

ccm-70-8R

**OS-3 REFERENCE MANUAL**  
for OS-3 Version 4.3

July 1973

OSU

**COMPUTER CENTER**

Oregon State University  
Corvallis, Oregon 97331

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## PREFACE

This manual provides an accurate description of control mode instructions, file structure, and job initialization for OS-3 Version 4.3. It does not include detailed descriptions of particular software systems. A user, with this manual and the manuals about the particular software package he is using should, however, be able to use the system with very little additional assistance.

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## A BRIEF INTRODUCTION TO OS-3

"OS-3" is really a shorthand form of OSOSOS. This is an acronym for Oregon State Open Shop Operating System. With OS-3 each user is totally independent of all other users. OS-3 allows great flexibility in the use of commands and programming languages.

OS-3 runs on a Control Data Corporation 3300 or 3500 computer. The Oregon State University computer currently includes about 98,000 words of memory, with magnetic disks for additional information storage. Input can be presented to the computer from the card reader, magnetic tapes, CRT terminals, Teletypes or Graphics terminals. Output can be punched on cards, printed on a line printer, plotted on an X-Y plotter, written on magnetic tape, or listed on Teletype or CRT terminals. Users may also store information permanently on the magnetic disks.

OS-3 is a time-sharing system. This means that many users may be using the computer simultaneously with each user having the impression that he, alone, has the entire computer facility at his disposal. This is accomplished by time-slicing and memory-swapping. These techniques involve allowing each user to utilize all necessary facilities for a time interval of about 100 milliseconds on a "round robin" basis. Only the portion of a user's program which is needed for a particular 100 millisecond time slice is actually in the computer memory at that time; the remainder of the program is stored on the magnetic disks.

The following terminology is used throughout this manual:

BATCH            --A job in which the user is not in conversational mode with OS-3. This type of job normally uses cards as the input medium.

REMOTE

BATCH --A job submitted from any remote terminal which is to be run as a batch job.

CONVERSATIONAL

MODE --The user at a Teletype or CRT terminal interacts with OS-3.

FILE

--May mean either of the following:

(a) a type of disk storage area under OS-3 in which information is referenced in a sequential manner. It closely simulates a magnetic tape. In this context, FILE is usually capitalized.

(b) any type of data structure. In this context it is written in lower case letters. While it may seem that (a) is a special case of (b), the context in which it is used should remove any ambiguity.

JOB NUMBER --A 6-digit number assigned by the Computer Center for billing purposes.

LUN --Logical Unit Number. All input/output under OS-3 is with LUNs. (See section on EQUIP page 28.)

TASK --The word TASK is used to define a LUN to be the future input unit for a remote batch job.

TELETYPE --Any terminal that transmits 8-bit ASCII codes. This includes model 33, 35, and 37 Teletypes, Teletype-compatible CRTs, and Tektronix graphic terminals.

TV --A Control Data 210 or 211 display and entry terminal. (Note that Tektronix terminals are considered Teletypes.)

USER CODE --A 4-character alpha identifier used to provide access security to OS-3.



## JOB INITIATION FROM BATCH

There are two types of batch jobs under OS-3, the only difference being the origin of the input. Remote batch jobs are the result of copying card images onto a TASK unit. Card reader batch jobs are jobs submitted from regular 80-column Hollerith cards. Batch jobs must start with a job card in one of the following formats:

<sup>7</sup>  
<sub>8</sub>JOB, JOB NUMBER, USER CODE, USER IDENTIFICATION

<sup>7</sup>  
<sub>8</sub>JOB, JOB NUMBER, USER CODE, 61=NAME, USER IDENTIFICATION

The USER IDENTIFICATION is any distinctive, identifying information which the user selects to identify his deck so that it may be returned to him by the Computer Center staff.

The NAME parameter is used mainly for remote batch jobs. It is used to change LUN 61 from a line printer to a saved file. If it is used, all information that is written onto the standard output unit (LUN 61) will appear on the named file (including all control cards). (See the section on the EQUIP statement for a detailed explanation of logical unit assignments.)

Remote batch is designed to be used when a user has a large time-consuming job that he does not want to wait for at a terminal. To use remote batch, a user equips a LUN to TASK (see section on EQUIP) and by using COPY statements or the EDITOR, creates a file of card images that will run his job. All control cards should be present as in a card batch job. When he is finished and unequips the LUN or logs off, the system will queue the job to be run following previously submitted remote batch jobs. From remote terminals a left bracket, [, is used in place of the multiple <sup>7</sup><sub>8</sub> punch.

## JOB INITIATION FROM TELETYPE

The following procedure should be used to initiate remote use from a Teletype using OS-3.

1. Turn the Teletype power switch to the LINE position. If the Teletype chatters out of control, then the Teletype has been disconnected at the Computer Center. If this occurs, shut off the Teletype, call the computer operator and ask to have your Teletype connected. Be sure to specify which Teletype you wish to use. (The Teletype number for most Teletypes is written on the front or top of the machine.) Allow a reasonable amount of time for the operator to connect the Teletype, and then turn the power switch back to the line position. When the chattering has stopped you may proceed.
2. Depress "Control Shift A"; the Teletype should respond by printing a pound sign (#) at the left margin of a new line. You now have approximately twenty (20) seconds to enter your job number and user code separated by a comma but no spaces; follow your user number with a carriage return. For example:

712345,3751 (CR)

3. If the numbers are valid, the Teletype will overprint these numbers so that they are unreadable, print out the current date and time, the internal OS-3 terminal number of the user, and then enter control mode (see Page 10) for the next command. If the numbers are invalid, an appropriate error message will be provided. If after typing the carriage return nothing happens, go back to step 2 because your 20 seconds have elapsed.

NOTE: Do not press BREAK while the date and terminal numbers are being printed because credits for bad

runs cannot be given unless these are typed on the output to provide definite identification.

If at any time you have a Teletype malfunction call the computer operator and tell him both the Teletype and terminal numbers of the machine you are using.

## JOB INITIATION FROM A TV

To initiate a job from a TV terminal, first clear the screen. Then type a '#' (shift 7) and type your job number and user code and press SEND. If the number you typed was valid, OS-3 will print out the date, time, and the internal terminal number of your TV terminal, and put you in control mode. For example:

```
#712345,KING▲
```

## DISK FILE STRUCTURES AND FILE NAMING

If the user enters an invalid control mode instruction the command is assumed to be the name of an overlay file and an attempt is made to ovload the file (see OVLOAD instruction). If the file does not exist or is not in proper form, then "ILLEGAL CONTROL STATEMENT" is printed.

There are two types of file structures under OS-3. One is called a "FILE", the other a "RAF" (RANDOM ACCESS FILE).

A FILE is a sequential access device that resembles a magnetic tape. A user can read, write, rewind, and search for file marks on a FILE. If a user writes in the middle of a FILE, all previously written information past that point becomes inaccessible to him.

A RAF is a simulated word addressable drum or disk unit of N words ( $N \leq 2^{18}(2^9-2)$ ). The words are numbered from 0 to N-1. A user can locate to any word on the RAF by use of the SEEK function in FORTRAN or by using the SEEK instruction in COMPASS. Since there is a higher cost associated with processing RAF units than FILE units, the user should use FILEs if possible.

If a user wants to keep a file on a permanent basis, he has to save it (see section on SAVE). If a user wants a file to be public (accessible from all job number, user code pairs) the first character must be an \*. If he wants the file to be semi-public (accessible from all user codes on the job number that created the file) the first character must be an †.

Unless a public or semi-public file is read-only (file protected), any user who has access to the file can write, release, delete or

destroy the file in addition to reading, rewinding, etc. Therefore, a user should file-protect all public files that do not need to be write-enabled to prevent them from being written on or destroyed.

If a file name has more than eight characters, only the first eight are used.

## OS-3 CONTROL MODE INSTRUCTIONS

Instructions may be given to the OS-3 operating system whenever the computer is in control mode. Control mode is indicated on the Teletypes by the pound sign (#) printed at the left-hand margin of the Teletype page. Control mode instructions from the batch or remote batch are indicated by the digits 7 and 8 multi-punched on card column 1. TV control mode is indicated by ≠ in the upper left corner of the screen.

Any time that a user at a Teletype wishes to get to control mode, he may do so by depressing "Control Shift A". The printer carriage will return, line feed, and print #. A TV user may get into control mode by pushing <reset>, ≠, and <send>.

All control mode instructions executed by batch jobs are listed on the line printer (logical unit 61) as they are executed.

Only card columns 1 through 72 are examined for control mode instructions submitted from batch jobs. However, the entire 80 columns of the card are printed.

All control mode instructions entered from a Teletype must be followed by a carriage return. Those from a TV terminal must be followed by <send> or <return>.

Unless otherwise noted in this manual, all control mode commands may be given by either remote users (Teletypes and TVs) or batch users.

Whenever OS-3 is ready for the user to enter another control mode instruction, a Teletype will line feed and print # at the left-hand margin. A TV will clear and put a ≠ in the upper left corner of the screen.

To cause an invalid or undesired control mode instruction to be ignored from a Teletype, depress "Control Shift A" instead of carriage return. The Teletype will respond with a line feed and # printed at the left margin. TV users can just clear the screen, type # and retype the command.

Control Mode commands may not be entered from the paper tape reader on a Teletype.

The OS-3 control statements are described in alphabetical order on the following pages and use the following notations:

[ ]	optional item or items
[ ]...	optional item or items that may be repeated
< >	required item or items
LUN	logical unit number
NAME	file name



ALGOL [,A[=LUN]] [ ,I [ =LUN  
=NAME ] ] [ ,L[=LUN]] [ ,P[=LUN]]  
[ ,X[=LUN] [ ,R]]

This control mode instruction causes OS-3 to load the Algol compiler. For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

- A=LUN This specifies that an assembly language listing of the program is to be prepared and sent to the logical unit specified. If no LUN is specified, then LUN 61 is assumed unless a LUN is specified in the L parameter.
- I=LUN This specifies that the input to the Algol compiler is to come from the logical unit specified. If no LUN is specified, LUN 60 is assumed. The logical unit number in this parameter may be replaced by the name of a saved file. Input logical units are re-wound, if possible, by the Algol compiler before reading.
- L=LUN This specifies that a listing of the source program is to be sent to the logical unit listed. LUN 61 is assumed if no LUN is specified by the user.
- P=LUN This functions exactly as X, except that LUN 62 is assumed if no LUN is specified.
- R This parameter is used in conjunction with the X parameter to specify that the Algol compiler is to call the loader after compilation if there were no fatal errors.
- X=LUN This specifies that the output from the Algol

compiler (binary object program) should be sent to the logical unit specified. If no LUN is specified, then LUN 56 is assumed.

All logical units specified in the Algol control mode instruction must have been previously defined by the user. Any of the parameters A,I,L,P,R,X may be omitted; the desired ones may be listed in any order. Only the most common Algol parameters are listed above; others are discussed in the Algol manual (Control Data publication No. 60214900).

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of Algol control mode instructions are:

```
ALGOL, I=45,L=67,P=89,A=91
ALGOL,L,X
ALGOL, INPUT=33,A=61,X=3,L=47
ALGOL,L,X,R
ALGOL,I=TEST,L,X
```

```

ASSEM [ ,D [ =LUN[/R] ] [ =NAME ] ] [ ,I [ =LUN[/R] ] [ =NAME ] ] [ ,L [ =LUN[/R] ] [ =NAME ] ]
      [ ,P [ =LUN[/R] ] [ =NAME ] ] [ ,R [ =LUN[/R] ] [ =NAME ] ] [ ,S [ =LUN[/R] ] [ =NAME ] ]
      [ ,X [ =LUN[/R] ] [ =NAME ] ]

```

This control mode instruction causes OS-3 to load the ASSEMBLER. For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

If any LUN is followed by /R the LUN will be rewound before it is used.

D=LUN This parameter specifies that a short form of diagnostic messages will be sent to the LUN specified. If no LUN is specified, then logical unit 61 is assumed.

I=LUN This specifies that the input to the assembler is to come from the logical unit specified. If no LUN is specified, then LUN 60 is assumed.

L=LUN This specifies that a listing of the source program is to be prepared on the LUN specified. If no LUN is assigned, LUN 61 is assumed.

P=LUN This specifies that the output (binary object program) from the assembler should be sent to

the logical unit specified. If no LUN is specified, then logical unit 62 is assumed.

R=LUN This instructs the assembler to prepare a cross reference list of symbols and send it to the LUN specified or to the same logical unit as specified in L. If L was not specified, then logical unit 61 is assumed.

S=LUN This specifies that symbol output is to be prepared on the LUN specified or on the same logical unit as specified in P. If P is not specified, it assumes the X unit; if X is not specified, logical unit 56 is used.

X=LUN This functions exactly as P above, except that LUN 56 is assumed if no LUN is specified.

Any of the parameters D,I,L,P,R,S,X, may be omitted; the desired ones may be listed in any order. All logical units specified in the parameter string should have been previously defined by the user.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of ASSEM control mode instructions are:

```
ASSEM,I=23,P=49,X=97,L=12,R
ASSEM,IN=23,XEQ
ASSEM,L,R,X
ASSEM,IN=TEST,D,X
ASSEM,X
ASSEM,X,L=43,PUNCH=62,INPUT=2
ASSEM,IN=13,S=43,L,X
ASSEM,IN=TEST,L,X
```

BASIC

This command causes OS-3 to load the BASIC compiler.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

For more information about the BASIC compiler see CCM-71-08.

An example of this command is:

BASIC

BKSP [ ,LUN [(Number)] ] ...

This command causes each of the logical units listed to be backspaced one physical record. If the LUN is not a FILE or magnetic tape, this command will cause an error. Each of the logical units listed in the BKSP command must have been previously defined. After the execution of a BKSP command, control returns to the OS-3 control mode. A logical unit may be listed more than once; the LUN will backspace once for each time it is listed. If it is desired to backspace any unit more than once a repetition factor may be used. To do this the number of backspaces desired is enclosed in parenthesis after the LUN. For example:

BKSP,17(4)

will backspace unit 17 four times.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO. Examples of this command are:

BKSP,23,89,90,71

BKSP,23(14)

BKSP,34(3),17,14(10),83

BREAK

This control mode instruction will transfer control to RADAR, an on-line debugging language, without losing the status of the program which has been previously interrupted by a Teletype user depressing [CS,A] or a TV user executing [clear,≠,send]. (This is not the break key on a Teletype. You must type BREAK.)

An example of a BREAK instruction is:

BREAK

CC

The CC control mode instruction is legal only from batch jobs. It is used to print comments on batch job listings and has no effect on the job being run.

Examples of the CC instruction are:

```
CC THIS IS A COMMENT LINE
CC UNIT 6 IS FOR INPUT UNIT 7 IS FOR OUTPUT
CC THIS CARD HAS NO EFFECT ON THE JOB
```



COBOL [ ,I [ =NAME  
LUN [/R] ] ] [ ,L [ =NAME  
LUN [/R] ] ] [ ,M ] [ ,O ]  
[ ,P [ =NAME  
LUN [/R] ] ] [ ,X [ =NAME  
LUN [/R] ] ]

This control mode instruction causes OS-3 to load the COBOL compiler. For each of the parameters described below, any group of letters may be appended to the single letter that specifies the parameter.

- I This specifies the input unit for the compiler.
- L This specifies the listing unit for the compiler. If no LUN or name is present, the listing is written on LUN 61.
- M This requests the compiler to produce a memory map of the programs DATA division storage if no severe diagnostics are detected during compilation. The map is written on the L unit if a listing was requested or unit 61 if not.
- O This requests the compiler to produce a listing of the object code generated by the compiler if no severe diagnostics are detected during compilation. The object listing will be written on the L unit if it was specified, or on unit 61 if not.
- P This requests the compiler to punch a binary deck on the specified unit. If no unit is specified, unit 62 is used.

- X        This requests the compiler to punch a binary deck on the specified unit.  If no unit is specified, unit 56 is used.

Any of the parameters may be omitted and the desired ones may be in any order.  All logical units specified in the parameter string should have been previously defined by the user.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of COBOL control mode instructions are:

COBOL,I=PROG,L,X

COBOL,L,X

COBOL,L,O,M,P

COBOL,L=17,M,X

COMPASS    [ ,D [=LUN] ]    [ ,I [ =LUN ] [ =NAME ] ]    [ ,L [=LUN] ]  
                  [ ,M [=LUN] ]    [ ,P [=LUN] ]    [ ,R [=LUN] ]  
                  [ ,S [=LUN] ]    [ ,X [=LUN] ]

This control mode instruction causes OS-3 to load the COMPASS assembler. COMPASS is no longer being actively supported by OS-3. New coding should be done using ASSEM rather than COMPASS (see section on ASSEM).

For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

- D=LUN    This parameter specifies that a short form of diagnostic messages will be sent to to LUN specified. If no LUN is specified, then logical unit 61 is assumed.
- I=LUN    This specifies that the input to the COMPASS assembler is to come from the logical unit specified. If no LUN is specified, then LUN 60 is assumed. A saved file name may be substituted for LUN with this parameter.
- L=LUN    This specifies that a listing of the source program is to be prepared on the LUN specified. If no LUN is assigned, LUN 61 is assumed.
- M=LUN    This indicates that the library of COMPASS macro instructions will be found on the LUN indicated. A logical unit must be specified

- P=LUN This specifies that the output (binary object program) from the COMPASS assembler should be sent to the logical unit specified. If no LUN is specified, then logical unit 62 is assumed.
- R=LUN This instructs the COMPASS assembler to prepare a cross reference list of symbols and send it to the LUN specified or to the same logical unit as specified in L. If L was not specified, then logical unit 61 is assumed.
- S=LUN This specifies that symbol output is to be prepared on the LUN specified or on the same logical unit as specified in P. If P is not specified, it assumes the X unit; if X is not specified, logical unit 56 is used.
- X=LUN This functions exactly as P above, except that LUN 56 is assumed if no LUN is specified.

Any of the parameters D,I,L,M,P,R,S,X, may be omitted; the desired ones may be listed in any order. All logical units specified in the COMPASS parameter string should have been previously defined by the user. For more information, see Control Data COMPASS Reference Manual (Publication number 60236800).

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of COMPASS control mode instructions are:

```
COMPASS,I=23,P=49,X=97,L=12,R
COMPASS,IN=23,XEQ
COMPASS,L,R,X
COMPASS,IN=TEST,D,X
```

COPY [,C= N1 ] [ ,I [ =LUN [/R] ] ] [ ,F=<N2> ] [ ,O [ =LUN [/R] ] ]  
 [ ,P=<N3> ] [ ,S=<N4> ]  
 [ ,T=N5 ] [ ,V ]

COPY is used to copy information from one LUN to another. An explanation of each parameter follows. On all parameters the starting letter may be followed by any character string. All parameters are optional and may appear in any order.

- C    COUNT - The C parameter specifies the number of records to copy. If the parameter is omitted the input is copied to end-of-DATA unless the F parameter is present.
- F    FILES - The F parameter specifies the number of files to copy. If N2 is zero all information on the input unit is copied to the output unit. The default value is zero unless the input unit is a TV, magnetic tape, or a RAF. F defaults to one in these cases.
- I    INPUT - The I parameter specifies the input unit. If a name is used or a LUN is specified between 50 and 59 the unit is rewound before use. If the input unit is a LUN and the delimiting character is a / rather than a comma, the letter R (or any character string starting with R) also specifies rewinding. If the I parameter is omitted, LUN 60 (standard input unit) is assumed.
- O    OUTPUT - The O parameter specifies the output unit. The O parameter uses the same rules for rewinding as the I parameter. If the O parameter is omit-

ted, LUN 61 (standard output unit) is assumed. If a name is used for output and no saved file exists for the user with that name, the file is created. If a LUN is used that is not already equipped the LUN is equipped to a scratch FILE.

- P PARITY - The P parameter specifies the parity of the output unit. If N3 is zero the output is written in BCD, if non-zero it is written in binary. The default value is to write the output in the same parity as the input.
- S SHIFT - If <N4> is positive it specifies the number of leading blanks to be inserted at the front of each record. If <N4> is NEGATIVE it specifies the number of characters to be deleted from the front of the RECORD before it is written onto the output device. If the parameter is omitted, the default value is four for Teletypes and line printers and zero for all other devices. This parameter can be used to supply carriage control for files that do not have it, or to position lines on the line printer page. If a file with carriage control is to be copied to a printing device N4 should be zero.
- T TRUNCATE - The T parameter is used for truncating input records to a specified length of four-character words. If N5 is omitted COPY will abort with the message PARAMETER ERROR. The T parameter may be used when copying from a magnetic tape to specify the length (in words) of the input records. If it is not used COPY will discover how

long the records are, though it is more efficient to use the T parameter. The T parameter may be used to remove sequence numbers from a file by setting T=18 (72 characters). If the output unit is a TV terminal and the user does not specify T, T is assumed to be 250 words (1 screen). In all other cases T is automatically set to approximately 60,000 words.

- V VARIABLE LENGTH - The V parameter specifies that variable length records are to be written (trailing blanks on BCD records or trailing zeros on binary records are not written out). This is used to save file space.

The COPY command will destroy the status of an interrupted program such that it may not be restarted by a GO command.

Examples of COPY statements:

- 1) To copy a saved file to a printer on LUN 4 and automatically have single-spaced records

```
COPY,I=FILENAME,O=4
```

- 2) To do the above but using carriage control already on the file

```
COPY,INPUT=FILENAME,OUTPUT=4,SHIFT=0
```

- 3) To do the above example deleting all information past column 40

```
COPY,IN=FILENAME,OUT=4,S=0,T=10
```

- 4) To copy a file to a saved file, changing all records to BCD

```
COPY,I=7,OUT=FILENAME,P=0
```

- 5) To copy the first six files from LUN 7 onto LUN 8

COPY,I=7/REWIND,O=8,F=6

- 6) To copy a file onto LUN 61 and suppress trailing blanks

COPY,I=FILENAME,V

- 7) To create a data file from a card deck

COPY,O=FILENAME

- 8) Copying a deck of cards to make a listing on the line printer

COPY

- 9) To copy the first 89 records of a file to another file and delete the first six characters of each record

COPY,I=IN,O=OUT,C=89,S=-6



COSY [ ,=LUN] [ ,L [=LUN]] [ ,Z] [ /=<character>]

This control mode instruction causes OS-3 to load COSY. For both of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as show below, however.

I=LUN This specifies that the input to COSY is to come from the logical unit specified. If no LUN is specified, or I is not present, then LUN 60 is assumed.

L=LUN This specifies that the LOG listing from COSY should be sent to the logical unit specified. If no LUN is given, then LUN 61 is assumed. If L is not present no LOG listing will be produced.

Z This specifies that the COSY control cards have free form input. The default is that the key words on all COSY control cards must start in column 10.

/=<character> This specifies that the / character on COSY control cards is to be changed to <character>.

All logical units specified in the COSY control mode instruction must have been previously defined by the user. For more information see Computer Center publication CCM-70-6.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of COSY control mode instructions are:

COSY,I=34,L=29

COSY,I,L

COSY,INPUT=73,LIST=2

COSY

COSY,LOG,Z,/=\*

DATE [,LUN]

This control mode instruction will cause OS-3 to print the current date (month, day and year) as well as the current time (to the nearest minute) on the LUN specified. Logical unit 6] is assumed if no LUN is specified. This information can be useful for determining what sequence of steps were performed when many separate computer runs were used to modify a particular problem.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of DATE instructions are:

DATE,43

DATE

DELETE [,NAME]...

The DELETE command is used to remove the name of a saved file from the file directory. The saved file may not be file protected. File protected files may be deleted by first removing the file protection, and then deleting them. By first equipping LUN=FILENAME and then deleting the filename the user may still refer to the information by referencing the LUN.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO.

Examples of DELETE commands are:

DELETE,PROGRAM

DELETE,DATA

DELETE,FILEA,FILEB,FILEZ

DESTROY [,NAME]...

The DESTROY command is used to annihilate each of the files listed. No private file can be protected from this command.

This instruction may be given without disrupting the status of a program which has been interrupted. Execution may be resumed by using GO.

This command produces the same results as the following sequence of commands:

EQUIP,59=FILENAME

RFP,FILENAME

RELEASE,59

DELETE,FILENAME

UNEQUIP,59

Examples of DESTROY control mode instructions are:

DESTROY,TEST,DATA,EDF

DESTROY,ESG

DIRECTORY[,LUN]

This control mode instruction allows users to obtain a copy of their file names. DIRECTORY will print out a complete list of file names saved under the job user number. More information about each file may be obtained by adding a logical unit number or file name to the DIRECTORY call. This will result in the file names, file length, last change date and last referenced date to be printed.

This instruction may be given without disrupting the status of a program which has been interrupted. Execution may be resumed by typing GO.

Files saved during one day will not appear in the DIRECTORY list until the next day as updates are made each night.

Users who do not wish their file names to be accessible should contact the Computer Center.

Examples:

DIRECTORY

DIRECTORY,61

DO 

LUN
NAME

This control mode instruction causes the control mode to begin obeying control statements in the specified file. Statements do not require any special character at the left, and may be control mode statements, or library calls, or overlay calls. If processing is interrupted (by break or control A, for example), it can be resumed by DO (with no LUN or NAME).

The LUN or NAME specified will always be rewound before control mode processes the first statement.

A file of control cards that is set up for remote batch processing may be run from a terminal by the use of the DO command.

Examples of DO commands are:

DO,ZIP

DO,5

DO

```
DUMP [,ABORT] , [LUN] [ , [<STARTING ADDRESS>]
, [<ENDING ADDRESS>] ]
```

The DUMP command will generate an octal dump of the computer memory on the LUN specified. the <STARTING ADDRESS> and <ENDING ADDRESS> are both expressed in octal. If the <STARTING ADDRESS> and <ENDING ADDRESS> are not specified, then the contents of the entire lower bank of memory will be dumped. If the LUN is not specified, LUN 61 is assumed. The LUN used in the DUMP command must have been previously defined. After the execution of a DUMP command, control returns to the OS-3 control mode.

If the abort parameter is present the dump will be made only if the user has been aborted. Only the letter A is required to specify the abort parameter.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of control mode DUMP commands are:

```
DUMP,34,13452,47233
```

```
DUMP
```

```
DUMP,,13452,47233
```

```
DUMP,A
```

```
DUMP,ABORT,13
```



## EDIT

This command causes OS-3 to load the EDITOR.

The EDITOR, which is available to remote users only, may be used to prepare program and data files for use by other parts of the OS-3 system. For more information see Computer Center publication CCM-70-7.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

An example of an EDIT command is:

EDIT

EQUIP[<LUN= DEVICE>] . . .

The EQUIP statement allows the user to associate logical unit numbers with particular pieces of hardware. These devices are subsequently referred to by LUN. The LUN must be an integer constant between 0 and 99. Normally, the following logical units are associated with the following devices:

<u>LUN</u>	<u>DEVICE</u>
60	STANDARD INPUT
61	STANDARD OUTPUT

Most compilers and assemblers use logical units numbered between 54 and 59. Therefore, a user should not normally use these logical units. Also some system software will unequip input units in the range 50-59.

Logical unit 100 is permanently assigned to the user's standard input unit. It may appear only on the right-hand side of the equal sign (=) in an EQUIP instruction.

For remote users, standard input and standard output both refer to the user's terminal. Batch users have the card reader as standard input and a line printer as standard output.

The DEVICE to the right of the equal sign must be a previously defined logical unit number (60, 61, 100, or a LUN which appears to the left of the equal sign in an earlier EQUIP statement) or one of the following:

FILE The word FILE is used to define a LUN as a sequential disk storage area. This storage area may be saved for future use by using a SAVE command. If the file is not saved, it will be destroyed when the user logs off, or the LUN is unequipped.

LP The characters LP equip a line printer as an output device. Any information sent to this LUN will be printed on the high-speed line printer.

MSF <pack number> <comments to the operator>

The letters MSF are used to equip a LUN equivalent to a user disk pack.

The comment field is printed on the 3300 console to give the operators additional information about the disk pack.

OS-3 will check the label on the disk to verify that the mounted pack is the one the user requested before the user's first operation is allowed to occur.

MT,<tape number><comments to the operator>

MT,<tape number> AT <tape density><comments to the operator>

The letters MT are used to equip a LUN equivalent to a magnetic tape. Magnetic tape may be used only by jobs submitted from batch or remote batch.

Tape number is the identifying number assigned by the Computer Center to the reel of tape. (Use numbers 1 through 9 for scratch tapes or tapes that do not have a number.)

Tape density, if present, must be 200, 556, or 800 (all others will result in an error). If the density field is not present, 800 BPI is assumed. OS-3 automatically sets the correct density before each read or write operation.

The comment field is printed on the 3300 console to give the operators additional information such as with or without ring or to use a scratch tape. (See the examples.)

The word AT must be present and should be delimited by spaces if the user wants 200 or 556 BPI. (The word "BPI"

is unnecessary, and if present, is treated as part of the comment field.)

(NAME) The (NAME) is used to equip a LUN equivalent to the file (NAME). (NAME) may be the name of a public file, of the name of one of the user's private files which he has previously saved under the currently used account number and user number.

NULL The word NULL is used to define a device which will destroy any information sent to it. It may be thought of as a line printer feeding directly into an incinerator.

PLOT The word PLOT is used to define a LUN equivalent to the X-Y plotter.

PTP The word PTP is used to define a LUN equivalent to the high speed paper tape punch.

PUN The word PUN is used to define a LUN as a card punch. Information sent to this LUN will be punched on cards.

RAF The characters RAF are used to define a random access disk storage area. This storage area may be saved for future use with a SAVE command. If it is not saved, the information will be lost when the user logs off or unequips the unit.

TASK The word TASK is used to define a LUN to be the future input unit for a remote batch job. (See page 3 for a description of remote batch operations.)

PUN, PLOT, PTP and LP units must be labeled to prevent loss

of output; see section on LABEL.

A particular LUN may not be used on the left of the equal sign in an EQUIP statement more than once. If one wishes to redefine a LUN he must UNEQUIP it first.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO.

Examples of EQUIP commands are:

```
EQUIP,04=FILE,7=FILE,8=FILE
EQUIP,02=61
EQUIP,45=04
EQUIP,99=NULL,9=FILE
EQUIP,71=PLOT
EQUIP,77=100
EQUIP,1=MT 1 AT 556 TAPE WITH JOB
EQUIP,2=MT 4693 NO RING
EQUIP,3=MT 8143 AT 556 WITH RING
EQUIP,4=MT 7778
```

FORMS,<LUN, message to operator>

This command will tell the operator to put special forms into the output device specified by LUN. This command should also be used in cases where the user is depending upon large amounts of materials being in the output device.

If LUN is 62 and unequipped, it will automatically be equipped to PUN.

This control mode instruction will not destroy any interrupted program. It may be restarted with a GO command.

Examples of FORMS commands are:

FORMS,9, 70 feet of plotter paper needed

FORMS,10, two-part paper 8½ \* 11

FORMS,20, need ½ roll of paper tape

FORMS,17, blue striped cards

FORTRAN [ ,A [=LUN [/R]] ] [ ,C [=LUN [/R]] ] [ ,D [=LUN [/R]] ]  
 [ ,E ] [ ,H [=LUN [/R]] ] [ ,I [=LUN [/R] ] ] [ ,K=<NUM> ]  
 [ ,L [=LUN [/R]] ] [ ,M [=LUN [/R]] ] [ ,N=<NUM> ]  
 [ ,P [=LUN [/R]] ] [ ,R [=LUN [/R]] ] [ ,S [=LUN [/R]] ]  
 [ ,X [=LUN [/R]] ]

This control mode instruction causes OS-3 to load the FORTRAN compiler. For each of the parameters described below, any group of letters may be substituted for the single letter shown to the left of the equal sign. The first letter of the group must be as shown below, however.

If any LUN is followed by "/R", the LUN will be rewound before it is used.

**A=LUN** This specifies that an assembly language listing of the program is to be written onto the logical unit specified. If no LUN is specified, the A output will go to the L device. If no L parameter was specified, the output goes to LUN 61.

**C=LUN** This specifies that assembly language statements equivalent to the FORTRAN program are to be written onto the logical unit specified. If no LUN is specified, 62 is assumed.

- D=LUN This specifies that the diagnostic error messages are to be sent to the LUN specified. If no LUN is specified, it will go to the L device. If no L parameter was specified, it goes to 61.
- E This parameter instructs FORTRAN to generate extended error checking into the compiled program. This extra error checking principally checks for array bound errors.
- H=LUN This specifies that a copy of the source deck for the FORTRAN program is to be written onto the specified LUN. If no LUN is specified, 62 is assumed.
- I=LUN This specifies that the input to the FORTRAN compiler is to come from the specified LUN. If no LUN is specified, 60 is assumed. The logical unit number may be replaced by a name of a saved file. The FORTRAN compiler will rewind the input device, if possible, before reading from it. Input units numbered between 50 and 59 are unequipped at the end of compilation.
- K=<NUM> This informs the FORTRAN compiler which input card code is being used. If <NUM> is 029, then the input deck is taken in extended BCD code (EBCDIC). If <NUM> is 026 or the K parameter is omitted, then the input deck is taken to be punched in standard 026 codes. If <NUM> is 027, then the input deck is assumed to contain cards punched on both 026 and 029 keypunches. The K option should be used only with special card decks.
- L=LUN This specifies that a listing of the source program is to be made on the LUN specified. LUN 61 is assumed if no LUN is specified.



- M=LUN This specifies that a list of symbols and their relative positions in the compiled program is to be written onto the LUN specified. If no LUN is specified, then it is written onto the L device. If the L parameter is not present, then it is written onto LUN 61.
- N=<NUM> This specifies the number of lines to appear on each page of the listing output. If the N parameter is not present, FORTRAN assumes 61 lines per page.
- P=LUN This functions exactly as X, except LUN 62 is assumed if no LUN is specified.
- R=LUN This specifies that binary object output should be sent to the LUN specified. If no LUN is specified, 56 is assumed. This parameter differs from X in that the LUN is released before being written on, and at the object output is designed as an input to the loader (see I parameter for the LOAD command), since it is terminated with a BCD record containing "RUN".
- S=LUN This instructs the FORTRAN compiler to write symbol output (for RADAR, etc.) on the LUN specified. If no LUN is specified, then the P device is assumed. If no P parameter is present, then the X device is assumed. If the X parameter is not present, then the R device is assumed. If neither P, X, nor R is present, then an error occurs.
- X=LUN This specifies that the binary object output from the FORTRAN compiler is to be written

onto the LUN specified. If no LUN is specified, then 56 is assumed.

All logical units specified must have been previously defined by the user. Any of the parameters (A, C, D, E, H, I, K, L, M, N, P, R, S, X) may be omitted, and the desired parameters may be listed in any order.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of FORTRAN control mode instructions are:

```
FORTRAN,I=TEST,S=33,L=67,P,A=91
FORTRAN,L,R
FORTRAN,IN=TEST,RUN=47
FORTRAN,R,INPUT=TEST
FORTRAN,I=45,C=27,X,L=18,D=61,K=029,S
```

FP [ LUN  
NAME ] . . .

The letters FP are used to indicate FILE PROTECT. LUN must refer to a FILE or RAF. File protection makes a file read-only and thus prevents the user from modifying the contents of the file associated with LUN. A protected file which the user does not save will be destroyed at the end of his job. File protection may be removed by using the RFP,LUN command. If a name is used a FILE or RAF must be already saved with that name. See page 7.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO.

Examples of this command are:

FP,33,17

FP,45

FP,BURP

FWSP [,LUN [(number)] ] . . .

This command causes each of the logical units listed to be forward-spaced one physical record. Each of the logical units listed in the FWSP command must have been previously defined to be a file or mag tape. After the execution of a FWSP command, control returns to the OS-3 control mode. A logical unit may be listed more than once; the LUN will forward space once for each time it is listed.

If it is desired to forward space any unit more than once, a repetition factor may be used. To do this the number of forward spaces desired is enclosed in parentheses after the LUN. For example:

```
FWSP,17(4)
```

will forward space unit 17 four times.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using GO.

Examples of this command are:

```
FWSP,23,89,90,71
```

```
FWSP,23(14)
```

```
FWSP,34(3),17,14(10),83
```

GO [,Parameter string]

The GO command is used to resume computer operation after the execution of a program has been interrupted either by a program error which the user has since fixed, or by the user putting himself into control mode. Control mode instructions which will prevent the user from re-starting a program with this command are indicated individually.

An example of the GO command is:

GO

LABEL [,LUN]  $\left[ \begin{array}{l} \neq \text{ message} \\ / \text{ message} \end{array} \right]$

This command allows users to write a message on an output device to facilitate the identification of the user's output at the Computer Center. If the LUN is omitted, LUN 61 is assumed.

If the first character of the message is a  $\neq$ , this command will simply output the message on the specified LUN in BCD form. The user carriage control is the first character after the  $\neq$  if LUN is a printing device.

If the first character of the message is a  $/$ , LABEL will do different things for different types of output devices. If LUN is a punch, then the first six characters of the message are punched in block letters on a card. If LUN is an x-y plotter, then the message is written on the plotter in one-half-inch-high block letters. For all other devices one space is inserted at the front of the message and the message is output to the device in BCD form.

If LUN is 62 and LUN 62 is undefined, it will be equipped to a card punch.

Examples of the LABEL command are:

```
LABEL/JONES
LABEL,77/plot for SMITH
LABEL,62/USER
LABEL,14 $\neq$ 0 BOB SMITH
```

LOAD [ LUN [/R] ] . . . [ ,L=LUN [/R] ] . . . [ ,I=LUN [/R] ]  
 [ ,O=LUN [/R] ]

This control mode instruction calls the OS-3 binary program loader. The binary input is produced by compilers and assemblers (FORTRAN, ASSEM, COBOL and ALGOL). The information is loaded from the logical units or file names listed after the word LOAD. Any LUN followed by /R will be rewound before use. The loader information, representing programs or subprograms, is loaded in the order specified. After reading from all of the specified units, the loader will attempt to read more loader information from the unit or name after the I parameter or from logical unit 60 until a loader control statement is found. All loader control statements cause the loader to do some specific task. The legal loader control statements and their functions are listed below.

- RUN        The word RUN will cause the programs just loaded to be executed. This statement will terminate all loading.
- END        The word END will terminate loading. The program that has just been loaded will not be run and control returns to OS-3 control mode.
- MAP        The MAP statement instructs the loader to  
 MAP=LUN prepare a list of how the programs occupy the computer memory. Normally the map is made on logical unit 61 unless another unit is specified. The first map made from a teletype will contain only subprogram addresses. To

obtain a complete map on a teletype it is necessary to type MAP a second time. The MAP statement must be followed by another loader control statement.

RADAR Control is given to the RADAR program.

The loader control statements (RUN, MAP, END, and RADAR) should not be preceded by a control-A or a 7-8 punch. From a teletype they must be terminated with a carriage return.

The loader will make an overlay of the programs on the saved file or logical unit if the 0 parameter was specified. If the saved file does not exist, the loader will create it. The letters between the 0 and the equals in OVERLAY are ignored.

An example of a job might be:

```
#EQUIP,1=FILE
#EQUIP,2=FILE
#ASSEM,I=TALLY,X=1,D

#FORTRAN,I=OUTCTDW,X=2
```

```
#LOAD 1/R,2/R,BINPROG
MAP (CR)
```

{ NOTE: Teletype MAP contains only subprogram addresses.

SUBPROGRAMS

73100 POWRF	73446 FORMAT	74176 FLOAT	74211 ABSF
74222 XTOI	74442 FIXF	74511 Q10	74652 BCDOUT
76143 Q8Q	76513 SIGT	76732 SALI	77331 WRITENTE
77507 GTSHIFT	77532 READ	77565 TALLY	

RUN (CR)  
RUN



The "L=" parameter is used to specify loader libraries.

If after loading all of the indicated loader information the loader finds some unresolved external symbols, the loader will try to resolve the symbols by loading subprograms from loader libraries. Normally the standard OS-3 loader library is used; however, other libraries may be used. The standard OS-3 library will be used only if other libraries failed to resolve all of the external symbols. If more than one library is specified, the last library in the list will be examined first. If LIB=NULL is specified, the loader will not try to use the standard OS-3 loader library.

```
#FORTRAN,I=WPLOTT,X
```

```
NO ERRORS FOR UVACCUM
```

```
#LOAD,56,LIB=CALTEK (CR)
RUN (CR)
RUN
```

```
#EQUIP,3=FILE
#LOAD 1/R,2,BINPROG
MAP=3 (CR)
MAP (CR)
```

NOTE: MAP option typed twice

## SUBPROGRAMS

73100 POWRF	73446 FORMAT	74176 FLOAT	74211 ABSF
74222 XTOI	74442 FIXF	74511 QIQ	74652 BCDOUT
76143 Q8Q	76513 SIGT	76732 SALI	77331 WRITENTE
77507 GTSHIFT	77532 READ	77565 TALLY	

## ENTRIES

73100 F1.EXOR	73100 Q1QEXRR	74122 Q8QDUMP	74040 PWRTBLO
74176 FLOAT	74211 XABSF	74211 IABS	74211 ABSF
:			
76143 Q8QENTRY	77507 GTSHIFT	77352 WRITENTE	77532 READ
77620 MAIN	00005 PCD.BYTE	00074 LOWMEM	73077 HIGHMEM

## DATA BLOCKS

00020

END

#

#LOAD,BINPROG,2/R,OVERLAY=OVPROG  
END

(CR)

(CR)

#

Loader error messages are listed in Appendix A.

## LOGOFF

The LOGOFF command is the last command given to OS-3 by a user. A LOGOFF command causes all logical units still equipped to be unequipped.

After the user types the LOGOFF command, the computer will print a summary of his computer use.

An example of the LOGOFF command is:

LOGOFF

## LUNLIST

This command will print the status of all the logical units a user has equipped. See STATUS command for example of the output from this command.

Teletype users will not have file size/record count information printed for the LUNLIST command. To obtain this information on an individual file or LUN see the STATUS command.

A program may be restarted by using GO after this command.

An example of this command is:

LUNLIST

```
MFBLKS [=<number>]
        [+<number>]
```

If the delimiting character on this command is an = sign, this command will set the limit on temporary (scratch) file space to <number>.

If the delimiting character on this command is a + sign this command will set the limit on temporary file space to the amount currently being used plus number. Thus, if a user currently has 50 scratch blocks in use the statement

```
MFBLKS+10
```

will set his limit to 60 blocks.

These two forms of this command are useful for limiting scratch space during program debugging.

If a user does not use either of these statements, the scratch limit for a job will be the lesser of 100 blocks and the limit for the job number.

If the delimiting character is neither + or = , this command will print out the maximum number of scratch blocks used during this job (MFBLKS) and the amount currently in use (CFBLKS).

This command may be used without disrupting the status of a program which has been interrupted. The program may be resumed by typing GO.

Examples of this command are:

```
MFBLKS=175
```

```
MFBLKS+70
```

```
MFBLKS
```

MI [,parameter string]

MI means manual interrupt. Since the result of this command varies with the program currently being run, instructions for its use are included in all manuals about programs that use it.

An example of MI is:

MI

```
OSCAR [ I=LUN
       'R=LUN ]
```

OSCAR

This control mode instruction calls OSCAR.

OSCAR is a conversational language for use with remote terminals. Consult one of the many Computer Center publications about OSCAR for more information.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

An example of an OSCAR control mode instruction is:

```
OSCAR
```

```
OSCAR,I=LUN
```

This control mode instruction is used to call OSCAR in a batch job. The LUN must be previously equipped and will be used as standard input to OSCAR. If the I parameter is omitted, OSCAR uses LUN 60 as input.

An example of this form of control mode instruction is:

```
OSCAR,I=17
```

```
OSCAR,R=LUN
```

This control mode instruction is used to call OSCAR from a TV terminal. If the R parameter is used, OSCAR will record all TV inputs and outputs on the specified LUN. If the LUN is not equipped, OSCAR equips it as a file. If the R parameter is omitted, OSCAR does not record TV inputs and outputs.

An example of this form of control mode instruction is:

```
OSCAR,R=35
```

OVLOAD  $\langle$  LUN  
'NAME  $\rangle$  [ ,parameter string ]

The OVLOAD control mode instruction causes a binary program overlay to be loaded from the LUN or NAME specified.

The unit is rewound, if possible, before loading. After loading, control is transferred to the loaded program.

The parameter string may be included at the option of the user if the program being loaded requires it.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

Examples of OVLOAD control mode instructions are:

OVLOAD,37

OVLOAD

OVLOAD,HENRY

OVLOAD,17,ZIP

OVLOAD,88,ZDRCH=14,X=5,ZIP



## RADAR

This control mode instruction calls RADAR. RADAR is used to examine, selectively trace, and make on-line changes to running programs.

For more information see ccm 70-9.

This control mode instruction will destroy any interrupted program so that it may not be restarted with a GO command.

To use RADAR without destroying the interrupted program's status see section on BREAK.

An example of a RADAR control mode instruction is:

RADAR

RELEASE [,LUN] . . .

If a LUN is a write-enabled FILE or RAF, line printer, card punch, or plotter, the information stored on it is destroyed and the file space it used is returned to OS-3. If a LUN is a magnetic tape, the tape is rewound. If a LUN is a NULL, nothing is done to the LUN. This is illegal for a read only FILE or RAF, TV, Teletype or Card Reader.

This command may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of RELEASE commands are:

RELEASE,33,67,21

RELEASE,32

```
RENAME[,<old NAME>=<new NAME>[±]]...
```

This command changes the name of the saved file <old NAME> to <new NAME>. If the character terminating <new NAME> is "+" <new NAME> is protected; if the terminating character is "-" <new NAME> is left unprotected; any other terminating character leaves <new NAME> with the same protect condition that <old NAME> had previously.

If the message "RENAME FAILURE--LUN<n>" occurs, the file could not be saved under <new NAME> and for some reason it could not be saved again under <old NAME>. The file, which is not saved, is equipped to logical unit <n>. All other errors leave the file saved under <old NAME>.

This command does not destroy status so that a program may be restarted with a "GO".

Examples:

```
RENAME,ZOT=*ZIM+
```

(change ZOT to \*ZIM and file protect)

```
RENAME,CREAM=MILK-
```

(change CREAM to MILK and remove file protect)

```
RENAME,AT15=DONE5
```

(change AT15 to DONE5 and leave file protect condition unchanged)

```
RENAME,ZOT=*ZIM+,CREAM-MILK-,AT15=DONE5
```

(do all of the above)

```
RESET[+] [,First LUN[,Last LUN]]
```

This command unequips all of the logical units between "First LUN" and "Last LUN" except those that are file protected and not saved. If these include logical units 60 and 61, LUN 60 is then equipped to the standard input unit and LUN 61 to the standard output unit. If only one parameter is given, it defaults to "First LUN" and "Last LUN" defaults to LUN 99. If both parameters are omitted, the "First LUN" defaults to 0 and "Last LUN" defaults to 99.

The + is used to designate the exception for file protected files. When the + is used, ALL logical units are unequipped as described above. The + must be the first non-blank delimiter in the parameter string.

Examples of the RESET command are:

```
RESET  
RESET,90  
RESET,10,40  
RESET+  
RESET+,20  
RESET+,40,80
```

REWIND [,LUN] . . .

The REWIND command is used to return the user to the start of the logical units specified. Any number of logical units may be rewound using a single command.

All logical units used in a REWIND command must have been previously defined and must refer to either a magnetic tape, a FILE, or a RAF.

This command may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of REWIND commands are:

REWIND,45,37,12,99

REWIND,12

RFP [ LUN  
'NAME ] . . .

The letters RFP are used to indicate Remove File Protect. Remove File Protect negates the effect of the File Protect command. (It makes a file write enabled.) LUN must refer to a FILE or RAF.

After file protection has been removed from a file, it may be modified at the user's option. File protection may be removed only by the owner of a file.

If a file is saved, the name must be used instead of LUN.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using the GO command.

Examples of Remove File Protect commands are:

RFP,33

RFP,83,73,44,10

RFP,HESD

SAVE [,LUN=<NAME>]. . .

The SAVE command is used whenever the user wishes to store file information on a permanent basis. LUN must refer to a FILE or RAF. <NAME> is an identifier of eight characters or less, assigned by the user to identify the file. (See File Naming, p.7.) NAME cannot be one of the standard hardware types (see EQUIP). If LUN was file protected, the saved file is also file protected. To use a saved file, the user must have logged in using exactly the same <job number> and <user number> (unless the file is public or semi-public).

It is the user's responsibility to remember the names which he assigns to his saved files.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using the GO command.

Examples of SAVE commands are:

```
SAVE,83=PROGRAM
SAVE,22=DATA,14=DATA2
SAVE,17=*GLERCH
SAVE,75=↑DATA
```

SEFB[,LUN[(number)]] . . .

This control mode instruction will cause each logical unit specified to be spaced backward until a file mark is passed, or the beginning of the file is found. A file mark may be thought of as a mark which separates individual subfiles on the same logical unit. Each of the logical units specified must have been previously defined. A logical unit may be listed more than once; the search back command will be executed as many times as the LUN is listed. If it is desired to SEFB any unit more than once, a repetition factor may be used. To do this the number of searches desired is enclosed in parentheses after the LUN. For example,

SEFB,17(4)

will SEFB unit 17 four times. All logical units listed must refer to either a magnetic tape or a FILE.

This control mode instruction will not disrupt the status of a program which has been interrupted. Execution may be resumed by using GO.

Examples of SEFB control mode instructions are:

SEFB,21,33,76

SEFB,37

SEFB,29(3)



SEFF[,LUN[(number)]] . . .

This control mode instruction will cause each logical unit specified to be spaced forward until a file mark is passed, or the end of the file is found. Each of the logical units specified must have been previously defined. A logical unit may be listed more than once; the search forward command will be executed as many times as the LUN is listed. If it is desired to SEFF any unit more than once, a repetition factor may be used. To do this the number of SEFF desired is enclosed in parentheses after the LUN. For example,

SEFF,17(4)

will SEFF unit 17 four times. All logical units must be FILES, RAFs, or magnetic tapes.

This control mode instruction may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of this command are:

SEFF,39,73,21

SEFF,35

SEFF,26(3)

SEND,LUN to <DEVICE>

This command allows a user to send output to a different printer than the one normally associated with the user's job. The only devices currently allowed are:

PR1       --the standard 512 printer in the I/O room  
UT01       --the printer on the 200 user terminal.

This control mode instruction may be used without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of the SEND command are:

SEND,17 to UT01  
SEND,99 to PR1

## SFBLKS

The letters SFBLKS stand for Saved File Blocks. This control mode instruction causes the current number of saved file blocks in use to be printed along with the saved file block limit associated with the particular <job number> and <user number> combination. The difference between the two values listed is the remaining space left for the storage of saved files.

This control mode instruction may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

An example of a SFBLKS control mode instruction is:

SFBLKS

START [, <ADDRESS> [, parameter string]]

This control mode instruction causes control to be transferred to the address specified. The (address) must be expressed as a six or fewer digit octal number.

Examples of START instructions are:

START, 71653

START, 132014, I=1

START, 0

## STATUS

The user should type the command mode instruction STATUS whenever it appears that a program has completely blown up and the user is confused as to what went wrong. OS-3 will respond by typing the content of all registers which may be helpful to the programmer in trying to figure out what happened. This command is automatically executed if a batch job terminates abnormally.

This instruction may be used without disrupting a program which has been interrupted. The program may be resumed by using GO.

An example of a STATUS command is:

STATUS

STATUS, [LUN  
NAME ]

This command is used to get the hardware type and a limited amount of information about a logical unit or named file. The following table defines the status of LUN:

Character	Definition
+	read only (file protect)
[	load point
]	end of data
F	file mark just processed
B	binary record processed
A	abnormal/unavailable
E	address error (RAF only)
S	saved file

The above status is followed by additional file-size/record-count information. On all LUNs except unit-record equipment the number of blocks are printed. If the LUN is a unit-record device, both the number of blocks and the number of records are printed.

A program may be restarted by using GO after this command.

Examples of this command are:

STATUS,14

STATUS,DATA

```
TIME [ =<number> ]  
      [ +<number> ]
```

If the delimiting character on this command is an = sign, this command will set the time limit to <number> seconds.

If the delimiting character on this command is a + sign, this command will set the time limit to the amount currently used plus number. Thus, if a user has used 50 seconds, the statement

```
TIME+10
```

will set his limit to 60 seconds.

These two forms of this command are useful for limiting time during program debugging.

If a user does not use either of these statements, the time limit for a job will be the lesser of 60 seconds and the limit for the job number.

If the delimiting character is neither + or =, this command will print out the time used so far, the maximum number of scratch blocks used during this job (MFBLKS), and the amount currently in use (CFBLKS).

This command may be used without disrupting the status of a program which has been interrupted. The program may be resumed by typing GO.

Examples of this command are:

```
TIME=175
```

```
TIME+70
```

```
TIME
```

## TRAFFIC

This control mode instruction will cause OS-3 to approximate the current system load for the user's reference. This information may be useful for judging response time as the system load increases.

This command may be used before logging in to determine approximate system loading.

This command may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

An example of a TRAFFIC command is:

TRAFFIC



UNEQUIP[,LUN] . . .

The UNEQUIP statement causes the LUN to become undefined. The LUN may be used in a subsequent EQUIP statement. If LUN was a file which was not saved, its contents are lost.

If LUN is an output device, such as the printer or card punch, the information on LUN is sent to the proper output device at this time. Any logical unit numbered between 0 and 99, inclusive, may be unequipped, except that Logical Units 60 and 61 should not be unequipped by batch users.

This instruction may be used without disrupting the status of a program which has been interrupted. The program may be resumed by using the GO command.

Examples of UNEQUIP commands are:

UNEQUIP,4

UNEQUIP,99

UNEQUIP,7,15,8

WFM[,LUN[(number)]] . . .

WEOF[,LUN[(number)]]

The Write End of File command instructs the computer to place a file mark on each of the logical units specified. A file mark on a line printer will cause a skip to the top of the next page. Each of the logical units listed must have been previously defined. If it is desired to write a file mark on any unit more than once, a repetition factor may be used. To do this the number of file marks desired is enclosed in parentheses after the LUN. For example,

WFM,17(4)

will write four file marks on unit 17.

The command is illegal for any LUN that is a TV or card reader.

This command may be given without disrupting the status of an interrupted program. Execution may be resumed by using GO.

Examples of this command are:

WFM,37,69,43

WFM,76

WFM,10(14)

WEOF,11,12,13

APPENDICES



## Appendix A

### LOADER ERROR MESSAGES

- PPPPP - Subprogram name
- EEEE - Entry point name. (FORTRAN function or subroutine name.)
- TTT - Type of binary loader card (IDC,RIF,XNL, EPT,TRA,EXS)

#### EEEE UNDEFINED SYMBOL IN PPPP

The external symbol or FORTRAN subroutine name EEEEE was used in program PPPP, but after loading no such entry point or FORTRAN subroutine was found.

#### EEEE DUPLICATE SYMBOL IN PPPP

While loading program PPPP, the entry point or FORTRAN subroutine name EEEEE was found a second time. Often this is caused by loading two copies of the same subprogram.

#### Ø TRANSFER SYMBOLS

After loading all of the programs, no main program had been loaded. If the number of transfer symbols is greater than two it means that more than two main programs have been loaded.

#### NON-LOADER FILE LUN XX

#### ILLEGAL BCD RECORD LUN XX

The loader was instructed to load from LUN XX. However, the information on LUN XX was not a loader file.

PARAMETER STRING ERROR

An error has been found in the parameter string of the LOAD statement.

LOADER CONTROL CARD ERROR

A statement other than a legal loader control statement was found after the LOAD control mode statement. This may be caused by misspelling RUN, MAP, or END.

EOD ON INPUT UNIT

An end-of-data condition was found.

CAN NOT EQUIP SAVE FILE XXXX

The loader was asked to equip file XXXX. However, either no such file exists, or the file is busy.

PPPPP TTT CARD OUT OF SEQUENCE

Missing, extra, or scrambled cards in a loader file.

PPPPP TTT CHECKSUM ERROR

Either a card has been incorrectly read or punched or the card type (TTT) is TRA which indicates that there are extra or omitted cards. Every binary loader record is checksummed except for the TRA card which contains a checksum for the complete subprogram.

PPPPP DATABLOCK SIZE ERROR

A labeled common area in program PPPPP was larger than the same labeled common area in a previous program and the loader could not

expand the labeled common area without causing a memory allocation overlap.

PPPPP MEMORY OVERFLOW

Program PPPPP caused the sum of all memory used by programs and common to exceed 32K words. This error occurs most often when very large arrays are being used.

LIBRARY FORMAT ERROR

A file or logical unit was declared a library but was not in the correct loader library format.

PPPPP EXS FORMAT ERROR

EXS card not in proper format.

PPPPP EEEEE EXS STRING LOOP

Symbol EEEEE is equated back to symbol EEEEE, possibly by way of other symbols. (EXS,A=B and EXS,B=A)

PPPPP EEEEE STRING LOOP

The loader, while following an external linkage chain, has detected a loop. If this is the only error, it may indicate that the program that generated the binary deck PPPPP has made an error.

LUN XX RECORD SIZE ERROR

A record too long for the loader input buffer has been read.

PPPPP TTT ILLEGAL RELOCATION

Relocatable information is not relocated in a

meaningful way. This error should not normally occur.

NO OVERLAY MADE

An overlay was requested but no information was loaded. Hence the loader cannot make an overlay.

LUN XX REWOUND

Logical unit XX was left at end-of-data. The loader will rewind the unit before reading from it.

LUN XX EMPTY

The logical unit is both at loadpoint and at end-of-data.



## Appendix B

### Printer Carriage Control

Column 1 of information being sent to a line printer specifies control of paper movement during printing. This character will not be printed. Listed below are the control characters and the action that will be performed before and after printing.

<u>CONTROL CHARACTER</u>	<u>ACTION BEFORE PRINT</u>	<u>ACTION AFTER PRINT</u>	<u>RESULT WITH STANDARD CARRIAGE TAPE</u>
(blank)	space 1	no action	single space, skip over bottom margin
∅ (zero)	space 2	no action	double space, skip over bottom margin
- (minus)	space 3	no action	triple space, skip over bottom margin
+	no action	no action	overprint
1	eject page	no action	top of page
2	skip to level 12	no action	1" from bottom of page
3	skip to level 6	no action	level 6 is every 6th line
4	skip to level 5	no action	level 5 is every 5th line
5	skip to level 4	no action	level 4 is every 4th line
6	skip to level 3	no action	level 3 is every 3rd line
7	skip to level 2	no action	level 2 is every even line
8*	skip to level 11	no action	
9*	skip to level 7	no action	
Z*	skip to level 8	no action	
Y*	skip to level 9	no action	
X*	skip to level 10	no action	
A	space 1	eject	
B	space 1	skip to level 12	level 12 is 1/2" from bottom of page
C	space 1	skip to level 6	level 6 is every 6th line
D	space 1	skip to level 5	level 5 is every 5th line
E	space 1	skip to level 4	level 4 is every 4th line
F	space 1	skip to level 3	level 3 is every 3rd line
G	space 1	skip to level 2	level 2 is every 2nd line
H*	space 1	skip to level 11	
I*	space 1	skip to level 7	
J*	space 1	skip to level 8	
K*	space 1	skip to level 9	
L*	space 1	skip to level 10	

\*These codes work on the 512 printer only

Q+	clear auto page eject	no print	print over page perforation
R+	set auto page eject	no print	skip over page perforation
S+*	set 6 lines per inch	no print	
T+*	set 8 lines per inch	no print	

Note: To use all 136 print positions (i.e. no carriage control) write the record in binary format instead of BCD format. FORTRAN users can do this with the buffer out statement.

\*These codes work on the 512 printer only.

+These codes should be followed by a page eject.

## APPENDIX C

### CONTROL MODE ERROR MESSAGE

This is a list of error conditions that will cause the OS-3 time sharing monitor to stop the execution of a user's program. These errors are passed from the OS-3 resident monitor to the control mode program. The control mode program then notifies the user of the error condition.

#### Memory Parity Error

There are two causes of the memory parity error message. In all cases the user should expect some of his memory to have been lost. The conditions which may cause the memory parity error message are:

- 1) A magnetic core memory parity error occurring in the users memory.
- 2) An irrecoverable read error when attempting to swap in the users memory from a mass storage memory device (disk).

#### Tape Drive Failure

This error message occurs when the tape drive fails to respond to the commands that OS-3 issues the tape drive. This may occur when there is no tape on the tape drive, when the tape drive is manually stopped, or when the program attempts to read past the last record on the tape.

### Insufficient File Space

The user's program has attempted a write or WFM instruction that will cause the user to exceed his scratch or saved file space limit. The user may determine which limit he has exceeded by examining the status of the logical unit which caused the insufficient file space. If the file is a saved file, the user has reached the limit of his accounts allocated saved file space. If the file is not a saved file, there are two limits that the user may have reached. The user's account has a scratch file space limit and the user may declare a temporary limit by using the MFBLKS command. The temporary limit is initially set to 100 scratch file blocks when the user logs on.

Each file block contains about 2000 characters of information, depending on the length of the records. There is an "overhead charge" of one saved file block for each saved file name.

### Memory Protect Violation

The user's program has attempted to store into protected memory. This may indicate that a system program (such as FORTRAN or OSCAR) is not operating correctly. The program may be continued by using the "GO" command. Please contact the computer center.

### File Protect Violation

A write, WFM, or release instruction has been attempted on a protected file or RAF or on a tape containing no write ring.

### LUN Undefined

A read, write, seek or control ( except status) has been attempted on a logical unit that is not equipped.

The user may equip the unit and then use the "GO" command to continue running his program.

### Illegal Instruction

This message may be generated when a program attempts to execute an instruction which the computer (and OS-3) does not recognize or for some reason cannot execute. Listed here are the instructions which are illegal.

- 1) All halt instructions.
- 2) All BDP instructions when the BDP is off.
- 3) An XREQ (71) instruction when any of the following conditions exist:
  - A) Index 1 contains an undefined value.
  - B) Index 1 is less than six and the effective address is greater than 99.
  - C) Index 1 is seven (zeropage) and the effective address is greater than 37 octal.
- 4) A Cntl (72) instruction when any of the following conditions exist:
  - A) The Q register is larger than 11 octal (illegal function code).
  - B) Functions other than 0-3 on a LP, PUN, PLOT, PTP, or TASK.
  - C) Functions other than 0-1 on a MSF, TV, or the batch standard input unit.
  - D) Functions other than 0-2 on a TTY.
  - E) Functions other than 0-5 on a RAF.
  - F) Functions other than 0, 1, or 3 on a destructive read file.
- 5) A seek (73) instruction on any device except a RAF, NULL, or MSF.

- 6) A read (74) instruction when any of the following conditions exist:
  - A) More than 250 words are specified on a read from a TV.
  - B) More than 20,000 words are specified on a read from a tape.
  - C) A read from a LP, PUN, NULL, PTP, PLOT, or TASK.
  - D) A read from a file at end of data.
  - E) A read from a RAF or MSF with address error condition present.
  - F) A read of zero length from a RAF or MSF.
- 7) A 75 instruction.
- 8) A write (76) instruction when any of the following conditions exist:
  - A) The length is zero.
  - B) A write is attempted on a destructive read file.
  - C) The address error bit is set on a RAF or MSF.
  - D) The length is too large on a LP (34 words), PTP (62 words), TV (250 words), magnetic tape (20,000 words), or PUN (20-40 words).
- 9) Any of the following instructions:
  - 77200000 - 77277777
  - 77400000 - 77517777
  - 77650000 - 77707777
  - 77730000 - 77747777
  - 77770000 - 77777777
- 10) A CTI instruction when the user is not at a teletype and a parameter string does not exist.
- 11) A CTO instruction when the user is not at a teletype terminal
- 12) An ACI instruction when the parameter string is too long (80 characters).

### Time Cut

The user's time limit has been exceeded. There are two limits. One limit may be changed by using the "TIME" command. This limit is initially set to 60 seconds when the user logs on. The other limit is associated with the user's account and may be changed only by contacting the computer center.

### Operator Termination

Operator termination may occur when the computer operator ends the OS-3 operating system. It will also occur if the operator terminates a specific user.

### Abnormal I/O Condition

This error occurs when the OS-3 operating system discovers an abnormal condition while attempting to execute a read, write, BKSP, FWSP, SEFF, SEFB, or WFM instruction. This may indicate that the file structure is defective, or the data on the disk cannot be read.

### Operator Abort

The operator has terminated the current phase of the user's job.