System Control

1.   Introduction

The purpose of these laboratory assignments is for you to design the circuits and system components required to implement a lighting measurement system interfaced to a laboratory PC. The specific objective of this laboratory assignment is for you to create circuits and systems needed to both store lighting data for access by the host computer as well as control the light bulb.

2.   Laboratory Procedure - Hardware

1.   The FIFO you will use is the <u>IDT72200 256 x 8-bit Parallel SyncFIFO</u> and will reside at address $FA000_{16}$ in physical memory. Design a circuit that allows the 8088 to store the 8-bit digital output read from the ADC by performing a memory write operation and using the appropriate 74LS138 output. Make sure you understand how the FIFO works, how each signal and control line is used, and how data is stored. Make sure you maintain the FIFO write interface independent from the FIFO read interface.
       How much data must be in the FIFO to activate the AF and AE flags?
2.   The light bulb will be controlled based on commands written to the input port register that will reside at address $FC000_{16}$ in physical memory. Design a circuit that allows the 8088 to load an 8-bit registered command word sent from a laboratory PC.
       What must be added to the circuit to guarantee data integrity on the data bus?

3.   Laboratory Procedure - Software

1.   Your assembly language code from laboratory two should already write the 8-bit value read from the ADC to the base physical address at which the FIFO resides. Modify this code as necessary to ensure that the write operation targets the proper FIFO address within the memory address space.
       Demonstrate the operation of this program to your course instructor, TA, or LA.
2.   Modify your assembly language code to check the 8-bit command read from the input port register. If the command code is 34_{16}, turn on the light bulb, read a sample from the ADC, and then write the sample value to the FIFO. Perform this operation sixteen times and then turn off the light bulb.
       What is the data rate for write operations to the FIFO?
       Demonstrate the operation of this program to your course instructor, TA, or LA.

4.   Laboratory Report and Grading

Grading will be on:

- Hardware implementation and demonstration
- Circuit wiring neatness

- Software and software documentation
- Laboratory write-up

Include the following items in your laboratory report:

- Cover page with names and email addresses.
- Authorship page (who did what).
- Introduction detailing what the laboratory is trying to accomplish.
- A discussion of your circuits and programs.
- Clean-copy schematics for your hardware design.
- A discussion of your software implementation.
- Well commented program listings including the assembler map for the EEPROM.
- Conclusions regarding the laboratory.