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PROGRAM

File Directory Check Program

TAPES

Absolute Binary: 091-000056

ABSTRACT

This is a Stand Alone absolute binary program used to check the integrity of a disk file directory, disk allocation map, and all currently allocated files in a DOS system. Files can be truncated to correct multiply linked blocks.

## 1. REQUIREMENTS

### 1.1 Memory

4K or larger read/write memory.

### 1.2 Equipment

Any NOVA family DOS configuration which includes an ASR teletype and 4034A or 4034B line printer.

### 1.3 External Subroutines

None.

### 1.4 Other

None.

## 2. OPERATING PROCEDURE

- a) Load the program using the binary loader, (091-000004).
- b) Reset and start at location:

000002 - to perform trace mode

000003 - to perform resolve mode.

Whichever entry is selected, the program will issue the following question on the ASR printer: "FIXED HEAD DISK? ANSWER YES OR NO." "YES" or "NO" is then typed by the user on the keyboard as appropriate.

If the unit contains a moving head disk, the system will ask for the disk unit number: "TYPE THE DISK UNIT NUMBER." If something other than 0, 1, 2, or 3 is then typed by the operator, the system responds with "???" and repeats the question. The system then issues one final information request before performing either the trace or resolve function: "TYPE THE NUMBER OF HEADS, 2, 10, OR 20." As before, if an improper response is given the system responds with "???" and repeats the query.

The program will then proceed to perform either the trace or resolve function. Uncommon fatal errors will cause the message "FATAL ERROR, LOCATION xxxx" to be output. The following list

b) (Continued)

explains the error condition associated with each location.

<u>Locations</u>	<u>Error Indicated</u>
505 521	Less than two files in the Directory. The System Directory is given as the last file.
740, 747, 767, 2027, 2036, or 2055	A block appears bad during disk read attempt; block was OK before.
745, 765, 1137, 2034, or 2033 1204	Disk write error. MAP, DR block after block 2 is bad and no blocks are left for the new MAP, DR .
1211	Unknown hardware error.
1511	Disk error following seek attempt.
1534	Error status following recalibrate attempt.
2044	Block #1 is bad, but was OK earlier.

More common fatal and all non-fatal error conditions will cause explanatory messages like "CANNOT READ FILE DIRECTORY, BLOCK 1" to be output on the ASR printer. The program halts after encountering fatal error conditions, and tries to complete its task if only a non-fatal error condition occurs. At the conclusion of a successful run, the program prints "END DIRECTORY, JOB FINISHED" and halts.

### 3. DISCUSSION

#### 3.1 Trace Mode

The trace mode of program operation is used to produce a list of all file names. Files are ordered according to their first blocks; the file with the lowest beginning block number is given first, then the file with the next lowest beginning number, etc. An exhaustive list of block numbers comprising each disk file is also produced.

Following each name the successively linked block numbers are printed on the line printer for each file. Blocks with conflicting links are preceded by "\*". The trace mode does not alter the disk contents and may either be used by itself or in conjunction with the resolve mode. If the resolve mode is to be used, a trace should be performed before the resolve mode of operation is attempted.

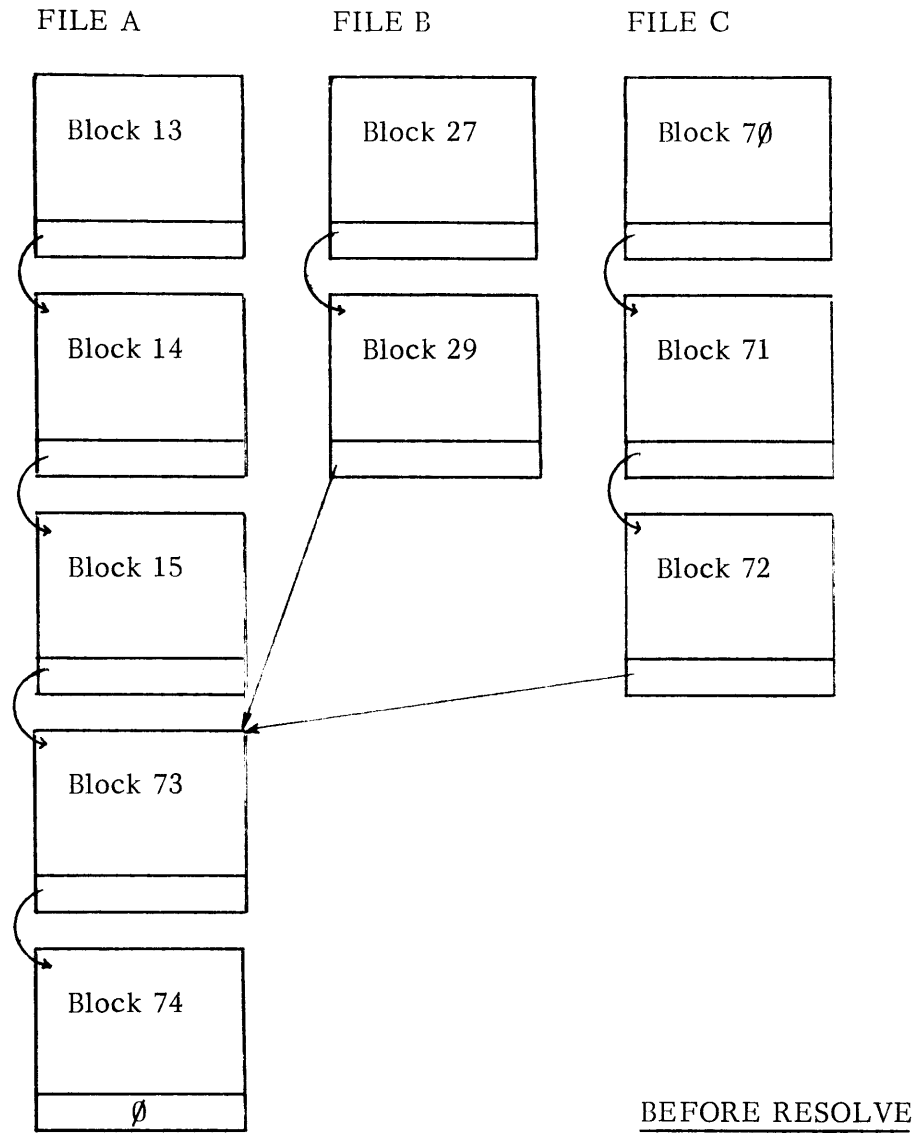
### 3.2 Resolve Mode

The resolve mode is used to correct multiply linked files. These are files which each claim ownership of a common block of disk storage, an error condition commonly caused by a hardware malfunction. The resolve mode performs the following operation sequence. First the current Map Directory file, MAP.DR, is not saved. A new map directory is built as files are checked, and this is written onto the disk at the end of the operation.

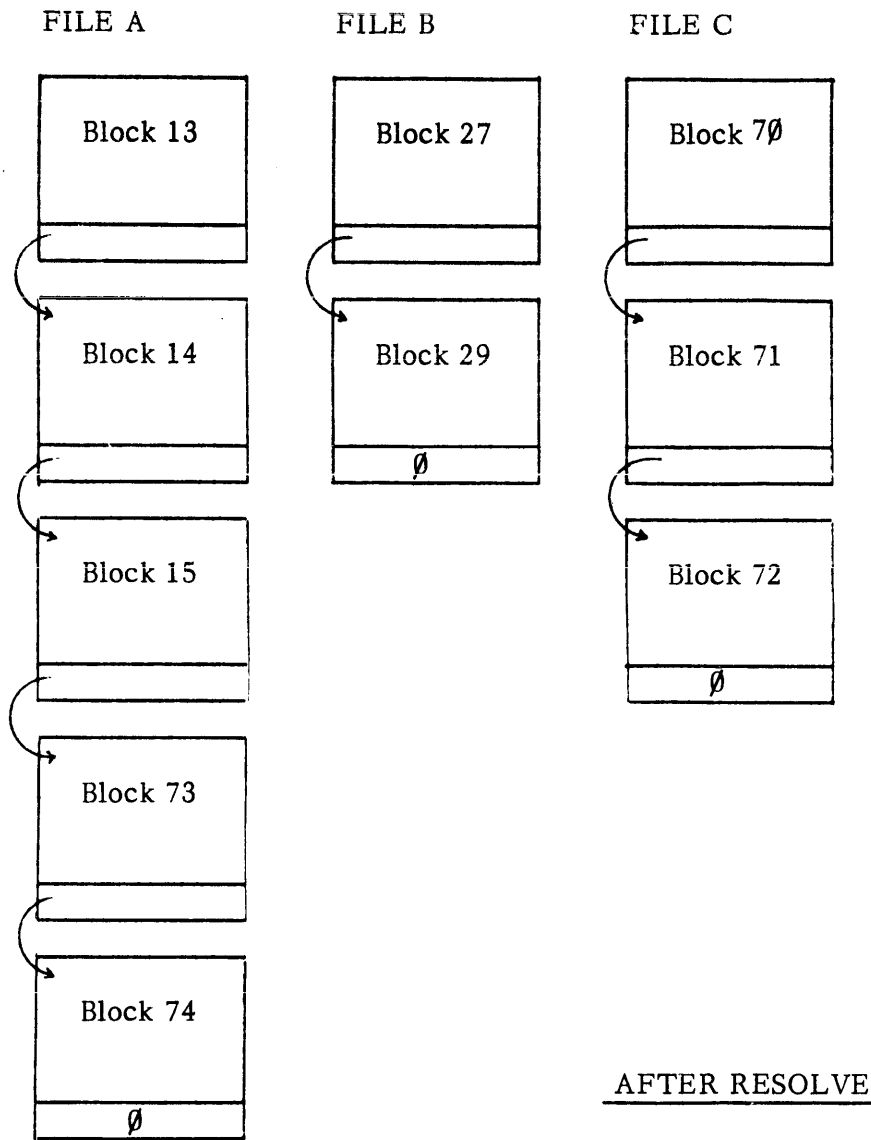
Links for the Command Line Interpreter blocks, blocks 3 through 6, are set to zero. The System File Directory, SYS.DR, is then read and checked to insure that the System File Directory and Map Directory are the first two entries on the disk (except for block  $\emptyset$ , the bootstrap block).

Files are processed in the order that they appear in the file directory. Each file name, the first block number, and the number of blocks used are printed on the line printer when the file is processed. Bad blocks or multiply linked blocks (blocks which appear to be part of two or more files) will result in truncated files. In the case of multiply linked blocks, the first file that is processed will arbitrarily be assigned the block in question, and all following files will be truncated after the first block which attempts to link with the multiply linked block.

3. DISCUSSION (Continued)



3. DISCUSSION (Continued)



Ordinarily, the trace mode is performed again after a resolve operation to indicate the structure of the new system directory.

To assist the interpretation of data printed by both the trace and resolve operations, a review of the DOS file structure follows.

3.3 Block Definition

Each block of disk storage is composed of  $256_{10}$  sequential 16 bit words. The last word of each block is reserved for the link to the next block of storage, and the other 255 words are used for general purpose storage. The link is a pointer to the next block of disk file

### 3.3 Block Definition (cont'd)

storage formed by the expression (LAST BLOCK NUMBER) .XOR. (NEXT BLOCK NUMBER). The terminating block in a file has an all-zero link; single-block files also have all-zero links.

<u>Word</u>	<u>Contents</u>	
∅	DATA	
.	.	
.	.	<u>GENERAL BLOCK</u>
.	.	<u>DEFINITION</u>
376	DATA	
377	Link to next block	

### 3.4 Block Assignments

The first 7 blocks of disk storage have fixed assignments, but the remainder are free for general purpose use.

<u>Block Number</u>	<u>Contents</u>	<u>Assignment Type</u>	
∅	Bootstrap	Fixed Assignment	
1	SYS.DR	Fixed Assignment	
2	MAP.DR	Fixed Assignment	
3	Push Space, 4 levels	Fixed Assignment	<u>DISK</u> <u>BLOCK</u> <u>ASSIGN-</u> <u>MENTS</u>
4	Push Space, 4 levels	Fixed Assignment	
5	Push Space, 4 levels	Fixed Assignment	
6	Push Space, 4 levels	Fixed Assignment	
7	Open for any use	Dynamic Allocation	
1∅	Open for any use	Dynamic Allocation	
11	Open for any use	Dynamic Allocation	
12	Open for any use	Dynamic Allocation	
.	.		
.	.		
.	.		

### 3.5 SYS.DR Structure

The System File Directory (SYS.DR) is a variable length file containing an entry describing the number of files currently on the disk, and a series of eleven-word entries which describe the characteristics of each file. The first entry in SYS.DR describes the System File Directory itself, and the second entry describes the Map Directory File; the other entries describe the remaining files found on the disk.

### 3.5 SYS.DR Structure (Continued)

<u>Word</u>	<u>Contents</u>	
∅	Number of files in this block	
1	Systems directory file entry	<u>SYSTEM</u> <u>FILE</u> <u>DIRECTORY</u> <u>STRUCTURE</u>
.		
.		
.		
13		
14	Map directory file entry	
.		
.		
.		
26		
27	Any file directory entry	
.		
.		
.		
41		
.		
.		
.		
377	Link (∅ if end of file directory)	

Each eleven-word entry in SYS.DR has the fixed structure shown below. The entry contains information about the file describing its name, its two-character name extension, the attributes of the file, the file size, the address of the first block, and a link to the Device Control Table.

<u>Word</u>	<u>Contents</u>
∅-4	File name in ASCII, bytes packed left/right, left justified, trailing zero bytes
5	Two-character name extension (SV, RB, etc.)
6	File attributes (Permanent, Write/Protect, etc.)
7	Total number of blocks, less one, in file
1∅	Total number of bytes in last block
11	Address of first file block ( zero if unassigned )
12	DCT Link

#### TYPICAL SYS.DR ENTRY



### 3.6 MAP.DR Structure

Finally, the map directory (MAP.DR) is a file indicating which blocks of disk storage are currently in use and which are free for assignment. Each bit in each word of MAP.DR indicates whether the block is in use or not ( 0 ↔ not in use, 1 ↔ block is in use). Block assignments are from left to right in ascending block order. Thus bits 0 through 6 of word zero are always set since blocks 0 through 6 have fixed assignments.

<u>Word</u>	<u>Contents</u>
0	Block allocation map, 1 bit/block, from left to right in ascending block order: 0 ↔ block available, 1 ↔ block has been allocated.
.	
.	
.	
376	.
377	Link

### 4. EXAMPLES

Samples of output from the trace and resolve modes of operation appear on the following pages.

### 5. PROGRAM LISTING

None is given.

DOS FILE DIRECTORY, TRACE MODE

DISK SIZE = 1024 BLOCKS  
 640 USED 384 UNUSED BLOCKS

NAME	# BLOCKS	1ST BLOCK					
SYS.DR	2	1	1	441			
MAP.DR	1	2	2				
STTI.	1	0					
STTO.	1	0					
STTR.	1	0					
STTP.	1	0					
SPTR.	1	0					
SPTP.	1	0					
SLPT.	1	0					
SYS.SV	81	7	7	10	11	12	13
			14	15	16	17	20
			21	22	23	24	25
			26	27	30	31	32
			33	34	35	36	37
			40	41	42	43	44
			45	46	47	50	51
			52	53	54	55	56
			57	60	61	62	63
			64	65	66	67	70
			71	72	73	74	75
			76	77	100	101	102
			103	104	105	106	107
			110	111	112	113	114
			115	116	117	120	121
			122	123	124	125	126
			127				
COM.CH	1	130	130				
AL2.SV	39	137	137	160	161	162	163
			164	165	166	167	170
			171	172	173	174	175
			176	177	200	201	202
			203	204	205	206	207
			210	211	212	213	214
			215	216	217	220	221
			222	223	224	225	
OEDIT.SV	4	226	226	227	230	231	
SYS.LB	11	232	232	233	234	235	236
			237	240	241	242	243
			244				
ASM.SV	18	245	245	246	247	250	251
			252	253	254	255	256
			257	260	261	262	263
			264	265	266		
FTC1.SV	41	267	267	270	271	272	273
			274	275	276	277	300
			301	302	303	304	305
			306	307	310	311	312
			313	314	315	316	317
			320	321	322	323	324
			325	326	327	330	331
			332	333	334	335	336
			337				
ALGOL.SV	5	340	340	341	342	343	344
RLDR.SV	10	505	505	506	507	510	511
			512	513	514	515	516

TRACE MODE

DOS FILE DIRECTORY, RESOLVE MODE

DISK SIZE = 1024 BLOCKS  
 640 USED 384 UNUSED BLOCKS

NAME	# BLOCKS	1ST BLOCK
SYS.DR	2	1
MAP.DR	1	2
\$TTI.	1	0
\$TTO.	1	0
\$TTR.	1	0
\$TTP.	1	0
\$PTR.	1	0
\$PTP.	1	0
\$LPT.	1	0
SYS.SV	81	7
COM.CM	1	130
AL2.SV	39	157
OEDIT.SV	4	226
SYS.LB	11	232
ASM.SV	18	245
FTC1.SV	41	267
ALGOL.SV	5	340
RLDR.SV	10	505
LIBRARY.	1	345
EDIT.SV	9	346
SOS.LH	1	357
ALGOL4.LB	5	360
ALGOL2.LB	43	365
ALGOL3.LB	35	440
FTLIB.	1	544
LFE.SV	14	545
ALGOL0.LB	2	563
AL1.SV	38	565
FTC4.SV	25	633
FTC2.RB	32	664
FTC1.RB	10	724
LEXIC.RB	20	736
ALGOL1.LB	40	762
LEXIC.AL	26	1032
FTC4.AL	3	1064
FTC1.AL	13	1067
FTC.TX	17	1104
ERRT.	2	1125
LITRL.AL	4	1127
FUNCTION.RB		11
TABLES.RB	26	1146
FTC2.AL	32	1200
FTC3.AL	12	1265

1133

NEW MAP.DR FILE

640 USED 384 UNUSED BLOCKS

RESOLVE MODE