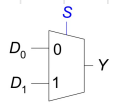
1 Multiplexers (Mux)

- 여러 개의 입력, 한 개의 출력
- select signal 이 곧 제어함
- 하나의 input 을 골라 output 에 연결



S	D_1	D_0	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

S	Y
0	D_0
1	D_1

입력이 바뀌면 출력도 바뀜

전형적인 combinational logic

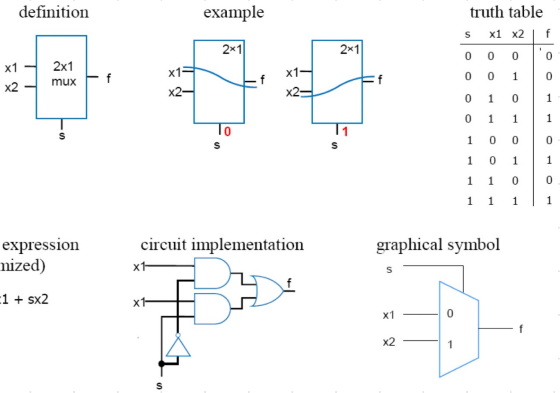
mux	S	총 input 개수
2 : 1	1	2
4 : 1	2	6
8 : 1	3	11

총 input 개수 ⇒ $2^n + n$

⇒ 2^n : 1

2^n = input, 1 = output, n = S의 개수

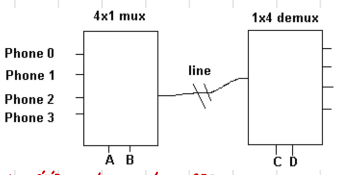
→ S도 input 임을 기억하자!



s	x1	x2	f
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

+1 DeMultiplexer (DeMux)

- 한 개의 입력, 여러 개의 출력 → 동시에 그 이상의 출력 X



⇒ 1 : 2^n

out : $\bar{A}\bar{B}P_0 + A\bar{B}P_1 + \bar{A}BP_2 + ABP_3$

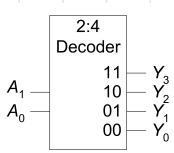
2. Decoders

- N개의 입력, 2^N개의 출력
  - ↳ binary encoding 이 되어있음 → binary decoding

⇒ N : 2^N

input : N, output : 2^N

- One-hot output 의 형태



A_1	A_0	Y_3	Y_2	Y_1	Y_0
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0

1:2 Decoder:
- Out0 = S'
- Out1 = S

2:4 Decoder:
- Out0 = S1' • S0'
- Out1 = S1' • S0
- Out2 = S1 • S0'
- Out3 = S1 • S0

3:8 Decoder:
- Out0 = S2' • S1' • S0'
- Out1 = S2' • S1' • S0
- Out2 = S2' • S1 • S0'
- Out3 = S2' • S1 • S0
- Out4 = S2 • S1' • S0'
- Out5 = S2 • S1' • S0
- Out6 = S2 • S1 • S0'
- Out7 = S2 • S1 • S0

+1 Encoders

- 2^N개의 입력, N개의 출력 ⇒ 2^N : N
- One-hot input 의 형태

I0	I1	I2	I3	I4	I5	I6	I7	Y2	Y1	Y0
1	0	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	1	0	0	0	1	0	0
0	0	0	0	0	1	0	0	1	0	1
0	0	0	0	0	0	1	0	1	1	0
0	0	0	0	0	0	0	1	1	1	1

+1 DeMux vs. Decoders

	Demultiplexer	Decoder
Definition	1 data input 2^n outputs	It has n inputs 2^n outputs It has n control inputs
Characteristic	Connects the data input to the data output	Selects one of the 2^n outputs by decoding the binary value on the basis of n inputs
Reverse of	Multiplexer	Encoder