2.3 DISC SERVICE PROCESSOR (DSP)

DSP is an on-line interactive utility package for the debugging and servicing of processors and other files under IRIS. Any location in memory or any file on disc can be accessed by the use of DSP. The system manager may allow limited access to DSP for authorized accounts (see Section 5.11.2.3).

CAUTION

DSP is a powerful tool! Use with care!

2.3.1 DSP ACCESS/EXIT

To use DSP, first log on to the manager's account. DSP is accessed as follows:

DSP <CTRL-E>key<CTRL-E>

where key is the password assigned by the system manager (the default password is X).

DSP may be exited either with <CTRL-C> or the X command.

- If you exit DSP using <CTRL-C>, it may be reentered from the same terminal without a password. It will have retained the previously selected context (i.e., file, disc block, or memory).
- To prevent unauthorized use of DSP, be sure to exit with an X command when leaving the terminal.

2.3.2 USING DSP

Unless otherwise noted, a <RETURN> is required to activate the command string. The <RETURN> is not shown unless it is the only command required.

Any command which follows an F, G, or H command, examines and/or modifies data and operates either on real memory, on a file, or on a disc block.

Any address may be specified as a byte address by adding a hyphen to the address. For example, D3025- will dump bytes starting with the right-hand byte of word address 1412, and E17000- will allow entry of bytes starting at the left-hand byte of word address 7400. The contents of any byte address may not exceed 377 octal. If a byte address is given when an enabled driver file (i.e., $file) is selected, then that byte address in real memory is referenced; this eliminates the need to select real memory to examine the driver's buffers.

F$filename may be used to select an enabled driver. The Dx' command may then be used to display the memory-resident copy of that driver including the current value of the local temporary cells.

where

x - the address in the disc file; corresponds to the Assembly language listing

' - (apostrophe) selects the memory-resident copy of the driver instead of the disc file

The memory-resident copy of the driver does not reside at address x but address translation is handled by DSP automatically.

Similarly, FDISCSUBS allows x' to display the memory-resident copy of a memory-resident discsub.

When a symbolic instruction such as a user defined function is entered via an insert (x:v or E) or an append (Ax) command, the system translates it into Assembly language instruction format. For example, the user enters

SEQ 0,1

When the L command is used to check the entry, DSP displays

SUB# 0,1,SZR

Commands may be entered in lower case letters with the exception of N in the LxN command which must be upper case.

For a description of the commands used in DSP see Table 2-6.

TABLE 2-6. DSP FUNCTIONS

Command	Description
x:v	Insert the value v at address x. This is very useful for entering into a single memory location. The value v may be either a symbolic instruction (i.e., user-defined function) or an octal number. If v is omitted, a zero is written into address x. See the E command for more information.
Ax	Append the block which is to contain address x (x does not have to be on a block boundary) to the file selected by the last F command. The first memory address and the real disc address of the appended block will be displayed. The block is filled with 077377 halt instructions.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
Bx	Insert a breakpoint at address x. This command is meaningful only if the specified file is a runnable processor. If that processor is then used on the same port, and the breakpoint is encountered, control will revert to DSP, and the contents of the registers and carry flip-flop are displayed. The breakpoint is cleared when it is encountered, and it is also cleared by any F, G, H, or X command. It is impossible to resume processor execution after encountering the breakpoint.
Bxcond'n	Insert a conditional breakpoint at address x. A breakpoint may be conditional on a register containing a specified value (indicated by Ar=v, where r is a register number 0 to 3, and v is an octal value), and/or conditional on a memory cell containing a specified value (indicated by x=v, where x is a memory address), and/or the breakpoint may be activated only after executing the instruction at the breakpoint location a specified number of times (indicated by an octal value by itself). For example B7235,A1=260,225=16003,4 will breakpoint the fourth time location 7235 is reached with the value 260 in register A1 and the value 16003 in memory location 225. The conditions may be given in any order, and the memory location may be specified indirectly; e.g., @37422=177723 means that the contents of location 37422 is used as a pointer to a cell that is to be checked for the value 177723.
Ccommand	The "command" given is passed on to SCOPE as a system command. This is equivalent to pressing <CTRL-C> and then entering the command.
Dx	Dump octal starting at address x. The contents of storage starting at location x are printed in octal, eight words per line. The address of the first word of the line is printed at the beginning of each line. Listing may be terminated by pressing <ESC>.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
Dx,y	Dump table starting at address x. Prints storage starting at location x in octal, y words per line; y ranges from 1 through 10 (octal). The address of the first word in each line prints at the beginning of the line. <ESC> terminates dump.
Ex	Enter octal or symbolic instruction (i.e., user-defined instruction) sequentially in memory starting at address x. Each entry must be followed by a <RETURN>. If <RETURN> is pressed without a preceding entry, a zero is stored at address x. Machine instructions may be entered in symbolic form, but the device address must be given in octal (rather than using device name) in I/O instructions (e.g., 10 rather than TTI). Labels may not be used, but absolute addresses will be converted to relative if possible. Press <ESC> to terminate entry mode.
F	Select real memory to be examined and/or modified.
Ffilename	Select the file identified by filename to be examined and/or modified. Logical unit zero is assumed unless given in the form LU/filename, where LU is the logical unit number in decimal. **NOTE** If an extended random file is selected, any address x given will refer to a location in the header extenders rather than to the data blocks.
F@	Select this port's active file to be examined and/or modified. The form F@n will select the active file of port number n to be examined and/or modified. The main memory address in the active file header is ignored, and all addressing is relative to the beginning of user storage in the partition.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
F.	Select the body of the file of the currently selected file header block (i.e., selected by an H command) for examination and/or modification. An error message is displayed if a file's header is not currently selected.
Gu/x or Gx	Select, on logical unit u (where u is in octal), the disc block at real disc address x to be examined and/or modified. In this mode, only cells 0 through 377 (octal) will be accepted. The simple form Gx asumes logical unit zero.
H	Select the header block of the currently selected file to be examined and/or modified. In this mode, only addresses less than 400 octal will be accepted.
Ix:text	Input ASCII string, where "text" is any string of characters terminated by <RETURN>, starting at address x. The result is identical to use of assembler pseudo-op .TXTF with reverse packing (i.e., preceded by .TXTM 1). <RETURN> may be imbedded in the string as a <CTRL-Z>.
Jx,y	Search for potential address errors. Scans from address x-200 through x+177 for all relative reference instructions spanning address x that are less than y words from maximum relative displacement; i.e., any place that an address error would be caused by inserting y lines of code at location x. Displays these instructions in octal and symbolic form.
Kx,y,z	Store the octal constant z in locations x through y, inclusive.
Lx	List both octal values and symbolic Assembly language instructions starting at address x. Output must be terminated by pressing <ESC>.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
LxN	Same as Lx except only the Assembly language instructions are printed.
Mx,y,z	Move the contents of locations x through y, inclusive, to locations starting at z. The destination will receive the contents of the original source, even if source and destination overlap.
Nx,y,z	Search location x through y inclusively for a location not equal to the octal constant z. If found, displays the location and its content in octal and symbolic form.
Nx,y,z,m	Same as Nx,y,z but the contents of each cell are ANDed with mask m before being compared with constant z. For example, the command N400,1120,53,101777 applies the mask, 101777, to the contents of locations 400 through 1120 and checks for any value not equal to octal 53.
Ox	Output ASCII string starting at address x. Output terminates on any byte equal to 0, 200 octal, or if <ESC> is pressed. Control characters (<40 octal) are displayed with a caret followed by the corresponding printable character.
Px,y	Punch locations x through y, inclusive, on the high-speed paper tape punch in binary loader format. If the system does not have a high-speed punch (no $PTP driver) then DSP attempts to use the master terminal ($PTM driver). **NOTE** Leader is automatically punched when the first Px,y command is given.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
Px	Punch an end block with a starting address x, which must be nonzero, then punch trailer. Must be preceded by at least one Px,y command.
P	Punch an end block with no starting address, then punch trailer. Must be preceded by at least one Px,y command.
Qx	Query cell continuously. Repeatedly displays the contents of address x in octal, allowing a swap after each display. May be used from one terminal to monitor changes to a cell, either in memory or in a disc file, while executing tasks from another terminal to cause such changes. Terminate by pressing <ESC>.
R	Read binary-format paper tape into the destination selected by last F, G, or H command. Each tape record (about four inches) is read into a buffer and checksummed before data is stored. The first 21 words octal of the last breakpoint snapshot (see U and Y commands) will be lost because the same buffer area is used. If the system does not have $PTR enabled, then $PTM will be assumed. See "Copy Processor" in the IRIS R8 User Manual for restrictions on using $PTM.
Rx	Same as R except that all addresses on the tape are displaced the same amount so that the first word on the tape goes into address x, which must be nonzero.
Sx,y,z	Search locations x through y, inclusive, for the octal constant z. If found, displays the location and its content in octal and symbolic form.

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
Sx,y,z,m	Same as Sx,y,z except that the contents of each cell are ANDed with mask m before being compared with constant z. For example, the command S400,1120,53,101777 searches locations 400 through 1120, inclusive, for any instruction referencing location 53.
T	Not used.
Ux	Display snapshot yanked into FMAP cells of active file at last breakpoint. Start display (in octal dump format) at virtual address x where y <= x <= y+100 and y is the snapshot address set by the last Y command. **CAUTION** The addresses will be wrong if a different Y command has been given since the breakpoint was encountered.
V	Verify paper tape. This and the Vx command are the same as the respective R commands except that information from the tape is compared with the contents of the selected file (or memory) instead of being stored. If a difference is detected, the address and the word from storage are displayed.
Wu/x or Wx	Write the disc block selected by the last G or H command on disc at real disc address x of logical unit u. This command is rejected if u/x is not a legal real disc address or if a single disc block has not been selected. The simple form Wx assumes logical unit zero.
X	Exit from DSP, clear any existing file selection or breakpoint, and prevent re-entry to DSP without the password.
X0,77777	Calculate Check Sum

TABLE 2-6. DSP FUNCTIONS (Cont)

Command	Description
Xx,y	Compute and display a "rotating" checksum over memory locations x through y. The checksum is produced by an SUBL instruction in order to detect a change (e.g., if two words in memory are swapped). Useful for testing if a change has occurred anywhere in a section of memory or on disc.
Xx',y	Checksum the memory-resident copy of a discsub or driver as selected by a Ffilename command.
Yx	Set first address of 101 word (octal) memory area to be yanked into the FMAP cells of the active file header as a memory "snapshot" when a breakpoint is encountered. If x=0, do not yank any area of memory.
Zx	Search for relative reference. The 256 words centered on location x are searched for any storage reference instruction that references location x using relative addressing. Any such instruction is displayed in octal and symbolic form.
Zx,y	Same as Zx except a search is done for each address x through y.
;	Comment. Any line starting with a semi-colon will be ignored by DSP. This is used mainly to include comments on patch tapes.

TABLE 5-1. CONFIG FILE

Location (octal)	Description
0-277	Reserved.
300-377	Initialization Table, reserved for use by SIR. DO NOT CHANGE!
400-577	General Information Table. See Section 5.2.1.
600-777	System Information Table. See Section 5.2.2.
1000-1177	Memory-resident Discsub Table. See Section 5.3.
1200-1377	Reserved.
1400-2777	Disc Driver Table. See Section 5.4.1.
3000-13377	Reserved.
13400-13577	Specific IPL sequences.
13600-13777	Reserved.
14000-15777	BZUD and R/W entry addresses of the disc drivers.
16000-16377	Log-on Restrictions Table. See Section 5.5.
16400-17377	Log-on Program Startup Table. See Section 5.6.2.
17400-17777	IPL Program Startup Table. See Section 5.6.1.
20000-77777	Disc Drivers.

5.2.1 GENERAL INFORMATION TABLE (PSIZ)

The General Information Table contains data that is referenced during the IPL process. Its location is 400 (octal) in the CONFIG file.

Currently, the General Information Table consists of the following:

Location (octal)	Label	Description
400	PSIZ	Partition Size. The size of each memory partition.
401	NPART	Number of memory-resident partitions. For a MARK 9, include partitions in mapped memory.
402	MTYPE	Memory type: 0 = standard MARK 3 or 5 memory 1 = MARK 9 or Nova 3-type mapped memory

For information on BASIC program partition requirements, refer to Section 5.12.1.

5.2.2 SYSTEM INFORMATION (INFO) TABLE

The System Information (INFO) Table contains system parameters starting at location 600 in the CONFIG file. Some of these parameters are set at IPL time, others may be modified to reflect the requirements of a particular system configuration. The locations (in octal) of the various parameters are shown in Table 5-2.

TABLE 5-2. INFO TABLE

Location (octal)	Label	Description
600	SDAT	System creation date (hours after BASEYEAR). DO NOT CHANGE!
601	SPED	Average CPU speed in instructions per millisecond: Computer — Speed (octal) POINT 4 MARK 9 — 2500 POINT 4 MARK 5 — 2000 POINT 4 MARK 3 — 1200 NOVA — 302 NOVA 1200 or D-116 — 653 NOVA 2 or D-116H — 770 NOVA 800 — 1325 NOVA 3 — 770 SUPER NOVA — 1255 SUPER NOVA SC — 1762
602	MILU	Maximum number of installed logical units - The total number of physical disc partitions defined in the Disc Driver Table. See Section 5.4.1.
603	NDCH	Number of data channels per port - Each data channel occupies eight words of memory. NDCH is usually set to 12 (decimal 10). Minimum NDCH is 2.
604	LPCA	Location of port control area - Contains the address of port control block (PCB) for Port 0. It is automatically modified by SIR if any driver's attributes table specifies a PCB location.

(Table continues on next page)

TABLE 5-2. INFO TABLE (Cont)

Location (octal)	Label	Description
605	TNAP	Total number of active ports - If the value in TNAP represents less than the total number of interactive ports contained in all driver's attributes tables, SIR increases the value automatically. **NOTE** This value is NEVER decreased automatically by the system - If the number of ports on the system is decreased, set TNAP to 1. SIR will then increase the number of interactive ports automatically.
606	SPCF	Special conditions flags - These are flags which control certain system functions and options:
		Bit 13 - Temporary Dirty Page Flag (TDPF) writes to disc at end of a user's time slice (see Section 5.14.3).
		Bit 14 - Suppress Error Message Flag (SEMF). Set to 0, error message text is printed. Set to 1 (40000 octal), messages are suppressed.
		Bit 15 - No Dirty Page Flag (NDPF). Set bit 15 to 1 (100000 octal) to force a write-to-disc of any dirty buffer pool page. (Refer to Sections 5.13 and 5.14.)
		All other bits are reserved.
607	LEPS	Location of end of processor storage - This cell indicates the first available memory space above the processor overlay area. LEPS must be a multiple of 400 octal greater than the beginning of processor storage (BPS). DO NOT CHANGE LEPS unless RUN is modified accordingly!

TABLE 5-2. INFO TABLE (Cont)

Location (octal)	Label	Description
610	TOPW	Highest addressable word in memory - IRIS ignores any memory above this address. The memory available above 77777 octal is used for user partitions and buffer pooling. Do not set TOPW above 77777 unless the CPU and all disc controllers on the system use a 16-bit memory address. All other devices use lower (<32K) memory.
611	ABUF	Size of auxiliary buffer area (number of words) - Must be at least 1004 words octal if indexed data files are to be used.
612	UDSB	Number of user discsubs - The minimum value is one greater than the largest subroutine number in the DISCSUBS.USER file.
613	NCQN	Number of extra character queue nodes - SIR allocates two nodes per interactive port plus this number of extra nodes. Extra nodes are required to handle peak input rates if extra heavy character processing is required. Each node occupies two words of memory. Minimum value is two.
614	NNOD	Minimum number of free nodes - Each node occupies 32 words (decimal).
615	NSIG	Number of signal buffer nodes - This is the maximum number of signals which can be waiting to be received. Each node occupies 4 words of memory. Minimum value is 1.
616	SDSB	Number of System discsubs - The minimum value is one greater than the largest subroutine number in the DISCSUBS file.

TABLE 5-2. INFO TABLE (Cont)

Location (octal)	Label	Description
617	KTSL	Time slice parameters - Used by the scheduler for determining the time slice (Long Time Slice * 400 + Short Time Slice). See Section 5.10.
620		Default (application) logical unit - Used by the system when searching for a specified program. If invoked from SCOPE, the system searches for the program in the following sequence: • LU/0 • assigned LU • default LU If invoked from CHAIN, the system searches for the program in the following sequence: • the default LU • assigned LU • LU/0 Value of 177777 indicates no default LU.
621		Reserved.
622	SZLNK	Pseudo-device linkage table size - A pseudo-device has no device code (e.g., $CTUS).
623 to 631		Reserved.
632 to 777		Reserved.

TABLE	DISPLACEMENT	CONTENTS	COMMENTS
ATRIB	0	X	ATRIB IS LOCATED AT THE END OF THE DRIVER FILE. ITS ADDRESS IS FOUND THROUGH THE POINTER IN WORD 1 OF THE ENTRY TABLE.
	1	X	
	2	X	
LINKAGE TABLE	0	X } 1	THE LINKAGE TABLE FOLLOWS THE ATRIB TABLE. EACH DRIVER MAY HAVE 0 OR MORE LINKAGE TABLE ENTRIES (2 WORDS PER ENTRY). THE LINKAGE TABLE TERMINATES WITH A –1(177777). IN THIS EXAMPLE THERE ARE 3 LINKAGE TABLE ENTRIES.
	1	X }	
	2	X } 2	
	3	X }	
	4	X } 3	
	5	X }	
	6	177777	
PDT	0	PORTS	THE PORT DEFINITION TABLE FOLLOWS THE LINKAGE TABLE. IT MAY HAVE 0 OR MORE PORT DEFINITION ENTRIES (8 WORDS PER ENTRY). THE PORT DEFINITION TABLE TERMINATES WITH A –1(177777).
	1	PCW	
	2	BUFFER	
	3	RDE/TTC } 1	
	4	RESERVED	
	5	RESERVED	
	6	AF	
	7	RESERVED	
	10	PORTS	
	11	PCW	
	12	BUFFER	
	13	RDE/TTC } 2	
	14	RESERVED	
	15	RESERVED	
	16	AF	
	17	RESERVED	
	20	177777	

Figure 5-5. Driver File Tables

5.8.1.4 Port Definition Table (PDT)

The Port Definition Table (PDT) follows the Linkage Table's terminator. POINT 4 recommends that the system configurator (SETUP) be used to set up the PDT (see Section 6). PDT consists of zero or more entries and must be terminated by 177777. It is located at ATRIB+3+Linkage Table. If there is no PDT, there will be a terminator at its location.

The Port Definition Table consists of eight words per entry as follows:

Word 0 - Number of ports (with the characteristics described in words 1-7).

Word 1 - Port Control Word (PCW) in the Port Definition Table (PDT) and in the port control block (PCB) controls various characteristics of the port such as baud rate, modem control, parity checking, etc., provided that the hardware allows these parameters to be controlled by software. (For example, with the POINT 4 MARK 3, baud rate is hardware controlled.) PCW should be zero for any device which cannot control any of these characteristics. The general format of the PCW is shown in Figure 5-6. Values that may be entered into PCW for a MARK 3 System are shown in Table 5-8.

Word 2 - Input/output buffer size (bytes)

Word 3 - Return delay (RDE) and terminal type code (TTC)

RDE - Carriage return delay. For a port on a POINT 4 Mux, the delay is in fiftieths of a second. For ports on all other devices, the delay is the number of null codes before the next character. RDE is given in the upper (left-hand) byte.

TTC - The number assigned to a Terminal Translation Module (see Section 5.9). TTC is given in the lower (right-hand) byte.

Word 4 - Reserved.

Word 5 - Reserved.

Word 6 - Size of active file on disc in blocks. The recommended size is 40 (octal) blocks.

Word 7 - Reserved.

The port entries must be terminated by a -1; the table may be empty, but the -1 terminator is required. A Port Control Block (PCB) is assigned for each port listed.

NOTE

PDT cannot extend over a block boundary.

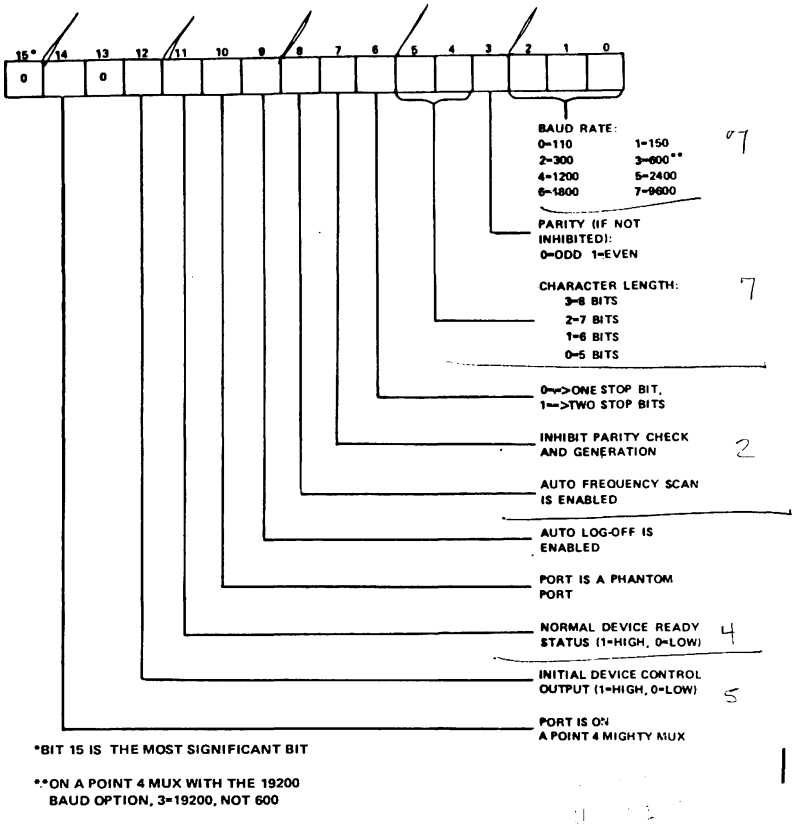

Figure 5-6. Port Control Word Format (Does Not Apply to MARK 3)

TABLE 5-8. PCW VALUES FOR A MARK 3 SYSTEM

No. of Data Bits	Parity	No. of Stop Bits	PCW Value
7	Even	2	140201
7	Odd	2	140205
7	Even	1	140211
7	Odd	1	140215
8	Inhibited	2	140221
8	Inhibited	1	140225
8	Even	1	140231
8	Odd	1	140235

NOTE

The PCW value for a phantom port on a MARK 3 is 2000.

IR FILE HEADER LAYOUT

*See R7 User

1-6 NAME
: 151703 146656 141656 143311 146305 0 0
(SCH.C.FILE)
14 digits
14 zeros w/follow if not 14 digits

7 ACNT - Account No
Bits 15-14 Priv Level
13-6 Acct Group #
5-0 Acct User #
ex: 100001
If this word is changed ran sorted LIBR old & new all

10 TYPE *
: 77032
Basic Prog Stand Alone
Text File Formatted Contiguous Peripheral
Includes: Protection Loadable Type
LHB = PROTECT.
RHB = TYPE

11 NBLK
Disc BLKs alloc. to file incl. header
ex: 2

12 STAT *
File Status Word
BIT 12=1 Formatted
BIT 0=1 Extended

13 NITM
If format, file (see wd 12), this is # items in each rcd

14 LRCD
Length = # wds of each record
ex: 24

15 NRPB
If formatted file, # of records per block.

16 NRCD*
Reads in contiguous or # Rcds written to formatted
ex: 5

17 COST
Amt chgd to other users for access.
ex: 0

20-21 CHGS
Accumulated amt chgd to other users.

22-23 LDAT
Last Access Date
ex: 164021

24-25 CDAT
Files creation date.
ex: 164021

26 NTAC
Number of times accessed counter

27 CATR *
Applies to catalogue.

30-31 CLAS*
Applies to Catalogue

32-34
Not Used

35 PPRI
Program's priority.
Range 0-377
200 is assumed.

36 SNUM
SCO # Last Applied

37 ADAT
Date SCO applied.

40-47 DASA Decimal Accumulator Save Area
Used by "AFSETUP" to save the six DA cells at swap-out so that they can be restored by "LOADUSER" at the next swap in.

50-67 DSPS * Used only by Disc Service Processor & other system routines
DSP also uses: WITM (wd 13) NRPB (wd 15) FMAP (wds 70-170)
LRCD (wd 14) NRCD (wd 16)

70-170 FMAP *
Used for formatted
· Index-contiguous.
· Index-contiguous, Used for directory info.

171 HTEM*

172 STAD
Stand Alone Program's starting address. See note on periphs.
ex: 177777

173 ABLK
No. of active blocks to be transferred.

174 DSAF
Default size of active file specified in port drivers attrib. table

175 CORA
Core addr of 1st data block. Zero for text or contiguous

176 UNIT
LU # where file resides
ex: 5

177 DADR
RDA of files header
ex: 21335

200-377 Disc Address List Contains RDA of each data block, unless extended or contiguous.
Extended → Header extender blocks
Contiguous → no disc addr list; all blocks sequentially follow the header.