

# Opening borders and other things

Opening the upper and lower borders is a very common VIC trick that I'm sure coders still use today.

The basic idea of this is to change the rows-bit of \$d011 on the last row of a frame. This makes the VIC think that the borders have already started being drawn- when in reality they haven't. The VIC will place graphics from \$3fff/\$7fff/\$bfff/\$ffff depending on your selected VIC bank in the opened area. Make sure to set \$3fff to 0 so this can't be seen. This doesn't need to be done with stable timing.

So, here's an example piece of code (TASS syntax):

```
;Opening the upper and lower borders
;Coding by Karmic/HVSC

sei ;disable interrupts
lda #$35 ;bank off Kernal and BASIC roms
sta $01
lda #$7f ;disable timer and CIA IRQs/NMIs
sta $dc0d
sta $dd0d
lda $dc0d ;acknowledge any pending interrupt
lda $dd0d
lda #<irq ;set the IRQ vectors
sta $fffe
lda #>irq
sta $ffff
lda #$f8 ;set rasterline- can be done on lines $f8-$fa
sta $d012
lda #$01 ;enable raster irq
sta $d01a
lda #$00 ;make it so $3fff area displays nothing
sta $3fff
sta $d010 ;all MSBs of X positions off
lda #$ff ;make a block sprite at $3000
ldx #63
sta $3000,x
dex
bpl *-4
ldx #$07
loop
lda #$01 ;set sprite colors to white
sta $d027,x
lda #$c0 ;set sprite pointers
sta $07f8,x
dex
bpl loop
inx ;set sprite positions
clc
lda #$40
```

```
loop2
  sta $d000,x
  sta $d001,x
  adc #$18
  inx
  inx
  cpx #$10
  bcc loop2
  lda #$ff ;enable sprites now
  sta $d015
  inc $d019 ;acknowledge any pending VIC IRQs
  cli ;enable interrupts again
main
  ldy #8 ;delay
  dey
  bpl *-1
  nop
  inc $d020 ;something to look at
  inc $d021
  jmp main
irq
  lda #$13 ;make it 24 rows
  sta $d011
  lda #$fc ;wait for line $fc- anything not in the last row will work
  cmp $d012
  bne *-3
  lda #$1b ;set back to 25 rows
  sta $d011
  clc
  ldx #1 ;move the sprites around
loop3
  inc $d000,x
  dec $d002,x
  txa
  adc #4
  tax
  cpx #$10
  bcc loop3
  inc $d019 ;acknowledge IRQ
  rti ;end
```

Wait, but that's not all. You can also disable the main screen and show nothing but sprites. \$3fff will be displayed on the whole screen. This has the advantage of not having to worry about badlines. This idea is very similar to the previous, except with a few differences:

You must write \$1b to \$d011 first, and then write \$00. The first write can be done on lines \$31-\$f6, and the second write can be done on lines \$f8-\$fa.

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