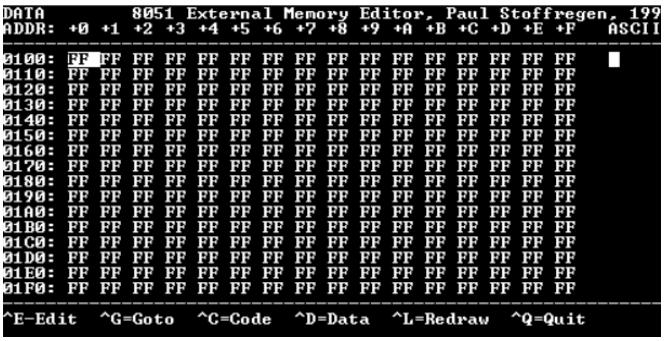
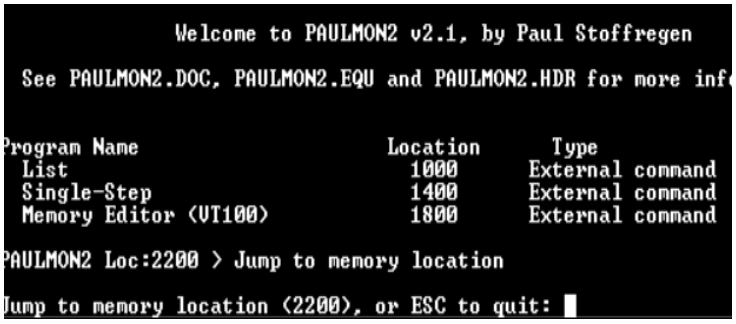
# Lab 3 WriteUp

The write up consists of the verification steps taken during the course of the project.

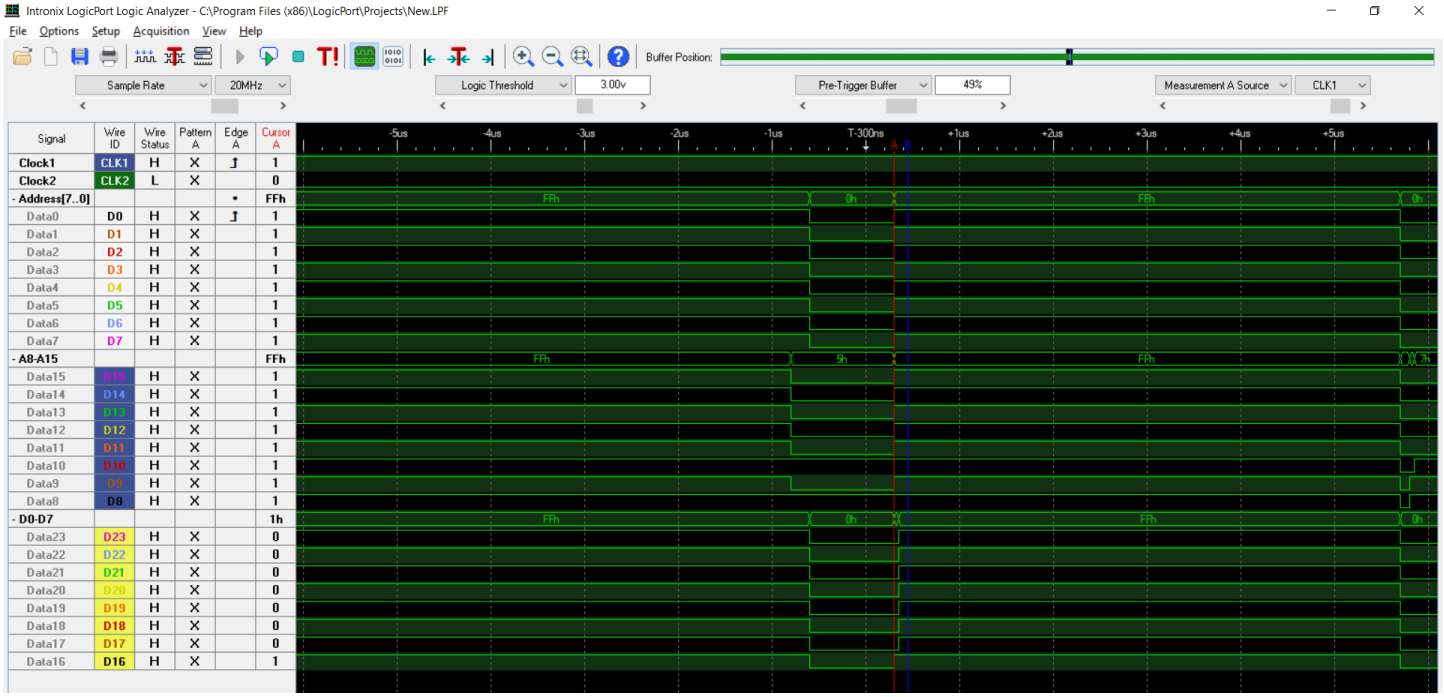

To check the memory whether it is being accessed from 0000 to 7FFF, we wrote 55 on the same address, and obtained the above results. After pushing the reset button, we got the result below, as from 0000 to 03FF, we want our memory to be in internal ram, so after pressing reset, all the address will be cleared from 0000 to 03FF.



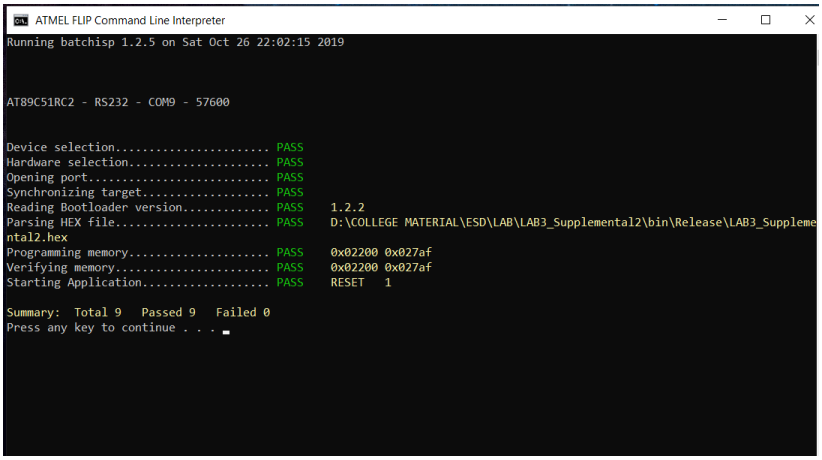




Since, we didn't want to overwrite the paulmon code, we kept our 8051 heap allocation and execution code at 2200 address, which is shown below. The code was verified by Dominic Doty during the signoff.

For more verification, we used the debug port code and used the logic analyzer to check whether the address which aren't being addressed are written. We wrote 01 to the address FFFF. The image is shown below



For ease of operation, a batch file was created to upload the code to the AT89c51. The below code is written for supplemental 2.

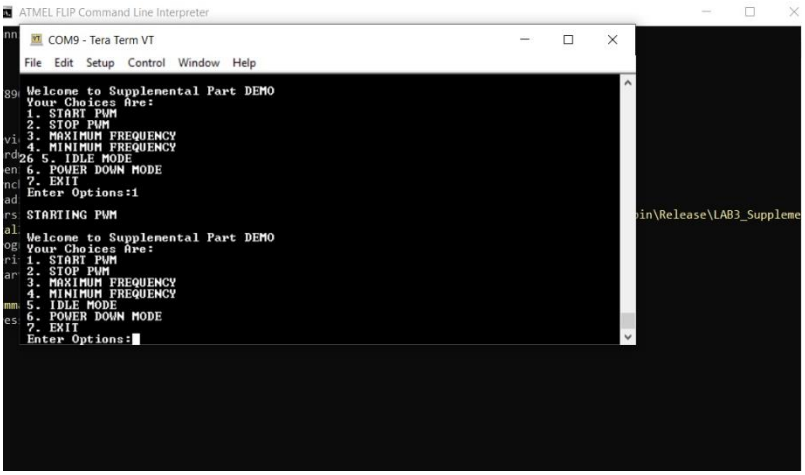



The whole MSP432 Required Code was written based on the examples given in the resource folder example and was signed off by Tanmay Chaturvedi. Some of the observations include:

- **It was observed that if we use the uart to change the pwm duty cycle, then it was much smoother than the changing the pwm duty cycle through switches. This might be due to usage of hardware interrupts in the switches while software interrupts were used in the Keyboard part. (Still to be verified by the TA).**
- **While doing the 89C51 supplement, there were some bugs experienced but were quickly solved. They were usually because of some silly mistakes like not using the refresh function for Watchdog timer, or not setting the proper value while refreshing.**
- **One more bug was that while using X2 mode, the display on the UART wasn't proper, i.e the baud rate required was different and wasn't set automatically. It was needed to be changed manually, it still needs some rectified as the supplemental was done after the signoff.**
- **Also, after setting the minimum frequency, the program stopped on the uart while, the pwm was showing at the minimum frequency.**

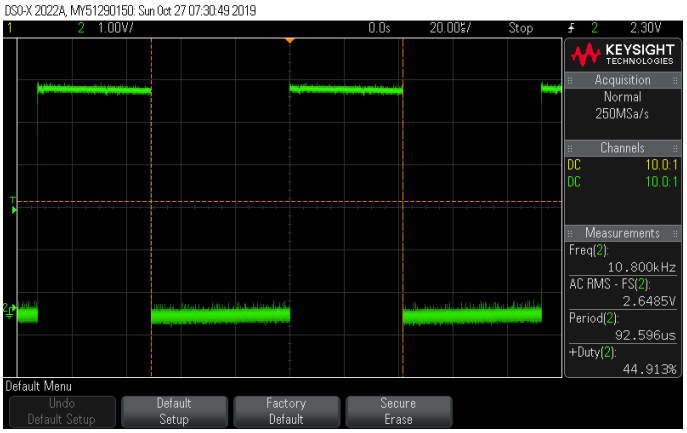
**This work is done till 10/26/2019 and more modification will be informed to the TA as soon as possible.**

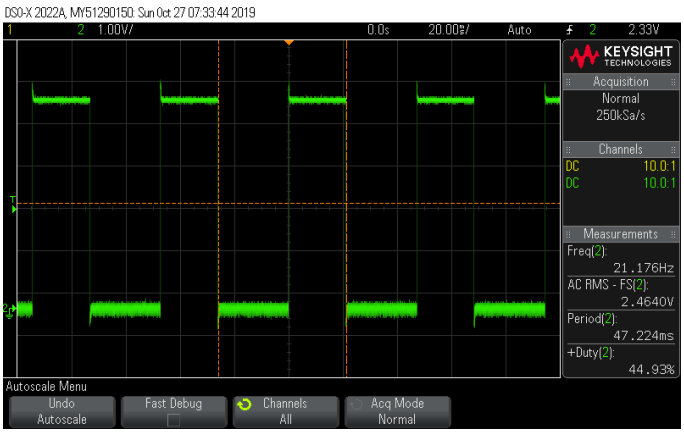
# Screenshots



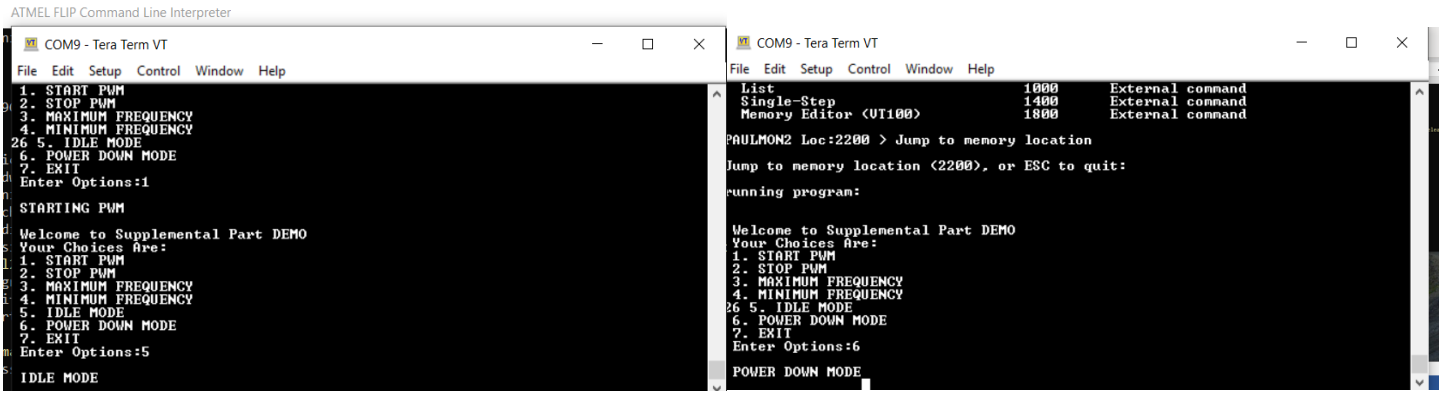

The image is the User interface for the 89C51 supplemental of different choice given to the user.

It can clearly viewed that after starting the PWM, the program is still running.

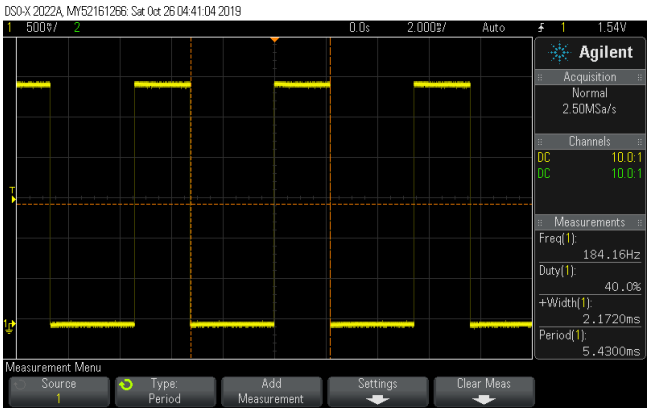


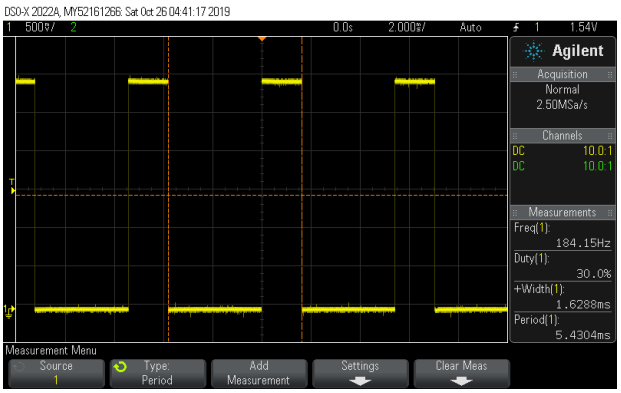



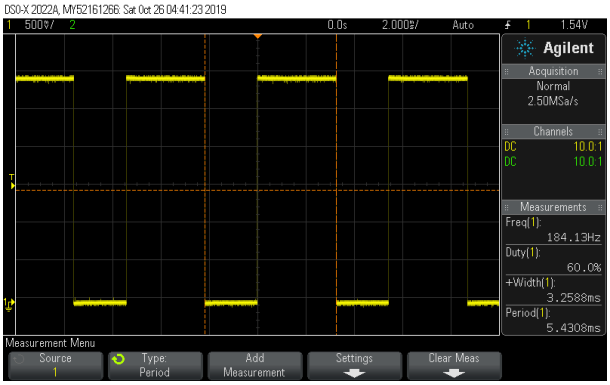

The Above screenshots are for pwm for the maximum and minimum Clock frequency , respectively.(Supplemental)




The above pictures are for the IDLE and Power Down mode, it can be clearly seen that the program has stopped, and requires external interrupt or rest for accessing the board again.




The Three images are for the PWM generated using the MSP432, First at the top left is the default 40%, right to it is the PWM after decreasing it to 30% and the bottom one is the increased duty cycle of the PWM at 60%, it was done by both switches and keyboard.

# LAB 3 Part 2 Answers

1. Operating System used for programming: Windows 10.
2. Compiler Used: SDCC 3.9.0
3. IDE Used: Code::Blocks without custom makefile. For ARM, Code Composer Studio.
4. Any other Software: No other software required
5. The global variables were not initializing and faced a lot of problems during compilations and running of the program, in sdcc.

# SIGNOFF SHEET

**ECEN 5613** **Lab #3 Signoff Sheet** **Fall 2019**

You will need to obtain the signature of your instructor or TA on the following items in order to receive credit for your lab assignment. This assignment is due by **Friday, October 18, 2019 (Part 1 Required Elements) and Friday, October 25, 2019 (Part 2 Required and Supplemental Elements)**.

Print your name below, sign the honor code pledge, circle your course number, and then demonstrate your working hardware & firmware in order to obtain the necessary signatures.

**Student Name:** Nitik Satish Gupta

**Honor Code Pledge**: "On my honor, as a University of Colorado student, I have neither given nor received unauthorized assistance on this work. I have clearly acknowledged work that is not my own."

**Student Signature:** Gupta

**Signoff Checklist**

Part 1 Required Elements

- ☑ Schematic of acceptable quality (all components shown)
- ☑ Pins and signals labeled, decoupling capacitors, and two 28-pin wire wrap sockets present on board
- ☑ Very good knowledge of a terminal emulator
- ☑ Demonstrates all 32KB of XRAM in memory map are functional, including monitor block fill command
- ☑ Using PAULMON2, demonstrates highest baud rate as: 57600
- ☑ Knows how to use SDCC [IDE or make optional]
- ☑ Knows how to analyze output files (.RST, .MEM, .MAP) for correct addresses
- ☑ C serial program and virtual debug port functional and code commented
- ☑ Hex display of buffer contents — DCBOK FUNCTIONAL; DUMP IN ASCII, BAD FORMATTING

TA signature and date: 10/18/19

Part 2 Required and Supplemental Elements

- ☑ ARM code integration and execution → 10/25/2019
- ☑ 8051 PWM control works correctly, X2 mode
- ☑ Correctly enters Idle mode and exits via external interrupt 1
- ☑ Correctly enters Power Down mode
- ☑ All other PCA software menu items function correctly
- ☑ Good understanding of PCA modes
- ☐ Good user interface; program is easy to use

TA signature and date: 10/25/19

**Instructor/TA Comments:** ☐ ☐ ☐

10/28/2019 — Partial

| **FOR INSTRUCTOR USE ONLY** **Part 1 Elements** | Not Applicable | Below Expectation | Meets Requirements | Exceeds Requirements | Outstanding |
|---|---|---|---|---|---|
| Schematics, SPLD code | ☐ | ☐ | ☐ | ☐ | ☐ |
| Hardware physical implementation | ☐ | ☐ | ☐ | ☐ | ☐ |
| Part 1 Required Elements functionality | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sign-off done without excessive retries | | ☐ | ☐ | | |
| Student understanding and skills | ☐ | ☐ | ☐ | ☐ | ☐ |
| Overall Demo Quality (Part 1 elements) | ☐ | ☐ | ☑ | ☐ | ☐ |

| **FOR INSTRUCTOR USE ONLY** **Part 2 Elements** | Not Applicable | Below Expectation | Meets Requirements | Exceeds Requirements | Outstanding |
|---|---|---|---|---|---|
| Part 2 Required Elements functionality | ☐ | ☐ | ☑ | ☐ | ☐ |
| Supplemental Elements functionality | ☐ | ☐ | ☑ | ☐ | ☐ |
| Student understanding and skills | ☐ | ☐ | ☐ | ☐ | ☐ |
| Overall Demo Quality (Part 2 elements) | ☐ | ☐ | ☑ | ☐ | ☐ |

**Comments:**

- ☑ Optional Challenge: PAULMON2 RUN command
- ☐ Optional Challenge: ISP API calls
- ☐ Optional Challenge: C and Assembly interfacing
- ☐ Optional Challenge: Serial ISR
- ☐ Optional Challenge: SDCC heap memory management analysis

10/18/19 PT1

+ BATCH ISP SCRIPT FOR PROGRAMMING
- ONLY ALLOCATES BUFF0 NO BUFF1
- HEX DUMP IN ASCII NOT HEX
- NO PROTECTION ON WRITING PAST ~~ARRAY~~ END

10/25/19 Part2

(*) NO supplemental for 8051
(+) PWM +/- for MSP432 [supplemental]
(+) UART echo works, Temp in °C, °F [supplemental]

10/28/19

(+) PWM for 8051 works.
(+) Sw timer for 8051 PCA
(-) ~~No UI for WDT~~.
(-) ~~No~~ UI for PWM, fCLK, IDLE, Power down in a separate code.