**Experiment 7**

**To design and analyze the operation of 1 to 2-line multiplexer**

**Objective**

In this lab students will

* Analyze the operation of 1 to 2-line multiplexer using IC74LS157 or IC74LS158.
* Design a combinational circuit and implement it with the multiplexer.

**Components**

* IC74LS157×1 or
* IC74LS158×1
* AM2000 TRAINER
* Multimeter
* Cutter
* Single core wire
* Pair of Pliers

**Theory:**

Multiplexer is a device that has multiple inputs and a single line output. The select lines determine which input is connected to the output, and also to increase the amount of data that can be sent over a network within certain time. It is also called a data selector. For n select lines, we have 2n input lines.



**Multiplexer Types**

Multiplexers are classified into four types:

* 2-1 multiplexer (1select line)
* 4-1 multiplexer (2 select lines)
* 8-1 multiplexer (3 select lines)
* 16-1 multiplexer (4 select lines)

**IC diagram of 74LS157**

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**Truth Table**



**Procedure:**

1. Connect the AM2000 trainer to the 220V AC power supply
2. Turn on the trainer and verify the voltage of the power supply using the multimeter. It should be +5V exactly.
3. Install IC74LS157 or IC74LS158 on the trainer’s board.
4. Wire the circuit according to the diagram by consulting gate IC’s diagram.
5. Use any of the two logic switches from S2 to S9 for inputs A and B respectively.
6. For output indication use any of the LED’s from L0 to L15.
7. Supply the +5v and GND to the pins 14 and 7 of the IC respectively.
8. Test all the possible combinations of inputs and verify the output according to the truth tables of 2 to 1-line multiplexer.
9. Make truth table according to the results.

**In case of trouble:**

1. Check the power supply.
2. Check the Vcc and GND at pins 14 and 7 respectively.
3. Check all the wire connections.
4. Check the circuit wiring and remove the breaks.
5. Check the IC using truth table.

**Truth Table [5]**

|  |  |
| --- | --- |
| **Input** | **Output** |
| **Strobe** | **Select**  | **1A** | **1B** | **1Y** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
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**Exercise**

Design and analyze the 3 input XOR gate using 2 to 1 line multiplexers. [5]

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Implement the following Boolean function with 4 to 1-line multiplexer. [5]

$$F\left(A,B,C\right)=\sum\_{}^{}(1,2,5,6)$$

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Read the data sheet of IC74LS158 and mention the role of strobe input. [3]

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What are the applications of multiplexers? [3]

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Conclusion [5]

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