The accelerometer outputs a raw signal ranging from 700 mV to 2.2 V (with a 1.5 V swing). To output a 0 V – 5 V signal, the LM6144 Quad Op-Amp in an inverting configuration is used to amplify and center the signal on 2.5 V using a reference voltage. We see that a 3.3 gain is necessary. We will use the following equation to solve for the reference voltage.

From the gain calculation we choose the following resistor values

We now fill in the equation with Vout as 5 V and Vin as .700 V

The same calculation can be done with a Vout of 0 and Vin of 2.2

We now can use a voltage divider to obtain the reference voltage.

The flex sensor used for the throttle outputs a raw signal ranging from 1.36 V to 2.42 V (with a 1.06 V swing). To output a 0 V – 5 V signal, the LM6144 Quad Op-Amp in an inverting configuration is used to amplify and center the signal on 2.5 V using a reference voltage. We see that a 4.7 gain is necessary. We will use the following equation to solve for the reference voltage.

From the gain calculation we choose the following resistor values

We now fill in the equation with Vout as 5 V and Vin as .700 V

The same calculation can be done with a Vout of 0 and Vin of 2.2

We now can use a voltage divider to obtain the reference voltage.

Current Calculations

|  |  |
| --- | --- |
| **Component / Device** | **Max Current Draw** |
| XBee | 100 mA |
| Accelerometer | 600 uA |
| Flex Sensor | 250 uA |
| OpAmp | 880 uA |
| Hall Switch | 1.20 mA |
| MOSFET+ LED chain | 300 mA |
| L7805 Quiescent Current | 6 mA |
| **Total** | **409 mA** |

Total battery capacity for NiCad batteries is 1500mA-h.

If all the subsystems run continuously, we need 3 batteries in parallel to meet the 8-hour control running time. Three batteries give us the capacity to run the controller for 11 hours. We are not running all the subsystems continuously. (The LEDs are off approximately ¼ of the time dropping our current consumption significantly.) Thus, 2 batteries are sufficient for 8 hours of running time.