Subsystem 3 Trouble Shooting

Some suggestions for trouble shooting system 3 are listed below. If a logic analyzer is used to measure logic values, signals can be taken from wire wrap socket pins. However, if an oscilloscope is used to measure voltages, signals should be taken from **IC pins**. Also, in many cases, you need push the reset button before your measurements.

1. Check if the HyperTerminal and your single board computer have the same configuration.
2. Use EP program to read back the data stored in the EPROM to check if the stored data are correct.
3. Download binary file **proj3.bin** from the class web page. Load proj3.bin and the jump instructions given in the project instructions into the EPROM. The binary code proj3.bin let your single-board computer continuously send letter "A" to the HyperTerminal.
4. If proj3.bin works with your single-board computer and you think your assembly program is correct (e.g. your program works at other single-board computers), the failure in your single board computer may be caused by problems associated with the SRAM. To check this, modify your program to remove subroutine calls. All subroutine calls can be replaced by jump instructions and change subroutines to become a part of the main program. Subroutine calls cause stack operation and the stack is implemented in the SRAM. If there are problems with SRAM circuits, programs with subroutine calls will not work properly.
5. Use a multimeter to check the connection between RS232 and DB9 connector. Also, use an oscilloscope to check if proper voltage are applied to the pins of RS232.
6. Use an oscilloscope to verify that proper clock signals apeear at 8251 pins 9 and 25 (what is the frequency of these clock signals? It depends on the configurations of the DIP switch). Also, verify that V_{high} and V_{low} of these clock signals meet the specification in 8251 data sheet ($-0.3V \leq V_{low} \leq 0.8V$ and $2.2V \leq V_{high} \leq Vcc + 0.3V$).
7. Use an oscilloscope to verify that the proper clock signal appears at pin 20 (what is the clock frequency of this clock signals). Also, verify that V_{high} and V_{low} of the clock signal meet the specification in 8251 data sheet (same as the above).
8. Use an oscilloscope to check reset signal (pin 21), If the reset button is pushed, the voltage at pin 21 should be around Vcc. If the reset button is not pressed, the voltage at pin 21 should be around zero. There should not be large noise appearing at pin 21.
9. Use an oscilloscope to verify the following voltage signals: $V_{26} = Vcc$ and $V_4 = V_{17} = V_{22} = 0$. These signals are DC signals and should not contain large noise.
10. Check if the microprocessor repeatedly reads the status of 8251. Use a logic analyzer to observe signals at pins 21 (reset), 13 ($\overline{RD}$), 12 ($C/\overline{D}$), 20 (CLK), and 11($\overline{CS}$). You should see $\overline{CS}$ and $\overline{RD}$ are periodically pulled low.
    - If you do not observe $\overline{CS}$ signal going low, check the operation of 74HC138 decoder by following the steps discussed in subsystem 2 trouble shooting.
    - If you do not observe $\overline{RD}$ signal going low, check if you have proper ALE signal.
        - If you do not have correct ALE signal, check if your computer system works in subsystem 2 configuration.
        - If you have correct ALE signal, try to analyze which memory locations your computer reads.
11. Check the status of 8251. Use a logic analyzer to observe the signal at pin 27. You may also need to feed clock and other control signals to the logic analyzer to understand when it is in a read operation. During a read operation, the signal at pin 27 should be pulled high.
    - If you observe that the signal at pin 27 goes high, use a logic analyzer to compare the signals at 8251 pin 27 and 8088 pin 16 (AD_0). These two signals should be the same when 8088 read the status of 8251.

- If you do not observe the proper signal at 8251 pin 27 or the signals at 8251 pin 27 and 8088 pin 16 are different, check the operation of 74HC245 by using the techniques discussed in subsystem 1 trouble shooting.
- If your tests suggest that 74HC245 works properly, download binary code read.bin from the class web page and load the code into your EPROM. This program will repeatedly write data CE into 8251 mode register. In this test, you need observe if $\overline{CS}$ is periodically pulled low and if correct data arrive at the input pins of 8251.