

Encoders

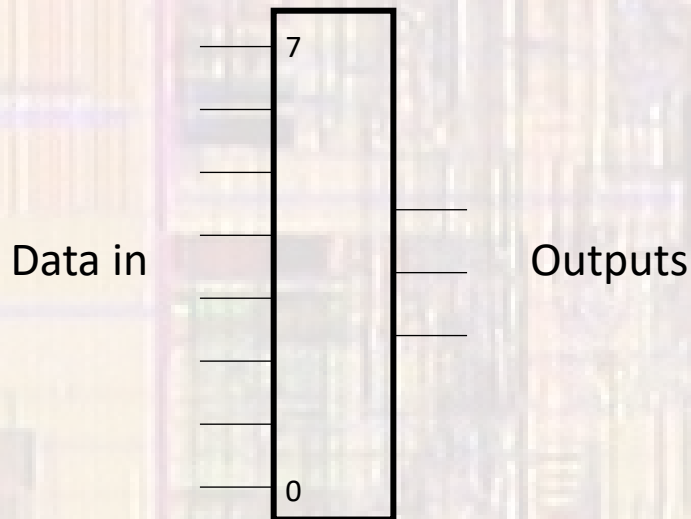
Last updated 10/31/24

Encoders

- An encoder creates a representation of an N input signal
 - N data inputs
 - E data outputs
 - N:E Encoder

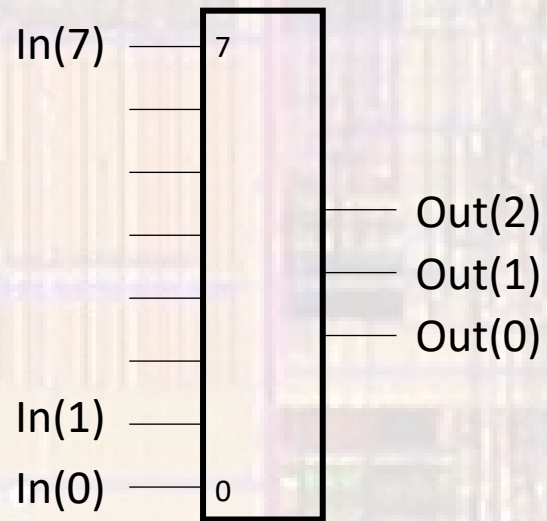
N = 8

E = 3



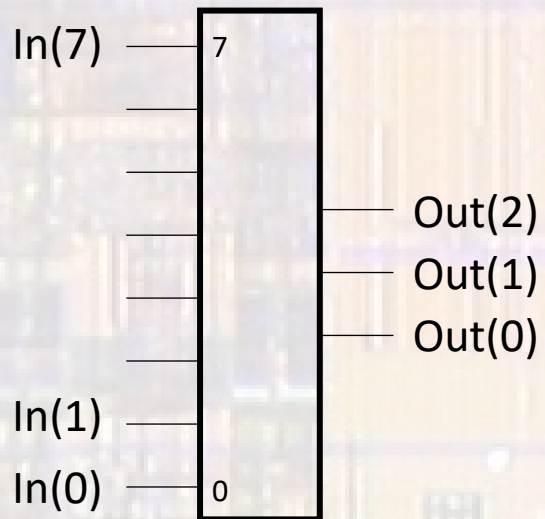
Encoders

- A closer look



Encoders

- Binary Encoder
 - Creates the binary value of the single high input
 - 8:3 Binary Encoder



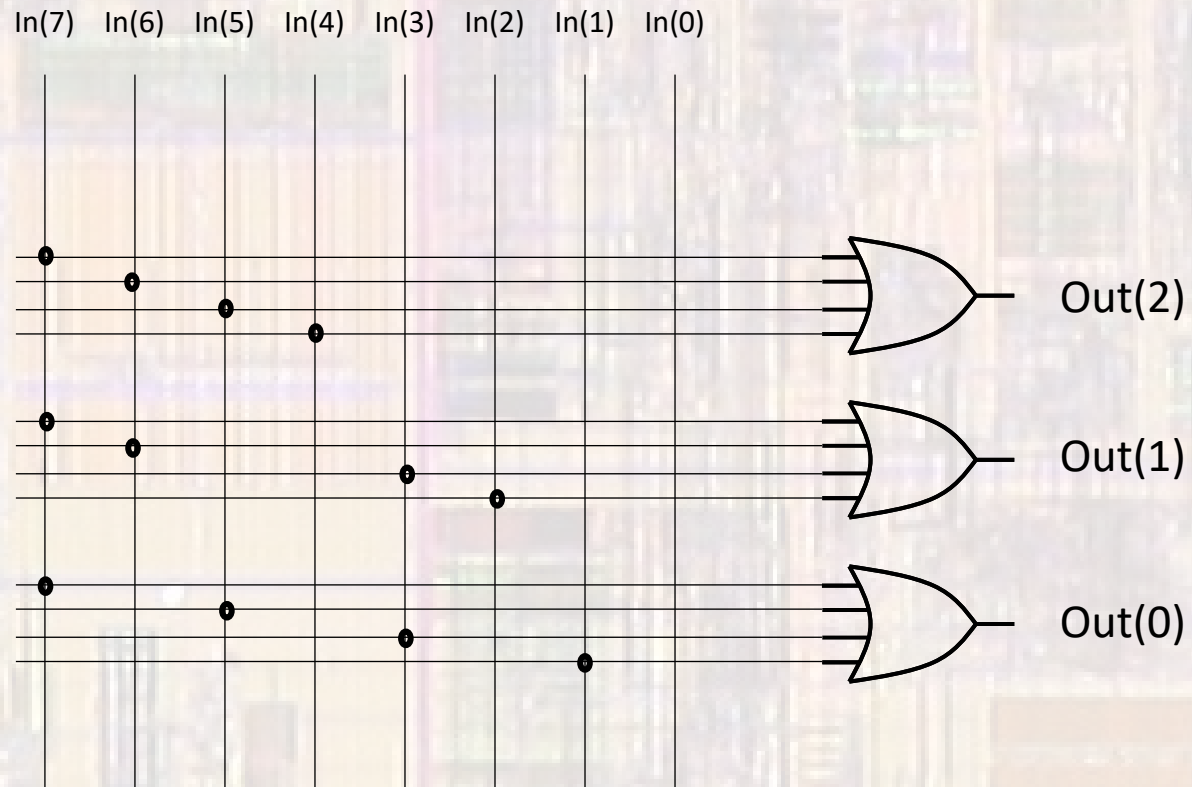
In(7)	In(6)	In(5)	In(4)	In(3)	In(2)	In(1)	In(0)	Out(2)	Out(1)	Out(0)
1	0	0	0	0	0	0	0	1	1	1
0	1	0	0	0	0	0	0	1	1	0
0	0	1	0	0	0	0	0	1	0	1
0	0	0	1	0	0	0	0	1	0	0
0	0	0	0	1	0	0	0	0	1	1
0	0	0	0	0	1	0	0	0	1	0
0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	0	0	1	0	0	0

Only one input high

Encoders

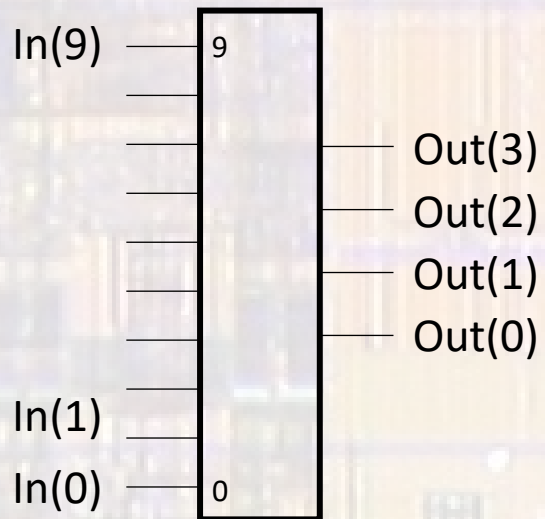
- Implementation – Binary Encoder
 - Direct Synthesis

Only one input high



Encoders

- Decimal to BCD Encoder
 - Creates the BCD value of the single high decimal input
 - Decimal : BCD Encoder

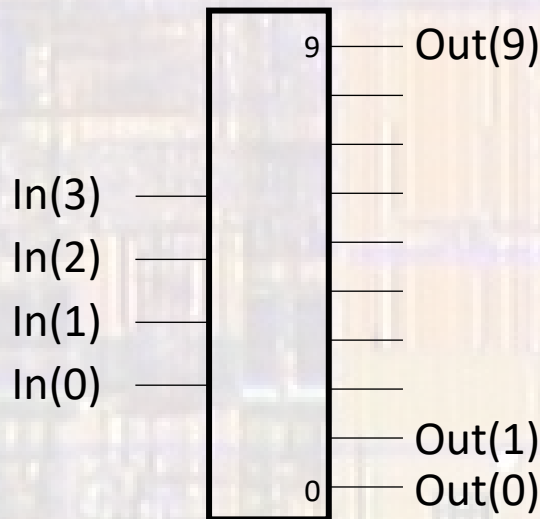


Only one input high

In (9)	In (8)	In (7)	In (6)	In (5)	In (4)	In (3)	In (2)	In (1)	In (0)	Out (3)	Out (2)	Out (1)	Out (0)
1	0	0	0	0	0	0	0	0	0	1	0	0	1
0	1	0	0	0	0	0	0	0	0	1	0	0	0
0	0	1	0	0	0	0	0	0	0	0	1	1	1
0	0	0	1	0	0	0	0	0	0	0	1	1	0
0	0	0	0	1	0	0	0	0	0	0	1	0	1
0	0	0	0	0	1	0	0	0	0	0	1	0	0
0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	1	0	0	0	0	1	0
0	0	0	0	0	0	0	0	1	0	0	0	0	1
0	0	0	0	0	0	0	0	0	1	0	0	0	0

Encoders

- BCD to Decimal Encoder
 - Creates the single Decimal value of the BCD input
 - BCD : Decimal Encoder



In (3)	In (2)	In (1)	In (0)	Out (9)	Out (8)	Out (7)	Out (6)	Out (5)	Out (4)	Out (3)	Out (2)	Out (1)	Out (0)
1	0	0	1	1	0	0	0	0	0	0	0	0	0
1	0	0	0	0	1	0	0	0	0	0	0	0	0
0	1	1	1	0	0	1	0	0	0	0	0	0	0
0	1	1	0	0	0	0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	1	0	0	0	0
0	0	1	1	0	0	0	0	0	0	1	0	0	0
0	0	1	0	0	0	0	0	0	0	0	1	0	0
0	0	0	1	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	1

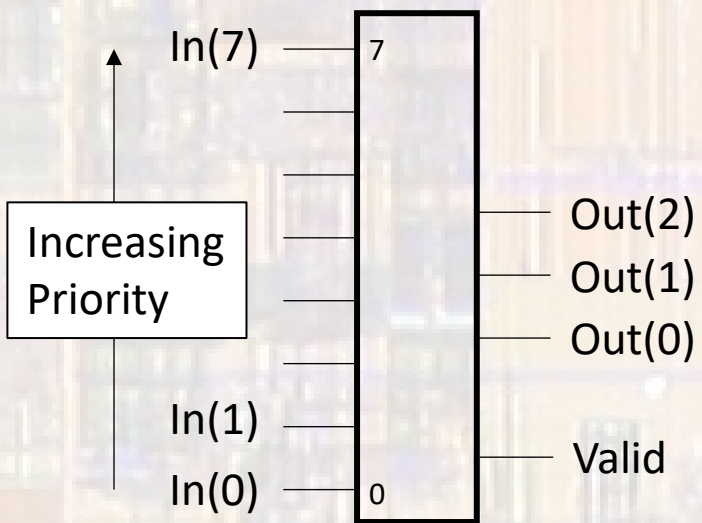
Encoders

- Priority Encoder

- Creates the binary value associated with the highest priority input

- Has a Valid output to indicate at least 1 input is high

- 8:3 Priority Encoder



In(7)	In(6)	In(5)	In(4)	In(3)	In(2)	In(1)	In(0)	Out(2)	Out(1)	Out(0)	V
1	X	X	X	X	X	X	X	1	1	1	1
0	1	X	X	X	X	X	X	1	1	0	1
0	0	1	X	X	X	X	X	1	0	1	1
0	0	0	1	X	X	X	X	1	0	0	1
0	0	0	0	1	X	X	X	0	1	1	1
0	0	0	0	0	1	X	X	0	1	0	1
0	0	0	0	0	0	1	X	0	0	1	1
0	0	0	0	0	0	0	1	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0

At least one input high

Encoders

- Encoders can have ambiguous or incorrect results
 - More than 1 input high (Binary, BCD)
 - No inputs high
- Special care must be taken to account for these situations
 - In the encode itself
 - In the logic driving the encoder
 - In the logic following the encoder