

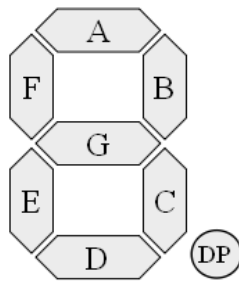
TECH 4234

Lab #1

7-Seg LED Driver

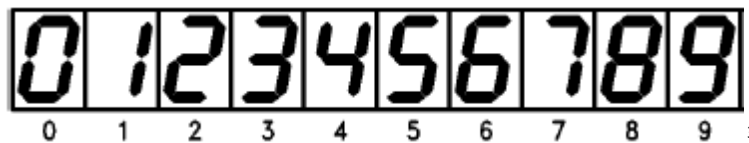
Background:

If you recall from TECH 3232, seven segment displays are commonly used in calculators to display each decimal digit. Each segment of a digit is controlled separately, and when all seven of the segments are on, the number 8 is displayed. The top segment of the display (called segment A) comes on when displaying the numbers 0, 2, 3, 5, 6, 7,8, 9.¹



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You can see how each number is formed in the table below:



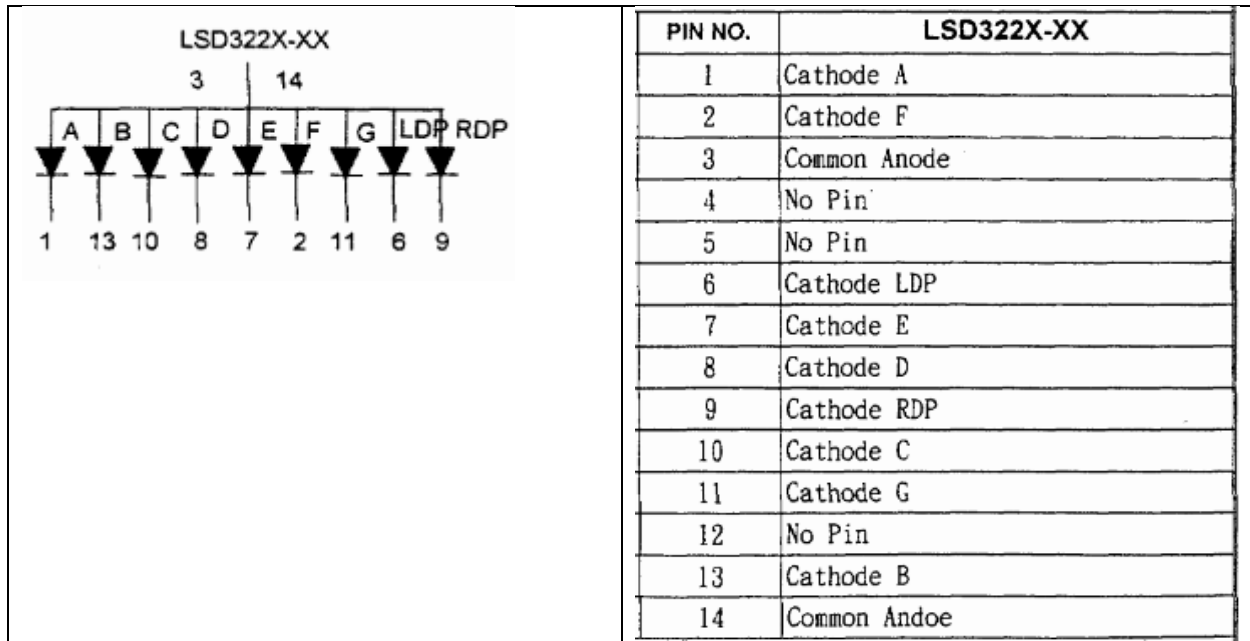
We will use a LSD3221 7-Seg display⁴:

¹ Digital Electronics, William Kleitz Prentice Hall 2006

² http://upload.wikimedia.org/wikipedia/commons/0/02/7_segment_display_labeled.svg

³ http://www.datasheetcatalog.org/datasheets/120/375650_DS.pdf

⁴ From [datasheet](#)



To prevent the LED from burning out, we will need to put a 220Ω resistor in line between the output pin and the Cathode of the LED segments.

C Programming Review: Review the following C concepts:

- [Variables](#)
- [Arrays](#)
- [For Loops](#)

Assignment: Create the necessary hardware and software to display digits 0-9 on the LED, displaying each digit for 1 second. The program should return to 0 after 9 is displayed and repeat indefinitely. For full marks, use an array and for loop to accomplish the task.

Procedure: Wire up the 7-seg so that they connected to PORT D on the Atmega328P IC so that segment A is on PortD0 and Seg G is on PORTD6. Remember to take each output line through a 220Ω resistor, or you could burn out the LED. You will need to connect one of the Common Anode pins (pin 3 or 14) of the LCD to +5v (as shown in the diagram above).

Note: since this is a COMMON ANODE device, PORTD will be supplying a path to ground to turn on the LED (output of 0 will turn on the LED, output of 1 will turn off the LED).

Now determine the binary pattern to create each digit to be displayed (0-9) and put the binary pattern in the table below:

	nc	g	f	e	d	c	b	a	
Digit (dec)	PortD 7	PortD 6	PortD 5	PortD 4	PortD 3	PortD 2	PortD 1	PortD 0	Hex Value
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									

The hex values (in the last column) can be stored in an array and used to output to the port to display the corresponding digit.

Now create the program in Atmel Studio 7 using the following steps:

- 1) Open Atmel Studio
- 2) File | New | Atmel Start Project
- 3) Select the Atmega328p-PU and the IC (best to use "Filter on device..." and type in 328p). We will NOT be adding any drivers to this project, so you can hit the "Create New Project" button.
- 4) On the next screen click on the "gear" in the CPU box and then scroll down and change the Input Clock Frequency from 8000000 to 16000000 (this is due to the Arduino board using an external 16MHz clock instead of the built in 8MHZ clock on the IC). Then click on Generate Project.
- 5) In the solution explorer, find and click on main.c (in utils) to start editing code.

When finished, demonstrate your code to the instructor. Submit a .zip file of the entire project (default location is under documents/atmel studio/7.0/name_of_project) via the online submission system.