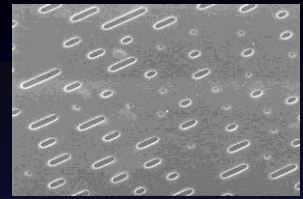


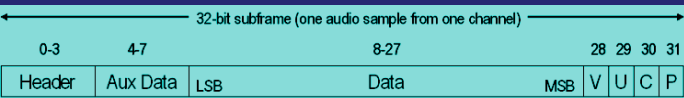
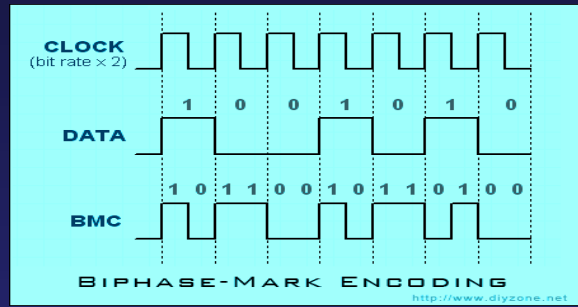
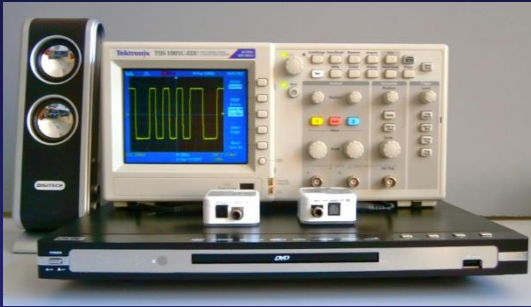
DIGITAL OPTICS

An optical digital signal from a CD player is decoded to give an audio signal. This type of link, called a TOSLINK uses a 1mm diameter polymer fibre with a low power red LED and usually has a short range.



CD pits that create the digital signal

The CD sample rate is 44.1KHz (44,100 times per second). Each sample is coded into Bi-phase-Mark-Code by using a clock signal that runs at twice the rate of the data stream. There are two changes of signal for each data 1 transmitted and one change only for each data 0.



Each sample is transmitted as a 32 bit word. 16 bits determine the audio or voltage level of the signal and the rest are control or unused bits. With two channels (stereo) the bit rate is $44,100 \times 32 \times 2 = 2,822,400$ bits per second

Things to Do

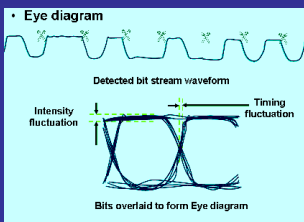
Remove the TOSLINK plug from the in line transmitter and observe the red light (650nm) emerging from the fibre. Signal transmission uses an eye safe LED (Light Emitting Diode)

Plug the TOSLINK into digital-analog convertor and press PLAY on the CD player.

The digital signal can be seen on the oscilloscope. Use the AUTO SCALE and RUN/STOP buttons to observe the digital signal. Adjust the HORIZONTAL and VERTICAL controls to change the amount of signal on the screen.

Try and calculate the bit rate! Is it about 2.8 Megabits (2,800,000 pulses per second)?

Press WAVEFORM DISPLAY and PERSIST buttons to see an “EYE” diagram



The original analog music signal is digitized and after transmission is used to recreate the analog signal. Note the small digital steps.

