

Library 1 Test Plan

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1. Introduction

A plan describing the processes and methods of testing for the delay Suite of functions for the Library 1 Components Project for 4235 Embedded Systems II. It includes the resources used, scope, approaches, results, and issues discovered over the testing period.

2. Testing Resources

Connlaoi Fruit and Daniel Covaci were the testers for these functions as designers of the Delay Suite in Group 7.

Items needed: A StopWatch (testers used a digital stopwatch but a mechanical stopwatch works too), an Oscilloscope, and all tests were run on a RPi 4 running at 1.8GHz CPU.

3. Scope of Testing

In-Scope:

All of the functions of the Delay Suite (E4235_Delaynano, E4235_Delaymicro, E4235_Delaymilli, E4235_Delaycenti, E4235_Delaysec, E4235_Delaymin).

Out-of-Scope:

The functions in the Lib Structure (4235_KYBdeblock, Whatami) and GPIO (4235_GPIOselect, 4235_GPIOwrite, 4235_GPIOread) Suites

4. Testing Approaches

Stopwatch Method:

The delay function is implemented alone in a test program and is set to a specific delay amount. The test program is begun simultaneously with a Stopwatch which will run alongside the program. Once the program finishes executing, the Stopwatch is stopped and the measured delay of the Stopwatch is compared to the input delay in the test program.

Wave Method:

For delays of extremely small increments of time, the limits of the int data type used for input make it difficult for the Stopwatch Method to be viable for certain functions. One such function is the E4235_Delaynano function which has a maximum round number delay of 2 seconds which, when used with the Stopwatch Method, incurred a delay with significant error due to the reaction time of the testers. To compensate for this, the Wave Method is used. The Wave Method relies on using the delay function to control the delay for a square wave output on one of the RPi GPIOs. The expected frequency is then compared to the expected frequency given the delay

used in the test program.

5. Test Results

Stop Watch Method	E4235_Delaynti	E4235_De laynano	E4235_D elaymicr o	E4235_D elaymilli	E4235_D elaysec	E4235_D elaymin
Input Delay	1 Min	2 Sec	1 Min	1 Min	1 Min	1 Min
Measured Delay	1.04 Min	2.9 Sec	1.02 Min	1.04 Min	1.06 Min	1.03 Min

Wave Method	E4235_D elaynano
Input Frequency	1 Hz
Measured Frequency	0.9 Hz



6. Risks & Issues

Planned implementation will include the Whatami function from the Lib Structure Suite which will allow the use of the Delay Suite on a variety of CPUs. Until this implementation is available, the Delay Suite assumes the CPU of the device used is 1.8 GHz.

The Delay Suite utilizes the int data type for all inputs and assumes a positive input value. This restricts usable delays to be between 1 and 2,147,483,647 (decimal inclusive).

The E4235_Delaynano function will be increasingly inaccurate for all CPU speeds below 2 GHz due to the hardware limitations of such a small increment of time needing to be delayed in a function of this form. As previously noted, all testing was performed with a 1.8 GHz CPU and this affected our testing results.