

Laboratory Session 3 – The 7-Segment LED

Reminder: The meeting times and places for the two lectures of October 25/26 are as follows:

	October 25, 2005	October 26, 2005
Section 1	ECE Lab: Barton 123	Lecture: Shaffer 2
Section 2	Lecture: Shaffer 2	ECE Lab: Barton 123

For the lab section, you will need to find a partner, as there are only 20 stations, and there are roughly 30 of you in each section.

Your name: _____ **Your partner's name:** _____

Materials:

- | | |
|--------------------------------------|---------------|
| 7-segment LED (common cathode) | 4 switches |
| BCD to 7-segment decoder (7447 chip) | Protoboard |
| 7 inverters (two 7404 chips) | Wires |
| 7 470 Ω resistors | Wire Stripper |

Introduction:

A huge language barrier separates humans from computers. Sure some people, like students like yourself, can go in and measure voltages and certain points to see what's going on, but to most people this isn't possible. How can computers communicate with people? A popular form of communication is the 7-segment LED. You've seen them on stereos, VCR's, clocks, everywhere. This visual display communicates information from the computer to a person, transforming 1's and 0's into decimal numbers.

In this lab we will build a tool to convert binary numbers into visible digits using a 7447 BCD decoder chip. This chip simply converts a binary input into a form the 7-segment can interpret. The device pinouts in the following figure are a physical view of the chips. A pinout shows the physical pin that each input or output is assigned to.

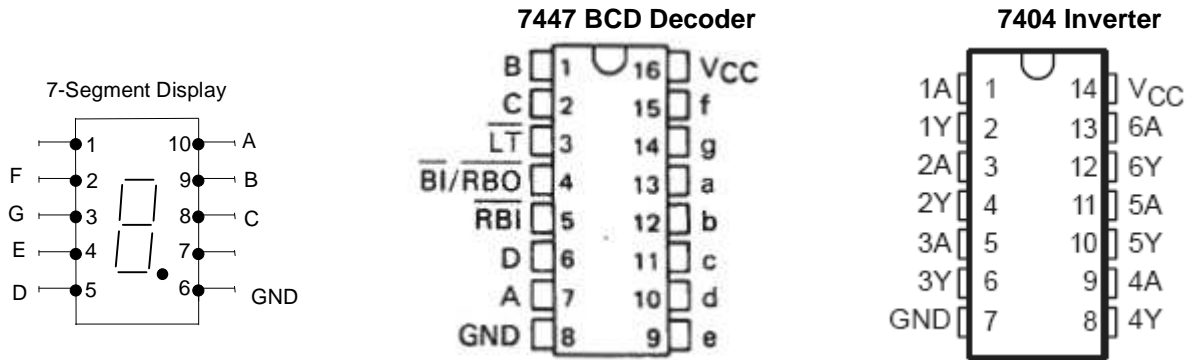


Figure 1 – Device Pinout Diagrams

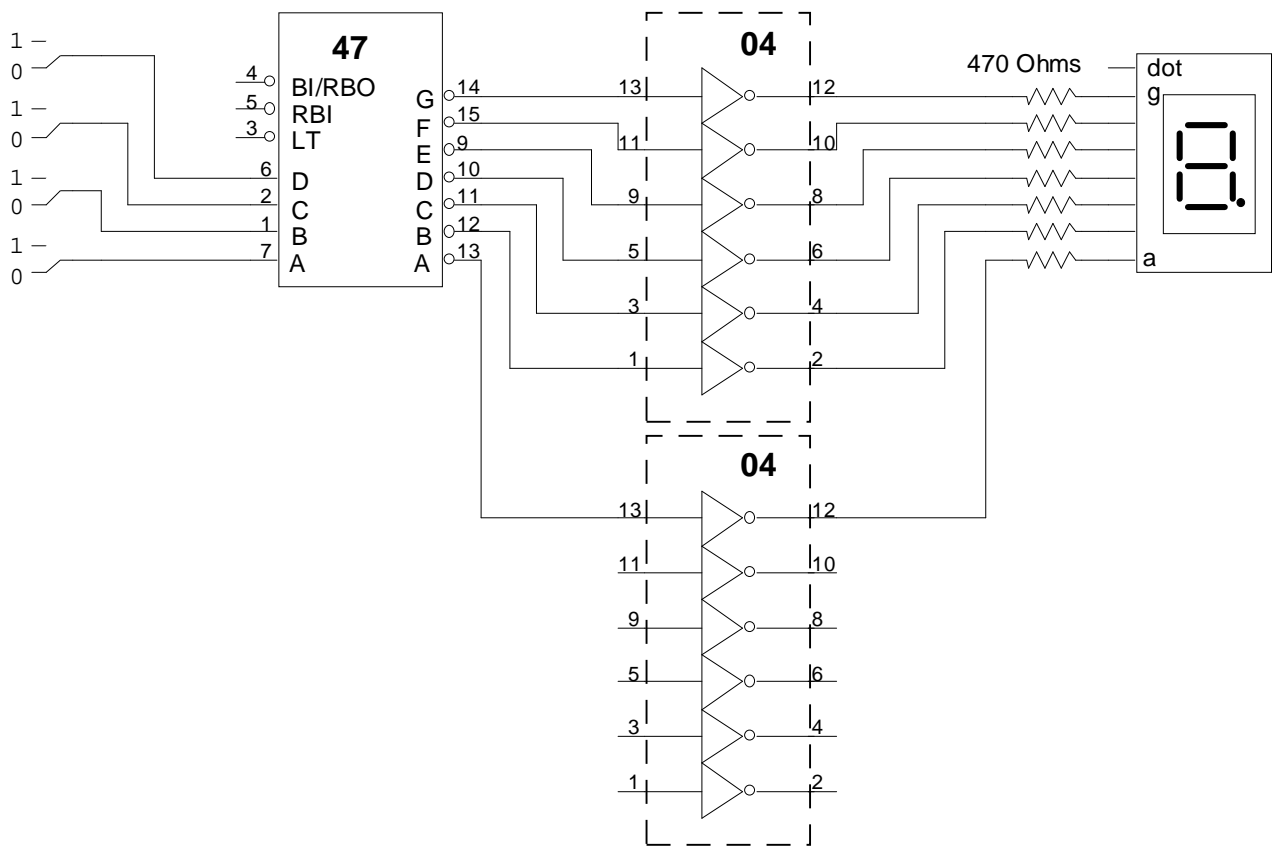
1. Connect VDD (+5V) and GND (0V) for each of the chips.
2. The input is a 4-digit binary number, ABCD, where A is the MSB (Most Significant Bit) and D is the LSB (Least Significant Bit). Connect A, B, C, and D of the 7447 chip to the switches on the board. A switch simply alternates between HI and LO when it is flipped. Leave LT, BI/RBO, and RBI unconnected.

- The outputs of the chip need to be inverted before going into the 7-segment display. Connect the outputs from the 7447 BCD Decoder to the corresponding 7-Segment display pins through the 7404 inverter. For example, connect the 'a' output of the 7447 (pin 13) to '1A' of the 7404 (pin 1). Then connect '1Y' of the 7404 (pin 2) to 'A' of the 7-Segment display (pin 10). Do the same with the other letters. Note that you will need two 7404 inverter chips.

Use the chip information above to help you build your circuit. The full schematic shown below shows all the connections between chips.

- Now you should be able to make a binary pattern out of the four switches on the board and see the decimal digit displayed on the 7-segment display. Test all of the ten numerical digits to make sure everything is working properly.

Figure 2 - Binary to Decimal/7-Segment LED Circuit Schematic



Instructor's initials: _____