Lecture 13

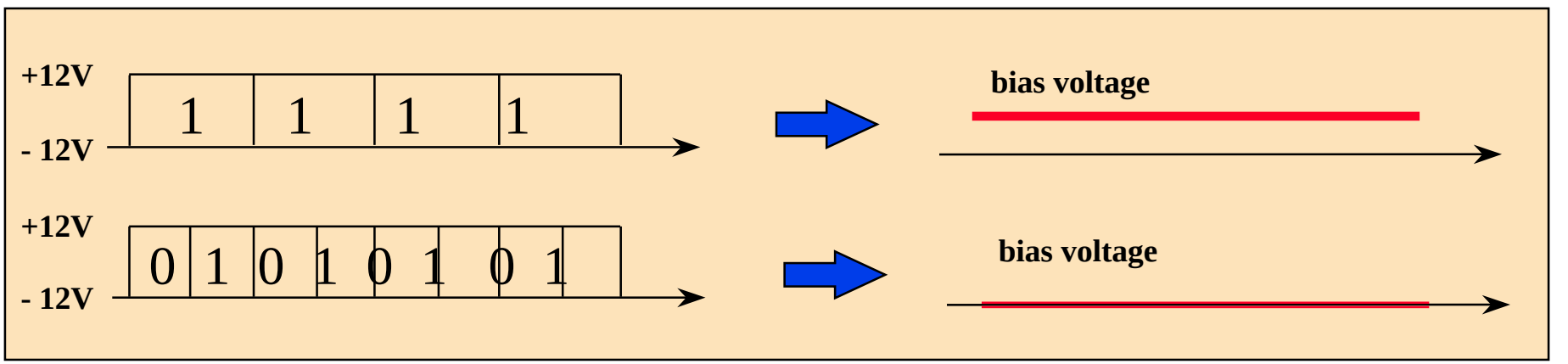
ADVANCED DESIGN EXAMPLE

Manchester Encoder

Slides of Mark Schulz used

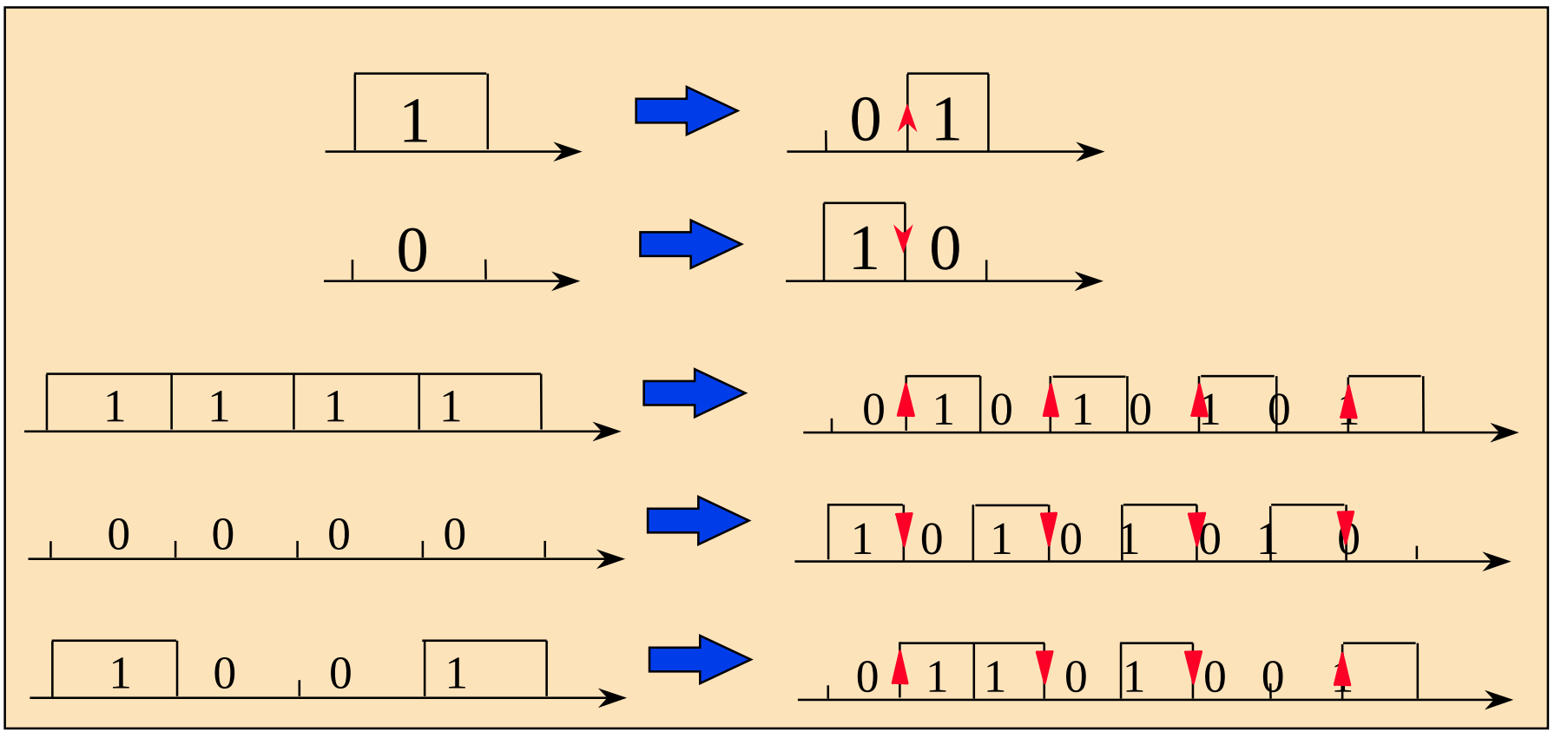
Manchester2 Encoder/Decoder

- Short specification
- **Manchester encoding scheme is used in communication to convert binary data streams into electrical signals that are suitable for sending over long wires.**
  This method makes the average value of a digital signal close to 0 and thus prevents the electrical bias of a transmission line.
- **It also allows to embed the clock information into the data signal, so there is no need to send the clock by a separate line.**



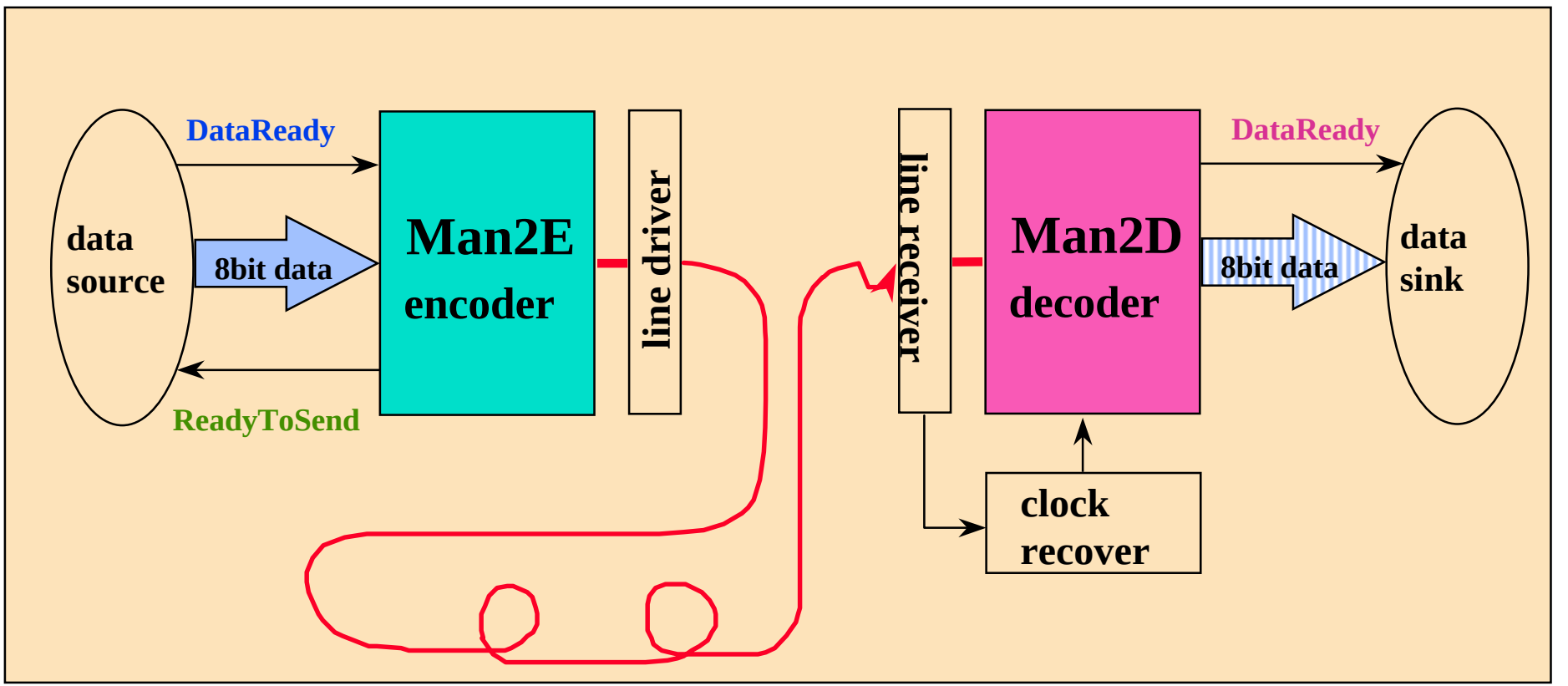
Manchester2 Encoder/Decoder

- Short specification
- **Principles of Manchester encoding**



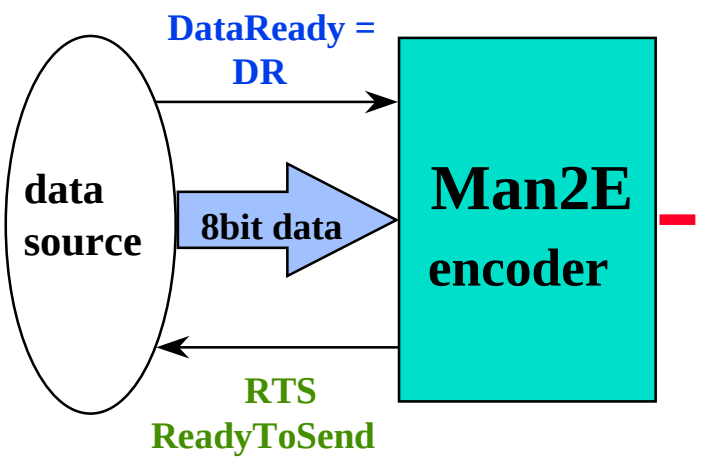
Manchester2 Encoder/Decoder

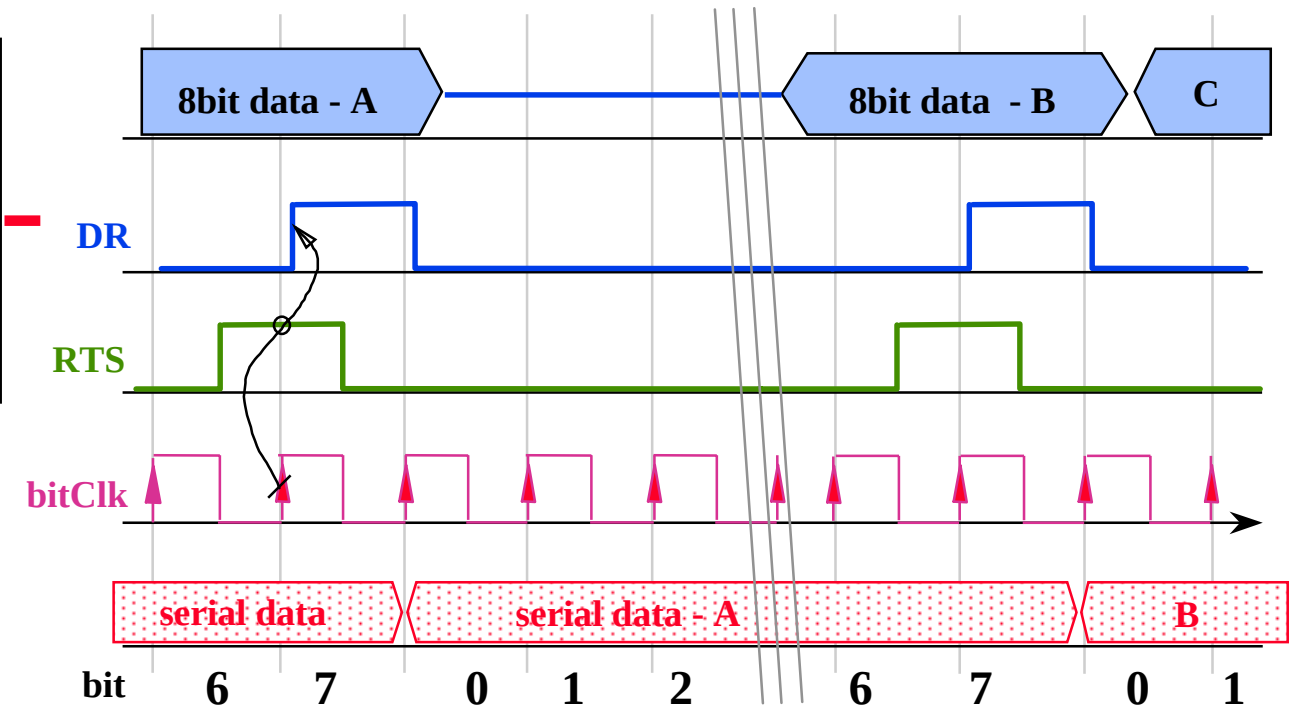
- Short specification
- **Structure of a simple communication link**



Manchester2 Encoder

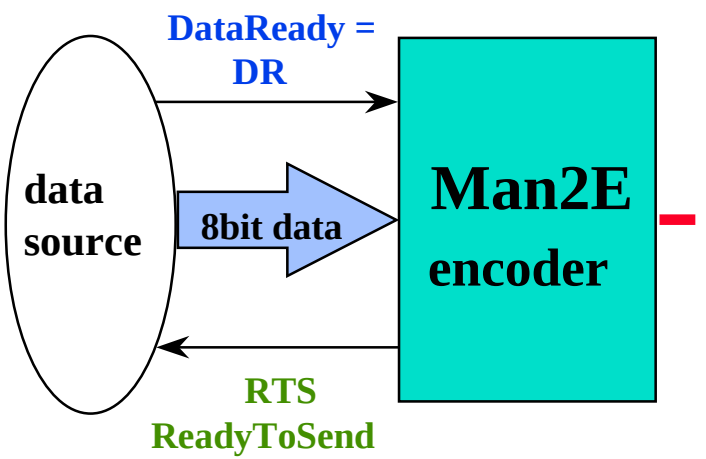
- Short specification
- **Handshake protocol ManEncoder <-> DataSource**

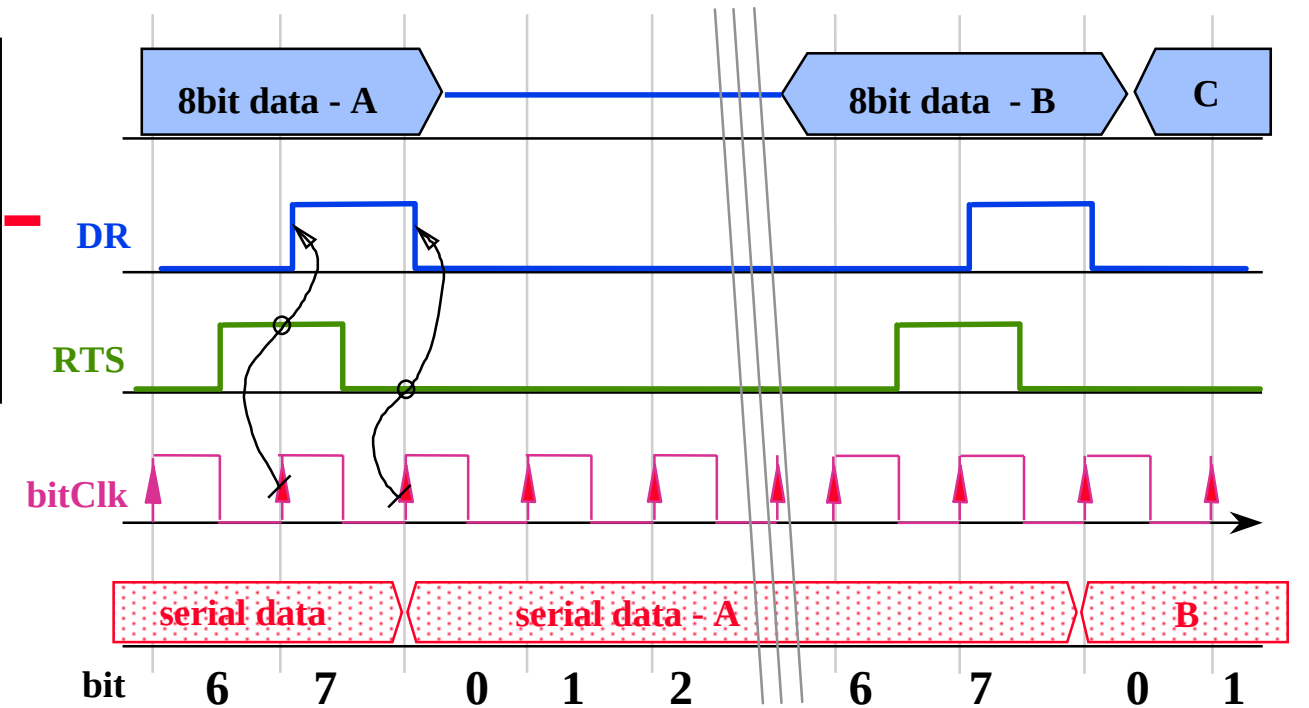




Manchester2 Encoder

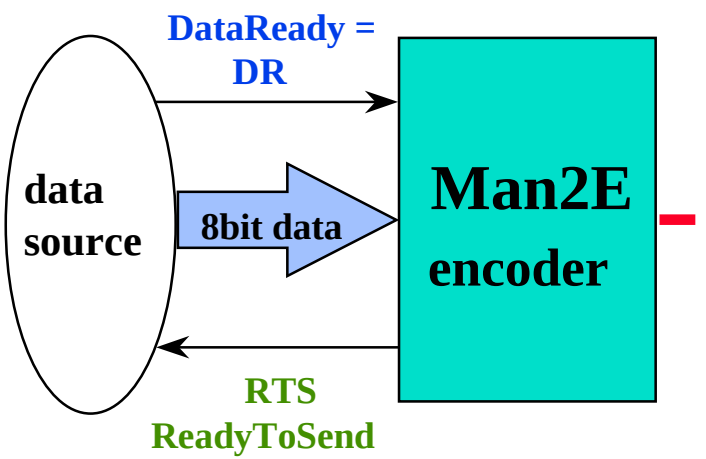
- Short specification
- **Handshake protocol ManEncoder <-> DataSource**

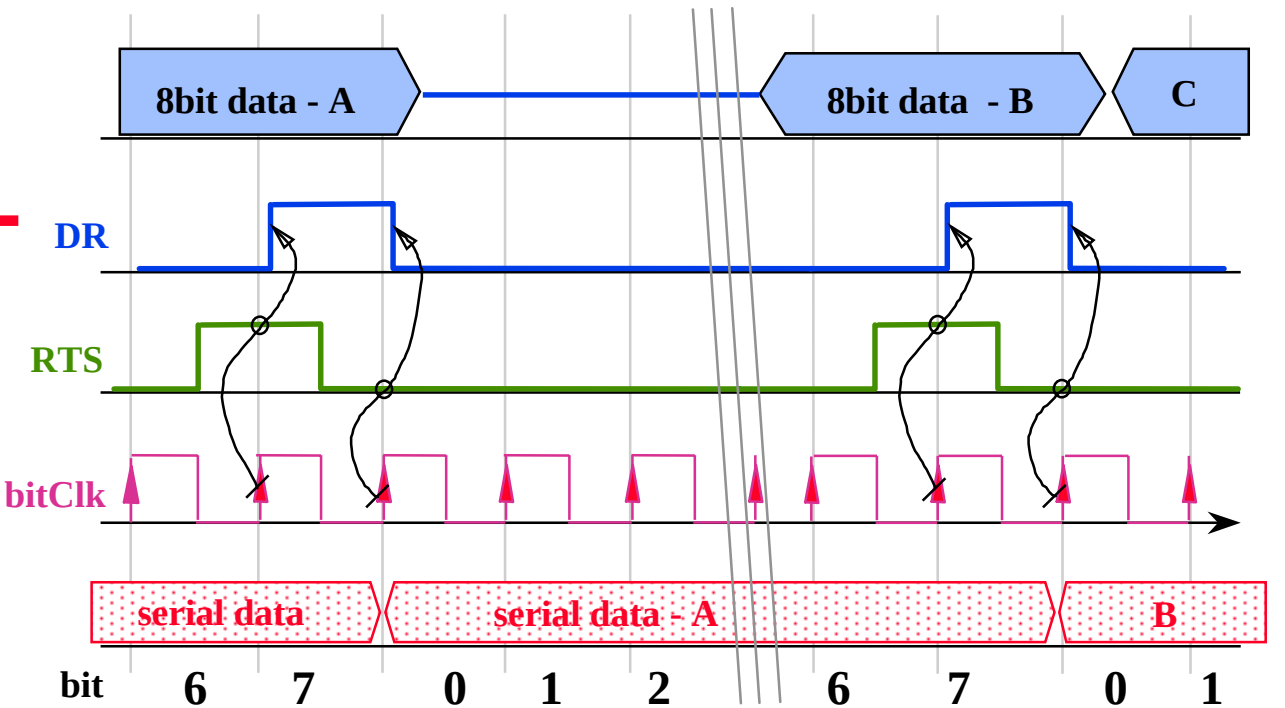




Manchester2 Encoder

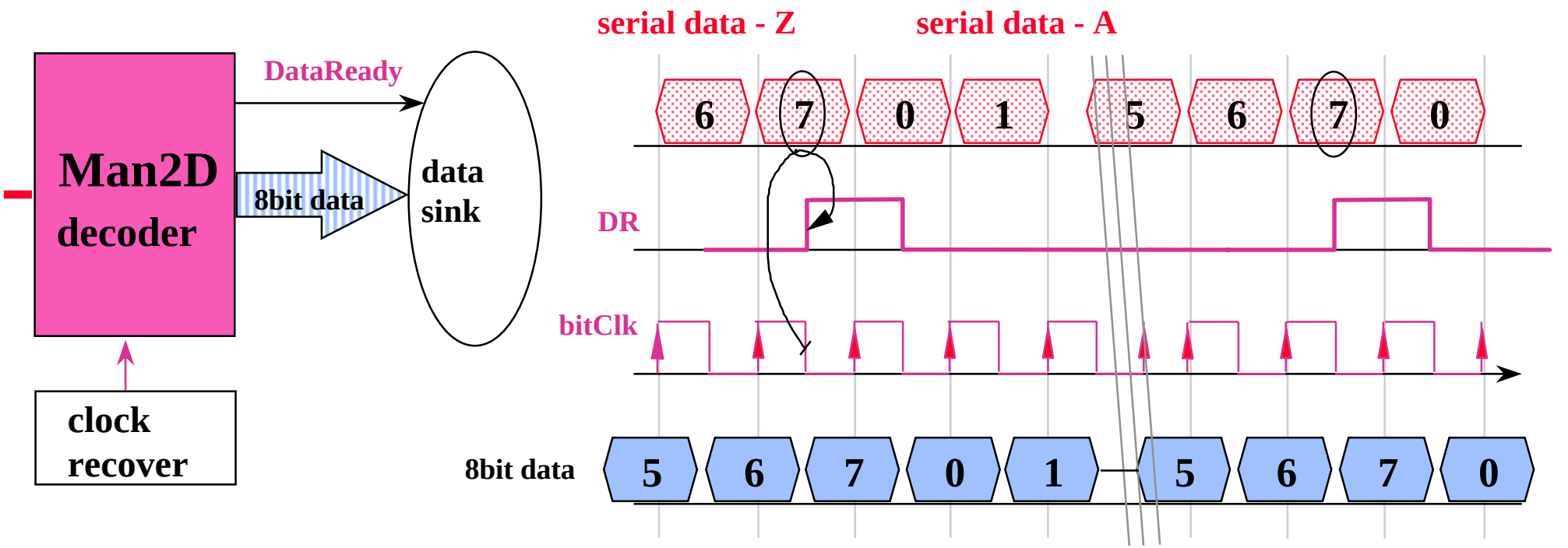
- Short specification
- **Handshake protocol ManEncoder <-> DataSource**





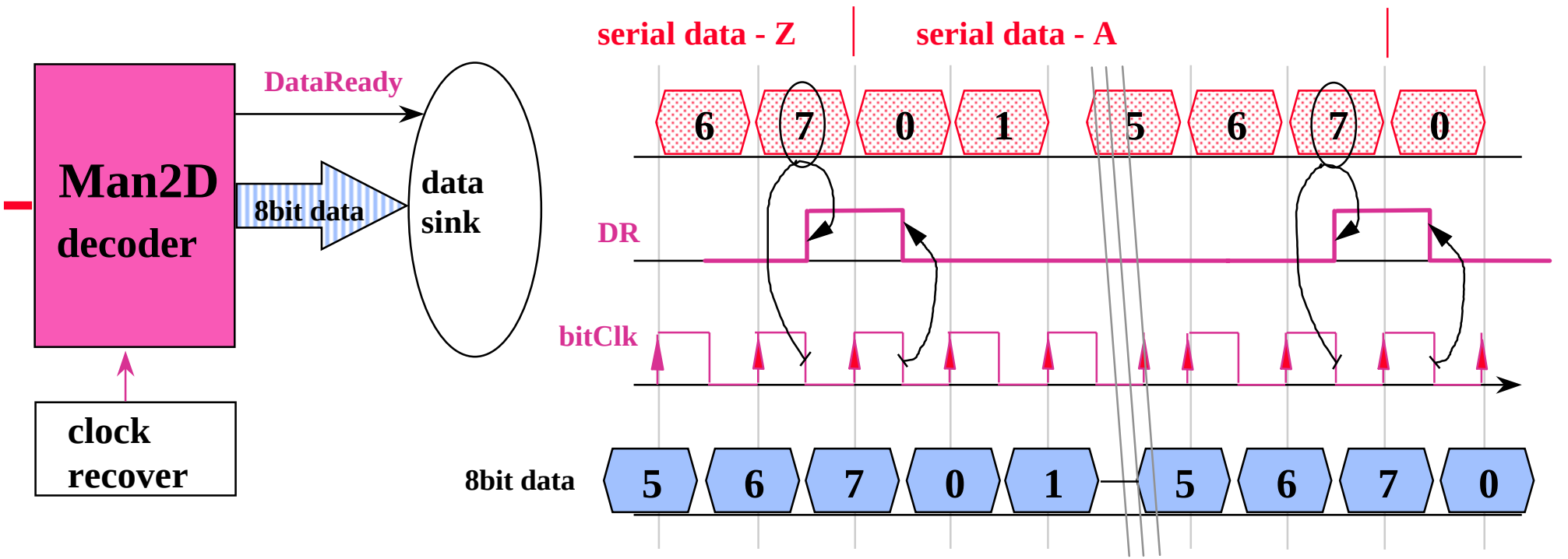
Manchester2 Decoder

- Short specification
- **Handshake protocol ManDecoder <-> DataSink**



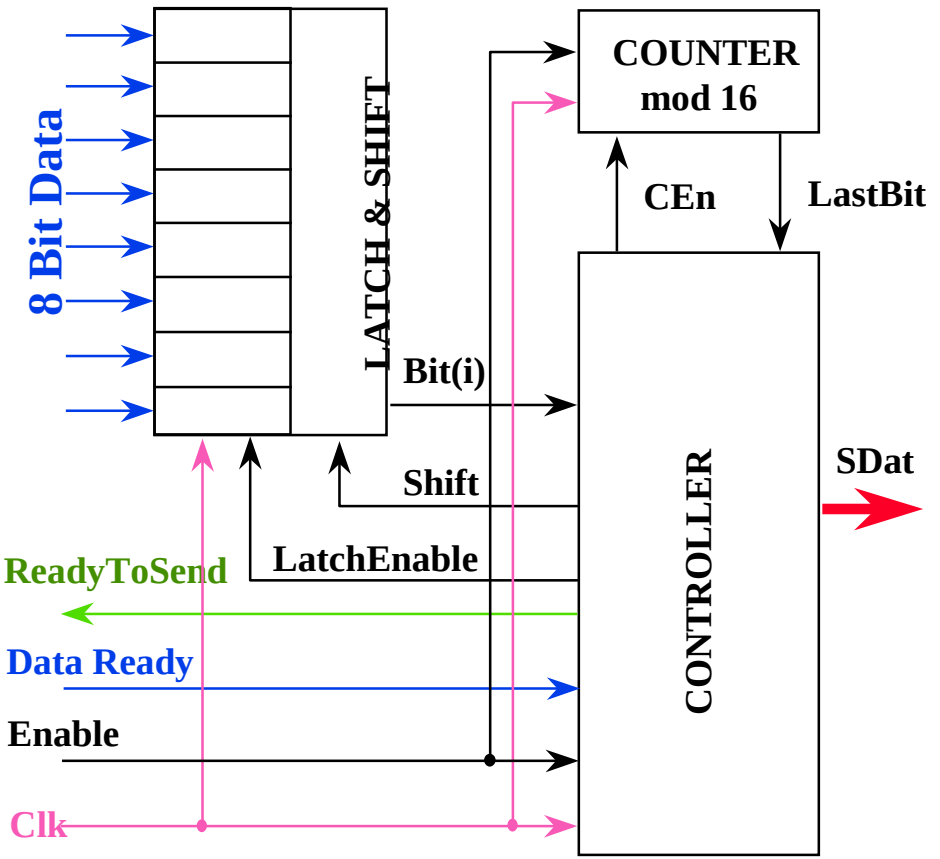
Manchester2 Decoder

- Short specification
- **Handshake protocol ManDecoder <-> DataSink**



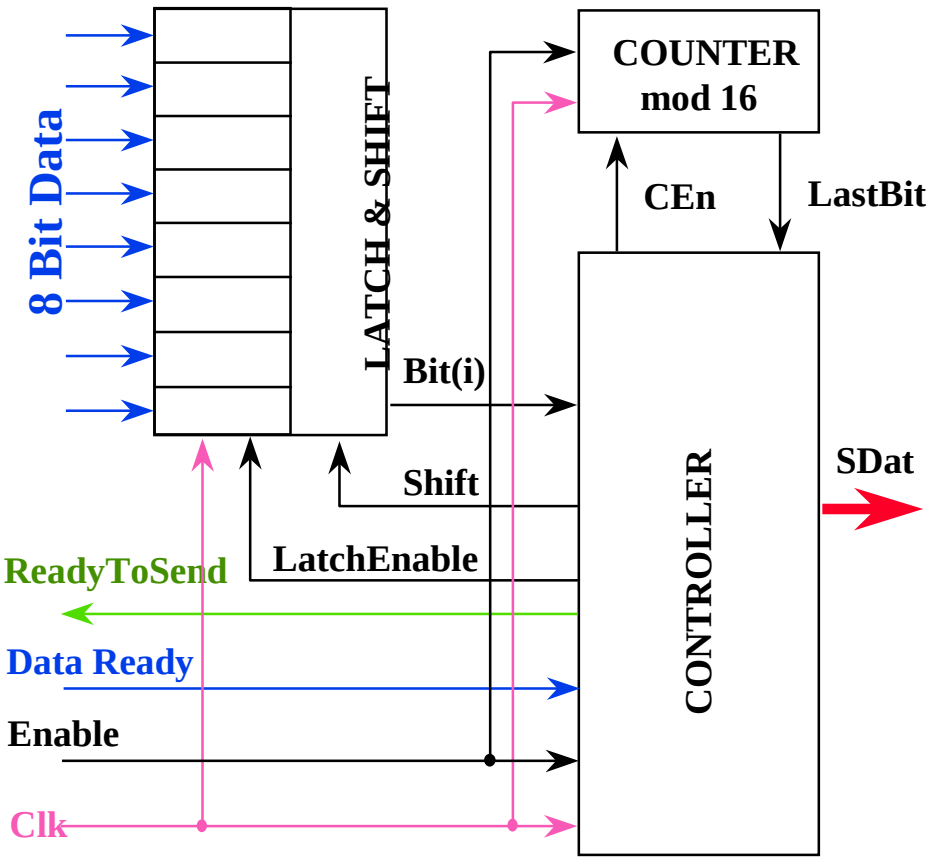
Manchester2 Encoder

- Block Structure

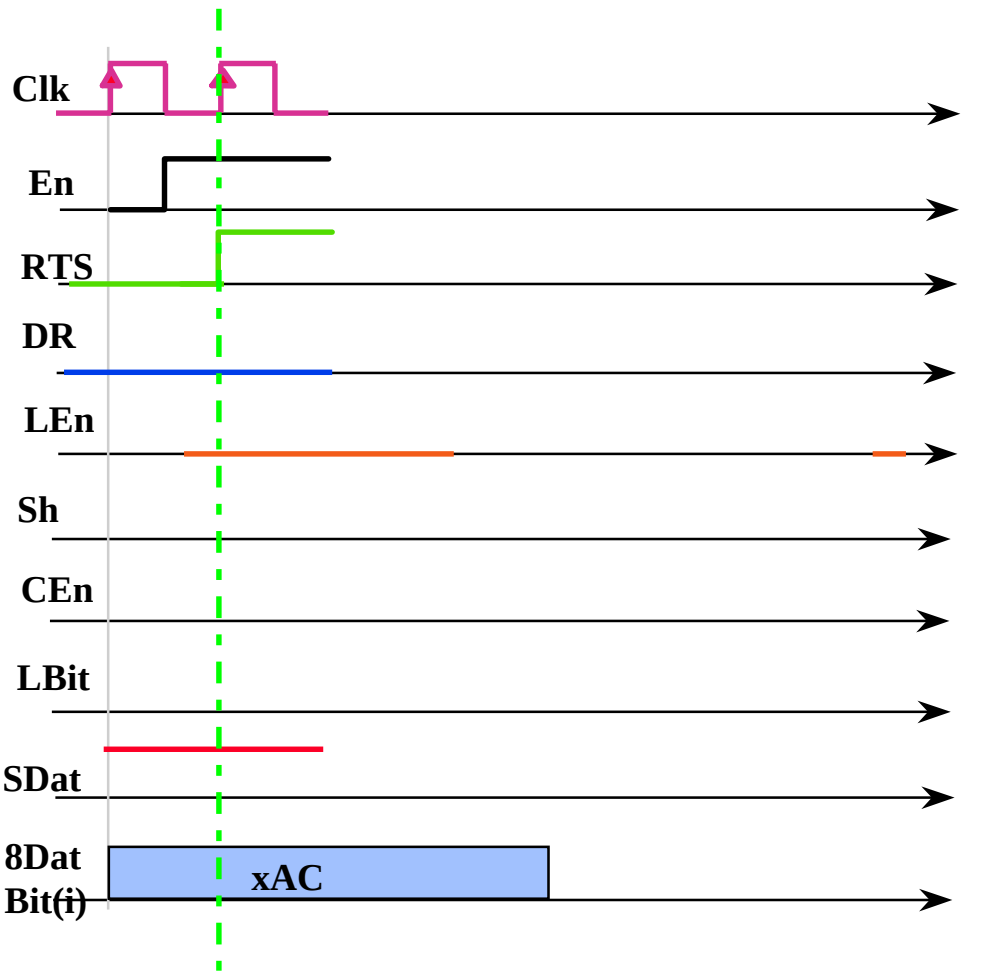


Manchester2 Encoder

- Block Structure

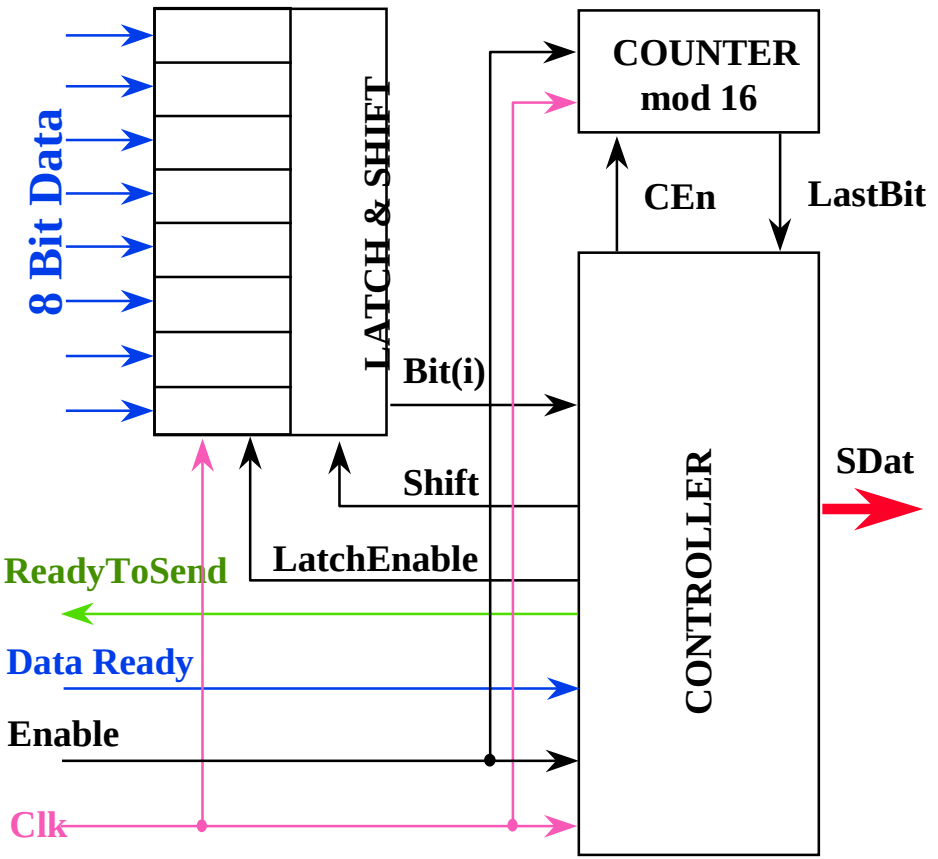


How it works

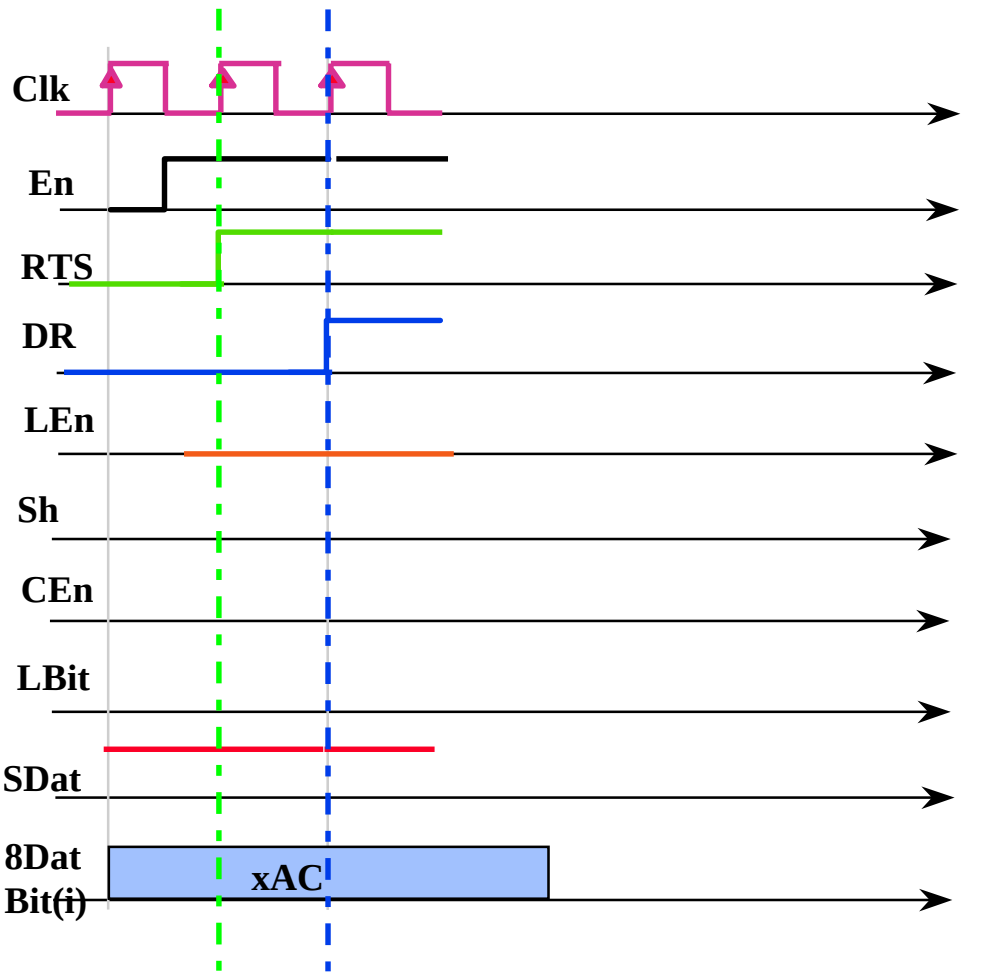


Manchester2 Encoder

- Block Structure

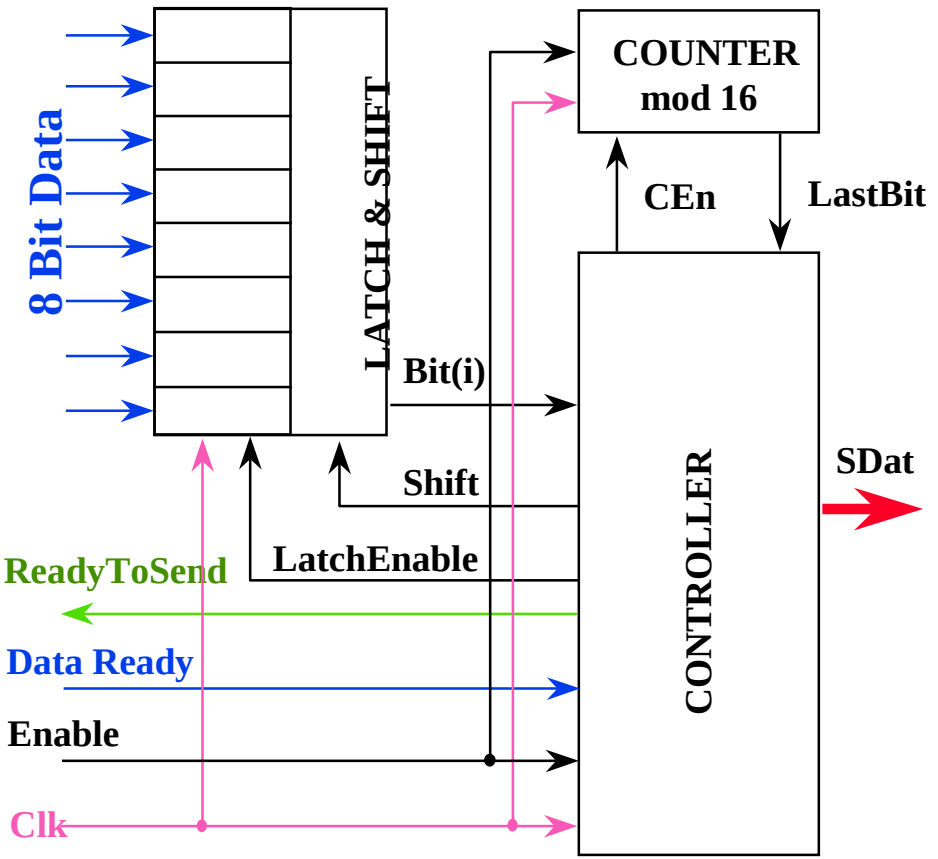


How it works

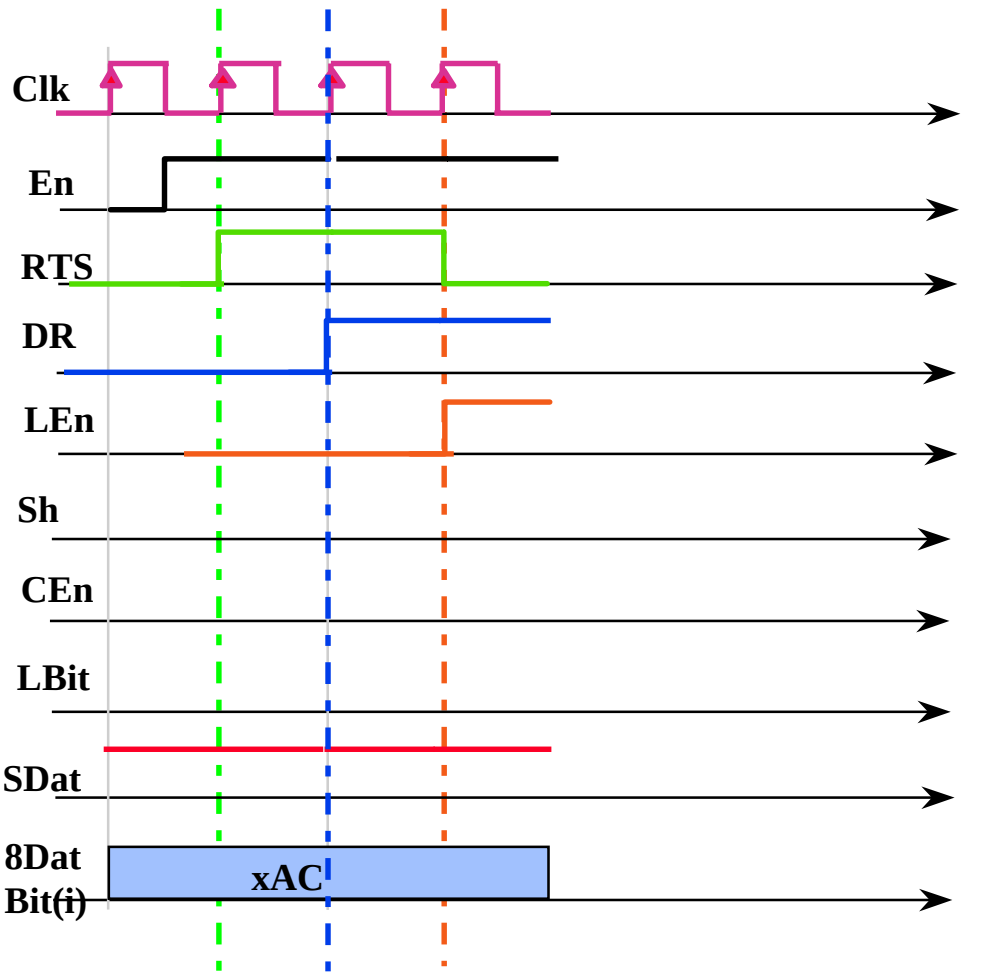


Manchester2 Encoder

- Block Structure

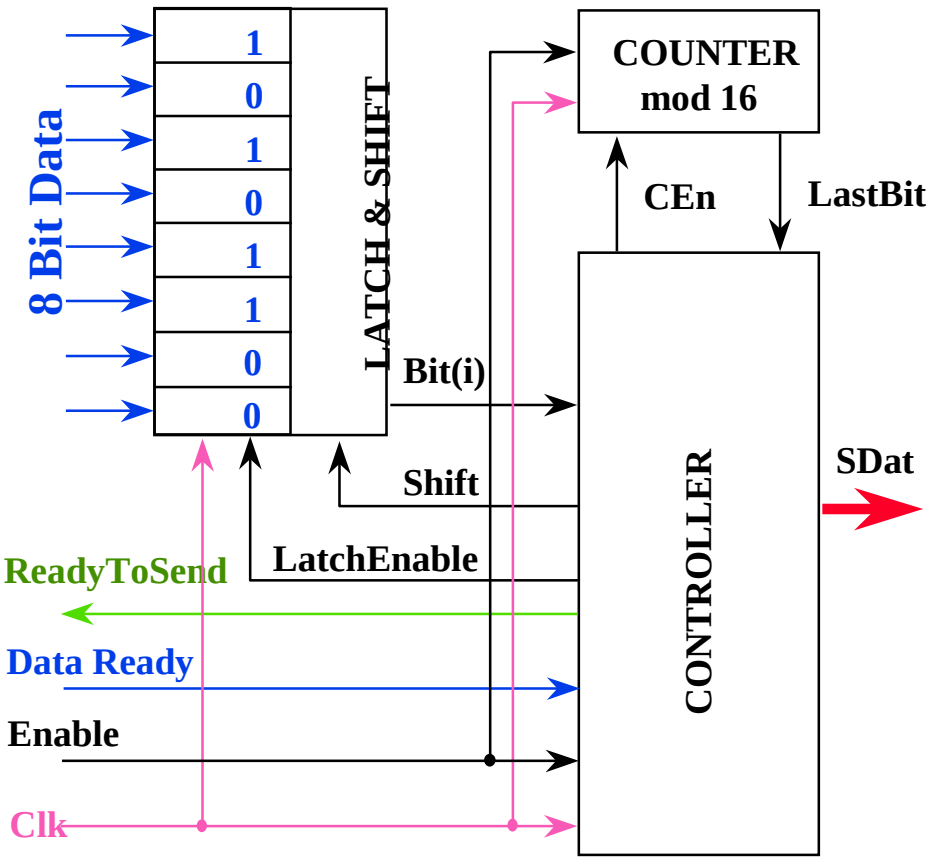


How it works

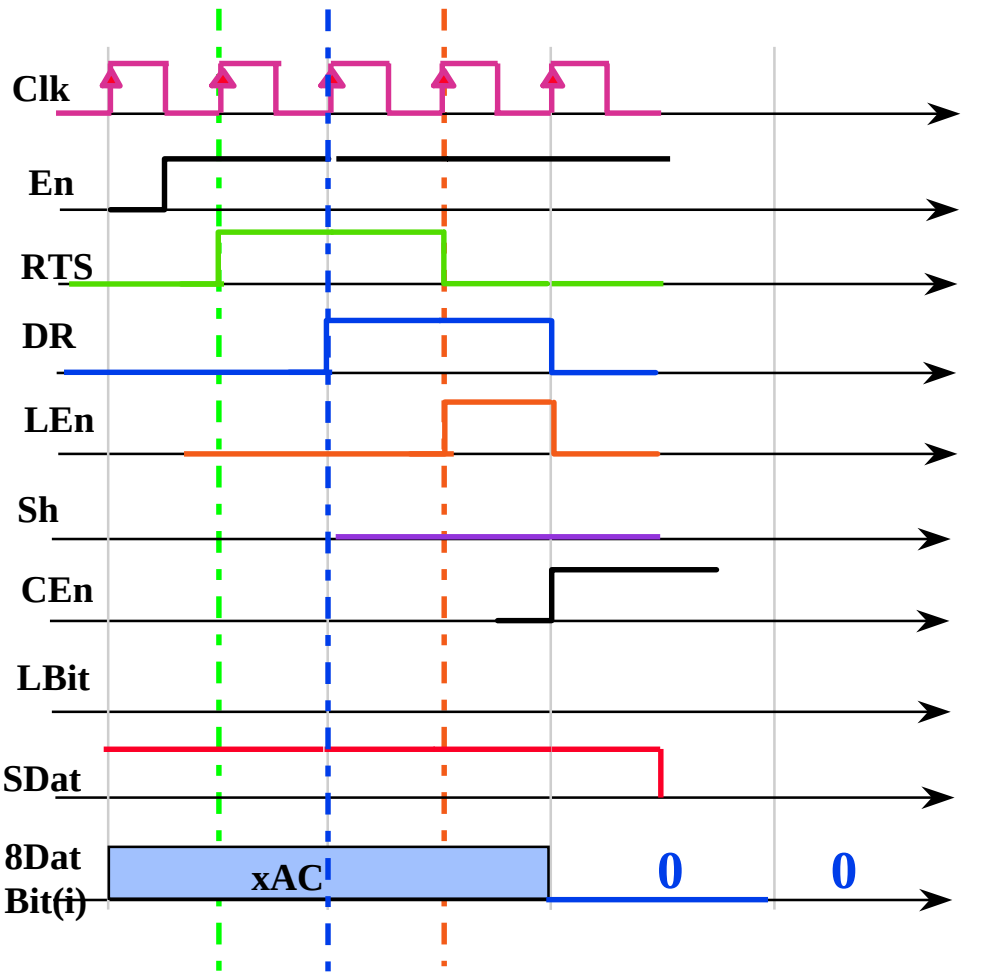


Manchester2 Encoder

- Block Structure

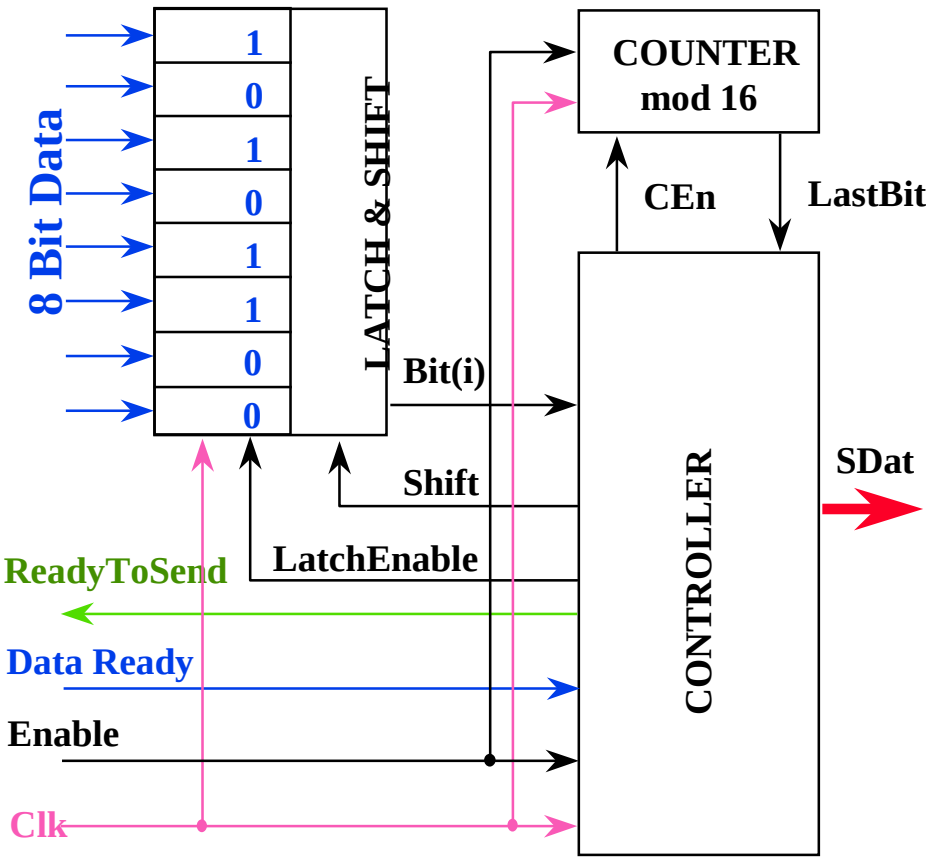


How it works

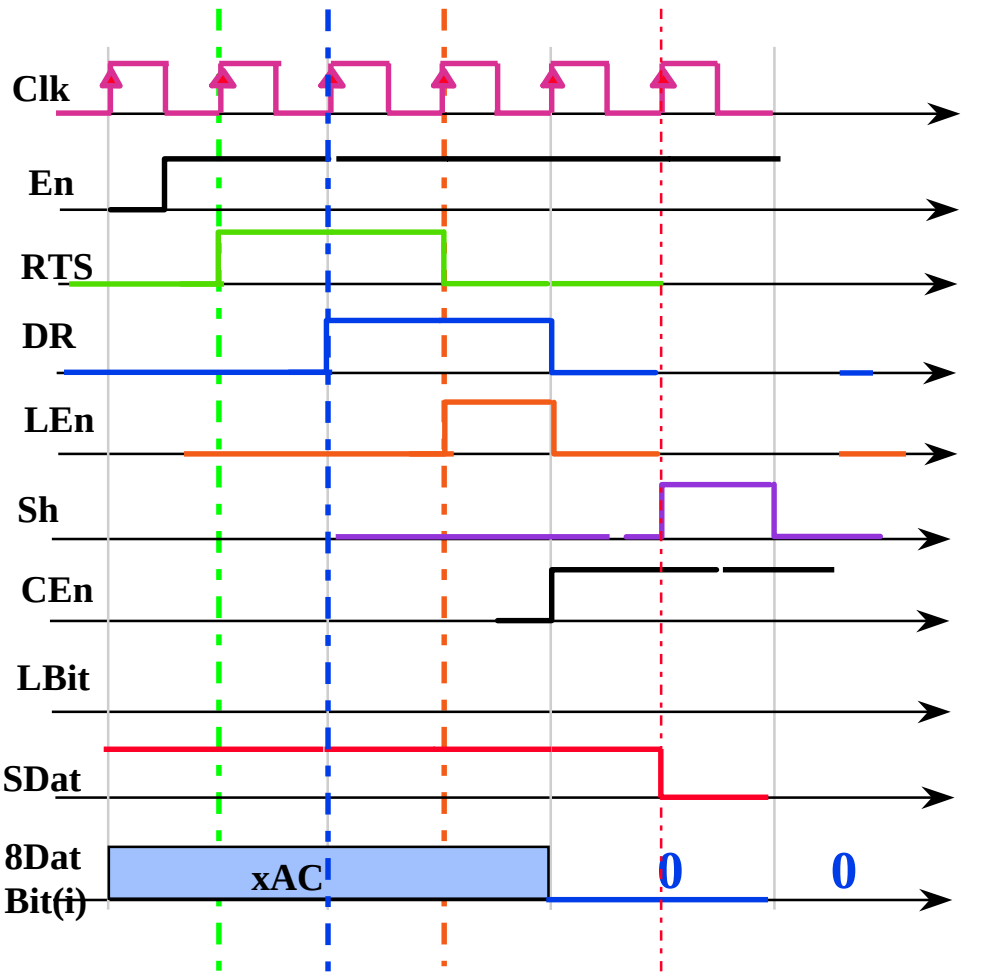


Manchester2 Encoder

- Block Structure

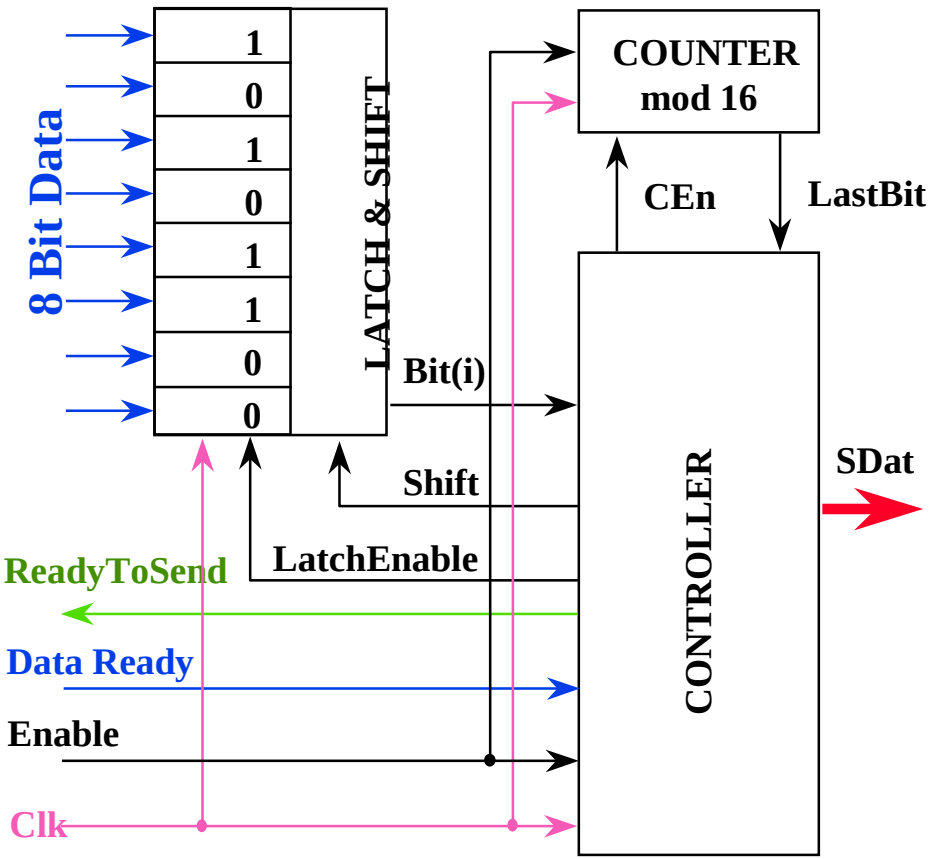


How it works

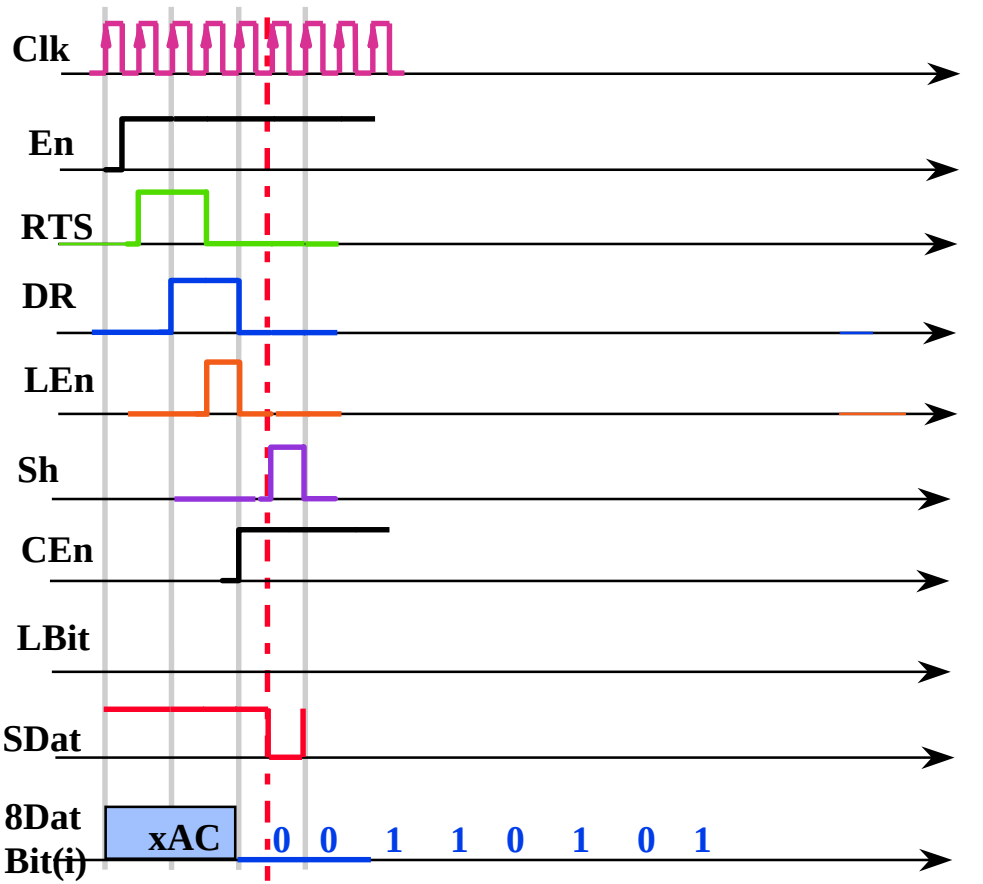


Manchester2 Encoder

- Block Structure

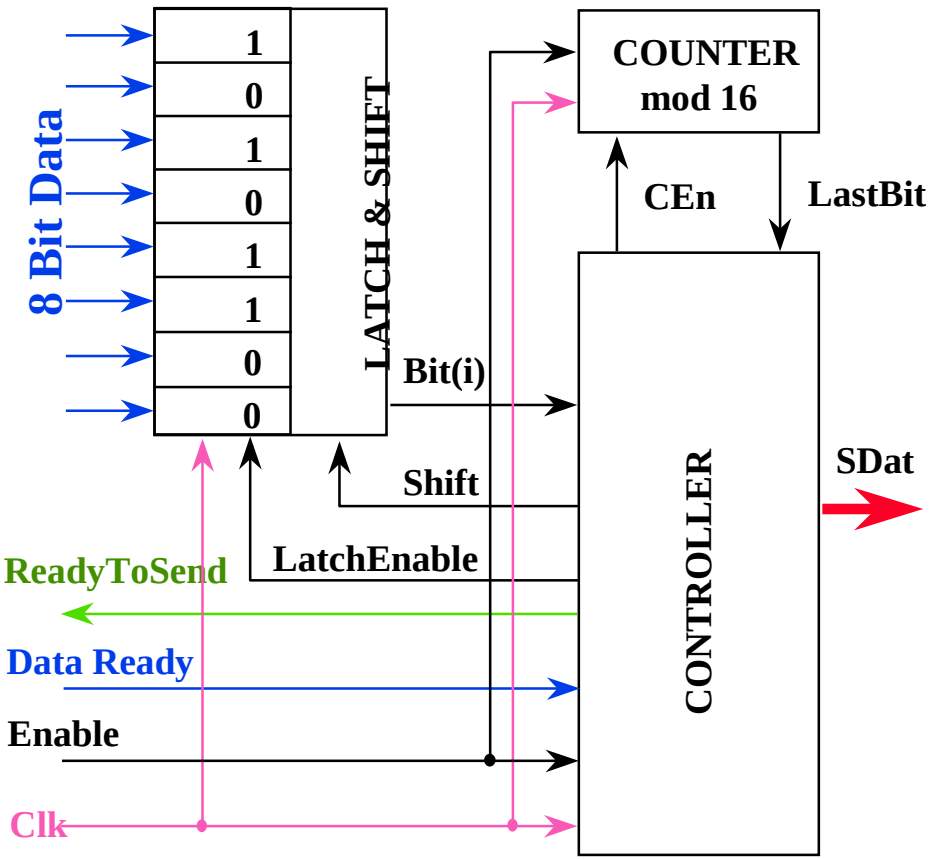


How it works



Manchester2 Encoder

- Block Structure



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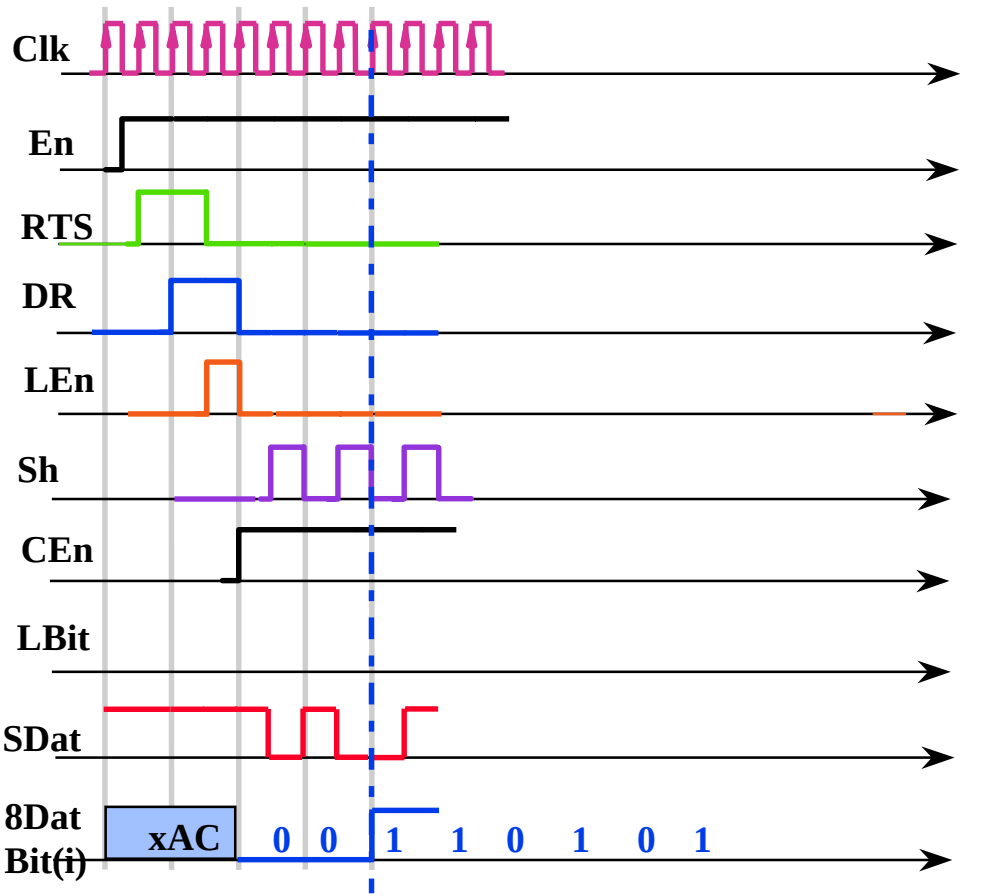

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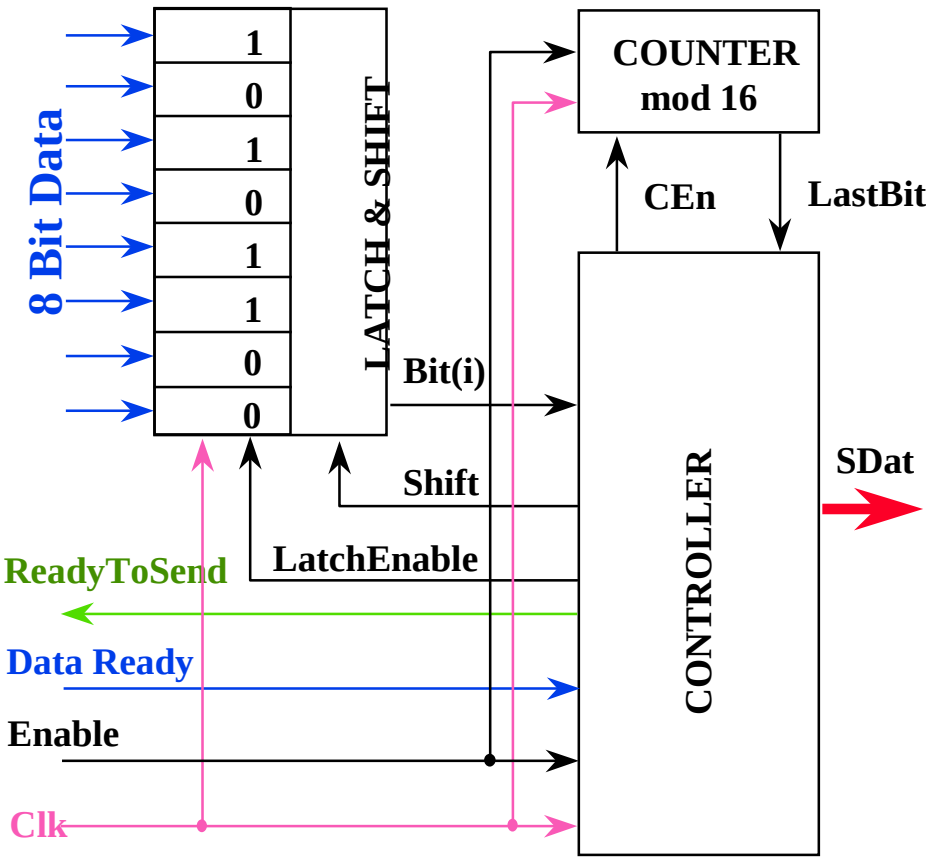

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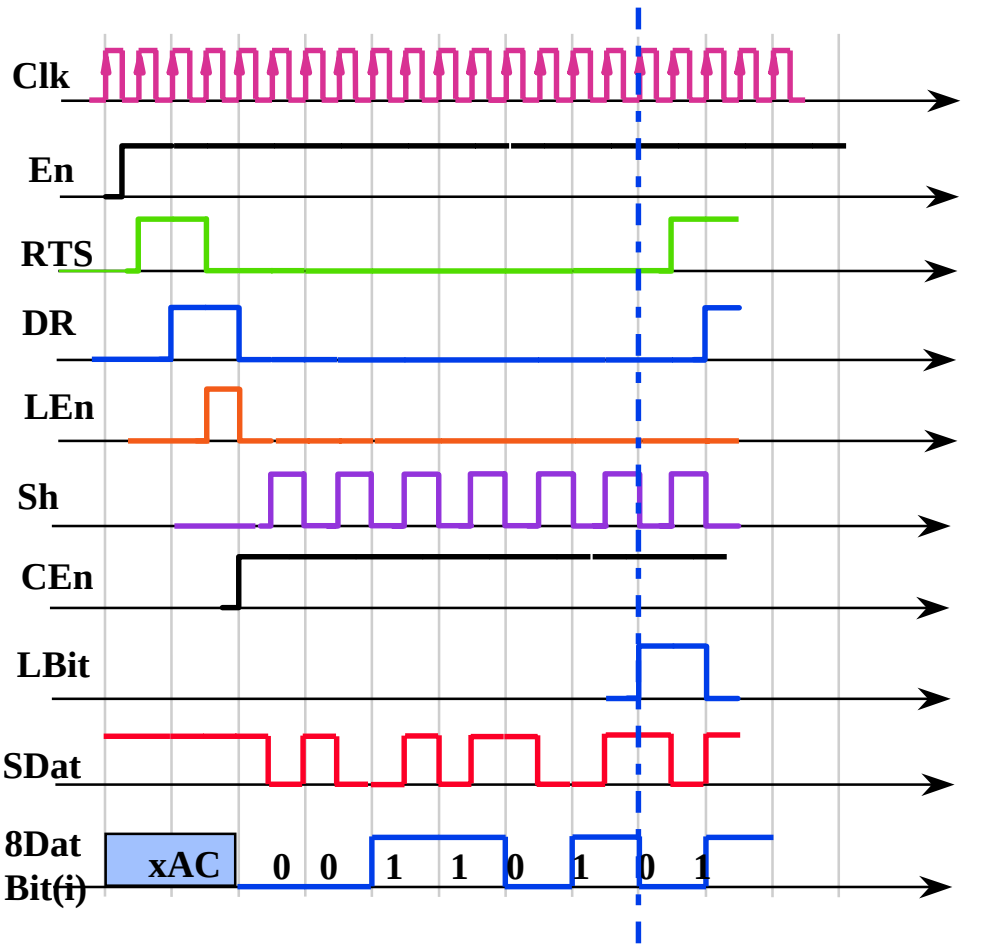

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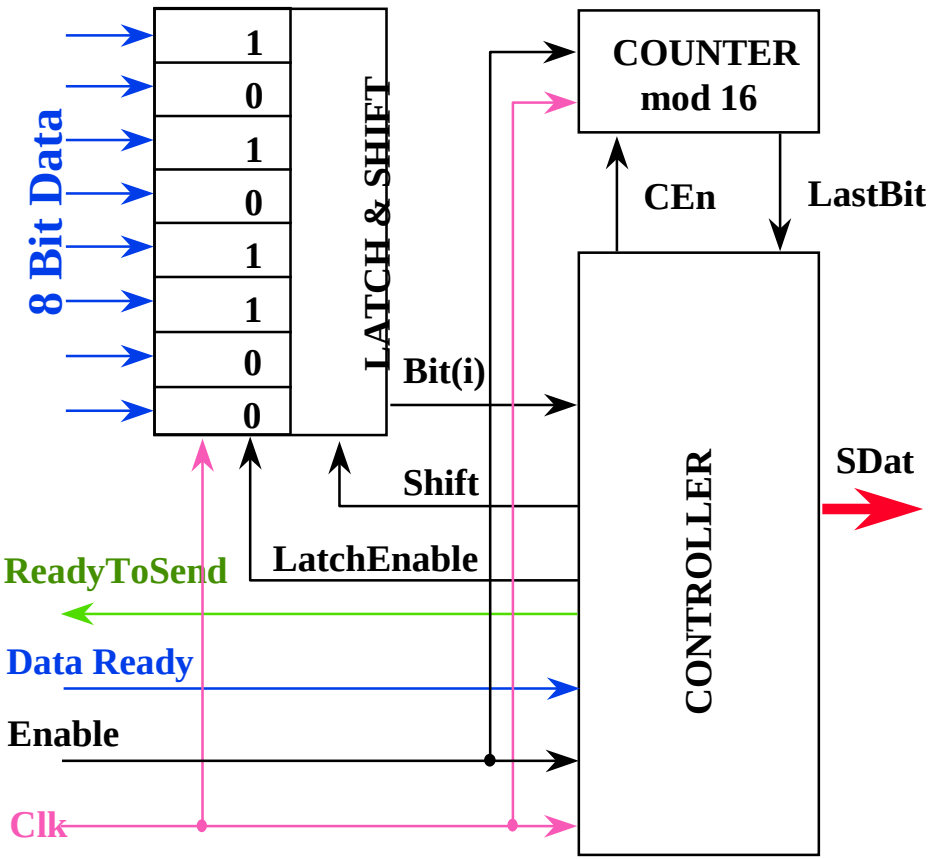

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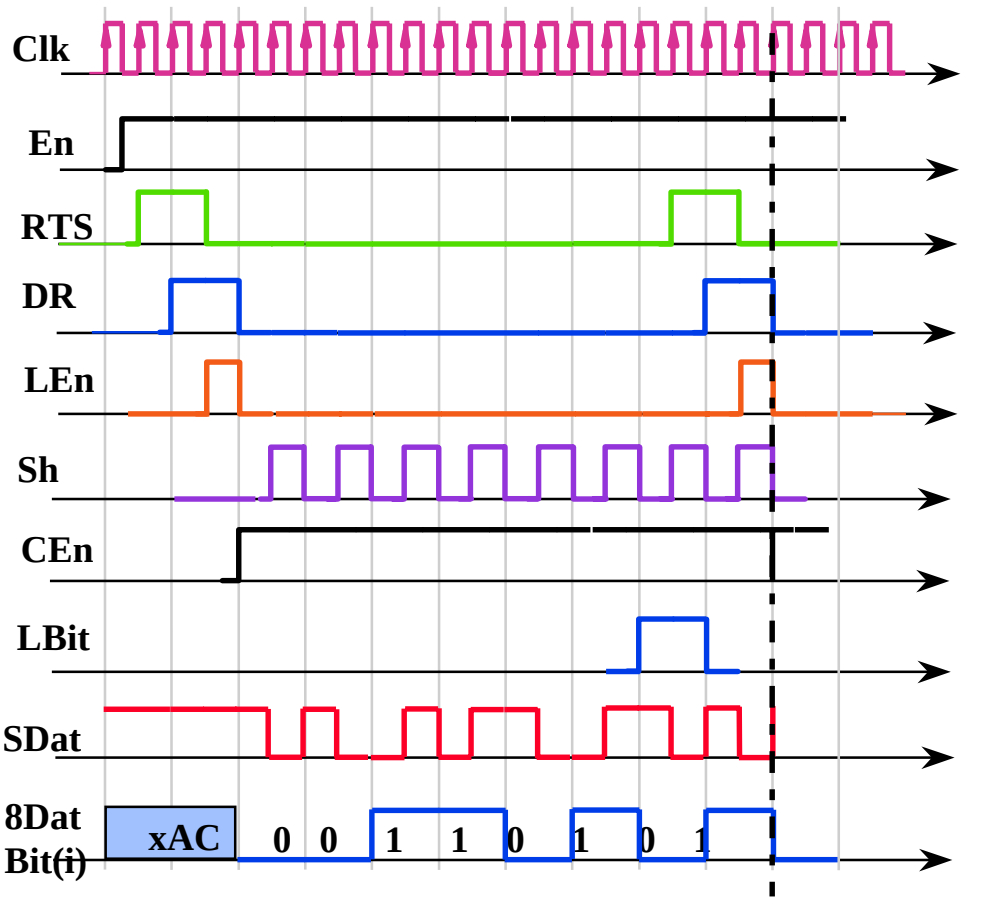

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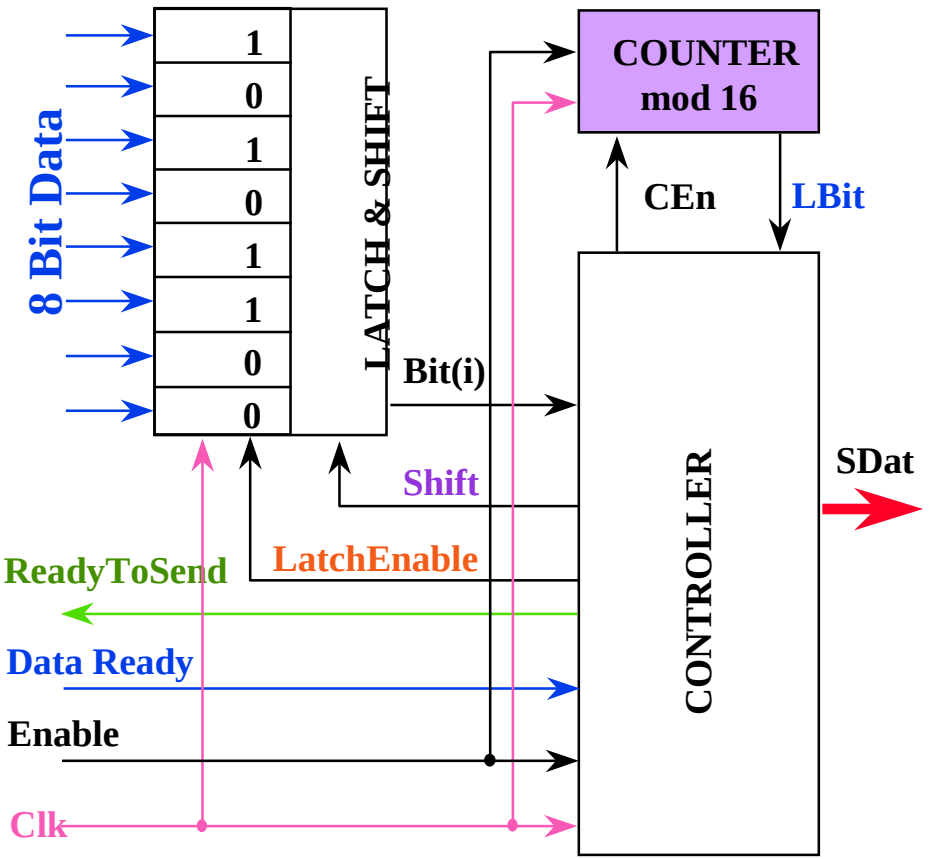
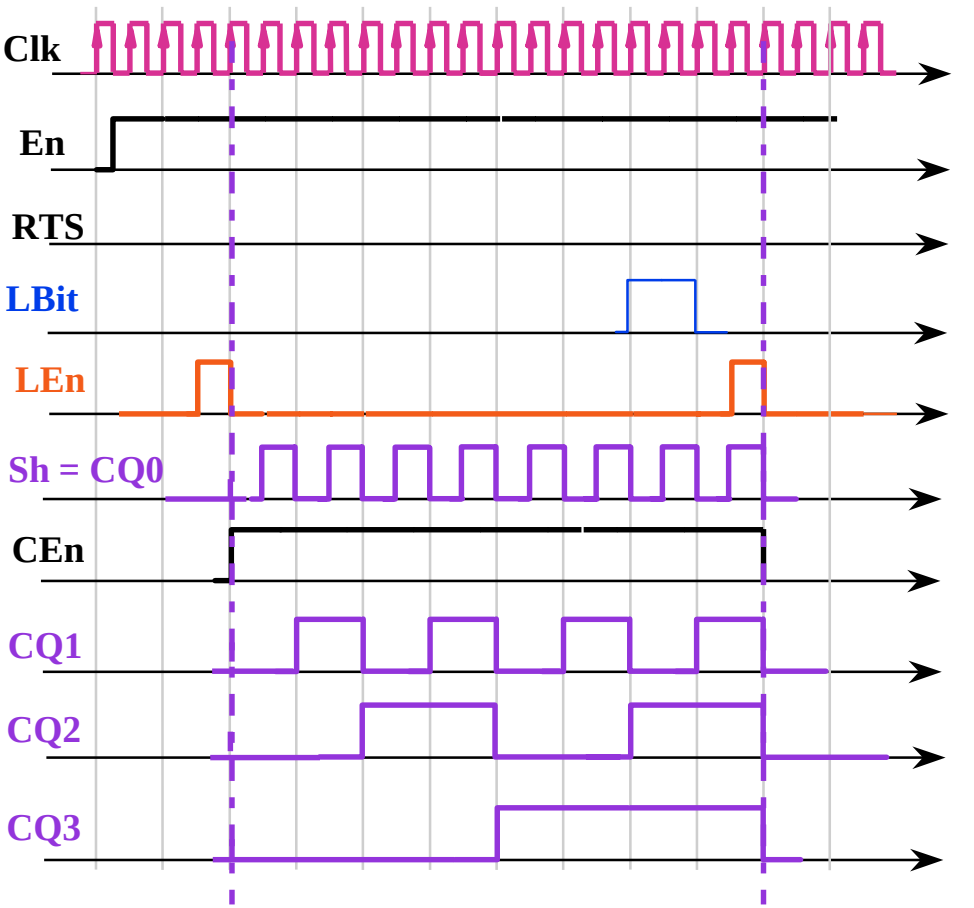
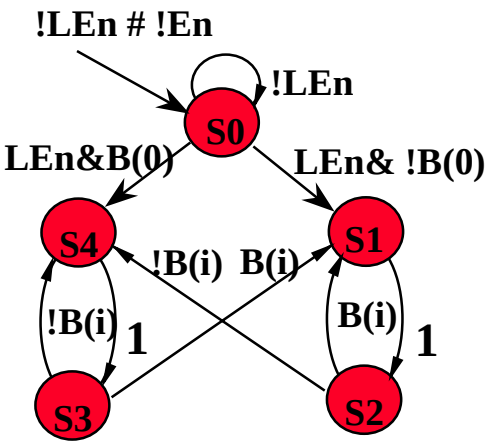


Counter timing



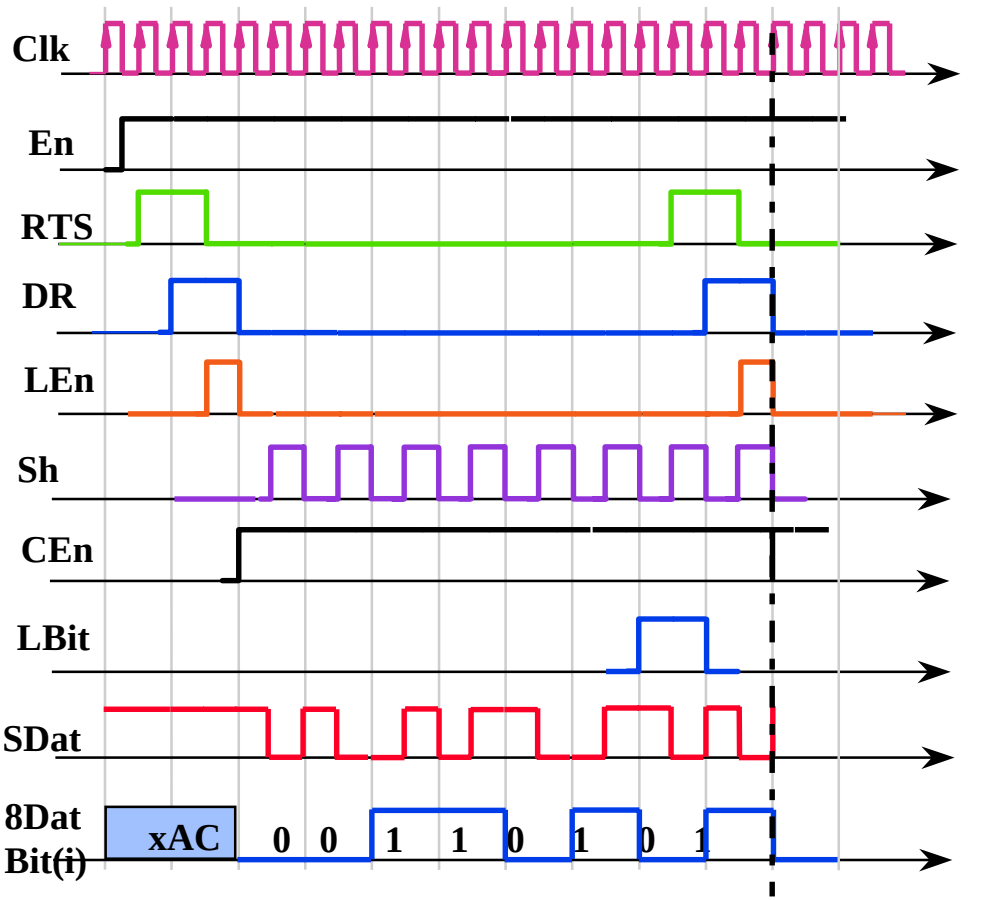
Manchester2 Encoder

- CONTROLLER



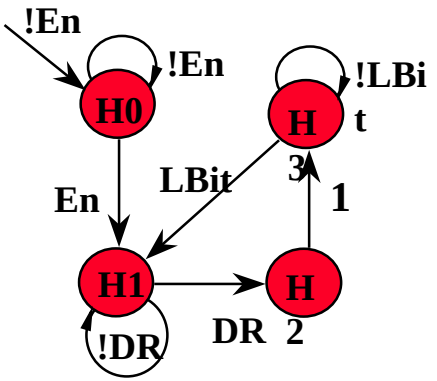
	Q0	Q1	Sdat	
S0	0	0	1	
S1	1	0	1	0
S2	0	1	0	
S3	0	1	1	1
S4	1	0	0	

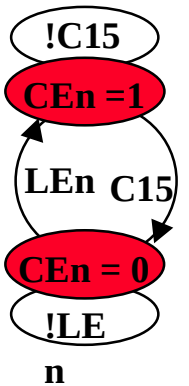
Timing



Manchester2 Encoder

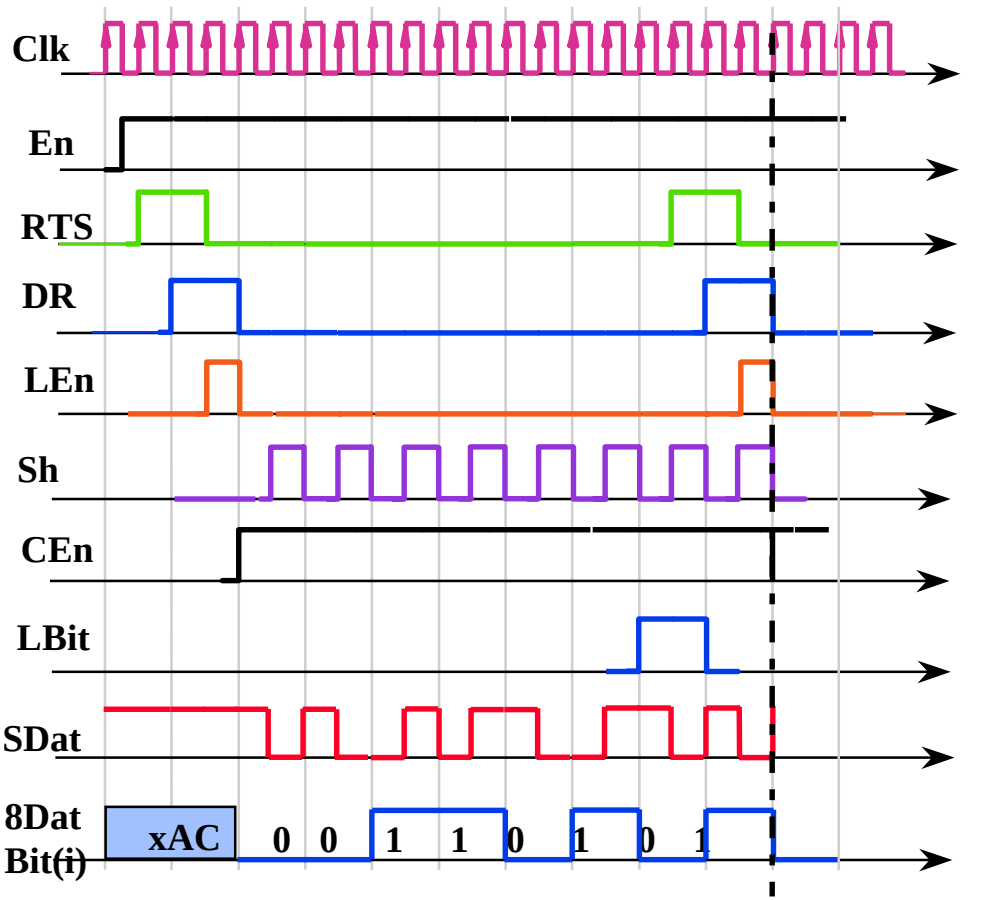
- CONTROLLER





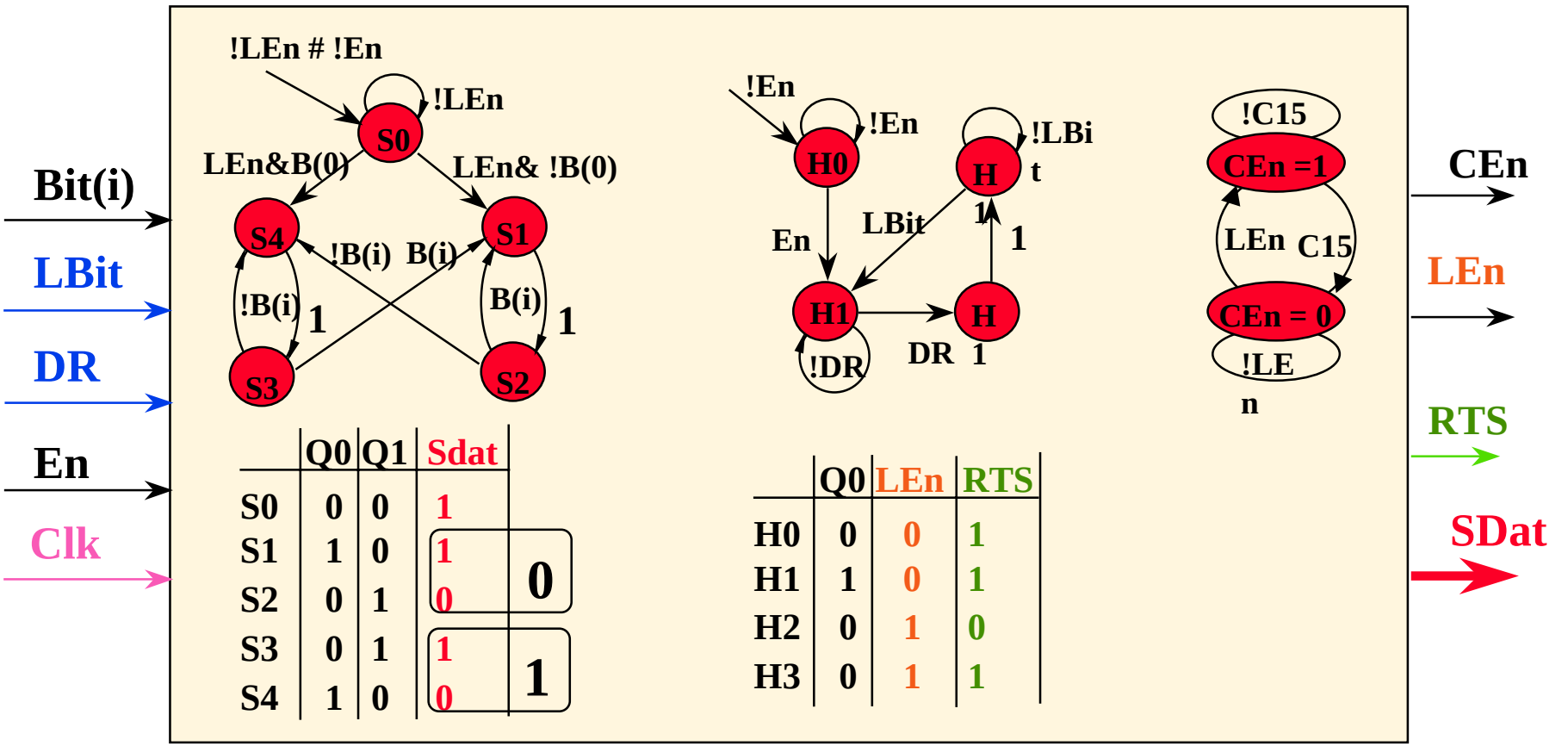
	Q0	LEn	RTS
H0	0	0	0
H1	0	0	1
H2	0	1	0
H3	1	0	0

Timing



Manchester2 Encoder

- CONTROLLER



	Q0	Q1	Sdat
S0	0	0	1
S1	1	0	1
S2	0	1	0
S3	0	1	1
S4	1	0	0

	Q0	LEn	RTS
H0	0	0	1
H1	1	0	1
H2	0	1	0
H3	0	1	1

What have we learnt?

- Top down design methods suite well design of digital systems.
- State diagrams are efficient tools in design of sequential logic.
  A controller can be defined as a set of interacting FSMs.
- Timing diagrams are important to understand interactions in more complex designs.
- Synchronous systems are safe and relatively easy to design.