DOS PACK REPAIR
DOS 1.2 REPAIR 1.1
JUNE 20, 1973

Program users guide

DOS 1.2 REPAIR 1.1

USER'S GUIDE

Datapoint Corporation

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to take notes and refer to this USER'S GUIDE in order to save a file, rather than delete the file and then have to re-create it.

1.4 Program Structure

The REPAIR program is a completely self-contained program and does not require a working DOS to run. REPAIR can be executed as a COMMAND from the DOS or from a LOAD&GO cassette. The REPAIR program carries its own copies of the standard basic DOS I/O routines (DR$, DW$, KEYIN$, DSPLY$), and the DOS interrupt handler and the DOS DEBUG$ routine, all of which are located in memory from 01000 to 03777. The main body of executable code is located from 04000 to 025000. Various tables are located from 025000 to 030000, and data storage and messages are located from 030000 to 040000.

1.5 Physical Configuration Requirements.

The minimal physical configuration required to support REPAIR 2.1 is a 2200-126 computer (16K version 2) and a 2200-350 or 2200-351 disk peripheral.

DOS REPAIR 1.1

1. INTRODUCTION

1.1 General Background Information

The purpose of the REPAIR program is to repair a malfunctioning or non-functioning DOS pack. The performance of the DOS is directly related to the correctness of disk-resident system tables. Errors in these tables can cause DOS difficulties ranging from occasional mysterious losses of data to complete inability of the DOS to function on the pack. The REPAIR program finds, identifies to the operator, and attempts to correct errors in the system tables.

1.2 Operator Interface

The REPAIR program, once activated by an operator, is capable of seeking errors and determining corrective measures on its own. However, there are operator interfaces which exist to give a human operator the power to monitor and control the program's progress. The program will constantly display on the screen information about what it is doing. There are five points in the program's execution which always occur which require operator response. These are explained in sections 5.2, 5.3, 5.9, 5.12, and 5.13 of this USERS'S GUIDE. Finally, if errors are discovered the operator will be asked if the error should be corrected on disk. Thus, the operator has control over any changes made to disk and may suppress any correction suggested by the program.

1.3 Program Operation

The REPAIR program execution consists of three phases; the Cluster Allocation Table and Directory check phase, the Retrieval Information Blocks check phase, and the Cluster Allocation Table regeneration phase. In general terms, the program progresses from simple error analysis to quite invloved error analysis during its execution. Beginning with the cylinders-to-be-locked-out information supplied by the operator, each program phase progresses according to information developed during preceding checks.

The amount of interface and systems expertise required of the operator ranges from almost zero to very much, and is directly proportional to two things: how badly the pack is damaged and whether the operator wants to try to save files with errors. If the operator merely permits REPAIR to delete every file found to be in error, the result would be guaranteed to be error-free disk-resident system tables, and the operator would not need to understand any details of the DOS. Sometimes, however, it will be easier for the operator

2. REPAIR 1.1 APPLICATIONS

2.1 DOS Problems

There are three general classes of errors that can cause a DOS to work improperly:

1. Errors in the data within a file.
   Example: An incorrectly written object code record in a program object file may make the program unloadable and/or unexecutable.

2. Errors in the DOS system files.*
   Example: If one of the six DOS system files were inadvertently damaged, as by being partially overwritten, then sooner or later some part of the DOS would not function properly.

3. Errors in the disk system tables.
   Example: The Cluster Allocation Table is overwritten.

The most commonly occurring class of error is class 3. (Incidentally, the most common error is the one given for the example: a destroyed C.A.T.) Also, class 1 and class 2 errors most often occur because of previously existing class 3 errors.

REPAIR will not find or fix class 1 or 2 errors. Once those errors have occurred the file with the error should be reloaded to disk. If the user is interested in fixing these kinds of errors he should refer to part three of this USER'S GUIDE.

REPAIR can fix almost all class 3 errors, and therefore can fix almost all of the problems that commonly occur with a disk pack.

* A pack does not need to have the DOS system programs on it in order to be usable by the DOS. A pack does not need to have any programs on it, for that matter. This could be the case in a multi-drive system, where a pack is used solely for data files.

2.2 When to use REPAIR

There are three times to run the REPAIR program:

1. Regular disk-pack checking.
   It is advisable to run REPAIR after every few hours of disk use, in order to catch errors that may be developing that have not been noticed.

2. Unexplained strange things start happening.
   If you ever see the message:

   FAILURE IN SYSTEM DATA

   it is time to run REPAIR. If other error messages are displayed by the DOS, such as:

   RECORD FORMAT ERROR

   and there seems to be no reason that the error should have occurred, REPAIR may find the reason. If files or records in files disappear or get scrambled, it is probably a good idea to run REPAIR to see if errors have developed in the system tables.

3. The DOS will not run at all.
   Many times if the DOS will not "boot" it is because the C.A.T. has been destroyed - specifically, the AUTO PFN (the last byte in the C.A.T. MASTER) is not 000. REPAIR will always reset the AUTO PFN to 000 when it writes the regenerated C.A.T. to disk.

3. REPAIR 1.1 USER'S GUIDE USE

This USER'S GUIDE is divided into three sections for three levels of reference:

1. Minimal operator interface.

The first section is for users who wish to use REPAIR to make their pack work again as quickly and with as little effort as possible. To use REPAIR, one does not _have_ to understand very much about the DOS or the structure of the data on disk.

2. Medial operator interface.

The second section is a rather comprehensive discussion of the various messages and options provided by the REPAIR program, and is for users who wish to be able to take advantage of the file-saving options available with REPAIR.

3. Maximal operator interface.

The third section discusses a variety of things that can go wrong on a disk pack and how REPAIR can be used to deal with those problems. This section is for users who are interested in understanding the DOS disk data structure for its own sake, with emphasis, of course, on problems that can occur.

3.1 _Preliminary Reading_

Reading the DOS OPERATOR'S GUIDE is a prerequisite to using the REPAIR program. The REPAIR user must have a concept of what a DOS _FILE_ is, and should be acquainted with the use of the _OPERATOR COMMANDS_ (entered to the DOS _KEYBOARD FACILITY_) and _FILE NAMES_. The user must understand the concept of _FILE DELETION_. The user must also know what _DRIVE NUMBER_ means.

If possible, the REPAIR user should read and understand the _DOS SYSTEM MANUAL_, particularly section 3.1, _Disk Structure_. To use and understand REPAIR to the maximum extent, the user should understand terms such as: cylinder, sector, cluster allocation table, directory, directory page, directory MASTER and COPY, directory entry, retrieval information block, segment descriptor, and cluster.

4. MINIMAL OPERATOR INTERFACE

This section of the USER'S GUIDE is for those who wish to use REPAIR to make their pack work again as quickly and with as little effort as possible. To use this section of the USER'S GUIDE requires no knowledge of the DOS beyond the concept of files. It does require the ability to read through and understand the following step-by-step instructions.

In the most ultimately simple case, the user will not want to lock out any cylinders (a cookbook process -- you do not have to know what a cylinder is), and the REPAIR program will not find any errors. The main structure of the following example is built on such a case. However, places in the example where there may be variations are noted and what section in the manual to find explanations of these variations is also noted.

4.1 Executing REPAIR.

If the REPAIR program is cataloged on the disk (as REPAIR/CMD), and if the DOS is capable of loading and executing it, the fastest and easiest way to get REPAIR started is by simply keying REPAIR to the DOS keyboard facility.

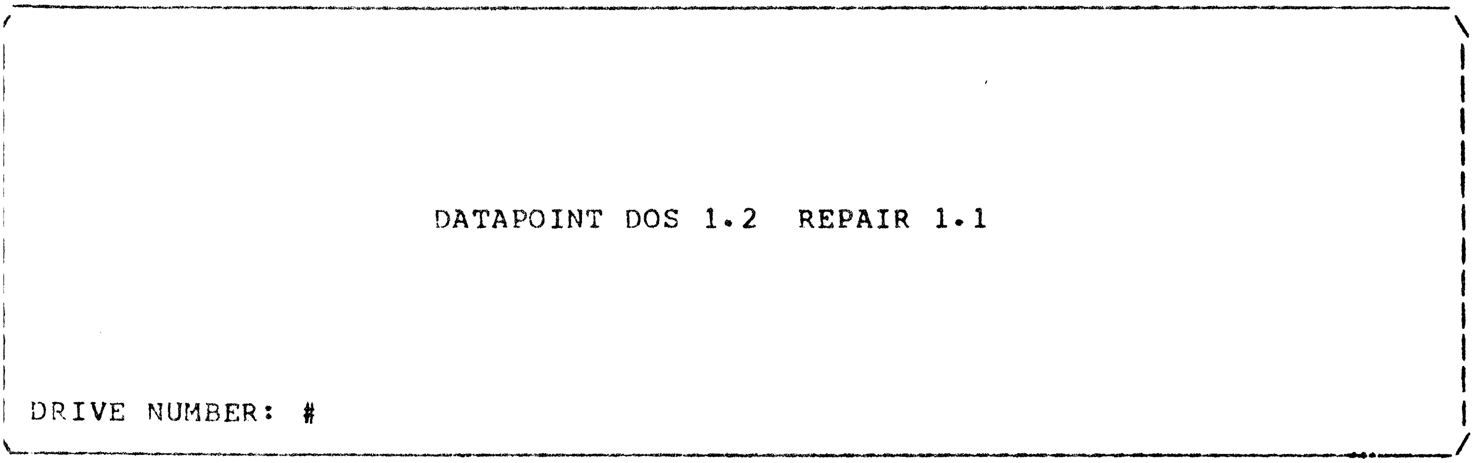
REPAIR may also be executed by placing a LOAD-AND-GO tape of REPAIR in the back cassette deck of the 2200 and pressing RESTART.

In either case, the pack to be checked must be placed in a drive connected to the 2200 and the LOAD/RUN switch set to RUN.

In the following examples, a pictogram of the state of the 2200 display will be given followed by a brief explanation and instructions for the operator.

NOTE THAT A POUND SIGN (#) IN ONE OF THE BOTTOM LINES OF THE PICTOGRAM REPRESENTS THE CURSOR POSITION. THE CURSOR WILL BE FLASHING WHEN THE OPERATOR IS REQUIRED TO RESPOND TO THE INFORMATION ON THE SCREEN.

4.2 Sign-On and Drive Number Specification:

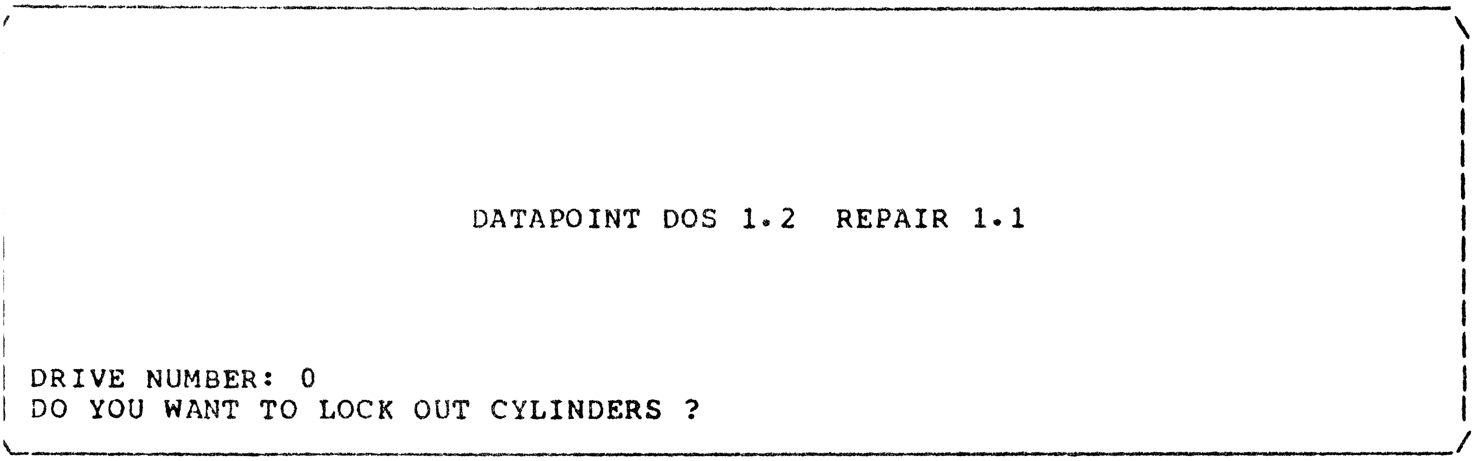


```
                    DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: #
```

The screen appears as above when REPAIR has been loaded and execution has begun.

The operator must enter the number of the drive holding the disk pack that is to be REPAIRed. The operator must enter 0, 1, 2, or 3.

4.3 Cylinder Lock-Out.

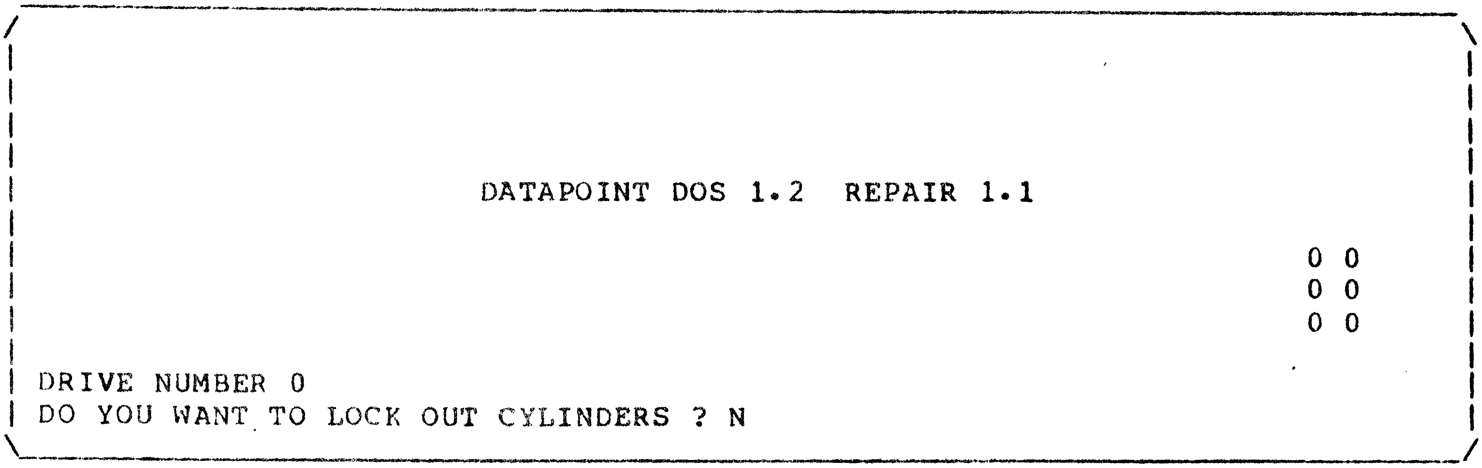


```
                     DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ?
```

The screen appears as above when REPAIR is ready to accept cylinder lock-out. Cylinder lock-out is a way of reserving disk space from DOS use. If cylinders are to be locked out, there will be a sticker or label on the case of the disk pack with the numbers of the cylinders to be reserved. If there are cylinders to be locked-out refer to APPENDIX A.

If no cylinders are to be locked out, enter "N".

4.4 Directory Check Monitor:

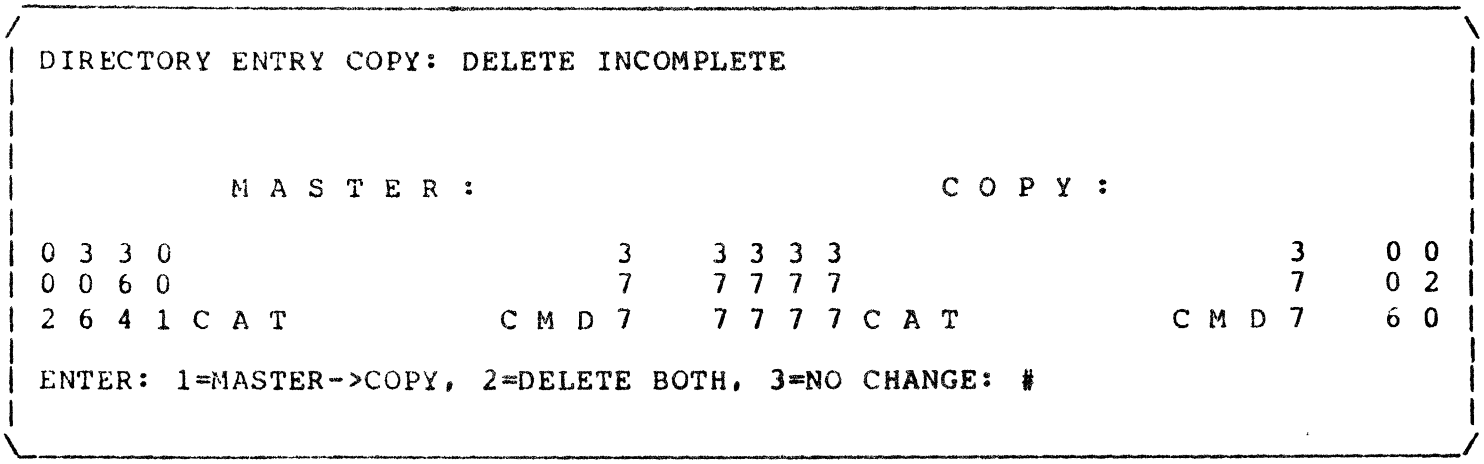


```
                         DATAPOINT DOS 1.2  REPAIR 1.1

                                                                 0 0
                                                                 0 0
                                                                 0 0

DRIVE NUMBER 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
```

The screen appears as above when the cylinder lock-out option has not been taken and the C.A.T. and Directory check phase has begun. Specifically, note the vertical numbers at the right center of the screen: these numbers monitor the cycling of the directory check. IF SOMETHING BESIDES THESE NUMBERS APPEARS ON THE SCREEN AFTER THE CYLINDER LOCK-OUT IS COMPLETED, REFER TO APPENDIX B.

No operator response is required.

4.5 Directory Errors.



```
DIRECTORY ENTRY COPY: DELETE INCOMPLETE



         M A S T E R :                            C O P Y :

0 3 3 0                       3    3 3 3 3                      3    0 0
0 0 6 0                       7    7 7 7 7                      7    0 2
2 6 4 1 C A T           C M D 7    7 7 7 7 C A T          C M D 7    6 0

ENTER: 1=MASTER->COPY, 2=DELETE BOTH, 3=NO CHANGE: #
```

The screen will appear as above (in general -- specific words will vary) if REPAIR finds an error in the directory.

For explanation of the messages refer to section 5.5. To delete the file enter the number corresponding to DELETE BOTH (in this example, 2=DELETE BOTH).

4.6 Retrieval Information Blocks Check.

```
 ------------------------------------------------------------------------------
/                                                                              \
|           RIB MASTER:                 (PFN 000)       RIB COPY:              |
|                                           *                                   |
|                                           *                                   |
|                                           *                                   |
|                                           *                                   |
|                                           *                                   |
|                                           *                           0 0     |
|                                                                       0 0     |
|                                                                       0 0     |
|                                                                              |
|                                                                              |
\______________________________________________________________________________/
```

The screen appears as above during the Retrieval Information Blocks check. The vertical numbers at the right of the screen monitor the cycling of the R.I.B. check. The column of asterisks is displayed only while a R.I.B. is actually being checked. If a pack does not have several files on it the asterisks will not appear during most of the R.I.B. check.

No operator response is required.

4.7 Retrieval Information Blocks Errors.

```
 ------------------------------------------------------------------------------
/                                                                              \
| PFN ERROR                 LRN ERROR     * PFN ERROR                 LRN ERROR |
| 4TH BYTE NOT 0377                       * 4TH BYTE NOT 0377                   |
| 1ST SEG.DES. ERROR                      * 1ST SEG.DES. ERROR                  |
| MULTIPLE ALLOCATION 00001               * MULTIPLE ALLOCATION 00001           |
| CYL.ADR.OVERFLOW          CYL.ERROR     * CYL.ADR.OVERFLOW          CYL.ERROR |
| RIB TERMINATOR ERROR                    * RIB TERMINATOR ERROR                |
|                          0 3 2 0                    3                         |
|                          0 0 1 2                    7                         |
|                          1 0 0 3 S Y S T E M 0   S Y S 7                      |
|                                                                               |
| DELETE THE FILE ? #                                                           |
|                                                                               |
\_______________________________________________________________________________/
```

The screen will appear as above (in general - specific words will vary) if REPAIR finds an error in a R.I.B.

For explanation of the messages refer to section 5.7.

To delete the file enter "Y".

4.8 End of R.I.B. Check.

```
 ____________________________________________________________________________
/                                                                            \
| 0000 FILES HAVE RIB FORMAT ERRORS.                                         |
| 0025 FILES HAVE NO RIB FORMAT ERRORS.                                      |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
| CLUSTER ALLOCATION PHASE, PASS 1. PFN #                                    |
|                                                                            |
|                                                                            |
|                                                                            |
\____________________________________________________________________________/
```

The screen appears as above when the R.I.B. check phase is finished. The messages at the top of the screen are a summary of the information accumulated during the R.I.B. check phase. The message near the bottom of the screen is notification to the operator that REPAIR is ready to begin the cluster allocation phase (for Cluster Allocation Table regeneration).

To proceed, depress the ENTER key.

4.9 Cluster Allocation Phase, Pass 1.

```
 ____________________________________________________________________________
/                                                                            \
| 0000 FILES HAVE RIB FORMAT ERRORS.                                         |
| 0025 FILES HAVE NO RIB FORMAT ERRORS.                                      |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                    0 0     |
|                                                                    0 0     |
| CLUSTER ALLOCATION PHASE, PASS 1. PFN 000                          0 0     |
|                                                                            |
|                                                                            |
|                                                                            |
\____________________________________________________________________________/
```

The screen appears as above during the first pass of the cluster allocation phase. The vertical numbers at the right of the screen are the pass cycle monitor.

No operator response is required.

4.10 Cluster Allocation Phase, Pass 2.

```
 0000 FILES HAVE RIB FORMAT ERRORS.
 0025 FILES HAVE NO RIB FORMAT ERRORS.





                                                                   0 0
                                                                   0 0
 CLUSTER ALLOCATION PHASE, PASS 1. PFN 000                         0 0
 CLUSTER ALLOCATION PHASE, PASS 2. PFN 000


```

The screen appears as above during the cluster allocation phase, pass 2. The bottom message is displayed and the cycle monitor numbers at the right of the screen are restarted when pass 2 begins.

No operator response is required.

4.11 Cluster Allocation Phase, Pass 3.

```
  0000 FILES WITH ALLOCATION CONFLICTS.
 00000 CLUSTERS IN THOSE FILES.





                                                                   0 0
                                                                   0 0
 CLUSTER ALLOCATION PHASE, PASS 1. PFN 000                         0 0
 CLUSTER ALLOCATION PHASE, PASS 2. PFN 000
 CLUSTER ALLOCATION PHASE, PASS 3. #

```

The screen appears as above at the end of the cluster allocation phase, pass 2. The messages at the top of the screen are a summary of the information gathered during cluster allocation phase pass 1 and 2. The message at the bottom of the screen indicates that REPAIR is ready to begin the cluster allocation phase pass 3.

To proceed, depress the ENTER key.

4.12 Cluster Allocation Conflicts.

```
 PFN 200                                      PFN 220
  0 0 3 0                          3           0 0 3 0                          3
  0 0 6 0                          7           0 0 6 0                          7
  3 0 4 1 S I N            C M D 7             3 6 4 1 S O U T          C M D 7
 # OF CLUSTERS IN FILE: 00001                 # OF CLUSTERS IN FILE: 00002
 # OF CONFLICTING FILES: 002                  CONFLICTING FILE # 001
 # OF CONFLICTING CLUSTERS: 00001             # OF CONFLICTING CLUSTERS: 00001
 # OF CORRECT PFN/LRN: 00004 OF 00006         # OF CORRECT PFN/LRN: 00000 OF 00006


 ENTER: DELETE FILE: 1=LEFT, 2=RIGHT, 3=BOTH; 4=NO CHANGE: #
```

The screen will appear as above (in general, specific words will vary) if REPAIR finds that two or more files are trying to use the same space on disk.

For explanation of the messages refer to section 5.13.

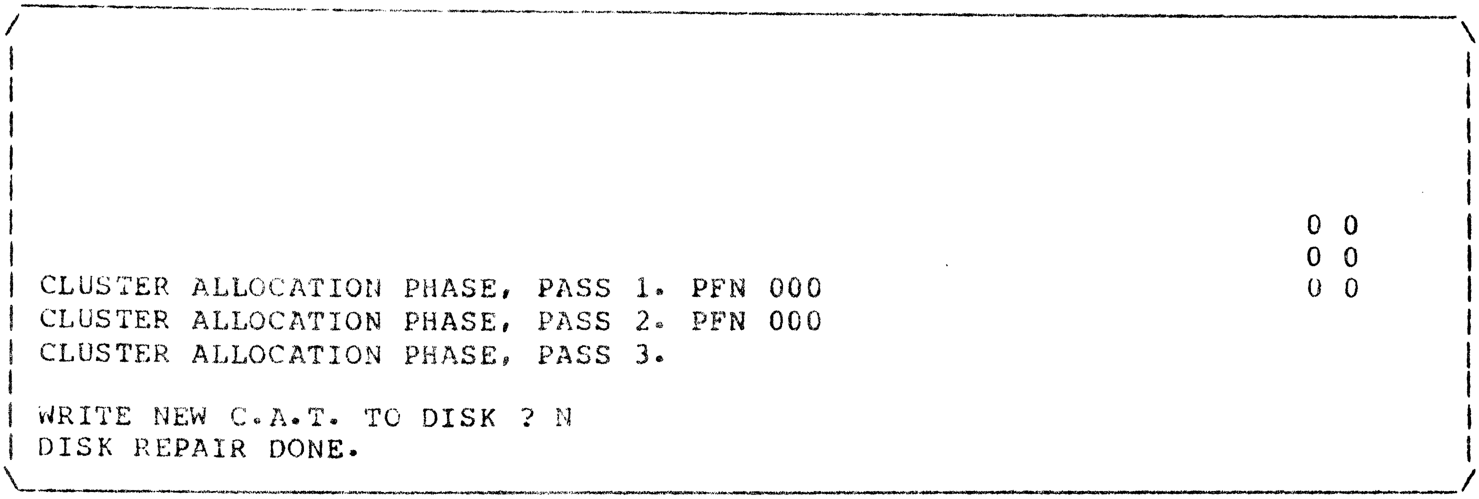
To delete the files in error enter "3".

4.13 Cluster Allocation Table Replacement.

```
 00000 CLUSTERS IN THOSE FILES.




                                                                       0 0
                                                                       0 0
 CLUSTER ALLOCATION PHASE, PASS 1. PFN 000                             0 0
 CLUSTER ALLOCATION PHASE, PASS 2. PFN 000
 CLUSTER ALLOCATION PHASE, PASS 3.

 WRITE NEW C.A.T. TO DISK ? #
```

The message on the last line of the screen above will appear when the REPAIR program has completed all of its checks and is ready to write the regenerated C.A.T. to disk.

To overwrite the C.A.T. on disk, enter "Y". To prevent overwrite of the C.A.T. on disk, enter "N". If no errors have been discovered by the REPAIR program, the operator should enter "N".



```
                                                                            0 0
                                                                            0 0
CLUSTER ALLOCATION PHASE, PASS 1. PFN 000                                   0 0
CLUSTER ALLOCATION PHASE, PASS 2. PFN 000
CLUSTER ALLOCATION PHASE, PASS 3.

WRITE NEW C.A.T. TO DISK ? N
DISK REPAIR DONE.
```

The message on the last two lines of the screen above will appear when the REPAIR program is finished checking the disk. The REPAIR program does not attempt to re-load the DOS when it is finished. To get any other program running on the computer again, the operator must press the RESTART key.

No operator response is required.

5. MEDIAL OPERATOR INTERFACE

This section of the USER'S GUIDE is a comprehensive discussion of the various messages and options provided by the REPAIR program, and is for users who want to take advantage of the file-saving options available with REPAIR. To use this section of the USER'S GUIDE will require an understanding of the error(s) that REPAIR finds and that the user wishes to repair. For example, if the only errors on the user's pack are in the DIRECTORY, it is not necessary for the user to study in order to understand RETRIEVAL INFORMATION BLOCKS or CLUSTER ALLOCATION.

This section of the USER'S GUIDE follows the section numbering scheme of the previous section, MINIMAL OPERATOR INTERFACE.

When a facet of REPAIR operation is discussed more appropriately elsewhere in the USER'S GUIDE, the discussion is not repeated in this section, but that user is referred to the section containing the discussion.

Discussions in this section of the USER'S GUIDE will occasionally refer to pictograms of the state of the display in other sections of the GUIDE.

5.1 Executing REPAIR.

If the REPAIR program is cataloged on the disk (as REPAIR/CMD), and if the DOS is capable of loading and executing it, the fastest and easiest way to get REPAIR started is by simply keying REPAIR to the DOS keyboard facility.

REPAIR may also be executed by placing a LOAD-AND-GO tape of REPAIR in the back cassette deck of the 2200 and pressing RESTART.

In either case, the pack to be checked must be placed in a drive connected to the 2200 and the LOAD/RUN switch set to RUN.

In the following examples, a pictogram of the state of the 2200 display will be given followed by a discussion of the messages and options.

NOTE THAT A POUND SIGN (#) IN ONE OF THE BOTTOM TWO LINES OF THE PICTOGRAM REPRESENTS THE CURSOR POSITION. THE CURSOR WILL BE FLASHING WHEN THE OPERATOR IS REQUIRED TO RESPOND TO THE INFORMATION ON THE SCREEN.

5.2 Sign-on and Drive Number Specification:

Refer to the pictogram in section 4.2.

After the operator has entered the number of the drive holding the pack to be REPAIRed, REPAIR will wait for that drive to come ready (yellow light comes on) before proceding to do cylinder lock-out.

5.3 Cylinder Lock-out.

APPENDIX A is a discussion with examples of the cylinder lock-out process.

Cylinders are locked out because they give read/write errors or because by system design they are to be reserved for some special use.

5.4 Directory Check Monitor:

Refer to the pictogram in section 4.4.

The DIRECTORY check monitor is the means by which REPAIR indicates its progress to the operator. Specifically, the DIRECTORY check monitor constantly displays the disk address of the current DIRECTORY entry being checked. This display is in the form of two vertically displayed octal numbers at the right of the screen. The first number is the sector, and the second number is the buffer page address, of the DIRECTORY entry being checked. Since the cylinder address is always zero, it is not displayed.

If the DIRECTORY check monitor stops and no other messages are displayed, the REPAIR program was loaded to memory improperly or something is wrong with the hardware. The operator should stop the computer immediately.

5.5 Directory Errors.

The DIRECTORY is a table of entries for files on the pack. There are two copies of the DIRECTORY, the MASTER and the COPY. There are 16 pages to each copy of the DIRECTORY, each page holds entries for up to 16 files. (One disk physical sector is one DIRECTORY logical page.) Therefore, the DIRECTORY has a MASTER and a COPY entry for up to 256 files.

The DIRECTORY MASTER is on cylinder 0 track 0 in sectors 006 thru 024. The DIRECTORY COPY is on cylinder 0 track 1 in sectors 006 thru 024.

The REPAIR program checks the DIRECTORY one file at a time. That is, the MASTER and the COPY of a DIRECTORY entry are checked at the same time.

If an error in the MASTER or the COPY entry or both is detected, REPAIR will display:

1. A brief error description at the top of the screen.
2. The MASTER and COPY entries across the lower center of the screen.
3. An option message near the bottom of the screen.

The error description will indicate whether the error is in the MASTER or the COPY entry or both, and will define the type of error.

NOTE THAT ALTHOUGH DIRECTORY ENTRIES FOR A FILE MAY HAVE SEVERAL TYPES OF ERRORS AT THE SAME TIME, REPAIR WILL DEAL WITH ONLY ONE ERROR TYPE AT A TIME.

The DIRECTORY entries are displayed under their respective headings, (MASTER: and COPY:). The first four bytes and the last byte of each entry are always displayed in vertical octal. The 5th through 15th bytes (being the file name and extension) of each entry are displayed in ASCII EXCEPT for bytes in those fields which cannot be displayed in ASCII on the 2200 display; those bytes will be converted to vertical octal.

The option message at the bottom of the screen will enable the operator, by selecting and entering a digit, to correct the MASTER entry with information from the COPY entry, to correct the COPY entry with information from the MASTER entry, to delete both entries (and thus the file), or to make specific changes to one or both entries, or to make no change at all to either entry.

Below are examples of the various DIRECTORY errors that can occur and discussions of the respective messages. The first example is the most complete; the other DIRECTORY error routines work basically the same way but the examples in this USER'S GUIDE are not as expanded.

Note that for the examples concerning the DIRECTORY MASTER, the same messages (transposing the words COPY and MASTER) apply to the DIRECTORY COPY.

5.5.1 Delete Errors:

5.5.1.1 One Entry Deleted:

```
/                                                                              \
| DIRECTORY ENTRY MASTER: DELETED                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|          M A S T E R :                           C O P Y :                   |
|                                                                              |
| 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3    0 3 3 0                        3      0 0 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    0 0 6 0                        7      0 2 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    2 6 4 1 C A T            C M D 7      6 0 |
|                                                                              |
| ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: #                         |
|                                                                              |
\______________________________________________________________________________/
```

The screen will appear as above if REPAIR finds a file for which the DIRECTORY MASTER entry is deleted (filled with 0377's) but the DIRECTORY COPY is not.

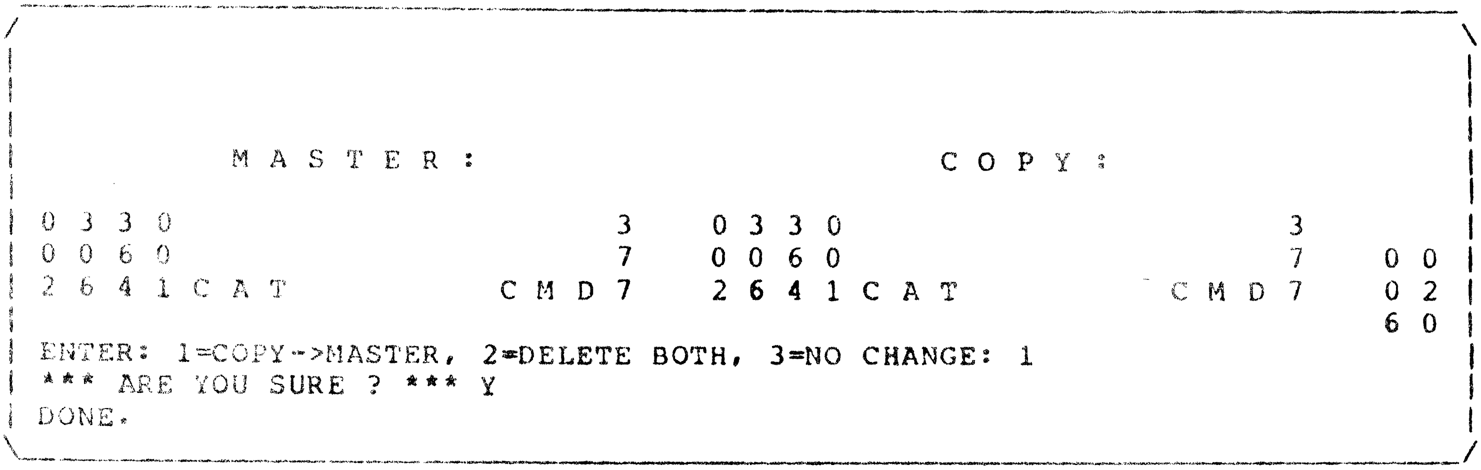
The operator has three options:

1. Enter "1" to have REPAIR copy the COPY entry to the MASTER entry, thus saving the file's name in the DIRECTORY;
2. Enter "2" to delete both entries, and thus the file;
3. Enter "3" to have REPAIR take no action on the file's entries and continue the DIRECTORY check.

```
/                                                                              \
| DIRECTORY ENTRY MASTER: DELETED                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|          M A S T E R :                           C O P Y :                   |
|                                                                              |
| 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3    0 3 3 0                        3      0 0 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    0 0 6 0                        7      0 2 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    2 6 4 1 C A T            C M D 7      6 0 |
|                                                                              |
| ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 1                         |
| *** ARE YOU SURE ? *** #                                                     |
\______________________________________________________________________________/
```

The message on the last line of the screen above will appear when the operator has selected and entered one of the digits given in the option message. REPAIR will always make sure the operator entered what he intended to before proceeding to carry out the operation.

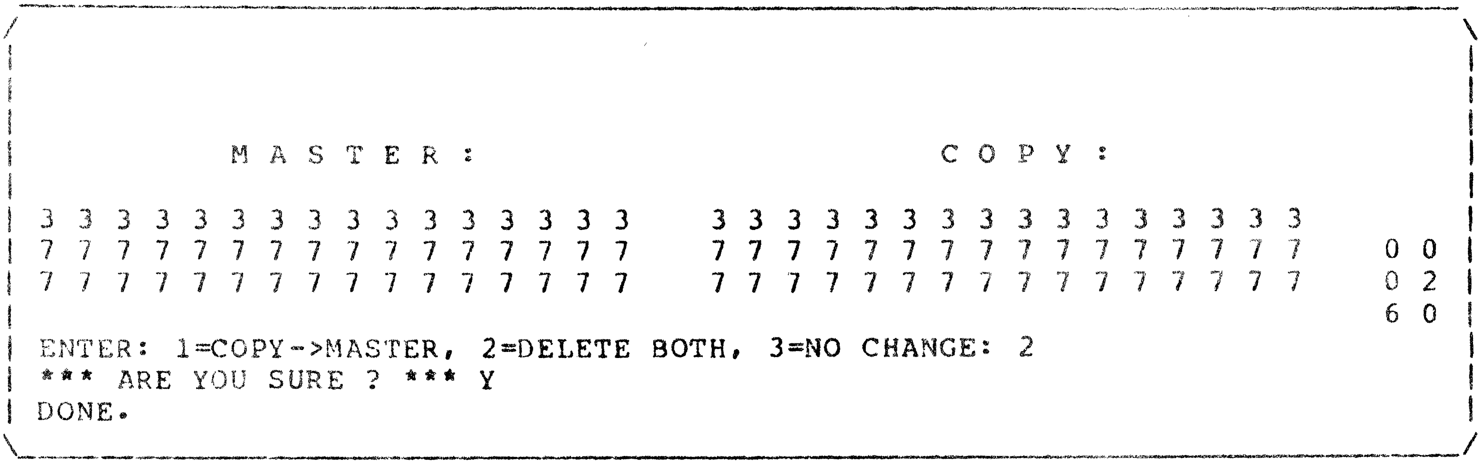
To carry out the operation selected enter "Y". If "N" is entered the option message will be re-displayed.



```
        M A S T E R :                                   C O P Y :

0 3 3 0                            3    0 3 3 0                            3
0 0 6 0                            7    0 0 6 0                            7     0 0
2 6 4 1 C A T                C M D 7    2 6 4 1 C A T                C M D 7     0 2
                                                                                 6 0
ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 1
*** ARE YOU SURE ? *** Y
DONE.
```

The screen will appear as above if the operator has replied "1" to the message above and replied "Y" to the message "*** ARE YOU SURE ? ***". When REPAIR makes any change to DIRECTORY entries, both entries are re-displayed to show the operator the results of the change, and the message: "DONE." is displayed at the bottom of the screen.

No further operator response is required.



```
        M A S T E R :                                   C O P Y :

3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3    3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7     0 0
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7     0 2
                                                                       6 0
ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 2
*** ARE YOU SURE ? *** Y
DONE.
```

The screen will appear as above if the operator has replied "2" to the message above and replied "Y" to the message "*** ARE YOU SURE ? ***". When REPAIR deletes the entries from the DIRECTORY, the entries are re-displayed to show the operator that the delete has been accomplished, and the message: "DONE." is displayed at the bottom of the screen.

No further operator response is required.

```
 /-----------------------------------------------------------------------\
|                                                                         |
|                                                                         |
|                                                                         |
|          M A S T E R :                              C O P Y :          |
|                                                                         |
| 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3    0 3 3 0                    3   0 0 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    0 0 6 0                    7   0 2 |
| 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7    2 6 4 1 C A T        C M D 7   6 0 |
|                                                                         |
| ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 3                    |
| *** ARE YOU SURE ? *** Y                                                |
 \-----------------------------------------------------------------------/
```

The screen will appear as above if the operator has replied "3" to the message above and replied "Y" to the message "*** ARE YOU SURE ? ***". REPAIR will make no change to the entries and will resume the DIRECTORY check.

No further operator response is required.

5.5.1.2 Delete Incomplete:

```
 /-----------------------------------------------------------------------\
| DIRECTORY ENTRY MASTER: DELETE INCOMPLETE                               |
|                                                                         |
|                                                                         |
|                                                                         |
|          M A S T E R :                              C O P Y :          |
|                                                                         |
| 3 3 3 3 3 3                  3    0 3 3 0                    3   0 0 |
| 7 7 7 7 7 7                  7    0 0 6 0                    7   0 2 |
| 7 7 7 7 7 7 T          C M D 7    2 6 4 1 C A T        C M D 7   6 0 |
|                                                                         |
| ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: #                    |
|                                                                         |
 \-----------------------------------------------------------------------/
```

The screen will appear as above if REPAIR finds a file for which the DIRECTORY MASTER entry is partially deleted (partially filled with 0377's) but the DIRECTORY COPY is not.

The operator options and REPAIR actions are the same as for One entry deleted, see section 5.5.1 above.

5.5.2 R.I.B. Address Errors:

5.5.2.1 R.I.B. Address Invalid

```
DIRECTORY ENTRY MASTER: R.I.B. ADDRESS INVALID



          M A S T E R :                            C O P Y :

0 3 3 0                      3   0 3 3 0                      3    0 0
0 0 6 0                      7   0 0 6 0                      7    0 2
0 6 4 1 C A T          C M D 7   2 6 4 1 C A T          C M D 7    6 0

ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: #
```

The screen will appear as above if REPAIR finds a DIRECTORY MASTER entry with an invalid R.I.B. address.

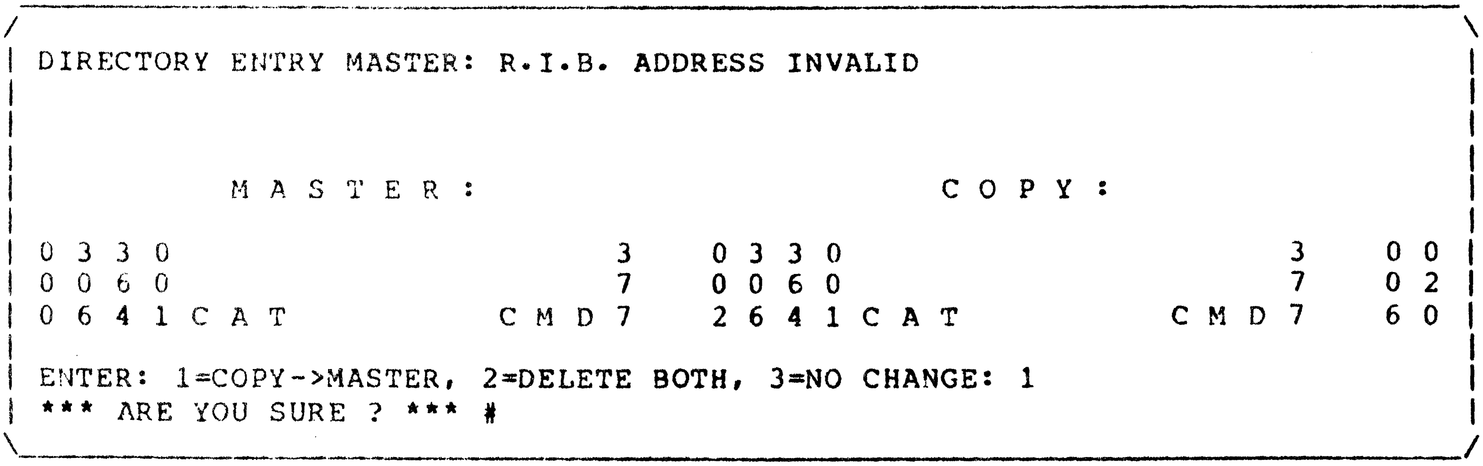
In this example, the R.I.B. address of the DIRECTORY MASTER (the area in the box) is invalid because the cylinder address is 000.

The R.I.B. address is the first byte and the bottom two digits of the second byte of a DIRECTORY entry. The first byte is the cylinder address and to be valid must be an octal number in the range 001 thru 202 inclusive. The bottom two digits of the second byte define the sector address and to be valid must be one of the following:

00, 06, 14, 22, 40, 46, 54, 62

The operator has three options:

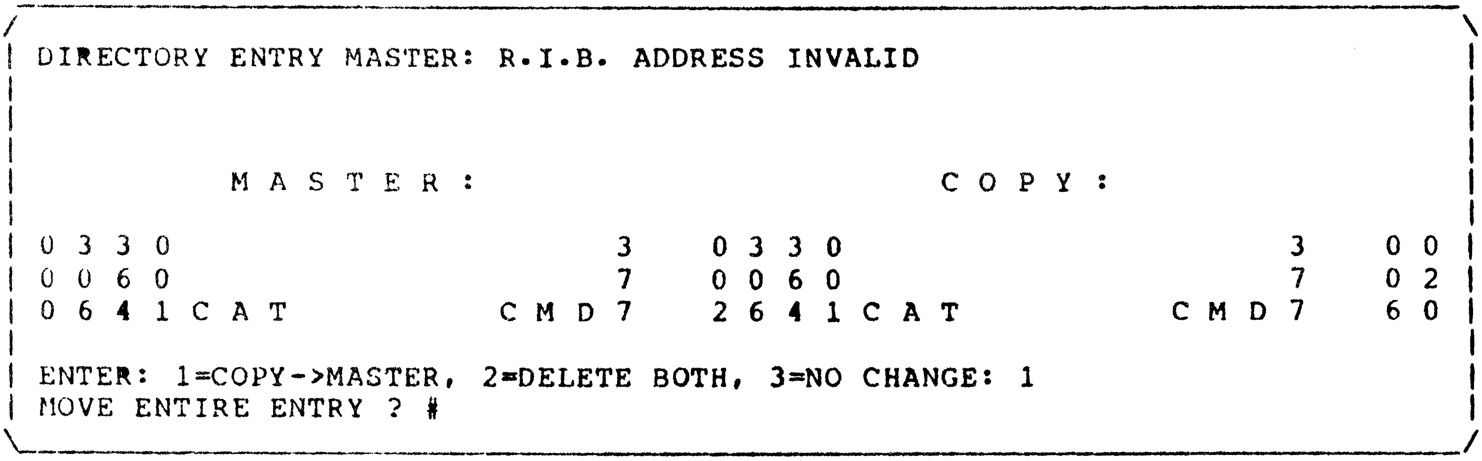
1. Enter "1" to have REPAIR copy the COPY entry R.I.B. address to the MASTER entry R.I.B. address;
2. Enter "2" to delete both entries, and thus the file;
3. Enter "3" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.



```
 DIRECTORY ENTRY MASTER: R.I.B. ADDRESS INVALID



         M A S T E R :                        C O P Y :

 0 3 3 0                    3    0 3 3 0                    3    0 0
 0 0 6 0                    7    0 0 6 0                    7    0 2
 0 6 4 1 C A T        C M D 7    2 6 4 1 C A T        C M D 7    6 0

 ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 1
 *** ARE YOU SURE ? *** #
```

The message on the last line of the screen above will appear if the operator has replied "1" to the message above.

To carry out the operation selected enter "Y".



```
 DIRECTORY ENTRY MASTER: R.I.B. ADDRESS INVALID



         M A S T E R :                        C O P Y :

 0 3 3 0                    3    0 3 3 0                    3    0 0
 0 0 6 0                    7    0 0 6 0                    7    0 2
 0 6 4 1 C A T        C M D 7    2 6 4 1 C A T        C M D 7    6 0

 ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: 1
 MOVE ENTIRE ENTRY ? #
```

The message on the last line of the screen above will appear if the operator replied "Y" to the message "*** ARE YOU SURE ? ***".

Enter "N" to have REPAIR copy ONLY the R.I.B. address from the COPY entry to the MASTER entry. Enter "Y" to have REPAIR copy the entire COPY entry to the MASTER entry.

The "MOVE ENTIRE ENTRY ?" option is given to enable the operator to correct many types of errors in an erroneous entry at one time, rather than correct each error as it is found. If the operator can recognize a severely destroyed entry the first time he sees it, this option can enable him to REPAIR the DIRECTORY more quickly.

5.5.2.2 R.I.B. Addresses Not Equal:

```
DIRECTORY ENTRY MASTER & COPY: R.I.B. ADDRESSES NOT EQUAL



          M A S T E R :                            C O P Y :

0 3 3 0                      3  0 3 3 0                      3   0 0
0 0 6 0                      7  0 0 6 0                      7   0 2
2 6 4 1 C A T          C M D 7  3 6 4 1 C A T          C M D 7   6 0

ENTER: 1=MASTER->COPY, 2=COPY->MASTER, 3=DELETE BOTH, 4=NO CHANGE: #

```

The screen will appear as above if REPAIR finds a file with DIRECTORY entries with R.I.B. address that are both valid but not equal.

In this example, the R.I.B. address in the MASTER is 002,06 and in the COPY is 003,06.

The operator has four options:

1. Enter "1" to have REPAIR copy the MASTER entry R.I.B. address to the COPY entry R.I.B. address;
2. Enter "2" to have REPAIR copy the COPY entry R.I.B. address to the MASTER entry R.I.B. address;
3. Enter "3" to have REPAIR delete both entries, and thus the file;
4. Enter "4" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.

If it is not obvious by visual inspection of the DIRECTORY entries which is in error, the operator should note the R.I.B. address as given by each DIRECTORY entry, and enter "4". If REPIAR later discovers PFN and LRN errors in the actual R.I.B.s for the file (see section 5.8), then the operator can be fairly sure the DIRECTORY MASTER entry for the file is in error, since only the DIRECTORY MASTER entry is used to determine the R.I.B. address of a file for the R.I.B. check phase of REPAIR.

If the operator wants to make very sure which, if either, of the DIRECTORY entries is correct, he can use the DISK DUMP program to look at the file after REPAIR has finished execution (see section 6.5).

When it is determined which DIRECTORY entry for the file has the correct R.I.B. address, the operator can execute REPAIR again, this time entering "1" or "2" as appropriate to correct the erroneous DIRECTORY entry.

If neither entry is correct, and it would be easier to modify the DIRECTORY entries for the file than to delete them and re-create the file, refer to section 6.5.

5.5.3 FILE Protection Not Same:

```
/                                                                          \
| DIRECTORY ENTRY MASTER & COPY: FILE PROTECTION NOT SAME                  |
|                                                                          |
| ENTRY MASTER: WRITE PROTECTION                                           |
|   ENTRY COPY: NO PROTECTION                                              |
|         M A S T E R :                   C O P Y :                        |
|                                                                          |
| 0 3 3 0                    3   0 0 3 0                     3    0 0     |
| 0 0 6 0                    7   0 0 6 0                     7    0 2     |
| 2 6 4 1 C A T        C M D 7   2 6 4 1 C A T         C M D 7    6 0     |
|                                                                          |
| ENTER:1=DELETE ENTRIES,2=NO CHANGE;PROTECTION: 3=NONE,4=DELETE,5=WRITE: # |
|                                                                          |
\__________________________________________________________________________/
```

The screen will appear as above if REPAIR finds a file with DIRECTORY entries with protection not the same.

In this example, the DIRECTORY MASTER entry has WRITE protection indicated for the file, while the DIRECTORY COPY entry has no protection indicated for the file. Note: where the bits for both WRITE and DELETE protection are set, WRITE protection has precedence, since WRITE protection implies DELETE protection.

The protection indication is in the top two bits (top digit) of the second byte of a DIRECTORY entry. If the top bit is set on (the digit is 2) then the DIRECTORY entry indicates that the file is DELETE protected. If the bottom bit is set on (the digit is 1 or 3) then the DIRECTORY entry indicates that the file is WRITE protected. If neither of the top bits is set on (the digit is 0) then the DIRECTORY entry indicates NO protection for the file, that is, that the file is unprotected.

The operator has five options:

1. Enter "1" to have REPAIR delete both entries, and thus the file;
2. Enter "2" to have REPAIR take no action on the file's entries and resume the DIRECTORY check;
3. Enter "3" to have REPAIR set both entries to indicate NO protection;
4. Enter "4" to have REPAIR set both entries to indicate DELETE protection;
5. Enter "5" to have REPAIR set both entries to indicate WRITE protection.

5.5.4 Length Limit Errors:

5.5.4.1 Length Limit Invalid:

```
 ------------------------------------------------------------------------------
/                                                                              \
| DIRECTORY ENTRY MASTER: LENGTH LIMIT INVALID                                 |
|                                                                              |
|                                                                              |
|                                                                              |
|          M A S T E R :                              C O P Y :               |
|                                                                              |
| 0 3 3 3                    3   0 3 3 0                          3    0 0    |
| 0 0 7 7                    7   0 0 6 0                          7    0 2    |
| 2 6 7 7 C A T        C M D 7   2 6 4 1 C A T             C M D 7    6 0    |
|                                                                              |
| ENTER: 1=COPY->MASTER, 2=DELETE BOTH, 3=NO CHANGE: #                         |
|                                                                              |
\______________________________________________________________________________/
```

The screen will appear as above if REPAIR finds a DIRECTORY MASTER entry with an invalid length limit.

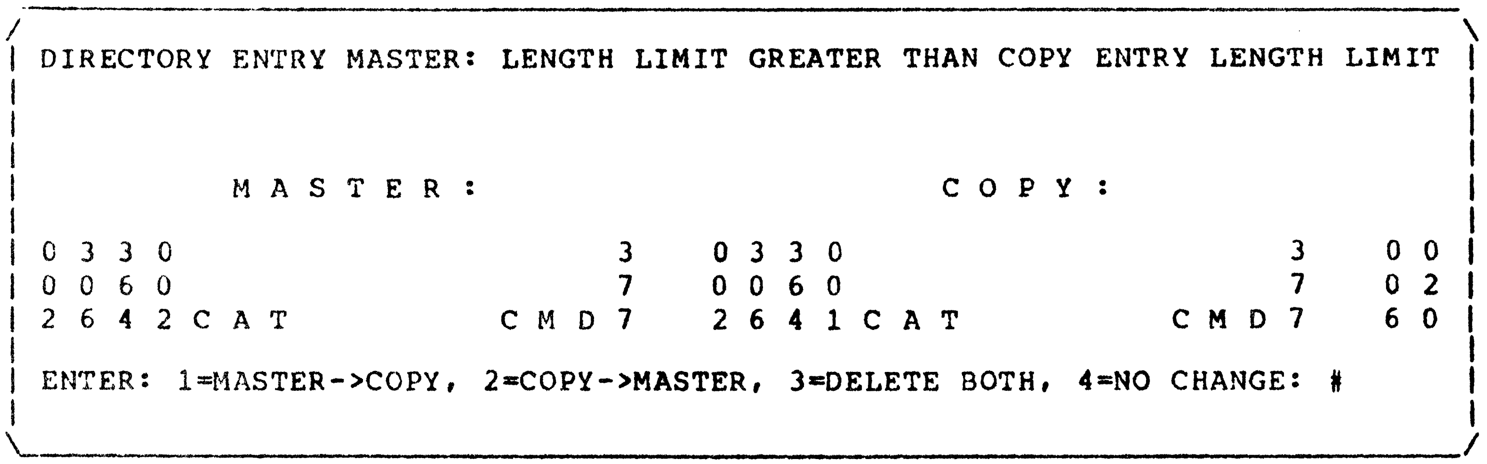
The LENGTH LIMIT of a DIRECTORY entry is the contents of the third and fourth bytes of the entry. The third byte is the least significant portion, and the fourth byte is the most significant portion of a 16-bit number.

The LENGTH LIMIT of a DIRECTORY entry is invalid if it exceeds the maximum number of user-available physical records (sectors) on the pack, which is 9,696 records. In two-byte octal, 9,696 is (LSP) 341 (MSP) 045.

The operator has three options:

1. Enter "1" to have REPAIR copy the COPY entry LENGTH LIMIT to the MASTER entry LENGTH LIMIT.
2. Enter "2" to have REPAIR delete both entries, and thus the file;
3. Enter "3" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.

5.5.4.2 Length Limits Not Equal:



```
DIRECTORY ENTRY MASTER: LENGTH LIMIT GREATER THAN COPY ENTRY LENGTH LIMIT



          M A S T E R :                                C O P Y :

0 3 3 0                       3    0 3 3 0                           3    0 0
0 0 6 0                       7    0 0 6 0                           7    0 2
2 6 4 2 C A T           C M D 7    2 6 4 1 C A T               C M D 7    6 0

ENTER: 1=MASTER->COPY, 2=COPY->MASTER, 3=DELETE BOTH, 4=NO CHANGE: #
```

The screen will appear as above if REPAIR finds a file with a DIRECTORY MASTER entry with a LENGTH LIMIT that is greater than the DIRECTORY COPY entry LENGTH LIMIT.

In this example, the LENGTH LIMIT in the MASTER is (MSP,LSP) 002 364, and in the COPY is (MSP,LSP) 001 364.

The operator has four options:

1. Enter "1" to have REPAIR copy the MASTER entry LENGTH LIMIT to the COPY entry LENGTH LIMIT;
2. Enter "2" to have REPAIR copy the COPY entry LENGTH LIMIT to the MASTER entry LENGTH LIMIT;
3. Enter "3" to have REPAIR delete both entries, and thus the file;
4. Enter "4" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.

5.5.5 Name-Extension Not Equal:

```
 ______________________________________________________________________
/                                                                      \
| DIRECTORY ENTRY MASTER & COPY: NAME-EXTENSION NOT EQUAL              |
|                                                                      |
|                                                                      |
|                                                                      |
|         M A S T E R :                      C O P Y :                 |
|                                                                      |
| 0 3 3 0                   3   0 3 3 0                   3    0 0    |
| 0 0 6 0                   7   0 0 6 0                   7    0 2    |
| 2 6 4 1 C A T X X X X X C M D 7   2 6 4 1 C A T           C M D 7    6 0    |
|                                                                      |
| ENTER: 1=MASTER->COPY, 2=COPY->MASTER, 3=DELETE BOTH, 4=NO CHANGE: # |
|                                                                      |
\______________________________________________________________________/
```

The screen will appear as above if REPAIR finds a file with DIRECTORY entries that do not have the same NAME/EXTENSION.

The NAME/EXTENSION of a DIRECTORY entry is located in bytes 5 through 15 inclusively. The NAME/EXTENSION of a DIRECTORY entry (and the file) is the normal means by which the file is identified and manipulated, especially from the DOS keyboard facility.

Note that REPAIR does not seek or identify as erroneous files with NAME/EXTENSIONS that contain non-ASCII characters, since by DOS rules non-ASCII characters are perfectly legal in the NAME/EXTENSION field.

The operator has four options:

1. Enter "1" to have REPAIR copy the MASTER entry NAME/EXTENSION to the COPY entry NAME/EXTENSION;
2. Enter "2" to have REPAIR copy the COPY entry NAME/EXTENSION to the MASTER entry NAME/EXTENSION;
3. Enter "3" to have REPAIR delete both entries, and thus the file;
4. Enter "4" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.

5.5.6. Last Byte Not 0377:

```
 -----------------------------------------------------------------------------
/                                                                              \
| DIRECTORY ENTRY MASTER: LAST BYTE NOT 0377                                    |
|                                                                               |
|                                                                               |
|          M A S T E R :                                 C O P Y :              |
|                                                                               |
| 0 3 3 0                               0     0 3 3 0                    3    0 0 |
| 0 0 6 0                               0     0 0 6 0                    7    0 2 |
| 2 6 4 1 C A T                   C M D 0     2 6 4 1 C A T        C M D 7    6 0 |
|                                                                               |
| ENTER: 1=COPY->MASTER, 2=SET BOTH 0377, 3=DELETE BOTH, 4=NO CHANGE #          |
|                                                                               |
\______________________________________________________________________________/
```

The screen will appear as above if REPAIR finds a DIRECTORY MASTER entry with a last byte that is not 0377.

In this example, the last byte of the DIRECTORY MASTER entry is 000.

The last byte of a DIRECTORY entry is not used by DOS 1.1 or 1.2 and should always be 377 for packs used only by these versions of the DOS.

The operator has three options:

1. Enter "1" to have REPAIR copy the COPY entry last byte to the MASTER entry last byte;
2. Enter "2" to have REPAIR set the last byte of both entries to 0377;
3. Enter "3" to have REPAIR delete both entries, and thus the file;
4. Enter "4" to have REPAIR take no action on the file's entries and resume the DIRECTORY check.

5.6 Retrieval Information Blocks check.

```
 ------------------------------------------------------------------------------
/                                                                              \
|          RIB MASTER:             (PFN 000)         RIB COPY:                 |
|                                       *                                      |
|                                       *                                      |
|                                       *                                      |
|                                       *                                      |
|                                       *                                      |
|                                       *                             0 0      |
|                                                                     0 0      |
|                                                                     0 0      |
|                                                                              |
|                                                                              |
|                                                                              |
\------------------------------------------------------------------------------/
```

The screen appears as above during the Retreival Information Blocks check.

The REPAIR program checks Retrieval Information Blocks (R.I.B.´s) for all files in the DIRECTORY with a valid R.I.B. address, in the order of the files' occurence in the DIRECTORY. The three-digit octal number after "PFN" in the top line will indicate the actual Physical File Number currently being checked. The two vertically-displayed octal numbers at the right of the screen provide the same information as the DIRECTORY check monitor described in section 5.4.

There are two R.I.B.´s for each file, a MASTER and a COPY. The R.I.B. MASTER is the very first record in the file and the R.I.B. COPY is the second record in the file. Each R.I.B. uses one full physical disk record. Refer to the DOS SYSTEM MANUAL, section 3.1, for a description of the structure of the R.I.B.s.

If REPAIR detects any errors in the R.I.B. MASTER, a message describing the class of error will be displayed in the portion of the screen under the heading "R.I.B. MASTER:". If REPAIR detects any errors in the R.I.B. COPY, a message will be displayed in the portion of the screen under the heading "R.I.B. COPY:".

The PFN indicator and the cycle monitor numbers are incremented and displayed for each entry in the DIRECTORY. The column of asterisks is displayed only while the R.I.B.´s for a file are actually being checked.

5.7 Retrieval Information Blocks errors:

```
 ____________________________________________________________________________
/                                                                            \
|        RIB MASTER:                (PFN 000)           RIB COPY:            |
| PFN ERROR                 LRN ERROR   * PFN ERROR                LRN ERROR |
| 4TH BYTE NOT 0377                     * 4TH BYTE NOT 0377                  |
| 1ST SEG.DES. ERROR                    * 1ST SEG.DES. ERROR                 |
| MULTIPLE ALLOCATION 00001             * MULTIPLE ALLOCATION 00001          |
| CYL.ADR.OVERFLOW          CYL.ERROR   * CYL.ADR.OVERFLOW           CYL.ERROR |
| RIB TERMINATOR ERROR                  * RIB TERMINATOR ERROR               |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
\____________________________________________________________________________/
```

The screen will appear as above if REPAIR finds errors in the R.I.B. MASTER or COPY for a file. Note that all of the messages given in the example above will not necessarily appear. The pictogram above shows the screen as it would appear while the R.I.B. check was in progress. The next pictogram shows the state of the screen when the R.I.B. check has finished and has displayed the file's DIRECTORY MASTER entry and is ready for operator response.

Below is a discussion of each of the messages in the screen above. In the above pictogram all possible messages are shown in their respective positions for both the R.I.B. MASTER and the R.I.B. COPY. Note that since the R.I.B. MASTER and COPY have the same formats, (indeed, normally they are exact duplicates of each other, except for their Logical Record Number [LRN]) they can have the same errors.

There are two types of errors that a R.I.B. may have: simple and complex. If REPAIR finds only one simple error in only one of the R.I.B.'s then the operator will be given the option of having REPAIR correct the error. If multiple simple errors or any complex errors are detected then the errors are too serious for REPAIR to cope with and will only give the operator a choice between deleting the file or making no change at all. However, even with multiple or complex errors the file may be saveable; refer to section 6.7.

PFN ERROR

This message is displayed if the first byte of the R.I.B. is not the file's Physical File Number (PFN). This is a simple error and is correctable under the conditions given above.

LRN ERROR

This message is displayed for the R.I.B. MASTER if the Logical Record Number (LRN) is not zero, and for the R.I.B. COPY if the LRN is not one. This is a simple error and is correctable under the conditions given above.

4TH BYTE NOT 0377

This message is displayed if the 4th byte of the R.I.B. is not 0377. When the DOS object code loader loads a program into memory it skips over disk records with a 0377 in the 4th byte: since the R.I.B.'s of a file are not part of the object code of a file their fourth byte should always be 0377 so the loader will not attempt to load them to memory. This is a simple error and is correctable under the conditions given above.

1ST SEG.DES. ERROR

Expanded: First Segment Descriptor Error. This message is displayed if the first segment descriptor of the R.I.B. does not point to itself. Since the R.I.B.'s are the first two records in any file, they will always be in the first cluster. The first segment descriptor must point to the beginning of the file, which is the cluster where the R.I.B.'s are.

MULTIPLE ALLOCATION 00001

This message is displayed if REPAIR discovers that, according to the R.I.B.'s SEGMENT DESCRIPTORS, two or more SEGMENTS of the file overlap. Specifically, SEGMENT DESCRIPTORS identify CLUSTERS on the disk which belong to the given file. If one or more of these CLUSTERS is indicated as belonging to more than one SEGMENT, then there is MULTIPLE ALLOCATION of CLUSTERS. The five digit octal number indicates how many CLUSTERS are multiply allocated.

CYL.ADR.OVERFLOW

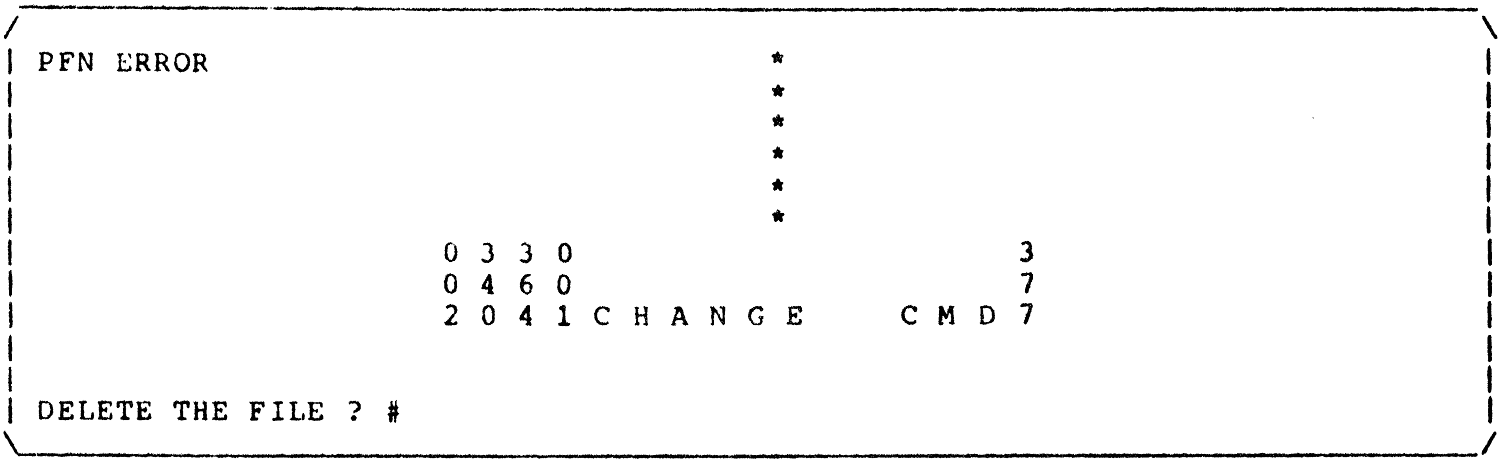
This message is displayed if REPAIR discovers a SEGMENT DESCRIPTOR which indicates that a SEGMENT overruns the physical end of the disk. Of course, it is not actually possible for a file to extend beyond the upper limit of the disk space, but it is possible for a SEGMENT DESCRIPTOR to erroneously indicate this. For example, a SEGMENT DESCRIPTOR might say, in effect: "This SEGMENT begins at the last CLUSTER on the disk and extends for ten CLUSTERS."

CYL.ERROR

This message is displayed if REPAIR discovers a SEGMENT DESCRIPTOR with a cylinder address that is either 0 (always reserved for the CLUSTER ALLOCATION TABLE and the DIRECRTORY) or greater than 202 (the last cylinder on a disk).

RIB TERMINATOR ERROR

This message is displayed if REPAIR discovers a R.I.B. that has an incorrect terminator. The logical end of a R.I.B. is indicated by either the actual physical end of the disk record or a pair of 0377's. A 0377 in the first byte of a SEGMENT DESCRIPTOR but a non-0377 in the second byte defines a TERMINATOR ERROR.



```
PFN ERROR                                    *
                                             *
                                             *
                                             *
                                             *
                                             *
                          0 3 3 0                        3
                          0 4 6 0                        7
                          2 0 4 1 C H A N G E      C M D 7


DELETE THE FILE ? #
```

The screen will appear as above when REPAIR has completed the R.I.B. check for a file whose R.I.B.s had only one simple error. Note that the screen is rolled up one line so that the heading containing the PFN is no longer displayed. However, the DIRECTORY MASTER entry for the file, (containing the NAME/EXTENSION for the file) is displayed under the error message area.

To simply have REPAIR delete the file enter "Y". To attempt to save the file enter "N".

```
 ------------------------------------------------------------------------------
/                                                                              \
|                                          *                                   |
|                                          *                                   |
|                                          *                                   |
|                                          *                                   |
|                                          *                                   |
|                          0 3 3 0                     3                       |
|                          0 4 6 0                     7                       |
|                          2 0 4 1 C H A N G E     C M D 7                     |
|                                                                              |
|                                                                              |
| DELETE THE FILE ? N                                                          |
| WRITE CORRECTION TO DISK ? #                                                 |
\______________________________________________________________________________/
```

The message on the last line of the screen above will appear if the operator replied "N" to the message above.

Enter "Y" to have REPAIR write the correct R.I.B. information to the R.I.B. in error and resume the R.I.B. check.

```
 ------------------------------------------------------------------------------
/                                                                              \
|                                        *                                     |
|                                        *                                     |
|                                        *                                     |
|                                        *                                     |
|                          0 3 3 0                    3                        |
|                          0 0 6 0                    7                        |
|                          2 0 4 1 C H A N G E    C M D 7                      |
|                                                                              |
|                                                                              |
| DELETE THE FILE ? N                                                          |
| WRITE CORRECTION TO DISK ? N                                                 |
| FILE SPACE WILL NOT BE ALLOCATED.#                                           |
\______________________________________________________________________________/
```

The message on the last line of the screen above will appear if the operator replied "N" to the message above. REPAIR will not allocate space to a file if there is any uncorrectable error in either of the R.I.B.'s.

REPAIR will wait until the operator depresses the ENTER key before resuming the R.I.B. check.

```
 ____________________________________________________________________________
/                                                                            \
|                                       *                                    |
|                                       *                                    |
|                                       *                                    |
|                                       *                                    |
|                                       *                                    |
|                         0 3 3 0                     3                       |
|                         0 0 6 0                     7                       |
|                         2 0 4 1 C H A N G E   C M D 7                       |
|                                                                            |
|                                                                            |
| RIBS' SEGMENT DESCRIPTORS NOT EQUAL.                                       |
| DELETE THE FILE ? #                                                        |
\____________________________________________________________________________/
```

The messages on the last two lines of the screen above will appear if the R.I.B. MASTER and COPY for a file individually have no format errors but do not describe the same segments for the file.

Enter "Y" to have REPAIR delete the file from the DIRECTORY. Enter "N" to have REPAIR make no change to the file and resume the R.I.B. check.

NOTE that whether or not the file is deleted, REPAIR will not allocate any space on disk for the file. Refer to the pictogram and discussion above.

5.8 <u>End of R.I.B. Check:</u>

Refer to the pictogram in section 4.8.

When all of the R.I.B.s for all of the files on the disk have been checked, REPAIR will count the number of files with uncorrected R.I.B. format errors and the number of files with no R.I.B. format errors and will display the counts on the screen. The files that do have R.I.B. format errors will not be allocated space on disk and will not be processed in the CLUSTER ALLOCATION PHASE (below).

5.9 <u>Cluster Allocation Phase, Pass 1.</u>

Refer to the pictogram in section 4.9.

The CLUSTER ALLOCATION PHASE of REPAIR re-constructs in memory the C.A.T. from the information in the R.I.B.s of files that have no R.I.B. format errors. The CLUSTER ALLOCATION PHASE consists of three passes. The first pass makes one pass through all the files on the pack with no R.I.B. format errors and builds in memory two C.A.T.'s: one for all files that have no space (cluster allocation) conflicts with other files and a second for files which do have cluster allocation conflicts.

5.10 Cluster Allocation Phase, Pass 2.

Refer to the pictogram in section 4.10.

The second pass of the CLUSTER ALLOCATION PHASE makes another pass through all the files allocated to the first C.A.T. and finds any that may have conflicts with space allocated to the second C.A.T., and removes those files' space allocation from the first C.A.T. and allocates their space to the second C.A.T.

5.11 <Cluster Allocation Phase, PASS 3.

Refer to the pictogram in section 4.11

The third pass of the CLUSTER ALLOCATION PHASE does an analysis on any two files with disk space (cluster allocation) conflicts with each other and displays the results of the analysis on the screen (see section 5.12 below). If no files have cluster allocation conflicts REPAIR displays the CLUSTER ALLOCATION TABLE REPLACEMENT message (see section 5.13 below).

5.12 Cluster Allocation Conflicts:

```
 ------------------------------------------------------------------------------
/                                                                              \
| PFN 200                                    PFN 220                            |
|  0 0 3 0                          3         0 0 3 0                        3  |
|  0 0 6 0                          7         0 0 6 0                        7  |
|  3 0 4 1 S I N              C M D 7         3 6 4 1 S O U T          C M D 7  |
| # OF CLUSTERS IN FILE: 00001               # OF CLUSTERS IN FILE: 00002       |
| # OF CONFLICTING FILES: 002                CONFLICTING FILE # 001             |
| # OF CONFLICTING CLUSTERS: 00001           # OF CONFLICTING CLUSTERS: 00001   |
| # OF CORRECT PFN/LRN: 00004 OF 00006       # OF CORRECT PFN/LRN: 00000 OF 00006 |
|                                                                               |
|                                                                               |
| ENTER: DELETE FILE: 1=LEFT, 2=RIGHT, 3=BOTH; 4=NO CHANGE: #                   |
|                                                                               |
\______________________________________________________________________________/
```

The screen appears as above (in general, specific words will vary) if REPAIR finds two files with cluster allocation conflicts - that is, if two files have according to their respective R.I.B.'s been allocated in whole or in part, the same clusters on disk.

The possible combinations of file cluster allocation conflicts are myriad. One file may have conflicts with only one other file. One file may have conflicts with many other files. Many files may have conflicts with many files in different combinations of numbers.

REPAIR handles any possible combination of files with cluster allocation conflicts by dealing with only two files at a time. As in the above example, the DIRECTORY MASTER entry (and some additional information) for a file is dispalyed on the left of the screen, and the DIRECTORY MASTER entry (and some additional information) for a file that has cluster allocation conflicts with it is displayed on the right of the screen.

As long as the file on the left of the screen is not deleted, all of the files that have cluster allocation conflicts with it will be displayed in turn on the right of the screen. When all of the cluster allocation conflicts with the file on the left of the screen have been dealt with, then the next file with cluster allocation conflicts will be displayed on the left of the screen, and all files that have cluster allocation conflicts with it will be displayed in turn on the right of the screen, and so on until all files that have cluster allocation conflicts have been dealt with.

The information displayed for the two files having cluster allocation conflicts is to guide the operator in deciding among the four options given by REPAIR. For explanation of the messages see section 5.13.1 following.

The REPAIR program corrects a cluster allocation conflict by deleting one of the files invloved. If many files are involved in cluster allocation conflicts, then the operator will probably want to enter "4" after each display so that he can accumulate the information necessary to decide which files should be deleted and which should be retained (that is, REPAIR will be executed twice, once to gather all the information about cluster allocation conflicts and once to actually delete files).

Specifically, the operator has four options:

1. Enter "1" to have REPAIR delete the file indicated on the left of the screen;
2. Enter "2" to have REPAIR delete the file indicated on the right of the screen;
3. Enter "3" to have REPAIR delete both of the files;
4. Enter "4" to have REPAIR take no action on either of the files and resume the CLUSTER ALLOCATION PHASE, PASS 3.

5.12.1. Cluster Allocation Phase, Pass 3; Messages

The explanations below describe the information given in the respective messages and how the operator can interpret the information.

5.12.1.1 Left Side of Screen

PFN 000

This message gives the PHYSICAL FILE NUMBER of the file whose DIRECTORY MASTER entry is displayed immediately below it.

The PFN is a means of identifying the file besides the NAME/EXTENSION given in the DIRECTORY entry. Additionally, the PFN of a file tells the file's relative location in the DIRECTORY (refer to the DOS SYSTEM MANUAL, section 3.1, discussion of the DIRECTORY). This information can be useful, especially with a relatively new pack, in indicating which files are older and which are newer.

DIRECTORY MASTER entry

The DIRECTORY entry for a file provides the fundamental means of identifying the file on the disk. The DIRECTORY entry contains information as follows:

The physical disk address of the beginning of the file is given in the first byte and the lower two digits of the second byte. The first byte is the cylinder address and the lower two digits of the second byte is the track/sector address. Since the R.I.B.'s are the first two records in the file, this address points to the file's R.I.B.'s.

The PROTECTION of the file is given in the top digit of the second byte. 1 or 3 = write protection; 2 = delete protection; 0 = no protection.

The LOGICAL RECORD NUMBER LIMIT is given in the third (LSP) and fourth (MSP) byte of the file, as a 16-bit binary number.

The NAME/EXTENSION of the file is given in the 5th through 12th byte and the 13th through 15th byte respectively.

The last byte of the DIRECTORY entry is not used by DOS 1.1 or 1.2 and should always be 377 for packs used only by those versions of DOS.

OF CLUSTERS IN FILE: 00000

This message gives the number of clusters in the file as a 5-digit octal number.

Besides giving the operator an indication of the size of the file, it can be compared to the number of clusters in the file involved in cluster allocation conflicts (below), to give a relative indication of what percent of the file may be in error.

OF CONFLICTING FILES: 000

This message gives the number of files (in octal) that conflict with the file displayed on the left of the screen.

If the number is very large, and the file not very important to the operator, then the operator may decide to delete the file rather than look at all of the files that have cluster allocation conflicts with it.

OF CONFLICTING CLUSTERS: 00000

This message gives the number (in octal) of clusters that are in conflict for the entire file. If the file has conflicts with many files then this number will almost always be larger than the corresponding number on the right side of the display.

The number of conflicting clusters for a file can give the operator a quantitative indication of possible damage to the file.

OF CORRECT PFN/LRN: 00000 OF 00000

This message gives the number of records in the file that have the correct DOS header information in them (being the PFN in the first byte of the physical record and the LRN in the second and third bytes of the record) for the clusters that are in conflict with other files, and the number of records in the clusters that are in conflict. Both of the numbers are in octal.

If a record in a contested cluster does not have the correct PFN/LRN information, then it has probably been overwritten by a record of a file that also claims the cluster.

This message gives the operator an indication of actual damage to the file. If the number of correct PFN/LRN is high, then there is little damage to the file and the R.I.B. for the file is probably correct. If the number of correct PFN/LRN is very low, then the file has probably been overwritten by another file and/or the file's R.I.B. is incorrect.

5.12.1.2 Right Side of Screen

PFN 000

Same as for left side of screen.

DIRECTORY MASTER entry

Same as for left side of screen.

OF CLUSTERS IN FILE: 00000

Same as for left side of screen.

CONFLICTING FILE # 000

This message provides a counter (in octal) to help the operator keep track of which file among several that he is dealing with which the file on the left of the screen has cluster allocation conflicts. This number can never exceed the # OF CONFLICTING FILES: 000 count.

OF CONFLICTING CLUSTERS: 00000

This message gives the number (in octal) of clusters that are in conflict between the files indicated on the left and right of the screen.

OF CORRECT PFN/LRN: 00000 OF 00000

This message gives the number of records in the file that have the correct DOS header information in them (PFN and LRN) for the clusters that are in conflict with the file indicated on the left of the screen, and the number of records in the clusters that are in conflict. Both of these numbers are in octal.

Refer to the discussion under this message for the left side of the screen.

5.13 Cluster Allocation Table Replacement.

Refer to the pictogram in section 4.13.

The CLUSTER ALLOCATION TABLE that will be written to disk is a combination of the C.A.T. for files that had no cluster allocation conflicts and the C.A.T. for files that had cluster allocation conflicts but that the operator did not wish to delete. The allocation for files with cluster allocation conflicts is retained so that if a new file is created it will not take space that is being used by one of the un-deleted but erroneous files, thus compounding cluster allocation conflicts.

Files that will still be listed in the DIRECTORY but <u>will not have space allocated to them</u> will be:

Files with an invalid R.I.B. address in their DIRECTORY MASTER entry;
Files with any uncorrected error in either R.I.B.

The reason disk space is not allocated to these files is that if REPAIR cannot find the R.I.B. for a file or if the R.I.B. has uncorrected errors then REPAIR has no way of knowing where the file's clusters should be located. Any files of this class are best OUTed or SOUTed to cassette (if possible) and KILLed before any new data is loaded to disk.

5.14 <u>End Of REPAIR Execution.</u>

Refer to the pictogram in section 4.14.

When the REPAIR program has finished execution it goes into a dead loop; that is, it executes a JUMP to self. This "locks up" the processor until the operator takes some specific ation, such as putting a LGO program cassette in the rear deck and depressing RESTART. REPAIR cannot assume that the DOS is loadable so it does not return to the DOS. If the auto-restart tab were punched out of the cassette in the rear deck and REPAIR executed STOP at end-of-job, then the 2200 would attempt to load and execute the cassette in the rear deck, which the operator may not wish to happen.

6. MAXIMAL OPERATOR INTERFACE.

This section of the USER'S GUIDE discusses a variety of things that can go wrong on a disk pack and how REPAIR can be used to deal with those problems. This section is for users who are interested in understanding the DOS disk data structure for its own sake, with emphasis, of course, on problems that can occur.

To use this section of the USER'S GUIDE requires that the user have a copy and understand the use of the DISK DUMP program. The ability to use the 2200 Assembler will be mandatory in some cases.

This section of the USER'S GUIDE assumes that the REPAIR program is used as an error-finding tool, and that the user, with the aid of the DISK DUMP program and special programs that he can create, can fix errors that develop on the disk. A specific example is the case of a file with bad R.I.B.'s. REPAIR can tell the operator that the file's R.I.B.'s contain errors. DISK DUMP can be used to determine the magnitude of the damage to the R.I.B.'s, and, if necessary, where the file's records actually are on disk. If necessary, the user can create a simple Assembly language program to re-create the file's R.I.B.'s on disk. Sometimes it will be less effort to re-create a file's R.I.B.'s than to re-create the file itself.

This section of the USER'S GUIDE follows the section numbering scheme of the two previous sections, MINIMAL and MEDIAL OPERATOR INTERFACE.

When a facet of REPAIR operation is discussed more appropriately elsewhere in the USER'S GUIDE, the discussion is not repeated in this section, but the user is referred to the section containing the discussion.

6.1 Executing REPAIR.

Refer to the discussion in section 5.1.

6.2 Sign-on and Drive Number Specification:

Refer to the discussion in section 5.2.

6.3 Cylinder Lock-out.

Refer to the discussion in section 5.3.

If the user is not sure whether cylinders have been locked out on a pack, or there is not a record of which cylinders were flagged or locked out, the DISK DUMP program can be used to look at the cylinders on disk.

If a cylinder has never been written to, then it will give a C.R.C. error for any sector in it. To find such cylinders, the operator needs to put the DISK DUMP program in screen mode, cylinder address mode, and increment the address through the disk. The first sector of each cylinder will be read each time the "I" key is depressed, and any cylinder not previously written to will cause the DISK DUMP program to display the C.R.C. error message and abort the screen mode.

Cylinders that have been reserved for special use can be recognized by the formatting of their sectors. Sectors that have not been used by the normal DOS routines will not have the special DOS header information in the first three bytes. The first byte is the PFN (Physical File Number) of the file, and the second and third bytes give the LRN (Logical Record Number) of the record in the file. For records that _have_ been written by the normal DOS, each block of six records will have the same first byte, and the second and third bytes will be incremented by one (LSP, MSP).

6.4 _Directory Check Monitor:_

Refer to the discussion in section 5.4.

If a page in the DIRECTORY has been accidentally overwritten by a record from a file, then REPAIR will find many errors in that DIRECTORY page. If while executing REPAIR the operator notices that there are quite a few errors in the DIRECTORY, he can note the DIRECTORY page address, or the actual sector address in cylinder 0, in the _DIRECTORY check monitor_ . (The left number of the DIRECTORY check monitor is the physical sector number of the DIRECTORY page.) Using DISK DUMP the operator can look at the bad DIRECTORY page(s). On very rare occasions a disk drive miss-seek may cause a record to be written in the DIRECTORY instead of in a file. If there has been damage to the C.A.T. then file space may be allocated in the DIRECTORY.

If the damage is only to one copy of the DIRECTORY (the usual case) then REPAIR can recover the DIRECTORY. However, the operator may wish to use DISK DUMP to look at the DIRECTORY to see if, by examining the data there, he can determine if an error in a user program has caused the DIRECTORY to be overwritten. Clues to such events can be gleaned by noting the first byte of the record (which would be a file PFN), for example.

6.5 _Directory Errors._

Refer to the discussion in section 5.5 and 6.4 above.

6.6 Retrieval Information Blocks Check.

Refer to the discussion in 5.6.

6.7 Retrieval Information Blocks Errors:

Refer to the discussion in 5.7.

The following discussion gives an example of how the user can go about re-constructing one or both damaged R.I.B.'s for a file. Only the case of complex errors (errors in the segment descriptors) is considered because REPAIR is capable of correcting simple errors.

Complex R.I.B. errors can come in infinetely many kinds and combinations. The REPAIR diagnostics will describe specific errors, but if the user is considering fixing a R.I.B. he must examine the R.I.B. himself and determine what is wrong with it and how to correct it. Sometimes this will involve examining records on disk and determining whether or not the records belong to the file and how they should be organized in the R.I.B.'s SEGMENT DESCRIPTORS. Because of the potential complexity of this operation, version 2.1 of REPAIR does not attempt the analysis necessary to re-construct a R.I.B. with complex errors.

6.7.1 A Simple Case:

A relatively simple-to-fix case might go like this:

1. REPAIR would find a file with simple and complex errors in the R.I.B. MASTER.

2. The user would use the DISK DUMP program to look at the R.I.B.'s and determine that the R.I.B. MASTER had somehow been completely destroyed, but the format of the R.I.B. COPY seemed to be correct.

3. Using the information in the SEGMENT DESCRIPTORS of the R.I.B. COPY, the user would determine that the COPY was correct.

4. The user would then use the DISK DUMP program CASSETTE DUMP command to dump the R.I.B. COPY to cassette, then use the DISK DUMP program CASSETTE LOAD command to load the record to the R.I.B. MASTER.

5. The user would run REPAIR again. This time REPAIR would find that the R.I.B. MASTER for the file had one simple error, namely, that the LRN was incorrect. REPAIR could correct this error.

6. The original error is thus corrected.

6.7.2 A Complex Case.

The worst case of R.I.B. damage could be corrected in the following manner:

1. REPAIR would find a file with simple and complex errors in both the R.I.B. MASTER and COPY.

2. The user would use DISK DUMP to look at the R.I.B.'s and determine that the R.I.B.'s had somehow been completely destroyed, but that the file following the R.I.B.'s was not damaged. (This can happen when a program incautiously uses DOS logical file 0.)

3. Using the MAP and DISK DUMP programs the user would locate and map all of the file's SEGMENTS on disk.

4. From the information about the file's segments, the user would re-construct the file's R.I.B.'s, and write a program to write the R.I.B.'s to disk.

5. As a check on the above, REPAIR would be run to insure that the new R.I.B.'s for the file did not indicate an allocation conflict with another file.

6. The error is thus corrected.

6.8 Through 6.11

Refer to the discussion in sections 5.8 through 5.11.

6.12 Cluster Allocation Conflicts:

Refer to the discussion in section 5.12.

The user may wish to use the DISK DUMP program to inspect the actual data on disk before deleting one or both of two files with cluster allocation conflicts.

For a file with cluster allocation conflicts, one of five things may be true:

1. The file may have correct R.I.B.'s and all correct records. (That is, the error is in the file(s) having the cluster allocation conflict with this file.)

2. The file may have incorrect R.I.B.'s.

3. The file's space has been erroneously allocated to another file.

4. Another file has erroneously been allocated the file's space.

5. Any combination of 2., 3., and 4. above.

The DISK DUMP program can be used to look at the R.I.B.'s of files with cluster allocation conflicts. From the information given by the SEGMENT DESCRIPTORS the DISK DUMP program can be used to look at where the file's records should be on disk. If the records for the file are where they should be according to the R.I.B., then the file has no errors.

NOTE: FOR FILES SUCH AS INDEXED DATABUS 7 FILES, ALL OF THE SPACE ALLOCATED TO A FILE WILL NOT NECESSARILY BE USED. The user will need to be aware of the structure of the files being examined.

From the information gathered by examination of the actual data on disk, the user can determine whether a file has errors and if so, whether corrections should be made, and if so, what corrections. In some cases the user may want to change a file's R.I.B. to relocate the file on disk. This, of course, would require careful study of the real allocation of space on the disk and regeneration of the file's R.I.B.'s.

6.13 and 6.14

Refer to the discussion in sections 5.13 and 5.14.

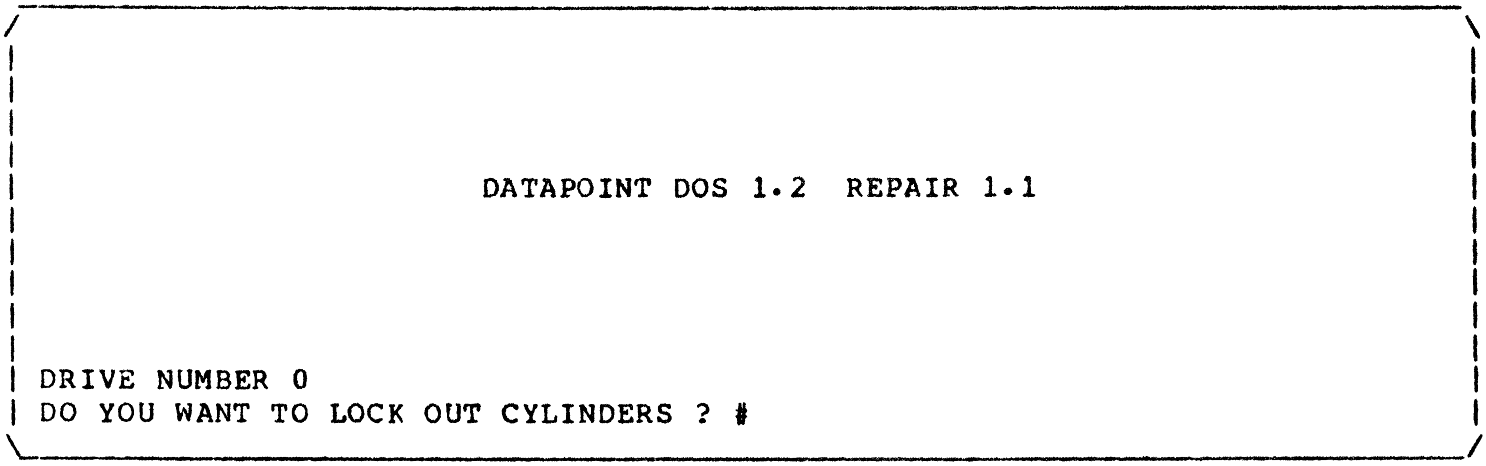
Appendix A - CYLINDER LOCK-OUT.

This appendix describes the mechanics of locking out cylinders. To accomplish this with the REPAIR program does not require an understanding of the cylinder concept.

Any cylinders that are reserved (locked out) on a disk will be recorded on a sticker or label on the case of the pack. The list of cylinders to be locked out will look something like:

```
FLAGGED CYLINDERS (or TRACKS):
            40-50
             167
           200-202
```

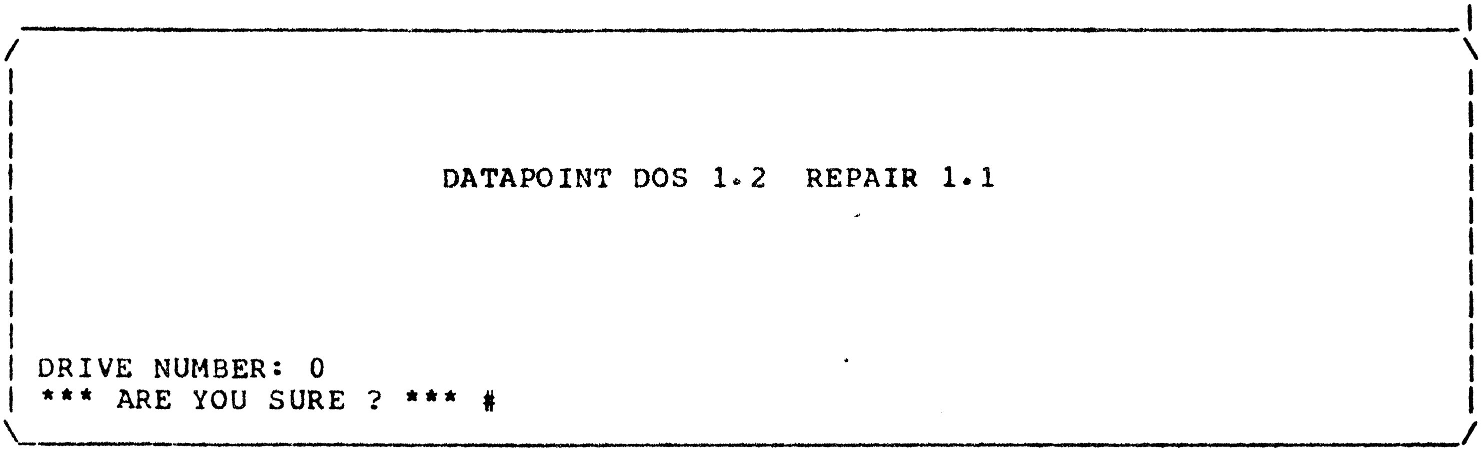
The following example shows how a list of cylinders as above would be locked out in the REPAIR program.



```
                        DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER 0
DO YOU WANT TO LOCK OUT CYLINDERS ? #
```

The screen appears as above when REPAIR is ready to accept cylinder lock-out instructions.

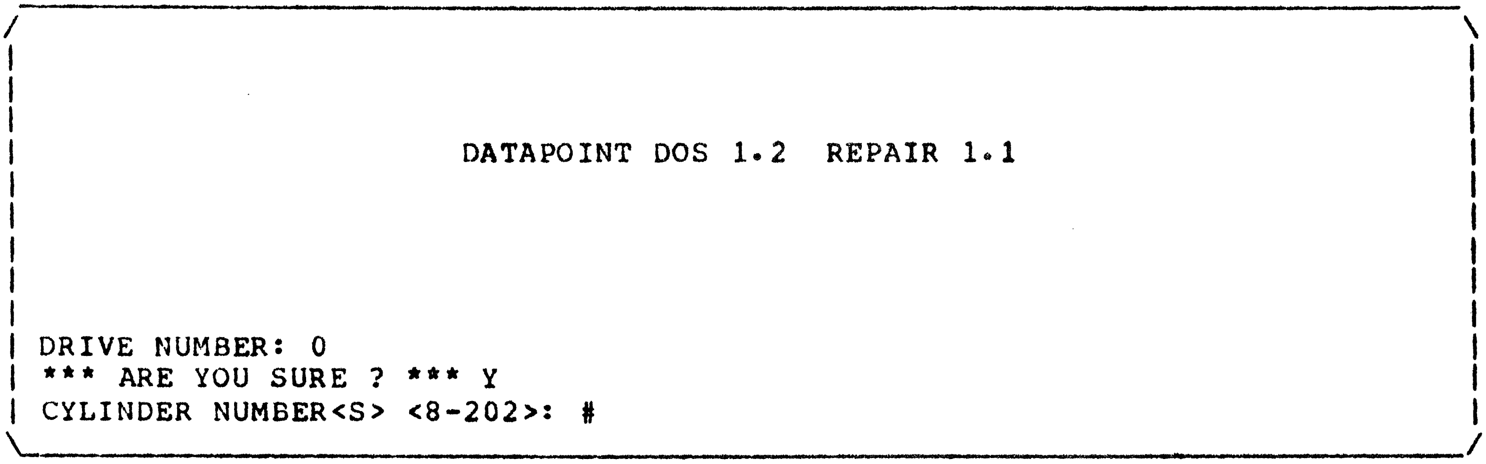
To lock out cylinders, the operator must enter "Y".



```
                     DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: 0
*** ARE YOU SURE ? *** #
```

The REPAIR program will make sure the operator wants to lock out cylinders before acceptinq cylinder numbers to be locked out.

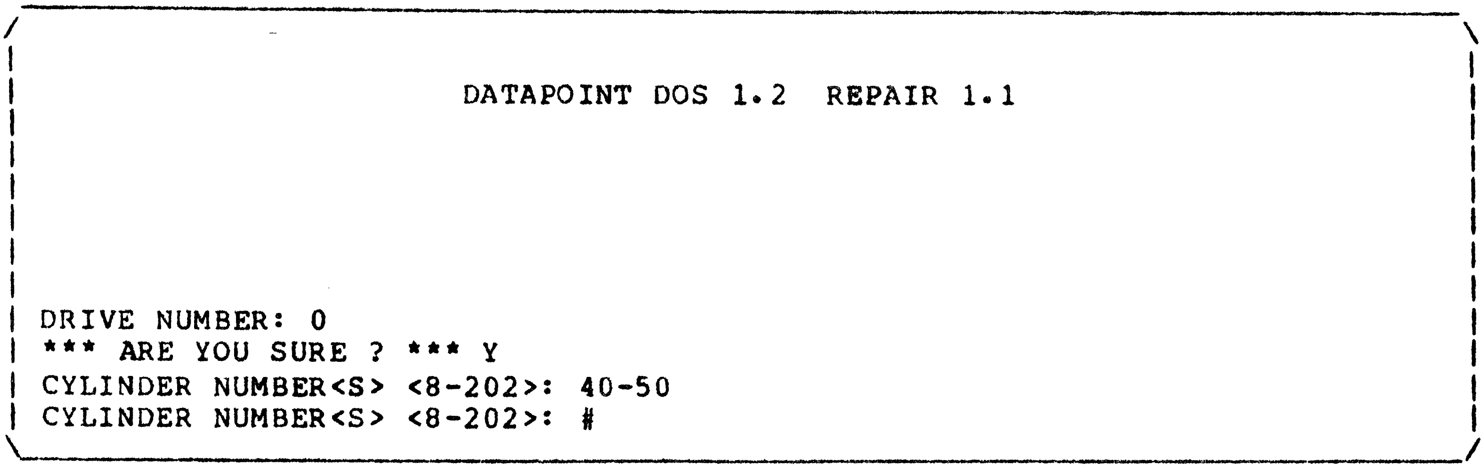
To lock out cylinders, the operator must enter "Y".



```
                     DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: 0
*** ARE YOU SURE ? *** Y
CYLINDER NUMBER<S> <8-202>: #
```

The screen will appear as above when REPAIR is ready to accept the first cylinder(s) to be locked out.

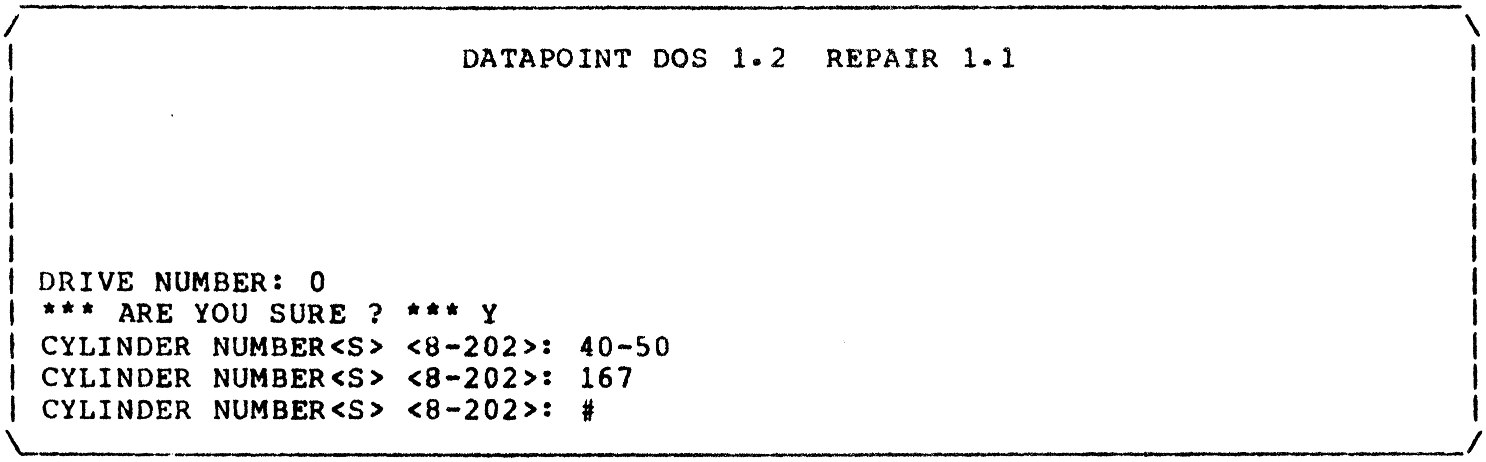
If the operator were locking out the cylinders listed above, he would enter 40-50 and press ENTER.



```
                        DATAPOINT DOS 1.2  REPAIR 1.1







DRIVE NUMBER: 0
*** ARE YOU SURE ? *** Y
CYLINDER NUMBER<S> <8-202>: 40-50
CYLINDER NUMBER<S> <8-202>: #
```

The screen appears as above when REPAIR has accepted the previous cylinder lock out and is ready for the next cylinder number(s).

According to the above sample list, the operator would now enter 167.



```
                        DATAPOINT DOS 1.2  REPAIR 1.1






DRIVE NUMBER: 0
*** ARE YOU SURE ? *** Y
CYLINDER NUMBER<S> <8-202>: 40-50
CYLINDER NUMBER<S> <8-202>: 167
CYLINDER NUMBER<S> <8-202>: #
```

The screen appears as above when REPAIR has accepted the previous lock-out and is ready to accept the next cylinder number(s).

According to the above list the operator must now enter 200-202.

```
 ________________________________________________________________________
/                                                                        \
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
|                                                                        |
| DRIVE NUMBER: 0                                                        |
| *** ARE YOU SURE ? *** Y                                               |
| CYLINDER NUMBER<S> <8-202>: 40-50                                      |
| CYLINDER NUMBER<S> <8-202>: 167                                        |
| CYLINDER NUMBER<S> <8-202>: 200-202                                    |
| CYLINDER NUMBER<S> <8-202>: #                                          |
\________________________________________________________________________/
```

The screen appears as above when REPAIR has accepted the previous lock-out and is ready to accept the next cylinder number(s).

According to the above list the operator has no more cylinders to lock out. At this point then, the operator would merely depress the ENTER key to signal REPAIR that no more cylinders are to be locked out. REPAIR would proceed immediately to the cluster allocation table and directory check phase.

Appendix B - CLUSTER ALLOCATION TABLE errors and DIRECTORY read/write errors.

This appendix describes messages displayed by the REPAIR program when it discovers an error (of any kind) in the CLUSTER ALLOCATION TABLE (C.A.T.) or a read or write error in the DIRECTORY.

These errors are the first type of error checked for by REPAIR. A format (logic) error in the C.A.T. is not fatal (will not cause REPAIR to abort), but will be noted to the operator. An uncorrectable read or write error in either the C.A.T. or the DIRECTORY is fatal, because the disk pack is in very serious trouble if hardware errors occur in either of these tables.

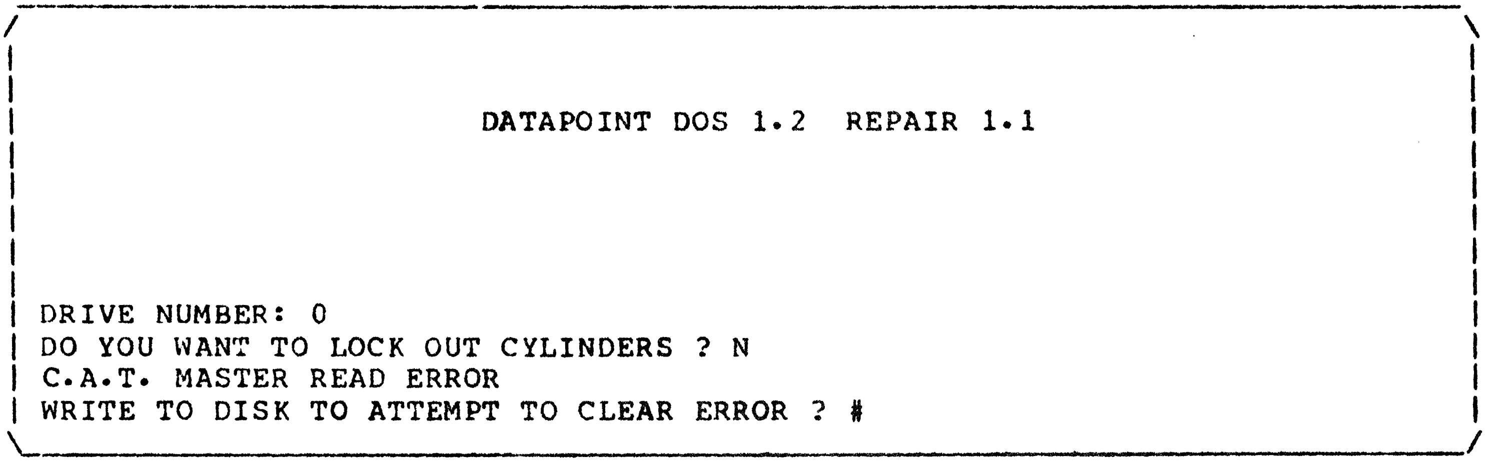
The REPAIR program does not consider a read error in the C.A.T. or DIRECTORY fatal until either an attempt to clear the error by writing back to disk has failed or the operator has instructed REPAIR not to attempt the write. A write error to the C.A.T. or DIRECTORY is always fatal.

There is a working (MASTER) and a backup (COPY) version of both the C.A.T. and the DIRECTORY.

The examples that follow are given in the sequence of their potential occurence in REPAIR execution.

B.1 CLUSTER ALLOCATION TABLE read error.

Note that although this example concerns the C.A.T. MASTER, the same messages (substituting the word COPY for MASTER) apply to the C.A.T. COPY.



```
                          DATAPOINT DOS 1.2  REPAIR 1.1






DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
C.A.T. MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? #
```

The messages on the last two lines of the screen above will appear when the REPAIR program has detected a read error in the C.A.T. MASTER.

To have REPAIR attempt to clear the read error enter "Y"; otherwise enter "N".

```
                       DATAPOINT DOS 1.2  REPAIR 1.1





DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
C.A.T. MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
READ ERROR CLEARED.
```

The message on the last line of the screen above will appear when the operator has replied "Y" to the message above and the attempt to clear the read error was successful.

No further operator response is required.

```
                       DATAPOINT DOS 1.2  REPAIR 1.1





DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
C.A.T. MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? N
READ ERROR UNCORRECTABLE.
THE PACK IS NOT FIXABLE.
```

The messages on the last two lines of the screen above will appear if the operator replies "N" to the message above or if the write to disk did not clear the read error. The REPAIR program will not accept any further commands. To get any other program running on the computer the operator must press the RESTART key.

No operator response is required.

```
                         DATAPOINT DOS 1.2  REPAIR 1.1





 DRIVE NUMBER: 0
 DO YOU WANT TO LOCK OUT CYLINDERS ? N
 THE C.A.T. MASTER HAS DEVELOPED A READ ERROR
 THE PACK IS NOT FIXABLE.
```

The messages on the last two lines of the screen above will appear if a read error occurs when REPAIR reads the C.A.T. MASTER for the second time during the C.A.T. check. This read error is automatically considered fatal because it is evidence of a transient hardware error in the C.A.T.

No operator response is required.

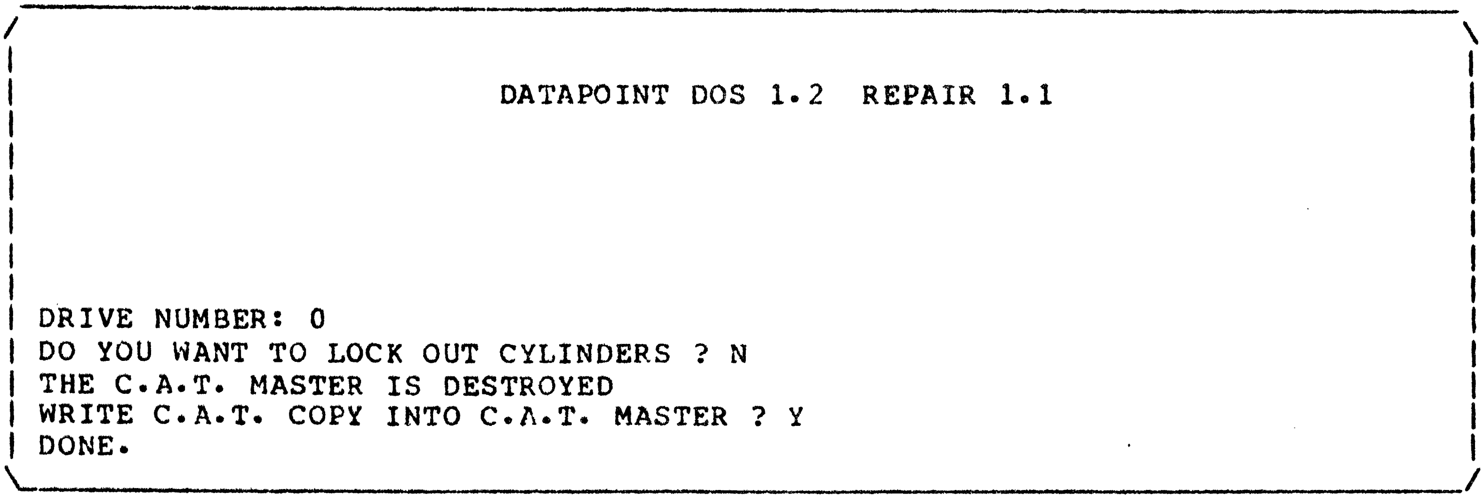
B.2 CLUSTER ALLOCATION TABLE is destroyed.

Note that although this example concerns the C.A.T. MASTER, the same messages (transposing the words COPY and MASTER) apply to the C.A.T. COPY.

```
                         DATAPOINT DOS 1.2  REPAIR 1.1




 DRIVE NUMBER: 0
 DO YOU WANT TO LOCK OUT CYLINDERS ? N
 THE C.A.T. MASTER IS DESTROYED
 WRITE C.A.T. COPY INTO C.A.T. MASTER ? #
```

The messages on the last two lines of the screen above will appear when the REPAIR program has discovered that the C.A.T. MASTER is destroyed but the C.A.T. COPY appears to be valid.

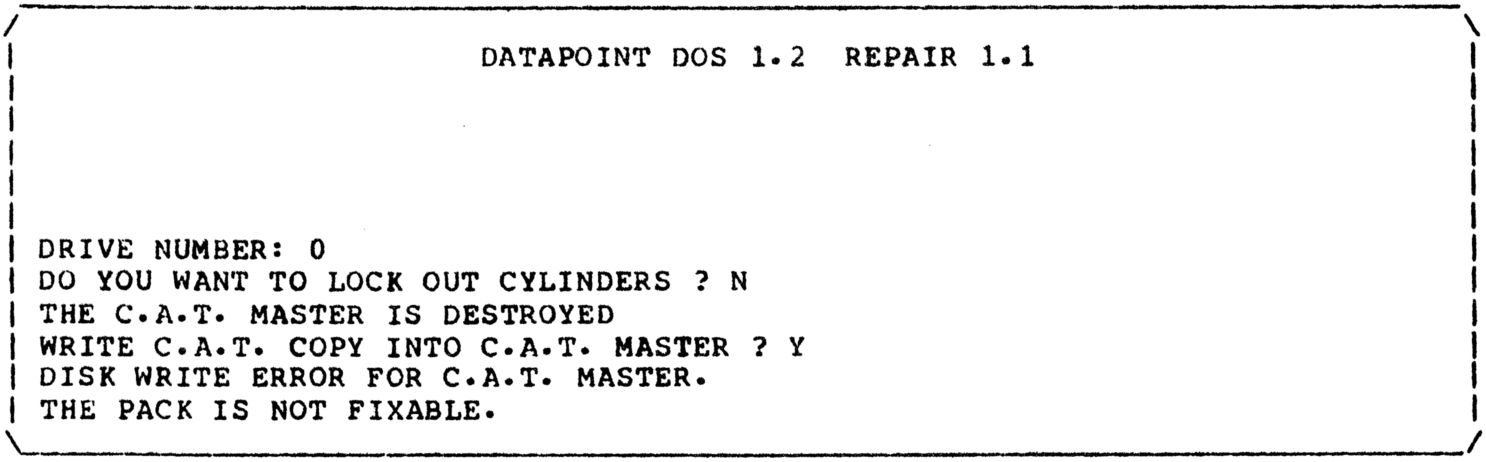
To have REPAIR copy the C.A.T. COPY into the C.A.T. MASTER, enter "Y". Otherwise, enter "N".



```
                        DATAPOINT DOS 1.2  REPAIR 1.1








DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
THE C.A.T. MASTER IS DESTROYED
WRITE C.A.T. COPY INTO C.A.T. MASTER ? Y
DONE.
```

The message on the last line of the screen above will appear when the operator has replied "Y" to the message above and the write to the C.A.T. MASTER was successful. REPAIR will proceed to check the DIRECTORY (see section 4.4).

No operator response required.



```
                       DATAPOINT DOS 1.2  REPAIR 1.1






DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
THE C.A.T. MASTER IS DESTROYED
WRITE C.A.T. COPY INTO C.A.T. MASTER ? Y
DISK WRITE ERROR FOR C.A.T. MASTER.
THE PACK IS NOT FIXABLE.
```

The messages on the last two lines of the screen above will appear if a write error occurs when REPAIR tries to write to the C.A.T. MASTER. The REPAIR program will not accept any further commands. To get any other program running on the computer the operator must press the RESTART key.

No operator response is required.

```
 ____________________________________________________________________________
/                                                                            \
|                                                                            |
|                        DATAPOINT DOS 1.2  REPAIR 1.1                       |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
| DRIVE NUMBER: 0                                                            |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                      |
| THE C.A.T. MASTER IS DESTROYED                                             |
| THE C.A.T. MASTER & COPY ARE DESTROYED                                     |
| THE C.A.T. MASTER & COPY WILL HAVE TO BE RECONSTRUCTED FROM THE R.I.B.'S   |
\____________________________________________________________________________/
```

The messages on the last three lines of the screen above will appear if REPAIR discovers that both copies of the C.A.T. are destroyed. After the messages are displayed REPAIR will proceed to check the DIRECTORY (see section 4.4).

B.3 CLUSTER ALLOCATION TABLE copies do not match.

```
 ____________________________________________________________________________
/                                                                            \
|                                                                            |
|                                                                            |
|                        DATAPOINT DOS 1.2  REPAIR 1.1                       |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
| DRIVE NUMBER: 0                                                            |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                      |
| C.A.T. MASTER & COPY DO NOT MATCH                                          |
| THE C.A.T. MASTER & COPY WILL HAVE TO BE RECONSTRUCTED FROM THE R.I.B.'S   |
\____________________________________________________________________________/
```

The messages on the last two lines of the screen will appear when REPAIR has discovered that the C.A.T. MASTER and COPY versions do not agree with each other. Since it is not possible for REPAIR to choose which version is correct at this point, it will proceed to check the DIRECTORY.

No operator response is required.

B.4 DIRECTORY read errors.

Note that although this example concerns the DIRECTORY MASTER, the same messages (transposing the words COPY and MASTER) apply to the DIRECTORY COPY.

```
                     DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
DIRECTORY PAGE MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? #
```

The messages on the last two lines of the screen above will appear when REPAIR has detected a read error in the DIRECTORY MASTER.

To have REPAIR attempt to clear the read error enter "Y", otherwise enter "N".

```
                     DATAPOINT DOS 1.2  REPAIR 1.1




DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
DIRECTORY PAGE MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
WRITE COPY PAGE TO MASTER PAGE ? #
```

The message on the last line of the screen above will appear if the operator has replied "Y" to the message above.

To have REPAIR copy the DIRECTORY COPY page to the DIRECTORY MASTER page enter "Y", otherwise enter "N". If "N" is entered the DIRECTORY check will continue.

```
 ___________________________________________________________________________
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|                      DATAPOINT DOS 1.2  REPAIR 1.1                        |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
| DRIVE NUMBER: 0                                                           |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                     |
| DIRECTORY PAGE MASTER READ ERROR                                          |
| WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y                               |
| WRITE COPY PAGE TO MASTER PAGE ? Y                                        |
| DONE.                                                                     |
\___________________________________________________________________________/
```

The message on the last line of the screen above will appear when the write to the DIRECTORY MASTER has been successful. The DIRECTORY check will continue.

No further operator response is required.

```
 ___________________________________________________________________________
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|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
| DRIVE NUMBER: 0                                                           |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                     |
| DIRECTORY PAGE MASTER READ ERROR                                          |
| WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y                               |
| WRITE COPY PAGE TO MASTER PAGE ? Y                                        |
| DIRECTORY PAGE MASTER WRITE ERROR                                         |
| THE PACK IS NOT FIXABLE.                                                  |
\___________________________________________________________________________/
```

The messages on the last two lines of the screen above will appear if the operator replied "Y" to the message above and REPAIR detected a write error when it attempted to write to the DIRECTORY MASTER. The REPAIR program will not accept any further commands. To get another program running on the computer the operator must press the RESTART key.

No operator response is required.

```
DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
DIRECTORY PAGE MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
WRITE COPY PAGE TO MASTER PAGE ? Y
DIRECTORY PAGE MASTER READ ERROR
THE PACK IS NOT FIXABLE.
```

The messages of the last two lines of the screen above will appear if the operator replied "Y" to the message above and REPAIR detected a read error when it attempted to re-read the DIRECTORY MASTER page it had just written.

No operator response is required.

```
DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
DIRECTORY PAGE MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
WRITE COPY PAGE TO MASTER PAGE ? Y
DIRECTORY COPY PAGE HAS DEVELOPED A READ ERROR
THE PACK IS NOT FIXABLE.
```

The messages on the last two lines of the screen above will appear if the operator replied "Y" to the message above and REPAIR detected a read error when it attempted to re-read the DIRECTORY COPY to compare it against the DIRECTORY MASTER page just written and re-read.

No operator response is required.

```
 ___________________________________________________________________________
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|                                                                           |
|                                                                           |
|                                                                           |
| DRIVE NUMBER: 0                                                           |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                     |
| DIRECTORY PAGE MASTER READ ERROR                                          |
| WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y                               |
| WRITE COPY PAGE TO MASTER PAGE ? Y                                        |
| DIRECTORY PAGE MASTER & COPY DO NOT MATCH                                 |
| THE PACK IS NOT FIXABLE.                                                  |
\___________________________________________________________________________/
```

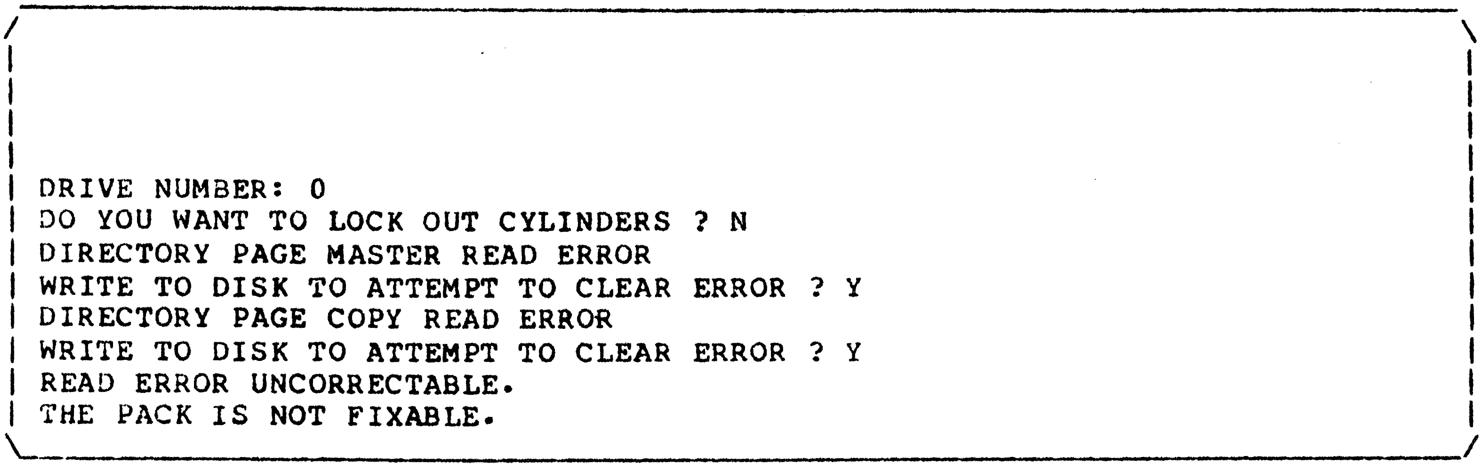
The messages on the last two lines of the screen above will appear if the operator replied "Y" to the message above but the DIRECTORY page MASTER and COPY did not match after the page copy had been made. This error is automatically considered fatal because it is evidence of a hardware error in the DIRECTORY.

No operator response is required.

```
 ___________________________________________________________________________
/                                                                           \
|                        DATAPOINT DOS 1.2  REPAIR 1.1                      |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
| DRIVE NUMBER: 0                                                           |
| DO YOU WANT TO LOCK OUT CYLINDERS ? N                                     |
| DIRECTORY PAGE MASTER READ ERROR                                          |
| WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y                               |
| DIRECTORY PAGE COPY ALSO GIVES READ ERROR                                 |
| WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? #                               |
\___________________________________________________________________________/
```

The messages on the last two lines of the screen above will appear if the operator replies "Y" to the message above and REPAIR detects a read error in the DIRECTORY COPY page.

To have REPAIR attempt to clear the read error enter "Y", otherwise enter "N". If the write is successful REPAIR will continue with the DIRECTORY check.



```
DRIVE NUMBER: 0
DO YOU WANT TO LOCK OUT CYLINDERS ? N
DIRECTORY PAGE MASTER READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
DIRECTORY PAGE COPY READ ERROR
WRITE TO DISK TO ATTEMPT TO CLEAR ERROR ? Y
READ ERROR UNCORRECTABLE.
THE PACK IS NOT FIXABLE.
```

The messages on the last two lines of the screen above will appear if the operator replied "N" to the message above or if the write to disk did not clear the read error.

No operator response is required.