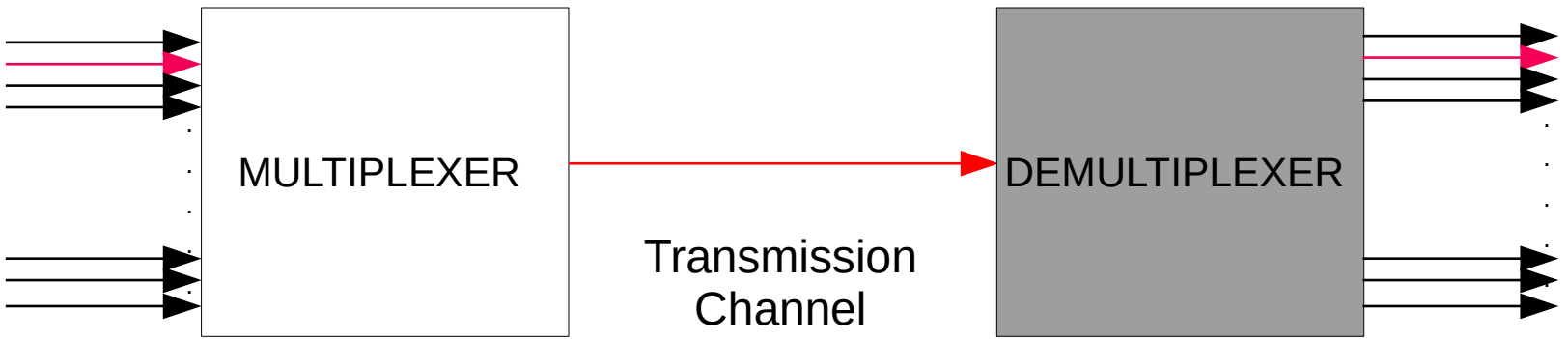
De-multiplexer

Introduction

- Combinational circuit
- Output depends only on present input(s)
- Takes a single input, and transmits it to one selected output line
- Also called **DE**MUX or *data distributor*

Introduction

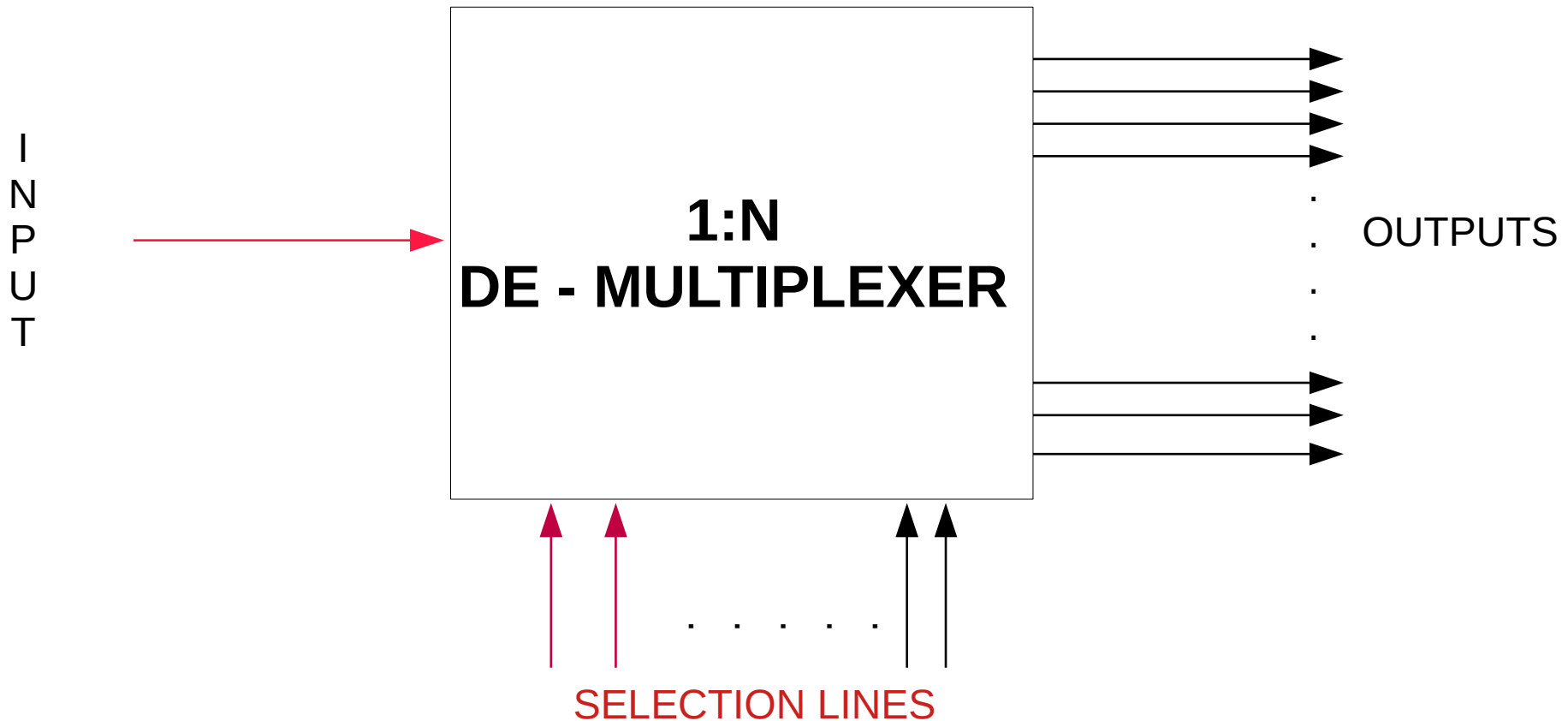


Introduction

- Can take *1* input
- Provide n outputs

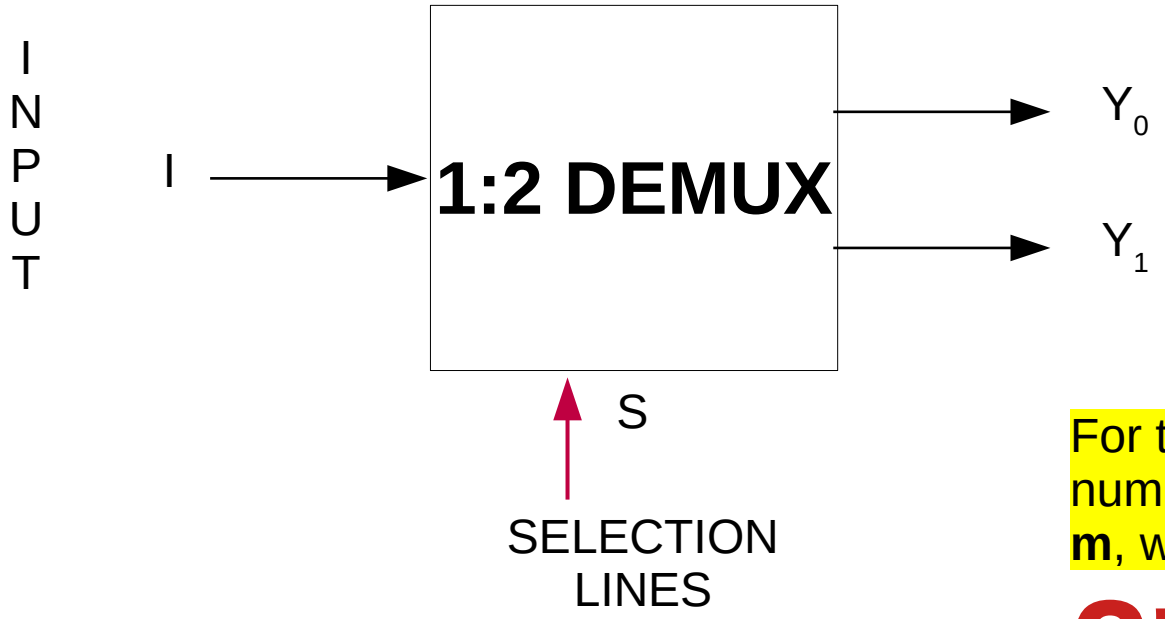
- The single input is transmitted as *one of the many possible outputs*, based on **selection**

General Block Diagram



1:2 DEMUX – Block Diagram

- 1:2 DEMUX or 1 line to 2 line DEMUX



For the 1:n DEMUX, the number of selection lines is **m**, where,

$$2^m = n$$

1:2 DEMUX

- If S = 0, $\mathbf{Y_0}$ is selected for sending I
- If S = 1, $\mathbf{Y_1}$ is selected for sending I

S	$\mathbf{Y_0}$	$\mathbf{Y_1}$
0	I	0
1	0	I

1:2 DEMUX

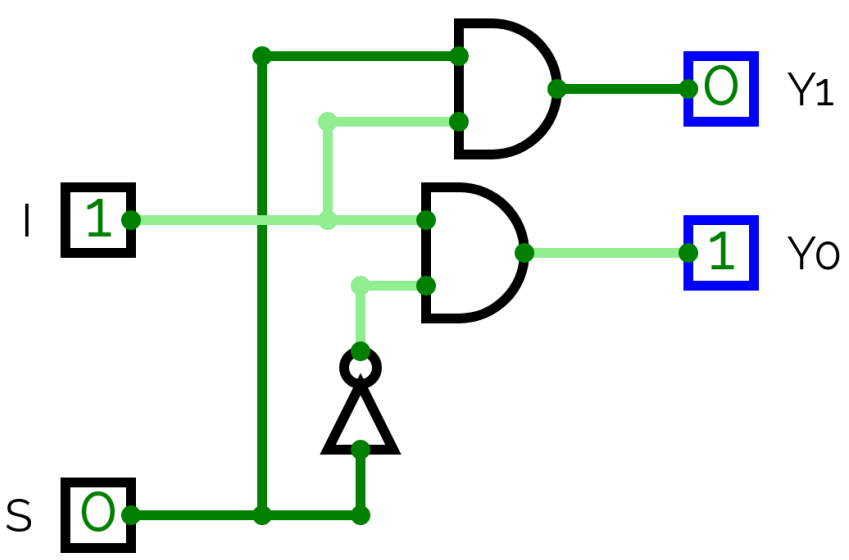
- Here, the output Y can take 2 values:

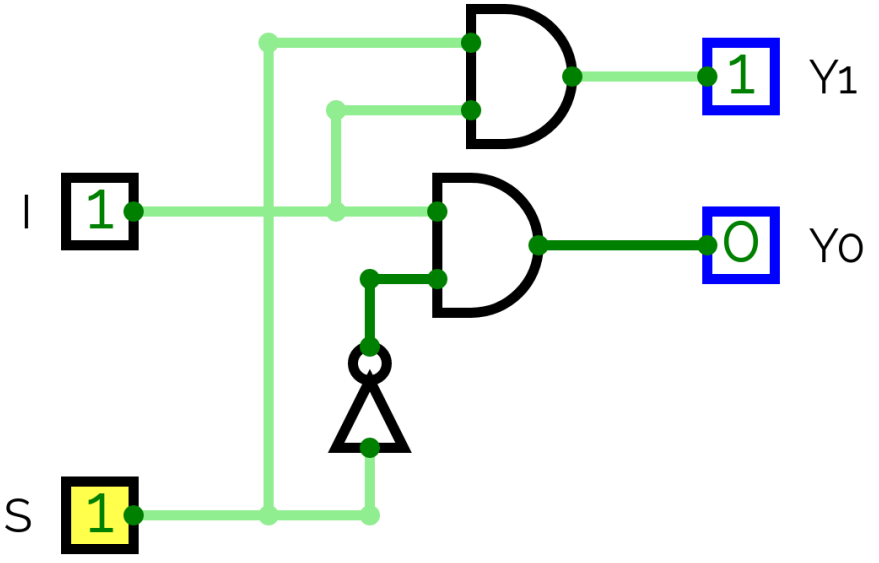
$Y_0 = S'.I$

$Y_1 = S.I$

S	Y_0	Y_1
0	I	0
1	0	I

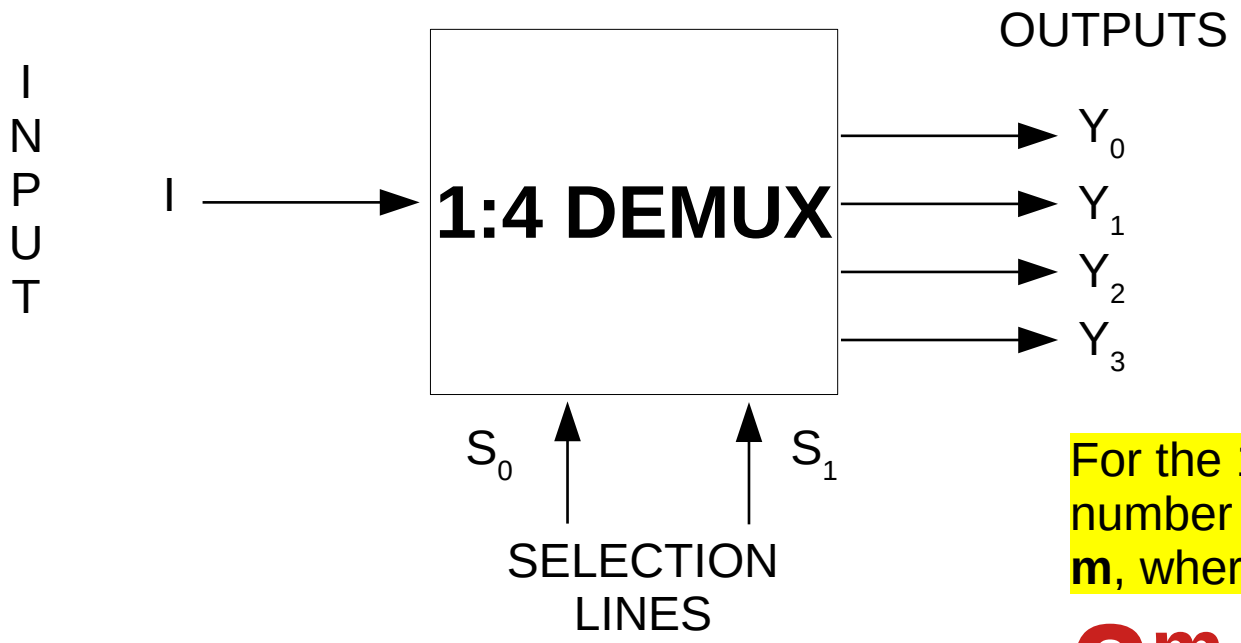
Circuit Diagram – 1:2 DEMUX





1:4 DEMUX – Block Diagram

- 1:4 DEMUX or 1 line to 4 line DEMUX



For the 1:n DEMUX, the number of selection lines is **m**, where,

$$2^m = n$$

1:4 DEMUX

- If $S_1 = 0$ and $S_0 = 0$, Y_0 is selected for sending I
- If $S_1 = 0$ and $S_0 = 1$, Y_1 is selected for sending I
- If $S_1 = 1$ and $S_0 = 0$, Y_2 is selected for sending I
- If $S_1 = 1$ and $S_0 = 1$, Y_3 is selected for sending I

S1	S0	Y0	Y1	Y2	Y3
0	0	I	0	0	0
0	1	0	I	0	0
1	0	0	0	I	0
1	1	0	0	0	I

1:4 DEMUX

- Here, the expressions for the outputs are:

$$Y_0 = S_1' S_0' I$$
$$Y_1 = S_1' S_0 I$$
$$Y_2 = S_1 S_0' I$$
$$Y_3 = S_1 S_0 I$$

S1	S0	Y0	Y1	Y2	Y3
0	0	I	0	0	0
0	1	0	I	0	0
1	0	0	0	I	0
1	1	0	0	0	I

Circuit Diagram – 1:4 DEMUX