

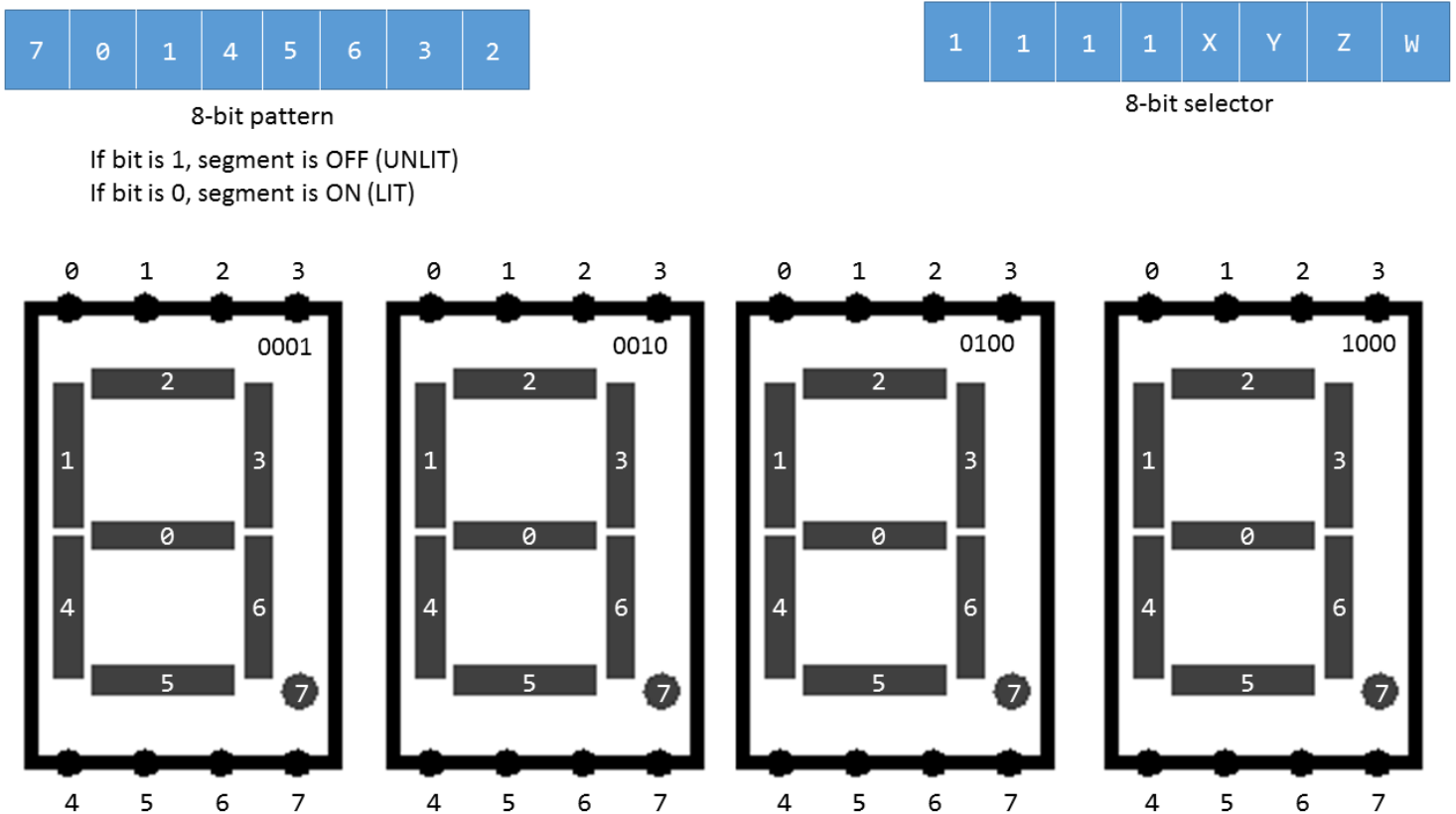
# Lab 5

Published ⋮

Required lab tools: Arduino and Arduino IDE

## [Step 1: Using shift registers to drive a 7-segment display]

1. The Arduino contains 4x 7-segment displays to show information to the user. This is implemented using two "shift registers"
2. The following picture shows how the four 7-segment displays are laid out in the Arduino:



3. You will see that there are eight pins connecting to each 7-segment display (+1 for the decimal point). If the pin is driven HIGH (logical 1), the segment turns OFF. This may seem backwards, but there is a reason they do it this way.

4. Remember that there are two "shift registers" that connect all four displays. One shift register determines which of the 8 pins are set to 0 or 1. You can see the layout of this 8-bit register in the upper-left corner of the picture. The other shift register controls which 7-segment display to "select". The upper-right corner of the picture depicts how to select a seven segment display. In the upper-right corner of the 7-segment display is a 4-bit number. This is what you put in the XYZW to select a 7-segment display to write a number to. For example, if I want to select the leftmost 7-segment display, the binary string would be 0b11110001 or 0xf1.

5. Download [lab5stud.ino](#)

## [Step 2: Completing lab5stud]

1. Open lab5stud.ino using the Arduino IDE
2. You will notice that two arrays need to be completed: SEGMENTS[] and DIGITS[]
3. The SEGMENTS[] array contains the appropriate 8-bit binary value to select a segment. For example, if I want to write to the first segment (segment 0), then I would write to SEGMENTS[0].
4. Now, complete the DIGITS[] array. You'll notice that digits 0 and 1 are done for you. You need to complete 2-9 by using the picture above and the appropriate binary values.
5. Complete the SetupPins() function. This function will set the pin mode of CLK\_DIO, LATCH\_DIO, and DATA\_DIO all to OUTPUT. This allows us to write values to those pins rather than read from them. You can use the pinMode() function to do this.
6. Complete the SetSegment() function. This function takes two parameters: segment and digit. The steps to write to the 7-segment displays are already commented in the function itself.
7. Upload your program and test your code by using the "Serial Monitor". Entering a value, such as 1100 should put 1100 on the Arduino's display. Then, test your digits by typing something like 9876 and see if the Arduino displays 9876.

## [Step 3: Counting]

1. SAVE your project from step 2. If you can't get this working correctly, you still can earn credit for the previous steps.
2. You now have all of the functions required to create a counter.
3. Using SetSegment and loop(), have your 7-segment display count from 0000 up to 9999. When the value reaches 9999, reset back to 0000 and continue to count up. Then, put a delay of 10ms by using the delay() function *delay(10)*.
4. You will need to erase the loop() function and start over. However, you can use the loop() function's contents to help you solve this step.
5. Upload your file and test using the Arduino. The numbers should count from 0000 to 0001 to 0002 and so forth.

## [You are finished with this lab!]

Submit your .ino file as a .txt file. For example, lab5.ino will be uploaded as lab5.txt. This is because Canvas has trouble interpreting the extension .ino.

Points 100

Submitting a file upload

File Types txt

<b>Due</b>	<b>For</b>	<b>Available from</b>	<b>Until</b>
Sep 26, 2017	Everyone else	Sep 22, 2017 at 7:58am	Sep 26, 2017 at 11:59pm
Nov 20, 2017 at 7:45pm	1 student	-	Nov 20, 2017 at 7:45pm

## Lab 5

Criteria	Ratings						Pts
7-segment Display Counting (step 3)	<b>25.0 pts</b> <b>Full Marks</b>	<b>20.0 pts</b> <b>Minor Problems</b>	<b>12.0 pts</b> <b>Some Problems</b>	<b>5.0 pts</b> <b>More Problems</b>	<b>2.0 pts</b> <b>Major Problems</b>	<b>0.0 pts</b> <b>No Marks</b>	25.0 pts
Segments	<b>20.0 pts</b> <b>All 4 segments</b>	<b>11.0 pts</b> <b>3/4 segments</b>	<b>6.0 pts</b> <b>2/4 segments</b>	<b>3.0 pts</b> <b>1/4 segments</b>	<b>0.0 pts</b> <b>No Marks</b>	20.0 pts	
Digits	<b>25.0 pts</b> <b>All 10 digits</b>	<b>20.0 pts</b> <b>8 digits</b>	<b>17.0 pts</b> <b>5 digits</b>	<b>5.0 pts</b> <b>3 digits</b>	<b>0.0 pts</b> <b>No Marks</b>	25.0 pts	
SetupPins()	<b>20.0 pts</b> <b>Full Marks</b>			<b>0.0 pts</b> <b>No Marks</b>		20.0 pts	
SetSegment() -Student only used digitalWrite - shiftOut is NOT permitted!	<b>20.0 pts</b> <b>Full Marks</b>			<b>0.0 pts</b> <b>No Marks</b>		20.0 pts	
<b>Total Points: 110.0</b>							

