MOSN-5.

Revision 0

TO: Distribution

FROM: N.I. Morris

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SUBJECT: Operator's Guide to BOS

This MOSN applies to Multics System operation on the Multics

Series Model 6180.

Table of Contents

Description

BOS (Bootload Operating System) is a set of programs for performing

functions such as loading the Multics system; core, disk, and bulk

store dumping; patching; and normal and emergency shutdown.

BOS consists of five parts:

1. Loader   A program loaded from tape which loads

                        the other BOS programs onto the disk.

2. toehold   A 400_8 (octal) word program permanently

                        residing in core at location 4000_8.

3. control program   A program to perform administrative

                        functions for BOS. These include

                        saving and restoring machine conditions

                        and loading command programs.

4. command programs   A number of programs which perform the

                        various functions of BOS.

5. utility package   Utility subroutines used by the

                        command programs and accessed through

                        a transfer vector.

Channel Requirements

BOS requires the following IOM peripheral channels for proper

operation:

Peripheral Device	IOM Channel #
operator's console	20_8
magnetic tape	12_8
printer	15_8
card reader	16_8

BOS will use as much core memory as is available.

Loading BOS

The BOS loader is operated as follows:

1. Place the one card IOM bootstrap loader followed by the
    loader control cards into the card reader.

2. Mount a BOS system tape at loadpoint on drive 0.

3. Press initialize and reset console.

4. Press bootload

The BOS bootstrap card reads the first program from the tape and

transfers control to it. This is the BOS loader, and it will read

one or more of the following loading control cards:

WARM disk first last channel area

This tells BOS the portion of the disk where it is to store its

various files. disk must be D190, D181, D170, or D270. first

is the first 64 word sector to be used, last is the first sector

not to be used, channel is the disk channel number, area is the

disk unit to use. All numbers are octal.

COLD disk first last channel area

This card performs the functions of the WARM card plus it resets

the command directory and clears the configuration deck.

One of these four cards must immediately follow the card bootstrap:

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various files. <u>disk</u> must be D190, D181, D170, or D270. <u>first</u>

is the first 64 word sector to be used, <u>last</u> is the first sector

not to be used, <u>channel</u> is the disk channel number, <u>area</u> is the

disk unit to use. All numbers are octal.

COLD <u>disk</u> <u>first</u> <u>last</u> <u>channel</u> <u>area</u>

This card performs the functions of the WARM card plus it resets

the command directory and clears the configuration deck.

One of these four cards must immediately follow the card bootstrap:

The BOS Toehold

The BOS toehold is a program which resides in the first 400(8)

locations of memory starting at absolute location 4000(8). The

toehold communicates very closely with the control program in the

following manner:

When Multics is running, the toehold is invoked by manually forcing

the processor to execute an XED 4000 instruction. The toehold

saves the processor registers and writes the first 20000_8 locations

of memory onto the disk. It then reads SETUP, the control program,

into locations 4400_8-13677_8 and transfers control to it. The

control program saves the remaining core (locations 20000_8 to

37777_8) and reads the first BOS command line from the input stream.

The toehold is also invoked as a result of the GO or CONTIN command

issued in BOS. Here, the control program restores the core and

machine conditions that it saved and transfers into the toehold.

The toehold restores the core and machine conditions that it

saved and restarts the program that was originally running.

The toehold program has another feature which should be discussed.

When an XED 4000 is executed, the toehold sets a switch indicating

that BOS is now operating. If a second XED 4000 is issued, the

switch is checked. If the switch is on, the original core image

and machine conditions (referred to as machine image) are not

modified. If trouble develops while running BOS, it may be re-

started by forcing an XED 4000, retaining the old machine image.

When BOS is left as the result of a GO, CONTIN, BOOT, SALV, or

ESD command, the switch is turned off.

This feature would make it impossible to take a dump of BOS

itself except that an XED 4002 will ignore the switch setting.

If BOS is restarted with an XED 4002, the new machine image will be

of BOS and can be examined with the DUMP and PATCH commands.

The toehold may also be entered with an XED 4004. This has the

same effect as an XED 4000, except that the instruction counter

saved in the machine image is increased by one. This allows Mul-

tics to enter BOS and later be restarted at the next location.

If XED 4000 and XED 4002 should fail, XED 4004 could be manually

executed.

BOS Command Language

The BOS control program (SETUP) performs the functions already

mentioned plus it loads and executes the BOS commands. A com-

mand is executed whenever its name appears as the first field in

an input line read by the control program. If a command to the

control program turns out to be a runcom file, then that runcom

will be executed. (See the description of the RUNCOM command

and machine conditions (referred to as machine image) are not

modified. If trouble develops while running BOS, it may be re-

started by forcing an XED 4000, retaining the old machine image.

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ESD command, the switch is turned off.

This feature would make it impossible to take a dump of BOS

itself except that an XED 4002 will ignore the switch setting.

If BOS is restarted with an XED 4002, the new machine image will be

of BOS and can be examined with the DUMP and PATCH commands.

The toehold may also be entered with an XED 4004. This has the

same effect as an XED 4000, except that the instruction counter

saved in the machine image is increased by one. This allows Mul-

tics to enter BOS and later be restarted at the next location.

If XED 4000 and XED 4002 should fail, XED 4004 could be manually

executed.

BOS Command Language

The BOS control program (SETUP) performs the functions already

mentioned plus it loads and executes the BOS commands. A com-

mand is executed whenever its name appears as the first field in

an input line read by the control program. If a command to the

control program turns out to be a runcom file, then that runcom

will be executed. (See the description of the RUNCOM command

sources are set to the operator's console. Up to five previous

sources are remembered, but only one runcom file may be active at

any time. Runcoms initiated by other runcoms return to the input

source in use before the first runcom was executed.

After a QUIET OFF command is read, lines read from the card reader

or runcom file will be printed on the operator's console. After a

QUIET ON or QUIET command, neither these lines nor "BOS AT" mes-

sages will be printed.

Any character typed on the operator's console may be erased by

following it with a #. Several #'s will erase several characters

until the beginning of the line is reached. An entire line may

be erased by pressing the input error button.

Any input lines which will be used as commands or control cards

will be broken down into their various fields (often referred to

as arguments). Fields are separated by one or more blanks. If the

first character of a field contains a number, then that field is

converted as both an octal and decimal number. Generally, only the

octal number is used. If a numeric field is immediately followed

by a decimal point, it will be converted only as a decimal number.

If a field begins with a non-numeric character, then it is interpre-

ted as a character string. The scanning of fields ends with the

first asterisk. The remainder of the line is treated as a comment.

BOS Commands

There are two types of BOS commands: those executed within the

BOS control program and those loaded from the bulk store or disk.

Control Program Commands

CONTIN

Format: CONTIN

Purpose: To restore the machine state and continue running an

               interrupted activity (usually Multics).

Notes: When BOS is entered, the machine state is saved. CONTIN

               allows these saved conditions to be restored so that

               Multics can continue running from the point at which

               BOS was entered.

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GO

Format: GO

Purpose: Identical to CONTIN.

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LIST

Format: LIST

Purpose: To cause a list to be printed which contains all the cur-

               rent disk resident BOS command programs and runcoms

               and their device addresses.

Summary of Bulk Store or Disk Loaded Commands

BLAST   print messages to terminals

BOOT   Multics bootload

CONFIG   Loads, prints, changes and appends to configuration
                               deck.

CORE   saves and restores core onto tape

DIE   destroys BOS

DMP355   dumps DataNet 355 core storage

DUMP   segment dumper

ESD   restarts Multics to do an emergency shutdown

FD355   writes a DataNet 355 dump into the dump partition

FDUMP   writes a system dump into the dump partition

FMT   writes format information on disk packs

IF   conditionally executes BOS commands

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LABEL   prints tape label

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LOADDM   loads additional or replacement commands into BOS

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LD355   loads DataNet 355 core storage

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PATCH   core disk or bulk store patch

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PRINT   print a tape

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RESTOR   restores contents of secondary storage devices

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RUNCOM   loads, prints and starts a runcom file

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SALV   starts Multics salvager

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SAVE   saves contents of secondary storage devices

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TAPED   produces an octal dump of a tape

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TEST   tests bulk store and disks

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TIME   reads system clocks and does time conversions

TSTCHN   allows testing of an IOM channel

WRITE   causes output to be written on operator's console

Bulk Store or Disk Loaded Commands Descriptions

BLAST

BLAST can be used from BOS to print messages to all consoles dialed into the DataNet 355.

Format: BLAST CRASH

Purpose: When Multics dies and BOS has been entered, this command will cause the canned message MULTICS NOT IN OPERATION AT (time) to be typed to all dialed-in consoles.

Format: BLAST

Purpose: The operator will be asked to type a message. If for some reason Multics will not be up in a short length of time, this command can be used to explain the situation to dialed-in users.

Format: BLAST HANGUP

Purpose: To hang up all consoles.

BOOT

Format: BOOT   -number- -name-

Purpose: To initiate a bootload of Multics.

Notes: Additional arguments may be supplied to the boot

              command. If a number is given, it is the tape drive

              to boot from. If a name is given, it is the name of

              the secondary storage partition to be used (as

              described by a PART configuration card). Normally,

              the MULT partition will be used.

Format: BOOT COLD

Purpose: This command should be used only by express instructions

              of the programming staff. It is used to initiate a

              complete reload of secondary storage.

CONFIG

Format: CONFIG L
                    (configuration deck)
            QUIT

Purpose: To load a configuration deck.

Format: CONFIG A
                    (additional configuration cards)

            QUIT

Purpose: To add more configuration cards to an existent configu-

            ration deck.

Format: CONFIG C
                        (changes to configuration cards)

            QUIT

Purpose: To change existent configuration cards. The confi-

            guration deck will be searched for each card in the

            deck of changes. The first card found matching both

            the first and second fields will be replaced. If no

            such card is found, the first card matching the first

            field will be replaced. If no such card is found,

            the change card will be added to the configuration

            deck.

Example: Configuration deck:

                CPU   A   4
                MEM   C   200   ON
                MEM   D   200   OFF

CONFIG (continued)

Changes:

```
CPU    B    5
MEM    D    200    ON
BULK   O    2048.    2  2
```

New configuration deck:

```
CPU    B    5
MEM    C    200    ON
MEM    D    200    ON
BULK   O    2048.    2  2
```

Format: CONFIG P -arguments-

Purpose: To print the current configuration deck. If arguments

             are supplied, only selected configuration cards will

             be printed.

Format: CONFIG D -arguments-

Purpose: To delete selected configuration cards. All occurrences

             of a specified configuration card will be deleted.

Notes: Whenever a card is read, certain conversions are performed.

             The results of each conversion are stored in one word

             of a 15 word array. Any unused words are filled with -1.

             The first field is stored as a four character ASCII string.

             If a field contains a number, it is considered to be

             an octal number and its binary equivalent is stored.

             If a field contains a number followed by a period, it

             is considered to be a decimal number and its binary

equivalent is stored.

If a field is a single letter A through H, then

the corresponding number 1 through 8 is stored.

Otherwise, the field is stored as a four character

ASCII string.

The 15 word array and a word indicating what conversions

were performed on each field are packed together to

form the internal representation of the configuration

deck.

CORE

Format: CORE SAVE n

Purpose: To write the machine registers and core image onto

               tape n. If n is not given, 1 is assumed.

Format: CORE RESTOR WAIT n

Purpose: To read a tape produced by CORE SAVE. If WAIT is

               not present, the core image is automatically started.

               n is an optional tape number, the default is 1.

DIE

Format: DIE

Purpose: To require a subsequent cold boot of BOS.   DIE

            destroys the data BOS has stored in core and on the

            disk insuring that a test version of BOS will not acci-

            dentally be used.

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DMP355

Format: DMP355

Purpose: To dump on the online printer fault data, trace

             table contents, and core image from the DataNet 355.

Format: DMP 355 ABS

Purpose: To dump only the core image from the DataNet 355.

Note: The DataNet 355 image is read into BOS and printed.

             Thus, the printer should be configured to BOS, not

             to the DataNet 355.

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DUMP

Format: DUMP

Purpose: To dump on the online printer or tape the current

               machine image. Once the dumper is entered the

               following commands may be read from the input

               stream (all numbers must be octal):

                    REG   ABS   SET   STACK   CONT   DUMP   CONFIG

                    PROC   DBR   FILL

                    BULK   D190   D181   D270   D170

                    TAPE   PRT   EOF

                    QUIT   GO   PATCH

REG

Format: REG

Purpose: To dump machine conditions and descriptor segment.

Example: REG   *Comment

ABS

Format: ABS loc count

Purpose: The ABS request directs the BOS dumper to dump count

               locations starting from absolute location loc.

Example: ABS 200   1160

                                        (continued)

DUMP (continued)
SEG

Format: SEG <u>n</u>

                 where: <u>n</u> is a segment number

Purpose: To dump segment <u>n</u> only

Example: SEG 105

STACK

Format: STACK <u>seg</u> <u>offset</u>

                 where: <u>seg</u>   is a segment number (used as a base).

                        <u>offset</u>   is an octal offset (used as a stack

                                pointer).

Purpose: To dump segment <u>n</u> as stack frames (both forwards and

                 backwards) starting from <u>offset</u>.

Notes: If offset is missing, the location of the first stack

                 frame is used. If no <u>seg</u> is specified, the contents of

                 pointer register 6 in the machine conditions will be used.

Example: STACK   205   1770

CONT

Format: CONT <u>n</u> <u>accesswords</u>

                 where: <u>n</u> specifies a segment number. If null, 0 is

                 assumed. <u>accesswords</u> are a string of paired fields

                 The fields are used to select the segments to be

                 dumped. Each element of a paired field is a variable

string of any logical combination of the following

letters:

    W = write permit   E = execute permit

    P = privileged procedure   A = all (REPW)

These elements specify access bits in the segment

descriptor word (SDW) access field. The first element

of each pair specifies the SDW access bits which must

be ON; the second element of each pair specifies the

SDW access bits which must be OFF.

Purpose: To dump all segments selected by accesswords starting

with segment n in the descriptor segment specified by

a DBR command, if given, or by the DBR value in the

machine conditions. The conditions specified by all

pairs are OR'ed to determine whether a segment is to

be dumped. If no accesswords are specified, then W

is assumed.

DUMP

Format: DUMP accesswords

    where: accesswords is an optional argument that is

            a string of paired fields used to select seg-

            ments to be dumped.

Purpose: To dump the segments specified by accesswords. DUMP

accesswords is equivalent to:

                              REG
                              CONFIG
                              CONT 0 accesswords
                              STACK

PROC

Format: PROC

Purpose: To dump all write permit segments and directories of

             all running or stopped processes. Any segment common

             to more than one process will be dumped only with the

             first process.

Format: PROC   LONG

Purpose: To dump all existing processes.

DBR

Format: DBR   add word2

             where: add is a 24 bit address.

                     word2 is an optional argument which, if

                     supplied, will set the bound and paged fields

                     in the second word of the DBR.

Purpose: To define the location of the descriptor segment of

             the process being dumped to begin at address add.

             If this command is not given, the DBR in the machine

             conditions will be used.

DUMP (continued)

Notes: The following bits are set:

Bits 0-23 of the DBR represent the descriptor segment

address.   They are set by <u>add</u>.

Bits 36-71 are set by second word (see DSBR description

in Processor Manual); if missing, the old value is

unchanged.

Example: DBR   273 170000000

FILL

Format: FILL <u>name</u> <u>value</u>

where: <u>name</u> is one of the following:

HCDBRL⎫   <u>value</u> is the contents of the upper and lower
HCDBRU⎭

part of the DBR to be used to find hardcore

segments.   The default value is obtained from

absolute location 5776 in the Multics core image.

SLTSEG   <u>value</u> is the segment number of the SLT (segment

loading table).   The default is 7.   The SLT

is used to find the segment numbers of other

hardcore segments.

PAGE   <u>value</u> is ON to page-in pages from the bulk

store or disk;

<u>value</u> is OFF to turn this feature off.   The

DUMP (continued)

default is ON.

BOS   value is ON to dump BOS in core; value

is OFF to dump core image saved on the

bulk store or disk. The default is OFF.

PML   value is ON to simulate dynamic page multi-

level; value is OFF to bypass simulation.

The default is ON.

Purpose: To set important segment numbers and options within

the dumper.

BULK

Format: BULK address count

Prints count records beginning at the indicated

Multics sector address.

Format: BULK BOS address count

Prints count 64-word sectors from the indicated

64-word sector address.

Purpose: To print bulk store sectors.

D270

Format: D270 address count

Prints count records beginning at the indicated

Multics record address.

DUMP (continued)

default is ON.

BOS   <u>value</u> is ON to dump BOS in core; <u>value</u>

is OFF to dump core image saved on the

bulk store or disk. The default is OFF.

PML   <u>value</u> is ON to simulate dynamic page multi-

level; <u>value</u> is OFF to bypass simulation.

The default is ON.

Purpose: To set important segment numbers and options within

the dumper.

BULK

Format: BULK <u>address</u> <u>count</u>

Prints <u>count</u> records beginning at the indicated

Multics sector address.

Format: BULK BOS <u>address</u> <u>count</u>

Prints <u>count</u> 64-word sectors from the indicated

64-word sector address.

Purpose: To print bulk store sectors.

D270

Format: D270 <u>address</u> <u>count</u>

Prints <u>count</u> records beginning at the indicated

Multics record address.

DUMP (continued)

TAPE

Format: TAPE n

                where: n is a tape number.

Purpose: To direct dumper output to tape n. The tape is

                written in BCD mode, one line per record. When the

                tape is full, it is unloaded. Dumping will continue

                with the same tape number.

PRT

Format: PRT

Purpose: To direct output to an available printer.

EOF

Format: EOF

Purpose: To write an end of file and unload the output tape

                if the dumper's output was directed to tape. If the

                output was directed to the printer, 10 page ejects are

                given.

QUIT

Format: QUIT

Purpose: To return control to the BOS control program.

DUMP (continued)

Format: D270 BOS <u>area</u> <u>sector</u> <u>count</u>

Prints <u>count</u> 64-word sectors from the indicated

<u>area</u> and <u>sector</u> within that area.

Format: D270 PHY <u>eu</u> <u>su</u> <u>sector</u> <u>count</u>

Prints <u>count</u> 64-word sectors from the indicated

electronics unit, storage unit, and sector within

that unit.

Purpose: To print DSU-270 sectors.

D190, D181, D170

Format: {D190, D181, D170} <u>address</u> <u>count</u>

Prints <u>count</u> records beginning at the indicated

Multics record address.

Format: {D190, D181, D170} BOS <u>area</u> <u>sector</u> <u>count</u>

Prints <u>count</u> 64-word sectors from the indicated area

and <u>sector</u> within that <u>area</u>.

Format: {D190, D181, D170} PHY <u>unit</u> <u>spindle</u> <u>cylinder</u> <u>track</u> <u>record</u> <u>count</u>

Prints <u>count</u> 64-word sectors from the indicated <u>unit</u>,

<u>spindle</u>, <u>cylinder</u>, <u>track</u>, and <u>record</u>.

Purpose: To print DSU-190, -181, and -170 sectors.

DUMP (continued)

TAPE

Format: TAPE n

                where: n is a tape number.

Purpose: To direct dumper output to tape n. The tape is

                written in BCD mode, one line per record. When the

                tape is full, it is unloaded. Dumping will continue

                with the same tape number.

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PRT

Format: PRT

Purpose: To direct output to an available printer.

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EOF

Format: EOF

Purpose: To write an end of file and unload the output tape

                if the dumper's output was directed to tape. If the

                output was directed to the printer, 10 page ejects are

                given.

—————————————

QUIT

Format: QUIT

Purpose: To return control to the BOS control program.

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DUMP (continued)

GO

Format: GO

Purpose: GO causes the machine image which was being dumped

             to be restarted.

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PATCH

Format: PATCH

Purpose: PATCH causes the BOS patcher to be entered.

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CONFIG

Format: CONFIG

Purpose: To cause the current configuration deck to be printed.

(This concludes the BOS dumper commands.)

ESD

Format: ESD

Purpose: To start an emergency shutdown of Multics.

Operation: Sets the   PSR   to the segment number of emergency_

               shutdown and the   ILC   to 0 .   This new machine

               image is restarted.

Note: If the segment number of emergency_shutdown cannot be

               found in the SLT (Segment Loading Table), a default

               segment number of 13 will be used.

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FD355

Format: FD355

Purpose: To take a dump of DataNet 355 core and place it in

              an appropriate area of the DUMP partition.

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FDUMP

Format: FDUMP

Purpose: To take a dump similar to the PROC command of DUMP.

               Instead of printing segments, they are transferred

               as binary words into the DUMP partition on the disk.

               A header to this partition is created which con-

               tains the length of the dump, a switch indicating that

               the dump hasn't been read, the time of the dump, its

               error report form number, the machine conditions

               and the segment directory.

               If the previous dump hasn't been read by Multics,

               the operator is asked if he wishes to overwrite

               the previous dump.

Format: FDUMP n

Purpose: To set the next error report form number to n.

FMT

(TO BE SUPPLIED)

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IF

Format   IF $\left\{\begin{array}{l}\text{SHUT} \\ \text{SWITCH } \underline{\text{mask}} \\ \text{FDUMP} \\ \text{LD355}\end{array}\right\}$ $\left\{\begin{array}{l}\text{EQ} \\ \text{NEQ}\end{array}\right\}$ <u>value</u> <u>command</u> <u>arg1</u>...<u>argn</u>

SHUT causes the Multics system shutdown state to be

tested. Possible values are as follows:

code (octal)	meaning
0	Normal Multics operation (no ESD)
1	EDS part 1 started
2	ESD part 1 completed
3	ESD completed with lock errors
4	ESD completed with no errors
5	Fast Salvager started
6	Fast Salvager finished with errors
7	Fast Salvager finished with no errors
10	(not used)
11	Active Salvager started
12	Active Salvager finished with errors
13	Active Salvager finished with no errors
14	(not used)
15	Regular Salvager started
16	Regular Salvager finished with errors
17	Regular Salvager finished with no errors
20	(not used)
21	Long Salvager started
22	Long Salvager finished with errors
23	Long Salvager finished with no errors

SWITCH <u>mask</u> reads the processor data switches and masks

them with the specified octal mask before comparison.

FDUMP tests the success of a previous fast dump.

Possible values are as follows:

IF (continued)

                    0 - FDUMP was never called
                    1 - FDUMP was entered
                    2 - FDUMP was aborted because the dump
                        partition already contained an old dump
                    3 - the dump was successfully completed

LD355 tests the success of a previous LD355 command.

Its value is non-zero if a previous LD355 command was

successful and zero otherwise.

value is specified as an octal number. It will be

used in a test for equality or inequality depending

on whether EQ or NEQ was specified. If the condition

is met, command will be invoked with the arguments

arg1...argn.

Purpose: The IF command can be used to test the value of

             several variables in the Multics and BOS environments.

             Another BOS command will be executed conditionally

             on the results of the test. It is most useful

             within BOS runcom files.

Examples: ESD   *TRY TO EMERGENCY SHUTDOWN

             IF SHUT NEQ 4   EDUMP   *TAKE DUMP IF FAILURE

             FDUMP   *TAKE FAST DUMP

             IF FDUMP NEQ 3 TDUMP   *TAKE TAPE DUMP IF FAILURE

LABEL

Format: LABEL -tape_#-

Purpose: Reads tape or drive specified by optional tape_#

                 (default is drive 1) and prints tape label on BOS

                 console.

LD355

Format: LD355

Purpose: To load the DataNet 355 core image. The LD355

command should be issued prior to performing a

Multics bootload.   The programs D355 and B355 will

be loaded into DataNet 355 memory. These programs

should have been loaded from the BOS tape as if

they were BOS commands.

LOADDM

Format: LOADDM n

Purpose: To read the segments from the BOS system tape on

                 drive n. These segments become BOS commands and may

                 be executed by typing their name (6 characters or

                 less). Only the last copy of a command will be remem-

                 bered.

PATCH

Format: PATCH

The PATCH command is used by the Multics programming

staff or under the direction of a member of the

Multics programming staff.

Purpose: To provide a method of examining and modifying the

contents of machine registers, core locations, bulk

store or disk sectors.

Notes: To call the PATCH program from BOS command level, type:

PATCH

The patcher will be brought into core and will read

requests from the input stream.

The two basic patterns for requests are:

address -count-

will examine count locations starting at address.

If count is missing, one location is printed.

SET address val1 -val2-...

will place val1, val2... into successive locations

starting with address. If the input stream is in

the QUIET OFF mode, then the old and new contents

are printed.

Address may take several forms:

1) an absolute address

2) segment number | offset

   (blanks must surround the |)

3) PRn | offset

4) a machine register from the list: A, Q, E, TR, XC,

   X1, X2, X3, X4, X5, X6, X7, AP, AB, BP, BB, LP,

   LB, SP, SB, PSR, ILC, DSBR, INT, PRn (n = 0, ..., 7)

5) MCM port

   port is the port number of the memory controller

6) address request offset

   Will reference a secondary storage device. The

   possible forms for address request are:

   BULK Multics device address

   {D190, D181, D170, D270} Multics device address

   BULK BOS sector

   {D190, D181, D170, D270} area sector

   D270 PHY electronics unit storage unit sector

   {D190, D181, D170} PHY unit spindle cylinder track record

   A Multics device address is in the form found in a

   file map. sector is a 64 word address within an are .

   A D270 area is one storage unit. They are numbered

   0 to 23 with 0 to 4 in the 0th electronics unit, 5

   to 11 in the 1st electronics unit, etc.

A D190, D181 or D170 <u>area</u> is the disk drive

unit number.

The <u>address</u> <u>request</u> is described in greater

detail in the section on Secondary Storage

Device Addressing.

7) BOS <u>command</u> <u>location</u>

This will reference a <u>location</u> in a BOS <u>command</u>.

The character "." may be used to represent the pre-

vious address which was examined or set. The operators

"+" and "-" may be used between any numbers of "."

with the obvious effect. All numbers are octal and

must be surrounded by blanks.

PATCH will also accept the following commands:

GO   causes the machine image to be

        restarted.

DUMP   enters the BOS dumper

DBR   <u>add</u> <u>word2</u>. The DBR value used

in the simulated appending is

changed.   (See the DUMP command

for a more complete description.)

QUIT   return to BOS.

FILL   changes various values and options.

(See the DUMP writeup for a

complete description.)

PUNCH   An argument of ON will cause all

patch requests to be punched onto

cards.   OFF will suspend punching.

MOSN- 5.
Revision 0

PRINT

Format: PRINT

Purpose: PRINT will print tapes produced by the BOS dumper.

The procedure for using it is:

      1) Type the BOS command PRINT.

      2) Mount the tape on drive 1.

      3) Printing will continue until an EOF is read.

         The tape is then unloaded.

      4) Additional tapes may be printed by mounting

         them on the appropriate drives.

      5) After all tapes have been printed, pressing

         REQUEST on the operator's console will

         re-enter BOS.

Tape errors are retried and, if persistent, a comment

is printed on the operator's console. Printing will

then continue.

RESTOR

Format: RESTOR -address extent- -TAPE n-

Purpose: To reload the bulk store and disks from a set of tapes

               written by SAVE. The arguments are the same as those

               for SAVE (except ALL has no meaning). The tape

               headers contain the state of the ALL option along with

               a copy of the fsdct. See the section on Secondary

               Storage Device Addressing for the format of address

               extent. If address extent arguments of the RESTOR

               don't match those of the SAVE, the following actions

               take place:

               1) The record address ranges of this tape and

                  all following tapes are printed.

               2) The record address ranges of the RESTOR's

                  address extent are printed.

               3) The operator is asked if this is the correct

                  tape. If answered NO, control is returned

                  to BOS.

               4) If answered YES, the operator is asked if

                  entire tape(s) should be loaded.

               5) If answered YES, the RESTOR's address extent

                  is changed to equal the address extent of

                  the tape(s) resulting in all of the tape(s) being

read. Otherwise, the RESTOR is executed

as originally indicated on the command

line.

Examples: The input tapes in each example were produced by

typing SAVE only.

RESTOR BULK DEVICE

will restore the bulk store only from tapes containing

an entire save if the two questions asked of the opera-

tor are answered YES and NO respectively.

RESTOR D170 1234 RECORD

will restore only DSU-170 record 1234.

RESTOR TAPE 3

will continue a restore from tape 3 if both questions

are responded to with a YES.

RUNCOM

Format: RUNCOM LOAD name

                 This command will load card images containing command

                 lines until a RUNCOM END card image is found. The

                 file name is added to the BOS command directory and

                 the runcom file is written on the disk.

                 A LIST command will list runcom files along with the

                 regular BOS commands. (Runcom files may not be

                 loaded from tape.)

Purpose: To manage BOS RUNCOM files. A runcom file contains

                 a predefined sequence of commands which can be auto-

                 matically executed.

Format: RUNCOM PRINT name

                 The RUNCOM file name is printed.

Format: RUNCOM SKIP name

                 Successive lines of the runcom file will be printed

                 and the keyboard unlocked after each. If the runcom

                 line is not to be executed, press EOM and the next

                 line will be printed. Once the correct line is

                 reached, type GO and execute will begin with this

                 line. The first line executed must be a command to

                 BOS.

Format: <u>name</u>

A runcom file may be executed by simply typing

its name as a command to BOS. This forces the

execution of RUNCOM RUN "name".

Format: RUNCOM PUNCH <u>name</u>

The runcom file will be punched out.

Format: RUNCOM EDIT <u>name</u>

The runcom editor is entered to edit the runcom

file <u>name</u>. The commands to the editor are:

Pn	Print n lines from pointer. Leave pointer at next line.
Dn	Delete n lines from pointer. Leave pointer at next line.
I	Enter Input Mode. Lines input are inserted before current line. Exit from input mode via blank line.
Bn	Back up n lines from current line or to top of file
Nn	Go forward n lines from current line or to bottom of file
W (name)	Writes out file with optional name if desired.
Q	Exit from editor

SALV

Format: SALV

Purpose: To start the salvager by forcing the execution of

BOOT WARM SALV 2.

_____

SAVE

Format: SAVE -address extent- -ALL- -TAPE n-

If present, the arguments must be in order given.

See the section on Secondary Storage Device Addressing

for a description of the address extent.

Normally, SAVE will write onto tape only those secondary

storage records which currently contain useful data.

This is done by using a system-maintained table of

assigned records called the fsdct. The fsdct will con-

tain valid information only after a successful system

shutdown or salvage. If for some reason a salvage can-

not be performed, SAVE may be instructed to ignore the

fsdct contents and save all secondary storage records by

use of the optional ALL argument. If the ALL argument is

not present, a successful shutdown or salvage must

have preceded the SAVE.

Purpose: To write the contents of the disks and bulk store onto

tape. Unless told to do otherwise, SAVE will copy the

contents of all devices in the Multics partition onto

tapes 1, 2, etc. As each tape is started, the device

name and the address of the first record is printed.

This may be used to restart the save at the beginning of

a tape or to find the tape which contains a particular

record.

SAVE (continued)

Examples: SAVE PART DUMP ALL

               will save the dump partition only.

               SAVE BULK DEVICE

               will save the bulk store only.

               SAVE D270 AREA 5 AREA ALL

               will save all of the 5th DSU-270 unit.

               SAVE D170 5634 ON TAPE 5

               will continue a save starting with tape 5,

               DSU-170 record 5634, and continue to the end.

TAPED

Format: TAPED $\underline{n}$

Purpose: To dump the contents of tape $\underline{n}$ in octal. The tape

             must be written in binary mode. TAPED will print

             "EOF" and "ERROR" whenever they occur.   TAPED

             recognizes no end-of-tape marks. TAPED may be

             stopped by pressing the REQUEST button.

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TAPED

Format: TAPED n

Purpose: To dump the contents of tape n in octal. The tape

must be written in binary mode. TAPED will print

"EOF" and "ERROR" whenever they occur.   TAPED

recognizes no end-of-tape marks. TAPED may be

stopped by pressing the REQUEST button.

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nl nl nl nl ...

nl n2 nl n2 ...

nl n2 n3 nl nl n2 n3 nl ...

nl n2 n3 n4 nl n2 n3 n4 ...

MARK   The first data word to be checked

or written will contain the device

number and device address. The

remaining words of each record will

be zero.

Note: TEST may be stopped at any time by pressing the

REQUEST button.

TIME

Format: TIME

The operator's console keyboard will be unlocked

to accept data. Following the input of data,

the time will be printed as shown:

<u>NNNNN, NNNNNN NNNNNN</u>, <u>TTTTT TTTTTT</u>, <u>MM/DD/YY HH:MM:SS.S</u>

      1   2   3

1) a 52 bit octal integer as read from the clock.

2) a 36 bit integer formed by shifting the 52 bits

    right 16 places. This is the number to place

    in the switches to set the clock.

3) the date and time as month/day/year hour:

    minute:second.

The following data is accepted:

R to read the calendar clock in the low order memory.

<u>number</u> is assumed to be input in form 2 above. It

will be converted and printed in all the three forms

above.

<u>two numbers</u> are the upper 16 bits and lower 36 bits of

the 52 bit form. All three forms are printed.

(continued)

TIME

Format: TIME

The operator's console keyboard will be unlocked

to accept data. Following the input of data,

the time will be printed as shown:

NNNNN, NNNNNN NNNNNN, TTTTTT TTTTTT, MM/DD/YY HH:MM:SS.S

   1   2   3

  1) a 52 bit octal integer as read from the clock.

  2) a 36 bit integer formed by shifting the 52 bits

    right 16 places. This is the number to place

    in the switches to set the clock.

  3) the date and time as month/day/year hour:

    minute:second.

The following data is accepted:

R to read the calendar clock in the low order memory.

number is assumed to be input in form 2 above. It

will be converted and printed in all the three forms

above.

two numbers are the upper 16 bits and lower 36 bits of

the 52 bit form. All three forms are printed.

(continued)

TSTCHN

Format: TSTCHN

Purpose: To test an IOM channel. This command is intended

for special use by the programming staff. Its usage

is described in the program listing.

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WRITE

Format: WRITE text

            Everything on the command line following the

            first six characters is typed out.

Format: WRITE ALERT

            The audible alarm is turned on.

Purpose: To write a line of text on the operator's console

            or to turn on the audible operator alarm.

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Secondary Storage Device Addressing

The arguments supplied to the SAVE, RESTOR, or TEST commands which specify secondary storage addressing are called an <u>address extent</u>.

An <u>address extent</u> is:

> <u>extent request</u>
> (In this case the default partition of MULT is used.)

or

> PART <u>partition name</u> <u>extent request</u>

An <u>extent request</u> is:

> <u>address request</u> RECORD
>
> to handle one secondary storage record

or

> <u>address request</u> AREA
>
> to specify the rest of an entire area

or

> <u>address request</u> DEVICE
>
> to specify the rest of an entire secondary storage device
>
> (as specified on the appropriate PART card).

or

> <u>address request</u> ON
>
> to specify all secondary storage following a given point
>
> (as specified on the appropriate PART card).

or

address request TO address request

to specify lower and upper secondary storage address limits.

(The upper limit and the first secondary storage address

not desired.)

_____

An address request specifies a starting (or ending) point. It

is a secondary storage device address in one of the several

following forms:

device name

or

device name AREA area number

to specify a particular physical device area.

or

device name record number

to specify a Multics (1024 word) record number.

or

device name BOS area number record number

to specify a BOS (64 word) record number.

or

device name PHY physical device address

to specify a physical device address. The format of

physical device address is dependent on the particular device.

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Secondary Storage Device Addressing
continued

The currently acceptable device names are:

   BULK

   D190

   D181

   D270

   D170

physical device addresses are specified as follows:

for DSU-270:

   electronics unit storage unit sector

for DSU-190, DSU-181 and DSU-170:

   disk unit spindle cylinder track record

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Examples:

1. To save an entire partition:

               SAVE PART PAGE ALL

    This command will save all secondary storage records described

    by the PART PAGE configuration CARD.

2. To restore an entire device:

               RESTOR D170 DEVICE

    This command will restore (from tape) all records on the DSU-170

    disk.

3. To test a physical device area:

TEST D270 AREA 14 AREA

This command will read all records on DSU-270 area 14.

4. To save all the records beyond a given record:

SAVE 270 12345 ON

This command will save all records starting from record 12345

on the DSU-270 disks.

5. To restore a group of records:

RESTOR D270 1122 to D270 1127

This command will restore DSU-270 records 1122 through 1126,

inclusive.