BCD Counter

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June 17, 2009

Abstract

Designing a simple, but human friendly digital counter can present several problems for an Engineer to overcome. Here a circuit is designed around discrete logic ICs, 7-segment displays and a rotary telephone dial to explore these issues.

1 Introduction

Traditionally digital circuits count in binary, a numbering system foreign to the average person. Egineers are required to create solutions in software or hardware to convert the binary to decimal, or base ten, a system familiar and useful to the everyday person. However, a third option exists: counting in binary coded decimal.

A digital counter was designed using TTL logic chips, a rotary telephone dial as an input and a pair of 7-segment displays for output to tackle this, and few other peripheral digital design issues, for the purpose of hands-on-learning.

2 Design Challenges

2.1 Roll-Your-Own Carry

Table 1 or in Figure 1, blah blah blah.

$$V_{pin} = Vcc[1 - e^{(-t/\tau)}] \tag{1}$$

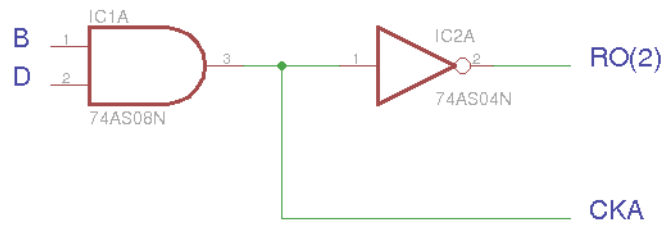| D	C	B	A	X
0	0	0	0	0
0	0	0	1	0
	...			0
1	0	0	1	0
1	0	1	0	1

Table 1: Binary greater than nine truth table.

Figure 1: Resulting logic from truth table.

$$\tau = RC = 10k\Omega(\underbrace{C_1 \parallel C_2}_{20nF}) = 5ms \tag{2}$$