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ABSTRACT

A disk sector utility program (called TRAX) was designed and developed since a computer aid capable of inspecting and modifying the byte data on a disk platter, independent of any other program or system, was not commercially available. This report: (1) provides an overview of the TRAX system; (2) briefly describes the major system options; and (3) contains a guide to operating the TRAX utility. (JN)

TAEG

TRAINING ANALYSIS AND EVALUATION GROUP

TECHNICAL MEMORANDUM 84-1

TRAX
(DISK SECTOR UTILITY PROGRAM)

JULY 1984

FOCUS ON THE TRAINED PERSON

TRAINING ANALYSIS AND EVALUATION GROUP
ORLANDO FLORIDA 32813

Technical Memorandum 84-1

TRAX
(Disk Sector Utility Program)

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July 1984

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report presents the TRAX system which was designed to aid programmers and system operators with inspection and modification of the byte data on a disk platter. An overview of the TRAX is provided. The major system options are described. The report also contains a guide to operating the TRAX utility.

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INTRODUCTION

Computer software development is a complex and, often, tedious task. During normal operations, it is not uncommon to encounter some magnetic disk problems. These problems may result from hardware problems, programming errors, and changing requirements, or program misuse or abuse. Normally, correction of these problems involves byte reorganization on the disk or some modification (addition, deletion, or correction) of a file on the disk.

The need for a computer aid capable of inspecting and modifying the byte data on a disk platter, independent of any other program or system, was recognized by the Training Analysis and Evaluation Group (TAEG) during development efforts for the Chief of Naval Education and Training Automated Budget System (CABS) and the Chief of Naval Education and Training Automated Manpower Reporting System (CAMPRS). Efforts were initiated to obtain a commercially-produced program to meet requirements; however, none were available. Consequently, a disk sector utility program, called TRAX, was designed and developed. The TRAX system evolved slowly because of modifications that were needed to solve both current and expected future disk problems of other systems and application software in use, or under development, by TAEG. TRAX is currently a working utility program in use by the computer community supported by TAEG.

PURPOSE

This report presents the TRAX system and provides a guide on how to operate the utility.

ORGANIZATION OF THIS REPORT

In addition to this introduction, the report contains two additional sections. Section II provides an overview of TRAX and briefly describes the major system options. Section III is a guide to the operation of the TRAX utility.

SECTION II

OVERVIEW OF THE TRAX UTILITY

This section presents an overview of the TRAX utility. The major features of the utility are identified and a brief discussion of the functions of each available user option is provided.

The TRAX utility program consists of several disk-related subprograms. It is written in BASIC-2 and designed to operate on a WANG 2200 MVP within a 56K partition. The program was designed to aid programmers and system operators with inspection and modification of the byte data on a disk platter. The system was designed to be interactive and user oriented; however, the system was not designed for, nor intended to be operated by, the casual user. A certain degree of computer systems knowledge and sophistication is required if the system is to be used correctly and successfully.

SYSTEM OPTIONS

The following options are available in the TRAX system:

ASCII modify	allows the user to modify a sector in ASCII.
Exit	allows the user to exit the TRAX program.
Dump/printer	allows the user to print the current sector being viewed.
Find string	allows the user to locate a specified string.
Hex modify	allows the user to modify a sector in hexadecimal.
Link sectors	allows the user to jump according to a link pointer to another sector or record.
Mode	allows the user to change the disk address and/or the Relative or Absolute mode.
%pause	allows the user to refresh the normal viewing screen approximately once each minute.
↑point	allows the user to place pointers at any byte on the screen for easier viewing.

Position	allows the user to locate the position of the sector currently being viewed or the description of a file if its name is in the catalog while using the find string option.
Replace	allows the user to replace a located string with another string of the user's choice. This option can only be used in conjunction with the find string option.
Skip sectors	allows the user to jump forward or backward by a specified number of sectors.
Translate	allows the user to perform various translations and calculations.

The remainder of this report is a tutorial presentation on the use of TRAX and its various system options.

SECTION III

TRAX OPERATING PROCEDURES

It is assumed that the required computer hardware (CRT, disk drive) is available to the person intending to use the TRAX program. Initializing the equipment is an extremely easy task. However, because of the many possible equipment configurations, it is desirable that personnel knowledgeable in WANG equipment set up the program for subsequent use. After loading and starting the execution of program TRAX, the following screen will appear.

```
T R A X      Disk Address          :365

          welcome Chazz previous user was yourself

   This program tracks, displays, and modifies mag. disk sectors on a WANG
   2200-MVP system.  It was designed for use by the TAEG computer annex at
   NTC Orlando, Fl and can be hazardous if used improperly.  cj a/7914609
```

(Note: The TRAX program can be used with a start program that passes the name of the user in a common global variable '@Z1$' dimensioned eight characters long, it stores up to 10 users and information on where each user was in TRAX when they last exited it.)

The user can now enter the address of the disk he has an interest in or the disk address of the file he wishes to inspect. The user presses RETURN if the default address is correct and the following screen will appear:

```
T R A X      Disk Address          :365          Absolute or Relative

          welcome Chazz previous user was yourself

   This program tracks, displays, and modifies mag. disk sectors on a WANG
   2200-MVP system.  It was designed for use by the TAEG computer annex at
   NTC Orlando, Fl and can be hazardous if used improperly.  cj a/7914609
```

The user must now enter an "A" for Absolute mode or an "R" for Relative mode or Special Function key 15 (SF'15) to return to the disk address. The Absolute mode is selected when the user is not sure which sectors need to be inspected. The Relative mode is selected if the user knows which file is to be inspected. If the Absolute is chosen, the first sector of the disk platter is defaulted to and the user can inspect any sector on the disk regardless of file. If Relative is chosen, the user is prompted to enter the name of the file to be inspected and the following display appears:

```
T R A X      Disk Address          :365        file name: _____________


                  welcome Chazz previous user was yourself

    This program tracks, displays, and modifies mag. disk sectors on a WANG
    2200-MVP system.  It was designed for use by the TAEG computer annex at
    NTC Orlando, Fl and can be hazardous if used improperly.  cj a/7914609
```

Once a valid file name is entered, the first sector of the file is defaulted to. If the user had been previously inspecting this file and the user exited the program, the default sector will be the one that was being inspected at the time of exit.

The next screen to appear is the normal viewing screen, which lists the available options along the right side. All the options that are available at any given time in TRAX are listed here. If an option is not available, it will not be listed.

The normal viewing screen is displayed next.

```
RRR LIBP range:(38455 to 39454)  used: (= 998 of 999 = 99.90%)
- sector number or RETURN to proceed

 ##############0000000000#t#Line,#D##Duplicate#value,#RETURN/RE
 8080080C801F000033333333307246662242247766667627667622545554254
 1120021721600000000000000040C9E5C040D450C93145061C55C025452EF25

 CALL#-next/last#item#######(PAGE 6)#ENTER:#Line####P##Page,#U-Ne
 4444226677266772676600OF1002544423224454532466622225225666225246
 31CC00DE584FC13409450D0f8088017506905E452A0C9E5033003301750050E5

 xt#UIC/PE/OBSE/CL,#F-First UIC/PE/OBSE/CL,#######E-Exit#N-More#B
 772544254244542442242467772544254244542442222222424767224246762 4
 840593F05FF235F3CC06D692340593F05FF235F3CC0000005D5894C0EDDF2502

 illets,#T-Totals,#RETURN#-next#line,#C-List#AC/BA Codes########
 6666772252567667225455542266772666622424677244244246667000F00000
 9CC543C04D4F41C3C025452E0DE5840C0E5C03DC934013F2103F453D00E00000

 Ascii modify
 Hex   modify
 Skip sectors
 Link sectors
 Find string
 Position
 Translate
 Mode/Disk
 %pause
 pointer
 Dump/printer
 Exit

rel. sector 0 of RRR LIBP, abs. sector 38455 of disk D12
```

In addition to the options available, the user may press RETURN and proceed to the next sector, or enter any sector number to proceed to that sector. Special Function keys 4 through 7 and 11 through 14 may also be used to move forward and backward. Table 1 provides a quick reference for using the Special Function keys. TRAX will check the validity of all sector numbers. In a Relative mode only sector numbers within the file in question are valid and the sector numbers are relative to that file. In an Absolute mode all sectors up to the current end of the disk are valid.

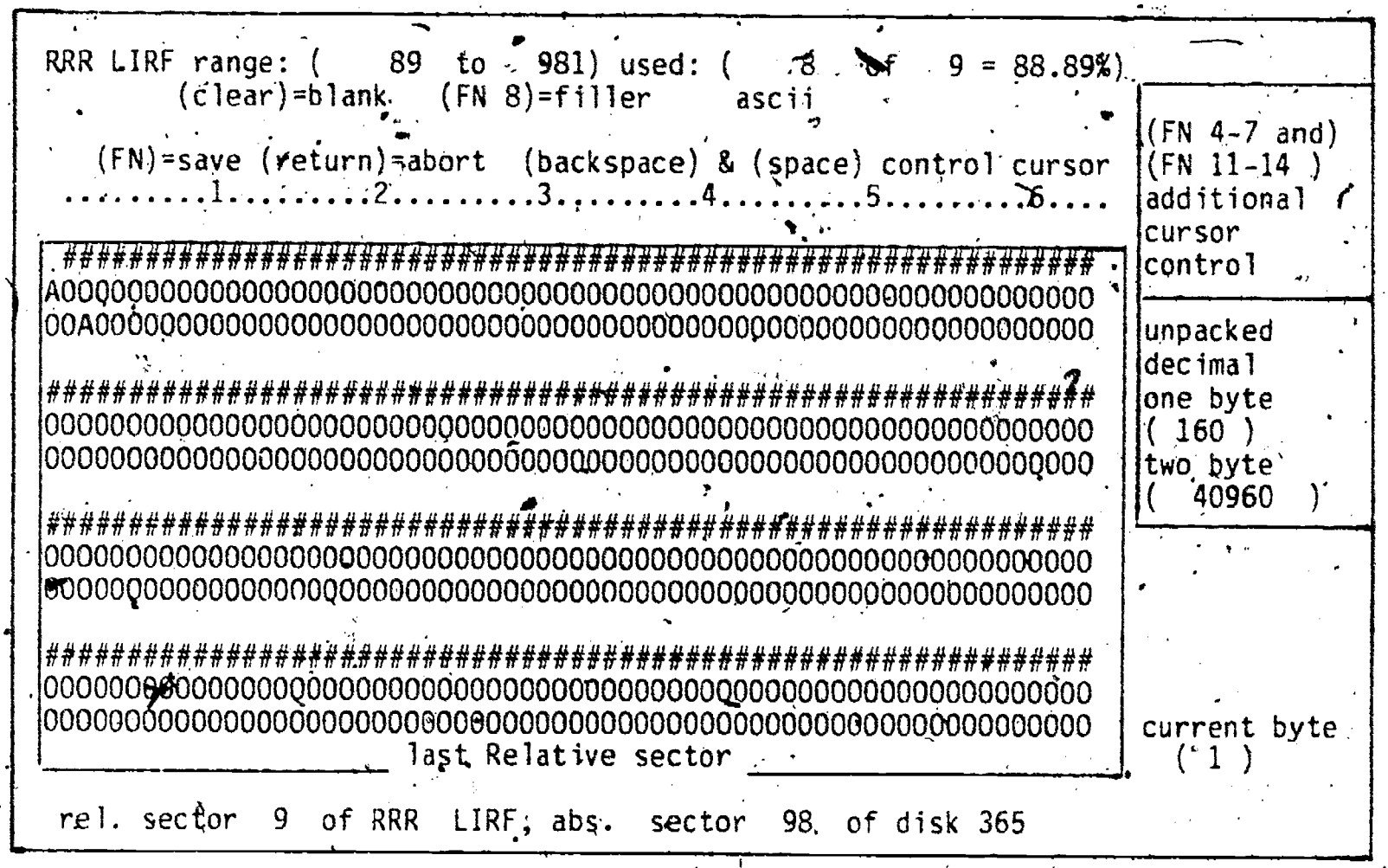
SF 4	In the Relative mode the last sector of the file is displayed.
SF 5	In the Relative or Absolute mode proceed to the next sector.
SF 6	In the Relative or Absolute mode proceed to the previous sector.
SF 7	In the Relative mode the first sector of the file is displayed.
SF 11	In the Relative or Absolute mode proceed forward five sectors.
SF 12	In the Relative or Absolute mode proceed to the next sector.
SF 13	In the Relative or Absolute mode proceed to the previous sector.
SF 14	In the Relative or Absolute mode proceed backward five sectors.

A description of the options available with TRAX is provided in the remainder of this section. The options are presented in their order of occurrence on the CRT. Detailed procedures for operating each option are provided.

Figure 1. Special function key operations.

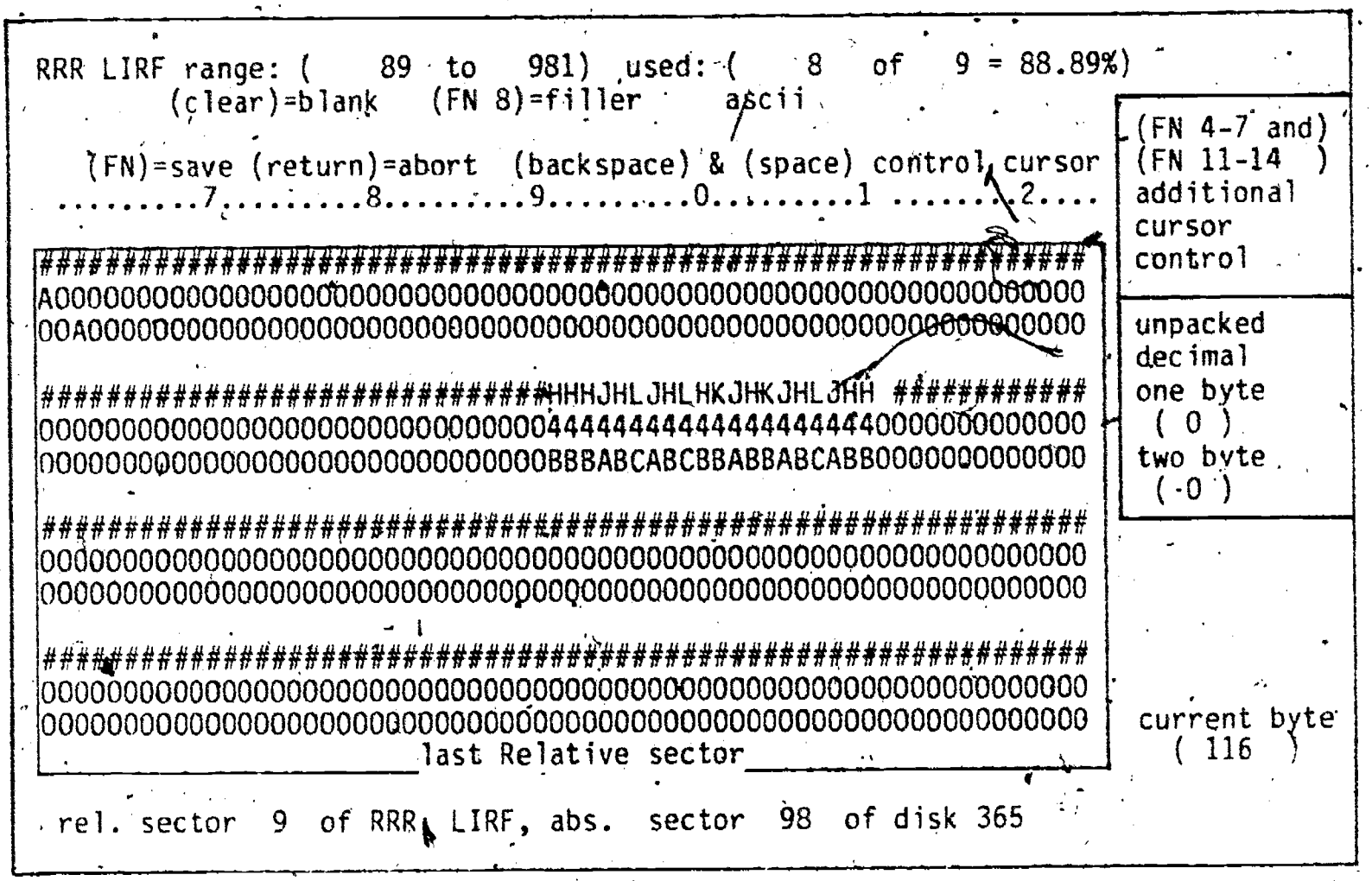
ASCII MODIFY OPTION

Selecting the ASCII_Modify Option will cause the system to display:



This option allows the user to modify the ASCII portion of a sector. Once an "A" is entered at the prompt at the top of the screen, the available options will appear. The user can control the cursor with Special Function keys 4 through 7 and 11 through 14 or with the SPACE and BACKSPACE keys. The CLEAR key will cause a blank space (HEX(20)) where the cursor is positioned. All changes are made by typing over what appears on the screen. The FN key will save all changes that have been made, the RETURN key will abort the ASCII Modify Option without saving any changes and return the user to the normal viewing screen. Special Function key 8 allows the user, while in the ASCII Modify Option, to modify more than one hexadecimal byte with some common hexadecimal. Once Special Function key 8 is entered, a prompt will appear at the top right side of the screen for the hexadecimal code to be entered. After a valid hexadecimal code is entered, a prompt will appear for the start byte and then the end byte to be filled with this hexadecimal.

If a blank is entered at any of these prompts, the user is returned to the previous prompt. The unpacked decimal value of the current one and two byte position is displayed on the right side of the screen for the users convenience.



HEX MODIFY OPTION

Selecting the HEX Modify Option will cause the system to display:

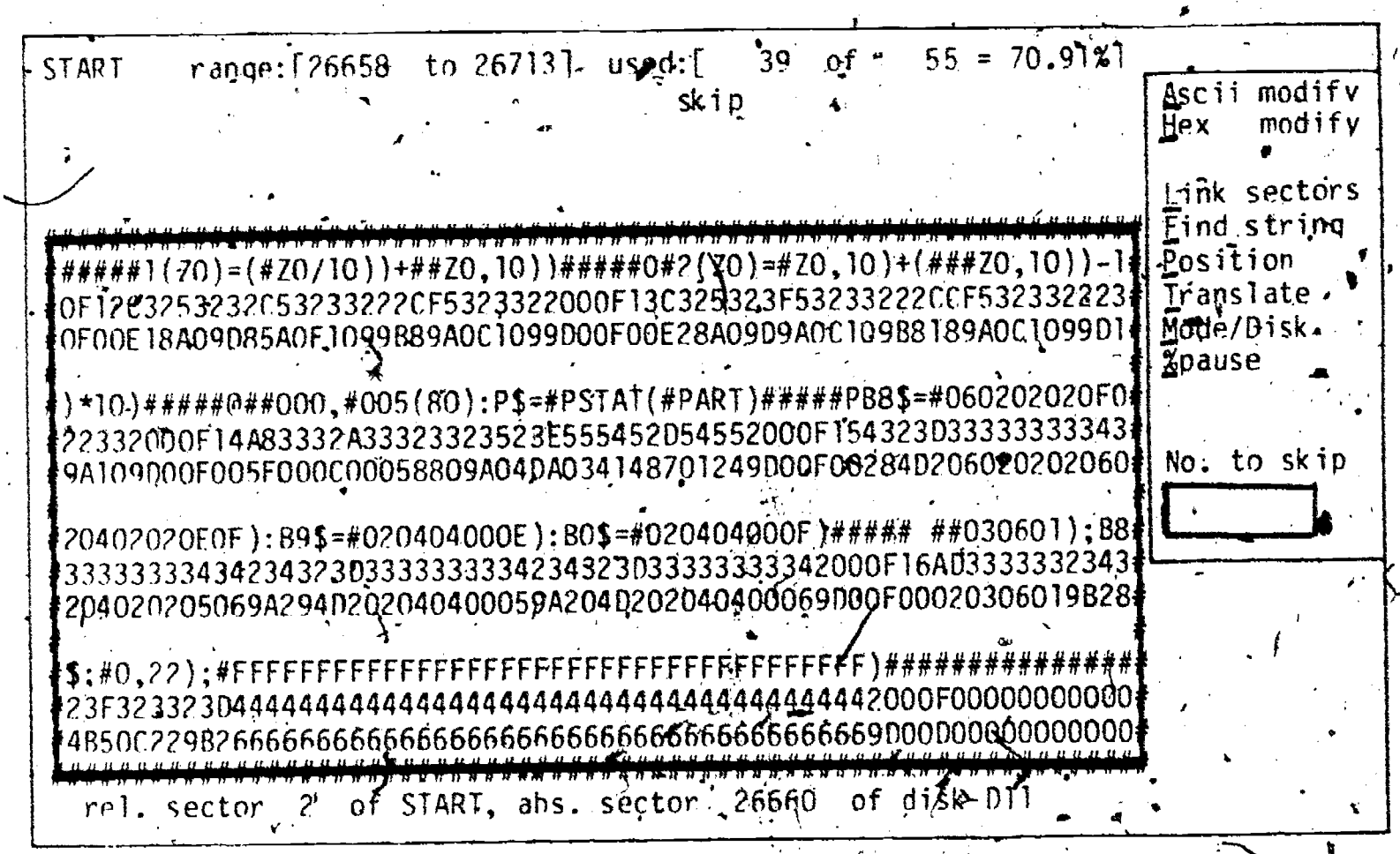
```
START    range:[26658 to 26713] used:[   39 of    55 = 70.91%]
  sector number or RETURN to proceed

#####%:[#System#Security#Start#]#NTEC#(N-1/TAEG)#Charles#'chazz'#
#0F10A25325777662566776772576772324544224232544422466766722666772#
#0F0025EC039345D035352949034124OE0E45308ED1F4157903812C5307381AA7#

#Johnson#######@Z1$8,@Z0$2:#Z$(10,10)8,Z9$(10,10)11,R(2):#Z$8,R3#
#24666766000F11A45323245323395223323325322332332332523239523253#
#0AF8E3FED00F0060A148C0A042A3A4810C1098CA9481OC1091 1C2829A3A48C23#

#$8,R2$80,V$16,L$2,Q$1,K$1,C1$5,C2$5,E$60,B9$5,B0$5,B8$11,R0$1,R1#
#232532332523324232423242324323242332423242332432324323253232533#
#48C22480C6416CC42CF41CB41C3145C3245C5460C2945C2045C28411C2041C21#

#$5,R9$16,R8$16,R6$17,P$29,E1$25:#PSTAT="=start="################
#232532332532332532332523324323 33E5554532377677320 00F0000000000#
#45C29416C28416C26417C0429C51425AA03414D2D34124D2D00D0000000000000#
```

rel. sector 1 of START, abs. sector 26659 of disk D11.

This option is exactly like the ASCII Modify Option, except the hexadecimal portion of a sector is being modified and the CLEAR key is disabled. Once an "H" is entered at the prompt at the top of the screen, the options available to aid in the modification will appear.

SKIP OPTION

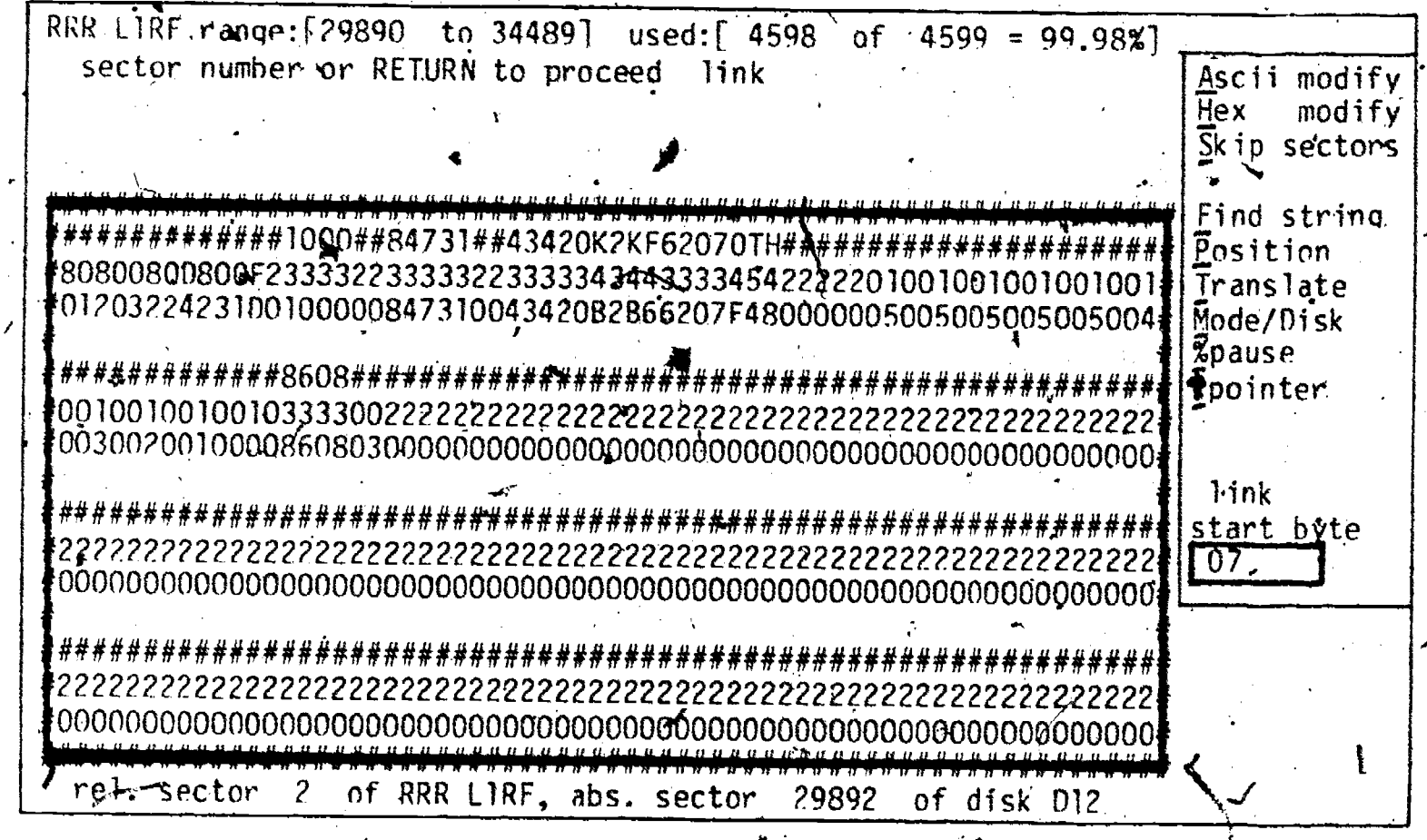
Selecting the Skip Option will cause the system to display:



This option allows the user to skip or jump any number of sectors specified, forward or backward, in a file or on a disk. Once an "S" is entered at the top of the screen, a prompt will appear on the right side asking for the number of sectors to skip. If nothing is entered, the prompt will return to the top of the screen. If a negative value is entered, the skip will be backwards.

LINK OPTION

Selecting the Link Option will cause the screen to display:



This option allows the user to follow a link structured data file where the link pointer bytes must be two bytes long. Once an "L" is entered at the prompt at the top of the screen, a prompt will appear on the right side asking for the start byte of the link pointer in the sector currently being viewed. If nothing is entered, the prompt will return to the top of the screen. Once a legal start byte is entered, the next sector linked to will appear with the relative position of the next link in a prompt line above the start byte prompt. A blank can be entered here and the prompt will return to the top of the screen or this number can be altered to deviate from the link pointer. If the number is unaltered, pressing RETURN will display the next linked sector as shown on the next screen.

RRR LIRF range:[29890 to 34489] used:[4598 of 4599 = 99.98%]
link

```
##############1000##8473I##43420K2KJ62070TH#######################
8080D80D8FFF233332233333223333343443333454222220100100100100100l
0122422?2FFD0100000847310043420B28A6207F480000006006006006006005
##############8855#################################################
0010010010010333308222222222222222222222222222222222222222222222
0050050050050885531000000000000000000000000000000000000000000000
##################################################################
2222222222222222222222222222222222222222222222222222222222222222
0000000000000000000000000000000000000000000000000000000000000000
##################################################################
2222222222222222222222222222222222222222222222222222222222222222
0000000000000000000000000000000000000000000000000000000000000000
```

Ascii modify
Hex modify
Skip sectors

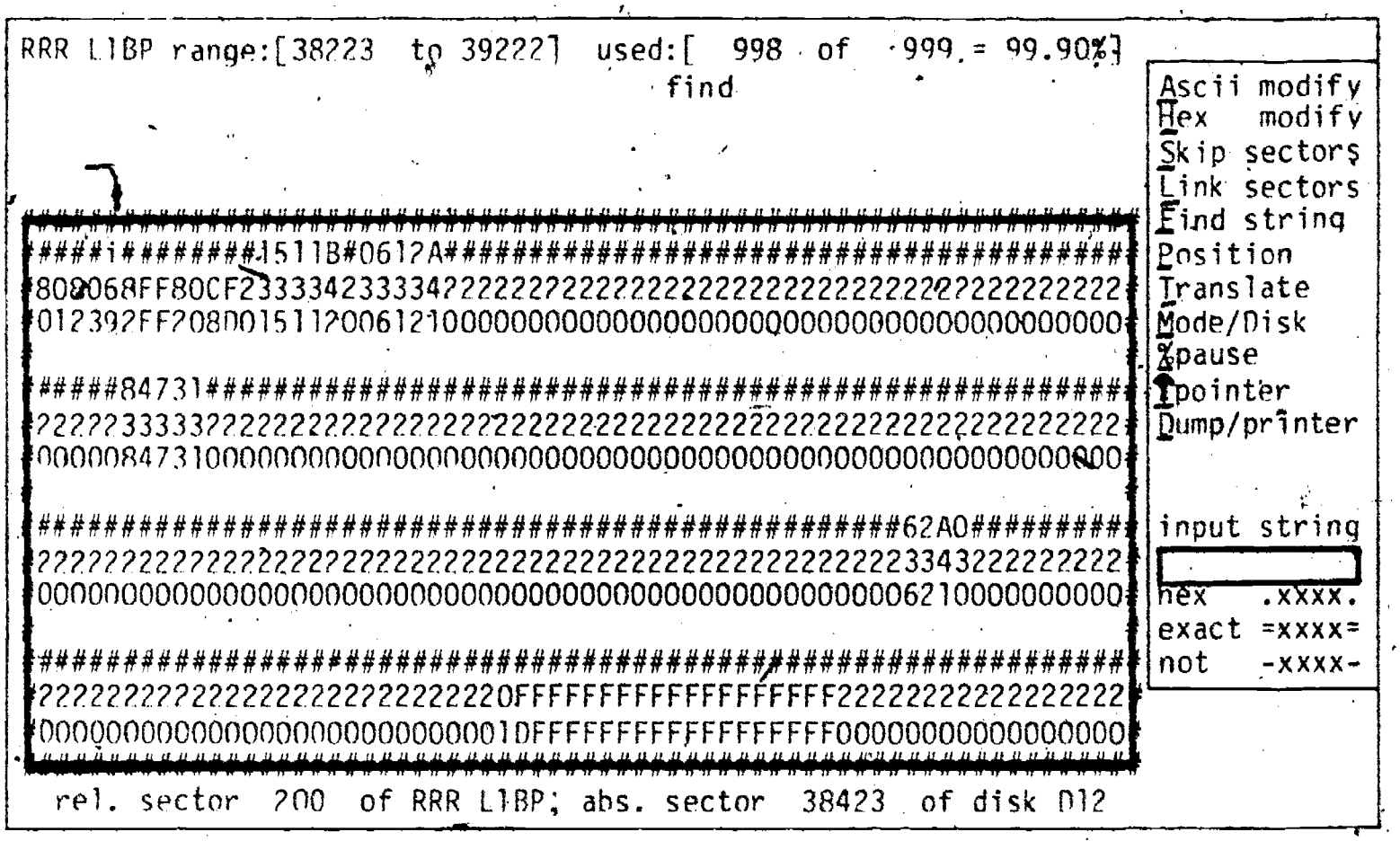
Find string
Position
Translate
Mode/Disk
%pause
Pointer

next link
+00005
start byte
07

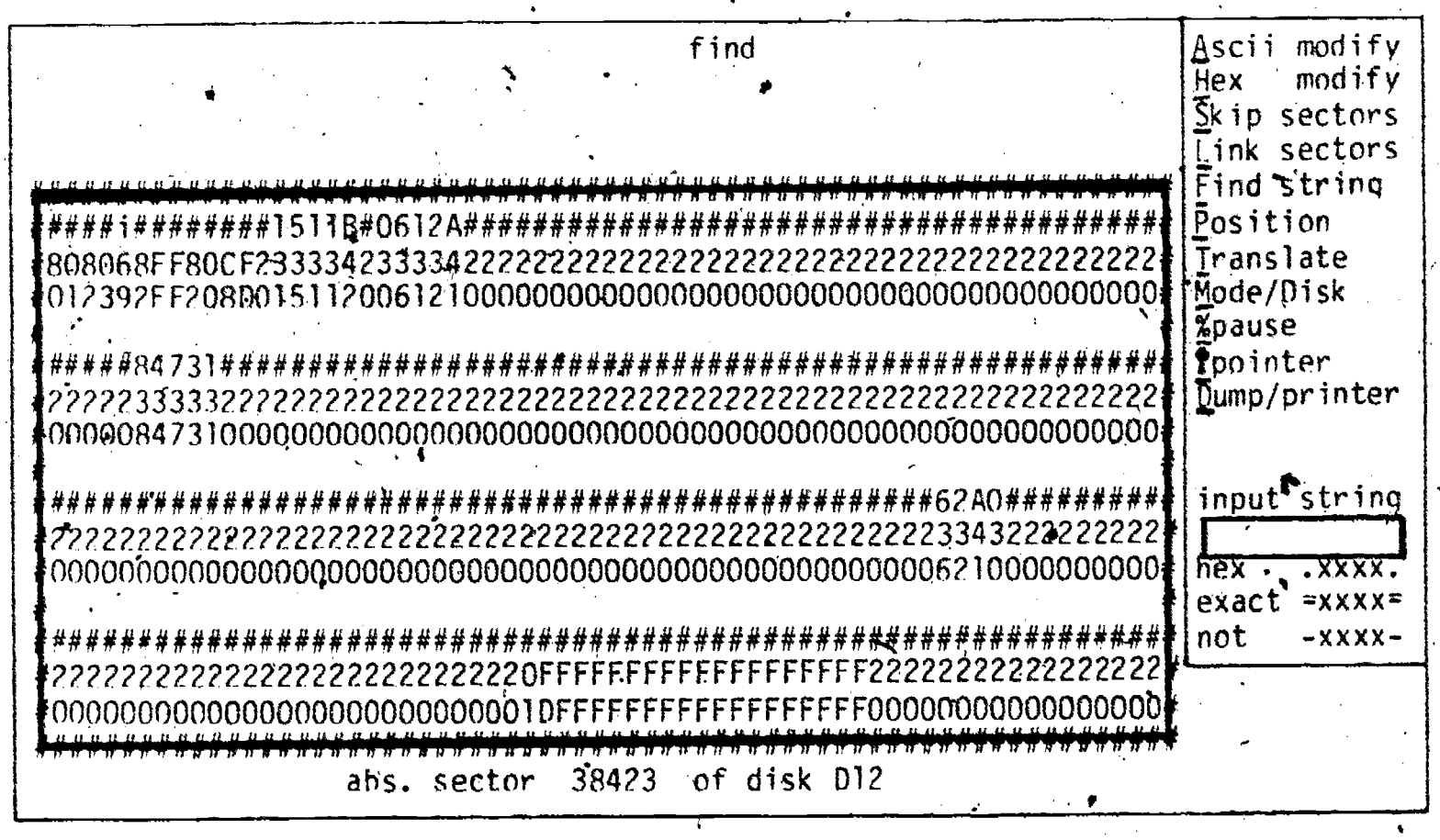
rel. sector 724 of RRR LIRF, abs. sector 30614 of disk D12

FIND A STRING OPTION

Selecting the Find a String Option will cause the system to display an image similar to the following if you are in the Relative mode:

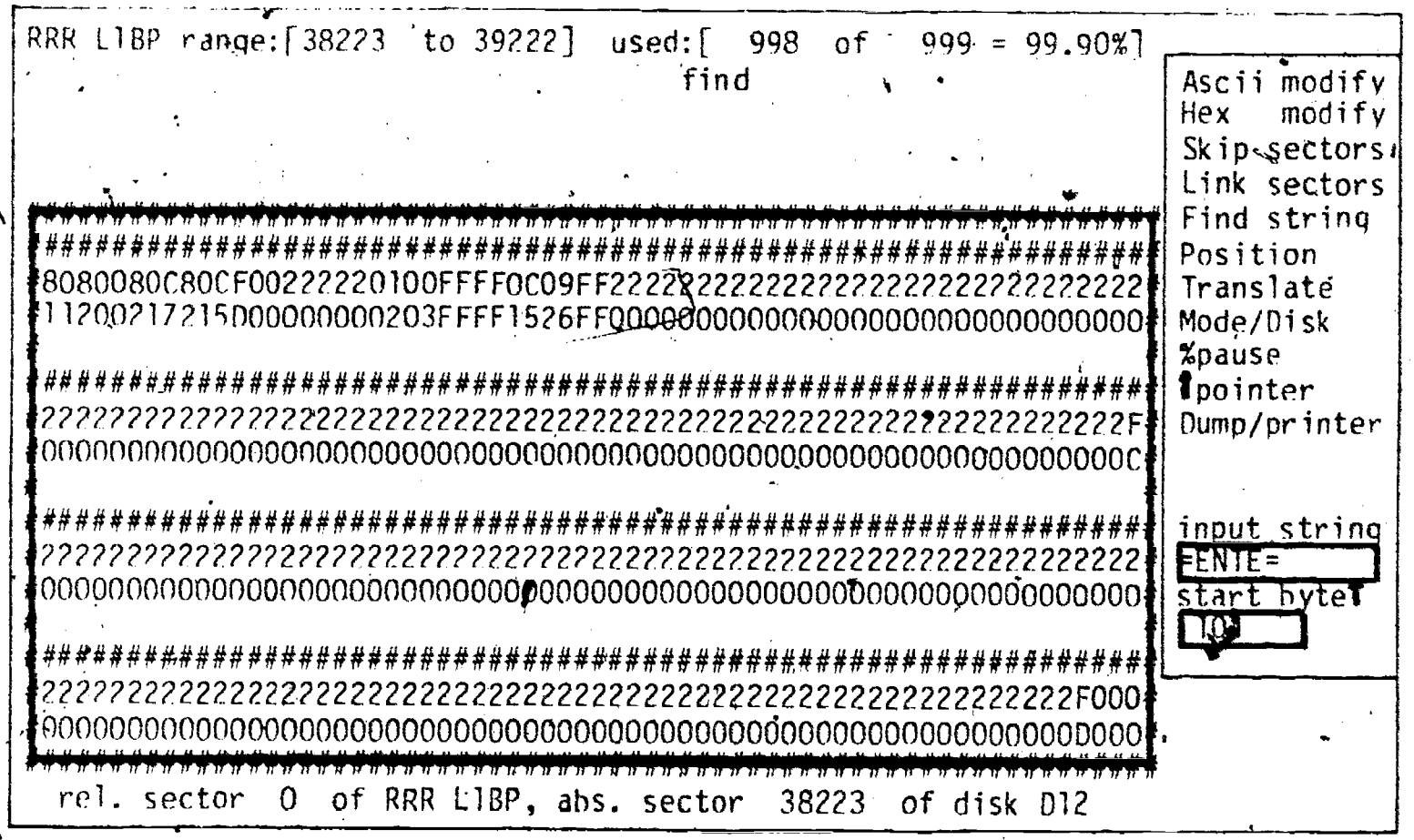


or, an image similar to the following if you are in the Absolute mode:

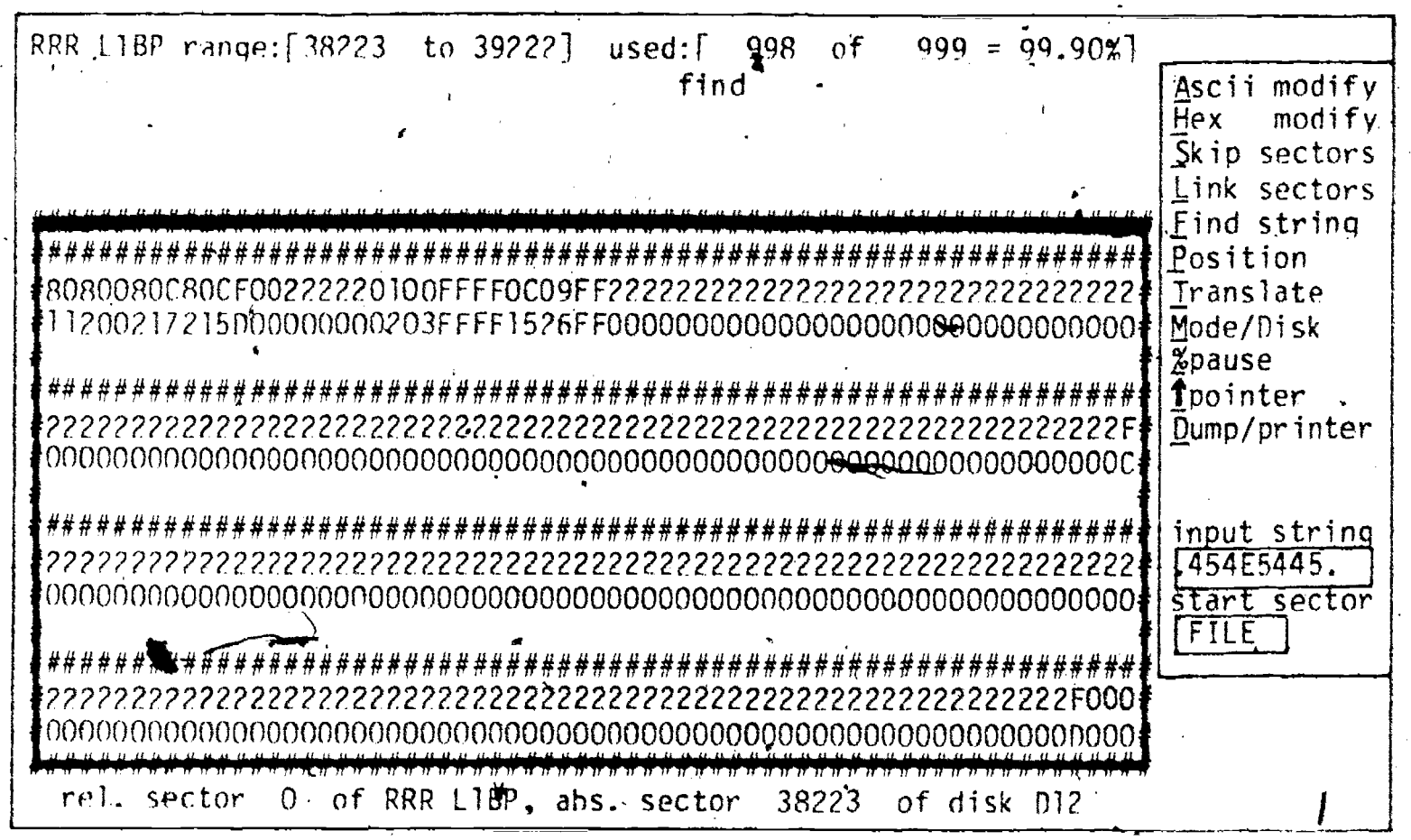


This option allows the user to locate an ASCII string (up to 64 characters) or a hexadecimal string (up to 62 hexadecimal digits). This option can find up to 1,000 occurrences with a maximum of 20 occurrences per sector. The user may specify the location of a string only at a certain byte position within the sector. The user may also find all occurrences where the string starting at a particular byte position is not the given string. Once an "F" is entered at the prompt at the top of the screen, a prompt will appear on the right side asking the user to input the string to locate. If a blank is entered, the user is returned to the normal viewing screen. If the string entered contains valid hexadecimal characters with a period (.) just before and after the string, then it is accepted as a hexadecimal string; otherwise, it is considered to be an ASCII string.

If the string (either hexadecimal or ASCII) has an equal (=) sign just before and after it, then it indicates the user would like to look for that string starting at a specified byte. A prompt will appear for that starting byte as shown below.

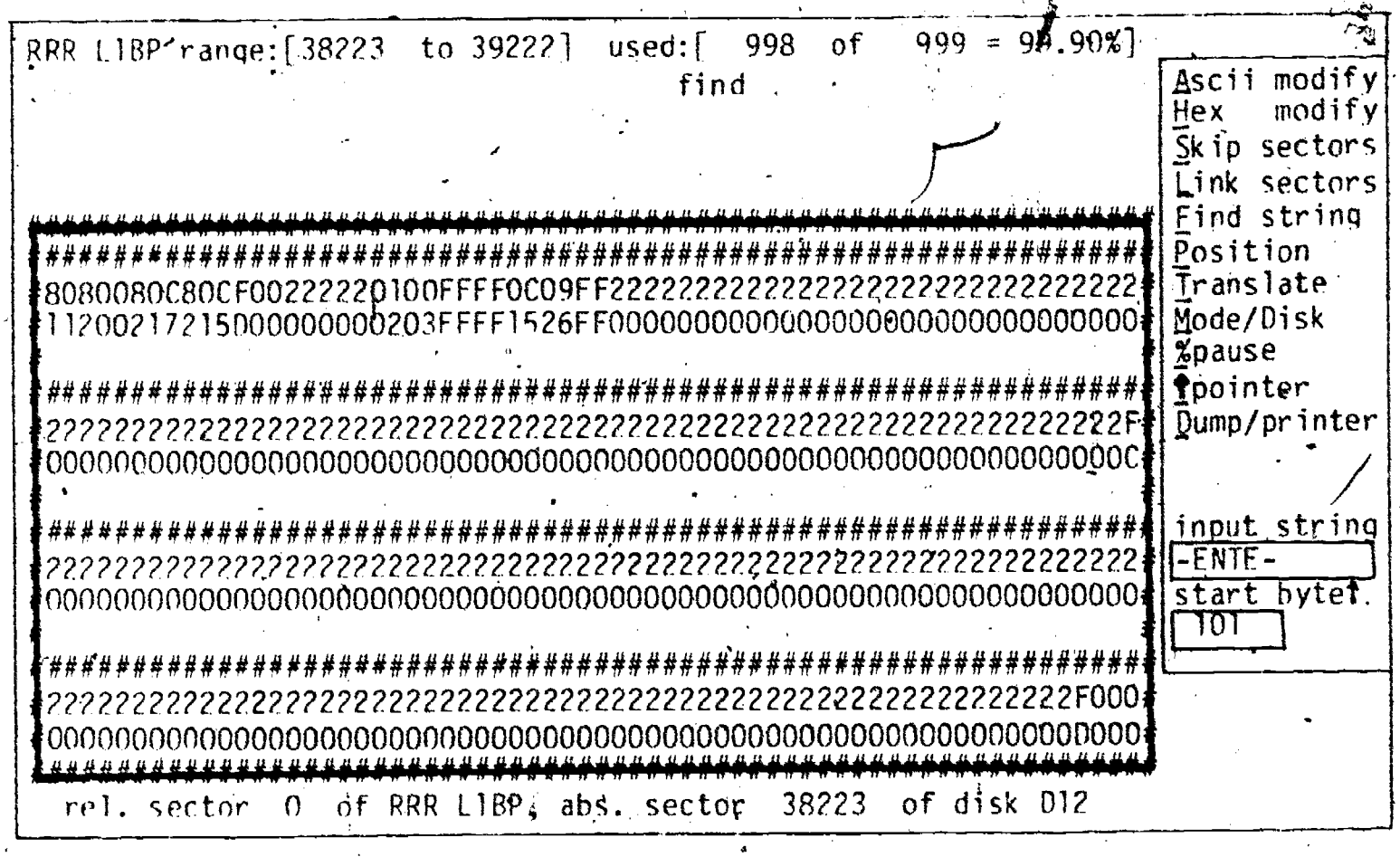


An example of inputting a hexadecimal string is shown below.



If the string (hexadecimal or ASCII) has a negative (-) sign just before and after it, then it indicates the user would like to find the occurrences, starting at a specified byte, that are not the input string.

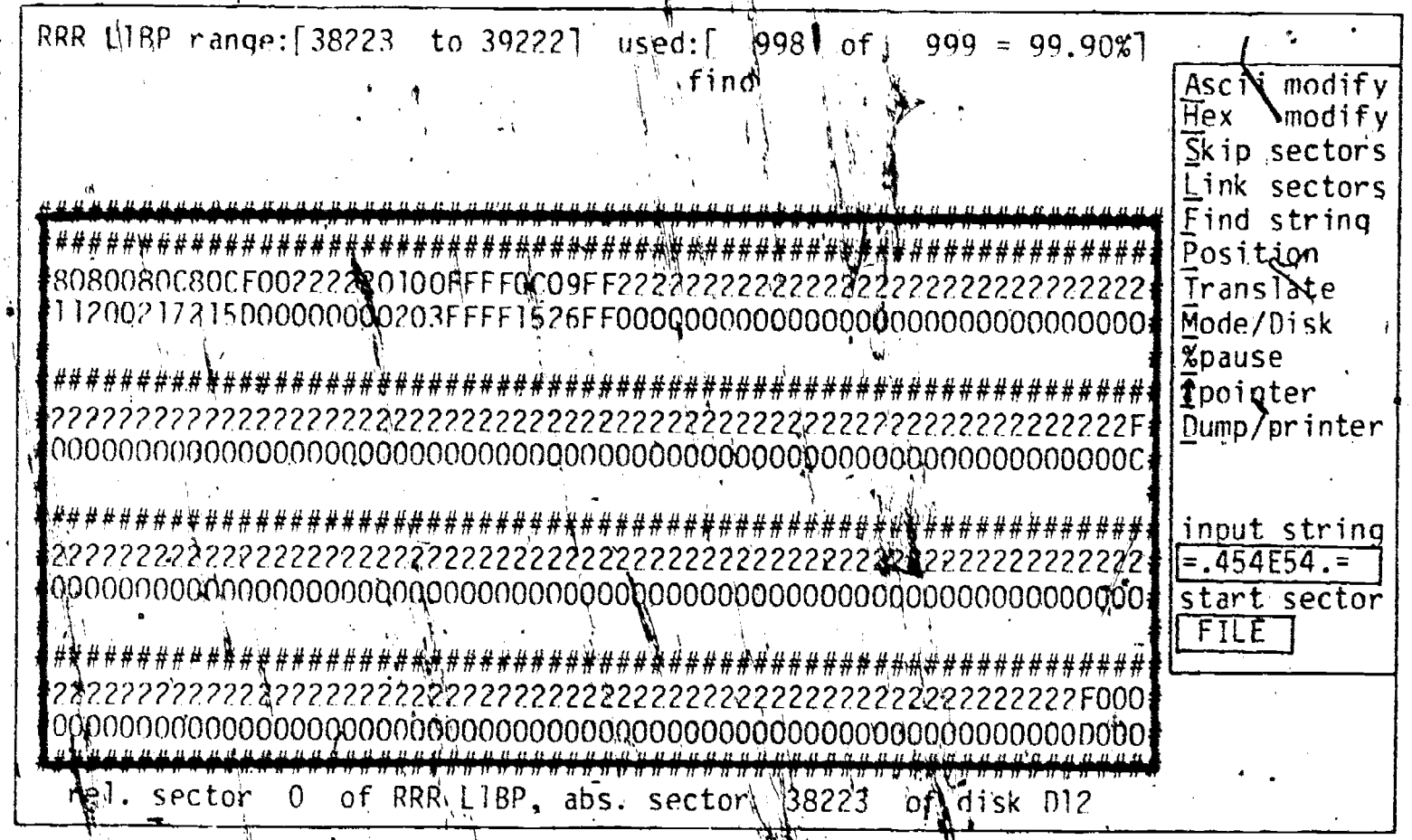
An example is shown below.



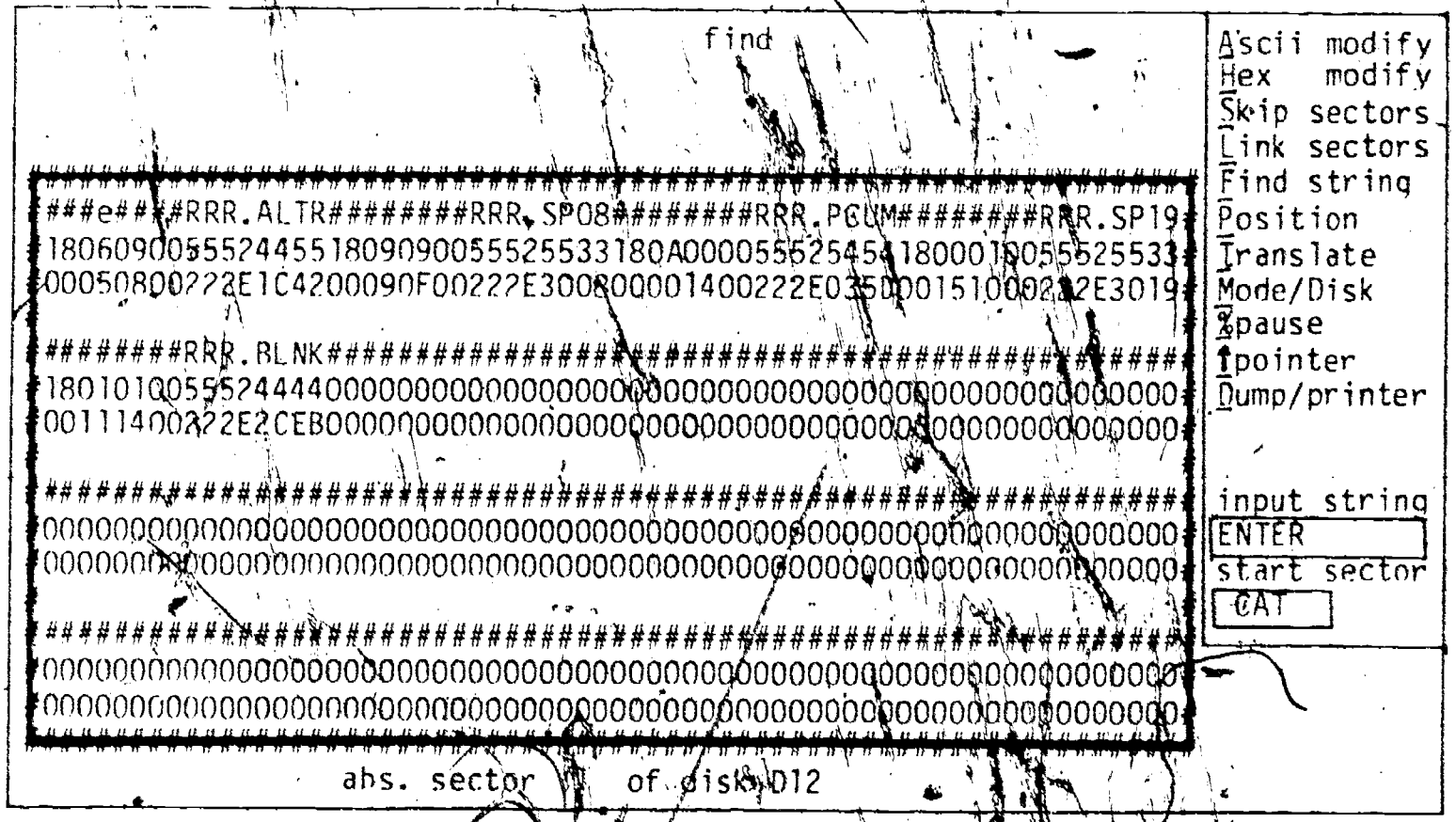
After the string has been entered, as well as the starting byte, if required, a prompt will occur below the input string. The user will be asked for the starting sector of the search. (This would be the starting relative sector if the user is in a Relative mode or starting absolute sector if the user is in an Absolute mode.)

At this prompt, the user may enter "file". If the user is in a Relative mode, then the parameters of the current file will become defaults. If the user is in an Absolute mode, the user may enter "cat", for catalog and the parameters of the disk catalog will become defaults, or "disk" may be entered and the parameters of the disk, other than the catalog, will become defaults.

This is an example of the Relative mode display:



This is an example of the Absolute mode display:



After a valid starting sector is entered, a prompt will appear just below it for the number of sectors to search. This number will default down to fit the file if the user is in a Relative mode and the number exceeds the file parameters, or, it will default down to fit the disk if the user is in an Absolute mode and the number exceeds the disk parameters. The next prompt asks for the number of finds. This number can have any value from one to 1,000. When a valid number is entered the search will begin. (Note: Entering a blank at any of the aforementioned prompts will cause the previous prompt to appear.) During the search, the top bar graph will display the percentage of the range searched and the small bar graph below it will display the number of finds, out of the number desired. Any key that is pressed during the search, except the RETURN key, will cause the number of the current sector being searched to be displayed. If the RETURN key is pressed, searching is halted. Pressing any key except the RETURN key will continue the search; pressing the RETURN key again will abort the search.

If nothing is found, the input string prompt will appear again. Entering a blank here will return the user to the normal viewing screen. If something was located, the sector numbers (up to a maximum number of 20) will be displayed at the top of the screen and a prompt will appear allowing the user to track sectors.

search terminated at sector 85 find Track sectors

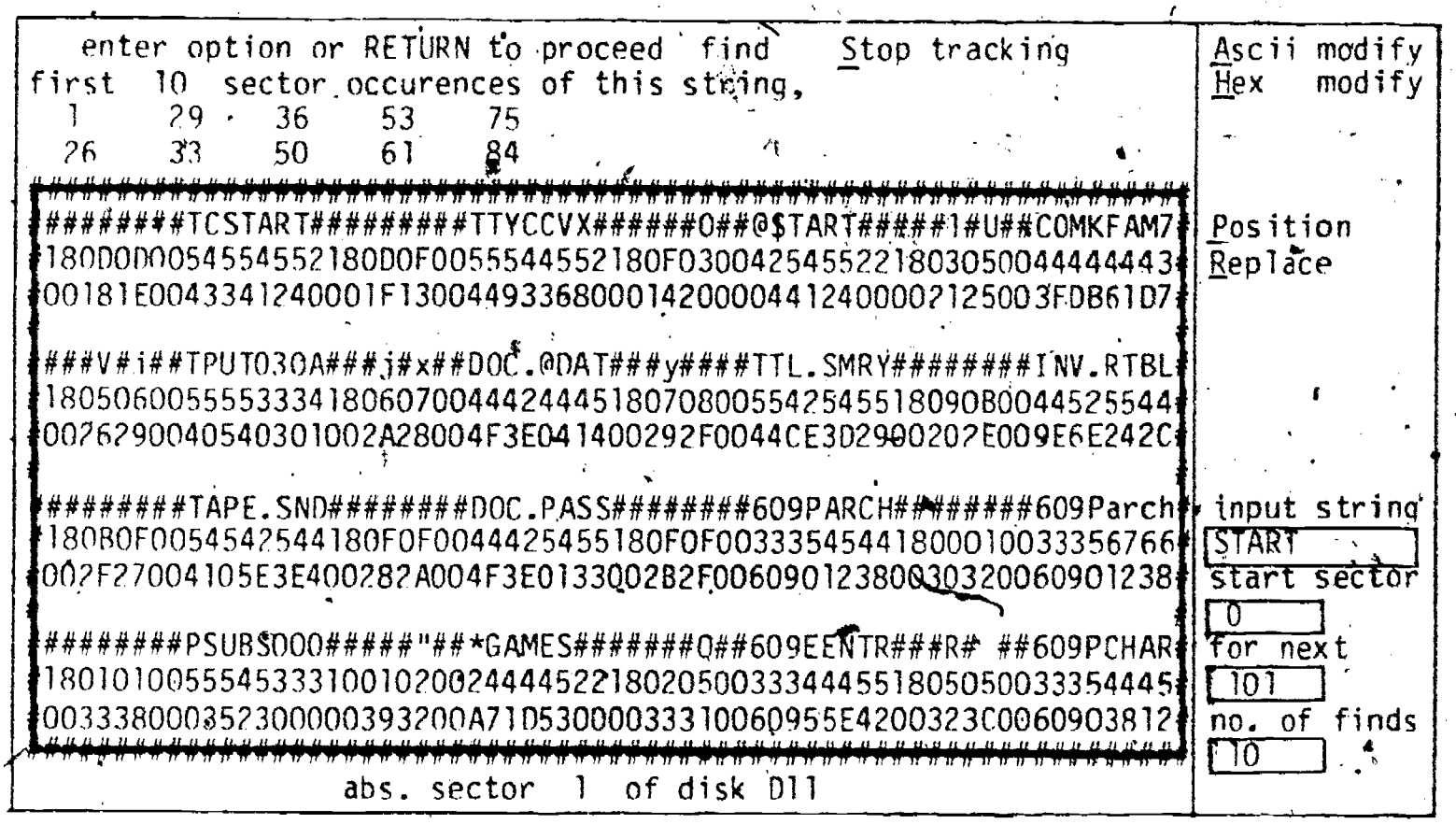
1 29 36 53 75
26 33 50 61 84

```
########TCSTART########TTYCCVX######0##@$TART#####1#U##COMKFAM7
180D0D0054554552180D0F0055544552180F0300425455221803050044444443
00181F0043341240001F13004493368000142000044124000021250O3FDB61D7

###V#i##TPUT030A###j#x##DOC.@DAT###y####TTL.SMRY########INV.RTBL
18050600555533341806070044424445180708005542545518090B0044525544
00262900405403010O2A28004F3E041400292F0044CE3D2900202E009E6E242C

########TAPE.SND########DOC.PASS##,######609PARCH########609Parch
180B0F0054542544180F0F0044425455180F0F0033354544180001003335676G
002F27004105E3E400282A004F3E0133002B2F0060901238003032006090123B

########PSUBS000#####"##*GAMES#######Q##609EENTR###R# ##609PCHAR
18010100555453331001020024444522180205003334445518050500335444G
00333800035230000039320OA71D53000033310060955E4200323C00609038I2
```

input string
START
start sector
0
for next
101
no. of finds
10

abs. sector 1 of disk D11

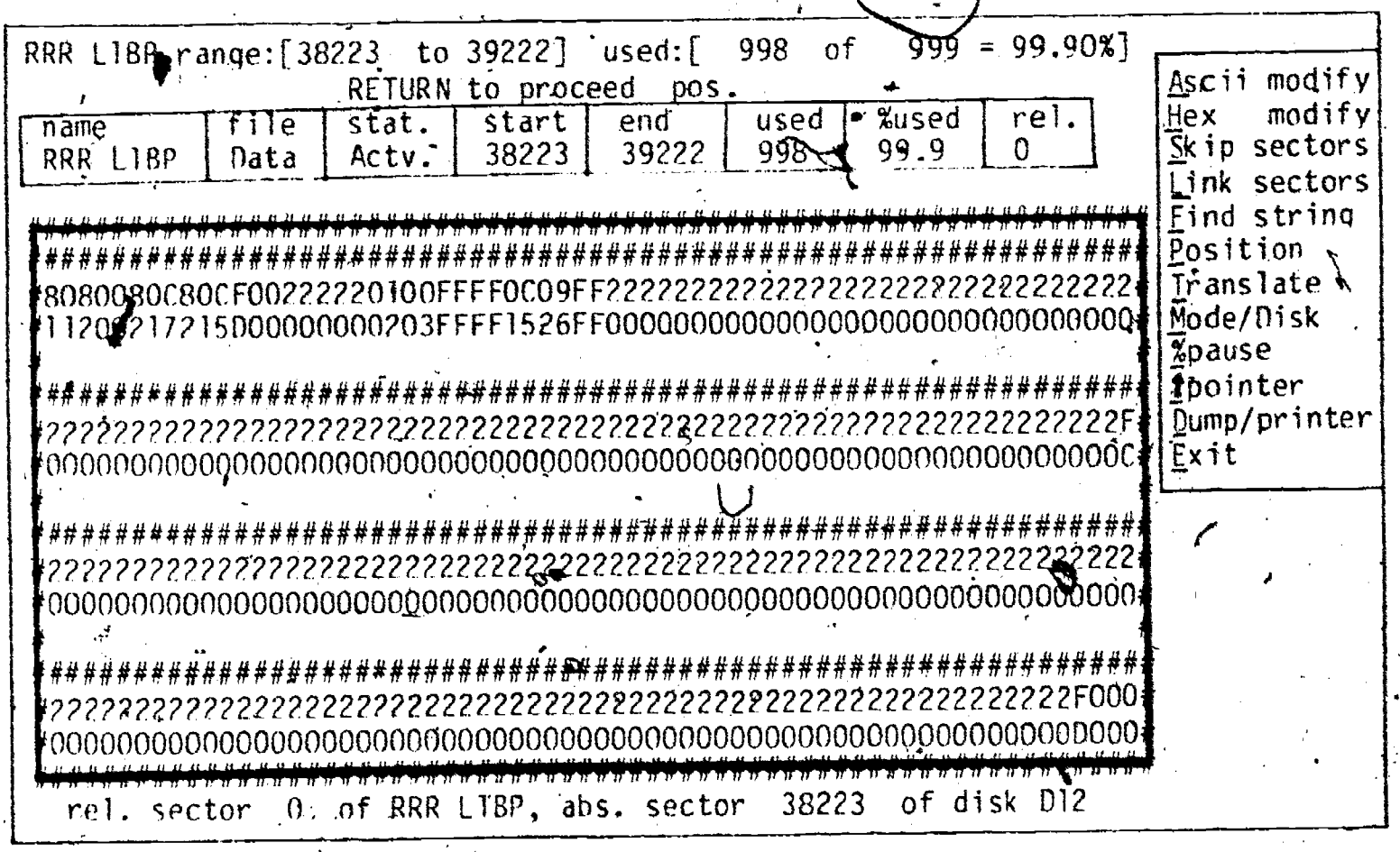
If a "T" is entered, the screen will begin displaying the sectors searched out, one at a time. To display the next located sector, press RETURN; to display the previous located sector, press BACKSPACE. To terminate the sector tracking, enter an "S" for Stop tracking. Any of the options listed on the right side of the screen can be used while tracking the located string.



REPLACE OPTION. This option can only be used while tracking a located string with the Find a String Option. Once an "R" is entered while tracking a located string, a prompt will appear along the right side asking what the located string is to be replaced with. This replacement string must not exceed the located string in length and must be hexadecimal if the located string is hexadecimal or ASCII if the located string is ASCII. Once the correct replacement string is entered, the replacement is accomplished and the user is returned to the normal tracking of the new string.

POSITION OPTION

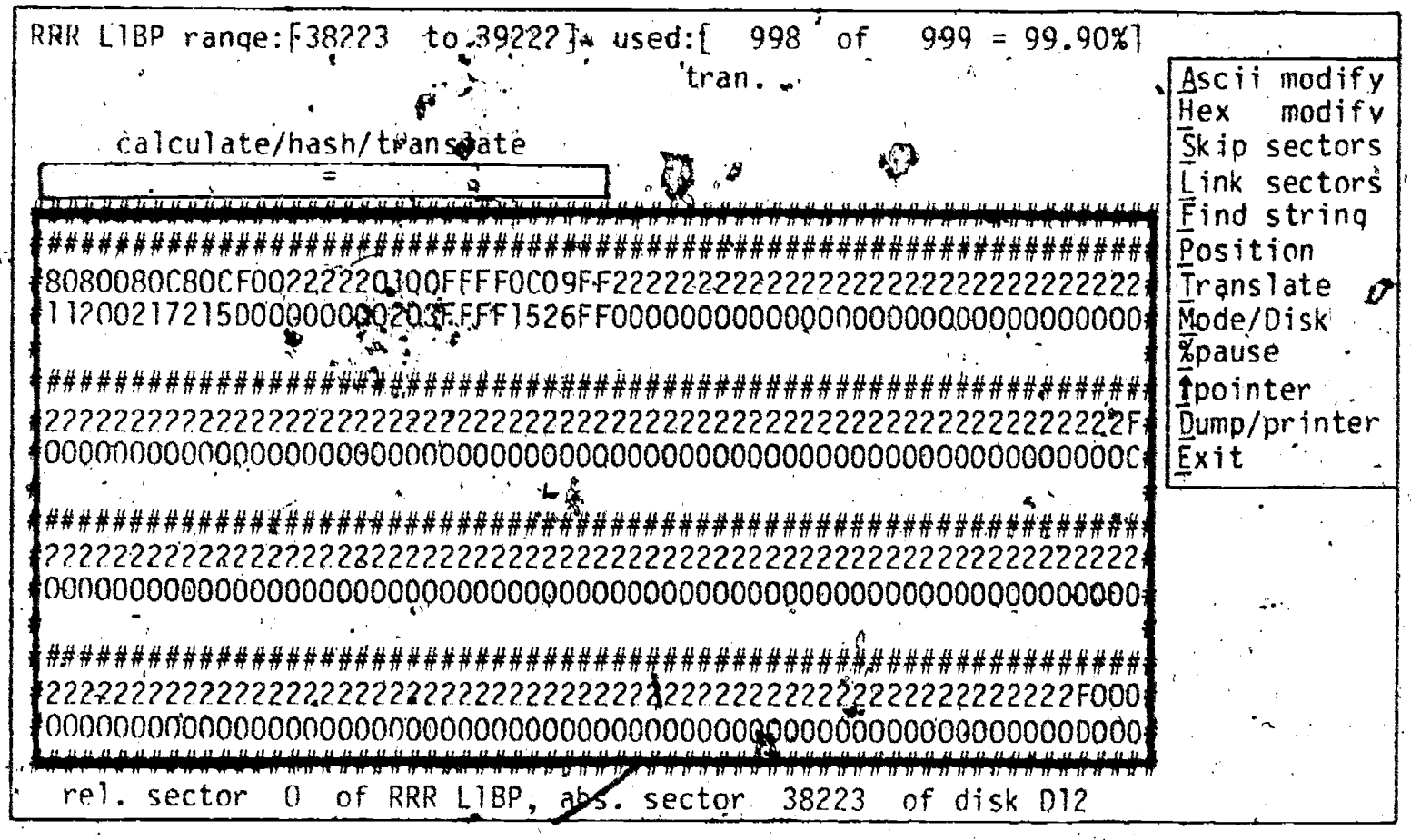
Selecting the Position Option will cause the screen to display:



This option allows the user to locate the current sector displayed, as defined by the disk catalog. This option can be used in the Relative mode or Absolute mode; however, it is more useful in the Absolute mode since the user can be in any file and may not know which file is currently being displayed. Once a "P" is entered at the prompt at the top of the screen, a display will occur stating that the catalog is being searched. Shortly after this, the data from the disk catalog will be displayed across the top of the screen. If the user is tracking a located string with the Find a String Option and is in the catalog of the disk, the Position Option will state the user is in the catalog and state the catalog file information involving the located string. Press RETURN to return to the prompt at the top of the screen.

TRANSLATION OPTION

Selecting the Translation Option will cause the following screen to appear:



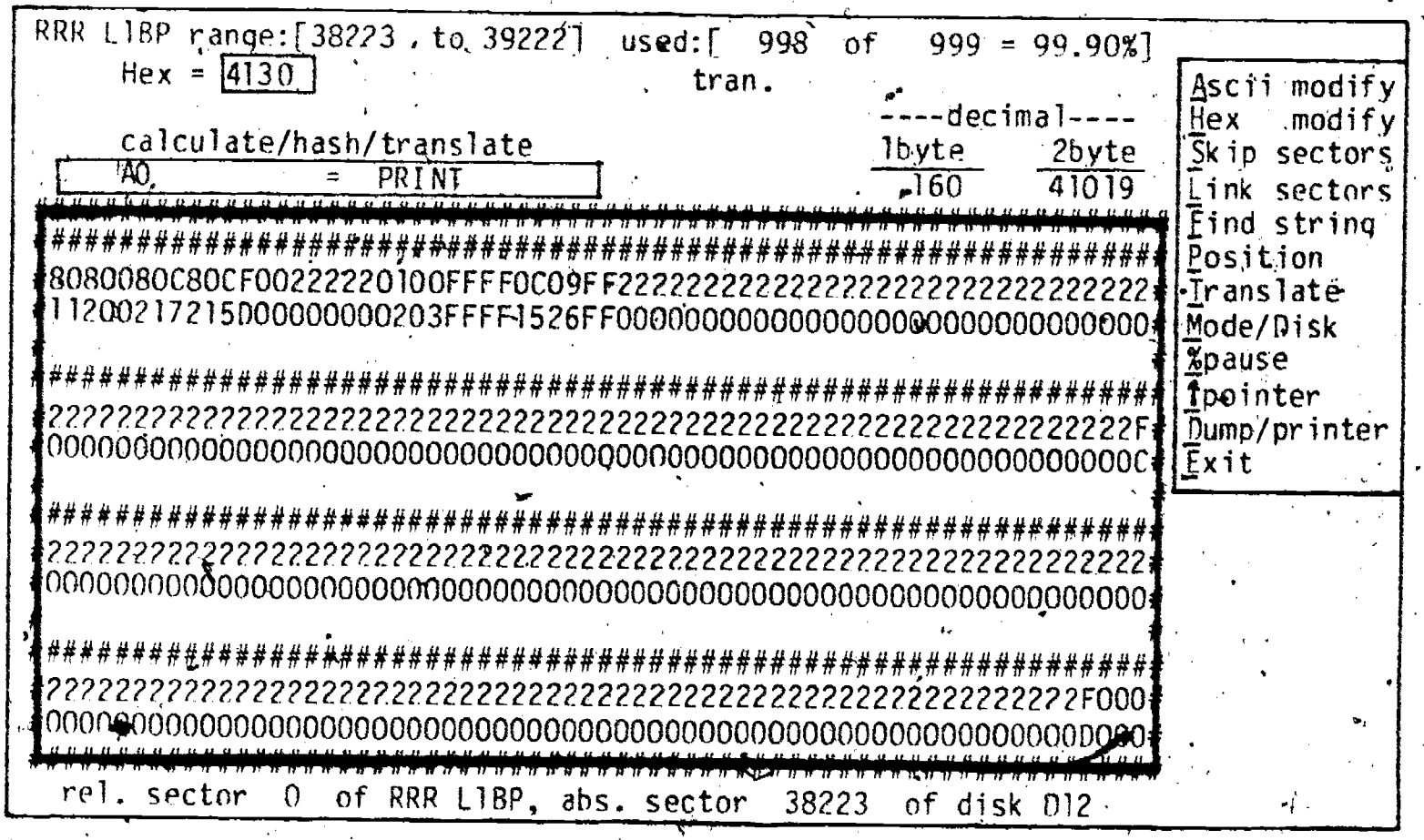
This option allows the user to perform various translations and calculations. Once a "T" is entered at the prompt at the top of the screen, a prompt will appear on the top left side asking for input. If a blank is entered, or if RETURN is pressed twice, the user returns to the normal viewing screen. If a number is input, it will be translated to hexadecimal, two byte binary hexadecimal, one and two byte decimal and relative/absolute sector addresses as shown following:

```
RRR LIBP range:[38223  to 39222]  used:[  998  of   999 = 99.90%]
     Hex = 313233                        tran.                        Ascii modify
rel/-38100  +rel/ 123  abs/ 38346   --binary--   ----decimal----      Hex   modify
   calculate/hash/translate           2 byte      1byte     2byte     Skip sectors
 123            =          none        0078        18        4667     Link sectors
################################################################      Find string
8080080C80CF00222220100FFFF0C09FF2222222222222222222222222222222      Position
11200217215D00000000203FFFF1526FF0000000000000000000000000000000      Translate
                                                                      Mode/Disk
################################################################      %pause
???????????????????????????????????????????????????????????????F      ↑pointer
000000000000000000000000000000000000000000000000000000000000000C      Dump/printer
                                                                      Exit
################################################################
????????????????????????????????????????????????????????????????
0000000000000000000000000000000000000000000000000000000000000000

################################################################
????????????????????????????????????????????????????????????F000
000000000000000000000000000000000000000000000000000000000000D000
  rel. sector  0  of RRR LIBP, abs. sector  38223  of disk D12
```

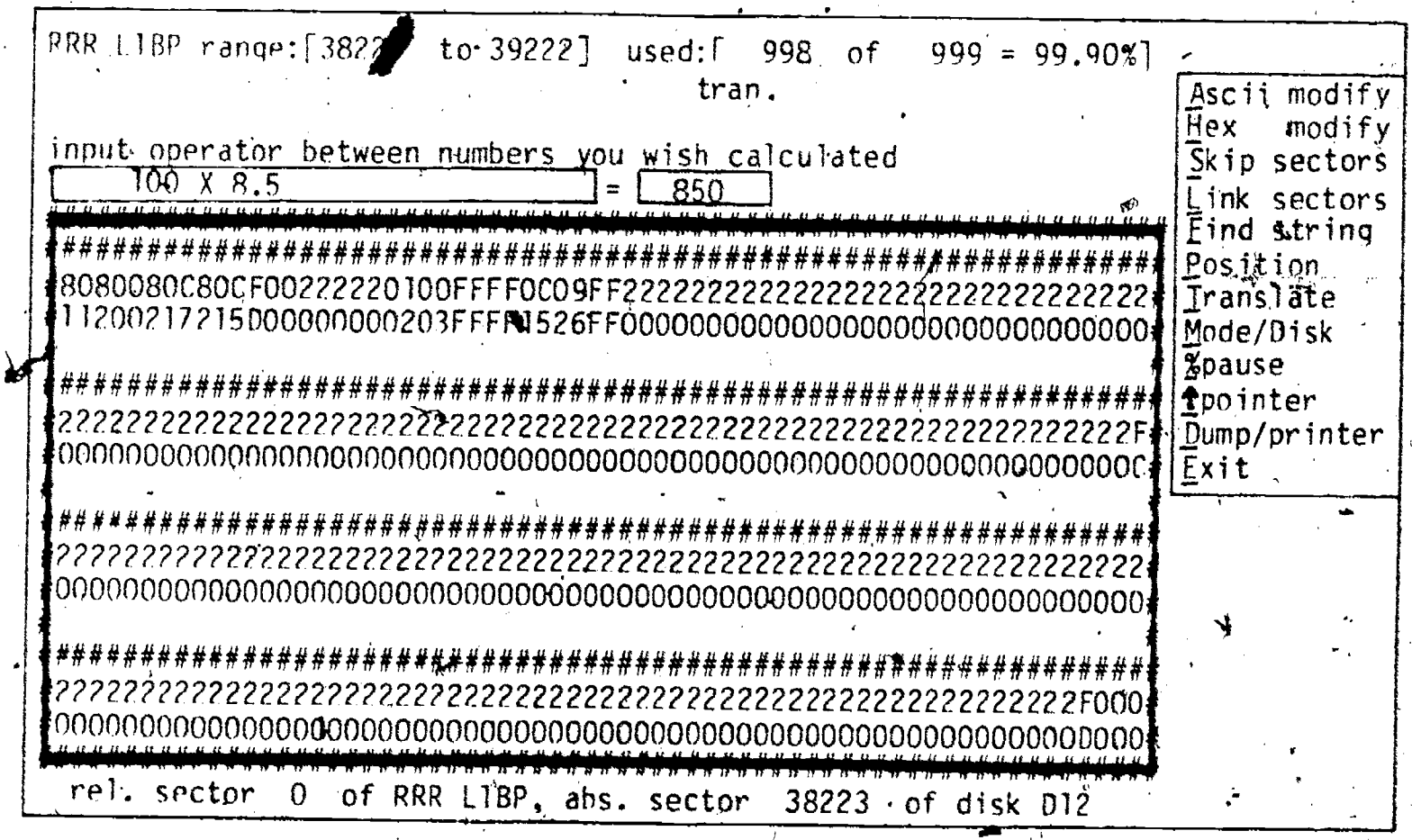
If a BASIC-2 reserve word or its hexadecimal equivalent is input, its complement will be given.

```
RRR LIBP range:[38223  to 39222]  used:[  998  of   999 = 99.90%]
     Hex = 5052494E54                    tran.                        Ascii modify
                                                                      Hex   modify
   calculate/hash/translate                                           Skip sectors
   PRINT          =    A0                                             Link sectors
################################################################      Find string
8080080C80CF00222220100FFFF0C09FF2222222222222222222222222222222      Position
11200217215D00000000203FFFF1526FF0000000000000000000000000000000      Translate
                                                                      Mode/Disk
################################################################      %pause
???????????????????????????????????????????????????????????????F      ↑pointer
000000000000000000000000000000000000000000000000000000000000000C      Dump/printer
                                                                      Exit
################################################################
????????????????????????????????????????????????????????????????
0000000000000000000000000000000000000000000000000000000000000000

################################################################
????????????????????????????????????????????????????????????F000
000000000000000000000000000000000000000000000000000000000000D000
  rel. sector  0  of RRR LIBP, abs. sector  38223  of disk D12
```

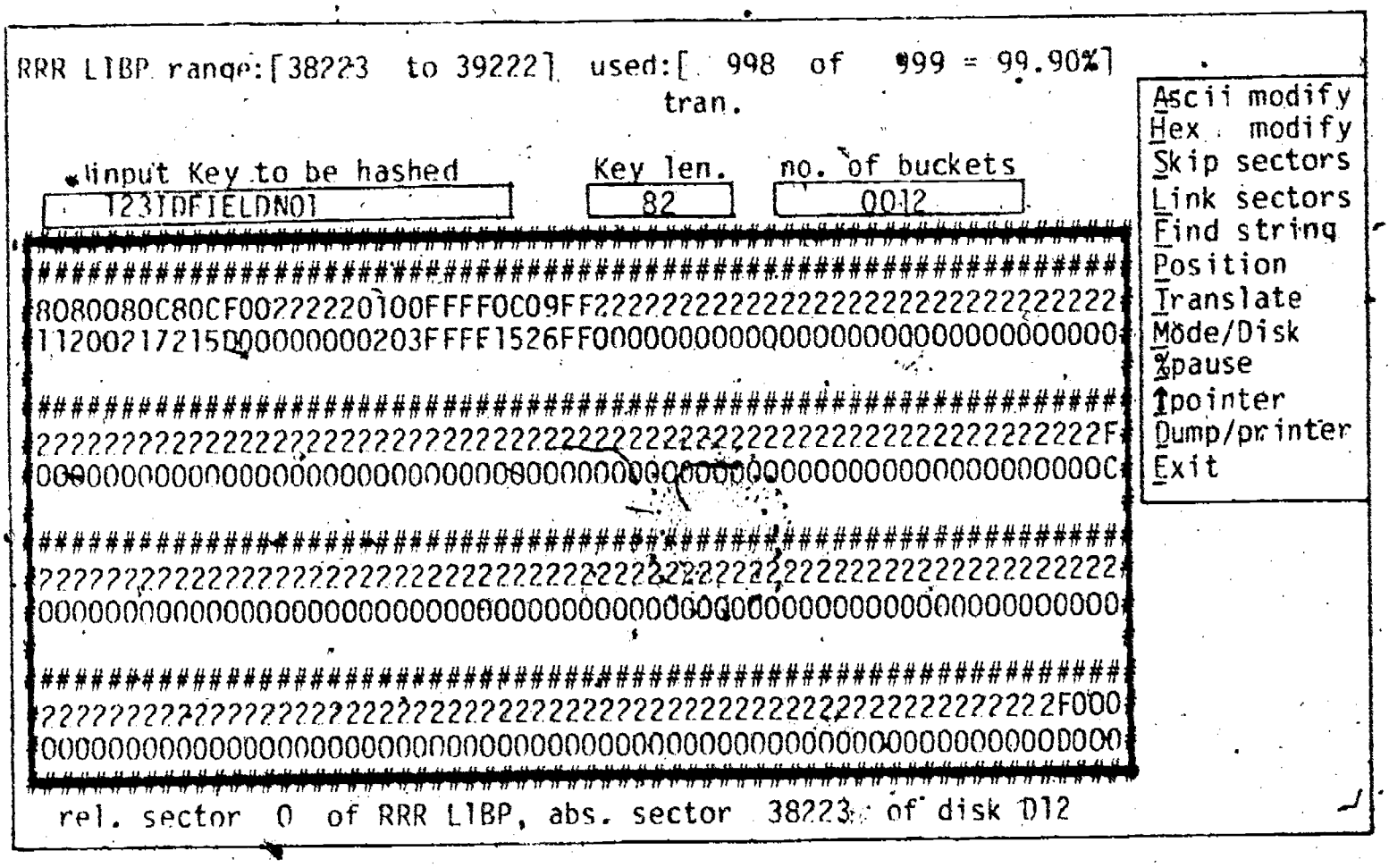
If a hexadecimal number is entered, its decimal number equivalent is given.



If "CAL" is entered, a new prompt is displayed and asks for some operator between two numbers. Only two numbers can be operated on at one time; however, there is no restriction on the number format or operator.



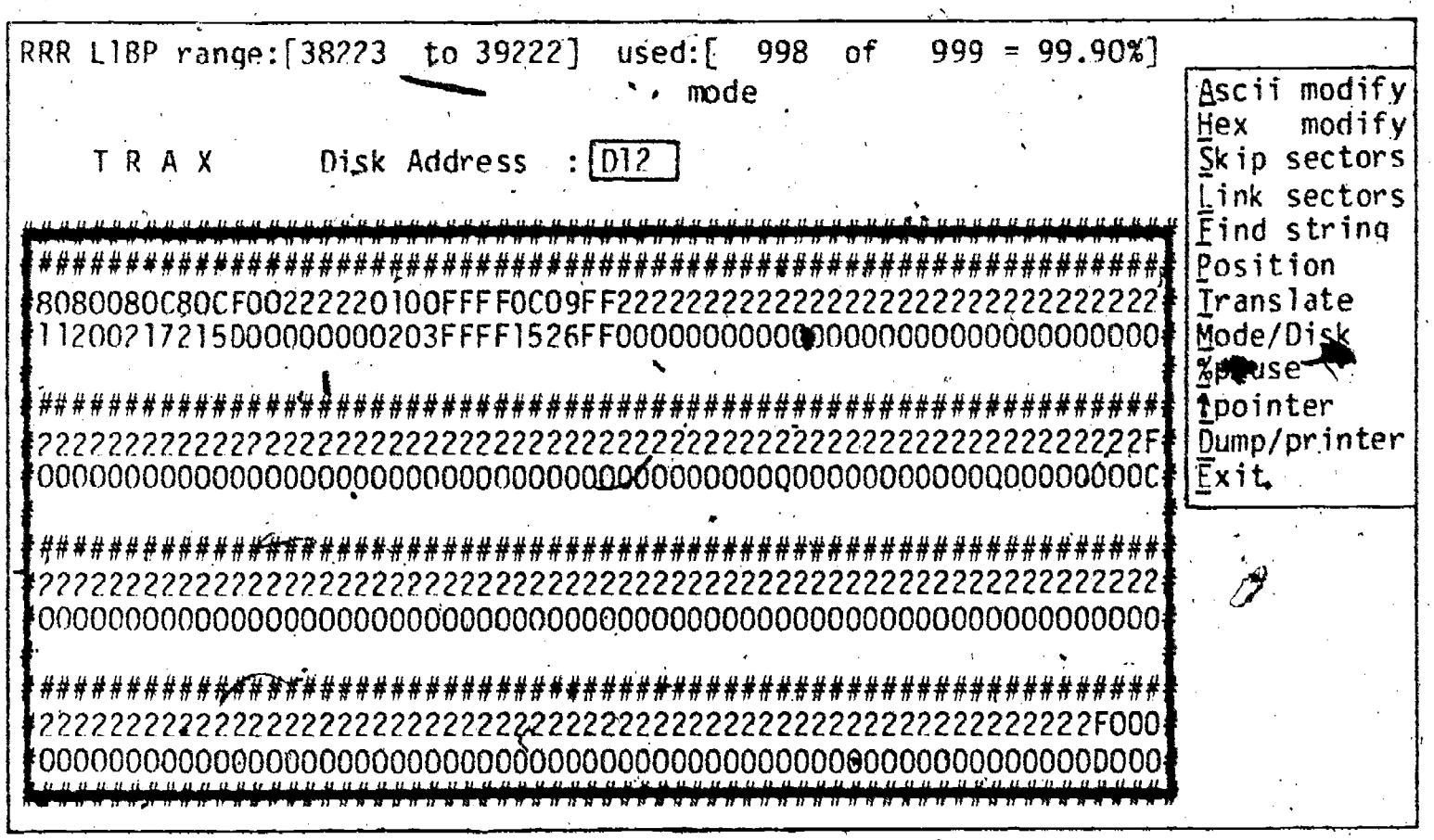
If "HASH" is entered, a new prompt is displayed and asks for some string to hash. (Note: Hash is the IDEAS 1 format.)



After the hash string has been entered, a prompt will appear for the desired length of the string to hash. This is followed by a prompt for the number of buckets in the data file (IDEAS I). If the preceding data was entered correctly, the bucket number with the string in it and its relative sector address will be displayed across the top of the previously entered hash string. Entering a blank at any of the aforementioned prompts will cause the previous prompt to appear.

MODE OPTION

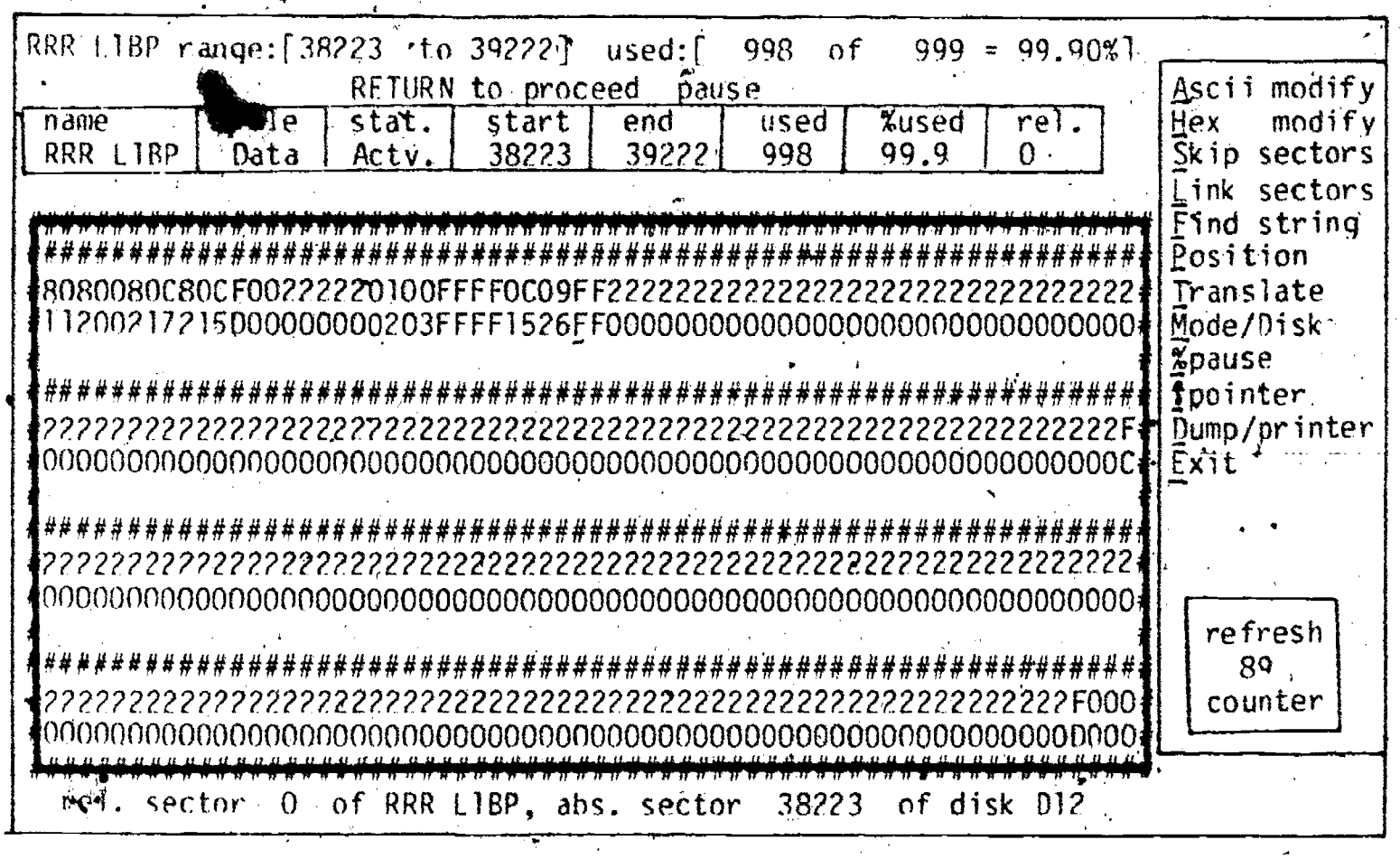
Selecting the Mode Option will cause the following display to appear:



This option allows the user to change the disk address and to choose between the Relative mode and Absolute mode. The procedure to follow is the same as when entering the TRAX program.

%PAUSE OPTION

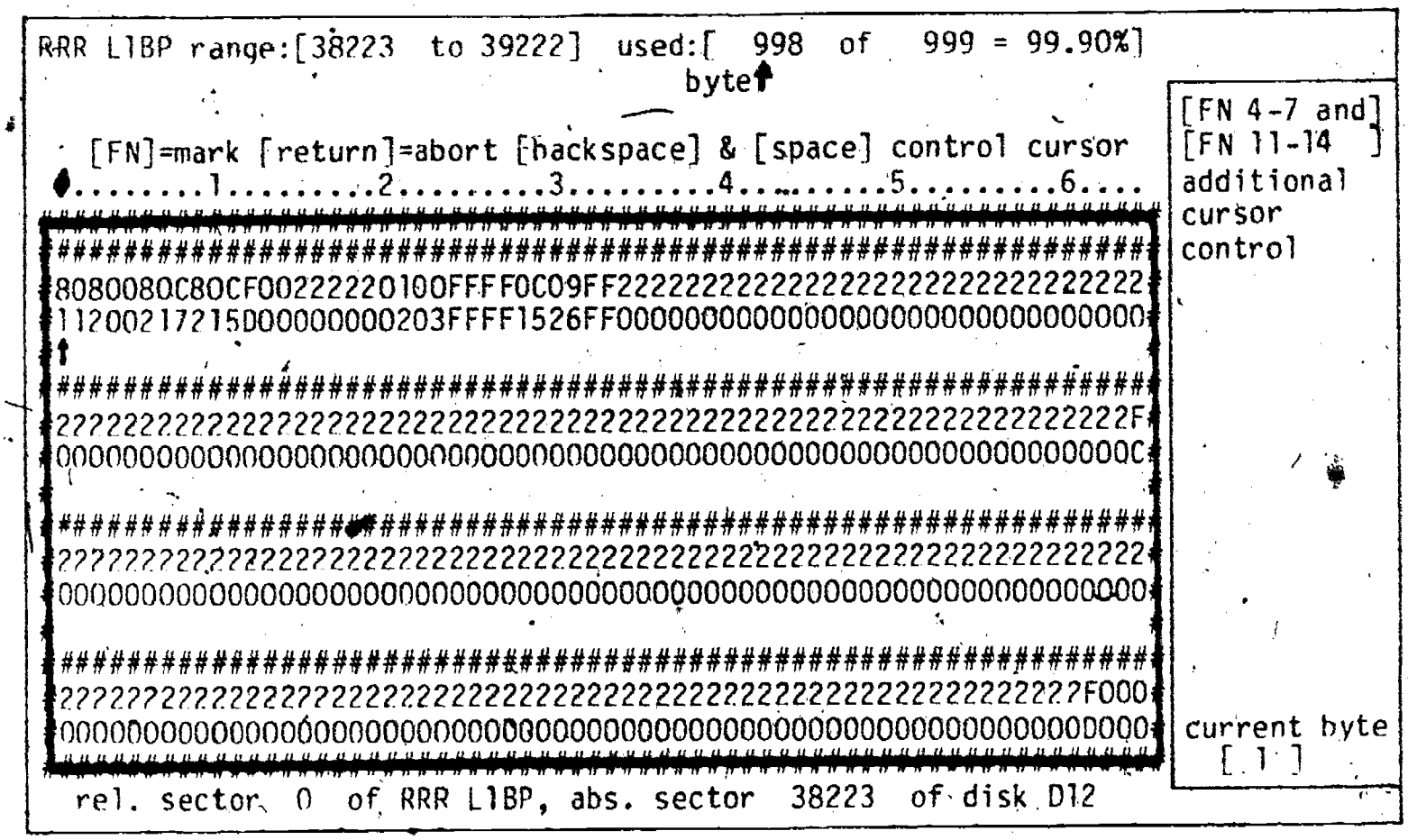
Selecting the Pause Option will cause the system to display:



This option allows the user to refresh the normal viewing screen approximately once each minute. (Note: Time varies with system usage and this does not utilize an MXE board in the CPU.) If the sector currently being viewed has changed by as little as one byte, this will be indicated under the counter on the lower right side of the screen. This option is useful in dealing with large sort data files or in testing some disk writing operation. Pressing RETURN will return to the normal viewing screen.

POINTER OPTION

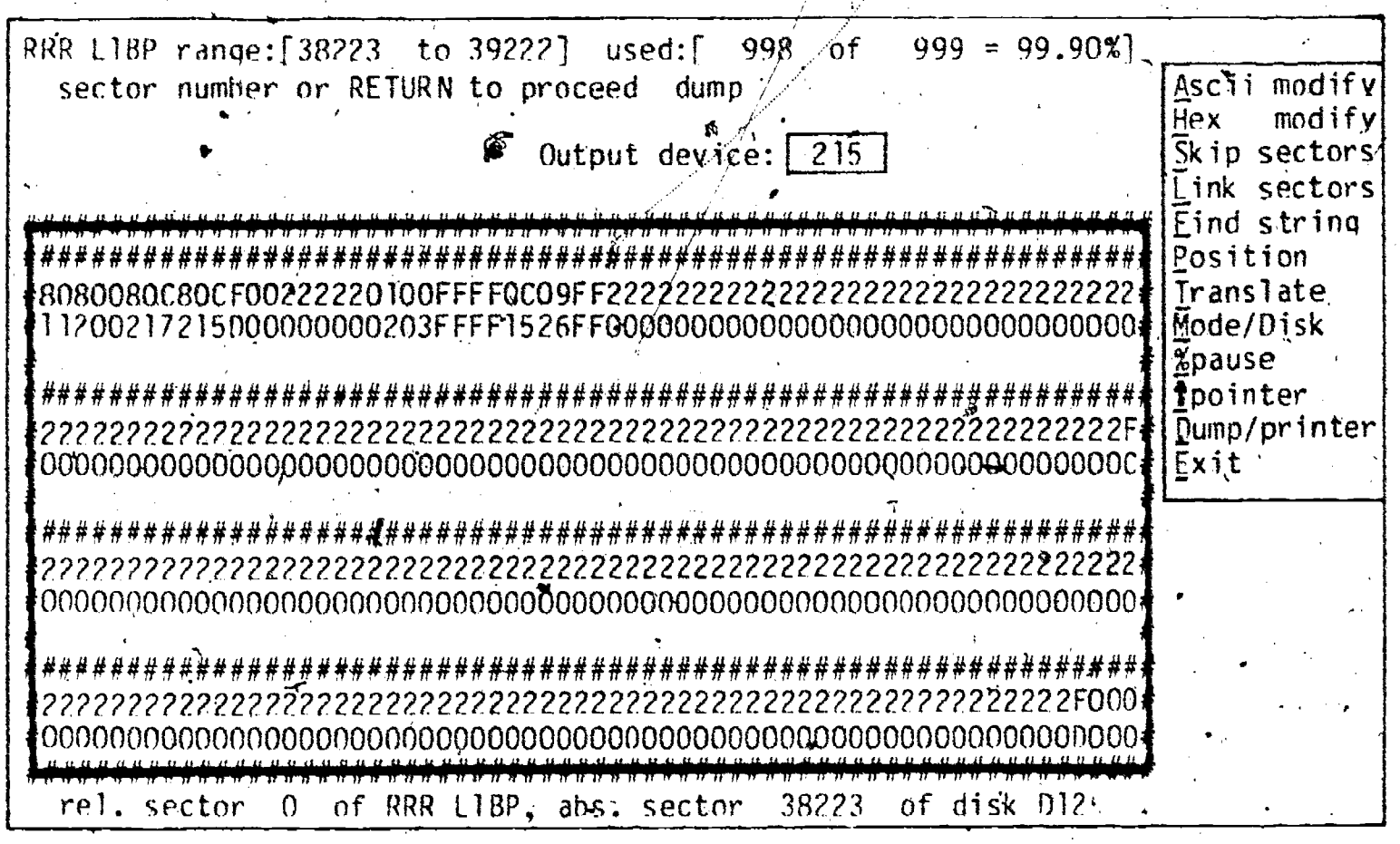
Selecting the Pointer Option will cause the following display to appear:



This option allows the user to place pointers at any byte displayed on the screen for easier reference and viewing. Once an " " is entered at the prompt at the top of the screen, the available options to place the pointer will appear. These control options for the pointer are exactly like the ASCII Modify and Hex Modify options, except that the CLEAR key and Special Function key 8 are not used.

DUMP/PRINTER OPTION

Selecting the Dump/Printer Option will cause a prompt to ask for a printer address as in the following display:



Once a correct printer address is entered, the current sector displayed will be printed at the printer specified.

EXIT OPTION

To exit the program enter, an "E" at the prompt at the top of the screen. Pressing Special Function key 31 will also exit from the program.

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