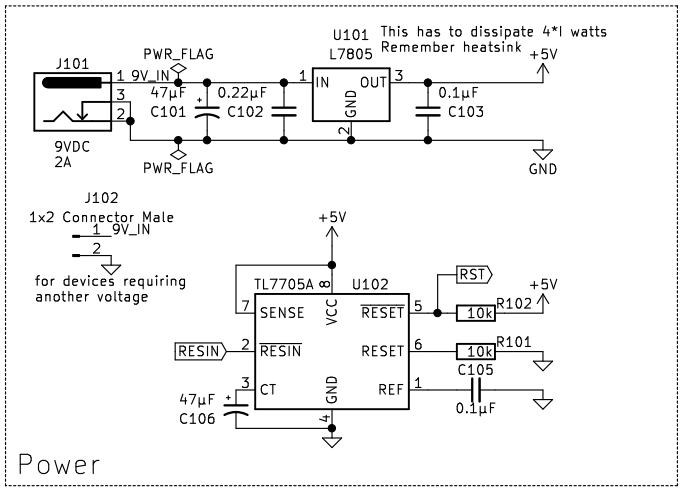
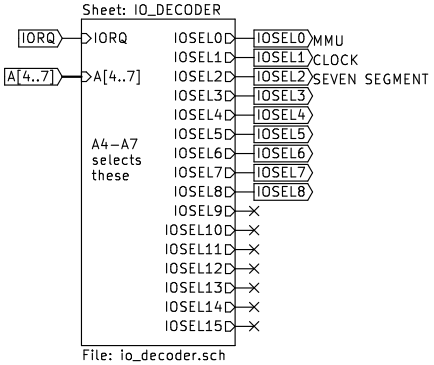
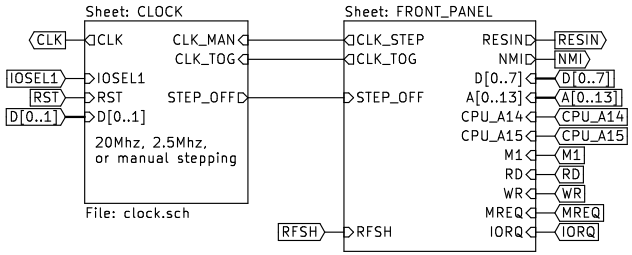
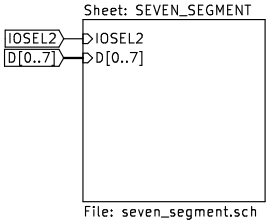
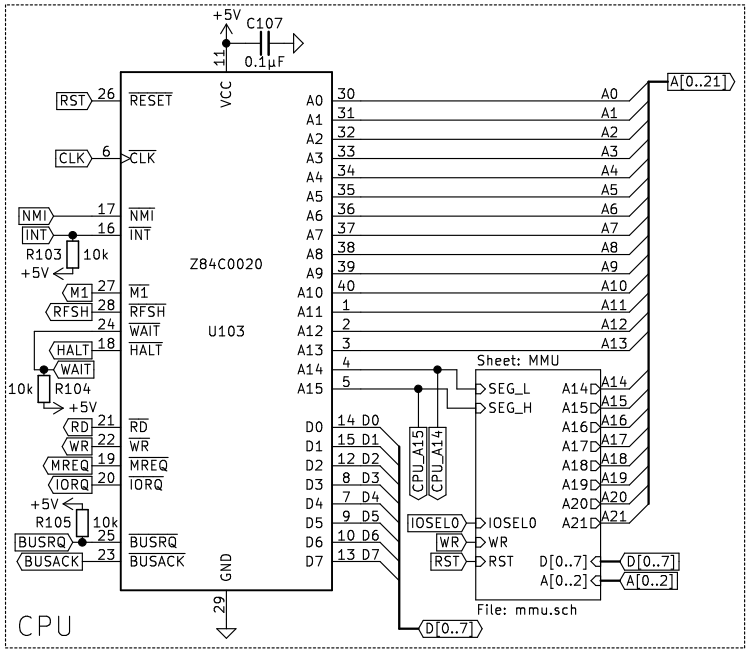
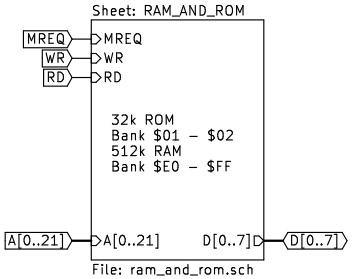


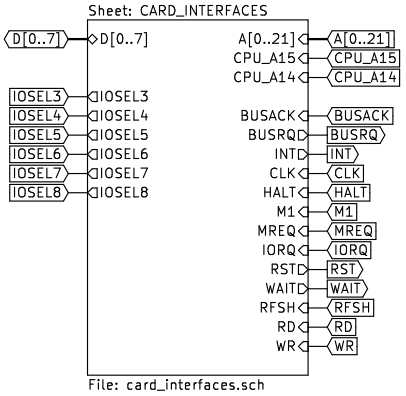












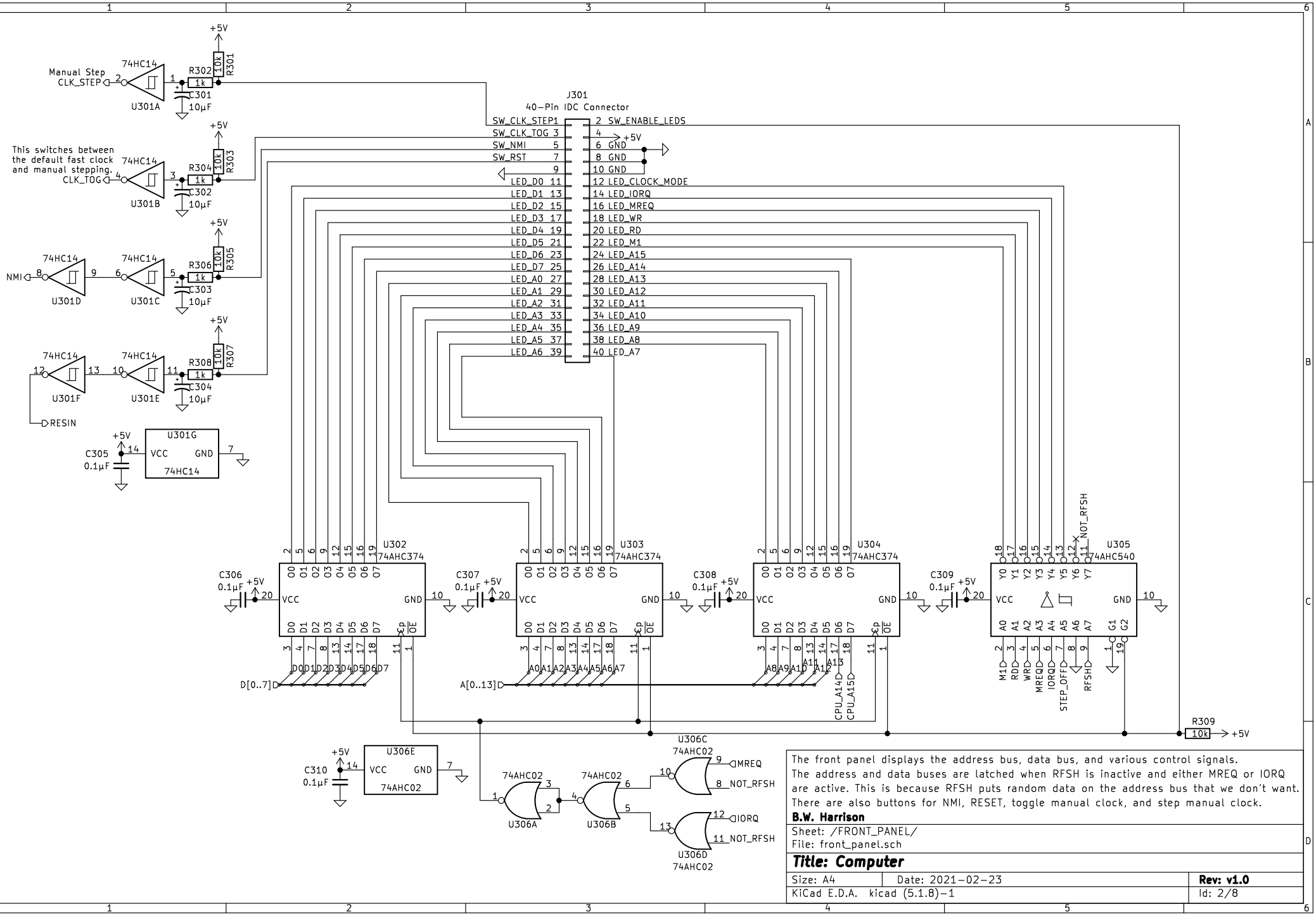
8-Bit Z80 computer motherboard
4 MB of pageable address space and 6 expansion slots
32 KB ROM and 512 KB RAM included
The 40-pin IDC connector hooks up to the front panel switches and LEDs

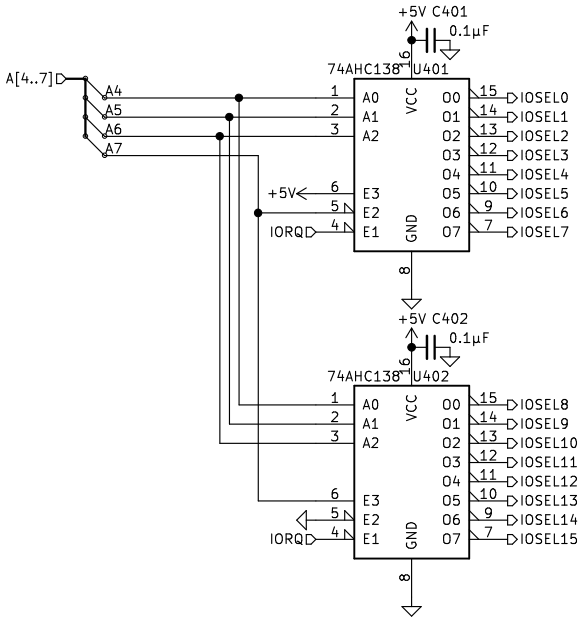
Bailey Harrison

Sheet: /
File: computer.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 1/8


Manual Step
CLK_STEP
This switches between the default fast clock and manual stepping.
CLK_TOG
NMI
RESIN
74HC14
U301A
U301B
U301C
U301D
U301E
U301F
U301G
R301
R302
R303
R304
R305
R306
R307
R308
10k
1k
C301
C302
C303
C304
C305
10µF
0.1µF
+5V
J301
40-Pin IDC Connector
SW_CLK_STEP1
SW_CLK_TOG 3
SW_NMI 5
SW_RST 7
2 SW_ENABLE_LEDS
4 +5V
6 GND
8 GND
10 GND
LED_D0 11
LED_D1 13
LED_D2 15
LED_D3 17
LED_D4 19
LED_D5 21
LED_D6 23
LED_D7 25
LED_A0 27
LED_A1 29
LED_A2 31
LED_A3 33
LED_A4 35
LED_A5 37
LED_A6 39
12 LED_CLOCK_MODE
14 LED_IORQ
16 LED_MREQ
18 LED_WR
20 LED_RD
22 LED_M1
24 LED_A15
26 LED_A14
28 LED_A13
30 LED_A12
32 LED_A11
34 LED_A10
36 LED_A9
38 LED_A8
40 LED_A7
U302
U303
U304
U305
74AHC374
74AHC540
C306
C307
C308
C309
VCC
GND
D[0..7]
A[0..13]
CPU_A14
CPU_A15
NOT_RFSH
M1
RD
WR
MREQ
IORQ
STEP_OFF
RFSH
R309
U306A
U306B
U306C
U306D
U306E
74AHC02
MREQ
IORQ
NOT_RFSH
The front panel displays the address bus, data bus, and various control signals.
The address and data buses are latched when RFSH is inactive and either MREQ or IORQ are active. This is because RFSH puts random data on the address bus that we don't want.
There are also buttons for NMI, RESET, toggle manual clock, and step manual clock.
B.W. Harrison
Sheet: /FRONT_PANEL/
File: front_panel.sch
Title: Computer
Size: A4
Date: 2021-02-23
Rev: v1.0
KiCad E.D.A. kicad (5.1.8)-1
Id: 2/8



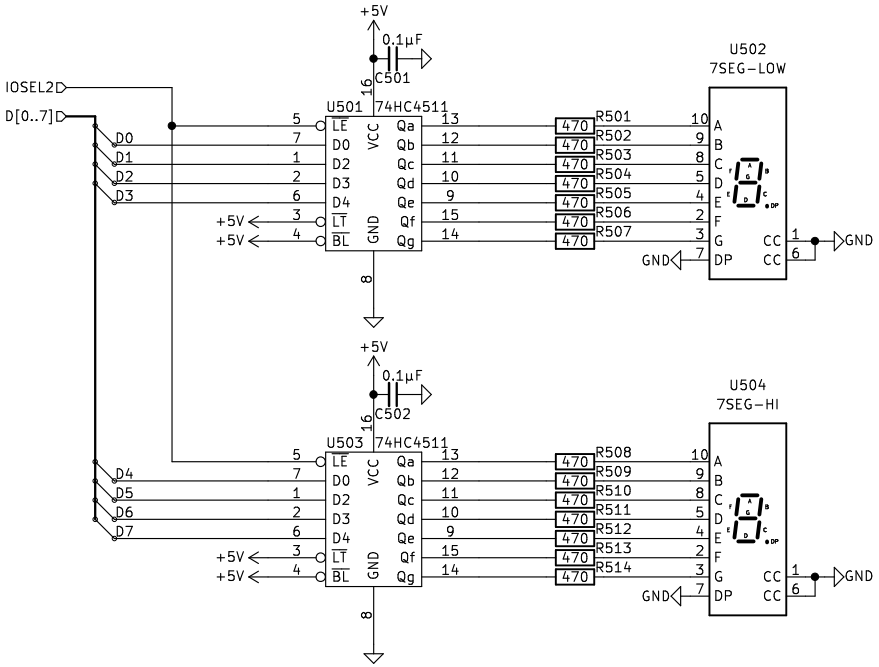
Decodes A4–A7 for IO device selection.
This leaves 4 bits free per device, so each device can have 16 ports.
Format: DDDDPPPP
D = device to select, P = port to select

B.W. Harrison

Sheet: /IO_DECODER/
File: io_decoder.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 3/8



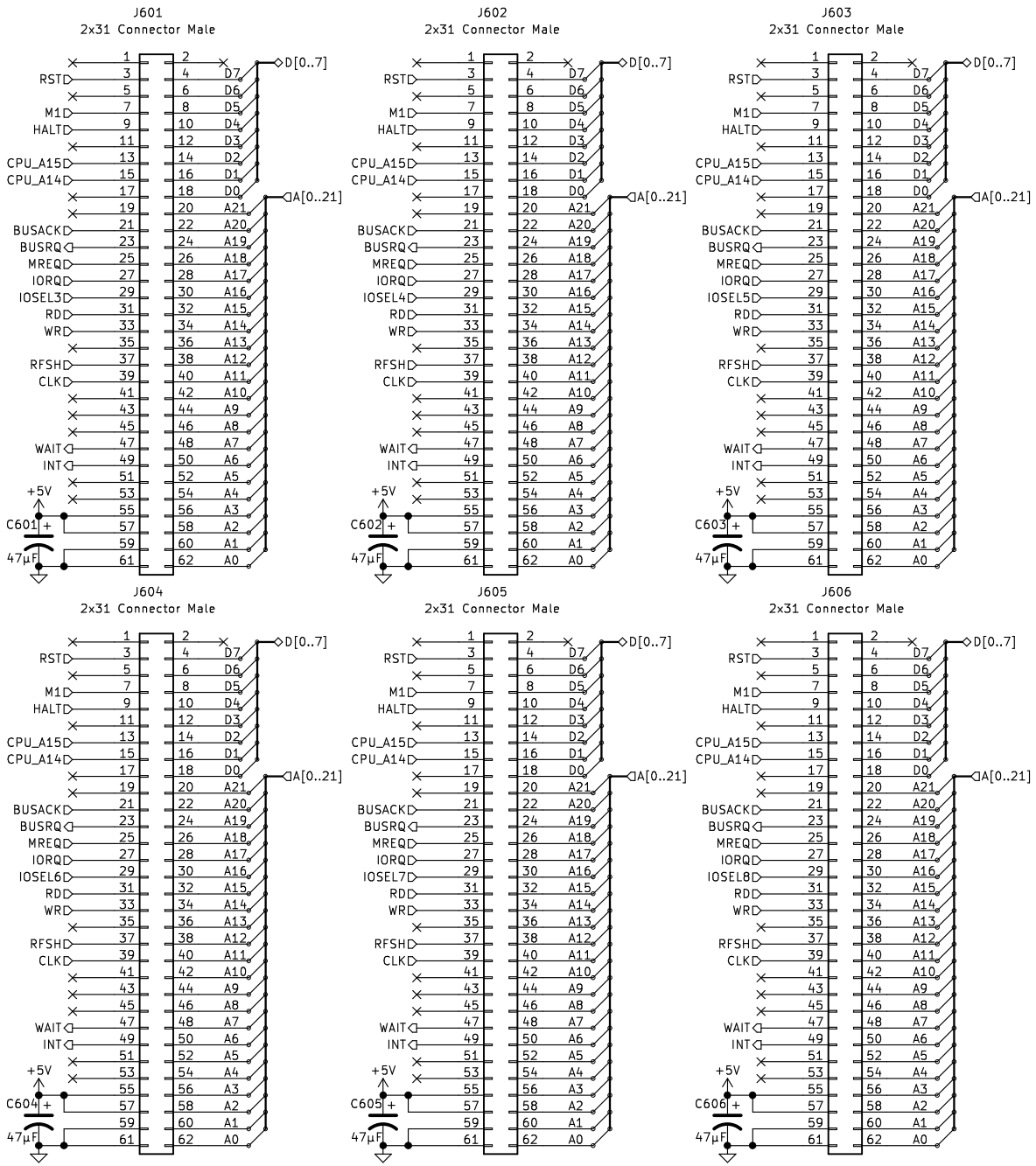
Two seven-segment displays with BCD inputs.
D[0..3] is the low-order digit, D[4..7] is the high-order digit.
To reduce the number of ICs, the WR line is not checked. Trying to read the IO port will result in unpredictable data being stored in the latches.

B.W. Harrison

Sheet: /SEVEN_SEGMENT/
File: seven_segment.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 4/8



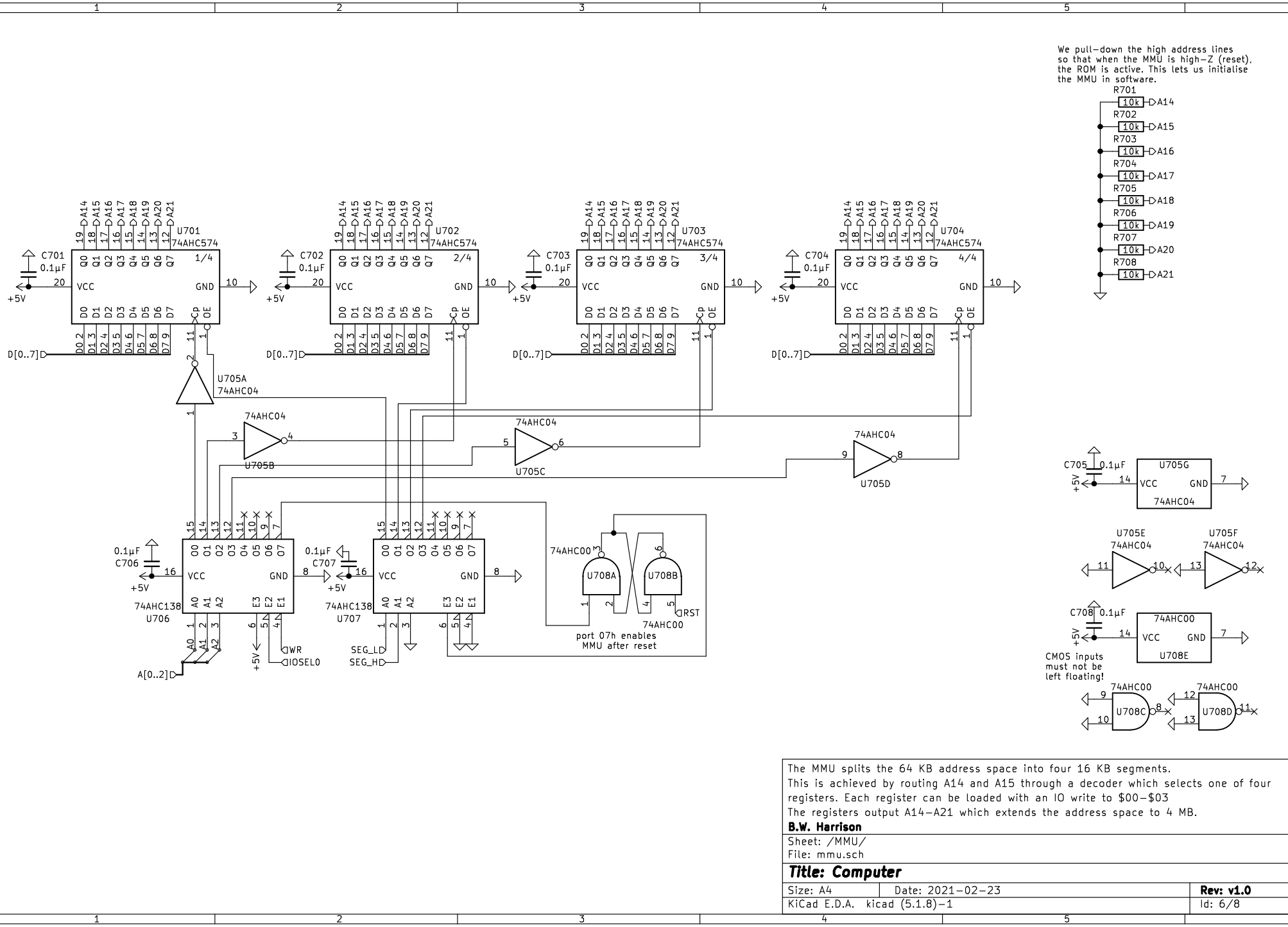
Six 62-pin connectors for expanding the functionality of the system.

B.W. Harrison

Sheet: /CARD_INTERFACES/
File: card_interfaces.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 5/8



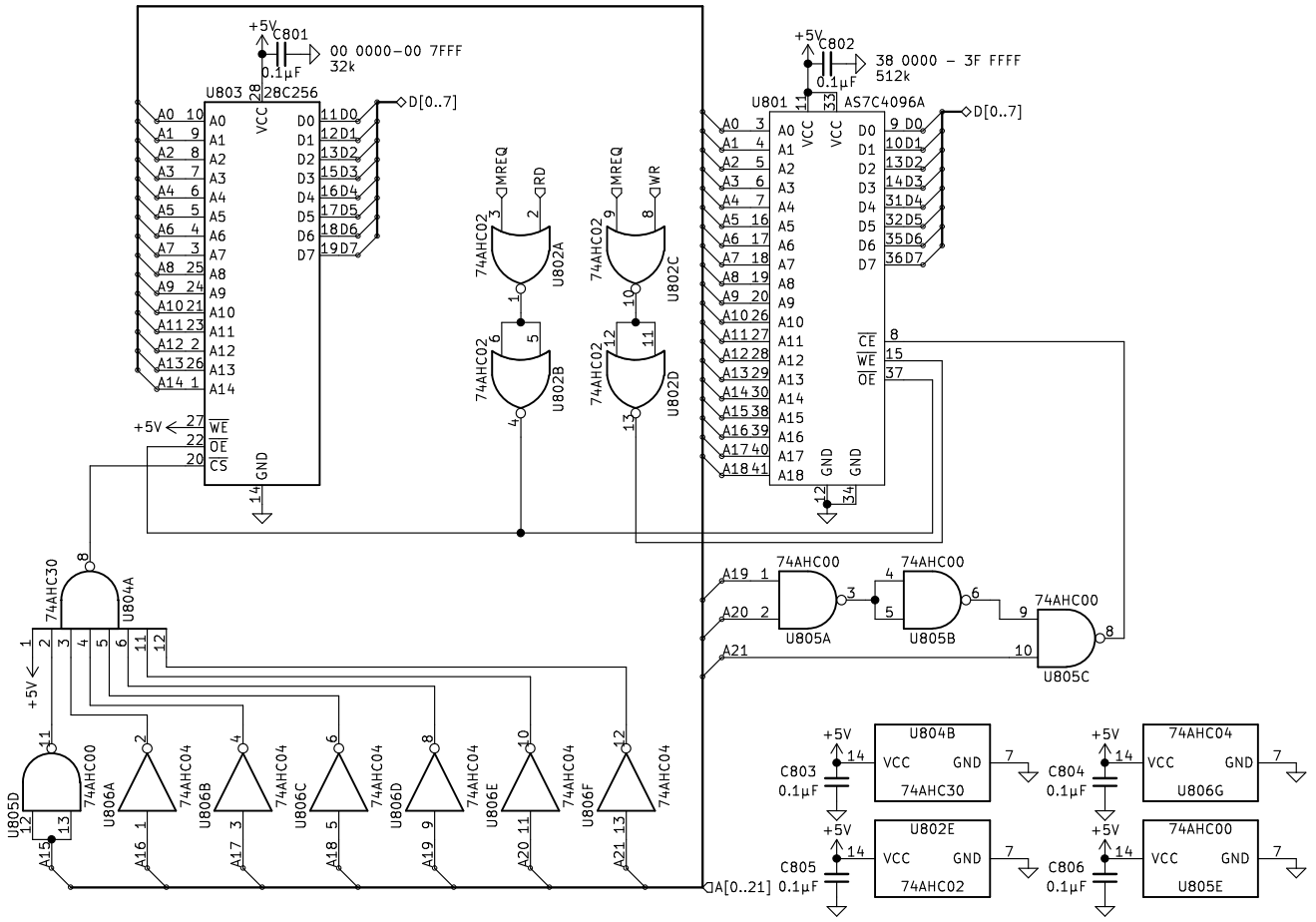
The MMU splits the 64 KB address space into four 16 KB segments.
This is achieved by routing A14 and A15 through a decoder which selects one of four registers. Each register can be loaded with an IO write to $00-$03
The registers output A14-A21 which extends the address space to 4 MB.

B.W. Harrison

Sheet: /MMU/
File: mmu.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 6/8



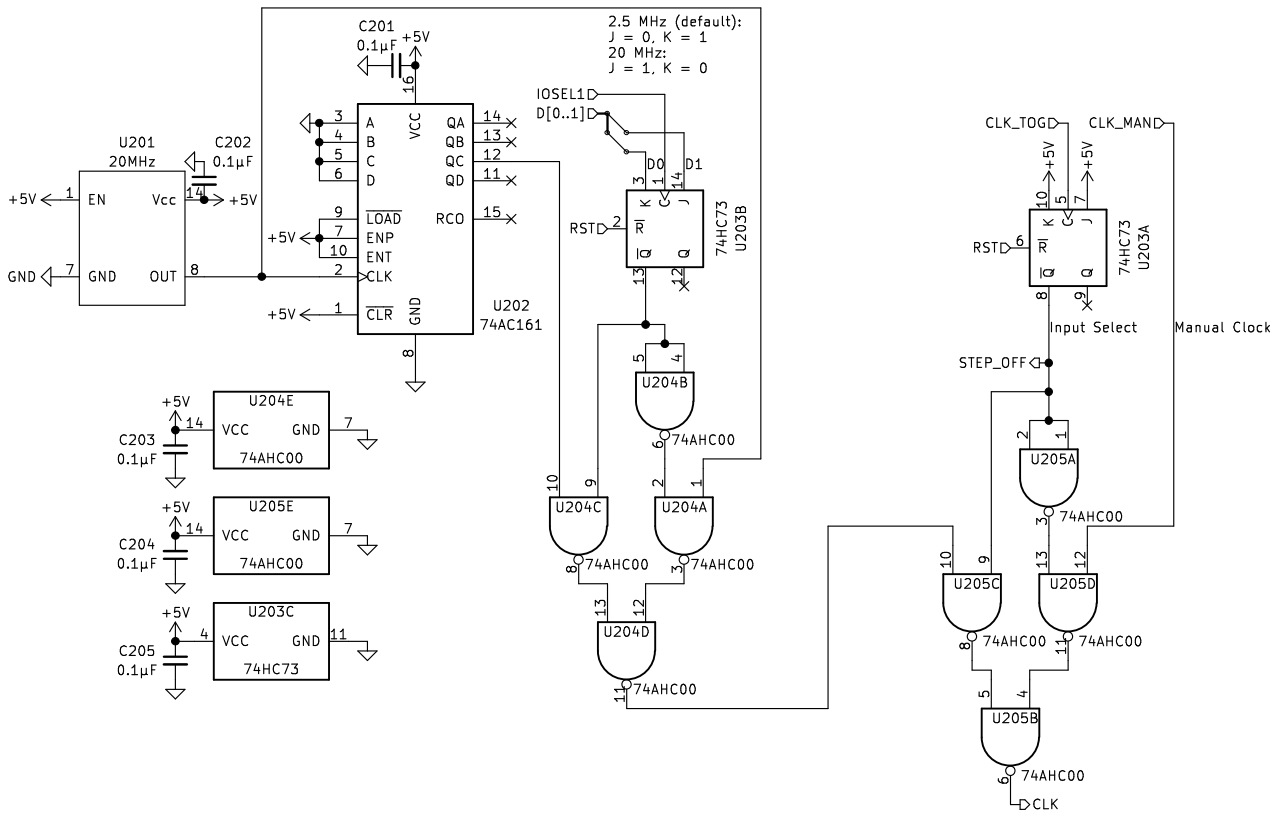
32 KB ROM pages $00–$01, 512 KB RAM pages $E0–$FF
Because of the ROM's slow access time (150ns), the clock speed is initially set to 2.5MHz.
The clock speed should only be changed to 20MHz when the ROM is no longer being accessed by the CPU.

B.W. Harrison

Sheet: /RAM_AND_ROM/
File: ram_and_rom.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 7/8



This circuit generates the appropriate system-wide clock signal depending on which mode is selected. There are 3 clock modes: 2.5MHz, 20MHz, and manual step.
2.5MHz is selected automatically on reset to allow the ROM to be read.
2.5MHz/20MHz can be toggled with an IO write. Manual step is toggled by the front panel.

B.W. Harrison

Sheet: /CLOCK/
File: clock.sch

Title: Computer

Size: A4	Date: 2021-02-23	**Rev: v1.0**
KiCad E.D.A. kicad (5.1.8)-1		Id: 8/8