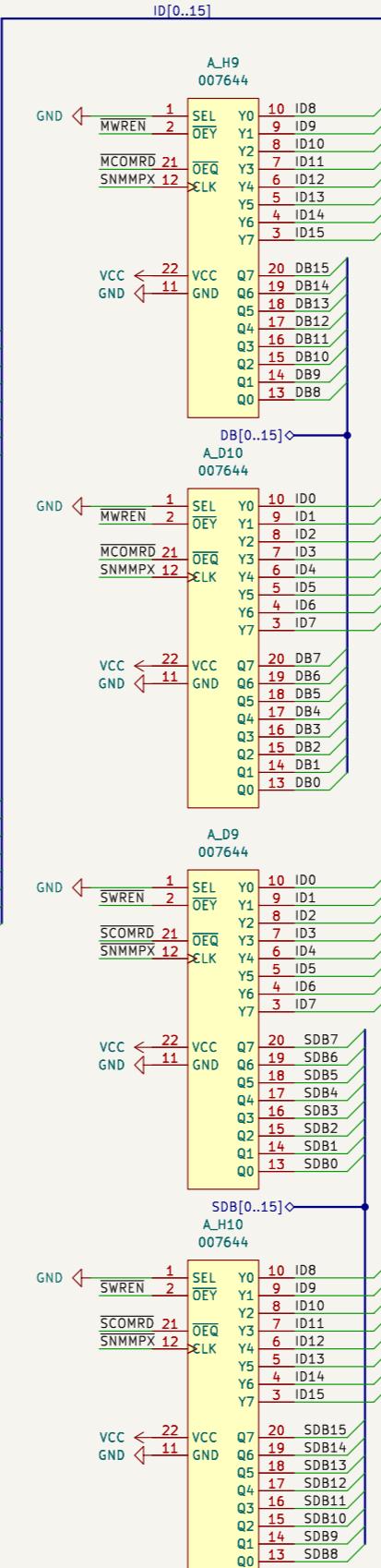
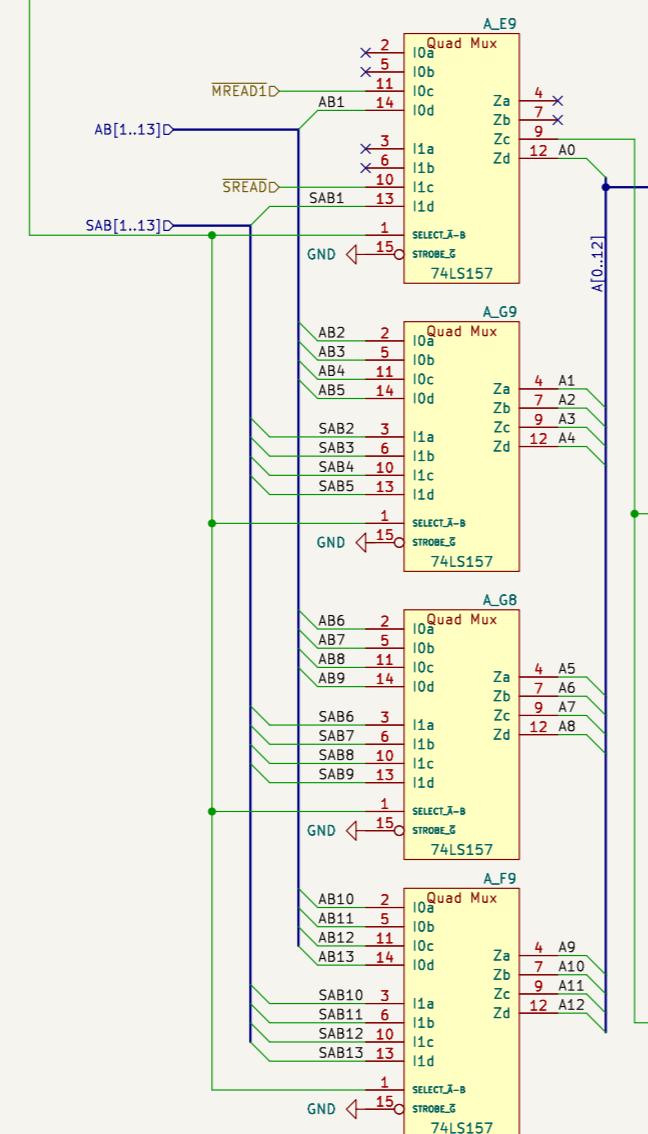
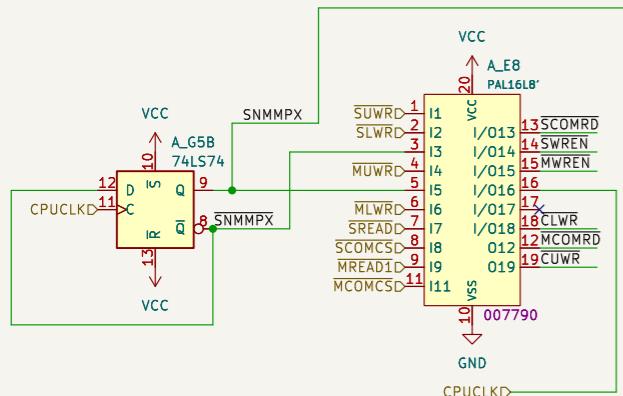


Konami 007790

$MCOMRD = \neg(MREAD1 \& \neg MCOMCS) = MREAD1 \mid MCOMCS$   
 $SCOMRD = \neg(SREAD \& \neg SCOMCS)$   
 $SWREN = \neg(SNMMPPX \& SREAD \& \neg SCOMCS)$   
 $MWREN = \neg(SNMMPPX \& MREAD1 \& \neg MCOMCS)$   
 $CLWR = \neg(CLWR \& \neg SNMMPPX \& SREAD \& \neg SCOMCS \& \neg CPUCLK \mid \neg SNMMPPX \& MREAD1 \& \neg MCOMCS \& \neg CPUCLK)$   
 $CUWR = \neg(CUWR \& \neg SNMMPPX \& SREAD \& \neg SCOMCS \& \neg CPUCLK \mid \neg MUWR \& \neg SNMMPPX \& MREAD1 \& \neg MCOMCS \& \neg CPUCLK)$

A All AND logic can be converted to OR form. But since AND logic and inverters are used in the PAL16LB device it is kept in that form. The equations follow verilog syntax. The active low signals are not inverted, the bar is there only to show activeness.



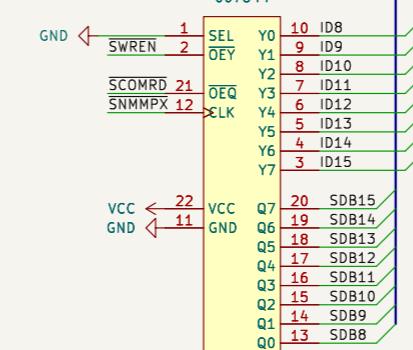
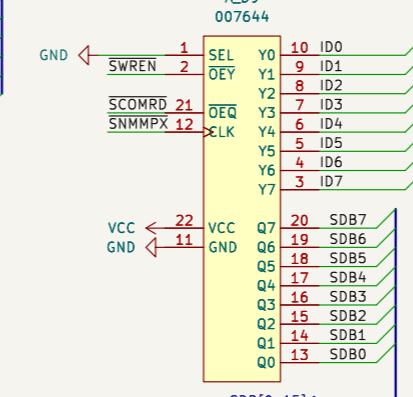
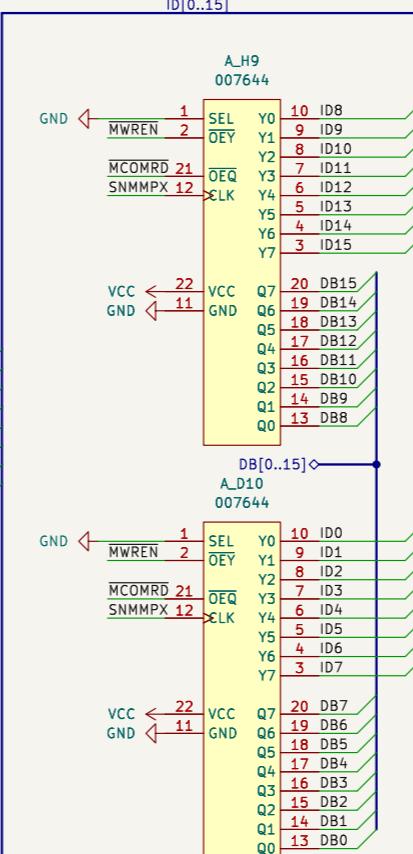
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Sheet: /Shared Resources/  
File: shared\_resources.kicad\_sch

**Title: Twin 16 – Rev B**

Size: A3 Date: 2024-09-08  
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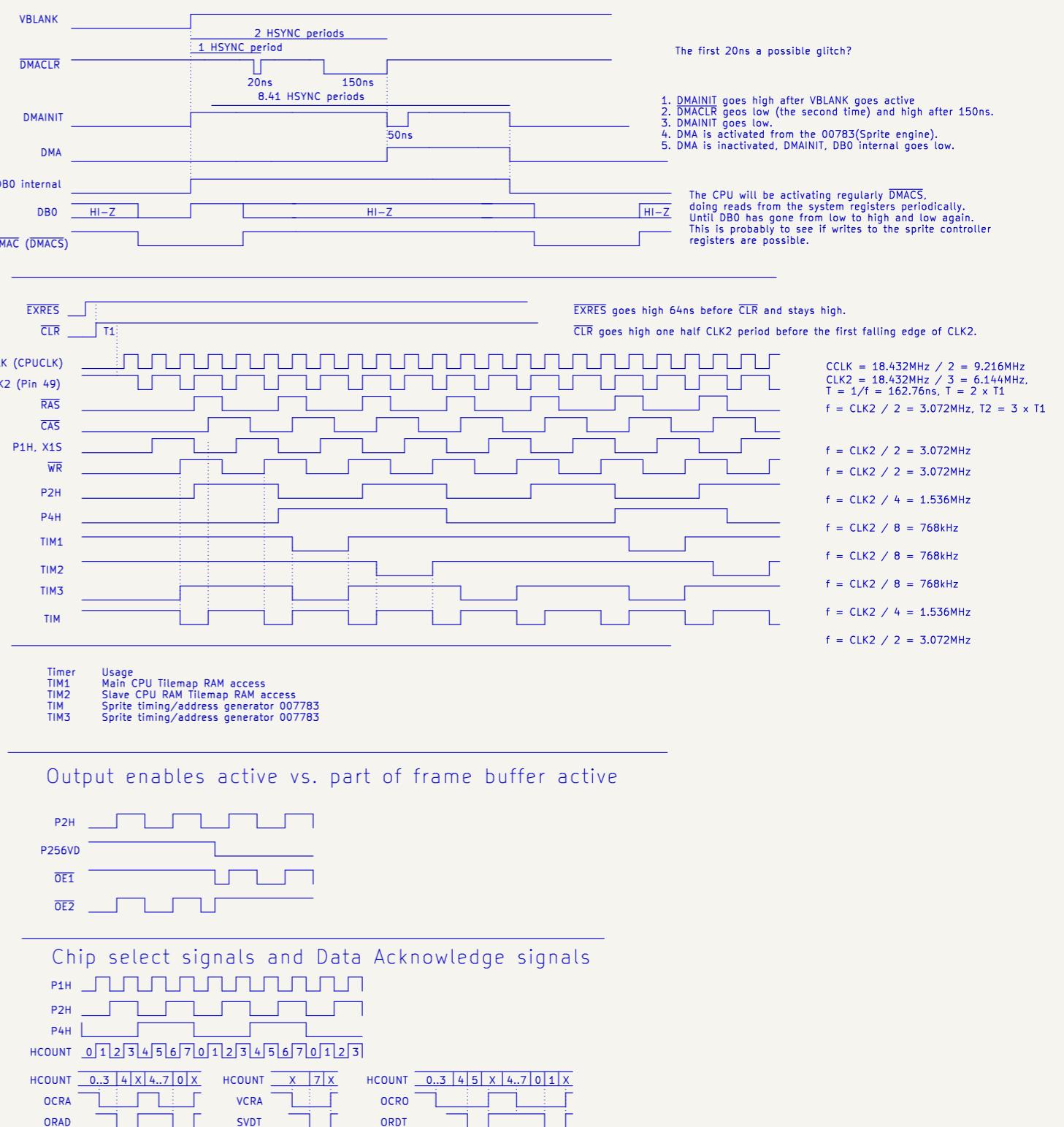
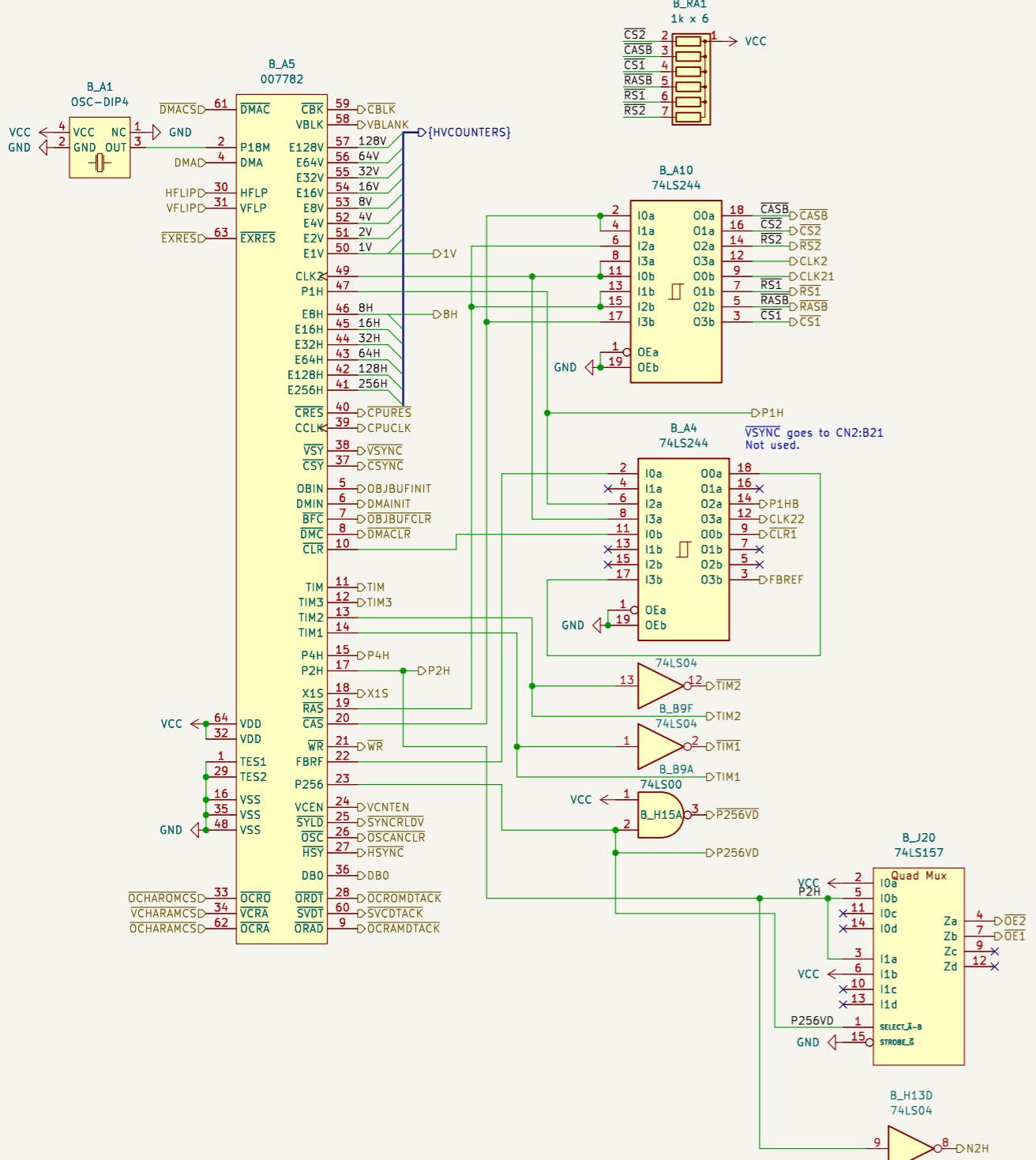
This is from jammarcade.net

Pin 1 = SEL – changes whether the Q outputs require a rising edge clock or not.  
Pin 2 = OEQ – Output enable for the Y outputs else they are inputs. Active LOW  
Pin 21 = OEQ – Output enable for the Q (clocked) outputs else they are inputs. Active LOW  
Pin 12 = CLK – Clock input

Pins 3–10 = Y outputs – normal outputs. If OEQ is LOW these pins become outputs mirroring the state of the Q input pins. SEL and CLK pins are not used in this mode.

Pins 13–20 = Q outputs – clocked outputs. If OEQ is LOW these pins become outputs. If SEL is HIGH and CLK is HIGH these outputs will mirror the state of the Y inputs. If SEL is LOW then the outputs will only change state on a rising edge CLK.

## DMA Synchronization



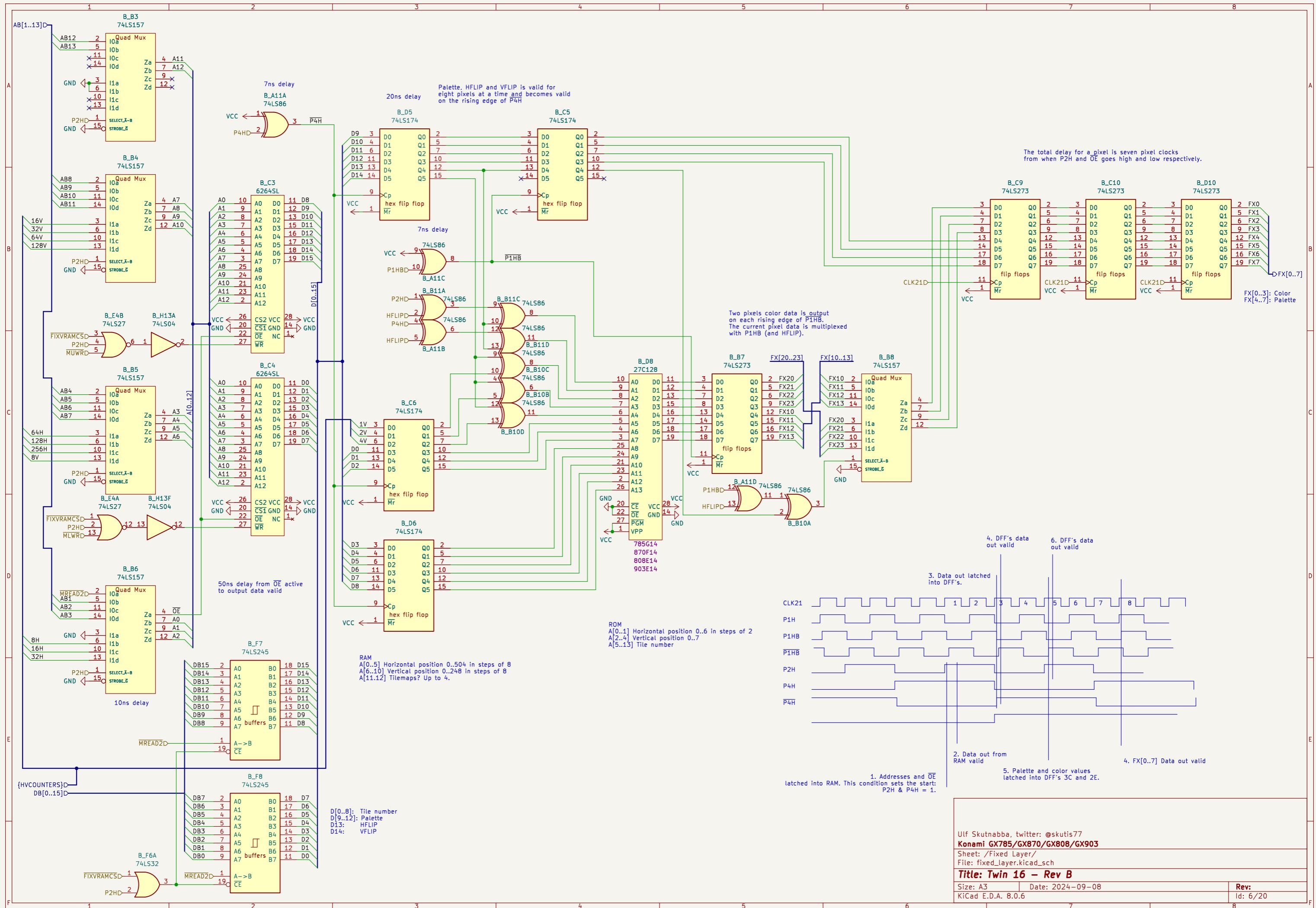
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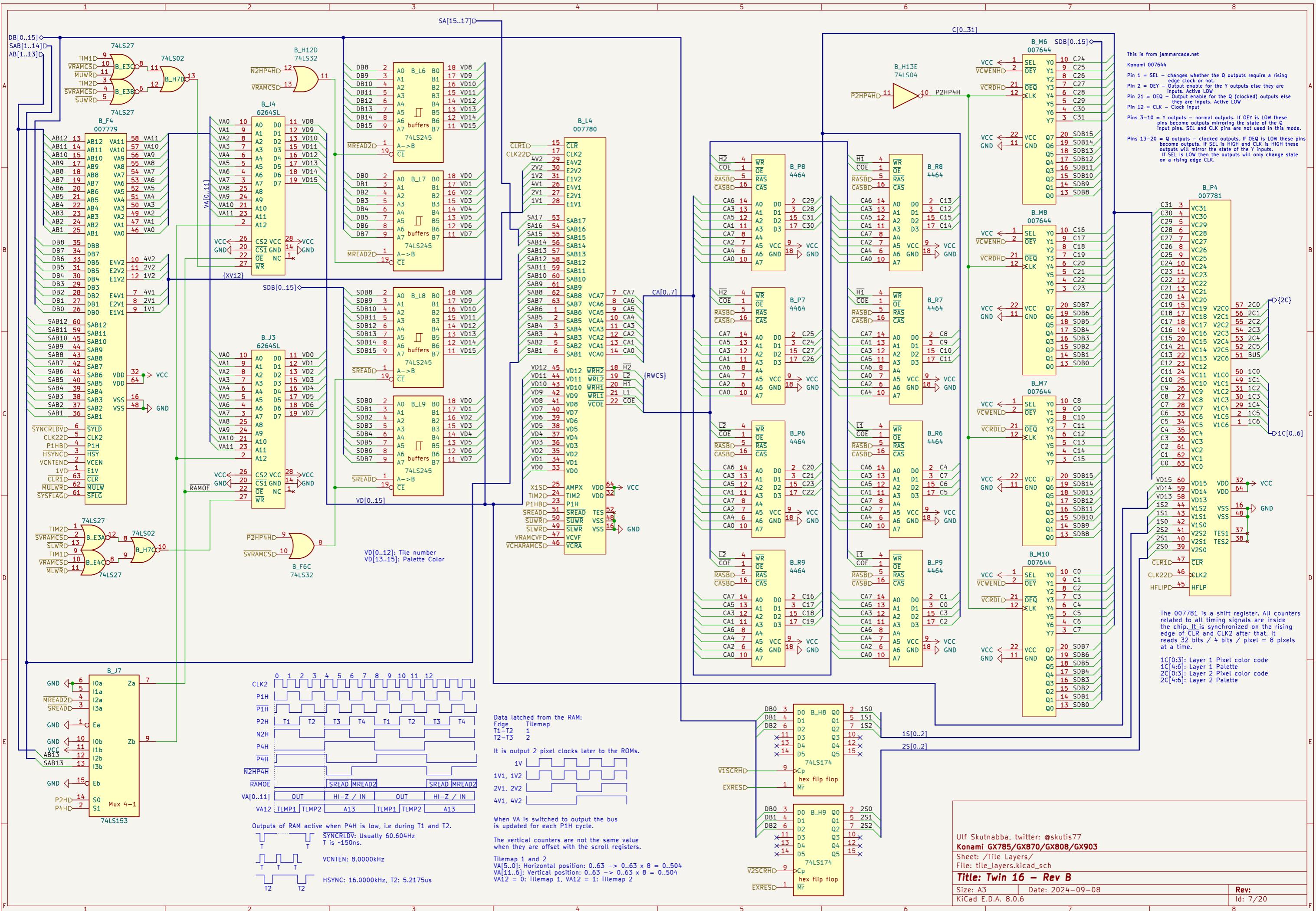
Sheet: /Timing/  
File: timing.kicad\_sch

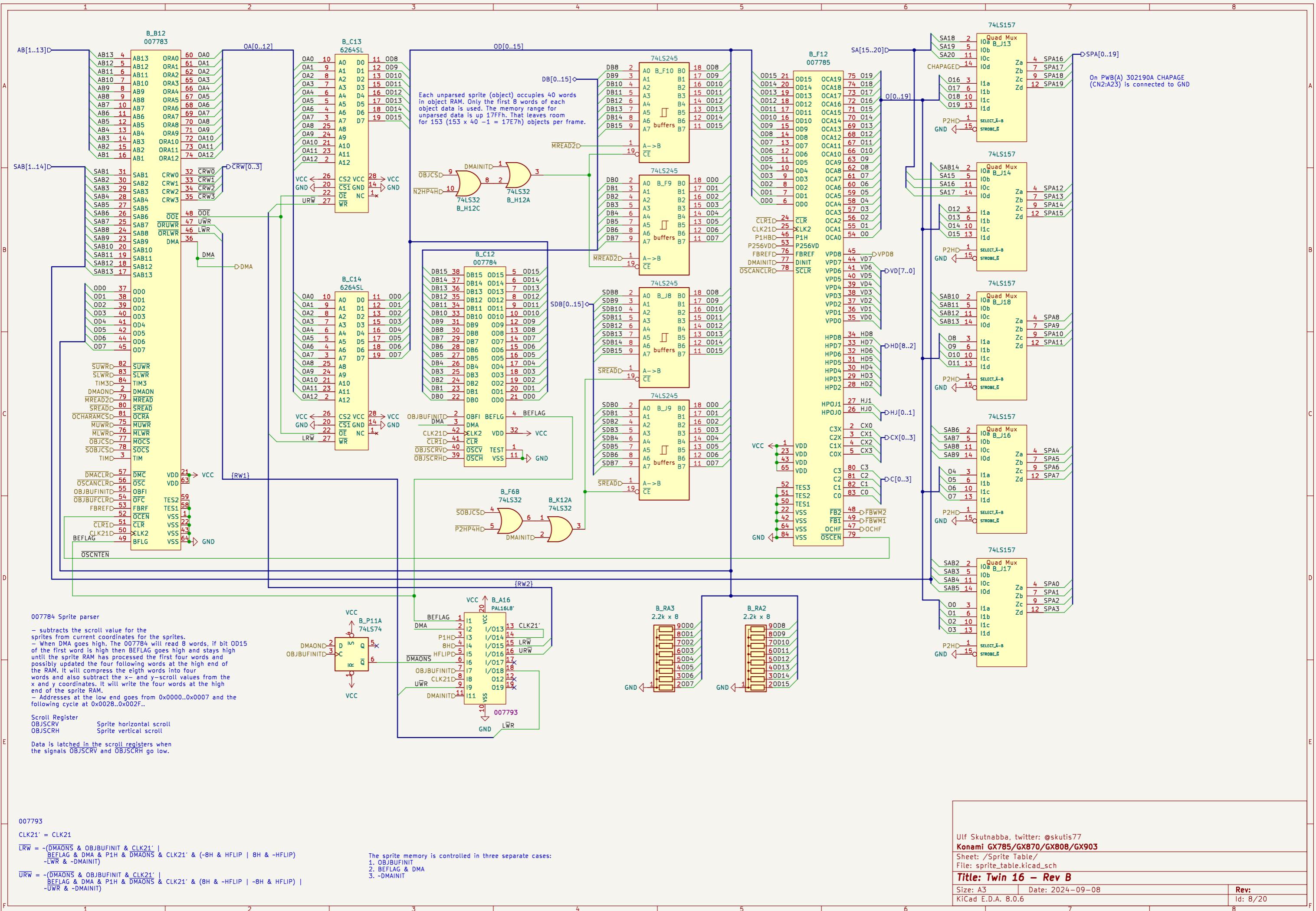
Title: Twin 16 – Rev B

Size: A3 Date: 2024-09-08  
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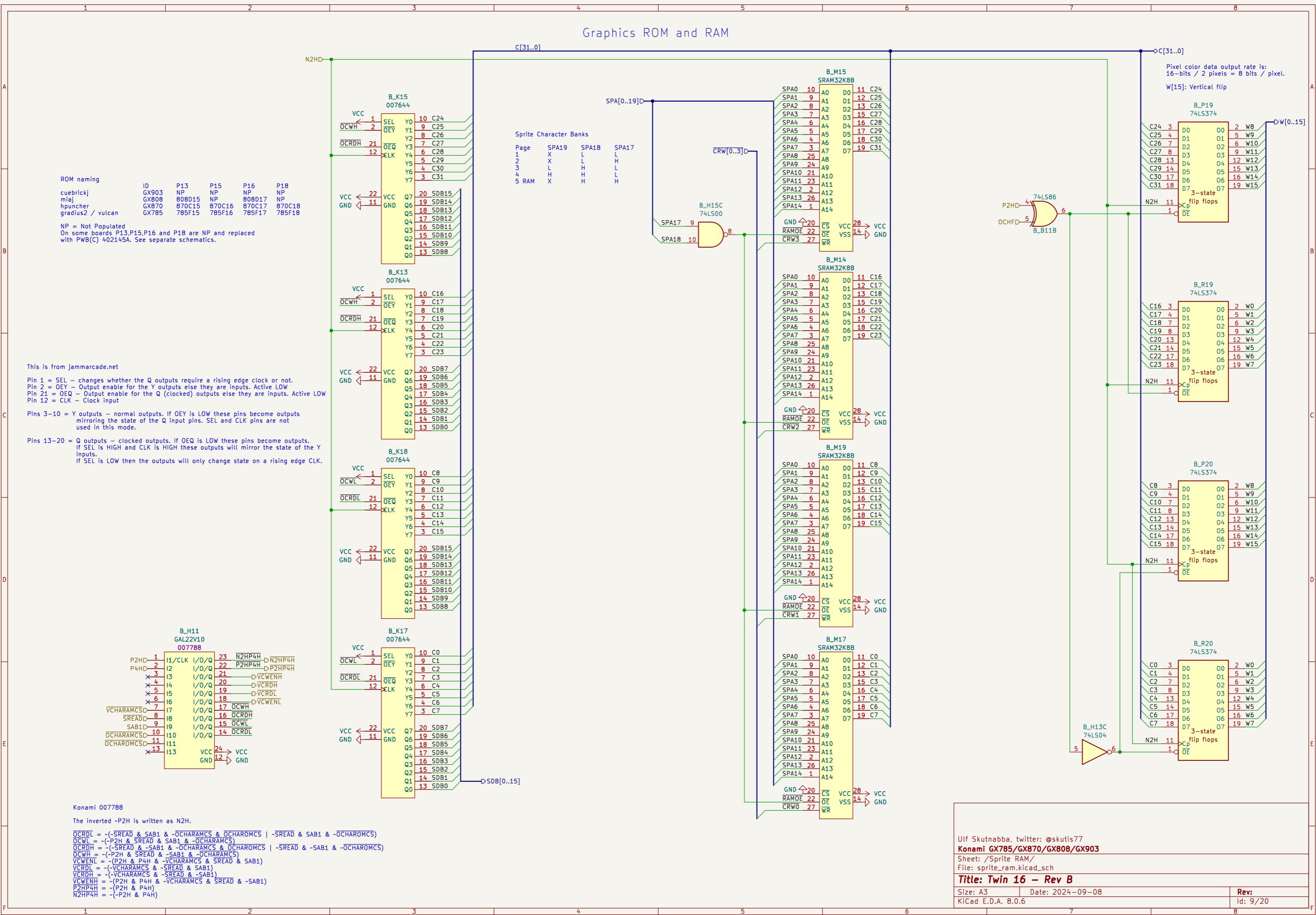
Rev: Id: 5/20

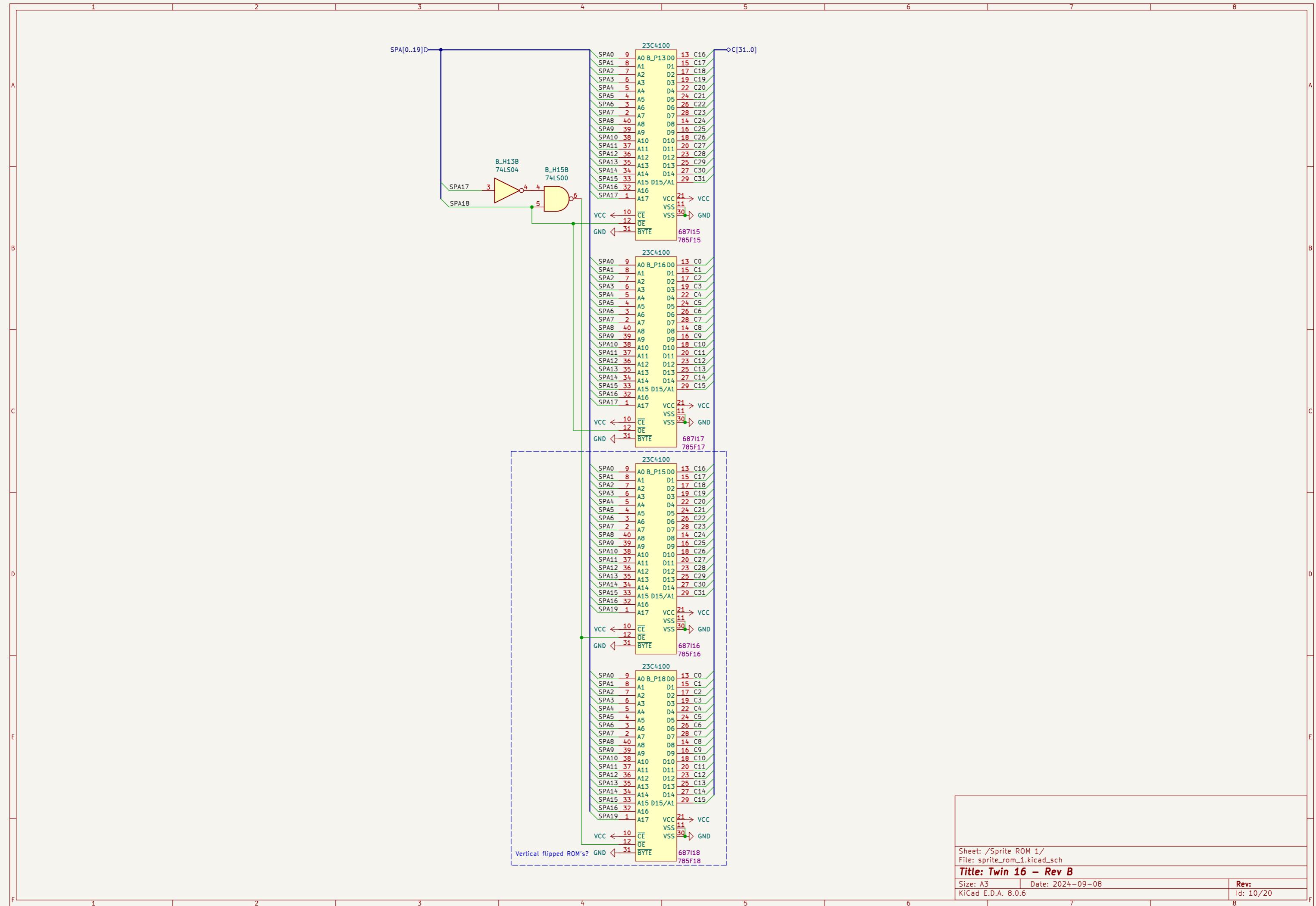


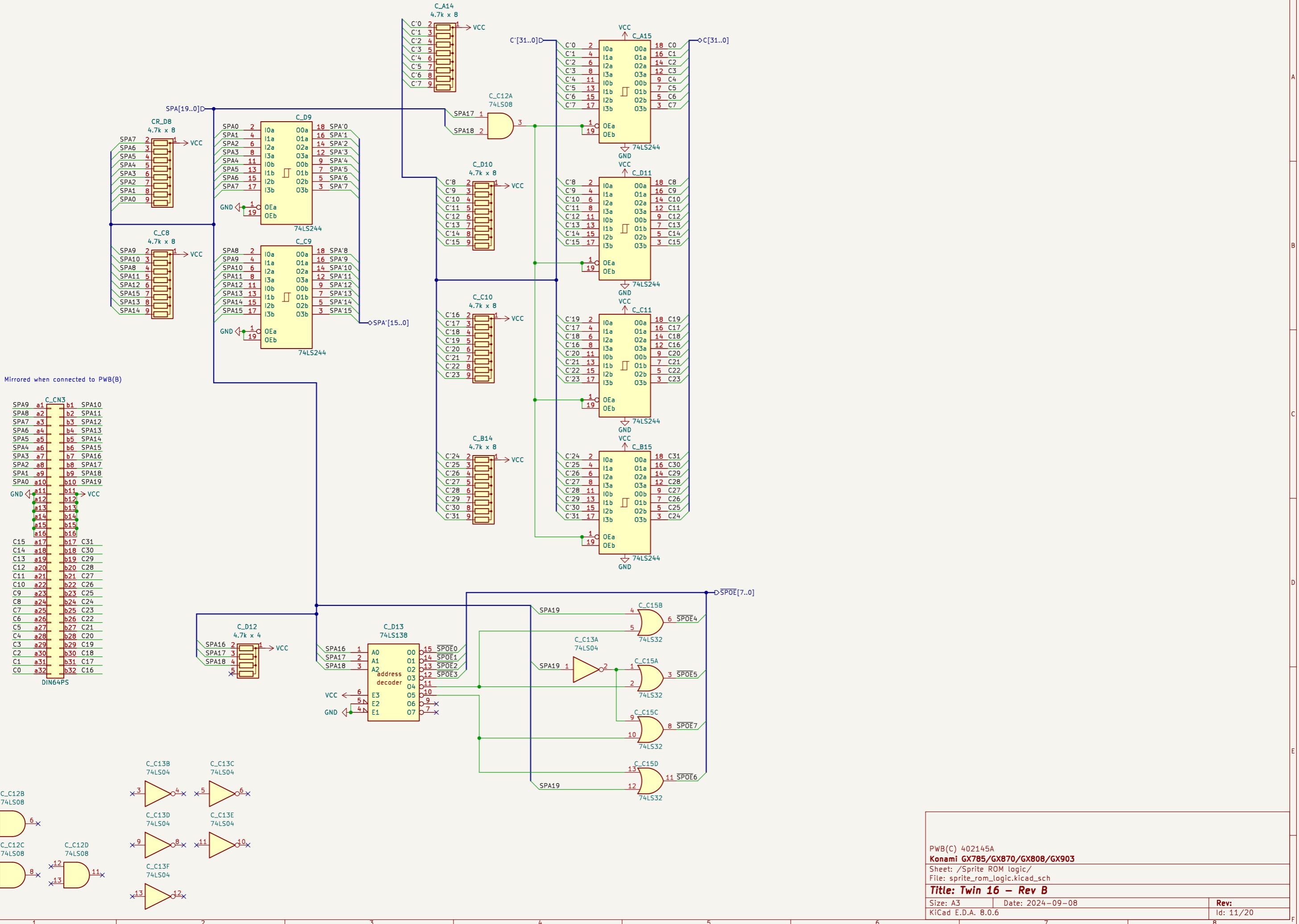


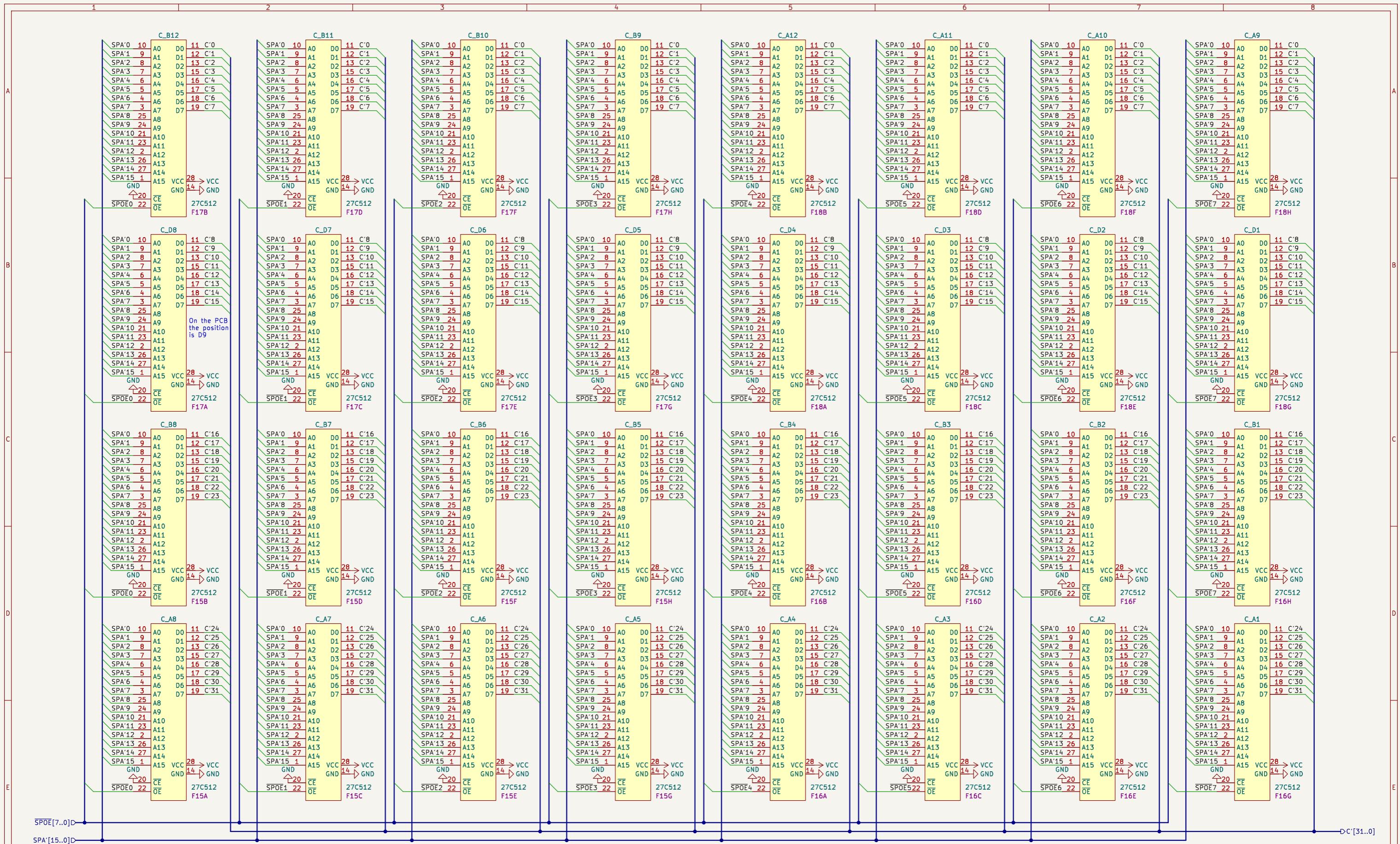


## Graphics ROM and RAM









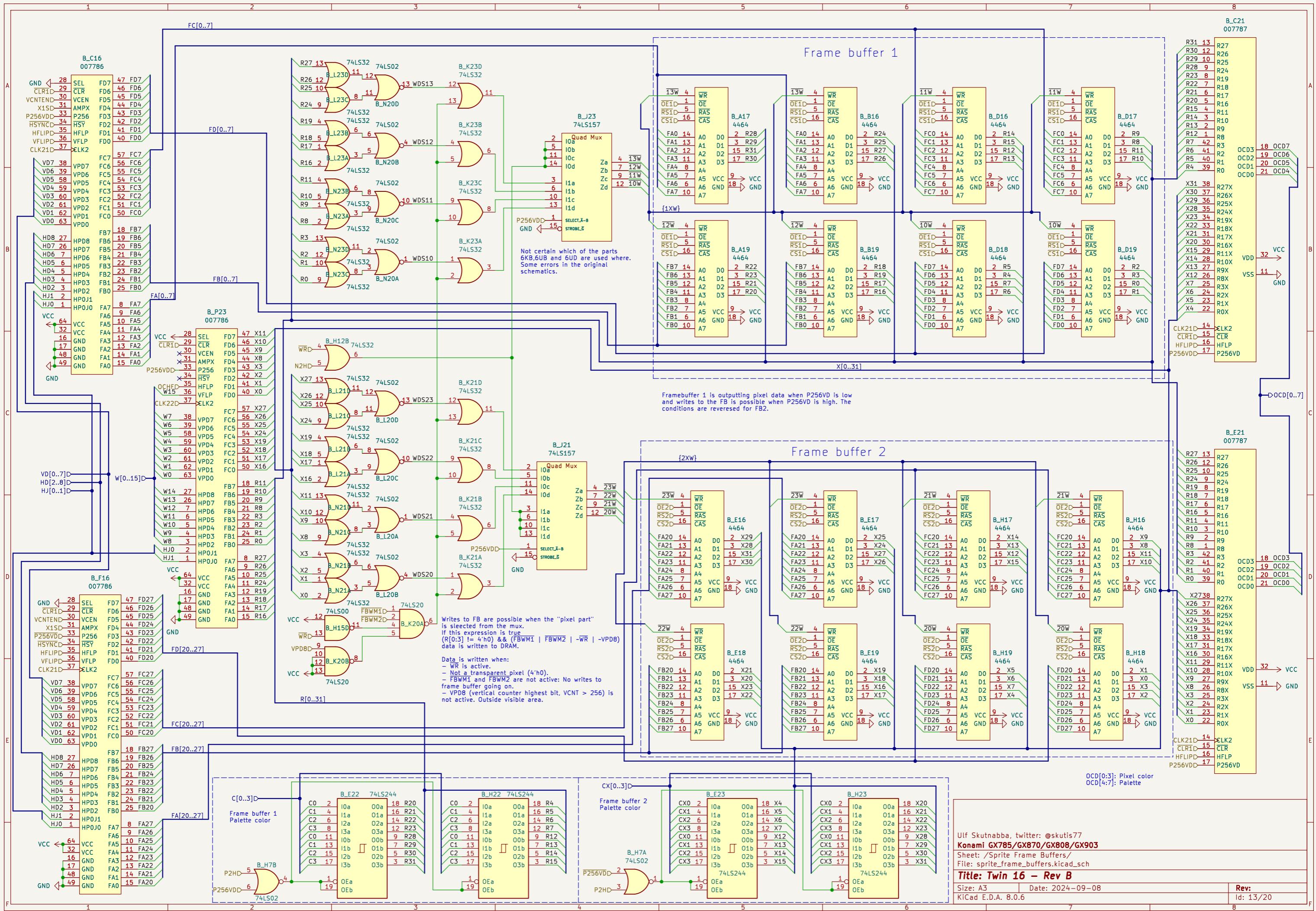
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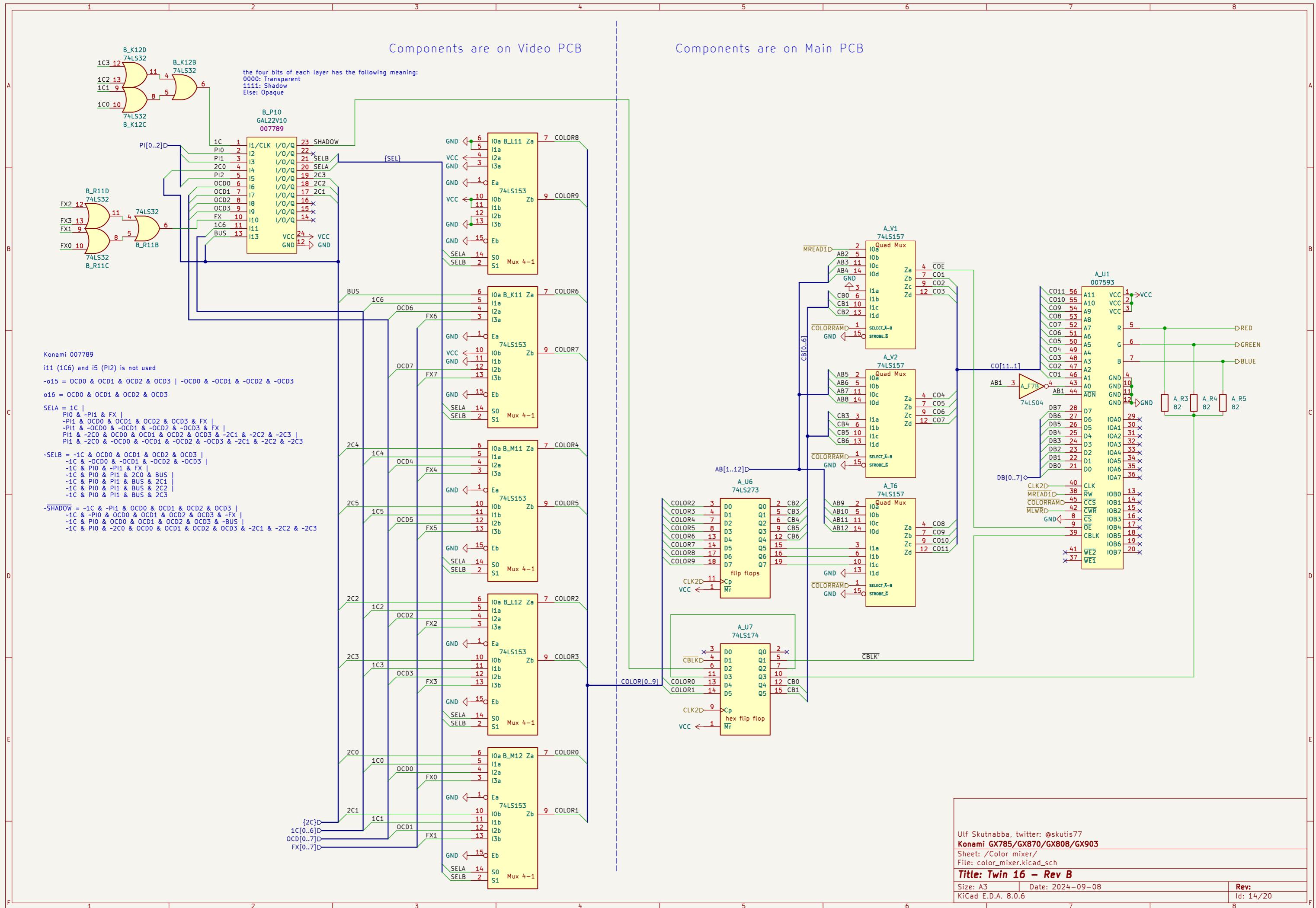
Sheet: /Sprite ROM 2/  
File: sprite\_rom\_2.kicad\_sch

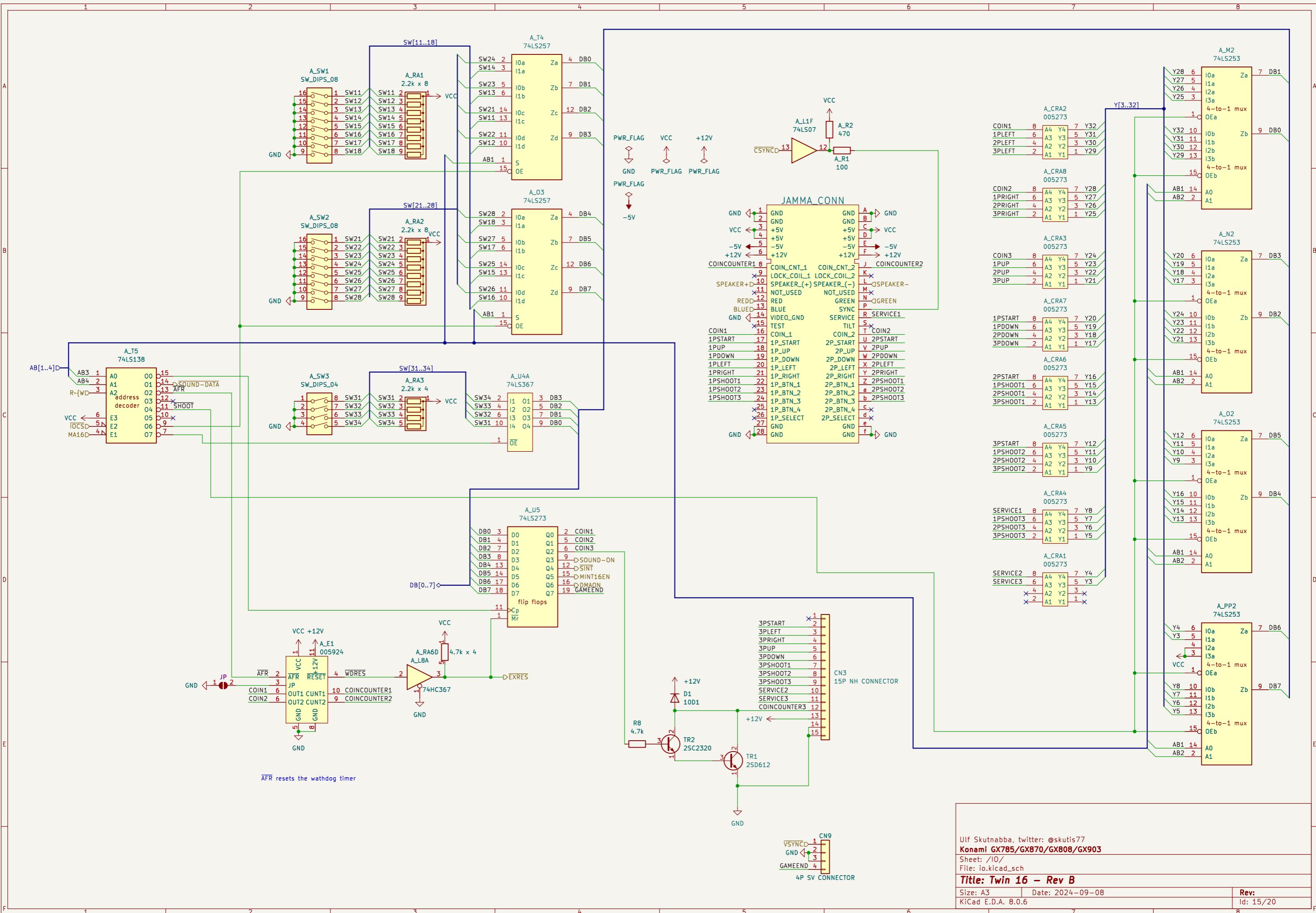
Title: Twin 16 - Rev B

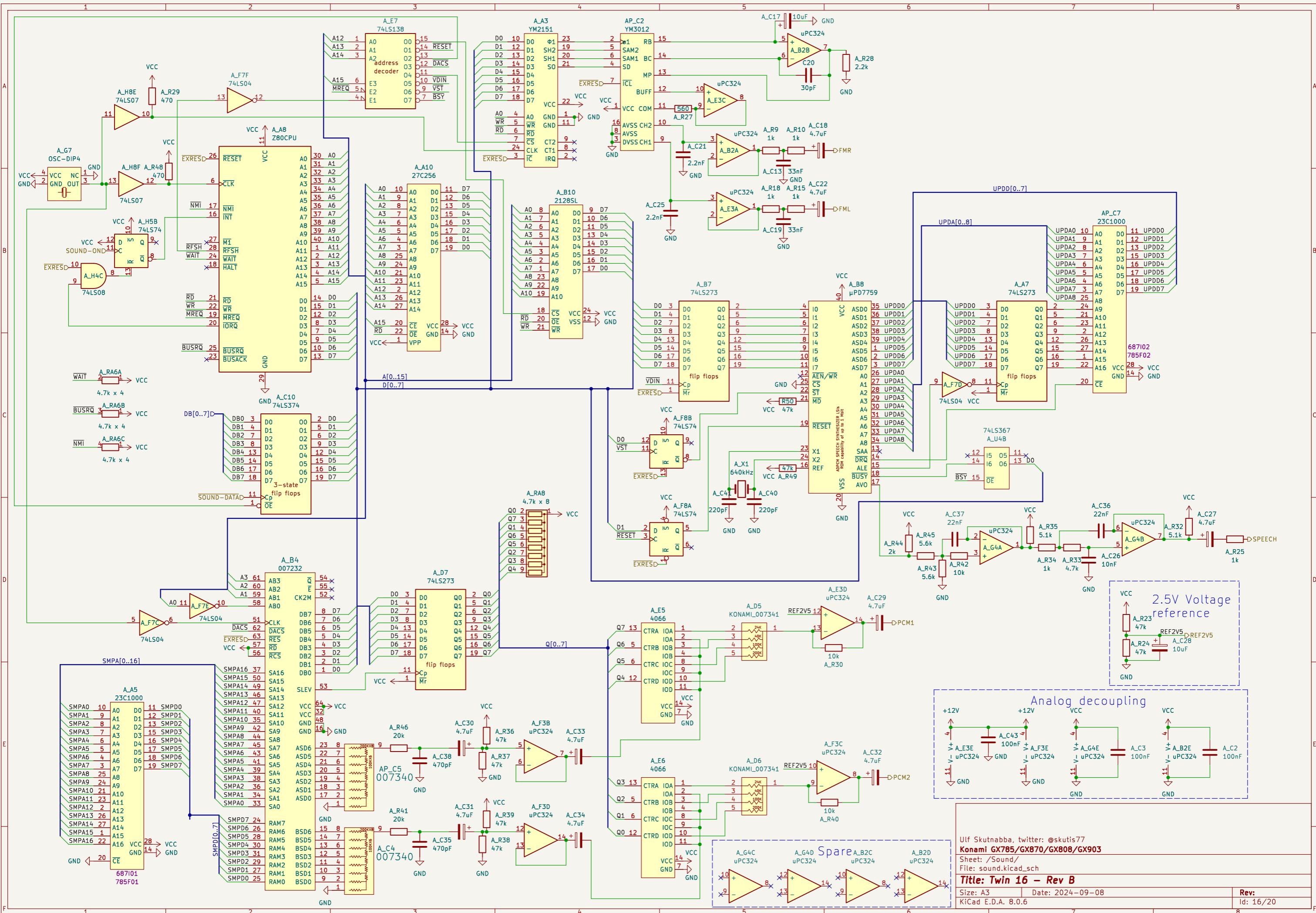
Size: A3 Date: 2024-09-08  
KiCad E.D.A. 8.0.6

Rev:  
Id: 11/20

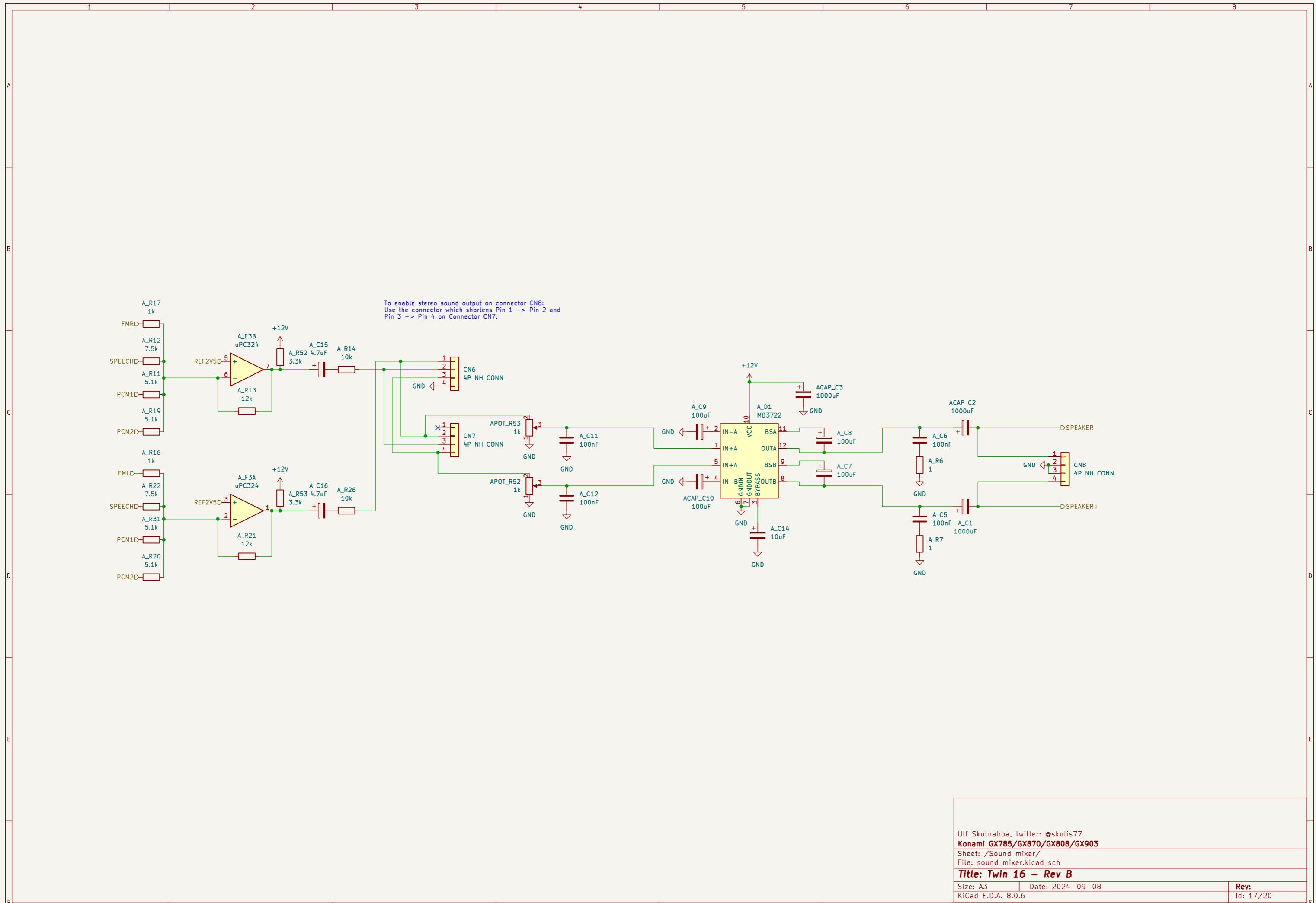








1 2 3 4 5 6 7 8



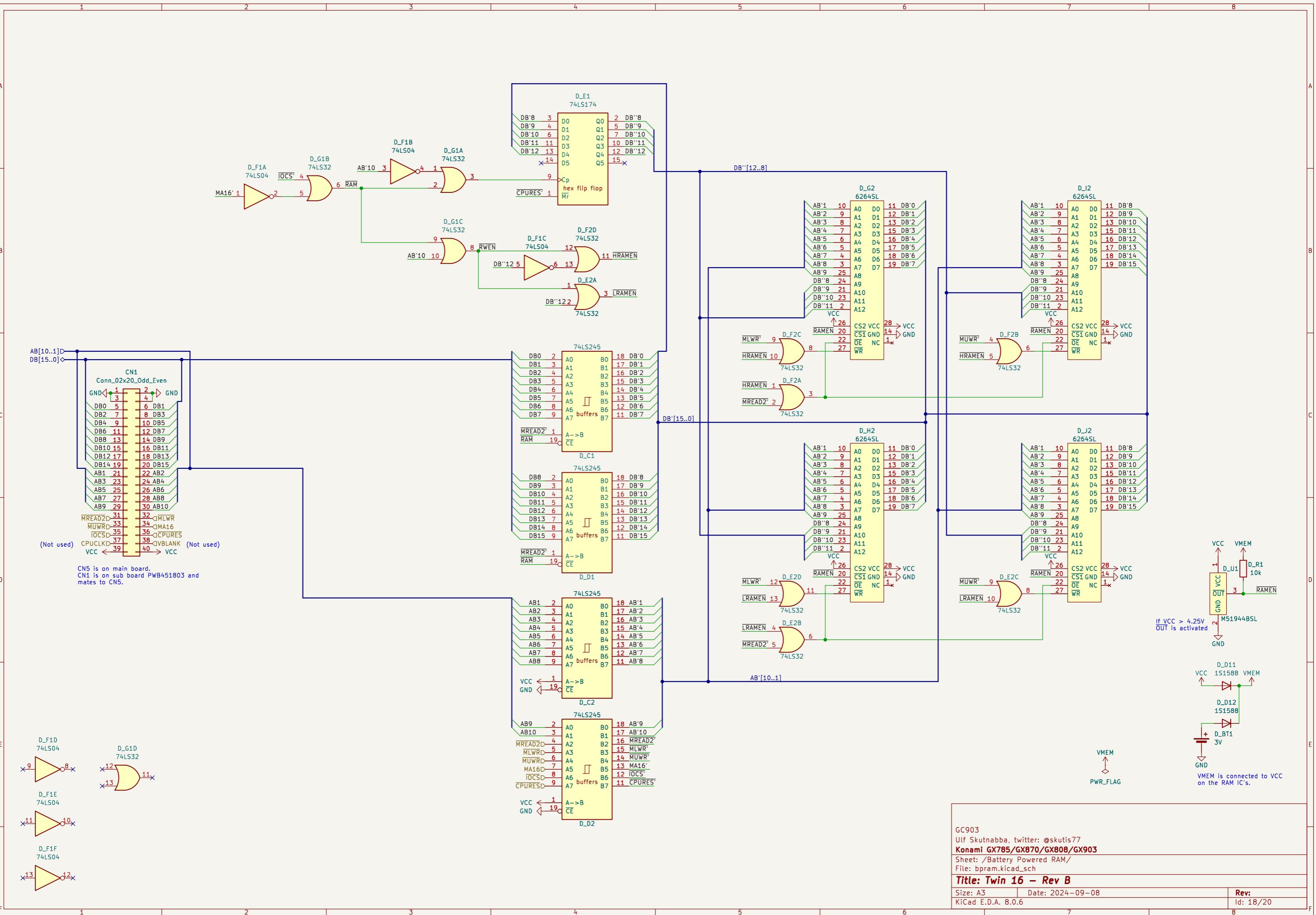
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Sheet: /Sound mixer/  
File: sound\_mixer.kicad\_sch

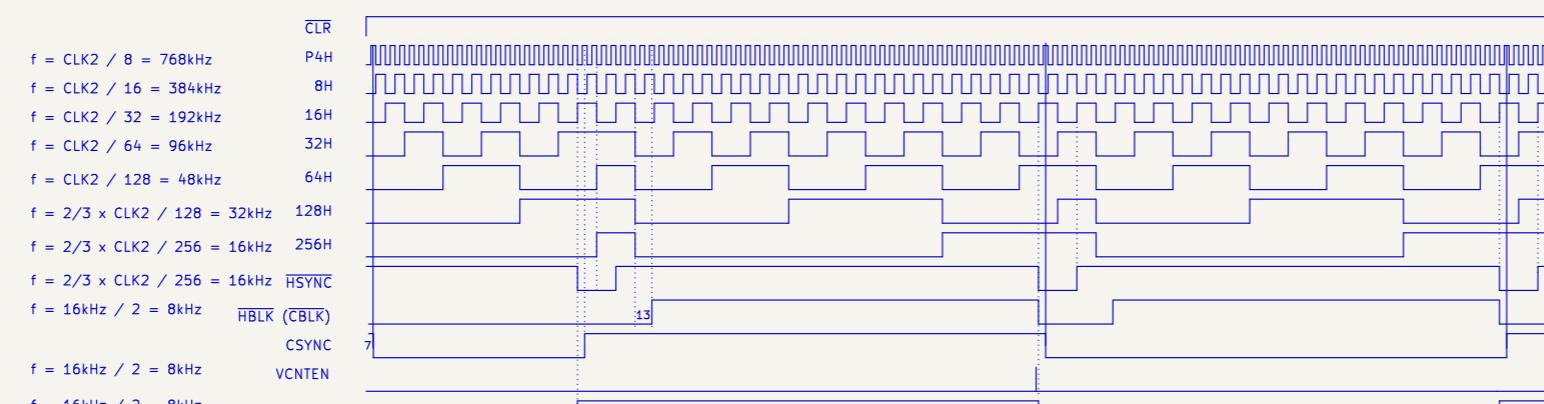
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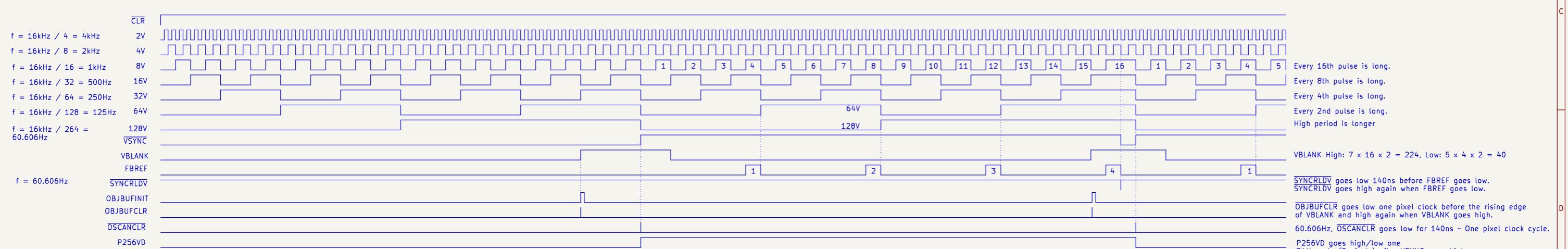
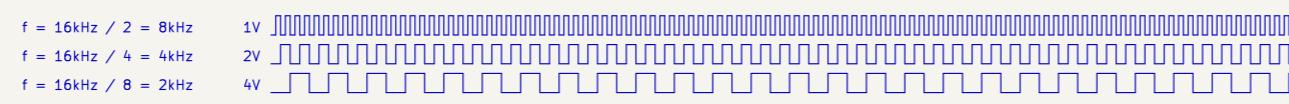
## Horizontal signals



– The first VCNTEN is skipped after reset.  
It goes low 140ns before HSYNC goes low,  
and high again when HSYNC goes low.  
VCNTEN is active right before every second falling edge of  
HSYNC.

– CPURES goes high, and stays high, on the seventh falling edge  
of HSYNC.

## Vertical signals



## Horizontal and vertical synch timing diagrams

The numbers in the HSYNC and HBLK diagrams are HSYNC cycles.  
All edges are synchronised to the rising edge of CLK2.

Pixel clock CLK2 = 18.432MHz / 3 = 6.144MHz

Horizontal lines

HSYNC freq = 6.144MHz / 384 = 16kHz  
HSYNC period = 1 / 16kHz = 62.5us

Pixels / line: 384

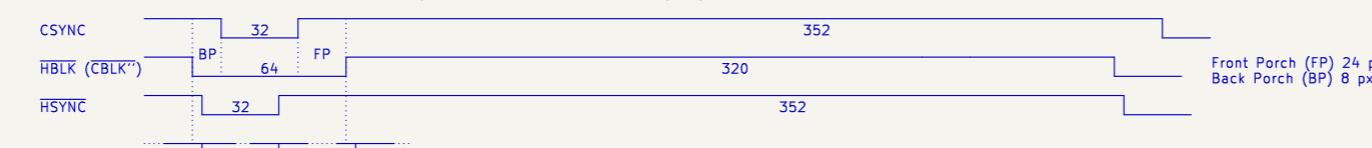
Active pixels: 320

Blank pixels: 64

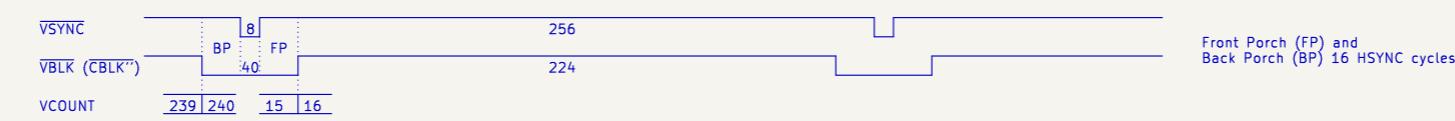
Vertical lines  
VSYNC freq = 16kHz / 264 = 60.60606Hz  
VSYNC period = 1 / f = 264 / 16kHz = 16.5ms  
scanlines / frame: 264

Active lines: 224

Blank lines: 40



The numbers in the VSYNC and VBLK diagrams are HSYNC cycles.  
All edges are synchronised to the falling edge of HSYNC.



HCOUNT is bits [256H, 128H, 64H, 32H, 16H, 8H, P4H, P2H, P1H]  
VCOUNT is bits [128V, 64V, 32V, 16V, 8V, 4V, 2V, 1V]

CBLK<sup>II</sup> is at the output of color mixer 007593.  
CBLK<sup>I</sup> is shifted inside the 007593 one pixel clock.

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Sheet: /Timing diagrams/  
File: timing\_diagrams.kicad\_sch

Title: Twin 16 – Rev B

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A

B

C

D

E

F

A

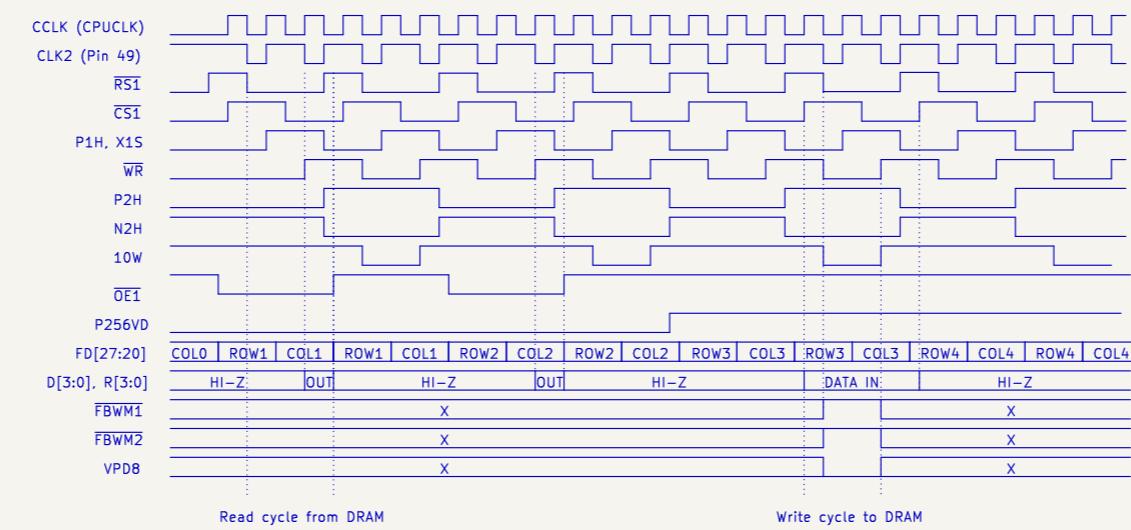
B

C

D

E

F



The same row and column addresses are repeated twice.  
One for read cycle and the other for write cycles.

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Sheet: /Sprite timing diagrams/  
File: sprite\_timing\_diagrams.kicad\_sch

**Title: Twin 16 – Rev B**

Size: A3 | Date: 2024-09-08  
KiCad E.D.A. 8.0.6

Rev:  
Id: 20/20