FAT-16 Examples

```
Command: s 0
0000: 33 C0 8E D0 BC 00 7C FB  50 07 50 1F FC BE 1B 7C  3.....|.P.P....|
0010: BF 1B 06 50 57 B9 E5 01  F3 A4 CB BE BE 07 B1 04  ...PW...........
0020: 38 2C 7C 09 75 15 83 C6  10 E2 F5 CD 18 8B 14 8B  8,|.u...........
0030: EE 83 C6 10 49 74 16 38  2C 74 F6 BE 10 07 4E AC  ....It.8,t....N.
0040: 3C 00 74 [illegible] 0E CD 10 EB F2 89 46 25  <.t...........F%
0050: 96 8A 46 [illegible] 74 11 B4 0B 3C 0C 74 05  ..F...<.t...<.t.
0060: 3A C4 75 [illegible] 06 75 24 BB AA 55 50 B4  :.u+@.F%.u$..UP.
0070: 41 CD 13 [illegible] 55 AA 75 10 F6 C1 01 74  A..Xr...U.u....t
0080: 0B 8A EC [illegible] A1 06 EB 1E 88 66 04 BF  ....V$.......f..
0090: 0A 00 B8 [illegible] C9 83 FF 05 7F 03 8B 4E  .......3.......N
00A0: 25 03 4E [illegible] BE 46 07 81 3E FE 7D 55  %.N...r).F..>.}U
00B0: AA 74 5A [illegible] 85 F6 75 83 BE 27 07 EB  .tZ.......u..'..
00C0: 8A 98 91 [illegible] 13 56 0A E8 12 00 5A EB  ...R..F..V....Z.
00D0: D5 4F 74 E4 33 C0 CD 13  EB B8 00 00 00 00 00 00  .Ot.3...........
00E0: 56 33 F6 56 56 52 50 06  53 51 BE 10 00 56 8B F4  V3.VVRP.SQ...V..
00F0: 50 52 B8 00 42 8A 56 24  CD 13 5A 58 8D 64 10 72  PR..B.V$..ZX.d.r
0100: 0A 40 75 [illegible] 80 C7 02 F2 E7 F8 5E FC EB 74 49  .@u.B......^..tI
0110: 6E 76 61 6C 69 64 20 70  61 72 74 69 74 69 6F 6E  nvalid partition
0120: 20 74 61 62 6C 65 00 45  72 72 6F 72 20 6C 6F 61   table.Error loa
0130: 64 69 6E 67 20 6F 70 65  72 61 74 69 6E 67 20 73  ding operating s
0140: 79 73 74 [illegible] 6D 00 4D 69 73 73 69 6E 67 20 6F 70  ystem.Missing op
0150: 65 72 61 [illegible] 67 20 73 79 73 74 65 6D 00 00  erating system..
0160: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0170: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0180: 00 00 00 8B FC 1E 57 8B  F5 CB 00 00 00 00 00 00  ......W.........
0190: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 80 01  ................
01C0: 01 00 06 03 FF 3F 3F 00  00 00 C1 32 03 00 00 00  .....??....2....
01D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 55 AA  ..............U.

24 bits (3 bytes) CHS format   CHS(cylinder, head, sector)
   H7 H6 H5 H4 H3 H2 H1 H0 S5 S4 S3 S2 S1 S0 : C7 C6 C5 C4 C3 C2 C1 C0


partition entries
  byte  0     bootable
        1-3   first block CHS
        4     system id, 6=new DOS with FAT-16, 4=old DOS with 32MB limit
        5-7   last block CHS (int binary, 1100111111 is 831)
        8-11  first block as a 32-bit int
       12-15  number of blocks as a 32-bit int.


Command: m
  partition 1:          ACTIVE ---  kind 06 = DOS 16-bit FAT >=32M
    102 MB or 209601 sectors, first is 63, last is 209663
          CHS (0,1,1) to (831,3,63)

This disc has 63 blocks per track and 4 heads
```

```
Command: s 63
0000: EB 3C 90 4D 53 57 49 4E  34 2E 31 00 02 04 01 00  .<.MSWIN4.1.....
0010: 02 00 02 00 00 F8 CD 00  3F 00 04 00 3F 00 00 00  ........?...?...
0020: C1 32 03 00 80 00 29 ED  15 77 38 4D 53 44 4F 53  .2....).w8MSDOS
0030: 37 31 30 20 20 20 46 41  54 31 32 20 20 20 33 C9  710   FAT12   3.
0040: 8E D1 BC FC 7B 16 07 BD  78 00 C5 76 00 1E 56 16  ....{...x..v..V.
0050: 55 BF 22 05 89 7E 00 89  4E 02 B1 0B FC F3 A4 06  U."..~..N.......
0060: 1F BD 00 7C C6 45 FE 0F  38 4E 24 7D 20 8B C1 99  ...|.E..8N$} ...
0070: E8 7E 01 83 DC 3B 74 1C  7C 66 3B 07 8A 57 FC  .~...:f..|f;..W.
0080: 75 06 80 CA 02 88 56 02  80 C3 10 73 ED 33 C9 FE  u.....V....s.3..
0090: 06 D8 7D 8B 46 1A 66 16  03 46 1C 13 56 1E  ..}.F...f..F..V.
00A0: 03 46 0E 13 D1 8B 76 11  60 89 46 FC 89 56 FE B8  .F....v.`.F..V..
00B0: 20 00 F7 E6 8B 5E 0B 03  C3 48 F7 F3 01 46 FC 11   ....^...H...F..
00C0: 4E FE 61 BF 00 00 E8 E6  01 72 3E 38 2D 74 17 60  N.a....(.r>8-t.`
00D0: B1 0B BE 77 7D F3 A6 74  3D 4E 74 09 83 C7 20  ....}..at=Nt...
00E0: 3B FB 72 E7 B4 00 CD 1A  D8 7D 7B A7 BE 7F 7D AC  ;.r......}{...}.
00F0: 98 03 F0 AC 98 40 74 0C  48 74 13 B4 0E BB 07 00  .....@t.Ht......
0100: CD 10 EB EF BE 82 7D EB  E6 BE 80 7D EB E1 CD 16  ......}....}....
0110: 5E 1F 66 8F 04 CD 19 BE  81 7D 8B 7D 1A 8D 45 FE  ^.f......}.}..E.
0120: 8A 4E 0D F7 E1 03 46 FC  13 56 FE B1 04 E8 C2 00  .N....F..V......
0130: 72 D7 EA 00 02 70 00 52  50 06 53 6A 01 6A 10 91  r....p.RP.Sj.j..
0140: 8B 46 18 A2 26 05 96 92  33 D2 F7 F6 91 F7 F6 42  .F..&...3......B
0150: 87 CA F7 76 1A 8A F2 8A  E8 C0 CC 02 0A CC B8 01  ...v............
0160: 02 80 7E 02 0E 75 04 B4  42 8B F4 8A 56 24 CD 13  ..~..u..B...V$..
0170: 61 61 72 0A 40 75 01 42  03 5E 0B 49 75 77 C3 03  aar.@u.B.^.Iuw..
0180: 18 01 27 0D 0A 49 6E 76  61 6C 69 64 20 73 79 73  ..'..Invalid sys
0190: 74 65 6D 20 64 69 73 6B  FF 0D 0A 44 69 73 6B 20  tem disk...Disk
01A0: 49 2F 4F 20 65 72 72 6F  72 FF 0D 0A 52 65 70 6C  I/O error...Repl
01B0: 61 63 65 20 74 68 65 20  64 69 73 6B 2C 20 61 6E  ace the disk, an
01C0: 64 20 74 68 65 6E 20 70  72 65 73 73 20 61 6E 79  d then press any
01D0: 20 6B 65 79 0D 0A 00 00  49 4F 20 20 20 20 20 20   key....IO
01E0: 53 59 53 4D 53 44 4F 53  20 20 20 53 59 53 7F 01  SYSMSDOS   SYS..
01F0: 00 41 BB 00 07 60 66 6A  00 E9 3B FF 00 00 55 AA  .A...`fj..;...U.

EB 3C is a jump instruction, skips 3C bytes
90 is a no-op instruction

Bios Parameter Block starts at byte 11
 11-12  bytes per sector (0200 = 512)
 13     sectors per cluster (04 = 4)
 14-15  number of reserved sectors (0001 = 1)
 16     number of FATs (02 = 2)
 17-18  max number of entries in root directory (0200 = 512)
 19-20  total number of sectors (0: too many to say in 16 bits)
 21     code (F8 means normal disc, FD means floppy)
 22-23  size of FAT in sectors (00CD = 205)
 24-25  sectors per track (003F = 63)
 26-27  number of surfaces (0004 = 4)
 28-31  number of hidden sectors (0000003F = 63) not very meaningful.


This is block 63, 2 copies of FAT means 2×205 blocks, 64+410 = 474
So...
```

This is where we expect to find the first block of the root directory

```
Command: s 474
0000: 4D 53 44 4F 53 37 31 30  20 20 20 28 00 00 00 00  MSDOS710   (....
0010: 00 00 00 00 00 70 FA 72  78 34 00 00 00 00 00 00  .....prx4......
0020: 44 4F 53 37 31 20 20 20  20 20 20 10 00 00 00 00  DOS71       .....
0030: 00 00 78 34 00 00 55 73  78 34 02 00 00 00 00 00  ..x4..Usx4......
0040: 53 4F 55 4E 44 20 20 20  20 20 20 10 00 00 00 00  SOUND       .....
0050: 00 00 78 34 00 00 70 73  78 34 34 0F 00 00 00 00  ..x4..psx44.....
0060: 4D 45 44 49 41 20 20 20  20 20 20 10 00 00 00 00  MEDIA       .....
0070: 00 00 78 34 00 00 74 73  78 34 EC 10 00 00 00 00  ..x4..tsx4......
0080: 43 43 44 4F 53 20 20 20  20 20 20 10 00 00 00 00  CCDOS       .....
0090: 00 00 78 34 00 00 7D 73  78 34 20 17 00 00 00 00  ..x4..}sx4 .....
00A0: 50 44 4F 53 20 20 20 20  20 20 20 10 00 00 00 00  PDOS        .....
00B0: 00 00 78 34 00 00 73 73  78 34 AF 1A 00 00 00 00  ..x4...sx4......
00C0: 50 44 4F 53 20 20 20 20  44 45 46 20 00 00 00 00  PDOS    DEF ....
00D0: 00 00 78 34 00 00 67 6C  01 2F 95 1C 74 08 00 00  ..x4..gl./..t...
00E0: 49 4F 20 20 20 20 20 20  53 59 53 27 00 00 00 00  IO      SYS'....
00F0: 00 00 78 34 00 00 78 84  7C 2F 9A 1C 1C 00 02 00  ..x4..x.|/......
0100: 4D 53 44 4F 53 20 20 20  53 59 53 27 00 00 00 00  MSDOS   SYS'....
0110: 00 00 78 34 00 00 8B 73  78 34 DB 10 39 02 00 00  ..x4...sx4..9...
0120: 43 4F 4D 4D 41 4E 44 20  43 4F 4D 20 00 00 00 00  COMMAND COM ....
0130: 00 00 32 37 00 00 C0 B2  A5 2E DC 1C 54 70 01 00  ..27........Tp..
0140: 43 4F 4E 46 49 47 20 20  53 59 53 20 00 00 00 00  CONFIG  SYS ....
0150: 00 00 32 37 00 00 9B 73  78 34 0B 1D 1B 02 00 00  ..27...sx4......
0160: 47 49 4D 50 20 20 20 20  20 20 20 00 00 00 00 00  GIMP        .....
0170: 00 00 78 34 00 00 F0 74  78 34 CB 00 20 00 00 00  ..x4...tx4.. ...
0180: 4C 4F 47 4F 20 20 20 20  53 59 53 20 00 00 00 00  LOGO    SYS ....
0190: 00 00 78 34 00 00 01 46  7E 2F 0D 1D 6B F8 01 00  ..x4...F~/..k...
01A0: 49 46 53 48 45 4C 50 20  20 53 59 53 20 00 00 00  IFSHELP  SYS ....
01B0: 00 00 32 37 00 00 C0 B2  A5 26 4D 1D 7C 0E 00 00  ..27.....&M.|...
01C0: 44 52 56 53 50 41 43 45  42 49 4E 27 00 00 00 00  DRVSPACEBIN'....
01D0: 00 00 78 34 00 00 C0 B2  A5 26 4F 1D 07 0D 01 00  ..x4.....&O.....
01E0: 44 42 4C 53 50 41 43 45  42 49 4E 20 00 00 00 00  DBLSPACEBIN ....
01F0: 00 00 78 34 00 00 C0 B2  A5 26 71 1D 07 0D 01 00  ..x4.....&q.....
```

Each entry is 32 bytes, looking at the entry for CONFIG.SYS

```
  bytes 0-7:   name before the dot (CONFIG  )
        8-10:  name after the dot (SYS)
        11:    file attributes (20 = "archive")
        12-21: officially reserved. Who knows what the 32 37 is
        22-23: time of last change
                 (739B: first five bits 01110 = hour = 14
                        next six bits = 011100 = minute = 27
                        remaining five bits = 11011 = seconds/2=28, secs=56)
        24-25: date of last change
                 (3478: first seven bits 0011010 = year-1980 = 26, year=2006
                        next four bits = 0011 = month = 3
                        remaining five bits = 11000 = day = 24)
        26-27: first cluster number = 1D0B or 7435 in decimal
        28-31: exact file length in bytes = 0000021B or 539 in decimal
```

The line as printed by the DIR command is:

```
  CONFIG   SYS          539  03/24/2006  2:27:56p CONFIG.SYS
```

The command TYPE CONFIG.SYS produces 16 lines, the first of which is

```
  DEVICE=C:\DOS72\ECHO.SYS W/e/l/c/o/m/e /t/o MS-DOS 7.20...
```

The root directory started at block 41h and is 32 blocks long, so
the first available cluster for data starts at block 506.

Our file's cluster number is 7435, but they start counting from 2, so
it really mean[illegible] 7433.
Each cluster i[illegible]e file starts at data block 29732

506 + 29732 = [illegible]s the real data of the file starts at
absolute block[illegible]le disc.

Command: s 302[illegible]

```
0000: 44 45 56 [illegible] 3A 5C 44 4F 53 37 31 5C  DEVICE=C:\DOS71\
0010: 45 43 48 [illegible] 20 57 2F 65 2F 6C 2F 63  ECHO.SYS W/e/l/c
0020: 2F 6F 2F 6D 2F 65 20 2F  74 2F 6F 20 4D 53 2D 44  /o/m/e /t/o MS-D
0030: 4F 53 20 37 2E 31 30 2E  2E 2E 0D 0A 44 45 56 49  OS 7.10.....DEVI
0040: 43 45 3D 43 3A 5C 44 4F  53 37 31 5C 45 43 48 4F  CE=C:\DOS71\ECHO
0050: 2E 53 59 53 20 43 2F 6F  2F 70 2F 79 2F 72 2F 69  .SYS C/o/p/y/r/i
0060: 2F 67 2F 68 2F 74 20 4D  2F 69 2F 63 2F 72 2F 6F  /g/h/t M/i/c/r/o
0070: 2F 73 2F 6F 2F 66 2F 74  20 43 2F 6F 2F 72 2F 70  /s/o/f/t C/o/r/p
0080: 2E 20 41 2F 6C 2F 6C 20  2F 72 2F 69 2F 67 2F 68  . A/l/l /r/i/g/h
0090: 2F 74 2F 73 20 2F 72 2F  65 2F 73 2F 65 2F 72 2F  /t/s /r/e/s/e/r/
00A0: 76 2F 65 2F 64 2E 0D 0A  44 45 56 49 43 45 3D 43  v/e/d...DEVICE=C
00B0: 3A 5C 44 4F 53 37 31 5C  48 49 4D 45 4D 2E 53 59  :\DOS71\HIMEM.SY
00C0: 53 0D 0A 44 45 56 49 43  45 3D 43 3A 5C 44 4F 53  S..DEVICE=C:\DOS
00D0: 37 31 5C 45 4D 4D 33 38  36 2E 45 58 45 20 4E 4F  71\EMM386.EXE NO
00E0: 45 4D 53 0D 0A 44 45 56  49 43 45 48 49 47 48 3D  EMS..DEVICEHIGH=
00F0: 43 3A 5C 44 4F 53 37 31  5C 53 45 54 56 45 52 2E  C:\DOS71\SETVER.
0100: 45 58 45 0D 0A 44 45 56  49 43 45 48 49 47 48 3D  EXE..DEVICEHIGH=
0110: 43 3A 5C 44 4F 53 37 31  5C 56 49 44 45 2D 43 44  C:\DOS71\VIDE-CD
0120: 44 2E 53 59 53 20 2F 44  3A 49 44 45 2D 43 44 0D  D.SYS /D:IDE-CD.
0130: 0A 52 45 4D 20 44 45 56  49 43 45 48 49 47 48 3D  .REM DEVICEHIGH=
0140: 43 3A 5C 44 4F 53 37 31  5C 44 49 53 50 4C 41 59  C:\DOS71\DISPLAY
0150: 2E 53 59 53 20 43 4F 4E  3D 28 2C 2C 31 29 0D 0A  .SYS CON=(,,1)..
0160: 43 4F 55 4E 54 52 59 3D  30 30 31 2C 34 33 37 2C  COUNTRY=001,437,
0170: 43 3A 5C 44 4F 53 37 31  5C 43 4F 55 4E 54 52 59  C:\DOS71\COUNTRY
0180: 2E 53 59 53 0D 0A 53 48  45 4C 4C 3D 43 4F 4D 4D  .SYS..SHELL=COMM
0190: 41 4E 44 2E 43 4F 4D 20  2F 50 20 2F 45 3A 36 34  AND.COM /P /E:64
01A0: 30 0D 0A 44 4F 53 3D 48  49 47 48 2C 55 4D 42 2C  0..DOS=HIGH,UMB,
01B0: 41 55 54 4F 0D 0A 46 49  4C 45 53 3D 33 30 0D 0A  AUTO..FILES=30..
01C0: 46 43 42 53 48 49 47 48  3D 34 2C 30 0D 0A 42 55  FCBSHIGH=4,0..BU
01D0: 46 46 45 52 53 48 49 47  48 3D 32 30 2C 30 0D 0A  FFERSHIGH=20,0..
01E0: 4C 41 53 54 44 52 49 56  45 48 49 47 48 3D 32 36  LASTDRIVEHIGH=26
01F0: 0D 0A 53 54 41 43 4B 53  48 49 47 48 3D 39 2C 32  ..STACKSHIGH=9,2
```

FAT entries
 0 = free
 2 to FFF6 next block in file
 FFF7 bad block
 FFF8 to FFFF end of file

We are interested in cluster number 7435.

Each FAT entry [illegible] we want to look at bytes 14870 and 14871.
14870 / 512 is [illegible] so out entry should start at byte 22 of
the 29th block

The FAT starts [illegible] 64, so we want to look at block 64+29 = 93

Command: s 93

```
0000: 01 1D 02 1D 03 1D 04 1D  05 1D 06 1D 07 1D 08 1D  ................
0010: 09 1D 0A 1D 0B 1D 0C 1D  00 00 0E 1D 0F 1D 10 1D  ................
0020: 11 1D 12 1D 13 1D 14 1D  15 1D 16 1D 17 1D 18 1D  ................
0030: 19 1D 1A 1D 1B 1D 1C 1D  1D 1D 1E 1D 1F 1D 20 1D  .............. .
0040: 21 1D 22 1D 23 1D 24 1D  25 1D 26 1D 27 1D 28 1D  !."#.$.%.&.'.(.
0050: 29 1D 2A 1D 2B 1D 2C 1D  2D 1D 2E 1D 2F 1D 30 1D  ).*.+.,.-.../.0.
0060: 31 1D 32 1D 33 1D 34 1D  35 1D 36 1D 37 1D 38 1D  1.2.3.4.5.6.7.8.
0070: 39 1D 3A 1D 3B 1D 3C 1D  3D 1D 3E 1D 3F 1D 40 1D  9.:.;.<.=.>.?.@.
0080: 41 1D 42 1D 43 1D 44 1D  45 1D 46 1D 47 1D 48 1D  A.B.C.D.E.F.G.H.
0090: 49 1D 4A 1D 4B 1D 4C 1D  FF FF 4E 1D FF FF 50 1D  I.J.K.L.[illegible]
00A0: 51 1D 52 1D 53 1D 54 1D  55 1D 56 1D 57 1D 58 1D  Q.R.S.T.U.V.W.X.
00B0: 59 1D 5A 1D 5B 1D 5C 1D  5D 1D 5E 1D 5F 1D 60 1D  Y.Z.[.\.].^._.`.
00C0: 61 1D 62 1D 63 1D 64 1D  65 1D 66 1D 67 1D 68 1D  a.b.c.d.e.f.g.h.
00D0: 69 1D 6A 1D 6B 1D 6C 1D  6D 1D 6E 1D 6F 1D 70 1D  i.j.k.l.m.n.o.p.
00E0: FF FF 72 1D 73 1D 74 1D  75 1D 76 1D 77 1D 78 1D  [illegible]s.t.u.v.w.x.
00F0: 79 1D 7A 1D 7B 1D 7C 1D  7D 1D 7E 1D 7F 1D 80 1D  y.z.{.|.}.~.....
0100: 81 1D 82 1D 83 1D 84 1D  85 1D 86 1D 87 1D 88 1D  ................
0110: 89 1D 8A 1D 8B 1D 8C 1D  8D 1D 8E 1D 8F 1D 90 1D  ................
0120: 91 1D 92 1D FF FF 70 00  00 00 00 00 00 00 00 00  ................
0130: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0140: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0150: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0160: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0170: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0180: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
0190: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01A0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01B0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
```

Starting from byte number 22 we see FFFF, which is the END-OF-FILE signal.
so we know that after reading all of the first cluster of this file, there
will be no more.

That makes sense because the file size is 539, and a cluster of four blocks
has 4×512 = 2048 bytes. More than enough for our config.sys.

Now for a longer file. TEXT.TXT:

```
Command: s 476
0000: E5 30 58 58 20 20 20 20  54 4D 50 20 00 00 00 00  .0XX    TMP ....
0010: 00 00 33 37 00 00 A6 78  33 37 CA 00 00 00 00 00  ..37...x37......
0020: 54 52 59 20 20 20 20 20  43 4F 4D 20 00 00 00 00  TRY     COM ....
0030: 00 00 7D 36 00 00 D9 56  7D 36 D8 00 24 00 00 00  ..}6...V}6..$...
0040: 41 74 00 65 00 78 00 74  00 2E 00 0F 00 90 74 00  At.e.x.t......t.
0050: 78 00 74 [illegible] FF FF 00 00 FF FF FF FF  x.t.............
0060: 54 45 58 [illegible] 54 58 54 20 00 00 A6 78  TEXT    TXT ...x
0070: 33 37 33 [illegible] 33 37 CA 00 BA 1F 00 00  3737...x37......
0080: 00 00 00 [illegible] 00 00 00 00 00 00 00 00  ................
0090: 00 00 00 [illegible] 00 00 00 00 00 00 00 00  ................
00A0: 00 00 00 [illegible] 00 00 00 00 00 00 00 00  ................
00B0: 00 00 00 [illegible] 00 00 00 00 00 00 00 00  ................
```

Decoding the e[illegible]l way, the file size 00001FBA is 8122 bytes, and its first cluster is number 00CA = 202.

Computing its first block number in the same was as before, 506+4×(202-2) is 1306.

```
Command: s 1306
0000: 61 62 63 64 65 66 67 68  69 6A 6B 6C 6D 6E 6F 70  abcdefghijklmnop
0010: 71 72 73 74 75 76 77 78  79 7A 2E 0D 0A 61 62 63  qrstuvwxyz...abc
0020: 64 65 66 67 68 69 6A 6B  6C 6D 6E 6F 70 71 72 73  defghijklmnopqrs
0030: 74 75 76 77 78 79 7A 2E  0D 0A 61 62 63 64 65 66  tuvwxyz...abcdef
0040: 67 68 69 6A 6B 6C 6D 6E  6F 70 71 72 73 74 75 76  ghijklmnopqrstuv
0050: 77 78 79 7A 2E 0D 0A 61  62 63 64 65 66 67 68 69  wxyz...abcdefghi
0060: 6A 6B 6C 6D 6E 6F 70 71  72 73 74 75 76 77 78 79  jklmnopqrstuvwxy
0070: 7A 2E 0D 0A 61 62 63 64  65 66 67 68 69 6A 6B 6C  z...abcdefghijkl
0080: 6D 6E 6F 70 71 72 73 74  75 76 77 78 79 7A 2E 0D  mnopqrstuvwxyz..
0090: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
```

The file just consists of the alphabet repeated many times, so it is easy to recognise. Remembering that a cluster is 4 blocks, we know that blocks 1306, 1307, 1308, and 1309 all make up the beginning of the file. Skip to 1309 and see how it ends:

```
Command: s 1309
0000: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
0010: 70 71 72 73 74 75 76 77  78 79 7A 2E 0D 0A 61 62  pqrstuvwxyz...ab
......
01D0: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
01E0: 70 71 72 73 74 75 76 77  78 79 7A 2E 0D 0A 61 62  pqrstuvwxyz...ab
01F0: 63 64 65 66 67 68 69 6A  6B 6C 6D 6E 6F 70 71 72  cdefghijklmnopqr
```

Note that the last character in this cluster is ‘r’, so if we find the next one correctly, it will begin with ‘s’.

Looking in the FAT and using the same calculation as last time, cluster number 202 will occupy bytes 404 and 405 (hexadecimal 194 and 195) of the very first block of the FAT. That is block 64.

```
Command: s 64
0000: F8 FF FF FF 60 0A FF FF  FF FF FF FF FF FF 08 00  ....`...........
....
0190: FF FF FF FF CC 00 FF FF  CD 00 CE 00 FF FF 00 00  ................
....
01F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
```

You’ll notice that the bytes in question contain the number 00CC = 204

Note that this isn't contiguous allocation, the first cluster was number 202. cluster 204 starts at block 1314:

```
Command: s 1314
0000: 73 74 75 76 77 78 79 7A  2E 0D 0A 61 62 63 64 65  stuvwxyz...abcde
0010: 66 67 68 69 6A 6B 6C 6D  6E 6F 70 71 72 73 74 75  fghijklmnopqrstu
0020: 76 77 78 79 7A 2E 0D 0A  61 62 63 64 65 66 67 68  vwxyz...abcdefgh
0030: 69 6A 6B 6C 6D 6E 6F 70  71 72 73 74 75 76 77 78  ijklmnopqrstuvwx
0040: 79 7A 2E 0D 0A 61 62 63  64 65 66 67 68 69 6A 6B  yz...abcdefghijk
0050: 6C 6D 6E 6F 70 71 72 73  74 75 76 77 78 79 7A 2E  lmnopqrstuvwxyz.
0060: 0D 0A 61 62 63 64 65 66  67 68 69 6A 6B 6C 6D 6E  ..abcdefghijklmn
0070: 6F 70 71 72 73 74 75 76  77 78 79 7A 2E 0D 0A 61  opqrstuvwxyz...a
0080: 62 63 64 65 66 67 68 69  6A 6B 6C 6D 6E 6F 70 71  bcdefghijklmnopq
....
```

and there it is, the letter 's' as expected

Just to prove the point, look at the previous block, 1313:

```
Command: s 1313
0000: 02 C7 06 39 0D 50 00 B6  01 BC D1 06 BE C8 42 01  ...9.P........B.
0010: 26 3A 06 C5 0D 76 04 26  A2 C5 0D 07 80 C9 20 8A  &:...v.&...... .
0020: FA 80 3E B4 08 01 76 05  FE CF 80 F1 20 33 C0 A0  ..>...v..... 3..
....
01D0: 0E E8 E8 A8 BD A3 0F E8  F2 F8 E8 61 06 EA C8 F4  ...........a....
01E0: 5A 05 C4 3E 58 0D 26 80  7D D4 80 74 0A 26 C4 3D  Z..>X.&.}..t.&.=
01F0: 83 FF FF 75 F1 EB 4D B0  02 26 88 45 05 26 C4 3D  ...u..M..&.E.&.=
```

Clearly nothing to do with the alphabet file. The last block of our cluster, 1317 ends like this:

```
....
01C0: 62 63 64 65 66 67 68 69  6A 6B 6C 6D 6E 6F 70 71  bcdefghijklmnopq
01D0: 72 73 74 75 76 77 78 79  7A 2E 0D 0A 61 62 63 64  rstuvwxyz...abcd
01E0: 65 66 67 68 69 6A 6B 6C  6D 6E 6F 70 71 72 73 74  efghijklmnopqrst
01F0: 75 76 77 78 79 7A 2E 0D  0A 61 62 63 64 65 66 67  uvwxyz...abcdefg
```

and where does the file continue? Back to the FAT.
Cluster 204 leads us to bytes 408 and 409 of the FAT (198 and 199 hexa.)

```
0190: FF FF FF FF CC 00 FF FF  CD 00 CE 00 FF FF 00 00  ................
```

They contain 00CD = which is 205, so the third cluster of the file is number 205.

The entry in the FAT for cluster 205 says 00CE = 206, so the fourth cluster is number 206. Contiguous allocation gets used a lot when the disc is nearly empty, but is not to be expected normally.

The FAT entry for cluster 206 says FFFF, which is the "end-of-chain" signal, so we know that cluster 206 is the last one in the file. It starts at block 1322, which is full of alphabet:

```
Command: s 1322
0000: 7A 2E 0D 0A 61 62 63 64  65 66 67 68 69 6A 6B 6C  z...abcdefghijkl
0010: 6D 6E 6F 70 71 72 73 74  75 76 77 78 79 7A 2E 0D  mnopqrstuvwxyz..
0020: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
....
01D0: 7A 2E 0D 0A 61 62 63 64  65 66 67 68 69 6A 6B 6C  z...abcdefghijkl
01E0: 6D 6E 6F 70 71 72 73 74  75 76 77 78 79 7A 2E 0D  mnopqrstuvwxyz..
01F0: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
```

And the next block and the next block are also both full of alphabet.
But the last block of this cluster, block 1325, isn't full.

We've had 3 full clusters and three more full blocks, for a total of 15 blocks or 7680 bytes. The file length was given as 8142 so there should 442 bytes of text in this block. 442 is hexadecimal 1BA:

```
Command: s 1325
0000: 79 7A 2E 0D 0A 61 62 63  64 65 66 67 68 69 6A 6B  yz...abcdefghijk
0010: 6C 6D 6E 6F 70 71 72 73  74 75 76 77 78 79 7A 2E  lmnopqrstuvwxyz.
0020: 0D 0A 61 62 63 64 65 66  67 68 69 6A 6B 6C 6D 6E  ..abcdefghijklmn
0030: 6F 70 71 72 73 74 75 76  77 78 79 7A 2E 0D 0A 61  opqrstuvwxyz...a
0040: 62 63 64 65 66 67 68 69  6A 6B 6C 6D 6E 6F 70 71  bcdefghijklmnopq
0050: 72 73 74 75 76 77 78 79  7A 2E 0D 0A 61 62 63 64  rstuvwxyz...abcd
0060: 65 66 67 68 69 6A 6B 6C  6D 6E 6F 70 71 72 73 74  efghijklmnopqrst
0070: 75 76 77 78 79 7A 2E 0D  0A 61 62 63 64 65 66 67  uvwxyz...abcdefg
0080: 68 69 6A 6B 6C 6D 6E 6F  70 71 72 73 74 75 76 77  hijklmnopqrstuvw
0090: 78 79 7A 2E 0D 0A 61 62  63 64 65 66 67 68 69 6A  xyz...abcdefghij
00A0: 6B 6C 6D 6E 6F 70 71 72  73 74 75 76 77 78 79 7A  klmnopqrstuvwxyz
00B0: 2E 0D 0A 61 62 63 64 65  66 67 68 69 6A 6B 6C 6D  ...abcdefghijklm
00C0: 6E 6F 70 71 72 73 74 75  76 77 78 79 7A 2E 0D 0A  nopqrstuvwxyz...
00D0: 61 62 63 64 65 66 67 68  69 6A 6B 6C 6D 6E 6F 70  abcdefghijklmnop
00E0: 71 72 73 74 75 76 77 78  79 7A 2E 0D 0A 61 62 63  qrstuvwxyz...abc
00F0: 64 65 66 67 68 69 6A 6B  6C 6D 6E 6F 70 71 72 73  defghijklmnopqrs
0100: 74 75 76 77 78 79 7A 2E  0D 0A 61 62 63 64 65 66  tuvwxyz...abcdef
0110: 67 68 69 6A 6B 6C 6D 6E  6F 70 71 72 73 74 75 76  ghijklmnopqrstuv
0120: 77 78 79 7A 2E 0D 0A 61  62 63 64 65 66 67 68 69  wxyz...abcdefghi
0130: 6A 6B 6C 6D 6E 6F 70 71  72 73 74 75 76 77 78 79  jklmnopqrstuvwxy
0140: 7A 2E 0D 0A 61 62 63 64  65 66 67 68 69 6A 6B 6C  z...abcdefghijkl
0150: 6D 6E 6F 70 71 72 73 74  75 76 77 78 79 7A 2E 0D  mnopqrstuvwxyz..
0160: 0A 61 62 63 64 65 66 67  68 69 6A 6B 6C 6D 6E 6F  .abcdefghijklmno
0170: 70 71 72 73 74 75 76 77  78 79 7A 2E 0D 0A 61 62  pqrstuvwxyz...ab
0180: 63 64 65 66 67 68 69 6A  6B 6C 6D 6E 6F 70 71 72  cdefghijklmnopqr
0190: 73 74 75 76 77 78 79 7A  2E 0D 0A 61 62 63 64 65  stuvwxyz...abcde
01A0: 66 67 68 69 6A 6B 6C 6D  6E 6F 70 71 72 73 74 75  fghijklmnopqrstu
01B0: 76 77 78 79 7A 2E 0D 0A  0D 0A 00 00 00 00 00 00  vwxyz...........
01C0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01D0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01E0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
01F0: 00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  ................
```

And that is exactly where the contents stops.