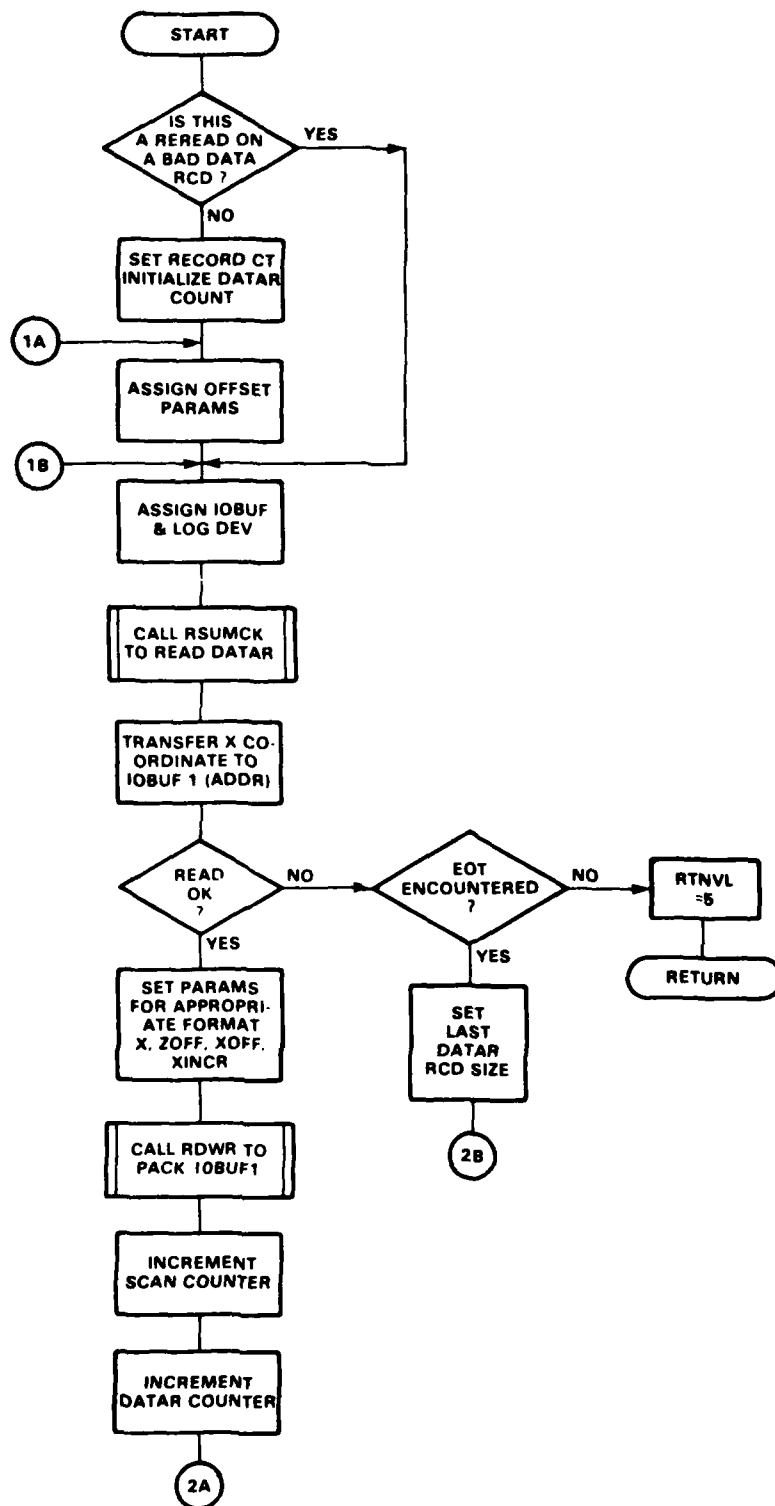
Figure 4-9.   CHOICE Flow Diagram (Sheet 1 of 4)
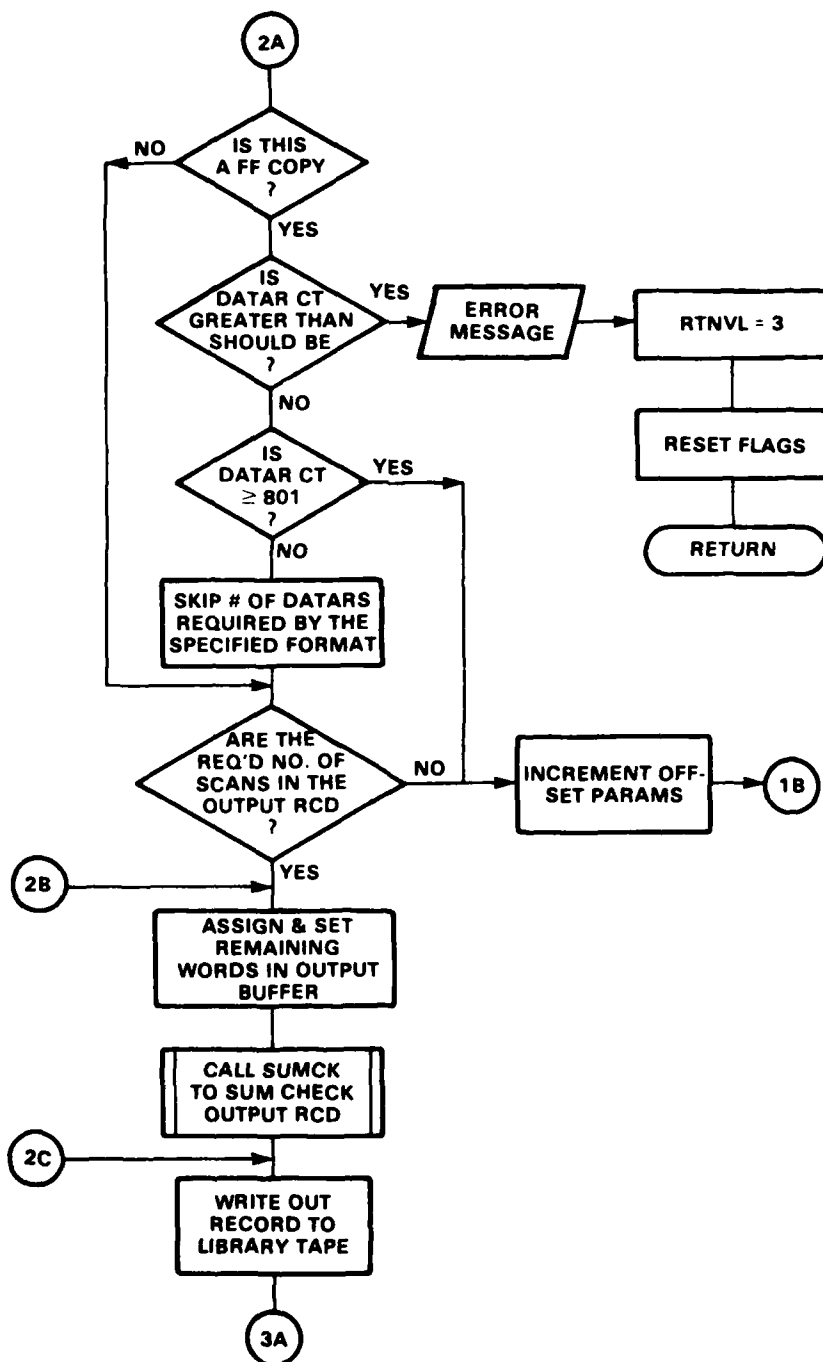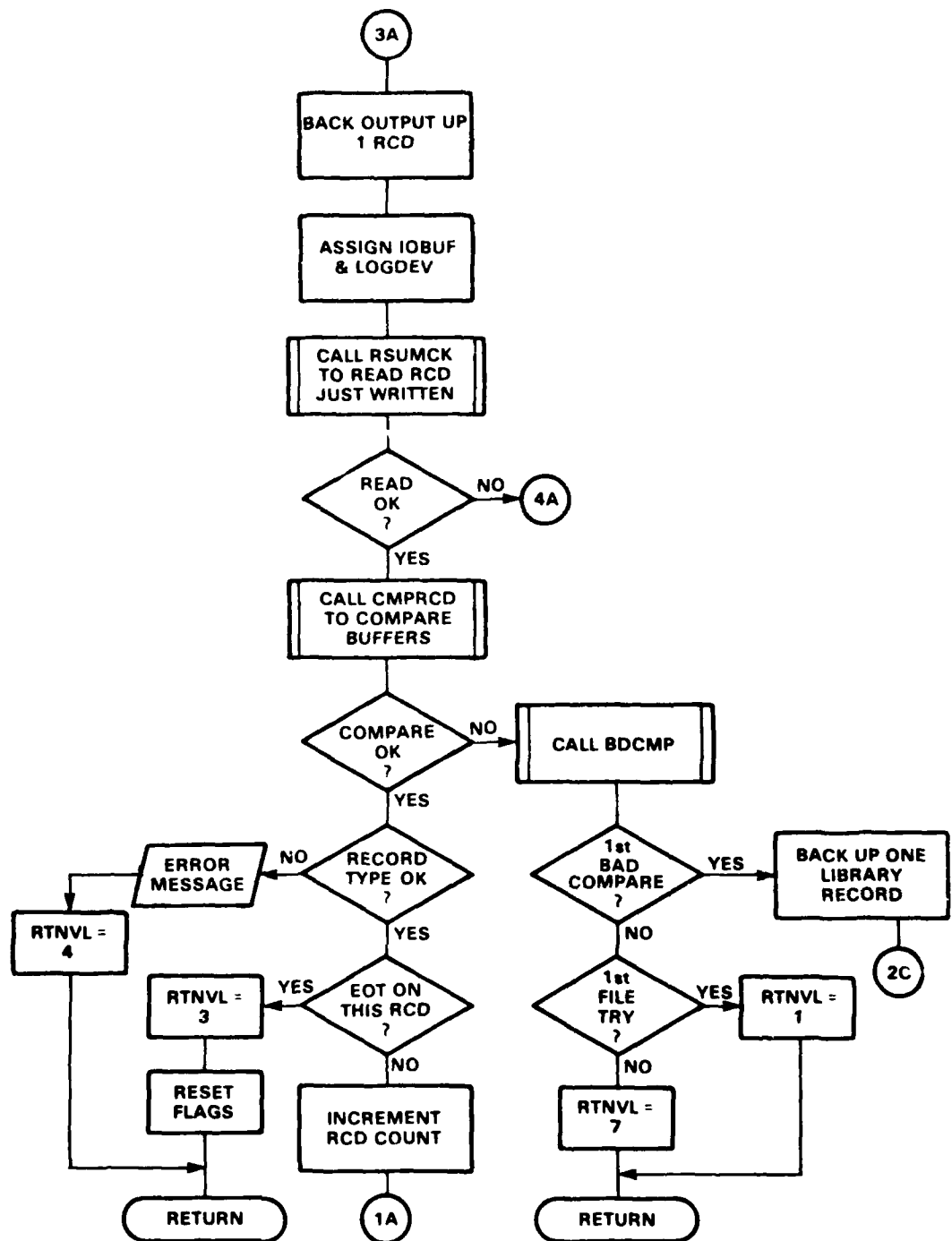
4-50

Figure 4-9. CHOICE Flow Diagram (Sheet 2 of 4)

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Figure 4-9. CHOICE Flow Diagram (Sheet 3 of 4)

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UNC

096

	1.0	
	2.8	2.5
	3.2	2.2
	3.6	
1.1		2.0
		1.8
1.25	1.4	1.6
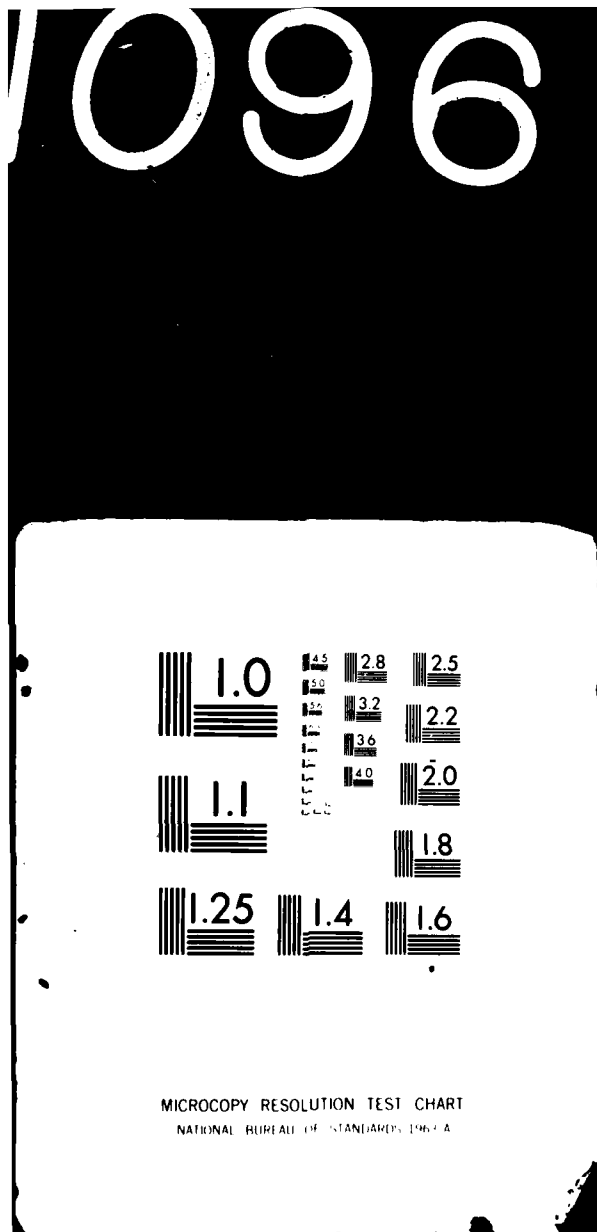
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A
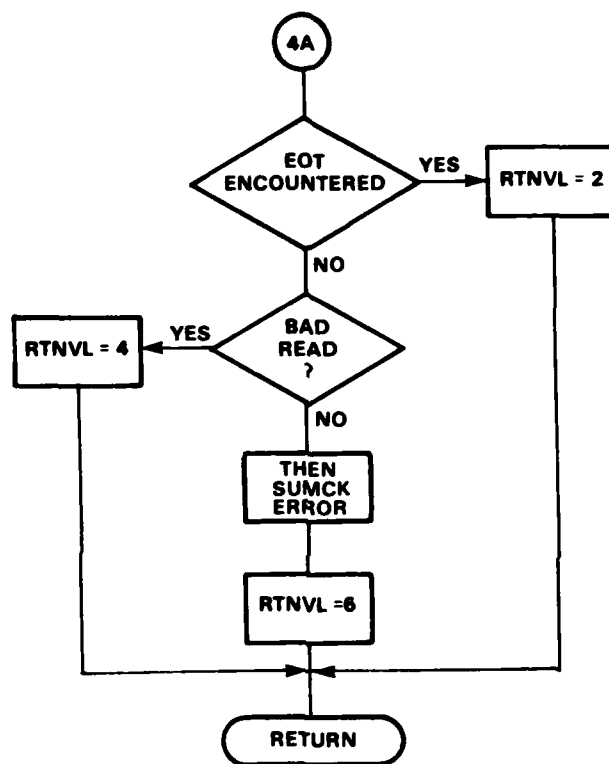
Figure 4-9. CHOICE Flow Diagram (Sheet 4 of 4)

4.10 TPTP

TPTP reads records from an original tape into IOBUF1. It writes out the record unchanged and then reads this record back into IOBUF2. It then calls CMPRCD to compare the two buffers.

TPTP is called by UTLCPY when a tape-to-tape copy is selected. Each record is checked for bad reads and sum check errors.

Figure 4-10 shows the TPTP flow diagram.
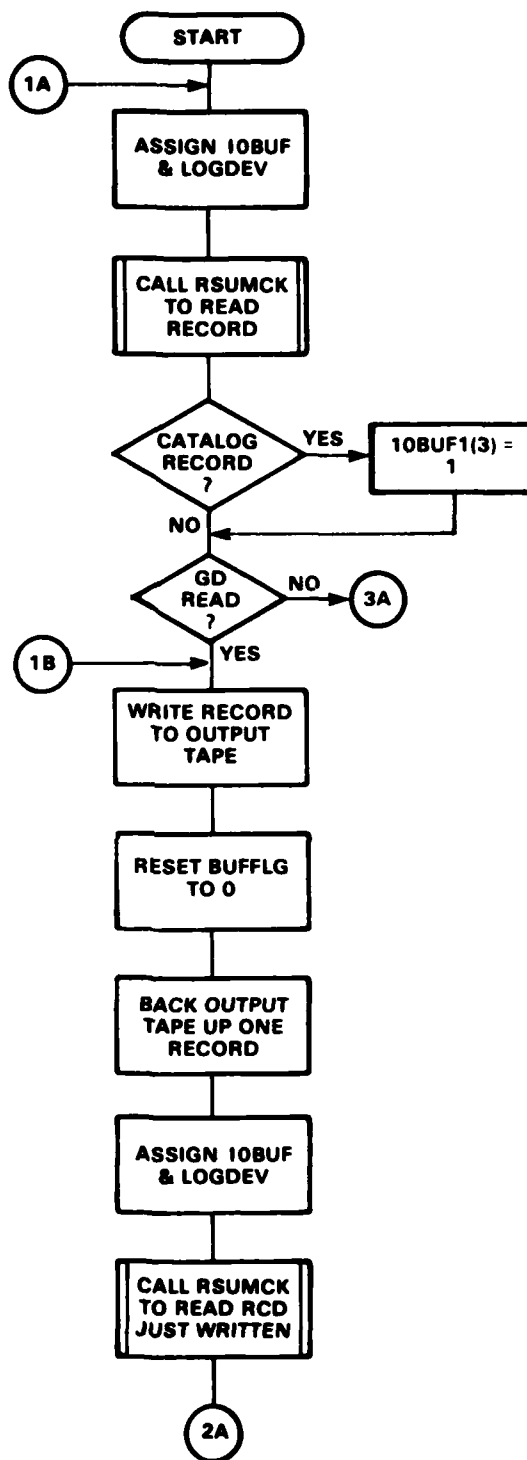
Figure 4-10. TPTP Flow Diagram (Sheet 1 of 3)

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Figure 4-10. TPTP Flow Diagram (Sheet 2 of 3)

4-56
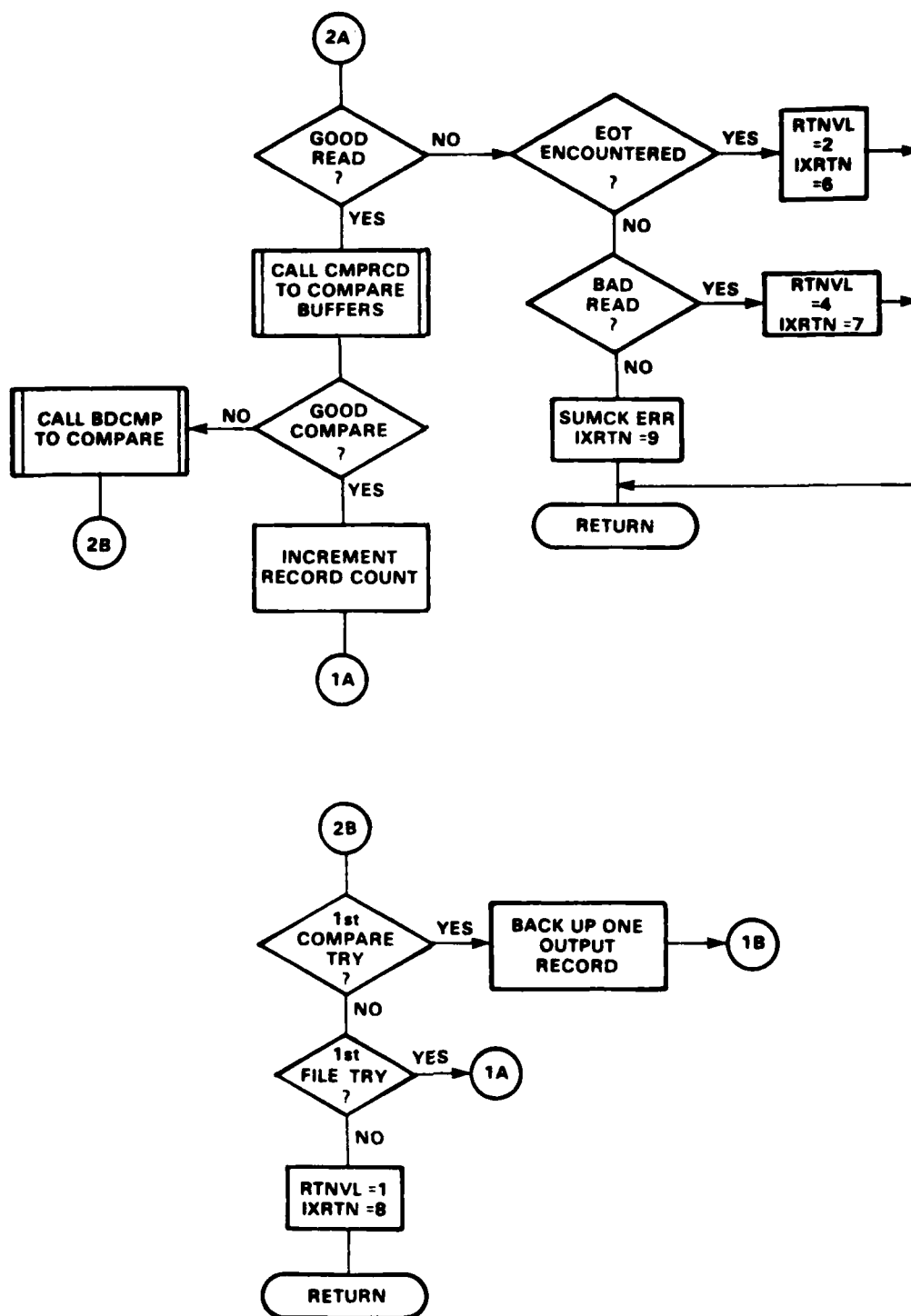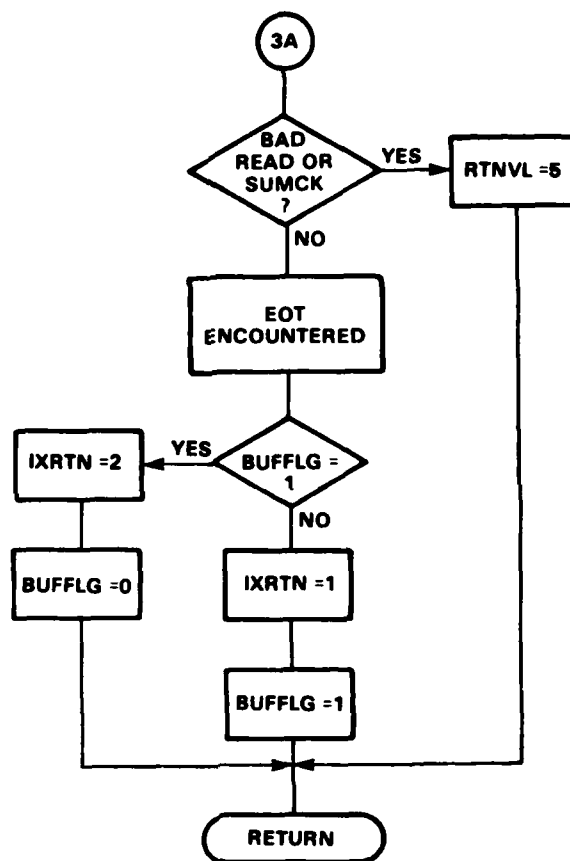
Figure 4-10. TPTP Flow Diagram (Sheet 3 of 3)

4.11 RSUMCK

RSUMCK reads a record from a tape device and checks the read to determine if an EOT was encountered, if the read was bad, or if a sum check error was detected. Depending on values assigned to variables IOBUF and LOGDEV, RSUMCK will read from any tape device into IOBUF0, IOBUF1, or IOBUF2. The read status is returned via IXRTN (in the common /UNVRSL/):

IXTRN = 1 Good read

      = 2 EOT encountered

      = 3 Bad read

      = 4 Sum check error detected

RSUMCK is called whenever a read and check operation is required. Refer to Figure 4-11 for the RSUMCK flow diagram.

Figure 4-11. RSUMCK Flow Diagram (Sheet 1 of 2)

4-59
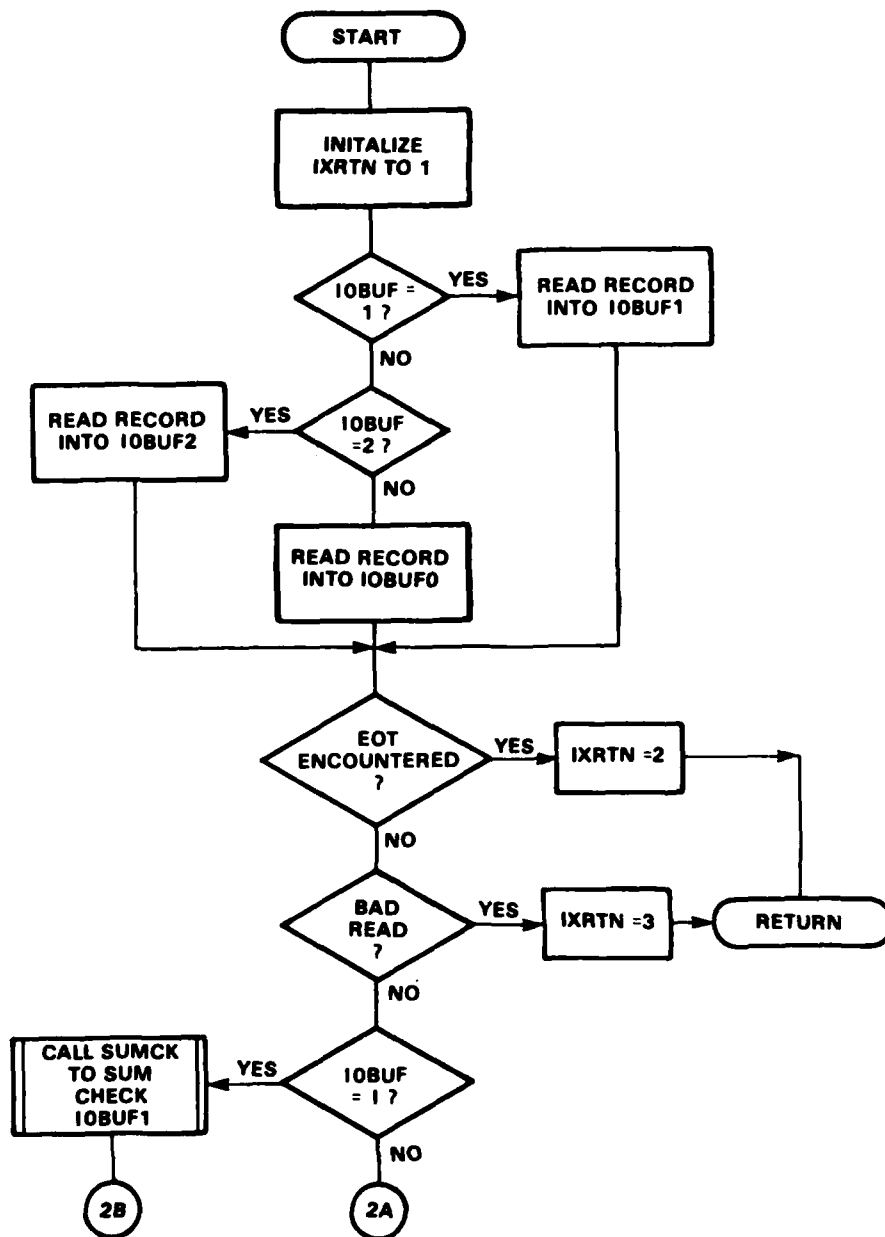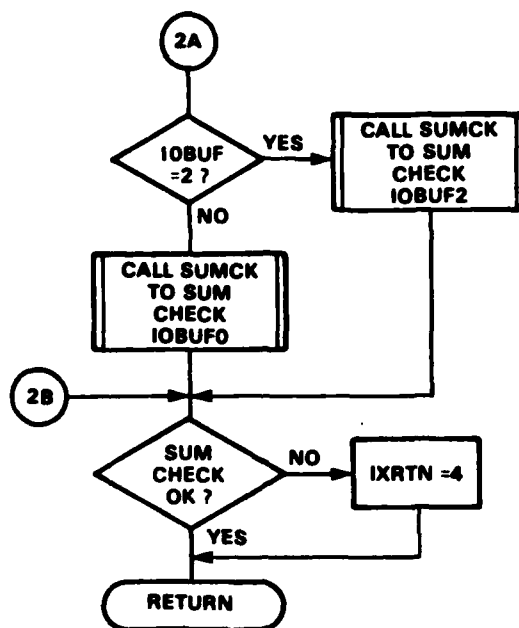
Figure 4-11. RSUMCK Flow Diagram (Sheet 2 of 2)

4.12 RDWR

RDWR controls the packing of the output record (IOBUF1) with the required number of scans for each format. RDWR does the actual packing of the buffer; the control for the actual number and the offset for each scan come from CHOICE, the calling routine. As CHOICE reads an input record into IOBUFO, RDWR is called to transfer the height deviation (HD) values, word by word, into IOBUF1. BYTERD and BYTEWR are called to transfer the upper and lower values of each word. The information is stored into a temporary location called TGT, which is then read into the appropriate location in IOBUF1. The HD values from each additional scan are offset with a given increment for packing into IOBUF1. In addition, each format picks off a given number of HD values from the original. ML and MLBU formats take all the values, while the FF formats vary.

In addition to the four passed variables, several data base common variables are used to transfer the information. The XR, XC, SM, and RC values are in commons and are, respectively, the number of kilometers in the N/S direction, the number of datars transferred, the spacing multiple, and the record count. An equivalence is set up to transfer record type, record count, spacing, and the first HD value.

YOFFST is also in commons and controls the IOBUF1. Once incremented for each scan in CHOICE, RDWR increments it by 1 so that each byte of IOBUF1 is filled. The passed variables IA, CTR, XOFFST, and XI are set to retrieve information from the input buffer IOBUFO. IA is the IADDR value set in CHOICE. It is originally set to 4 to retrieve the

x coordinate from the input record and put it into the fourth byte of the output record. It is incremented for each scan so that the x coordinate value is always retrieved and put into the appropriate location in IOBUF1. CTR is the number of scans in the output record, and XOFFST defines the original offset to retrieve the first HD value from IOBUFO. XOFFST is set in CHOICE and then incremented by the value of XI in RDWR. XOFFST controls the HD values picked up from IOBUFO to be transferred. For the 125m format, XI = 1, so that every HD value in the DMA record is read and transferred. For the 250m format, XI = 2, so that every other point in the scan is read and transferred. For the 500m format, XI = 4, and every fourth point is transferred. For the 1,000m format, XI = 8 and every eighth point is transferred. (The FF tapes contain less information.) Not only are the scans skipped (points in the X direction), but data values within the scans (Y direction values) are also skipped. The result is much less definition for the FF tapes.

Figure 4-12 shows the RDWR flow diagram.

START

TRANSFER RECORD TYPE TO IOBUF1

ZERO OUT TEMP STORAGE (TGT)

RETRIEVE VALUES FROM COMMON

CALCULATE "J"-VALUE FOR CONVERSION LOOP (# OF SCANS FOR FORMAT)

TRANSFER XC & HD1 VALUES TO IOBUF1

SET LOOP COUNT

1A

CALL BYTERD TO READ INFO FROM IOBUF0 (BEGINNING AT XOFFSET VALUE) AND STORE IN TGT

INCREMENT XOFFSET BY IX
XI 1 FOR ML, MLBU
X 2 250m
X 4 500m
8 1000m

CALL BYTEWR TO WRITE VALUE STORED IN TGT INTO IOBUF1 STARTING AT YOFFSET POSITION

2A

Figure 4-12. <u>RDWR</u> Flow Diagram (Sheet 1 of 2)

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Figure 4-12. RDWR Flow Diagram (Sheet 2 of 2)

4.13 JMPSW

JMPSW interprets the result of a copy process and takes appropriate action. The value of the status variable, IXRTN, is checked and various actions are taken for each value. JMPSW is called by UTLCPY after each copy process. The actions associated with each IXRTN value are given in Table 4-2. JMPSW returns a value of STSVL (through common /UNVRSL/) to UTLCPY, which then acts on it to perform the action decided by JMPSW. The values for STSVL are as follows:

STSVL = 1 Continue with next file

= 2 Read same record again

= 3 Write same record again

= 4 Try entire file again

= 5 End-of-tape encountered

In general, if everything was good, the program goes on with the next file. If there was a bad read or sum check error on an input record, it tries to read the same record again. If it still gets an error, it backs the output tape to the beginning of the file, backs the input tape up to the beginning of the same file, and tries the entire file again. If it gets an error on the second file try, it stops trying to process the file and goes on to the next one.

If there was a bad read or sum check error on an output record, or if an improper record was detected, it tries to write the same record out again. The output tape is backed up one record, and the input tape is backed up the number of records needed (DMA - 1 record; ML, MLBU - 5 records; FF - 10, 20, or 25), and the program tries to read and write the record again. If it still gets an error, it writes out a buffer to space

TABLE 4-2. ACTIONS ASSOCIATED WITH IXRTN VALUES

IXRTN VALUE	ACTION
IXRTN = 1	Good copy; "FILE TRANSFER OK"; STSVL = 1 Continue
IXRTN = 2	EOT encountered; "EOF/EOT ENCOUNTERED ON INPUT DE-VICE TAPE DRIVE ____" outputs two EOT's, Rewind tapes; STSVL = 5, Continue.
IXRTN = 3	"BAD READ ON ORIGINAL TAPE RECORD____" *On the first time, try to read same record again; STSVL = 2. **On the second time, back up output tape to the beginning of file, back up input tape to the begin- ning of that input file, and try file again; STSVL = 4 On second file try, if still bad, stop processing file and go on to the next file. STSVL = 1.
IXRTN = 4	"BAD SUMCK ON RECORD ____" Handled same as 3*
IXRTN = 5	"WRONG RECORD COUNT" Handled same as 3**
IXRTN = 6	"IMPROPER RECORD FOUND FOUND ____ EXPECTING ____" *On first try, back up output tape one record and back up input tape the number of records required

TABLE 4-2.   ACTIONS ASSOCIATED WITH IXRTN VALUES (Continued)

based on the format: CPYOBJ - 1 record; ML, MLBU - 5 records; FF - 10, 20, or 25: Try read and write process again. STSVL = 3.

**On second try, assume bad spot on tape. Write out buffer to space output tape, put an EOT out, and update file count. Back up input file to beginning and try to write the entire file again. STSVL = 4. If second file attempt fails, processing is stopped for this file and goes on to the next one. STSVL = 1.

IXRTN = 7   "BAD READ AFTER WRITE"

Handled same as 6 above.

IXRTN = 8   "BAD COMPARE - SECOND TIME"

Check for EOT, if not there put one out and update file count. Stop processing of this file, go on to the next one.

IXRTN = 9   "BAD SUMCK ON OUTPUT RECORD _____"

Handled same as 6 above.

NOTE: The message displayed to the operator is in quotes.

the tape and puts an EOT on the output tape. The input tape is backed up to the beginning of the same file, and the entire file is tried again. If the second file attempt fails, it stops trying to process that file and goes on to the next one.

A wrong record count or a second bad compare causes the output tape to be backed up one file, and the entire input file is tried again. If there is still an error, it stops processing that file and goes on to the next file.

Refer to Figure 4-13 for the JMPSW flow diagram.
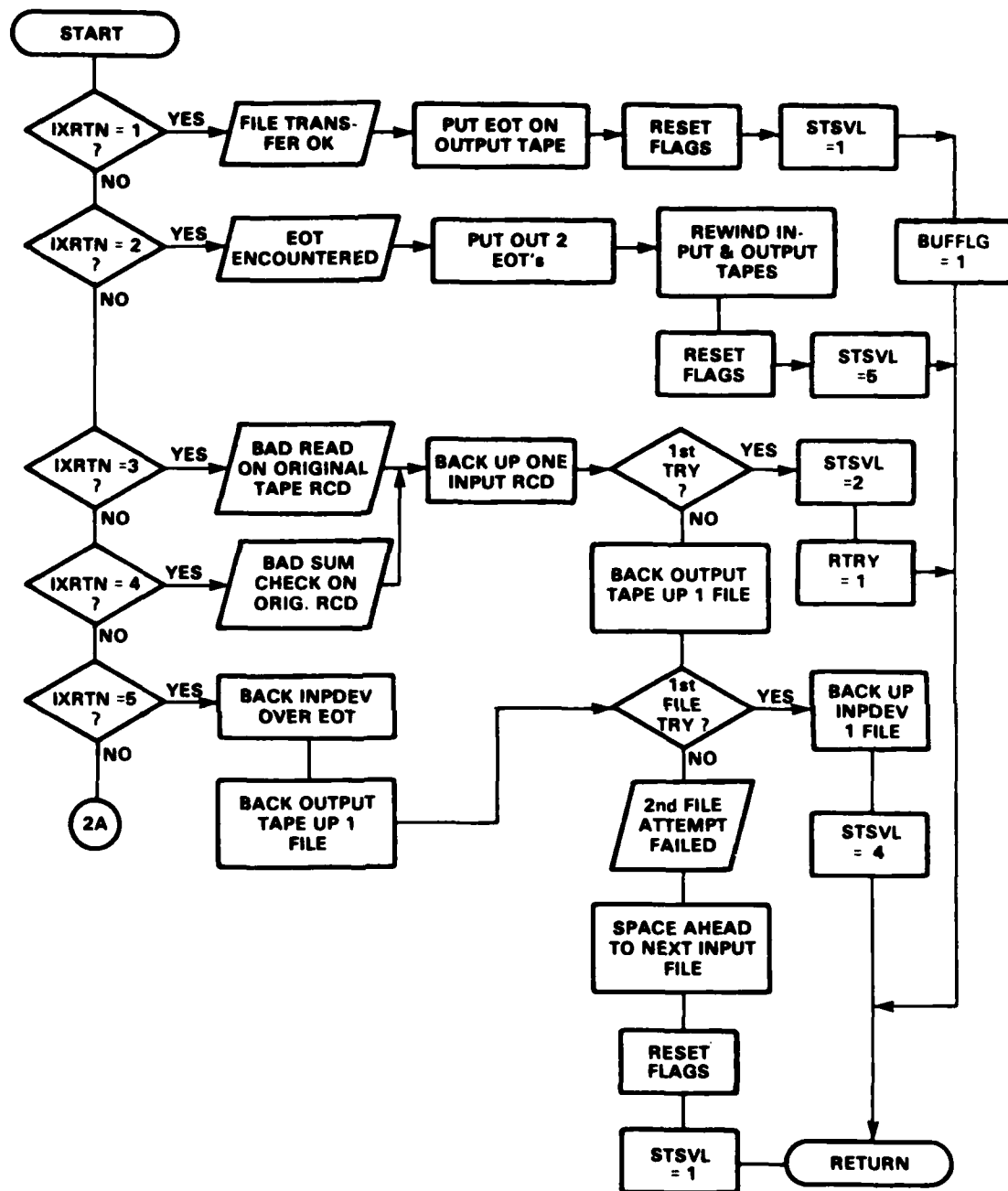
Figure 4-13. JMPSW Flow Diagram (Sheet 1 of 3)
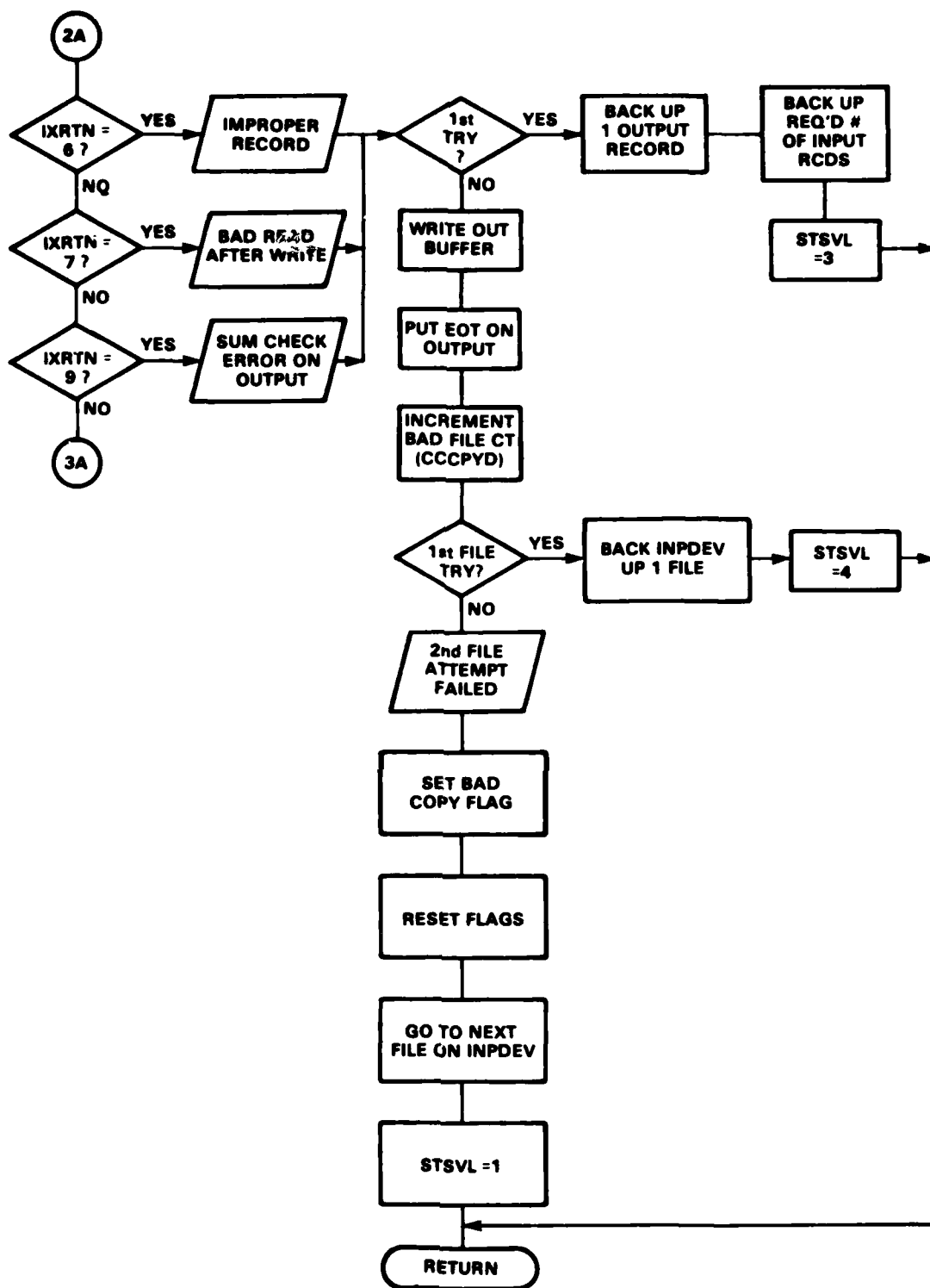
Figure 4-13. JMPSW Flow Diagram (Sheet 2 of 3)
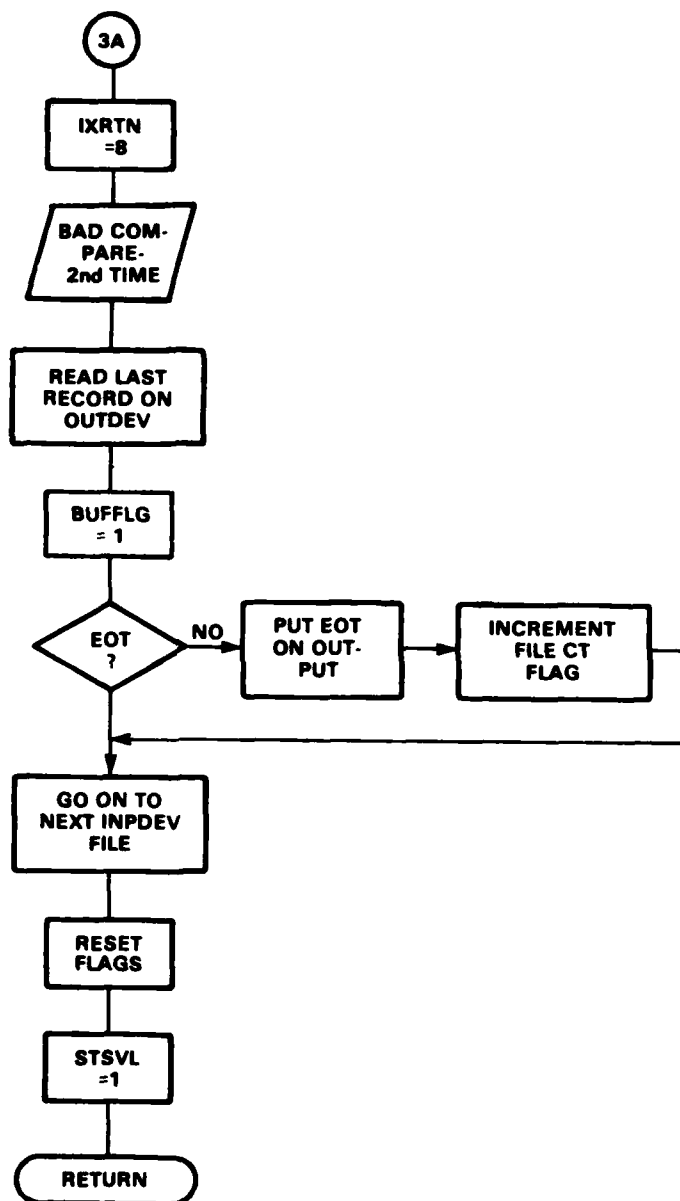
Figure 4-13. JMPSW Flow Diagram (Sheet 3 of 3)

4.14 RDWKTP

RDWKTP reads the working files stored on the working tape into memory. RDWKTP is called by MASTER prior to any processing. The working files are required for all library management functions.

If the working tape does not load, the previous tape is requested. If this does not load either, RDWKTP is exited with GBGMSG = 1. This flags MASTER to the failure.

The flow diagram for RDWKTP is given in Figure 4-14.
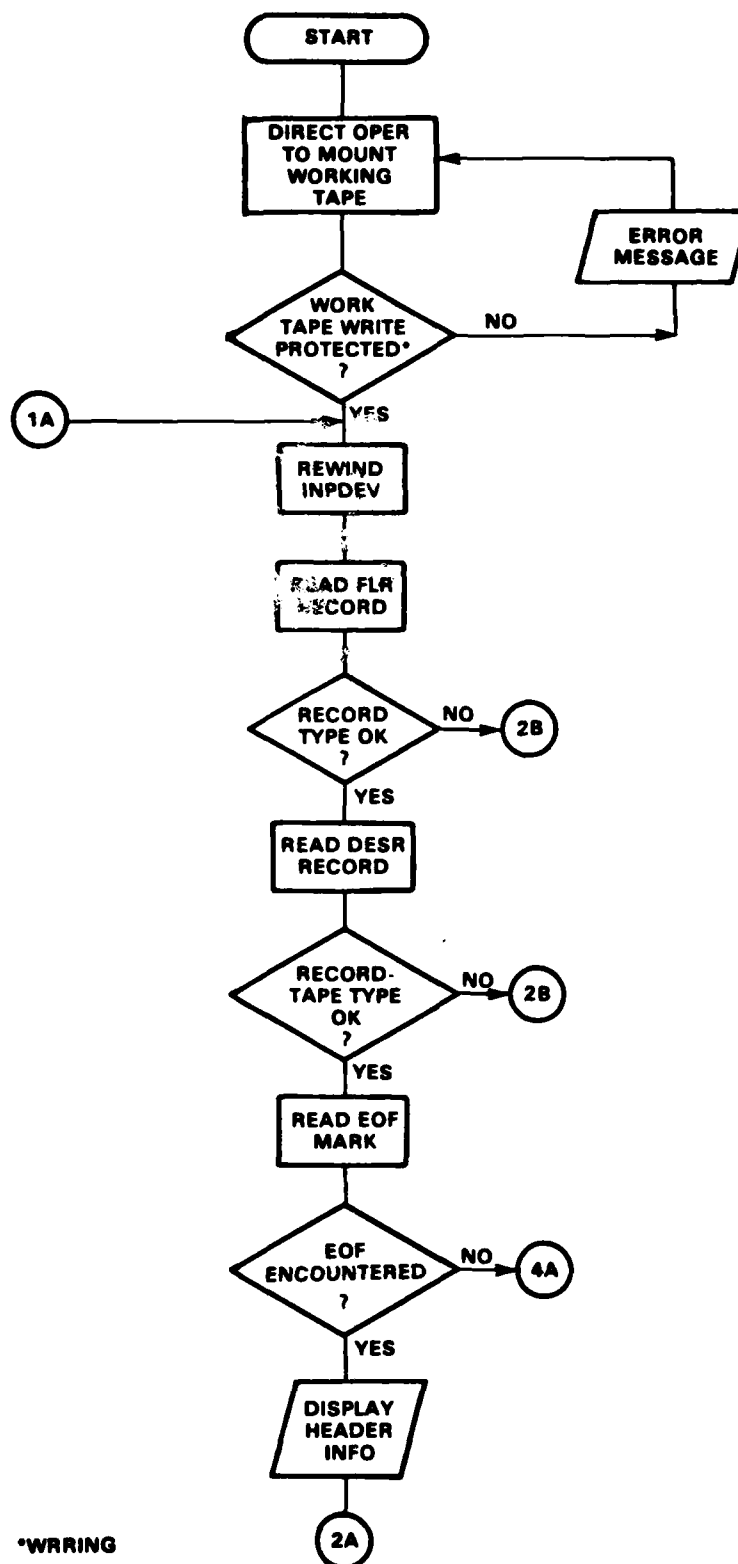
Figure 4-14. RDWKTP Flow Diagram (Sheet 1 of 4)
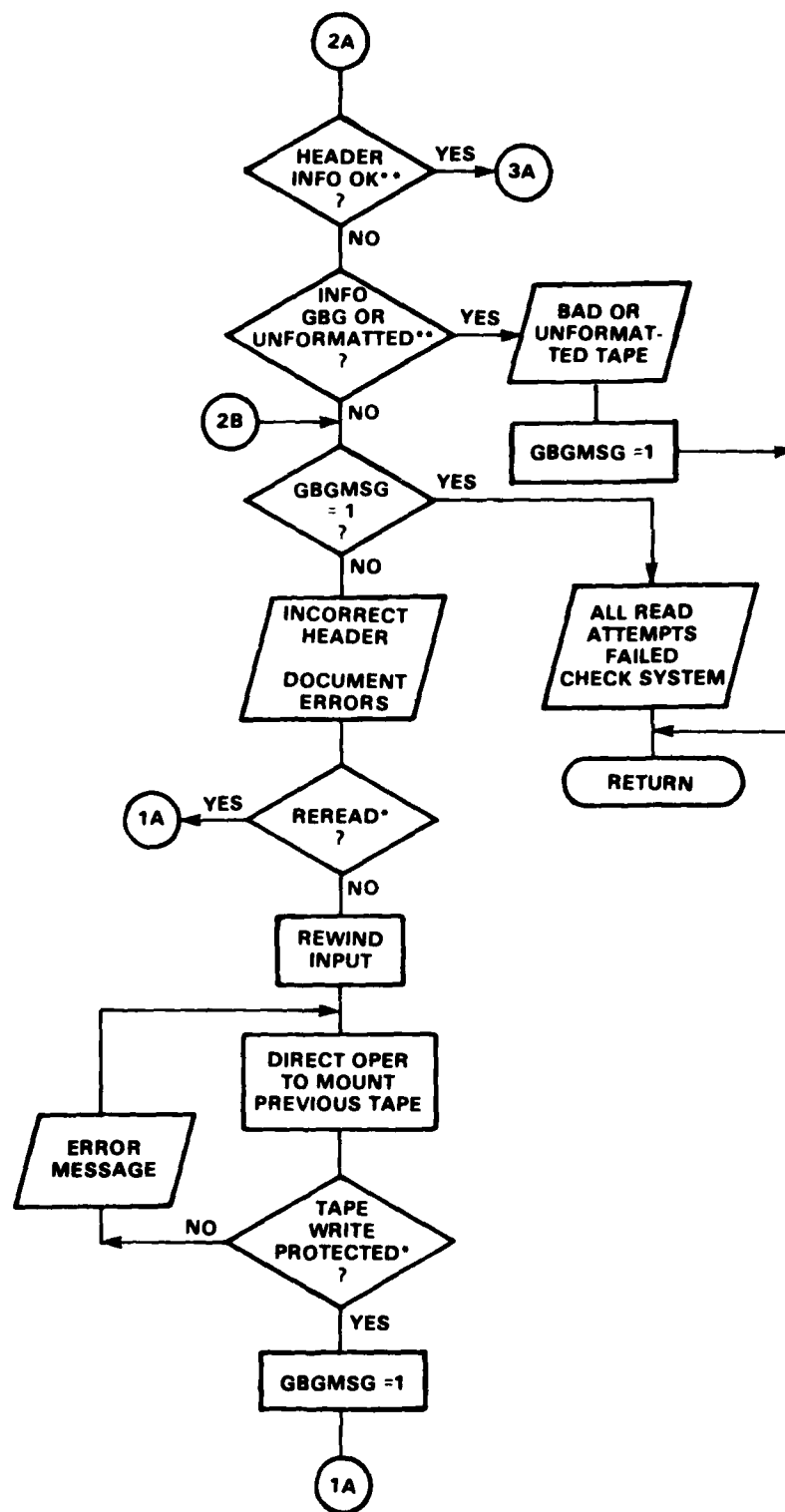
*WRRING
**YESNO

Figure 4-14. RDWKTP Flow Diagram (Sheet 2 of 4)
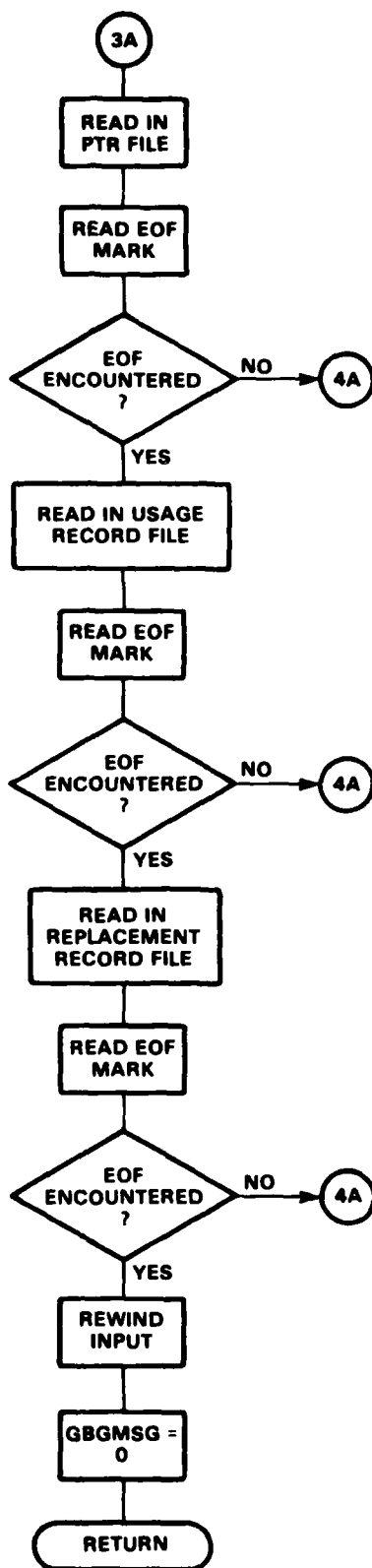
Figure 4-14. RDWKTP Flow Diagram (Sheet 3 of 4)
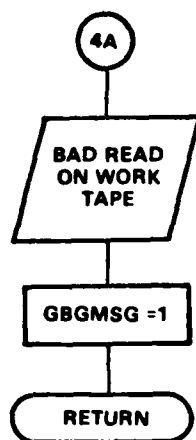
Figure 4-14. RDWKTP Flow Diagram (Sheeet 4 of 4)

4.15 EODPRC

EODPRC produces a working log to record the result of the day's processing. It prints the PTR table, the usage tables, and the replacement tables. Any maps processed are listed, giving their location and the result of processing. EODPRC also produces a new working tape and backup working tape to store the updated files.

EODPRC is called independently from the Master Menu, END-OF-DAY PROCESSING, or by LIBCPY after a map has been entered in the library.

Refer to Figure 4-15 for the flow diagram of EODPRC. A copy of a working log printout is shown in Figure 4-16.
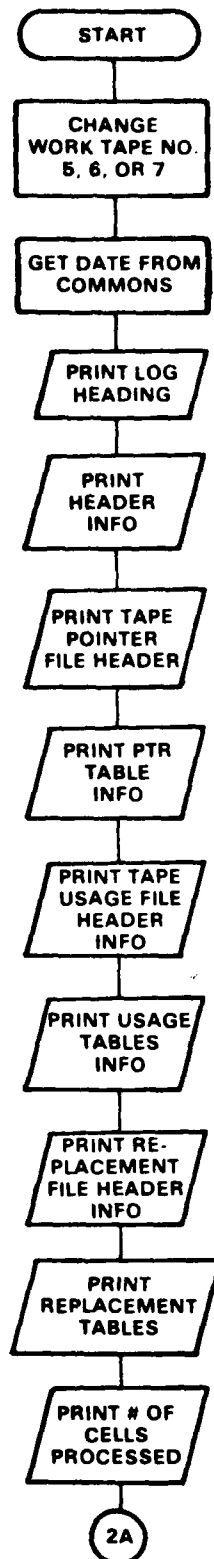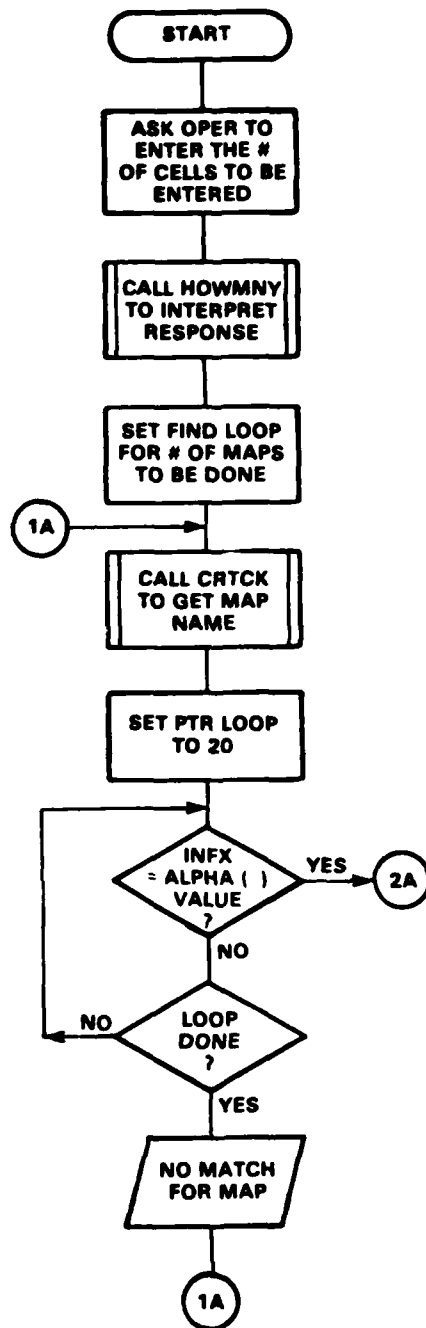
Figure 4-15. EODPRC Flow Diagram (Sheet 1 of 3)
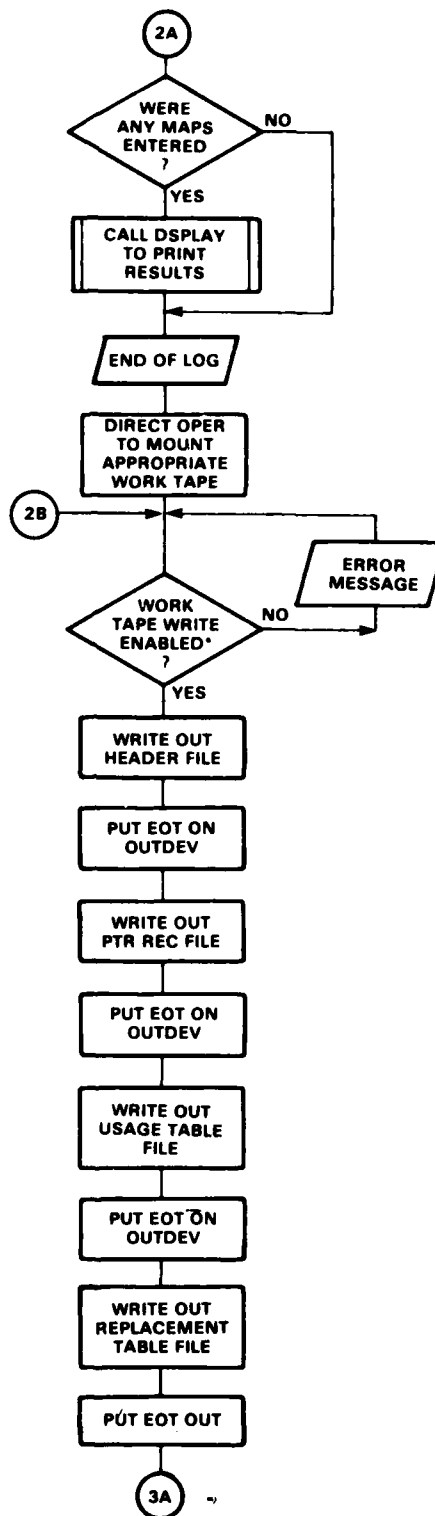
Figure 4-15. EODPRC Flow Diagram (Sheet 2 of 3)

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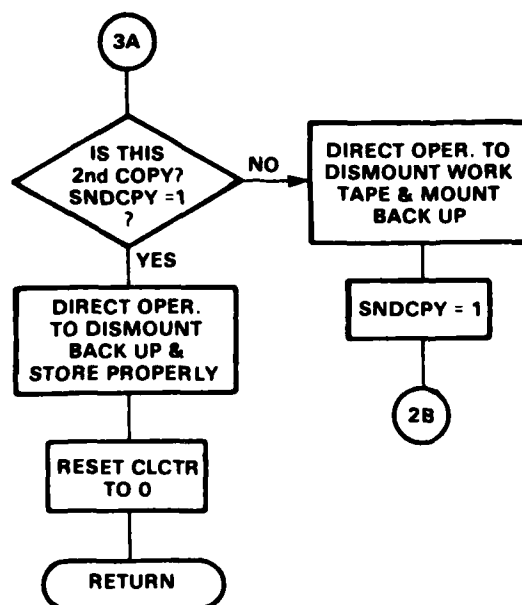
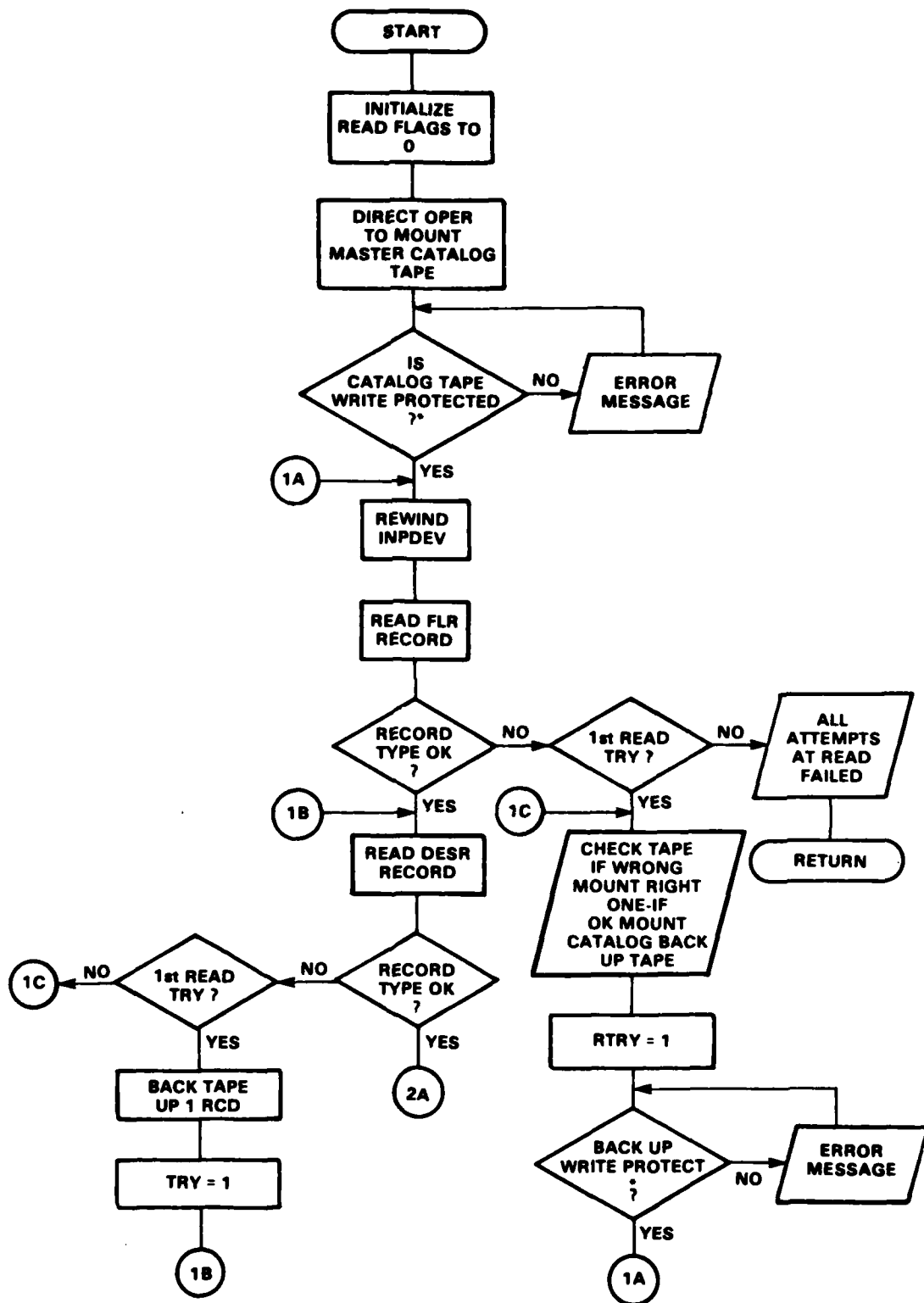Figure 4-15. EODPRC Flow Diagram (Sheet 3 of 3)

WORKING FILES LOG

DATE: 7/ 7/1981
OLD WORK TAPE NO: 5
CURRENT TAPE NO: 6

HEADER FILE

FIXED LENGTH RECORD--FIXREC

RECORD TYPE	RECORD COUNT	CELLS/ FILE	LENGTH DESREC
152152	0	1	20

TAPE DESIGNATOR RECORD--DESREC

RECORD TYPE	RECORD COUNT	WORKTAPE NUMBER	CREATION DATE
110011	1	6	7/ 7/1981

TAPE POINTER FILE

FIXED LENGTH RECORD--FXRECP

RECORD TYPE	RECORD COUNT	LENGTH DSRECP
152152	0	0

FILE DESIGNATOR RECORD--DSRECP

RECORD TYPE	RECORD COUNT	FILE TYPE	LENGTH PTRREC
110011	1	7	1205

TAPE POINTER RECORD--PTRREC

RECORD TYPE

075075

TAPE POINTER TABLE--PTRTBL

PTR	TAPE NO	PTR	TAPE NO	PTR	TAPE NO	PTR	TAPE NO	PTR	TAPE NO	PTR	TAPE NO	PTR	TAPE NO
37	0	187	0	337	0	487	0	637	1	787	0	937	0

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Figure 4-16. Working Log Printout

4.16 LBTPFD

LBTPFD identifies the ML, MLBU and FF tapes assigned to each map being entered into the library. If a tape has not been assigned yet, LBTPFD calls the appropriate routine to create it. LIBCPY calls LBTPFD to get all the information on the maps to be processed.

LBTFD calls CRTCK to direct the operator to enter the map names. The grid zone of each map is separated into a PRFX and INFX value which is returned to LBTPFD through the common /FIND/. LBTPFD uses these values to calculate the pointer table reference (PTR) number associated with each grid zone. For the actual calculation of the PTR number, see section 2.2, Working Tape.

Once the PTR is determined, the PTRTBL is checked to see if a tape number has been assigned for the grid zone. If a tape number has been assigned, the files already entered on the tape are checked to see if there is room. If all is well, the ML, MLBU, and FF tapes are computed and displayed. The map name, tape numbers, and PRFX and INFX values are then entered into CLINFO for later use.

If a tape has not been assigned, or if the assigned tape did not have any room on it, TPUTL is called to create a new tape before the ML, MLBU and FF numbers are calculated.

The flow diagram for LBTPFD is given in Figure 4-17.

Figure 4-17. LBTPFD Flow Diagram (Sheet 1 of 3)

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Figure 4-17. LBTPFD Flow Diagram (Sheet 2 of 3)

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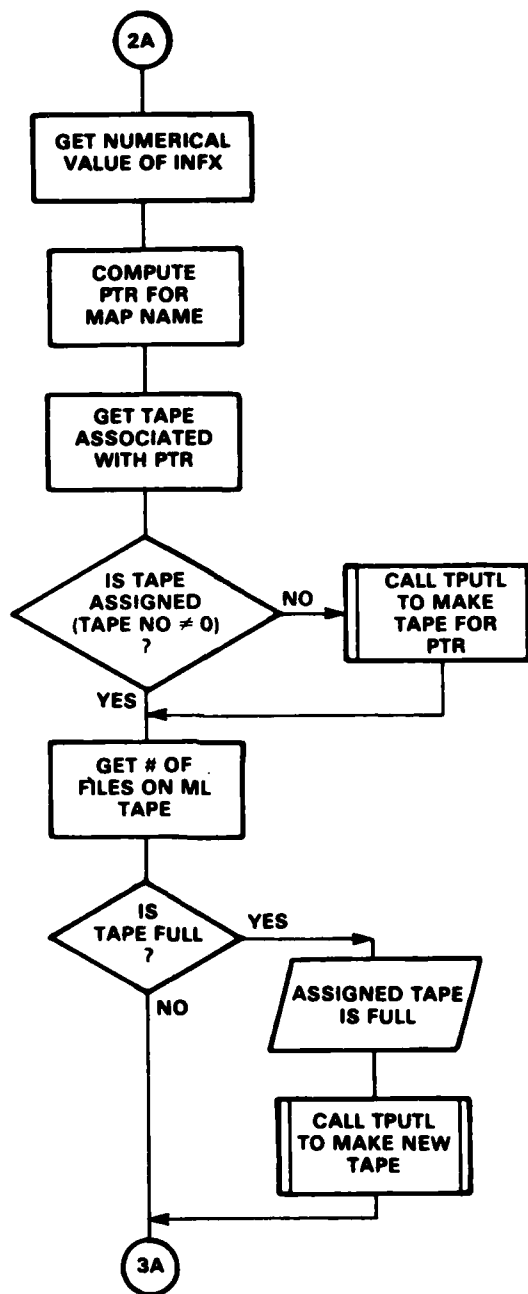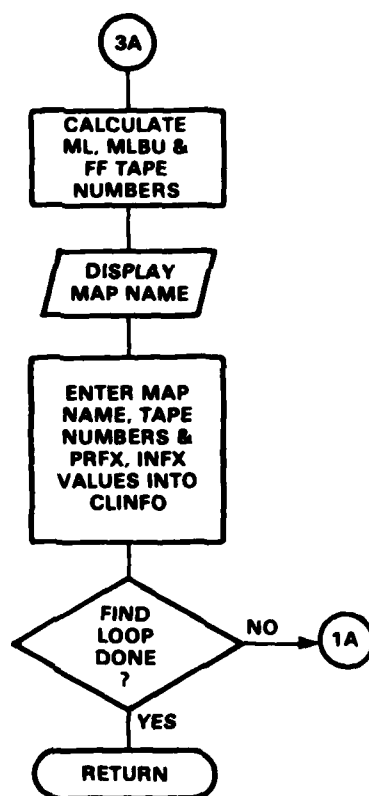
Figure 4-17. LBTPFD Flow Diagram (Sheet 3 of 3)

4.17 CATFND

CATFND searches the catalog tape to determine if and where a map is located in the library. The operator can enter up to 30 maps at a time. If the map is found, the tape and file number for the ML, MLBU, and FF are printed. If the map is not in the library, a message is printed - "No match found."

The flow diagram for CATFND is given in Figure 4-18. See Figure 4-19 for a sample printout.
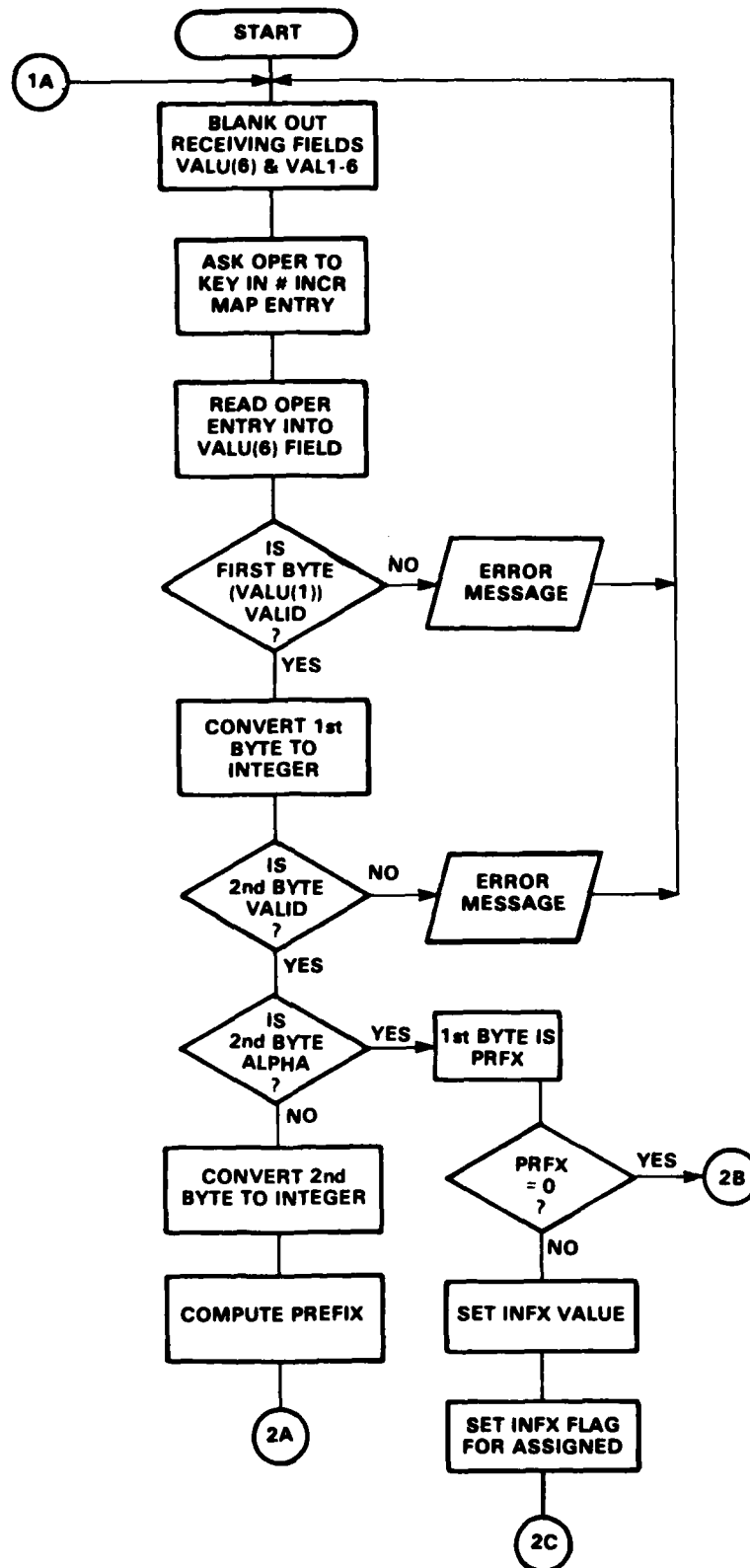
Figure 4-18. CATFND Flow Diagram (Sheet 1 of 5)
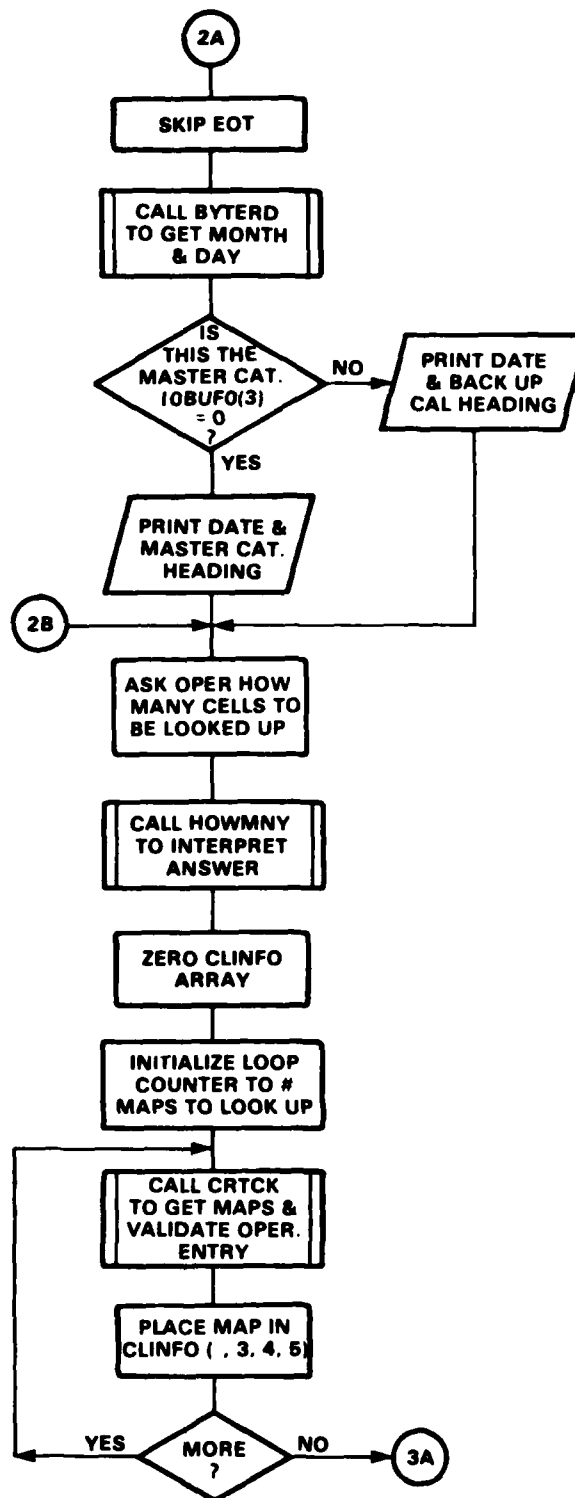
Figure 4-18. CATFND Flow Diagram (Sheet 2 of 5)
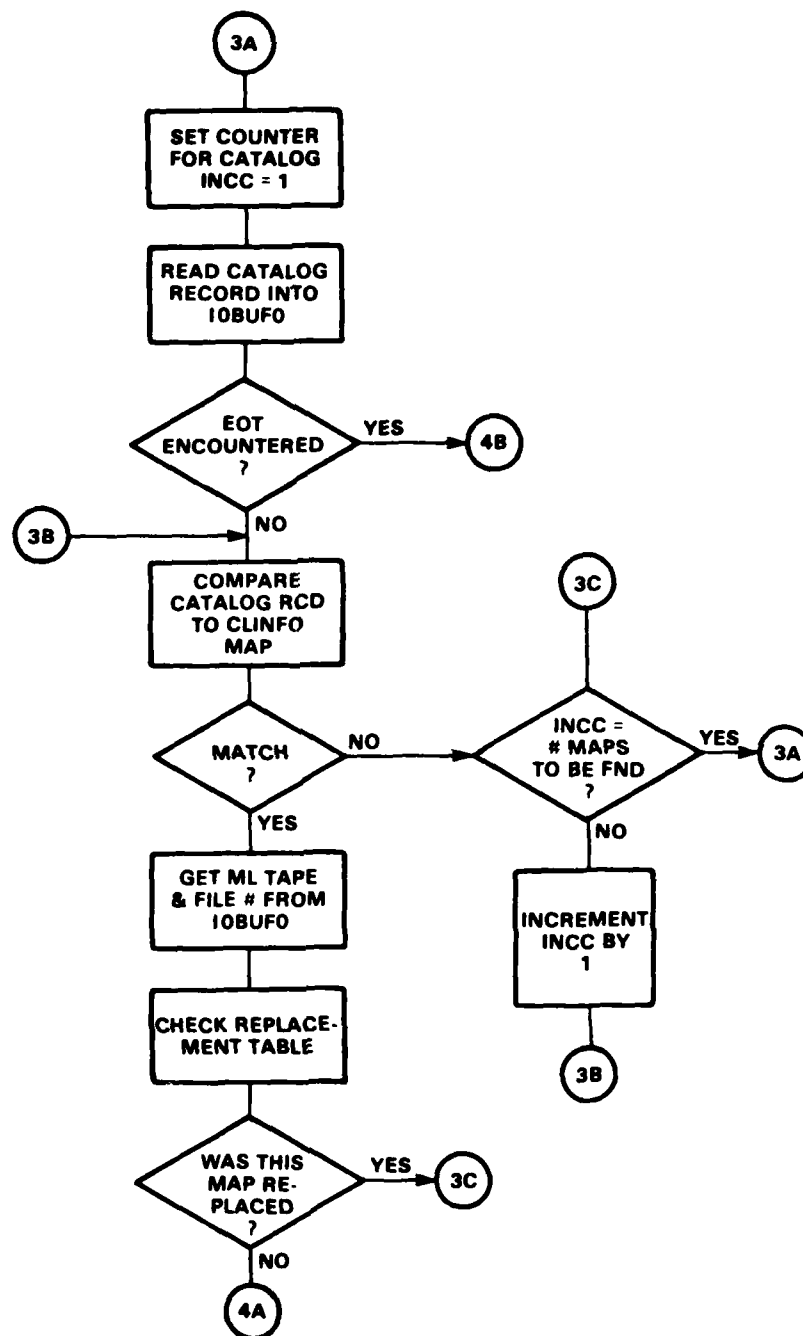
Figure 4-18. CATFND Flow Diagram (Sheet 3 of 5)
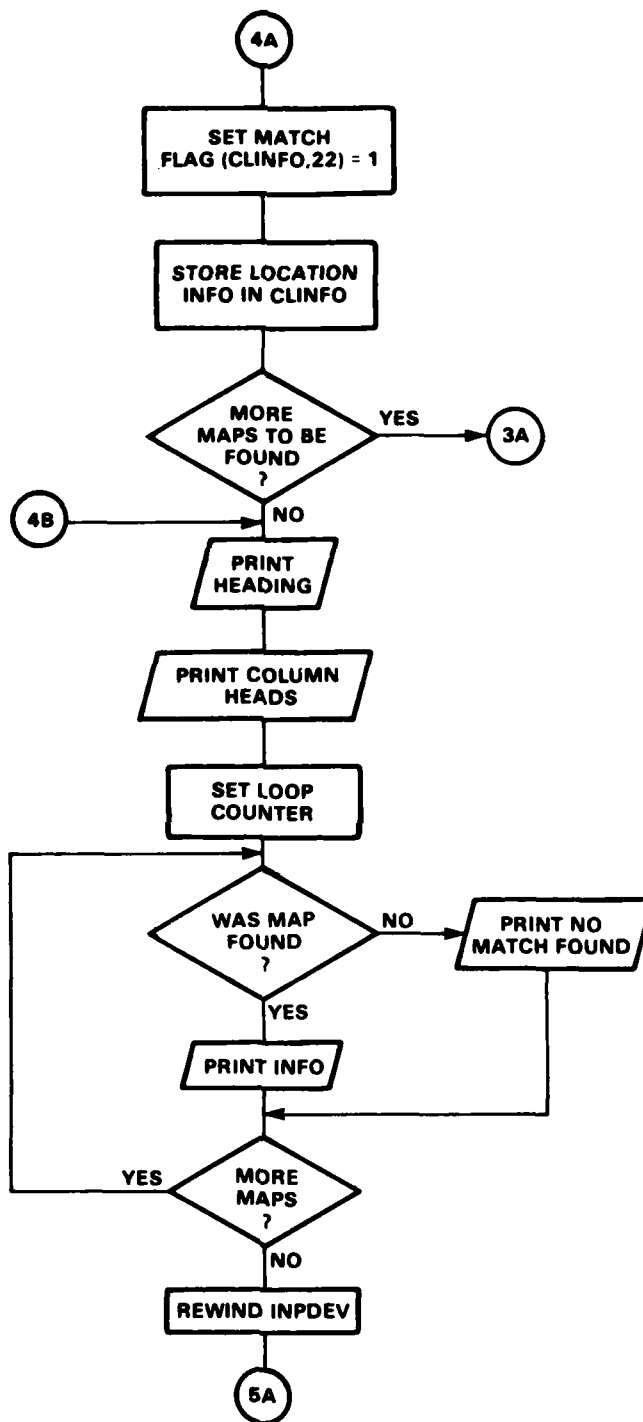
Figure 4-18. CATFND Flow Diagram (Sheet 4 of 5)
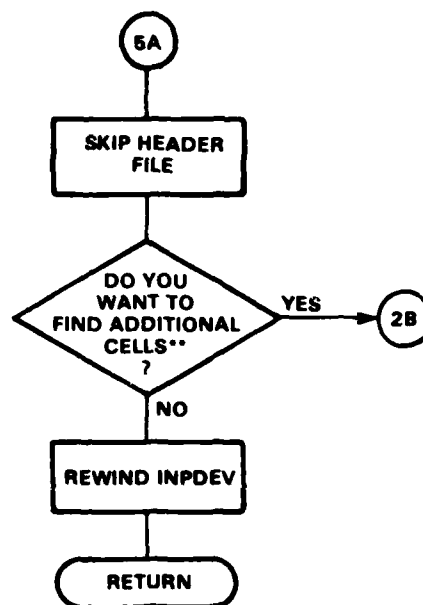
Figure 4-18. CATFND Flow Diagram (Sheet 5 of 5)

MASTER CATALOG LISTING

SORTED BY: UNSORTED

DATE: 4/ 3/81

HEADER INFORMATION

FIXED LENGTH RECORD--FLR

RECORD TYPE	RECORD COUNT	LENGTH DESR
152152	0	10

TAPE DESIGNATOR RECORD--DESR

RECORD TYPE	RECORD COUNT	TAPE TYPE	TAPE CREATION
110011	1	1	4/ 1/1981

CELL RECORDS--CELLR

GRID ZONE DESIGNATOR	NORTHING	EASTING	RECORD NUMBER	KM N/S	KM E/W	ML TAPE NO	MLBU TAPE NO	ML FILE NO	MLBU FILE NO	FF TAPE NO	FF FILE NO	FILE CREATION DATE
32UKA	5500000.	200000.	0	100	100	2001	3001	2	2	4001	2	4/ 1/198
32UKC	5700000.	200000.	1	100	100	2001	3001	3	3	4001	5	4/ 1/198
31UGV	5900000.	700000.	2	100	100	2002	3002	2	2	4002	2	4/ 1/198
32UKC	5700000.	200000.	3	100	100	2001	3001	4	4	4001	8	4/ 1/198
32UPF	6000000.	600000.	4	100	100	2001	3001	5	5	4001	11	4/ 2/198
31UGV	5900000.	700000.	5	100	100	2002	3002	3	3	4002	5	4/ 2/198

Figure 4-19.   Sample Printout

4.18 CRTCK

CRTCK requests the operator to enter a UTM map designator (15PKQ; 2PKQ, etc.). It checks that the entered designator is valid. That is, it checks that I or O is not one of the alpha characters, that only a maximum of five characters are entered, and that the PRFX is valid. CRTCK then separates the designator into PRFX, INFX, SFFX1, and SFFX2 values. The designator is separated as shown below:

4-character designators

```
2PKQ                        2     P     K     Q
                            |     |     |     |

                          PRFX  INFX  SFFX1  SFFX2
```

5-character designators

```
15PKQ                      15     P     K     Q
                            |     |     |     |

                          PRFX  INFX  SFFX1  SFFX2
```

CRTCK is called by LBTPFD to get the maps that will be entered into the library. CRTCK is also called by CATFND to get the maps that will be looked up.

There is one passed variable, INCR. This keeps track of the number entry of the map.

INCR = 1 for the first entry

INCR = 2 for the second entry, etc.

The CRTCK flow diagram is shown in Figure 4-20.

Figure 4-20. CRTCK Flow Diagram (Sheet 1 of 4)
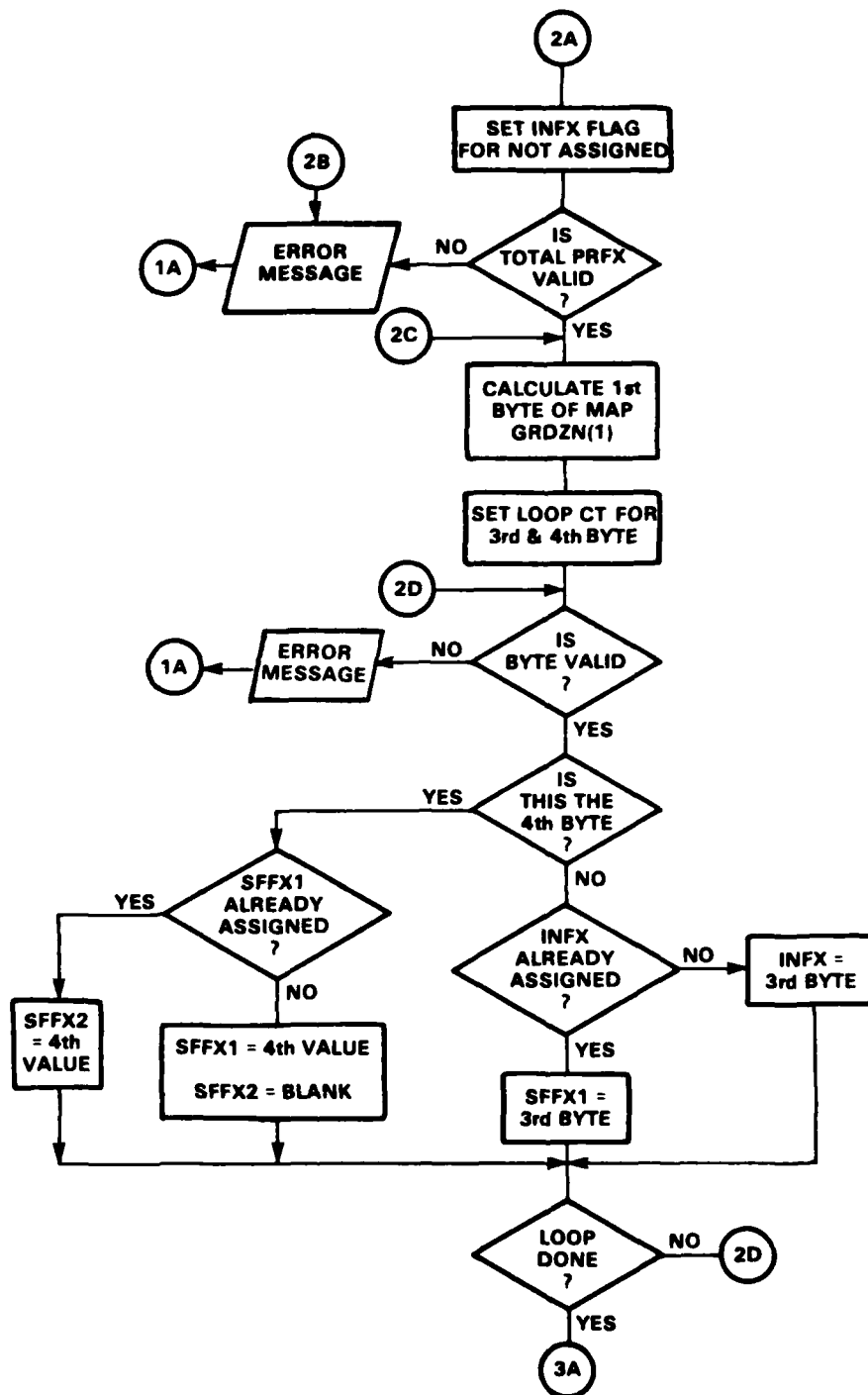
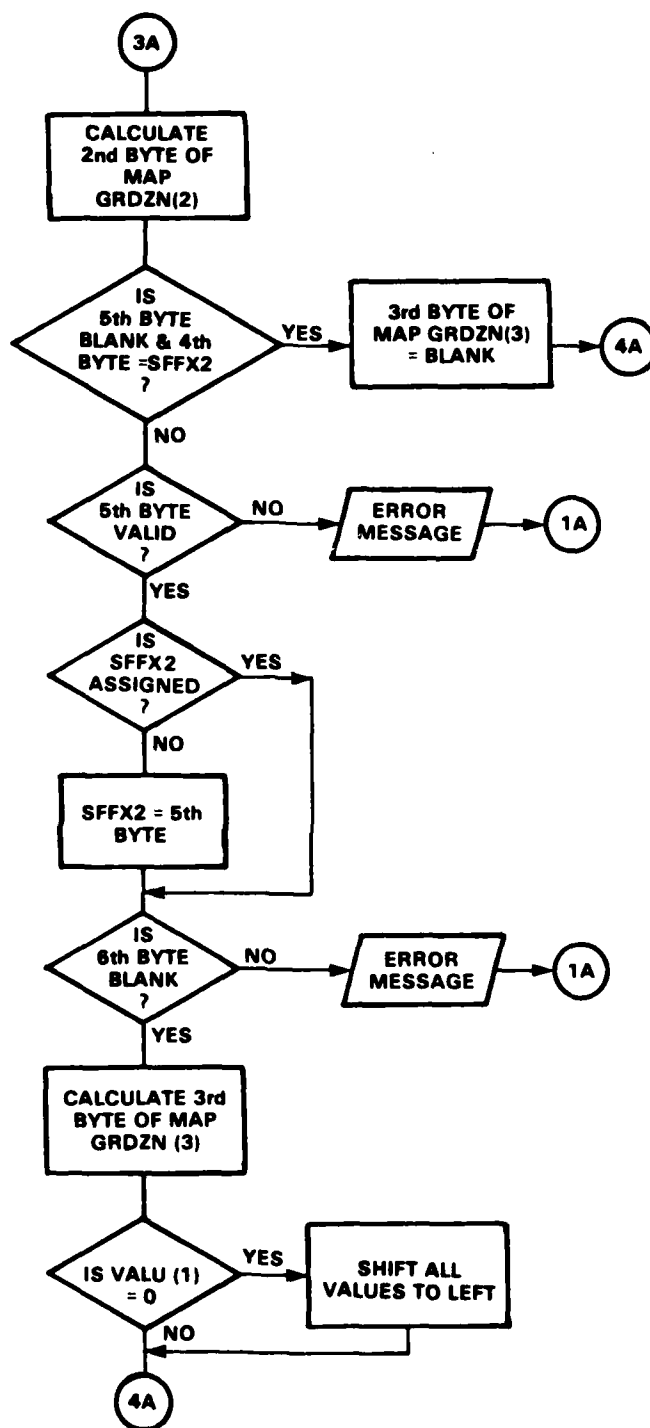Figure 4-20. CRTCK Flow Diagram (Sheet 2 of 4)

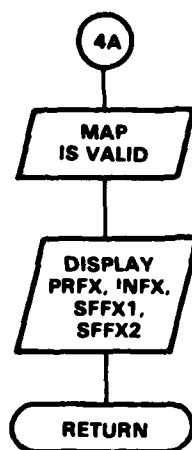Figure 4-20. CRTCK Flow Diagram (Sheet 3 of 4)

Figure 4-20. CRTCK Flow Diagram (Sheet 4 of 4)

4.19 CMPRCD

CMPRCD compares each word of IOBUF1 and IOBUF2. If all the words
are the same, the variable, ISCS (in common /UNVRSL/), is set to zero.
If the comparison fails, ISCS is set to 1.

CMPRCD is called by various copy routines to check that what was
written out is what was supposed to be written out.

Figure 4-21 is the flow diagram for CMPRCD.

CMPRCD
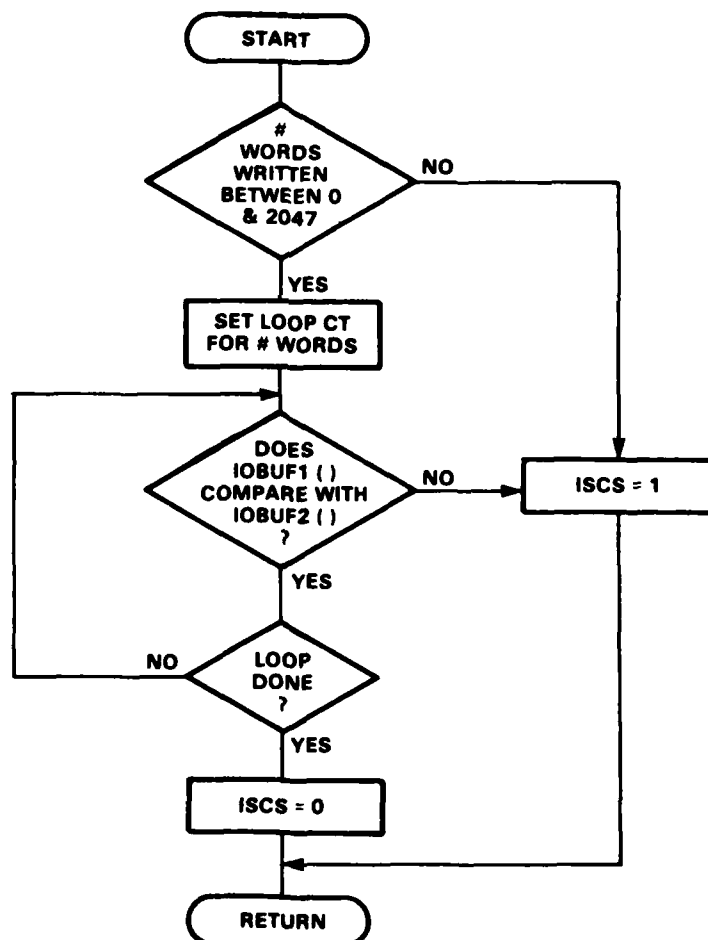
Figure 4-21. CMPRCD Flow Diagram

4.20 BDCMP

BDCMP is called whenever a comparison between IOBUF1 and IOBUF2 fails during a copy routine. Normally, a bad compare is rare. If it happens several times, a more serious system problem may be the cause.

BDCMP checks how many comparison tries were made and determines if another is warranted. BDCMP returns a value for CMPBAD to the calling routine through the commons /FFILES/. The first bad compare causes the program to back up the output tape one record, write out the original buffer again, and reread it from the output tape. If the compare fails a second time, a bad spot is assumed. A buffer is written out to space down the tape and a tape mark is output. Then, the input tape is backed up to its beginning and the entire file is tried again. If the compare fails this time, processing is stopped for that map and an error message is output.

Figure 4-22 is the BDCMP flow diagram.
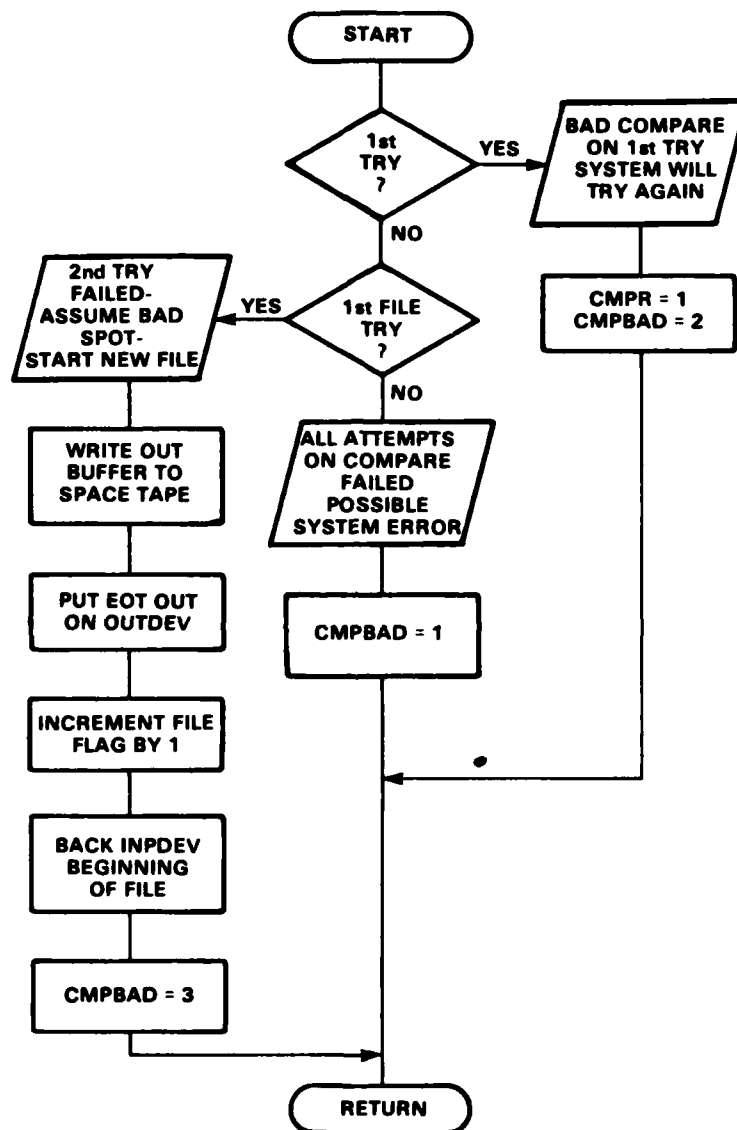
Figure 4-22. BDCMP Flow Diagram

4.21 CATUTL

CATUTL creates the master and backup catalog tapes. The operator
is directed to mount a blank tape, then is given the choice of creating
a master or backup tape. The header file for either tape is built and
written out.

CATUTL is called independently by the utility REBUILD CATALOG.
CATUTL is also called by GBGRTN when a new catalog is made to delete
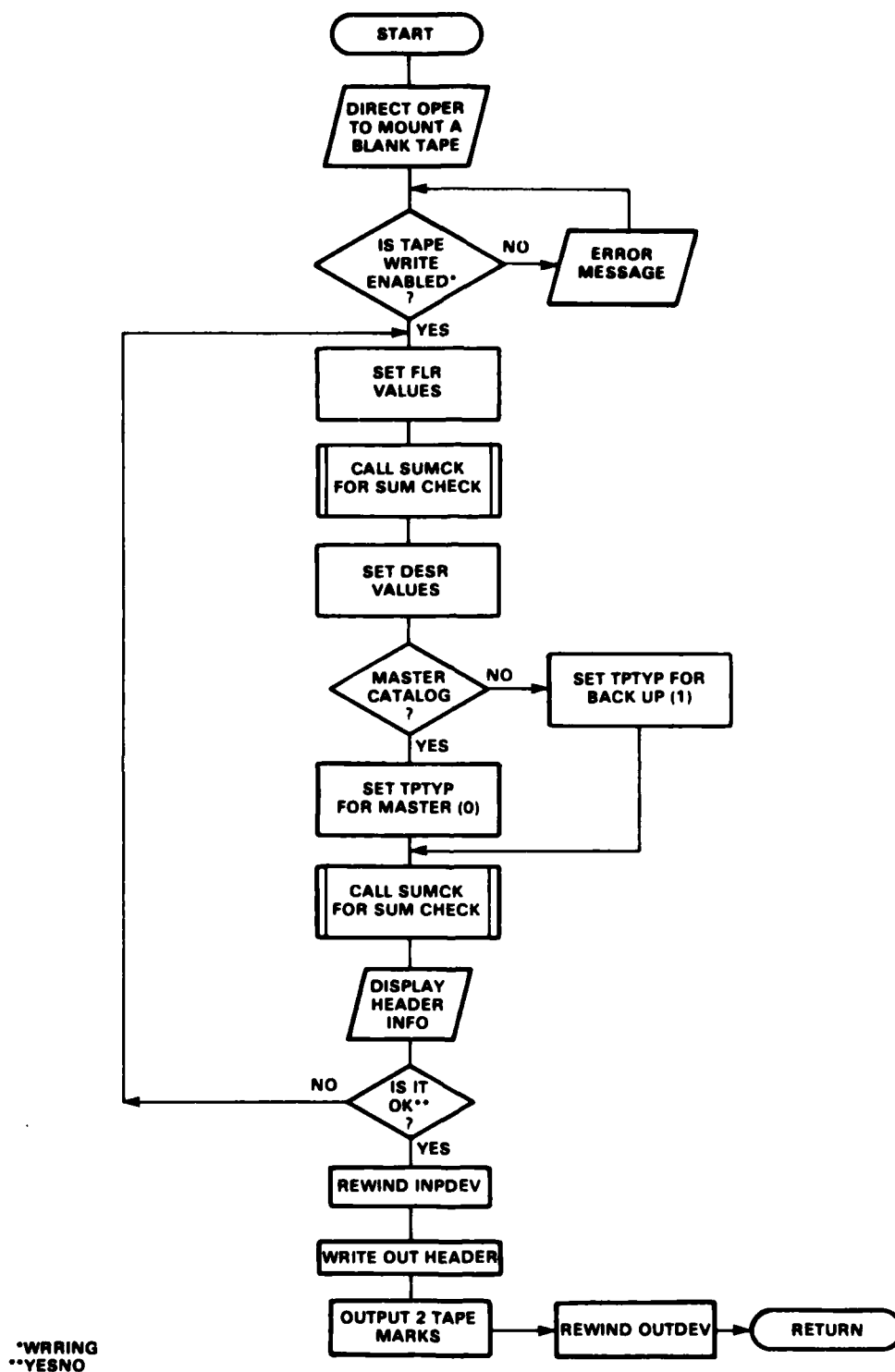the replaced maps.

The CATUTL flow diagram is shown in Figure 4-23.

Figure 4-23. CATUTL Flow Diagram

4.22 TPUTL

TPUTL creates the headers for the ML, MLBU, and FF tapes. TPUTL can be called independently through the utility BUILD TAPE WITH HEADER FILE, or by LBTPFD whenever a new tape trio is required. There is one passed variable (LIBTAP) which indicates whether TPUTL is to create a new tape trio or a trio to replace existing tapes.

The operator is given the choice of grid zones (up to a maximum of five) to be assigned to the tape number. TPUTL finds the next available tape number, records it in the PTRTBL location for the assigned grid zones, and creates the new tapes.

When a map is entered to be put in the library and a tape has not been assigned to it yet, LBTPFD calls TPUTL with LIBTAP equal to zero. TPUTL functions the same as when called by the operator. The choice of grid zones is given, and the PTRTBL is updated.

When a map to be entered is already assigned to a tape, but the tape is full, LBTPFD calls TPUTL with LIBTAP equal to the old tape number. TPUTL will get the next available tape number and then go through the PTRTBL. Every time it encounters a position which has the old tape number, it substitutes the new one for the old. The number of substitutions is counted and the grid zone designators associated with each PTR location are determined. The number and grid zones are then used to make the header files for the replacement tape. The operator is never consulted - whatever grid zones were on the original tape will be on the new tape.

After each header file is constructed, it is displayed and the operator is asked if it is correct. If it is, the file is written out to a blank tape, reread, and displayed. The operator is again asked if it is correct. If at any point the operator indicates that the header is wrong (wrong grid zone entered, bad read/write, etc), the MASTER program is exited. A "no" response from the operator sets INFOBF (in the common /CATALG/) to 999. TPUTL and all other subroutines involved with the entry operation test INFOBF to see if a header failure occurred. If so, the entire program is exited and the operator has to re-execute MASTER.

The operator is forced to re-execute the program to protect the PTR table. PTR assignments are made before the header is displayed, so an error means that the wrong information has been entered. When the working tape is read in, the PTR table is set to its original state. The operator can then continue.

After the tapes are made, TPUTL is exited. Figure 4-24 shows the flow diagram for TPUTL.

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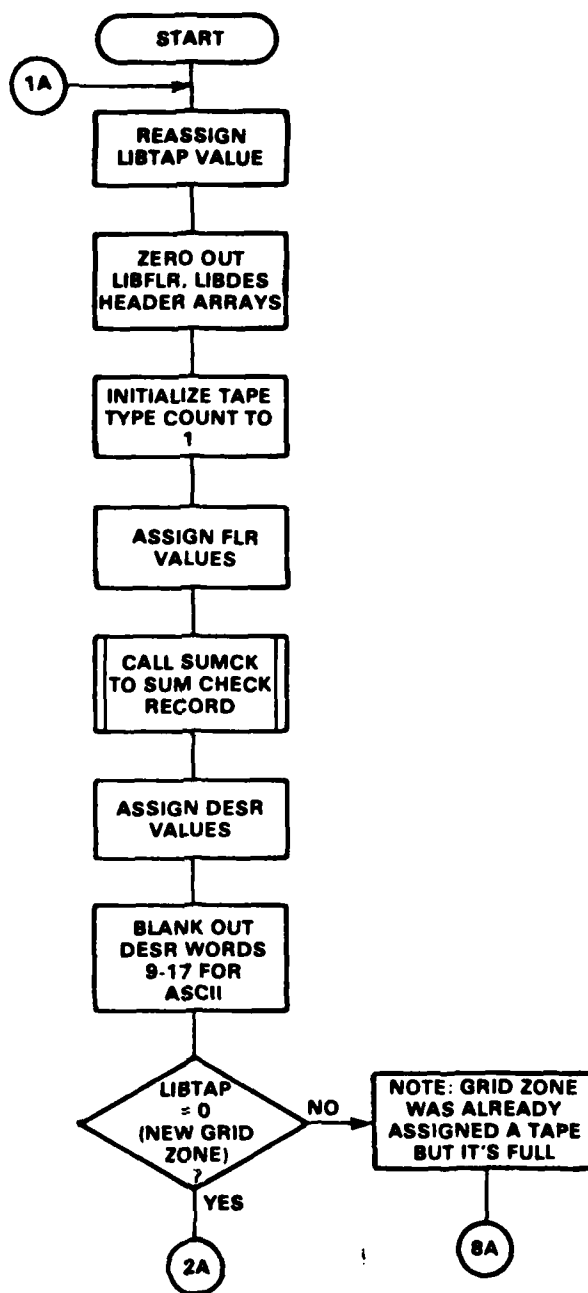
Figure 4-24. TPUTL Flow Diagram (Sheet 1 of 9)
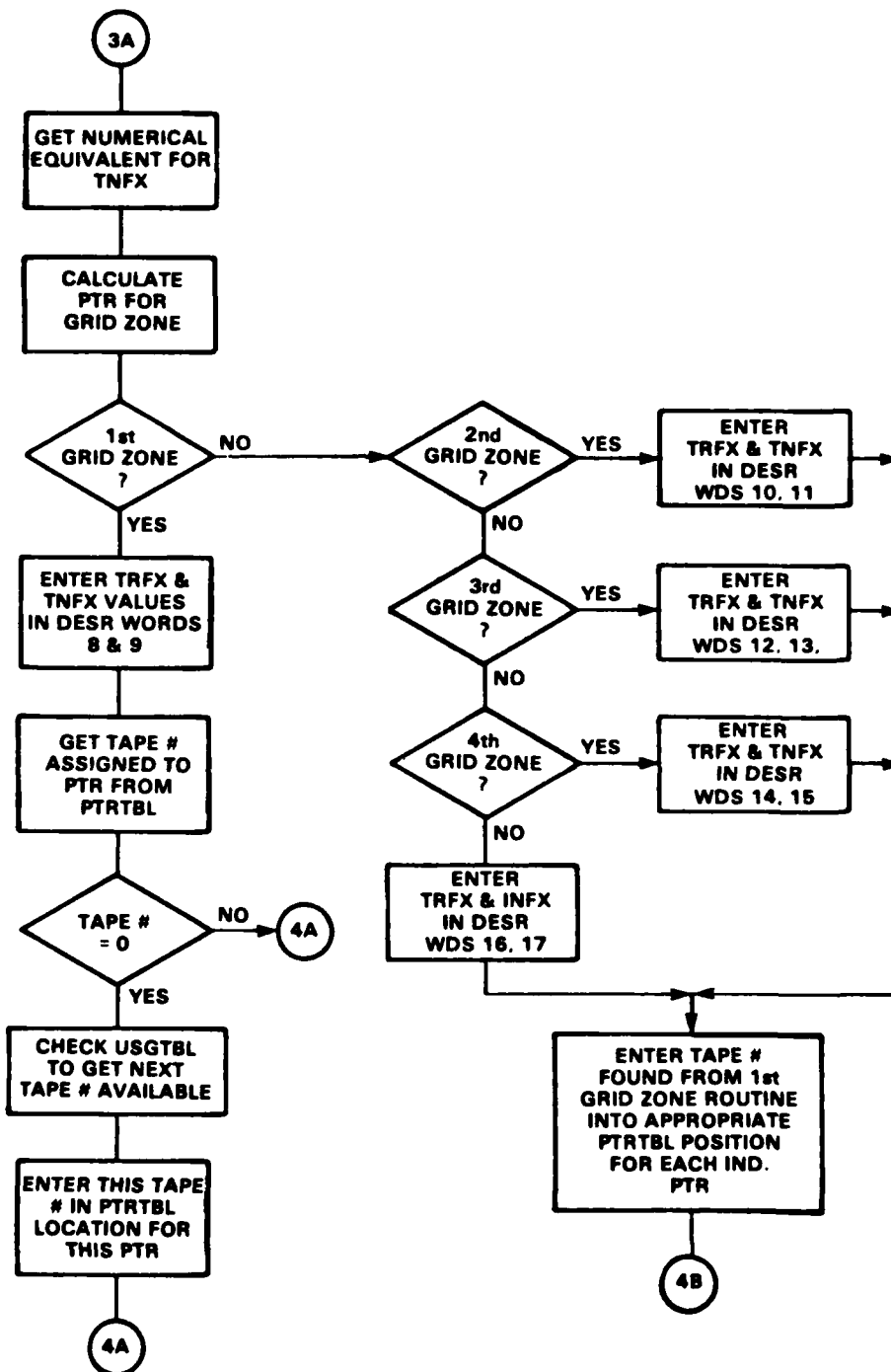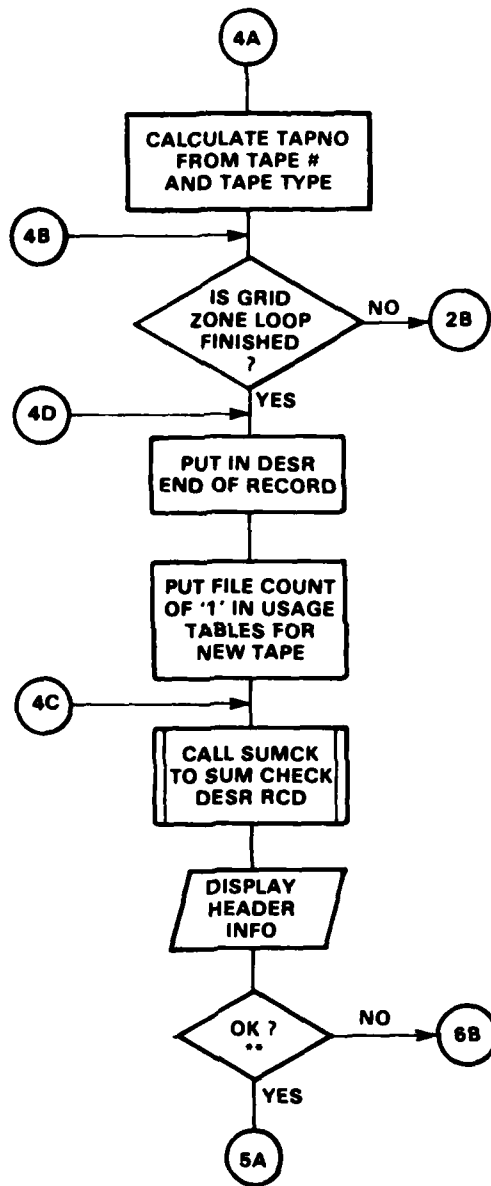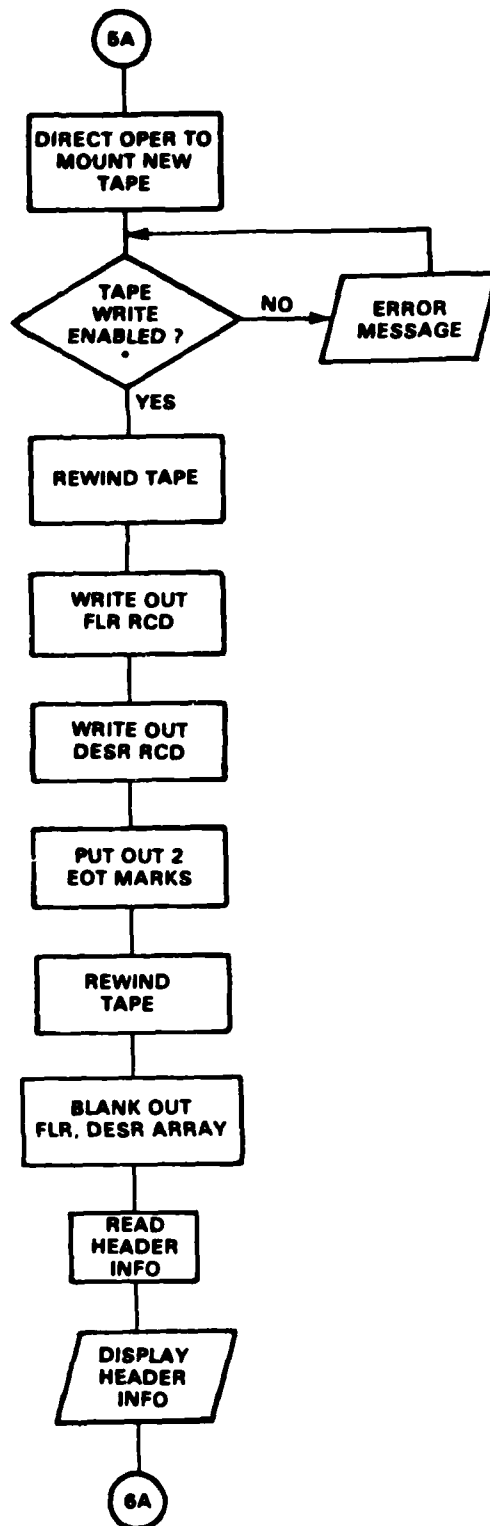
4-105
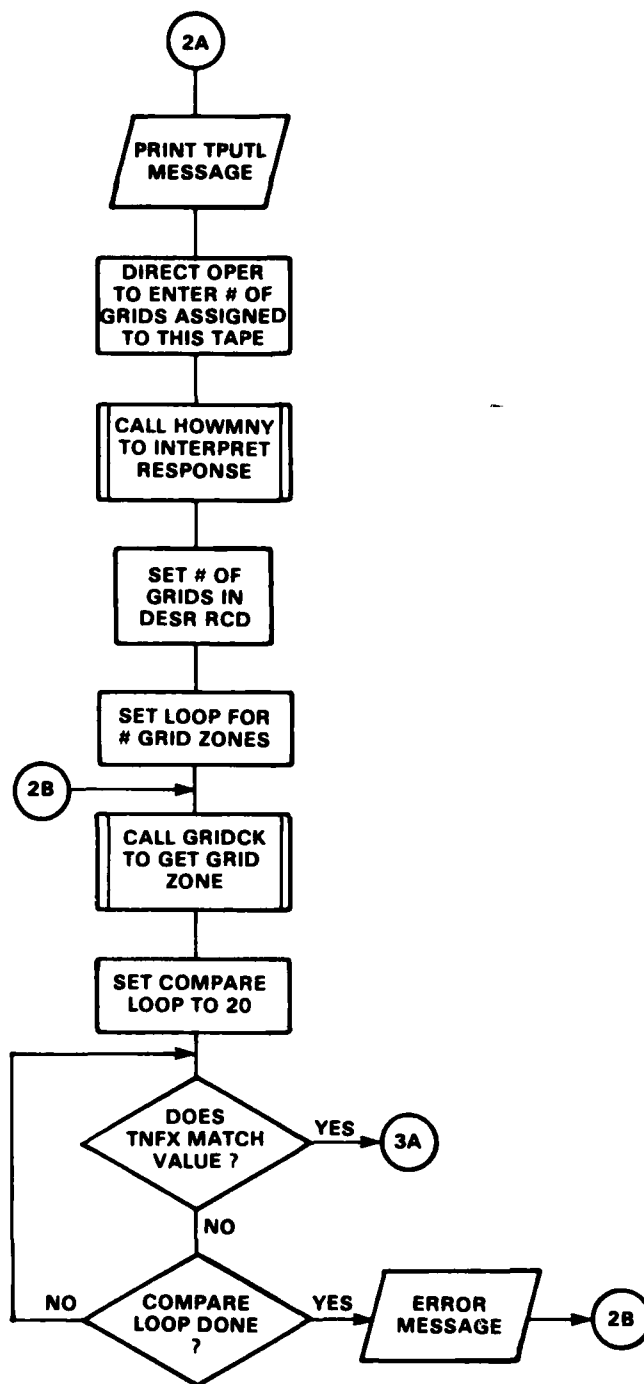
Figure 4-24. TPUTL Flow Diagram (Sheet 2 of 9)
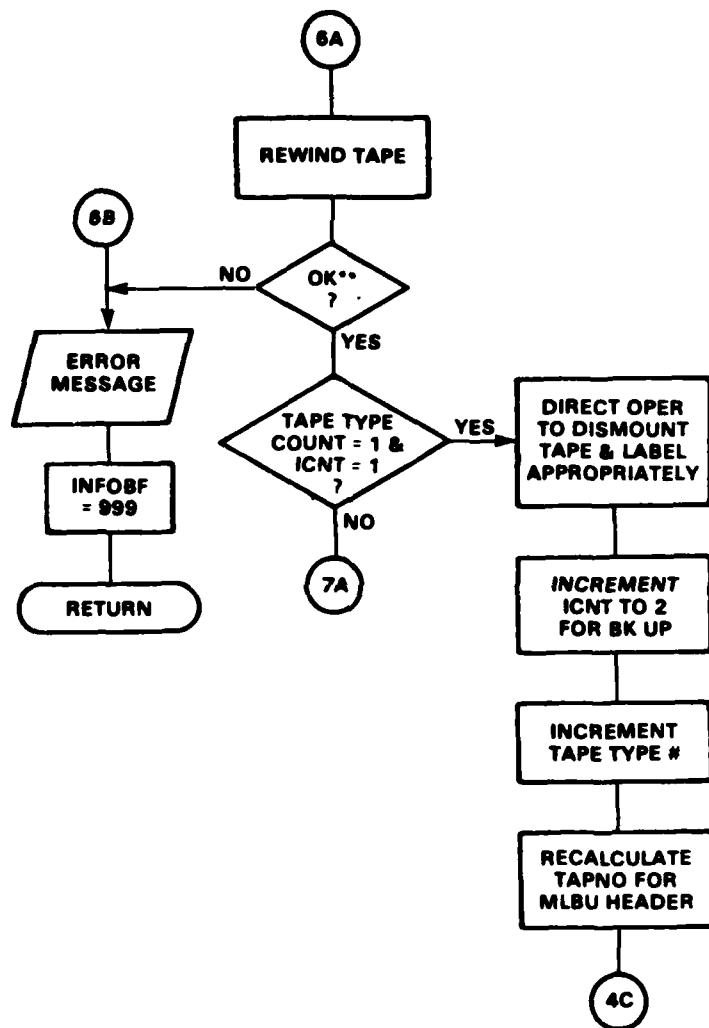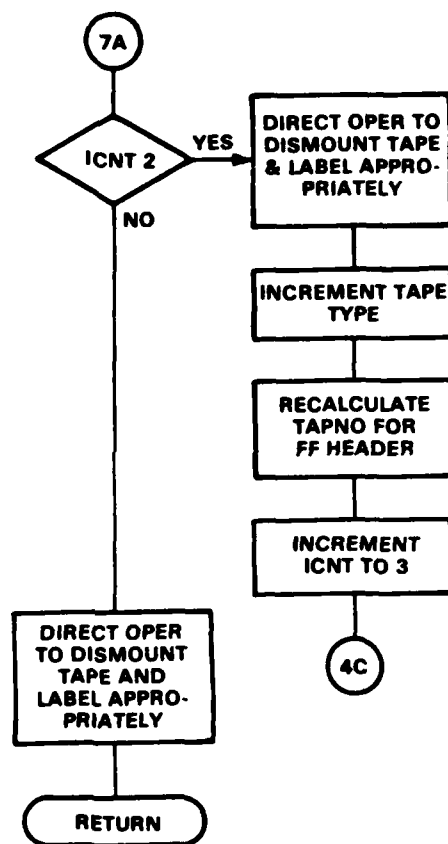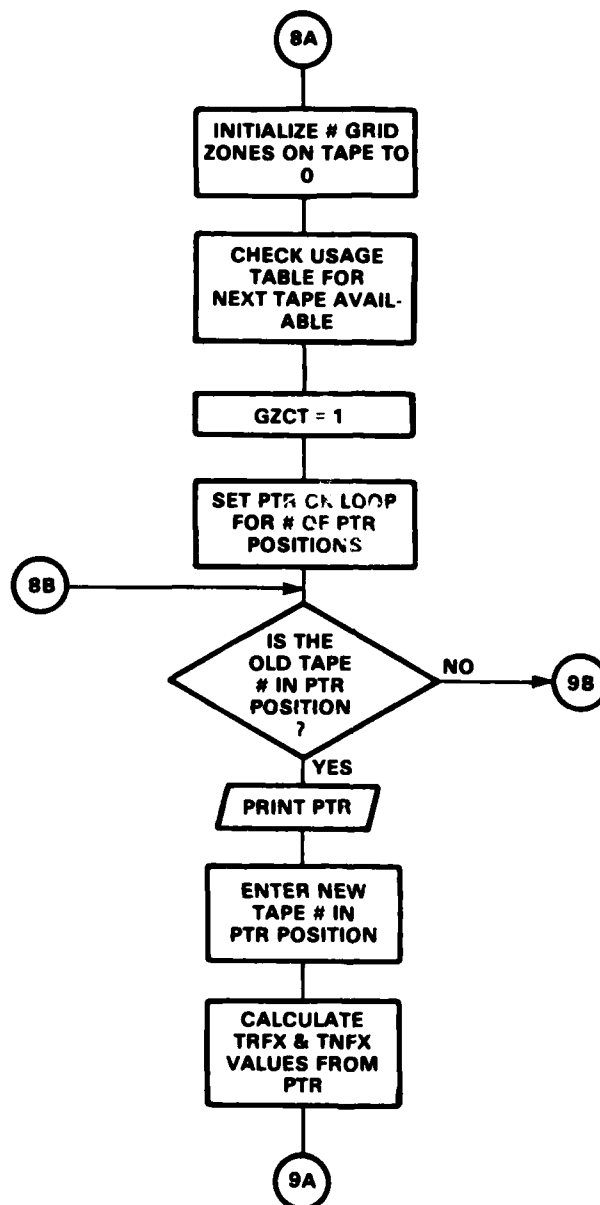
Figure 4-24. TPUTL Flow Diagram (Sheet 3 of 9)

Figure 4-24. TPUTL Flow Diagram (Sheet 4 of 9)

* WRRING

Figure 4-24. TPUTL Flow Diagram (Sheet 5 of 9)

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(6A)

REWIND TAPE

(6B)

NO ← OK**
?

YES

ERROR MESSAGE

TAPE TYPE COUNT = 1 & ICNT = 1 ? — YES → DIRECT OPER TO DISMOUNT TAPE & LABEL APPROPRIATELY

INFOBF = 999

NO

(7A)

RETURN

INCREMENT ICNT TO 2 FOR BK UP

INCREMENT TAPE TYPE #

RECALCULATE TAPNO FOR MLBU HEADER

(4C)

**YESNO

Figure 4-24. TPUTL Flow Diagram (Sheet 6 of 9)

Figure 4-24. TPUTL Flow Diagram (Sheet 7 of 9)

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Figure 4-24. TPUTL Flow Diagram (Sheet 8 of 9)
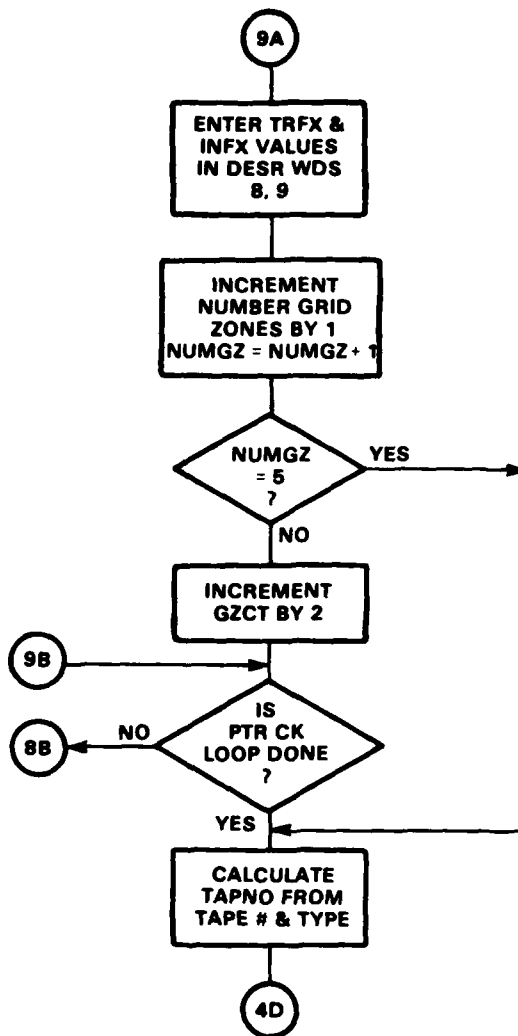
Figure 4-24. TPUTL Flow Diagram (Sheet 9 of 9)

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4.23 WFUTL

WFUTL produces an initial work tape - it defines a header file, tape pointer file, tape usage file, and replacement list file. All assignments and lists are initialized to zero. The work tape created is the starting point for the library management functions.

NOTE: The program has to be re-executed using this tape as the work tape to start at the starting point.

WFUTL is called only through the utility, REBUILD WORKING FILE.

Figure 4-25 is a flow diagram of WFUTL.

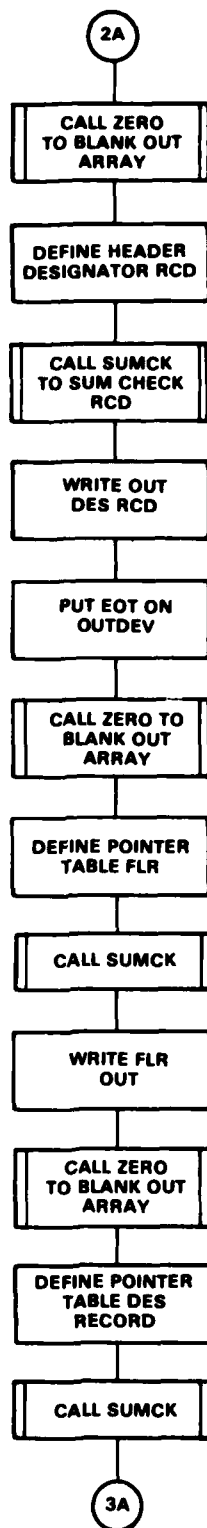Figure 4-25. WFUTL Flow Diagram (Sheet 1 of 5)

4-115
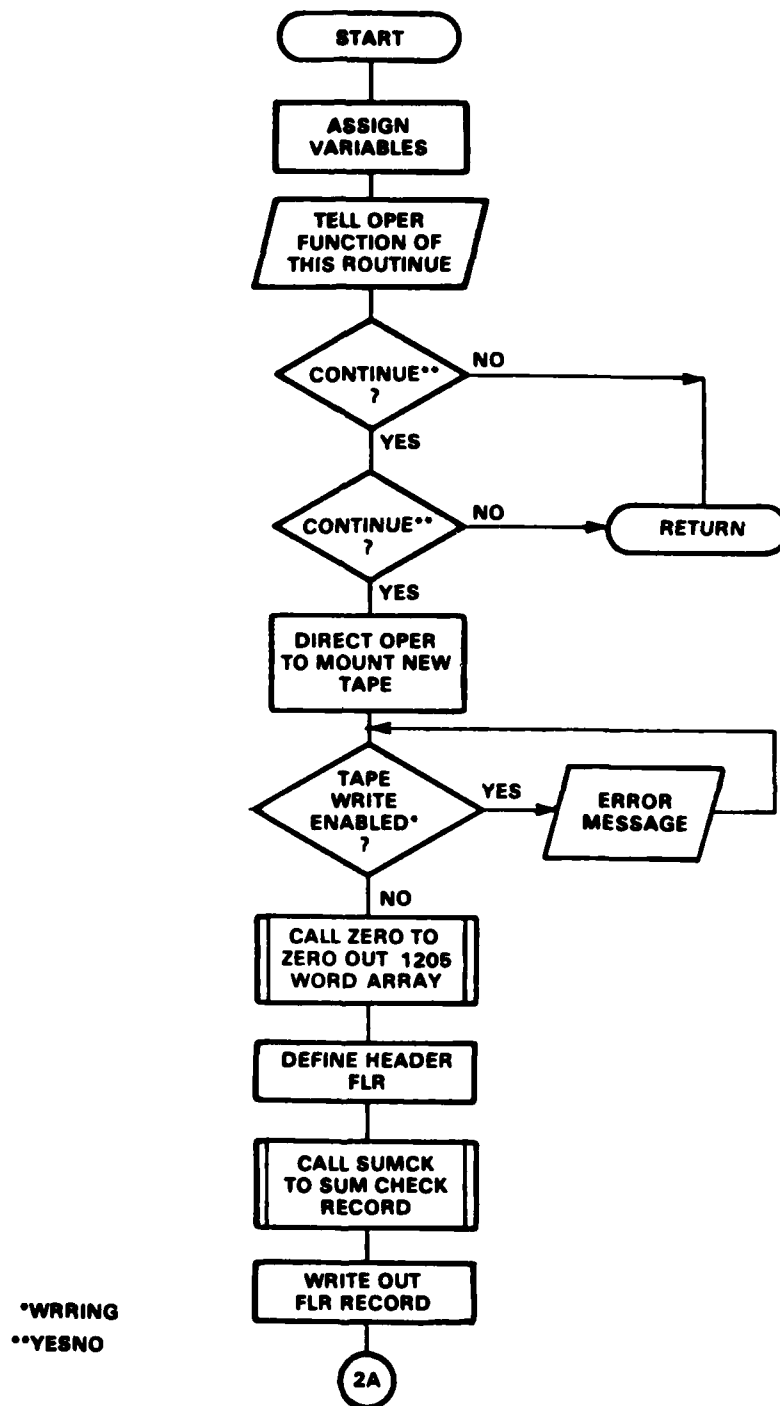
Figure 4-25. WFUTL Flow Diagram (Sheet 2 of 5)

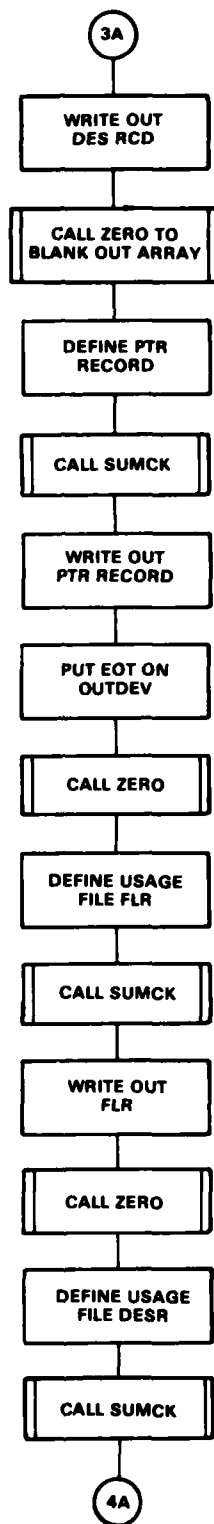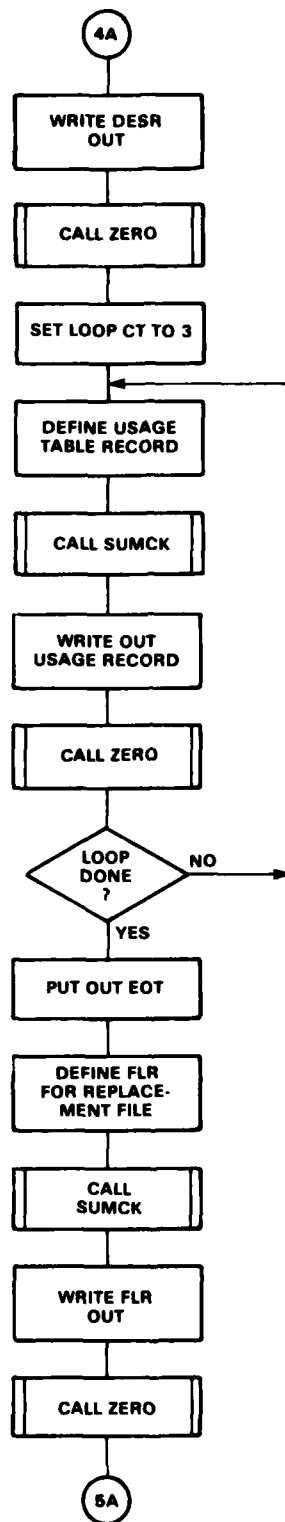Figure 4-25. WFUTL Flow Diagram (Sheet 3 of 5)
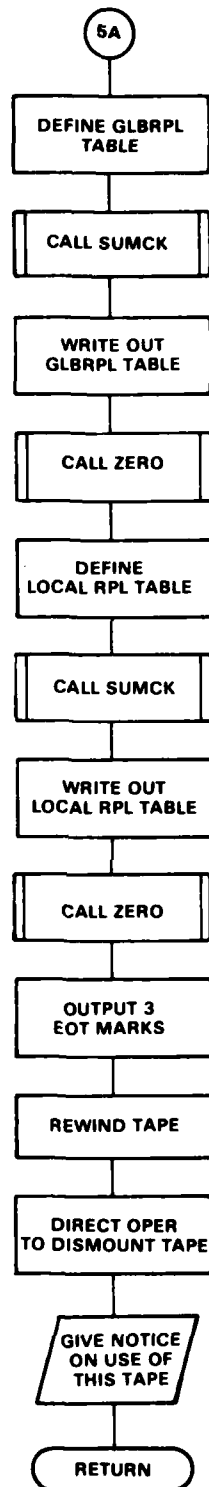
Figure 4-25. WFUTL Flow Diagram (Sheet 4 of 5)

Figure 4-25. WFUTL Flow Diagram (Sheet 5 of 5)

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4.24 CATUPD

CATUPD updates the master catalog to reflect the maps added to the library. When the master catalog is updated, it makes a backup catalog by copying the master. CATUPD is called by LIBCPY after the maps have been processed.

The operator is directed to mount the master catalog tape. The program then verifies that the tape is write-enabled and that the correct tape has been mounted. The subroutine WFUPD is then called to update the replacement table. When control returns to CATUPD, the variable NWCAT is checked to see if a replacement catalog was made. (This happens when the number of replaced cells reaches 40.) If a new catalog was made, the entire sequence is begun again from the beginning of CATUPD.

If a new catalog was not made, the program then checks if this will be the first entry to the catalog. (This would happen only at the very beginning of the library.) If it is, the record count is initialized to -1, so the first record would be zero. If it is not the first entry, the record count of the last entry is retrieved and incremented.

For each CLINFO entry, the record type, record count, and date are added. Each CLINFO record is then transferred to the CELLR array. It is sum checked, then written out to the catalog tape. After all the records are written, two EOT marks are output, and the operator is notified that the catalog is written. To make the backup catalog, ENTTP is called. The operator is then directed to dismount the tapes and store them properly.

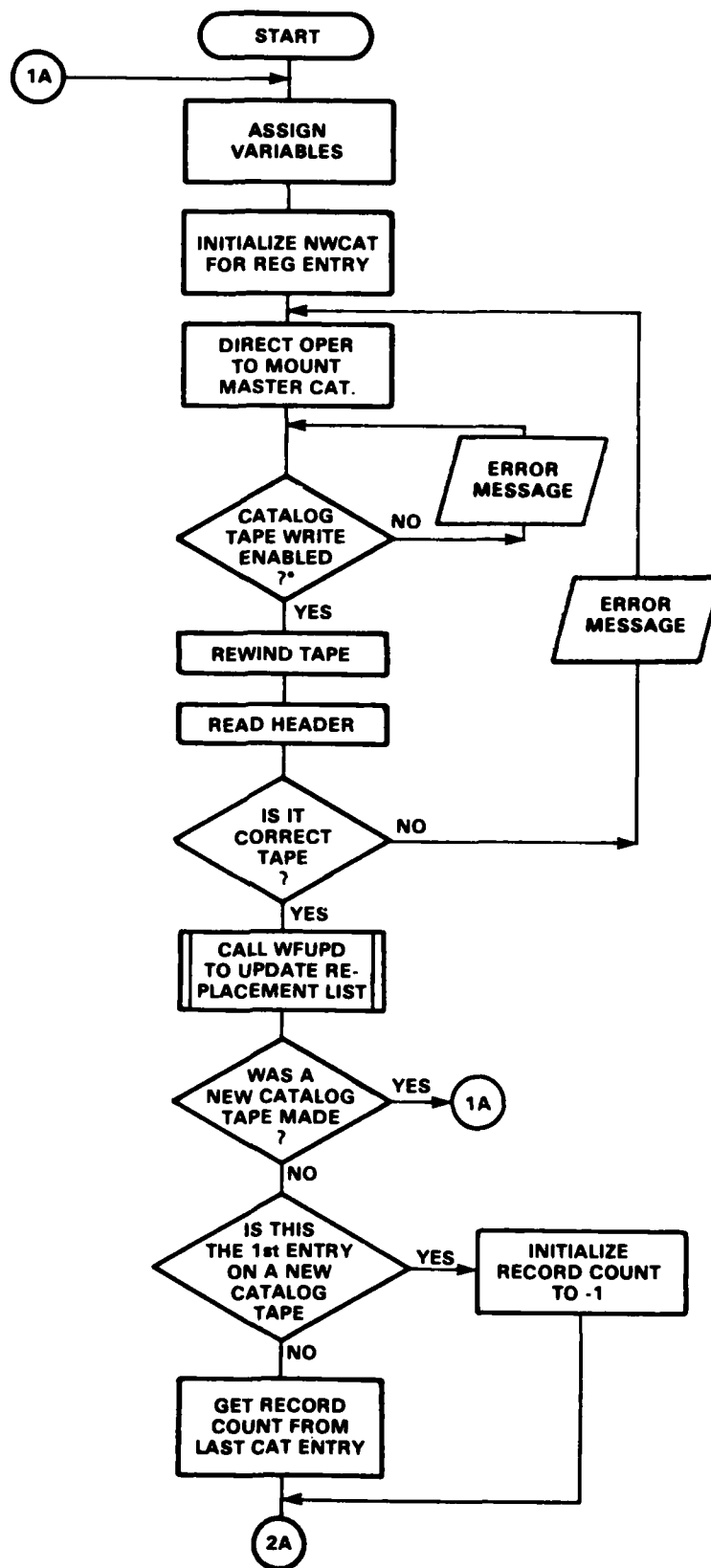The flow diagram for CATUPD is shown in Figure 4-26.
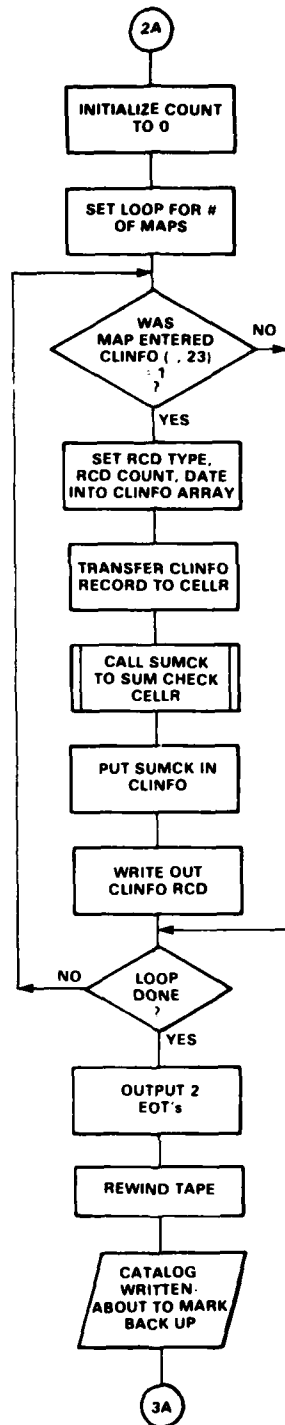
Figure 4-26. CATUPD Flow Diagram (Sheet 1 of 3)

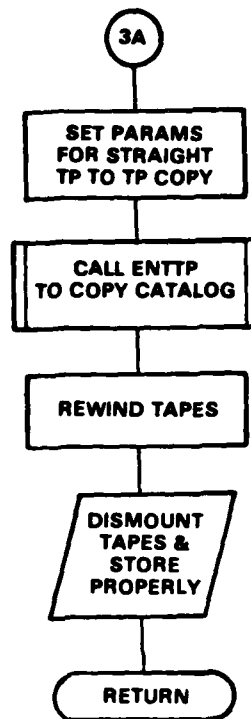Figure 4-26. CATUPD Flow Diagram (Sheet 2 of 3)

Figure 4-26. CATUPD Flow Diagram (Sheet 3 of 3)

4.25 WFUPD

WFUPD updates the global replacement table every time replacement maps are added to the library. WFUPD reads all current catalog entries and compares them with the maps about to be entered. If there is a match (meaning that a new map will replace an existing map), the replaced map is entered in the replacement table. The replacement table can hold a maximum of 40 entries. When it is full, GBGRTN is called to make a new catalog and delete all the replaced maps. WFUPD is called by CATUPD. The flow diagram for WFUPD is shown in Figure 4-27.

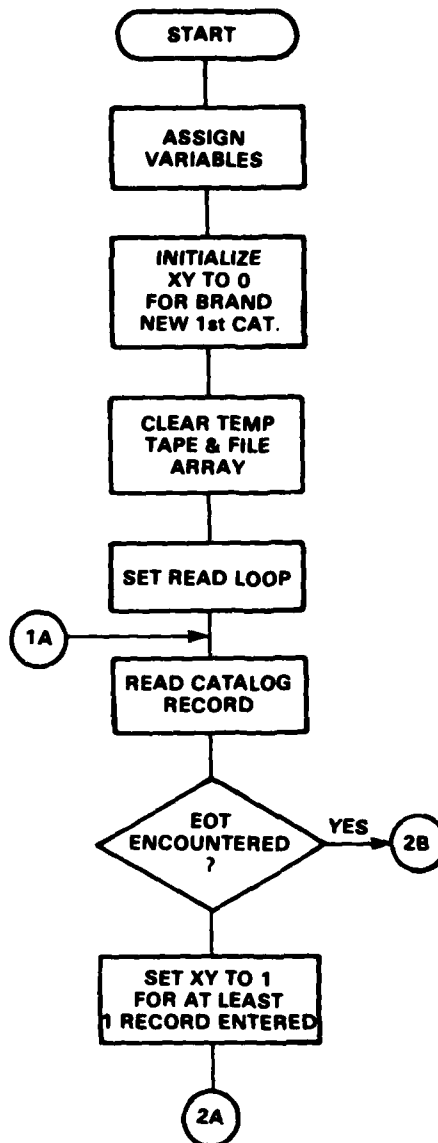Refer to the section on working files for the function of the global replacement table.

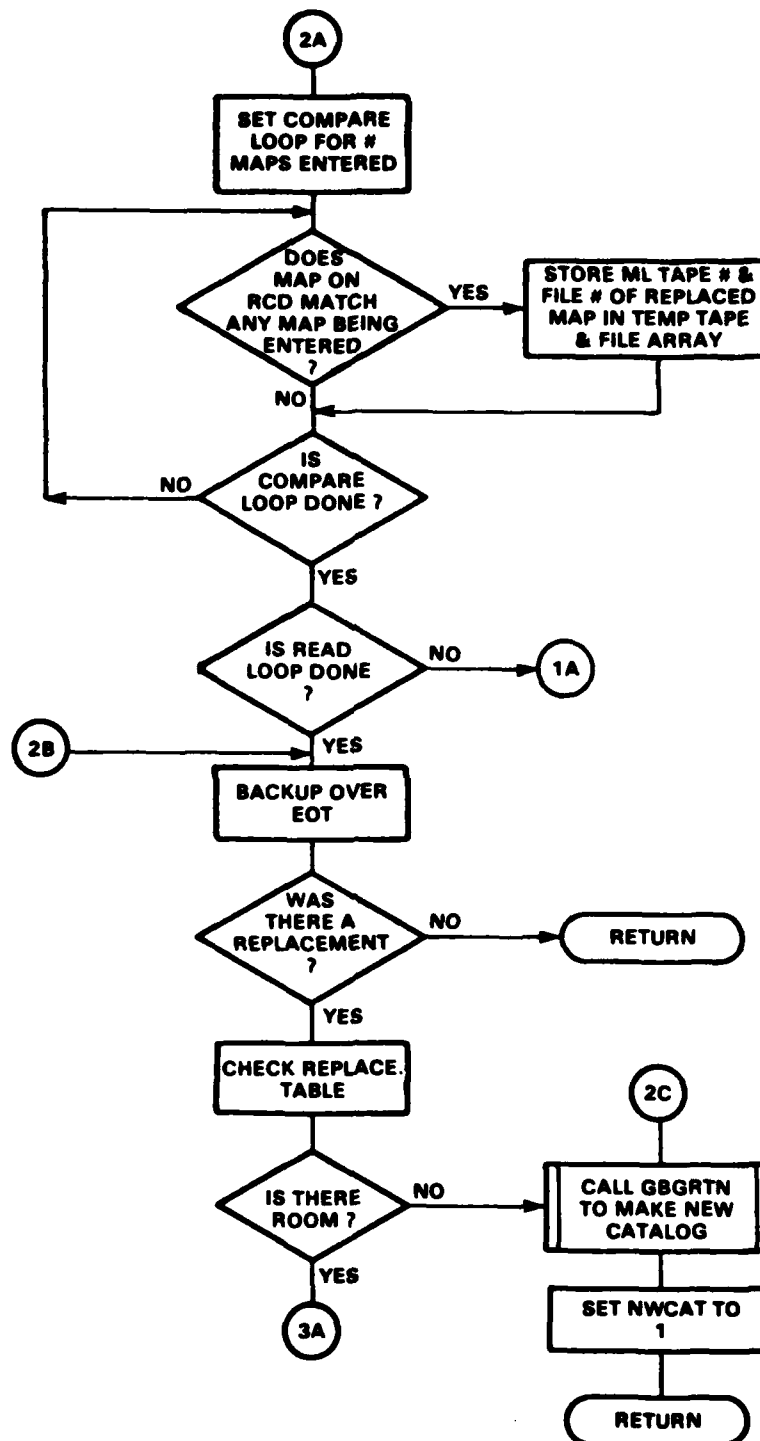Figure 4-27. <u>WFUPD</u> Flow Diagram (Sheet 1 of 3)

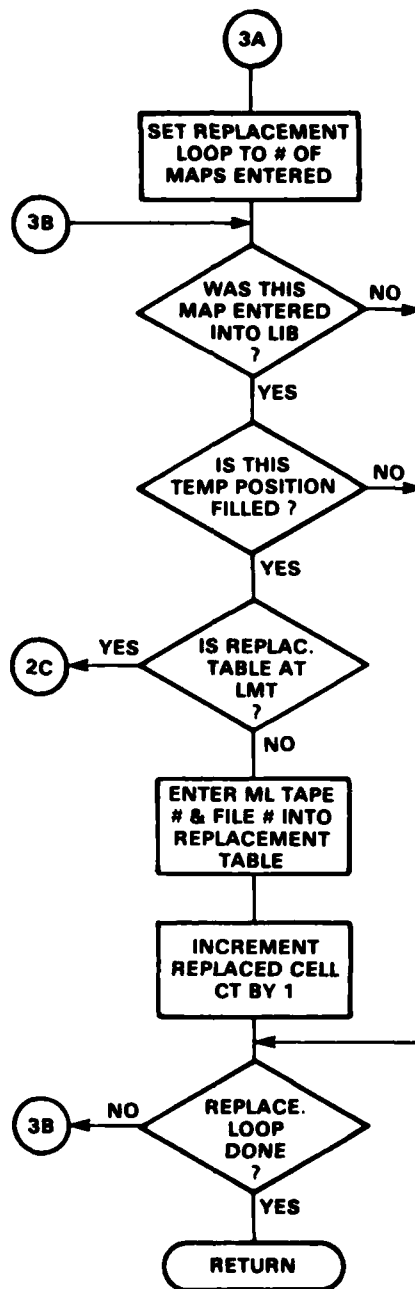Figure 4-27. WFUPD Flow Diagram (Sheet 2 of 3)

Figure 4-27. WFUPD Flow Diagram (Sheet 3 of 3)

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4.26 UNSRTD

UNSRTD provides an unsorted listing of all the entries on the master catalog or backup catalog tape. It prints the heading, the date the listing was made, the header information, and the catalog listing. The listing gives the grid zone designator, the northing and easting coordinates, the record number, the km in the N/S and E/W directions, the tape and file numbers of the ML, MLBU, and FF location, and the date the map was entered into the library.

Refer to Figure 4-28 for the UNSRTD flow diagram. Figure 4-29 shows a printout of the unsorted listing.
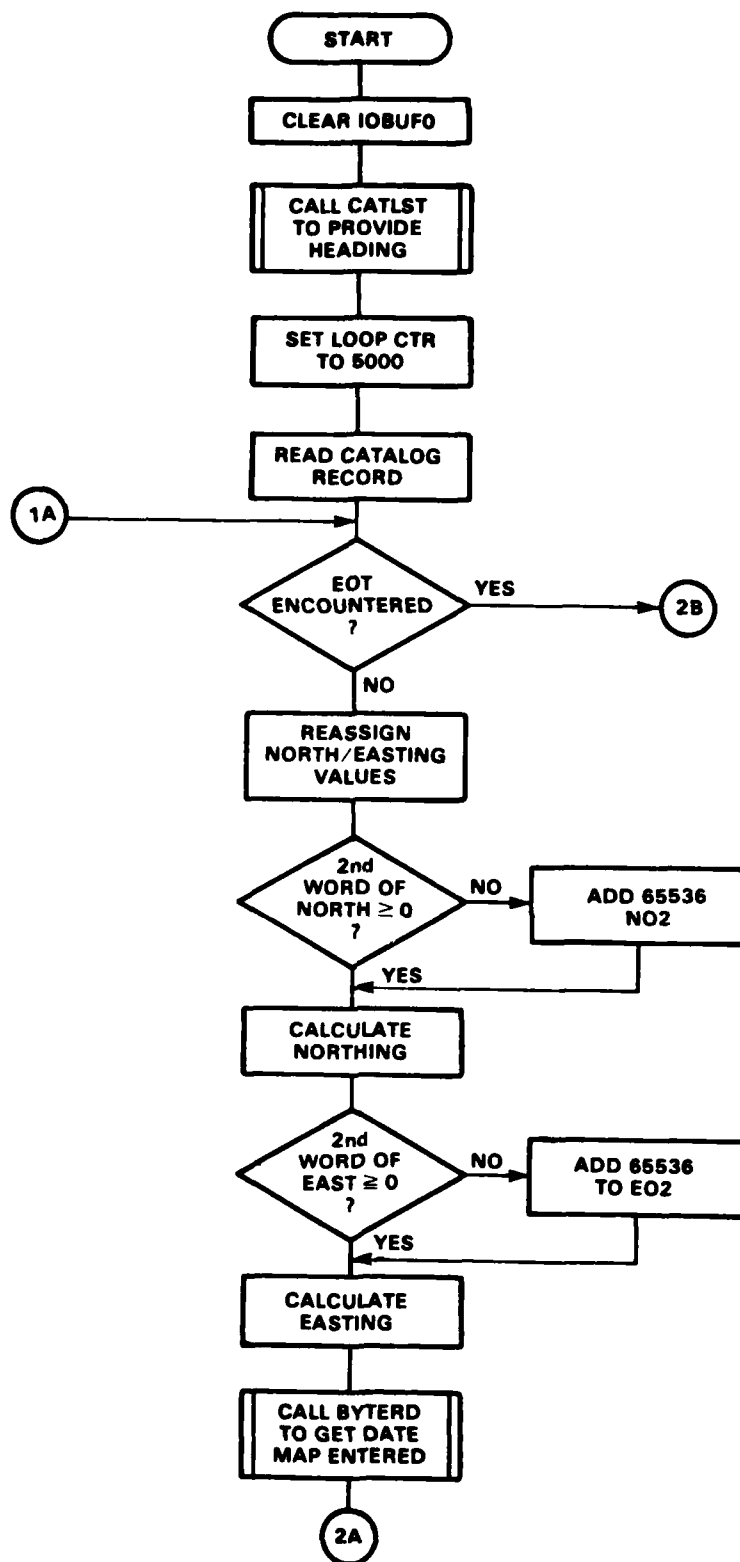
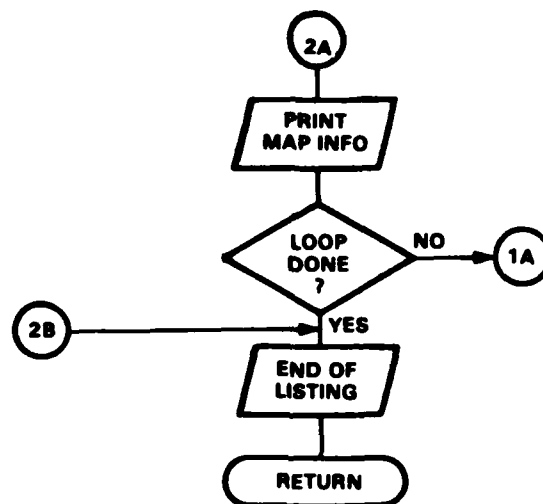Figure 4-28. UNSRTD Flow Diagram (Sheet 1 of 2)

Figure 4-28. UNSRTD Flow Diagram (Sheet 2 of 2)

MASTER CATALOG LISTING

SORTED BY: UNSORTED

DATE: 4/ 3/81

HEADER INFORMATION

FIXED LENGTH RECORD--FLR

RECORD TYPE	RECORD COUNT	LENGTH DESR
152152	0	10

TAPE DESIGNATOR RECORD--DESR

RECORD TYPE	RECORD COUNT	TAPE TYPE	TAPE CREATION
110011	1	1	4/ 1/1981

CELL RECORDS--CELLR

GRID ZONE DESIGNATOR	NORTHING	EASTING	RECORD NUMBER	KM N/S	KM E/W	ML TAPE NO	ML FILE NO	MLBU TAPE NO	MLBU FILE NO	FF TAPE NO	FF FILE NO	FILE CREATION DATE
32UKA	5500000.	200000.	0	100	100	2001	2	3001	2	4001	2	4/ 1/1981
32UKC	5700000.	200000.	1	100	100	2001	3	3001	3	4001	5	4/ 1/1981
31UGV	5900000.	700000.	2	100	100	2002	2	3002	2	4002	2	4/ 1/1981
32UKC	5700000.	200000.	3	100	100	2001	4	3001	4	4001	8	4/ 1/1981
32UPF	6000000.	600000.	4	100	100	2001	5	3001	5	4001	11	4/ 2/1981
31UGV	5900000.	700000.	5	100	100	2002	3	3002	3	4002	5	4/ 2/1981

Figure 4-29. Printout of Unsorted Listing

4.27 CATLST

CATLST provides the headings and header information for the master catalog listing. CATLST is called only by UNSRTD at this time. When the sort by grid designator or sort by northing/easting routine is incorporated, these sorts will also call CATLST.

There is one passed parameter, SRTTYP, which is assigned by the calling program. Depending on the value of SRTTYP, CATLST will print the type of sort: SRTTYP = 1 Unsorted

= 2 Grid designator

= 3 Northing/easting

CATLST directs the operator to mount the master catalog tape, reads the header information, and prints the appropriate heading.

Refer to Figure 4-30 for the CATLST flow diagram. The printed heading for an unsorted listing can be seen in Figure 4-29.
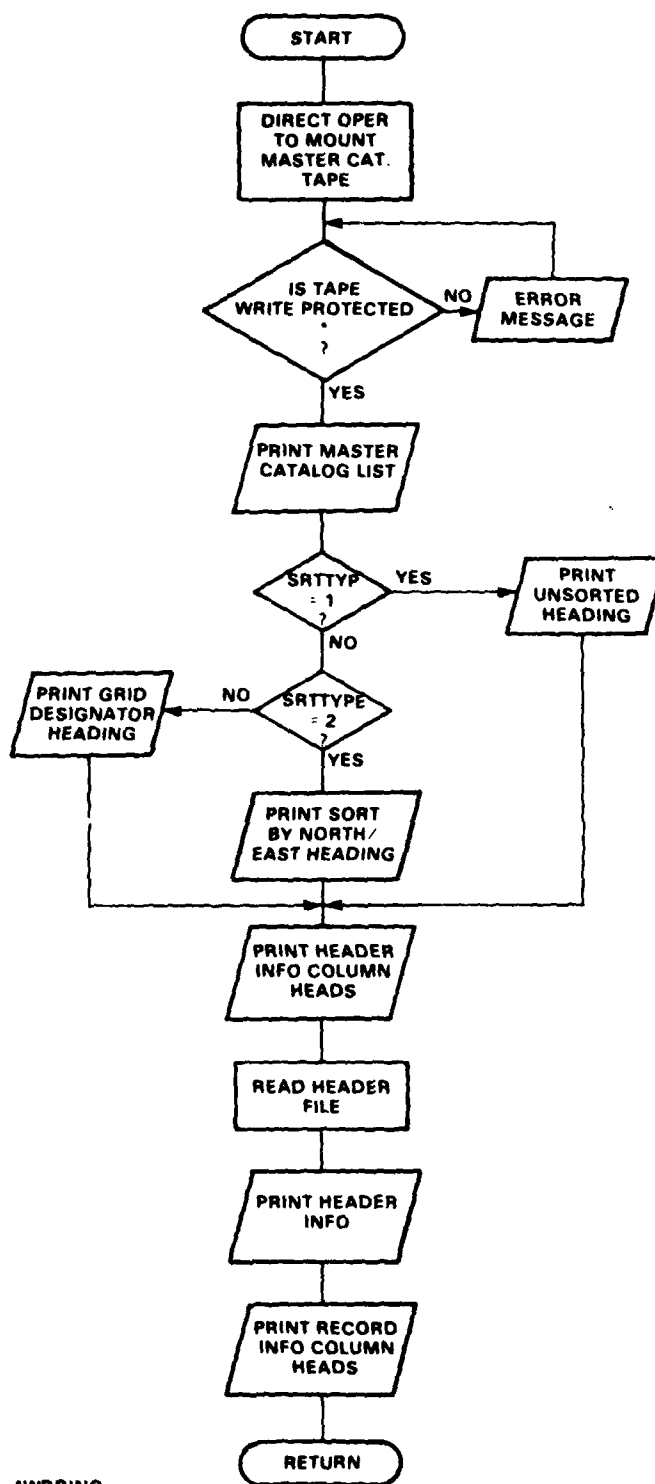
Figure 4-30. CATLST Flow Diagram

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4.28 LOCFLS

LOCFLS is the controlling routine for identifying the maps on the CPYOBJ scratch tape. Interacting with FDMPNU and POSTAP, LOCFLS searches the CPYOBJ scratch tape and puts the location of each map to be entered in the pointer position (CLINFO (, 22)) for each map. The map's location is determined by the file number it has on the scratch tape. The file number is put into CLINFO to record the location for later use. If any maps on the scratch tape are unreadable or not on the tape, a message is printed out, and the status word (CLINFO (, 23)) is loaded with a "3." No further processing is attempted for these maps.

LOCFLS is called by CLLTP when maps are to be entered into the library. LOCFLS calls FDMPNU to read the header of each map on the scratch tape. LOCFLS then compares each map read with the maps entered in CLINFO. If there is a match, the location of the map is put into the associated CLINFO pointer position. If the maps do not match, LOCFLS continues reading the scratch tape until all the maps in CLINFO are found, or until an end-of-tape is encountered.

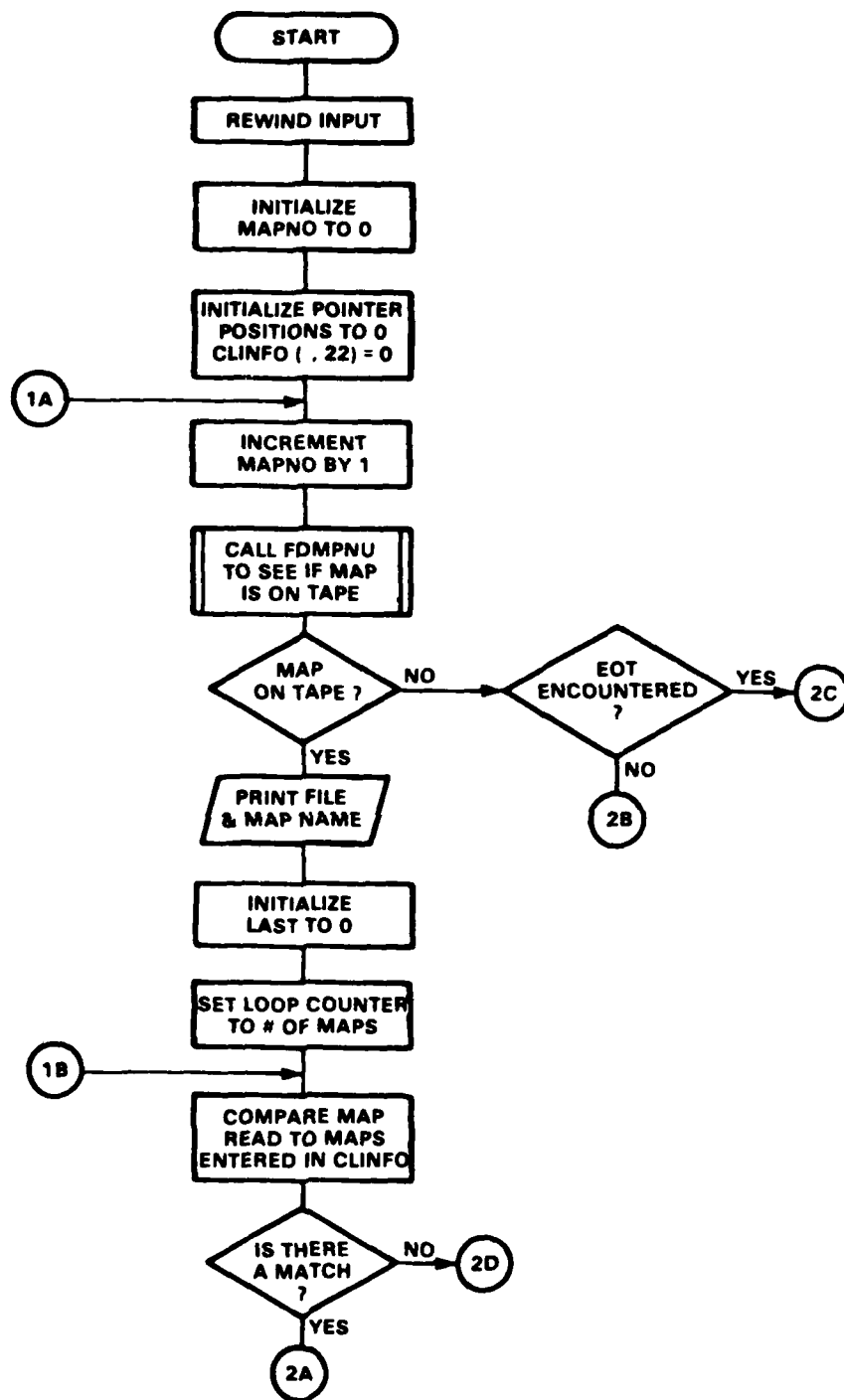The flow diagram for LOCFLS is given in Figure 4-31.

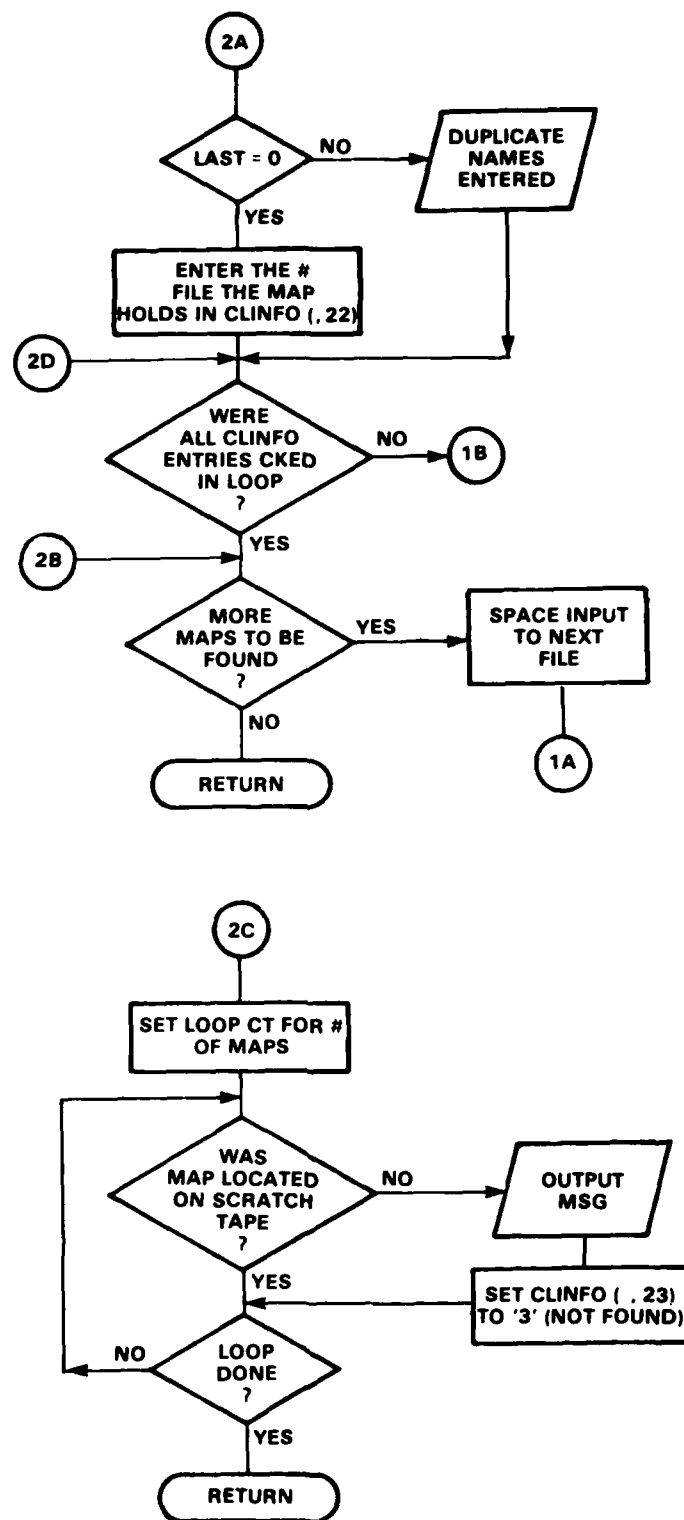Figure 4-31. LOCFLS Flow Diagram (Sheet 1 of 2)

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Figure 4-31. LOCFLS Flow Diagram (Sheet 2 of 2)

4.29 FDMPNU

FDMPNU determines if a map on the CPYOBJ scratch tape is good. FDMPNU is called by LOCFLS to identify the maps on the CPYOBJ scratch tape. There are two passed variables, NUMBER and STATUS. NUMBER is the file number a map holds on the scratch tape; STATUS is the returned variable, indicating the status of the map. The values returned for STATUS are:

STATUS = 1   Good read

= 2   FLR, DESR was unreadable, or there was a sum check error

= 3   POSTAP did not identify the file, or an EOT was encountered

FDMPNU calls POSTAP to determine if the file is on the tape. If it is, FDMPNU reads the header and determines if the map is good. The tape is then backed up to the beginning of the file, and the STATUS is sent back to the calling program.
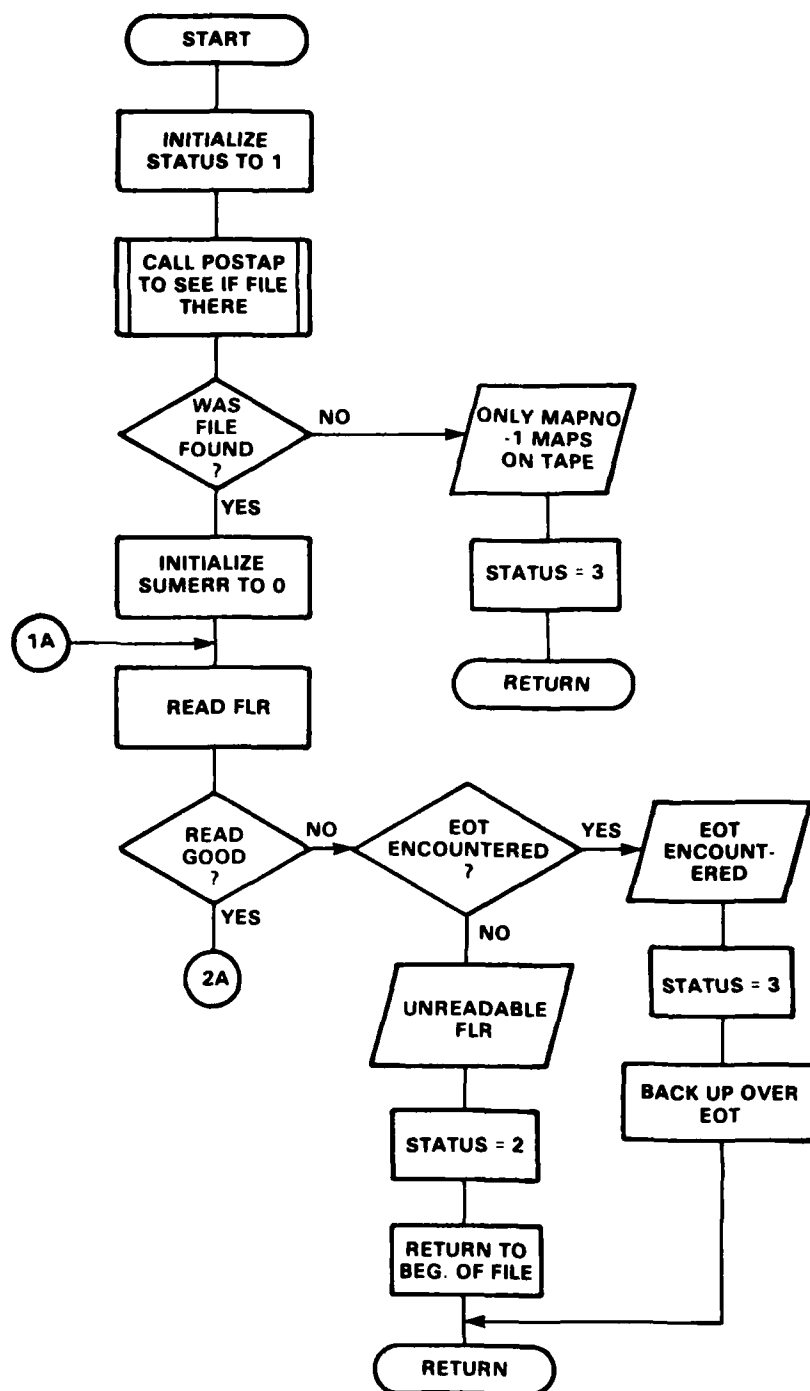
Refer to Figure 4-32 for the FDMPNU flow diagram.

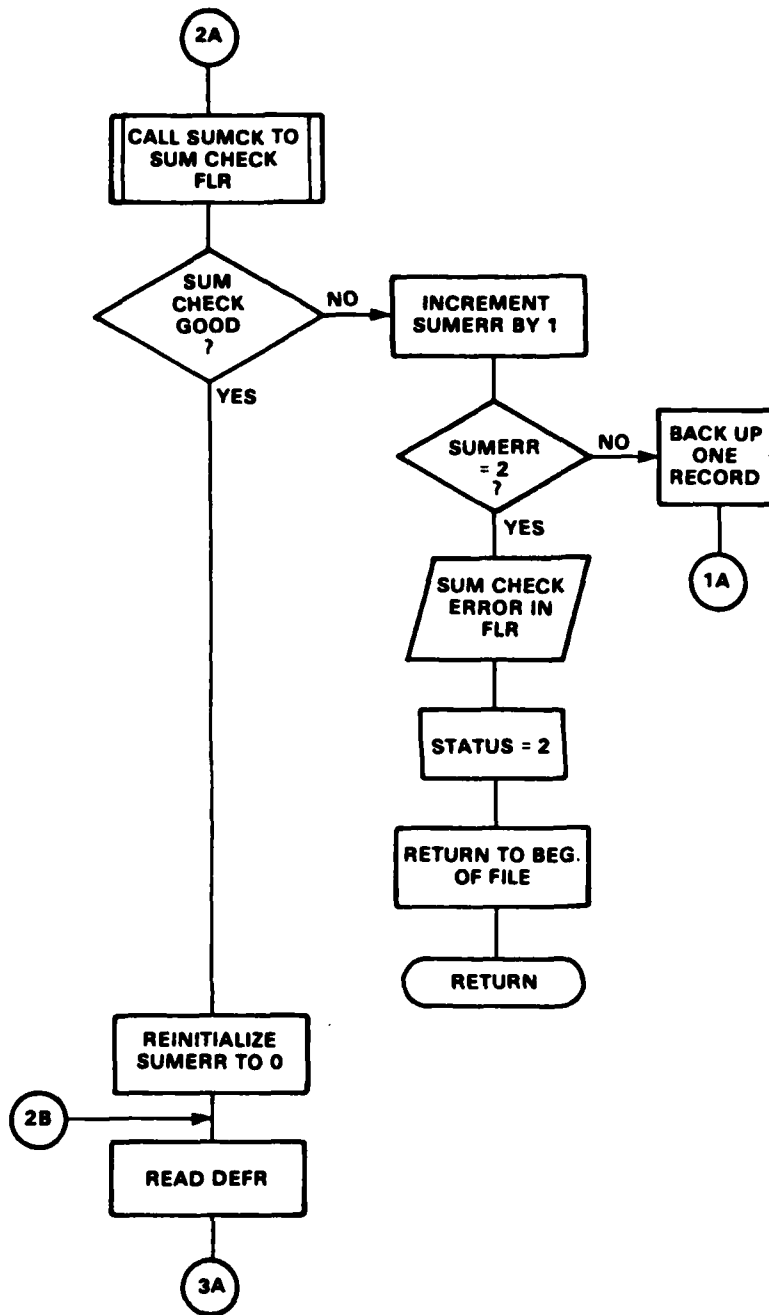Figure 4-32. FDMPNU Flow Diagram (Sheet 1 of 3)

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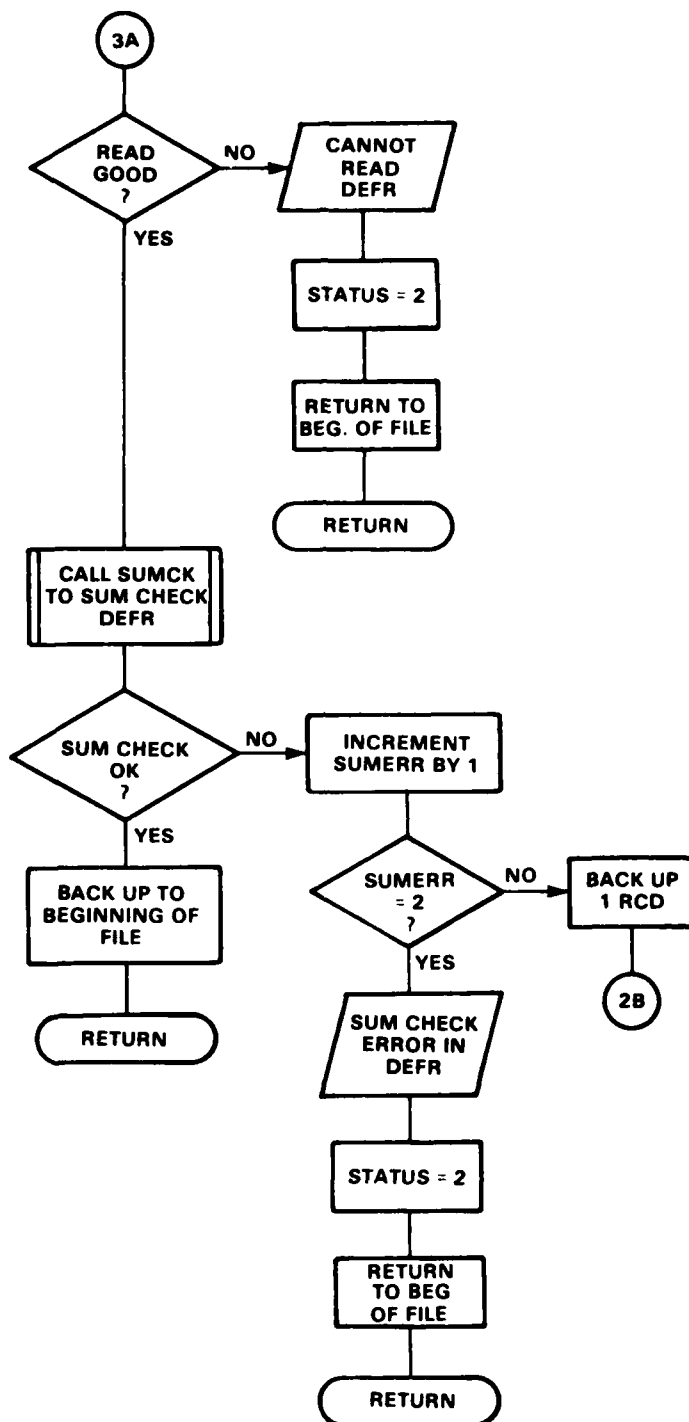Figure 4-32. FDMPNU Flow Diagram (Sheet 2 of 3)

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Figure 4-32. FDMPNU Flow Diagram (Sheet 3 of 3)

4.30 POSTAP

POSTAP positions the CPYOBJ scratch tape to a specified file. POSTAP performs two functions during library copies: When the CPYOBJ scratch tape is first mounted, FDMPNU calls POSTAP to identify each file on the scratch tape. At this point, POSTAP only has to check that a file exists. Further on in the library entry routine, CLLTP calls POSTAP prior to each file copy to position the tape to the correct file. Here, POSTAP compares the file number of the map to be copied with the file where the CPYOBJ tape is presently positioned. POSTAP then spaces the CPYOBJ tape ahead or back so that the file wanted is under the read head.

There are three passed variables: NUMBER, FOUND, and AUTREV. NUMBER is the file number of the next map to be copied. FOUND is the returned parameter, taking on a logical true if the file is found and a logical false if the end-of-tape is encountered before the file is found. AUTREV is not used at this time. MAPNO, the file number at which the CPYOBJ tape is positioned, is passed to the routine through the common /TAPPOS/. MAPNO and NUMBER are compared, and appropriate action is taken.
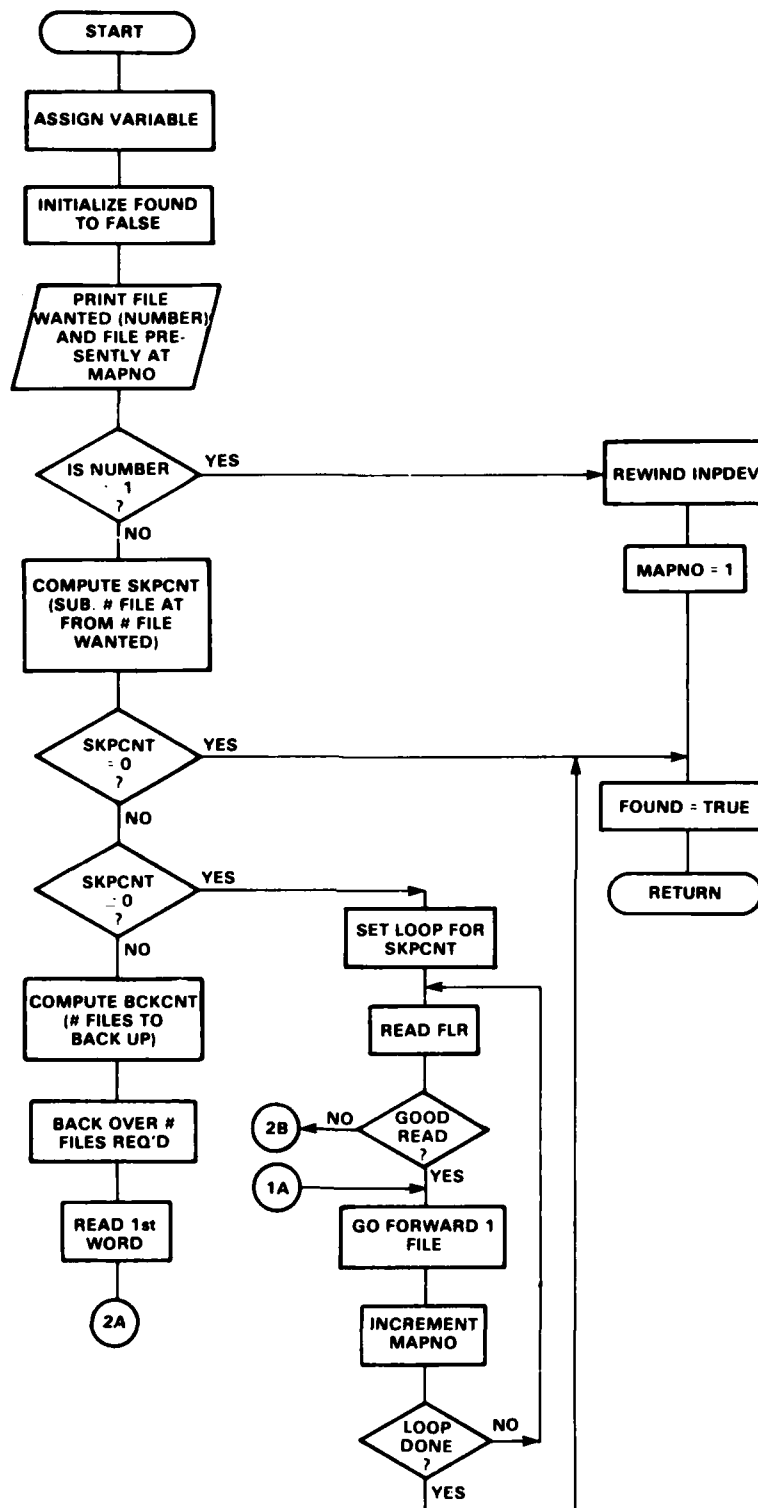
The POSTAP flow diagram is shown in Figure 4-33.

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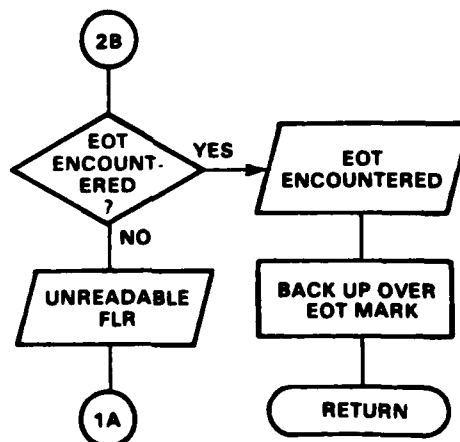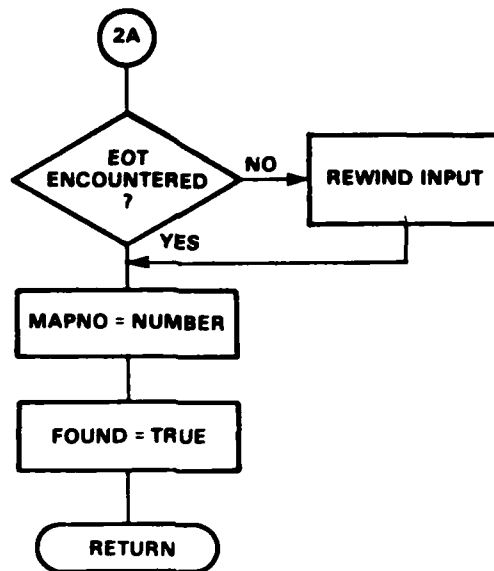Figure 4-33. POSTAP Flow Diagram (Sheet 1 of 2)

Figure 4-33. POSTAP Flow Diagram (Sheet 2 of 2)

4.31 DSPLAY

DSPLAY prints and displays the result of the maps processed for entry into the library. It lists the maps in five categories:

- Maps processed and entered into the library.

- Maps not processed by operator direction.

- Maps not found on the CPYOBJ tape.

- Maps not processed because the tape was full.

- Maps not processed because of a bad copy.

The status word (CLINFO (, 23)) is checked for each map and the appropriate message printed:

CLINFO (, 23) = 0 Not processed

= 1 Processed

= 2 Not processed due to tape limitation

= 3 Not processed because map was not found on CPYOBJ tape

= 4 Not processed due to bad copy

DSPLAY is called by CLLTP after maps have been processed and by EODPRC as part of the working files log.

Figure 4-34 is the DSPLAY flow diagram.

START

PRINT HEADING
FOR PROCESSED

SET LOOP CT

MAP ENTERED ? — YES → PRINT MAP INFO

NO

LOOP DONE ? — NO

YES

PRINT HEADING
FOR NOT PROCESSED

SET LOOP CT

PROCESSING STOPPED BY OPER ? — YES → PRINT MAP INFO

NO

LOOP DONE ? — NO

YES

SET LOOP CT

MAP NOT LOCATED ON SCRATCH — YES → PRINT MAP & REASON
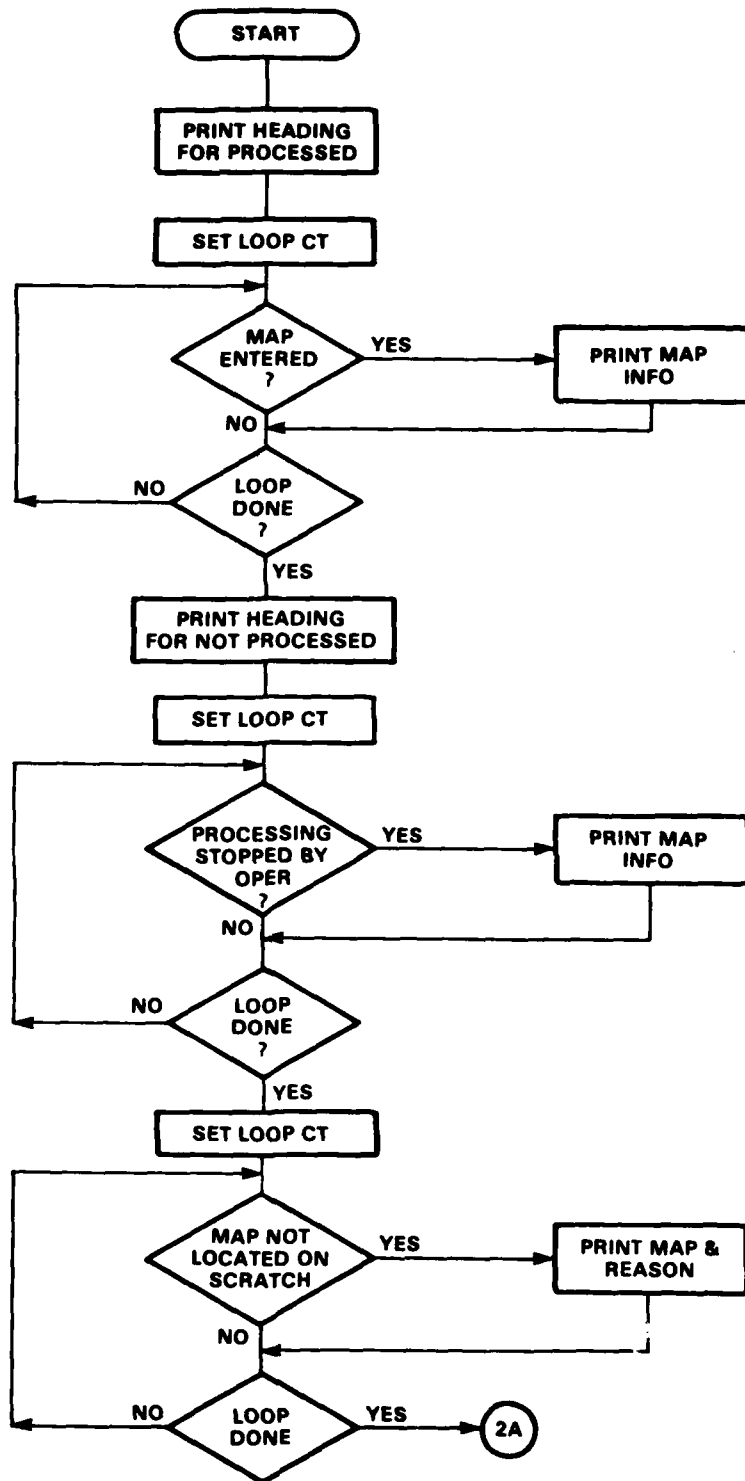
NO

LOOP DONE — NO / YES → 2A

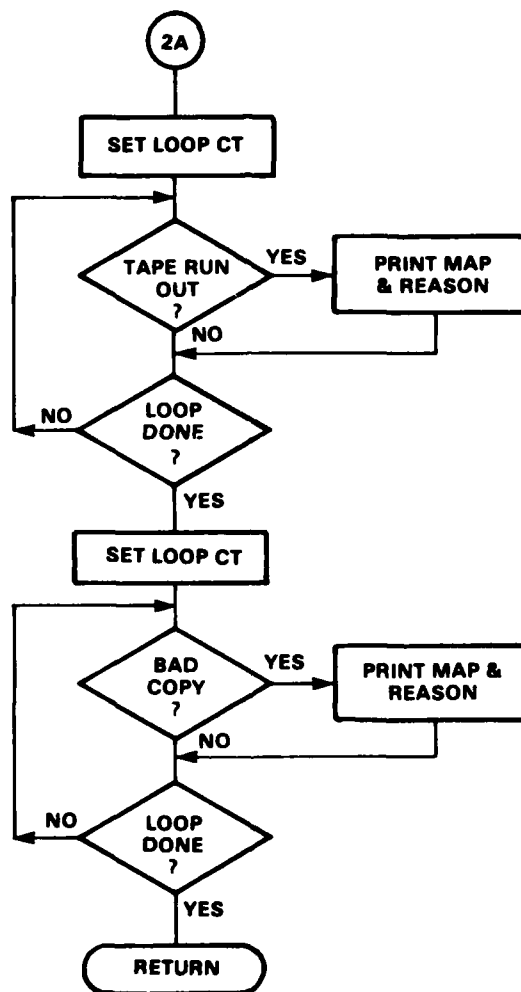Figure 4-34. DSPLAY Flow Diagram (Sheet 1 of 2)

Figure 4-34. DSPLAY Flow Diagram (Sheet 2 of 2)

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4.32 WRRING

WRRING checks whether or not a write ring is present on a tape mounted on a given tape drive. It is called by various subroutines to check whether a given tape is write protected/enabled. There are two passed variables, DEVNUM and STAT; both are set by the calling program. DEVNUM is the logical device number of the tape drive on which the tape is mounted. STAT is the condition for which the program is checking:

STAT = 0 Write ring should be on

STAT = 1 Write ring should be off

If the correct condition does not exist, WRRING interrupts with an error message directing the operator to take appropriate action. When the correct condition is met, WRRING is exited.

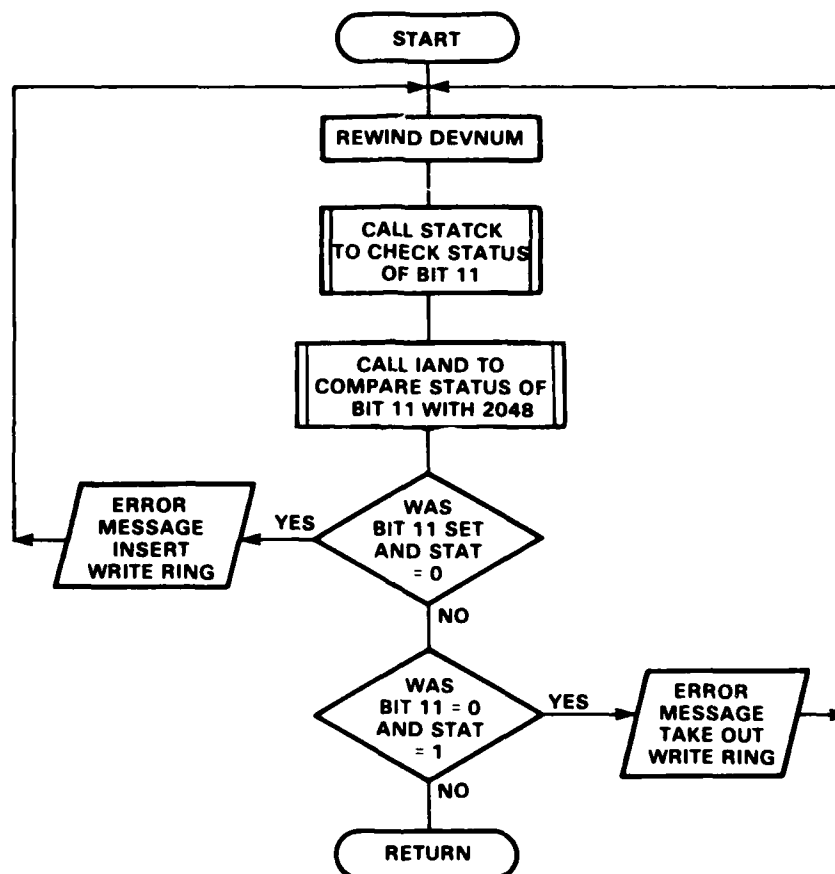See Figure 4-35 for the WRRING flow diagram.

Figure 4-35. WRRING Flow Diagram

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1.0

1.1

1.25

2.8   2.5

3.2   2.2

3.6

4.0   2.0

1.8

1.4   1.6

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A
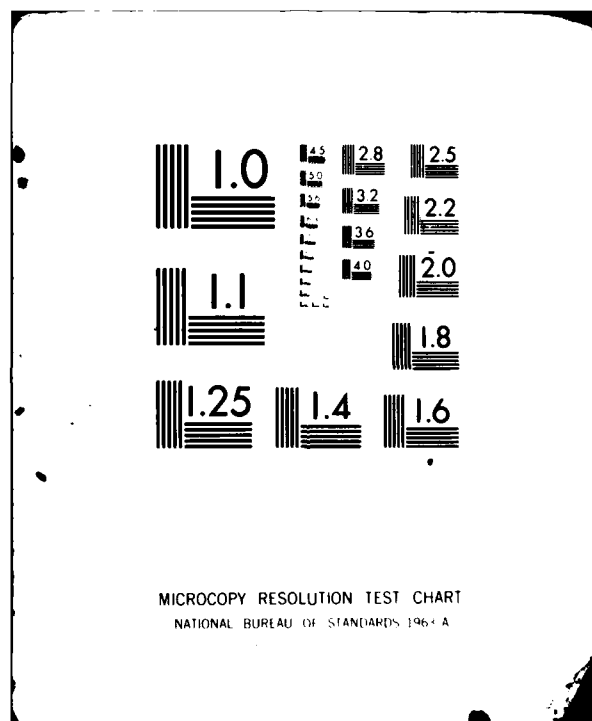
4.33 YESNO

YESNO interprets the operator's "yes" or "no" response and returns a logical value for the calling routine to evaluate. YESNO is called whenever the operator is asked for a YES/NO decision. There is one passed parameter, FLAG, which returns the logical equivalent of the operator's response to the calling program. If the operator answers with anything other than "Y," "YE," "YES," "N," or "NO," an error message is displayed and the operator is asked to reenter the response.
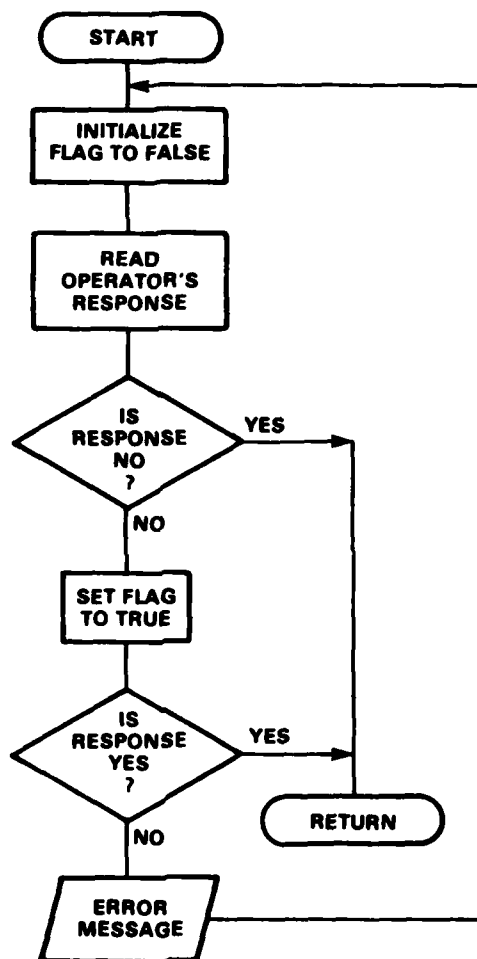
The YESNO flow diagram is shown in Figure 4-36.

Figure 4-36. YESNO Flow Diagram

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4.34 SELECT

SELECT interprets an operator's response to alphabetical choices and returns a numerical value for the calling routine to evaluate. SELECT is called whenever the operator is given an alphabetic format choice (e.g., A, B, C, etc).

There are two passed parameters, N and CHC. N is the number of choices presented to the operator; it is set by the calling routine. CHC is the return parameter, giving the numerical equivalent to the operator's selection. If the operator enters an invalid choice, an error message is displayed and the operator is asked to select again.

Refer to Figure 4-37 for the SELECT flow diagram.
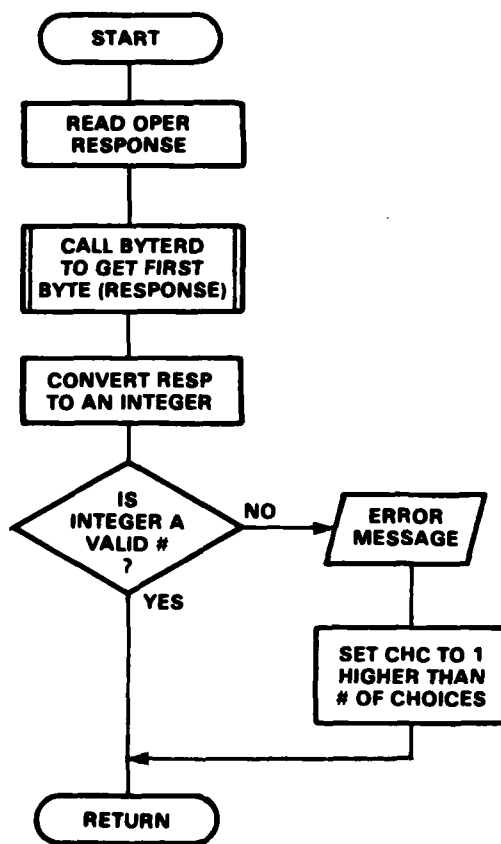
START

READ OPER
RESPONSE

CALL BYTERD
TO GET FIRST
BYTE (RESPONSE)

CONVERT RESP
TO AN INTEGER

IS
INTEGER A
VALID #
?

NO

ERROR
MESSAGE

YES

SET CHC TO 1
HIGHER THAN
OF CHOICES

RETURN

Figure 4-37. SELECT Flow Diagram

4.35 HOWMNY

HOWMNY interprets an operator's numerical response and determines if it is within acceptable limits. HOWMNY is called whenever the operator is directed to enter numerical values. There are two passed variables, NUM and LMT. NUM is the value returned to the calling program. LMT is the maximum value NUM can have. LMT is set by the calling program. If the number entered is greater than the specified limit, an error message is displayed and the operator is directed to reenter the number.
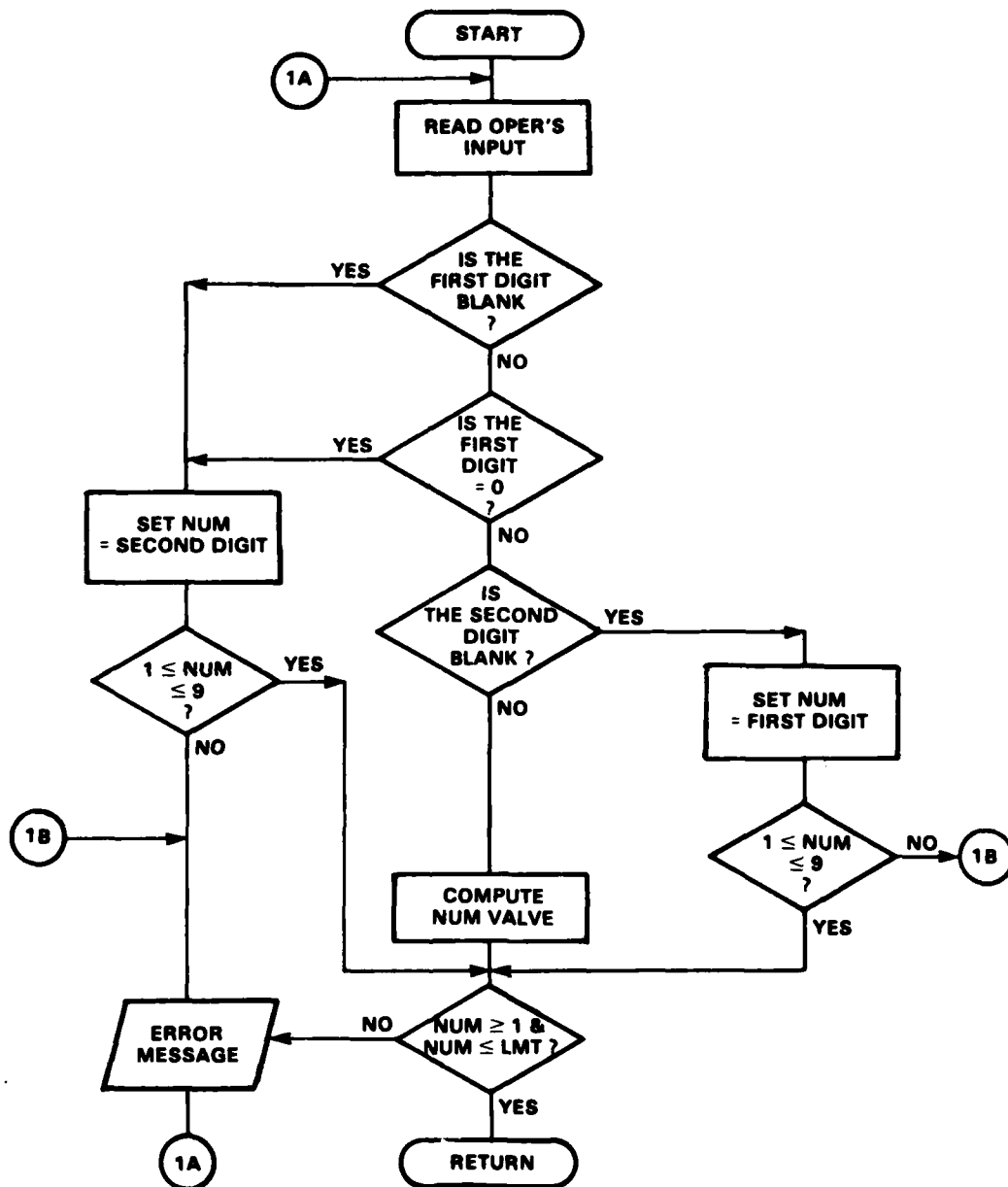
See Figure 4-38 for the flow diagram for HOWMNY.

Figure 4-38. HOWMNY Flow Diagram

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4.36 ZERO

ZERO zeroes out an array. It is called by WFUTL only when creating files for the work tape. It has one passed parameter, N, which determines the size of the array to be zeroed. The array has a maximum of 1,205 words at this point. The array value is passed through the common B.
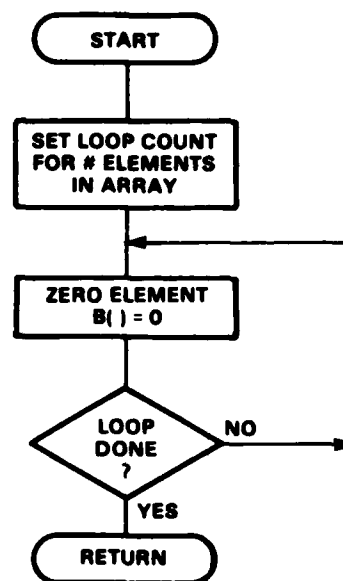
See Figure 4-39 for the ZERO flow diagram.

```
        ┌──────────────┐
        │    START     │
        └──────┬───────┘
               │
        ┌──────▼───────┐
        │ SET LOOP COUNT│
        │ FOR # ELEMENTS│
        │   IN ARRAY    │
        └──────┬───────┘
               │      ◄──────────┐
        ┌──────▼───────┐         │
        │ ZERO ELEMENT │         │
        │   B( ) = 0   │         │
        └──────┬───────┘         │
               │                 │
            ╱──▼──╲              │
          ╱  LOOP  ╲   NO        │
         ╱  DONE    ╲────────────┘
         ╲    ?     ╱
          ╲        ╱
            ╲──┬──╱
               │ YES
        ┌──────▼───────┐
        │   RETURN     │
        └──────────────┘
```

Figure 4-39. ZERO Flow Diagram

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4.37 GBGRTN

GBGRTN makes a new master catalog tape, deleting all replaced maps. It is called by WFUPD when the global replacement table is full.

Before creating the new catalog, GBGRTN calls UNSRTD to record all existing catalog entries. The replacement table is also printed out. These procedures will provide enough information to reconstruct a new catalog if necessary.

CATUTL is called to create the new catalog and header file. After the header is made, each of the old catalog records is read, and the map contained on them is compared with the replacement list file. If the map was replaced, the replacement list position is zeroed out, and the record is ignored.

If the map contained on the record was not replaced, the record is transferred to the new catalog and verified. The program continues to read the catalog until the EOT mark is reached. Two EOT marks are put on the new catalog and the tapes are rewound. The number of replaced cells is also reset to zero.

The operator is directed to store the old catalog and write protect the new one.

If any of the records did not copy well, a message is given to the operator to verify the catalog tapes and re-create, if necessary.

GBGRTN then calls CATUTL again to make a new backup catalog tape. The operator is notified that the backup tape was made, and the routine is exited.

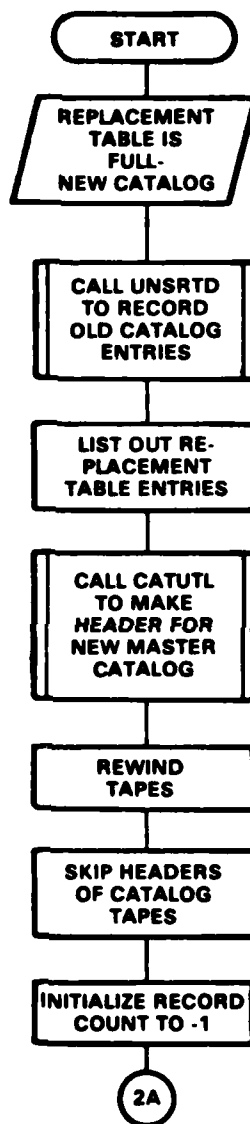The flow diagram for GBGRTN is given in Figure 4-40.

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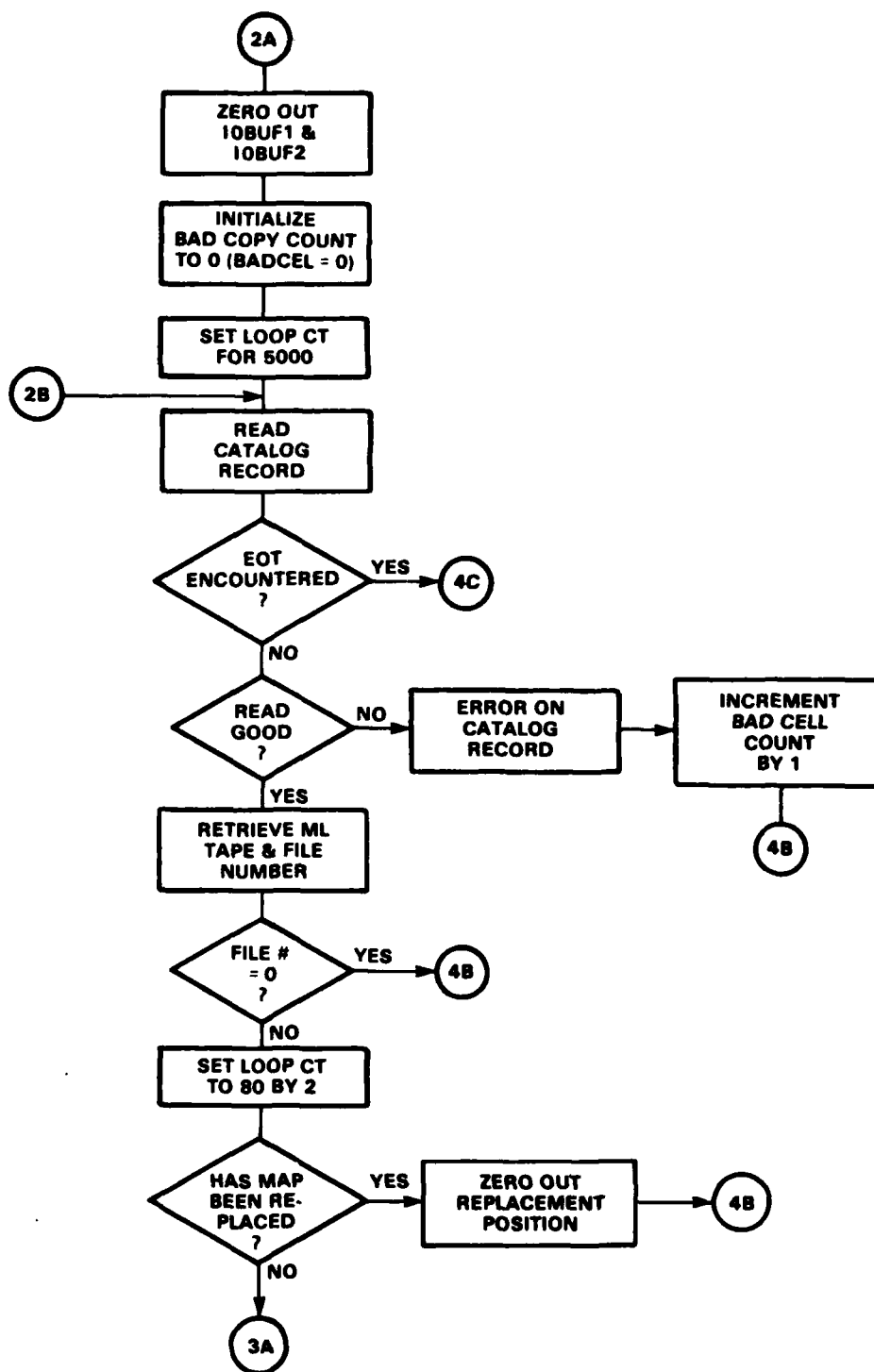Figure 4-40. GBGRTN Flow Diagram (Page 1 of 5)

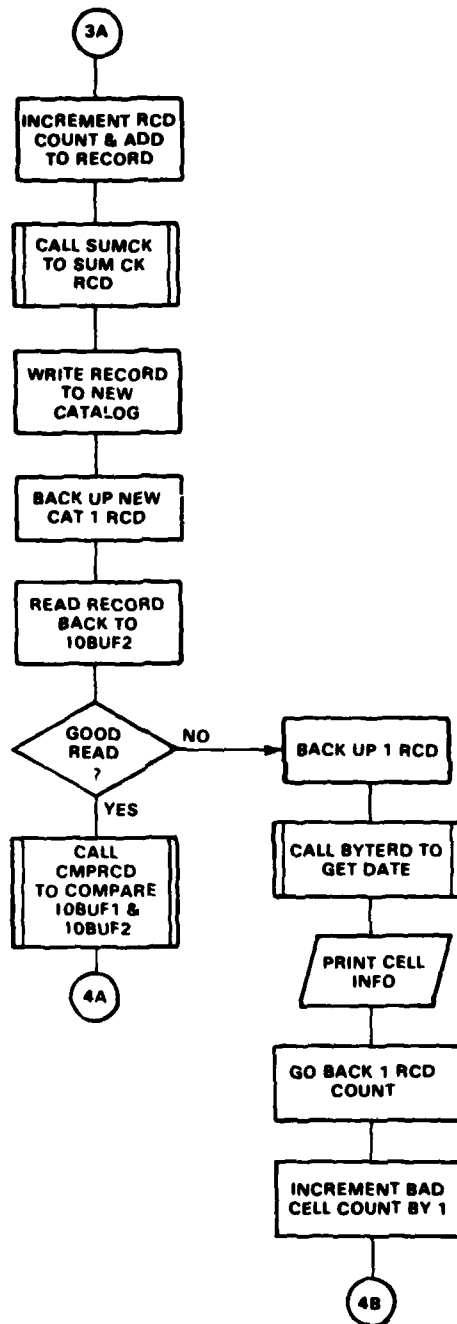Figure 4-40. GBGRTN Flow Diagram (Page 2 of 5)
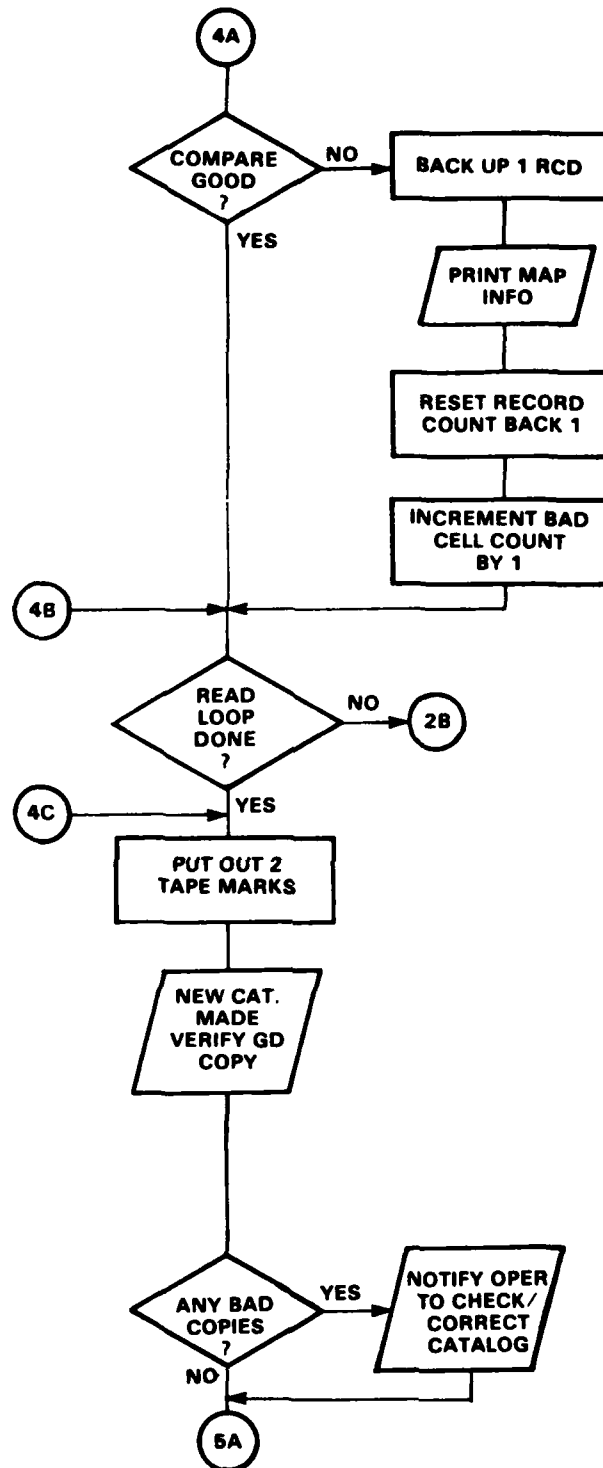
Figure 4-40. GBGRTN Flow Diagram (Page 3 of 5)

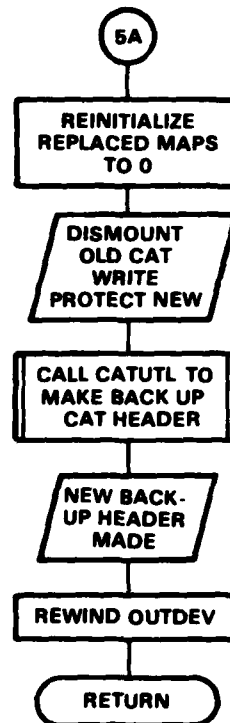Figure 4-40. GBGRTN Flow Diagram (Page 4 of 5)

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Figure 4-40. GBGRTN Flow Diagram (Page 5 of 5)

4.38 GRIDCK

GRIDCK interprets and validates UTM grid zone designators (i.e., 2S, 15K) entered by the operator. It performs a function similar to CRTCK. GRIDCK is called by TPUTL only when library tapes are being created. GRIDCK is used to get the grid zones which will be put on each tape. The grid zone is divided into a prefix and suffix as shown below:

grid zone   2S   15   K

                prefix suffix   prefix suffix

The values for the prefix and suffix, TRFX and TNFX, are returned to TPUTL through the common /TFIND/. A separate common area was required to keep values entered through CRTCK separate from header information.

There is one passed variable, INCR, which identifies the order of the grid zones: INCR = 1 for the first grid zone; INCR = 2 for the second, etc.

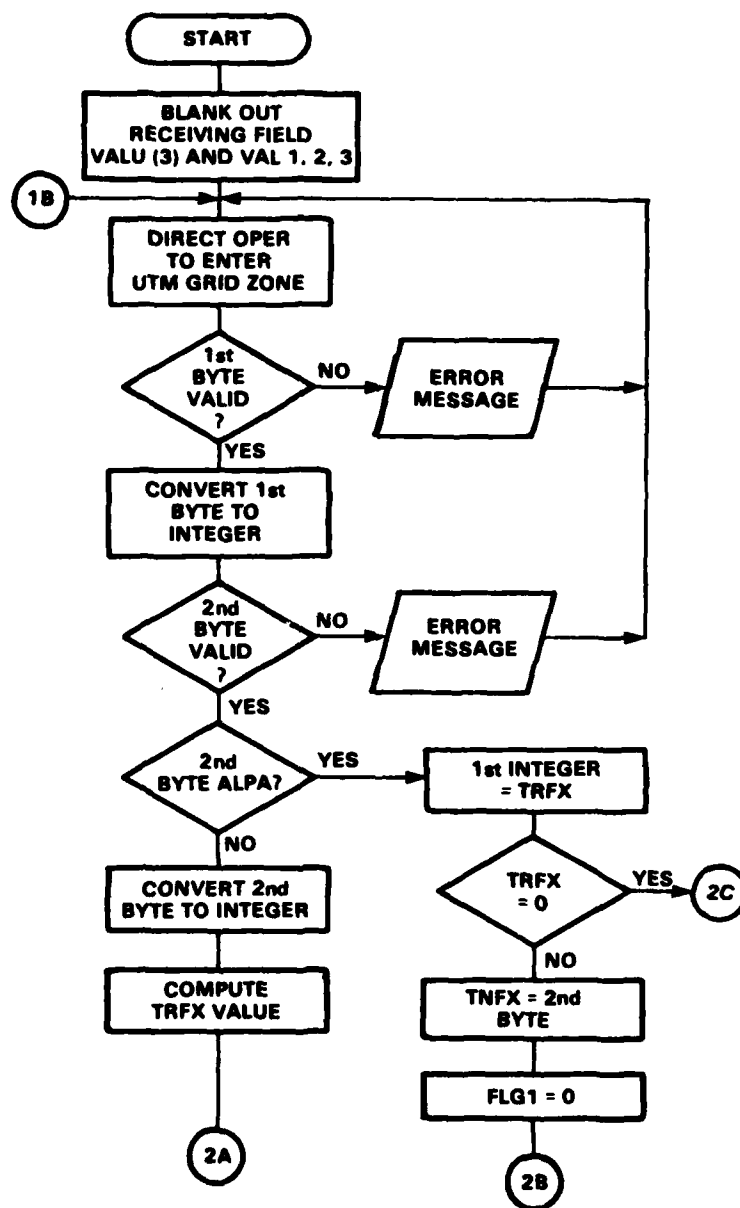Refer to Figure 4-41 for the GRIDCK flow diagram.
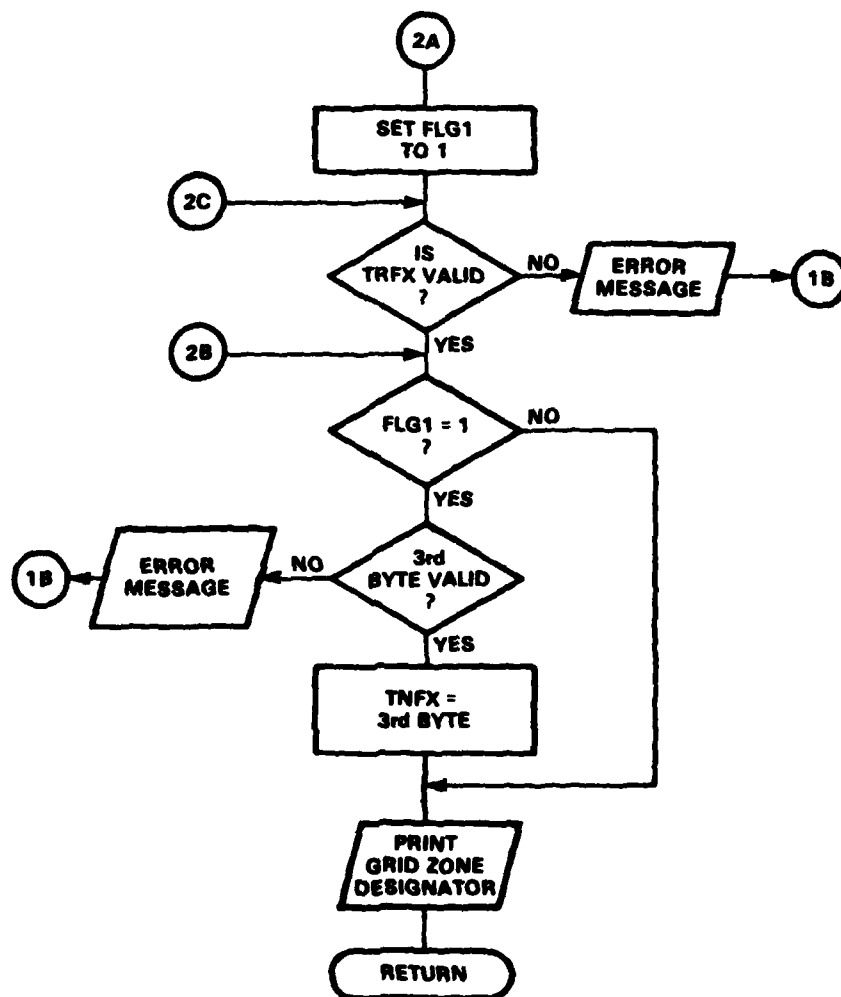
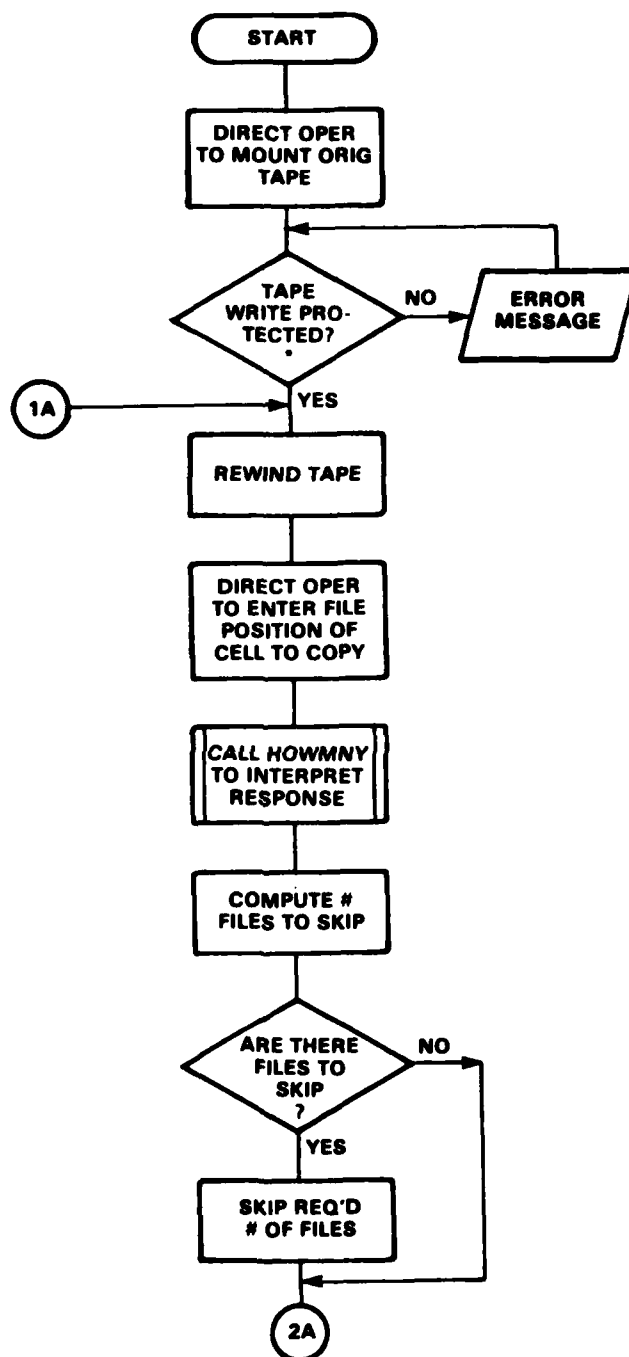Figure 4-41. GRIDCK Flow Diagram (Page 1 of 2)

Figure 4-41. GRIDCK Flow Diagram (Page 2 of 2)

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4.39 FLCPY

FLCPY makes a verbatim copy of a specified file. It enables the operator to create a scratch tape with files in any order. FLCPY is called only from the COPY OPTION menu, COPY FILE option.

The operator is directed to enter the position of the file to be copied, and whether any files already on the scratch tape are to be skipped. Both tapes are then spaced down to the appropriate file space and the file is copied. After each file copy, the operator is given the option to copy another file, end the tape, or just return to the COPY OPTION menu.

Refer to Figure 4-42 for the FLCPY flow diagram.
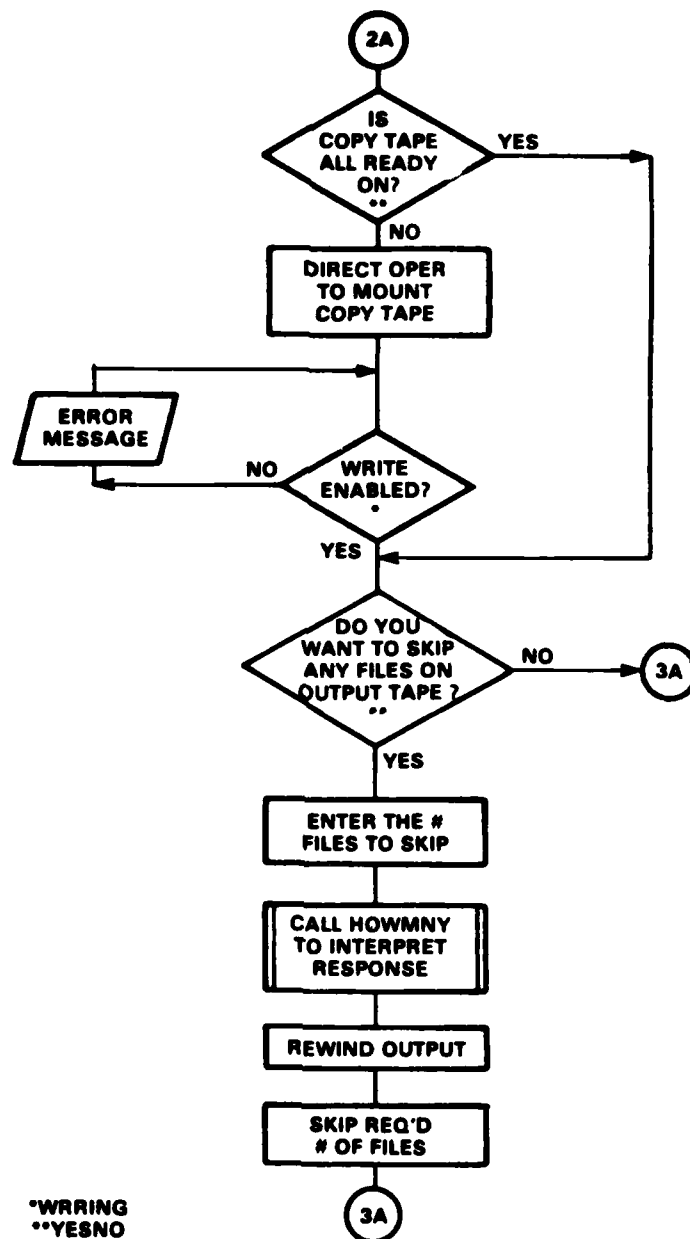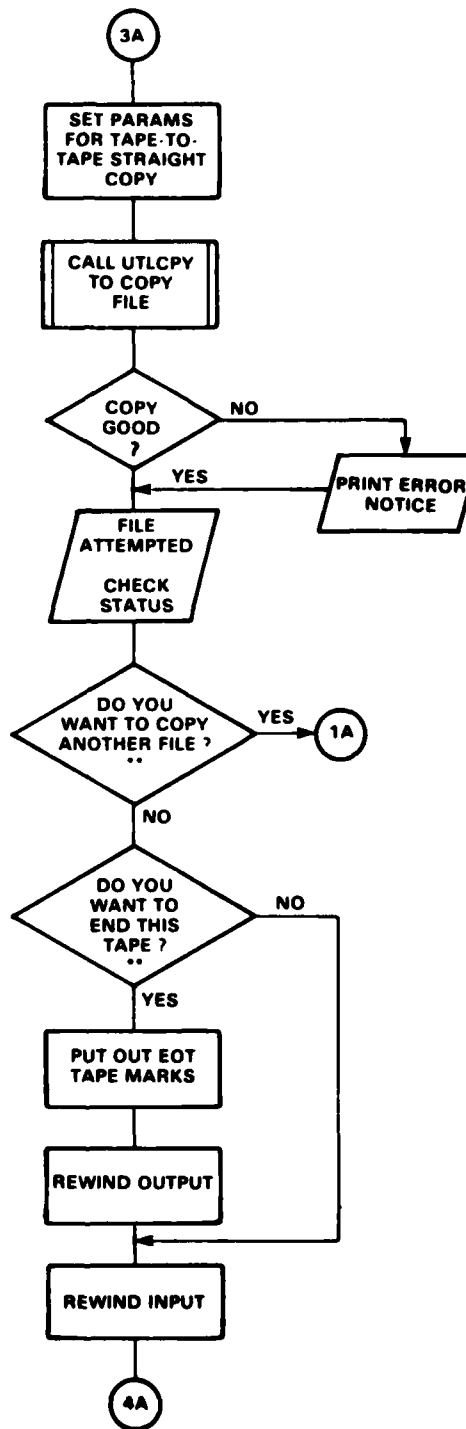
Figure 4-42. FLCPY Flow Diagram (Page 1 of 4)

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Figure 4-42. FLCPY Flow Diagram (Page 2 of 4)

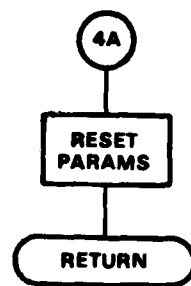4-167

Figure 4-42. FLCPY Flow Diagram (Page 3 of 4)

Figure 4-42. FLCPY Flow Diagram (Page 4 of 4)

SECTION 5

COMPUTER PROGRAM LISTINGS

This section contains the computer program listings for the FFDTDVLDS. An explanation of the operating system SIO subroutine is given below to help the reader to fully understand these listings.

SIO

The SIO subroutine is the nonstandard system I/O call used throughout the library program to perform the following operations: read, write, pass records or files, and finalize. The routine has six passed parameters:

CALL SIO (FUNCTION, DEVICE, ARRADR, WDCNT, STATUS, WDSDONE)

FUNCTION defines the function that SIO is to perform:

0 = Read	5 = Pass File Forward
1 = Write	6 = Finalize
2 = Initialize	7 = Rewind
3 = Pass Record Forward	8 = Pass File Backward
4 = Pass Record Backward	

DEVICE is the logical number assigned to a given device:

1 = T1	6 = PRINTR
2 = T2	7 = RAMTEK
3 = T3	8 = RAYMOND
4 = T4	9 = CARD READER
5 = UNISCOPE	

ARRADR is the location (word or array) to be loaded or read from.

WDCNT is the index count for various functions:

- For Read or Write functions, WDCNT is the number of 16-bit words to be read or written out. The maximum for a single call is 32,767.

- For the Initialize or Rewind functions, WDCNT has no effect.

● For the Pass Record or Files functions, WDCNT is the number of records or files to be passed forward or back.

● For the Finalize function, WDCNT is the number of termination marks to be output. A maximum of 63 is allowed.

STATUS is returned by the system; it indicates the status of the operation:

0 = Good Operation
1 = Bad Packet or Fatal I/O Error
2 = End-of-File Encountered

WDSDONE gives the number of words read or operations actually performed.

5.1	MASTER	5.21	CATUTL
5.2	CPYDOC	5.22	TPUTL
5.3	RDTAPE	5.23	WFUTL
5.4	LIBCPY	5.24	CATUPD
5.5	ENTTP	5.25	WFUPD
5.6	CLLTP	5.26	UNSRTD
5.7	UTLCPY	5.27	CATLST
5.8	XFRFIL	5.28	LOCFLS
5.9	CHOICE	5.29	FDMPNU
5.10	TPTP	5.30	POSTAP
5.11	RSUMCK	5.31	DSPLAY
5.12	RDWR	5.32	WRRING
5.13	JMPSW	5.33	YESNO
5.14	RDWKTP	5.34	SELECT
5.15	EODPRC	5.35	HOWMNY
5.16	LBTPFD	5.36	ZERO
5.17	CATFND	5.37	GBGRTN
5.18	CRTCK	5.38	GRIDCK
5.19	CMPRCD	5.39	FLCPY
5.20	BDCMP		

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