

SOFTWARE OPERATING PROCEDURES



GENERATING DOS-M

PREREQUISITE SOP MODULES:

Software Input/Output System
Configuration (5951-1374)

REFERENCE MANUALS:

Moving-Head Disc Operating
System (02116-91779)



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5951-1375

April, 1971

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GENERATING DOS-M

The Moving-Head Disc Operating System (DOS-M) is a disc-based software system for the batch processing of user jobs and the maintenance of disc files. DOS-M must be generated into usable form on the disc before user jobs can be processed. This SOP module consists of several procedures and an appendix. The procedures should normally be followed in order although each is self-contained.

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PROCEDURE 1

USING DSGEN TO CREATE DOS-M

DSGEN (the DOS-M Generator) is a stand-alone program that generates a system to fit the user's core memory size, I/O equipment, and programming needs. The relocatable program modules of DOS-M (in paper tape, magnetic tape, or disc) are input to DSGEN. Output from DSGEN is a configured system disc on any active subchannel of the disc controller.

To accomplish this, DSGEN requests certain information from the user. DSGEN then accepts the relocatable program modules to be included in the system, determines where they belong in core or on the disc, relocates them into absolute format, and stores them on the disc. DSGEN also creates I/O tables by identifying each I/O device and its associated driver routine, and establishing procedures for interrupt processing on each channel.

DSGEN is an absolute program, loaded into core by the Basic Binary Loader (BBL). Since DSGEN is independent of the DOS-M which it generates, the I/O operations of DSGEN require SIO Drivers.

Using other standard Hewlett-Packard software, the user can create a magnetic tape file of the relocatable program modules to speed up the program loading phase of system generation. (See *PREPARE TAPE SYSTEM*, 02116-91751.) Alternatively, the modules can be stored in relocatable form on the disc for even more convenient system generation.

DSGEN operates on the same minimum configuration as that required for DOS-M.

*Any error in the next three phases can be recovered from by
pressing HPA:
P = 1000*

Operating Instructions

*or
a reference that phase*

The operation of DSGEN involves four phases:

- I INITIALIZATION PHASE. DSGEN requests specifications for the DOS-M, including description of available disc space, memory, time base

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generator channel, system generation code, computer identification, system and user disc subchannel, and program input devices.

|| PARAMETER INPUT PHASE. Parameters to change EXEC modules or drivers from disc to core-resident may be entered. The programs' NAM records are already set for a minimum core system except that DVR00 should be changed to disc-resident. DISCM, \$EX30, (if EFMP used), DVR31 (moving-head disc driver) and DVR05 (teleprinter driver) must be core-resident.

|| DISC LOADING PHASE. DSGEN requests a specification of the base page linkage, and begins loading programs onto the disc. Systems programs (i.e., the modules of DOS-M) are loaded first, after which DSGEN requests information for the equipment table, device reference table (logical unit table), and interrupt table and proceeds to load the rest of the programs onto the disc.

To execute DSGEN and configure DOS-M, follow these steps:

- || Turn on all equipment, and unprotect the disc.
- || Configure DSGEN with the SIO Teleprinter Driver and the tape reader and magnetic tape reader and magnetic tape drivers (if desired). Load the configured DSGEN through the tape reader using the Basic Binary Loader.
- || Start DSGEN at location 100₈. DSGEN begins the initialization phase.

INITIALIZATION PHASE

During the initialization phase, DSGEN requests information necessary to begin generating the DOS-M. After each question is printed, the operator responds by giving the required information terminated by a return linefeed. The

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following responses are typical. (The operator responses are only examples, actual responses should be appropriate to the particular system being generated.)

1. DSGEN requests a decimal system generation code. This code is written in the label field of the system disc for identification.....SYS GEN CODE?
Operator responds.....79
2. DSGEN requests the octal channel number (select code) of the disc controller.....SYS DISC CHNL?
Operator responds with the high priority (low number) channel.....10
3. DSGEN requests the number of sectors per physical track on the disc. This is half the number of sectors per logical or software track.....# SECTORS/TRACK?
Operator responds with 12 for the 2870 disc or 23 for the 2883.....12
4. DSGEN requests the number of tracks (decimal) on the system disc.....SYS DISC SIZE?
Operator responds with a decimal number less than or equal to 200. (A response of 200 leaves three tracks as spares. A response less than 200 leaves extra tracks as spares.).....200
5. DSGEN requests the number of drives on the system.....# DRIVES?
Operator responds with 1 or 2 (2883 disc) or between 1 and 4 inclusive (2870 disc).....3

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6. DSGEN requests the decimal number of the first track on the system disc which is available to DOS-M.....FIRST SYSTEM TRACK?
Operator responds.....0
7. DSGEN requests the decimal number of the first sector available to DOS-M.....FIRST SYSTEM SECTOR?
Operator responds. (The system area cannot begin before track 0, sector 3).....3
8. DSGEN requests the subchannel number of the system disc.....SYS DISC SUBCHNL?
Operator responds with a number between 0 and 7.....0
9. DSGEN requests the subchannel number of the user disc. (This may be the same as the system disc.).....USER DISC SUBCHNL?
Operator responds with a number between 0 and 7. (System efficiency increases if the user disc is on a different drive from the system disc.).....2
10. DSGEN requests the I/O channel (select code) of the Time Base Generator.....TIME BASE GEN CHNL?
Operator responds with an octal number or 0 if the time base is not present.....0
11. DSGEN asks whether the computer is a 2114 or not...IS 2114?
Operator responds with YES or NO.....YES

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12. DSGEN requests the last word of available
core memory in octal.....LWA MEM?
Operator responds.....17677
13. DSGEN asks whether :SS directives are to be
allowed in the system.....ALLOW :SS?
Operator responds either YES or NO.....YES
14. DSGEN requests the type of first input unit for
relocatable program modules.....PRGM INPT?
Operator responds with PT (for paper tape),
TY (for teleprinter), DF (for disc file), or
MT (for magnetic tape; see PTS manual,
02116-91751).....~~PT~~
*PUT DOS TAPE A
ONLINE CHANNEL 0
IT HAS TO READ FIRST
EOF ON TAPE
MT normally*
15. If the previous answer is DF and an SIO Magnetic
Tape Driver is not present, DSGEN requests the sub-
channel number of the disc containing the relo-
catable program modules.....INPUT DISC SUBCHNL?
Operator responds with the appropriate
subchannel number. The subchannel must
contain a disc (prepared by a pre-existing
DOS-M) whose user area contains only
relocatable modules of DOS-M. By specifying
PT to the next question (LIBR INPT?) the
operator can include programs from the paper
tape reader in addition to those on the disc
file.....3
16. DSGEN requests the type of optional input unit
for relocatable program modules.....LIBR INPT?
Operator responds with PT, TY, DF or MT.....PT

NOTE: Any type of program can be entered through the
Program Input Unit or the Library Input Unit.

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17. DSGEN requests the type of input unit for the parameters, input phase.....PRAM INPT?

Operator responds with PT or TY.....TY

LOOK FOR A 10 SEC DELAY

When DSGEN finishes the initialization phase, the computer halts. (162077)

PROGRAM INPUT PHASE

MAG TAPES

PAPER TAPES

During the program input phase, DSGEN accepts relocatable programs from the Program Input Unit and Library Input Unit specified during the initialization phase. The operator selects the input device by setting switch register bits 0-1 (00₂ for the Program Input Unit, or 10₂ for the Library Input Unit), and places the programs in the input device. Main programs must enter prior to their segments. DISCM should be the first module loaded.

The suggested order of tape input is:

DOS-M CORE-RESIDENT SYSTEM (DISCM)

DOS-M I/O DRIVERS (DVR05, DVR01,...ETC)

DOS-M EXEC MODULES (\$EX01...)

EFMP EXEC MODULES (IF DESIRED-\$EX30...)

DOS-M JOB PROCESSOR/FILE MANAGER (JOBPR)

DOS-M RELOCATING LOADER (LOADR)

DOS-M ASSEMBLER (MAIN CONTROL, SEGMENTD, SEGMENT1,...)

DOS-M FORTRAN (MAIN CONTROL, PASS 1,...)

DOS-M EFMP UTIL (IF \$EX30... AND FORTRAN IV LIBRARY ARE INCLUDED)

RTE/DOS ALGOL

RTE/DOS FORTRAN IV LIBRARY OR RTE/DOS BASIC FORMATTER

RTE/DOS RELOCATABLE PROGRAM LIBRARY (EAU OR NON-EAU)

Any relocatable user programs to be made a permanent part of DOS-M.

NOTE: If the FORTRAN IV Library is to be included in an 8K system, certain rules must be followed:

1. The system must be generated without any compilers or an assembler.
2. A magnetic tape SIO driver cannot be used with DSGEN.
3. The compilers and assembler must be loaded into the system during operation (using the Loader).

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Load the first input module and start the computer executing. When entering paper tape, the message "*EOT" is printed whenever an end-of-tape occurs. The computer halts. Program input can be switched back and forth between the input units by varying the switch register bits between 00_2 and 10_2 before starting the computer.

To terminate the program input phase, the user must set switch register bits to 01_2 , and start the computer. If there are no undefined externals, this message is printed on the system teleprinter:

NO UNDEF EXTS

If there are undefined externals, the following message is printed:

UNDEF EXTS

The externals are listed one per line and the computer halts. External references are satisfied by loading more programs. The user must set switch register bits to 00_2 (for Program Input Unit) or 10_2 (for the Library Input Unit) and start the computer executing. If the externals are to be left unsatisfied, set the switch register bits to 01_2 and start the computer executing.

NOTE: \$EX30 through \$EX33 (the EFMP EXEC modules) are not listed when missing.

PARAMETER INPUT PHASE

During the parameter input phase, the operator can change some modules from disc to core-resident. (If an I/O driver is changed from disc-resident (type 4) to core-resident (type 0), the associated EQT entry must include the R parameter.) Since DVR00 is a DOS driver, it is distributed as a core-resident driver; it should be changed to disc-resident if DVR05 is included in DOS-M. Any unnecessary I/O drivers must be eliminated at this time. DVR05, DVR31, DISCM, and \$EX30 are distributed as core-resident modules; they must not be changed to disc-resident.

Each parameter record is of this general form:

name,type

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where *name* is the name of the program

type is the program type code;

- Ø - System core-resident
- 1 - System disc-resident EXEC modules
- 3 - User disc-resident main
- 4 - Disc-resident I/O driver
- 5 - User segment
- 6,7 - Library

EXEC modules and drivers that are often used may be changed from disc to core-resident. The functions of the EXEC modules are:

<u>Module Name</u>	<u>Called by User EXEC Request Codes</u>	<u>Function</u>
\$EXØ1	16	Disc Work Tracks Status.
\$EXØ2	17	Disc Work Tracks Limits.
\$EXØ3	6	Program Completion.
\$EXØ4	7	Program Suspension and associated messages.
\$EXØ5	8,1Ø	Program Main or Segment Search (Note: \$EXØ5 calls \$EX1Ø)
\$EXØ6	18	User File Name Search
\$EXØ7	11	Current Time Processor
\$EXØ8	4 (RT)	Real Time Disc Allocation
\$EXØ9		:EQ Processor
\$EX1Ø	8,1Ø	Load and Execute Main Program or Segment (Note: See also \$EXØ5)
\$EX11	14,15	System File Name Search (Note: Used for File Read/Write)
\$EX12		System Startup
\$EX13		Error Message Processor
\$EX14		:UP, :DN, :LU Processor
\$EX15		Abort and Post Mortem Dump
\$EX16		:GO Parameter Processor
\$EX17	23	:UD Processor

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<u>Module Name</u>	<u>Called by</u>		<u>Function</u>
	<u>User</u>	<u>EXEC</u>	
<u>Request Codes</u>			
\$EX18	1,2,3		I/O Initiation Processor
	14,15		(Note: See also \$EX11)
\$EX19			:IN Processor
\$EX20			Disc Parity Processor

Functions of EFMP EXEC Modules

\$EX30	-	Always core-resident (common routines and values).
\$EX31	-	DEFINE, CREATE, DESTROY, OPEN, CLOSE
\$EX32	-	READ, WRITE, RESET, STATUS, CHANGE
\$EX33	-	COPY, REPACK

When EXEC modules are made core-resident, certain associated subroutines must also be changed to be core-resident. Several EXEC modules use \$ADDR:

\$EX01
\$EX02
\$EX06
\$EX07
\$EX08

The following EXEC modules use \$LBL:

\$EX17
\$EX19

The following EXEC modules use \$SRCH:

\$EX05
\$EX06
\$EX11

These EXEC modules use ASCII:

\$EX04
\$EX09
\$EX13
\$EX14
\$EX15

To end the parameter input phase and continue on to the disc loading phase, the operator enters "/E" instead of a parameter record.

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DISC LOADING PHASE

DSGEN asks two questions before entering DISC LOADING PHASE.

1. DSGEN requests the estimated number of system linkages required in base page.....# SYSTEM LINKS?

Operator responds with a decimal number.

(The more modules that are core-resident the more links are needed, 130 should be the minimum response.).....130

2. DSGEN requests the estimated number of user linkages required in base page.....# USER LINKS?

Operator responds with a decimal number.

(Since the loader requires approximately 320 linkages, 320 should be the minimum number entered.).....320

NOTE: If the system requires more linkages than you have assigned, it takes them away from the user link area. If the total of the two responses overflows base page (>677₁₀), the questions are repeated. If DOS-M does not need all the system links it adds them to the user links.

Figure DOSM-1 shows the relative location of the various core areas. Loading of the absolute, resident supervisor begins after the establishment of the user and system linkage areas. As each program is loaded, DSGEN prints a memory map giving the starting locations and, if switch register bit 15 is on, the entry points for all main programs and subroutines. (Subroutines are indented two spaces, and entry point addresses are preceded by an asterisk.)

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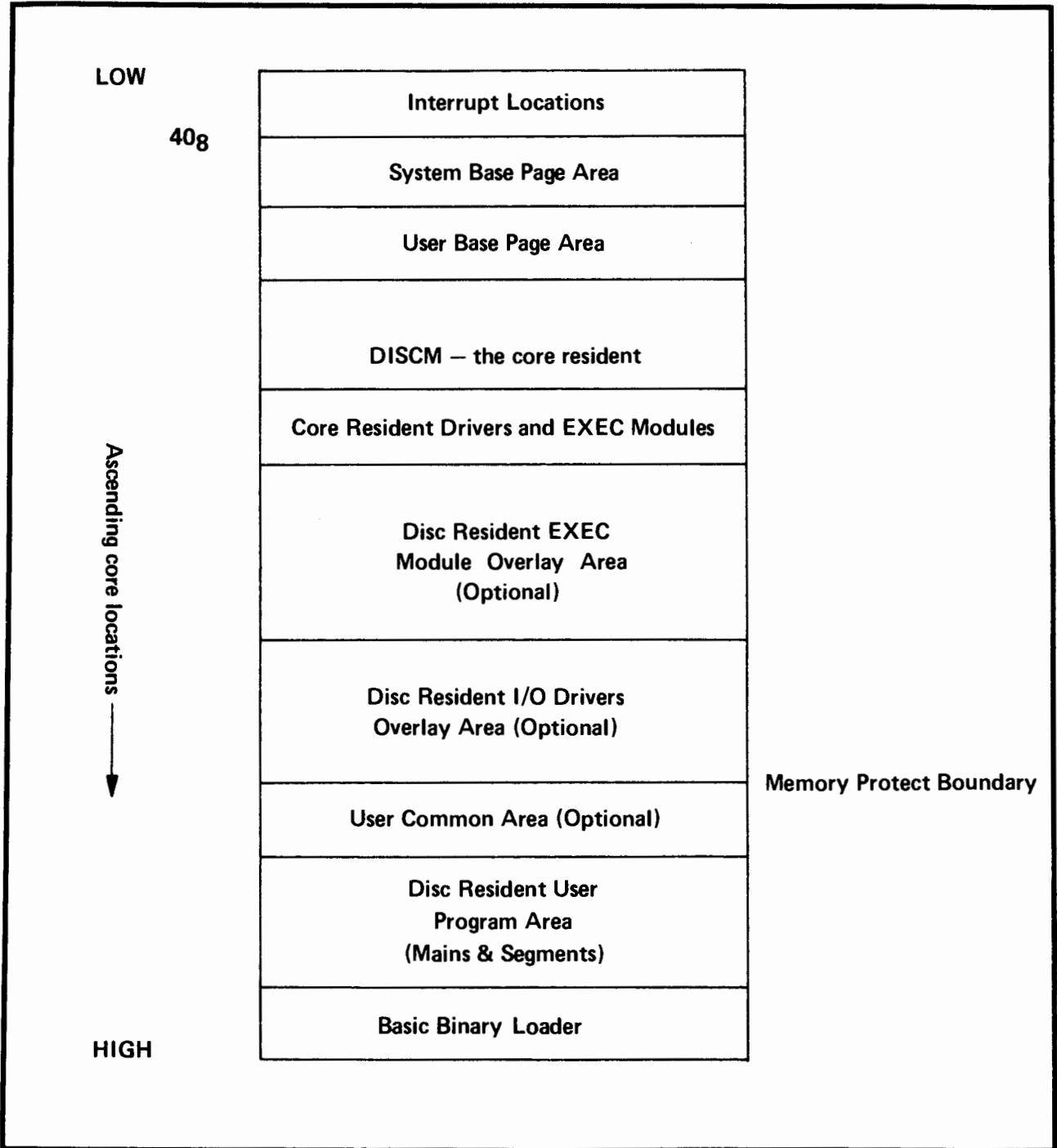


Figure DOSM-1. Core Allocations in DOS-M

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Input/Output Tables

Next, DSGEN generates the three I/O tables: equipment table, device reference table (logical unit table), and the interrupt table.

3. DSGEN requests the equipment table entries.....EQUIPMENT TABLE ENTRY?

Operator responds with a series of one line EQT entries, which are assigned EQT numbers sequentially from one as they are entered. The EQT entry relates the EQT number to an I/O channel and driver, in this format.....*n1,DVRnn [,D] [,R][,U]*

where *n1* is the I/O channel (lower number if multi-board),

DVRnn is the driver name (*nn* is the equipment type code).

D, if present, means DMA channel required,

R, if present, means driver is core-resident (must be type 0)

U, if the physical subchannel number.

Operator terminates the equipment table entries by typing...../E

Here is a sample Equipment Table:

* EQUIPMENT TABLE ENTRY

10,DVR31,D,R	(EQT entry #1 = disc)
12,DVR23,D	(EQT entry #2 = magnetic tape)
14,DVR05,R	(EQT entry #3 = special teleprinter)
15,DVR01	(EQT entry #4 = photoreader)
16,DVR02	(EQT entry #5 = tape punch)
17,DVR12	(EQT entry #6 = line printer)
/E	(End of table)

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4. DSGEN requests the logical unit assignments for the device reference table.....DEVICE REFERENCE TABLE?

For each logical unit number, DSGEN prints..... $n = \text{EQT} \#?$

Operator responds with an EQT entry number (m)

appropriate to the standard definition of n .

Numbers above 6 may be assigned any EQT entry

desired..... m

Operator terminates entry by typing...../E

Here is a sample Device Reference Table:

* DEVICE REFERENCE TABLE

1 = EQT #? (System teleprinter on channel 14, EQT #3)
3
2 = EQT #? (Disc on channel 10, EQT #1)
1
3 = EQT #? (Disc on channel 10 EQT #1 -- reserved for system use)
1
4 = EQT #? (Standard punch unit on channel 16, EQT #5)
5
5 = EQT #? (Standard input unit on channel 15, EQT #4)
4
6 = EQT #? (Standard list unit on channel 17, EQT #6)
6
7 = EQT #? (Standard unit definable by user)
2
8 = EQT #? (End of table)
/E

NOTE: The number of responses given here determines the number of logical units allowed in the system. To allow unassigned logical units for the user, respond with a \emptyset to as many questions as units are desired.

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5. DSGEN requests the interrupt table entries.....INTERRUPT TABLE

Operator responds with an entry for each I/O
location which may interrupt, in ascending
order, and in this format..... $n1$, $n2$

where $n1$ is the octal channel number (high number -- lower priority -- for
two board interfaces) between 10_8 and 37_8 inclusive (must be
entered in ascending order), and

$n2$ is a decimal EQT entry number.

Operator terminates entry by typing...../E



Here is a sample Interrupt Table:

* INTERRUPT TABLE

*Note the higher
order disc.
select code
is used for interrupt
(16 for DH)*

11,1	(Channel 11 linked to EQT #1)
13,2	(Channel 13 linked to EQT #2)
14,3	(Channel 14 linked to EQT #3)
15,4	(Channel 15 linked to EQT #4)
16,5	(Channel 16 linked to EQT #5)
17,6	(Channel 17 linked to EQT #6)
/E	(End of table)

NOTE: The EQT numbers need not appear in numerical order. This
order is determined by refereing back to the Equipment
Table. The octal channel numbers, however, must be in
ascending sequence.

Following the completion of the I/O tables, DSGEN loads the disc-resident
executive modules (if any), and the disc-resident I/O drivers (if any).

6. DSGEN reports the last address plus 1 of the supervisor.....LWA SYS xxxxx

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7. DSGEN requests the first word address of the
user program area.....FWA USER?

Operator responds with an octal address
greater than or equal to XXXXX. In an 8K
computer, this response must be less than
or equal to 7300₈ (This option is provided
so that user programs can start on a page
boundary, if desired).....nnnnn

DSGEN proceeds to load all user main programs
and segments onto the disc with memory map
listings as described for system programs.

8. When system generation is complete, DSGEN prints...*SYSTEM STORED ON DISC

9. Protect the disc. DOS-M may now be bootstrapped into memory (procedure 4).

switch and report (1/2)

Restart

During any of the phases the operator can restart that phase if any error occurs
by restarting DSGEN at location 100₈.

TYPICAL SYSTEM GENERATION

The following is a listing from the generation of a 16K DOS-M (using the HP 2870
Disc Drive) with the relocatable programs modules coming from a disc file.

SYS GEN CODE?

0000

SYS DISC CHNL?

14

SECTORS/TRACK?

12

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SYS DISC SIZE?

200

DRIVES?

1

FIRST SYSTEM TRACK?

0

FIRST SYSTEM SECTOR?

3

SYS DISC SUBCHNL?

0

USER DISC SUBCHNL?

0

TIME BASE GEN CHNL?

0

IS 2114?

NO

LWA MEM?

37677

ALLOW :SS?

YE

PRGM INPT?

DF

INPUT DISC SUBCHNL?

1

LIBR INPT?

PT

PRAM INPT?

TY

*EOT

*EOT

*EOT

*EOT

Some additional modules were entered via paper tape.

NO UNDEF EXTS

ENTER PROG PARAMETERS

*EX05-0

*EX06-0

*EX11-0

*EX1A-0

*SRCH-0

*ADDR-0

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DVR00,4
/E

SYSTEM LINKS?
149

USER LINKS?
528

SYSTEM

DISCM	02000
#EX05	04173
#EX06	04400
#EX11	04437
#EX18	04623
#ADDR	05303
#SRCH	05320
DVR05	05620
DVR31	06065

* EQUIPEMNT TABLE ENTRY

11,DVR00
13,DVR01
14,DVR31,D,R
16,DVR02
17,DVR05,R
22,DVR23,D
/E

* DEVICE REFERENCE TABLE

1 = EQT #?
5
2 = EQT #?
3
3 = EQT #?
3
4 = EQT #?
4
5 = EQT #?
2
6 = EQT #?
1
7 = EQT #?
0
8 = EQT #?
6
9 = EQT #?
/E

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* INTERRUPT TABLE

11,1
13,2
15,3
16,4
17,5
23,6
/E

EXEC SUPERVISOR MODULES

\$EX01	07040
\$EX02	07040
\$EX03	07040
\$EX04	07040
ASCII	07355
\$EX07	07040
\$EX08	07040
\$EX09	07040
ASCII	07321
\$EX10	07040
\$EX12	07040
\$EX13	07040
ASCII	07416
\$EX14	07040
ASCII	07401
\$EX15	07040
ASCII	07340
\$EX16	07040
\$EX17	07040
\$LBL	07427
\$EX19	07040
\$LBL	04616
\$EX20	07040

I/O DRIVER MODULES

DVR01	07522
DVR02	07522
DVR23	07522
DVR00	07522
LWA SYS	10336

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FWA USER?
11000

USER SYSTEM PROGRAMS

LOADR	11000
JOBPR	11000
ASMB	11000
ASMBD	16120
ASMB1	16120
ASMB2	16120
ASMB3	16120
ASMB4	16120
ASMB5	16120
ALGOL	11000
.EAU.	23275
%WRIT	23345
SREAD	24043
DUMRX	24576
.OPSY	24662
ALGL1	24722
FTN	11000
FTN01	12127
SREAD	20241
.OPSY	20774
DUMRX	21034
FTN02	12127
FTN03	12127
FTN04	12127
%WRIT	16515
FADSB	17213
.OPSY	17371
.FLUN	17431
.PACK	17452
DUMRX	17566
.ZRLB	17652
.EAU.	17713

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FTN4 11000

F4.1 26636

F4.2 26636

* SYSTEM STORED ON DISC

PROCEDURE 2

USING DSGEN TO FORMAT DISCS

Before a fresh disc cartridge or pack can be used as a disc in DOS-M, it must be formatted by DSGEN. System discs are formatted during system generation, but user discs must be formatted by running DSGEN again in a special mode. Formatting a disc involves assigning it a system generation code, reading every sector, clearing any existing user or system directory, etc. The result is a unlabeled user disc ready for use in DOS-M.

Operating Instructions

1. Turn on all equipment.
2. Unprotect the disc controller.
3. Load a configured DSGEN using the Basic Binary Loader (BBL).
4. Set up a starting address at location 100_8 .
5. Set switch register bit 15 equal to 1.
6. Start the computer executing.
7. DSGEN asks for a decimal number to be written on the disc label. This number is used for identification.....SYS GEN CODE?
Operator responds with a decimal number.....79
8. DSGEN requests the octal select code of the disc controller.....SYS DISC CHANNEL?
Operator responds with an octal number10

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9. DSGEN asks the number of sectors per hardware track on the disc (this is half the number of sectors on a software track).....# SECTORS/TRACK

Operator responds with 12 for the 2870 disc or 23 for the 2883 disc.....12
10. DSGEN requests the subchannel number (0 to 7) of the user disc to be formatted.....USER DISC SUBCHANNEL?

Operator responds with a number between 0 and 7 inclusive.....3
11. DSGEN requests that the disc be unprotected (if it is still unprotected)
.....TURN ON DISC PROTECT OVERRIDE - PRESS RUN

Operator unprotects the disc and starts the computer executing.
12. DSGEN carries out formatting on the specified subchannel and halts with a code of 102007₈.
13. This procedure should be repeated for each proposed user disc.

Operator can start the computer to format a new disc (switch 15 must still be equal to 1). DSGEN repeats fromUSER DISC SUBCHANNEL?

Operator can set switch 15 equal to 0 and start the computer to proceed to system generation.

APPENDIX

ERROR HALTS AND MESSAGES

During the creation and operation of DOS-M error conditions may occur. These are signalled to the user either by halting the computer with a specific halt code or by printing a error message.

ERROR CONDITIONS DURING EXECUTION OF DSGEN

Both halts and messages can occur in DSGEN.

ERROR HALTS

<u>Halt Code</u>	<u>Cause</u>	<u>Recovery Action</u>
102000	Follows an irrecoverable error message. Generator unable to find \$STRT in DISCM. DISCM is probably missing.	Irrecoverable. Not recoverable.
102002	Follows ERR02.	See ERR02 in error messages.
102003	Follows ERR03	See ERR03 in error messages.
102004	Follows ERR04.	See ERR04 in error messages.
102007	Normal halt. Disc initialization of subchannel has completed.	Start the computer executing to initialize another subchannel or to generate a system.
102022	Disc error after ten attempts. Disc address in A, disc status in B	Start execution to retry ten more times. When preceded by ERR12 continues to next track.

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<u>Halt Code</u>	<u>Cause</u>	<u>Recovery Action</u>
102032	Disc not ready or disc should be unprotected. Disc address in A and disc status in B.	Ready or unprotect the disc. Start the computer executing.
102077	Normal halt. Ready to receive another program tape.	Continue generation. Enter next tape and start the computer executing.
102000	If DSGEN is above 10000 _g , an impossible condition has occurred.	Either a hardware/software failure has occurred or DSGEN has overflowed its work area because the system was too large.



ERROR MESSAGES

The following messages may be printed on the terminal during execution of DSGEN:

<u>Message</u>	<u>Meaning</u>	<u>Action</u>
<u>Messages During Initialization and Input Phase</u>		
ERRØ1	Invalid response to initialization request.	Request is repeated. Enter valid reply.
ERRØ2	Checksum error on program input.	Computer halts; to try again, reposition tape to beginning of record and start the computer.
ERRØ3	Record out of sequence.	Same as ERRØ2.
ERRØ4	Illegal record type.	Same as ERRØ2.
ERRØ5 name	Duplicate entry point.	Revise program by reloading the entry points (the current entry point replaces the previous entry point).

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<u>Message</u>	<u>Meaning</u>	<u>Action</u>
ERR06	Invalid base page length in BCS-produced rel. tape (must be zero).	Base page area is ignored, but memory protect error will occur if program is executed.
ERR07	Program name or entry point table overflow of available memory.	Irrecoverable error. Revise or delete programs.
ERR08 <i>name</i>	Duplicate program name.	The current program replaces the previous program.

Messages During the Parameter Phase

ERR09	Parameter name error (no such program).	Enter valid parameter statement.
ERR10	Parameter type error.	Same as ERR09.

General Messages

ERR12	Disc error during disc initialization.	Start the computer executing to bypass the faulty tracks.
ERR13	User segment precedes user main program.	Irrecoverable.
ERR15	More than 63 subprograms called by a main program.	Revise main program (subsequent calls to subprograms are ignored).
ERR16	Base page linkage overflow.	Diagnostic printed for each word required. Revise order and composition of program loading to reduce linkage requirements.
ERR17	Current disc address exceeds number of available tracks.	Irrecoverable error.

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<u>Message</u>	<u>Meaning</u>	<u>Action</u>
ERR18	Memory overflow (absolute code exceeds LWA memory).	Diagnostic printed for each word required (absolute code is generated beyond LWA). Revise program.
ERR19	Program overlay (current word of absolute code has identical location to previous).	Current word is ignored (the address is printed).
ERR20	Binary DBL record overflow of internal table.	Records overlay previous DBL records (diagnostic printed for each overflow record). Revise program.
ERR21	Module containing entry point \$CIC not loaded.	Irrecoverable error.
ERR22	Read parity/decode disc error. A-register bits 8-14 show track number; bits 0-7 show sector number.	After ten attempts to read or write the disc sector, the computer halts. To try ten more times, start the computer executing.
ERR23	EQT not entered for disc-resident I/O module.	Restart at 1000 _h .

Messages During I/O Table Entry

ERR24	Invalid channel number.	Enter valid EQT statement
ERR25	Invalid driver name or no driver entry points.	Same as ERR24.
ERR26	Invalid or duplicate D,R,U operands.	Same as ERR24.
ERR27	Invalid logical unit no.	Enter valid DRT statement.
ERR28	Invalid channel number.	Enter valid INT statement.

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<u>Message</u>	<u>Meaning</u>	<u>Action</u>
ERR29	Channel number decreasing.	Same as ERR28.
ERR31	Invalid EQT number.	Same as ERR28.
ERR35	Base page interrupt locations overflow into linkage area.	Restart Disc Loading Phase.
ERR36	Invalid number of characters in final operand.	Same as ERR28.

ERROR CONDITIONS DURING USE OF DOS-M BOOTSTRAP

The following halts can occur during use of DOS-M Bootstrap:

<u>Halt Code</u>	<u>Cause</u>	<u>Recovery Action</u>
102011	Disc error status is in the A-register.	Check that the device is ready and then call maintenance.
102031	Same as above.	Occurs during execution of disc-resident part of Bootstrap. Check that the disc is ready then call maintenance.

ERROR CONDITIONS DURING OPERATION OF DOS-M

Both halts and messages can occur during execution of DOS-M. The halts that can occur include:

<u>Halt Code</u>	<u>Location</u>	<u>Cause</u>	<u>Recovery Action</u>
102002	location 2 ₈	Possible memory wrap-around when memory protect is not present.	Program error. Bootstrap DOS-M from the disc and correct the program.
102003	location 3 ₈		

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<u>Halt Code</u>	<u>Location</u>	<u>Cause</u>	<u>Recovery Action</u>
102004	DISCM	Power has gone up or down with powerfail option present.	Bootstrap DOS-M from disc and restart.
102011	\$EX20	Disc parity error. Halt occurs after a message is printed giving location of error.	Unprotect the disc and start the computer executing. DOS-M assigns next spare track.
102031	DVR31	Trying to write on disc cylinder that is flagged "protected" without first unprotecting the disc.	Starting the computer executing to exit DVR31 with no action taken.
102077	\$EX20	Follows message telling operator to protect the disc after spare track assignment.	Protect the disc and start the computer executing. DOS-M aborts the job that was running.

NOTE: The sub-systems of DOS-M also print out error messages. The error messages for FORTRAN, ALGOL, and Assembler are documented in a separate module of the SOFTWARE OPERATING PROCEDURES. The messages generated by UTIL (the Extended File Management Package Utility program) are covered in the DOS-M manual.

ERROR MESSAGES

During the operation of DOS-M certain messages may be printed on the system terminal. These messages may be error reports or simply informative; they are generated by various parts of DOS-M. The messages are listed alphabetically including where they originated, what they mean, and what response, if any, the operator must make. Messages that begin with a variable name or a non-alphabetic character are listed by the first non-variable, alphabetic character.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
BAD CONTROL STATE.	JOBPR	Directive just entered is not acceptable in DOS-M. Enter correct directive on system teleprinter.
BEGIN 'DEBUG' OPERATION	DEBUG	Any legal DEBUG operations may now be entered. Enter any legal DEBUG operations.
CHECKSUM ERROR	JOBPR	Checksum error in INPUT to :ST,R,file, LU directive. Correct tape.
CW <i>nnnn</i>	DISCM	In a READ/WRITE EXEC call at <i>nnnn</i> ,buffer extends beyond memory bounds. Correct program.
DEVICE # <i>nn</i> DOWN	JOBPR	EQT # <i>nn</i> is unavailable (down). Use the :UP, <i>nn</i> directive to make the device available (UP). (Then use the :GO directive if needed.)
DICTIONARY OVERFLOW	JOBPR	No room is left for entries in the user file dictionary. Put file on another disc or remove some of the files.
??? DISC	DISCM	Informs user that disc is not recognizable by DOS-M. <u>Must</u> be labeled or unlabeled with :IN, or formatted with DSGEN, before using in DOS-M.
DISC GEN CODE <i>nnn</i> NOT SYS GEN CODE <i>nnnn</i> ERR POSS	DISCM	Informs the user that the disc being requested was initialized (labeled) by a system with a different system Generation Code. Generation code on disc may be updated by labeling or unlabeled using :IN.
DISC NOT ON SYSTEM	DISCM	No disc pack with the currently requested label can be found on the system. Mount disc pack with correct label or ready drive containing disc.
DONE?	JOBPR	Thirty feed frames (paper tape) or an end-of-file (magnetic tape) have occurred during input. Enter YES for end of input; NO for more input.
??? LABEL <i>xxxxxx</i> DOS LABEL <i>xxxxxx</i> TSB LABEL <i>xxxxxx</i>	DISCM	Attempting to label (or unlabeled) an already labeled disc pack. Enter YES to relabel the disc pack or NO to drop the request to relabel the disc pack.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
DUPLICATE FILE NAME	JOBPR	Doubly defined file name found in a STORE directive (other than STORE,F), or an EDIT directive with a new file name; or on DD,U. Remove file or rename file.
\$END ALGOL	ALGOL	End of ALGOL compilation. No response required
\$END ASMB	ASMB	Assembly as completed. No response required
\$END ASMB CS	ASMB	Assembly has ended because of an error in the assembler control statement. Correct the control statement.
\$END ASMB NPRG	ASMB	Assembly has terminated because no JFILE was found when required. Define the file using a JFILE directive.
\$END ASMB PASS	ASMB	Another pass of the source program through the input device is required. Printed on the system after Pass 1. Replace the program in the input device and type: :GO.
\$END ASMB XEND	ASMB	Assembly stops. An EOF occurred in the source program before an END statement. Add an END statement to the program.
END FILE	JOBPR	During an EDIT, (1) the master file ended before completion of editing or (2) a colon occurred in column 1 of a source statement. Check input to the EDIT program.
\$END FTN	FTN	Compilation has completed. No response required.
END JOB xxxx [RUN = xxxx MIN. xx.x SEC EXEC = xxxx MIN. xx.x SEC]	JOBPR	End of current job. Total job time and execution time of the job are printed on the system teleprinter and standard list device if a time-base generator is present.
ENTER FILE NAME(S) OR /E	LOADR	Enter list of relocatable program files. To terminate list of file names type "/E".
ENTRY ERROR	DEBUG	DEBUG operation entered was illegal. Correct entry.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
EQT xx CH xx DVRxx D R Ux Sx JOB		Equipment table entry printed by the directive :EQ. No action required.
EXTRA PARAMETERS	JOBPR	More than 15 parameters in a directive. Excess parameters are not processed.
FI nnnnn	DISCM	In a FILE READ/WRITE EXEC call; (1) the file requested at nnnnn cannot be found. If nnnnn is not present, enter the file. (2) the length of the buffer requested at nnnnn extends beyond the end at the file. Correct the buffer length. Either case causes calling program to abort.
HPAL	ALGOL	Control statement error. Correct control statement.
IB nnnnn	DISCM	Illegal buffer address in EXEC call at location nnnnn. Program is aborted. Correct buffer program address.
IE nnnnn	DISCM	If a colon occurs in the first column of input entered through the batch device during a program execution, the program is aborted, control is given to the JOBPR and the input is processed as a directive. nnnnn is the memory location of the input request.
IGNORED	DISCM	Input from system teleprinter during program execution cannot be processed. Correct input.
*IGNORED	JOBPR	All directives following EJOB and before next JOB except BATCH, TYPE, TRACKS and OFF are ignored. Enter acceptable directive.
file ILLEGAL	JOBPR	On a source file LIST directive, the requested file was not a source file. Re-type LIST directive using source file. A file name begins with a non-alphabetic character. Rename the file.
ILLEGAL DIGIT	JOBPR	In a decimal number, character is other than 0-9. Enter correct decimal number. In an octal number, digit is other than 0-7. Enter correct octal number.
ILLEGAL LUN	JOBPR	Logical unit requested is equal to zero, greater than the number of logical units in the system, not the correct type (i.e., input type for output device), etc. Enter a correct logical unit.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
ILLEGAL PROGRAM RUN LIMITS		
	DISCM	Attempt to run a user main or segment whose user area limits or base page limits will not fit within the limits of the current system. Recreate user mains or segments on current system using LOADR.
ILLEGAL PROGRAM TYPE	JOBPR	Program requested in a RUN or PROG is not legal. Enter correct name.
INPUT ERROR	DISCM	Equipment table entry number or logical unit number in EQ, LU, UP or DN is illegal. Enter correct equipment table or logical unit entry number.
INPUT :DATE, XXXXXXXXXX[,H,M,]	DISCM	When system is initiated from the disc, DOS-M requires a DATE directive. The "HM" is ignored in DOS-M if a Time Base Generator is not in the system. Enter a DATE directive.
I/O ERR ET EQT #mm	DISCM	End-of-tape on device #mm. EQT #mm is unavailable. To make the device available (up), use the UP,n directive.
I/O ERR NR EQT #mm	DISCM	The device #mm is not ready. To make the device available (up), use the UP,n directive.
I/O ERR PE EQT mm	DISCM	Parity error on device #mm returns to program return address with A set to status, B set to 0. Call maintenance.
IT nnnnn	DISCM	Illegal disc track or sector address in EXEC call from location nnnnn. Program is aborted. Correct the track or sector address in EXEC call.
I/O ERR $\left\{ \begin{matrix} \text{PE} \\ \text{NR} \end{matrix} \right\}$ USER DISC	DISCM	A parity error or device not ready occurred when attempting to assign a user disc. Disc may not be formatted; format it with DSGEN.
JBIN OVFL	FTN, ASMB	Overflow of job binary area during assembly or compilation. Reduce size of job or purge user files.
JOB ABORTED!	JOBPR	Correct problem and start new job.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
JOB xxxxx dddddddddd [TIME = xxxx MIN. xx.x SECS EXEC = xxxx MIN. xx.x SEC.]		
	JOBPR	Message printed at the beginning of each job. The time information is deleted in DOS-M if a Time Base Generator is not included in the system. Start job.
L01	LOADER	Checksum error on tape.
L02		Illegal record.
L03		Memory overflow.
L04		Base page overflow.
L05		Symbol table overflow.
L06		Duplicate main or segment name (may be caused by attempting to run the loader twice in one job).
L07		Duplicate entry point.
L08		No main or segment transfer address.
L09		Record out of sequence.
L10		Insufficient directory work area, or user area space.
L11		Program name table overflow.
L12		User file specified cannot be found.
L13		Program name duplication.
L14		Non-zero base page length.
L15		Segment occurred before main.
L16		Program overlay (illegal ORG).
L17		Illegal library record.
LBL = 111111	DISCM	Disc subchannel referenced is labeled 111111. If attempting to change user disc subchannel, enter UD with correct label.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
LIMIT ERROR	JOBPR	In a directive, source statement numbers are out of order (EDIT), dump limits are incompatible (PDUMP, ADUMP), sector numbers are illegal (DUMP), or beginning source statement number is greater than final statement number (EDIT). Correct directive and re-enter.
xxxx LINES	JOBPR	Total number of statements stored by a STORE,S directive. No response required.
****LIST END****	JOBPR	Terminates list of source statements generated by a LIST directive. No response required.
LN nnnnn	DISCM	Logical unit requested by an EXEC call at nnnnn is unassigned. Program is aborted. Reassign logical unit.
LOADR COMPLETE	LOADR	Loading has completed. No responses required.
LOADR SUSP	LOADR	Loader has suspended (usually at EOT). Type :GO,n to restart the Loader with proper parameter value.
LOADR TERMINATED	LOADR	Loader has terminated because of an error. Check input.
LOAD TAPE	LOADR	In conjunction with LOADR SUSP, this message requests that next relocatable tape be loaded before GO. Load the next relocatable tape and enter :GO to read next tape or :GO,1 to indicate that all tapes are read in.
LU nnnnn	DISCM	Illegal logical unit in EXEC call at nnnnn. Program is aborted. Enter correct logical unit number.
LUxx EQTxx	JOBPR	Logical unit table entry; EQT #xx assigned to LU#xx. No response required.
LUN UNASSIGNED	JOBPR	Logical unit requested in a directive is unassigned. Assign logical unit number requested in the directive.
xxxxx MISSING	DISCM	Segment xxxxx requested by an EXEC call is not in system or user directory. Job is aborted. Correct job.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
MISSING PARAMETER	JOBPR	A parameter is missing in a directive. Retype the directive correctly.
MP <i>nnnnn</i>	DISCM	Memory protect violation at location <i>nnnnn</i> . Program is aborted. Correct the program.
NAME *IGNORED	JOBPR	Illegal JOB <i>name</i> ; non-alphabetic first character. Retype correct job name.
NEXT AVAIL TRACK= <i>tt</i> BAD= <i>n</i>	JOBPR	In TRACK directive, <i>tt</i> = first track beyond end of current user area; <i>n</i> = number of bad tracks. "BAD= <i>n</i> " returned only if bad tracks do exist. <i>tt</i> = "NONE" if no tracks are available.
NO BIN END	JOBPR	No END record detected when storing a relocatable binary program.
NO PROGRAMS LOADED	LOADR	No programs were loaded by the LOADR. Loading terminates.
NO SOURCE	JOBPR	No source statements following a /R or /I in an EDIT directive. Job is aborted. Enter source statements after the /R or /I.
NO SOURCE	ALGOL	Source file from disc not pre-set.
NUMBER OVERFLO	JOBPR	An integer is too large.
OR <i>nnnnn</i>	DISCM	I/O operation requested by EXEC call at <i>nnnnn</i> is rejected. Program is aborted. Check program.
OVERFLOW JBIN	JOBPR	There is not enough room in the JBIN for storing the relocatable binary output from the assembler or compilers.
PARAMETER ILLEGAL	JOBPR	A parameter of a directive is illegal. Re-enter directive.
PARITY ERROR SC= <i>m</i> ,TRK= <i>ttt</i> ,SCTR= <i>sss</i>	JOBPR	Parity error during disc read or write. Call maintenance.
PAUSE <i>xxxx</i>	LIBR (Formatter)	Program has temporarily suspended itself. <i>xxxx</i> is an octal number. Restart program using the GO directive.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
RE-ENTER STATEMENT ON TTY	JOBPR	Follows most error messages that do not cause abort. Type in the correct statement.
RQ nnnnn	DISCM	Illegal request code in EXEC call at nnnnn. Program is aborted. Correct the program.
SPARE TRK OVERFLOW	JOBPR	Defective cylinder detected and no spare tracks available for reassignment.
STOP xxxxx nnnnn	LIBR	Program xxxxx has terminated at location nnnnn.
SUBCHAN = n	DISCM/ JOBPR	Given in response to :UD information request or when :SS makes new subchannel assignment. No response required.
xxxxx SUSP	DISCM	Program xxxxx suspended by EXEC call or PAUSE directive. Restart program using the GO directive.
TAPE END	JOBPR	EOT flag set on magnetic tape or paper tape device during output via JOBPR directives :DUMP and :LIST or output of a JOB or EJOB statement. If a magnetic tape, it is rewound with standby, if paper tape a trailer is punched. The JOBPR will then pause to allow new tape to be set up. Mount a new magnetic tape. Enter :GO to continue the output.
TM nnnnn	DISCM	Maximum execution time exceeded. The program is currently at nnnnn and is aborted. Increase execution time.
#TRACKS UNAVAILABLE	DISCM	There are not enough work tracks for the compiler. Purge disc of unnecessary files.
TRAC # TOO BIG	JOBPR	Track requested is higher than last available disc track (track may be in JBIN area). Redefine the track request or purge files or use different disc.
TSB DISC	DISCM	Informs user that the user disc was labeled by a non-DOS-M system. May be made DOS-M disc by labeling or unlabeled with :IN.
TURN { ON } { OFF }	DISC PROTECT DISCM	DISC PROTECT OVERRIDE SWITCH Unprotect [ON] or protect [OFF] the disc.

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<u>Message</u>	<u>Source</u>	<u>Description</u>
UD <i>nnnnn</i>	DISCM	Unable to find user disc requested by EXEC call at <i>nnnnn</i> . Mount required disc and type :GO; or terminate program with :AB or :OF.
UNLBL	DISCM	User disc specified in UD is unlabeled. If trying to change user disc assignment, enter UD,*[,n].
<i>file name</i> UNDEFINED	JOBPR	Undefined file name in PURGE, LIST, RUN, STORE or DD,U, <i>file</i> . Retype correct file name on the system teleprinter.
UNDEFINED EXTS	LOADR	Undefined external references exist in programs Loaded. The external references are listed one per line. To load additional programs from paper tape type :GO,Ø[,n].
WRONG INPUT	JOBPR	Relocatable binary input furnished for a source file request or vice-versa. Put in a correct input.
<i>nn xx</i>	ERRØ	Library routine error code.
@	JOBPR/ DISCM	Directives may be entered. Enter desired directive.
*	DISCM	Operator attention directives may be entered. Enter desired directive.