SYSTEM ANALYST DOS-M COURSE

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SYSTEM ANALYST DOS-M COURSE OUTLINE

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I. INTRODUCTION

A. Minimum Hardware Requirements

1. Why DOSM?
2. DOS/DOSM minimum hardware [SLIDE 1]
3. Cost Comparison
4. Comparison to competitor - (IBM 1130) [SLIDE 1A]
5. DOSM Hardware options [SLIDE 1B]

B. Advantages and Disadvantages [SLIDE 2]

1. ADVANTAGES (Special Points)

   a. Another cabinet and power supply needed when number of drives is expanded to 3 or 4.

   b. User could operate in his own instrument driver environment if no MP (Memory Protect).

   c. If User does not want EAU or clock, he is not forced to have it. Gains one more I/O channel without TBG option.

   d. Easy creation of System Backup (which will not be hardware protected) on Cartridge.

   e. Multiple System Discs with different configurations on separate drives.

   f. Exchange of user files between systems even though systems may be configured differently.

   g. Hardware protection scheme using DISC PROTECT OVERRIDE SWITCH and PCI (Protected Cylinder Indicator).

   h. Operation with USER DISCS Labeled to avoid using incorrect cartridge.

   i. Minimum core resident system reduced from DOS (DVRØ5 and DVR31 changes).

2. DISADVANTAGES (Special Points)

a. Three bootstraps (cover details later). Method of System Start-up.

b. No plans at present for moving head RTE or TSB. Some talk for ISS system (ISS disc cost about $ 35,000 and has about 12 million word storage).

c. Better to lose sale rather than deliver an 8K system that will "strangle" customer's programs (during loading or execution). Just because JOBPR will fit is not any indication that system will be adequate.

C. IOMEC Overall Description

1. CONTROLLER [SLIDE 3]

a. Interface between computer and drive(s).

b. Interface cards on computer side.

(1) Identical electronically except for positions of jumper wires.

(2) Signals inverted from positive-true/ ground-false logic to ground-true/ positive-false to be compatable with controller.

(3) DATA CHANNEL - Transfers data, status, and addressing information. DMA controls data; program controls status and addressing.

(4) COMMAND CHANNEL - Transfers commands, drive selection, and drive attention bits (LSB). All under program control.

2. DRIVE (Maximum of 4 per controller)
   a. Fixed Disc and Removable Cartridge.
   b. Movable heads and their numbers.
   c. Power ON/OFF.
   d. Cartridge LOCK/UNLOCK and light.
   e. READY light.
   f. Physical description of PACK.
      (1) Opening at rear for heads entry.

      (2) Opening underneath for forced air.

      (3) Rim markers for TRACK/SECTOR origins.

3. DISC
   a. Physical storage capacity breakdowns [SLIDE 4].
   b. Physical layout [SLIDE 5].
   c. Addressing [SLIDE 6].
      (1) Physical (Drive, Cylinder, Head, Sector).
      (2) Logical (Subchannel, Track, Sector). Software inverts (complements) lower order bit of subchannel # for higher order bit of head #.
   d. Sector Address and Data Fields [SLIDE 7].

      (1) INITIALIZE WRITE COMMAND is used for controller to construct and write the Sector Address Field with PCI=DCI=Ø (only disc formatting seciton of generator does this).
      (2) WRITE PROTECTED COMMAND is used for controller to set PCI=1 in Sector address field (only generator does this).
      (3) WRITE DEFECTIVE COMMAND is used for controller to set DCI=1 in Sector Address Field Only $EX2Ø makes this call (DVR31 will accept under system operation).

(Continued)

(4) Controller does not send back any status on PCI or DCI if DISC PROTECT OVERRIDE SWITCH is "ON" (i.e. UP). This switch must be "ON" when executing (1), (2), or (3) on the preceding page!

D. DOSM Software and Relationship to Discs

1. Components [SLIDES 8A, 8B, 8C, 8D].
2. Disc to Memory Transfers [SLIDE 9].
3. DOSM General Core Layout [SLIDE 10A].
   a. EQT Format [SLIDE 10B].
   b. DRT Format [SLIDE 10C].
   c. INT Table Format [SLIDE 10D]
4. Discs Layout
   a. Concept of "SYSTEM" and "USER" Discs.
   b. Oversimplified "SYSTEM " disc layout [SLIDE 11A].
   c. More detailed "SYSTEM" disc layout [SLIDE 11B].
   d. User disc layout [SLIDE 11C].
   e. Label Sectors
      (1) System Disc [SLIDE 12A].
      (2) User Disc [SLIDE 12B].

E. System Startup Operation Example with block diagrams.

1. Execution of Configured Supplied Bootstrap [SLIDE 13A.1].
   a. Loads Disc Resident Bootstrap into high core, relocating it as necessary.
   b. Transfers control to start of DRB just loaded.

E. SYSTEM Startup Operation Example with block diagrams.

2. Execution of Disc Resident Bootstrap [SLIDE 13A.2].

   a. Loads Core Resident System from System Disc in four parts.

   b. Configures continuator section of DVRØ5 and DVR31.

   c. Transfers control to $STRT in DISC MONITOR by JMP 3,I.

3. Disc Monitor First Entry [SLIDE 13A.3].

   a. $STRT calls $MDLD to transfer control to $EXI2 (System Startup).

   b. $MDLD makes decision whether to load $EXI2 from Disc (if Disc Resident) then transfers control to $EXI2.

4. Execution of $EXI2 [SLIDE 13A.4].

   a. Sets (MP FENCE ADDRESS = UMFWA) with OTA 5.

   b. Reads System Buffer Sector to Base Page.

   c. Builds new System Buffer Sector and writes back on disc if not valid one (i.e., does not end with "SB").

   d. Calls $SYIO to output "INPUT :DATE,XXXXXX,H,M" on System TTY.

   e. Sets input request code = "DA" and transfers control to $TYPE for System K.B. Input.

5. Execution of $TYPE for System K.B. Input [SLIDE 13A.5].

   a. Calls $SYIO to output (CR) (LF) @.

   b. Calls $SYIO to input 72 characters into JOB INPUT BUFFER.

   c. $SYIO calls $TEST routine to force :DA input.

   d. If :DA not inputted, calls $SYIO to output "IGNORED" and goes to b. above.

   e. If :DA inputted, transfers control to $JLOD to load and branch to JOBPR.

6. Execution of $JLOD to load JOBPR [SLIDE 13A.6].

   a. $JLOD calls DISCX twice to read in JOBPR (MAIN and Base Page) and then transfers control to JOBPR main entry point.

   b. Each call to DISCX results in call to $DISC which in turn calls $SYIO to read DISC.

7. Execution of JOBPR to Update System Buffer Sector [SLIDE 13A.7].

   a. Date routine in JOBPR reads System Buffer Sector from Disc to its own internal buffer by JSB EXEC call.

   b. Updates DATE, LU TABLE entries, and Default User Label in System Buffer Sector.

   c. Writes updated System Buffer Sector back on Disc by JSB EXEC call.

8. Execution of JOBPR to report Default USER DISC SUBCHANNEL # and LABEL [SLIDE 13A.8].

   a. Date Routine continues by executing EXEC call to request CURRENT USER DISC SUBCHANNEL # and LABEL.

   b. $EXI7 is used just as if :UD directive had been entered.

c. Point out that if GENERATION CODE or PROPRIETARY CODE do not agree with System Disc, ERROR MESSAGE may be printed here.

d. At end JOBPR then calls $TYPE for System TTY to output (CR) (LF) and @ and to input from Keyboard.

9. Summary of 1-8 above.

a. JOBPR is a USER PROGRAM and must do all I/O by JSB EXEC.

b. At end of 8 above, the JOBPR remains in memory until :PROG,X entered or :OFF given in response to * (here $CLER loads JOBPR fresh).

c. No part of Core Resident System ever does any I/O by JSB EXEC; always does by $SYIO.

d. MP and Interrupt System "ON" when in USER AREA. MP and Interrupt System "OFF" when in System Area.

f. DOSM I/O REQUEST PROCESSING [LARGE CHART].

II. OPERATIONAL DIFFERENCES FROM DOS

A. System Startup

1. Bootstrap rather than BBDL (at X776Ø).

   a. DOS procedure using BBDL.

   b. DOSM procedure using Bootstrap [SLIDES 14A & 14B].

      (1) Configure and execute.

      or (2) Configure, punch configured bootstrap, load configured bootstrap.

   c. No "FR" or "CO" entry statement as in DOS.

B. NEW DIRECTIVES

1. :OFF [SLIDE 15].

   a. Does not clear Job Binary Area.

2. :IN [SLIDE 16A & 16B]

   a. Can prepare discs for use in DOSM that were formatted by other software

   b. DISC PROTECT OVERRIDE SWITCH must be "ON" to purge a protected Disc (PCI=1).

3. :UD [SLIDES 17A, 17B].

4. :DD [SLIDE 18].

   a. No SDUMP with DOSM; do not need!

   b. Source Disc for User Area is current user disc.

5. :SS [SLIDES 19A, 19B].

   a. Duplicate file handling

6. Example Slides using the above directives. [SLIDES 20A, 20B, 20C].

C. Operational Difference Summary [SLIDES 21A, 21B, 21C, 21D].

III. PROGRAMMING DIFFERENCES FROM DOS

A. New EXEC call to change user disc [SLIDES 22A, 22B, 22C].

1. :EJOB resets changes made.

2. Error messages if incorrect SYSTEM GENERATION or SYSTEM PROPRIETARY CODE, but assignment still made.

B. DOS/DOSM EXEC calls with negative request codes [SLIDE 23A].

C. DOSM Disc I/O with EXEC calls [SLIDE 23B].

D. EXEC calls difference summary [SLIDE 24].

E. Other important points.

1. If MP option not used the following are valid.

a. All I/O instructions and HALT

b. Base page modifications.

c. Special interaction with DISC MONITOR (DISCM).

2. LOADR is unaffected by :SS condition. File searches it initiates are for only current user disc. Order of scanning is:

a. JOB BINARY (if any programs in it)
b. USER FILES (if any given)
c. PAPER TAPE (if specified)
d. DISC RESIDENT RELOCATABLE LIBRARY

IV. INSTALLATION

A. Introduction to System Generation.

1. Binary tapes needed [SLIDES 3ØA, 3ØB].

2. Preliminary Considerations

   a. Medium of input

      (1) Paper tape.

      (2) Magnetic tape (restrictions with FORTRAN IV in 8K).

      (3) Combination

   b. Core size [SLIDE 31] -- GENERAL (Projecture #1)

      (1) Speed of System Operation needed.

      (2) Core Resident versus Disc Resident EXEC Modules and I/O Drivers.

      (3) System Modules size breakdown [SLIDE 32] (Projecture #2).

         a. Minimum System Analysis using slides 31 and 32.

   c. Particular needs for given application.

   d. System and User Disc subchannel declaration.

      (1) More efficient (time wise) if System and User Discs are on different drives, depending on what System is doing.

   e. Other System Discs considerations.

      (1) If both generated so that linkage and DISCM are in same place, then user main programs LOADED on one system would "RUN" and be compatable with the other. Location of EXEC entry in DISCM must be same; # links must be enough; Etc...

f. Hardware required for Generation.

3. Starting System Generator

a. SIO Configuration - loading Generator.

b. All equipment to be used "ON".

c. Disc Drive for Generated system "READY".

d. Disc Protect Override Switch "ON".

e. Starting Generator (S.A. = 100 octal).

(1) Switch 15 DOWN for Straight Generation.

(2) Switch 15 UP only for User Disc Formatting.

4. Brief description of the four PHASES and ability to restart at any one at 100 octal.

B. System Generation Procedure and Example

1. Initialization Phase [SLIDE 40A].

a. Responses to questions about the System (in general) to be generated.

b. System Generation Code - maximum 4 decimal positive digits. Written in Label Sector of System Disc.

c. # Sectors/Track - Actually # Sectors/Physical track which is 12 for low density disc.

d. System Disc Size - actually # cylinders.

e. First System Sector - System uses first 3 sectors on track 0 of System Disc.

f. 2114 question - only for DMA considerations (only one DMA Channel available on 2114B).

g. Program Input, Library Input questions - Unimportant whether PT or MT entered here

(1) MT may not be used for FORTRAN IV in 8K.

(2) DF also valid entry for disc file input. (SIO driver for IOMEC available later).

h. Parameter Input question - only applies to PARAMETER INPUT PHASE.

3. Program Input and Parameter Input Phases [SLIDE 40B].

a. Input device selected via S.R. switches Ø-1.

$ØØ_2$ - PROGRAM INPUT
$1Ø_2$ - LIBRARY INPUT
$Ø1_2$ - TERMINATE LOADING

b. Restrictions

(1) DISCM should be loaded first for intersystem compatability.

(2) Main Programs (like FTN) must be loaded prior to segments (like FTNØ1, FTNØ2, ... etc.)

(3) If generating 8K system with FORTRAN IV no Compilers, or Assembler may be loaded at this time. (Must be loaded using LOADR during System operation).

c. If undefined externals exist (message printed), may load module forgot by setting S.R. accordingly as in a. above and pressing "RUN".

d. During PARAMETER INPUT PHASE, be sure to declare other routines ($SRCH, $LBL, etc...) core resident too if certain EXEC modules are declared core resident. Generator will not flag if omitted.

e. LINKAGE QUESTIONS

(1) #SYSTEM LINKS - only used by Core Resident System.

(2) #USER LINKS - only used by User Programs

(3) To make DISCM start at 2ØØØ octal (page boundary) respond with 177 and 5ØØ respectively.

f. Switch 15 must be up for Subroutines (indented two spaces) and entry points (preceeded by "*") to be printed in memory allocation listing.

3. Disc Loading Phase (class follows Xerox of Generation).

TOPIC	[SLIDE] MAIN PROJECTOR	[SLIDE] AUXILIARY PROJECTOR
a. Links	AP-1	
b. Loc. 4-Start of Links	AP-1	AP-6
c. Core Res Prog & Links	AP-1	AP6-13
d. Equip. Table	AP-1,AP-2	AP-14
e. DRT + Int. Tables	AP-1,AP-3	AP-14
f. Disc Res. Exec Mod.---TABLE	AP-1,AP-4	AP-14
g. Disc Res Exec. Mod.	AP-1	AP-5
h. Disc Res. I/O Drivers	AP-1	AP-5
i. Disc Res User Prog.	AP-1	AP-5

j. Value of A-Reg. at end (do on slide 40J)

k. Listing of :EQ & :LU [SLIDE AP-5]

C. Formatting User Discs or Cartridges [SLIDE 41].

1. Example printout [SLIDE 42].

V. INTERNAL SYSTEM ORGANIZATION

A. Format for Disc Files

(1) Absolute (Core Image) [SLIDE 43].

(2) Relocatable [SLIDE 44].

(3) ASCII Source Statements [SLIDES 45A, 45B].

(4) ASCII or Binary Data.

a. System simply reserves space - does not set initial file contents to any value(s).

B. Disc Layout for Generation Example

TOPIC	MAIN PROJECTURE	AUX. PROJECTURE
Overall Disc Layout	5Ø	-----
System Label Sector	51	AD-1
Disc Resident Bootstrap	5Ø	AD-1
System Directory	5Ø,52	AD-1 → AD-3
Core Res. Sys. (#2)	5Ø,53	AD-3 → AD-1Ø
Core Res. Sys. (#3)	5Ø,54,55	AD-1Ø
Disc Res. Programs	5Ø,56	AD-1Ø → AD-24
Core Res. Sys. (#4)	5Ø,57,58	AD-25
Core Res. Sys. (#1)	5Ø,58	AD-26 → AD-27
User Label Sector	5Ø,59	AD-28
User Directory	5Ø,6Ø,61	AD-28 → AD-29

C. Detailed Description of System Base Page Communication Area. (Found in Appendix A of Operators' Manual). Description starts on next page. Slides AP-1 (General Core Layout) and AP-6 (Low Core of Memory Dump) will be used to relate values where possible.

DOS-M BASE PAGE LOCATIONS

LOCATION (S)	TYPE	CONTENTS
3	--	Start address for System Start-up (branched to indirect by Disc Resident Bootstrap following loading of Core Resident System).
4-37	--	JSB N,I where N is a Base Page Location containing the Central Interrupt Controller ($CIC) address.
4Ø	DEC	-64 (177ØØ)
41	DEC	-1Ø (177766)
42	DEC	-9 (177767)
43	DEC	-8 (17777Ø)
44	DEC	-7 (177771)
45	DEC	-6 (177772)
46	DEC	-5 (177773)
47	DEC	-4 (177774)
5Ø	DEC	-3 (177775)
51	DEC	-2 (177776)
52	DEC	-1 (177777)
53	DEC	Ø (Ø)
54	DEC	1 (1)
55	DEC	2 (2)
56	DEC	3 (3)
57	DEC	4 (4)
6Ø	DEC	5 (5)
61	DEC	6 (6)
62	DEC	7 (7)
63	DEC	8 (1Ø)

LOCATION	TYPE	CONTENTS	
64	DEC	9	(11)
65	DEC	10	(12)
66	DEC	17	(21)
67	DEC	64	(100)
70	OCT	17	(17)
71	OCT	37	(37)
72	OCT	77	(77)
73	OCT	177	(177)
74	OCT	377	(377)
75	OCT	177400	(177400)
76	OCT	3777	(3777)
77	OCT	177700	(177700)

LOCATION	LABEL	CONTENTS
100	UMLWA	Last word address of user available memory. Will always be one less than contents of location 123.
101	JBINS	Start TRACK/SECTOR of job binary area. =0 if job binary area not assigned. =-1 if this area overflows during compilation or assembly. = TRACK/SECTOR at end-of-disc for area assigned.
102	JBINC	Current TRACK/SECTOR of job binary area. Only set by compilers or assembler using this area.
103	TBG	Time Base Generator I/O Channel address. Will be 0 if TBG not on system.
104	CLOCK	Minutes part of System Time Clock.
105	CLOCK+1	Tenths of seconds part of System Time Clock.
106	CLEX	Minutes part of execution Time Clock. Bit 15 is set "ON" to turn this clock off.
107	CLEX+1	Tenths of seconds part of Execution Time Clock.
110	CXMX	Maximum allowable execution time. Set by :RUN Directive time parameter or to 5 if not given.

LOCATION	LABEL	CONTENTS
111	BATCH	Logical Unit # of Batch Input Device. Set by :BATCH Directive.
112	SYSTY	Logical Unit # of System Teletype.
113	DUMPS	Abort/Post Mortem dump flags. Bit 15 --- Abort dump flag. Bit Ø --- Post mortem dump flag. Bit will be on if condition set. These bits will be set by :ADUMP and :PDUMP Directives and cleared by either their execution, :OFF Directive, or new :JOB Directive.
114	SYSDR	System Directory start TRACK/SECTOR. Set to where system is declared as starting during generation.
115	SYSBF	System Buffer TRACK/SECTOR. Since always on track boundary, sector part will always be Ø.
116	SECTR	Number of logical sectors per disc track.
117	EQTAB	Start Address of Equipment Table.
12Ø	EQT#	Number of entries in entire Equipment Table.. Each entry is 17 words.
121	LUTAB	Start address of Logical Unit Table.
122	LUT#	Number of entries in Logical Unit Table.
123	JBUF	Start address of Job Input Buffer.
124	JFILS	Start TRACK/SECTOR address of source file. Set by execution of :JFILE Directive.

LOCATION	LABEL	CONTENTS
125	JFILC	Current TRACK/SECTOR address of source file. Updated as Compiler or Assembler accesses the source file.
126-140	RONBF RONBF+1 ⋮ RONBF+10	Multi-purpose 11 word buffer used by system when user program is executing. Some uses are: (1) Saving of two 5 word user File directory entries to increase system efficiency when user program is running on only one subchannel. System looks here first for Directory entry before searching Disc Directory. (2) Contains actual parameter valves (P1,P2,...) following :PROG, and :GO directives. (3) Information is passed to $EX20 (Parity Error Processor) by these locations.
141-153	EXPG ⋮ EXPG+10	Directory Entry for currently executing USER program. For MAIN programs having segments: The first 2 1/2 words will always be those of the MAIN program's Directory entry (File Name in ASCII) with the remaining 8 1/2 words equal to the segment currently executing Directory entry information.
154	DISCO	Bits 11-15 (Disc Data Channel select code). Bits 0-10 (Last Track on System).
155	SYSSC	System Disc Subchannel number. Will always be equal to S.C. bootstrapped down from.

LOCATION	LABEL	CONTENTS
156	SCCNT	Number of Subchannels on System -1.
157	UDNTS	Next TRACK/SECTOR address on Current User Disc.
160	SYNTS	Next TRACK/SECTOR address on System Disc. Will always equal the start of Work Area.
161	CUDSC	Current User Disc subchannel number.
162	CRFLG	Current Disc request flag.(Ø for System Disc; ≠Ø for Current User Disc). DVR31 always clears on completion of Disc request and examines on entry to see what disc to access.
163	CUDLA	Current User Disc TRACK/SECTOR address last accessed. Only used by DVR31.
164	SDLA	System Disc TRACK/SECTOR address last accessed. Only used by DVR31.
165	CUMID	Computer identification code. (≠Ø if computer is 2114B thus only having one DMA channel).
166-170	DBUFR	System Disc Request Parameter Buffer. DBUFR = TRACK/SECTOR DBUFR+1 = BUFFER ADDRESS DBUFR+2 = NUMBER OF WORDS (Set by System prior to Disc I/O for DVR31 to use).

LOCATION	LABEL	CONTENTS
171-173	UBUFR	Current User Disc Request Paramenter Buffer. UBUFR = TRACK/SECTOR UBUFR+1 = BUFFER ADDRESS UBUFR+2 = NUMBER OF WORDS (set by System prior to Disc I/O for DVR31 to use).
174	TSONE	Last referenced TRACK/SECTOR address +1. Set by DVR31. Could be used by User program accessing the WORK AREA to see what next available TRACK/SECTOR address is.
175	GUDSC	Default User Disc Subchannel number. Always follows System Disc Subchannel number when Default User Disc is on same subchannel as System. (like when :DD executed), otherwise it stays where started W.R.T. Bootstrapped System.
176	SYSCD	System Generation Code.
177	JFLSC	Current Source File Subchannel number. Set by :JFILE Directive.
200	DISCL	User label TRACK/SECTOR address. =Ø if Current User Disc is not on System Disc. If Current User Disc is on System Disc this Disc address = System Buffer Sector address. Incrementing this Disc address by one sector always gives the start of the User Directory TRACK/SECTOR address on the Current User Disc.

LOCATION	LABEL	CONTENTS
201	INTAB	Start address of Interrupt Table.
202	INT#	Number of Interrupt Table entries.
203-223	EQT1 EQT2 ⋮ EQT17	Addresses of Current Equipment Table Entry
224	RQCNT	Number of request parameters in current EXEC call. JSB EXEC and DEF RTN are not counted.
225	RQRTN	Request return address in current EXEC call.
226-235	RQP1 RQP2 ⋮ RQP8	Addresses of current request parameters. RQP1 is for the request code address etc.
236	NABRT	Illegal request code abort/no abort option parameter. ≠Ø if set. Set by N parameter in :RUN Directive.
237	XA	A Register contents at time of interrupt.
240	XB	B Register contents at time of interrupt.
241	XEO	E (Bit 15) and O (Bit Ø) Register contents at time of interrupt.
242	XSUSP	Address at time of interrupt (P-Register)
243	EXLOC	Start address of EXEC MODULE DOUBLET TABLE

LOCATION	LABEL	CONTENTS
244	EX#	Number of entries in EXEC MODULE DOUBLET TABLE.
245	EXMOD	EXEC MODULE currently in EXEC MODULE overlay area. = Ø if none resident. = +N if module #N resident and available. = -N if module #N resident and BUSY.
246	EXMAN	EXEC MODULE overlay area low Main Core Address.
247	EXMAN+1	EXEC MODULE overlay area high Main Core Address.
25Ø	EXBAS	EXEC MODULE Base Page linkage low address.
251	EXBAS+1	EXEC MODULE Base Page linkage high address.
252	IODMN	START ADDRESS OF I/O Driver Main overlay area.
253	IODBS	Start address of I/O Driver Base Page overlay area.
254	UMFWA	Start address of User Main Area.
255	UBFWA	Start address of User Base Page Linkage Area.
256	UBLWA	Last word address of User Base Page Linkage Area.
257	CHAN	Current DMA channel number assigned. = Ø if no DMA in use.

LOCATION	LABEL	CONTENTS
26Ø	OPATN	Operator attention flag. = Ø for not set. ≠ Ø if desired. Set by System TTY Driver.
261	OPFLG	System TTY busy flag. = Ø if not busy. ≠ Ø if busy.
262	SWAP	Job Processor resident flag. BIT 15 = 1 if System TTY is Batch Device. BIT Ø = 1 if Job Processor is in core.
263	JOBPM	Job Processor start TRACK/SECTOR address.
264	JOBPM+1	# of words in MAIN section of Job Processor.
265	JOBPB	# of words in Base Page Linkage for Job Processor.
266	EJOBF	End-of-Job flag used only by Job Processor. = "blanks" if re-entry of :DATE allowed = Ø if in a job. = 1 if between jobs. = -1 if end-of-job.
267	RTRK	Real Time simulation track #.
27Ø-467	$BUF $BUF+1 ⋮ $BUF+127	128 Word System I/O Buffer. Used only by Monitor and EXEC modules.
47Ø	$GOPT	Point of suspension return address. Contains return address when $IDCD (location 471 below) = GO

LOCATION	LABEL	CONTENTS
471	$IDCD	Input request code check characters. = Ø for no special restrictions. ≠ Ø for special restrictions placed on what can be entered via system TTY keyboard (like DA, GO, etc...).
472-473	$MDBF	2 Word EXEC Module Data Buffer.
474-5Ø2	TEMP TEMP+1 ⋮ TEMP+6	System Temporary.
5Ø3	TEMPØ	System Temporary.
5Ø4	TEMP1	System Temporary.
5Ø5	TEMP2	System Temporary.
5Ø6	TEMP3	System Temporary.
5Ø7	TEMP4	System Temporary.
51Ø	TEMP5	System Temporary.
511	MSECT	Negative # of logical SECTORS per TRACK.
512	VADR	Address of last instruction that caused a memory protect violation.
513	IODMD	I/O Driver Overlay Area resident flag. = Ø if no I/O Driver in this area. ≠ Ø if an I/O Driver is in this area. The value (if not Ø) will be: + (Address of resident Driver's first EQT entry) if area is available OR - (Address of resident Driver's first EQT entry) if this area is not available

514	RCODE	Current request code value. Will always be positive.
515	SXA	Operator attention A Register save.
516	SXB	Operator attention B Register save.
517	SXEO	Operator attention E (Bit 15) and O (Bit Ø) Register save.
52Ø	SXSUS	Operator attention return address save (P-Resister).
521	SEQTI	Operator attention EQT Table address save.
522	DSCLB	Disc TRACK/SECTOR Address of Disc Resident Relocatable Library. Used by Relocating Loader.
523	DSCL#	Number of sectors in Disc Resident Relocatable Library.
524	LSTCH	Last Disc referenced flag. = Ø if current user program (to be executed by :PROG or :RUN) is on System Disc. ≠ Ø if current user program (to be executed by :PROG or :RUN) is on Current User Disc.
	NOTE:	$EXIO (Program Load) uses to see how to set CRFLG flag (location 162).
525	FLFLG	User file table validity flag. (= Ø if invalid; ≠ Ø if valid). $EXII uses to see if OK to use $BUF area for user file directory entry storage.

LOCATION	LABEL	CONTENTS
526	XFLG	Transfer Address for Disc Not Ready condition. = Ø to process Not Ready condition normally. ≠ Ø to transfer to this address if Not Ready condition present. A good use is to ignore "NOT READY" Drives when doing multiple Drive System Searches.
527	SSFLG	System Search Flag Values it can have are: a. ASCII "NO" if :SS Directive not allowed. b. Ø for only current user Disc (:SS,99 condition). c. -X for full System Search (:SS) where X= # subchannels on system -1. d. +X for Selected System Search Bits Ø-7 are used to represent Subchannels Ø-7 respectively. Bit ON=OK, Bit OFF=not OK.
53Ø-531	CHARC	System Temporary.

VI. INTERNAL SYSTEM OPERATION

A. IOMEC Command Sequences

1. Seek Record [SLIDE 69A]
2. Read Data [SLIDE 69B]
3. Write Data [SLIDE 69C]
4. Check Data [SLIDE 69D]
5. Status Check [SLIDE 69E]
6. Constants and Storage [SLIDE 69F] -- Second Projector

B. Supplied DOS-M Bootstrap Listing Study ("A" Version)

1. Configuration Section (Start Address =2) [SLIDES 7ØD - 7ØF]
   a. Data Channel in Switches Ø-5
   b. Configure DMA Control Word
   c. Loop to Configure all D.C. and C.C. Instructions
   d. Switch 15 Down -- HALT
      Switch 15 UP -- Punch Configured Bootstrap in absolute tape format.
2. Execution Section (Start Address =1ØØB or 5) [SLIDES 7ØA-7ØC]
   a. Loads Disc Resident Bootstrap form Track Ø Sectors 1 & 2 on Subchannel specified to memory locations 154ØØ - 15777 octal.
   b. Sets locations in DRB as follows:

      15771 ◄— Ø.
      15772 ◄— Head # (Bits 8-9).
      15776 ◄— System Disc Drive #.
      15773, 15774 ◄— Data Channel I/O select code for Run Time Disc.
      15775 ◄— Command Channel I/O select code for Run Time Disc.

   c. Uses address in ASPBF of DRB (which was set earlier during generation) to see what page LWAM declared in adjusts for one page lower for relocation of Disc Resident Bootstrap.
   d. Adjusts DEF's in DRB for correct page (ASPBF, DEFDY, and DVADR).
   e. Relocates entire DRB to new page -- only does page relative move.

f. Transfers control to relocated DRB to have it bring in Core Resident DOS-M System from Disc.

C. Disc Resident Bootstrap (DRB) Listing Study [SLIDES 71A - 71F]

1. Configures all Disc I/O instructions (within locations 15643-15724 octal) according to Data Channel already setup in location 15773 by supplied bootstrap.
2. Calls PLOAD routine four times to load in the four sections of Core Resident System defined in ASPBF through ASPBF+11 (3 words per load). SLOAD reads a sector at a time. Note how DMA Control Word does not have to be output again here because it was already outputted by Supplied Bootstrap in loading DRB.
3. Examine Equipment Table of CRS just loaded to accomplish the following:
   a. For DVRØ5 - configure all I/O instructions in this System TTY driver.
   b. For DVR31 - modify its EQT entry for "RUN TIME DISC" channels. Configure all I/O instructions in this driver. Configure DMA control word in this driver. Set + and - # sectors per track locations in this driver.
4. Set RUN TIME DISC channel in DISCO (base page location 154B; bits 15-11).
5. Set RUN TIME DISC Interrupt Table entries in correct interrupt table entry and also put correct entry in interrupt table where Generator Disc Channel entries were.
6. Set new I/O channels in Equipment Table for devices swapped with RUN TIME DISC.
7. Set RUN TIME SYSTEM Subchannel in Base Page location 155 octal from information passed by Supplied Bootstrap.
8. Set User Label TRACK/SECTOR Disc Address (Base Page location 2ØØ octal) according to Base Page locations 155 and 175 octal.
9. Set Next TRACK/SECTOR Address on Current User Disc (Base Page Location 157 octal).
10. Set Current User Disc Subchannel # (location 161) equal to Default User Disc Subchannel # (location 175).
11. Branch to location 3 indirect to start DOS-M System.

D. DOS-M System Halts [SLIDE 72]

These Halts are only during System Operation following successful bootstrap.

E. DOS-M I/O Request Processing Example

1. Materials used

   a. Tape Recording of step by step execution

   b. Large chart of DOS-M I/O Request Processing

   c. Foldout flowcharts on DOS-M (next section)

   d. Slides

      (1) Equipment Table Format; # 10B

      (2) Device Reference Table Format; # 10C

      (3) Interrupt Table Format; # 10D

2. Procedure

   a. Using the above tape recording and materials, trace an example I/O Request Operation (b below) through all major steps that occur from the initial EXEC call until the I/O operation is complete.

   b. The example I/O operation will be:

```
      JSB EXEC          (Call to Executive Supervisor)
      DEF RTN           (Define Return Address)
      DEF RCODE         (Define Request Code Address)
      DEF CONWD         (Define Control Word Address)
      DEF BUFA          (Define Buffer Start Address)
      DEF BUFL          (Define Buffer Length Address)
RTN (Return Point)
        .
        .
        .
RCODE DEC 1             (Read Operation R.C.)
CONWD OCT 5             (Logical Unit 5)
BUFA  BSS 36            (36 word or 72 char. Buffer)
BUFL  DEC -72           (72 character length)
```

DOS-M FLOWCHARTS TABLE OF CONTENTS

DISC MONITOR

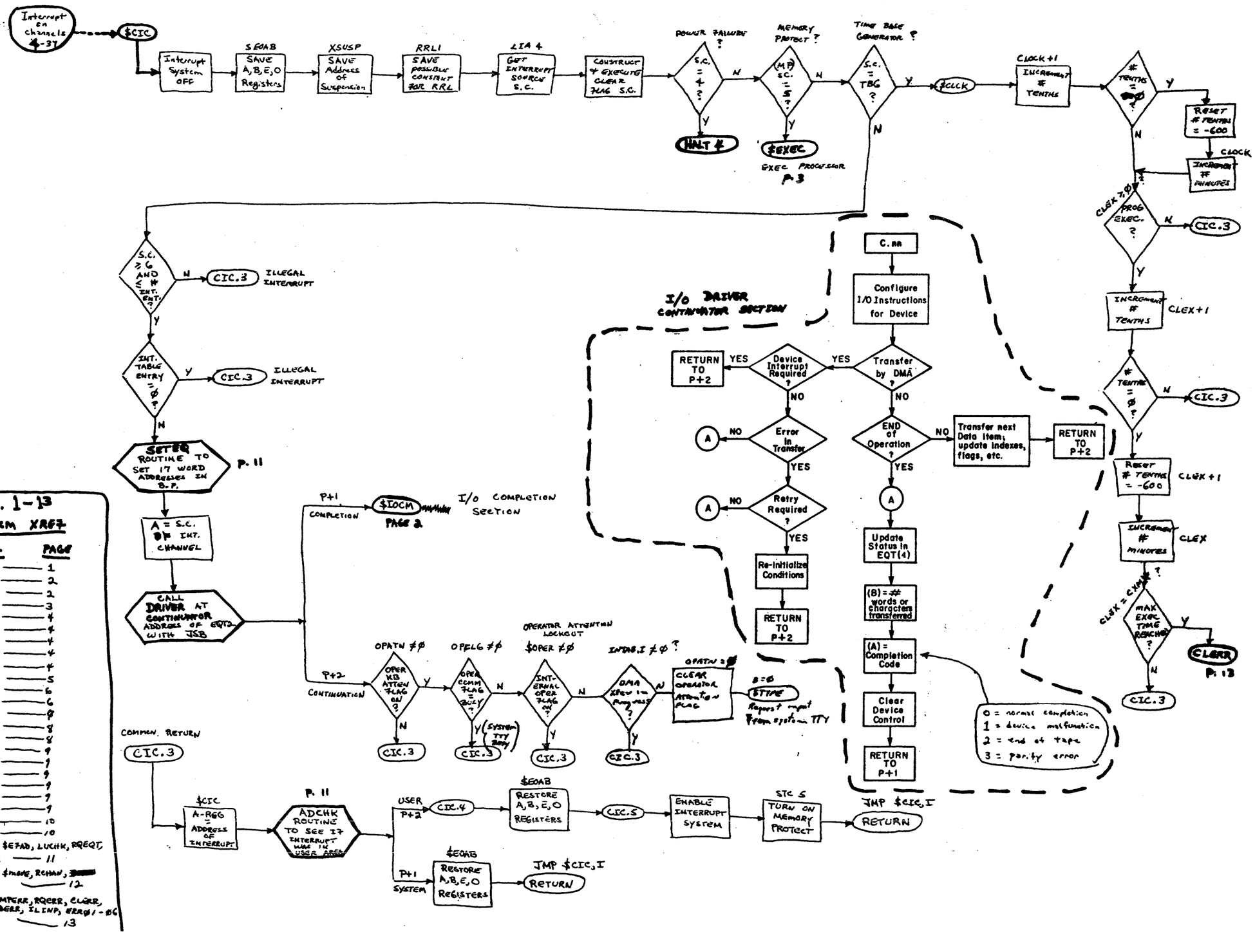
EXECUTIVE MODULES

EXECUTIVE MODULES (continued)

SYSTEM SUBROUTINES

DRIVERS

CENTRAL INTERRUPT CONTROL PROCESSOR ($CIC)

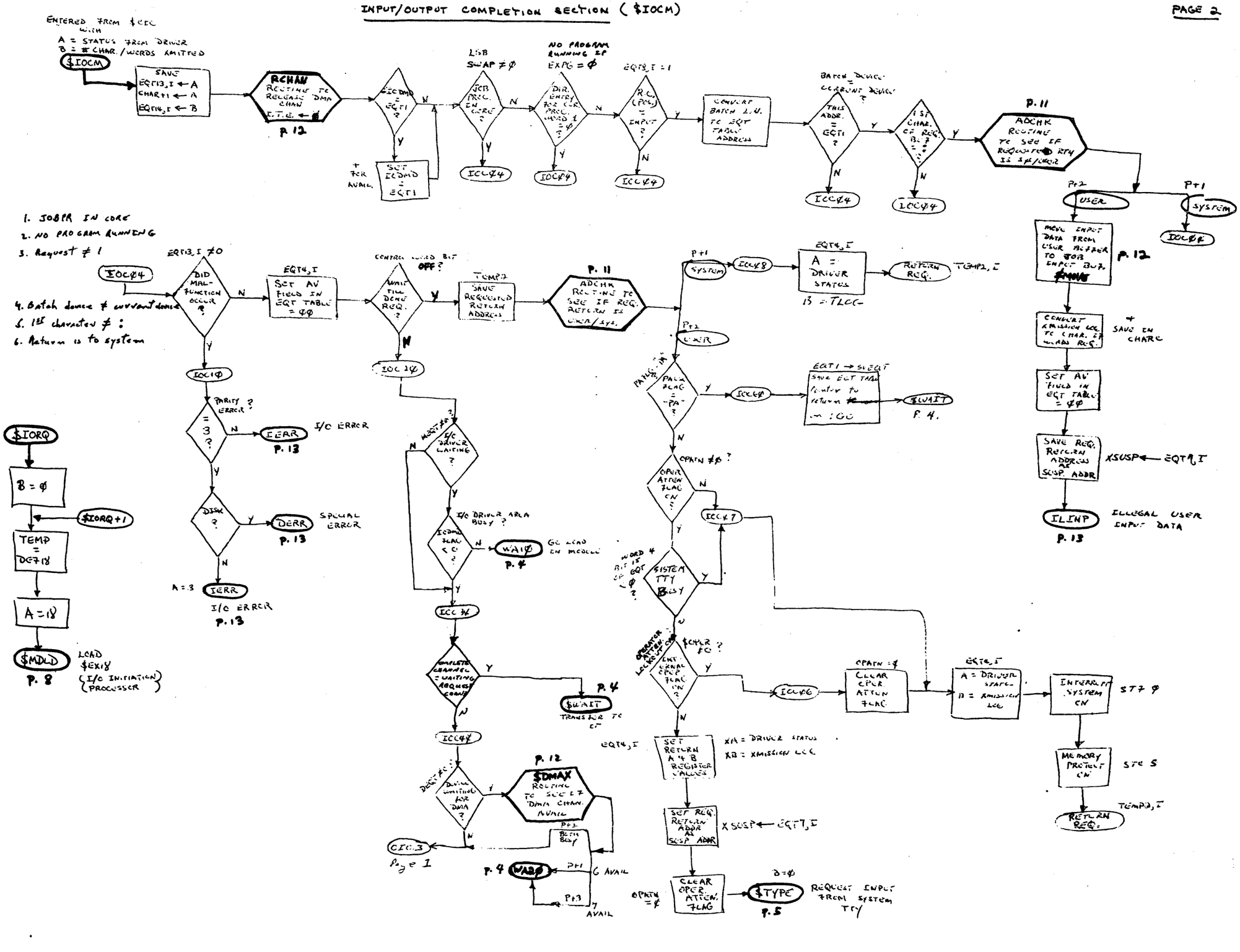


p. 1-13

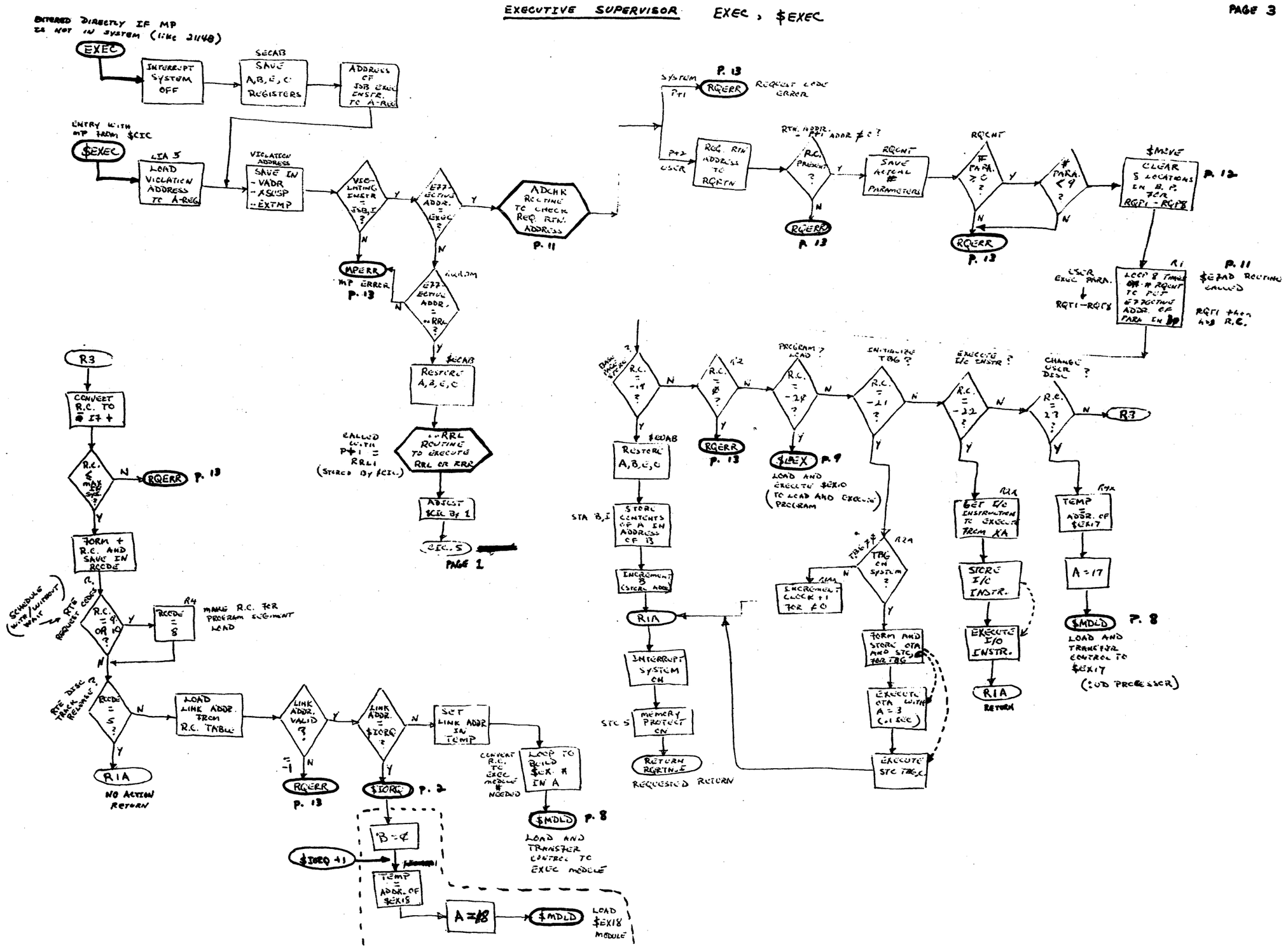
DISCM XREF

LABEL	PAGE
$CIC	1
$IOCM	2
$IORQ	2
EXEC	3
$WAIT	4
$BLOP	4
$MBSY	4
$DMA	4
$EBSY	4
$TYPE	5
$SYIO	6
DRIVR	6
$TEST	8
$JLOD	8
$MDLD	8
$LDVR	9
DISCK	9
$GDTK	9
$DISC	9
$LDEX	9
$STAT	9
$IRLI	10
$CLER	10
ADCHK, $EFAD, LUCHK, RREQT, SETEQ	11
$DMAX, $MASK, RCHAN, [redacted]	12
ERRTN, MTERR, RQERR, CLERR, ERR, BGER, ILINP, ERR0/-8C	13

INPUT/OUTPUT COMPLETION SECTION ($IOCM)

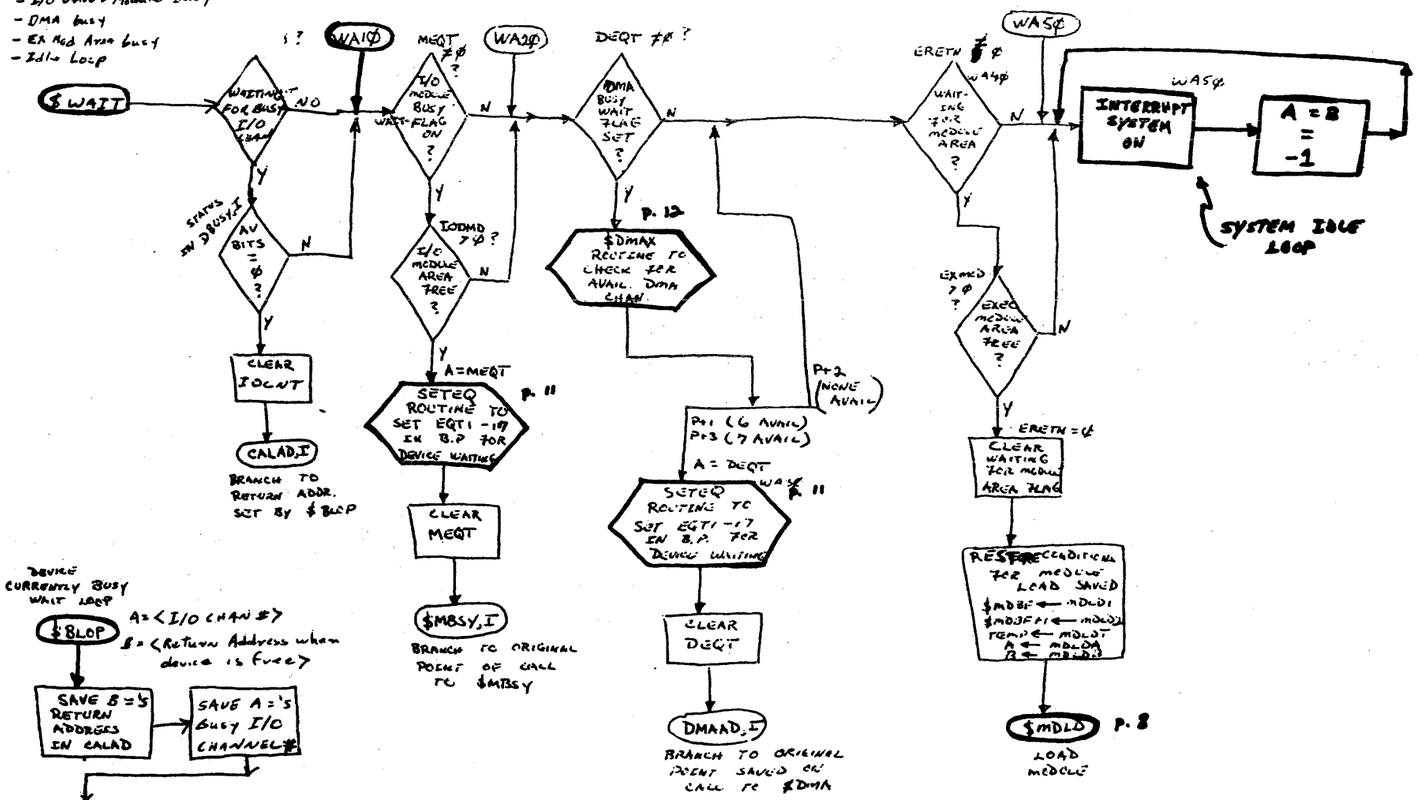


EXECUTIVE SUPERVISOR EXEC, $EXEC

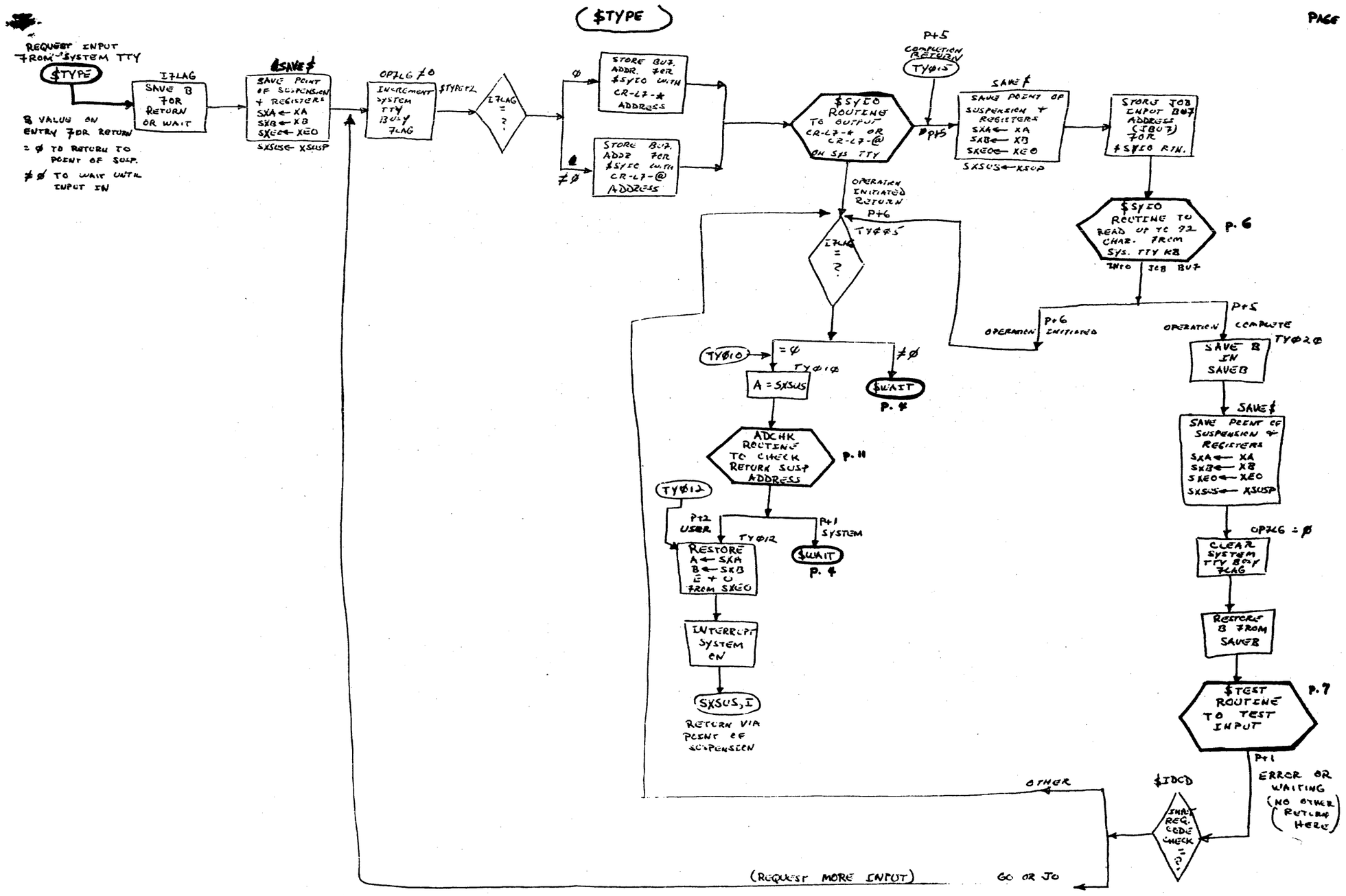


$WAIT, $BLOP, $MBSY, $DMA, $EBSY

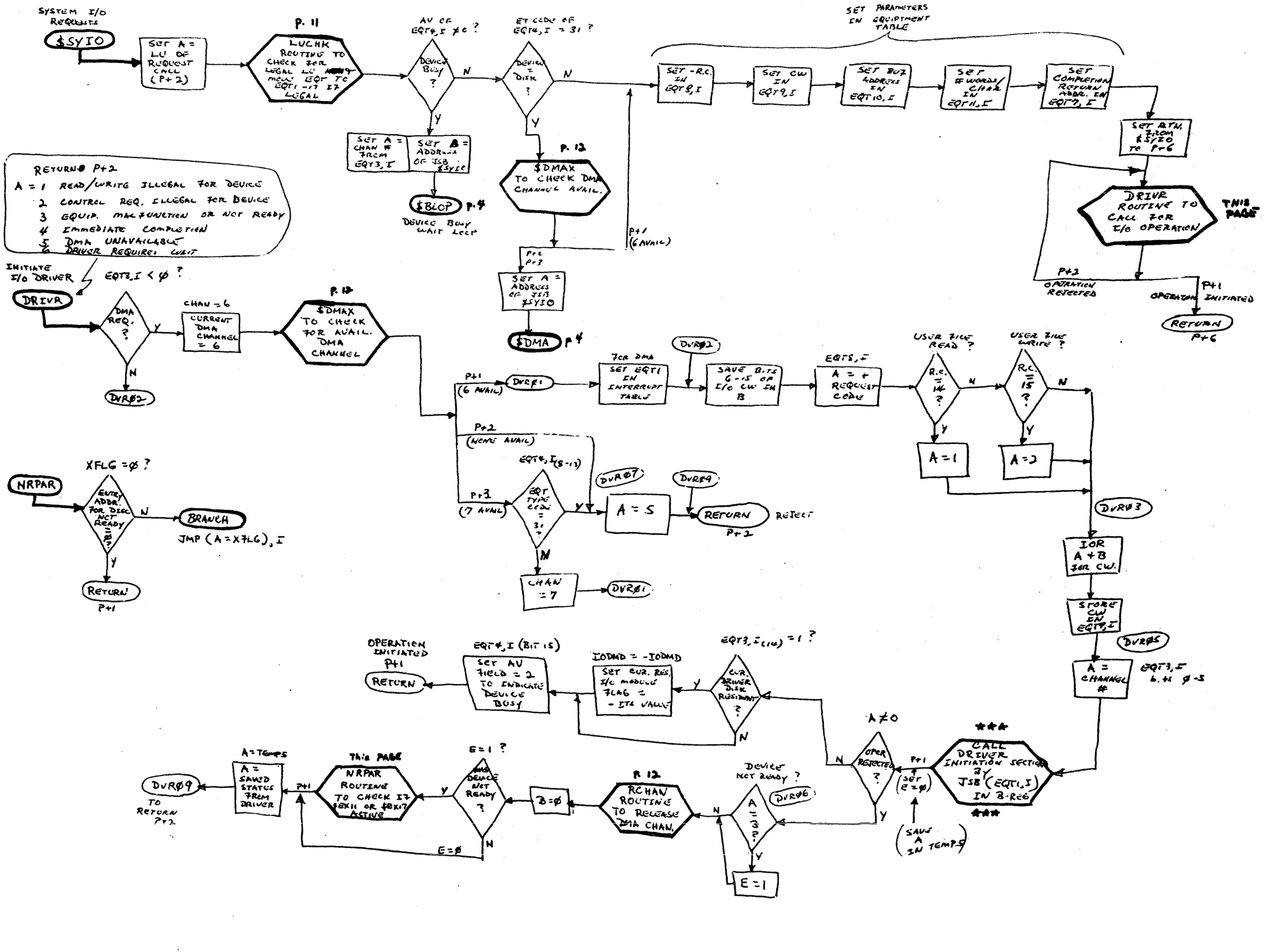
System Idling
- Busy I/O CHAN
- I/O Device Module busy
- DMA busy
- EA Mod Area busy
- Idle Loop



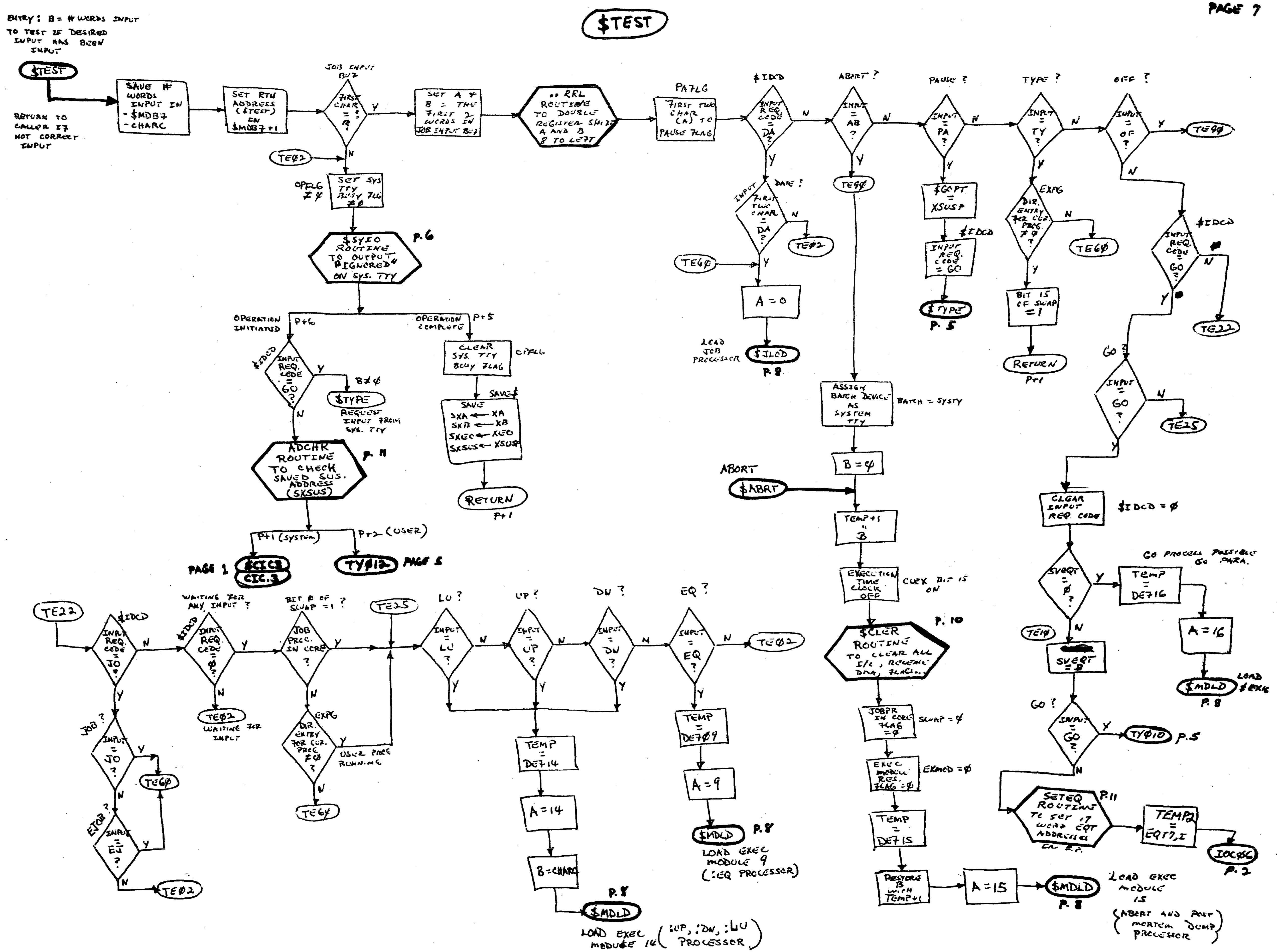
$TYPE


REQUEST INPUT FROM SYSTEM TTY
$TYPE
I7LAG
SAVE B FOR RETURN OR WAIT
B VALUE ON ENTRY FOR RETURN
= Ø TO RETURN TO POINT OF SUSP.
≠ Ø TO WAIT UNTIL INPUT IN
$SAVE$
SAVE POINT OF SUSPENSION + REGISTERS
SXA ← XA
SXB ← XB
SXEO ← XEO
SXSUS← XSUSP
OP7LG ≠ Ø
INCREMENT SYSTEM TTY BUSY FLAG
$TYP012
I7LAG = ?
Ø
≠ Ø
STORE BUF. ADDR. FOR $SYEO WITH CR-L7-* ADDRESS
STORE BUF. ADDR FOR $SYEO WITH CR-L7-@ ADDRESS
$SYEO ROUTINE TO OUTPUT CR-L7-* OR CR-L7-@ ON SYS TTY
P+5 COMPLETION RETURN
TYØ15
P+5
SAVE $
SAVE POINT OF SUSPENSION + REGISTERS
SXA ← XA
SXB ← XB
SXEO ← XEO
SXSUS ← XSUSP
STORE JOB INPUT BUF ADDRESS (JIBUF) FOR $SYEO RTN.
$SYEO ROUTINE TO READ UP TO 72 CHAR. FROM SYS. TTY KB
P. 6
INTO JOB BUF
OPERATION INITIATED RETURN
P+6
TY@5
I7LAG = ?
OPERATION P+6 INITIATED
OPERATION P+5 COMPLETE
TY@20
SAVE B IN SAVEB
SAVE $
SAVE POINT OF SUSPENSION + REGISTERS
SXA ← XA
SXB ← XB
SXEO ← XEO
SXSUS ← XSUSP
OP7LG = Ø
CLEAR SYSTEM TTY BUSY FLAG
RESTORE B FROM SAVEB
$TEST ROUTINE TO TEST INPUT
P. 7
P+1
ERROR OR WAITING (NO OTHER RETURNS HERE)
$IOCD
SNAT REQ. CODE CHECK = ?
OTHER
GO OR JO
TY@10
= Ø
≠ Ø
A = SXSUS
$WAIT
P. 4
ADCHK ROUTINE TO CHECK RETURN SUSP ADDRESS
P. 11
TY@12
P+2 USER
P+1 SYSTEM
RESTORE A ← SXA B ← SXB E + U FROM SXEO
INTERRUPT SYSTEM ON
SXSUS, I
RETURN VIA POINT OF SUSPENSION
(REQUEST MORE INPUT)

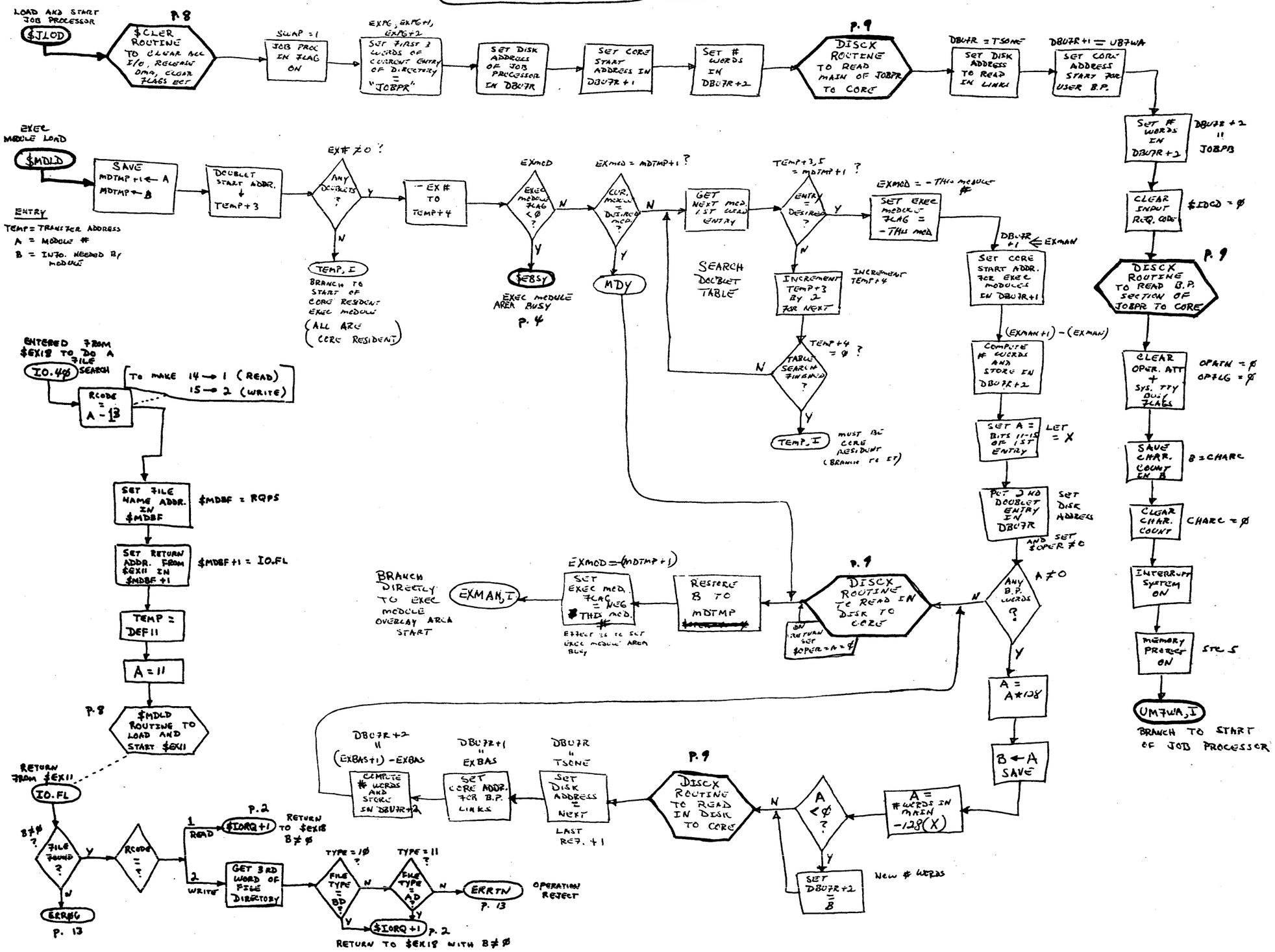
$SYIO, DRIVR


SYSTEM I/O REQUESTS
$SYIO
SET A = LU OF REQUEST CALL (P+2)
P. 11
LUCHK ROUTINE TO CHECK FOR LEGAL LU ... MOVE EQT TO EQT1 -17 IF LEGAL
AV OF EQT4,I ≠ 0 ?
DEVICE BUSY ?
N
Y
ET CODE OF EQT4,I = 31 ?
DEVICE = DISK ?
N
Y
SET A = CHAN # FROM EQT3,I
SET B = ADDRESS OF ISB $SYIO
$BLOP P.4
DEVICE BUSY WAIT LOOP
P. 12
$DMAX TO CHECK DMA CHANNEL AVAIL.
SET PARAMETERS IN EQUIPMENT TABLE
SET -R.C. IN EQT8,I
SET CW IN EQT9,I
SET BUF ADDRESS IN EQT10,I
SET # WORDS/CHAR IN EQT11,I
SET COMPLETION RETURN ADDR. IN EQT9,I
SET RTN. FROM $SYIO TO P+6
DRIVR ROUTINE TO CALL FOR I/O OPERATION
THIS PAGE
P+2 OPERATION REJECTED
P+1 OPERATION INITIATED
RETURN
P+6
RETURNS P+2
A = 1 READ/WRITE ILLEGAL FOR DEVICE
2 CONTROL REQ. ILLEGAL FOR DEVICE
3 EQUIP. MALFUNCTION OR NOT READY
4 IMMEDIATE COMPLETION
5 DMA UNAVAILABLE
6 DRIVER REQUIRES CWLIT
INITIATE I/O DRIVER
DRIVR
EQT3,I < 0 ?
DMA REQ. ?
Y
N
DVR02
CHAN = 6
CURRENT DMA CHANNEL = 6
P. 13
$DMAX TO CHECK FOR AVAIL. DMA CHANNEL
P+2
P+3
SET A = ADDRESS OF ISB $SYIO
$DMA P.4
P+1 (6 AVAIL)
DVR01
FOR DMA
SET EQT1 IN INTERRUPT TABLE
DVR02
SAVE BITS 6-15 OF I/O CW IN B
EQT8,I
A = -R REQUEST CODE
USER BUF READ ?
R.C. = 14 ?
USER BUF WRITE ?
R.C. = 15 ?
A = 1
A = 2
DVR03
IOR A+B FOR CW.
STORE CW IN EQT7,I
DVR05
A = CHANNEL #
EQT3,I bits 6-11
P+2 (NONE AVAIL)
EQT4,I(8-13)
EQT TYPE CODE = 31 ?
DVR07
DVR09
A = 5
RETURN
REJECT
P+2
P+3 (7 AVAIL)
CHAN = 7
DVR01
XFLG = 0 ?
NRPAR
ENTRY ADDR. FOR DISC NOT READY = 0 ?
N
Y
BRANCH
JMP (A=XFLG),I
RETURN
P+1
OPERATION INITIATED
P+1
RETURN
EQT4,I (BIT 15)
SET AV FIELD = 2 TO INDICATE DEVICE BUSY
IODMD = -IODMD
SET CUR. RES. I/O MODULE FLAG = - ITS VALUE
EQT3,I(14) = 1 ?
CUR. DRIVER DISK RESIDENT ?
Y
N
A ≠ 0
OPER REJECTED ?
N
Y
P+1
SET E = 0
SAVE A IN TEMP 5
CALL DRIVER INITIATION SECTION BY JSB (EQT1,I) IN B-REG
DEVICE NOT READY ?
A = 3 ?
DVR06
N
Y
E = 1
R 12
RCHAN ROUTINE TO RELEASE DMA CHAN.
B = 0
E = 1 ?
AND DEVICE NOT READY ?
y
N
E = 0
This PAGE
NRPAR ROUTINE TO CHECK IF $BX11 OR $BX17 ACTIVE
P+1
A = TEMP 5
A = SAVED STATUS FROM DRIVER
DVR09
TO RETURN P+2

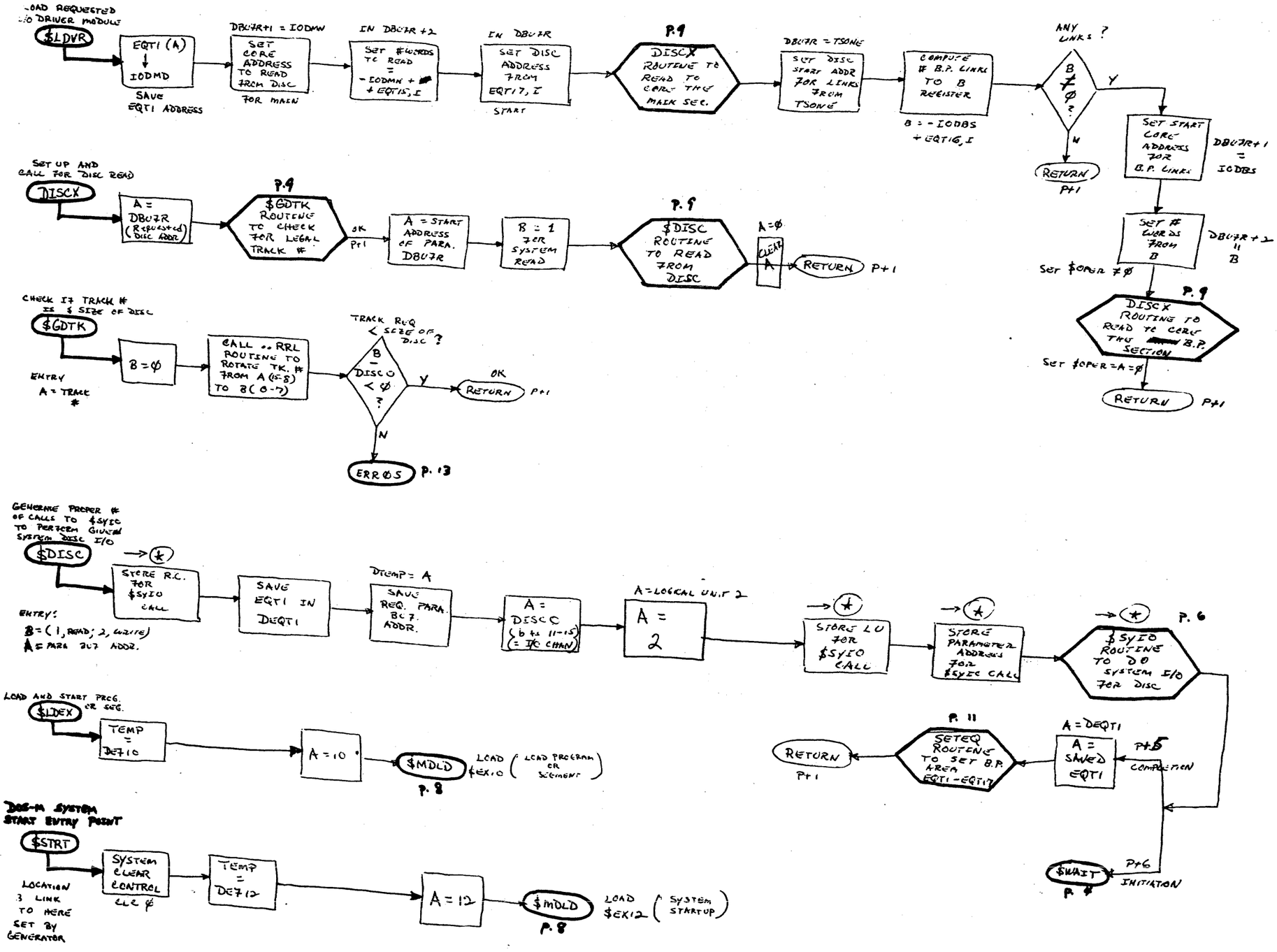
$TEST


ENTRY: B = # WORDS INPUT
TO TEST IF DESIRED INPUT HAS BEEN INPUT
$TEST
RETURN TO CALLER IF NOT CORRECT INPUT
SAVE # WORDS INPUT IN -$MDB7 -CHARC
SET RTN ADDRESS ($TEST) IN $MDB7+1
JOB INPUT BUF
FIRST CHAR = !?
SET A & B = THE FIRST 2 WORDS IN JOB INPUT BUF
RRL ROUTINE TO DOUBLE REGISTER SHIFT A AND B 8 TO LEFT
PAFLG
FIRST TWO CHAR (A) TO PAUSE FLAG
$IDCD
INPUT REQ. CODE = DA ?
ABORT ?
INPUT = AB ?
PAUSE ?
INPUT = PA ?
TYPE ?
INPUT = TY ?
OFF ?
INPUT = OF ?
TE99
TE02
OPFLG ≠ Ø
SET SYS TTY BUSY FLG ≠ Ø
$SYIO ROUTINE TO OUTPUT "IGNORED" ON SYS. TTY
P.6
OPERATION INITIATED P+6
OPERATION COMPLETE P+5
$IDCD
INPUT REQ. CODE = GO ?
B ≠ Ø
$TYPE
REQUEST INPUT FROM SYS. TTY
ADCHR ROUTINE TO CHECK SAVED SUS. ADDRESS (SKSUS)
P. 11
P+1 (SYSTEM)
P+2 (USER)
PAGE 1
$CIC2
CIC.3
TY$12
PAGE 5
CLEAR SYS. TTY BUSY FLAG
OPFLG
SAVE$
SAVE SXA ← XA SXB ← XB SXEO ← XEO SXSUS ← XSUS
RETURN P+1
DATE ?
INPUT FIRST TWO CHAR = DA ?
TE02
TE60
A = 0
LOAD JOB PROCESSOR
$JLOD
P.8
TE90
$GOPT = XSUSP
$IDCD
INPUT REQ. CODE = GO
$TYPE
P. 5
EXPG
DIR. ENTRY FOR CUR. PROG. ≠ Ø ?
TE60
BIT 15 OF SWAP = 1
RETURN P+1
$IDCD
INPUT REQ. CODE = GO
TE22
GO ?
INPUT = GO ?
TE25
ASSIGN BATCH DEVICE AS SYSTEM TTY
BATCH = SYSTY
B = Ø
ABORT
$ABRT
TEMP+1 = B
EXECUTION TIME CLOCK OFF
CLEX BIT 15 ON
$CLER ROUTINE TO CLEAR ALL I/O, RELEASE DMA, FLAGS...
P. 10
JOBPR IN CORE FLAG = Ø
SWAP = Ø
EXEC MODULE RES. FLAG = Ø
EXMOD = Ø
TEMP = DEF15
RESTORE B WITH TEMP+1
A = 15
$MDLD
P. 8
LOAD EXEC MODULE 15 (ABORT AND POST MORTEM DUMP PROCESSOR)
CLEAR INPUT REQ. CODE
$IDCD = Ø
GO PROCESS POSSIBLE GO PARA.
SVEQT = Ø ?
TEMP = DEF16
A = 16
$MDLD
LOAD $EX16
P. 8
TE10
SVEQT = B
GO ?
INPUT = GO ?
TY$10
P.5
SETEQ ROUTINE TO SET 17 WORD EQT ADDRESSES IN B.P.
P.11
TEMP2 = EQT7,I
IOC$6
P. 2
TE22
$IDCD
INPUT REQ. CODE = JO ?
WAITING FOR ANY INPUT ?
$IDCD
INPUT REQ. CODE = Ø ?
TE02
WAITING FOR INPUT
BIT Ø OF SWAP = 1 ?
JOB PROC. IN CORE ?
EXPG
DIR. ENTRY FOR CUR. PROG. ≠ Ø ?
USER PROG RUNNING
TE64
TE25
JOB ?
INPUT = JO ?
TE60
EJOB ?
INPUT = EJ ?
TE02
LU ?
INPUT = LU ?
UP ?
INPUT = UP ?
DN ?
INPUT = DN ?
EQ ?
INPUT = EQ ?
TE02
TEMP = DEF14
A = 14
B = CHARC
P.8
$MDLD
LOAD EXEC MODULE 14 (:UP, :DN, :LU PROCESSOR)
TEMP = DEF09
A = 9
$MDLD
P.8
LOAD EXEC MODULE 9 (:EQ PROCESSOR)

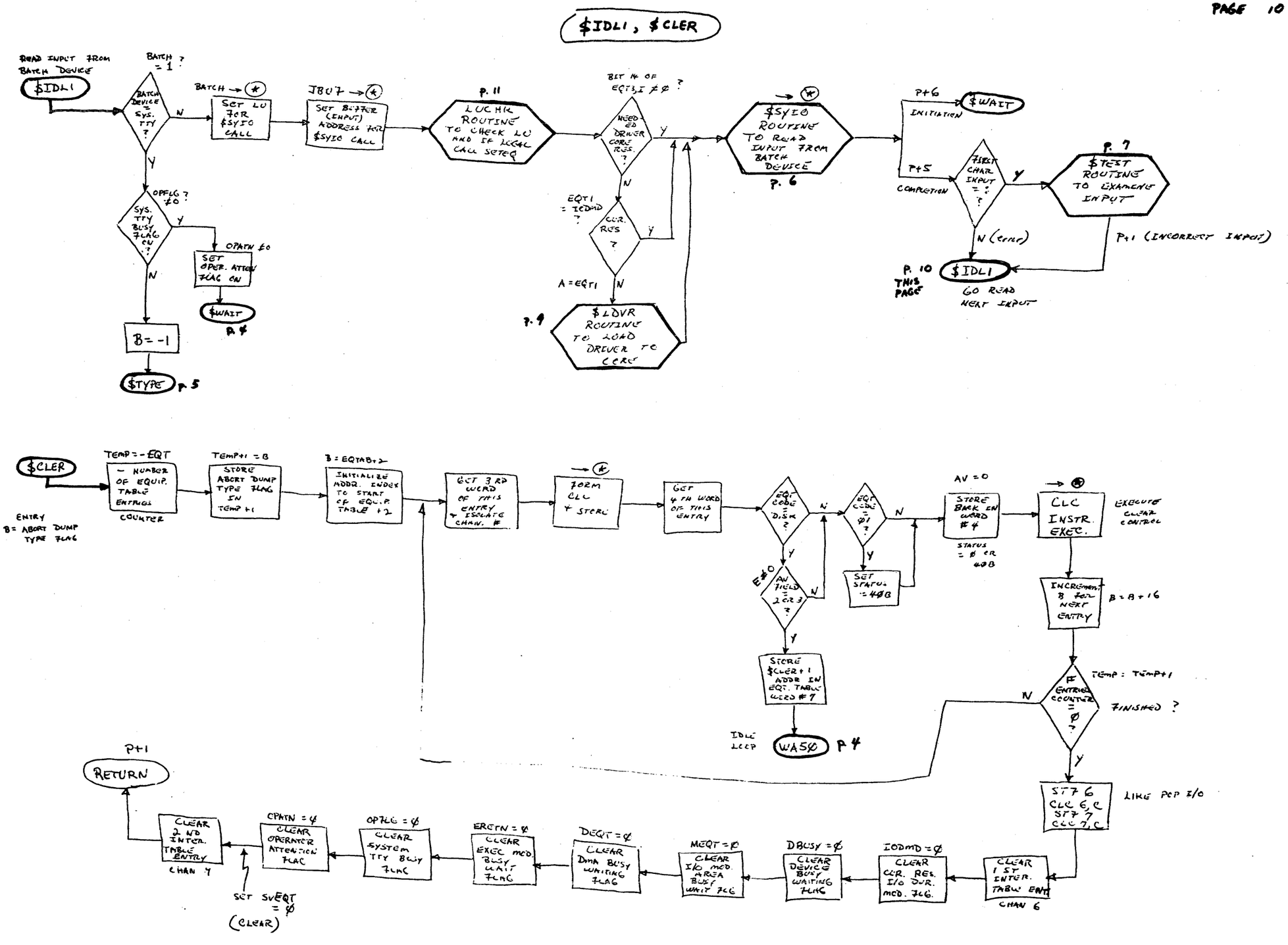
($JLOD , $MDLD) IO.4Ø



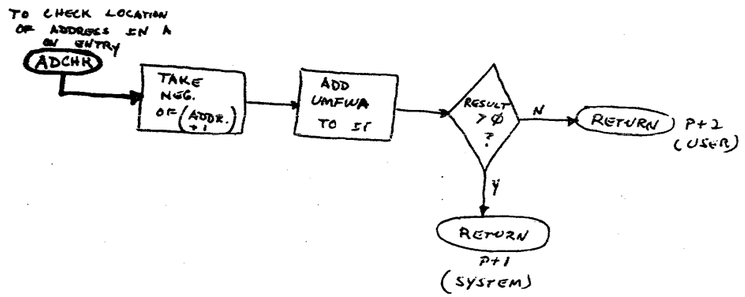
($LDVR, DISCX, $GDTK, $DISC) $LDEX, $STRT

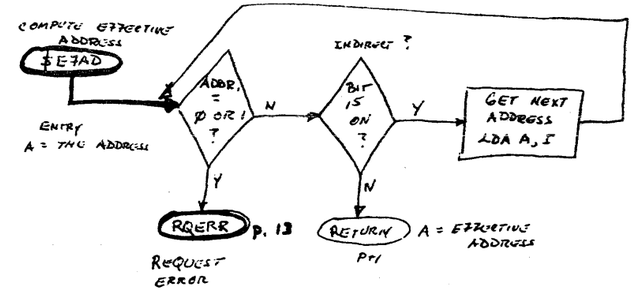


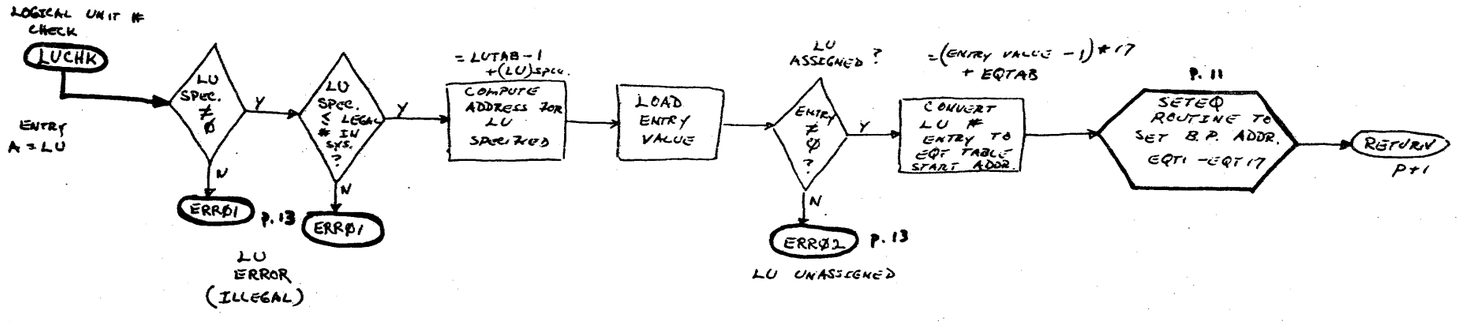
$IDLI, $CLER

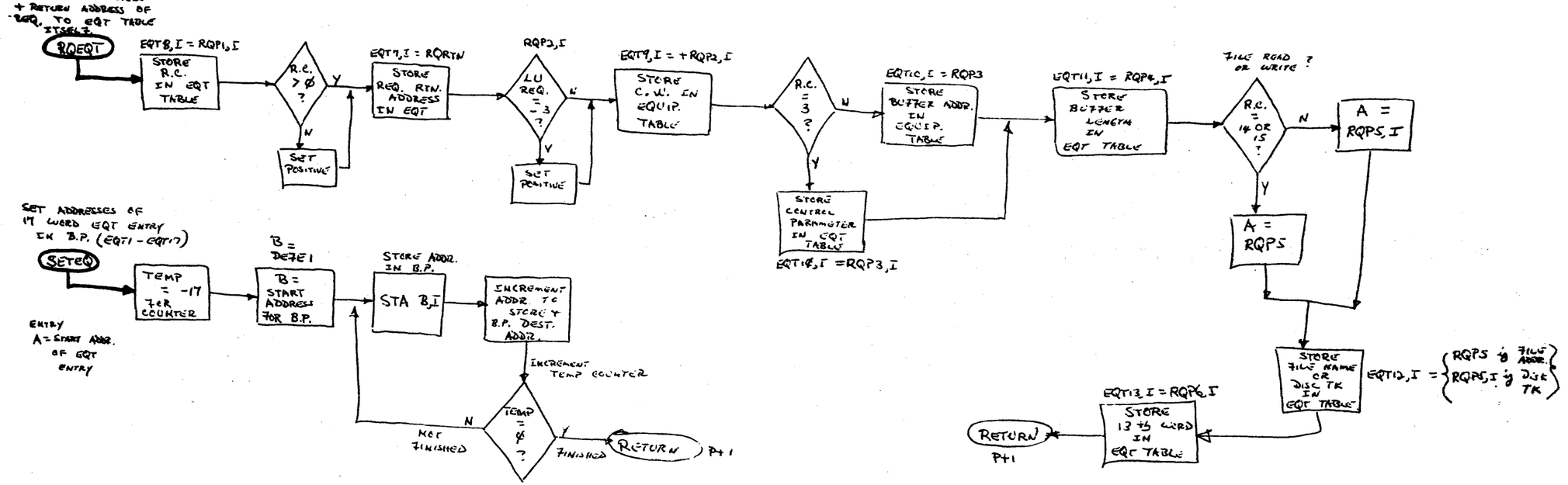

READ INPUT FROM BATCH DEVICE
$IDLI
BATCH ? = 1
BATCH DEVICE = SYS. TTY ?
N
Y
BATCH → *
SET LU FOR $SYIO CALL
JBUF → *
SET BUFFER (INPUT) ADDRESS FOR $SYIO CALL
P. 11
LUCHK ROUTINE TO CHECK LU AND IF LEGAL CALL SETEQ
BIT 14 OF EQT3,I ≠ Ø ?
NEEDED DRIVER CORE RES. ?
Y
N
EQT1 = IDDMD ?
CUR. RES ?
A = EQT1
N
P. 9
$LDVR ROUTINE TO LOAD DRIVER TO CORE
→ *
$SYIO ROUTINE TO READ INPUT FROM BATCH DEVICE
P. 6
P+6
$WAIT
INITIATION
P+5
COMPLETION
FIRST CHAR INPUT = ? ?
Y
P. 7
$TEST ROUTINE TO EXAMINE INPUT
N (error)
P+1 (INCORRECT INPUT)
P. 10 THIS PAGE
$IDLI
GO READ NEXT INPUT
OPFLG ? Ø
SYS. TTY BUSY FLAG SET ?
Y
N
OPATN Ø
SET OPER. ATTEN FLAG ON
$WAIT
P. 4
B = -1
$TYPE
P. 5
$CLER
ENTRY
B = ABORT DUMP TYPE FLAG
TEMP = -EQT
- NUMBER OF EQUIP. TABLE ENTRIES
COUNTER
TEMP+1 = B
STORE ABORT DUMP TYPE FLAG IN TEMP+1
B = EQTAB+2
INITIALIZE ADDR. INDEX TO START OF EQUIP TABLE +2
GET 3 RD WORD OF THIS ENTRY & ISOLATE CHAN. #
FORM CLC & STORE
GET 4 TH WORD OF THIS ENTRY
EQT CODE = DISK ?
E≠0
AN FIELD = 2 OR 3 ?
STORE $CLER+1 ADDR IN EQT. TABLE WORD #7
IDLE LOOP
WAIT
P. 4
EQT CODE = Ø1 ?
SET STATUS := 40B
AV = 0
STORE BACK IN WORD # 4
STATUS = Ø OR 40B
CLC INSTR. EXEC.
EXECUTE CLEAR CONTROL
INCREMENT B FOR NEXT ENTRY
B = B + 16
# ENTRIES COUNTER = Ø ?
TEMP = TEMP+1
FINISHED ?
ST 7 6
CLC 6,C
SFS 7
CLC 7,C
LIKE PREP I/O
CLEAR 1 ST INTER. TABLE ENT.
CHAN 6
IODMD = Ø
CLEAR CLR. REQ. I/O DUR. MOD. FLG.
DBUSY = Ø
CLEAR DEVICE BUSY WAITING FLAG
MEQT = Ø
CLEAR I/O MOD. AREA BUSY WAIT FLG
DEQT = Ø
CLEAR DMA BUSY WAITING FLAG
ERETN = Ø
CLEAR EXEC MOD. BUSY WAIT FLAG
OPTLG = Ø
CLEAR SYSTEM TTY BUSY FLAG
OPATN = Ø
CLEAR OPERATOR ATTENTION FLAG
CLEAR 2 ND INTER. TABLE ENTRY
CHAN 4
SET SVEQT = Ø
(CLEAR)
P+1
RETURN

UTILITY SUBROUTINES



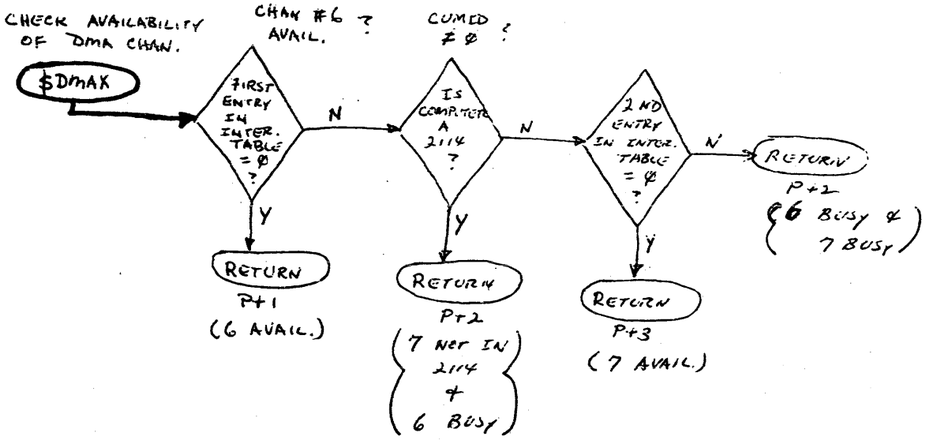




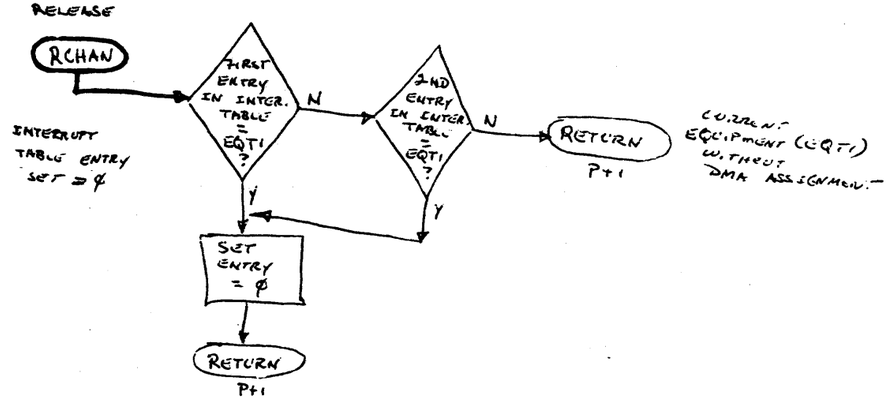


UTILITY SUBROUTINES

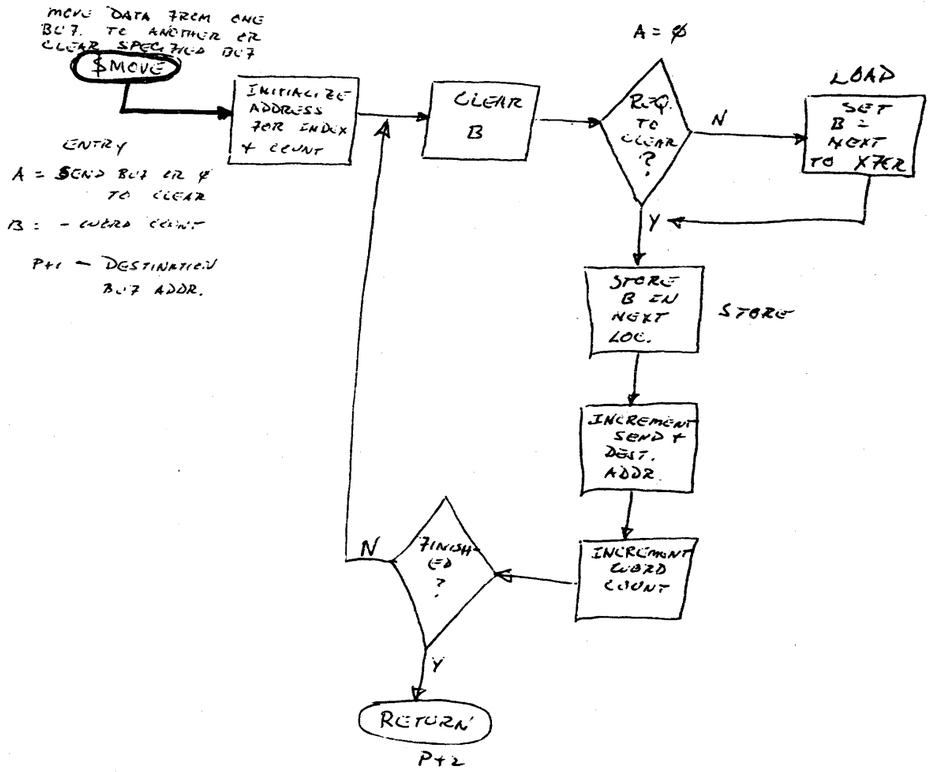
CHECK AVAILABILITY OF DMA CHAN.

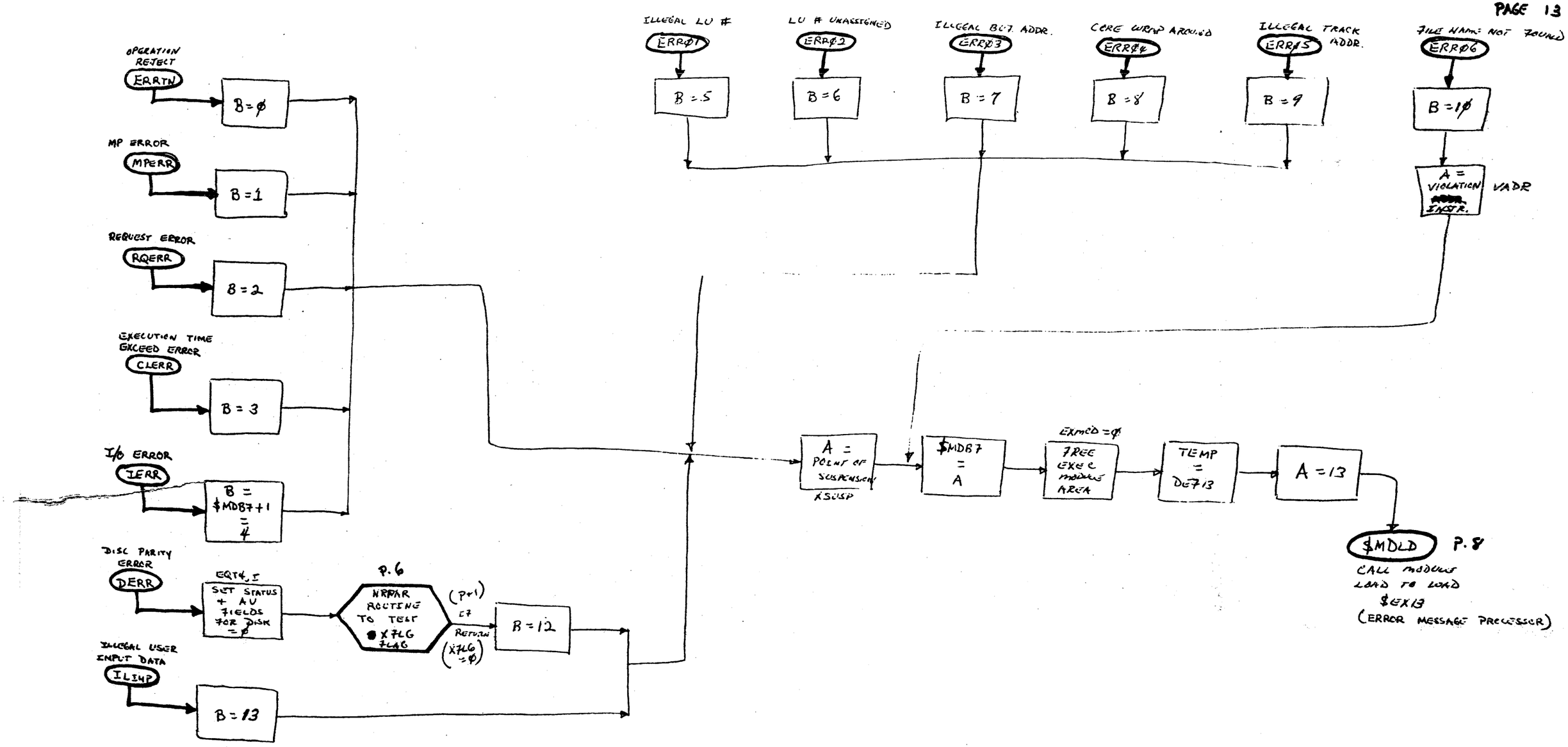


DMA CHANNEL RELEASE



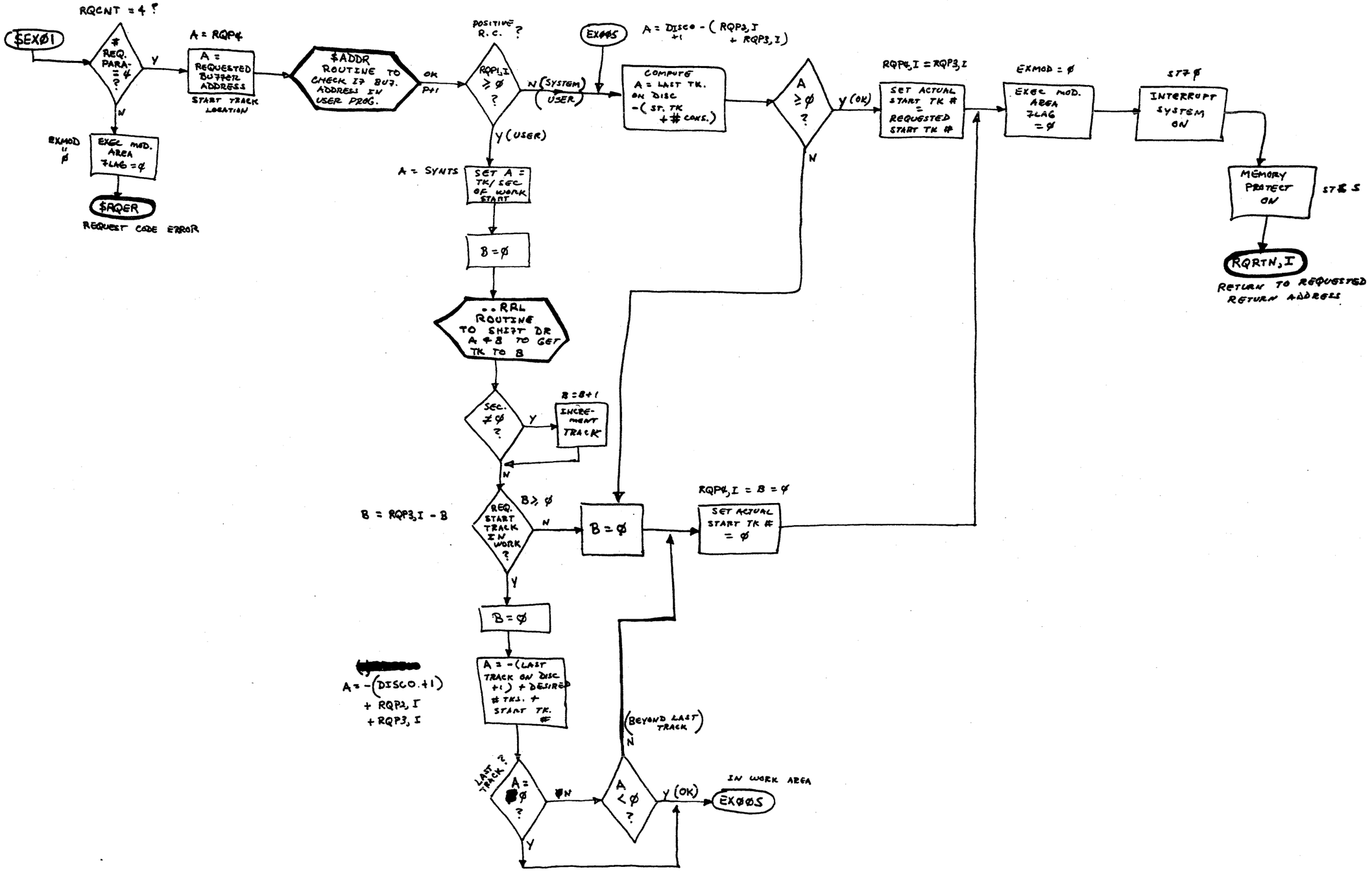
MOVE DATA FROM ONE BUF. TO ANOTHER OR CLEAR SPECIFIED BUF



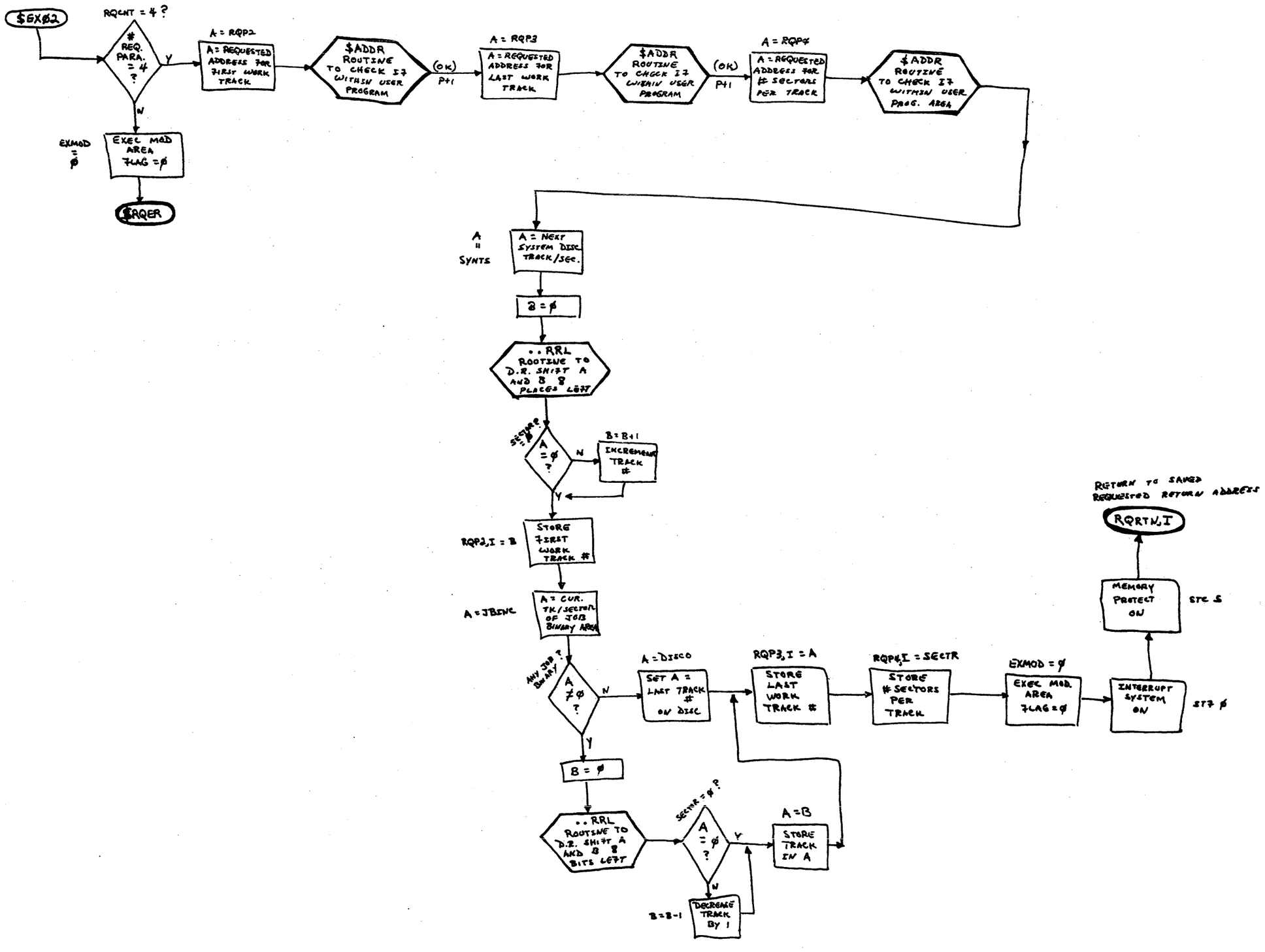


ERROR ENTRY POINTS

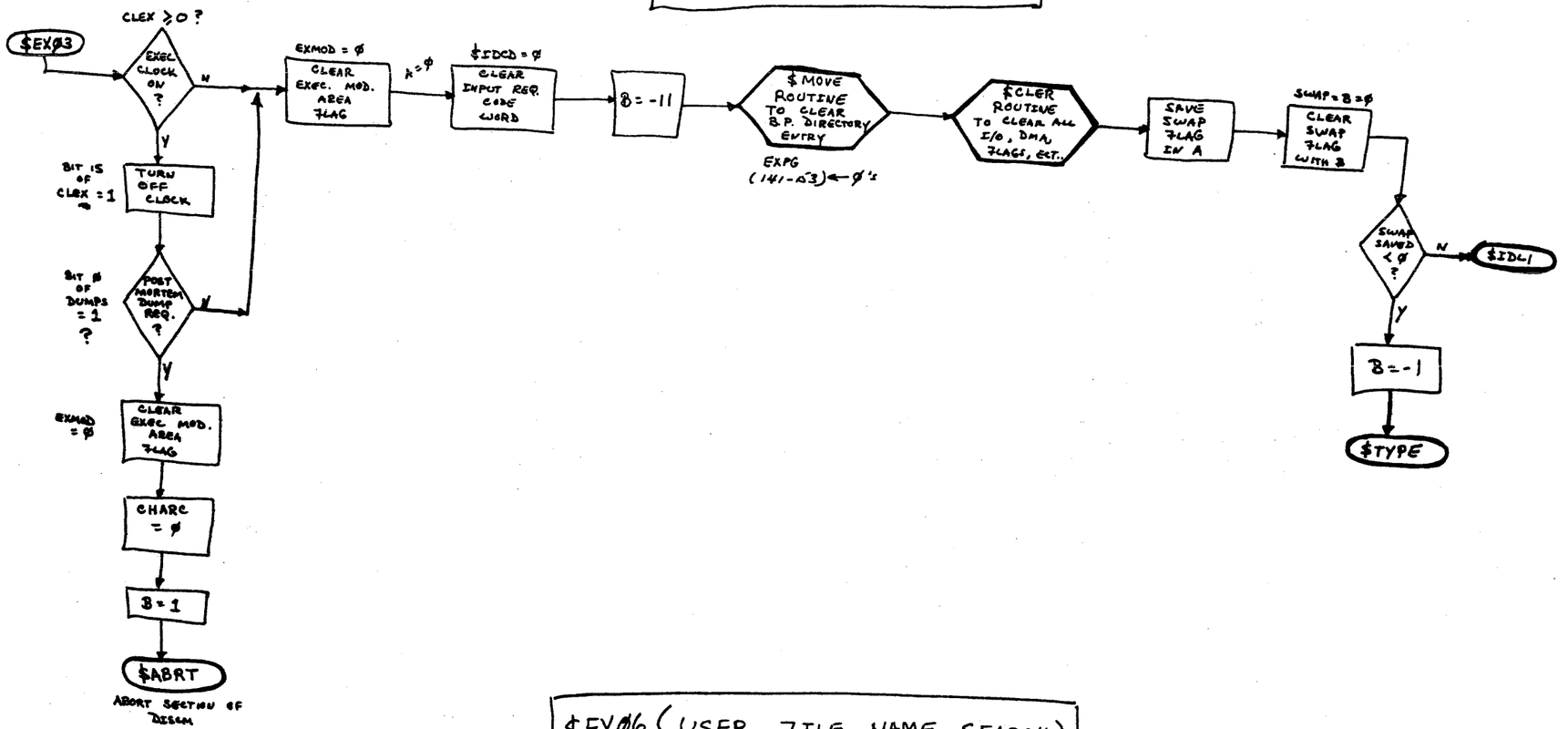
$EXØ1 (DISC TRACK STATUS)



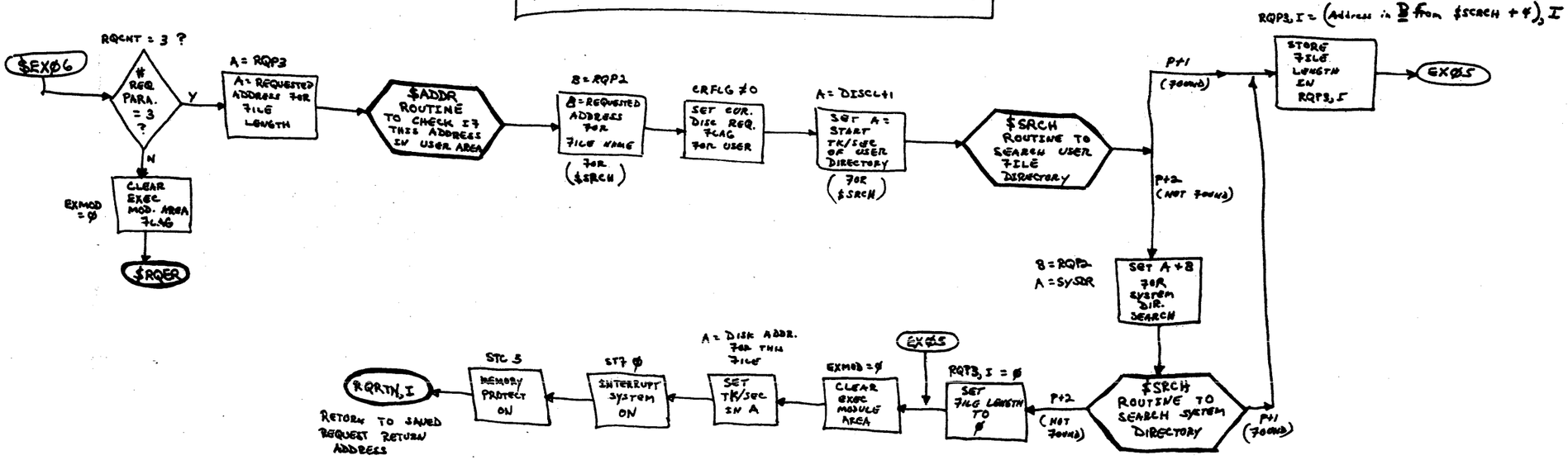
$EX02 (DISC WORK TRACK LIMITS)

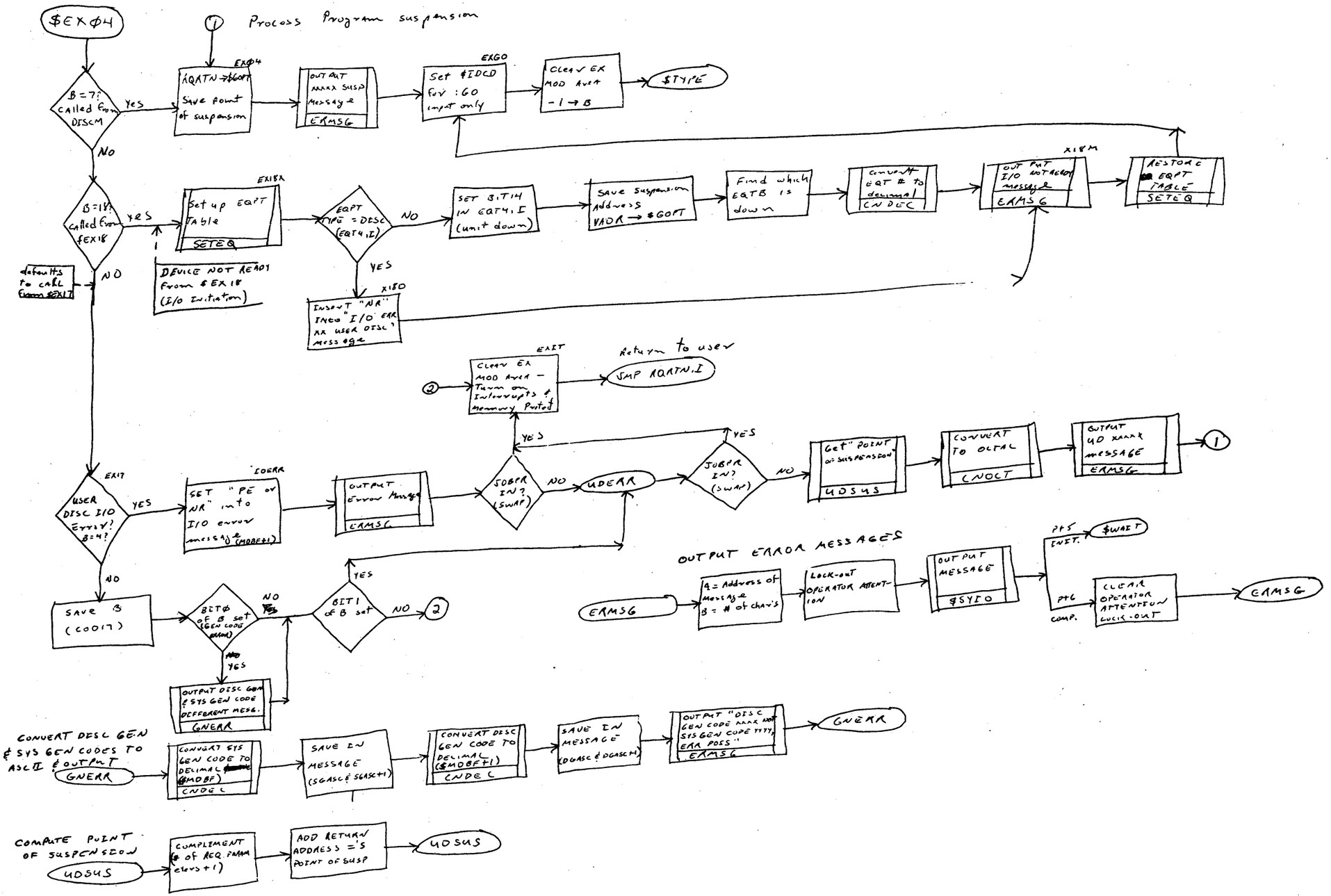


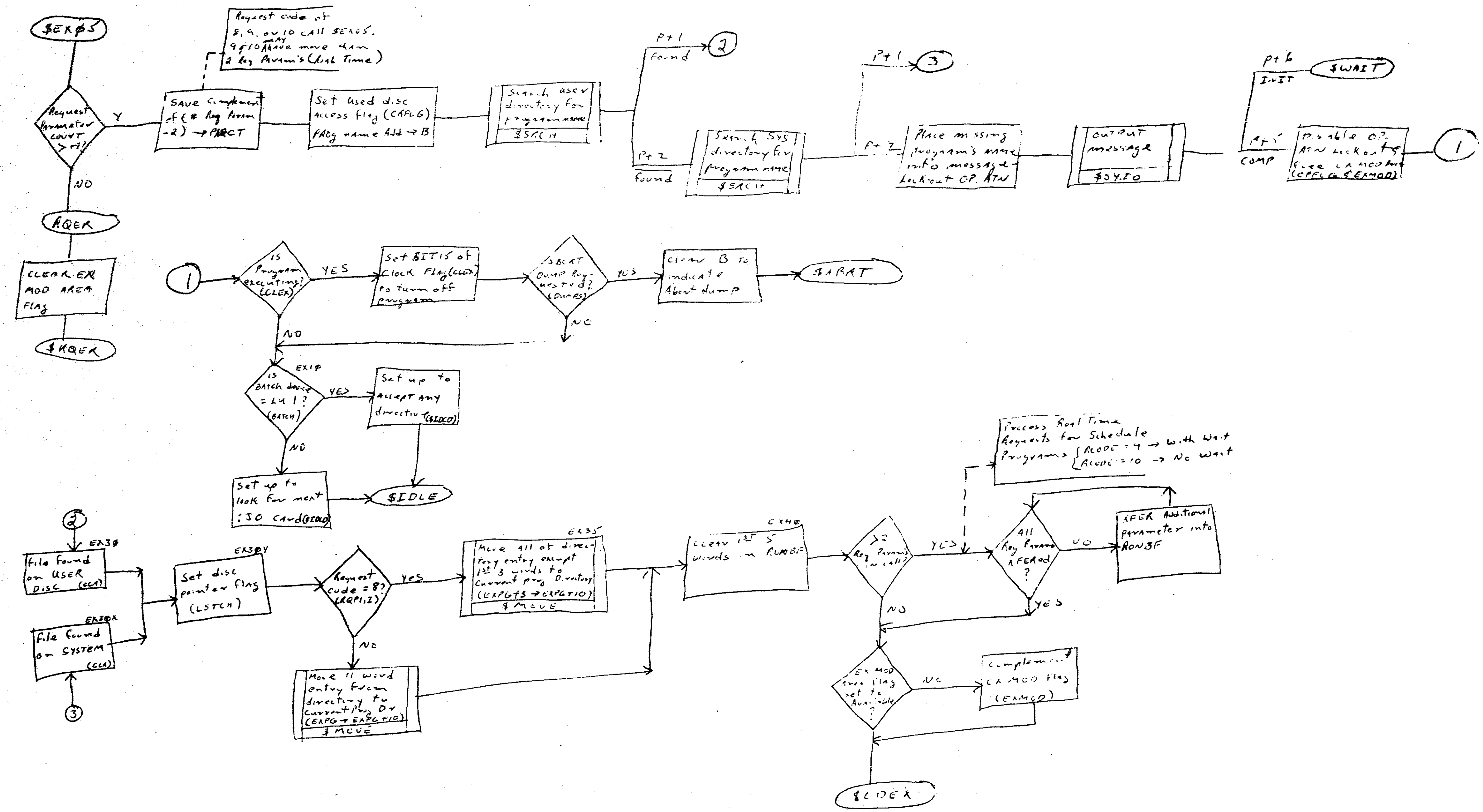
$EXØ3 (PROGRAM COMPLETION)

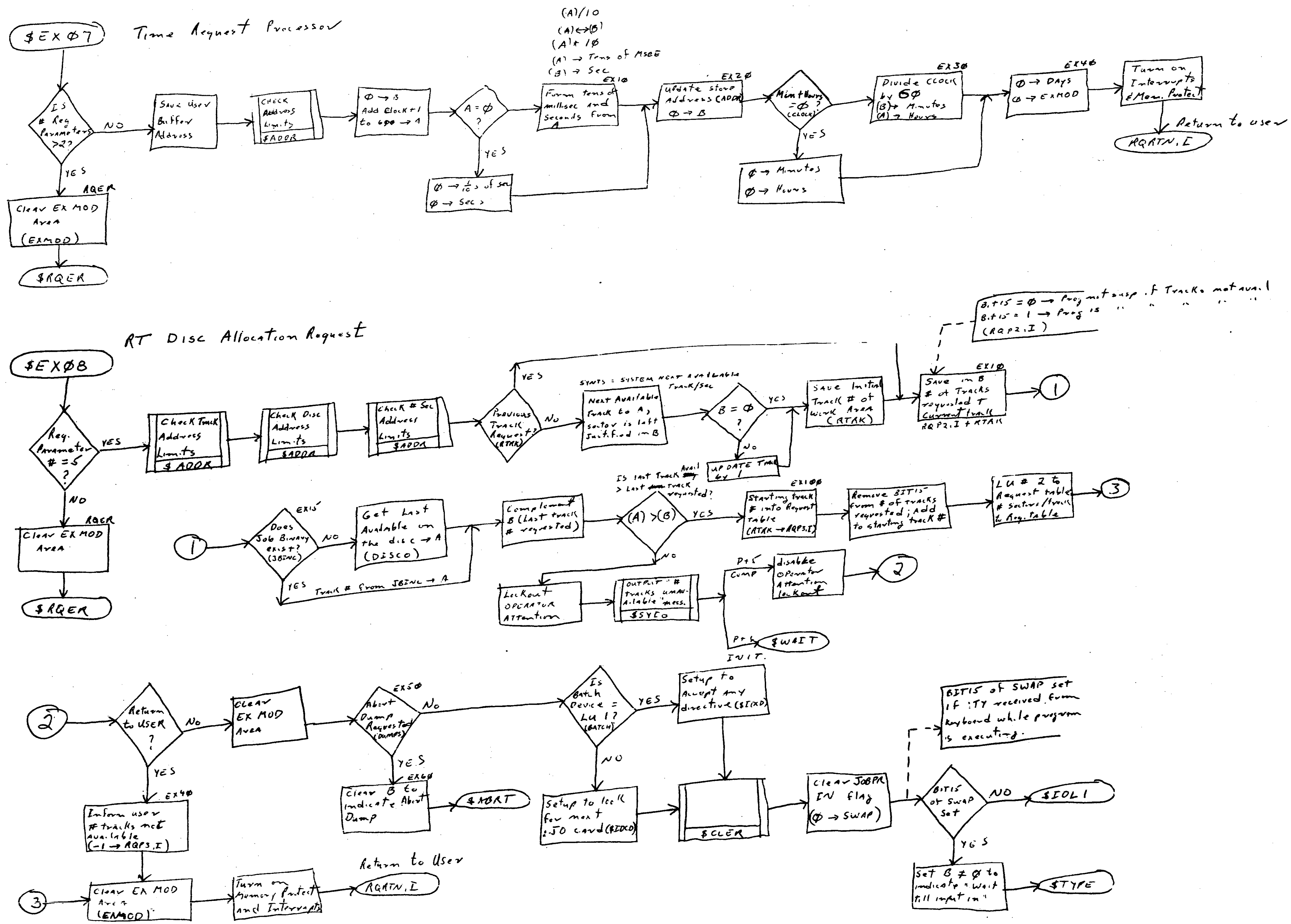


$EXØ6 (USER FILE NAME SEARCH)

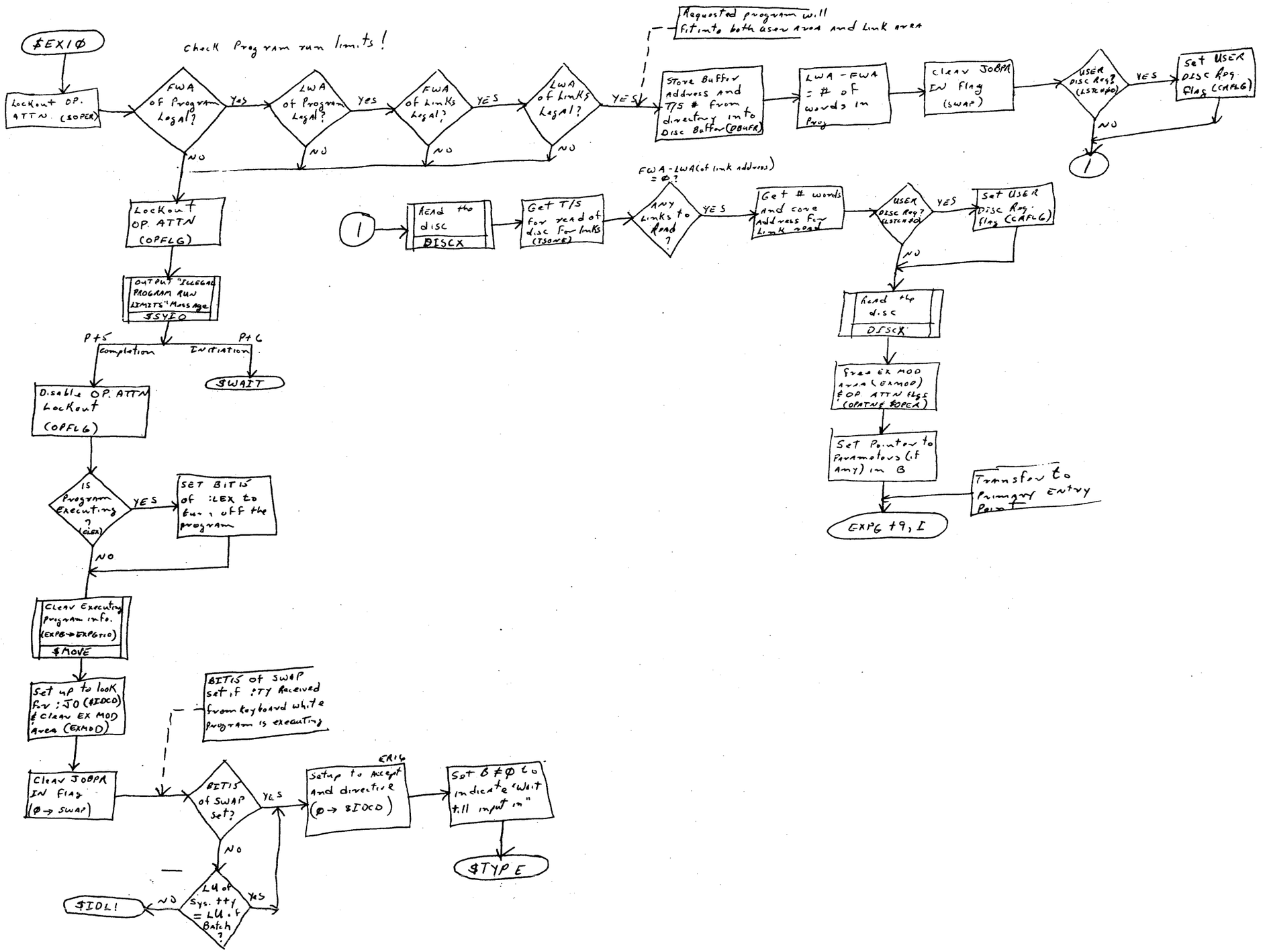



$EXΦ4
Process Program suspension
B=7? called from DISCM
Yes
No
EXΦ4
XQATN→$GOPT
Save point of suspension
OUTPUT xxxx SUSP Message
ERMSG
EXGO
Set $IDCD for :GO input only
Clear EX MOD Area -1→B
$TYPE
B=11? called from $EX18
Set up EQPT Table
SETEQ
EX18X
DEVICE NOT READY from $EX18 (I/O Initiation)
EQPT TYPE = DISC (EQT4,I)
SET BIT14 IN EQT4,I (unit down)
Save Suspension Address VADR→$GOPT
Find which EQTB is down
Convert EQT # to decimal
CNDEC
OUTPUT I/O NOT READY Message
ERMSG
X18M
RESTORE EQPT TABLE
SETEQ
Return to user
INSERT "NR" INTO "I/O ERR OR USER DISC" message
X18D
Return to user
CLEAR EX MOD AREA - Turn on Interrupts & Memory Protect
EXIT
JMP XQATN,I
USER DISC I/O Error? B=4?
EXIT
SET "PE or NR" into I/O error message (MODBFI)
EDERR
OUTPUT Error Message
ERMSG
JOBPR IN? (SWAP)
NO
UDERR
YES
Get "POINT OF SUSPENSION"
UDSUS
CONVERT TO OCTAL
CNOCT
OUTPUT UD xxxx MESSAGE
ERMSG
SAVE B (COOIT)
BIT Φ of B set (GEN CODE ERROR)
NO
YES
BIT 1 of B set
NO
OUTPUT DISC GEN & SYS GEN CODE DEFFERENT MESG.
GNERR
OUTPUT ERROR MESSAGES
ERMSG
A = Address of Message
B = # of char's
LOCK-OUT OPERATOR ATTENTION
OUTPUT MESSAGE
$SYIO
PTS ENET.
$WAIT
PTC COMP.
CLEAR OPERATOR ATTENTION LOCK-OUT
ERMSG
CONVERT DESC GEN & SYS GEN CODES TO ASCII & OUTPUT
GNERR
CONVERT SYS GEN CODE TO DECIMAL (MODBF)
CNDEC
SAVE IN MESSAGE (SGASC & SGASC+1)
CONVERT DESC GEN CODE TO DECIMAL (MODBF+1)
CNDEC
SAVE IN MESSAGE (DGASC & DGASC+1)
OUTPUT "DESC GEN CODE MAY NOT SYS GEN CODE TTY, ERR POSS"
ERMSG
GNERR
COMPUTE POINT OF SUSPENSION
UDSUS
COMPLEMENT (# of REQ. PARM words + 1)
ADD RETURN ADDRESS ='S POINT OF SUSP
UDSUS

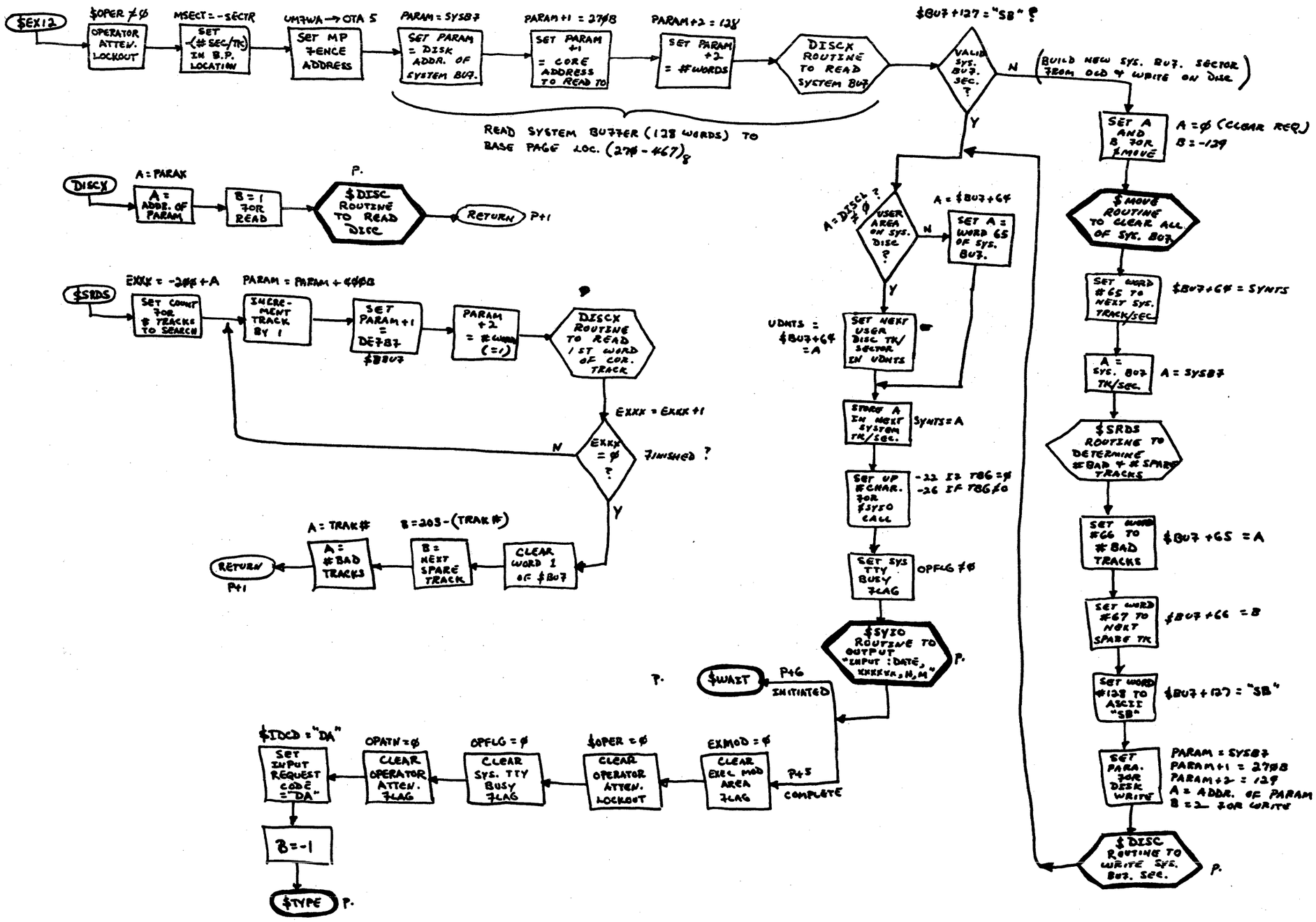

$EXØ5
Request parameter count > 1?
Y
NO
AQER
CLEAR EX MOD AREA Flag
$AQER
Request code of 8, 9, or 10 call $EXØ5. 9 & 10 may have more than 2 Req Param's (Real Time)
Save Complement of (# Req Param -2) → PRCT
Set used disc access flag (CRFLG) Prog name Add → B
Search user directory for program name
$SRCH
P+1 Found
P+2
Search Sys directory for program name
$SRCH
Found
P+1
P+2
Place missing program's name into message. Lockout OP. ATN
OUTPUT message
$SYIO
P+6 INIT
$WAIT
P+5 COMP
Enable OP. ATN Lockout & free EX MOD Area (CPFLG & EXMOD)
Is Program executing? (CLEX)
YES
NO
Set BIT 15 of Clock Flag (CLEX) to turn off program
ABORT Dump Requested? (DUMPS)
YES
NO
Clear B to indicate Abort dump
$ABRT
EXIP
Is BATCH device = LU 1? (BATCH)
YES
NO
Set up to accept any directive (SIDCO)
Set up to look for next :JO card (SIDCO)
$IDLE
EX3Ø
File found on USER DISC (CCA)
EX3ØX
File found on SYSTEM (CLA)
EX3ØY
Set disc pointer flag (LSTCH)
Request code = 8? (RQP1, I)
YES
NO
EX35
Move all of directory entry except 1st 3 words to current prog directory (EXPGT3 → EXPGT10)
$MOVE
Move 11 word entry from directory to current Prog Dr (EXPG → EXPGT10)
$MOVE
EX40
Clear 1st 5 words in RQBUF
> 2 Req Param's in call?
YES
NO
Process Real Time Requests for Schedule Programs { RCODE = 9 → with wait; RCODE = 10 → No wait
All Req Param XFERed?
NO
YES
XFER Additional parameter into RQNBF
EX MOD Area flag set to Available?
NO
Complement EX MOD flag (EXMOD)
$IDLEX

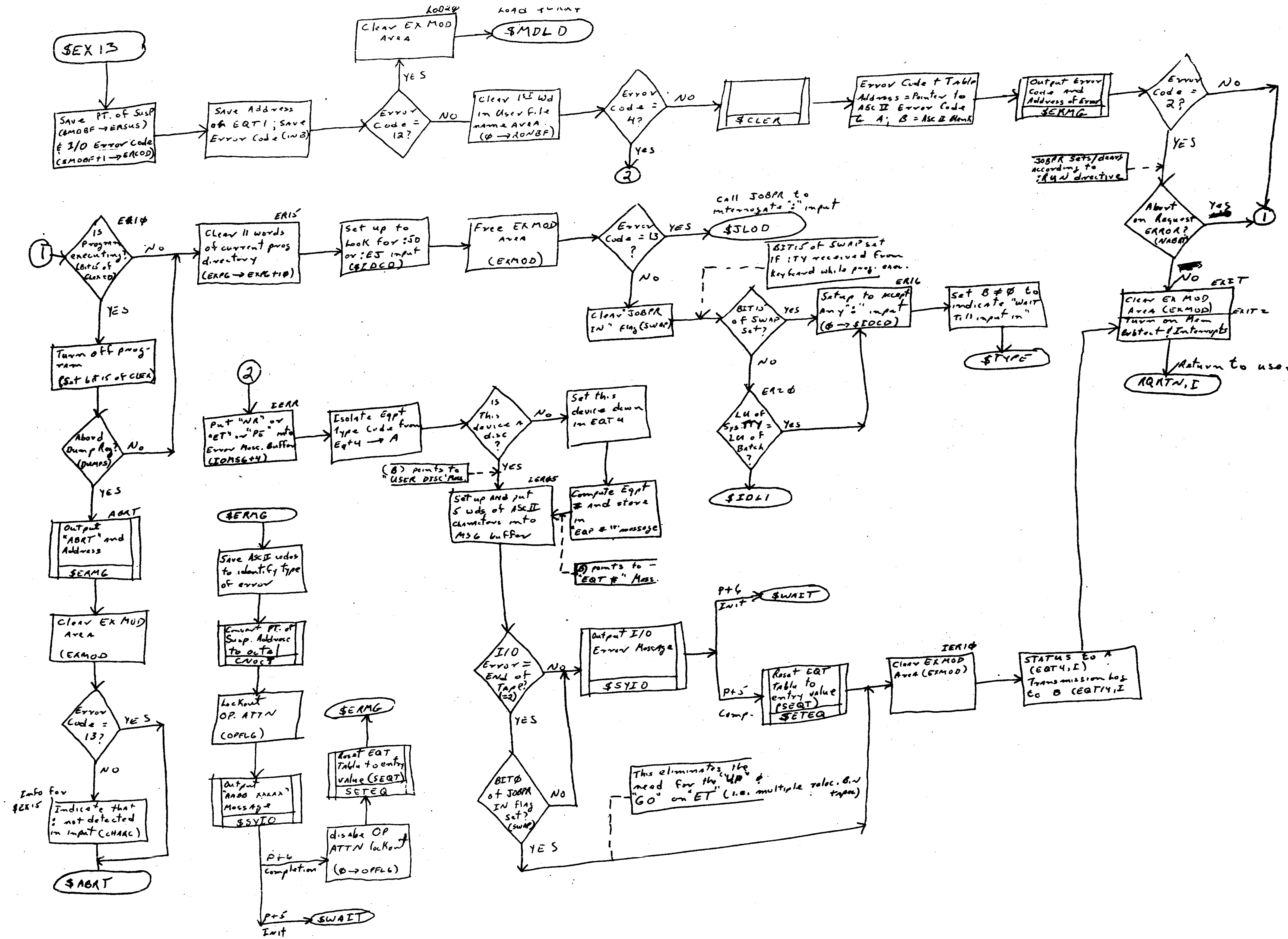

$EX07
Time Request Processor
Is # Req Parameters > 2?
NO
YES
Save User Buffer Address
Check Address Limits
$ADDR
Ø → B
Add Clock+1 to 6Ø → A
A = Ø ?
YES
Ø → 1/10's of Sec
Ø → Sec's
(A)/10
(A)↔(B)
(A)+1Ø
(A) → Tens of Msec
(B) → Sec
EX1Ø
Form tens of millisec and Seconds from A
EX2Ø
Update store Address (ADDR)
Ø → B
Min & Hours = Ø ? (CLOCK)
YES
Ø → Minutes
Ø → Hours
EX3Ø
Divide Clock by 6Ø
(B) → Minutes
(A) → Hours
EX4Ø
Ø → Days
Ø → EXMOD
Turn on Interrupts & Mem. Protect
Return to user
RQRTN, I
RQER
Clear EX MOD Area (EXMOD)
$RQER
RT Disc Allocation Request
$EXØB
Req. Parameter # = 5 ?
YES
NO
Check Track Address Limits
$ADDR
Check Disc Address Limits
$ADDR
Check # Sec Address Limits
$ADDR
Previous Track Request? (RTAK)
YES
NO
SYNTS = SYSTEM NEXT AVAILABLE TRACK/SEC
Next Available Track to A, Sector is left Satisfied in B
B = Ø ?
YES
NO
UPDATE TRAK by 1
Save Initial Track # of Work Area (RTAK)
B, T15 = Ø → Prog not swap if Tracks not avail
Bit 15 = 1 → Prog is " " " "
(RQP2, I)
EX1Ø
Save in B # of Tracks requested T Current Track
RQP2, I + RTAK
1
RQER
Clear EX MOD Area
$RQER
1
Does Job Binary exist? (JBINC)
EX15
NO
YES
Get Last Available on the disc → A (DISCO)
Track # from JBINC → A
Complement B (Last track # requested)
Is last Track Avail > Last Track requested?
(A) > (B)
YES
NO
EX1Ø
Starting track # into Request Table (RTAK → RQP3, I)
Remove BIT15 from # of tracks requested; Add to starting track #
LU # 2 to Request table
Sectors/track to Req. Table
3
Lockout OPERATOR ATTention
OUTPUT " # TRACKS UNAVAILABLE" mess.
$SYCO
P+5 COMP
disable Operator Attention lockout
2
P+6
$WAIT
INIT.
2
Return to USER ?
NO
YES
EX4Ø
Inform user # tracks not available (-1 → RQP3, I)
CLEAR EX MOD Area
Abort Dump Request? (DUMPS)
EX5Ø
NO
YES
EX6Ø
Clear B to indicate Abort Dump
$ABRT
Is Batch Device = LU 1? (BATCH)
YES
NO
Setup to Accept any directive ($IXD)
Setup to look for next :JO card ($IXD)
$CLER
Clear JOBPR IN flag (Ø → SWAP)
BIT15 of SWAP set if :TY received from keyboard while program is executing.
BIT15 of Swap Set
NO
YES
$IOLI
Set B ≠ Ø to indicate "Wait till input in"
$TYPE
3
Clear EX MOD Area (EXMOD)
Turn on Memory Protect and Interrupts
Return to User
RQRTN, I

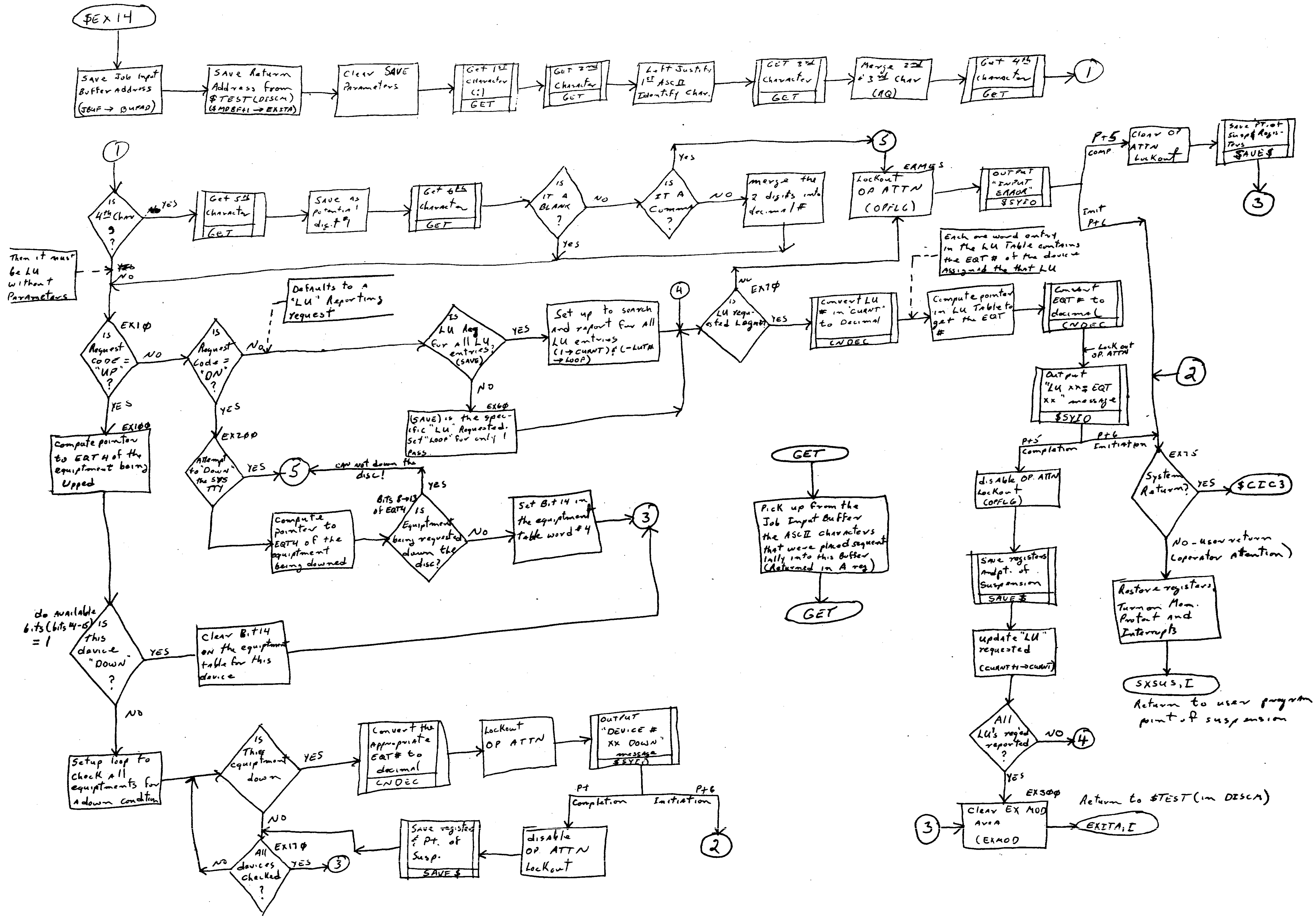
Load and Execute Program

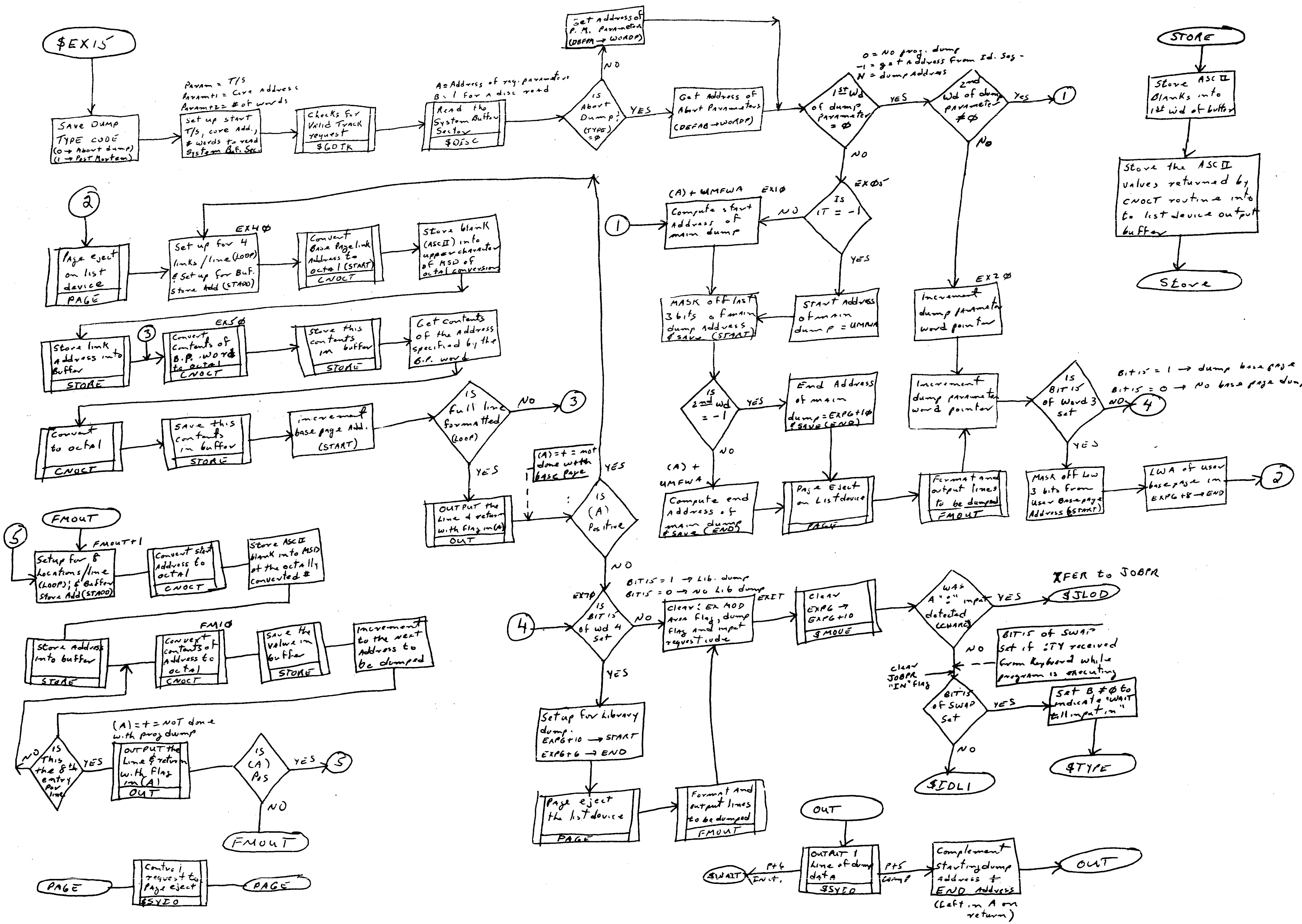


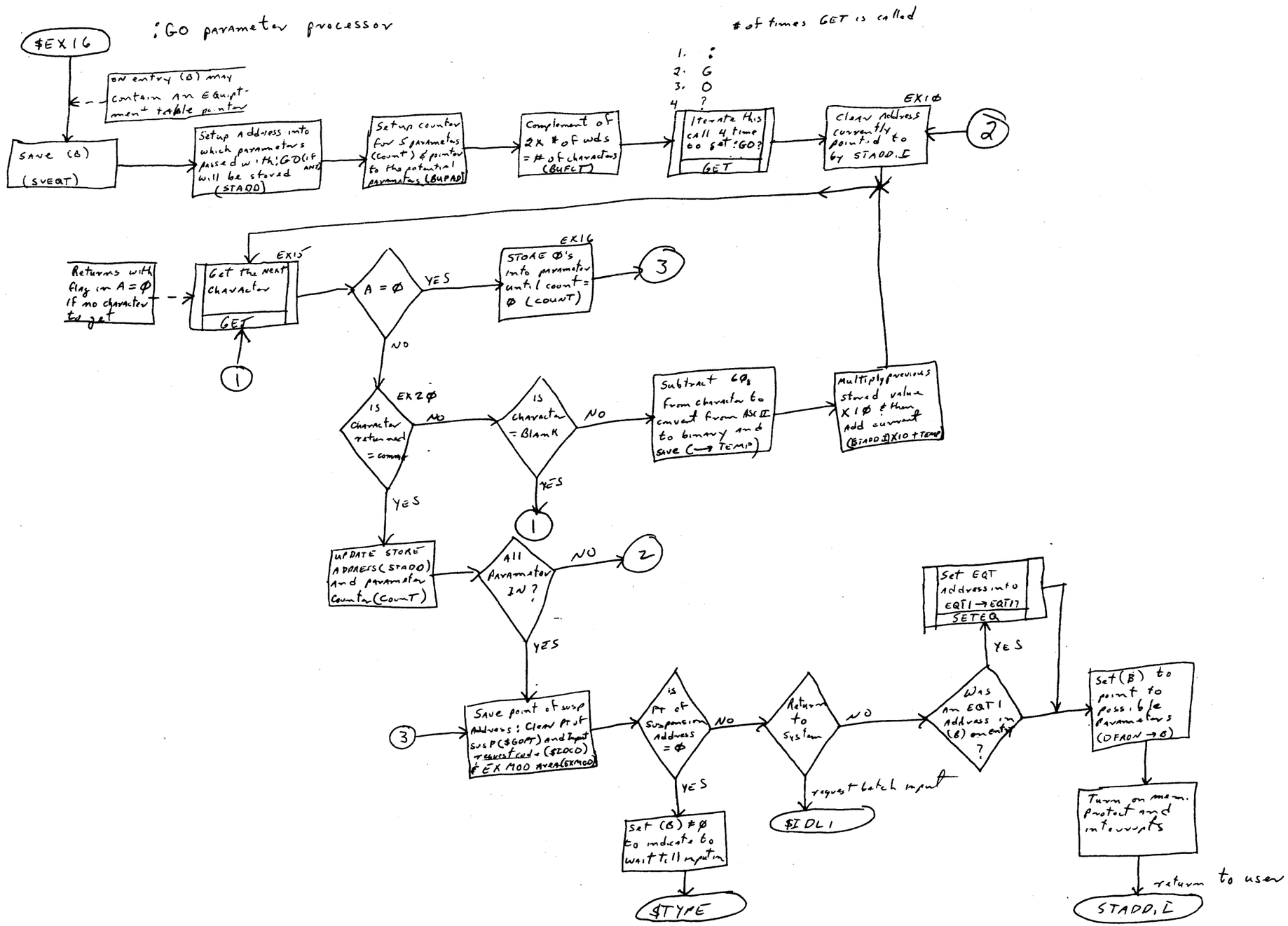
$EX12 (SYSTEM STARTUP)



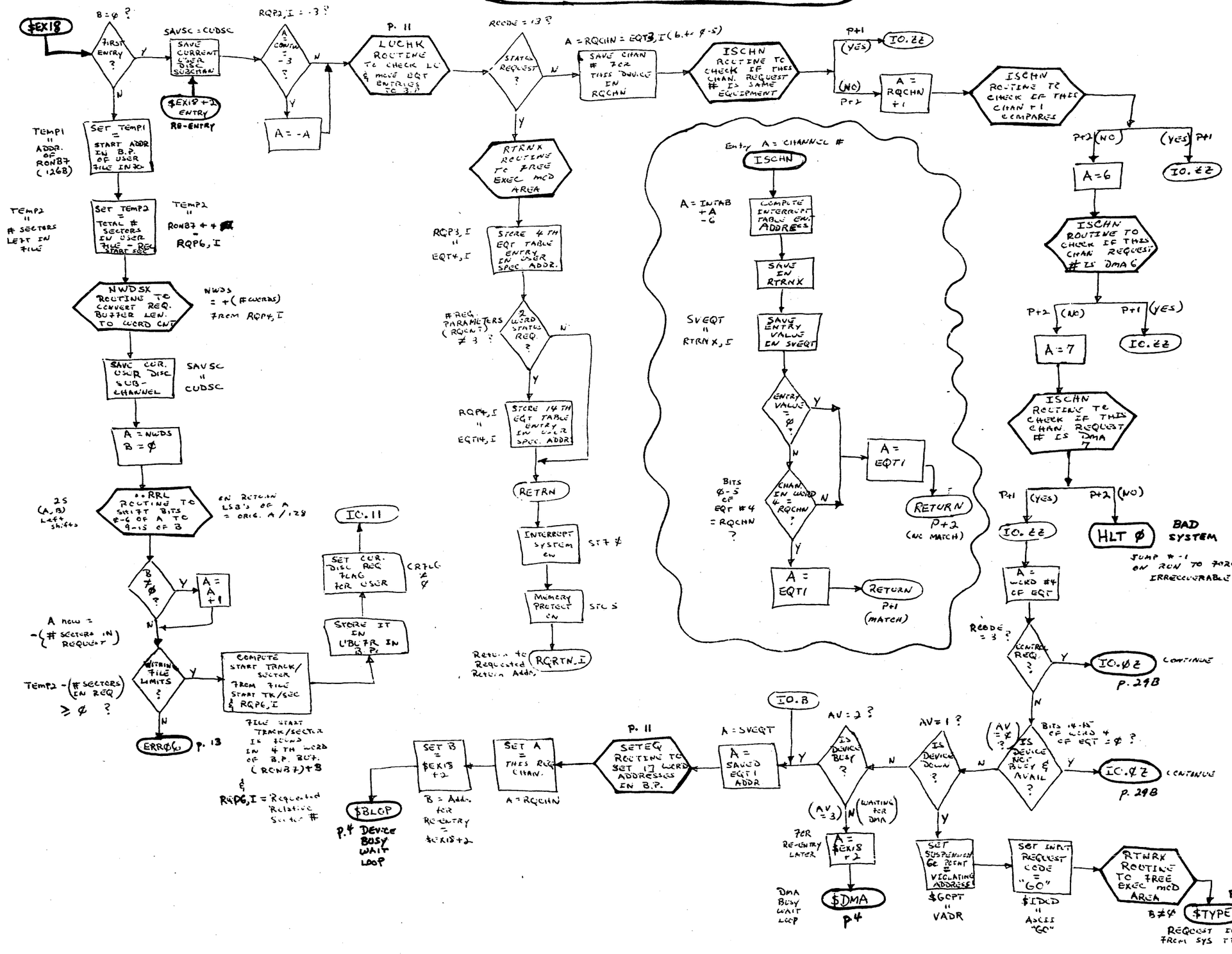

$EX13
Save PT. of SusP ($MOBF → ERSUS) & I/O Error Code ($MOBF+1 → ERCOD)
Save Address of EQT1; Save Error Code (in B)
Error Code = 12?
YES
NO
Clear EX MOD Area
$MDLD
Clear 1st Wd in User file name area (φ → ZONBF)
Error Code = 4?
NO
YES
2
$CLER
Error Code + Table Address = Pointer to ASC II Error Code to A; B = ASC II Blank
Output Error Code and Address of Error
$ERMG
Error Code = 2?
NO
YES
JOBPR Sets/clears according to :RUN directive
Abort on Request ERROR? (NABR)
YES
NO
1
EXIT
Clear EX MOD Area (EXMOD)
Turn on Mem Protect & Interrupts
EXIT2
Return to user
RQRTN,I
1
ER1φ
Is Program executing? (Bit15 of CLER)
No
YES
Turn off program ($et bit 15 of CLER)
Abort Dump Req? (DUMPS)
No
YES
ABRT
Output "ABRT" and Address
$ERMG
Clear EX MOD Area (EXMOD)
Error Code = 13?
YES
NO
Info for $ER15
Indicate that : not detected in input (CHARC)
$ABRT
ER15
Clear 11 words of current prog directory (EXPG → EXPG+10)
Set up to look for :SO or :ES input ($IDCD)
Free EX MOD Area (EXMOD)
Error Code = 13?
YES
No
Call JOBPR to interrogate ":" input
$JLOD
Clear "JOBPR IN" Flag (SWAP)
BIT15 of SWAP set IF :TY received from keyboard while prog. exec.
BIT15 of SWAP Set?
Yes
No
ER16
Setup to accept Any ":" input (φ → $IDCD)
Set B ≠ φ to indicate "WAIT Till input in"
$TYPE
ER2φ
LU of Sys. TTY = LU of Batch?
Yes
$IDLI
2
IERR
Put "NR" or "ET" or "PE" into Error Msg. Buffer (IOMSG+4)
Isolate Eqpt type Code from Eqt4 → A
Is This device a disc?
No
YES
(B) points to "USER DISC" Mess.
Set this device down in EQT4
IERR5
Set up and put 5 wds of ASC II characters into MSG buffer
Compute Eqpt # and store in "EQP #" message
(B) points to "EQT #" Mess.
$ERMG
Save ASC II codes to identify type of error
Convert PT. of Susp. Address to octal
CNVOT
LockOut OP. ATTN (OPFLG)
Output "ANDD XXXXX" Message
$SYIO
P+6 Completion
P+5 Init
$WAIT
$ERMG
Reset EQT Table to entry value ($EQT)
SETEQ
disable OP ATTN lockout (φ → OPFLG)
I/O Error = End of Tape? (=2)
No
YES
BITφ of JOBPR IN Flag set? (SWAP)
No
YES
Output I/O Error Message
$SYIO
P+6 Init
$WAIT
P+5 Comp.
Reset EQT Table to entry value ($EQT)
$ETEQ
IER1φ
Clear EX MOD Area (EXMOD)
STATUS to A (EQT4,I)
Transmission log. to B (EQT14,I
This eliminates the need for the "UP" & "GO" on "ET" (i.e. multiple reloc. bin tapes)

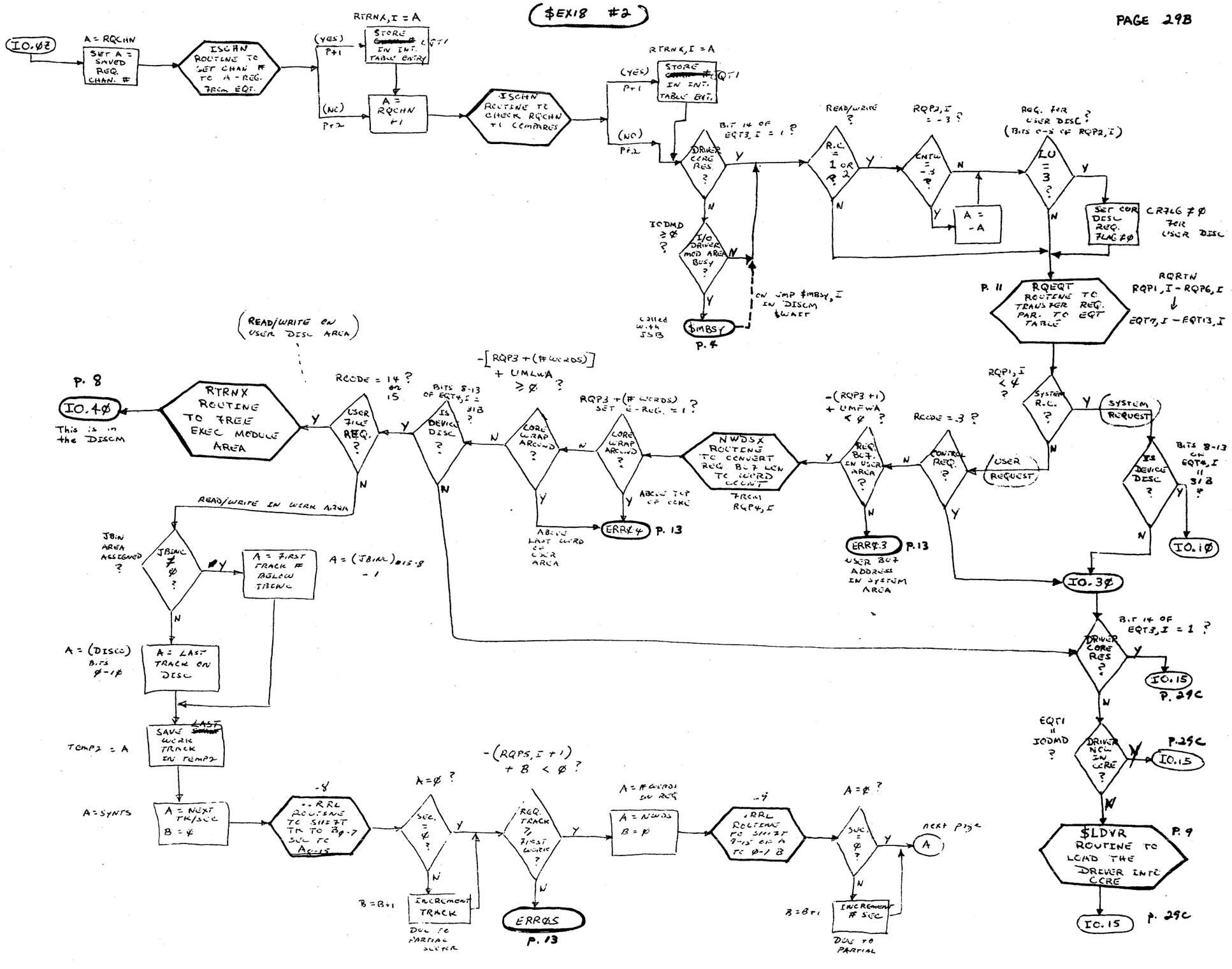

$EX14
Save Job Input Buffer Address (JBUF → BUFAD)
Save Return Address from $TEST (DISCM) ($MDBFL → EXITA)
Clear SAVE Parameters
Get 1st character (:) GET
Get 2nd Character GET
Left Justify 1st ASCII Identify Char.
Get 3rd Character GET
Merge 2nd & 3rd Char (RQ)
Get 4th character GET
Is 4th Char 9?
YES
Get 5th character GET
Save as potential digit #1
Get 6th character GET
Is it a BLANK?
Is it a Comma?
merge the 2 digits into decimal/#
Lockout OP ATTN (OPFLG)
ERMSS
OUTPUT "INPUT ERROR" $SYIO
P+5 Comp.
Clear OP ATTN Lockout
Save Pt. of Susp & Registers $SAVE$
Init P+6
Then it must be LU without Parameters
NO
Defaults to a "LU" Reporting request
EX10
Is Request Code = "UP"?
Is Request Code = "DN"?
Is LU Req for all LU entries? (SAVE)
Set up to search and report for all LU entries (1 → CURNT) & (-LUT# → LOOP)
Is LU requested Logged?
EX10
Convert LU # in "CURNT" to Decimal CNDEC
Each one word entry in the LU Table contains the EQT # of the device assigned to that LU
Compute pointer in LU Table to get the EQT #
Convert EQT # to decimal CNDEC
Lockout OP. ATTN
Output "LU xx = EQT xx" message $SYIO
EX60
(SAVE) is the specific "LU" Requested. Set "LOOP" for only 1 pass.
EX100
Compute pointer to EQT # of the equipment being Upped
EX200
Attempt to "Down" the SYS TTY
can not down the disc!
Compute pointer to EQT # of the equipment being downed
Bits 8-13 of EQT4
Is Equipment being requested down the disc?
Set Bit 14 in the equipment table word # 4
GET
Pick up from the Job Input Buffer the ASCII characters that were placed sequentially into this Buffer (Returned in A reg)
GET
P+5 Completion
P+6 Initiation
disable OP. ATTN lockout (OPFLG)
EX75
System Return?
$CIC3
No - user return (operator attention)
Save registers & pt. of Suspension SAVE$
Restore registers, Turn on Mem. Protect and Interrupts
update "LU" requested (CURNT+1 → CURNT)
$XSUS,I
Return to user program point of suspension
All LU's req'ed reported?
do available bits (bits 4-5) = 1
Is this device "DOWN"?
Clear Bit 14 on the equipment table for this device
Setup loop to check all equipments for a down condition
Is this equipment down
Convert the Appropriate EQT# to decimal CNDEC
Lockout OP ATTN
OUTPUT "DEVICE # XX DOWN" message $SYIO
P+ Completion
P+6 Initiation
disable OP ATTN Lockout
Save registers & Pt. of Susp. SAVE$
EX170
All devices checked?
EX300
Clear EX MOD Area (EXMOD
Return to $TEST (in DISCM)
EXITA,I

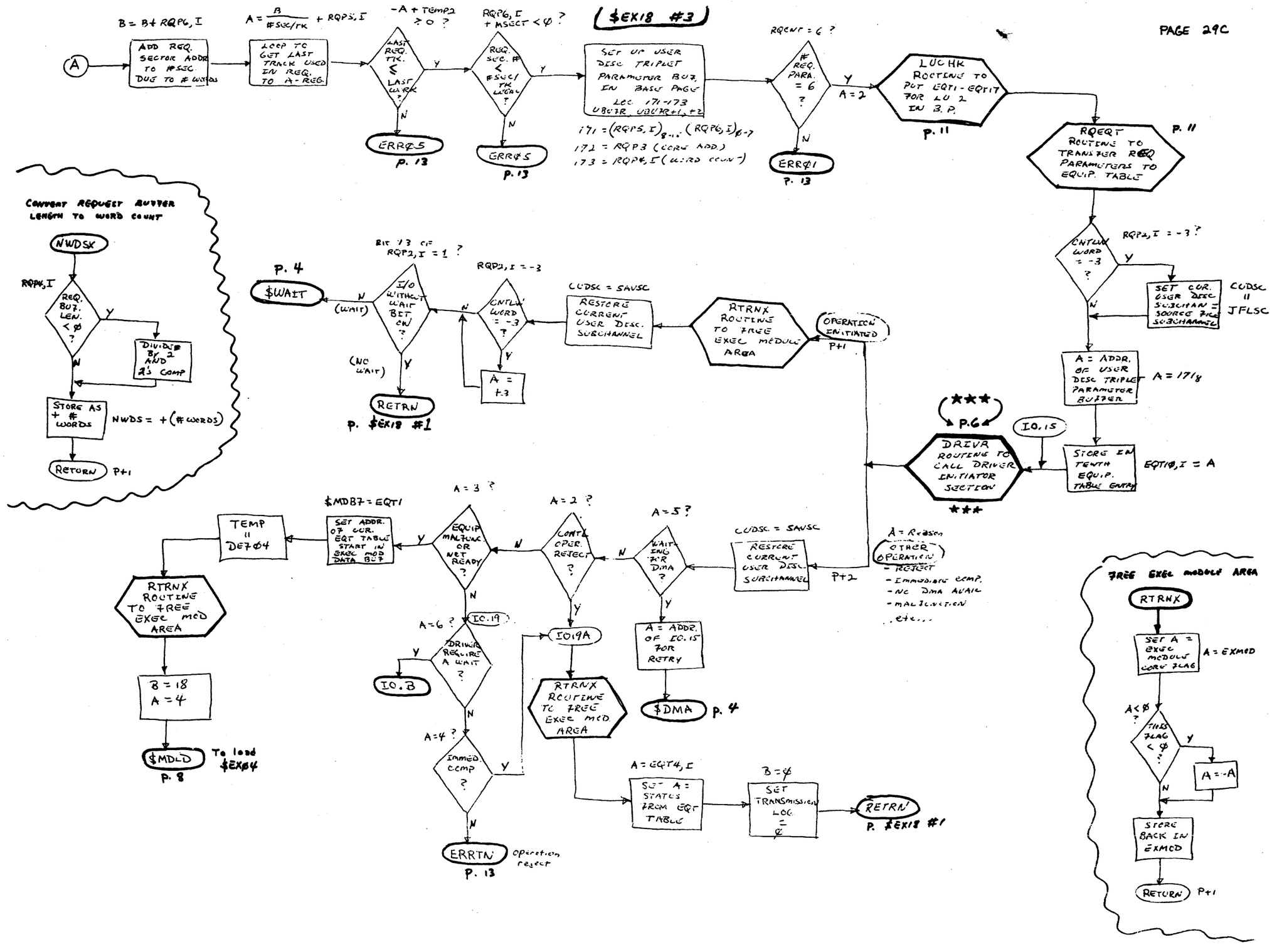

$EXIS
Save Dump Type code (0 → About dump) (1 → Post Mortem)
Param = T/S
Paramt1 = Core address
Paramt2 = # of words
Set up start T/s, core Add, # words to read System Buf. Sec.
Checks for valid track request
$GOTK
A = Address of req. parameters
B = 1 for a disc read
Read the System Buffer Sector
$DISC
Is About Dump? (TYPE) = Ø
YES
NO
Set Address of P. M. Parameters (DEFPM → WORDP)
Get Address of About Parameters (DEFAB → WORDP)
0 = No prog. dump
-1 = get address from Id. Seg.
N = dump address
1st Wd of dump parameter = Ø
2nd Wd of dump parameter ≠ Ø
Yes
No
EXØ5
Is IT = -1
(A) + UMFWA
EX1Ø
Compute start Address of main dump
Start address of main dump = UMFWA
MASK off last 3 bits of main dump address & save (START)
Is 2nd wd = -1
End Address of main dump = EXPG+1Ø & save (END)
(A) + UMFWA
Compute end address of main dump & save (END)
Page Eject on List device
PAGE
EX2Ø
Increment dump parameter word pointer
Increment dump parameter word pointer
Format and output lines to be dumped
FMOUT
Is BIT 15 of Word 3 set
Bit 15 = 1 → dump base page
Bit 15 = 0 → No base page dump
Mask off low 3 bits from User Base page Address & (START)
LWA of user base page in EXPG+8 → END
STORE
Store ASC II Blanks into 1st wd of buffer
Store the ASC II values returned by CNOCT routine into to list device output buffer
Store
Page eject on list device
PAGE
EX4Ø
Set up for 4 links/line (LOOP) & Set up for Buf. Store Add (STADD)
Convert Base Page link Address to octal (START)
CNOCT
Store blank (ASC II) into upper character of MSD of octal conversion
Store link Address into buffer
STORE
EX5Ø
Convert contents of B.P. WORD to octal
CNOCT
Store this contents in buffer
STORE
Get contents of the address specified by the B.P. word
Convert to octal
CNOCT
Save this contents in buffer
STORE
increment base page Add. (START)
Is full line formatted (LOOP)
No
YES
OUTPUT the line & return with flag in (A)
OUT
(A) = + = not done with base page
Is (A) Positive
EXTP
Is BIT 15 of wd 4 Set
BIT 15 = 1 → Lib. dump
BIT 15 = 0 → No Lib dump
Clear: EX MOD Area flag, dump flag and input request code
EXIT
Clear EXPG → EXPG+1Ø
$MOVE
WAS A ":" input detected (CHARC)
XFER to JOBPR
$JLOD
BIT 15 of SWAP Set if :TY received from Keyboard while program is executing
Clear JOBPR "IN" flag
BIT 15 of SWAP Set
Set B ≠ Ø to indicate "WAIT till input"
$TYPE
$IDLI
Setup for library dump: EXPG+1Ø → START EXPG+6 → END
Page eject the list device
PAGE
Format and output lines to be dumped
FMOUT
FMOUT
FMOUT+1
Setup for 8 locations/line (LOOP); & Buffer Store Add (STADD)
Convert start address to octal
CNOCT
Store ASC II blank into MSD of the octally converted #
FM1Ø
Store address into buffer
STORE
Convert contents of Address to octal
CNOCT
Save the value in buffer
STORE
Increment to the next Address to be dumped
Is This the 8th entry per line
(A) = + = NOT done with prog dump
OUTPUT the line & return with flag in (A)
OUT
Is (A) Pos
FMOUT
PAGE
Control request to page eject
$SYIO
PAGE
OUT
OUTPUT 1 line of dump data
$SYIO
$SWAP
Init.
Complement starting dump address & END Address (Left in A on return)
OUT


;GO parameter processor
$EX16
On entry (B) may contain an Equipment table pointer
SAVE (B) (SVEQT)
Setup address into which parameters passed with ;GO (if any) will be stored (STADD)
Setup counter for 5 parameters (COUNT) & pointer to the potential parameters (BUFAD)
Complement of 2X # of wds = # of characters (BUFCT)
# of times GET is called
1. :
2. G
3. O
4 ?
Iterate this call 4 time to get ;GO?
GET
EX1Ø
Clear address currently pointed to by STADD,I
2
Returns with flag in A = Ø if no character to get
EX15
Get the next character
GET
1
A = Ø
YES
EX16
STORE Ø's into parameter until (count) = Ø (COUNT)
3
NO
EX2Ø
IS Character returned = comma
NO
IS character = BLANK
NO
Subtract 6Ø₈ from character to convert from ASCII to binary and save (→ TEMP)
Multiply previous stored value X 1Ø & then add current (STADD,I) X1Ø + TEMP
YES
1
YES
UPDATE STORED ADDRESS (STADD) And parameter Count (COUNT)
All parameters IN ?
NO
2
YES
3
Save point of susp Address; Clear PT of susP ($GOPT) and Input request code ($IOCO) & EX MOD AREA (EXMOD)
is PT of Suspension Address = Ø
NO
Return to System
NO
Was an EQT1 Address in (B) entered ?
YES
Set EQT address into EQT1 → EQT17
SETEQ
YES
Set (B) to point to possible parameters (DFADR → B)
Turn on mem. protect and interrupts
return to user
STADD,I
Set (B) ≠ Ø to indicate to wait till input
$TYPE
request batch input
$IDL1

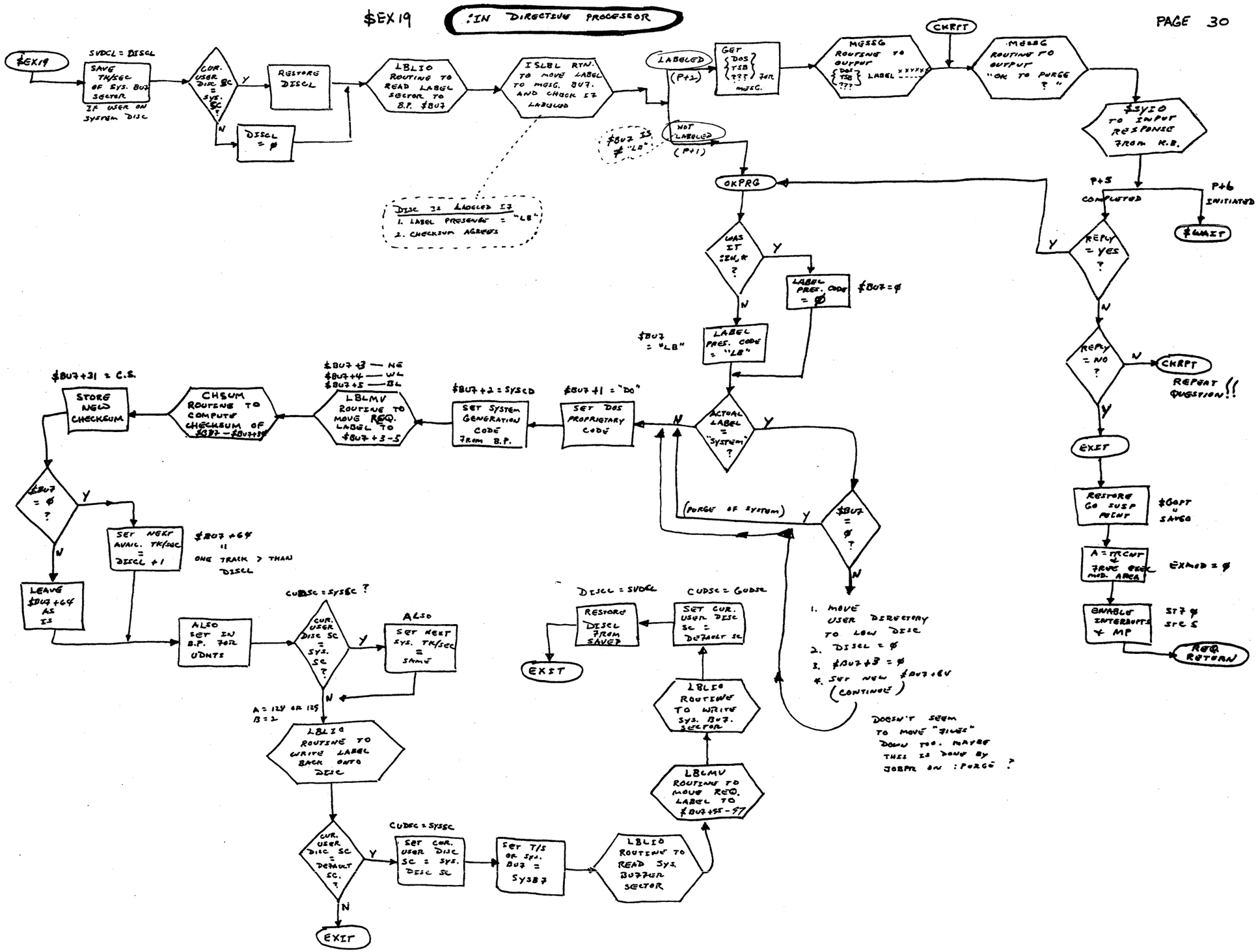
$EX18 (INPUT/OUTPUT CONTROL PROCESSOR) #1




IO.ØZ
A = RQCHN
SET A = SAVED REQ. CHAN. #
ISCHN ROUTINE TO SET CHAN # TO A-REG. FROM EQT.
(YES) P+1
(NO) P+2
RTRNX, I = A
STORE CHAN # IN INT. TABLE ENTRY
A = RQCHN +1
ISCHN ROUTINE TO CHECK RQCHN +1 COMPARES
DRIVER CORE RES. ?
BIT 14 OF EQT3, I = 1 ?
IODMD ≥ Ø ?
I/O DRIVER MOD AREA BUSY ?
Called with JSB
$IMBSY
P. 4
ON JMP $IMBSY, I IN DISCM $WAIT
READ/WRITE ON USER DISC AREA
P. 8
IO.4Ø
This is in the DISCM
RTRNX ROUTINE TO FREE EXEC MODULE AREA
RCODE = 14 OR 15 ?
USER FILE REQ. ?
BITS 8-13 OF EQT4, I = 31B ?
IS DEVICE DISC ?
READ/WRITE IN WORK AREA
JBIN AREA ASSIGNED ?
JBINC ≠ Ø ?
A = FIRST TRACK OF ALLOW JBINC
A = (JBINC)BITS 15-8 - 1
A = (DISCC) BITS Ø-1Ø
A = LAST TRACK ON DISC
SAVE LAST WORK TRACK IN TEMP2
TEMP2 = A
A = SYNTS
A = NEXT TK/SEC
B = Ø
-Ø
** RRL ROUTINE TO SHIFT TK TO Bg-7 SEC TO ACCUM
A = Ø ?
SEC. = Ø ?
B = B+1
INCREMENT TRACK
DUE TO PARTIAL SECTOR
-(RQP3 + (# WORDS) + UMLWA ≥ Ø ?
RQP3 + (# WORDS) SET E-REG. = 1 ?
CORE WRAP AROUND ?
ABOVE TOP OF CORE
ABOVE LAST WORD OF USR AREA
ERR Ø4
P. 13
NWDSX ROUTINE TO CONVERT REQ BUF LEN TO WORD COUNT
FROM RQP4, I
-(RQP3 +1) + UMFWA < Ø ?
REQ. BUF. IN USER AREA ?
ERR Ø3
P. 13
USER BUF ADDRESS IN SYSTEM AREA
RCODE = 3 ?
CONTROL REQ. ?
USER REQUEST
REQ. FOR USER DISC ? (BITS 6-8 OF RQP2, I)
LU = 3 ?
SET COR DISC REQ. FLAG ≠ Ø
CRFLG ≠ Ø FOR USER DISC
A = -A
ENTW = -3 ?
RQP2, I = -3 ?
READ/WRITE ?
R.C. = 1 OR 2 ?
P. 11
RQEQT ROUTINE TO TRANSFER REQ. PAR. TO EQT TABLE
RQRTN
RQP1, I - RQP6, I
EQT7, I - EQT13, I
RQP1, I < Ø ?
SYSTEM R.C. ?
SYSTEM REQUEST
BITS 8-13 OF EQT4, I = 11B ?
IS DEVICE DISC ?
IO.1Ø
IO.3Ø
BIT 14 OF EQT3, I = 1 ?
DRIVER CORE RES ?
IO.15
P. 29C
EQT1 = IODMD ?
DRIVER NOT IN CORE ?
P. 29C
IO.15
$LDVR ROUTINE TO LOAD THE DRIVER INTO CORE
P. 9
IC.15
p. 29C
-(RQP5, I + 1) + B < Ø ?
REQ. TRACK = FIRST TRACK ?
ERRØ5
P. 13
A = # WORDS IN REQ
B = Ø
-Ø
RRL ROUTINE TO SHIFT FIRST SEC IN A TO Ø-1 B
B = B+1
INCREMENT # SEC
DUE TO PARTIAL
next page
A


$EX18 #3
A
B = B + RQP6, I
ADD REQ. SECTOR ADDR TO #SEC. DUE TO # WORDS
A = B / #SEC/TK + RQP5, I
LOOP TO GET LAST TRACK USED IN REQ. TO A-REG.
-A + TEMP2 ≥ 0 ?
LAST REQ. TK. ≤ LAST WORK ?
ERR#5
p. 13
RQP6, I + #SEC/TK < 0 ?
REQ. SEC. # < #SEC/TK WORK ?
ERR#5
p. 13
SET UP USER DESC TRIPLET PARAMETER BUF. IN BASE PAGE
LOC 171-173
UBUFR, UBUFR+1, +2
171 = (RQP5, I)8-15 (RQP6, I)0-7
172 = RQP3 (CORE ADD.)
173 = RQP4, I (WORD COUNT)
RQCNT = 6 ?
# REQ. PARA. = 6 ?
ERR#1
p. 13
A = 2
LUCHK
ROUTINE TO PUT EQT1 - EQT17 FOR LU 2 IN B.P.
p. 11
RQEQT
ROUTINE TO TRANSFER REQ PARAMETERS TO EQUIP. TABLE
p. 11
CONVERT REQUEST BUFFER LENGTH TO WORD COUNT
NWDSK
RQP4, I
REQ. BUF. LEN. < 0 ?
DIVIDE BY 2 AND 2's COMP
STORE AS + # WORDS
NWDS = +(# WORDS)
RETURN P+1
RQP2, I = -3 ?
CNTLW WORD = -3 ?
SET CUR. USER DESC. SUBCHAN = SOURCE TYPE SUBCHANNEL
CUDSC = JFLSC
A = ADDR. OF USER DESC TRIPLET PARAMETER BUFFER
A = 1718
IO.15
STORE IN TENTH EQUIP. TABLE ENTRY
EQT10, I = A
***
p.6
DRIVR
ROUTINE TO CALL DRIVER INITIATOR SECTION
***
OPERATION INITIATED
P+1
RTRNX
ROUTINE TO FREE EXEC MODULE AREA
RESTORE CURRENT USER DESC. SUBCHANNEL
CUDSC = SAVSC
RQP2, I = -3
CNTLW WORD = -3 ?
A = -3
Bit 13 of RQP2, I = 1 ?
I/O WITHOUT WAIT BIT ON ?
(WAIT)
(NO WAIT)
RETRN
p. $EX18 #1
p. 4
$WAIT
A = Reason
OTHER OPERATION
- REJECT
- Immediate comp.
- No DMA avail
- Malfunction
...etc...
P+2
CUDSC = SAVSC
RESTORE CURRENT USER DESC. SUBCHANNEL
WAITING FOR DMA ?
A = ADDR. OF IO.15 FOR RETRY
$DMA
p. 4
A = 5 ?
A = 2 ?
CONTL OPER. REJECT ?
IO19A
RTRNX ROUTINE TO FREE EXEC MOD. AREA
A = EQT4, I
SET A = STATUS FROM EQT TABLE
B = 0
SET TRANSMISSION LOC. = 0
RETRN
p. $EX18 #1
A = 3 ?
EQUIP MALFUNC OR NOT READY ?
$MDB7 = EQT1
SET ADDR. OF CUR. EQT TABLE START IN EXEC MOD DATA BUF
TEMP = DE704
RTRNX ROUTINE TO FREE EXEC MOD AREA
B = 18
A = 4
$MDLD
p. 8
To load $EX04
A = 6 ?
IO.19
DRIVER REQUIRE A WAIT ?
IO.B
A = 4 ?
IMMED. COMP ?
ERRTN
p. 13
Operation reject
FREE EXEC MODULE AREA
RTRNX
SET A = EXEC MODULE CORE FLAG
A = EXMOD
A < 0 ?
THIS FLAG < 0 ?
A = -A
STORE BACK IN EXMOD
RETURN P+1

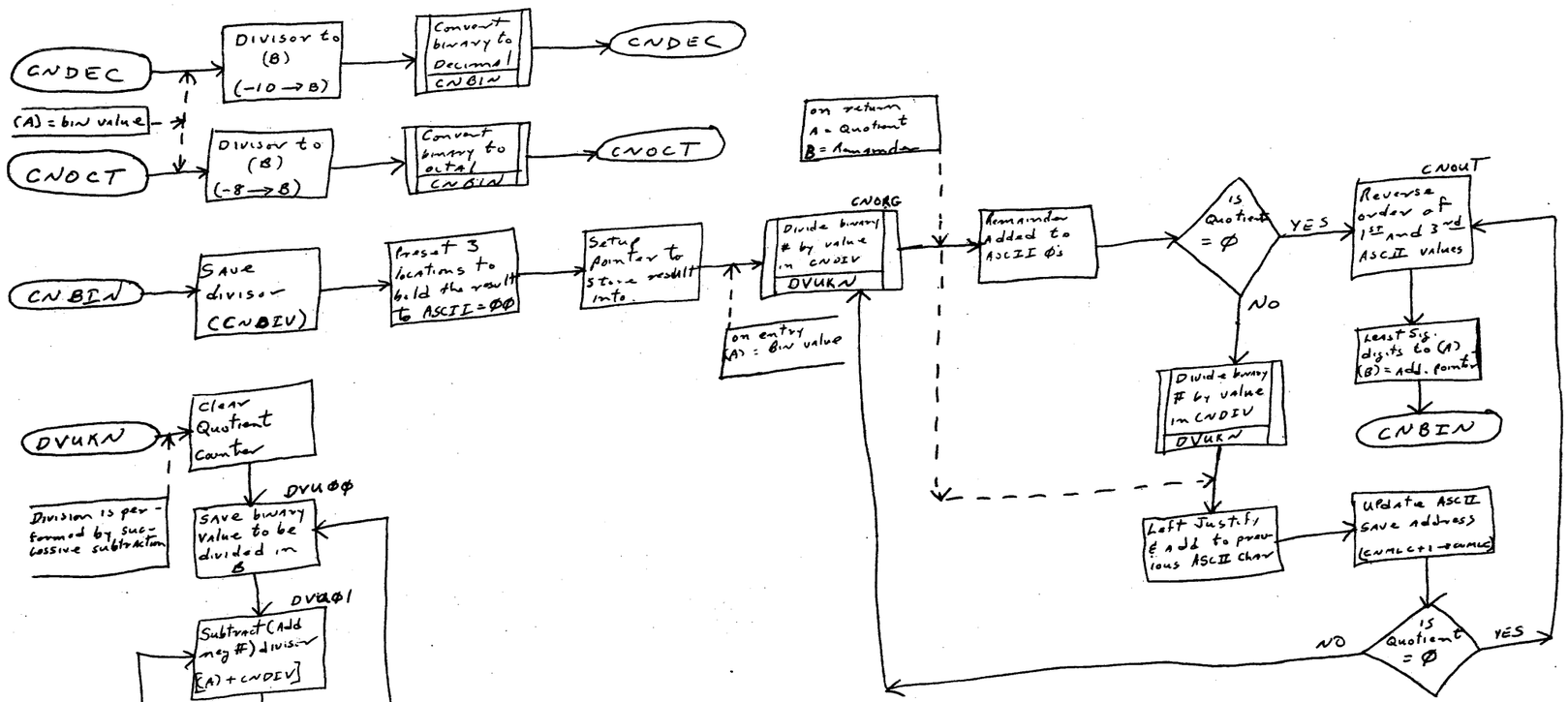
$EX19 — :IN DIRECTIVE PROCESSOR



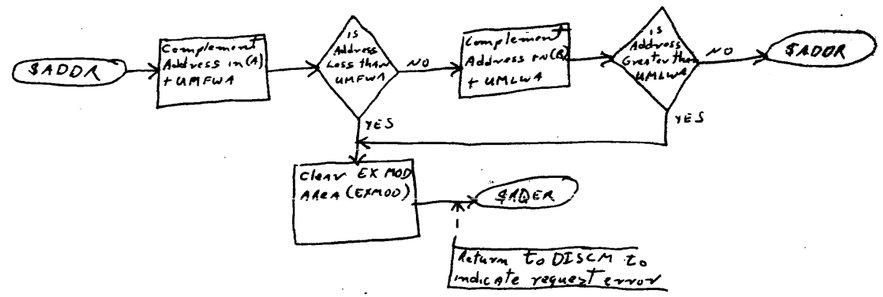
ASCII → Convert Binary to ASCII Octal or Decimal

Calling sequence: LDA <Value in binary>
JSB CNDEC/CNOCT

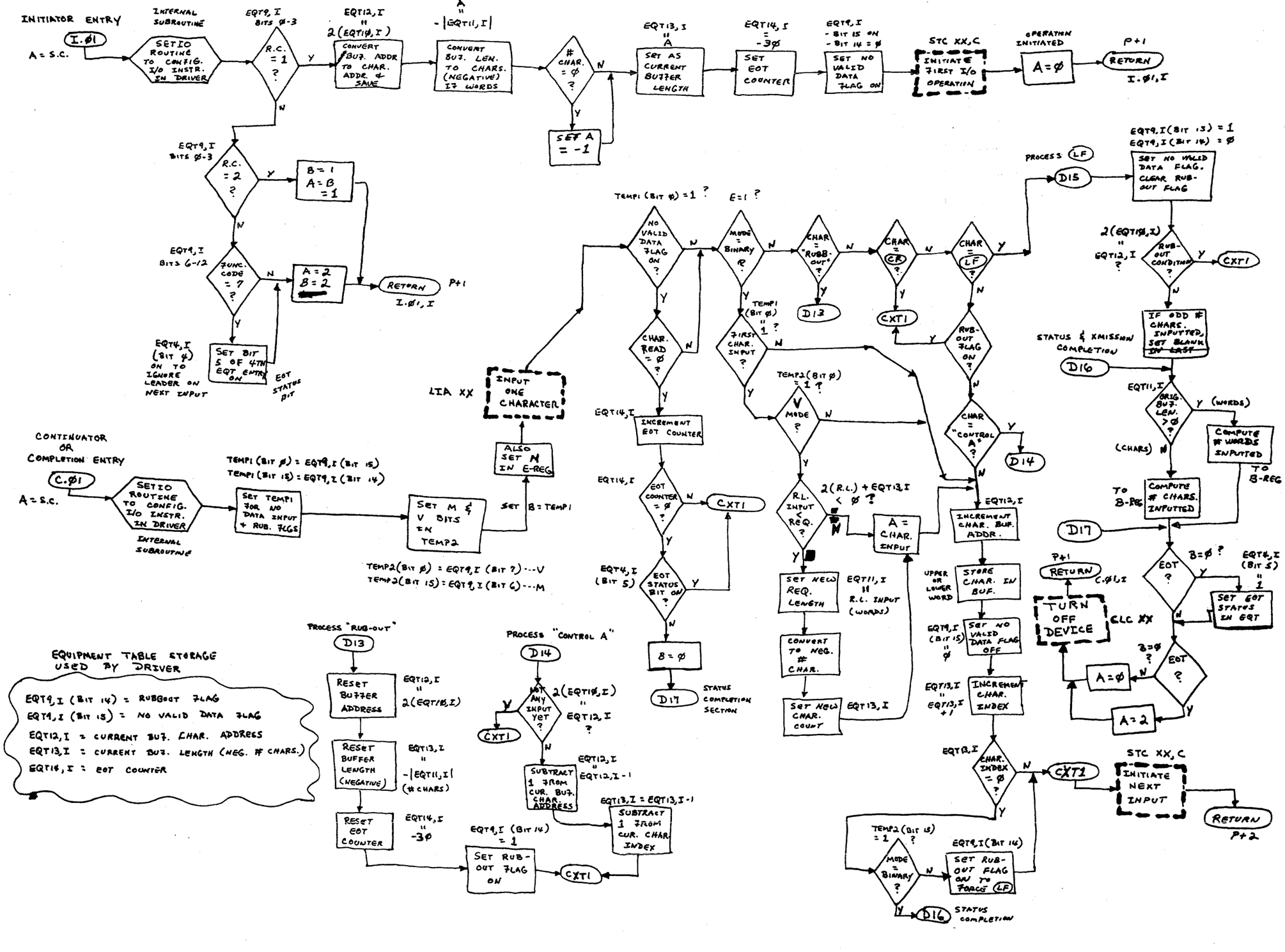
Return: (A) Least significant 2 digits
(B) Address of most significant digits



$ADDR - checks if buffer address limits are within the user Program area limits



DOS/DOS-M READER DRIVER (DVRØ1) "A"-VERSION



DOS/DOSM MINIMUM HARDWARE COST COMPARISON

DOS

PROVIDES MINIMUM HARDWARE CONFIGURATION CONSISTING OF:

		PRICE 115V 60Hz	PRICE 230V 50Hz
1.	2116B Computer with 8192 Word Memory	$20,000	$20,000
2.	Direct Memory Access, Accessory No. 12578A	3,000	3,000
3.	Extended Arithmetic Unit, Accessory No 12579A	3,000	3,000
4.	Memory Parity Check, Accessory No. 12591A	1,000	1,000
5.	Time Base Generator, Accessory Kit No. 12539A	1,000	1,000
6.	Memory Protect, Accessory Kit No. 12581A	2,000	2,000
7.	Teleprinter Input/Output consisting of:		
	HP 2752A Teleprinter (Modified Teletype ASR-33) with	1,250	1,450
	HP 12531B Teleprinter Input/Output Interface Kit	750	750
8.	Teleprinter Input/Output, consisting of:		
	HP 2754B Heavy-Duty Teleprinter (modified Teletype ASR-35) with	3,850	4,250
	HP 12531B Teleprinter Input/Output Interface Kit	750	750
9.	Disc Memory consisting of:		
	HP 2770A Disc Memory (368,640 words non-expandable)	17,000	17,200
	HP 2772A Disc Memory Power Supply	2,500	2,700
	HP 12606A Disc Memory Interface Kit	4,000	4,000
10.	2886A Single-Bay Cabinet	900	900
	TOTAL COST	$61,000	$62,000

(Four-Year Lease @ $1,690/month)

DOSM

PROVIDES MINIMUM HARDWARE CONFIGURATION CONSISTING OF:

		PRICE 115V 60 Hz	PRICE 230V 50 Hz
1.	2114B Computer with 8K memory	$13,000	$13,100
2.	Direct Memory Access, Accessory Kit No. 12607A	1,500	1,500
3.	Memory Parity Check with Interrupt, Accessory Kit No. 12598A	1,000	1,000
4.	System Console, consisting of:		
	HP 2752A Teleprinter (Modified Teletype ASR-33) with	1,250	1,450
	HP 12531B Teleprinter Input/Output Interface Kit	750	750
5.	System Input, consisting of:		
	HP 2748A Punched Tape Reader with	1,500	1,600
	HP 12597A-002 Punched Tape Interface Kit	600	600
6.	Cartridge Disc Memory System, consisting of:		
	HP 2870A Disc Drive (includes HP 12536A Disc Cartridge)		
	HP 2871A Disc Controller	13,500	13,650
	HP 2881A Power Supply		
	HP 2882A Cabinet		
	HP 12557A Disc Interface Kit	2,500	2,500
	TOTAL COST	$35,600	$36,150

(Five-Year Lease @ $765/Month)

HP DOS-M/IBM 1130 COST COMPARISON

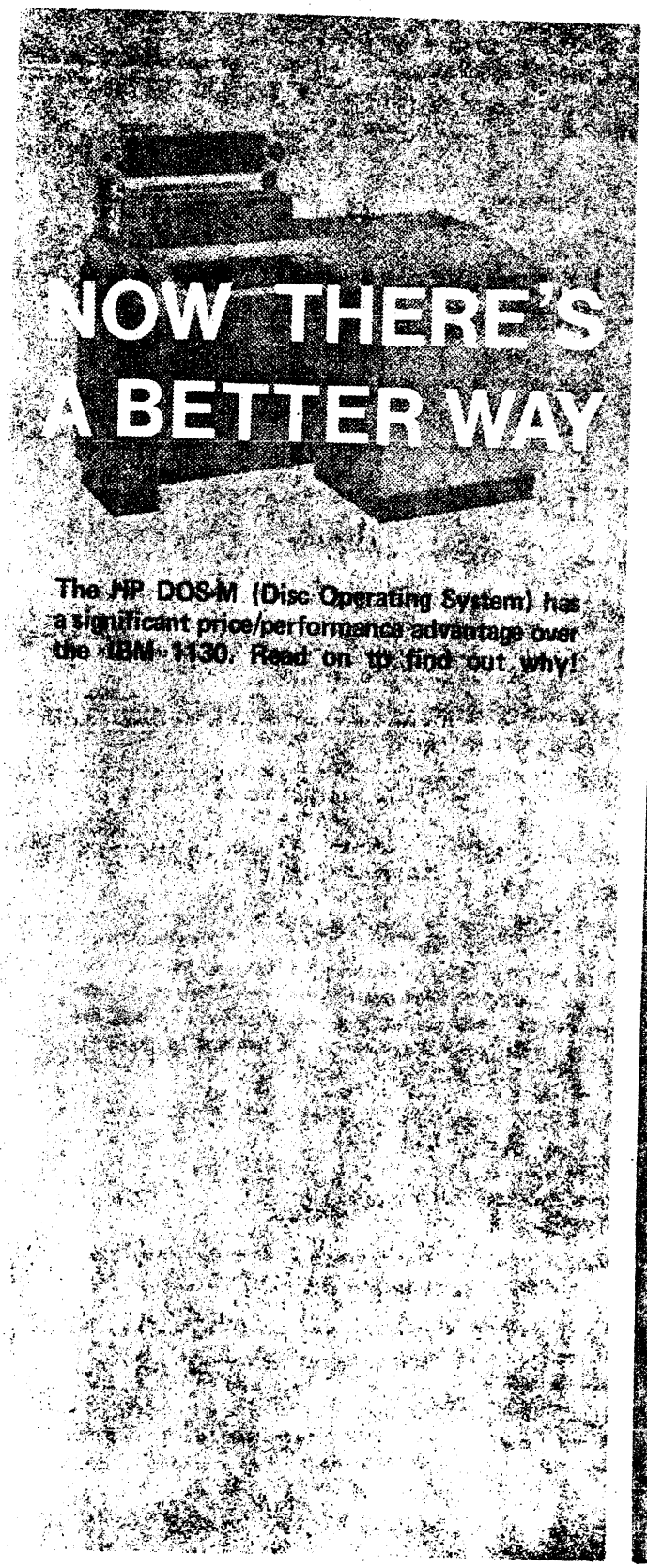
HP DOS-M		IBM 1130	
MINIMUM SYSTEM (WITH PAPER TAPE)	PURCHASE	MINIMUM SYSTEM (WITH PAPER TAPE)	PURCHASE
2114B (2.0 MICROSEC)	$ 8,500	1131-2A (3.6 MICROSEC)	$ 34,610
OPTION 4 (8K MEMORY TOTAL)	4,500	TTY/PRINTER CONSOLE	
12591A MEMORY PARITY CHECK	1,000	4K CORE, 500K DISC	
12067A DIRECT MEMORY ACCESS	1,500	1134 PAPER TAPE READER (60 CHARACTERS/SEC)	1,270
2870A CARTRIDGE DISC DRIVE	8,700	3623 P.T. READER ATTACHMENT	450
2871A DISC CONTROLLER	2,800	1055 PAPER TAPE PUNCH (14.8 CHARACTER/SEC)	900
12557A DISC INTERFACE	2,500	7923 P.T. PUNCH ATTACHMENT	900
2882A DISC CABINET	600		
2881A DISC POWER SUPPLY	1,400	(WITH CARD I/O)	$ 38,130
2752A TELEPRINTER ASR-33	1,250	1131-2A AS SHOWN ABOVE	34,610
12551B TELEPRINTER INTERFACE	750	1442 CARD READER/PUNCH (160 COLUMNS/SEC)	12,750
2784A PAPER TAPE READER (500 CHARACTERS/SEC)	1,500	4419 CARD READER/PUNCH ATTACHMENT	1,525
12597A P.T. READER INTERFACE	600	3630 1442 INTERFACE	225
	$ 35,600		$ 49,110
TYPICAL SYSTEM	PURCHASE	TYPICAL SYSTEM	PURCHASE
2114B (2.0 MICROSEC)	$ 8,500	1131-3B (2.2 MICROSEC)	$ 58,050
OPTION 4 (8K MEMORY TOTAL)	4,500	TTY/PRINTER CONSOLE	
12591 MEMORY PARITY CHECK	1,000	8K CORE, 500K DISC	
2870A CARTRIDGE DISC DRIVE	8,700	1134 PAPER TAPE READER (60 CHAR/SEC)	1,270
2871A DISC CONTROLLER	2,800	3623 P.T. READER ATTACHMENT	450
12557A DISC INTERFACE	2,500	1055 PAPER TAPE PUNCH (14.8 CHAR/SEC)	900
2882A DISC CABINET	600	7923 P.T. PUNCH ATTACHMENT	900
2881A DISC POWER SUPPLY	1,400	1132 LINE PRINTER	11,350
2752A TELEPRINTER ASR-33	1,250	82 LPM ALPHAMERIC	
12551B TELEPRINTER INTERFACE	750	110 LPM NUMERIC	
2748A PAPER TAPE READER (500 CHAR/SEC)	1,500	2310 DISC DRIVE 500K WORDS	12,150
12597A P.T. READER INTERFACE	600		
2753A PAPER TAPE PUNCH (120 CHAR/SEC)	3,300		
12597A P.T. PUNCH INTERFACE	600		
2767A LINE PRINTER (80 COL. 356-1110 LPM)	10,000		
12653A LINE PRINTER INTERFACE	2,500		
	$ 52,000		$ 85,070

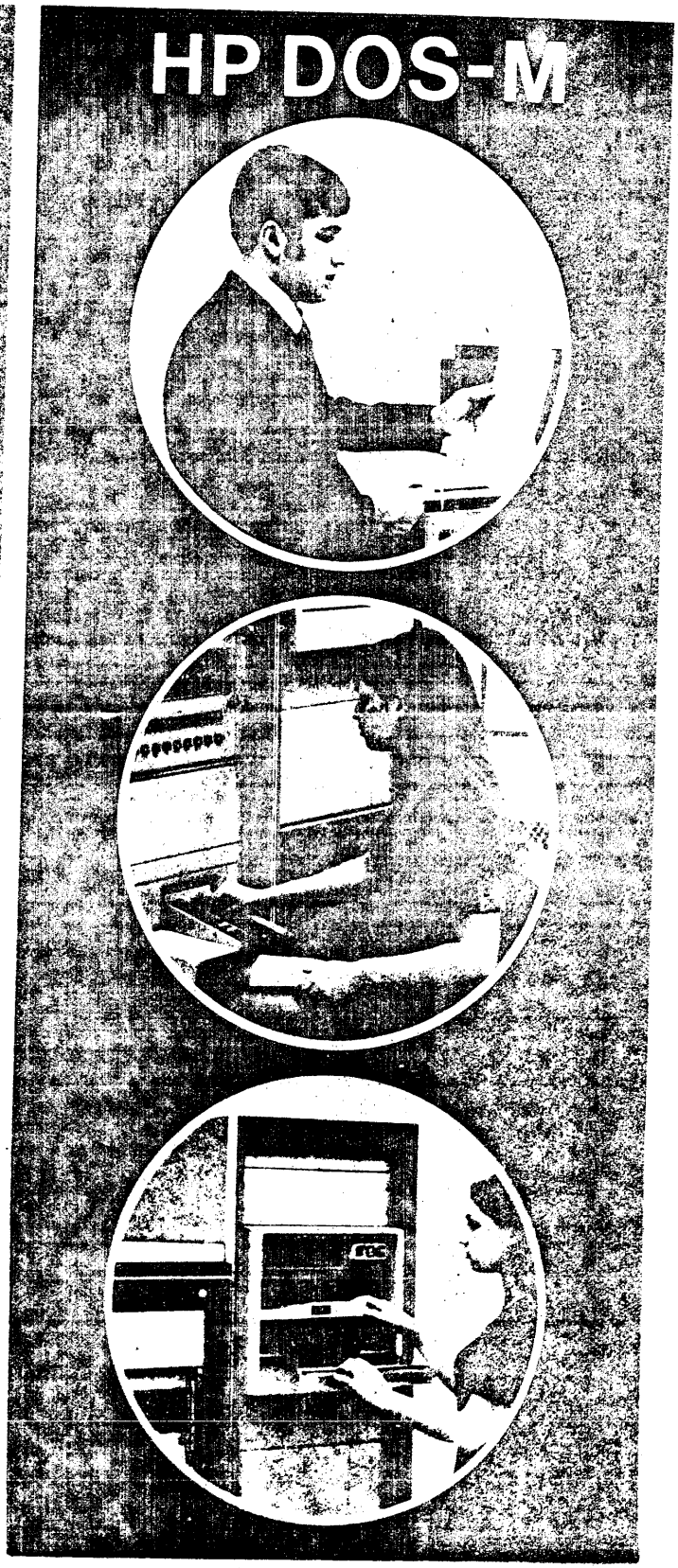
DOSM HARDWARE OPTIONS

1. ADDITIONAL MEMORY
   16,384 OR 32,768 WORDS ON 2116B
2. ADDITIONAL I/O CHANNELS
   EXTENDERS ARE AVAILABLE FOR 2114B OR 2116B
3. TIME BASE GENERATOR (TBG)
4. EXTENDED ARITHMETIC UNIT (EAU)
   AVAILABLE ONLY ON 2116B
5. MEMORY PROTECT (MP)
   AVAILABLE ONLY ON 2116B
6. PHOTOREADER
7. PAPER TAPE PUNCH
8. LINE PRINTER (2778A CDC OR 80 COLUMN D.P.)
9. MARK SENSE CARD READER
10. MAGNETIC TAPE (3030A OR 7970A)
11. CALCOMP PLOTTER
12. UP TO THREE ADDITIONAL DRIVES

HP DOS-M vs IBM 1130

SALES AMPLIFIER 101A





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HEWLETT hp PACKARD

INTRODUCTION

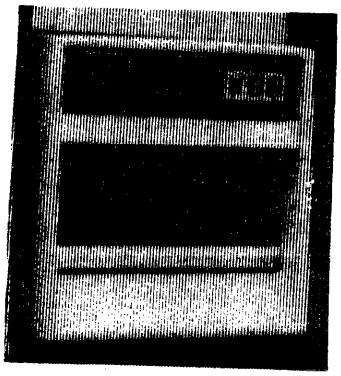
The IBM 1130 is a desk size, word-oriented computer intended primarily for small scale scientific applications. It can also serve as a low cost processor for certain business applications that do not require high I/O speeds. IBM announced the 1130 system in 1965, and the initial customer deliveries were made an November, 1965.

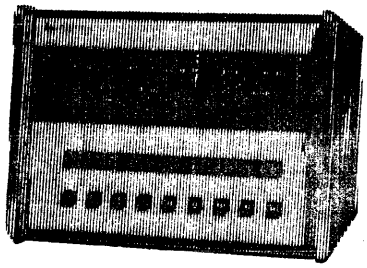
Since the initial introduction, a number of software and hardware announcements have followed (i.e., a 2.2 microsecond cycle time versus 3.6, more peripheral flexibility, commercial subroutine packages, etc.).

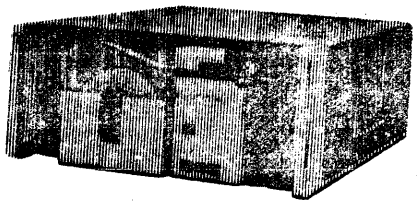
It is purported that IBM has between 6500 and 7500 units in the field.

HP DOS-M VS IBM 1130

COMPARISON	DOS-M	IBM 1130
DISC STORAGE		
1. MAXIMUM ON LINE	4.8 million words	2.5 million words
2. AVERAGE RANDOM ACCESS TIME	90 milliseconds	790 milliseconds
CORE STORAGE		
1. CYCLE TIME	2 microseconds on the 2114B 1.6 microseconds on the 2116B	2.2 to 3.6 microseconds depending on the CPU model
2. MEMORY SIZE	8K in the 2114B Expandable to 32K in the 2116B	Expandable from 4K to 32K
IMPLICATIONS:	**DOS-M requires much less time than the 1130 to retrieve information from core or disc. This significantly decreases the amount of overhead involved in system and user program execution. The quantity of disc storage available on line may be expanded to 4.8 million words – (approximately twice the amount available on the 1130).**	
I/O DEVICE INTERFACING		
1. NUMBER OF DEVICES	A maximum of 24 peripherals may be interfaced to a DOS-M.	A maximum of 11 peripherals may be attached to an 1130.
2. KINDS OF DEVICES	Instrumentation devices may be easily interfaced to the system.	Non-IBM devices are *extremely difficult* to interface to this system.
3. DEVICES OF THE SAME TYPE	The user may attach several peripherals of the same type to the system. Note: 4 discs (max)	Normally only one peripheral of each type may be included in the system. Note: 5 discs (max) 2 printers (max)
IMPLICATIONS:	**The DOS-M system is capable of supporting a much more varied range of peripherals than the 1130. Each HP system may be custom configured to the peripheral needs of the user.**	







COMPARISON

DOS-M

IBM 1130

SYSTEM PROTECTION

1. HARDWARE DISC PROTECT	Standard	None
2. SOFTWARE SYSTEM PROTECT	Yes	Yes

IMPLICATIONS:

Hardware disc protect insures the integrity of DOS-M; the 1130 system, on the other hand, can be destroyed by user software. (Users have called the 1130 crash prone.)

SYSTEM BACK UP

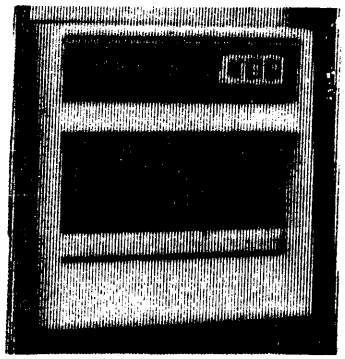
1. **BACK UP CREATION (minimum configuration)**	DOS-M system programs, user programs, and data files may be copied from the fixed portion of the disc to the disc cartridge. This back up cartridge may then be removed, stored off line, and replaced with a scratch cartridge.	IBM supplies 1130 users with a card copy of the 1130 operating system. Back up for user programs or data files, however, must be obtained by copying them from disc to punched cards. (IBM 1130s may use paper tape I/O instead of card I/O, but such systems are rare.)
2. **RESTORATION FROM BACK UP (minimum configuration)**	System restoration may be accomplished by copying the contents of the back up cartridge onto the fixed portion of the disc. The back up cartridge may then be removed and replaced with a scratch cartridge.	In a minimum 1130 system, the user must restore system software, user programs, and user files by copying information from punched cards to disc.

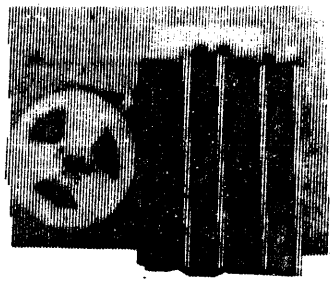
IMPLICATIONS:

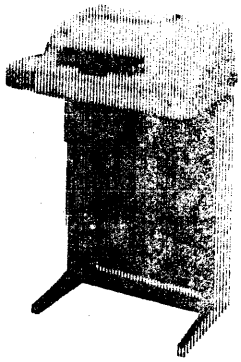
On a minimum 1130 system, back up for user programs and data files may only be created on punched cards. DOS-M, on the other hand, *does not require card punch hardware* but is capable of creating a spare copy of disc resident information quickly, efficiently, and in an easily storable form – a cartridge disc pack.

If a one disc 1130 system fails, the software must be copied from card to disc – at least a 30 minute process. A DOS-M system, however, may be restored by copying software from disc to disc.

Each user at a DOS-M installation may keep an off line copy (disc pack) of a system custom configured to his needs – system programs, user programs, source files, and data files.







COMPARISON

DOS-M

IBM 1130

SYSTEMS FEATURES

1. SOURCE FILE CAPABILITY

User may store copies of source programs in named disc files on line.

none

2. SOURCE FILE EDITING

User may insert, delete, or replace disc file source statements on line.

none

IMPLICATIONS:

The ability of DOS-M to store and edit disc source programs on line makes the system extremely useful for software development work. Once source statements have been stored on disc, they may be edited and recompiled directly from disc. All source program editing on the 1130, however, must be done off line; recompilation requires the user to reload his card deck or source tape.

3. DATA FILE ADDRESSING

DOS-M allows the user to read or write data on disc by file name and relative sector or by actual track and sector address. Both addressing methods may be used in Fortran or Assembly language.

The 1130 system allows Fortran users to address data files by number in READ or WRITE statements. Assembly language disc I/O subroutines require actual track and sector addresses and therefore cannot make use of symbolic file addressing.

IMPLICATIONS:

The ability of DOS-M to address information on disc by file name makes file handling more mnemonic and simpler to use.

4. USER PROGRAM SEGMENTATION AND OVERLAY

The user must segment his program and code segment overlay requests.

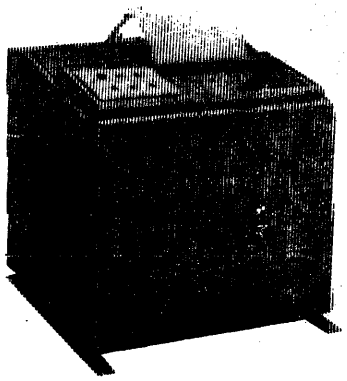
Fortran *subprograms* may behave as automatically called overlay segments if the original program size exceeds available core. This "Automatic Segmentation" is not available if the main program is written in Assembly language. User controlled segmentation is also available.

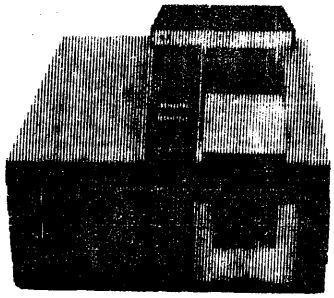
IMPLICATIONS:

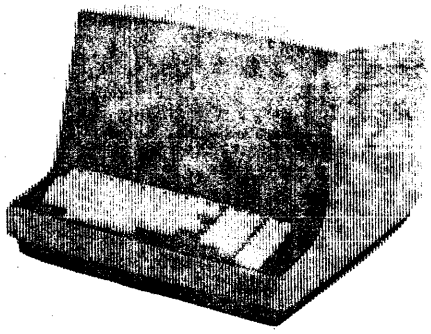
"Automatic Segmentation" is a strong feature of the 1130. It should be noted, **however, that it will not segment main programs but treats subroutines** as segments. If **the main program and overlay area are larger than available core,** the user must **segment his program.**

The use of the "Automatic Segmentation" feature may increase a program's execution **time very substantially – (in direct proportion to the number** of time consuming **overlay requests) due to the slow (790 millisecond access time)** disc.

Assembly language system development work may not use the "Automatic **Segmentation" feature.**







COMPARISON	DOS-M	IBM 1130
5. RESIDENT MONITOR (size)	3500_{10} locations	From 480_{10} to 930_{10} locations.
IMPLICATIONS:	**The limited size of the 1130 monitor leaves more core available for user program execution but requires that the bulk of the system be kept on disc. By making only a small portion of the system core resident, the 1130 incurs greater disc transfer overhead during system program execution.**	
	Since program segmentation may be used with the 1130 and DOS-M, the amount of user available core is seldom critical. Indeed, the whole purpose of a disc operating system is to use mass storage to extend limited core storage.	
6. PROGRAM DEBUGGING FACILITIES	The DOS-M system permits the user to dump an octal core image of his program. Dumps may be taken whether the program terminates normally or aborts execution. An additional debug package allows the user to monitor his program's execution on line.	There are several core dump routines available for the 1130. Some of these programs must be called by the user during the execution of his program, while others must be loaded off line and executed.
IMPLICATIONS:	**The core dump on abnormal program termination and the debug package of DOS-M make it very useful in a software development environment. All core dumps and debug facilities do not require any modification of the user's in line code. All on line 1130 core dumps, however, require that the user either place calls to dump routines** ***into his program code,*** **or use an** ***off line*** **dump routine.**	
7. I/O DEVICE REFERENCE TECHNIQUES	I/O devices are referenced using logical unit numbers. These numbers correspond to various I/O *functions* – system input, list, punch, etc.	The 1130 references peripherals with a set of numbers assigned to each type of I/O device which may be attached to the system.
	Logical unit assignments may be changed on line to associate any appropriate system device with a given logical unit number.	Unit reference number assignments are permanently determined. In a Fortran program, however, the user may substitute a variable unit reference number which will be determined at execution time.
IMPLICATIONS:	**DOS-M programs coded with logical unit numbers may be executed on any other DOS-M system regardless of hardware configuration. If 1130 programs use constant logical unit numbers, they may not be compatible with other 1130 hardware configurations. (Devices associated with fixed logical unit numbers cannot be changed on line in the 1130 system.)**	

SUPPORTING SOFTWARE

1. TRANSLATORS	Assembly language FORTRAN II or IV ALGOL	Assembly language FORTRAN IV subset RPG COBOL (available Feb. 1971) APL
2. USER APPLICATION PACKAGES	under development	petroleum exploration and engineering type composition civil engineering coordinate geometry math pack - 20 Fortran subroutines electric field theory elasticity fluid flow etc. Statistical system numerical surface techniques countour map plotting commercial subroutine package (21 Fortran subroutines)
3. SOFTWARE COST	All presently available system software is furnished free of charge with a DOS-M system. The pricing structure on applications packages will be announced as they become available.	All IBM 1130 software developed prior to "unbundling" (June 23, 1969) is available without charge. Recently developed software, however, will be rented on a monthly basis. (The 1130 COBOL compiler will rent for $75/month.)

IMPLICATIONS:

The quantity of applications software available is one of the strongest features of the IBM 1130. The majority of these programs are available free of charge. It should be noted, however, that OEMs will be primarily interested in the quality of the operating system itself and the ease with which the system may be used to develop specific user-oriented applications packages.

DATA COMMUNICATIONS

At this time no data communications software capability is available with the DOS-M. All hardware cards needed to implement this capability are presently available, however, and may be used by a customer to develop his own applications software.

The 1130 may act as a remote job entry work station for a larger IBM 360 operating system. In this capacity, the 1130 sends jobs via telephone lines to the larger system and outputs results sent back. If the 1130 has at least 16K of core, job output can be buffered on the disc and dumped after the remote job entry processing is terminated.

IMPLICATIONS:

The 1130 system's ability to communicate with a larger computer is certainly a powerful feature. It should be noted, however, that all programs and job control language sent to a 360 system must be 360 operating system compatible. (If an 1130 user has an assembly language program which he wishes to run with remote job entry, the program must be in IBM 360 assembly language and must have the appropriate 360 job control language statements associated with it.)

PRICING STRUCTURE

IMPLICATIONS

Although the DOS-M system purchase price is significantly (15 to 65%) less than that of a comparable 1130 system, IBM offers a variety of attractive lease/rental plans including 30 and 90 day cancellation options. This can be a significant advantage in the educational market. IBM does *not*, however, offer an educational *discount* on the 1130 system.

HP DOS-M

PRICE COMPARISON

IBM 1130

MINIMUM SYSTEM (with paper tape)	PURCHASE
2114B (2.0 microsec)	$8,500
Option 4 (8K memory total)	4,500
12591A Memory Parity Check	1,000
12067A Direct Memory Access	1,500
2870A Cartridge Disc Drive	8,700
2871A Disc Controller	2,800
12557A Disc Interface	2,500
2882A Disc Cabinet	600
2881A Disc Power Supply	1,400
2752A Teleprinter ASR-33	1,250
12531B Teleprinter Interface	750
2748A Paper Tape Reader (500 characters /sec)	1,500
12597A P.T. Reader Interface	600
	$35,600

MINIMUM SYSTEM (with paper tape)	PURCHASE
1131-2A (3.6 microsec) TTY/Printer Console 4K core, 500K disc	$34,610
1134 Paper Tape Reader (60 characters/sec)	1,270
3623 P.T Reader Attachment	450
1055 Paper Tape Punch (14.8 character/sec)	900
7923 P.T. Punch Attachment	900
	$38,130
(with card I/O)	
1131-2A as shown above	$34,610
1442 Card Reader/Punch (160 columns/sec)	12,750
4419 Card Reader/Punch Attachment	1,525
3630 1442 Interface	225
	$49,110

HP DOS-M

PRICE COMPARISON

IBM 1130

TYPICAL SYSTEM	PURCHASE
2114B (2.0 microsec)	$8,500
Option 4 (8K memory total)	4,500
12591A Memory Parity Check	1,000
12067A Direct Memory Access	1,500
2870A Cartridge Disc Drive	8,700
2871A Disc Controller	2,800
12557A Disc Interface	2,500
2882A Disc Cabinet	600
2881A Disc Power Supply	1,400
2752A Teleprinter ASR-33	1,250
12531B Teleprinter Interface	750
2748A Paper Tape Reader (500 char/sec)	1,500
12597A P.T. Reader Interface	600
2753A Paper Tape Punch (120 char/sec)	3,300
12597A P.T. Punch Interface	600
2767A Line Printer (80 col. 356-1110 lpm)	10,000
12653A Line Printer Interface	2,500
	$52,000

TYPICAL SYSTEM	PURCHASE
1131-3B (2.2 microsec) TTY/Printer Console 8K core, 500K disc	$58,050
1134 Paper Tape Reader (60 char/sec)	1,270
3623 P.T. Reader Attachment	450
1055 Paper Tape Punch (14.8 char/sec)	900
7923 P.T. Punch Attachment	900
1132 Line Printer 82 LPM Alphameric 110 LPM Numeric	11,350
2310 Disc Drive 500K words	12,150
	$85,070

5950-4350 (22)

FROM WALL STREET JOURNAL OCT. 29, 1970

IBM Enters the Mini-Computer Market As It Unveils 2 New Models, Its Cheapest

By a Wall Street Journal Staff Reporter

NEW YORK — International Business Machines Corp. introduced two small computers for office and industrial applications.

The two are the least expensive that the world's largest computer maker has offered, and one of them, at least, puts IBM into competition for the first time with makers of what have come to be called mini-computers.

Digital Equipment Corp. of Maynard, Mass., has been the dominant manufacturer of mini-computers, which generally are priced under $20,000 and as low as $5,000. Such computers have been used largely for calculations by scientists and engineers, but they are being applied increasingly to industrial processes and some small-business uses. Other leading manufacturers include Honeywell Inc., Varian Associates Inc., Hewlett-Packard Co. and Data General Corp.

Trading in Digital Equipment's stock on the American Stock Exchange yesterday reacted sharply to IBM's announcement. Digital Equipment closed at $61.875, down 2⅞ points a share. During the day it traded as low as $57.50. IBM, traded on the New York Stock Exchange, closed at $298.50, up $5.50 a share.

The new IBM model that can be considered a mini-computer is the System 7, designed specifically to monitor and control industrial and laboratory processes. It may be purchased for a minimum of $16,060 or rented for $352 a month and up. First deliveries to customers are scheduled for November 1971.

In Maynard, a Digital Equipment spokesman said the System 7 appears to be priced too high to be a mini-computer by the company's standard. He added that Digital Equipment probably has competed very well with IBM's previous process control models and that "we think we will continue to do well."

The System 7, operating unattended, can monitor and analyze control processes in petroleum and chemical plants, electric-utility systems, steel mills and lumber yards and in a variety of other industries. It can take as many as 256,000 readings a second from instruments, analyze them and, if desired, forward the data to a larger central computer.

As do several mini-computers already on the market, the System 7 has a main memory made of integrated electronic circuits, rather than of the usual magnetic cores.

The System 7 isn't designed for business data processing or for direct use by an engineer or scientist, IBM said. However, F. T. Rodgers, president of IBM's Data Processing division, was asked if the System 7 would be available for purchase as a component by other assemblers of control systems, who currently represent a large share of the market for mini-computers. "We'll be delighted to sell this to anybody," Mr. Rodgers replied.

IBM's other new computer is the System 3 Model 6, an extension of the System 3 small-scale computer, since designated the Model 10, that was introduced in 1969. System 3 computers are aimed for the most part at business op-

[illegible] previously used computers and had said that more than 1,000 System 3 computers have been delivered this year.

Designed for business data processing, a typical Model 6 unit can be purchased for $48,200 or rented for $1,015 a month. First deliveries of it, in contrast to those of the System 7, are scheduled within 60 days. IBM distinguished the first production unit of the Model 6 in Hood River, Ore.

The Model 6 can be used for accounting functions, including the processing of standard ledger cards, and also for engineering calculations in a "conversational" mode, IBM said. It stores data on magnetic disks and can communicate with other IBM computers.

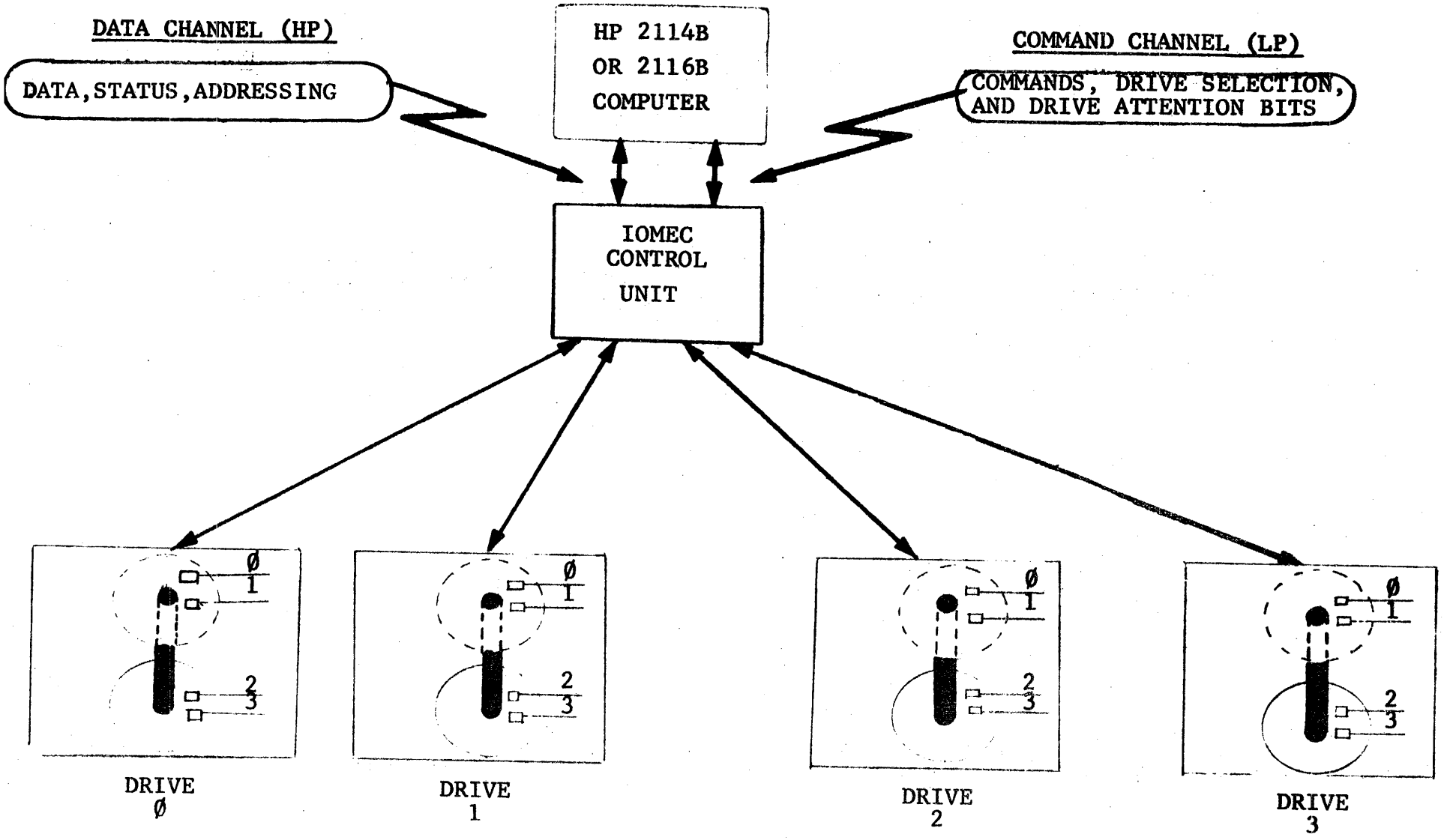
The two new computers aren't part of the System 370 family of medium and large general-purpose computers announced by IBM in June. Both of the computers are being pro-

[illegible] is a plant in Boca Raton, Fla., the System 3 Model 6 also is in production in Vista, Calif.

DOSM ADVANTAGES AND DISADVANTAGES WITH RESPECT TO DOS

ADVANTAGES	DISADVANTAGES
1. LOWER INITIAL SYSTEM COST.	1. SLOWER DISC AVERAGE ACCESS TIME (ABOUT 100 MILLISECONDS).
2. LOWER DISC EXPANDABLE COST.	2. CUMBERSOME AND SOMEWHAT CONFUSING SYSTEM BOOTSTRAP.
3. FLEXIBILITY IN OPTIONS (EAU, TBG, MP) SELECTION.	3. NO OTHER HP DISC BASED SYSTEM (RTE, TSB).
4. USE OF 2114B OR 2116B.	4. OVERSELLING 8K FEATURE.
5. FLEXIBILITY IN DISC STORAGE MEDIUM WITH REMOVEABLE CARTRIDGE.	
6. DISC CONTENT PROTECTION.	
7. DISC LABELING CAPABILITY.	
8. LOWER CORE RESIDENT SYSTEM.	
9. INTERDISC FILE(S) TRANSFER.	

COMPUTER/DISC CONTROL/DISC DRIVES LAYOUT



[SLIDE 3]

PHYSICAL ALLOCATION FOR EACH DRIVE

203 CYLINDERS
4 TRACKS PER CYLINDER
12 SECTORS PER TRACK
128 WORDS PER SECTOR

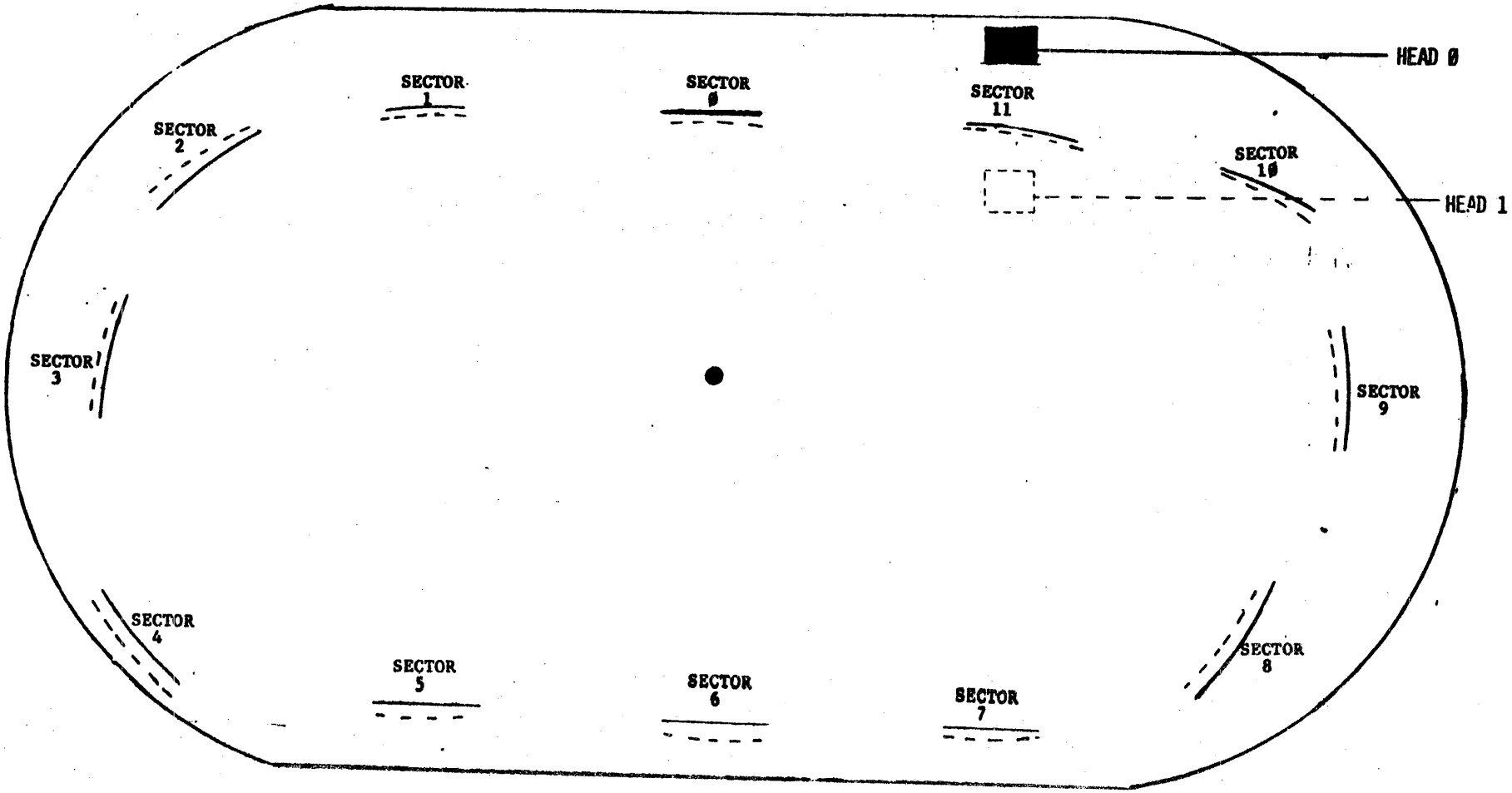
∴ TOTAL WORD CAPACITY PER DRIVE IS
203 X 4 X 12 X 128 = 1,247,232 WORDS

PHYSICAL ALLOCATION FOR EACH DISC

203 CYLINDERS
2 TRACKS PER CYLINDER
12 SECTORS PER TRACK
128 WORDS PER SECTOR

∴ TOTAL WORD CAPACITY PER DISC IS
203 X 2 X 12 X 128 = 623,616 WORDS

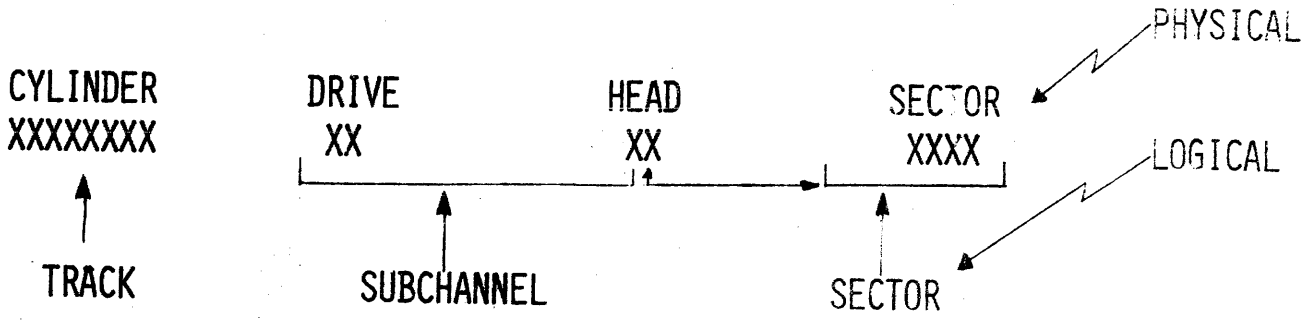
TWO PHYSICAL TRACKS ON CARTRIDGE DISC



"TOP" SURFACE IS ONE PHYSICAL TRACK (12 SECTORS) FOR THIS POSITION OF HEAD Ø
"BOTTOM" SURFACE IS ONE PHYSICAL TRACK (12 SECTORS) FOR THIS POSITION OF HEAD 1
THERE ARE 202 OTHER POSITIONS (CYLINDERS) THESE HEADS MAY BE MOVED TO!

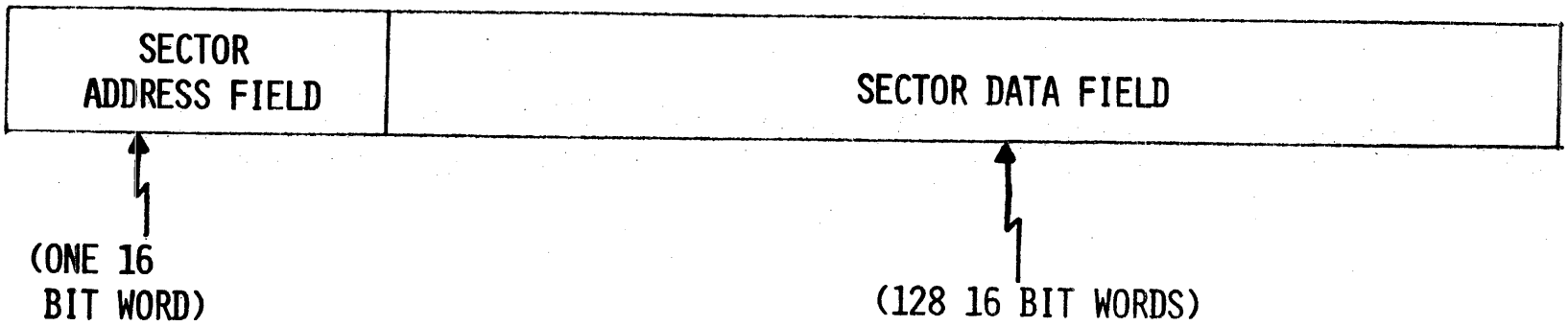
[SLIDE 5]

DISC ADDRESSING



SUBCHANNEL	DRIVE	HEADS	ADDRESSED DISC
000	00	10 11	FIXED DISC DRIVE Ø HEADS 2 & 3
001		00 01	CARTRIDGE DISC DRIVE Ø HEADS Ø & 1
010	01	10 11	FIXED DISC DRIVE 1 HEADS 2 & 3
011		00 01	CARTRIDGE DISC DRIVE 1 HEADS Ø & 1
100	10	10 11	FIXED DISC DRIVE 2 HEADS 2 & 3
101		00 01	CARTRIDGE DISC DRIVE 2 HEADS Ø & 1
110	11	10 11	FIXED DISC DRIVE 3 HEADS 2 & 3
111		00 01	CARTRIDGE DISC DRIVE 3 HEADS Ø & 1

CONTENTS OF EACH SECTOR



1. SECTOR ADDRESS FIELD CONTAINS:
   - 8 BITS FOR CYLINDER #
   - 2 BITS FOR HEAD #
   - 4 BITS FOR ITS SECTOR #
   - 1 BIT USED FOR DCI (DEFECTIVE CYLINDER INDICATOR)
   - 1 BIT USED FOR PCI (PROTECTED CYLINDER INDICATOR)

2. SECTOR DATA FIELD CONTAINS DATA TRANSFERRED TO AND FROM COMPUTER

NOTE: BOTH FIELDS ARE CYCLIC CHECKED BY CONTROLLER

DOSM SOFTWARE COMPONENTS (PART 1)

PROGRAM	NAME(S)	GENERAL FUNCTION(S)
System Generator ⊛	DSGEN	DOSM System Generation User Disc and Cartridge Formatting
System Bootstrap ⊛	BOOTSTRAP	Preparation of configured System bootstrap
Disc Monitor	DISCM	Interrupt Processing ($CIC) Executive Processor (EXEC) I/O Processor ($IORQ)
Executive Modules	$EXØ1	Disc Work Track Status
	$EXØ2	Disc Work Track Limits
	$EXØ3	Program Completion
	$EXØ4	Program Suspension
	$EXØ5	Program Segment Load
	$EXØ6	User File Name Search
	$EXØ7	Current Time Processor
	$EXØ8	Real-Time Disc Allocation
	$EXØ9	Execution Time :EQ Processor
	$EX1Ø	Load and Execute Program
	$EX11	System File Name Search
	$EX12	System Startup
	$EX13	Error Message Processor
	$EX14	Execution Time :UP, :DN, :LU Processor
	$EX15	Abort and Post Mortem Dump
	$EX16	:GO Parameter Processor
	$EX17	:UD Processor
	$EX18	I/O Initiation Processor
	$EX19	:IN Processor
	$EX2Ø	Disc Parity Error Processor
Executive Module Subroutines	$LBL	Service Routines for Label Checking
	$SRCH	Search System or User Directory
	$ADDR	Buffer Address Validity Check
	ASCII	Convert Binary to ASCII
	DUMRX	RTE simulation routines
Special DOSM Drivers	DVRØ5	System Teleprinter Driver
	DVR31	Moving Head Disc Driver

⊛ This is an ABSOLUTE program executed in a separate process from the DOSM system

DOSM SOFTWARE COMPONENTS (PART 2)

PROGRAM	NAME(S)	GENERAL FUNCTION(S)
Job Processor	JOBPR	Directive Processing File Management
Relocating Loader	LOADR	Relocates relocatable binary code created by Assembler or Compilers.
Assembler	ASMB ASMBD ASMB1 ASMB2 ASMB3 ASMB4 ASMB5	Translates Assembly language source code into binary. EAU or NON-EAU options included. (MAIN SECTION) (6 SEGMENTS)
HP Basic FORTRAN Compiler	FTN FTNØ1 FTNØ2 FTNØ3 FTNØ4	Translates HP Basic FORTRAN source code into NON-EAU relocatable binary. (MAIN SECTION) (4 SEGMENTS)
ALGOL Compiler ⊛	ALGOL ALGL1	Translates HP ALGOL source code into Non-EAU relocatable binary. (MAIN SECTION) (1 SEGMENT)
FORTRAN IV Compiler (4K user)	FTN4	Translates ASA FORTRAN IV source code into Non-EAU relocatable binary. Consists of one MAIN section and 18 SEGMENTS.
FORTRAN IV Compiler (10K user)	FTN4	Translates ASA FORTRAN IV source code into NON-EAU relocatable binary. Consists of one MAIN section and 2 SEGMENTS.
CROSS REFERENCE TABLE GENERATOR	XREF	Generates Cross Reference Table for Assembly Language Source Code.

⊛ Requires minimum 16K environment

DOSM SOFTWARE COMPONENTS (PART 3)

DOS AND DOSM DRIVERS

EQUIPMENT TYPE CODE (DVR__)	DEVICE	DOS ONLY	DOSM ONLY	BOTH	DMA
ØØ	Teleprinter			X	
Ø1	Photoreader			X	
Ø2	Punch			X	
Ø5	Teleprinter		X		
1Ø	Plotter			X	
12	2778A CDC Line Printer			X	
15	Mark Sense Card Reader			X	X
16	Data Products Line Printer (8Ø column)			X	
22	3Ø3Ø Mag. Tape			X	X
23	797Ø Mag. Tape			X	X
3Ø	Fixed Head Disc	X			X
31	Moving Head Disc (IOMEC)		X		X
32	Moving Head Disc (ISS)		X		X

Equipment Type Code Numbering Convention

ØØ - Ø7 Paper Tape Devices — Odd # for INPUT, Even # for OUTPUT

1Ø - 17 Unit Record Devices

2Ø - 37 Mass Storage Devices

[SLIDE 8C]

DOSM SOFTWARE COMPONENTS (PART 4)

LIBRARIES

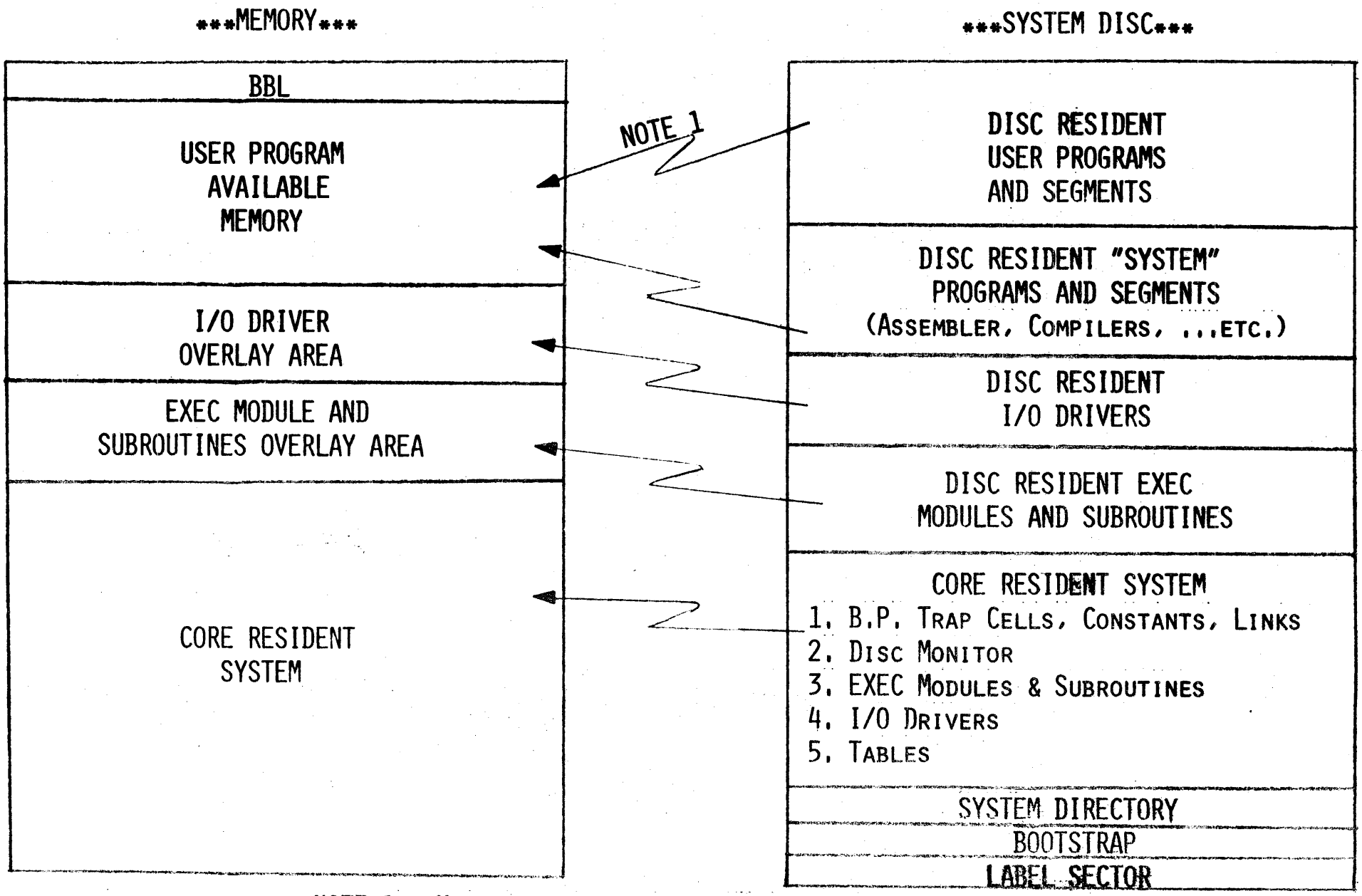
NAME	RELOCATABLE LIBRARY TYPE
F2N.V	NON-EAU RTE/DOS/DOSM (no Formatter)
F2E.V	EAU RTE/DOS/DOSM (no Formatter)
F4D.V	RTE/DOS/DOSM FORTRAN IV with FORTRAN IV Formatter (Double Precision)
_____	RTE/DOS/DOSM HP FORTRAN Formatter (no Double Precision)
_____	RTE/DOS/DOSM Plotter

where V = the revision letter (A, B, C ....)

NOTES:

1. System must include F2N.V or F2E.V even if FORTRAN IV library (F4D.V) is to be included. This is because the FORTRAN IV library references routines whose entry points are in F2N.V and F2E.V libraries.
2. RTE/DOS/DOSM HP FORTRAN Formatter is seperate from F2N.V and F2E.V due to FORTRAN IV library (F4D.V) containing a formatter.

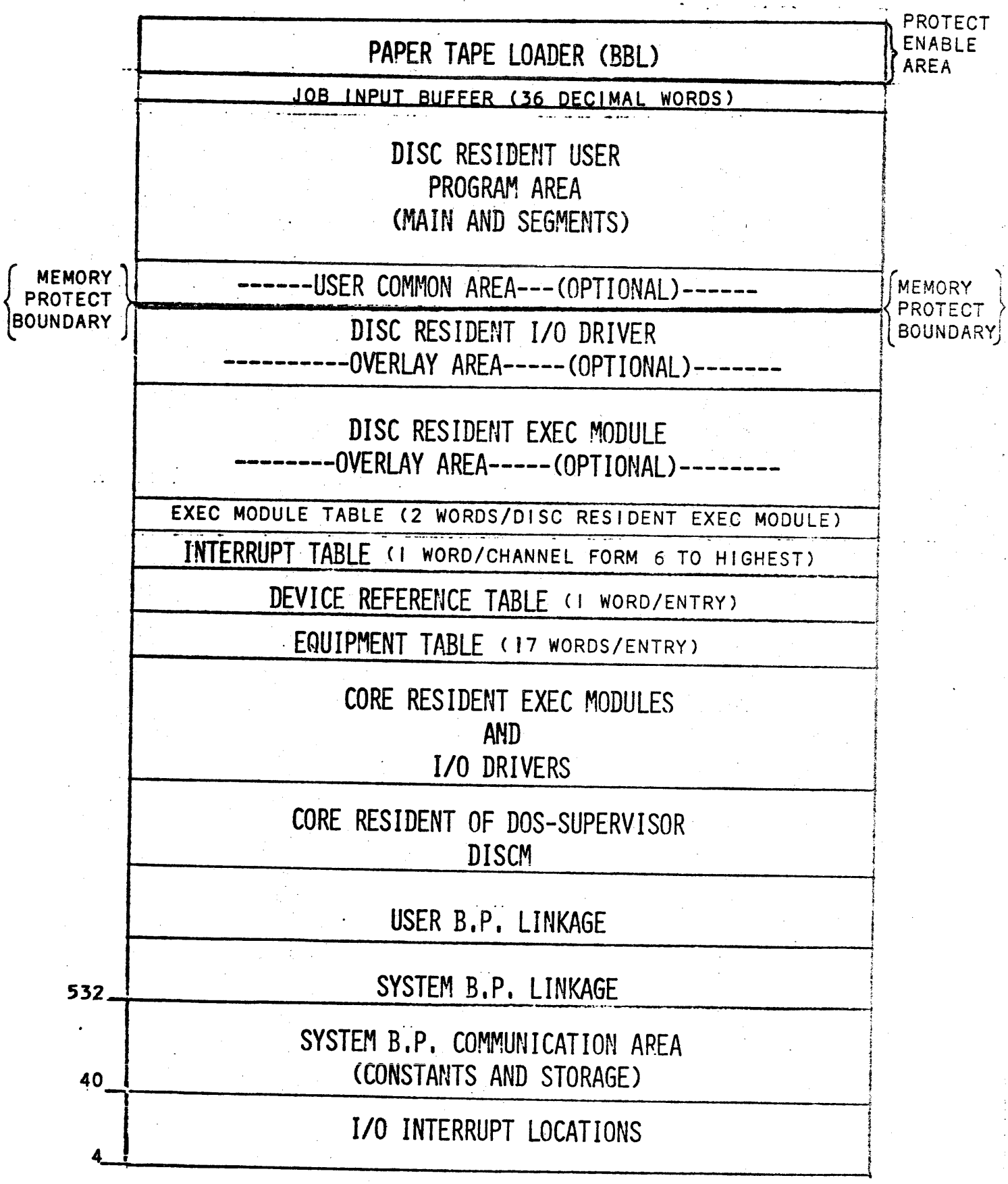
DOSM DISC TO MEMORY TRANSFERS (GENERAL)



NOTE 1: MAY BE FROM "SYSTEM" DISC OR USER DISC(S)

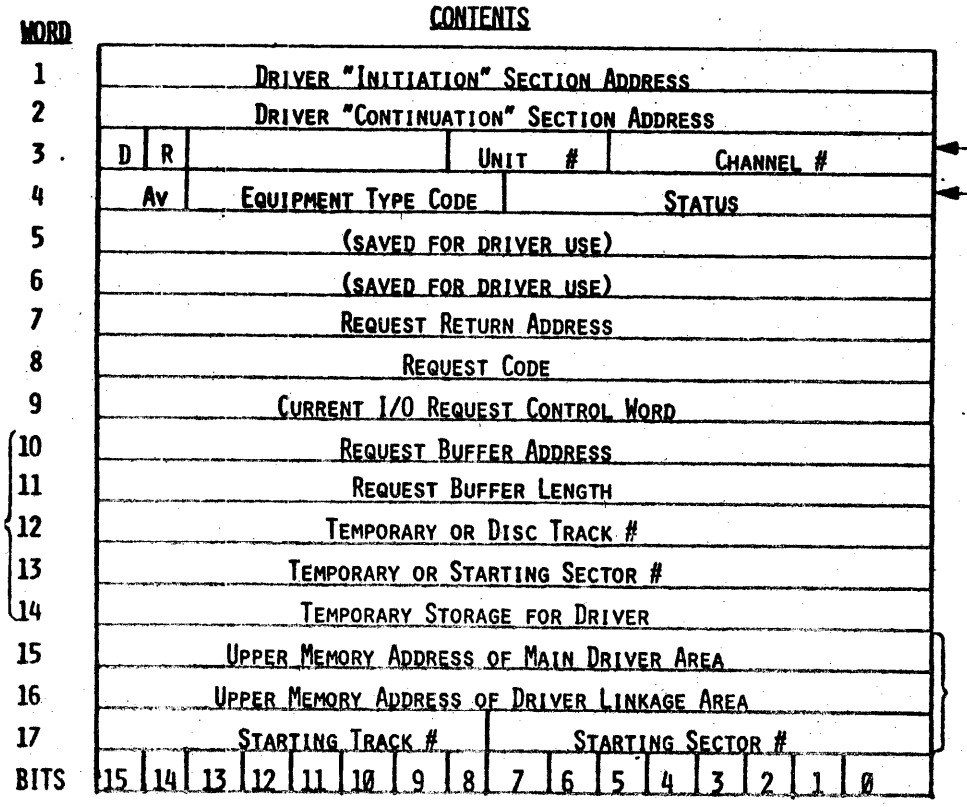
[SLIDE 9]

DOSM GENERAL CORE LAYOUT



[SLIDE 10A]

EQUIPMENT TABLE ENTRY FORMAT



D = 1 if DMA channel required.
R = 1 if driver type is core-resident.
Unit # May be used for sub-channel addressing.
Channel # I/O select code for device (lower number if multiboard interface.)

Av = Ø - Unit not busy and available
= 1 - Unit disabled (down)
= 2 - Unit busy
= 3 - Unit waiting for an available DMA channel

(This field set by system)

Status - Actual or simulated unit status at end of operation. (Driver must set this field)

Equipment Type Code - Identifies type of device and associated software driver. Assigned equipment type codes in octal ar

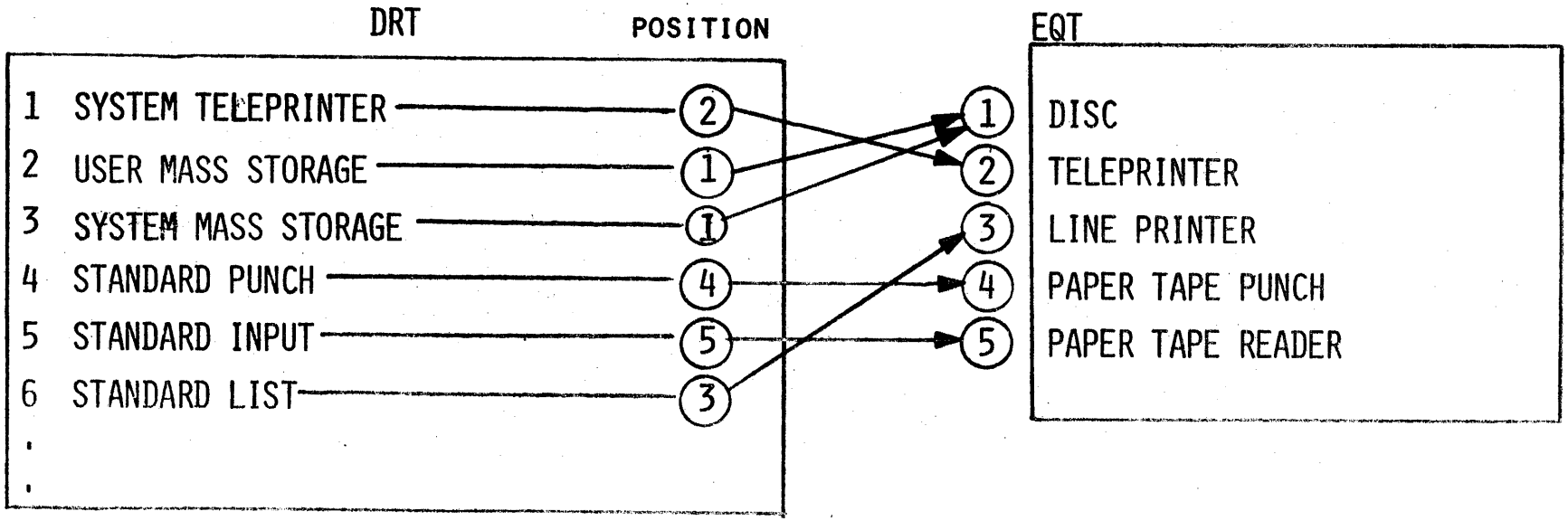
Ø0-07	**Papter Type Devices**
Ø0	Teleprinter
Ø1	Punched Tape Reader
Ø2	High Speed Punch
Ø5	Teletype (System)
10-17	**Unit Record Devices**
10	Reserved for Plotter
12	Line Printer
15	Mark Sense Card Reader
20-37	**Magnetic Tape/Mass Storage and other devices capable of both input and output.**
22	3030 Magnetic Tape
31	Moving-Head Disc

For equipment type codes 1 through 17, odd number indicate input devices and even number indicate output devices (except Ø5, which is both input and output).

[SLIDE 10B]

THE DEVICE REFERENCE TABLE

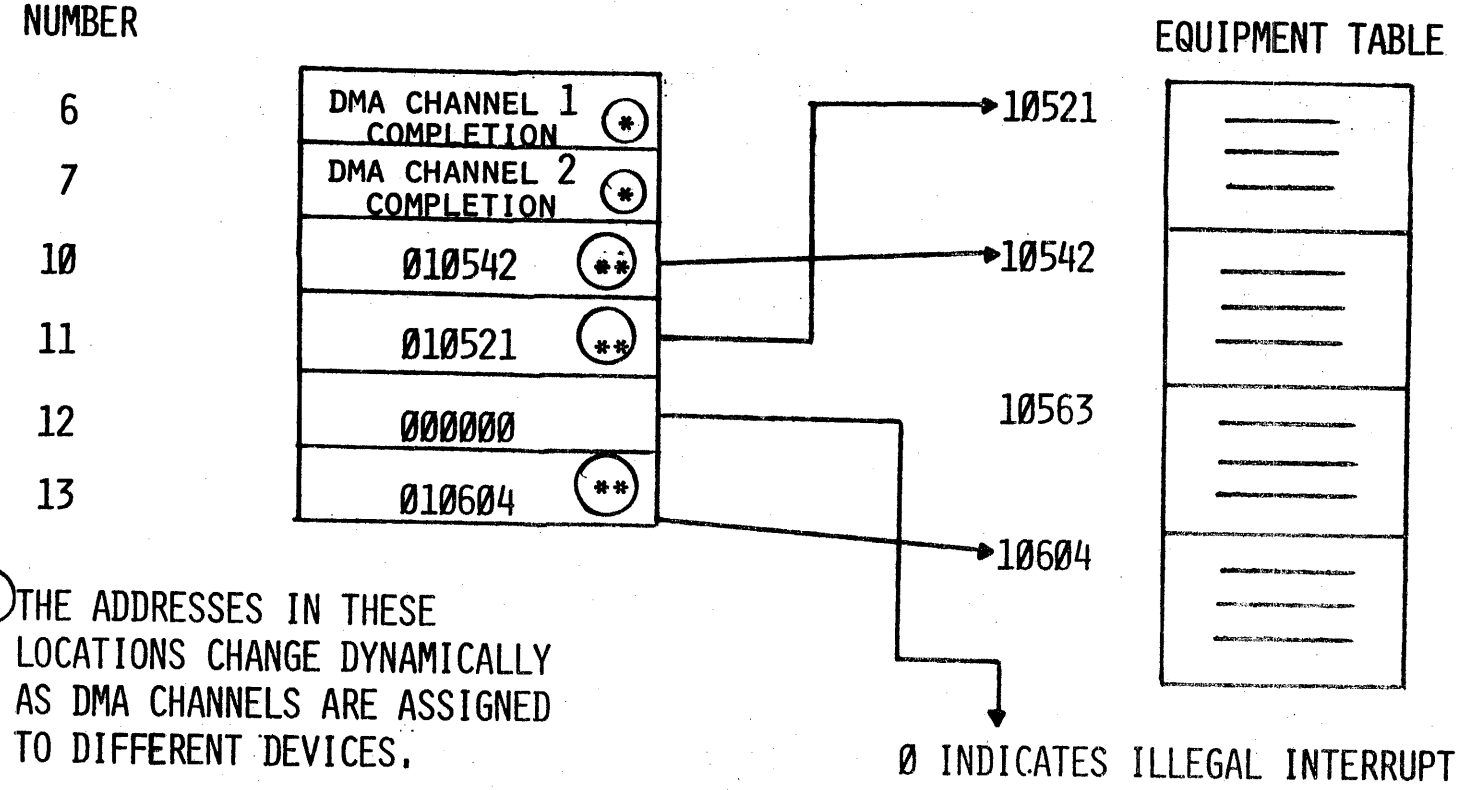
THE DEVICE REFERENCE TABLE PROVIDES FOR LOGICAL ADDRESSING OF PHYSICAL UNITS DEFINED IN THE EQUIPMENT TABLE. THE DRT CONSISTS OF ONE WORD ENTRIES CORRESPONDING TO THE RANGE OF USER-SPECIFIED LOGICAL UNITS (1 TO N, WHERE $N \leq 63$). THE CONTENTS OF THE WORD CORRESPONDING TO A LOGICAL UNIT IS THE RELATIVE POSITION OF THE EQT ENTRY DEFINING THE PHYSICAL UNIT.



[SLIDE 10C]

THE INTERRUPT TABLE

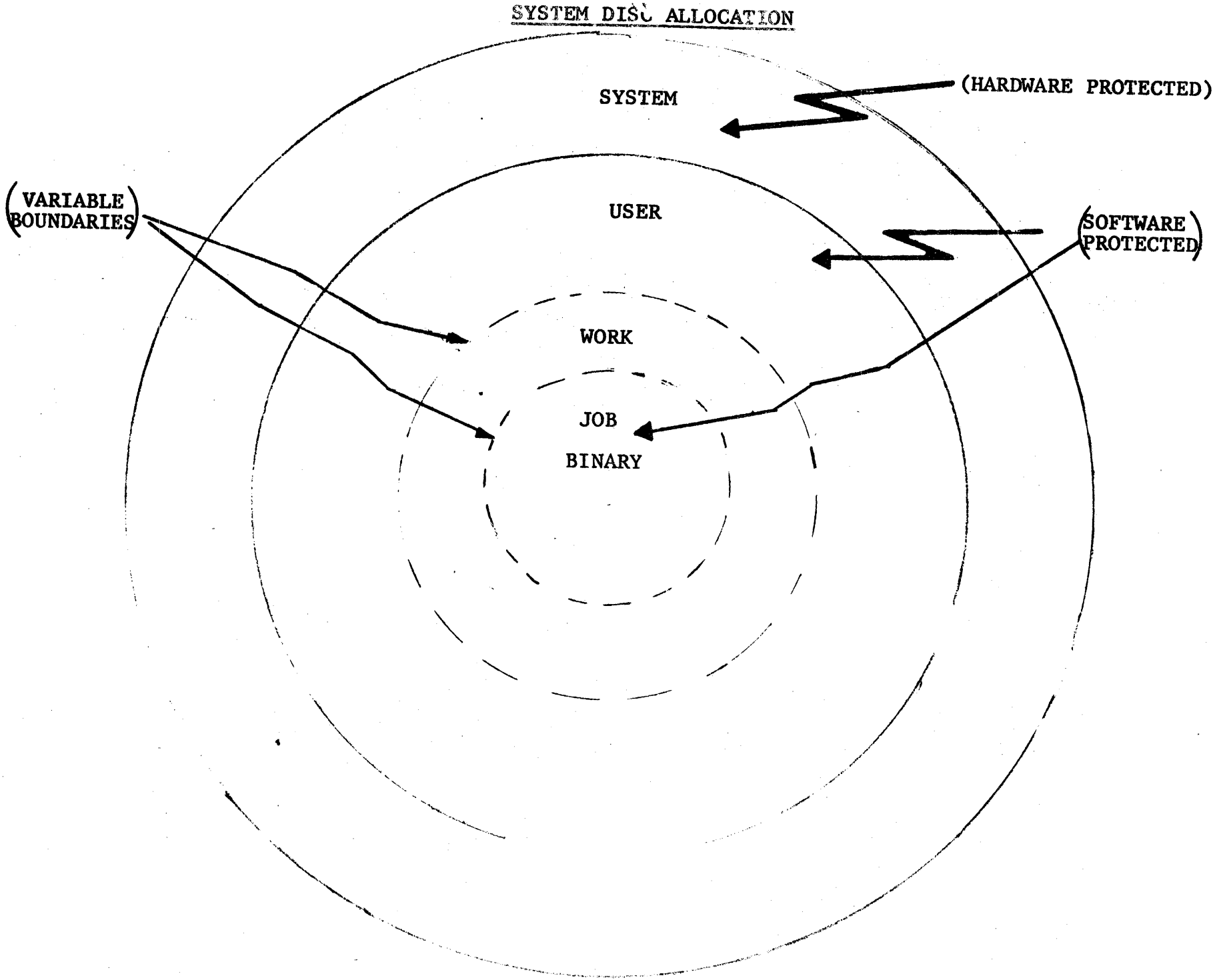
THE INTERRUPT TABLE CONTAINS A ONE WORD ENTRY FOR EACH I/O DEVICE. THESE ENTRIES CONTAIN THE ADDRESSES OF EQUIPMENT TABLE ENTRIES FOR DEVICES ASSOCIATED WITH THESE CHANNELS.



(*) THE ADDRESSES IN THESE LOCATIONS CHANGE DYNAMICALLY AS DMA CHANNELS ARE ASSIGNED TO DIFFERENT DEVICES.

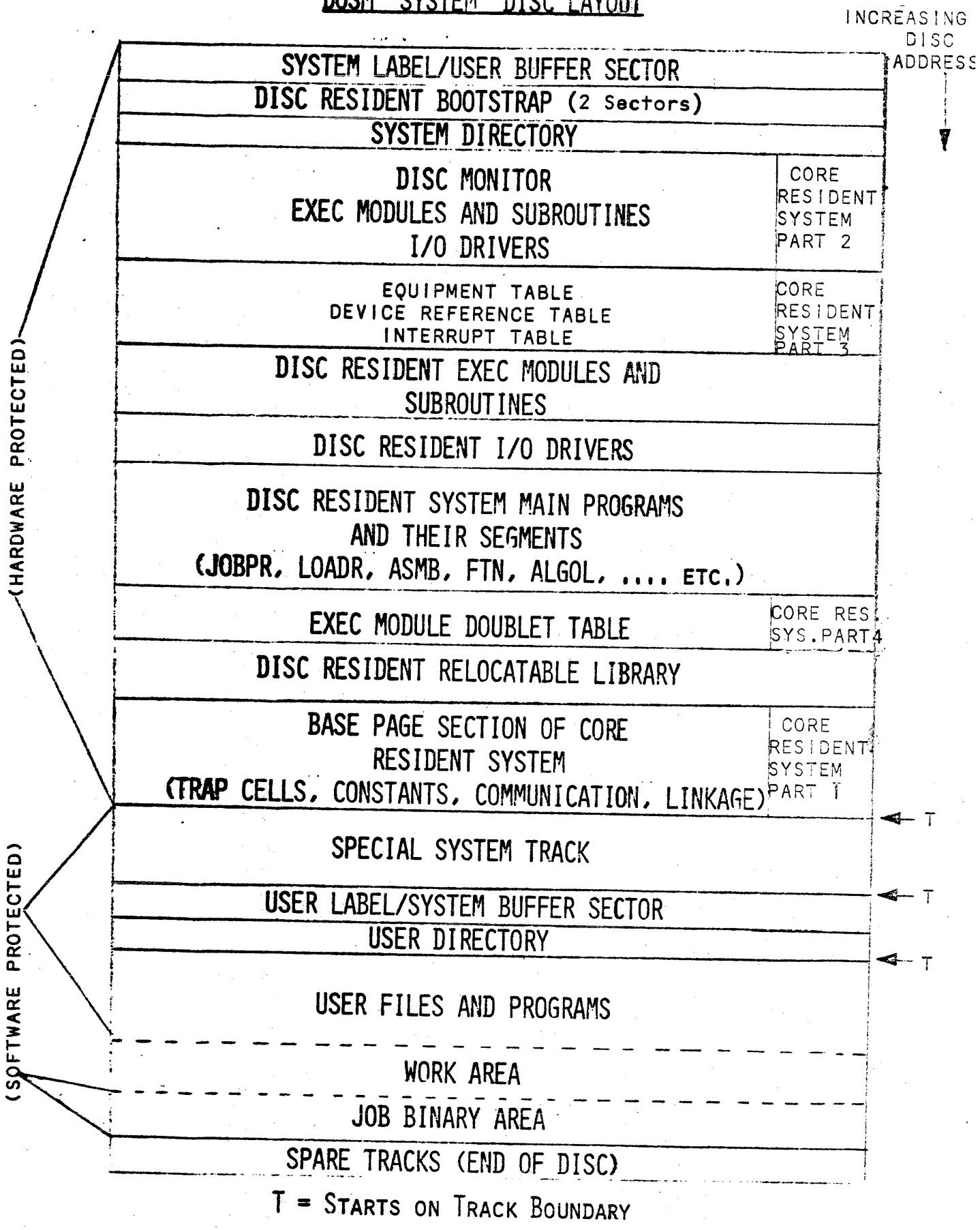
(**) THE ADDRESSES IN THESE LOCATIONS CHANGE DYNAMICALLY AS DIFFERENT EQT ENTRIES ARE USED FOR GIVEN I/O CHANNEL.

SYSTEM DISC ALLOCATION



[SLIDE 11A]

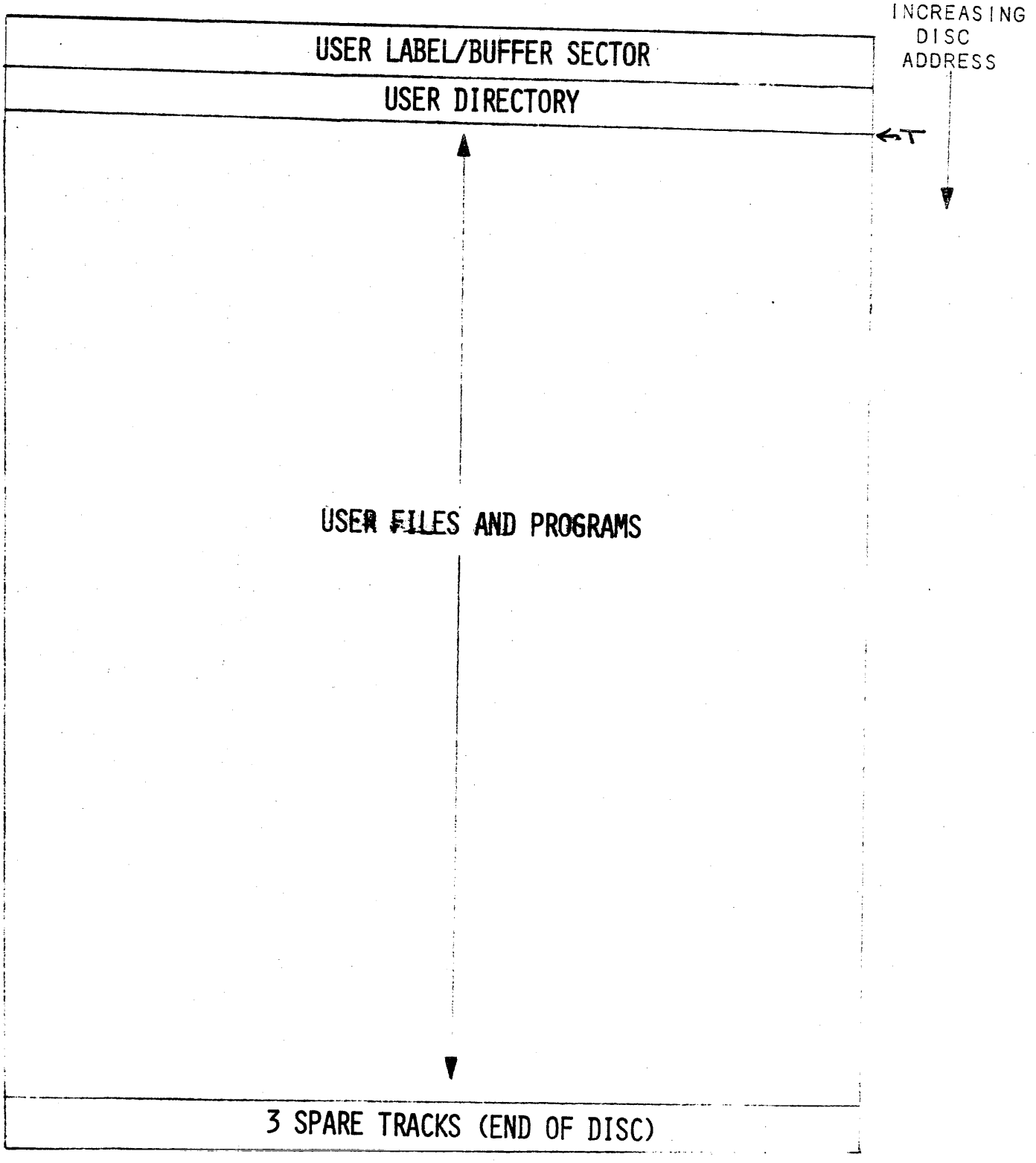
DOSM "SYSTEM" DISC LAYOUT



T = STARTS ON TRACK BOUNDARY

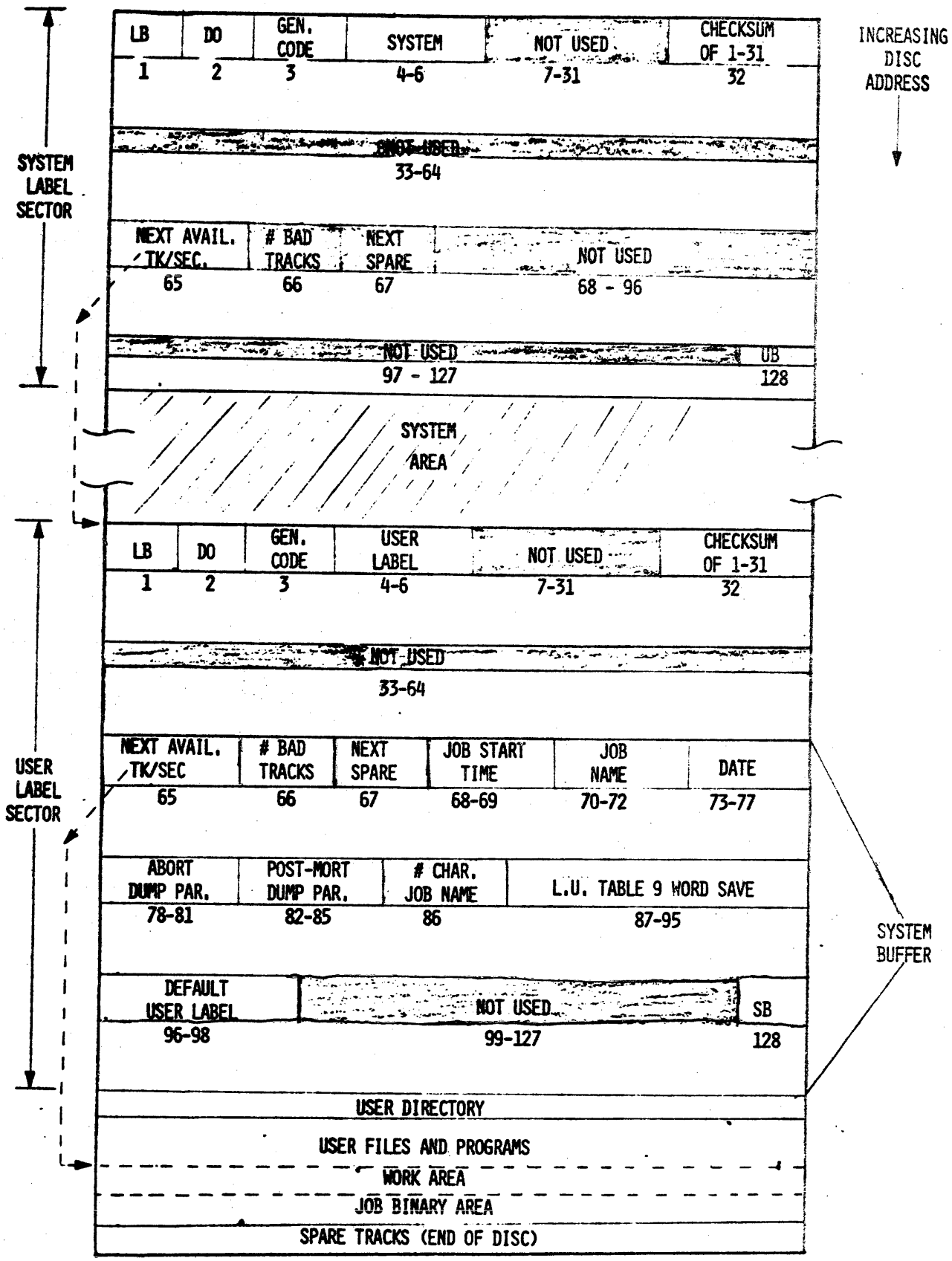
[SLIDE 11B]

DOSM "USER" DISC LAYOUT (PURE)

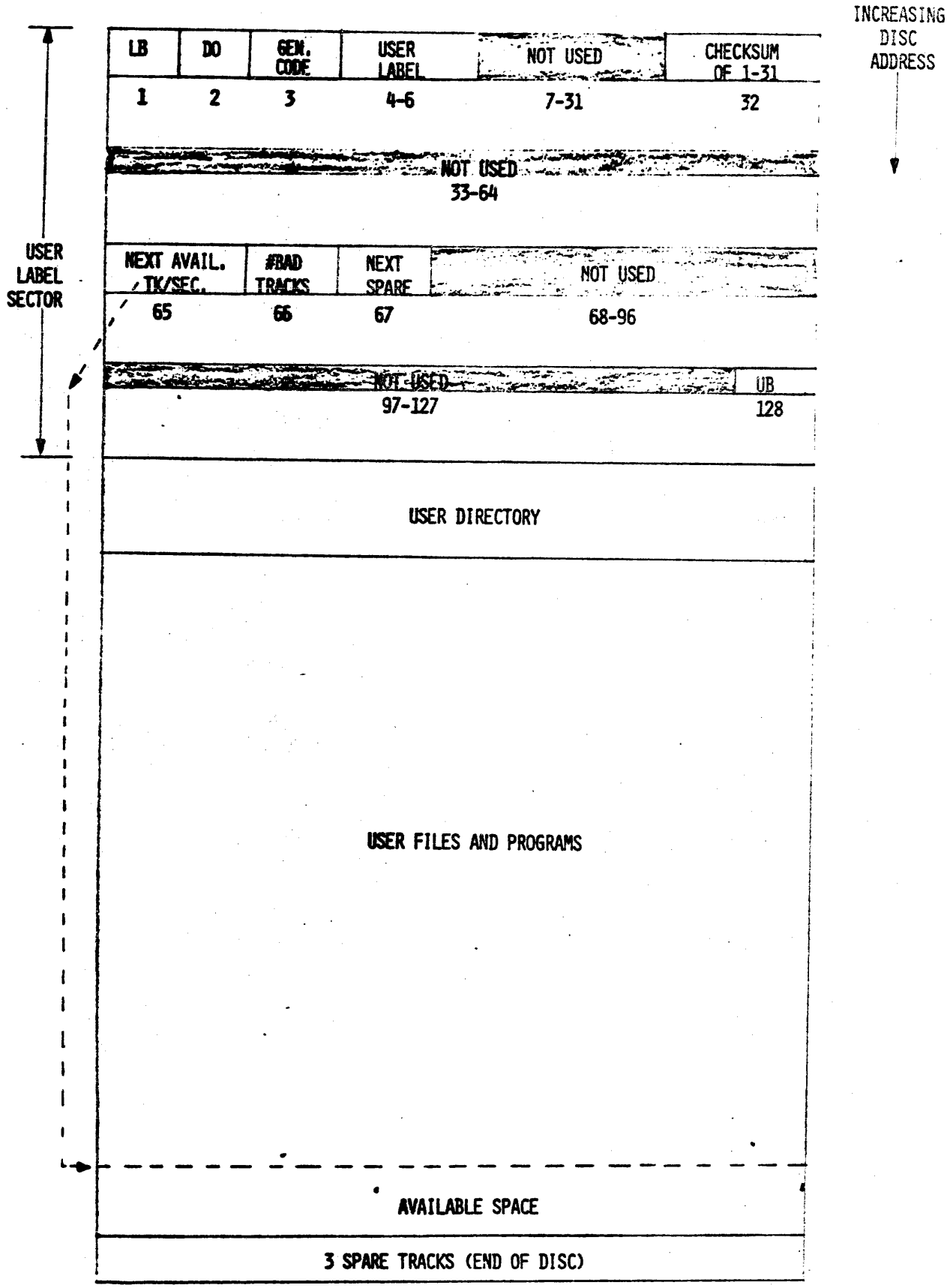


[SLIDE 11C]

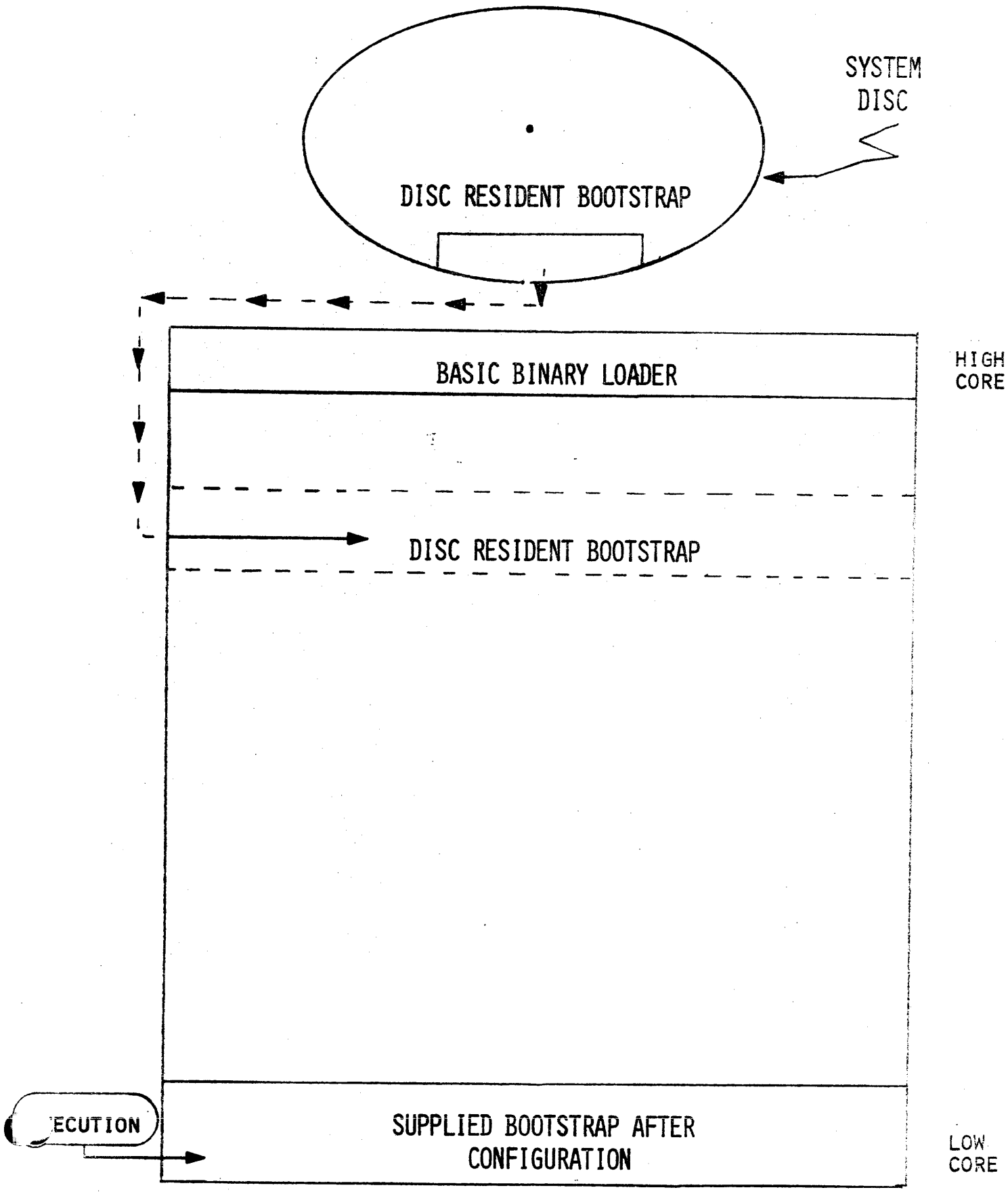
"SYSTEM" DISC (LABEL SECTORS DESCRIPTION)



"USER" DISC (LABEL SECTOR DESCRIPTION)

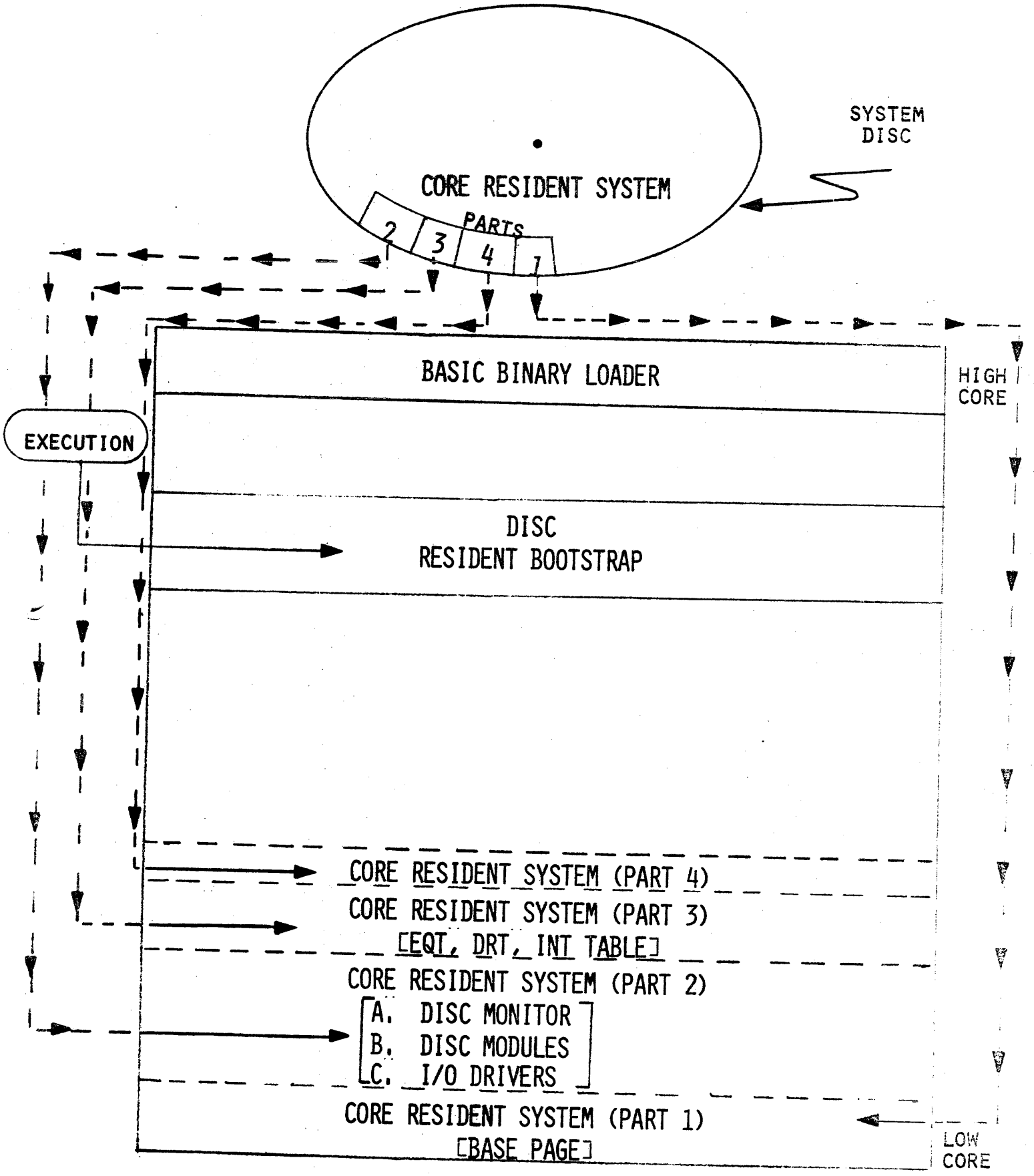


SYSTEM STARTUP (PART 1)
(EXECUTION OF CONFIGURED BOOTSTRAP)



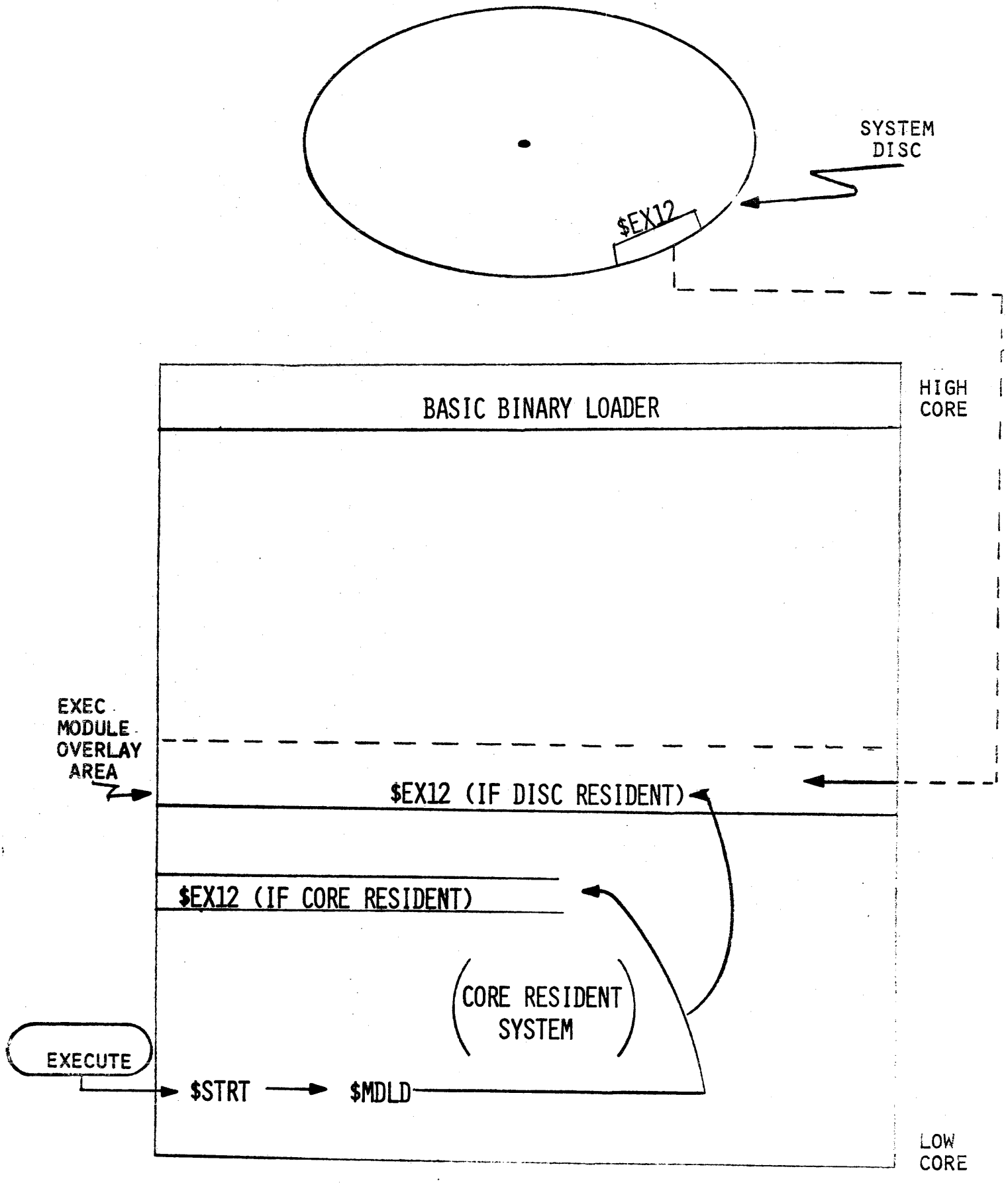
[SLIDE 13A.1]

SYSTEM STARTUP (PART 2)
(EXECUTION OF DISC RESIDENT BOOTSTRAP)

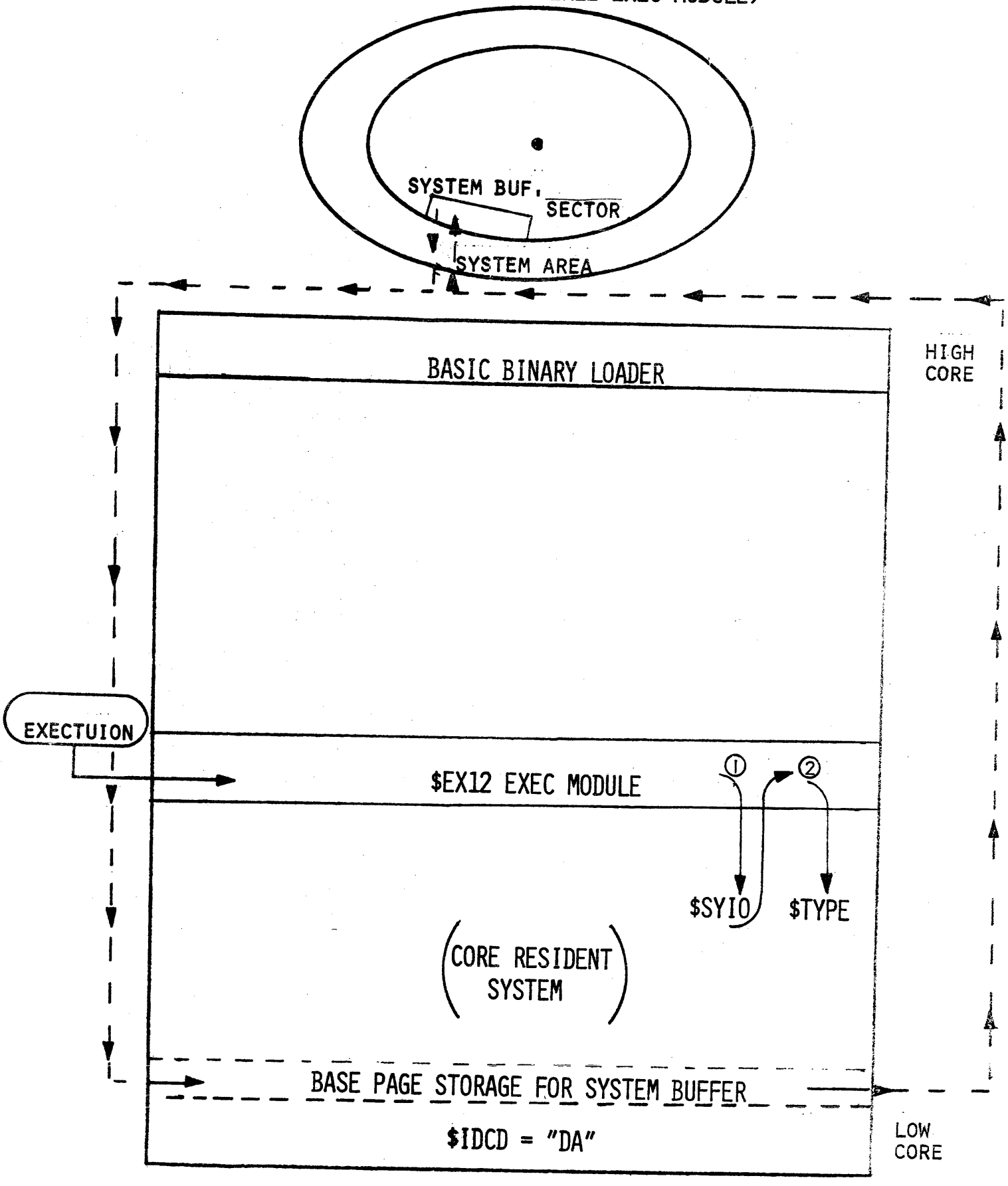


[SLIDE 13A.2]

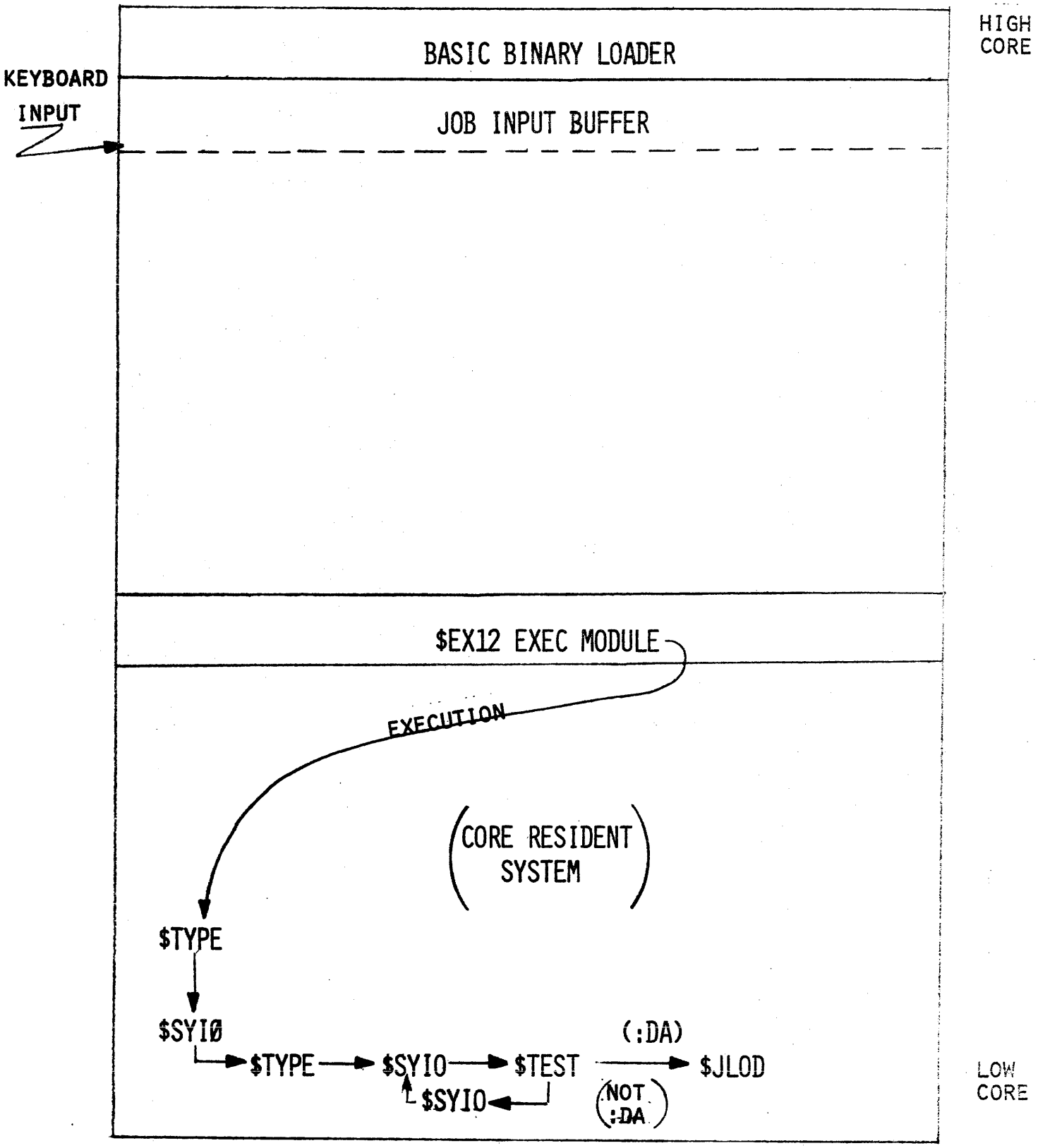
SYSTEM STARTUP (PART 3)
(DISC MONITOR FIRST ENTRY)



SYSTEM STARTUP (PART 4)
(EXECUTION OF $EX12 EXEC MODULE)

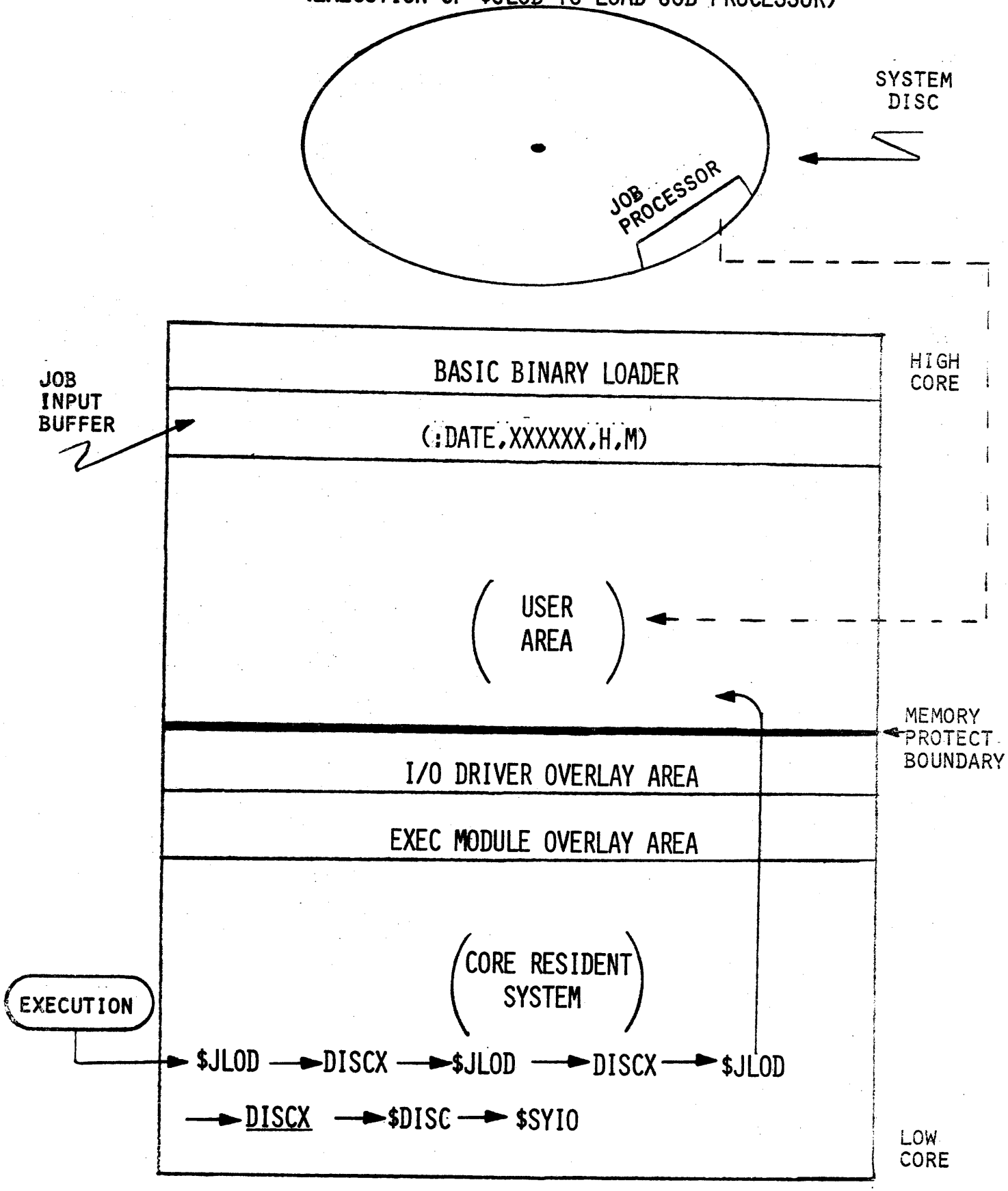


SYSTEM STARTUP (PART 5)
(EXECUTION OF $TYPE FOR ":DATE" INPUT)

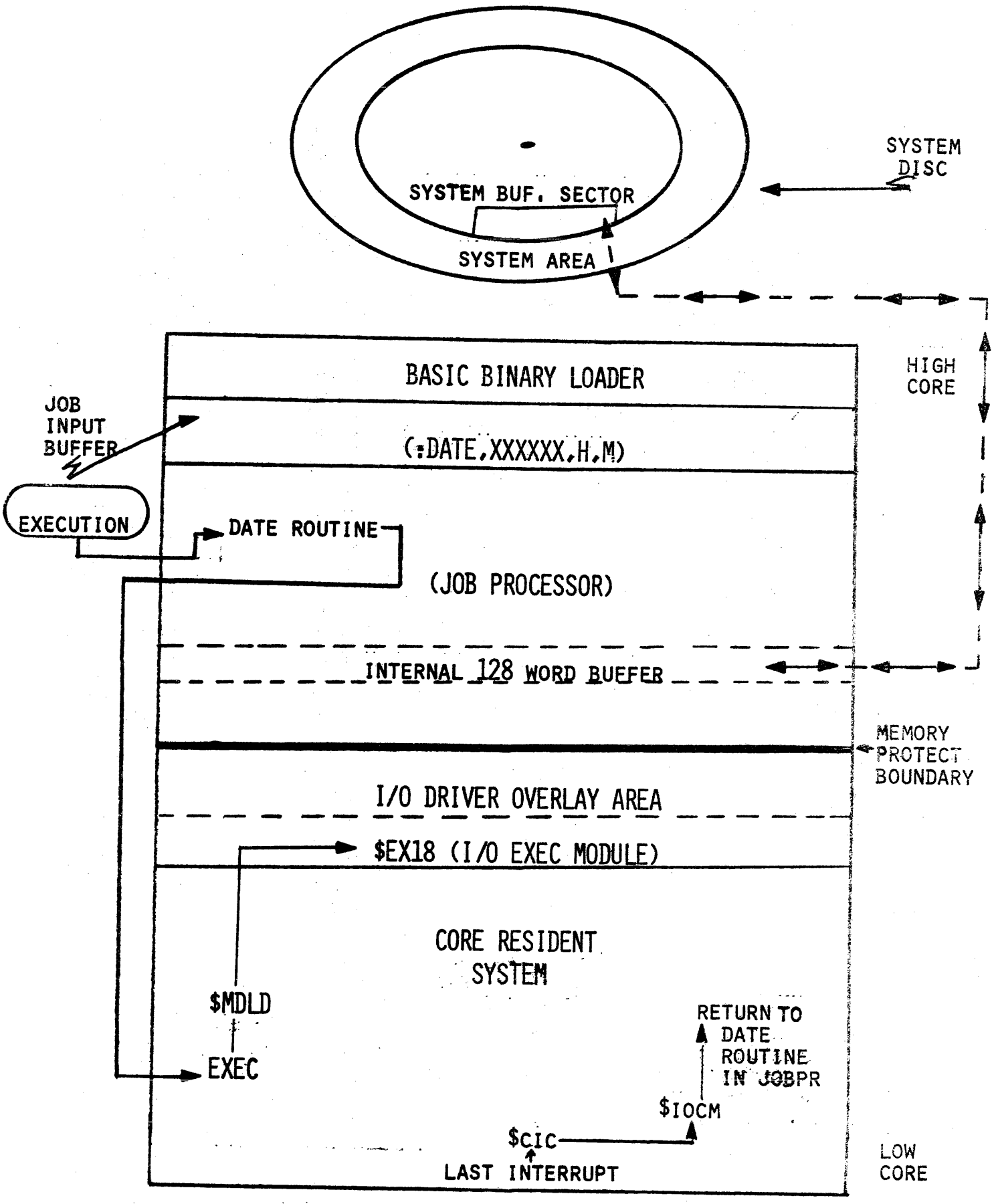


[SLIDE 13A.5]

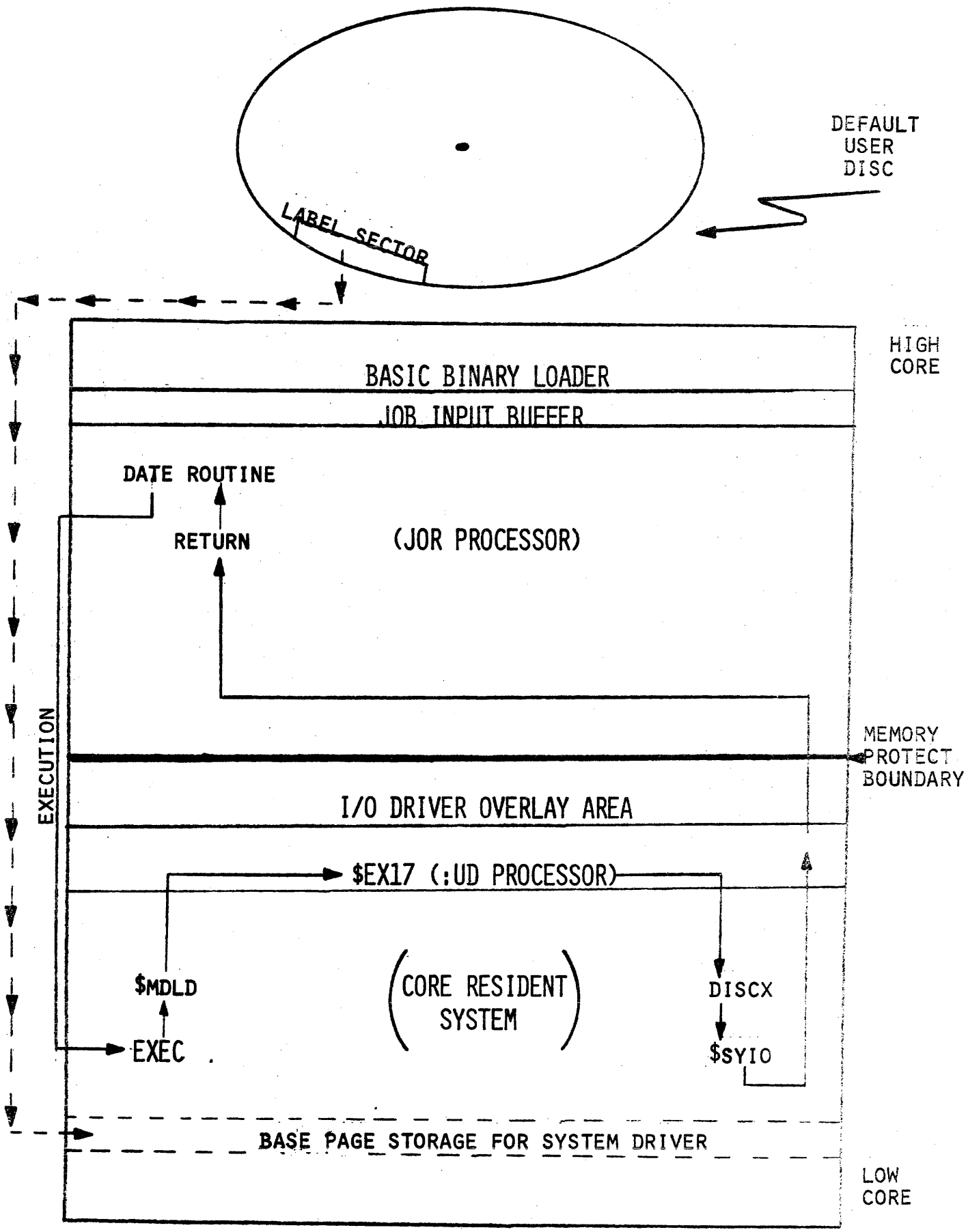
SYSTEM STARTUP (PART 6)
(EXECUTION OF $JLOD TO LOAD JOB PROCESSOR)



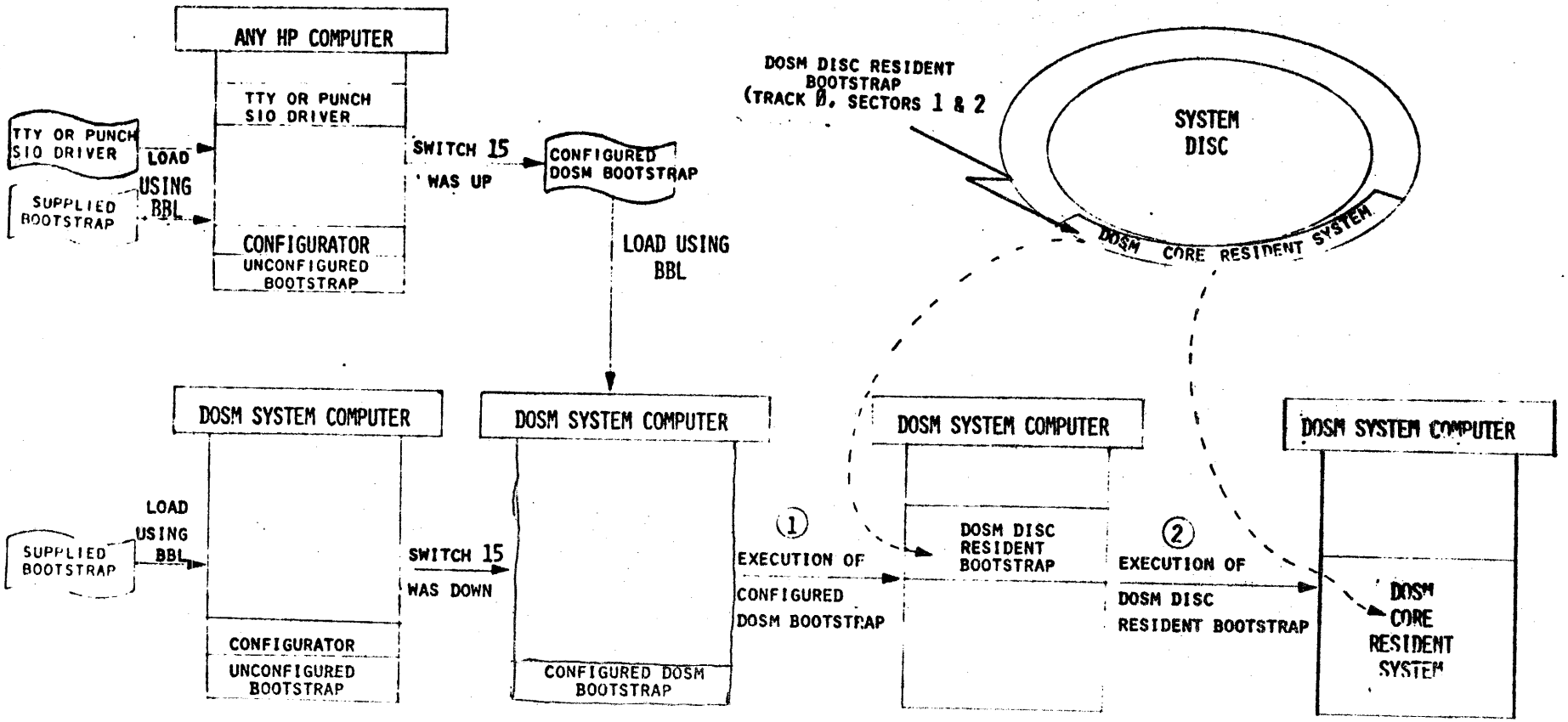
SYSTEM STARTUP (PART 7)
(EXECUTION OF JOBPR TO UPDATE SYSTEM BUFFER SECTOR)



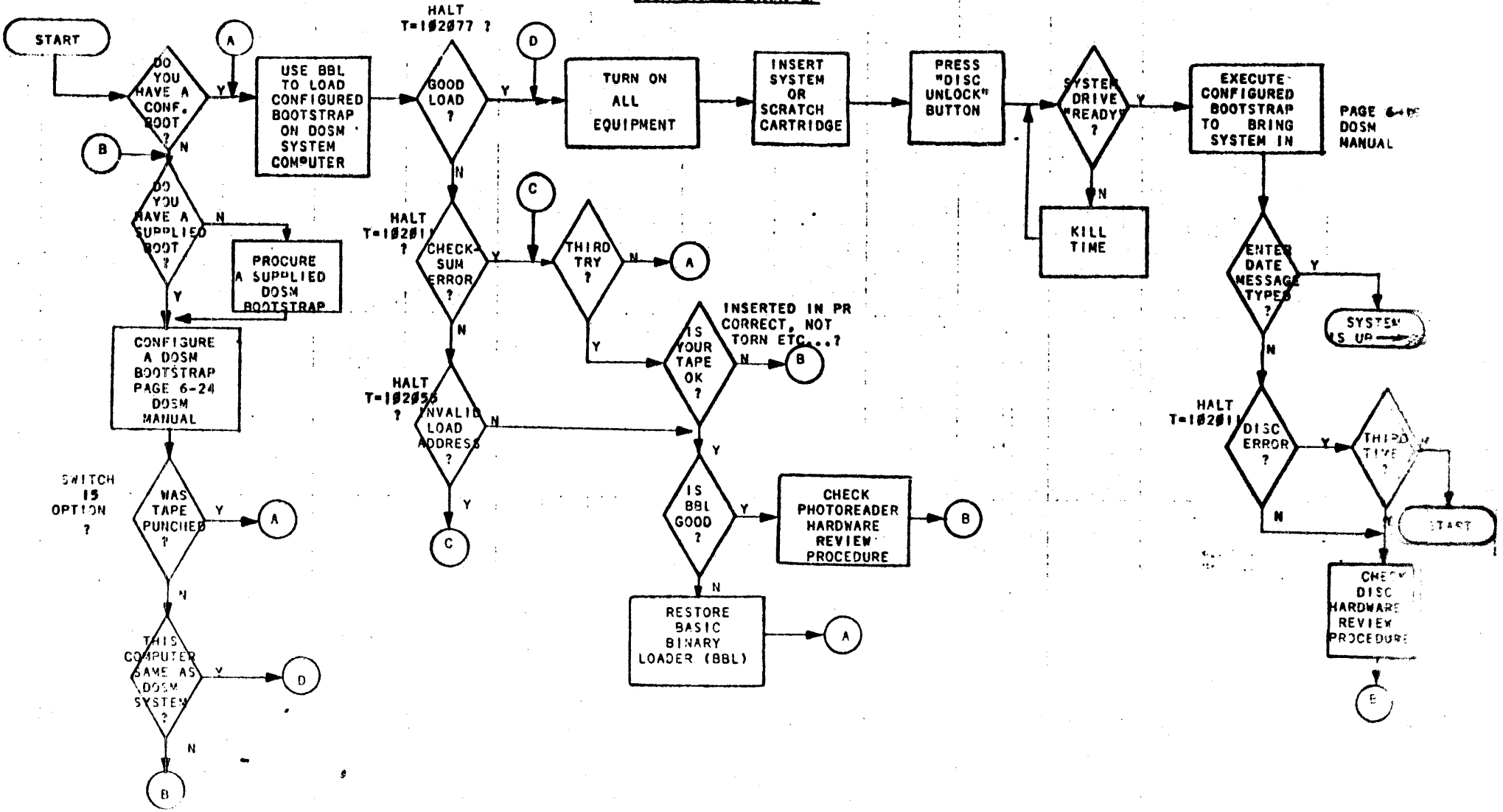
SYSTEM STARTUP (PART 8)
(REPORTING OF DEFAULT USER DISC SUBCHANNEL AND LABEL)



BOOTSTRAPPING DOSM UP FROM DISC



DOSM SYSTEM START-UP



OFF DIRECTIVE

PURPOSE: TO ABORT CURRENTLY EXECUTING USER PROGRAM OF SYSTEM OPERATION WITHOUT TERMINATING THE JOB.

FORMAT: :OFF

NOTES:

1. RETURNS SYSTEM TO KEYBOARD MODE.
2. CAN BE USED TO TERMINATE UNDESIRED LISTS, EDITS, DISC-TO-DISC DUMPS, PROGRAM LOOPS, LOADER OPERATIONS, ASSEMBLIES, AND COMPILATIONS.
3. CANCELS ANY :DD, :AD, OR :PD DIRECTIVES, UNLESS A PROGRAM IS RUNNING, IN WHICH CASE A PENDING :AD IS EXECUTED.
4. MUST NEVER BE GIVEN DURING A PURGE (:PURGE DIRECTIVE) OR FOLLOWING /E IN AN EDIT LIST.

INITIALIZE DIRECTIVE

PURPOSE: TO LABEL OR UNLABEL THE CURRENT USER DISC.

FORMAT: :IN,LABEL

WHERE THE LABEL IS A SIX-CHARACTER NAME TO BE WRITTEN IN WORDS 4-6 OF THE LABEL SECTOR ON THE CURRENT USER DISC. A "*" IS ENTERED TO UNLABEL THE DISC. THE FIRST LETTER OF LABEL MUST NOT BE "CONTROL@".

NOTES:

1. IF THE CURRENT USER DISC IS ALREADY LABELED, DOSM PRINTS THE FOLLOWING MESSAGE:

   { TSB / DOS / ??? } LABEL XXXXXX (WHERE XXXXXX IS EXISTING LABEL)

   OK TO PURGE?

   THE OPERATOR THEN ANSWERS "YES" OR "NO".

2. :IN,* EXECUTION PURGES ALL FILES ON THE CURRENT USER DISC AS FOLLOWS BELOW:

   A. LABEL PRESENCE CODE SET = Ø.
   B. FIRST AVAILABLE TK/SEC SET TO START OF USER AREA (IF USER DISC) OR START OF SYSTEM DIRECTORY TRACK +1 (IF SYSTEM DISC).
   C. SETS FIRST WORD IN DIRECTORY = Ø TO INDICATE END-OF-DIRECTORY.
   D. * SET IN FIRST CHARACTER OF LABEL FIELD.
   E. SETS SYSTEM GENERATION CODE AND PROPRIETARY CODE = TO THAT ON SYSTEM LABEL SECTOR.
   F. GENERATES NEW CHECKSUM.

INITIALIZE DIRECTIVE - NOTES CONTINUED:

3. :IN,NEWLB PURGES UNPROTECTED SYSTEM AND MOVES ANY USER FILES DOWN TO LOW DISC IF THE CURRENT USER DISC IS LABELED "SYSTEM" AND IS NOT HARDWARE PROTECTED (I.E., IT WAS CREATED WITH :DD,X DIRECTIVE).

4. SYSTEM GENERATION CODE AND SYSTEM PROPRIETARY CODE ARE SET EQUAL TO THOSE IN THE CURRENT SYSTEM.

CHANGE USER DISC DIRECTIVE (PART 1)

PURPOSE: TO CHANGE SUBCHANNEL ASSIGNMENT FOR THE CURRENT USER DISC.

FORMAT: :UD [, [LABEL] [,N]]

WHERE LABEL IS A SIX-CHARACTER LABEL OR
*IF UNLABELED DISC.

AND N IS THE SUBCHANNEL NUMBER.

NOTES:

1. SIX BASIC FORMS ARE POSSIBLE (PART 2).
2. IF THE DISC ON SUBCHANNEL #N HAS A SYSTEM PROPRIETARY CODE NOT EQUAL TO "DO", THE ASSIGNMENT IS STILL MADE AND THE SYSTEM PRINTS THE FOLLOWING:

   {TSB / ???} DISC

3. IF THE DISC ON SUBCHANNEL #N HAS A SYSTEM GENERATION CODE NOT EQUAL TO THAT OF THE CURRENT SYSTEM, THE ASSIGNMENT IS STILL MADE AND THE SYSTEM PRINTS THE FOLLOWING:

   DISC GEN CODE XXXX NOT SYS GEN CODE YYYY ERR POSS

4. USER DISC SUBCHANNEL ASSIGNMENTS MADE BY THIS DIRECTIVE ARE ONLY TEMPROARY; THE USER DISC SUBCHANNEL ASSIGNMENT IS RESET TO THAT SPECIFIED DURING SYSTEM GENERATION AT THE END OF EACH JOB.
5. USED IMMEDIATELY FOLLOWING :DD (DISC DUMP) DIRECTIVE TO SPECIFY DESTINATION DISC.

CHANGE USER DISC DIRECTIVE (PART 2)

EXAMPLE	ACTION
:UD (WITHOUT LABEL OR SUBCHANNEL)	INTERROGATES THE CURRENT USER DISC SUBCHANNEL AND PRINTS ITS LABEL ON THE SYSTEM TELEPRINTER: SUBCHAN = n LBL = label (or UNLBL)
:UD,,n (NO LABEL)	IF n IS LABELED, DOS-M PRINTS: LBL = label (OR UNLBL) NO ASSIGNMENT IS MADE.
:UD,label (NO SUBCHANNEL)	DOS-M SEARCHES FOR THE label, STARTING WITH THE HIGHEST NUMBER SUBCHANNEL (DETERMINED AT SYSTEM GENERATION). IF label IS FOUND, DOS-M MAKES IT THE USER DISC AND PRINTS: SUBCHAN = n IF label IS NOT FOUND, DOS-M PRINTS: DISC NOT ON SYS
:UD,label,n	IF n IS LABELED WITH THE SPECIFIED label, DOS-M ASSIGNS n AS THE USER DISC. IF n IS UNLABELED OR HAS A DIFFERENT label, DOS-M PRINTS: LBL = label (OR UNLBL) OPERATOR CAN THEN REISSURE :UD,label,n WITH THE CORRECT LABEL.
:UD,*,n	IF n IS UNLABELED, DOS-M ASSIGNS n AS THE USER DISC. IF n IS LABELED, DOS-M MAKES NO ASSIGNMENT AND PRINTS: LBL = label
:UD,*	ASSIGNS THE HIGHEST NUMBER UNLABELED DISC AS THE USER DISC AND PRINTS: SUBCHAN = n IF THERE ARE NO UNLABELED DISC, DOS-M PRINTS: DISC NOT ON SYS

DISC-TO-DISC DUMP DIRECTIVE

PURPOSE: To dump onto another subchannel

1. An entire Disc using :DD
2. The System Area (including system buffer) using :DD,X.
3. All or specified files of the User Area (optionally assigning some new file names) using

   :DD,U[,FILE 1 [,(FILE A)],FILE 2[,(FILE B)],....]

where X specifies the System Area
U specifies the User Area
FILE 1, FILE 2, ... specify the files to be dumped
FILE A, FILE B, ... specify the optional new names for FILE 1, FILE 2, ...

NOTES:

A. Renamed files may be intermixed with unchanged files in 3. above.

B. The destination disc must be specified by the :UD directive immediately following the :DD directive. For :DD,:DD,X the following :UD directive must be :UD,*,n where n is not the System Disc.

C. When the destination disc for a :DD,U is a System Disc (other than current system), the user files are dumped in the user area following the System files.

D. If files of the source disc will not completely fit on the destination disc, the system will transfer as many WHOLE FILES as possible and print: TRAC # TOO BIG.

SYSTEM SEARCH DIRECTIVE (PART 1)

PURPOSE: TO SPECIFY A LIST OF DISC SUBCHANNELS TO BE SEARCHED BY SYSTEM FOR FILE NAMES OTHER THAN THE CURRENT USER DISC.

FORMATS:

`:SS`

ALL ACTIVE SUBCHANNELS ARE SEARCHED IN THE FOLLOWING ORDER:

1. CURRENT USER DISC SUBCHANNEL
2. HIGHEST ACTIVE SUBCHANNEL IN SYSTEM
3. NEXT HIGHEST ACTIVE SUBCHANNEL IN SYSTEM

. . .

LOWEST ACTIVE SUBCHANNEL IN SYSTEM

`:SS,N1,N2,N3,....`

ALL ACTIVE SUBCHANNELS (WITHIN N1,N2,N3,...LIST) ARE SEARCHED IN THE FOLLOWING ORDER:

1. CURRENT USER DISC SUBCHANNEL
2. LOWEST NUMBERED ACTIVE SUBCHANNEL SPECIFIED IN N1,N2,N3,...LIST.
3. NEXT LOWEST NUMBERED ACTIVE SUBCHANNEL SPECIFIED IN N1,N2,N3,...LIST.

. . .

HIGHEST NUMBERED ACTIVE SUBCHANNEL SPECIFIED IN N1,N2,N3,...LIST.

`:SS,99`

ONLY THE CURRENT USER DISC SUBCHANNEL IS SEARCHED. THIS IS THE DEFAULT CONDITION. EVERY JOB STARTS OUT IN THIS CONDITION.

SYSTEM SEARCH DIRECTIVE (PART 2)

NOTES:

1. THIS IS AN OPTIONAL DIRECTIVE VALID ONLY IF "YES" WAS RESPONSE TO ALLOW :SS? QUESTION DURING SYSTEM GENERATION.

2. THE :SS CONDITION SET APPLIES TO ALL EXEC CALLS AND DIRECTIVES THAT REQUIRE A FILE SEARCH.

3. CURRENT USER DISC SUBCHANNEL NUMBER IS CHANGED TO THE SUBCHANNEL CONTAINING THE FILE THAT INITIATED THE FILE SEARCH. THIS IS REPORTED BY SYSTEM EACH TIME IT CHANGES WITH TTY PRINTOUT, SUBCHAN = n IF THE JOB PROCESSOR IS IN CORE (I.E. NO OTHER USER PROGRAM EXECUTING).

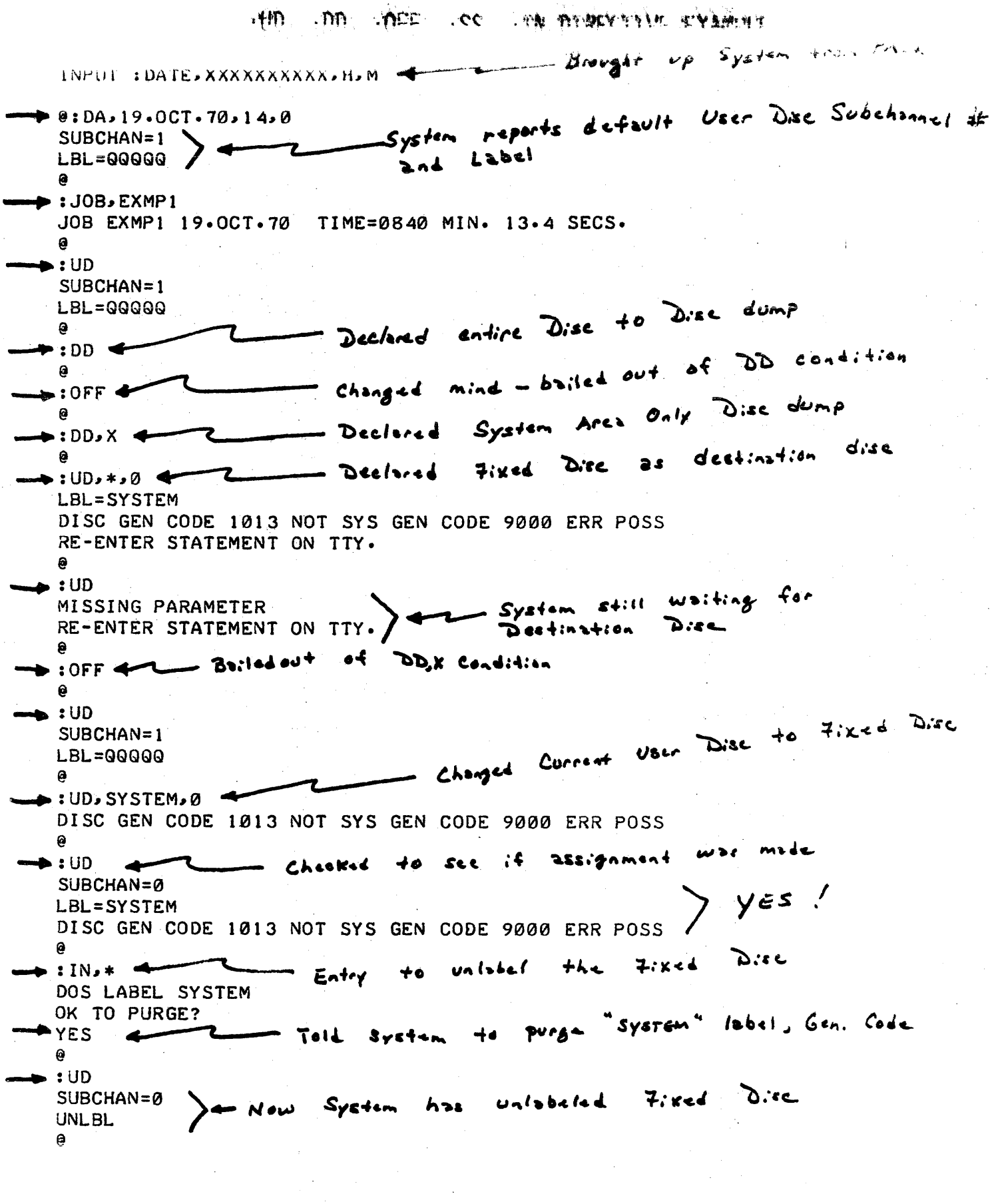
4. IF SEARCH DOES NOT FIND THE DESIRED FILE, THE CURRENT USER DISC SUBCHANNEL NUMBER IS RESTORED TO ITS VALUE BEFORE SEARCH.

5. IF SEARCH IS INTERRUPTED BEFORE COMPLETION, THE CURRENT USER DISC SUBCHANNEL NUMBER WILL BE ON WHATEVER SUBCHANNEL NUMBER THE SYSTEM WAS SEARCHING WHEN INTERRUPTION OCCURRED.

6. :LIST,U DIRECTIVE DOES NOT STOP ON DUPLICATE FILE NAMES, BUT CONTINUES SEARCHING AND PRINTING USER DIRECTORY. AT COMPLETION, THE CURRENT USER DISC SUBCHANNEL IS RESTORED TO NUMBER BEFORE THIS DIRECTIVE ENTERED.

7. MORE THAN ONE :SS CONDITION MAY BE SET DURING A JOB. EACH ONE SET REMAINS IN EFFECT UNTIL A NEW ONE IS ENTERED OR THE JOB IS ENDED.

8. :SS CONDITIONS SET ARE NOT FOLLOWED BY RELOCATING LOADER (LOADR) OR TO DISC DUMPS INITIATED BY :DD DIRECTIVE.


INPUT :DATE,XXXXXXXXXX,H,M
Brought up System
@:DA,19.OCT.70,14,0
SUBCHAN=1
LBL=QQQQQ
System reports default User Disc Subchannel # and Label
@
:JOB,EXMP1
JOB EXMP1 19.OCT.70 TIME=0840 MIN. 13.4 SECS.
@
:UD
SUBCHAN=1
LBL=QQQQQ
@
:DD
Declared entire Disc to Disc dump
@
:OFF
Changed mind - bailed out of DD condition
@
:DD,X
Declared System Area Only Disc dump
@
:UD,*,0
Declared Fixed Disc as destination disc
LBL=SYSTEM
DISC GEN CODE 1013 NOT SYS GEN CODE 9000 ERR POSS
RE-ENTER STATEMENT ON TTY.
@
:UD
MISSING PARAMETER
RE-ENTER STATEMENT ON TTY.
System still waiting for Destination Disc
@
:OFF
Bailed out of DD,X Condition
@
:UD
SUBCHAN=1
LBL=QQQQQ
@
:UD,SYSTEM,0
Changed Current User Disc to Fixed Disc
DISC GEN CODE 1013 NOT SYS GEN CODE 9000 ERR POSS
@
:UD
Checked to see if assignment was made
SUBCHAN=0
LBL=SYSTEM
DISC GEN CODE 1013 NOT SYS GEN CODE 9000 ERR POSS
YES !
@
:IN,*
Entry to unlabel the Fixed Disc
DOS LABEL SYSTEM
OK TO PURGE?
YES
Told System to purge "System" label, Gen. Code
@
:UD
SUBCHAN=0
UNLBL
Now System has unlabeled Fixed Disc
@

[SLIDE 20A]

```
:UD,QQQQQ,1 *  - Reassign USER DISC
@
:UD  <-- Checked to make sure assignment made
SUBCHAN=1
LBL=QQQQQ
@
:DD,X  <-- Declared System area only Disc dump
@
:UD,*,0  <-- Declared Destination Disc
@
:UD
SUBCHAN=0
LBL=SYSTEM
@
:UD,,0  <-- Checked Label on Subchannel # 0 (Fixed Disc)
LBL=SYSTEM
@
:UD
SUBCHAN=0
LBL=SYSTEM
@
:LI,U  <-- Incorrect Statement Entered
MISSING PARAMETER
RE-ENTER STATEMENT ON TTY.
@
:LI,U,1  <-- List USER Directory
NAME TYPE SCTRS DISC ORG PROG LIMITS   B.P. LIMITS   ENTRY LIBR.  P-BIT
SUBCHAN=0
                NOTHING ON Fixed Disc to be listed
@
:SS  <-- Set System Search for all active subchannels
@
:LI,U,1
NAME TYPE SCTRS DISC ORG PROG LIMITS   B.P. LIMITS   ENTRY LIBR.  P-BIT
SUBCHAN=0
SUBCHAN=1
XREF  UM  0013  T023 000 12000 14750   01002 01036   12000 14071
@T1   SS  0001  T023 013
WEOT  UM  0002  T023 014 12000 12013   01002 01003   12000 12013

*:OFF  <-- Bailed out of long listing
@
:SS,99  <-- Reset default System Search
@

:LI,U,1  <-- List User Directory
NAME TYPE SCTRS DISC ORG PROG LIMITS   B.P. LIMITS   ENTRY LIBR.  P-BIT
SUBCHAN=1
XREF  UM  0013  T023 000 12000 14750   01002 01036   12000 14071

*:OFF  <-- Bailed out
@
:UD
SUBCHAN=1  <-- Note how Current user Disc is still 1
LBL=QQQQQ
@
```

[SLIDE 20B]

```
:UD
SUBCHAN=1
LBL=QQQQQ
@
:DD,U
@
:UD,SYSTEM,0
XREF
EOT1
WEOT
XREFR
DISCM
EXECS
DVR05
DVR31
LIBRY
DVR02
DVR01
DVR22
LODR
JOBP
ASMBL
ASMD
ASM3
ASM4
ASM5
FRTN
FTN1
FTN2
FTN3
FTN4
ASM1
ASM2
SIO1
BASC1
BOOT
FTNH
EOF
FSPCE
RWIND
D.00S
TSRTS
TSRTR
CLEAR
@
:UD
SUBCHAN=0
LBL=SYSTEM
@
:LI,U,1
NAME TYPE SCTRS DISC ORG PROG LIMITS   B.P. LIMITS   ENTRY LIBR.  P-BIT
SUBCHAN=0
XREF   UM  0013  T024 000 12000 14750   01002 01036   12000 14071
EOT1   SS  0001  T024 013
WEOT   UM  0002  T024 014 12000 12013   01002 01003   12000 12013
*:ABORT
JOB ABORTED!
END JOB EXMP1 RUN=0011 MIN. 52.2 SEC.  EXEC=0000 MIN. 00.0 SEC.
@
```

Declared User Area only Disc Dump

Destination Disc

System Reported Each User File Name Transfered as transfer done

List user Directory

Bailed out and aborted

[SLIDE 20C]

OPERATIONAL DIFFERENCE SUMMARY (PART 1)

CONDITION	DOS	DOSM
SYSTEM START-UP	Outputs the following: INPUT FR = FRESH; CO = CONTINUATION	Does not output this message. Outputs INPUT :DATE,XXXXXXXXXX,H,M (H and M are omitted if system does not have Time Base Generation)
:OFF Directive	Does not exit. Must use :ABORT to terminate the current job.	New Directive to abort without terminating current job.
:DD Directive	Does not exist. SDUMP program must be used to create backup copies on Mag. Tape	New Directive to perform disc to disc dumps. Backup copy may be put on cartridge disc.
:SS Directive	Does not exist.	New Directive to enable multi-disc file searching.
:IN Directive	Does not exist. Discs are not labeled.	New Directive to label or unlabel discs.
:UD Directive	Does not exist.	New Directive to change current user disc.
System Recognition of Operator Attention by outputting *	Following are valid entries at this time: :ABORT, :DN, :EQ, :LU, :TYPE, :UP	Following are valid entries at this time: :OFF, :PAUSE, :ABORT, :DN, :EQ, :LU, :TYPE, :UP
:JOB Directive	Current time is always printed on the System Teleprinter and List device along with the job name and date. TBG is System requirement.	Current Time is only printed on the system Teleprinter and list device when Time Base Generator is in system. TBG is an option.

OPERATIONAL DIFFERENCE SUMMARY (PART 2)

CONDITION	DOS	DOSM
:EJOB Directive	Not Applicable	System resets :SS condition to be only standard user disc.
	System condenses User file. Only one User File Area.	System condenses all user discs following :SS condition.
	Not Applicable	User Disc subchannel assignment reset to standard subchannel # unless standard is "NOT READY" or new cartridge has been inserted with different label.
	Message is printed on System Teleprinter and standard List device with job name, execution and run times. TBG is a System Requirement.	Execution and Run times are not printed if the Time Base Generator is not in the system. TBG is optional.
:PROG Directive	Not Applicable Only one user area in system.	File Search for program specified follows :SS condition. User files are searched first, then system files.
:RUN Directive	Optional "time parameter" always used. TBG is System requirement.	"Time parameter" is ignored if Time Base Generator is not in system. TBG is optional.
	Not Applicable. Only one user area in system.	File search for User program follows :SS condition.

OPERATIONAL DIFFERENCE SUMMARY (PART 3)

CONDITION	DOS	DOSM
:TRACKS DIRECTIVE	REQUIRES THAT THE OPERATOR INFORM SYSTEM OF THE FAULTY TRACKS ON A FRESH START-UP FOLLOWING THE DATE DIRECTIVE.	DOES NOT INCLUDE THIS OPTION BECAUSE A RECORD IS MAINTAINED IN THE LABEL SECTOR ON EACH DISC FOR NUMBER OF FAULTY TRACKS, THE ADDRESS OF NEXT SPARE TRACK, ETC...
	REPORTS TRACK NUMBERS THAT ARE FAULTY.	REPORTS TOTAL NUMBER OF TRACKS THAT HAVE BEEN REPLACED BY SPARES.
:STORE DIRECTIVE	CHECKS USER AREA FOR DUPLICATE FILE NAMES.	CHECKS ALL ACTIVE SUBCHANNELS (ACCORDING TO :SS CONDITION) FOR DUPLICATE FILE NAME. STORE ACUALLY DONE ON CURRENT USER DISC.
	ONE SECTOR = 64 WORDS	ONE SECTOR = 128 WORDS
:JFILE DIRECTIVE	SOURCE FILE SPECIFIED IS IN ONE USER AREA.	SOURCE FILE SPECIFIED MAY BE ON ANY ACTIVE SUBCHANNEL (ACCORDING TO :SS CONDITION).
:EDIT DIRECTIVE	SOURCE FILE SPECIFIED IS IN ONE USER AREA.	SOURCE FILE SPECIFIED MAY BE ON ANY ACTIVE SUBCHANNEL (ACCORDING TO :SS CONDITION).
	UPDATED OR NEW SOURCE FILE IS STORED IN ONLY ONE USER AREA.	IF NEW FILE NAME IS SPECIFIED, THIS FILE IS STORED ON SAME SUBCHANNEL AS OLD FILE.
:PURGE DIRECTIVE	FILES SPECIFIED ARE ONLY IN ONE USER	FILES SPECIFIED MAY BE ON ANY ACTIVE SUBCHANNEL (ACCORDING TO :SS CONDITION). ALL ASSOCIATED USER DISCS ARE REPACKED FOR EFFICIENTY. USE :IN,* TO PURGE ALL USER FILES ON A GIVEN USER DISC.

OPERATIONAL DIFFERENCE SUMMARY (PART 4)

CONDITION	DOS	DOSM
:LIST DIRECTIVE	DOSE NOT HAVE P-BIT FIELD FOR DIRECTORY LISTINGS.	HAS ALL FIELDS OF DOS WITH ADDITIONAL FIELD, P-BIT. ENTRY UNDER THIS FIELD WILL BE "T" TO INDICATE THAT THE ASSOCIATED FILE IS TEMPORARY AND WILL BE PURGED AT :EJOB IF NOT STORED WITH :STORE.
	USER DIRECTORY IS ONLY ON ONE DISC.	USER DIRECTORY LISTING HAS SUBCHANNEL NUMBERS PRECEEDING USER FILES ON THAT SUBCHANNEL.
	NOT APPLICABLE	CURRENT USER DISC SUBCHANNEL NUMBER IS RESTORED FOLLOWING :LIST,U.
	SOURCE FILE SPECIFIED IS ON ONE USER AREA.	SOURCE FILE SPECIFIED MAY BE ON ANY ACTIVE SUBCHANNEL (ACCORDING TO :SS CONDITION).
:DUMP DIRECTIVE	USER FILES ONLY ON ONE DISC.	FILE SPECIFIED MAY BE ON ANY ACTIVE SUBCHANNEL (ACCORDING TO :SS CONDITION)
:SA OR :SO DIRECTIVES	CALLED DISC DUMP	CALLED SECTOR DUMP TO DISTINGUISH FROM :DD (DISC DUMP).
	DUMP IS TO SYSTEM TELEPRINTER (LU # 1)	DUMP IS TO STANDARD LIST DEVICE (LU #6).
	ANY PORTION OF DISC(S) ON SYSTEM MAY BE DUMPED.	DUMP ANY PORTION OF CURRENT USER DISC EVEN IF USER AREA IS ON SYSTEM DISC.
:DATE DIRECTIVE	HOURS AND MINUTES ENTRIES ARE ALWAYS MEANINGFUL. TBG IS SYSTEM REQUIREMENT	IF TIME BASE GENERATOR IS NOT PRESENT IN SYSTEM, HOURS AND MINUTES ARE SET TO ZERO.

CHANGE USER DISC EXEC CALL

(GENERAL FORMAT)

PURPOSE

To change the subchannel assignment for the user disc.

ASSEMBLY LANGUAGE

```
      EXT EXEC
       .
       .
       .
      JSB EXEC                  (Transfer control to DOS-M)
      DEF *+3 (or 4)            (Point of return from DOS-M)
      DEF RCODE                 (Request Code)
      DEF LABEL                 (Disc Label)
      DEF SUBCH                 (Disc Subchannel; optional)
      RETURN POINT
       .
       .
       .
RCODE DEC 23                    (Request Code = 23)
LABEL ASC 3, xxxxxx             (Label = xxxxxx)
SUBCH DEC (Ø to 7)
```

FORTRAN

```
      IRCDE = 23
      DIMENSION LABEL (3)
      LABEL (1) = xx
      LABEL (2) = xx
      LABEL (3) = xx
      ICHNL = M        (Ø THROUGH 7)
      CALL EXEC (IRCDE, LABEL, ICHNL)
```

CHANGE USER DISC EXEC CALL -- FORM # 1

(LABEL AND SUBCHANNEL SPECIFIED)

CALLING SEQUENCE:

```
JSB EXEC          TRANSFER CONTROL TO EXEC
DEF *+4           DEFINE RETURN POINT
DEF RCODE         DEFINE REQUEST CODE LOCATION
DEF LABEL         DEFINE LABEL LOCATION
DEF SUBCH         DEFINE SUBCHANNEL LOCATION
(RETURN POINT)
  .
  .
  .
RCODE DEC 23      23 FOR REQUEST CODE
LABEL ASC 3,xxxxxx  6 CHARACTER DISC LABEL OR "*"
SUBCH DEC N       N = Ø-7 FOR SUBCHANNEL #
```

SYSTEM ACTION	OPERATOR ACTION
CHECKS IF SUBCHANNEL N IS LABELED AS SPECIFIED IN CALL (LABEL NAME OR "*")	NONE REQUIRED
MATCH - MAKES ASSIGNMENT AND RETURNS	NONE REQUIRED
NO MATCH - PRINTS MESSAGE: LBL = (LABEL NAME FOUND ON SUBCHANNEL N) OR UNLBL IF "*" xxxxx SUSP WHERE xxxxx IS NAME OF EXECUTING PROGRAM.	1. IF CORRECTLY LABELED DISC ON HAND: MOUNT IN DRIVE AND "READY" DRIVE. THEN ENTER :GO FOR SYSTEM TO EXECUTE AT START OF EXEC CALL. OR 2. IF NO PROPERLY LABELED DISC ON HAND: ENTER: :ABORT OR :OFF

CHANGE USER DISC EXEC CALL -- EXEC # 6

(ONLY LABEL SPECIFIED)

CALLING SEQUENCE:

```
JSB EXEC          TRANSFER CONTROL TO EXEC
DEF *+3           DEFINE RETURN POINT
DEF RCODE         DEFINE REQUEST CODE LOCATION
DEF LABEL         DEFINE LABEL LOCATION
(RETURN POINT)
  .
  .
  .
RCODE DEC 23      23 FOR REQUEST CODE
LABEL ASC 3,xxxxxx  6 CHARACTER LABEL OR "*"
```

SYSTEM ACTION	OPERATOR ACTION
SEARCHES FOR LABEL OR "*" DISC STARTING WITH THE HIGHEST SUBCHANNEL NUMBER.	NONE REQUIRED
MATCH - MAKES ASSIGNMENT AND RETURNS	NONE REQUIRED
NO MATCH - PRINTS MESSAGE: DISC NOT ON SYST xxxxx SUSP WHERE xxxxx IS NAME OF EXECUTING PROGRAM.	1. IF PROPERLY LABELED DISC ON HAND: MOUNT IN DRIVE AND "READY" DRIVE. THEN ENTER :GO FOR SYSTEM TO EXECUTE AT START OF EXEC CALL. OR 2. IF NO APPROPRIATELY LABELED DISC ON HAND: ENTER: :ABORT OR :OFF

DOS/DOSM GENERAL PURPOSE EXEC CALLS WITH NEGATIVE REQUEST CODES

REQUEST CODE	FUNCTION	CALLING SEQUENCE
-19	BASE PAGE STORE (STA B,I)	LDA "VALUE TO STORE" LDB "DESTINATION ADDRESS" JSB EXEC DEF *+2 DEF RCODE (RETURN WITH B = FORMER VALUE +1) . . . RCODE DEC - 19
-20	TO LOAD AND START EXECUTION OF A PROGRAM WHOSE DIRECTORY ENTRY IS IN LOCATIONS 141-153 OCTAL	STORE DIRECTORY ENTRY OF DESIRED PROGRAM IN LOCATIONS 141-153B JSB EXEC DEF *+2 DEF RCODE (RETURN) . . . RCODE DEC - 20
-21	TO INITIALIZE TBG (IF IN SYSTEM) FOR .1 SECOND TIMED INTERRUPTS	JSB EXEC DEF *+2 DEF RCODE (RETURN) . . . RCODE DEC - 21
-22	TO EXECUTE AN I/O INSTRUCTION	LDA "I/O INSTRUCTION" JSB EXEC DEF *+2 DEF RCODE (RETURN) . . . RCODE DEC - 22

DOSM DISC I/O WITH EXEC CALLS
(ABSOLUTE DISC ADDRESSING)

GENERAL CALLING SEQUENCE:

```
        JSB EXEC   (TRANSFER TO EXEC)
        DEF RTN    (DEFINE RETURN ADDRESS)
        DEF RCODE  (SEE BELOW)
        DEF CNTLW  (SEE BELOW)
        DEF BUFFR  (DEFINE BUFFER ADDRESS)
        DEF BUFFL  (DEFINE BUFFER LENGTH)
        DEF TRCK   (DEFINE TRACK #)
        DEF SECT   (DEFINE SECTOR #)
RTN     (RETURN POINT)
```

RCODE	CNTLW	DISC AREA ADDRESSED
+1 (READ) +2 (WRITE)	2	"WORK AREA" ON SYSTEM DISC ONLY. SYSTEM CHECKS FOR LEGALITY OF TRCK/SECT IN CALL.
-1 (READ) -2 (WRITE)	2	"ANY AREA" ON SYSTEM DISC. SYSTEM DOES NOT CHECK FOR LEGALITY OF TRCK/SECT IN CALL.
	3	"ANY AREA" ON CURRENT USER DISC. SYSTEM DOES NOT CHECK FOR LEGALITY OF TRCK/SECT IN CALL.
	-3	"ANY AREA" ON CURRENT JOB FILE (JFILE) DISC. SYSTEM DOES NOT CHECK FOR LEGALITY OF TRCK/SECT IN CALL.

NOTE: SYSTEM WILL HALT (WITH T-REG. =102031 OCTAL) IF DISC PROTECT OVERRIDE SWITCH IS "OFF" (DOWN) AND REQUEST MADE TO WRITE ON A SECTOR THAN IS FLAGGED PROTECTED (PCI=1).

BINARY TAPES NEEDED FOR SYSTEM GENERATION (PART 1)

PROGRAM(S)	# TAPES	COMMENTS
SYSTEM GENERATOR	1	OPERATES IN SIO ENVIRONMENT, THEREFORE THE FOLLOWING SIO DRIVERS MAY BE NEEDED: TELETYPE, PHOTOREADER, PUNCH (IF SIO DUMP TO BE USED), AND MAGNETIC TAPE. GENERATOR CONTAINS DISC I/O DRIVER INTERNAL TO ITSELF, THEREFORE, NO SIO DISC DRIVER NEEDED.
DISC MONITOR (CORE RESIDENT SYSTEM)	1	ALWAYS MADE CORE RESIDENT BY GENERATOR. GOOD PRACTICE TO LOAD AS FIRST PROGRAM FOR SYSTEM COMPATABILITY BETWEEN PROGRAMS LOADED ON OTHER SYSTEMS.
EXECUTIVE MODULES AND SUBROUTINES	1	MUST BE INCLUDED IN SYSTEM GENERATION. CONTAINS $EX01 - $EX20 EXEC MODULES AND SUBROUTINES $LBL, $SRCH, $ADDR, ASCII, DUMRX. ALL EXEC MODULES ARE PROGRAM TYPE 1 (SYSTEM DISC RESIDENT), BUY MAY BE MADE SYSTEM CORE RESIDENT DURING GENERATION (PROGRAM TYPE 0). CAUTION: IF CERTAIN EXEC MODULES ARE MADE SYSTEM CORE RESIDENT, THEIR ASSOCIATED SUBROUTINES MUST ALSO BE DECLARED CORE RESIDENT.
I/O DRIVERS	1 PER DRIVER	DVR31 (IOMEC DISC DRIVER) MUST ALWAYS BE INCLUDED. IT IS DECLARED PROGRAM TYPE 0 (SYSTEM CORE RESIDENT) AND MUST NOT BE REDECLARED. DVR05 DVR00 ONE OF THESE DRIVERS MUST BE INCLUDED. BOTH ARE DECLARED PROGRAM TYPE 0 (SYSTEM CORE RESIDENT). THE ONE TO BE USED AS SYSTEM TELETYPE MUST NOT BE REDECLARED AS DISC RESIDNET. DVR05 IS SHORTED IN CORE REQUIREMENTS. ALL OTHER DRIVERS ARE DECLARED PROGRAM TYPE 4 (DISC RESIDENT I/O DRIVER) AND MAY BE REDECLARED PROGRAM TYPE 0 IF DESIRED.
JOB PROCESSOR	1	MUST ALWAYS BE INCLUDED IN GENERATION. MUST ALWAYS BE DISC RESIDENT.
RELOCATING LOADER	1	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION, BUT IF NOT INCLUDED NO PROGRAMS COULD BE RELOCATED INTO CORE IMAGE ABSOLUTE FORM BY THE SYSTEM THAT IS GENERATED. DECLARED PROGRAM TYPE 3 (USER MAIN) AND MAY NOT BE MADE CORE RESIDENT. MUST ALWAYS BE DISC RESIDENT.

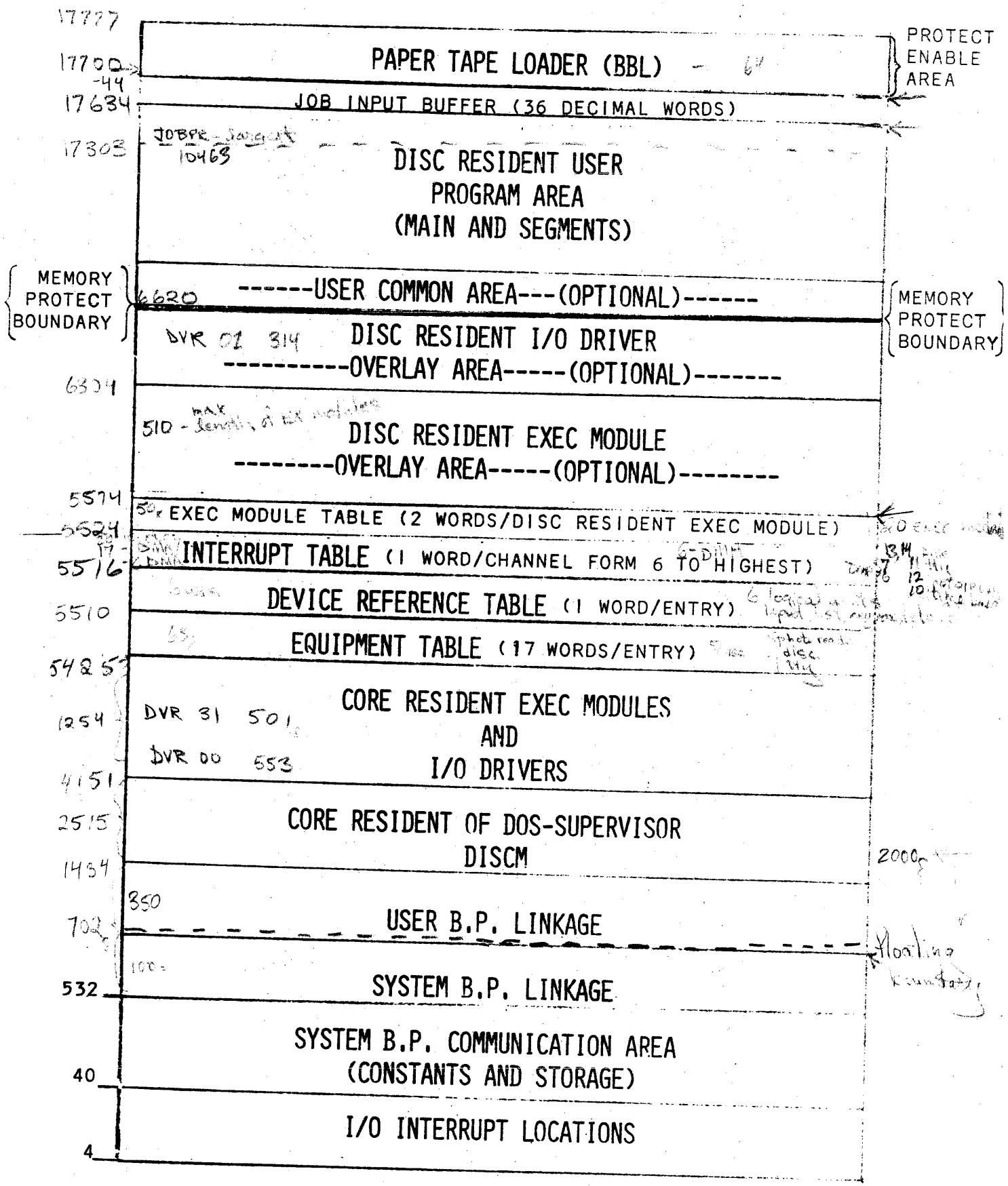
BINARY TAPES NEEDED FOR SYSTEM GENERATION (PART 2)

PROGRAM(S)	# TAPES	COMMENTS
EXTENDED ASSEMBLER	7	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION. ONE TAPE IS THE MAIN PROGRAM (TYPE 3) AND SIX TAPES ARE SEGMENTS (PROGRAM TYPE 5). THE MAIN PROGRAM (ASMB) MUST BE LOADED PRIOR TO ITS SEGMENTS. MUST ALWAYS BE DISC RESIDENT.
HP BASIC FORTRAN COMPILER	5	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION. ONE TAPE IS THE MAIN PROGRAM (TYPE 3) AND FOUR TAPES ARE SEGMENTS (PROGRAM TYPE 5). THE MAIN PROGRAM (FTN) MUST BE LOADED PRIOR TO ITS SEGMENTS. MUST ALWAYS BE DISC RESIDENT.
HP ALGOL COMPILER	2	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION. ONE TAPE IS THE MAIN PROGRAM (TYPE 3) AND ONE SMALL TAPE IS THE ONLY SEGMENT (PROGRAM TYPE 5). THE MAIN PROGRAM (ALGOL) MUST BE LOADED PRIOR TO THE SEGMENT. MUST ALWAYS BE DISC RESIDENT. REQUIRES 16K MINIMUM CORE.
HP FORTRAN IV COMPILER	19	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION. ONE TAPE IS THE MAIN PROGRAM (TYPE 3) AND 18 OTHER TAPES ARE ITS SEGMENTS (PROGRAM TYPE 5). THE MAIN PROGRAM (FTN4) MUST BE LOADED PRIOR TO THE 18 SEGMENTS. MUST ALWAYS BE DISC RESIDENT.
CROSS REFERENCE TABLE GENERATOR	1	DOES NOT HAVE TO BE INCLUDED IN SYSTEM GENERATION. DELARED PROGRAM TYPE 3 (USER DISC RESIDENT MAIN). MUST BE DISC RESIDENT.
LIBRARIES	5	THE LIBRARIES INCLUDED DURING SYSTEM GENERATION WILL DEPEND ON THE PARTICULAR SYSTEM THAT IS BEING GENERATED AND WILL VARY ACCORDINGLY. FACTORS THAT WILL HELP DETERMINE ARE: 1. IS EAU TO BE USED. 2. IS FORTRAN IV COMPILER TO BE INCORPORATED INTO SYSTEM. 3. IS PLOTTING EQUIPMENT TO BE USED.
ANY USER PROGRAMS TO BE MADE A PERMANENT PART OF SYSTEM	?	SAME CONVENTIONS MUST BE FOLLOWED IN SEGMENTATION. USER MAIN MUST BE LOADED PRIOR TO SEGMENTS ETC. LIBRARY PROGRAMS MUST BE DECLARED TYPE 6 OR 7.

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).

DOSM GENERAL CORE LAYOUT



SYSTEM SOFTWARE SIZE BREAKDOWN ("A" VERSIONS)

PROGRAM NAME	LENGTH (OCTAL)	LENGTH (DECIMAL)	EXTERNAL ROUTINES
DISCM	2515	1357	-----
$EX01	62	50	$ADDR
$EX02	50	40	$ADDR
$EX03	35	29	-----
$EX04	315	205	ASCII
$EX05	156	110	$SRCH
$EX06	37	31	$ADDR, $SRCH
$EX07	157	111	$ADDR
$EX08	143	99	$ADDR
$EX09	261	177	ASCII
$EX10	156	110	-----
$EX11	164	116	$SRCH
$EX12	172	122	-----
$EX13	342	226	ASCII
$EX14	360	240	ASCII
$EX15	272	186	ASCII
$EX16	133	91	-----
$EX17	373	251	$LBL
✓ $EX18	510	328	-----
$EX19	320	208	$LBL
$EX20	306	198	ASCII
$LBL	73	59	
$SRCH	304	196	
$ADDR	15	13	
ASCII	72	58	
DUMRX	64	52	
✓ DVR00 tty (my punch capability)	553	363	
✓ DVR01 photo reader	314	204	
DVR02	202	130	
DVR05	250	168	
DVR10	135	93	
DVR12	527	343	
DVR15	325	213	
DVR22	634	412	
DVR23	566	374	
DVR30	252	170	
✓ DVR31 Disc	501	321	
✓ JOBPR	10463	4403	
LOADR	7032	3610	

DOSM SYSTEM GENERATION EXAMPLE
("A" VERISION TAPES USED)

SYS GEN CODE?
→ 9000 — written in label field of the system disc for ident. (decimal #)

SYS DISC CHNL?
→ 14 — select code of disc controller (octal #)

SECTORS/TRACK?
→ 12 — (12 for 2870 [illegible] disc)

SYS DISC SIZE? — # tracks
→ 200

DRIVES?
→ 1

FIRST SYSTEM TRACK?
→ 0

FIRST SYSTEM SECTOR?
→ 3

SYS DISC SUBCHNL?
→ 1

USER DISC SUBCHNL?
→ 1

TIME BASE GEN CHNL?
→ 12 — if type of TBG is not present

IS 2114?
→ NO

LWA MEM? — last word of available core memory — [basic binary loader (BBL) starts in 37700]
→ 37677

ALLOW :SS? — (system search directive)
→ YES

PRGM INPT?
→ PT — (type of 1st input unit for relocatable prog. module)

LIBR INPT?
→ PT — (type of optional input unit for RPM's) — for prog. input phase [DF - disc file, TY - teletype, PT - paper tape, MT - mag. tape]

PRAM INPT?
→ TY — {type of input unit for parameters in param. input phase [PT or TY]

INITIALIZATION PHASE

[SLIDE 40A]

```
*EOT      - signifies end of tape when reading off ...
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT
*EOT

NO UNDEF EXTS
```

PROGRAM INPUT PHASE

input all progs to be made permanent part of DOS-M (must input main before segments)

01 terminates
00 prgm input
10 library input

```
ENTER PROG PARAMETERS
→ $EX01,0    — Disc Work Tracks Status
→ $EX02,0    —   "     Limits
→ $EX06,0    — User file name search
→ $EX11,0    System file name search - for file read/write
→ $EX17,0    I/O Processor
→ $EX18,0    I/O Initiation processor
→ $ADDR,0    Buffer addr validity check
→ $LBL,0     Service routine for label checking
  $60 (struck out)
→ $SRCH,0    Search system or User directory
  /E

# SYSTEM LINKS?    # of system linkages required in base page   (130 min response)
→ 177

# USER LINKS?      # of user linkages in B.P.    (320 min #)
→ 400
```

PARAMETER INPUT PHASE (from TY in the ...)

SYSTEM

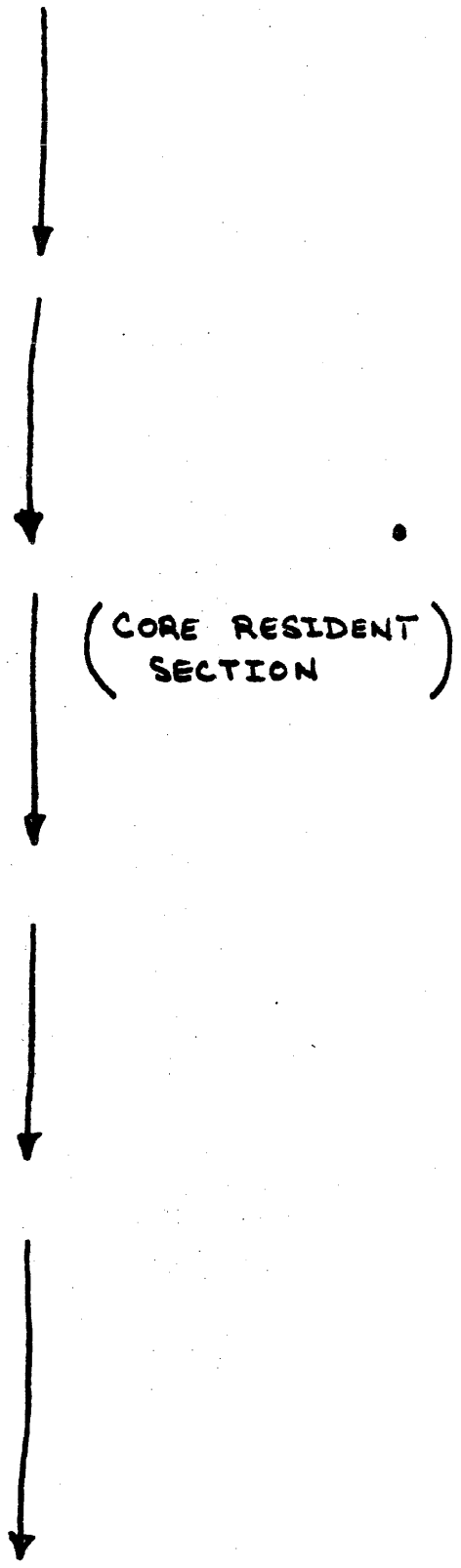
relative starting location

DISCM	01634
✓*$CIC	01634
*$STRT	04160
*$LDEX	04154
✓*EXEC	02214
*$DISC	03400
*$IDL1	03511
*$MDLD	03020
*$RQER	02635
*$JLOD	03744
*$MOVE	03361
*$TYPE	03426
*$SYIO	04165
*$BFND	04267
*$EFAD	02507
*$ABRT	04010
*$WAIT	03244
*SETEQ	03345
*$BLOP	03177
*$CIC3	01714
*SAVE$	03563
*$CLER	04044
*$OPER	02212
*ERR01	02653
*ERR03	02657
*ERR04	02661
*ERR05	02663
*ERR06	02665
*LUCHK	02553
*$DMA	03214
*$MBSY	03207
*$LDVR	03143
*RQEQT	02576
*DRIVR	02700
*ERRTN	02631
*IO.40	02521
*$GDTK	03130
*DISCX	03117
*..RRL	04243
*DEF04	02445
*DEF19	04302
*DEF20	04303
$EX01	04314
*$EX01	04314
$EX02	04376
*$EX02	04376
$EX06	04446
*$EX06	04446
$EX11	04505
*$EX11	04505
$EX17	04671

entry points

DISC LOADING PHASE

(CORE RESIDENT SECTION)



[SLIDE 40C]

DISC LOADING PHASE (CON'T)

```
   *$EX17   04671

$EX18       05264
   *$EX18   05264

$ADDR       05774
   *$ADDR   05774

$SRCH       06011
   *$SRCH   06011
   *$CMPR   06266

$LBL        06315
   *LBLIO   06354
   *ISLBL   06336
   *LBLMV   06330
   *CHSUM   06315
   *MESSG   06372

DVR05       06410
   *I.05    06410
   *C.05    06464

DVR31       06660
   *I.31    06660
   *C.31    06743
```

(CORE RESIDENT SECTION)

```
* EQUIPMENT TABLE ENTRY
```

select code → I/O slot number ← driver core resident

```
11,DVR05,R  teleprinter  (12) TBG
13,DVR01    photoreader
14,DVR31,R,D IOMEC disc (SYS DISC CHNL)
16,DVR02    Punch
22,DVR22,D  Dmft channel required
            3030 mag tape
/E
```

BUILD EQT TABLE

```
* DEVICE REFERENCE TABLE
```

logical unit

```
 1 = EQT #? 1   system teleprinter (entry in eqt table)
 2 = EQT #? 3   user mass storage (IOMEC DVR31 disc)
 3 = EQT #? 3   System mass storage
 4 = EQT #? 4   Standard punch device
 5 = EQT #? 2   Standard input device (photoreader)
 6 = EQT #? 1   Standard list device (teleprinter)
 7 = EQT #? 5   mag tape
 8 = EQT #?
/E
```

BUILD DRT TABLE

IT generated:

0 - no interrupt

```
* INTERRUPT TABLE
11,1
13,2
15,3
16,4
23,5
/E
```

6 0 14 0
4 0 15 addr 21 0
10 0 16 addr 0 22 0
11 addr ENT 1 17 0 23 addr
12 TBG 20 0
13 addr ENT 2

14 locations in memory

BUILD INTERRUPT TABLE

EXEC SUPERVISOR MODULES

```
$EX03       07567
   *$EX03   07567

$EX04       07567
   *$EX04   07567
  ASCII     10104
   *CNDEC   10104
   *CNOCT   10110

$EX05       07567
   *$EX05   07567

$EX07       07567
   *$EX07   07567

$EX08       07567
   *$EX08   07567

$EX09       07567
   *$EX09   07567
  ASCII     10050
   *CNDEC   10050
   *CNOCT   10054

$EX10       07567
   *$EX10   07567

$EX12       07567
   *$EX12   07567

$EX13       07567
   *$EX13   07567
  ASCII     10131
   *CNDEC   10131
   *CNOCT   10135

$EX14       07567
   *$EX14   07567
  ASCII     10147
   *CNDEC   10147
   *CNOCT   10153

$EX15       07567
   *$EX15   07567
  ASCII     10061
   *CNDEC   10061
   *CNOCT   10065
```

Main entry pt. subroutine

DISC LOADING PHASE (CON'T)

(DISC RESIDENT SECTION)

DISC LOADING PHASE (CON'T)

```
$EX16        07567
   *$EX16    07567

$EX19        07567
   *$EX19    07567

$EX20        07567
   *$EX20    07567


 ASCII       10075
  *CNDEC     10075
  *CNOCT     10101

I/O DRIVER MODULES

DVR01        10241
   *I.01     10241
   *C.01     10313

DVR02        10241
   *I.02     10241
   *C.02     10320

DVR22        10241
   *I.22     10241
   *C.22     11001

LWA SYS  11075    last addr +1 of supervisor

FWA USER?         1st wd of user prog. area
→12000

USER SYSTEM PROGRAMS

LOADR        12000
   *LOADR    12000

JOBPR        12000
   *JOBPR    12000

ASMB         12000
   *ASMB     16522
   *?ASCN    13700
   *?ASMB    12554
   *?BNCN    14510
   *?BPKU    15326
   *?CHOP    12646
   *?CHPI    15610
   *?DCOD    15616
   *?ENDS    15230
   *?ERPR    15150
```

(DISC RESIDENT SECTION)

DISC LOADING PHASE (CON'T)

*?GETC	15654
*?MOVE	13437
*?MSYM	14775
*?RLUN	16375
*?AFLG	16430
*?LSTL	14717
*?LUNI	16436
*?RFLG	16425
*?%	16446
*?ASM1	13371
*?LABE	13407
*?OKOL	15307
*?ORRP	14603
*?PNLE	16443
*?SETM	15674
*?SUP	15303
*?LPER	15306
*?PERL	15271
*?LOUT	15336
*?LTFL	15275
*?DRFL	16433
*?LTSA	15560
*?LTSB	15561
*?ORGS	15301
*?CNTR	15370
*?TSTR	16434
*?ASII	16452
*?ICSA	15146
*?FLGS	16422
*?BFLG	16423
*?LFLG	16424
*?TFLG	16426
*?X	16445
*?MESX	12505
*?ASCI	16451
*?LINC	15110
*?LINS	14765
*?LIST	14653
*?LUNP	16440

(DISC RESIDENT SECTION)

*?OPLK	12600
*?OPER	15640
*?PKUP	15321
*?PLIT	15406
*?PNCH	13632
*?PRNT	15033
*?RSTA	13105
*?LWA	16444
*?RDSC	16401
*?WEOF	16021
*?WRIF	16102
*?LGFL	16432
*?SEGM	12541
*?SYMK	13506
*?V	15633

```
    *?ARTL   15472
    *?LST    15274
    *?PLIN   16435
    *?PCOM   15112
    *?SECT   16420
    *?NEAU   12443
    *?HA38   15347
    *?XRFI   12540

ASMBD        17120
    *ASMBD   17442

ASMB1        17120
    *ASMB1   17366
    *?LITI   20030
    *?CMQ    17560
    *?INSR   17726
    *?HA3Z   17527
    *?ENP    17662
    *?EXP    17645

ASMB2        17120
    *ASMB2   17351
    *?ART    20021
    *?BREC   17475
    *?LKLI   20535
    *?SKPR   17441
    *?SPCR   17444

ASMB3        17120
    *ASMB3   17630

ASMB4        17120
    *ASMB4   17366
    *?INS?   17541

ASMB5        17120
    *ASMB5   17351

FTN          12000
    *%WLIC   13042
    *%FTN0   12000
    *%WPRN   12735
    *%ERRR   12701
    *%RDIS   12557

    *%WDIS   12244
    *%SEGN   12224
    *%WTRA   12236
    *%WSEC   12237
    *%RTRA   12347
    *%RSEC   12350
    *%RBFA   12352
    *%LUNO   12203
    *%LUNI   12204
```

DISC LOADING PHASE (CON'T)

(DISC RESIDENT SECTION)

[SLIDE 40H]

DISC LOADING PHASE (CONT)

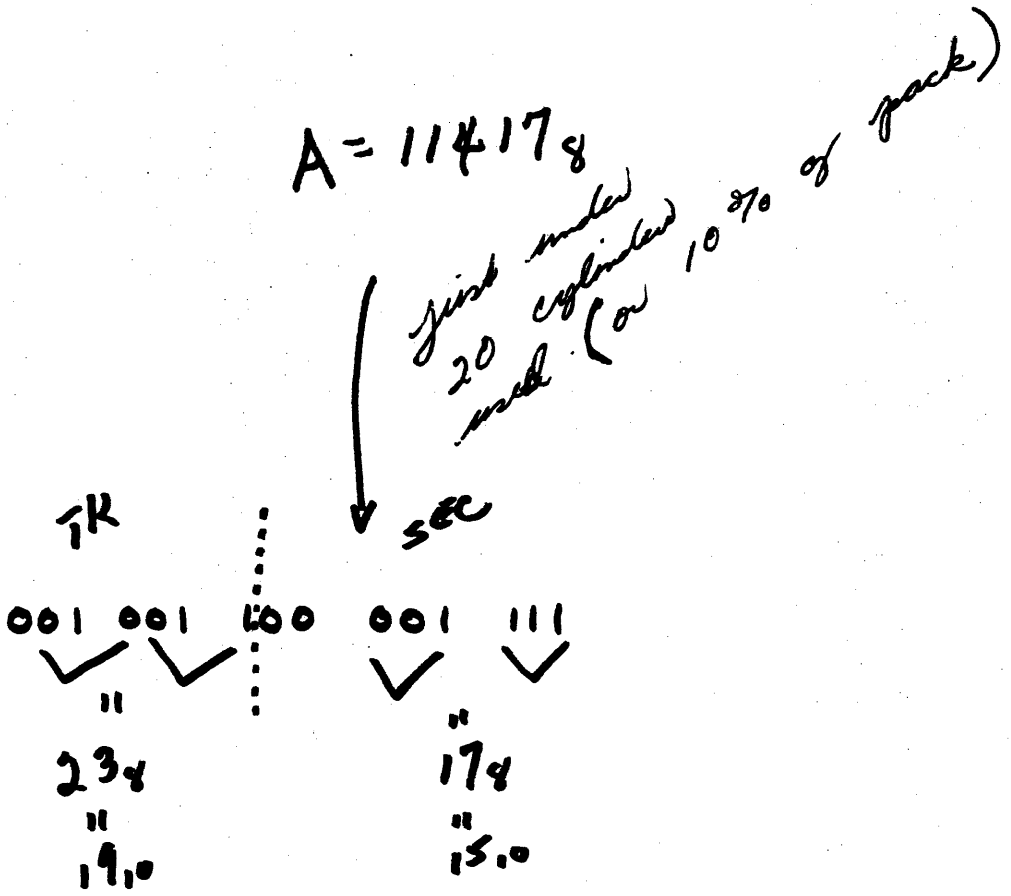
*%TYP	12227
*%WLIN	13017
*%WPAG	13043
*%TILT	13074
*%RDSI	13044
*%WDSI	13056
*%WOUT	12334
*%RBFW	12623
*%LABL	12733
*%CONA	12734
*%ENDP	13105
*%WDLU	12241
*%RDLU	12346
*%RFLG	12554
*%WBFW	12341
*%WBFA	12232
*%HEDN	13010
*%DUP8	12373
*%NXDV	12402
*%NELM	12352
*%STYP	12433
*%LGO	12202
FTN01	13127
*%FTN1	16550
SREAD	21241
*%READ	21241
*%JFIL	21707
*%RDSC	21663
.OPSY	21774
*.OPSY	21774
DUMRX	22034
*$LIBR	22034
*$LIBX	22062
FTN02	13127
*%FTN2	13741
FTN03	13127
*%FTN3	15117
FTN04	13127
*%FTN4	13702
%WRIT	17515
*%WRIT	17700
*%WRIF	17577
*%WBUF	17777
FADSB	20213
*.FAD	20213

(DISC RESIDENT SECTION)

[SLIDE 40]

```
 *.FSB    20222
.OPSY     20363
 *.OPSY   20363
.FLUN     20423
 *.FLUN   20423
.PACK     20444
 *.PACK   20444
DUMRX     20560
 *$LIBR   20560
 *$LIBX   20606
.ZRLB     20644
 *.ZRLB   20644
DLDST     20705
 *.DLD    20705
 *.DST    20715
```

*SYSTEM STORED ON DISC



[SLIDE 40J]

FORMATTING USER DISCS OR CARTRIDGES

PURPOSE: To format a USER DISC or CARTRIDGE anytime a new DISC is added or an old SYSTEM DISC is to be reused as a USER DISC.

WHAT SYSTEM DOES: Creates an Unlabeled Disc ready for use in DOSM System by

1. Writing new Label Sector on sector Ø with
   A. First two words as Ø,DO
   B. Generation Code # entered by operator
   C. Three label words as *Y,ST,EM
   D. # bad tracks as Ø
2. Writing new bootstrap on sectors 1 and 2
3. Clearing all PCI and DCI on all sectors

OPERATION PROCEDURE:

1. All equpment on. "READY" Drive.
2. DISC PROTECT OVERRIDE SWITCH "ON".
3. Load Configured System Generator (DSGEN) into memory using BBL.
4. LOAD ADDRESS 1ØØ octal.
5. Switch 15 "UP".
6. PRESET and RUN.
7. Answer requests printed on TTY.
8. System Generator halts with T=1Ø2ØØ7 at end. Press "RUN" to do another Disc (with switch 15 still "UP") OR put switch 15 down and press "RUN" to begin SYSTEM GENERATION proper.

FORMATTING USER DISCS EXAMPLE

```
    SYS GEN CODE?
→9000

    SYS DISC CHNL?
→14

    # SECTORS/TRACK?
→12

    USER DISC SUBCHNL?
→0
    TURN ON DISC PROTECT OVERRIDE - PRESS RUN

    USER DISC SUBCHNL?
→1

    SYS GEN CODE?
→9000

    SYS DISC CHNL?
→14

    # SECTORS/TRACK?
→12

    SYS DISC SIZE?
→200

    # DRIVES?
→1

    FIRST SYSTEM TRACK?
→0
    FIRST SYSTEM SECTOR?
→3

    SYS DISC SUBCHNL?
→1

    USER DISC SUBCHNL?
→1

    TIME BASE GEN CHNL?
→12

    IS 2114?
→NO

    LWA MEM?
→37677

    ALLOW :SS?
→YES

    PRGM INPT?
→PT

    LIBR INPT?
→PT
```

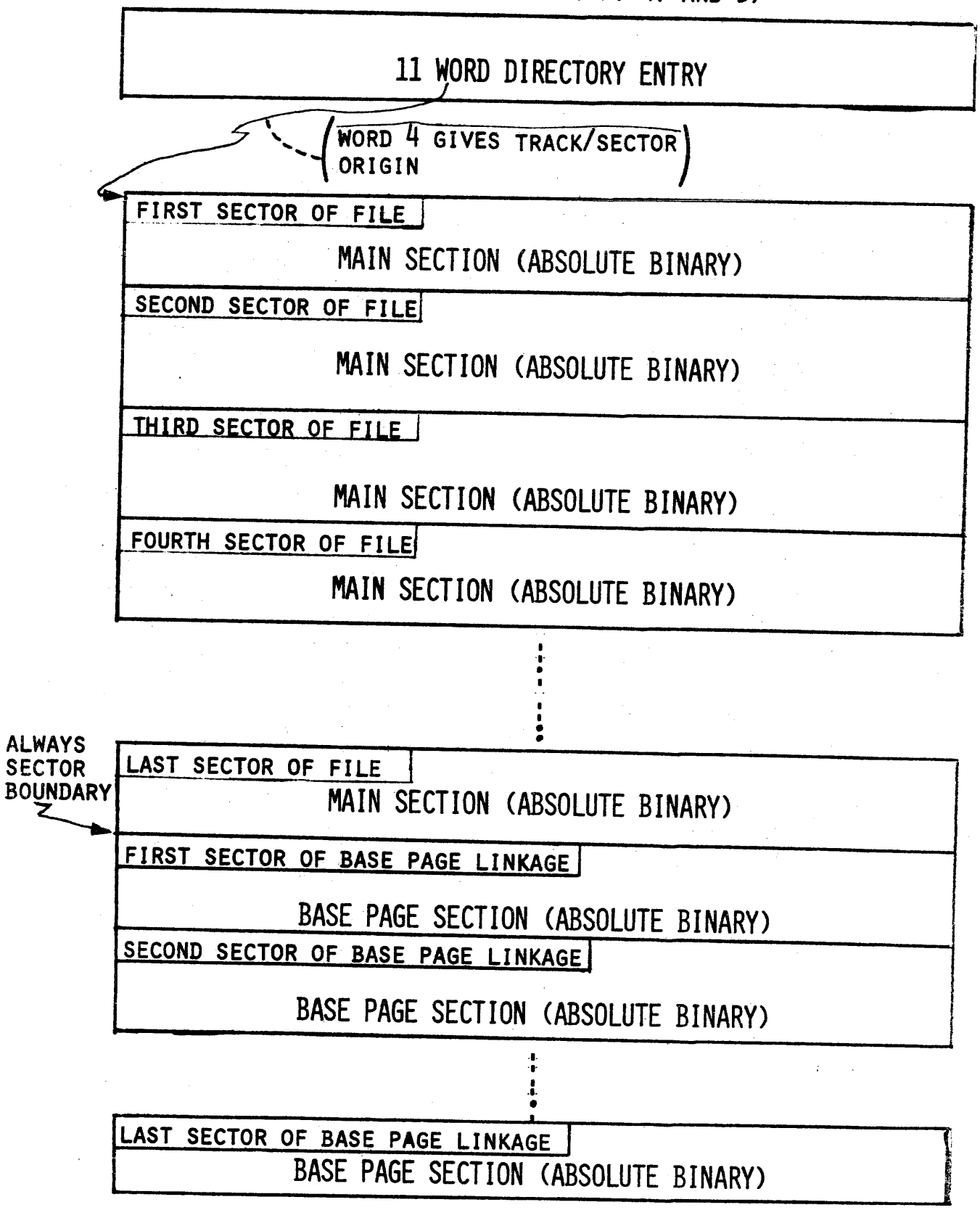
FORMATTED FIXED DISC

FORMATTED CARTRIDGE

WENT DIRECTLY INTO STANDARD SYSTEM GENERATION BY PUTING SWITCH 15 DOWN AND PRESSING "RUN"

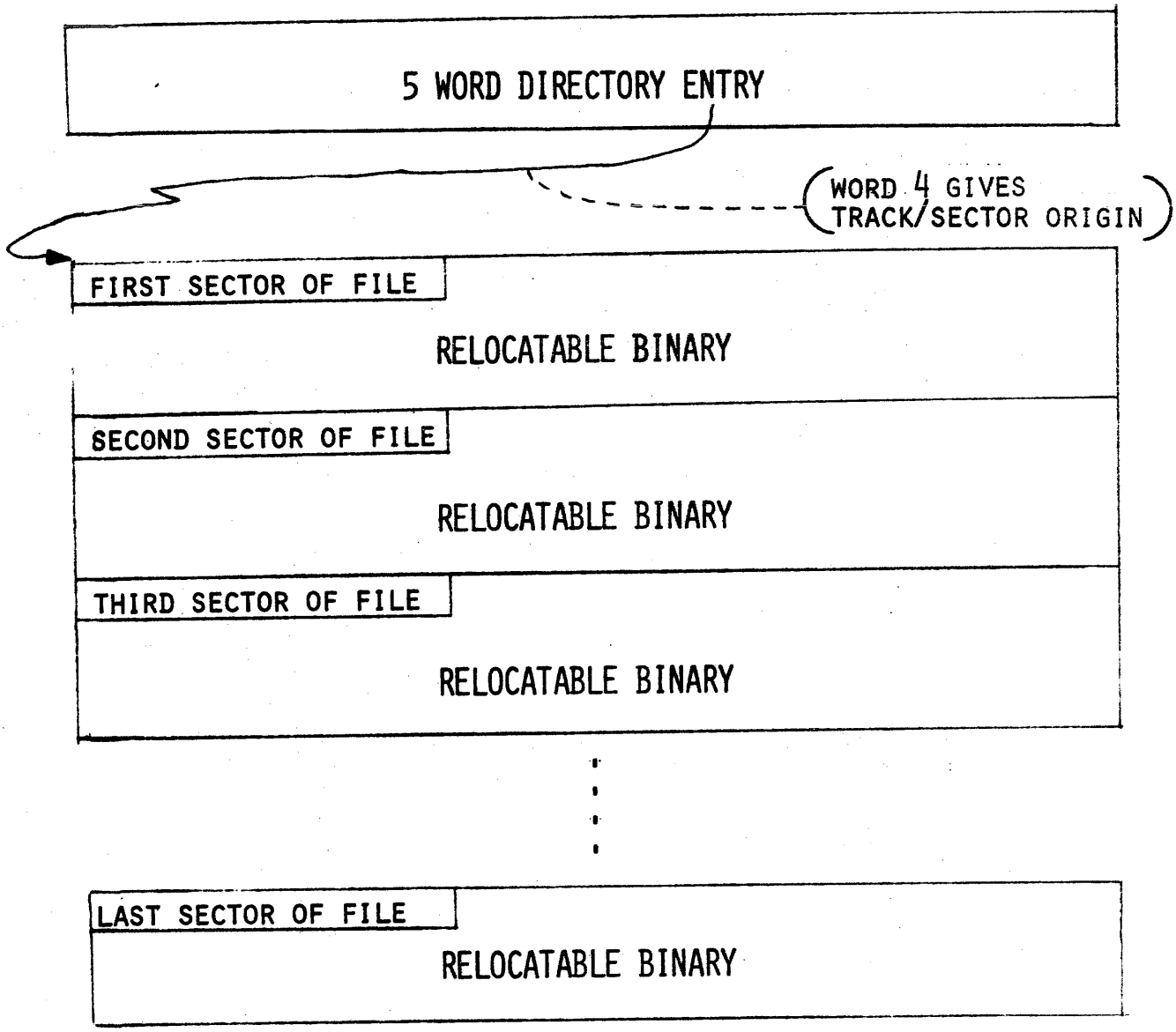
DOSM ABSOLUTE DISC FILE FORMAT

(ENTRY TYPES 1, 2, 3, 4, AND 5)



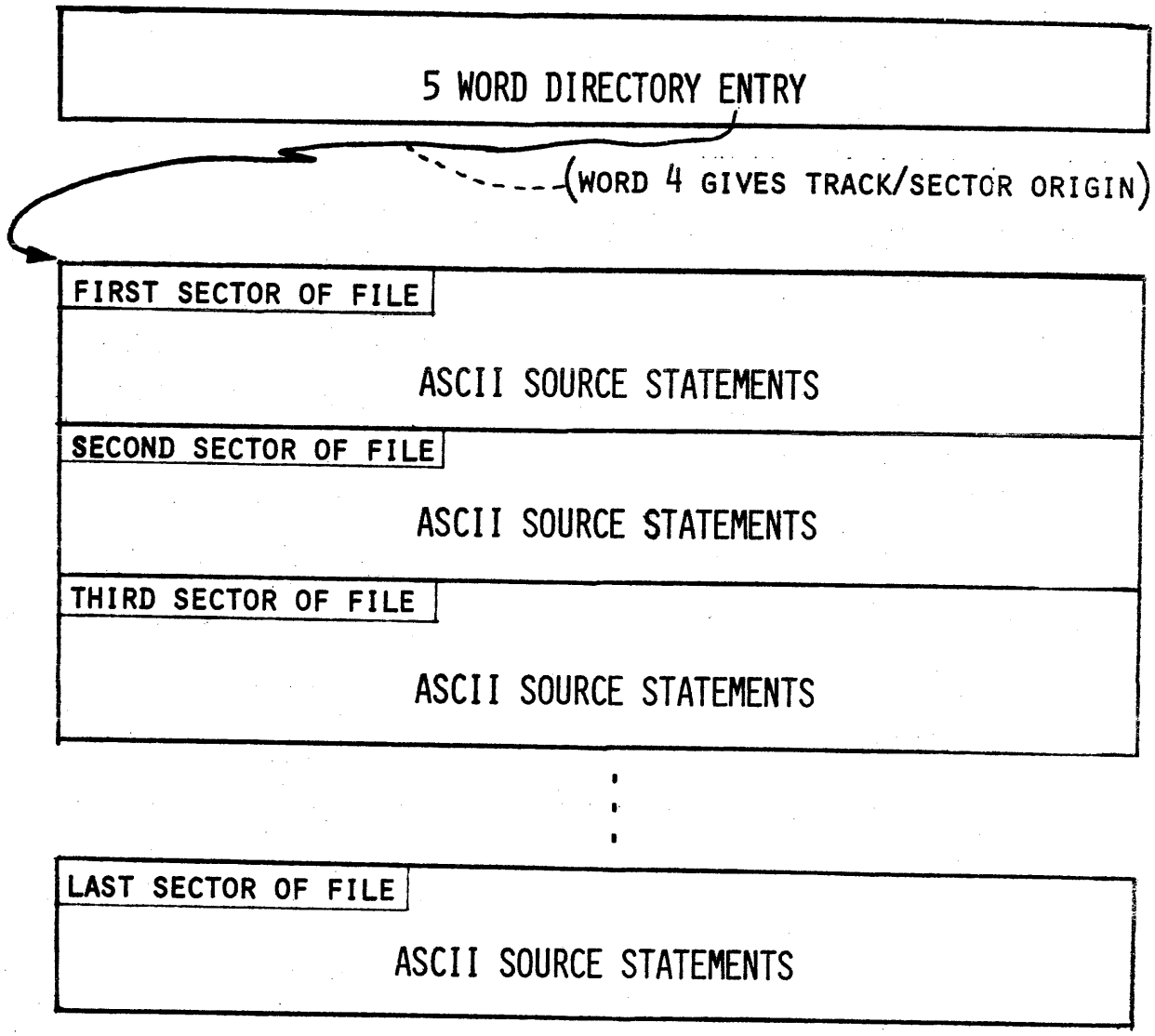
[SLIDE 43]

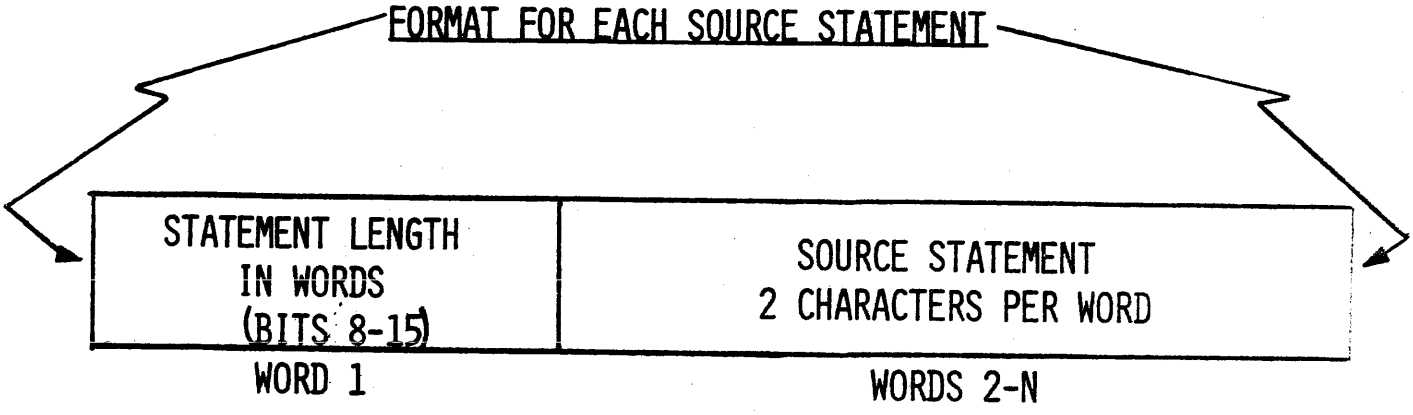
DOSM RELOCATABLE DISC FILE FORMAT
(ENTRY TYPES 6, 7 AND 8)



NOTE: "NAM" RECORD LENGTH FOR RTE/DOS/DOSM SYSTEMS IS 17 WORDS IN LENGTH WHICH IS INCOMPATABLE TO "NAM" RECORD LENGTH OF 9 WORDS OF BCS SYSTEMS.

DOSM ASCII SOURCE STATEMENT DISC FILE FORMAT
(ENTRY TYPE 9)





[SLIDE 45A]

ASCII SOURCE FILE FORMAT EXAMPLE

```
INPUT :DATE,XXXXXXXXXX,H,M

@:DA,27.OCT.70,9,15
SUBCHAN=1
LBL=QQQQQ
@
:JOB,ASCII
JOB ASCII 27.OCT.70   TIME=0555 MIN. 16.0 SECS.
@
:ST,S,SORSE,1

AAAA
BBBBB
CCCCCC
DDDDDDD
::
0004 LINES
@
:LIST,U,1,SORSE
NAME TYPE SCTRS DISC ORG PROG LIMITS   B.P. LIMITS    ENTRY LIBR.  P-BIT
USCHAN=1
SORSE SS  0001  T055 003
@
:SO,55,3
001 001000 040501 040501 001400 041102 041102 041040 001400
    041503 041503 041503 002000 042104 042104 042104 042040
    000000 177777 020000 036164 000000 041456 031062 020000
    036164 000000 046117 040504 051000 036155 000000 163252
    041120 051000 036146 000000 040523 046502 020000 036137
    000000 037501 051503 047000 036137 000000 037501 051515
    041000 036137 000000 037502 047103 047000 036137 000000
    037502 050113 052400 036137 000000 037503 044117 050000
    033403 000000 000312 000024 177767 040523 041511 044440
    031067 027117 041524 027067 030040 000000 000000 000000
    000000 000000 000000 000000 000000 000005 000001 000003
    000003 000004 000002 000001 000005 000000 000000 020473
    050521 050421 044456 031461 020000 037515 051531 046400
    036137 000000 037522 046125 047000 036137 000000 037501
    043114 043400 036137 000000 037514 051524 046000 036137
    000000 037514 052516 044400 036137 000000 037522 051502

@
```

SOURCE FILE CREATED

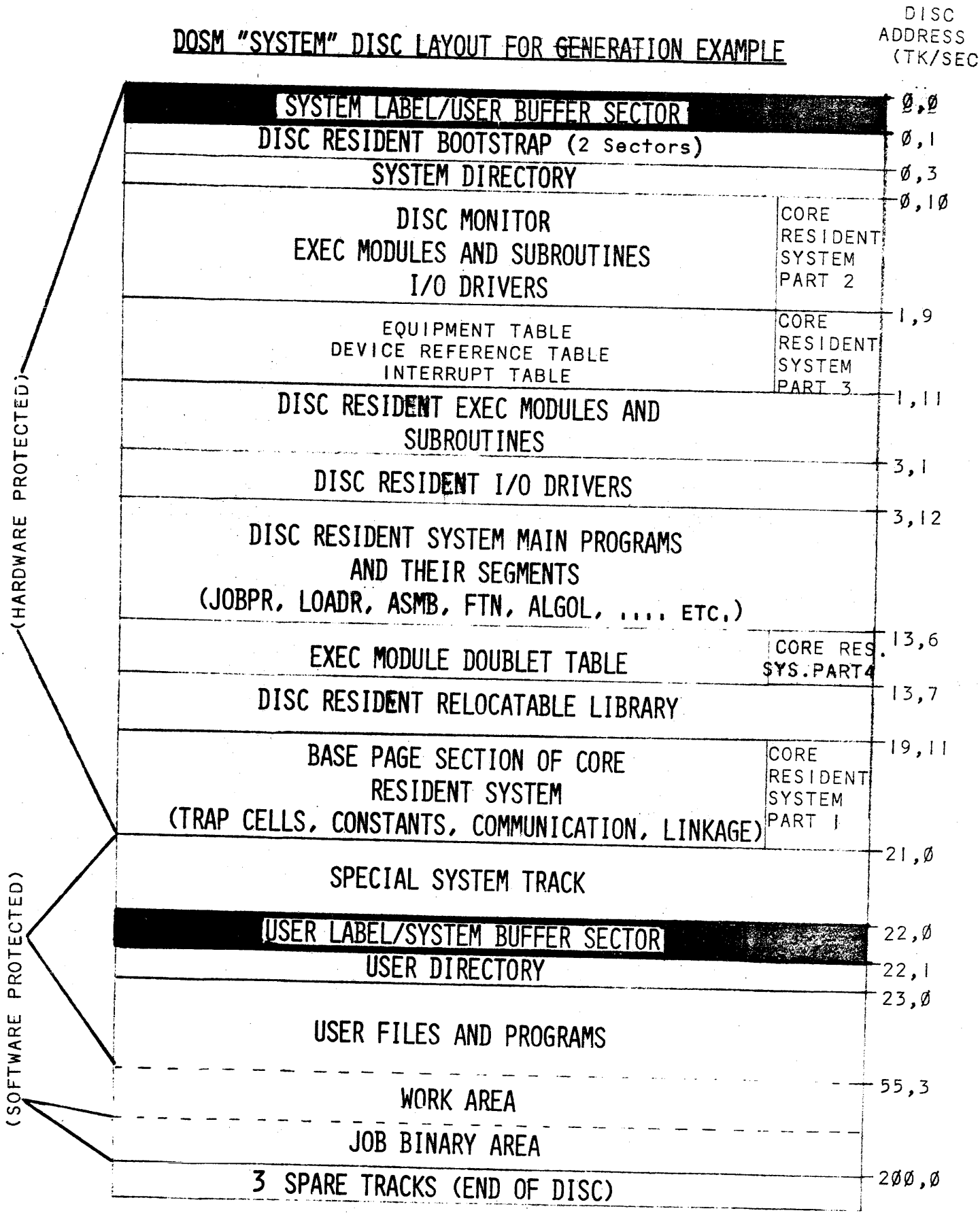
3 WORDS

3 WORDS

2 WORDS

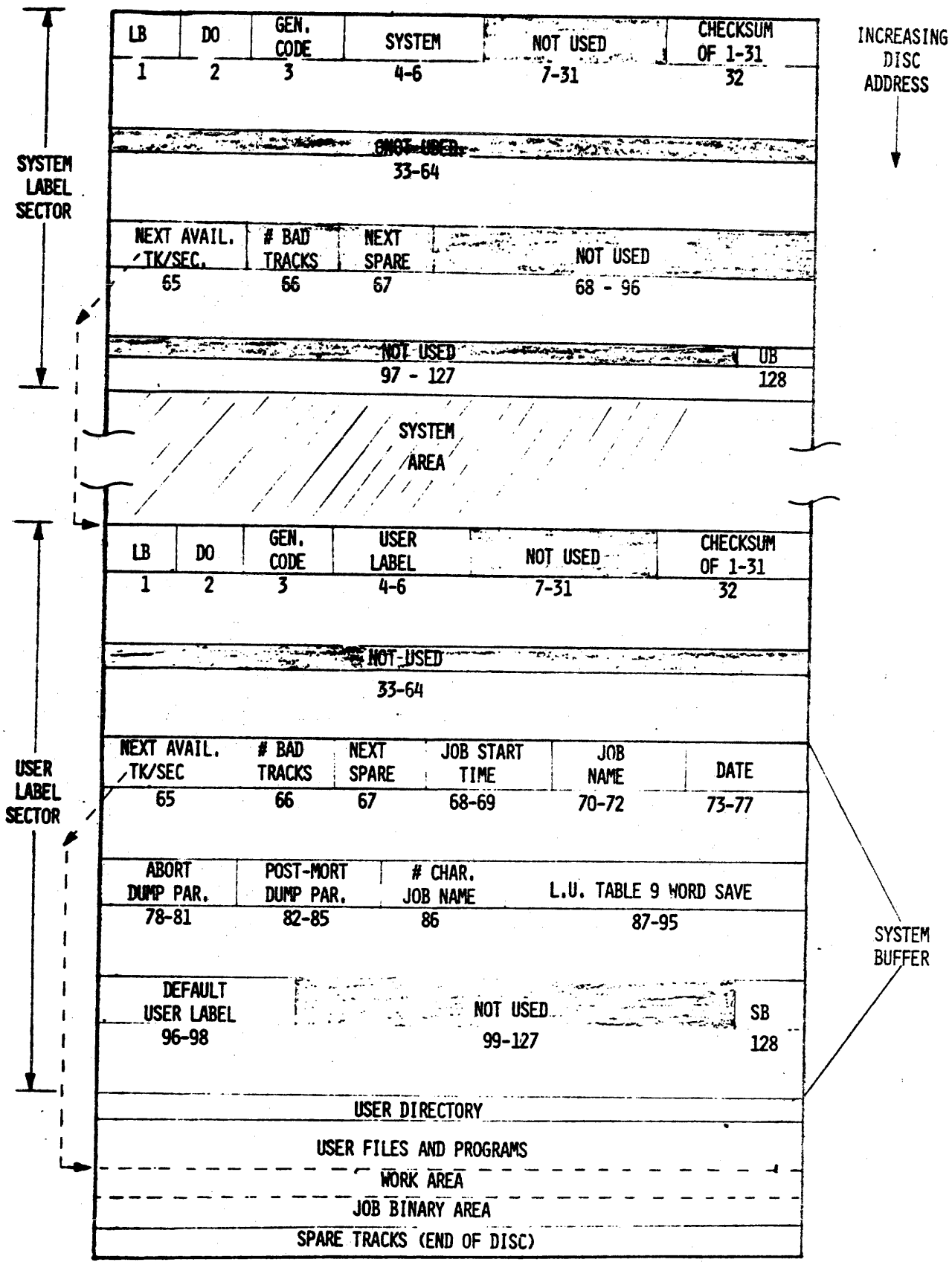
EOF

DOSM "SYSTEM" DISC LAYOUT FOR GENERATION EXAMPLE

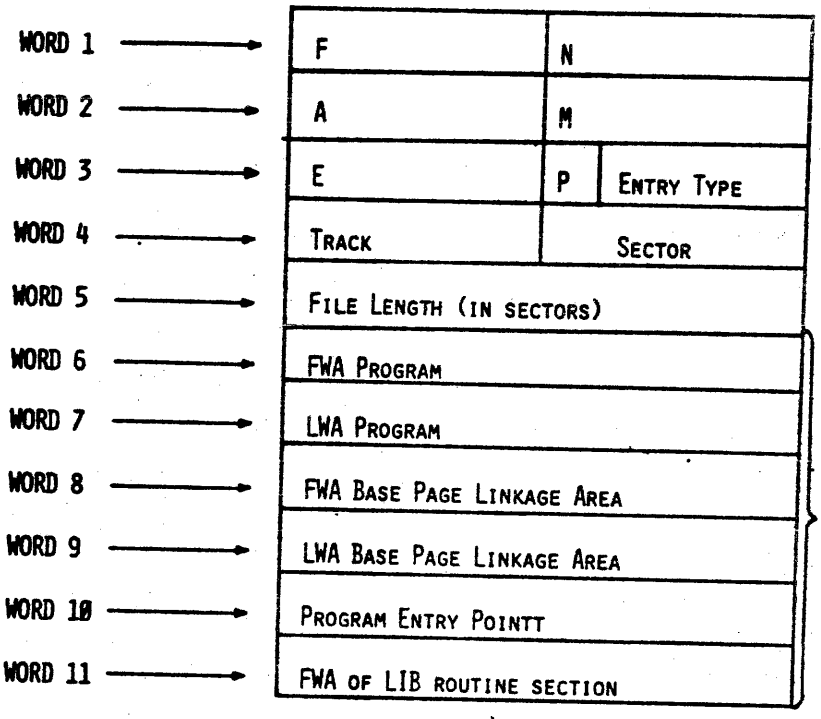


[SLIDE 5Ø]

"SYSTEM" DISC (LABEL SECTORS DESCRIPTION)



DIRECTORY ENTRY FORMAT



ENTRY TYPE	FILE
0	SYSTEM RESIDENT
1	DISC RESIDENT EXECUTIVE SUPERVISOR MODULE
2	CURRENTLY UNUSED
3	USER PROGRAM, MAIN
4	DISC RESIDENT DEVICE DRIVER
5	USER PROGRAM, SEGMENT
6,7	LIBRARY
10_8	RELOCATABLE BINARY
11_8	ASCII SOURCE STATEMENTS
12_8	BINARY DATA
13_8	ASCII DATA

'P' BIT

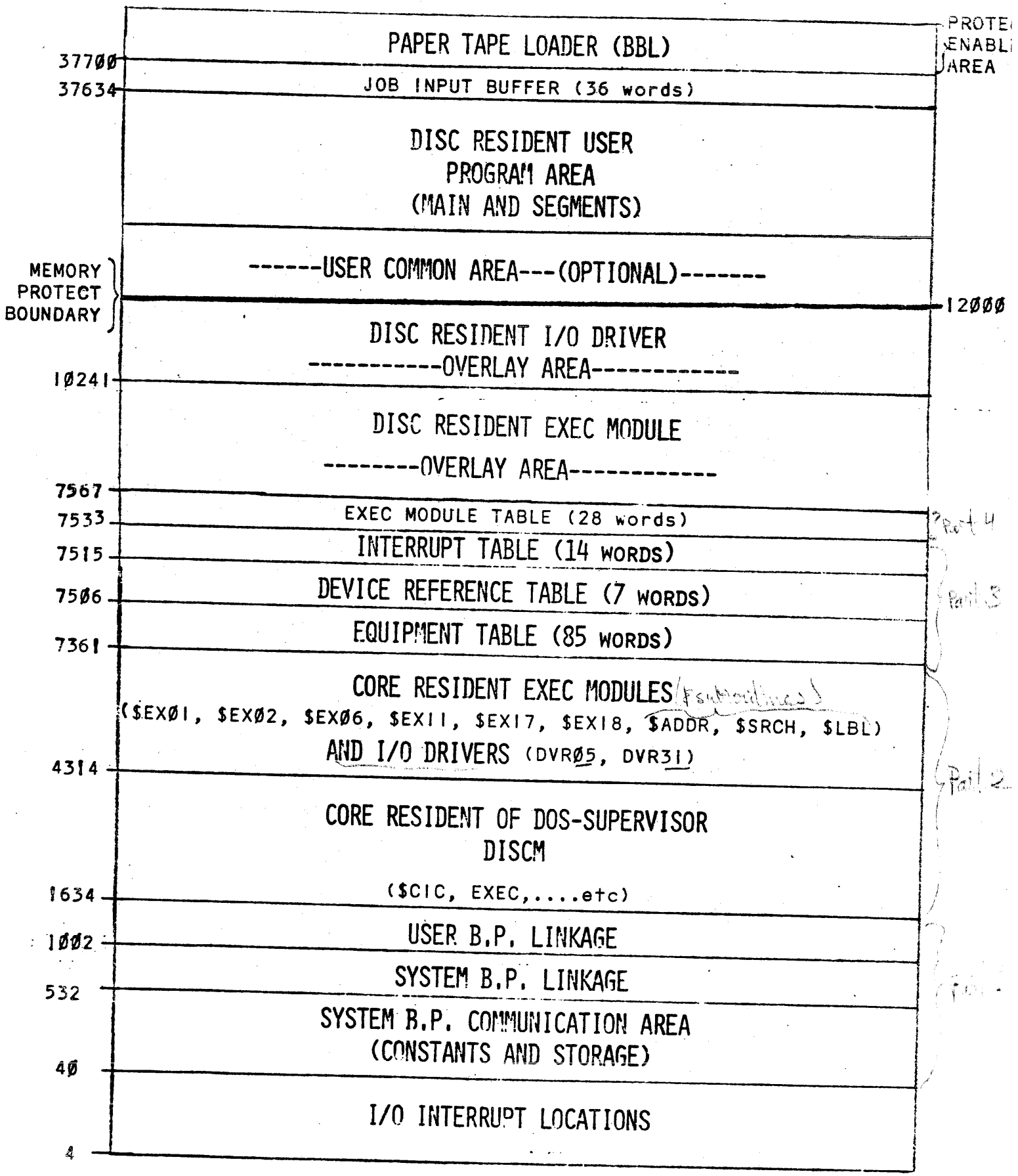
0 = NO ACTION

1 = PURGE THIS ENTRY AT THE END OF THE JOB OR FOLLOWING ANY EXECUTION OF :PU DIRECTIVE. THIS BIT IS SET BY THE LOADER AND CLEARED BY A :STORE,P,[file-name] REQUEST.

THE LAST DIRECTORY ENTRY IN EACH SECTOR IS FOLLOWED BY A WORD CONTAINING '-1' UNLESS THE GIVEN SECTOR IS EXACTLY FILLED WITH ENTRIES.

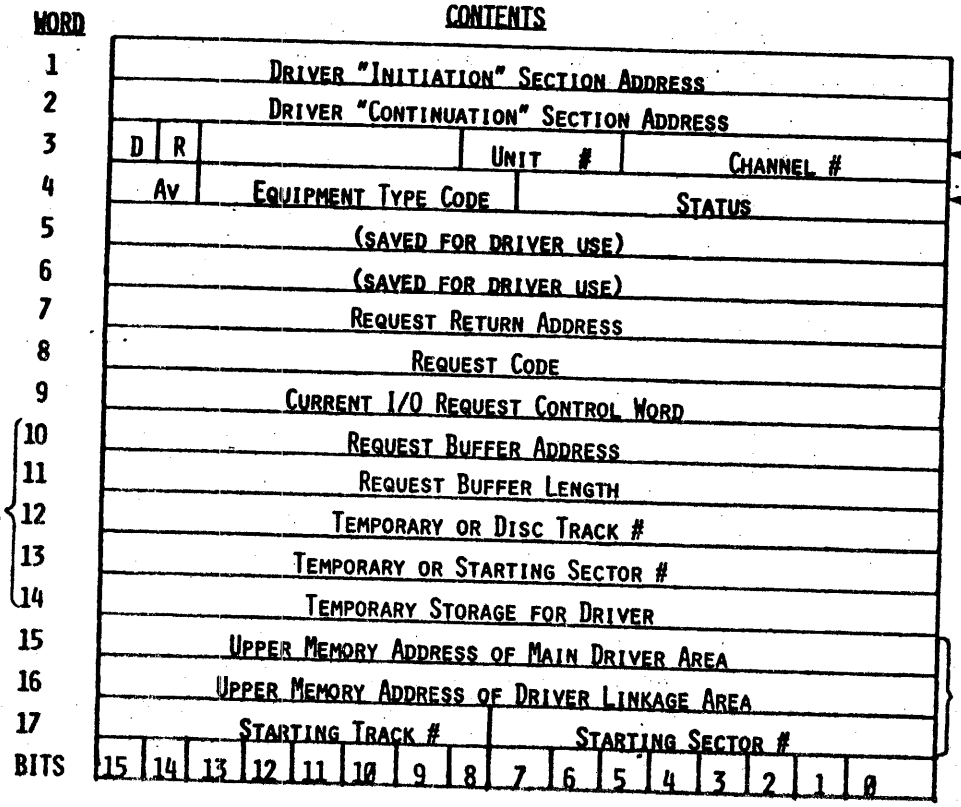
THE LAST ENTRY IN THE DIRECTORY IS FOLLOWED BY A WORD CONTAINING ZERO.

CORE MAP FOR DOSM SYSTEM GENERATION EXAMPLE (16K)



[SLIDE 53]

EQUIPMENT TABLE ENTRY FORMAT



D = 1 if DMA channel required.
R = 1 if driver type is core-resident.
Unit # May be used for sub-channel addressing.
Channel # I/O select code for device (lower number if multiboard interface.)

Av = 0 - Unit not busy and available
= 1 - Unit disabled (down)
= 2 - Unit busy
= 3 - Unit waiting for an available DMA channel (this field set by system)

Status - Actual or simulated unit status at end of operation (Driver must set this field)

Equipment Type Code - Identifies type of device and associated software driver. Assigned equipment type codes in octal are:

00-07	Papter Type Devices
00	Teleprinter
01	Punched Tape Reader
02	High Speed Punch
05	Teletype (System)
10-17	Unit Record Devices
10	Reserved for Plotter
12	Line Printer
15	Mark Sense Card Reader
20-37	Magnetic Tape/Mass Storage and other devices capable of both input and output.
22	3030 Magnetic Tape
31	Moving-Head Disc

For equipment type codes 1 through 17, odd number indicate input devices and even number indicate output devices (except 05, which is both input and output).

[SLIDE 54]

DEVICE REFERENCE TABLE FORMAT

EACH ENTRY IN THIS TABLE REQUIRES ONLY ONE WORD IN MEMORY. THE VALUE OF EACH ENTRY (DECIMAL NUMBER, 1-63) ASSOCIATES A LOGICAL UNIT NUMBER WITH AN EQUIPMENT TABLE ENTRY FOR THE SYSTEM IN THE FOLLOWING MANNER:

SEQUENCE IN MEMORY TABLE	LOGICAL UNIT #	FUNCTION
1	1	SYSTEM TELEPRINTER
2	2	USER MASS STORAGE
3	3	SYSTEM MASS STORAGE
4	4	STANDARD PUNCH DEVICE
5	5	STANDARD INPUT DEVICE
6	6	STANDARD LIST DEVICE
7-63	7-63	ANY DEVICE

INTERRUPT TABLE FORMAT

EACH ENTRY IN THIS TABLE REQUIRES ONLY ONE WORD IN MEMORY AND IS ASSOCIATED WITH EACH I/O CHANNEL IN THE COMPUTER (STARTING WITH LOCATION 6) WHICH CAN CAUSE AN INTERRUPT. EACH LOCATION IN THIS TABLE HAS AN ENTRY VALUE. MEMORY LOCATIONS ARE ASSOCIATED IN CONSECUTIVE INCREASING ORDER WITH AN I/O CHANNEL. TABLE VALUES ARE ZERO FOR AN I/O CHANNEL NOT REQUIRING INTERRUPT. I/O CHANNELS REQUIRING INTERRUPT CONTAIN THE START ADDRESS OF THE EQUIPMENT TABLE ENTRY OF THE ASSOCIATED DEVICE.

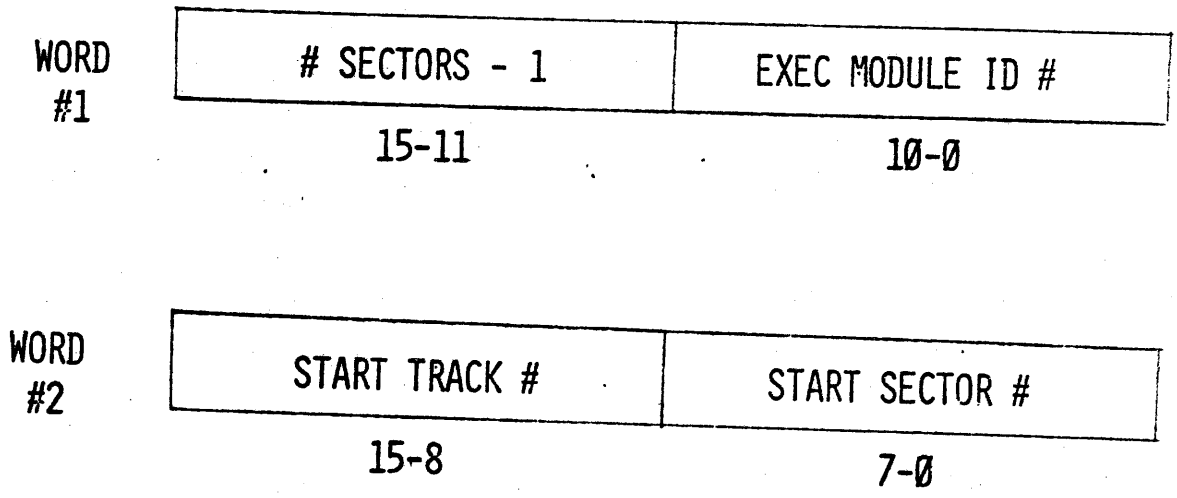
SYSTEM DIRECTORY LISTING FOR GENERATION EXAMPLE

NAME	TYPE	SCTRS	DISC	ORG	PROG LIMITS		B.P. LIMITS		ENTRY	LIBR.	P-RIT
SUBCHAN=1											
$EX03	XS	0002	T001	011	07567	07624	00732	00733	07567	07624	
$EX04	XS	0004	T001	013	07567	10176	00732	00741	07567	10176	
$EX05	XS	0002	T001	017	07567	07745	00732	00733	07567	07745	
$EX07	XS	0002	T001	019	07567	07746	00732	00733	07567	07746	
$EX08	XS	0002	T001	021	07567	07732	00732	00733	07567	07732	
$EX09	XS	0003	T001	023	07567	10142	00732	00763	07567	10142	
$EX10	XS	0002	T002	002	07567	07745	00732	00733	07567	07745	
$EX12	XS	0002	T002	004	07567	07761	00732	00733	07567	07761	
$EX13	XS	0004	T002	006	07567	10223	00732	00754	07567	10223	
$EX14	XS	0004	T002	010	07567	10241	00732	00751	07567	10241	
$EX15	XS	0003	T002	014	07567	10153	00732	00763	07567	10153	
$EX16	XS	0002	T002	017	07567	07722	00732	00733	07567	07722	
$EX19	XS	0003	T002	019	07567	10107	00732	01000	07567	10107	
$EX20	XS	0003	T002	022	07567	10167	00732	00761	07567	10167	
DVR01	DR	0003	T003	001	10241	10555	01000	01002	10241	10555	
DVR02	DR	0003	T003	004	10241	10443	01000	01002	10241	10443	
DVP22	DR	0005	T003	007	10241	11075	01000	01002	10241	11075	
LOADR	UM	0032	T003	012	12000	21032	01002	01425	12000	21032	
JOBPR	UM	0038	T004	020	12000	22463	01002	01414	12000	22463	
ASMB	UM	0023	T006	010	12000	17120	01002	01362	16522	17120	
ASMBD	US	0004	T007	009	17127	17647	01362	01363	17442	17647	
ASMB1	US	0006	T007	013	17366	20542	01362	01424	17366	20542	
ASMB2	US	0007	T007	019	17345	20550	01362	01410	17351	20550	
ASMB3	US	0003	T008	002	17473	17771	01362	01363	17630	17771	
ASMB4	US	0004	T008	005	17366	20027	01362	01371	17366	20027	
ASMB5	US	0006	T008	009	17345	20425	01362	01404	17351	20425	
FTN	UM	0006	T008	015	12000	13127	01002	01047	12000	13127	
FTN01	US	0031	T008	021	13254	22120	01047	01502	16550	22120	
FTN02	US	0025	T010	004	13254	21027	01047	01356	13741	21027	
FTN03	US	0024	T011	005	13254	20600	01047	01277	15117	20600	
FTN04	US	0025	T012	005	13254	20750	01047	01360	13702	20750	
LIBRY	LB	0147	T013	007							

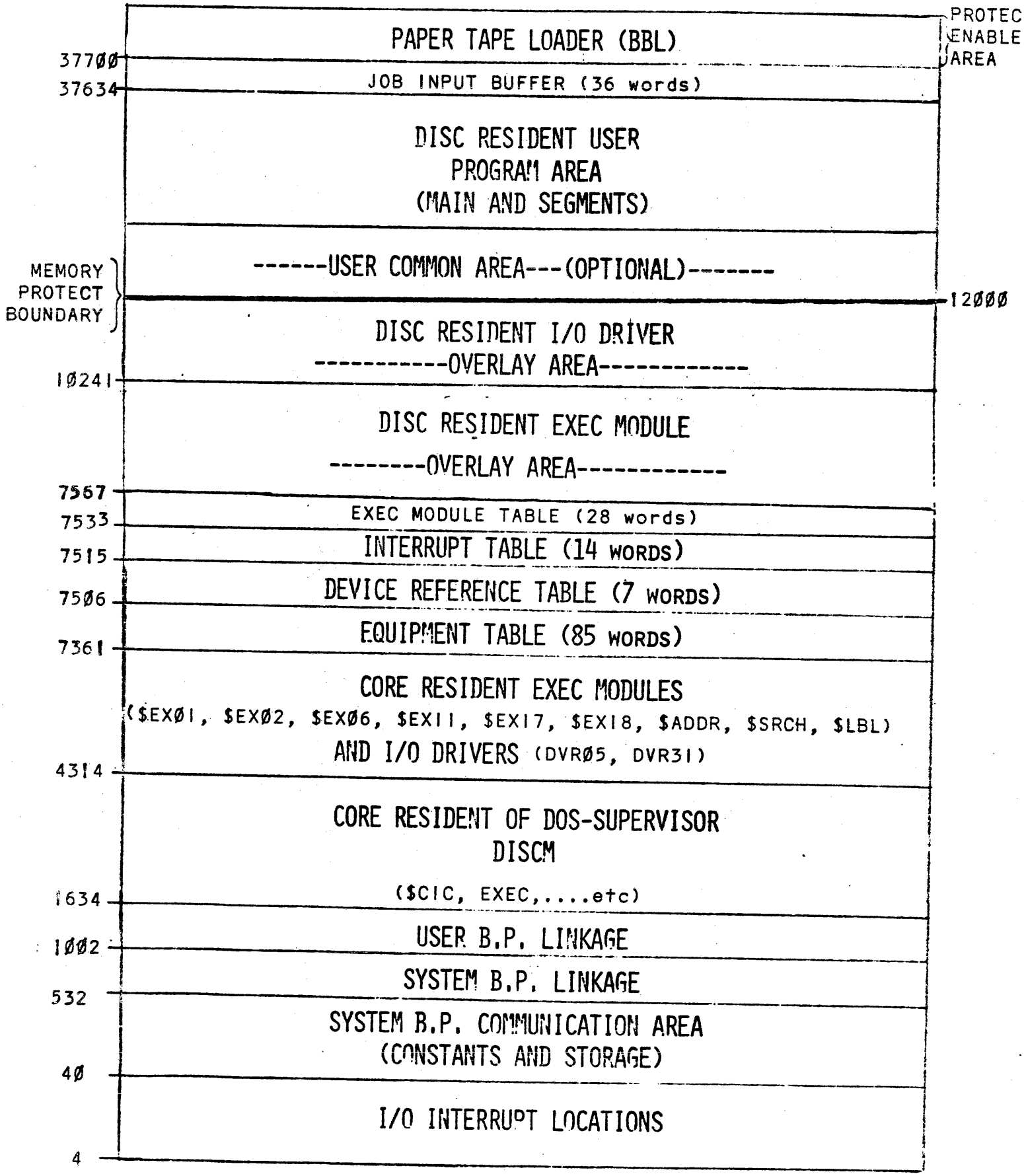
[SLIDE 56]

EXEC MODULE DOUBLET TABLE FORMAT

(TWO WORDS PER DISC RESIDENT EXEC MODULE)

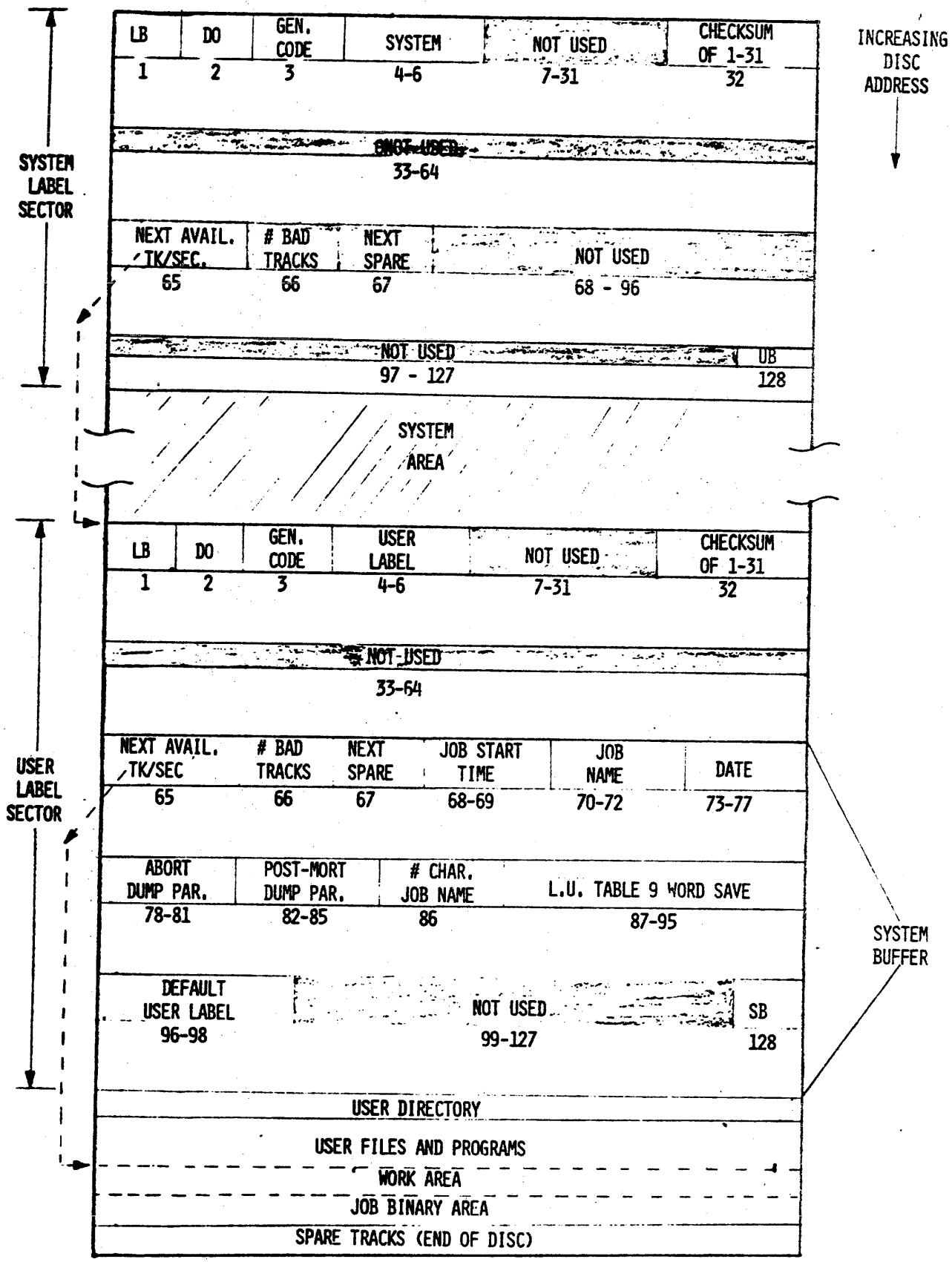


CORE MAP FOR DOSM SYSTEM GENERATION EXAMPLE (16K)



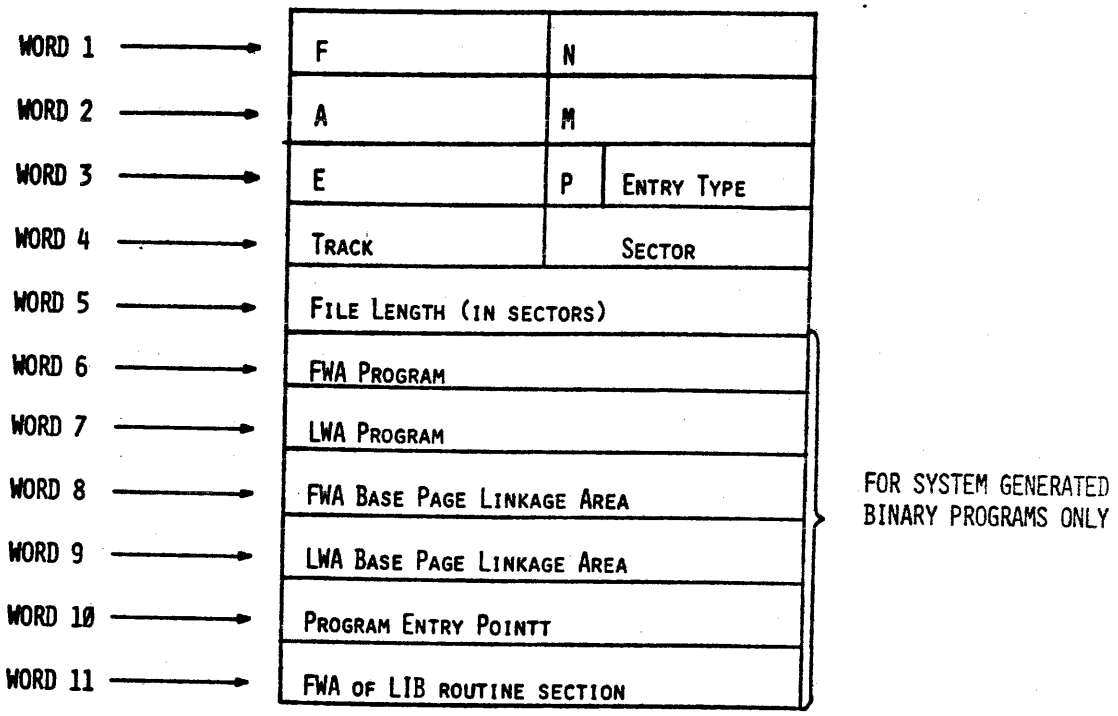
[SLIDE 58]

"SYSTEM" DISC (LABEL SECTORS DESCRIPTION)



[SLIDE 59]

DIRECTORY ENTRY FORMAT



ENTRY TYPE	FILE
0	SYSTEM RESIDENT
1	DISC RESIDENT EXECUTIVE SUPERVISOR MODULE
2	CURRENTLY UNUSED
3	USER PROGRAM, MAIN
4	DISC RESIDENT DEVICE DRIVER
5	USER PROGRAM, SEGMENT
6,7	LIBRARY
10_8	RELOCATABLE BINARY
11_8	ASCII SOURCE STATEMENTS
12_8	BINARY DATA
13_8	ASCII DATA

'P' BIT

0 = NO ACTION

1 = PURGE THIS ENTRY AT THE END OF THE JOB OR FOLLOWING ANY EXECUTION OF :PU DIRECTIVE. THIS BIT IS SET BY THE LOADER AND CLEARED BY A :STORE,P,[file-name] REQUEST.

THE LAST DIRECTORY ENTRY IN EACH SECTOR IS FOLLOWED BY A WORD CONTAINING '-1' UNLESS THE GIVEN SECTOR IS EXACTLY FILLED WITH ENTRIES.

THE LAST ENTRY IN THE DIRECTORY IS FOLLOWED BY A WORD CONTAINING ZERO.

USER DIRECTORY LISTING IN GENERATION EXAMPLE SYSTEM

NAME	TYPE	SCTRS	DISC	ORG	PROG LIMITS		B.P. LIMITS		ENTRY	LIBR.	P-BIT
SUBCHAN=1											
XREF	UM	0013	T023	000	12000	14750	01002	01036	12000	14071	
EOT1	SS	0001	T023	013							
WEOT	UM	0002	T023	014	12000	12013	01002	01003	12000	12013	
XREFR	RB	0016	T023	016							
DISCM	RB	0020	T024	008							
EXECS	RB	0063	T025	004							
DVR05	RB	0003	T027	019							
DVR31	RB	0005	T027	022							
LIBRY	RB	0143	T028	003							
DVR02	RB	0002	T034	002							
DVR01	RB	0003	T034	004							
DVR22	RB	0007	T034	007							
LODR	RB	0049	T034	014							
JOBP	RB	0065	T036	015							
ASMBL	RB	0040	T039	008							
ASMD	RB	0004	T041	000							
ASM3	RB	0004	T041	004							
ASM4	RB	0006	T041	008							
ASM5	RB	0010	T041	014							
FRTN	RB	0008	T042	000							
FTN1	RB	0048	T042	008							
FTN2	RB	0045	T044	008							
FTN3	RB	0042	T046	005							
FTN4	RB	0031	T047	023							
ASM1	RB	0012	T049	006							
ASM2	RB	0011	T049	018							
SIO1	SS	0005	T050	005							
BASC1	SS	0009	T050	010							
BOOT	SS	0021	T050	019							
FTNH	SS	0001	T051	016							
EOF	UM	0001	T051	017	12000	12013	01002	01002	12000	12013	
FSPCE	UM	0001	T051	018	12000	12013	01002	01002	12000	12013	
RWIND	UM	0001	T051	019	12000	12013	01002	01002	12000	12013	
D.00S	SS	0067	T051	020							
TSRTS	SS	0006	T054	015							
TSRTR	RB	0005	T054	021							
CLEAR	BD	0001	T055	002							

[SLIDE 61]

```
0004*
0005*****  SEEK RECORD  *****
0006*
0007   00002 000000  SEEK   NOP
0008   00003 054155         LDB CYL        CYLINDER (TRACK) NUMBER
0009   00004 106610         OTA DC         OUTPUT CYL# TO DATA CHNL      NOTE 1
0010   00005 103710         STC DC,C
0011   00006 060136         LDA SKCMD      LOAD SEEK COMMAND
0012   00007 054154         CPB LSTSK      * IF CYL# = LAST CYL# ACCESSED,
0013   00010 030151         IOR MSIGN      *    CHANGE CMND TO ADDRS RECORD
0014   00011 074154         STB LSTSK      * UPDATE LAST SEEK INDICATOR
0015   00012 030157         IOR DRV        INCLUDE DRIVE#                NOTE 2
0016   00013 106711         CLC CC
0017   00014 106611         OTA CC         OUTPUT SEEK/ADDRESS COMMAND
0018   00015 103711         STC CC,C         TO CMND CHNL
0019   00016 102310         SFS DC         <-- WAIT FOR CYL# ACCEPTANCE
0020   00017 024016         JMP *-1
0021   00020 060156         LDA RDSCT      HEAD:BITS 15-8; SECTOR:BITS 7-0
0022   00021 106610         OTA DC         OUTPUT HEAD/SECTOR TO DATA CHNL
0023   00022 103710         STC DC,C                    NOTE 3
0024   00023 102311         SFS CC         * IN INTERRUPT MODE, EXIT HERE
0025   00024 024023         JMP *-1        *    AND RETURN ON INTERRUPT
0026   00025 014121         JSB STAT       <-- (CHECK STATUS)
0027   00026 124002         JMP SEEK,I
0028*
0029* NOTE: EITHER A SEEK (03000008) OR AN ADDRESS RECORD (13000008)
0030*       COMMAND MUST BE ISSUED PRIOR TO ANY OTHER DISC COMMAND
0031*       EXCEPT STATUS CHECK. ADDRESS RECORD MAY BE ISSUED ONLY
0032*       IF THE HEAD (ON THE SELECTED DRIVE) IS ALREADY IN POSITION
0033*       FOR THE CURRENT ACCESS; IT WILL EXECUTE FASTER THAN A
0034*       SEEK UNDER THESE CONDITIONS. THE CODING IN THE EXAMPLE
0035*       FOR CHECKING THIS CONDITION IS APPLICABLE ONLY TO A SINGLE
0036*       DRIVE SYSTEM. IN A MULTI-DRIVE ENVIRONMENT, PROVISION
0037*       MUST BE MADE TO MAINTAIN AND CHECK THE HEAD POSITION
0038*       INDICATOR FOR EACH DRIVE.
0039*
```

NOTE 1 : BITS 0-7 = CYLINDER # ; BITS 8-15 = 0

NOTE 2 : BITS 12-14 = COMMAND CODE ; BITS 0-1 = DRIVE #

NOTE 3 : BITS 8-9 = HEAD # ; BITS 0-3 = SECTOR #

```
0041*
0042* ***** READ DATA *****
0043*
0044  00027 000000  READ   NOP
0045  00030 000152         LDA DMACW      LOAD DMA CONTROL WORD,
0046  00031 030153         IOR DCHNL        INCLUDE DATA CHNL#,
0047  00032 102606         OTA 6            AND OUTPUT TO DMA CHNL
0048  00033 102702         CLC 2
0049  00034 060160         LDA CORAD      LOAD CORE BUFFER ADDRESS,
0050  00035 030151         IOR MSIGN        INCLUDE DIRECTION BIT,
0051  00036 102602         OTA 2            AND SET IN MEMORY ADDRESS REG
0052  00037 102702         STC 2
0053  00040 060161         LDA WDCNT      LOAD NEG # OF WORDS
0054  00041 102602         OTA 2            AND SET IN WORD COUNT REG
0055  00042 103710         STC DC,C       SET DATA CHNL FOR INPUT   NOTE 1
0056  00043 060140         LDA RDCMD      LOAD READ COMMAND
0057  00044 030157         IOR DRV        INCLUDE DRIVE#
0058  00045 106711         CLC CC                                   NOTE 2
0059  00046 102611         OTA CC         OUTPUT READ COMMAND TO CMND CHNL
0060  00047 103706         STC 6,C        START DMA
0061  00050 103711         STC CC,C       START DATA TRANSFER
0062  00051 106706         CLC 6          INHIBIT DMA INTERRUPT
0063  00052 102311         SFS CC         * IN INTERRUPT MODE, EXIT HERE
0064  00053 024052         JMP *-1        *   AND RETURN ON INTERRUPT
0065  00054 014121         JSB STAT       (CHECK STATUS)
0066  00055 124027         JMP READ,I
```

NOTE 1 : PREPARE DATA CHANNEL TO RECEIVE DATA FROM CONTROLLER

NOTE 2 : BITS 12-15 = READ COMMAND ; BITS 0-1 = DRIVE #

```
0068*
0069****** WRITE *****
0070*
0071  00056 000000  WRITE NOP
0072  00057 060152        LDA DMACW       LOAD DMA CONTROL WORD,
0073  00060 030153        IOR DCHNL         INCLUDE DATA CHNL#,
0074  00061 102606        OTA 6             AND OUTPUT TO DMA CHNL
0075  00062 106702        CLC 2
0076  00063 060160        LDA CORAD       LOAD CORE BUFFER ADDRESS
0077  00064 102602        OTA 2             AND SET IN MEMORY ADDRESS REG
0078  00065 102702        STC 2
0079  00066 060161        LDA WDCNT       LOAD NEG # OF WORDS
0080  00067 102602        OTA 2             AND SET IN WORD COUNT REG
0081  00070 102110        STF DC          SET DATA CHANNEL FOR OUTPUT
0082  00071 060144        LDA WRCMD       LOAD WRITE COMMAND
0083  00072 030157        IOR DRV         INCLUDE DRIVE#
0084  00073 106711        CLC CC
0085  00074 102611        OTA CC          OUTPUT WRITE CMND TO CMND CHNL
0086  00075 103706        STC 6,C         START DMA
0087  00076 103711        STC CC,C        START DATA TRANSFER
0088  00077 106706        CLC 6           INHIBIT DMA INTERRUPT
0089  00100 102311        SFS CC          * IN INTERRUPT MODE, EXIT HERE
0090  00101 024100        JMP *-1         *   AND WAIT FOR INTERRUPT
0091  00102 014121        JSB STAT <-(CHECK STATUS)
0092  00103 124056        JMP WRITE,I
0093*
0094* NOTE: THE *WRITE* SEQUENCE ABOVE MAY BE USED,
0095*       WITH THE APPROPRIATE COMMAND, AS FOLLOWS:
0096*
0097*        COMMAND (OCTAL)      FUNCTION
0098*
0099*           0100XX            WRITE DATA
0100*           110000            INITIALIZE DATA
0101*                               (USED TO  INITIALIZE ADDRESS
0102*                               FIELDS OF A NEW DISC)
0103*           110400            FLAG DEFECTIVE CYLINDER
0104*           111000            FLAG PROTECTED CYLINDER
0105*
0106*       ALL EXCEPT WRITE DATA REQUIRE THAT THE
0107*         DISC PROTECT OVERRIDE SWITCH BE TURNED ON
0108*
0109*       ALL OF THESE COMMANDS ACTUALLY WRITE DATA IN
0110*         THE SECTOR(S) BEING PROCESSED. IF THE WCR
0111*         GOES TO ZERO BEFORE THE END OF THE SECTOR
0112*         IS REACHED, THE REMAINDER OF THE SECTOR
0113*         WILL BE FILLED WITH ZEROS; THUS IF ZERO
0114*         WORDS ARE SPECIFIED, THE ENTIRE SECTOR IS
0115*         WRITTEN WITH ZEROS.
0116*
0117*       FLAG CYLINDER PROTECTED OR DEFECTIVE ARE SUBSETS
0118*         OF THE INITIALIZE DATA COMMAND, AND WRITE THE
0119*         ADDRESS FIELD(S) OF THE SECTOR(S) BEING PROCESSED.
0120*
```

```
0122*
0123***** CHECK DATA *******
0124*
0125  00104 000000  CHECK NOP
0126  00105 060162        LDA SCTRS     LOAD SECTOR COUNT TO BE CHECKED
0127  00106 102610        OTA DC          AND OUTPUT TO DATA CHANNEL
0128  00107 103710        STC DC,C                                  NOTE
0129  00110 060141        LDA CHCMD     LOAD CHECK DATA COMMAND       1
0130  00111 030157        IOR DRV       INCLUDE DRIVE#
0131  00112 100711        CLC CC
0132  00113 103611        OTA CC,C      OUTPUT CHECK COMMAND          NOTE 2
0133  00114 103711        STC CC,C        TO CMND CHNL
0134  00115 102311        SFS CC        * IN INTERRUPT MODE, EXIT HERE
0135  00116 024115        JMP *-1       *   AND RETURN ON INTERRUPT
0136  00117 014121        JSB STAT <--- (CHECK STATUS)
0137  00120 124104        JMP CHECK,I
```

NOTE 1 ; A = +(# SECTORS TO BE CHECKED) BITS 0-4

NOTE 2 ; BITS 12-15 = CHECK DATA COMMAND

BITS 0-1 = DRIVE #

THE CONTROLLER EXECUTES THIS COMMAND MUCH AS IT DOES READ DATA ; HOWEVER, NO TRANSFER OF DATA OCCURS. RESULTS OF CHECK MAY BE OBTAINED WITH STATUS COMMAND CALL.

```
0139*
0140****** STATUS CHECK *****
0141*
0142  00121 000000  STAT  NOP
0143  00122 103100        CLF 0           (TURN OFF INTERR SYS IF IT'S ON)
0144  00123 103710        STC DC,C        SET DATA CHANNEL FOR INPUT
0145  00124 060157        LDA DRV         LOAD DRIVE#
0146  00125 100711        CLC CC
0147  00126 102611        OTA CC          OUTPUT STATUS COMMAND
0148  00127 103711        STC CC,C          TO CMND CHANNEL
0149  00130 102310        SFS DC
0150  00131 024130        JMP *-1
0151  00132 100711        CLC CC
0152  00133 102510        LIA DC          GET STATUS FROM DATA CHNL
0153  00134 102100        STF 0           (RESET INTERR SYS IF IT WAS ON)
0154  00135 124121        JMP STAT,I
0155*
0156*  NOTE: IOMEC STATUS BITS
0157*
0158*          15 - ATTENTION - OPERATION COMPLETED
0159*          14 - FIRST SEEK - DRIVE HAS GONE FROM NOT READY TO READY
0160*          13 - OVERRUN - LATE DATA TRANSFER - HARDWARE FAILURE
0161*          12 - READ/WRITE UNSAFE - HARDWARE FAILURE
0162*          11 - ACCESS UNSAFE - HARDWARE FAILURE
0163*          10 - ACCESS HUNTING - HARDWARE FAILURE
0164*           9 - SEEK INCOMPLETE - HARDWARE FAILURE
0165*           8 - SEEK CHECK - SOFTWARE ERROR (E.G., CYL# > 202)
0166*           7 - (NOT USED)
0167*           6 - NOT READY (ALSO SET WHEN BITS 11 AND/OR 12 SET)
0168*           5 - END OF CYLINDER - SOFTWARE ERROR - ATTEMPTED TO
0169*                 WRITE PAST THE END OF A CYLINDER
0170*           4 - ADDRESS ERROR - ADDRESS ISSUED DOES NOT AGREE WITH
0171*                 DISC ADDRESS - HARDWARE FAILURE OR DISC NOT
0172*                 INITIALIZED - OR - IF BIT 3 IS ALSO ON, THEN
0173*                 THE CYLINDER BEING PROCESSED HAS BEEN FLAGGED
0174*                 DEFECTIVE.
0175*           3 - FLAGGED CYLINDER - SET IF CYLINDER BEING PROCESSED
0176*               HAS BEEN FLAGGED PROTECTED OR (IF BIT 4 IS ALSO SET )
0177*               DEFECTIVE - OR - INITIALIZE DATA COMMAND HAS BEEN
0178*               ISSUED WITH DISC PROTECT OVERRIDE SWITCH OFF
0179*           2 - DRIVE BUSY - SEEK IN PROCESS
0180*           1 - DATA ERROR - CYCLIC CHECK INCORRECT
0181*           0 - ANY ERROR - TURNED ON WHEN ANY OF THE ABOVE EXCEPT
0182*                 BIT 15 OR, ON A READ OR CHECK DATA, BIT 3, IS SET.
0183*
0184* NOTE: ANY HARDWARE FAILURE WHICH DOES NOT SET BIT 6 MAY BE
0185*           RECOVERABLE ON RETRY.
0186*
```

```
0188*
0189*****  DATA CONSTANT AND STORAGE AREA  *****
0190*
0191  00010            DC     EQU 10B          DATA CHANNEL (HIGH PRIORITY)
0192  00011            CC     EQU 11B          COMMAND CHANNEL (LOW PRIORTY)
0193*
0194  00136 030000  SKCMD OCT 030000           SEEK RECORD COMMAND
0195  00137 130000  ADCMD OCT 130000           ADDRESS RECORD COMMAND
0196  00140 020000  RDCMD OCT 020000           READ DATA COMMAND
0197  00141 060000  CHCMD OCT 060000           CHECK DATA COMMAND
0198  00142 000000  STCMD OCT 000000           STATUS CHECK COMMAND
0199  00143 050000  RFCMD OCT 050000           REFINE SECTOR COMMAND
0200*
0201  00144 000000  WRCMD NOP                  STORAGE FOR CURRENT WRITE CMND
0202*
0203  00145 010000  WDCMD OCT 010000           WRITE DATA COMMAND
0204  00146 110000  INCMD OCT 110000           INITIALIZE DATA COMMAND
0205  00147 111000  PCCMD OCT 111000           FLAG PROTECTED CYLINDER CMND
0206  00150 110400  DCCMD OCT 110400           FLAG DEFECTIVE CYLINDER CMND
0207*
0208  00151 100000  MSIGN OCT 100000           BIT 15
0209  00152 120000  DMACW OCT 120000           DMA CONTROL WORD
0210*
0211  00153 000010  DCHNL OCT 10               DISC DATA CHNL# (HP)
0212  00154 000313  LSTSK DEC 203              LAST SEEK IND. (INIT. > 202)
0213*
0214  00155 000000  CYL    NOP                 CYLINDER#
0215  00156 000000  HDSCT  NOP                 HEAD#(15-8), SCTR#(7-0)
0216  00157 000000  DRV    NOP                 DRIVE#
0217  00160 000000  CCRAD  NOP                 CORE BUFFER ADDRESS
0218  00161 000000  WDCNT  NOP                 NEG #WORDS TO BE TRANSFERRED
0219  00162 000000  SCTRS  NOP                 POS #SCTRS TO BE CHECKED
0220*
0221                 END
** NO ERRORS*
```

[SLIDE 69F]

DOS-M SUPPLIED BOOTSTRAP ("A" VERSION)

```
0001                    ASMB,L,A
0002*
0003  00002                   ORG 2B
0004  00002 024223          JMP CONFG      <- GO CONFIGURE BOOTSTRAP
0005*
0006  00005                   ORG 5B
0007  00005 102501    BOOT  LIA 1          GET SYSTEM SUBCHNL
0008  00006 010200          AND M7
0009  00007 000065          CLE,ERA
0010  00010 070166          STA DRV#       SET DRIVE#
0011  00011 006400          CLB
0012  00012 106600          OTB DC         OUTPUT TRK#
0013  00013 103700          STC DC,C         FOR SEEK
0014  00014 030204          IOR SEEK
0015  00015 102601          OTA CC         OUTPUT SEEK CMND
0016  00016 103701          STC CC,C         TO COMMAND CHNL
0017  00017 102300          SFS DC
0018  00020 024017          JMP *-1        <- WAIT FOR TRACK # RECEIVED
0019  00021 060206          LDA HDSCT
0020  00022 002040          SEZ            SUBCHNL ON REMOVABLE PACK?
0021  00023 010200          AND M7           -YES, SET HEAD# = 0
0022  00024 102600          OTA DC         OUTPUT HEAD/SCTR
0023  00025 103700          STC DC,C         TO DATA CHNL
0024  00026 010203          AND M1774
0025  00027 070170          STA HDMSK
0026  00030 060207          LDA DMACW
0027  00031 102606          OTA 6          OUTPUT DMA CNTRL WORD
0028  00032 106702          CLC 2
0029  00033 060210          LDA MEMAD
0030  00034 102602          OTA 2          OUTPUT BFR ADDRS
0031  00035 102702          STC 2
0032  00036 060173          LDA N256
0033  00037 102602          OTA 2          OUTPUT WORD COUNT
0034  00040 102301          SFS CC         WAIT FOR SEEK
0035  00041 024040          JMP *-1          TO COMPLETE
0036  00042 014056          JSB STAT       <- CHECK STATUS
0037  00043 060205          LDA READ
0038  00044 030166          IOR DRV#
0039  00045 106701          CLC CC
0040  00046 102601          OTA CC         OUTPUT READ COMMAND
0041  00047 103700          STC DC,C       SET DATA CHNL FOR READ
0042  00050 103706          STC 6,C        START DMA
0043  00051 103701          STC CC,C       START READ OPERATION
0044  00052 102301          SFS CC         WAIT FOR READ
0045  00053 024052          JMP *-1          TO COMPLETE
0046  00054 014056          JSB STAT       <- CHECK STATUS
0047*
0048  00055 024110          JMP RELOC      GO RELOCATE BOOTSTRAP
0049*
0050  00056 000000    STAT  NOP
0051  00057 103700          STC DC,C
0052  00060 060166          LDA DRV#
0053  00061 106701          CLC CC
0054  00062 102601          OTA CC         OUTPUT STATUS CMND
0055  00063 103701          STC CC,C         TO COMMAND CHNL
0056  00064 102300          SFS DC
```

BOOTSTRAP PROPER

SET-UP DMA

```
0057  00065 024064          JMP *-1
0058  00066 102500          LIA DC <-------- GET STATUS
0059  00067 000010          SLA              ANY ERROR?
0060  00070 102011          HLT 11B           -YES
0061  00071 124056          JMP STAT,I
0062*
0063  00100                 ORG 100B         BOOTSTRAP START ADDRESS
0064  00100 024005          JMP BOOT
0065  00105                 ORG 105B
0066  00105 000222  DFEND DEF CHSUM
0067*
0068  00110                 ORG 110B
0069*
0070  00110 002400  RELOC CLA
0071  00111 170212          STA CLER1,I
0072  00112 170213          STA CLER2,I
0073  00113 060170          LDA HDMSK
0074  00114 170214          STA ABHDM,I    SAVE HEAD# FOR DISC-RES. BOOT
0075  00115 060166          LDA DRV#
0076  00116 170220          STA ABDRV,I
0077  00117 060165          LDA CHAN
0078  00120 170215          STA ACHNL,I    SAVE DISC I/O CHNLS
0079  00121 170216          STA ADCHN,I
0080  00122 002004          INA              FOR DISC-RESIDENT
0081  00123 170217          STA ACCHN,I      BOOTSTRAP
0082*
0083  00124 064221          LDB SPPNT
0084  00125 144221          ADB SPPNT,I                          ASPBF
0085  00126 160001          LDA B,I        GET ADDRESS OF [redacted]
0086  00127 010202          AND M76K       ISOLATE PAGE BITS
0087  00130 040176          ADA N2KB       SUBTRACT 1 PAGE
0088  00131 070171          STA PGMSK
0089  00132 160001          LDA B,I
0090  00133 010201          AND M1777
0091  00134 030171          IOR PGMSK                ASPBF
0092  00135 170001          STA B,I        ADJUST [redacted] ADDRESS
0093  00136 044175          ADB N1
0094  00137 160001          LDA B,I
0095  00140 010201          AND M1777
0096  00141 030171          IOR PGMSK
0097  00142 170001          STA B,I        ADJUST DEFDY
0098  00143 044175          ADB N1
0099  00144 160001          LDA B,I
0100  00145 010201          AND M1777
0101  00146 030171          IOR PGMSK
0102  00147 170001          STA B,I        ADJUST DVADR
0103  00150 060211          LDA DBOOT
0104  00151 010201          AND M1777
0105  00152 030171          IOR PGMSK
0106  00153 070172          STA RELBT      SET TRANSFER ADDRESS
0107  00154 064173          LDB N256
0108  00155 074167          STB WDCNT
0109  00156 164211  MVMOR LDB DBOOT,I    *
0110  00157 174000          STB A,I        *
0111  00160 002004          INA            * RELOCATE
0112  00161 034211          ISZ DBOOT      * BOOTSTRAP
```

BOOTSTRAP PR...

[SLIDE ZAP]

```
0113  00162 034167          ISZ WDCNT      *
0114  00163 024156          JMP MVMOR      *
0115*
0116  00164 124172          JMP RELBT,I    <-TRANSFER TO DISC-RES. BOOTSTRAP
0117*
0118  00000           DC     EQU 0          DISC DATA CHANNEL
0119  00001           CC     EQU 1          DISC CMND CHANNEL
0120  00165 000000    CHAN   NOP
0121  00166 000000    DRV#   NOP
0122  00167 000000    WDCNT  NOP
0123  00170 000000    HDMSK  NOP
0124  00171 000000    PGMSK  NOP
0125  00172 000000    RELBT  NOP
0126  00173 177400    N256   DEC -256
0127  00174 177405    N251   DEC -251
0128  00175 177777    N1     DEC -1
0129  00176 176000    N2KB   OCT -2000
0130  00177 177700    N100   OCT -100
0131  00200 000007    M7     OCT 7
0132  00201 001777    M1777  OCT 1777
0133  00202 076000    M76K   OCT 76000
0134  00203 177400    M1774  OCT 177400
0135  00204 030000    SEEK   OCT 030000
0136  00205 020000    READ   OCT 020000
0137  00206 001001    HDSCT  OCT 001001
0138  00207 120000    DMACW  OCT 120000
0139  00210 115400    MEMAD  OCT 115400
0140  00211 015400    DBOOT  OCT 15400
0141  00212 015771    CLER1  OCT 15771
0142  00213 015772    CLER2  OCT 15772
0143  00214 015772    ABHDM  OCT 15772
0144  00215 015773    ACHNL  OCT 15773
0145  00216 015774    ADCHN  OCT 15774
0146  00217 015775    ACCHN  OCT 15775
0147  00220 015776    ABDRV  OCT 15776
0148  00221 015777    SPPNT  OCT 15777
0149*
```

BOOTSTRAP PROPER

BOOTSTRAP CONFIGURATOR

```
0151*
0152  00222 000000  CHSUM NOP
0153*
0154  00223 102501  CONFG LIA 1          GET DISC DATA CHANNEL
0155  00224 010337       AND B77
0156  00225 070165       STA CHAN
0157  00226 030207       IOR DMACW
0158  00227 070207       STA DMACW      CONFIGURE DMA CNTRL WORD
0159  00230 060337       LDA B77
0160  00231 003000       CMA
0161  00232 040327       ADA DEFBT
0162  00233 070330       STA CNTR
0163  00234 064327       LDB DEFBT
0164  00235 006004  CLOOP INB            *
0165  00236 160001       LDA B,I        *
0166  00237 002021       SSA,RSS        * CONFIGURE ALL
0167  00240 024247       JMP CNEXT      *
0168  00241 010340       AND MASK       *   DISC I/O
0169  00242 002002       SZA            *
0170  00243 024247       JMP CNEXT      *   INSTRUCTIONS
0171  00244 160001       LDA B,I        *
0172  00245 040165       ADA CHAN       *   IN BOOTSTRAP
0173  00246 170001       STA B,I        *
0174  00247 034330  CNEXT ISZ CNTR
0175  00250 024235       JMP CLOOP
0176*
0177  00251 102501       LIA 1
0178  00252 002020       SSA            PUNCH CONFIGURED BOOTSTRAP?
0179  00253 024256       JMP *+3         -YES
0180*
0181  00254 102077       HLT 77B        -NO (HALT IRREGOUGRABLE)
0182  00255 024254       JMP *-1
0183*
```

[SLIDE 70D]

PUNCH CONFIGURATED BOOTSTRAP

```
0185  00256 060334          LDA .2
0186  00257 070326          STA ABSAD      SET BOOTSTRAP START ADDRESS
0187  00260 003004          CMA,INA
0188  00261 040105          ADA DFEND
0189  00262 070331          STA TEMP       SAVE BOOTSTRAP END ADDRESS
0190  00263 001727          ALF,ALF
0191  00264 010203          AND M1774
0192  00265 070325          STA RCLNG      SET PUNCH RECORD LENGTH
0193*
0194  00266 002400          CLA
0195  00267 070002          STA 2B
0196  00270 070003          STA 3B
0197  00271 070004          STA 4B
0198  00272 060331          LDA TEMP
0199  00273 003004          CMA,INA
0200  00274 070330          STA CNTR       SET COUNTER FOR CHECKSUM
0201  00275 060326          LDA ABSAD
0202  00276 064334          LDB .2
0203  00277 140001  KLOOP ADA B,I         *
0204  00300 006004          INB            * GENERATE
0205  00301 034330          ISZ CNTR       *   CHECKSUM
0206  00302 024277          JMP KLOOP      *   FOR BBL
0207  00303 070222          STA CHSUM      *
0208*
0209  00304 060332  PMORE LDA N50
0210  00305 064341          LDB AFDFR
0211  00306 114103          JSB HSPDR,I    PUNCH LEADER
0212*
0213  00307 060333          LDA N2
0214  00310 064324          LDB SHREC
0215  00311 114103          JSB HSPDR,I    PUNCH RECORD LENGTH, ABS ADDRS
0216*
0217  00312 060331          LDA TEMP
0218  00313 003004          CMA,INA
0219  00314 002004          INA
0220  00315 064336          LDB .4
0221  00316 114103          JSB HSPDR,I    PUNCH BOOTSTRAP
0222*
0223  00317 060332          LDA N50
0224  00320 064341          LDB AFDFR
0225  00321 114103          JSB HSPDR,I    PUNCH TRAILER
0226*
0227  00322 102077          HLT 77B
0228  00323 024304          JMP PMORE
0229*
0230  00324 000325  SHREC DEF *+1
0231  00325 000000  RCLNG NOP
0232  00326 000000  ABSAD NOP
0233  00000         A      EQU 0B
0234  00001         B      EQU 1B
0235  00103         HSPDR  EQU 103B
0236  00327 000005  DEFBT DEF BOOT
0237  00330 000000  CNTR   NOP
0238  00331 000000  TEMP   NOP
0239  00332 177716  N50    DEC -50
0240  00333 177776  N2     DEC -2
```

```
0241   00334 000002   .2      OCT 2
0242   00335 000003   .3      OCT 3
0243   00336 000004   .4      OCT 4
0244   00337 000077   B77     OCT 77
0245   00340 070036   MASK    OCT 070036
0246*
0247   00341 000342   AFDFR   DEF *+1
0251                          LST
0252*
0253                          END
**   NO ERRORS*
```

DOS-M DISC RESIDENT BOOTSTRAP


```
0350  15400                ORG 15400B
0351*
0352*  THE FOLLOWING LOADER PERMITS LOADING OF THE RESIDENT PORTIONS
0353*  OF THE DISC MONITOR SYSTEM. THE LOADER IS LOCATED ON SECTORS 1 & 2
0354*  TRACK 0 OF THE SYSTEM DISC.  IT IS GENERATED BY THE SYSTEM
0355*  GENERATOR AND CONSISTS OF:
0356*
0357*  (1) THE INSTRUCTIONS REQUIRED FOR LOADING THE SYSTEM
0358*  (2) THE DISK AND CORE ADDRESSES SPECIFYING LOADING
0359*
0360*
0361*  THE ADDRESSES REQUIRED FOR LOADING ARE THE FOLLOWING:
0362*
0363*  (A) BASE PAGE LINKAGES
0364*      (1) LOW CORE ADDRESS
0365*      (2) HIGH CORE ADDRESS
0366*      (3) DISK ADDRESS OF ABSOLUTE CODE
0367*
0368*  (B) SYSTEM, R1 RESIDENT MAIN
0369*      (1) LOW CORE ADDRESS
0370*      (2) HIGH CORE ADDRESS
0371*      (3) DISK ADDRESS OF ABSOLUTE CODE
0372*
0373*  RELEASED "A" VERSION 10-70
0374*
0375*
0376*
0377  15400 000000  START NOP
0378  15401 06/731        LDB DEFDY
0379  15402 017570        JSB CNFGR      CONFG. BOOTSTRAP I/O INSTR.
0380  15403 06/732        LDB ASPBF      GET APPRS OF DISC SPEC. BFR
0381  15404 077762        STB SPCAD      SET CURRENT SPBUF ADDRESS
0382  15405 017613        JSB PLOAD      LOAD BP LINKAGES
0383  15406 017613        JSB PLOAD      LOAD MAIN SYSTEM
0384  15407 017613        JSB PLOAD      LOAD I/O TABLES
0385  15410 017613        JSB PLOAD      LOAD EXEC DOUBLETS
0386*
0387  15411 064120        LDB BEQT#      GET # OF EQUIPMENT
0388  15412 00/004        CMB,INB          TABLE ENTRIES AND
0389  15413 07/310        STB CNTR         STORE NEGATIVE
0390  15414 064117        LDB BEQTB      GET FWA OF EQUIPMENT TABLE
0391  15415 044055  CNFG1 ADB .2
0392  15416 160001        LDA B,I        A = 3RD WORD OF EQT entry
0393  15417 044051        ADB .2N
0394  15420 010072        AND M.77
0395  15421 075773        STA CHANL      SAVE I/O CHANNEL#
0396  15422 053774        CPA RUND1       =RUN TIME DISC DATA CHNL?
0397  15423 077763        STB SWP1         -YES, SAVE
0398  15424 053775        CPA RUND2       =RUN TIME DISC CMND CHNL?
0399  15425 077764        STB SWP2         -YES, SAVE
0400  15426 077304        STB EQCUR      SAVE CURRENT EQPT TABLE ADDRESS
0401  15427 044056        ADB .3
0402  15430 160001        LDA B,I        A = 4TH WORD OF EQT Entry
0403  15431 001727        ALF,ALF
0404  15432 013752        AND M.377
0405  15433 075305        STA EWPCD      SAVE EQPT TYPE CODE
```

LOAD CORE RESIDENT SYSTEM

DOS-M DISC RESIDENT BOOTSTRAP


```
0406  15434 050060          CPA .5          =SYSTEM TELETYPE?
0407  15435 02/460          JMP CNFG4        -YES
0408  15436 053765          CPA DISK        =DISC ?
0409  15437 02/445          JMP CNFG3        -YES
0410  15440 06/304 CNFG2    LDB EQCUR
0411  15441 044066          ADB .17D        INCR TO NEXT EQPMT TABLE ENTRY
0412  15442 03/310          ISZ CNTR        CHECKED ALL ENTRIES?
0413  15443 02/415          JMP CNFG1        -NO
0414  15444 02/505          JMP CNFG7        -YES
0415  15445 044052 CNFG3    ADB .1N
0416  15446 160001          LDA B,I
0417  15447 023773          XOR CHANL
0418  15450 033774          IOR RUND1
0419  15451 170001          STA B,I         SET DISC EQPT TABLE AT RUN TIME
0420  15452 063773          LDA CHANL
0421  15453 073302          STA GEND1       SAVE DISC I/O CHN2 AT GEN. TIME
0422  15454 002004          INA
0423  15455 073303          STA GEND2        SAVE GEN. DISC CMND CHNL
0424  15456 063774          LDA RUND1
0425  15457 07[illegible]773 STA CHANL      SET CHAN= RUN TIME DISC CHNL
0426  15460 06/30[illegible] CNFG4 LDB EQCUR
0427  15461 160001          LDA B,I
0428  15462 073730          STA DVADR       SAVE DRIVER ENTRY POINT
0429  15463 164000          LDB A,I         GET CONFIGURATION STOP POINT
0430  15464 01/570          JSB CNFGR  <-- CONF. ALL I/O INST. IN DRIVER
0431*
0432  15465 063305          LDA EQPCD       GET EQPMT TYPE CODE
0433  15466 050060          CPA .5           =SYSTEM TELETYPE?
0434  15467 02/440          JMP CNFG2        -YES
0435  15470 006004          INB              -NO, MUST BE DISC
0436  15471 160001          LDA B,I
0437  15472 033773          IOR CHANL       CONFIGURE DMA CNTRL WORD
0438  15473 170001          STA B,I          AND STORE
0439  15474 006004          INB
0440  15475 063747          LDA #SPIK       * SET + AND -
0441  15476 170001          STA B,I         *  SECTORS/TRACK
0442  15477 006004          INB             *     IN
0443  15500 003004          CMA,INA         *  DISC DRIVER
0444  15501 170001          STA B,I         *
0445  15502 06/304          LDB EQCUR       SAVE ADDRESS OF
0446  15503 07/311          STB EQDSK         DISC EQPMT TABLE
0447  15504 02/440          JMP CNFG2
0448*                                       CONTINUE
0449  15505 060154 CNFG7    LDA BDSC0       *
0450*
0451  15506 001722          ALF,ALA         *
0452  15507 013767          AND M,740       * SET RUN TIME
0453  15510 033774          IOR RUND1       *   DISC CHANNEL
0454  15511 001727          ALF,ALF         *   IN *DISC0*
0455  15512 001723          ALF,RAR         *
0456  15513 070154          STA BDSC0       *
0457*
0458  15514 063763          LDA SWP1        *
0459  15515 06/302          LDB GEND1       * SET NEW ENTRIES
0460  15516 01/606          JSB INSWP       *   IN SYS GEN. TIME
0461  15517 063764          LDA SWP2        *   DISC CHANNEL
```

DOS-M DISC RESIDENT BOOTSTRAP


```
0462  15520 06/303        LDB GEND2     *   INTERRUPT TABLE LOCATIONS
0463  15521 017606        JSB INSWP     *
0464*
0465  15522 002400        CLA           *
0466  15523 06/774        LDB RUND1     * SET RUN TIME
0467  15524 017606        JSB INSWP     *   DISC CHANNELS
0468  15525 063311        LDA EQDSK     *     IN
0469  15526 06/775        LDB RUND2     *   INTERRUPT TABLE
0470  15527 017606        JSB INSWP     *
0471*
0472  15530 06/763        LDB SWP1      *
0473  15531 006003        SZB,RSS       *
0474  15532 02/540        JMP SWAP2     * SET NEW I/O CHANNELS
0475  15533 044055        ADB .2        *
0476  15534 160001        LDA B,I       *   IN EQUIPMENT TABLE ENTRIES
0477  15535 023774        XOR RUND1     *
0478  15536 033302        IOR GEND1     *   OF DEVICES
0479  15537 170001        STA B,I       *
0480  15540 06/764  SWAP2 LDB SWP2      *   SWAPPED
0481  15541 006003        SZB,RSS       *
0482  15542 027546        JMP SWPSC     *   WITH RUN TIME DISC
0483  15543 023775        XOR RUND2     *
0484  15544 033303        IOR GEND2     *
0485  15545 170001        STA B,I       *
0486*
0487  15546 063776  SWPSC LDA BDRV#
0488  15547 001200        RAL
0489  15550 06/772        LDB BHMSK
0490  15551 006003        SZB,RSS  <--- PACK BOOTSTRAPPED UP ?
0491  15552 002004        INA      <--- yes! set S.C. add...
0492  15553 064155        LDB BSYSC
0493  15554 070155        STA BSYSC     SET RUN TIME SYS SUBCHNL
0494  15555 054175        CPB BUDSC
0495  15556 070175        STA BUDSC
0496  15557 006400        CLB
0497  15560 050175        CPA BUDSC     SYS SC = USER SC?
0498  15561 064115        LDB BSYBF      -YES,
0499  15562 074200        STB BDSCL        SET DISCL
0500  15563 047757        ADB .400
0501  15564 074157        STB BUNIS        = SYSTEM NEXT TRK/SCTR
0502  15565 064175        LDB BUDSC
0503  15566 074161        STB BCDSC
0504*                                          GO START SYSTEM
0505  15567 124003        JMP 3B,I      GO START DOS <---
0506*
0507  15570 000000  CNFGR NOP
0508  15571 05/730        CPB DVADR     DONE CONFIGURING THIS DRIVER?
0509  15572 12/570        JMP CNFGR,I    -YES
0510  15573 03/730        ISZ DVADR      -NO, INCR TO NEXT INSTRUCTION
0511  15574 163730        LDA DVADR,I   LOAD INSTRUCTION
0512  15575 002021        SSA,RSS       *
0513  15576 02/571        JMP CNFGR+1   * CHECK IF INSTRUCTION
0514  15577 013766        AND MASK      *   IS I/O
0515  15600 002002        SZA           *   FOR DEVICE (EXCLUDING DMA)
0516  15601 02/571        JMP CNFGR+1   *
0517  15602 163730        LDA DVADR,I    -YES,
```

DOS-M DISC RESIDENT BOOTSTRAP


```
0518  15603 043773          ADA CHANL       CONFIGURE INSTRUCTION
0519  15604 173730          STA DVADR,I     AND STORE
0520  15605 027571          JMP CNFGR+1
0521*
0522  15606 000000  INSWP   NOP             *
0523  15607 044045          ADB .6N         * THIS SUBROUTINE
0524  15610 044201          ADB BINTB       *   IS USED TO SWAP
0525  15611 170001          STA B,I         *   INTERRUPT TABLE ENTRIES
0526  15612 127606          JMP INSWP,I     *
0527*
0528  15613 000000  PLOAD   NOP             DISC READ ROUTINE
0529  15614 167762          LDB SPCAD,I     GET LOW CORE ADDRESS
0530  15615 037762          ISZ SPCAD       INCR CURRENT SPBUF ADDRESS
0531  15616 167762          LDA SPCAD,I     GET HIGH CORE ADDRESS
0532  15617 037762          ISZ SPCAD       INCR CURRENT SPBUF ADDRESS
0533  15620 003304          CMA,CCE,INA     COMPLEMENT, SET DIRECTION BIT
0534  15621 040001          ADA B           SET A = TOTAL WORD COUNT
0535  15622 005225          RBL,ERB         SET DIRECTION BIT IN CORE ADDR
0536  15623 106702          CLC 2
0537  15624 106602          OTB 2           SET MEMORY ADDRESS REGISTER
0538  15625 167762          LDB SPCAD,I     GET DISK ADDRESS OF ABSOLUTE COD
0539  15626 037762          ISZ SPCAD       INCR CURRENT SPBUF ADDRESS
0540*
0541  15627 002021  SLOAD   SSA,RSS         SKIP - MORE SECTORS TO LOAD
0542  15630 127613          JMP PLOAD,I     RETURN - THIS SECTION LOADED
0543  15631 043754          ADA P,128       ADJUST FOR NEXT COUNT
0544  15632 073761          STA RECNT       SET REMAINING COUNT
0545  15633 002020          SSA             SKIP - LESS THAN 128 WORDS
0546  15634 002400          CLA
0547  15635 043753          ADA N,128       SET A = CURRENT SECTOR COUNT
0548  15636 102702          STC 2
0549  15637 102602          OTA 2           SET WORD COUNT REGISTER
0550  15640 060001          LDA B           LOAD CURRENT DISK ADRS INTO A,
0551  15641 001767          ALF,CLE,ALF       ROTATE TO LO BITS,
0552  15642 013752          AND M,377         AND ISOLATE TRK#
0553  15643 102600  DSKA    OTA 0           OUTPUT TRK#
0554  15644 103700          STC 0,C           TO DATA CHANNEL
0555  15645 063755          LDA SKCMD       LOAD SEEK COMMAND
0556  15646 033776          IOR BDRV#       INCLUDE DRIVE #
0557  15647 106701          CLC 1
0558  15650 102601          OTA 1           OUTPUT SEEK/ADDRESS CMND
0559  15651 103701          STC 1,C           TO COMMAND CHANNEL
0560  15652 102300          SFS 0           CHECK DATA CHNL FLAG,
0561  15653 027652          JMP *-1           LOOP UNTIL SET
0562  15654 060001          LDA B           LOAD CURRENT DISK ADDRESS INTO A
0563  15655 013752          AND M,377         ISOLATE SECTOR#
0564  15656 043751          ADA #SPTK       ADD NEG #SCTRS/TRK
0565  15657 002021          SSA,RSS         CHECK IF SCTR# > #SCTRS/TRK
0566  15660 033757          IOR .400          -YES, SET LOWER HEAD#
0567  15661 002020          SSA
0568  15662 043747          ADA #SPTK         -NO, ADD #SCTRS/TRK BACK IN
0569  15663 033772          IOR BHMSK       INCLUDE SYS HEAD# MASK
0570  15664 102600          OTA 0           OUTPUT HEAD/SECTOR
0571  15665 103700          STC 0,C           TO DATA CHANNEL
0572  15666 102301          SFS 1           CHECK CMND CHNL FLAG,  > WAIT FOR SEEK
0573  15667 027666          JMP *-1           WAIT UNTIL SET       >
```

DOS-M DISC RESIDENT BOOTSTRAP


```
0574  15670 017714          JSB BSTAT          <-
0575  15671 063756          LDA RDCMD          LOAD READ COMMAND
0576  15672 033776          IOR BDRV#          INCLUDE DRIVE#
0577  15673 102601          OTA 1              OUTPUT COMMAND FOR READ
0578  15674 103700          STC 0,C
0579  15675 106701          CLC 1
0580  15676 103706          STC 6,C            INITIATE DMA
0581  15677 103701          STC 1,C            INITIATE DATA TRANSFER
0582  15700 102301          SFS 1              CHECK CMND CHNL FLAG,
0583  15701 027700          JMP *-1              WAIT UNTIL SET
0584  15702 017714          JSB BSTAT          <-
0585  15703 060001          LDA B              LOAD CURRENT DISC ADDRESS INTO A
0586  15704 013752          AND M.377            AND ISOLATE
0587  15705 053750          CPA #SPCY          CHECK IF LAST SECTOR ON CYL
0588  15706 002001          RSS                 -YES
0589  15707 002405          CLA,INA,RSS         -NO
0590  15710 063760          LDA #MASK
0591  15711 044000          ADB A              INCR TO NEXT DISC ADDRESS (TRACK)
0592  15712 063761          LDA RECNT          GET REMAINING COUNT
0593  15713 027627          JMP SLOAD          LOAD NEXT [illegible] SECTOR
0594*
0595  15714 000000  BSTAT   NOP
0596  15715 103700          STC 0,C
0597  15716 063776          LDA BDRV#
0598  15717 106701          CLC 1              OUTPUT STATUS COMMAND
0599  15720 102601          OTA 1                                      STATUS
0600  15721 103701          STC 1,C                                    SUBRTN.
0601  15722 102300          SFS 0
0602  15723 027722          JMP *-1
0603  15724 102500  DSKY    LIA 0              <- GET STATUS
0604  15725 000010          SLA
0605  15726 102031          HLT 31B
0606  15727 127714          JMP BSTAT,I
0607*                                            DATA AREA
0608*
0609  15730 015642  DVADR   DEF DSKA-1
0610  15731 015724  DEFDY   DEF DSKY
0611*                                          CONTAINS 4 Entries
0612  15732 015733  ASPBF   DEF *+1            (3 words each) for
0613  15733 000000          BSS 12             loading CRS.
0614*
0615  15747 000000  #SPTK   NOP                #SCTR/TRK (physical)
0616  15750 000000  #SPCY   NOP                #SCTR/CYL - 1
0617  15751 000000  #SPTN   NOP                NEG # SCTRS/TRK (physical)
0618  15752 000377  M.377   OCT 377
0619  15753 177600  M.128   DEC -128
0620  15754 000200  P.128   DEC 128
0621  15755 030000  SKCMD   OCT 030000         SEEK COMMAND
0622  15756 020000  RDCMD   OCT 020000         READ COMMAND
0623  15757 000400  .400    OCT 400            LOWER HEAD# BIT
0624  15760 000351  #MASK   OCT 351            INCR. TRK# MASK
0625  15761 000000  RECNT   OCT 0              CURRENT REMAINING COUNT
0626  15762 000000  SPCAD   OCT 0              CURRENT DISK SPEC. BUFFER ADDR
0627*
0628  15300         SPBF    EQU 153008
0629  15302         GEND1   EQU SPBF+2
```

DOS-M DISC RESIDENT BOOTSTRAP


```
0630   15303           GEND2  EQU SPBF+3
0631   15304           EGCUR  EQU SPBF+4
0632   15305           EGPCD  EQU SPBF+5
0633   15310           CNTR   EQU SPBF+8
0634   15311           EGDSK  EQU SPBF+9
0635*
0636   00053           .      EQU 53B
0637   00045           .6N    EQU .-6
0638   00051           .2N    EQU .-2
0639   00052           .1N    EQU .-1
0640   00055           .2     EQU .+2
0641   00056           .3     EQU .+3
0642   00060           .5     EQU .+5
0643   00066           .17D   EQU .+11
0644   00071           M.37   EQU .+14
0645   00072           M.77   EQU .+15
0646*
0647   00100           .      EQU 100B
0648   00115           BSYBF  EQU .+13
0649   00117           BEQTB  EQU .+15
0650   00120           BEQT#  EQU .+16
0651   00154           BDSCU  EQU .+44
0652   00155           BSYSC  EQU .+45
0653   00157           BCNTS  EQU .+47
0654   00160           BSNTS  EQU .+48
0655   00161           BCDSC  EQU .+49
0656   00175           BLDSC  EQU .+61
0657   00200           BDSCL  EQU .+64
0658   00201           BINTB  EQU .+65
0659*
0660   15763 000000    SWP1   NOP
0661   15764 000000    SWP2   NOP
0662   15765 000031    DISK   OCT 31
0663   15766 070036    MASK   OCT 070036
0664   15767 177740    M.740  OCT 177740
0665*
0666   15777           END    EQU 15777B
0667   15772           BPMSK  EQU END-5
0668   15773           CHANL  EQU END-4
0669   15774           RCND1  EQU END-3
0670   15775           RCND2  EQU END-2
0671   15776           BDRV#  EQU END-1
0672*
0673   15777                  ORG 15777B
0674   15777 177733           ABS ASPBF-*
0675*
0676                          END DSGEN
**  NO ERRORS*
```

BASE PAGE COMMUNICATION AREA LOCATIONS

HALTS IN DOS-M DURING SYSTEM OPERATION

T-REGISTER CONTENTS	PROGRAM LOCATION	CAUSE OF HALT	RECOVERY ACTION
102000	$EX18	System was unable to use Interrupt Table to match channel # in Equipment Table for given I/O request.	Check Interrupt Table entries and patch if possible. Regenerate correct system. Irrecoverable halt.
102004	DISCM	Power UP or DOWN with DOS-M System in core with P.F. option present	Bootstrap System back up from Disc and Restart.
102011	$EX20	Disc Parity Error. Halt occurs after printing messages on System TTY to inform operator where error occurred. (TRACK #, SECTOR #, and Sub-channel #).	Turn ON "Disc Protect Override Switch" and press "RUN" for System to assign next spare track.
102077	$EX20	Follows message telling operator to turn OFF "Disc Protect Override Switch" after spare track assignment.	Turn OFF "Disc Protect Override Switch" and press "Run". System aborts job that was running.
102031	DVR31	Trying to write on cylinder that has been flagged protected with "Dics Protect Override Switch" OFF.	Press "Run" to exit driver with no action taken on Disc.

DISC DUMP FOR DOSM GENERATION EXAMPLE

Φ,Φ	LB	DO	9000	SY	ST	EM		
001	046102	042117	021450	051531	051524	042515	044456	031461
	020000	036173	000723	041456	031461	020000	036173	000724
	044456	031062	020000	036164	000000	041456	031062	020000
	036164	000000	046117	040504	001000	036165	000000	171373 C.S.
	041120	051000	036146	000000	040523	046502	020000	036137
	000000	037501	051503	047000	036137	000000	037501	051515
	041000	036137	000000	037502	047103	047000	036137	000000
	037502	050113	052400	036137	000000	037503	044117	050000
TRK 22 SEC Φ	013000	000000	000312	044120	044400	036137	000000	037504
	041517	042000	036137	000000	037505	047104	051400	036137
	000000	037505	051120	051000	036137	000000	037515	051531
	051400	036137	000000	037507	042524	041400	036137	000000
	037515	047526	042400	036137	000000	037515	051531	046400
	036137	000000	037522	046125	047000	036137	000000	037501
	043114	043400	036137	000000	037514	051524	046000	036137
	000000	037514	052516	044400	036137	000000	037522	052502 DB
Φ,1								
002	000000	067731	017570	067732	077762	017613	017613	017613
	017613	064120	007004	077310	064117	044055	160001	044051
	010072	073773	053774	077763	053775	077764	077304	044056
	160001	001727	013752	073305	050060	027460	053765	027445
	067304	044056	037310	027415	027505	044052	160001	023773
	033774	170001	063773	073302	002004	073303	063774	073773
	067304	160001	073730	164000	017570	063305	050060	027440
	006004	160001	033773	170001	006004	063747	170001	006004
	003004	170001	067304	077311	027440	060154	001722	013767
	033774	001727	001723	070154	063763	067302	017606	063764
	067303	017605	002400	067774	017606	063311	067775	017606
	067763	006003	027540	044055	160001	023774	033302	170001
	067764	006003	027546	023775	033303	170001	063776	001200
	067772	006003	002004	064155	070155	054175	070175	006400
	054175	064115	074200	047757	074157	064175	074161	124003
	000000	057730	127570	037730	163730	002021	027571	013766
Φ,2								
003	002002	027571	163730	043773	173730	027571	000000	044045
	044001	170001	127606	000000	167762	037762	163762	037762
	003304	040001	005225	106702	106602	167762	037762	002021
	127613	043754	023761	002020	002400	043753	102702	102602
	060001	001767	013752	102600	103700	063755	033776	106701
	102601	103701	102300	027552	060001	013750	043751	002021
	033757	002020	043747	033772	102600	103700	102301	027666
	017714	063756	033776	102601	103700	106701	103706	103701
	102301	027700	017714	060001	013752	053750	002001	002405
	063760	044000	063761	027627	000000	103700	063776	106701
	102601	103701	102300	027722	102500	000010	102031	127714
	015642	015724	037733	000002	000732	011413	001634	007301
	000012	007361	007567	000411	007533	007567	006406	000014
	000027	177764	000377	177600	000200	030000	020000	000400
	000351	000000	000000	000000	000000	000031	070036	177740
	015771	046511	000000	000015	000015	000016	000000	177733
Φ,3								
004	022105	054060	031401	000413	000002	007567	007624	000732
	000733	007567	007624	022105	054060	032001	000415	000004
	007567	010176	000732	000741	007567	010176	022105	054060
	032001	000421	000002	007567	007745	000732	000733	007567
	007745	022105	054060	034401	000423	000002	007567	007746
	007732	000733	007567	007746	022105	054060	034001	000424
	000002	007567	007732	000732	000733	007567	007732	022105
	054060	034401	000457	000003	007567	010142	000732	000763

$EXF3 SYSTEM DIRECTORY
$EXF4
$EXF5
$EXF7
$EXF8
$EXF9

SYSTEM LABEL / USER BUFFER SECTOR

DISC RESIDENT BOOTSTRAP

MEMORY BOUNDS & DISC ADDRESSES FOR C.R. SYSTEM

SYSTEM DIRECTORY

```
007567 013142 022105 054061 030001 001002 000002 007567   $EX10
007745 000732 000733 007567 007745 022105 054061 031001
001004 000002 007567 007761 000732 000733 007567 007761   $EX12
022105 054061 031001 001006 000004 007567 010223 000732   $EX13
000751 007567 010223 022105 054061 032001 001012 000004   $EX14
007567 010241 000732 000751 007567 010241 022105 054061
032001 001016 000003 007567 010163 000732 000763 007567   $EX15
010153 177777 000000 000000 000000 000000 000000 000000
```

Ø,4 — LAST DIRECTORY ENTRY THIS SECTOR

```
005 022105 054061 033001 001021 000002 007567 007720 000732   $EX16
000733 007567 007722 022105 054061 034001 001023 000003   $EX19
007567 010107 000732 001000 007567 010107 022105 054062
030001 001026 000003 007567 010167 000732 000761 007567   $EX20
010167 042126 051060 030404 001401 000003 010241 010555   DVRØ1
001000 001002 010241 010555 042126 051060 031004 000404   DVRØ2
000003 010241 010443 001000 001002 010241 010443 042126   DVR22
051062 031004 001007 000005 010241 010555 001000 001002
010241 011075 046117 040504 051003 001414 000040 012000   LOADR
021032 001002 001425 012000 021032 046117 041120 051003
002024 000006 012000 022463 001002 001414 012000 022463   JOBPR
040523 046502 020003 003412 000027 012000 012120 000002   ASMB
001352 016522 017120 040523 046502 042005 033411 000004   ASMBD
017127 017647 001352 001363 017442 017647 040523 046502   ASMB1
030405 003415 000006 017366 020542 001362 001424 017366
020542 177777 000000 000000 000000 000000 000000 000000
```

Ø,5 — LAST DIRECTORY ENTRY THIS SECTOR

```
006 040523 046502 031005 003423 000007 017345 020550 001362   ASMB2
001410 017351 020550 040523 046502 031405 004002 000003   ASMB3
017473 012771 001362 001363 017630 017771 040523 046502
032005 004005 000004 017366 020027 001362 001371 017366   ASMB4
020027 040523 046502 032405 004005 000006 017345 020425   ASMB5
001362 001404 017351 020425 043124 047040 020003 004017   FTN
000006 012040 013127 001002 001047 012000 013127 043124   FTNØ1
047060 030405 003025 000037 013254 022120 001047 001502   FTNØ2
016550 022120 043124 047060 031005 005004 000031 013254
021027 001047 001356 013741 021027 043124 047060 031405   FTNØ3
005405 000030 013254 020500 001047 001277 015117 020500   FTNØ4
043124 047060 032005 005005 000031 013254 020750 001047
001360 013702 020750 045111 041122 054405 000407 000223   LIBRY
000000 000000 000000 000000 000000 000000 000000 000000
000000 000000 000000 000000 000000 000000 000000 000000
000000 000000 000000 000000 000000 000000 000000 000000
```

Ø,6 — LAST DIRECTORY ENTRY

```
007 000000 000000 000000 000000 000000 000000 000000 000000
000000 000000 000000 000000 000000 000000 000000 000000
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```

not used

Φ7

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000 000000 000000 000000 000000 000000 000000 000000 000000
    000000 000000 000000 000000 000000 000000 000000 000000
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Φ8

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000 000000 000000 000000 000000 000000 000000 000000 000000
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Φ9

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010 000000 000000 000000 000000 000000 000000 000000 000000
    000000 000000 000000 000000 000000 000000 000000 000000
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    000000 000000 000000 000000 000000 000000 000000 000000
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```

NOT USED "B" VERSION GENERATOR WILL NOT WRITE

Φ10

```
011 000000 103100 017736 063634 070242 163634 170627 102504
    033635 073646 000000 102504 054657 102504 054660 124630
    054103 027754 044045 074000 002020 027714 003000 040202
    002020 027714 044201 160001 002003 027714 114552 102504
    164264 114001 027776 060260 002003 027714 060261 002002
    027714 160557 164201 006003 002002 027714 074260 124544
    063634 017746 002001 027722 017726 127634 017726 102100
    102705 127634 000000 060241 103101 000036 102101 060237
    064240 127726 000000 070237 074240 001520 102201 002004
```

DISCM

CRS2

CRS2

DISCM

```
      070241  127736  000000  003000  040254  002020  037746  127746
      034105  027761  063775  070105  034104  060106  002020  027714
      034107  027714  063775  070107  034106  060106  050114  134631
      027714  176650  170217  170531  174200  017331  060513  003004
      050203  070513  060202  000010  034070  050141  002003  025070
      160212  002020  003004  050054  002001  026070  007400  044111
      044121  003400  140001  114632  040117  050203  002001  026070
Ø,11
Ø12   160214  160000  010075  150633  002001  026070  160211  114634
      026070  060123  072052  160214  066207  017361  002052  160220
      164215  006021  026061  002004  001100  070530  160206  012211
      170206  160211  070242  026651  160217  002002  026152  160206
      012211  170206  160213  012210  002002  026163  160211  070505
      164220  114634  026150  164635  154636  026204  060260  002003
      026143  003400  140121  114632  040117  040056  160000  002020
      026143  052212  002002  026141  160206  070237  164220  074240
      160211  070242  006400  074260  027426  006400  074260  114220
      160206  102100  102705  124505  160206  124505  050056  002301
      026641  160206  110637  150640  026644  060056  026641  063213
      002003  026171  060513  002021  027256  160205  010072  053204
      027244  053200  002003  124554  017003  027271  124554  027271
      060203  072213  027244  177734  020000  037777  000000  000000
      000000  103100  114641  062214  040052  002001  102505  070512
      070242  072424  036424  160000  012473  052475  002001  026633
Ø,12
Ø13   160512  012474  160000  052476  002001  026315  066424  160001
      114634  026635  160001  070225  007004  040001  002003  026635
      040052  070224  002020  026635  040042  002021  026635  064043
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CRS$_2$ & CRS$_3$

	063356	003004	040073	001727	001200	010071	102600	103700	DVR31
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DKS

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1,12 ← S.P. LINKAGE FOR $EXP3

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020040 020040 051525 051520 000472 114552 160206 001727
010073 053623 027704 160206 013622 033621 170206 060512
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114733 073702 063671 067746 114735 060472 114552 027612
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020105 050524 021440 020040 020040 063676 073773 063766
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006004 160001 073753 063747 064041 114735 027575 177754
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$EXP4

1,14

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ASCII

ASCII

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	037631	124551	102400	070261	070245	060106	002020	027646
	033737	070196	060113	002021	027646	006400	124550	063740
	064111	054054	002400	070471	124537	002400	027657	003400
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BASE PAGE LINKS FOR $EX04

$EX05

← B.P. LINK FOR $EX05

NOTE: $EX05 uses $SRCH but not needed here because CORE RES.

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$EX07

$EX08

NOTE: $ ... Uses ... $ADDR ... no ... here

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1,22 ← BASE PAGE LINK FOR $EXØ8

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$EXØ9

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	076116	016120	146116	176116	002003	026104	016120	005727
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ASCII

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BASE PAGE LINKAGES FOR $EXØ9

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051	134557	050254	003004	040146	002020	027660	060147	003004	
	040100	002020	027660	060255	003004	040150	002020	027660	
	060151	003004	040256	002020	027660	060146	070167	060144	
	070166	060146	003004	040147	070170	002400	070262	064524	
	006002	034162	114576	060174	070166	060150	003004	040151	
	002003	027650	070170	060150	070167	064524	006002	034162	$EX10
	114576	002430	070245	170557	070260	067724	102100	102705	
	124152	034251	114545	000002	000001	007725	177746	007670	
	124551	002400	070261	060106	002020	027677	033743	070106	
	002400	067744	114543	000141	063742	070471	002400	070245	
	006400	060262	074262	002021	027720	002400	070471	007400	
	124544	060112	050111	027714	124537	000126	044514	046105	
	043501	045040	050122	047507	051101	046440	051125	047040	
	046111	046511	052123	045117	100000	177765	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	
2,3	← BASE PAGE LINKAGE FOR $EX10								
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053	134557	060116	003004	070511	060254	102605	060115	073726	$EX12
	063751	073727	063754	073730	017671	060467	053747	027634	
	002400	067757	114543	000270	060160	070370	060115	017676	
	070371	074372	063747	070467	060115	073726	063751	073727	
	063755	073730	063731	064051	114536	060200	002042	027641	
	060370	027643	060370	070157	070160	067756	060103	002003	
	077655	034261	114545	000002	000001	007732	177746	007660	
	124551	002400	070245	170557	070260	070261	063750	070471	
	002400	124544	000000	063731	006404	114536	127671	000000	
	073726	001727	043753	073725	063726	043752	073726	063751	
	073727	060052	073730	017671	037725	027703	002400	070270	
	067760	060525	003004	044000	060525	127676	000000	000000	
	000000	000000	007726	044516	050125	052040	035104	040524	
	042454	054130	054130	054130	054130	054130	026110	026115	
	051502	042101	000270	000400	177470	000200	000201	177752	

DRS

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055	060472	170735	064473	073723	060203	073722	074270	057732
	027626	002400	070126	054057	027736	114556	064270	047700
	160001	067717	114736	064270	054055	002001	027634	060236
	002003	027634	002400	070245	102100	102705	124225	160602
	070474	063733	006400	074245	124540	006400	060106	002020
	027645	033721	070106	060113	002020	124737	002400	067734
	114543	000141	063720	070471	002400	070245	064270	057731
	002001	027663	064530	124542	006400	060262	074262	002021
	027674	002400	070471	007400	124544	060112	050111	027670
	124537	007701	047522	046520	051121	052115	000000	046125
	046115	044502	041527	044524	043111	042104	000000	044505
	020040	045117	100000	000000	000000	000000	000000	037777
	040000	000031	000015	000014	000024	177765	177757	063723
	140740	160000	170741	160206	001727	010072	164742	053730
	027770	160206	013726	033727	170206	064117	007004	044203
	002404	006303	027765	002004	047735	027760	114733	170743
2,7								*$EX13*
056	164744	060046	073724	160745	073725	160001	173725	006004
	037725	134746	124747	160750	050055	002001	026011	060202
	000010	026022	114545	000002	000001	010027	177756	010020
	124551	160751	114552	002400	070245	160206	164220	124752
	044457	047440	042522	051040	000000	020040	020040	020040
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	021440	000000	020040	010053	020125	051505	051040	042111
	051503	010063	347122	042524	050105	062076	066077	015100
	006400	074245	060270	150753	002001	074530	124550	040502
	051124	000000	072034	076035	062130	114734	072041	160001
	072037	006004	160001	072040	034261	114545	000002	000001
	010034	177762	010123	124551	002400	070261	160751	114552
	126100	000000	000000	064041	016141	126131	000000	064043
	016141	126135	000000	076222	066200	076174	076175	076176
	066173	076177	016201	146177	176177	002003	026165	016201
	005727	146177	176177	036177	002002	026151	066176	062174
2,8								*ASCII*
057	072175	076171	066173	126141	010174	000000	000000	000000
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	002021	025204	006020	026205	066222	007004	044000	062221
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	010052	010050	010044	010043	007724	007774	007723	007722	
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2,10									
059	064123	004066	077745	060473	073751	002400	073753	073754	
	017725	017725	001727	073752	017725	033752	073752	017725	
	053756	002001	027632	017725	010070	073753	017725	053755	
	027632	053756	124734	010070	073754	063753	001723	043753	
	043753	043754	073753	063752	053757	027766	053760	124735	
	063753	002002	027650	002004	073747	064122	007004	077750	
	027653	073747	003400	073750	063747	003004	040122	002020	
	124734	063747	114733	073762	063747	040052	040121	160000	
	114733	073765	034261	114545	000002	000001	007761	177766	
	007716	060520	003000	040254	002021	124554	060517	103101	
	000036	102101	060515	064516	102100	102705	124520	002400	
	070261	114555	037747	037750	027653	124736	000000	067745	
	004065	160001	002041	001727	010074	005600	006004	077745	
	127725	000000	070001	001700	040001	127740	000000	000000	$EX14
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	052520	042116	046125	000000	020105	050524	000000	063753	
2,11									
060	114737	040052	017740	040117	040056	073746	160000	001222	
	010056	050054	002001	026007	160740	012104	170740	026136	
	060120	003004	170741	002404	170742	064117	060001	044066	
	174743	040056	160000	001222	010056	050054	026033	160743	
	134742	134741	026015	026136	160742	114733	072056	034261	
	114545	000002	000001	010052	177761	010046	124744	002400	
	070261	114555	026026	042105	053111	041505	020043	054130	
	020104	047527	047040	160745	016110	150121	026123	040052	
	114746	040117	040056	170743	160000	012106	052107	026123	
	160740	012104	032105	170740	026136	037777	040000	037400	
	014400	000000	002003	026123	002020	026123	064120	007000	
	144745	006021	026123	126110	034261	114545	000002	000001	
	010141	177765	010133	124744	002400	070261	114555	002400	
	070245	124747	044516	050125	052040	042522	051117	051040	
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	000000	076240	066216	076212	076213	076214	066211	076215	

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2,12 — ASCII

061	016217	146215	176215	002003	026203	016217	005727	146215
	176215	036215	002002	026167	066214	062212	072214	076212
	066211	126157	010212	000000	000000	000000	000000	030060
	000000	006400	076237	070001	042240	036237	002021	026222
	006020	026223	066240	007004	044000	062237	044052	126217
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2,13 — BASE PAGE LINKAGES FOR $EX14

062	007567	010147	010123	010062	010136	010110	107746	007750
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2,14 — $EX15

063	174734	060115	170735	160735	170737	160740	170741	160735
	114575	160742	006404	114536	160734	002020	002400	164743
	002002	164744	174745	006004	160746	002002	027622	164001
	006003	027644	027624	050052	027626	040254	027627	060254
	110747	170750	134745	160746	050052	027637	040254	027640
	060153	170751	114752	017744	002001	134745	134745	160746
	002021	027710	063255	110747	170750	060151	170751	114752
	060047	170753	063776	170754	160750	114733	160001	010074
	130755	170001	114756	160757	114733	114756	160757	001265
	160000	114733	114756	134750	134753	027672	017772	002021
	027657	134745	160746	002021	027723	060153	110747	170750
	060147	170751	114752	017744	002400	070245	070113	070471
	164760	114543	000141	002400	064530	006002	124542	060262
	074262	002021	124537	007400	124544	000000	060043	170753
	063776	170754	160750	114733	160001	010074	130755	170001
	114756	160757	114733	114756	134750	134753	027760	017772

2,15

064	002021	027745	127744	000000	114545	000002	000006	000333
	177670	010002	124551	062047	003004	042052	124761	000000
	062037	172051	036051	160001	172051	036051	006004	160001
	172051	036051	006004	160001	172051	036051	126006	000000
	114545	000003	001106	177777	000000	010036	124551	126026
	020040	020000	000000	000000	000000	000000	010042	000000
	000004	000000	000000	000000	177765	000200	000270	000405
	000411	177770	000000	064041	016071	126061	000000	064043

ASCII

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ASCII

016071 125065 000000 076152 066130 076124 076125 076126
066123 076127 016131 146127 176127 002003 026115 016131
005727 146127 176127 036127 002002 026101 066126 062124
072126 076124 066123 126071 010124 000000 000000 000000
000000 030060 000000 006400 076151 070001 042152 036151
002021 026134 006020 026135 066152 007004 044000 062151
040052 125131 000000 000000 000000 000000 000000 000000
000000 000000 000000 000000 000000 000000 000000 000000

2,16

065 007567 010045 010041 010042 010055 010043 010054 010044
010045 010056 010057 010046 110046 010060 010047 010052
010026 010050 010051 010040 010006 110047 010053 107772
010061 000000 000000 000000 000000 000000 000000 000000
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BASE PAGE LINKAGES FOR $EX15

2,17

066 000000 077721 063710 073716 060046 073717 060123 000066
073714 060472 001200 003004 073715 017672 017672 017672
017672 002400 173716 017672 002002 027623 037716 037717
002001 027645 173716 027615 053711 027642 053713 027612
010074 043712 073720 163716 070001 041723 040001 040001
043720 173716 027612 037716 037717 027610 060470 073716
006403 074470 074471 074245 007400 002003 124544 003000
040254 002021 124537 063721 002002 114552 002400 067710
102100 102705 127716 000000 063715 002003 127672 067714
004065 150001 002041 001727 010074 037714 037715 127672
127672 000126 000054 177720 000040 000000 000000 000000
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$EX16

2,18

067 007567 ← BASE PAGE LINK FOR $EX16 000000 000000 000000 000000 000000 000000 000000
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2,19

068	060200	170733	064161	002400	170734	170735	054155	160733
	070200	160736	006404	114720	160737	114721	002001	027705
	164740	160227	010075	150741	006400	074270	160742	050273
	060274	150743	060275	150744	027742	160745	070271	060176
	070272	060227	164746	114724	060470	170747	114725	070327
	060200	140750	064270	006002	060370	070370	070157	064161
	054155	070160	160736	064270	006003	160751	074470	064055
	114720	060161	050175	006405	124752	060155	070161	060115
	070200	160736	114720	060227	164753	114724	160736	064055
	114720	060175	070161	160733	070200	124752	060271	170754
	164755	150745	164756	150757	164760	154755	160761	174762
	160763	164764	114722	160765	164766	114722	114545	000001
	000401	010106	177776	007734	124551	160767	150770	027607
	150771	124752	027722	006003	027624	160733	170772	070200
	001727	170773	170735	160736	006404	114720	060370	170774
	060511	002004	170775	134772	134734	160772	070200	160736

$EX19

2,20

060	006404	114720	160734	070200	160736	064055	114720	160735
	140773	072035	036036	124776	002400	070200	062046	006404
	114720	062030	003004	042033	070370	002400	070273	072030
	124777	062105	070470	062035	006400	074245	102100	102705
	124225	000000	000000	000000	000000	000000	000000	000000
	000273	000427	020040	025000	000400	177764	177760	000200
	000201	037477	037440	054505	047117	046102	052123	041040
	042117	051440	051531	051524	042515	010073	010066	000000
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	047513	020124	047440	050125	051107	042477	000000	000000
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2,21

070	007567	010030	010032	010035	010046	010064	010054	010042
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	010020	010040	010066	010051	010060	010055	010056	010050
	010067	010065	010045	010076	010044	010106	010052	010053
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BASE PAGE LINKAGES FOR $EX19

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	130735	170736	060126	070161	114733	130735	170737	060130
	114733	170740	160741	164742	017737	160743	164744	017737
	160745	170746	160747	067777	017737	102011	002400	074200
	006404	017755	164750	050273	060274	150751	060275	150752
	002001	027645	060370	070200	006404	017755	064161	060370
	070157	054155	070160	060154	010074	064372	054000	027733
	005727	077774	044075	074372	034371	064055	017755	064511
	077776	067767	074526	063775	006404	[illegible]	[illegible]	[illegible]

$EX20

DR5

$EX2Ø

```
      017755 063775 073166 063773 070167 002404 070170 067770
      074526 063772 164753 034162 114536 037774 037775 037776
      027670 160754 170746 160747 067777 017737 102077 006400
      074245 074526 074525 124550 160755 164756 017737 027726
      000000 073746 077747 034261 114545 000002 000001 000000
      000000 017752 124551 002403 070261 127737 000000 070166
      063771 070167 160757 070170 063772 034162 114536 127755
2,23
072 007766 007714 000270 000166 007774 000000 000000 000000
      177732 177750 177756 177764 000200 010403 036400 047040
      043106 051531 051524 042515 010014 050101 051111 052131
      020105 051122 047522 010023 051503 020040 026040 020124
      051113 020040 020040 026040 020123 041524 051075 000400
      010040 052125 051116 020117 020040 020104 044523 041440
      050122 047524 042503 052040 047526 042522 051111 042105
      020123 053511 052103 044040 010064 051520 040522 042440
      052122 045440 047526 042522 043114 047527 000000 064041
      016105 126075 000000 064043 016105 126101 000000 076166
      066144 076140 076141 076142 066137 076143 016145 146143
      176143 002033 026131 016145 005727 146143 176143 036143
      002002 026115 066142 062140 072142 076140 066137 126105
      010140 000000 000000 000000 000000 030060 000000 006400
      076165 070001 042166 036165 002021 026150 006020 026151
      056166 007004 044000 062165 040052 126145 000000 000000
3,0
073 007567 010075 010031 010005 010030 010024 010036 010013
      010002 010022 010000 010006 010043 010037 010010 010011
      010012 010004 010007 010003 010001 010003 010101 000000
      000000 000000 000000 000000 000000 000000 000000 000000
      000000 000000 000000 000000 000000 000000 000000 000000
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      000000 000000 000000 000000 000000 000000 000000 000000
3,1
074 000000 016530 160213 010056 050054 026267 006404 050055
      026265 160213 001727 001222 010074 050062 002001 026264
      160206 032542 170206 006004 060001 126241 160214 001200
      170216 160215 002020 026277 001000 003004 002003 003400
      170217 062547 170220 160213 012541 032545 170213 102700
      002400 126241 000000 016530 160213 001200 072550 001727
      072551 020266 066550 102500 004010 002002 026340 134220
      026425 160206 012542 002002 026425 006400 026516 002040
      026355 010073 050073 026430 052553 026425 050065 026464
      006020 026425 050054 026451 026376 006011 026376 066551
      006011 026376 070001 001000 140217 002021 026375 060001
      170215 001000 003004 170217 060001 164216 004065 134216
      002041 001727 072552 060074 002040 001727 110001 032552
      170001 160213 012541 170213 134217 026425 062551 002020
      026503 160213 032546 170213 102700 036313 126313 160214
      001200 170216 160215 002020 026440 001000 003004 002003
3,2
075 003400 170217 062547 170220 160213 032546 170213 026425
```

ASCII

BASE PAGE LINKAGES FOR $EX2Ø

DVRØ1

DRS

DVR01

	160214	001200	150216	026425	160216	040052	170216	160217
	040052	170217	026425	160213	012541	032545	170213	160214
	001200	150216	026425	164216	004065	160001	010075	032542
	002040	170001	160217	164215	006020	026514	005000	044000
	004031	006004	026516	007004	044000	160206	010075	006003
	032542	170206	002400	006003	060055	106700	126313	000000
	032554	072324	042543	072310	072425	032544	072526	126530
	037777	000040	001200	004000	100000	040000	177742	000000
	000000	000000	000015	102500	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
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3,3 — BASE PAGE LINKS FOR DVR01

076	010241	010313	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000

3,4 — DVR02

077	000000	016420	160213	010056	050054	126241	050055	026300
	160213	001727	001222	010073	050063	026263	050064	026267
	060055	126241	062442	170216	002400	026276	160214	002021
	003004	002203	003400	170216	060065	170217	026313	160214
	001200	170216	160215	002020	026310	001000	003004	170217
	002400	170220	062441	072320	026322	002400	126241	000000
	016420	160213	070001	001727	001200	072440	002400	150216
	026402	004010	026360	150217	026364	164216	134216	004065
	160001	002041	001727	010074	066440	134217	026354	006020
	026354	052436	026402	102600	102700	036320	126320	160217
	134216	003000	026354	062440	002020	026402	164220	062435
	056435	060065	170220	056435	026377	026354	006400	174216
	026354	102500	070001	160206	010075	030001	170206	002400
	006002	060055	164215	006020	007004	106700	126320	000000
	032437	072402	040067	072354	042433	072355	032434	072416
	126420	000040	001100	004000	000015	000137	102500	000000

3,5

078	010315	177610	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000

DRS

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	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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	000000	000000	000000	000000	000000	000000	000000	000000

3,6 ← BASE PAGE LINKS FOR DVR02

079	010241	013327	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000

3,7

DVR22

080	000000	164207	005600	064257	005623	174207	016700	073001
	002001	015536	160213	010056	050056	026401	004033	026252
	000031	026346	005310	026546	016524	016550	076550	007007
	026376	044045	160214	006121	026330	072536	060045	072524
	072612	060257	067037	050062	067046	076521	160213	001727
	001226	002541	063055	170001	006004	036612	026314	066521
	162536	170001	036536	006004	036550	026321	062521	016633
	066261	063030	016657	010266	016557	067056	062345	016657
	010336	064064	063034	016657	010342	150215	026372	016612
	060050	170217	016550	160214	016633	067057	063035	016657
	010353	016557	134217	002001	026567	067056	062361	016657
	010366	160213	010067	002002	026440	060057	126241	016536
	160213	013050	053061	026376	004033	026400	053062	026422
	053063	026440	053064	026445	053065	026452	050067	026476
	026531	016625	067056	063031	016657	010423	002400	170207
	006401	006404	063001	002020	026376	002400	127001	016524

3,8

081	064056	063036	016657	010441	016625	067066	063031	016657
	010446	016521	010067	002003	026462	064056	062475	016657
	010456	067067	107627	016521	001323	001310	026472	102727
	026427	067063	062475	016657	010462	005310	026546	016612
	064064	062510	016657	010501	067070	063033	016657	010505
	016521	013071	002003	026432	067056	063032	016657	010515
	000000	102527	126521	000000	016521	013072	002103	126524
	067001	060055	006021	127001	126241	000000	005727	006020
	026546	067063	062536	016657	110536	060056	126241	000000
	164215	006321	007005	005100	076524	126550	000000	016521
	013071	002002	126557	160213	002011	026573	016521	001727
	002020	026606	102502	002002	033073	003004	016550	044000
	007004	160215	002020	005000	026436	164215	006020	007004
	026436	000000	016521	013072	002303	126612	160207	001623
	170207	002340	026531	126612	000000	016521	010067	002002
	026427	126625	000000	036635	177777	106702	001225	102602

3,9

082	062557	033074	102606	102702	062524	142602	126633	003400
	072635	162657	001275	160000	067063	002001	000000	170216

DRS

DVR22

```
107627 016521 001323 001310 026650 002400 052635 103726
102727 036635 103706 063001 002007 126241 124000 000000
072557 064000 062706 016775 072706 106726 002004 072711
106727 062670 016775 072670 006004 062463 016775 072463
072661 062470 016775 072470 072671 062522 016775 072522
062257 062643 016775 072643 073013 040047 072640 072646
062673 016775 072673 062747 016775 072747 106706 040047
044047 072636 062573 016775 072573 062644 016775 072644
016521 010074 070001 160206 010075 030001 170206 016521
070001 003400 072635 126700 000000 010077 030001 126775
000000 164207 005265 006002 050001 027022 074257 040052
016700 002400 102606 160216 004050 002405 124000 005400
127001 070001 063026 016775 073026 106700 026674 010335
010427 010500 010511 010265 010362 010431 011040 020040
```

3,10

```
083 020040 020040 020040 020040 020040 011047 020040 020040
020040 020040 020040 020040 020040 000041 000023 017700
000600 000200 000300 000400 000500 000201 000101 000035
000022 030040 140000 060000 000000 000000 000000 000000
000000 000000 000000 000000 000000 000000 000000 000000
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3,11

BASE PAGE LINKS FOR DVR22

```
084 010241 011001 000000 000000 000000 000000 000000 000000
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3,12

```
085 160001 002002 131003 171004 006004 160001 002003 026012
131005 171006 006004 160001 171007 006004 160001 171010
006004 160001 171011 002400 171012 171013 171014 060527
151015 026035 171016 002400 165017 115020 060255 171021
171022 003004 171023 040256 171024 141025 171026 002004
171027 171030 161025 003004 040255 171031 060045 040100
171032 171033 161024 003004 171034 165025 002400 170001
006004 135034 026067 114535 012101 000066 020677 015171
020771 161035 003004 141036 070001 040051 002020 027307
161036 002004 001727 073037 161035 003004 141036 001100
141035 001727 171037 001727 064155 054161 026132 060154
```

LOADR

FOR 32

13,6

EXEC MODULE DOUBLET TABLE CRS4

001	004003	000413	014004	000415	004005	000421	004007	000423
	004010	000425	010011	000427	004012	001002	004014	001004
	014015	001006	014016	001012	010017	001016	004020	001021
	010023	001023	010024	001026	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	124112	037236
	037567	037135	037405	016000	036514	036515	001633	007777
	006000	002266	004134	004000	004150	005010	005035	005071
	005152	003123	003151	002135	006000	000471	000513	000534
	010132	010144	010072	010030	010000	011135	011210	000765
	011005	011114	001461	010021	005177	003136	007660	010755
	015400	015600	015732	006004	005160	005324	003525	005334
	001160	001163	001177	001211	001223	012246	002151	000522
	000523	000673	007726	012000	000207	001350	015747	015750

13,7

RELOCATABLE LIBRARY

002	010400	020000	167137	040523	041511	044440	000072	000000
	000003	000006	000143	000000	000000	000000	000000	000000
	000000	005400	040002	170452	041516	042105	041400	000000
	041516	047503	052000	000004	036000	060135	140462	000000
	001320	000000	064041	016000	000010	126000	000000	000000
	013212	064043	016000	000010	126000	000004	000000	076000
	000071	133332	066000	000047	076000	000043	076000	000044
	076000	000045	066000	000042	133320	076000	000046	016000
	000050	146000	000046	176000	000046	002003	132132	026000
	000034	016000	000050	005727	146000	000046	176000	000046
	121320	036000	000046	002002	026000	000020	050000	000045
	010400	060106	121765	000035	133332	062000	000043	072000
	000045	076000	000043	066000	000042	126000	000010	020000
	000043	021000	060122	052445	000046	000012	000000	030060
	000000	006400	076000	000070	013212	070001	042000	000071
	036000	000070	002021	026000	000053	013200	006020	026000

13,8

FOR TOTAL OF 147 SECTORS

003	000054	066000	000071	007004	044000	121200	062000	000070
	040052	126000	000050	003000	060101	060172	000071	000000
	000000	002000	120000	120000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
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	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000

13,9

004	010400	020000	005144	042125	046522	054040	000064	000000
	000000	000006	000143	000000	000000	000000	000000	000000
	000000	005400	040002	142464	022114	044502	051000	000000
	022114	044502	054000	000026	035400	060136	033267	000000
	013320	000000	072000	000056	162000	000000	036000	000000
	002002	133200	026000	000010	036000	000061	026000	000024
	002004	002004	121332	076000	000057	005500	076000	000060
	066000	000000	046000	000062	001212	164001	174000	066000

CRS,

19,11

001	124003	004160	114532	114532	114532	114532	114532	114532	JSB $CIC
	114532	114532	114532	114532	114532	114532	114532	114532	
	114532	114532	114532	114532	114532	114532	114532	114532	
	114532	114532	114532	114532	114532	114532	177765	177766	
	177767	177770	177771	177772	177773	177774	177775	177776	CONSTANTS
	177777	000000	000001	000002	000003	000004	000005	000006	
	000007	000010	000011	000012	000021	000100	000017	000037	
	000077	000177	000377	177400	003777	177700	037633	000000	
	000000	000012	000000	000000	000000	000000	000000	000001	
	000001	000000	000003	013000	000030	007361	000005	007506	
	000007	037634	000000	000000	000000	000000	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	
	000000	000000	060307	000001	000001	013400	013400	000001	
	000000	000377	000377	000000	000000	000000	000000	000000	
	000000	000000	000003	000001	021450	000000	013000	007515	

19,12

002	000016	000000	000000	000000	000000	000000	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	
	000000	000000	000000	000000	000000	000000	000000	000000	BASE PAGE COMMUNICATION AREA
	000000	000000	000000	000000	000000	000000	000000	000000	
	000000	007533	000016	000000	007567	010241	000732	001000	
	010241	001000	012000	001002	001633	000000	000000	000000	
	000000	002024	010453	000412	000000	000000	000000	000000	
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19,13

003	000000	000000	000000	000000	000000	000000	000000	000000	
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	000000	000000	000000	000000	000000	000000	000000	177750	
	000000	000000	000000	000000	000000	000000	000000	000000	
	006407	000120	000001	000000	000000	000000	114532	114532	
	001634	004160	004154	002214	003400	003511	003020	002635	
	003744	003361	003426	004165	004267	002507	004010	003244	DISCM ENTRY POINTS LINKAGE
	003345	003177	001714	003563	004044	002212	002653	002657	
	002661	002663	002665	002553	003214	003207	003143	002576	
	002700	002631	002521	003130	003117	004243	002445	004302	

19,14

004	004303	004314	004376	000000	000000	000000	004446	000000	EXEC MODULES ENTRY LINKS
	000000	000000	000000	004505	000000	000000	000000	000000	
	000000	004671	005264	000000	000000	002322	002222	002637	
	004262	004151	001746	004034	004125	004304	004305	001736	DISCM PAGE BOUNDARY LINKS
	001726	001723	004300	004301	004307	004272	004312	004313	
	004310	004311	004274	004150	004126	004127	004135	004124	
	004005	004024	004136	004035	004137	004277	004131	004132	
	004133	004134	004270	004275	004130	004145	004146	004147	

CRS,

DISCM PAGE LINKS

EXEC MODULES LINKS

	003607	002213	003743	103575	003325	002463	003204	003213
	003220	003236	003003	005774	006011	006266	006354	006336
	006372	006424	006330	006315	006410	006466	006660	006743
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
19,15								
005	023776	154025	117770	060413	115154	041036	102074	012676
	025574	053370	126760	064446	151114	130736	070402	161004
	150516	127742	066412	155024	140556	110042	026612	055424
	133050	074626	000162	000344	000710	001620	003440	007100
	016200	034400	071000	162000	152506	133722	076352	003432
	007064	016150	034320	070640	161500	151706	132322	073352
	166724	164356	157442	146612	122132	052772	125764	062456
	145134	120776	050502	121204	051110	122234	053176	126374
	063476	147174	125076	060702	141604	112116	032742	065704
	153610	136126	102762	014452	031124	062250	144520	117746
	046422	115044	040616	101434	011576	023374	046770	115760
	042446	105114	020736	041674	103570	016066	034154	070330
	160660	150246	127222	065152	152324	133356	075442	001612
	003424	007050	016120	034240	070500	161200	151106	130722
	070352	160724	150356	127442	065612	153424	135556	102042
	012612	025424	053050	126120	062746	145714	122336	103216
19,16								
006	002502	175321	012410	165774	052040	124100	056706	135614
	102136	013002	026004	054010	130020	060540	155314	141336
	111402	031512	063224	146450	125626	056162	134344	077416
	005542	013304	026610	055420	133040	074606	000122	000244
	000510	001220	002440	005100	012200	024400	051000	122000
	052506	125214	061136	142274	113276	035302	072604	165410
	161526	151762	132452	073632	167464	165656	162242	153212
	135132	100772	010472	021164	042350	104720	020346	040714
	101630	012166	024354	050730	121660	052246	124514	057736
	137674	106276	023302	046604	115410	041526	103254	015236
	032474	065170	152360	133446	075622	002152	004324	010650
	021520	043240	106500	023706	047614	117430	045566	113354
	035436	073074	166170	163066	154662	140252	107232	025172
	052364	124750	050426	141054	110636	030202	060404	141010
	110526	027762	057744	137710	106326	023362	046744	115710
	042326	104654	020236	040474	101170	011066	022154	170601
19,17								
007	110660	067143	060514	117671	111166	031062	062144	144310
	117326	045362	112744	034416	071034	162070	152666	134262
	077252	005232	012464	025150	052320	124640	050206	140414
	107536	026002	054004	130010	060526	155254	141236	111202
	031112	062224	144450	117626	046162	114344	037416	077034
	004576	011374	022770	045760	113740	036406	075014	000536
	001274	002570	005360	012740	025700	053600	127400	065506
	153214	135136	101002	010512	021224	042450	105120	020746
	041714	103630	016166	034354	070730	161660	152246	133222
	075152	001032	002064	004150	010320	020640	041500	103200
	015106	032214	064430	151060	130646	070222	160444	147616
	126142	063012	146024	122556	054042	130104	066716	155634
	142176	113102	034712	071624	163450	155626	142162	113052
	034632	071464	163150	155026	140562	110052	026632	055464
	133150	075026	000562	001344	002710	005620	013440	027100
	056200	134400	077506	005722	013644	027510	057220	127110

REMAINDER OF TRACK 19 NOT USED

21,23

```
061 026000 000273 162000 000164 002002 026000 000061 002004
    120132 072000 000160 064122 007004 076000 000161 026000
    000064 121320 072000 000160 003400 072000 000161 062000
    000160 003004 001320 040122 002000 026000 000334 062000
    000160 035400 060147 112466 000072 113200 016004 072000
    000173 062000 000160 040052 040121 011210 160000 016004
    072000 000176 034261 016001 000202 000002 000001 000172
    177766 000127 000010 000020 003000 040254 002021 026002
    000000 060517 103101 000036 102101 060515 000000 064516
    102100 102705 124520 002400 011332 070261 016003 036000
    000160 036000 000161 026000 000064 121200 026000 000347
    000000 056000 000156 004065 017000 060123 011144 000141
    000000 160001 002041 001727 010074 005600 013200 006004
    076000 000156 126000 000136 000000 070001 001200 001700
    040001 126000 000151 000000 000100 000000 000000 000000
    000000 000000 035000 060143 112160 000166 000000 000040
```

12,0 LB DO D8 D9 D10 D11

```
062 045102 042117 021450 050521 050521 050421 044456 031461
    020000 036173 000723 041456 031461 020000 036173 000724
    044456 031062 020000 036164 000000 041456 031062 020000
    036164 000000 046117 040504 051000 036155 000000 163252  C.S.
    041120 051000 036146 000000 040523 046502 020000 036137
    000000 037501 051503 047000 036137 000000 037501 051515
    041000 036137 000000 037502 047103 047000 036137 000000
    037502 050113 052000 036137 000000 037503 044117 050000
    033403 000000 000312 000003 177250 046040 020040 020040
    042040 020040 020040 020040 020040 000000 000000 000000
    000000 000000 000000 000000 000000 000001 000001 000003
    000003 000004 000002 000001 000005 000000 000000 050521
    050521 050421 044456 031461 020000 037515 051531 046000
    036137 000000 037522 046125 047000 036137 000000 037501
    043114 043400 036137 000000 037514 051524 046000 036137  SB
    000000 037514 052516 044400 036137 000000 037522 051502
```

USER LABEL/ SYSTEM BUFFER SECTOR

TK55 SEC 3

22,1

```
063 054122 042506 020003 013400 000015 012000 014750 001002  XREF
    001036 012000 014071 042517 052061 020011 013415 000001  EOT/
    053505 047524 020003 013416 000002 012000 012013 001002
    001003 012000 012013 054122 042506 051010 013420 000020
    042111 051503 046410 014010 000024 042530 042503 051410
    014004 000077 042126 051060 052410 015423 000003 042126
    051063 030410 015426 000005 046111 041122 054410 016003
    000217 042126 051060 031010 021002 000002 042126 051060
    030410 021004 000003 042126 051062 031010 021007 000007
    046117 042122 020010 021016 000061 046117 041120 020010
    022017 000101 040523 046502 046010 023410 000050 040523
    046504 020010 024400 000004 040523 046463 020010 024404
    000004 040523 046464 020010 024410 000006 040523 046465
    020010 024416 000012 043122 052116 020010 025000 000010
    043124 047061 020010 025010 000060 043124 047062 020010
    026010 000055 043124 047063 020010 027005 000052 177777
```

USER DIRECTORY

ETC

LAST DIRECTORY ENTRY THIS SECTOR

22,2

```
064 043124 047064 020010 027427 000037 040523 046461 020010
    030405 000014 040523 046462 020010 030422 000013 051511
    047461 020011 031005 000005 041101 051503 030411 031012
    000011 041117 047524 020011 031023 000025 043124 047110
    020011 031420 000001 042517 043040 020003 031421 000001
    012000 012013 001002 001002 012000 012013 043123 050103
    042403 031422 000001 012000 012013 001002 001002 012000
    012013 051127 044516 042003 031423 000001 012000 012013
```

END OF USER DIRECTORY

USER DIRECTORY

	001002	001002	012000	012013	042056	030060	051411	031424
	000103	052123	051124	051411	033017	000006	052123	051124
	051010	033025	000035	041514	042501	051012	033402	000001
	000000	020010	024400	000004	040523	046463	020010	024404
	000003	040523	046464	020010	024410	000000	040523	040465
	020010	024416	000012	043122	052116	020010	025000	000010
	043124	047061	020010	025010	000060	043124	047062	020010
	026010	000055	043124	047063	020010	027005	000052	177777

END

[illegible] LAST DIRECTORY ENTRY THIS SECTOR

22,3

065	000257	162000	000257	012120	050052	026000	000050	040254
	026000	000051	060153	133212	072000	000263	016000	000237
	016000	000155	002001	036000	000257	132120	036000	000257
	162000	000257	002021	026000	000121	060255	132132	012000
	000271	072000	000260	060151	072000	000263	016000	000237
	013320	060047	072000	000261	062000	000207	072000	000262
	035000	050136	017074	000074	130012	062000	000260	016012
	160001	010074	032000	000251	013312	170001	016000	000217
	162000	000260	016012	016000	000217	120112	162000	000260
	001265	150000	016012	016000	000217	133320	036000	000260
	036000	000261	026000	000103	016000	000203	002021	133212
	026000	000070	036000	000257	162000	000257	002021	026000
	000134	013212	060153	012000	000271	072000	000260	060147
	072000	000263	035000	060143	044350	000132	132000	016000
	000237	016000	000155	002400	070245	070113	013000	070471
	066000	000264	016007	000141	002400	001000	064530	006002

22,4

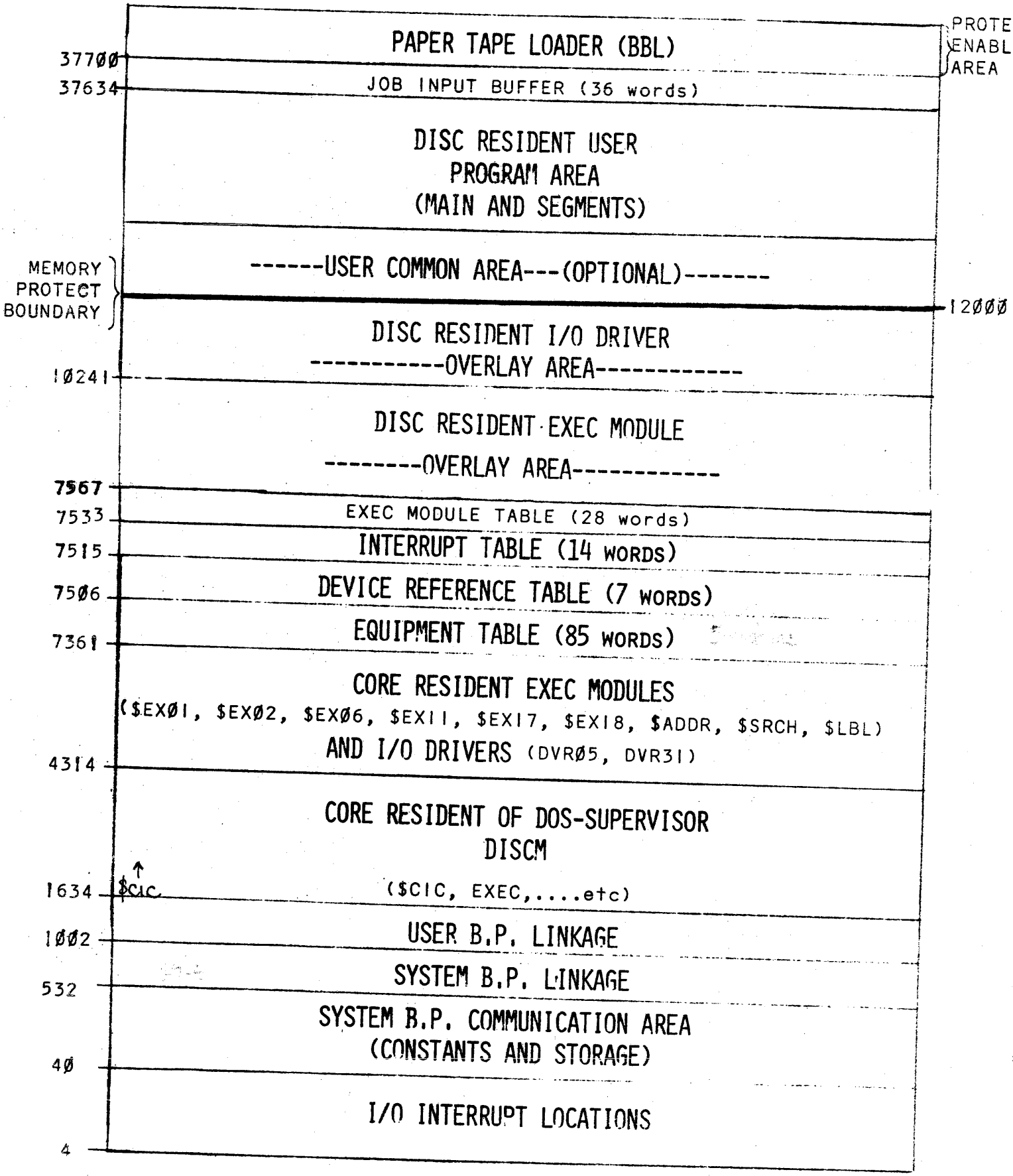
066	026005	060262	074262	010100	002021	026004	007400	026010
	000000	013332	060043	072000	000261	062000	000207	072000
	000262	062000	000260	100120	016012	160001	010074	032000
	000251	170001	133132	016000	000217	162000	000260	016012
	016000	000217	036000	000260	035400	060140	044452	000175
	133212	036000	000261	026000	000171	016000	000203	002021
	026000	000156	121000	126000	000155	000000	016002	000002
	000006	000312	000333	177670	000213	026011	062000	000260
	013212	003004	042000	000263	120000	000203	000000	062000
	000250	132132	172000	000262	036000	000262	160001	172000
	000262	036000	000262	001320	006004	160001	172000	000262
	036000	000262	006004	012000	160001	172000	000262	014300
	060116	153075	000235	132100	036000	000262	126000	000217
	000000	016002	000003	000030	001106	177777	000000	000247
	026011	120000	126000	000237	020040	020000	000000	011400
	060114	102330	000256	020000	000253	000000	000000	000000

REST OF TRACK 22 IS RESERVED FOR USER DIRECTORY ENTRIES

22,5

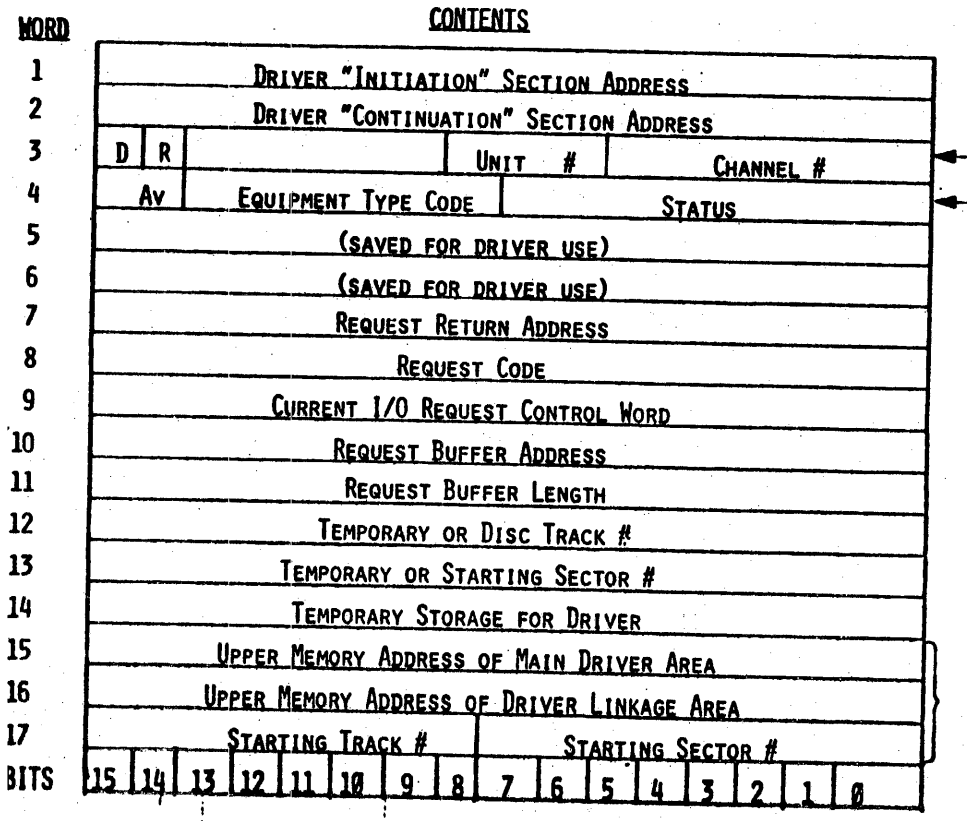
067	000000	000000	000000	177765	000200	000270	000405	000000
	000411	177770	002000	120000	120000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000
	000000	000000	000000	000000	000000	000000	000000	000000

CORE MAP FOR DOSM SYSTEM GENERATION EXAMPLE (16K)



[SLIDE AP-1]

EQUIPMENT TABLE ENTRY FORMAT



D = 1 if DMA channel required.

R = 1 if driver type is core-resident.

Unit # May be used for sub-channel addressing.

Channel # I/O select code for device (lower number if multiboard interface.)

Av
- = Ø - Unit not busy and available
- = 1 - Unit disabled (down)
- = 2 - Unit busy
- = 3 - Unit waiting for an available DMA channel

(This field set by system)

Status - Actual or simulated unit status at end of operation. (Driver must set this field)

Equipment Type Code - Identifies type of device and associated software driver. Assigned equipment type codes in octal are

Ø0-07	Papter Type Devices
Ø0	Teleprinter
Ø1	Punched Tape Reader
Ø2	High Speed Punch
Ø5	Teletype (System)
10-17	Unit Record Devices
10	Reserved for Plotter
12	Line Printer
15	Mark Sense Card Reader
20-37	Magnetic Tape/Mass Storage and other devices capable of both input and output.
22	3030 Magnetic Tape
31	Moving-Head Disc

For equipment type codes 1 through 17, odd number indicate input devices and even number indicate output devices (except Ø5, which is both input and output).

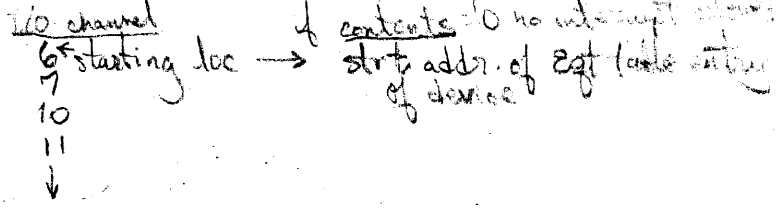
DEVICE REFERENCE TABLE FORMAT

EACH ENTRY IN THIS TABLE REQUIRES ONLY ONE WORD IN MEMORY. THE VALUE OF EACH ENTRY (DECIMAL NUMBER, 1-63) ASSOCIATES A LOGICAL UNIT NUMBER WITH AN EQUIPMENT TABLE ENTRY FOR THE SYSTEM IN THE FOLLOWING MANNER:

SEQUENCE IN MEMORY TABLE	LOGICAL UNIT #	FUNCTION
1	1	SYSTEM TELEPRINTER
2	2	USER MASS STORAGE
3	3	SYSTEM MASS STORAGE
4	4	STANDARD PUNCH DEVICE
5	5	STANDARD INPUT DEVICE
6	6	STANDARD LIST DEVICE
7-63	7-63	ANY DEVICE

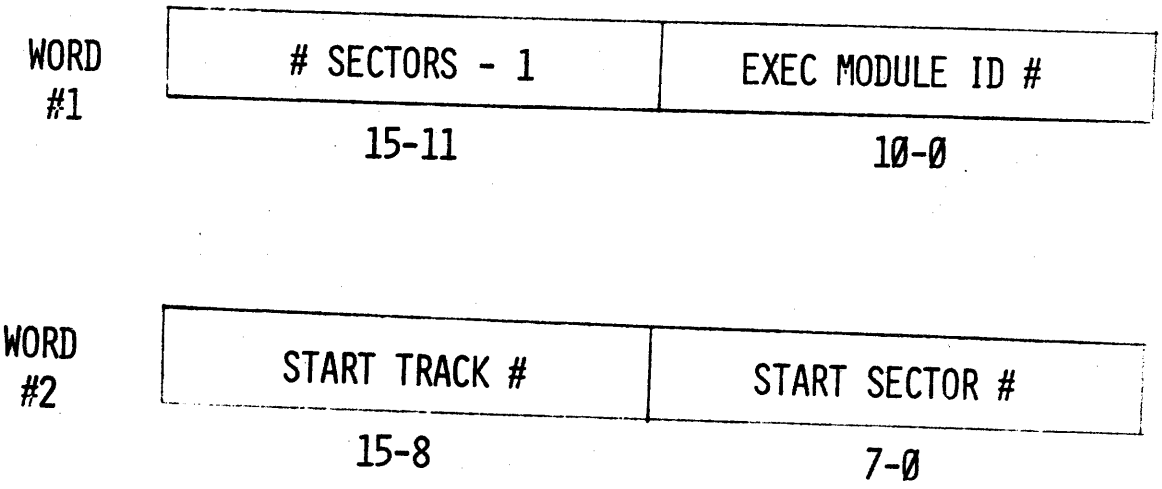
INTERRUPT TABLE FORMAT

EACH ENTRY IN THIS TABLE REQUIRES ONLY ONE WORD IN MEMORY AND IS ASSOCIATED WITH EACH I/O CHANNEL IN THE COMPUTER (STARTING WITH LOCATION 6) WHICH CAN CAUSE AN INTERRUPT. EACH LOCATION IN THIS TABLE HAS AN ENTRY VALUE. MEMORY, LOCATIONS ARE ASSOCIATED IN CONSECUTIVE INCREASING ORDER WITH AN I/O CHANNEL. TABLE VALUES ARE ZERO FOR AN I/O CHANNEL NOT REQUIRING INTERRUPT. I/O CHANNELS REQUIRING INTERRUPT CONTAIN THE START ADDRESS OF THE EQUIPMENT TABLE ENTRY OF THE ASSOCIATED DEVICE.



EXEC MODULE DOUBLET TABLE FORMAT

(TWO WORDS PER DISC RESIDENT EXEC MODULE)



SYSTEM DIRECTORY LISTING FOR DOSM GENERATION EXAMPLE

NAME	TYPE	SCTRS	DISC	ORG	PROG LIMITS		B.P. LIMITS	ENTRY LIBR.	P-BIT
SUBCHAN=1									
$EX03	XS	0002	T001	011	07567	07624	00732 00733	07567 07624	
$EX04	XS	0004	T001	013	07567	10176	00732 00741	07567 10176	
$EX05	XS	0002	T001	017	07567	07745	00732 00733	07567 07745	
$EX07	XS	0002	T001	019	07567	07746	00732 00733	07567 07746	
$EX08	XS	0002	T001	021	07567	07732	00732 00733	07567 07732	
$EX09	XS	0003	T001	023	07567	10142	00732 00763	07567 10142	
$EX10	XS	0002	T002	002	07567	07745	00732 00733	07567 07745	
$EX12	XS	0002	T002	004	07567	07761	00732 00733	07567 07761	
$EX13	XS	0004	T002	006	07567	10223	00732 00754	07567 10223	
$EX14	XS	0004	T002	010	07567	10241	00732 00751	07567 10241	
$EX15	XS	0003	T002	014	07567	10153	00732 00763	07567 10153	
$EX16	XS	0002	T002	017	07567	07722	00732 00733	07567 07722	
$EX19	XS	0003	T002	019	07567	10107	00732 01000	07567 10107	
$EX20	XS	0003	T002	022	07567	10167	00732 00761	07567 10167	
DVR01	DR	0003	T003	001	10241	10555	01000 01002	10241 10555	
DVR02	DR	0003	T003	004	10241	10443	01000 01002	10241 10443	
DVR22	DR	0005	T003	007	10241	11075	01000 01002	10241 11075	
LOADR	UM	0032	T003	012	12000	21032	01002 01425	12000 21032	
JOBPR	UM	0038	T004	020	12000	22463	01002 01414	12000 22463	
ASMB	UM	0023	T006	010	12000	17120	01002 01362	16522 17120	
ASMBD	US	0004	T007	009	17127	17647	01362 01363	17442 17647	
ASMB1	US	0006	T007	013	17366	20542	01362 01424	17366 20542	
ASMB2	US	0007	T007	019	17345	20550	01362 01410	17351 20550	
ASMB3	US	0003	T008	002	17473	17771	01362 01363	17630 17771	
ASMB4	US	0004	T008	005	17366	20027	01362 01371	17366 20027	
ASMB5	US	0006	T008	009	17345	20425	01362 01404	17351 20425	
FTN	UM	0006	T008	015	12000	13127	01002 01047	12000 13127	
FTN01	US	0031	T008	021	13254	22120	01047 01502	16550 22120	
FTN02	US	0025	T010	004	13254	21027	01047 01356	13741 21027	
FTN03	US	0024	T011	005	13254	20600	01047 01277	15117 20600	
FTN04	US	0025	T012	005	13254	20750	01047 01360	13702 20750	
LIBRY	LB	0147	T013	007					

EQUIPMENT TABLE LISTING

```
:EQ
EQT 01 CH 11 DVR05 0 R U0 S0
EQT 02 CH 13 DVR01 0 0 U0 S0
EQT 03 CH 14 DVR31 D R U0 S0
EQT 04 CH 16 DVR02 0 0 U0 S0
EQT 05 CH 22 DVR22 D 0 U0 S0
@
```

LOGICAL UNIT TABLE LISTING

```
:LU
LU01 EQT01
LU02 EQT03
LU03 EQT03
LU04 EQT04
LU05 EQT02
LU06 EQT01
LU07 EQT05
@
```

MEMORY DUMP FOR DOSM SYSTEM GENERATION EXAMPLE

CORE DUMP: 000004-007566

000000:					114532	114532	114532	114532	TRAP CE
000010:	114532	114532	114532	114532	114532	114532	114532	114532	JSB $CI
000020:	114532	114532	114532	114532	114532	114532	114532	114532	
000030:	114532	114532	114532	114532	114532	114532	114532	114532	
000040:	177700	177766	177767	177770	177771	177772	177773	177774	
000050:	177775	177776	177777	000000	000001	000002	000003	000004	
000060:	000005	000006	000007	000010	000011	000012	000021	000100	CONSTANT
000070:	000017	000037	000077	000177	000377	177400	003777	177700	
000100:	037633	000000	000000	000012	000000	000000	000000	000000	
000110:	000000	000001	000001	000000	000003	013000	000030	007361	
000120:	000005	007506	000007	037634	000000	000000	000000	000000	
000130:	000000	000000	000000	000000	000000	000000	000000	000000	
000140:	000000	000000	000000	000000	000000	000000	000000	000000	
000150:	000000	000000	000000	000000	060307	000001	000001	033403	
000160:	033403	000001	000000	000377	000026	000000	001005	000000	
000170:	000046	000000	000000	000000	013001	000001	021450	000000	
000200:	013000	007515	000016	007361	007362	007363	007364	007365	CURRENT EQT TABL
000210:	007366	007367	007370	007371	007372	007373	007374	007375	ADDRGSSES
000220:	007376	007377	007400	007401	000000	000000	000000	000000	
000230:	000000	000000	000000	000000	000000	000000	000000	177777	
000240:	177777	077777	003327	007533	000016	000000	007567	010241	
000250:	000732	001000	010241	001000	012000	001002	001633	000006	
000260:	000000	000001	000000	002024	010463	000412	000000	000000	
000270:	046102	042117	021450	050521	050521	050421	044456	031461	
000300:	020000	036173	000723	041456	031461	020000	036173	000724	
000310:	044456	031062	020000	036164	000000	041456	031062	020000	
000320:	036164	000000	046117	040504	051000	036155	000000	163252	
000330:	041120	051000	036146	000000	040523	046502	020000	036137	SYSTEM I/O BUFFER
000340:	000000	037501	051503	047000	036137	000000	037501	051515	
000350:	041000	036137	000000	037502	047103	047000	036137	000000	
000360:	037502	050113	052400	036137	000000	037503	044117	050000	
000370:	033403	000000	000312	001534	177610	020040	020040	020040	
000400:	030471	027117	041524	027067	030040	000000	000000	000000	
000410:	000000	000000	000000	000000	000000	000000	000001	000003	
000420:	000003	000004	000002	000001	000005	000000	000000	050521	
000430:	050521	050421	044456	031461	020000	037515	051531	046400	
000440:	036137	000000	037522	046125	047000	036137	000000	037501	
000450:	043114	043400	036137	000000	037514	051524	046000	036137	
000460:	000000	037514	052516	044400	036137	000000	037522	051502	
000470:	000000	042101	000000	000000	000000	000000	000000	007552	
000500:	177771	000000	000000	000000	000000	003463	000000	000000	
000510:	000000	177750	000000	000000	000000	177777	177777	077777	
000520:	003327	000000	006407	000120	000001	000000	000000	000000	
000530:	114532	000000	001634	004160	004154	002214	003400	003511	
000540:	003020	002635	003744	003361	003426	004165	004267	002507	DISCM ENT POINT LINKS
000550:	004010	003244	003345	003177	001714	003563	004044	002212	
000560:	002653	002657	002661	002663	002665	002553	003214	003207	
000570:	003143	002576	002700	002631	002521	003130	003117	004243	
000600:	002445	004302	004303	004314	004376	000000	000000	000000	
000610:	004446	000000	000000	000000	000000	004505	000000	000000	EXEC ENT POINTS
000620:	000000	000000	000000	004671	005264	000000	000000	002322	
000630:	002222	002637	004262	004151	001746	004034	004125	004304	
000640:	004305	001736	001726	001723	004300	004301	004307	004272	
000650:	004312	004313	004310	004311	004274	004150	004126	004127	
000660:	004135	004124	004005	004024	004136	004035	004137	004277	DISCM PAGE LINKS
000670:	004131	004132	004133	004134	004270	004275	004130	004145	
000700:	004146	004147	003607	002213	003743	103575	003325	002463	
000710:	003204	003213	003220	003236	003003	005774	006011	006266	

DISC RESIDENT I/O DRIVER B.P. LINKAGE

EXEC SUBROUTINE LINKS

EXEC MO
DISC RE
LINKAGE

USER BASE PAGE LINKAGE

000720:	006354	006336	006372	105774	006330	006315	006410	006464
000730:	006660	006743	007567	000000	000000	000000	000000	000000
000740:	000000	000000	000000	000000	000000	000000	000000	000000
000750:	000000	000000	000000	000000	000000	000000	000000	000000
000760:	000000	000000	000000	000000	000000	000000	000000	000000
000770:	000000	000000	000000	000000	000000	000000	000000	000000
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001010:	021023	015342	015465	014302	014733	022213	115037	014623
001020:	015442	015754	020307	015124	015216	015221	014035	014711
001030:	020431	020432	014364	020433	020434	020435	015101	015557
001040:	021237	015623	014027	021051	022017	020443	020444	020445
001050:	020446	020447	020450	020451	020452	021015	014124	115101
001060:	014645	020453	015217	015256	017674	017377	017621	017661
001070:	022263	015753	021173	017625	020427	014435	014370	014353
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001130:	013157	012063	012636	013152	016551	013435	013626	013147
001140:	013627	013140	013166	016242	013142	013433	013434	013170
001150:	020426	013161	021647	020757	021016	017427	021001	013126
001160:	020624	017412	016276	016410	016267	016561	016026	016273
001170:	013141	016010	013163	015427	012645	015214	020330	020327
001200:	015755	020326	115427	015341	015317	012103	015466	015445
001210:	015570	022214	022052	015266	015443	015675	015430	015462
001220:	015432	015433	015434	021026	015227	015431	021042	013164
001230:	015756	015343	022326	015624	020323	020324	020325	022264
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001250:	022271	022267	022272	022305	022314	022320	022323	022324
001260:	014432	115442	014434	015131	020274	020015	022176	016415
001270:	017622	016416	015127	016376	016763	016720	017026	017623
001300:	015104	016422	017606	022463	022464	016411	016414	017600
001310:	017157	017156	022203	015444	022205	016417	016420	017632
001320:	016426	015722	013151	013133	016424	015037	015102	115102
001330:	016372	013174	016423	015720	022201	022204	022174	022036
001340:	022177	022207	022062	012722	022212	022210	022206	022211
001350:	022200	022215	022001	022003	021767	016241	021651	021664
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001370:	021541	021540	021461	021474	016721	116721	013154	020527
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001410:	020441	020442	014351	020314	012214	012215	012216	021000
001420:	020777	020653	020757	012213	021023	020043	020057	020206
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001440:	017661	017542	017624	113276	017421	017111	017112	017571
001450:	017077	117112	017423	017107	017424	017422	017110	017106
001460:	017103	017113	117110	017306	117107	017102	017114	013271
001470:	013267	017101	013275	017305	117436	021707	021663	021774
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001510:	144716	140722	154640	125215	105252	120311	147320	152724
001520:	120315	140731	120301	146323	147640	141305	120323	142714
001530:	142703	152305	142240	143317	151240	140640	151711	147307
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001570:	120240	120240	120240	120240	120240	120240	120240	120240
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001620:	120240	120240	120240	120240	120240	120240	120240	120240
001630:	120240	120240	120240	120240	120240	120240	120240	120240
001640:	070242	163634	170627	102504	033635	073646	103111	106504
001650:	054057	102004	054060	124630	054103	027754	044045	074000

FIC DISCM

Core resident

[SLIDE AP-7]

DISCM

001660:	002020	027714	003000	040202	002020	027714	044201	160001	
001670:	002003	027714	114552	102504	164204	114001	027776	060200	
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001710:	002002	027714	074260	124544	063634	017746	002001	027722	
001720:	017726	127634	017726	102100	102705	127634	001721	060241	
001730:	103101	000036	102101	060237	064240	127726	001637	070237	
001740:	074240	001520	102201	002004	070241	127736	002106	003000	
001750:	040254	002020	037746	127746	034105	027761	063775	070105	
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001770:	034106	060106	050110	124631	027714	176650	170217	070531	
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002040:	002001	026070	160211	114634	026070	060123	072052	160214	
002050:	066207	017361	002052	160220	164215	006021	026061	002004	
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002100:	002002	026163	160211	070505	164220	114634	026150	164635	
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002140:	027426	006400	074260	164220	160206	102100	102705	124505	
002150:	160206	124505	050056	002301	026641	160206	110637	150640	
002160:	026644	060056	026641	063213	002003	026171	060513	002021	
002170:	027256	160205	010072	053204	027244	063220	002003	124554	
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002220:	040052	002001	102505	070512	070242	072424	036424	160000	
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002240:	002001	026315	066424	160001	114634	026635	160001	070225	
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002270:	007004	036424	062266	070505	162424	016507	170505	034505	
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002450:	100607	100611	177777	002431	002431	002431	100603	100604	
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002470:	000022	000013	000004	176000	001777	114000	002214	004243	
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002510:	002003	026635	050054	026635	001275	002001	126507	160000	
002520:	026510	140646	070514	060232	070472	066552	074473	160647	
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DISCM

002620:	154650	026625	154651	026625	160232	170216	160233	170217
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002670:	060242	070472	002400	070245	160654	070474	160653	027020
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003040:	053116	027047	034477	034477	034500	027036	124474	003004
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003570: 060241 070517 060242 070520 127563 000000 074530 074472
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004060: 160001 001265 012304 052305 002041 026073 062072 044056
004070: 170001 124706 004045 052153 032152 170001 107700 144707
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004470: 002400 070245 044052 160001 102100 102705 124225 044057
004500: 160001 026467 002400 070245 124541 060472 072664 060473
004510: 072665 060245 052666 026537 060262 002002 026601 060525
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DISCM

$EXØ1

$EXØ2

$EXØ6

$EX11

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$EX11

$EX17

$EX18

$EX18

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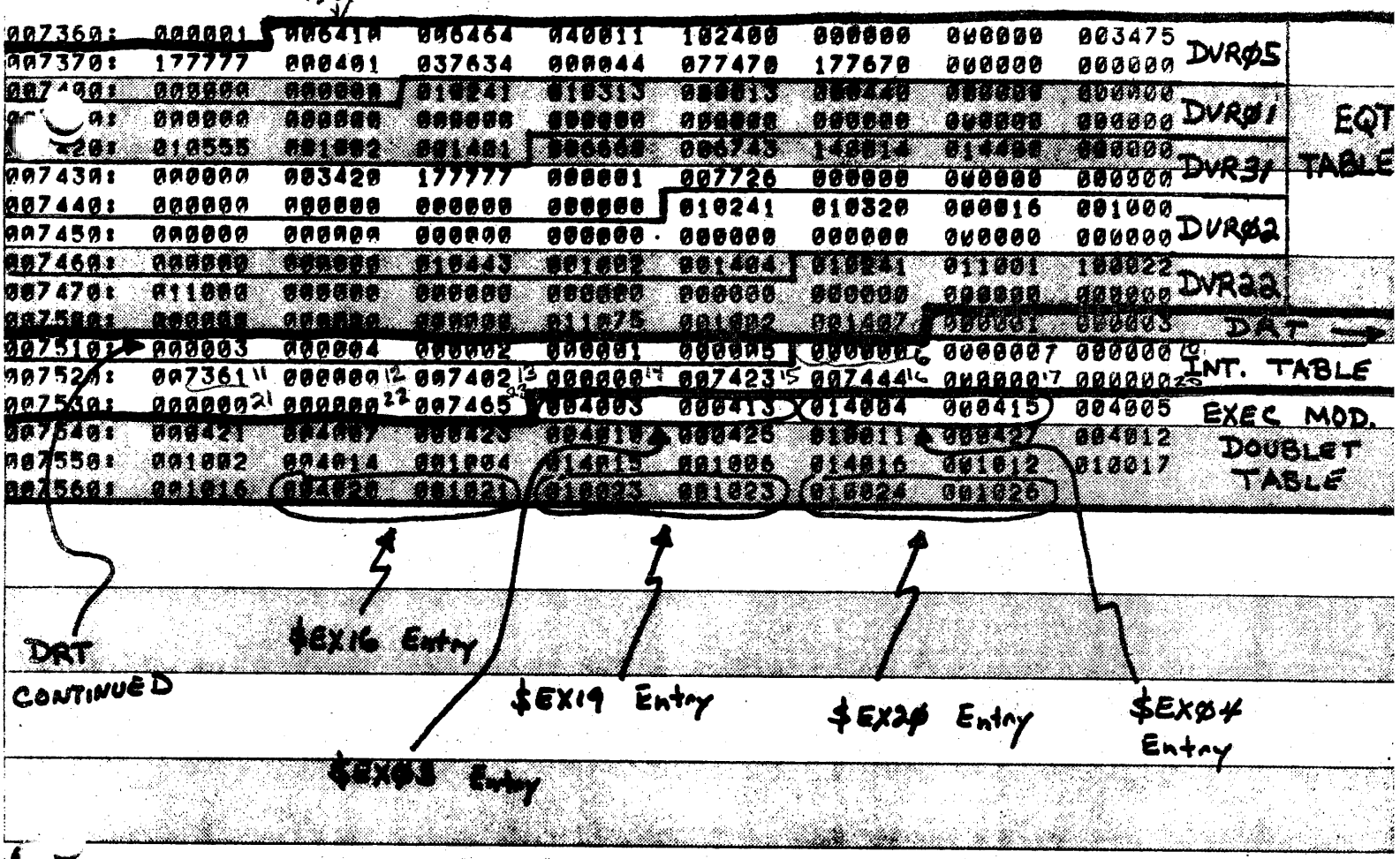
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