HP 3000 Computer Systems

MPE V TABLES MANUAL
MPE V/E (VUF G.08.00)
MPE V Release 23

HEWLETT PACKARD
8010 FOOTHILLS BLVD. ROSEVILLE, CA 95678

Part No. 32033-90147
E1091

Printed in U.S.A. 10/91

CAUTION

The normal checks and limitations that apply to the standard MPE users are bypassed in Privileged Mode. It is possible for a Privileged Mode program to destroy file integrity including the MPE operating system software itself. Upon request Hewlett-Packard will investigate and attempt to resolve problems resulting from the use of Privileged Mode code. This service is available on a time and materials billing basis. However, Hewlett-Packard will not support, correct, or attend to any modifications of the MPE operating system software.

LIST OF EFFECTIVE PAGES

The List of Effective Pages gives the date of the current edition, and lists the dates of all changed pages. Unchanged pages are listed as "ORIGINAL". Within the manual, any page changed since the last edition is indicated by printing the date the changes were made on the bottom of the page. Changes are marked with a vertical bar in the margin. If an update is incorporated when an edition is reprinted, these bars and dates remain. No information is incorporated into a reprinting unless it appears as a prior update.

First Edition(G.03.00) . . . . . June 1987
Second Edition(G.03.05) . . . . . November 1988
Third Edition(G.03.05) . . . . . April 1989
Fourth Edition(G.03.07) . . . . . August 1989
Fifth Edition(G.23.00) . . . . . October 1991

Effective Pages	Date
ALL	June 1987
ALL	November 1988
ALL	April 1989
ALL	August 1989
ALL	October 1991

PRINTING HISTORY

New editions are complete revisions of the manual. Update packages, are NOT issued for the MPE V TABLES MANUAL The date on the title page and back cover of the manual changes when a new edition is published.

The software date code number printed alongside the date indicates the version level of the software product at the time the manual edition or update was issued. Many product updates and fixes do not require manual changes, and conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

First Edition	JUNE 1987	G.03.00
Second Edition	NOVEMBER 1988	G.03.03
Third Edition	APRIL 1989	G.03.05
Fourth Edition	AUGUST 1989	G.03.07
Fifth Edition	OCTOBER 1991	G.23.00

CONTENTS

CONTENTS (Continued)

CHAPTER 3 DISC LAYOUT

CHAPTER 4 DIRECTORY

CONTENTS (Continued)

CHAPTER 5 LOCK RESOURCES

CHAPTER 6 FILE SYSTEM

CHAPTER 7 PROCESS TABLES

CONTENTS (Continued)

CHAPTER 10 PREPARED OBJECT CODE

CONTENTS (Continued)

CONTENTS (Continued)

CHAPTER 13 I/O

CONTENTS (Continued)

CONTENTS (Continued)

CHAPTER 15 UNIFIED COMMAND LANGUAGE (UNCL)

CHAPTER 16 SYSDUMP/INITIAL

CONTENTS (Continued)

CHAPTER 17 MISCELLANEOUS

CHAPTER 18 MESSAGE FILES

CONTENTS (Continued)

CONTENTS (Continued)

CONTENTS (Continued)

CHAPTER 22 DISC FREE SPACE MAP

CHAPTER 23 MPE DISC CACHING

CHAPTER 24 NATIVE LANGUAGE SUPPORT

CONTENTS (Continued)

CHAPTER 25 ATP/ATP37/ADCC

PREFACE

This edition of the MPE Release 23 Tables Manual describes the internal table organization of the MPE V operating system. It is intended for the technically sophisticated user with Privilege Mode capability. We strongly discourage modifying the contents of the MPE tables because you may destroy the operating system. The following caution applies:

CAUTION

The normal checks and limitations that apply to the standard MPE users are bypassed in Privileged Mode. It is possible for a Privileged Mode program to destroy file integrity including the MPE operating system software itself. Upon request Hewlett-Packard will investigate and attempt to resolve problems resulting from the use of Privileged Mode code. This service is available on a time and materials billing basis. However, Hewlett-Packard will not support, correct, or attend to any modifications of the MPE operating system software. Hewlett-Packard reserves the right to change the structure and the content of any system tables in future releases of MPE.

The major highlights of this edition include:

- Corrections/Additions were made in bringing the information up to Release 23.

We hope you will find this edition informative. Your comments and suggestions are welcome via the "Reader Comment Sheet" at the back of this manual.

CHAPTER 1 MEMORY LAYOUT

Fixed Low Memory (Series 3x/4x/5x/6x/70,Micros)

X		DEC	
0	CSTB (BASE OF CST TABLE)**	0	
1	XCSTB (POINTER TO CURRENT EXECUTING PROGRAM BLOCK)	1	
2	DSTB (BASE OF DST TABLE)**	2	
3	0	3	
4	CPCB (CURRENT PCB INDEX)**	4	>PCB REL
5	QI (INITIAL Q FOR ICS)**	5	
6	ZI (INITIAL Z FOR ICS)**	6	
7	SYSTEM INTERRUPT MASK WORD**	7	
10	DRTBANK (BANK OF DRT TABLE)	8	
11	DRTADDR (BASE OF DRT TABLE)	9	
12	DBBANK (FOR INITIAL'S STACK)*	10	
13	DB (FOR INITIAL'S STACK)*	11	
14		12	
15		13	
16		14	
17		15	
20		16	
21	LR (INTERRUPT INTERVAL)+	17	
22	TEMPLR (TEMP STORAGE OF LIMIT REG)+	18	
23	LR (SYSTEM CLOCK LIMIT REGISTER)**	19	
24		20	

Fixed Low Memory (Series 44/48/64/68) (Cont.)

25	TR (TIME SINCE LAST SOFT TIMER INTERRUPT)**	21
26	SCST (SYSTEM CLOCK STATUS)**	22
27	SCLC (SYSTEM CLOCK LAST COUNT)**	23
30-37		24-31

NOTE: All pointers are absolute addresses.

LEGEND: ** Needed by Firmware and/or by System, always
* Needed during INITIAL
\+ Needed by MPE, set up by INITIAL or PROGENITOR

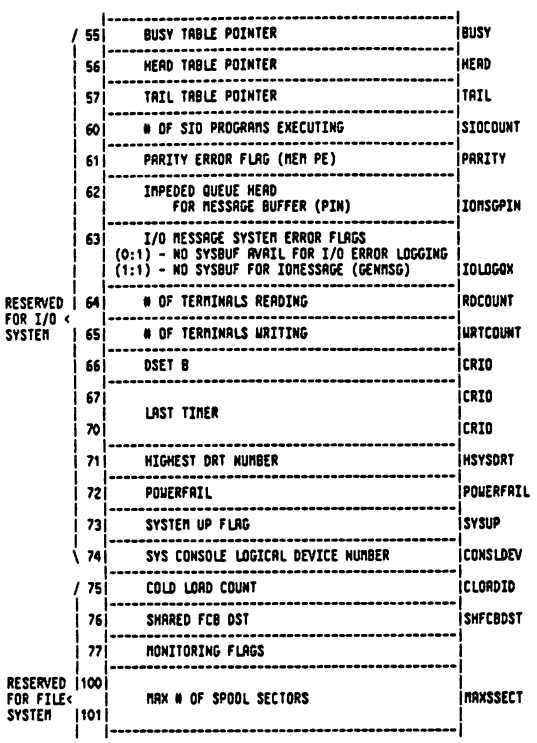
System Global Area

OCTAL	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NAME
0	SYSGLOB																
1	CST BASE																CST
2	DST BASE																DST
3	PCB BASE																PCB
4	SWAPTAB BASE																$LL
5	IOQ BASE																IOQ
6	SBUF BASE																BUF
7	ICS QI																ICS
10	LPDT BASE																LPDT
11	SMON BASE																SMON
12	TRL BASE																TRL
13	JCUT BASE																SIR
14	SIR BASE																SDCTAB
15	JPCNT BASE																JPCNT
16	TBUF BASE																BUF
17	DISC REQUEST BASE																DRQ
20	MEMORY ADDRESS OF FIRST LINKED MEMORY REGION																
21																	
22	TIME OF LAST CYCLE																
23																	
24	RESERVED																
25	BREAK POINT FLAG													LK	SY		BPTF

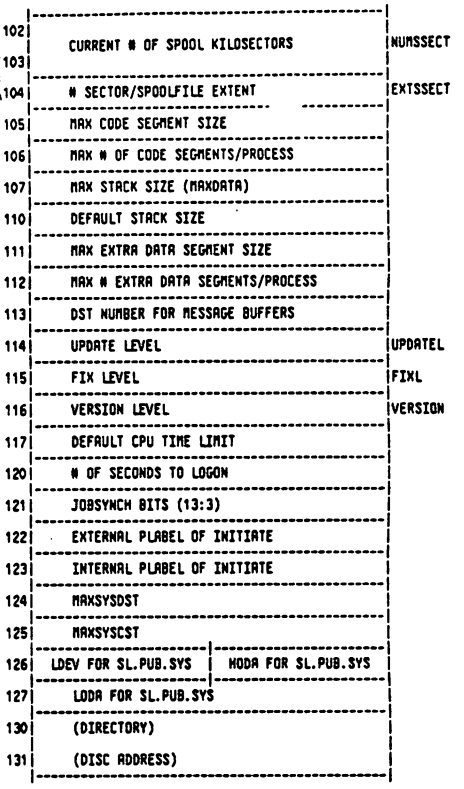
System Global Area (Cont.)

26	VDSNTAB BASE	VDSNTAB
27	STATIC FENCE (# CONFIGURED MEMORY BANKS)	
30	CURRENT CST BLOCK INDEX	CSTBX
31	MEASIO BASE	MEASIO
32	DISPLACEMENT TO CODE = @CST(0)-@DST(0)	DFC
33	DISPLACEMENT TO SHARABLE = @CST(LAST)-@DST(0)	DFS
34	SMON INDEX	
35	ABSOLUTE ADDRESS (SYSDIT(8))	DIT8
36	RESERVED	SBANK
37	ABSOLUTE ADDRESS OF PMBC TABLE FOR LST/STT CHECKING	SBASE
40	RESERVED FOR INITIAL (VDSENTRY)	
41	RESERVED FOR INITIAL (VDSMAP)	
42	SRTTAB BASE	SRTTAB
43	SPECQ HEAD	SPECQHEAD
44	NUMBER OF AVAILABLE REGIONS	HOLECOUNT
45	NUMBER OF PAGES IN LARGEST CURRENTLY AVAILABLE REGION	MAXAVAILREG
46	MAKE OVERLAY CANDIDATE INFORMATION	MOCINFO
47	NUMBER OF MEMORY BANKS CONFIGURED - 1	NBANKS
50	SCHEDULER TO AWAKE MESSAGE	DISPTOAWAKEMSG
51	CSTBLK TABLE BASE ADDRESS	CSTXBLCKPOINTER
52	PRIORITY OF PROCESS TO BE SERVICED NEXT	AWAKETOSCHEDMSG
53	WAIT --> DISP COMMUNICATION WD	WAITTODISPMSG
54	CURRENT ACTIVITY'S PRIORITY	CURACTPRI

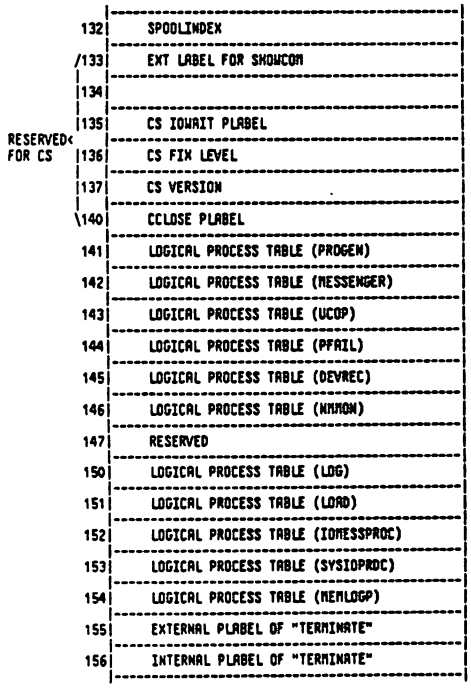
System Global Area (Cont.)



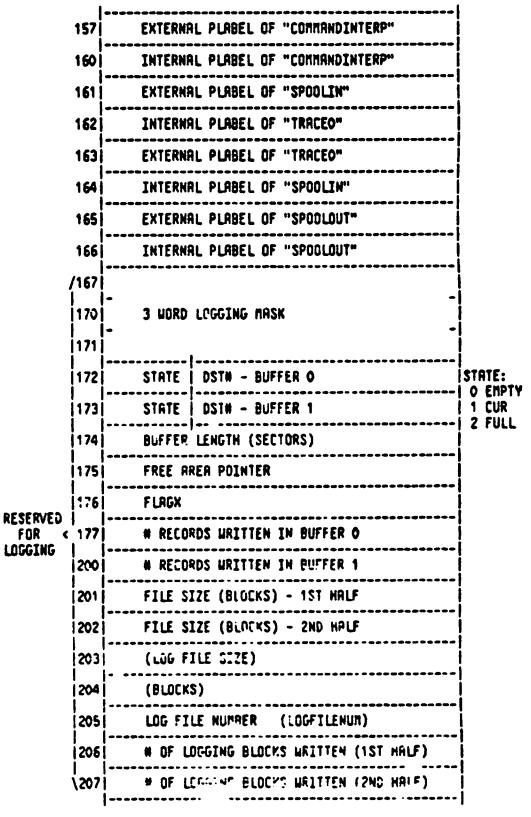
System Global Area (Cont.)



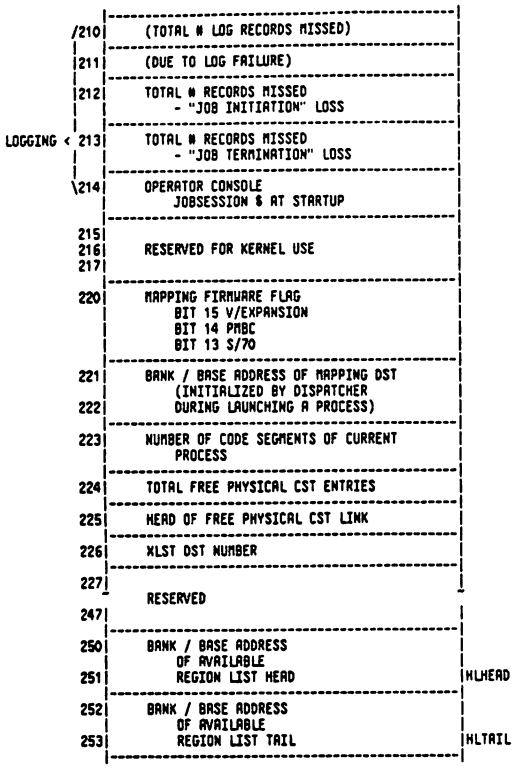
System Global Area (Cont.)



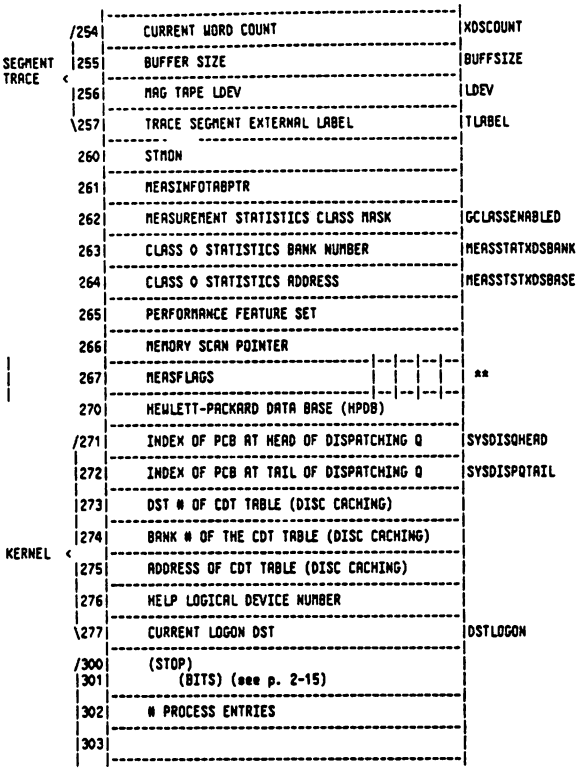
System Global Area (Cont.)



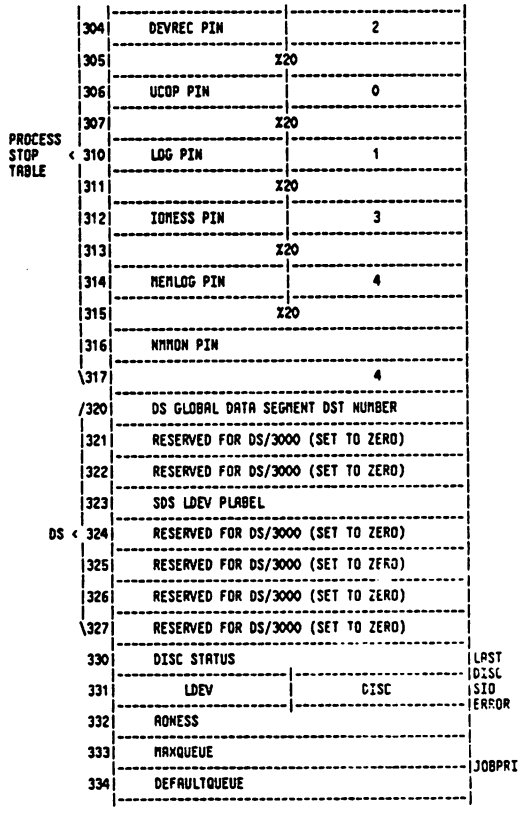
System Global Area (Cont.)



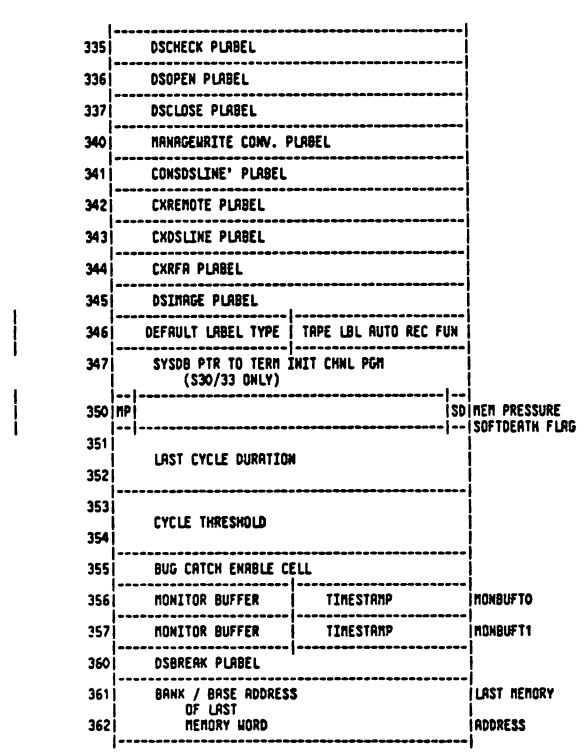
System Global Area (Cont.)



System Global Area (Cont.)



System Global Area (Cont.)



System Global Area (Cont.)

	/363	PVPROC PIN				
	364	PV RECOGNITION COUNT				
PRIVATE VOLUMES	365	VMOUNT FLAGS	MT	AU	AL	ON
	366					
	367					
	\370					
	371	MSG CATALOG LDEV				
	372	MESSAGE CATALOG DISC ADDRESS				
	373	MSG DST				
	374	CONSMPLINE' PLABEL				
	375	CONSMRJE PLABEL				
	376	SYSTEM LEVEL UDC FLAG (1 = SYS UDC'S EXIST)				
	377	SYSDB RELATIVE POINTER TO SYSGLOB EXTENSION				
	400	CPU NUMBER (SET BY SOFTDUMP)				
	/401	MICROCODE MEMORY LOCATIONS *NOTE THAT THE CONTENTS DEPEND ON THE TYPE OF CPU THAT MPE IS RUNNING AND WHETHER A DUMP, POWERFAIL, OR CNTL B/HALT HAS OCCURRED				
	\402					

** MEASFLAGS (12:1) = 1 = Tape Error
(13:1) = 1 = EOT on Monitor Tape
(14:1) = 1 = Buffer Flip/Flop
(15:1) = 1 = Monitor Enabled

VMOUNT Flags: MT - mount
AU - auto
AL - all
ON - on

The following locations refer to all systems:

X1401 = DUMPDEVORT	X1406 = Q	X1413 = PB - BANK
1402 = X	1407 = S	1414 = PB
1403 = DL	1410 = S - BANK	1415 = P
1404 = DB - BANK	1411 = Z	1416 = PL
1405 = DB	1412 = STATUS	1417 = CIR
		1420 = High Bank

The following locations refer exclusively to the Series 37:

X1421 = Microcode Version Number
Bit (0:2) 00 = Master Released
10 = Pending Release
11 = Experimental
Bit (2:6) Base Level (1-64)
Bit (8:8) Patch Level (1-99)
X1422 = Flags/Misc
BIT (0:1) 1 If On ICS
Bit (1:1) 1 If In Dispatcher
Bit (2:1) Logical/Physical
1 If Logical
Bit (3:1) 1 If Channel Program Is Running
Bit(4:1) Split Bank Flag
1 If Split
Bit(5:3) Unused
Bit(8:8) Last Stop Code
X1423/7377 = Channel Program Area For Booting Software
(Used Only During Boot).

The following are assignments after software has been loaded and launched:

X1540/1617 = ROM Input Buffer For Terminal I/O
1620/1677 = ROM Output Buffer For Terminal I/O
1700/1710 = ROM Control Buffer For Terminal I/O
1711/1737 = ROM Control B Interface Buffers

The following assignments refer to the Series 3x/4x/5x/6x/70,Micros

30/33/39/4x/5x	6x/70
X1421 = System Halt #	X1421 = CPK1 Register
1422 = ISR (Interrupt Register)	1422 = CPK2 Register
	1514 = System Halt Flag
X1515 = System Interrupt Mask	X1515 = MIR Register
1516 = DRT 0	
1517 = DRT 1	37/6x/70,Micros
1520 = DRT 2	
1521 = DRT 3	1516 = DRT 0
	1517 = DRT 1
	1520 = DRT 2
	1521 = DRT 3
	1522 = DRT Bank
	1523 = DRT Address Offset
	(6x/70 only) 1524 = Interrupt Mask For IMB0
	(6x/70 only) 1525 = Interrupt Mask For IMB1
	(6x/70 only) 1526 = Interrupt Mask For IMB2
	(6x/70 only) 1527 = Interrupt Mask For IMB3

All Systems: 1740 = Start Of SysGlob Extension

System Halt Flag: 0 - Unexpected (unknown) Interrupt
1 - STT Violation in Segment #1
2 - Absent Segment while executing on the ICS
3 - Absent or Trace on Segment #1
4 - Stack Overflow on the ICS
5 - CST Table length (word 0) found to be 0
6 - Bootstrap Channel Program Timeout
7 - Bootstrap Checksum Error
8 - Bootstrap Channel Program Abort
9 - PSEB Instruction while QI-18 = 0
10 - Module Send Message Timeout
11 - Incorrect Module Responding
12 - Channel not System Controller
13 - Code Segment Violation while in Segment #1
14 - Non-responding Channel
15 - Channel 0 Responding (to IPOLL)
16 - No CSRQ or IRQ on Message Interrupt
17 - Channel cannot be made Controller-in-charge
18 - Module Receive Message Timeout
19 - I/O Error, Parity or Timeout
20 - WCS Checksum Error
21 - LUT Checksum Error
22 - Bad CPU Command Code

SysGlob Extension

X200 words long; Pointer found at SysDB + X377

X 0	SWAP QUEUE DELAY (*100MS)	SWAPQDELAY
1	BANK / BASE ADDRESS OF FIRST MEMORY REGION IN LINKED MEMORY	FIRST MEMORY REGION
2		
3	GARBAGE COLLECTION ENABLE FLAG	GARBCOLLENAB
4	MOVE THRESHOLD (IN PAGES, FOR GARB COLL)	MOVETHRESH
5	MAIN MEMORY PAGE SIZE (IN WORDS)	
6	VDS PAGE SIZE	
7	TIME OF LAST MAKEROOM CALL	HOTIMELAST-MAKEROOM LOTIMELAST-MAKEROOM
10		
11	MEMORY PRESSURE DURATION THRESHOLD	
12	NATIVE LANGUAGE TABLE (NLT) DST #	
13	RESERVED FOR NATIVE LANGUAGE SUPPORT	
14	BAUD RATE OF THE SYSTEM CONSOLE	
15	INITIAL LDEV OF SYSTEM CONSOLE	
16	PLABEL FOR REMOTE'MPE	
17	PLABEL FOR GETDS'NODENAME	
20	WCS VERSION	
21	WORD 0 MICROCODED PROCEDURES, PERFORMANCE FEATURE SET BIT MAP	
22	WORD 1 MICROCODED PROCEDURES, PERFORMANCE FEATURE SET BIT MAP	
23	WORD 2 MICROCODED PROCEDURES, PERFORMANCE FEATURE SET BIT MAP	
24	WORD 3 MICROCODED PROCEDURES, PERFORMANCE FEATURE SET BIT MAP	

SysGlob Extension (Cont.)

For Word 3 (X24) the following applies:

Bit 15 is set if ERRORON'70 is present
Bit 14 is set if ERROREXIT'70 is present
Bit 13 is set if EXCHANGEDB'70 is present
Bit 12 is set if TIMER'70 is present
Bit 11 is set if TIMEREQ'70 is present
Bit 10 is set if MMSTAT'70 is present

30	SECURITY TABLE			
56				
57				
60	PLABEL USERLOG (EXTERNAL)			
61	PLABEL USERLOG (INTERNAL)			
62	PLABEL RECLOG (EXTERNAL)			
63	PLABEL RECLOG (INTERNAL)			
64	PLABEL RESTART (EXTERNAL)			
65	PLABEL RESTART (INTERNAL)			
66	PMBC LOW CORE BANK # (USER)			
67	PMBC LOW CORE ADDRESS (USER)			
70	RESERVED FOR IMAGE			
71	RESERVED FOR MERSIO	MIOCNT	*	
72	LOADER CACHE SEGMENT NUMBER			
73	PLABEL 3270 (EXTERNAL)			
74	VERSION			
75	UPDATE			
76	FIX			

SysGlob Extension (Cont.)

77	COUNT OF TAPE CONTROLLERS USING MERSIO		
100	PORT DATA SEGMENT NUMBER		
101	RESERVED FOR SECOND PORT DATA SEGMENT		
v	SYSTEM FPMAP OPTION FLAG	SYSFPMAP	
103			
104			
105			
106	GLOBAL ALLOW MASK		
107			
110			
111	MMSTAT ENABLE WORD	***	
112	RESERVED		
117			
120	SYS PORT PROCESS PCB RELATIVE INDEX		
121	GLOBAL AFT DST NUMBER		
122	INITIAL/PROGEN COMM. DSEG NUMBER (CH. 16)		
123	INITIAL SYSTEM STARTUP OPTION		
124	PORT'MAX'SER'COUNTER		
125			
126	CURRENTLY UNASSIGNED		
127			
130	Address Allocation DST	SYSGLOB EXT. X130 - X144 HAVE BEEN ALLOCATED TO NS TRANSPORT	
131	IPC Plabel		
132	Multicast DST		
133	PD DST		
134	IP Update DST		
135	Node Name DST		
136	Address Reference DST		
137	IP Identification		

SysGlob Extension (Cont.)

140	SM4 DST	
141	Flags word	
142	Trigger DST	
143	Util. DST	
144	FastPath SM4	
145	RESERVED FOR SPL	
146	PATH FLOW	
147	ANALYZER	
150		
151	PC SUBSYSTEM INFO	
152	KODIAK M-CODE PERFORMANCE	
153	MAESTRO'WORD	
154	MAESTRO DST-NUMBER	
155	<< SYSGLOB X155 IS UNUSED >>	
156	PSEUDO TERMINAL LINKAGE	
157	VIRTUAL TERMINAL LINKAGE	
160	DST # FOR NS/3000, X.25 PRODUCT STARTED	
161	PAD (Package Assembly/Disassembly)	
162	MPE PRODUCT VERSION LEVEL (VD4 and later)	
163	MPE PRODUCT UPDATE LEVEL (VD4 and later)	
164	MPE PRODUCT FIX LEVEL (VD4 and later)	
165	NS/X.25 DST # (VD6 and later)	
166	PLABEL OF TAPE MGMT CATALOG PROCEDURE	
167	RESERVED FOR KNOWN VENDOR TABLE	
200		

* MIOCNT = MERSIOCOUNT (3 BITS)

*** BIT 0 = Enable HARDRES MMSTAT call

MAESTRO'WORD DEFINITION
(0:1) = 1 = START'UP'BIT
(1:9) - (Not Used)
(10:1) = 1 = Pending Spooler Request
(11:1) = 1 = Queue Entry in XDS

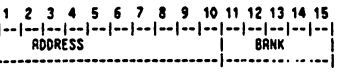
MAESTRO DST-NUMBER - Contains the DST index for the XDS shared between Filter and GENMSG.

NS/X.25 DST#(word X165) - DST # for the MPE V/E NS/X.25 TRANSPORT link for INP's.
STARTUP OPTION(word X123) - Contains the last LOAD/START option as follows:

0 = WARMSTART
1 = COOLSTART
2 = COLDLOAD(or COLDSTART)
3 = UPDATE
4 = RELOAD (ACCTS/NULL/SPREAD)
5 = RELOAD (COMPACT)
6 = RELOAD (RESTORE)

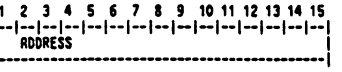
SYSDB Words

System tables may be accessed by using the LST/SST instructions. Pointers have the following format:



Address is the whole word with "Bank" masked out to 00000

Systems that have MPE V/E microcode (all 6X systems, 4X systems with new boards) can have a non-zero bank number. Systems running pre-MPE V/E microcode can only use bank 0, therefore the pointer will look like:



SysGlob Word Definitions

ADDRESS	NAME	FUNCTION
DB+55	BUSY	- SYSDB relative pointer to BUSY TABLE for I/O resources
DB+56	HEAD	- SYSDB relative pointer to table containing head pointers to I/O resource queues
DB+57	TAIL	- SYSDB relative pointer to table containing head pointers to tail of I/O resource queues
DB+60	SIO COUNT	- Number of I/O Programs currently executing
DB+72	POWER FAIL	- 0-no power fail 1-system disc recovery 2-all other disc recovery 3-all other device recovery
DB+73	SYSUP	- System is up and operable
DB+74	CONSLDEV	- System console logical device number
DB+400	CPU NUMBER	- Set when system aborts

JOBSYNCH - Job synchronization via jobsynch (sysglob+121(8))

(13:1) - JOBSREADY - set by DEVREC & MORGUE (via procedure STARTDEVICE) indicating a ready job. This prevents UCOP from going to a wait state when a job is just made ready.

(15:1) - DEVFREED - set by DEALLOCATE when device count goes to 0.

NOTE: Both bits above used for synchronization of job-made-ready or devicefreed when UCOP is running.

(14:1) - JOBSWAITING- set by UCOP just before waiting if any job is waiting for list device. Signals DEALLOCATE to awake UCOP when a device is freed.

Allow Mask Format

The Allow mask for MPE V is expanded to six words. There is a mask in each user's JIT and in the SYSGLOB area. The Allow mask contains enough bits for a one-to-one correspondence to every present OPERATOR type command, or any future OPERATOR command. When a user is ALLOWed any OPERATOR command or ASSOCIATEd to a device (which will use OPERATOR type commands) then the corresponding bit(s) in the mask in that user's JIT for that command is set. If the ALLOW or ASSOCIATE was done on a global scale, then the bit(s) in the mask of the SYSGLOB area is/are updated.

The following EQUATEs define the mask bit for each operator command.

The first set of commands define the operator commands dealing with devices.

When adding a new command to this set of EQUATEs, be sure to add a corresponding move statement in LOGIMAGE, even if the command will not be logged.

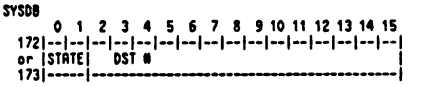
	Word	Bit	#
ABORTIO	0	0	0
ACCEPT	0	1	1
DOWN	0	2	2
GIVE	0	3	3
HEADOFF	0	4	4
HEADON	0	5	5
REFUSE	0	6	6
REPLY	0	7	7
STARTSPOOL	0	8	8
TAKE	0	9	9
UP	0	10	10
MPLINE	0	11	11
DSCONTROL	0	12	12

Allow Mask (Cont.)

	Word	Bit	#
UPPER LIMIT->DEVICE COMMANDS			
ABORTJOB	0	13	13
ALLOW	0	14	14
ALTSPOOLFILE	0	15	15
ALTJOB	1	0	16
BREAKJOB	1	1	17
DELETESPOOLFILE	1	2	18
DISALLOW	1	3	19
JOBFENCE	1	4	20
LIMIT	1	5	21
STOPSPOOL	1	6	22
SUSPENDSPOOL	1	7	23
OUTFENCE	1	8	24
RECALL	1	9	25
RESUMEJOB	1	10	26
RESUMESPOOL	1	11	27
STREAMS	1	12	28
CONSOLE	1	13	29
WARN	1	14	30
WELCOME	1	15	31
MON	2	0	32
MOFF	2	1	33
VMOUNT	2	2	34
LMOUNT	2	3	35
LDISMOUNT	2	4	36
RJECONTROL	2	5	37
JOBSECURITY	2	6	38
DOWNLORD	2	7	39
MIOENABLE	2	8	40
MIODISABLE	2	9	41
LOG	2	10	42
FOREIGN	2	11	43
IMFCONTROL	2	12	44
SHOWCOM	2	13	45
OPENQ	2	14	46
SHUTQ	2	15	47
DISCRPS	3	0	48

Logging Related Locations

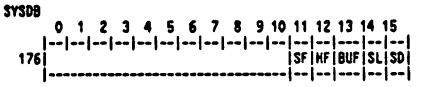
SYSDB



STATE = 0 if respective buffer empty
1 if respective buffer is current
2 if respective buffer is full

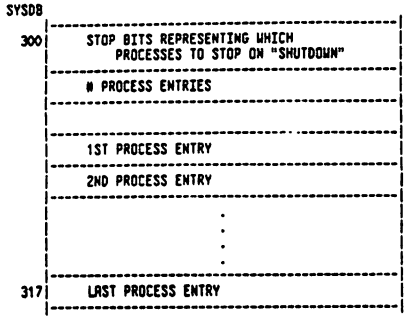
FLAGX

SYSDB

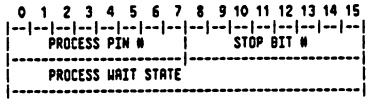


SF = 1 if soft failure
HF = 1 if hard failure
BUF = 0 if current log buffer is buffer 0
= 1 if current log buffer is buffer 1
SL = 1 to indicate a switch in log buffers (from 0 to 1 or from 1 to 0)
SD = 1 to indicate shutdown in progress

Process Stop List General Layout



Entry Format



Preassigned Entries

ENTRY #	PROCESS	STOP BIT #
1	devrec	2
2	ucop	0
3	log	1

Initial Memory Allocation

This section is a description of the method used by INITIAL to allocate memory for MPE tables and code segments in MPE V/E. All memory allocated by INITIAL is permanently allocated. All non-core resident code and data is put on disc before exiting INITIAL.

At the most basic level INITIAL will try to build memory to look exactly as diagramed below. There are, however, several ways in which to deviate from this structure. Before going into the sources of these deviations, it is necessary to point out which portions of memory are used by INITIAL during the restart and, therefore, cannot be used by MPE until INITIAL has finished.

Before INITIAL begins to allocate any memory space, it relocates its core resident code, its code segment swapping area and its stack to the highest configured memory space. Additionally, it uses the last %326 words of bank 0 on series 4X machines for its I/O buffer area and temporary code segment table. After INITIAL has built all of core resident MPE (tables and code), it builds the disc resident MPE tables. Since some of the disc resident tables may be too large to be built in INITIAL's stack, these tables are built in unused memory space. Therefore, in addition to the memory space required for INITIAL's code, INITIAL's stack and core resident MPE, there must be enough space left in which to build the largest of the disc resident tables.

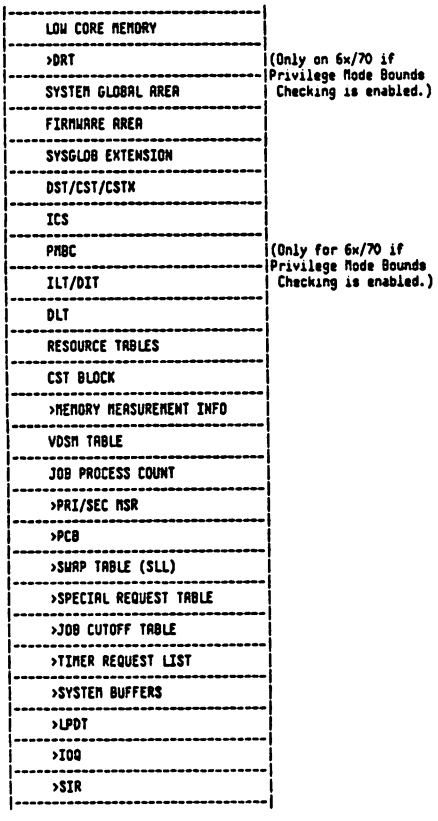
For Series 6X machines with the MPE V/E firmware, INITIAL will build the tables with ">" signs by them out of Bank 0 if necessary. For all other tables, INITIAL will essentially build memory in the order shown below. There may be an unused fragment of memory between the DRTs and the system global area which INITIAL will fill with the smaller tables. Neither the tables marked with an asterisk nor the code segments will ever be put in this area. NOTE: INITIAL will build all tables on 32-word boundaries.

If the system being built by INITIAL is configured with 128K words or 160K words of memory then INITIAL's stack will be in bank 1 (the code also on a 128K word memory size). If INITIAL is occupying part of bank 1 and the space is needed for a core resident MPE code segment or to build a disc resident table then INITIAL will print the error message "ERROR #350 OUT OF MEMORY".

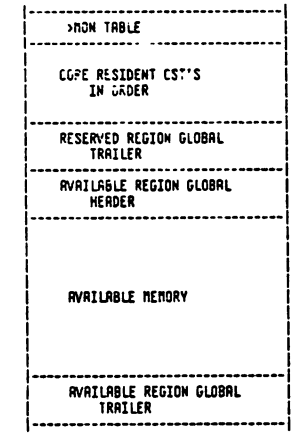
Except for the exceptions stated above, for every allocation of memory INITIAL will first try to allocate any remaining space between the DRTs and SYSDB. It will then try the next available space in bank 0, then the next available space in bank 1. If it were necessary it could continue searching until all all banks were checked for available space.

Immediately before exiting INITIAL, INITIAL lays down all the memory region headers and trailers as shown below. For any one bank of memory there will only be one block of core resident MPE, regardless of its contents. The only block of core resident MPE that does not have a reserved region global header is in bank 0. It does have the reserved region global trailer though. Before placing any code outside bank 0 the first 24 words of every bank (except bank 0) is reserved for the region global header.

Bank 0

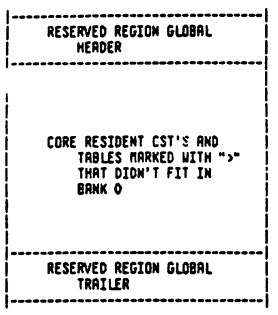


Bank 0 (Cont.)



NOTE: The > means these tables can move out of Bank 0 if necessary.

Bank 1

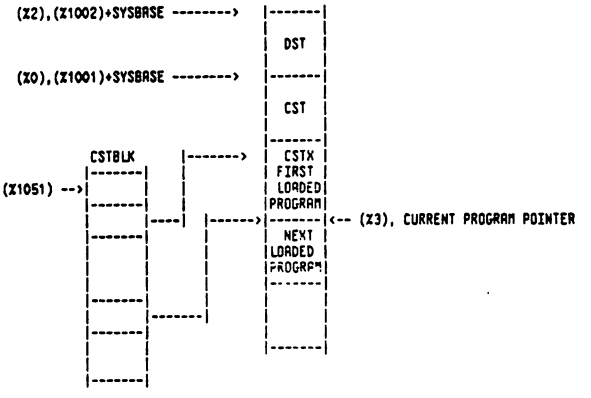


CHAPTER 2 MEMORY MANAGEMENT TABLES

Segment Table Structure

The current location and state of each data segment and loaded code segment is maintained in the Segment Table. This table is partitioned into three separate tables as shown below. The partitions are based on the segment classes: a segment is a data segment, a segment is a system SL segment, or a segment is part of a program. The structure and format of each partition is described in the following.

Overall ST Structure



Pointers and DST #'s of Segment Table Components

i. DST

X 2 absolute address of entry 0 of the DST.
X1002 sysbase relative index of entry 0 of DST.
DST number 2 is the DST Table DST #.

ii. CST

X 0 absolute address of entry 0 of System SL.
X1001 sysbase relative index of entry 0 of System SL.
X1032 displacement from DST base of entry 0 of System SL (i.e., @CST(last) - @DST(0) = DFS).
DST number 1 is the CST Table DST #.

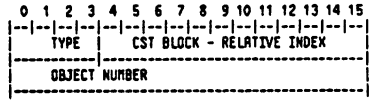
iii. CSTX

X 1 absolute address of entry 0 of current program.
X1033 displacement from DST base to first CSTX entry SL.
DST number 4 is the CSTX Table DST #.

iv. CSTBLK

X1051 sysbase relative index of CST Block Table.
DST number 35 (X43) is CSTBLK's DST #.

Standard Object Identifier Format

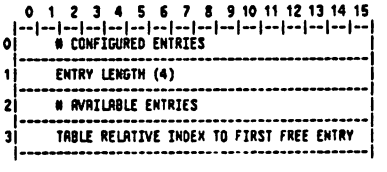


OBJIDENTIFIER(0).(0:4) = TYPE
= 0 Object is a Data segment
= 1 Object is an SL segment
= 2 Object is a Program segment
= 3 Object is a Cache Domain

OBJIDENTIFIER(0).(4:12) = CST BLOCK Table index to list of CST segments
OBJIDENTIFIER(1).(0:16) = Number field:
DST, CST, CSTX, or CDT number

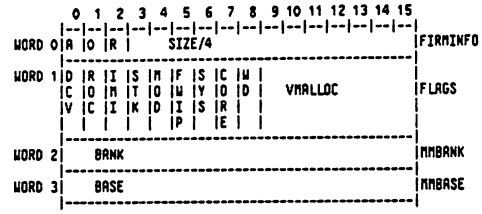
DST Entry Formats

DST/CST Entry 0 Format

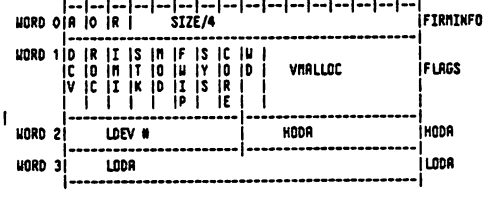


DST General Entry Format

Case (i) DST Entry for a Present Data Segment



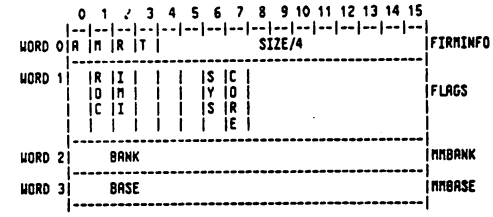
Case (ii) DST Entry for an Absent Data Segment



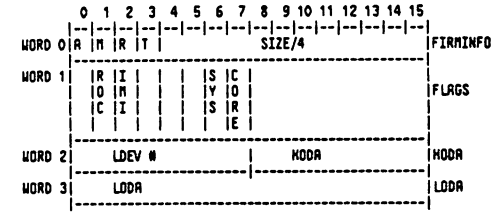
CST Entry Formats

CST General Entry Format

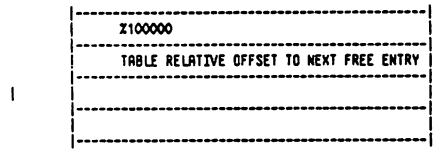
Case (i) CST Entry for a Present SL Segment or CSTX Segment



CASE (ii) CST Entry For An Absent Segment SL or CSTX Segment



Case (iii) DST/CST Free Entry

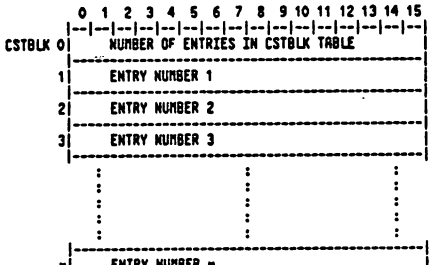


Refer to the Logical Segment Table Format in Chapter 11 for more information on XCST.

CST Entry Field Descriptions

A = 1 = segment absent
M = 1 = segment privileged
R = 1 = segment has been referenced
T = 1 = segment is being traced
DCV = 1 = disc copy is valid
STK = 1 = segment is a stack
MOD = 1 = a segment change in size or location is requested
FWIP = 1 = a forced write of this segment is in progress
VMPAGECNT = # of virtual memory pages allocated to this segment
ROC = 1 = segment is recoverable overlay candidate
IMI = 1 = segment is in motion in
SYS = 1 = segment is a system segment
CORE = 1 = segment is core resident
WD = 1 = write disabled

CSTBLK Format

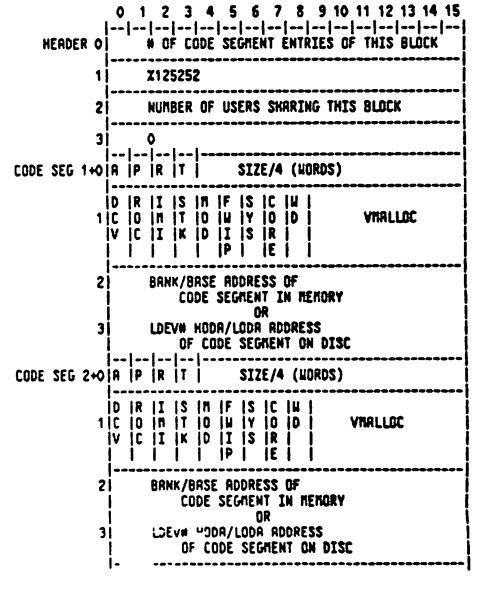


The table entries are initialized to -1 to denote an unassigned entry. When an entry is assigned, its contents is replaced with a DST relative address which points to the header entry of the code segment list (see the CST EXTENSION table format for more information).

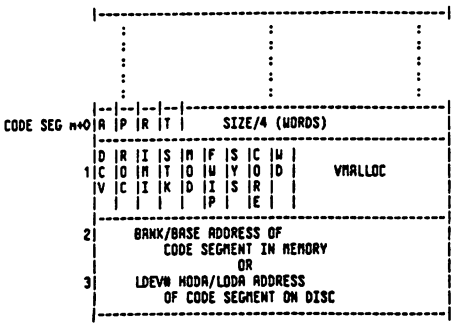
CST EXTENSION and the CSTXMAP

Since programs can be dynamically loaded and unloaded, the segment table must be kept packed or fragmentation would occur. Thus, the block of ST entries for a program segment begins at an ST entry number that changes if a program which was loaded before it gets unloaded. To manage this dynamic structure, an auxiliary structure, the CSTXMAP is used. The CSTXMAP is a contiguous block of entries inside the CST EXTENSION. It contains a header entry describing the block of entries and a group of CST entries describing each of the program code segments. The start of the CSTXMAP is pointed to by an entry (CSTXEIX) from the CST BLOCK (CSTBLK) table.

Entry Format - CSTXMAP



Entry Format - CSTXMAP (Cont.)



The value of CSTXEIX is established when a CST extension block is allocated. This index into the array CSTBLK is maintained in the PCB of each process sharing the block.

Fixed DST Entry Assignments

OCTAL		DECIMAL	TABLE NAME
0		0	
1	CST	1	CST
2	DST	2	DST
3	*PCB	3	PCB
4	CSTX	4	CSTX
5	SYSTEM GLOBAL AREA	5	SYS
6	CORE	6	CORE
7	ICS	7	ICS
10	*SYSTEM BUFFERS	8	SBUF
11	UCOP REQUEST QUEUE	9	UCRQ
12	PROCESS-PROCESS COMMUNICATION TABLE	10	PPCOM
13	*I/O QUEUE	11	IOQ
14	TERMINAL BUFFERS	12	TBUF
15	*LOGICAL-PHYSICAL DEVICE TABLE	13	LPDT
16	LOGICAL DEVICE TABLE	14	LDT
17	DRIVER LINKAGE TABLE	15	DLT
20	I/O RESOURCE TABLES	16	BUSY, HEAD, TAIL
21	*SECONDARY MSG TABLE	17	SECMSGTAB
22	*LOADER SEGMENT TABLE	18	LST
23	TIMER REQUEST LIST	19	TRL
24	DIRECTORY	20	DDS

* Can be moved out of BANK 0 if necessary.

Fixed DST Entry Assignments (Cont.)

OCTAL		DECIMAL	TABLE NAME
25	DIRECTORY SPACE	21	
26	RIN TABLE	22	RIN
27	*SWAPTABLE (SLL)	23	SWAPTAB
30	JOB PROCESS COUNT	24	JPCNT
31	JOB MASTER TABLE	25	JMAT
32	TAPE LABEL TABLE	26	VDD
33	LOG TABLE	27	LOGTAB
34	REPLY INFORMATION TABLE	28	RIT
35	VOLUME TABLE	29	VTAB
36	BREAKPOINT TABLE	30	STOP
37	LOG BUFFER1	31	
40	LOG BUFFER2	32	
41	LOG ID TABLE	33	LIDTAB
42	ASSOCIATE TABLE	34	
43	CST BLOCK	35	CSTBLK
44	*JOB CUTOFF TABLE	36	JCUT
45	SYSTEM JIT	37	SJIT
46	*SPECIAL REQ TABLE	38	SRT
47	VIRTUAL DISC SPACE MANAGEMENT TABLE	39	VDSMTAB
50	DEVICE CLASS TABLE	40	DEVCLASS
51	RESERVED KERNEL	41	

* Can be moved out of BANK 0 if necessary.

Fixed DST Entry Assignments (Cont.)

OCTAL		DECIMAL	TABLE NAME
52	ILT	42	ILT
53	*SIR TABLE	43	SIR
54	FMAVT	44	FMAVT
55	INPUT DEVICE DIRECT	45	IDD
56	OUTPUT DEVICE DIRECT	46	ODD
57	WELCOME MESSAGE #1	47	LOGONDSTN1
60	WELCOME MESSAGE #2	48	LOGONDSTN2
61	CS DATA SEGMENT	49	CSTAB
62	PROCESS-JOB CROSS REFERENCE	50	PJXREF
63	SYSTEM JDT	51	SYSJDT
64	COMMAND LOGON DST	52	CILOGOST
65	MOUNTED VOL. SET TABLE	53	MVTAB
66	PRI. VOL. USER TABLE	54	PVUSER
67	RESERVED KERNEL	55	
70	DISC REQUEST TABLE	56	DISCREQTAB
71	MSG HARBOR TABLE	57	MSGHARBTAB
72	*PRIMARY MESSAGE TABLE	58	PRIMMSGTAB
73	*MEASUREMENT INFO TABLE	59	MEASINFOTAB
74	FIRST FREE DST	60	

* Can be moved out of BANK 0 if necessary.

Swap Tables

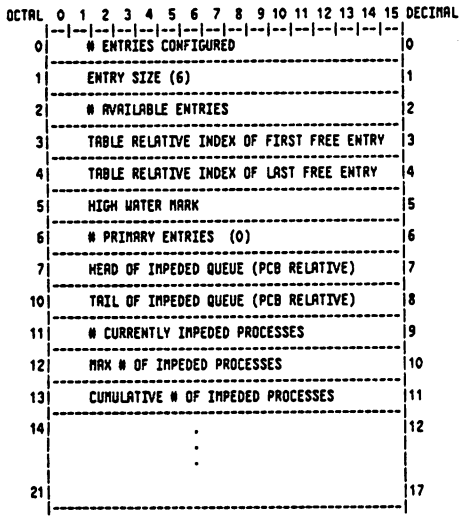
The SWAPTAB is a core resident memory management table used to keep track of the locality lists of the competing processes. The PCB entry for a process has a SWAPTAB relative pointer to the header entry of the process.

SWAPTAB DST# = 23 (X27)

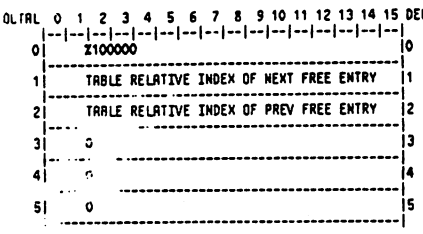
X1004 System table pointer to SWAPTAB entry 0.

NOTE: The number of entries configured will be 3 greater than the number configured via SYSDUMP. (Entry 0 consumes 3 entries).

SWAPTAB Entry 0 Format



SWAPTAB Unassigned Entry Format



An assigned entry in the SWAPTAB is a process' SLL header or a member of a process' SLL. These formats are now described.

Notes:

Word 0: In an unused entry only has X100000 if this entry was previously for a DST or CST, otherwise it is 0.

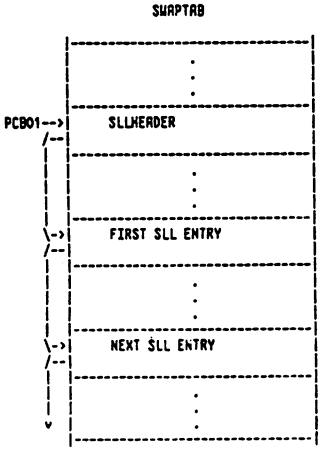
Word 2: The PREVIOUS pointers are not valid. MPE does not maintain (or use) them. Only NEXT pointers are valid.

Words 3-5: Are not zeroed out when a used entry becomes free, but will still contain the old data. They are only zero'd when the table is first initialized.

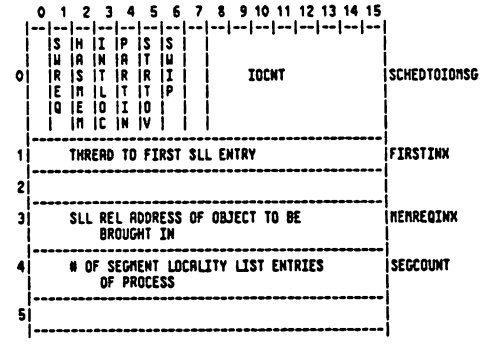
Segment Locality Lists (SLL)

The system maintains for each process a segment locality list (SLL) of the segments belonging to that process' current working set. The process' SLL consists of a header and a list of entries. The header and list entries are taken from the SWAPTAB.

A process' SLL is located via the process' PCB entry. PCB01 contains the SLL relative index of the process' SLL header.

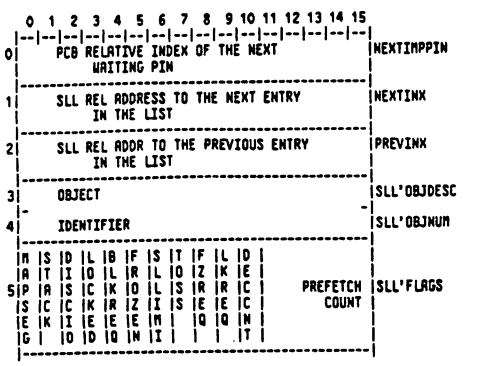


Segment Locality List (SLL) Header Format



$LL(SLLHEADINX+0)
.(1:1) SWREQ, Swap Required Flag
.(2:1) HASMEM, Has Memory Flag
.(3:1) INITLOC, Initialize locality list to minimum
.(4:1) PARTIN, Process partially swapped in
.(5:1) STRTOV, Start swap over flag
.(6:1) SWIP, Swap In Progress Flag
.(8:8) IOCNT, Number of READ I/O completions until SWAPIN is completed and the process is able to be awakened

Segment Locality List (SLL) Entry Format



SLL(SLLINX+0) NEXTIMPPIN, next make present deferred queue PCB Index

SLL(SLLINX+1) NEXTINX, next SLL entry

SLL(SLLINX+2) PREVINX, previous SLL entry

SLL(SLLINX+3) SLL'OBJDESC, 1st word of object identifier*

SLL(SLLINX+4) SLL'OBJNUM, 2nd word of object identifier*

SLL(SLLINX+5)

.(0:1) MAPSEG, Process' CST mapping segment (LSTT)
.(1:1) STK, Process' stack entry
.(2:1) DISCIOSEG, Disc I/O pending on this segment
.(3:1) LOCKED, Segment locked in memory
.(4:1) BLKLK, Request for blocked lock
.(5:1) FROZE, Segment frozen in memory
.(6:1) SLLIMI, Process queued for this segment
.(7:1) TOSS, Toss this entry
.(8:1) FRZREQ, Request segment to be frozen
.(9:1) LKREQ, Request to lock segment in memory
.(10:1) DECCNTFLAG, Decrement # I/O completion before awake flag
.(11:5) PREFETCHCOUNT, Number of prefetch segment request counter

NOTE: The Swap Table will be configured with at least twice the number of configured PCBs.

* See Standard Object Identifier Format for more information.

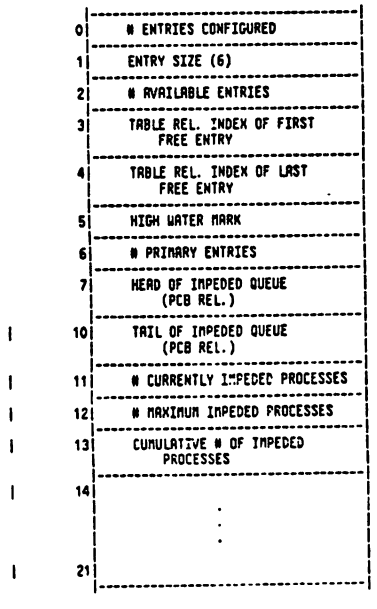
Special Request Table

Used for passing data segment size change info and for keeping a list of devices waiting for a segment to arrive in memory.

Z1042 - SRT relative index to entry # 0
Z1043 - SRT relative index to the head of the queue

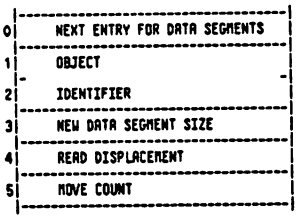
NOTE: The number of entries configured will be 3 greater than the number configured via SYSDUMP. (Entry #0 consumes 3 entries).

SRT Entry 0 Format

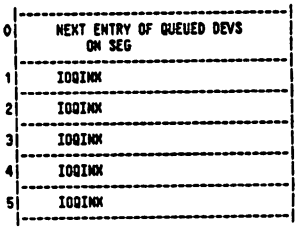


SRT Entry 0 Format (Cont.)

The following entry format is for data segment size/location modifications:

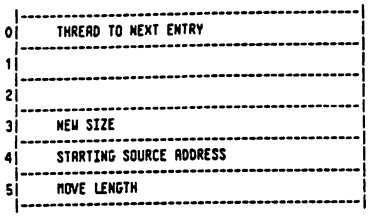


The following is the format for devices waiting on a segment: (The region header for the segment contains an SRT relative index to this entry. If more that 5 devices are waiting on this segment, another entry will be linked to this entry.)



NOTE: The number of primary configured entries will be equal to the total number of LDEVs configured. The number of secondary entries will be configured to be at least the same as the number of PCBs configured. Data segment change entries are secondary type, while devices queued entries will be primary entries.

The following is the format for a request to have the data segment moved:



Main Memory Region Headers and Trailers

Main memory is partitioned into regions. Each region is in one of four states: available, reserved, assigned, or cached.

An available region is available for consumption by the free space allocation mechanism. An available region consists of neighboring subregions, each of which is either a hole or an overlay candidate. An available region is linked into the available region list.

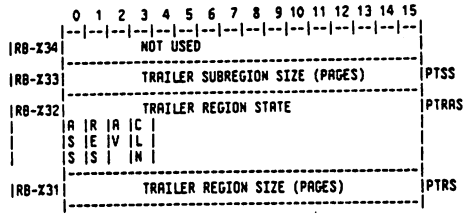
A reserved region is a main memory region which is in the transition state from available to assigned. A reserved region has been cleaned, and there is a pending disc read of a segment into the region.

Assigned regions are occupied by present segments. Available and reserved regions consist of one or more adjacent subregions. Region headers and trailers are partitioned into global and local components. The global region header/trailer is only valid for the first/last subregion in regions consisting of more than one subregion.

The region headers and trailers of available, reserved, and assigned regions contain the state and control information pertaining to the current or planned contents of the region.

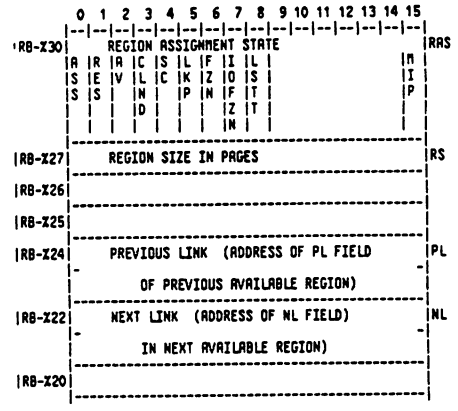
Cache domains are another form of assigned regions and are designated as such in the subregion header. If the cache domain is "mapped" (I/O pending against it) then the object identifier will have a non-zero value in the second word of the segment identifier field. If the second word of the segment identifier field is zero, then this region is a cache domain that is unmapped. (Refer to Chapter 23 for further information regarding Disc Caching.)

Global Region Trailer



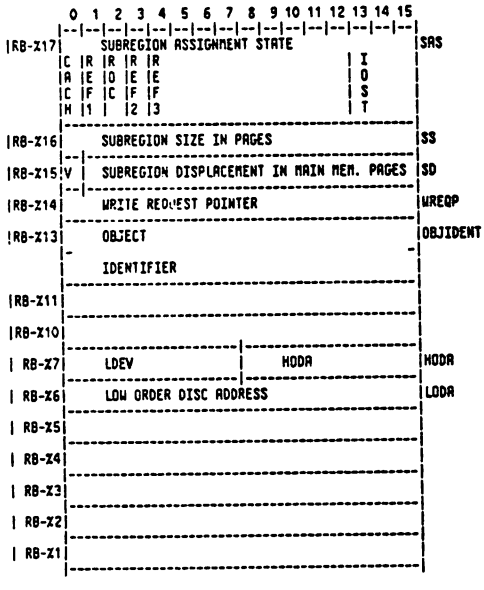
| Trailer length = 4

Global Region Header (Available Regions)

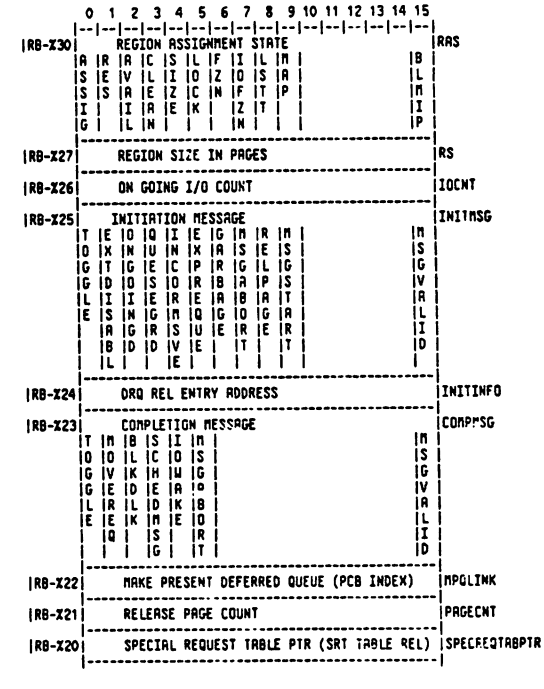


| Header length = 24 (X30)

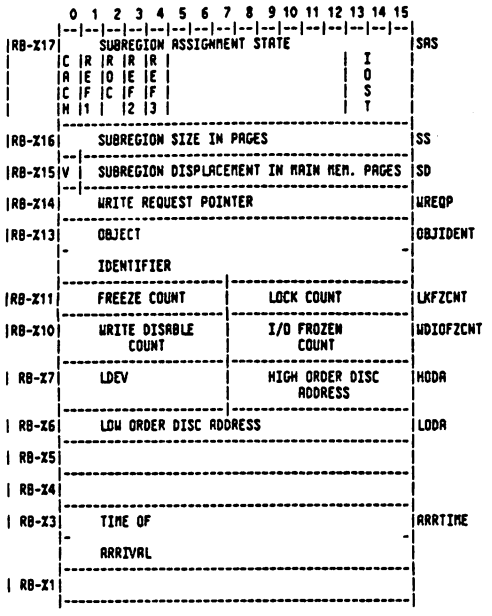
Subregion Header (Available Regions)



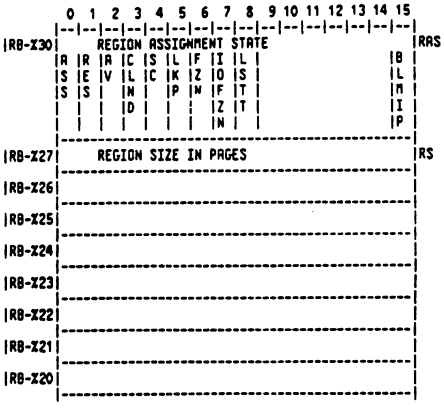
Global Region Header (Reserved Regions)



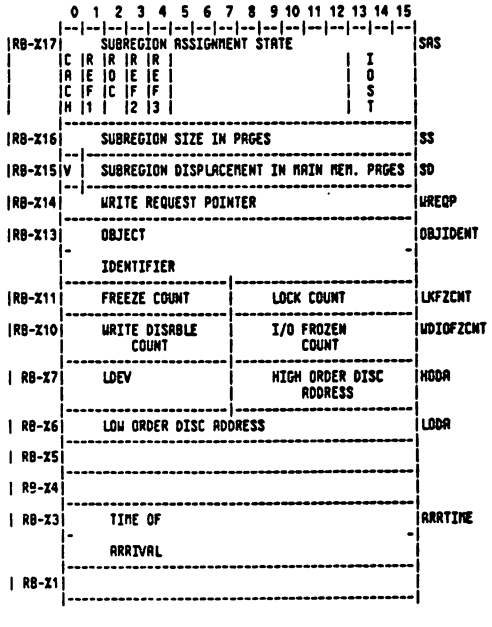
Subregion Header (Reserved Regions)



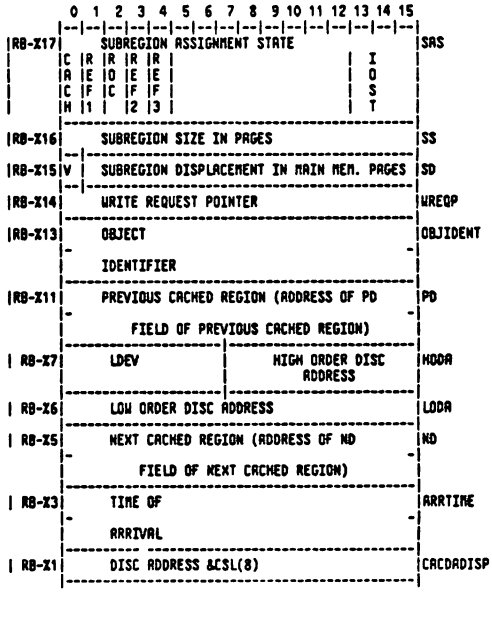
Global Region Header (Assigned Regions)



Subregion Header (Assigned Regions)



Subregion Header (Cached Regions)



Region Header and Trailer Field Descriptions

RAS, Region Assignment State
.(0:1) Region Assigned Flag
.(1:1) Region Reserved Flag
.(2:1) Region Available Flag
.(3:1) Region Cleaned Flag
.(4:1) Size Change Pending Flag
.(5:1) Region Locked Flag
.(6:1) Region Frozen Flag
.(7:1) Region I/O Frozen Flag
.(8:1) LSTT segment, Region Map Flag
.(9:6) Not used
.(15:1) Blocked Lock Migration in Progress Flag

IOCNT, On-Going I/O Count
= # of on-going I/Os in the region which must complete before the initiation message can be processed.

INITMSG, Initiation Message
.(0:1) Message Processed Toggle Switch
.(1:1) Message Externally Disabled Flag
.(2:1) Message On-going I/O Disabled Flag
.(3:1) Queue Segment Read Disc Request Flag
.(4:1) Incore Move Request Flag
.(5:1) Expansion Request Flag
.(6:1) Garbage Collection Flag
.(7:1) Message Aborted Flag
.(8:1) Release Residual Pages Flag
.(9:1) OK To Start Completion Flag
.(15:1) Message Valid Flag

INITINFO, Initiation Message Auxiliary Information
= DRQ relative index of segment read disc request if INITMSG.QREADREQ =1
or
QREADREQ = +/- Displacement to initiation message for moves and expansions.

COMPMSG, Completion Message

.(0:1) Message Processed Toggle Switch
.(1:1) Segment Modification Required
.(2:1) Block Lock Request
.(3:1) Send Scheduler A Message
.(4:1) Awaken A Device
.(5:1) Message Aborted
.(6:9) Available
.(15:1) Message Valid Flag

MPQLINK PCB relative index of the HEAD of the make present queue.

PAGECNT, Release Page Count
= # of extra pages to release before processing initiation message.

SPECREQTABPTR, A Special Request Table relative index to the list of devices queued on this segment.

SAS, Subregion Assignment State
.(0:1) Cached region
.(1:1) Referenced
.(2:1) Recover Overlay Candidate
.(3:1) Reference 2
(4:1) Reference 3
(13:3) I/O Status from region fetch

SS, Subregion Size (in pages)

SD, Subregion Displacement
.(0:1) Displacement Count Valid Flag
.(1:15) # Pages to Base of Region

WREQP, Write Request Pointer
= DRQ Relative Index of Disc Write Request when the Data Segment in the Subregion is in Motion Out When the region belongs to a cached domain which is mapped (i.e., OBJIDENT = 30000/non zero number) this word is non zero. If the cached domain is not mapped WREQP is zero.

OBJIDENT, Object Identifier - has standard object identifier format

LKFZCNT, Lock and freeze count
.(0:8) Number of times region has been frozen
.(8:8) Number of times region has been locked

WDIOFZCNT, I/O freeze count
.(0:8) Not used
.(8:8) Number of times region has been iofrozen

For regions belonging to cached domains, the above two words contain the absolute address of the PD field in the previous region belonging to a cached domain.

MSDA, High order disc address in virtual memory of this region

LSDA, Low order disc address in virtual memory of this region

ND, Next cached domain link for cached domain regions only. Contains the absolute address of the ND field of the next cached region. (2 words)

ARRTIME, Arrival time, contains the time at which the segment contained in the region became present

CACDADISP Valid only for regions containing a cached domain, this word represents the disc address (in one word) of the segment contained in the region. This word which exists in each member of a linked list of cached domains, is used as the target word during the LLSH instruction.

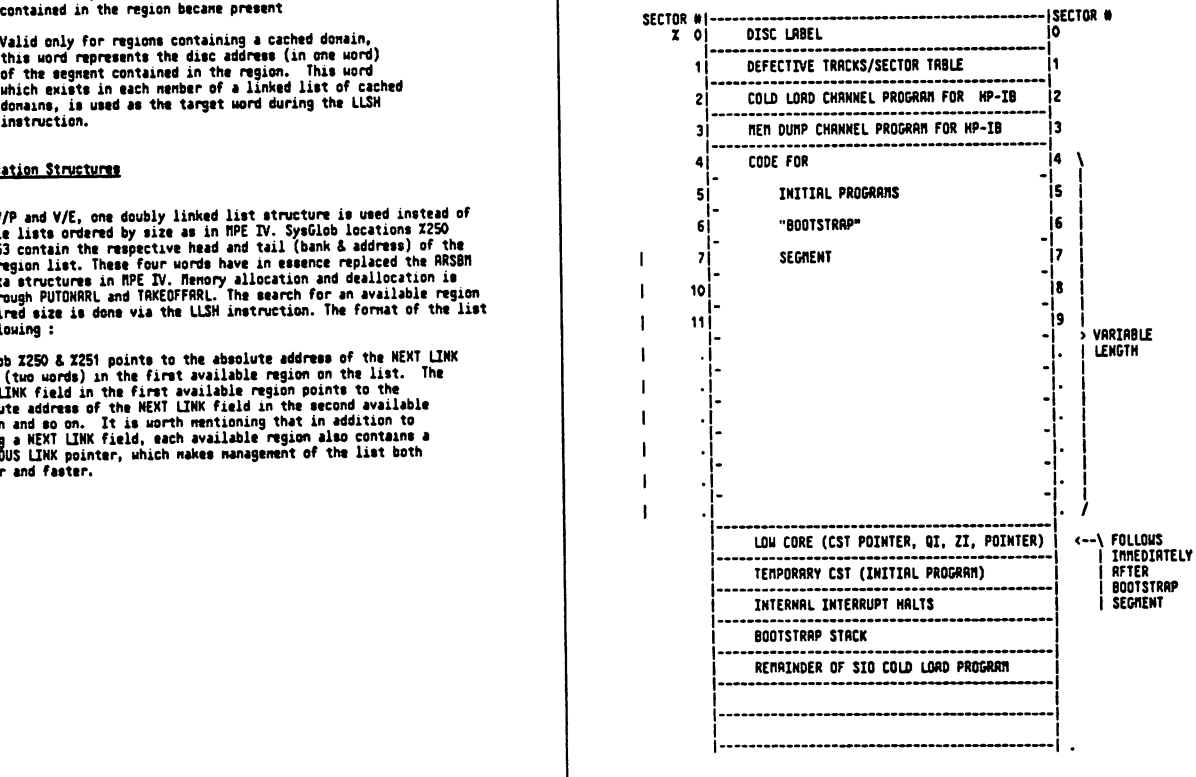
Space Allocation Structures

As of MPE V/P and V/E, one doubly linked list structure is used instead of the multiple lists ordered by size as in MPE IV. SysGlob locations %250 through %253 contain the respective head and tail (bank & address) of the available region list. These four words have in essence replaced the ARSBM and ARL data structures in MPE IV. Memory allocation and deallocation is handled through PUTONARL and TAKEOFFARL. The search for an available region of the desired size is done via the LLSH instruction. The format of the list is the following :

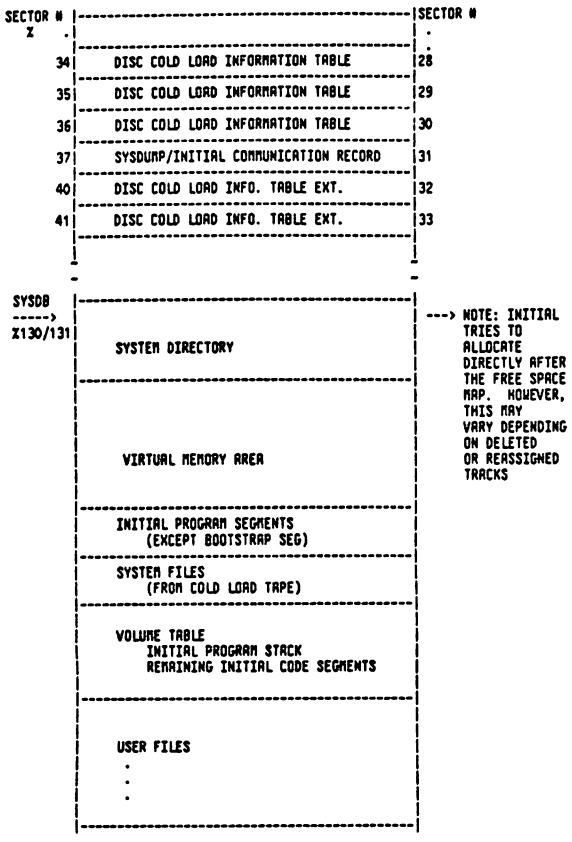
SysGlob %250 & %251 points to the absolute address of the NEXT LINK field (two words) in the first available region on the list. The NEXT LINK field in the first available region points to the absolute address of the NEXT LINK field in the second available region and so on. It is worth mentioning that in addition to having a NEXT LINK field, each available region also contains a PREVIOUS LINK pointer, which makes management of the list both easier and faster.

CHAPTER 3 DISC LAYOUT

System Disc Layout

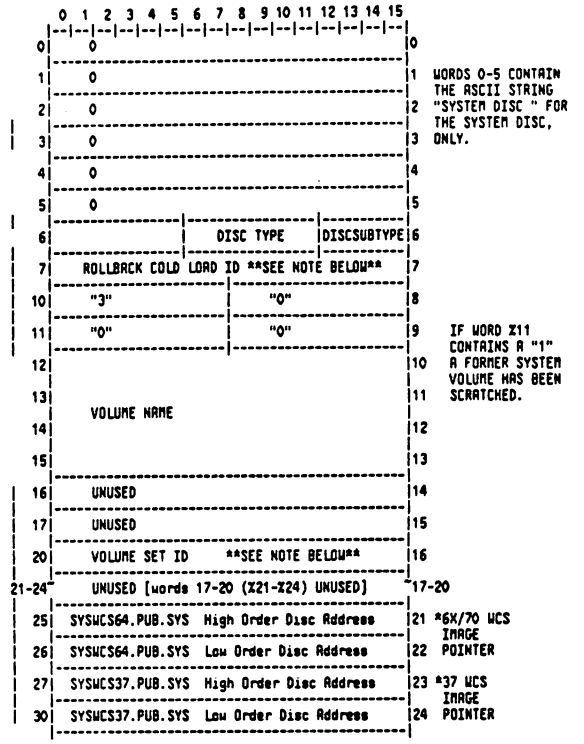


System Disc Layout (Cont.)

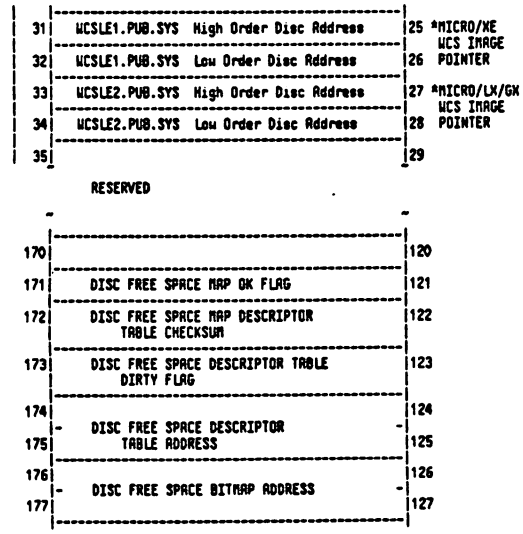


Disc Label (Sector 0 of Disc)

System Volume



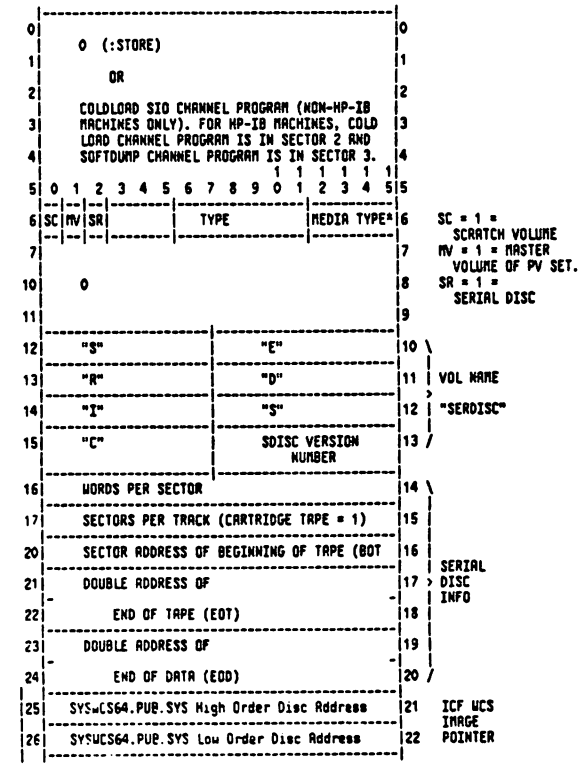
System Volume (Cont.)



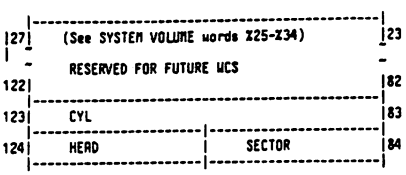
* WCS image pointers point to the start of the WCS data (File label address + 1). Always on LDEV 1.

** As of V-Delta-5 (G.03.05) the way the COLDLOAD ID's are used has been changed. A Volume set ID (VID) has been created to logically link together a set of discs. Originally the COLDLOAD ID peformed this, as well as enabling the FILE SYSTEM to tell if the file was open when the system failed. The VID is NOT changed on each system start, only on a RELOAD. In order to maintain backward compatibility, the old COLDLOAD ID locations have been changed to ROLLBACK COLDLOAD ID's. The actual COLDLOAD ID (for FILESYS) is in the Disc Cold Load info Table (DCLT) word 46 (X56).

Serial Volume

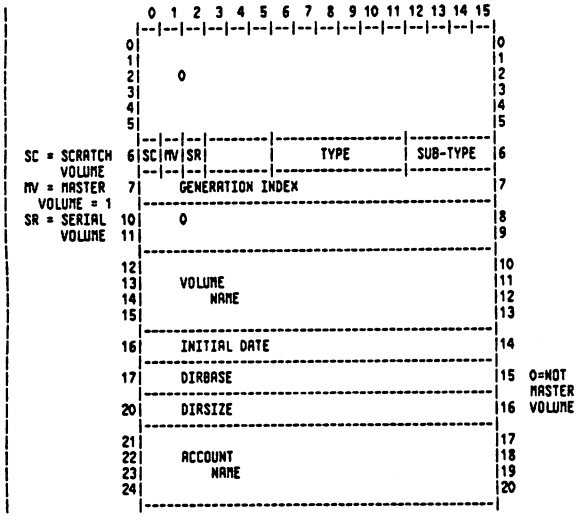


Serial Volume (Cont.)

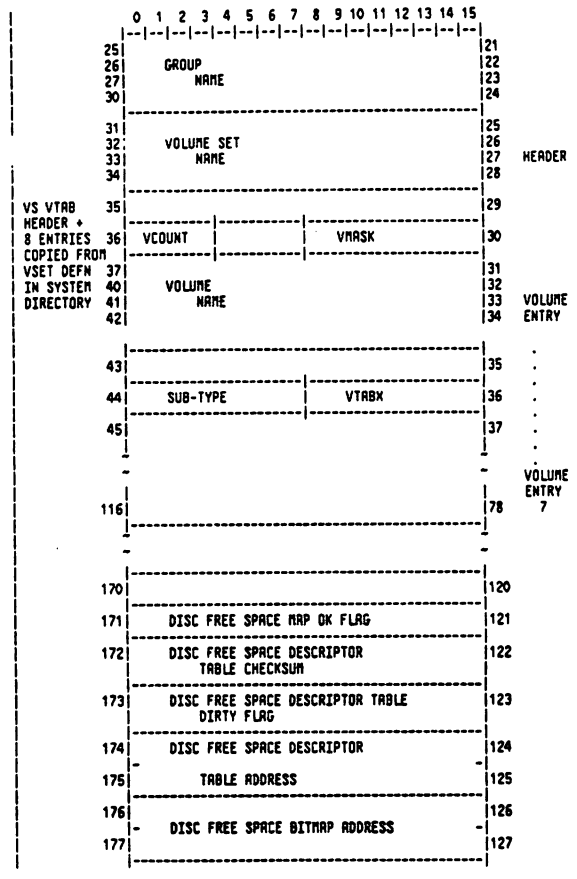


* MEDIA TYPE is the device subtype for all serial volumes except cartridge tape. For cartridge tape, this field is always 0 (the HP 9110 subtype), despite a different actual cartridge tape subtype. This allows both forward and backward interchangeability of cartridges between the HP 9110 and HP 9144.

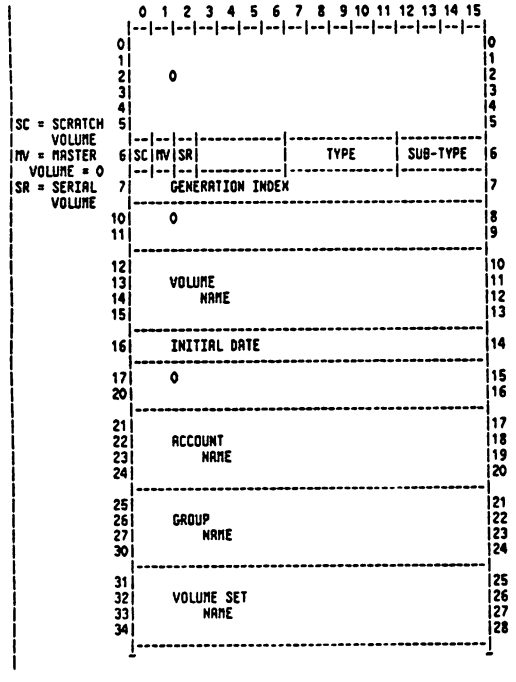
Master Volume



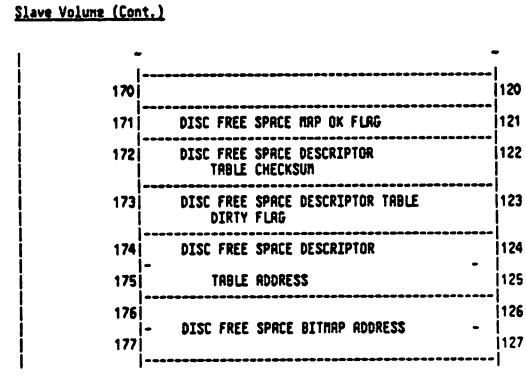
Master Volume (Cont.)



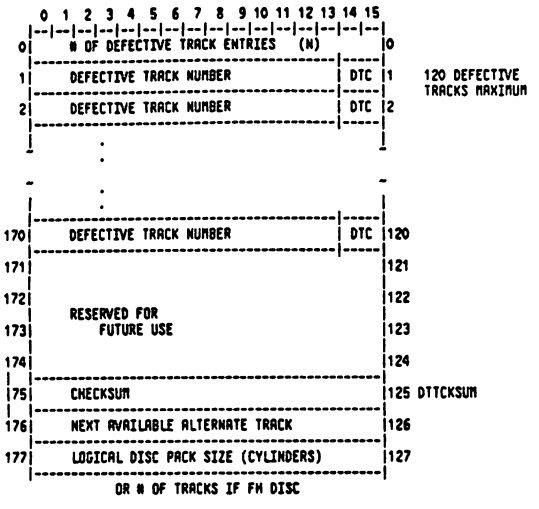
Slave Volume



Slave Volume (Cont.)



Defective Tracks Table (Sector 1 of Disc)
(Not Used On CS-80 Discs)

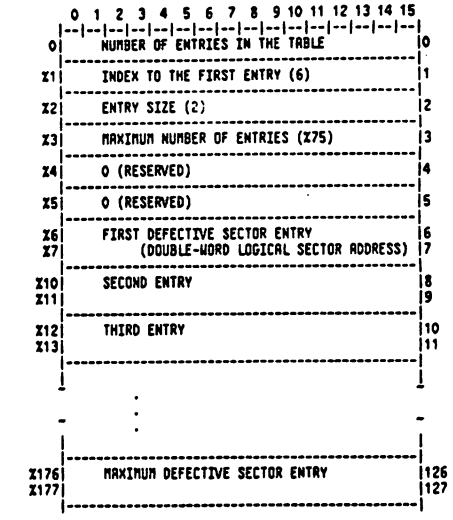


DTC	(DEFECTIVE TRACK CODE)
0	suspect
1	suspect alternate
2	deleted
3	reassigned

NOTE: The situation where there are two entries for the same track, n, one having a DTC of 0 (suspect) and the other having a DTC 3 (reassigned) results from a situation where the disc driver could not "read" (unreadable) the address of the particular track.

| DTTCKSUM (System Volumes only): | This is an EXCLUSIVE-OR checksum(from a base of -1) of the DTT | excluding word X175. Each time a suspect track is inserted or | modified, a new checksum is calculated and stored in word X175. | At system startup INITIAL recalculates the checksum and compares | against original value at X175. If the checksums do not match | a COLDLOAD ERROR 202 (MOUNT CORRECT VOLUMES OR RELOAD) will occur.

Defective Sector Table (DSCT -- Sector 1 of Disc)
(The DSCT Exists On Device Type 3 (CS-80) Discs, Except Cartridge Tape)

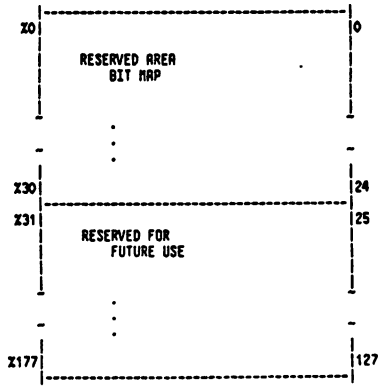


Unlike the DTT, entries in the DSCT are not permanent. Once a suspect sector is handled by INITIAL, SDISC, or VINIT, its entry is removed from the table. Thus, this table contains only unprocessed suspect sectors.

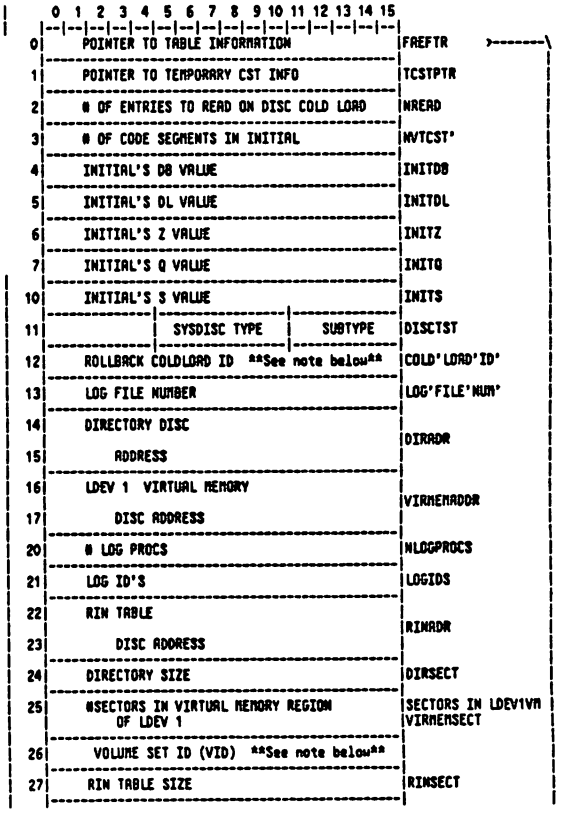
Reserved Area Bit Map (Sector 4 of the System Disc)

The first 400 sectors of the system disc are reserved for Initial's use. This area contains permanent data structures for the boot. It is also used as a temporary storage area for data during sparing. All other system volumes and private volumes reserve only the first 10 sectors of the disc. They do not have a reserved area bit map.

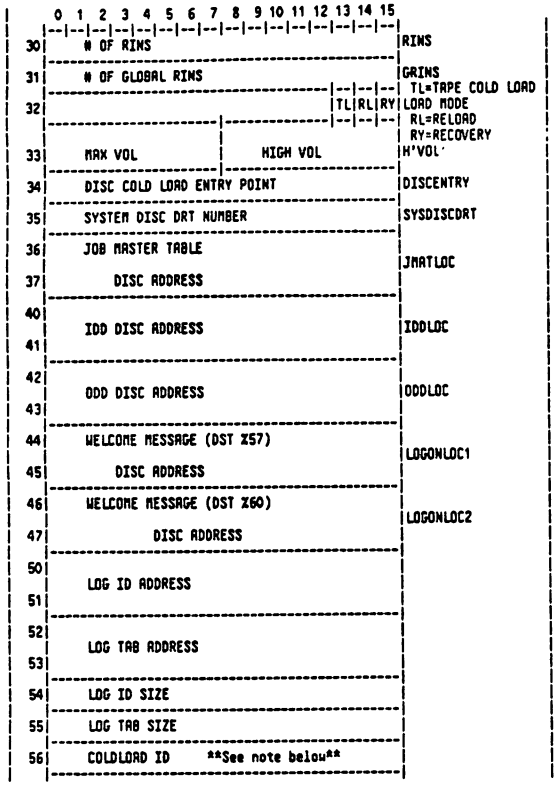
The bit map contains 1 bit per sector. A '1' means the sector is free.



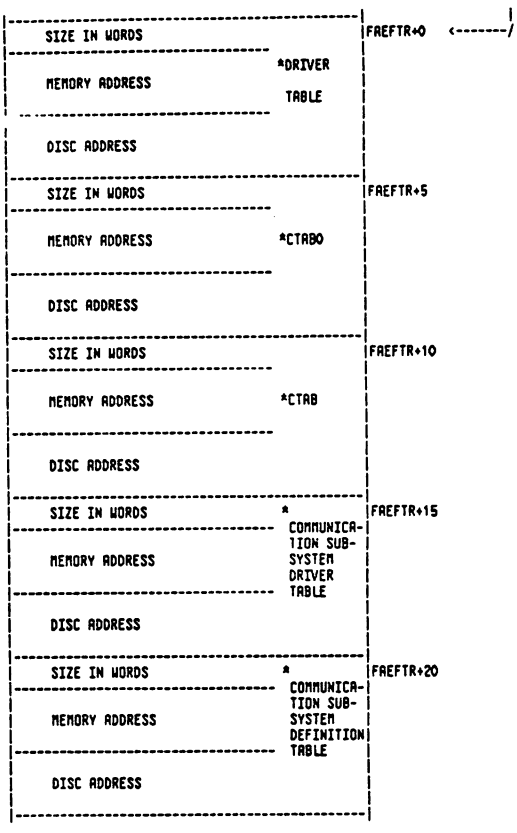
Disc Cold Load Information Table (Sectors X34-X36)



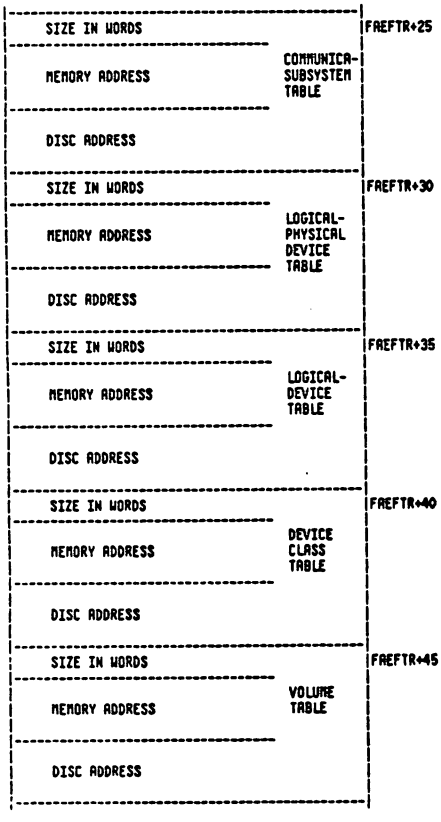
Disc Cold Load Information Table (Cont.)



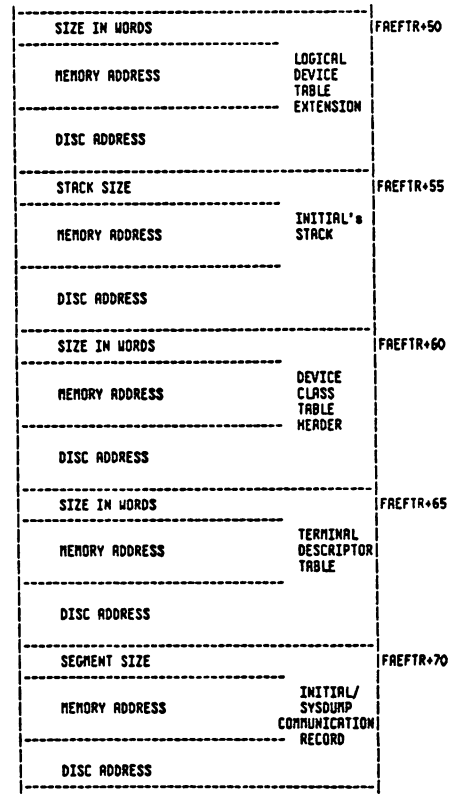
Disc Cold Load Information Table (Cont.)



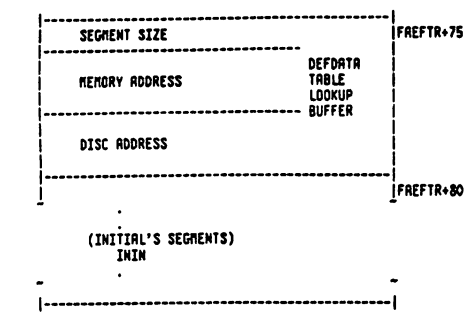
Disc Cold Load Information Table (Cont.)



Disc Cold Load Information Table (Cont.)



Disc Cold Load Information Table (Cont.)



INITIAL Program CST Map

LOGICAL CST#	PHYSICAL CST#	SEGMENT NAME	
0	1	ININ	\
1	2	BOOTSTRAP	|----> Core Resident
2	3	RESIDENT	/
3	4	MAINSEG1	\
4	5	MAINSEG1A	|
5	6	CONFIGURE	| /Noncore Resident
6	7	DEFCTRACKS	| |but present in core
7	10	SETUP	|-----> |at completion of
10	11	TAPEIO	| \Cold Load
11	12	FILEIO	|
12	13	DISCSPACE	/
13	14	DIRECTORY1	
14	15	DIRECTORY2	
15	16	SL PROGRAM	
16	17	PROCESS	
17	20	MAINSEG1B	
20	21	MAINSEG2	
21	22	MAINSEG3	
22	23	MAINSEG4	

*Code segment swapping starts at completion of MAINSEG1

** As of V-Delta-5 (G.03.05) the way the COLDLOAD ID's are used has been changed. A Volume set ID (VID) has been created to logically link together a set of discs. Originally the COLDLOAD ID peformed this, as well as enabling the FILE SYSTEM to tell if the file was open when the system failed. The VID is NOT changed on each system start, only on a RELOAD. In order to maintain backward compatibility, the old COLDLOAD ID locations have been changed to ROLLBACK COLDLOAD ID's. The actual COLDLOAD ID (for FILESYS) is in the Disc Cold Load info Table (DCLT) word 46 (X56). This value is put in SYSGLOB(X75).

SYSDUMP/Initial Communication Record (Sector X37)

	0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5	
0	MIT VERSION	0
1	MIT UPDATE	1
2	MIT FIX	2
3	VERSION	3
4	UPDATE	4
5	FIX	5
6	EXP. SOFTWARE SYSTEM NO.	6
7	HIGHEST DPT	7
10	HIGHEST LDEV	8
11	MAX VOL / HIGH VOL	9
12	# OF ADD'L DRIVERS	10
13	COLD LOAD COUNT	11
14	FILES DUMPED	12
15	SERIAL DISC LOAD (F D S)	13
16	TAPE RECORD SIZE	14
17	DISC COLD LOAD ENTRY	15
20	MAX INITIAL SEG SIZE	16
21	SPARE	17
22	SPARE	18
23	SPARE	19
24	DEV CLASS TAB SIZE	20
25	TERM DESCRIPTOR SIZE	21
26	OLD VTAB SIZE	22
27	OLD INFO SIZE	23

F=>Set if FOS Sysdump
D=>Set if Future Date Sysdump
S=>Set if Serial Disc Sysdump

SYSDUMP/Initial Communication Record (Cont.)

30	CS TABLE SIZE	24
31	TABLE LOOKUP BUF SIZE	25
32	TABLE LOOKUP BUF ENTRIES	26
33	SYSTEM TAPE LDEV #	27
34	SPARE	28
35	SPARE	29
36	CONVERSION BITS WORD 1 (M)	30
37	MIT FIX LEVEL INDICATOR **	31
40	CONVERSION BITS WORD 3	32
41	CONVERSION BITS WORD 4	33
42	SPARE	34
43	SPARE	35
44	SPARE	36
45	SPARE	37
46	SPARE	38
47	SPARE	39
50	LOG FILE NUMBER	40
51	LAST FULLBACKUP DUMP DATE	41

M=(15:1) MPE Version
0=MPE (G.00.00)
1=MPE (G.01.00)

** As of V-Delta-5 (G.03.05) word 31 (X37) of the SYSDUMP/INITIAL COMMUNICATION RECORD is now used as the MIT FIX LEVEL INDICATOR. It was previously used as the CONVERSION BITS WORD 2.

As of V-Delta-5 it (word X37) will contain the value Z170005. The '5' in bits (13:3) is added by INITIAL during the update to V-Delta-5 so INITIAL will know that it is using the new COLDLOAD ID/VID mechanism.
Bits (0:4) signal that the following tables have been converted to MPE V/E format:

0 - IO tables converted.
1 - Cold Load Info table converted.
2 - Rin table converted.

3 - Sysdump initial Communication record.

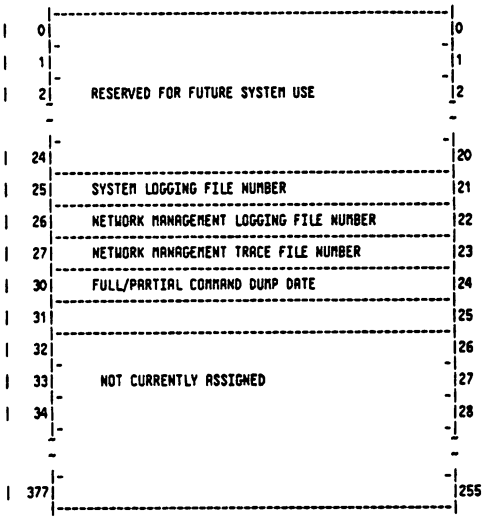
Cold Load Information Table Extension

The Cold Load Information Table Extension is a part of the Cold Load Information Table that has no use in booting the system. It exists for different system level processes to hold information that would only be created during a RELOAD. A good example of this is the system log file number. This is only created on a RELOAD, and changed whenever a log file is full or a boot (other than a RELOAD) is performed.

In order to protect the Cold Load Info Table, the extension was created. In this way no I/Os should be performed to the Cold Load Information Table during MPE operation. However to process data into the Cold Load Info Extension a process must use the access routine "PROCESS'COLD'LOAD'INFO". The exact calling sequence can be found in KERNELD.

The Cold Load Information Extension is 2 sectors long and immediately follows the SYSDUMP/Initial Communication Record starting at sector address #31 on logical device 1. The assigned entries are as follows:

Sector X40



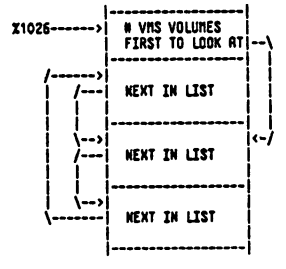
Virtual Disc Space Management Structures

Disc space for data segments is allocated from reserved regions of system volumes which have been assigned the virtual memory supporting (VMS) attribute. The data structure used for accounting and management of the virtual disc space of the various VMS volumes is the Virtual Disc Space Table (VDSMTAB). This structure consists of a circular list of entries, one for each VMS volume. Each entry contains the information defining the state of the virtual memory region on that volume.

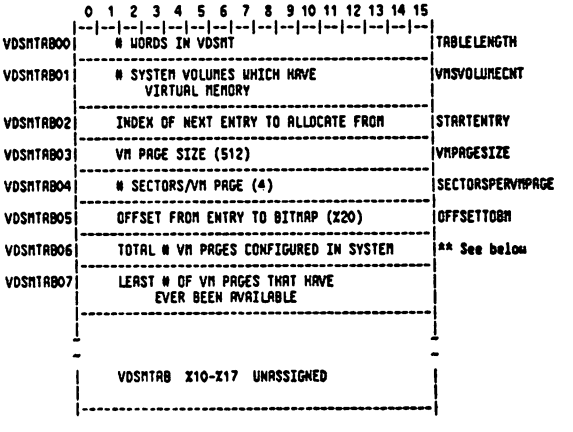
Virtual Disc Space Management Table

VDSMTAB DSTN = 39 (X47)
VDSMTABPTR = Absolute(X1026) = SYSGLOB X26

General Structure

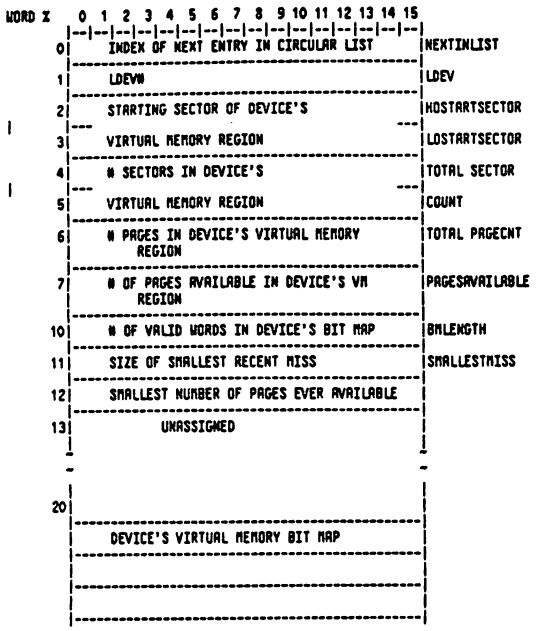


VDSMTAB Entry 0 Format



** This 16 bit field can only accommodate 32K Pages or 255K sectors. Each volume can have up to 255K sectors of virtual memory. This word will overflow if there are more than 255K total VM pages configured on all system discs. MPE does not use this word. It instead uses the general VDSMTAB entry for each volume to find out the total virtual memory sectors on a particular volume.

VDSMTAB General Entry Format

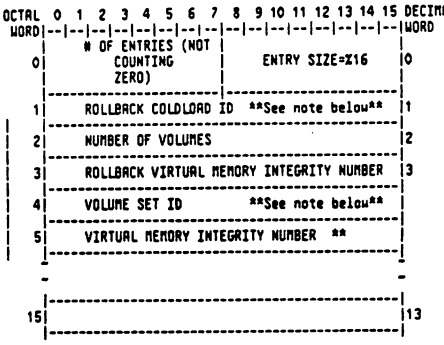


***COMMENT: A bit on in a device's VM BIT MAP = Corresponding VM page is free.

Volume Table

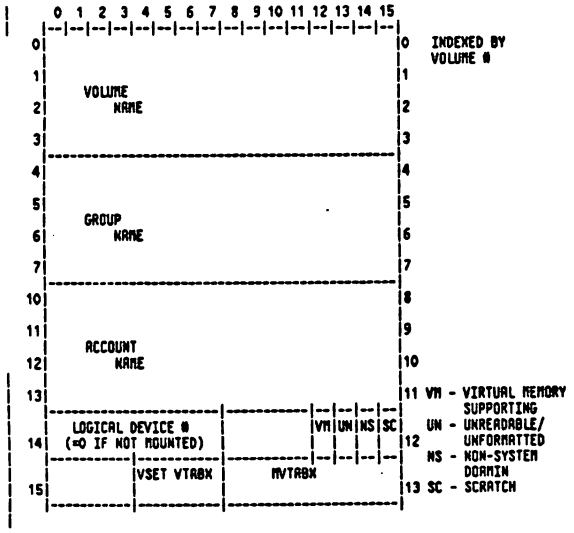
SIR #22=X26
DST #29=X35

Zero Entry

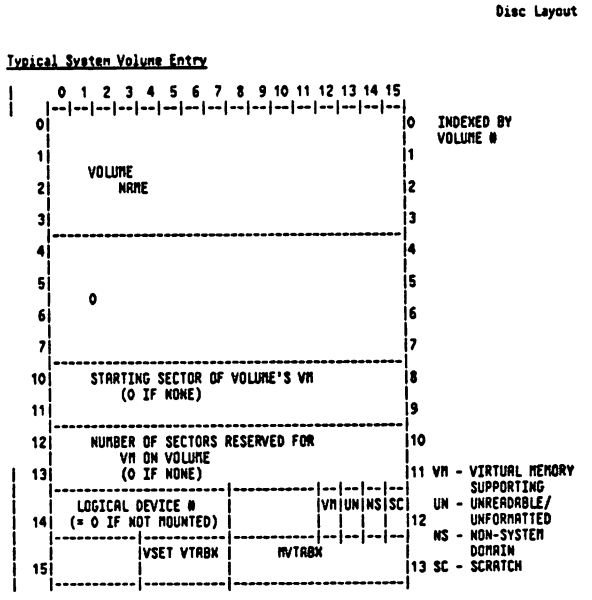


** As of V-Delta-5 (G.03.05) the way the COLDLOAD ID's are used has been changed. A Volume set ID (VID) has been created to logically link together a set of discs. Originally the COLDLOAD ID peformed this, as well as enabling the FILE SYSTEM to tell if the file was open when the system failed. The VID is NOT changed on each system start, only on a RELOAD. In order to maintain backward compatibility, the old COLDLOAD ID locations have been changed to ROLLBACK COLDLOAD ID's. The actual COLDLOAD ID (for FILESYS) is in the Disc Cold Load info Table (DCLT) word 46 (X56).

Typical Private Volume Entry



Typical System Volume Entry



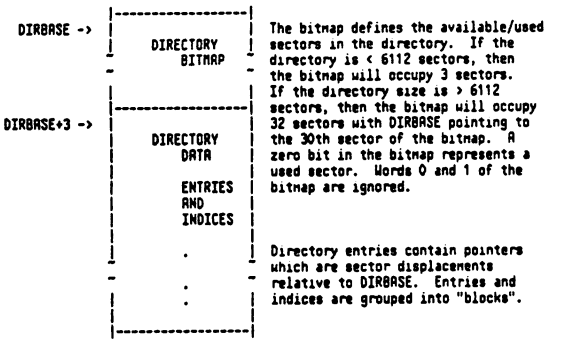
CHAPTER 4 DIRECTORY

Introduction to the Directory

SYSGLOB cells:

DIRBASE <----absolute disc addr of base [SYSGLOB+X130 AND X131]

Directory on disc consists of a contiguous area:



The bitmap defines the available/used sectors in the directory. If the directory is < 6112 sectors, then the bitmap will occupy 3 sectors. If the directory size is > 6112 sectors, then the bitmap will occupy 32 sectors with DIRBASE pointing to the 30th sector of the bitmap. A zero bit in the bitmap represents a used sector. Words 0 and 1 of the bitmap are ignored.

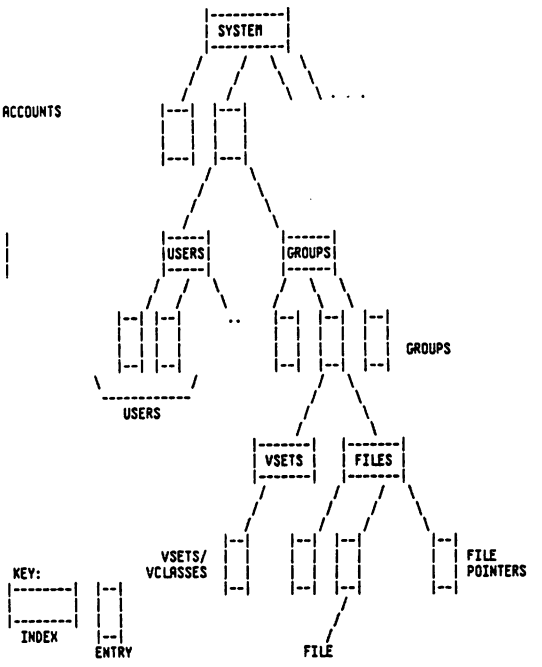
Directory entries contain pointers which are sector displacements relative to DIRBASE. Entries and indices are grouped into "blocks".

The capacities for accounts/groups/users/files are dependent on their block sizes.

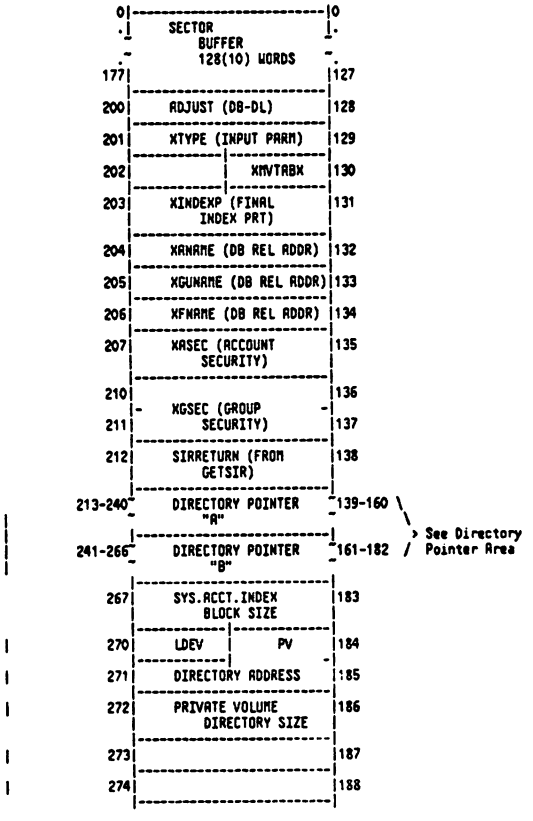
*	SYSSAIBSIZE	System acct index block size (3 sectors)
	SYSAUIBSIZE	Acct. user index block size (1-3 sectors)
	SYSAGIBSIZE	Acct. group index block size (1-3 sectors)
	SYSGFIBSIZE	Group file index block size (2 sectors)
	SYSGVSIBSIZE	Group volume set definition ind. blk. size(1 sector)
*	SYSAEBSIZE	Acct. entry block size (3 sectors)
	SYSUEBSIZE	User entry block size (2 sectors)
	SYSGEBSIZE	Group entry block size (2 sectors)
	SYSFEBSIZE	File entry block size (2 sectors)
	SYSVSEBSIZE	Volume set definition entry block size (1 sector)
	SYSMAXBSIZE	Maximum of above. (used to initialize DDS.)

*These values are used once for the creation of the (root) system, account index or new systems. This root index is always at address DIRBASE+3.

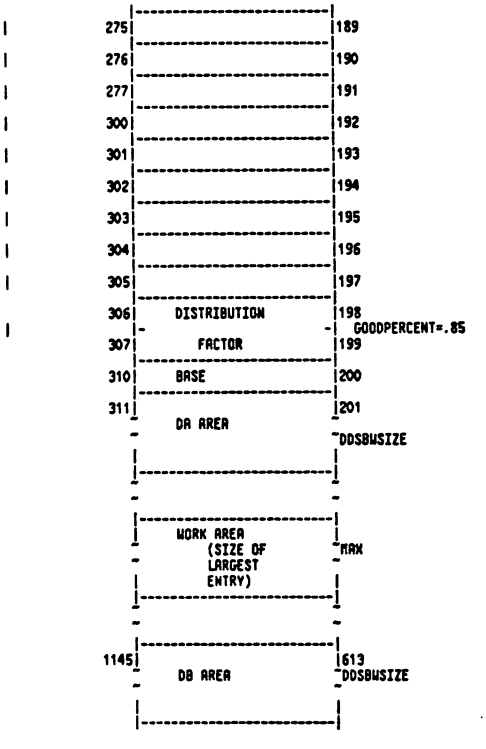
Overview of Directory



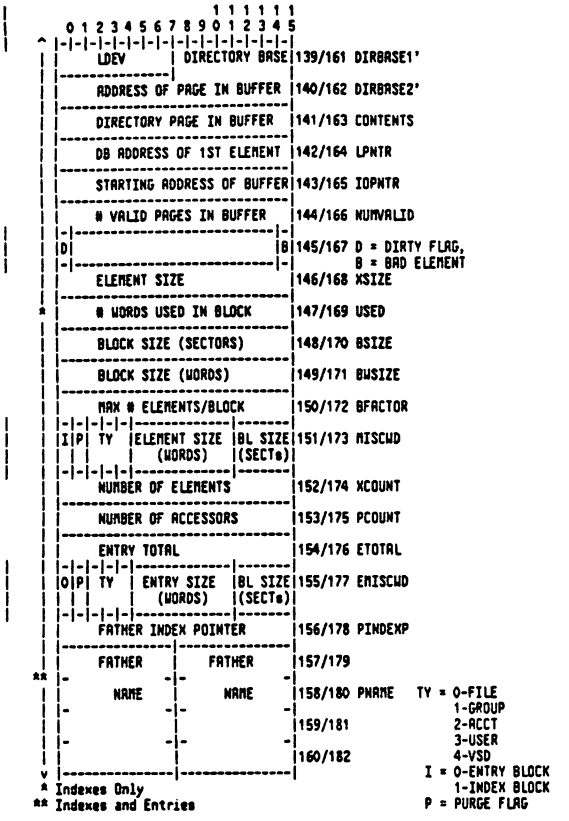
Directory Data Segment



Directory Data Segment (Cont.)

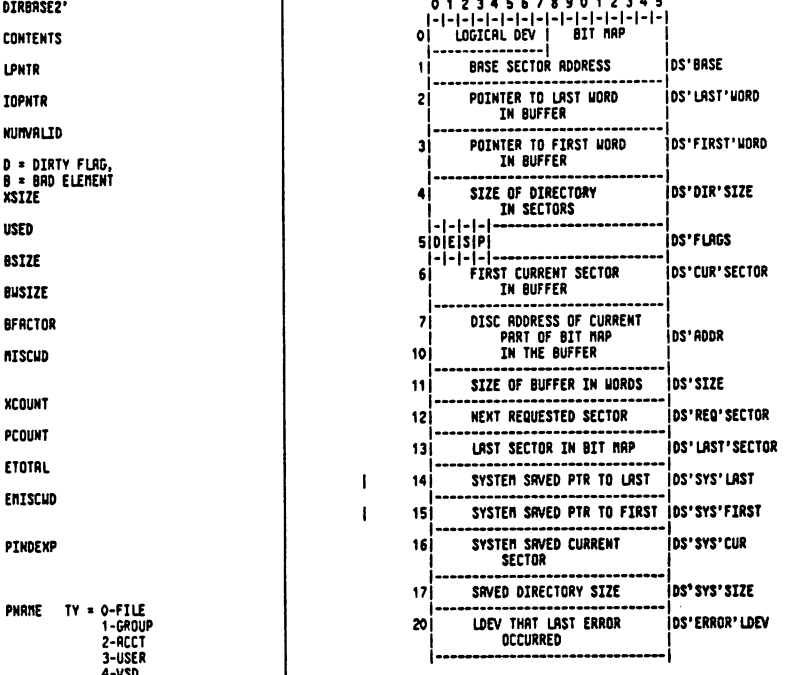


Directory Pointer Area [DA or DB] DST=X24 SIR=8



Directory Space Data Segment (DIRSDS)

DST=21 (X25)
SIR=8 (X10)



Directory Space Data Segment (DIRSDS) (Cont.)

21 TYPE OF ERROR THAT OCCURRED DS'ERROR'TYPE

THIS SECTION OF THE BIT MAP DST IS OCCUPIED BY UP TO 3 SECTORS OF BIT MAP. IT IS SWAPPED IN 3 SECTORS AT A TIME AS NEEDED. DS'FIRST'WORD IS UPDATED TO SEARCH FOR SPACE IN THE BIT MAP. WHEN IT REACHES DS'LAST'WORD FOR THE SECOND PASS, THE NEXT 3 SECTORS OF BIT MAP WILL BE SWAPPED IN.

Partial definitions:

```
DS'LDEV         = DS'BASEO.(0:8)
DS'DIRTY        = DS'FLAGS.(0:1)
DS'ERR'IN'PROG  = DS'FLAGS.(1:1)
DS'DIR'DISABLED = DS'FLAGS.(2:1)
DS'PERM'DISABLE = DS'FLAGS.(3:1)
```

Descriptions:

DS'ADDR

This is the address of the section of bit map that is currently in the buffers. For example, this address will usually be the same as DS'BASE. If we need to page in more sectors of bit map than the first three, then this address will be subsequently larger than DS'BASE.

DS'BASE

This is the base address of the directory bit map. If the directory is greater than 6112 sectors, then this address will be 29 sectors less than the address found in the Cold Load Information table on disc.

DS'CUR'SECTOR

This is the current bit map sector number of the first sector in the buffer area. Its value can range from 1 to 30. This number minus one added to DS'BASE will result in DS'ADDR.

DS'DIR'DISABLED

If this bit is on, the directory allocation and deallocation is off and only a WARMSTART will turn this bit off. The bit is turned on if an I/O error occurs on a directory bit map sector or if we find data integrity problems with the bit map, i.e., if we attempt to deallocate a sector that is already deallocated.

DS'DIR'SIZE

This is the size (sectors) of the directory area. This size includes only the last 3 sectors of the bit map. If the directory is greater than 6112 sectors, then this size does not include the extra 29 sectors of bit map. It can also be thought of as the number of bits in the bit map.

DS'DIRTY

This bit is set if the bit map sectors in the buffer have been modified in any way. When more sectors must be brought into the buffers, or if we switch to a different domain (system to PV, PV to system) this bit is interrogated to determine if the sectors presently in the buffers must be first written to disc.

DS'ERROR'LDEV

The LDEV in which the last directory error occurred.

DS'ERROR'TYPE

This word describes the type of directory bit map error that occurred. Its legal values are:

0 - No error
1 - I/O error on a write
2 - I/O error on a read
3 - Attempting to deallocate space that is already deallocated
4 - Directory space management is already disabled

DS'ERR'IN'PROGRESS

A directory space management error is currently in progress.

DS'FIRST'WORD

A DST relative pointer to the word in the bit map buffer that we will interrogate next when directory space is needed. When the system first comes up, this word is always initialized to DS'HEADER+2 (i.e., to point to the first word in the bit map). On subsequent bit map sector reads, it is set to DS'HEADER since subsequent sectors will not have the 2 word overhead that exists in the first sector of the bit map.

DS'FLAGS

This word contains numerous flags. See individual descriptions.

DS'LAST'SECTOR

This is the total number of active bit map sectors. This number will range from 1 to 32.

DS'LAST'WORD

This is the current number of bit map word in the buffer. It can range from 1 to X577 + DS'HEADER. If there exists 3 full sectors in the buffer, then it will have the value X600 + DS'HEADER - 1 or X621. It is compared to DS'FIRST'WORD to determine if we have hit the end of the current buffer area.

DS'PERM'DISABLE

If this bit is set, then directory allocation/deallocating is permanently disabled. This bit should not be set.

DS'REQ'SECTOR

This is the next sector to begin reading in up to 3 bit map sectors. It is updated by 2 or 3 and the read procedure will bring in up to 3 sectors starting from this sector. If this sector is set to be greater than DS'LAST'SECTOR, then it is reset to 1. After the sectors are read in, DS'CUR'SECTOR is set the DS'REQ'SECTOR.

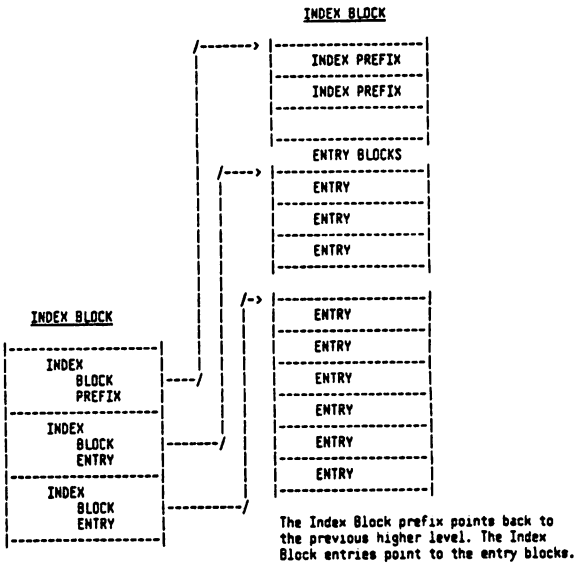
DS'SIZE

This is the size in words of the bit map buffer area. It is always a multiple of a sector (128 words). It will usually have the value of X600. Legal values are X200, X400, and X600.

DS'SYS'LAST, DS'SYS'FIRST, DS'SYS'CUR, & DS'SYS'SIZE

The values of DS'LAST'WORD, DS'FIRST'WORD, DS'CUR'SECTOR, and DS'SIZE will be stored in these locations when the directory space management switches from the system directory to a private volume directory. And, of course, when DSM switches back to system domain, the above mentioned values are reinitialized with these values.

Directory Structure

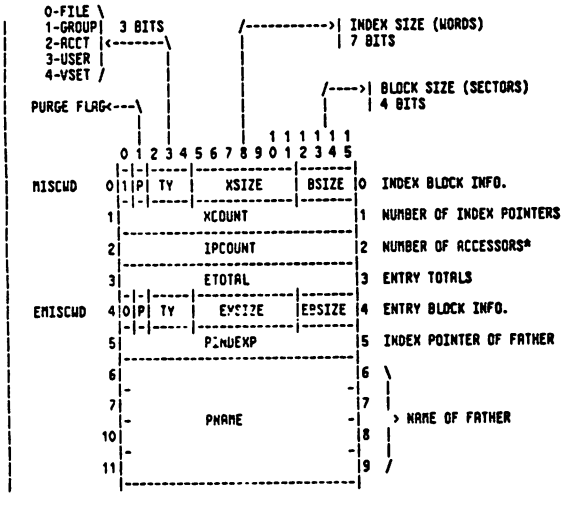


The Index Block prefix points back to the previous higher level. The Index Block entries point to the entry blocks.

Directory Definitions

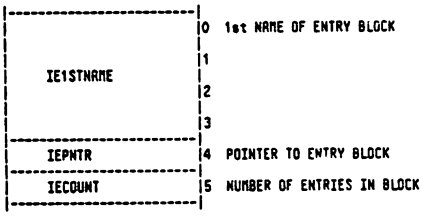
>PAGE - smallest allocatable record ("phys.recd")-currently sector.
>BLOCK - integral# of pages; contains contiguous indices or entries.
>INDEX - pointer to entry block, containing name of 1st entry.
>ENTRY - information-containing "object" may contain pointer to an index block.
>POINTER - 15-bit positive relative page number (relative to directory base).
>DDS - directory data segment.
>ELEMENT - a generic name for index or entry.

Index Block Prefix (10 Words)

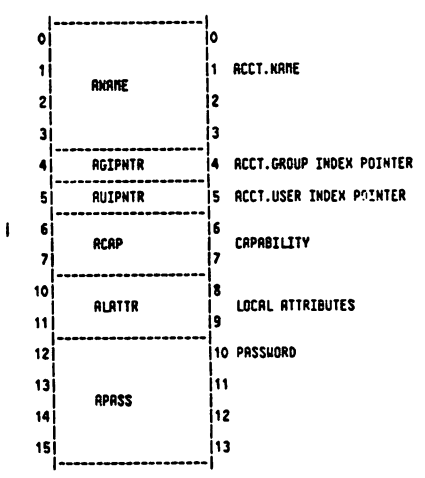


*The count is incremented by each access that uses and relies upon a pointer to the index block, i.e., it is guaranteed not to be purged while the count is not = 0.

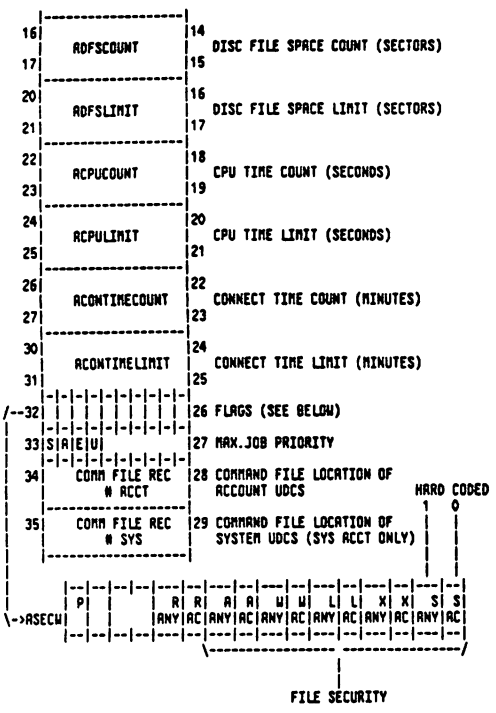
Index Entry (6 Words)



Account Entry (X36 Words)

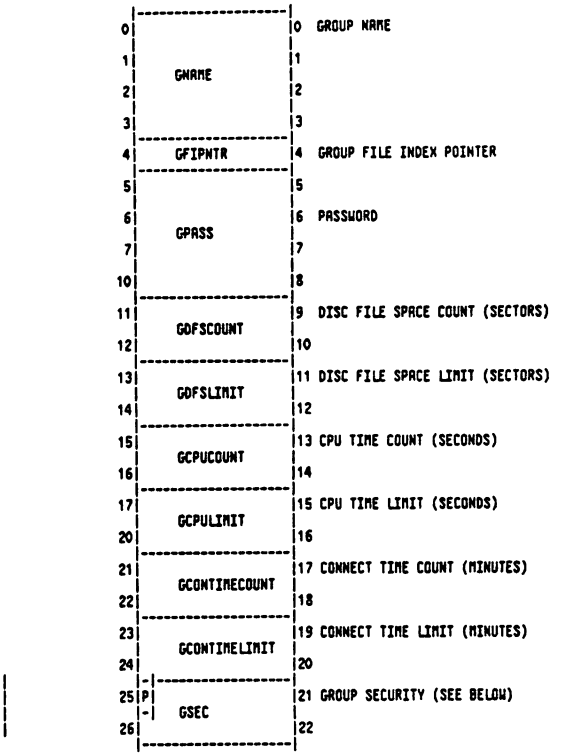


Account Entry (Cont.)



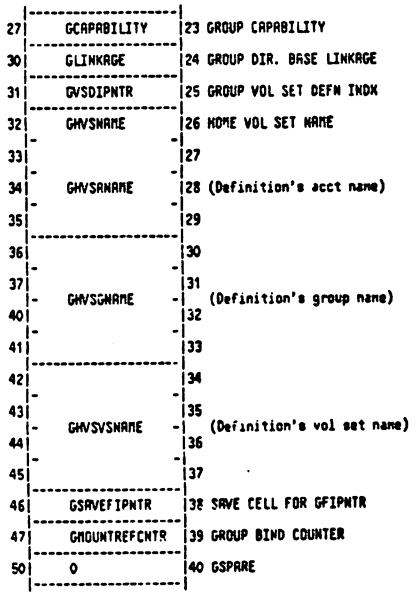
P PURGE flag
S If 1, system level UDCs exist (only in "SYS" account)
A If 1, account level UDCs exist for account
E Account Password Encrypted
U Account Password Required

Group Entry (251 Words)

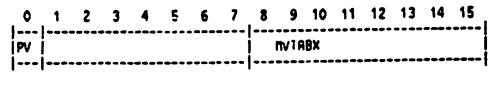


P = PURGE FLAG

Group Entry (Cont.)



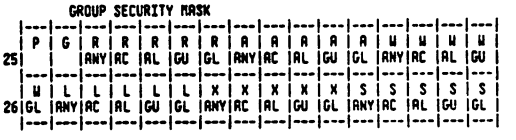
GLINKAGE



Group Entry (Cont.)

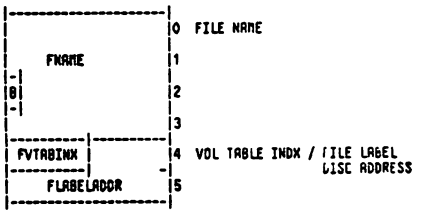
GLINKAGE (0:1) = 0; HVS is in System Domain
(0:1) = 1; HVS is in Private Volume Domain
(8:8) = 0; If not PV or Not Bound
(8:8) <>0; If PV and Bound

GROUP SECURITY MASK



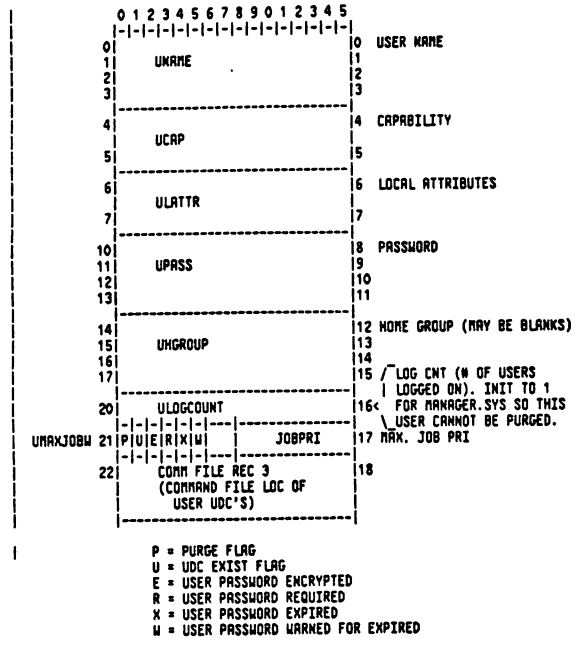
G - Group Password Encrypted

File Entry (File Pointer - 6 Words)

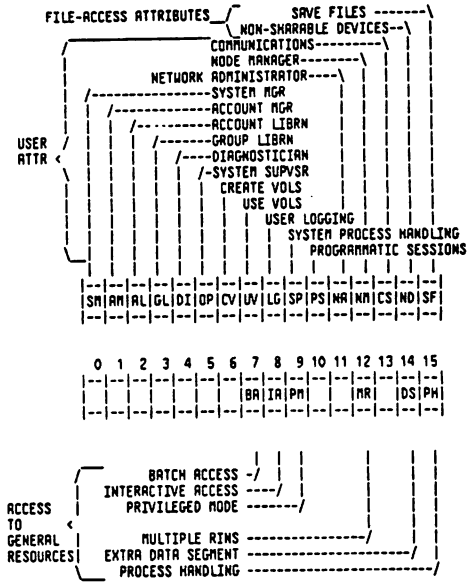


B - Bad file label
(0:1) = 0 - not defective
= 1 - defective

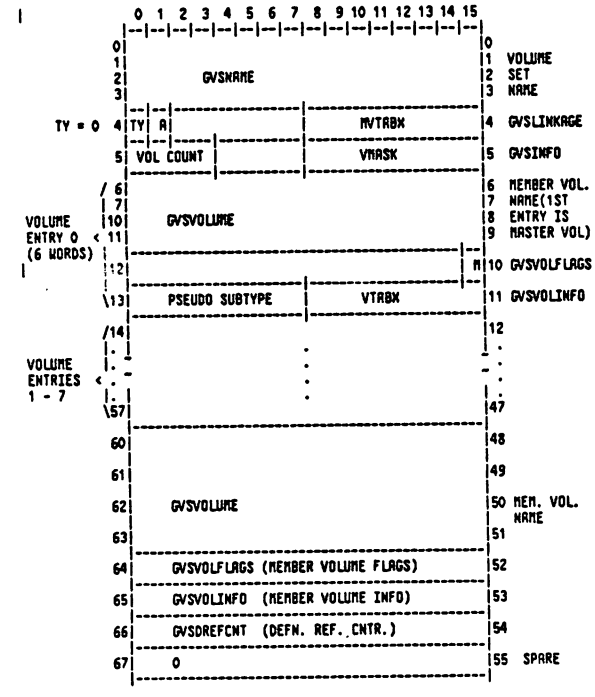
User Entry (19 Words)



User Attributes/Capabilities

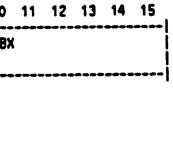


Volume Set Definition Entry



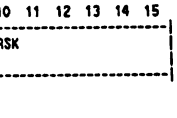
TY = 0: Volume Set Definition
= 1: Volume Class
MVTABX: Mounted Volume Table Index (If Mounted)
VMASK: Volume Mask
M = 0: Not mounted
M = 1: Mounted
VTABX: Volume Table Index
VOL COUNT: No. of Volumes

G V S L I N K A G E



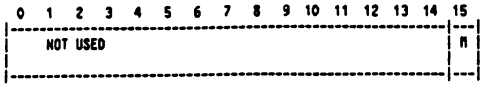
T - TYPE
0 = Volume Set Definition
1 = Volume Set Class
A - ALLOCATING FLAG
0 = not initially allocating (not 1st user of set)
1 = 1st user of set allocating resources (transitional)
MVTABX - Mounted Volume Table Index
0 if volume set not logically mounted

G V S I N F O



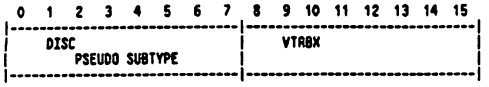
VOLCNT - Number of members in set
VSMASK - Bit mask of volume member usage
Order is from right to left
i.e., bit 15 is 1st member, bit 14 is 2nd member ...

GVSVOLFLAGS



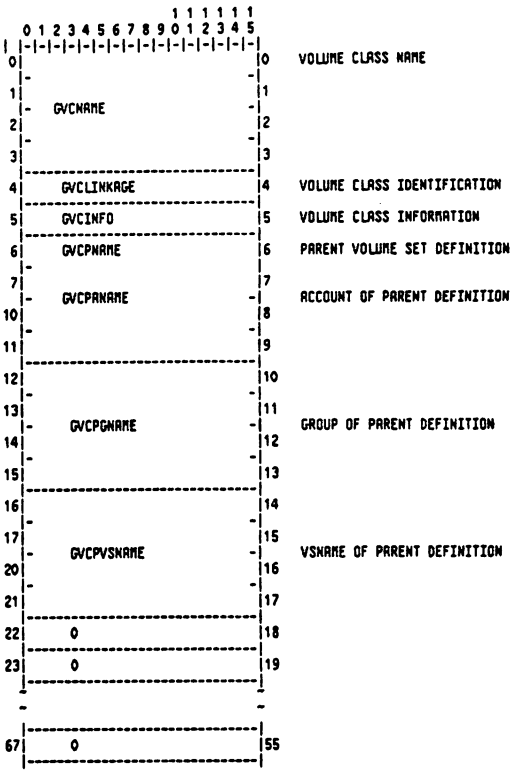
M - Member Mounted Flag
0 = not mounted
1 = mounted

GVSVOLINFO

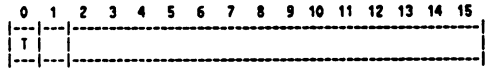


DISC PSEUDO-SUBTYPE = (Actual type *16) + actual subtype.
VTRBX - Volume Table Index

Volume Set Class Entry

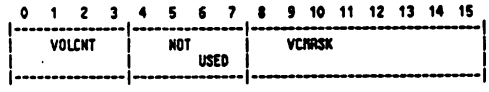


GVCLINKAGE



T - TYPE
1 = Volume Set Definition
0 = Volume Set Class

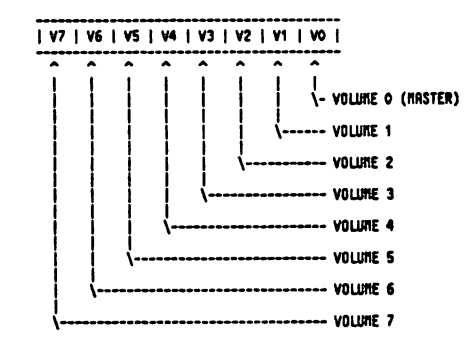
GVCINFO



VOLCNT - Number of members in set
VCMASK - Bit mask of volume member usage (VOLUME CLASS MASK)
Order is from right to left
i.e., bit 15 is 1st member, bit 14 is 2nd member ...

Volume Mask Format

- USED IN MVTAB, PVUSER, FILE CONTROL BLOCK (FCB), VOLUME SET/CLASS DEFINITION, VOLUME SET VTAB.
- 8-BIT MASK.



0: NOT MOUNTED OR NON-MEMBER 1: MOUNTED OR MEMBER

CHAPTER 5 LOCK RESOURCES

SIR # Allocation DST Z53

SIRs Ordered by SIR Number

SIR #	RANK	SIR NAME
1	10	LOAD PROCESS
2	335	CACHE CONTROL
3	91	IDD
4	92	ODD
5	50	PROCESS TREE STRUCTURE
6	60	SCHEDULING QUEUE
7	70	CST ENTRIES
8	80	SYSTEM DIRECTORY
9	90	LPDT
10	85	LDT
11	110	STORAGE IN OVERLAY AREA
13	130	JPCNT
14	140	JCUT
15	27	JMAT
16	5	FMAVT
17	22	LOADER SEGMENT TABLE
18	180	VDD
19	190	SPOOL
20	200	MESSAGE CATALOGUE
21	210	RIT
22	220	VOLUME TABLE
23	230	WELCOME MESSAGE SIR
24	240	ASSOCIATION TABLE
25	250	CS ALLOCATE
26	260	LOGGING BUFFER
27	83	PV MVTAB
28	280	MEASSIR
29	290	PV USER TABLE
30	300	IMAGE
31	310	KSAM
32	320	USER LOGGING
33	330	DEBUG BREAKPOINT TABLE
34	340	PCB
35	350	SUB-QUEUE MAPPING TABLE
36	360	CILOG
37	25	FILE INTEGRITY
38	380	RIN
39	390	TAPE LABELS
40	87	DEVICE CLASS TABLE
41	400	Reserved
42	401	Cold Load SIR
43		1st JOB
44		2nd JOB
.	.	.
.	.	.

SIRs Ordered by Ranking

RANK	SIR #	SIR NAME
5	16	FMAVT
10	1	LOAD PROCESS
22	17	LOADER SEGMENT TABLE
25	37	FILE INTEGRITY
27	15	JMAT
50	5	PROCESS TREE STRUCTURE
60	6	SCHEDULING QUEUE
70	7	CST ENTRIES
80	8	SYSTEM DIRECTORY
83	27	PV MVTAB
85	10	LDT
87	40	DEVICE CLASS TABLE
90	9	LPDT
91	3	IDD
92	4	ODD
110	11	STORAGE IN OVERLAY AREA
130	13	JPCNT
140	14	JCUT
180	18	VDD
190	19	SPOOK
200	20	MESSAGE CATALOG
210	21	RIT
220	22	VOLUME TABLE
230	23	WELCOME MESSAGE
240	24	ASSOCIATION TABLE
250	25	CS ALLOCATE
260	26	LOGGING BUFFER
280	28	MEASSIR
290	29	PV USER TABLE
300	30	IMAGE
310	31	KSAM
320	32	USER LOGGING
330	33	DEBUG BREAKPOINT TABLE
335	2	CACHE CONTROL
340	34	PCB
350	35	SUB-QUEUE MAPPING TABLE
360	36	CILOG
380	38	RIN
390	39	TAPE LABELS
400	41	Reserved

SIR Table Information

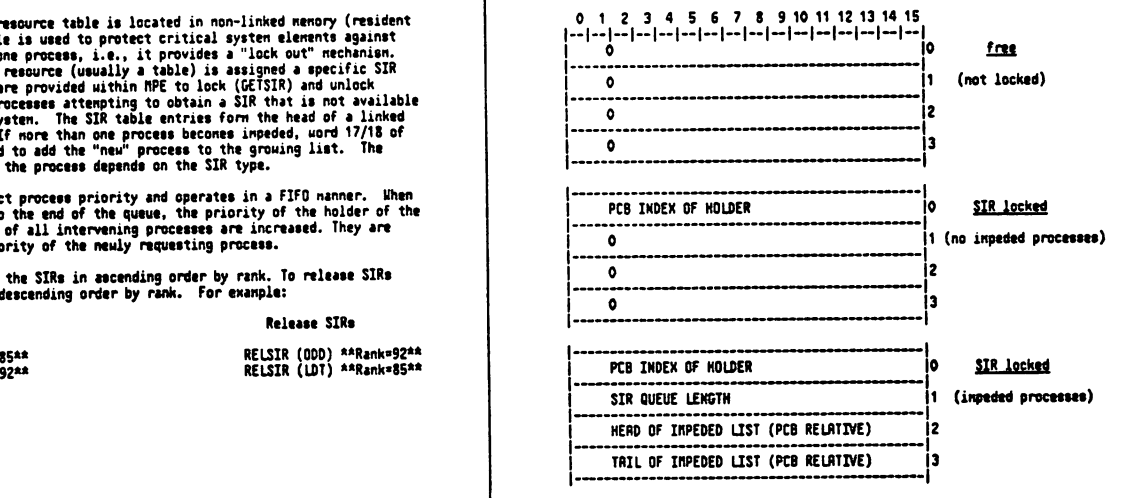
The system internal resource table is located in non-linked memory (resident table). The SIR table is used to protect critical system elements against access by more than one process, i.e., it provides a "lock out" mechanism. Each critical system resource (usually a table) is assigned a specific SIR number. Procedures are provided within MPE to lock (GETSIR) and unlock (RELSIR) the SIR. Processes attempting to obtain a SIR that is not available are impeded by the system. The SIR table entries form the head of a linked list in this case. If more than one process becomes impeded, word 17/18 of the PCB entry is used to add the "new" process to the growing list. The method of unimpeding the process depends on the SIR type.

A SIR does not respect process priority and operates in a FIFO manner. When a process is added to the end of the queue, the priority of the holder of the SIR and the priority of all intervening processes are increased. They are increased to the priority of the newly requesting process.

To get SIRs, arrange the SIRs in ascending order by rank. To release SIRs arrange the SIRs in descending order by rank. For example:

Get SIRs	Release SIRs
GETSIR (LDT) **Rank=85**	RELSIR (ODD) **Rank=92**
GETSIR (ODD) **Rank=92**	RELSIR (LDT) **Rank=85**

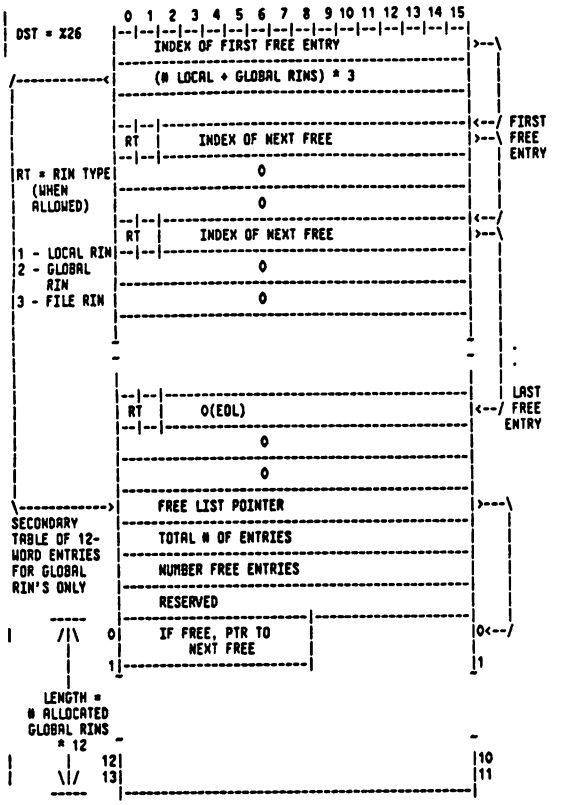
SIR Entry Formats



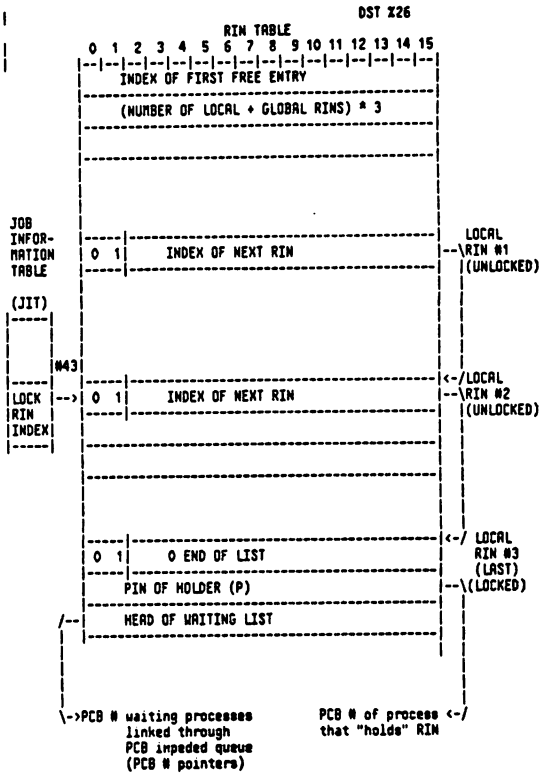
P = PIN #
PIN = PCB table entry number
SIR QUEUE LENGTH - number of processes queued for this SIR

The SIR table is indexed by SIR#, with each SIR# corresponding to a unique, preassigned system internal resource. Entry #0 is not used. Impeded lists are established by using the SIR table entry (2) as the head of the list and PCB(15) for elements. PINs are always used as pointers, with 0 indicating end of list.

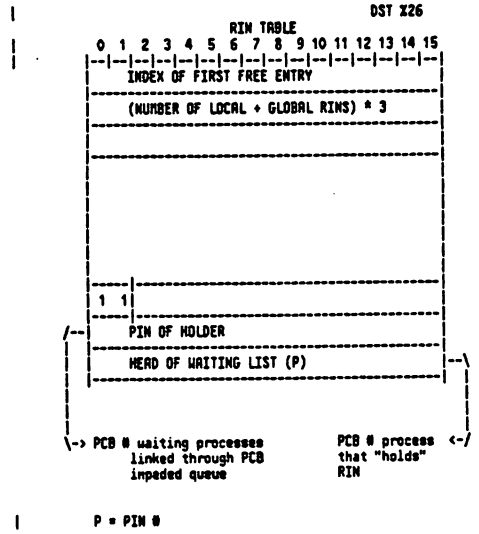
RIN Table General Layout (Initialized State)



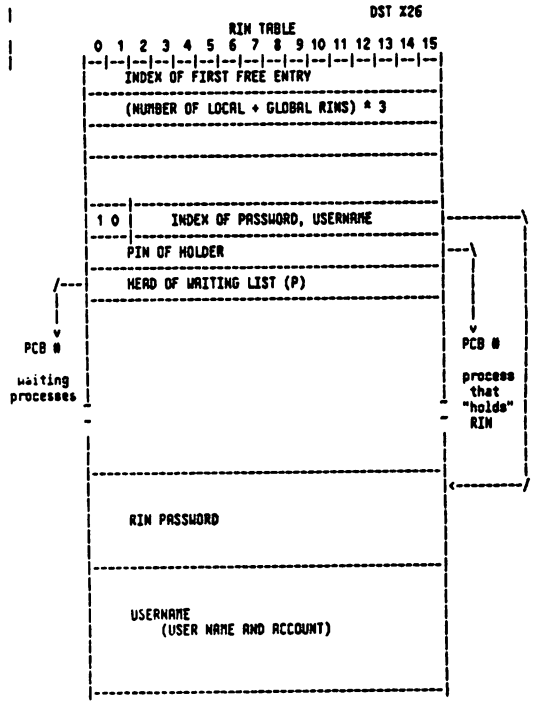
Allocation and Locking of Local RINS



Allocation and Locking of File RINS



Allocation and Locking of Global RINS



CHAPTER 6 FILE SYSTEM

File System Overview

This chapter describes the MPE V file system, including the basic concepts and the table structures used.

I/O to files is done by reference to file numbers, which are assigned by calling the FOPEN intrinsic. This establishes an initial "point of attachment", which may be described as a connection between a program (i.e., process) and that particular point in a particular file at which the next FREAD or FWRITE would cause data to be transferred. A point of attachment is described by a control block, of which there are several different kinds (described later in this chapter). Control blocks may exist in the process's own stack or in an extra data segment assigned by the file system. In order to find control blocks quickly, a pointer scheme called vectors is used. A control block is uniquely described by a vector, which consists of two words with the first word containing a segment number and the second word containing a word offset into the control table of the vector table entry which describes the location of the control block within that segment. The entire assemblage, consisting of eight overhead words, the vector table, and all of the control blocks to which it points, comprises the entire segment; if in a stack, it occupies part of the PXFILE part of the PCBX.

The point of attachment is described by a "physical access control block", or PACB, which will exist as a result of an FOPEN to any file (except $NULL). Any required I/O buffers are associated with the PACB.

All FOPENs specifying "multi-access" for all processes running under a single job use a single PACB for references to a multi-access file. Although all these are attached to a single point in the file, the type of attachment (i.e., AOPTIONS) may be different. Therefore, each FOPEN specifying a multi-access file establishes a "logical access control block", or LACB, which contains the point-of-attachment local values. The use of a single buffer (i.e., PACB) ensures that references by various processes or against various FOPENs within one process are dealt with in strict sequential order. Note that references to a file by other jobs, or by other processes not specifying multi-access, will be through other PACBs, whose buffers will be read or written at the pleasure of the file system; in order to ensure any sort of coherence to such shared references, the jobs must use global RINS and FLOCK and FUNLOCK the file. $STDIN, $STDLIST, and spoolfiles are opened multi-access automatically.

In the case of disc files, there is another kind of control block: the file control block (FCB). It contains copies of information read from the file label, such as the end-of-file pointer, the extent map, and the record and block structure. The EOF pointer is updated in the FCB as the file is written, and all changes made to the FCB are posted to the file label when the file is closed. An FCB is shared by all jobs in the system which reference the file.

The file number assigned by an FOPEN is an index into the Available File Table (AFT), a table of six-word entries which is at the end of the PXFILE part of the PCBX. Two double words are vectors to the PACB and (if it exists) the LACB.

AFT entries can also reside in a global AFT extra data segment. If the file was opened Global AFT (specified in the AOPTIONS) and the program is privileged, then the AFT is placed into this global AFT DST. Any accesses to the file are identical to local AFTs. All accesses to the file opened global must be done from privilege mode code. The file system intrinsics distinguish this file by a negative file number. Again, these files are identical in every other way except for where the AFT entry resides.

Because control blocks are shared among processes, it is necessary to have a scheme for coordinating access to them. A control block is "locked" by a process which requires exclusive access to it for a time. Other processes which attempt to lock the block will find it already locked, and will be impeded and queued. It may also be necessary to lock an entire control block table so that a process can create or destroy a control block in it, or lock or unlock an existing control block in the table.

Another table used by FOPEN is the File Multi-Access Vector Table (FMAVT). This table exists in a system extra data segment and is used by all jobs and processes in the system. When a file is being FOPENed with multi-access specified, the FMAVT is searched; if the file is already open, the FMAVT gives the PACB vector for the prior reference for each job.

Buffers

A bit in AOPTIONS specifies, when a file is opened, whether access is to be buffered or unbuffered. If unbuffered, data is transferred directly between the I/O device and the user's buffer (usually in his stack), which will be frozen in memory for the duration of the transfer. If buffered, the data is moved between the user's buffer and a file system buffer to which the I/O is actually done.

Buffers are associated with the PACB, attached to it as an appendage.

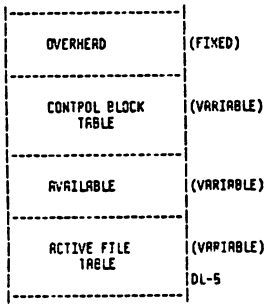
Table Formats

Below is a detailed discussion of the main tables constructed and used by the file system. The location and overall structure of each table is given, in addition to the table format and a discussion of each field in the table. Table indices at the right of the table are in octal. Index names apply to the entire word; if in parentheses, the names are defined in the file system listing but not explicitly used there.

File System Section of PCBX (PXFILE)

The PXFILE area is a subsection of the PCBX. It is a contiguous, expandable and contractible block of storage that is managed by the file system primarily for its own use. Other subsystems, namely CS and DS, also make use of the PXFILE section. In doing so they must conform to the conventions of the file system.

The overall structure of the PXFILE area is:



Overhead

The part labeled Overhead contains information that pertains to the entire section. It is addressed via the pointer at DL-3.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		
0	PXFILE SIZE IN WORDS	0 PXFSIZE
1	LAST DOPEN ERROR NO. / LAST COPEN ERROR NO.	1
2	N	2
3	LAST DS AFT	3
4	SLAVE AFT NUMBER	4
5	LAST KOPEN ERROR NO. / LAST FOPEN ERROR NO.	5
6	AFT SIZE IN WORDS	6 PXAFTSIZE
7		7
	CS TRACE FILE INFO	(PXCTRINFO)
10		8
11	LAST RESPONDING NO-WAIT I/O AFT ENTRY NUMBER	9 PXFLEFTOFF
12	1ST USER (NOBUF) CONTROL BLOCK TABLE DST NO.	10 PXFCBT1
13	2ND USER (NOBUF) CONTROL BLOCK TABLE DST NO.	11 (PXFCBT2)
14	3RD USER (NOBUF) CONTROL BLOCK TABLE DST NO.	12 (PXFCBT3)
15	4TH USER (NOBUF) CONTROL BLOCK TABLE DST NO.	13 (PXFCBT4)
16	5TH USER (NOBUF) CONTROL BLOCK TABLE DST NO.	14 (PXFCBT5)
17	6TH USER (NOBUF) CONTROL BLOCK TABLE DST NO.	15 (PXFCBT6)
20	7TH USER (NOBUF) CONTROL BLOCK TABLE DST NO.	16 (PXFCBT7)
21	8TH USER (NOBUF) CONTROL BLOCK TABLE DST NO.	17 (PXFCBT8)

Partial word field identifiers are:

```
PXFDOPEN    = PXFILE(1).(0:8)W,  last DOPEN error code
PXFCOPEN    = PXFILE(1).(8:8)W,  last COPEN error code
PXFNOCB     = PXFILE(2).(0:1)W,  no CBs in PXFILE CBT?
PXFKOPEN    = PXFILE(5).(0:8)W,  last KOPEN error code
PXFFOPEN    = PXFILE(5).(8:8)W,  last FOPEN error code
```

Discussion:

PXFAFTSIZE — This is the size (in words) of the Active File Table (AFT). The size is in words to simplify calculating the size of the available block.

PXFCBT1-8 — These are the DST numbers of the user (KOBUF) control block tables. A DST number of 0 indicates that no data segment is allocated.

PXFCOPEN — This contains the last COPEN error number. Not used by the file system.

PXFCTRINFO — This contains information pertinent to the CS trace file. Not used by the file system.

PXFDOPEN — This contains the last DOPEN error number. Not used by the file system.

PXFDSINFO — Reserved for DS. Not used by the file system.

PXFFOPEN — This contains the last FOPEN error number. If it is zero then the last FOPEN successfully completed; otherwise the last FOPEN was unsuccessful and the number is the file system error number.

PXFKOPEN — This contains the last KOPEN error number. KSAM is partly embedded in the file system, and an FOPEN failure on a KSAM file can be caused by a failure to open either the key file or the data file. This error number is used in conjunction with PXFFOPEN to determine which file caused the KSAM open failure. This error number is not used by the file system.

PXFLEFTOFF — This is the AFT entry number of the last file/line that completed a nowait I/O; if zero then no nowait I/O has been completed. This cell is maintained solely by and for the IOWAIT intrinsic.

PXFNOCB — This bit signifies that control blocks are not to be created in the PXFILE control block table. This bit is set by the NOCB parameter to the CREATE intrinsic or the :RUN command. This feature permits the user to have as much stack space as possible; otherwise the file system will take several hundred words of stack for the PXFILE control block table.

PXFSIZE — This is the size (in words) of the complete PXFILE area. It is the sum of the overhead block, the control block table, the active file table and the available block.

PXFILE Control Block Table (PXFCBT)

Addressing within a PXFILE control block table is somewhat more complicated than addressing an extra data segment CBT since the table does not begin at DB+0. As a result all pointers within the table are table relative; the starting address of the table must be added to a pointer to generate a final DB-relative address. This addressing convention is consistently applied to all control block tables.

When the control block table is expanded, space is taken from the AVAILABLE area. If no space is available then the PXFILE area is expanded and the acquired space is added to the AVAILABLE area.

Available Block

The part labeled AVAILABLE is used to provide space when the Control Block Table or the Active File Table is expanded. These two tables grow towards each other, and when more space is needed it is simply taken from the AVAILABLE Block.

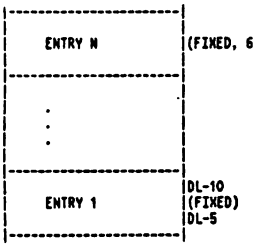
When the AVAILABLE area is exhausted, the PXFILE area is expanded, the AFT is relocated and the new space is added to the AVAILABLE Block.

Currently the PXFILE area is only expanded; it is never contracted.

Active File Table (AFT)

The part labeled Active File Table contains information used by the file system (or CS, DS, etc.) to grossly characterize the file access and, most importantly, to give the location of the control blocks.

The overall structure of the AFT is:

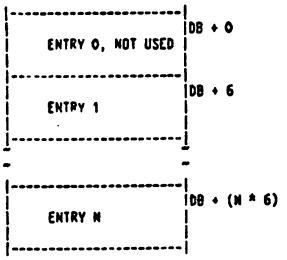


Where N = PXFAFTSIZE / 6.

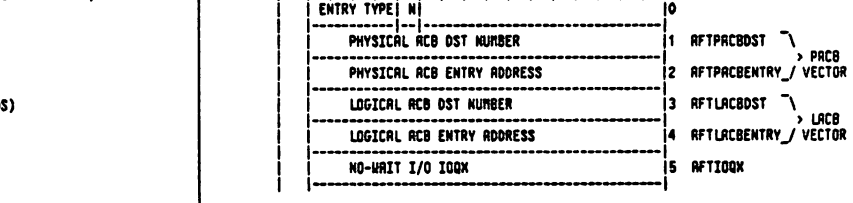
The length of the AFT is specified by PXFAFTSIZE. Unused entries are all zeros. When the table is full it is expanded by taking space from the Available block.

The AFT is negatively indexed by file number: the entry at DL-10 corresponds to file number 1, the entry at DL-16 corresponds to file number 2, etc.

The structure of the global AFT DST is as follows:



The structure of a file system AFT entry is:



Entry format depends on the entry type; the file system uses entry type 0.

The following partial word field identifiers are used:

```
AFTTYPE     = AFT.(0:4)#,    entry type
AFTNULL     = AFT.(4:1)#,    $NULL file
```

Discussion:

AFTIOQX — This is the IOQ index of the pending nowait I/O (if any). This is applicable if the file was opened with the NOWAIT option specified. Also, CS and DS have the same capability and use this cell in a consistent manner. This is because the IOWAIT intrinsic services the file system as well as CS and DS, and is the principal user of this cell. If the IOQX is negative, then one of two possibilities exist. If the file is a message file, then file IOQX is the accessor's reply port. If the file is a standard MPE file, then a read was done to a nonexistent extent and this is simply a stub inserted by the file system.

AFTLACBDST — This is the DST that the Logical ACB (LACB) if it exists. This is applicable if the file was opened with the multi-access option specified.

AFTLACBENTRY — This is the word offset into the control block table of the LACB vector table entry, applicable if the file was opened with the multi-access option specified.

AFTNULL — This bit signifies that the file is $NULL and that there are no control blocks.

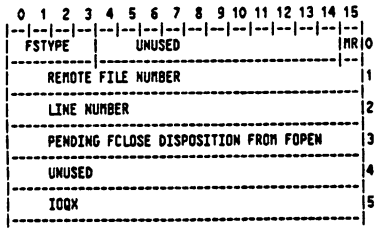
AFTPACBDST — This is the DST that contains the Physical ACB (PACB). A PACB exists for all files except $NULL.

AFTPACBENTRY — This is the word offset into the control block table of the PACB vector table entry. This will be nonzero for all files except $NULL.

AFTTYPE — This is the AFT entry type number. At present the following entry types are defined:

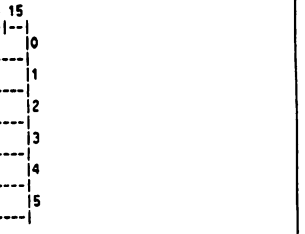
0 - File system
1 - Remote file
2 - DS (nowait I/O disallowed)
3 - DS (nowait I/O allowed)
4 - CS
5 - CS (Autodial)
6 - KSAM
8 - Message File
9 - RFA Port
13 - Advanced Network Subsystem

Remote File AFT Entry



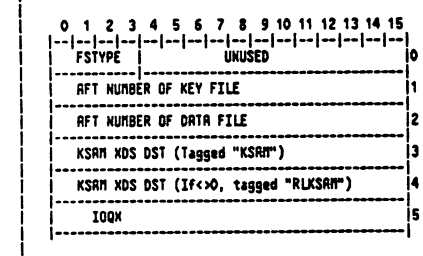
AFT 0
FSTYPE - This value will be 1 for remote files.
MR - Set if the file was opened multi-access.
AFT 1 - Local line number of remote file.
AFT 2 - File number of the remote file.
AFT 3 - Pending disposition of the file. Set when file was FOPEN'd and will possibly be used as the FCLOSE disposition.
AFT 5 - No wait I/O Queue Index.

DS AFT Entry



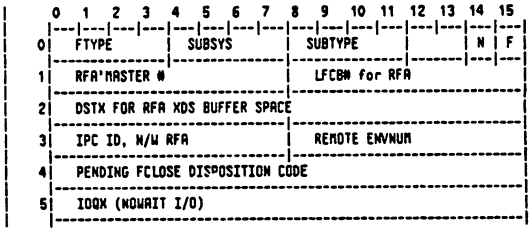
AFT 0
FSTYPE - This field will have the value 2 or 3.
C - On if DSOPEN called by CXDSLINE or REMOTE'HELLO.
M - On if Master PTOP AFT.
P - On if PTOP related.
R - On if remote main process.
AFT 1 - DS data segment table pointer.
AFT 2 - DSDSCB Index - DS data segment control block index.
AFT 3 - Logical device number.
AFT 4 - Preceding DS open AFT Pointer.
AFT 5 - IOQX - Same as described above.

KSAM AFT Entry



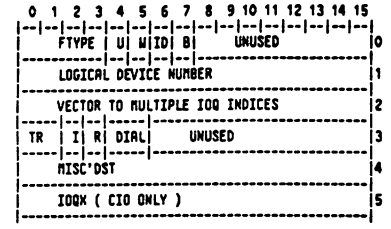
AFT 0.(0:4) - FSTYPE (6)
AFT 1 - AFT number of key file
AFT 2 - AFT number of data file
AFT 3 - KSAM XDS DST (Tagged "KSAM")
AFT 4 - KSAM XDS DST (If non-zero, the tag will be "RLKSAM")
AFT 5 - No wait I/O Queue Index

AFT for RFA



AFT 0
FTYPE - This field will be 9. Data Comm FTYPE.
SUBSYS - This field will be 2. ADS application services.
SUBTYPE - 1 = Remote File Access.
4 = Remote Data Base Access.
N - 0 = File is regular waited.
1 = File I/O is nowait.
F - 0 = An error/failure occurred.
1 = No error. Normal operation.
AFT 1
RFA'MASTER # - Buffer number of RFA Master Entry.
LFCB # - Buffer number of Local File Control Block Entry.
AFT 2 - DST number of RFA XDS.
AFT 3
IPC ID - IPC ID for RFA nowait I/O.
ENVNUM - Environment number of remote environment.
AFT 4 - Pending FCLOSE disposition code.
AFT 5 - IOQX - If <> 0, then it is the system DB address of a single request IOQ entry. IOWAIT uses this word to pass the IOQ index of the completed request for this AFT to CSIOWAIT.

CS Line Entry



RFT 0
- FTYPE - This value will be 4 or 5. A 5 signifies that the line has an autodialer attached.
- U - The line has been opened with no waiting on I/O requests.
- ID - Line is a multipoint control or 3270 station.
- B - Line was opened with buffering.

RFT 1 - Logical device number of the line.

RFT 2 - Vector to multiple IOQ indices.

RFT 3
- TR - Bit 0 on signifies tracing enabled. Bit 1 on signifies trace all.
- I - On if line is currently connected.
- R - Signifies that this CS device is an SCCP device.
- DIAL - 0 = Dial on write, answer on read.
  1 = Answer on write, dial on read.
  2 = Always dial.
  3 = Never dial.

RFT 4 - DST number of the line's misc data segment.

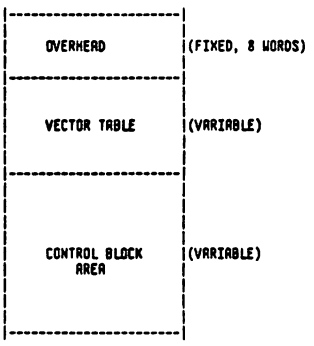
RFT 5 - If <> 0, then it is the system DB address of a single request IOQ entry. IOWAIT uses this word to pass the IOQ index of the completed request for this AFT to CSIOWAIT.

File Control Block Table (CBTAB)

A file control block table can be located in two places: as a subpart of the PXFILE area, or in a data segment. Although putting control block tables in PXFILE has the advantage of providing rapid access, it detracts from the space for the user's stack; so the larger control blocks (or optionally, all control blocks) are put into extra data segments. On the other hand, referencing extra data segments may result in an absence trap, which is slow.

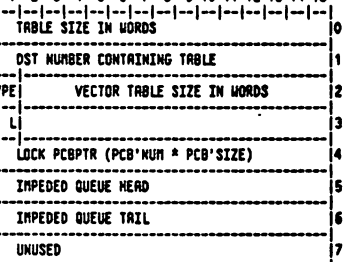
There are three types of extra data segment control blocks; expandable, nonexpandable, and shared FCB. Nonexpandable CBTs are used for a single PRCB with buffers, i.e., where the control block is large or where the control block can't be local to a single process (for multi-access). Expandable (or NOBUF) CBTs are used for small control blocks ,as LACBs, PRCBs with no buffers, and FCBs which are local to a single process. A list of the expandable CBTs associated with a process is kept in the overhead area of PXFILE. When a small control block is needed, these CBTs are checked in order to see if one of them has room. Shared FCB CBTs are similar to expandable CBTs except that they belong to the system rather than to a single process; the system keeps a list of DSTs which it has assigned for this purpose.

The overall structure of a control block table is:



Overhead

The part labeled Overhead contains information pertaining to the entire table.



Other identifiers used:

```
CBTTYPE    = CBTAB(2).(0:2)      Control block table type
CBTVTSIZE  = CBTAB(2).(2:14)     Vector table size
CBTLOCKBIT = CBTCONTROL.(1:1)    Lock bit
```

Discussion:

CBTDSTN — This is the DST number of the data segment that contains the control block table. If the table is contained in a stack, i.e., in the PXFILE area, then this is the DST number of the stack and not 0.

CBTLOCKBIT — If the entire control block table is locked, then this bit is set. No locking count is kept since control blocks are locked only once from FCREATECB and FDELETECB when control blocks are added to and deleted from the table. The procedure LOCK'CB does not lock the control block because it runs PSEUDODISABLED during the critical times.

CBTQUEUE — This is the impeded queue for the table and has the same format as the impeded queue for a control block in the table. There is no second impeded queue because that facility is used exclusively for BREAK requests against the PRCB for $STDIN/$STDLIST.

CBTPIN — This is the PCBPTR of the process that has the control block locked (PCBPTR = PIN'NUM * PCB'ENTRY'SIZE).

CBTSIZE — This is the size in words of the table. It is initialized when the table is created and changed when the table is expanded. At present a table is never contracted, even though this is possible.

CBTTYPE — This field is the type of the control block table. Possible values are:

- 0 - Stack [PXFILE]
- 1 - NOBUF (expandable)
- 2 - System shared FCB
- 3 - Buffered (Contains a single PRCB)

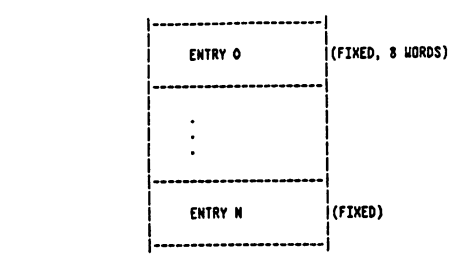
CBTVTSIZE — This is the size, in words, of the vector table area in the control block table. It does not reflect the number of entries used or unused.

NOTE: All PINs are kept as the word offset into the PCB table and as the actual PIN number.

Vector Table

The part labeled Vector Table contains information used to locate and lock or unlock control blocks in the control block table.

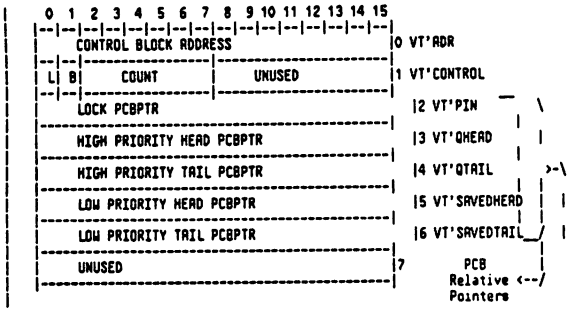
The overall structure of the vector table is:



Where N = (CBTVTSIZE/8) - 1.

An unused vector table entry will have zeros in all the words of the entry. A used vector table entry will have a nonzero value in the first word of the entry (the control block address is necessarily nonzero).

The general structure of a vector table entry is:



The following partial word identifiers are used:

```
VT'LOCK'BIT  =  VT'CONTROL.(0:1)
VT'BREAK'BIT =  VT'CONTROL.(1:1)
VT'COUNT     =  VT'CONTROL.(2:6)
```

|Discussion: (Note: PIN = PCBPTR in the discussions | PCBPTR = PIN'NUM * PCB'ENTRY'SIZE)

VT'ADR — Control block address is the table relative address of the control block associated with the vector table entry. It is a word displacement from the beginning of the control block table.

VT'BREAK'BIT — This bit signifies that we are in the middle of break mode. This is used for the PACB of $STDIN/$STDLIST from a terminal session only.

VT'LOCK'BIT — This bit is set whenever the control block is locked.

VT'COUNT — This is the count of the number of times that the control block has been locked by the process identified in VT'PIN. If it is zero, then the control block is not locked.

VT'PIN — Contains the PCBPTR of the process which has exclusive access to the control block. Other processes attempting to access the block will be impeded and queued. PCBPTR = (PCB'NUM * PCB'ENTRY'SIZE)

VT'QUEUE — The high priority impeded queue is a double word of PINs that are the head and tail of the impeded queue of processes waiting for access to the control block. Processes are impeded and unimpeded by the file system using the normal mechanisms available under MPE.

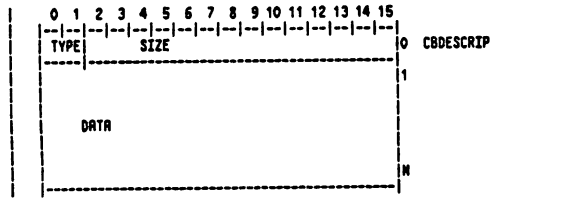
VT'SAVEDQUEUE — The low priority impeded queue is a double word of PINs and has the same format as VT'QUEUE. The only time this word is used is when the control block is in BREAK mode, which can only happen to an ACB corresponding to $STDIN/$STDLIST. It is used to save the current VT'QUEUE when the control block goes into BREAK mode and to restore VT'QUEUE when the control block goes back into non-BREAK mode.

NOTE: All PINs are stored as offsets within the PCB table and not as actual PIN numbers.

Control Block Area

The part labeled CONTROL BLOCK AREA contains the control blocks used by the file system.

To facilitate storage management, all control blocks have the same overall structure:



Where N = Size-1.

Partial word field identifiers are:

```
CBTYPE  =  CB.(0:2)W,     control block type number.
CBSIZE  =  CB.(2:14)W;    control block size
```

Discussion:

CBDESCRIP — This is the first word of a control block; the format is common for all control blocks.

CBSIZE — This is the size (in words) of the control block. The size includes the descriptor word.

CBTYPE — This is the type number of the control block. There are four types of control blocks:

0 - Garbage
1 - FCB
2 - PACB
3 - LACB

When a control block table is created the initial control block area is completely allocated to a single control block of type garbage. When space is requested for a new control block the control block area is scanned (using a first fit algorithm) for a garbage control block that is as large as the size requested. The space for the new control block is taken from this garbage control block and the space remaining becomes the new garbage control block size.

When space is returned it becomes a new garbage control block. To reduce fragmentation the new garbage control block is combined with either of the two neighboring control blocks if they are of type garbage.

If space is requested and no garbage control block is large enough to contain the new control block then the control block area and control block table are expanded by a sufficient amount. If expansion is not possible, some other control block table must be used.

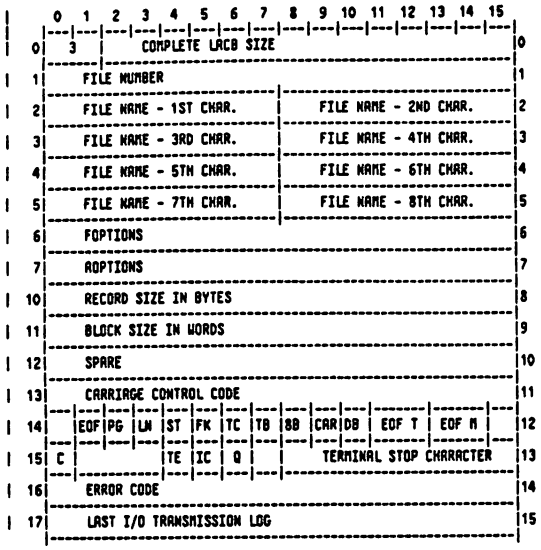
Access Control Block (ACB)

Virtually every file system intrinsic constructs an ACB as its first action. When using the multi-access option, each accessor shares a single PACB. However each accessor is permitted to view the shared file in a slightly different manner than the other accessors. For example, one accessor may access the file in a read-only mode while the other accessors may access the file in a read-write mode. To do this, each accessor must, during his access, have a slightly different ACB.

The PACB holds information that is global to all accessors of the file. The LACB holds information that is local to each accessor of the file. At the beginning of a particular access, an ACB is constructed by calling LOC'ACB, which copies information from both the LACB and the PACB. At the end of the access, the ACB is released by calling UNLOCK'ACB; this updates the PACB and LACB from the ACB since some of the fields may have been modified due to the access. This scheme nearly eliminates EXCHANGEDB's to access the various data segments.

Logical Access Control Block (LACB)

All LACBs have the same structure:



Partial word field identifiers are:

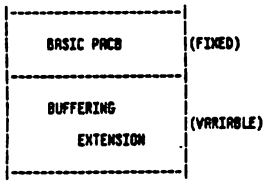
```
LACBSIZE       = LACB.(2:14)W,   size in words
LACBSTOPCHAR   = LACB(2).(0:8)W, terminal stop character
```


Discussion:

LACBAOPTIONS	See ACBAOPTIONS.
LACBBSIZE	See ACBBSIZE.
LACBCTL	See ACBCTL.
LACBERROR	See ACBERROR.
LACBFNUM	See ACBFNUM.
LACBFOPTIONS	See ACBFOPTIONS.
LACBMODE	See ACBMODE.
LACBNAME1-8	See ACBNAME.
LACBPACB	This is the DST and vector table entry for the Physical ACB (PACB) for the file.
LACBRSIZE	See ACBRSIZE.
LACBSIZE	This is the size, in words, of the LACB. All LACBs are eighteen (decimal) words long.
LACBSTATE	See ACBLSTATE.
LACBSTOPCHAR	See ACBSTOPCHAR.
LACBTLOG	See ACBTLOG.

Physical Access Control Block (PACB)

The overall structure of the PACB is:

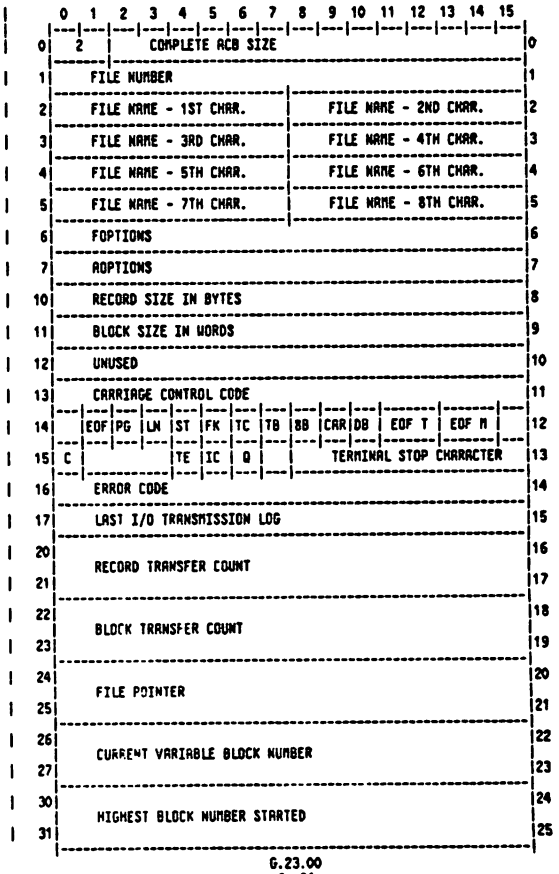


The buffering extension is optional; it is present if and only if the file is accessed with buffering. There are, therefore, two possible formats for an ACB:

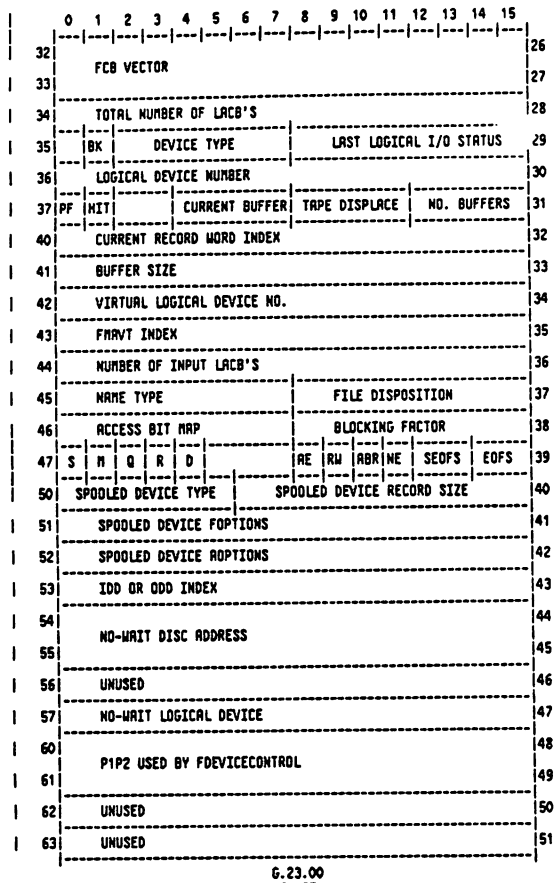
1. No buffers; the buffering extension is not present.
2. PACB buffers; the buffering extension is present and the buffers are in the buffering extension.

If multiple PACB buffers exist, there will be a buffering extension for each, immediately preceding the buffer. The basic PACB (or NOBUF PACB) is copied into the the ACB as words 0 through X63; an ACB "extension" is then generated in words X64 - X67. The resulting ACB thus has the following format:

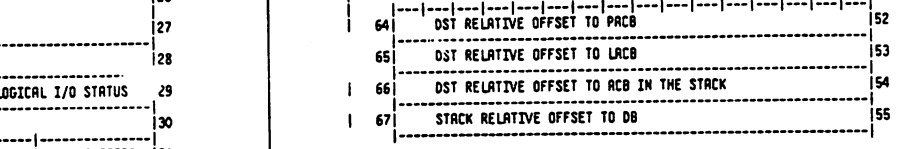
Access Control Block (ACB) and Physical Access Control Block (PACB)



Access Control Blocks (ACB's) (Cont.)



The above words, 0-Z63, are physically located in the PACB of the file. Below, words Z64-Z67, are used by file system intrinsics, and are placed onto the stack by the procedure LOC'ACB when locking the ACB. Therefore, the buffering extension, present, will immediately follow word Z63 of the actual ACB in the Control Block Table of the file.



The following identifiers are used when referring to an ACB:

```
(ACBSIZE)      = ACB.(2:14)#,      size in words
ACBFNUM        = ACB(1)#,          file number
ACBNAME        = ACB(2)#,          file name
ACBNAME1       = ACBDBL(1)#,       file name - first half
ACBNAME2       = ACBDBL(2)#,       file name - second half
ACBFOPTIONS    = ACB(6)#,          FOPTIONS
ACBAOPTIONS    = ACB(7)#,          AOPTIONS
ACBRSIZE       = ACB(8)#,          record size (bytes)
ACBBSIZE       = ACB(9)#,          block size (words)
Spare          = ACB(10)#,         Unused
ACBCTL         = ACB(11)#,         carriage control word
ACBLSTATE      = ACB(12)#,         local state flags
ACBEOF         = ACBLSTATE.(1:1)#, end of file sensed
ACBLPCTL       = ACBLSTATE.(2:2)#, page and line control
ACBPAGECTL     = ACBLSTATE.(2:1)#, page control
ACBLINECTL     = ACBLSTATE.(3:1)#, line control
ACBSTREAM      = ACBLSTATE.(4:1)#, stream I/O
ACBFKEYS       = ACBLSTATE.(5:1)#, restore function keys
ACBXMITCRLF    = ACBLSTATE.(6:1)#, transmit CR,LF to user
ACBTBLOCK      = ACBLSTATE.(7:1)#, disable block mode
ACBBINARYIO    = ACBLSTATE.(8:1)#, 8-bit terminal transfers
ACBCARRIAGE    = ACBLSTATE.(9:1)#, carriage control flag
(ACBDEFBLOCK)  = ACBLSTATE.(10:1)#, default blocking
ACBREADCODE    = ACBLSTATE.(11:4)#, input EOF check
ACBREADTYPE    = ACBLSTATE.(11:2)#, input EOF type
ACBREADMODE    = ACBLSTATE.(13:2)#; input EOF mode
ACBMODW        = ACB(13)#,         mode word
ACBMODE        = ACBMODW.(0:8)#,   mode setting
ACBCIROVERFLOW= ACBMODW.(0:1)#,    signifies CIR overflow
ACBSETMODE     = ACBMODW.(4:4)#,   FSETMODE bits
ACBTAPEERROR   = ACBMODW.(4:1)#,   report recovered tape error
ACBINHIBCRLF   = ACBMODW.(5:1)#,   inhibit terminal CR/LF
ACBQUIESCE     = ACBMODW.(6:1)#,   critical output verify
```



```
ACBSTOPCHAR    = ACBMODW.(8:8)#,   terminal stop character
ACBERROR       = ACB(14)#,         error code
ACBTLOG        = ACB(15)#,         last I/O transmission log
ACBFPTR        = ACBDBL(08)#,      current record number
ACBBLK         = ACBDBL(09)#,      current variable block
ACBRTFRCT      = ACBDBL(10)#,      logical record TFR count
ACBBTFRCT      = ACBDBL(11)#,      block transfer count
ACBHIBLK       = ACBDBL(12)#,      highest block started
ACBFCBV        = ACBDBL(13)#,      FCB Vector table entry
ACBSHCNT       = ACB(28)#,         # of LACBs
ACBSTATW       = ACB(29)#,         access class, status, etc.
ACBBREAK       = ACBSTATW.(1:1)#,  break ($STDIN/LIST only)
ACBDTYPE       = ACBSTATW.(2:6)#,  device type
ACBACCCL       = ACBSTATW.(2:3)#,  device access class
ACBSUBCL       = ACBSTATW.(5:3)#,  device sub-class
ACBSTATUS      = ACBSTATW.(8:8)#,  last logical I/O status
ACBQSTATUS     = ACBSTATW.(8:5)#,  qualifying status part
ACBGSTATUS     = ACBSTATW.(13:3)#, general status part
ACBDADDR       = ACB(30)#,         Ldev number of file
ACBBUFX        = ACB(31)#,         buffer data & misc. flags
ACBPRIV        = ACBBUFX.(0:1)#,   privileged access only
ACBHIT         = ACBBUFX.(1:1)#,   buffer hit flag
ACBCURRBUF     = ACBBUFX.(4:4)#,   current buffer nor.
ACBNUMBUFS     = ACBBUFX.(12:4)#,  number of buffers less 1
ACBBUFUSED     = ACB(32)#,         used block word count
ACBBUFSIZE     = ACB(33)#,         buffer size (words)
ACBSPVDEV      = ACB(34)#,         spooled virtual device
ACBFMAVTX      = ACB(35)#,         FMAVT index
ACBSHCNTIN     = ACB(36)#,         number of input LACBs
ACBDNTD        = ACB(37)#,         type & disposition
ACBDNTYPE      = ACBDNTD.(0:8)#,   name type for dir. search
ACBDISP        = ACBDNTD.(8:8)#,   file disposition
ACBAMLD        = ACB(38)#,         access mask & LDEV
ACBACCESS      = ACBAMLD.(0:8)#,   access mask
ACBBLKFACT     = ACBAMLD.(8:8)#,   Blocking factor of file
ACBGSTW        = ACB(39)#,         spool control flags
ACBSPOOLED     = ACBGSTW.(0:1)#,   spooled device flag
ACBSPOOLIO     = ACBGSTW.(0:2)#,   spooled IN/OUT
ACBSPSQ        = ACBGSTW.(2:2)#,   squeeze flags
ACBSPSQZ       = ACBGSTW.(2:1)#,   file squeezed
ACBSPRSQ       = ACBGSTW.(3:1)#,   request to squeeze
ACBSPDSQ       = ACBGSTW.(4:1)#,   squeeze just done
ACBNOWAITEOF   = ACBGSTW.(8:1)#,   EOF advanced?
ACBNOWAITMODE  = ACBGSTW.(9:1)#,   last I/O: 0=read, 1=write
ACBABORTREAD   = ACBGSTW.(10:1)#,  abort broken re-read?
ACBNEWEOF      = ACBGSTW.(11:1)#,  EOF advanced - tape file
ACBSAVEEOFS    = ACBGSTW.(12:2)#,  for saving ACBEOFS
ACBEOFS        = ACBGSTW.(14:2)#,  EOF flags - :EOD/:
ACBSPTYRC      = ACB(40)#,         spooled dev type/recsize
ACBSPTYPE      = ACBSPTYRC.(0:6)#, spooled dev type
ACBSPREC       = ACBSPTYRC.(6:10)#, spooled dev rec size
ACBSPFOPT      = ACB(41)#,         spooled dev FOPTIONS
ACBSPAOPT      = ACB(42)#,         spooled dev AOPTIONS
```



```
ACBSPXDDX      = ACB(43)#,         IDD/ODD index
ACBNOWAITDA    = ACBDBL(22)#,      Nowait disc address
Spare          = ACB(46)#,         Unused
ACBNOWAITLDEV  = ACB(47)#,         Nowait logical device
ACBP1P2        = ACBDBL(24)#,      Used by FDEVICECONTROL
ACBP1          = ACB(48)#,           "  "       "   "
ACBP2          = ACB(49)#;           "  "       "   "
```

Discussion:

ACBABORTREAD This flag is used to abort a broken terminal re-read. The flag is set via the ABORT parameter to FUNBREAK. If the flag is set then the READ PENDING message will be aborted along with the re-read. This feature is needed to handle the BREAK...:ABORT, etc., situation.

ACBACCCL This is the access class part of the device type number. The following are legal values:

0 - direct (e.g., disc)
1 - serial input (e.g., card reader)
2 - parallel input/output (e.g., terminal)
3 - serial input/output (e.g., magnetic tape)
4 - serial output (e.g., line printer)

ACBACCESS This is the access bit map for the file. The following are the bit definitions of this eight-bit field:

(0:1) - unused
(1:1) - unused
(2:1) - read
(3:1) - append
(4:1) - write
(5:1) - lock
(6:1) - execute
(7:1) - save

This access security is determined by the ACCCHECK intrinsic and enforced by the file system.

ACBAOPTIONS This is the AOPTIONS in effect for this file access.

ACBBINARYIO This bit controls full eight bit transfers on the 2644 page mode terminal. It is adjusted by FCONTROL(26) and FCONTROL(27).

ACBBLK — This is the block number of the current variable record format block. Applicable if the record format is variable.

ACBBLKFACT — This is the blocking factor for the file. It is the number of records in a block. Legal values range from 1 to 255.

ACBBREAK — This is the break mode flag. It is applicable if the ACB is for $STDIN or $STDLIST. If set it means that the BREAK key has been hit and that the CI should have high priority access to the ACB. The flag will be cleared when a RESUME or ABORT is issued.

ACBBSIZE — This is the block size, in words, of the file.

ACBBTFRCT — This is the total number of blocks transferred to and from the file. The initial value is 0D.

ACBBUFUSED — This is the word index, relative to the base of the block, for the selected record within the block. This is applicable if the file access is buffered.

ACBCARRIAGE — This bit signifies that the file has carriage control. It is the same as the carriage control bit in ACBFOPTIONS if the file is spooled. If not spooled, the bit is zero, and IOMOVE will pass the FWRITE carriage control parameter directly to the driver rather than embedding it as the first character of the output record.

ACBCTL — This is the CONTROL parameter from the last FWRITE. This value is pertinent if the file was opened with carriage control.

ACBCURRBUF — This is the buffer number (0-relative) containing the most recently referenced record. Applicable if the file access is buffered.

ACBDADDR — This is the logical device number of the file. For a disc file this is the logical device number of the first extent.

ACBDEFBLOCK — This bit signifies that the file is to be accessed with default blocking. The bit is initialized from the FOPEN state word STATE. It does not need to be in the ACB; it is mentioned here only to signify that the bit is effectively used due to the way ACBLSTATE is initialized from STATE.

ACBDISP — This is the file close disposition derived from the FOPEN call. The only way this can be specified is via a file equation. The legal values are the same as those for FCLOSE.

ACBDNTYPE — This is the file reference format type number and is derived from the FOPEN call. The following are legal values:

0 - full name
1 - account name absent
2 - group and account name absent
3 - null name

This information is needed by FRENAME.

ACBDTYPE — This is the device type number of the file. The following are legal values (octal):

0 - moving head disc
1 - fixed head disc
3 - CS80 device
7 - foreign disc
10 - card reader
11 - paper tape reader
20 - terminal
24 - card reader/interpreter/punch
26 - SSLC
27 - programmable controller
30 - magnetic tape
31 - serial disc
40 - line printer
41 - card punch
42 - paper tape punch
43 - CALCOMP 500 plotter
44 - CALCOMP 600 plotter
45 - CALCOMP 700 plotter

ACBEOF — This bit is set when EOF has been sensed.

ACBEOFS — This is the type of EOF detected on $STDIN(X). This field consists of two bits:

(0:1) - super colon (i.e., EOF for $STDINX)
(1:1) - regular colon (i.e., EOF for $STDIN)

Applicable for multi-access to $STDIN(X) only.

ACBERROR — This is the error number for the file. It is used by all intrinsics except FOPEN. When an error is detected the error number is placed in this cell. The error number is cleared at the beginning of each callable intrinsic except FCHECK (which reads it).

ACBFCB — This is the FCB vector for the file. Applicable only to disc files.

ACBFKEYS — This bit controls the definition of the f1 and f2 function keys on the 2644 page mode terminal; it is adjusted by FCONTROL(32) and FCONTROL(33). (Obsolete function)

ACBFNUM — File number, range from 1 to 255. Used mostly for calling routines that access things such as labels by file number.

ACBFOPTIONS — This is the FOPTIONS in effect for this file access.

ACBFPTR — This is the sequential access record pointer; it contains the next sequential record number. The initial value is 0D. This value is used only by the FREAD, FWRITE, and FUPDATE intrinsics. However, the value is maintained by all data transferring file system intrinsics.

ACBFMAVTX — This is the entry index into the file multi-access vector table (FMAVT). This is valid if the file access is multi-access.

ACBGSTATE — These are miscellaneous state flags. These are "global" in nature in that they are the same for all accessors in a multi-access environment. The constituent bits are described individually.

ACBGSTATUS — This is the general part of the last I/O status for the file. The following are the legal values:

0 - pending
1 - successful
2 - end of file
3 - unusual condition
4 - irrecoverable error

ACBHIBLK — This is the highest block number for which an anticipatory read has been issued, and is applicable if the file access is buffered. The initial value is -1D.

ACBHIT — This is the buffer hit flag. If set it indicates that the last read or write request was serviced without any physical I/O required. This flag is used only for performance measurement. The code which manipulates it is optional to the file system, and is controlled by compiler toggle H3.

ACBINHIBCRLF — This bit controls the termination of lines written to the terminal. If not set then each line is terminated with a CR and LF; if set then no line termination characters are used. This bit is valid if the file is a terminal file; it is adjusted by FSETMODE.

ACBLINECTL — This is the line control bit. If not set then each line is post-spaced; if set then each line is pre-spaced. This bit is used by line printers and terminals only. It is adjusted by FCONTROL(1) and FWRITE with the appropriate carriage control.

ACBLPCTL — This are the line and page control bits, which are described separately.

ACBLSTATE — These are miscellaneous state flags. They are "local" in nature in that they may be different for each accessor in a multi-access environment. Bits (9:6) are initialized from the state word local variable called STATE in FOPEN; the ten remaining bits are initialized individually. The constituent bits are described individually.

ACBMODE — These are miscellaneous mode flags. The constituent bits are described individually.

ACBNAME — This is the local file name. The name is eight bytes in length with trailing blanks added.

ACBNEWEOF — This flag when set indicates that a new tape mark should be written before the tape is rewound or backspaced. Applicable only to magnetic tape files.

ACBNOWAITEOF — This bit is used to save the value of the local EOF advanced flag NEWEOF in IOMOVE between the I/O initiation and I/O completion calls. This flag is applicable if the file is accessed in nowait I/O mode.

ACBNOWAITMODE — This cell is used to save the I/O mode between nowait I/O initiation and completion calls. If the bit is set then the last I/O request was a write; otherwise it was a read. This cell is pertinent if the file is accessed in nowait I/O mode.

ACBNUMBUFS — This is the number of buffers, less one, used for the file access. Applicable if the file access is buffered.

ACBPAGECTL — This is the page control bit. If not set then a page is assumed to consist of 60 lines (auto page eject); if set then a page is assumed to consist of 66 lines (no auto page eject). This is used primarily for line printers but is also valid for terminals; these are the only devices for which this is valid. This bit is adjusted by FCONTROL(1) and FWRITE with the appropriate carriage control.

ACBPRIV — This flag when set indicates that the file is privileged in that it has a negative file code; the user must be in privileged mode to access it.

ACBQSTATUS — This is the qualifying part of the last I/O status for the file. The values are unique for each general status part. See I/O System IRS for all legal values.

ACBQUIESCE — This bit controls critical output verification. If set, buffered output is guaranteed to have been written to the device when control is returned to the user. This bit is adjusted by FSETMODE.

ACBREADCODE — This field consists of the input EOF checking type and mode, and is used to generate the P1 parameter to ATTACHIO. These fields are described individually.

ACBREADMODE — This field controls the input EOF checking mode. It is 00 for reading $STDIN, 01 for reading $STDINX, and 10 for the Command Interpreter.

ACBREADTYPE — This field controls the input EOF checking type. It is 01 for JOBs, 10 for SESSIONs, and 00 for DATA.

ACBRSIZE — This is the file's record size in positive bytes.

ACBRTFRCT — This is the total number of records transferred to and from the file. The initial value is 0D.

ACBSAVEEOFS — This field is used to save the contents of ACBEOFS during BREAK mode processing.

ACBSHCNT — This is the total number of LACBs that exist for this PACB. Valid if the file access is multi-access.

ACBSHCNTIN — This is the total number of input-only LACBs that exist for this PACB. Valid if the file access is multi-access.

ACBSHCNTS — This is the total LACB and total input-only LACB counts, each of which is described separately.

ACBSIZE — This is the size, in words, of the ACB. The complete size (including buffers) may be calculated from the DST size containing the ACB. It does not include the buffering extension, if present.

ACBSPROPT — This is the ROPTIONS for the spooled device. Applicable if the file access is to a spooled device.

ACBSPFOPT — This is the FOPTIONS for the spooled device. Applicable if the file access is to a spooled device.

ACBSPOOLED — This is the spooled device flag. If set then the file access is to a spooled device.

ACBSPOOLIO — This field is a combination of the spooled device flag and the input/output mode of the spooled device. Legal values are:

00 - not spooled
01 - illegal
10 - input spooling
11 - output spooling

ACBSPREC — This is the record size, in bytes, of the spooled device. Applicable if the file access is to a spooled device.

ACBSPTYPE — This is the device type (from the LDT) of the spooled device. Applicable if the file access is to a spooled device.

ACBSPTYRC — This cell contains the spooled device type and record size, which are described separately.

ACBSPVDEV — This is the logical device number of the spooled device. Applicable if the file access is to a spooled device.

ACBSPXDDX — This is the index into the IDD or ODD for a spoolfile. Applicable if the file access is to either a spooled device or a spoolfile.

ACBSTATUS — This is the last I/O status for the file. It comes from the I/O status part of the IOCB returned by ATTACHIO. Not all ATTACHIO calls update this cell.

ACBSTOPCHAR — This is the record termination character used for terminal reads. This character can be changed via FCONTROL(25).

ACBSTREAM — This bit signifies inter-block garbage for disc files. If set, the block size is a multiple of 128 words and therefore, there is no garbage data between blocks. This fact is used to improve multirecord I/O by mapping the request into as few ATTACHIOs as possible.

ACBSUBCL — This is the sub-class part of the device type number. The sub-class is unique for each access class. The following are the legal sub-class values for each device class:

0 - direct
  0 - moving head disc
  1 - fixed head disc
  7 - foreign disc
1 - serial input
  0 - card reader
  1 - paper tape reader
2 - parallel input/output
  0 - terminal
  4 - card reader/punch
  6 - SSLC
  7 - programmable controller
3 - serial input/output
  0 - magnetic tape
  7 - serial disc
4 - serial output
  0 - line printer
  1 - card punch
  2 - paper tape punch
  3 - CALCOMP 500 plotter
  4 - CALCOMP 600 plotter
  5 - CALCOMP 700 plotter

ACBTAPEERROR — This bit controls the reporting of recovered magnetic errors. If not set the recovered errors are not reported to the user; if set then recovered errors are reported to the user by returning CCL and error number 39. Valid if the file is a magnetic tape file. This bit is adjusted by FSETMODE.

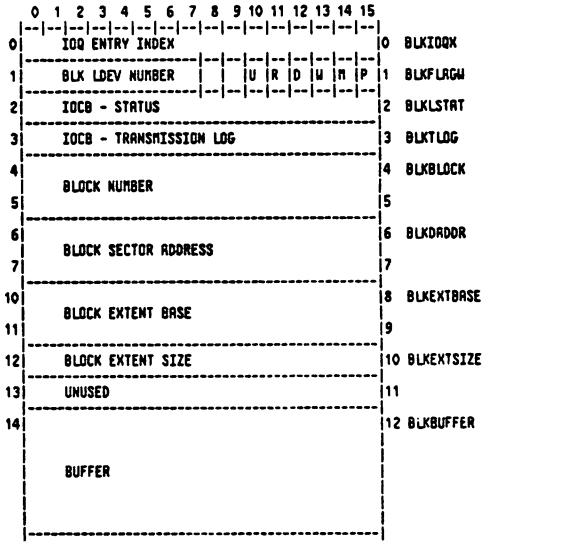
ACBTBLOCK — This bit controls block mode transfers on the 2644 page mode terminal. This bit is adjusted by FCONTROL(28) and FCONTROL(29).

ACBTLOG — This is the last I/O transmission log for the file. It comes from the I/O transmission log part of the IOCB returned by ATTACHIO. Not all ATTACHIO calls update this cell.

ACBVDADDR — This is the volume table index for the file. Applicable if the file is a disc file.

ACBXMITCRLF — This bit controls CR and LF insertion into the user buffer on the HP 2644 Page Mode Terminal. This bit is adjusted by FCONTROL(30) and FCONTROL(31).

If present, the PACB buffering extension contains from one to sixteen block buffers each having the following format:



Other identifiers used:

```
BLKFLAGW       = BLK(1)#,          flag and LDEV word
BLKLDEV        = BLKFLAGW.(0:8)#,  block logical device number
BLKFLAGS       = BLKFLAGW.(0:8)#,  block I/O flags
BLKUNALLOCEXT  = BLKFLAGW.(10:1),  block from unalloc. extent
BLKREVERSE     = BLKFLAGW.(11:1),  FREPDBACKWARD (not used)
BLKDONTWAIT    = BLKFLAGW.(12:1),  I/O status not checked
BLKIOOUT       = BLKFLAGW.(13:1)#, last I/O was write?
BLKDIRTY       = BLKFLAGW.(14:1)#, buffer modified?
BLKIOPEND      = BLKFLAGW.(15:1)#, I/O in progress
BLKIOCOMP      = BLKFLAGW.(14:2)#, I/O complete - not dirty
BLKIOCB        = BLKDBL(1)#,       IOCB
```

Discussion:

BLKBLOCK — This is the block number of the data contained in the buffer. A value of -1D indicates that the buffer is empty.

BLKBUFFER — This is the actual file system buffer space. Each buffer is exactly one file block in size.

BLKDRADDR — This is the block's logical device and sector number.

BLKDIRTY — This flag is set if the contents of the buffer has been modified. When the block buffer is re-used this flag is checked to see if the block needs to be written to the device.

BLKDONTWAIT — This bit will be on if the I/O was already completed via "DONT'WAIT" but the status has not been checked yet. Check the status before using the block in the buffer.

BLKEXTBASE — This is the sector address of the extent base in which the block resides. This is used for disc caching.

BLKEXTSIZE — The size, in sectors, of the extent in which the block resides. This is used for disc caching.

BLKFLAGS — These are the miscellaneous flags associated with the block, which are described separately.

BLKIOCB — This is the IOCB returned by the I/O system when the block I/O has completed. On a blocked I/O request this is obtained from the ATTACHIO call; on an unblocked I/O request this is obtained from WAITFORIO.

BLKIOCOMP — This is the buffer modified flag (BLKDIRTY) and the I/O in progress flag (BLKIOPEND), which are described separately. This field is usually interrogated to see if it contains the value 2, which means that the buffer has been modified but not yet written to the device.

BLKIOOUT — This is the mode of the I/O operation for the block. It is set by a write and cleared by a read.

BLKIOPEND — This is the I/O in progress flag. It is set if the I/O is pending; it is cleared when the I/O has completed.

BLKIOQX — This is the IOQ index of the unblocked I/O request for the block. It is used as the argument to WAITFORIO, which ensures the completion of the I/O request.

BLKLDEV — This is the logical device number of the block. (Valid only for disc files.)

BLKLSTAT — The I/O status part of the IOCB consists of the PCB number and the error code for the completed I/O request.

BLKTLOG — The transmission log part of the IOCB is the number of words or bytes transferred by the I/O request.

BLKREVERSE — This bit would indicate that we are reading back- wards from a tape. However, currently FREADBACK- WARDS can only be performed unbuffered.

BLKUNALLOCEXT — This bit signifies that the block was "read" from an unallocated extent. Actually, the buffer was simply cleared with fill characters. Therefore, if a write is attempted to the block residing in this buffer, it must pass through FCOMVBLK to allocate the extent first.

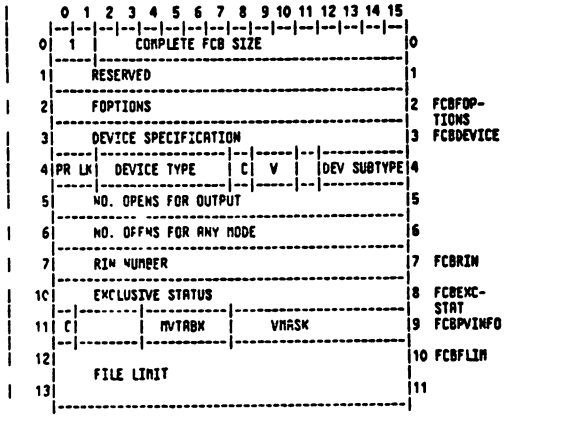
File Control Block (FCB)

The FCB coordinates access to a file on a sharable device. At present the only sharable device is a disc, so only disc files have FCBs.

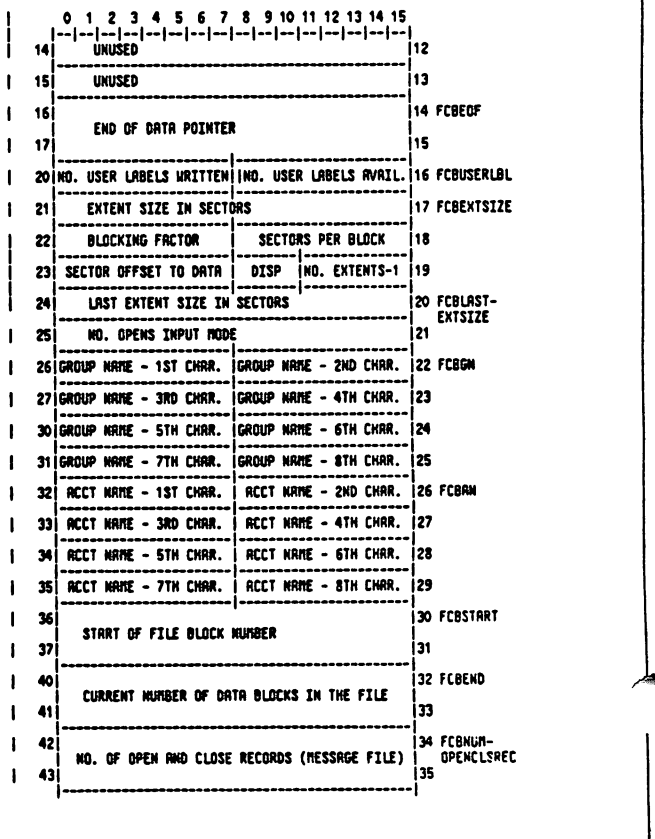
The information contained in an FCB is derived from the file label. The FCB is used to hold this information, rather than the file label, since it can be accessed more quickly.

There are two strategies to choose from in deciding where to place the FCB. If the file has been opened exclusive and no other process could possible share this file, then the FCB is placed into the PXFILE area (or in a NOBUF expandable CBT if it won't fit in the PXFILE area or if the program is run with NOCB). If the file could possible be shared, then the FCB is always placed in a shared control block table. The number of a data segment containing a list of shared file system data segments is kept in system global location 1076 octal. The size of the FCB depends on the maximum number of extents specified at FOPEN; there are 44 (octal) words plus two per extent. There will be at least one extent, since the file label always exists in the first extent. The FCB extent map is in terms of logical device and sector number. The extent map in the file label is in terms of volume rather than logical device; the map is converted by VTRBTOLDEV when the label is read, and converted back by LDEVTOVTRB when the label is written to disc.

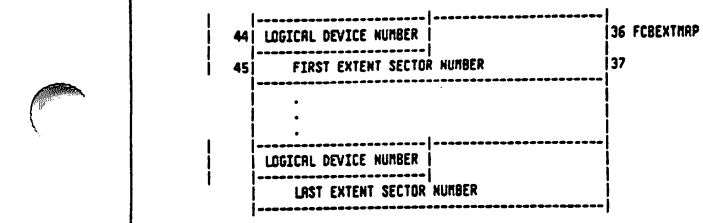
The File Control Block has the following format:



File Control Block (Cont.)



File Control Block (Cont.)



Other identifiers used:

```
FCBSIZE      = FCB(0).(2:14)#,  size in words
FCBLKST      = FCB(4).(0:2)#,   previous lock state
FCBDTYPE     = FCB(4).(2:6)#,   device type
FCBCRUNCH    = FCB(4).(8:1)#,   pending crunch disposition
FCBVERSION   = FCB(4).(9:2)#,   file version (V-Delta-3)
FCBSUBTYPE   = FCB(4).(12:4)#,  device subtype
FCBOCNTOUT   = FCB(5).(0:8)#,   no. accessors - output
FCBOCNT      = FCB(5).(8:8)#,   no. accessors
FCBCLASSFLG  = FCB(9).(0:1)#,   PV class flag
FCBMVTABX    = FCB(9).(4:4)#,   mounted volume table index
FCBVMASK     = FCB(9).(8:8)#,   volume mask
FCBLBLEOF    = FCB(16).(0:8)#,  no. labels written
FCBLBL       = FCB(16).(8:8)#,  no. labels available
FCBBLKFACT   = FCB(18).(0:8)#,  blocking factor
FCBSECTPBLK  = FCB(18).(8:8)#,  sectors per block
FCBSECTOFF   = FCB(19).(0:8)#,  sector offset to data
FCBDISP      = FCB(19).(8:3)#,  pending disposition
FCBNUMEXTS   = FCB(19).(11:5)#, no. extents less 1
FCBOCNTIN    = FCB(21).(8:8)#,  no. accessors - input
FCBLABEL     = FCBDBL(18)#,     label LDEV and sector
FCBLDEV      = FCB(36).(0:8)#,  label LDEV
```

Discussion:

FCBACBDST — This is the DST of the ACB that was created at the same time as the FCB. This is used in conjunction with FCBNEWFCBDST when relocating the FCB.

FCBACBV — This is the vector table entry of the ACB that was created at the same time as the FCB. This is used in conjunction with FCBNEWFCBV when relocating the FCB.

FCBAN — This is the account name of the file. It is eight bytes in length with trailing blanks added.

FCBBLKFACT — This is the blocking factor of the file. It is the number of logical records in a physical block. Legal values range from 1 to 255.

FCBDEVICE — This specifies the device on which the file resides. If it is positive then it represents a logical device number; if negative it represents a (negative) device class index.

FCBDISP — This is the pending FCLOSE disposition for the file. Legal values are:

0 - no change
1 - save permanent
2 - save temporary and rewind
3 - save temporary but do not rewind
4 - release
7 - invalid file (file label access error)

FCBCRUNCH — This bit governs if space will be returned beyond the EOF upon the last FCLOSE of the file.

0 - no change
1 - return space beyond EOF

FCBDTYPE — This is the device type number of the first extent of the file. See ACBDTYPE for a list of legal values.

FCBEND — Block number of the file's EOF, relative to FCBSTART.

FCBEOF — This is the end-of-file pointer for the file. It is a double integer representing the number of records in the file. It can also be viewed as the record number of the next record past EOF.

FCBEXCLSTAT — This is the exclusive status of the file access. If -1 then the file is being accessed exclusively; otherwise it is the number of semi-exclusive accessors.

FCBEXTMAP — This is the extent map of the file. The number of extents is specified by FCBNUMEXTS; a 0D extent descriptor indicates that the extent has not been allocated.

FCBEXTSIZE — This is the extent size, in sectors, of the file. All extents in the file except possibly the last have this size. This is a logical value, and legal values range from 1 to 65535 sectors. This restricts the maximum file size to 2097120 sectors (268,431,360 words).

FCBFLIM — This is the end-of-space pointer for the file. It is a double word integer representing the maximum number of records (fixed length record format) or blocks (undefined or variable length record format) in the file.

FCBFOPTIONS — This is the FOPTIONS in effect for the file.

FCBGN — This is the group name of the file. It is eight bytes long with trailing blanks added.

FCBLABEL — This is the logical device and sector number of the file label, which is the same as the first extent descriptor.

FCBLASTEXTSIZE — This is the size, in sectors, of the last extent in the file. If the file has one extent then this is the same as FCBEXTSIZE; otherwise this value may be different from FCBEXTSIZE. This is the size of the last physical extent for the file; it is not the size of the last allocated extent.

FCBLBL — This is the number of user labels allocated for the file. Since each label is a sector long, this is also the number of sectors allocated for user labels.

FCBLBLEOF — This is the end-of-data pointer for the user labels. It is analogous to FCBEOF in that it represents the number of labels written. The initial value is 0.

FCBLDEV — This is the logical device number of the first extent of the file.

FCBLKST — This is the previous lock state of the file and is derived from the file label. Legal values are:

0 - no accessors
1 - read
2 - write
3 - read/write

FCBMVTABX — If the file resides on a private volume, then this field represents the mounted volume table index of the volume set entry on which the file resides.

FCBNEWFCBDST — This is the DST of the new FCB for the file. It is used in conjunction with FCBACBDST to move the FCB to a system (shared FCB) control block table when the second accessor is established. If this value is zero then there is no new FCB; if nonzero then a new FCB has been created.

FCBNEWFCBV — This is the vector table entry of the new FCB for the file. It is used in conjunction with FCBACBV to move the FCB to a system (shared FCB) control block table when the second accessor is established. If this value is zero then there is no new FCB; if nonzero then a new FCB has been created.

FCBNUMEXTS — This is the maximum number of extents, less one, allowed for the file. It is not the number of extents presently allocated, which is always determined by counting nonzero entries in the extent map.

FCBNUMOPENCLSREC — Number of open and close records in the message file.

FCBOCNT — This is the number of accessors for the file. Alternatively it can be viewed as the number of PACBs created for the file.

FCBOCNTIN — This is the number of file accessors having input access.

FCBOCNTOUT — This is the number of file accessors having output access.

FCBRIN — This is the RIN number used to support dynamic locking (i.e., FLOCK and FUNLOCK) for the file. If there is no dynamic locking then this number is zero.

FCBSECTOFF — This is the sector offset from the file label to the first block of the file. This is not necessarily equal to FCBLBL+1 since an integral number of blocks are allocated for the file and user labels.

FCBSECTPBLK — This is the number of sectors in a block for the file.

FCBSIZE — This is the size, in words, of the complete FCB. It includes the extent map.

FCBSTART — Block number of the file's start, excluding the file label block.

FCBSUBTYPE — This is the device subtype number of the first extent.

FCBUSERLBL — This field describes the user labels for the file. It consists of FCBLBL and FCBLBLEOF, described separately.

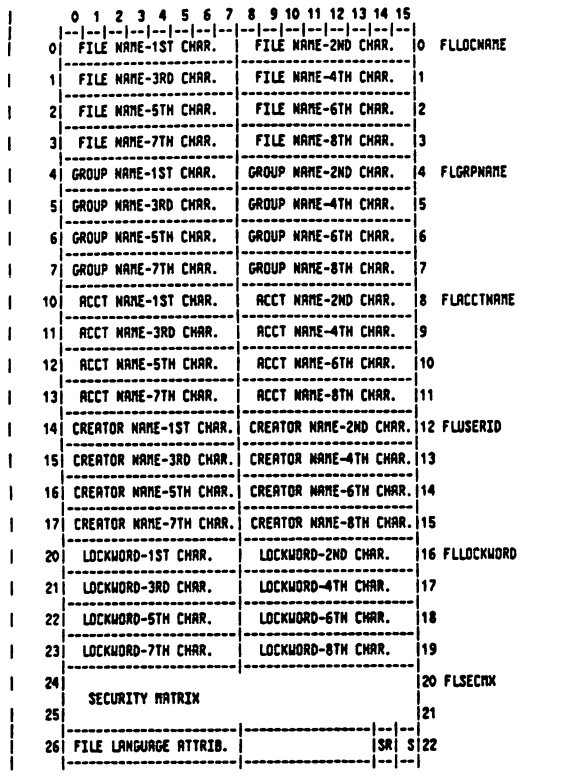
FCBVERSION — Starting with V-Delta-3 this field specifies the version of MPE a file was created on. Legal values:

0 - a file created before V-Delta-3
1 - a file created on V-Delta-3 or later
2,3 - currently undefined

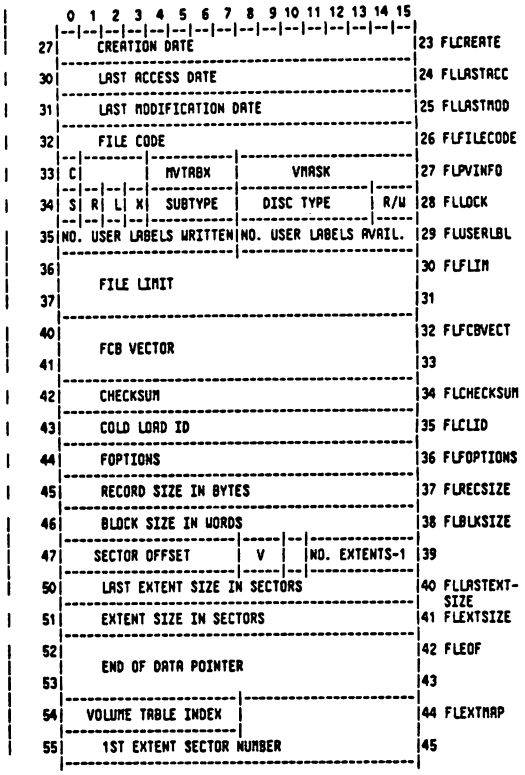
FCBVMASK — If the file resides on a private volume set, this bit mask signifies which volume of the set in which the file resides. Bit 15 is on if it resides on the first volume, bit 14 if on the second, and so forth.

File Label (FLAB)

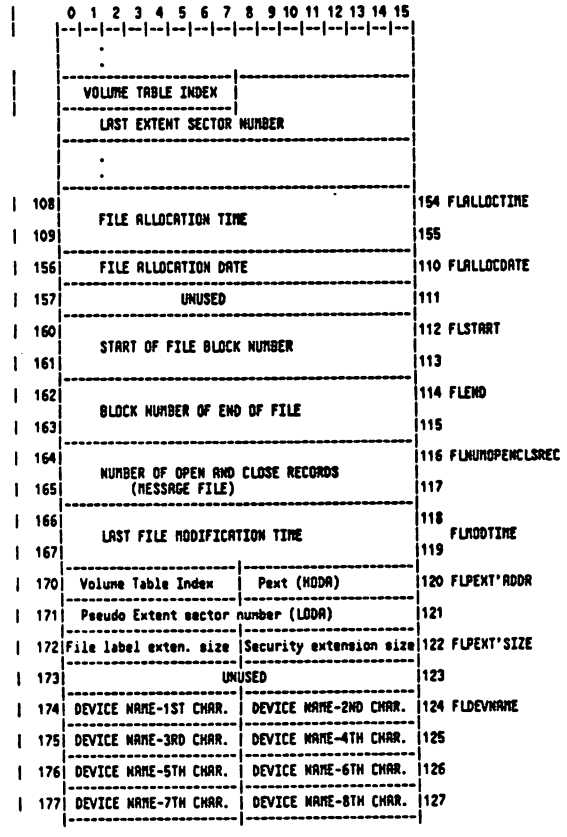
The file label has the following format:



File Label (Cont.)



File Label (Cont.)



Other identifiers used:

```
FLSECURE      = FLAB(22).(15:1)#,  file secure bit
(FLSRRELEASE)= FLAB(22).(14:1)#,  STORE/RESTORE released bit
FLCLASSFLG    = FLPVINFO.(0:1)#,   Class flag bit
FLMVTABX      = FLPVINFO.(4:4)#,   Mounted volume table index
FLVMASK       = FLPVINFO.(8:8)#,   Volume mask
(FLSTORE)     = FLAB(28).(0:1)#,   file being stored
FLRESTORE     = FLAB(28).(1:1)#,   file being restored
(FLLOAD)      = FLAB(28).(2:1)#,   file loaded
FLEXCL        = FLAB(28).(3:1)#,   exclusive access
FLSR          = FLAB(28).(0:2)#,   S & R bits
FLSRL         = FLAB(28).(0:3)#,   S, R, & L bits
(FLSRLX)      = FLAB(28).(0:4)#,   S, R, L, & X bits
FLSUBTYPE     = FLAB(28).(4:4)#,   device subtype
FLDTYPE       = FLAB(28).(8:6)#,   device type
FLSTATUS      = FLAB(28).(14:2)#,  write/read status
(FLLBLEOF)    = FLAB(29).(0:8)#,   no. labels written
(FLLBL)       = FLAB(29).(8:8)#,   no. labels available
FLSECTOFF     = FLAB(39).(0:8)#,   sector offset to data
FLVERSION     = FLAB(39).(8:2)#,   file version(>=V-Delta-3)
FLNUMEXTS     = FLAB(39).(11:5)#,  no. extents less 1
FLLABEL       = FLABDBL(22)#,      label VTAB and sector
FLVTAB        = FLAB(44).(0:8)#,   label VTAB index
FLALLOCTIME   = FLABDBL(54)#,      time allocated on this system
FLALLOCDATE   = FLAB(110),         date allocated on this system
FLSTART       = FLABDBL(56)#,      starting block number
FLEND         = FLABDBL(57)#,      ending block number
FLNUMOPENCLSREC FLABDBL(58)#,      number of open,close records
FLMODTIME     = FLABDBL(59)#,      last time file was modified
FLPEXT'ADDR   = FLABDBL(60)#,      start address of pseudo extent
FLPEXT'SIZE   = FLAB(122)#,        pseudo extent size
  FLFLAB'EXT'SIZE = FLPEXT'SIZE.(0:8)#,
  FLSEC'EXT'SIZE  = FLPEXT'SIZE.(8:8)#
```

Discussion:

FLACCTNAME — This is the account name of the file. It is eight bytes in length with trailing blanks added.

FLALLOCDATE — Date that the file was allocated on this system.

FLALLOCTIME — Double-word containing the time that the file was allocated on this system.

FLBLKSIZE — This is the block size, in sectors, of the file.

FLCHECKSUM — This is the exclusive-OR checksum of the file label (excluding words 34, 42, and 43 octal) and is used for error detection. Each time the file label is read from disc the checksum is calculated and compared against the value recorded in the file label. Similarly, each time the file label is written to the disc the checksum is calculated and inserted into the file label.

FLCLID — This is the cold load number in effect the last time that the file was accessed. This should always be the current cold load number. If it is not, it means that the system crashed while the file was open and that the data in the file label should be "reset" (principally the FCB vector FLFCBVECT). FLCREATE This is the creation date of the file. It is in the format defined by the CALENDAR intrinsic.

FLDEVNAME — This is the FOPEN device specification that was used when the file was created. This information is needed when new extents are allocated.

FLDTYPE — This is the device type number of the first extent of the file; see ACBDTYPE for a list of legal values. This value is determined by configuration.

FLEND — Number of current data blocks (that is, the end of file block number relative to the start of file). Valid for variable and message files only.

FLEOF — This is the end-of-file pointer for the file. It is a double word integer representing the number of records in the file. It can also be viewed as the record number of the next record past EOF.

FLEXCL — This is the exclusive access flag for the file. If set it means that the file has been opened exclusively by a single accessor. If not set then the file is potentially accessible by others.

FLEXTMAP — This is the extent map of the file. The number of extents is specified by FLNUMEXTS; a 0D extent descriptor indicates that the extent has not been allocated.

FLEXTSIZE — This is the extent size, in sectors, of the file. All extents in the file, except the last, have this extent size. This is a logical value, and legal values range from 1 to 65535 sectors. This limits the maximum file size to 2097120 sectors.

FLFCBVECT — If nonzero, this is the vector of the FCB for the file. If zero, the file is not being accessed.

FLFILECODE — This is the file code of the file. Known values are:

Filecode	Mnemonic	Explanation
1024	USL	User Subprogram Library
1025	BASD	Basic Data
1026	BASP	Basic Program
1027	BASFP	Basic Fast Program
1028	RL	Relocatable library
1029	PROG	Program File
1030	NMPRG	Native Mode Program
1031	SL	Segmented Library
1032	NMXL	Native Mode External Library
1033	NMRL	Native Mode Relocatable Library
1035	VFORM	View Form File
1036	VFAST	View Fast Forms File
1037	VREF	View Reformat File
1040	XLSAV	Cross Loader ASCII File (SAVE)
1041	XLBIN	Cross Loader Relocated Binary File
1042	XLDSP	Cross Loader ASCII File (DISPLAY)
1050	EDITQ	Edit Quick File
1051	EDTCQ	Edit KEEPQ File (COBOL)
1052	EDTCT	Edit TEXT File (COBOL)
1054	TDPDT	TDP Diary File
1055	TDPQM	TDP Proof Marked QMARKED
1056	TDPP	TDP Proof Marked non-COBOL File
1057	TDPCP	TDP Proof Marked COBOL File
1058	TDPQ	TDP Workfile
1059	TDPXQ	TDP Workfile (COBOL)
1060	RJEPN	RJE Punch File
1070	QPROC	QUERY Procedure File
1080	KSAMK	KSAM Key File
1083	GRAPH	GRAPH Specification File
1084	SD	User Logging Log File
1090	LOG	Self-describing File
1100	WDOC	HPWORD Document
1101	WDICT	HPWORD Hyphenation dictionary
1102	WCONF	HPWORD Configuration File
1103	W2601	HP 2601 Environment File
1110	PCELL	IDS/3000 Character Cell File
1111	PFORM	IDS/3000 Form File
1112	PENV	IFS/3000 Environment File
1113	PCCMP	
1114	RASTR	Graphics Image in RASTR Format
1130	OPTLF	OPT/3000 Log File
1131	TEPES	TEPE/3000 Script File
1132	TEPEL	TEPE/3000 Log File

1133	SAMPL	APS/3000 Log File
1139	MPEDL	MPEDCP/DRP Log File
1140	TSR	HPToolset Root File
1141	TSD	HPToolset Data File
1145	DRAW	Drawing File for HPDRAW
1146	FIG	Figure File for HPDRAW
1147	FONT	Font File for HPDRAW
1148	COLOR	Color Definition File
1149	D48	
1152	SLATE	Compressed SLATE File
1153	SLATW	Expanded SLATE Workfile
1156	DSTOR	Store File for RAPID/3000 Utility DICTDBU
1157	TCODE	Code File for Transact/3000 Compiler
1158	RCODE	Code File for Report/3000 Compiler
1159	ICODE	Code File for Inform/3000 Compiler
1166	MDIST	HPDESK Distribution list
1167	MTEXT	HPDESK Text
1168	MARPA	ARPA Message File
1169	MARPD	ARPA Distribution List
1170	MCMND	HPDESK Abbreviated Commands File
1171	MFRTN	
1173	MEFT	
1174	MCRPT	
1175	MSERL	
1176	VCSF	
1177	TTYPE	Term Type File
1178	TVFC	Term Vertical Format Control File
1192	NCONF	Network Configuration File
1193	NTRAC	Network Trace File
1194	NLOG	Network Log File
1195	MIDAS	
1211	NDIR	ANODE
1212	INODE	INODE
1213	INVRT	
1214	EXCEP	
1215	TAXON	
1216	QUERF	
1217	OOCDR	
1226	VC	VC File
1227	DIF	DIF File
1228	LANGD	Language Definition File
1229	CHARD	Character Set Definition File
1230	MGCAT	Formatted Application Message Catalog
1235		Reserved
1236	BMAP	MAP File
1242	BDATA	BASIC Date File
1243	BFORM	BASIC Field Order File for VPLUS
1244	BSAVE	BASIC Saved Program File
1245	BCNFG	Config. File for default Option BASIC program
1246	BKEY	
1247	NMBSU	Business Basic/XL Program File
1248	NMBDT	Business Basic/XL DATA File
1249	CMBBN	Business Basic/V Binary File

1258	PFSTA	Pathflow STATIC File
1259	PFDYN	Pathflow DYNAMIC File
1270	RFDCA	Revisable Form DCA Document
1271	FFDCA	Final Form DCA Document
1272	DIU	Document Interchange Unit File
1273	PDOC	HPWORD/150 Document
1275	DFI	
1276	SRI	
1401	CWPTX	
1421	MAP	HPMAP/3000 Map Specification File
1422	GAL	
1425	TTX	
1428	RDIC	
1429	RSPEC	
1430	RSPCF	
1431	REXEC	
1432	RJOB	
1433	ROUTI	
1434	ROUTD	
1435	PRINT	
1436	RCONF	
1437	RDICN	HPBRW Dictionary File
1438	REXNM	HPBRW Execution File
1441	PIF	
1461	NMOBJ	
1462	PRSLB	
1476	TIFF	Tag Image File Format
1477	RDF	Revisable Document Format
1478	SOF	Serial Object File Format
1479	GPH	Chart File for Charting Gallery Chart
1480	GPD	Data File for Charting Gallery Chart
1483	VCGPM	
1484	FRMAT	Formatter
1485	DUMP	Dump File
1486	NWMDO	New Wave Mail Distribution
1491	X4HDR	X.400 Header
1500	WP1	Other WP1
1501	WP2	Other WP2
1502	LO123	Lotus 123 Spreadsheet
1514	FTCF	Forms tester Cmd Spec
1521	DSKIT	HPDesk Intrinsics Transaction
/ 8000 < to \ 8099		Reserved for RPL

FLFLIM — This is the end-of-space pointer for the file. It is a double integer representing the maximum number of records (fixed length record format) or blocks (undefined or variable length record format) in the file.

FLFOPTIONS — This is the FOPTIONS of the file.

FLGRPNAME This is the group name of the file. It is eight bytes long with trailing blanks added.

FLLABEL This is the volume table index and sector number of the file label, which is the same as the first extent descriptor.

FLLASTACC This is the last access date of the file. It is in the format defined by the intrinsic CALENDAR.

FLLASTMOD This is the last modification date of the file. It is in the format defined by the intrinsic CALENDAR.

FLLASTEXTSIZE This is the size, in sectors, of the last extent in the file. If the file has one extent, then this is the same as FLEXTSIZE; if the file has more than one extent, then this value may be different from FLEXTSIZE. This is the size of the last physical extent for the file; it is not the size of the last allocated extent.

FLLBL This is the number of user labels allocated for the file. Since each label is a sector long, this is also the number of sectors allocated for user labels.

FLLBLEOF This is the end-of-data pointer for the user labels. It is analogous to FLEOF in that it represents the number of labels written.

FLLOAD This is the LOADED flag for the file. If set, it means that the file is a loaded program or SL file and cannot be modified except by a privileged accessor. This flag is set and cleared by the loader, not the file system.

FLLOCK This identifies the word containing the lock bits, which are described separately.

FLLOCKWORD This is the lock word of the file. It is eight bytes long with trailing blanks added. If it is all blanks, then the file does not have a lockword. FLLOCNAME This is the local name of the file. It is eight bytes long with trailing blanks added.

FLMODTIME Last time the file was modified.

FLNUMEXTS This is the number of extents, less one, allowed for the file. It is not the number of extents allocated. Legal values range from 0 to 31, i.e., 1 to 32 extents.

FLNUMOPENCLSREC Number of open and close records in the message file.

FLPEXT'ADDR This has the disc address of the start of the pseudo extent (ACD) that has been attached to this file. The high order byte contains the volume table index, the remaining 24 bits contains the sector address.

FLPEXT'SIZE This word holds the size of the pseudo extent. It is broken up into two halves of one byte each. The high order byte holds the size of the file label extension(not currently implemented), and the low order byte contains the size of the ACD (security extension). Both sizes are in sectors. The pseudo extent is partitioned into two extensions, with the security extension always appearing first, and the file label extension appearing after.

FLPVINFO File label private volume information. This is in the same format as the FCBPVINFO.

FLRECSIZE This is the record size of the file in negative bytes.

FLRESTORE This is the RESTORE flag for the file. If set, it means that the file is being RESTOREd and cannot be accessed. RESTORE also sets the STORE bit for the file (FLSTORE); see FLSR for a full description of the use of these bits. This flag is set and cleared by STORE/RESTORE, not the file system.

FLSECMX This is the security matrix of the file. The bits are organized into five groups of six bits each. (Bits 0:2 are not used.) The groups correspond to the access types: READ, APPEND, WRITE, LOCK, and EXECUTE. Within each group, each bit specifies who may have the access: ANY, ACCOUNT MGR, ACCOUNT LIB- RARIAN, GROUP, GROUP LIBRARIAN, CREATOR.

FLSECTOFF This is the sector offset from the file label to the first block of the file. This is not necessarily equal to FLLBL+1 since an integral number of blocks are allocated for the file and user labels.

FLSECURE This is the file security enforcement flag for the file. If not set, then the file has been RELEASEd and the security matrix FLSECMX should be ignored. If set, then secure as specified by the security matrix.

FLSR This is the STORE and RESTORE flags for the file, which are described separately. STORE and RESTORE decode the two-bit field to indicate their operation. Legal values are:

0 - file not in use by either STORE or RESTORE
1 - illegal value
2 - file being STOREd
3 - file being RESTOREd

The file system interprets the leftmost bit as indicating that the file is being accessed by either STORE or RESTORE. The rightmost bit is interpreted as indicating what access should be permitted: 0 (file being STOREd) allows read access; 1 (file being RESTOREd) allows no access. This field is set and reset by STORE/RESTORE, not the file system.

FLSRL This is the STORE, RESTORE, and LOADED flags for the file, which are described separately.

FLSRLX This is the STORE, RESTORE, LOADED, and exclusive flags for the file, which are described separately.

FLSRRELEASE This flag is used by STORE/RESTORE. If a file is STOREd with the ";RELEASE" keyword, STORE will set this flag in the tape copy of the file label. RESTORE will allow any user to access such files, regardless of the file's normal security. If this bit is off in the tape copy of the file label, RESTORE applies normal security checks (as defined by the information in FLSECMX and FLSECURE). This bit is zero for files on disc.

FLSTART Block number of the file's start, excluding the file label block. Valid for variable and message files only.

FLSTATUS This is the read/write status of the file. Legal values are:

0 - no accessors
1 - read
2 - write
3 - read/write

FLSTORE This is the STORE/RESTORE flag for the file. If set it means that the file is being either STOREd or RESTOREd. The RESTORE bit (FLRESTORE) must be interrogated to determine which operation is taking place; see FLSR for a full description of the use of these bits. This flag is set and cleared by STORE/RESTORE, not the file system.

FLSUBTYPE This is the device subtype number of the first extent of the file. This value is determined by configuration.

FLUSERID This is the creating user name of the file. It is eight bytes long with trailing blanks added.

FLUSERLBL This field describes the user labels of the file. It consists of FLLBL and FLLBLEOF, which are described separately.

FLVERSION Starting with V-Delta-3, this field specifies the MPE version that a file was created on. Legal values:
0 - a file created before V-Delta-3
1 - a file created on or after V-Delta-3
2,3 - currently undefined

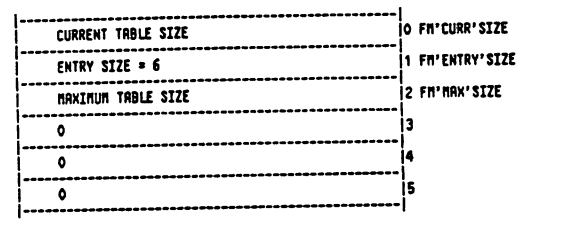
FLVTAB This is the volume table index of the first extent of the file.

File Multi-Access Vector Table (FMAVT) (DST X54)

The FMAVT is used to locate shared PACBs for files opened multi-access. When an old disc file has been opened multi-access, the FMAVT is searched to determine if the file has previously been opened. The JITDST and the DADDR found in the FMAVT are compared to the JITDST of the job and the DADDR of the device or disc file being opened multi-access. If an entry exists for the file, then the PACB can be easily located for that file. If this is the first process opening the file, then an entry is created and inserted into the FMAVT for the file.

Spoolfiles are opened multi-access, therefore, they will have entries in the FMAVT. $STDIN and $STDLIST also have entries in the FMAVT since they too are opened multi-access.

Zero Entry Format



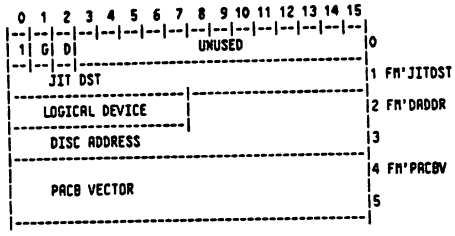
Descriptions:

FM'CURR'SIZE The current size of the FMAVT in words. This value increases in increments of X200 words until FM'MAX'SIZE is reached.

FM'MAX'SIZE The maximum allowable size in words that the FM'CURR'SIZE can get. The current value of this is X4000. FM'MAX'SIZE can be changed only by changing the code in Initial. The open of the multi-access file is failed if this maximum is reached.

FM'ENTRY'SIZE Size in words of an FMAVT entry, 6 words at present.

Typical Entry Format



FM'DEVICE = FMAVT(0).(2:1)#, Device bit
FM'GLOBAL = FMAVT(0).(1:1)#, Global multi-access bit
FM'LDEV = FM'DADDR(0).(0:8)#, Logical device number of file

Descriptions:

FM'DADDR The disc address of the file label for disc files. For device files, the disc address is zero.

FM'DEVICE This bit is 1 for device files and 0 for disc files.

FM'LDEV Logical device number of device files or the LDEV of the disc containing the file label for disc files.

FM'JITDST The DST number of the JIT for the job that has the file open. If this field is nonzero, then only processes in the family tree of this particular job can open the file. This field is zero if the file was open global multi-access.

FM'GLOBAL This bit is 1 if the file was opened global multi-access, this allows multi-access to the file between jobs.

FM'PACBV The PACB vector for this multi-access file. Used to easily find the Physical Access Control Block for files opened multi-access.

System Global Area (SYSGLOB)

The file system uses several words in the system global area for its own use.

```
SHFCBDST     = SYSDB+X76,     shared CBT DST no.
MONITOR      = SYSDB+X77,     monitoring flag word
MAXSSECT     = SYSDB+X100,    max # spoolfile sectors
NUMSSECT     = SYSDB+X102,    current # spoolfile sectors
EXTSSECT     = SYSDB+X104,    # sectors/spoolfile extent
SPOOLINDEX   = SYSDB+X132,    class spool index
CSIOWAIT     = SYSDB+X135,    CSIOWAIT PLABEL
CCLOSEPLABL  = SYSDB+X140,    CS CCLOSE PLABEL - FPROCTERM
DSCHKPLABL   = SYSDB+X335,    DSCHECK PLABEL
DSOPENPLABL  = SYSDB+X336,    DSOPEN PLABEL
DSCLOSEPLABL = SYSDB+X337,    DSCLOSE PLABEL
SDSLDEVLABEL = SYSDB+X323,    PLABEL for SDSLDEV
MAKWCPLABL   = SYSDB+X340;    MAKAGEWRITECONV PLABEL
GLOBALAFTDST = SYSGLBEXT+X121 Global AFT DST number
```

SIRs, Locks, and Deadlocks

The file system uses two SIRs: the File SIR, which is intended to protect file label integrity, and the FMAVT SIR, which is to guarantee the integrity of the FMAVT. Since the file system locks these resources and also locks control blocks, deadlocks can occur if locking is done in the wrong order. Not only must the file system handle locking correctly, but the entire ensemble of the file system, its callers, and its callees must do so also. These include KSAM, which has a SIR of its own, SYSDUMP, and STORE, which lock the File SIR because they tweak bits in file labels. The presently accepted order is:

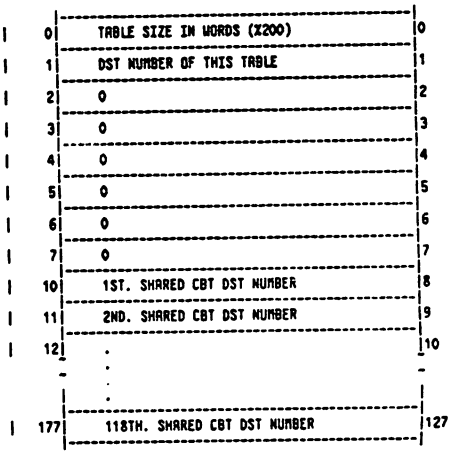
```
Get FMAVT SIR
Lock ACB
Get File SIR
Lock FCB
```

It may not be necessary to do all of these things in any particular procedure. In modifying a procedure, you should be sure that any of these locks which you change are consistent not only within your own code, but also with its callers and callees.

Shared CBT DST

In sysglobal X76 (ABSOLUTE X1076) there exists the shared Control Block Table DST number. This DST holds a list of shared CBTs. Shared CBTs are used to keep any and all file system control blocks that have the potential to be shared between processes. Any disc file opened shared will have its FCB kept in one of these CBTs. Also, all terminal PACBs will be stored in a system shared CBT so that an extra data segment is not wasted. This is possible because all terminal access is performed NOBUF, which means that the PACB will be a minimal PACB and can be placed in these CBTs. Lastly, any file opened with global file access will have all its control blocks placed into these system CBTs.

The format of the system shared CBT DST is similar to a Control Block Table. It has the same words of overhead and the data (the list of DSTs) starts in the next word after the overhead. The system CBTs are created one at a time as needed. Usually, there are only a few DSTs in the list.



CHAPTER 7 PROCESS TABLES

The operating system maintains state, control, and accounting information on each process. The data structures for this purpose are the process control block table (PCB; core resident, 1 entry per process) and the process control block extension (PCBX; contained in the process' stack below DL). Process related information which must be accessible when the process' stack is not present in main memory is maintained in the process' PCB entry. All other process related information is maintained in the process' PCBX.

A process is identified in the system by its PCB entry number, referred to as its PIN (process identification number), or by its PCBPT=(PIN)^(PCB entry size).

The structure of the PCB table, PCB entry format, PCBX structure, and PCBX format are specified in this chapter.

Process Control Block Table Structure and Format

Fixed Cells Related to PCB

RBS(4) PCB relative index of current process' PCB entry
X1003 SYSGLOB relative address of the PCB table base
The bank & address are represented as per the MPEV ERS.
X1271 PCB relative address of head of dispatching queue's PCB entry
X1272 PCB relative address of tail of dispatching queue's PCB entry

PCB Entry 0 Format

0	# OF CONFIGURED ENTRIES	0
1	ENTRY LENGTH (X25)	1
2	# OF UNASSIGNED ENTRIES	2
3	TABLE RELATIVE INDEX TO FIRST UNASSIGNED ENTRY	3
4	TABLE RELATIVE INDEX OF LAST FREE ENTRY	4
5	HIGH WATER MARK	5
6	NUMBER OF PRIMARY CONFIGURED ENTRIES (0)	6
7	HEAD OF IMPEDED QUEUE PCB RELATIVE INDEX	7
10	TAIL OF IMPEDED QUEUE PCB RELATIVE INDEX	8
11	NUMBER OF CURRENTLY IMPEDED PROCESSES	9
12	NUMBER OF MAXIMUM IMPEDED PROCESSES (CURRENT)	10
13	CUMULATIVE NUMBER OF IMPEDED PROCESSES (CURRENT)	11
14	0	12
15	0	13
16	0	14
17	0	15
20	0	16
21	0	17
22	0	18
23	0	19
24	0	20

Unassigned PCB Entry Format

0	0	0
1	TABLE RELATIVE INDEX TO NEXT UNASSIGNED ENTRY	1
	. . .	
24	X177777	20

Note: Only word 1 and word 20 are valid for an unassigned PCB entry.

Assigned PCB Entry Format

0	RESABORTINFO		
1	SLL RELATIVE ADDRESS OF PROCESS' SEGMENT LOCALITY LIST	SLLPTR	
2	EXTRA DATA SEGMENT'S DST	DBXDSINFO	
3	DST ENTRY # FOR PROCESS' STACK	STKINFO	
4	WAKEMASK		
5	FATHER'S PCB INDEX	FATHERINFO	
6	SON'S PCB INDEX	SONINFO	
7	BROTHER'S PCB INDEX	BROTHERINFO	
10	PSIM, WS, QA, DF, SE, UNUSED	PIINFO	
11	LIV, BMS, PPC, SQV, PTYPE, SI, HK, SK, ST, HB, CY, BK	PROCSTATE	
12	EVENT FLAGS	WS	EVENTFLAGS
13	SEGIDENTIFIER OF LAST REFERENCED		LASTREFCODESEG0
14	SWAPPABLE CODE SEGMENT		LASTREFCODESEG1
15	DILSP Q, CDEICA, PRIORITY	QUEUEINGINFO	

Assigned PCB Entry Format (Cont.)

16	INDEX WITHIN CSTBLOCK TABLE (CSTBLK)	PBXWORDNUM
17	LOGICAL SEGMENT TRANSFORM TABLE (LSTT) DST #	MAPDST
20	ADDRESS (PCB RELATIVE) TO PREVIOUS IMPEDED PCB	PIMPPIN
21	ADDRESS (PCB RELATIVE) TO NEXT IMPEDED PCB	NIMPPIN
22	BREAKPOINT TABLE RELATIVE ENTRY ADDRESS	BPTLINK
23	ADDR (PCB REL) OF NEXT PROCESS IN SCHED QUEUE	NQPTR
24	ADDR (PCB REL) OF PREV PROCESS IN SCHED QUEUE	PQPTR

PCB00.(0:1) SAR - scheduling attention required
.(1:1) Bounds Flag - Privilege mode bounds check
.(2:1) CRIT - process is critical or with SIR
.(3:1) HSIR - process has a sir
.(4:1) PIOVR - pseudo interrupt happened when process had SIR or was impeded
.(5:1) HSPRI - hold sir priority
.(6:1) IPEXP - incore protect expired
.(7:1) PC - pre-empt capability
.(8:1) DSOFT - Delayed soft int processing. A pending soft int cannot be processed because of sir or critical state. PSEUDOINT will be invoked when these condition(s) go away.
.(9:1) LW - long wait
.(10:1) SW - short wait
.(11:1) TRW - terminal read wait
.(12:1) USEDQ - used a quantum since transaction began
.(13:1) HIPRI - don't alter priority
.(14:1) STOVR - process aborting due to stack overflow
.(15:1) RITBK - Request Information Table Break (e.g., message awaiting operator response)

PCB01.(0:16) SLLPTR, SLL relative index to process' segment locality list

PCB02.(0:1) RDB, set if DB pointing to an absolute address
.(2:14) XDS, DST entry number of extra data segments to which DB is set; zero if none.

PCB03.(0:1) STOVRALL FLAG - stack overflow is already allocated
.(1:2) SC, set if executing system code
.(2:14) DST entry number of process' stack

PCB04.(0:1) M, mourning wait
(1:1) RG, global RIN wait
(2:1) RL, local RIN wait
.(3:1) MA, mail wait
.(4:1) BIO, blocked on I/O wait
.(5:1) IO, I/O wait
.(6:1) UCP, UCOP wait and RIT wait
.(7:1) JNK, junk wait
.(8:1) TIM, timer (pause) wait
.(9:1) MSG, file system basic IPC message wait
.(10:1) SON, son wait
.(11:1) FA, father wait
.(12:1) IMP, process waiting to be unimpeded
.(13:1) SIR, process waiting for a sir
.(14:1) TIM, process waiting for a time out (set up by system to prevent a process hang due to a possible "lost" event)
.(15:1) MEM, process waiting for memory

PCB05.(0:16) FPIN, father's PCB relative index

PCB06.(0:16) SPIN, son's PCB relative index

PCB07.(0:16) BPIN, brother's PCB relative index

| PCB10.(0:3) PSIM, pseudo - interrupt mode
1: hard kill
2: soft kill
3: stop
4: hibernate
5: escape (Control-Y)
6: break
7: normal
.(3:1) WSOFT, OK for soft interrupt to wake process even though it is waiting on another event
.(4:2) OA (origin of activate)
0: other source
1: father
2: son
3: reply done on RIT wait
.(6:1) DEAD, set during expiration
.(7:1) FRC, if set, the father is to be activated on process termination
| .(8:1) SERVE, if set, this process is a DS SERVER process

| PCB11.(0:1) LIVE, set if process is alive
.(1:2) BMS, block mail, valid if MA set
0: sent to father
1: received from father
2: send to son
3: received son
.(3:2) PPC, process to process communication, set with respect to son
0: null
1: son to father
2: father to son
3: blocked
.(5:1) STOV, abort - stack overflow has occurred
.(6:3) PTYPE, process type
0: user
1: user, son of main
2: user, main
3: user, main, task
4: system
5:
6: system, UCOP
7:
.(9:1) SI, set when the Dispatcher (and PSEUDOINT) should be aware of a pending soft interrupt
.(10:1) HK, hard kill pseudo interrupt
.(11:1) SK, soft kill pseudo interrupt
.(12:1) ST, stop pseudo interrupt
.(13:1) HB, hibernate pseudo interrupt
.(14:1) CY, Control-Y pseudo interrupt
.(15:1) BK, break pseudo interrupt

PCB12.(0:15) EVENTFLAGS, one for each wait class in PCB04
.(15:1) WS, wake up waiting switch set if an awake is missing (i.e., the event occurred before the process has a chance to wait for it)

PCB13.(0:32) LASTREFSWAPSEG, segment identifier of last referenced swappable code segment

PCB15 (QUEUING INFO)
.(0:1) DISPQ - dispatcher's scheduling queue
.(1:1) L scheduling class
.(2:1) C scheduling class
.(3:1) D scheduling class
.(4:1) E scheduling class
.(5:1) INTER =- process is interactive
.(6:1) CORER - process is core resident
.(7:1) ASOFT, Allow soft interrupt (A value of 1 inplies that user soft interrupts will be processed. A zero value inhibits user soft ints (they are queued). This bit is managed by FINTSTATE and FINTEXIT intrinsics.)
.(8:8) Process' scheduling priority

PCB16.(0:16) PBX, CSTX block map index of process' program

PCB17.(0:16) MAPDST, DST entry number of the CST mapping table

| PCB20.(0:16) PIMPPIN, PCB relative index of previous impeded PIN

| PCB21.(0:16) NIMPPIN, PCB relative index of next impeded PIN

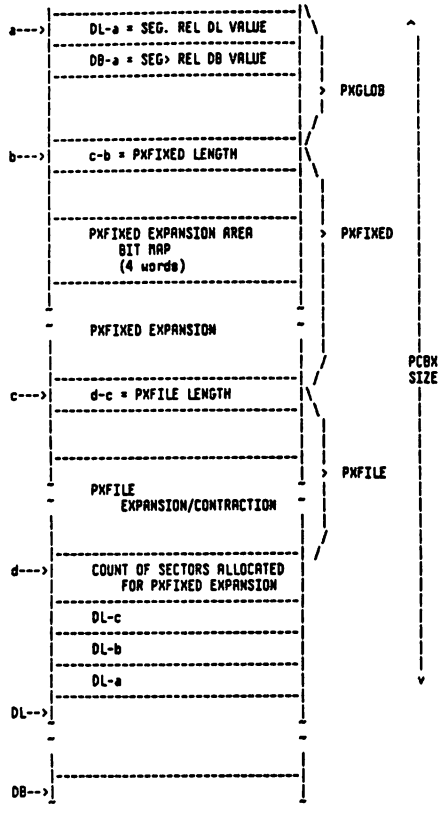
| PCB22.(0:16) BPTLINK, breakpoint table relative entry address

| PCB24.(0:16) NQPTR, PCB relative index of next proc in disp queue

| PCB25.(0:16) PQPTR,PCB relative index of prev proc in disp queue
| queue (= -1 if process is not alive)

Process Control Block Extension (PCBX) Structure and Format

Process Control Block Extension (PCBX) General Structure



PXGLOB Format

The PXGLOB portion of the pcbx is for job information, and contains the same job related information for all processes belonging to the same job.

	0 1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	
0	EXPAND TO DISPLACEMENT FROM PCBX TO DL		0
1	EXPAND TO DISPLACEMENT FROM PCBX TO DB		1
2	USER ATTRIBUTES (See JIT's UCAP word)		2
3	JMAT INDEX		3
4	JPCNT INDEX		4
5	JCUT INDEX		5
6	SB R TY D I GA * *	STACK DUMP FLAGS	6
7		NATIVE LANGUAGE	7
10	ACTUAL JOB INPUT LDEV		8
11	ACTUAL JOB OUTPUT LDEV		9
12	JDT DST INDEX		10
13	JIT DST INDEX		11

R = restart bit
I = job in/list interactive
D = job in/list duplicative
TY = job type
0 = undefined
1 = session
2 = job
3 = task
* = reserved:
SB = stun bit ; used for stack underflow simulation for ICF44 or ICF55.
GA = Global Allow bit

Stack Dump Flags
Bit 10 = Armed
Bit 11 = Suppress traceback
Bit 12 = Suppress ASCII
Bit 13 = Q-63 to S
Bit 14 = QINIT to S
Bit 15 = DL to QINIT

PXFIXED Assignments

The PXFIXED portion of the PCBX contains specific information and control information.

	0 1 2 3 4 5 6 7	8 9 10 11 12 13 14 15	
0	C-B PXFIXED SIZE		0
1	RELATIVE S(S-DB)		1
2	RELATIVE Z(Z-DB)		2
3	DB to MORGUE's Q-4		3
4	INITIAL RELATIVE DL (DB-DL)		4
5	GENERAL RESOURCE CAPABILITY (FROM PROG-FILE)		5
6	AT LT ST CY CT * * *	U L C G A LN LP	6
7	LINK TO XDS ENT'S IN EXP area	XDS CNT	7
10	P S EXTRA DATA SEGMENT DST INDEX		8
11	P S EXTRA DATA SEGMENT DST INDEX		9
12	P S EXTRA DATA SEGMENT DST INDEX		10
13	P S EXTRA DATA SEGMENT DST INDEX		11
14	X A ABORT Y RW	INITIAL CST INDEX	12
15	MAXIMUM STACK SIZE (MAXDATA LIMIT)		13
16	ARITHMETIC TRAP ENABLE MASK		14
17	ARITHMETIC TRAP PLABEL		15
20	LIBRARY TRAP PLABEL		16
21	SYSTEM TRAP PLABEL		17
22	CONTROL Y PLABEL		18

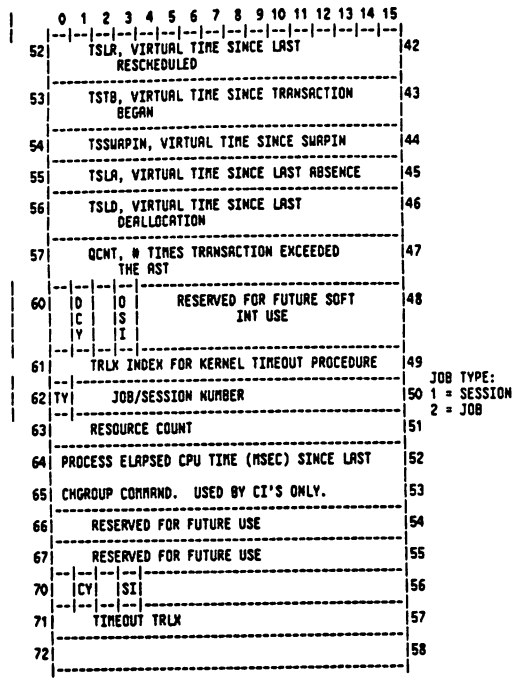
4 LN MDST existed
LP LOADPROCed
5 Trap Modes
.AT(0:1)-Arith.
.LT(1:1)-Library
6 .ST(2:1)-System
.CY(3:1)-Ctrl-Y
7 .CT(4:1)-Code
U User UDC exist
8 L Logging
C Share Clock
9 G Global RIN acquired
A Acct UDC exist
10 / 0:1 RESERVED FOR CST EXPANSION
11 | 1:1 = 1 IF ABORT IN PROGRESS
12 < 7:1 = 0 IF HAVE R/W ACCESS TO PROG FILE
13 | = 1 OTHERWISE
14 | 8:8 = CST # OF SEG INITIALLY EXECUTED AT
15 | AT PROC-
16 \ CREATION

NOTE: The General Resource Capability Word (X5) in the PXFIXED area is used by HP Business Basic. Please inform them when making any changes to it or to its' location.

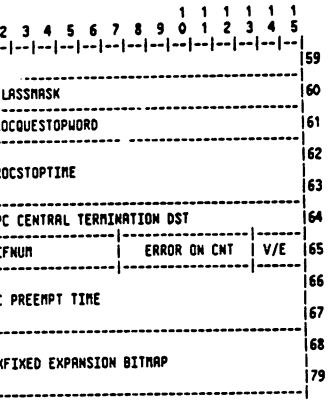
PXFIXED Assignments (Cont.)

23	CODE TRAP PLABEL	19
24	DATA COMM TERMINATION TRAP PLABEL	20
25	IMAGE TRAP PLABEL	21
26	RESERVED	22
27	CURRENT MAX STACK SIZE (LARGEST VALUE EVER FOR Z-DL)	23
30	PROCESS ELAPSED CPU TIME	24
31	(MSEC)	25
32	MAXIMUM DATA SEG SIZE USED(IN SECTORS)	26
33	TOTAL VIRTUAL STORAGE USED(IN SECTORS)	27
34	CURRENT EXTRA DATA SEGMENT SPACE	28
35	MAXIMUM EXTRA DATA SEGMENT SPACE	29
36	PRIV MODE BOUNDS FLAGS / STOV COUNT	30
37	PROCESS EXECUTION TIME REMAINDER (IN MSEC)	31
40	SET TO-1 WHEN IN BREAK MODE *	32
41	CONTINUE FLAG (:CONTINUE COMMAND) **	33
42	ACTUAL SIZE OF VIRTUAL SPACE ALLOCATED TO STACK	34
43	ERROR LEVEL	35
44	INTRINSIC ERRORS	36
45	INTRINSIC ERRORS	37
46	INTRINSIC ERRORS	38
47	INTRINSIC ERRORS	39
50	INTRINSIC ERRORS	40
51	INTRINSIC ERRORS	41

PXFIXED Assignments (Cont.)



PXFIXED Assignments (Cont.)



NOTES: P = 1 if opened by priv user
S = 1 if data segment is sharable

PCLASSMASK = Bit mask of classes this process has enabled
PROCQUESTOPWORD.(0:4) = PROCESS PRIORITY: 7 = L queue
6 = C queue
2 = D queue
1 = E queue
.(4:12) = REASON STOPPED: 1 = stop seg fault
2 = stop disc wait
3 = blocked I/O, non-terminal
4 = terminal read
5 = stop impede
6 = stop active
PROCSTOPTIME = DBL word timestamp of when process stopped for reason given in PROCQUESTOPWORD

DCY A delayed Control-Y is pending (this bit is checked by ININ on bounds violation to determine if it got: 1) true bounds violation or 2) an induced bounds violation that indicated that the Control-Y trap procedure may now be entered).

OSI State of the "WSOFT" PCB bit when control-y trap was entered. WSOFT = 1 allows user soft interrupts against the process. It is set to zero when the control-y handler is entered. It is set to its prior state when the user calls RESETCONTROL.

* Set to command record length when command pending (i.e., command entered during break or encountered during flushing).

** CONTINUE FLAG Values
0 = No CONTINUE in effect
1 = CONTINUE just encountered
2 = CONTINUE in effect for this command

CY FLAG

PCBXFIXED(56).(1:1) = Set by PSEUDOINT when there is a pending control-y which cannot be processed because of system code or privileged code. ININ checks this bit on bounds violation or trace trap.

SI FLAG

PCBXFIXED(56).(3:1) = Specifies the state of the user interrupt flag when the current control-y was processed.

PRIV MODE BOUNDS FLAGS:
BITS 0-1 = 0 if DB, Q and S bounds checking is disabled
= 1 if DB bounds checking is disabled with Q and S bounds checking enabled
= 2 if DB bounds checking is enabled with Q and S bounds checking disabled
= 3 if DB, Q and S bounds checking enabled

IFNUM: File number from intrinsic TRACE

ERROR ON CNT: Number time though error on

V = V/Plus transaction trace (1=ON; 0=OFF)

E = Tracing Enable (1=Enable; 0=Disable)

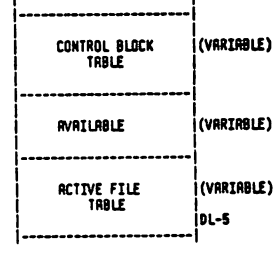
PXFIXED Expansion Bitmap

The PXFIXED bitmap and expansion area is for use in accounting of extra data segments acquired by the process.

File System Section of PCBX (PXFILE)

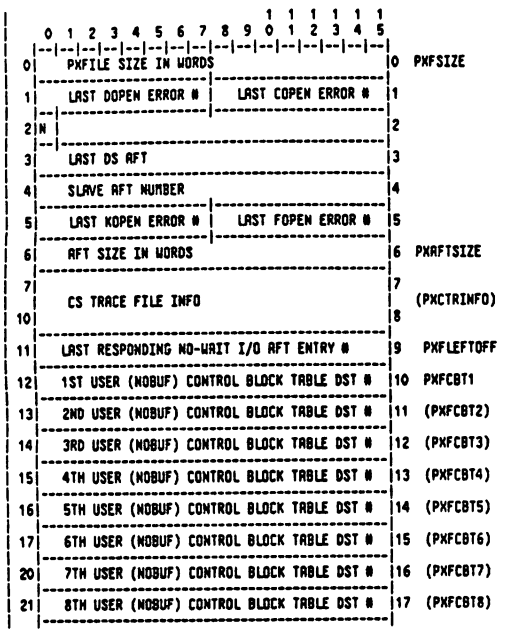
The PXFILE area is a subsection of the PCBX. It is a contiguous, expandable and contractible block of storage that is managed by the file system primarily for its own use. Other subsystems, namely CS and DS, also make use of the PXFILE section. In doing so they must conform to the conventions of the file system.

The overall structure of the PXFILE area is:



Overhead

The part labeled Overhead contains mation that pertains to the e section. It inforis addressed via the pointer at DL-3.
entir



Partial word field identifiers are:

```
PXFDOPEN    = PXFILE(1).(0:8)#,   last DOPEN error code
PXFCOPEN    = PXFILE(1).(8:8)#,   last COPEN error code
PXFNOCB     = PXFILE(2).(0:1)#,   no CBs in PXFILE CBT?
PXFKOPEN    = PXFILE(5).(0:8)#,   last KOPEN error code
PXFFOPEN    = PXFILE(5).(8:8)#,   last FOPEN error code
```


Discussion:

PXFAFTSIZE This is the size (in words) of the Active File Table (AFT). The size is in words to simplify calculating the size of the available block.

PXFCBT1-8 These are the DST numbers of the user (NOBUF) control block tables. A DST number of 0 indicates that no data segment is allocated.

PXFCOPEN This contains the last COPEN error number. Not used by the file system.

PXFCTRINFO This contains information pertinent to the CS trace file. Not used by the file system.

PXFDOPEN This contains the last DOPEN error number. Not used by the file system.

PXFDSINFO Reserved for DS. Not used by the file system.

PXFFOPEN This contains the last FOPEN error number. If it is zero then the last FOPEN successfully completed; otherwise the last FOPEN was unsuccessful and the number is the file system error number.

PXFKOPEN This contains the last KOPEN error number. KSAM is partly embedded in the file system, and an FOPEN failure on a KSAM file can be caused by a failure to open either the key file or the data file. This error number is used in conjunction with PXFFOPEN to determine which file caused the KSAM open failure. This error number is not used by the file system.

PXFLEFTOFF This is the AFT entry number of the last file/line that completed a nowait I/O; if zero then no nowait I/O has been completed. This cell is maintained solely by and for the IOWAIT intrinsic.

PXFNOCB This bit signifies that control blocks are not to be created in the PXFILE control block table. This bit is set by the NOCB parameter to the CREATE intrinsic or the :RUN command. This feature permits the user to have as much stack space as possible; otherwise the file system will take several hundred words of stack for the PXFILE control block table.

PXFSIZE This is the size (in words) of the complete PXFILE area. It is the sum of the overhead block, the control block table, the active file table and the available block.

PXFILE Control Block Table (PXFCBT)

Addressing within a PXFILE control block table is somewhat more complicated than addressing an extra data segment CBT since the table does not begin at DB+0. As a result all pointers within the table are table relative; the starting address of the table must be added to a pointer to generate a final DB-relative address. This addressing convention is consistently applied to all control block tables.

When the control block table is expanded, space is taken from the AVAILABLE area. If no space is available then the PXFILE area is expanded and the acquired space is added to the AVAILABLE area.

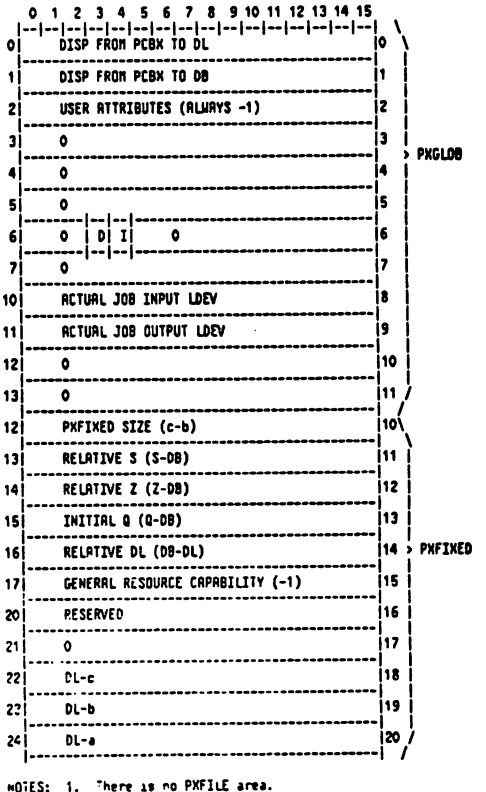
Available Block

The part labeled Available is used to provide space when the Control Block Table or the Active File Table is expanded. These two tables grow towards each other, and when more space is needed it is simply taken from the Available Block.

When the Available area is exhausted, the PXFILE area is expanded, the AFT is relocated and the new space is added to the Available Block.

Currently the PXFILE area is only expanded; it is never contracted. For more information refer to Chapter 6, "File System", and see the Active File Table.

PCBX For Core Resident System Process Stacks

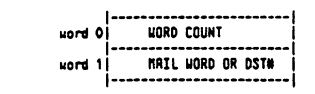


NOTES: 1. There is no PXFILE area.
2. The PXFIXED area is much smaller than a normal PCBX

Process To Process Communication Table

This table is used as the communication link by which father and son processes communicate with one another via the mailbox scheme. This table contains two words per entry and is indexed by PCBM (entry index 0 is meaningless). Each two word entry of index N essentially relates where, as well as how much, mail may be found for a process N with respect to communications between N and his father process.

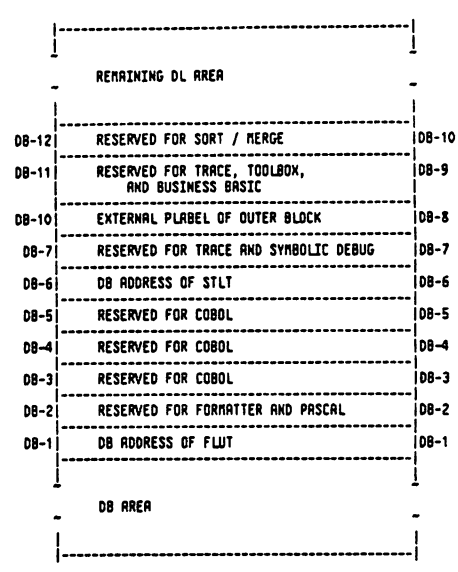
Entry Format



Where word 0 = the # of mail words to be transferred.
word 1 = the only word of mail itself if word 0 = 1
otherwise
it contains the DSTM of the extra data segment where "word count" words of mail exist.

NOTE: Assume process S is the son of process F. Then the process to process communication table index which will be used for mailbox communication between son S and father F will be that of the son (i.e., S).

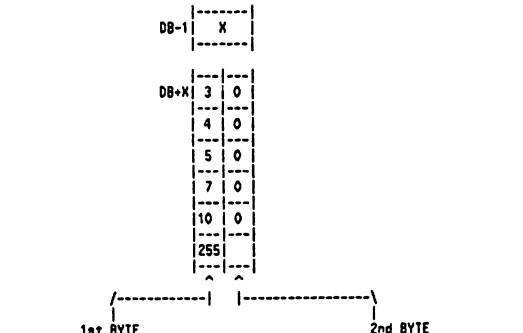
Subsystem Reserved DL Area



FORTRAN Logical Unit Table (FLUT)

The segmenter is responsible for the preparation and initialization of a FORTRAN logical unit table. This is done when a program is prepared if that program contains at least one program unit that references a logical unit. The location of the FLUT is in the secondary DB area and the address of this location is contained in DB-1.

The FLUT is formatted as per the following example:



CHAPTER 8 JOB TABLES

Job Tables Overview

Job Master Table (JMAT): One entry per job/session. Contains information needed to get the job/session running. Entry is created at the introduction of job/session.

Job Information Table (JIT): One DST per job/session. Contains information needed by the job/session as it is executing.

Process Job Cross Reference Table (PJXREF): One DST per system. Used to determine the job/session main process (Command Interpreter) for any process on the system.

Job Process Count Table (JPCNT): One entry per job/session. Entry number used to index into the JIR to lock job resources.

Job Directory Table (JDT): One DST per job/session. Contains the following sub-tables used by descendants of job/session. Must obtain JIR (by using JPCNT index) before accessing JDT. Sub-tables:

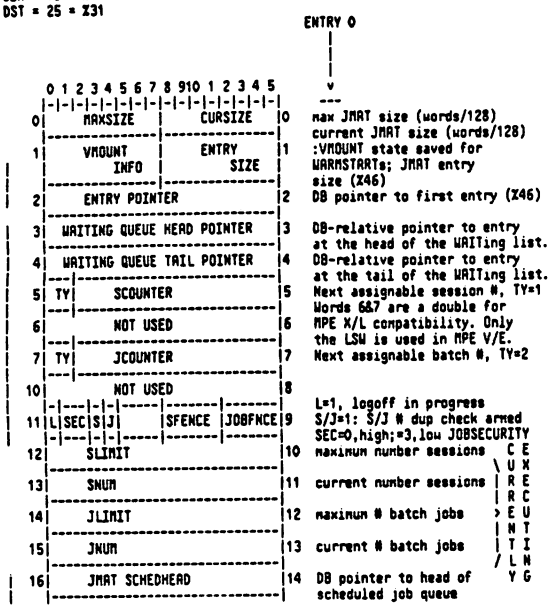
1. Data Segment Directory - Directory of sharable DSTs used by job/session
2. Temporary File Directory
3. File Equation Table
4. Line Equation Table
5. Job Control Word Table

Job Cut-off Table (JCUT): Stores total CPU time limit of job/session and accumulates the CPU time that job/session uses.

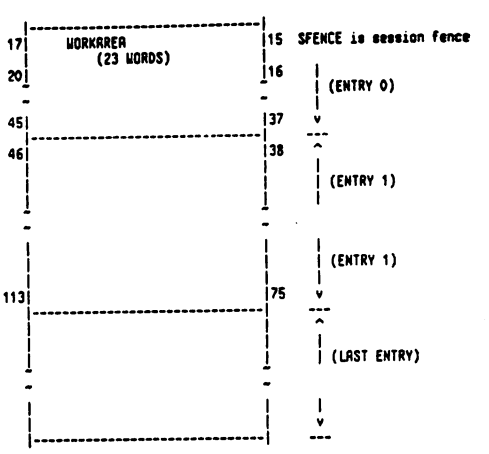
UCOP Request Queue: A queue of Process Identification Numbers that are terminating.

Job Master Table (JMAT) Structure

SIR = 15 = X17
DST = 25 = X31



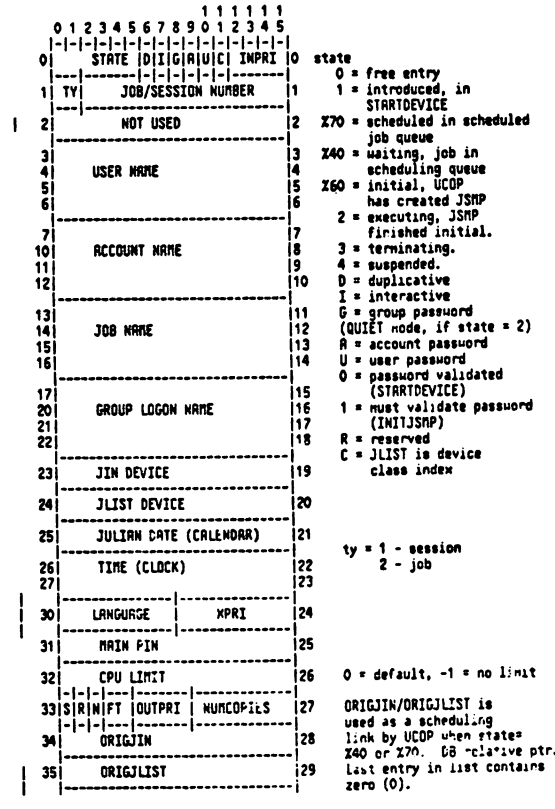
Job Master Table (JMAT) Structure (Cont.)



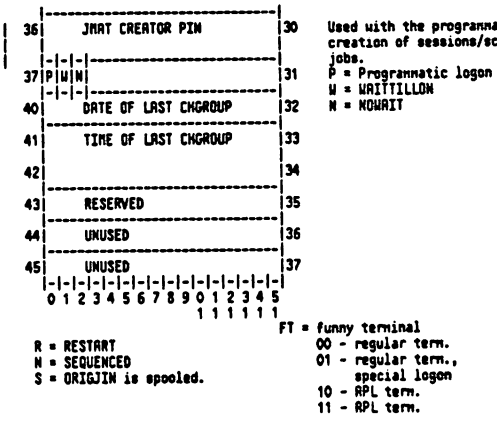
SCHEDULING QUEUE

WAITING SESSIONS
FIFO within HIPRI/INPUT priority
[ERROR JOBS
FIFO]
WAITING JOBS
FIFO within HIPRI/INPUT priority

Job Master Table (JMAT) Entry



Job Master Table (JMAT) Entry (Cont.)



Job States

JOB STATES - JMAT ENTRY WORD 0.(0:6)

SHOWJOB - Displays job states by scanning JMAT DST (%31)

LOGON uses all states except "SUSPEND"

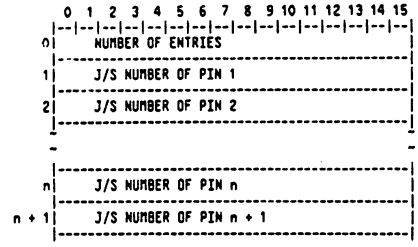
STATE NO.	STATE NAME	PROCESS	SEGMENT	PROCEDURE(S)
1	INTRO	DEVREC JSMP SPOOLER	NURSERY	STARTDEVICE - PUTJMAT - ALLOCENTRY IN SEGMENT ALLOCUTIL
%70	SCHED	UCOP	JOBSCHED	CMSTSTREAM SCHEDULEDSCHED
%40	WAIT	DEVREC JSMP SPOOLER	NURSERY SPOOLING	STARTDEVICE - SCHEDULEJOB SPOOLSTUFFIN ->SCHEDULEJOB
%60	INIT-IALIZAT-ION	UCOP	UCOP	LAUNCHJOB
2	EXEC	JSMP	NURSERY	INITJSMP
3	TERMIN-ATING	JSMP	MORGUE	TERMINATE - EXPIRE - CLEANUPJOB
0	FREE ENTRY	JSMP	MORGUE	TERMINATE - EXPIRE - CLEANUPJOB - DEALLOCENTRY IN ALLOCUTIL
4	SUSP	JSMP	OPLOW	CMBREAKJOB

For states INTRO and WAIT,

DEVREC = logon command originated on terminal or other unspooled device.
SPOOLER = logon command originated on spooled device.
JSMP = logon command is the result of the execution of a :STREAM command. (This also includes USER processes which have done programmatic :STREAMs.)

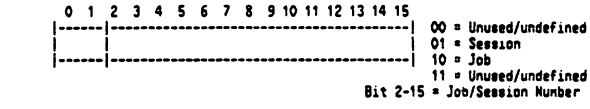
Process Job Cross Reference Table (PJXREF)

DST = %62
TABLESIZE = # PCB entries + 1



This table is only used by the SHOWQ command. The entries in the table are set up through PROCREATE and modified by MORGUE.

The job/session number is in the format:

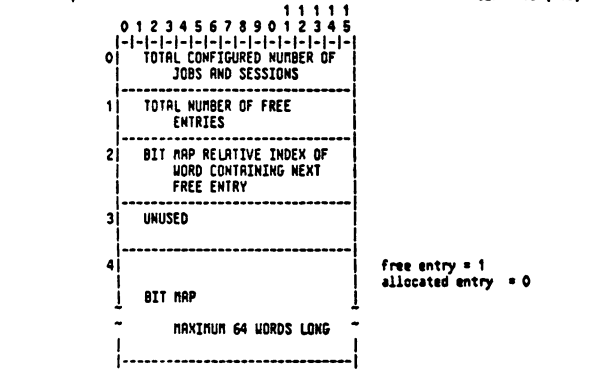


A completely zero entry is either from a system process or a currently unused pin.

Job Process Count Table (JPCNT)
(1 Bit Entry / Running Job)

MEMORY RESIDENT

SYSGLOB BASE = DB+13(%15)
DST = 24 (%30)
SIR = 13 (%15)



A JPCNT entry must be allocated before the main process can be procreated. The JPCNT Index is located in word 4, PXGLOBAL area, of the stack of a job or session. One JPCNT Index is allocated per job or session.

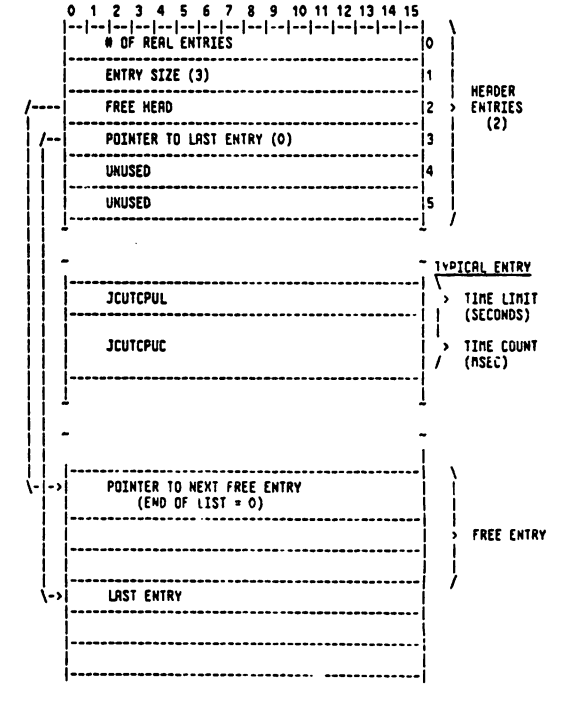
The job SIR (JIR) = base + JPCNT index, where base is the number of system reserved SIRs. The JIR is used to lock the Job Directory Table.

NOTE: This table is completely bit oriented with each entry consisting of one bit. Entries are taken from available pool on a "first found" basis. A "1" found in the bit map indicates a free entry. A zero (0) found in the bit map indicates an allocated entry. Word 2 of this table is the index of the word in the Bit Map where the next free entry resides. At system start up, this word is set to zero (0). The Bit Map can be thought of as ranging from 0-63 (64 total words - 1024 entries).

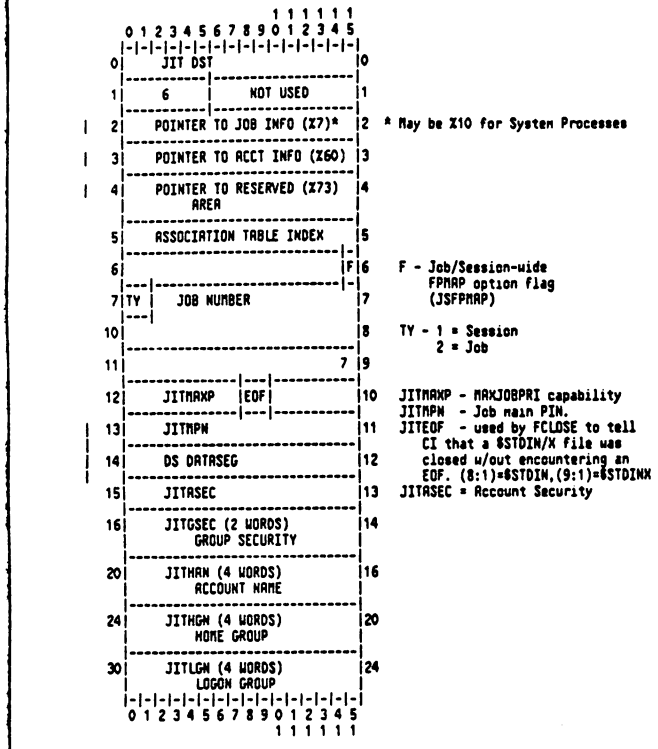
Job Cutoff Table (JCUT)
1 Entry / CPU-limited Job

MEMORY RESIDENT

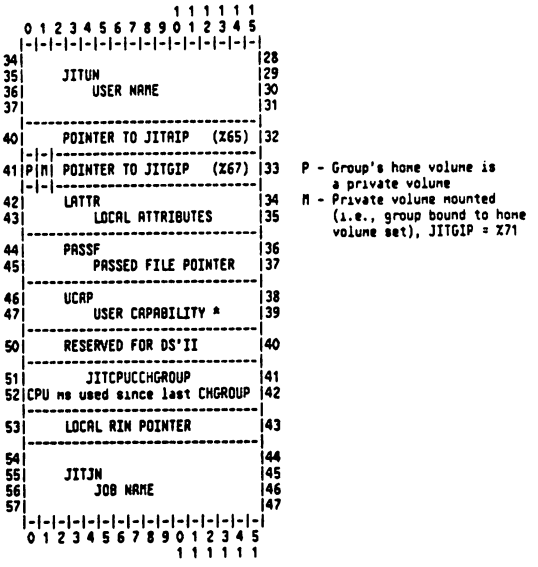
SYSGLOB BASE = DB+11(%13)
DST=36 (%44);SIR=14 (%16)
SYSGLOB + %117 = default CPU time limit for jobs



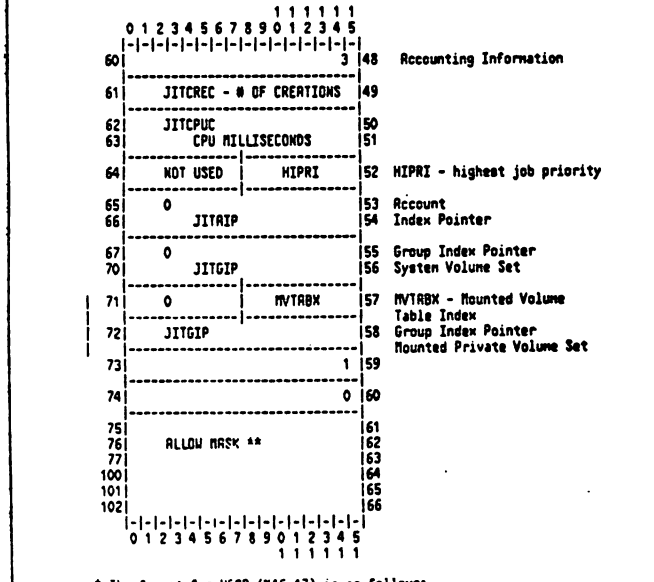
Job Information Table (JIT)
JIT DST is word 11 (base 10) in PXGLOB



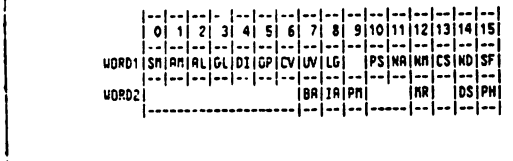
Job Information Table (JIT) (Cont.)



Job Information Table (JIT) (Cont.)



* The format for UCAP (X46-47) is as follows:



Allow Mask Format

** The Allow mask for MPE V is expanded to six words. There is a mask in each user's JIT and the global allow mask in the SYSGLOB extension area. The Allow mask contains enough bits for a one-to-one correspondence to every present OPERATOR type command, or any future OPERATOR command. When a user is ALLOWed any OPERATOR command or ASSOCIATEd to a device (which will use OPERATOR type commands) then the corresponding bit(s) in the mask in that user's JIT for that command is set. If the ALLOW or ASSOCIATE was done on a global scale, then the bit(s) in the mask of the SYSGLOB area is/are updated.

The following EQUATEs define the mask bit for each operator command.

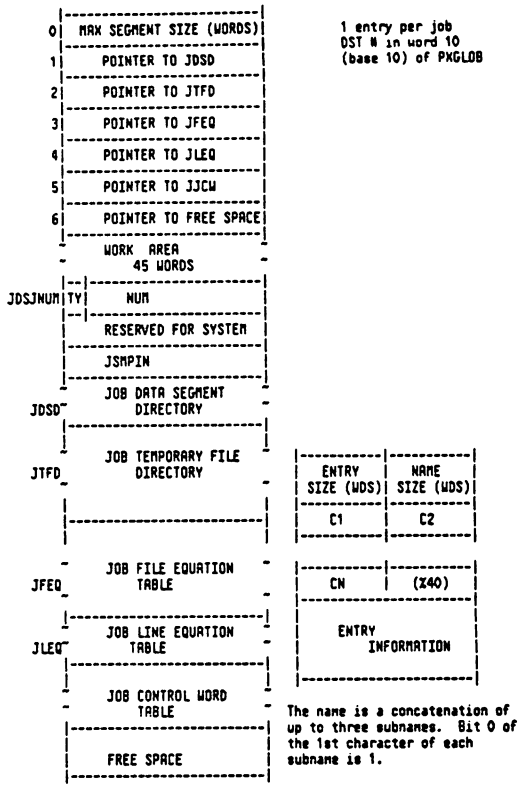
The first set of commands define the operator commands dealing with devices.

When adding a new command to this set of EQUATEs, be sure to add a corresponding move statement in LOGIMAGE, even if the command will not be logged.

	Word	Bit	#
ABORTIO	0	0	0
ACCEPT	0	1	1
DOWN	0	2	2
GIVE	0	3	3
HEADOFF	0	4	4
HEADON	0	5	5
REFUSE	0	6	6
REPLY	0	7	7
STARTSPOOL	0	8	8
TAKE	0	9	9
UP	0	10	10
RPLINE	0	11	11
DSCONTROL	0	12	12
UPPER LIMIT -> DEVICE COMMANDS			
ABORTJOB	0	13	13
ALLOW	0	14	14
ALTSPOOLFILE	0	15	15
ALTJOB	1	0	16
BREAKJOB	1	1	17
DELETESPOOLFILE	1	2	18
DISALLOW	1	3	19
JOBFENCE	1	4	20
LIMIT	1	5	21
STOPSPOOL	1	6	22
SUSPENDSPOOL	1	7	23
OUTFENCE	1	8	24
RECALL	1	9	25

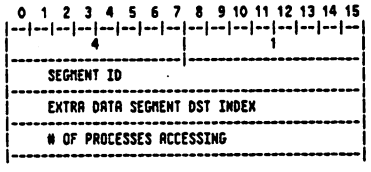
		Word	Bit	#
	RESUMEJOB	1	10	26
	RESUMESPOOL	1	11	27
	STREAMS	1	12	28
	CONSOLE	1	13	29
	WARN	1	14	30
	WELCOME	1	15	31
	MON	2	0	32
	MOFF	2	1	33
	VMOUNT	2	2	34
	LMOUNT	2	3	35
	LDISMOUNT	2	4	36
	MRJECONTROL	2	5	37
	JOBSECURITY	2	6	38
	DOWNLOAD	2	7	39
	MIOENABLE	2	8	40
	MIODISABLE	2	9	41
	LOG	2	10	42
	FOREIGN	2	11	43
|	IMFCONTROL	2	12	44
	SHOWCOM	2	13	45
	OPENQ	2	14	46
	SHUTQ	2	15	47
|	DISCRPS	3	0	48

Job Directory Table (JDT)



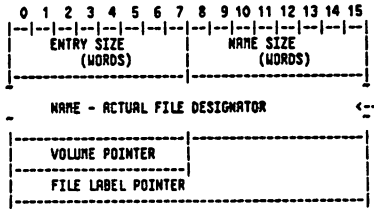
Job Data Segment Directory Entry (In JDT)

If a DST is allocated as sharable, then it will have entries in both the JDT and PXFIX. Sharable means that it can be be shared by all processes in the Command Interpreter process tree (sons, etc.). Nonsharable DSTs only have entries in the PXFIXED.



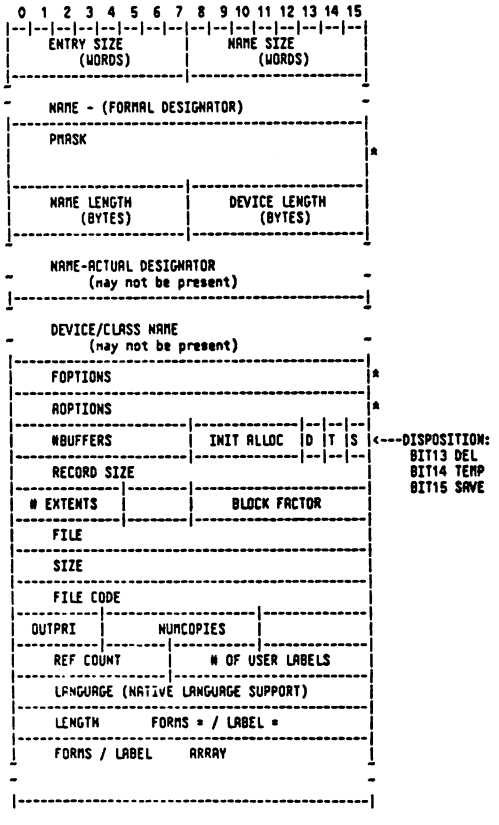
NOTE: A return of %2004 in the INDEX value after using the GETDSEG intrinsic indicates that there is no more room in the Job Directory Table for another job sharable data segment.

Job Temporary File Entry (In JDT)

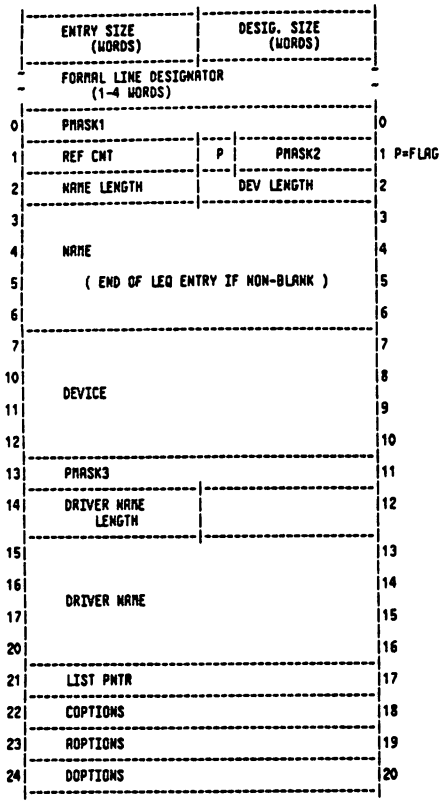


Since all son processes of a CI share the same JDT, exclusive access of the JDT is controlled with the Job SIR (JIR) and is locked and unlocked by calls to LOCKJIR and UNLOCKJIR. The JIR number is found in the PXGLOBAL area (JPCOUNT index). Only job and sessions traces have JIRs, system processes do not, even though they have JDTs. The JDTs were provided for system processes for consistency, but are not meant to be increased or reduced.

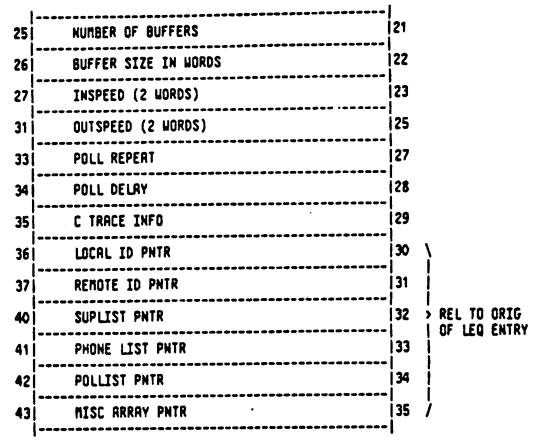
File Equation Table Entry (In JDT)



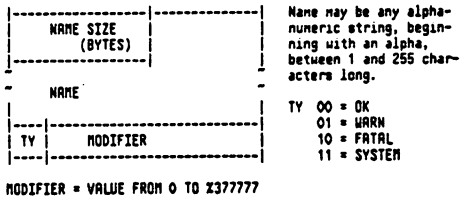
Job Line Equation (JLEQ) Entry



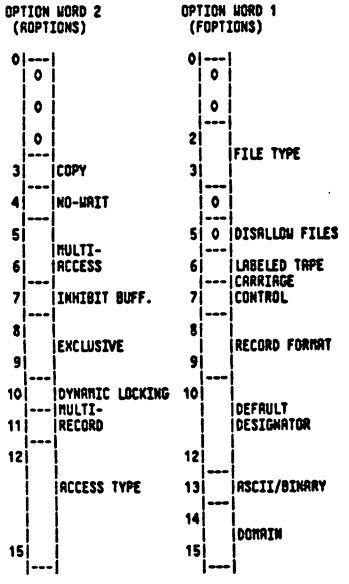
Job Line Equation (JLEQ) Entry (Cont.)



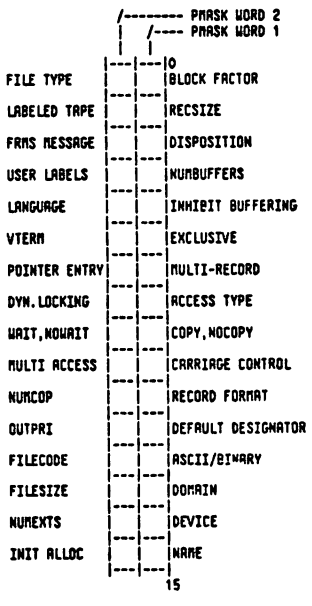
Job Control Word Table (JJCW)



Roptions and Foptions Word Breakdown



PMASK Word Breakdown

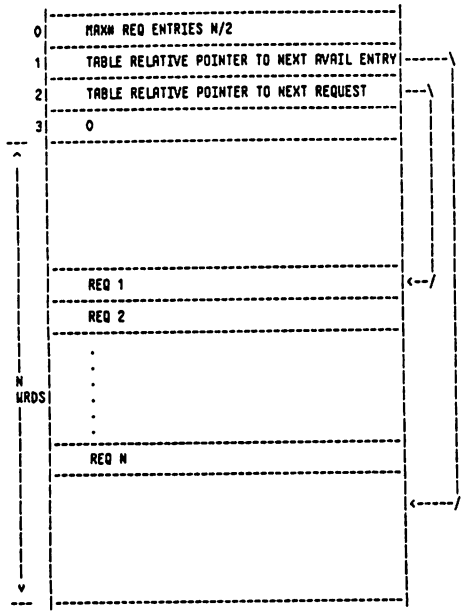


1 = info present
0 = info absent

UCOP Request Queue (DST # 9)

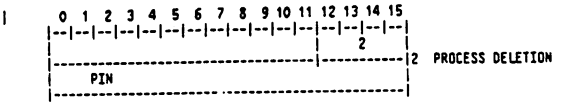
The UCOP Request Queue (URQ) is used to to signal UCOP that a process is requesting process deletion. The URQ is a circular queue using a FIFO algorithm to process requests. When the next available pointer is equal to the next request pointer, then the table is empty. When the next available pointer is (logically) one less than the next request pointer and the request is entered, then the table is full. A full table will cause System Failure 1 (SF1). Thus, the last (logical) entry cannot be used. An entry is added via a call to REQUCOP.

The UCOP Request Queue (MPE IV) was previously used for many functions such as stack expansion, but those functions moved to other areas with MPE V. The only valid entry now is a type 2 entry (process deletion). The original format is retained in the event that more functions are added.



UCOP Entry Format

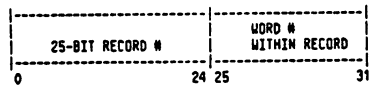
Each entry is 2 words long



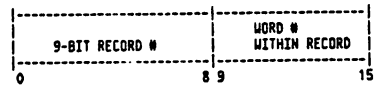
CHAPTER 9 RELOCATABLE OBJECT CODE

USL Files Introduction

- USL record length is always 128 words
- Layout of double-word disc addresses:

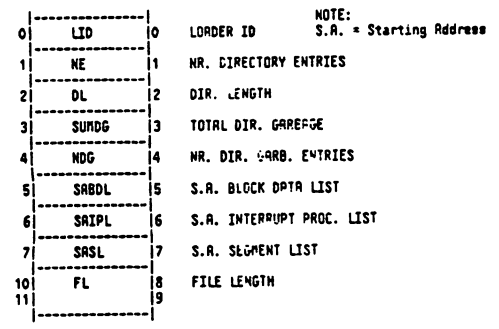


- Hash links join all entries with the same hash key regardless of type
- Linear lists terminate with a zero link
- Circular lists containing only the list head point directly to themselves
- Single-word disc addresses:



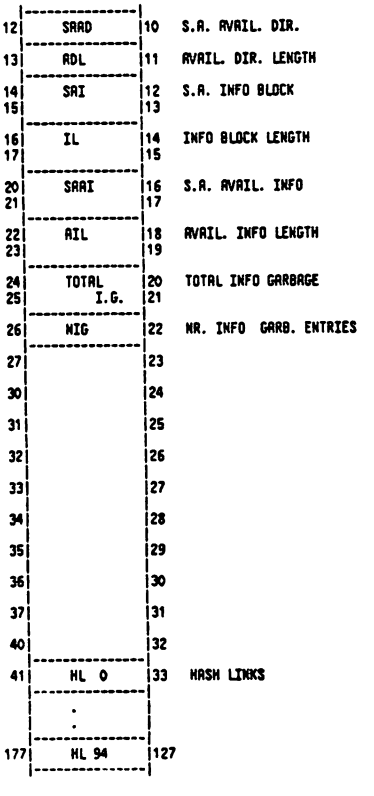
- Uninitialized fields are reserved for future use and should be set to zero.

Record 0 and Overall USL File Format

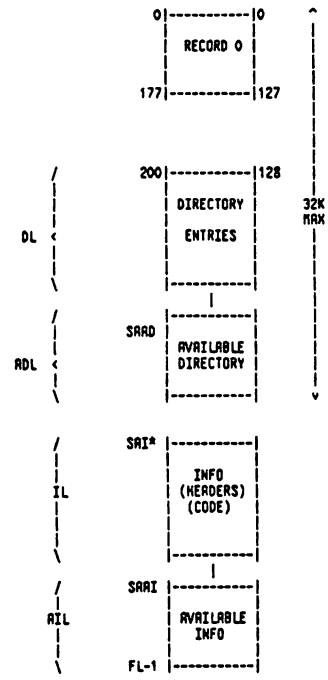


NOTE:
S.A. = Starting Address

Overall USL File Format (Cont.)



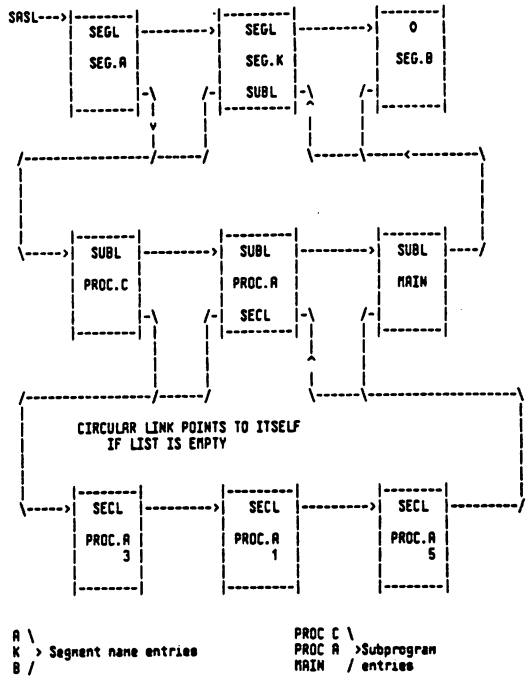
USL Files General Information



* SRI must be on a record boundary

NOTE: All addresses in record 0 are word addresses.

USL Files General Information (Cont.)

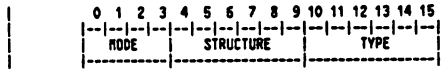


A, K, B \ > Segment name entries

PROC C, PROC A, MAIN > Subprogram entries

A 3, A 1, A 5 > Secondary entry point entries

Data Descriptors, Passed Parameters



TYPE	WORDS	CODE
NULL		0
LOGICAL	1	1
INTEGER	1	2
BYTE	1/2	3
REAL	2	4
DOUBLE	2	5
LONG	3	6
COMPLEX	4	7
LABEL (SPL)		10
CHARACTER (STRING)	N/2	11
LABEL (FORTRAN)		12
UNIVERSAL (MATCHES ANY TYPE)		13

STRUCTURE	
SIMPLE VARIABLE	0
POINTER	1
ARRAY	2
PROCEDURE	3

MODE	
NULL	0
VALUE	1
REFERENCE	2
NAME	3

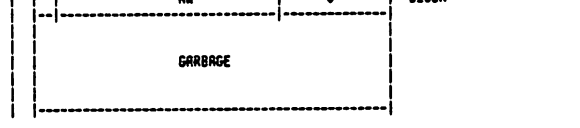
NOTE: A descriptor of 0 results in an automatic match.

Pascal

Pascal sets the high order bit in the parameter type descriptor when it is generating hashed values. The remaining 15 bits are based on a hash of the types of the parameter. Only the Pascal compiler can compute the value, and the SEGMENTER must match the whole 16 bit value.

Entry Type 0

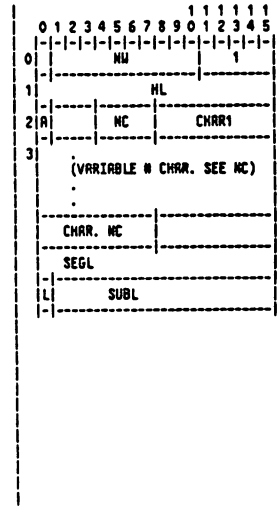
GARBAGE



Number of words in this block

Entry Type 1

SEGMENT NAME



NW - Number of words in entry block

HL - Hash link - points to next entry having the same hash code

A - Activity bit
0 if active
1 if inactive
(initialize to 0)

Note: An inactive segment implies that all entry points are inactive

NC - Number of characters in name. Max is 16

CHAR. 1 - First character in variable field

CHAR. NC - Last character in variable field

SEGL - Segment link - points to next segment name entry

SUBL - Subprogram link - points to next entry having the same segment name

L - Last entry in list
0 if not last
1 if last

Clarification Notes on Entry Types 2 and 4
With Respect to SPL and FORTRAN

*ENTRY TYPE 2 SPL O.B.	**ENTRY TYPE 4 SPL PROC	*ENTRY TYPE 2 FORTRAN MAIN	**ENTRY TYPE 4 FORTRAN SUB.
TPDB	0	0	0
1,5 TSDB	1 TSDB	1,2,3,4 TSDB	1,2,3,4 TSDB
NWPUST	NWPUST	NWPUST	NWPUST
5 NWSDB	NWD	NWD	NWD

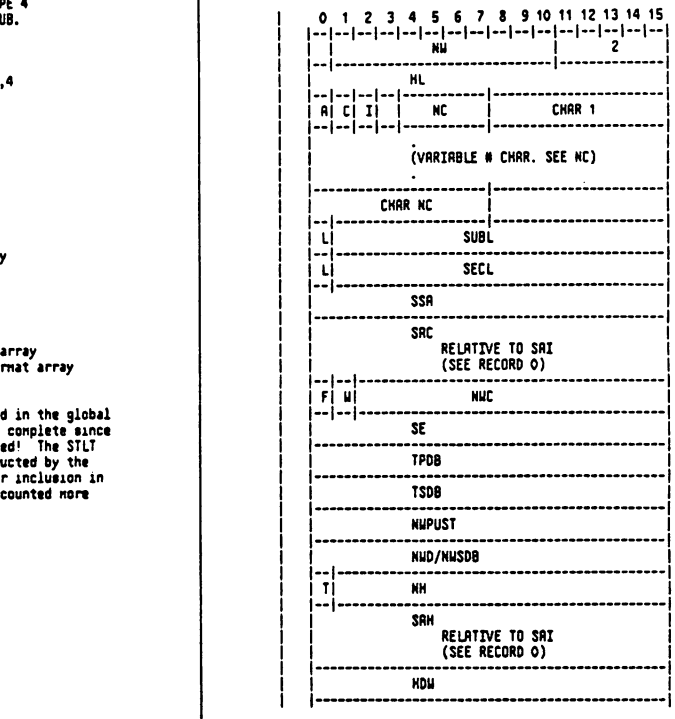
Where: TPDB = Total primary DB length in words
TSDB = Total secondary DB length in words
NWPUST = Number of words in "TRACE" array
NWSDB = Number of words in secondary DB array
NWD = Number of words in own array
NWD = Number of words in data array

Notes: 1. Does not include the length of the STLT
2. Does not include the length of the FLUT
3. Does not include the length of any common array
4. Includes the length of any DB-allocated format array
5. Are not necessarily equal

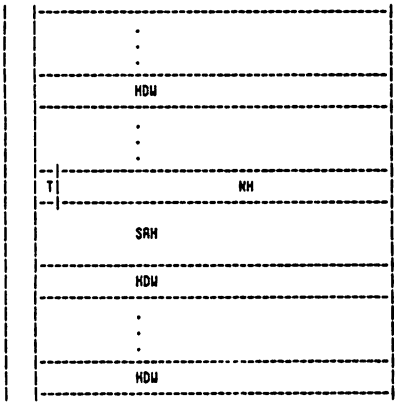
In general TPDB and TSDB are summations of storage allocated in the global area of the program's data segment. They are not, however, complete since the compilers are not aware of all storage actually allocated! The STLT and FLUT are examples of this since these tables are constructed by the segmenter. Common arrays also present a problem since their inclusion in TPDB and TSDB might cause their storage requirements to be counted more than once.

Entry Type 2

OUTER BLOCK



Entry Type 2 (Cont.)



NW - Number of words in entry block

HL - Hash link - points to next entry with same hash code

A - Activity bit - 0 if active, 1 if inactive outer block

C - Callability bit set if entry point is uncallable

I - Privilege mode bit - set if program unit is to be executed in Privilege mode

NC - Number of characters in name - max is 16

CHAR. 1 - First character in variable field

CHAR. NC - Last character in variable field

L - Last entry in list
0 if not last
1 if last

Entry Type 2 (Cont.)

SUBL - Subprogram link - points to next entry having the same segment name

SECL - Secondary entry point list link

SSR - Program unit starting PB address

SRC - Starting (FILE) address of code module

F - Set if fatal error

W - Set if nonfatal error

NWC - Number of words in code module

SE - Stack size estimate

TPDB - Total number of words of primary DB to be allocated

TSDB - Total number of words of secondary DB to be allocated

NWPUST - Number of words in trace array (PUST)

NWD - Number of words in data array (FORTRAN)

NWSDB - Number of words in secondary DB array (SPL)

T - Terminating bit - set if last set of headers in entry

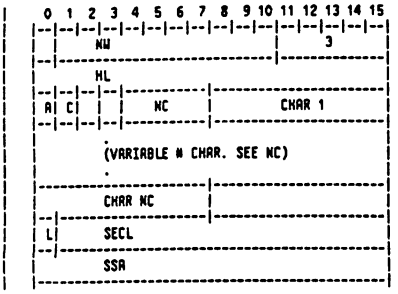
NH - Number of headers

SAH - Starting address of header (relative to SRI)

HDW - Header (pointer)

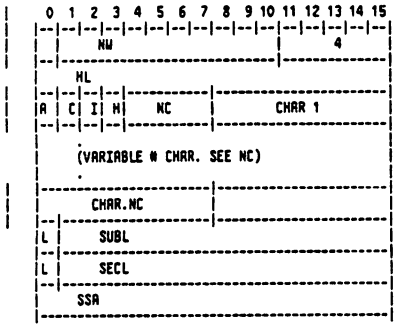
Entry Type 3

OUTER BLOCK - SECONDARY ENTRY POINT

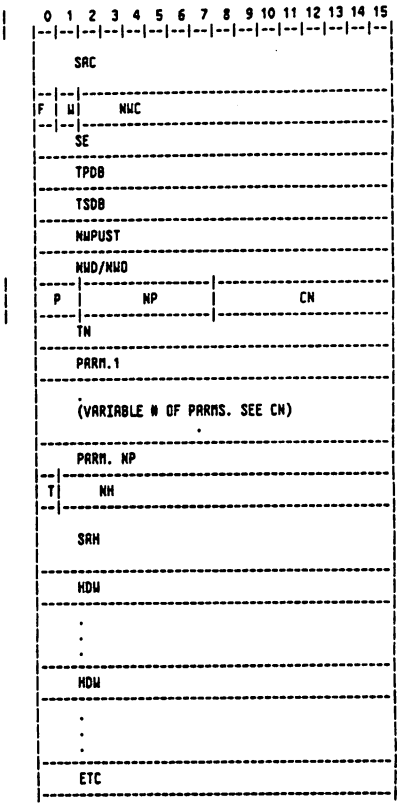


Entry Type 4

PROCEDURE



Entry Type 4 (Cont.)



Entry Type 4 (Cont.)

NW - Number of words in entry block

HL - Hash link - points to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry point

C - Callability bit set if entry point is uncallable

I - Privilege mode bit. Set if procedure is to be executed in privilege mode

H - Hidden entry point. Set if entry point will not be in library directory

NC - Number of characters in name. Max is 16

CHAR1 - First character in variable field

CHAR NC - Last character in variable field

L - Last entry in list
0 if not last
1 if last

SUBL - Subprogram link. Points to next entry having the same segment name

SECL - Secondary entry point list link

SSA - Unit starting PB address

SRC - Starting (file) address of code module

F - Set if fatal error

W - Set if nonfatal error

NWC - Number of words in code module

SE - Stack size estimate

TPDB - Total number of words of primary DB to be allocated

TSDB - Total number of words of secondary DB to be allocated

NWPUST - Number of words in trace array (PUST)

Entry Type 4 (Cont.)

NWD - Number of words in data array (FORTRAN)

NWO - Number of words in own array (SPL)

P - Parameter checker
00 no checking. (Implies NP undefined, FN and PARMs absent)
01 check procedure type. (Implies NP is undefined and PARMs absent)
10 check procedure type and number of PARMs (implies PARMs absent)
11 check procedure type, number of PARM 's and type of each PARM.

NP - Number of PARMs

CN - Character count of PARMs

TN - Procedure Type (see Data Descriptors earlier in this chapter).

T - Terminating bit. Set if last set of headers in entry.

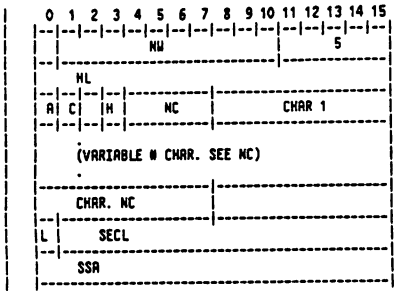
NH - Number of headers

SRH - Starting address of header

HDW - Header (pointer)

Entry Type 5

PROCEDURE - SECONDARY ENTRY POINT



NW - Number of words in entry block

HL - Hash link - points to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry point

C - Callability bit set if entry point is uncallable

H - Hidden entry point set if entry point will not be in library directory

NC - number of characters in name, max is 16

CHAR 1 - First character in variable field

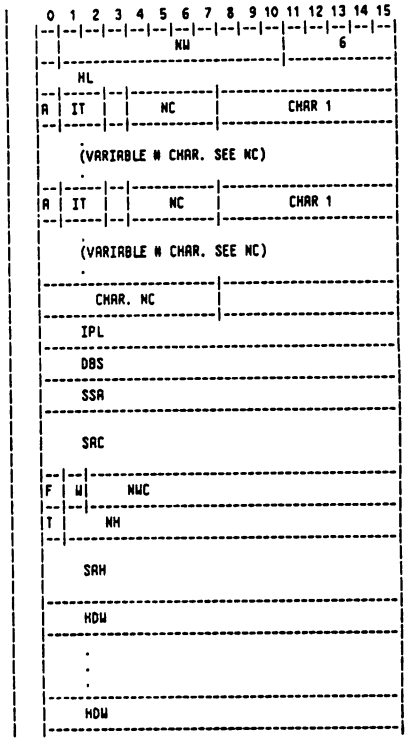
L - Last entry in list
0 if not last
1 if last

SECL - Secondary entry point list link

SSA - Unit starting PB' address

Entry Type 6

INTERRUPT PROCEDURE



Entry Type 6 (Cont.)

NW - Number of words in entry block

HL - Hash link. Points to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry.

IT - Interrupt procedure type number

NC - Number of characters in name (maximum is 16)

CHAR 1 - First character in variable field.

CHAR NC - Last character in variable field

IPL - Interrupt procedure link

DBS - Number of words of DB storage required

SSA - Unit starting PB' address

SAC - Starting (file) address of code module

F - Set if fatal error

W - Set if nonfatal error

NWC - Number of words in code module

T - Terminating bit. Set if last set of headers in entry

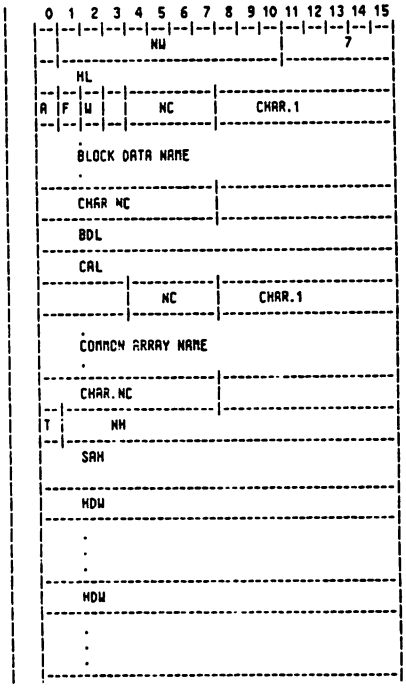
NH - Number of headers

SAH - Starting address of header

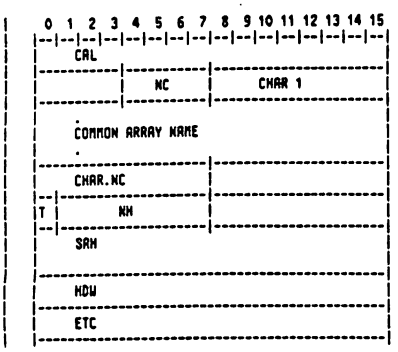
HDW - Header (pointer)

Entry Type 7

BLOCK DATA



Entry Type 7 (Cont.)



NW - Number of words in block

HL - Hash link. Points to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive block

F - Set if fatal error

W - Set if nonfatal error

CHAR 1 - First character in variable field

CHAR NC - Last character in variable field

BDL - Block data link

CAL - Common array length

T - Terminating bit. Set if last set of headers in entry

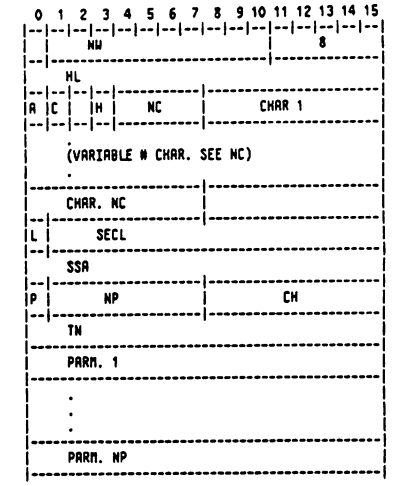
NH - Number of headers

SAH - Starting address of headers

HDW - Header (pointer)

Entry Type 8

PROCEDURE - SECONDARY ENTRY POINT



NW - Number of words in entry block

HL - Hash Link - points to next entry with same hash code

A - Activity bit. 0 if active, 1 if inactive entry

C - Callability bit set if entry point is uncallable

H - Hidden entry point. Set if entry point will not be in library directory

NC - Number of characters in name, max is 16

Entry Type 8 (Cont.)

CHAR 1 - First character in variable list

CHAR NC - Last character in variable list

L - Last entry in list
0 if not last
1 if last

SECL - Secondary entry point list link

SSA - Unit starting PB' address

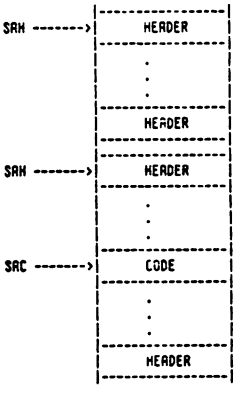
P - PARM checker
00 No checking (Implies NP undefined, TN and PARMS absent)
01 Check procedure type (implies NP is undefined and PARMS absent)
10 Check procedure type and number of PARMS. (Implies PARMS absent)
11 Check procedure type, number of PARMS and type of PARM

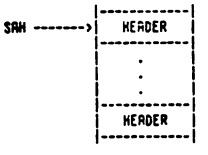
NP - Number of PARMS

CN - Character count of PARMS

TN - Procedure type

Entry Header Format





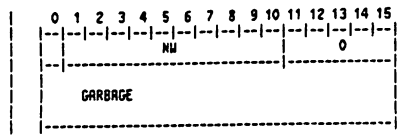
Each entry (except secondary entry point entries) must describe N > 0 sets of headers. The headers in each set must be continuous and in the same order as the HDW list describing the set.

The code module may be placed in any position in a header set. Note that if the code module is at the beginning of a set, SAC = SAH.

If the entry has no header set, then NH, SAH sequence is absent.

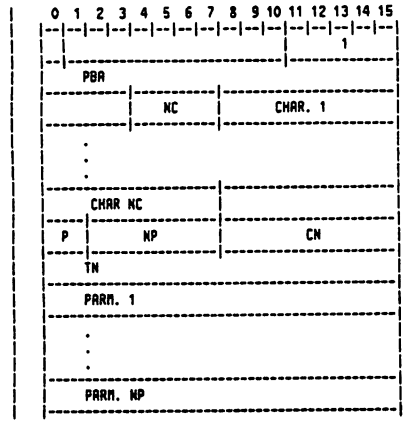
Header Type 0

GARBAGE



Header Type 1

PCALs



PBA - PB' address of linked list of PCAL instructions to be repaired - lower 14 bits used as negative disp. - bit 0 set means that the word is not a PCAL instruction, but a pointer to a SST label of "EXTERNAL" format - a link of 0 terminates the list - bit 1 set means that the word is to be initialized with the PB address of the procedure.

Header Type 2

PB ADDRESSES

PBA - PB' address of PB address to be corrected

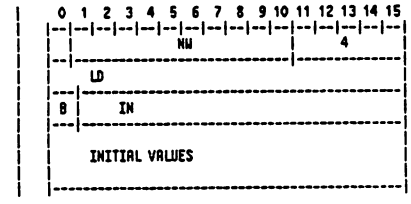
Header Type 3

OWN / DATA VARIABLES

PBA - PB' address of own variable pointer to be corrected

Header Type 4

DSOB / OWN / DATA / VALUES



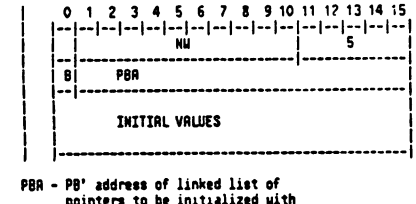
LD - Logical word displacement in own array for initial values

B - Byte bit - set implies that LD is type BYTE and that the first word of the initial value block is a count of the number of bytes in the initial value block

IN - Integration number - number of times the block of initial value is to appear in the secondary BD - 1 - no duplication. 2 - duplication, etc

Header Type 5

PUST

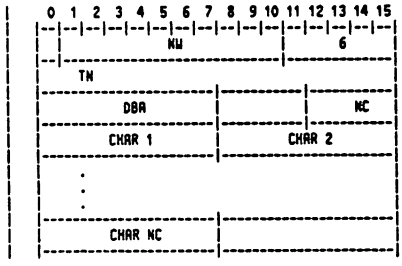


PBA - PB' address of linked list of pointers to be initialized with DB address of PUST (same list format as for format strings) A PBA of -1 indicates NO FIX-UPS.

NOTE: All references to the PUST include the four-word header that is appended by the segmenter. These words are not present in the header; they are automatically allocated and initialized by the segmenter.

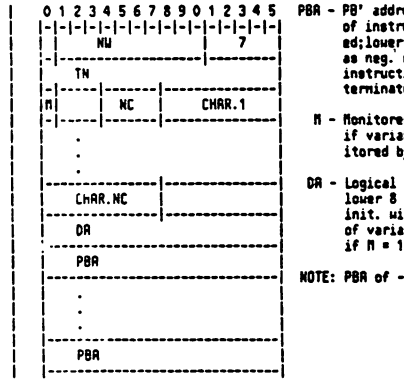
Header Type 6

GLOBAL VARIABLES



Header Type 7

EXTERNAL VARIABLES



PBA - PB' address of linked lists of instructions to be repaired;lower 8 bits of inst. used as neg. displacement to next instruction; a link of 0 terminates the list.

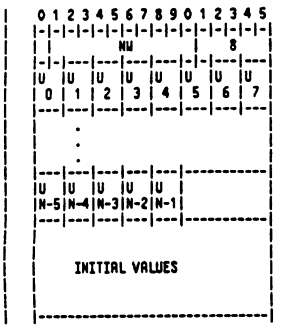
M - Monitored variable bit; set if variable is being monitored by DEBUG.

DA - Logical word disp. in PUST; lower 8 bits of word will be init. with prin.DB address of variable; DA is present if M = 1.

NOTE: PBA of -1 implies null list

Header Type 8

PRIMARY DB



U - ADDRESS BITS
- 00 if no address
- 01 if no address
- 10 if word address in secondary DB
- 11 if byte address in secondary DB

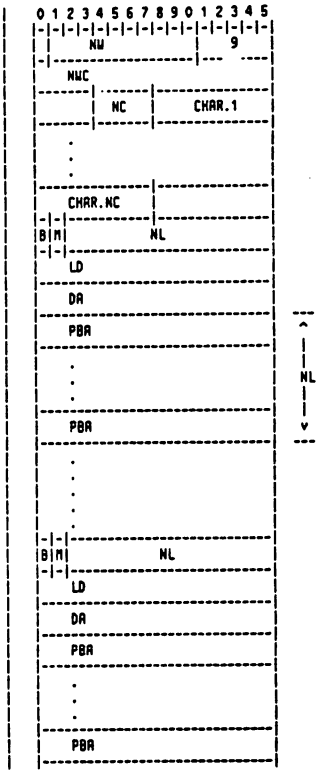
N - NWPDB

NOTE: Initial addresses that are secondary DB addresses are 0

Relative (i.e., they are logical displacements in secondary DB).

Header Type 9

COMMON VARIABLES



Header Type 9 (Cont.)

NWC - Number of words in common array

NC - Number of characters in common name - if blank COMMON 4 COM'

DA - Logical word disp. in PUST - lower 8 bits of word will be init. with prim. DB address of variable - NOTE DA is present if M = 1

B - Byte bit
- 0 if the primary DB pointer to be allocated and initialized and LD are of type word
- 1 if type BYTE

M - Monitored variable bit - set if variable is being monitored by DEBUG

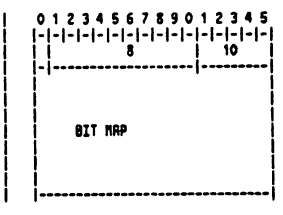
NL - Number of address lists for variable

LD - Logical displacement of variable in common array

PBA - PB' address of linked lists of instructions to be repaired - lower 8 bits used as negative displacement to next instruction - a link of 0 terminates the list
PBA = -1 indicates NO FIX-UPS

Header Type 10

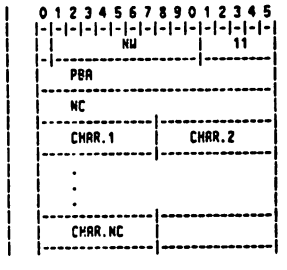
LOGICAL UNITS



BIT MAP - Bit map of logical units referenced; bit 0 corresponds to LU 0, etc. (1 less than or equal to LU less than or equal to 99)

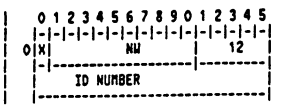
Header Type 11

FORMAT STRING

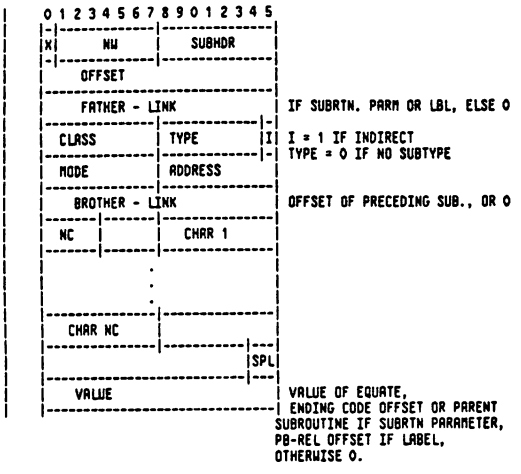


PBA - PB' address of linked list of pointers to be initialized lower 14 bits of word used as negative displacement to next pointer - bit 0 set means that the pointer is to be type BYTE - a link of 0 terminates the list.

Header Type 12



Sub-Header For Header Type 12



Header Type 13 & 14

For Header Type 12, 13, & 14:

NW - The total length in words of the header.

SUBHDR - 0 if non-variable, 1 if var., 2 if PB array.

ID NUMBER - A unique reference for each block. (A block is a procedure, subroutine, or the outer block.) This number is kept in the 24th word of record zero of the USL file. It is incremented every time a block is processed, and survives from compile to compile as long as the USL file is not initialized.

V - Set to 1 if this is a modifiable identifier (i.e., a variable).

OFFSET - A number assigned to each identifier within a block. When combined with the ID Number, this uniquely identifies each identifier in a program.

FATHER-LINK - The offset of the parent procedure of this subroutine. Since more than one subroutine in a procedure can have the same parameter and label names, the FATHER-LINK serves the same purpose on a local level that the ID Number does globally. When combined, the FATHER-LINK.ID NUMBER.OFFSET combination provides definitive identifier recognition.

BROTHER-LINK - The offset of the subroutine preceding this one, (if any).

SON-LINK - The offset of the first subroutine (if any) in the procedure or outer block.

CLASS/TYPE - The identifier class and subclass (See SPL IMS).

I - Set to 1 if a reference parameter.

MODE/ADDRESS - The identifier addressing mode & offset (See IMS).

NC - The number of characters in the identifier name.

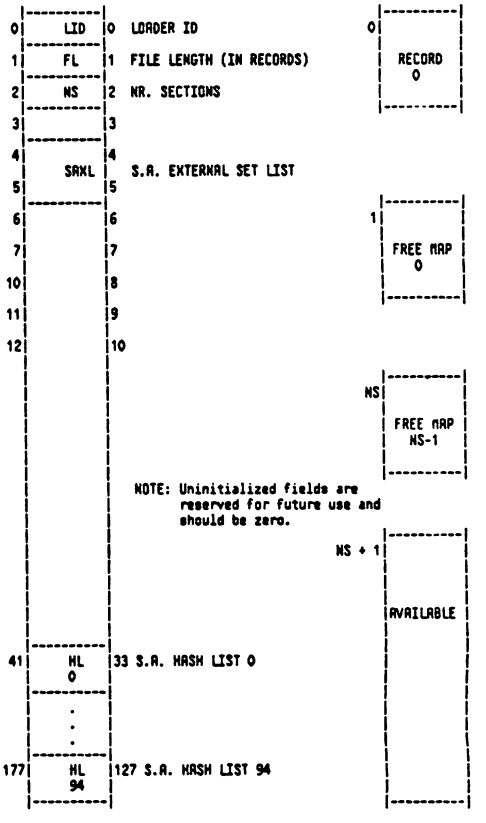
CHAR1..CHARNC - The identifier name.

SPL - A value (currently 99) identifying the source language to Symbolic Debug.

VALUE - See Diagram.

LEVEL - See Diagram.

RL File Format



NOTE: Uninitialized fields are reserved for future use and should be zero.

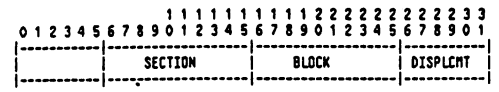
Storage Management

File space is managed in terms of 32 word blocks (4 blocks per 128 word record).

Free space (blocks) is accounted for in a bit map, which is partitioned into records (2K blocks per section). A 0 indicates that a block is used, a 1 indicates that it is free.

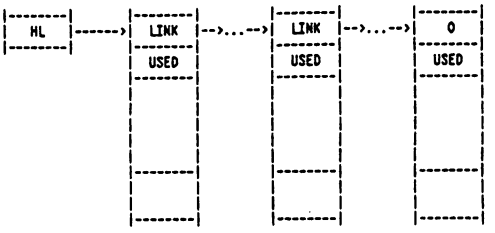
File space is also partitioned into 512 record sections (64 max. sections, 2K blocks per section, 1 map per section). The number of sections in a file is NS = (FL + 511) & LSR(9). The first NS records following record 0 (records 1 to NS) are reserved for the section maps.

A complete file address would have the following configuration:



File (word) Address
Double Word

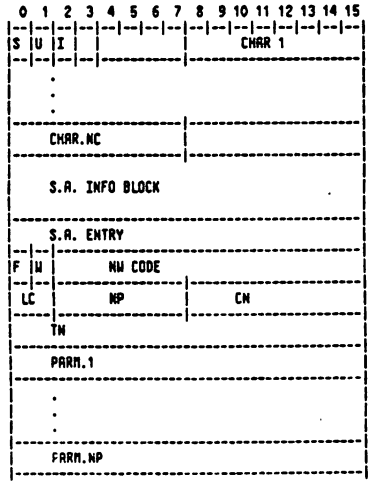
Entry Point Directory



The directory is partitioned into 95 HASH LISTS (same HASH function as USL); each HASH LIST is a linked list of records.

Each record contains a successor link (record #) and a used space count. A link of 0 terminates a list. When a record is void of entries (USED=2), its space is returned to the free storage area.

Typical Directory Entry



S - Secondary entry point bit - set if the entry point was originally a secondary entry point

U - Uncallable bit - set if entry point is uncallable

I - Privileged Mode bit - set if code module is to be run in PRIVILEGE MODE

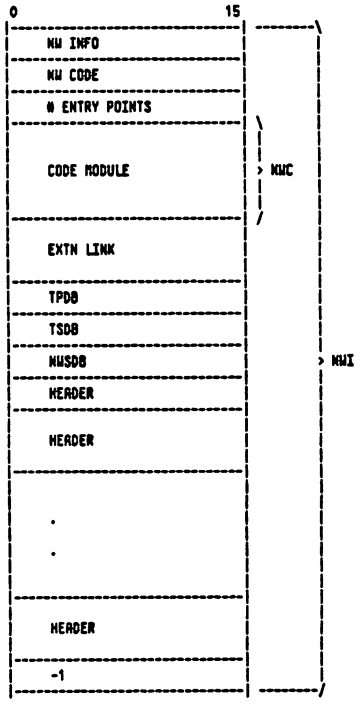
LC is (0:2)...Level of Checking
- 0 = No checking
- 1 = Check for procedure type
- 2 = Check for # parameters
- 3 = Check for parameter type

NP is (2:6) is # parameters

CN- Character count

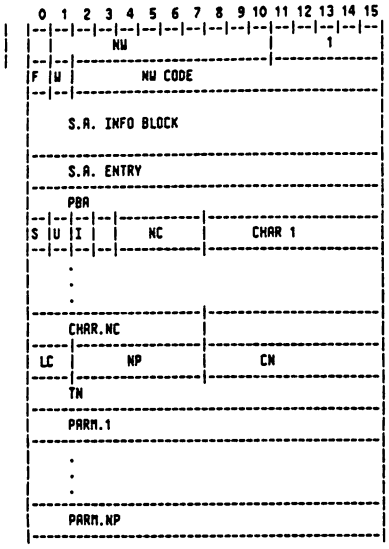
TN- Procedure Type (see Data Descriptors earlier in this chapter).

Procedure Information Block



All headers for the procedure are appended to the info block. The header sets (EXTERNAL LISTS) are linked by increasing file address; a link of X'17777777777D terminates the list.

Headers



F - Set if fatal error
W - Set if non-fatal error
S - Satisfied bit - set if EXTERNAL is
    satisfied within RL
U - Uncallable bit
I - Privileged bit
    module is to be run in PRIVILEGE MODE
LC is (0:2)...Level of Checking
      0 = No checking
      1 = Check for procedure type
      2 = Check for # parameters
      3 = Check for parameter type
NP is (2:6) is # parameters
CN- Character count
TN- Procedure Type (see Data Descriptors earlier in this chapter).

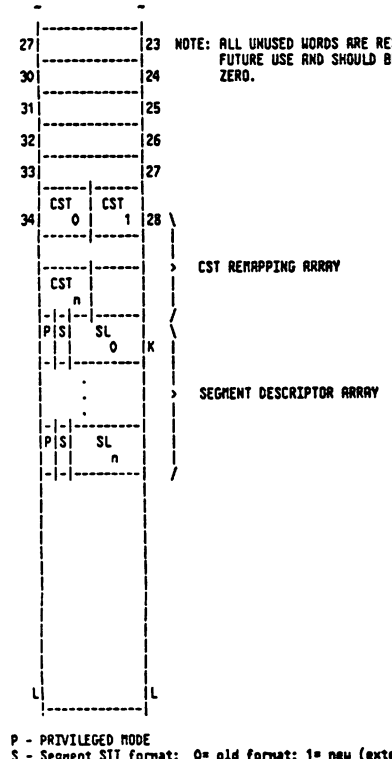
All headers are the same as in a USL except for the PCAL header.

CHAPTER 10 PREPARED OBJECT CODE

Program File Format

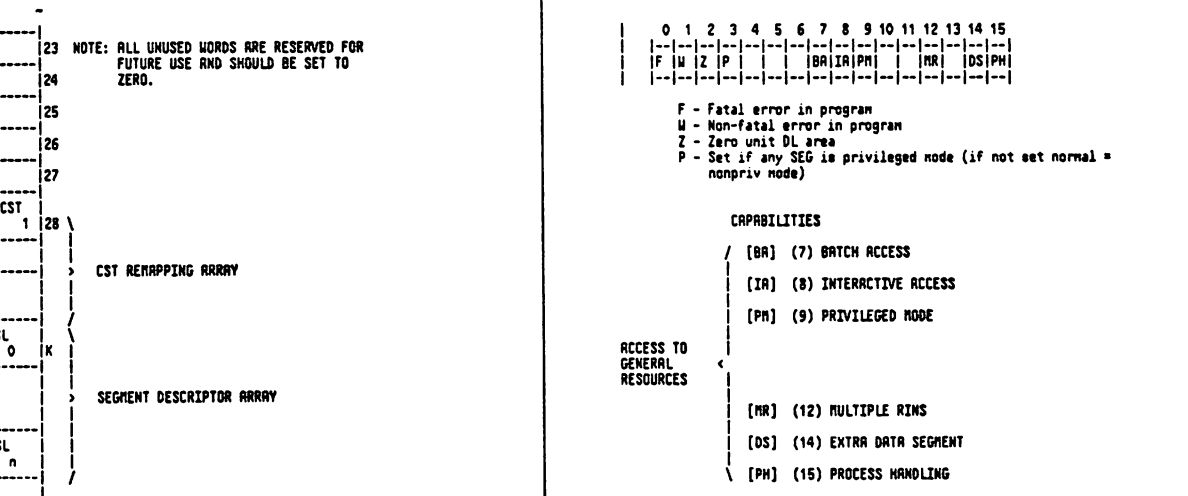
0	FLAGS	0
1	NS	1 NUMBER OF CODE SEGMENTS
2	GS	2 GLOBAL SIZE (DB TO QI) IN WORDS
3	SAG	3 GLOBAL AREA RECORD #
4	SAS	4 SEGMENT SET RECORD # (EACH SEG. STARTS IN NEW RECORD)
5	ISS	5 INITIAL STACK SIZE IN WORDS
6	IDLS	6 INITIAL DL SIZE IN WORDS
7	MAXD	7 MAX. DATA SEGMENT SIZE (DL TO Z) IN WORDS
10	SAE	8 ENTRY POINT LIST RECORD #
11	SSEG	9 STARTING SEGMENT #
12	SADR	10 PRIN. ENTRY PT PB ADDRESS
13	SASTLT	11 DB ADR. OF STLT (-1 IF NO STLT) (STLT=Segment Length Table)
14	SAFLUT	12 DB ADR. OF FLUT (-1 IF NO FLUT)
15	SAX	13 EXTERNAL LIST RECORD #
16	SSTT	14 PRIN. ENTRY PT SST #
17	SATC	15 STARTING ADDRESS OF TRAPCOM'
20	SAPMAP	16 STARTING RECORD OF PMAP INFO
21	SASI	17 STARTING RECORD OF SYMBOLIC ITEMS
22	FLAGS2	19
23	CKSUM	19 TOTAL CHECKSUM OF ALL SEGMENTS
24		20
25		21 > Three words reserved for MPE/XL.
26		22

Program File Format (Cont.)



P - PRIVILEGED MODE
S - Segment STT format: 0= old format; 1= new (extended) format
N = NS -1
K = 28 + (NS +1)/2
L = ((28 + NS + (NS + 1)/2 + 127)/128) 128

Flags



Flags2

T - Patch area existed in all code segments
K - Checksum valid

CST Remapping Array

Contains the last CST numbers assigned to the segments, indexed by segment number. When a program file is prepared, the array is initialized to 0, 1...,N. This array is used to re-establish intra-program linkage when the program is loaded.

Segment Descriptor Array

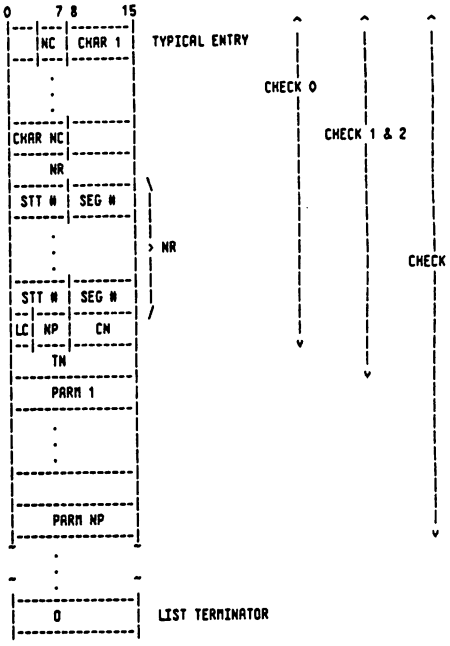
Contains the segment length and a flag indicating if the segment is to be loaded in privileged mode, indexed by segment number. All segments begin on a record boundary. The number of records for a given segment is (SL + 127)/128. The record number, SAS, of segment N (0 <=N <=NS-1) is:

```
If N > 0 then
FOR I=0 TO N-1
 BEGIN
 SAS:=SAS + (SL(I) + 127)/128
 END
ELSE
   SAS:=SAS;
```

Global Area Format

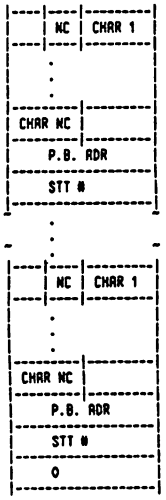
A set of records containing the initial set begins at record SAG (Word 3) and consists of (GS + 127)/128 records.

External List



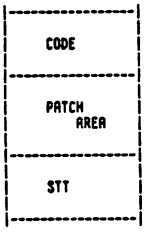
LC (0:2) = Level of Checking
0 >= No checking
1 >= Check for procedure type
2 >= Check for # parameters
3 >= Check for parameter type
NR = Number of References
NP (2:6) = Number of Parameters
Parm1...Parm NP = Contain Data Descriptors documented in Chapter 9, "Relocatable Object Code"

Entry Point List

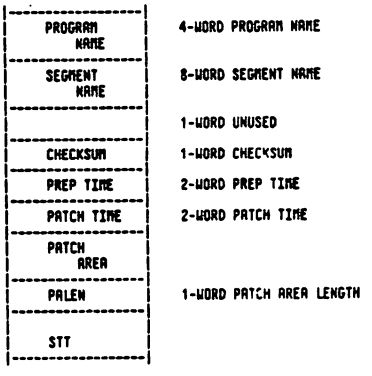


NOTE: The entry point list must immediately follow the external list.

Code Segment With Patch Area



Patch Area



PMAP Information

PTT	PMAP TYPE TABLE
SPP	SEGMENT PMAP POINTERS
APD	ACTUAL PMAP DATUM

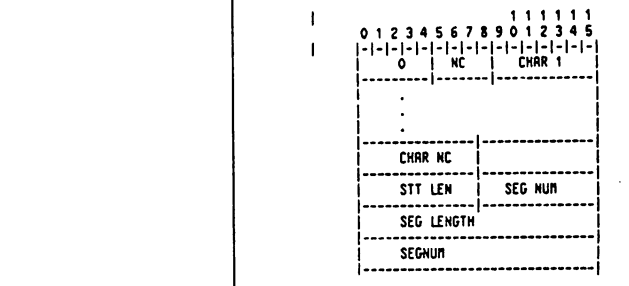
PMAP Type Table

PTTL	TYPE TABLE LENGTH
LPR0	LENGTH OF PMAP RECORD TYPE 0
LPR1	LENGTH OF PMAP RECORD TYPE 1
.	
.	
LPRn	LENGTH OF PMAP RECORD TYPE n

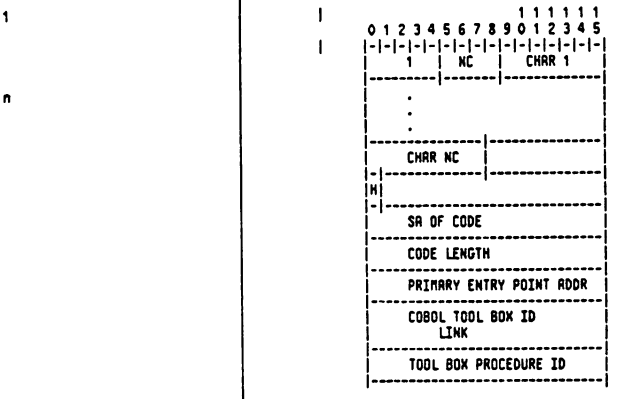
NOTE: n = PTTL - 2

PMAP Records

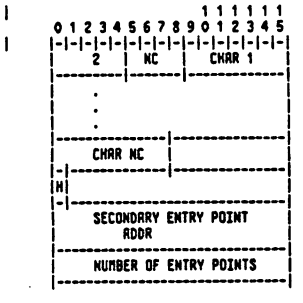
Type 0 Segment PMAP Record



Type 1 Procedure PMAP Record

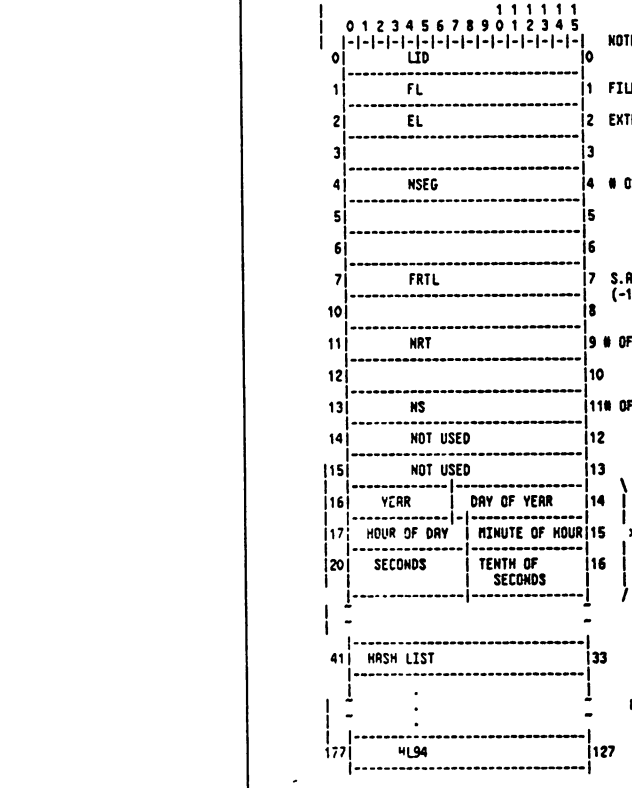


Type 2 Secondary Entry PMAP Record

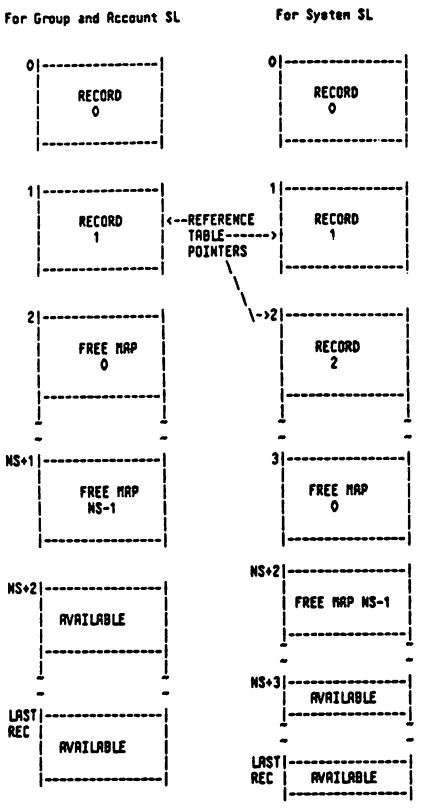


H = Hidden entry flag

SL File Format



SL File Format (Cont.)



NS = Number of Sections

Storage Management

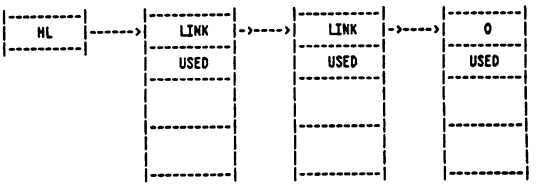
File space is managed in terms of 128 word blocks (1 block per 128 word record).

Free space (blocks) is accounted for in a bit map, which is partitioned into records (2k blocks per section). A 0 indicated that a block is used; a 1 indicated that it is free.

File space is also partitioned into 2048 record sections (16 maximum sections for Group and Account SLs, 32 maximum sections for the System SL; 2K blocks per section, one (1) map per section). The number of sections in the file is NS = (FL + 2047)/2048. The first NS records following records 0 and 1 for Group and Account SL (records 2 + NS + 1) or following records 0, 1, 2 for System SL (records 3 to NS +2) are reserved for the section maps.

If the section maps specify more space than is potentially available, those records beyond FLIMIT are marked as "USED".

Entry Point Directory

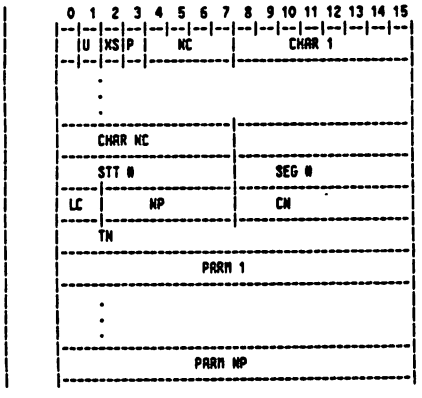


The directory is partitioned into 95 Hash Lists (same HASH function as USL); each Hash List is a linked list of records.

Each record contains a successor link (record #) and a used space count. A LINK of 0 terminates a list. When a record is void of entries (USED = 2), its space is returned to the free storage area.

The Hash List head pointers (HL in the diagram above) are in record 0, words X41 TO X177.

Typical Directory Entry



LC is (0:2)...Level of Checking
- 0 >= No checking
- 1 >= Check for procedure type
- 2 >= Check for # parameters
- 3 >= Check for parameter type

NP is (2:6) is # parameters

P - 0 = Not permanently allocated
- 1 = Permanently allocated

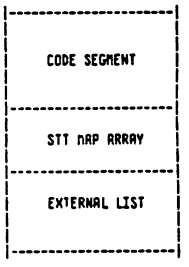
U - Uncallable bit - set if entry point is uncallable

XS- The most significant bit of segment number
- = 0 if < 256
- = 1 if >=256

NC- The number of characters in the entry point name

CN- Character count for parameters

Code Segment Linkage Structure



Each code segment occupies an integral number of records. This block of information can be subdivided into three tables: the CODE SEGMENT proper, an STT SEGMENT map array, and an EXTERNAL LIST.

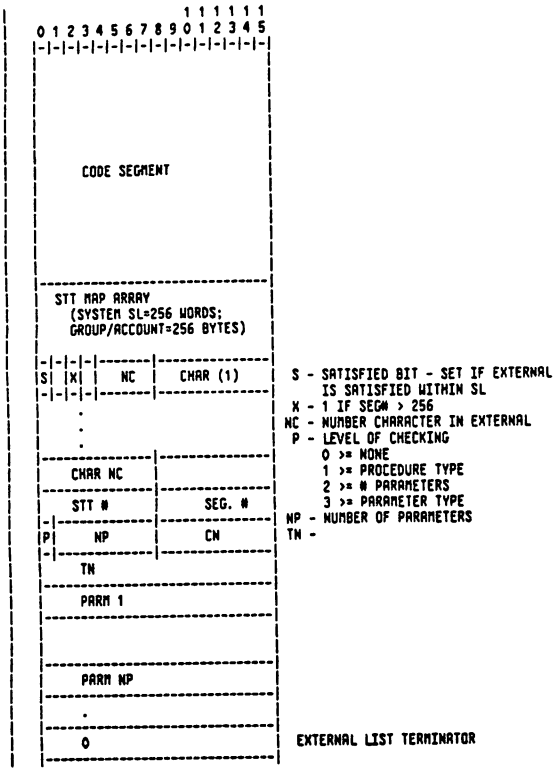
STT Map Array

In the System SL, the STT Map Array is a 1 Word X 256 Word array. In Group and Account SLs, it is a 1 byte x 256 byte array. It is indexed by STT number. It contains the segment number which has the entry point corresponding to the external of the STT number. If no entry point in the SL matches the external, each bit in the Word (or byte) is set to one. This array is used whenever the segment is loaded and is updated whenever the SL is bound by the Segmenter.

External List

A symbolic list of the EXTERNALS of the segment. Each entry contains information about the EXTERNAL: parameter checking level and parameter matching information, and the segment number and STT number if the EXTERNAL is satisfied within the SL.

Code Segment Structure (Cont.)



Reference Table Structure

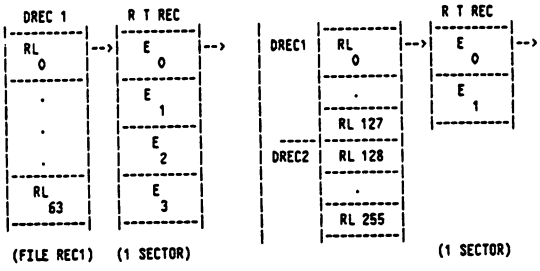
Each segment has a corresponding Reference Table.

- For Group and Account segments, Reference Tables are packed four (4) entries to a record; each entry has a 32-word length. To determine entry number and displacement, divide segment number by 4: remainder = R T REC entry number, quotient = displacement into the Reference Table Pointer Map, Record 1.
- For System SL segments, Reference Tables are packed two (2) entries to a record; each entry has a 64-word length. To determine entry number and displacement, divide segment number by 2: remainder = R T REC entry number, quotient = displacement into Reference Table Pointer Map, Records 1 and 2.

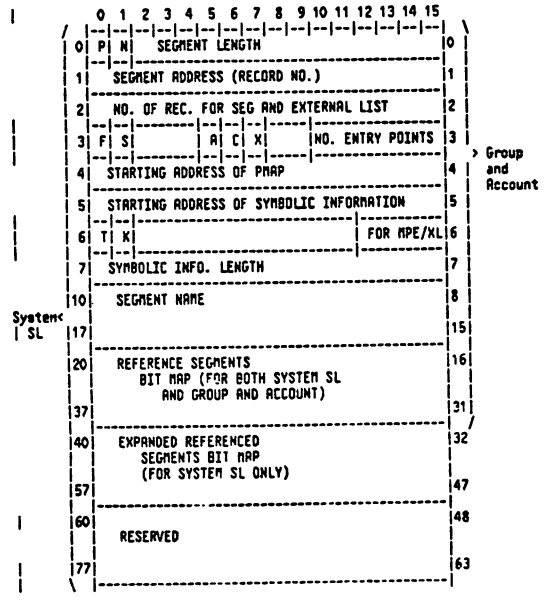
When you delete a segment, the corresponding Reference Table entry is released. Free entries are linked in a list. The segment number (link) is the first word of the entry

When you add a segment, it is assigned the first free Reference Table entry number. The segment is assigned the next available Reference Table entry and space is allocated for the new entry.

Reference Table Pointer Map



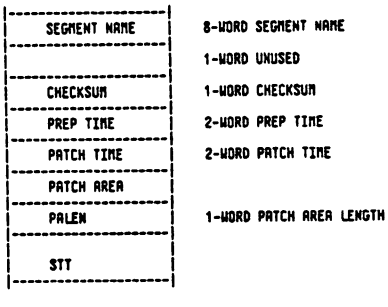
Reference Table (510 Maximum Entries)



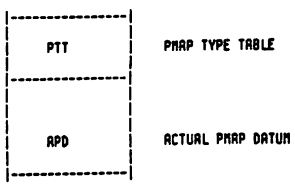
Where: P=1 if the code segment contains a privileged instruction.
N=0 if the STT is in the old format.
N=1 if the STT is in the new format.
F=1 if the segment is deleted.
S=1 if all external are satisfied.
A=1 if the segment is permanently allocated.
C=1 if the segment is core resident segment.
X=1 if the segment is an MPE segment.
T=1 if the segment contains a patch area.
K=1 if the segment contains a checksum.

Code Segment With Patch Area

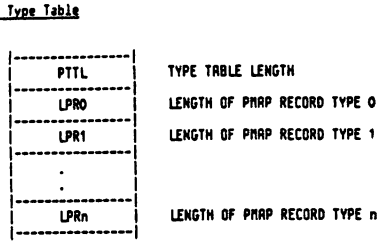
Patch Area



PMAP Information



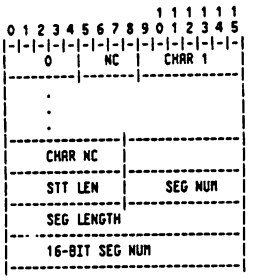
PMAP Type Table



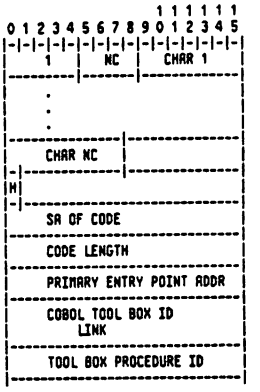
NOTE: n = PTTL - 2

PMAP Records

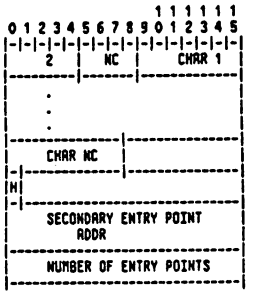
Type 0 Segment PMAP Record



Type 1 Procedure PMAP Record



Type 2 Secondary Entry PMAP Record



H = HIDDEN ENTRY FLAG

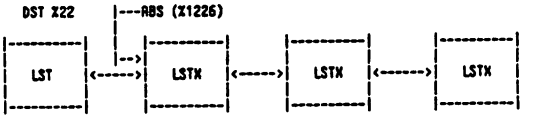
CHAPTER 11 LOADER

MPE Loader

The loader is a system process which will do loads sequentially. If a process needs code to be loaded, it must use the MPE intrinsics or commands which will get the load process' SIR, fill the loader communication table, and then awaken the loader. Upon completion, the loader will return its status through the loader communication table, and then the waiting process will be activated.

Loader Segment Table Overview

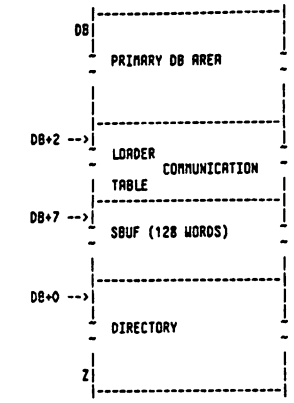
The Loader Segment Table consists of at least two DSTs. The first one is DST X22 and is known as the LST. The others are known as LSTX data segments and are linked together by a doubly linked list with the list head in the LST. SYSGLOB X226 also points to the first LSTX in the chain. The following illustrates this structure:



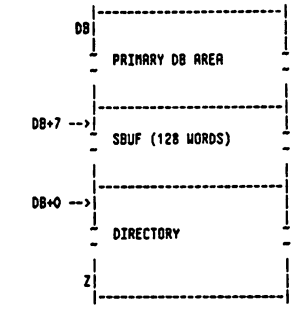
The primary purpose of the LST/LSTX data segment is to store directory entries, which keep track of loaded code segments in program and SL files. The LST data segment contains an additional area, known as the Loader Communication Table, through which all processes in the system communicate with the Loader process. Management of the messages in this area is handled exclusively by privileged system code.

The overall layouts of the LST and LSTX data segments are as follows:

LST Overview



XLST Overview



The layouts of the Primary DB areas in LST and LSTX data segments are identical. However, only those words required for management of the directory area are maintained in LSTX data segments. All other primary DB cells are defined only for the LST data segment.

The purpose of the LSTXs is to provide relatively unlimited storage for the LST directory data structure. For performance (and implementation) reasons, only those entry types related to LOADPROC functions reside in LSTX data segments. When these entries need to be accessed, they are copied into temporary entries in the directory of the LST data segment. In order to be sure that this is possible, a maximum-sized entry of each LOADPROC entry type (LOADPROCMASTER and EXTENSION) is reserved in the LST data segment by the Loader process. Pointers to these special reserved entries are stored in the Primary DB area of the LST data segment. If one of these pointers is zero, it means the Loader process was unable to allocate a maximum-sized entry, in which case a dynamically allocated entry of the required size must be allocated for the copy of the needed LSTX entry.

The first word of each permanently allocated, temporary entry is used to indicate whether or not the entry is currently in use. Zero means it's available; anything else means it's already being used to access an LSTX entry. Existing loader logic should not require access to more than one LSTX entry of a given type at a time.

In order to prevent temporary entries from accumulating in the LST data segment's directory, they must be explicitly removed (copied back to the LSTX data segment first, if modified) when no longer needed. This differs from LST-data-segment-resident entries, which require no special logic in the accessing code to release such entries. And this, in turn, is what makes moving entries from the LST to the LSTX so difficult; it's sometimes hard to tell exactly when an entry is no longer needed, and, therefore, is safe to release.

Loader Segment Table Primary DB

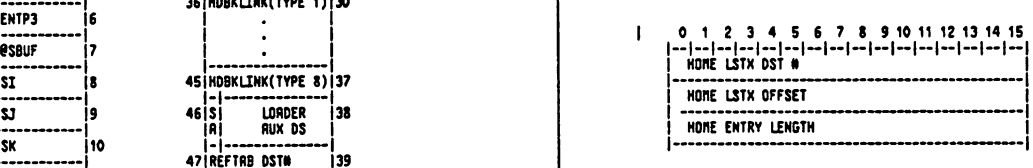
0	@DIR	0	24	HDFWLINK(TYPE 0)	20
1	DIR LEN	1	25	HDFWLINK(TYPE 1)	21
2	@LCT	2		.	
3	ENTP	3		.	
4	ENTP1	4	34	HDFWLINK(TYPE 8)	28
5	ENTP2	5	35	HDBKLINK(TYPE 0)	29
6	ENTP3	6	36	HDBKLINK(TYPE 1)	30
7	@SBUF	7		.	
10	SI	8		.	
11	SJ	9	45	HDBKLINK(TYPE 8)	37
12	SK	10	46	S|A LOADER AUX DS	38
13	SL	11	47	REFTAB DST#	39
14	SM	12	50	CUR # LSTX DSEGS	40
15	SN	13	51	MAX # LSTX DSEGS	41
16	SO	14	52	PREV LST/X DST#	42
17	SP	15	53	CURRENT LST/ X DST #	43
20	SQ	16	54	NEXT LST/X DST#	44
21	SR	17	55	TEMP EXT ENTP	45
22	SS	18	56	TEMP MASTER ENTP	46
23	ST	19	57	LCT	47
				.	
				.	
				.	

ENTPn = Pointers point to the current accessed entry
SBUF = Utility buffer. Usually contains program file record 0 information
SI ~ ST = Utility DB relative variables
SA = Global system wide AUTOALLOCATE ON/OFF flag.
HDFWLINKs = Head of forward link for each type
HDBKLINKs = Head of backward link for each type
REFTAB DST#= DST number for the DST which contains all the reference table entries for SL.PUB.SYS.

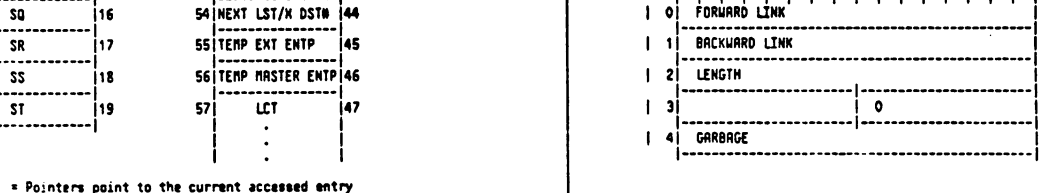
A reference table entry in SL.PUB.SYS is 64 words long (however, only the first 48 words are used). The data segment only contains the 48 words of the entry which are used so as to not waste space.

Directory Entries

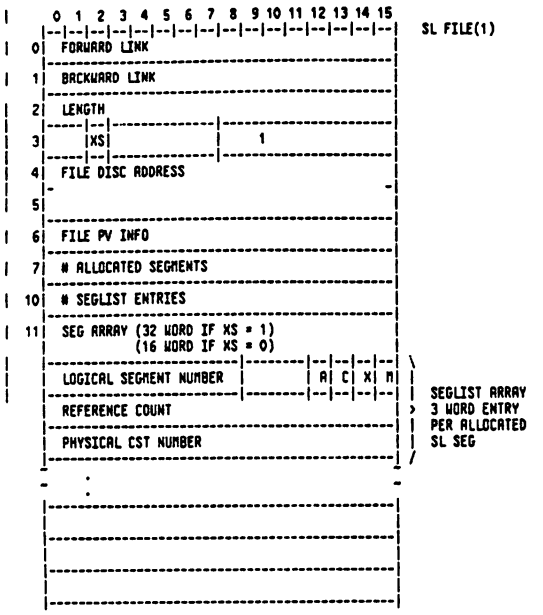
This section shows the layouts of all LST directory entry types. The layouts given are those for permanent entries in the LST or LSTX. For temporary entries (i.e., those entries in the LST data segment which are copies of entries which reside in an LSTX data segment), the following three-word prefix should be attached:



ENTP in the Primary DB area always points to the word after the LENGTH word of the entry currently being accessed. ENTPn pointers are used to access other structures within the current entry. The first three words of permanent entries (or first six words of temporary entries) define the entry header words, and are negatively addressed through ENTP.

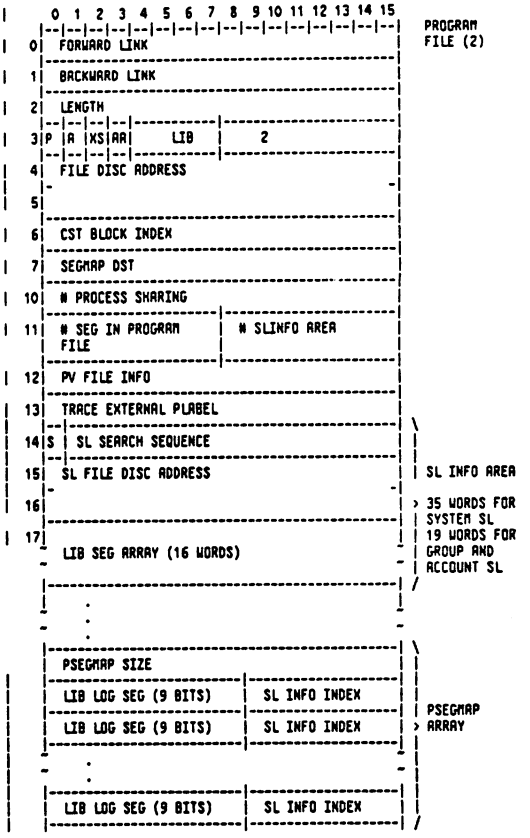


Directory Entries (Cont.)



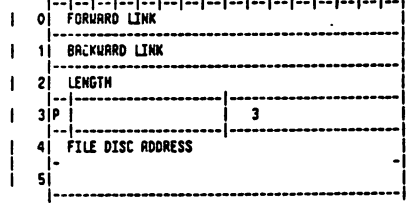
Where XS = 1 means entry is for the Extended System SL bit map
of 32 words.
A = 1 means code segment is allocated.
C = 1 means code segment is core resident.
X = 1 means code segment is an MPE system segment.
M = 1 means code segment is physically mapped.
= 0 means code segment is logically mapped.

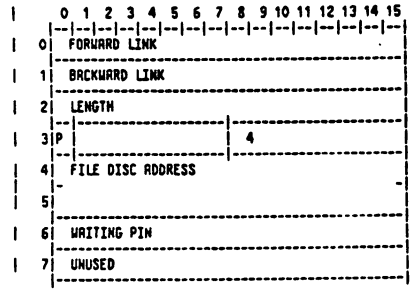
Directory Entries (Cont.)



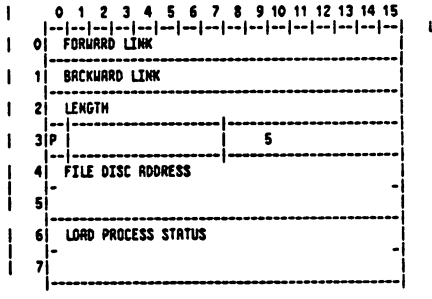
Directory Entries (Cont.)

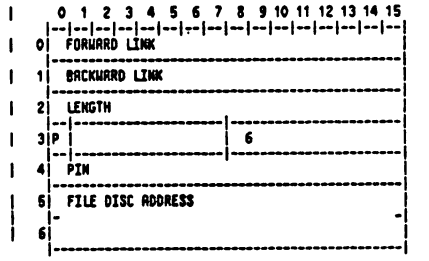
Where P = 1 means program is executed with NOPRIV option.
A = 1 and AR = 0 means program is allocated.
AR = 1 and A = 1 means program is auto allocated.
XS = 1 means entry contains an Extended System SL bit map
of 32 words.
S = 1 means this bit map is for the Extended System SL and
contains 32 words.



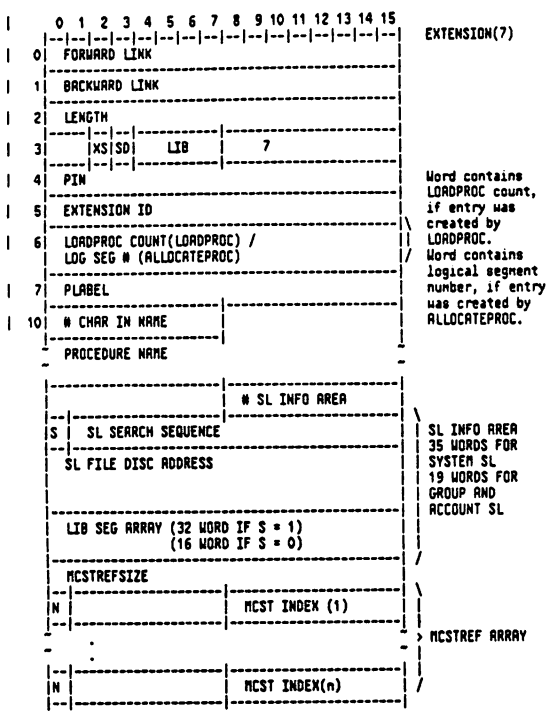


Directory Entries (Cont.)



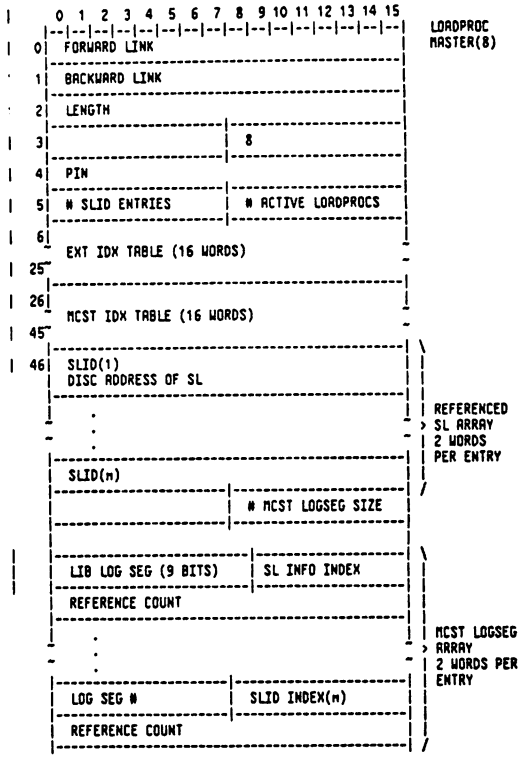


Directory Entries (Cont.)



XS = 1 means entry contains an Extended Systen SL bit map of 32 words.
SD = Search Domain
= 1 means use program group and account for library search.
= 0 means use log on group and account for library search.
S = 1 means this bit map is for the Extended Systen SL and contains 32 words.

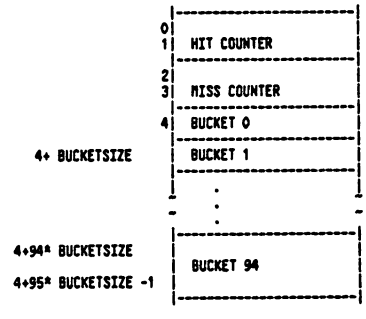
Directory Entries (Cont.)



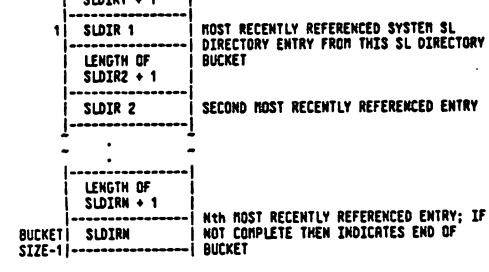
Loader Cache

SYSGLOB extension area + X72 contains DST number of cache
BUCKETSIZE = X52

Cache Data Segment Format



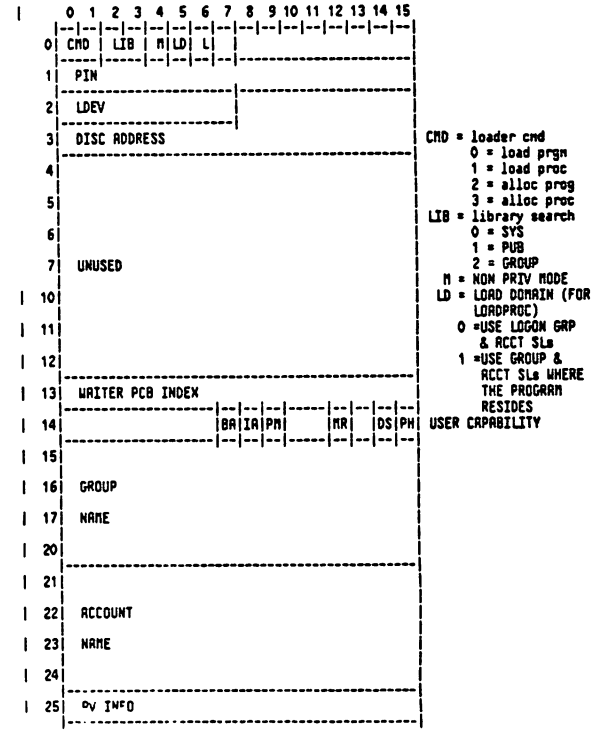
Bucket Format



All bucket words are initialized to BUCKETSIZE + 1, indicating no entries.

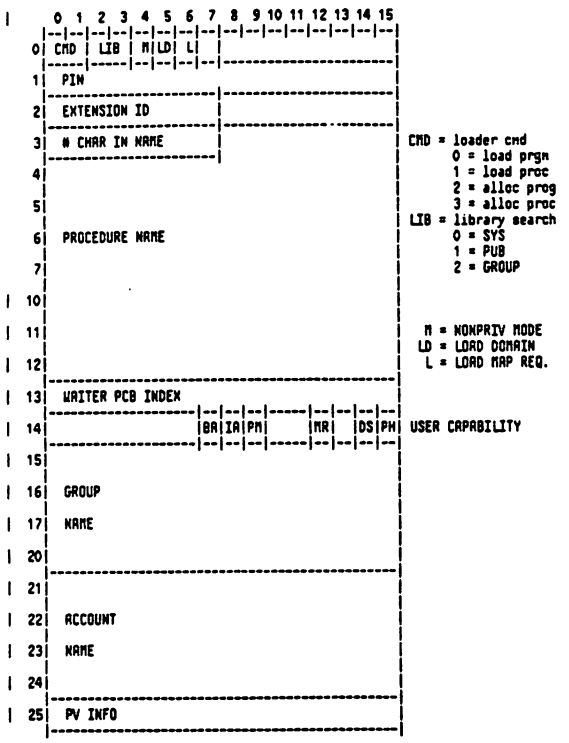
Loader Communication Table (LCT)

Form Inconing to Loader (Load/Allocate Program)



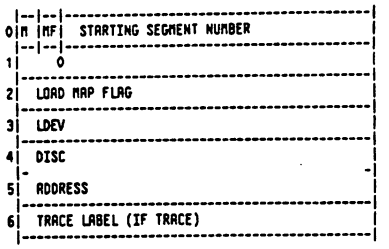
Loader Communication Table (LCT) (Cont.)

Form Incoming to Loader (Load/Allocate Procedure)

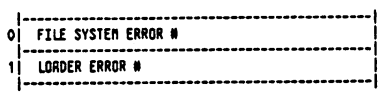


Loader Communication Table (LCT) (Cont.)

Form Returned (No Error)



Form Returned (Error Occurred)

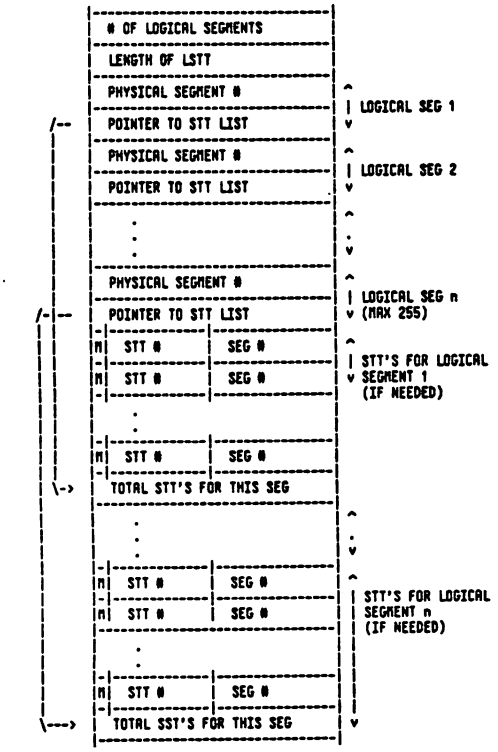


Logical Segment Transform Table (LSTT)

When a process references any user SL segments, these segments are assigned logical segment numbers if the new mapping ucode is running. The LSTT provides a map mapping these logical segments into their physical segment numbers and having true STT's for the mapped segments. The LSTT is created by LOADER during the load time. It occupies an DST and the DST number is stored in PCB(X17). If no user SL segment is referenced, the LSTT will not be needed, hence it will not be created.

The new mapping microcode depends on the existence of the LSTT for getting the physical segment number for a mapped segment. So the LSTT has to be included in process' locality list if there is an LSTT. Dispatcher will then bring the LSTT in before the process can be run. Also the bank and address for the LSTT belonging to the current running process are stored in sysglob cells (X221 and X222) during the launch time by the dispatcher. These cells are used by microcode for fast accessing the LSTT.

Logical Segment Transform Table (LSTT) (Cont.)



Loader Auxiliary Data Segment

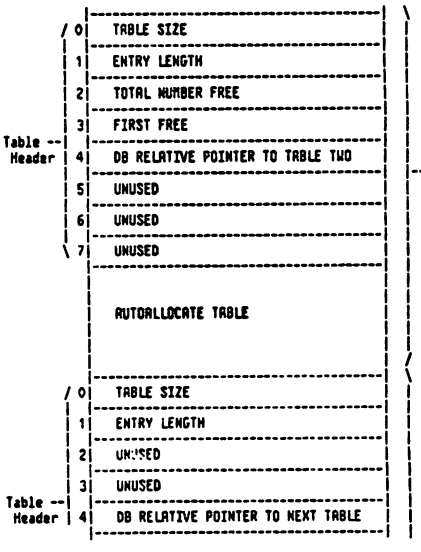
Overview

The loader auxiliary data segment is a multi-table data segment. Each table within the data segment has a standard header and they are linked together via DB relative pointers.

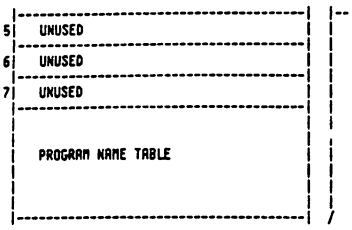
Tables within the loader auxiliary data segment are the:

1. Autoallocate table
2. Program name table.

Loader Auxiliary Data Segment Format



Loader Auxiliary Data Segment Format (Cont.)



Autoallocate Table

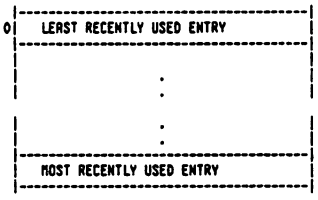
Overview

The autoallocate table is a table to aid in the automatic allocation/deallocation of programs. It is a least recently used list of programs which are not being used at the moment and thus are candidates to be automatically deallocated.

Entry Contents

Each entry is a DB relative address of a program file entry in the loader segment table (LST).

Autoallocate Table



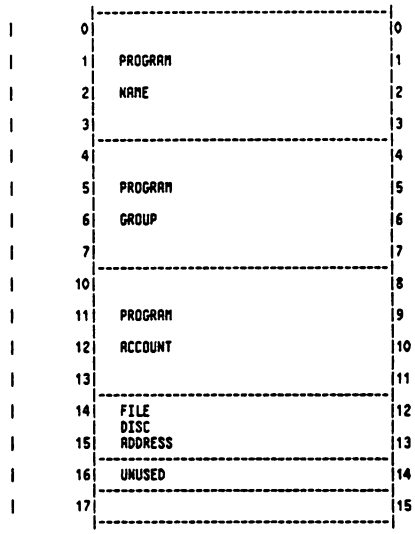
Program Name Table

Overview

The program name table contains the fully qualified file names and the disc address of all programs currently loaded in the system. The name of a program can be found by indexing into the program name table with the same index used for the CSTX block table. This index can be found in the PCB and in the program entry of the LST.

When a program is loaded, its name is entered into this program name table. However, when it is unloaded, it is not removed. Thus the program name table entry "x" will contain the name of the program which is currently allocated to the corresponding CSTX block index. If the corresponding CSTX block index is free then the contents of the program name table is the program which was last allocated to that index.

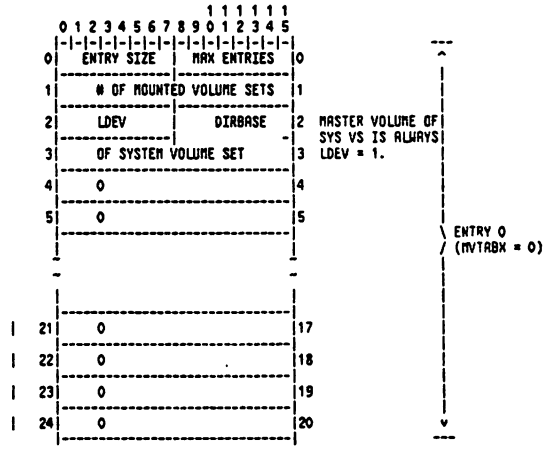
NOTE: Entry 0 of the program name table is used by the loader as a scratch area since there is no legal CSTX block index of zero.



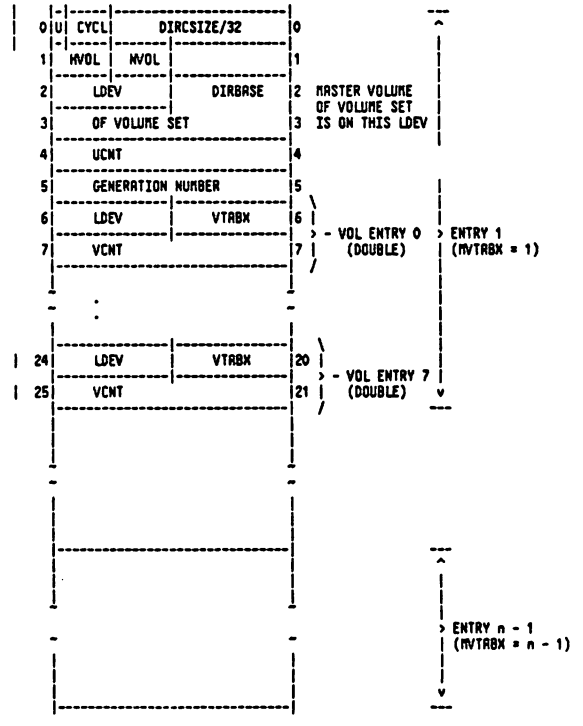
CHAPTER 12 PRIVATE VOLUMES / SERIAL DISC

Mounted Volume Table (MVTAB)

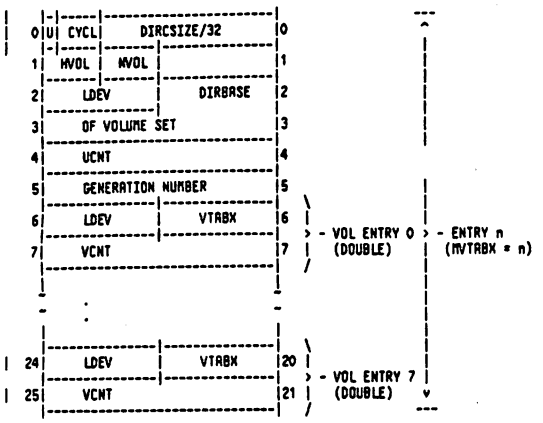
DST = 53 = X65
SIR = 27 = X33



Mounted Volume Table (MVTAB) (Cont.)



Mounted Volume Table (MVTAB) (Cont.)



U - In Use (1)
Not Used (0)

CYCL - Cyclical volume index (local VTABX) for disc space allocation

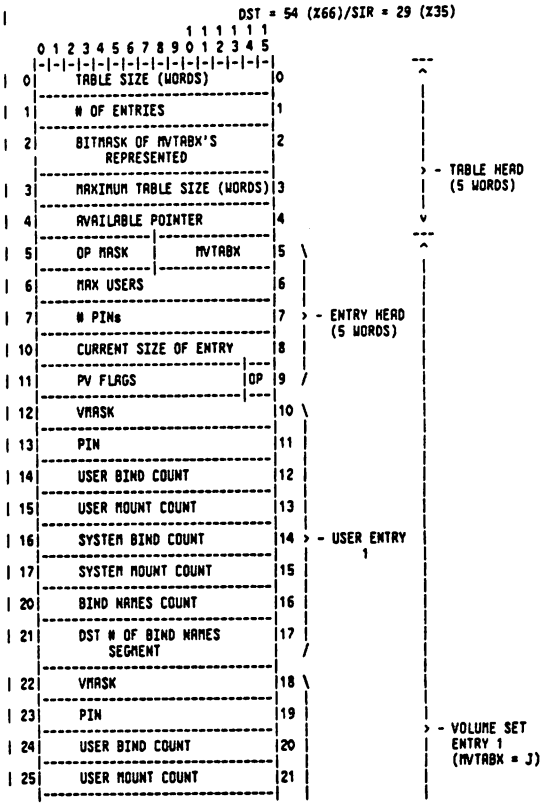
MVOL - Highest (ordinal) volume index (volume index being the volume set's local VTABX) of a mounted member of the volume set (class)

NVOL - # of volumes mounted for the volume set (class)

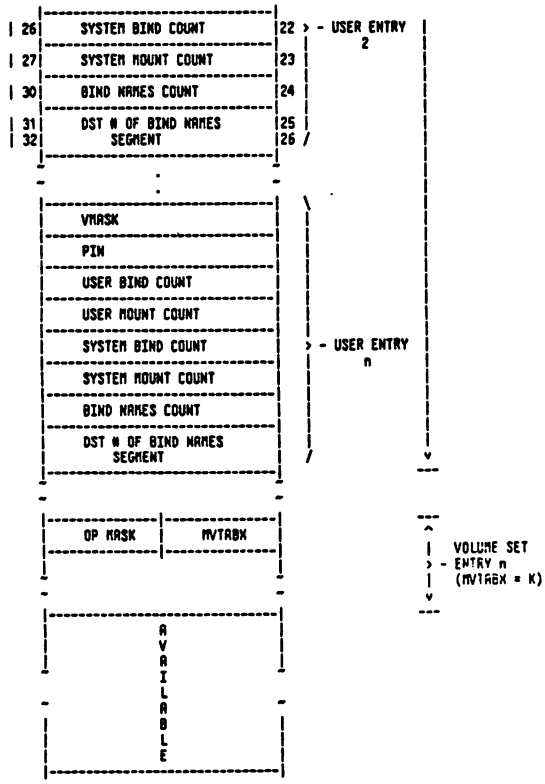
UCNT - # of users having mounted the volume set

VCNT - # of users having mounted the volume.

Private Volume User Table (PVUSER)

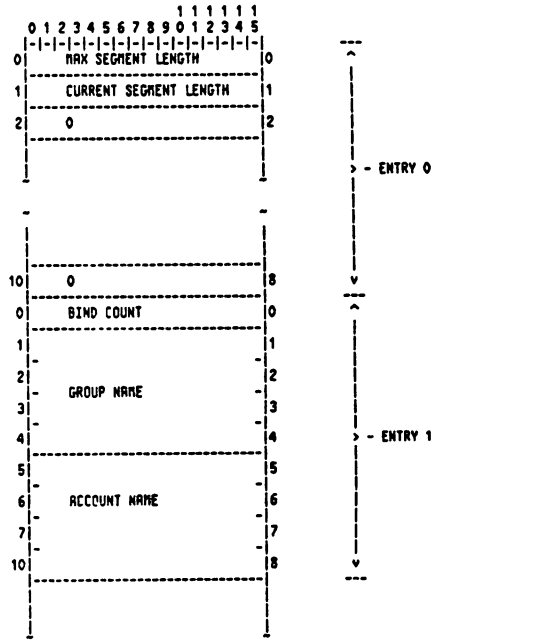


Private Volume User Table (PVUSER) (Cont.)

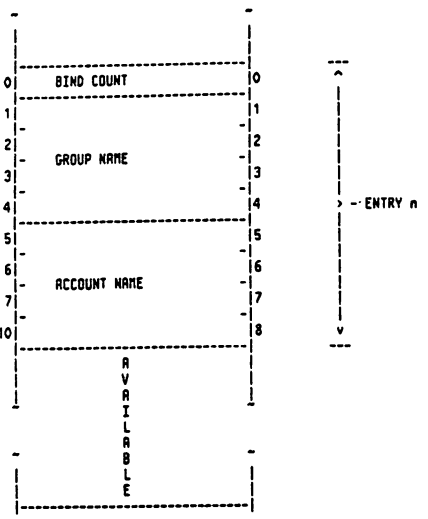


Bind Names Data Segment

(Created and managed via PVUSER Table)



Bind Names Data Segment (Cont.)

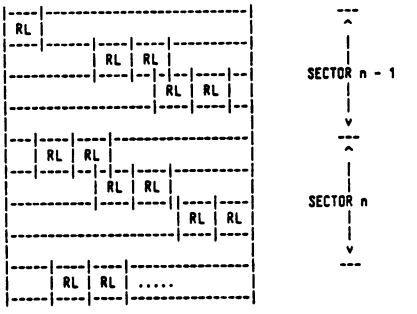


Serial Disc Tables and Data Structures

Data Record Format

The primary purpose of the Serial Disc Interface (SDISC) is to adapt the undefined length transfers characteristic of magnetic tape to the fixed-length environment of a disc or cartridge tape (CTAPE). To accomplish this, data is buffered within SDISC. The buffer is an integral number of sectors (blocks for the CTAPE) long. Files always start on a sector boundary, but data records within files may start anywhere and straddle sector boundaries. A record in the buffer is structured as follows:

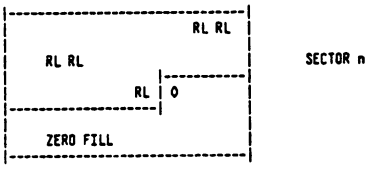
The record length is always a one-word positive byte count which includes only the data portion of the record, not the length words themselves. Records within a file might be stored on the disc as follows:



The reason for the trailing byte count is to implement an easy way to backspace records.

End-of-File Format

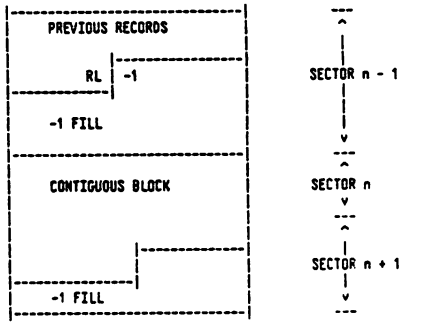
Files start on a sector boundary, and end on one. The End-of-File consists of a 0 record length and 0-fill to the end of the current sector as follows:



An End-of-File entry is made in the Gap Table, so that files may be skipped by scanning Gap Table entries instead of serially scanning the data area. Refer to "Gap Table Format" in this chapter for detailed information.

Contiguous Block Format

A serial disc can perform all the tasks that a magnetic tape can do. It can also be a coldload device. The machine microcode must be able to read a bootstrap channel program and the resident segments of INITIAL from the disc into memory. The microcode and channel programs cannot interpret the record length words which surround standard data records. A structure, called a CONTIGUOUS BLOCK, which has the data without the length words is utilized. Information as to the length of each contiguous block is stored elsewhere. Entries in the Gap Table hold the beginning and ending sector addresses of each contiguous block. Each block must begin and end on a sector boundary. To distinguish contiguous blocks from normal data, a record length and a fill character of %177777 is used, as follows:



Hole Format

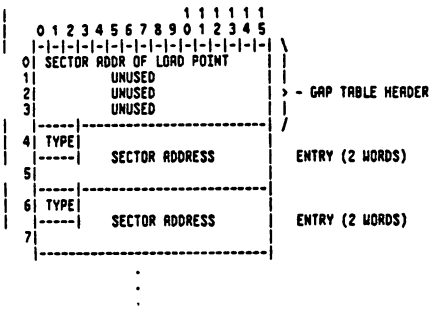
Holes on the serial disc have the same format as contiguous blocks (they start and end on sector boundaries with -1 fill characters as required). Starting with MPE version G.00.00, holes are obsolete and SDISC will not generate them. However, code has been left in SDISC to process any holes found on serial discs written with earlier versions of SDISC. Further details may be found in the Serial Disc IMS.

Gap Table Format

The Gap Table is a four-word header followed by a series of two-word device address entries. A permanent copy is on the device, starting in sector 4, while a working copy is in main memory. The copy in memory is posted to the disc only when a backspace or rewind operation occurs after writing (when the copy in main memory has changed). The length of the Gap Table is device-dependent according to the table below:

Device	Number or Sectors (or CTAPE blocks)
HP 7920	44
HP 7925	106
HP 7933/35	219 (250 for G.00.00 and later releases.)
HP 7902/9895	26
HP 35401/HP 9110/HP 9144	4 blocks ("S" cartridge)
HP 35401/HP 9110/HP 9144	15 blocks ("L" cartridge)

The following is an illustration of the Gap Table:



The type field is bits 0, 1 and 2 of the first word. The eight possible types are:

0. END-OF-FILE. The associated sector address contains one or more end-of-file fill characters (0) to fill out that sector. If the record ends exactly at a sector boundary, the following end-of-file sector contains all zeros.

1. END-OF-DATA. The associated sector address is the last address of valid data plus 1, (the next available address). Such an entry is usually preceded by an end-of-file entry. The EOD entry is written when writing terminates. The file system will not backspace or rewind after writing without sending a WRITE END-OF-FILE. An EOD entry is also written at the beginning of the Gap Table when new (unwritten) media is inserted. This prevents erroneous reading of blank media.

2. BEGINNING OF HOLE. The starting address of a defective area of the disc. It is usually found on a track boundary, but may be in mid-track if a contiguous block was being written when the defect was encountered. Obsolete, starting with MPE version G.00.00.

3. END OF HOLE. The corresponding ending address of the defective area. It is always found at a track boundary. Obsolete, starting with MPE version G.00.00.

4. BEGINNING OF (CONTIGUOUS) BLOCK. The starting address of a contiguous block, exclusive of the -1 fill characters which may have been required to get to a sector boundary. Unlike the End-of-File fill characters, there need not be any -1 characters if the previous record or contiguous block (with or without the trailing length word) ended exactly on a sector boundary.

5. END OF (CONTIGUOUS) BLOCK. The address of the last sector containing contiguous block data. The sector may also contain -1 fill characters to get to a sector boundary, but as with the beginning of block they are not required if the contiguous block ends exactly on a sector boundary.

6. END OF TAPE MARK. The sector address of the simulated End-of-Tape reflector. This type is now written only to floppy discs for use by the INITIAL serial disc interface. When read by the MPE SDISC, it is skipped no matter what device it is found on. This ensures compatibility with older serial discs.

7. END OF GAP TABLE. No associated sector address. This type is created whenever the Gap Table is cleared, by initializing the table to -1.

SDISC Extra Data Segments

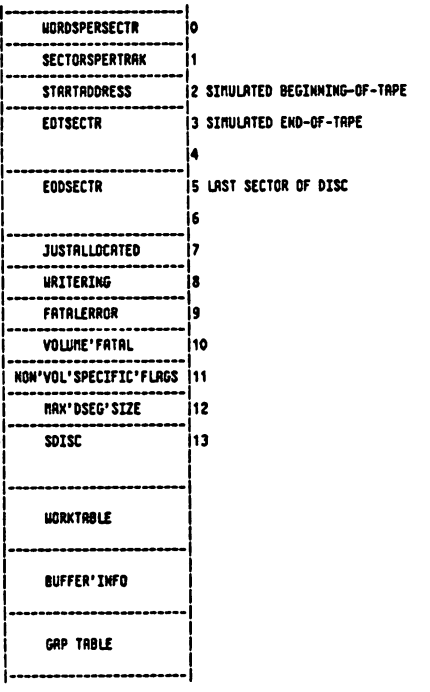
With few exceptions, SDISC operates entirely in split-stack mode using an extra data segment for working storage. Starting with MPE version G.00.00, there are two additional data segments used as no-wait data buffers. For the most part, the discussion here is restricted to the original data segment, now used only for variables, the Gap Table, and data buffer management.

The working storage extra data segment (XDS) is usually acquired by the external procedure ALLOCATE when the serial disc device is first assigned to a user as part of an FOPEN. The external procedure DEALLOCATE releases the XDS in processing the final FCLOSE against the device. The system program PVPROC may also acquire and release an XDS to allow the tape label routines in LABSEG to use SDISC when DEVREC processes a device on-line interrupt. SDISC allocates the two data buffer segments as they are needed, then releases them as part of the Device Close procedure.

The XDS contains the global storage area for SDISC, including the data buffer management area (BUFFER'INFO), and a small buffer (called WORKTABLE). The contents of the Serial Disc label sector is stored in WORKTABLE when it is read in by SDISC as part of the self-configuration. The Defective Tracks Table (HAC family discs) or Defective Sector Table (CS80 discs) is also stored in WORKTABLE while suspect or deleted tracks are being reassigned.

The three arrays in the XDS (WORKTABLE, BUFFER'INFO and GPT (Gap Table)) are dynamically configured by SDISC as indirect arrays. The array names are declared as pointers, then appropriately computed element-0 addresses are inserted in them.

The extra data segment is organized as follows:

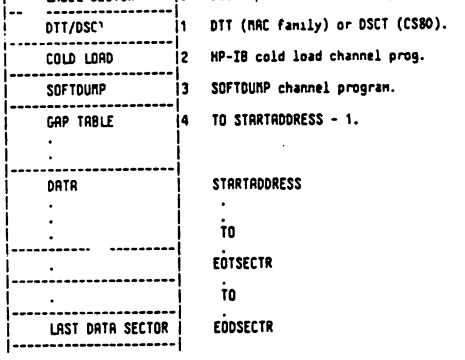


The first thirteen words are reserved for use when the data segment is created. The first seven words are filled with information taken from the label sector, and the last six are filled by ALLOCATE.

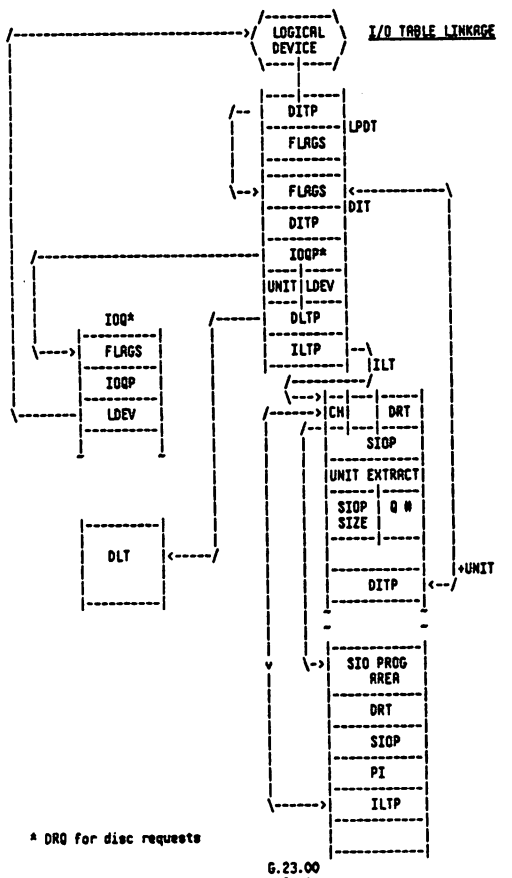
WORDSPERSECTR	- Words per sector
SECTORSPERTRAK	- Sectors per track
STARTADDRESS	- Simulates Beginning-of-Tape
EOTSECTR	- Simulates End-of-Tape
EODSECTR	- Simulates tape runoff
JUSTALLOCATED	- Initializes SDISC parameters to BOT if true
WRITERING	- Simulates tape write ring
FATALERROR	- Disables SDISC permanently when true
VOLUME'FATAL	- Disables SDISC until a new volume is mounted when true
NON'VOL'SPECIFIC'FLAGS	- SDISC global flags that are non-volume specific.
MAX'DSEG'SIZE	- Maximum size of the XDS
SDISC	- Global variables, including array pointers
WORKTABLE	- Length is 512 words
BUFFER'INFO	- Length is calculated as: MAX'NUM'BUFFERS (currently 2) INFO'ENTRY'SIZE (currently 8)
GAP TABLE	- Length varies with device - is calculated by the SDISC routine as part of self-configuration

Serial Disc Organization

The disc is organized as follows:

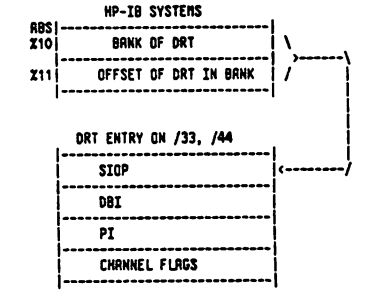


CHAPTER 13 I/O
I/O Table Linkage



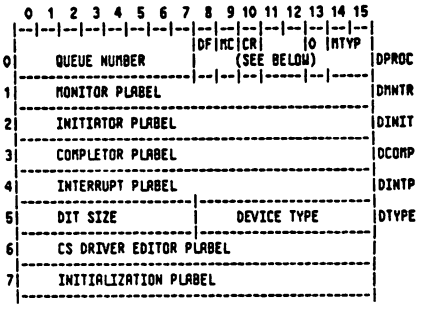
* DRQ for disc requests

Device Reference Table (DRT)



SIOP - Absolute address of SIO program.
PI - Interrupt handler PLABEL.
DBI - This is the absolute address of the ILT.

Driver Linkage Table (DLT)



There is one DLT for each type of driver. A pointer in the DIT allows different devices on a controller to have different drivers and interrupt handlers.

DPROC.QNUMB - This field contains the I/O process request queue number for type 2 drivers - zero for all other types.

.(8:1).DRVRFRZN (DF) - Driver code frozen - set by MAM when the driver code segment has been made present and frozen from a request from SIODM.

.(9:1).MAMERRORC (MC) - MAM Error on Code Makepresent.

.(10:1).CORERES (CR) - If set both initiator and completor code are core resident.

.(14:2).DRVRTYPE (MTVP) - DRIVER/MONITOR TYPE
0 - Not used.
1 - Driver can be executed on any stack.
2 - Driver can be executed in the user process or in the I/O process identified by IONUMB.
3 - Run only in process whose PCB number is in IONUMB.

DMNTR - I/O Monitor PLABEL.

DINIT - Driver Initiator Procedure PLABEL.

DCOMP - Driver Completor Procedure PLABEL.

DINTP - Special Interrupt Handler PLABEL - called by GIP if ISPEC is set DFLAG (no other action is taken by GIP except to set the Interrupt Status in DSTAT).

DTYPE.DITSIZE - The length of the DIT in words for this driver.

Logical-To-Physical Device Table (LPDT)

| DST = 13 (X15)
| SIR = 9 (X11)

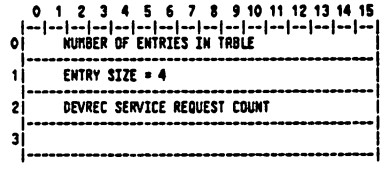
The LPDT has several fields which describe the state of a device. Some of these fields have the same meaning for all devices. Others are device dependent. All are described below.

There are two types of devices represented in the LPDT: real devices and virtual devices. A real device is one which has been configured into the system and is capable of performing input and/or output. A virtual device simulates some of the properties of a real device (for example a spooled line printer or an INP), but there is no physical I/O involved. The two main uses for virtual devices are for OPEN spooled devicefiles and certain communication devices (such as INPs).

A given virtual device entry is in use only while the devicefile it represents is open. When the file is closed by FCLOSE, the entry becomes available for another virtual device. This is the reason for the SYSDUMP/INITIAL configurator question MAX # OF OPEN SPOOLFILES--it needs to know how many virtual device entries to allocate to the LPDT (and to the LDT).

Entries in the LPDT are ordered by logical device number. The first word address of a real device entry is obtained by multiplying the LDN by the entry size. Except for the 0th entry, entries for which no logical device is configured on a given system are used for virtual device entries. Any remaining virtual device entries follow the last real device entry.

Entry 0

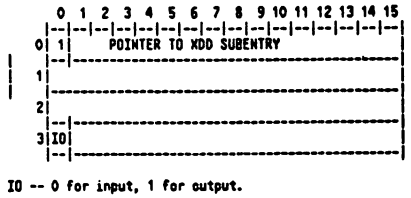


Word 2 is incremented by a device driver whenever it sets the Device Ownership State field (below) to 2 (Service Requested). DEVREC decrements the count for each interrupt it services until the count reaches 0, at which time DEVREC hibernates.

-- CAUTION --

Device drivers must lock this table by using DISABLE/ENABLE, not by trying to acquire the LPDT SIR.

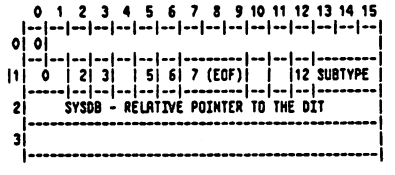
Typical Entry (Virtual Devices)



IO -- 0 for input, 1 for output.

Word 0, bit 0 is 1 for a virtual device, 0 for a real device. The fields in word 1 are the same, as applicable, as for the real device represented by a given virtual device. See below.

Typical Entry (All Real Devices)



0 - Word 1.(0:2) - Device Ownership State:
0 - Not owned by any process.
1 - Owned by a process.
2 - Service requested - set by driver for unexpected interrupt, then wakes DEVREC.
3 - Device reserved (alternate use) - set during :STARTSPOOL to remove the device from the pool of available devices while other checks are made or resources are acquired; the field is set to 1 when these steps are completed.

2 - Word 1.(2:1) - Device is Job/Session Accepting if true.

3 - Word 1.(3:1) - Device is Data Accepting if true.

5 - Word 1.(5:1) - Device is Duplicative if true (all devices except discs).

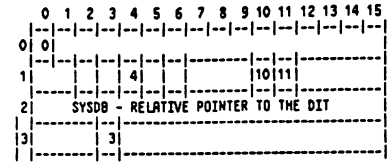
6 - Word 1.(6:1) - Device is Interactive if true (all devices except discs).

7 - Word 1.(7:3) - End of File condition:
0 - No EOF detected.
1 - Hardware EOF (e.g., tape mark).
2 - :DATA record read.
3 - :EOD record read.
4 - :HELLO record read.
5 - :BYE record read.
6 - :JOB record read.
7 - :EOJ record read.

12 - Word 1.(12:4) - Device subtype - see discussion for tape entry (below) for a description of the Auto bit (12:1).

The remaining bits in Word 1 are device-dependent and are described with their corresponding entry diagram.

Entry for Terminal-Like Devices



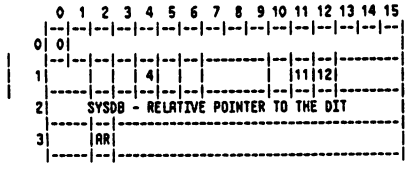
3 - Word 3.(3:1) - If set, NLIO translation is invoked for ALL data transferred to and from the device.

4 - Word 1.(4:1) - Control-Y is allowed and has been detected.

10 - Word 1.(10:1) - BREAK has been detected. Ignore BREAK if the CI is running.

11 - Word 1.(11:1) - The terminal is logging on - this bit is set by PROGEN and DEVREC when the logon sequence starts. If the bit is off when polled by INITJSMP the terminal has disconnected. Only IOTERMO and HIOTERM HIOTERM support the use of this bit. Multipoint and DS pseudo-terminals do not.

Entry for Tape Drives



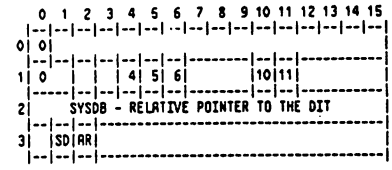
4 - Word 1.(4:1) - BOT. Tape is at Load Point -OR- no tape mounted. Recording density may only be switched when this bit is true (for multiple density tape drives).

11 - Word 1.(11:1) - If true, DEVREC is performing Automatic Volume Recognition (AVR) on a tape (or PVPROC is doing the same on a serial disc), -OR- AVR is to be suppressed on job or data accepting devices.

12 - Word 1.(12:1) - Part of Device Subtype field. If true, device may be allocated automatically when opened. If false, operator

RR - Word 3.(2:1) - must allocate. AUTO REPLY. Device may be allocated without prompting the operator for REPLY if certain run-time conditions are met; this bit is set automatically if word 1.(12:1) is TRUE.

Entry for Disc Drives



0 - Word 1.(0:2) - Device Ownership State. May not be 1 (owned) for shared device (system volume or private volume). Serial and foreign discs are non-sharable and may be owned. See the full discussion of this field under Typical Entry, above.

4 - Word 1.(4:1) - If true, the disc is a nonsystem domain (private volume, serial disc or foreign disc) disc drive.

5 - Word 1.(5:1) - If true, disc is a mounted private volume.

6 - Word 1.(6:1) - If true, the disc is a reserved volume used to satisfy the requirements of a multiple volume private volume set.

10 - Word 1.(10:1) - If true, the disc is a physically and logically mounted serial or foreign disc. Bits 5 and 6 must be false.

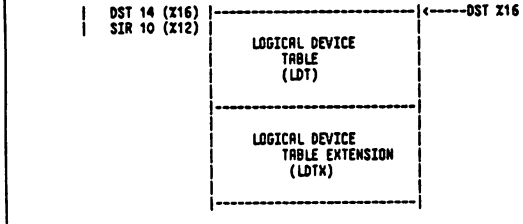
11 - Word 1.(11:1) - If bit 10 is true, then 1 ==> foreign disc, 0 ==> serial disc.

SD - Word 3.(1:1) - If true, the device is currently being used as a serial disc (that is, it is allocated to a user as a serial disc). This bit duplicates a bit in the LDTX entry so that this information can be found in a system (memory-resident) table.

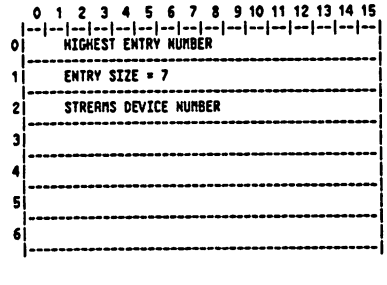
RR - Word 3.(2:1) - AUTO REPLY (serial or foreign disc only) Device may be allocated without prompting the operator if certain run-time conditions are met.

Logical Device Table (LDT)

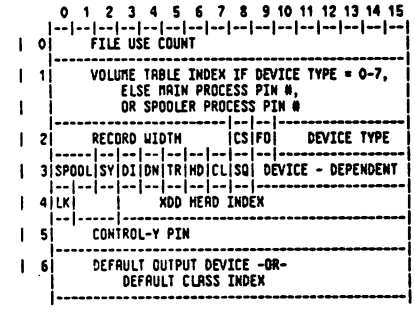
Overview of Data Segment



Zero Entry Format



Typical Entry Format



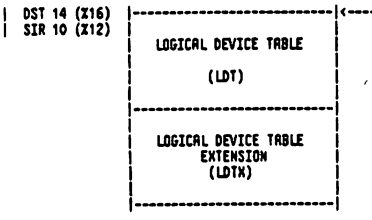
CS - Word 2.(8:1) - Communication system device if set.
FO - Word 2.(9:1) - If set, there are special forms mounted on the device.
Word 3.(0:2) - Spooled state of the device:
0 - Not spooled.
1 - Owned by an input spooler.
2 - Owned by an output spooler.
SY - Word 3.(2:1) - Device is available to system (not down).
DI - Word 3.(3:1) - Device is available to diagnostics (obs).
DN - Word 3.(4:1) - :DOWN requested, honored when use count = 0.
TR - Word 3.(5:1) - If set, trailers are disabled.
HD - Word 3.(6:1) - If set, headers are disabled; these two bits are managed such that header/trailers are generated in pairs or not at all.
CL - Word 3.(7:1) - If I/O, word 6 is the Device Class Table index/LDEVN of the default output class/device associated with this device.
SQ - Word 3.(8:1) - Spooling has been enabled (spool queues are open) for this device.
Word 3.(9:1) - Device dependent information:
1. For terminal-like devices, the default terminal type to be used if not specified in the :HELLO command.
2. For variable density tape drives.
Word 3.(10:3) - Actual tape density.

Word 3.(13:3) - Density requested in FOPEN for writes to unlabeled tapes only.
For either:
0 = unknown density/no FOPEN w/urite
1 = 1600 BPI
2 = 6250 BPI
3 = 800 BPI

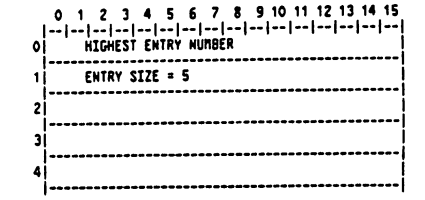
Word 4.(0:1) - Auxiliary lock mechanism - if set, device is being deallocated but LDT and XDD are inconsistent and their SIRs are released; :ALLOCATE cooperates by rejecting access to the device.

Logical Device Table Extension (LDTX)

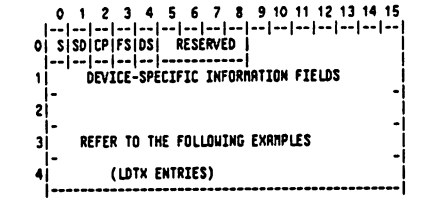
Overview of Data Segment



Zero Entry



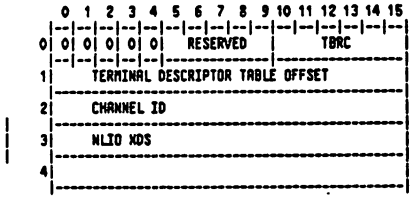
Typical Entry



Where:

S = Seek ahead enable/disable flag (system or PV disc only).
SD = This logical device is a Serial or Foreign Disc.
CP = This logical device uses the CIPER protocol.
FS = This is a system or PV disc with Disc Free Space management.
DS = This LDEV is a DS or data communications device.

Terminal Entry



TBRC = Terminal's baud rate code (CPS = characters per second).

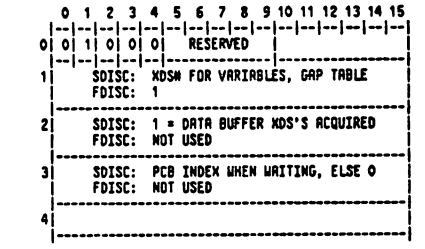
Speed (CPS)	RDCC/RTP (HPIB) TBRC
Not known	0
1920	16 (RTP only)
960	8
480	9
240	7
120	11
60	6
30	13
15	14
14	---
10	15

WS = This terminal is connected to a Workstation Configurator port.

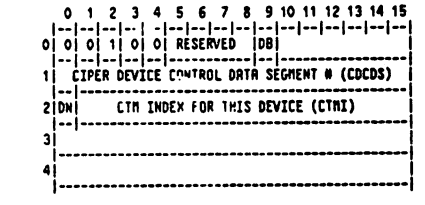
TDT = Offset from the base of the Terminal Descriptor Table (TDT) to the TDT entry for this terminal. A -1 indicates no TDT entry exists for this terminal.

NLIO XDS = Extra Data Segment Number of Working storage for NLIO translation.

Serial or Foreign Disc Entry

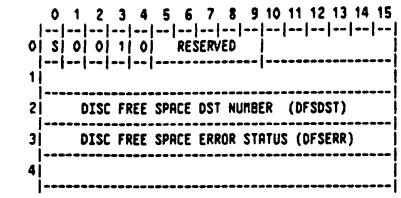


CIPER Entry



DB = If set to 1, then debugging is in effect.
DN = If 1, the CIPER facility has been deactivated for this device because of error.
CTMI = Control Table Map Index (an index into the Control Table Map (CTM), which is located in the CDCDS.

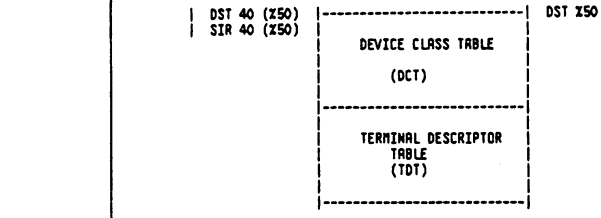
System or Private Volume Disc Entry



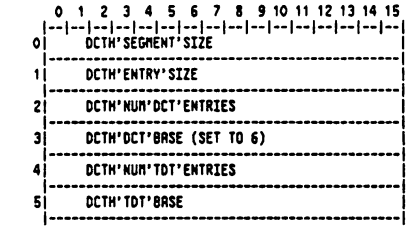
S = Seek ahead enable/disable flag

Device Class Table (DCT)

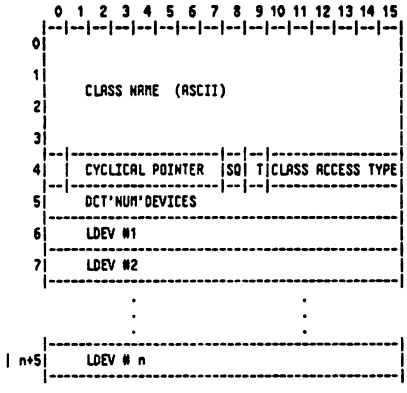
Overview of Data Segment



Header Entry Format



Device Class Table Typical Entry Format



The Device Class Table (DCT) contains a varying number of variable length entries. This is because you may configure an arbitrary number of device classes on a system, and each device class may be comprised of an arbitrary number of logical devices. There is one DCT entry per device class, and each DCT entry contains a list of logical devices in the class. There is no established order of entries in the DCT, nor is there an order of LDEVs within an entry.

Due to the haphazard nature of the DCT, its overall properties are kept in the header entry. These include the segment-relative starting address of the DCT (in case the header entry should be expanded later) and the number of entries in the table. A segment-relative pointer to the Terminal Descriptor Table (which follows the DCT) may also be used to calculate the size of the DCT. Also note the "Entry size" word. It is meaningless for this table, but is included for compatibility with other fixed-length entry TPE tables.

Since the DCT entries are of variable length, when you want a particular entry you must always start at the beginning of the DCT and link through each entry until you find the one you're interested in.

Some fields in the DCT require further description, as follows:

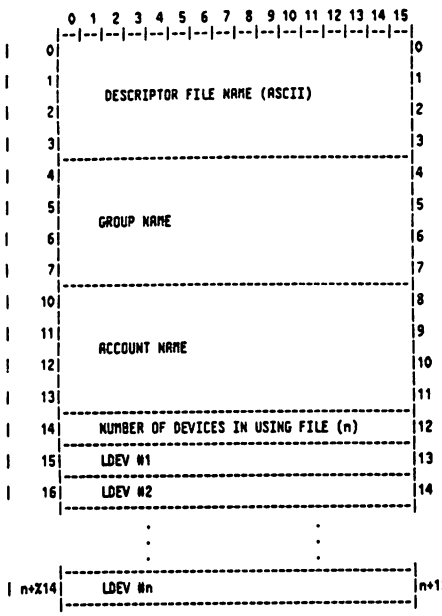
Word 4.(1:7) -Cyclical pointer. Currently used only for system and private volume disc devices. The pointer varies from 1 to N (number of entries in the class) and indicates the LDEV# in the class list on which the last extent was allocated. The disc space allocation routines will try to satisfy the next request on the next disc drive indicated by the cyclical pointer (with wraparound to 1 if the pointer > N). If that fails, the pointer is incremented until space is found or all devices in the class have been tried.

Word 4.(8:1) -If set, spooling has been enabled (spool queues opened) for this device class.

Word 4.(9:1) -If set, the class is a terminal type class.

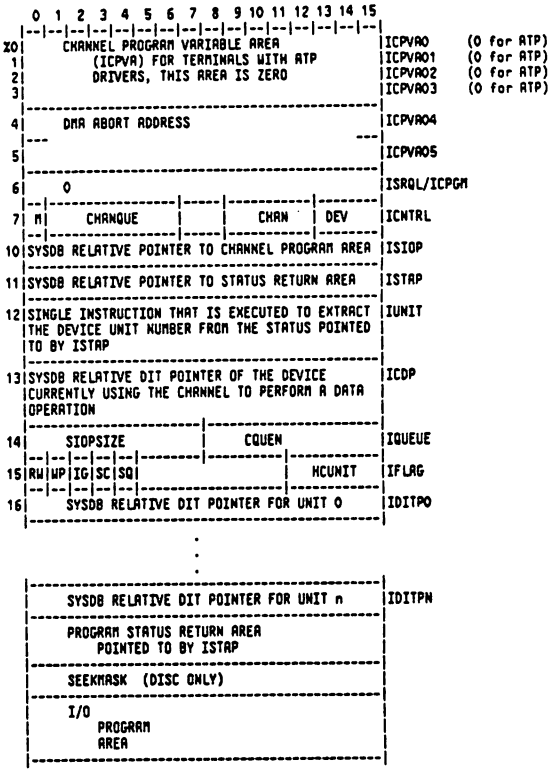
Word 4.(10:6) -Usually the same as the device type represented by the class (0-7 for disc, 24 for tape, 32 for printer, etc.). Serial disc classes are disc devices accessed as tape drives, so their true device types are kept in the LDT, while this field holds a special type (31, or X37), indicating a serial I/O (non-concurrent) device. Similarly, a foreign disc is a nonsharable disc drive, so that fact is reflected by a special type 7 in this field, even though the true hardware type is kept in the LDT, as for serial discs.

Terminal Descriptor Table Typical Entry Format



The Terminal Descriptor Table contains a varying number of variable length entries, because each Terminal Descriptor entry may have an arbitrary number of logical devices. However, you can only configure a fixed number of valid terminal entry files. These are the TTnn or TTPCLnn files which reside in PUB.SYS. SYS is one of these files.

Interrupt Linkage Table (ILT) for HP-IB Systems



ILT (Cont.)

ICPVA - These four words comprise the channel program variable area where information is stored concerning a channel program Interrupt instruction or abort. CPVA0 should be used only for channel program aborts.

ICPVA4 - Words 4 and 5 contain DMA address, when channel program aborts during DMA transfer.

ISRQL - Serial poll request queue length. HP-IB Systems do not support any serial poll devices. This should always be zero.

ICPGM - This is the SYSDB relative address of the channel program to be started for this device after receiving a HIOP interrupt in GIP. GIP will call STARTID when the flags word indicates "ignore halt interrupt" and "start channel program" bits are set.

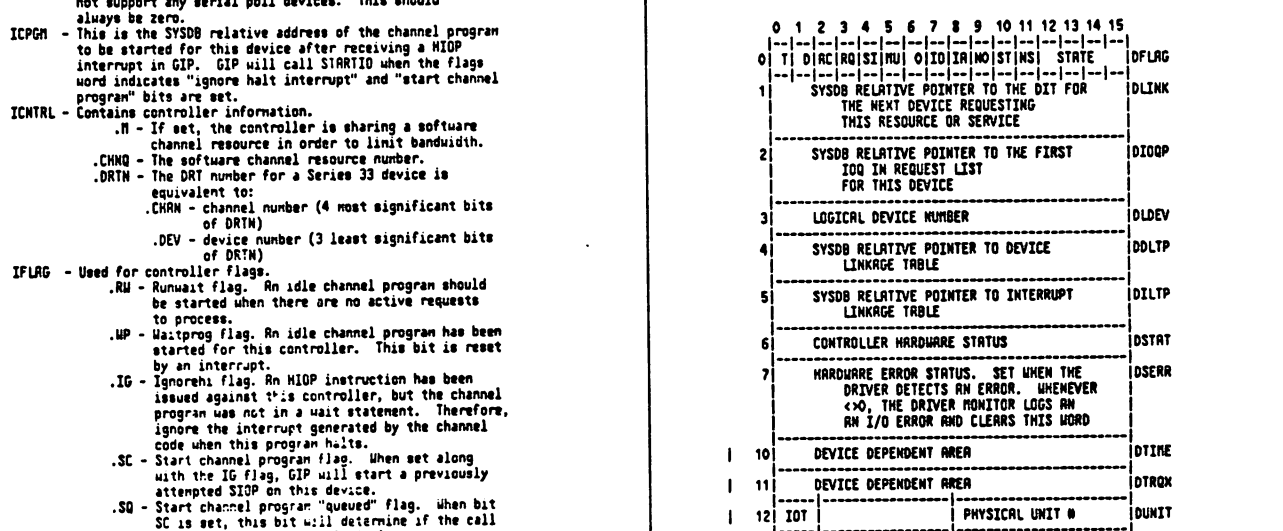
ICNTRL - Contains controller information.
- .M - If set, the controller is sharing a software channel resource in order to limit bandwidth.
- .CHNQ - The software channel resource number.
- .DRTN - The DRT number for a Series 33 device is equivalent to:
  - .CHAN - channel number (4 most significant bits of DRTN)
  - .DEV - device number (3 least significant bits of DRTN)

IFLAG - Used for controller flags.
- .RW - Runwait flag. An idle channel program should be started when there are no active requests to process.
- .WP - Waitprog flag. An idle channel program has been started for this controller. This bit is reset by an interrupt.
- .IG - Ignorehi flag. An HIOP instruction has been issued against this controller, but the channel program was not in a wait statement. Therefore, ignore the interrupt generated by the channel code when this program halts.
- .SC - Start channel program flag. When set along with the IG flag, GIP will start a previously attempted SIOP on this device.
- .SQ - Start channel program "queued" flag. When bit SC is set, this bit will determine if the call to START'HPIB will have logical parameter QUEUED true or false.
- .HCUNIT - Highest configured unit number for this controller.

Device Information Table (DIT)

There is one DIT per physical device. If a physical device represents represents more than one logical device, the logical device number is obtained from the I/O queue element. Although details of DITs vary with device, the following structure is common to all:

DIT for HP-IB Systems



DTRQX Used by some device drivers, it denotes timer request index.

DIT Terminology for HP-IB Systems

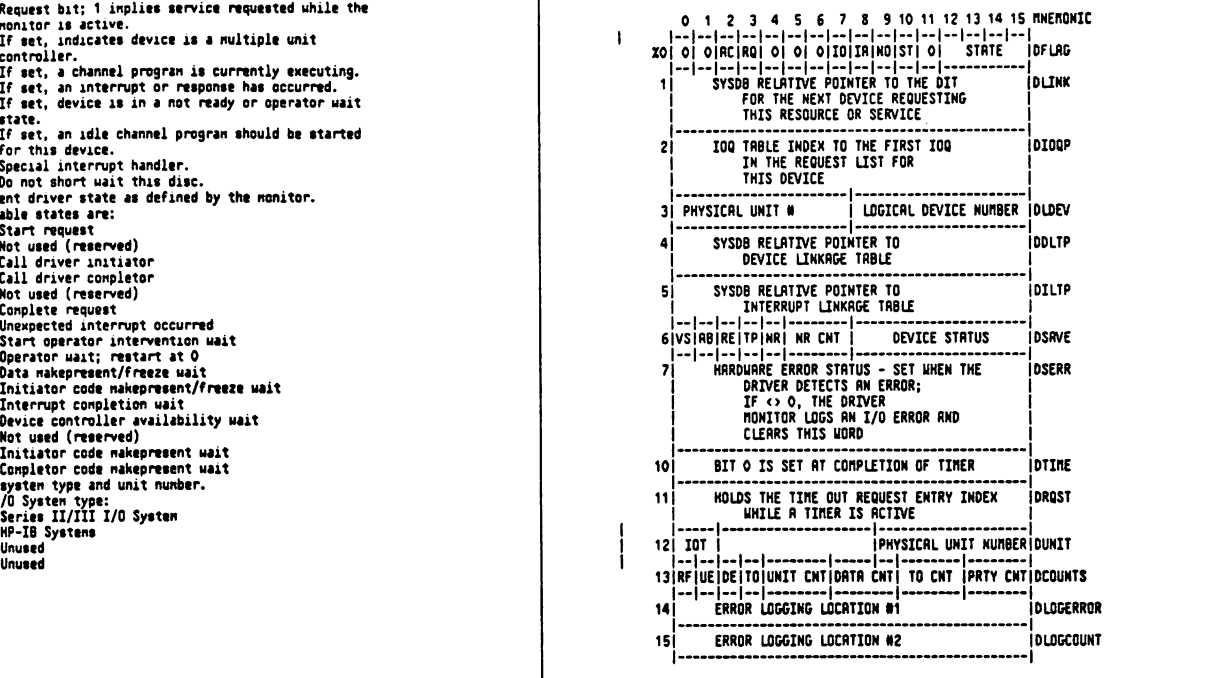
DFLAG - Device relative flags.
- T - Set if device is a terminal.
- D - Set if device is a disc.
- AC - Active bit; 1 implies a monitor currently servicing this device.
- RQ - Request bit; 1 implies service requested while the monitor is active.
- MU - If set, indicates device is a multiple unit controller.
- IO - If set, a channel program is currently executing.
- IR - If set, an interrupt or response has occurred.
- NO - If set, device is in a not ready or operator wait state.
- ST - If set, an idle channel program should be started for this device.
- SI - Special interrupt handler.
- NS - Do not short wait this disc.

STATE - Current driver state as defined by the monitor.
Allowable states are:
- X0 - Start request
- 1 - Not used (reserved)
- 2 - Call driver initiator
- 3 - Call driver completor
- 4 - Not used (reserved)
- 5 - Complete request
- 6 - Unexpected interrupt occurred
- 7 - Start operator intervention wait
- 10 - Operator wait; restart at 0
- 11 - Data makepresent/freeze wait
- 12 - Initiator code makepresent/freeze wait
- 13 - Interrupt completion wait
- 14 - Device controller availability wait
- 15 - Not used (reserved)
- 16 - Initiator code makepresent wait
- 17 - Completor code makepresent wait

DUNIT - I/O system type and unit number.
IOT - I/O System type:
- 0 - Series II/III I/O System
- 1 - HP-IB Systems
- 2 - Unused
- 3 - Unused

Device Information Table (DIT) for CIPER

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element (however, this driver only supports one device per controller.) The following diagram shows the DIT used for the HP-IB CIPER physical driver.



DFLAG - Flags and request state.
- AC ACTIVE - A monitor is currently servicing this device.
- RQ REQUEST - A service request is pending while the monitor is active.
- IO IOPROG - An I/O Channel Program is running for this device.
- IR IRK - An interrupt or response has occurred for this device.
- NO NOTRDY - Go to state X10 after Idle Channel Program is started.
- ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.
- STATE - State of the device monitor; specifies the next action to be taken in SIODM in servicing the request:
  - X0 - Start new request
  - 1 - Not used
  - 2 - Call driver initiator procedure
  - 3 - Call driver completor procedure
  - 4 - Not used
  - 5 - Process request completed
  - 6 - Initiate device recognition sequence
  - 7 - Start operator intervention wait
  - 10 - Wait for interrupt (operator intervention) restart at state 0
  - 11 - Wait for data segment freeze, then state 2
  - 12 - Wait for driver initiator to be frozen, then allocate controller (state 2)
  - 13 - Wait for I/O completion interrupt, then state 3
  - 14 - Wait for controller, then call driver initiator
  - 15 - Not used
  - 16 - Wait for initiator make present, then state 2
  - 17 - Wait for completor make present, then state 3

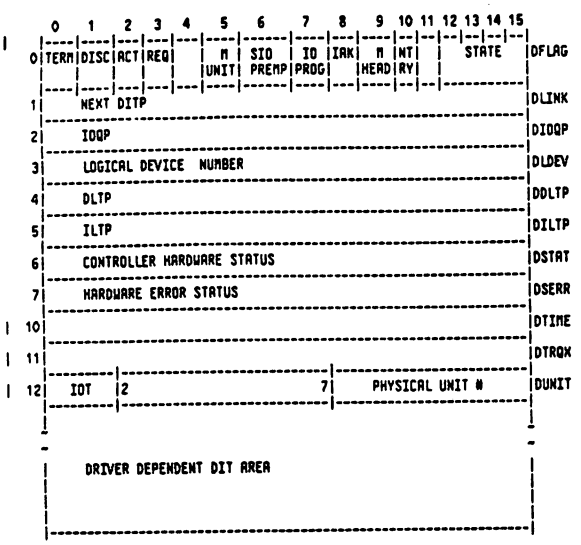
DLDEV - Logical device number.
DUNIT - I/O system type and unit number.
- 0 - HP 3000 Series II/III
- 1 - HP 3000 HP-IB
- 2 - Unused
- 3 - Unused

DSRVE - Device processing flags.
- VS - VALID STATUS - Set to indicate Device Status has been updated.
- AB - DVRABFLAG - Sequence Abort in progress due to ABORT request.
- RE - RETRYFLAG - Sequence Abort in progress due to an error.
- TP - TIMERPOPPED - Current error is due to software timer popping.
- NR - NOTRDYFLAG - Not Ready Wait in progress.
- NR CNT - Number of Not Ready Waits during this request.
- DEVICE STATUS - Device status returned during a Sequence Abort.
  - BIT 8 - CRC available and enabled.
  - " 9 - Reserved.
  - " 10 - Reserved.
  - " 11 - Reserved.
  - " 12 - Power fail or reset has occurred.
  - " 13 - A protocol error has been detected.
  - " 14 - A parity error has been detected.
  - " 15 - The peripheral has data to send.

DSERR - Pointer to status to be logged.
Bits (0:8) - Number of words to be logged.
Bits (8:8) - Offset relative to DITP(0).

DCOUNTS - Error flags and error counts (4).
- RF - REQ FAILED - An error has forced this request to be aborted.
- UE - UNIT ERROR - The current error is a Unit Error.
- DE - DATA ERROR - The current error is a Data Error.
- TO - TIME OUT - The current error is a GIC Time Out Error.
- UNIT CNT - Number of Unit Errors during this request.
- DATA CNT - Number of Data Errors during this request.
- TO CNT - Number of GIC Time Outs during this request.
- PRTY CNT - Number of HP-IB Parity Errors during this request.

DIT for Channel Devices



DFLAG.TERMINAL - Device is a terminal.
.DISC - Device is a disc (Bit 0 = 0).
.ACTIVE - A monitor is currently servicing this device.
.REQUEST - Service requested while monitor was active.
.MUNIT - Device controller servicing multiple units.
.SIOPREMPT - IF set then a request has been queued for this device; preempt code is set in IOQ.
.IOPROG - I/O program in progress; decrement SIOCOUNT and check for multi-channel when complete.
.IAK - Interrupt or Response has occurred.
.M HEAD - Moving head disc.
.NT RY - Not ready for SIO; SIODM holds off next SIO until ALLOWPOLL is done.

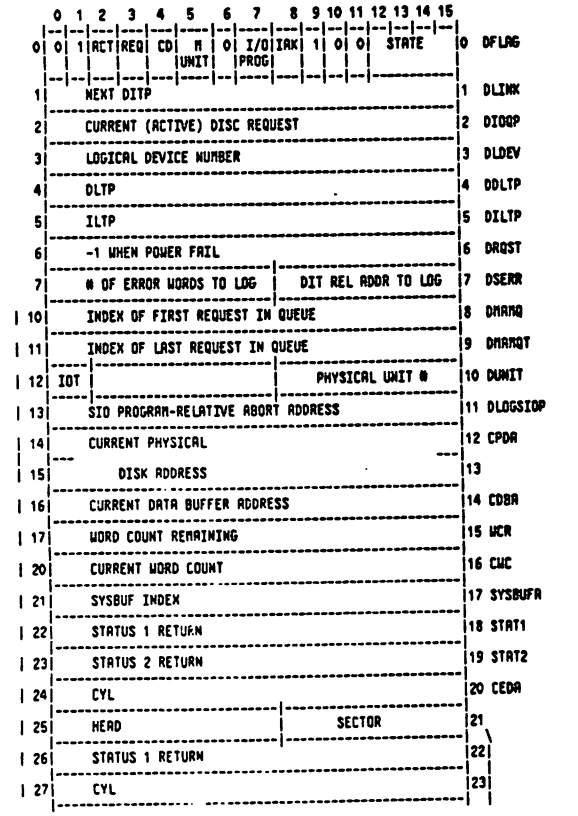
DIT for Channel Devices (Cont.)

DFLAG.STATE - This quantity specifies the next action to be taken in servicing the request.

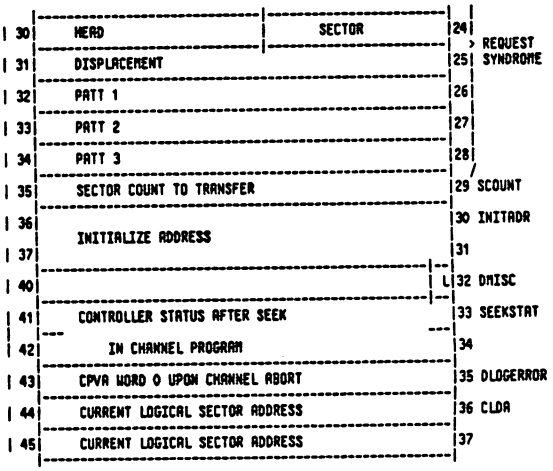
X0 - New; start request
1 - Not used
2 - Call Driver Initiator Procedure
3 - Call Driver Completor Procedure
5 - Complete request
6 - Device recognition
7 - Start operator intervention wait (X10)
10 - Restart request on interrupt
11 - Wait for data to be frozen then state 2
12 - Wait for driver code to be frozen then state 2
13 - Call completor on interrupt
14 - Wait for device controller
15 - Not used
16 - Wait for initiator make present then state 2
17 - Wait for completor make present then state 3

DLINK - SYSDB relative pointer to the DIT for the next device requesting this resource or service.
DIOQP - SYSDB relative pointer to the first IOQ in the request list for this device.
DLDEV - Logical Device Number.
DDLTP - SYSDB relative pointer to the DLT.
DILTP - SYSDB relative pointer to the ILT.
DSTAT - interrupt status for this device. Set each time the device interrupts.
DSERR - Hardware Device Controller Status. Set when the driver detects an error. Whenever not zero, SIODB logs an I/O error and clears this word.
DTIME - Timeout completed flags. If a timeout occurs in response to a timer request type X20 (I/O request), the sign bit is set in this word. The IA bit in DFLAG is also set, and the monitor for this device is awakened. (Only used if timer services are requested. Must be word #8 if timer services are requested.)
DTRQX - Used by some device drivers, it denotes timer request index.
DUNIT - I/O system type and unit number.
.UNIT - Unit number of the physical device.
.IOT - IO type 0= Series III I/O; 1= HPIB I/O

DIT For 7905/7906/7920/7925



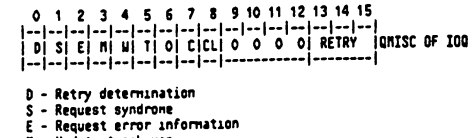
DIT For 7905/7906/7920/7925 (Cont.)



DMISC
(15:1) L'STAT'ERR - 1 Last transfer ended in error.

DUNIT - I/O system type and unit number.
IOT - I/O Devices.
0 - Non-HP-IB
1 - HP-IB Systems
2 - Unused
3 - Unused

Error and Retry Information

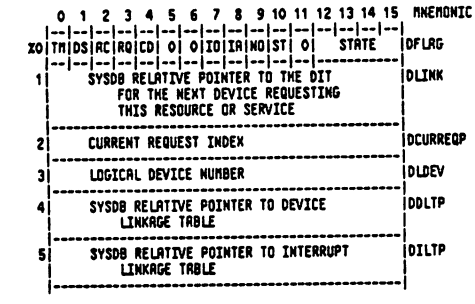


D - Retry determination
S - Request syndrome
E - Request error information
M - Update track map
W - Writing track map
C - Issued a recalibration
CL - Driver issuing channel clear
T - Timeout wait

NOTE: Integrated Cartridge Tape's DIT has the same format.

CS 80 Disc Device Information Table (DIT)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element. For the CS'80 disc controller, there will only be one device. The following diagram shows the DIT used by the CS'80 disc driver.



CS 80 Disc Device Information Table (DIT) (Cont.)

DFLAG - Flags and request state.

TM TERM - Set if device is a terminal.
DS DISC - If TM = 0 and this bit is set then the device is a disc, otherwise device dependent.
AC ACTIVE - A monitor is currently servicing this device.
RQ REQUEST - A service request is pending while the monitor is active.
IO IOPROG - An I/O Channel Program is running for this device.
IR IRK - An interrupt or response has occurred for this device.
NO NOTRDY - Go to the state X10 after Idle Channel Program is stated.

ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.
STATE - State of the device monitor; specifies the next action to be taken in SIODM in servicing the request:

XO - Start new request
1 - Not used
2 - Call driver initiator procedure
3 - Call driver completor procedure
4 - Not used
5 - Process request completed
6 - Initiate device recognition sequence
7 - Start operator intervention wait
10 - Wait for interrupt (operator intervention) restart at state 0
11 - Wait for data segment freeze, then state 2
12 - Wait for driver initiator to be frozen, then allocate controller (state 2)
13 - Wait for I/O completion interrupt, then state 3
14 - Wait for controller, then call driver initiator
15 - Not used
16 - Wait for initiator make present, then state 2
17 - Wait for completor make present, then state 3

DLINK - A SYSDB relative pointer to the next DIT requesting this resource or service.

DCURREQP - A current request sysbase index.

DUNIT.(0:2) - I/O system type and unit number.

0 - Non-HP-IB
1 - HP 3000 HP-IB Systems
2 - Unused
3 - Unused

DLDEV - Logical device number of this device.

DSTAT - Set to a -1 when a system powerfail has occurred.

DSERR - Pointer to status to be logged:

Bits(0:7) - Number of words to be logged.
Bits(8:15) - Offset relative to DITP(0).

DMISC - Device dependent processing flags.

LOCK'FLG - Lock flag denoting unload status of the disc volume:

0 - Allow operator unload to the volume.
1 - Deny operator unload to the volume .

IGNORE'INT'FLG- Ignore unexpected interrupt flag.

SUBSTATE - Indicates state of the idle channel program:

0 - Normal idle channel program wait.
1 - Idle request being serviced wait.

DSBUFADDR - SYSDB relative pointer to the system buffer element used to read the DSCT; zero, if no element gotten.

DBADBLK1 - High order logical sector address of the bad block for the Defective Sector Table (DSCT) entry.

DBADBLK2 - Low order logical sector address of the bad block for the DSCT entry.

DBADXFER - Byte transfer left when bad block occurred.

DLOGERROR - CPVR(0) logged on hardware error status.

DSIOPSTOP - Stopped channel program relative offset location due to an error in CPVR(0).

DSTATUS - 20 bytes disc status logged on status error (See CS'80 Disc Drive Status).

RPSWORD1 - Flags and local state:

RE - Read revision code done.
Set if read revision code level is done.
DC - RPS revision code.
Set if controller is "PEP"ed.
DR - RPS desirable.
Set if RPS is desirable.
EN - RPS enabled.
Set if default value for RPS is enabled.
MR - Driver is processing a marginal data error from the drive; does not return hard error.
Local State - State of the local request made by driver:

0 - No local request is being processed.
1 - Reading revision code.
2 - Setting default RPS.

RPSWORD2 - Default value for RPS.

T1 - Time to target in hundreds of microseconds.
T2 - Window size in hundreds of microseconds.

DIT for 7970 Magnetic Tape

```
|    0 1  2   3   4  5   6   7   8   9 10 11 12 13 14 15
|   |--|--|---|---|--|----|---|----|---|--|--|--|--|--|--|
|   | 0| 0|ACT|REQ| 0|  M | 0| I/O|IAK| 0| 0| 0|   STATE   |DFLAG
|   |  |  |   |   |  |UNIT|  |PROG|   |  |  |  |           |
|   |--|--|---|---|--|----|--|----|---|--|--|--|-----------|
|  1|     NEXT DITP                                         |DLINK
|   |-------------------------------------------------------|
|  2|     IOQP                                              |DIOQP
|   |-------------------------------------------------------|
|  3|     LOGICAL DEVICE NUMBER                             |DLDEV
|   |-------------------------------------------------------|
|  4|     DLT PTR                                           |DDLTP
|   |-------------------------------------------------------|
|  5|     ILT PTR                                           |DILTP
|   |--|--|---|---|--|----------------------------------------|
|  6|RW|RU| SH| CE|DC|     HARDWARE STATUS                    |DSTAT
|   |--|--|---|---|--|----------------------------------------|
|  7|     ERROR STATUS                                      |DSERR
|   |-------------------------------------------------------|
| 10|     TIMEOUT FLAGS                                     |DTIME
|   |-------------------------------------------------------|
| 11|     TIMER REQUEST INDEX                               |DTRQX
|   |-----|-----------------------|-----------------------|
| 12| IOT |                       |     PHYSICAL UNIT #   |DUNIT
|   |-----|-----------------------|-----------------------|--|--|
| 13|                                                     |R4|RW|DDFLAGS
|   |-----------------------------------------------------|--|--|
```

DUNIT - I/O system type and unit number.
IOT - I/O Devices.
0 - Non-HP-IB
1 - HP-IB Systems
3 - Unused
4 - Unused

DSAVE - Device processing flags.
RW RWBIT - Indicates tape has been rewound.
RU RWUNLD - Indicates that a rewind/unload was performed to allow a write-ring mount.
SH SHORT - A short read is in progress; after completion of read, EOF is checked for and if not present, the requested bytes are transferred from the short-read buffer to the user's buffer.
CE CESTAT - Channel parity error processing is in progress.
DC DSFLAG - Transfer used data chaining - used for computing the transmission log.
DDFLAGS - Device dependent flags.
R4 DDFLAGS - (bit 14) if set, need to rewind tape before next write.
RW DDFLAGS - (bit 15) if set, tape is rewound.

MISC

```
 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |FORWARD | BACK   |        |
| R| B| F| G| E| S| U| SPACE  | SPACE  | RETRY  |
|  |  |  |  |  |  |  |COUNTER |COUNTER |COUNTER |
|--|--|--|--|--|--|--|--------|--------|--------|
```

R - Retry in progress.
B - Backspace in progress.
F - Forward space in progress.
G - Gap in progress.
E - Backspace on data end-of-file.
S - Short read in progress.
U - Unload tape for write ring installation.

DIT for 7974/78 Magnetic Tape Drives

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element. The following diagram shows the DIT used for the mag tape driver.

```
|    0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15   MNEMONIC
|  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  0| 0| 0|AC|RQ| 0|MU| 0|IO|IA|NO|ST| 0|   STATE   |  DFLAG
|  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  1| SYSDB relative pointer to the DIT for the next|  DLINK
|   | device requesting this resource or service    |
|  +-----------------------------------------------+
|  2| SYSDB relative pointer to the first IOQ in    |  DIOQP
|   | request list for this device                  |
|  +-----------------------------------------------+
|  3|            Logical device number              |  DLDEV
|  +-----------------------------------------------+
|  4| SYSDB relative pointer to Device Linkage Table|  DDLTP
|  +-----------------------------------------------+
|  5| SYSDB relative pntr to Interrupt Linkage Table|  DILTP
|  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  6|RW|RU|SH|     |PF|          |EOV|          |PA|  DSAVE
|  +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|  7| Hardware error status.  Set when the driver   |  DSERR
|   | detects an error.  Whenever <>0, the driver   |
|   | monitor logs an I/O error and clears this word|
|  +-----------------------------------------------+
| X10| Bit 0 is set at completion of timer          |  DTIME
|  +-----------------------------------------------+
| X11| Interrupt status for this unit.  Set by the  |  DSTAT
|   | driver each time it processes an interrupt.   |
|  +-----------------------------------------------+
| X12| IOT    |////////////| Physical unit number    |  DUNIT
|  +-----------------------------------------------+
| X13| Holds the time out request entry index while  |  DRQST
|   | a timer is active.                            |
|  +-----------------------------------------------+
| X14| Error log. Contains 5 valid bytes of status   |  DLOGERROR
|  +-----------------------------------------------+
```


|DFLAG - Flags and request state
| AC ACTIVE - A monitor is currently servicing this device.
| RQ REQUEST - A service request is pending while the monitor is active.
| MU MUNIT - This device is on a multi-unit controller.
| IO IOPROG - An I/O Channel Program is running for this device.
| IA IAK - An interrupt or response has occurred for this device.
| NO NOTRDY - Go to state X10 after Idle Channel Program is started.
| ST STWAIT - The device monitor is starting an Idle Channel Program for this device. There is no IOQ associated with this type of request.
| STATE - State of the device monitor. Specifies the next action to be taken in SIODM in servicing the request:
| 0 - start new request
| 1 - not used
| 2 - call driver initiator procedure
| 3 - call driver completor procedure
| 4 - not used
| 5 - process request completed
| 6 - initiate device recognition sequence
| 7 - start operator intervention wait
| X10 - wait for interrupt (operator intervention) restart at state 0
| X11 - wait for data segment freeze, then state 2
| X12 - wait for driver initiator to be frozen, then allocate controller (state 2)
| X13 - wait for I/O completion interrupt, then state 3
| X14 - wait for controller, then call driver initiator
| X15 - not used
| X16 - wait for initiator make present, then state 2
| X17 - wait for completor make present, then state 3

|DSAVE - Device processing flags

| RW RWBIT - Indicates tape has been rewound.
| RU RWUNLD - Indicates that a rewind/unload was performed to allow a write-ring mount.
| SH SHORT - A short read is in progress. After completion of read, EOF is checked for and if not present, the requested bytes are transfered from the short-read buffer to the user's buffer.
| PF POWER - Device power up indication.
| PA PENDING ABORT - An abort is pending for a command queued IOQ.
| FO FIRST OPERATION - The first read or write after a rewind command is not done in queuing mode.
| EOV End'Of'Volume - enable check on 2 consecutive EOFs.

|DSTAT - Mag tape controller status

BITS	USE
0	END OF FILE (EOF)
1	BEGINNING OF TAPE (BOT) / LOAD POINT (LP)
2	END OF TAPE (EOT)
3	SINGLE TRACK ERROR (NOT LOGGED FOR READS)
4	COMMAND REJECT (REJECT)
5	FILE PROTECT (NOT WRITE ENABLED; NO WRITE RING)
6	MULTIPLE TRACK ERROR (MTE)
7	UNIT ONLINE
8	GCR (6250 BPI DENSITY)
9	UNIT NUMBER (MSB)
10	UNIT NUMBER (LSB)
11	TIMING ERROR
12	TAPE RUNAWAY
13	REWINDING *
14	UNIT BUSY ** (REPORTED AS UNIT NOT READY)
15	INTERFACE BUSY *

DIT for 7979/80 Magnetic & DAT Tape Drives

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ array.

X	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MNEMONIC
0	0	0	RC	RQ	0	MU	0	IO	IR	NO	ST	0	State				DFLAG
1	SYSDB relative pointer to the DIT for the next device requesting this resource or service																DLINK
2	SYSDB relative pointer to the first IOQ in request list for this device.																DIOQP
3	Logical device number																DLDEV
4	SYSDB relative pointer to Device Linkage Table																DDLTP
5	SYSDB relative pntr to Interrupt Linkage Table																DILTP
6	RW	RU	SH	GR		PF					EOV		PP	IR	EI		PR	DSRVE
7	Hardware error status. Set when the driver detects an error. Whenever <> 0, the driver monitor logs an I/O error and clears this word																DSERR
10	Bit 0 is set at completion of timer.																DTIME
11	Interrupt status for this unit. Set by the driver each time it processes an interrupt.																DSTAT
12	IOT ////////////////////								Phys. unit #								DUNIT
13	Holds the time out request entry index while a timer is active.																DRQST
14 15 16	Error log. Contains 6 bytes of status from the previous operation.																DDEVSTAT

DFLAG - Device Flags and Request State.
- RC - A monitor is currently servicing this device.
- RQ - A service request is pending while the monitor is active.
- MU - This device is on a multi-unit controller.
- IO - An I/O Channel Program is running for this device.
- IR - An interrupt or response has occurred for this device.
- NO - Not ready, start Idle Channel Program then go to state X10.
- ST - The device monitor is starting an idle channel program for this device. There is no IOQ associated with this state.

STATE - Device Monitor State.
Specifies the next action to be taken by SIODM in servicing the request:
- 0 - Start a new request.
- 1 - Not used.
- 2 - Call driver initiator procedure.
- 3 - Call driver completor procedure.
- 4 - Not used.
- 5 - Completed request processing.
- 6 - Initiate device recognition sequence.
- 7 - Start operator intervention wait.
- X10 - Wait for interrupt (operator intervention), restart at state 0.
- X11 - Wait for data segment freeze, then state 2.
- X12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
- X13 - Wait for I/O completion interrupt, then state 3.
- X14 - Wait for controller, then call driver initiator.
- X15 - Not used.
- X16 - Wait for initiator make present, then state 2.
- X17 - Wait for completor make present, then state 3.

DSRVE - Device processing flags.
- RW - Indicates tape has been rewound.
- RO - Indicates a rewind/offline was performed to allow a write-ring mount.
- SH - Indicates a short read is in progress. After completion of the read, EOF is checked for and if not present, the data requested is transferred from the short read buffer to the user's buffer.
- GR - Good retries on previous operation.
- PF - Indicates device is powered up.
- EOV - enable check on 2 consecutive EOFs.
  - 0 - no check
  - 1 - enable
  - 2 - 1 EOF read
  - 3 - 2 consecutive EOFs encountered
- PP - Device powerfail processing flag.
  - 0 - Device powerfail process complete.
  - 1 - 1st pass of device powerfail processing.
- IR - Immediate report status.
  - 0 - Immediate report is disabled.
  - 1 - Immediate report is enabled.
- EI - EOF processing indicator.
  - 0 - Last operation was not a write file mark.
  - 1 - Last operation was a write file mark.
  - 2 - Device buffered operations are being completed prior to issuing the second of a double write file mark (EOF).
- PR - Pending abort processing.

DSTAT - First two bytes of device status.

WORD 1

Bit	Meaning
0	End-of-file (EOF)
1	Beginning-of-tape (BOT)/Load-point (LP)
2	End-of-tape (EOT)
3	Recovered error (STE)
4	Command reject
5	File protect (not write enabled; no write ring)
6	Unrecovered error (HTE)
7	Unit online
8	GCR (6250 BPI Density)
9	Unknown density
10	Data parity error
11	Timing error
12	Tape runaway
13	Door open
14	Not used
15	Immediate report enable

WORD 2

Bit	Meaning
0	PE (1600 BPI Density)
1	NRZI (800 BPI Density)
2	Power restored
3	HPIB Command Parity Error
4	Position Unrecovered
5	Formatter error
6	Servo error
7	Controller error
8-10	Command Reject detail 000 - Null code 001 - Reserved 010 - Device Reject 011 - Protocol Reject 100 - Reserved 101 - Prior error reject 110 - Reserved 111 - Selftest failure
11-15	Retry count.

WORD 3 (left byte)

The contents of this byte contains binary coded information regarding the specific error encountered.

If COMMAND REJECT

- 5 - Device is write protected when a write type command was initiated.
- 6 - Tape was not tensioned when the command was queued.
- 7 - Write density command given but requested density is not available (option not present).
- 9 - The tape to be read was unidentifiable as to format. The density read may not be available, or the tape may have an unreadable identifications field, or may be blank
- 10 - The tape to be written on has not been identified as to format. A write Record, Write File Mark, or Write Gap command was received but cannot be processed without a Write Format command if the tape was unidentified at load point.
- 11 - Drive not online.
- 16 - A write format command was issued but the tape isn't at load point.
- 19 - A backward type command (except a rewind command) was just initiated but the tape was already positioned at BOT.
- 22 - An improper command sequence was detected by the drive.
- 23 - Protocol not synced.
- 24 - The tape command byte received was unknown to the drive.
- 31 - The length of a write record requested exceeded the size of the drive's data buffer.
- 37 - Cannot write past 10 feet beyond end-of-tape.
- 40 - Door open reject. The door was opened during a long gap while the tape was beyond the end-of-tape marker. This condition is non-retriable to prevent unspooling of the tape.

If UNRECOVERED ERROR

- 41 - Tape velocity was out of specification.
- 43 - Tape tension was out of specification.
- 45 - Multiple tracks were in error. Either two or more tracks were in error for a PE or NRZI write, or two or more tracks were in error for a GCR write.
- 47 - Failure to verify a tape mark or density ID just written.
- 48 - Noise on detect. Indistinguishable flux transitions were detected while attempting to detect a recorded block.
- 49 - Data format error. Flux transitions were found or were missing in the appropriate tracks for a block detect.
- 50 - Failure to identify tape following a rewind command
- 51 - Gap detected before end-of-data. The read formatter dected a full tape width dropout within the data portion of a data block.
- 52 - Data block dropout. A full tape width dropout was detected within the preamble or postamble of a data block.
- 53 - Redundancy check error. The read formatter detected either a CRC, RCRC, LRC or residual error while reading or verifying a data block.
- 54 - Read parity error. The read formatter detected an unrecovered parity error within a data block. For PE this error could include multiple tracks in error, and for GCR this error could also include a redundancy check error. (Buckhorn only).
- 55 - Abnormal command abort, door opened (Antelope only).
- 57 - Maximun skew exceeded (Antelope only).
- 58 - False preamble or postamble detected (Antelope only).
- 59 - Corrected data error on write (Antelope only).
- 61 - Data block timeout. Could not detect the gap following a data block. Could be caused by a record length longer than the drive supportes on read.
- 62 - Tape mark dropout. A full tape width dropout was detected within a tape mark.
- 63 - Tape mark unverified. A tape mark was detected which does not meet ANSI specifications in terms of flux transitions and erasure in the appropriate tracks.
- 64 - Tape mark timeout. Could not detect the gap following a detected tape mark.

If POSITION UNRECOVERED

- 81 - Servo controller unresponsive. The servo will not take data from the master controller.
- 82 - Servo failed to reach the desired state requested by the master controller.
- 83 - Servo shutdown. The servo system lost tape tension unexpectedly.
- 84 - Servo controller hard failure. The servo controller has detected a hard failure within itself.
- 85 - Servo protocol error. An invalid byte was received by the servo from the master controller.
- 86 - A run time error was detected by the servo.
- 87 - In position interrupt not received. Master controller did not get the in position interrupt it expected.
- 88 - No gap detected by the servo after reading or writing a data block or tape mark.
- 90 - No BOT detected on load or rewind.
- 91 - Speed out of specifications.
- 92 - The desired state requested by the master controller was invalid for the current context.
- 94 - Tape positioning failure.

If FORMATTER ERROR

- 101 - Buckhorn read formatter unresponsive. The read formatter did not respond with end of record status after a data block was detected.
- 102 - Buckhorn read formatter hardware error.
- 103 - Bad block type detected on a write operation.
- 104 - Erase failure. Flux transitions were detected in a portion of tape currently being erased.
- 105 - No data detected after write.
- 106 - Tracks out of sync on write verify.
- 107 - Antelope formatter hardware error.
- 108 - Antelope formatter unresponsive.
- 110 - Formatter byte count mismatch with data buffer.

If CONTROLLER ERROR

- 121 - Transaction ID mismatch between command sent to Device program and the returned report.
- 122 - No pending command found for report received from Device program.
- 123 - Invalid report message received from Device program.
- 124 - Report queue overflow.
- 125 - Unknown command received by Device program.
- 126 - Command queue overflow.
- 128 - Missing end-of-record flag in data buffer.
- 131 - Byte count mismatch between putting a record into the data buffer and removing it.
- 133 - Processor handshake abort between HP-IB interface board and channel program.
- 134 - Unknown HP-IB interface exception detected.
- 138 - Device program firmware error.
- 139 - Hardware utilities firmware error.
- 140 - Channel program firmware error.

If COMMAND REJECT and PROTOCOL REJECT

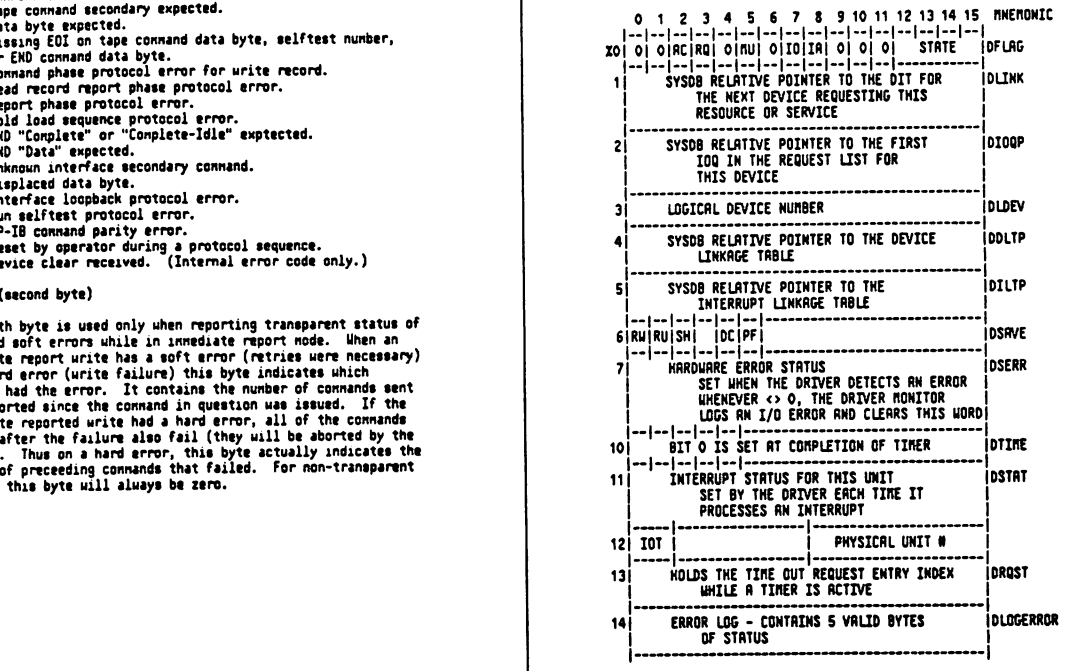
161 - Command queue not empty. Cannot accept new tape command or diagnostic request.
162 - Request DSJ expected.
163 - Request status expected.
165 - Unknown unit select.
166 - Tape command secondary expected.
167 - Data byte expected.
168 - Missing EOI on tape command data byte, selftest number, or END command data byte.
170 - Command phase protocol error for write record.
172 - Read record report phase protocol error.
173 - Report phase protocol error.
174 - Cold load sequence protocol error.
176 - END "Complete" or "Complete-Idle" exptected.
178 - END "Data" expected.
180 - Unknown interface secondary command.
181 - Misplaced data byte.
184 - Interface loopback protocol error.
185 - Run selftest protocol error.
188 - HP-IB command parity error.
189 - Reset by operator during a protocol sequence.
190 - Device clear received. (Internal error code only.)

WORD 3 (second byte)

The sixth byte is used only when reporting transparent status of hard and soft errors while in immediate report mode. When an immediate report write has a soft error (retries were necessary) or a hard error (write failure) this byte indicates which command had the error. It contains the number of commands sent and reported since the command in question was issued. If the immediate reported write had a hard error, all of the commands issued after the failure also fail (they will be aborted by the device). Thus on a hard error, this byte actually indicates the number of preceeding commands that failed. For non-transparent status, this byte will always be zero.

DIT for 7976 Magnetic Tape

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element. The following diagram shows the DIT used for the mag tape driver.



DFLAG - Flags and request state.
AC ACTIVE - A monitor is currently servicing this device.
RQ REQUEST - A service request is pending while the monitor is active.
MU MUNIT - This device is on a multi-unit controller.
IO IOPROG - An I/O Channel Program is running for this device.
IA IAK - An interrupt or response has occurred for this device.
NO NOTRDY - Go to state X10 after Idle Channel Program is started.
ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.
STATE - State of the device monitor; specifies the next action to be taken in SIODM in servicing the request:
X0 - Start new request.
1 - Not used.
2 - Call driver initiator procedure.
3 - Call driver completor procedure.
4 - Not used.
5 - Process request completed.
6 - Initiate device recognition sequence.
7 - Start operator intervention wait.
10 - Wait for interrupt (operator intervention) restart at state 0.
11 - Wait for data segment freeze, then state 2.
12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
13 - Wait for I/O completion interrupt, then state 3.
14 - Wait for controller, then call driver initiator.
15 - Not used.
16 - Wait for initiator make present, then state 2.
17 - Wait for completor make present, then state 3.

DSRVE - Device processing flags.
RW RWBIT - Indicates tape has been rewound.
RU RWUNLD - Indicates that a rewind/unload was performed to allow a write-ring mount.
SH SHORT - A short read is in progress; after completion of read, EOF is checked for and if not present, the requested bytes are transferred from the short-read buffer to the user's buffer.
DC DSFLAG - Transfer used data chaining - used for computing the transmission log.
PF POWER - Device power up indication.

DSTAT - Mag Tape Controller Status

BITS	USE
0	End-of-file (EOF)
1	Beginning-of-tape (BOT) / Load Point (LP)
2	End-of-tape (EOT)
3	Single track error (not logged for reads)
4	Command reject (reject)
5	File protect (not write enabled; no write ring)
6	Multiple track error (MTE)
7	Unit online
8	GCR (6250 BPI density)
9	Unit number (MSB)
10	Unit number (LSB)
11	Timing error
12	Tape runaway
13	Rewinding *
14	Unit busy ** (reported as unit not ready)
15	Interface busy *

DIT for 9144 Cartridge tape drive

word	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	MNEMONIC
0	|TM|DS|AC|RQ| 0| 0| 0|IO|IA|NO|ST| 0| State	DFLAG
1	SYSDB relative pointer to the DIT for the next device requesting this resource or service	DLINK
2	Pointer to the current IOQ	DIOQP
3	Logical device number	DLDEV
4	SYSDB relative pointer to Device Linkage Table	DDLTP
5	SYSDB relative pntr to Interrupt Linkage Table	DILTP
6	Set to -1 when system powerfail occurs.	DSTAT
7	Hardware error status. Set when the driver detects an error. Whenever <> 0, the driver monitor logs an I/O error and clears this word	DSERR
10	index of first request in the queue	DQHEAD
11	index of last request in the queue	DQTAIL
12	IOT | | Physical Unit #	DUNIT
13	LK|IG|IM| | SUBSTATE	DMISC
14	High order logical sector address of bad block	DBADBLK1
15	Low order logical sector address of bad block.	DBADBLK2
16	Byte transfer left when bad block occured	DBADXFER
17	Hardware logged error status - CPVA (0).	DLOGERROR
20	Relative offset of channel program abort.	CSIOPSTOP
21	Accum byte count of transfer > 6144 bytes.	DBYTECNT
22		
23	Device status (20 bytes), errors logged	DSTATUS
.	.	
.	.	
34	.	

DFLAG - Device flags and request state.
- TM - Set if device is a terminal
- DS - If TM = 0 and this bit is set then device is a disc, otherwise device dependent.
- AC - A monitor is currently servicing this device.
- RQ - A service request is pending while the monitor is active.
- IO - An I/O channel program is running for this device.
- IA - An interrupt or response has occurred for this device.
- NO - Not ready, start idle channel program then go to state X10.
- ST - The device monitor is starting an idle channel program for this device. There is no IOQ associated with this state.
- STATE - State of the device monitor. Specifies the next action to be taken by SIODM in servicing the request:
  - 0 - Start a new request.
  - 1 - Not used.
  - 2 - Call driver initiator procedure.
  - 3 - Call driver completor procedure.
  - 4 - Not used.
  - 5 - Request complete.
  - 6 - Initiate device recognition sequence.
  - 7 - Start operator intervention wait.
  - X10 - Wait for interrupt (operator intervention), restart at state 0.
  - X11 - Wait for data segment freeze, then state 2.
  - X12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
  - X13 - Wait for I/O completion interrupt, then state 3.
  - X14 - Wait for controller, then call driver initiator.
  - X15 - Not used.
  - X16 - Wait for initiator make present, then state 2.
  - X17 - Wait for completor make present, then state 3.

DLINK,
DQHEAD,
DQTAIL,
DUNIT - Not used.

DMISC - Miscellaneous device information.
- LK - Lock flag denoting unload status of the device.
  - 0 - Allow operator unload of the volume.
  - 1 - Deny operator unload of the volume.
- IG - Ignore unexpected interrupt flag.
- IM - Immediate report.
  - 0 - Disabled.
  - 1 - Enabled.
- SUBSTATE - Idle channel program state.
  - 0 - Normal idle channel program wait.
  - 1 - Idle request being serviced wait.

DBADBLK1 - High order logical sector address of bad block encountered.

DBADBLK2 - Low order logical sector address of bad block encountered.

DBADXFER - Byte transfer left when bad block occured.

DLOGERROR - CPVA (0) logged on hardware error status.

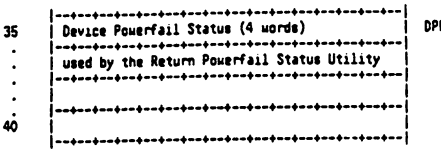
DSIOPSTOP - Relative offset location of channel program when error in CPVA (0) occured.

DBYTECNT - Accumulative transfer count for transfers greater than 6144 bytes.

DSTATUS - 20 bytes of status logged when a status error occurs. (Refer to CS/80 Instruction Set manual for description.)

DIT for HP9145 Cartridge Tape Drive

word	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	MNEMONIC
0	|TM|DS|AC|RQ| 0| 0| 0|IO|IA|NO|ST| 0| State	DFLAG
1	SYSDB relative pointer to the DIT for the next device requesting this resource or service	DLINK
2	Pointer to the current IOQ	DIOQP
3	Logical device number	DLDEV
4	SYSDB relative pointer to Device Linkage Table	DDLTP
5	SYSDB relative pntr to Interrupt Linkage Table	DILTP
6	Set to -1 when system powerfail occurs.	DSTAT
7	Hardware error status. Set when the driver detects an error. Whenever <> 0, the driver monitor logs an I/O error and clears this word	DSERR
10	index of first request in the queue	DQHEAD
11	index of last request in the queue	DQTAIL
12	IOT | |RV| | Physical Unit #	DUNIT
13	LK|NR|IM|PI| |SL|MP| | SUBSTATE	DMISC
14	High order logical sector address of bad block	DBADBLK1
15	Low order logical sector address of bad block.	DBADBLK2
16	Byte transfer left when bad block occurred	DBADXFER
17	Hardware logged error status - CPVA (0).	DLOGERROR
20	Relative offset of channel program abort.	CSIOPSTOP
21	Accum byte count of transfer > 6144 bytes.	DBYTECNT
22		
23	Device status (20 bytes), errors logged	DSTATUS
.	used by Request Status Function	
.		



DFLAG - Device flags and request state.
- TM - Set if device is a terminal
- DS - If TM = 0 and this bit is set then device is a disc, otherwise device dependent.
- AC - A monitor is currently servicing this device.
- RQ - A service request is pending while the monitor is active.
- IO - An I/O channel program is running for this device.
- IA - An interrupt or response has occurred for this device.
- ND - Not ready, start idle channel program then go to state X10.
- ST - The device monitor is starting an idle channel program for this device. There is no IOQ associated with this state.
- STATE - State of the device monitor. Specifies the next action to be taken by SIODM in servicing the request:
  - 0 - Start a new request.
  - 1 - Not used.
  - 2 - Call driver initiator procedure.
  - 3 - Call driver continuator procedure.
  - 4 - Not used.
  - 5 - Request complete.
  - 6 - Initiate device recognition sequence.
  - 7 - Start operator intervention wait.
  - X10 - Wait for interrupt (operator intervention), restart at state 0.
  - X11 - Wait for data segment freeze, then state 2.
  - X12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
  - X13 - Wait for I/O completion interrupt, then state 3.
  - X14 - Wait for controller, then call driver initiator.
  - X15 - Not used.
  - X16 - Wait for initiator make present, then state 2.
  - X17 - Wait for continuator make present, then state 3.

DLINK,
DQHEAD,
DQTAIL - Not used.
DUNIT - IOT - I/O Type. 01 for this device.
- AV - AVR flag. Set by driver, tested by SIODM.
  - 1 - Driver can detect unexpected (AVR) conditions and will exit to SIODM State 6 when safe. SIODM should bypass State 6 when called from GIP. New functionality.
  - 0 - Driver cannot detect AVR condition. SIODM should honor a State 6 call from GIP. Previous functionality.
- Unit - Unit number for multi-unit controllers. Always 0 for this driver.

DMISC - Miscellaneous device information.
- LK - Lock flag denoting unload status of the device.
  - 0 - Allow operator unload of the volume.
  - 1 - Deny operator unload of the volume.
- NR - Not Ready. Remembers the state of DIT'DEV'NOT'RDY the last time status was read from the device. Used for detecting off-line transitions.
- IM - Immediate report.
  - 0 - Disabled.
  - 1 - Enabled.
- PI - Pending Interrupt. Set if a tape comes online while the driver is processing an IOQ in the continuator. This is checked before the driver enters IDLE in the initiator. If set, the driver will return unexpected interrupt up to SIODM. This will AVR the tape.
- SL - Spares Lost. Set if no IOQs are being processed and a pfail has occurred such that the spares table is lost. If this is set when the next IOQ is processed, that IOQ'STAT will be set to X274.
- MP - Must Powerfail Next I/O. Set if no I/Os are being processed and a pfail has occurred such that data was lost from the I/O. If this is set when the next IOQ is processed, that IOQ'STAT will be set to X63 POWERFAIL'ABORT.
- SUBSTATE - Idle channel program state.
  - 0 - Normal idle channel program wait.
  - 1 - Idle request being serviced wait.

DBYTECNT - Accumulative transfer count for transfers greater than 6144 bytes.

DSTATUS - 20 bytes of status logged when a status error occurs. (Refer to CS/80 Instruction Set manual for a more detailed description.)

The following table denotes the only valid status bits that can be set by Excalibur.

WORD 0 : IDENTIFICATION ERRORS FIELD

bits	Meaning	Driver Variable Name
0:4	Volume Number	DIT'FIRST'STAT'WORD
4:4	Unit Number	DIT'FIRST'STAT'WORD
8:8	Status Pending	DIT'UNIT'ATTENTION

WORD 1 : REJECT ERRORS FIELD

bit#	Meaning	Driver Variable Name
2	Channel Parity Error	DIT'CHRN'PARITY'ERR
5	Illegal Opcode	DIT'ILL'OPCODE
6	Module Addressing	DIT'MODULE'ADDR'ERR
7	Address Bounds	DIT'ADDR'BOUNDS
8	Parameter Bounds	DIT'PARAMETER'BOUND
9	Illegal Parameter	DIT'ILL'PARAMETER
10	Message Sequence	DIT'ILL'MSG'SEQ
12	Message Length	DIT'MSG'LENGTH'ERR

WORD 2 : FAULT ERRORS FIELD

bit#	Meaning	Driver Variable Name
6	Unit Fault	DIT'UNIT'FAULT
8	Diagnostic Result	DIT'DIAG'FAIL
14	Powerfail	DIT'DEV'POWERFAIL
15	Retransmit	DIT'RETRANSMIT

WORD 3 : ACCESS ERRORS FIELD

bit#	Meaning	Driver Variable Name
1	Uninitialized Media	DIT'UNINIT'MEDIA
2	No Spares Available	DIT'SPARE'UNAVAIL
3	Not Ready	DIT'DEV'NOT'READY
4	Write Protected	DIT'WRITE'PROTECT
9	Unrecoverable Data	DIT'UNRECOV'DATA
11	End Of File	DIT'END'OF'FILE
12	End Of Volume	DIT'END'OF'VOLUME

WORD 4 : INFORMATION ERRORS FIELD

bit#	Meaning	Driver Variable Name
0	Operator Req Release	DIT'I'OPR'REL'REQ
1	Diagnostic Req Release	DIT'I'DIAG'REL'REQ
7	Ruto Sparing Invoked	DIT'DEFECT'BLK'SPARE
11	Recoverable Data	DIT'RECOV'DATA

WORDS 5,6,7,8,9 : PARAMETER FIELD

Refer to the CS'80 Manual for the meaning of these bytes. The bytes depend upon which error is reported in the status bits.

DPFSTATUS - This status is returned by the Return Powerfail Status Utility after a device powerfail. It is valid ONLY directly after the QSTAT=2 report is received from the device. Do not interpret this status if a powerfail has not just occurred.

The Utility returns 7 bytes at present, but 4 words are set aside for it.

BYTEN	Meaning
0	Total Number of bytes returned by Utility, including byte 0 (currently = 7) Driver Variable Name : DIT'PFAIL'NUM'BYTES
1	Powerfail Status Flag Driver Variable Name : DIT'PFAIL'PFSTATUS 0 : If no pfail has occurred (media loaded w/no pfail) 1 : Pfail occurred, but no tape LOADed (tape could be present or UNLOADing but it is not LOADed) 2 : Pfail occurred and a tape has LOADed Successfully 3 : Pfail occurred, tape attempted to LOAD, but LOAD failed
2	Powerfail Data Loss Flag Driver Variable Name : DIT'PFAIL'DATA'LOSS 0 : If no data was lost during last pfail 1 : Host data in buffer was not written to media after pfail (data lost) 2 : Spares table was not updated to tape after pfail (this is FATAL)
3 - 6	Address of First Host Block Not Written Driver Variable Names : DIT'PFAIL'HOST'ADDR1 ... DIT'PFAIL'HOST'ADDR4 If Byte#2 = 1 then this is the logical host block address of the first block not written to tape after the powerfail. If Byte#2 = 0 or 2 then this will be zero.

DIT for HP35401 Cartridge Tape Drive

word	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	MNEMONIC
0	|TM|DS|RC|RQ| 0| 0| 0|IO|IR|NO|ST| 0| State	DFLAG
1	SYSDB relative pointer to the DIT for the next device requesting this resource or service	DLINK
2	Pointer to the current IOQ	DIOQP
3	Logical device number	DLDEV
4	SYSDB relative pointer to Device Linkage Table	DDLTP
5	SYSDB relative pntr to Interrupt Linkage Table	DILTP
6	Set to -1 when system powerfail occurs.	DSTAT
7	Hardware error status. Set when the driver detects an error. Whenever <> 0, the driver monitor logs an I/O error and clears this word	DSERR
10	index of first request in the queue	DQHEAD
11	index of last request in the queue	DQTAIL
12	IOT | |RV|RC| RL | | Physical Unit #	DUNIT
13	|LK|NR|IM|PI|RG|LW|MP| | SUBSTATE	DMISC
14	High order logical sector address of bad block	DBADBLK1
15	Low order logical sector address of bad block.	DBADBLK2
16	Byte transfer left when bad block occured	DBADXFER
17	Hardware logged error status - CPVR (0).	DLOGERROR
20	Relative offset of channel program abort.	CSIOPSTOP
21	Accum byte count of transfer > 6144 bytes.	DBYTECNT
22		
23	Device status (20 bytes), errors logged	DSTATUS
.	.	
.	.	
34	.	

DFLAG - Device flags and request state.
- TM - Set if device is a terminal
- DS - If TM = 0 and this bit is set then device is a disc, otherwise device dependent.
- RC - A monitor is currently servicing this device.
- RQ - A service request is pending while the monitor is active.
- IO - An I/O channel program is running for this device.
- IR - An interrupt or response has occurred for this device.
- NO - Not ready, start idle channel program then go to state X10.
- ST - The device monitor is starting an idle channel program for this device. There is no IOQ associated with this state.
- STATE - State of the device monitor. Specifies the next action to be taken by SIODM in servicing the request:
  - 0 - Start a new request.
  - 1 - Not used.
  - 2 - Call driver initiator procedure.
  - 3 - Call driver completor procedure.
  - 4 - Not used.
  - 5 - Request complete.
  - 6 - Initiate device recognition sequence.
  - 7 - Start operator intervention wait.
  - X10 - Wait for interrupt (operator intervention), restart at state 0.
  - X11 - Wait for data segment freeze, then state 2.
  - X12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
  - X13 - Wait for I/O completion interrupt, then state 3.
  - X14 - Wait for controller, then call driver initiator.
  - X15 - Not used.
  - X16 - Wait for initiator make present, then state 2.
  - X17 - Wait for completor make present, then state 3.

DLINK,
DQHEAD,
DQTAIL - Not used. <<09421>>

DUNIT - IOT - I/O Type. 01 for this device. <<09421>>
- RV - RVR flag. Set by driver, tested by SIODM. <<09421>>
  - 1 - Driver can detect unexpected (RVR) conditions and will exit to SIODM State 6 when safe. SIODM should bypass State 6 when called from GIP. New functionality. <<09421>>
  - 0 - Driver cannot detect RVR condition. SIODM should honor a State 6 call from GIP. Previous functionality. <<09421>>
- Unit - Unit number for multi-unit controllers. Always 0 for this driver. <<09421>>
- RC - This bit is the Release count bit. It is used to count how many release commands have been sent to the Merlin. It will either be a 0 or a 1.
  - 0 - No release command has yet been sent to the Merlin.
  - 1 - A release command has ben sent to the Merlin.

  This bit is to insure that we never send send more than two releases.
- RL - These are the Release command bits. We can send a Release to the Merlin from three areas and RL keeps track of where Release was sent from.
  - 0 - No Release command sent.
  - 1 - Release sent from Initiator se.
  - 2 - Release sent from Continuator.
  - 3 - Release sent as a function code.

DMISC - Miscellaneous device information.
- LK - Lock flag denoting unload status of the device.
  0 - Allow operator unload of the volume.
  1 - Deny operator unload of the volume.
- NR - Not Ready. Remembers the state of DIT'DEV'NOT'RDY the last time status was read from the device. Used for detecting off-line transitions. <<09421>>
- IM - Immediate report.
  0 - Disabled.
  1 - Enabled.
- PI - Pending Interrupt. Device came on line while driver was waiting on command completion (i.e., not in idle CP). On line interrupt was used to complete command, so SIODM didn't wake DEVREC. The interrupt also set this bit. If the bit is set when SIODM starts the idle CP, we return the Unexpected Interrupt state so that SIODM will wake DEVREC. <<09421>>
- RG - Release Granted. Device requested a release and driver O.K.'ed it. If this bit is set when we are ready to start the idle CP, we issue a status request CP instead. This is because the device does not set a DSJ of 2 when completing the release due to coming on line! It needs an additional command to do so. The status request CP ensures that we finish all on line processing before we exit. <<09421>>
- LW - Last operation is a WRITE. <<J9456>>
- MP - Must Powerfail the next operation. <<J9456>>
- SUBSTATE - Idle channel program state.
  0 - Normal idle channel program wait.
  1 - Idle request being serviced wait.

DBADBLK1 - High order logical sector address of bad block encountered.

DBADBLK2 - Low order logical sector address of bad block encountered.

DBADXFER - Byte transfer left when bad block occured.

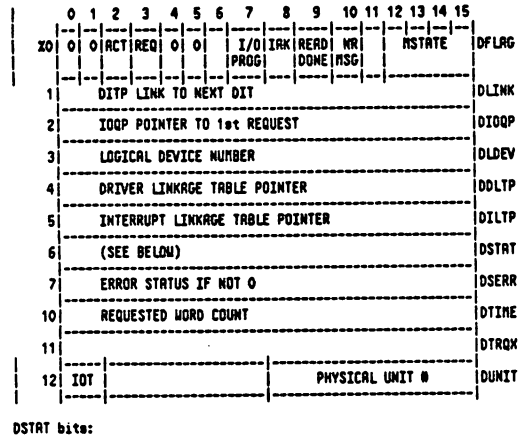
DLOGERROR - CPVA (0) logged on hardware error status.

DSIOPSTOP - Relative offset location of channel program when error in CPVA (0) occured.

DBYTECNT - Accumulative transfer count for transfers greater than 6144 bytes.

DSTATUS - 20 bytes of status logged when a status error occurs. (Refer to CS/80 Instruction Set manual for description.)

Card Reader DIT



DSTAT bits:

BIT 0 = SIO OK
BIT 1 = 0
BIT 2 = Interrupt pending
BIT 3 = Timing error
BIT 4 = Light dark check
BITS 5-6 = 00 Column binary mode
01 Unused
10 Packed binary mode
11 Hollerith-to-ASCII mode
BIT 7 = Compare error
BIT 8 = EOF detected
BITS 9-10 = 00 Normal
01 Hopper empty
10 Unused
11 Stacker full
BIT 11 = Invalid Hollerith
BIT 12 = Pick fail or motor check
BIT 13 = Test
BIT 14 = Trouble
BIT 15 = Not ready

Card Reader DIT Field Definitions

DFLAG - Flags and device state.
- ACTIVE - Monitor is currently active servicing this device.
- REQUEST - Service for this device was requested while the monitor was active.
- IOPROG - SIO program in progress.
- IRK - Interrupt occurred or request aborted or preempted.
- READDONE - Previous read resulted in an EOF with a backup save requested; the data has been saved in an auxiliary buffer and will be passed back on the next read request.
- NRMESSAGE - Set when a not ready message has been issued, and cleared when the reader is found ready; used to prevent multiple Not Ready messages when power is turned on.
- MSTATE - Monitor State; see SIODM specifications for details.

DLINK - SYSDB relative pointer to the DIT for the next device requesting service for this resource.

DIOQP - SYSDB relative pointer to the first IOQ element in the request list for this device.

DLDEV - Logical device number.

UNIT - Unit number of device.

DDLTP - SYSDB relative pointer to driver linkage table (DLT).

DSTAT - Device interrupt status; contains the device interrupt status at the last interrupt (See hardware ERS for details).

DSERR - Device interrupt error status; if not zero, then it holds the device interrupt status from an operation with an erroneous completion status (Causes SIODM to log an error).

DWCNT - Holds the requested transfer count in words.

DUNIT - I/O system type and unit number.

Device Information Table for HP-IB Card Reader

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element. The following diagram shows the DIT used for the card reader driver.

```
     0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15  MNEMONIC
   |--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
 X0| 0| 0|AC|RQ| 0|MU| 0|IO|IA|NO|ST| 0|   STATE   |DFLAG
   |--|--|--|--|--|--|--|--|--|--|--|--|-----------|
  1|     SYSDB RELATIVE POINTER TO THE DIT          |DLINK
   |        FOR THE NEXT DEVICE REQUESTING          |
   |        THIS RESOURCE OR SERVICE                |
   |------------------------------------------------|
  2|     IOQ TABLE RELATIVE INDEX TO THE FIRST      |DIOQP
   |        IOQ IN THE REQUEST LIST FOR THIS        |
   |        DEVICE                                  |
   |------------------------------------------------|
  3|     LOGICAL DEVICE NUMBER                      |DLDEV
   |------------------------------------------------|
  4|     SYSDB RELATIVE POINTER TO DEVICE           |DDLTP
   |        LINKAGE TABLE                           |
   |------------------------------------------------|
  5|     SYSDB RELATIVE POINTER TO THE              |DILTP
   |        INTERRUPT LINKAGE TABLE                 |
   |--|--|------------------------------------------|
  6|RD|AF|                                          |DSAVE
   |--|--|------------------------------------------|
  7|     HARDWARE ERROR STATUS                      |DSERR
   |        SET WHEN THE DRIVER DETECTS AN          |
   |        ERROR.  WHENEVER <> 0, THE DRIVER       |
   |        MONITOR LOGS AN I/O ERROR AND           |
   |        CLEARS THIS WORD                        |
   |------------------------------------------------|
 10|     NOT USED                                   |DTIME
   |------------------------------------------------|
 11|     REQUEST WORD COUNT                         |DWCNT
   |-----|----------------|-------------------------|
 12| IOT |                |     PHYSICAL UNIT #     |DUNIT
   |-----|----------------|-------------------------|
 13|     DEVICE STATUS - READ FROM DEVICE           |DSTAT
   |        DURING EACH EXECUTION OF THE            |
   |        CHANNEL PROGRAM                         |
   |------------------------------------------------|
 14|     LOGGING WILL BE DONE FROM HERE             |DLOGERROR
   |------------------------------------------------|
```


DFLAG - Flags and request state:
- AC ACTIVE - A monitor is currently servicing this device.
- RQ REQUEST - A service request is pending while the monitor is active.
- MU MUNIT - This device is on a multi-unit controller.
- IO IOPROG - An I/O Channel Program is running for this device.
- IA IAK - An interrupt or response has occurred for this device.
- NO NOTRDY - Go to state X10 after Idle Channel Program is started.
- ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.

STATE - State of the device monitor - specifies the next action to be taken in SIODM in servicing the request:
- X0 - Start new request.
- 1 - Not used.
- 2 - Call driver initiator procedure.
- 3 - Call driver completor procedure.
- 4 - Not used.
- 5 - Process request completed.
- 6 - Initiate device recognition sequence.
- 7 - Start operator intervention wait.
- 10 - Wait for interrupt (operator intervention) restart at state 0.
- 11 - Wait for data segment freeze, then state 2.
- 12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
- 13 - Wait for I/O completion interrupt, then state 3.
- 14 - Wait for controller, then call driver initiator.
- 15 - Not used.
- 16 - Wait for initiator make present, then state 2.
- 17 - Wait for completor make present, then state 3.

DUNIT - I/O system type and unit number.

IOT I/O TYPE - I/O System type:
- 0 = Series II/III I/O system
- 1 = HP-IB Systems
- 2 = Unused
- 3 = Unused

DSAVE - Device processing flags.
- RD READDONE - A card has already been read.
- AF ABORTFLAG - A device clear has already been sent for this series of aborted IOQs.

2608 Line Printer DIT (HP-IB Systems)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element (however, there is only one device per 2608 controller.) The following diagram shows the DIT used for the 2608 line printer driver.

```
     0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15  MNEMONIC
   |--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
 X0| 0| 0|AC|RQ| 0| 0| 0|IO|IA|NO|ST| 0|   STATE   |DFLAG
   |--|--|--|--|--|--|--|--|--|--|--|--|-----------|
  1|     SYSDB RELATIVE POINTER TO THE DIT          |DLINK
   |        FOR THE NEXT DEVICE REQUESTING          |
   |        THIS RESOURCE OR SERVICE                |
   |------------------------------------------------|
  2|     IOQ TABLE RELATIVE INDEX TO THE FIRST IOQ  |DIOQP
   |        IOQ IN THE REQUEST LIST FOR             |
   |        THIS DEVICE                             |
   |------------------------------------------------|
  3|     LOGICAL DEVICE NUMBER                      |DLDEV
   |------------------------------------------------|
  4|     SYSDB RELATIVE POINTER TO THE              |DDLTP
   |        DEVICE LINKAGE TABLE                    |
   |------------------------------------------------|
  5|     SYSDB RELATIVE POINTER TO THE              |DILTP
   |        INTERRUPT LINKAGE TABLE                 |
   |--|-----|-----------|-----------------|--|--|--|
  6|VM|     |    TAB    |                 |PS|FL|TP|DSAVE
   |--|-----|-----------|-----------------|--|--|--|
  7|     HARDWARE ERROR POINTER                     |DSERR
   |        SET WHEN THE DRIVER DETECTS AN          |
   |        ERROR.  WHENEVER <> 0, THE DRIVER       |
   |        MONITOR LOGS AN I/O ERROR AND           |
   |        CLEARS THIS WORD                        |
   |------------------------------------------------|
 10|     BIT 0 IS SET AT COMPLETION OF TIMER        |DTIME
   |------------------------------------------------|
 11|     HOLDS THE TIME OUT REQUEST ENTRY INDEX     |DRQST
   |        WHILE A TIMER IS ACTIVE                 |
   |-----|----------------|-------------------------|
 12| IOT |                |     PHYSICAL UNIT #     |DUNIT
   |-----|----------------|-------------------------|
 13|     HARDWARE LOGGED ERROR STATUS               |DLOGERROR
   |------------------------------------------------|
```


DFLAG - Flags and request state:
- AC ACTIVE - A monitor is currently servicing this device.
- RQ REQUEST - A service request is pending while the monitor is active.
- IO IOPROG - An I/O Channel Program is running for this device.
- IA IAK - An interrupt or response has occurred for this device.
- NO NOTRDY - Go to state X10 after Idle Channel Program is started.
- ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.

STATE - State of the device monitor - specifies the next action to be taken in SIODM in servicing the request:
- X0 - Start new request.
- 1 - Not used.
- 2 - Call driver initiator procedure.
- 3 - Call driver completor procedure.
- 4 - Not used.
- 5 - Process request completed.
- 6 - Initiate device recognition sequence.
- 7 - Start operator intervention wait.
- 10 - Wait for interrupt (operator intervention) restart at state 0.
- 11 - Wait for data segment freeze, then state 2.
- 12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
- 13 - Wait for I/O completion interrupt, then state 3.
- 14 - Wait for controller, then call driver initiator.
- 15 - Not used.
- 16 - Wait for initiator make present, then state 2.
- 17 - Wait for completor make present, then state 3.

DUNIT - I/O system type and unit number.

IOT I/O TYPE - I/O System type:
- 0 = Series II/III I/O system
- 1 = HP-IB Systems
- 2 = Unused
- 3 = Unused

DSAVE - Device processing flags:
- VM VFCMOD - VFC has been modified.
- TAB TABDFAULT - System tab default.
- PS PRESPACE - Last request used prespacing.
- FL FULL - Line printer buffer is full.
- TP TOP - Printer is at top of form.

2608 Line Printer Status

BYTE 1 & BYTE 2:
BITS USE

0 On line

1 Not ready
2 VFC channel 9 (bottom of form)
3 VFC channel 12 (top of form)

4 VFC initialized
5 6/8 lines per inch
6 (not used)

7 Power restored/unit reset
8 On line
9 Print mechanism error

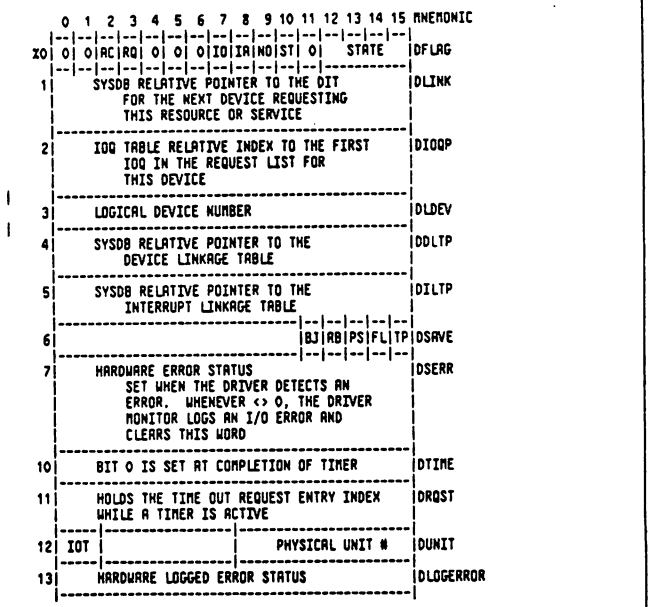
10 Self test failure
11 Paper error
12 Self test mode

13 6/8 lines per inch
14 Platen/ribbon error
15 (not used)

BYTE 3: Print mode
BITS 0-7 Mode number
BYTE 4: Primary/secondary
BITS 0-3 Secondary character set code
BITS 4-7 Primary character set code
BYTE 5: Self test
BITS 0 Pass/fail
BITS 1-7 Subtest number
BYTE 6: 6 LPI dot row count
BYTE 7: 6 LPI form line number
BYTE 8: 6 LPI form length in lines
BYTE 9: 8 LPI dot row count
BYTE 10: 8 LPI form line number
BYTE 11: 8 LPI form length in lines
BYTE 12: Firmware identification code
BYTE 20: Power-up language
BITS 0-3 Secondary character set code
BITS 4-7 Primary character set code

HP 2619A or 2613 Line Printer DIT (HP-IB Systems)

There is one DIT per physical device. If a physical device represents more than one logical device, the logical device number is obtained from the IOQ element (however, there is only one device per HP 2631 controller.) The following diagram shows the DIT used for the HP 2631 line printer driver.



DFLAG - Flags and request state:
AC ACTIVE - A monitor is currently servicing this device.
RQ REQUEST - A service request is pending while the monitor is active.
IO IOPROG - An I/O Channel Program is running for this device.
IA IRK - An interrupt or response has occurred for this device.
ND NOTRDY - Go to state X10 after Idle Channel Program is started.
ST STWAIT - The device monitor is starting an Idle Channel Program for this device; there is no IOQ associated with this type of request.

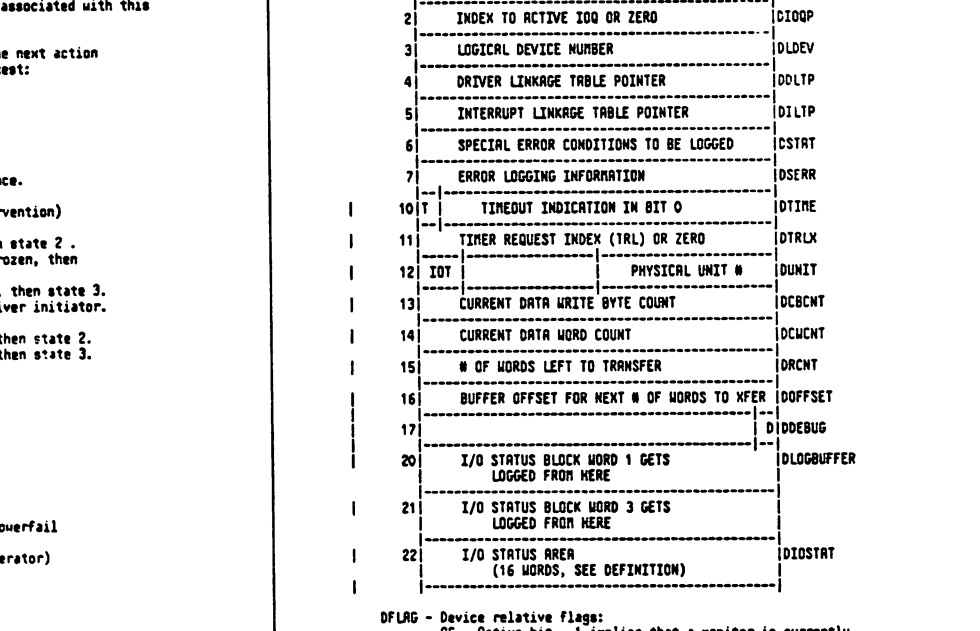
STATE - State of the device monitor - specifies the next action to be taken in SIODM in servicing the request:
X0 - Start new request.
1 - Not used.
2 - Call driver initiator procedure.
3 - Call driver completor procedure.
4 - Not used.
5 - Process request completed.
6 - Initiate device recognition sequence.
7 - Start operator intervention wait.
10 - Wait for interrupt (operator intervention) restart at state 0.
11 - Wait for data segment freeze, then state 2 .
12 - Wait for driver initiator to be frozen, then allocate controller (state 2).
13 - Wait for I/O completion interrupt, then state 3.
14 - Wait for controller, then call driver initiator.
15 - Not used.
16 - Wait for initiator make present, then state 2.
17 - Wait for completor make present, then state 3.

DUNIT - I/O system type and unit number.

IOT I/O TYPE - I/O System type:
0 = Series II/III I/O System
1 = HP-IB Systems
2 = Unused
3 = Unused

DSAVE - Device processing flags:
BJ BETJOB - Between jobs flag; if set, the Powerfail message is suppressed.
AB ABORT - Abort (caused by Powerfail or Operator) has occurred.
PS PRESPACE - Last request used prespacing.
FL FULL - Line printer buffer is full.
TP TOP - Printer is at top of form.

HP 2680A/2688A DIT



DFLAG - Device relative flags:
AC - Active bit - 1 implies that a monitor is currently servicing this device.
RQ - Request bit - 1 implies service requested while the monitor is active.

SP - SIO preemption - if set, then a preemptive request has been queued for this device; the preempt code is set in the IOQ element.
CP - Channel program in progress - if set, then a channel program is currently executing.
IR - If set, an interrupt or response has occurred.
NR - If set, the device is in a not ready or operator wait state.
SW - If set, an idle channel program should be started for this device.

MSTATE - Current driver state as defined by the monitor; allowable states are:
- IO - Start request.
- 1 - Not used (reserved).
- 2 - Call driver initiator.
- 3 - Call driver completor.
- 4 - Unused (reserved).
- 5 - Complete request (perhaps return to user).
- 6 - Unexpected interrupt occurred.
- 7 - Start operator intervention wait.
- 10 - Waiting (on operator) - restart at 0.
- 11 - Waiting (data makepresent/freeze).
- 12 - Waiting (initiator code makepresent/freeze).
- 13 - Waiting (for completion interrupt).
- 14 - Waiting (for device controller availability).
- 15 - Unused (reserved).
- 16 - Waiting (initiator code makepresent).
- 17 - Waiting (completor code makepresent).

DUNIT - I/O system type and unit number.
IOT - I/O system type:
- 0 - HP 3000 Series II/III (SIO/DIO)
- 1 - HP-IB Systems
- 2 - Reserved
- 3 - Reserved

DCBCNT - Current byte count to be transferred.

DCWCNT - Current word count to be transferred.

DRCNT - Remaining word count to be transferred.

DOFFSET - Offset in buffer of next number of words to transfer.

DDEBUG - If bit 15 = 1 then debugging information will be sent to the console.

DLOGBUFFER - Status words 1 & 3 are moved here to be logged - if they were logged from the I/O status block their contents might be changed before they were logged.

DIOSTAT - I/O status area (16 words) - see I/O status block definition.

INP Device Information Table (DIT)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
DIT0	0		AC	RQ	TI	0	PR	IO	IN	SM	MAMSTATE					IOSTATE	DFLAG
1	POINTER TO NEXT DIT																DLINK
2	INPUT REQUEST QUEUE																DIOQX
3	LOGICAL DEVICE NUMBER																DLDEV
4	DRIVER LINKAGE TABLE POINTER																DDLTP
5	INTERRUPT LINKAGE TABLE POINTER																DILTP
6	INTERRUPT STATUS																DSTATUS
7	SOFTWARE TIMER REQUEST INDEX																DTRLX
10	SW	HW	HARDWARE TIMER REQUEST INDEX (33)														DTIME
11	RESERVED																
12	RESERVED																
13	READY QUEUE HEAD POINTER																READYQ
14	READY QUEUE TAIL POINTER																
15	ACTIVE QUEUE HEAD POINTER																ACTIVEQ
16	ACTIVE QUEUE TAIL POINTER																
17	WAITED QUEUE HEAD POINTER																WAITEDQ
20	WAITED QUEUE TAIL POINTER																
21	EO	UP	TR	PFSTATE				UF	PR	NR	SD	OS				RB	DSTATE
22	RESERVED					MESSAGE TO INP TYPE											DOUTMSG
23	REQUEST IDENTIFIER (IOQX)																DOUTID
24	PARAMETER 1 (QMISC)																DOUTP1
25	OUT COUNT																DOUTCNT

INP Device Information Table (DIT) (Cont.)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
26	PARAMETER 2 (QPAR2)																DOUTP2
27	SEND DIALOG COUNTER																DSEND
30	RECEIVE DIALOG COUNTER																DRECV
31	"MESSAGE SENT" ECT BUFFER																DEOT
32	RESERVED							MESSAGE FROM INP TYPE									DINMSG
33	REQUEST IDENTIFIER (IOQ X)																DINID
34	ERROR CODE -							WT					CN	STATUS			DRSTATUS
35	IN COUNT																DINCNT
36	TRANSMISSION LOG																DXLOG
37	PARAMETER																DINPARM
40	TRACE READY REQUESTS COUNT																DTRCNT
41	EXTERNAL TRACE EXTRA DATA SEGMENT NUMBER																DDSTN
42	RESERVED							OUT MSG TYPE AT ERROR									DERROR
43	REQUEST IDENTIFIER (IOQX)																
44	PARAMETER 1 (QMISC)																
45	OUT COUNT																
46	PARAMETER 2 (QPAR2)																
47	LAST CS ERROR CODE																DCSERR
50	IOQP POINTER AT TIME OF ERROR																DSAVE
51	TP	PHY DRVR VERSN #				M	LOGICAL DRVR VERSN #										DVERSION
52	RESERVED							IN MSG TYPE AT ERROR									DERROR1
53	REQUEST IDENTIFIER (IOQX)																
54	ERROR CODE							WT					CN	STATUS			
55	IN COUNT																

INP Device Information Table (DIT) (Cont.)

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
56	TRANSMISSION LOG																
57	PARAMETER																
60	DRIVER ERROR CODE																DDRVRERR
61	MONITOR ERROR CODE																DMNTRERR
62	HARDWARE ERROR STATUS								SIO PROGRAM INDEX								DSERR
63	TOOTHPICK HARDWARE ERROR STATUS																DTP'ERROR
64																	
65	DRIVER TRACE READ IOQ INDEX																DTR'IOQX
66	RESERVED																
67	DSTN FOR PORT TRANSLATOR																DTRANDSTN
70	PLABEL FOR PORT TRANSLATOR																DTRANPLBL
71	INP CONTROLLER DIT SIZE																DITSIZE

INP DIT Field Definitions:

DFLAG - Flags, IOSTATE and MAMSTATE.

.ACTIVE - If set, the Driver is active servicing this device.

.REQUEST - If set, service for this device was requested while the Driver was active. The Driver is run again to insure servicing of the condition which caused REQUEST to be set.

.DO'TIMING - If set, the hardware and software timers are started in the normal manner when performing an operation. If clear, no timing is done.

.SIOPREEMPT- Preemptive request queued by ATTACHIO. Not used by this Driver.

.IOPROG - If set, an I/O program is in progress. Set by STARTIO and cleared by GIP. Not used by the Driver.

.IRK - Interrupt Acknowledge. If set, an interrupt has occurred or a software timeout has completed.

.SIMULATOR - If set, all I/O is to be simulated. The Driver will set flags in the DRT instead of calling STARTIO.

.MAMSTATE - Memory Manager State.
0 - Null, no Memory Management requests or condition.
1 - Not used.
2 - Data segment associated with the first request in the Active Queue is being made present and frozen.
3 - Data segment associated with the first request in the Active Queue is frozen in memory.
4 - Data segment associated with the second request in the Active Queue is being made present and frozen. Implies the data segment associated with the first request is frozen.
5 - Data segments associated with the first and second requests on the Active Queue are frozen in memory.
6 - Not used.
7 - Not used.

.IOSTATE - Current I/O program operation being performed.
0 - Inactive. No I/O in progress.
1 - Idle Read. The Idle Read I/O program has been started.
2 - Sending message. An I/O program which sends a message without data and then goes to the Idle Read section of the I/O program has been started.
3 - Sending data. An I/O program which sends a message and data and then goes to the Idle Read section has been started.
4 - Send message and interrupt. An I/O program which sends a message without data then interrupts and halts when the message sent has been started.
5 - Send data and interrupt. An I/O program which sends a message with data then interrupts and halts has been started.
6 - Receive data. An I/O program which sends a message and receives data then interrupts and halts has been started.
7 - Do not start I/O. Used to hold off requesting any I/O activity during a power on reset or when an error occurs.

DLINK - Link word for the linked list of devices waiting to be served by the I/O process associated with this device.

DIOQP - System DB relative pointer to the first element in the request to be processed list for this device. The requests are queued to this list by ATTACHIO but in processing, they are moved to other queues depending of the state of the request. the Driver always attempts to keep this list empty.

DLDEV - Logical Device Number of this device.

DDLTP - System DB relative pointer to the Driver Linkage Table (DLT)

DILTP - System DB relative pointer to the Interrupt Linkage Table (ILT)

DSTATUS - Controller hardware status. Set by GIP on interrupt and the Physical Driver during certain service operations. See INP ERS for description. For the Toothpick version, this word contains the software timeout flags as described for the word DTIME below.

DTRLX - Timer request index for software timeouts as returned by the MPE procedure TIMEREQ.

DTIME - Timed out flags and type 3 driver process PCB Number.

.TIMED - If set, a software timeout has completed.

READYQ - System DB relative pointer to the IOQ for the first request the Ready Queue. If zero, the Ready Queue is empty.

READYQTL - System DB relative pointer to the last IOQ in the Ready Queue. When the queue is empty, this word points to the word preceding then queue head pointer in the DIT.

ACTIVEQ - System DB relative pointer to the IOQ for the first request the Active Queue. If zero, the Active Queue is empty.

ACTIVEQTL - System DB relative pointer to the last IOQ in the Active Queue. When the queue is empty, this word points to the word preceding then queue head pointer in the DIT.

WAITEDQ - System DB relative pointer to the IOQ for the first request the Waited Queue. If zero, the Waited Queue is empty.

WAITEDQTL - System DB relative pointer to the last IOQ in the Waited Queue. When the queue is empty, this word points to the word preceding then queue head pointer in the DIT.

DSTATE - Driver state and control flags.

.ERRORONLY - If set, the Driver trace record is to be returned to the Trace Process only when an error occurs.

.WRAP - If set, the Driver will overlay the oldest trace entry when a trace record overflow occurs. If clear, entries are lost when an overflow occurs.

.TRACEON - If set, the Driver trace facility is enabled and the Driver generates trace entries for most of its local subroutine calls.

.PFSTATE - Power failure recovery state.
0 - No power failure recovery in progress.
1 - Powerfailure detected on the Mainframe before INP indication. Check for completion of any pending I/O and then wait in PFSTATE 2 for INP to PFAIL.

2 - Power failure detected on the Mainframe before INP has indicated a power failure. Wait for INP to indicate a power failure.
3 - Power failure indicated by INP before being informed by the Mainframe power failure routines. Wait for the Mainframe power failed request.
4 - Power failure indicated both on the Mainframe and by INP. Power failure recovery may be started.
5 - Send Redo. The Mainframe receive count was less than the INP send count so the dialog must be restarted. The Driver is sending the Redo message.
6 - Send Ignore. The Mainframe send count was greater than the INP receive count so any part of a dialog so far received is to be ignored and the entire dialog will be retransmitted. The Driver is sending Ignore message
7 - Recovered. The Mainframe and INP dialog counters agree or Mainframe not sending, so no recovery is necessary. The Driver is sending the recovered message informing INP to go back to its normal mode.

.UNFRZ - If set, the source data segment is to be unfrozen when the data has been transmitted to the INP. If clear, the source data segment remains frozen until a request complete indication is returned by the INP.

.PASSREADS - If set, then read requests are to be passed around other requests which have been impeded because no buffers are available on the INP.

.NOTRDYWAIT- If set, then a request has been impeded because no buffers were available on the INP.

.SENDING - If set, an I/O program which sends a message, with or without associated data, has been started but not completed.

.OPENSTATE - Operational state of the Driver and INP.
0 - Not opened or closed.
1 - In ROM. The device has been opened but the RAM Operating System has not been entered.
2 - Crashed. Some catastrophic error has occurred.
3 - In RAM. The device has been opened, down loaded, and is in the RAM Operating System.

.ABORT - If set, one or more requests have been aborted but the abort was not done because the aborted request was in the process of doing a Memory Management function or I/O when request to abort was processed. The actual abort will take place when the Memory Management function completes.

DOUTMSG - Message type code for messages sent to INP.

DOUTID - Request identifier associated with the message being sent.

DOUTP1 - Parameter one of the message being sent to INP.

DOUTCNT - Count parameter of the message being sent to INP.

DOUTP2 - Parameter two of the message being sent to INP.

DSEND - Messages sent counter. This word contains the number of messages sent since the RAM Operating System was entered. It is used for power failure recovery.

DRECV - Messages received counter. This word contains the number of messages received from INP since the RAM Operating System was entered. It is used for power failure recovery.

DEOT - End of dialog flag. When a message has been sent and the EOT indicating INP has received the message is transmitted, is received into this word. This flag is used to indicate the Logical Driver that a transmission has been completed and the Physical Driver should be called to check the completion status and update the IOSTATE.

DINMSG - Message type code of message from INP.

DINID - Request Identifier associated with message from INP.

DRSTATUS - Request Completion status.

DINCNT - Number of bytes of data to be received associated with the completion of a request which results in data being sent from INP.

DXLOG - Transmission log to be returned when the request identified by DINID is completed.

DINPARM - Parameter associated with the completion of this request. This word is returned in the X register by IOSTATUSX.

DTRCNT - Trace ready pending count. This word contains the number of Trace Ready messages received but not satisfied by Trace Ready requests.

DDSTN - If not zero, then internal Driver extra data segment tracing is enabled and this is the data segment number into which the trace entries are to be set.

DERROR - Driver Error block. The following sixteen words are used to store information describing the current operations being performed when a catastrophic Driver error occurred. A catastrophic error occurs on illegical Driver control data, MPE errors, or when INP does not respond in an expected manner. The first five-word block is used to hold the current or last message transmitted to INP when a catastrophic error condition was detected. It contains the data in the same form as message to INP block.

DCSERR - CS Error Code associated with a catastrophic Driver error.

DSRVE - Request Identifier of the request being processed when a catastrophic Driver error was detected.

DVERSION - Version numbers of the Physical and Logical Drivers.

.TP - If set, the Physical Driver is for the Toothpick System.

.PVERSION - Physical Driver version number.

.LVERSION - Logical Driver version number.

DERROR1 - The six-word block beginning here is used to hold the last message received from INP before a catastrophic Driver error was detected. It contains the data in the same format as the message from INP block.

DDRVRERR - Holds the code specifying the catastrophic error detected by the Physical Driver. See ERRORS under the PHYSICAL DRIVER INTERNAL SPECIFICATIONS for the definition.

DMNTRERR - Holds the code specifying the catastrophic error detected by the Logical Driver. See ERRORS under the LOGICAL DRIVER INTERNAL SPECIFICATIONS for the definition.

DSERR - Hardware Controller status when a catastrophic Driver error was detected.

.HSTATUS - Left byte of the DSTATUS word at time of error.

.SIOPX - SIO program area relative index to the last order executed or current order being executed at time of error.

DTP'ERROR - Toothpick hardware error status. To be defined.

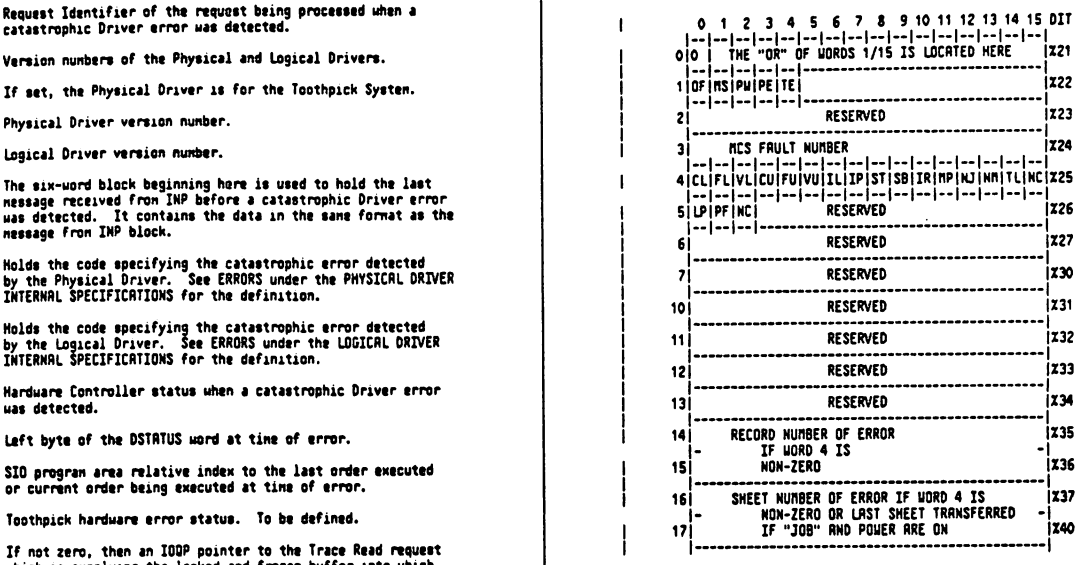
DTR'IOQX - If not zero, then an IOQP pointer to the Trace Read request which is supplying the locked and frozen buffer into which the Driver places trace entries to generate a trace record.

DTRANDSTN - DSTN for port translator.

DTRANPLBL - PLABEL for the port translator.

DITSIZE - INP controller DIT size.

I/O Status Block



WORD 0 - Each bit is the 'OR' of one word in the table (except bit 0 which is not used); bit .(1:1) is set if word 1 in the table is non-zero.

WORD 1 - bit = 0 - (OF) online/offline bit.
1 - (MS) message being displayed on the 2680A/2688A console.
2 - (PW) power up completed since last I/O status read.
3 - (PE) parity error detected on PHI command.
4 - (TE) transmission error detected in the printer.
5/15 - Reserved (unused).

WORD 2 - Reserved (unused).

WORD 3 - MCS fault number - contains an integer describing the last fault to occur since the last time the I/O status was read or the HP 2680A/2688A was powered down; if the word is zero there is no MCS fault (see DCS ERS for a description of the MCS fault numbers).

WORD 4 - bit = 0 - (CL) no room for attempted character set load.
1 - (FL) no room for attempted form load.
2 - (VL) no room for attempted VFC load.
3 - (CU) attempt to print data and there is no currently selected character set.
4 - (FU) attempt to select an undefined form set.
5 - (VU) attempt to print data and there is no currently selected VFC set.
6 - (IL) attempt to print data and there is no currently selected logical page table (LPT) entry.
7 - (IP) attempt to move pen off the logical page.
8 - (ST) the 2680A/2688A could not process all of the data before it was supposed to be transferred to the drum/paper - data was lost.
9 - (SB) spooler block contains format error.
10 - (IR) invalid recovery block received from the spooler.
11 - (MP) maximum number of copies per physical page has been exceeded - this is a result of the spooler process setting the maximum copies per page with function code 132.
12 - (NJ) a command or function code was received when no "JOB" was in progress - the command or function was ignored by the DCS.
13 - (NM) no memory - 2680A/2688A dynamic memory allocation has detected that main memory is completely occupied with character sets, VFCs, forms and data such that the 2680A/2688A cannot process the current input data - data will be lost.
14 - (TL) attempt to print data and there are more than the maximum allowable Logical Page Table (LPT) entries selected.
15 - (NC) a non-existent VFC channel was skipped to.

WORD 5 - BIT = 0 - (LP) logical page truncated to fit physical page.
1 - (PF) page size required by programmer did not match page size set by operator - operator page size prevails.
2 - (NC) no character set selected.

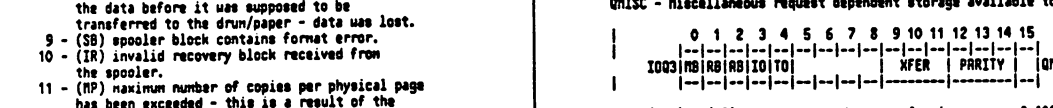
WORD 6/13 - Reserved for future use (unused).

WORD 14/15 - The record number which contains the offending error as defined by word four - if a power fail occurs during a "JOB", the power fail bit is set and a sheet number is made available in words fourteen and fifteen; however, the record number is lost and cannot be reported (these words occur in a "JOB" only).

WORD 16/17 - The sheet number on which the error occurred as defined by word four - if an error occurs in the environment file at the start of a "JOB", then this number will be zero; additionally, when a power fail occurs during a "JOB", the power on bit is set in word one and the sheet number of the last successfully transferred page is placed here (this information is for use by the spooler should a recovery of a "JOB" be determined - these words occur in a "JOB" only).

All words of the I/O Status are cleared whenever the status block is returned to the host. It is up to the host CPU to retain any ongoing status bits required.

QMISC - Miscellaneous request dependent storage available to driver.



.(0:1) - (MB) user requested a transfer in excess of 4096words; the driver can write up to 4096 words to the 2680A/2688A. In order to handle up to 32K words, multiple writes are used without a return to the user who called the driver. This bit indicates that multiple writes are being done to the 2680A/2688A.

.(1:1) - (RB) the current write block must be retried.

.(2:1) - (AB) user requested abort in progress flag.

.(3:1) - (IO) I/O status has been read and is available.

.(4:1) - (TO) general I/O controller times out.

.(5:4) - Reserved (unused).

.(9:3) - (XFER) 2680A/2688A transfer error counter.

.(12:3) - (PARITY) channel program command parity error counter.

.(15:1) - Reserved (unused).

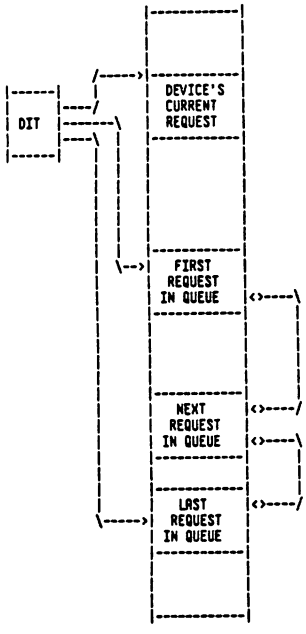
NOTEIn the above example, single bit fields are as defined when the bit is a logical "1".

Disc Request Table and Disc Requests

Requests for disc transfers are effected by acquiring an entry from the Disc Request Table (DISCREQTAB), filling the proper information, and calling the DISCQMANAGER to link the request into the device's doubly linked request queue.

The head and tail of a device's request queue are contained in the devices' DIT.

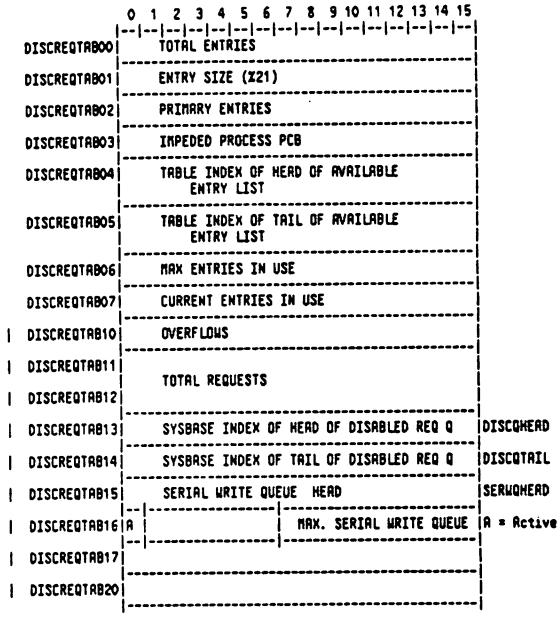
DISCREQTAB



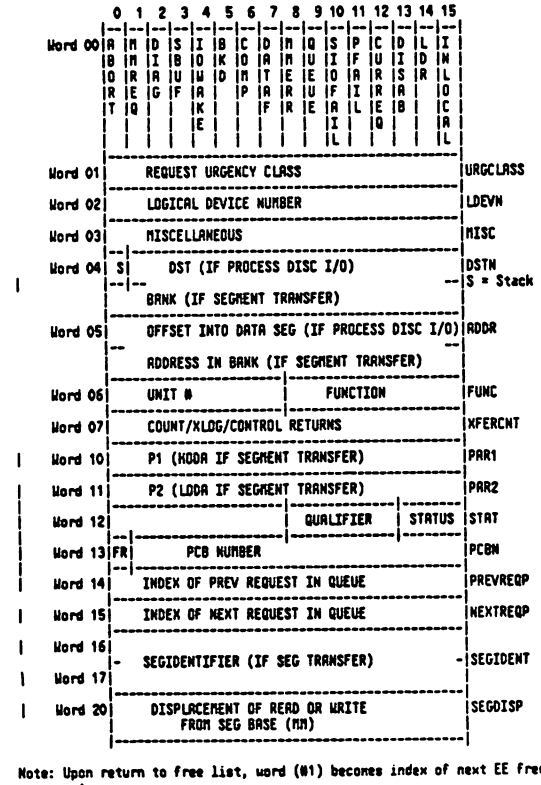
Disc Request Table

DISCREQTAB DST = 56 (%70)
DISCREQTAB PRT = %1017

Disc Request Table Entry 0 Format



Disc Request Element Format



Note: Upon return to free list, word (#1) becomes index of next EE free entry.

Word 0 - QFLAG - Request dependent flags.

Bit 0	.ABORT	Request has been aborted externally.
Bit 1	.MMREQ	Request is for a segment transfer.
Bit 2	.DIAG	Diagnostic request (not used).
Bit 3	.SBUF	System Buffer. Target is a system buffer whose index is relative to the start of the SBUF table.
Bit 4	.IOWKE	Wake caller on completion of request.
Bit 5	.BLOCKED	Blocked I/O. Caller is waited in ATTACHIO until request is completed.
Bit 6	.COMPLETED	Request has been completed and caller awoken if he had specified.
Bit 7	.DATAFRZN	Data segment has been made present and is frozen.
Bit 8	.MMERRORD	MM error on data segment make present.
Bit 9	.PREQQUEUED	Request is queued into disc's request queue.
Bit 10	.SFAIL	Start SIO failure in GIP.
Bit 11	.PFAIL	The I/O has been aborted because of a powerfail.
Bit 12	.CURREQ	Request is device's current request.
Bit 13	.DISABLED	Request is disabled.
Bit 14	.LDR	Request in logical DRQ.
Bit 15	.INLOCAL	Buffer DST is in process locality.

Word 2 - QLDEV.QLDEVN - Logical Device Number.

Word 3 - QMISC - Device dependent.

Word 4 - QDSTN - If SYSBUFRs is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for NOWAIT IO and NOBUF).

Word 5 - QADDR - Offset in data segment or sys buff table to target data buffer.

Word 6 - QFUNC.FUNC - Function code and qualifiers as specified by driver.

Word 7 - QXFERCNT - On initiation specifies the word count if positive or the byte count if negative. At completion of the request this location contains the actual transmission count in the same units as the original call. Certain control requests return data through this location.

Word 10 - QPAR1 - Parameter one, defined by driver.

Word 11 - QPAR2 - Parameter two, defined by driver.

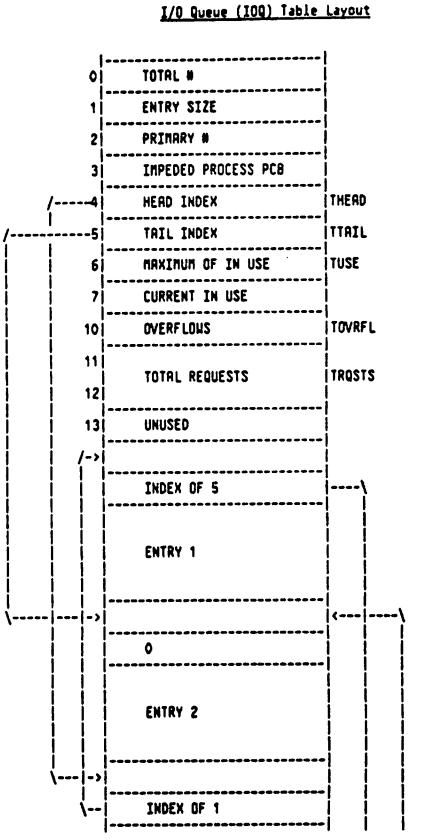
Word 12 -
QSTAT.QUALIFIER - A code which further defies or qualifies the general status. Defined by the driver.
QSTAT.STATUS - General status. Indicates current and result state of the request according to the following codes:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End of file detected.
3 - Unusual condition.
4 - Irrecoverable error.

Word 13 - QPCBN.PCBN - PCB Number of process which made this request Zero if not associated with any process and IOQ is to be returned by the system.

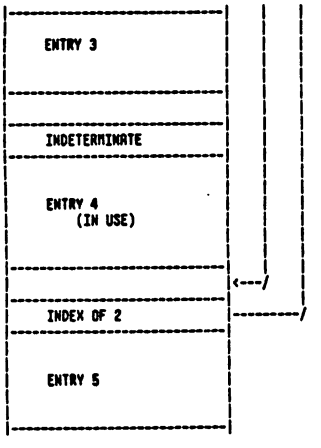
Word 13 - bit 0 = 1 - Q element is on free list.

NOTE: See I/O System Status Returns later in this chapter.

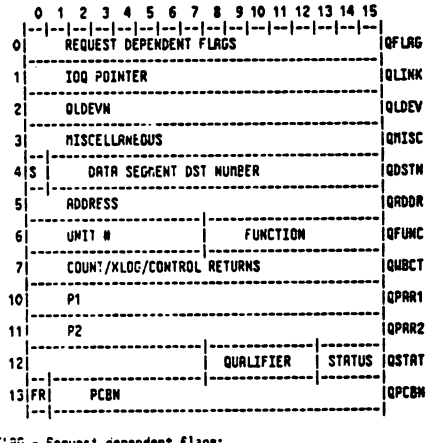
I/O Queue (IOQ) Table Layout



I/O Queue (IOQ) Table Layout (Cont.)



I/O Queue Element (IOQ)



QFLAG - Request dependent flags:
Bit 0 .ABORT - Request has been aborted externally.
Bit 1 .SPECIAL - Special handling is to be applied to this request; for disc, indicates a memory management request.
Bit 2 .DIAG - Diagnostic request (not used).
Bit 3 .SBUF - System Buffer. Target is a system buffer whose index is relative to the start of the SBUF table.
Bit 4 .IOWAKE - Wake caller on completion of request.
Bit 5 .BLOCKED - Blocked I/O. Caller is waited in ATTACHIO until request is completed.
Bit 6 .COMPLETED - Request has been completed and caller awoken if he had specified.
Bit 7 .DATAFRZN - Data segment has been made present and is frozen.
Bit 8 .MAMERROR - MAM error on data segment make present.
Bit 9 .PREQ - This request has been started but was preempted by a MAM request.

I/O Queue Element (Cont.)

Bit 10 .SFAIL - Start SIO failure in GIP.
Bit 11 .PFAIL - The I/O has been aborted because of a powerfail.
Bit 12/13 .PREEMPT - Preemptive type code:
1 - soft
2 - hard
Bit 15 .MSGDONE - A message request reply has completed.

QLINK - Table relative index of next IOQ element; points to first word of element.

QLDEV - Logical Device Number.

QMISC - Miscellaneous request dependent storage available to driver.

QDSTN - If SYSBUFRs is clear then this is the DST number of the target data segment; if bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for NOWAIT IO and NOBUFF) - S(Word 4(0:1) - Stackflag - If set is DB relative.

QRDDR - Offset in data segment or system buffer table to target data buffer.

QFUNC.FUNC - Function code and qualifiers as specified by driver.

QWBCT - On initiation specifies the word count if positive or byte count if negative; at completion of the request this location contains the actual transmission count in the same units as the call (Certain control requests return data through this location).

QPAR1 - Parameter one, defined by driver.

QPAR2 - Parameter two, defined by driver.

QSTAT - .QUALIFIER - A code which further defies or qualifies the general status; defined by the driver.
QSTAT - .STATUS - General Status. Indicates the current and resulting state of the request according to the following codes:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-Of-File detected.
3 - Unusual condition.
4 - Irrecoverable error.

QPCBN - .PCB - Number of process which made this request; zero if not associated with any process and IOQ is to be returned by the system.

Word 13 bit 0 - Queue element is on free list.

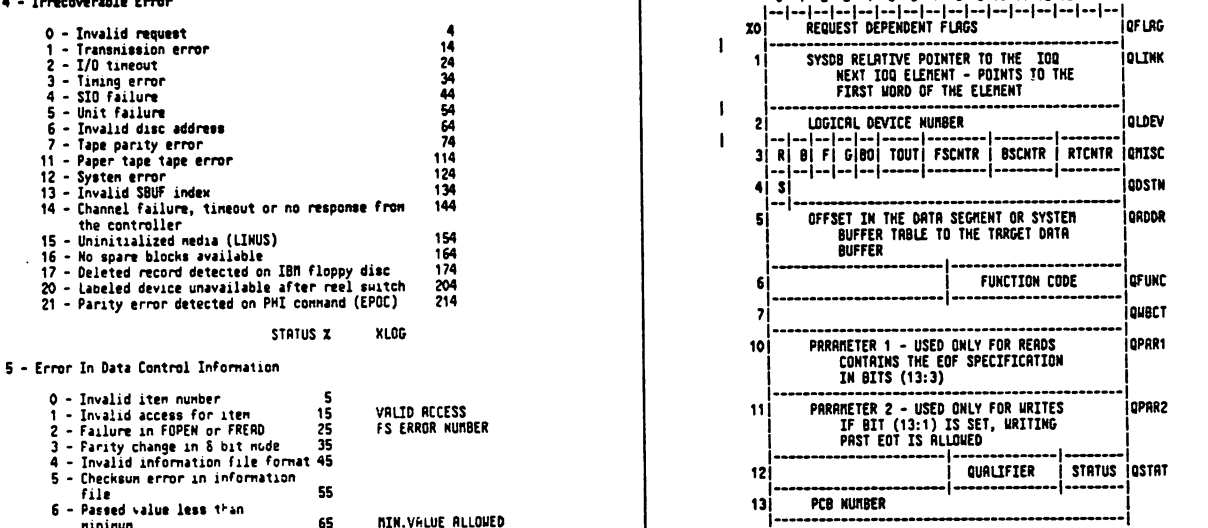
I/O System Status Returns

	STATUS %
0 - Pending	
1 - Waiting for completion	10
2 - Doing error recovery	20
3 - Not ready wait	30
4 - No write ring wait	40
5 - New paper tape wait	50
1 - Successful	
0 - Normal	1
1 - Read terminated with special character	11
2 - Tape retry for success required	21
3 - Low tape or end-of-tape after write	31
2 - End-Of-File	
1 - Physical end-of-file	12
2 - Data	22
3 - End-of-data	32
4 - HELLO	42
5 - BYE	52
6 - JOB	62
7 - End-of-job	72
3 - Unusual Condition	
1 - Terminal parity error	13
2 - Terminal read timed out	23
3 - I/O aborted externally	33
4 - Data lost	43
5 - Data set not ready or disconnect, or unit not online	53
6 - Aborted because of power fail	63
7 - BOT and BSR, BSF request	73
10 - Tape runaway	103
11 - EOT and write request	113
12 - No write ring after request to operator	123
13 - End-of-tape (paper tape low)	133
14 - Plotter limit switch reached	143
15 - Enable subsystem BREAK and no CONTROL Y PIN	153
16 - Read time returned overflow	163
17 - BREAK stopped read	173
20 - Write and no card in wait station	203
21 - Device powered on - operating environment lost	213
27 - VFC has been reset	273

I/O System Status Returns (Cont.)

	STATUS %	XLOG
4 - Irrecoverable Error		
0 - Invalid request	4	
1 - Transmission error	14	
2 - I/O timeout	24	
3 - Timing error	34	
4 - SIO failure	44	
5 - Unit failure	54	
6 - Invalid disc address	64	
7 - Tape parity error	74	
11 - Paper tape tape error	114	
12 - System error	124	
13 - Invalid SBUF index	134	
14 - Channel failure, timeout or no response from the controller	144	
15 - Uninitialized media (LINUS)	154	
16 - No spare blocks available	164	
17 - Deleted record detected on IBM floppy disc	174	
20 - Labeled device unavailable after reel switch	204	
21 - Parity error detected on PHI command (EPOC)	214	
5 - Error In Data Control Information		
0 - Invalid item number	5	
1 - Invalid access for item	15	VALID ACCESS
2 - Failure in FOPEN or FREAD	25	FS ERROR NUMBER
3 - Parity change in 8 bit mode	35	
4 - Invalid information file format	45	
5 - Checksum error in information file	55	
6 - Passed value less than minimum	65	MIN.VALUE ALLOWED
7 - Passed value greater than maximum	75	MAX.VALUE ALLOWED
10 - Passed value is unsupported	105	
11 - Count less than required to return all information	115	MIN.SPACE NEEDED
12 - Count greater than available for storing information	125	MAX.SPACE AVAIL
13 - Passed values not in ascending order	135	OFFSET OF ELEMENT
14 - Passed character has other defined function	145	OTHER FUNCTION

I/O Queue Element for 7976A Magnetic Tape



QFLAG - Request dependent flags:
Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIAL - Apply special handling to this request (unused).
Bit 2 DIAG - This is a request from the diagnostic subsystem (unused).
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed - implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.

Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - Unused.
Bit 10 SFAIL - Delayed failure of SIO instruction - if a call to START'HPIB resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

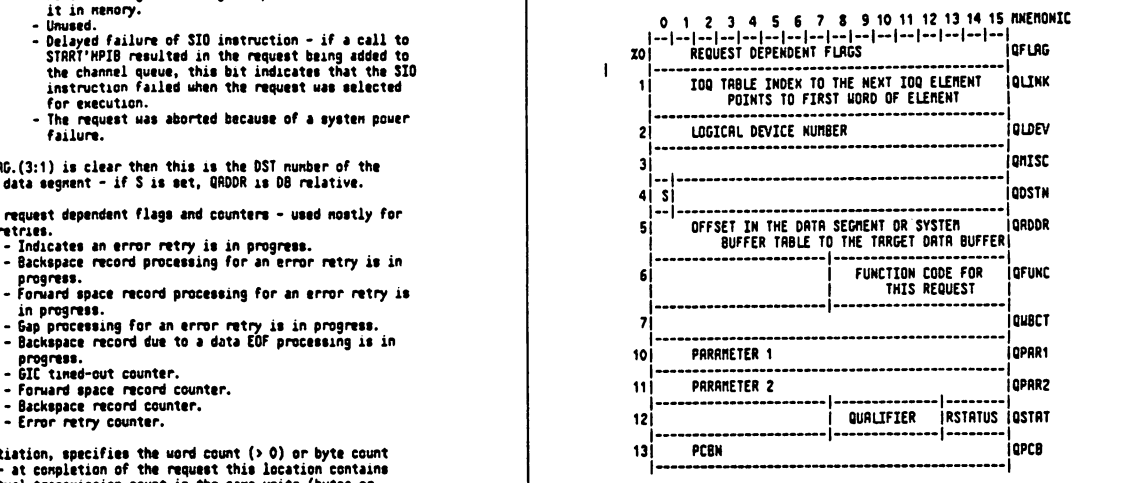
QDSTN - If QFLAG.(3:1) is clear then this is the DST number of the target data segment - if S is set, QADDR is DB relative.

QMISC - Driver request dependent flags and counters - used mostly for error retries.
R - Indicates an error retry is in progress.
B - Backspace record processing for an error retry is in progress.
F - Forward space record processing for an error retry is in progress.
G - Gap processing for an error retry is in progress.
BO - Backspace record due to a data EOF processing is in progress.
TOUT - GIC timed-out counter.
FSCNTR - Forward space record counter.
BSCNTR - Backspace record counter.
RTCNTR - Error retry counter.

QWBCT - On initiation, specifies the word count (> 0) or byte count (< 0) - at completion of the request this location contains the actual transmission count in the same units (bytes or words) as in the request.

QSTAT - PCB number and request completion status.
PCBN - The Process Control Block (PCB) number of the process which made this request - if zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request - the following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status (see the section Driver Return Status Codes on the next page).

I/O Queue Element (IOQ) for CIPER



QFLAG - Request dependent flags:
Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIAL - Apply special handling to this request (unused).
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed; implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.

Bit 9 PREQ - (Unused).
Bit 10 SFAIL - Delayed failure of SIO instruction; if a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QDSTN - If QFLAG.(3:1) is clear then this is the DST number of the target data segment; if S is set, QADDR is DB relative.

QWBCT - On initiation, specifies the word count (> 0) or byte count (< 0); at completion of the request this location contains the actual transmission count in the same units (bytes or words) as in the request.

QSTAT - PCB number and request completion status.
PCBN - The Process Control Block (PCB) number of the process which made this request; if zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
RSTATUS - General status indicating the final state of the request - the following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status (see the section Driver Return Status Codes on the next page).

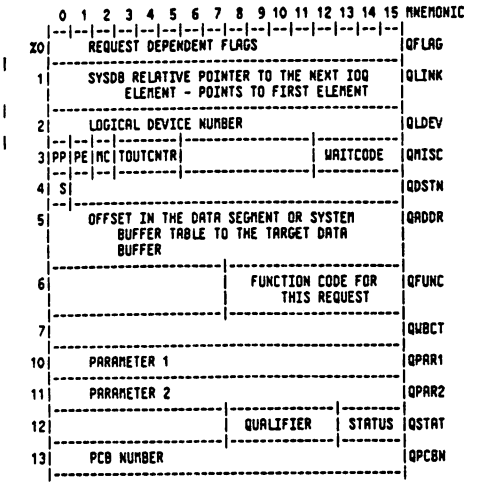
MP-IB CIPER Physical Driver Request Codes

OPERATION	FUNCTION	PARAMETERS
READ	0	None
WRITE	1	None
FILE OPEN	2	None
FILE CLOSE	3	None
DEVICE CLOSE	4	None
CIPER INIT	184	None

CIPER Driver Return Status Codes

General Status (13:3)	Qualifying Status (8:5)	Overall (8:8)
0 - Pending	1 - Waiting For Completion	X10
	3 - Not Ready Wait	X30
1 - Successful	0 - No Errors	X1
2 - End-of-File	(Unused)	
3 - Unusual Condition	3 - Request Aborted	X33
	6 - Powerfail Abort	X63
	X21 - Device Powered Up	X213
4 - Irrecoverable Error	0 - Invalid Request	X4
	1 - Transfer Error	X14
	2 - I/O Timed Out Before Complete	X24
	4 - SIO Failure	X44
	5 - Unit Failure	X54
	X12 - System Error	X124
	X14 - Channel Failure	X144
	X21 - Parity Error	X214

2608 Line Printer I/O Queue Element (HP-IB Systems)



QFLAG - Request dependent flags.
- Bit 0 ABORT - Abort this request and return an error indication to the caller.
- Bit 1 SPECIAL - Apply special handling to this request (unused).
- Bit 2 DIAG - This is a request from the diagnostic subsystem (unused).
- Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
- Bit 4 IOWAKE - Wake caller on completion of request.
- Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed; implies IOWAKE.
- Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
- Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.

- Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
- Bit 9 PREQ - (Unused).
- Bit 10 SFAIL - Delayed failure of SIO instruction; if a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
- Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Driver request dependent flags and counters
- PRE'TO'POST - Pre to post spacing change flag.
- PEJECT - Last operation was a page eject.
- MASTERCLR - Master clear done to clear powerfail bit in status, or Master clear needs to be done from not ready condition.
- TOUTCNTR - Channel time-out retry counter.
- WAITCODE - Indicates type of wait:
  - 0 - New request.
  - 1 - Completion wait.
  - 2 - Not ready wait.

QDSTN - If QFLAG.(3:1) is clear then this is the DST number of the target data segment; if S is set, QADDR is DB relative.

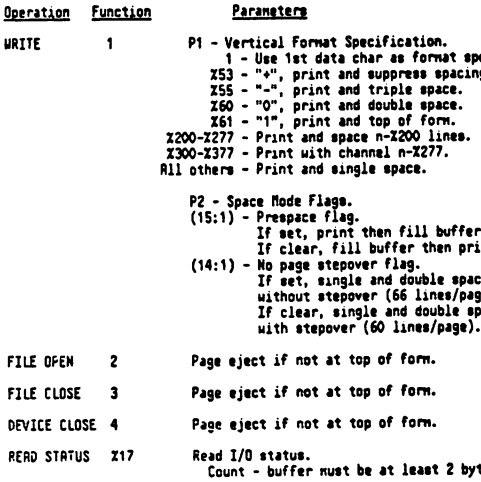
QWBCT - On initiation, specifies the word count (> 0) or byte count (< 0); at completion of the request this location contains the actual transmission count in the same units (bytes or words) as in the request.

QSTAT - PCB number and request completion status.
- PCBN - The Process Control Block (PCB) number of the process which made this request; if zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
- STATUS - General status indicating the final state of the request; The following codes are used:
  - 0 - Not started or awaiting completion.
  - 1 - Successful completion.
  - 2 - End-of-file detected.
  - 3 - Unusual, but recoverable, condition detected.
  - 4 - Irrecoverable error has occurred.
- QUALIFIER - A code which further defines or qualifies the general status (see the section Driver Return Status Codes above).

2608 Line Printer Request Codes

Operation	Function	Parameters
WRITE	1	P1 - Vertical Format Specification. 1 - Use 1st data char as format spec. %53 - "+", print and suppress spacing. %55 - "-", print and triple space. %60 - "0", print and double space. %61 - "1", print and top of form. %200-%277 - Print and space n-%200 lines. %300-%377 - Print with channel n-%277. All others - Print and single space. P2 - Space Mode Flags. (15:1) - Prespace flag. If set, print then fill buffer. If clear, fill buffer then print. (14:1) - No page stepover flag. If set, single and double space without stepover (66 lines/page). If clear, single and double space with stepover (60 lines/page).
FILE OPEN	2	Page eject if not at top of form.
FILE CLOSE	3	Page eject if not at top of form.
DEVICE CLOSE	4	Page eject if not at top of form.
READ STATUS	%17	Read I/O status. Count - buffer must be at least 2 bytes.
VFC SET	%100	Load VFC RAM. Count - Form length in words (0 loads RAM from internal ROM). P1 - 6 for 6 LPI or 8 for 8 LPI any other value defaults to 6 LPI.
TAB SET	%101	Sets logical column definition. P1 - 0 to 15, any other value defaults to 15.

2619A & 2631 Line Printer IOQ Element (HP-IB Systems)



QFLAG - Request dependent flags.
- Bit 0 ABORT - Abort this request and return an error indication to the caller.
- Bit 1 SPECIAL - Apply special handling to this request (unused).
- Bit 2 DIAG - This is a request from the diagnostic subsystem (unused).
- Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
- Bit 4 IOWAKE - Wake caller on completion of request.
- Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed; implies IOWAKE.
- Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
- Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
- Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.

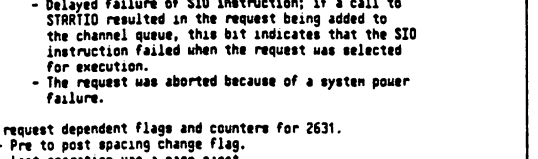
Bit 9 PREQ - (Unused).
Bit 10 SFAIL - Delayed failure of SIO instruction; if a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Driver request dependent flags and counters for 2631.
PRE'TO'POST - Pre to post spacing change flag.
PEJECT - Last operation was a page eject.
TOUTCNTR - Channel time-out retry counter.
POWERFAIL - Power fail flag indicates power fail occurred.
WAITCODE - Indicates type of wait:
0 - New request.
1 - Completion wait.
2 - Not ready wait.

QDSTN - If QFLAG.(3:1) is clear then this is the DST number of the target data segment; if S is set, QADDR is DB relative.

QWBCT - On initiation, specifies the word count (> 0) or byte count (< 0); at completion of the request this location contains the actual transmission count in the same units (bytes or words) as in the request.

Format For 2619A



QMISC - Device dependent flags:
TOUTCNTR - (TO) Channel timeout flag.
BUF'FILL - (BF) Buffer fill operation in progress.

QSTAT - PCB number and request completion status:
PCBN - The process control block (PCB) number of the process which made this request; if zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status (see the section Driver Return Status Codes earlier in this chapter).

2619 Line Printer Request Codes

Operation	Function	Parameters
WRITE	1	P1 - Vertical Format Specification. 1 - Use 1st data char as format specification. X53 - "+", print and suppress spacing. X55 - "-", print and triple space. X60 - "0", print and double space. X61 - "1", print and top of form. X200-X277, Print and space n-X200 lines. X300-X312, Print with channel N-X277. X320 - Fill Line Printer Buffer Only. All others, print and single space. P2 - Space Mode Flags. (15:1) - Prespace flag. If set, print then fill buffer. If clear, fill buffer then print. (14:1) - No page stepover flag. If set, single and double space without stepover (66 lines/page). If clear, single and double space with stepover (60 lines/page).
FILE OPEN	2	Page eject if not at top of form.
FILE CLOSE	3	Page eject if not at top of form.
DEVICE CLOSE	4	Page eject if not at top of form.
READ STATUS	X17	Read I/O status. Count - buffer size.
*IDENTIFY	X110	Return ID value in Bank & Buffaddr.
*SELF TEST:		
INITIATE	X111	Subtest number to execute in Bank and Buffaddr (subtest number ranges from 0 to 7).
STATUS	X112	Subtest result returned in Bank & Buffaddr.
*LOOPBACK TEST:		
WRT DATA	X113	Data to LP in Bank & Buffaddr [PING].
READ DATA	X114	Data from LP read into Bank & Buffaddr [PONG]. Count - Buffer Size (256 bytes max).

2631 Line Printer Request Codes (MP-IB)

Operation	Function	Parameters
WRITE	1	P1 - Vertical Format Specification. 1 - Use 1st data char as format specification. X53 - "+", print and suppress spacing. X55 - "-", print and triple space. X60 - "0", print and double space. X61 - "1", print and top of form. X200-X277, print and space N-X200 lines. X300-X307, print with channel N-X277. X320 - Fill Line Printer Buffer Only. All others, print and single space. P2 - Space Mode Flags. (15:1) - Prespace flag. If set, print then fill buffer. If clear, fill buffer then print. (14:1) - No page stepover flag. If set, single and double space without stepover (66 lines/page). If clear, single and double space with stepover (60 lines/page).
FILE OPEN	2	Page eject if not at top of form.
FILE CLOSE	3	Page eject if not at top of form.
DEVICE CLOSE	4	Page eject if not at top of form.
READ STATUS	X17	Read I/O status. Count - 1 byte minimum required.
VFC SET	X100	LOADS VFC RAM P1 - 1 - 1 LPI (lines per inch) 2 - 2 LPI 3 - 3 LPI 4 - 4 LPI 5 - 5 LPI 6 - 6 LPI 8 - 8 LPI 12 - 12 LPI Any other value defaults to 6 LPI.

I/O Queue Element For HP-IB Card Reader

```
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 MNEMONIC
  |--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
0 |  REQUEST DEPENDENT FLAGS (SEE BELOW)          |QFLAG
  |-----------------------------------------------|
1 |  SYSDB RELATIVE POINTER TO NEXT IOQ ELEMENT.  |QLINK
  |  POINTS TO FIRST WORD OF ELEMENT.             |
  |-----------------------------------------------|
2 |  LOGICAL DEVICE NUMBER                        |QLDEV
  |-----------------------------------------------|
3 |  AUXILIARY BUFFER FLAG.                       |QMISC
  |--|--------------------------------------------|
4 | S| IF QFLAG.(3:1) IS CLEAR THEN THIS IS THE   |QDSTN
  |  | DST NUMBER OF THE TARGET DATA SEGMENT.  IF |
  |  | S IS SET, QADDR IS DB RELATIVE.            |
  |--|--------------------------------------------|
5 |  OFFSET IN THE DATA SEGMENT OR SYSTEM BUFFER  |QADDR
  |  TABLE TO THE TARGET DATA BUFFER.             |
  |-----------------------|-----------------------|
6 |                       | FUNCTION CODE FOR     |QFUNC
  |                       | THIS REQUEST.  (SEE   |
  |                       | NEXT SECTION.)        |
  |-----------------------|-----------------------|
7 |  ON INITIATION, SPECIFIES THE WORD COUNT (>0) |QWBCT
  |  OR BYTE COUNT (<0).  AT COMPLETION OF THE    |
  |  REQUEST THIS LOCATION CONTAINS THE ACTUAL    |
  |  TRANSMISSION COUNT IN THE SAME UNITS (BYTES  |
  |  OR WORDS) AS IN THE REQUEST.                 |
  |-----------------------------------------------|
10| PARAMETER 1.  CONTAINS THE EOF SPECIFICATION  |QPAR1
  |-----------------------------------------------|
11| PARAMETER 2.  CONTAINS THE DATA MODE          |QPAR2
  |  SPECIFICATION IN BITS (11:2). (SEE BELOW CARD|
  |  READER REQUEST CODES FOR DETAIL INFORMATION) |
  |-----------------------|-------------|---------|
12|                       |  QUALIFIER  | STATUS  |QSTAT
  |-----------------------|-------------|---------|
13|  PCB NUMBER                                   |QPCBN
  |-----------------------------------------------|
```


QFLAG - Request dependent flags.

Bit 0 ABORT - Abort this request and return an error indication to the caller.
Bit 1 SPECIAL - Apply special handling to this request. (Not used)
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SYSBUFF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Set by the memory management routines (MAM) when a MAKEPRESENT request is successfully completed and indicates the data segment is frozen in memory.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQ - (Not used).
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.

QMISC - Auxiliary buffer flag used to indicated a read into the driver's buffer and not the user's buffer.

QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.
STATUS - General status indicating the final state of the request. The following codes are used:
0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.
QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes earlier in this chapter.)

CS 80 Disc Request I/O Queue Element (IOQ)

```
   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 MNEMONIC
  |--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
0 |  REQUEST DEPENDENT FLAGS (SEE BELOW)          |QFLAG
  |-----------------------------------------------|
1 |  REQUEST URGENCY CLASS                        |QURGCLASS
  |-----------------------------------------------|
2 |  LOGICAL DEVICE NUMBER                        |QLDEV
  |-----|--|--|--|--|-----|--|--|-----|-----------|
3 |CHANF|RS|OP|IM|SR|RTRAN|LF|SP|     | WAITCODE  |QMISC
  |--|--|--|--|--|--|-----|--|--|-----|-----------|
4 | S|   DST   (IF PROCESS DISC I/O)              |QDSCTN
  |  |            OR                              |
  |  |  DST (IF SEGMENT TRANSFER) [S=STACK]       |
  |--|--------------------------------------------|
5 |  OFFSET IN THE DATA SEG (IF PROCESS DISC I/O) |QADDR
  |                  OR                           |
  |  ADDRESS IN BANK (IF SEGMENT TRANSFER)        |
  |-----------------------|-----------------------|
6 |        UNIT #         | FUNCTION CODE FOR     |QFUNC
  |                       | THIS REQUEST.         |
  |-----------------------|-----------------------|
7 |  ON INITIATION, SPECIFIES THE WORD COUNT (>0) |QWBCT
  |  OR BYTE COUNT (<0).  AT COMPLETION OF THE    |
  |  REQUEST THIS LOCATION CONTAINS THE ACTUAL    |
  |  TRANSMISSION COUNT IN THE SAME UNITS (BYTES  |
  |  OR WORDS) AS IN THE REQUEST.                 |
  |-----------------------------------------------|
10|  P1 - PARAMETER 1 (USUALLY HIGH ORDER OF      |QPAR1
  |  CURRENT LOGICAL DISC ADDRESS [CLDA1])        |
  |-----------------------------------------------|
11|  P2 - PARAMETER 2 (USUALLY LOW ORDER OF       |QPAR2
  |  CURRENT LOGICAL DISC ADDRESS [CLDA2])        |
  |-----------------------|-------------|---------|
12|                       |  QUALIFIER  | STATUS  |QSTAT
  |-----------------------|-------------|---------|
13|  PCB                                          |QPCB
  |-----------------------------------------------|
14| SYSBASE RELATIVE INDX OF PREVIOUS REQ IN QUEUE|QPREVREQP
  |-----------------------------------------------|
15|  SYSBASE RELATIVE INDX OF NEXT REQ IN QUEUE   |QNEXTREQP
  |-----------------------------------------------|
16|                                               |QSEGIDENT
  |-  SEGIDENTIFIER (IF SEG TRANSFER)           --|
17|                                               |
  |-----------------------------------------------|
20|DISPLACEMENT OF READ OR WRITE FROM SEG BASE(MM)|QSEGDISP
  |-----------------------------------------------|
```


QFLAG - Request dependent flags

Bit 0 ABORT - Request has been aborted externally.
Bit 1 MAREQ - Request is for a segment transfer.
Bit 2 DIAG - This is a request from the diagnostic subsystem.
Bit 3 SBUF - Target is an index relative to the SBUF Table of the data buffer.
Bit 4 IOWAKE - Wake caller on completion of request.
Bit 5 BLOCKED - Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Implies IOWAKE.
Bit 6 COMPLETED - The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7 DATAFRZN - Data segment has been present and is frozen.
Bit 8 MAMERRORD - An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9 PREQUEUED - Request is queued into disc's request queue.
Bit 10 SFAIL - Delayed failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11 PFAIL - The request was aborted because of a system power failure.
Bit 12 CURREQ - Request is device's current request.
Bit 13 DISABLED - Request is disabled.
Bit 14 DISATMPT - Attempt to disable this request.
Bit 15 MSGDONE - A message request reply has completed.

QLDEV.QLDEVN - Logical Device Number.

QMISC - Driver request dependent flags and counters.

CHAN'ERR'FLG - Channel error retry flag.
RSTAT'FAIL'FLG - Request status failed flag.
OPER'REQ'FLG - Operator requested release flag.
IN'FAULT'FLG - Internal maintenance fault flag.
STAT'RTRY'FLG - Status error single retry flag.
RTRANS'FLG - Retransmit required flag.
LOAD'FLG - Media load flag.
SYS'PFAIL'FLG - System powerfail flag.

WAITCODE - Indicates type of wait:

0 - New request.
1 - Completion wait.
2 - Not ready wait.
3 - Release/release deny wait.
4 - IOQ defer wait.
5 - DSCT read wait.
6 - DSCT write wait.
7 - Synchronization wait.

QDSTN - If system buffer is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for NOWAIT I/O and NOBUFF).

QADDR - Offset in data segment or system buffer table to target data buffer.

QFUNC - Function code and qualifiers as specified by driver.

QSTAT - PCB number and request completion status.

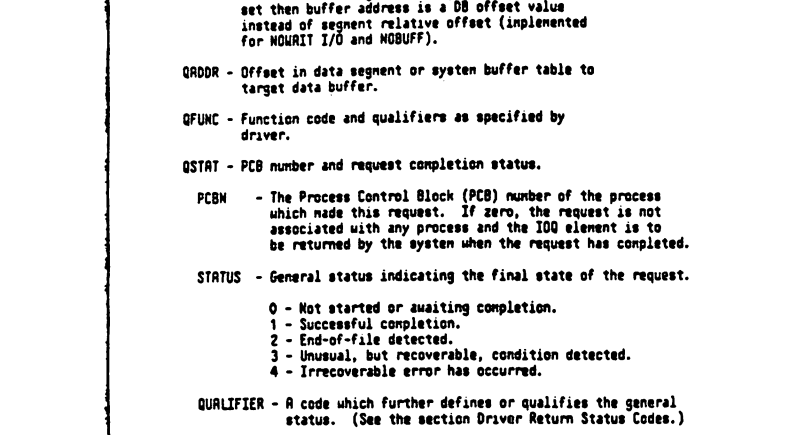
PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.

STATUS - General status indicating the final state of the request.

0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.

QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes.)

INP I/O Queue Element (IOQ)



INP IOQ Field Definitions

QFLAG - Flags and Control Information.

.ABORT - If set, then request has been aborted.

.DIAG - Diagnostic Flag. Not used.

.SYSBUFR - System Buffer Flag. Not used.

.IOWAKE - Wake caller on completion of request.

.BLOCKED - Blocked I/O. Caller is waited in ATTACHIO until the request is completed. Implies wake.

.COMPLETED - Request has been completed and caller awoken (if specified) and request is no longer known to the Driver.

.DATAFRZN - If set, the target data segment is frozen in memory. Set by MRM when a delayed make present request is successfully completed.

.MAMERRD - A MRM error has occurred in trying to make present and freeze the target data segment.

.READWRITE - If set, then this request allows data to be received after data is sent. The read target buffer offset is in QPAR1 and the read target buffer length is in QPAR2.

.HELD - If set, processing of this request has been suspended because INP did not have buffer space available.

.WORDCOUNT - If set, QWBCT specified words, else QWBCT specified bytes.

.PREEMPT - Preempt Code. Not used.

.TIME - If set, a software timeout is started when the request initiation message is sent to INP and the Request Completion message must be received before the timeout expires.

.ABORTER - If set, this is a request to abort another request.

QLINK - SYSDB relative pointer to the next new IOQ element.

QLDEV - Holds Logical Device Number and Current Queue Index.

.OLDEVN - Logical Device Number of Controller.

QMISC - Miscellaneous parameter. Use varies with Function Code. See INP FUNCTIONS for specific meaning.

QDSTN - DST Number and Request State.

.DBFLAG - If set, QADDR is the offset from DB to the target buffer, otherwise QADDR is the offset from the DST base.

QADDR - Offset to target data area from data segment base or DB.

QFUNC - Error Code and Function.

.QUEUE - DIT relative index to head of queue holding this requests.
0 - Input Queue.
9 - Ready Queue.
11 - Active Queue.
13 - Waited Queue.

.SERVICE - Service code. This field controls the operations to be done for this request and its disposition on completion.

0 - Send message only, no data.
1 - Send message and data.
2 - Move data from trace write to trace read buffer.
3 - Move Logical Driver Status Block to target buffer.
4 - This is a request to abort another request.
5 - Message has been sent to INP.
6 - Receive data from INP.
7 - Issue a power on reset.
8 - Complete request when IOSTATE is inactive.
9 - Soft Abort pending on this request.
10 - Send data requested with Soft Abort pending.
11 - No service currently required for this request.

.FUNCTION - Function Code as specified by driver.

QWBCT - Word or byte count. May also be used to return information certain functions. On initiation, it specifies a word count positive or a byte count if negative. It is converted to a count during preprocessing of the request with the sense kept in the flag WORDCOUNT. At completion, the actual transmission count is returned in this word with the same sense as the original specification.

QPAR1 - Parameter one as defined by the driver. When a request has been completed and data is to be received, the word contains the byte count of the data to be received.

QPAR2 - Parameter two as defined by the driver.

QSTAT - Caller PCB Number and request completion status.

.ERRORCODE - The Irrecoverable Error Code as defined in CS ERS.

.LS - Line State. If set, the line is connected. This field is valid only for read and write completions.

.WR - If set, this was a write request completion.

.CSTATUS - Encoded Completion Status.
1 - Successful Completion.
2 - End of Transmission.
3 - Irrecoverable Error Completion.
4 - Unrecovered Recoverable Error Completion.
5 - Catastrophic Controller Error.

QPCBN - PCB Number of the originator of this request. If zero, this IOQ element is returned by the Logical Driver when the request is completed.

CS 80 Integrated Cartridge Tape Request

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MNEMONIC
0	REQUEST DEPENDENT FLAGS (SEE BELOW)																QFLAG
1	REQUEST URGENCY CLASS																QURGCLASS
2	LOGICAL DEVICE NUMBER																QLDEV
3	CHANF	RS	OP	IM	RETRY				LF	SP	WAITCODE						QMISC
4	S	DST (IF PROCESS DISC I/O) OR DST (IF SEGMENT TRANSFER) [S=STACK]															QDSCTN
5	OFFSET IN THE DATA SEG (IF PROCESS DISC I/O) OR ADDRESS IN BANK (IF SEGMENT TRANSFER)																QADDR
6	UNIT #								FUNCTION CODE FOR THIS REQUEST.								QFUNC
7	ON INITIATION, SPECIFIES THE WORD COUNT (>0) OR BYTE COUNT (<0). AT COMPLETION OF THE REQUEST THIS LOCATION CONTAINS THE ACTUAL TRANSMISSION COUNT IN THE SAME UNITS (BYTES OR WORDS) AS IN THE REQUEST.																QWBCT
10	P1 - PARAMETER 1 (USUALLY HIGH ORDER OF CURRENT LOGICAL DISC ADDRESS [CLDA1])																QPAR1
11	P2 - PARAMETER 2 (USUALLY LOW ORDER OF CURRENT LOGICAL DISC ADDRESS [CLDA2])																QPAR2
12	PCBN								QUALIFIER					STATUS			QSTAT
13	SYSBASE RELATIVE INDX OF PREVIOUS REQ IN QUEUE																QPREVREQP
14	SYSBASE RELATIVE INDX OF NEXT REQ IN QUEUE																QNEXTREQP
15	SEGIDENTIFIER (IF SEGMENT TRANSFER																QSEGIDENT
16	DISPLACEMENT OF READ OR WRT FROM SEG BASE (MM)																QSEGDISP
17	S W R P																

QFLAG - Request dependent flags.

Bit 0	ABORT	- Request has been aborted externally.
Bit 1	MMREQ	- Request is for a segment transfer.
Bit 2	DIAG	- This is a request from the diagnostic subsystem.
Bit 3	SBUF	- Target is an index relative to the SBUF Table of the data buffer.
Bit 4	IOWAKE	- Wake caller on completion of request.
Bit 5	BLOCKED	- Blocked I/O. The caller is waited in ATTACHIO until the request is completed. Inplies IOWAKE.
Bit 6	COMPLETED	- The request has been completed and the caller awakened if he had requested (with IOWAKE).
Bit 7	DATAFRZN	- Data segment has been present and is frozen.
Bit 8	MAMERROR	- An error has occurred while MAM was trying to make the target data segment present and freeze it in memory.
Bit 9	PREQUEUED	- Request is queued into disc's request queue
Bit 10	SFAIL	- Delayed failure of SIO instruction. If a call to STARTIO resulted in the request being added to the channel queue, this bit indicates that the SIO instruction failed when the request was selected for execution.
Bit 11	PFAIL	- The request was aborted because of a system power failure.
Bit 12	CURREQ	- Request is device's current request.
Bit 13	DISABLED	- Request is disabled.
Bit 14	DISATMPT	- Attempt to disable this request.
Bit 15	MSGDONE	- A message request reply has completed.

QLDEV.QLDEVN - Logical Device Number.

QMISC - Driver request dependent flags and counters.

CHAN'ERR'FLG	- Channel error retry flag.
RSTAT'FAIL'FLG	- Request status failed flag.
OPER'REQ'FLG	- Operator requested release flag.
IN'FAULT'FLG	- Internal maintenance fault flag.
RETRY'COUNT	- Retry count area.
LOAD'FLG	- Media load flag.
SYS'PFAIL'FLG	- System powerfail flag.

WAITCODE - Indicates type of wait:

0 - New request.
1 - Completion wait.
2 - Not ready wait.
3 - Release/release deny wait.
4 - IOQ defer wait.
5 - DSCT read wait.
6 - DSCT write wait.
7 - Synchronization wait.

QDSTN - If system buffer is clear then this is the DST number of the target data segment. If bit 0 is set then buffer address is a DB offset value instead of segment relative offset (implemented for NOWAIT I/O and NOBUFF).

QADDR - Offset in data segment or system buffer table to target data buffer.

QFUNC - Function code and qualifiers as specified by driver.

QSTAT - PCB number and request completion status.

PCBN - The Process Control Block (PCB) number of the process which made this request. If zero, the request is not associated with any process and the IOQ element is to be returned by the system when the request has completed.

STATUS - General status indicating the final state of the request.

0 - Not started or awaiting completion.
1 - Successful completion.
2 - End-of-file detected.
3 - Unusual, but recoverable, condition detected.
4 - Irrecoverable error has occurred.

QUALIFIER - A code which further defines or qualifies the general status. (See the section Driver Return Status Codes earlier in this chapter.)

SBUF Table Layout

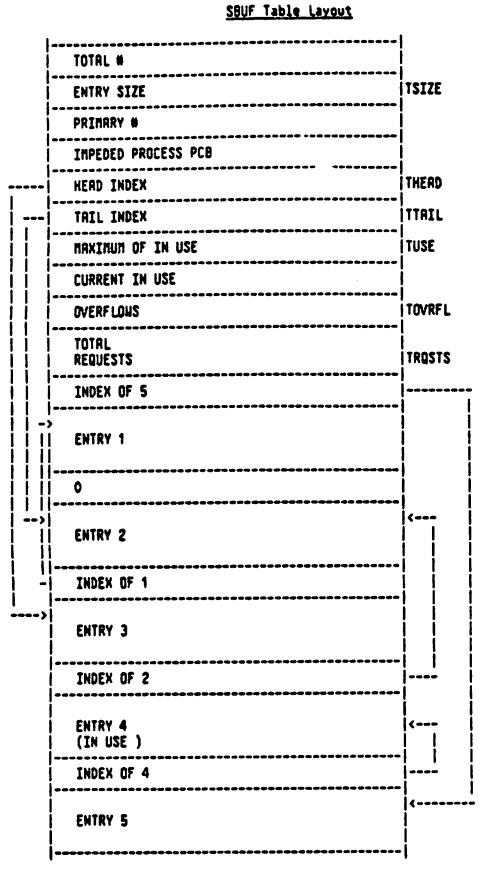


Table Element Allocation (SBUF)

The allocation of the elements in the IOQ terminal buffer (TBUF) and system buffer (SBUF) tables is of concern to the I/O system.

Free List Of Table Elements

These tables are in the form of a free-linked list of the free elements. For the SBUF's the -1 word of entry is the link to the next element. For the TBUF's, word zero is the link and word 1 is the link for the IOQ elements.

Each word has an 11-word header beginning at the base of the table . The first six words of the header are for managing the table and the second five are for monitoring table activity.

The entries follow the header at word eleven.

Element Allocation

Elements are obtained from the beginning of the free list, pointed to by the head and returned to the end of the free list pointed by the tail.

When the free list is empty, the head index is zero and the tail index is set to point at the head index.

The tables are divided into two areas: a primary and a secondary area. Most requests are obtained from the primary area. The secondary area is used only for critical requirements when the primary area is exhausted. These areas are logical areas determined by parameters in the header.

The utility of the core resident tables is seriously reduced if their use is not restricted to dynamic situations.

One of three responses must be specified to the routines which allocate elements from the I/O system tables:

1. Impede caller if primary is empty.
2. Get from primary area only.
3. Get from secondary area if primary area is empty.

Table Element Allocation (Cont.)

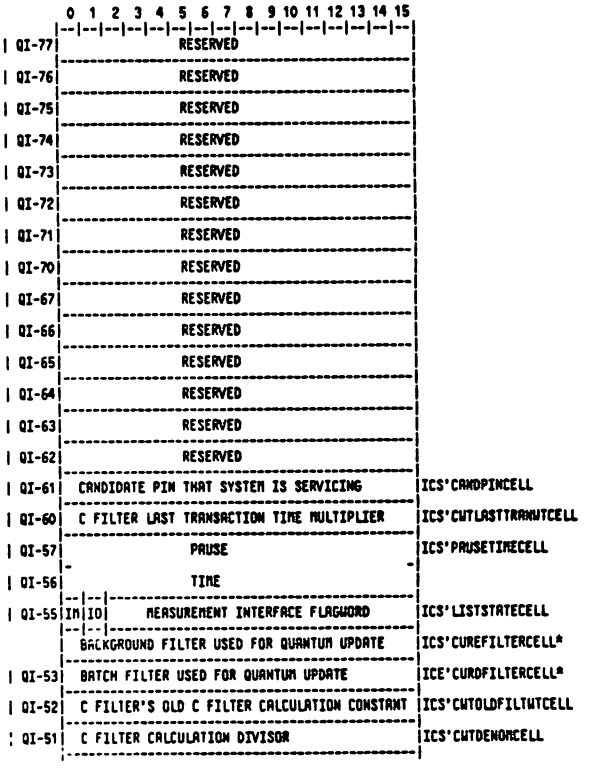
Request types 2 and 3 return an indication to the caller if the request could not be satisfied. The following table specifies the types of calls for element allocation and the action if an element is not activated.

BUFFER USER	CALL TYPE	FINAL ACTION
SBUF's		
File system	Impede	---
Ptape	Impede	---
Bad track	Primary	Forget request
IOQ's		
ATTACHIO (can be impeded)	Primary	Return IOQX-0
ATTACHIO (can be impeded)	Impede	---
SIODM (memory management)	Secondary	Sudden death
IOMESSAGE	Secondary	I/O error

HEADER DEFINITION:

Primary #	- Number of elements in the primary area.
Total #	- Total number of elements in the table.
Size	- Size in words of each element.
Impeded PCB	- If not zero then contains the PCB number of the first process waiting for an element in this table.
Head index	- Index of first free element.
Tail index	- Index of last free element.
In use	- Current number not in free list.
Overflows	- Number of requests made for an element.
Total requests	- Total number of elements requested.

Interrupt Control Stack (ICS) Format



Interrupt Control Stack (ICS) Format (Cont.)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
QI-50	TIME IN CPU BEFORE PRIORITY DROP	ICS'CURCFILTERCELL
QI-47	MINIMUM TIME IN CPU BEFORE PRIORITY DROP	ICS'MAXCFILTERCELL*
QI-46	MAXIMUM TIME IN CPU BEFORE PRIORITY DROP	ICS'MINCFILTERCELL*
QI-45	MAXIMUM PRIORITY (LOWEST VALUE) WHEN ON E QUEUE	ICS'ESCHEDBASECELL*
QI-44	MAXIMUM PRIORITY (LOWEST VALUE) WHEN ON D QUEUE	ISC'DSCHEDBASECELL*
QI-43	MAXIMUM PRIORITY (LOWEST VALUE) WHEN ON C QUEUE	ICS'CSCHEDBASECELL*
QI-42	MINIMUM PRIORITY (HIGHEST VALUE) WHEN ON E QUEUE	ICS'WORSTEPRICELL*
QI-41	MINIMUM PRIORITY (HIGHEST VALUE) WHEN ON D QUEUE	ICS'WORSTDPRICELL*
QI-40	MINIMUM PRIORITY (HIGHEST VALUE) WHEN ON C QUEUE	ISC'WORSTCPRICELL*
QI-37	SU	
QI-36	E QUEUE PRIORITY OSCILLATION ENABLED	
QI-35	D QUEUE PRIORITY OSCILLATION ENABLED	
QI-34	C QUEUE PRIORITY OSCILLATION ENABLED	
QI-33	BOUNDS CHECKING - XDS' BANK ADDRESS	ISC'XDSEGBNKCELL[64]
QI-32	BOUNDS CHECKING - XDS' BASE ADDRESS	ICS'XDSEGBASECELL[64]
QI-31	BOUNDS CHECKING - LAST VALID XDS' SEGMENT #	ISC'DSEGLIMCELL[64]
QI-30	AM | MODE | BNDS	ICS'PMBNDSTATCELL[64]
QI-27		
QI-26		
QI-25	PAUSE TIME	
QI-24	(MPE III ONLY)	

Interrupt Control Stack (ICS) Format (Cont.)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
QI-23	PAUSE CODE (MPE III ONLY)	
QI-22	DISABLE/ENABLE DISPATCHER TO RUN COUNTER	ICS'PDISCNTCELL**
QI-21	RESERVED	
QI-20	CURRENT PROCESS STACK DST NUMBER (FROM PCB)	ICS'STKDSTCELL
QI-17	PSEUDO INTERRUPT PROCESSOR'S STATUS WORD	ICS'PISTATUSCELL
QI-16	BASE ADDRESS OF PSEUDO INTERRUPT PROCESSOR	ICS'PIDELTAPCELL
QI-15		
QI-14		
QI-13	ABSOLUTE JOB CUTOFF TABLE ENTRY ADDRESS	ICS'JCUTCELL
QI-12	PCB RELATIVE ADDRESS FOR ENTRY OF CUR PROCESS	ICS'CURPCBTCELL
QI-11	CURRENT PROCESS' BASE ADDRESS TO ITS STACK	ICS'STKBASECELL
QI-10	CURRENT PROCESS' DB REL VALUE TO Z IN STACK	ICS'STKDBRELZCELL**
QI- 7	CURRENT PROCESS' DB REL VALUE TO DL IN STACK	ICS'STKDBRELDLCELL**
QI- 6	CURRENT PROCESS' DB REL VALUE TO S IN STACK	ICS'STKDBRELSCELL**
QI- 5	CURRENT PROCESS' BANK ADDRESS TO ITS STACK	ICS'STKBANKCELL**
QI- 4	CURRENT PROCESS' BASE ADDRESS TO DB IN STACK	ICS'ABSSTKDBCELL**
QI- 3	INITIAL STACK MARKER'S X REGISTER VALUE	
QI- 2	T | L | INITIAL STACK MARKER'S P REGISTER VALUE	
QI- 1	INITIAL STACK MARKER'S STATUS WORD	
QI- 0	P | INITIAL STACK MARKER'S Q VALUE (=0)	
QI+ 1	INITIAL STACK MARKER'S DB BANK ADDRESS	
QI+ 2	INITIAL STACK MARKER'S DB BASE ADDRESS	
QI+ 3	INTERRUPT PARAMETER	

* Tunable by the TUNE command.
** Known by the firmware.
[64] Series 64 only.

QI-45 MEASUREMENT INTERFACE word:
Bit 0 = In-Motion-In Flag (IM).
1 = DISC I/O flag bit (IO).
2-15 = Measurement Interface Word.

QI-31 SIMULATIONS word:
Bit 1 = 1 if to enable stack underflow simulations call by STACKUNDERFLOW in ININ.

QI-24 Privilege Mode Bounds Checking.
Bit 0 = Absolute Mode - DB and DB bank not matched (AM).

8-9 = Mode field (MODE).
= 0 if stack mode - DB = extended CPU register XRA120 and DB bank = extended CPU register XRB1200.
= 1 if low core mode - DB<=extended CPU register XRA122 and DB bank <=extended CPU register XRB122.
= 2 if xdseg mode - DB = extended CPU register XRA121 and DB bank = extended CPU register XRB121.

14-15 = Bounds check flag (BNDS).

= 0 if DB, Q, and S bounds enabled.
= 1 if DB bounds disabled, Q and S bounds disabled.
= 2 DB bounds enabled, Q and S bounds disabled.
= 3 DB, Q, and S bounds enabled.

QI- 2 Initial stack marker's P word.
Bit 0 = TRACE enabled flag bit (T).
1 = logically/physically mapped code segment (L).
2-15 = program location value.

QI- 0 Initial stack marker's Q word.
Bit 0 = 1 if there is a pending DSP that cannot be processed immediately (e.g., DISPATCHER was PDISABLED or on the ICS).
1-15 = 0 (indicating no previous stack marker).

QI+ 3 Interrupt Parameter word.
<1 if External Program Label parameter.
>0 if a parameter that is passed to internal interrupt handler.

ICS Global Cells With Initial Values

ICS'ABSSTKDBCELL - Absolute address of the currently running process' stack.

ICS'STKBANKCELL - Bank address for process' stack.

ICS'STKDBRELSCELL - Stack DB relative S.

ICS'STKDBRELDLCELL - Stack DB relative DL.

ICS'STKDBRELZCELL - Stack DB relative Z.

ICS'STKBASECELL - Absolute stack address.

ICS'CURPCBTCELL - PCB table relative pointer to word 0 of the running process' Process Control Block.

The above cells are to be initialized for the PROGENITOR.

ICS'STKDSTCELL - DST number for running process' stack.

ICS'JCUTCELL - The bank 0 absolute address of the JCUT (Job Cutoff) Table.

ICS'PIDELTAPCELL - PB relative address for the procedure PSEUDOINT (handles pseudo/soft interrupts)

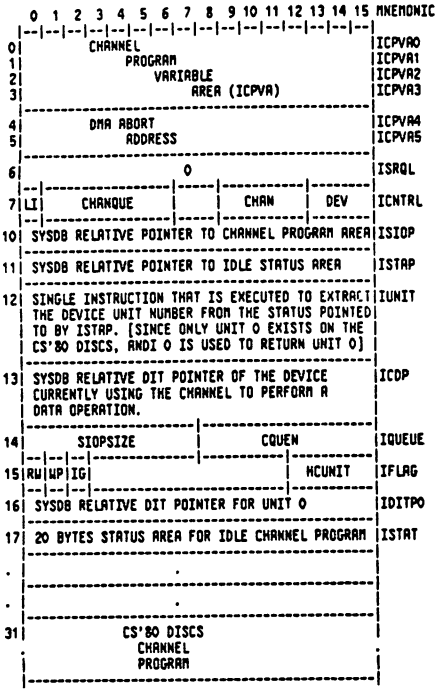
ICS'PISTATUSCELL - Status value for PSEUDOINT (X40000+CST#)

ICS'PDISCNTCELL - PSDB counter, initially 0

INITIAL sets the above as described.

CS 80 Disc Interrupt Linkage Table (ILT)

There is one ILT for each device controller configured on the system. A controller may support more than one unit, however the CS'80 disc driver will only concern itself with the single unit controller.



ICPVA0 - Channel Program Variable Area.

The first word is used by the channel program processor to store status information after I/O channel aborts. The next word is used by the driver to indicate if status should be examined for special conditions or errors. The other two words are not used.

ICPVA4 - DMA abort address.

If a DMA abort occurs, the absolute address where the abort occurred is stored in this area.

ICNTRL - Contains controller information.

LIM - If this bit is set, the controller is sharing a software channel resource in order to limit bandwidth.

CHANQUE - The software channel resource number.

CHAN - Channel number (four most significant bits of DRTN).

DEV - Device number (three least significant bits of DRTN).

IQUEUE - The channel program contains:

SIOPSIZE - (number of words + 1)/2 in the channel program area.

CQUEN - or a multi-unit controller this field contains the software controller resource number.

IFLAG -Controller and Channel Program state flags.

RUNWAIT -An Idle Channel Program should be started when there are no active requests to process.

WAITPROG -An Idle Channel Program has been started for this controller. This bit is reset by an interrupt.

IGNOREMI -An MIOP instruction has been issued against this controller but the channel program was not in a wait statement. Therefore, ignore the interrupt generated by the channel code when this program halts.

HCUNIT -Highest configured unit number for this controller.

ISTAT -20 bytes of status from the idle channel program.

CHAPTER 14 SPOOLING

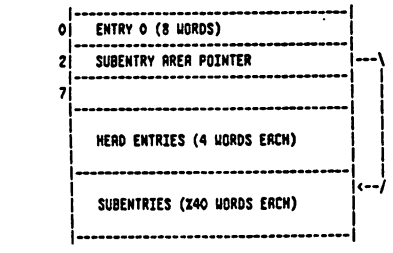
Input Device Directory/Output Device Directory

IDD/ODD (Common attributes referred to as XDD)

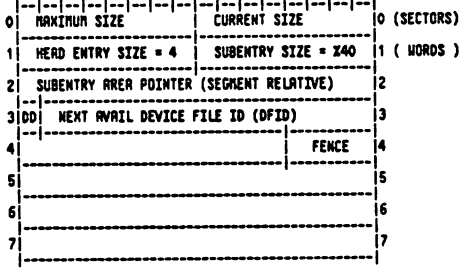
IDD: DST = 45 (X55) SIR = 3

ODD: DST = 46 (X56) SIR = 4

Overview of Table Structure



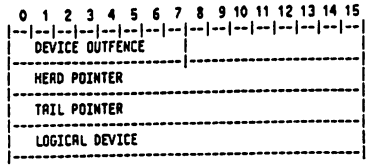
Entry 0 (Overall Table Definitions)



DD: 0 = This is the IDD,
1 = This is the ODD.

Fence: For spooled output devices (ODD), the system-wide out-fence. For spooled input devices (IDD), the JOBFENCE.

Typical Head Entry (4 Words)

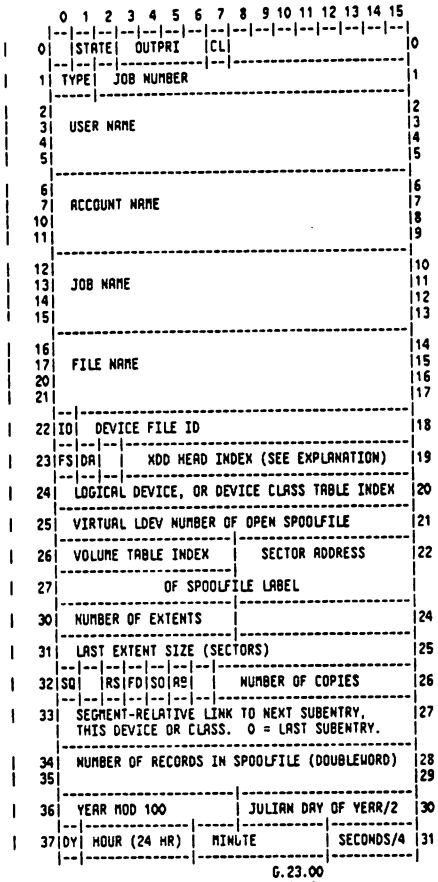


There are two types of head entries; a class entry and a logical device entry. There is only one class entry; it is the first head entry in the ODD. The IDD does not have a class entry; position is filled with zeros. All spoolfiles opened by class (e.g., LP, SLOWLP, EPOC, PP) are linked to this entry. There is one logical device entry for each real (physical, as opposed to virtual) device on the system. Output devices appear in the ODD, input devices in the IDD. RC/DC devices such as terminals appear in both directories.

Each head entry is linked to 0 or more subentries (a typical subentry is shown in the next table). A null chain (0 subentries) consists of head pointer = 0 and tail pointer = segment-relative address of the associated head pointer. If one or more subentries exists, the pointers are segment-relative addresses of the first word of the first and last subentries of the chain. Any intermediate subentries are linked through the subentries. The tail subentry always contains a 0-link.

The Device OUTFENCE and LDEV# fields are meaningless for the class entry. For logical device entries (non-0 Logical Device field), a non-0 Device OUTFENCE means that this OUTFENCE overrides the system-wide OUTFENCE in word 4 of entry 0, but only for this device.

Typical Subentry (X40 Words)



Note: Words 0-X24 are used in all subentries. Words X25-X37, although present in all subentries, are zero unless the subentry is for a spooled file (spoolfile).

Word 0 - STATE - State of subentry:
- 0 = Active
- 1 = Ready
- 2 = Open
- 3 = Locked

CL - 1 = Word X24 is a class index into the Device Class Table.
0 = Word X24 is the LDEV associated with this subentry.

Word 1 - TYPE - Describes which environment created the subentry:
- 0 = Session' (SPOOK)
- 1 = Session
- 2 = Job
- 3 = Job' (SPOOK)

Word X22 - IO - 1 = Output DFID
0 = Input DFID

Word X23 - FS - There are one or more forms message requests in the spoolfile.

DA - The spoolfile was created via a :DATA record (input spooling only).

HEAD INDEX - The (segment-relative address)/4 of the head entry with which this subentry is linked. Since head entries are four words long, this can be thought of as an index into the head entry portion of the XDD if you disallow values of 0 and 1.

Word X24 - See description of Word 0.

Word X25 - VDEV - LPDT index of virtual device LDEV. Simulates the properties of a real LDEV to the process which FOPENs a new (previously non-existing) file (State field (XDD(0).(1:2)) = 2 (Open)).

Word X26 - VTINX - The volume table index of the logical device in class SPOOL where the file label (first extent) of the spoolfile lives.

Word X32 - SQ - 1 = Squeeze (purge) spoolfile extents as the final copy is printed. Obsolete starting with C.00.20.
0 = Purge only when final copy printed.

RS - 1 = Restart job when warmstarting (input spooling only).

FD - 1 = There are non-standard forms on the device.

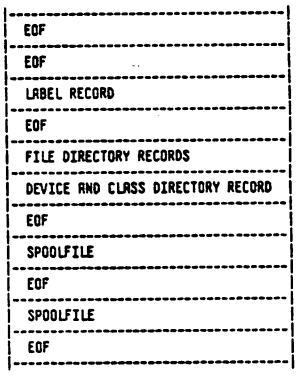
SO - Spaced Out bit. File System could not acquire a new extent when creating spoolfile.

AB - This is the $STDLIST of an aborted job.

Words X36-37 - Time stamp when spoolfile was made READY, or 0D if not closed properly. Julian day is 9 bits starting with Word X36, bit 8.

SPOOK Tape Format

The overall format of output tapes produced by the SPOOK "OUTPUT" command is shown below. The various components of the tape are then described in detail. The format described here is subject to change as MPE evolves. Also, there may be errors in SPOOK which would cause the actual tape format to differ from the one described here in some cases. All numeric information is in integer format unless otherwise specified.



Mechanisms for end-of-tape and tape switching are the same as for STORE/RESTORE tapes.

Label Record

Words 0-13:	SPOOLFILETAPE LABEL-HP3000
Word 23:	REEL NUMBER (FIRST REEL IS NUMBER)
Word 24:	DATE (FROM CALENDAR INTRINSIC)
Words 25&26:	TIME (FROM CLOCK INTRINSIC)
Words 30&31:	"MPEV" IF AN MPE V SPOOK TAPE

All other words are zero.

File Directory

The File Directory has one entry for each spoolfile on the tape. Each entry is 12 words, and entries are packed into as many 1020 word records as needed. The last record will be padded with zeros if necessary. The entry format is:

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Word 0:	0| DEVICE FILE ID NUMBER
Words 1-3:	0
Words 4-7:	USER NAME
Words 8-11:	ACCOUNT NAME

0 = 1 File is an output spoolfile

Device and Class Directory

The Device and Class Directory is contained in one 1024-word record. There is no EOF separating this record from the File Directory. This directory contains one entry for each logical device or device class linked to the spoolfiles on the tape. Also, there is an entry for each logical device in each class in the directory, whether or not that logical device was directly referenced by a spoolfile. The entries are packed into the tape record one after another in no particular order. The entry formats are shown below.

Logical Device Entry

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Word 0:	LOGICAL DEVICE NUMBER
Word 1:	DEVICE SUBTYPE | LENGTH OF ENTRY (3)
Word 2:	DEVICE TYPE

Device Class Entry

Word 0:	DEVICE CLASS NUMBER (NEGATED). THIS IS THE NUMBER OF THE ENTRY OF THIS DEVICE CLASS IN THE SYSTEM'S DEVICE CLASS TABLE
Word 1:	TOTAL NUMBER OF WORDS IN THIS ENTRY
Words 2 On:	THE ENTIRE CONTENTS OF THE DEVICE CLASS TABLE ENTRY FOR THIS DEVICE CLASS

Spoolfile Format

ODD ENTRY (32-WORD TAPE RECORD)
SPOOLFILE BLOCK ---> TWO SPOOLFILE BLOCKS PACKED SPOOLFILE BLOCK INTO ONE 1024-WORD TAPE RECORD
TWO SPOOLFILE BLOCKS
TWO SPOOLFILE BLOCKS

The first few spoolfile blocks have been modified to contain user label information from the spoolfile. This is explained under the User Labels Information section below.

Spoolfile Block Format

A spoolfile block is a 512-word block that contains variable length records in spooler format. Spoolfile records start at the first word of the block. The last record is followed by a -1 to indicate that no more records follow. The last two words of the block contain a doubleword which is the record number of the first record in the block.

Spoolfile Record Format

Word 0:	BYTE COUNT OF RECORD - 2
Word 1:	BYTE COUNT OF DATA PORTION OF RECORD. NOTE THAT THIS COUNT INCLUDES TRAILING BLANKS. HOWEVER, TRAILING BLANKS ARE TRUNCATED IN THE ACTUAL RECORD, SO THIS COUNT MAY BE MORE THAN THE NUMBER OF BYTES ACTUALLY PRESENT IN THE DATA PORTION.
Word 2:	FUNCTION CODE: 1 = FWRITE 2 = FCONTROL 3 = FOPEN 4 = FCLOSE X100 AND BEYOND = FDEVICECONTROL
Word 3:	P1 -- ATTACHIO PARAMETER
Word 4:	P2 -- ATTACHIO PARAMETER
Word< 5 on:	DATA PORTION OF RECORD

User Labels Information

Spoolfiles have a number of user labels with several kinds of information. These are:

1. Master: user label 0.
2. FOPEN entry catalog: user labels 1-10.
3. Circular queue for restart checkpointing: user labels 11-27.

Since older versions of MPE did not use user labels, a way was needed to incorporate them into the SPOOK tape format without losing forward and backward compatibility. The method used is to add several special spoolfile blocks to the beginning of the spoolfile on tape. Each of these blocks has exactly one FOPEN record at its beginning. This record is followed by a -1. Thus old versions of MPE will assume that the rest of the block is garbage. However, the rest of the block is actually used to contain user label information. The first two spoolfile blocks (i.e., the first tape record of the spoolfile proper) contain only the FOPEN records. The next five tape records actually contain user labels in addition to the FOPEN records. The user labels are packed three to a spoolfile block, six to a tape record. Each spoolfile block of 512 words has the following format:

Words 0-4:	FOPEN RECORD
	TO TERMINATE THE BLOCK
Words X200-X377:	USER LABEL
Words X400-X577:	USER LABEL
Words X600-X777:	USER LABEL

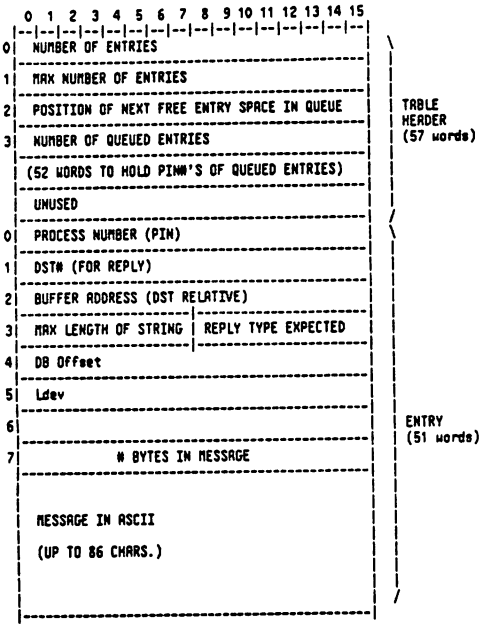
Following this special group of blocks, the spoolfile resumes a normal format. The special FOPEN records all have the number of user labels in P2.

It is often the case that some of the 27 user labels have not been initialized before the tape is written. In that case, their places will be filled with garbage. There is no easy way of detecting this except by careful inspection.

CHAPTER 15 UNIFIED COMMAND LANGUAGE (UNCL)

Reply Information Table (RIT)

DST X34; SIR X25



NOTE: Process Number = 0 means entry is empty
Reply Type = 0 for number (nun)
= 1 for yes or no (y/n)
= 2 for string (sxx)
= 3 for yes, no, or number
= 4 for string
TABLE SIZE = 2046 words
MAX # OF ACTIVE ENTRIES = 39
MAX # OF QUEUED ENTRIES = 52

Message System General Description

The message system consists of the following parts:

- Callable intrinsic GENMESSAGE
- Uncallable procedure GENMSG which is used by MPE
- System message catalog (CATALOG.PUB.SYS) and any number of user catalogs
- Program MAKECAT which builds message catalogs
- MESSAGE SIR X24
- MESSAGE SYSGLOB CELLS X371-373
- MESSAGE DATA SEGMENT

The message system is used by calling GENMESSAGE (or GENMSG) with a message number. The message system fetches the message from a message catalog, inserts parameters, then routes the message to a file or returns the message in a buffer to the caller.

A message catalog is a numbered editor-type file containing sets of messages. The sets serve to break a catalog into manageable portions. A message system user may call GENMESSAGE using either his own message catalog or using MPE's catalog (CATALOG.PUB.SYS).

After creating a message file, run the program MAKECAT in order to build a catalog that is readable by the message system. This file is still readable by the editor (it can be "texted") but it contains a directory (written as a user label).

In order to use the message catalog, the program must first open the message catalog, then call GENMESSAGE with the file number, set number and message number. (MPE users don't need to open the catalog, GENMSG automatically uses CATALOG.PUB.SYS.) The file must be opened with the &options "NOBUF" and "MULTI"-record access.

Message Catalog

Messages in the catalog can be of any length and can contain up to five parameters. Continuation of a message is indicated by "%" or "&" at the end of a line. The "%" symbol indicates that the message is continued and that a carriage return, line feed be issued the terminal. The "&" symbol indicates that the message is continued on the same line with no carriage return, line feed.

Parameters may be inserted into the message fetched from the catalog. The parameters are passed in the GENMESSAGE (or GENMSG) call and inserted wherever a "!" is found. For the system message catalog, the back slash (\) is also a parameter, reflecting a logical device number. The message is routed to the user associated with that logical device through the :ASSOCIATE command. Message sets are indicated by "$SET n" starting in column 1 (the rest of the line is treated as a comment). Maximum value for n is 63. Comments can be inserted in the catalog by placing "$" in column 1. Message numbers are positive integers, need not be contiguous, but must be in ascending order. After processing by the program MAKECAT, the catalog file contains records of 80 bytes, blocked 16, in 32 extents. (The system message catalog is only one extent, however.) The format of the message catalog is as follows:

```
$SET 1    SYSTEM MESSAGES
1 LDEV #! IN USE BY FILE SYSTEM
2 LDEV #! IN USE BY DIAGNOSTICS
3 LDEV IN USE, DOWN PENDING
5 IS "!" ON LDEV#! (Y/N)?
   .
   .
   .
$ MESSAGE 35 IS TWO LINES LONG, A PARAMETER STARTS THE
$ FIRST LINE AND THE SECOND LINE IS "HP32002"
35 !%
HP32002B.00.!
   .
   .
   .
276 LDEV # FOR "!" ON ! (NUM)!
$
$SET 2 CIERROR MESSAGES
82 STREAM FACILITY NOT ENABLED:  SEE OPERATOR.  (CIERR 82)
200 MORE THAN 30 PARAMETERS TO BUILD COMMAND.  (CIERR 200)
   .
   .
   .
204 FILE COMMAND REQUIRES AT LEAST TWO PARAMETERS, INCLUDING
THE
FORMAL NAME OF THE FILE  (CIERR 204)
   .
   .
   .
```


MAKECAT Program

The program MAKECAT.PUB.SYS is used to build message catalogs (and also HELP catalogs). The program's input file has the format designator INPUT, which must be used for all entry points. The program has the following entry points:

(no entry point) - Reads from input file and builds a temporary file (formal designator CATALOG). Also renames any old temporary CATALOG, CATnn, using an archival numbering scheme (i.e., CAT1, CAT2).

BUILD - (Must log on under MANAGER.SYS.) Reads from input file, build the system message catalog (formal designator CATALOG), and installs the message system. Existing catalog is renamed CATnnnn according to the same scheme as for no entry point (above). Installation of the message system means moving the directory contained in the user label of the catalog into a data segment. The DST number and the disc address of CATALOG are placed in system global area. The message system may be installed while the system is running.

DIR - (Must have PM or OP capability.) Installs the system message catalog (does not build a new one). Opens input file, moves the directory in the CATALOG into a data segment, and places the DST number and disc address of CATALOG in system global area. This may be done when the message system seems to be "broken", but the catalog is intact. (MPE is issuing "MISSING MSG. SET=mm. MSG=nn" at terminals and at the Console.) This may be done while the system is running.

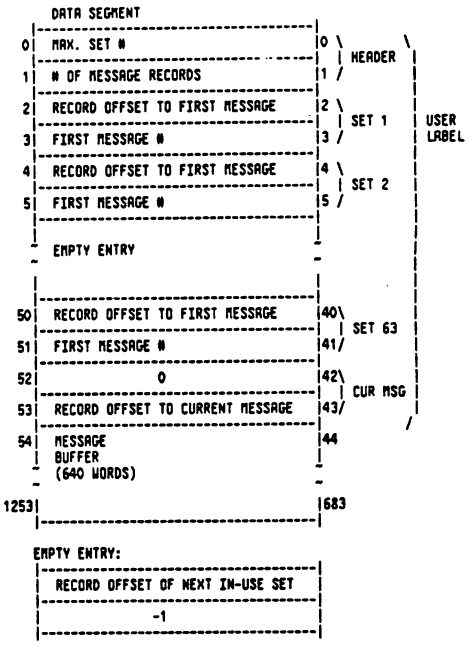
HELP - Used to build the HELP catalog. Reads input file and builds a HELP catalog (formal designator HELPCAT).

Message System CATALOG.PUB.SYS

$SET 1 - System messages
$SET 2 - CI errors and warnings messages
$SET 3 - Miscellaneous ABORT messages
$SET 4 - Program error abort messages
$SET 5 - Intrinsics abort messages
$SET 6 - Run-time abort messages
$SET 7 - CI general messages
$SET 8 - File System error messages
$SET 9 - Loader error messages
$SET 10 - CREATE error messages
$SET 11 - ACTIVATE error messages
$SET 12 - SUSPEND error messages
$SET 13 - MYCOMMAND error messages
$SET 14 - LOCKGLORIN error messages
$SET 15 - Private Volumes error messages
$SET 16 - DS/3000 messages
$SET 17 - HELP facility error messages
$SET 18 - Graphic devices messages
$SET 19 - Serial Disc error messages
$SET 20 - User Logging error messages
$SET 21 - Association Utility (ASOCTABL) messages
$SET 22 - 2680A Page Printer messages
$SET 25 - 2680A Page Printer error file messages
$SET 26 - Disc Free Space messages
$SET 27 - System Internal Error messages
$SET 28 - Ciper Device messages
$SET 29 - Store/Restore messages

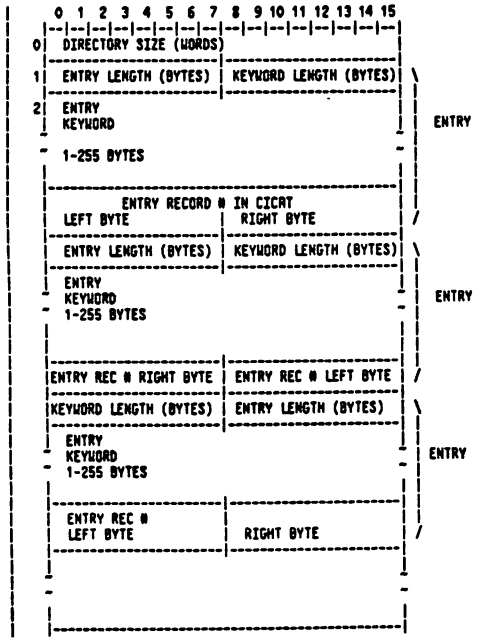
Message Set Directory

- DST # in SYSGLOB X373
- CAT DISC ADDR in SYSGLOB X371-372
- Created by running MAKECAT.PUB.SYS
- Kept in a Data Segment and in a User Label



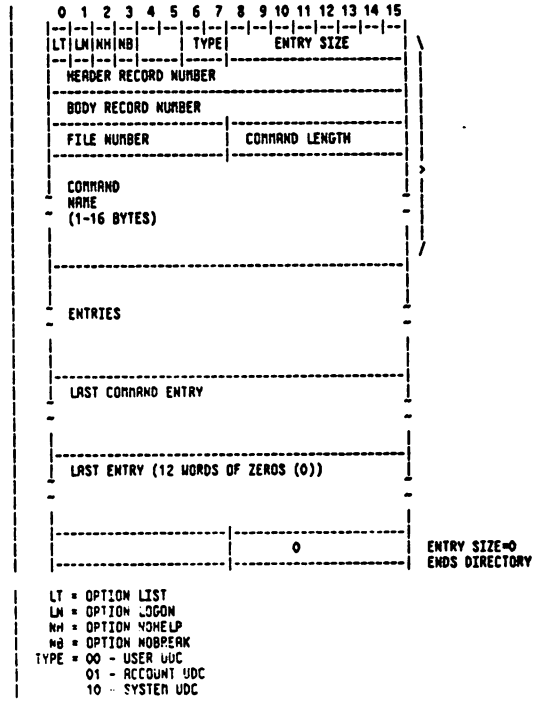
HELP Subsystem

- Kept as User Label
- Read onto User's Stack
- Uses SEARCH Intrinsic Format
- Variable entry size



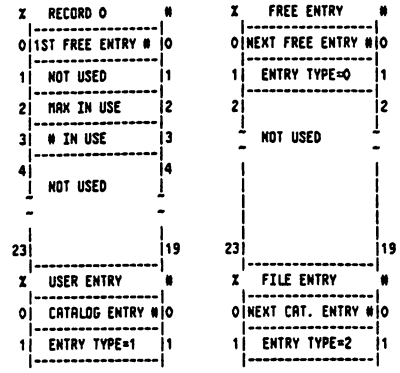
UDC Directory

- Extra Data Segment - DST # in DB+X255 of UMAIN Stack
- Built by INITUDC

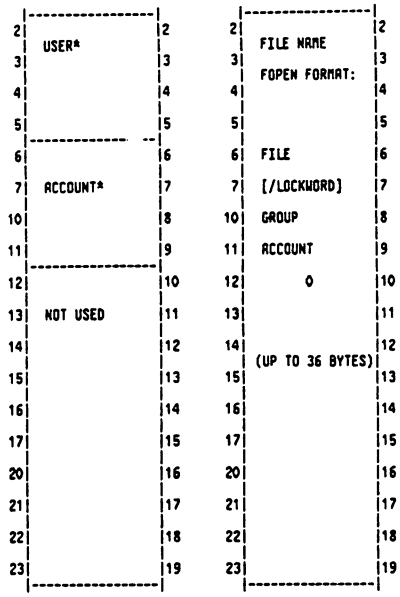


UDCs COMMAND.PUB.SYS

- Record Size = 20(10) Words, 6 Records/Block
- Keeps track of who is using what UDC Catalog
- Can be purged to disable UDCs
- Can be rebuilt to re-enable UDCs



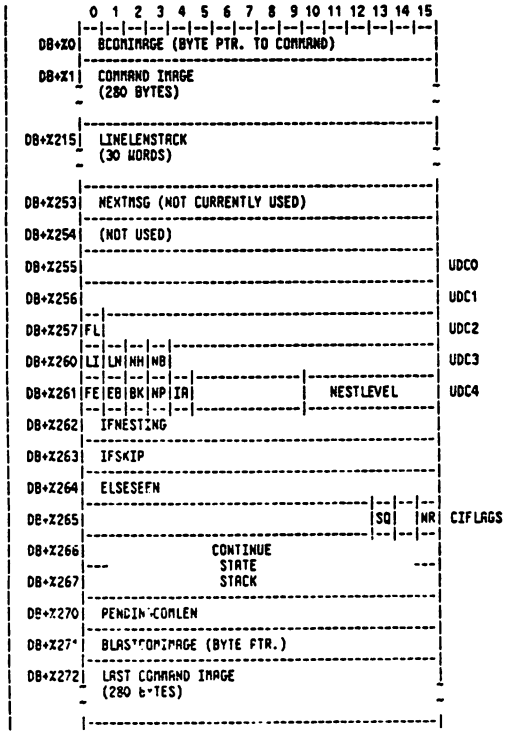
UDCs COMMAND.PUB.SYS (Cont.)



- If the User Field and the Account Field contain "@_____", this indicates System Level UDCs.

  If only the User Field contains @ and 7 spaces, this indicates Account Level UDCs.

CI Stack Definition



Field Definitions

BCOMIMAGE - Byte pointer to COMIMAGE (sometimes called WCOMIMAGE) in the CI stack.

COMMAND IMAGE - Command character string currently being executed.

LINELENSTACK - A CI command can span up to 30 input lines. This stack holds the length of each input line.

NEXTMSG - Used to be used to link messages together. No longer being used.

UDC0 - Holds the DST number of the UDC definitions.

UDC1 - Holds the old S register value for UDCs.

UDC2: (0:1) - FLUSHUDC, used by :SETCATALOG

UDC3: (0:1) - OPTION LIST = 1
(1:1) - OPTION LOGON = 1
(2:1) - OPTION NOHELP = 1
(3:1) - OPTION NOBREAK = 1

UDC4: (0:1) - UDC Fatal CI Error
(1:1) - UDC EXITBREAK
(2:1) - UDC BREAKDETECTED
(3:1) - UDC NOPRINT
(4:1) - UDC IMAGEADJUST
(10:6) - UDC NESTLEVEL

IFNESTING - Level of nesting of :IF commands.

IFSKIP - Whether the current commands are being skipped as the false part of a :IF command.

ELSESEEN - Level of the :ELSE commands.

CIFLAGS:(13:1)- Sequenced: line numbers at rear.
(15:1)--Not REDOable (last command).

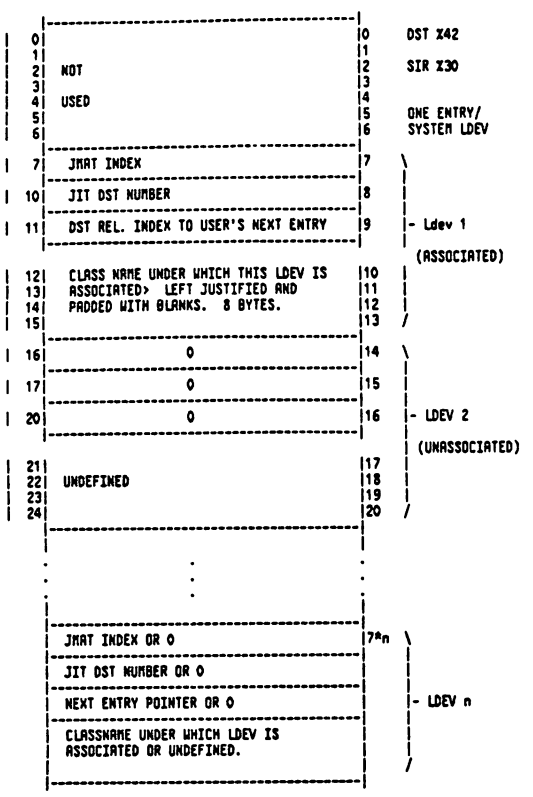
CONTINUE STATE STACK: History of the :CONTINUE commands:
= 0 - No :CONTINUE
= 1 - Just seen
= 2 - In effect

PENDINGCOMLEN - If <> 0, command is already in stack and this word is the command string length.

BLASTCOMIMAGE - Byte pointer to last command image.

LAST COMMAND IMAGE - When a command completes execution, the command string is copied here for use by the :REDO command.

Association DST Layout



Application Message Facility

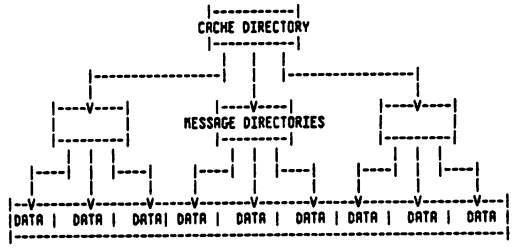
The Application Message Facility consists of two parts: GENCAT, the catalog maintenance facility, and the "CAT" intrinsics, through which the message catalogs are accessed. The "compiled" catalog, which GENCAT creates, contains an extensive directory at the front of the file which describes where every message in the catalog is located. When a message catalog is opened (via CATOPEN) part of this directory is read into an extra data segment which is created specifically for that purpose. This "caching" of the directory provides nearly direct access to the desired message.

These messages include message set number, message numbers, and record numbers placed or "cached" into 384 word message caches. The first set number and message number of each message cache is placed into a cache directory (set and message numbers must be ascending). A message is found by scanning first the cache directory, then the message cache searching for the desired set and message number. The retrieved message directory entry contains the record number in the catalog file of that message. Now, the catalog file can be read directly using the record number.

Internally, the two layer directory format is used by both the formatted application message catalog, and the message extra data segment created by the intrinsic CATOPEN (and used by CATREAD).

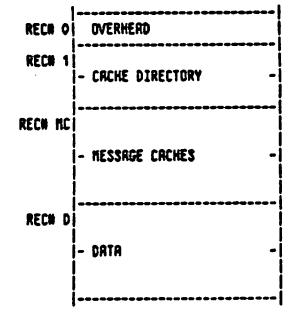
The catalog files created for MAKECAT and GENCAT may be used with the Application Message Facility. In most cases, applications will increase their performance in message routing and decrease the file space with formatted catalogs.

NLS Message Catalog/DST Overview



The maximum catalog size is 65536 sectors long. The largest set number is 255. The largest message number is 64766, while the smallest set and message number is 1.

Formatted Catalog File Structure

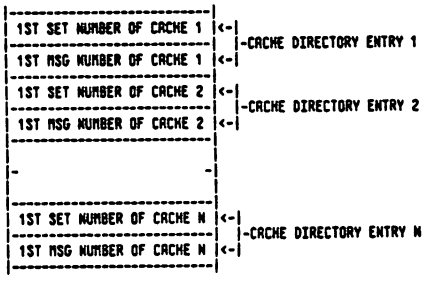


Where: MC = 2 + (2 * #message caches)/128
D = MC + (384 * #message caches)/128

Each physical record is one sector long (128 words). Each structure starts on a sector boundary.

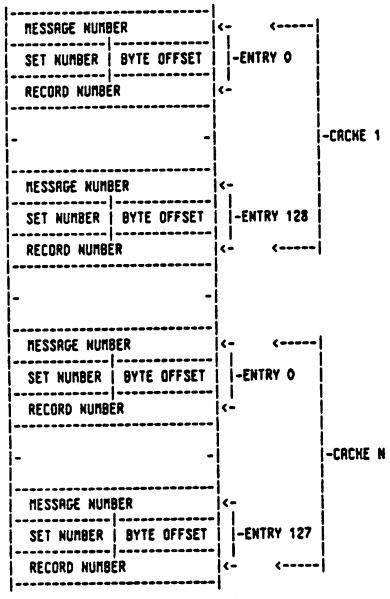
Cache Directory

Each entry in the cache directory is a two-word entry. There exists one cache directory entry for each 384-word message cache. The first word of the cache directory entry is the set number of the first entry in the associated message cache. The second word of the cache directory entry is the message number of the first entry in the associated message cache.



Message Cache Format

Each message cache is 384 words long (3 records). A message cache entry is 3 words long, 128 entries per message cache. Each entry contains the message number and set number of the message. The byte offset is the offset to the start of the message in the record specified by the record number. Entry 127 is a duplicate of the first entry in the next cache. This is to allow the total number of bytes of the message to be computed without reading the next message cache.



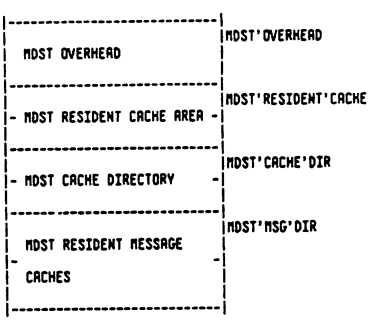
Data Format

The format of the messages is straightforward. It contains only the text of the message. It contains no comment records, message numbers or set numbers. All leading and trailing blanks are stripped from the message.

Message DST (MDST) Structure

A message extra data segment is allocated during a CATOPEN. The data segment number is kept by the application on the return from CATOPEN. The format of the data segment is similar of that of the formatted message catalog. The main difference is the addition of a table to track resident caches in the DST, and the catalog data is not kept in the DST.

Message DST Overview



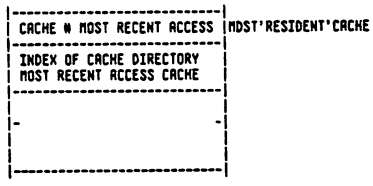
NOTE: A resident cache is a message cache copied from the formatted catalog. Resident caches are swapped in and out of the MDST and are used to determine the record number of the desired set and message.

Message DST Overhead

0	"M"	"D"	MDST'ID
1	"S"	"T"	
2	SIZE OF MDST (IN WORDS)		MDST'SIZE
3	CATALOG FILE NUMBER		MDST'CAT'FNUM
4	OFFSET TO RESIDENT CACHE		MDST'RESIDENT'CACHE
5	OFFSET TO CACHE DIRECTORY		MDST'CACHE'DIR
6	OFFSET TO MSG DIRECTORIES		MDST'MSG'DIR
7	CACHE DIRECTORY SIZE (WDS)		MDST'CDIR'SIZE
10	MSG DIRECTORY SIZE (WDS)		MDST'DIR'SIZE
11	MAX NUM OF RESIDENT CACHE		MDST'CACHE'MAX
12	RECNUM OF FIRST MSG DIR.		MDST'FIRSTDIR'RECNUM
13	RESERVED		
14	RESERVED		

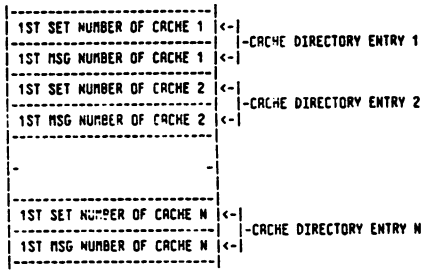
Message DST Resident Cache Area

The Resident Cache Area is a table of the message directory blocks currently stored in the MDST, together with their index. They are held in order from the most recently accessed at the top and the oldest on the bottom. The maximum number of caches held in the MDST at any one time is MDST'CACHE'MAX.



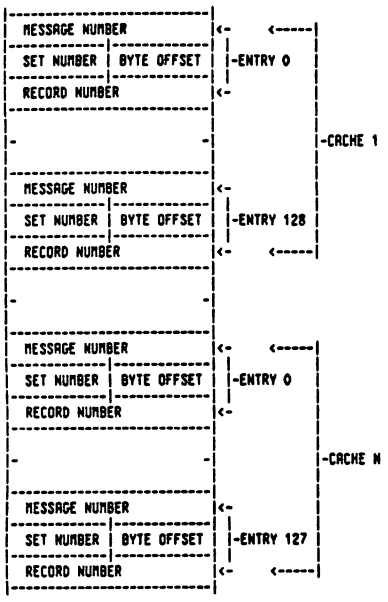
MDST Cache Directory

Each entry in the cache directory is a two-word entry. There exists one cache directory entry for each 384 word message cache. The first word of the cache directory entry is the set number of the first entry in the associated message cache. The second word of the cache directory entry is the message number of the first entry in the associated message cache.



MDST Message Cache Format

Each message cache is 384 words long (3 records). A message cache entry is 3 words long, 128 entries per message cache. Each entry contains the message number and set number of the message. The byte offset is the offset to the start of the message in the record specified by the record number. Entry 127 is a duplicate of the first entry in the next cache. This is to allow the total number of bytes of the message to be computed without reading the next message cache.



CHAPTER 16 SYSDUMP/INITIAL

CONFDATA File

Record 0 of CONFDATA File (CTAB0)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
0	CHECKSUM OF CTAB (REC 0)	0
1	CURRENT VERSION OF CTAB	1
2	STANDARD STACK SIZE	2
3	CORESIZE IN K WORDS	3
4	TERMINAL BOUND PRIORITY	4
5	NORMAL PRIORITY	5
6	CPU BOUND PRIORITY	6
7	# OF SECONDS TO LOGON	7
10	LOG FILE RECORD SIZE (SECTORS)	8
11	LOG FILE SIZE (RECORDS)	9
12		10
13	LOG BITS (ONLY 11 USED)	11
14		12
15	<<DEFINES WHAT IS BEING LOGGED>>	13
16		14
17		15
20	DEFAULT JOB/SESSION CPU TIME LIMIT	16
	-	
34	MAXIMUM OPEN SPOOL FILES	28
35		29
36	MAXIMUM # OF SPOOL FILES (KILO SECTORS)	30
37		31
40		32
41	# SECTORS PER SPOOL EXTENT	33

Record 1 of CONFDATA File (CTAB)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
0	# OF CST ENTRIES	0
1	# OF DST ENTRIES	1
2	# OF PCB ENTRIES	2
3	# OF IOQ ENTRIES	3
4	# OF TERMINAL BUFFERS	4
5	# OF CST EXTENSION ENTRIES	5
6	INTERRUPT CONTROL STACK SIZE (Q1 to Z1)	6
7	# UCOP REQUEST QUEUE ENTRIES	7
10	# BREAKPOINT ENTRIES	8
11	# TRL ENTRIES	9
12	# OF RINS	10
13	# GLOBAL RINS	11
14	# OF SYSTEM BUFFERS	12
15	# OF CONCURRENT PROGS	13
16	LOADER SEGMENT SIZE	14
	-	
24	SIZE OF VIRTUAL MEMORY	20
25	DIRECTORY SIZE (SECTORS)	21

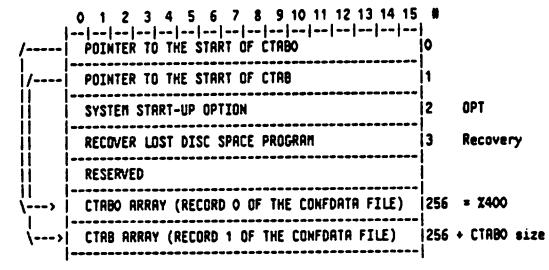
Record 1 of CONFDATA File (CTAB) (Cont.)

36	MAXIMUM CODE SEGMENT SIZE	30
37	MAXIMUM # OF CODE SEGMENTS/PROCESS	31
40	MAXIMUM STACK SIZE (MAXDATA)	32
41	MAXIMUM EXTRA DATA SEGMENT SIZE	33
42	MAXIMUM # OF EXTRA DATA SEGMENTS/PROCESS	34
	-	
50	MAXIMUM # RUNNING SESSIONS	40
51	MAXIMUM # OF RUNNING JOBS	41
52	# LOG PROCS	42
53	LOG ID's	43
54	# DISC REQUEST TABLE ENTRIES	44
55	# SPECIAL REQUEST TABLE ENTRIES	45
56	# PRIMARY MESSAGE TABLE ENTRIES	46
57	# SWAP TABLE ENTRIES	47
58	# SECONDARY MESSAGE TABLE ENTRIES	48

INITIAL/PROGEN Communication DST

The INITIAL/PROGEN Communication data segment is used by Initial to pass information to PROGEN. This segment is only temporary and not memory resident.

COMMDSTN = SYSGLOBEXT (X122) DST (SYSGLOBEXT (X122))



DESCRIPTIONS

OPT = Start-up option
- 0 = Warmstart
- 1 = Coolstart
- 2 = Coldstart
- 3 = Update
- 4 = Reload

Recovery = 1 If Recover Lost Disc Space
= 0 If Not Recover Lost Disc Space

CTAB & CTABO - See the descriptions of CONFDATA file in this chapter.

The microcode will store the CNTRL B command into (QI-11) equivalent to (ABS(5)-11) for the Series 37.

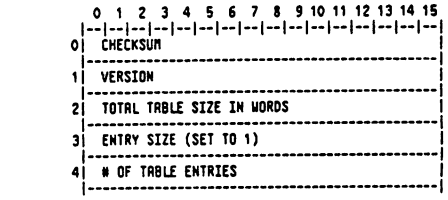
CNTRL B
- 0 = Start
- 1 = Warmstart
- 2 = Coolstart
- X10 = Load
- X11 = Update
- X12 = Coldstart
- X13 = Reload
- X14 = New
- X20 = Dump

Starttype = ABS (ABS (5)-11)

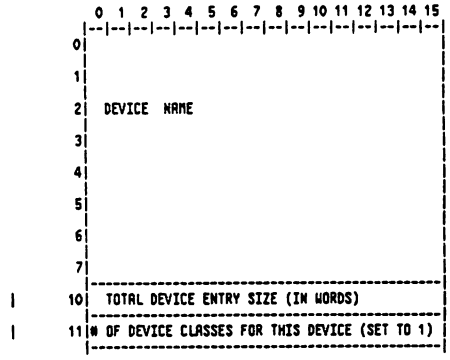
DEFDATA Table Lookup File

This file contains the default information for HP-supported devices. This file, DEFDATA.PUB.SYS, is available to Sysdump and Initial and eliminates the necessity for looking up default information every time a device is added to the system. Despite its name, DEFDATA.PUB.SYS in not only a file, but a table in the Coldload Information Table. It is not easily modified. Therefore, it is recommended that the file be left alone; if any user is unhappy with the defaults, they can be overridden during the Sysdump or Initial dialogues.

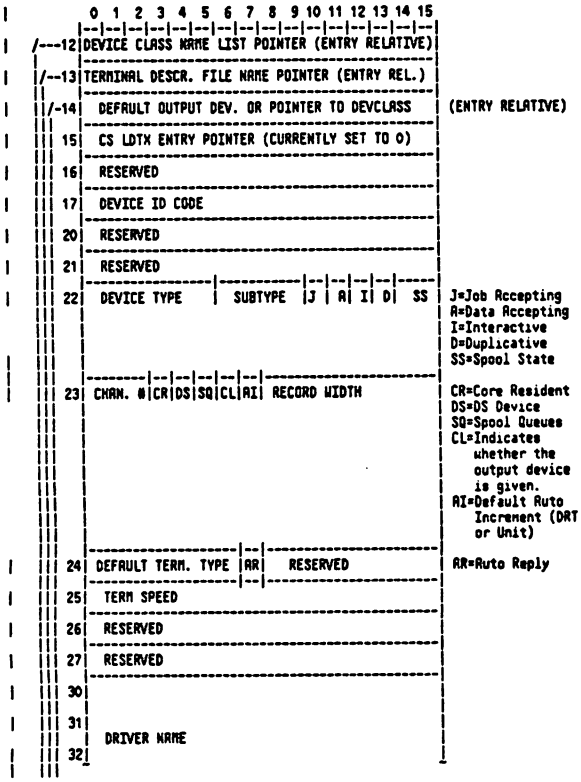
DEFDATA Table Lookup File Header Format



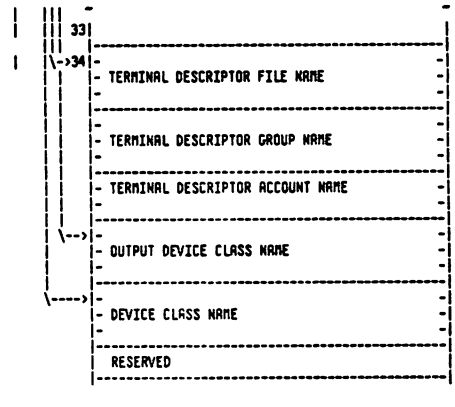
DEFDATA Table Lookup File Entry Format



DEFDATA Table Lookup File Entry Format (Cont.)

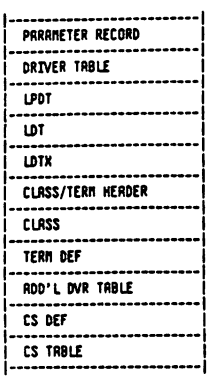


DEFDATA Table Lookup File Entry Format (Cont.)

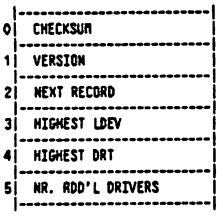


DEVDATA.PUB.SYS

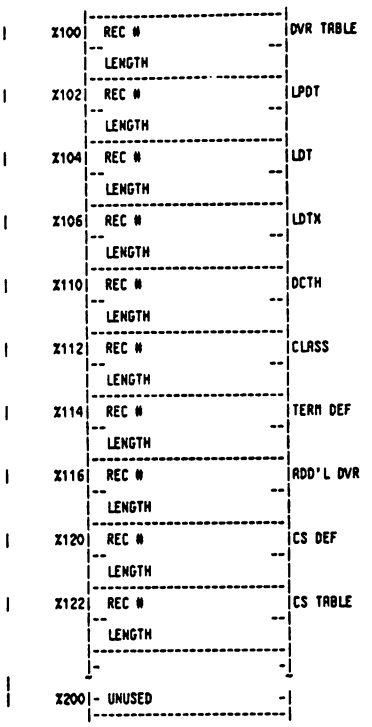
Overview



Parameter Record

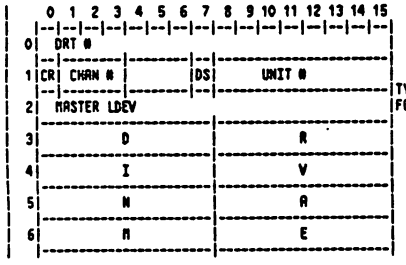


Parameter Record (Cont.)



Driver Table

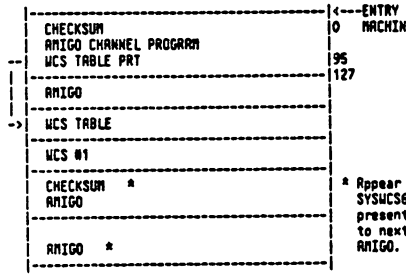
The Driver Table consists of 7 word entries, in correspondence to the LDEV entries, up to the highest LDEV used, entry zero is a dummy entry.



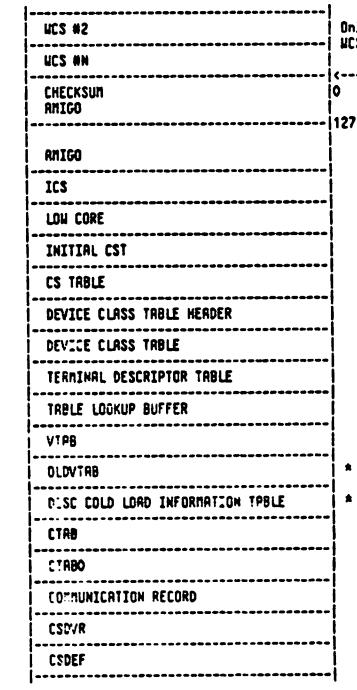
DS	DS DEVICE (if set DRT is zero)
CR	CORE RESIDENT
CHAN #	CHANNEL #
MASTER LDEV	LDEV of device which this DS device is linked to.

Words 3-7 contain the driver name.

SYSDUMP Format



SYSDUMP Format (Cont.)



SYSDUMP Format (Cont.)

INITIAL'S DB AREA	
STACK MARKER	
DRIVER TABLE	
LPDT	
LDT	
LDTX	
INITIAL'S SEGMENTS	
RIN TABLE	*
LOGGING IDENTIFIER TABLE	*
DIRECTORY HEADER	*
DIRECTORY	*
EOF	
SYSTEM PROGRAMS, SL, NON-STD. DRIVERS	
EOF	
STORE/RESTORE HEADER	
EOF	
STORE/RESTORE DIRECTORY	*
EOF	
USER FILES (SEPARATED BY "EOF'S"	*
STORE/RESTORE TRAILER	
EOF	
EOF	
EOF	

* NOT DUMPED IF DATE = CARRIAGE RETURN

Note: On disc, READ-SIO-PROGRAM kept in Disc Label.

WCS Table Format

0	# RECORDS TO WCS * # RECORDS OF WCS # RECORDS AFTER WCS WCS RECORD SIZE ON TAPE	0
1		1
2		2
3		3
4		4
X45		37

* If SYSWCS64 is present, #WCS records following =0.
If SYSWCS64 is not present, the preceding entry is repeated.

Series 6x/70 WCS Table Format

One entry (Entry 4) is used by Series 64, 68, and 70.

128 WORD HEADER	SLOW WCS	FAST WCS

0	MICROCODE VERSION (8 BYTES ASCII)
3	
4	# OF WCS LOCATIONS (64 BIT WORDS)
5	
6	# OF LUT LOCATIONS (32 BIT WORDS)
7	
10	SLOW WCS CHECKSUM
11	FASTWCS CHECKSUM

Series 37, 37XP and 37 Micro WCS Table Format

Three entries (Entries 5, 6, and 7) used by Series 37, 37XP and 37 Micro.

128 WORD HEADER	WCS	LUT

0	MICROCODE VERSION (8 BYTES ASCII)
3	
4	# OF WCS LOCATIONS (64 BIT WORDS)
5	
6	# OF LUT LOCATIONS (32 BIT WORDS)
7	
10	WCS CHECKSUM
11	LUT CHECKSUM

Store Tape Format

First Volume

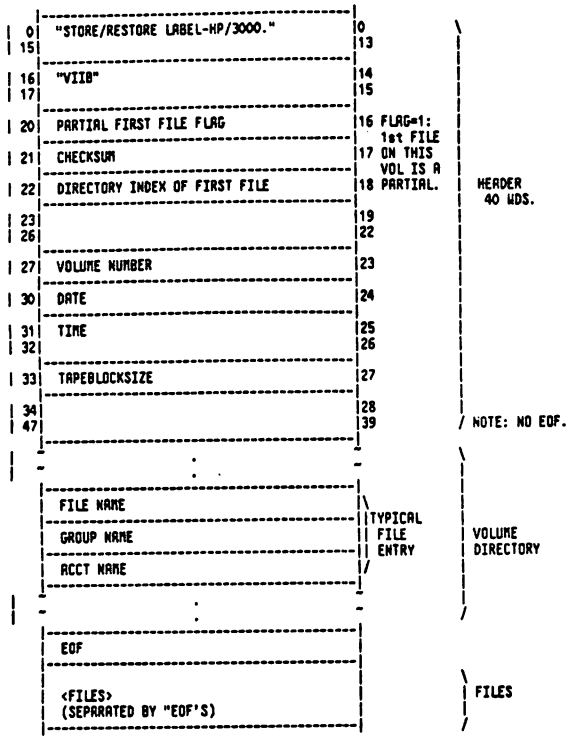
	EOF	
	EOF	
0	"STORE/RESTORE LABEL-HP/3000."	0
15		13
16	"VIIB"	14
17		15
20	PARTIAL FIRST FILE FLAG	16

First Volume (Cont.)

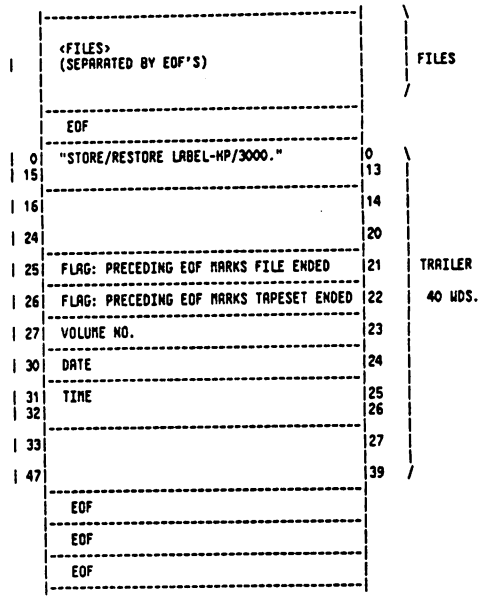
21	CHECKSUM	17	HEADER 40 WORDS
22	DIRECTORY INDEX OF FIRST FILE	18	
23		19	
	~	~	
24		22	
27	VOLUME NUMBER	23	
30	DATE	24	DATE: 0:7 last 2 digits of year 7:9 Julian date
31	TIME	25	
32		26	
33	TAPEBLOCKSIZE (#WORDS/BLOCK;DEF=4096)	27	TIME: 25.(0:8) hours (8:8) minutes 26.(0:8) seconds (8:8) .1 secs.
34		28	
~		~	
47		39	

EOF	
~ . ~	
FILE NAME	TYP FILE ENTRY (12 WDS.)
GROUP NAME	
ACCT. NAME	
~ . ~	VOLUME DIRECTORY: # ENTRIES DETERMINED BY TAPEBLOCK-SIZE
EOF	
FILES (SEPARATED BY "EOF'S")	FILES

Subsequent Volumes



End of Volume



CHAPTER 17 MISCELLANEOUS

Labeled Tape Subsystem

The MPE labeled tape subsystem permits convenient access to tapes labeled to either ANSI or IBM standards. It operates as a set of subprocedures to the file system. A labeled tape consists of one or more logical files. Each logical file consists of three physical files, i.e., tape areas delimited by tape marks. The first physical file contains header labels, the second contains the data, and the third contains trailer labels which are (except for minor differences) copies of the header labels. The tape mark following trailer labels will be followed either by header labels for the next file, or by another tape mark if there is no next file. Labels are 80 bytes long, and conventionally are identified by their first four characters (three letters and a digit) and contain information as follows (CP := character position; L:= length):

VOL1: Present only on the first file of a volume, the volume label contains the volume identifier, which is usually the number on the tape strap, and is thus not expected to be changed.

CP	FIELD NAME	L	CONTENT
1/3	LABEL IDENTIFIER	3	"VOL"
4	LABEL NUMBER	1	"1"
5/10	VOLUME IDENTIFIER	6	VOL ID
11	ACCESSIBILITY	1	"0" IF IBM, ELSE " "
12/79	NOT USED	62	BLANKS
80	LABEL-STANDARD VERSION	1	"1" IF HP ANSI ELSE " "

UVLn: User volume labels. May be present on tapes from foreign shops, but are not written by MPE. If encountered, they are ignored.

HDR1: First header label. Required for each file and specifies:

CP	FIELD NAME	L	CONTENT
1/3	LABEL IDENTIFIER	3	"HDR"
4	LABEL NUMBER	1	"1"
5/21	FILE IDENTIFIER	17	FILE NAME, IF TAPE WAS NOT WRITTEN BY MPE, ONLY THE FIRST EIGHT ARE SIGNIFICANT
22/27	VOLUME SET IDENTIFIER	6	NAMES THE VOLUME ON WHICH THE SET OF FILES BEGINS
28/31	REEL NUMBER	4	COUNTS THE REELS THAT CONTAIN THIS FILE (1 STARTS)
32/35	FILE SEQUENCE NUMBER	4	COUNTS THE FILES IN THE SET OF FILES (1 STARTS)
36/39	GENNUM	4	ALWAYS "0001"
40/42	VERSION	3	ALWAYS "00"
43/48	CREATION DATE	6	YEAR AND DAY WITHIN YEAR WHEN THE FILE WAS WRITTEN
49/53	EXPIRATION DATE	5	YEAR AND DAY WITHIN YEAR WHEN THE FILE MAY BE OVER-WRITTEN WITHOUT PERMISSION
54	ACCESSIBILITY	1	X230 IF LOCKWORD, "0" IF IBM
55/60	BLOCK COUNT	6	NUMBER OF BLOCKS IF IBM
61/73	SYSTEM CODE	13	"HP MPE 3000 "
74/80	NOT USED	7	BLANKS

HDR2: Second header label. Although defined by the standard, may be missing on foreign tapes; it contains:

CP	FIELD NAME	L	CONTENT
1/3	LABEL IDENTIFIER	3	"HDR"
4	LABEL NUMBER	1	"2"
5	RECORD FORMAT	1	"F" = FIXED "V" = VARIABLE "U" = UNDEFINED OTHERS TREATED AS UNDEFINED
6/10	BLOCK LENGTH	5	BLOCK LENGTH (IN CHARACTER FORMAT)
11/15	RECORD LENGTH	5	RECORD LENGTH (ADHERING TO TO MPE RULES) IN CHARACTERS
16/23	LOCKWORD	8	MPE FILE LOCKWORD
24/36	NOT USED	13	MPE WRITES BLANKS
37	RECORD TYPE	1	"A" = ASCII "B" = BINARY
38	CARRIAGE CONTROL	1	"C" = CONTROL " " = NO CONTROL
39	BLKSIZE=RECSIZE?	1	YES="A", NO="B"
40/49	NOT USED	10	BLANKS
50/51	BUFFER OFF	2	ALWAYS "00"
52/80	NOT USED	29	BLANKS

IBM has a slightly different format which is:

CP	FIELD NAME	L	CONTENT
1/3	LABEL IDENTIFIER	3	"HDR"
4	LABEL NUMBER	1	"2"
5	RECORD FORMAT	1	"F" = FIXED "V" = VARIABLE "U" = UNDEFINED OTHERS TREATED AS UNDEFINED
6/10	BLOCK LENGTH	5	BLOCK LENGTH (IN CHARACTER FORMAT)
11/15	RECORD LENGTH	5	RECORD LENGTH (ADHERING TO TO MPE RULES) IN CHARACTERS
16	NOT USED	1	BLANK
17	IBM POSITION	1	"0" = NO VOLUME SWITCH "1" = A SWITCH HAS OCCURRED
18/38	NOT USED	11	BLANKS
39	IBM BLOCK ATTRIBUTE	1	"B" = BLOCKED RECORDS "S" = SPANNED RECORDS "R" = BLOCKED AND SPANNED " " = NO BLOCKED OR SPANNED
40/80	NOT USED	41	BLANKS

User header labels: optional. Standard prescribes UHLn in the first four characters, but MPE doesn't care.

EOV1: End of Volume; used as first trailer label. Required if the logical file is continued onto another reel. Identical to HDR1, except contains the number of physical blocks of data in the data area.

CP	FIELD NAME	L	CONTENT
1/3	LABEL IDENTIFIER	3	"EOV"
4	LABEL NUMBER	1	"1"
5/54	SAME AS HDR1	50	
55/60	BLOCK COUNT	6	NUMBER OF DATA BLOCKS SINCE LAST BEGINNING OF FILE SECTION LABEL GROUP
61/80	SAME AS HDR1	20	

EOV2: Defined by the standard, but may be missing on foreign tapes. Follows EOV1; format same as HDR2.

EOF1: End of File; used as first trailer label. Required if this is the end of the logical file. Format same as EOV1.

EOF2: Same as EOV2 except used after EOF1.

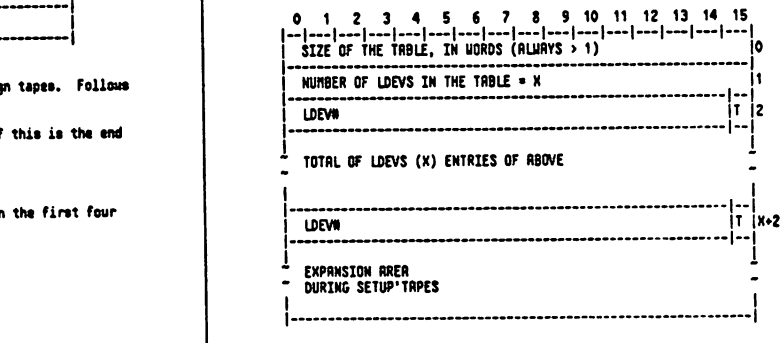
User trailer labels: optional. Standard prescribes UTLn in the first four characters, but MPE again doesn't care.

Tape Label Table

The tape label table is the private playground of the tape label subsystem. It consists of two parts: LDEV Control Blocks (LCBs) and Volume Control Blocks (VCBs). The LDEV area is set up at system initialization and contains one entry for each magnetic tape LDEV and serial disc device in the system. As is common in MPE, the first entry is a dummy which tells where the other things in the table are. The volume area contains one entry for each labeled tape volume requested or active on the system.

Although table entries are stored in an extra data segment, they are generally manipulated via local copies on the stack. The procedures GETLDEV and GETFNUM look for LDEV and volume entries as specified; they copy them to stack buffers and return the DST address for use in copying them back. POSTVTENT copies the entries back, and in the case of a new volume entry, allocates space for it in the volume section of the tape label table.

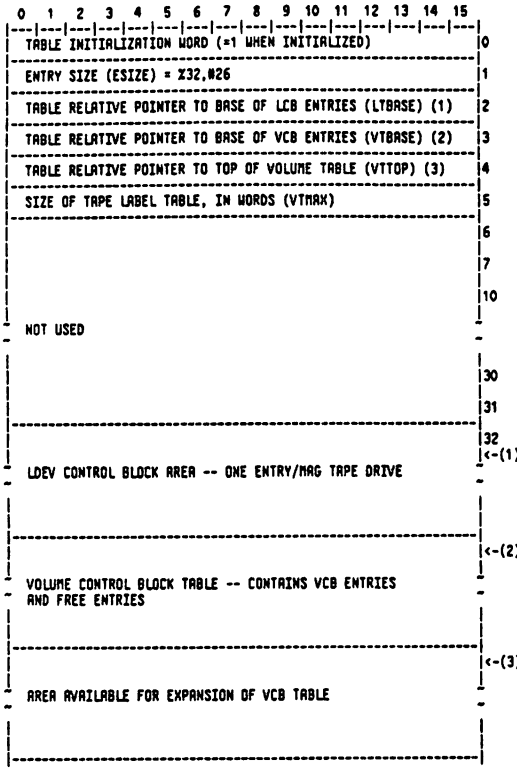
Initial will build the "uninitialized" TLT as follows:



T: 1 if Tape drive 0 if not Tape drive (i.e., serial disc)

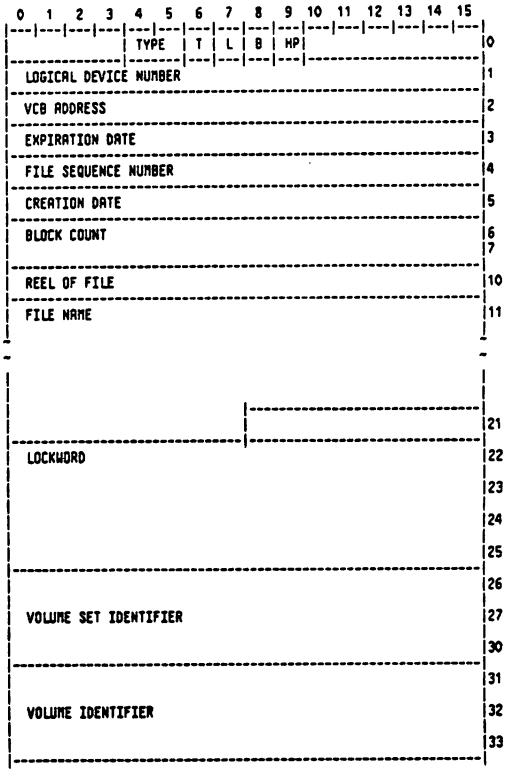
During PROGEN, SETUP'TAPES is called to initialize the table. The overall structure of the initialized TLT is:

TLTDST -- X32,#26 TLTSIR -- X47,#39



LCB Entry Format

The LCB entries have the following structure:

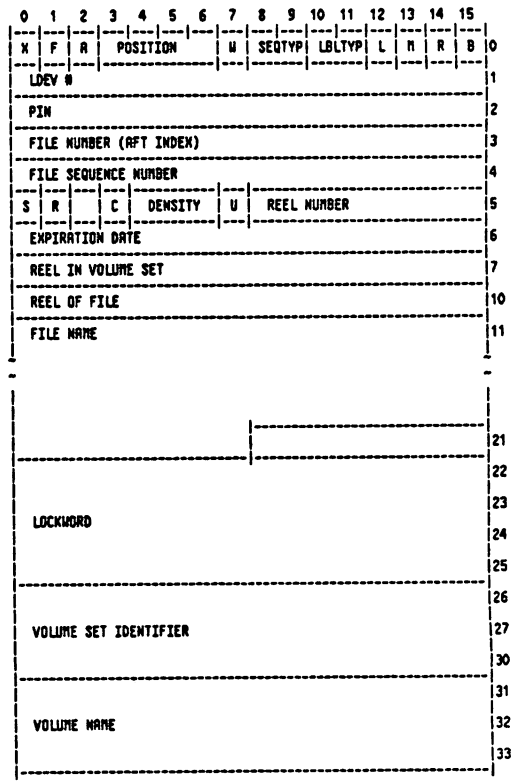


Type: 00 = No tape mounted
01 = Unlabeled
10 = ANSI
11 = IBM
L: 1 if file has lockword.
T: 1 if device is a tape drive.
B: 1 if tape is from Burroughs, which has incorrect block/record size in the HDR2 label. Code can be patched to correct the size.
HP: 1 if tape is Hewlett-Packard ANSI format.

VCB address: Pointer to VCB entry describing volume mounted on tape drive, only if linked. Otherwise, 0.

VCB Entry Format

The VCB format is:



X: All Files Expired
F: Flush bit - operator did REPLY <pin>,0.
A: APPEND access
Position: Gives head position within logical file.
0 = At load point (LDPNT)
1 = HDR1 label next (H1NX)
3 = After HDR2 label (AH2)
4 = After user header labels (AHU)
6 = Data next (DNX)
7 = After data (AD)
8 = EOF1/EOV1 label next (T1NX)
10 = After EOF2/EOV2 label (AT2)
11 = After user trailer labels (ATU)
W: Write access specified.
SeqTyp: File open sequencing type.
0 = Match filename
1 = NEXT
2 = ADDF
3 = Use file sequence number
LblTyp: As in LCB entry.
L: Linkwait - mark left by CREATETLTENT for LINKLABEL.
M: Mount wait - waiting for operator to mount tape on FOPEN.
R: Reel switch wait - waiting for next reel.
B: Busy bit - this entry is in use.

LDEV #: Logical device number of tape drive with this volume, only if linked. Otherwise, 0.

S: STORE tape.
R: REELSWITCH has been done. Used by STORE/RESTORE to handle STORE label and directory file.
D: Next file is directory. Used by STORE.
Density: volume set density. During a volume set open, contains the density requested by the user in FOPEN. Once the volume set is open, contains the actual density of the volume set. Only valid for tapes on variable density tape drives.
0 = Default density for volume set open
1 = 1600 BPI
2 = 6250 BPI
V: 1 if volume set is being opened. Reset after completion of FOPEN.
U: User logging warmstart recovery file access. (Set only during file open.)

Volume Recognition

Volume recognition is the responsibility of DEVREC, which reads the first record of a newly-mounted tape on an unowned drive and passes the record to AVREC. AVREC may see: VOL1 in the first 4 bytes, in ASCII, in which case the tape is ANSI; VOL1 in the first 4 bytes, in EBCDIC, in which case the tape is IBM; Anything else, in which case the tape is considered unlabeled.

If the tape is unlabeled, AVREC reports to DEVREC that no further action is required. If the tape is labeled, AVREC wants to see the first HDR1 label, so asks DEVREC to read another record. (Unfortunately, DEVREC cannot be stopped long enough for AVREC to do its own read.) When the HDR1 record is found, the volume entries can be searched to see if there is a pending request for this volume. If so, the waiting process is restarted.

If the system has been restarted with tapes mounted, there will not be interrupts to alert DEVREC. The procedure RECOGNIZE is called when needed to see if any such tapes exist.

Opening a File

FOPEN gets into the tape label code in three different places. The first is to call CREATETLTENT, which parses the string passed in the FORMSMSG parameter to identify the labeled tape file required. If there is no existing corresponding entry in the volume area, this is a volume set open, and a new volume entry is created. There may be an existing entry (if the tape was FOPENed and FCLOSEd with disposition 2 or 3), in which case there is an associated LDEV entry for the drive on which the tape was left mounted by the prior operation. In this case, the new information is stuffed into the existing volume entry. A bit (LINKWAIT) is left set to mark the entry for LINKLABEL.

The second entry is through LINKLABEL, which is called from ALLOCATE. At this time, it is necessary to identify the LDEV to be used for the tape. If no LDEV is associated, the LDEV entries are searched to see if the operator has already mounted the required tape. If so, the volume and LDEV entries are cross-tied and LINKLABEL is done. If the search turns up nothing suitable, the operator is requested to mount the appropriate tape. Then the procedure waits for either a REPLY or for AVREC to discover the appearance of a suitable tape and restart the process. If the operator enters a reply, it is validated.

The third entry is through POSITION, which is responsible for positioning the tape to the requested file. At the file, the HDR1 and HDR2 label are examined as required to determine the file characteristics.

Reading and Writing Files

All procedures which move tape go through the catchall procedure CHECKUL, which takes care of necessary labeled tape doings. The code insures that the sequence: header labels (including user labels), data, trailer labels (including user labels) is maintained. There is a separate CASE leg for each such procedure.

If an EOT reflective mark or an EOF in data is found, REELSWITCH is called (principally from the file system procedure IOMOVE) to call for the next reel, if any. If another reel is needed, the tape drive is set Unowned so that AVREC will be called to recognize the new tape when it is mounted. REELSWITCH returns to its caller when it is satisfied that an appropriate tape is mounted.

Closing Files

FCLOSE calls CHECKUL to handle writing EOF1 and EOF2, if needed, and resolving the tape position. If the disposition is 3, the tape is left positioned at the next file. If the disposition is 2, the tape is supposed to be left at the beginning of the current file, but the code does not presently provide for reel switching if the present file began on a prior reel.

At present, ensuing volumes of a multi-volume set must be mounted on the same drive as the first, mostly because neither the file system nor STORE/RESTORE was capable of dealing with LDEV changes in the middle of a file. REELSWITCH reports the LDEV being used, however, so that the capability of using a different LDEV can be added in the future.

Store/Restore

Complications ensue on labeled STORE/RESTORE tapes because there needs to be a file directory at or near the beginning of each tape of a multi-volume set; RESTORE uses this directory to determine whether the specified file(s) can exist on this tape. Because the reel switching process would otherwise be invisible to STORE/RESTORE, special bits (VCB'RSWDONE and VCB'WRITDIR) are kept to enable special intrinsics callable by STORE/RESTORE to report whether a directory needs to be written or is about to be encountered.

The special procedure NEXTTAPEFILE is used by STORE/RESTORE in lieu of doing a FCLOSE(,3) followed by an FOPEN to get to the next file. This permits cleaner handling of both REPLY 0 and Forward Space (logical) File over a Reel switch, as well as saving the time needed to tear down and reconstruct all the control blocks.

Miscellaneous

PVOLID is used by the SHOWDEV command processor (in SPOOLCOMS) to obtain the name of the volume on the specified drive without having to know the structure of the tape label table. For the same reason, TGETINFO is used by the FFILEINFO intrinsic (in FILEIO) to get labeled tape information.

System Failure 86 in MPE is defined as a major problem in LABSEG. Generally speaking it is a problem with the TLT setup, for example if LABSEG cannot find an LDEV in the table.

Breakpoint Table

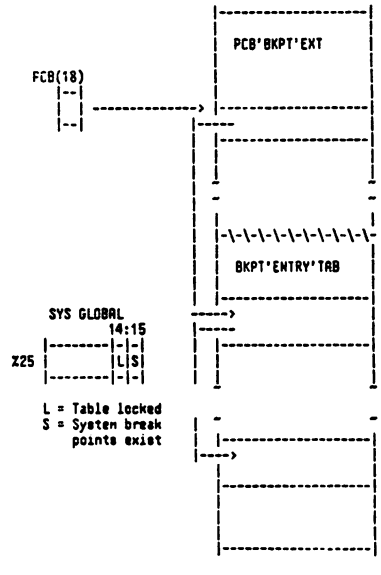
DST = 30(10) = Z36

The break point table is divided into 2 sections:

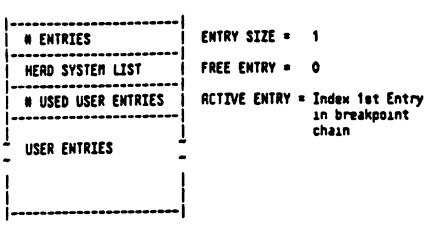
1) PCB BREAKPOINT EXTENSION TABLE (PCB'BKPT'EXT)
This table contains the heads of the breakpoint chains.

2) BREAKPOINT ENTRY TABLE (BKPT'ENTRY'TAB)
This table contains the actual entries.

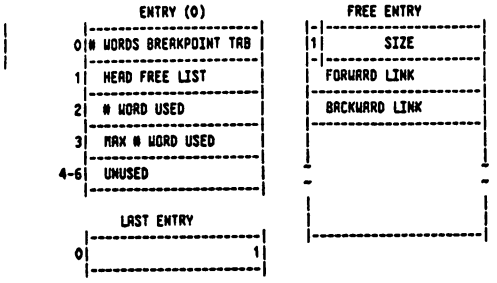
General Layout



PCB Breakpoint Extension Table

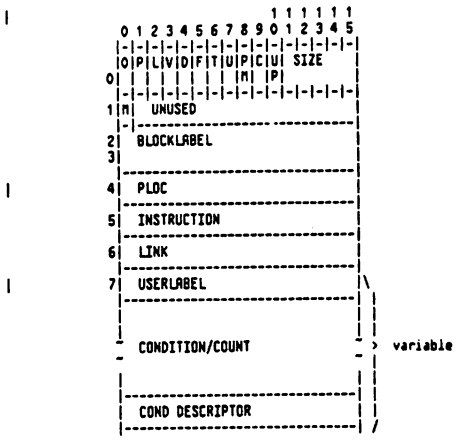


Breakpoint Entry Table



The breakpoint entry table consists of variable length entries.
The minimum entry size is 7.

Active Entry



Active Entry (Cont.)

ENTRY(0).(0:1) = FR: Free Entry
1 = Free
0 = Used

ENTRY(0).(1:1) = P: Privileged Mode Breakpoint
1 = PRIV.
0 = NON-PRIV

ENTRY(0).(2:1) = L: Process-Local Breakpoint
1 = Process-Local
0 = System

ENTRY(0).(3:1) = V: Validation Bit
1 = Instruction In Entry(3)
0 = Instruction Not In Tab

ENTRY(0).(4:1) = D: Double Trap
1 = Breakpoint Oscillates Between P/P+1
0 = Not Double Trap

ENTRY(0).(5:1) = F: Fake "Dummy" Trap
1 = Breakpoint At P+1
0 = Breakpoint At P (Orig. Loc)

ENTRY(0).(6:1) = T: Two Word Instruction
1 = Two Word Instruction
0 = Not Two Word Instruction

ENTRY(0).(7:1) = U: User Label Present
1 = Trap To User Supplied Label
0 = Trap To DEBUG

ENTRY(0).(8:1) = PM: Permanent Breakpoint
1 = PERM
0 = TEMPORARY

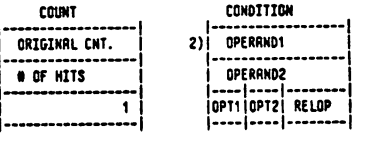
ENTRY(0).(9:1) = C: Condition/Count
1 = Condition/Count Specified
0 = No Cond/Count

ENTRY(0).(10:1) = UP: Updating
1 = Entry In Process Of Being Updated/Removed
0 = Not Being updated/Removed

ENTRY(1).(0:1) = N User PLABEL Mode
ENTRY(6) = LINK: Link
0 = End Of Chain
>0= Index Next Entry

Active Entry (Cont.)

Breakpoint Entry Table (Cont.)



RELOP -> (8:8) RELOP NUMBER:
3 = LT 9 = LTE
4 = GT 10 = GTE
5 = EQ 11 = NEQ
OPT1 -> (0:2) OPERAND1'S TYPE
OPT2 -> (2:2) OPERAND2'S TYPE

OPERAND TYPES:
0 -> CONSTANT (SINGLE WORD)
1 -> ADDRESS (DOUBLE WORD)
3 -> INDIRECT ADDRESS (TRIPLE WORD)

OPERAND FORMS:
CONSTANT -> CONST

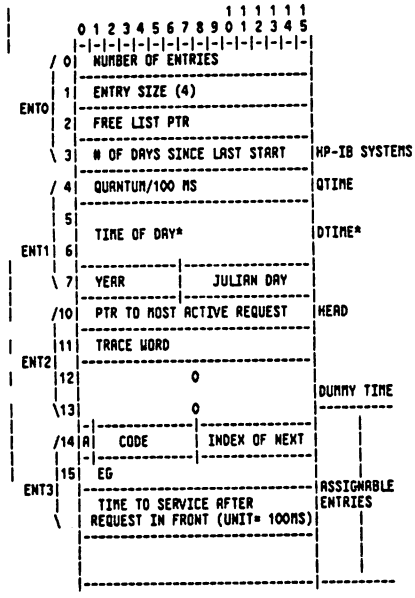
ADDRESS -> REG | BASE
OFFSET
IND. OFFSET (TYPE 3 ONLY)

REG -> (0:6) CORRESPONDING INDEX INTO 'REGY':
3 = A 10 = DL
4 = SY 11 = Q
7 = DA 12 = S
8 = DX 17 = EA
9 = DB

BASE -> (6:10) SEG #/BANK #

Timer Request List (TRL)

The system clock interrupts every 100 ms, with the CR being automatically cleared. An exception is the Shared Clock Interface measurement service which allows rates as fast as 5 ms. The interrupt handler is the procedure TICK. On entry, DB is pointing to the base of timer request list. Besides timeout requests, the clock also controls time slicing.



A: 0 if inactive request
1 if active request

Timer Request List (TRL) (Cont.)

CODE & REQ indicate the type of request.

CODE:	REQ:	TYPE:
0	DITP	Hangup
1	DITP	Carrier failure
2	DITP	202 turnaround
3	DITP	Read
4	DITP	Logon
5	PCBB index to process	Delay
6	DITP	LP not ready
7	DITP	2640
X10	Port mask	Msg port timeout
X11	DITP	Block mode read timeout (30 secs)
X12	PCBB index to process	Watchdog timer for process
X13	Port DST	Port Procedure Timeout

The list of pending requests is kept ordered by time with later entries at the tail.

X20-X37	DITP	SIO device timeout: DIT8. (code_1 on expiration, cleared on Timereq.
X5/X6	*DTIME	For Series 30/33, DTIME is # of TICS (0.091457 ms) since last midnight.

MPE User Logging

MPE User Logging enables users and subsystems to log changes to data sets on disc or serial files. This "change" file can later be used to recover data lost due to a system or program failure. The log file can itself be used for auditing purposes.

General Design Overview

Hardware Environment

No special hardware is required to operate the system. However, if logging to a tape file is desired, the hardware configuration must include a tape drive. If there is no tape drive, then it may log to a serial disc class device.

Software Environment

MPE User Logging is an integral part of MPE. No other special software is required.

Design Narrative

User Logging enables users and subsystems to journalize additions and modifications to MPE and subsystem files. The journal can reside on either disc or serial log files.

User Logging consists of a logging process, a memory buffer, a disc resident logging buffer (for serial logging) and a user defined destination log file on disc or serial media.

The logging process has two functions depending on whether the destination file resides on disc or serial media. If the destination file is serial, the logging process performs all output to the destination file. If the destination file is on disc, the logging process allocates additional space (extents) as it is required by the user.

The logging buffer is divided into communication and buffer areas. The communication area is used to pass information among the users and the logging process. This information includes status of the logging process and logging file, space remaining in the logging file and error information important to users or the logging process. The buffer portion of the logging data segment blocks inputs into the logging file before the data is actually posted. The buffer is flushed any time a user requests to close a log file or when a logging process is terminated. (The buffer is also flushed by the begin/end transaction or buffer flush requests).

Error Recovery Description

The error recovery mechanisms provided by User Logging are power fail recovery and recovery from system failure.

Power failure recovery applies only to tape log files since MPE provides adequate recovery for disc files during power fail. When a power failure is detected, a message will be printed on the console asking the operator to place the tape drive back on-line. (If the operator places the tape on-line before the message valid data may be overwritten). (To reset the tape drive the operator must hit the load button until the tension returns to the drive. Then hit the reset button followed by placing the tape drive back on-line.) At this time the log process will recover the file by rewinding to the load point and then forward spacing to the point where the power fail occurred. Writing to the log file will continue at that point.

In the event of a system failure, the warm start load option initiates recovery of User Logging files. In the case of a serial file, the file is read and compared to the disc logging buffer. All records found in the disc buffer that are not on the serial log file are posted and a proper end-of-file written. If the destination file is a disc file, all records are read and verified and an end-of-file posted to the file. In order to continue logging to a User Logging file that has been recovered in this manner, the logging process for the file must be restarted using the console command :LOG.

NOTE: Any records in the buffer area of the logging buffer will be lost.

User logging has been enhanced to work with labeled serial discs. Internally the log process handles serial disc serial disc (or cartridge tape) log files the same as for tape files.

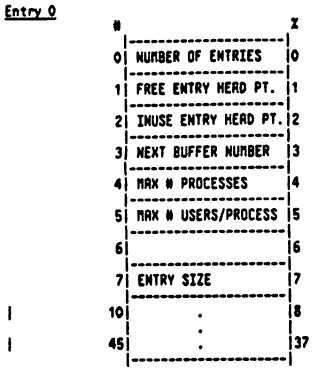
Design Structures

User Logging Table

| ENTRY SIZE = X44 words
DST X33

Table containing an entry for each activated user logging process. Each entry is created when the process is started, and deleted when the process terminates (via :LOG command). The information is extracted from the Logging Identifier Table (LIDTAB).

Entry 0



WORD ENTRIES

NUMENTRIES	=	LOGTAB
FREE	=	LOGTAB(1)
INUSE	=	LOGTAB(2)
BUFNUM	=	LOGTAB(3)
MAXLOGPROC	=	LOGTAB(4)
MAX'USR'PROC	=	LOGTAB(5)
LOGTAB'ESIZE	=	LOGTAB(7)

NUMENTRIES - The number of entries in the logging table.

FREE - A table relative pointer to the first free entry in the logging table. (-1 = Table Full.)

INUSE - A table relative pointer to the first entry in the the logging table that is being used. (-1 = No Entries in Use.)

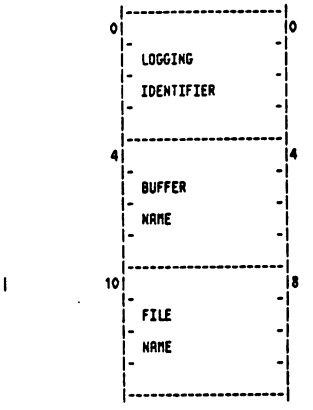
BUFNUM - The number of the buffer associated with this logging process. Used to create the name of the buffer file if serial log file (i.e., ULOGxxxx.PUB.SYS).

MAXLOGPROC - The maximum number of user logging processes allowed.

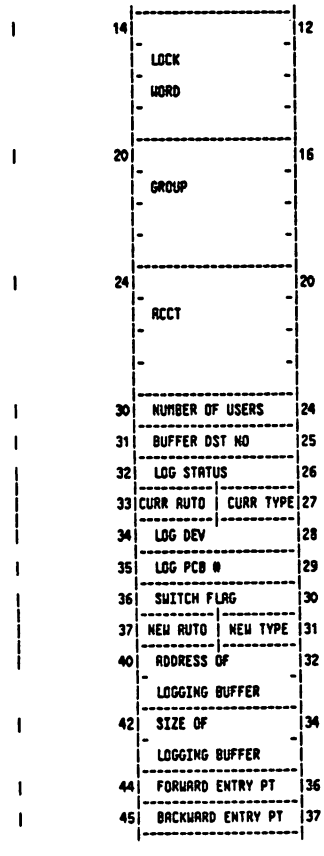
MAX'USR'PROC - The maximum number of users per logging process.

LOGTAB'ESIZE - The size (in words) of each entry in the table.

Typical Entry



Typical Entry (Cont.)



TABINDEX	=	WORD INDEX TO CURRENT ENTRY
BTABINDEX	=	BYTE INDEX TO CURRENT ENTRY
DTABINDEX	=	DOUBLE INDEX TO CURRENT ENTRY
LGNAME	=	BTABINDEX
BNAME	=	BTABINDEX+8
LFNAME	=	BTABINDEX+16
LFLOCKW	=	BTABINDEX+24
LFGROUP	=	BTABINDEX+32
LFACCT	=	BTABINDEX+40
NUMUSERS	=	TABINDEX+24
DST	=	TABINDEX+25
STATUS	=	TABINDEX+26
LGAUTO	=	TABINDEX+27.(0:8)
LGTYPE	=	TABINDEX+27.(8:8)
LGDEV	=	TABINDEX+28
PIN	=	TABINDEX+29
LGSWITCH	=	TABINDEX+30
LGNEWAUTO	=	TABINDEX+31.(0:8)
LGNEWTYPE	=	TABINDEX+31.(8:8)
LGADDR	=	DTABINDEX+16
BSIZE	=	DTABINDEX+17
NEXT	=	TABINDEX+36
PREV	=	TABINDEX+37

LGNAME - The name of the logging process (logging identifier).

BNAME - The name of the disc buffer used if the logging process destination file is a serial file. This is a file that resides in PUB.SYS. The format of the name is ULOGxxxx where xxxx is the buffer number padded on the left with zeros.

If the switch flag is true, the following will be the fully qualified file name of the new log file.

LFNAME - The name of the logging file.

LFLOCKW - The lockword of the disc logging file.

LFGROUP - The group that the destination logging file resides in if the file is a disc file.

LFACCT - The account that the destination logging file resides in if the file is a disc file.

NUMUSERS - The number of users currently accessing the logging file.

DST - The DST number of the logging data segment (LOGBUFF). (-1 = LOGBUFF not created yet.)

STATUS - The status of the logging process.
INITIALIZING = -1
INACT = 0
ACT = 1
RECOVERING = 2

LGAUTO - True if the automatic changelog facility was enabled. (Not used - for future use.)

LGTYPE - The type of destination file of the logging process.
DISC = 0
TAPE = 1
SDISC = 2
CTAPE = 3

LGDEV - The logical device number of the disc logging file or the disc logging buffer.

PIN - The PCB number for the logging process (PIN * PCBSIZE).

LGSWITCH - Flag indicating a CHANGELOG is pending (if true). (Not used - for future use.)

LGNEWAUTO - True if the automatic changelog facility was requested for the new log file. (Not used - for future use.)

LGNEWTYPE - If a switch is pending, this will be the type of the new log process. (-1 = no switch pending.) (Not used - for future use.)

LGADDR - Sector number of the current extent in the disc logging file or the disc buffer file. (Disc buffer file has only 1 extent)

BSIZE - The number of records in the current extent (for disc logging) or the number available in the disc logging buffer.

NEXT - A table relative pointer to the next entry in the logging table. (-1 = this is last entry.)

PREV - A table relative pointer to the previous entry in the logging table. (-1 = this is first entry)

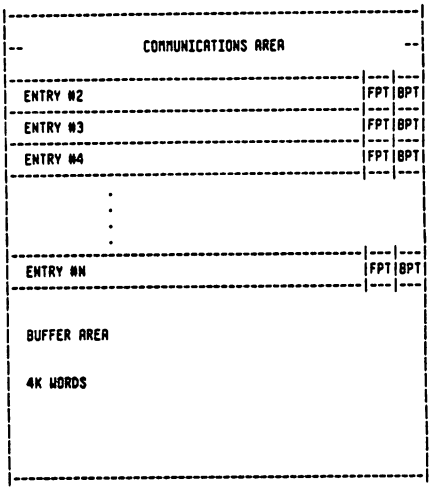
User Logging Buffer

There will be one of these tables around for the life of any active user logging process. The table consists of three parts:

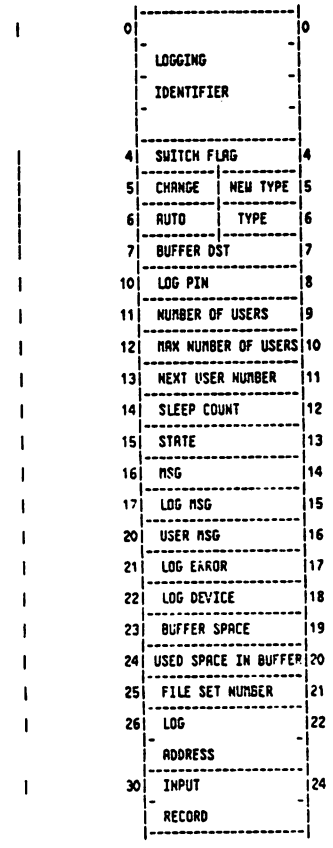
COMMUNICATIONS AREA - Information about status of the process, etc. that is common to all users of the process. Also the cells for messages to/from the process.

USER ENTRIES - Information for a specific user of the process. One of these for every user of a process (Setup by OPENLOG, released by CLOSELOG).

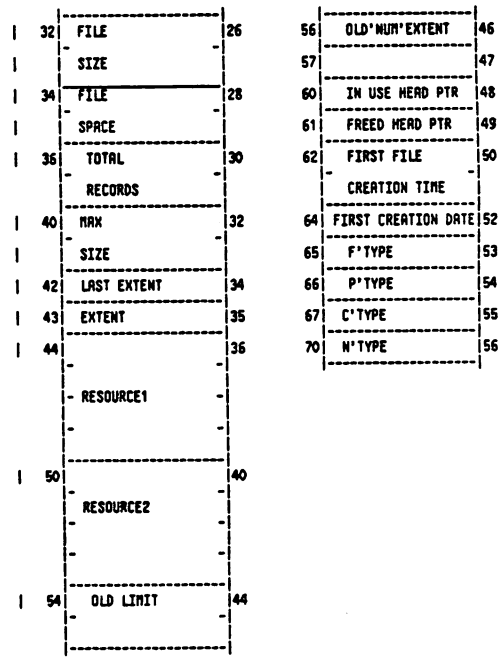
BUFFER AREA - Buffer used to hold logging records from all users before writing to the log file.



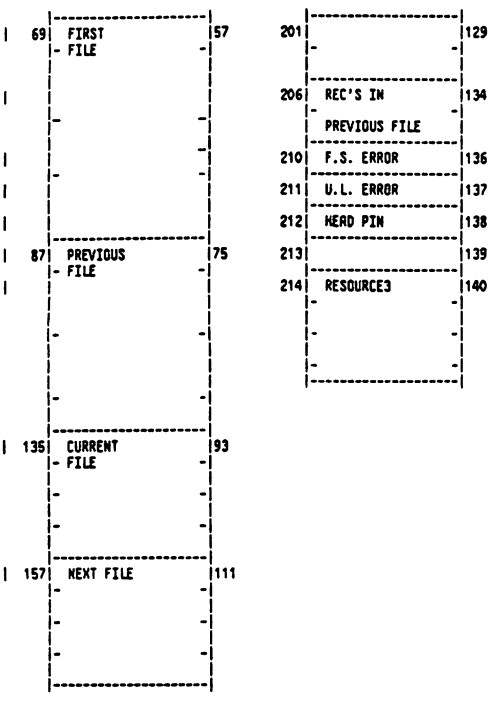
Communications Area



Communications Area (Cont.)



Communications Area (Cont.)



LOGID	=	BLOGBUFF(0)
SWITCH'	=	LOGBUFF(4)
RCHANGE	=	LOGBUFF(5).(0:8)
NEWTYPE	=	LOGBUFF(5).(8:8)
AUTO	=	LOGBUFF(6).(0:8)
LOGTYPE	=	LOGBUFF(6).(8:8)
BDST	=	LOGBUFF(7)
LOGPIN	=	LOGBUFF(8)
NUMUSER	=	LOGBUFF(9)
MAXUSER'	=	LOGBUFF(10)
USERNO	=	LOGBUFF(11)
SLPCT	=	LOGBUFF(12)
STATE	=	LOGBUFF(13)
MSG	=	LOGBUFF(14)
LOGMSG	=	LOGBUFF(15)
USERMSG	=	LOGBUFF(16)
LOGERR	=	LOGBUFF(17)
LOGDEV	=	LOGBUFF(18)
BSPACE	=	LOGBUFF(19)
BUFUSED	=	LOGBUFF(20)
VSETNO	=	LOGBUFF(21)
LOGADDR	=	DLOGBUFF(11)
INBUFREC	=	DLOGBUFF(12)
FSIZE	=	DLOGBUFF(13)
FSPACE'	=	DLOGBUFF(14)
TRECS	=	DLOGBUFF(15)
MAXFSPACE	=	DLOGBUFF(16)
LASTEXT'	=	LOGBUFF(34)
EXTENT	=	LOGBUFF(35)
RESOURCE	=	LOGBUFF(36)
RESOURCE2	=	LOGBUFF(40)
UHEAD	=	LOGBUFF(48)
FHEAD	=	LOGBUFF(49)
FIRST'C'TIME	=	DLOGBUFF(50)
FIRST'C'DATE	=	LOGBUFF(52)
F'TYPE	=	LOGBUFF(53)
P'TYPE	=	LOGBUFF(54)
C'TYPE	=	LOGBUFF(55)
N'TYPE	=	LOGBUFF(56)
FIRST'FILE	=	BLOGBUFF(57)
PREVIOUS'FILE	=	BLOGBUFF(75)
CURRENT'FILE	=	BLOGBUFF(93)
NEXT'FILE	=	BLOGBUFF(111)
RECSIN'PREV	=	DLOGBUFF(67)

FSERR'CODE	=	LOGBUFF(136)
ULERR'CODE	=	LOGBUFF(137)
HEAD'CHANGE'PIN	=	LOGBUFF(138)
RESOURCE3	=	LOGBUFF(140)
NOT'SAFE'TO'STOP	=	LOGBUFF(144)

LOGID - The name of the logging process.

SWITCH' - True if log file switch is in progress.

CHANGE - True if log file name, such that changelog is allowed (i.e., first file in the set name filename 001).

NEWTYPE - If a switch was requested, this will be the type of the new logging file. (-1 = no switch pending)
(Not used - for future use.)

AUTO - True if the automatic changelog option was specified for the current log file.

LOGTYPE - The type of destination file for the logging process.
DISC = 0
TAPE = 1
SDISC = 2
CTAPE = 3

BDST - The data segment number of this table.

LOGPIN - This is the PCB number for the logging process (PIN*PCBSIZE).

NUMUSER - The number of users currently accessing the logging file.

MAXUSER' - The maximum number of users allowed to access the logging file.

USERNO - The next sequential number to be assigned users accessing the system. It will get incremented for every unique OPENLOG and is used as the log # in the logging record format.

SLPCT - The number of users currently waiting for activation by the logging process.

STATE - The state of the user logging process.
INACTIVE = 0
ACTIVE = 1

MSG - An internal message word used to indicate an error or operator request.
6 - Continue processing, all is fine.
2 - Suspend - error reading buffer file or writing to serial file
3 - Stop - set when issue :LOG logid,STOP or when an EOF condition is found on the disc log file.

LOGMSG - A messages from the logging process.
6 - Continue processing, all is fine.
15 - EOF - if there are no more extents available to be allocated.
12 - Disc space - could not allocate the new extent because no space left in the group.
9 - Write error - error occurred while writing to log file.

USERMSG - A messages from the user process.
6 - Continue processing, all is fine.
12 - Disc space - user process needs another extent allocated for disc logging.

LOGERR - True if error condition during changelog.

LOGDEV - The logical device number of the current extent of the disc file file or the disc buffer file (buffer file has only 1 extent).

BSPACE - The amount of space, in records, that are currently available to the users. On the last block of the last extent, one record will be saved by the logging process so that the proper close information can be posted to the file - either the trailer record (if the log logging process is stopped) or the change'to'new record because of an EOF condition ;(and the AUTO option had been specified).

BUFUSED - The number of records currently in the buffer. On all extents, except the last extent BUFSPACE+BUFUSED = 32 (number of records in a complete block). However, on the last block of the last extent this will NOT be true since one record is always held in reserve by the logging process.

VSETNO - This shows the order in the log file "set" of the currently opened log file.

LOGADDR - The disc address of the current extent of the disc log file. If it's a serial file, this is the disc address of the disc buffer for the file. (Current file.)

INBUFREC - The record number of the next block to be written to the logging destination file or the disc logging buffer for serial files. (Used as an offset into the current extent for the writes - since each record is one sector in length). (Current file.)

FSIZE - The current extent size of the logging destination file or disc logging buffer file for serial destination files. (on the last extent this will be the last extent size minus 1).

FSPACE' - The space in records that remains in the current extent of the disc logging destination file or disc buffer for tape destination files. (On the last extent of the disc log file, this is the amount of space minus 1).

TRECS - The total number of records written to the logging destination file (including those records currently in the buffer). (Total records written to all log files in the set.)

MAXFSPACE - The total file size, in records, minus 1. (Need that last record to post close information.) (Current file.)

LASTEXT' - The extent number of the final extent in the disc logging file or disc buffer file.

EXTENT - The current extent number of the disc logging file or disc logging buffer.

RESOURCE - Used for resource management (i.e., locking the buffer area and buffer information in the communications area). Format is:
RESOURCE + 0 = Owner PCB number
RESOURCE + 1 = Head of inpeded queue PCB number
RESOURCE + 2 = Tail of inpeded queue PCB number
RESOURCE + 3 = Queue length

RESOURCE2 - Use for locking file information and messages in the communications area.

OLD'LIMIT - The number of records in the last disc log file.

OLD'NUM'EXTENT-The number of extents in the last disc log file.

UHEAD - A table relative pointer to the first entry into the logging data segment. (-1 = no entries currently in use)

FHEAD - A table relative pointer to the first free entry in the logging data segment. (-1 = no free entries)

FIRST'C'TIME-First file creation time.

FIRST'C'DATE-Firest file creation date.

F'TYPE - First log file type.

P'TYPE - Previous log file type.

C'TYPE - Current log file type.

N'TYPE - Next log file type.

FIRST'FILE - First log file in the log sequence.

PREVIOUS'FILE-Previous log file in the log sequence.

CURRENT'FILE -Current log file in the log sequence.

NEXT'FILE - Next log file in the log sequence.

RECS'IN'PREV- Total number of records in all of the previous file in the log file set.

FSERR'CODE - File system error encountered upon changelog.

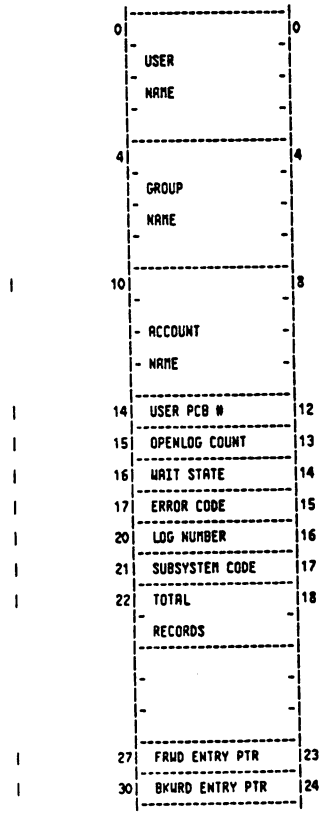
ULERR'CODE - User logging error encountered upon changelog.

HEAD'CHANGE'PIN-PCB index of process waiting for :CHANGELOG command to flush. Note only one process waiting at a time.

RESOURCE3 - Use for locking user entry area and pointer information about the user entries in the communications area.

NOT'SAFE'TO'STOP-If it is set, then do not process the Stoplog until exchangelog resets the bit.

Typical Logbuff Entry




```
BINDEX    =  BYTE INDEX TO CURRENT ENTRY
INDEX     =  WORD INDEX TO CURRENT ENTRY
DINDEX    =  DOUBLE INDEX TO CURRENT ENTRY

USER      =  BINDEX
GROUP     =  BINDEX+8
ACCT      =  BINDEX+16

UPIN      =  INDEX+12
OPENCNT   =  INDEX+13
WSTATE    =  INDEX+14
ERROR     =  INDEX+15
LGNUM     =  INDEX+16
SCODE     =  INDEX+17

RECS      =  DINDEX+9

NENTRY    =  INDEX+23
PENTRY    =  INDEX+24
```

USER - The name of the user who opened the logging file through this entry.

GROUP - The group of the user who opened the logging file.

ACCT - The account of the user who opened the logging file.

UPIN - The PCB number of the user process (PIN * PCBSIZE).

OPENCNT - Counter of how many times this user called OPENLOG. (Incremented for every OPENLOG, decremented for every CLOSELOG).

WSTATE - The wait status of the users process.
INACTIVE = 0
ACTIVE = 1

ERROR - Used to hold error information for this user.
-1 = No room in disc (or disc buffer) and NOWAIT.
0 = OK.

LGNUM - The logging number assigned to the user. (From USERNO in global area to be used as log # in the log record).

SCODE - The subsystem code for the caller. This applies only to privileged callers.

RECS - The number of records written by this user.

NENTRY - A table relative pointer to the next entry in the logging data segment. (-1 = this is the last entry)

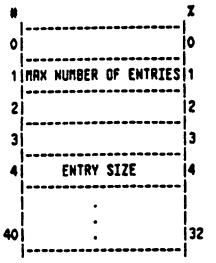
PENTRY - A table relative pointer to the previous entry in the logging data segment. (-1 = this is the first entry)

User Logging Identifier Table

| ENTRY SIZE = X41 words
DST X41

Table containing an entry for each potential logging process. Entries are added via :GETLOG and released via :RELLOG.

Entry #0



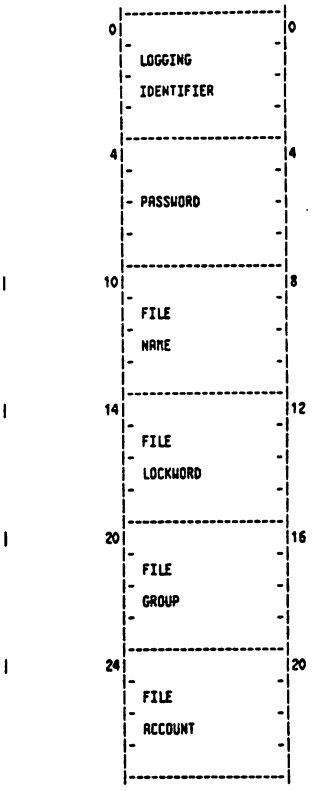
ENTRIES

MENTRIES = LIDTAB(1)
ENTRYSIZE = LIDTAB(4)

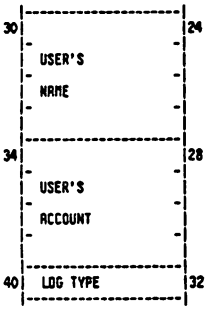
MENTRIES - The maximum number of entries in the table (i.e., maximum number of user logging processes; 1 entry for every process - activated or not).

ENTRYSIZE - The size of each entry in the table.

Typical Entry



Typical Entry (Cont.)



BYTE ENTRIES

LID = BLIDTAB
PW = BLIDTAB(8)
FNAME' = BLIDTAB(16)
LW = BLIDTAB(24)
FGROUP = BLIDTAB(32)
FACCT = BLIDTAB(40)
UNAME = BLIDTAB(48)
UACCT = BLIDTAB(56)

WORD ENTRIES

TYP = LIDTAB(32)

LID - The logging identifier name. This is a maximum of eight characters long.

PW - The pass word for the logging identifier. This is a maximum of eight characters long.

The following is the fully qualified file name of the current log file:

FNAME' - The name of the destination file.

LW - The lockword on the destination file if the file is on disc.

FGROUP - The group that the file resides in.

FACCT - The account that the destination file resides in.

UNAME - The name of the user who created the logging identifier.

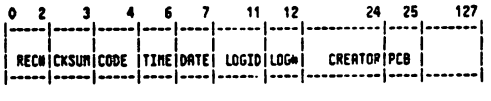
UACCT - The account of the user who created the logging identifier.

TYP - The status of the entry.
(0:1) = Auto changelog allowed
(1:1) = No Auto on :GETLOG, :ALTLOG
(2:7) = Previous type
(9:7) = New type
0 = Disc log file
1 = Tape log file
2 = Serial disc log file
3 = Cartridge tape log file

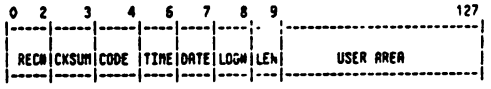
Logging Record Format

RECORD SIZE = 128 words
USER AREA = 119 words

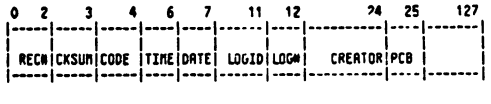
LOG RECORD AT OPENLOG



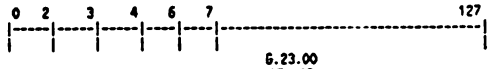
USER OR SUBSYSTEM/CONTINUATION LOG RECORD (from WRITELOG)

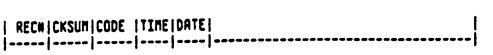


LOG RECORD AT CLOSELOG

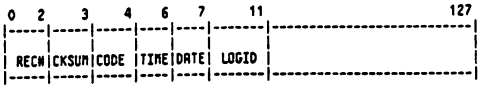


CRASH MARKER

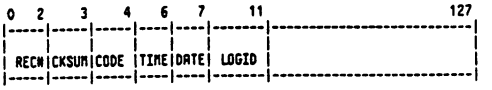




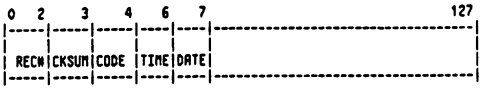
HEADER RECORD (START/RESTART)



TRAILER RECORD (STOP)

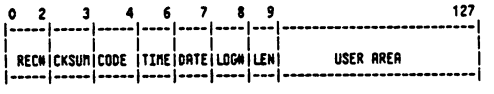


NULL RECORD

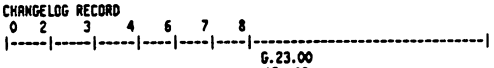


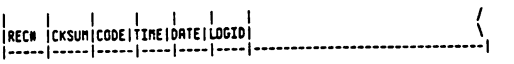
BEGIN TRANSACTION MARKER

END TRANSACTION MARKER

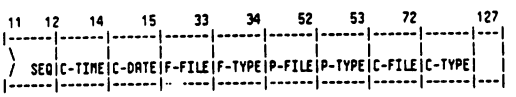


CHANGELOG RECORD





CHANGELOG RECORD (Cont.)



Note: If CODE = 12, P-File = Previous file in set.
If CODE = 13, P-FILE = Next file in set.

CODE DEFINITION

CODE.(8:8) =

1	Open log record
2	User/subsystem record (WRITELOG)
3	Close log record
4	Header record
5	Trailer record
6	Restart record
7	Continuation of a user or subsystem record
9	Crash marker
10	End transaction record
11	Begin transaction record
12	Changelog record in new file
13	Changelog record in old file
SPACE	NULL record

DATA FIELDS OF LOG RECORDS

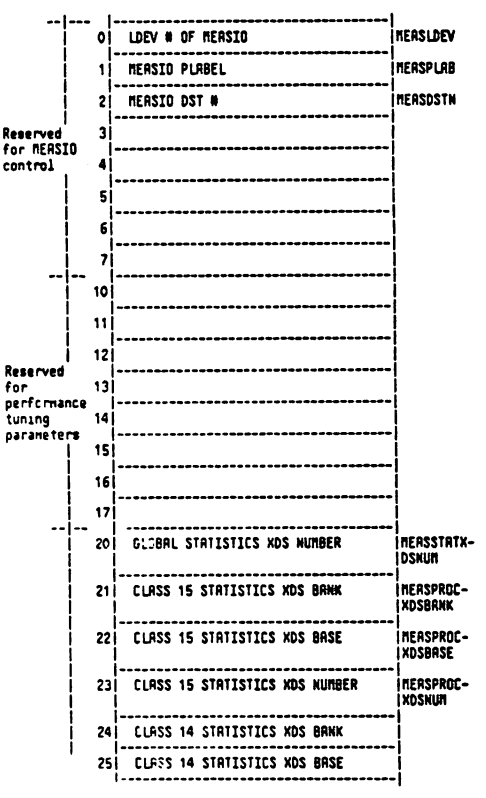
RECW	=	DOUBLE INTEGER
CKSUM	=	INTEGER
CODE	=	INTEGER
TIME	=	DOUBLE (from intrinsic CLOCK)
DATE	=	INTEGER (from intrinsic CALENDAR)
LOGID	=	ASCII
LOGW	=	INTEGER
LEN	=	INTEGER
USERAREA	=	ASCII
CREATOR	=	ASCII
PCB	=	INTEGER
C-DATE	=	INTEGER
C-TIME	=	DOUBLE
F-FILE-NAME	=	ASCII
P-FILE-NAME	=	ASCII
C-FILE-NAME	=	ASCII
F-TYPE	=	INTEGER
P-TYPE	=	INTEGER
C-TYPE	=	INTEGER
SEQ	=	INTEGER

NOTE:

1. The checksum algorithm uses the exclusive or (XOR) function against a base of negative one.
2. Null record is used for filler.
3. The code word of the logging record can contain a subsystem code defined by the user in the first half of the word (0:8). User logging allows privileged users to pass this code in the index parameter of the OPENLOG intrinsic.
4. The "len" field will contain the entire length of the data in the transaction (i.e., the length passed to WRITELOG, BEGINLOG, ENDLOG). If a continuation record is part of the transaction, it will also contain the entire length of the data. For example, a length of 140 was passed to the intrinsic. The "len" field of the first record will be 140, the "len" field of its continuation record will also be 140 - even though the actual amount of data found in the first record will be 119 and the data found in the continuation record will be 21. (Positive length = # words, negative length = # bytes)

MEASINFOTAB

DST = X73 (59)



MEASINFOTAB (Cont.)

	26	CLASS 14 STATISTICS XDS NUM.
	27	CLASS 13 STATISTICS XDS BANK
	30	CLASS 13 STATISTICS XDS BASE
	31	CLASS 13 STATISTICS XDS NUM.
	32	CLASS 12 STATISTICS XDS BANK
	33	CLASS 12 STATISTICS XDS BASE
	34	CLASS 12 STATISTICS XDS NUM.
	35	CLASS 11 STATISTICS XDS BANK
	36	CLASS 11 STATISTICS XDS BASE
	37	CLASS 11 STATISTICS XDS NUM.
	40	CLASS 12 STATISTICS 2ND XDS BANK
	41	CLASS 12 STATISTICS 2ND XDS BASE
	42	CLASS 12 STATISTICS 2ND XDS NUM.
	43	CLASS 15 STATISTICS 2ND XDS BANK
	44	CLASS 15 STATISTICS 2ND XDS BASE
	45	CLASS 15 STATISTICS 2ND XDS NUM.

** As of Release 23, all pin #s > 629 for classes 12 and 15 will appear in the 2ND set of extra data segments.

MEASINFOTAB (Cont.)

reserved for measurement interface			
	50	CLASS 0 ENABLED COUNT	CLASS 1 ENABLED COUNT
	51	CLASS 2 EN.CNT.	CLASS 3 EN.CNT.
	52	CLASS 4 EN.CNT.	CLASS 5 EN.CNT.
	53	CLASS 6 EN.CNT.	CLASS 7 EN.CNT.
	54	CLASS 8 EN.CNT.	CLASS 9 EN.CNT.
	55	CLASS 10 EN.CNT.	CLASS 11 EN.CNT.
	56	CLASS 12 EN.CNT.	CLASS 13 EN.CNT.
	57	CLASS 14 EN.CNT.	CLASS 15 EN.CNT.
	60		
	61		
reserved for shared clock interface user	62		
	63		
	64		
	65		
	66		
	67		

MEASINFOTAB (Cont.)

		A	FLAG	A	
	70	R	FLAG	R	
shared	71		XDS1		
clock	72		XDS2		
interface	73		DCOUNT		
cells	74		DLIMIT		
	75		TCOUNT		
	76		TLIMIT		
	77		DLABEL		
	100		MONITOR BUFFER INDEX		SMONIDX
	101		MERS BUFFER		MEASBUFO
	102		MERS BUFFER INDEX		MEASIDX
reserved for event logging	103		MERS ENABLED FLAGS		MEASMSKO
	104		MERS ENABLED FLAGS		MEASMSK1
	105		MERS BUFFER BANK		MEASBUFBANK
	106				
	116				
	117				

R: Interrupt has missed due to last interrupt handling.

A: Current interrupt handling active.

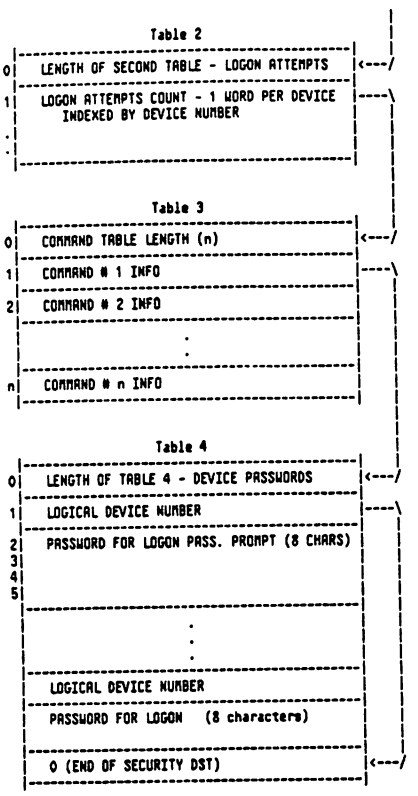
System Global Security DST

DST # in SYSGLOB extension X30.

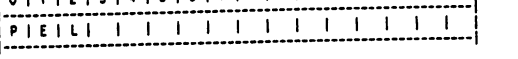
X	Table 1
0	LENGTH OF FIRST TABLE
1	USE COUNT
2	CURRENT PASSWORD ENCRYPTION (ON/OFF)
3	MINIMUM PASSWORD LENGTH (# OF CHARS)
4	MAX # OF INVALID LOGON ATTEMPTS PER DEV.
5	PASSWORD PROMPT REQUIRED OPTION (ON/OFF)
6	UDC FAILURE TERMINATION OPTION (ON/OFF)
7	GENERIC LOGON INTERFACE ERROR MSG (ON/OFF)
10	FOPEN FAILURE LOGGING ONLY OPTION
11	IDLE SESSION TIME-OUT IN SECONDS
12	SECURITY DOWN TIME-OUT IN SECONDS
13	programmatic access warning flag
14	Password expiration interval in days
15	Next global password expiration date
16	WIC| | | | | | Number of days to warn
17	Embedded password disallowed for jobs
20	Cross streaming disallowed for jobs
21	Stream privilege for bypass password
22	Assurance of logging
23	File maximum protection on creation

W = Warning flag set in user entry
C = SECURITYPROC to clear the warn flag

System Global Security DST (Cont.)



Command Info Entry



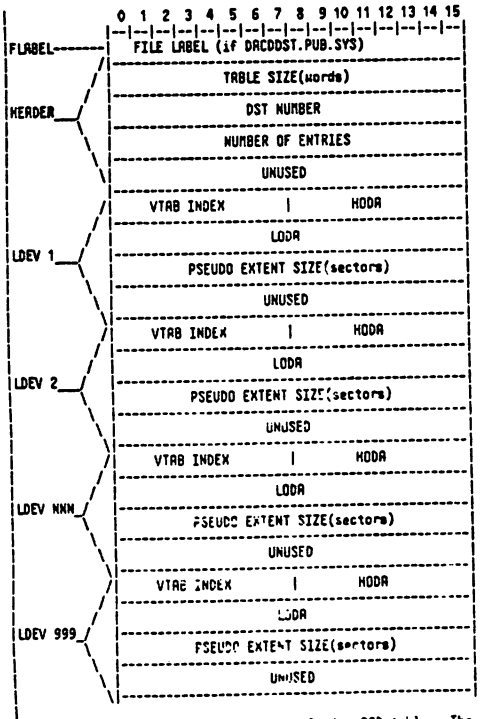
P = Programmatically execution disabled. (1=disabled, 0=enabled)
E = Execution of this command disabled. (1=disabled, 0=enabled)
L = Logging enabled for this command. (1=enabled, 0=disabled)

```
EQUATE
   SEC'ENCRYPTION'WORD          = 2,
   SEC'PASS'LEN'WORD            = 3,
   SEC'NUM'ATTEMPTS'WORD        = 4,
   SEC'REQUIRED'PROMPT'WORD     = 5,
   SEC'UDC'TERMINATION'WORD     = 6,
   SEC'GENERIC'MSG'WORD         = 7,
   SEC'FOPEN'LOGGING'WORD       = 8,
|  SEC'SESSION'TIMEOUT'WORD     = 9,
|  SEC'DOWN'TIMEOUT'WORD       =10,
|  SEC'PROG'WARN'WORD          =11,
|  SEC'PW'AGING'WORD           =12,
|  SEC'EXP'DATE'WORD           =13,
|  SEC'WARN'DAY'WORD           =14,
|  SEC'JOB'EMBED'PW'WORD       =15,
|  SEC'CROSS'STREAM'WORD       =16,
|  SEC'STREAM'PRIV'WORD        =17,
|  SEC'INSURE'LOG'WORD         =18,
|  SEC'MAX'PROTECT'WORD        =19;

EQUATE
   GLOBAL'OPTION'TAB            = 1,
   ATTEMPT'COUNT'TAB            = 2,
   COMMAND'INFO'TAB             = 3,
   DEVICE'PASSWORD'TAB          = 4;

EQUATE
|  TAB1'LEN                     = 25,
|  TAB2'LEN                     = 1025,
|  TAB3'LEN                     =400;
|<<TAB4'LEN is variable>>
```

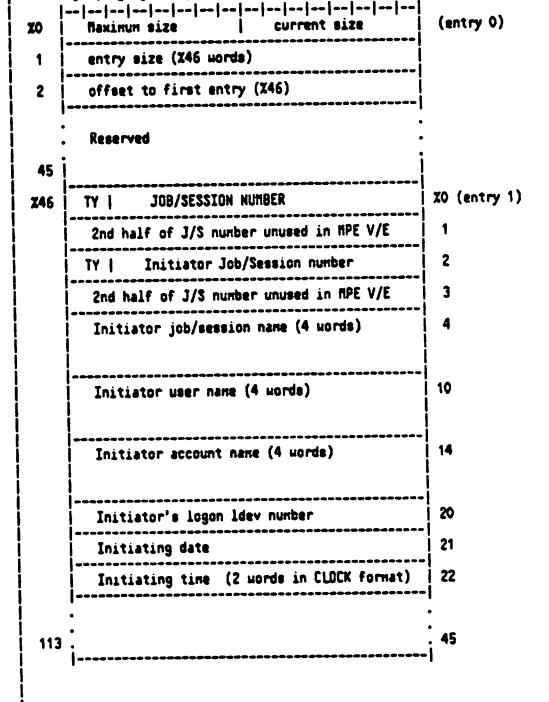

Security Table - DACD (Device Access Control Definition)



Device ACD's are pointed to by the Device ACD table. The Device ACD table is stored in DACDDST.PUB.SYS. When the system is brought up, this file will be copied to a data segment for faster access. The DACD is indexed by ldev number.

JSECDST Table (DST X75)

DST = 61 = X75
SIR = 15 = X17 (JMAT SIR IS USED)



Information on who,when and where a job is streamed will be displayed in the job's $STDLIST. This info will be put in the Job Security

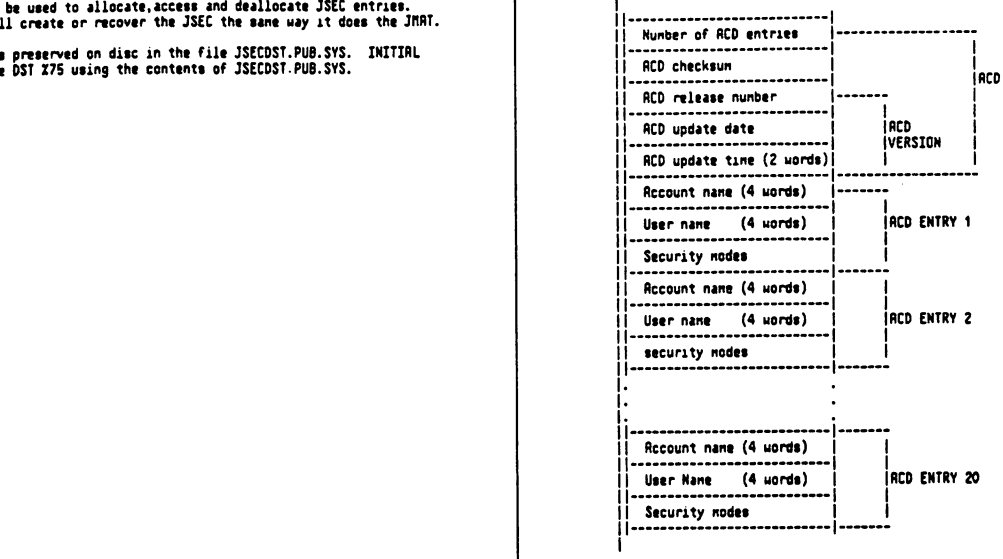
Master Table at job creation time.

The JSEC DST is similar to the JMAT, there is one per system. JSEC will have the same entry size and total size as the JMAT. The JMAT index will be used to allocate,access and deallocate JSEC entries. INITIAL will create or recover the JSEC the same way it does the JMAT.

The JSEC is preserved on disc in the file JSECDST.PUB.SYS. INITIAL will create DST X75 using the contents of JSECDST.PUB.SYS.

Access Control Definition

An Access Control Definition (ACD) has the following format:



An ACD consists of the ACD HEADER followed by a maximum of 20 entries.

The ACD HEADER has 3 components: NUMBER OF ACD ENTRIES, ACD CHECKSUM and ACD VERSION. The ACD VERSION includes the ACD RELEASE NUMBER, the ACD UPDATE DATE and the ACD UPDATE TIME.

NUMBER OF ACD ENTRIES: Number of entries currently in this ACD.

ACD CHECKSUM: A number representing the EXCLUSIVE OR of all the words that comprise the entries in the ACD.

ACD RELEASE NUMBER: A number representing the current ACD software used to create the ACD. (MPE V/E VD4 = 5)

ACD UPDATE DATE: Date when the ACD was last modified(CALENDAR format).

ACD UPDATE TIME: Time when the ACD was last modified(CLOCK format).

There can be a maximum of 20 entries. Each entry consists of an ACCOUNT NAME, USER NAME, and the SECURITY MODES granted to the specified user. Wild cards can be used instead of ACCOUNT NAME and USER NAME. The only valid wild card user specifications are:

```
@.ACCOUNT
@.@
```

"@." is represented internallt with the character "`".

Entries are sorted as per the following example:

```
SAM.ACCTING
TOM.ACCTING
@.ACCTING
ROSE.FINANCE
@.FINANCE
@.@
```

Each entry consists of:

ACCOUNT NAME: The account name specified by the creator. Upshifted, with trailing blanks added.
USER NAME: THE USER name specified by the creator. Upshifted, with trailing blanks added.
SECURITY MODES: This is the word indicating the access/permission the user is granted. It is 2 bytes (1 word).

Note: Z = Permission to read ACD, N = No access

CHAPTER 18 MESSAGE FILES

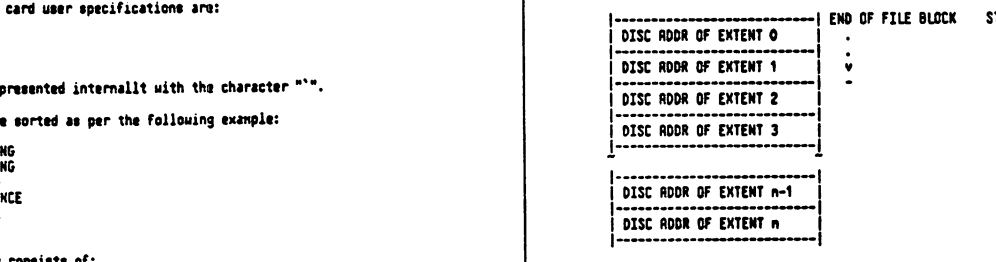
Message File Data Structures

This chapter contains the data structures necessary to support message files. The first section details the message file's version of the familiar file system data structure, such as the file label, file control block, and the access control block.

The second section shows the tables used by the basic IPC mechanism which is a set of internal, MPE procedures designed to support the "boundary conditions" of IPC files. For example, signaling a no wait reader that its record has arrived. See the section's introduction for a detailed description.

File Structure

File Label/FCB Extent Map



The EOF and SOF are examples only, meant to show:

1. The start of file moves into the extent map as records are read.

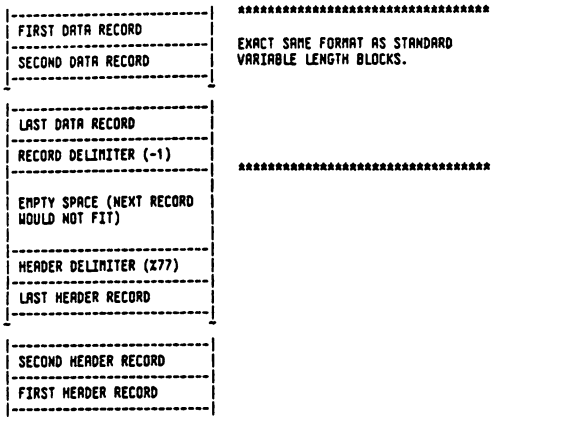
2. The file can wrap around and, hence, cause the SOF to be greater than the EOF.

When a file becomes empty the SOF and EOF are reset to the first block of extent zero.

Each extent is composed of a number of blocks. Extents all have the same number of blocks. Extent zero also contains space for the file label and user labels in the exact same format as standard files. Starting with block zero, sufficient blocks are allocated to the file label/user labels to satisfy their space requirements.

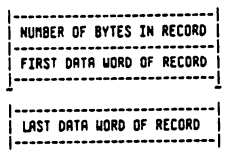
Extents outside of the SOF/EOF range may not exist. They are deleted at close time when there are no more writers accessing the file.

Block Structure



Separating the data portion of the records from their header enables the standard file system access procedures to read the records with no knowledge that they are message file records.

Record Format



Length word's value does not include itself.

Header Format

C (0:1) - Set on if this was the last record written before the system crashed. This bit is set on by the first open on the file after the crash.

LC (1:1) - Valid only for close headers. Set to one if this is the last writer to close the file.

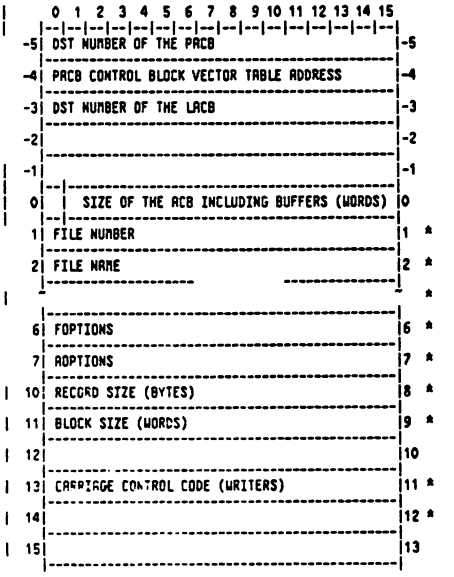
EU (2:1) - Set for the last record written before the file label EOF was updated.

Type(8:8)- 0 - data
1 - open
2 - close

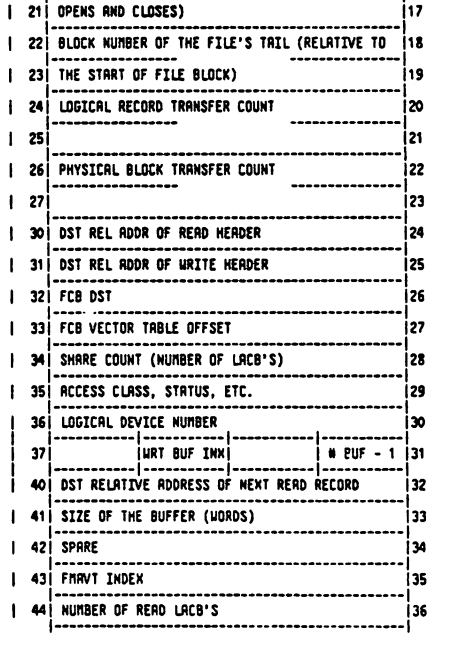
Message Access Control Block

Notes:
1. Words/fields that do not pertain to message files are left blank.

2. This diagram shows the "combined" ACB as it appears to the message access procedures (the procedures in IPC). Thus it is a combination of the LACB and the PACB.



Message Access Control Block (Cont.)



Message Access Control Block (Cont.)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
45	TYPE AND DISPOSITION	37
46	ACCESS MASK | RECORDS PER BLOCK	38
47	MISC. MSG FILE FLAGS	39
50	0 | # RD BUF | # WT BUF |ER|QW|M |C |D |S |F	
51	NUMBER OF FREE WORD IN THE CURRENT FREE RECORD	41
52	NUMBER OF FREE RECORDS	42
53		43
54	NUMBER OF NONDATA RECORDS IN THE FILE	44
55		45
56	DST RELATIVE ADDRESS OF THE NEXT WRITE RECORD	46
57	NOPEN RECORDS | # READ REQUESTS	47
60	LAST READ ERROR | LAST WRITE ERROR	48
61	HEAD RECORD'S TYPE	49
62	HEAD RECORD'S WRITER ID	50
63	HEAD RECORD'S FLAGS	51
64	DST REL ADDRESS OF THE PACB	52
65	DST REL ADDRESS OF THE LACB	53
66	DST RELATIVE ADDRESS OF THE STACK RCB	54
67	STACK DST RELATIVE ADDRESS OF DB	55
70	TARGET AREA'S DST NUMBER	56
71	RESERVED FOR CALLING PARAMETERS	57
72		58
73		59

Message Access Control Block (Cont.)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
74	RESERVED FOR THE STACK MARKER FROM FILE SYSTEM	60
75	INTRINSICS	61
100	USER'S SOFT INTERRUPT PLABEL	64 *
101	# OF SECONDS TO WAIT ON BOUNDARY CONDITION	65 *
102	0|EX|ND|VR|BT|IM|C |W | CARRIAGE CONTROL	66 *
103	REPLY PORT (BASIC IPC PORT)	67 *
104	WRITER ID	68 *
105	NOWAIT WRITER RECORD BUFFER ADDRESS	69 *
106	NOWAIT WRITER RECORD BUFFER DST	70 *
107	NOWAIT WRITER BUFFER ENTRY NUMBER	71 *
110	NO WAIT I/O RESULTANT ERROR CODE	72 *
111	NO WAIT I/O RESULTANT TRANSMISSION LOG	73
112	NO WAIT I/O FREAD TARGET DST	74 *
113	NO WAIT I/O FREAD TARGET ADDRESS 113*	75 *
114	WRITE WAIT QUEUE (BASIC IPC PORT)	76
115	READ WAIT QUEUE (BASIC IPC PORT)	77
116	RECORD SIZE & OVERHEAD	78
117	HEAD RECORD'S LENGTH IN BYTES	79
120	WRITER ID	80
121	LOCAL FLAGS	81
122	TARGET DST NUMBER	82
123	DST RELATIVE ADDRESS OF TARGET AREA	83
124	LENGTH OF TARGET AREA	84

Message Access Control Block (Cont.)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
125	WAITER'S REPLY PORT. 0=USING RCB COMPLTN AREA	85
126	WAITING PROCESS'S PIN	86
127	WAITING PROCESS'S FILE NUMBER	87
130	WAITER'S SOFT INTERRUPT PLABEL	88
131	RESULTANT ERROR CODE	89
132	RESULTANT TRANSMISSION LOG	90
133	RESULTANT WRITE ID	91
134	DST REL ADDRESS OF FIRST BUFFER	92
135	DST REL ADDRESS OF BUFFER TWO	93

* Value is private to a particular accessor.

Message Access Control Block (Cont.)

Word	Field	Description
X50		File's global flags.
	(1:4)	- number of read buffers
	(5:4)	- number of write buffers
	(9:1) ER	1 - extended read
	(10:1) QW	1 - one or more writers has been queued on the wait queue.
	(11:1) M	1 - wait msg is located in the RCB
	(12:1) C	1 - completion msg is located in the RCB
	(13:1) D	1 - the current write buffer has dirty bit set
	(14:1) S	0 - the start of file is block zero
	(15:1) F	0 - the RCB buffers have not been filled
X102		Accessor's local flags.
	(0:1) O	1 - have not yet issued an FREAD/FWRITE against the file.
	(1:1) EX	1 - extended wait mode.
	(2:1) ND	1 - do not destroy the next record read.
	(3:1) VR	1 - writer has not yet written first record.
	(4:1) BT	0 - transmission log should be expressed in words.
		1 - " " " " " " bytes.
	(5:1) IM	1- only user mode procedures can be soft interrupted.
	(6:1) C	- no wait completion message is in LACB area.
	(7:1) W	1 - wait disabled and just opened.
	(8:8) CAR CTL	- carriage control character to be used for the writer's record (a value of one indicates no carriage control character).

MRSTAT Definitions

Octal Value	Event Type	Parameter 1	Parameter 2
72/0	Read init	# free rec	
72/1	Read compl	(0:8) error, (8:8) ID	Number of records
72/2	Write init	(0:8) # rec, (8:8) ID	Number of free records
72/3	Write compl	(0:8) error, (8:8) ID	Number of free records
72/4	Control	(0:8) error, (8:8) ID	(0:4) func, (4:12) parm
72/5	EOF	(0:8) error, (8:8) ID	Number of records
72/6	Open	(0:8) error, (8:8) ID	Number of records
72/7	Close	(8:8) #free, (8:8) ID	Number of records
72/10	Initiation	0	(0:8) fix, (8:8) update
73/0	Put record	(0:8) error, (8:8) ID	(0:3) rec type, (3:13) number of records
73/1	Delete rec	(0:8) error, (8:8) ID	(0:3) rec type (3:13) number of records
73/2	Delete blk	Start of file block #	End of file block #

Notes:
1. The aa/bb notation in the "octal value" column denotes type/subtype. Type is the actual MRSTAT event number. Subtype is (0:4) of parameter 0.

2. Several items can possibly exceed their fields, in that case the bits beyond the field are lost. These items are number of records, number of free records, start of file, and end of file.

3. Parameter word zero has a common format for all the MRSTAT events.

Field	Description
(0:4)	Event's subtype.
(4:2)	File's state 0 - empty 1 - partially full 2 - only a fraction of a free record is left 3 - completely full
(6:1)	Nonzero indicates that there is one or more waiting readers.
(7:1)	Nonzero indicates that there is one or more waiting writers.
(11:1)	Nonzero indicates that the write has a carriage control character.
(12:4)	Flags local to the accessor. (12:1) - the accessor has done no FREADs/FWRITEs (13:1) - extended wait (14:1) - nondestructive read (15:1) - writer has not written any records

File System Basic IPC Definitions

The objective of this set of uncallable procedures is to provide a simple IPC mechanism to support the IPC file access procedures. It enables one process to send short, control messages to another process.

General Behavior

FCPORTOPEN Procedure

The heart of this mechanism is the port. A process desiring to receive messages would first open (create) a port. This process is termed the "port manager". When the port is created, a port number is returned to the opener. Since the port number value cannot be known in advance, potential senders need some method of obtaining the port number from the port manager.

Both the ports and the messages are contained in a single disc resident data segment. There can be a total of over thirty-five hundred open ports and outstanding messages, therefore, ports and message blocks are not scarce resources.

FCPORTSEND Procedure

This procedure sends a 0 to 5 word message to a port. Optionally a timeout value may be specified which will limit the duration the message will remain attached to the port. Expiration of the timeout causes the message to be deleted from the target port's queue and placed on the sender's reply port (specified by the sender in the FCPORTSEND procedure call).

FCPORTRECEIVE

Reads and deletes the head message from a port. The sender's return port number is also given to the receiver, enabling him to send a reply message.

FCPORTCLOSE

Demolishes the port.

IPC File's Use Of This Mechanism

All open message files have two ports open for the file (read wait queue and write wait queue), plus one port per accessor (reply port). Their use is described in the following.

Reader and Writer Wait Queues

When an empty message file is accessed by more than one reader (share), then there must be a way of having the readers' FREADs satisfied in the same order that they were issued. That is, there must be queue of waiting readers. The IPC access procedures accomplish this by dedicating a basic IPC port as a "read wait queue". Whenever a reader's request is stalled because the file is empty, a message is sent to the read wait queue. Subsequent FREADs by other processes will queue up behind the first reader in a FIFO manner. An FWRITE will take the first entry from the wait queue and send a "read may be done" message to the reader's reply port.

In a like manner, multiple writers will queue on the write wait queue when the file is full.

Completion Notification For Nowait I/O

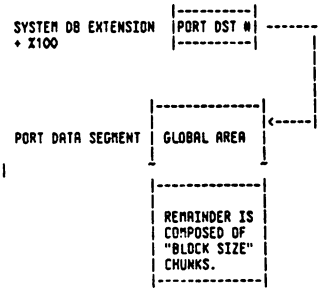
The IOWAIT intrinsic waits for a message to be sent to the reply port(s) of the specified user files.

Timeouts

When an accessor encounters a boundary condition (i.e., a reader accesses an empty file), it may specify that the condition must be satisfied in x seconds (FCONTROL 4). To this end the IPC access procedures merely issue the FCPORTSEND to the wait queue with the user's timeout value specified. The timeout will tear the message from the wait queue and place it on the accessor's reply port.

Port Data Structures

Port Data Segment



The chunks are a combination of free entries, ports, message queue entries, and timer list entries.

Port With Two Outstanding Messages

Port Number

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
PORT INDEX | PORT DATA SEGMENT RELATIVE ADDR/8

Port index - Index into the port DST number array

Port DST Number Array

Located in System DB Extension Area.

100	PORT DATA SEGMENT NUMBER	64
101	RESERVED FOR A SECOND PORT SEGMENT	65

Port Data Segment Global Area

0	DATA SEGMENT NUMBER OF THIS PORT DATA SEGMENT	0
1	BLOCK SIZE IN WORDS	1
2	TOTAL NUMBER OF BLOCKS	2
3	MAXIMUM NUMBER OF BLOCKS	3
4	CURRENT NUMBER OF FREE BLOCKS	4
5	NUMBER OF OPEN PORTS	5
6	HEAD OF FREE LIST	6
7	TAIL OF FREE LIST	7
10	HEAD OF IMPEDED PROCESS LIST	8
11	TAIL OF IMPEDED PROCESS LIST	9
12	HEAD OF TIMEOUT THREAD (TQE ADDRESS)	10
13	TRLX OF TIMEOUT	11
14	VALUE RETURNED BY TIMER INTRINSIC WHEN	12
15	TIMEOUT WAS INITIATED	13
16	HEAD OF PORT LIST (IN UNITS OF PORT NUMBERS)	14
17	NOT USED	15

Port

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
0	HEAD MQE ADDRESS	0
1	TAIL MQE ADDRESS	1
2	E | W | NEXT PORT NUMBER IN PORT LIST THREAD	2
3	I | SUBTYPE | PIN OR PORT OWNER	3
4	SOFT INTERRUPT FILE NUMBER	4
5	NUMBER OF MQES IN THE PORT'S QUEUE	5
6	NUMBER OF SENDS TO THIS PORT	6
7	SOFT INTERRUPT PLABEL	7

E Enable wake up bit
0 - Do not awaken the process
1 - Awaken the process

W type Action to be taken on an enabled port when a message is received

0 - Awaken the process on a message wait bit

1 - Generate user software interrupt

2 - Generate system software interrupt

I Interrupt mode

0 - Both priv and user mode code can be interrupted.

1 - Only user mode can be interrupted.

Subtype Soft interrupt subtype
1 - Message file software interrupts.

Message Queue Entry (MQE)

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
0	NEXT MQE ENTRY; IF LAST, (PORT ADDR) LOR 7	0
1	PORT NUMBER OF RETURN PORT	1
2	TIME LIST ENTRY (TLE),0=NO TIMEOUT,-1=TIMED OUT	2
3	PARAMETER ZERO	3
4	PARAMETER ONE	4
5	PARAMETER TWO	5
6	PARAMETER THREE	6
7	PARAMETER FOUR	7

Timer entry definitions - 0 - no timeout
1 - timeout expired
2 - TLE address for a pending timeout

File System Message Files

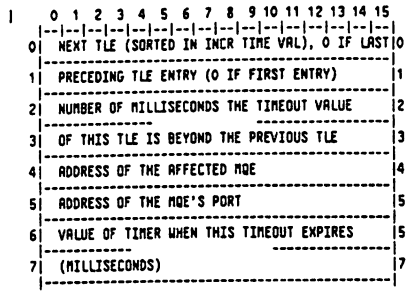
Wait Message:

parm#
0 - WRITER ID
1 - LOCAL FLAGS (differ with each accessor)
(0:1) - accessor just opened file
(1:1) - will wait on boundary condition if no synbiotic process
(3:1) - writer has not written a record
(4:1) - transmission log in bytes
(8:1) - carriage control code
2 - DST# of data buffer
3 - Address of data buffer (DST relative)
4 - Length of data buffer in bytes

Completion Message:

0 - Resultant error code
1 - Resultant transmission log in bytes

Timer List Entry (TLE)



MMSTAT Definitions

Octal Value	Event Type	Parameter 0	Parameter 1	Parameter 2
62	Open	Port number	Port DST num	Flags parameter
63	Receive completion	Port number	MQE address 15:1 Waitspc	Return port
64	Send	Port number	MQE address 15:1 Q type	Return port
65	Change status	Port number	0 = enable 1 = disable	Head MQE address
66	Abort	Port number	Parameter zero	Return port
67	Close	Port number	Port DST	# open ports left
70	Expand	Port DST num	# expand blks	Total # blocks
71	Timeout expired	Port number	MQE address	Return port

CHAPTER 19 MPE MEMORY RESIDENT MESSAGE FACILITY

Overview of Facility

The memory resident message facility of MPE V addresses the need for an efficient, simple, and uniform method for system code to send short status-type messages to processes.

Each process is created with a "port" in the message harbor table (DST X71) which supports a set of message subqueues which are private to that process. There are a maximum of five subqueues per port in the initial implementation. This limit can be easily extended when new subqueues are required.

Any system code, even code running on the ICS, can send a message to any subqueue of any process. The destination process' PIN must be known, any a priori conventions on subqueue number and message formats must be established. The caller of SENDMSG may optionally specify that the destination process be awakened from a message wait.

A message can be any length up to the configured maximum. Message length is specified in the call to SENDMSG and RECEIVEMSG. In the initial implementation, messages are limited to 6 words in length with 4 words available for data. This maximum can easily be increased if the need arises.

By calling PORTSTATUS, a process may at any time determine whether a specified subqueue is non-empty or obtain the subqueue number of the most urgent non-empty subqueue (lowest numbered one).

By calling RECEIVEMSG, a process may receive the message at the head of the specified subqueue. This receive is optionally non-destructive.

A process can wait on a message wait, or on a combination of message wait and other wait types.

Message Intrinsics

SENDMSG

```
Procedure SENDMSG(Destpin, Subqueue, MsgLength, Flags);
Value             Destpin, Subqueue, MsgLength, Flags;
Integer           Destpin, Subqueue, MsgLength;
Logical                                         Flags;
Option Privileged, Uncallable;
```

Destpin, Subqueue, and MsgLength have to be within range or a System Failure 622 will occur.

The caller of SENDMSG stacks the message contents before calling the procedure. SENDMSG expects the first msg word to be at Q-7-MsgLength, and the last msg word at Q-8. The message contents at Q-8 to Q-7-MsgLength are deleted from the top of stack by the exit from SENDMSG to the caller.

Flags.(1:1) = 1 = Wake-up destination process from a message wait.

Return CC = CCG if process was already awake else CC = CCE.

PORTSTATUS

```
Logical Procedure PORTSTATUS(Subqueue);
Value                        Subqueue;
Integer                      Subqueue;
Option Privileged, Uncallable;
```

When supplied a valid subqueue number, PORTSTATUS returns a true value if the subqueue is non-empty and a false value if the subqueue is empty.

When passed a -1 a subqueue parameter, PORTSTATUS returns the subqueue number of the process' most urgent non-empty subqueue (the smaller the number, the more urgent the subqueue).

If all subqueues are empty, PORTSTATUS returns CC = CCE. If at least one subqueue is non-empty, PORTSTATUS returns CC = CCG.

RECEIVEMSG

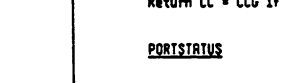
```
Procedure RECEIVEMSG(Subqueue, MsgLength, Flags);
Value                Subqueue, MsgLength, Flags;
Integer              Subqueue, MsgLength;
Logical                                  Flags;
Option Privileged, Uncallable;
```

Subqueue and MsgLength has better be within range or a System Failure 622 will occur.

The caller of RECEIVEMSG does an ASSEMBLE(ADDS MsgLength) to make space for the message contents. RECEIVEMSG stores the message contents into Q-8, Q-9,...,Q-7-MsgLength. Q-7-MsgLength contains the first word of the message.

Flags.(0:1) = do not release message from head of subqueue (non destructive read).

Return CC = CCG if all subqueues were empty, else CC = CCE.



LS = Subqueue or Link
L = Length (2-6)

Supporting Data Structures

Message Harbor Table

DST = X71 (57)

0	DST INDEX NUMBER (X71)	
1	DATA SEGMENT SIZE	
2	USER REGION POINTER	
3	MAXIMUM NUMBER OF PINS + 1	
4	MAXIMUM MSG SIZE (6)	
5	MAX CONTEXT SIZE	
6	MESSAGE POOL HEAD POINTER	
7	MESSAGE POOL TAIL POINTER	
10	AVAILABLE MSG FRAMES COUNT	
11	HEAD OF IMPEDED QUEUE	
12	TAIL OF IMPEDED QUEUE	
13	MAX # OF PENDING MSGS	
14	CURRENT # OF PENDING MSGS	
15	PORTS (16 WORDS EACH) (6 FOR HEADER + 2 LINK WORDS FOR EACH OF 5 SUBQUEUES)	
	MESSAGES (6 WORDS EACH) (2 FOR HEADER + 4 FOR DATA)	

** Note: The Message Harbor Table serves as the System Port Data Segment. The Ports Facility also allows the creation of additional Port Data Segments which have a similar format. In the header of a Port Data Segment other than the Message Harbor Table, words X13 and X14 will contain the Timer Head and the Timer TRLX respectively. Networking software is the primary user of Port Data Segments although they also use subqueues in the System Port Data Segment (Message Harbor Table).

Message Harbor Table (Cont.)

Port

0	FLAGS	0
1	MASK	1
2	PIN	2
3	CONTEXT	3
4	TYPE	4
5	PLABEL	5
6	SUBQ 0 HEAD	6
7	SUBQ 0 TAIL	7
10	SUBQ 1 HEAD	8
11	SUBQ 1 TAIL	9
12	SUBQ 2 HEAD	10
13	SUBQ 2 TAIL	11
14	SUBQ 3 HEAD	12
15	SUBQ 3 TAIL	13
16	SUBQ 4 HEAD	14
17	SUBQ 4 TAIL	15

Message Harbor Table (Cont.)

Port/Subqueue Explanations

SUBQUEUE USERS:

Subqueue 0 - Various system process functions. Examples:
PROGEN - DFS Errors
IOMESSPROC - Misc. Message Handling
SECURITYPROC - Messages for DOWNed Devices
Subqueue 1 - User Soft Interrupts
Subqueue 2 - System Soft Interrupts (not used)
Subqueue 3 - Logon Synch between DO'START & INITJSMP. Also used by Networking Software.
Subqueue 4 - LOAD/LOADER1 Communication

Each process has a port # equaling its pin #. Port 0 is the Kernel Port used by the Dispatcher & Memory Manager routines. The subqueue assignments for Port 0 are as follows:

Subqueue 0 - Make Absent Port
Subqueue 1 - Segment Modification Complete Port
Subqueue 2 - Release Region Port
Subqueue 3 - Fetch Segment Port for I/O Device Monitors
Subqueue 4 - Cache Move Request Port

Port 4 is usually assigned to SYSPORTSERVER (pin 4) which has its own uses for the subqueues as follows:

Subqueue 0 - Not used
Subqueue 1 - Port Segment Completor
Subqueue 2 - Port Timeout
Subqueue 3 - Not used
Subqueue 4 - Port Enable

Message Harbor Table (Cont.)

Message

0	LINK	0
1	LENGTH	1
2		2
3	DATA	3
4		4
5		5
6		6
7		7
10		8
11		9

Timer

0	LINK	
1	LENGTH	
2	REQ ID	
3	SUB QUEUE	
4	DELTA TIME	
5		
6	REPLY PORT	
7		

CHAPTER 20 MMSTATS EVENTS

MMSTATS Catalog Index

MMSTATS Catalog Index (Cont.)

(-) = Events are not logged in Monitor Table but may be logged on magnetic tape.

MMSTAT CATALOG INDEX

MMSTAT Event Group 0 (Memory Manager)

Event 0

EVENT NAME: QONOBJ

DESCRIPTION: ABSENCE TRAP ON CODE/DATA SEGMENT

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): QUEUEONOBJECT

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment type field
- 0 = Data Segment
- 1 = SL Segment
- 2 = Program Segment
- 3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Type 2 Only)

P2 = Segment Number

P3 = SLL Pointer (SLL Table Relative)

P4 = STATUS Word (From Stack Marker) Of Calling (Trapping) Segment

P5 = P REG Word (from Stack Marker) Of Calling (Trapping) Segment

P6 = Not Used

Event 1

EVENT NAME: MAKEOC

DESCRIPTION: MAKE SEGMENT AN OVERLAY CANDIDATE - RELEASE SEGMENT TO THE POOL OF AVAILABLE SPACE

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): MAKEOC

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment Type Field
0 = Data Segment
1 = SL Segment
2 = Program Segment
3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Type 2 Only)

P2 = Segment Number

P3 = Bank Of Region

P4 = Address Of Region

P5-P6 - Not Used

Event 2

EVENT NAME: SPECIALRQ

DESCRIPTION: REQUEST OF SEGMENT EXPANSION/CONTRACTION, UNLOCK, UNFREEZE, IOUNFREEZE, LOCK, IOFREEZE, FREEZE

CALLING MODULE: KERNELC, KERNELD, ININ

CALLING PROCEDURE(S): UNLOCKSEG', IOFREEZE', FETCHOBJECT-(KERNELC) DLSIZE, ZSIZE, GETPXSEG, ALTDSEGSIZE, ALTPXFILESIZE-(KERNELD), STACKOVERFLOW-(ININ)

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment Type Field
0 = Data Segment
1 = SL Segment
2 = Program Segment
3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Program Segment Only)

P2 = Segment Number

P3 = .(0:1) = 1 = If FETCHIOBJECT Is Called With I/O FREEZE, FREEZE Or LOCK Options
.(12:4) Type Of Request
= 0 = IOFREEZE
= 1 = FREEZE
= 2 = LOCK
= 3 = IOUNFREEZE
= 4 = UNFREEZE
= 5 = UNLOCK
= 6 = DLSIZE Expansion
= 7 = DLSIZE Contraction
= 10 = PXFIXED Expansion
= 11 = PXFILE Expansion
= 12 = PXFILE Contraction
= 13 = XDS Expansion
= 14 = XDS Contraction
= 15 = ZSIZE Expansion
= 16 = ZSIZE Contraction
= 17 = STACKOVERFLOW

P4 = For Types (P3.(12:4))
= 0,2,3,5 = P4.(8:8) = LOCK Or IOFREEZE Count
= 1,4 = P4.(0:8) = FREEZE Count
= 6-16 = Requested Size Of Area In Words
= 17 = S Reg Value When Stack Overflow Occurred

P5 = Status Word If Request Type Is STACKOVERFLOW

P6 = PDISABLE Count If Request Type Is STACKOVERFLOW

Event 4

EVENT NAME: FETCHSEG

DESCRIPTION: SEGMENT REQUEST (FOR I/O SYSTEM OR PROCESS)

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): FETCHSEGMENT

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment Type Field
0 = Data Segment
1 = SL Segment
2 = Program Segment
3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Type 2 Only)

P2 = Segment Number

P3 = Requester ID
.(0:1) = 1 = I/O System Request
.(1:15) = Ldev #
.(0:1) = 0 = Process Request
.(1:15) = PIN # Of Requesting Process

.(1:1) = 1 = IOFREEZE Request
.(2:1) = 1 = Blocked LOCK Request
.(3:1) = 1 = LOCK Request
.(4:1) = 1 = FREEZE Request

P4= .(13:3)= 0 = Segment Already Present
= 1 = Segment Is Recover Overlay Candidate
= 2 = Segment Already On Its Way In For Someone (Segment In Motion In)
= 3 = Segment Not Present, Must Fetch (Full Fetch)

P5-P6 - Not Used

Event 5

EVENT NAME: SEGIO

DESCRIPTION: MEMORY MANAGEMENT READ/WRITE OF SEGMENT FROM/TO DISC QUEUED

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): PROCESSINITMSG, STARTSEGWRITE

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment Type Field
0 = Data Segment
1 = SL Segment
2 = Program Segment
3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Type 2 Only)

P2 = Segment Number

P3 = Disc Request Index - (DRQ Table Relative)

P4 = .(0:1) = 1 = WRITE START
= 0 = READ START
.(1:15)= Ldev #

P5-P6 - Not Used

Event 6

EVENT NAME: SIODONE

DESCRIPTION: MEMORY MANAGEMENT SEGMENT READ/WRITE FROM/TO DISC COMPLETE

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): SEGREADCOMPLETOR, SEGWRITECOMPLETOR

Parameter Description

P1,P2 = Segment Identifier

P1.(0:4) = Segment Type Field
0 = Data Segment
1 = SL Segment
2 = Program Segment
3 = Cache Domain

P1.(4:12) = Program Index Into CSTBLK (Type 2 Only)

P2 = Segment Number

P3 = Disc Request Index - (DRQ Table Relative)

P4 = .(0:1) = 1 = Write Complete
= 0 = Read Complete

P5-P6 - Not Used

Event 7

EVENT NAME: CGARBAGE

EVENT DESCRIPTION: GARBAGE COLLECTION HAS JUST TAKEN PLACE

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): COLLECTGARBAGE

Parameter Description

P1 = Bank of Source Just Moved From

P2 = ADDR of Source Just Moved From

P3 = MOVEPAGECNT, Number of Pages Just Moved From

P4-P6 - Not Used

Event 8 (X10)

EVENT NAME: SWAPIN

DESCRIPTION: SWAP IN A PROCESS

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): SWAPIN

Parameter Description

P1 = PIN of Process Being SWAPPED In

P2 = .(0:1) = 0 = Being SWAPPED
= 1 = End SWAP
.(1:1) = 0 = Normal (Partial SWAP OK)
= 1 = SWAP Required
.(12:4)= 0 = Process SWAPIN Complete
2 = No Room, Hard REQ May Succeed
3 = No Room, Hard REQ Failed
4 = SWAPIN Stopped - More Urgent Activity
8 = No Lock Space

P3 = HARDREQUEST = TRUE = Hard Request On SWAPIN
FALSE= Normal

P4-P6 - Not Used

MMSTAT Event Group 1 (Memory Manager/Caching)

Event 12 (X14)

EVENT NAME: ALLOCMEM

DESCRIPTION: FOUND A HOLE FOR A SEGMENT REPLACEMENT REQUEST

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): RESERVEREGION

Parameter Description

P1 = Requested Size In Pages

P2 = Bank Of Selected Region

P3 = Address Of Selected Region

P4-P6 - Not Used

Event 13 (X15)

EVENT NAME: DEALLOCM

DESCRIPTION: RELEASE REGION OF MEMORY TO AVAILABLE STATUS

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): RELEASEREGION

Parameter Description

P1 = Size Released In Pages

P2 = Bank Of Released Region Base

P3 = Address Of Released Region Base

P4-P6 - Not Used

Event 14 (X16)

EVENT NAME: CACHEMOV

DESCRIPTION: A CACHE MOVE (I.E., LOGICAL DISC REQUEST) HAS JUST COMPLETED

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): PROCESSCDTLOGREQQUE

Parameter Description

P1,P2 = Segment Identifier Of Target DST (LDR'BUFDST)
P2.(0:1) = 1 Then This Is A Stack

P3 = Mapped Domain CDT Entry Number

P4 = Transfer Count

P5-P6 = Unused

Event 15 (X17)

EVENT NAME: GET_CDT

DESCRIPTION: CALLED WHEN AN ENTRY IN THE CDT TABLE IS OBTAINED OR RELEASED.

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): GET'CDT'ENTRY, CDT'FREE'ENTRY.
CDT'GET'MD'ENTRY, CDT'REL'MD'ENTRY

Parameter Description

P1 = CDT Entry Number

P2 = Type of call
0 = Free entry
1 = Get Entry
2 = Get Mapped Domain Entry
3 = Release Mapped Domain Entry

P3 = If P2=3 Then Ldev Entry Number

P4-P6 - Not Used

Event 16 (X20)

EVENT NAME: QUE_LDR

DESCRIPTION: CALLED WHEN AN LDR IS QUEUED ONTO THE CDT

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'QUEUE'LDR

Parameter Description

P1 = Mapped Domain CDT Entry Number

P2 = LDR Entry Index To Be Queued

P3 = Queue Type
X12 - CDT Inpeded Queue
X13 - CDT Active Queue

P4-P6 - Not Used

Event 17 (X21)

EVENT NAME: DQUE_LDR

DESCRIPTION: CALLED WHEN AN LDR IS REMOVED FROM THE CDT QUEUE

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'DEQUEUE'LDR

Parameter Description

P1 = Mapped Domain CDT Entry Number

P2 = LDR Entry Index Being Removed From The Queue

P3 = Queue Type
X12 - CDT Inpeded Queue
X13 - CDT Active Queue

P4-P6 - Not Used

Event 18 (X22)

EVENT NAME: FIND_DE

DESCRIPTION: CALLED WHEN NEED TO FIND AN ASSIGNED CDT DEVICE ENTRY

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'FIND'DE

Parameter Description

P1 = LDEV Number Of The CDT Device Entry To Be Found.

P2 = CDT Device Entry

P3-P6 - Not Used

Event 19 (X23)

EVENT NAME: LOCKRANG

DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE(S):

MMSTAT Event Group 2 (Memory Manager)

Event -20 (-X24)

EVENT NAME: ALCSTBLK

DESCRIPTION: REQUEST TO RESERVE A BLOCK OF ENTRIES IN THE CSTX

CALLING MODULE: KERNELD

CALLING PROCEDURE(S): ALCSTBLOCK

Parameter Description

P1 = EIX = CST Block Index Assigned

P2 = CSTX = DST Relative Index Of Word 0 Of The First Reserved CSTX Entry
P3 = N = Number Of CSTX Entries Reserved

P4-P6 - Not Used

Event -21 (-X25)

EVENT NAME: DEALCSTBLK

DESCRIPTION: INDICATES THAT A CST EXTENSION BLOCK HAS BEEN DEALLOCATED

CALLING MODULE: KERNELD

CALLING PROCEDURE(S): DEALCSTBLOCK

Parameter Description

P1 = EIX = CST Block Index Assigned To The Block Of CST Entries

P2 = CSTX = DST Relative Index Of Word 0 Of The First CST Entry To Be Released

P3 = NCNT = (NAllocated CSTX Entries- #Entries Being Released)*4

P4-P6 - Not Used

Event -23 (-X27)

EVENT NAME: RELRESOURCES

DESCRIPTION: RESOURCES (VDS,MAIN MEMORY, ST ENTRY) RESERVED FOR THE SEGMENT HAVE BEEN RELEASED

CALLING MODULE: KERNELD

CALLING PROCEDURE(S): RELDATASEG

Parameter Description

P1 = New DB DST Number

P2 = DELTA P At EXCHANGEDB Call

P3 = Status At EXCHANGEDB Call

P4-P6 - Not Used

Event 25 (X31)

EVENT NAME: STACKOVERFLOW

DESCRIPTION: INDICATES THAT S>2 (NORMAL STACK EXPANSION NEEDED) OR THAT S>MAXDATA (STACK OVERFLOW ABORT)

CALLING MODULE: IMIN

CALLING PROCEDURE: STACKOVERFLOW

Parameter Description

P1 = Current process' PCB RESABORTINFO WORD

P2 = Current process' PCB PROCSTATE WORD

P3 = Current process' S Register value

P4 = P Reg within module receiving overflow

P5 = STATUS WORD of module receiving overflow

P6 = PDISABLE count

MMSTAT Event Group 3

(NOT CURRENTLY ASSIGNED)

MMSTAT Event Group 4 (Scheduling)

Event 40 (%50)

EVENT NAME: QUIESCE

DESCRIPTION: PROCESS SWITCH - STATE OF PROCESS SAVED

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): DSP

Parameter Description

P1 = PCB00(CPCB)
.(0:1) = 1 = SAR - Scheduling Attention Required
.(2:1) = 1 = CRIT - Process Is Critical
.(3:1) = 1 = HSIR - Process Has SIR
.(4:1) = 1 = PIOVR - Pending PI, Process Critical
.(5:1) = 1 = HSPRI - Hold SIR Priority
.(6:1) = 1 = IPEXP - Incore Protect Expired
.(7:1) = 1 = PC - Preempt Capability
.(8:1) = 1 = MP - Must Preempt
.(9:1) = 1 = LW - Long Wait
.(10:1)= 1 = SW - Short Wait
.(11:1)= 1 = TRW - Terminal Read Wait
.(12:1)= 1 = USEQD - Used A Quantum Since Transaction Began
.(13:1)= 1 = HIPRI - Hold Impeded Priority
.(14:1)= 1 = Allow Soft Interrupts Even Though In System Code
.(15:1)= 1 = RITBK - Process In RIT Break

P2 = PCB04(CPCB)
.(0:1) = 1 = M - Mourning Wait
.(1:1) = 1 = RG - Global RIN Wait
.(2:1) = 1 = RL - Local RIN Wait
.(3:1) = 1 = MA - Mail Wait
.(4:1) = 1 = BIO - Blocked IO Wait
.(5:1) = 1 = IO - IO Wait
.(6:1) = 1 = UCP - UCOP Wait, RIT Wait
.(7:1) = 1 = JNK - Junk Wait
.(8:1) = 1 = TIM - Timer Wait
.(9:1) = 1 = INT - Interrupt Wait

.(10:1)= 1 = SON - Son Wait
.(11:1)= 1 = FA - Father Wait
.(12:1)= 1 = IMP - Process Waiting To Unimpeded
.(13:1)= 1 = SIR - Process Waiting For SIR
.(14:1)= 1 = TIM - Process Waiting For Time Out
.(15:1)= 1 = MEM - Process Waiting For Memory

P3 = PCB13(CPCB)
.(0:1) = 1 = DISPQ - Process On Dispatching Queue

.(1:1) = 1 = L Scheduling Class
.(2:1) = 1 = C Scheduling Class
.(3:1) = 1 = D Scheduling Class
.(4:1) = 1 = E Scheduling Class
.(5:1) = 1 = Inter-Process Is Interactive
.(6:1) = 1 = Corer-Process Is Core-Resident
.(8:8) = Process' Scheduling Priority

P4-P6 - Not Used

MMSTAT Event Group 5 (IPC/MSG File)

Event -50 (-%62)

EVENT NAME: FCPORTOPEN

DESCRIPTION: OPEN BIPC PORT

CALLING MODULE: BIPC

CALLING PROCEDURE: FCPORTOPEN

Parameter Description

P1 = Port Number

P2 = Port DST Number

P3 = Flags

P4-P6 - Not Used

Event -51 (-%63)

EVENT NAME: FCPORTRECEIVE

DESCRIPTION: RECEIVE MESSAGE FROM BIPC PORT

CALLING MODULE: BIPC

CALLING PROCEDURE: FCPORTRECEIVE

Parameter Description

P1 = Port Number

P2 = Message Address/Flags

P3 = Return Port

P4-P6 - Not Used

Event -52 (-%64)

EVENT NAME: FCPORTSEND

DESCRIPTION: SEND TO BIPC PORT

CALLING MODULE: BIPC

CALLING PROCEDURE: FCPORTSEND

Parameter Description

P1 = Port Number

P2 = Message Address/Flags

P3 = Return Port

P4-P6 - Not Used

Event -53 (-%65)

EVENT NAME: PORT STATUS CHANGE

DESCRIPTION: ENABLE/DISABLE BIPC PORT

CALLING MODULE: BIPC

CALLING PROCEDURE: FCPORTENABLE/FCPORTDISABLE

Parameter Description

P1 = Port Number

P2 = 0 = Enable; 1 = Disable

P3 = Address of First Message

P4-P6 - Not Used

Event -54 (-%66)

EVENT NAME: FCMSGABORT

DESCRIPTION: PURGE MESSAGES

CALLING MODULE: BIPC

CALLING PROCEDURE: FCMSGABORT

Parameter Description

P1 = Port Number

P2 = Match Parameter

P3 = Return Port

P4-P6 - Not Used

Event -55 (-%67)

EVENT NAME: FCPORTCLOSE

DESCRIPTION: CLOSE BIPC PORT

CALLING MODULE: BIPC

CALLING PROCEDURE: FCPORTCLOSE

Parameter Description

P1 = Port Number

P2 = Port DST Number

P3 = Number of Ports Left Open

P4-P6 - Not Used

Event -56 (-%70)

EVENT NAME: EXPANDPORT SEG

DESCRIPTION: EXPAND BIPC PORT TABLE

CALLING MODULE: BIPC

CALLING PROCEDURE: EXPANDPORTSEG

Parameter Description

P1 = Port DST Number

P2 = Number of Blocks Added

P3 = Total Number of Blocks

P4-P6 - Not Used

Event -57 (-X71)

EVENT NAME: TIMEOUT EXPIRED

DESCRIPTION: MESSAGE TIMER EXPIRED

CALLING MODULE: FCPOSTIMEOUT

CALLING PROCEDURE: FCPOSTIMEOUT

Parameter Description

P1 = Port Number

P2 = Message Address

P3 = Return Port

P4-P6 - Not Used

Event -58 (-X72)

EVENT NAME: IPC INTERNAL EVENT

DESCRIPTION: IPC INTERNAL EVENT

CALLING MODULE: IPC

CALLING PROCEDURE: MAKEMMSTAT

Parameter Description

The parameter values are a function of the event and the first four (4) bits of parameter 1, which is a subtype.

P1 Bits (0:4) - Subtype
(4:2) - File State
0 = Empty
1 = Non-empty
2 = Less Than One Full Record Left
3 = Full
(6:1) = 1 = Waiting Readers
(7:1) = 1 = Waiting Writers
(11:1) = Carriage Control Characters
(12:4) = Local Flags

Event/ Subtype	Name	P2 (0:8)	P2 (8:8)	P3
72/0	Read Initiation	Record Number	ID	Number of Records
72/1	Read Completion	Error	ID	Number of Records
72/2	Write Initiation	Record Number	ID	Free Records
72/3	Write Completion	Error	ID	Free Records
72/4	Control	Error	ID	(0:4) = Function (4:12) = Parameter
72/5	EOF	Error	ID	Number of Records
72/6	Open	Error	ID	Number of Records
72/7	Close	Free Records	ID	Number of Records
72/10	Initialization	0	0	(0:8) = FN (8:8) = Update

P4-P6 - Not Used

Event -59 (-X73)

EVENT NAME: IPC INTERNAL EVENT

DESCRIPTION IPC INTERNAL EVENT

CALLING MODULE: IPC

CALLING PROCEDURE: MAKEMMSTAT

Parameter Description

The parameter values are a function of the event and the first four (4) bits of parameter 1, which is a subtype.

P1 Bits (0:4) = Subtype
(4:2) = File State
0 = Empty
1 = Non-empty
2 = Less Than One Full Record Left
3 = Full
(6:1) = 1 = Waiting Readers
(7:1) = 1 = Waiting Writers
(11:1) = Carriage Control Characters
(12:4) = Local Flags

Event/ Subtype	Name	P2 (0:8)	P2 (8:8)	P3
73/0	Put Record	Error	ID	(0:3) = Rectype (3:12) = # of Records
73/1	Delete Record	Error	ID	(0:3) = Rectype (3:12) = # of Records
73/2	Delete Block	Start of File Block Number		End of File Block

P4-P6 - Not Used

MMSTAT Event Group 6 (FILESYS)

These events are for development use only and are not normally enabled.

Event -60 (-X74)

EVENT NAME: FOPEN

DESCRIPTION: OLD FILE OPEN

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FOPENDA

Parameter Description

P1 = FILE # = (0:2)=2 -> Non-Spooler Access
(0:2).NE.2 ->

P2 = AOPTIONS - See Intrinsics Manual

P3 = File Label FOPTIONS - See Intrinsics Manual

P4 = Record Size

P5 = File Label Block Size

P6 = # Of Buffers

Event -61 (-Z75)

EVENT NAME: FOPEN'

DESCRIPTION: OLD FILE OPEN (CONTINUATION OF EVENT -60)

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FOPENDA

Parameter Description

P1 = File Label File Limit - MSW

P2 = File Label File Limit - LSW

P3 = File Label # Of Extents

P4-P6 - Unused

Event -60 (-Z74)

EVENT NAME: FOPEN

DESCRIPTION: NEW DISC FILE OPEN

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FOPEN

Parameter Description

P1 = FILE # = (0:2)=2 = Non-Spooler Access
(0:2).NE.2 =

P2 = AOPTIONS - See Intrinsics Manual

P3 = FOPTIONS - See Intrinsics Manual

P4 = Record Size

P5 = Block Size

P6 = # Of Buffers

Event -61 (-Z75)

EVENT NAME: FOPEN'

DESCRIPTION: NEW DISC FILE OPEN (CONTINUATION OF EVENT -60)

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FOPEN

Parameter Description

P1 = FCB File Limit

P2 = FCB Max # Extents

P3 = (0:8)= Initial Allocation Extents

P4-P6 - Not Used

Event -62 (-Z76)

EVENT NAME: FREAD

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FREAD

Parameter Description

P1 = File #

P2 = ACBTLOG - Transfer Count

P3 = FLAGS - (15:1) Buffer Hit Flag

Event -63 (-Z77)

EVENT NAME: FWRITE

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FWRITE

Parameter Description

P1 = File #

P2 = TCOUNT - See Intrinsics Manual

P3 = FLAGS - (15:1) Buffer Hit Flag

Event -64 (-Z100)

EVENT NAME: FREADDIR

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FREADDIR

Parameter Description

P1 = File #

P2 = ACBTLOG - Transfer Count

P3 = FLAGS - (15:1) Buffer Hit Flag

P4 = REC # - MSW

P5 = REC # - LSW

P6 = Not Used

Event -65 (-Z101)

EVENT NAME: FWRITEDIR

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE: FWRITEDIR

Parameter Description

P1 = File #

P2 = TCOUNT - See Intrinsics Manual

P3 = FLAGS - (15:1) Buffer Hit Flag

P4 = REC # - MSW

P5 = REC # - LSW

P6 = Not Used

Event -66 (-X102)

EVENT NAME: FUPDATE

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FUPDATE

Parameter Description

P1 = File #

P2 = TCOUNT - See Intrinsics Manual

P3 = FLAGS - (15:1) Buffer Hit Flag

P4-P6 - Not Used

Event -67 (-X103)

EVENT NAME: IOWAIT

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): IOWAIT

Parameter Description

P1 = File #

P2 = ACBTLOG - TRANSFER COUNT

P3 = FLAGS - (15:1) Buffer Hit Flag

Event -68 (-X104)

EVENT NAME: FREADSEEK

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FREADSEEK

Parameter Description

P1 = File #

P2 = FLAGS - (15:1) Buffer Hit Flag

P3 = REC # - MSW

P4 = REC # - LSW

P5-P6 - Not Used

Event -69 (-X105)

EVENT NAME: FSPACE

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FSPACE

Parameter Description

P1 = File #

P2 = DISPLACEMENT - See Intrinsics Manual

P3-P6 - Not Used

MMSTAT Event Group 7 (FILESYS)

These events are for development use only and are not normally enabled.

Event -70 (-X106)

EVENT NAME: FPOINT

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FPOINT

Parameter Description

P1 = File #

P2 = REC # - MSW

P3 = LSW - LSW

P4-P6 - Not Used

Event -71 (-X107)

EVENT NAME: FCONTROL

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FCONTROL

Parameter Description

P1 = File #

P2 = Code - See Intrinsics Manual

P3-P6 - Not Used

Event -72 (-X110)

EVENT NAME: FSETMODE

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FSETMODE

Parameter Description

P1 = File #

P2 = MODEFLAGS - See Intrinsics Manual

P3-P6 - Not Used

Event -74 (-X112)

EVENT NAME: FCHECK
DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FCHECK

Parameter Description

P1 = File #

P2 = ERRORCODE - See Intrinsics Manual

P3-P6 - Not Used

Event -75 (-X113)

EVENT NAME: FGETINFO

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FGETINFO

Parameter Description

P1 = File #

P2 = FOPTIONS - See Intrinsics Manual

P3 = AOPTIONS - See Intrinsics Manual

P4-P6 - Not Used

Event -76 (-X114)

EVENT NAME: FREADLABEL

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S):

Parameter Description

P1 = File #

P2 = TCOUNT - See Intrinsics Manual

P3-P6 - Not Used

Event -77 (-X115)

EVENT NAME: FWRITELABEL

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FWRITELABEL

Parameter Description

P1 = File #

P2 = TCOUNT - See Intrinsics Manual

P3-P6 - Not Used

Event -78 (-X116)

EVENT NAME: FLOCK

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FLOCK

Parameter Description

P1 = File #

P2 = LOCKCOND - See Intrinsics Manual

P3 = COND CODE - See Intrinsics Manual

Event -79 (-X117)

EVENT NAME: FUNLOCK

DESCRIPTION:

CALLING MODULE: FILEIO

CALLING PROCEDURE(S): FUNLOCK

Parameter Description

P1 = File #

P2-P6 - Not Used

MMSTAT Event Group 8 (FILESYS/Caching)

Event -80 (-X120)

EVENT NAME: FRENAME

DESCRIPTION:

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FRENAME

Parameter Description

P1 = File #

P2-P6 - Not Used

Event -81 (-X121)

EVENT NAME: FCLOSE

DESCRIPTION:

CALLING MODULE: FILEACC

CALLING PROCEDURE(S): FCLOSE

Parameter Description

P1 = File #

P2 = DISP - See Intrinsics manual

P3 = SECCODE

P4-P6 - Not Used

Event 82 (X122)

EVENT NAME: AWAKEDEV

DESCRIPTION: AWAKES I/O DEVICE MONITOR WHEN SEGMENT FETCH COMPLETES

CALLING MODULE: KERNELC

CALLING PROCEDURE(S): PROCESSSCHEDMSG,UNDEFEROBJSMPQ

Parameter Description

P1 = SYSDB RELATIVE DIT POINTER OF LDEV TO BE AWAKENED

P2 = WORD 0 (FLAGS WORD) OF THE DIT OF THE LDEV TO BE AWAKENED

P3 = IF DATA OBJECT THEN IOQ OR DRQ INDEX OTHERWISE LDEV NUMBER

P4-P6 - Not Used

Event 83 (X123)

EVENT NAME: STRATEGY

DESCRIPTION: CALLED TO DETERMINE THE TYPE OF STRATEGY USED BASED ON WHO THE CALLER OF CDT'ATTACHIO IS

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'STRATEGY

Parameter Description

P1 = CDT Mapped Domain entry

P2 = LDR Entry Index

P3 = Strategy
- 0 - Unknown Caller
- 1 - Unknown From File System
- 2 - Spooler
- 3 - Directory
- 4-7 - Unknown
- 8 - GENMESSAGE
- 9 - File System, Quiesce I/O
- 10 - File System, Sequential, NOBUF
- 11 - File System, Direct, NOBUF
- 12 - File System, Sequential, BUF
- 13 - File System, Direct, BUF
- 14 - File System, KSAM
- 15 - File System, IMAGE

P4-P6 - Not Used

Event 84 (X124)

EVENT NAME: INITIATE

DESCRIPTION: CALLED WHEN STARTING/COMPLETING LOGICAL DISC REQUEST

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'INITIATOR, CDT'COMPLETOR

Parameter Description

P1 = CDT Mapped Domain Entry Number

P2 = LDR Entry Index

P3 = Type
- 0 = Initiator
- 1 - Completor

P4-P6 - Not Used

Event 85 (X125)

EVENT NAME:

DESCRIPTION:

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Event 86 (X126)

EVENT NAME: CDT_ATT

DESCRIPTION: CALLED FROM CDT'ATTACHIO

CALLING MODULE: CACHESEG

CALLING PROCEDURE(S): CDT'ATTACHIO

Parameter Description

P1 = Ldev

P2 = Function

P3 = Flags

P4-P5 = Parm1, Parm2

P6 = Count

Event 87 (X127)

EVENT NAME: MAP_DOM

DESCRIPTION: CALLED WHEN NEED TO "MAP" A DISC DOMAIN

CALLING MODULE: CACHESEG

CALLING PROCEDURE: CDT'MAP'CACHED'DOMAIN

Parameter Description

P1 = New CDT Entry Number

P2 = Returned CDT Entry

P3-P6 - Not Used

Event 88 (X130)

EVENT NAME: UN_MAP_RG

DESCRIPTION: CALLED WHEN DISC DOMAIN NO LONGER MAPPED. (I.E., BOTH THE LOGICAL AND PHYSICAL I/O IS COMPLETE)

CALLING MODULE: CACHESEG

CALLING PROCEDURE: CDT'MAP'CACHED'REGION

Parameter Description

P1 = CDT Ldev Entry Number

P2 = Region CDT Entry Number

P3-P6 - Not Used

Event 89 (X131)

EVENT NAME: LINK_REG

DESCRIPTION: CALLED WHEN A DISC DOMAIN GETS LINKED INTO THE LINKED LIST OF DOMAINS FOR AN LDEV

CALLING MODULE: CACHESEG

CALLING PROCEDURE: LINK'CACHED'REGION,UNLINK'CACHED'REGION

Parameter Description

P1 = Type
- 0 = Link
- 1 = Unlink

P2,P3 = Address Of Region Base

P4 = CDT Entry Number Found In The Header

P5 = # Of Pages

P6 - Not Used

MMSTAT Event Group 9 (Disc I/O Requests)

Event 90 (X132)

EVENT NAME: REQCACHE

DESCRIPTION: CALLED TO SEE IF CACHING WILL ACCEPT THIS I/O REQUEST

CALLING MODULE: CACHESEG

CALLING PROCEDURE: REQUEST'CACHE

Parameter Description

P1 = LDR Entry Index

P2-P6 - Not Used

Event -98 (-X142)

EVENT NAME: DISK TRAFFIC

DESCRIPTION: DISC I/O REQUEST HAS BEEN QUEUED

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): ATTACHIO

Parameter Description

P1=CNT Data Transfer Count:Words If >0; Bytes If <0

P2=FLAGS.(0:4)

P3=FNCT =0 = Read
=1 = Write
=2 = Open File
=3 = Close File
=4 = Close Device

MMSTAT Event Group 10 (Disc Errors)

Event 100 (X144)

EVENT NAME: DISK ERROR

DESCRIPTION: RECORD DISC ERROR

CALLING MODULE: IOFDISC1

CALLING PROCEDURE(S): FMDDVR

Parameter Description

P1 = DIPT(DSTAT) - Hardware Status

P2 = SO - QMISC

P3 = IOQP(QLDEV).QLDEVN LOR STOCOUNT&LSL(8)) = DEV/SIO Program Counter

Event 101 (X145)

EVENT NAME: DISK ERROR

DESCRIPTION: RECORD DISC ERROR

CALLING MODULE: IOMDISCO

CALLING PROCEDURE(S): MMDDVR

Parameter Description

P1 = DIPT(DSTAT) - Hardware Status

P2 = SO - QMISC

P3 = IOQP(QLDEV).QLDEVN LOR STOCOUNT&LSL(8))
= LDEV/SIO Program Counter

MMSTAT Event Group 11 (SIO)

Event -110 (-X156)

EVENT NAME: START I/O

DESCRIPTION: DRIVER INITIATOR FOR SIO DEVICE HAS BEEN CALLED

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

P1 = IOQPL(QSTAT) LOR IOQPL(QLDEV).LDEVN
= (0:8) PCB Entry # Of Process Making Request
= (8:8) Logical Device Number Of Device For I/O

P2 = IOQP(QWBCT)=Word Count If>0;Byte Count If<0

P3 = (0:2) = Function Code Specified By Driver
= 0 = Read
= 1 = Write
= 2 = Control
= (6:10)= DSTN Of Target Data Seg

Event -111 (-X157)

EVENT NAME: I/O COMPLETION

DESCRIPTION: SIO COMPLETION

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

P1 = IOQP(QLDEV).LDEVN=Logical Device Number Of Disc Involved In Transfer

P2 = IOQP(QPAR1) - (Defined By Driver)

P3 = IOQP(QPAR2) - (Defined By Driver)

MMSTAT Event Group 12 (Disc Space)

Event 120 (X170)

EVENT NAME: SOFT'DEATH

DESCRIPTION: BUG CATCHER

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SOFT'DEATH

Parameter Description

P1 = SOFT'DEATH I.D. Number

P2 = Caller's Status Register

P3 = Caller's Delta P

Event 125 (X175)

EVENT NAME: IOBUFTRP

EVENT DESCRIPTION: IOSYSTEM BUFFER TRAP

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

P1 = IOQP

P2 = IOQP(QDSTN).DSTN = DST Number Of Buffer

P3 = 0

Event -130 (-Z202)

EVENT NAME:

DESCRIPTION:

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): ATTACHIO

Parameter Description

P1 = LDEV

P2 = P Register

P3 = RSTATUS

P4-P6 - Not Used

Event -131 (-Z203)

EVENT NAME:

DESCRIPTION:

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): ATTACHIO

Parameter Description

P1, P2 = Extent Base

P3 = Extent Size

P4-P6 - Not Used

Event -132 (-Z204)

EVENT NAME:

DESCRIPTION:

CALLING MODULE: HARDRES

CALLING PROCEDURE: ATTACHIO

Parameter Description

P1, P2 = Formal Parameters Given To ATTACHIO Which Are Device Dependent Parameters

P3 = Formal.FLAGS Parameter Supplied To ATTACHIO By The Caller

P4-P6 - Not Used

MMSTAT Event Group 13 (Disc Caching)

Event 139 (Z213)

EVENT NAME: C_ABSENT

DESCRIPTION: EITHER THE MAPPED DISC DOMAIN OR THE TARGET DST WAS ABSENT WHEN A CACHE MOVE WAS ATTEMPTED

CALLING MODULE: CACHESEG

CALLING PROCEDURE: PROCESSCDTLOGREQQUEUE

Parameter Description

P1 = 0 Mapped Domain Absent

P2 = Pin

P3,P4 = Segment Identifier Of Mapped Domain

P5-P6 - Not Used

P1 = LDR Entry Index (DST Not Present)

P2 = Pin

P3,P4 = Segment Identifier Of DST (P4.(0:1) = 1 Stack)
P5-P6 - Not Used

MMSTAT Event Group 14 (CS/3000)

Event 140 (Z214)

EVENT NAME: COPEN

DESCRIPTION:

CALLING MODULE: COMSYS2

CALLING PROCEDURE(S): COPEN

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = PMAP1

P3 = PMAP2

Event 142 (Z216)

EVENT NAME: CABORTIO

DESCRIPTION:

CALLING MODULE: COMSYS1

CALLING PROCEDURE(S): CABORTIO

Parameter Description

P1 = Logical Device Number

P2 = IOGINDEX

P3 = 0

Event 144 (X220)

EVENT NAME: CSIOWAIT

DESCRIPTION:

CALLING MODULE: COMSYS1

CALLING PROCEDURE(S): CSIOWAIT

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = Transmission Log

P3

Event 146 (X222)

EVENT NAME: CCLOSE

DESCRIPTION:

CALLING MODULE: COMSYS3

CALLING PROCEDURE(S): CCLOSE

Parameter Description

P1 (0:8) = CS Error Code
(8:8) = Logical Device Number

P2 = Line Number

P3 = 0

Event 147 (X223)

EVENT NAME: CREAD

DESCRIPTION:

CALLING MODULE: COMSYS4

CALLING PROCEDURE(S): CREAD

Parameter Description

P1 = (0:8) = CS Error Code
(8:8) = Logical Device Number

P2 = INCOUNT

P3 = STATION

Event 149 (X225)

EVENT NAME: CWRITE

DESCRIPTION:

CALLING MODULE: COMSYS4

CALLING PROCEDURE(S): CWRITE

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = OUTCOUNT

P3 = INCOUNT

MMSTAT Event Group 15 (CS/3000)

Event 150 (X226)

EVENT NAME: CSDRIVER

DESCRIPTION:

CALLING MODULE: BSCLCM

CALLING PROCEDURE(S): CSDRIVER

Parameter Description

P1 = TIMER - LSW

P2 = CURRENTSTATE - Where The Driver Is In The State Transition Table

P3 = CURRENTEVENT - (0:8) = Current Event
(8:8) = Logical Device That Caused The Driver To Become Active

Event 152 (X230)

EVENT NAME: CCONTROL

DESCRIPTION

CALLING MODULE: COMSYS5

CALLING PROCEDURE(S): CCONTROL

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = Control Code

P3 = Parameter

Event 153 (X231)

EVENT NAME: COPENTRACEFILE

DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE(S): COPENTRACEFILE

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = CTRACEINFO

P3 = 0

Event 154 (X232)

EVENT NAME: CCLOSETRACEFILE

DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE(S): CCLOSETRACEFILE

Parameter Description

P1 = (0:8) = CS Error Code
= (8:8) = Logical Device Number

P2 = 0

P3 = 0

Event 155 (%233)

EVENT NAME: CPOLLIST

DESCRIPTION:

CALLING MODULE:

CALLING PROCEDURE(S): CPOLLIST

Parameter Description

P1 = Logical Device

P2 = CS Error Code

P3 = PMAP

MMSTAT Event Group 16 (CS/3000)

Event 160 (%240)

EVENT NAME: CREAD

DESCRIPTION:

CALLING MODULE: DSMON

CALLING PROCEDURE(S):

Parameter Description

P1 = Time Stamp

P2 = (0:4) Not Used
(4:1) Block
(5:2) State
(7:3) Next
(10:1) :=0 Initialization Event
:=1 Completion Event
(11:5) Sub Event Number

P3 = Depends On The Sub Event Number And
If It Is An Initialization Or Completion Event
MSG: (0:4) STRNTYPX
(4:6) MSG CLS
(10:16) STRNTYP

SUB EVENT NO.	SUB EVENT NAME	INIT PARM	COMP PARM
0	CREAD	0	LEN
1	CWRITE	X MSG	LEN
2	IOWAIT	0	LEN
3	CCHECK	0	ERRCOD
4	DSATTN	0	0
5	DSWC	X MSG	R MSG
6	CHNGEWAIT	PARM	0
7	MONREQ	REQ	0
10	CABORT	0	T/F
11	CRESET	0	0
12	CSDATA	R MSG	
13	CSREREAD		

MMSTAT Event Group 19 (Disc Controller Intrpt)

Event 191 (%277)

EVENT NAME: DISKINTRPT

DESCRIPTION: A 7905/7920 CONTROLLER IS PROCESSING AN ATTENTION INTERRUPT (ONLINE/OFFLINE)

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

P1 = @DITP - (US) - (i.e., Who Got The Interrupt)

P2 = @DITP - (THEM) - (i.e., Who Ran The Poll Program)

P3 = DITP - "OUR" DIT Flags Word

There should be at least an %300 and an %303 for each SIO PRGM. A single isolated (in time) request will generate at least a %303, %300, %303. If the queue of IOQ'S on a DIT never empties, there would be one %300 and one %303 per SIO PRGM.

Event 192 (%300)

EVENT NAME: GIPINTERRUPT

DESCRIPTION: INTERRUPT JUST PROCESSED

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): GIP

Parameter Description

P1 = LDEV

P2 = Queue Element Word Entry Index

P3 = Contents Of DIT Word 0: The Flags Word

P4 = Channel Program Instruction Pointer

P5 = Controller Status

P6 = LSW of a Return from TIMER

Event 193 (%301)

EVENT NAME: STARTIO

DESCRIPTION: ISSUING SIOP MACHINE INSTRUCTION

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): START'MPIB, STARTIO

Parameter Description

P1 = Absolute Address Of SIO Program To Start

P2 = LDEV Number

P3 = DRT Number

P4 = Q'ENTRY'INDEX From DITP(DIOQP)

P5 = DIT Word 0: The DIT Flags Word

P6 = LSW Of A Return From A Call To TIMER

Event 194 (X302)

EVENT NAME: SIODM-ENTRY

DESCRIPTION: ENTERING SIODM

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

P1 = LDEV

P2 = IOQ OR DRQ Table Relative Index

P3 = DIT Word 0 (DIT FLAGS)

P4 = Current State Of The Variable State In SIODM

P5 = Not Used

P6 = LSW Returned By Call To TIMER

Event 195 (X303)

EVENT NAME: SIODM-EXIT

DESCRIPTION: LEAVING SIODM MAIN LOOP

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): SIODM

Parameter Description

The same as Event 194 (X302), above.

MMSTAT Event Group 20 (Private Volumes)

These Events are for development use only and are not normally enabled.

Event 200 (X310)

EVENT NAME: DISKBUGCATCHER

DESCRIPTION: A MOUNTED VOLUME TABLE CHANGE IS BEING MADE.

CALLING MODULE: PVSYS

CALLING PROCEDURE(S): MVTABLE

Parameter Description

P1 = FUNCT
- 0 = Delete Entry
- 1 = Add Entry
- 2 = Preserve Entry

P2 = MVTABX (Mounted Volume Table Index)

P3 = DELTAP (Value Of Q-2)

Event 201 (X311)

EVENT NAME: DISKBUGCATCHER

DESCRIPTION: A PRIVATE VOLUME USER TABLE CHANGE IS BEING MADE.

CALLING MODULE: PVSYS

CALLING PROCEDURE(S): USERTABLE

Parameter Description

P1 = FUNCT
- 0 = Create User Entry
- 1 = Rename User Entry
- 2 = Return All MVTABX Indices Used By A Specific PCB
- 3 = Return All PCB Pointers Using A Specific MVTABX
- 4 = Get User Entry

P2 = MVTABX (Mounted Volume Table Index)

P3 = DELTAP (Value Of Q-2)

MMSTAT Event Group 21 (Process Creation And Termination)

Event 211 (X323)

EVENT NAME: PROCESS COMPLETION

DESCRIPTION: PROCESS HAS TERMINATED

CALLING MODULE: MORGUE

CALLING PROCEDURE(S): TERMINATE

Parameter Description

P1 = 0

P2 = 0

P3 = 0

MMSTAT Event Group 22 (Monitor Config Information)

Event 221 (X335)

EVENT NAME: CONFIGURATION INFORMATION

DESCRIPTION: EVENT GROUP MASK

CALLING MODULE: CRIO

CALLING PROCEDURE(S): CONSMON

Parameter Description

P1 = MEASMSK0

P2 = MEASMSK1

P3 = Reserved

Event 222 (%336)

EVENT NAME: CONFIGURATION INFORMATION

DESCRIPTION: MPE VERSION FIX UPDATE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = Version

P2 = FIXL

P3 = UPDATEL

Event -223 (-%337)

EVENT NAME: CONFIGURATION INFORMATION

DESCRIPTION: SYSTEM TABLE LOCATIONS AND AVAILABLE LINKED MEMORY INFORMATION

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = F (%1032)=@CST(0)-@DST(0) =Displacement To Code
P2 = F(%1033)=@CST(LAST)-@DST(0) =Displacement To Sharable
P3 = LOGICAL(TOTAL&DLSK(4))=Linked Memory Size

Event -224 (-%340)

EVENT NAME: SYSPINS

DESCRIPTION: LOGICAL PROCESS TABLE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = ABSOLUTE(%1141)=PROGEN'S PCB Entry Number

P2 = ABSOLUTE(%1142)=MRM'S PCB Entry Number

P3 = ABSOLUTE(%1143)=UCOP'S PCB Entry Number

Event -225 (-%341)

EVENT NAME: SYSPINS(CNTD.)

DESCRIPTION: LOGICAL PROCESS TABLE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = ABSOLUTE(%1144)=PFAIL'S PCB Entry Number

P2 = ABSOLUTE(%1145)=DEVREC'S PCB Entry Number

P3 = ABSOLUTE(%1146)=PRMSG'S PCB Entry Number

Event -226 (-%342)

EVENT NAME: SYSPINS(CNTD.)

DESCRIPTION: LOGICAL PROCESS TABLE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = ABSOLUTE(%1147)=STMSG'S PCB Entry Number

P2 = ABSOLUTE(%1150)=LOG'S PCB Entry Number

P3 = ABSOLUTE(%1151)=LOAD'S PCB Entry Number

Event -227 (-%343)

EVENT NAME: SYSPINS(CNTD.)

DESCRIPTION: LOGICAL PROCESS TABLE

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = ABSOLUTE(%1152)=IOMESSPROC'S PCB Entry Number

P2 = ABSOLUTE(%1153)=SYSIOPROC'S PCB Entry Number

P3 = ABSOLUTE(%1154)=MEMLOGP'S PCB Entry Number

Event -228 (-%344)

EVENT NAME: TIMESTAMP

DESCRIPTION: TIMESTAMP

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1=CALENDAR (0:7) = Year Of Century
(7:9) = Day Of Year

P2=CLOCK(WORD1).(0:7) = Hour Of Day
(8:8) = Minute Of Hour

P3=CLOCK(WORD2).(0:7) = Seconds Into Minute
.(8:8) = Tenths Of Seconds

Event -229 (-%345)

EVENT NAME: MONOFF

DESCRIPTION: END EVENT TRACING

CALLING MODULE: OPCOMMAND

CALLING PROCEDURE(S): CXMON

Parameter Description

P1 = 0

P2 = 0

P3 = 0

MMSTAT Event Group 23 (Terminal I/O)

Event 230 (X346)

EVENT NAME: TERMREAD
DESCRIPTION: TERMINAL READ COMPLETION
CALLING MODULE: HARDRES
CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV
P2 = Read Duration
P3 = Bytes Read

Event 231 (X347)

EVENT NAME: DC1DC2ACK
DESCRIPTION: DC1/DC2 HAS BEEN SATISFIED
CALLING MODULE: HARDRES
CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV
P2 = Duration (Between Start And DC2)
P3 = Bytes Read (Excluding DC2)

Event 232 (X350)

EVENT NAME: TERMWRITE
DESCRIPTION: WRITE COMPLETION
CALLING MODULE: IOTERMO
CALLING PROCEDURE(S): TERMIOM

Parameter Description

P1 = LDEV
P2 = 0
P3 = Byte Count Of Transfer

Event 233 (X351)

EVENT NAME: BINREAD
DESCRIPTION: BINARY READ COMPLETED
CALLING MODULE: HARDRES
CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV
P2 = Duration
P3 = Bytes Read

Event 234 (X352)

EVENT NAME: TERMLOGON
DESCRIPTION: TERMINAL JUST LOGGING ON
CALLING MODULE: IOTERMO
CALLING PROCEDURE(S): TERMIOM

Parameter Description

P1 = LDEV
P2 = 0
P3 = 0

Event 235 (X353)

EVENT NAME: TERMLOGOFF
DESCRIPTION: TERMINAL JUST LOGGED OFF
CALLING MODULE: IOTERMO
CALLING PROCEDURE(S): TERMIOM

Parameter Description

P1 = LDEV
P2 = 0
P3 = 0

Event 236 (X354)

EVENT NAME: SPECCHAR
DESCRIPTION: PROCESSED SPECIAL CHARRACTER
CALLING MODULE: HARDRES
CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV
P2 = Special Character Processed
P3 = 0

Event 237 (X355)

EVENT NAME: BREAK
DESCRIPTION: PROCESSED BREAK
CALLING MODULE: HARDRES
CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV
P2 = DSTATE
P3 = 0

Event 238 (X356)

EVENT NAME: SPECREAD

DESCRIPTION: SPECIAL READ TERMINATION CHARACTER DETECTED

CALLING MODULE: HARDRES

CALLING PROCEDURE(S): TIP

Parameter Description

P1 = LDEV

P2 = Duration

P3 = BCNT

MMSTAT Event Group 24 (Power Fail)

Event 240 (X360)

EVENT NAME: PFAIL

DESCRIPTION: POWER FAIL DETECTED

CALLING MODULE: ININ, PFAIL

CALLING PROCEDURE(S): POWERUP (ININ), POWERUP (PFAIL)

Parameter Description

P1 = 0 Called From Powerup In ININ
1 Called From Entry In Powerup In PFAIL
2 Called From End Of Powerup In PFAIL

P = For P1=0 This Is 0
For P1=1,2:
TRUE = Multiple Powerfail
FALSE= First Powerfail

P3 = PF
0 = No Powerfail Or PFAIL Processing Complete
1 = Set By The Power Down Trap In ININ
2 = Set By The Power Up Trap In ININ
3 = Set When Awake The PFAIL Process
4 = Set By PFAIL After Message Appears On Console

P4 = SYSUP
0 = System Not Back Up After Powerfail
1 = System Back Up After Powerfail

P5-P6 - Not Used

Event -241 (-X361)

EVENT NAME: PSEUDOINT

DESCRIPTION: PSEUDO/SOFT INTERRUPT HANDLING

CALLING MODULE: MISCSEGC

CALLING PROCEDURE(S): PSUEDOINT

Parameter Description

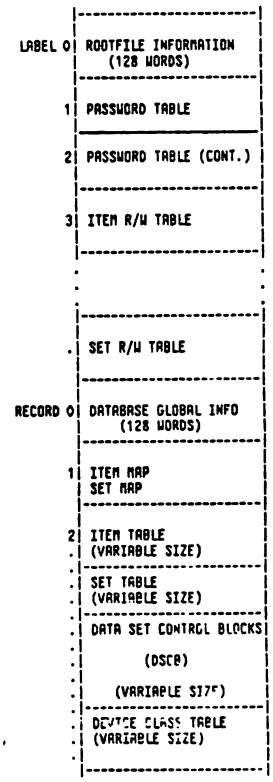
P1 = Interrupt Type
= 0 If Hard Kill (P2, P3 Not Used)
= 1 If Soft Kill (P2, P3 Not Used)
= 2 If Control-Y (P2, P3 Not Used)
= 3 If Break (P2, P3 Not Used)
= 4 If System Soft Interrupt
P2 =
P3 =
= 5 If User Soft Interrupt
P2 =
P3 =

P2, P3 = Dependent on P1

P4, P5, P6 - Not Used

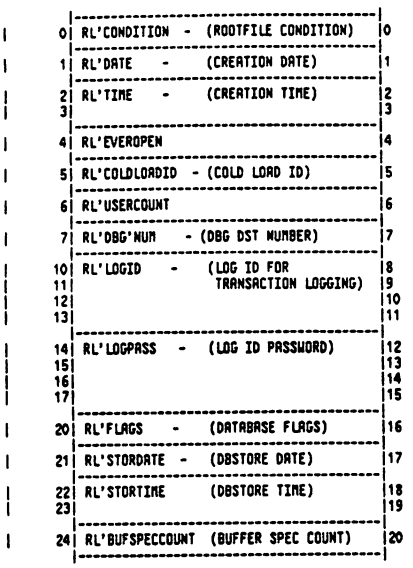
CHAPTER 21 ROOTFILE LAYOUT

General Rootfile Layout

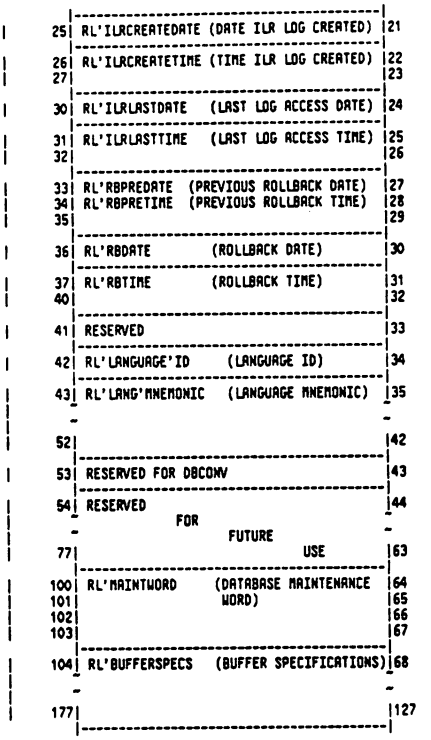


The data base ROOT FILE is an MPE file with filecode equal to -400. The record size is 128 words, fixed, binary format with a blocking factor of 1. The size of the file depends on the number of data items and data sets defined in the data base.

Root File Label 0



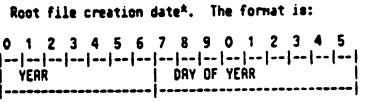
Root File Label 0 (Cont.)



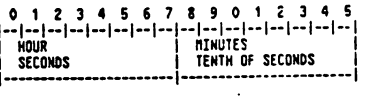
Root File Label 0 (Cont.)

RL'CONDITION (IN ASCII):
- JB - Virgin. The database has not been created yet.
- FW - OK. The database is OK.
- RM - Modified deferred. The database is being modified.
- MC - Maintenance create. The database is being created.
- ME - Maintenance erase. The database is being erased.
- IL - ILR recovery in progress.
- IE - ILR enable in progress.
- ID - ILR disable in progress.
- CN - Conversion by DBCONV was in progress and cannot be continued.
- CA - Conversion by DBCONV was in progress and can be continued.
- MV - Database file move is in progress.

RL'DATE - Root file creation date*. The format is:



RL'TIME - Root file creation time*. The format is:



RL'EVEROPEN - This field is no longer used under IMAGE B

RL'FLAGS -

(0:1) - RECOVERY	Default is NO	(0)
(1:1) - LOGGING	Default is NO	(0)
(2:1) - ACCESS	Default is YES	(1)
(3:1) - DUMPING	Default is NO	(0)
(4:1) - OUTPUT DEFER	Default is NO	(0)
(5:2) - SUBSYSTEM ACCESS	Default is R/W	(00)
(7:1) - ILR	Default is NO	(0)
(8:1) - ROLLBANK	Default is NO	(0)
(9:1) - RESERVED		
(10:1)- DIRTY FLAG	Default is YES (1). This indicates the database has been modified but not DBSTOREd.	
(11:1)- DBRECOV RESTART	Default is NO	(0)
(12:4)- RESERVED		

Root File Label 0 (Cont.)

RL'STORDATE - Same format as RL'DATE*.

RL'STORTIME - Same format as RL'TIME*.

RL'BUFSPECCOUNT - Maximum number of buffer specifications allowed.

RL'ILRCREATEDATE - Same format as RL'DATE*.

RL'ILRCREATETIME - Same format as RL'TIME*.

RL'ILRLASTDATE - Same format as RL'DATE*.

RL'ILRLASTTIME - Same format as RL'TIME*.

RL'RBPREDATE - Same format as RL'DATE*.

RL'RBPRETIME - Same format as RL'TIME*.

RL'RBDATE - Same format as RL'DATE*.

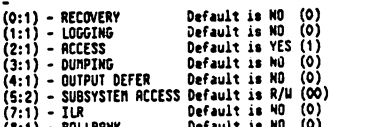
RL'RBTIME - Same format as RL'TIME*.

RL'LANGUAGE'ID - Same format as defined in system configuration.

RL'LANG'MNEMONIC - Language mnemonic for this database. Maximum 16 characters.

RL'MAINTWORD - For data bases with no maintenance word this field has 2 semicolons (';;') and trailing blanks.

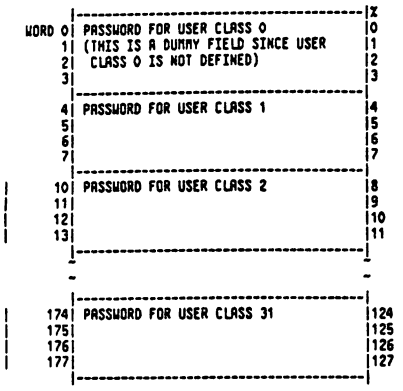
RL'BUFFSPECS -



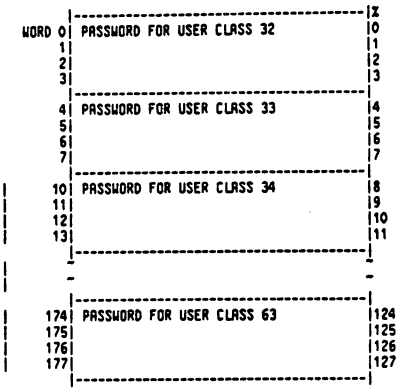
* The DATE and TIME fields can be formatted (for display purposes) individually by calling the FMTCALENDAR and FMTCLOCK Intrinsics respectively, or both fields can be formatted at once with FMTDATE intrinsic.

Root File Labels 1 & 2

Label 1

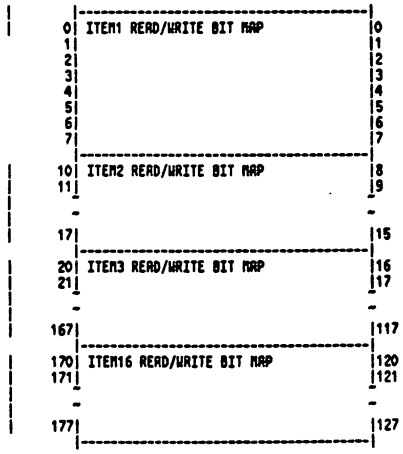


Label 2



The Password Table occupies user labels number 1 and 2. There are four words (8 characters) reserved for each password. The relative position of a password corresponds to the user class number defined in the schema. For user class numbers not defined in the SCHEMA, the four word field is filled with blanks.

Root File Label 3



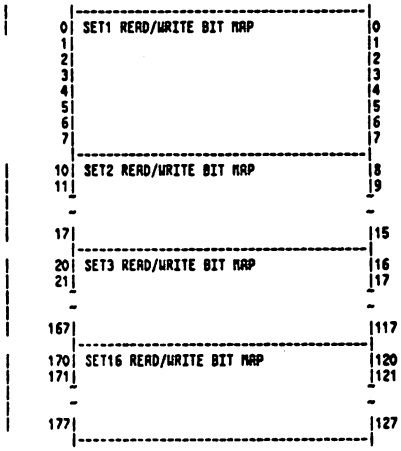
The Item Read/Write Table starts in user label #3. There are eight words for each Item Read/Write bit map. For databases with more than 16 items, the Read/Write table continues in the next user labels. The specific format of this table is explained after the Set Read/Write Table since it is defined the same way. The number of user labels occupied by the Item Read/Write Table depends on the number of data items defined in the schema and can be obtained by rounding upwards (ceiling)the result of:

Num-of-labels = [(Num-of-items)*8]/128

Since there can only be a maximum of 1023 data items in the schema, the maximum size for this table in user labels would be:

Max-size = [(1023)*8]/128 = 63.93 => 64 labels.

Root File - Next Label(s)



The Set Read/Write Table starts on a user label boundary after the Item Read/Write Table. There are eight words for each Set Read/Write bit map. For databases with more than 16 data sets, the read/write table continues in the next user labels. The specific format of this table is shown on the next page.

The number of user labels occupied by the Set Read/Write Table depends on the number of data sets defined in the schema, and is obtained by rounding upwards (ceiling) the result of:

Num-of-labels = [(Num-of-sets)*8]/128

Since there can only be a maximum of 199 data sets defined in the schema the maximum size for this table in user labels is:

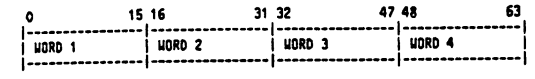
Max-size = [(199)*8]/128 = 12.44 = 13 labels

Root File - Next Label(s) (Cont.)

Iten/Set Read/Write Table Format

There are eight words per iten/set Read/Write Table definition and up to 16 items/sets per record (user label). Within each 8 words, the first 4 words are the flags for the user classes which have read access to the iten/set. The second 4 words are the flags for the user classes which have write access to the iten/set. The detail format for an eight word field is shown below.

1. Four words for read access:

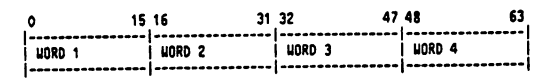


Four words represent 64 bits. Bit n represents read access for user class n to the iten/set. If bit n is set to 1 then user class n has read access to the iten/set. For example, if the word settings are:

WORD 1	WORD 2	WORD 3	WORD 4
%000016	%020000	%000410	%001300

This means that user classes 12, 13, 14, 18, 39, 44, 54, 56 and 57 have read access to the iten/set. If no read/write security is defined at all for the iten/set, then all of the read security bits are set to 1.

2. Four words for write access:



Write access flags have the same format as the read access flags. Bit n represents write access for user class n to the iten/set. If bit n is set to 1, then user class n has write access to the iten/set. For example, if the word settings are:

WORD 1	WORD 2	WORD 3	WORD 4
%000010	%020000	%000000	%001100

This means that the user classes 12, 18, 54 and 57 have write access to the iten/set. If no read/write security is defined at all for the iten/set, then all of the write security bits are set to 0.

Root File Record 0

0	ROOT'DBSTATUS	0
1	ROOT'DBNAME	1
2		2
3		3
4		4
5	ROOT'TRLRLGTH (TRAILER AREA LENGTH)	5
6	ROOT'BUFFLGTH (BUFFER LENGTH)	6
7	ROOT'LGTH (ROOTFILE LENGTH)	7
10		8
11	ROOT'ITEMCT (NUMBER OF ITEMS)	9
12	ROOT'SETCT (NUMBER OF DATA SETS)	10
13	ROOT'ITEMPTR (RECORD # OF ITEM TABLE)	11
14	ROOT'DSETPTR (RECORD # OF SET TABLE)	12
15	ROOT'DSCBPTR (RECORD # OF DSCB'S)	13
16	ROOT'DEVICEPTR (RECORD # OF DEVICE CLASS TABLE)	14
17	ROOT'DBGFLAG	15
20	RESERVED (SET TO BLANKS)	16
21		17
22		18
23		19
24	NOWOPEN	20
25	MAXOPEN	21
26	PR'RESTART'CALENDAR	22
27	RR'RESTART'TIMESTAMP	23
30		24
31	RR'RESTART'FNAME	25
32		26
33		27
34		28

Root File Record 0 (Cont.)

35	RE'RESTART'FGROUP	29
36		30
37		31
40		32
41	RR'RESTART'FACCT	33
42		34
43		35
44		36
45	RESERVED (SET TO BINARY 0'S)	37
~	~	~
177		127

ROOT'DBSTATUS
(0:8) - IMAGE version ('C' in ASCII)
(8:8) - Binary 2 (filler)

ROOT'DBNAME - DATABASE name left justified (last 2 chars are blank).

NOWOPEN - Number of data sets opened. This field is not used in IMAGE B & C.

MAXOPEN - Maximun number of data sets that can be opened. This field is not used in IMAGE B & C.

ROOT'DBGFLAG - 1: Information can fit in DBG.
0: Information can not fit in DBG.

RR'RESTART'FNAME - Restart file name for DBRECOV stop/restart.

Root File Record 1

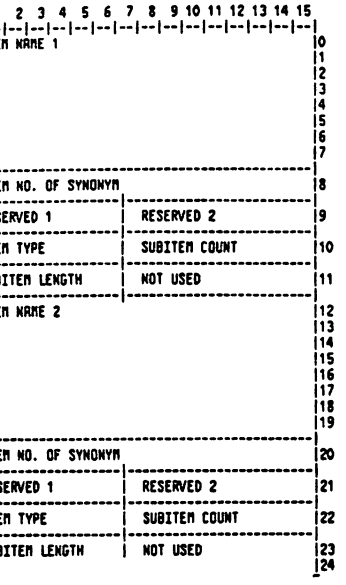
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
0		0
1		1
~	ITEM MAP	~
35		30
37		31
40	RESERVED FOR FUTURE USE	32
41		33
~		~
76		62
77		63
100		64
101		65
~	SET MAP	~
136		94
137		95
140	RESERVED FOR FUTURE USE	96
141		97
~		~
176		126
177		127

The Item Map occupies Words 0-31.

The Set Map occupies Words 64-95.

These two maps are used by DBOPEN for faster access to information in the Item Table and Set Table.

Root File Record 2



The Item Table starts in record #2.

Each entry is 12 words long and the length of the table depends on the number of data items defined in the schema. The relative position of an item definition depends on its relative position in the schema.

Item-name: is a data item name, left-justified and with trailing blanks

Item-number-of-synonym: is the number of the item whose name has the same hashed result as this one (this is utilized for quick item name searches).

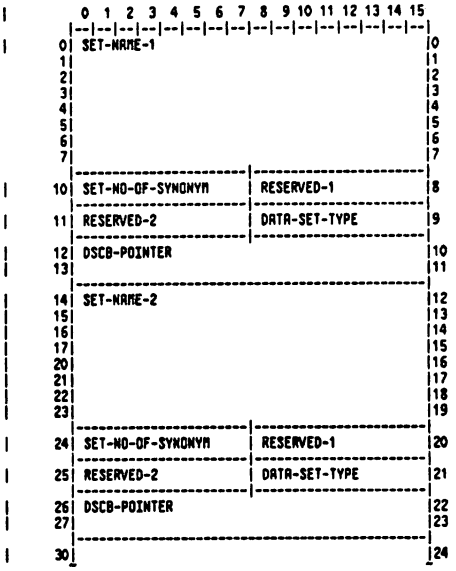
Item-type: is one of the following: I, J, K, R, X, U, Z, or P

Root File Record 2 (Cont.)

The maximum size for this table is 12*1023 = 12276 words

NOTE: The reserved-1 and reserved-2 fields are the 'old' level numbers for read and write security. Now, the values are always zero.

Root File- Next Record(s) Set Table



Root File - Next Record(s) (Cont.)

Set Table follows the Item Table. Each entry is 12 words long. The length of the table depends on the number of data sets defined in the schema. The relative position of a set definition depends on its relative position in the schema.

Set-name: is a data set name, left-justified and with trailing blanks.

Set-number-of-synonym: is the number of a data set whose name has the same hashed result as this one (this is utilized for quick set name searches).

Data-set-type is one of the following: A, M, or D.

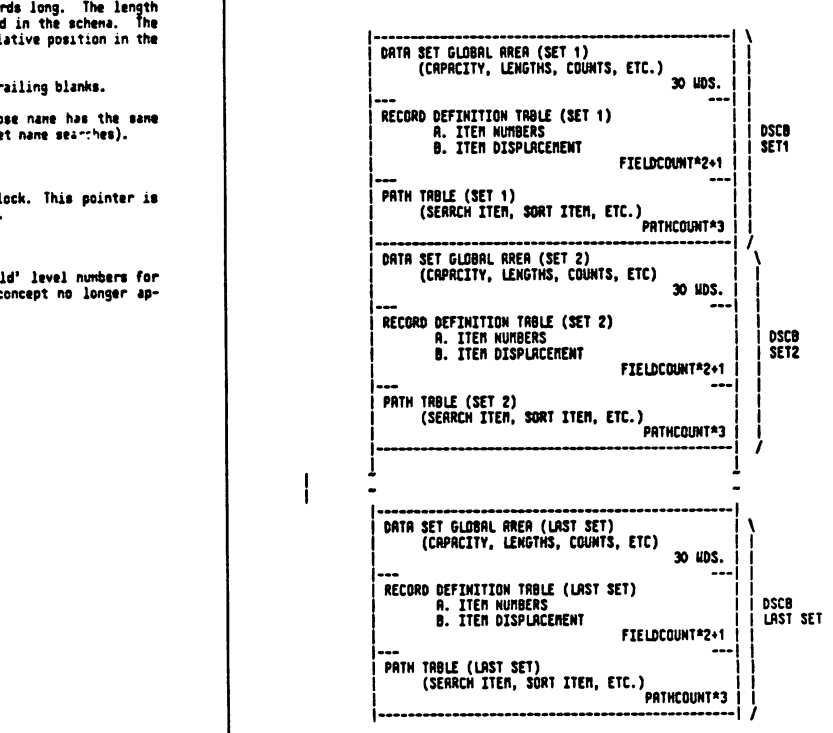
DSCB-pointer: is a pointer to the Data Set Control Block. This pointer is word offset from record NO. The DSCB is described below.

The maximum size for this table is 12*199 = 2388 words.

NOTE: The reserved-1 and reserved-2 fields are the 'old' level numbers for the read and write access respectively. Since this concept no longer applies, the values are set to zero.

Root File - Next Record(s) (Cont.)

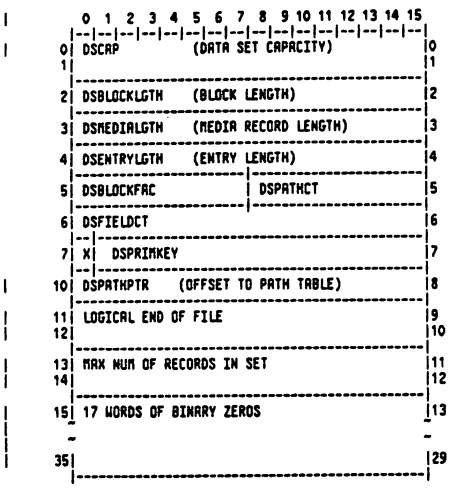
Data Set Control Blocks (DSCB)- General Layout



The DSCBs follow the SET TABLE in the Root File. There is one DSCB for each data set defined. The function of the DSCB is to define each data set within the data base.

Root File - Next Record(s) (Cont.)

Data Set Control Block (Global Area)



DSCAP - Data set capacity as reported by the SCHEMA processor.

DSBLOCKLGTH - Data set block length including the bit map overhead.

DSMEDIALGTH - Data set media record length (remember that this length includes the pointer overhead)

DSENTRYLGTH - Data set entry length.

DSBLOCKFAC - Data set blocking factor.

DSPATHCT - Data set path count. This is the number of paths that are specified for the data set.

Root File - Next Record(s) (Cont.)

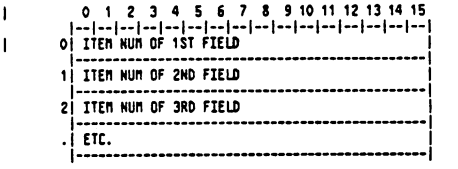
DSFIELDCT - Data set field count. This is the number of fields specified for the data set.

X-DSKEYTYPE - Data set key type. If DSKEYTYPE = TRUE then the key is hashed.

DSPRIMKEY - Data set primary path or key.
For master data sets, this is the field number of the search item.
For detail data sets, this is the field number of the primary path.

DSPATHPTR - Data set path table pointer. Word offset to the data set path table which contains an entry for each path defined. It points to path 0th entry in the table, so to get to the first entry the pointer should be incremented by the length of the entry (which is currently 2 words).

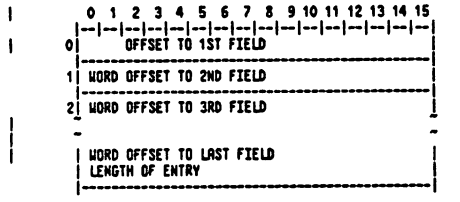
Data Set Control Block (Item Numbers)



The Item Numbers Table follows the Global Area of the DSCB. The size of this table (in words) is equal to the number of items in the given data set.

Root File - Next Record(s) (Cont.)

Data Set Control Block (Record Definition Item Displacement)



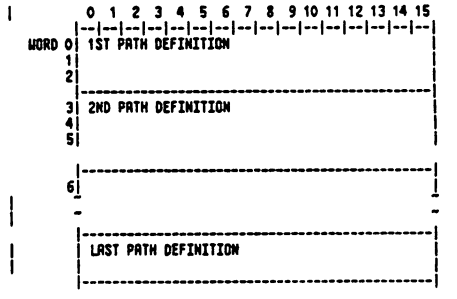
This table immediately follows the Item Numbers Table.

The word offset points to the starting location of the field within the media record. Remember that the media record includes the pointer overhead so this offset varies for master and detail data sets. If a master data set has only one path, the word offset for the first field is 11, since there are 11 words of overhead (6 words for the synonym chain pointers and 5 words for the data set chain head that it would be pointing to). On a detail data set with one path, the overhead is only 4 words.

The 'LENGTH-OF-ENTRY' field is the same as the media record length.

Root File - Next Record(s) (Cont.)

Data Set Control Block (Path Table)



There are 3 words (6 bytes) for each path definition. The Path Table for master data sets has a different layout from the Path Table for detail data sets.

Master sets:

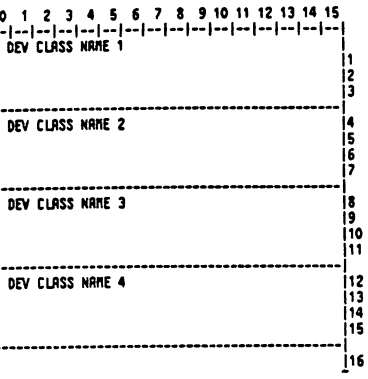
Byte	Description
1-2:	item number of the search item in the related detail set.
3-4:	item number of the sort item in the related detail set.
5:	set number of the related detail data set
6:	path number of the corresponding path in the related detail data set.

Detail sets:

Byte	Description
1-2:	field number of the search item.
3-4:	field number of the sort item.
5:	set number of the related master data set
6:	path number of the corresponding path in the related master data set.

Root File - Next Record(s) (Cont.)

Device Class Table



Device Class Table follows the DSCBs.

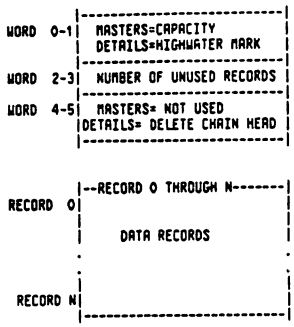
Each entry is 4 words long, and contains the device class name which is optionally specified for a data set by the user. For data sets without user specified device class names, the entries will be filled with blanks.

The length of the table depends on the number of data sets defined in the schema. The relative position of a device class entry depends on its relative position in the schema.

The maximum size for this table is 4*199 = 796 words.

General Data Set Layout

User Label 0



Data Set User Label 0

Word 0-1: Record name of the highest readable record. Record name consists of an MPE file record number (0 byte to 2nd byte) and a slot number (3rd byte), where the MPE file record number is equal to the quotient of the highest entry divided by blocking factor and the slot number is equal to the remainder of the highest entry divided by blocking factor. For Masters, this is the highest record in the set (i.e., Capacity). For Details this is the greatest number of records that have been written to the set thus far. For example, if there is room in the Detail data set for 100 records and 75 were written last week when the data set was loaded with DBLOAD, and yesterday 15 records were deleted from the data set, the High Water Mark should point at the highest entry, '75', in the form of record name. If the data set has a blocking factor of 10, the record name should have an MPE record number of 7 and a slot number of 5.

Word 2-3: Number of unused records in the data set. This field is incremented when a record is deleted and decremented when a record is added. To determine the current number of entries used in the set subtract Word 2-3 (unused count) from Word 0-1 (Capacity).

Word 4-5: The delete chain head for Details. This points to the record most recently deleted or contains a value of zero if no records have been deleted. This field is not used in Master data sets.

Data Set Records

The data in the data set records is arranged according to the Media records.

CHAPTER 22 DISC FREE SPACE MAP

Disc Resident Data Structures

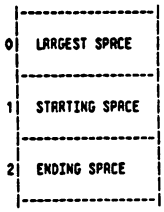
There are two disc resident free space data structures, the bit map and the descriptor table, for each disc volume that has a free space map, i.e., system discs and private volumes. The addresses of these data structures are kept in the disc label. The symbols that define the descriptor table and bit map are in the include file INCLDFS2.

Bit Map

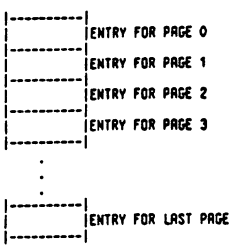
The bit map is divided up into pages, which is the physical block of the map that is read or written. At the moment, a page is defined to be one sector long (128 words). This may be changed by changing a compile time constant. The last word of the page is a checksum for that page, all other words are data. There is a one to one correspondence between bits in the map and sectors of the disc. A one bit represents a free sector and a zero bit represents an allocated sector. The bit map is a contiguous set of pages, enough to represent the entire disc, excluding spare tracks and spare sectors.

Descriptor Table (DT)

The descriptor table is an array of three word entries, one entry for each page of the bit map. Each entry looks as follows:



The descriptor table looks as follows:



Each entry describes the free space on the corresponding page of the bit map. The largest space word is the size of the largest contiguous block of free space on the page, which is not at the very beginning or very end of the page. That is, the first bit physically representing the space is not the first bit of data on the page or the last bit representing the space is not the last bit of data on the page. Starting space is the number sectors of contiguous space represented by the set of bits whose first bit is the first bit of data on the page. Ending space is the number of sectors of contiguous space represented by the set of bits whose last bit is the last bit of data on the page. The starting space and ending space fields allow looking across page boundaries, thus preventing fragmentation on page boundaries. Therefore, if all sectors represented on a page are free, then starting and ending space will be the same and have the total number of free sectors represented on the page. Largest space will be zero, as there is no block of space that is not at the beginning or end of the page. A value of - 1 for all the fields in an entry indicates the corresponding page is bad, either from a checksum or I/O error.

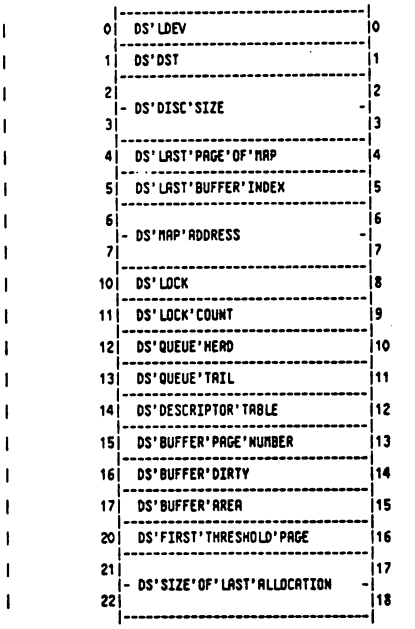
Virtual Memory Resident Data Structures

For each system disc or physically mounted private volume there is a data segment which has information about the disc free space map, the current copy of the descriptor table, some work space for the procedures while in split stack mode, and buffers for pages of the bitmap. The DST number of the data segment for a given disc is found in the LDTX entry for that disc.

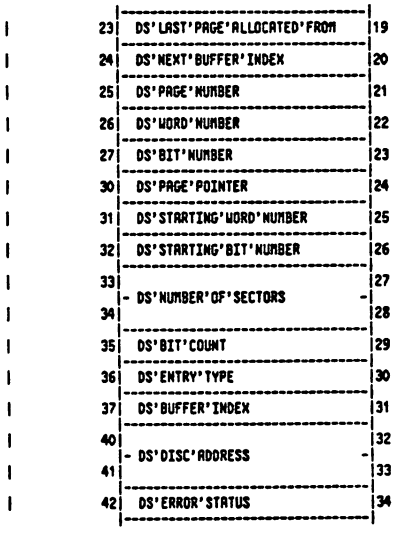
Disc Free Space Data Segment

For each system disc or physically mounted private volume in the up and running system there is a DST which contains information about the disc free space map for that disc, some work area, a copy of the descriptor table and buffers for the pages of the bit map.

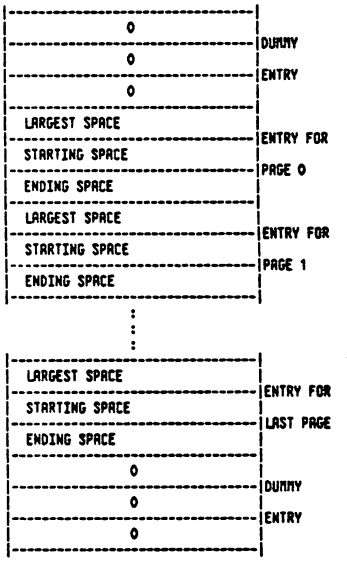
All symbols that define these data segments are in the include file INCLDFS1, and they are prefixed with "DS'". The structure of the data segment is as follows:



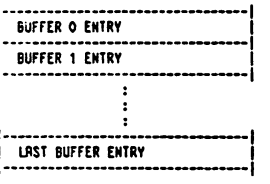
Data Segment Structure (Cont.)



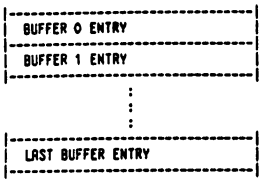
The rest of the data segment contains tables whose size and location is dependent on the size of the disc and/or the number of buffers in the data segment. They are shown below just to demonstrate their relation to one another, for their actual location, the pointers should be examined. The symbol "DS'ARRAY'AREA" defines the start of the area. The first table is the descriptor table, it is in the same format as the disc copy, but a dummy entry of all zeros is added before and after the table, these are needed by procedures "FIND'PAGE" and "BUILD'DESCRIPTOR'ENTRY". The pointer to this table is "DS'DESCRIPTOR'TABLE", it points to the entry for page zero, not the dummy entry.



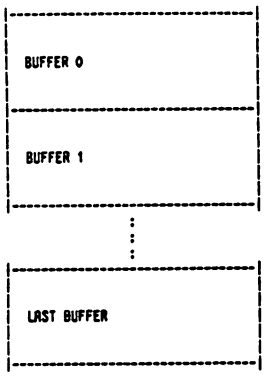
The next table is DS'BUFFER'PAGE'number table, it has a one word entry for each buffer in the data segment. Each entry contains the page number of the page currently in the corresponding buffer or -1 if the buffer is empty. This is pointed to by "DS'BUFFER'PAGE'NUMBER".



The next table is the DS'BUFFER'DIRTY table, which has a one word entry for each buffer. A TRUE indicates the page in the corresponding buffer is dirty, i.e., the disc copy is not up-to-date. A FALSE indicates that the buffer is clean. If DFS was compiled with dirty buffer management turned off, this table is not present and the DS'BUFFER'DIRTY pointer is zero.



The remainder of the data segment contains the buffers. Each buffer is the size of one page of the bit map, which is currently one sector(128 words). The beginning of the buffer area is pointed to by "DS'BUFFER'AREA" and the number of buffers is the value in "DS'LAST'BUFFER'INDEX" plus one.



Each of the fields of the data segment is described in the include file INCLDFS1, where they are defined. It should be noted that the following fields are just workspace, used to pass information between procedures while in split stack mode and have no meaning between calls to the disc free space management subsystem:

DS'PAGE'NUMBER	DS'WORD'NUMBER
DS'BIT'NUMBER	DS'PAGE'PTR
DS'STARTING'WORD'NUMBER	DS'STARTING'BIT'NUMBER
DS'NUMBER'OF'SECTORS	DS'ENTRY'TYPE
DS'BIT'COUNT	DS'BUFFER'INDEX
DS'DISC'ADDRESS	

The field DS'ERROR'STATUS normally has no meaning between calls unless the ERROR'TYPE field has a value greater than "FATAL'DFS'ERROR", which means that disc space may no longer be allocated on this disc.

CHAPTER 23 MPE DISC CACHING

Disc Caching Overview

Disc Caching is an optional feature of MPE that utilizes excess main memory/CPU horsepower to keep portions of frequently referenced disc "domains" in memory. (A disc "domain" is a copy of a portion of disc residing in main memory. These disc domains are considered "cached" when they are in memory and are considered "mapped" when there is I/O pending against them.) Disc Caching manages the bi-directional transfer of these disc domains between main memory and disc storage. No main memory is permanently dedicated to cached disc domains. Cached disc domains share main memory with all other types of MPE segments and are not treated differently by the memory manager. By keeping cached disc domains in memory, a significant portion of the references to disc storage can be resolved without actually needing to physically access the disc. Disc Caching policies are integrated into the MPE Kernel, File System, and I/O System which allows the system performance to be tuned based on the current workload and resource availability.

Disc Caching uses the MPE kernel resource management mechanisms and strategies. These mechanisms are extended to handle cached disc domains in the same manner as segments. Thus, cached disc domains can be of variable size, fetched in parallel with other segments or cached domains, garbage collected, and replaced in the same manner as stacks, data and code segments. The relative use of main memory between stacks, data and code segments, and cached disc domains is dynamic. This partitioning is based on the current workload requirements and current memory availability.

Disc Caching can be enabled/disabled on a disc-by-disc basis. When caching is enabled for the first disc, the code segment containing the Disc Caching code will be locked into memory. Also at this time the Cache Directory Table (CDT) will be built and locked into memory. When caching is disabled for the last disc, the code segment will be unlocked from memory and the CDT will be released. Thus if caching is not enabled no memory will be wasted.

The CDT is used to keep track of the following information:

1. The disc Ldevs currently enabled for caching. There will be a Device Entry in the table for each cached disc.

2. A linked list of cached domains for each disc with caching enabled. The head and tail of this linked list will be contained in the Device Entry (i.e., there is a separate linked list of cached domains for each cached disc Ldev).

3. The cached domains that currently have user I/O pending (i.e., FREADs/FWRITEs) or have memory management I/O pending (i.e., fetching the disc domain into memory, or posting the disc domain back out to disc). There will be a Mapped Domain Entry in the table for each disc domain has that I/O pending and is thus "mapped".

4. A linked list of all user I/O pending against the mapped disc domains. There will be a Logical Disc Request (LDR) queued to the Mapped Domain entries that will describe the user I/O to take place. This is analogous to a Disc Request queued to a specific DIT waiting for service.

When a request is made to access disc information, Disc Caching must first determine if the requested disc domain is present in memory. Disc Caching will first determine if the requested area of disc is already mapped into memory by scanning through the Mapped Domain entries of the CDT. If the requested transfer can be satisfied with a currently mapped disc domain, then the I/O request will be queued (FIFO) behind the other I/Os pending against that mapped domain. If the requested area is not already mapped, then a search is made through the linked list of cached disc domains for the specified disc Ldev. (The region header contains the disc address and size that a disc domain represents.) If the requested domain is found in this list (i.e., present in memory), then this region will be mapped. A domain is then considered mapped when there is an entry for it in the Mapped Domain portion of the CDT. Mapping the domain allows Disc Caching to manage either a pending or currently active I/O for a particular disc domain. Once the disc domain is mapped and present, the data can be moved between the process' data area and the mapped disc domain. The process can then continue executing without interruption or a process switch. The user/subsystem process for which the move is done will be charged with the CPU overhead.

When a request is made to read data that is not currently cached in memory (i.e., a read "miss"), the fetch strategy uses the File System's knowledge of the type of access (sequential or random), the extent size of the file, along with the current memory load to select the optimal size of the disc domain to be fetched and mapped into memory. The fetch of the disc domain is then initiated on the user's stack without a process switch. After the fetch is initiated, it completes in an unblocked manner so that this process (if no-wait I/O) or another process can proceed in parallel with the cache fetch.

In general, when writing, a process will not wait for completion of the physical I/O. Instead, the process will be awakened as soon as the transfer has completed between the process's data area and the mapped disc domain (i.e., no-wait-for-post). The physical I/O will then be posted at background priority while the process continues. (Users can specify wait-for-post on a file by file basis in place of the default no-wait-for-post with the FSETMODE intrinsic, or on a global basis via :CACHECONTROL.) If the access request is a write and there is a current write pending against the specified mapped disc domain, the process request is queued until the pending write is posted to disc. If the disc domain to be written is not currently cached in memory, a free piece of memory will be obtained to map the corresponding disc image and then the "write" takes place from the process' data area to the mapped disc domain. This prevents data from having to be read before being written. After that, a post to disc is initiated (on any write only the portion of a mapped disc domain that is modified will be posted to disc). After the move to the mapped disc domain is complete and the post to disc is initiated, the process performing the "write" is allowed to continue to run without having to wait for the post to complete. Writes that must be posted to disc in a certain order use the Global Serial Write Queue. These ordered writes include things like updating disc free space maps for a new file extent before updating the file extent map in the file label.

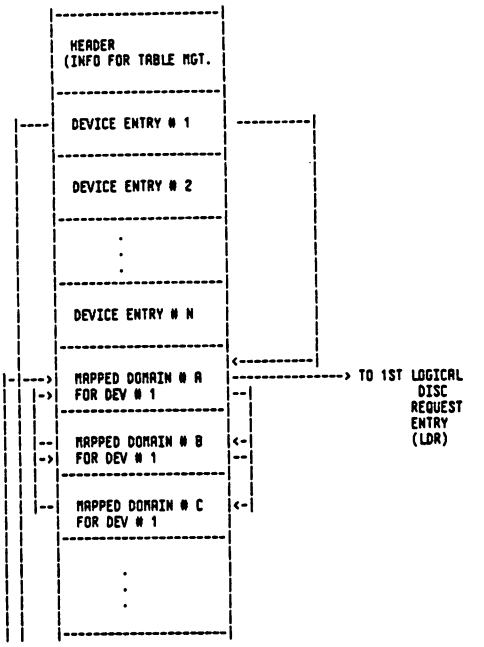
There are two disc request entries used for disc caching requests. The first entry is a Logical Disc Request (LDR) entry and is used to manage the data moves to/from the user's data area and the disc domain (i.e., the logical I/O). The second entry is a regular Disc Request (DRQ) entry and is used to perform the physical I/O necessary to map a disc domain (for a read "miss") or to perform the physical post (on write requests). The disc domain will remain mapped until both the logical and physical I/O completes. If a request is not completely described by one disc domain already in memory or a Mapped Domain CDT entry (i.e., the requested disc area falls into more than one disc domain) then the overlapping disc domain(s) will be flushed to disc and the new complete disc domain will be fetched (if read) and mapped. No partial mappings are allowed.

The DST number of the Cache Directory Table (CDT) is at X1273 and the bank and offset are kept in X1274-X1275. The Caching SIR (2) is used when starting and stopping caching (via :STARTCACHE/:STOPCACHE) and by the LOADER when loading a program file (this SIR is only used when updating the STT at load time).

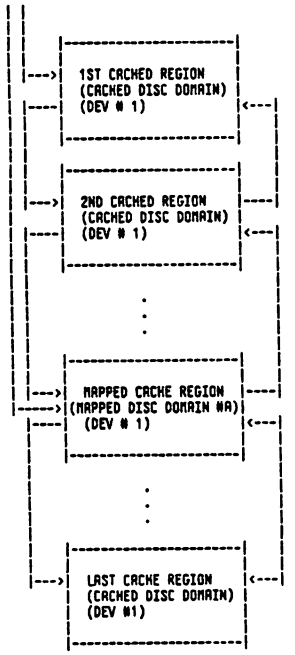
When caching is enabled for a disc, a bit in the flags word of the DIT is set. Also, the Global Serial Write queue can be found by examining the header entry of the Disc Request Table. See Chapter 13, "I/O", for a more detailed explanation of both the DIT and the Disc Request Table header. See Chapter 2, "Memory Management Tables", for a description of the Memory Region Header for a disc domain (cached region).

Disc Caching Tables Overview

Cache Directory Table (CDT)



Memory Regions



Cache Directory Table

The Cache Directory Table (CDT) is the bookkeeping structure for managing cached disc domains. This table is divided into three parts:

1. CDT Header Entry
   This entry contains all information necessary to manage the entire table and also contains global caching related information.

2. CDT Device Entry
   There will be one of these entries for every disc Ldev that currently has caching enabled. These entries keep track of all cached disc domains in memory for this device. In addition, these entries contain statistics regarding the number of I/Os performed to the Ldev.

3. CDT Mapped Domain Entry
   These entries describe disc domains that are currently "mapped" into memory. This means that there is logical I/O (cache move) and/or physical I/O (fetch or post) pending. These entries keep track of the state of the cached disc domain (IMI, ROC, etc.) just as the DST Table keeps track of data segments.

The following low core cells contain the address of the CDT:

X1273 - contains the DST Number of the CDT
X1274 - contains the Bank Number of the CDT
X1275 - contains the Offset within the bank of the CDT

Header Entry

0	# ENTRIES	CDT'ENTRIES
1	ENTRY SIZE (X32)	CDT'SIZE
2	# FREE ENTRIES	CDT'FREE'COUNT
3	1ST FREE ENTRY (TABLE OFFSET)	CDT'FREE'HEAD
4	LAST FREE ENTRY (TABLE OFFSET)	CDT'FREE'TAIL
5	MAX # ENTRIES USED	CDT'MAX'USED
6	# LDEVS CACHED	CDT'NUM'LDEVS
7	1ST CACHE DEVICE ENTRY (ENTRY NUMBER)	CDT'DISC'HEAD
10	# WORDS THIS DST	CDT'DST'WORDS
11	TRUE IF STOPCACHE PENDING	CDT'STOP'PND
12	# SECTORS SEQUENTIAL FETCH	CDT'SEQ'MINFTCH
13	# SECTORS RANDOM FETCH	CDT'RND'MINFTCH
14	TRUE IF WAIT FOR PHYSICAL POST	CDT'FORCE'POST
15	HEAD OF IMPEDED QUEUE (PIN)	CDT'STOP'QUEUE
16		
	.	
	.	
	.	
31		

CDT'ENTRIES
The total number of CDT entries configured in this table (i.e., includes all three types of entries). The number of entries in the table will be:

1 entry for the header
+ 1 entry for each disc Ldev configured.
(CDT Device entries)
+ 1 entry for each DRQ configured.
(CDT Mapped Domain entries)

This scheme insures that this table can never overflow (since an entry in the DRQ table is always obtained before an entry in this table).

CDT'SIZE
Size of each entry in the table.

CDT'FREE'COUNT
Total number of entries currently unassigned.

CDT'FREE'HEAD
Table relative offset (i.e., Entry number * entry size) of the first available entry.

CDT'FREE'TAIL
Table relative offset of the last available entry.

CDT'MAX'USED
The maximum number of entries in use at one time.

CDT'NUM'LDEVS
The number of ldevs currently cached.

CDT'DISC'HEAD
The entry number of the first Device Entry.

CDT'DST'WORDS
The total number of words in this data segment.

CDT'STOP'PND
This value will be TRUE if there is a pending :STOPCACHE.

CDT'SEQ'MINFTCH
If there is a prefetch for a sequential read ("miss"), the size of the prefetch is delimited by the extent size of the file. Within this limitation, the prefetch is equal to the greater of two sizes:

1. Requested size.

2. The largest integer multiple of the request size that is smaller than the value found in this cell.

The default value is 96 sectors. (This value may be changed via :CACHECONTROL.)

CDT'RND'MINFTCH
This is the same as CDT'SEQ'MINFTCH except that it's for random access. The default value is 16 sectors. (This value may be changed via :CACHECONTROL.)

CDT'FORCE'POST
When this value is TRUE, all writes will "block" until the physical update on disc completes. The system default is FALSE. (This value may be altered via :CACHECONTROL.)

CDT'STOP'QUEUE
If CDT'STOP'PENDING is TRUE this will be the PIN number of the head pin of the processes impeded until the :STOPCACHE completes.

CDT'DE'NEXT'LDEV
The entry number of the next Device Entry.

CDT'DE'PREV'LDEV
The entry number of the previous Device Entry.

CDT'DE'LDEV
The Ldev number for this cached device.

CDT'DE'MAPD'PAGES
Total number of main memory pages allocated to disc domains for this cached device. This includes mapped and unmapped regions. (1 main memory page = 128 words).

CDT'DE'MAPD'CNT
The total number of Mapped Domain entries associated with this Device Entry.

CDT'DE'MAPD'HEAD
The entry number of the first Mapped Domain entry for this device.

CDT'DE'MAPD'TAIL
The entry number of the last Mapped Domain entry for this device.

CDT'DE'REGIONS
The total number of disc domain regions for this Ldev (includes mapped and unmapped regions).

CDT'DE'REG'HD
Memory address to the head region of the disc domain linked list. Disc domain regions are linked in order based on the disc address they represent (i.e., small disc address at head, large disc address at tail). This address will not point to the region base (RB), but to the next domain (ND) field of the region header. (This is to facilitate the use of the LDSN instruction.)

CDT'DE'REG'TL
Memory address of the tail region of the disc domain linked list. This address will be of the previous domain (PD) field of the region header.

CDT'DE'RHIT
Total number of times that a read was requested and the requested disc domain was present in memory (i.e., a read "hit"). This means that the read completed without performing any I/O (to fetch the domain). Thus this is actually the number of read I/Os eliminated. This value will reset to zero on overflow.

CDT'DE'WHIT
Total number of times that a write was requested and the requested disc domain was present in memory (i.e., a write "hit"). If there was no other write pending to the "hit" domain, then the process would continue as soon as the cache move completes, therefore, eliminating a block for I/O. Otherwise, the process would block waiting for the first write to complete. This value will reset to zero on overflow.

CDT'DE'RMISS
Total number of times that a read was requested and the requested disc domain was not in memory (i.e., a read "miss"). This means that the requested disc domain had to be fetched into memory before the read could complete, therefore, potentially blocking the process. This value will reset to zero on overflow.

CDT'DE'WMISS
Total number of times that a write was requested and the requested disc domain was not in memory (i.e., a write "miss"). This does not mean that the process would block until the disc domain is fetched as is the case for reads. Rather, a free memory region would be obtained to be the destination of the cache move. This disc domain would then be posted in the background (unless overridden via :CACHECONTROL or FSETMODE) allowing the process to continue without blocking. This value will reset to zero on overflow.

CDT'DE'STOP
Total number of times that a process had to block on a cache transfer. Will reset to zero on overflow.

CDT'DE'SCANPT
The memory address of the last region looked at on a search. This address will be of the next domain (ND) field of the region header. This value will be used along with CDT'DE'REG'HD to determine where to start the next search for a cached disc domain. At times it will be more efficient to start with this address since the disc domain requested may be of a higher disc address than found in this region header, rather than always starting the search with CDT'DE'REG'HD.

CDT'DE'SHIFT'CNT
The number of bits used to execute DLSL instruction.

CDT'DE'MAKE'EVEN
An additional word used to make the entry size an even number. CDT'ENTRY'SIZE must be an even number for disc caching to correctly access the CDT Device Entry Table and the Mapped Domain Entry Table.

Device Entry

Word	Contents	Name
0	NEXT LDEV ENTRY (ENTRY NUMBER)	CDT'DE'NEXT'LDEV
1	PREV LDEV ENTRY (ENTRY NUMBER)	CDT'DE'PREV'LDEV
2	LDEV FOR THIS DISC	CDT'DE'LDEV
3	# PAGES IN DEVICE'S DOMAIN	CDT'DE'MAPD'PAGES
4	# DISC DOMAINS CURRENTLY MAPPED	CDT'DE'MAPD'CNT
5	HEAD OF MAPPED DOMAIN (ENTRY NUMBER)	CDT'DE'MAPD'HEAD
6	TAIL OF MAPPED DOMAIN (ENTRY NUMBER)	CDT'DE'MAPD'TAIL
7	# DISC DOMAIN REGIONS FOR THIS DEVICE	CDT'DE'REGIONS
10	MEMORY ADDRESS OF HEAD CACHED DISC DOMAIN	CDT'DE'REG'HD
12	MEMORY ADDRESS OF TAIL CACHED DISC DOMAIN	CDT'DE'REG'TL
14	# READ HITS	CDT'DE'RHIT
16	# WRITE HITS	CDT'DE'WHIT
20	# READ MISSES	CDT'DE'RMISS
22	# WRITE MISSES	CDT'DE'WMISS
24	# STOPS	CDT'DE'STOP
26	MEMORY ADDRESS OF LAST REFERENCED DOMAIN	CDT'DE'SCANPT
30	# BITS TO SHIFT	CDT'DE'SHIFT'CNT
31	NOT USED	CDT'DE'MAKE'EVEN

Mapped Domain Entry

Word	Contents	Name
0	PREV MAPPED DOMAIN ENTRY (ENTRY NUMBER)	CDT'MD'PREV
1	NEXT MAPPED DOMAIN ENTRY (ENTRY NUMBER)	CDT'MD'NEXT
2	START SECTOR ADDRESS	CDT'MD'SECTOR
4	LAST SECTOR ADDRESS	CDT'MD'END'SECTOR
6	ABSENT | IMI | IMO | MISS | LOCKED | FWIP | ROC | VIRGIN | NOPOST | SEQ | | STATE	CDT'MD'FLAGS
7	# READS PENDING	CDT'MD'READ'CNT
10	# WRITES PENDING	CDT'MD'WRITE'CNT
11	LOCK WAITING	CDT'MD'LKD'CDT
12	HEAD OF IMPEDED LDR	CDT'MD'IMPED'HD
13	HEAD OF ACTIVE LDR	CDT'MD'LDR'HEAD
14	MEMORY ADDRESS IF PRESENT	CDT'MD'MEM'ADR
16	DRQ FOR THIS MAPPED DOMAIN	CDT'MD'DISCREQ
17	# FLUSHING CDT'S	CDT'MD'LK'CNT
20	LDEV FOR THIS MAPPED DOMAIN	CDT'MD'LDEV
21	HEAD IMPEDED QUEUE (PIN)	CDT'MD'IMPEDED
22	DEVICE ENTRY (ENTRY NUMBER)	CDT'MD'DE
23	| ENTRY LENGTH	CDT'MD'DEFERRED
31		

CDT'MD'PREV
Entry number of the previous mapped domain entry for this device.

CDT'MD'NEXT
Entry number of the next mapped domain entry for this device.

CDT'MD'SECTOR
The starting disc sector address representing this mapped domain entry.

CDT'MD'END'SECTOR
The ending disc sector address representing this mapped domain entry.

CDT'MD'FLAGS
Flags describing the state of this mapped domain entry and the region associated with it:

(0:1) - Absent.
Region is not present in memory.

(1:1) - IMI.
Region is already In-Motion-In. (Set when the fetch for this cached region is initiated.)

(2:1) - IMO.
Region is In-Motion-Out. (Set by STARTOBJWRITE when performing the background post of a cached region.)

(3:1) - MISS.
This disc domain was not present and had to be prefetched.

(4:1) - LOCK. Not used.

(5:1) - FWIP.
Forced Write In Progress. Region was forced out of memory to make room for another object.

(6:1) - ROC.
Recover Overlay Candidate. Region may be forced out of memory to make room for another object. However, if this region is referenced again it can be recovered.

(7:1) - VIRGIN.
Clean region in the write state. Cleared as soon as a move completes. (I.e., if this bit is on, then a write can complete immediately. Otherwise the write will have to wait until the current write completes the physical post.)

(8:1) - NOPOST.
Set when the CDT is being posted out as a result of a write request that did not want to wait for the physical post to complete. This will be cleared by the cache completor when the physical post completes. (This is used to insure that a cache move for any subsequent write request will not be serviced until the physical post completes.)

(9:1) - SEQ.
Set if doing sequential I/O. When the request for the last area of this disc domain is complete, this domain will be made a ROC.

(10:3) - Not used.

(13:3) - STATE
0 - AVAIL. CDT is an available entry.
1 - READ. Only read LDR(s) are attached.
2 - WRITE. Write LDR(s) and possibly read LDR(s) are attached.
3 - FLUSH. CDT is being flushed out.
4 - LOCK. Unused.

CDT'MD'READ'CNT
The number of LDRs attached that are for reads (move not complete).

CDT'MD'WRITE'CNT
The number of LDRs attached that are for writes. NOTE: This count will not be decremented until both the cache move and the physical write completes. However, as soon as the cache move completes, the LDR will be dequeued from the CDT.

CDT'MD'LKD'CDT
Not used.

CDT'MD'IMPED'HD
The first LDR that is impeded. (I.e., the CDT is in a write state already and another write is attached. The second write will be placed in this queue until the first write completes.)

CDT'MD'LDR'HEAD
The first LDR that is on the active list for this CDT.

CDT'MD'MEM'ADDR
The memory address (region base) for this mapped disc domain, if present.

CDT'MD'DISCREQ
The disc request table index associated with this mapped disc domain. This will be used to fetch this region in, or to post this region after any logical I/Os (writes) have completed. (I.e., this DRQ is used for the physical I/O.)

CDT'MD'LK'CNT
Not used.

CDT'MD'LDEV
The Ldev number for this mapped domain.

CDT'MD'IMPEDED
The PIN for the first process impeded on this mapped disc domain. Processes get impeded here when they do WAITFORIO when their LDR is on the CDT impeded queue and the Mapped Domain is currently being written out. (This will also happen upon a :STOPCACHE to force all LDRs to complete.) As soon as the physical post of the Mapped Domain is complete, all processes impeded here will be awakened.

CDT'MD'DE
The entry number for the Device entry that this Mapped Domain entry is associated with.

Logical Disc Request Table

X1017 Pointer to Logical Disc Request Table

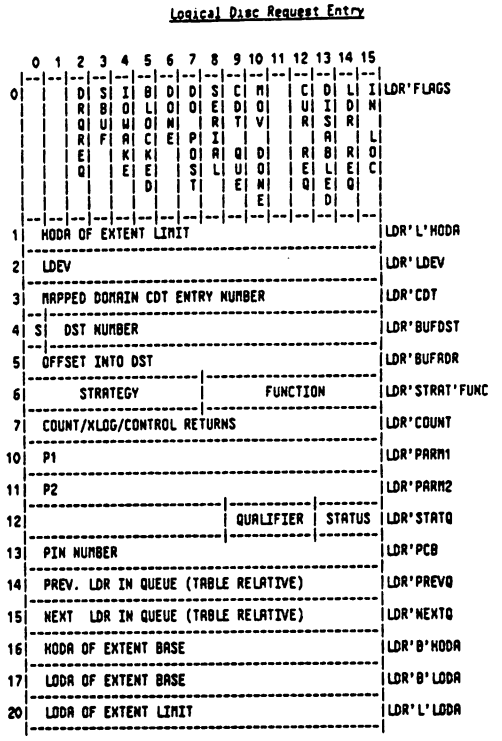
NOTE: This table is really part of the DRQ (refer to Chapter 13). Any entry with the logical request bit set in the flags will conform to this format and not the format of the standard DRQ.

Logical disc requests entries are used to manage requests between the requesting process and a mapped disc domain. They are the counterpart of disc requests entries used to manage physical I/O requests between a process and a disc. These entries are kept as part of the DRQ Table, but will never be queued to the disc's DIT, instead they will be queued to the mapped disc domain CDT entry. LDR entries may only be placed onto the following queues:

1. The CDT active list.
2. The CDT impeded LDR list.
3. The Disabled Disc Request. (This will only happen if the buffer segment is absent when the logical I/O (cache move) is attempted.)

NOTE: LDRs are singly linked onto the CDT queues and doubly linked onto the disabled disc request queue.

Logical Disc Request Entry



LDR'FLAGS
Flags.
- (0:2) Not used.
- (2:1) - DRQREQ. Set if LDR causes a physical I/O.
- (3:1) - SBUF. Set if request is to/from a System Buffer.
- (4:1) - IOWAKE. Set if system should wake up the process when the logical I/O completes.
- (5:1) - BLOCKED. Set if the process wants to wait for the logical disc request to complete.
- (6:1) - DONE. Set when the logical disc request is complete and the process will be awakened (if IOWAKE is set)
- (7:1) - DO'POST. Set if the caller wants to be waited until the physical post to disc completes. Only valid for write requests.
- (8:1) - SERIAL'POST. Set when the physical post should be through the Global Serial Write queue.
- (9:1) - CDT'QUEUED. This request has been queued either onto the CDT active queue (see CDT Mapped Domain entries) or onto the disabled disc request list.
- (10:1) - MOVE'DONE. The move has been completed, but the process won't be awakened until the DONE bit is set.
- (11:1) - Not used.
- (12:1) - CUR'REQ. Set if this request is the current/active request.
- (13:1) - DISABLE. Set if the request is disabled.
- (14:1) - LDR'REQ. Set if this is a logical disc request.
- (15:1) - LDR'INLOC. Set if Mapped Domain CDT entry is in process's locality list.

LDR'L'MODA
The High Order Disc Address of the extent limit.
(See note with LDR'B'MODA.)

LDR'LDEV
The Ldev for this request.

LDR'CDT
The CDT number for the Mapped Domain entry associated with this request.

LDR'BUFDST
Data Segment number for the target of the logical I/O request.
If bit zero is set, then this is the process's stack.

LDR'BUFADR
Offset within the DST (above) for the target address. If the DST is the process' stack, then this address will be DB relative.

LDR'STRAT'FUNC
(0:8) - Strategy
- 0 - Unknown caller
- 1 - Unknown File System
- 2 - Spooler
- 3 - Directory
- 4 - Disc Free Space
- 5-7- Unknown caller
- 8 - GENMESSAGE
- 9 - File System, Quiesce I/O
- 10 - File System, Sequential, No Buf
- 11 - File System, Direct, No Buf
- 12 - File System, Sequential, Buffered
- 13 - File System, Direct, Buffered
- 14 - File System, KSAM
- 15 - File System, IMAGE

(8:8) - Function
- 0 - Read
- 1 - Write

LDR'COUNT
On initiation, this specifies the requested transfer count (+words, -bytes). At completion of the request, this contains the actual transmission count (+words, -bytes).

LDR'PARM1
This is the High Order Disc Address of the requested disc sector.

LDR'PARM2
This is the Low Order Disc Address of the requested disc sector.

LDR'STATQ
Uniform status returns.

LDR'PCB
PIN of the requesting process.

LDR'PREVQ
Table relative index of the previous LDR in the queue. (NOTE: LDRs are singly linked on the CDT queues, and doubly linked on the disabled disc request queue).

LDR'NEXTQ
Table relative index of the next LDR in the queue.

LDR'B'HODA
The High Order Disc Address of the extent base. (Used when the logical disc request is through the file system. Caching uses this data when searching memory for a "hit" on a cached domain).

LDR'B'LODA
The Low Order Disc Address of the extent base. (See note above.)

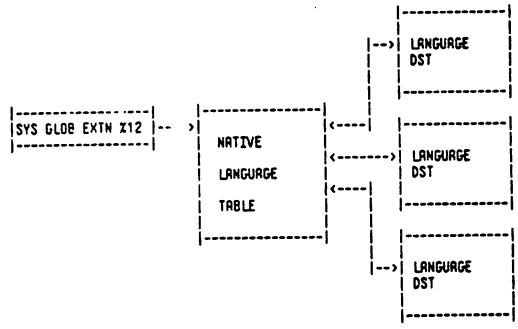
LDR'L'LODA
The Low Order Disc Address of the extent limit. (See note above.)

CHAPTER 24 NATIVE LANGUAGE SUPPORT

NL/3000 Internal Table Structure

NLS FILE CODES
LANGDEF.PUB.SYS - 1228
CHRDEFXX.PUB.SYS - 1229
NLSDEF.PUB.SYS - 1229

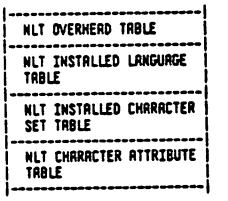
Native Language Support (NLS) Table Overview



Native Language Table (NLT)

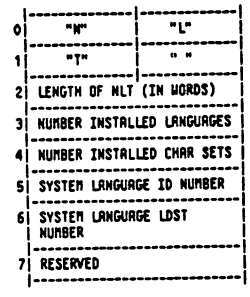
This table is created by INITNLS (called by PROGEN). The DST number is contained in SYSGLOB extension X12. The Native Language Table (NLT) contains the description of all the character sets needed to support the installed languages, and additional information needed to support the configured languages (DST numbers of the languages associated DSTs, character sets, etc.).

Every installed language has an associated Language DST, as set up by INITNLS.



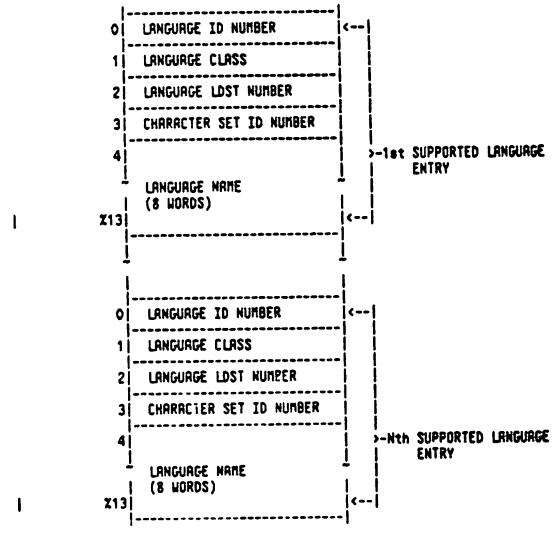
NLT Overhead Table

The NLT overhead table is eight (8) words long.



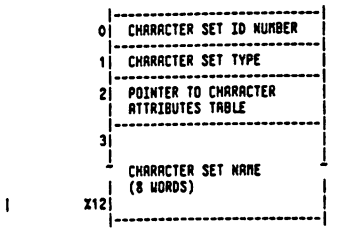
NLT Installed Language Table Format

For each supported non-NATIVE/3000 languages there is a 12-word language entry.



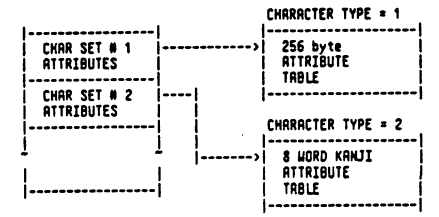
NLT Installed Character Set Table Format

For each character set installed on the system there is an 11 word character set table. It has the following format:



NLT Character Attributes Table

The NLT Character Attributes Table is comprised of a table for each configured character set. At this time, only two character sets are configurable: Class Four Languages (KANJI-based) and Nonclass Four Languages.

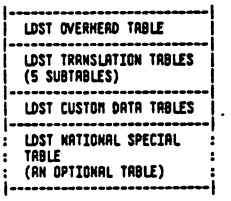


The type = 1 attribute table is a 256 byte table. Each byte corresponds to a character with that octal value.

Attribute 0 - Numeric character
1 - Special character (i.e., "!", "?", ".")
2 - Alphabetic uppercase character
3 - Alphabetic lowercase character
4 - Control code
5 - Invalid character (unused code)

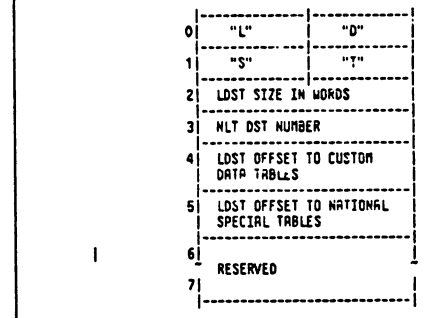
Language DST

For each language installed on a target system (with the exception of NATIVE-3000) INITNLS will build one language DST with the following structure:



LDST Overhead Table

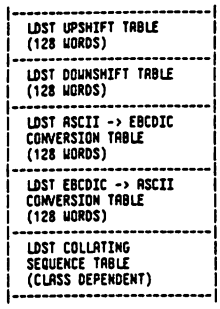
The overhead region has the following format:



The national special table is optional. If it does not exist, the pointer to it is zero.

LDST Translation Tables

For each language several translation tables are stored:



LDST Collating Sequence Table

The LDST Collating Sequence Table is of different formats depending upon the class of the language.

Overview

Class One Languages: Some languages, namely American English and Katakana, can be be collated by using the numerical representation of the ASCII encoding as the sequence number for any given character. These languages can use the Compare Bytes machine instruction.

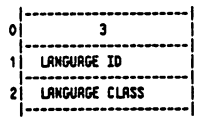
Class Two Languages: Some languages may be able to use the COBOLII machine instruction, Compare-Translated-Strings. These languages need to have a one-to-one mapping of character encoding to sequence number. Any algorithm for this class of language must take into account the fact that not every HP 3000 has COBOLII firmware.

Class Three Languages: Many languages will not be able to use either of the tactics described above. There are a number of language-dependent algorithms that need to be supported.

Class Four Languages: Some languages require 16-bit character string encoding. Collating these languages is not supported. The collating sequence table for this class of language is reserved.

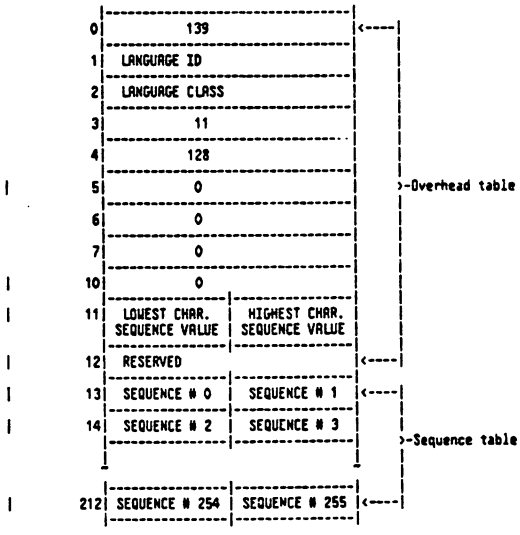
Class One Languages

Since class one languages will use the compare bytes machine instruction (CMPB), the whole collating sequence table for this class is 3 words.



Class Two Languages

This sequence table has a 13-word over head table and a 128-word sequence table.

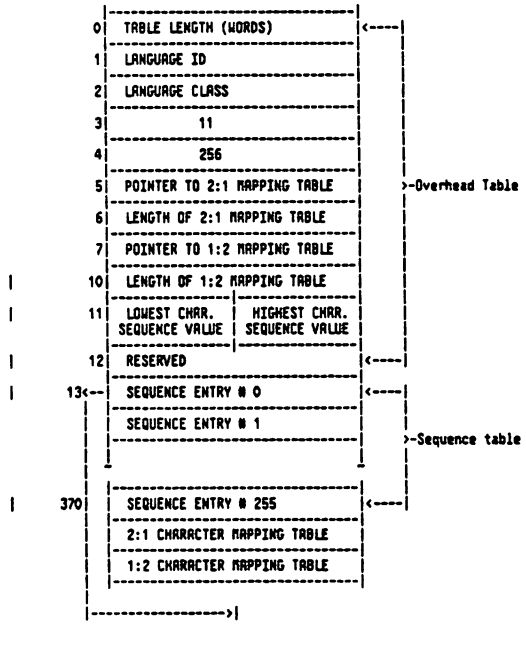


Note: Word X11 of the overhead contains in the left byte the character value, which has the lowest sequence number and in the right byte the character value, which has the highest sequence number.

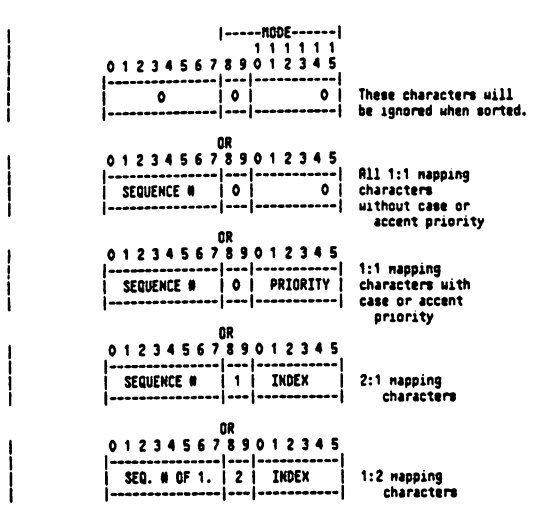
In the 128-word sequence table, the byte value of the character is used as a byte pointer in the collating table.

The byte value of the character is used as a byte pointer collating entries.

Class Three Languages

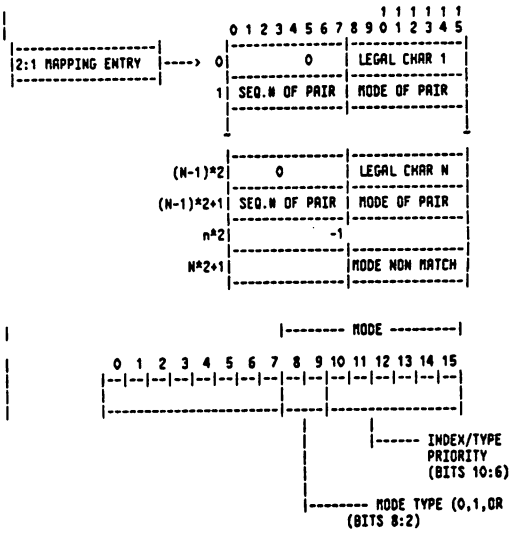


Class Three Languages (Cont.)



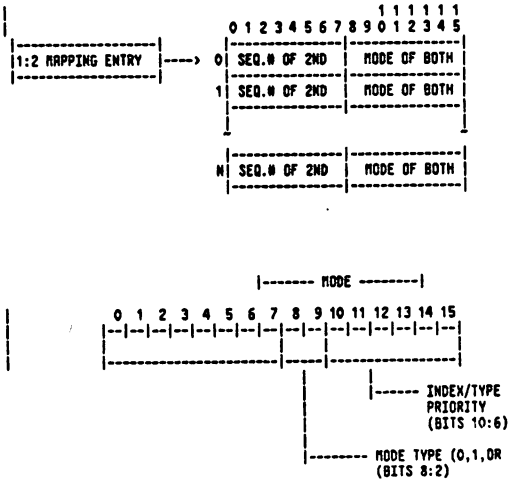
The byte value of the character is used as an index to the sequence entries.

2:1 Character Mapping Table



Entry has same format as mode options in the LDST Collating Sequence Table Format for Class Three Languages.

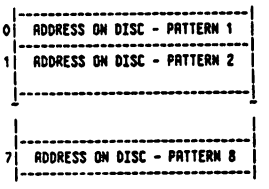
1:2 Character Mapping Table



Entry has same format as one above.

Class Four Languages

Class four languages require 16-bit character encoding. Sorting in class four languages is not implemented in this release of NLS. A preliminary collating sequence table is planned to be 8 words in length.



LDST Custom Data Table Format

This table is 196 words long. The formats and information in this table are language dependent, and may be modified with LANGINST.PUB.SYS.

0	LDST CALENDAR SKELETON (9 WORDS)	0
11	LDST CUSTOM DATE SKELETON (13 BYTES)	9
20	LDST TIME SKELETON (4 WORDS)	16
24	LDST ABBREVIATED MONTH NAMES (24 WORDS)	20
54	LDST FULL MONTH NAMES (122 WORDS)	44
164	LDST ABBREVIATED WEEKDAY NAMES (21 BYTES)	116
177	LDST FULL WEEKDAY NAMES (42 WORDS)	127
251	LDST YES/NO CHARACTER STRINGS (6 WORDS)	169
257	LDST THOUSANDS INDICATORS (1 WORD)	175
260	LDST CURRENCY SYMBOL (5 BYTES)	176
263	LDST RESERVED	179

LDST National Special Table

This table is optional and its existence is signaled by a nonzero pointer in the LDST overhead region. It is used to store data unique to a given language (e.g. the Emperor data for the Japanese calendar).

LENGTH
NATIONAL DEPENDENT DATA

Date Formats for Japan and Taiwan

For a given language, there is only one date format possible. The format of the year stored in the date format of the LDST can either be yyyy or yy for the Julian dates or Nyy for either the Japanese date (Emperor Era) or the Taiwanese date foundation of republic date).

If the format of the year stored as the date format in the LDST is Nyy then either the Japanese emperor dates or the Taiwanese foundation date has to be stored in the national dependent table.

National Dependent Table Formats

X0	LENGTH OF TABLE(WORDS)
X1	ID
X2	NUMBER OF ENTRIES
X3	NUM OF HP SUPPLIED ENTR.
X4 + X5	PERIOD ENTRY 1
(2n+2) + (2n+3)	PERIOD ENTRY n

The period entries are two word entries of the following format:

0 6	7 15	
YEAR OF CENTURY	DAY OF THE YEAR	WORD 1 (STARTING DATE)

0 7	8 15	
STARTING YEAR	EMPEROR SYMBOL	WORD 2

The ID for Japanese and Taiwanese date formats is always set to 1.

Japanese Date Format

There are three entries which do not change. The user can add new entries. These entries have to be stored in ascending order sorted by word 1.

The values of the entries are:

	Starting Date (MDY)	Octal Value	Starting year	Emperor Symbol
*	1/ 1/1873	X1	X41	M
	7/30/1912	X14324	X1	T
	12/25/1926	X32547	X1	S

* Since this starting time is in the 19 th century and we are not able to handle dates before 1900 easily, we store X1 as starting time.

For new date entries created by the customer the starting year will always be 1.

Taiwanese Date Format

There are two entries for the Taiwanese national dependent table.

The values of the entries are:

Starting Date (MDY)	Octal Value	Starting Year	Emperor Symbol
1/ 1/1900	X1	X0	X40
1/ 1/1912	X14001	X1	X40

The user does not need to add new entries.

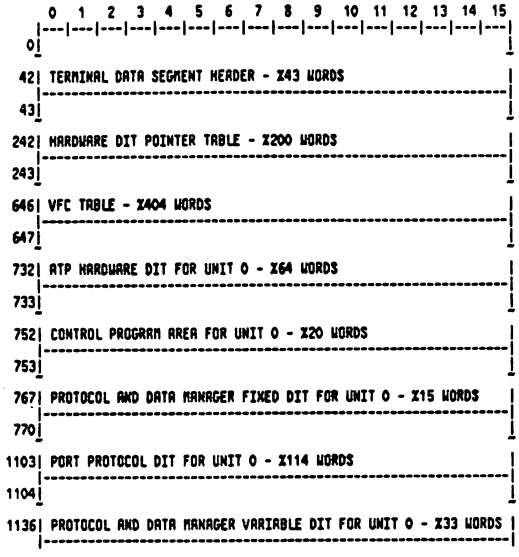
CHAPTER 25 ATP/ATP37/ADCC

Overview

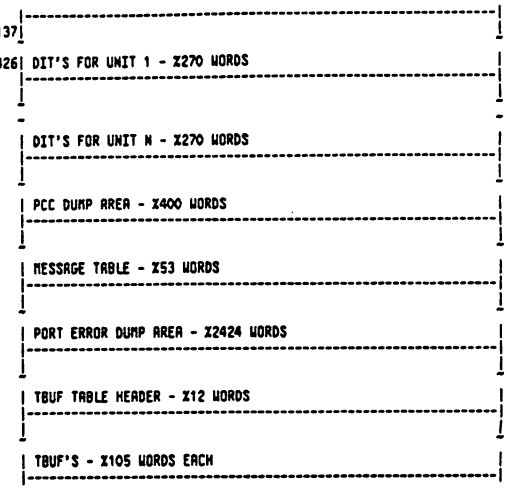
This chapter contains a description of the monitor/printer DIT and tables in the terminal data segment (TDS) used by the MPE V/E ATP/ATP37 and ADCC terminal drivers.

Terminal Data Segment Formats

ATP/ATP37 Terminal Data Segment Format



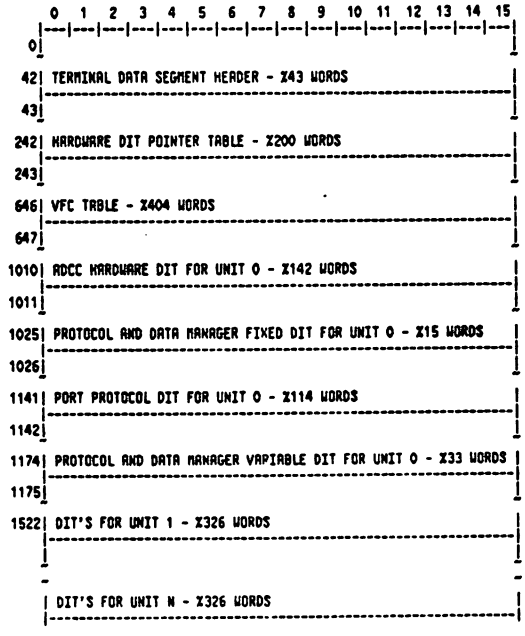
ATP/ATP37 Terminal Data Segment Format (Cont.)



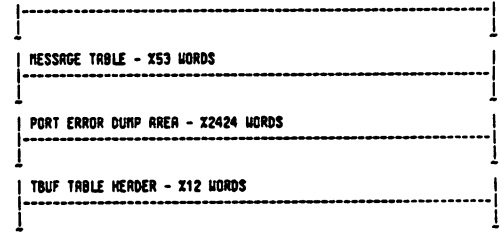
Fixed overhead is X3760 words. Overhead per logical device is X270 words. Each TBUF is X105 words.

For ATP37s there is one data segment created for each channel (DRT) that contains an ATP37. For ATPs there is at least one, maybe two data segments created for each channel (DRT) that contains an ATP. Devices configured between units 0/47 are in one data segment and if devices are configured between units 48/95 they are in a second data segment. The addresses for the data segment(s) are contained in the first six words of the ILTX for the channel. If there is a second ATP data segment then the data segment address is in the second six words of the ILTX.

ADCC Terminal Data Segment Format



ADCC Terminal Data Segment Format (Cont.)



Fixed overhead is X3360 words. Overhead per logical device is X326 words. Each TBUF is X105 words.

For ADCCs there is one data segment created for all configured ADCC devices. It will contain the tables for a maximum of 64 configured devices. The address of the data segment is in the first six words of the ILTX.

Terminal Data Segment Tables

Terminal Data Segment Header Format

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
X0	TERMINAL DATA SEGMENT VERSION NUMBER
1	TDS RELATIVE POINTER TO HARDWARE DIT TABLE
2	TDS RELATIVE POINTER TO TBUF TABLE
3	TDS RELATIVE POINTER TO VFC TABLE
4	TDS RELATIVE POINTER TO 1ST HARDWARE DIT
5	TDS RELATIVE POINTER TO 1ST DEVICE WAITING FOR A TBUF
6	TDS RELATIVE POINTER TO LAST DEVICE WAITING FOR A TBUF
7	DRT NUMBER OF CHANNEL - ATP/ATP37 ONLY
10	LOWEST LOGICAL DEVICE NUMBER IN TDS
11	HIGHEST LOGICAL DEVICE NUMBER IN TDS
12	AIB POLL MASK - ATP/ATP37 ONLY
13	TDS RELATIVE POINTER TO MESSAGE TABLE
14	TDS RELATIVE POINTER TO PCC DUMP AREA - ATP/ATP37 ONLY
15	TDS RELATIVE POINTER TO PORT ERROR DUMP AREA
16	LOWEST LOGICAL DEVICE CONFIGURED ON CHANNEL - ATP/ATP37 ONLY
17	HIGHEST LOGICAL DEVICE CONFIGURED ON CHANNEL - ATP/ATP37 ONLY
20	STATUS WORD OF TDS WHEN IT WAS BUILT - ATP ONLY
21	STATUS WORD OF TDS WHEN IT WAS INITIALIZED - ATP ONLY
22	STATUS WORD FOR DIAGNOSTICS
23	
24	VERSION NUMBER OF LPMON

Terminal Data Segment Header Format (Cont.)

25	
26	VERSION NUMBER OF TERMMON
27	
30	VERSION NUMBER OF PHYSICAL DRIVER - ATPDRIVER/ADCCDRIVER
31	
32	VERSION NUMBER OF IHANDLER
33	
34	VERSION NUMBER OF INITIALIZATION PROCEDURE-ATP/ATP37/ADCCINIT
35	
36	VERSION NUMBER OF IMANAGER
37	
40	VERSION NUMBER OF TERMUTIL
41	
42	VUUFF NUMBER OF SOFTWARE

Hardware DIT Pointer Table Format

ATP/ATP37 Hardware DIT Pointer Table Format

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0	TDS RELATIVE POINTER TO ATP/ATP37 UNIT 0 HARDWARE DIT
1	TDS RELATIVE POINTER TO ATP/ATP37 UNIT 1 HARDWARE DIT
177	TDS RELATIVE POINTER TO ATP/ATP37 UNIT 127 HARDWARE DIT

This table, words X43/X242 in the data segment, contains a data segment relative pointer to the hardware DIT for each unit configured. If the unit is not configured the pointer will be a minus one.

ADCC Hardware DIT Pointer Table Format

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0	DRT NUMBER OF 1ST DEVICE
1	TDS RELATIVE POINTER TO 1ST ADCC HARDWARE DIT
2	DRT NUMBER OF 2ND DEVICE
3	TDS RELATIVE POINTER TO 2ND ADCC HARDWARE DIT
176	DRT NUMBER OF LAST DEVICE
177	TDS RELATIVE POINTER TO LAST ADCC HARDWARE DIT

This table, words X43/X242 in the data segment, contains a data segment relative pointer to the hardware DIT for each device configured. The table also contains the DRT number of the device. If the device is not configured the pointer and DRT number will be a minus one.

VFC Table Format

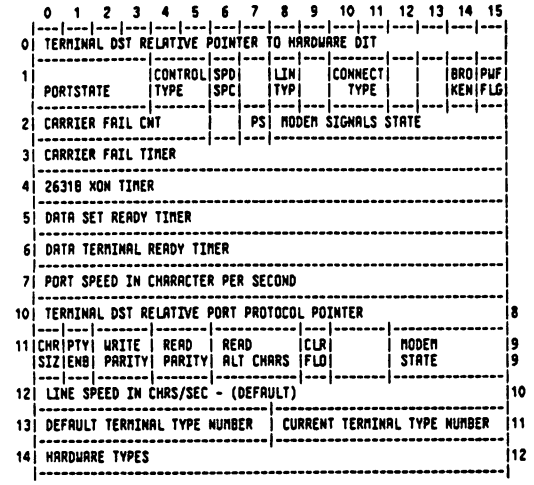
	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
-4	
-1	VFC TABLE SIR
0	
17	VFC ENTRY 0
360	
377	VFC ENTRY 15

VFC Entry Format

	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
0	
3	VFC FILE NAME
4	
7	VFC FILE GROUP NAME
10	
13	VFC FILE ACCOUNT NAME
14	REFERENCE COUNT
15	TDS RELATIVE POINTER TO TBUF CONTAINING INITIALIZATION STRING
16	TDS RELATIVE POINTER TO TBUF WITH VFC 0/VFC 7
17	TDS RELATIVE POINTER TO TBUF WITH VFC 8/VFC 15

Protocol and Data Manager DITs Format

Protocol and Data Manager Fixed DIT Format



WORD 0

PD'IODITP

Terminal DST relative pointer to the hardware DIT.

WORD 1

PD'PORTSTATE(1).(0:4)

Indicates the current state of the hardware. This field is set after "started" is returned from the physical driver.

0 - Unused.
1 - Reading. The hardware is transferring data from the device to main memory.
2 - Writing. The hardware is transferring data from main memory to the device.
3 - Idle read. The driver is doing a "dummy read" while waiting for the next operation. Only special characters will be processed.
4 - Input save. The hardware is currently idle. The hardware is saving read characters to be processed against the next read, write or idle read. The Interrupt Manager cannot be called by the physical driver when in the input save state.
5 - Unused.
6 - Unused.
7 - Unused.
8 - Unused.
9 - Selftest. The hardware is currently doing a selftest.
10- Speedsensing. The hardware is currently waiting to speedsense the port.
11- Set port protocol. The port protocol is currently being set up. This includes:

- XON/XOFF enable/disable
- 7-bit/8-bit characters
- FF enable/disable
- Input parity enable/disable
- Output parity type
- ENQ/ACK characters and block count
- Delay characters and delay count
- Linespeed

12- Set special characters. The read, read secondary, write, and write edit special character sets are currently being set up.
13- Modem control. The modem interface, input, and output control lines are currently being set up.
14- Unused.
15- Unused.

PD'CONTROLLER(1).(4:2)

Indicates the type of controller.

0 - Unused.
1 - ATP.
2 - RDCC.
3 - Unused.

PD'SPEED'SPECIFIED(1).(6:1)

Indicates if the device is to be a speed-specified port.

0 - Speedsensed.
1 - Speed-specified.

PD'LINETYPE(1).(8:1)

Indicates the type of line. Currently unused.

0 - Asynchronous.
1 - Synchronous.

PD'CONNECTTYPE(1).(10:2)

Indicates the type of connection.

0 - Direct connect. Device configured as subtype 0 or 14.
1 - Modem connect. Device configured as subtype 1 or 15.
2 - Modem connect. Device configured as subtype 9 or 13. This subtype is for CCITT type modems.

PD'BRGKEN(1).(14:1)

Indicates if the port is broken.

0 - Port is not broken.
1 - Port is broken.

PD'POWERFAIL(1).(15:1)

Indicates if a power fail has just occurred.

0 - No power fail.
1 - Power fail has just occurred.

WORD 2

PD'CF'CNT(2).(0:6)

Indicates the number of times DCD has gone off during a read. This is incremented by the Interrupt Manager each time there is a carrier fail during the read. If carrier fails more that 50 times during the read the modem will be disconnected.

PD'PENDING'START(2).(7:1)

Indicates if there is a pending request.

0 - No pending request.
1 - Indicates that a pending operation needs to be started by the physical driver. This occurs only on modem ports when the physical driver was in the middle of processing a request and there was a carrier fail. The current request can not be started until carrier detect is back on. Pending is then returned to the P&D Manager. Once carrier goes back on the Interrupt Manager will start the pending operation.

PD'MODEM'SIGNALS(2).(8:8)

Indicates the last known state of the modem input signals. A zero (0) indicates the signal is on and a one (1) indicates the signal is unused or off.

Bit 0 - Unused.
Bit 1 - Clear to send.
Bit 2 - Signal quality.
Bit 3 - Data set ready.
Bit 4 - Call origin status.
Bit 5 - Secondary carrier detect.
Bit 6 - Ring indicator.
Bit 7 - Carrier detect.

WORD 3

PD'CFTIMER

Contains a carrier fail timer index. This is a 30-second timer that is started by the Interrupt Handler when a carrier fail occurs. If carrier detect does not come back on within 30 seconds the modem is disconnected.

WORD 4

PD'XONTIMER

Contains an XON timer index. For term types 21 and 22 (HP 2631B processing) a 60-second timer is started by the Interrupt Handler when the XOFF is received. If the XON is not received within the 60 seconds the "LDEV NOT READY" message is printed by the Initiation Manager.

WORD 5

PD'DSRTIMER

Contains a data set ready timer index. If the port is to be speedsensed a 2-minute timer is started by the Interrupt Handler when DSR goes on. A speedsense must then be completed within the 2-minutes. If the port is being FOPEN'ed then the timer is started by the Initiation Manager. DSR and DCD must come on and the modem connected within the 2-minutes.

WORD 6

PD'DTRTIMER

Contains a data terminal ready timer index. This is a 5-second timer started by the Initiation Manager when a modem is to be disconnected. DTR is driven low for 5 seconds to disconnect the modem.

WORD 7

PD'PORTSPEED

Indicates the current line speed in characters-per-second.

WORD 8

PD'PPROTOCOL

Terminal DST relative pointer to the port protocol table.

WORD 9

PD'CHARSIZE(9).(0:1)

Indicates the size of the data character.

0 - 7-bit characters with a parity bit.
1 - 8-bit characters.

PD'PARITYENAB(9).(1:1)

Indicates the state of parity checking.

0 - Parity checking disabled.
1 - Parity checking enabled.

PD'WPARITY(9).(2:2)

Indicates the type of parity generation for writes.

0 - Space, high order bit forced to zero.
1 - Mark, high order bit forced to one.
2 - Even parity.
3 - Odd parity.

PD'RPARITY(9).(4:2)

Indicates the type of parity for read characters. Types are the same as PD'WPARITY.

PD'ALL'PARITY(9).(1:5)

A reference to the above 5-bit parity field.

PD'ALTCHARSET(9).(6:3)

Indicates the contents of the read alternate character set.

0/2 - Unused.
3 - Idle read set.
4 - Transparent read set.
5 - View read set.
6 - Binary read set.
7 - Unused.

PD'CLEARF(9).(9:1)

Indicates if flow control waits should be aborted before the next write is started. Flow controls are aborted by the Initiation Manager after break or subsystem break has been accepted by the monitor.

0 - Don't abort any flow controls.
1 - Flow controls should be aborted.

PD'MODEM'STATE(9).(12:4)

Indicates the current state of a modem.

0 - Unused.
1 - Data set ready sensing. The Interrupt Manager is waiting for DSR to come on. After DSR is on the Interrupt Manager will wait for DCD to come on. The modem state will then be set to 3.

2 - Data set ready sensing for FOPEN. This is the same as state 1 except that the port will be FOPEN'ed instead of speedsensed.
3 - Data carrier detect sensing. The Interrupt Manager is waiting for DCD to come on. DCD must come on within 30 seconds after DSR is on otherwise the modem will be disconnected. After DCD is on the port will be speedsensed and the modem state will then be set to 5.
4 - Data carrier detect sensing for FOPEN. This is the same as state 3 except the port is being FOPEN'ed.
5 - Speedsensing. The modem has been connected and a speedsense has been started.
6 - Connected. The modem is connected and the port has been successfully speedsensed if FOPEN'ed. If DCD goes off once the modem is connected it must come back on within 30 seconds or the modem is disconnected. If DSR goes off the modem is disconnected.
7 - Disconnecting. The modem is being disconnected. The driver will drop DTR for 5 seconds. Then the modem state will go back to 1 or 2.

WORD 10

PD'DPORTSPEED

Indicates the configured line speed in characters-per-second.

WORD 11

PD'PPENTRYNUMB(11).(0:8)

Indicates the term type number as specified in the I/O configuration. If a term type file name was specified instead of a number or there was an error in trying to use the file name this field will default to 31.

PD'TERMTYPE(11).(8:8)

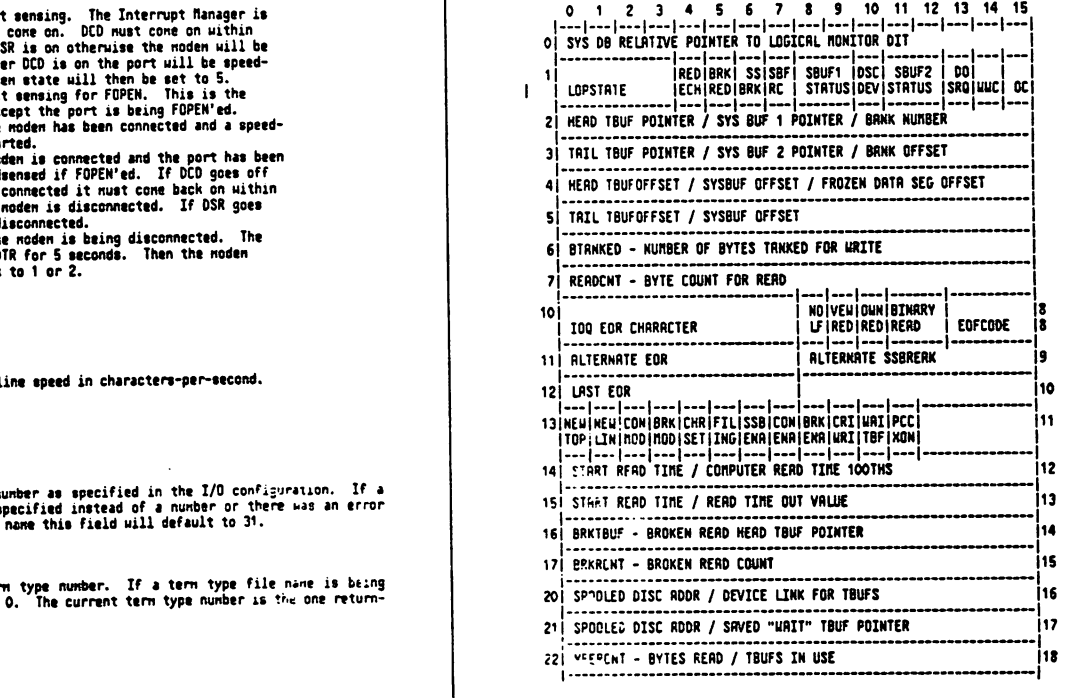
Indicates the current term type number. If a term type file name is being used this field will be a 0. The current term type number is the one returned for FCONTROLs.

WORD 12

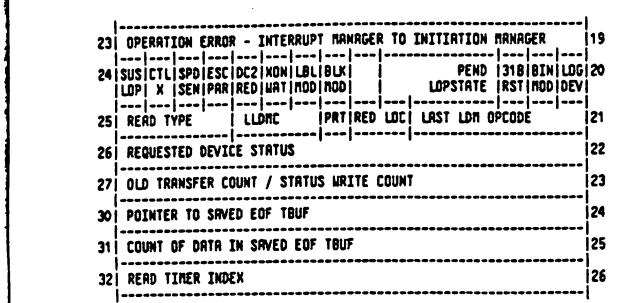
PD'HARDWARE'TYPE

A controller dependent word. For ATP it contains the results of the selftest. The contents of the word are the same as HW'SELFTEST in the ATP physical driver DIT. For ADCC controllers the word is unused.

Protocol and Data Manager Variable DIT Format



Protocol and Data Manager Variable DIT Format (Cont.)



WORD 0

PD'LDMDIT

SYS DB relative offset to the logical device monitor DIT.

WORD 1

NOTE:

This word is write shared between the Initiation Manager and Interrupt Manager. When the Initiation Manager is modifying this word the interrupt system should be off.

PD'LOPSTATE(1).(0:4)

Indicates the current logical operation state of a request.

0 - No operation. The driver has finished a request and is waiting for the next request.
1 - Reading.
2 - Writing.
3 - Status request to a device. The driver is currently writing a status request sequence to an HP 26318 printer.
4 - Status read. The driver is currently reading status back from an HP 26318.
5 - Control-X response. The driver is currently writing the "!!!,cr,lf" after receiving the Control-X.
6 - Waiting for a carriage return. The driver is currently waiting for a carriage return to start or terminate a block mode read.
7 - Write with pending read. The driver is currently writing and at the completion of the write a read should be started.
8 - Hardware setup with pending read. The driver is currently setting up the hardware and when done it should start the pending read.
9 - Write with pending status request. The driver is currently writing and at the completion of the write should request status from the HP 26318 printer.
10- Speedsensing.
11- Set port protocol. The driver is currently setting up the current port protocol. This will include:
  - Enable/disable ENQ/ACK handshake
  - Enable/disable XON/XOFF handshake
  - ENQ/ACK handshake characters
  - ENQ/ACK block count
  - Delays for CR, LF, and FF
12- Set special characters. The driver currently setting up the read, the read alternate, the write, and the write edit special character sets.
13- Modem control. The driver is setting up the modem logic and is waiting for the modem signals to go to a known state.
14- Freezing. The driver is waiting for the users stack to be frozen before starting the current read. Not currently used.
15- View read set up. The driver is writing out the sequence to home the cursor and lock the key board before starting the current read.

PD'NO'READECHO(1).(4:1)

Indicates the current state of echo.

0 - Echo is enabled. Echo may be enabled by an IOQ function code of 8 (FCONTROL 12) by the Initiation Manager or an "ESC semicolon" from the device by the Interrupt Manager.
1 - Echo is disabled. Echo may be disabled with an IOQ function code of 9 (FCONTROL 13) by the Initiation Manager or by an "ESC colon" from the device by the Interrupt Manager.

PD'BREAK(1).(5:1)

Indicates if break has been detected.

0 - Break has not been detected.
1 - Break is enabled and has been read. This is set by the Interrupt Manager when break is detected and cleared by the Initiation Manager when break has been accepted or rejected.

PD'SSBREAK(1).(6:1)

Indicates if subsystem break has been detected.

0 - Subsystem break has not been detected.
1 - Subsystem break is enabled and has been detected. This is set by the Interrupt Manager when the subsystem break is read and cleared by the Initiation Manager when the subsystem break is accepted or rejected.

PD'SBUFREADCOMP(1).(7:1)

Indicates if software is currently processing a read byte count exhausted interrupt for a spooled read.

0 - Read complete interrupt is not currently being processed for a spooled read.
1 - Read complete is currently being processed for a spooled read.

PD'SBUF1'STAT(1).(8:2)

If the current read is using system buffers this field contains the status of one of the two system buffers used for the read.

0 - Empty. Available for the read.
1 - Filling. Currently being used for the read.
2 - Full. The buffer is full.

PD'DISCNCT'DEV(1).(10:1)

Indicates that the port is being disconnected so some error conditions will be ignored while this is taking place.

0 - No disconnect in progress.
1 - Disconnect in progress.

PD'SBUF2'STAT(1).(11:2)

If the current read is using system buffers this field contains the status of the second of the two system buffers used for the read.

0 - Empty. Available for the read.
1 - Filling. Currently being used for the read.
2 - Full. The buffer is full.

PD'DO'STATREQ(1).(13:1)

Indicates if an HP 26318 status request should be done after all the data tanked for the write has been written out.

0 - Don't request printer status.
1 - Request printer status at completion of the write.

PD'WWC(1).(14:1)

If set then the write is a non-critical write and logical device monitor is awakened at the completion of the write. The bit is set by the Initiation Manager and cleared by the Interrupt Manager.

PD'LOPCOMPLETE(1).(15:1)

Indicates if the current logical operation is complete.

0 - The logical operation is not complete.
1 - The logical operation is complete. Set by the Interrupt Manager at the end of the operation, i.e., read is complete. The logical monitor is then awakened and notified the operation is complete.

WORD 2

This word contains an address for the current data transfer. There are three types of data transfers with the current type indicated in PD'READ'LOC. The type of transfer indicates the type of address.

PD'HEADTBUF

A DS relative pointer to the Head TBUF.

PD'SBUF1

A SYS DB relative pointer to a system buffer. System buffers are used for spooled reads where the transfers are done in disc sector sizes (128 words). There are two system buffers used, the second in PD'SBUF2, for the read. When one becomes full the second one is used while the Initiation Manager transfers the data from the buffer to the disc. This swing buffer process is done until the read is complete.

PD'BANKNUMB

Contains the bank number of the data segment used for frozen reads.

WORD 3

This word contains an address for the current data transfer. There are three types of data transfers with the current type indicated in PD'READ'LOC. The type of transfer indicates the type of address.

PD'TAILTBUF

A TDS relative pointer to the tail TBUF.

PD'SBUF2

A SYS DB relative pointer to a system buffer. See PD'SBUF1 for information on how system buffers are used.

PD'BANKOFFSET

Contains the offset into a bank of the data segment used for frozen reads.

WORD 4

PD'HEADOFFSET

Contains a byte offset into the head TBUF or system buffer. For reads this is an offset to the first byte read. For writes this is an offset to the next byte to be written.

PD'RBSOFFSET

Contains an offset into the frozen data segment of where the spooled read data should be saved.

WORD 5

PD'TAILOFFSET

Contains a byte offset into the tail TBUF or system buffer. For reads this offset is to the last byte read. For writes this is an offset to the last byte to be written.

WORD 6

PD'BTANKED

This indicates the number of bytes that have been tanked into the TBUF for the write. If -1, then all bytes have been tanked. The Initiation Manager will tank up to a maximum of 5 TBUFs of write data before the write is started. As each TBUF is emptied the Interrupt Manager will restart the write. When there are 2 TBUFs left the Initiation Manager is notified and the tanking will resume, while the last two TBUFs are being emptied. This continues until all the data has been tanked by the Initiation Manager, and all the data written out by the Interrupt Manager.

WORD 7

PD'READCNT

This indicates the number of bytes for the current or pending read.

WORD 8

PD'IOQEOR(8).(0:8)

Contains the end-of-record character in the current read IOQ.

PD'NOLF(8).(8:1)

Indicates if a LF should be sent out at the end of the read.

0 - Send a LF when the read is terminated by an EOR character.
1 - Don't send a LF when the read is terminated by an EOR character.

PD'VIEWREAD(8).(9:1)

Indicates if the current read is a View read.

0 - The current read is not a View read.
1 - The current read is a View read. When a DC2 is received the Interrupt Manager will write out the sequence to home the cursor and lock the key board.

PD'DWNREAD(8).(10:1)

Indicates if special processing is done on DC2s received during the read.

0 - DC2 characters are processed "normally", and will start block mode transfers.
1 - DC2s don't start block mode transfers and will be saved as normal read data.

PD'BINARYREAD(8).(11:2)

Indicates if the read is a binary read.

0 - The read is not binary.
1 - The read is a binary read.

PD'EOF(8).(13:3)

End-of-file code. Not currently used.

PD'READFLAGS

A reference to all of the above fields.

WORD 9

PD'ALTEOR(9).(0:8)

Contains the EOR character as specified in FCONTROL 41.

PD'ALTSSBREAK(9).(8:8)

Contains the alternate subsystem break character. The alternate subsystem break character is not deleted from the read when detected.

PD'TRANSPARENT

A reference to both alternate characters. If non-zero then the read is known as a transparent read.

PD'ALTCHARS

A reference to both alternate characters.

WORD 10

PD'LASTEOR(10).(0:8)

This contains the last EOR character. When EOR characters are to be changed by the Initiation Manager this field will indicate if a physical change should be done, i.e., if the new EOR and old EOR are the same.

WORD 11

NOTE:

This is a write only word for the Initiation Manager. The Interrupt Manager should not write to any (used or unused) fields as it may cause software problems.

PD'NEWTOP(11).(0:1)

Indicates if the device is at top of form.

0 - Device is not at top of form.
1 - Device is at top of form.

PD'NEWLINE(11).(1:1)

Indicates if the device carriage is at the beginning of a new line. Note that this field is currently unused.

PD'CONSMODE(11).(2:1)

Indicates if the device is currently in console mode.

0 - Device is not in console mode. Console mode can be cleared with an IOQ function code of 31 by the Initiation Manager.
1 - Device is in console mode. Console mode can be set with an IOQ function code of 31 by the Initiation Manager.

PD'BREAKMODE(11).(3:1)

Indicates if the device is currently in breakmode.

0 - Device not in breakmode. Cleared with an IOQ function code of 30 by the Initiation Manager.
1 - Device is in breakmode. Set with an IOQ function code code of 30 by the Initiation Manager.

PD'CHARSET(11).(4:1)

Indicates what read special character set is currently being used.

0 - Secondary.
1 - Primary.

PD'FILLING(11).(5:1)

Indicates if the Initiation Manager is currently active and filling a write TBUF.

0 - Not filling.
1 - Filling. This is cleared after the TBUF has been filled and linked into the tail of write TBUFs.

PD'SSBRKENAB(11).(6:1)

Indicates if subsystem break is enabled.

0 - Subsystem break is disabled. Subsystem break is disabled with an IOQ function code of 12 (FCONTROL 16) by the Initiation Manager.
1 - Subsystem break is enabled. Subsystem break is enabled with an IOQ function code of 13 (FCONTROL 17) by the Initiation Manager.

PD'CONSENAB(11).(7:1)

Indicates if the console interrupt is enabled.

0 - Console interrupt is disabled. This is disabled with an IOQ function code of 38 by the Initiation Manager.
1 - Console interrupt is enabled. This is enabled with an IOQ function code of 38 by the Initiation Manager.

PD'BREAKENAB(11).(8:1)

Indicates if break is enabled.

0 - Break is disabled. Break is disabled with an IOQ function code of 10 (FCONTROL 14) by the Initiation Manager.
1 - Break is enabled. Break is enabled with an IOQ function code of 11 (FCONTROL 15) by the Initiation Manager.

PD'CRITICALW(11).(9:1)

Set by the Initiation Manager if the write is a critical write. At the completion of the write the logical device monitor is awakened and cleared by the Initiation Manager.

PD'WAITFORTBUF(11).(10:1)

Indicates if the driver is currently waiting for a TBUF.

0 - Not waiting for a TBUF.
1 - Driver is waiting for a TBUF. This is set when the driver requests a TBUF and one is not available. See PD'DEVLINK for a complete explanation of when and how the driver gets TBUFs that are not available.

PD'PCC'XON'XOFF(11).(11:1)

Indicates if the hardware will do the XON/XOFF handshake.

0 - The P&D driver will handle the XON/XOFF handshake.
1 - The hardware will handle the XON/XOFF handshake.

WORD 12

PD'READTIME

Contains the computed read time, in 1/100ths of a second of the last timed read. This is returned to the caller with an FCONTROL 18.

WORD 13

PD'TIMINGREAD(13).(0:1)

Indicates if the next read time is to be calculated.

0 - Don't compute read time for next read. Cleared with an IOQ function code of 16 by the Initiation Manager when the next read is started.
1 - Compute read time for next read. Set with an IOQ function code of 17 by the Initiation Manager when the next read is started. The computed read time is placed in PD'READTIME by the Interrupt Manager.

PD'RDTIMEOUTVAL(13).(1:15)

Contains a read time out value in .1's of seconds if the next read is to be timed. This is set with an FCONTROL 5 by the Initiation Manager when the next read is started.

PD'PREADTIMING

A reference to the above read timing information.

WORD 12 & WORD 13

PD'RDSTARTIME

For reads that are to return a computed read time this double word will contain the read start time. This is initially set by the Initiation Manager when the read is started. When the read is complete the Interrupt Manager places the computed read time in PD'READTIME.

WORD 14

PD'BRKTBUF

Contains a TDS relative pointer to the head TBUF of the broken read data.

WORD 15

PD'BROKRCNT

Contains the byte read count of the broken read.

WORD 16

PD'DEVLINK

Contains a TDS relative pointer to the next device waiting for a TBUF. The pointer is to the P&D variable DIT. When the driver can't get a TBUF it will set PD'WAITFORTBUF, indicating it is waiting for a TBUF. In the TDS header (TDS'WAITHEAD'P and TDS'WAITTAIL'P) there is a linked list of devices waiting for TBUFs. Again the list points to P&D variable DITs. The driver will then link its variable DIT to the tail of the list. As TBUFs become free, RETURNLYNXBUF will give the TBUF to the device at the head of the list and then awaken the driver. The new TBUF pointer is placed, by RETURNLYNXBUF in PD'TBUFWAIT in the variable DIT.

WORD 17

PD'TBUFWAIT

Contains a TBUF given to the driver (by RETURNTBUF) that was waiting for a TBUF. See PD'DEVLINK for a complete explanation of when and how the driver gets TBUFs that are not available.

WORD 16 & WORD 17

PD'DISCADDR

Contains a disc address for spooled reads.

WORD 18

PD'XFERCNT

Contains the current count on the number of bytes read if currently reading. This count is only updated when the read is interrupted (i.e., TBUF becomes full or read special character) and is complete or has to be restarted.

PD'TBUFS'IN'USE

A count on the number of write TBUFs currently in use. Each time the Initiation Manager fills a TBUF this count is incremented. As the TBUFs become empty the Interrupt Manager will decrement this count. When the count gets to 2 and there is still data to be tanked (PD'BTANKED <> -1) then the Initiation Manager is awakened to resume tanking.

WORD 19

PD'ERROR

Contains an error coded for the current transfer. This is a communication word used by the Interrupt Manager to pass information to the Initiation Manager.

1 - No system or terminal buffer available to restart the read.
2 - Overrun error.
3 - Framing error.
4 - Unused.
5 - Parity error.
6 - Unused.
7 - Modem error.
8 - Unused.
9 - Unused.
10 - A type 2 EOR has been detected.

WORD 20

NOTE:

This is a write only word for the Interrupt Manager. The Initiation Manager should not write to any (used or unused) fields as it may cause software problems.

PD'SUSPLOPSTATE(21).(0:1)

Set if a logical operation has been suspended that will resume later.

PD'CNTRLX(20).(1:1)

Indicates if the Control-X response should be sent when a Control-X is received.

0 - Don't send the Control-X response. The Control-X response is disabled with an IOQ function code of 27 by the Initiation Manager.
1 - Control-X response is enabled. The Control-X response is enabled with an IOQ function code of 26 by the Initiation Manager.

PD'SPDSENSE(20).(2:1)

Indicates if the device has been speedsensed.

0 - The device has not been speedsensed.
1 - Set by the Interrupt Manager after a successful speedsense.

PD'ESCPAIR(20).(3:1)

Indicates if the driver is in the middle of processing an ESC sequence to maybe enable or disable echo.

0 - Not processing an ESC pair sequence.
1 - Driver is currently processing an ESC pair. Set by the Interrupt Manager when an "ESC" special character is detected. A one-byte read is then started to determine if echo should be changed.

PD'DC2READ(20).(4:1)

Indicates if a DC2 was read during the current read.

0 - DC2 has not been read.
1 - DC2 has been read. Set by the Interrupt Manager and indicates that the read is a View read, blockmode or lineblock mode read.

PD'XONWAIT(20).(5:1)

Indicates if the driver has read a DC3 (XOFF) and is waiting for the DC1 (XON). Note that this is only used when the driver processes the XON/XOFF. The hardware may actually do the XON/XOFF processing and the device may be in an XOFF state and this bit may not be set.

0 - XOFF has not been read.
1 - XOFF has been read.

PD'LBLOCKMODE(20).(6:1)

Indicates if the current read is a line block mode read.

0 - The current read is not a line block mode read.
1 - A DC2,CR has been read and the read is a line block mode read.

PD'BLOCKMODE(20).(7:1)

Indicates if the current read is a block mode read.

0 - The current read is not a block mode read.
1 - A DC2 has been read and the read is a block mode read.

PD'PENDLOPSTATE(20).(9:4)

This field contains the old logical operation. This is used when an event occurs (i.e., modem interrupt) that results in a new sequence or logical operations before the old one can be resumed.

PD'26318'RESET(20).(13:1)

Indicates if the HP 26318 is initially being reset. This is used to prevent bad status reports between FOPEN's, etc., that may occur when the printer is being reset.

0 - HP 26318 not being reset.
1 - HP 26318 being reset. Don't report any transfer errors.

PD'BINARY'MODE(20).(14:1)

Indicates if in binary mode.

0 - Not in binary mode.
1 - Binary mode enabled.

PD'LOGONDEV(20).(15:1)

Indicates if the device is a logon/speedsense device.

0 - The device is not a logon device.
1 - The device is a logon/speedsense device.

WORD 21

NOTE:

This is a write only word for the Initiation Manager. The Interrupt Manager should not write to any (used or unused) fields as it may cause software problems.

PD'READTYPE(21).(0:4)

This indicates the type of read that is currently active. This is set by the Initiation Manager and not changed until the read is logically complete. Different read types are:

0 - No operation.
1 - Character mode/block mode read.
2 - Spooled read.
3 - Idle read.
4 - Transparent character/block mode read.
5 - View/3000 read.
6 - Binary read.
7 - Not used.

PD'LLDMC(21).(4:3)

Contains the last logical device monitor call to the Initiation Manager.

0 - Unused.
1 - Set device characteristics (IM'SET'DEV).
2 - Read (IM'READ).
3 - Write (IM'WRITE).
4 - Abort call (IM'ABORT).
5 - Refuse call (IM'REFUSE).
6 - Device control call (IM'DEV'CONTROL).
7 - Unused.

PD'PRINTER(21).(7:1)

Set if logical device is a printer.

PD'READLOC(21).(8:2)

Indicates where the data is going for the current read.

0 - Unused.
1 - TBUFs are being used for current read.
2 - System buffers are being used for current read.
3 - Read data is going to a frozen data segment.

PD'LDMOPCODE(21).(10:6)

Contains the opcode of the last call by the monitor to the Initiation Manager. PD'LLDMC will indicate the last Initiation Manager call.

Opcodes for calls to IM'SET'DEV:

0 - Partial completion. Initiation Manager should continue with old operation.
1 - Return device characteristics.
2 - Set a new term type.
3 - Change parity.
4 - Change the echo flag.
5 - Change transparent read special characters.
6 - Enable/disable subsystem break.
7 - Enable/disable break.
8 - Enable/disable Control-A.
9 - Set/clear console mode.
10- Set/clear console mode.
11- Set data length.
12- Disconnect.
13- Enable/disable Control-K reply.
14- Hangup timeout.
15- Selftest.
6 - Wait for current operation to complete.
7 - Flush broken read TBUFs.
8 - Disconnect immediately.

Opcodes for calls to IM'READ:

0 - Continue current operation.
1 - TBUF read.
2 - Frozen stack read. Not used.
3 - Spooled read.
4 - Speedsense request.
5 - Read timeout.
6 - New read request.
7 - Start pending read.
8 - Break accepted.
9 - Subsystem break accepted.

Opcodes for calls to IM'WRITE:

0 - Continue current operation.
1 - Tank data.
2 - Tank token.
3 - Start write.
4 - HP 26318 status request check.

Opcodes for calls to IM'ABORT:

0 - Unused.
1 - Halt all I/O.
2 - Abort current operation and start idle read.
3 - Hard preempt.
4 - Soft preempt.
5 - Break accepted.
6 - Subsystem break accepted.

Opcodes for calls to IM'REFUSE:

0 - Unused.
1 - Break refused.
2 - Subsystem break refused.

WORD 22

PD'STATUS

Contains the status byte returned from an HP 26318 printer.

Bit 4 - If set then a transfer error occurred.
Bit 5 - If set then the device is offline.
Bit 6 - If set then the device buffer is full.
Bit 7 - If set then the device is out of paper.

WORD 23

PD'OLDXFERCNT

Indicates the number of bytes read up to the last back space. Needed so the successive LF's are not output on devices that required a LF in response to a BS. Set and cleared by the Interrupt Manager.

PD'STATUS'WCNT

Contains the write count for a HP 2631B status request.

WORD 24

PD'EOFTBUF

Contains a TDS relative pointer to the saved EOF TBUF(s).

WORD 25

PD'EOFCNT

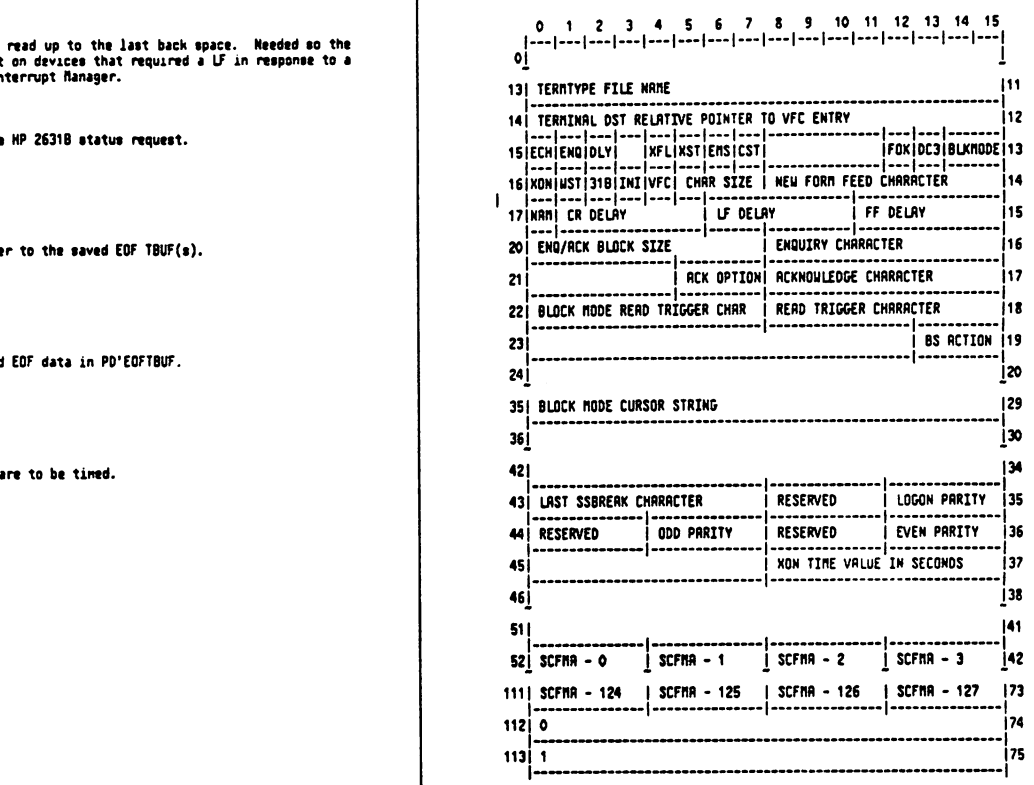
Contains a byte count of saved EOF data in PD'EOFTBUF.

WORD 26

PD'READTIMERINDEX

A timer index for reads that are to be timed.

Port Protocol DIT Format



WORDS 0/11

Contains a file name of the termtype file.

WORD 12

PP'VFC

Terminal DST relative pointer to a VFC entry in the VFC table.

WORD 13

PP'ECHO.(0:1)

Indicates the initial state of echo.

0 - Echo is disabled.
1 - Echo is enabled.

PP'ENQRCK.(1:1)

Indicates if the device does ENQ/ACK handshaking.

0 - ENQ/ACK handshaking is disabled.
1 - ENQ/ACK handshaking is enabled. PP'ENQCHAR and PP'ACKCHAR will contain the ENQ/ACK character and PP'ENQBLOK will contain the block size.

PP'DELAY.(2:1)

Indicates if delays should be enabled.

0 - Delays are not enabled.
1 - Delays are enabled. PP'DELAYCR, PP'DELAYLF and PP'DELAYFF will contain the delay amount in 10ths of seconds.

PP'XFLOW.(4:1)

Indicates if XON/XOFF handshaking should be enabled.

0 - XON/XOFF handshaking is disabled.
1 - XON/XOFF handshaking is enabled.

PP'XSTRIP.(5:1)

Indicates if the XON/XOFF should be stripped.

0 - The XON/XOFF should not be stripped from read data.
1 - The XON/XOFF will be stripped from read data if handshakes are disabled.

PP'EMSTRIP.(6:1)

Indicates if Control-Y should be stripped.

0 - Control-Y should not be stripped from read data.
1 - Control-Y will be stripped from read data.

PP'CONS'STRIP.(7:1)

Indicates if Control-A should be stripped.

0 - Control-A should not be stripped from read data.
1 - Control-A will be stripped from read data.

PP'FFOK.(12:1)

Indicates if FF should be allowed as output.

0 - The FF should be replaced by PP'FF'NEWCHAR.
1 - The FF are valid.

PP'DC3'CONTROL.(13:1)

Indicates if a DC3 should be appended to write data after each CF, LF.

0 - Don't append any DC3s to write data.
1 - Append a DC3 following the CF, LF.

PP'BLOCKMODE.(14:2)

Indicates the type of blockmode read to do on DC2s.

0 - None.
1 - Line blockmode.
2 - Page blockmode.
3 - Either line or page blockmode.

WORD 14

PP'DO'XON'TIMER.(0:1)

Indicates if the driver should start an XON timer after an XOFF is received.

0 - Don't start an XON timer if an XOFF is received.
1 - Start an XON timer, indicated by PP'XON'TIME if an XOFF is received.

PP'WRITESTATUS.(1:1)

Indicates if a status request, "ESC?DC1", should be written to the device.

0 - Don't request status from the device.
1 - Send a status request to the device.

PP'2631B'FIX.(2:1)

Indicates if status should be requested from the device after an XOFF even though PP'WRITESTATUS may be set.

0 - Don't worry about when the status request is sent.
1 - Don't request status as the XOFF was received in the middle of a line and we don't want to possibly send an ESC sequence in the middle of a user ESC sequence.

PP'INIT'DEV.(3:1)

Indicates if an initialization sequence should be sent to the device.

0 - There is no initialization sequence.
1 - There is an initialization sequence.

PP'VFC'OK.(4:1)

Indicates if there is a VFC file for the device.

0 - There is no VFC file to send to the device.
1 - There is a VFC file for the device.

PP'CHAR'SIZE.(5:3)

Indicates the size of the data characters. The value is 1 less than the actual character size, i.e., 8-bit data will be indicated by a 7.

PP'FF'NEWCHAR.(8:8)

Contains the replacement character for FFs if FFs are to be replaced.

WORD 15

PP'NAME'VALID.(0:1)

Indicates if the term type file name is the current term type.

0 - The current term type is specified by a numbered term type. PP'TERMTYPE will contain a number and the file being used will be TERM"number".PUB.SYS.
1 - The current term type is specified by a file name. PP'TERMTYPE will contain a 0.

PP'DELAYCR.(1:5)

Indicates the amount of time in 10ths of seconds to delay on CR.

PP'DELAYLF.(6:5)

Indicates the amount of time in 10ths of seconds to delay on LFs.

PP'DELAYFF.(11:5)

Indicates the amount of time in 10ths of seconds to delay on FFs.

WORD 16

PP'ENQBLOK.(0:8)

Indicates the number of characters to send before doing the ENQ/ACK handshake.

PP'ENQCHAR.(8:8)

Contains the inquire character, normally the ENQ.

WORD 17

PP'NORCKACTION.(5:3)

Indicates what to do if the ACK is not received on an ENQ/ACK handshake.

1 - Resume write with no ENQ.
2 - Resume write with ENQ.

PP'ACKCHAR.(8:8)

Contains the acknowledge character, normally the ACK.

WORD 18

PP'BLOCK'TRIG.(0:8)

Contains the blockmode read trigger character, normally a DC1.

PP'TRIGGER'CHAR.(8:8)

Contains the read trigger character, normally a DC1.

WORD 19

PP'BSRESP.(13:3)

Indicates the response for the back space character.

1 - Nothing.
2 - Send end of medium.
3 - Send a "LF".
4 - Send a "/".
5 - Erase the character.

WORDS 20/29

Contains the block mode cursor string.

WORD 35

PP'LAST'SSBRK.(0:8)

Contains the last subsystem break character detected.

PP'PARITY'ENAB.(12:1)

Indicates if parity checking should be enabled when the device is FOPEN'ed.

0 - Parity checking is disabled.
1 - Parity checking is enabled.

PP'FOPEN'PARITY.(13:3)

Indicates what the parity should be when the device is FOPEN'ed.

0 - Space.
1 - Mark.
2 - Even.
3 - Odd.

WORD 36

PP'ODD'ENAB.(4:1)

Indicates if parity checking should be enabled if odd parity is sensed.

0 - Parity checking is disabled.
1 - Parity checking is enabled.

PP'ODD'PARITY.(5:3)

Indicates what the parity should be if odd (0) parity is sensed.

0 - Space.
1 - Mark.
2 - Even.
3 - Odd.

PP'EVEN'ENAB.(12:1)

Indicates if parity checking should be enabled if even parity is sensed.

0 - Parity checking is disabled.
1 - Parity checking is enabled.

PP'EVEN'PARITY.(13:3)

Indicates what the parity should be if even (1) parity is sensed.

0 - Space.
1 - Mark.
2 - Even.
3 - Odd.

WORD 37

PP'XON'TIME.(8:8)

Contains the amount of time in seconds to wait for the XON after an XOFF.

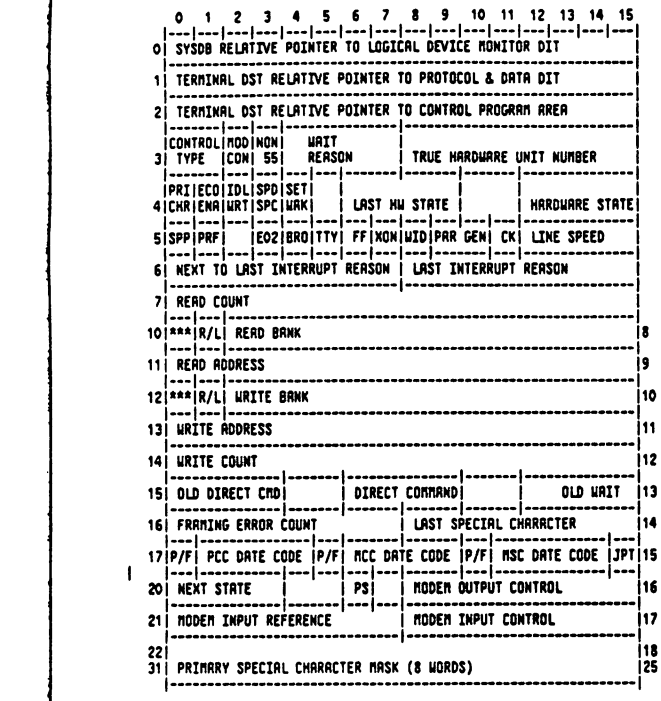
WORDS 42/73

Contains a special character function code for each of the 128 ASCII characters. This is an array of 128 4-bit entries. There is one entry for each character, going sequentially from 0 to 127. The special character function codes are as follows:

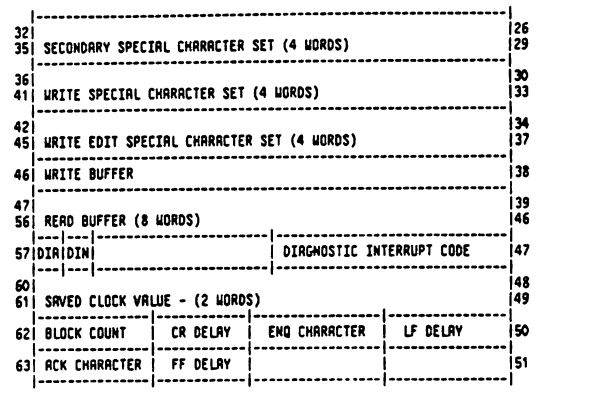
0 - No special function.
1 - Console attention (i.e., Control-A).
2 - Cancel one character (i.e., backspace).
3 - Horizontal tab.
4 - Linefeed.
5 - Type 1 end-of-record (i.e., CR).
6 - Type 2 end-of-record (i.e., an IOQ EOR character).
7 - XON
8 - Block mode alert character (i.e., DC2).
9 - XOFF
10- Rewrite input buffer.
11- Cancel line (i.e., Control-X.
12- Subsystem break (i.e., Control-Y).
13- Strip and ignore.
14- Escape character.

Hardware DIT Format

ATP/ATP37 Hardware DIT Format



ATP/ATP37 Hardware DIT Format (Cont.)



WORD 0

HW'LDITP

SYSDB relative pointer to the logical monitor DIT.

WORD 1

HW'PDITP

Terminal DST relative pointer to the protocol and data management DIT.

WORD 2

HW'CP'P

Terminal DST relative pointer to the control program area. Control program area is 32 bytes.

WORD 3

HW'CONTROLLER(3).(0:2)

Indicates the type of controller.

0 - Unused.
1 - ATP controller.
2 - ADCC controller.
3 - Unused.

HW'MODEMPANEL(3).(2:1)

Indicates the type of connection/junction panel.

0 - Direct connection, device subtype was configured as 0 or 14.
1 - Modem connection, device subtype was configured as 1 or 15.

HW'NON55(3).(3:1)

Indicates the type of CPU.

0 - Series 64 type CPU.
1 - Series 40/44 type CPU.

HW'WAIT'REASON(3).(4:4)

This indicates how the next interrupt should be processed. A wait reason is set up when the driver is about to halt the PCC and will want to selectively process the next interrupt. Wait reasons are as follows:

0 - No wait reason. Process the interrupt as per the interrupt type.
1 - Abort pending. The physical driver is trying to halt the PCC. Modem interrupts are processed otherwise all other interrupts satisfy the halt.
2 - Reset DIT. The port is being reset. When the next interrupt occurs the reset will be completed.
3 - Disconnect. The PCC is being halted so that a control program can be started to disconnect the modem. Any interrupt will satisfy the halt.
4 - MCC setup. The MCC is being set up and the driver is waiting for the "end of control program" interrupt indicating the MCC has been set up. Any interrupt except modem errors will satisfy the setup complete.
5 - Monitor modem signals. The driver has set up the MCC and is waiting for an interrupt indicating that a modem line is in the correct state, i.e., DSR on.
6 - EO2 reset. The PCC is hung and the driver is in the process of resetting the PCC before it does the next read or write.

7 - Dump port. The PCC is dumping its RAM.
8 - Speed-specified. The hardware is waiting for the "end of control program" interrupt indicating that the hardware has been set up accordingly as a speed-specified port.

HW'UNIT'NUM(3).(8:8)

Indicates the true unit number of the device. Unit numbers will range from 0 to 127.

WORD 4

HW'PRISPCL(4).(0:1)

Indicates what read special character set is being used.

0 - Secondary read special character set enabled.
1 - Primary read special character set enabled.

HW'ECHO(4).(1:1)

Indicates the current state of echo.

0 - Echo is disabled.
1 - Echo is enabled.

HW'IDLE'WRT(4).(2:1)

Indicates if the current perform I/O will write out one or two trigger characters before the read begins.

0 - No trigger characters are to be sent.
1 - One or two trigger characters are to be written.

HW'SPOS(4).(3:1)

Indicates whether the port is a speed-specified port.

0 - The port is speedsensing.
1 - The port is speed-specified.

HW'MCC'SETUP'WAK(4).(4:1)

Indicates whether we wait for end CP after setting up modem signals.

0 - Wait for end CP.
1 - Do not wait for end CP.

HW'LSTSTATE(4).(6:4)

This indicates the last state of the PCC. When an interrupt occurs the current state in HW'STATE is saved in HW'OLD'STATE. Then HW'STATE is set to "input save".

HW'STATE(4).(12:4)

This indicates the current state of the PCC. Set when a PCC control program is started or after an interrupt occurs. Possible states are as follows:

1 - Reading.
2 - Writing.
3 - Speedsensing.
4 - Unused.
5 - Set port protocol.
6 - Set special characters.
7 - Selftest.
8 - Dumping PCC.
9 - Port is frozen.
10 - Reading modem inputs.
11 - Reset.
12 - Idle read.
13 - Setting up modem signals.
14 - Monitoring modem signals.
15 - Input save.

WORD 5

HW'SET'PROTOCOL(5).(0:1)

Indicates if the PCC has done a set port protocol.

0 - The PCC has not done a set port protocol. No I/O should be done until after a set port protocol.
1 - The PCC has done a set port protocol. The current protocol is indicated in bits 11/15 of this word.

HW'POWERFAIL(5).(1:1)

Indicates if a power fail has occurred and is being processed.

0 - No power fail has occurred.
1 - Power fail has occurred.

HW'RESET'DIT(5).(2:1)

Indicates if the hardware DIT is being reset.

0 - DIT is not being reset.
1 - DIT is being reset.

HW'CLEAR'E02(5).(3:1)

Indicates if the driver is in the process of resetting the PCC to clear up the problem of the PCC getting hung because location E0 of its RAM never is cleared.

0 - The driver is not trying to fix a hung PCC.
1 - The driver is in the middle of trying to free a hung PCC.

HW'BROKEN(5).(4:1)

Indicates if the port is broken.

0 - The port is not broken.
1 - The port is broken and will not operate until reset.

HW'DELAY'ENAB(5).(5:1)

Indicates if TTY delays are enabled.

0 - TTY delays are disabled.
1 - TTY delays are enabled. There will be a delay following the transmission of each "CR", "LF", or "FF".

HW'FF'ENAB(5).(6:1)

Indicates if form feeds are enabled.

0 - Form feeds are disabled. Each form feed character will be replaced with a "LF".
1 - Form feeds are enabled. Each "FF" character is written out and not replaced with a "LF".

HW'XON'ENAB(5).(7:1)

Indicates if the PCC will do the XON/XOFF handshake.

0 - The PCC will not do the XON/XOFF handshake.
1 - The PCC will do the XON/XOFF handshake.

HW'8'BIT'MODE(5).(8:1)

Indicates the size of the data character.

0 - Data will be transmitted as 7-bit with a parity bit.
1 - Data will be transmitted as 8-bit data.

HW'PARITY'GEN(5).(9:2)

Indicates the type of parity generation. This field is only valid for 7-bit data.

0 - Output disabled and the 8th bit is forced to 0.
1 - Output disabled and the 8th bit is forced to 1.
2 - Output parity generation is enabled and it will be even.
3 - Output parity generation is enabled and it will be odd.

HW'PARITY'CHECK(5).(11:1)

Indicates if input parity checking is enabled.

0 - Input parity checking is disabled.
1 - Input parity checking is enabled.

HW'LINE'SPEED(5).(12:4)

Indicates the current transfer rate of the PCC.

0 - 110 baud.
1 - 300 baud.
2 - 600 baud.
3 - 1200 baud.
4 - 2400 baud.
5 - 4800 baud.
6 - 19200 baud.
7 - 9600 baud.
8 - 76800 baud - unsupported.
9 - 9600 baud.
10 - 1200 baud.
11 - 300 baud.

WORD 6

HW'LAST'INTERRUPT(6).(0:8)

Contains the old interrupt code. When an interrupt occurs the interrupt code in HW'INTERRUPT'CODE is moved here and the new interrupt is placed in HW'INTERRUPT'CODE.

HW'INTERRUPT'CODE(6).(8:8)

Contains the last interrupt code. Some of the interrupt codes have different meanings depending on the PCC version. Those different codes are noted. Interrupt codes 20/28 are only for pass 3 PCCs.

0 - Invalid.
1 - Redundant start I/O.
2 - End control program.
3 - Illegal control program.
4 - Write special character.
5 - Ten-second ACK timeout.
6 - Read complete.
7 - Parity error.
8 - Read special character.
9 - Pass 2 PCCs - break detected. Pass 3 PCCs - framing error.
10 - Overrun error.
11 - Pass 2 PCCs - character read and not in read state. pass 3 PCCs - not used.
12 - Speedsense complete.
13 - Pass 2 PCCs - modem error. Pass 3 PCCs - break detected.
14 - Write complete.
15 - Selftest complete.
16 - Edit special character.
17 - Diagnostic failure.
18 - Control program halted.
19 - Dump complete.
20 - Modem data overrun.
21 - Modem AIB hardware error.
22 - Modem invalid PCC read.
23 - Modem PCC message error.
24 - Modem link error.
25 - Modem debounce error.
26 - Modem non-maskable interrupt error.
27 - MC6801 error.
28 - Unknown modem error.

WORD 7

HW'READ'CNT

Current PCC read byte count.

WORD 8

Note that this word is used in full for the ATP DMA registers. It should not be changed in its format.

HW'RD'RIGHT'LEFT(8).(1:1)

Indicates to the PCC what byte to start the transfer to.

0 - Left.
1 - Right.

HW'RERD'BANK

Indicates the bank number for the current read.

WORD 9

HW'READ'ADDR

Contains the absolute start address of the read.

WORDS 8/9

HW'READ'ABS'ADDR

Contains a double word absolute start address for the read.

WORD 10

Note that this word is used in full for the ATP DMA registers. It should not be changed in its format.

HW'WT'RIGHT'LEFT(10).(1:1)

Indicates to the PCC what byte to start the write from.

0 - Left.
1 - Right.

HW'WRITE'BANK

Indicates the bank number for the current write.

WORD 11

HW'WRITE'ADDR

Contains the absolute start address of the write.

WORDS 10/11

HW'WRITE'ABS'ADDR

Contains a double word absolute start address of the write.

WORD 12

HW'WRITE'CNT

Current PCC write byte count.

WORD 13

HW'OLD'DIRECT'CMD(13).(0:4)

Contains the old direct command. When a new direct command is issued HW'DIRECT'COMMAND is saved here. Then the new direct command is saved in HW'DIRECT'COMMAND. Possible direct commands are:

1 - Modem freeze.
2 - PCC freeze.
4 - Start I/O.
8 - Halt direct command.

HW'DIRECT'COMMAND(13).(6:4)

Contains the last direct command issued. When a new command is issued the old command is saved in HW'OLD'DIRECT'CMD.

HW'OLD'WAIT'REASON(13).(13:3)

Contains the old wait reason. HW'WAIT'REASON is saved here before a new wait reason is set up.

WORD 14

HW'FRAMING'ERROR(14).(0:8)

Contains a running count on the number of framing errors that occur. Used only for gathering information when dumps are read.

HW'SPEC'CHAR(14).(8:8)

Contains the last special character detected. Updated each time a new special character is detected.

WORD 15

HW'SELFTEST

Contains the results from the PCC/MSC selftest.

HW'PCC'PF(15).(0:1)

Indicates the results of the PCC selftest.

0 - Selftest passed.
1 - Selftest failed.

HW'PCC'DATE(15).(1:4)

Contains the current PCC date code.

0 - Pass 1 PCC.
1 - Pass 2 PCC.
2 - Pass 3 PCC.
3 - Pass 4 PCC.

HW'MCC'PF(15).(5:1)

Indicates the results of the MCC selftest.

0 - Selftest passed.
1 - Selftest failed.

HW'MCC'DATE(15).(6:4)

Contains the current MCC date code.

0 - Pass 1 MCC.
1 - Pass 2 MCC.
2 - Pass 3 MCC.

HW'MSC'PF(15).(10:1)

Indicates the results of the MSC selftest.

0 - Selftest passed.
1 - Selftest failed.

HW'MSC'DATE(15).(11:4)

Contains the current MSC date code.

0 - Pass 1 MSC.
1 - Pass 2 MSC.
2 - Pass 3 MSC.

HW'JUNCTION'TYPE(15).(15:1)

Indicates the type of junction panel.

WORD 16

HW'NEXT'STATE(16).(0:4)

Indicates the next state of the PCC. See HW'PENDING'START for an explanation of how this field is used.

HW'PENDING'START(16).(6:1)

Indicates if there is a pending start. This occurs when the driver is active and a modem signal changes preventing the next read or write from starting. Everything is saved in the DIT and when the modem line is correct (i.e., DCD is on) the read or write will be started.

0 - No pending start.
1 - A pending read or write is ready.

HW'MODEM'OUTPUT(16).(8:8)

Contains an 8-bit modem output control mask. If a bit is set then that signal will be "on" or plus 12 volts.

Bit 0 - Frequency select.
Bit 1 - High order binary digit.
Bit 2 - Second order binary digit.
Bit 3 - Low order binary digit.
Bit 4 - Secondary request to send.
Bit 5 - Call request.
Bit 6 - Request to sent.
Bit 7 - Data terminal ready.

WORD 17

HW'MODEM'REF(17).(0:8)

Contains an 8-bit modem reference mask. There is one bit for each input signal. If the signal is different from the reference and is a needed signal as specified by the control mask then an interrupt will occur.

Bit 0 - Unused.
Bit 1 - Clear to send.
Bit 2 - Signal quality.
Bit 3 - Data set ready.
Bit 4 - Call origin status.
Bit 5 - Secondary carrier detect.
Bit 6 - Ring indicator.
Bit 7 - Carrier detect.

HW'MODEM'CTL(17).(8:8)

Contains an 8-bit modem control mask. There is one bit for each input signal. If the bit is set then the signal will be used, otherwise it is ignored. The mask is the same as in HW'MODEM'REF.

WORDS 18/25

HW'PRI'SCHRS

Contains an 128-bit mask of the primary special character set. There is 1-bit for each of the 128 ASCII characters. If set then the character is a special character. The bit map has to be looked at as a 16-byte map where the characters are numbered 0-7, right to left. For example if Control-A is a special character the first word of the table would be X1000. If backspace was set the first word would be 1.

WORDS 26/29

HW'SEC'SCHRS

Contains an 8-character buffer for a secondary special character set.

WORDS 30/33

HW'WRI'SCHRS

Contains an 8-character buffer for write special characters.

WORDS 34/37

HW'EDIT'SCHRS

Contains an 8-character buffer for write edit special character set.

WORD 38

HW'WRITE'BUFR

Contains a 2-character write buffer used to send trigger characters for reads.

WORDS 39/46

HW'READ'BUFFER

Contains a 16-character read buffer used by the PCC for idle reads.

WORD 47

HW'DIAGNOSTIC(47).(0:1)

Indicates if the diagnostics are running.

0 - The diagnostics are not running.
1 - The diagnostics are running and all interrupts will be processed by the diagnostics.

HW'DIAG'INTERRUPT(47).(1:1)

Indicates if an interrupt occurred that has to be processed by the diagnostics.

0 - No interrupt has occurred.
1 - An interrupt has occurred and the interrupt reason is in HW'DIAG'REASON.

HW'DIAG'REASON(47).(8:8)

Contains the current diagnostic interrupt code. The current interrupt code is saved here when an interrupt occurs and the diagnostic bit is set. The interrupt codes are the same as specified in HW'INTERRUPT'CODE.

WORD 48/49

HW'MODEM'TIME

Contains the current clock value when a modem control program is started. When the driver is to halt the PCC and this word is non-zero then the halt will not occur until 200 msec have passed. This is to prevent a modem overrun error.

WORD 50

HW'PP1(50).(0:8)

Contains either the ENQ/ACK block count or the CR delay.

HW'PP1(50).(8:8)

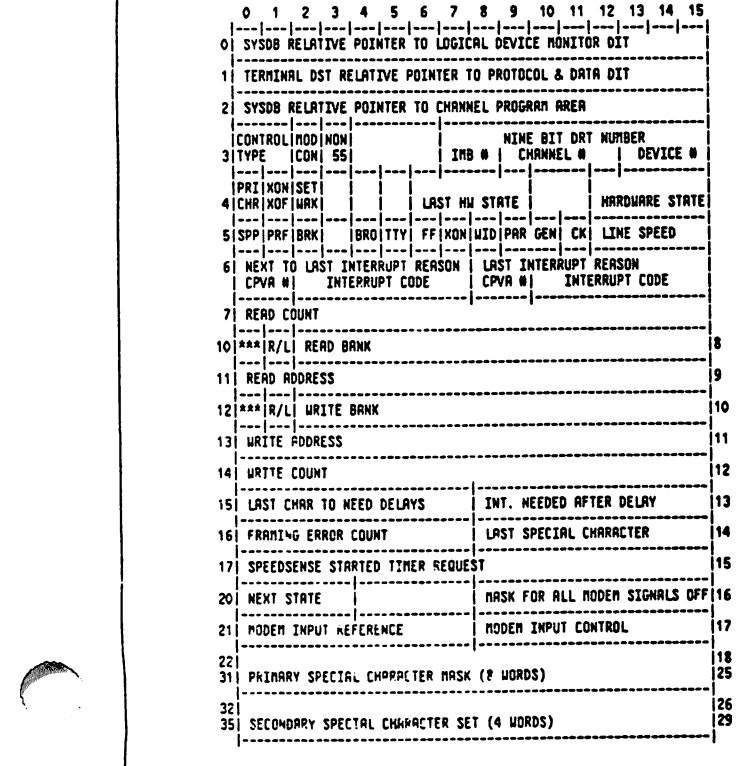
Contains either the ENQ character or the LF delay, depending on whether we use ENQ/ACK handshake or time delay for flow control.

WORD 51

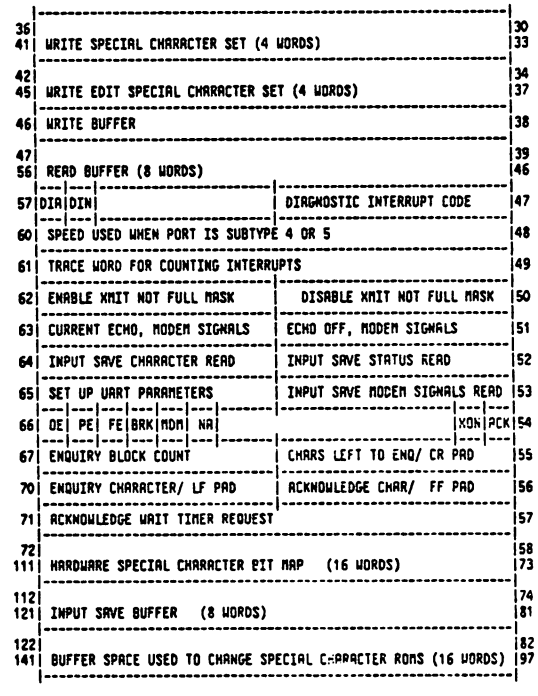
HW'PP2(51).(0:8)

Contains either the ACK character or the FF delay.

ADCC Hardware DIT Format



ADCC Hardware DIT Format (Cont.)



WORD 0

HW'LDITP

SYSDB relative pointer to the logical monitor DIT.

WORD 1

HW'PDITP

Terminal DST relative pointer to the protocol and data management DIT.

WORD 2

HW'CP'P

SYSDB relative pointer to the channel program area.

WORD 3

HW'CONTROLLER(3).(0:2)

Indicates the type of controller.

0 - Unused.
1 - ATP controller.
2 - RDCC controller.
3 - Unused.

HW'MODEMPANEL(3).(2:1)

Indicates the type of connection/junction panel.

0 - Direct connection, device subtype was configured as 0 or 14.
1 - Modem connection, device subtype was configured as 1 or 15.

HW'NON55(3).(3:1)

Indicates the type of CPU.

0 - Series 64 type CPU.
1 - Series 40/44 type CPU.

HW'DRT(3).(7:9)

Contains the 9-bit DRT number of the device. This consists of a 2-bit IMB number, 4-bit channel number, and 3-bit device number.

WORD 4

HW'PRISPCL(4).(0:1)

Indicates what read special character set is being used.

0 - Secondary read special character set enabled.
1 - Primary read special character set enabled.

HW'DO'XON'XOFF(4).(1:1)

This bit indicates if XON/XOFF handshaking is enabled.

HW'SETUP'WAKE(4).(2:1)

Indicates whether we wait for end CP after setting up modem signals.

0 - Wait for end CP.
1 - Do not wait for end CP.

HW'OLD'STATE(4).(6:4)

This indicates the last state of the RDCC. When an interrupt occurs the current state in HW'STATE is saved in HW'OLD'STATE, if the state is not "input save". Then HW'STATE is set to "input save".

HW'STATE(4).(12:4)

This indicates the current state of the RDCC. Set when an RDCC channel program is started or after an interrupt occurs. Possible states are as follows:

1 - Reading.
2 - Writing.
3 - Speedsensing.
4 - Generating an interrupt from an input save event.
5 - Set port protocol.
6 - Set special characters.
7 - Unused.
8 - Unused.
9 - Unused.
10 - Unused.
11 - Outputting trigger characters.
12 - Idle read.
13 - Setting up modem signals.
14 - Monitoring modem signals.
15 - Input save.

WORD 5

HW'SET'PROTOCOL(5).(0:1)

Indicates if the RDCC has done a set port protocol.

0 - A set port protocol has not been done.
1 - A set port protocol has been done. The current protocol is indicated in bits 11/15 of this word.

HW'POWERFAIL(5).(1:1)

Indicates if a power fail has occurred and is being processed.

0 - No power fail has occurred.
1 - Power fail has occurred.

HW'BREAK'DETECTED(5).(2:1)

Indicates that a BREAK condition has been detected.

0 - No BREAK condition detected.
1 - A BREAK condition is currently being processed.

HW'BROKEN(5).(4:1)

Indicates if the port is broken.

0 - The port is not broken.
1 - The port is broken and will not operate until reset.

HW'DELAY'ENAB(5).(5:1)

Indicates if TTY delays are enabled.

0 - TTY delays are disabled.
1 - TTY delays are enabled. There will be a delay following the transmission of each "CR", "LF", or "FF".

HW'FF'ENAB(5).(6:1)

Indicates if form feeds are enabled.

0 - Form feeds are disabled. Each form feed character will be replaced with a "LF".
1 - Form feeds are enabled. Each "FF" character is written out and not replaced with a "LF".

HW'XON'ENAB(5).(7:1)

Indicates if the driver will do the XON/XOFF handshake.

0 - The driver will not do the XON/XOFF handshake.
1 - The driver will do the XON/XOFF handshake.

HW'8'BIT'MODE(5).(8:1)

Indicates the size of the data character.

0 - Data will be transmitted as 7-bit with a parity bit.
1 - Data will be transmitted as 8-bit data.

HW'PARITY'GEN(5).(9:2)

Indicates the type of parity generation. This field is only valid for 7-bit data.

0 - Output parity generation is enabled and it will be even.
1 - Output parity generation is enabled and it will be odd.
2 - Output parity generation is enabled and it will be even.
3 - Output parity generation is enabled and it will be odd.

HW'PARITY'CHECK(5).(11:1)

Indicates if input parity checking is enabled.

0 - Input parity checking is disabled.
1 - Input parity checking is enabled.

HW'LINE'SPEED(5).(12:4)

Indicates the current transfer rate of the RDCC.

0 - External - unused.
1 - External - unused.
2 - 50 baud - unused.
3 - 75 baud - unused.
4 - 134.5 baud - unused.
5 - 200 baud - unused.
6 - 600 baud.
7 - 2400 baud.
8 - 9600 baud.
9 - 4800 baud.
10 - 1800 baud - unused.
11 - 1200 baud.
12 - 2400 baud.
13 - 300 baud.
14 - 150 baud.
15 - 110 baud.

WORD 6

HW'OLD'INTERRUPT(6).(0:8)

Contains the old interrupt code. When an interrupt occurs the interrupt code in HW'INTERRUPT'CODE is moved here and the new interrupt is placed in HW'INTERRUPT'CODE. The first two bits show the CPVA number and the remaining bits are the interrupt code.

HW'INTERRUPT'CODE(6).(8:8)

Contains the last interrupt code. The first two bits are the CPVA number, and the last six bits are the interrupt code.

CPVA 0 - Belated HIOP interrupt and channel program aborts.

CPVA 1 - Speedsensing interrupts and ACK wait interrupts.

0 - Unused.
1 - 9600 baud or first part of 4800 baud.
2 - First part of 2400 baud.
3 - First part of 1200 baud.
4 - First part of 600, 300, or 110 baud.
5 - Second part of 600 or 300 baud.
6 - Second part of 110 baud.
7 - Last part of all but 9600 baud.
8 - Non-speedsense detected by channel program.
9 - Modem lines may have changed.
10 - Special character received during ACK wait.

CPVA 2 - Input Save state interrupts/Error conditions

0 - Unused.
1 - Input save buffer full.
2 - Error condition during input save.
3 - Special character during input save.
4 - Error condition (overrun, parity, framing, break, modem change).

CPVA 3 - Standard channel program interrupts.

0 - Unused.
1 - Unused.
2 - End of set port protocol.
3 - Unused.
4 - Special character during write.
5 - Unused.

6 - Read complete.
7 - Parity error detected.
8 - Special character during read.
9 - Framing error detected.
10 - Overrun error detected.
11 - Unused.
12 - Unused.
13 - Break detected.
14 - Write complete.
15 - Unused.
16 - Edit special character found.
17 - Unused.
18 - Unused.
19 - Unused.
20 - Unused.
21 - Unused.
22 - Unused.
23 - Unused.
24 - Unused.
25 - Unused.
26 - Unused.
27 - Unused.
28 - Unused.
29 - Modem line change detected.
30 - Need to insert pad characters.
31 - Special character during wait.
32 - Trigger characters written.
33 - An ENQ character has been written.
34 - An ACK character has been written.
35 - End of modem control channel program.

WORD 7

HW'READ'CNT

Current read byte count.

WORD 8

HW'RD'RIGHT'LEFT(8).(1:1)

Indicates what byte to start the transfer on.

0 - Left.
1 - Right.

HW'READ'BANK

Indicates the bank number for the current read.

WORD 9

HW'READ'ADDR

Contains the absolute start address of the read.

WORD 10

HW'WT'RIGHT'LEFT(10).(1:1)

Indicates what byte to start the write from.

0 - Left.
1 - Right.

HW'WRITE'BANK

Indicates the bank number for the current write.

WORD 11

HW'WRITE'ADDR

Contains the absolute start address of the write.

WORD 12

HW'WRITE'CNT

Current write byte count.

WORD 13

HW'DELAY'CHAR(13)(0:8)

Contains the last character (either output data or a trigger character) that requires delay syncs after it.

HW'DELAY'INT(13).(8:8)

Contains the interrupt code to generate after the delay syncs have been generated.

WORD 14

HW'FRAMING'ERROR(14).(0:8)

Contains a running count on the number of framing errors that occur. Used only for gathering information when dumps are read.

HW'SPEC'CHAR(14).(8:8)

Contains the last special character detected. Updated each time a new special character is detected.

WORD 15

HW'SENSE'TIMER

When the first interrupt during a speedsense occurs (the first part of the bit pattern has been received), a one-second timer is started to abort the sense if not completed during that time. This word is used to store the timer request index.

WORD 16

HW'NEXT'STATE(16).(0:4)

Indicates the next state of the ADCC.

HW'MASK'OFF(16).(8:8)

This word contains the bit pattern necessary to mask off all modem signals. This is used whenever a modem change is detected in order to cancel the channel service request until the next request to change the modem output signals.

WORD 17

HW'MODEM'REF(17).(0:8)

Contains an 8-bit modem reference mask. There is one bit for each input signal. If the signal is different from the reference and is a needed signal as specified by the control mask then an interrupt will occur.

Bit 0 - Unused.
Bit 1 - Unused.
Bit 2 - 0 = reference (1 = mask).
Bit 3 - Clear to send.
Bit 4 - Data set ready.
Bit 5 - Ring indicator.
Bit 6 - Data carrier detect.
Bit 7 - Secondary data carrier detect.

HW'MODEM'CTL(17).(8:8)

Contains an 8-bit modem control mask. There is one bit for each input signal. If the bit is set then signal will be used, otherwise it is ignored. The mask is the same as in HW'MODEM'REF.

WORDS 18/25

HW'PRI'SCHRS

Contains an 128-bit mask of the primary special character set. There is 1-bit for each of the 128 ASCII characters. If set then the character is a special character. The bit map has to be looked at as a 16-byte map where the characters are numbered 0-7, left to right. For example if Control-A is a special character the first word of the table would be X100000. If backspace was set the first word would be X200.

WORDS 26/29

HW'SEC'SCHRS

Contains an 8-character buffer for a secondary special character set.

WORDS 30/33

HW'WRI'SCHRS

Contains an 8-character buffer for write special characters.

WORDS 34/37

HW'EDIT'SCHRS

Contains an 8-character buffer for write edit special character set.

WORD 38

HW'WRITE'BUFR

Contains a 2-character write buffer used to send trigger characters for reads.

WORDS 39/46

HW'READ'BUFFER

Contains a 16-character read buffer used by the RDCC for idle reads.

WORD 47

Not currently used.

WORD 48

HW'SPEC'SPEED(48)

If the port is configured as subtype 4 or 5, this word contains the speed (in CPS) at which we will initially set up the UART. This is the same as the configured speed.

WORD 49

This word is currently used for performance measurements.

WORD 50

HW'ENABLE'XMIT(50).(0:8)

This field contains the bit pattern necessary to enable the transmitter buffer not full channel service request.

HW'DISABLE'XMIT(50).(8:8)

This field contains the bit pattern necessary to disable the transmitter buffer not full channel service request.

WORD 51

HW'ECHO(51).(3:1)

This bit indicates the current state of echo during reads.

0 - Echo is off.
1 - Echo is on.

HW'MODEM'OUT1(51).(4:4)

This field contains the current setting of the modem output lines. When the entire byte (0:8) is output to the RDCC, echo and modem lines are set. The bits are used as follows:

Bit 4 - Request to send.
Bit 5 - Data terminal ready.
Bit 6 - Speed select.
Bit 7 - Secondary request to send.

HW'MODEM'OUT2(51).(12:4)

This field contains the identical information as HW'MODEM'OUT1. When the entire byte (8:8) is output to the RDCC, the modem lines are set and echo is turned off. This is used when transferring to the input save state from a read.

WORD 52

HW'SAVE'READ(52).(0:8)

This field contains the character read whenever an error status is detected. This is needed to distinguish a break from an ordinary framing error.

HW'STATUS'FE(52).(12:1)

This contains the framing error status bit read from the UART. It indicates either a framing error or break.

HW'STATUS'OE(52).(13:1)

This contains the overrun error status bit read from the UART.

HW'STATUS'PE(52).(14:1)

This contains the parity error status bit read from the UART.

WORD 53

HW'UART(53).(0:8)

This field contains all the UART control information including character width, parity, and stop bit information. It also has the bit set which causes a master clear to be performed on the UART.

HW'SAVE'MODEM(53).(8:8)

This field contains the status of the modem lines being monitored. Only bits 3 through 7 of the byte are used and they have the same format as HW'MODEM'REF above.

WORD 54

HW'INSAVE'OE(54).(0:1)

This bit is set true when an overrun error was detected during input save, and cleared when the condition has been serviced.

HW'INSAVE'PE(54).(1:1)

This bit is used as above for the parity error condition.

HW'INSAVE'FE(54).(2:1)

This bit is used as above for the framing error condition.

HW'INSAVE'BREAK(54).(3:1)

This bit is used as above for the break condition.

HW'INSAVE'MODEM(54).(4:1)

This bit is used as above for a modem line change.

HW'INSAVE'NOACK(54).(5:1)

This bit is used as above for an ACK timeout.

HW'XON'WAIT(54).(14:1)

This bit indicates that an XOFF was received and the driver is waiting for an XON to continue.

HW'ACK'WAIT(54).(15:1)

This bit indicates that an ENQ was sent and the driver is waiting for an ACK to continue.

WORD 55

HW'ENQ'BLOCK(55).(0:8)

This field contains the block count of characters used in the ENQ/ACK handshake. If the value is zero, the handshake is not used.

HW'ENQ'COUNT(55).(8:8)

If ENQ/ACK is enabled, this field contains the number of characters left to write before another ENQ should be generated.

HW'CR'DELAY(55).(8:8)

If ENQ/ACK is disabled, this field contains the number of .1 seconds to delay after CR characters.

WORD 56

HW'ENQ'CHAR(56).(0:8)

If ENQ/ACK is enabled, this field contains the Enquiry character.

HW'LF'DELAY(56).(0:8)

If ENQ/ACK is disabled, this field contains the number of .1 seconds to delay after LF characters.

HW'ACK'CHAR(56).(8:8)

If ENQ/ACK is enabled, this field contains the Acknowledge character.

HW'FF'DELAY(56).(8:8)

If ENQ/ACK is disabled, this field contains the number of .1 seconds to delay after FF characters.

WORD 57

HW'ENQ'TIMER(57)

When an Enquiry character has been written to the terminal, a ten-second timer is started. This word contains the timer request index for that timer.

WORD 58/73

HW'CHAR'MAP

These sixteen words contain a bit map which reflects the 256-bit map special character array in the hardware.

WORD 74/81

HW'INSAVE'BUF

These sixteen bytes are used as the input save buffer.

WORD 82/97

HW'CHAR'BUFFER

These thirty words are used as buffer space whenever the special character array in hardware must be changed.

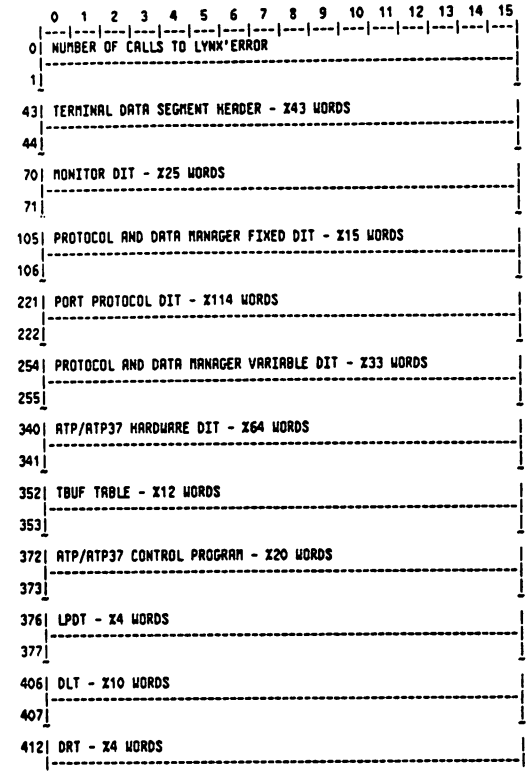
Message Table Format

The message table is not used but contains the following:

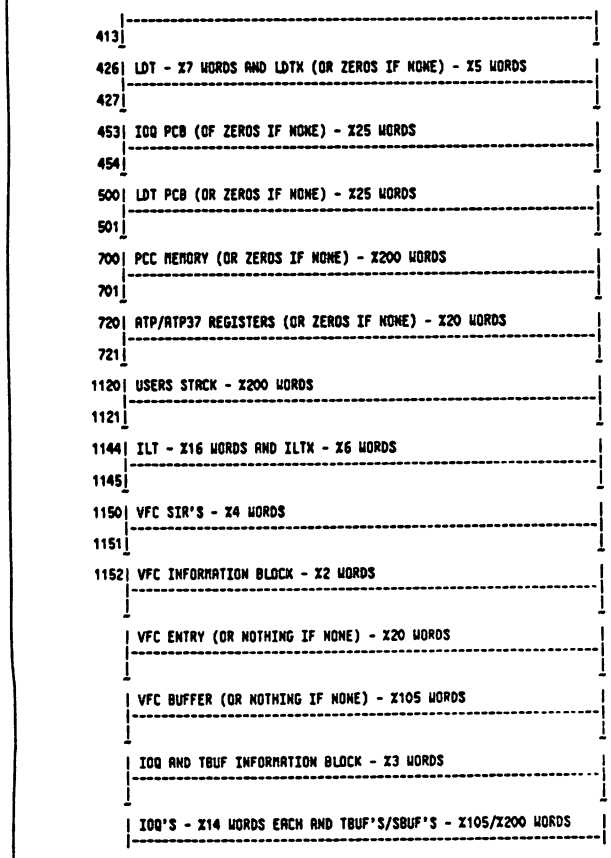
"cr,lf,bell,bell","LDEV #1 NOT READY ","cf,lf"

Port Error Area Format

ATP/ATP37 Port Error Area Format



ATP/ATP37 Port Error Area Format (Cont.)



The VFC information block contains the following:

Word 0.(0:1) - 0: No VFC entry or data dumped.
1: A VFC entry was dumped.
.(8:4) - Number of initialization buffers dumped.
.(12:4) - Number of data buffers dumped.

Word 2 - TDS relative pointer to IOQ/TBUF information block.

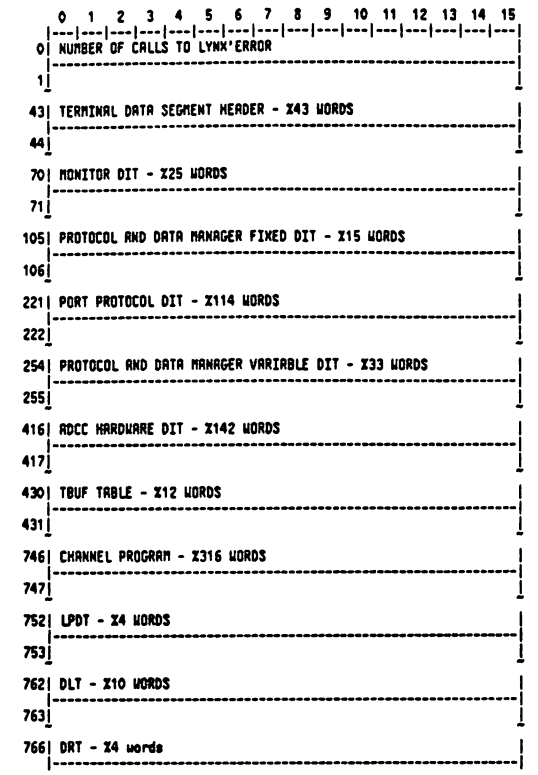
The IOQ/TBUF information block contains the following:

Word 0 - Number of IOQs dumped.

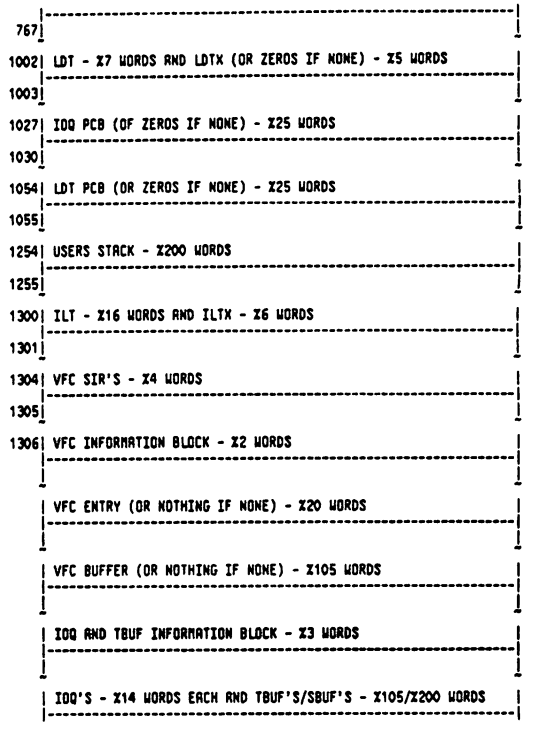
Word 1 - TDS relative pointer first TBUF dumped.

Word 2.(0:2) - 0: No TBUFs or SBUFs were dumped.
1: TBUFs were dumped.
2: SBUFs were dumped.
.(2:14) - Number of TBUFs or SBUFs dumped.

ADCC Port Error Area Format



ADCC Port Error Area Format (Cont.)



The VFC information block contains the following:

Word 0.(0:1) - 0: No VFC entry or data dumped.
1: A VFC entry was dumped.
.(8:4) - Number of initialization buffers dumped.
.(12:4) - Number of data buffers dumped.

Word 2 - TDS relative pointer to IOQ/TBUF information block.

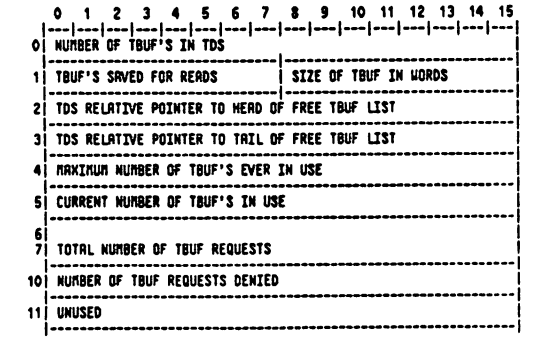
The IOQ/TBUF information block contains the following:

Word 0 - Number of IOQs dumped.

Word 1 - TDS relative pointer first TBUF dumped.

Word 2.(0:2) - 0: No TBUFs or SBUFs were dumped.
1: TBUFs were dumped.
2: SBUFs were dumped.
.(2:14) - Number of TBUFs or SBUFs dumped.

TBUF Table Format



WORD 0

TBUF'NUM'WRD

Contains the number of TBUFs in the data segment.

WORD 1

TBUF'READ'SAVE(1).(0:8)

Contains the number of TBUFs saved for reads.

TBUF'BUFSIZE(1).(8:8)

Indicates the size in words of each TBUF.

WORD 2

TBUF'LISTHEAD'P

Contains a TDS relative pointer to the head TBUF in the TBUF free list.

WORD 3

TBUF'LISTTAIL'P

Contains a TDS relative pointer to the tail TBUF in the TBUF free list.

WORD 4

TBUF'MAXUSED

Indicates the maximum number of TBUFS in use at any time.

WORD 5

TBUF'INUSE'WRD

Indicates the number of TBUFs currently in use.

WORDS 6/7

TOTALREQUESTS

Indicates the total number of TBUF requests.

WORD 8

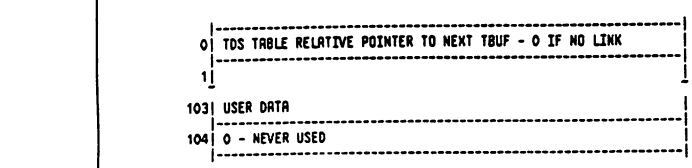
TBUF'DENIED'WRD

Indicates the number of TBUF requests that were denied because there were no free TBUFS.

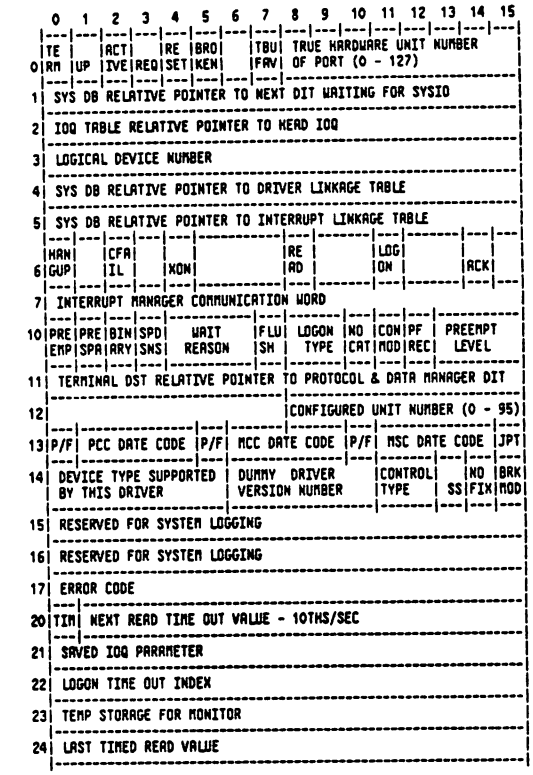
WORD 9

Not currently used.

TBUF Format



Terminal Monitor DIT Format



WORD 0

DL'TERM(0).(0:1)

Indicates if the device is a terminal. Always a one.

0 - Device is not a terminal.
1 - Device is a terminal.

DL'UP(0).(1:1)

Indicates if the device is "up".

0 - Device is not up.
1 - Device is up and has been speedsensed or FOPEN'ed.

DL'ACTIVE(0).(2:1)

Indicates the monitor is active.

0 - The monitor is not active. 1 - The monitor is active and processing a function.

DL'REQUEST(0).(3:1)

Indicates if the monitor was awakened while active.

0 - There is no pending request.
1 - The monitor was awakened while active and has a pending request.

DL'RESET(0).(4:1)

Indicates if the monitor should reinitialize the port.

0 - Don't reinitialize the port.
1 - Reinitialize the port. This is equivalent to doing an ABORTJOB or device close against the port.

DL'BROKEN(0).(5:1)

Indicates if the port is broken.

0 - The port is not broken.
1 - The driver detected an error and marked the port broken. The error code will be in DL'ERROR'CODE.

DL'TBUFAVAIL(0).(7:1)

Indicates if a TBUF is now available for the device.

0 - No meaning.
1 - A TBUF(s) is available and the write can resume.

DL'TRUEUNIT(0).(8:8)

Contains the true unit number of the device. Is only used for devices connected to an ATP/ATP37 controller. Unit numbers will range from 0 to 127.

WORD 1

DL'NEXT

Contains a SYS DB relative pointer to the next DIT waiting for SYSIO/TERMIO.

WORD 2

DL'IOQP

Contains a IOQ table relative pointer to the current IOQ.

WORD 3

DL'LDEV

Contains the configured logical device number of the device.

WORD 4

DL'DLTP

Contains a SYS DB relative pointer to the driver linkage table.

WORD 5

DL'ILTP

Contains a SYS DB relative pointer to the interrupt linkage table.

WORD 6

DL'TICK

The TICK communication word. If a timer is running and expires the bit corresponding to the type of timer is set in DL'TICK. The monitor is then awakened to process the timeout.

DL'HANGUP'TO(6).(0:1)

Timer used by the Initiation Manager when disconnecting a modem.

DL'CFAIL'TO(6).(2:1)

Timer used by the Initiation Manager and Interrupt Manager when trying to connect a modem, waiting for DSR and DCD to come on or when there is a carrier fail.

DL'XON'TO(6).(4:1)

Timer used by the Interrupt Manager when waiting for an XON.

DL'READ'TO(6).(8:1)

Timer used by the Initiation Manager and Interrupt Manager for reads.

DL'LOGON'TO(6).(11:1)

Timer used by the monitor for a logon timeout.

DL'ACK'TO(6).(14:1)

Timer used by the RDCC physical driver for a 10 ENQ/ACK timeout.

WORD 7

DL'INT'MRN

The Interrupt Manager communication word. When the Interrupt Manager needs to awaken the monitor it will place an interrupt code in this word and then awaken the monitor via AWAKETERMINAL. This word contains 4 4-bit fields so that the Interrupt Manager may awaken the monitor for more that one reason. The fields are processed by the monitor left to right. Interrupt codes are as follows:

1 - Disconnect interrupt. Data set ready has dropped or carrier fail has occurred more that 50 times during the read. The monitor will initiate a disconnect sequence of the modem.
2 - Partial hardware setup. The hardware has been partially set up and the monitor will call the Initiation Manager to continue/finish setting up the hardware.
3 - Partial read interrupt. The read has been completed or there were no TBUFs available to complete the read. The monitor will call the Initiation Manager to complete the read.
4 - Partial write interrupt. The write was a critical write or there was an "ACK" time out or tanking needs to be resumed on the write. The monitor will call the Initiation Manager to continue/complete the write.
5 - Speedsense interrupt. The device has successfully been speedsensed. The monitor will awaken "DEVREC" for device recognition and then call the Initiation Manager to initialize the port.

6 - Subsystem break interrupt. A subsystem break has been detected. The monitor will call "BREAKSS" to see if MPE will accept the subsystem break. The Initiation Manager is then called. If reading the read data is returned. If writing the write data is flushed. The flush bit is then set in all linked IOQs. If the subsystem break is not accepted the current operation is resumed.
7 - Operation done. The current write is complete and the monitor needed to be notified.
8 - Break interrupt. A break interrupt has been detected. The monitor will call "BREAKJOB" to see if MPE will accept the break. If accepted the Initiation Manager is called. If reading the read data is returned. If writing all write data is flushed. The IOQs are then marked broken. If the break is not accepted the current operation is resumed.
9 - Reset done. The reset of the port is complete. The monitor will either continue with the "open" if in the middle of the "open" or start of a speedsense.

WORD 8

DL'PREEMPT(8).(0:1)

Indicates if there is a preemptive request.

0 - No preemptive request.
1 - Set by ATTACHIO if there is a preemptive IOQ linked in the DIT.

DL'PRESPACE(8).(1:1)

Indicates if the driver is prespacing writes.

0 - Prespacing is not enabled.
1 - The last IOQ specified prespacing.

DL'BINARY(8).(2:1)

Indicates if in binary mode.

0 - Not in binary mode.
1 - Binary mode.

DL'SPD'SNS(8).(3:1)

Indicates if the device has been speedsensed.

0 - The device has not been speedsensed.
1 - The device has been speedsensed.

DL'WAIT'RSN(8).(4:3)

This indicates that the monitor is waiting to be awakened by the Interrupt Manager. Wait reasons are as follows:

0 - Not waiting.
1 - Disconnect complete.
2 - Hardware set up complete.
3 - Preempt complete.
4 - Partial IOQ complete.
5 - IOQ complete.
6 - Hard reset complete.
7 - Unused.

DL'FLUSH(8).(7:1)

Indicates if break was accepted by "BREAKJOB".

1 - Break was accepted and all IOQs should be flushed until a clear flush and write request is processed.

DL'LOGON'TYP(8).(8:2)

Indicates the logon type.

0 - Data accepting device.
1 - Session.
2 - Job.

DL'DONT'CAT(8).(10:1)

DL'CONSOLE(8).(11:1)

Indicates if in console mode.

0 - Not in console mode.
1 - Device is in console mode.

DL'PF'RECV(8).(12:1)

Indicates if a power fail occurred and the driver should go through its power fail processing.

0 - No power fail occurred.
1 - A power fail has occurred and the driver will process the power fail.

DL'PRP'LEVEL(8).(13:3)

Contains the preempt level of the current write.

WORD 9

DL'PD'DITP

Contains a TDS relative pointer to the Protocol and Data Manager DIT.

WORD 10

DL'UNIT(10).(8:8)

Contains the configured logical unit number of the device. It is only used for devices connected to the ATP/ATP37 controller. Unit numbers will range from 0 to 95.

WORD 11

DL'DATE'CODE

Contains information that indicates the level of hardware. For an ATP controller this will contain the date codes of the 6801's and the results from selftest. For the RDCC this is unused.

WORD 12

DL'DEVTYPE(12).(0:6)

Indicates the driver type. For terminals the driver type will be 16.

DL'VERSION(12).(6:5)

Indicates the current version of the driver. For ATP the driver is MIOTERM1/MIORSLP0 and for the RDCC the driver is MIOTERM2/MIORSLP2.

DL'CONTROLLER(12).(11:2)

Indicates the type of controller used by this LDEV.

1 - ATP.
2 - RDCC.

DL'SSTO(12).(13:1)

Indicates how to process the logon timer that is running.

0 - If the logon timer expires the logon did not occur and the port should be disconnected.
1 - If the logon timer expires the speedsense should be aborted and restarted.

DL'UNFIXABLE(12).(14:1)

Indicates if the port is broken and unfixable.

0 - Port is not unfixable, but may be broken.
1 - Port is unfixable. A warmestart of the system will reset the port.

DL'BRK'MODE(12).(15:1)

Indicates if the device is in break mode.

0 - The device is not in break mode. Cleared with an IOQ function code of 31.
1 - The device is in break mode. Set with an IOQ function code of 31.

WORD 13

DL'LOG

Used for system logging. When a port failure occurs LYNX'ERROR will save in here the status register from the stack marker.

WORD 14

DL'LOG1

Used for system logging. When a port failure occurs LYNX'ERROR will save in here the P register from the stack marker.

WORD 15

DL'ERROR'CODE

Contains the error code when a port failure occurs. The code is placed here by LYNX'ERROR when the failure occurs. It is a 4-digit (decimal) code where the first two digits are the module number in which the error occurred and the second two are a unique error code.

WORD 16

DL'TIME'FLAG(16).(0:1)

Indicates if the next read will be timed.

0 - The next read is not timed. Cleared with an IOQ function code of 16.
1 - The next read will be timed. Set with an IOQ function code of 17.

DL'READ'TVAL(16).(1:15)

Contains the time out value for the next read that is to be timed. Set with an IOQ function code of 5

DL'TIME

A reference to both read time fields.

WORD 17

DL'QPARM

Saved IOQ parameter.

WORD 18

DL'LOGN'TRLX

Contains the logon timer index.

WORD 20

DL'TEMP

Temporary storage used by monitor

WORD 19

DL'READ'TIME

For reads that are timed, DL'TIME'FLAG = 1, this will contain the read time for the last read.

Line Printer Monitor DIT Format

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	TE RM	UP	ACTIVE	REQ	RESET	BROKEN		TBUFAV	TRUE HARDWARE UNIT NUMBER OF PORT (0 - 127)							
1	SYS DB RELATIVE POINTER TO NEXT DIT WAITING FOR SYSIO															
2	IOQ TABLE RELATIVE POINTER TO HEAD IOQ															
3	LOGICAL DEVICE NUMBER															
4	SYS DB RELATIVE POINTER TO DRIVER LINKAGE TABLE															
5	SYS DB RELATIVE POINTER TO INTERRUPT LINKAGE TABLE															
6	HANG UP		CFAIL		XON				RESET			LOGON			RCK	
7	INTERRUPT MANAGER COMMUNICATION WORD															
10	RESET			PRESP	NO STOP								PFREC			
11	TERMINAL DST RELATIVE POINTER TO PROTOCOL & DATA MANAGER DIT															
12									CONFIGURED UNIT NUMBER (0 - 95)							
13	P/F	PCC DATE CODE					P/F	MCC DATE CODE				P/F	MSC DATE CODE			JPT
14	DEVICE TYPE SUPPORTED BY THIS DRIVER							DUMMY DRIVER VERSION NUMBER				CONTROL TYPE			NO FIX	
15	RESERVED FOR SYSTEM LOGGING															
16	RESERVED FOR SYSTEM LOGGING															
17	ERROR CODE															
20	TEMP STORAGE FOR MONITOR															

WORD 0

DL'TERM(0).(0:1)

Indicates if the device is a terminal. Always a one.

0 - Device is not a terminal.
1 - Device is a terminal.

DL'UP(0).(1:1)

Indicates if the device is "up".

0 - Device is not up.
1 - Device is up and has been FOPEN'ed.

DL'ACTIVE(0).(2:1)

Indicates the monitor is active.

0 - The monitor is not active.
1 - The monitor is active and processing a function.

DL'REQUEST(0).(3:1)

Indicates if the monitor was awakened while active.

0 - There is no pending request.
1 - The monitor was awakened while active and has a pending request.

DL'RESET(0).(4:1)

Indicates if the monitor should reinitialize the port.

0 - Don't reinitialize the port.
1 - Reinitialize the port. This is equivalent to doing an ABORTJOB or device close against the port.

DL'BROKEN(0).(5:1)

Indicates if the port is broken.

0 - The port is not broken.
1 - The driver detected an error and marked the port broken. The error code will be in DL'ERROR'CODE.

DL'TBUFAVAIL(0).(7:1)

Indicates if a TBUF is now available for the device.

DL'TRUEUNIT(0).(8:8)

Contains the true unit number of the device. Is only used for devices connected to an ATP controller. Unit numbers will range from 0 to 127.

WORD 1

DL'NEXT

WORD 2

DL'IOQP

Contains an IOQ table relative pointer to the current IOQ.

WORD 3

DL'LDEV

Contains the configured logical device number of the device.

WORD 4

DL'DLTP

Contains a SYS DB relative pointer to the driver linkage table.

WORD 5

DL'ILTP

Contains a SYS DB relative pointer to the interrupt linkage table.

WORD 6

DL'TICK

The TICK communication word. If a timer is running and expires the bit corresponding to the type of timer is set in DL'TICK. The monitor is then awakened to process the timeout.

DL'HANGUP'TO(6).(0:1)

Timer used by the Initiation Manager when disconnecting a modem.

DL'CFAIL'TO(6).(2:1)

Timer used by the Initiation Manager and Interrupt Manager when trying to connect a modem, waiting for DSR and DCD to come on or when there is a carrier fail.

DL'XON'TO(6).(4:1)

Timer used by the Interrupt Manager when waiting for an XON.

DL'READ'TO(6).(8:1)

Timer used by the Initiation Manager and Interrupt Manager for reads.

DL'LOGON'TO(6).(11:1)

Timer used by the monitor for a logon timeout.

DL'ACK'TO(6).(14:1)

Timer used by the RDCC physical driver for a 10 ENQ/ACK timeout.

WORD 7

DL'INT'MAN

The Interrupt Manager communication word. When the Interrupt Manager needs to awaken the monitor it will place an interrupt code in this word and then awaken the monitor via AWAKETERMINAL. This word contains 4 4-bit fields so that the Interrupt Manager may awaken the monitor for more than one reason. The fields are processed by the monitor left to right. Interrupt codes are as follows:

1 - Disconnect interrupt. Data set ready has dropped or carrier fail has occurred more that 50 times during the read. The monitor will initiate a disconnect sequence of the modem.

2 - Partial hardware setup. The hardware has been partially set up and the monitor will call the Initiation Manager to continue/finish setting up the hardware.

4 - Partial write interrupt. The write was a critical write or there was an "ACK" time out or tanking needs to be resumed on the write. The monitor will call the Initiation Manager to continue/complete the write.

9 - Reset done. The reset of the port is complete. The monitor will either continue with the "open" if in the middle of the "open" or start a speedsense.

WORD 8

DL'RESETTING(8).(0:1)

Set if the port should be reset.

DL'PRESPACE(8).(4:1)

Set if the last request used prespacing.

DL'NO'STP'OV(8).(5:1)

Set if the driver does not perform auto perforation skip.

DL'WAIT(8).(6:1)

Set if the monitor is waiting for a request to complete.

DL'PF'REC(8).(12:1)

Set if the monitor should execute its power fail recovery code.

WORD 9

DL'PD'DITP

Contains a TDS relative pointer to the Protocol and Data Manager DIT.

WORD 10

DL'UNIT(0).(8:8)

Contains the configured logical unit number of the device. It is only used for devices connected to the ATP controller. Unit numbers will range from 0 to 95.

WORD 11

DL'DATE'CODE

Contains information that indicates the level of hardware. For an ATP controller this will contain the data codes of the 6801's and the results from selftest. For the RDCC this is unused.

WORD 12

DL'DEVTYPE(12).(0:6)

Indicates the driver type. For printers the driver type will be 32.

DL'VERSION(12).(6:5)

Indicates the current version of the driver. For ATP the driver is HIOTERM1 and for RDCC the driver is HIOTERM2.

DL'CONTROLLER(12).(11:2)

Indicates the type of controller used by this LDEV.

1 - ATP.
2 - RDCC.

DL'UNFIXABLE(12).(14:1)

Indicates if the port is broken and unfixable.

0 - Port is not unfixable, but may be broken.
1 - Port is unfixable. A warmstart of the system will reset the port.

WORD 13

DL'LOG

Used for system logging. When a port failure occurs LYNX'ERROR will save in here the status register from the stack marker.

WORD 14

DL'LOG1

Used for system logging. When a port failure occurs LYNX'ERROR will save in here the P register from the stack marker.

WORD 15

DL'ERROR'CODE

Contains the error code when a port failure occurs. The code is placed here by LYNX'ERROR when the failure occurs. It is a 4-digit (decimal) code where the first two digits are the module number in which the error occurred and the second two are a unique error code.

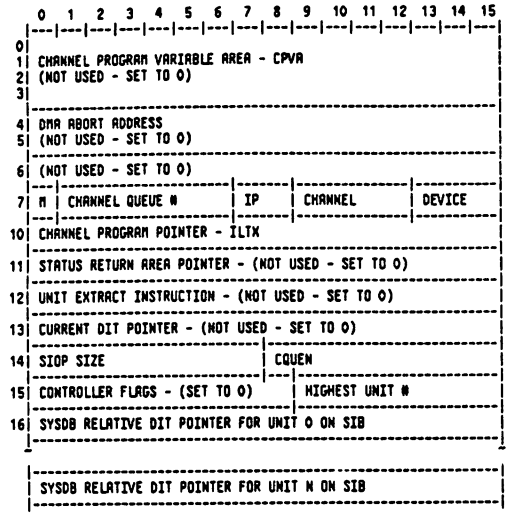
WORD 16

DL'TEMP

Temporary storage used by monitor.

ILT/ILTX Format

ATP/ATP37 ILT Format



WORD X7

ILT'DRT.(7:9)

Contains DRT number for controller on channel.

WORD X10

ILT'ISIOP

Contains a SYSDB relative pointer to the channel program area also known as the ILTX.

WORD X14

ILT'SIOP'SIZE.(0:8)

Contains size, in words, of channel program area (ILTX).

WORD X15

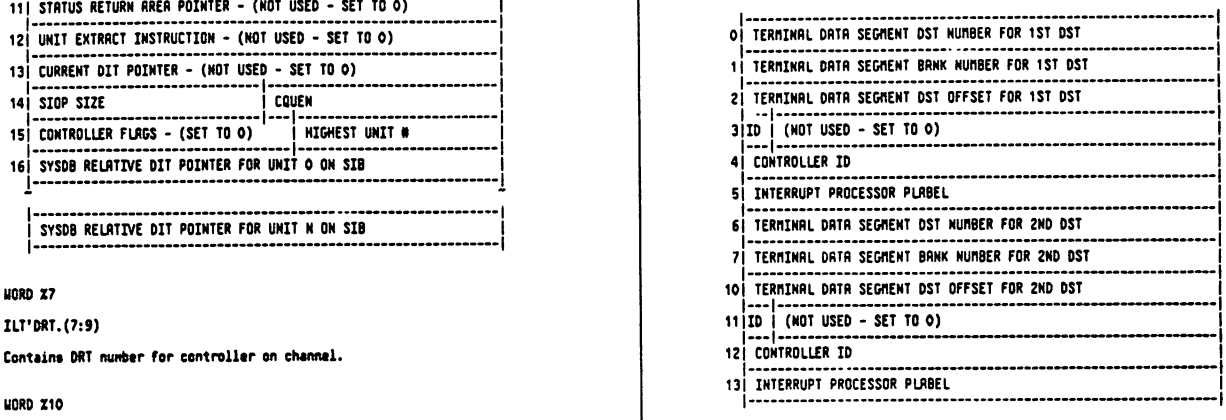
ILT'HUNIT.(9:7)

Contains the highest configured unit number on the channel.

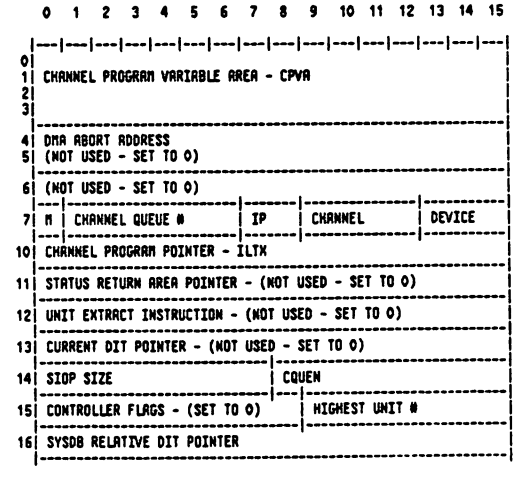
WORD X16

Starting at word X16 there is a SYSDB relative pointer to the monitor DIT for each unit configured on the channel.

ATP/ATP37 ILTX Format



ADCC ILT Format



ADCC ILTX Format

READER COMMENT SHEET

MPE V Tables Manual for MPE V, Version G.23.00

32033-90147 October 1991

We welcome your evaluation of this manual. It is one of several that serve as a reference source for HP 3000 Computer Systems. Your comments and suggestions help us to improve our publications and will be reviewed by appropriate technical personnel. HP may make any use of the submitted suggestions and comments without obligation.

Is this manual technically accurate?	Yes [] No []	(If no, explain under Comments, below.)
Are the concepts and wording easy to understand?	Yes [] No []	(If no, explain under Comments, below.)
Is the format of this manual convenient in size, arrangement and readability?	Yes [] No []	(If no, explain or suggest improvements under Comments, below.)

Comments:

We appreciate your comments and suggestions. This form requires no postage stamp if mailed in the U.S. For locations outside the U.S., your local HP representative will ensure that your comments are forwarded.

Date: _____

FROM:

Name _____

Company _____

Address _____

_____

_____

FOLD FOLD

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1070 CUPERTINO, CALIFORNIA

POSTAGE WILL BE PAID BY ADDRESSEE

Documentation Manager
Hewlett-Packard Company
Software Technology Division
8010 Foothills Blvd
Roseville, California 95678
ATTN: Documentation Manager: R5YF

FOLD FOLD

READER COMMENT SHEET

MPE V Tables Manual for MPE V, Version G.23.00

32033-90147 October 1991

We welcome your evaluation of this manual. It is one of several that serve as a reference source for HP 3000 Computer Systems. Your comments and suggestions help us to improve our publications and will be reviewed by appropriate technical personnel. HP may make any use of the submitted suggestions and comments without obligation.

Is this manual technically accurate?	**Yes [] No []**	(If no, explain under Comments, below.)
Are the concepts and wording easy to understand?	**Yes [] No []**	(If no, explain under Comments, below.)
Is the format of this manual convenient in size, arrangement and readability?	**Yes [] No []**	(If no, explain or suggest improvements under Comments, below.)

Comments:

We appreciate your comments and suggestions. This form requires no postage stamp if mailed in the U.S. For locations outside the U.S., your local HP representative will ensure that your comments are forwarded.

Date: _____

FROM:

Name _____

Company _____

Address _____

_____

_____

FOLD FOLD

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1070 CUPERTINO, CALIFORNIA

POSTAGE WILL BE PAID BY ADDRESSEE

Documentation Manager
Hewlett-Packard Company
Software Technology Division
8010 Foothills Blvd
Roseville, California 95678
ATIN: Documentation Manager: R5YF

FOLD FOLD

READER COMMENT SHEET

MPE V Tables Manual for MPE V, Version G.23.00

32033-90147 October 1991

We welcome your evaluation of this manual. It is one of several that serve as a reference source for HP 3000 Computer Systems. Your comments and suggestions help us to improve our publications and will be reviewed by appropriate technical personnel. HP may make any use of the submitted suggestions and comments without obligation.

Is this manual technically accurate?	**Yes [] No []**	(If no, explain under Comments, below.)
Are the concepts and wording easy to understand?	**Yes [] No []**	(If no, explain under Comments, below.)
Is the format of this manual convenient in size, arrangement and readability?	**Yes [] No []**	(If no, explain or suggest improvements under Comments, below.)

Comments:

We appreciate your comments and suggestions. This form requires no postage stamp if mailed in the U.S. For locations outside the U.S., your local HP representative will ensure that your comments are forwarded.

Date: _____

FROM:

Name _____

Company _____

Address _____

_____

_____

FOLD FOLD

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 1070 CUPERTINO, CALIFORNIA

POSTAGE WILL BE PAID BY ADDRESSEE

Documentation Manager
Hewlett-Packard Company
Software Technology Division
8010 Foothills Blvd
Roseville, California 95678
ATTN: Documentation Manager: R5YF

FOLD FOLD

Part No. 32033-90147
Printed in U.S.A. 10/91
1091

HEWLETT PACKARD