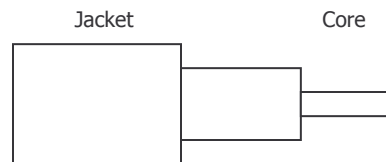# Optical Fiber

Types of Fiber
Step index, multimode
Graded index, multimode
Single Mode

Jacket   Core

Step Index
In the step index, the idea is that the entire core has the same index of refraction throughout the whole thing.

Not all the light rays associated with a particular signal arrive at the same time on the other end. This results in some **spreading**, which reduces the maximum data transfer rate that can be used. Signals can begin to overlap with one another, thus resulting in intersymbol interference.

Graded Index
The index of refraction is greater in the center than it is on the outside. This changes the speed at which light can propagate through it. This slows down the light rays going through the center, thus helping the spreading issue that happens with step index.

This allows for higher data rates.

Single Mode
Same index of refraction throughout the entire core. However, the core's diameter is much smaller. This keeps the light from bouncing around all over the place and allows for fast data transmission.

What's nice about optical fiber is that you can have multiple channels of communication using different colors of light. Ex: 10 Gbps, 80 channel concurrent transmission.

Encoding Techniques

Directions
Digital Data / Digital Signals
Digital Data / Analog Signals
        Modem
Analog Data / Digital Signals
Analog Data / Analog Signals

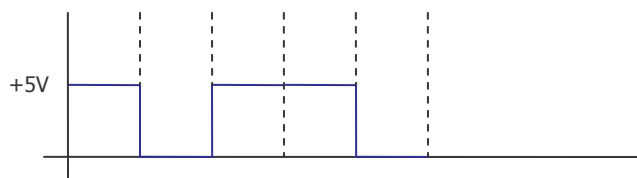Voice transmitted on the telephone wire on the local loop

Digital Data / Digital Signals

The simplest type of encoding is called **NRZ** (non return to zero).

The data that is being transmitted is turned into electrical voltages. The voltage doesn't change during the time that the data is being transmitted.

If transmitting 1 0 1 1 0:

Unipolar Digital Signal

Bipolar Digital Signal