Error Detection

Checksum

Add up all the bytes that are being sent. What's left is a "residue" – the lower eight bits of the sum of all the bytes. The transmitter sends the checksum with the data. The receiver compares its own checksum of the data with that of the transmitter.

This is better than parity for detecting errors. However, there is a better alternative.

Cyclic Redundancy Check (CRC)

A frame check sequence (FCS) is calculated … k-bits in a frame.

$k + n$

Where n is the size of the frame check sequence

The receiver gets the information and is also doing the cyclic redundancy check. It is actually a division algorithm. A particular number is used as a divisor. After transmitted, $k + n$ is calculated and divided by the dvisor. If the remainder is not 0, there was an error in transmission

Example:

```
1010001101          Pattern being sent
    110101          6-bit pattern. Therefore, FCS = 5 bits
```

101000110100000 Divides by the pattern, which is 110101

The remainder to this division is 01110. This gets tacked on to the end, in the place of 00000:

101000110101110

The receiver will divide by the same divisor (the 6-bit pattern 110101)

Types of errors that can be detected

- All single bit errors
- All double bit errors if the pattern contains as least three ones.
- Any odd number of errors if it contains x + 1
- Any burst errors if the burst has fewer bits than the pattern

CRC-12 = $x^{12} + x^{11} + x^3 + x^2 + x^1 + 1$
CRC-16 = $x^{16} + x^{15} + x^2 + 1$