

ENGR-355

Lab 4

The goal of this lab is to learn more about interrupts and interrupt handlers.

Begin by download from the class web page a zipped file named lab4_22.zip (it is near the bottom of the ENGR-355 web page) to the computer and folder you use for this ENGR355 lab. Unzip the file and it will create a folder named lab4 containing source files for a program we will use in lab today.

Start the Keil uVision program and create a new project in the lab4 folder. Add the C source files from the lab4_21 zip file to the project.

From the Flash > Configure Flash Tools dialog window select the Debug tab and select the CMSIS-DAP debugger rather than the default Ulink debugger.

This program has one input, a switch, outputs to turn on/off the multi-color LED on the Freedom board, and two GPIO “debug” outputs for monitoring program operation. The ports used in the program for input and some output needs to be changed to be compatible with the I/O board being used with the Freedom boards. Switch inputs are on Port A rather than D and the debug outputs are on Port D rather than Port B.

Modify the input and output ports. The following will work:

- Switch input on PortA bit 1.
- Debug output DBG_ISR_POS on Port D bit 0
- Debug output DBG_MAIN_POS on Port D bit 2

Update the source files to use these ports and bits (i.e. pins on the port). Compile and download a revised program to the processor. Remember to press the reset button on the processor PCB after downloading.

Connect 3 oscilloscope probes to: PortD bit0, PortD,bit1, and the push button switch on Port A bit 1. Set up appropriate voltage range on each scope input. The DBG_MAIN_POS signal should be active and running continuously. If not, fix it. Once it is running place the scope into stop mode (upper right button on the Tektronix scopes) and press the Single button next to it. Then press button one on the development board. A snapshot of data should become visible on the scope.

Measure the following time intervals:

- Time from button press (falling edge) to the start of the interrupt handler (DBG_ISR_POS signal)
- Duration of the interrupt handler
- Main program loop time without the ISR running.
- Main program loop run time with an ISR run occurring

Write up a short description of what you did and saw including the measurements listed above as your Lab 4 report. Turn in to the D2L dropbox. Also submit the dropbox the source files you used and modified (.c files)