



# Connectors and Wiring Standards



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# Physical Media

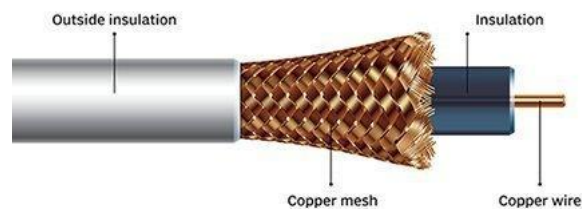
Coaxial Cable  
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## Coaxial Cable

A type of copper cable specially built with a metal shield and other components engineered to block signal interference



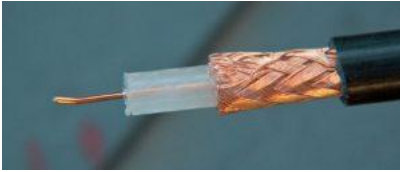
- ✓ Inexpensive
- ✓ Easy to install
- ✓ Easy to expand
- ✓ Resistance to EMI
- ✓ Up to 10 Mbps
- ✓ Durable

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## Coaxial Cable

There are two types of coaxial cable:



Thicknet (10Base5)



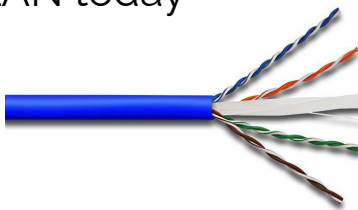
Thinnet (10Base2)

Thicknet and thinnet are used in Ethernet implementations



## Twisted-Pair Cable

The most common type of network medium used in LAN today



UTP - Unshielded Twisted pair



STP - Shielded Twisted pair



Cheaper



Easy to work



High transmission



# ► Twisted-Pair Cable

## N <Signaling> X

**N:** Signaling rate in Mbps

**<Signaling>:** Signalling type (*baseband or broadband*)

**X:** Unique identifier

### Examples:

10Base-T: 10Mb or 10Megabits twisted pair

100Base-F: 100Mb or 100Megabits fiber



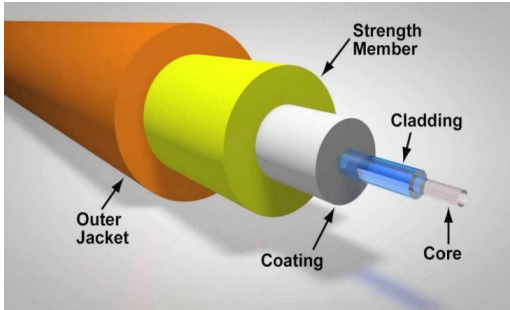
# ► Twisted-Pair Cable

Category	Maximum Speed	Max. Length	Frequency	SHIELDING	Application
CAT 1	Up to 1Mbps(Carry only Voice)	--	1MHz	Unshielded	Old telephone cabling
CAT 2	Up to 4Mbps	--	4MHz	Unshielded	Token Ring Network
CAT 3	Up to 10Mbps	100m	16MHz	Unshielded	Token Ring & 10BASE-T Network
CAT 4	Up to 16Mbps	100m	20MHz	Unshielded	Token Ring Network
CAT 5	Up to 100Mbps	100m	100MHz	Unshielded	Ethernet, Fast ethernet and Token Ring
CAT 5e	Up to 1Gbps	100m	100MHz	Unshielded or Shielded	Ethernet, Fast ethernet & Gigabit ethernet
CAT 6	Up to 10Gbps	100m	250MHz	Unshielded or Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 6a	Up to 10Gbps	100m	500MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 7	Up to 10Gbps	100m	600MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(100 meter)
CAT 8	Up to 40Gbps	100m	2000MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 25G-40G Ethernet(30 meter)



# Fiber-Optic Cable

Very thin strand of pure glass that acts as a waveguide for light over long distances

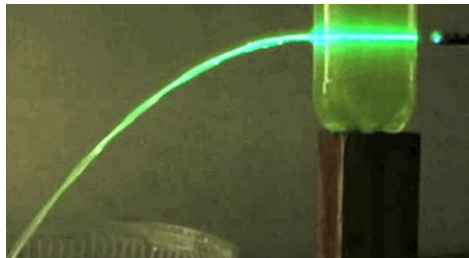


Total internal reflection



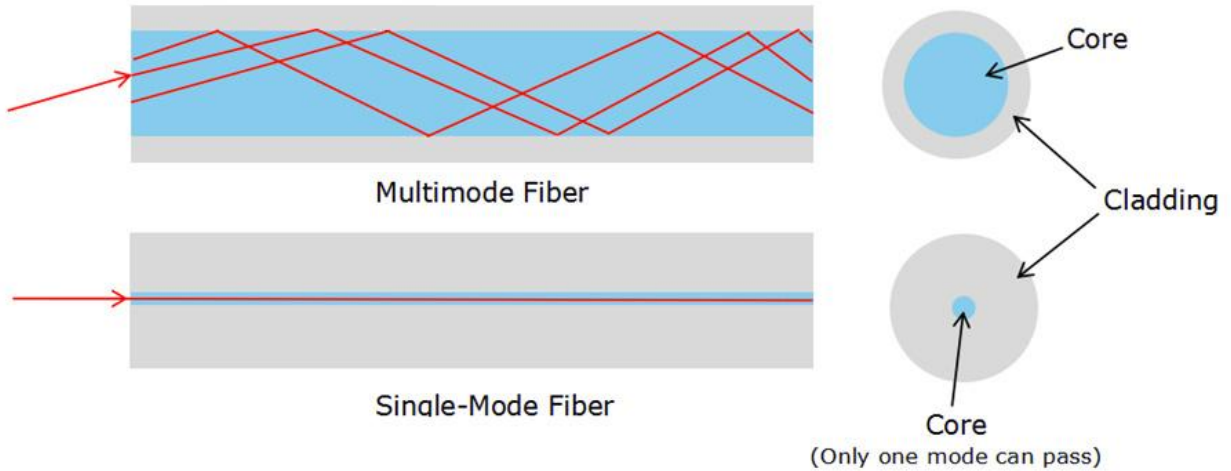
# Fiber-Optic Cable

- |                                    |  |
|------------------------------------|--|
| ✓ Immune to EMI and RFI*           | ✗ Difficult to install   |
| ✓ Very long range                  | ✗ More expensive than TP   |
| ✓ Broad bandwidth (Tbits/s or THz) | ✗ Troubleshooting equipment is more expensive than TP test equipment |
| ✓ Low transmission loss            | ✗ Harder to troubleshoot   |
| ✓ Not dissipate heat               |  |





# Fiber-Optic Cable



# Media Converters

Converts Ethernet or other communication protocols from one cable type to another type

Main types:

- Fiber-to-Ethernet
- Fiber-to-Coaxial
- Fiber-to-Fiber
- Ethernet-to-Coaxial



Fiber-to-Ethernet converter



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## Cable Properties



## Cable Properties

### Transmission Speeds

Based on the type of cable or fiber, network administrators can control the speed of a network to meet the network's traffic demands

Media Type	Bandwidth	Performance: Typical Error Rate
Twisted-pair for analog voice applications	1 MHz	Poor to fair ( $10^{-5}$ )
Coaxial cable	1 GHz	Good ( $10^{-7}$ to $10^{-9}$ )
Microwave	100 GHz	Good ( $10^{-9}$ )
Satellite	100 GHz	Good ( $10^{-9}$ )
Fiber	75 THz	Great ( $10^{-11}$ to $10^{-13}$ )



# Cable Properties

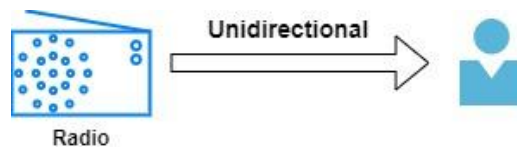
## Distance

Standard	Data Rate	Max Distance	Cable Type
10Base2	10 Mbps	185 m	Coaxial
10Base5	10 Mbps	500 m	Coaxial
10BaseT	10 Mbps	100 m	Ethernet
100BaseT	100 Mbps	100 m	Ethernet
1000BaseT	1 Gbps	100 m	Ethernet
10BaseFL	10 Mbps	2 km	Fiber (Multi Mode)
100BaseSX	100 Mbps	300 m	Fiber (Multi Mode)
100BaseLX	100 Mbps	100 km	Fiber (Single Mode)
1000BaseLH	1 Gbps	70 km	Fiber (Single Mode)

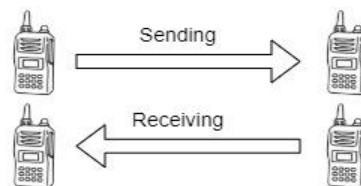


# Cable Properties

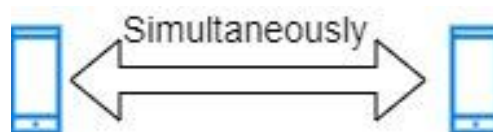
## Simplex



## Half-duplex



## Full-duplex







# THANKS!

## Any questions?

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