

# Lecture 14 - PN Sequences and Scrambling

**Exercise 1:** How many flip-flops would be required to generate a ML PRBS of period 8191? How many ones would the sequence have? What is the longest sequence of 0's? How many runs of 5 ones are there?

$$2^{10} = 1024$$
$$2^3 = 8$$

- period = 8191 =  $2^k - 1$

$$2^k = 8192 \quad k = 13$$

- number of 1's =  $2^{k-1} = 2^{12} = 4096$

- one run of  $k-1$  zeros =  $13-1$  zeros = 12.

- ...

**Exercise 2:** Why not?

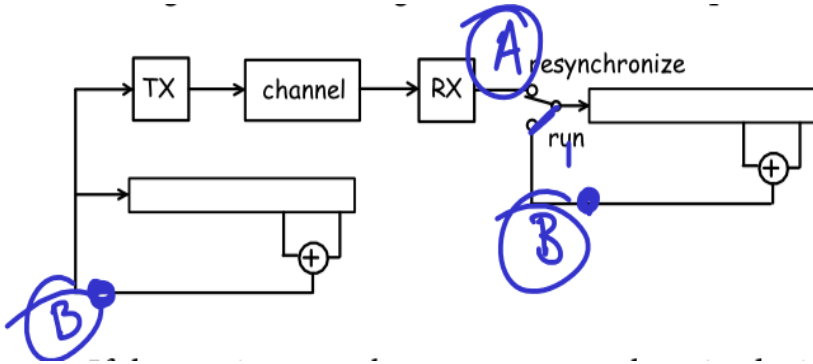
- descrambler algorithm is public

- anyone can descramble

**Exercise 3:** How many errors will appear in the output of a V.34 descrambler if there is one input error?

3 errors  
(1 for initial error  
1 for each flip)

**Exercise 4:** In the diagram above, what two signals would the receiver compare to detect errors?



compare A & B