Prototype Design

F2019 – Edit this document into a deliverable.

|  |  |  |  |
| --- | --- | --- | --- |
| Lab Section: | 5 | Group: | 4 |

# Necessary Changes and Notes

**Answer these questions by editing and adding to Table 1 and Table 2 below.**

**Table 1:** What changes had to be made to get your Feasibility Model working as expected?

Table : Necessary Design Changes

|  |  |  |
| --- | --- | --- |
| # | Change | Reason/Notes |
| 1 | Use a multiplexer (reversed) to select motors to drive with PWM | We do not have enough PWM pins to drive all of our motors using separate lines. |
| 2 | Use a DC barrel jack adapter for 5V input | Need external 5V input to drive motors. Required to use a wall socket for power instead of a power supply. |
|  |  |  |

**Table 2:** Lessons Learned – Is there anything you want to remember so that you don’t make the same mistake again? Or, not waste time on something you already figured out?

Table : Important Notes

|  |  |
| --- | --- |
| # | Note |
| 1 | Always read the datasheet thoroughly. We had difficulty getting the small servo motors to move in the direction desired. It was later discovered that we were setting the duty cycle to incorrect values and that the correct values were listed at the very bottom of the datasheet. |
| 2 | It is important to figure out what pins need to be used to each task. It is a good idea to keep a spread sheet or a diagram of pins currently assigned to perform tasks. This is a good way to ensure that there are no conflicts where a single pin was desired to have multiple functions. |
|  |  |

# Signal Specifications

**Answer these questions by editing and adding to Table 3 below.**

**Table 3:** For all the important signals in your Prototype:

* Name the signal
* State which signal property is important (voltage, frequency, rise time, etc.)
* State whether you need to include a Test Point (TP) on the PCB so you can probe the signal
* State which software mode will let you test the signal as indicated
  + You may need to create a special test mode in your code to exercise the signal to its limits
* State the Minimum (Min), Nominal, and Maximum (Max) acceptable values for that signal property, as appropriate
* Include signals for attached components, modules, sensors, etc. Do not include power rails.

Table : Hardware Signal Test Plan

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Signal (TP\*) | Property | Required Software Mode | Min | Nominal | Max |
| PWM Out (X) | Voltage | Motor on | 0 V |  | 3.3 V |
|  | Period | Motor on |  | 20 ms |  |
|  | Duty Cycle | Motor on | 5 % |  | 10 % |
| LS\_out (X) | Voltage | Analog sensor test mode | 0V |  | 3V3 |
| TMP36\_out1 (X) | Voltage | Analog sensor test mode | 0.2V | 0.8V | 1.4V |
| TMP36\_out2 (X) | Voltage | Analog sensor test mode | 0.2V | 0.8V | 1.4V |
| MS\_out1 (X) | Voltage | Analog sensor test mode | 2.3 V |  | 2.9V |
| MS\_out2 (X) | Voltage | Analog sensor test mode | 2.3 V |  | 2.9V |
| MX\_enable (X) | Voltage | Motor On | 0V |  | 5V |

\*Indicates Test Point Required

# Signal Mapping

**Answer these questions by editing and adding to Table 4 below.**

**Table 4:** How will your Prototype design electrically connect to the LaunchPad?

MSP430FR4133 IC pin <--> BoosterPack pin on J1/J2 of the LaunchPad <--> Your Prototype

Table : Hardware Signal Connectivity

|  |  |  |  |
| --- | --- | --- | --- |
| Signal | MSP430FR4133 Pin | LaunchPad J1/J2 Pin | Prototype Connection |
| PWM Out | P1.7 (PWM) | J2 pin 2 | U 14 pin 3 (mux) |
| TMP36\_out1 | P1.4(A4) | J1 pin 9 | U2 pin2 |
| TMP36\_out2 | P1.5 (A5) | J2 pin 10 | U3 pin2 |
| MS\_out1 | P1.3(A3) | J2 pin 8 | J3 pin 4 |
| MS\_out2 | P1.6(A6) | J2 pin 3 | J4 pin 4 |
| MX\_enable | P2.5 | J1 pin1 | U14 pin 6 |
| Mux\_i0 | P8.2 | J1 pin 9 | U14 pin 11 |
| Mux\_i1 | P8.3 | J1 pin 10 | U14 pin 10 |
| LS out | P8.1 (A9) | J1 pin 2 | U1 pin 2 |