

Ethernet on the cable

10 Mbit/s Ethernet

Signals sent over all 10 Mbit/s media systems uses Manchester encoding. Manchester encoding combines data and clock into bit symbols, which provide a clock transition in the middle of each bit. A logical zero (0) is defined as a signal that is high for the first half of the bit period and low for the second half, i.e. a negative signal transition. A logical (1) is defined as a positive signal transition in the middle of the bit period.

The signal transition makes it easy for a receiver to synchronise with the incoming signal and to extract data from it. A drawback is that the worst case signalling rate is twice the data rate. A link test signal is transmitted when there is no data to send.

Fast Ethernet

100Base-T media systems uses 4B/5B block encoding. Blocks of 4-bit data are translated into 5-bit code symbols for transmission over the media system. The 5-bit encoding system allows for transmission of 32 5-bit symbols, including 16 symbols that carry the 4-bit data and 16 symbols used for control. The IDLE control symbol is continually sent when no other data is present. For this reason Fast Ethernet is continually active, sending 5-bit IDLE symbols at 125 Mbit/s if there is nothing else to send. Each 100 Mbit/s (Fast Ethernet) system uses different media signalling.

100Base-TX uses scrambling and multilevel threshold-3 (MLT-3) signalling. The signal, on the cable, can have one of three levels. A change from one level to the next marks a logical one (1). Constant single level indicates a logical zero.

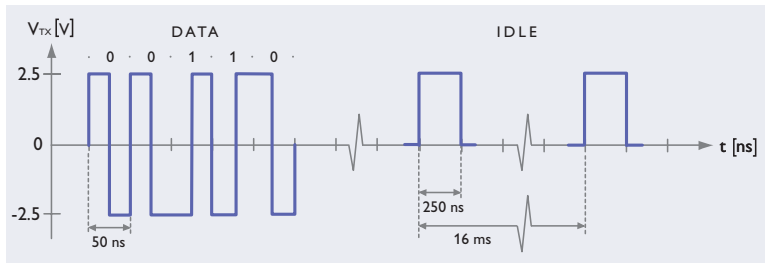
To reduce (spread out) the electromagnetic emission a scrambling process is applied before the signal is MLT-3 modulated. The scrambler produces a non-repetitive bit sequence of the bits to be transmitted.

A **100Base-FX** fibre media system uses NRZI encoding. This system makes no change in the signal level when sending a logical zero, but inverts the level at logical ones.

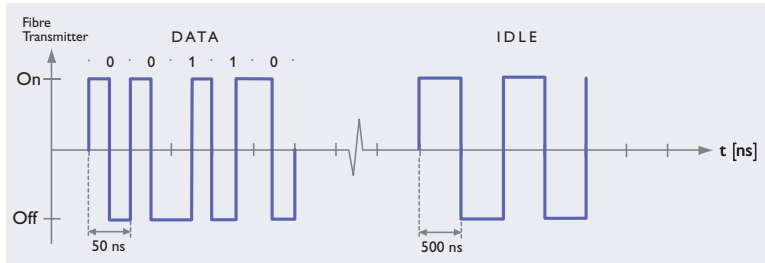
Gigabit Ethernet

1000Base-T (copper) uses 4D-PAM5 encoding. The system transmits and receives data on four wire pairs simultaneously (4D), using five voltage levels (PAM5) at each twisted pair.

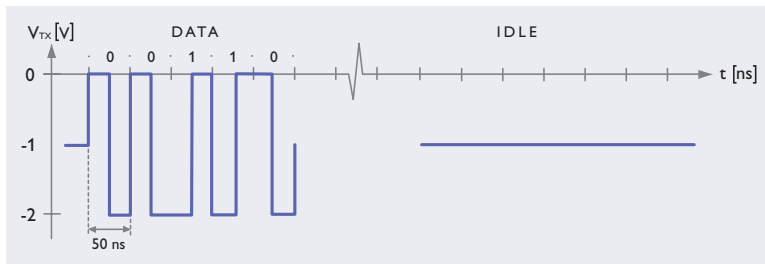
100Base-T (fibre) uses 8B/10B encoding. Data and control symbols are transmitted at a rate of 1250 Mbit/s. The high signalling rate requires use of laser transceivers.



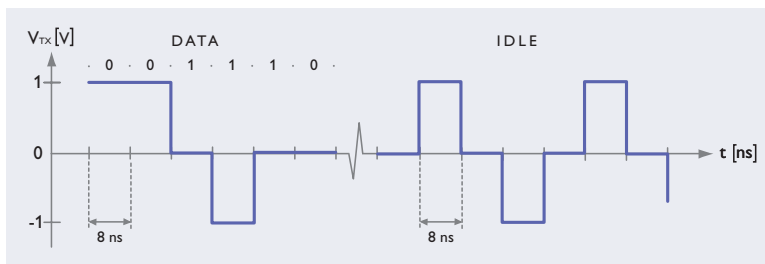
10Base-T



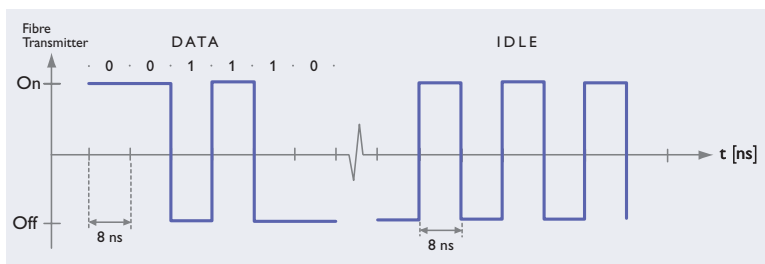
10Base-FL



10Base2



100Base-TX



100Base-FX