EEE-1212: Digital Logic Design Lab

1st Year 2nd Semester
Session: 2015-2016

Experiment Number: 11

Name of the Experiment:

Implementation of 1-line-to-8-line Demultiplexer using 74LS138

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Experiment Date: 6th November 2016
Submission Date: 22th November 2016

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Experiment name:

11. Implementation of 1-line-to-8-line Demultiplexer using IC 74LS138.

Objectives:

1. Implementing the circuit of 1-line-to-8-line Demultiplexer using 74LS138.

Theory:

A multiplexer takes several inputs and transmits one of them to the output. A demultiplexer (DEMUX) performs the reverse operation. It takes a single input and distributes it over several outputs. Figure (a) shows the functional diagram for a digital demultiplexer. The large arrows for inputs and outputs can represent one or more lines. The select input code determines to which output the DATA input will be transmitted. In other words, the demultiplexer takes one input data source and selectively distributes it to 1 of N output channels just like a multiposition switch.

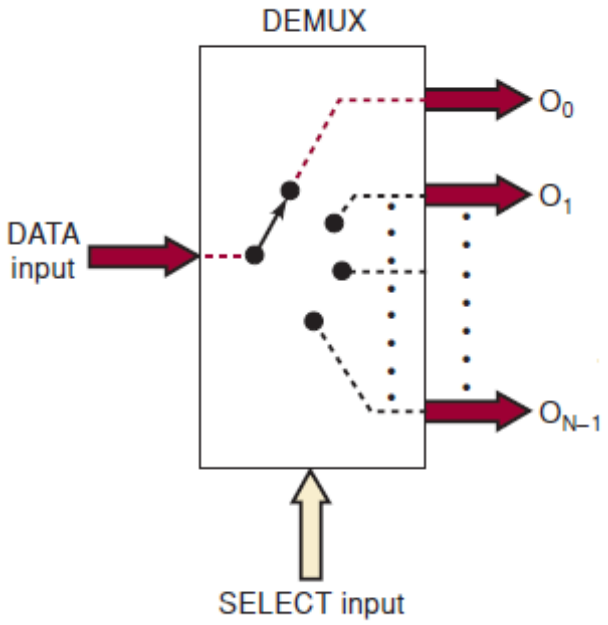

Fig (a): DEMUX

A demux of n select lines has an output of 2^n output lines. So a 1-8 line demux has 8 output lines and $\log_2(8) = 3$ select lines. The outputs are active low which means they are usually high and the data input is pulsed low. For any select input only one output will be low and the rest will be high.

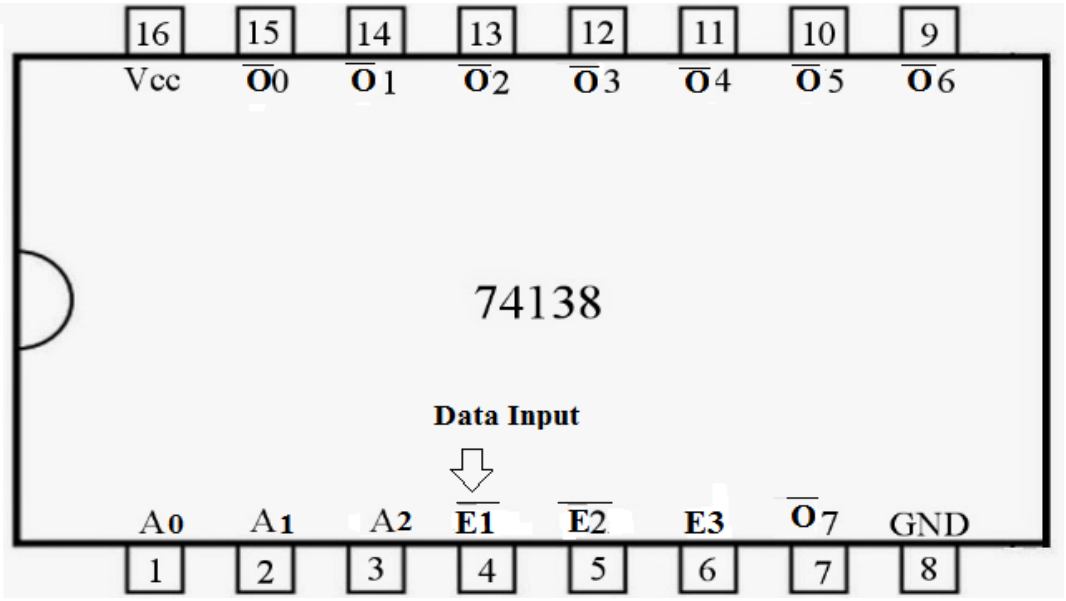

Figure 1: IC 74LS138

Instruments:

1. A Trainer Board
2. IC(s) IC-74138
3. Connecting wires.

Procedure :

1) At first we placed the integrated circuit with IC-74138 on a breadboard properly. This IC is placed across the gap in the center of the breadboard.

2) We gave biasing to the ICs with the VCC (5 volt) with pin-16 and grounded the pin-08.

3) Then we connected the inputs of the logic gate to the logic sources and its output to the logic indicator.

4) We have used TTL IC which contains 8 output pins, 3selector pins and 3 enable pins. We connected the input switches with the input pins through connecting wires according to the respective IC diagram.

5) We connected the output pin with the LED on the trainer board to get the HIGH and LOW output by the LED.

6) According to the select pins of the demultiplexer we got the output as the data input, where the LED is ON means the output is 1 (HIGH) and OFF means the output is 0 (LOW), thus, we were able to implement 1-8 line demultiplexer.

7) We observed outputs for various input combination.

Result:

SELECT CODE			OUTPUTS							
A_2	A_1	A_0	O_0	O_1	O_2	O_3	O_4	O_5	O_6	O_7
0	0	0	0	0	0	0	0	0	0	I
0	0	1	0	0	0	0	0	0	I	0
0	1	0	0	0	0	0	0	I	0	0
0	1	1	0	0	0	0	I	0	0	0
1	0	0	0	0	0	I	0	0	0	0
1	0	1	0	0	I	0	0	0	0	0
1	1	0	0	I	0	0	0	0	0	0
1	1	1	I	0	0	0	0	0	0	0

Here, I is the data input.

Discussion:

In this experiment were introduced with the demultiplexer and we had to implement 1-to-8-line demultimlexer using IC-74LS138. We constructed the circuit in the bread board using the IC's but faced some problem during the experiment. While doing the experiment, we found some inconsistencies with the trainer board. Some connection points were too tight and some were too loose. As a result we had difficulties inserting the wires and maintaining the proper connections. We also faced some technical difficulties when using trainer board. The input gates weren't working properly and the output LED was also not functioning properly. So we changed this board and started our work with another trainer board. But we figured them out and completed the experiment successfully.