

# DIG225-01

## Decoders

A MultiSim Lab

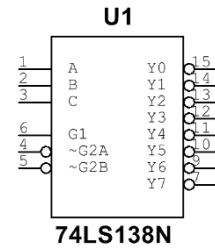
Student Name: \_\_\_\_\_ Class: \_\_\_\_\_

**Objectives:**

- To experiment with decoders.

**Procedure:**

1. Observe the logic symbol for the 74LS138 (called a 1-of-8 or a 3-to-8 decoder) shown at right.



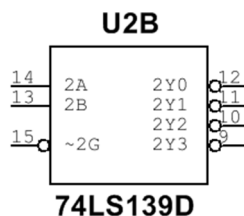
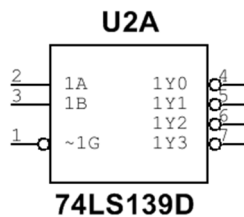
2. Complete the truth table for the 74LS138 (assuming it is enabled.)

Inputs			Outputs							
C	B	A	Y <sub>0</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	Y <sub>7</sub>
0	0	0								
0	0	1								
0	1	0								
0	1	1								
1	0	0								
1	0	1								
1	1	0								
1	1	1								

3. Using basic gates (AND, OR, NOT) construct a device functionally equivalent to the 74LS138 in MultiSim (including the enable inputs.) Add switches so you can toggle the select inputs, and indicators so you can observe the outputs.
4. Simulate your circuit. If it works correctly, demonstrate it to an instructor.

**Instructor Demo:** \_\_\_\_\_

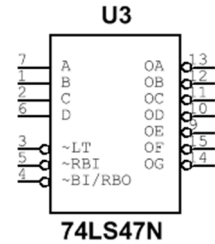
5. The following diagram shows the two 1-of-4 (also called 2-to-4) decoders inside a 74LS139. Illustrate how you would connect the two to make a 1-of-8 decoder.



6. Construct your circuit in MultiSim. Add switches so you can toggle the select inputs, and indicators so you can observe the outputs.
7. Simulate your circuit. If it works correctly, demonstrate it to an instructor.

**Instructor Demo:** \_\_\_\_\_

8. Observe the symbol for the 74LS47 shown at right. This is but one of the ICs which is a BCD-to-7-Segment decoder.



9. Observe the MultiSim depiction of a common anode 7-segment display shown at left.

10. Use these symbols to construct a complete BCD-to-7-Segment circuit in MultiSim. Add switches as necessary to operate the circuit.
11. Simulate your circuit. If it works correctly, demonstrate it to an instructor.

**Instructor Demo:** \_\_\_\_\_