**Arduino Project: Testing**

Design parameters restated:

For direct current input, the device should accept an input from -5 to 5 Volts, output an identical voltage, and display the binary equivalent of the value on the LCD screen.

For alternating current input, the device should accept a wave that has a maximum range of -5 to 5 Volts and output an identical wave.

Testing procedure:

1) Direct current

* Power the device
* Connect the input to a DC voltage source and the output to a multimeter
* For an input voltage of -6 to 6 Volts (0.5 V intervals), record the binary number on the LCD and the output voltage from the device.
* Assess performance and determine unacceptable errors, if any
  + Plot the output voltage vs. the input voltage
  + Plot the binary output vs. the input voltage

2) Alternating current

* Power the device
* Connect the input to an AC voltage source and the output to an oscilloscope
* Record the output wave for the following ranges of input:
  + Peak to peak voltage: 1 to 6 Volts at 1 Volt intervals
  + Period: 0.5 to 2.5 seconds at 0.5 second intervals
* Assess performance and determine unacceptable errors, if any

Sample Results:

Table 1: DC [0.5 Volt Interval]

|  |  |  |
| --- | --- | --- |
| Input (V) | LCD (binary) | Output (V) |
| -6.0 | -101.00 | -5.0 |
| -5.5 | -101.00 | -5.7 |
| -5.0 | -101.00 | -5.4 |
| -4.5 | -100.10 | -4.5 |
| -4.0 | -100.00 | -4.1 |
| -3.5 | -11.10 | -3.5 |
| -3.0 | -11.00 | -3.0 |
| -2.5 | -10.10 | -2.5 |
| -2.0 | -10.00 | -2.1 |
| -1.5 | -1.10 | 1.6 |
| -1.0 | -1.00 | -1.1 |
| -0.5 | -0.10 | -0.5 |
| 0.0 | 0.00 | 0.0 |
| 0.5 | 0.10 | 0.5 |
| 1.0 | 1.00 | 1.0 |
| 1.5 | 1.10 | 1.5 |
| 2.0 | 10.00 | 1.9 |
| 2.5 | 10.10 | 2.4 |
| 3.0 | 11.00 | 2.9 |
| 3.5 | 11.10 | 3.4 |
| 4.0 | 100.00 | 4.0 |
| 4.5 | 100.10 | 4.5 |
| 5.0 | 101.00 | 4.9 |
| 5.5 | 101.00 | 4.9 |
| 6.0 | 101.00 | 4.9 |

Table 2: AC [Limited Data]

|  |  |  |
| --- | --- | --- |
| Pk-Pk Input Voltage (V) | Period (s) | Pk-Pk Output Voltage (V) |
| 2.0 | 1.0 | 1.7 |
| 2.0 | 1.5 | 1.8 |
| 2.0 | 2.0 | 1.9 |
| 2.0 | 2.5 | 1.9 |
| 10.0 | 2.5 | 5.0 |

Performance Assessment:

Figure 1 demonstrates that the device is outputting DC inputs almost ideally, with the exception of voltages that are near the negative maximum range. Figure 2 shows perfect results from the binary conversion, which is likely due to the fact that 0.5 V intervals were used. The plot would almost certainly display some error if all the binary decimal points were tested, which would involve a lengthier testing procedure. Regardless, the testing for DC is satisfactory.

The data for AC inputs was taken with the sole purpose of estimating the frequency limits of the device. Table 2 suggests that 2 V (Pk-Pk) inputs with a period smaller than 2 seconds (frequency greater than 0.5 Hz) are attenuated significantly.