

# 8080 Computer Upgrades

## Drive activity indicator

- Relocate safety ground on front panel

## I/O Expansion Bus on main board

- Address 0-7, Data 0-7, /IORD, and /IOWR

## I/O Expansion Card

- Additional Serial Port
- Parallel Printer Port
- CBIOS drivers for each

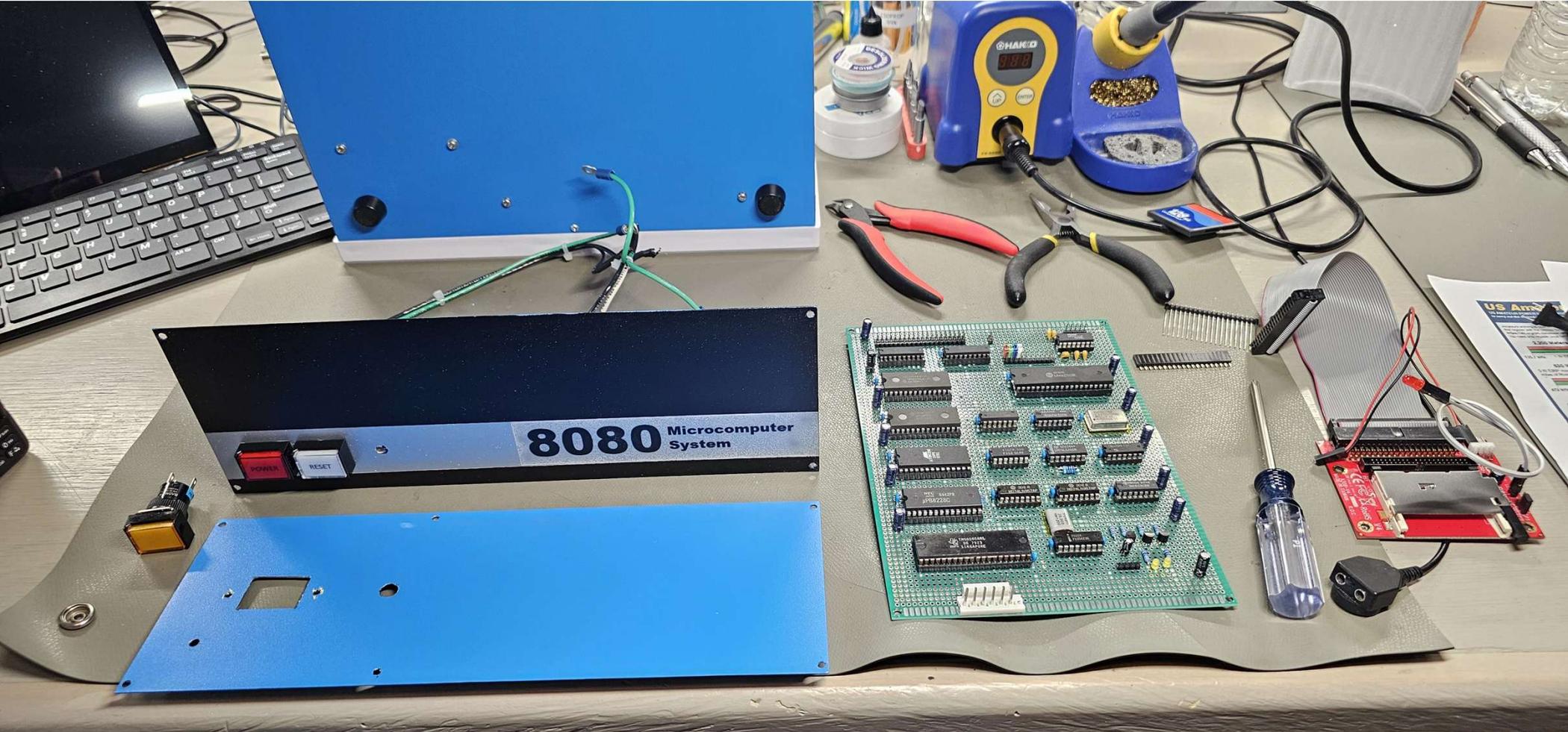
## DB-9/DB-25 connectors on back panel

- All RS-232 signals for DB-9, IBM Pinout for DB-25

## Switch for enabling/disabling shadow ROM feature

- Used during hardware testing for the I/O Expansion card

# Drive activity indicator



Drive activity indicator



Drive activity indicator

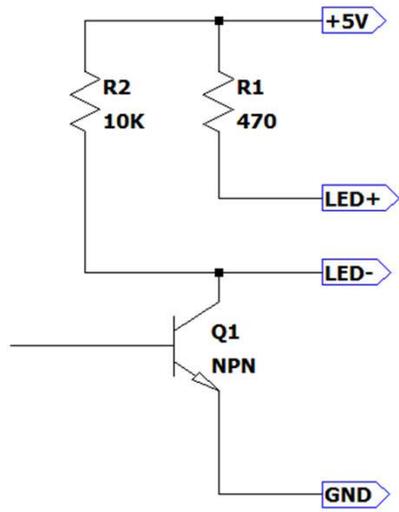


Drive activity indicator

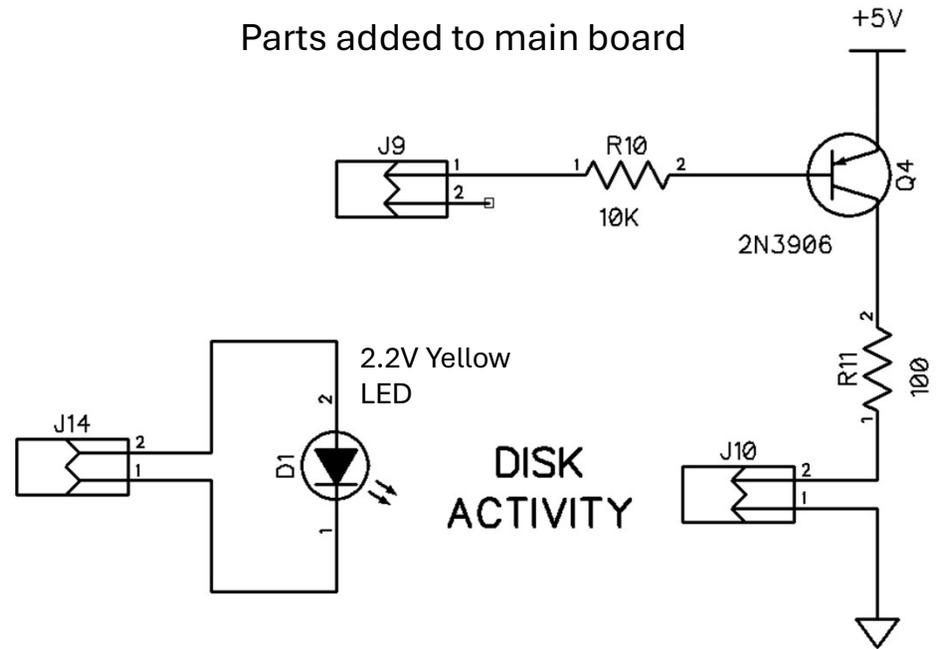


# Drive activity indicator

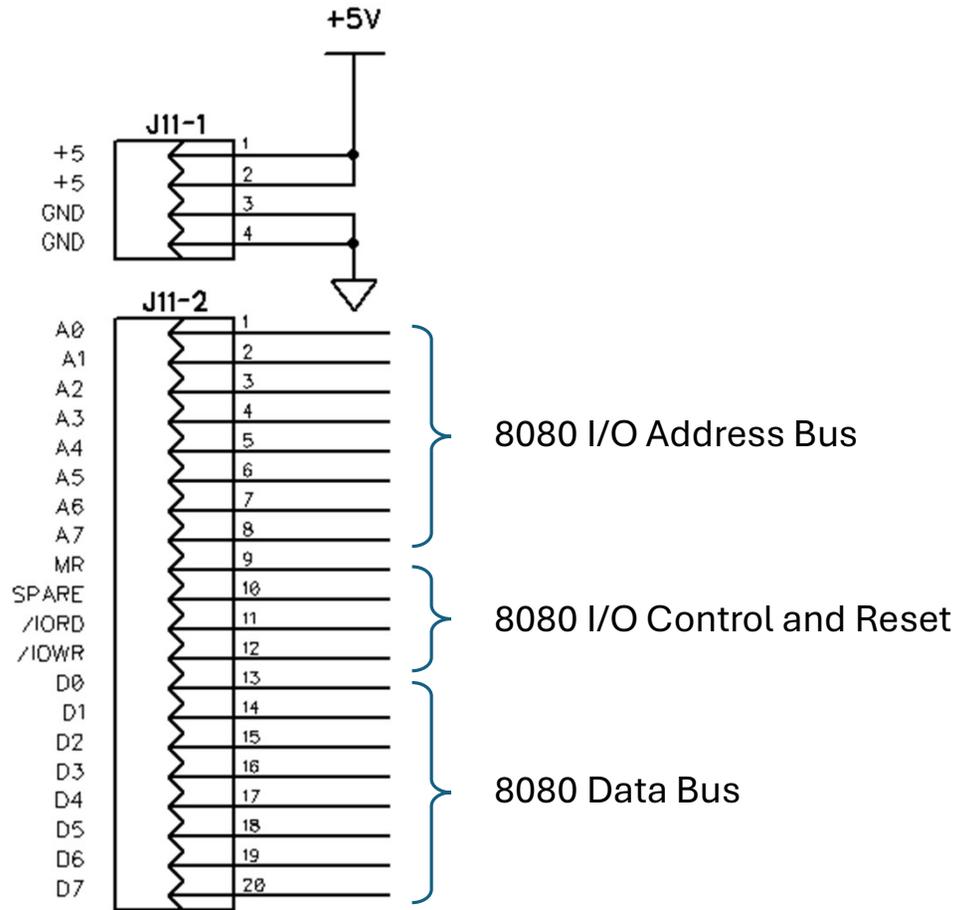
ATA Adapter LED circuit



Parts added to main board

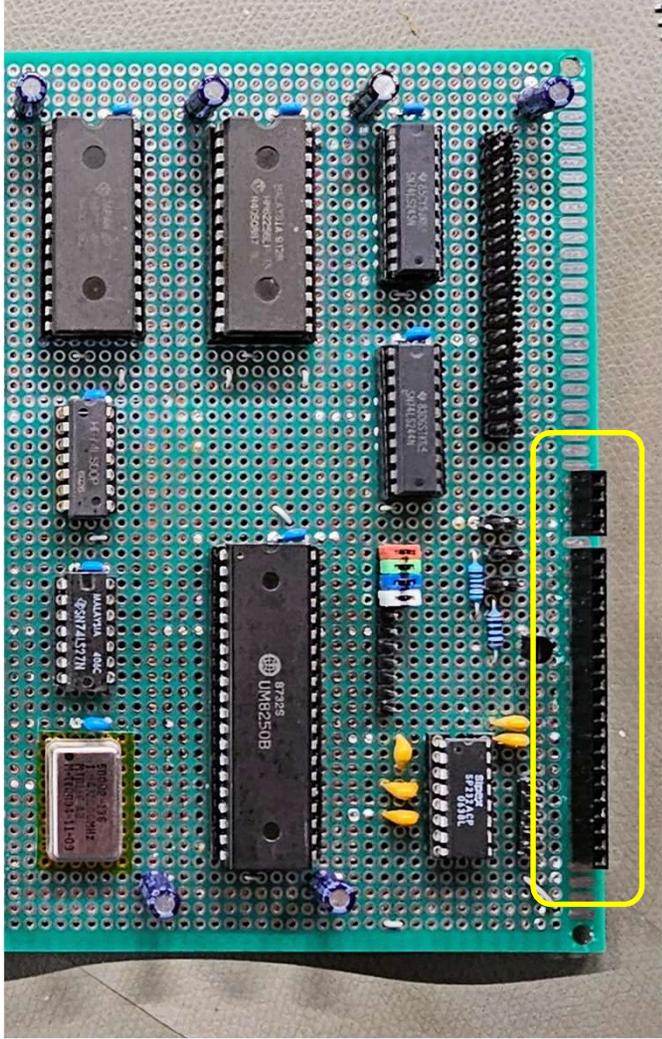


# I/O Expansion Bus



# I/O Expansion Bus

Main Board

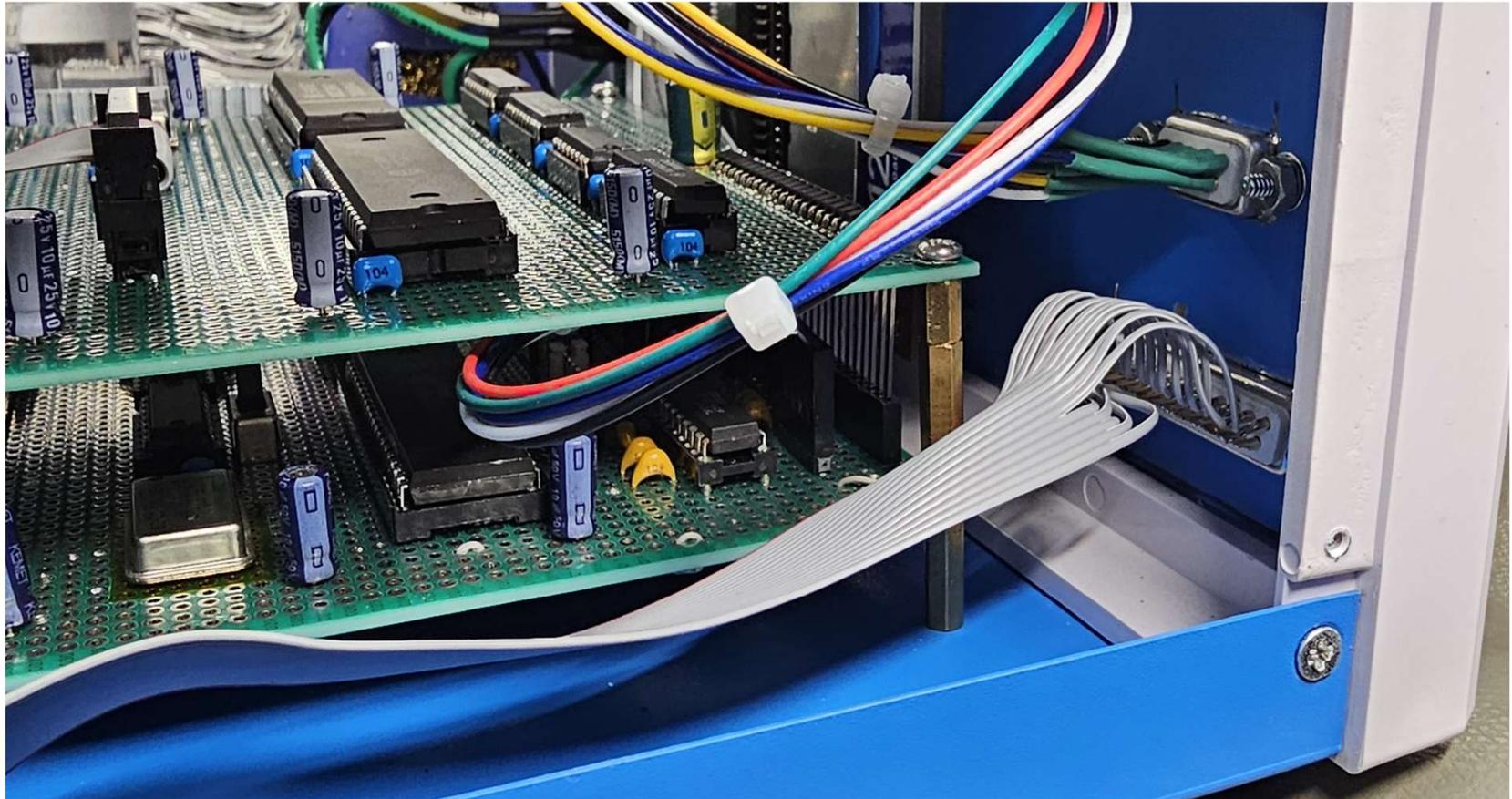


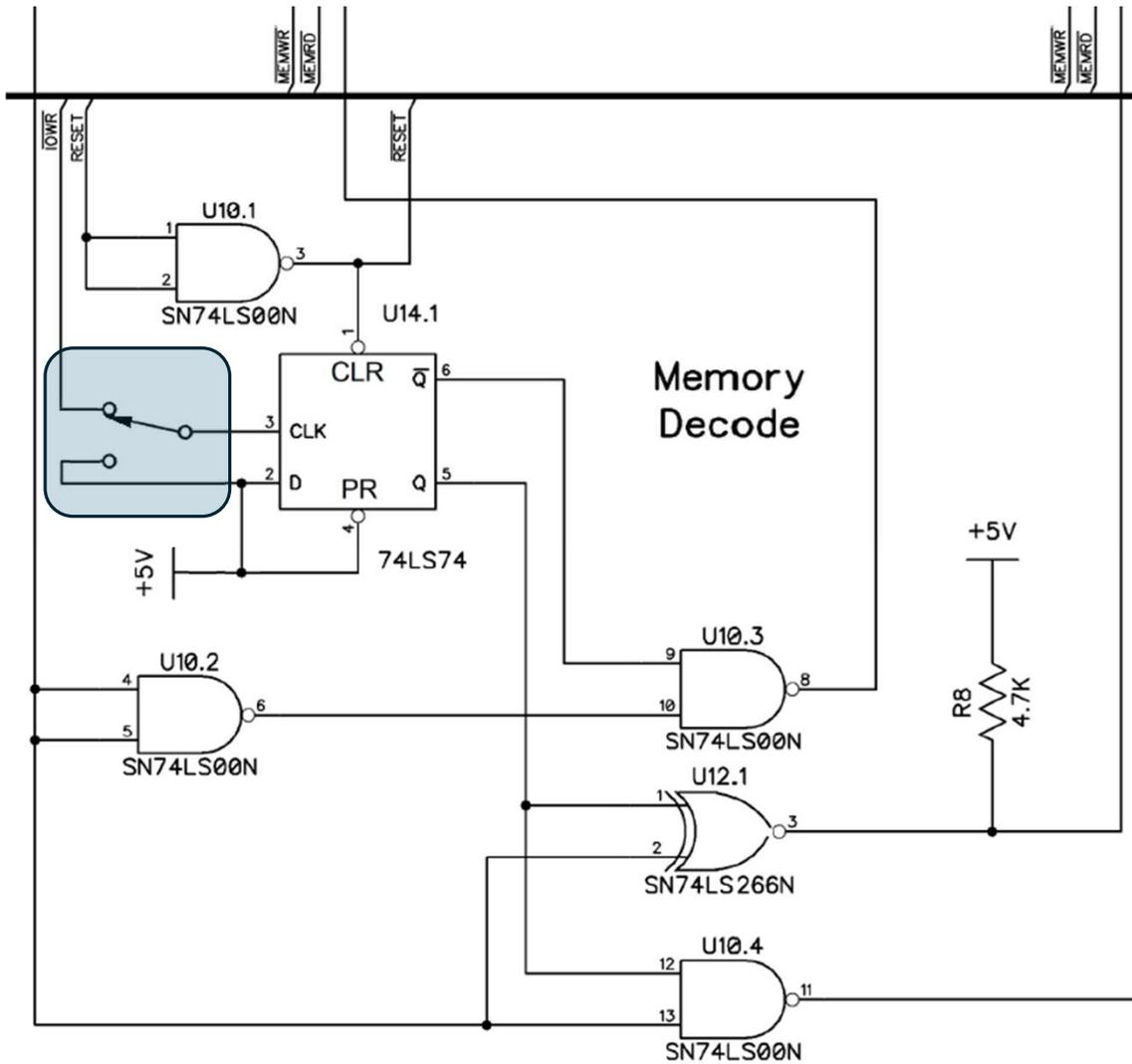
Female Header

1.25" Male Header

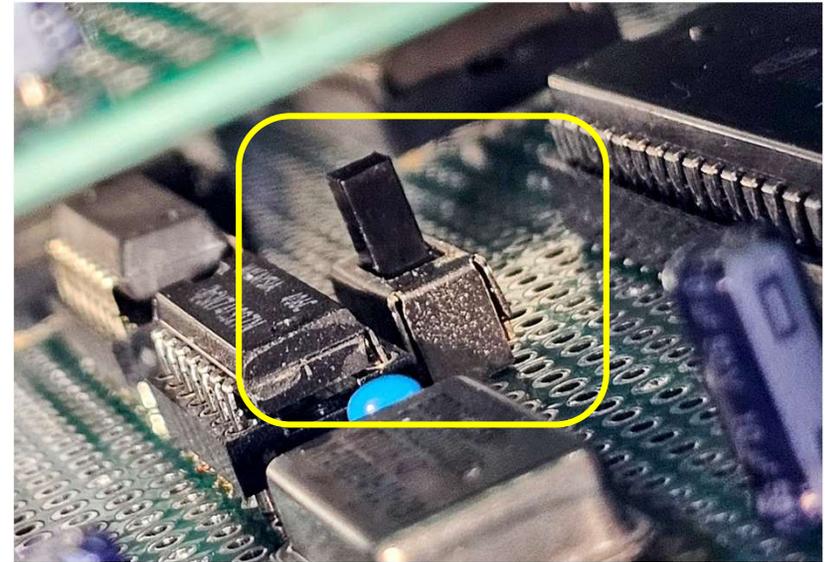


# I/O Expansion Card Clearance





## Shadow ROM switch

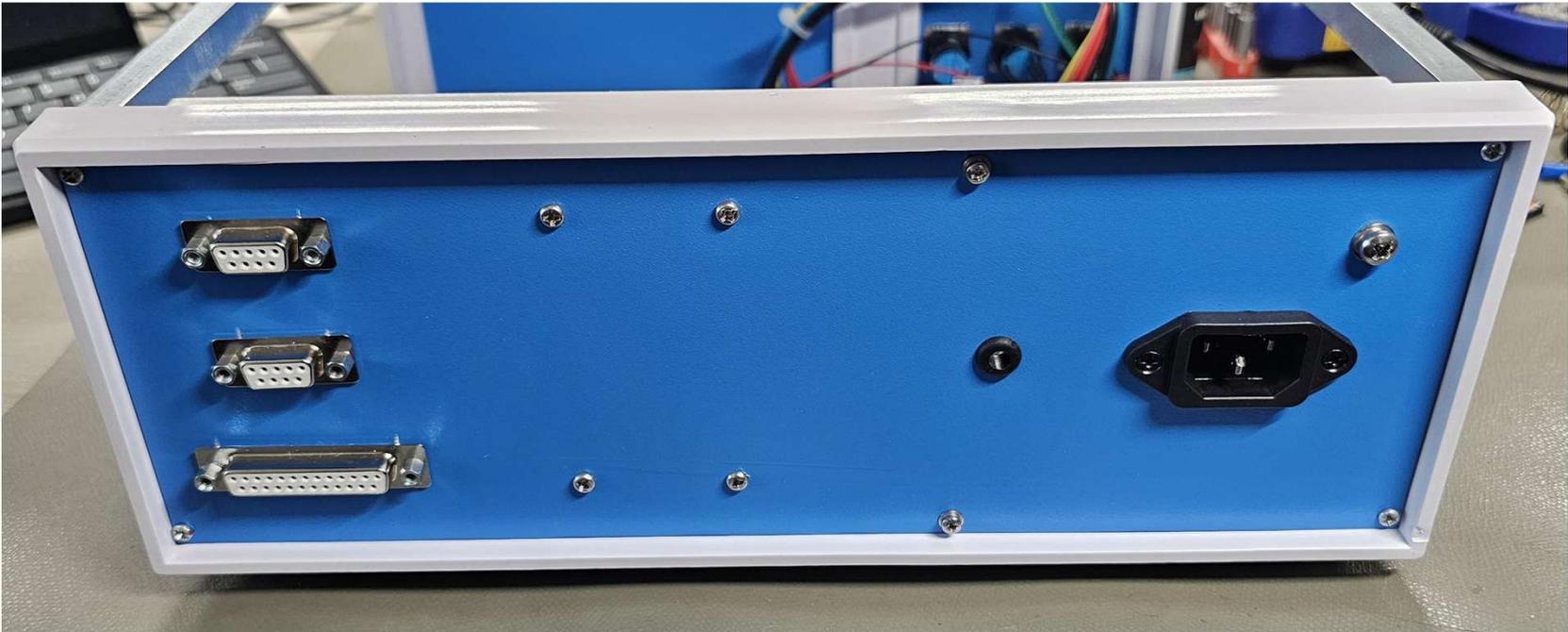


Added SPDT slide switch

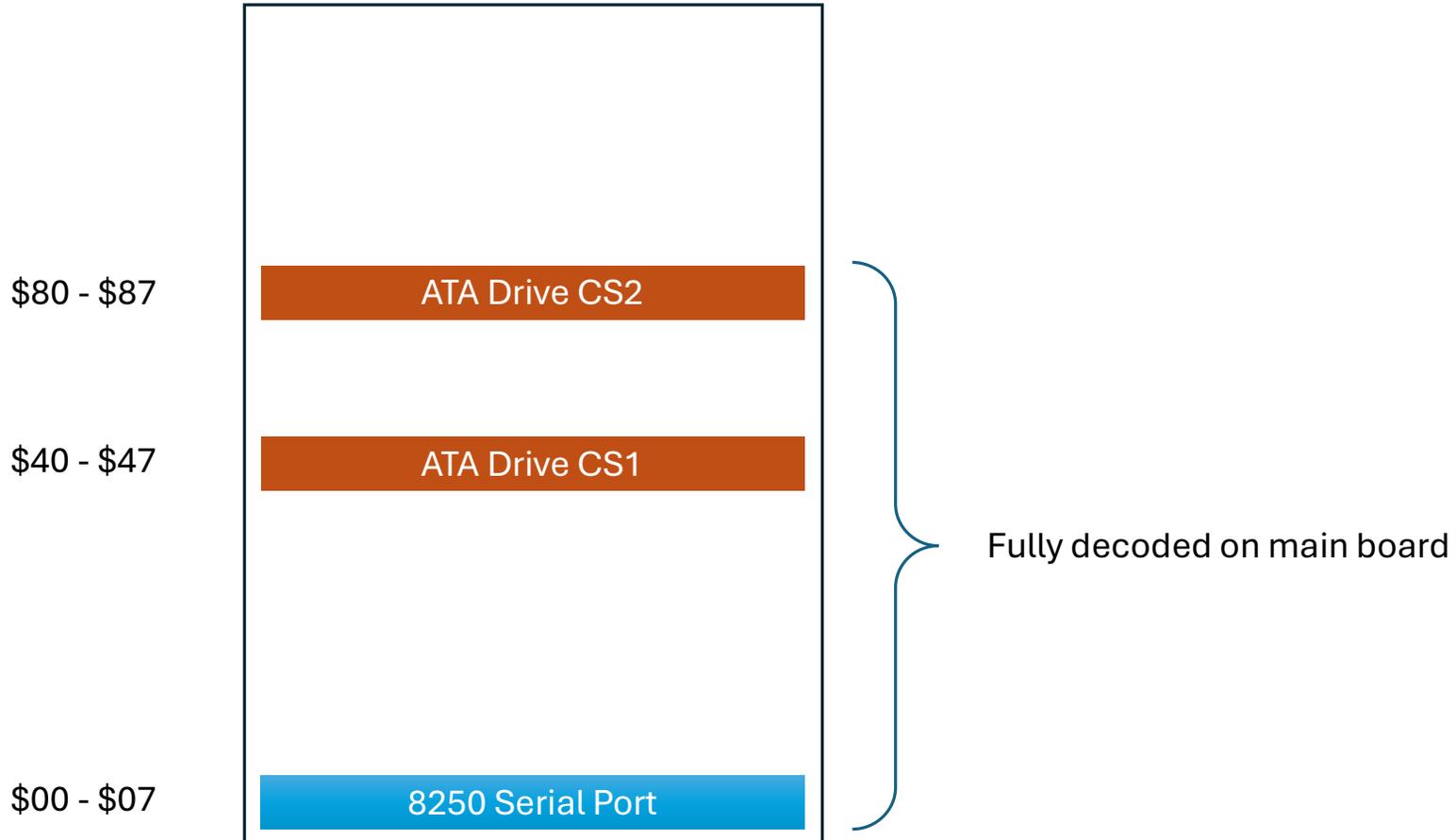
# Back Panel Connectors



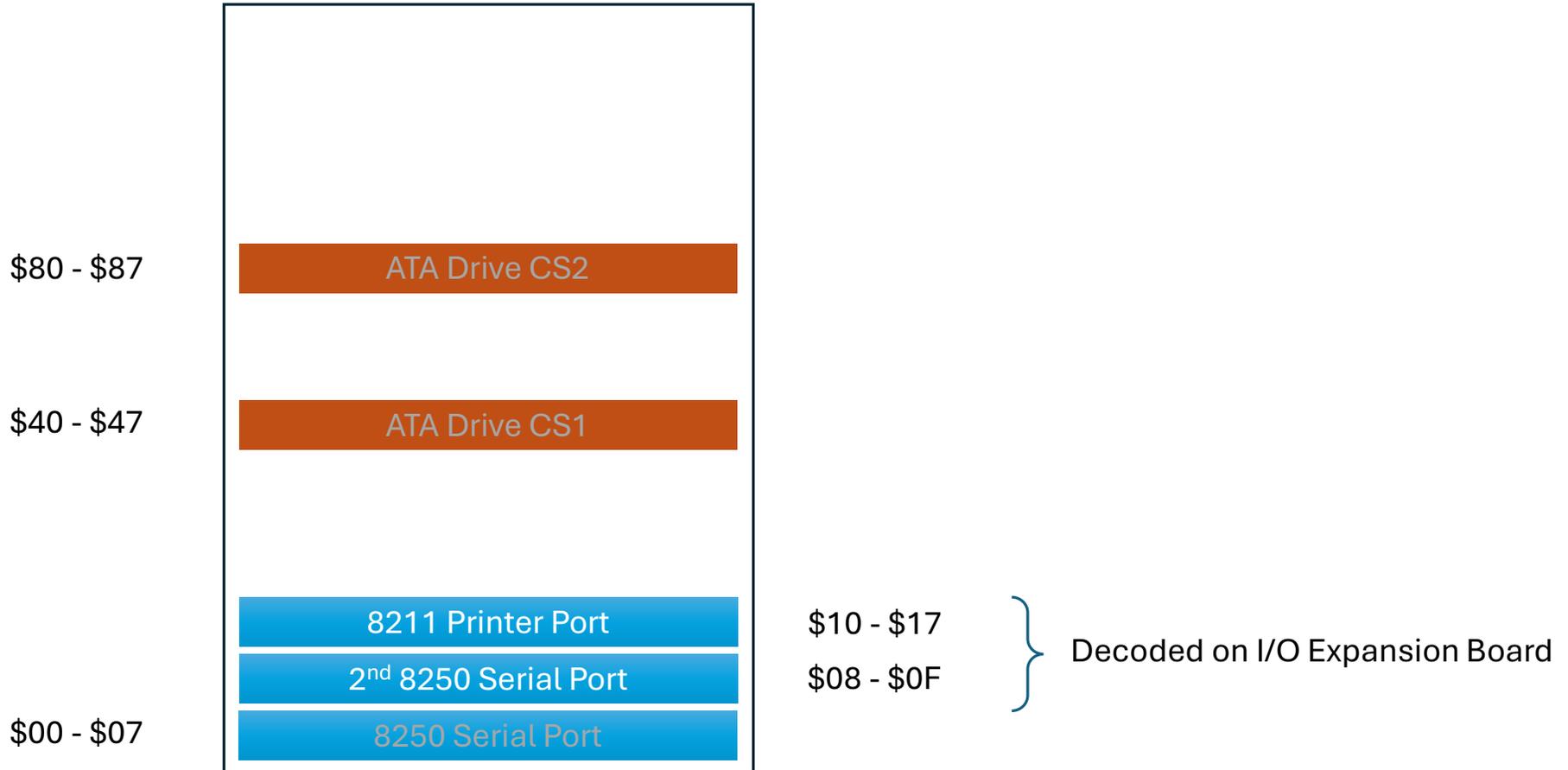
# Back Panel Connectors



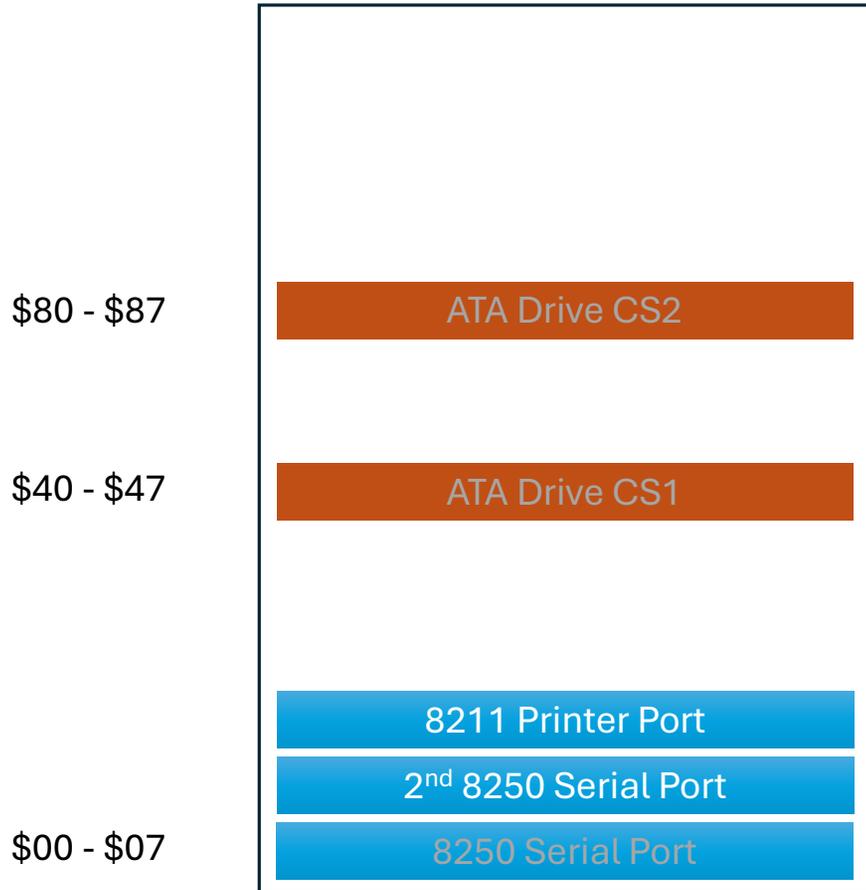
# I/O Device Map



# I/O Device Map



# I/O Device Map

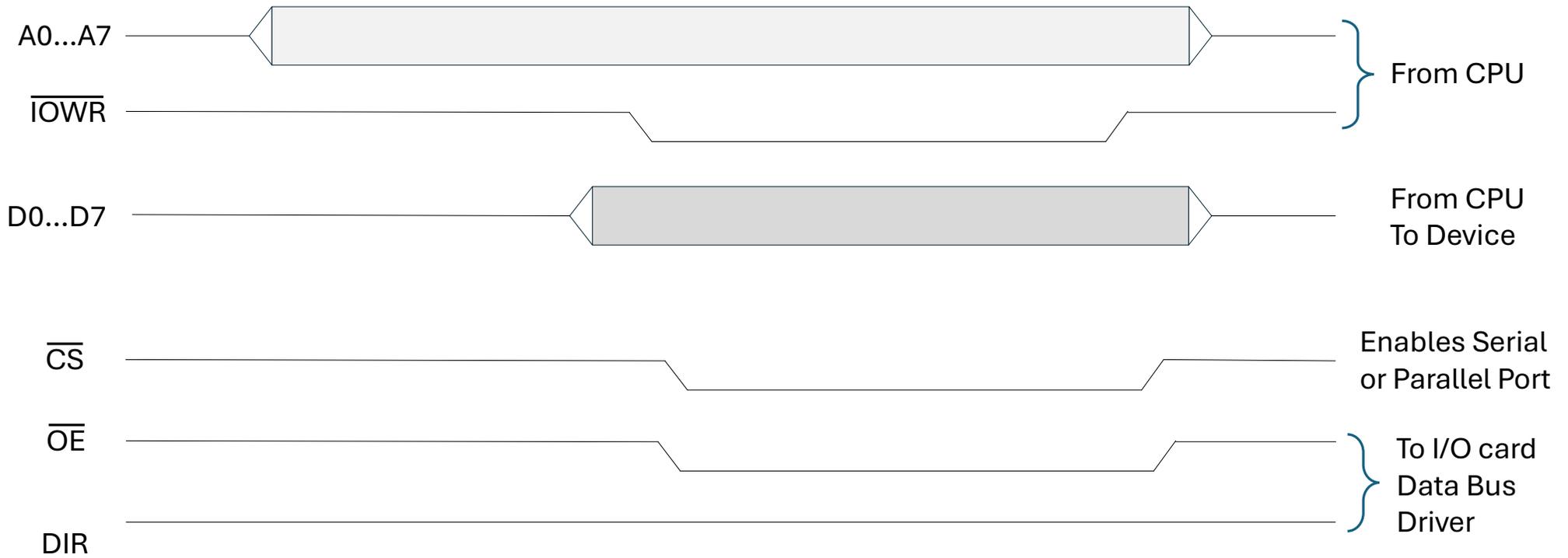


## I/O Address Bus

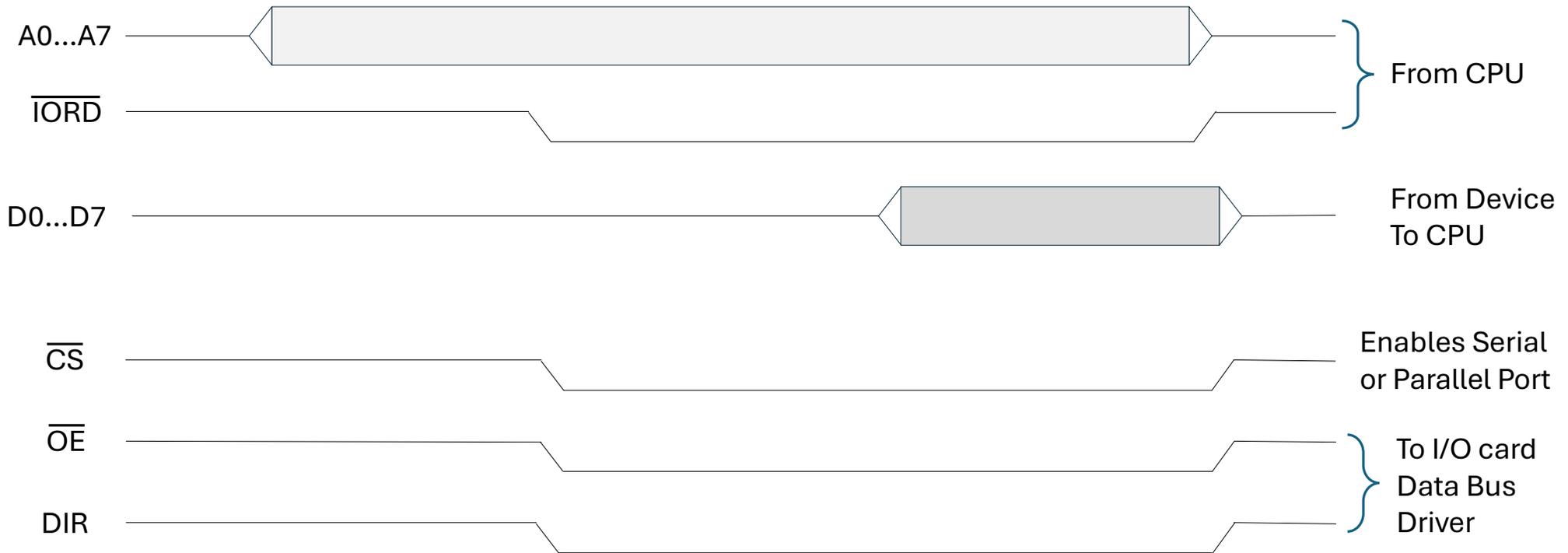
A7	A6	A5	A4	A3	A2	A1	A0
0	0	0	0	1	X	X	X
0	0	0	1	0	X	X	X

Always Zero (under A7-A5)  
 P A R A L L E L (under A4)  
 S E R I A L (under A3)  
 Reg (under A2-A0)

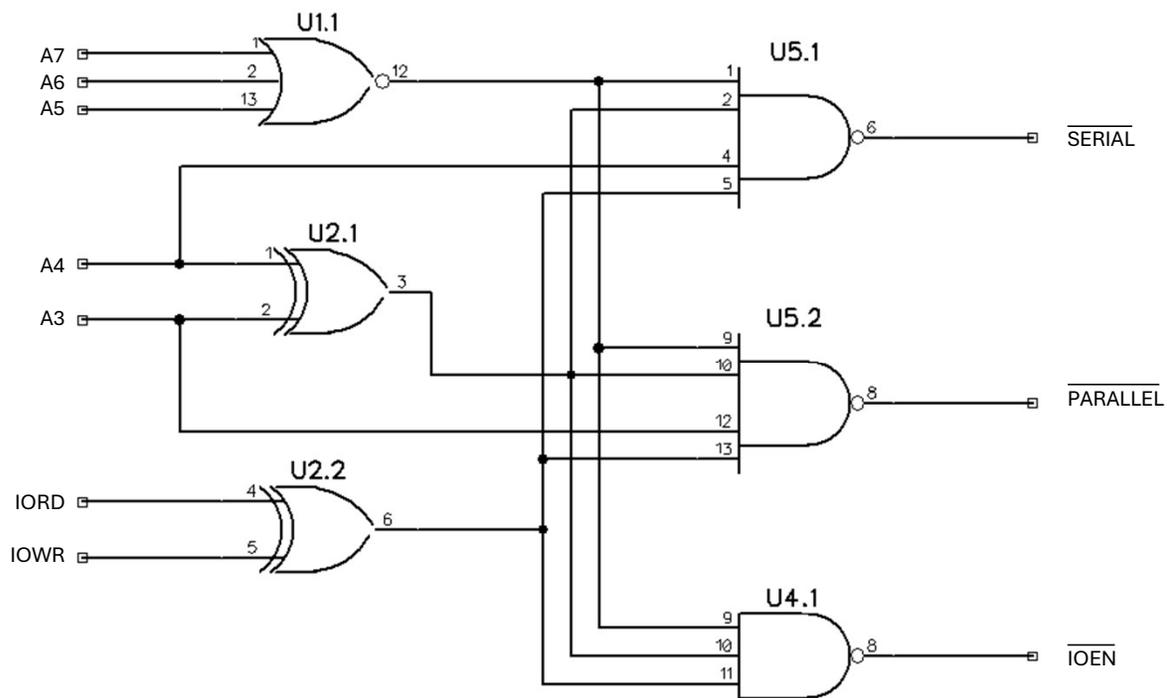
# 8080 I/O Write Timing



# 8080 I/O Read Timing

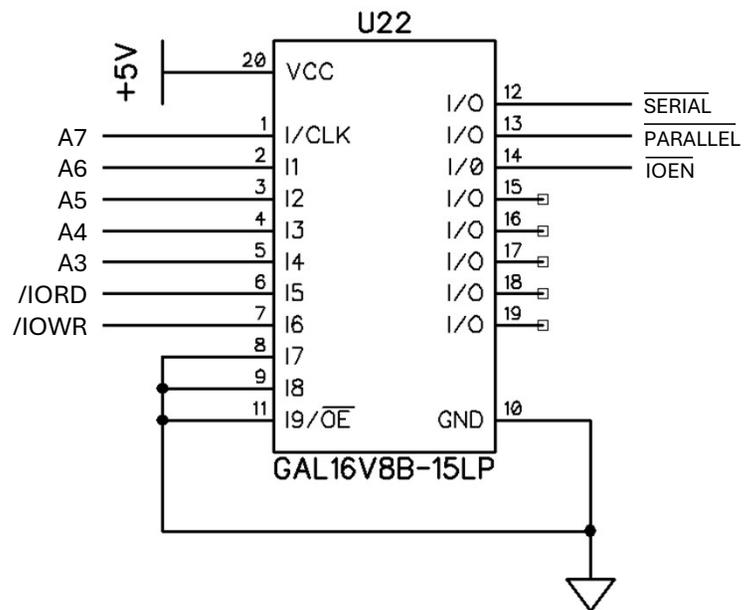


# I/O Expansion Chip Decoder



Wire up 4 different 74LS series logic gates.

# I/O Expansion Chip Decoder



OR use a 16v8 PAL

## PAL Equations

$$\overline{\text{SERIAL}} = !((\text{ab3 } \$ \text{ ab4}) \& \text{ ab3} \& !(\text{ab5 } \# \text{ ab6 } \# \text{ ab7}) \& (!\text{ior } \$ \text{ !iow}))$$

$$\overline{\text{PARALLEL}} = !((\text{ab3 } \$ \text{ ab4}) \& \text{ ab4} \& !(\text{ab5 } \# \text{ ab6 } \# \text{ ab7}) \& (!\text{ior } \$ \text{ !iow}))$$

$$\overline{\text{IOEN}} = !((\text{ab3 } \$ \text{ ab4}) \& (!\text{ior } \$ \text{ !iow}) \& !(\text{ab5 } \# \text{ ab6 } \# \text{ ab7}))$$

! = NOT

# = OR

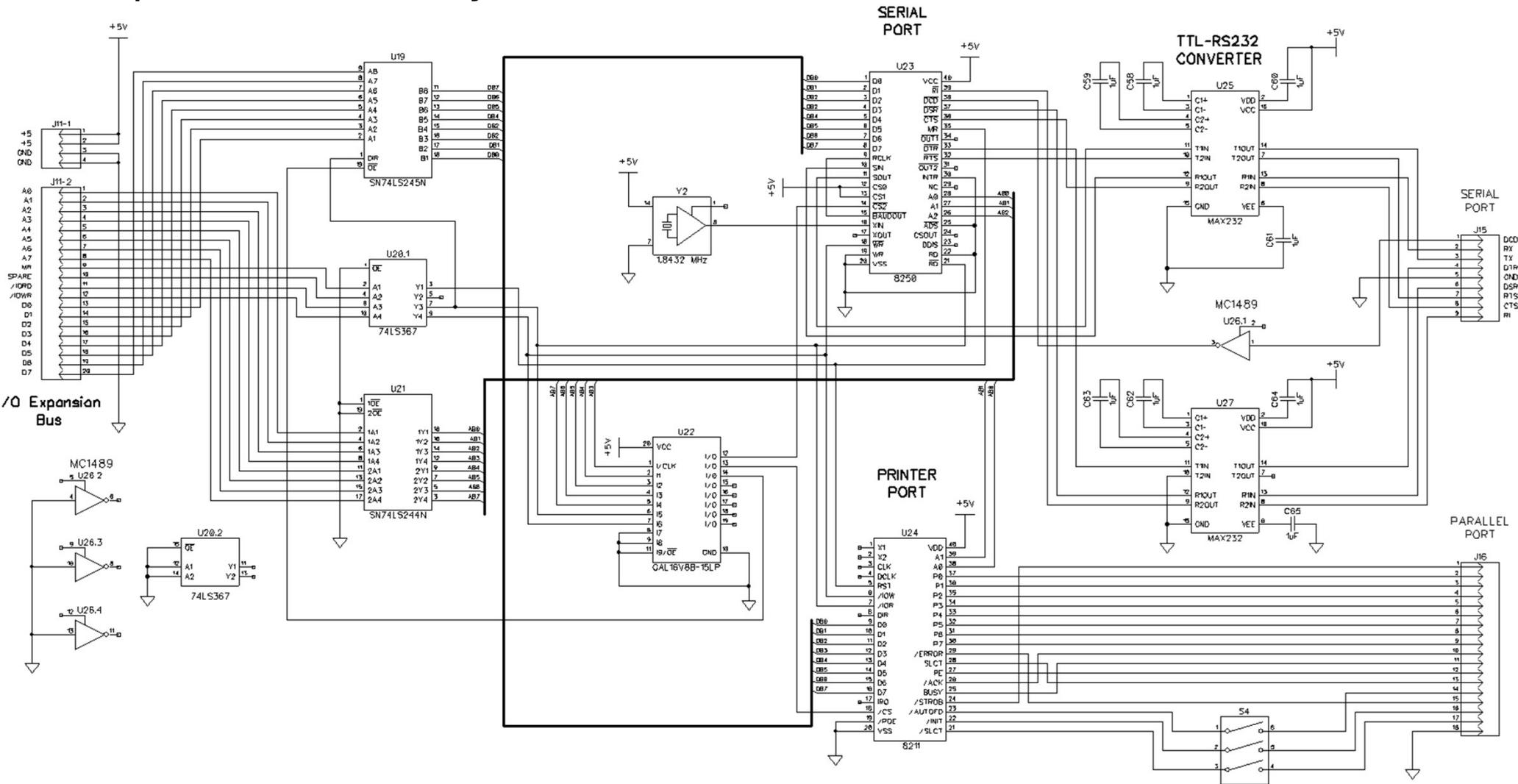
& = AND

\$ = XOR

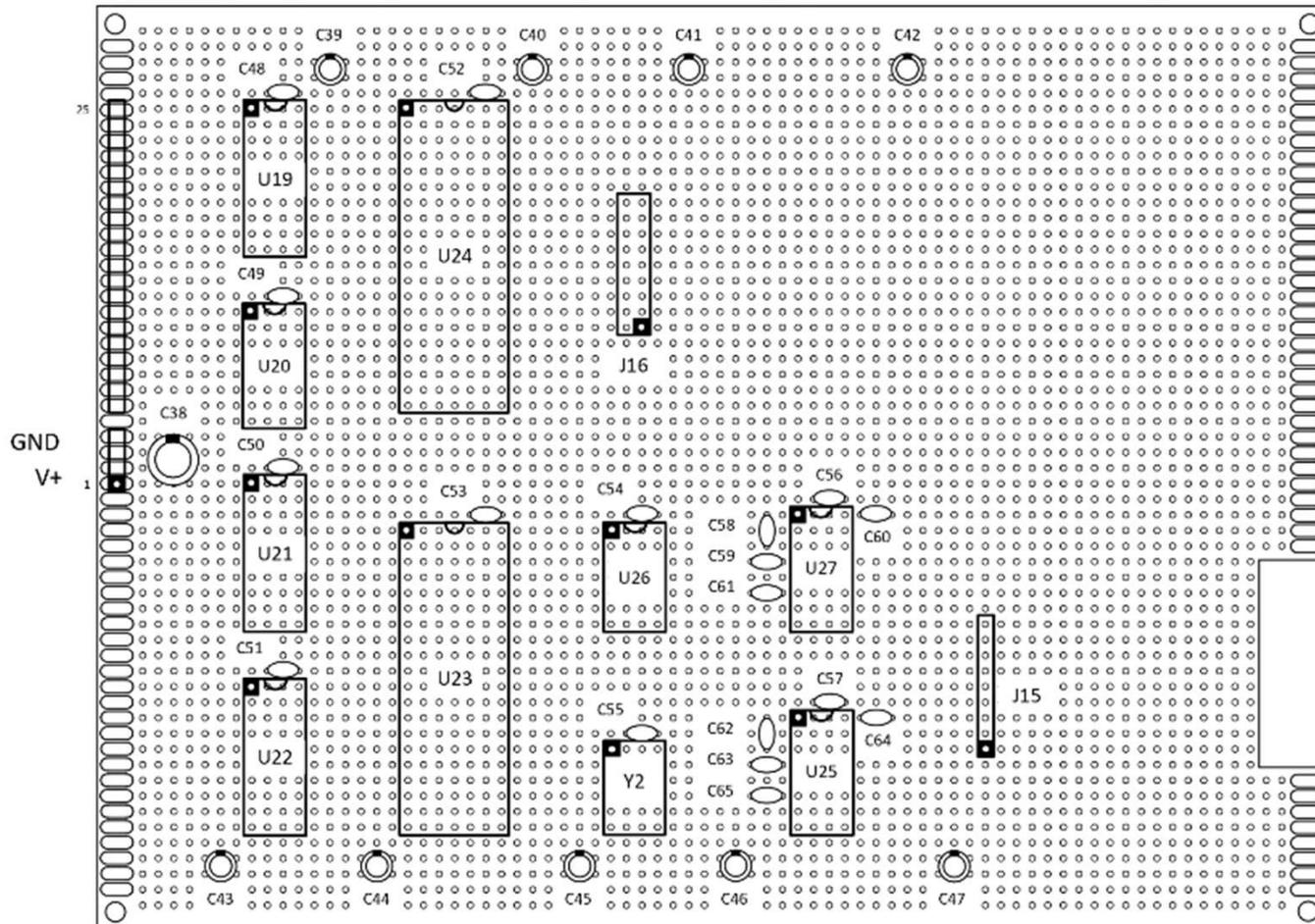
## PLD Programming with WinCUPL 2



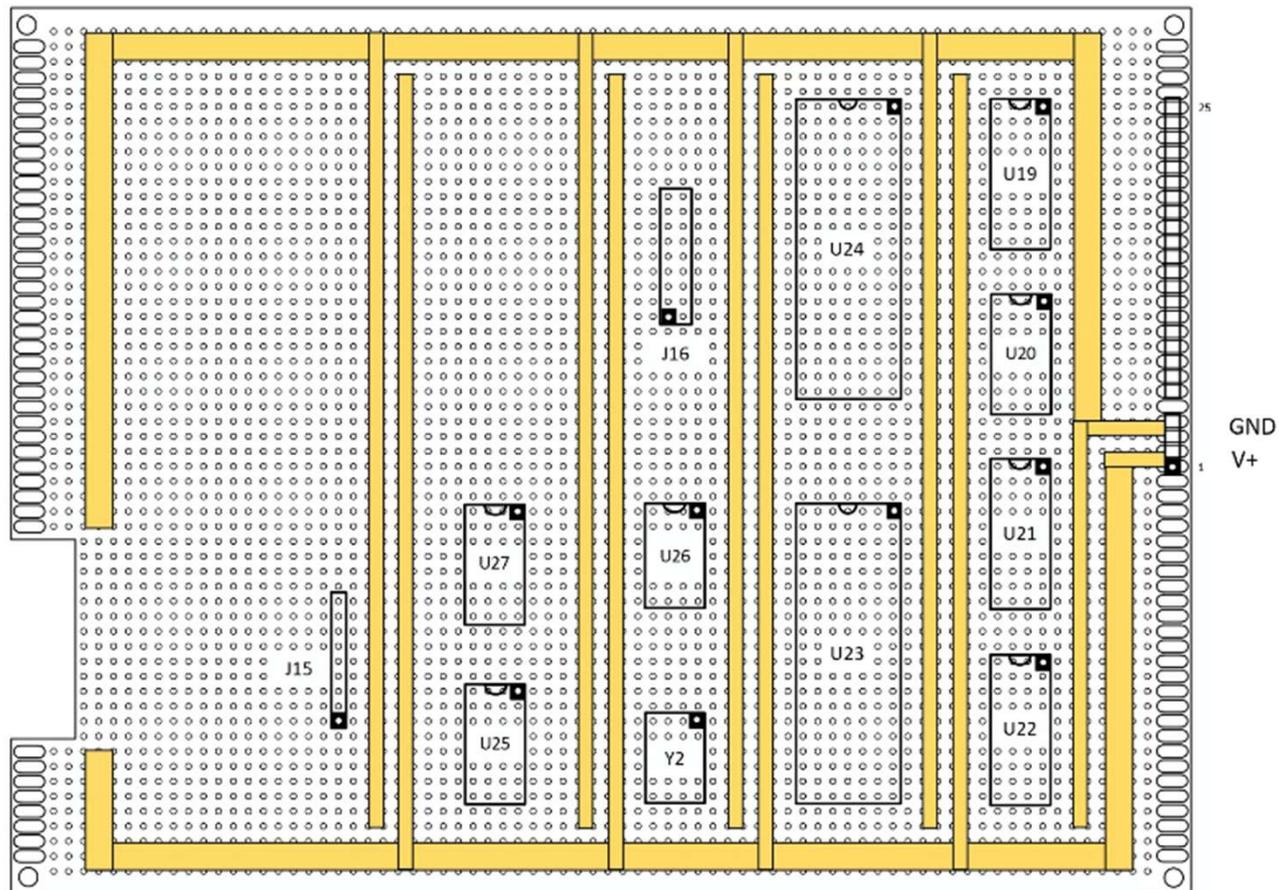
# I/O Expansion Board Layout – Schematic



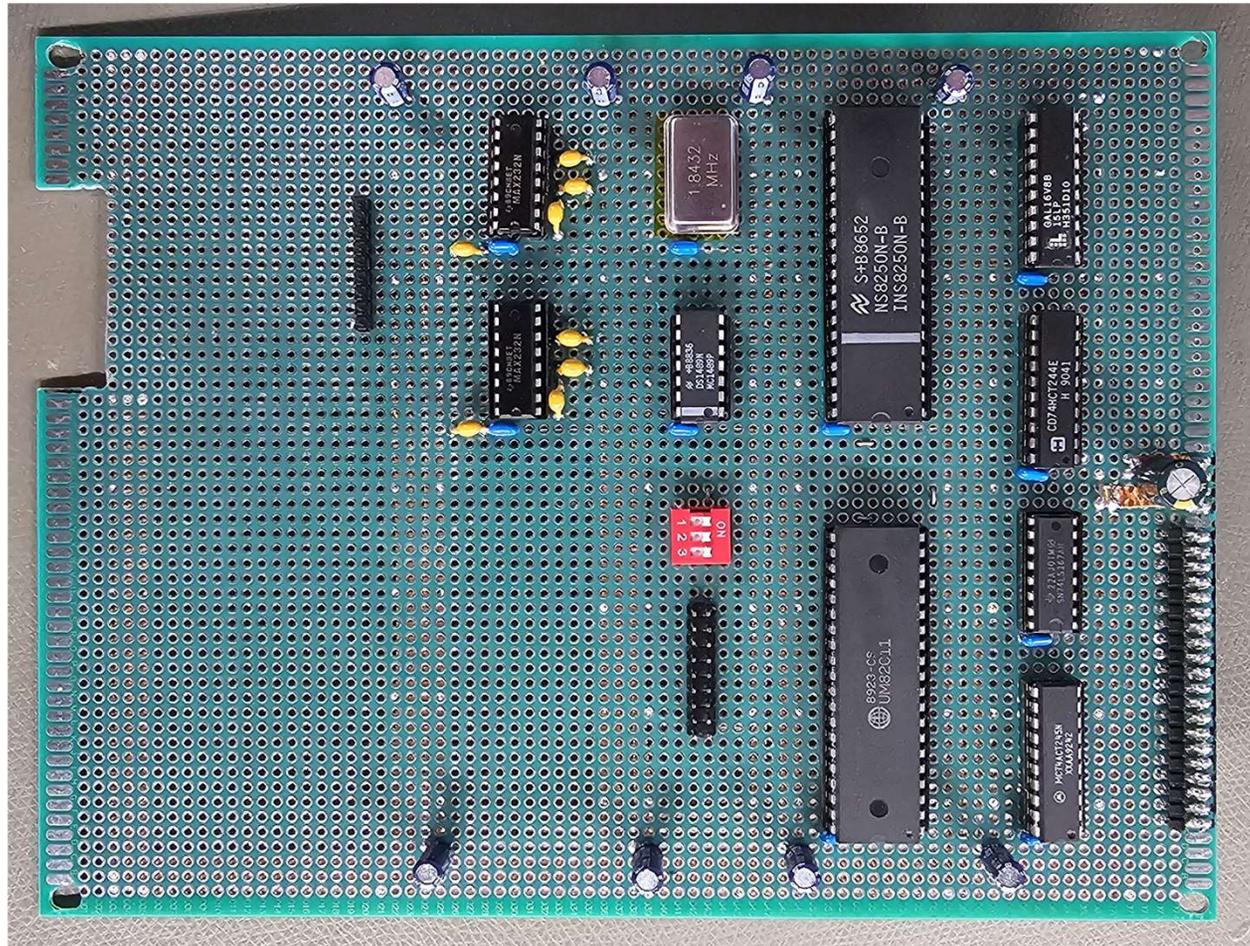
# I/O Expansion Board Layout – Top Side



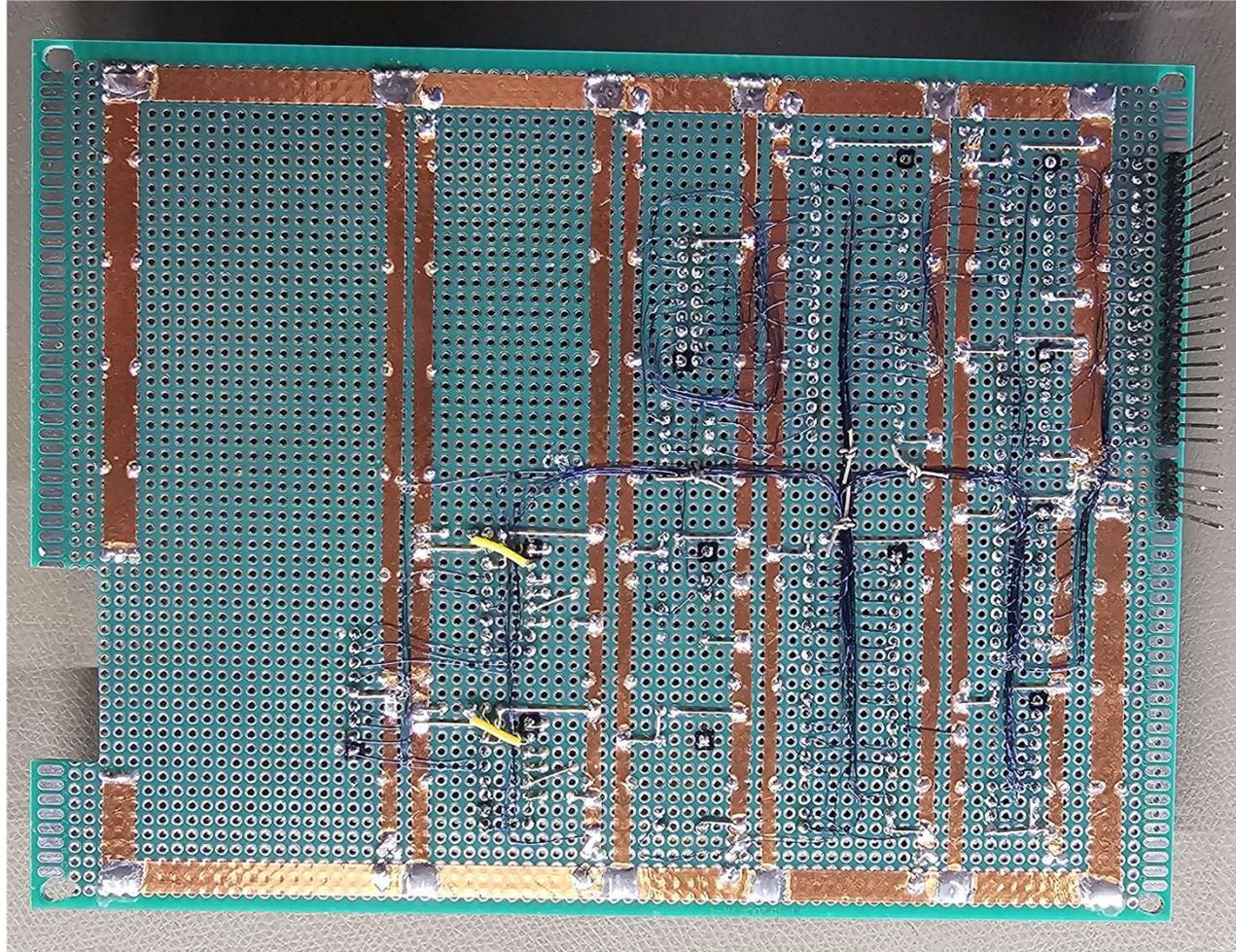
# I/O Expansion Board Layout – Bottom Side



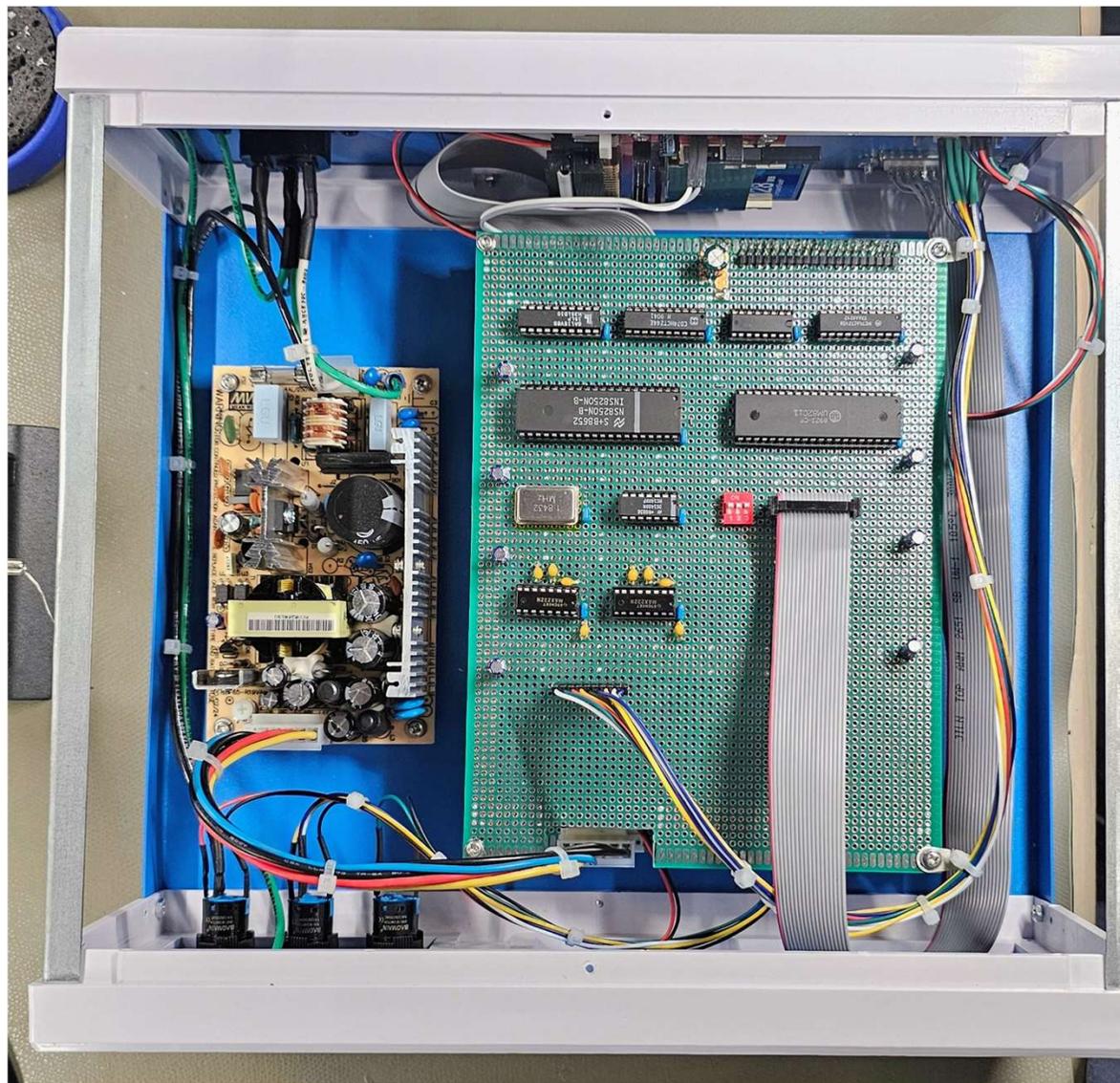
# Completed I/O Expansion Board – Top Side



## Completed I/O Expansion Board – Bottom Side



# Completed I/O Expansion Board Installed



# Completed 8080 Microcomputer System

