

# CS232 Run Length Encoding

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## 1 Introduction

The task is to design a data compression circuit using run-length encoding. It replaces continuously repeated occurrences of a byte by a repeat count and the byte value. The circuit receives a fresh byte at every positive transition of an externally supplied clock. We are to use the 'ESC' character to signal the use of a repeat count. Therefore, if the 'ESC' character itself appears in the input stream, it has to be handled in a special way, escaping it with another ESC character.

## 2 Structure

The idea is to, at each clock cycle, keep track of the previous input value by storing it in a **register**. We keep an output buffer that stores the byte packets that are to be sent as output since only 1 byte can be outputted per clock cycle, the rate of output may be less than or more than the clock rate. The flow of the circuit is as follows:

- Clock is at 0
- We take input from the file: call it input\_signal
- We have a temporary storage variable - temp
- If temp is empty store input\_signal in temp
- If temp = input\_signal then increment a counter
- If temp  $\neq$  input\_signal then
  - If temp = ESC then store ESC, counter and ESC in buffer
  - If temp  $\neq$  ESC then either store ESC, counter, temp or temp, temp or temp in the buffer
- At each falling edge of the clock empty the oldest element of the buffer while making data\_valid = 1 and keeping it 0 in case the buffer is empty

## 3 Assumptions

- A maximum input size of 32 bytes
- Inputs within the ASCII values