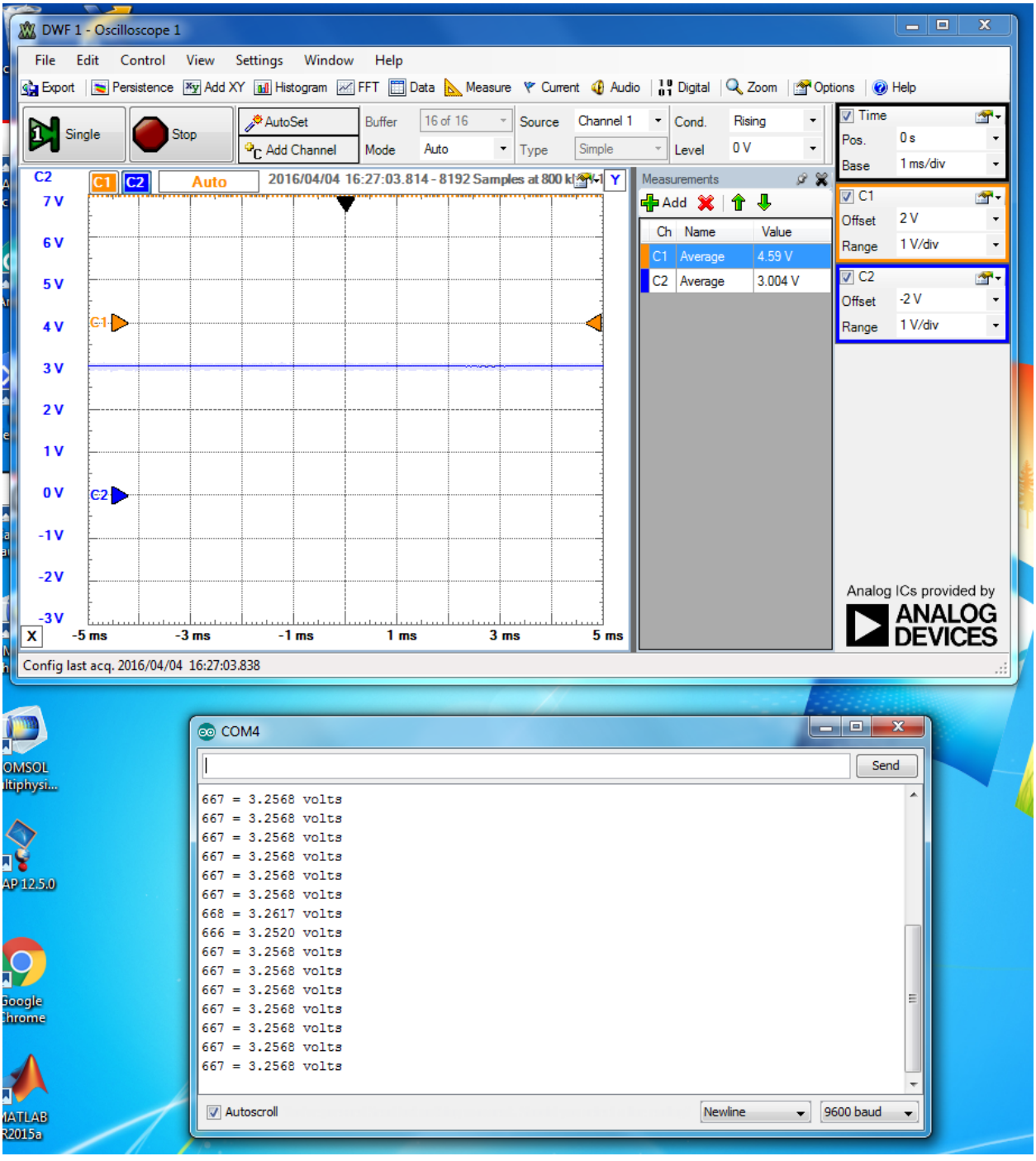
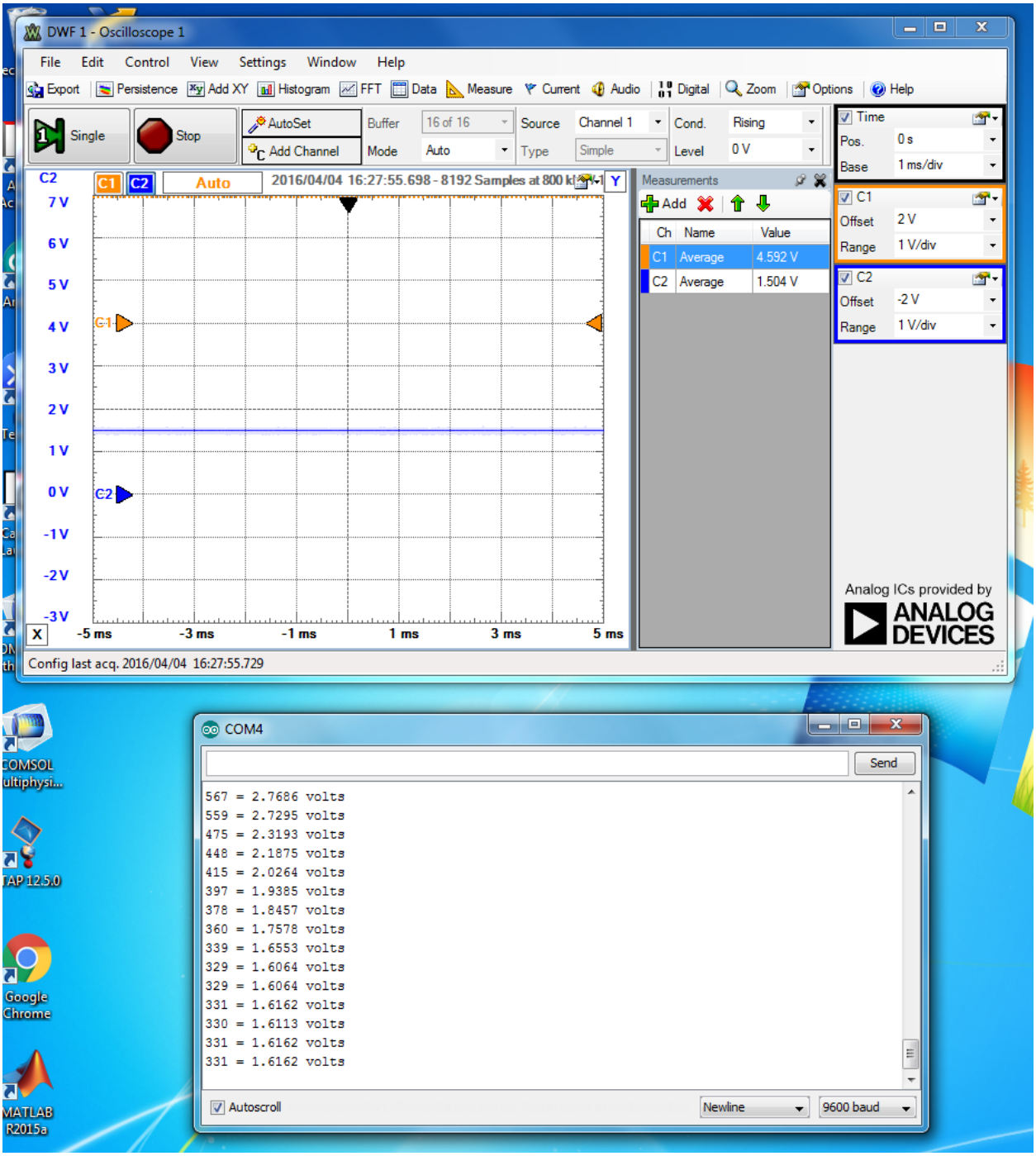
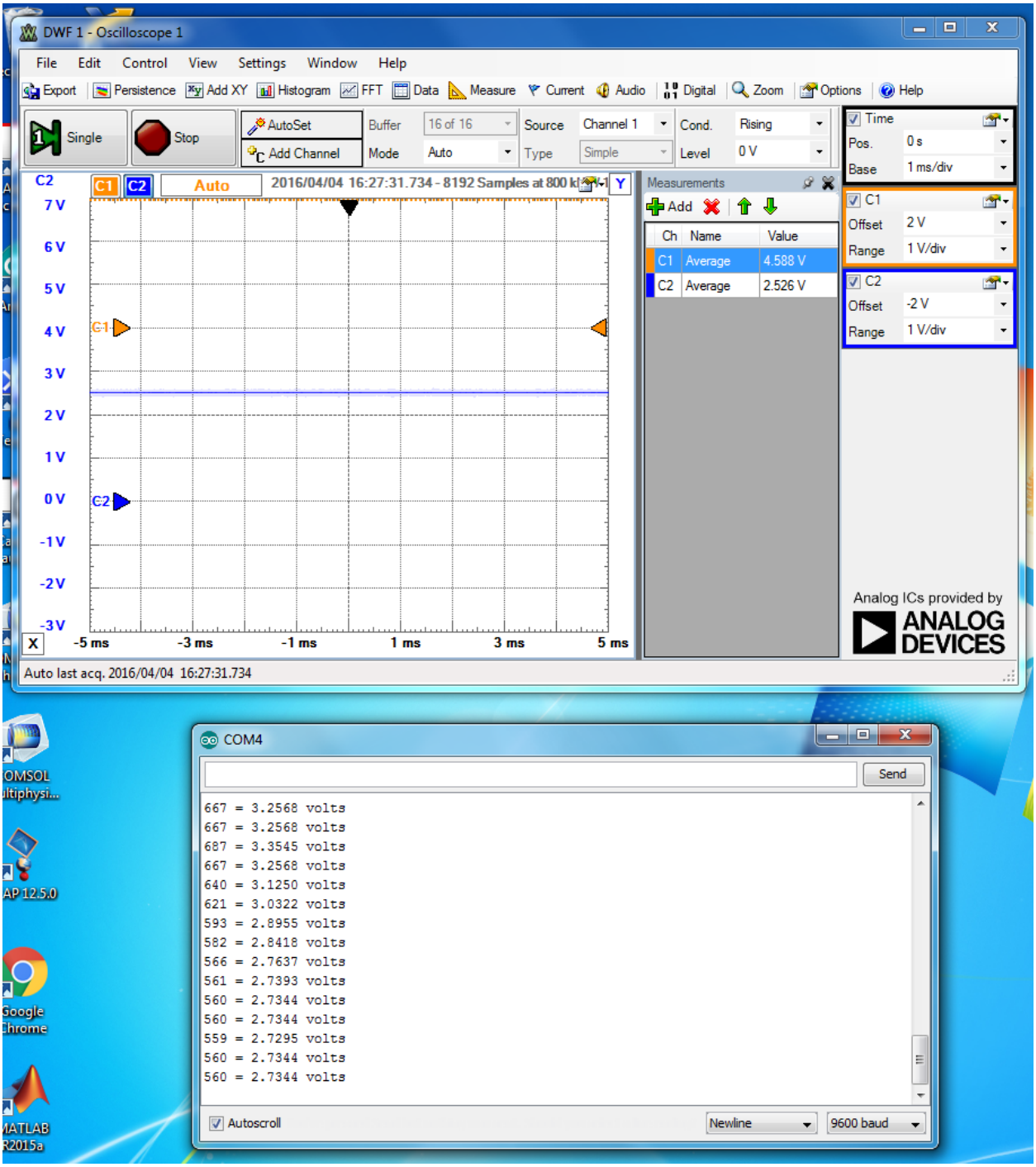
TERRAN BLAKE // Lab Report 9 // ECE 241

April 4, 2016




DWF 1 - Oscilloscope 1
File Edit Control View Settings Window Help
Export Persistence Add XY Histogram FFT Data Measure Current Audio Digital Zoom Options Help
Single Stop AutoSet Add Channel
Buffer 16 of 16 Mode Auto
Source Channel 1 Type Simple
Cond. Rising Level 0 V
Time Pos. 0 s Base 1 ms/div
C1 Offset 2 V Range 1 V/div
C2 Offset -2 V Range 1 V/div
C1 C2 Auto 2016/04/04 16:27:55.698 - 8192 Samples at 800 kHz
7 V 6 V 5 V 4 V 3 V 2 V 1 V 0 V -1 V -2 V -3 V
-5 ms -3 ms -1 ms 1 ms 3 ms 5 ms
Measurements
Add
Ch Name Value
C1 Average 4.592 V
C2 Average 1.504 V
Analog ICs provided by ANALOG DEVICES
Config last acq. 2016/04/04 16:27:55.729
COMSOL Multiphysi...
TAP 12.5.0
Google Chrome
MATLAB R2015a
COM4
Send
567 = 2.7686 volts
559 = 2.7295 volts
475 = 2.3193 volts
448 = 2.1875 volts
415 = 2.0264 volts
397 = 1.9385 volts
378 = 1.8457 volts
360 = 1.7578 volts
339 = 1.6553 volts
329 = 1.6064 volts
329 = 1.6064 volts
331 = 1.6162 volts
330 = 1.6113 volts
331 = 1.6162 volts
331 = 1.6162 volts
Autoscroll
Newline
9600 baud



	5 volts setting			
		1.5 volts	2.5 volts	3.0 volts
Analog Discovery Measurement:		1.504 volts	2.528 volts	3.018 volts
Arduino Serial Measurement:		1.6260 volts	2.7441 volts	3.2818 volts

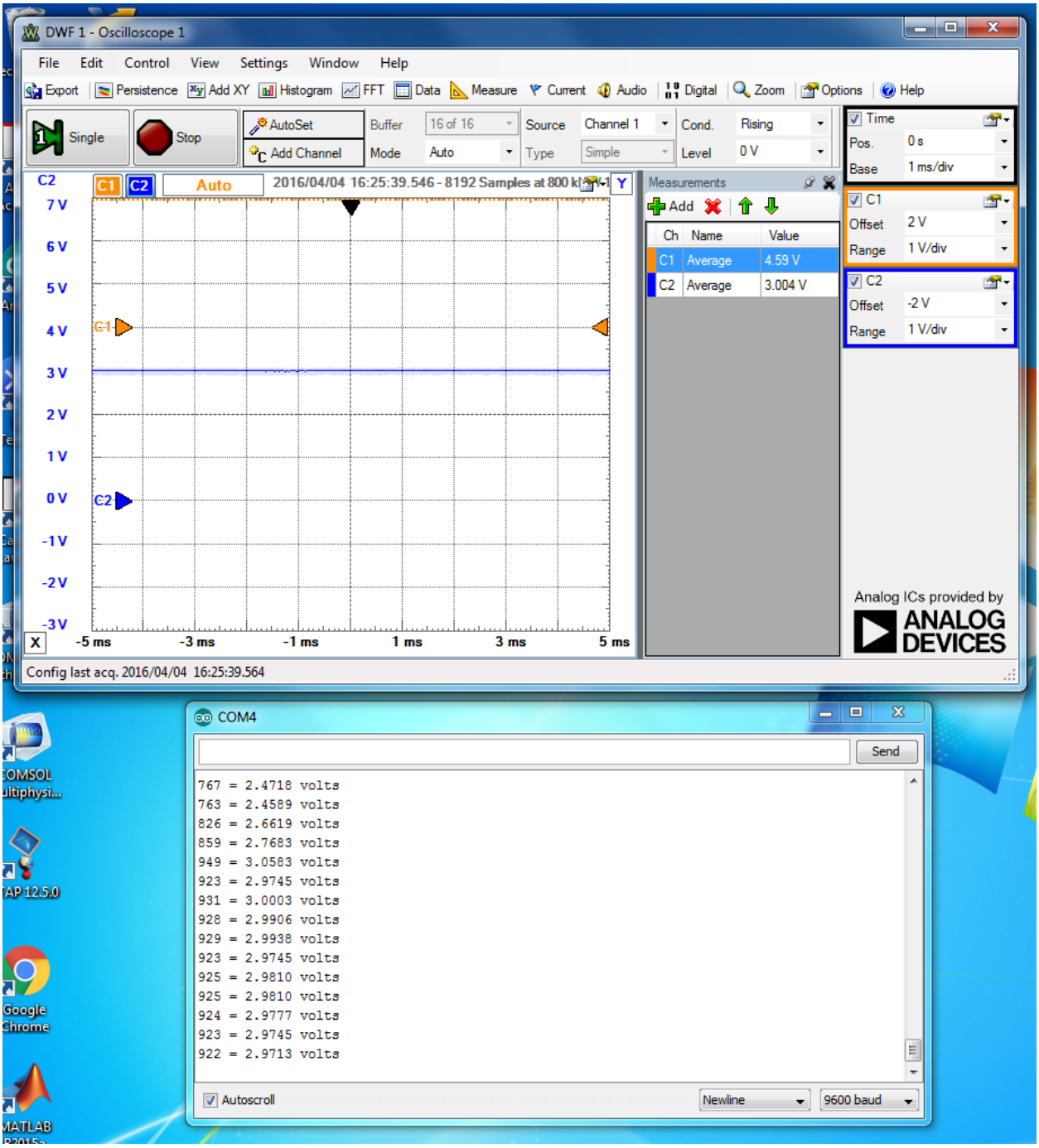
Picture 1: 5.0 Volt Power Supply: 1.5 Volt Potentiometer Reading on Analog Discovery and Arduino

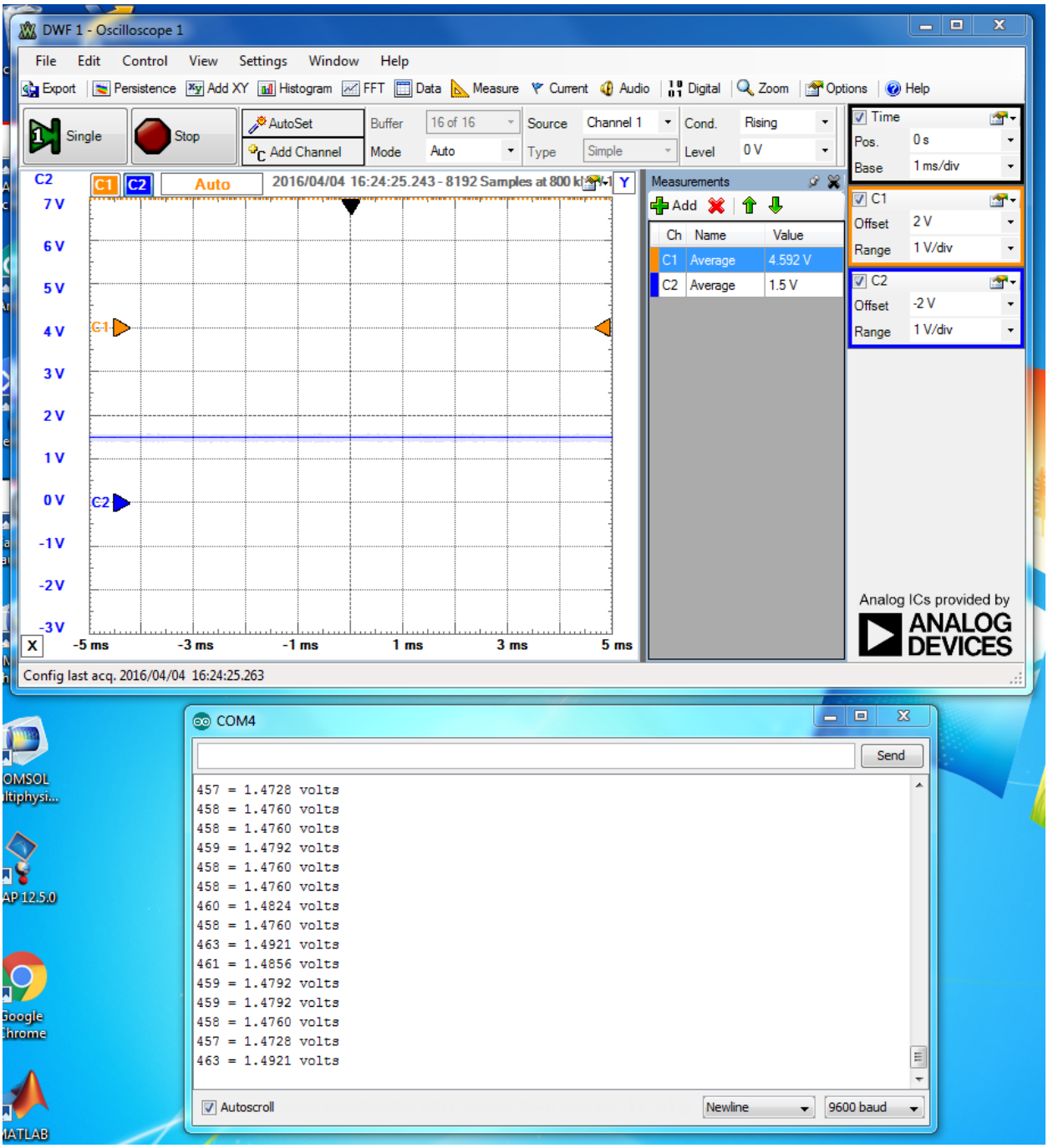
Picture 2: 5.0 Volt Power Supply: 2.5 Volt Potentiometer Reading on Analog Discovery and Arduino

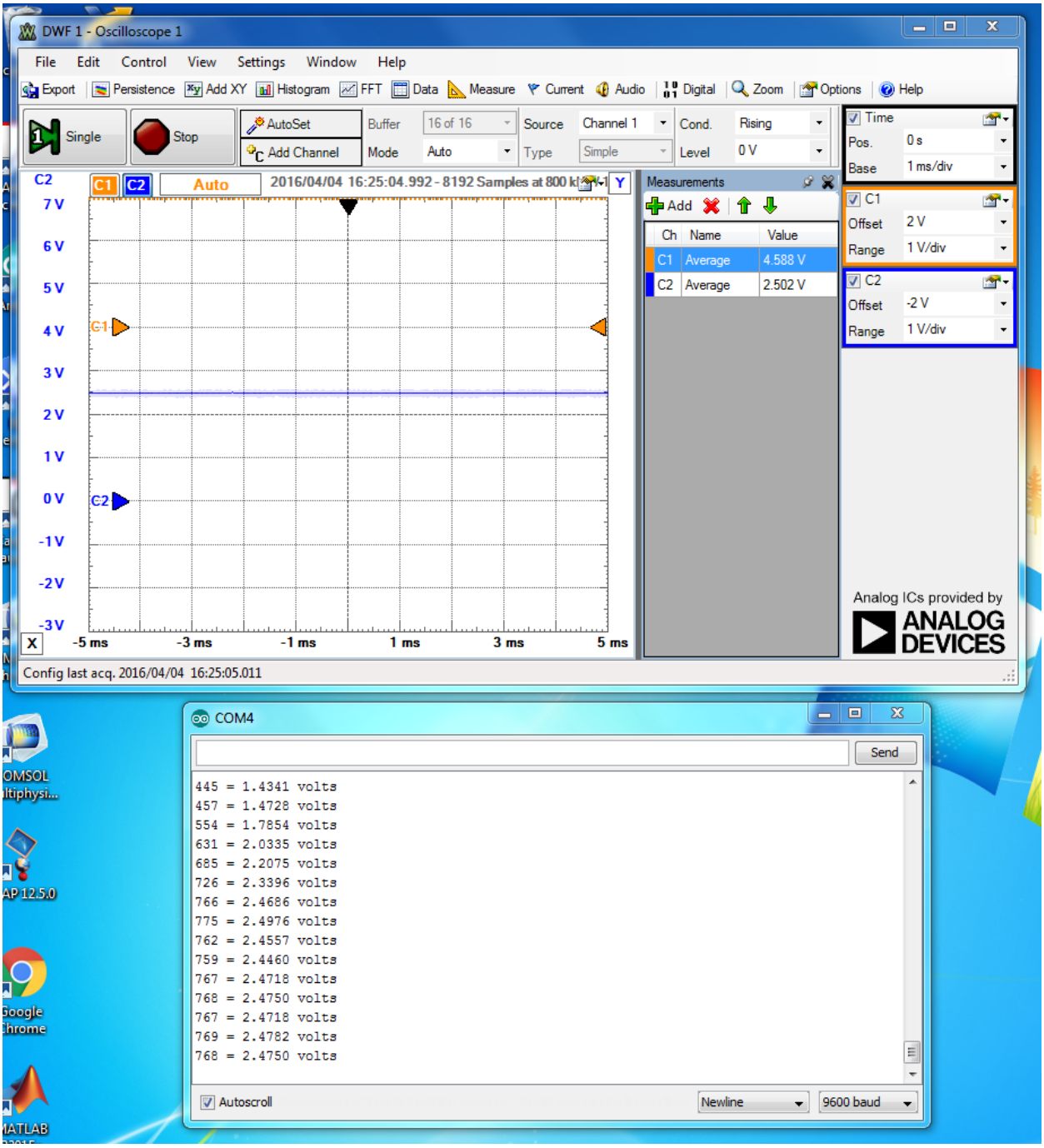
Picture 3: 5.0 Volt Power Supply: 3 Volt Potentiometer Reading on Analog Discovery and Arduino

Picture 4: Voltage Readings from the Analog Discovery and Arduino in an Excel Document

Question 1: The percent of error that was measured between the Arduino(Computed reading) and the Analog Discovery(Calculated reading) , limited to 5.0 Volts, was 5.25% overall.


DWF 1 - Oscilloscope 1
File Edit Control View Settings Window Help
Export Persistence Add XY Histogram FFT Data Measure Current Audio Digital Zoom Options Help
Single Stop AutoSet Add Channel
Buffer 16 of 16 Mode Auto
Source Channel 1 Type Simple
Cond. Rising Level 0 V
Time Pos. 0 s Base 1 ms/div
C1 Offset 2 V Range 1 V/div
C2 Offset -2 V Range 1 V/div
C2
C1 C2 Auto 2016/04/04 16:25:39.546 - 8192 Samples at 800 kS/s
7 V 6 V 5 V 4 V 3 V 2 V 1 V 0 V -1 V -2 V -3 V
C1 C2
-5 ms -3 ms -1 ms 1 ms 3 ms 5 ms
Measurements
Add
Ch Name Value
C1 Average 4.59 V
C2 Average 3.004 V
Analog ICs provided by
ANALOG DEVICES
Config last acq. 2016/04/04 16:25:39.564
COM4
Send
767 = 2.4718 volts
763 = 2.4589 volts
826 = 2.6619 volts
859 = 2.7683 volts
949 = 3.0583 volts
923 = 2.9745 volts
931 = 3.0003 volts
928 = 2.9906 volts
929 = 2.9938 volts
923 = 2.9745 volts
925 = 2.9810 volts
925 = 2.9810 volts
924 = 2.9777 volts
923 = 2.9745 volts
922 = 2.9713 volts
Autoscroll
Newline
9600 baud
COMSOL Multiphysi...
AP 12.5.0
Google Chrome
MATLAB


DWF 1 - Oscilloscope 1
File Edit Control View Settings Window Help
Export Persistence Add XY Histogram FFT Data Measure Current Audio Digital Zoom Options Help
Single Stop AutoSet Add Channel
Buffer 16 of 16 Mode Auto
Source Channel 1 Type Simple
Cond. Rising Level 0 V
Time Pos. 0 s Base 1 ms/div
C1 Offset 2 V Range 1 V/div
C2 Offset -2 V Range 1 V/div
C2 C1 C2 Auto 2016/04/04 16:24:25.243 - 8192 Samples at 800 kS/s
7 V 6 V 5 V 4 V 3 V 2 V 1 V 0 V -1 V -2 V -3 V
-5 ms -3 ms -1 ms 1 ms 3 ms 5 ms
Measurements
Add
Ch Name Value
C1 Average 4.592 V
C2 Average 1.5 V
Analog ICs provided by ANALOG DEVICES
Config last acq. 2016/04/04 16:24:25.263
COM4
Send
457 = 1.4728 volts
458 = 1.4760 volts
458 = 1.4760 volts
459 = 1.4792 volts
458 = 1.4760 volts
458 = 1.4760 volts
460 = 1.4824 volts
458 = 1.4760 volts
463 = 1.4921 volts
461 = 1.4856 volts
459 = 1.4792 volts
459 = 1.4792 volts
458 = 1.4760 volts
457 = 1.4728 volts
463 = 1.4921 volts
Autoscroll
Newline
9600 baud



	3.3 volts setting			
		1.5 volts	2.5 volts	3.0 volts
Analog Discovery Measurement:		1.496 volts	2.512 volts	3.004 volts
Arduino Serial Measurement:		1.4792 volts	2.4943 volts	2.9745 volts

Picture 5: 3.3 Volt Power Supply: 1.5 Volt Potentiometer Reading on Analog Discovery and Arduino

Picture 6: 3.3 Volt Power Supply: 2.5 Volt Potentiometer Reading on Analog Discovery and Arduino

Picture 7: 3.3 Volt Power Supply: 3 Volt Potentiometer Reading on Analog Discovery and Arduino

Picture 8: Voltage Readings from the Analog Discovery and Arduino in an Excel Document

Question 2: The percent of error that was measured between the Arduino(Computed reading) and the Analog Discovery(Calculated reading), using the 3.3 Volts reference, was 0.58% overall. In comparison to the error for the 5.0 Volt reference, the 3.3 Volts reference was more accurate by over 4%.

Question 3: The relative errors are very consistent between the various values measured, even when the Potentiometer is being changed at a rapid pace.

CODE:

Added 3.3 Volt Reference Code

```
void setup() {
  Serial.begin(9600);
  analogReference(EXTERNAL);

}

unsigned long oldMillis = 0;

void loop() {
  unsigned long currentMillis = millis();
  int interval = 500;
  int SampleFromADC;

  if (millis() - oldMillis >= interval) {
    SampleFromADC = analogRead(0);
    analogWrite (10, SampleFromADC/4);
    Serial.print(SampleFromADC);
    Serial.print( " = " );
    Serial.print( 3.3 5.0 * SampleFromADC / 1024.0, 4 );
    Serial.println( " volts " );
    oldMillis += interval;

  }
}
```