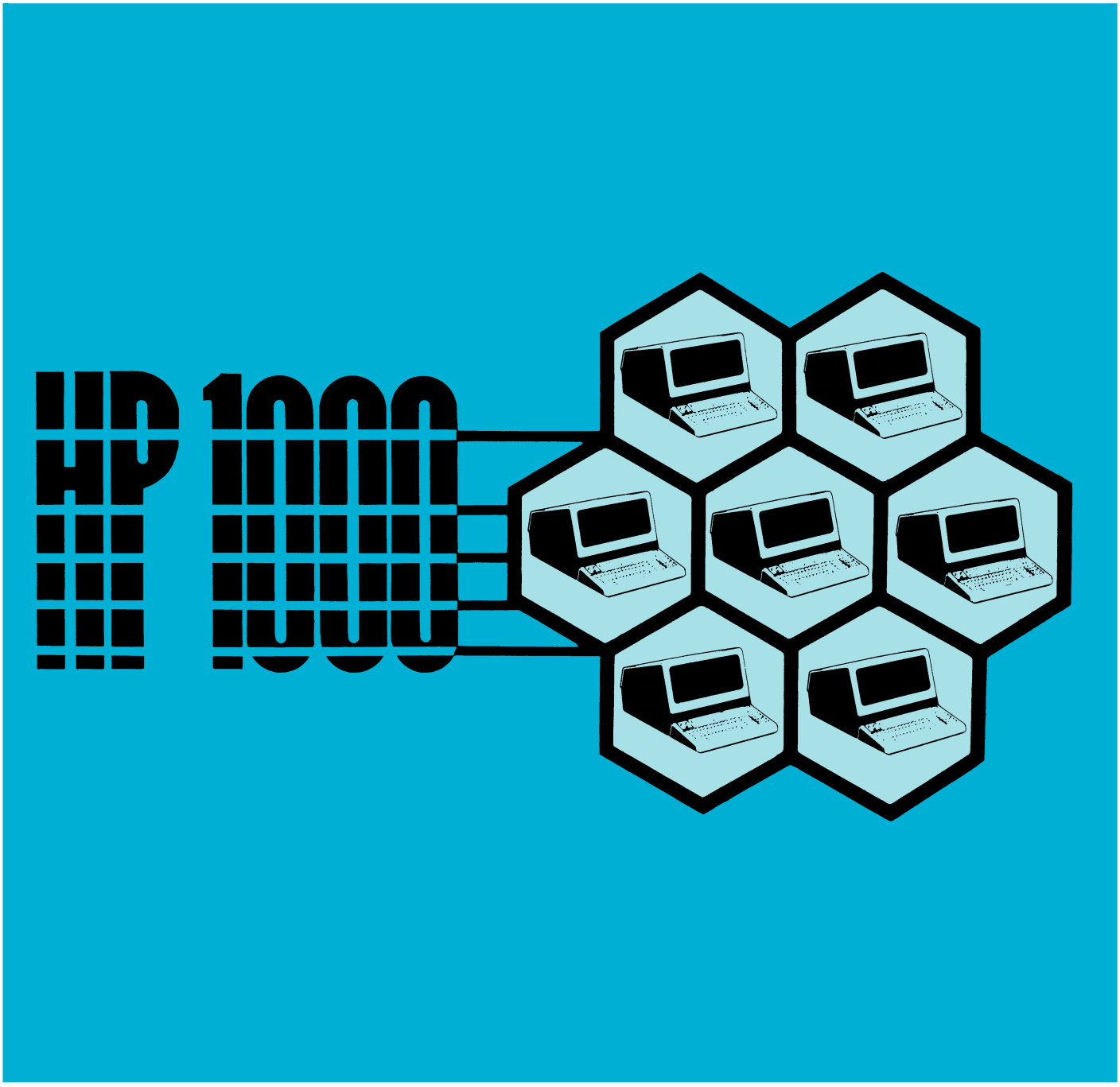
HEWLETT PACKARD

HP 92068A
Utility Programs

Reference Manual



RTE-IVB
UTILITY PROGRAMS

Reference Manual

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PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what software manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

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PREFACE

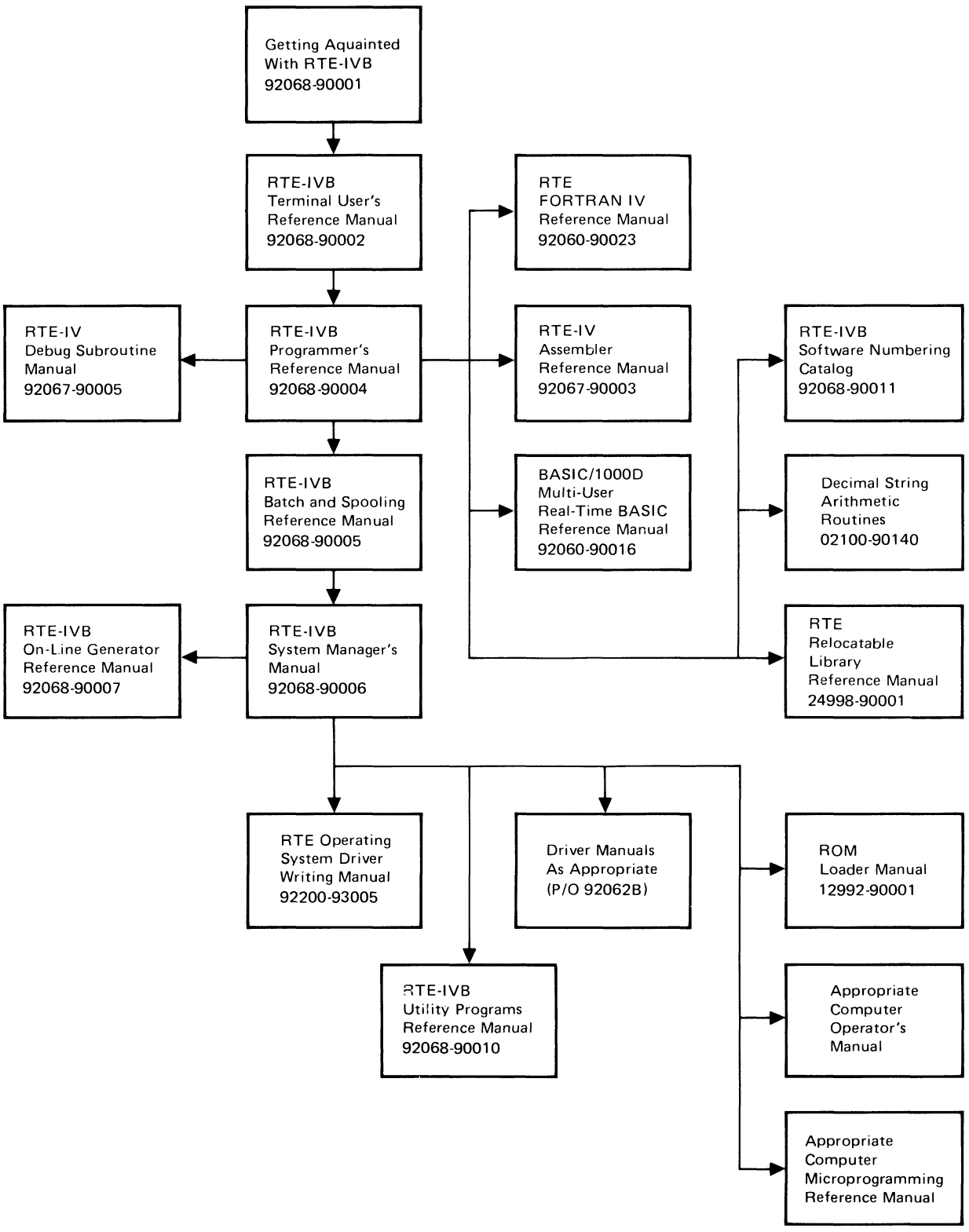
This manual describes the utility programs available as part of the Real-Time Executive (RTE-IVB) operating system. As new utilities are added to the system, they will be documented in this manual.

Anyone using these utilities should be familiar with the RTE-IVB operating system in which they are to be used. The RTE-IVB operating system is described in the following manual:

RTE-IVB Programmer's Reference Manual (part number 92068-90004).

Other manuals of interest to the RTE user are shown in the Documentation Maps following this preface.

RTE-IVB DOCUMENTATION MAP



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ILLUSTRATIONS

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SECTION I INTRODUCTION

1-1. INTRODUCTION

The following disc utility programs are available in RTE-IVB:

ICD/MAC Disc Backup Programs	Save data from disc to magnetic tape. Restore data saved on magnetic tape to disc. Copy data from disc to disc. These programs are NOT compatible with the 7900 Disc Backup Programs.
FORMT	Spare a disc track. Initialize a hard disc. Format a floppy disc.
7900 Disc Backup Programs	Save data from disc to magnetic tape. Restore data saved on magnetic tape to disc. Copy data from disc to disc. These programs are NOT compatible with the ICD/MAC Disc Backup Programs.
Disc Update Program	Replace disc files with files stored on mini-cartridge tape.
Flexible Disc Backup Utility	Save data from a 9885 flexible disc to magnetic tape. Restore data saved on magnetic tape to a 9885 flexible disc.
FC	Copy files between disc cartridges and magnetic tape.
File Analysis Utilities	Identify external references and specific character patterns in a source file.
FPORT	Physically transport files between HP 1000 and HP 9000 systems.

1-2. OPERATING ENVIRONMENT

These utilities operate under the following environment:

HP 1000 M/E/F Computer

RTE-IVB Operating System

The following discs are supported by one or more utilities:

1. ICD (Integrated Controller Disc) — 9895 flexible disc, 7906H, 7920H, 7925H discs using driver DVA32.
2. MAC (Multiple Access Controller) — 7905, 7906, 7920, 7925 discs using driver DVR32.
3. 7900 disc using driver DVR31.
4. 9885 flexible disc using driver DVR33.

The desired disc drivers must be generated into the system.

All the utilities may be generated or loaded on-line with no conflicts. Relocatable modules and program names are unique to avoid duplication. Each set of utilities is designed to work with specific hardware. Although some are similar in functions, they are not compatible and any attempt to mix usage will result in an error. For example, you cannot save disc information with the ICD/MAC Disc Backup Utility and restore it with the 7900 Disc Backup Utility.

The ICD/MAC Disc Backup and FORMT Programs lock themselves into memory. Therefore, your generation should allow background programs to do memory lock.

The FORMT program locks all discs which are on the same EQT as the LU being referenced. Any other I/O activity on this EQT will be severely limited or non-existent during that time. Refer to the appropriate sections in this manual for more information.

ICD/MAC DISC BACKUP UTILITY PROGRAMS

SECTION II

2-1. INTRODUCTION

The ICD (Integrated Controller Disc)/MAC Multiple Access Controller) Disc Backup Utility programs allow you to:

1. Save — transfer data from disc to magnetic tape (on-line only).
2. Restore — transfer saved data from magnetic tape back to disc.
3. Copy — transfer data from one disc to another

The ICD/MAC Disc Backup Utility programs are supported on RTE-IVB with a revision code of 2001 or greater. This utility is supported with the following devices:

1. 7905, 7906, 7920, and 7925 disc drives (13037B/C MAC disc controller card).
2. 9895 flexible disc (on-line use only) and 7906H, 7920H, and 7925H disc drives (12821A ICD disc interface card).
3. 7970 (9 track) magnetic tape drive.
4. Consoles using drivers type DVR00 or DVR05.

Disc driver DVR32 is used with MAC discs and disc driver DVA32 is used with ICD discs. Disc driver DVR33 is used with the 9885 flexible discs.

NOTE

> The 7900 disc is not supported by the ICD/MAC Disc Backup Utilities. Refer to the 7900 Disc Backup Utilities section of this manual.

The backup utilities are divided into on-line (under the control of RTE-IVB) and off-line (as a stand-alone program) programs. On-line it is possible to save an LU (logical unit) or disc unit, copy an LU or disc unit and restore an LU or disc unit previously saved. The same utility operations may be performed off-line except for the save. There is no off-line equivalent of the on-line save. Data is transferred on a track to track basis. Before using the backup utilities some differences should be noted.

1. The system part of the disc (LU2 and LU3) can not be copied to or restored on-line. RTE is self-protecting and will not allow its system disc areas to be over written. If you try to restore to LU2 or LU3, the utility will give you a warning. Any LU or subchannel may be restored or copied to off-line.

2. Track sparing and initialization are done automatically in the off-line restore and copy operations but they cannot be done on-line.

Table 2-1 shows the permitted save-restore combinations.

Table 2-2 describes the ICD/MAC Disc Backup Utilities briefly.

Table 2-1. ICD/MAC Disc Backup Save-Restore Combinations

SAVE \ RESTORE	ON-LINE		OFF-LINE
	LU	UNIT	
On-line LU	X		X
On-line UNIT		X	X
Off-line Saves are not allowed.			

Table 2-2. ICD/MAC Disc Backup Utility Applications

FUNCTION \ MODE	ON-LINE	OFF-LINE
SAVE LU	LSAVE: Saves all tracks on one sub-channel (not just FMGR files). Off-line REstore will do track sparing.	NOT AVAILABLE
SAVE UNIT	USAVE: Saves all tracks on disc according to track map table. Off-line restore will do track sparing.	NOT AVAILABLE
RESTORE LU	RESTR: Restore all tracks on one sub-channel from an LSAVE tape without shutting down system.	RE: Restore all tracks on one sub-channel from an LSAVE tape. Track sparing is done.
RESTORE UNIT	RESTR: For peripheral disc units (not LU 2 or LU 3), you can restore from a USAVE tape. The track map tables must match.	RE: Only way to restore a UNIT save with LU 2 or LU 3. Track sparing is done.
COPY LU	LCOPY: For backup of disc LU's if no magnetic tape is available.	CO: For backup of disc LU's if no magnetic tape is available. Track sparing is done.
COPY UNIT	NOT AVAILABLE	CO: Can only be done by copying each subchannel. For backup of disc LU's if no magnetic tape is available. Track sparing is done.

9895 Flexible Disc cannot be used with off-line utility.

2-2. COMPATIBLITY AMONG OTHER DISC BACKUP UTILITIES

The ICD/MAC backup utility and 7900 backup utility are two separate sets of programs that perform similar functions. Each set of programs is designed to work with specific hardware. Although the ICD/MAC backup utilities are similar to the 7900 backup utilities, they are not compatible and their programs are not interchangeable. Data saved with one set of utility programs may not be restored with the other set of utility programs. An attempt to mix the two sets will result in an error.

Neither of these utilities are compatible with the READT/WRITT utility described in Chapter 6 of the RTE-IVB Terminal User's Manual. However, all three types of utilities may be loaded into the same RTE-IVB system and used. The relocatable modules and entry points are all different to avoid duplication. Table 2-3 shows the various discs supported by the three sets of utilities.

Table 2-3. Utilities Disc Compatibility

UTILITIES / DISCS	ICD/MAC DISC BACKUP	7900 DISC BACKUP	*READT/WRITT
7900		X	X
ICD	X		X
MAC	X		X

*READT/WRITT does not support unit restore/save.

2-3. COMPATABILITY AMONG DISC MODELS

The ICD/MAC backup utility saves, copies, and restores disc by logical unit or subchannel. The utility does not use any directory or file structure information but does all data transfers on a track to track basis. This means discs used in copies must have the same track size. Data saved from a disc must be restored to a disc with the same track size.

Listed below are the discs that are supported and their respective track sizes.

Table 2-4. ICD/MAC Disc Configurations

RANGE OF DISC TYPE	CYLINDER NO.	NO. OF TRACKS	NO. OF SURFACES	HEAD NUMBER	TRACK SIZE (# WORDS PER TRACK)
9895	0-76	1-154	1-2	0-1	3840
7905	0-410	1-1233	1-3	0-2	6144
7906(H)	0-410	1-1644	1-4	0-3	6144
7920(H)	0-822	1-4115	1-5	0-4	6144
7925(H)	0-822	1-7407	1-9	0-8	8192

If you try to copy between discs of different track size or try to restore a tape file to a disc with a different track size from the disc it was saved from, an error message will be given. For example, you can restore a 7906 disc from magnetic tape to a 7920 disc (either MAC or ICD) because both discs have 6144 words per track. You cannot restore a 7906 disc from magnetic tape to a 7925 disc because a 7925 disc has 8192 words per track.

During an on-line restore of a unit-save, the track map tables stored on the magnetic tape and on the destination system disc must match. Otherwise, the on-line restore operation stops. Tables 2-5 and 2-6 show data transfers allowed by the on-line and off-line programs.

Table 2-5. ICD/MAC Disc Backup On-line Data Transfers

DESTINATION / SOURCE	7905 7906(H) 7920(H)	7925(H)	9895	TAPE
7905 7906(H) 7920(H)	LCOPY	N/A	N/A	LSAVE & USAVE
7925(H)	N/A	LCOPY	N/A	LSAVE & USAVE
9895	N/A	N/A	LCOPY	LSAVE & USAVE
TAPE	RESTR	RESTR	RESTR	N/A

N/A Not Allowed

Table 2-6. ICD/MAC Disc Backup Off-line Data Transfers

DESTINATION / SOURCE	7905 7906(H) 7920(H)	7925(H)	9895*	TAPE
7905 7906(H) 7920(H)	CO	N/A	N/A	N/A
7925(H)	N/A	CO	N/A	N/A
9895	N/A	N/A	N/A	N/A
TAPE	RE	RE	N/A	N/A

N/A Not Allowed
*9895 Flexible Disc is used on-line only.

2-4. ON-LINE OPERATIONS

The on-line utility programs run under the control of RTE-IVB. The logical units and subchannels are defined by the track map table(s) currently defined in the system. The on-line programs are:

LSAVE — to save one LU or subchannel to magnetic tape.

USAVE — to save all the subchannels on a disc unit to magnetic tape.

RESTR — to restore a subchannel or LU previously saved on magnetic tape by LSAVE or USAVE back to disc.

LCOPY — copy an LU from one disc lu to another.

All of these programs may be used interactively (except for LCOPY) or done in one RUN command.

Before using the on-line utility programs note the following:

1. LU2 and LU3 can not be copied to or restored on-line.
2. You should only use the utility programs when there is no other system activities affecting the discs you are using. Otherwise, if there is an open FMP (File Management Package) file in the subchannel saved, it will be open when it is restored.
3. When a program completes without an error, it will print "STOP : 0077". A "STOP : 0066" indicates an error in the operation and it should be tried again.
4. No other program should access the disc LU which is being used by LSAVE, USAVE, RESTR and LCOPY. These programs lock all disc drives with the same EQT as the disc LU being accessed for both MAC and ICD discs. Therefore, the system's performance is downgraded during execution of LSAVE, USAVE, RESTR and LCOPY.

2-5. LOADING ON-LINE UTILITIES

The on-line ICD/MAC utility programs are distributed as four relocatable programs and two libraries of relocatable subroutines, $DSCLB (part no. 92067-12002) and $DKULB (part no. 92067-12003). $DKULB is the ICD/MAC Disc Backup Utility Library. $DSCLB is the ICD/MAC Disc Utility Library also needed by the FORMT (see the FORMT section of this manual) and SWTCH (see the RTE-IVB System Manager's Manual) programs. The programs and libraries may be loaded during system generation or by LOADR. The following is a list of the programs and their size requirements.

Table 2-7. ICD/MAC Disc Backup On-line Utilities

PROGRAM	RELOCATABLE FILE NAME (AND PART NUMBER)	PROGRAM SIZE	DEFAULT TYPE (IF GENERATED)
LSAVE	%LSAVE (92067-16344)	17 pages	4
USAVE	%USAVE (92067-16345)	17 pages	4
RESTR	%RESTR (92067-16346)	16 pages	4
LCOPY	%LCOPY (92067-16347)	14 pages	4

All of these programs may be run as type 1, 2, 3, or 4 programs with no SSGA required.

Example of LOADR commands to on-line load LSAVE:

```
:RU,LOADR
/LOADR:    OP,LB          load program as large background.
/LOADR:    RE,%LSAVE      load LSAVE.
/LOADR:    SEA,$DKULB     search the ICD/MAC Disc Backup Utility Library if
                          not already loaded during system generation.
/LOADR:    SEA,$DSCLB     search the Disc Utility Library if not already loaded
                          during system generation.
/LOADR:    END
```

2-6. MAGNETIC TAPE INFORMATION FOR LSAVE, USAVE, AND RESTR

The on-line saves (LSAVE and USAVE) and restore (RESTR) perform their operations starting at the current tape position. The tape is not rewound after a save or restore so you can save more than one LU or subchannel on a tape. You can use the FMGR command CN to position the magnetic tape before doing a utility operation.

If an end-of-tape mark is detected during an operation the program will print the following message and pause:

```
END OF TAPE
MOUNT NEXT TAPE
TYPE GO, <PROG-NAM> TO CONTINUE
```

Mount a new tape and enter "GO,<PROG-NAM>", where <PROG-NAM> is the name of the utility program you are running.

If you are going to use the verify option with USAVE or LSAVE, the magnetic tape EQT should have a large time-out value or a time-out value of zero to indicate no time-out.

The format of the magnetic tape header of each file is described in Appendix A.

2-7. LSAVE

LSAVE is used to save one disc LU or subchannel onto magnetic tape. The data is transferred starting at the magnetic tape's current position and the tape is not rewound after the operation. For each save you have the option of verifying that the data is correctly saved on tape.

Note that LSAVE locks all LUs defined in the Equipment Table (EQT) for the LU given in the command runstring. Therefore, it is recommended that you run this utility when the system is idle.

The RUN command format for LSAVE follows. If optional parameters are omitted, commas must be used as place holders.

:RU,LSAVE [[,log lu],disc lu [,mt lu] [,VE] [,title]]

[log lu] LU of the device where messages are sent. Optional parameter, default is the session LU of your terminal.

disc lu positive LU of the disc subchannel to be saved. UTNDER Session Monitor, the disc lu must be in your SST (Session Switch Table).

[mt lu] LU of the magnetic tape drive. Optional parameter, default=8.

[VE] to verify the tape file after a save.
VE to verify. NO for no verify.
Optional parameter, default=NO.

[title] Up to 40 characters of label information stored in tape header, to identify the tape file. The utility also places the date and run string preceding the title in the header for additional identification. Optional parameter, no default.

To have the program prompt you for the parameters, just enter "RU,LSAVE". Enter a valid response to each question or a space and RETURN to take the default value. If a response is not valid, the question will be repeated. If you enter at least one comma after "RU,LSAVE" but have an incomplete or invalid run string, the program will default all optional parameters and prompt you for any missing or invalid parameter. To stop the program enter /E, EN, or EX in response to a program question.

When the program has completed, it will print the number of tracks saved on the logical device.

EXAMPLES

Save LU 2 onto magnetic tape using LSAVE in the interactive mode:

```
:RU,LSAVE
LOGLU DEFAULT TO        1
DISK LU?
2
MT LU? (DEFAULT=8)
(space, carriage return)
VERIFY?
YES
FILE ID (LABEL)?
LU2 SAVE OF 7906H DISC
   203 TRACKS SAVED       saves 203 tracks to magnetic tape
VERIFYING                 backspaces tape 1 file and reads header
 8:33 AM SAT.,  5 AUG 1979 LU2 SAVE OF 7906H DISC
VERIFY OK                 reads and verifies tape
  LSAVE : STOP 0077       leaves tape at current position
```

Save LU 49 using LSAVE with a run string and no operator intervention:

```
:SL,49,49                    make sure that LU 49 is in your SST
:RU,LSAVE,,49,,VE,LU 49 = CRN AJ (7925)
   203 TRACKS SAVED          saves 203 tracks to magnetic tape
VERIFYING                    backspaces tape 1 file and reads header
 7:13 PM WED., 24 OCT., 1979  LU 49 = CRN AJ (7925)
VERIFY OK                    reads and verifies tape
  LSAVE : STOP 0077
```

2-8. USAVE

USAVE saves all of the subchannels associated with a disc unit (disc drive). The save is done according to the track map table currently defined in the system. As in LSAVE, the data is saved starting at the current tape position and the tape is not rewound after the save. Each save has the option of being verified.

The RUN command format for USAVE follows. If optional parameters are omitted, commas must be used as place holders.

:RU,USAVE [[,log lu] ,disc lu[,mt lu] [,VE] [,title]]

[log lu] LU of the device where messages are sent. Optional parameter, default is the session LU of your terminal.

disc lu LU of any disc subchannel on the unit to be saved. USAVE will search the track map table and save all subchannels on the same unit as the LU given.

[mt lu] LU of the magnetic tape drive. Optional parameter, default=8.

[VE] Verify the tape file after the save.
Enter VE to verify.
Enter NO for no verify.
Optional parameter, default=NO.

[title] Up to 40 characters of information are stored in the tape header to identify the tape file. The utility appends this information to the date and the run string in the tape header for identification.

To have the program prompt you for the parameters just enter "RU,USAVE". Enter a valid response to each question or a space and RETURN to take the default value. If the response is not valid, the question will be repeated.

If you enter at least one comma after "RU,USAVE", but have an incomplete or invalid run string, the program will default all of the optional parameters and prompt you for any missing or invalid parameters. To stop the program enter /E, EN, or EX in response to any program question.

When the program has completed, it will print the number of tracks saved from each lu of the disc unit.

EXAMPLES

Save an entire 7906 disc using USAVE in the interactive mode:

```
:SL,49,49                    make sure that LU 49 is in your SST
:RU,USAVE
LOGLU DEFAULT TO        1
DISK LU?
49
MT LU? (DEFAULT=8)
8
VERIFY?
YES
FILE ID (LABEL)?
UNIT SAVE OF 7906 DISC       start saving the disc.
SAVING SUBCHNNL   00
SAVING SUBCHNNL   01
SAVING SUBCHNNL   02
SAVING SUBCHNNL   03
SAVING SUBCHNNL   04
SAVING SUBCHNNL   05
6 SUBCHANNELS SAVED
VERIFYING                    backspace to beginning of file
 7:13 PM WED., 24 OCT., 1979 UNIT SAVE of 7906 DISC
VERIFY OK                    and verify the save.
  USAVE : STOP 0077
```

2-9. RESTR

RESTR returns data saved on magnetic tape by USAVE or LSAVE to disc. However, RTE-IVB will not permit you to restore the system disc (LU2 or LU3). If LU2 or LU3 are included on a USAVE file, RESTR will skip LU2 or LU3 and continue restoring the remaining subchannels.

Track sparing and initialization will not be performed.

The RUN command format for RESTR follows. If optional parameters are omitted, commas must be used as placeholders.

:RU,RESTR [[,log lu] ,disc lu [,mt lu] [,DE]]

[log lu] LU of the device where messages are sent. Optional parameter, default is the session LU of your terminal.

disc lu Destination disc LU of the restore. If the file being restored was saved with LSAVE, RESTR will restore the tape file to this disc LU. If the tape file was saved with USAVE, the track map table of the current system must match the track map table of the USAVE system as recorded in the tape header. In restoring either a USAVE tape file or a LSAVE tape file, the disc being restored must have the same track size (words per track) as the source save disc. (See Disc Configuration Table 2-4.)

[mt lu] LU of the magnetic tape drive. Optional parameter, default=8.

[DE] Do not confirm the magnetic tape header. The program will list the tape file header and restore the disc LU or unit without further operator intervention.

If the DE option is not specified, the program lists the tape file header and asks for confirmation:

OK?

The response may be:

YE[S]	— restore the magnetic tape file to the disc.
NO	— move the tape forward to the next file, print its header, and ask to continue.
EN, /E, or EX	— stop the program.

If more than "RU,RESTR" is entered in the run string but there are missing parameters, RESTR will ask for them. Enter a valid response or a space and RETURN to take the default value. If a response or parameter is not valid, the question will be asked again.

Enter /E, EN, or EX to any question to stop the program.

If the source LU on the tape file has more or less tracks than the destination lu, the program prints the decimal track sizes to your terminal:

```
XXXX TRACKS IN SOURCE LU
YYYY TRACKS IN DEST. LU
OK TO PROCEED?
```

If you enter "YES", the program copies tracks until it has restored the last track of the destination LU or the last track of the source file LU, whichever LU is smaller.

After any RESTR is complete, the program prints:

```
NO. OF TRACKS RESTORED XXXX
RESTR : STOP 0077
```

CAUTION

When restoring a disc LU with FMGR files and directory track(s), be careful if you try to restore to a disc LU with less tracks than the source LU. The directory track may not be copied and the restore would not be valid. However, to restore to a disc LU with more tracks, you must do a complete FMGR MC command to recover the valid directory. In the MC command, specify the correct number of tracks restored from the source disc LU.

EXAMPLES

Restore LU 49 from magnetic tape to disc using RESTR in a run string and no operator intervention:

```
:SL,49,49                    make sure LU 49 is in your SST
:RU,RESTR,,49,,DE
 7:13 PM WED., 24 OCT., 1979 LSAVE,,49,,VE,LU49=CRN AJ 7920
TAPE # 01
NO. OF SUBCHANNELS BEING RESTORED    01
NO. OF TRACKS RESTORED    0203
  RESTR : STOP 0077
```

Try to restore LU 47 (originally from a 7920 disc) from magnetic tape to LU 22 on a 7906H disc:

```
:SL,22,22                    make sure LU 22 is in your SST
:RU,RESTR,,22,8
 8:15 PM WED., 24 OCT., 1979 LSAVE,,47,,VE,LU47=CRN AJ 7920
TAPE # 01
OK?
YES
NO. OF SUBCHANNELS BEING RESTORED    01
  0140  TRACKS IN SOURCE LU        Source LU 47 had 140 tracks.
  0203  TRACKS IN DEST. LU         Dest. LU 22 has 203 tracks.
OK TO PROCEED?YES
NO. OF TRACKS RESTORED    0140
  RESTR : STOP  0077


:MC,-22,P,140,LU022,1,22           Mount LU 22 specifying the 140
                                   tracks restored originally from
                                   LU 47 and recover the directory
                                   track.
```

Restore LU 49 from magnetic tape to disc using RESTR in the interactive mode:

```
:SL,49,49                    make sure that LU 49 is in your SST.
:RU,RESTR
LOGLU DEFAULT TO     1
DISK LU?
49
MT LU? (DEFAULT=8)
8
 7:13 PM WED., 24 OCT., 1979  LSAVE,,49,,VE,LU49=CRN AJ 7920
TAPE # 01
OK?
YES
NO. OF SUBCHANNELS BEING RESTORED    01
NO. OF TRACKS RESTORED    0203
  RESTR : STOP  0077
```

2-10. LCOPY

LCOPY can copy one disc LU to another disc LU. The source and destination LU may or may not be subchannels at the same disc unit but the source and destination track size (words per track) must be the same. (See Disc Configuration Table 2-4.)

Track sparing and initialization are not performed on-line.

The RUN command format for LCOPY follows:

:RU,LCOPY,source disc LU,destination disc LU

source disc LU	LU of the disc subchannel to copy from.
destination disc LU	LU of the disc subchannel to copy to (cannot be LU2 or LU3).

All parameters are required in the run string. There are no defaults. Messages are always output to your terminal. LU 2 and LU 3 may be source disc LU's but never destination LU's.

If the source LU has more or fewer tracks than the destination LU, the program prints the decimal track sizes to your terminal.

```
XXXX TRACKS IN DEST LU
YYYY TRACKS IN SOURCE LU
OK TO PROCEED?
```

If you enter YES, the program copies tracks until it has copied the last track of the source LU or has copied to the last track of the destination LU, whichever LU is smaller.

After the LCOPY is complete the program prints:

```
XXXX TRACKS COPIED
    LCOPY : STOP  0077
```

CAUTION

When copying a disc LU with FMGR files and directory track(s), be careful if you try to copy to a destination disc LU with less tracks than source LU. The directory track may not be copied and the copy would not be valid. However, to copy to a destination disc LU with more tracks, you must do a complete FMGR MC command to recover the valid directory. In the MC command, specify the correct number of tracks copied from the source disc LU.

EXAMPLES

Copy LU 46 onto LU 49:

```
:SL,46                      make sure that LU 46 and LU 49 are in
:SL,49,49                   your SST.
:RU,LCOPY,46,49             copy disc LU 46 to disc LU 49.
   203 TRACKS IN DEST LU
0203 TRACKS COPIED
  LCOPY : STOP  0077
```

Copy LU 22 onto LU 23; both are on a 7906 disc but with different track sizes:

```
:SL,22,22                   make sure LU 22 and LU 23 are defined
:SL,23,23                   in your SST.
:RU,LCOPY,22,23
   203 TRACKS IN DEST LU    Dest. LU 23 has 203 tracks.
   140 TRACKS IN SOURCE LU  Source LU 22 has 140 tracks.
OK TO PROCEED?
YES
0140 TRACKS COPIED
  LCOPY : STOP  0077

:DC,-23,RR
:MC,-23,P,140,LU023,1,23    Mount LU 23 specifying the 140
                            tracks copied originally from LU 22
                            and recover the directory track.
```

2-11. ON-LINE BACKUP UTILITIES ERROR MESSAGES

MESSAGE	EXPLANATION AND ACTION
BAD TRACK AT:	TRACK # CYL HEAD UNIT/ADDR XXXX CCCC HHHH UUU The track is defective or ten tries have been made to read or write without success. Program continues operation. Off-line restore and copy will spare bad tracks automatically. The FORMT utility may also be used to spare bad tracks.
CANNOT RESTORE TO LU2 OR LU3	Attempt to restore to LU2 or LU3 is not allowed. Program stops.
ILLEGAL DISC LU	LU specified for disc does not belong to a valid disc type or is not in your SST. Re-enter the number.
ILLEGAL MT LU	LU specified for MT does not belong to a valid MT device type or is not in your SST. Re-enter the number.
ILLEGAL VERIFY PARAMETER — DEFAULT TO NO VERIFY	The verify parameter is invalid, program assumes no verify and continues operation.

MESSAGE	EXPLANATION AND ACTION
MAG TAPE DOWN	The LU for the MT indicates "DOWN" status. Up the EQT for the LU.
MAG TAPE OFF LINE	The magnetic tape is off-line. Re-run the program when the tape is ready.
MT LU LOCKED	The magnetic tape LU is locked to another program. Program stops.
MT PARITY ERROR	Program encounters parity error from the magnetic tape. Program stops.
MT XMIT ERROR	The number of words transferred to or from the MT is zero. Check the EQT, driver and select code and re-start the program.
TAPE EOF ILLEGAL	Program reaches end-of-tape on magnetic tape unexpectedly on a RESTORE operation. Program stops.
TAPE FORMAT ERROR	Header information in the magnetic tape does not match the expected format (possibly wrong tape is mounted).
TRACK MAP TABLES DO NOT MATCH	For on-line UNIT restore operation, the track map table saved in the MT header must match the one in the current system. Program stops.
TRACK SIZES NOT EQUAL	Copy or restore to a disc with different track size (words per track) as the source disc is not allowed. Program stops.
SEEK ERROR	Hardware disc seek check error occurs. Program continues operating. Insure that the track map table matches the disc model and UNIT/address.
WRITE RING MISSING	The write ring is missing from the magnetic tape during a SAVE operation. Put the write ring on and re-run the program.
WRITING ON PROTECTED TRACKS	On-line restore program encounters a track which is protected. Program continues operation although tracks may not be restored properly.
VERIFY DATA ERROR-TRK X	An error has occurred while verifying on logical track number X.
UNABLE TO LOCK PROGRAM IN MEMORY WARNING: DEADLOCKS MAY OCCUR!	Memory lock for background programs is not allowed. Care should be taken to keep other programs from accessing the EQT of the LU's involved. Execution continues.
UNSUPPORTED DISC	The LU being accessed is not an ICD or MAC disc. Program terminates.

2-12. OFFLINE OPERATIONS

The off-line backup utility is implemented through the stand-alone program. RTE-IVB and file manager are not involved in any off-line operations. This means that information about system defined LU's or subchannels must be supplied to the utility by the user. All data transfers are therefore specified by physical disc location (i.e., # of tracks, first cylinder, # of surfaces, etc.).

Track sparing is automatically done in the off-line utility.

The 9895 flexible disc cannot be used with the off-line utility.

2-13. LOADING THE OFF-LINE UTILITY USING A LOADER ROM

The off-line utility program is stored in a type 1 file named !DISK (part no. 92067-16348). You can store this file on magnetic tape, paper tape, or mini-cartridge. To use the file, use the appropriate ROM loader to load !DISK. Appendix A of the RTE-IVB System Manager's Manual describes how to load !DISK from mini-cartridge. Also refer to the HP 12992 Loader ROM's Installation Manual (part no. 12992-90001). A summary of loading !DISK is as follows:

1. At the computer control panel:

   HALT the computer.

   Select and CLEAR the S-Register, then

   set bits 15-14 to the location of the Magnetic Tape Loader ROM.
   set bits 11-6 to the magnetic tape unit select code.
   set bit 5 (to indicate a slow boot is desired).

   Press STORE, PRESET, IBL, then PRESET again.

   Press RUN. A HLT 77 shoult occur (102077 octal displayed).

2. At this point, the utility is preconfigured for magnetic tape and a DVR05 console as follows:

Device	Select Code (octal)
System Console	14
Magnetic Tape	16
Time Base Generator	10

   If you want this configuration, set the S-register to 0. Otherwise, you can reconfigure these select codes by setting the S-register as follows:

   Bits 0-5 console select code (DVR05 or DVR00)
   Bits 6-11 magnetic tape select code
   Bits 12-15 Time Base Generator select code

   Select codes for the system console and the TBG must be defined by this point. The off-line utility itself does not allow LU1 (system console) nor the TBG to be reconfigured.

   Press the STORE switch.

3. Set the P-register to 2 and press the STORE switch.

4. Press PRESET and RUN.

After the above steps have been correctly executed, the system console will be used to send messages and receive replies. The utility now starts by asking you to reconfigure the drivers. If the system console is not responsive, then check all of your steps and repeat this sequence.

Proceed to the "RECONFIGURE DVA32 AND DVR32" Section of this manual.

2-14. LOADING THE OFF-LINE UTILITY USING !MTLDR

If you do not have a magnetic tape loader ROM, you can still load !DISK from magnetic tape. Use FMGR DU or ST to store the !DISK file on magnetic tape and the following procedure to load it:

1. Store !MTLDR (part no. 92067-16512) on paper tape or on mini-cartridge.

2. Load !MTLDR into memory as follows:

   HALT the computer.

   Select and CLEAR the S-Register, then

   set bits 15-14 to the location of the Cassette Loader ROM.
   set bits 11-6 to the terminal select code.

   Press STORE, PRESET, IBL, then PRESET again.

   Press RUN. A HLT 77 should occur (102077 octal displayed).

3. Mount !DISK on the magnetic tape drive.

4. Set the S-register as follows:

   Bits 0-5 = 0
   Bits 6-11 = magnetic tape select code
   Bits 12-15 = 0
   Press STORE

5. Set the P-register to 2 and press the STORE switch.

6. Press PRESET and RUN.

   !MTLDR will execute loading the !DISK utility executing a HLT 77B when completed. If !DISK is loaded incorrectly, a HLT 11B is displayed on the front panel of the computer.

7. When !DISK is loaded, set the S-register as follows:

   Bits 0-5 console select code (DVR05 or DVR00)
   Bits 6-11 magnetic tape select code
   Bits 12-15 Time Base Generator select code

   Select codes for the system console and the TBG must be defined by this point. The off-line utility itself does not allow LU1 (system console) nor the TBG to be reconfigured.

   Press the STORE switch.

8. Set the P-register to 2 and press the STORE switch.

   !DISK executes and you should proceed to the "RECONFIGURE DVA32 AND DVR32" Section of this manual.

2-15. RECONFIGURE DVA32 AND DVR32

After the utility has been loaded, it prints a header (e.g., DISK BACKUP UTILITY REV. 2001 790830), and displays the current I/O configuration. The following drivers are preconfigured in the utility:

LU	Driver	Select Code
1	DVR00 or DVR05	14 (Console)
4	DVA32	13 (12821A ICD Interface Card)
5	DVR32	11 (13037B/C MAC Disc Controller Card)
8	DVR23	16 (Magnetic Tape)

!DISK asks you to reconfigure the select codes for DVR32 and DVA32:

ENTER SELECT CODE FOR DVR32, DVA32:

Enter one of the following answers:

a. DVR32 select code and DVA32 select code separated by a comma to change the drivers select codes. A zero value does not change the select code.

b. /E, EN, or EX and carriage RETURN if you do not wish to change these select codes.

Examples:

21,25 change MAC card to select code 21 and the ICD card to select code 25.

21,0 the MAC card is at select code 21 and the ICD card select code is not changed.

0,25 the MAC card select code is not changed and the ICD card is at select code 25.

After specifying the select codes, !DISK prompts you with:

TASK?

which you answer with one of the off-line utility tasks.

2-16. OFF-LINE UTILITY TASKS

After configuring the disc select codes, the utility is ready to perform task. The following is a list of the tasks you can perform (check respective sections for more detail):

IO	List current I/O configuration and ask for reconfiguration.
RE	Restore magnetic tape file to disc lu or subchannel.
CO	Copy one disc subchannel to another disc subchannel.
RW	Rewind magnetic tape.
FF [,n]	Forward space magnetic tape n files, default of n=1.
BF [,n]	Backward space magnetic tape n files, default of n=1.

NOTE

All saves, restores, and copies of the 9895 flexible disc should be done with the on-line utilities. Since the off-line utility does not do formatting of flexible discs, the off-line utility can not be used with the 9895.

2-17. IO — I/O CONFIGURATION

After entering the IO command in response to TASK?, the utility prints the current I/O configuration and asks to be reconfigured.

LU	EQT	S.CHN	S.C.	Driver
1	1	1	14	DVR00 or DVR05 CON-SOLE*
4	4	0	13	DVA32 IC DISC
5	2	0	11	DVR32 13037B/C MAC DISC
8	7	0	16	DVR23 MAGNETIC TAPE

*The utility will reconfigure LU 1 to the appropriate EQT and driver according to the I/O card.

The utility then asks you to reconfigure any of the devices listed.

LU,NEW S.C. ?

If you want to change the configuration, enter the LU, followed by the octal select code, separated by a comma.

NOTE

LU1 (console) can not be reconfigured by this command. You must set the S-register on boot-up.

To leave the configuration unchanged or to exit from this task, enter /E, EN, or EX, and RETURN.

EXAMPLE

Upon boot-up the S-register was set with the following octal select codes:

Bits 15-12 14 (TBG)
Bits 11-6 23 (Magnetic Tape)
Bits 5-0 25 (Console)

Then the off-line utility output the following information on the console:

```
DISC BACK UP UTILITY REV.2001 790830
     LU     EQT    S.C. S.CHNL                    DRIVER
     1      3      25     0                DVR05 CONSOLE
     4      4      13     0                DVA32 I.C. DISCS
     5      2      11     0                DVR32 13037 DISCS
     8      5      23     0                DVR23 MAG TAPE
SEL. CODE OF TBG=     14
ENTER SELECT CODE FOR DVR32,DVA32:
EX
TASK?
IO

     LU     EQT    S.C. S.CHNL                    DRIVER
     1      3      25     0                DVR05 CONSOLE
     4      4      13     0                DVA32 I.C. DISCS
     5      2      11     0                DVR32 13037 DISCS
     8      5      23     0                DVR23 MAG TAPE

TO EXIT TYPE "/E"
ENTER LU,NEW S.C.?
--,--                                  Here we could change the select
--,--                                  codes for the discs or magnetic
 /E                                    tape drives.
TASK?
EN
VALID COMMANDS ARE:
IO,CO,RE,RW,FF,BF,EN
TASK?
```

2-18. RE — RESTORE

The RE command restores an LSAVE or USAVE tape file to disc. The RE command has the following format:

RE [[,map source] [,model]]

[,map source] Specify where the track map information is to be found.

= DE Restore the tape file according to the track map information stored in the tape header. The header will be printed but the user can not OK the header before the restore is performed.

= TM Print the header and track map information and ask the user for a new track map table definition (see below). You can not use this option with a USAVE tape file, since it must be restored exactly as saved.

If no option is given, the utility will print the tape header and ask if it is OK? to proceed. If YES, the restore will be done according to the track map information in the tape header.

[model] The model is the type of disc being restored to. This value is ignored if map source = TM.

= A Restore tape file to a MAC disc according to the tape header.

= H Restore tape file to an ICD disc according to the tape header.

To define new track map information ([map source] =TM), you are given the following message:

ENTER MODEL, #TRKS,1ST CYL,HEAD,#SURF,UNIT,#SPARES FOR SUBCHNL 00?

Enter values separated by commas in the same format as the utility message to define the disc subchannels starting with subchannel 00. (See the RTE-IVB On-line Generator Reference Manual for disc specifications.) Terminate the track map input with a /E, EX, or EN.

When the [map source] parameter is defaulted, the utility prints the header and asks to proceed.

OK?

Enter "YES" to perform the restore.

Enter "NO" to space forward the tape one file. The utility will then print the next header and ask again if it is OK? to proceed.

Enter /E, EN, or EX to exit REstore and get the TASK? again.

EXAMPLES

Restore LU 49 from magnetic tape onto disc; a bad track was found and spared during the restore:

```
TASK?
RE
 8:15 PM  WED., 24  OCT. 1979   LSAVE,,49,,VE,LU49=CRNAJ 7920
TAPE #  1
OK?
YES
RESTORE TO 13037 DISC UNIT 0
DEST. SUBCHANNEL
BAD TRACK AT: TRACK #  177 CYL 342 HEAD  6 UNIT/ADDRESS  0
SPARED TO:    TRACK #  203 CYL 345 HEAD  6 UNIT/ADDRESS  0
DONE
TASK?
```

Restore LU 49 from magnetic tape onto disc automatically:

```
TASK?
RE,DE
 8:15 PM  WED., 24  OCT., 1979   LSAVE,,49,VE,LU49=CRNAJ 7920
TAPE # 1
RESTORE TO 13037 DISC UNIT 0
DEST. SUBCHANNEL
BAD TRACK AT: TRACK #  177 CYL 342 HEAD  6 UNIT/ADDRESS  0
SPARED TO:    TRACK #  203 CYL 345 HEAD  6 UNIT/ADDRESS  0
DONE
TASK?
```

2-19. COPY — CO COMMAND

The CO command allows you to copy one disc subchannel to another disc subchannel according to the information you enter. The format is as follows with no parameters:

CO

After typing the CO command, the program will ask you to define the source subchannel and the destination subchannel definition as shown below:

ENTER MODEL,#TRKS,1ST CYL,HEAD,#SURF,UNIT,#SPARES FOR SOURCE SUBCH?

Enter the appropriate value separated by commas, in the same format as the message. For the model number, enter: 7905, 7906, 7906H, 7910H, 7920, 7920H, 7925, or 7925H.

The program then asks the same question for DESTINATION SUBCHANNEL: (Refer to the RTE-IVB On-Line Generator Reference Manual for disc specifications.)

ENTER MODEL,#TRKS,1ST CYL,HEAD,#SURF,UNIT,#SPARES FOR DEST SUBCH?

Enter /E, EN, or EX to terminate the copy operation and TASK? is asked again.

EXAMPLES

```
TASK?
CO
ENTER MODEL, #TRK, 1ST CYL, HEAD, #SURF, UNIT#, #SPARE
FOR SOURCE SUBCH:
7905,30,0,2,1,0,2
ENTER MODEL, #TRK, 1ST CYL, HEAD, #SURF, UNIT#, #SPARE
FOR DEST. SUBCH:
7905,30,0,0,1,0,2
   30 TRACKS COPIED
TASK?
```

```
TASK?
CO
ENTER MODEL, #TRK, 1ST CYL, HEAD, #SURF, UNIT#, #SPARE
FOR SOURCE SUBCH:
7906H,20,1,2,1,0,2
ENTER MODEL, #TRK, 1ST CYL, HEAD, #SURF, UNIT#, #SPARE
FOR DEST. SUBCH:
7906H,20,1,0,1,0,2
DISC UNIT/ADDRESS 0 NOT READY
READY DISC AND ENTER "GO" TO CONTINUE
GO
   20 TRACKS COPIED
TASK?
```

2-20. RE-STARTING THE OFF-LINE UTILITY PROGRAM !DISK

If you mistakenly perform a RESTR or COPY operation to a wrong disc interface select code, the program DISK will be I/O suspended. You may re-start the program by typing the following:

* OF,DISK	Put the program into dormant state
* OF,DISK,1	Abort program
* RU,DISK	Run the program again.

You are not advised to use the command OF,DISK,1 in any other cases.

2-21. OFF-LINE ERROR MESSAGES

MESSAGE	EXPLANATION AND ACTION
BAD SPARE AT: TRACK # XXXX CYL CCC HEAD HHH UNIT/ADDR UUU	The spare track is defective, program will ignore this spare track and use the next one in the pool.
BAD TRACK AT: TRACK # XXXX CYL CCC HEAD HHH UNIT/ADDRESS UUU	The track is defective or ten tries have been made to read or write without success. If the track is marked spare and in source subchannel, this message will also be printed.
DRIVE NOT READY — READY DISC AND ENTER "GO" TO CONTINUE	Ensure that the select code and disc unit no. are correct. If you do not wish to continue, enter "/E", "EX", or "EN" to stop and type "*RU,DISK" to re-start.
FORWARD/BACKWARD N FILES: N = XX.	The utility program attempts to forward or backward space N number files. If the tape is at load point, the BF command will have no effect on the tape.
HEAD NO. OUT OF RANGE	The head number specified during a CO command or TM option is out of range for this disc model.
INVALID SEL. CODE	The select code specified for DVA32 or DVR32 is less than 0 or not an octal number.
MT. PARITY ERROR	Parity error detected on the magnetic tape. Probably caused by positioning the tape in the wrong file.
OUT OF SPARE TRACKS FOR THIS LU	Ensure that you have enough spare tracks in the subchannel. Any bad tracks occurring after this message will not be spared. The utility continues operation.
SEEK ERROR	Hardware disc seek error occurs. Program continues operation. Probably caused by restoring or copying to a wrong disc (e.g., from 7906 to 7925).
SEL.CODE >77	The select code specified for DVR32 or DVA32 is greater than 77 octal.
TAPE EOF ILLEGAL	Program reaches end-of-file of magnetic tape unexpectedly. Program returns to TASK? mode.
TAPE FORMAT ERROR	Header information in the magnetic tape is incorrect (wrong tape mounted).
TRACK SIZES NOT EQUAL	Copy or restore a disc with different track size (words per track) is not allowed. Program returns to TASK? mode.

MESSAGE	EXPLANATION AND ACTION
TURN DISC PROTECT SWITCH OFF FOR UNIT/ADDRESS xxx TYPE "GO" TO CONTINUE	Check the disc "READ ONLY" switch. If you do not wish to continue, enter "/E", "EX", or "EN", to stop and type "*RU,DISK" to re-start.
TURN FORMAT SWITCH OFF FOR UNIT/ADDRESS xxx TYPE "GO" TO CONTINUE	Check the format switch of the disc. If you do not wish to continue, enter "/E", "EX", or "EN" to stop and type "*RU,DISK" to re-start.
UNIT # MUST BE FROM 0-7.	Ensure that you enter the correct disc unit number.
# OF TRKS MUST BE FROM 1 TO XXXX	Ensure the number of tracks for the disc model is correct.

FORMT UTILITY

SECTION III

3-1. INTRODUCTION

FORMT is an on-line disc utility program which formats a 9895 flexible disc, initializes a hard disc, or spares disc tracks. FORMT is used with ICD and MAC discs; it is not compatible with the 7900 disc. Refer to the ICD/MAC Disc Backup Utility Programs for a discussion of discs.

The terms "flexible disc" and "floppy disc" are used interchangeably.

FORMT provides the following functions:

1. Format a 9895 floppy disc — All new floppy discs must be formatted by writing track and sector addresses on them. Another function of FORMT is to identify bad tracks on the disc and "mark" them as such. Bad tracks are not spared but are made "invisible" to the user programs.

2. Initialize a disc LU (does not include 9895 floppy disc) — This is the process of removing the protected status of all the tracks in the LU, cleaning up the spare track pool, and preparing the LU for RTE-IVB use by sparing any bad tracks. (This is different from the IN command in FMGR.)

   Note that this implies that the user has purchased a disc drive or disc cartridge that has been formatted (i.e., track and sector addresses and timing surface are already written) at the factory. A disc cartridge supplied from another source or direct from assembly line will not work. Formatting is done only on test set-ups where correct alignment and calibration is maintained.

3. Spare individual bad tracks (does not include 9895 floppy disc) — The process of recovering data and replacing a reported bad track by a spare track so that the disc controller can access the track correctly in further operations.

4. Verify a disc LU — This is a read only verification for all data on a hard or floppy disc LU.

5. Reformat a hard disc LU — This is the process of writing zeros on the data block and clearing the status bits. It differs from the initialization function in that reformat will completely wipe the disc clean. It will not spare bad tracks nor will it save the information on the disc.

The terms "initialize", "format","spare", "verify", and "reformat" are clarified in the section "DISCUSSION OF INITIALIZATION, FORMATTING, AND SPARING" of this manual.

3-2. LOADING FORMT

Load FORMT from the relocatable file %FORMT (part no. 92067-16554) during generation or on-line with the LOADR. FORMT also needs $DSCLB (part no. 92067-12002), the Disc Utility Library during the load. Be sure to override its page requirements to allow a track buffer for the disc transfer. A floppy disc needs about 1 extra page and the largest hard disc about 8 extra pages for a buffer. The program size requirements when using different discs are:

Disc	Override Program Size
9895 Floppy	11 pages
7905/06(H) & 7920(H)	16 pages
7925(H)	18 pages

Example of LOADR commands to on-line load FORMT:

```
:RU,LOADR
/LOADR:   SZ,18          override program size requirements
/LOADR:   RE,%FORMT      load FORMT utility
/LOADR:   SEA,$DSCLB     search the Disc Utility Library if not already
                         included during system generation
/LOADR:   END
```

FORMT can be loaded as a type 1, 2, 3, or 4 program with no SSGA required. After FORMT is loaded, it is recommended to save FORMT as a type 6 file with access restricted to the System Manager only. (Refer to the FMGR SP command in the RTE-IVB Terminal User's Manual.) Because the format and initialize tasks alter the contents of the disc LU, FORMT should be used with that knowledge.

FORMT locks itself into a memory partition; therefore, the system should be generated to allow Background Partitions with memory lock.

CAUTION

No other program should access the disc LU which is being used by FORMT. The INitialize, SPare, VErify, and REformat tasks lock all disc drives with the same EQT as the disc LU being accessed for both MAC and ICD discs. Therefore, the system's performance is downgraded during execution of FORMT's "IN", "SP","VE", and "RE" tasks.

CAUTION

REformat is allowed on LU2 and LU3. This destroys the system disc. The operator must take suitable precautions.

3-3. USING FORMT

The RUN command formats for FORMT are:

:RU,FORMT [,[log lu] [,FO,disc lu,n]]

to FOrmat a floppy disc using n as the fill sector value (0-28). A fill value of n=1 is recommended for disc usage with the RTE-IVB FMGR (File Manager).

:RU,FORMT [,[log lu] [,IN,disc lu]]

to INitialize a hard disc.

:RU,FORMT [,[log lu] [,SP,disc lu,track]]

to SPare a bad track, where track is the logical bad track number within disc lu.

:RU,FORMT [, [log lu] [,VE, disc lu]]

to VErify a hard or floppy disc lu.

:RU,FORMT [, [log lu] [,RE, disc lu]]

to REformat a hard disc.

where:

log lu	logical unit of the terminal being used to respond to queries by FORMT. Default is the user terminal.
disc lu	logical unit of the disc; a postive integer > 0. With Session Monitor, the disc LU must be previously defined in your SST (Session Switch Table). For INitialize and REformat, cannot be LU 2 or LU 3. For INitialize and SPare, cannot be a floppy disc LU. For FOrmat, must be a 9895 flexible disc LU only.

Only the terminal LU may be defaulted. If the required parameters are supplied, the program does the single task specified in the run string and terminates. If all required parameters are not supplied, then the program operates in an interactive mode and asks for them.

If only RU,FORMT is entered, the program asks which task you want performed:

TASK?

Type one of the following:

SP	(spare a track — hard disc only)
IN	(initialize LU — hard disc only)
FO	(format a floppy — floppy disc only)
VE	(verify a disc lu)
RE	(reformat lu — hard disc only)
EN	(end)
??	(prints list of all valid responses)

Typing EN, /E, or EX terminates FORMT. After typing in the task, the program asks for the disc LU:

DISC LU?

Type in the LU number of the disc you want to spare, format or initialize. FORMT will then execute the function.

NOTE

INitialize LU (includes sparing), SPare a bad track, and REformat LU are applicable to ICD/MAC hard discs only. The floppy disc cannot be spared, initialized, or reformatted..

Before FORMT can be run on a disc, the FORMAT switch must be placed in the ON (down) position. Refer to the associated disc drive reference manual for details.

3-4. FORMAT A FLOPPY DISC (FO)

:RU,FORMT [,[log lu] [,FO,disc lu,n]]

Formatting a floppy disc means:

1. Write track and sector addresses. These are physical sectors of 128 words each.

2. Provide sector interleaving, if desired. This feature can help to minimize access time.

3. Identify bad tracks and make them "invisible". Bad tracks discovered during formatting are not spared but are no longer a concern to the user (unless the number of bad tracks is "excessive").

In the formatting process, all previous information on the disc LU is lost. Binary zeroes will be written on every track even on the directory track. It is recommended to take these steps:

1. Under Session Monitor, the disc LU must be defined in your SST (FMGR SL command).

2. Dismount the disc LU and make sure that no one else is using that disc LU (FMGR DC command).

3. Invoke the formatting function, which writes zeroes on every track and makes bad tracks "invisible".

4. When the disc LU has been formatted, mount the disc LU with a complete FMGR MC (Mount Cartridge) command.

Refer to the RTE-IVB Terminal User's Manual for information on the FMGR commands.

After the FO command is typed, the program will verify that the LU specified is indeed a floppy disc by examining the information defined in RTE-IVB's track map table. Under Session Monitor, FORMT also checks if the LU is in the user's SST. If there is a discrepancy, the program prints the following to request another disc LU:

INVALID DISC LU

Otherwise, FORMT continues and formats the floppy disc. If in the interactive mode, FORMT responds (since the contents of the disc will be destroyed):

DO YOU REALLY WANT TO FORMAT THIS DISC?

Type YES or NO. (Only the first two characters of the response are examined, so YE is sufficient to mean YES.)

Once the floppy disc LU has been determined as valid, FORMT scans the DRT (Device Reference Table) and finds all other disc LU's which point to the disc drives on the floppy controller. All of these LU's are then locked for the duration of the FORMT process. Both the left side and right side drive LU's are locked on the 9895. Therefore, it is not possible for other programs to access either side during the 'FO' command even though only one floppy disc LU is formatted. Then FORMT requests if in the interactive mode:

OF FILL SECTORS?

Enter the fill number, a value between 0 and 28. The fill number is the number of physical sectors between logical sectors.

If the number of fill sectors is zero, then sectors are addressed in the same order as they appear on the disc. If the number is not zero, then consecutive sector addresses are separated by the number of fill sectors. This is known as sector interleaving (interleave = fill value + 1). For further clarification, see the discussion on initialization, formatting and sparing later in this manual.

NOTE

A fill value of 1 will give the fastest transfer rate with the existing hardware, and is recommended. Refer to the performance graph in Figure 3-1 which plots the formatting time against the fill value.

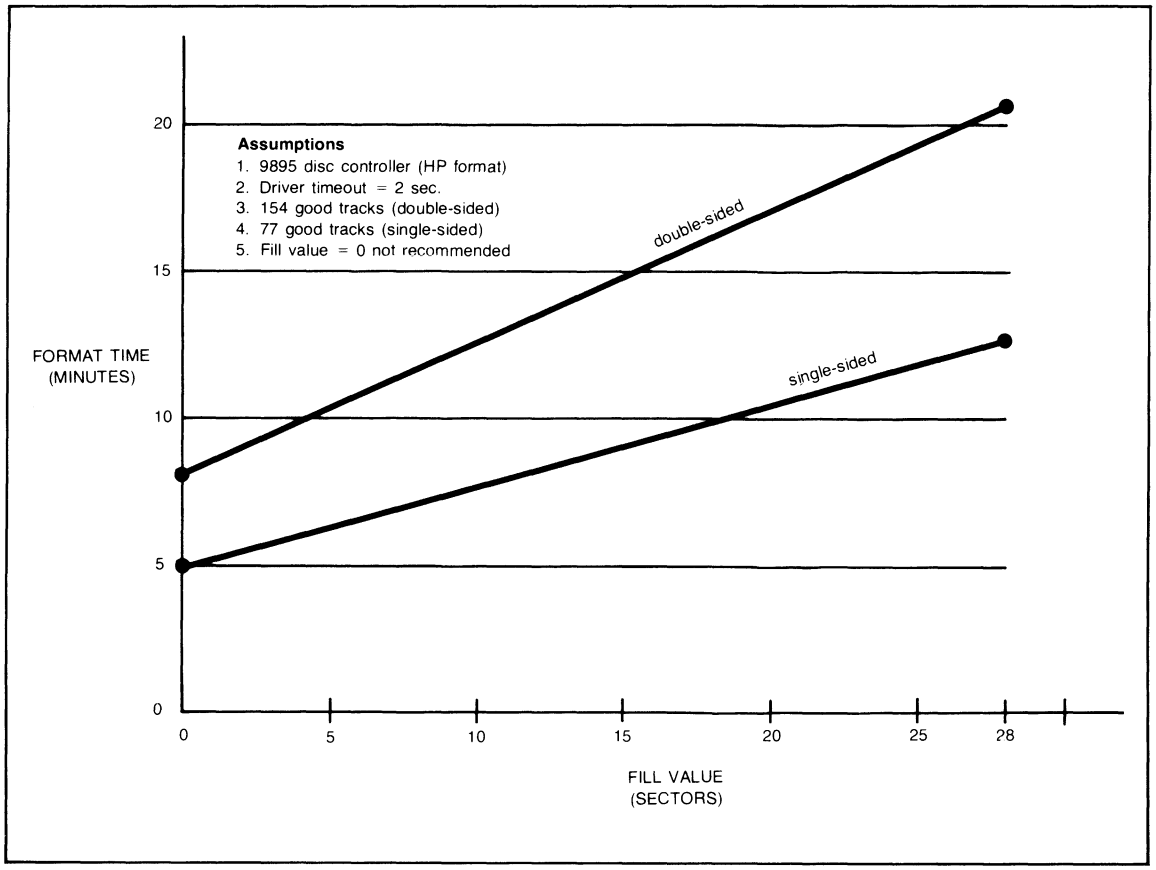


Figure 3-1. Approximate Formatting Times for Floppy Discs

FORMT makes 5 passes over the media in order to detect any potential defective areas. Since each pass can take several minutes, the following is displayed at the beginning of each pass.

FORMAT PASS # XX

During each pass, FORMT issues commands to the controller hardware that may take several minutes to execute. During these 'indivisible" commands, the controller physically locks the door on the drive so that the disc can not be removed. If FORMT is aborted by the operator, the controller leaves the door locked until it completes the last indivisible request issued by FORMT.

After formatting the floppy, the program reports the number of good tracks on the media:

OF GOOD TRACKS = XXXX

If in the interactive TASK? mode, the program then repeats the request for a task. Otherwise, FORMT terminates.

EXAMPLES

```
:RU,FORMT

TASK?
FO

DISC LU?
45

DO YOU REALLY WANT TO FORMAT THIS DISC?
YES

# OF FILL SECTORS?
1

READY DISC - ENTER " ",CR
(space, carriage return)
FORMAT PASS # 01
FORMAT PASS # 02
FORMAT PASS # 03
FORMAT PASS # 04
FORMAT PASS # 05

# OF GOOD TRACKS = XXXX

TASK?
EN

FORMT FINISHED
```

3-5. INITIALIZE AN LU (IN)

:RU,FORMT [,[log lu] [,IN,disc lu]]

The initialization process prepares an ICD or MAC hard disc cartridge LU for use. The previous contents of the disc are overwritten with a pattern of all zeroes. Bad tracks are spared to the spare pool at the end of the disc cartridge LU. The disc must have been previously formatted at the HP factory.

The directory track of the disc LU will also be overwritten with zeroes. Therefore, the following steps are recommended before using the FORMT IN command:

1. Under Session Monitor, the disc LU must be defined in your SST (FMGR SL command).
2. Then dismount the disc LU (FMGR DC command) and make sure that no one else is using the same disc LU.
3. Invoke the initialize function which writes zeroes on the disc LU.
4. After initialization, the disc LU must be mounted with a complete FMGR MC command.

Refer to the FMGR commands in the RTE-IVB Terminal User's Manual.

After invoking the IN function, FORMT checks the disc LU and its type. If you attempt to initialize a floppy disc LU, LU 2, or LU 3, or if the disc LU is not in your SST (under Session Monitor), following is printed:

INVALID DISC LU

During the interactive mode, FORMT then asks:

DATA WILL BE DESTROYED, OK TO PROCEED?

If the answer is YES, the program performs all the necessary operations to prepare the LU and reports its format as follows:

BAD TRACKS SUBCHANNEL XX

LU XX	LOGICAL	CYL	HEAD	UNIT/ADDR
BAD TRACK	XXXX	XXXX	XX	XX
SPARED TO	XXXX	XXXX	XX	XX

XXXX SPARE TRACKS AVAILABLE

If in the interactive TASK? mode, the program then repeats the request for a task. Otherwise, FORMT terminates.

CAUTION

The 'IN' command locks all disc drives sharing the EQT of the specified disc LU. The lock is issued on a track by track basis for each track on the specified disc LU. All loads, swaps, and other accesses to any of the discs sharing the same EQT will be severely limited during execution of the 'IN' command. If the system disc shares the same EQT as the disc LU being initialized, the 'IN' command should only be used at times when severely degraded system performance can be tolerated.

EXAMPLES

The following example shows an interactive example:

```
:SL,54,54                          make sure LU 54 is in SST.
:DC,54,RR                          dismount; also make sure no
                                   one else is using LU 54.
DISC CRN    54  LU   54 DISMOUNTED FROM SYSTEM
:RU,FORMT

TASK?
IN                                 invoke initialize function.

DISC LU?
54

DATA WILL BE DESTROYED, OK TO PROCEED?
YES                                executes initialization.

0004 SPARE TRACKS AVAILABLE

TASK?
/E                                 exit from FORMT.

FORMT FINISHED
:MC,-54,G,203,CRN54,1,54           initialize cartridge to obtain
                                   a directory track.
```

The following example uses a run string and no operator intervention:

```
:SL,14,14                          make sure LU 14 is in SST.
:DC,14,RR                          dismount LU 14 and make sure no
                                   one else is using LU 14.
DISC CRN    14 LU   14 DISMOUNTED FROM SYSTEM
:RU,FORMT,,IN,14

BAD TRACKS SUBCHANNEL 05           bad tracks found on LU 14 which
                                   references Subchannel 5.
LU 14      LOGICAL CYL HEAD UNIT/ADDR

BAD TRACK   0002  0210  02     00
SPARED TO   0198  0406  02     00
BAD TRACK   0089  0297  02     00
SPARED TO   0199  0407  02     00

0003 SPARE TRACKS AVAILABLE        3 spare tracks are left.

FORMT FINISHED
:MC,14,P,,LU14,1,14                initialize cartridge to obtain
                                   a directory track.
```

3-6. SPARE A TRACK (SP)

:RU,FORMT [,[log lu] [,SP,disc lu,track]]

Sparing applies to individual tracks discovered bad while the disc is in use (i.e, reported by RTE-IVB). A spare track is substituted for the defective track and as much data copied from the bad track as possible. Offset head reads are used in the recovery process and it is often possible to completely recover the data. In cases where this is not possible, usually only a single block will be lost.

After invoking the SP command, FORMT checks for a valid disc LU. If you attempt to spare a floppy disc or if the disc LU is not in your SST (under Session Monitor), the following message is printed:

INVALID DISC LU

You must then specify a valid disc LU.

After inputting an invalid parameter and/or in the interactive mode, FORMT asks:

TRACK TO BE SPARED?

Entering ?? to the query returns to you the track range for the LU. Then enter the track (logical track) found defective on the disc LU. If the track number of a good track is entered, it will be spared and can not be recovered as a good track. If the track does not lie within the bounds of the disc LU specified, the messages are displayed:

INVALID TRACK #

ENTER BAD TRACK # X — XXXX

You can then enter a bad track within the range specified.

CAUTION

Once a track is spared, it is marked defective permanently. This process is irreversible. Do not attempt to spare the same track twice.

The program copies data block by block from the bad track to the spared track. If all the information on the track can not be recovered, the following warning message is issued and FORMT continues:

WARNING! ALL INFORMATION ON TRACK NOT SUCCESSFULLY RECOVERED

When the program completes, the sparing is reported:

```
BAD TRACKS SUBCHANNEL XX

LU XX        LOGICAL   CYL   HEAD  UNIT/ADDR

BAD TRACK    XXXX      XXXX  XX      XX
SPARED TO    XXXX      XXXX  XX      XX

XXXX SPARE TRACKS AVAILABLE
```

If in the interactive TASK? mode, the program asks for another FORMT task. Otherwise, FORMT terminates.

CAUTION

All discs sharing the EQT of the specified disc LU are locked for the duration of the 'SP' command. All loads, swaps, and other accesses to any of the discs on the EQT will not be allowed for the duration of the 'SP' command.

EXAMPLES

The following example shows how to use FORMT interactively:

```
:SL,14,14                    put LU 14 into SST.
:MC,14                       mount LU 14 and make sure no
:RU,FORMT                    one else is using LU 14.

TASK?
SP                           invoke sparing.

DISC LU?
14                           spare bad track on LU 14.

TRACK TO BE SPARED?
3                            logical bad track on LU 14 which
                             is on subchannel 5.
BAD TRACKS SUBCHANNEL 05

LU  14      LOGICAL CYL HEAD UNIT/ADDR

BAD TRACK    0003  0211  02      00
SPARED TO    0202  0410  02      00

0000 SPARE TRACKS AVAILABLE      no more spare tracks left.

TASK?
/E                           exit from FORMT.

FORMT FINISHED
```

The following example shows a complete run string and no operator intervention is required:

```
:SL,23,23                 put LU 23 into SST.
:MC,23                    mount LU 23 and make sure no one else
                          is using LU 23.
:RU,FORMT,,23,SP,1        spare logical track # 1 on LU 23.

WARNING! ALL INFORMATION ON TRACK NOT SUCCESSFULLY RECOVERED

BAD TRACKS SUBCHANNEL 03

LU 23       LOGICAL CYL HEAD UNIT/ADDR

BAD TRACK    0001  0410  01     00
SPARED TO    0204  0410  00     00

0002 SPARE TRACKS AVAILABLE

FORMT FINISHED
```

3-7. VERIFY AN LU (VE)

:RU,FORMT [, [loglu] [,VE,disclu]]

The verification process reads and verifies all data on a hard or floppy disc. The contents of the disc are not altered or destroyed. If the data fails to verify, the track is reported as bad. If the track is already spared, the spare is verified.

The directory track of the disc LU will be checked. The unused spares in the spare track pool will not be checked.

The following steps are recommended before using the FORMT VE command:

1. Under Session Monitor, the disc LU must be defined in your SST (FMGR SL command).

2. Invoke the VE function which reads and verifies the disc LU.

Refer to the FMGR commands in the RTE-IVB Terminal User's Manual.

EXECUTION

After invoking the VE function, FORMT checks the disc LU and its type. If you attempt to verify a non-disc LU or a disc not in your SST (under Session Monitor), and FORMT is being run interactively, the following is printed:

INVALID DISC LU

The program performs all the operations necessary to verify the LU and reports any bad tracks without a valid spare as follows:

```
BAD TRACKS SUBCHANNEL XX

LU XX        LOGICAL   CYL   HEAD  UNIT/ADDR
BAD TRACK    XXXXX     XXXX  XX      XX
```

If in the interactive TASK? mode, the program then repeats the request for a task. Otherwise, FORMT terminates.

You may wish to spare the bad tracks reported here with the SP function of FORMT. See the Section on Sparing Bad Tracks.

CAUTION

For verifying a hard disc, the "VE" command locks all disc drives sharing the EQT of the specified disc LU. The lock is issued on a track by track basis for each track on the specified disc LU. All loads, swaps, and other accesses to any of the discs sharing the same EQT will be severely limited during execution of the VE command. If the system disc shares the same EQT as the disc LU to be verified, the VE command should only be used at times when severely degraded system performance can be tolerated.

For verifying a floppy disc, just the LU's associated with a specific disc lu are locked and remain locked until the completion of the VE function.

3-8. REFORMAT A HARD DISC (RE)

:RU,FORMT [,[loglu] [,RE,disclu]]

The RE reformat function clears the status bits on the disc area designated by the LU, including the spare track pool. It rewrites the preamble, writes zeros in the data area, and rewrites the postamble. It does not verify this data nor does it spare bad tracks. This allows the user to clear all accumulated bad tracks bits, including factory designated bad tracks, and clears the spare and protect bits as well.

The disc must have been previously formatted at the HP factory since the servo and timing data is not re-formatted. Any hardware disc errors occurring during the reformat process are reported to the operator.

The FORMT "IN" command (initialize) function should be used following reformat to prepare the disc for File Manager use. The "IN" function spares any tracks it finds bad and spares them according to the system track map table. You should also spare (FORMT SP) factory designated bad tracks even though the "IN"command may not have found them to be bad. Factory designated bad track records were delivered with the disc pack. If your records are misplaced, contact your Customer Engineer (CE) who will obtain these records from the factory.

The directory track of the disc LU will also be overwritten with zeros. Therefore, the following steps are recommended before using the FORMT RE command.

Reformatting disc LU's other than LU 2 or 3.

1. Under Session Monitor, the disc LU must be defined in your SST (FMGR SL command).

2. Back up (LSAVE or WRITT) all data from the LU to be reformatted.

3. Dismount the disc LU (FMGR DC command) and make sure no one else is using the disc LU.

4. Invoke the reformat function (RE) which writes zeros on the disc LU.

5. Invoke the initialize function (IN) which reports and spares all bad tracks.

6. After initializing with the FORMT IN function, the disc LU must be mounted with a complete FMGR MC command.

7. Restore the data, if desired, using RESTR or READT.

Refer to the FMGR commands in the RTE-IVB Terminal User's Manual.

Reformatting LU2 or LU3.

1. Under Session Monitor you must have command capability 60 (normally reserved for System Manager or other support persons) to be allowed to reformat LU2 or LU3.

2. Backup (LSAVE) all data from LU2 and LU3. After reformatting LU2 or LU3, the system will try to come back and the results will be unpredictable. Therefore, you should back up both LU2 and LU3 even if you are only reformatting one of them.

CAUTION

DO NOT USE WRITT. It does not save the system area of LU2 or LU3, it only saves the FMGR area.

3. Terminate all system activity. If reformatting both LU2 and LU3, failure to halt all system activity may cause FORMT to be swapped out onto the disc between the reformats, thus losing FORMT.

4. Invoke the RE function. For LU2 or LU3 reformatting, the function will only run interactively with appropriate messages.

5. Load the off-line disc backup utility !DISK.

6. Restore LU2 and LU3. The off-line utility !DISK spares any bad tracks and sets appropriate protect bits when restoring the system and file manager areas.

7. Re-boot the system.

CAUTION

Reformatting is allowed on LU2 and LU3 after appropriate warning messages. If LU2 or LU3 areas are reformatted on the system disc, the operating system is lost and the system will go down. This capability is to be used only with the full and complete understanding of how to backup the operating system using LSAVE, and how to restore it using the off-line back utility, !DISK.

Refer to the sections in the RTE-IVB Utility Programs Reference Manual dealing with LSAVE and !DISK.

EXECUTION

After invoking the RE function, FORMT checks the disc LU and its type. If you attempt to reformat a floppy disc LU, or if the disc LU is not in your SST (under Session Monitor), the following is printed:

INVALID DISC LU

If you attempt to reformat LU2 or LU3 without having command capability of 60, or without being in FORMT interactive mode, FORMT prints:

UNAUTHORIZED LU2,3 ACCESS — (COMMAND IGNORED)

During the interactive mode, FORMT warns:

DATA WILL BE DESTROYED, OK TO PROCEED?

For LU2 or LU3, FORMT must be in interactive mode. FORMT warns:

DO YOU REALLY WANT TO REFORMAT THE SYSTEM DISC?

If the answer was YES, the program performs all the necessary operations to prepare the LU.

FORMT then reports any disc errors.

If in the interactive TASK? mode, the program then repeats the request for a task. Otherwise, FORMT terminates.

CAUTION

The "RE" command locks all disc drives sharing the EQT of the specified disc LU. The lock is issued on a track by track basis for each track on the specified disc LU. All loads, swaps, and other accesses to any of the discs sharing the same EQT will be severely limited during execution of the RE command. If the system disc shares the same EQT as the disc LU being reformatted, the RE command should only be used at times when severely degraded system performance can be tolerated.

3-9. DISCUSSION OF INITIALIZATION, FORMATTING, AND SPARING

All data is written on the disc in blocks of 256 bytes (128 words). The block number is usually called a sector number in disc literature. However, the term "sector" in RTE literature means 128 bytes (64 words) and so the term "block" will be used in this discussion. Each block has three components:

Preamble	User Data — 256 bytes	Postamble

The postamble provides information needed by the disc drive for error checking, i.e. determining the validity of the data in the user data area.

The preamble has three functions:

1. To provide timing signals that indicate the start of the block. This information is in the synchronization field.

2. To indicate the status of the block. This is done with status bits set according to the actual disc type (hard or soft) and the disc design.

3. To provide an address which gives position information. The address is given in terms of the cylinder, head and block number.

The preamble is more complex for the hard disc than the soft (or flexible) disc. The status portion of the preamble includes three bits:

S bit: Indicates that that track is a "spare" for a defective track. Only hard discs supplied by HP permit sparing.

P bit: Indicates protected track. A protected track is a read-only track unless the FORMAT switch is activated on the disc drive.

D bit: Indicates that that track is defective and should be spared or not used at all.

For flexible discs supplied by HP, only the D bit is used in the preamble. The address field in the preamble has three basic components:

Cylinder number
Head number
Block number

In most cases, the address associated with the block will be the address of the block itself, i.e. it will "point" to itself. The exceptions are:

Hard Disc: If D bit set (track defective), then the address points to the track used as a spare.

If S bit set (track is a spare), then the address points to the defective track for which it is a spare.

Flexible Disc: If D bit set (track defective), then the address is not relevant (may be anything).

The RTE utility programs will declare an entire track bad if one bad block is found on the track. This method of management results in less head movement (hence faster access) when encountering spared blocks (tracks).

For the hard disc, once a track has been spared, any time a seek is made to that defective track, the disc controller finds that the track is spared. The disc drive will automatically access the spare track instead. The software has no knowledge of this process.

For the flexible disc, although the technique is not called sparing, the effect on the user software is almost the same. Once the D bit has been set for all defective tracks, FORMT gives the drive a command to make "invisible" all the defective tracks. This causes the drive to skip bad tracks, as if they did not exist on the disc. For example, the outermost track is normally track zero. But if the D bit has been set for this track, then when commanded to access track zero, this track (and any following bad tracks) will be skipped. The first good track becomes track zero.

If no bad tracks occur after the formatting process is complete, then it does not matter whether sparing is provided. The method provided by the hard disc (sparing) and the soft disc (skipping) do not really have any effect on the user programs. But if a bad track develops in using the disc, the hard disc sparing capability has the advantage that a "simple" recovery process is possible by running the FORMT utility. This is not possible with the flexible disc.

3-10. INITIALIZATION & SPARING THE HARD DISC

Disc initialization uses the track map table in RTE-IV to determine the starting cylinder, head number, number of tracks and number of spare tracks for each LU. Tracks in the "spare pool" are used only as replacements for the defective tracks — they are otherwise unused.

The initialization procedure is as follows:

1. "Clean-up" tracks in the spare pool. The full block (including preamble and postamble) is read and status bits examined. If D set (defective) go to next track. A track from the spare pool will not, itself, be spared. If D not set then re-write the full track with zeroes, including the S, P, and D bits. Verify by reading back the track. If found bad during verify, set the track defective.

2. Read each track in the mapped portion of the LU. If D set or unsuccessful read, set flag indicating sparing is needed.

3. If sparing is needed:

   a. Prepare preamble for defective track. Set D bit and set address of spare track in the preamble of defective track.

   b. Prepare preamble for spare track. Set S bit and set address of defective track in the preamble of the spare.

4. Write initialize the track, using the preambles set in Step 3 (if sparing). If this is a good track found in step 2, then the address will be the address of the good track (point to itself). If this is a spare track, then the address will be that of the defective track (backward pointer). If this is a defective track, then the address will be that of the spare.

   The data buffer will be all zeroes if processing the IN command. The same procedure is used to spare an individual track (SP) except that the data buffer will be copied (where possible) from the defective track on a block by block basis. In recovering user data, an offset read will be performed to pick up data that could not be normally read with the head aligned to the center of the track.

5. Verify the whole track on a block by block basis. If successful, do next track as in step 2. If unsuccessful (bad read status), get next spare and do sparing procedure above.

3-11. VERIFYING THE DISC (FLOPPY OR HARD)

Disc verification uses the track map table in RTE-IV to determine the starting cylinder, head number, number of tracks, and number of spare tracks for each LU. Tracks in the "spare pool" are used only as replacements for the defective tracks. They are not verified otherwise.

The verification procedure verifies by reading each track in the mapped portion of the LU. If the read is unsuccessful, the track is reported as bad.

3-12. REFORMATTING THE HARD DISC

Disc reformatting uses the track map table in RTE-IV to determine the starting cylinder, head number, number of tracks and number of spare tracks for each LU. All tracks in the LU including the spare track pool are reformatted.

The reformat procedure reformats all tracks in the LU including all spare tracks by writing zeros on the full track including the S, P, and D bits. Any disc errors occurring during REformat are reported to the operator.

3-13. FORMATTING THE FLOPPY DISC

Much of the information related to formatting has been given above. It is worth repeating because there is often confusion over the difference between formatting and initialization.

Formatting is the most basic form of initialization. Normal reads and writes cannot be made to a disc until it has been formatted. The initialization process for the hard disc assumes that the hard disc has been already formatted at least once. The formatting process writes the full block as described above, tagging the block with an address. Initially this address points to itself, but may be changed if the block is defective or a spare.

A hard disc should be formatted only at the factory to ensure interchangeability of disc packs. Therefore the capability to format a hard disc is not included in the FORMT program.

When formatting a flexible disc, FORMT provides the capability to define the order in which consecutive "logical" blocks are found on the disc. If the "fill number" is zero, then the N+1 th block follows the N th block. Otherwise, the fill number defines the number of blocks to be skipped between the N th and N+1 th blocks. Once the disc is formatted, the fill number is transparent to the user software.

The fill number may be chosen based upon a knowledge of how the user sofware is to access the disc and a knowledge of the rotational speed of the disc. For example, suppose that the software takes T milliseconds to read and process one block and it picks up sequential blocks. If the time to rotate once around the disc is divided by the number of blocks per track, then the time to move over a single block is found. The fill number is then computed so that the number times the time to scan one block is slightly greater than the processing time. Thus, the next block will rotate into the proper position for access just when it is needed.

EXAMPLE

360 RPM (rotations/minute) = 167 milliseconds/rotation

30 blocks/track means 5.6 milliseconds/block

If the processing time is less than 5.6 ms, then we may choose a fill number of one, since we will be through processing before the next block becomes available. But if processing time is between 5.6 ms and 11.2 ms, then we would pick a fill number of 2. If the number were 0, we would have to rotate the disc all the way around before we could pick up the next block (167 ms versus less than 5.6 ms).

Most user programs accessing files will define a data control block (DCB) of 144 words, of which 128 words (1 block) will be used for disc transfers. Therefore, a minimum fill number can be computed in terms of the amount of time to complete one EXEC request to write a block and return to the user program. Or the figure can be determined experimentally by trying several fill numbers. For sequential access to the files with a DCB of 144 words, an approximate number to use would be in the range 4 to 6.

3-14. FORMT UTILITY ERROR MESSAGES

MESSAGE	EXPLANATION AND ACTION
BAD TRACKS SUBCHANNEL XX LU XX LOGICAL CYL HEAD UNIT/ADDR BAD TRACK XXXX XXXX XX XX SPARED TO XXXX XXXX XX XX XXXX SPARE TRACKS AVAILABLE	A defective track encountered during an IN or SP task is spared.
CYLINDER COMPARE ERROR LU XX LOGICAL CYL HEAD UNIT/ADDR TARGET TRACK XXXX XXXX XX XX	Disc controller unable to seek to target track. Make sure the disc is formatted. Current task is aborted and FORMT returns to TASK? mode.
INVALID DISC LU	The disc LU is the wrong type (hard vs. floppy disc) or has 0 tracks defined in it, or the response was not a numeric parameter. Under Session Monitor, the disc LU must be defined in your SST (Session Switch Table). LU 2 and LU 3 can not be initialized.
INVALID DISC SPECIFICATIONS XX	The disc controller detects an out-of-bounds condition on either a cylinder, head, sector, or unit based on an invalid subchannel definition. Current task is aborted and FORMT returns to TASK? mode. XX is the subchannel number.
LU XX LOGICAL CYL HEAD UNIT/ADDR BAD SPARE XXXX XXXX XX XX	A defective spare is encountered in either the IN or SP task. (Message appears in conjunction with the BAD TRACKS heading.)
MAX OF 20 BAD TRACKS EXCEEDED	Formatting a floppy only. FORMT returns to TASK? mode.

MESSAGE	EXPLANATION AND ACTION
NOT ENOUGH ROOM FOR TRACK BUFFER	The memory bounds specified for FORMT at load time did not provide sufficient free memory to serve as a track buffer for the task and disc LU requested. FORMT terminates. Reload FORMT and resize it to the recommended program size.
OUT OF SPARE TRACKS FOR THIS LU	All spare tracks have been used up. SParing operation not performed. FORMT returns to TASK? mode.
READY DISC-ENTER " ",CR	The disc drive is not ready or there is no disc in the drive. Enter a space and carriage return when the disc is ready, or a /E to abort the task.
TURN OFF PROTECT OR READ-ONLY SWITCH-ENTER " ", CR	The disc protect (or read-only) switch is on. Also occurs if the floppy disc in the selected drive has the write-protect notch present. Turn off the switch and enter a space and carriage return to continue or /E to abort the task.
TURN ON FORMAT SWITCH-ENTER " ", CR	The utility is initializing the disc, but the format switch is off. Also occurs if a write operation is attempted to a track with its P-bit set while the format switch is off. Turn it on and enter a space and carriage return to continue or /E to abort the task.
WARNING! ALL INFORMATION ON TRACK NOT SUCCESSFULY RECOVERED	Spare command only. The track about to be spared was not successfully preserved. The FORMT continues.
WARNING! POSSIBLE BAD FLOPPY MEDIA - RETRY FORMT OR DISCARD FLOPPY	Formatting a floppy only. An error occurred on 5th and final FORMT/Verify combination. Re-start the FO process may mask the track defective unless the media is truly bad.
UNAUTHORIZED LU2,3 ACCESS – (COMMAND IGNORED)	An attempt has been made to reformat LU2 or LU3 without command capability 60 or without being in FORMT interactive mode. If you specified LU2 or LU3 for the REformat function in the run string, rerun FORMT interactively.

3-15. EXPLANATION MESSAGES (after a ?? response):

ENTER FO(RMAT), IN(ITIALIZE), SP(ARE), VE(rify), RE(format), EN
ENTER DISC LU < 64
ENTER YE, NO
ENTER BAD TRACK #, 0 XXXX
ENTER FILL SECTOR VALUE, 0-28

7900 DISC BACKUP PROGRAMS

SECTION IV

4-1. INTRODUCTION

You can use the 7900 disc backup utility programs to:

1. SAVE — transfer information from disc to magnetic tape.
2. RESTORE — transfer information from magnetic tape to disc.
3. COPY — transfer information from one disc to another.
4. VERIFY — check data after a save, restore, or copy operation.
5. INITIALIZE — initialize a disc cartridge.

These utilities are supported in RTE-IVB with the following devices:

- 7900 disc drives.
- 7905, 7906, 7920, and 7925 disc drives (13037 MAC disc controller).
- 7970 (9 track) magnetic drive.
- Consoles using drivers type DVR00 or DVR05.

Disc driver DVR31 is used with 7900 discs and disc driver DVR32 is used with MAC discs.

NOTE

Although the 7900 Disc Backup Utilities supports MAC discs also, it is not compatible with the ICD/MAC Disc Backup Utilities (which do not support 7900 discs). For this reason when using both sets of utilities, it is recommended to use the 7900 Disc Backup Utilities for 7900 discs only and the ICD/MAC Disc Backup Utilities for all other discs. Refer to Section II of this manual.

These data transfers can be performed in the following ways:

A. On-line (under control of the RTE system). On-line data transfers occur in logical mode. That is, track addresses are relative to the first logical unit (subchannel) track. During a restore, only logical addresses are used.

B. Off-line (stand alone). Off-line data transfers occur in physical mode. That is, the actual physical track addresses are used. A restored section on the destination disc will be an image of the saved section on the source disc.

There are three types of data transfers:

1. LU (Logical Unit) transfers: One logical unit (subchannel) is transferred. (Used on-line only.)

2. UNIT transfers: The entire disc drive (all data on the fixed and removable platters) is transferred. (Used off-line and on-line.)

3. FROM-TO transfers: You specify the starting track and the number of tracks to be saved or copied. Whatever was saved on tape is transferred during a restore. (Used off-line only.)

Any kind of an on-line save can be restored off-line. Table 4-1 shows the permitted save-restore combinations. For off-line data transfers, data must not be transferred between a 7900 disc and any other "non-7900" disc. Data saved off-line cannot be restored on-line. If such a restore is attempted, the utility prints OFF-LINE SAVE, CANNOT BE RESTORED ON-LINE and aborts.

Table 4-1. 7900 Disc Backup Utility Save-Restore Combinations

RESTORE / SAVE	ON-LINE		OFF-LINE
	LU	UNIT	
On-Line LU	X		X
On-Line UNIT		X	X
Off-Line UNIT			X
Off-Line FROM-TO			X

During a save or restore operation, you can specify which file (1 to 8) is to be used on your magnetic tape. The default is file number one. If end-of-tape is detected, the utility prints the message EOT REACHED, MOUNT NEW TAPE. Mount another tape and restart the program. The utility writes a header record on the new tape and continues saving data.

Any of the utilities can be aborted by typing AB in response to a question asked by the program. When a question requires a yes or no response, a reply with YE as the first two characters is interpreted as yes, AB is interpreted as abort, and all other letters are treated as no.

Both the on-line and off-line backup utilities can be used for many purposes; some general, others highly specific to a particular application. Table 4-2 contains a description of some of these functions. Although not comprehensive, it may be helpful in illustrating what to use, and when.

Table 4-2. 7900 Utility Applications

FUNCTION / MODE	TYPE	ON-LINE	OFF-LINE
SAVE	LU	Saves all tracks on one subchannel (not just FMGR files). Off-line restore will do track sparing.	Not available
SAVE	UNIT	No need for track map table information if track sparing. If you restore off-line you can get track sparing.	Can define track map table with any # of subchannels (like multiple LU saves). Can get track sparing.
SAVE	FR-TO	Not available	Saves all tracks within specified bounds. Bounds need not fall at subchannel divisions.
RESTORE	LU	Restore all tracks on one subchannel without shutting down system.	On-line LU save can be restored off-line. Track sparing is done.
RESTORE	UNIT	For peripheral disc units (not LU2 or LU3), you can restore without shutting down system.	Only way to restore a UNIT save containing LU2 or LU3. On-line UNIT save can be restored off-line to get track sparing.
RESTORE	FR-TO	Not available	Restore tracks designated by a FR-TO save.
COPY	LU	For fast backup of disc LU's if no magnetic tape unit is available.	Not available
COPY	UNIT	Backup with multiple disc drives if no magnetic tape unit is available.	Disc unit backup with multiple disc drives if no magnetic tape unit is available. Also to initialize cartridges with track sparing (disc diagnostics must be performed prior to this utility to insure successful initialization).
COPY	FR-TO	Not Available	For disc backup (see on-line LU copy).

4-2. ON-LINE OPERATIONS

You can perform either UNIT or LU transfers on-line by running SAVE, RSTOR, or COPY. Because the transfer of data is done in a logical mode, the formats of the source and destination discs do not have to be the same. You transfer data between devices using the programs named in Table 4-3.

Table 4-3. 7900 Disc Backup Utility On-Line Data Transfer Programs

SOURCE \ DESTINATION	7900	7905, 7906, 7920	7925	TAPE
7900	COPY	COPY	COPY*	SAVE
7905, 7906, 7920	COPY	COPY	COPY*	SAVE
7925	N/A	N/A	COPY	SAVE
MAGNETIC TAPE				
SAVE OF 7900	RSTOR	RSTOR	RSTOR*	
SAVE OF 7905, 7906, 7920	RSTOR	RSTOR	RSTOR*	
SAVE OF 7925	N/A	N/A	RSTOR	

N/A — Not allowed.

* — Only 6144 words per track transferred.

"TRACK SIZES NOT EQUAL" will be printed if you attempt to perform any of the tasks marked "N/A" above. The utility programs assume that the destination disc has the same track size as the source disc.

CAUTION

If you want an exact duplicate of a disc from an on-line transfer, you must run the utilities while there is no other system activity affecting the disc. The utility programs do not check if anyone else is using the disc concurrently. For example, if an open File Manager file is saved, it will be open when restored.

On-line utilities do not allow logical units 2 or 3 (system discs) to be used as destination subchannels during restore or copy operations. If this is attempted, the utility program prints DEST SUBCHNL IS LU2 OR LU3 and aborts.

You can specify that the transferred data is to be verified after completion of any of the three operations. Verification is done by reading corresponding records from the source and destination devices and making a word by word comparison. The verify program is scheduled by SAVE, RSTOR, or COPY.

When the source data is on logical units 2 and 3, only protected tracks and File Manager tracks are verified.

If data does not verify, the error message VERIFY ERROR AT TRACK *ttt* & LU# *ll* is printed.

4-3. LOADING THE ON-LINE UTILITIES

The on-line utility programs are distributed to you as four relocatable programs and a library (%DBKLB) of relocatable subroutines. The utilities can be loaded either during system generation or by LOADR. The program types are listed in Appendix B.

If you load the disc backup utility programs into an RTE-IVB system during generation, you must override the program size and increase the partition size as follows:

To load the program on-line in an RTE-IVB system, perform the following steps:

1. use the LOADR SZ command to specify the program size as per the information in Table 4-4.
2. relocate the program module using the LOADR RE command.
3. search the on-line utility library %DBKLB and the library $DSCLB with the LOADR SE command.

Table 4-4. 7900 Disc Backup On-Line Utilities Program Sizes

PROGRAM	RELOCATABLE FILE NAME	PROGRAM SIZE FOR 2048 WORD BUFFER	PROGRAM SIZE FOR TRACK SIZE BUFFER
SAVE	%SAVE	8 pages	14 pages
RSTOR	%RSTOR	8 pages	15 pages
COPY	%COPY	8 pages	14 pages
VERFY	%VERFY	7 pages	20 pages

4-4. BUFFER SIZE

If the partition size in which a utility runs is not large enough to hold a 2048 word buffer, the program prints PARTITION SIZE TOO SMALL and aborts. If there is enough memory in the utility's partition to hold a track size buffer but not enough memory in VERIFY's partition to hold two such buffers, the program prints WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/TRCK SIZE BUF (refer to Table 4-5 for track sizes). You have the option to choose a track size buffer by answering YES to TRACK SIZE BUFFER DESIRED? (You should reply NO if the warning was printed and you want the data verified.) If VERFY is not defined or its partition size is not large enough to hold two 2048 word buffers, the message WARNING-VERIFY NOT DEFINED OR PARTITION SIZE TOO SMALL is printed.

For restore, if the save was done with the larger buffer size and the partition cannot hold the track size buffer, the restore utility prints PARTITION SIZE TOO SMALL and aborts. In this case, you can only restore data off-line.

4-5. BAD TRACKS

Each utility attempts up to ten retries when a read or write operation is unsuccessful. If the retries are all unsuccessful, the program prints DISC ERROR AT FOLLOWING TRCK & LU# followed by the track and logical unit numbers. The utility then aborts. On-line utilities do not do track sparing.

4-6. PROTECTION STATUS

Your system may have disc tracks which have been protected — data cannot be written on them if the write protect switch is on. (These tracks usually contain system information.) During a save, the protection status for each track is recorded. When the information is restored on-line, the protection status of a destination track cannot be modified. (The program prints WARNING-WRITING ON PROTECTED TRCKS if data is written on protected tracks during a restore or copy.) Because of this, on-line restore and copy using the system subchannel (LU 2) as the source is not recommended. Only during an off-line restore or copy can the protect status bit be set for each track. This insures: 1. the entire system is protected, 2. all system tracks can be verified, and 3. no tracks are wasted.

4-7. FORMAT COMPATIBILITY

If a track map table is not defined for a source or destination disc unit, the utility program prints FOLLOWING TRACK MAP TABLE NOT FOUND followed by $TB31 for 7900 discs or $TB32 for discs other than 7900.

LU RESTORE OR COPY. When logical unit 2 is the source LU, the destination LU must have exactly the same number of tracks. For any other source LU's, the number of tracks in the destination subchannel must be greater than or equal to the number of tracks in the source subchannel. Destination disc track size must be larger than or equal to source disc track size.

UNIT RESTORE OR COPY. When logical unit 2 is part of the source unit, the destination unit must have a matching track map format (including track size). Otherwise, the copy and restore utilities map each source subchannel to a destination subchannel with at least as many tracks. If a destination or source subchannel is not assigned a logical unit number, the utility prints ASSIGN LU# TO FOLLOWING SUBCHNL followed by the subchannel number, then suspends itself. Assign an LU number with the LU command and restart the utility with the GO command.

When disc formats are not compatible, the program prints SOURCE & DEST TRACK MAP INFO NOT COMPATIBLE and aborts.

NOTE

The on-line disc backup utilities require an RTE-IVB operating system with a date code of 1926 or later.

Table 4-5. Disc Configurations

RANGE OF / DISC TYPE	NO. TRACKS	PLATTER NO.			TRACK SIZE (# WORDS PER TRACK)
7900	1-203	0-1			6144
RANGE OF / DISC TYPE	**CYLINDER NO.**	**NO. OF TRACKS**	**NO. OF SURFACES**	**HEAD NO.**	**TRACK SIZE (# WORDS PER TRACK)**
7905	0-410	1-1233	1-3	0-2	6144
7906	0-410	1-1644	1-4	0-3	6144
7920	0-822	1-4115	1-5	0-4	6144
7925	0-822	1-7407	1-9	0-8	8192

4-8. SAVE

To run the save utility, use the RU or ON command. For example,

RU,SAVE,console,type,source,destination[,disc]

where

console	logical unit number (LU) for operator console. Default is 1 or the LU provided by the multi-terminal monitor.
type	type of save: 0 for LU save (default), 1 or non-zero for UNIT save.
source	source subchannel LU (LU save, no default) or source disc drive unit (UNIT save, default = 0).
destination	destination magnetic tape LU. Default is 8.
disc	source disc type (UNIT save only). Refer to Table 4-5.

If a parameter is not acceptable, SAVE prints an appropriate error message (see Section 4-11) and asks for a new value. The first question the program asks is whether you want a track size buffer. If there is adequate room, SAVE asks if you want verification. The utility prompts for a file ID (a 72 character string written on the magnetic tape's header record) and the file number where the information is to be stored (a number from 1 to 8). The program then performs the operations you specified, printing a STOP message when done.

If you run a UNIT save under an RTE-IVB Session Monitor terminal, all the LUs associated with the disc unit must have been previously defined in the user's SST (Session Switch Table — See the RTE-IVB Terminal User's Manual). Otherwise, the program will print:

```
PLEASE DEFINE THE FOLLOWING LU(S) IN THIS SESSION:
XX
YY
ZZ
```

The program will then terminate.

Here are sample runs. The first is an LU save, the second a UNIT save.

```
:RU,SAVE,,,10,8
WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/ TRCK SIZE BUF
TRACK SIZE BUFFER DESIRED? (YES/NO)
NO
VERIFY? (YES/NO)
YES
FILE ID?
7900 LU 10 SAVE
FILE#?
2
VERIFYING
  VERFY : STOP     0000
  SAVE  : STOP     0000


:RU,SAVE,,1,0,8,7900
WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/ TRCK SIZE BUF
TRACK SIZE BUFFER DESIRED? (YES/NO)
YES
FILE ID?
7900 UNIT 0 SAVE  (LU2, LU10)
FILE#?
```

4-9. RESTORE

To run the restore utility, use the RU or ON command. For example,

RU,RSTOR,console,type,source,destination[,disc]

where

console	operator console LU. Default is 1 or the LU provided by the multi-terminal monitor.
type	type of restore: 0 for LU restore (default), 1 for UNIT restore. Must match type of save.
source	source magnetic tape LU. Default is 8.
destination	destination subchannel LU (LU restore, no default) or destination disc drive unit (UNIT restore, default=0). The LU cannot be 2 or 3, or the UNIT cannot contain LUs 2 or 3.
disc	destination disc type (UNIT restore only). Refer to Table 4-5.

If a parameter is not acceptable, RSTOR prints an appropriate error message (see Section 4-11) and asks for a new value. The first question the restore program asks is the file number (1 to 8) on your magnetic tape. After you enter the number, the program prints the file ID of that file and asks if it is the correct one. If you answer no, RSTOR suspends itself so you can mount another tape. After restarting the program with GO,RSTOR, you are asked for the file number again. Once the correct file is found, you are asked whether you want the data verified. If the type of restore does not match the type of save (recorded in the tape file's header record), RSTOR aborts. Otherwise program restores the data and prints a stop message when it is done.

If you run a UNIT RSTOR under an RTE-IVB Session Monitor terminal, all the LUs associated with the disc unit must have been previously defined in the user's SST (Session Switch Table — See the RTE-IVB Terminal User's Manual). Otherwise, the program will print:

```
PLEASE DEFINE THE FOLLOWING LU(S) IN THIS SESSION:
XX
YY
ZZ
```

The program will then terminate.

Here are examples of an LU restore and a UNIT restore:

```
:RU,RSTOR,,,8,28
FILE#?
1
FILE ID:
7900 UNIT 0 SAVE (LU2, LU10)
TAPE#:  01
OK?  (YES/NO)
NO
RESTART RSTOR BY ENTERING 'GO,RSTOR'
  RSTOR : PAUSE   0000
*GO,RSTOR
FILE#?
2
FILE ID:
7900 LU 10 SAVE
TAPE#:  01
OK?  (YES/NO)
YES
VERIFY? (YES/NO)
VERIFY? (YES/NO)
YES
VERIFYING
  VERFY : STOP    0000
  RSTOR : STOP    0000


:RU,RSTOR,,1,8,1,7900
FILE#?
1
FILE ID?
7900 UNIT 0 SAVE  (LU2, LU10)
TAPE#:  01
OK?  (YES/NO)
YES
WARNING-PARITION SIZE TOO SMALL FOR VERIFY W/ TRCK SIZE BUF
  RSTOR : STOP    0000
```

4-10. COPY

To run the copy utility, use the RU or ON commands. For example,

RU,COPY,console,type,source,destination

where

console	operator console LU. Default is 1 or the LU provided by the multi-terminal monitor.
type	type of copy: 0 for LU copy (default), 1 for UNIT copy.
source	source subchannel LU (LU copy, no default) or source disc drive unit (UNIT copy, default= 0).
destination	destination subchannel LU (LU copy, no default) or destination disc drive unit (UNIT copy, default=0). The LU cannot be 2 or 3, or the UNIT cannot contain LUs 2 or 3.

If a parameter is not acceptable, COPY prints an appropriate error and asks for a new value. The first question the program asks is whether you want a track size buffer. If there is adequate room, the program asks if you want verification. If you specified an LU copy, you are asked the types (refer to Table 4-5) of the source and destination discs. If the disc track maps are compatible and you are not writing on system discs (LU 2 or 3), the operations are performed and a stop message is printed.

Here are examples of an LU and a UNIT copy:

```
:RU,COPY,,,2,10
WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/ TRCK SIZE BUF
TRACK SIZE BUFFER DESIRED?  (YES/NO)
YES
  COPY  : STOP    0000
```

```
:RU,COPY,,1,0,0
WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/ TRCK SIZE BUF
TRACK SIZE BUFFER DESIRED?  (YES/NO)
YES
DISC TYPE FOR SOURCE DISC UNIT?
7900
DISC TYPE FOR DEST   DISC UNIT?
7905
  COPY  : STOP    0000
```

4-11. ON-LINE ERROR MESSAGES

Message	Meaning and Action
PARTITION SIZE TOO SMALL	The partition in which the utility program is running cannot hold a 2048 word buffer. The partition size must be 8 pages or more for SAVE, COPY, and RSTOR. The program is aborted. Reload the program and size it according to Table 4-4.
WARNING-PARTITION SIZE TOO SMALL FOR VERIFY W/TRCK SIZE BUF	The partition in which the utility program is running cannot hold two track size buffers. If you want to verify your data, do not use the track size buffer.
FOLLOWING DISC LU# IMPROPER, ENTER AGAIN	The logical unit number specified is invalid — it does not belong to a valid disc type. Enter the correct disc LU#
FOLLOWING DISC DRIVE# IMPROPER, ENTER AGAIN	The disc drive (unit number) is invalid. For 7900 discs, enter a number between 0 and 3. For discs other than 7900 enter a number between 0 and 7.
FOLLOWING DISC TYPE IMPROPER ENTER AGAIN	Invalid disc type specification (refer to Table 4-4). Enter the correct type.
IMPROPER MT LU#, LU#=?	The magnetic tape logical unit number is invalid. Enter a new value.
NO WRITE RING, WRITE ENABLE MT	The write ring is missing from the magnetic tape during a save operation. Put the write ring on and restart the utility with the GO command.
IMPROPER FILE#	The magnetic tape file number is not between 1 and 8. Enter a new value.
FILE NOT FOUND	The file number specified is greater than the number of files on the magnetic tape. Mount another tape, if necessary, and restart the utility with the GO command. Specify the correct file number.
EOT REACHED, MOUNT NEW TAPE	The entire magnetic tape has been read. Mount the next tape and restart the utility with the GO command.
FOLLOWING TRCK MAP TBL NOT FOUND	The entry point for the table describing the track map information ($TB31 for 7900 and $TB32 for discs other than 7900) for the source or destination disc unit cannot be found. The utility is aborted.
ASSIGN LU# TO FOLLOWING SUBCHNL	The indicated subchannel is defined in the track map table but is not assigned an LU number. Assign an LU number with the LU command and restart the utility with the GO command.

Message	Meaning and Action
SOURCE & DEST TRACK MAP INFO. NOT COMPATIBLE	One of the conditions described under Format Compatibility (Section 4-7) is not satisfied. The program is aborted.
SAVE TYPE NOT SAME AS RESTORE TYPE	The type of restore is not the same as the type of save recorded in the file's header record. RSTOR is aborted.
OFF-LINE SAVE, CANNOT BE RESTORED ON-LINE	The data was saved off-line and cannot be restored on-line. RSTOR is aborted.
DEST SUBCHNL IS LU2 OR LU3	Logical unit 2 or 3 is the destination subchannel for an LU restore or copy operation, or is in the destination unit for a unit copy or restore operation. The utility is aborted.
WARNING-WRITING ON PROTECTED TRCKS	RSTOR or COPY is writing on protected tracks.
DISC ERROR AT FOLLOWING TRCK & LU#	The number of words actually transferred is not equal to the number of words requested to be transfered to or from the disc. The utility is aborted.
SAVxx WAITING FOR MT LU LOCK RSTxx WAITING FOR MT LU LOCK	SAVE or RSTOR is waiting to lock the mag tape LU. Operation will continue when the magnetic tape LU is locked.
MISSING REC FOR FOLLOWING TRCK & LU#	During a restore operation a record was missing on magnetic tape. The utility is aborted.
WARNING-VERFY NOT DEFINED OR PARTITION SIZE TOO SMALL	The verify program is not defined or its partition is not large enough. You cannot verify your data.
VERIFY ERROR AT TRCK *ttt* & LU *ll*	Data read from or written to the given track location does not verify. The utility continues.
SAVxx ABORTED RSTxx ABORTED COPxx ABORTED	The utility program has been aborted because of one of the conditions listed above.
??	Carriage return prior to input or input device has timed out waiting for a response. Re-enter input.
IMPROPER TRCK MAP INFO	Subchannels for source or destination disc unit not defined in the track map table. The utility is aborted.

4-12. OFF-LINE OPERATIONS

You can perform UNIT and FROM-TO transfers off-line. However, it is your responsibility to insure disc types are the same.

Because data transfer is done in a physical mode, data transfer CANNOT be done between (1) a 7900 disc and a disc other than 7900, or (2) a 7925 disc and a disc other than a 7925. You can use the off-line utility to perform transfers between devices as shown in Table 4-6.

Because a 7925 disc has 8192 words per track while a "non-7925" disc has 6144 words per track, it is not possible to transfer data (via SAVE/RESTOR or COPY) from a 7925 disc to a 7905/06/20 disc. An attempt to do so will cause EOC (end-of-cylinder) error from the off-line program. Under no circumstances should an attempt be made to transfer data from a 7925 disc to a 7900 disc as the wrong disc driver will be invoked and the 7900 disc controller will not respond correctly; the same holds true in the reverse direction.

CAUTION

Transferring data from a 7905/06/20 disc to a 7925 disc may appear to work until a defective track is encountered, in which case the results are unpredictable. (Remember that only 6144 words of data will be stored on a track whose capacity is 8192 words.) The sparing operation results in only 48 of the 64 physical sector preambles on the defective track being set to the address of the spared track. This results in an error in the spare operation such that the next available spare track is tried with the same results. This process will continue until the spare track list is exhausted.

Table 4-6. Off-Line Device Transfers

DESTINATION / SOURCE	7900	7905,7906,7920	7925	TAPE
7900	X	N/A	N/A	X
7905,7906,7920	N/A	X	N/A	X
7925	N/A	N/A	X	X
Magnetic Tape	*	**	***	

*data must have been saved from 7900 disc
**data must have been saved from 7905/7906/7920 disc
***data must have been saved from 7925 disc
N/A — Not allowed

The off-line disc backup utility program requires a minimum of 30000 words of memory.

4-13. BUFFER SIZE

During save and copy operations, you have the option to choose either a 2048 word or track size buffer. During a restore operation, the buffer is the same size as that of the saved data.

4-14. BAD TRACKS

Whenever bad tracks are detected the message BAD TRACK AT: is printed, followed by the location of the track. For discs other than 7900, track sparing (spare tracks are used instead of bad tracks) occurs during the following operations: 1) Restore where the save was done on-line. 2) Unit save or copy with an HP DOS* source disc. 3) Unit save or copy with an RTE source disc and the track sparing option is chosen. When tracks are spared, the message SPARED TO: is printed, followed by the location of the spared track. Track sparing is not done for FROM-TO restore or copy operations.

4-15. PROTECTION STATUS

The protection status of each track is recorded as it is saved. When restoring an on-line or off-line save, the protection status of saved tracks is transferred to the corresponding restored tracks.

4-16. STARTING THE OFF-LINE UTILITY

To run the off-line utility, perform the following steps:

1. Load the utility program, !DSKUP, from the input device (paper tape reader, magnetic tape, mini-cartridge) using the appropriate ROM loader. Refer to the HP 12992 Loader ROM's Installation Manual (part no. 12992-90001).

   a. Clear and set the S-register (Switch Register) as follows:

      bits 0-5 zeroes
      bits 6-11 select code of the console
      bits 12-13 zeroes
      bits 14-15 address of the ROM loader

   b. Press the IBL switch, PRESET switch, then RUN switch. !DSKUP will then be read into main memory.

2. After the utility is loaded into memory, it will then execute a HALT 77B in the T-register. At this point the utility is preconfigured for magnetic tape and a DVR00 console as follows:

Device	Octal Select Code
System Console	15
Magnetic Tape	23

*DOS (Dics Operating System) is another HP operating system for 2100 series computers.

If you want this configuration, set the S-register to 0. If you want to reconfigure these I/O channels, set the S-register as follows (the utility will ask for the magnetic tape select code later):

bits 0-5	select code of the console
bits 6-15	zeroes

Disc channels are not preconfigured. Discs (and magnetic tape if the S-register is not zero) are configured through the dialogue with the utility program.

3. Set the P-register to 2.

4. Press PRESET and RUN.

After you perform these steps, the program uses the system console to send messages and receive replies. Typing?? in response to any prompt causes the utility to print all the valid responses to the question. (The valid responses will also be printed if you enter an invalid reply.) Typing AB will restart the utility. When the utility starts running, it prints a heading (DISC BACKUP UTILITY) and asks which task you want performed. Type SA (for save), RE (for restore), or CO (for copy). You may also specify RW to rewind the magnetic tape. (The magnetic tape select code must have been properly configured before using the RW command.)

4-17. SAVE

Refer to the examples below for the questions the utility program asks. The exact questions depend upon the type of save and type of disc. If the switch register is not zero, the program asks for the magnetic tape channel number. Reply with an octal value between 10 and 77. The source disc channel number is also an octal number between 10 and 77. The source disc type is one of those referenced in Table 4-5. The drive number is between 0 and 3 for 7900 discs or between 0 and 7 for discs other than 7900. The type of save is FR for FROM-TO and UN for UNIT.

For FROM-TO saves you must answer the following questions:

RTE OR DOS DISC? (discs other than 7900)
Enter RT or DO. (Enter RT for RTE-IVB)

FROM TRACK # ? (7900 only)
Enter a number between 0 and 202 specifying where the transfer begins.

FROM CYLINDER # ? (discs other than 7900)
Refer to Table 4-5 for appropriate values which will specify where the transfer is to begin.

OF TRACKS?
Indicate the number of tracks to be saved. For 7900 discs it must be between 1 and 203 minus FROM TRACK #. For DOS 7905 it must be between 1 and 200. Refer to Table 4-5 for information on the other RTE discs.

PLATTER # ? (7900 only)
Indicate which platter is to be saved: 0 for fixed platter or 1 for removable platter.

OF SURFACES? (discs other than 7900)
Type the number of surfaces to be saved (refer to Table 4-5).

STARTING HEAD # ? (discs other than 7900)
Enter the head number where save begins (refer to Table 4-5).

For UNIT saves you must answer these questions:

RTE OR DOS DISC? (discs other than 7900)
Enter RT or DO. (Enter RT for RTE-IVB)

WANT TRACK SPARING? (RTE discs other than 7900)
Reply YES or NO.

If you reply yes to track sparing, the program needs track map information for each subchannel. (See your system operating manual or generator manual for further information on track maps.) Enter four numbers separated by commas for each subchannel as shown in the second example below. The four values indicate the number of tracks, the cylinder at which the subchannel begins, the head number of the first track in the subchannel, and the number of surfaces the subchannel contains (refer to Table 4-5). Enter /E to terminate the subchannel prompts.

NOTE

Track sparing is done only during the off-line restore and copy operations.

OF SUBCHNLS TO BE COPIED? (7905 DOS discs only)
Indicate the number of subchannels to be saved (1 through 3). The save operation starts with subchannel 0.

You next indicate whether you want a large buffer and if you want the data to be verified. The utility asks for the file number (1 to 8) on the magnetic tape where you want the data to be recorded. The FILE ID is a 72 character field written into the file's header record.

At this point the actual transfer of data begins. The switch register contains the relative track number being saved. When the transfer (and verification) is done, the utility prints TASK COMPLETED.

When the task has been completed or aborted, the program asks for another task. (You cannot reconfigure magnetic tape and console select codes.)

NOTE

If all subchannels of a disc are not defined when doing a SAVE with track sparing, data on these subchannels could be overwritten on a restore. !DSKUP assumes that all tracks between defined subchannels are spares. If bad tracks are encountered during a restore, these tracks will be used as spares.

Here is an example of a FROM-TO save with a 7900 disc:

```
DISC BACKUP UTILITY
TASK?
SA
SOURCE DISC CHANNEL#?
21
SOURCE DISC TYPE?
7900
SOURCE DISC DRIVE#?
0
TYPE OF SAVE?
FR
FROM TRACK #?
0
# OF TRACKS?
100
PLATTER #?
1
TRACK SIZE BUFFER DESIRED?
YES
MT FILE#?
1
FILE ID?
7900 FROM-TO SAVE TRACKS 0-100 REMOVABLE PLATTER
VERIFYING
TASK COMPLETED
```

Here is an example of a UNIT save with a 7905 disc:

```
DISC BACKUP UTILITY
TASK?
SA
SOURCE DISC CHANNEL#?
27
SOURCE DISC TYPE?
7905
SOURCE DISC DRIVE#?
0
TYPE OF SAVE?
UN
RTE OR DOS DISC? (Enter RT for RTE-IVB)
RT
WANT TRACK SPARING?
YES
ENTER TRACK MAP INFO FOR SOURCE DISC UNIT AS SHOWN BELOW
# TRKS, FIRST CYL#, HEAD #, # SURFACES
SUBCHNL 00?
203,0,0,2
SUBCHNL 01?
203,103,0,2
SUBCHNL 02?
203,206,0,2
SUBCHNL 03?
203,309,0,2
SUBCHNL 04?
400,0,2,1
SUBCHNL 05?
/E
TRACK SIZE BUFFER DESIRED?
YES
VERIFY?
NO
MT FILE#?
1
FILE ID?
7905 UNIT SAVE WITH TRACK SPARING
TASK COMPLETED
```

4-18. RESTORE

Refer to the restore example for the questions the utility program asks. The exact questions depend upon the type of restore and type of disc. If the switch register is not zero, the program asks for the magnetic tape channel number. Reply with an octal value between 10 and 77. For the magnetic tape file number, type a number from 1 to 8 indicating which file contains the data to be restored. The utility prints the identification information and the tape number (which should be 1) from the file's header record. If this is not the tape you want, don't answer YES to the OK? question. Instead, answer NO, mount a new tape, restart the utility by entering GO, and answer the questions again, beginning with MT FILE#?. When you get the right file mounted, the program asks for the destination disc channel number. Input an octal number between 10 and 77. The destinaton disc drive can be between 0 and 3 for 7900 discs or between 0 and 7 for 7905/06/20/25. (The disc type is read from the header record.)

If the restore is FROM-TO (the type of restore is read from the header record), the program asks these questions:

TO TRACK #? (7900 only)
Enter a number between 0 and 202 specifying where the transfer begins.

TO CYLINDER #? (discs other than 7900)
Refer to Table 4-5 to specify where the transfer begins.

PLATTER #? (7900 only)
Indicate which platter is to be restored. 0 for fixed platter or 1 for removable platter.

OF SURFACES? (discs other than 7900)
Type the number of surfaces to be restored (refer to Table 4-5).

STARTING HEAD #? (discs other than 7900)
Enter the head number where restore begins (refer to Table 4-5).

You can have the data verified by answering VERIFY? with YES.

After the dialogue is complete, the data transfer operation begins. The switch register contains the relative track number being restored.

If an end-of-tape occurs during the restore, thr program prints the message EOT REACHED, MOUNT NEXT TAPE. Mount the next tape (tape number 2) and restart the utility by typing GO followed by a carriage return. (If tape 2 is read to the end, mount tape 3, etc.)

The switch register contains the relative track number being restored. When the transfer (and verification) is done, the program prints TASK COMPLETED.

When the task has been completed or aborted, the program asks for another task. (You cannot reconfigure magnetic tape and console select codes.)

Here is an example of a UNIT restore to a 7900 disc:

```
DISC BACKUP UTILITY
TASK?
RE
MT FILE#?
1
FILE ID:
7900 UNIT 0 SAVE  (LU2, LU10)
TAPE#:  01
OK?
YES
DEST   DISC CHANNEL#?
21
DEST   DISC DRIVE#?
0
VERIFY?
YES
VERIFYING
TASK COMPLETED
```

4-19. COPY

Refer to copy examples for the questions the utility program asks. The exact questions depend upon the type of copy and the type of disc. The source disc channel number must be an octal number between 10 and 77. Refer to Table 4-5 for a list of source disc types. The source disc drive number is between 0 and 3 for 7900 discs or between 0 and 7 for discs other than 7900. The type of copy is FR for FROM-TO and UN for UNIT.

For a FROM-TO copy you must answer the following questions:

RTE OR DOS DISC (discs other than 7900)
Enter RT or DO. (enter RT for RTE-IVB)

FROM TRACK #? (7900 only)
Enter a number between 0 and 202 specifying where the transfer begins.

FROM CYLINDER #? (discs other than 7900)
Refer to Table 4-5 for appropriate values which will specify where the transfer is to begin.

OF TRACKS?
Indicate the number of tracks to be copied. For 7900 discs it must be between 1 and 203 minus FROM TRACK #. For DOS 7905 it must be between 1 and 200. Refer to Table 4-5 for information on the other RTE discs.

PLATTER #? (7900 only)
Indicate which platter is to be copied: 0 for fixed platter or 1 for removable platter.

OF SURFACES? (discs other than 7900)
Type the number of surfaces to be copied (refer to Table 4-5).

STARTING HEAD #? (discs other than 7900)
Enter the head number where copy begins (refer to Table 4-5).

For a UNIT copy you must answer these questions:

RTE OR DOS DISC? (discs other than 7900)
Enter RT or DO. (enter RT for RTE-IVB)

WANT TRACK SPARING? (RTE discs other than 7900)
Reply YES or NO.

If you reply yes to track sparing, the program needs track map information for each subchannel. (See your system operating manual or generator manual for further information on track maps.) Enter four numbers separated by commas for each subchannel as shown in the second save example. The four values indicate the number of tracks (refer to Table 4-5), the cylinder at which the subchannel begins (refer to Table 4-5), the head number of the first track in the subchannel (refer to Table 4-5), and the number of surfaces the subchannel contains (refer to Table 4-5). Enter /E to terminate the subchannel prompts.

OF SUBCHNLS TO BE COPIED? (7905 DOS discs only)
Indicate the number of subchannels to be copied (1, 2, or 3). The copy operation starts with subchannel 0.

You next indicate whether you want a large buffer and if you want the data to be verified.

At this point the actual transfer of data begins. The switch register contains the relative track number being copied. When the transfer (and verification) is done, the utility prints TASK COMPLETED.

When the task has been completed or aborted, the program asks for another task. (You cannot reconfigure magnetic tape and console select code.)

Here is an example of a UNIT copy with 7900 discs:

```
DISC BACKUP UTILITY
TASK?
CO
SOURCE DISC CHANNEL#?
21
SOURCE DISC TYPE?
7900
SOURCE DISC DRIVE#?
0
TYPE OF COPY?
UN
DEST   DISC DRIVE#?
1
TRACK SIZE BUFFER DESIRED?
YES
VERIFY?
YES
VERIFYING
TASK COMPLETED
```

Here is an example of a FROM-TO copy with 7905 discs:

```
DISC BACKUP UTILITY
TASK?
CO
SOURCE DISC CHANNEL#?
27
SOURCE DISC TYPE?
7905
SOURCE DISC DRIVE#?
0
TYPE OF COPY?
FR
RTE OR DOS DISC? (Enter RT for RTE-IVB)
RT
FROM CYLINDER#?
0
# OF TRACKS?
100
# OF SURFACES?
2
STARTING HEAD#?
0
DEST   DISC DRIVE#?
0
TO CYLINDER #?
50
# OF SURFACES?
1
STARTING HEAD#?
2
TRACK SIZE BUFFER DESIRED?
YES
VERIFY?
NO
TASK COMPLETED
```

4-20. INITIALIZING DISCS

The off-line disc backup utility can be used to initialize (i.e., re-format) discs. To ensure successful initialization when using the off-line utilities to initialize, the disc must have been previously formatted and any bad tracks flagged by having run the appropriate disc diagnostic. If the cartridge had been previously formatted using the disc diagnostic, and initialized, it would be sufficient to do a UNIT COPY with track sparing using the same disc drive as source and destination drive to initialize it. In other words, you are reading and writing data onto the same place, however you are sparing according to the new track map (re-initializing). 7900 discs are initialized any time data is written on them. Only the portion of the disc that gets written on gets re-formatted. If a bad track is encountered, it is reported and the utility continues only if the user responds "YES" to the "CONTINUE" question. The off-line utility does not mark the bad track on the 7900 disc defective or take any other action. Discs other than 7900 are initialized doing a UNIT data transfer with track sparing requested. If only some subchannels on a particular disc need to be initialized (bad tracks spared) the track map table that is entered should define only these subchannels. Note: If the utility is performing a read or write without track sparing, the query CONTINUE is displayed. If the response YES, the transfer is continued. If the response is NO, or the operation is write with track sparing, the program is aborted.

4-21. OFF-LINE ERROR MESSAGES

Message	Meaning and Action
MT NOT READY	The magnetic tape is either off-line or busy. When it is ready, restart the utility by typing GO.
NO WRITE RING, WRITE ENABLE MT	The write ring is missing from the magnetic tape during a save operation. Put the write ring on and restart the utility by typing GO.
FILE NOT FOUND	The specified file number is greater than the number of files on the magnetic tape. Mount another tape, if necessary, and restart the utility by typing GO. Specify the correct file number.
EOT REACHED. MOUNT NEXT TAPE	The end of the magnetic tape has been detected. Mount the next tape and restart the utility by typing GO.
WARNING-SUBCHNLS ON SOURCE UNIT OVERLAP	discs other than 7900. The subchannels defined in the track map table for the source unit overlap. The utility assumes the number of spare tracks for the subchannel is 0.
IMPROPERLY DEFINED SUBCHNL	discs other than 7900. The specified subchannel is defined such that the starting head number plus the number of surfaces is greater than nine. The utility is aborted.
READY DISC	The disc drive is not ready. Restart the utility by typing GO when the disc is ready.
TURN OFF DISC PROTECT	The track is protected and the write protect switch is on. Turn off the disc protect switch and restart the utility.
TURN ON FORMAT SWITCH	The utility is formatting the disc, but the format switch is off. Turn it on and restart the utility.
LAST TRACK TOO LARGE	7900 discs only. The number of tracks specified in response to FROM TRACK # for FROM-TO save or copy is greater than 202. Re-enter the number of tracks.
BAD TRACK AT *loc**	Ten tries have been made to read or write on the specified track without success. The location, *loc*, is printed.
SPARED TO *loc**	A bad track has been spared to the indicated track location (*loc*).

Message	Meaning and Action
CYLINDER OR HEAD/SECT COMPARE ERROR AT *loc**	disc other than 7900. Ten tries have been made to recalibrate the disc if the error is a cylinder compare error. If the operation being performed is a read or write without track sparing, the utility displays the query CONTINUE? If your response is YES the transfer will continue. If your response is NO or the operation is a write with track sparing, the program is aborted.
ILLEGAL SPARE AT *loc**	discs other than 7900. During a read or a write without track sparing an illegal spare, a track not expected to be a spare, was found at the *loc*. The utility prints CONTINUE. If you respond YES, the transfer will continue. Otherwise it is aborted.
VERIFY ERROR AT *loc**	The verify operation was unsuccessful at the specified track location. The utility continues.
OUT OF SPARE TRACKS FOR SUBCHNL	discs other than 7900. All spare tracks have been used up. The utility is aborted.
UNRECOVERABLE DISC ERROR-EOC OR SEEK CHECK *loc**	An end of cylinder or seek error has occurred at *loc**. Error caused by incorrect track map information. If the operation being performed is a read or write without track sparing the utility displays the query CONTINUE? If your response is YES the transfer will continue. If your response is NO or the operation is a write with track sparing, the program is aborted.
WARNING-TRACK AT FOLLOWING LOC WAS NOT SAVED SUCCESSFULLY*	Restore only. The track about to be restored was not saved successfully. The utility continues.

---

*The format of the track location (*loc*) depends on the type of disc. For 7900 discs, the location is printed in the form

TRACK# *tttt*, PLATTER# *pp*, UNIT# *u*

For 7905/7906/7920/7925 discs the location is printed in the form

SBCHNL# *ss*, TRACK# *tttt*
CYL# *ccc*, HEAD# *h*, UNIT# *u*

The first line is not printed during UNIT transfers without track sparing or FROM-TO transfers (the track map table has not been defined).

Message	Meaning and Action
WARNING-MEM SIZE TOO SMALL FOR VERIFY W/TRCK SIZE BUF	The memory size is not large enough to hold two track size buffers for a verify. If you want to verify your data, do not request the track size buffer.
I/O ERR PE EQT #2	A parity error occurred on the magnetic tape. The utility must be reloaded.
I/O ERR NR EQT #2	The magnetic tape drive is not ready. The utility must be reloaded.

DISC UPDATE PROGRAM

SECTION V

The disc update program replaces files on a disc cartridge with files stored on a mini cartridge tape. You can use this utility to update software files on disc from a mini cartridge distributed by Hewlett-Packard, or you can produce your own mini cartridges to modify your own programs. This utility should be used to update feature products supported on RTE-IVB. To update RTE-IVB master software disc files, use the utility called %READR (92068-16054). This program reads mini cartridges that were written with a packed format incompatible with &UPDAT. Refer to the READR/SAVER Utility Reference Manual (92068-90016) for details.

The utility consists of the files in Table 5-1. Make sure they are loaded on your RTE master software cartridge before you try to run the utility. (Do not relocate the program RDNAM. &UPDAT does this for you.)

Table 5-1. Update Utility Software

NAME	DESCRIPTION
&UPDAT	Transfer File
&PKDIS	Transfer File
%RDNAM	File containing relocatable RDNAM

5-1. REQUIRED SYSTEM SETUP

The master RTE software disc to be updated must be a system or peripheral file manager cartridge with a cartridge reference number of 32767. All files to be updated must carry a security code of RT. The mini cartridge tape unit must be assigned to logical unit 5. There must be at least one blank ID segment in the system (for the program RDNAM).

5-2. OPERATION

Before execution of the update utility, the spool system must be shut down (if one is initialized on the RTE master software disc) and any type 6 files stored on the cartridge which have been restored by the RP command must be OF'ed. This is done so the disc can be packed. Otherwise an FMG-008 error will occur.

You start execution of the utility by entering the RTE command

```
*ON,FMGR,&UPDAT:RT:32767
```

(Note that &UPDAT is the transfer file, RT is the security code, and 32767 is the cartridge reference number.)

&UPDAT reads the mini cartridge directory into a file manager file named &DRCTY, then schedules LOADR to temporarily load the program RDNAM from the relocatable file named %RDNAM. RDNAM then reads the mini cartridge directory, purges the file names contained in the directory from the master disc, uses &PKDIS to pack the disc, and moves the files one-by-one from the mini cartridge to the master disc.

CAUTION

Because RDNAM purges old files before creating new files, you should maintain a backup RTE master software cartridge.

5-3. MINI CARTRIDGE TAPE FORMAT

HP mini cartridges (except diagnostics) are recorded in the following format. (If you create mini cartridges which will use this utility, they must follow this format.) Each mini cartridge contains the information shown in Figure 5-1.

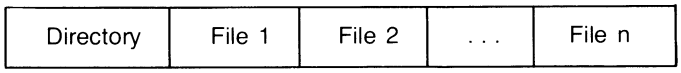


Figure 5-1. Mini Cartridge Format

The directory is a file consisting of 127-word records whose format is shown in Figure 5-2.

Words 1-3	4	5	6-127
File 1 Name	Type		Descriptive Title
File 2 Name	Type		Descriptive Title
⋮	⋮		⋮
File n Name	Type		Descriptive Title

Figure 5-2. Directory Format

The left half of the type (word 4) is an ASCII blank. The right half contains one of the following ASCII characters:

Type	Meaning
S	ASCII
R	Relocatable Binary
A	Absolute

Word 5 contains two ASCII blanks.

Because the directory contains all ASCII characters, you can list it on your 264X terminal in local mode.

FLEXIBLE DISC BACKUP UTILITY

SECTION VI

6-1. DESCRIPTION

The flexible disc backup utility software, SAFD (SAve Flexible Disc), provides the on-line capability of saving files on a flexible disc by transferring those files to cartridge tape (on a 26XX Display Station) or magnetic tape. SAFD can also restore files from cartridge tape or magnetic tape to the flexible disc. To save a fully recorded flexible disc, either six cartridge tapes or one 200-foot reel of magnetic tape (800 bits-per-inch recording density) is necessary.

6-2. SYSTEM REQUIREMENTS

Minimum hardware and software requirements for utilizing SAFD are as follows:

1. Operating System—RTE Software Operating System.
2. Flexible Disc—HP 12732A Flexible Disc.
3. Terminal—HP 26XX Display Station with cartridge tape option, configured with software driver DVR05 in the operating system, as system or auxiliary console.
4. Memory Requirement—SAFD requires 12K words of memory (background, disc resident).
5. Magnetic Tape Unit—HP 7970 9-track magnetic tape unit (optional).
6. The program type of SAFD must be one of the types specified for it in Appendix B.

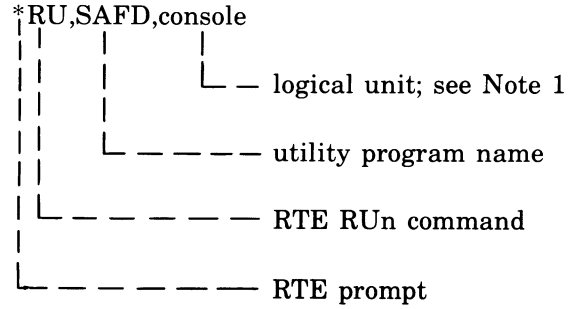
6-3. LOADING AND INITIALIZING SAFD

6-4. LOADING SAFD

SAFD is distributed as a relocatable program (%MSAFD). SAFD can be loaded either during system generation or on-line by the RTE loader. Refer to page iv or v for the technical manual containing information on using the appropriate loader in your operating system.

6-5. INITIALIZING SAFD

Once SAFD has been loaded into the system, it can be run from the RTE operating system with the following command:



Note 1: Console is the logical unit (LU) number (1 to 63) of the 26XX Display Station from which operator responses are to be made. If LU=0 or is omitted, it will default to LU=1. An illegal LU parameter aborts the program.

When SAFD is run with valid parameters, it will display the following request on the display station:

FLEXIBLE DISC SAVE OR RESTORE?(SA,RE,NO):

where SA=Save the flexible disc contents on cartridge or magnetic tape.
RE=Restore the flexible disc contents from cartridge or magnetic tape.
NO or any other two-character response terminates the program.

Refer to paragraph 6-7 for information on saving the flexible disc contents, and to paragraph 6-8 for information on restoring the flexible disc contents. Refer to paragraph 6-9 for program termination information.

6-6. USING SAFD

6-7. SAVING A FLEXIBLE DISC

If the operator wishes to save the flexible disc contents, enter SA in response to the program request explained in paragraph 6-5. SAFD will request the flexible disc LU by displaying the following:

ENTER FLEXIBLE DISC LU:

Enter the valid LU for the flexible disc with the contents to be saved.

If a valid LU for the flexible disc is entered, SAFD will request cartridge or magnetic tape LU:

ENTER CARTRIDGE OR MAG TAPE LU:

Enter the valid LU for the cartridge tape unit or magnetic tape unit used for storage of the flexible disc contents.

1. If the valid LU for a magnetic tape unit is entered, SAFD will request the magnetic tape file number:

   ENTER MAG TAPE FILE NUMBER:

   Enter the file number (1 to 8) to indicate where on magnetic tape the flexible disc contents will be saved. SAFD will then request tape header information:

   ENTER TAPE HEADER:

   Enter up to 60 alphanumeric characters for tape header information. SAFD will proceed to store files from the flexible disc to the magnetic tape unit.

2. If the valid LU for a cartridge tape unit is entered, SAFD will request tape header information:

   ENTER TAPE HEADER:

Enter up to 60 alphanumeric characters for tape header information. SAFD will proceed to store files from the flexible disc to the cartridge tape unit.

If the end of a cartridge tape or magnetic tape is reached, SAFD will display:

```
END OF CARTRIDGE OR MAG TAPE REACHED. INSERT NEW TAPE (#z).
TO CONTINUE HIT ANY KEY/RETURN
```

z—tape sequence number

Insert another cartridge or magnetic tape and hit any key and carriage return on the display station to continue.

When all of the files have been stored from the flexible disc onto the designated tape, SAFD will display:

```
FILES SAVED ON TAPE
```

SAFD will now go back to the beginning and ask the same questions until an exit is prompted, or SAFD is terminated as explained in paragraph 6-9. Examples of saving flexible disc contents are provided in Figure 6-1.

```
*RU,SAFD,1
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO): SA

ENTER FLEXIBLE DISC LU:  2

ENTER CARTRIDGE OR MAG TAPE LU:  8
ENTER MAG TAPE FILE NUMBER:  1

ENTER TAPE HEADER:  SAFD MAGNETIC TAPE SAVE AND RESTORE EXAMPLE

FILES SAVED ON TAPE
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO): NO
STOP


*RU,SAFD,1
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO): SA

ENTER FLEXIBLE DISC LU:  2

ENTER CARTRIDGE OR MAG TAPE LU:  4

ENTER TAPE HEADER:  SAFD CARTRIDGE TAPE SAVE AND RESTORE
EXAMPLE

FILES SAVED ON TAPE
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO):  NO
STOP
```

Figure 6-1. SAFD Save Examples

6-8. RESTORING A FLEXIBLE DISC

If the operator wishes to restore files to a flexible disc from a cartridge or magnetic tape, enter RE in response to the program request in paragraph 6-5.

SAFD will request the flexible disc LU:

ENTER FLEXIBLE DISC LU:

Enter the valid LU for the flexible disc to be restored.

If the valid LU for the flexible disc is entered, SAFD will request the cartridge or the magnetic tape LU:

ENTER CARTRIDGE OR MAG TAPE LU:

Enter the valid LU for the cartridge tape unit or magnetic tape unit used to restore the flexible disc.

1. If a valid LU for a magnetic tape unit is entered, SAFD will request the magnetic tape file number used to restore files to the flexible disc:

   ENTER MAG TAPE FILE NUMBER:

   Enter the file number (1 to 8) to indicate where on magnetic tape the flexible disc will be restored from. SAFD will then display tape header information on the display terminal:

   HEADER IS:
   <Tape header will be displayed here>

2. If the valid LU for a cartridge tape unit is input, SAFD will display tape header information on the display terminal:

   HEADER IS:
   <Tape header will be displayed here>

SAFD will then display the current tape sequence number on the display station:

TAPE #z

z—tape sequence number

At this point, SAFD will allow the operator to verify that the tape header and the tape sequence number are correct. SAFD will then allow the operator to terminate the program by displaying:

TERMINATE(YES/NO):

Enter YE to abort SAFD
Enter NO to continue

If the operator enters YE, SAFD will cease execution at this point. If the operator enters NO, SAFD will proceed to restore the flexible disc from the designated tape unit. Any other two-character input will cause SAFD to repeat the TERMINATE request.

When the end of a cartridge or magnetic tape is reached, SAFD will display:

```
END OF CARTRIDGE OR MAG TAPE REACHED. INSERT NEW TAPE (#z).
TO CONTINUE HIT ANY KEY/RETURN
```

z—tape sequence number

Insert another cartridge or magnetic tape, and hit any key and carriage return on the display station to continue. When all of the files have been restored to the flexible disc, SAFD will display on the terminal:

```
FILES RESTORED ON FLEXIBLE DISC.
```

SAFD will now go back to the beginning and ask the same questions until an exit is prompted, or SAFD is terminated as explained in paragraph 6-9. Examples of restoring flexible disc contents are provided in Figure 6-2.

Data should only be restored to a flexible disc LU with the same number of good tracks as the original flexible disc LU.

When restoring to a flexible disc with less good tracks than the original disc LU, SAFD reports the following message and ceases execution:

```
ERROR-NOT ENOUGH TRACKS ON FLEXIBLE DISC?
```

If the original flexible disc LU had less good tracks than the destination flexible disc LU, SAFD continues but does not move the file directory. Therefore, the restored flexible disc LU must be then mounted specifying the correct number of tracks saved from the original disc LU. Refer to the File Manager Mount Cartridge (MC) command in the RTE-IVB Terminal User's manual.

A summary of action is as follows:

Restoring Possibilities		**Action**
# of good tracks saved from original LU	> # of good tracks on destination LU	SAFD prints error message and ceases execution.
# of good tracks saved from original LU	= # of good tracks on destination LU	SAFD continues.
# of good tracks saved from original LU	< # of good tracks on destination LU	SAFD continues but does not move file directory. Mount restored disc LU with correct number of tracks saved from the original disc LU.

6-9. TERMINATING SAFD

If the operator wishes to terminate SAFD, any two-character input other than SA or RE can be entered in response to the program request in paragraph 6-5. SAFD will cease execution and the following will be displayed:

STOP

```
*RU,SAFD,1
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO): RE

ENTER FLEXIBLE DISC LU: 2

ENTER CARTRIDGE OR MAG TAPE LU: 8
ENTER MAG TAPE FILE NUMBER: 1

HEADER IS:
SAFD MAGNETIC TAPE SAVE AND RESTORE EXAMPLE

TAPE #(1)

TERMINATE(YES/NO): NO

FILES RESTORED ON FLEXIBLE DISC.
FLEXIBLE DISC SAVE OR RESTORE?(SA,RE,NO): NO
STOP


*RU,SAFD,1
FLEXIBLE DISC SAVE OR RESTORE? (SA,RE,NO): RE

ENTER FLEXIBLE DISC LU: 2

ENTER CARTRIDGE OR MAG TAPE LU: 4

HEADER IS:
SAFD CARTRIDGE TAPE SAVE AND RESTORE EXAMPLE

TAPE #(1)

TERMINATE(YES/NO): NO

FILES RESTORED ON FLEXIBLE DISC.
FLEXIBLE DISC SAVE OR RESTORE?(SA,RE,NO): NO
STOP
```

Figure 6-2. SAFD Restore Examples

6-10. ERROR MESSAGES

The following error messages may appear on the console during execution.

ERROR-NOT A FLEXIBLE DISC LU?
TERMINATE(YES/NO):

The LU entered is not the LU for a flexible disc or the subchannel was not ready (the flexible disc was not in place). The operator should respond with YE to cause SAFD to cease execution or NO to continue.

ERROR-NOT A CARTRIDGE OR MAG TAPE LU?
TERMINATE(YES/NO):

The LU entered is not the LU for a cartridge tape or magnetic tape or the LU entered is not a number. The operator should respond with YE to cause SAFD to cease execution or NO to continue.

ERROR-WRONG TAPE. INSERT NEW TAPE (#z)

The tape just inserted is the wrong tape (wrong tape sequence number). This error occurs only when restoring the flexible disc. Insert correct tape with tape sequence number z. Hit any key and carriage return to continue.

ERROR-NOT ENOUGH TRACKS ON FLEXIBLE DISC?

The number of tracks saved on the tape(s) is too large to fit on the destination flexible disc LU. SAFD ceases execution.

ERROR-EOT-FILE NOT FOUND?
ENTER MAG TAPE FILE NUMBER:

The specified file number is greater than the number of files on the magnetic tape. Enter the correct magnetic tape file number.

ERROR-NOT A POSITIVE #?
ENTER MAG TAPE FILE NUMBER:

The number entered for the file number was not positive. Re-enter the magnetic tape file number.

FC-FILE COPY UTILITY

SECTION VII

7-1. INTRODUCTION

The file backup utility FC provides a means for copying files between disc cartridges and 800/1600 bpi magnetic tape, either disc-to-disc, disc-to-tape, or tape-to-disc (tape-to-tape copying is not supported).

Files being copied may be given a different name, security code, or cartridge by specifying those fields of the destination namr. When copying from disc, file extents are automatically gathered and copied in ascending order following the main extent. As an option, you can eliminate extents and copy all sections of a file to the main extent. Options also can be selected to purge source disc files after copying, to list or suppress the listing of files copied, to replace duplicate files with the last duplicate copied, or to verify the copy. This verification is in addition to tape checksums, which are always used.

7-2. RUNNING FC

FC can be run interactively from your terminal, by specifying a command in the runstring, or by using the TRansfer command in the runstring to specify a control file.

When run interactively, FC continues to prompt for commands until you enter the exit or abort command, as

```
:RU,FC
 FC.nn: <command>
 FC.nn: <command>
    .
    .
    .
 FC.nn: EX
```

The *.nn* in the utility prompt identifies your FMGR session. Only the first two characters are required to identify a command, and FC recognizes commands entered as either upper case or lower case characters. Note that a comment can be entered at the end of a command-string, or by entering an asterisk (*) as the first character in the response. If a comment is entered after the command-string and all available optional parameters for the command are not used, commas must be inserted at the end of the string as place holders for the omitted parameters.

When a command is given in the runstring, as

```
:RU,FC,<command>,<parameters>
```

FC executes the command and terminates.

When a TR command is given in in the runstring, as

:RU,FC,TR,<control file>

where <control file> can be a device LU or namr, FC executes each of the commands contained in the control file and then terminates.

Before running FC on RTE-IVB, be sure that any tape EQTs to be used are set to the unbuffered state using the system EQ command. If this is not done, FC may give unpredictable results since the status from buffered EXEC writes is undefined, and since the System Available Memory (SAM) resource may be severely depleted by the buffering of large EXEC writes. (Refer to the RTE-IVB Terminal User's Reference Manual for details of the EQ command.)

7-3. FC COMMANDS

FC incorporates command sets that allow you to configure the copy operation and specify names for the formatted tape files and comment files, to selectively copy files and group copy commands, to transfer to and return from command files, and to direct listings to a log or list device. The command sets are summarized in Table 7-1 and described by functional groups in the following subsections.

7-4. INFORMATION COMMANDS

FC incorporates a help function to provide you with a brief summary of available commands and to provide information on FMGR errors encountered during execution.

7-5. COMMAND SUMMARY FUNCTION

Entering ? as the runstring command causes the command summary to be written to the log device, as

```
--------- FC commands ------- commands may be abbreviated to 2 chars -----
COPY,srce,dest,opts,[file1],[file2],[msc]    copy files
DEFAULT , srce , dest , opts                 set defaults for COPY command
GROUP / EG / AG           begin / end / abort GROUP of COPY commands
LL , namr                 set list file/device (dash means log device)
DL , srce , [msc] , opts  list tape directory (srce = -tlu or -tlu{namr})
CL , [-tlu] , options     list local cartridge list or tape cartridge list
CLAL                      list global cartridge list (RTE-IVB/6 only)
LH , -tlu , opts          list tape header file
LC , -tlu , opts          list tape comment file
ECHO [, ON/OFF]           turn ON/OFF cmd echo to list device (default ON)
TITLE , title             set tape title (for subsequent COPYs to tape)
CF , comment-file-namr    set comment file (for subsequent COPYs to tape)
TR , namr                 transfer to cmd file/device (dash means log device)
TR                        return from command file/device  COPY commands
EXIT                      exit FC             abort group of COPY commands
ABORT                     abort FC (same as EX except if copy group active)
SCRATCH , cartridge       set cartridge that FC will use for scratch files
* comment                 command line starting with * treated as comment
HELP [, key [, lu]]       get help, RTE-IVB/6 only (useful for FMGR errors)
? , <command>             list info about particular command (incl. options)
? , <option>              list info about particular option (all commands)
```

If you enter the ? command together with a command or option (as ?,SCRATCH), FC will respond with further information about the selected command/option.

Table 7-1. Summary of FC Commands

COMMAND	FUNCTION
Information Commands	
?	Provide a summary of available commands and command syntaxes
HELP	Define FMGR errors encountered during execution of FC
Configuration Commands	
LL	Set list device to be used by listing commands
TITLE	Establish title to be used in header file
CF	Establish namr for tape comment file
ECHO	Turn ON or OFF echoing of commands to list device
SCRATCH	Specify disc cartridge to be used for internal scratch files
Copy and Related Commands	
COPY	Initiate copy operation as specified
DEFAULT	Set default source, destination, and options for subsequent COPY commands
GROUP EG AG	Used for grouping more than one copy command into a single COPY operation
Listing Commands	
DL	Compile directory list of FC tape
CL	List FMP cartridge list, or cartridges included on FC tape
CLAL	List global FMP cartridge list
LC	List comment file from FC tape
LH	List header file from FC tape
Transfer and Exit Commands	
TR	Transfer to/from FC command file
EX	Exit FC. (If a group copy is active, it is processed before FC is aborted.)
AB	Abort FC, including any active group copy.
Comment Command	
*	Identifies following string as comment line

7-6. FMGR ERROR HELP FUNCTION

You also can call HELP, without exiting FC, to define any FMGR errors encountered in execution of the utility, as

HE[,key[,LU]]

As an example,

```
.
.
.
FMGR-032
FC.nn: HE                *enter HE
FMGR-032
CARTRIDGE NOT FOUND
AN ATTEMPT WAS MADE TO ACCESS A CARTRIDGE THAT CANNOT BE
FOUND IN THE CARTRIDGE LIST.  CHECK THE CARTRIDGE NUMBER
FOR CORRECTNESS
FC.nn:
```

7-7. CONFIGURATION COMMANDS

The configuration commands set attributes that affect the execution of other FC commands. They allow you to select the list device, to enable/disable command echoing to the list device, to set the title and comment file for tapes subsequently written, and to set the scratch-file disc cartridge.

7-8. LIST DEVICE: LL

Initially, the list device for FC is your terminal. With the LL command, you can specify another device or file to receive the list information. The command string for LL takes the form

LL,namr

or

LL,–

where

namr is the namr of the device or file to receive the list information. If a file namr is specified, it will be created if it doesn't exist. Any data in an existing file will be overwritten with the new information.

– resets the list device to your terminal - used when a preceding LL command has named another list device.

The cartridge and tape directories, header files, comment files, '?' command responses and command echoes are listed under control of the LL command. Copy status messages and error messages are always displayed on your terminal.

7-9. TITLE COMMAND: TI

The TI command establishes the title to be included in the header file of tapes created by subsequent copy commands. Each TI command title replaces the preceding title. The TI command takes the form

TI,title

Enter the title exactly as it is to appear in the header; lower-case characters are not converted to upper case. The title can be any ASCII characters up to a maximum of 72 characters. Titles longer than 72 characters are truncated to 72 characters.

7-10. NAME COMMENT FILE: CF

The CF command establishes the namr of the optional comment file to be copied from disc to tapes created by subsequent copy commands. Comment-file records longer than 128 words are truncated. Note that a comment file should not contain zero-length records, or a checksum error could result when the file is listed using the LC command. The CF command takes the form

CF,namr

Because the comment file is not encoded on mag tapes, the file can be read using the FMGR ST, LI or DU commands.

7-11. SCRATCH AREA DEFINITION: SC

Normally, FC builds each of its internal scratch files on the first cartridge with sufficient space for the initial size of the file. With the SC command, you can specify the cartridge on which the files are to be created. (This command is useful as a means of avoiding Cartridge Full errors in copy operations that require large amounts of scratch-file space.) If used, this command must be given before any CO operation. The command string takes the form

SC,cart

where

cart is the CRN or −LU to be used for the scratch file.

7-12. ECHO COMMAND: EC

Initially, command echoing to the list device is OFF. The EC command allows you to specify that each command be echoed to the list device as the command is processed and, subsequently, to suppress echoing if desired. The default is ON if neither ON or OFF is specified. The command takes the form

EC,ON

or

EC,OFF

7-13. COPY AND RELATED COMMANDS

The COpy command initiates the copy operation from disc-to-tape, tape-to-disc, or disc-to-disc. Cartridges and tapes can be written and restored by naming the devices as the source and destination parameters. Files being copied can be selected by name, security code, cartridge, etc., as desired. Selection by name can make use of wildcard characters.

The COpy command takes the form

CO[,srce[,dest[,optns[,file1[,file2[,msc]]]]]]

where

srce selects the file or files to be copied. The srce can be a single namr, a list of namrs enclosed in braces, or a negative tape LU with an optional namr or list of namrs enclosed in braces. Each namr may take the abbreviated form of a CRN or negative disc LU. Wildcard characters are acceptable in srce namrs.

Where used, the braces { } are required as defined. If the srce is a single namr, the braces can be omitted; if, however, the srce is a list of namrs, the list must be enclosed with braces, as

namr	*single-namr srce
{namr,namr...,namr}	*list of srce namrs

If the source is a tape LU, the braces can be omitted. If, however, it contains one or more optional namrs, the single namr or list of namrs must be enclosed with braces, as

−tlu
−tlu{namr}
−tlu{namr,namr...,namr}

dest determines whether the files selected by the source parameter are to be copied to disc or to tape, and allows specification of the name, security code, and cartridge for the destination files. The dest can be either a namr (for disc destinations) or a negative tape LU with an optional namr enclosed in braces. The namr may take the abbreviated form of a CRN or negative disc LU. The dest takes one of the forms

namr	or
−tlu	or
−tlu[{namr}]	

Only one destination can be specified, and wildcard characters cannot be used in dest namrs. (Refer to the subsection Grouping CO Commands for a method to specify multiple destinations.) If the name, security code or cartridge is not specified in the destination namr, then that attribute of the destination will be the same as on the source file.

optns may include any of the following option letters:

B	Do not list namrs for files being copied
F	List namrs for files being copied
C	Clear destination cartridge, issue prompt
!	Clear destination cartridge, suppress prompt
D	Replace duplicate files; disc-to-disc copy only on RTE-IVB
E	Eliminate file extents
I	Ignore file data errors on tape-to-disc copy
K	Keep tape on line when finished
L	Lock cartridges copy mode
O	Open files copy mode; ignored on RTE-IV tape-to-disc copy
P	Purge source files after successful copy
S	Read single volume of multi-volume set
T	Display tape length required for copy
U	recover Unused space
V	Verify data transfers

The options are not order-dependent; that is, they can be specified in any sequence. Refer to the subsection FC Options for a detailed description of each available option.

file1
file2 specifies optional limits on the range of files to be copied from the source. Within the range specified, files conforming to the source parameter are selected for copying to the destination. Note that disc-resident files are referenced by namr, tape-resident files are referenced by disc file reference number. (Refer to the DL command.) If only file1 is specified, the range is interpreted as falling between file1 and the last file on the source medium. If only file2 is specified, the range is interpreted to be all files between the first file on the source medium and file2.

If file1 is specified but not found, no files are copied. If file2 is specified but not found, all conforming files between the range of file1 and the end of the source medium are selected for copying to the destination.

If multiple disc cartridges are specified in the source parameter, the file1, file2 parameters are applied separately to each cartridge; for tape sources, the file1 and file2 parameters apply to the entire tape or set of tapes.

msc is the system Master Security Code. The msc allows a security code to be specified in the destination even if a security code is not specified in the source parameters. This parameter also allows files to be purged using the P and D options without requiring that file security codes match. The msc is also required if the C or ! options are specified. (Refer to the subsection COpy Command Options for a detailed description of the available options.

7-14. SOURCE, DESTINATION PARAMETER CONSIDERATIONS

When forming the source and destination parameters, the following characteristics of FC should be considered:

1. A null security code field is considered to be matched by any security code. A zero in the security code field is matched only by a zero security code.

2. For disc sources, a null cartridge field in the source namr is interpreted to mean the first cartridge containing a file matching the source file namr (including wildcard characters). A given namr cannot be used to select files from more than one cartridge.

3. For tape sources, a null cartridge field in the source namr is interpreted to mean all cartridges on the tape.

4. All files selected by the source and the file1 and file2 parameters are copied, except for type 0 files and files with "illegal names". The illegal-name files include scratch files with numeric names and special files created by system programs that contain a "+" in the file name.

5. A given namr cannot be used to select files from more than one cartridge. When the cartridge field is omitted, the cartridge selected will be the first cartridge on which a matching file is found.

6. In the destination parameter, a file security code field can be specified only if the security code is specified in the source namr, or if the msc is specified.

7. When the specified destination cartridge is different from that in the source, the copy operation is:

   Disc-to-disc: the file is copied to the cartridge named in the destination parameter.

   Disc-to-tape: the file is labeled on the tape with the cartridge named in the destination parameter.

   Tape-to-disc: the file is copied to the cartridge named in the destination parameter.

8. When copying to tape, if the destination cartridge that will be listed in the tape directory is specified by the destination parameter, it must be specified as CRN, not −LU.

9. Namrs specified with only one- or two-character file names (all other fields empty) cannot be distinguished from ASCII CRNs written in the abbreviated form (CRN only, rather than ::CRN). When applicable, the FMP cartridge list is searched first and, if a match is found, the namr is interpreted to be a CRN. If no match is found, the namr is interpreted as a file name. In some situations, it is impossible to recognize a CRN as such if it is given in the abbreviated form:

   a. If the destination parameter specifies a disc CRN that is to be automatically allocated (it does not yet exist on the cartridge list).

   b. If a CRN on a tape is specified in the source or destination parameter.

   In both cases, the CRN must be explicitly specified as ::CRN.

7-15. COPY COMMAND OPTIONS

Any of the following options may be specified with the CO command. Note that the options are order-independent and may be specified in any sequence. Any intervening spaces in the option string are ignored.

Option	Function

B,F Brief, Full status display format. As each file is copied, the source namr (and sometimes the destination namr) can be displayed, if desired. If the Brief mode is selected, the namrs are displayed only when an error occurs, to identify the affected file. If the Full mode is selected, the namrs are displayed for successfully copied files as well as those with errors. (Refer to the Error Messages section for the format of the displayed namrs.) Brief mode is the default if the files are selected only by tape LU and/or disc cartridge; Full mode is the default in all other cases.

C,! Clear destination disc. When this option is specified, the destination disc is cleared before the copy operation. This option is permitted only if the destination is a disc cartridge and if the system Master Security Code (MSC) is correctly specified in the FC command-string. Under session, any value in the msc parameter will be accepted for clearing private and group cartridges; the true system Master Security Code is required only for system and non-session cartridges.

Before clearing the disc, FC issues the message

DO YOU REALLY WANT TO PURGE DISC LU *nn*, CRN *nnn* ?

and waits for a YES or NO response. The ! works the same as the C option except that the above message is suppressed.

D Replace Duplicate files. This option is limited to disc-to-disc copies on RTE-IVB; specifying the D option on tape-to-disc copies will cause an error, and the offending copy command will be skipped. Normally, if a duplicate file is encountered in a copy, a duplicate name error (FMGR-002) is issued and the duplicate file is not copied. When the Duplicate option is selected and a duplicate file is encountered, the original file is purged and replaced with the duplicate. Normally, the replacement will not take place unless the security code of the duplicate destination file matches that of the destination file to be replaced (according to the standard FMP definition of matching security codes). However, if the system Master Security Code (MSC) is correctly specified in a CO command that includes the D option, file security code rules are superseded and all duplicates are replaced regardless of whether the file security codes match. (The security code of the new destination file comes from the source file except when this is overridden by a security code specified in the destination parameter.)

Duplicate names can occur when more than one source cartridge is copied to a single destination cartridge. In such cases the file from the first source cartridge normally is copied successfully and the rest are not copied because of duplicate name errors. With the D option selected, each successive duplicate replaces the previous one so that only the last duplicate file is copied.

E Eliminate extents. Selecting this option results in combining all file extents into the main extent. Extents are not eliminated in files that have missing extents (sparse files), or if the resulting main extent would exceed 16383 blocks. In these cases, a warning is issued. Be aware that if subsequent changes to a file result in the creation of a new extent, the extent created will be the same block size as the main extent.

I Ignore data errors. Normally, if a checksum or verify error occurs, the file is not copied. The I option overrides this feature on tape-to-disc copies, and the file (including data for which checksum errors were detected) is copied to the destination. Files that are copied with errors are not identified as such in the directory entry for the file; however, a message is issued to define the range of bad blocks copied. The I option is applicable only for tape-to-disc copy operations.

K Keep tape on-line. This option keeps the tape unit on-line under all circumstances. While this option is a convenience, it introduces the possibility that the tape could be overwritten by another program since the tape unit remains unlocked and on line. (Refer to the Tape Handling section for more details.)

L,O Cartridge Lock, Open. Files can be copied to/from cartridges either by locking the cartridge (Lock mode) or by opening individual files for the copy (Open mode). Open mode is not applicable for tape-to-disc copies on RTE-IVB. Lock mode is generally faster, but excludes other programs from accessing the cartridge. (Refer to the Performance Considerations section for details.) Lock mode cannot be used if other programs have files open on the cartridge. Lock mode also should not be used if other programs might need access to files on the cartridge during the copy. Once a Lock mode copy is started, other programs are prevented from opening files on the cartridge for the duration of the copy. In Open mode, source files are opened non-exclusively and destination files are opened exclusively. Therefore even the Open mode restricts access to files, although the restrictions are less severe than those for Lock mode. If neither L or O mode is specified, the defaults are:

1. If the source name (or names) contains wildcards or is null, or if more than one COpy operation is GROUPed, a cartridge lock is attempted. If it is successful, Lock mode is used.
2. If the lock is rejected, or if there are no wildcard or null source names and the GRoup command has not been given, Open mode is selected.

Tape-to-disc copies are always in Lock mode on RTE-IVB; the Open option has no effect. Therefore, the destination cartridge must not have any files open when copying from tape, or an error will occur.

P Purge source file. If the P option is specified, FC will purge the source file after it is successfully copied to the destination. To purge a file with a non-zero security code, either the security code field of the source parameter or the msc parameter must be specified correctly. If the necessary security code or msc is not specified, the file will not be purged. (This does not, however, prevent the file from being copied.) If the destination is a tape, the source files are purged after all files are copied. Thus, in the event of an error or if you abort the disc-to-tape copy in process (using the BReak command), the source files are not purged.

S Copy Single volume of multi-volume tape set. Normally, when copying from a multiple volume tape set, all volumes must be read in sequence. With the Single option you can suppress this feature and mount a single tape volume of a set. Note that files that cross volumes cannot be copied when using the S option.

T Display required Tape length. When this option is selected, FC reads the disc directory, calculates the amount of tape required to copy the specified files and issues the appropriate message.

U Recover Unused space. In order to copy data faster, FC may use more space on the destination medium than is required for the files being copied. This can only happen on disc-to-tape copies and lock mode disc-to-disc copies and usually does not result in a significant waste of space. The U option, however, can be specified to prevent any extra space from being used.

V Verify transferred data integrity. The V option specifies the following data verification operations:

Disc Read — Data is read twice and the checksums are compared to verify the read.

Disc Write — Data is written to the disc and then immediately read to a second buffer. The two data buffers are compared to verify the write.

Tape Read — The checksum is calculated for each buffer read from the tape and compared to the checksum read with the data. (This tape-read verification is performed even if the V option is not selected.)

Tape Write — The tape is rewound after each volume is written, and a tape-read verification performed as above.

7-16. DEFAULT COMMAND

The DEfault command is used with the COpy command to set default values for the source, destination, or options parameters. The default command takes the form

DE[,srce[,dest[,optns]]]

where the srce, dest and optns are as defined for the COpy command, except that a list of namrs may not be used in the srce parameter.

Fields that have been omitted in the source and destination parameters of the COpy command are replaced with the contents of the corresponding fields specified with the DEfault command. If the source and/or destination fields are specified in the COpy command, these fields override any DEfault fields specified.

When options are included in the DEfault command, these are appended to any options specified in succeeding COpy commands. As an example, a DEfault/COpy command set of the form

```
DE,,,EPV
CO,<srce>,<dest>,CDE
CO,<srce>,<dest>,D
```

would result in specifying CDEPV as the command options for the first CO command, and DEPV as the options for the second CO command. If a DEfault option conflicts with an option specified in the CO command, the default option is overridden.

Each DEfault command supersedes the preceding DEfault; therefore, defaults can be cancelled by specifying a DEfault command with all null fields.

7-17. CO COMMAND EXAMPLES

The following are examples of the CO command formats for copying files between discs and tapes.

```
FC.nn: CO,X,-8
```

Copy cartridge X to tape LU 8.

```
FC.nn: CO,&-----::X,-8
```

Copy all files beginning with & on cartridge X to tape LU 8. The ----- characters in the name field define the "don't care" (or wildcard) characters. The null security code will match any file security code.

```
FC.nn: CO,{filea,fileb,filec},Y
```

Copy three files to cartridge Y. Note that the destination cartridge is specified as "Y" rather than "::Y". This abbreviated form can be used to specify ASCII CRNs provided it appears in a disc source or destination parameter and is a currently mounted cartridge. The abbreviated form can always be used to specify numeric CRNs, (as CRN 1000) or if the cartridge is being specified as a negative disc LU (as LU −25).

```
FC.nn: CO,{FILE1::A,FILE2::B},-8,v
```

Copy FILE1 from cartridge A and FILE2 from cartridge B to tape LU 8 and verify the data transfer. Any files existing on LU 8 will be overwritten as the specified files are copied.

```
FC.nn: CO,{::X:4,::X:5}1,-8
```

Copy all type 4 and type 5 files from cartridge X to tape LU 8.

```
FC.nn: CO,{%-----::X,&-----::X},-8
```

Copy all files beginning with % and & from cartridge X to tape LU 8.

```
FC.nn: CO,-8
```

Restore all files from tape LU 8 to their original cartridges. The destination parameter is omitted, therefore the source namrs (from the tape) are used for the destination files. The tape directory file identifies the cartridge from which each file was copied to the tape.

```
FC.nn: CO,-8,X
```

Restore all files from tape LU 8 to cartridge X. The tape directory information identifying the cartridge of origin will be ignored and all files will be copied to cartridge X.

```
FC.nn: CO,-8{::X}
```

Restore from tape LU 8 only those files that were copied to the tape from CRN X. Because no destination cartridge is specified in the command, the files will be restored to the same CRN.

```
FC.nn: CO,-8{::X,::Y}
```

Restore from tape those files that were copied to tape from CRNs X and Y. Because no destination cartridge is specified in the command, the files will be restored to their original CRNs.

```
FC.nn: CO, FILE1,FILE2
```

Copy FILE1 to FILE2 on the same cartridge.

```
FC.nn: CO,A::X,B::Y
```

Copy file A on cartridge X to cartridge Y and name the file B.

```
FC.nn: CO,A:2,B:3
```

Copy file A to the same cartridge, name it file B, and change the security code from 2 to 3.

```
FC.nn: CO,::X,::Y,,FILE2,FILE6
```

Copy all files within the range of FILE2 and FILE6 from cartridge X to cartridge Y. If FILE2 is not found, no files will be copied. If FILE6 is not found, all files in the range of FILE2 and the end of the source medium are copied. In specifying the file1,file2 parameters, the range must be ascending on the medium; that is, a command of the form

```
FC.nn: CO,-8{FILEA},::Y,,FILE6,FILE2
```

would result in no files being copied if FILE2 precedes FILE6 on the cartridge.

```
FC.nn: CO,%-----::X,Y,,FILEA,%FILE6
```

Copy all files beginning with % within the range of FILEA and %FILE6 from cartridge X to cartridge Y.

```
FC.nn: CO,-8{%-----},Y,,2,6
```

The same as the preceding example, except that the source is a tape −LU and therefore the range of files must be specified as file reference numbers obtained from the DL command.

```
FC.nn: CO,-8,::X,,,5
```

Copy all files from file 1 through file 5 from tape LU 8 to cartridge X.

7-18. GROUPING CO COMMANDS

In copying to or from tapes, there may be applications that require specifying multiple source/destination pairs in a single copy operation. This would be true, for example, if files are to be copied to a tape and renamed, or if tape files are to be copied to discs other than the discs specified in the tape directory. The GRoup command allows you to group multiple copy commands in a single copy operation. The command takes the form

```
GROUP
CO,<parameters>
CO,<parameters>
  .
  .
  .
CO,<parameters>
EG
```

When the GRoup command is encountered, all following CO commands are executed as a single operation when the EG (End Group) command is encountered. The GR operation can be aborted using the AG (Abort Group) command.

Where the source or destination is common to all of the grouped CO commands, the DEfault command also can be specified, as

```
DE,-8                 Common source tape -LU
GR
CO,::AA,XX            Restore CRN AA from tape to CRN XX
CO,::BB,YY            Restore CRN BB from tape to CRN YY
CO,::CC,CC            Restore CRN CC from tape to itself
EG                    End group
DE                    Cancel default

DE,,-8                Common destination tape -8
GR
CO,ABCD,WXYZ          Copy file ABCD to -8 as WXYZ
CO,EFGHIJ,QRSTU       Copy file EFGHIJ to -8 as QRSTU
EG                    End group
```

7-19. LISTING COMMANDS

These commands direct listings of the FMP cartridge list, global FMP cartridge list, tape directory list, and the tape comment and header files to your terminal, a selected list device or a file.

7-20. LIST DIRECTORY: DL

The DL command provides a directory list of files on an FC tape specified by the command. (For directory listings of disc cartridges, use the FMGR DL command.) The DL command takes the form

DL,srce[,msc[,opts]]

where

srce is the source FC tape device, with optional namr, that specifies the files to be included in the list. If the namr is omitted, all files are listed. The source can only be a tape; use the FMGR DL command for listing cartridge files. If a namr is specified with the negative tape LU, the optional namr must be enclosed within braces, as

−tlu{namr}

msc is the system master security code. When the msc is specified, the file security code is contained in the directory list.

optn is one or more of the following options:

F Selects Full option, that results in including the extent size, record size, and # extents columns in the directory list.

S Selects Single option, that compiles a directory of only one volume of a multi-volume tape set.

K Keeps the tape unit on-line under all circumstances. Note that while the tape is on line, it could be overwritten by another user program since the on-line tape is unlocked.

The LL command can be used to direct the DL listing to another list device.

7-21. LIST CARTRIDGES: CL AND CLAL

The CL and CLAL commands function in exactly the same way as the FMGR CL and CLAL commands: CL command displays the list of all cartridges accessible to you, and CLAL command displays the list of all cartridges in the system.

Only the CL command can be used with a tape source; the CLAL command is not defined for use with tape.

```
title: SAMPLE OF TAPE DIRECTORY FORMAT
volume: 2
date and time of creation: 7:09 PM TUE.,  14 JULY, 1981
created under account name:  KURT.SYSTEM

                        extent  record  #extents  security  discfile
name     crn  LU  type   size    size    log  phy    code      ref #

JLMHI    CS   25   1      1       128     1    1      HP         1
*        CS   25   4      1               1    1                 2
'DVA32   CS   25   4     11               1    1                 3
*************************************************************************
 mounted volume starts here
*************************************************************************
'DVM33   CS   25   4     92               3    3      HP         4 CONT
*************************************************************************
 mounted volume ends here
*************************************************************************
'DVM33   CS   25   4     92               3    3      HP         4 CONT
'CM80L   CS   25   4     50               1    1                 5
**       CS   25   4      1               1    1                 6
'VERIF   CS   25   4     24               1    1                 7
'PBERS   CS   25   4    234               1    1                 8
'BKUP    CS   25   4     55               1    1                 9
&BOOTC   CS   25   4     18               1    1                10
/BIGL    CS   25   4      2               1    1                11
'DISC    CS   25   4      7               1    1                12
'R       CS   25   4      3               1    1                13
'NUMS    CS   25   4     41               1    1                14
```

NOTES:
1. title — specified using TI command
2. crn, LU — appear only if multiple cartridges are on a tape
3. extent size, record size — appear only if F option specified
4. # extents — appears only if F option specified:
   log = logical # of extents = last extent + 1
   phy = physical # of extents = total extents allocated to file
5. security code — appears only if msc specified correctly
6. "mounted volume starts/ends here" messages — appear only in multi-volume directory lists
7. CONT — appears if file is continued on next volume or is continued from previous volume

Figure 7-1. Tape Directory List Format

When the CL command is given with a tape −LU source parameter, as

CL,−tlu[,K]

the resultant list identifies the the cartridge files stored on the tape, as

```
title:  NNNNN
volume:  X
date and time of creation: hh:mm   ddd., mmmm, yyyy
created under account name: NNNNNN.NNNN
LU      CRN     LABEL     P/G/S    USER.GROUP
xx      xxx     xxxxx       x      xxxx.xxxx
```

If the cartridge was renamed as part of the copy operation, only the cartridge CRN is listed.

The K option can be specified to keep the tape drive on line under all circumstances. Note that while the tape is on line, it could be overwritten by another user program since the on-line tape is unlocked.

The LL command can be used to direct the CL and CLAL listings to another list device.

7-22. LIST COMMENT/HEADER FILES: LC,LH

The LC and LH commands allow you to list the ASCII Header file, (LH command) and the Comment file (LC command) to the list device. The commands take the form

LC,−tlu[,K]
and
LH,−tlu[,K]

The LL command can be used to direct the file listing to another list device.

The K option can be specified to keep the tape drive on-line under all circumstances. Note that while the tape is on line, it could be overwritten by another user program since the on-line tape is unlocked.

7-23. TRANSFER COMMAND

FC can be run interactively from your terminal, from a command file, or as a combination of both. The TRansfer command allows you to transfer control to and return from a control file, as

TR,namr	Transfer control to the named control file
TR,−	Transfer control to the log device
TR	Transfer back to the next higher level control file when TR files are nested. When encountered in the first level command file, serves the same function as the FC EXit command.

Control files can be nested to four levels, with control passed from file level to file level using the TR,namr command. The current state of any of the configuration commands (Set List Device, Title Header File, Name Comment File, Echo Commands, Group Commands) and the default values remain in effect through all levels of the nested command files.

7-24. TAPE HANDLING

Tapes are created by FC in a special format unique to this utility, and thus cannot be written or read using the FMGR ST or DU commands.

One of the following messages

```
put volume on LU n
put volume number n on LU n
```

is issued to prompt you to mount the initial tape on the specified device, or to mount the next volume of a multi-volume set during the read or write operation. FC checks the tape and device status and, if a problem is encountered, issues the appropriate error message:

```
tape LU n not ready
tape LU n not write enabled
```

Each of the messages above is followed by one of the messages

```
when ready to continue type GO, otherwise type BR
when ready to continue type GO, otherwise type BR or SK
```

Entering BR in response to the "when ready" prompt causes FC to terminate cleanly. The SK option is viable only if the operation is a multi-volume read. The SK response indicates that the volume specified by "n" in the "put volume" message should be skipped. In this case, FC will repeat the "put volume" message for the next volume in the set, and will report "files lost" or "data lost" error messages for files on the SKipped volume. Refer to the section Messages Logged by FC for a description of the message text and corrective action.

FC automatically rewinds the tape at the beginning of a copy operation and writes over any existing data. For this reason, a tape created by FC cannot be modified; all files must be copied in a single operation. The LH (List Header) or DL (Directory List) commands may be used to check the current contents before copying over a previously used tape. You can write a transfer file to run the FC LH command and issue a prompt before executing the copy, similar to the following:

```
:RU,FC,LH,-8,K
:PA,,DO YOU WANT TO OVERWRITE THIS TAPE (type :,YE or :,NO)?
:IF,1G,EQ,YE,2
:IF,1G,NE,NO,-3
:TR
:RU,FC,CO,XX,-8
:TR
```

FC reads the first record of a tape volume and, if it does not conform to the FC tape format, either logs a tape format error or issues the message

```
tape not readable by FC, first two records are
```

FC locks the LU before a tape is accessed to prevent other processes from accessing the tape. If the tape is write-protected, the LU is unlocked at the end of the command. If the tape is not write-protected, the LU remains locked until:

a tape-oriented command is encountered that specifies a different LU,

a timeout occurs while FC is waiting for a command, or
FC finishes executing.

To protect the tape, FC sets the device off-line before the lock is released, unless the Keep tape on-line option was specified in the last tape command, or the command was terminated due to an error or a BReak command. Under these conditions, the tape remains on-line.

Since having the device taken off-line can be inconvenient, you should use the write-protect mechanism or run FC interactively to retain the lock between commands. If you use the K option to keep the tape on-line under all circumstances, be aware that the result can be an unlocked tape on-line and unprotected from access by other processes.

If a copy to tape is interrupted by a BReak command, the full tape generally will not be usable. (In multi-volume sets, of course, volumes copied prior to the BR will be intact.) If, however, the BR was issued during the verify phase, all data copied up to the point of the break will be usable.

7-25. DESTINATION DISC HANDLING

On tape-to-disc copies in a session environment, automatic cartridge allocation is attempted when the destination cartridge is not already mounted and is either specified by CRN or defaulted. An attempt is made to allocate a cartridge at least as large as the data to be copied or, whenever possible, 20% larger to allow for expansion. When a cartridge is allocated, FC issues the message

```
allocated CRN xxxxx, LU nnn
```

and executes the commanded copy operation. Be aware that if a cartridge is mounted to your account but is not active in the current session, it will be allocated; thus there is the possibility of reactivating an existing cartridge rather than allocating a pool cartridge. If a cartridge cannot be allocated, FC issues the appropriate messsage and terminates the copy. Note that if the destination disc is specified by −LU, the disc is not automatically mounted; if the specified −LU is not mounted, the appropriate message is issued and FC exits.

If the destination cartridge was mounted, FC performs a size check on tape-to-disc copies before any files are copied. If the size check shows that there is insufficient data or directory space for the files to be stored, FC issues the appropriate error message and exits. (Note that in open mode, other processes can create files on the cartridge, thus it is possible for cartridge-full errors to occur even when the size check indicates sufficient space for the copy operation.)

For disc-to-disc copies, the size check is not performed and if a directory-full or cartridge-full error occurs, FC terminates and stores the status in the FMGR globals. (Refer to the section Error Handling for a definition of the FMGR global returns.)

7-26. LOADING FC

Load the utility using the LOADR command file #FC4 (92068-17001) or by including an equivalent sequence of commands in the generator answer file. After the utility is loaded, use the FMGR SP command to save FC and its segments (FC000, FC001, ..., FC00n) on a cartridge available to all FC users. If necessary, use the FMGR OF command to remove any previous versions of FC and its segments. The load process also requires copying the FC help file, "FCHLP (92084-17150) to a cartridge available to all users.

Before running FC on RTE-IVB, ensure that any tape EQTs to be used are set to the *unbuffered* state using the system EQ command. If this is not done, FC may give unpredictable results since the status from EXEC writes is undefined, and since the System Available Memory (SAM) resource may be severely depleted by the buffering of large EXEC writes. (Refer to the RTE-IVB Terminal User's Reference Manual for details of the EQ command.)

7-27. PERFORMANCE CONSIDERATIONS

The following guidelines are presented as an aid in further increasing the speed of the file copy operation.

1. *Specify source cartridges explicitely* if multiple cartridges are contained in the cartridge list. For example, if the cartridge list includes cartridges 10, 20 and 30 and you want to copy from cartridge 30, use a COpy command of the form

   ```
   CO,{A::30,B::30,C::30,D::30,E::30},-8
   ```

   In this way, FC will not have to search cartridges 10 and 20 for the files to be copied. You also could use the DEfault command to specify the cartridge, as

   ```
   DE,::30
   CO,{A,B,C,D,E},-8
   ```

   In the latter command form, be aware that sequences of commands cannot be put in the runstring.

2. *Keep file extents collected.* The speed of the FC COpy operation is increased if the file main and its extents are adjacent on the source cartridge. You can collect extents (make them adjacent) on all files on a cartridge using a COPY command of the form

   ```
   CO,100,,LDF
   ```

   which copies the contents of cartridge 100 to itself (the destination cartridge defaults to the same cartridge as the source). The L option is needed to ensure that extents created are adjacent. The D option is needed so that the new files (with extents collected) can replace the old files. The F option logs the name of each file copied.

   If a cartridge-full or directory-full error (FMGR-033 or FMGR-014) occurs on the above operation, pack the cartridge using the FMGR PK command and enter the CO command again. This may have to be repeated if the FMGR-033/-014 error recurs. If the error occurs on the same file, however, the PK will not help and a larger cartridge will be needed for the operation.

   If you have many small extents, you may want to make files sizes larger to reduce the number of extents. You can do this by copying each file using the ST command, or you can Eliminate all extents on a cartridge by using the CO command shown above with the E option added. (Note that it is not always desirable to eliminate extents because FMP will not be able to re-use the space as easily when these files are purged, and because larger file sizes tend to result in less efficient use of space.)

   Extent collection (and elimination, if desired) can be done as a periodic cleanup function much like a FMGR PK.

If the extent collection/elimination process affects a lot of files (as shown by the F option log), you should do a FMGR PK after the CO command.

3. *Use Lock and Open modes efficiently.* Determine whether Lock mode or Open mode works faster for your application and use that mode whenever possible. You can force a particular mode by specifying the L or O option in the CO command. For most copy operations involving large numbers of files, Lock mode is more efficient since entire cartridges are locked in one operation rather than opening individual files. However, in certain cases Lock mode may introduce other overhead which could make it slower than Open mode. Open mode is usually more efficient when a small number of files is being copied. The faster mode for a given cartridge may depend on the following factors:

   - The number of files being copied to or from the cartridge
   - The total number of files on the source disc cartridge
   - Whether the destination disc cartridge was initially empty
   - The number of files purged as a result of the D option.

4. *Use cartridges efficiently.* Copying to empty cartridges in Lock mode is faster than copying to cartridges containing other files.

7-28. ERROR HANDLING IN TRANSFER FILES

Certain error conditions can be detected in FMGR transfer files by checking the FMGR globals after running FC. If FC is scheduled by a program other than FMGR, the scheduling program can retrieve the same information as would appear in the FMGR globals by making a call to RMPAR. Since only one error can be returned in the globals, only the highest error category number (the most severe error) is returned if multiple errors occur during execution of FC. The parameters returned by RMPAR correspond to the FMGR globals:

PARAM(1) = 1P or characters 1-2 of 10G (next-source-file information)
PARAM(2) = 2P or characters 3-4 of 10G
PARAM(3) = 3P or characters 5-6 of 10G
PARAM(4) = 4P (error category number)
PARAM(5) = 5P (next-source-file information status)

where

4P = 10000 — program aborted due to OF or system violation. Violations (such as Memory Protect) could result from a bad segment load, or could be an FC bug.

The following errors terminate FC:

= 1000 — FC internal error (possibly a bug in FC)
= 300 — transfer file stack overflow
= 200 — scratch file error (see SCRATCH command)
= 100 — segment loading error

The following errors terminate current command:

= 90 — general error causing command termination
= 80 — destination disc cartridge or directory full
= 70 — break detected (system BR command)

The following errors allow command to continue, but purge phase is skipped on disc-to-tape copies:

= 50 — copying from current source volume aborted (tape-to-disc)
= 40 — unusual source file access error — file not selected
= 30 — general error on file being copied — file skipped
= 25 — tape format error (reading or verifying tape)

The following are warnings that do not affect FC operation:

= 20 — warning
= 10 — soft data error detected
= 0 — no error or warning

5P = 1 — next source file information not applicable
= 0 — no error
= −1 — next source file information valid (4P = 80)
= −2 — source is tape, number of next file greater than 32767

10G
1P = IF 5P = −1 (4P = 80):

if source is disc:
10G = name of next file to be copied from disc

if source is tape:
1P = ref # of next disc file to be copied from tape

IF 5P = 1 and 4P not 10000, or 5P = −2, or 5P = 0:

10G = ASCII nulls
1P = 0

IF 4P = 10000 (5P = 1):

10G and 1P undefined.

In some circumstances the meaning of the FMGR global information may be ambiguous. Since only the most severe error is posted to the FMGR globals, it is not possible to determine whether other errors occurred, or to determine the command on which an error occurred if multiple commands were given. Further, if a copy command has more than one source cartridge, you cannot determine which cartridge contains the "next source file". If the copy command grouping feature is used, additional ambiguity can result.

Because of these possible ambiquities, the use of FMGR globals to determine the "next source file" is intended only for command files containing a single COpy command and involving a single source cartridge.

Using Globals In Transfer Files

The information in the FMGR globals can be used to advantage in writing transfer files to copy one source cartridge to a series of destination cartridges, moving to the next cartridge when the current cartridge is full. Such a file is particularly useful for backing up large fixed discs to a series of flexible discs.

The file takes advantage of the fact that the CO command file1 parameter specifies the first file to be copied, and the fact that the 10G global contains the name of the next file to be copied when a copy terminates due to a cartridge-full error. Doing a series of COpies in which the ASCII contents of 10G is used as the file1 parameter allows each COPY to continue where the previous one stopped.

The following is an example of a transfer file for this purpose. The source cartridge is specified in the 1G global, the negative flexible disc LU is specified in the 2G global, and the system master security code (MSC) is specified in the 3G global. The MSC is required for the ! option, which is specified to clear the destination disc without the need for user intervention.

```
:PA,,Put in floppy and type TR
:MC,2G
:RU,FC,CO,1G,2G,!VF,,,3G
:DC,2G
:IF,5P,NE,-1,5
:PA,,Put in next floppy and type TR
:MC,2G
:RU,FC,CO,1G,2G,!VF,10G,,3G
:DC,2G
:IF,5P,EQ,-1,-5
:TR
```

Assuming a transfer file name FLOPUP, source CRN 100, destination LU -10, and MSC XX, the following FMGR TR command will cause CRN 100 to be backed up to a series of flexible discs on LU -10.

```
TR,FLOPUP,100,-10,XX
```

If CRN 100 contains 25 files, and 10 of these fit on the first flexible disc, 10 on the second, and five remain for the third, the process would be

```
:TR,FLOPUP,100,-10,XX
 :PA,,Put in floppy and type TR
:TR
 :MC,-10
 :RU,FC,CO,100,-10,!VF,,,XX
FILE1
   .
   .                                    First ten files copied
   .
FILE11
FMGR-033                                Cartridge-full error
copy terminated
  :DC,-10
  :IF,-1,NE,-1,5
  :PA,,Put in next floppy and type TR
:TR
  :MC,-10
  :RU,FC,CO,100,-10,!VF,FILE11,,XX      Next file namr in 10G
FILE11
   .
   .                                    Next ten files copied
   .
FILE21
FMGR-033                                Cartridge-full error
copy terminated
  :DC,-10
  :IF,-1,EQ,-1,-5
  :PA,,Put in next floppy and type TR
:TR
  :MC,-10
  :RU,FC,CO,100,-10,!VF,FILE21,,XX      Next file namr in 10G
FILE21
   .
   .                                    Copy remaining files
   .
FILE25
  :DC,-10
  :IF,0,EQ,-1,-5                        Test for cartridge-full error
  :TR
:                                       Copy complete; exit
```

7-29. MESSAGES LOGGED BY FC

This section contains a list of all the messages that can be generated by FC. In the listing, brackets [] surround those parts of a message that are included only under certain conditions. Angle brackets <> indicate variables that are replaced with the appropriate value when the message is issued.

7-30. ERRORS REQUIRING OPERATOR ACTION/RESPONSE

DO YOU REALLY WANT TO PURGE DISC LU <LU>, CRN <CRN> ?

A COPY command specified the "C" option in the options parameter to Clear the destination cartridge of all current data. FC requires a response to this prompt to be sure that you really want to destroy the data on the named LU or CRN. Use the "!" option instead of the "C" option to clear the destination cartridge without the warning prompt.

LU <LU> is down
correct problem and UP device, or use BR to break FC

Prior messages may help to indicate the nature of the problem. Once the situation has been corrected, bring the device up using the system UP command, at which point FC will continue. If the problem was not correctly solved before the UP command was issued, this message will occur again. If the problem cannot be corrected, issue the system BR command to signal FC to terminate the current command.

tape LU <LU> not ready
when ready to continue type GO, otherwise type BR [or SK]

This error usually means that the mag tape device is not on-line. Be sure that the correct LU was specified in the command. (Refer to the section on Tape Handling for an explanation of the GO, BR, and SK responses.)

tape LU <LU> not write enabled
when ready to continue type GO, otherwise type BR

The write-protect ring should be installed to allow writing to the tape. (Refer to the section on Tape Handling for an explanation of the GO and BR responses.)

put volume [number <n>] on LU <tape LU>
when ready to continue type GO, otherwise type BR [or SK]

The required tape should be mounted and on-line, or loaded. (Refer to the section on Tape Handling for an explanation of the GO, BR, and SK responses.)

waiting to lock list device

FC attempted to lock the list device and got an indication that either another program has the list device locked, or a resource number for the lock is not available. In either case FC waits, retrying the lock every 2 seconds. While operator action is not required, you can issue the system BR command at this point to abort the command rather than waiting for the device or resource to become available.

7-31. INFORMATION MESSAGES AND WARNINGS

<source namr> [<dest namr>]

When a namr or a pair of namrs is logged with no other message, it means that the indicated file was successfully copied from the source to the destination. When only a single namr is logged, it is the namr for the source file. When two namrs are logged, they are for the source and destination files, respectively. (The namrs may consist of the file name only, or may include the CRN.) The logging of namrs for successfully copied files is done in Full mode only. (Refer to the description of the COpy command B and F options for more information.)

tape needed: <n> feet if 800 BPI, <n> feet if 1600 BPI

This message is produced on a COPY from disc to 800/1600 BPI mag tape if the T option is specified.

scanning directories

Indicates that FC is searching the cartridge directories to determine what files are being copied to tape.

copying files

Indicates that FC is about to begin copying files to tape (assuming that the tape unit is ready).

cleaning up

Indicates that FC has finished copying files to tape, and is now either closing source files or unlocking source cartridges. This process may take some time, and should be allowed to complete.

verifying volume

Indicates that FC has finished writing to the current volume and is now reading the volume in order to verify it.

break acknowledged

This indicates that FC has detected a system BR command, and is in the process of cleanly terminating the current command.

writing tape at: <system time string>

This indicates the date and time that will be written in the tape header for this disc-to-tape copy.

beginning group

A GROUP command has been entered, and subsequent COPY commands will be saved and executed together once the EG (END GROUP) command is entered.

group aborted

The AG (ABORT GROUP) or AB (ABORT FC) command was entered, causing all COPY commands since the GROUP command to be ignored.

allocated CRN <CRN>, LU <LU>

On a tape-to-disc copy, a required CRN was not found in the cartridge list so it was allocated from the disc pool.

device is up, FC continuing

The device is now UP, and FC is attempting to continue the operation.

FC xxxxx-xxxxx REV.xxxx <xxxxxx.xxxx>
Use ? for help.

This message appears before the first prompt is issued in interactive mode. The first line indicates the FC part number, the revision code, and the date/time code for the last revision.

(timeout)

FC detected a terminal timeout while waiting for input from the log device. If a tape LU was locked, the lock is released, which may require that the tape unit be taken off-line. Refer to the section on Tape Handling for details.

copy terminated

This message appears when a copy operation is terminated before completion for any reason, which could be an error or an operator break.

title: <title>

This message is logged to verify the title entered in the TITLE command.

warning: title truncated
title: <title>

The TITLE command specified a title that was too long, causing the title to be truncated. The truncated title is logged.

warning: no match for:[namr = <namr>][file1 = <?>][file2 = <?>]

No files were found to match the combined restrictions of the source namr and the file1 and file2 parameters. Any combination of the three items may be listed, depending on what was specified. Note that this does not mean that no match was found for the file1 or file2 parameter itself, but rather that no files within the specified file1/file2 range were found to match the namr.

warning: unable to eliminate extents in one or more files

The E option was specified, but extents could not be eliminated from some files. See the description of the E option for details.

warning: O option has no effect on RTE-IVB tape-to-disc copy

The Open Files Copy Mode option (O) is ignored for tape-to-disc copies. Tape-to-disc copies are always in Lock Cartridge Copy Mode (L option).

no files selected

The COPY command had no effect because no source files were selected.

disc write required retries:
LU <LU> trk <n> sec <n> thru trk <n> sec <n>

The indicated disc write was unsuccessful on the first try, but succeeded after it was retried one or more times. The failure could be due to an error reported by the disc driver, or could be due to a verify error if the V option was specified.

disc read required retries:
LU <LU> trk <n> sec <n> thru trk <n> sec <n>

Same as above but for disc read.

disc directory write required retries:
LU <LU> dir tr <n> thru dir tr <n>

Same as above but for disc write in the directory area. The location of the read is isolated to a particular track or range of tracks. The track numbers indicated after "dir tr" are the directory track numbers, not the absolute track numbers on the disc LU. The first directory track (the one with the greatest absolute track number) would be indicated as "dir tr 1".

disc directory read required retries:
LU <LU> dir tr <n> thru dir tr <n>

Same as above but for disc read in the directory area.

tape format error <positive error code>

This error indicates that the data read from tape deviated from the expected format in some way, but copying from the tape could continue. The deviation is usually the result of some non-fatal tape read error. This message does not necessarily imply any loss of data; other errors also will occur if any data is lost. This message is provided mainly for diagnostic use by HP. This error is to be contrasted with a tape format error that has a negative error code, covered under "Errors that Result in Rejecting Current Source Tape Volume".

bad tape cartridge entry is:
<octal dump>

This message may accompany a tape format error message and is for diagnostic use by HP.

bad tape discfile entry is:
<octal dump>

Same as above.

bad chunk header is:
<chunk size> <chunk type> <#entries> <1st file # or 0>

Same as above.

bad microdirectory entry is:
<file#> <file blk> <#blks> <buffer block>

Same as above.

7-32. DISC DATA I/O ERRORS

disc write failed: LU <LU> trk <n> sec <n> thru trk <n> sec <n>

A disc write failed, even after retries were done. The failure could be due to an error reported by the disc driver, or could be due to a verify error if the V option was specified. FC will also report a disc error (FMGR-001) for each file affected.

disc read failed: LU <LU> trk <n> sec <n> thru trk <n> sec <n>

A disc read failed, even after retries. The failure could be due to an error reported by the disc driver, or could be due to a verify error if the V option was specified.

FC will also report a disc error (FMGR-001) for each file affected. On disc-to-disc copies, the affected files are *not* copied. On disc-to-tape copies, the affected files are copied, but the affected parts of the files are flagged to indicate the disc error so that an appropriate error message can be given when the tape is read.

7-33. NON-FATAL TAPE READ ERRORS

tape read error

The driver indicated an unrecoverable error on the tape read. FC does no retries in this case because the driver would have retried if appropriate.

checksum error (chunk header)

The driver indicated a successful read, but FC's checksum information indicated a problem. FC attempts retries to recover from this. If the retries fail, FC considers the information to be lost.

checksum error (chunk body)

The driver indicated a successful read, but FC's checksum information indicated a problem. FC attempts retries to recover from this. If the retries fail, FC considers the information to be lost, unless the I option was specified. In this case, FC may attempt to use the information in spite of the checksum error, depending on the context in which the error occurs. Appropriate warnings are given in this case. See the "data lost" messages below for more information.

bad record length

The driver indicated a successful read (from mag tape), but the record length indicated by the transmission log returned from the driver disagreed with the length value specified in the header field of the record. FC attempts retries to recover from this. If the retries fail, FC considers the information to be lost.

attempting to use data in spite of checksum error

See information above for "checksum error (chunk body)".

retrying tape read

A "checksum error ..." or "bad record length" error has occurred, and FC is attempting to recover from the error by retrying the tape read.

7-34. ERRORS AFFECTING SINGLE FILE

can't open <name>::<CRN> due to error:
FMGR <nnn>

The indicated source file could not be opened to copy. This is usually because the file is open exclusively to another program (FMGR-008), or because the cartridge is locked to another program (FMGR-013).

file <name>::<CRN>
purged or replaced during copy or directory entry corrupt

The indicated file was purged and possibly replaced by a different file during the time FC was scanning the directory, or else a directory entry for the indicated file is corrupt. The file is not copied.

<source namr> [<dest namr>]
FMGR <nnn>

When a namr or a pair of namrs is logged, followed by an FMGR error code, it means that the indicated file was not copied because of the FMGR error, except for FMGR-001 errors on disc-to-tape copies. For the FMGR-001 error, the file is copied to tape but the affected parts of the file are flagged to indicate the disc error, so that an appropriate error message can be given when the tape is read.

When only a single namr is logged, it is the namr for the source file. When a pair of namrs are logged, they are for the source and destination files, respectively. The namrs may consist of the file name only, or may also include the CRN.

<source namr> [<dest namr>]
FMGR <nnn>
warning: above file copied but not purged from source

Similar to the above error, except that the FMGR error only prevented the source file from being purged as requested by the P option, and did not prevent the file from being copied.

<source namr> [<dest namr>]
data lost

Similar to the above error, except that the "data lost" error occurred rather than a FMGR error. Data lost errors can only occur on tape-to-disc copies, and indicate that data was lost for the file due to some problem reading the source tape. Problems reading the tape may have been identified in earlier messages or a record could have been dropped, in which case no problem would have been detected other than the data lost error itself.

For data lost errors, it is possible that other messages may intervene between the line with the namrs and the data lost message. The data lost error applies to the most recently logged file namrs even if the namrs do not immediately preceed the data lost message.

If the message "checksum error (chunk body)" appears anywhere before a "data lost" message, it may be possible to recover some of the lost data by repeating the tape-to-disc copy with the I option specified. When the I option is specified, destination files are created even though some or all of the data was lost, and "data lost" messages are replaced by some of the more specific messages below, which indicate the exact part of the file affected and whether the data loss is certain or not.

<source namr> [<dest namr>]
data lost due to disc error when tape was made

Same as above except the data was lost because of a disc error that occurred when the tape was written, not because of a problem reading the tape. A FMGR-001 (disc error) occurred when this file was being copied to tape.

<source namr> [<dest namr>]
data lost: entire file

Same as "data lost", except this message occurs when the I option was used to attempt to recover part of the file, but the attempt did not succeed. Because the I option was specified, the destination file is created even though all of its data was lost. The resulting destination file is of no value, except for any identifying information that might be obtained from the directory entry.

<source namr> [<dest namr>]
data lost:
[xtnt <x1>] blk <b1> thru [xtnt <xn>] blk <bn>

Same as above, except that only part of the file was lost. The message indicates the range of blocks that were lost. The first and last block in the range are specified by giving the extent number (omitted if the block is in the main extent) and the relative block number within the main or extent. Blocks are numbered starting at zero within the main or extent.

More than one of these messages may be given for a single file. The file namrs are not repeated for subsequent data lost messages on the same file, even though it is possible that other messages may intervene, breaking up the sequence of data lost messages.

Because the I option was specified, the destination file is created even though some or all of its data was lost.

<source namr> [<dest namr>]
possible data loss: entire file

Same as "data lost: entire file" except that it is uncertain whether any data was lost. The file should be examined to determine the extent of the loss, if any.

<source namr> [<dest namr>]
possible data loss:
[xtnt <x1>] blk <b1> thru [xtnt <xn>] blk <bn>

Same as above, except that only part of the file might have been lost. The message indicates the range of blocks that might have been lost. The first and last block in the range are specified by giving the extent number (omitted if the block is in the main extent) and the relative block number within the main or extent. Blocks are numbered starting at zero within the main or extent.

More than one of these messages may be given for a single file. The file namrs are not repeated for subsequent data lost messages on the same file, even though it is possible that other messages may intervene, breaking up the sequence of data lost messages.

<source namr> [<dest namr>]
data lost due to disc error when tape was made: entire file

Same as "data lost due to disc error when tape was made" except this message occurs when the I option was used to attempt to recover part of the file, but the attempt did not succeed.

Because the I option was specified, the destination file is created even though all of its data was lost. The resulting destination file is of no value, except for any identifying information that might be obtained from the directory entry.

<source namr> [<dest namr>]
data lost due to disc error when tape was made:
[xtnt <x1>] blk <b1> thru [xtnt <xn>] blk <bn>

Same as above, except that only part of the file was lost. The message indicates the range of blocks that were lost. The first and last block in the range are specified by giving the extent number (omitted if the block is in the main extent) and the relative block number within the main or extent. Blocks are numbered starting at zero within the main or extent.

More than one of these messages may be given for a single file. The file namrs are not repeated for subsequent data lost messages on the same file, even though it is possible that other messages may intervene, breaking up the sequence of data lost messages. It is likely that this message may appear repeatedly for different parts of the same file, even if the different parts are adjacent, and even if the net meaning of all the messages is that the whole file was lost.

Because the I option was specified, the destination file is created even though some or all of its data may have been lost.

source file <name>::<CRN>
selected by commands with conflicting parameters

On a tape-to-disc copy specified by a GROUP with more than one COPY command, the indicated source file was selected by more than one COPY command but those particular COPY commands did not meet the following restrictions.

1. The destination parameters must be the same in all the commands.
2. The D option must be consistently selected or not selected in all the commands.
3. The E option must be consistently selected or not selected in all the commands.
4. The msc parameter must be consistent through all the commands.
5. It is not permissible for the L option to be specified in some of the commands and the O option in others.

7-35. LOSS OF UNIDENTIFIED FILES ON COPY FROM TAPE

files lost, reference numbers <n1> thru <n2>, names not available

Indicates that distributed directory information was lost for files with reference numbers n1 through n2. Because the directory information was lost, the names and other information about the files is not known. The main tape directory can be listed with the DL command to determine what files these numbers correspond to.

7-36. DISC-TO-TAPE COPY VERIFY ERRORS

files lost, reference numbers <n1> thru <n2>

Indicates that distributed directory information was lost for files with reference numbers n1 through n2. If necessary, the main tape directory can be listed with the DL command to determine what files these numbers correspond to.

data lost for file, reference number = <n>

Indicates that data was lost for file reference number n. If necessary the main tape directory can be listed with the DL command to determine what file this number corresponds to.

7-37. ERRORS THAT CAUSE REJECTION OF CURRENT SOURCE TAPE VOLUME

tape not readable by FC, first two records are:
<record 1>
<record 2>

The tape mounted is apparently not an FC tape. The first two records are logged to help in determining just what the tape is.

volume does not match others

On a multi-volume tape-to-disc copy, the tape volume just mounted does not come from the same set as the previous volumes.

wrong volume

The tape volume just mounted does not have the correct volume number. Volumes in a multi-volume tape set must be restored in the correct sequence. When FC prompts for a new volume, it indicates which volume number is to be mounted.

fatal tape read error

The tape driver reported an error while the header or comment file was being read. FC makes no attempt to recover from this, however you can retry the operation manually. On multi-volume tape-to-disc copies this does not involve starting over with the first volume, but merely requires responding "GO" to the prompt to mount the volume. Refer to the section on Tape Handling for an explanation of the options available at this point.

header file checksum error

The information in the header file is questionable due to a checksum error. It would be unwise for FC to continue reading the volume in this situation. As with the fatal tape read error, you can retry the operation manually.

tape format error <negative error code>

This error indicates that the data read from tape deviated from the expected format so severely that FC is unable to continue reading the volume. The deviation is usually the result of some non-fatal tape read error. The negative error code is for diagnostic use by HP. As with the fatal tape read error, you can retry the operation manually.

This error is to be contrasted with a tape format error that has a positive error code, covered under the heading INFORMATION AND WARNING MESSAGES.

7-38. COMMAND SYNTAX, PARAMETER ERRORS (COMMAND IS SKIPPED)

error: no such command (use ? for help)

Self-explanatory.

error: bad or missing parameter

Self-explanatory.

error: braces used where not permitted

Self-explanatory.

error: bad namr

An incorrectly formed namr appeared in the command.

error: mismatched braces

Self-explanatory.

error: namr list not allowed in this context

A list of namrs delimited by braces was used in a parameter where a list of namrs is not permitted.

error: unrecognized option character

An unrecognized character appeared in the "options" parameter.

error: incompatible options

Contradictory options, such as B and F, or L and O, were specified in the same command.

error: option not defined for this command

An option character was specifed in the "options" parameter which is not meaningful for the this command.

error: option not applicable

An option character was specified in a COPY command which is not applicable for this type of copy (disc-to-disc, disc-to-tape, or tape-to-disc).

error: bad file1 or file2 param

The value for the file1 or file2 parameter was incorrectly specified. These parameters specify file names when copying from disc, and file numbers when copying from tape.

error: bad msc parameter

Self-explanatory.

error: no tape-to-tape copy

Both the source and destination parameter specified a tape device, implying a tape-to-tape copy, which is not supported. Make sure the DEFAULT command hasn't been used incorrectly.

error: source or destination incompatible with group

The source and destination parameters must be consistently either a disc or a tape throughout the GROUP, and only one tape LU can be specified in a given group.

error: options inconsistent with group

Within a GROUP, certain options may not be specified in one copy command but omitted from another. These options are the V, I, S, F, B, T, and K options. The DEFAULT command may be useful in ensuring that these options are used consistently in all COPY commands within a GROUP.

error: L and O options must be consistent for a given cartridge

The L and O options must be consistent for a given disc cartridge within a GROUP. To be consistent, both the L and O options may not be specified for the same cartridge, even in different COPY commands within a group. It is permissible for the L or O option to be specified in one command while another command specifies neither option. (The command which specified neither option will be treated as if the same option had been specified.)

error: renaming multiple files to same name, or cartridge not found

The source name was omitted, or has wildcards, or the source is a list of namrs but the destination specifies a file name. A destination file name is permitted only if it is clear that the source parameter can select only one file.

Another possibility is that the destination parameter was intended to specify an ASCII CRN in the abbreviated form (CRN rather than ::CRN) but the ASCII CRN was interpreted as a file name because no cartridge with that CRN was found on the cartridge list.

error: bad destination name

An illegal file name was specified in the destination parameter.

error: on disc-to-tape copy, dest cartridge may not be specified as −LU

If a cartridge is specified in the destination parameter on a disc-to-tape copy, it must be specified as a positive CRN, not a negative LU.

error: P option requires explicit source cartridge

The P option may not be specified without also specifying the source disc cartridge explicitly in the source parameter.

error: L and O options require explicit source cartridge

The L or O option may not be specified without also specifying the source disc cartridge explicitly in the source parameter.

error: P option not allowed if source and dest are same cartridge

The P option may not be specified on a disc-to-disc copy in which the source and destination are on the same cartridge.

error: C and ! options require explicit destination cartridge

The C or ! option may not be specified without also specifying the destination disc cartridge explicitly in the destination parameter.

error: dest secu code not allowed w/o source secu code or good msc

A security code was specified in the destination parameter, but no security code was specified in the source parameter and the msc parameter was not specified correctly.

error: bad LU or device not supported

An LU specified in the command is not the LU of a disc or tape device supported by FC. Check the Session Switch Table.

error: bad tape LU

The tape LU specified in the command is not the LU of a tape device supported by FC. Check the Session Switch Table.

error: D option not allowed on RTE-IVB tape-to-disc copy

The Replace Duplicate Files option (D) is allowed only on disc-to-disc copies.

7-39. COMMAND OUT-OF-SEQUENCE ERRORS (COMMAND IS SKIPPED)

error: already in group

A GROUP command was entered before the previous GROUP was ended.

error: not in group

An EG (END GROUP) or AG (ABORT GROUP) command was entered, but there was no previous GROUP to end or abort.

7-40. OTHER ERRORS THAT TERMINATE CURRENT COMMAND

error on help file "FCHLP:
FMGR <nnn>

The indicated error occured when attempting to access FC's help file, "FCHLP, needed for the ? command.

error allocating CRN <CRN>:
FMGR <nnn>

On a tape-to-disc copy a required CRN was not found in the cartridge list, so FC attempted to allocate the CRN from the disc pool, but the allocation failed due to the indicated FMGR error.

cartridge lock error on disc LU <LU>:
FMGR <nnn>

FC was unable to lock the indicated disc cartridge due to the FMGR error. If the error is FMGR-103 (CORRUPT DIRECTORY DETECTED), resolve the problem before trying to access any files on the cartridge, otherwise unnecessary loss of data could result.

cartridge unlock error on disc LU <LU>:
FMGR <nnn>

Same as above, but for cartridge unlock.

cartridge clearing error on disc LU <LU>:
FMGR <nnn>

Same as above, but for clearing the directory on the disc cartridge.

error in cartridge status on disc LU <LU>:
FMGR <nnn>

Same as above, but more general.

disc directory write failed: LU <LU> dir tr <n> [thru dir tr <n>]
error writing directory on disc LU <LU>:
FMGR <nnn>

A directory write to the specified track or tracks failed due to a disc error (FMGR-001) or verify error (FMGR-049), even after retries were attempted. The location of the write is isolated to a particular track or range of tracks. The track numbers indicated after "dir tr" are the directory track numbers, not the absolute track numbers on the disc LU. The first directory track (the one with the greatest absolute track number) would be indicated as "dir tr 1".

disc directory read failed: LU <LU> dir tr <n> [thru dir tr <n>]
error reading directory on disc LU <LU>:
FMGR <nnn>

Same as above but for directory read instead of write.

comment file error:
FMGR <nnn>

The indicated FMGR error occurred when the comment file (determined by the most recent CF command) was opened or read.

error: number of cartridges to be copied to tape exceeds limit

Cartridges were renamed on a copy to tape with the result that the tape's cartridge list would contain more than 64 distinct cartridges.

error: volume not big enough for header/comment/directory files

The destination tape is too small to be used. There is not enough room for the minimum amount of information that must be written before going on to another volume.

error: fatal i/o error on LU <LU>, status = <octal A-Register status>

FC attempted I/O to the specified LU and the status returned in the A register indicates a problem that should never occur. The status value in the message is the value returned in the A-Register from the EXEC call.

error: comment file checksum error

A checksum error was detected when reading the comment file from the tape.

error: not enough memory

This message indicates that FC does not have enough free memory to allow the command to proceed. If FC was sized to less than 32 pages, increasing the size may solve the problem. If the GROUP command was specified, using fewer COPY commands in the GROUP may prevent this problem.

error: tape lock failed

FC is unable to lock the tape LU required by the command. Either the tape LU is locked to another program or no resource number is available for the lock.

error: error on tape write

An unrecoverable error was reported by the driver on a tape write request. FC does not retry in this case because the driver would have retried if appropriate. FC can not continue copying to tape after this because the resulting tape would be corrupt.

HELP scheduling error: <4-character system error mnemonic>

The HE command was unable to schedule the HELP program due to the indicated system error.

CRN <CRN> not found

In a non-session user environment, a tape-to-disc COPY command with an unspecified destination cartridge was issued, and the required CRN — determined by reading the tape directory — was not found. This error is not possible in a session environment, because the required cartridge could be allocated from the pool.

CRN <CRN> LU <LU> not large enough:
data blocks/dir entries needed: <bl>/<ent>, available: <bl>/<ent>

The specified cartridge does not have enough file or directory space for the files to be copied from the tape.

7-41. OTHER ERRORS

list file error:
FMGR <nnn>

The indicated FMGR error occured when FC attempted to access the list file (determined by the most recent LL command). This causes the list device to revert to the log device, and does not cause the command to terminate.

command file error:
FMGR <nnn>

The indicated FMGR error occurred when FC attempted to read a record from the command file (determined by the most recent TR command). This causes an automatic TR to the log device. (FC enters interactive mode.)

7-42. ERRORS THAT TERMINATE FC

fatal scratch file error:
FMGR <nnn>

An error occurred when FC tried to create or access one of its scratch files. Each scratch file created by FC is created on the first cartridge which has room for the initial size of the file.

If the error is FMGR-033 (disc cartridge full) or FMGR-014 (directory full), make more room on the cartridge or use the SCRATCH command to specify that FC create the scratch files on a cartridge with more room.

For any other error, if the SCRATCH command is being used, make sure it is used before any COPY commands are done.

can't load segment <segment name>

The indicated segment could not be loaded. Make sure that the type 6 files for the main (FC) and its segments (FC000 through FC00n) all exist on the same cartridge and that no other files with the same names exist on other cartridges higher on the cartridge list. Then OF the main and all the segments and try running FC again.

TR stack overflow

The command file stack used for the TR command overflowed. This will occur if more than four nested TR commands are given (excluding any TR command in the runstring).

internal error at <address>, last segment loaded: <segment name>

FC detected an inconsistency that cannot be interpreted. This error should never occur under normal conditions. The address and segment name are for diganostic use by HP.

internal error: pascal <error type#> <error#> <line#>

FC is being terminated due to a Pascal run-time error. This error should never occur under normal conditions. The numeric values are for diagnostic use by HP.

exec error <system error mnemonic>, exec params: <params in octal>

The operating system or I/O driver rejected an EXEC call made by FC. This error should never occur under normal conditions. The numerical values are for diagnostic use by HP.

FILE ANALYSIS UTILITIES

SECTION VIII

8-1. INTRODUCTION

The file analysis utilities FLAG and EXT work together to identify external references and specific character patterns in a source file. FLAG can use the HP-supplied patterns file, SEP.6, that contains a list of all FMP, EXEC, and system library routines that can be called. EXT can be used to customize or create a patterns file for FLAG.

8-2. PATTERNS FILE

The patterns file SEP.6 can be easily edited to include entry point names from other system libraries and subsystems, or specific declarations and variables occurring in a source file.

You also can create application-specific patterns files. The words in the patterns file may contain any printable characters to a maximum of 16 characters, with one word to a line. Refer to the EXT discussion for the file format. (Note that unsorted patterns files are compared more efficiently than sorted files.) Comments can be included in the patterns file by entering an asterisk (*) in the first column of the line.

8-3. FLAG

The pattern-matching utility FLAG searches one or more source files for words listed in the file SEP.6 (or a custom patterns file) and flags all matches. The matches found are listed to your terminal, or to an output file if the -O option is specified in the command line.

Run FLAG with the command line

[RU,]FLAG,pfile[,-options],sfile[,...]

where

pfile is the name of the patterns file, either SEP.6 or your custom patterns file.

sfile is the source file name or names to be searched for matches.

-options can be any combination of the following:

C For each word matched, print the count of lines that contain a match.

K Make case significant in determining a match. By default, case is not significant (i.e., a = A or a).

M Print the source file name at the beginning of each output line. This is the default when more than one source file is specified.

N Print the line number of each matched line at the beginning of the output line.

V Verbose mode. Print all lines in the file with line numbers. Flag matches in lines and print a summary of matches for each pattern. (The summary is identical to that given with the C option.)

PBFA Language options. (Pascal, BASIC, FORTRAN, Assembler.) All source files specified following a language option are assumed to contain code in that language, until the the next language option is specified. The purpose of this option is to cause FLAG to ignore all material in the comment fields. FLAG does not verify the actual language of the source; it only checks for the comment character associated with the language specified by the option. If no language option is specified, FLAG searches all material in the source file.

Ofile Specifies **file** as the output file, instead of your terminal. The file name must immediately follow the O option letter; a space may not be used. If the options are grouped, the O option must be the last member of the group.

All options or option groups must be preceded with a dash. The first argument without a leading dash is interpreted as the patterns file name; all following arguments without a leading dash are interpreted as the source file names. The options are order independent and can be placed anywhere in the command line. However, the language option must precede the associated source file or files. As an example, the command line

```
FLAF,-KV,SEP.6,-OAFLG,-P,&MUTWN::MR,&RUTWN::MR,-F,&STING::JT
```

specifies that FLAG should ignore comments in the Pascal source files &MUTWN::MR and &RUTWN::MR and the FORTRAN source file &STING::JT. Options -KV specify that case is significant in matching a pattern (K), and that the output is to be all lines of the file with matches flagged (V). The -O option names AFLG as the output file. The output file option O could also be grouped with the other named options, as the last member of the group (as -KVOAFLG,).

8-4. EXAMPLES

In the following example, FLAG is called to run in Verbose mode (-V) and to disregard all comment lines in the FORTRAN file &STING::JT (-F). The Verbose mode output is a listing of all lines of the file to the output file AFLG (-O option) with each matched pattern flagged, as (using the example output):

```
5>>            vvvvv
 >>      LU = LOGLU(Z)
 >>
```

A summary count of the matched patterns follows the program file listing.

```
FLAG,-VFOAFLG,SEP.6,&STING::JT

Flag/1000                8:56 PM MON., 15 AUG., 1983
Version 2.2              &STING::JT
   1          PROGRAM STING
   2          IMPLICIT INTEGER (A-Z)
   3          DIMENSION BUFR1 (40)
   4          DIMENSION BUFR2 (40)
   5>>              vvvvv
    >>        LU = LOGLU(Z)
    >>
   6    C   GET THE RUN STRING
   7>>              vvvv
    >>        CALL EXEC (14,1,BUFR1,40)
    >>
   8          WRITE (LU,1) BUFR1
   9    100   FORMAT ("EXEC14= ",40A2)
  10    C   GET THE PARAMETER STRING WITH GETST
  11>>              vvvvv
    >>        CALL GETST (BUFR2,40 TLOG)
    >>
  12          WRITE (LU,2) BUFR2
  13>>                vvvvv
    >>200     FORMAT("GETST= ",40A2)
    >>
  14          END

Flag/1000 summary>> 4 words flagged in &STING::JT

   EXEC>>1
   GETST>>2
   LOGLU>>1
```

In the following example, FLAG is called using only the -F language option. The output, defaulted to the terminal, is a summary of the patterns flagged, together with the line of code in which they were found. The comment line reference to GETST is ignored (see the full program listing in the first example).

```
FLAG,SEP.6,-F,&STING::JT
    LOGLU>>       LU = LOGLU(Z)
    EXEC>>        CALL EXEC (14,1,BUFR1,40)
    GETST>>       CALL GETST (BUFR2,40 TLOG)
    GETST>>200    FORMAT("GETST= ",40A2)
```

In the following example, FLAG is called with the -N option, but without the language option. The output, defaulted to the terminal, is a list of the patterns flagged (including the comment line reference to GETST), the related line of code, and the code line number.

```
FLAG,SEP.6,-N,&STING::JT
    5>LOGLU>>       LU = LOGLU(Z)
    7>EXEC>>        CALL EXEC (14,1,BUFR1,40)
    10>GETST>>C     GET THE PARAMETER STRING WITH GETST
    11>GETST>>      CALL GETST (BUFR2,40 TLOG)
    13>GETST>>200   FORMAT("GETST= ",40A2)
```

In the following example, FLAG is called with the -F language option to search two source files for matches. Because two source files are specified, the -M (print source file name) is automatically invoked. In this example the file &NULL::JT does not match any entries in the patterns file SEP.6, as noted in the output.

```
FLAG,-F,SEP.6,&STING::JT,&NULL::JT
    &STING::JT>LOGLU>>      LU = LOGLU(Z)
    &STING::JT>EXEC>>       CALL EXEC (14,1,BUFR1,40)
    &STING::JT>GETST>>      CALL GETST (BUFR2,40 TLOG)
    &STING::JT>GETST>>200   FORMAT("GETST= ",40A2)

    Flag>> no words matched in &NULL::JT
```

8-5. LOADING FLAG

FLAG is loaded with the following load command sequence:

```
OP,LB
LI,=PLIB
RE,=FLAG
LI,$VMCLB
EN
```

Because FLAG uses EMA, it must run as large background in a mother partition. If not sized as part of the load command sequence or assigned to a specific partition before running, it will run in the largest available mother partition.

8-6. EXT

EXT searches a relocatable input file, finds external references, and lists them to your terminal or to an output file if one is specified in the command line. You can use the BREAK key on your terminal to halt the output listing at any time.

Run EXT with the command line

EXT[,-options],srcfile[,outfile]

where

srcfile is the relocatable (type 5) file to be searched for external references.

outfile is the file to accept the external references found by EXT. If this file exists, the externals are appended to it unless the replace (-R) option is specified. If the file does not exist, EXT creates it.

-options can be any of the following:

C Condense the output list: separate the pattern words with spaces instead of putting them on separate lines. This option is used only when the output is to your terminal.

Lnnn Lengthen the output line to nnn characters. The default and minimum is 80; the maximum is 134. This option is used only when the output is to your terminal, and forces the C option.

Snn Scroll the output nn lines at a time. The default is 22. Use -S0 for continuous printing without prompting. This option is used only when the output is to your terminal.

N Include the name of the routine (the nam record) in which the externals are found.

T Identify entry point and external names.

V Verbose mode. Provide all of the information given with the C, N, and T options.

R Replace (overwrite) the output file if it exists, instead of appending to it.

Efile Send error messages to the named file. If the file already exists, the error messages are appended to it; if it does not exist, EXT creates it. If this option is omitted, error messages are displayed on your terminal.

Ffile In searching srcfile, find only the externals in the named patterns file. Ifile In searching srcfile, ignore the externals in the named file. This file should have the same structure as the patterns file.

If neither a patterns file nor an ignore file is named, EXT prints all externals in the source file. If both a patterns file and an ignore file are specified, EXT prints all externals in the source file that are named in the patterns file, less the externals in the ignore file.

Options are specified with a leading dash, and can be placed anywhere in the command line. EXT interprets the first argument without a leading dash as the source file name; the second, if specified, is interpreted as the output file name. The options can be specified singly or in a group, except that any option requiring a file name must be specified last in the group. The file name must immediately follow the E, F, or I option letter; a space may not be used. As an example, either of the two following command lines could be used to run EXT in verbose mode on the source file $BHLIB, scrolling the output 11 lines at a time to your terminal screen, and finding patterns from the file IMAGES::JT:

```
EXT,-VS11FIMAGES::JT,$BHLIB

EXT,$BHLIB,-V,-S11,-FIMAGES::JT
```

8-7. OUTPUT FORMATS

If you are using EXT to create or modify a patterns file for FLAG, run the utility with no output format options (i.e., do not specify the C, N, T, or V options).

8-8. NO OPTIONS

Running EXT with no format options produces the following output. Note that the output is not sorted; this is the most efficient form for comparing files for matches (using FLAG).

```
EXT,$BHLIB
    .MPY
    .DIV
    .ENTR
    CBYTE
    LBYTE
    MIN0
    .ENTR
    .MBT
    .SBT
    CRETS
    CLOSE
      .
      .
      .
    WRITF
    LOCF
    PURGE
    RUN
    .ENTR
    IDRPD
```

8-9. -C OPTION

The -C option output is the unsorted listing in condensed form, where information is separated with spaces rather than appearing on separate lines.

```
EXT,-C,$BHLIB
 .MPY    .DIV    .ENTR   CBYTE   LBYTE   MIN0
 .ENTR   .MBT    .SBT    CRETS   CLOSE   WRITF   LOCF    PURGE   RUN
 .ENTR   IDRPD   RP      NAMR    EXEC    IDGET   RMPAR
 .DIV    .ENTR   .GOTO   BLT     FSTAT   RDDIR   LBYTE
 .MPY    .ENTR   EXEC    ISHFT   CLUCR   NAMRT
 .DIV    .ENTR   SBYTE   WTREC
   .
   .
   .
 LOGLU
 .ENTR   EXEC    OPEN    CREAT   CLOSE   WRITF   LOCF    FMGER   .MVW
 LOGLU
 EXEC    .LBT    .SBT
 NAMR    .ENTR   .MVW
 .ENTR   .LBT
 .ENTR   .SBT
```

8-10. -T OPTION

The -T option output is the unsorted listing with each external and entry point identified.

```
ext,$bhlib,-t
   ent: KYWDS
   ext: .MPY
   ext: .DIV
   ext: .ENTR
   ext: CBYTE
   ext: LBYTE
   ext: MIN0
   ent: FMGR
   ext: .ENTR
   ext: .MBT
   ext: .SBT
        .
        .
        .
   ext: LUTRU
   ext: RDACT
   ext: MOD
   ext: ISHFT
   ext: MBYTE
   ext: SBYTE
```

8-11. -N OPTION

The -N option identifies the routine in which each external/entry point is found. The heading is the nam record, which gives the routine type and priority (n,nn), its size, and other information that can vary from routine to routine.

```
EXT,-N,$BHLIB
    KYWDS (7,99) 2024 WHH Keyword table searcher
      149 words
      .MPY
      .DIV
      .ENTR
      CBYTE
      LBYTE
      MIN0

    FMGR (7,99) 2023 WHH FMGR runner
      346 words
      .ENTR
      .MBT
      .SBT
      CRETS
      CLOSE
      WRITF
      LOCF
      PURGE
      RUN

    WILD (7,99) 2023 WHH Wildcard evaluator
      913 words
      .DIV
      .ENTR
      .GOTO
      BLT
      FSTAT
      RDDIR
      LBYTE
      .
      .
      .
    GETGU (7,99) 2023 WHH Get group and user id
      26 words
      $ESTB
      .ENTR

    TYPER(7,99) 2017 WHH Text typer
      235 words
      EXEC
      .ENTR
      REIO
```

8-12. -V OPTION

The -V option provides all of the information included in the -N option and the -T option for each routine, using the -C option format.

```
EXT,$BHLIB,-V
     KYWDS (7,99) 2024 WHH Keyword table searcher
          149 words
          ent: KYWDS
          ext: .MPY      .DIV      .ENTR     CBYTE     LBYTE     MIN0

     RUN (7,99) 2023 WHH RUN command processor
          170 words
          ent: RUN
          ext: .ENTR     IDRPD     RP        NAMR      EXEC      IDGET     RMPAR

     WILD (7,99) 2023 WHH Wildcard evaluator
          913 words
          ent: WILD
          ext: .DIV      .ENTR     .GOTO     BLT       FSTAT     RDDIR     LBYTE

     STDIO (7,99) 2023 WHH Standard I/O initialization
          81 words
          ent: STDIO     EXIT
          ext: .ENTR     EXEC      STDIN     STDOU     NAMRN     PRTN
               .
               .
               .

     RDACT (7,99) 2023 WHH Account file reader
          370 words
          ent: RDACT
          ext: .ENTR     OPEN      READF


     NAMRT (7,99) 2023 WHH NAMR typing routine
          20 words
          ent: NAMRT
          ext: .ENTR


     NAMRN (7,99) 2023 WHH Get next NAMR parameter
          105 words
          ent: NAMRN
          ext: .ENTR     BLT       NXPAR     SBYTE     NAMRU
```

8-13. LOADING EXT

Load EXT with the following load command sequence:

```
OP,LB
SZ,28
LI,=PLIB
LI,$VMCLB
RE,=EXT
RE,=AVL2
EN
```

If the SZ,28 command will not load EXT, try again with a smaller size.

8-14. ERROR HANDLING

EXT normally returns the value 0 in the FMGR 1P global. If an error occurs, EXT reports the non-zero value returned in 1P with an error message. A negative value indicates the corresponding FMP error. A positive value is returned with one of the following error messages:

Ext: (1) Didn't recognize X,X, options.

Ext: (2) Wrong file type for input <output><error><find><ignore> file NNN.

Ext: (3) Size EXT up, or use fewer entries in your find or ignore files.

The last message will appear only if EXT was loaded incorrectly, and indicates an internal table overflow. In all cases, EXT exits after issuing the message.

FILE TRANSPORT UTILITY

SECTION IX

9-1. INTRODUCTION

FPORT, the file transport utility, is used in conjunction with the Applications Migration Package (AMP/1000) to physically transport files between the HP 1000 and the HP 9000 systems.

In Export mode, FPORT writes specified files from disc to the transport medium. In Import mode, FPORT writes files from the transport medium to disc. The files to be transported are specified in a user-prepared transport map that is exported/imported with the files. Files can be in either FMGR format or HP-UX format (FPORT does not support the CI hierarchical file format).

File size, type, and record length information is exported with all FMGR files. Exported HP-UX text files are assigned FMGR type 4. Exported HP-UX binary files are assigned FMGR type 1. If an imported file is to be created as a FMGR file, the exported file size, FMGR file type, and record length is used to create the file. If an imported file is to be created as an HP-UX file, the FMGR file information is ignored.

9-2. TRANSPORT MAP

You must construct a transport map to specify all of the files to be transported and the way they are to be treated (i.e., as FMGR files or as HP-UX files). FPORT reads this transport map file and then exports/imports the listed files as defined.

A transport file is a series of transport specification lines, each consisting of an export file name, an import file name (optional), and flags (optional), separated by blanks. Comments can be included on the specification line by preceding the comment with "#". (FPORT ignores everything following the #.)

The following flags can be used:

-F Treat the export name as an FMGR name.

-f Treat the import name as an FMGR name.

-b Treat the file as a binary file. This flag has meaning only for HP-UX files.

Names are treated as HP-UX pathnames unless otherwise identified by a flag. If the import name is not specified, the file is imported with the export name.

FMGR names can be specified with security code and crn, but the file type and size are ignored. File names cannot contain embedded blanks or the "#" comment character. (Lowercase letters in FMGR file names are shifted to uppercase before the file is referenced.)

As an example, the following transport map might be used to move files from an HP 1000 to an HP 9000.

```
# sample transport map
#
#
&prog        prog.f      -F  #FMGR export name.
&sub1        lib/sub1.p  -F
&sub2::m1    lib/sub2.f  -F
data::50                 -fF #FMGR export, import names;
                             #default import name
```

9-3. RUNNING FPORT

Run FPORT with the command lines

[RU,]FPORT,-E,tmap[,tdev]

or

[RU,]FPORT,-I[FM],tmap[,tdev]

where

-E specifies Export mode.

-I specifies Import mode.

tmap is the transport map file defining the files to be exported/imported.

tdev is the device LU of the external medium through which tmap and the transported files are copied. The default is to LU 8.

FM mutually exclusive flags, applicable in Import mode only:

F Force the use of tmap as the transport map and ignore the transport map in the transport file.

M Map only. Import only the transport map from the transport file into tmap.

FPORT -E exports the files specified by the transport map file tmap to the transport medium tdev. If all files specified in the transport map file can be successfully opened, tmap is written to the transport medium, then each export file is written to the medium in the order specified by tmap.

FPORT -I imports the files specified in the transport map file tmap from the transport medium tdev. The transport map is read from the medium into tmap on the destination disc. Tmap is created if it does not exist, or overwritten if it exists on the disc. If all files specified by tmap can be successfully created, each import file is read from the medium tdev in the order specified by tmap. The import files are overwritten if they exist, or created if they do not.

If the files cannot be successfully created or opened, FPORT exits.

9-4. TRANSPORT MEDIA

Files can be transported on flexible discs, CS/80 cartridge tapes, or 1600-bpi magnetic tape. If a medium is not named in the command line, the default is to LU 8 (normally the magnetic tape device). FPORT automatically rewinds tdev before and after executing.

If the medium is a flexible disc, the disc must be mounted and initialized before running FPORT to export files. Use the following command sequence (refer to the RTE-IVB Terminal User's Guide for details of the FMGR commands):

```
:MC,lu                          *mount flexible disc
:IN,msc,-lu,crn,FPORT           *initialize disc with id FPORT
:CR,TFILE::crn:1:-1             *create TFILE on disc
:RU,FPORT,-E,TMAP,TFILE::crn    *run FPORT in Export mode to TFILE
:DC,lu                          *dismount disc
```

9-5. LOADING FPORT

Fport is loaded with the following load command sequence:

```
RE,%FPORT
EN
```

DISC UTILITY MAGNETIC TAPE FORMATS

APPENDIX A

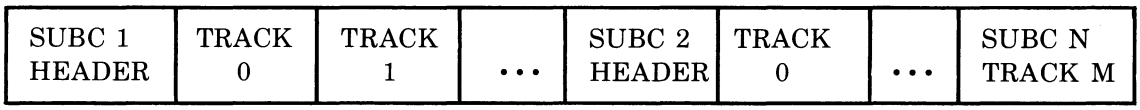
The ICD/MAC Disc Backup Utility Programs, LSAVE and USAVE, write a 247 word header record at the beginning of each magnetic tape file created. If end-of-tape is reached before all information was output, the save continues onto another tape. A new header record is written onto the next tape. The next tape number is recorded in word 247 of the header. The information contained in the header record is as follows:

WORDS	INFORMATION
1-15	Time and date
16-75	Run string
77-238	Track map table
239-243	Subchannel track map entry
244	1 = LU2 or LU3 included 0 = LU2 or LU3 not included
245	# of LSAVE's remaining on the USAVE tape
246	subchannel #
247	tape #

TAPE FORMAT

LSAVE UTILITY

USAVE UTILITY



NOTE

First word of each record contains:

Bit 15 = 1 Protected track
Bit 14 = 1 BAD track
Bits 0-13 Track #

The 7900 Disc Backup Utility Programs write a 140 word header record at the beginning of every magnetic tape file created. If end of tape is reached before a file is completely written out by the on-line or off-line utility, it is continued at the beginning of another tape with the header record written out first. This header record contains the same information as the one written on Tape 1 except that tape # information is changed. The information contained in the header record is as follows:

WORDS	INFORMATION
1-36	FILE ID (title)
37	TAPE #
38	Disc Type
39	On-line: 1 = LU save; 2 = UNIT save; 3 = not used Off-line: −1 = not used; −2 = UNIT save; −3 = FROM-TO save
40	0 = LU2 not included 1 = LU2 included
41	0 = RTE Disc 1 = DOS Disc 2 = neither
42	0 = 2048 word record size; 1 = 6144 word record size
43-140	Track map information

Each data record has the following format:

W0	W1	2048 or 6144 words − DATA

W0 - bits 0-14 = subchannel #
bit 15 = 0 if source track not write protected
= 1 if source track is write protected

W1 - bits 0-14 = logical track # (relative to first track in subchannel)
bit 15 = 0 if successful write
= 1 if data could not be written out successfully

UTILITY PROGRAM TYPES

APPENDIX B

The utility programs described in this manual should be one of the types listed in Table B-1 to assure proper operation. Refer to the RTE-IVB Programmers Reference manual for an explanation of program types.

Table B-1. RTE-IVB Utility Program Types

PROGRAM	DEFAULT TYPE (If loaded at system generation)	TYPE 1 without Table Area II	TYPE 1 with Table Area II	TYPE 2	TYPE 3	TYPE 4	SSGA REQUIRED
LSAVE	4	YES	YES	YES	YES	YES	NO
USAVE	4	YES	YES	YES	YES	YES	NO
RESTR	4	YES	YES	YES	YES	YES	NO
LCOPY	4	YES	YES	YES	YES	YES	NO
FORMT	3	YES	YES	YES	YES	YES	NO
SAVE	3	NO	NO	YES	YES	NO	NO
RESTOR	3	NO	NO	YES	YES	NO	NO
COPY	3	NO	NO	YES	YES	NO	NO
VERFY	3	NO	NO	YES	YES	YES	NO
SAFD	3	NO	NO	YES	YES	NO	NO

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LONDON COLNEY
Herts., AL2 1HA
Tel: (0727) 24400
Telex: 1-8952716
C,E

Hewlett-Packard Ltd
Tradax House, St. Mary's Walk
MAIDENHEAD
Berkshire, SL6 1ST
Tel: (0628) 39151
E,P

Hewlett-Packard Ltd.
308/314 Kings Road
READING, Berkshire
Tel: 61022
Telex: 84-80-68
CM,P

Hewlett-Packard Ltd.
Quadrangle
106-118 Station Road
REDHILL, Surrey
Tel: (0737) 68655
Telex: 947234 C,E

Hewlett-Packard Ltd.
Westminster House
190 Stratford Road
SHIRLEY, Solihull
West Midlands B90 3BJ
Tel: (021) 7458800
Telex: 339105
C

Hewlett-Packard Ltd.
King Street Lane
WINNERSH, Wokingham
Berkshire RG11 5AR
Tel: (0734) 784774
Telex: 847178
A,C,E,M

GREECE

Kostas Karaynnis
8 Omirou Street
***ATHENS** 133*
Tel: 32-30-303, 32-37-371
Telex: 21 59 62 RKAR GR
E,M,P

"Plaiso"
G. Gerados
24 Stournara Street
ATHENS
Tel: 36-11-160
Telex: 21 9492
P

GUATEMALA

IPESA
Avenida Reforma 3-48
Zona 9
GUATEMALA CITY
Tel: 316627, 314786, 664715
Telex: 4192 Teletro Gu
A,C,CM,E,M,P

HONG KONG

Hewlett-Packard Hong Kong, Ltd.
G.P.O. Box 795
5th Floor, Sun Hung Kai Centre
30 Harbour Road
HONG KONG
Tel: 5-8323211
Telex: 66678 HEWPA HX
Cable: HP ASIA LTD Hong Kong
E,CP,P

Schmidt & Co. (Hong Kong) Ltd.
Wing On Centre, 28th Floor
Connaught Road, C.
HONG KONG
Tel: 5-455644
Telex: 74766 SCHMX HX
A,M

ICELAND

Elding Trading Company Inc.
Hafnarnvoli-Tryggvagotu
P.O. Box 895
IS-REYKJAVIK
Tel: 1-58-20, 1-63-03
M

INDIA

Blue Star Ltd.
Bhavdeep
Stadium Road
***AHMEDABAD** 380 014*
Tel: 42932
Telex: 012-234
Cable: BLUEFROST
E

Blue Star Ltd.
11 Magarath Road
***BANGALORE** 560 025*
Tel: 55668
Telex: 0845-430
Cable: BLUESTAR
A,CM,C,E

Blue Star Ltd.
Band Box House
Prabhadevi
***BOMBAY** 400 025*
Tel: 422-3101
Telex: 011-3751
Cable: BLUESTAR
A,M

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
***BOMBAY** 400 025*
Tel: 422-6155
Telex: 011-4093
Cable: FROSTBLUE
A,CM,C,E,M

Blue Star Ltd.
7 Hare Street
***CALCUTTA** 700 001*
Tel: 12-01-31
Telex: 021-7655
Cable: BLUESTAR
A,M

Blue Star Ltd.
Meenakshi Mandiram
XXXXV/1379-2 M. G. Road
***COCHIN** 682-016*
Tel: 32069
Telex: 085-514
Cable: BLUESTAR
*A**

Blue Star Ltd.
133 Kodambakkam High Road
***MADRAS** 600 034*
Tel: 82057
Telex: 041-379
Cable: BLUESTAR
A,M

Blue Star Ltd.
Bhandari House, 7th/8th Floors
91 Nehru Place
***NEW DELHI** 110 024*
Tel: 682547
Telex: 031-2463
Cable: BLUESTAR
A,CM,C,E,M

Blue Star Ltd.
1-1-117/1 Sarojini Devi Road
***SECUNDERABAD** 500 033*
Tel: 70126
Telex: 0155-459
Cable: BLUEFROST
A,E

Blue Star Ltd.
T.C. 7/603 Poornima
Maruthankuzhi
***TRIVANDRUM** 695 013*
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
E

INDONESIA

BERCA Indonesia P.T.
P.O.Box 496/Jkt.
Jin. Abdul Muis 62
JAKARTA
Tel: 373009
Telex: 31146 BERSAL IA
Cable: BERSAL JAKARTA
A,C,E,M,P

BERCA Indonesia P.T.
P.O. Box 174/Sby.
J.L. Kutei No. 11
SUBAEE-SURABAYA
Tel: 68172
Telex: 31146 BERSAL SD
Cable: BERSAL-SURABAYA
A,E,M,P*

IRAQ

Hewlett-Packard Trading S.A.
Mansoor City 9B/3/7
BAGHDAD
Tel: 551-49-73
Telex: 2455 HEPAIRAQ IK
CP

IRELAND

Hewlett-Packard Ireland Ltd.
Kestrel House
Clanwilliam Court
Lower Mount Street
DUBLIN 2, Eire
Tel: 680424, 680426
Telex: 30439
A,C,CM,E,M,P

Cardiac Services Ltd.
Kilmore Road
Artane
***DUBLIN** 5, Eire*
Tel: (01) 351820
Telex: 30439
M

SALES & SUPPORT OFFICES

Arranged alphabetically by country

ISRAEL

Electronics Engineering Division
Motorola Israel Ltd.
16 Kremenetski Street
P.O. Box 25016
TEL-AVIV 67899
Tel: 338973
Telex: 33569 Motil IL
Cable: BASTEL Tel-Aviv
A,CM,C,E,M,P

ITALY

Hewlett-Packard Italiana S.p.A.
Traversa 99C
Giulio Petrone, 19
I-70124 **BARI**
Tel: (080) 41-07-44
M

Hewlett-Packard Italiana S.p.A.
Via Martin Luther King, 38/111
I-40132 **BOLOGNA**
Tel: (051) 402394
Telex: 511630
CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43G/C
I-95126 **CATANIA**
Tel: (095) 37-10-87
Telex: 970291
C,P

Hewlett-Packard Italiana S.p.A.
Via G. Di Vittorio 9
I-20063 **CERNUSCO SUL NAVLIGLIO**
Tel: (2) 903691
Telex: 334632
A,CM,CP,E,MP,P

Hewlett-Packard Italiana S.p.A.
Via Nuova san Rocco A
Capodimonte, 62/A
I-80131 **NAPOLI**
Tel: (081) 7413544
A,CM,CS,E

Hewlett-Packard Italiana S.p.A.
Viale G. Modugno 33
I-16156 **GENOVA PEGLI**
Tel: (010) 68-37-07 E,C

Hewlett-Packard Italiana S.p.A.
Via Turazza 14
I-35100 **PADOVA**
Tel: (49) 664888
Telex: 430315
A,CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.
Viale C. Pavese 340
I-00144 **ROMA**
Tel: (06) 54831
Telex: 610514
A,CM,CS,E,MS,P*

Hewlett-Packard Italiana S.p.A.
Corso Giovanni Lanza 94
I-10133 **TORINO**
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Telex: 221079
CM,CS,E

JAPAN

Yokogawa-Hewlett-Packard Ltd.
Inoue Building
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ATSUGI, Kanagawa 243
Tel: (0462) 24-0451
CM,C*,E

Yokogawa-Hewlett-Packard Ltd.
3-30-18 Tsuruya-cho
Kanagawa-ku, Yokohama-Shi
KANAGAWA, 221
Tel: (045) 312-1252
Telex: 382-3204 YHP YOK
CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Sannomiya-Daiichi Seimei-Bldg. 5F
69 Kyo-Machi Ikuta-Ku
KOBE CITY 650 Japan
Tel: (078) 392-4791
C,E

Yokogawa-Hewlett-Packard Ltd.
Kumagaya Asahi Yasoji Bldg 4F
4-3 Chome Tsukuba
KUMAGAYA, Saitama 360
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CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building
4-73, San-no-maru, 1-chome
MITO, Ibaragi 310
Tel: (0292) 25-7470
CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Sumitomo Seimei Bldg.
11-2 Shimo-sasajima-cho
Nakamura-ku
NAGOYA, Aichi 450
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CM,CS,E,MS

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg., 4th Floor
5-4-20 Nishinakajima, 5-chome
Yodogawa-ku, Osaka-shi
OSAKA, 532
Tel: (06) 304-6021
Telex: YHPOSA 523-3624
A,CM,CP,E,MP,P*

Yokogawa-Hewlett-Packard Ltd.
29-21 Takaido-Higashi 3-chome
Suginami-ku **TOKYO** 168
Tel: (03) 331-6111
Telex: 232-2024 YHPTOK
A,CM,CP,E,MP,P*

JORDAN

Mouasher Cousins Company
P.O. Box 1387
AMMAN
Tel: 24907, 39907
Telex: 21456 SABCO JO
E,M,P

KOREA

Samsung Electronics
4759 Shinkil, 6 Dong
Youngdeungpo-Ku,
SEOUL
Tel: 8334311, 8334312
Telex: SAMSAN 27364
A,C,E,M,P

KUWAIT

Al-Khalidya Trading & Contracting
P.O. Box 830 Safat
KUWAIT
Tel: 42-4910, 41-1726
Telex: 2481 Areeg kt
A,E,M

Photo & Cine Equipment
P.O. Box 270 Safat
KUWAIT
Tel: 42-2846, 42-3801
Telex: 2247 Matin
P

LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.
Blvd de la Woluwe, 100
Woluwedal
B-1200 ***BRUSSELS***
Tel: (02) 762-32-00
Telex: 23-494 paloben bru
A,CM,CP,E,MP,P

MALAYSIA

Hewlett-Packard Sales (Malaysia)
Sdn. Bhd.
Suite 2.21/2.22
Bangunan Angkasa Raya
Jalan Ampang
KUALA LUMPUR
Tel: 483544
Telex: MA31011
A,CP,E,M,P*

Protel Engineering
Lot 319, Satok Rd.
P.O. Box 1917
KUCHING, SARAWAK
Tel: 535-44
Telex: MA 70904 Promal
Cable: Proteleng
A,E,M

MEXICO

Hewlett-Packard Mexicana, S.A. de C.V.
Avenida Periferico Sur No. 6501
Tepepan, Xochimilco
MEXICO CITY 23, D.F.
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A,CP,E,MS,P

Hewlett-Packard Mexicana, S.A. de C.V.
Rio Volga 600
Colonia del Valle
MONTERREY, N.L.
Tel: 78-42-93, 78-42-40, 78-42-41
Telex: 038-410
CS

MOROCCO

Dolbeau
81 rue Karatchi
CASABLANCA
Tel: 3041-82, 3068-38
Telex: 23051, 22822
E

Gerep
2 rue d'Agadir
Boite Postale 156
CASABLANCA
Tel: 272093, 272095
Telex: 23 739
P

NETHERLANDS

Hewlett-Packard Nederland B.V.
Van Heuven Goedhartlaan 121
NL 1181KK **AMSTELVEEN**
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NL 1080 AR **AMSTELVEEN**
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Telex: 13 216
A,CM,CP,E,MP,P

Hewlett-Packard Nederland B.V.
Bongerd 2
NL 2906VK **CAPPELLE**, A/D Ijessel
P.O. Box 41
NL2900 AA **CAPELLE**, Ijssel
Tel: (10) 51-64-44
Telex: 21261 HEPAC NL
A,CM,CP

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Hewlett-Packard (N.Z.) Ltd.
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Cable: HEWPACK Auckland
CM,CS,E,P*

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
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Kilbirnie, **WELLINGTON** 3
Tel: 877-199
Cable: HEWPACK Wellington
CM,CP,E,P

Northrop Instruments & Systems Ltd.
Eden House, 44 Khyber Pass Road
P.O. Box 9682
Newmarket, ***AUCKLAND***
Tel: 794-091
A,M

Northrop Instruments & Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
CHRISTCHURCH
Tel: 64-165
A,M

Northrop Instruments & Systems Ltd.
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
WELLINGTON
Tel: 850-091
Telex: NZ 3380
A,M

NIGERIA

The Electronics Instrumentations Ltd.
N6B/S70 Oyo Road
Oluseun House
P.M.B. 5402
IBADAN
Tel: 461577
Telex: 31231 TEIL NG
A,E,M,P

The Electronics Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 6645
Mushin, ***LAGOS***
A,E,M,P

NORTHERN IRELAND

Cardiac Services Company
95A Finaghy Road South
BELFAST *BT 10 OBY*
Tel: (0232) 625-566
Telex: 747626
M

NORWAY

Hewlett-Packard Norge A/S
Folke Bernadottesvei 50
P.O. Box 3558
N-5033 **FYLLINGSDALEN** (BERGEN)
Tel: (05) 16-55-40
Telex: 16621 hpnas n
CM,CS,E

Hewlett-Packard Norge A/S
Oesterndalen 18
P.O. Box 34
N-1345 **OESTERAAS**
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Telex: 16621 hpnas n
A*,CM,CP,E,MS,P

OMAN

Khimji Ramdas
P.O. Box 19
MUSCAT
Tel: 72-22-17, 72-22-25
Telex: 3289 BROKER MB MUSCAT
P

PAKISTAN

Mushko & Company Ltd.
10, Bazar Road
Sector G-6/4
ISLAMABAD
Tel: 28624
Cable: FEMUS Rawalpindi
A,E,M

Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
KARACHI *0302*
Tel: 511027, 512927
Telex: 2894 MUSHKO PW
Cable: COOPERATOR Karachi
A,E,M,P

PANAMA

Electrónico Balboa, S.A.
Apartado 4929
Panama 5
Calle Samuel Lewis
Edificio "Alfa" No. 2
CIUDAD DE PANAMA
Tel: 64-2700
Telex: 3480380
Cable: ELECTRON Panama
A,CM,E,M,P

Foto Internacional, S.A.
P.O. Box 2068
Free Zone of Colon
COLON 3
Tel: 45-2333
Telex: 3485126
Cable: IMPORT COLON/Panama
P

PERU

Cómpania Electro Médica S.A.
Los Flamencos 145, San Isidro
Casilla 1030
LIMA *1*
Tel: 41-4325
Telex: Pub. Booth 25424 SISIDRO
Cable: ELMED Lima
A,CM,E,M,P

PHILIPPINES

The Online Advanced Systems Corporation
Rico House, Amorsolo Cor. Herrera Street
Legaspi Village, Makati
P.O. Box 1510
Metro MANILA
Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE
A,C,E,M

Electronic Specialists and Proponents Inc.
690-B Epifanio de los Santos Avenue
Cubao, ***QUEZON CITY***
P.O. Box 2649 Manila
Tel: 98-96-81, 98-96-82, 98-96-83
Telex: 742-40287
P

POLAND

Buro Informasji Technicznej
Hewlett-Packard
Ul Stawki 2, 6P
PL00-950 ***WARSZAWA***
Tel: 39-59-62, 39-67-43
Telex: 812453 hepa pl

SALES & SUPPORT OFFICES

Arranged alphabetically by country

PORTUGAL

Telectra-Empresa Técnica de Equipmentos Eléctricos S.a.r.l.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
***P-LISBON** 1*
Tel: (19) 68-60-72
Telex: 12598
A,C,E,P

Mundinter
Intercambio Mundial de Comércio S.a.r.l
P.O. Box 2761
Avenida Antonio Augusto de Aguiar 138
P-LISBON
Tel: (19) 53-21-31, 53-21-37
Telex: 16691 munter p
M

PUERTO RICO

Hewlett-Packard Puerto Rico
P.O. Box 4407
CAROLINA, Puerto Rico 00630
Calle 272 Edificio 203
Urb. Country Club
RIO PIEDRAS, Puerto Rico 00924
Tel: (809) 762-7255
Telex: 345 0514
A,CP

QATAR

Nasser Trading & Contracting
P.O. Box 1563
DOHA
Tel: 22170
Telex: 4439 NASSER
M

Scitecharabia
P.O. Box 2750
!'DOHA
Tel: 329515
Telex: 4806 CMPARB
P

ROMANIA

Hewlett-Packard Reprezentanta
Boulevard Nicolae Balcescu 16
BUCURESTI
Tel: 130725
Telex: 10440

SAUDI ARABIA

Modern Electronic Establishment
P.O. Box 193
AL-KHOBAR
Tel: 44-678, 44-813
Telex: 670136
Cable: ELECTA AL-KHOBAR
C,E,M,P

Modern Electronic Establishment
P.O. Box 1228, Baghdadiah Street
JEDDAH
Tel: 27-798
Telex: 401035
Cable: ELECTA JEDDAH
C,E,M,P

Modern Electronic Establishment
P.O. Box 2728
RIYADH
Tel: 62-596, 66-232
Telex: 202049
C,E,M,P

SCOTLAND

Hewlett-Packard Ltd.
Royal Bank Buildings
Swan Street
BRECHIN, Angus, Scotland
Tel: 3101, 3102
CM,CS

Hewlett-Packard Ltd.
SOUTH QUEENSFERRY
West Lothian, EH30 9TG
GB-Scotland
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A,CM,E,M

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Hewlett-Packard Singapore (Pty.) Ltd.
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6th Floor, Inchcape House
450-452 Alexandra Road
SINGAPORE 0511
Tel: 631788
Telex: HPSGSO RS 34209
Cable: HEWPACK, Singapore
A,CP,E,MS,P

SOUTH AFRICA

Hewlett-Packard South Africa (Pty.) Ltd.
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Howard Place
Pine Park Center, Forest Drive, Pinelands
CAPE PROVINCE 7450
Tel: 53-7955, 53-7956, 53-7957
Telex: 57-0006
A,CM,CS,E,MS,P

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 37066
Overport
DURBAN 4067
Tel: 28-4178, 28-4179, 28-4110
CM,CS

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 33345
Glenstantia 0010 **TRANSVAAL**
1st Floor East
Constantia Park Ridge Shopping Centre
Constantia Park
PRETORIA Tel: 98-1126 or 98-1220
Telex: 32163
C,E

Hewlett-Packard South Africa (Pty.) Ltd.
Daphny Street
Private Bag Wendywood
SANDTON 2144
Tel: 802-5111, 802-5125
Telex: 89-84782
Cable: HEWPACK Johannesburg
A,CM,CP,E,MS,P

SPAIN

Hewlett-Packard Española S.A.
c/Entenza, 321
E-BARCELONA 29
Tel: (3) 322-24-51, 321-73-54
Telex: 52603 hpbee
A,CM,CP,E,MS,P

Hewlett-Packard Española S.A.
c/San Vicente S/N
Edificio Albia II,7 B
E-BILBAO 1
Tel: (944) 423-8306, 423-8206
A,CM,E,MS

Hewlett-Packard Española S.A.
Calle Jerez 3
E-MADRID 16
Tel: 458-2600
Telex: 23515 hpe
A,CM,E,MP,P

Hewlett-Packard Española S.A.
Colonia Mirasierra
Edificio Juban
c/o Costa Brava 13, 2.
E-MADRID 34
Tel: 734-8061, 734-1162
CM,CP

Hewlett-Packard Española S.A.
Av Ramón y Cajal 1-9
Edificio Sevilla 1,
E-SEVILLA 5
Tel: 64-44-54, 64-44-58
Telex: 72933
A,CM,CS,MS,P

Hewlett-Packard Española S.A.
C/Ramon Gordillo, 1 (Entlo.3)
E-VALENCIA 10
Tel: 361-1354, 361-1358
CM,CS,P

SWEDEN

Hewlett-Packard Sverige AB
Enighetsvägen 3, Fack
P.O. Box 20502
S-16120 **BROMMA**
Tel: (08) 730-0550
Telex: (854) 10721 MESSAGES
Cable: MEASUREMENTS STOCKHOLM
A,CM,CP,E,MS,P

Hewlett-Packard Sverige AB
Sunnanvagen 14K
S-22226 **LUND**
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Telex: (854) 10721 (via BROMMA office)
CM,CS

Hewlett-Packard Sverige AB
Vastra Vintergatan 9
S-70344 **OREBRO**
Tel: (19) 10-48-80
Telex: (854) 10721 (via BROMMA office)
CM,CS

Hewlett-Packard Sverige AB
Frötallisgatan 30
S-42132 **VÄSTRA-FRÖLUNDA**
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Telex: (854) 10721 (via BROMMA office)
CM,CS,E,P

SWITZERLAND

Hewlett-Packard (Schweiz) AG
Clarastrasse 12
CH-4058 **BASLE**
Tel: (61) 33-59-20
A,CM

Hewlett-Packard (Schweiz) AG
47 Avenue Blanc
CH-1202 **GENEVA**
Tel: (022) 32-30-05, 32-48-00
CM,CP

Hewlett-Packard (Schweiz) AG
29 Chemin Château Bloc
CH-1219 **LE LIGNON**-Geneva
Tel: (022) 96-03-22
Telex: 27333 hpag ch
Cable: HEWPACKAG Geneva
A,CM,E,MS,P

Hewlett-Packard (Schweiz) AG
Zürcherstrasse 20
Allmend 2
CH-8967 **WIDEN**
Tel: (57) 50-111
Telex: 59933 hpag ch
Cable: HPAG CH
A,CM,CP,E,MS,P

SYRIA

General Electronic Inc.
Nuri Basha-Ahnat Ebn Kays Street
P.O. Box 5781
DAMASCUS
Tel: 33-24-87
Telex: 11215 ITIKAL
Cable: ELECTROBOR DAMASCUS
E

Sawah & Co.
Place Azmé
Boite Postale 2308
DAMASCUS
Tel: 16-367, 19-697, 14-268
Telex: 11304 SATACO SY
Cable: SAWAH, DAMASCUS
M

TAIWAN

Hewlett-Packard Far East Ltd.
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68-2, Chung Cheng 3rd Road
Shin Shin, Chu
KAOHSIUNG
Tel: 24-2318, 26-3253
CS,E,MS,P

Hewlett-Packard Far East Ltd.
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205 Tun Hwa North Road
TAIPEI
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Cable:HEWPACK Taipei
A,CP,E,MS,P

Hewlett-Packard Far East Ltd.
Taichung Branch
#33, Cheng Yih Street
10th Floor, Room 5
TAICHUNG
Tel: 289274

Ing Lih Trading Co.
3rd Floor 18, Po-la Road
TAIPEI
Tel:
Telex:
Cable: INGLIH TAIPEI
A

THAILAND

UNIMESA Co. Ltd.
Elcom Research Building
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*Bangchak, **BANGKOK***
Tel: 393-2387, 393-0338
Telex: TH81160, 82938, 81038
Cable: UNIMESA Bangkok
A,C,E,M

Bangkok Business Equipment Ltd.
5/5-6 Dejo Road
BANGKOK
Tel: 234-8670, 234-8671, 234-8672
Cable: BUSIQUIPT Bangkok
P

TRINIDAD & TOBAGO

Caribbean Telecoms Ltd.
P.O. Box 732
50/A Jerningham Avenue
PORT-OF-SPAIN
Tel: 624-4213, 624-4214
A,CM,E,M,P

TUNISIA

Tunisie Electronique
31 Avenue de la Liberte
TUNIS
Tel: 280-144
E,P

Corema
1 ter. Av. de Carthage
TUNIS
Tel: 253-821
Telex: 12319 CABAM TN
M

TURKEY

Teknim Company Ltd.
Riza Sah Pehievi
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