

Experiment # 6: Design circuit using encoder & decoder.

Objective:

- To get familiarized with **74ls138 [decoder]; 74ls148 [encoder]**
- To gain experience working with practical circuits.

Required Components:

1. IC 74138
2. IC 74148

Theory:

Enable Pin: An enable pin is a special input in a digital circuit that works like an ON/OFF switch. It controls whether the circuit or a part of it is active or inactive.

Active Low Circuit: Active-low means the circuit turns on or performs its function when the input is 0 (low voltage).

For example, if an enable pin is active-low, it means you must give a 0 (low voltage) to turn the circuit ON.

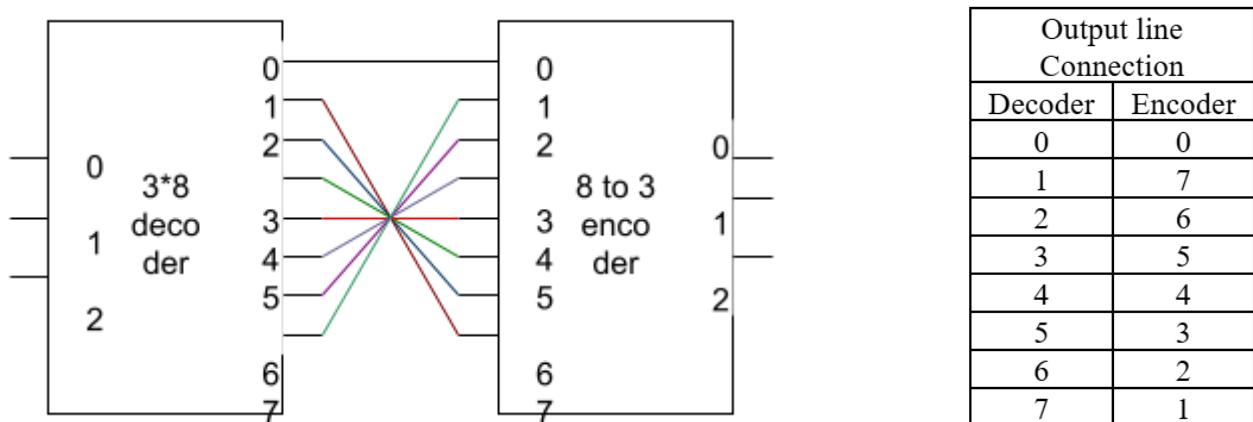
Task - 1: Design a circuit that outputs the 2's complement of a 3-bit number using encoder & decoder.

Truth Table:

| Inputs | | | | Expected Outputs | | | | Active Low Outputs | | |
|---------|---|---|---|------------------|----------------|----------------|----------------|--------------------|----|----|
| Minterm | C | B | A | Minterm | D ₂ | D ₁ | D ₀ | D2 | D1 | D0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 7 | 1 | 1 | 1 | 0 | 0 | 0 |
| 2 | 0 | 1 | 0 | 6 | 1 | 1 | 0 | 0 | 0 | 1 |
| 3 | 0 | 1 | 1 | 5 | 1 | 0 | 1 | 0 | 1 | 0 |
| 4 | 1 | 0 | 0 | 4 | 1 | 0 | 0 | 0 | 1 | 1 |
| 5 | 1 | 0 | 1 | 3 | 0 | 1 | 1 | 1 | 0 | 0 |
| 6 | 1 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 |
| 7 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |

Diagram:

Building a 3-bit 2's complement converter using encoder and decoder:

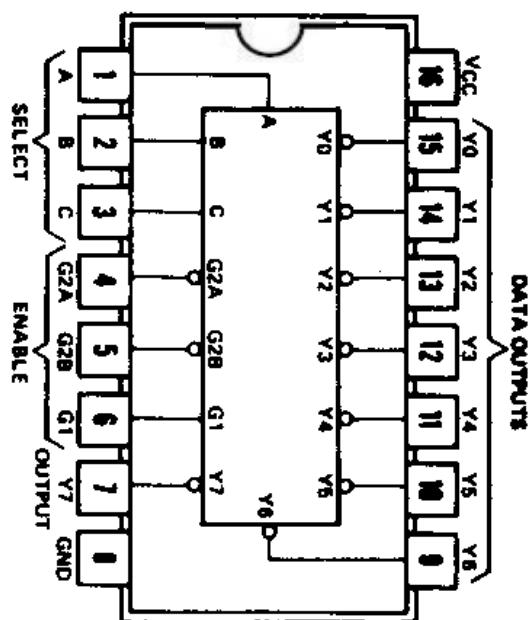


Procedure:

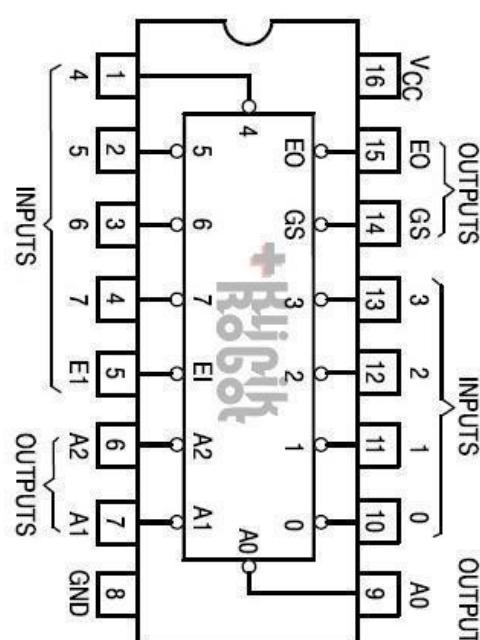
- Construct the Circuit Diagram on the breadboard.
- Remember to connect each IC's VCC pin to the "+5V" position of the DC Power Supply of the trainer board, and the GND or 0V pin to the "GND" position of the trainer board.
- Connect the inputs to the Data switches and outputs to any position of the LED Display.

Pin Diagrams of 74138 [decoder] and 74148 [encoder] ICs:

74138



74148



Report:

Your report must have the following segments:

1. Name of the Experiment.
2. Objective.
3. Required Components.
4. Experimental Setup - Draw the Circuit Diagram.
5. Results - Draw the truth table:
6. Discussions - Answer the following questions:
 - a) Draw a circuit diagram with encoder and decoder that will output the 1's complement of a 3-bit number.
 - b) Draw the circuit diagram of a half adder using encoder and decoder.
 - c) Design a BCD to Excess-6 circuit using encoder and decoder.
Note: You can only use 3x8 decoder(s), 8x3 encoder(s) and basic gate(s) if necessary.