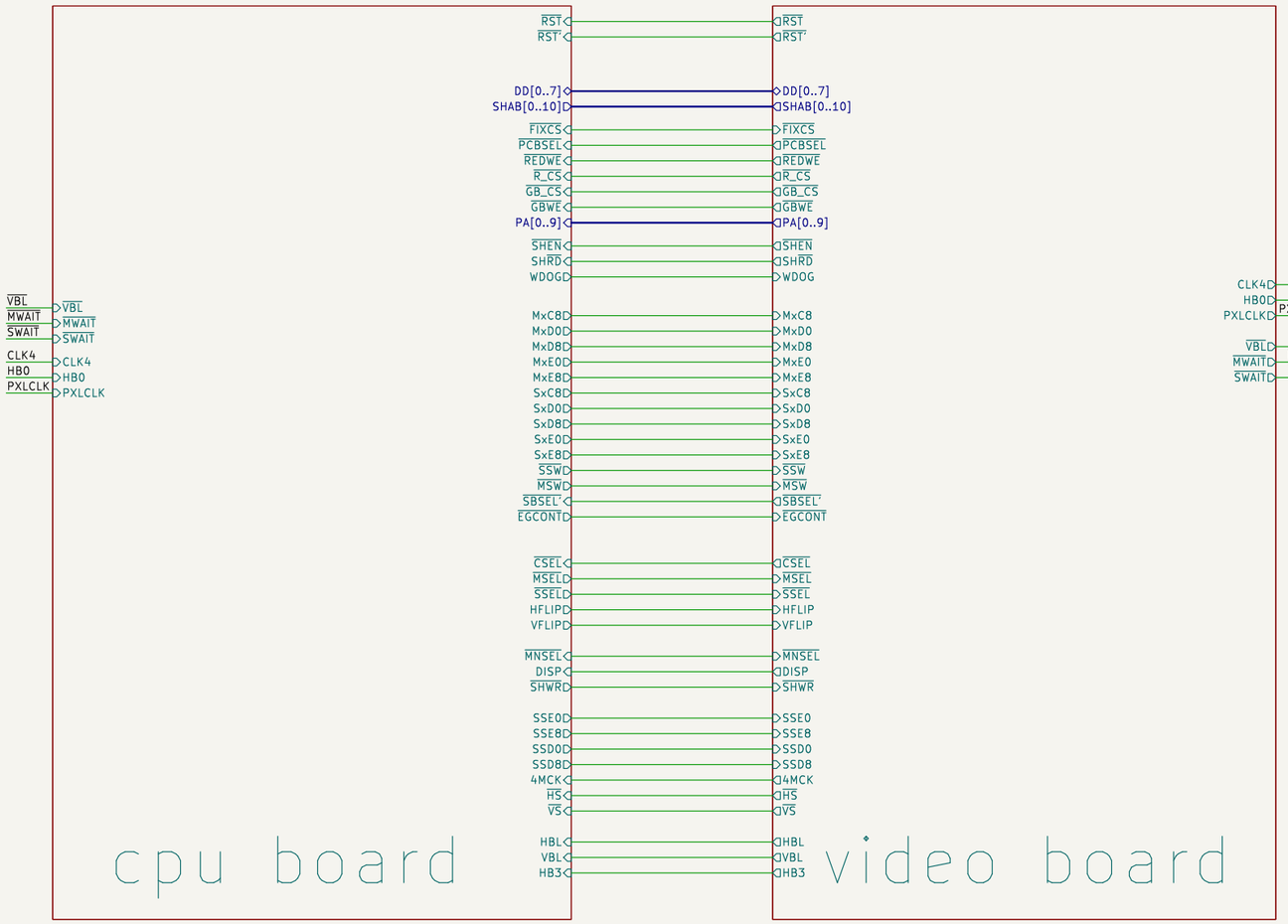

tehkanwch bootleg board

- original PCB has through-hole vias whereas the bootleg has filled vias
- original uses three custom packages from Mitsubishi with logic inside.
  These were replaced by a small daughter board on the bootleg, serving the same functionality
- different edge connectors
- debug edge connector on video board not present on bootleg
- cabinet input logic partly missing and rewired on the bootleg to replace the trackball interface for a joystick one
- different power amplifier for sound without heat sink on the bootleg
- slightly different frequencies for crystal oscillators (cost reduction?)
- device reference markers (silkscreen) on bootleg have reversed order on bootleg

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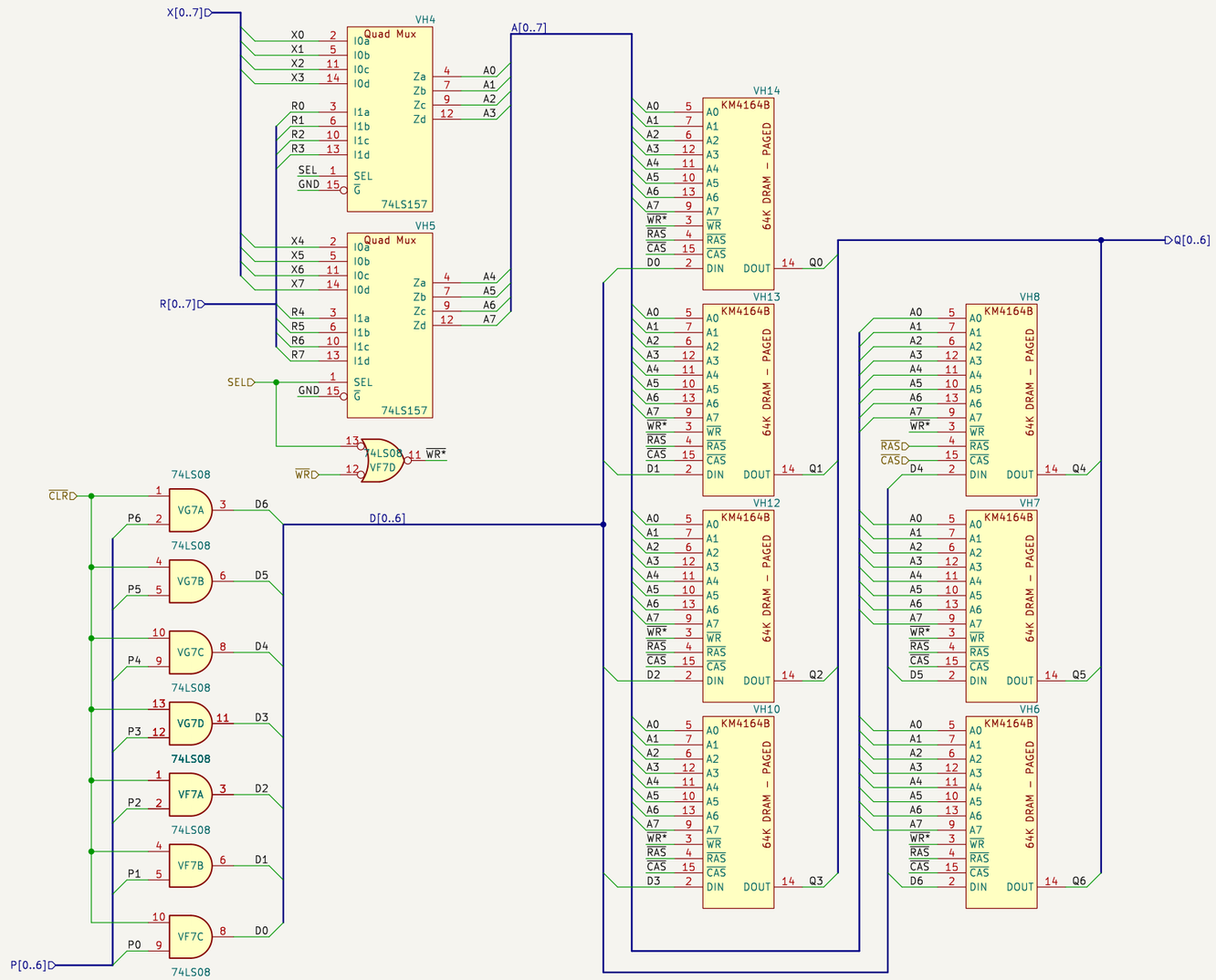
Sheet: /
File: tehkanwch.kicad_sch

Title: TEHKAN WORLD CUP (tehkanwch bootleg)

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 1/26


X[0..7]
R[0..7]
SELD
WRD
CLRD
P[0..6]
A[0..7]
D[0..6]
Q[0..6]
VH4
Quad Mux
74LS157
VH5
Quad Mux
74LS157
74LS08
VG7A
VG7B
VG7C
VG7D
VF7A
VF7B
VF7C
VF7D
VG7E
VF7E
VCC
GND
VH14
VH13
VH12
VH10
VH8
VH7
VH6
KM4164B
64K DRAM - PAGED
Jose Tejada
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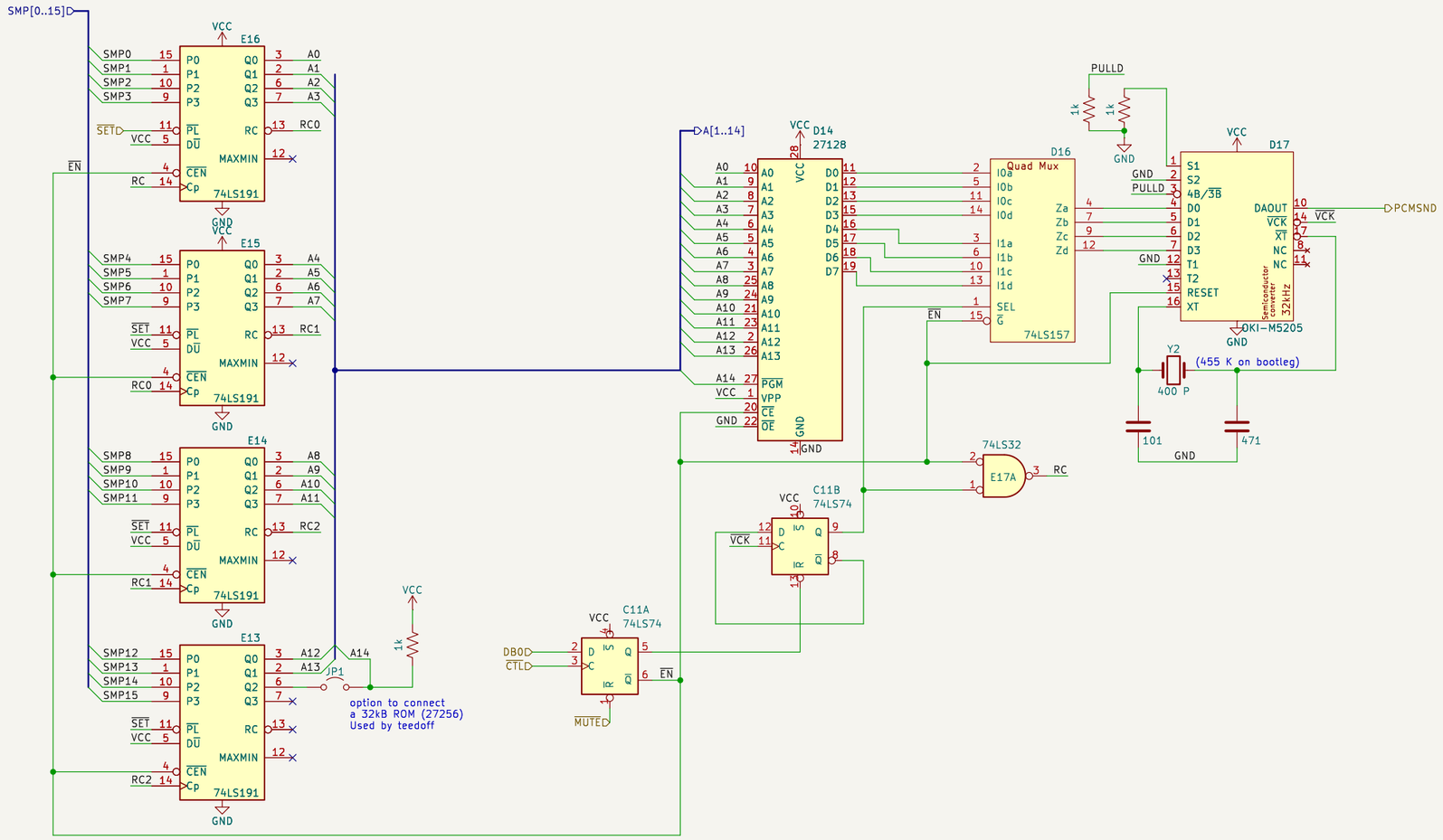
Sheet: /video board/object/frame buffer B/
File: buffer.kicad_sch
Title: Line Buffer
Size: A3
Date: 2024-11-15
Rev:
KiCad E.D.A. 8.0.9
Id: 2/26



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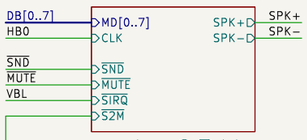
Sheet: /cpu board/sound/PCM/
File: pcm.kicad_sch

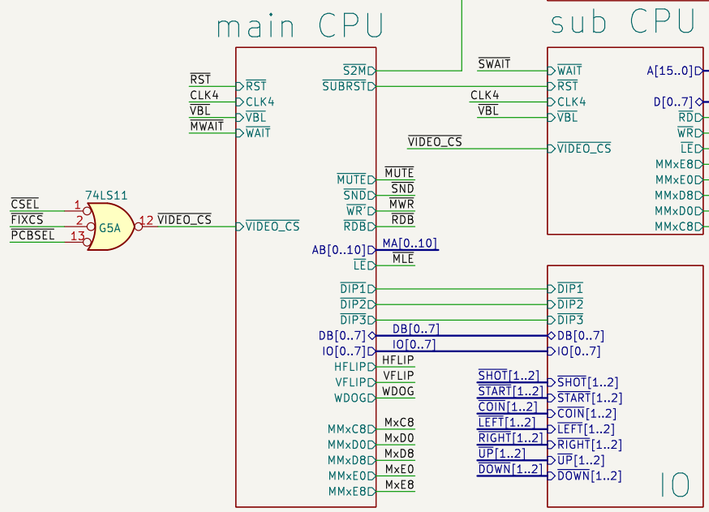
Title: PCM

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 5/26

sound



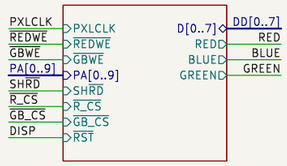
main CPU



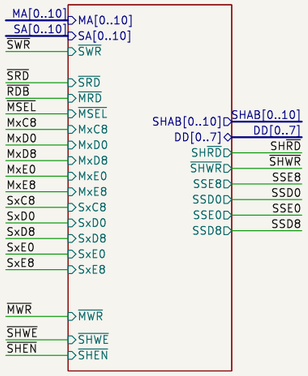
sub CPU

IO

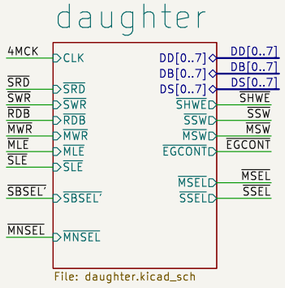
palette



shared

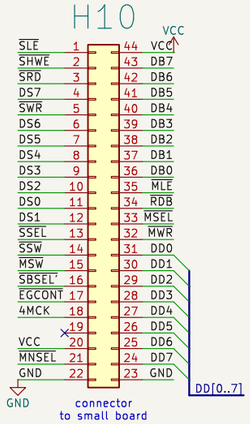


daughter

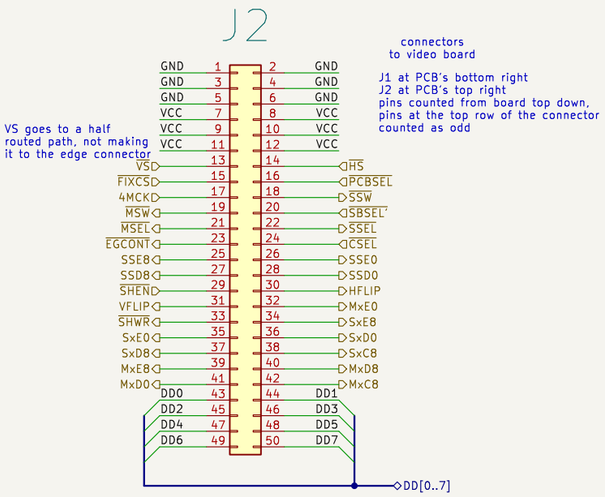


File: daughter.kicad_sch

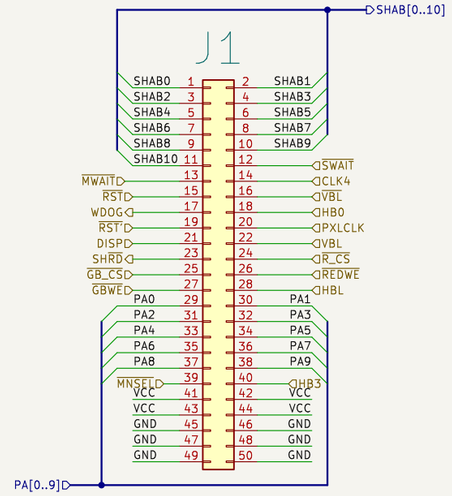
H10



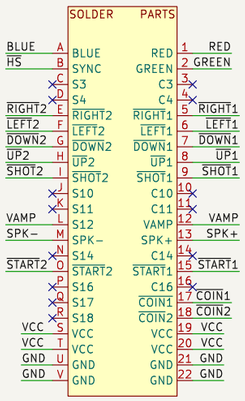
J2



J1



SOLDER PARTS



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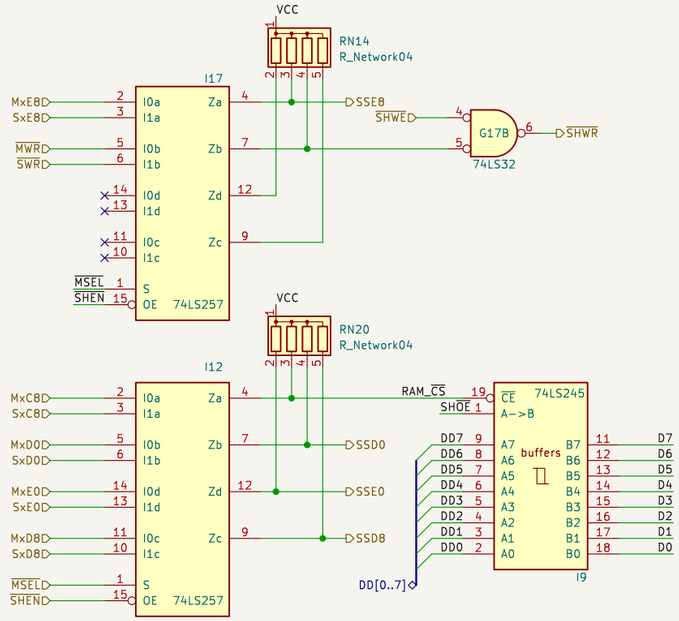
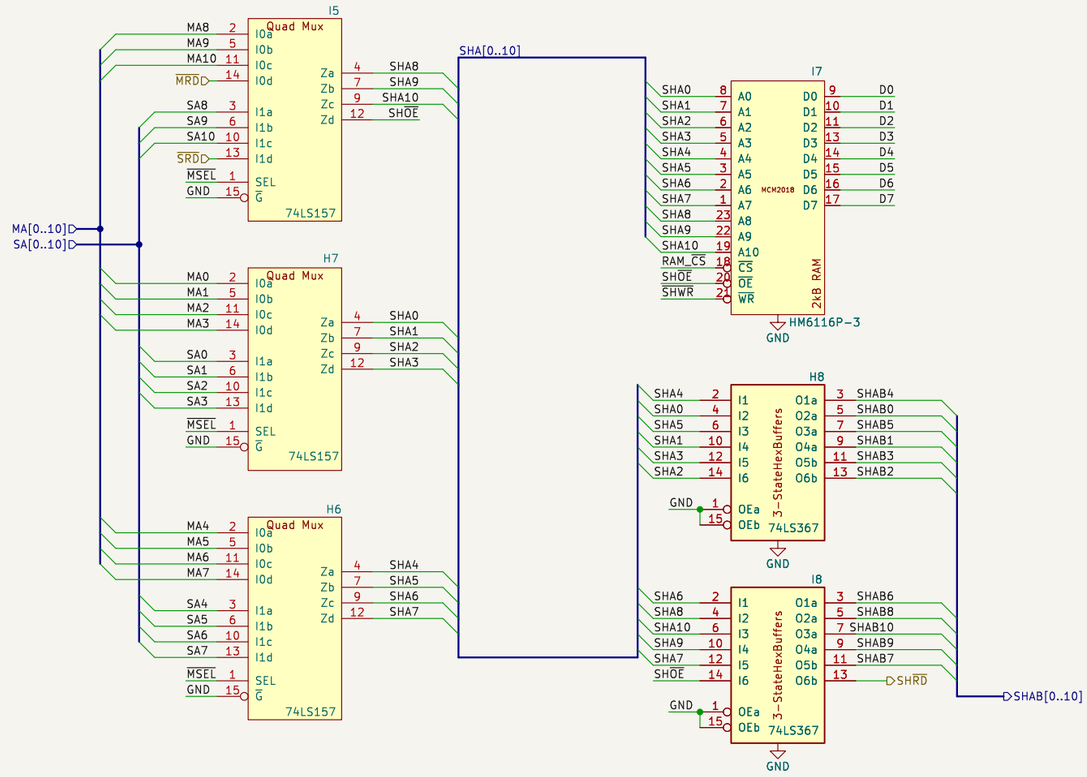
Sheet: /cpu board/
File: cpu.kicad_sch

Title: CPU board (top board)

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 9/26





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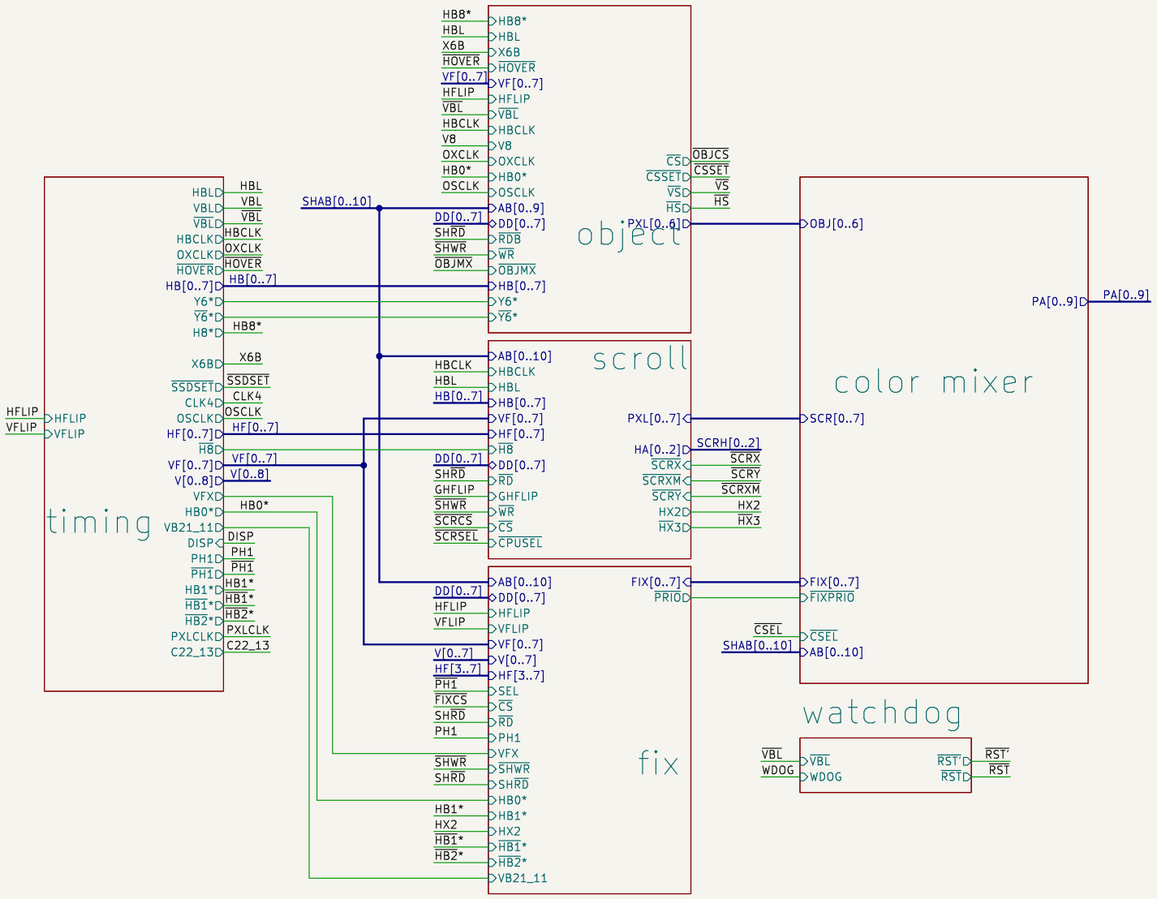
Sheet: /cpu board/shared/
File: shared.kicad_sch

Title: Shared Memory

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 10/26



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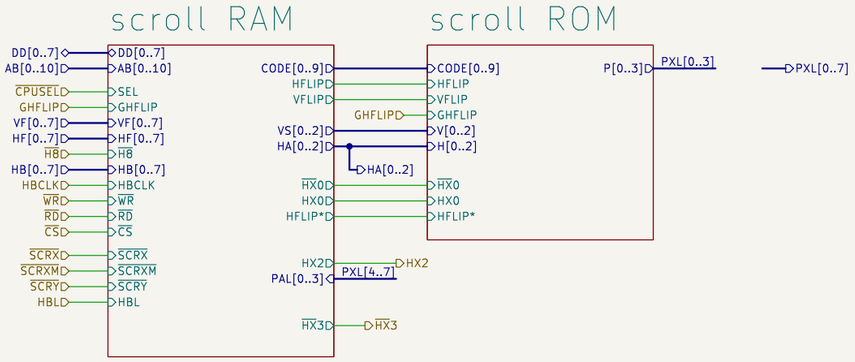
Sheet: /video board/
File: video.kicad_sch

Title: Video board (bottom board)

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 11/26



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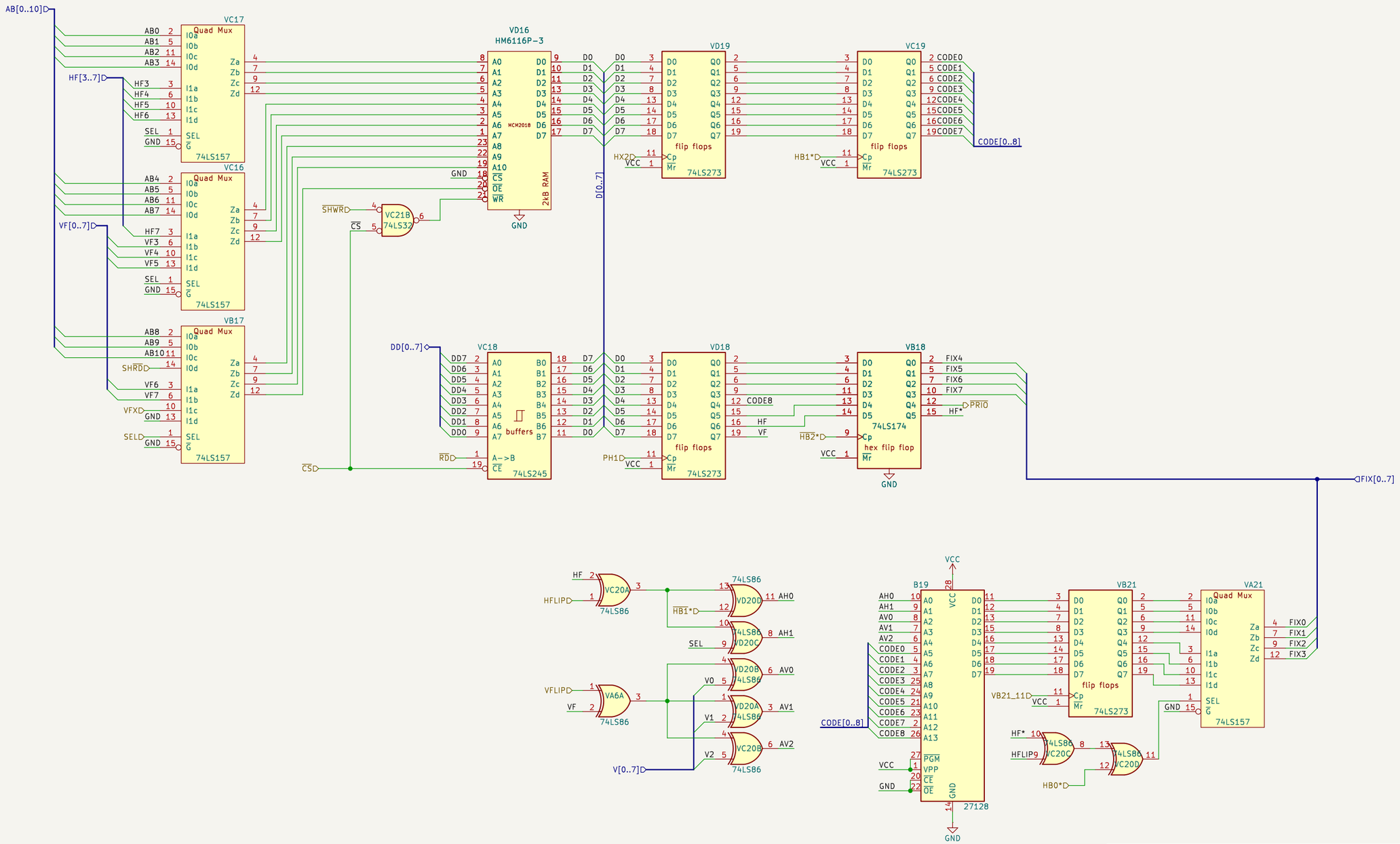
Sheet: /video board/scroll/
File: scroll.kicad_sch

Title: Scroll Subsystem

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 12/26



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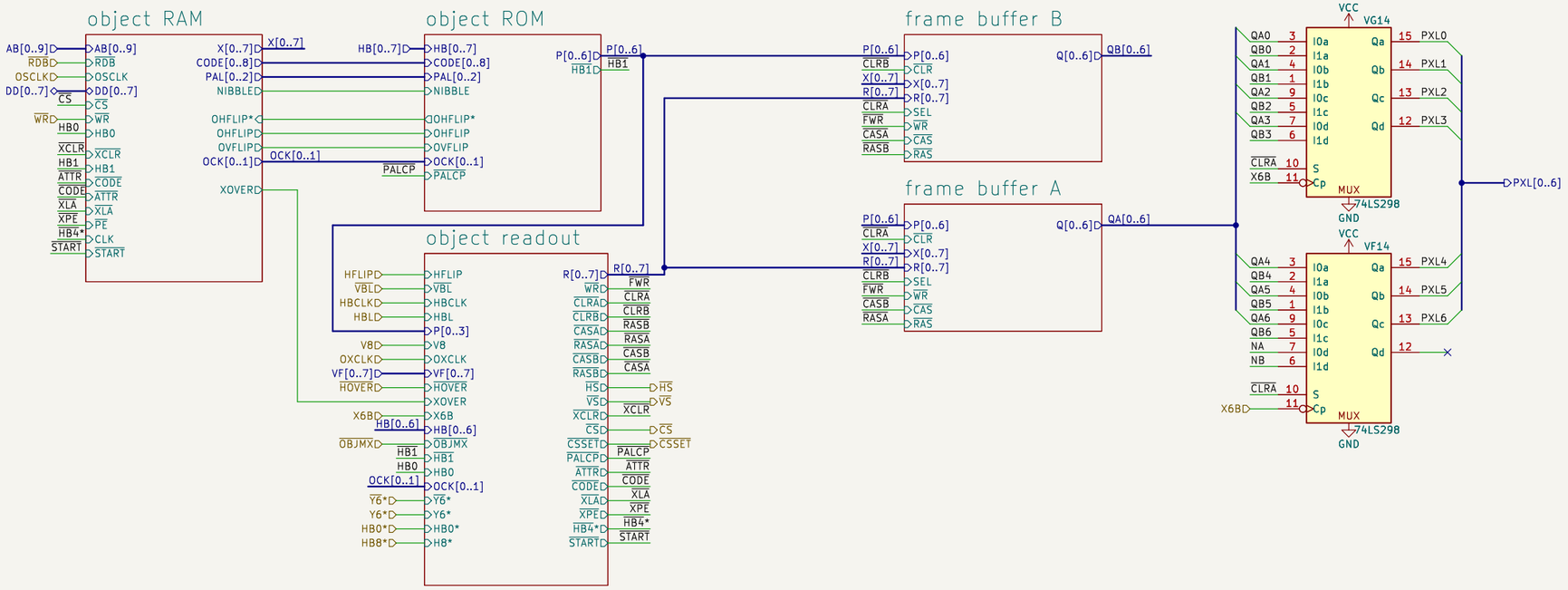
Sheet: /video board/fix/
File: fix.kicad_sch

Title: Fixed Character Layer

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 13/26



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Sheet: /video board/object/
File: object.kicad_sch

Title: Object Subsystem

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 14/26

(3.57MHz on bootleg)

Y3
4.0MHz
101
101
GND

VI22A 4069
VI22B 4069
VH22A 74LS04
CLK4

clock divider by 3

VI20B 74LS107
VI20A 74LS107
X6
Y6
HCLK
6.144 MHz
VCC

K15
330
VJ15B
74LS04
C3
101
330
VJ15A
74LS04
Y1
18.432
(18.000 on bootleg)

VI16 74LS161
VI15 74LS161
V[0..8]
V0
VTC
LSB
MSB
VG20F
74LS04

VI18 74LS161
VI19 74LS161
TCH
counter

VG19A 74LS74
H0
3MHz

74LS00
VH20B
VG20C
H8
H6
VG20B
VG21A
HOVER
VCLK
74LS74

VG19B
74LS74

74LS86
VH16D
VH16C
VH16B
VH16A
VF0
VF1
VF2
VF3

74LS86
VH15D
VH15C
VH15B
VH15A
VF4
VF5
VF6
VF7

VG18B
VFLIP
VF[0..7]

74LS20
VG17B
VG18C
VG17A
VH20D
74LS00
object scan clock
OSCLK
HBL
74LS27
VG16A
VG20A
74LS04
OXCLK
HBCLK
VG16B
VE21B
SSDSET

VH17
3-StateHexBuffers
74LS367
HB[0..7]
VI17
X6B
HBCLK
Y6*
HB6
HB7
Y6*

74LS08
VG18D
HFLIP
74LS86
VH18D
VH18C
VH18B
VH18A
HF0
HF1
HF2
HF3
VH19A
VH19B
VH19C
VH19D
HF7
HF6
HF5
HF4
HF[0..7]

74LS32
VC22B
VD21A
C22_13
101

VF21
74LS175
HB0*
VB21_11
HB1*
HB1*
VFX
HB2*

VF22A
VG22A
VG22B
VH22E
VH22F
VF20D
74LS08
PH1
DISP

VF20C
74LS08
VH20C
74LS00
VG21B
VBL
VBL

VE20C
74LS32
PXLCLK

VCC
GND

VE16C 74LS74
VG19C 74LS74
VJ15G 74LS04
VG18E 74LS08
VG15D 74LS10
VH20E 74LS00
VH18E 74LS86
VH19E 74LS86
VH16E 74LS86
VI20C 74LS107
VF22C 74LS74
VG22C 74LS74
VG20G 74LS04
VG21C 74LS74
VH22G 74LS04
VG17C
VG16D 74LS27
VE21G 74LS04
VF20E 74LS08
VE20E 74LS32

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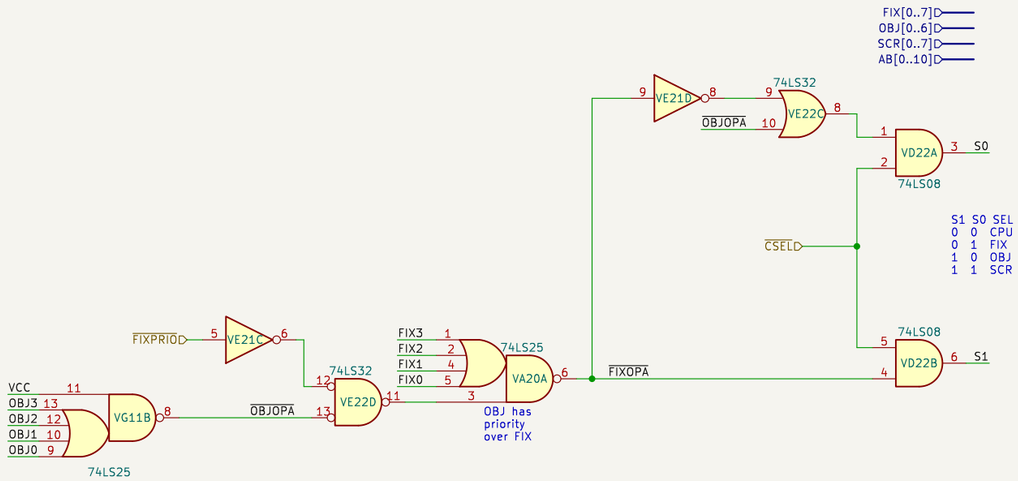
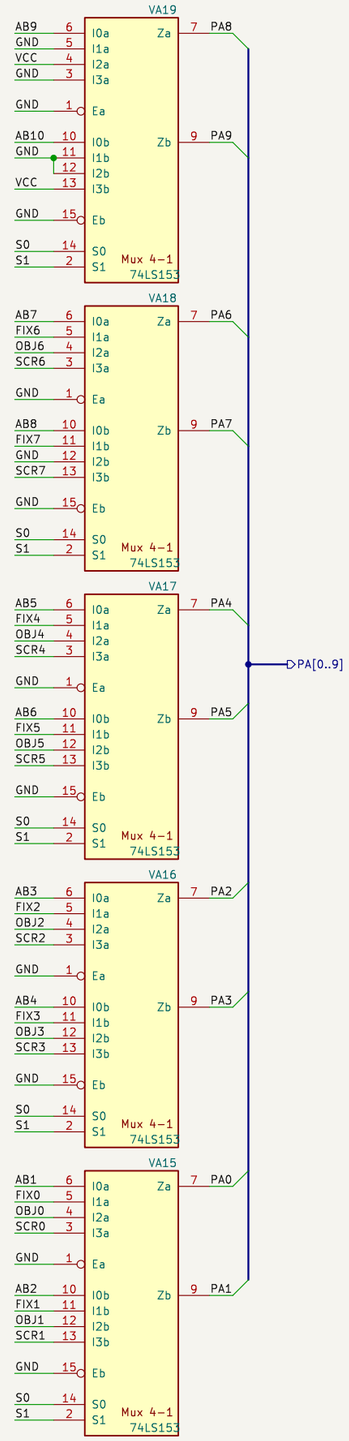
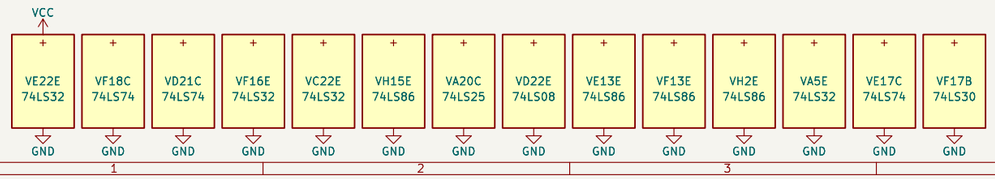
Sheet: /video board/timing/
File: timing.kicad_sch

Title: Video Timing

Size: A3 | Date: 2024-11-15 | Rev:
KiCad E.D.A. 8.0.9 | Id: 15/26







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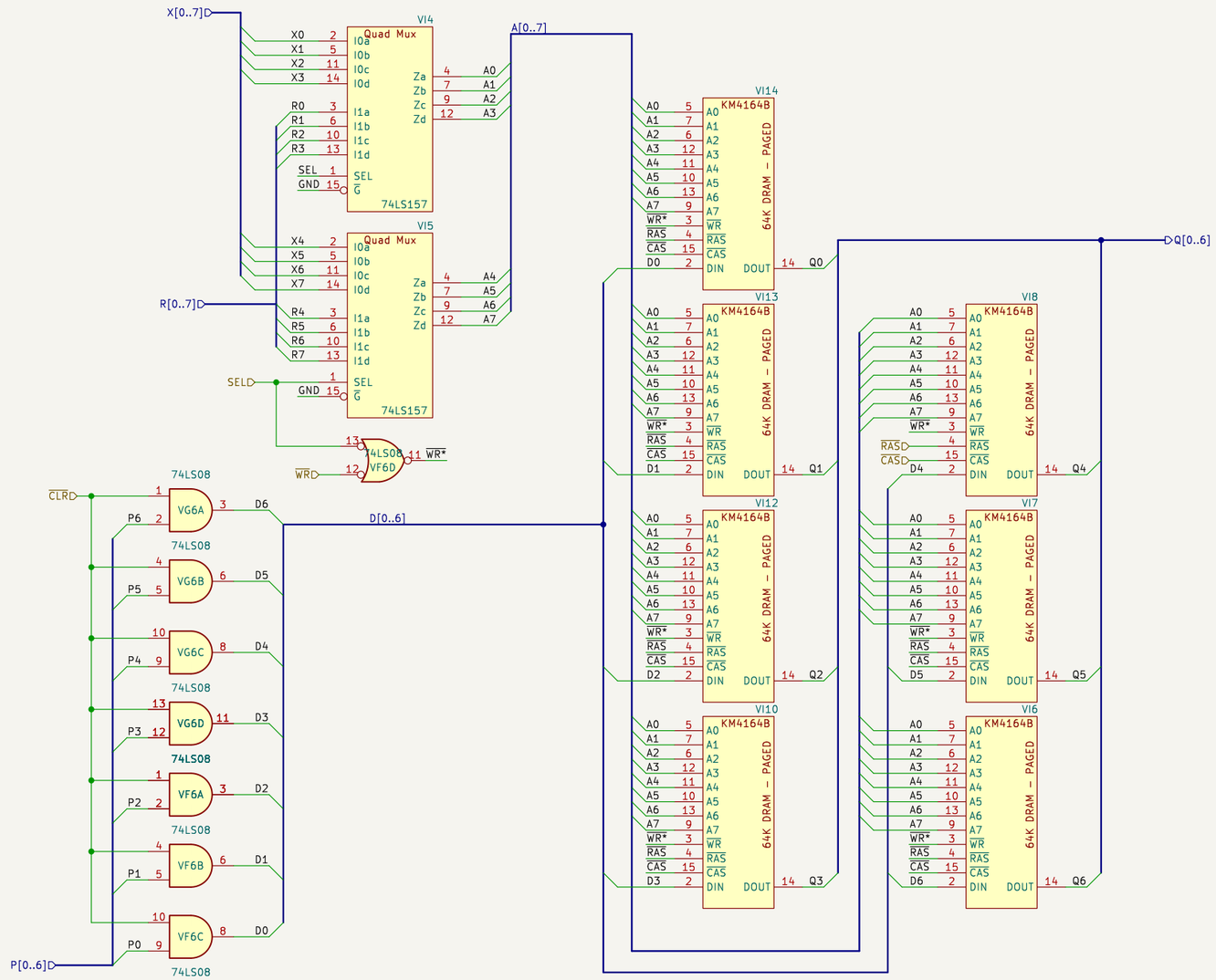
Sheet: /video board/color mixer/
File: colmix.kicad_sch

Title: Color mixer

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 16/26



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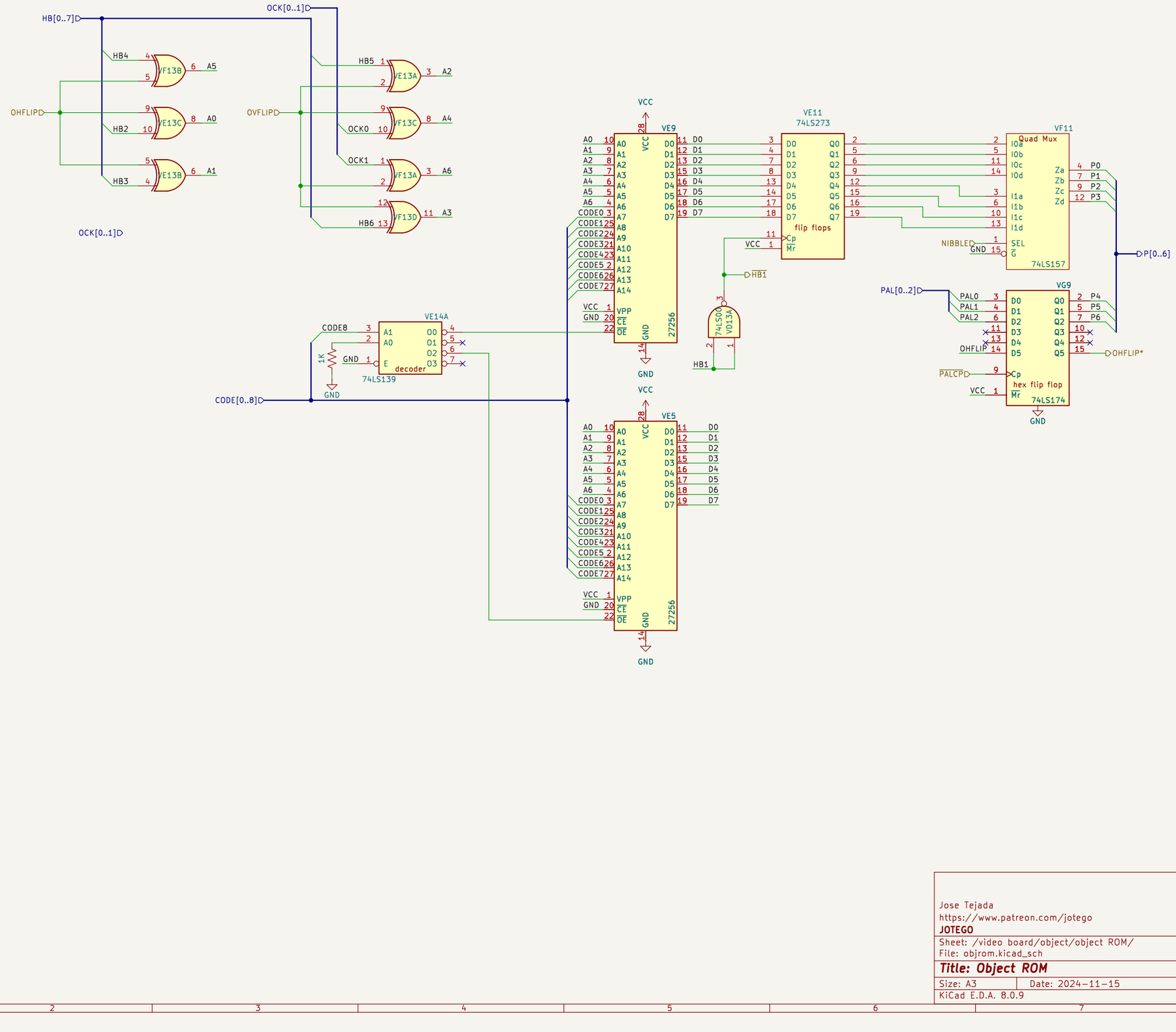
Sheet: /video board/object/frame buffer A/
File: buffer.kicad_sch

Title: Line Buffer

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 17/26



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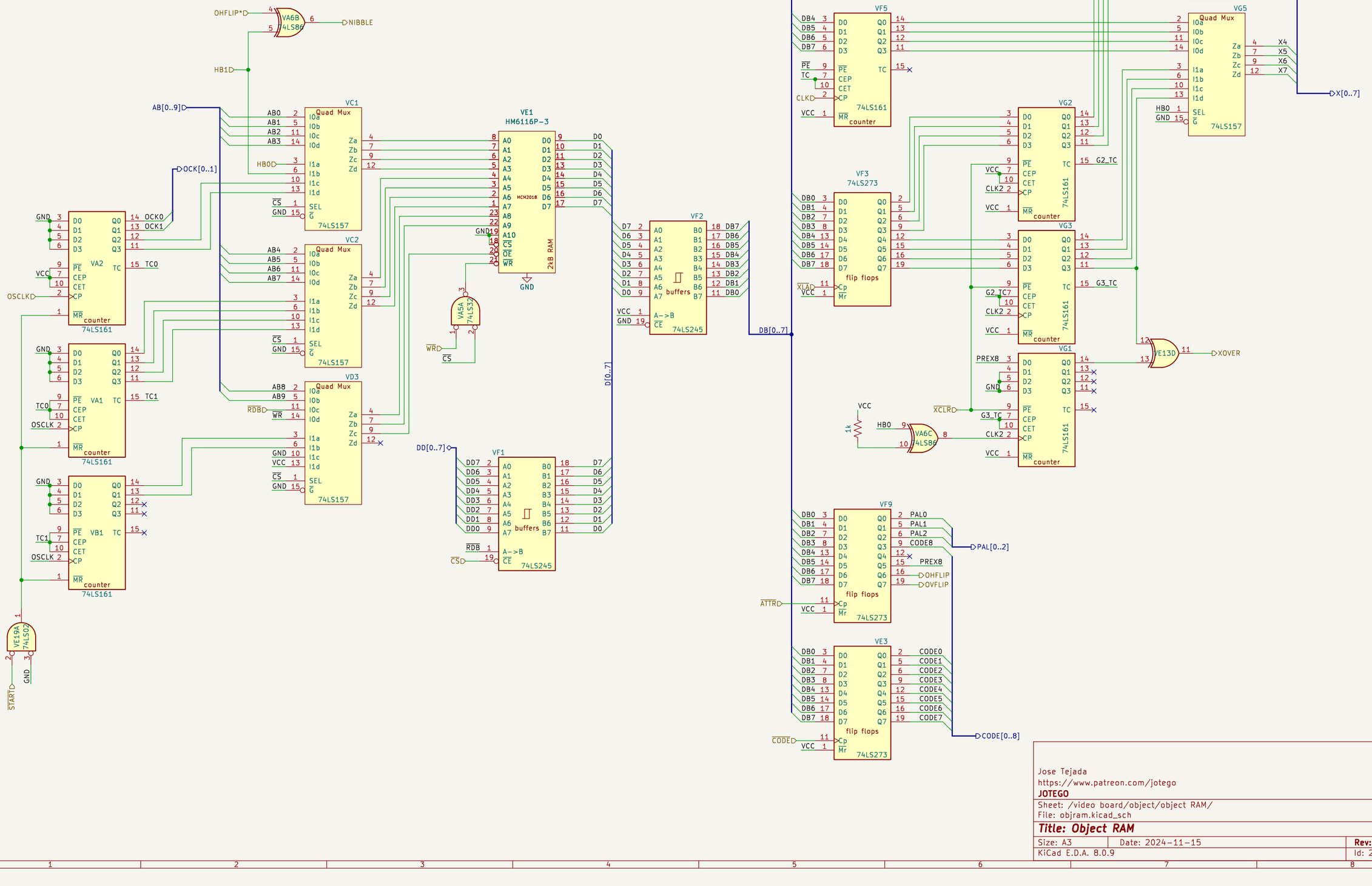
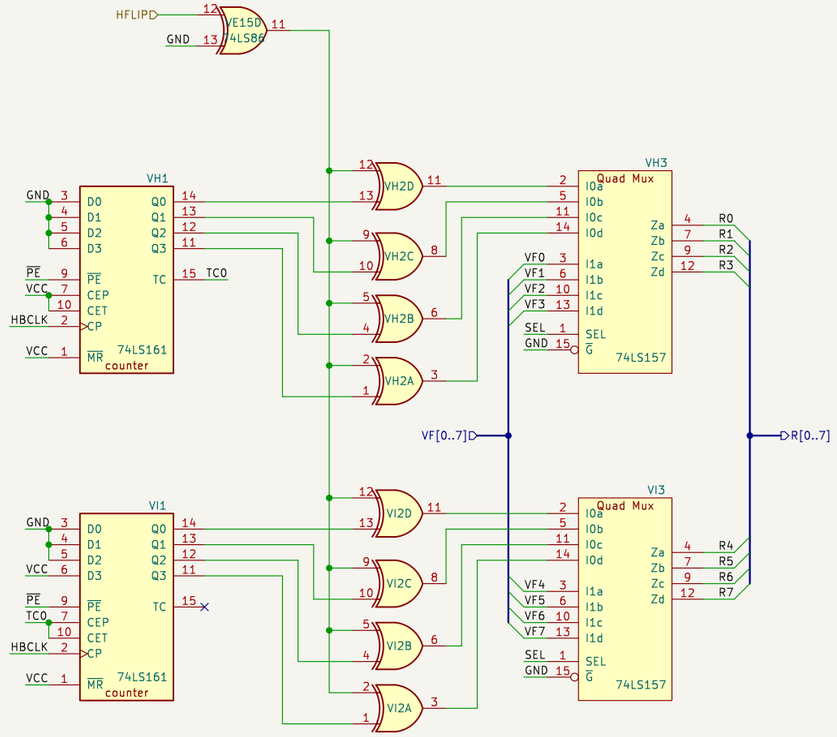
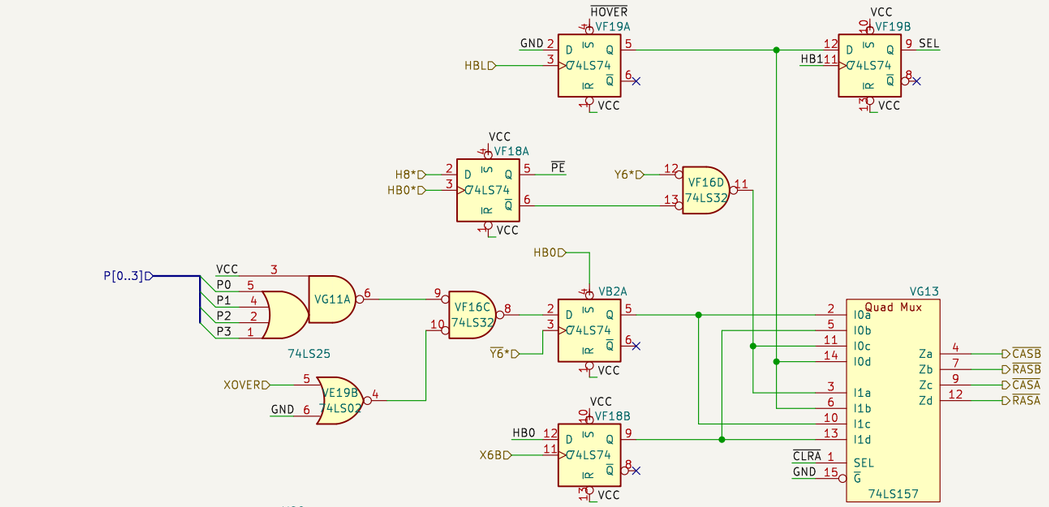
Sheet: /video board/object/object ROM/
File: objrom.kicad_sch

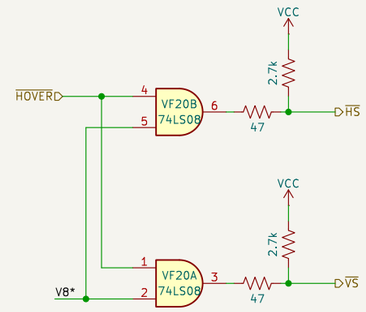
Title: Object ROM

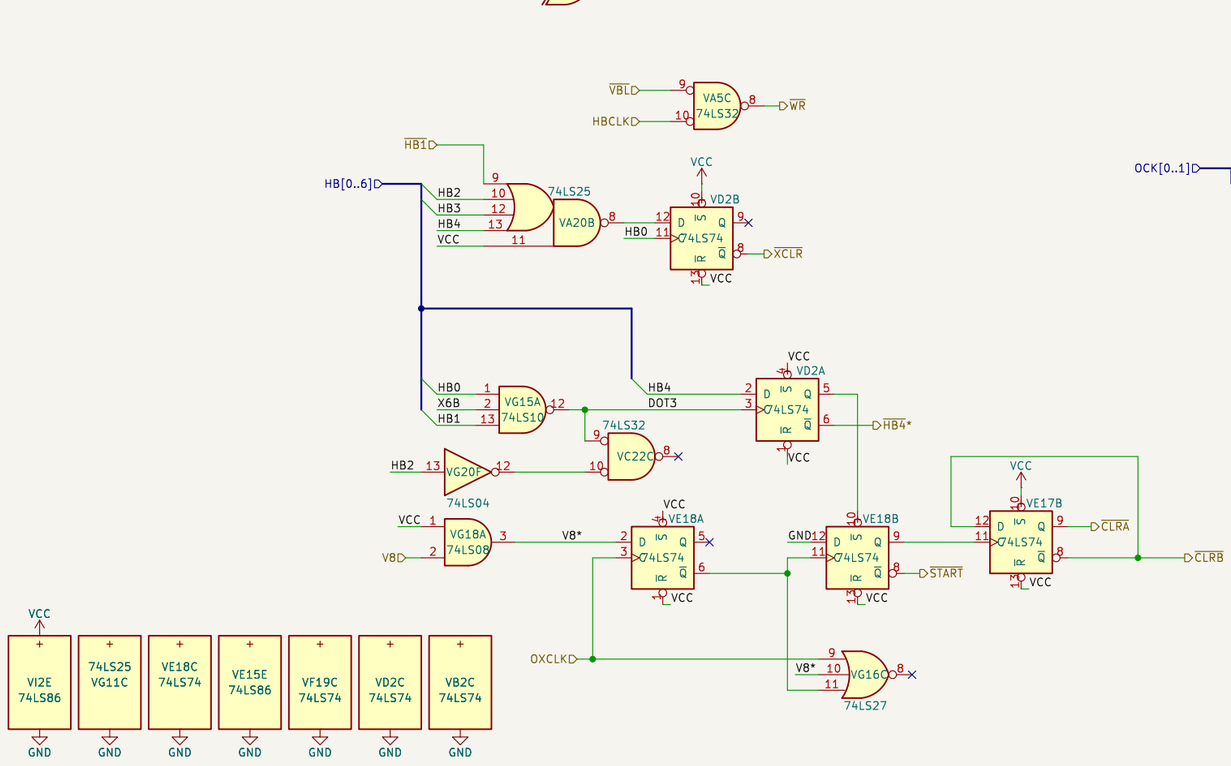
Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 19/26

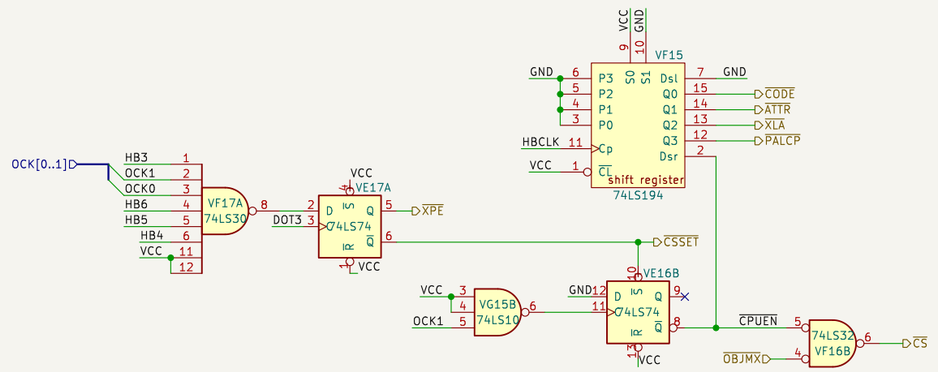

OHFLIP*
VA6B
74LS86
NIBBLE
HB1
AB[0..9]
OCK[0..1]
VC1
Quad Mux
74LS157
VC2
VD3
VA2
VA1
VB1
74LS161
counter
VE19A
74LS02
START
VE1
HM6116P-3
2kB RAM
MCM2018
VA5A
74LS32
WR
CS
VF2
buffers
74LS245
DB[0..7]
DD[0..7]
VF1
RDB
VF4
VF5
VF3
74LS273
flip flops
VG4
VG5
VG2
VG3
VG1
X[0..7]
XCLR
VA6C
VE13D
XOVER
VF9
PAL[0..2]
ATTR
VE3
CODE[0..8]
CODE
Jose Tejada
https://www.patreon.com/jotego
JOTEGO
Sheet: /video board/object/object RAM/
File: objram.kicad_sch
Title: Object RAM
Size: A3
Date: 2024-11-15
Rev:
KiCad E.D.A. 8.0.9
Id: 20/26











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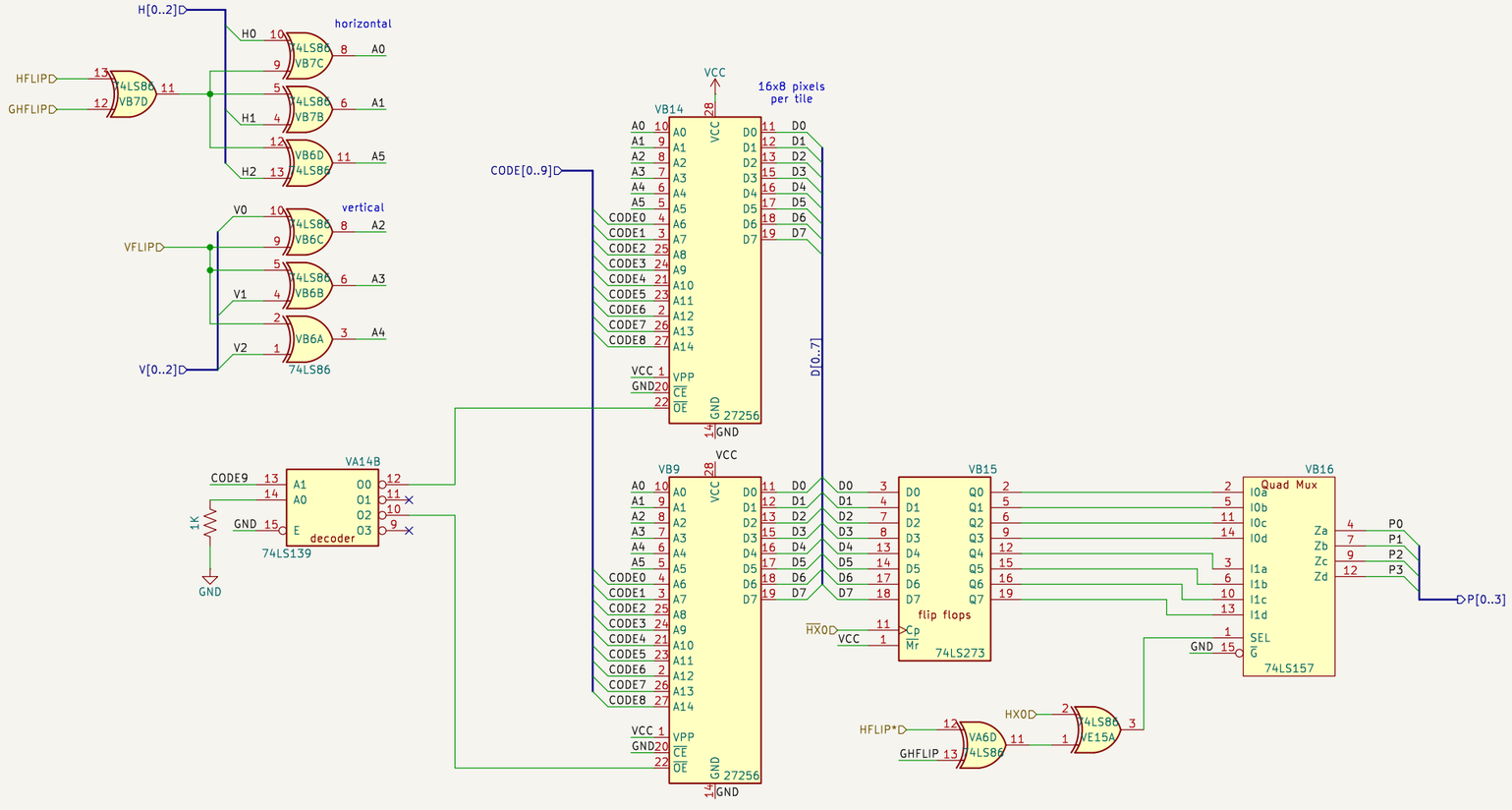
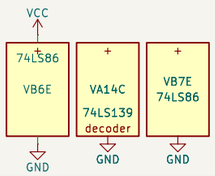
Sheet: /video board/object/object readout/
File: objread.kicad_sch

Title: Object readout sequencer

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 21/26





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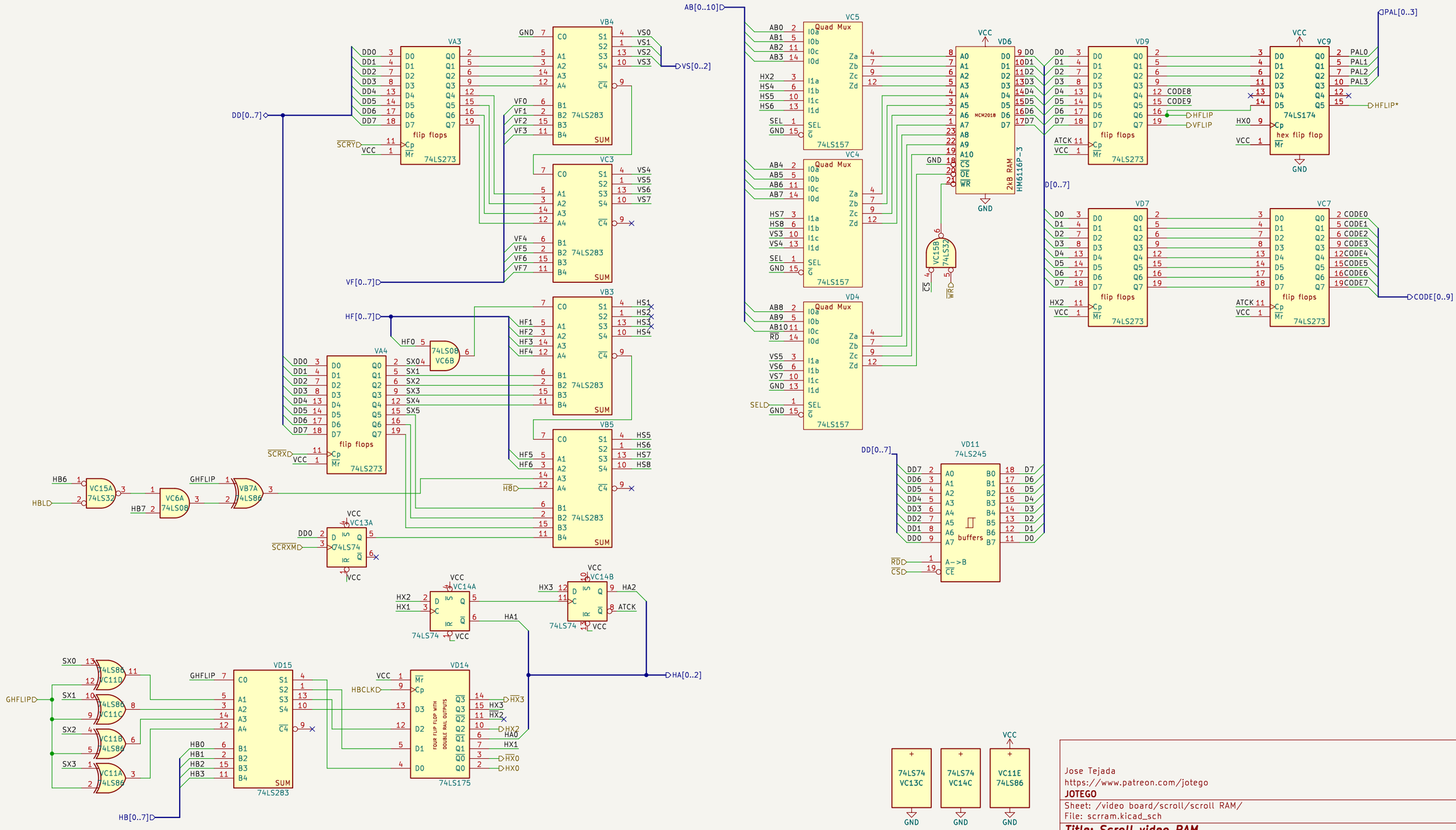
Sheet: /video board/scroll/scroll ROM/
File: scrrom.kicad_sch

Title: scroll ROM

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 22/26



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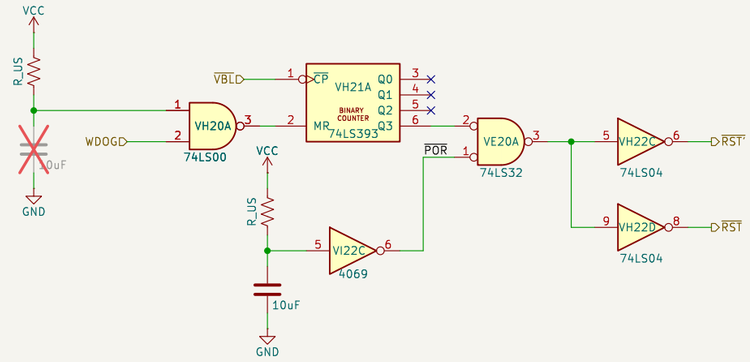
Sheet: /video board/scroll/scroll RAM/
File: scrram.kicad_sch

Title: Scroll video RAM

Size: A3	Date: 2024-11-15	Rev:
KiCad E.D.A. 8.0.9		Id: 23/26



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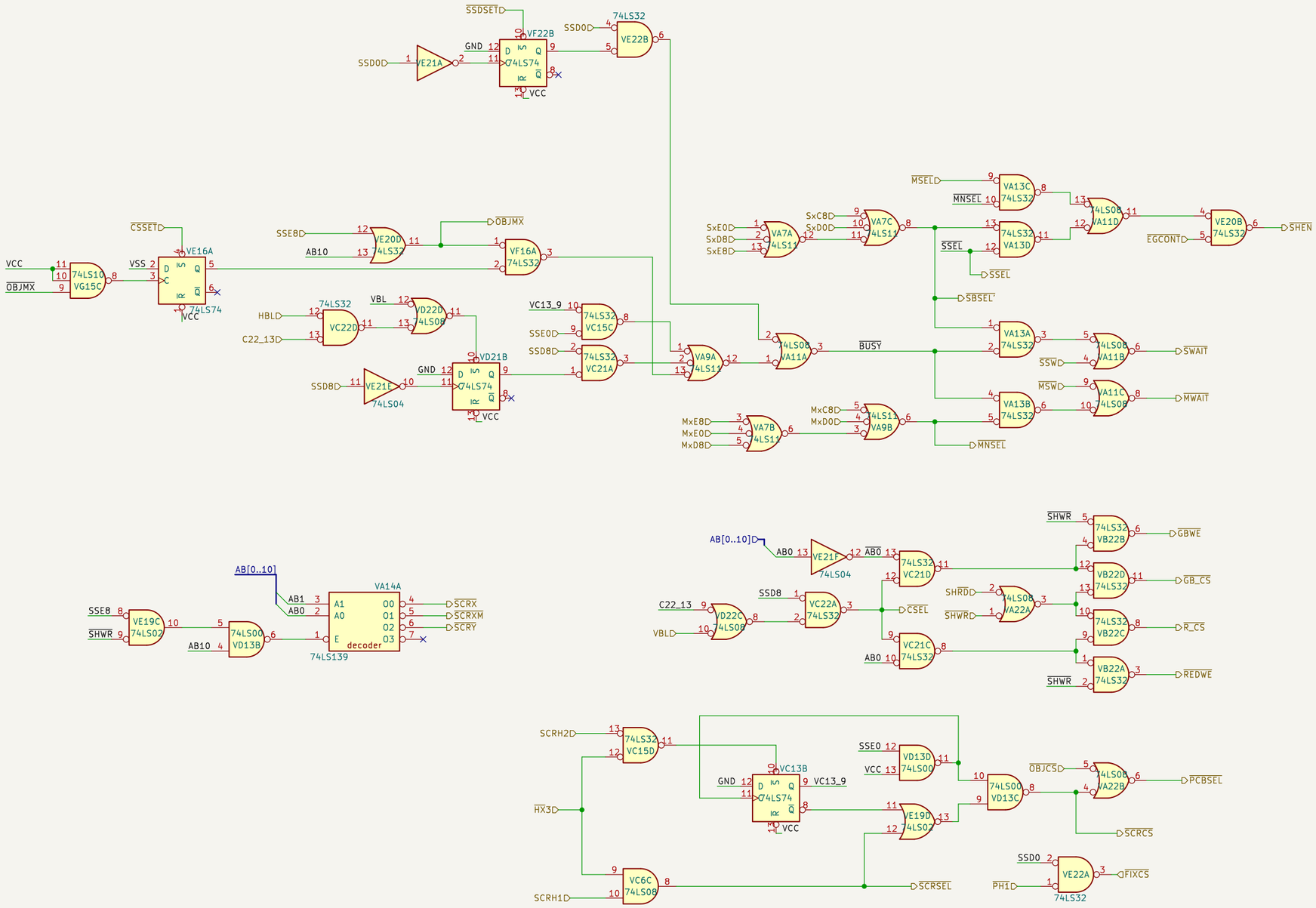
Sheet: /video board/watchdog/
File: watchdog.kicad_sch

Title: Watchdog Circuit

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 24/26



VCC VCC VCC

VA7D 74LS11	VA9D 74LS11	VA22E 74LS08	VC21E 74LS32	VB22E 74LS32	VC6E 74LS08	VC15E 74LS32	VE19E 74LS02	VD13E 74LS00	VA13E 74LS32	VA11E 74LS08

GND GND GND GND GND GND GND GND GND GND GND

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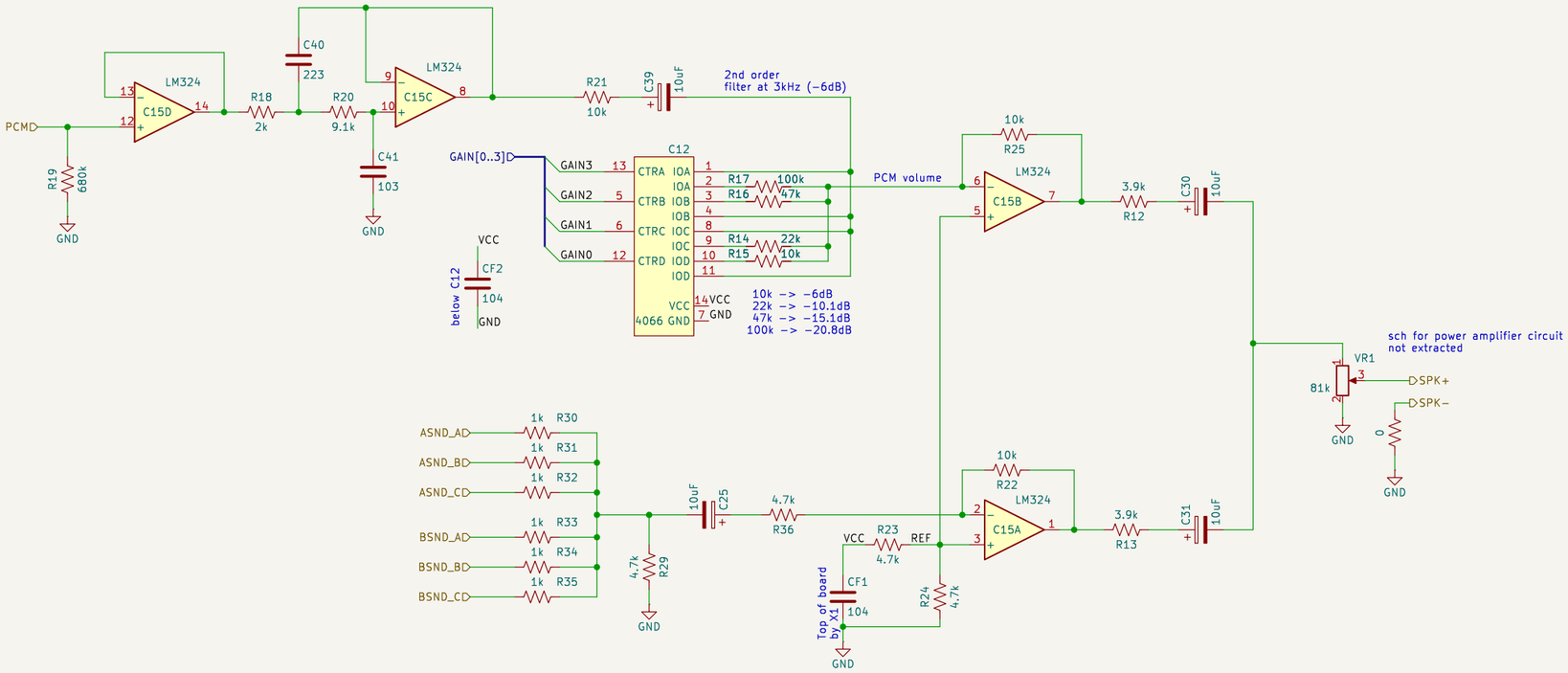
Sheet: /video board/address decoder/
File: decoder.kicad_sch

Title: Address decoder

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 25/26



Passive component references
when shown, came from original PCB.
The bootleg did not have
references for passives.

Device components follow bootleg references.
The bootleg counts letters from left to right and numbers from bottom to top
The original counts numbers left to right and letters bottom to top.

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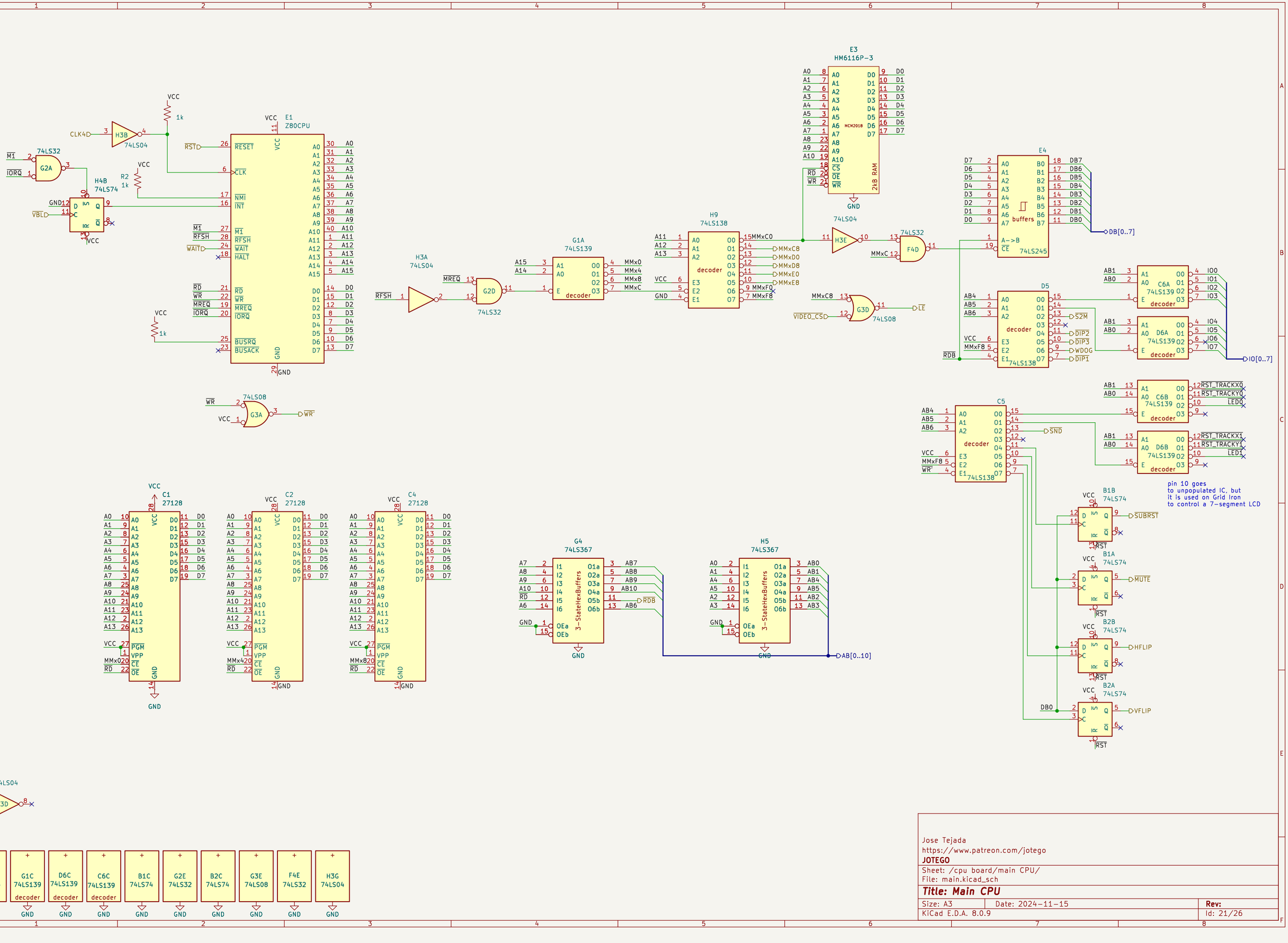
Sheet: /cpu board/sound/analog/
File: analog.kicad_sch

Title: Sound amplifiers

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 26/26



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Sheet: /cpu board/main CPU/
File: main.kicad_sch

Title: Main CPU

Size: A3	Date: 2024-11-15	Rev:
KiCad E.D.A. 8.0.9		Id: 21/26

H16B
74LS139
H17A
74LS04
74LS32
G17A
MREQ
RFSH
A15
A14
MMx0
MMx4
MMx8
MMxC
decoder
H16A
74LS139
E17B
74LS32
AB1
AB0
MMx8
WRB
PCMSET
PCMCTL
GAINSET
NMICLR
F12
YM2149
F15
YM2149
ASND_A
ASND_B
ASND_C
BSND_A
BSND_B
BSND_C
CNT0
CNT1
CNT2
CNT3
CNT4
CNT5
CNT6
CNT7
CNT8
CNT9
CNT10
CNT11
CNT12
CNT13
CNT[0..13]
SMP0
SMP1
SMP2
SMP3
SMP4
SMP5
SMP6
SMP7
SMP8
SMP9
SMP10
SMP11
SMP12
SMP13
SMP14
SMP15
SMP[0..15]
Taps to
unpopulated
sockets
E2C
74LS08
G6B
74LS74
G17C
74LS32
I16A
74LS74
SIRQ
M1
IORQ
GND
VCC
G13
Z80CPU
MUTE
CPUCLK
NMI
INT
WAIT
HALT
RD
WR
MREQ
IORQ
BUSRQ
BUSACK
RESET
CLK
I13
27128
PGM
VPP
CE
OE
I14
HM6116P-3
MCM2018
2kB RAM
D[0..7]
I16B
74LS74
PSGCLK
H17C
74LS04
CLKD
H17D
CPUCLK
MD[0..7]
E11
E12
3-state
flip flops
74LS374
F17
74LS367
3-StateHexBuffers
F4A
74LS32
G17D
S2M
F11
74LS245
buffers
A->B
D12
74LS174
hex flip flop
GAINSET
MUTE
GAIN[0..3]
E10D
74LS08
PCM
PCMSND
CTL
SET
DBO
MUTE
SMP[0..15]
CNT[0..13]
A[1..14]
analog
SPK+
SPK-
GAIN[0..3]
File: analog.kicad_sch
H17F
74LS04
E17D
74LS32
E17C
74LS32
F16B
F16D
F16A
G16B
G16D
G16A
ABDIR
ABC2
ABC1
BBDIR
BBC2
BBC1
IOAB1
IOAB0
BDIR BC2 BC1
0 X 0 inactive
1 0 0 latch address
1 1 0 data write
0 0 1 latch address
0 1 1 data read
H17G
74LS04
H16C
74LS139
decoder
E10E
74LS08
I16C
74LS74
F16E
74LS02
E2E
74LS08
G16E
74LS02
G6C
74LS74
G6A
74LS74
G16C
74LS02
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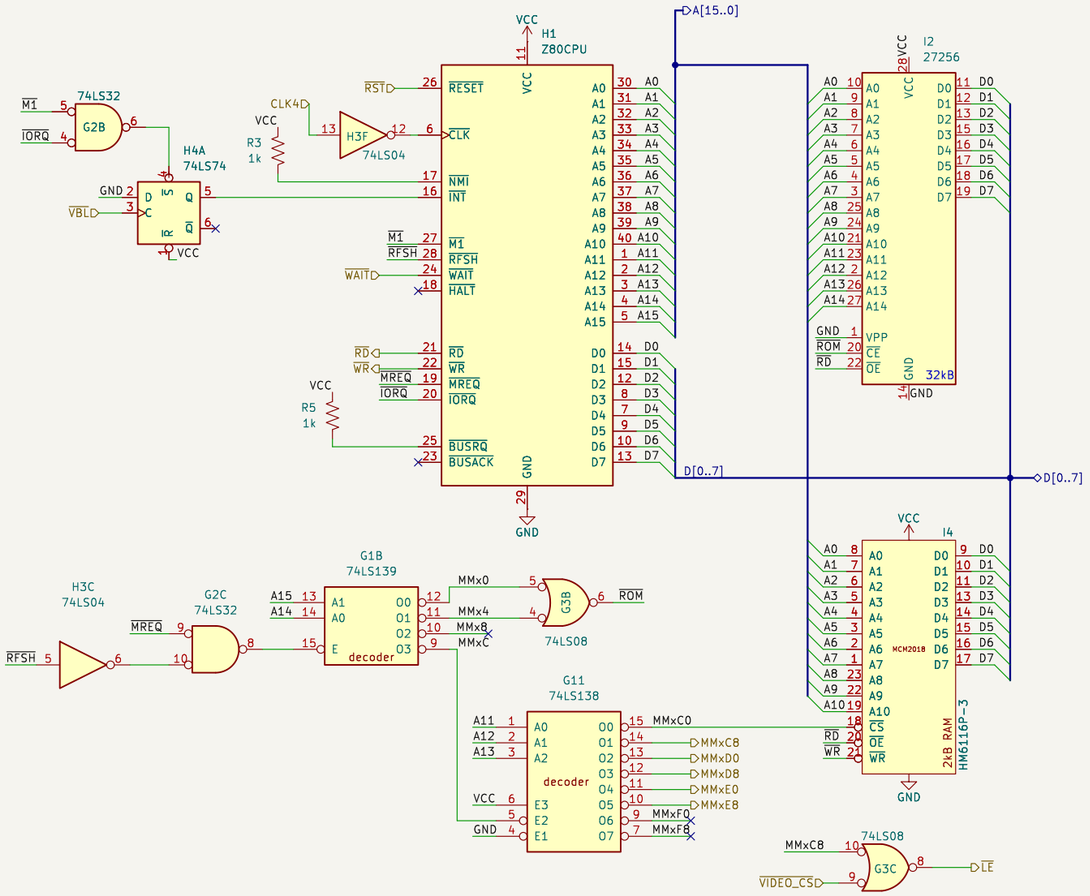
Sheet: /cpu board/sound/
File: sound.kicad_sch
Title: Sound
Size: A3
Date: 2024-11-15
Rev:
KiCad E.D.A. 8.0.9
Id: 22/26



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Sheet: /cpu board/sub CPU/
File: subcpu.kicad_sch

Title: Subordinate CPU

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 23/26

F5
SW_DIP_x08
E6
74LS244
GND
E5
SW_DIP_x08
F6
74LS244
GND
B3
3-StateHexBuffers
74LS367
GND
A2
SW_DIP_x04
DIP2
DIP3
DIP1
DB7
DB5
DB3
DB1
DB0
DB2
DB4
DB6
DB[0..7]
VCC
RN17
R_Network04
COIN[1..2]
COIN1
COIN2
START1
START2
START[1..2]
100
C
B12
IO[0..7]
IO2
B11
IO3
B4
IO7
SHOT1
SHOT2
100RD2
100RD1
SHOT[1..2]
RN13
RN19
Pull-up pin order
may not match the PCB
RPU15
RPU14
RPU13
RPU12
RPU11
RPU10
RPU9
RPU8
RPU23
RPU22
RPU21
RPU20
RPU19
RPU18
RPU17
RPU16
220
IO side of the board
contains unpopulated
footprints. The schematics
do not reflect the
full PCB on this side.
RN18
R_Network08_US
PU0
PU1
PU2
PU3
PU4
PU5
PU6
PU7
DOWN[1..2]
UP[1..2]
RIGHT[1..2]
LEFT[1..2]
maybe through
some pullup?
LEFT1
RIGHT1
UP1
DOWN1
LEFT2
RIGHT2
UP2
DOWN2
ROD1
ROC1
ROF1
ROE1
ROB1
ROA1
ROH1
ROG1
B5E
B5D
B7B
B7C
74LS04
C10
C9
C8
C7
Quad Mux
74LS157
D10
D9
D8
D7
IO0
IO1
IO4
IO5
B5G
B7G
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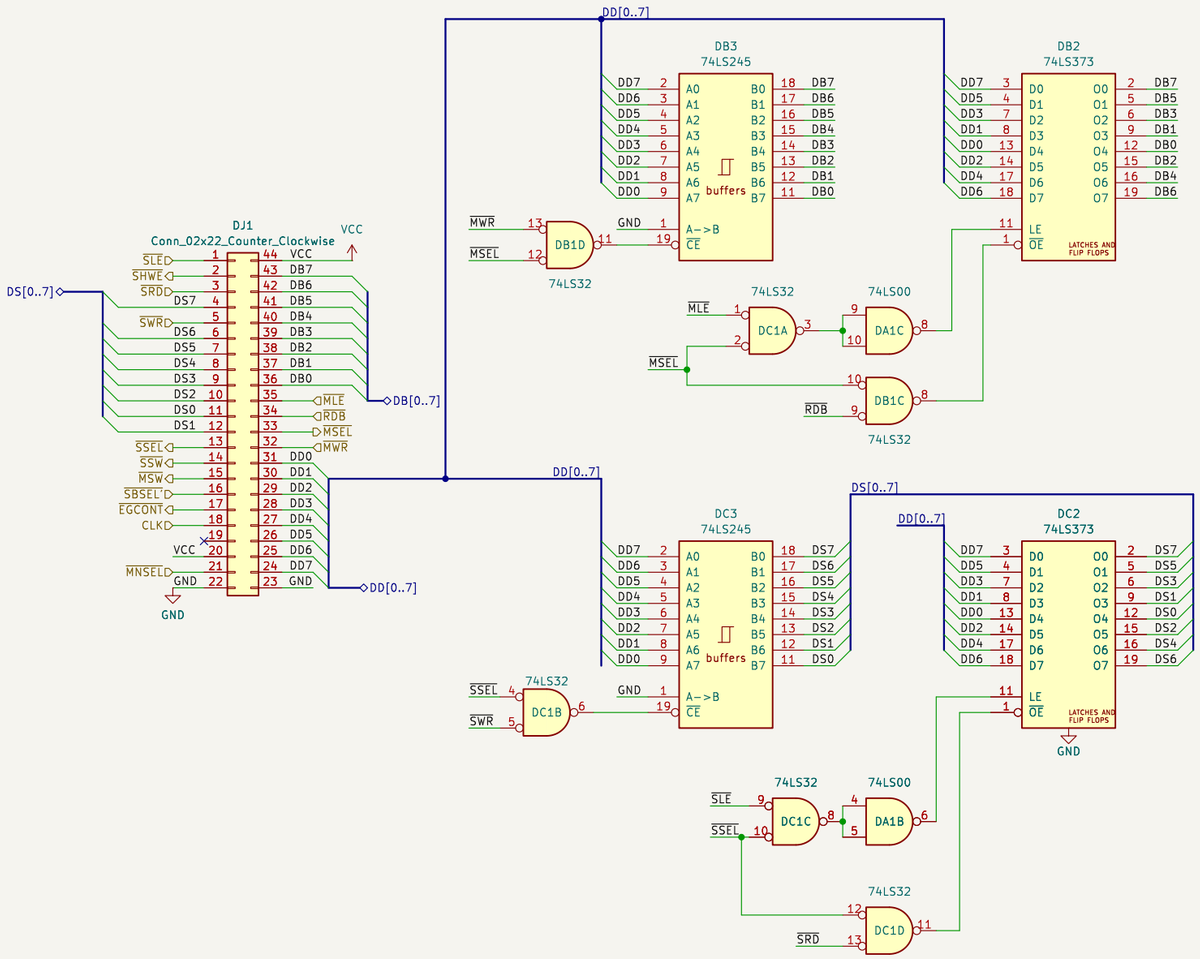
Sheet: /cpu board/IO/
File: io.kicad_sch
Title: Cabinet Input/Output
Size: A3
Date: 2024-11-15
Rev:
KiCad E.D.A. 8.0.9
Id: 24/26



This circuit takes three small boards on the original PCB.
These boards were manufactured by Mitsubishi and contain the circuits seen on the bootleg
– MA7053 x2, 28 pin each
– MA7054 x1, 15 pins
The layout around the daughter board on the bootleg differs slightly from the original in order to adjust the pinout to a single 44–pin board.

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Sheet: /cpu board/daughter/
File: daughter.kicad_sch

Title: Small daughter board

Size: A3	Date: 2024–11–15	**Rev:**
KiCad E.D.A. 8.0.9		Id: 25/26

Resistor networks reference:
RN1 = E9 top
RN2 = below RN1
...
RN11 = above RN12
RN12 = E7 bottom

R from pin 1 to 2 = 2.2kOhm

SYMBOL DOES
NOT MATCH
INTERNAL NETWORK

G and R
are likely
swapped

MSB to common pin 222 Ohm
Each bit up gets 2x (verified)

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Sheet: /cpu board/palette/
File: palette.kicad_sch

Title: Color Palette

Size: A3	Date: 2024-11-15	**Rev:**
KiCad E.D.A. 8.0.9		Id: #/26