



LZAP/CMD

THE Disk Modification Utility

for LDOS(c) – MOD I & III

QUALITY SOFTWARE DISTRIBUTORS

DALLAS, TX.

LZAP/CMD

Introduction

LZAP/CMD was written specifically for LDOStm and will only run under the LDOStm operating system. LZAP uses the resident disk driver of LDOStm and hence, enjoys its flexibility and device independence. It makes extensive use of the DCT (Drive Code Table) and will dynamically configure itself to whatever the drive capacity or diskette format. LZAP/CMD will support drives from 0 to 7, any cylinder count to 255, and any sector number to 255. It supports both single and double density recording formats automatically. Various drive sizes and densities can be intermixed and LZAP/CMD will page between them without error. Lower case input is supported.

This diskette included the model I and the model III versions of LZAP/CMD Ver 2.0. Also included is a machine readable copy of this documentation that may be formatted and printed in any format the user finds convenient.

*** NOTICE ***

This program is provided on a special distribution diskette. To access the programs, prepare an LDOStm system diskette to receive the new programs, place this diskette in drive 0, press reset, and then follow the directions.

It is highly recommended that TYPE AHEAD always be used with LZAP/CMD. The model III version is particularly cumbersome without TYPE AHEAD active due to that model's keyboard scan method.

Model III TRSDOStm diskettes are not supported.

Once the programs have been transferred to a system diskette, store the distribution diskette with your other master copy diskettes and use that system diskette for making your working copies of LZAP. It is suggested that the applicable version, LZAP1/CMD for the model I or LZAP3/CMD for the model III, be transferred to your work diskettes as just LZAP/CMD.

Throughout this document the term diskette is used to refer to media while disk or drive refers to the hardware device. Unfamiliar terms may be defined in the glossary.

To run the program, type LZAP <ENTER>. A title page is displayed. Press <ENTER> to enter command mode.

Command Mode:

1. (B)Backup

Enter B to make a mirror image of the target diskette for data recovery. The destination diskette must be formatted identically to the source diskette or Backup will abort with the error message "Source and Destination disks are NOT compatible" (e.g. if the source diskette is double density 41 tracks, the destination diskette must be double density 41 tracks). Backup will support disks with up to 36 sectors. The copy is performed a full cylinder at a time. NOTE: It is possible to backup a diskette to itself. I haven't found a use for this, but backup will do it correctly.

If backup is attempted with the error dictionary off, you must first initialize the DCT to the destination diskette. With the error dictionary on, enter the read command, enter the destination drive address, and then press X to return to command mode. Press N to turn off the error dictionary and proceed with the backup.

2. (R)Read

This is the primary display mode. After entering R, you will be prompted to "Enter drive # (0 to 7)". If the drive entered is not ready or nonexistent an error message will be posted and you will again be prompted to enter the drive number. When the drive number is entered, the drive is issued a Check Drive command. This will update the DCT (Drive Code Table) to the configuration of the inserted diskette. If the diskette has a damaged BOOT/SYS sector 0 or DIR/SYS sector 0 it will not initialize properly. See below examples of data recovery for how to correct this.

After the drive number has been entered, you will be prompted to "Enter Cylinder #". This prompt will accept any hexadecimal number up to FF. Pressing <ENTER> will default to 00, but only when this routine is entered from Command Mode. A check is made of the DCT and any entry greater than the drive capacity will cause the error message "Requested cylinder GREATER than drive capacity", and again issue "Enter cylinder #".

Next, the sector is asked for. This prompt behaves the same as the cylinder prompt.

The program will then enter the Display Mode.

3. (D)ebug

Entering D will cause immediate entry into the LDOStm Debug utility. You may return to LZAP, by entering G7000, if the memory occupied by the program has not been altered.

4. (E)xit

E will terminate LZAP, clear the screen, and return to LDOS Ready.

5. Error Dictionary (Y)es or (N)o

The Error Dictionary refers to the error traps in LZAP and within LDOStm. Y will turn it on and display "ON". N turns it off and will display "OFF". With it off it is possible to read diskettes ordinarily not readable, such as diskettes with a damaged BOOT/SYS or DIR/SYS and some protected diskettes that use a read lock or deleted record data address mark. Although it may become necessary to turn it off to recover some damaged diskettes, it is highly recommended that it normally be left on. Some of the automatic features such as G (go directory) and F (find file) will be disabled with the dictionary off. If you turn it off, you are on your own and better know what you are doing.

Display Mode:

Display mode is entered by the (R)ead command. The screen will display, from left to right: the first verticle column of one digit equals the current drive address; the next two digit column is the current cylinder; followed by the two digit current sector; the next two digit verticle column is the relative byte number of the starting byte of that row in the hexadecimal and ASCII display fields; the next 16x16 two digit per byte block is the hexadecimal representation of the sector data buffer; this is followed by a 5 character wide, blank verticle bar, refered to as the message area; next is the 16x16 byte ASCII display field.

The message area will be used to display the current mode, error messages, and the hash code.

The following commands are available:

1. <A> ASCII modify

The keyboard performs like a typewriter to enter ASCII data into the sector buffer. The full ASCII set supported by the keyboard may be entered, including lower case. The byte in the sector buffer and display buffer is changed on entry of the character and the cursor is advanced automatically.

The arrow keys may be used to position the cursor over any location. Entering a <CTRL> M will escape to the Hex Modify mode. This will allow toggle between ASCII modify and Hex modify. A <CTRL> W will home the cursor and exit to Display mode. A <CTRL> X will escape to Command mode.

2. Byte locate

After pressing B, the keyboard will be scanned for two hexadecimal digits. When they are entered, the cursor will be positioned over that relative byte number in the display buffer. At each of the keyboard scans, a check is made for the character X to abort Locate and return to Display mode.

3. <C> Compare

Entering a C will clear the screen and issue the prompts "Compare to:", "Enter Drive# (0 to 7)", "Enter cylinder #", and "Enter sector #". The same checks as made under the (R)ead command will be made at each entry. Default to 00 is not allowed. The compare may be made to any valid drive, cylinder, and sector.

After the entries have been accepted, the previously displayed sector will be compared, byte for byte, with the just entered sector number. In the case of a non-compare, the comparing will halt, the byte in error will be displayed and the option will be given to continue or terminate.

Terminating will return to the previously displayed screen, continuing will continue the compare operation. Upon completion of the compare, "ALL DONE!" will be displayed, and the program will return to Display mode, displaying the previous sector.

4. <D> Debug

This entry will cause immediate entry to the LDOStm Debug utility. Type G7000 to re-enter LZAP, if the program has not been altered.

5. <E> Exit

E clears the screen, exits LZAP, and returns to LDOS Ready.

6. <F> Find file

Position the cursor anywhere in the directory entry of the desired file and press F. The next display will be relative sector 0 of that file. This command is enabled only in the directory cylinder. It is also disabled if the Error Dictionary is turned off.

7. <G> Go directory

Pressing G will cause the display to go to relative sector 0 of the directory cylinder (Dir/SYS). This command is disabled if the Error Dictionary is off.

8. <H> Hash code

Position the cursor anywhere in the directory entry of the desired file and press H. This will calculate the hash code of the file for entry in the HIT (Hash Index Table). The HIT sector will be read and the hash code will be inserted in the proper location. The HIT sector will be displayed with the cursor positioned over the new hash code. This location is called the DEC (Directory Entry Code). The hash code will also be displayed in the message area of the screen.

It will be necessary to write the HIT sector back to the disk to make the change permanent.

9. <I> Find extent

This command can be used to locate the starting sector of file extents. A little more care must be taken with this command than others. The cursor must be placed over one of the two bytes of the extent rather than just somewhere in the directory entry. It behaves the same as the F command.

10. <L> Local search

The keyboard is scanned for two hexadecimal numbers to use in a byte by byte compare, from the current cursor position to the end of the sector data buffer. If the byte is found, the cursor is positioned over the byte in the display. The program will return to Display mode. If the byte is not found from the current cursor position to the end of the buffer, "NOT FOUND" will be displayed, the cursor will be homed, and the program will return to Display mode.

At each of the keyboard scans, a check is made for X, to abort Search and return to Display mode.

11. <M> Hex modify

The value of any byte in the sector data buffer may be changed in the Hex modify mode. The keyboard will be scanned for two hexadecimal characters at each cursor position. After the first character is entered, the display buffer will be changed and the cursor will be frozen until after entry of the second character. After entry of two characters, the sector data buffer will be modified and the cursor will advance automatically.

Normal exit is <CTRL> W after entry of the second character for that cursor position. The cursor will be homed and the program will return to Display mode. Entering a <CTRL> X will return to Command mode. Entering a <CTRL> A causes entry into ASCII Modify mode, allowing toggle between Hex and ASCII modify. The arrow keys may be used to position the cursor over any byte in the buffer, if you are not between characters modifying a byte.

If you exit between the first and second characters, the program will escape the Hex modify mode but, the sector data buffer will remain unchanged for that byte.

12. <P> Screen print

Entering a P will cause the display buffer to be printed on the parallel port line printer. A check is made for printer present. Pressing P without a printer attached to the system will be ignored. Pressing <BREAK> will abort the print out and return to Display mode. If you SPOOL *PR before running LZAP/CMD control will return almost immediately.

13. <R> Remove password

Position the cursor anywhere in the desired directory entry and press R. This will do four things: allow full access to the file, change the password to all blanks, make the file visible, and if the file is inactive (i.e. killed), make it active. Other attributes of the file are not changed. Note: You must write this sector back to the diskette for it to become permanent.

14. <S> Search global

The global search command provides a wide area search for a string in a particular file. The cursor must be positioned somewhere in the target directory entry. Pressing the S key while not at a valid directory entry, will be ignored. When the S command is entered, you will be asked to specify if the string is in ASCII (alpha-numeric) characters or in hexadecimal. Any number of characters up to 255 may then be entered followed by <ENTER>.

If the string is located within the file, the screen displays the first sector of the file in which it occurs and you are given the option to continue or end. If it is not found in the file, NOT FOUND is displayed and you are given the option to retry the search, with another string, or to abort the search operation.

If the string is found, the screen displays the sector that contains the first character of the string with the cursor positioned over that character. The string may span across sectors, file extents, or even extended directory entries. The message area of the screen will display SEARCH CONT/END. Entering C will continue the search and if found display the next occurrence of the string. E returns to the normal display mode.

15. <T> Toggle

This command is used to mark a position on a diskette for return. For example, you are working with a file directory entry with several extents and must continually return to that directory sector to find the next extent. The directory sector may be marked by pressing <CTRL> T. You can then return to that directory sector, from anywhere on the diskette, by pressing T. The <CTRL> T command also marks the drive number so you may return from another drive.

16. <W> Write

W causes the sector buffer to be written to the diskette. The option will be given to write to the current drive, cylinder, and sector, or to change the destination. If you elect to change the destination, you will be prompted to "Enter Drive#", "Enter Cylinder#", "Enter sector#". The usual checks are made for valid entries. Default to 00 is not allowed. At completion of the write command, the destination drive, cylinder, and sector is displayed.

17. <X> Escape

X Returns to Command mode. Most operations that require input can be escaped by pressing X or <CTRL> X.

18. <Z> Zero

The sector data buffer and display buffers will be zeroed.

19. <0> to <7> Page drive

Read the current cylinder and sector from that drive number. The drive will be issued the Check Drive command to update the DCT. A compare of the current cylinder and sector will be made with the new drive to ensure compatibility. If they are not compatible, an error message will be displayed and the program will return to Display mode displaying the previous drive, cylinder, and sector. After completion of the read, the program will return to Display mode, displaying the new drive's sector.

20. <ARROWS> Cursor controls

The arrow keys will move the cursor in the indicated direction over the Hex and ASCII display fields. The left and right arrows will wrap around, treating the display fields and data buffer as a contiguous string of 256 bytes. Pressing <SHIFT> Left Arrow will home the cursor.

21. <+> (or +) and <-> (or =) Page sector

Pressing ; (or +) will cause the sector to be incremented and display the next higher sector. If the current display is the highest numbered sector the drive is capable of, the cylinder will be incremented and sector 0 of the next higher cylinder will be displayed. If the current cylinder and sector being displayed is the highest the drive is capable of, the pressed key will be ignored.

Pressing - (or =) will cause the sector to be decremented and display the next lower sector. If the currently displayed sector is 0, the cylinder will be decremented and the highest sector of the next lower cylinder will be displayed. If cylinder 0 and sector 0 are currently being displayed, the pressed key is ignored.

22. <Q> Control key

This is the <CTRL> key. It is used as a super-shift in the ASCII and Hex modify modes for control functions. It is also used in conjunction with the T key to mark a diskette location for Toggle return.

23. <SPACE> Menu toggle

Pressing the space bar, while in display mode, will cause a summary of the available commands to be displayed. Press the space bar again to return to display mode.

Examples of use:

The primary purpose of this program is data recovery. Other uses will be found! such as removing passwords from protected files, direct patching of programs, as a tutorial to disk file organization, and any time it is desired to see and/or modify the actual data on the diskette. The following will give a few examples of how to use this program. The byte number references are those used in the LDOS User's Manual. There is not room in this document for a complete description of the directory and file organization. Two excellent publications exist and are highly recommended:

1. LDOS User's Manual, Tech Info Section; contains an excellent, concise description of the directory and file organization

2. TRS-80 Disk & Other Mysteries by H.C. Pennington; this is the "Bible" of disk data recovery.

Note! Before proceeding with data recovery, it is good practice to write-protect the target diskette and make a backup copy for use in the data recovery operation. The backup facility of this program is provided for that purpose.

Example #1 Recovering a killed file

This method will only work if the space occupied by the file has not been reassigned to another file. If it has been reassigned, the file is irrevocably lost.

Locate the directory cylinder by pressing G. Page through the directory, using the ; and - keys, until you find the filespec of the killed file. The filespec will be located at relative bytes DIR+5 to DIR+15 in the directory entry. If DIR+0 bit 4 is 0, it indicates the file has been killed and is no longer active.

Using the arrow keys, position the cursor anywhere in the directory entry and press R. This will make the file active, visible, and unprotected. Press W to enter Write Mode. Answer Y to the question "Write to this location?". The attribute byte and passwords of the file have now been changed on the diskette.

Position the cursor anywhere in the directory entry and press H. The hash code and DEC (Directory Entry Code) for the file will be calculated and the new HIT sector will be displayed. Press W to enter Write Mode. Answer Y to the write to this destination prompt and the new HIT will be written to diskette.

Press E to exit LZAP/CMD and return to LDOS Ready. A DIR command should now show the file active. Immediately COPY or XFER the file to another diskette. The file should once again be KILLED on the target diskette because the GAT (Granule Allocation Table) was not corrected to show the space occupied by the file. It is far easier to copy the file to another diskette and then reKILL it and let the system take care of the GAT.

Example #2 The clobbered BOOT/SYS or DIR/SYS

This is one case where it is necessary to turn off the Error Dictionary. The Check Drive command that is issued when the drive number is entered will fail and indicate that the drive is not ready or the program may even hang with the drive trying to locate the DIR/SYS on a nonexistent cylinder.

With the Error Dictionary turned off, look at the BOOT/SYS on cylinder 0 sector 0. If it has been clobbered, relative byte '02' may not indicate the correct cylinder for the DIR/SYS. Page through the diskette to locate the directory cylinder. This is the cylinder that is formatted with '00' pattern instead of the normal 'E5' or '6BD6' in double density.

Sector 0 of the DIR/SYS is necessary for the diskette to initialize correctly. If it is clobbered, read in sector 0 of DIR/SYS of a good diskette, press W to enter Write Mode and at the prompt "Write to this location?" answer N. Change the destination to the target diskette, the cylinder for the directory just found, sector 0.

Now return to the BOOT/SYS and change byte '02' to point to the cylinder of the directory. If byte '02' of BOOT/SYS points to the directory cylinder and the GAT of DIR/SYS is readable the diskette should initialize correctly.

If the HIT is damaged, it will be necessary to calculate the hash code for each file to be recovered and to write each newly calculated HIT sector to the diskette.

Using this procedure, you may be able to recover some or all of the data on the clobbered diskette, but if the directory entry for the file has been damaged it will require a complete rebuilding of the directory entry. See one the references mentioned above and good luck.

As in the above example no attempt has been made to correct the GAT. The recovered files must be copied to another diskette before they can be used.

Example #3 Changing passwords

Position the cursor anywhere in the target file directory entry and press R. Press W to write the directory sector to the diskette.

The file is now visible, unprotected, and the password is all blanks.

Example #4 CRC/Parity error

When a CRC/Parity error occurs during a file load or save LDOS^{tn} will issue an error message to indicate whether the error was in the file, the header, or the directory. Locate the failing sector with LZAP, with the error dictionary turned on. LZAP should issue the same error message as LDOS^{tn}. Once the failing sector is located, return to LZAP's command mode, turn the error dictionary off, and attempt to read the failing sector again. If it reads successfully, press W to write it back to the diskette.

The backup provision of LZAP, with the error dictionary on, may also be used to locate the failing sector. And backing up the failing diskette, with the error dictionary off, may recover the bad file.

If the diskette has physical damage at the failing sector, these methods may or may not work. In any case it is suggested that that diskette not be used again for any operation that requires high data reliability.

Example #5 Global search

Here is a practical example of the power of the global search command:

When running SCRIPSIT^{tn}, the special command END causes the system to re-boot. SCRIPSIT^{tn} may be easily patched to return to DOS Ready, by the following steps:

1. Locate the directory entry for SCRIPSIT^{tn}, by pressing G and using the + and - keys
2. Position the cursor in the SCRIPSIT^{tn} directory entry and press S
3. Select the Hex string input by pressing H
4. Type C3 00 00 <ENTER> (the spaces are inserted automatically by the program)
5. The screen will display the sector of SCRIPSIT^{tn} containing this code, with the cursor positioned over the C3.
6. Press the right <ARROW> key to advance the cursor to the first 00.
7. Press M to enter Hex modify and type 2D 40.
8. Press <CTRL> W to escape Hex modify.
9. Press W for write and answer Y to write to this location prompt.
10. Press E to return to LDOS Ready.

Now when the command END is entered SCRIPSIT^{tn} will return to the system instead of re-booting. This whole process is really much easier than it sounds. A little practice and you will be doing it like a pro.

Although this is a good example, if you have applied the SCRIPSIT/FIX patch this change will have already been made and the search will say Not Found. So try searching for C3 2D 40 to see how the global search works.

The Glossary:

Unfamiliar terms not found below may be in the LDOS User's Manual Glossary.

Boot/SYS -- the first record on the disk, located at cylinder 0 sector 0. This record is loaded by the Level-II ROM. It is used to indicate which sector contains the directory and is the program that loads SYS0/SYS the resident operating system.

Buffer -- a section of RAM (Random Access Memory) used to hold data while it is processed. In this manual, sector data buffer refers to a buffer used to hold the actual data from the diskette and display buffer refers to the video display memory.

Check Drive command -- refers to the system call vector @CKDRV, used to update and maintain the Drive Code Table

Cursor -- that blinky box that moves when you press the arrow key. Home refers to the upper left corners of the respective display fields.

Data Address Mark -- a particular sequence of bits used by the FDC (Floppy Disk Controller) to indicate the type of data recorded.

DCT -- see Drive Code Table

DEC -- see Directory Entry Code

Directory Entry -- a thirty-two byte field in the Dir/SYS to contain all of a files attributes. See LDOS User's Manual Tech Info - Directory Records.

Directory Entry Code -- the relative byte location of the hash code in the HIT (Hash Index Table). This byte position indicates where in the Dir/SYS the directory entry for the filespec is located. See LDOS User's Manual Tech Info - Directory Records - H.I.T.

Dir/SYS -- the system file that contains the directory. See LDOS User's Manual Tech Info - Directory Records.

Drive Code Table -- an area of system RAM (Random Access Memory) used to store pertinent information about the diskette. See LDOS User's Manual Tech Info - Drive Code Table.

Extended Directory Entry -- a part of Dir/SYS used to hold file access information of segmented files where the FPDE (File Primary Directory Entry) can not hold all the information. (e.g. more than four extents)

Extent -- see File Extent

File Extent -- a two byte field in the directory entry to indicate where a file is located, the starting granule number, and how many contiguous granules are assigned to the file. Each directory entry can contain four extents and a pointer to the next Extended Directory Entry.

GAT -- see Granule Allocation Table

Granule Allocation Table -- an area of Dir/SYS used to indicate assigned and unassigned area on the diskette. See the LDOS User's Manual Tech Info - Directory Records - G.A.T.

Global -- wide area as opposed to local. Encompassing the entire file.

Hash Code -- a pseudo-random one byte number from 01 to FF created from the filespec. Used to find the DEC (Directory Entry Code).

Hash Index Table -- a part of Dir/SYS used for storing the hash codes which are located at the DEC's (Directory Entry Codes).

Header -- a part of each sector written by the FDC (Floppy Disk Controller). It contains the sector and cylinder address and other pertinent information for retrieving data from the sector.

Hexadecimal -- the base sixteen numbering system. A convenient method of referring to binary numbers.

HIT -- see Hash Index Table

Target Diskette -- a diskette that is the object of an operation (e.g. data recovery).

Toggle -- to switch back and forth, having two states.

The Editorial:

This software package departs somewhat from normal practices in that it includes a soft copy of the documentation on the program diskette. Documentation is normally not included because it makes it easy to distribute unauthorized copies of the program. In other words, it makes it easy for the pirate. But, today, with a copier virtually on every corner it is easy to steal any author's work.

I personally feel any method to protect a work, that causes an inconvenience for the legitimate user, is a bad protection method. Piracy can only be stopped if we all refuse to give away, or to accept, unauthorized copies of software. There has been enough said in all the computer magazines for each of us to realize how piracy hurts us all, the software author and the legitimate user.

I find little books of program documentation difficult to store, handle, and keep track of and prefer everything in three ring binders. If you are like me, you can load the documentation into your word processor program, format it anyway you like, add additional notes, delete what you don't need, and print it on your printer. You will end up with exactly the kind of program documentation you want and need.

Frank

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Notes

LZAP

* C O M M A N D M O D E *

(R)EAD
(E)XIT
(D)EBUG
(B)ACKUP
ERROR DICTIONARY
(Y)ES (N)O
 ON

ENTER < LETTER >

DISPLAY MODE COMMAND SUMMARY

A ASCII MODIFY
C COMPARE
E EXIT
G GO DIRECTORY
I GO EXTENT
M MODIFY HEX
R REMOVE PASSWORD
W WRITE
Z ZERO BUFFER
ARROWS CURSOR CONTROLS
SPACE MENU TOGGLE

B LOCATE BYTE
D DEBUG
F FIND FILE
H HASH CODE
L LOCAL SEARCH
P PRINT SCREEN
S SEARCH GLOBAL
X ESCAPE
;+ -= PAGE SECTOR
0-7 PAGE DRIVE
@ CONTROL KEY