Network Communication Technology

Chapter 2
Introduction to Data Communication

Analog Signal:
A Sine Wave

- Frequency

- Amplitude

- Phase
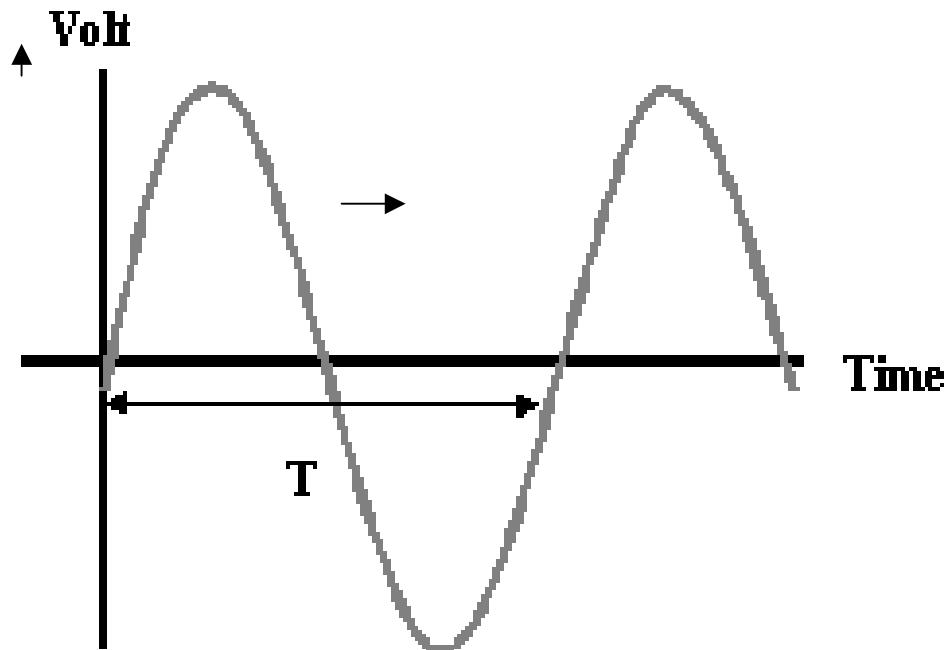

Figure 2.1

Amplitude
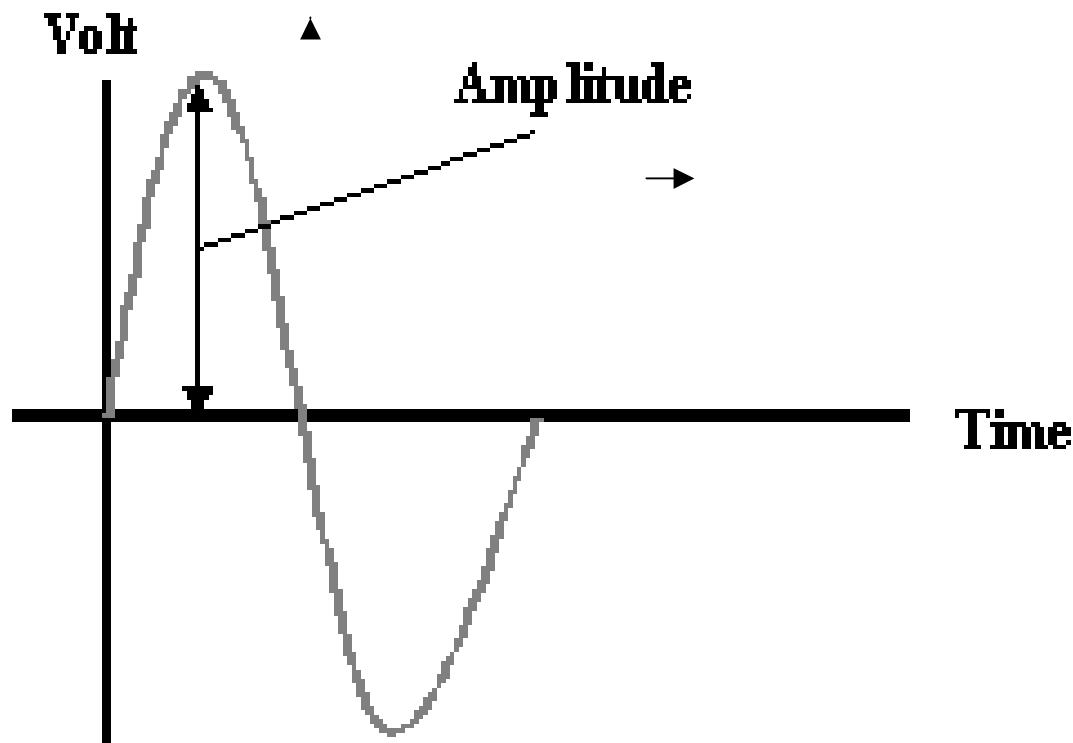

Figure 2.2

Phase

- TBD

Digital Signal
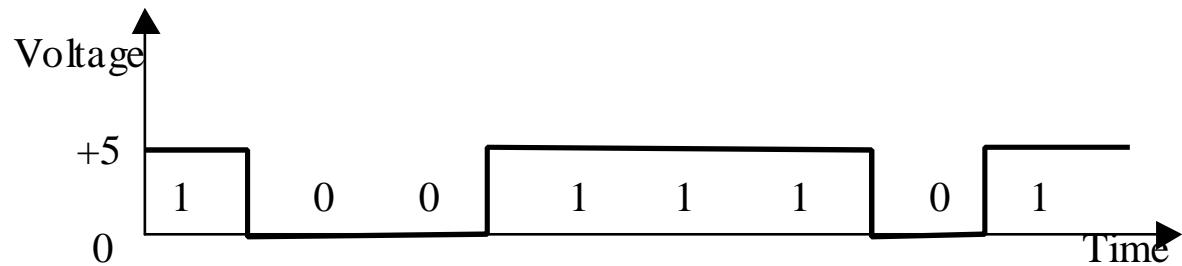
Figure 2.4

Asynchronous Transmission
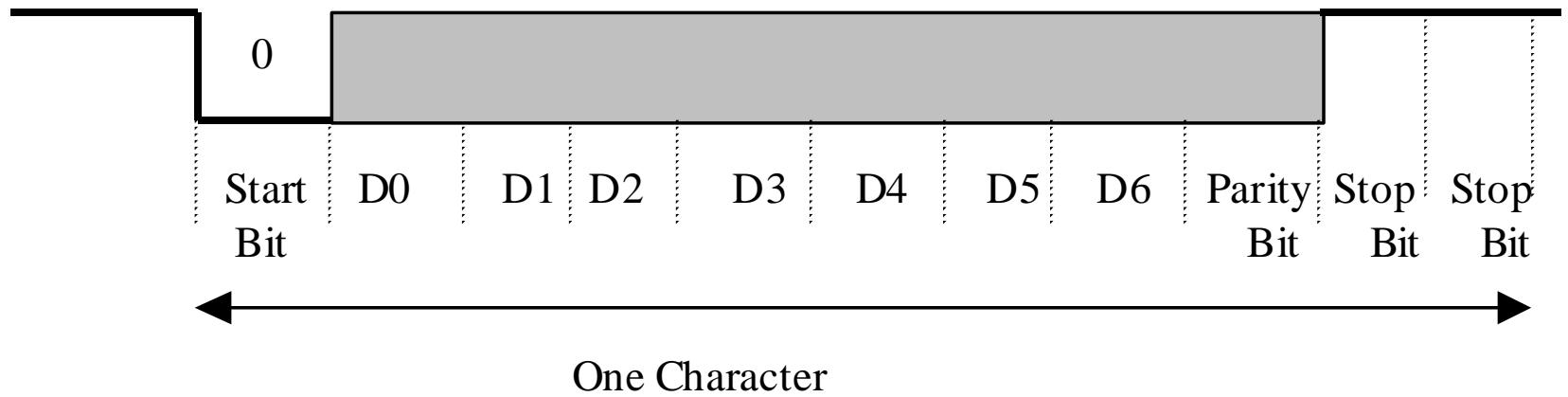
Figure 2.6

Synchronous Transmission

Transmitter   Receiver

data
 0   1   1   0   1

Clock
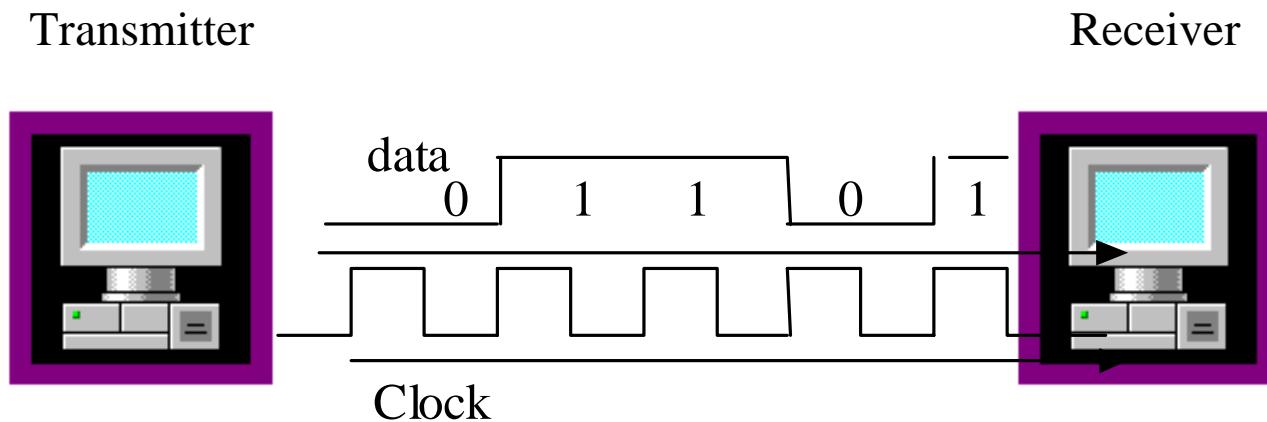
Figure 2.7

Serial Transmission

1 0 1 0 1 1 0 1

Ground Line
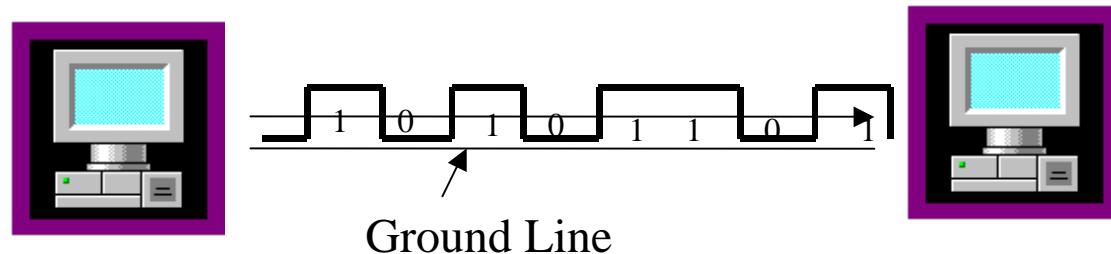
Figure 2.8

Parallel Transmission
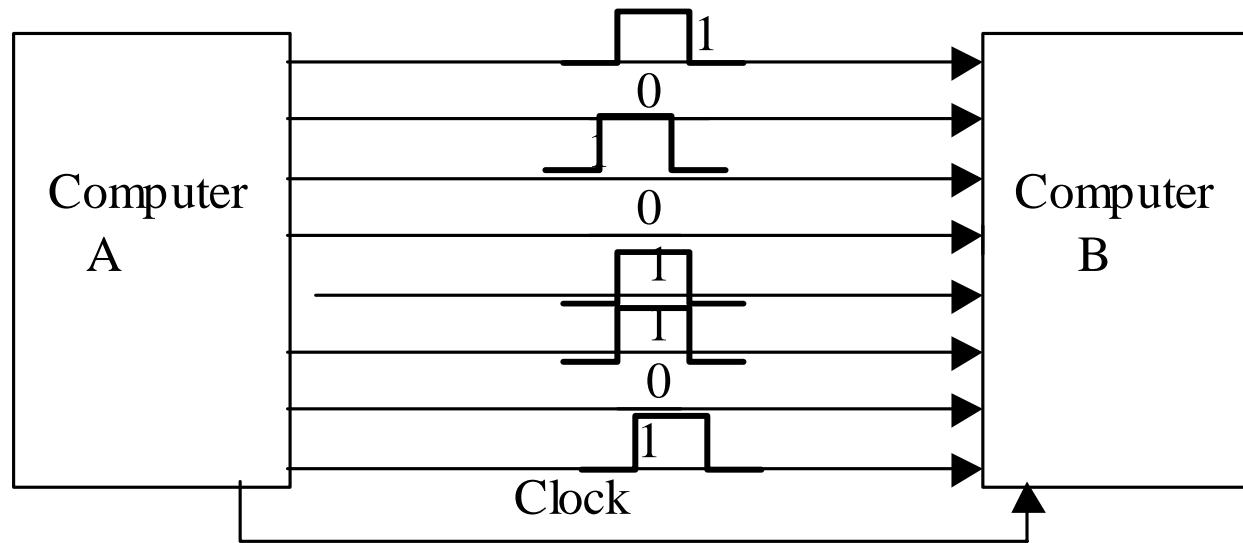
Figure 2.9

# Simplex/Duplex

Sender   Receiver
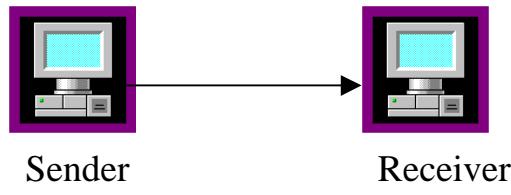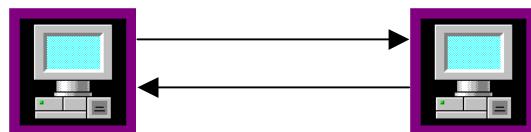
Simplex: Figure 2.9

Transmitting in both directions
only one direction at the time

Half Duplex: Figure 2.10
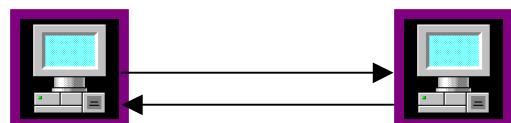
Full Duplex: Figure 2.11

Encoding
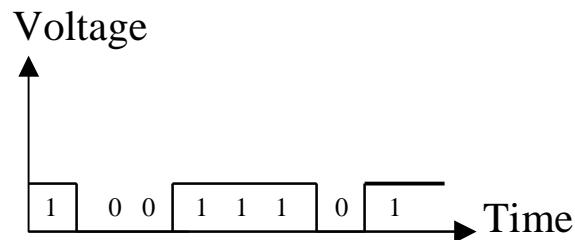
Unipolar: Figure 2.13
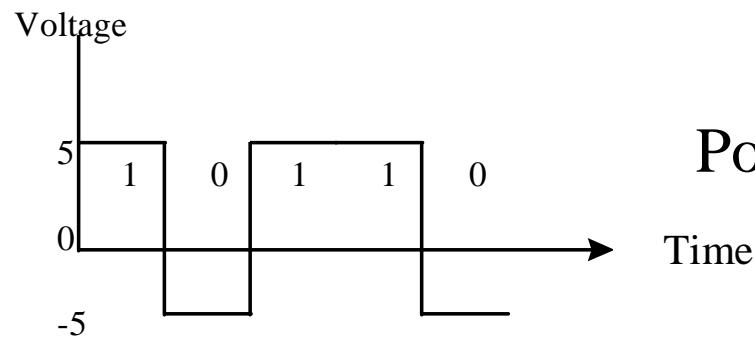
Polar (Anti-Podal): Figure 2.14

Encoding (Continued)
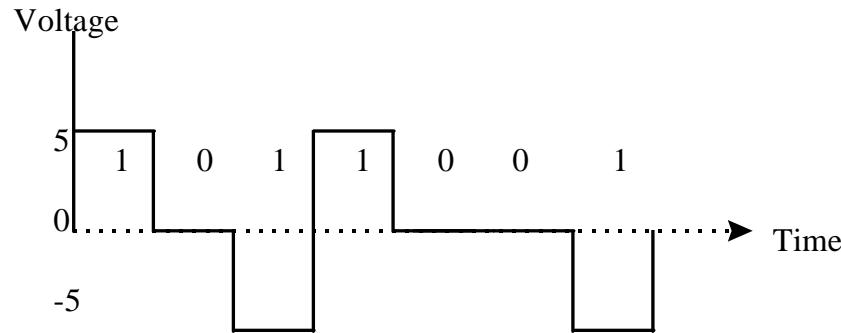
Bipolar: Figure 2.15
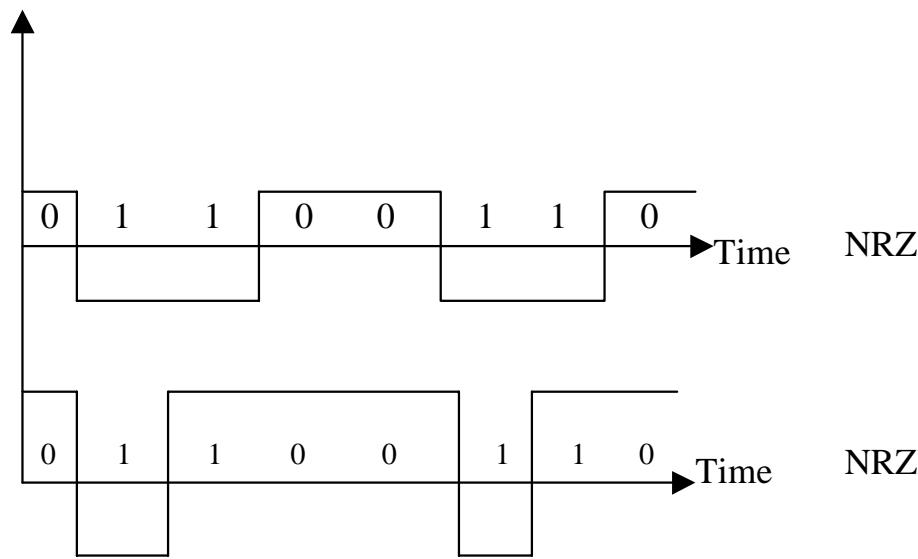
NRZ/NRZ-I
Figure 2.16/2.17

Manchester Encoding
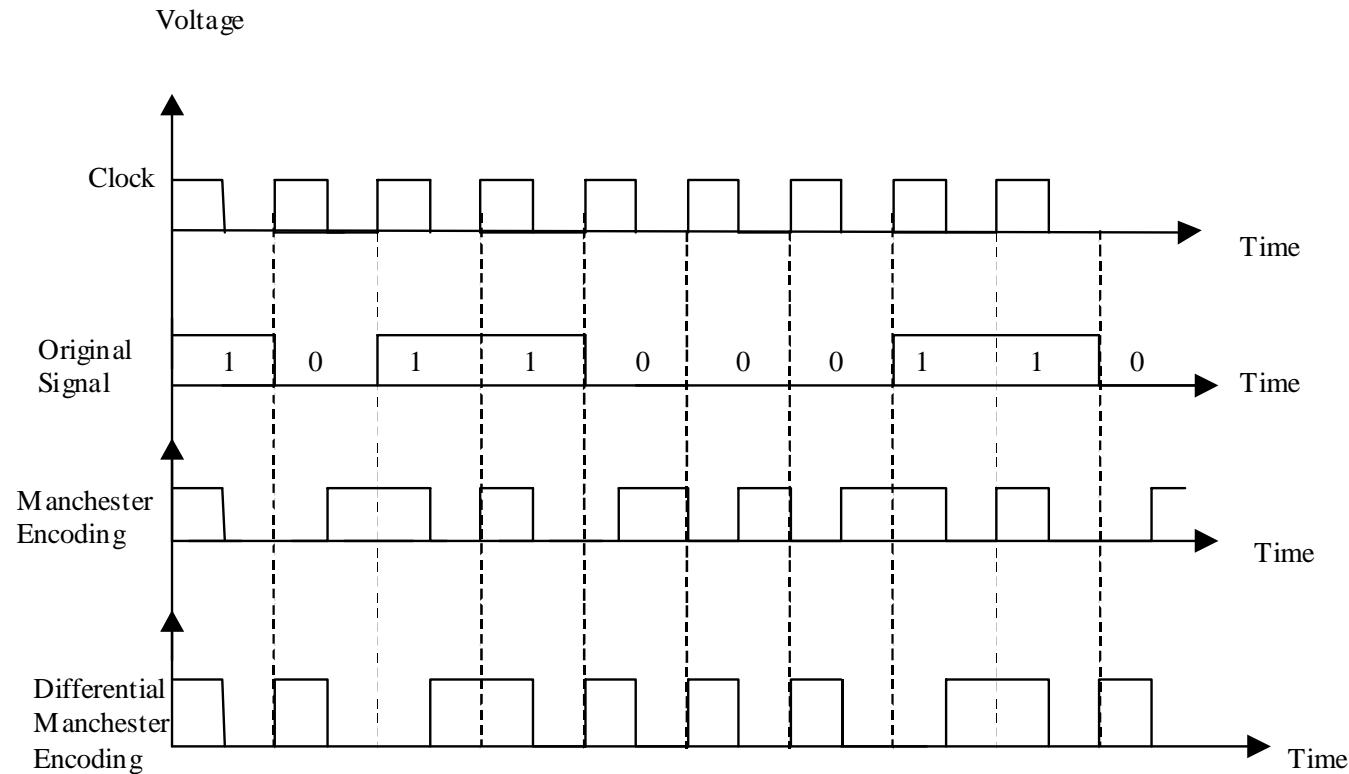
Figure 2.17

Parity Bit Generation

B6 B5 B4 B3 B2 B1 B0

Exclusive OR

Odd Parity Bit

Even Parity Bit
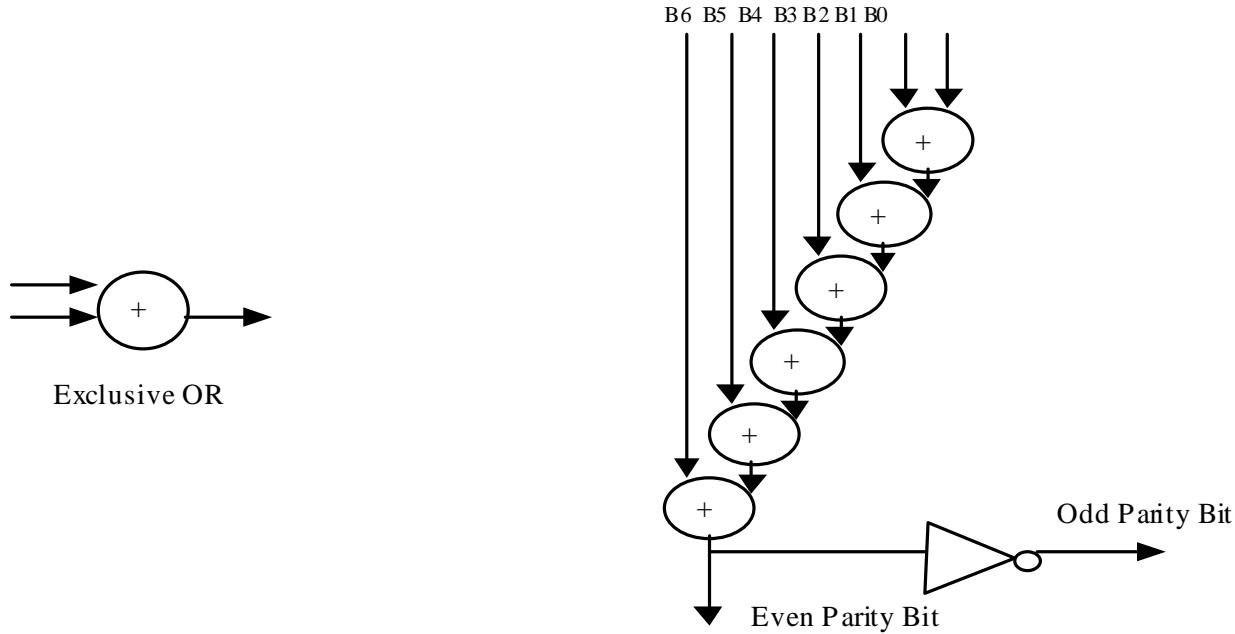
Figure 2.19

One's Complement of the Sum

transmitting side
   1000010
   1111101 Header contents
   0000001
   <u>0111100</u>
   1111100

therefore: One's complement is 000011

Receiving side
   1000010
   1111101
   0000001
   <u>0001100</u>
   0011001

therefore: One's Complement is 1100110

Figure 2.19

Frame Check Sequence (FRC) Calculation

```
                  101010 Quotient
          _____
    1101 /  111010000
             1101
          _____
             001110
              1101
            _____
             001100
               1101
             _____
             00010
```

Remainder or FCS is 010

Figure 2.21

Input 111010000

```
  +-----+     +-----+     +-----+     +-----+     (+)
  | C2  |<--( + )<--| C1  |<--| C0  |<--( + )
  +-----+     +-----+     +-----+     +-----+
```
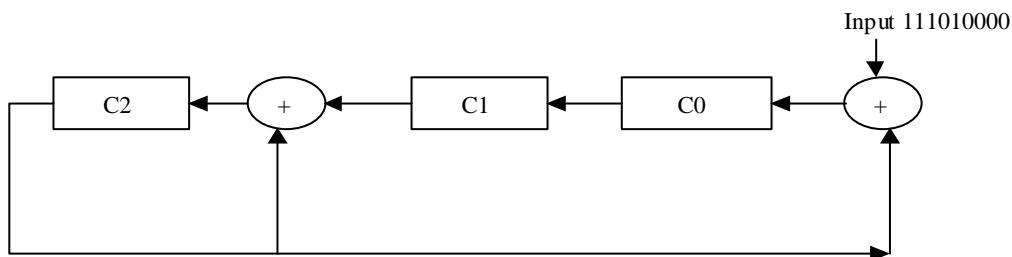
Figure 2.24
See Table 2.7

Cyclic Redundancy Check (CRC)
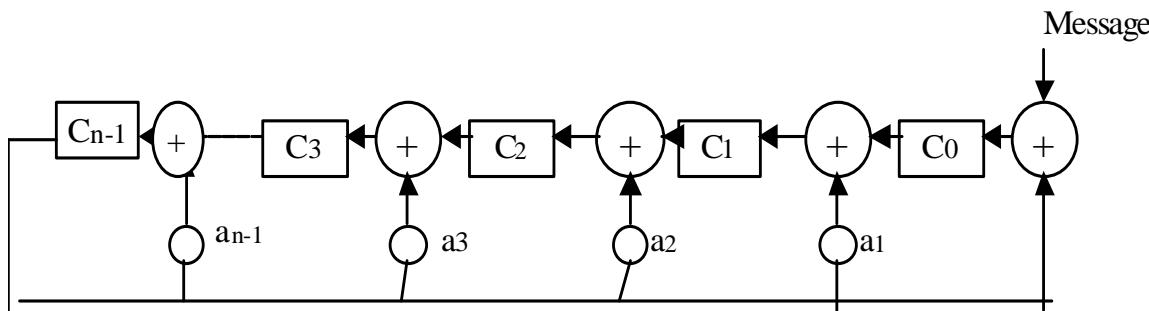
General Structure
Figure 2.22

$$P(X)=X^5+X^4+X^2+1$$
Figure 2.23