

Ultrasonic Distance Measurement using the TLV320AIC3268 miniDSP CODEC TIDA-00403

TI Design Test Data

The test setup for this design consisted of the TLV320AIC3268 CODEC setup as described in the design guide with GPIO1 and GPIO 2 monitored by an oscilloscope. The coefficients in the process flow were chosen for a medium measurement range from around 15 inches to 45 inches. The oscilloscope was set to monitor the time of flight acting as a host MCU and determining the time between the transmitted and reflected ultrasonic burst.

A flat planer object was set at known distances away from the ultrasonic transducers and the measured distance based on the time of flight was then compared to the known actual distance.

Test Data

Actual Distance (in)	Time of Flight	Measured Distance	Delta	Measured - Cal Factor	% Error
34	0.00563	38.17461113	4.175	34.100	0.294
32	0.00528	35.8014115	3.801	31.727	-0.854
28	0.00471	31.9364864	3.936	27.862	-0.493
24	0.00415	28.13936699	4.139	24.065	0.270
19	0.00341	23.12174493	4.122	19.047	0.248
16	0.00299	20.27390538	4.274	16.199	1.246

Speed of Sound (20C) 13561.14 in/S
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Avg Delta: (Calibration Factor)	4.07458772
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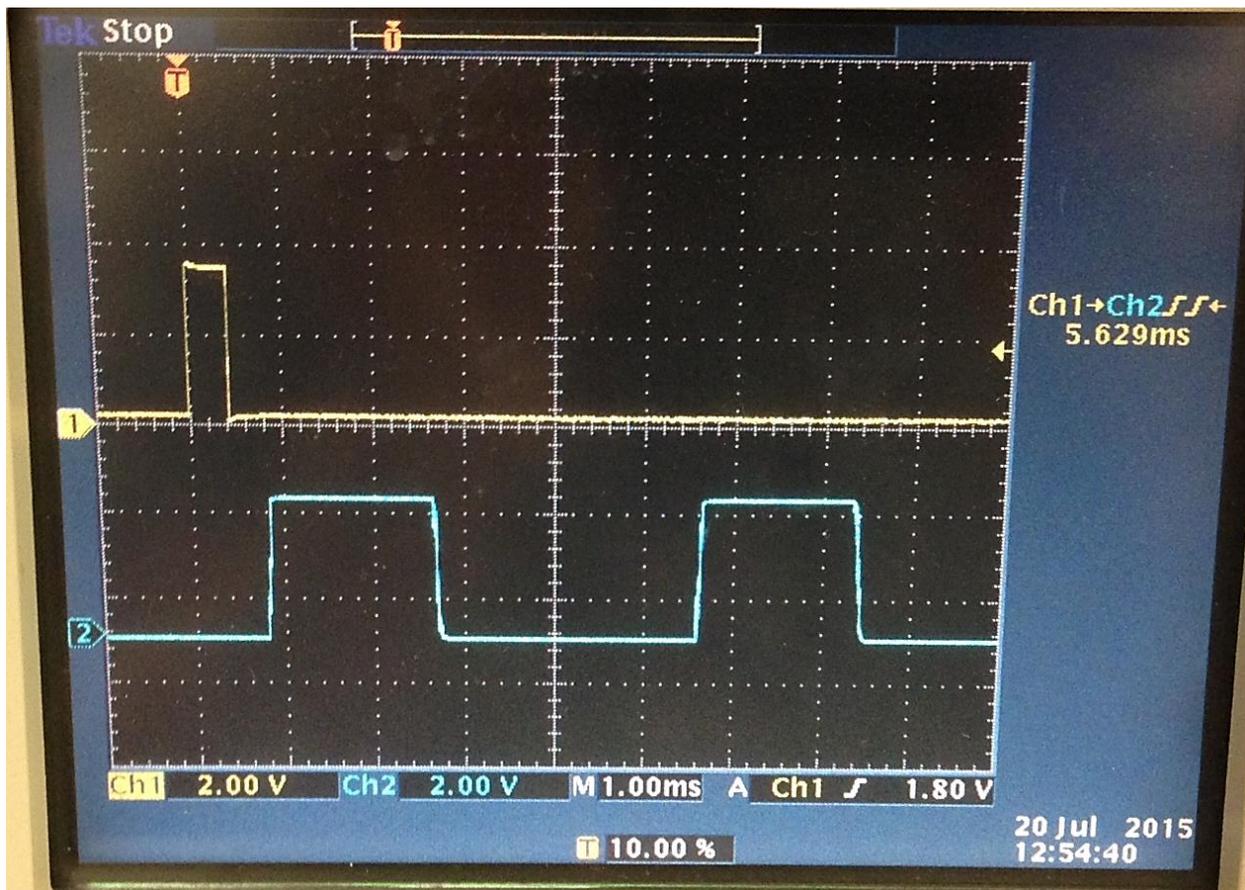
From the test data, a delta between the actual distance and the measured distance was observed. This was not unexpected due to timing delays in the CODEC processing as well as an assumed speed of sound at 20 degrees Celsius.

Since this delta should be a constant, it can be used as a calibration factor for the measurements. First, an average delta was found for the measurement set and then this calibration factor was subtracted from the measured distance. The percent error was then calculated between the calibration corrected data and the actual known distance.

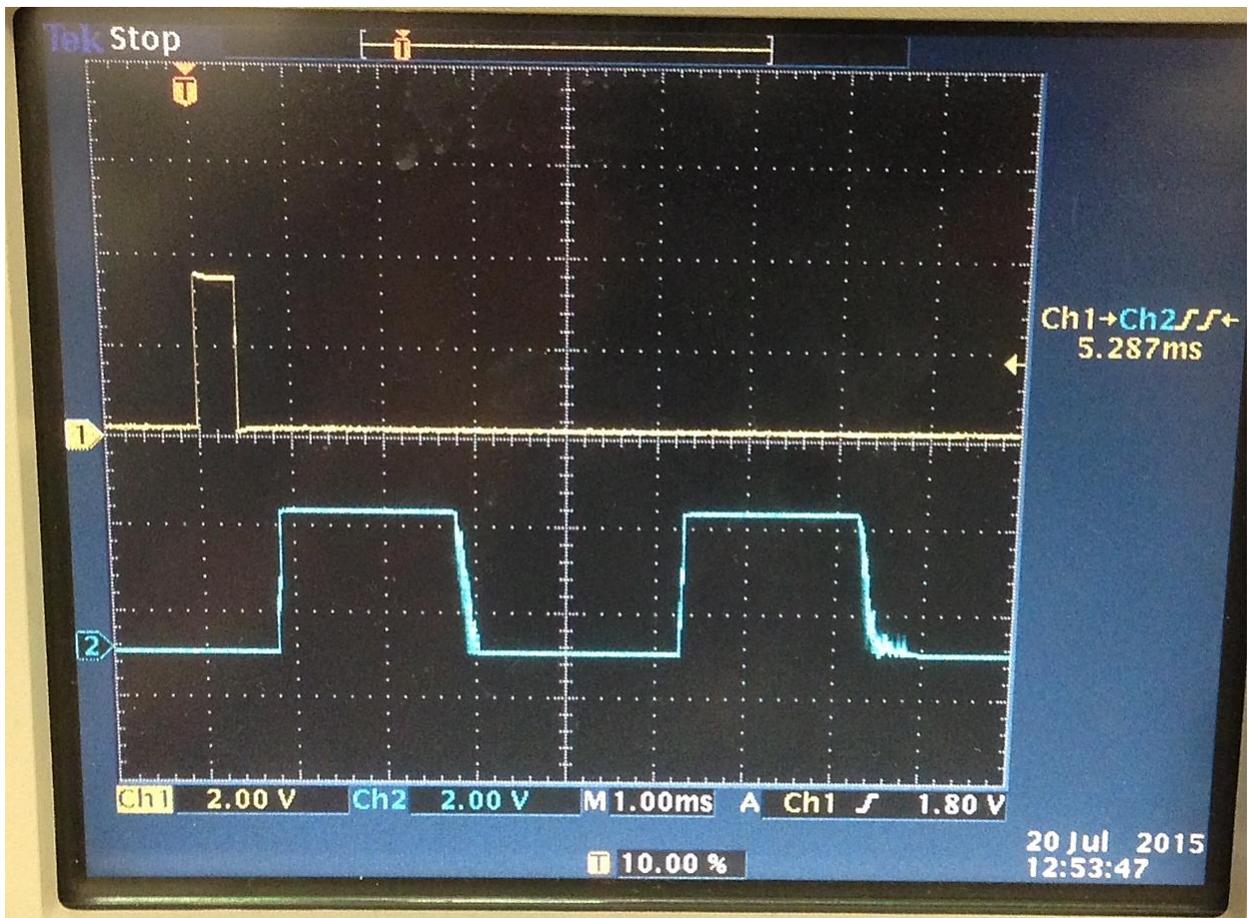
Very good results were achieved. It can be expected that averaging a few samples of the measured time of flight would result in more accurate data and a better calibration factor for even more accuracy.

For very tight tolerances, a precision test jig should be used with very precise calibrated distances since the resolution is very high.

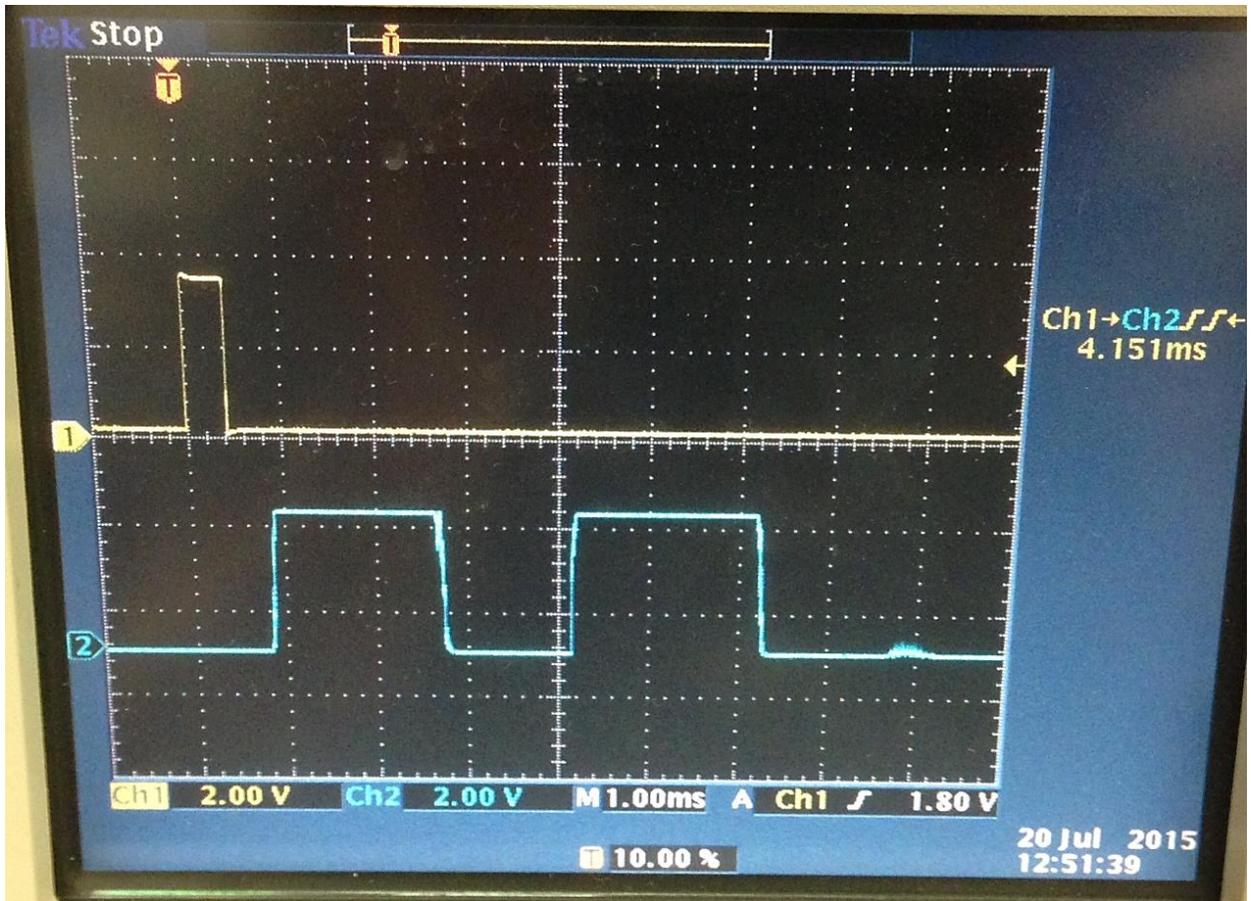
Oscilloscope Images



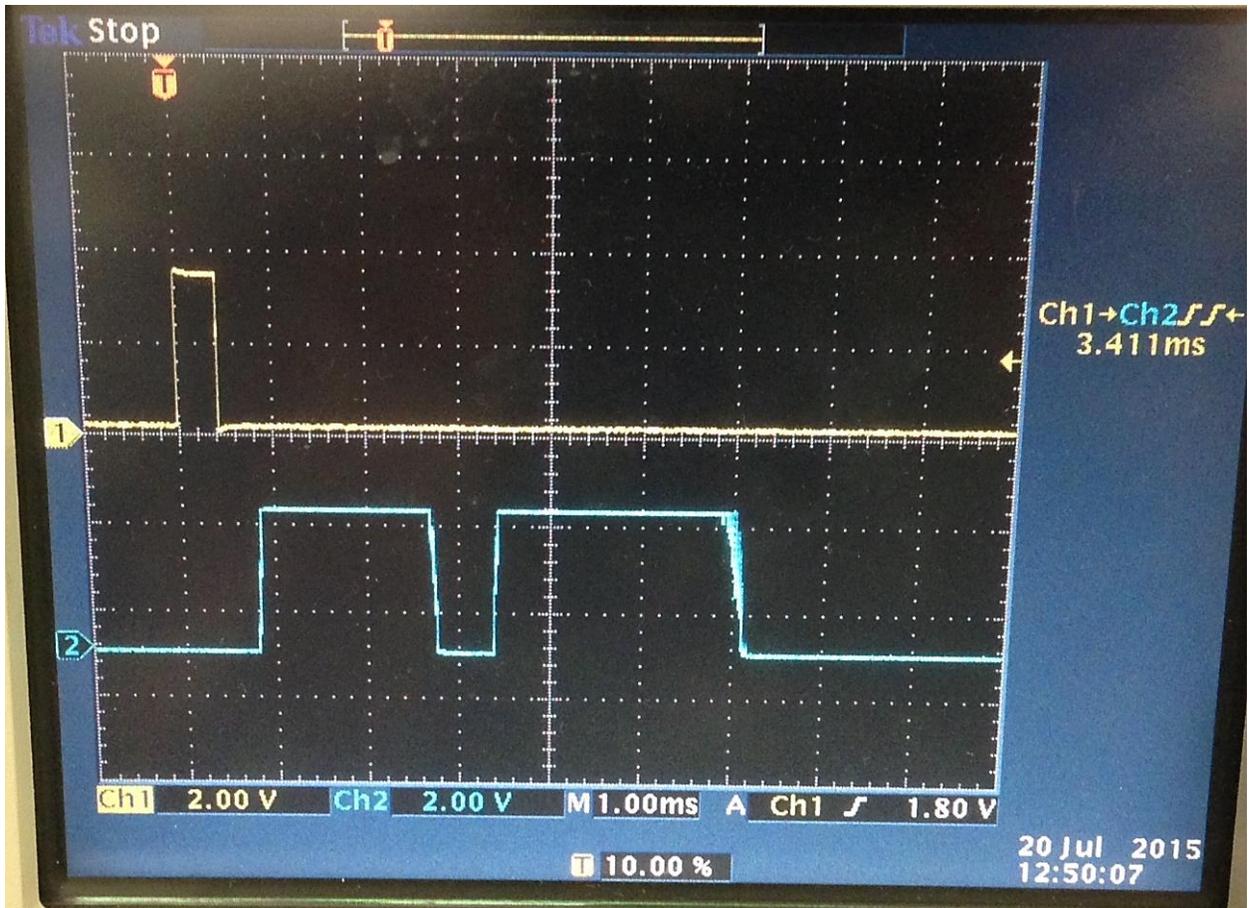
34 Inches



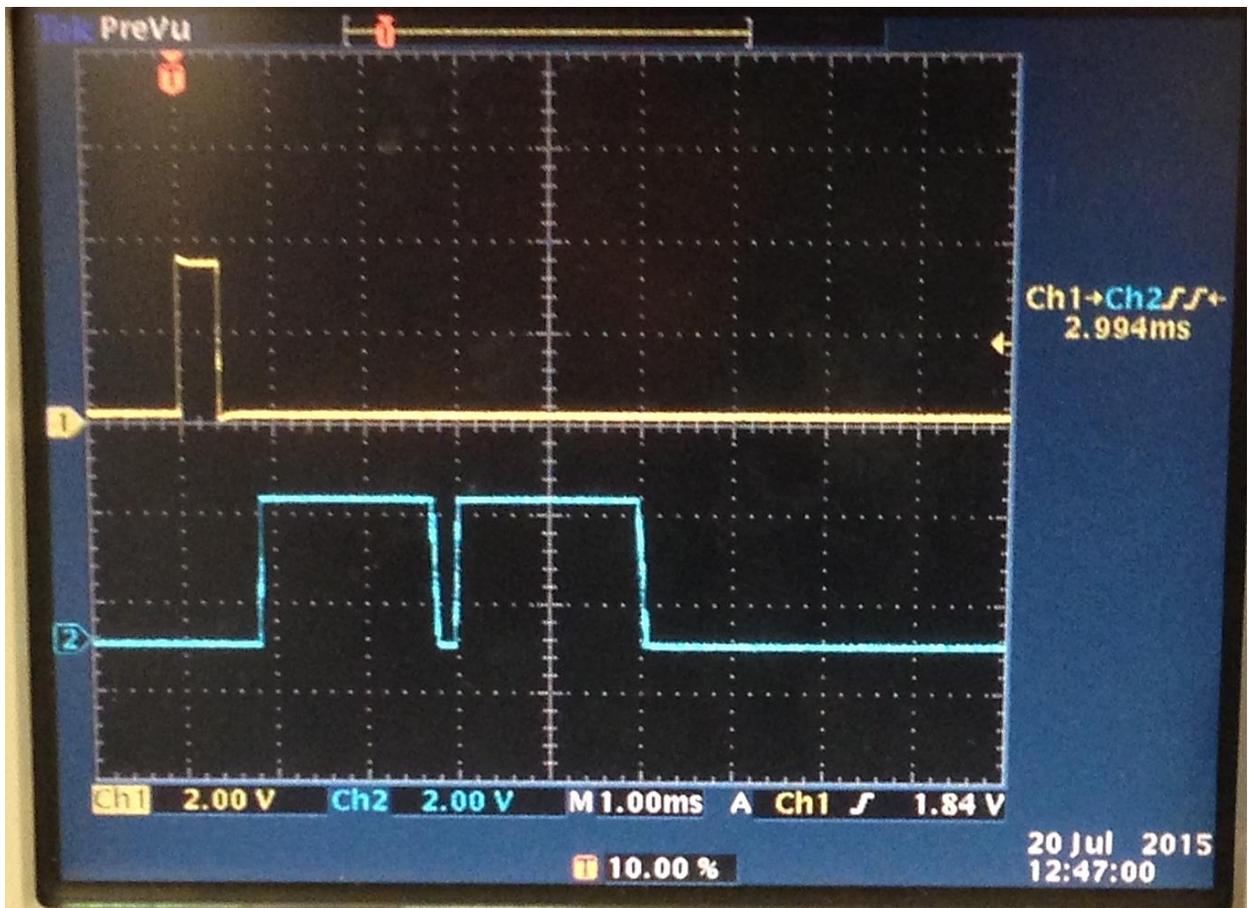
32 Inches



24 Inches



19 Inches



16 Inches

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