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***Decoder***



 A **decoder** is a combinational circuit that converts binary information from *n* inputs to exactly one output of a maximum of *2n* outputs. A 2-to-4 decoder operates according to the following truth table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A0 | D0 | D1 | D2 | D3 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 | 0 | 1 |

D0 = **A0’ A0’**

D1 = **A0’ A0**

D2 = **A0 A0’**

D3 = **A0 A0**

 The 2 bit input is called **A0** and the four outputs are called **D0, D1, D2, D3**. The output D0 is true only when the input A0 = 00, the output D1 is true only when the input A0 = 01, the output D2 is true only when the input A0 = 10, and the output D2 is true only when A0 = 11. This is that for every input it will be a uniquely output. Every instruction has a field known as *operation code* which indicates the type of operation to be realized. The decoder is the one in charge to extract the operation code in course, analyze it and emit signals to the rest of the elements. In our design, the decoder is the responsible to indicate in which of the registers the process will be written.