The x86 language has Turing Complete memory access

An abstract machine having a tape head that can be advanced in 0 to 0x7FFFFFFF increments an unlimited number of times specifies a model of computation that has access to unlimited memory. The technical name for memory addressing based on displacement from the current memory address is relative addressing.

When we define that abstract model of computation defined by the x86 language we are only including the syntactic byte sequence for each instruction and the functional result that each instruction was defined to achieve. We are explicitly excluding the hardware implementation details of how the instruction achieves this functional end result.

Because the abstract model of computation defined by the x86 language has relative addressing for both control flow and data access this abstract model would have control flow and data access to memory far outside of the boundaries of its 32-bit registers.

Jumps to an address that is 7FFFFFFF greater than FFFFFFF5

```
fffffff0: e9ffffff7f        jmp 0xfffffff5 + 0x7fffffff
fffffff5: 90                nop
```

Loads eax with data from an address 7FFFFFFF greater than FFFFFFFF

```
0000014b:  bbffffffff       mov ebx, 0xffffffff
00000150:  8b83ffffff7f     mov eax, dword ptr [ebx+0x7fffffff]
```

The semantics specified by the x86 language could be implemented by a memory architecture organzied as an unlimited sequence of contiguous 4GB blocks. Absolute addressing modes of the 86 language would then only refer to addresses within the current 4GB block. The concept of a current 4GB block would be analogous to the current location of a Turing Machine tape head, having no absolute location at all.

It is only hardware implementations of this abstract model that place any limit on memory access. These hardware limits are implementation details that are not any aspect of the abstract model itself.

The code begins @ machine address 0x100. Fills the 256 bytes preceding it with “@@@@”. Dynamically modifies its own first instruction to refer to its new code address. Copies itself to a new address that is exactly 0x100 bytes above its current code address and then does a relative jump to this new address.

The first 1024 bytes of memory are shown. Then all of the details of four complete cycles an execution trace are listed. Finally the first 1024 bytes of memory are displayed again. The x86 emulator terminates execution after these four complete cycles of execution.

According to the meaning of the syntax of the x86 language this program would continue to operate after it completed its execution @ machine address: FFFFFF00.

The language syntax allows:
(a) Relative Jumps as large as 0x7FFFFFFF even if the EIP = 0xFFFFFFF0.

(b) Data access offsets as large as 0x7FFFFFFF relative to the base register
even if the Base Register = 0xFFFFFFFF.

The only reason that the code would not continue to fill unlimited memory with “@@@@” would be that the physical implementation of the abstract model specified by the x86 language did not implement the semantics specified by the x86 language syntax.

```
100:  B800010000      mov eax, 0x100
105:  8BD8            mov ebx, eax
107:  81EB00010000    sub ebx, 0x100
10d:  C70340404040    mov dword ptr [ebx], 0x40404040
113:  83C304          add ebx, 0x4
116:  3BD8            cmp ebx, eax
118:  7CF3            jl 0x10d
11a:  8B4801          mov ecx, dword ptr [eax+0x1]
11d:  81C100010000    add ecx, 0x100
123:  894801          mov dword ptr [eax+0x1], ecx
126:  8BD8            mov ebx, eax
128:  8BD0            mov edx, eax
12a:  83C241          add edx, 0x41
12d:  8B0B            mov ecx, dword ptr [ebx]
12f:  898B00010000    mov dword ptr [ebx+0x100], ecx
135:  83C304          add ebx, 0x4
138:  3BDA            cmp ebx, edx
13a:  7CF1            jl 0x12d
13c:  E9BF000000      jmp 0x200
```

1024 byte memory block prior to code execution

```
; - - memory
;           0   1   2   3   4   5   6   7   8   9   a   b   c   d   e   f
00000000:  4c  01  04  00  de  1e  44  5f  9e  03  00  00  18  00  00  00
00000010:  00  00  00  00  2e  74  65  78  74  24  6d  6e  00  00  00  00
00000020:  00  00  00  00  e2  01  00  00  b4  00  00  00  96  02  00  00
00000030:  00  00  00  00  01  00  00  00  20  00  50  60  2e  64  61  74
00000040:  61  00  00  00  00  00  00  00  00  00  00  00  29  00  00  00
00000050:  a0  02  00  00  00  00  00  00  00  00  00  00  00  00  00  00
00000060:  40  00  50  c0  2e  64  65  62  75  67  24  53  00  00  00  00
00000070:  00  00  00  00  ac  00  00  00  c9  02  00  00  00  00  00  00
00000080:  00  00  00  00  00  00  00  00  40  00  10  42  2e  64  72  65
00000090:  63  74  76  65  00  00  00  00  00  00  00  00  28  00  00  00
000000a0:  75  03  00  00  00  00  00  00  00  00  00  00  00  00  00  00
000000b0:  00  0a  00  00  55  8b  ec  51  53  90  90  90  90  90  90  90
000000c0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000000d0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000000e0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000000f0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000100:  b8  00  01  00  00  8b  d8  81  eb  00  01  00  00  c7  03  40
00000110:  40  40  40  83  c3  04  3b  d8  7c  f3  8b  48  01  81  c1  00
00000120:  01  00  00  89  48  01  8b  d8  8b  d0  83  c2  41  8b  0b  89
00000130:  8b  00  01  00  00  83  c3  04  3b  da  7c  f1  e9  bf  00  00
00000140:  00  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000150:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000160:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000170:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000180:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000190:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001a0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001b0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001c0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001d0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001e0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
000001f0:  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90  90
00000200:  f4  f4  6a  10  e8  7e  00  00  00  83  c4  04  89  45  fc  f4
00000210:  5b  8b  e5  5d  c3  55  8b  ec  51  8b  45  08  03  45  0c  89
00000220:  45  fc  f4  8b  e5  5d  c3  55  8b  ec  53  56  57  bb  ff  ff
00000230:  ff  ff  8b  83  ff  ff  ff  7f  bb  38  02  00  00  8b  93  ff
00000240:  ff  00  00  8b  f3  8b  fa  8b  06  89  07  83  c6  04  83  c7
00000250:  04  3b  f3  7e  f2  8b  f3  c6  06  00  83  c6  04  3b  f2  7c
00000260:  f6  81  42  01  ff  ff  00  00  ff  e2  90  90  90  90  5f  5e
00000270:  5b  5d  c3  55  8b  ec  5d  c3  55  8b  ec  5d  c3  55  8b  ec
00000280:  5d  c3  55  8b  ec  5d  c3  55  8b  ec  5d  c3  55  8b  ec  5d
00000290:  c3  55  8b  ec  5d  c3  85  01  00  00  10  00  00  00  06  00
000002a0:  11  11  11  11  22  22  22  22  2d  2d  2d  2d  45  6e  64  20
000002b0:  6f  66  20  4d  65  6d  6f  72  79  20  41  6c  6c  6f  63  61
000002c0:  74  69  6f  6e  2a  2a  2a  2a  00  04  00  00  00  f1  00  00
000002d0:  00  9d  00  00  00  62  00  01  11  00  00  00  00  44  3a  5c
000002e0:  5f  48  50  5f  53  74  72  65  61  6d  5c  5f  5f  4e  4c  55
000002f0:  5f  4e  6f  74  65  73  5c  5f  5f  57  6f  72  6b  5f  49  6e
00000300:  5f  50  72  6f  67  72  65  73  73  5c  5f  5f  48  61  6c  74
00000310:  5f  44  65  63  69  64  65  72  5f  58  38  36  5c  5f  52  65
00000320:  61  64  5f  4f  62  6a  65  63  74  5f  46  69  6c  65  5c  48
00000330:  61  6c  74  37  2e  6f  62  6a  00  37  00  3c  11  03  02  00
00000340:  00  06  00  00  00  00  00  00  00  00  00  0e  00  10  00  92
00000350:  69  01  00  4d  69  63  72  6f  73  6f  66  74  20  28  52  29
00000360:  20  4d  61  63  72  6f  20  41  73  73  65  6d  62  6c  65  72
00000370:  00  00  00  00  00  2f  44  45  46  41  55  4c  54  4c  49  42
00000380:  3a  4c  49  42  43  4d  54  20  2f  44  45  46  41  55  4c  54
00000390:  4c  49  42  3a  4f  4c  44  4e  41  4d  45  53  20  00  40  63
000003a0:  6f  6d  70  2e  69  64  92  69  03  01  ff  ff  00  00  03  00
000003b0:  40  66  65  61  74  2e  30  30  10  00  00  00  ff  ff  00  00
000003c0:  03  00  2e  74  65  78  74  24  6d  6e  00  00  00  00  01  00
000003d0:  00  00  03  01  e2  01  00  00  01  00  00  00  00  00  00  00
000003e0:  00  00  00  00  00  00  2e  64  61  74  61  00  00  00  00  00
000003f0:  00  00  02  00  00  00  03  01  29  00  00  00  00  00  00  00
```

Execution trace of four complete cycles

```
[0100] b800010000               mov eax,00000100
[0105] 8bd8                     mov ebx,eax
[0107] 81eb00010000             sub ebx,00000100
[010d] c70340404040             mov [ebx],40404040
[0113] 83c304                   add ebx,+04
[0116] 3bd8                     cmp ebx,eax
[0118] 7cf3                     jl 0000010d
[010d] c70340404040             mov [ebx],40404040
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[010d] c70340404040         mov [ebx],40404040
[0113] 83c304               add ebx,+04
[0116] 3bd8                 cmp ebx,eax
[0118] 7cf3                 jl 0000010d
[011a] 8b4801               mov ecx,[eax+01]
[011d] 81c100010000         add ecx,00000100
[0123] 894801               mov [eax+01],ecx
[0126] 8bd8                 mov ebx,eax
[0128] 8bd0                 mov edx,eax
[012a] 83c241               add edx,+41
[012d] 8b0b                 mov ecx,[ebx]
[012f] 898b00010000         mov [ebx+00000100],ecx
[0135] 83c304               add ebx,+04
[0138] 3bda                 cmp ebx,edx
[013a] 7cf1                 jl 0000012d
[012d] 8b0b                 mov ecx,[ebx]
[012f] 898b00010000         mov [ebx+00000100],ecx
[0135] 83c304               add ebx,+04
[0138] 3bda                 cmp ebx,edx
[013a] 7cf1                 jl 0000012d
[012d] 8b0b                 mov ecx,[ebx]
[012f] 898b00010000         mov [ebx+00000100],ecx
[0135] 83c304               add ebx,+04
[0138] 3bda                 cmp ebx,edx
[013a] 7cf1                 jl 0000012d
[012d] 8b0b                 mov ecx,[ebx]
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[0135] 83c304               add ebx,+04
[0138] 3bda                 cmp ebx,edx
[013a] 7cf1                 jl 0000012d
[013c] e9bf000000           jmp 00000200
[0200] b800020000           mov eax,00000200
[0205] 8bd8                 mov ebx,eax
[0207] 81eb00010000         sub ebx,00000100
[020d] c70340404040         mov [ebx],40404040
[0213] 83c304               add ebx,+04
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[0216] 3bd8                cmp ebx,eax
[0218] 7cf3                jl 0000020d
[020d] c70340404040        mov [ebx],40404040
[0213] 83c304              add ebx,+04
[0216] 3bd8                cmp ebx,eax
[0218] 7cf3                jl 0000020d
[020d] c70340404040        mov [ebx],40404040
[0213] 83c304              add ebx,+04
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[020d] c70340404040         mov [ebx],40404040
[0213] 83c304               add ebx,+04
[0216] 3bd8                 cmp ebx,eax
[0218] 7cf3                 jl 0000020d
[021a] 8b4801               mov ecx,[eax+01]
[021d] 81c100010000         add ecx,00000100
[0223] 894801               mov [eax+01],ecx
[0226] 8bd8                 mov ebx,eax
[0228] 8bd0                 mov edx,eax
[022a] 83c241               add edx,+41
[022d] 8b0b                 mov ecx,[ebx]
[022f] 898b00010000         mov [ebx+00000100],ecx
[0235] 83c304               add ebx,+04
[0238] 3bda                 cmp ebx,edx
[023a] 7cf1                 jl 0000022d
[022d] 8b0b                 mov ecx,[ebx]
[022f] 898b00010000         mov [ebx+00000100],ecx
[0235] 83c304               add ebx,+04
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[0235] 83c304               add ebx,+04
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[0235] 83c304               add ebx,+04
[0238] 3bda                 cmp ebx,edx
[023a] 7cf1                 jl 0000022d
[023c] e9bf000000           jmp 00000300
[0300] b800030000           mov eax,00000300
[0305] 8bd8                 mov ebx,eax
[0307] 81eb00010000         sub ebx,00000100
[030d] c70340404040         mov [ebx],40404040
[0313] 83c304               add ebx,+04
[0316] 3bd8                 cmp ebx,eax
[0318] 7cf3                 jl 0000030d
[030d] c70340404040         mov [ebx],40404040
[0313] 83c304               add ebx,+04
[0316] 3bd8                 cmp ebx,eax
[0318] 7cf3                 jl 0000030d
[030d] c70340404040         mov [ebx],40404040
[0313] 83c304               add ebx,+04
[0316] 3bd8                 cmp ebx,eax
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[0318] 7cf3                jl 0000030d
[030d] c70340404040        mov [ebx],40404040
[0313] 83c304              add ebx,+04
[0316] 3bd8                cmp ebx,eax
[0318] 7cf3                jl 0000030d
[030d] c70340404040        mov [ebx],40404040
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[0316] 3bd8                     cmp ebx,eax
[0318] 7cf3                     jl 0000030d
[031a] 8b4801                   mov ecx,[eax+01]
[031d] 81c100010000             add ecx,00000100
[0323] 894801                   mov [eax+01],ecx
[0326] 8bd8                     mov ebx,eax
[0328] 8bd0                     mov edx,eax
[032a] 83c241                   add edx,+41
[032d] 8b0b                     mov ecx,[ebx]
[032f] 898b00010000             mov [ebx+00000100],ecx
[0335] 83c304                   add ebx,+04
[0338] 3bda                     cmp ebx,edx
[033a] 7cf1                     jl 0000032d
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[033a] 7cf1                jl 0000032d
[033c] e9bf000000          jmp 00000400
[0400] b800040000          mov eax,00000400
[0405] 8bd8                mov ebx,eax
[0407] 81eb00010000        sub ebx,00000100
[040d] c70340404040        mov [ebx],40404040
[0413] 83c304              add ebx,+04
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[0416] 3bd8                   cmp ebx,eax
[0418] 7cf3                   jl 0000040d
[040d] c70340404040           mov [ebx],40404040
[0413] 83c304                 add ebx,+04
[0416] 3bd8                   cmp ebx,eax
[0418] 7cf3                   jl 0000040d
[040d] c70340404040           mov [ebx],40404040
[0413] 83c304                 add ebx,+04
[0416] 3bd8                   cmp ebx,eax
[0418] 7cf3                   jl 0000040d
[040d] c70340404040           mov [ebx],40404040
[0413] 83c304                 add ebx,+04
[0416] 3bd8                   cmp ebx,eax
[0418] 7cf3                   jl 0000040d
[040d] c70340404040           mov [ebx],40404040
[0413] 83c304                 add ebx,+04
[0416] 3bd8                   cmp ebx,eax
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[040d] c70340404040           mov [ebx],40404040
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[040d] c70340404040           mov [ebx],40404040
[0413] 83c304                 add ebx,+04
[0416] 3bd8                   cmp ebx,eax
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```

```
[040d] c70340404040          mov [ebx],40404040
[0413] 83c304                add ebx,+04
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[040d] c70340404040          mov [ebx],40404040
[0413] 83c304                add ebx,+04
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[0418] 7cf3                  jl 0000040d
[040d] c70340404040          mov [ebx],40404040
[0413] 83c304                add ebx,+04
[0416] 3bd8                  cmp ebx,eax
[0418] 7cf3                  jl 0000040d
[040d] c70340404040          mov [ebx],40404040
[0413] 83c304                add ebx,+04
[0416] 3bd8                  cmp ebx,eax
[0418] 7cf3                  jl 0000040d
[040d] c70340404040          mov [ebx],40404040
[0413] 83c304                add ebx,+04
[0416] 3bd8                  cmp ebx,eax
[0418] 7cf3                  jl 0000040d
[041a] 8b4801                mov ecx,[eax+01]
[041d] 81c100010000          add ecx,00000100
[0423] 894801                mov [eax+01],ecx
[0426] 8bd8                  mov ebx,eax
[0428] 8bd0                  mov edx,eax
[042a] 83c241                add edx,+41
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
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[042d] 8b0b                  mov ecx,[ebx]
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[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
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[0435] 83c304                add ebx,+04
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[0435] 83c304                add ebx,+04
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[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
```

```
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
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[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[042d] 8b0b                  mov ecx,[ebx]
[042f] 898b00010000          mov [ebx+00000100],ecx
[0435] 83c304                add ebx,+04
[0438] 3bda                  cmp ebx,edx
[043a] 7cf1                  jl 0000042d
[043c] e9bf000000            jmp 00000500
```

1024 byte memory block after code execution

```
; - - memory
;            0   1   2   3   4   5   6   7   8   9   a   b   c   d   e   f
00000000:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000010:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000020:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000030:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000040:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000050:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000060:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000070:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000080:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000090:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000a0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000b0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000c0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000d0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000e0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000000f0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000100:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000110:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000120:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000130:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000140:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000150:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000160:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000170:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000180:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000190:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001a0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001b0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001c0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001d0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001e0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000001f0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000200:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000210:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000220:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000230:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000240:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000250:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000260:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000270:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000280:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000290:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002a0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002b0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002c0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002d0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002e0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000002f0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000300:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000310:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000320:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000330:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000340:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000350:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000360:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000370:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000380:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
00000390:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003a0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003b0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003c0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003d0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003e0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
000003f0:  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40  40
```