Ethernet Cabling

4.2.1

Twisted-Pair Cables

The networks in most homes and schools are wired with twisted-pair copper cable. This type of cable is inexpensive compared to other types of cabling, and it is readily available. The Ethernet patch cables that you can purchase through the internet or at a retail store are an example of copper twisted-pair cable.

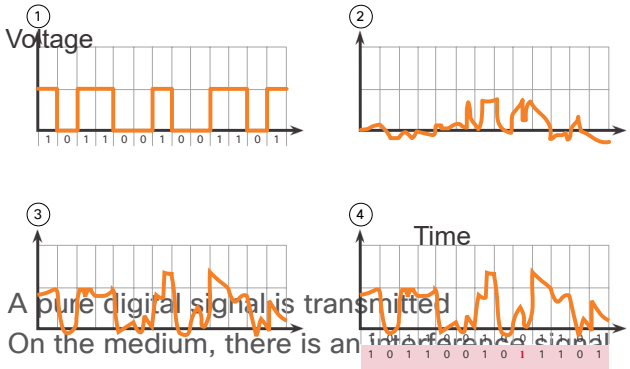
Twisted-pair cables consist of one or more pairs of insulated copper wires that are twisted together and housed in a protective jacket. Like all copper cables, twisted-pair uses pulses of electricity to transmit data.

Data transmission over copper cable is sensitive to electromagnetic interference (EMI), which can reduce the data throughput rate that a cable can provide. Common items in a home that can create EMI include microwave ovens and fluorescent light fixtures.

Another source of interference, known as crosstalk, occurs when cables are bundled together for long lengths. The electrical impulses from one cable can cross over to an adjacent cable. This occurs most frequently when cables are improperly installed and terminated. When data transmission is corrupted due to interference such as crosstalk, the data must be retransmitted. This can degrade the data carrying capacity of the medium.

The figure illustrates how data transmission is affected by interference.

Pure Digital Signal



1. A pure digital signal is transmitted.
2. On the medium, there is an interference signal.
3. The digital signal is corrupted by the interference signal.
4. The receiving computer reads a changed signal. Notice that a 0 bit is now interpreted as a 1 bit.

4.2.2

Types of Twisted-Pair Cables

There are two commonly installed types of twisted-pair cable:

- **Unshielded twisted-pair (UTP)** - This is the most commonly encountered type of network cable in North America and many other areas.
- **Shielded cables (STP)** - These are used almost exclusively in European countries.

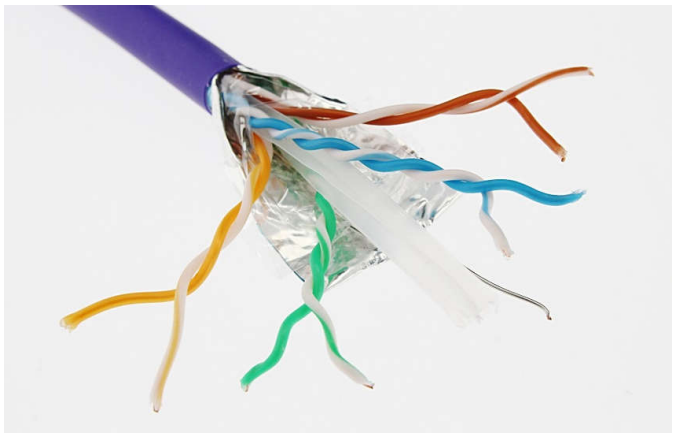
Click each twisted-pair type for more information.

UTP Cable STP Cable

STP Cable

There are electrical environments in which EMI and RFI are so strong that shielding is a requirement to make communication possible, such as in a factory.

In this instance, it may be necessary to use a cable that contains shielding, such as shielded twisted-pair (STP). Unfortunately, STP cables are very expensive, not as flexible, and have additional requirements because of the shielding that make them difficult to work with.



Many different categories of UTP cables have been developed over time, as shown in the table. Each category of cable was developed to support a specific technology and most are no longer encountered in homes or offices. The cable types which are still commonly found include Categories 3, 5, 5e, and 6.

Category	Speed	Features
Cat 3 UTP	10 Mbps at 16 MHz	• Suitable for Etherne LANs • Most often used for phone lines

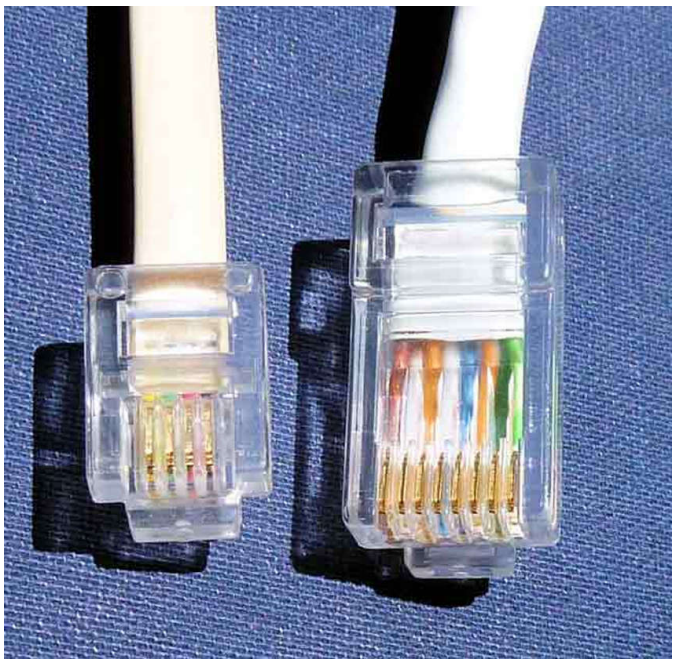
Category	Speed	Features
Cat 5 UTP	100 Mbps at 100 MHz	Manufactu with higher standard than Cat 3 to allow for higher data transfer rates
		• Manufa with higher standar than Cat 5 to allow for

Cat 5e UTP	1000 Mbps at 100 MHz	• More twists per foot than Cat 5 to better prevent EMI and RFI from outside sources
Cat 6 UTP	1000 Mbps at 250 MHz	• Manufa with higher standar than
Cat 6a UTP	1000 Mbps at 500 MHz	

Category	Speed	Features
Cat 7 ScTP	10 Gbps at 600 MHz	• Cat 5e • More twists per foot than Cat 5 to better prevent EMI and RFI from outside sources

All categories of data grade UTP cable are traditionally terminated into an **RJ-45** connector. There are still some applications that require the smaller **RJ-11** connector, such as analog phones and some fax machines. In the figure below, an example of an RJ-11 connector is on the left. The RJ-45 connector is on the right.

RJ-11 and RJ-45 Connectors



4.2.3

Check Your Understanding - Ethernet Cabling

Check your understanding of Ethernet cabling by choosing the correct answer to the following questions.

1. A type of interference that occurs when cables are bundled together for long lengths is known as:

- ◯ crosstalk
- ◯ cross-interference
- ◯ bundled-interference
- ◯ crosscheck

2. What type of Ethernet twisted-pair cable may be required when the electrical environment has strong EMI and RFI interference?

- ◯ UTP
- ◯ STP
- ◯ fiber-optic
- ◯ coaxial

3. Which of the following is the most common type of connector used to terminate twisted-pair cabling?

- ◯ RJ-10
- ◯ RJ-11
- ◯ RJ-41
- ◯ RJ-45

Check

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Reset

4.1 Network Media T...

4.3 Coaxial and Fiber...