Distinguish common network cables

Electromagnetic shielding / screening is made of a sheet of metal / polyester or metal wire, surrounded by individual pairs of wires or all wires. This article will help you differentiate some types of Ethernet cables.

Different network cables and communication cables are required depending on the physical layer, topology and scale of the network. Can you find the right patch cable and connector for use? This article will introduce some of the commonly used network cables and their features.

Distinguish network cables

What is a network cable?

Network cables and communication cables are network hardware used to connect one network device to other network devices, for example, connecting two or more computers to share printers and scanners; Connect multiple servers with an Access Switch. The range includes data sets and Ethernet cables, including twisted pair cables, coaxial cables, optical cables, power lines, etc. Twisted coaxial, coaxial and optical cables are the most common types.

There are several types of cables commonly used with LANs. In some cases, the network will use only one type of cable, while others will use a variety of cables. The type of cable selected for the network is related to the topology, protocol and size of the network. Understanding the characteristics of different cables and how they relate to other aspects of the network is essential to developing a successful network.

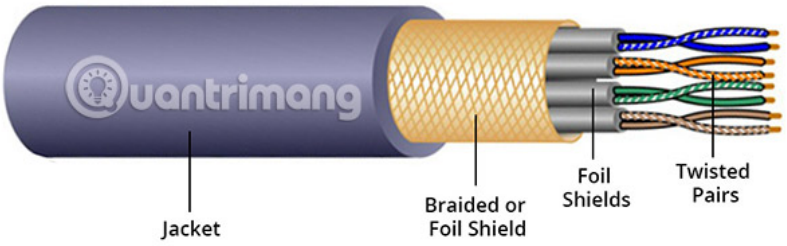
What is twisted pair and its standards

A twisted pair cable is a type of wire in which two conductors (usually copper) of a single circuit are twisted together. Why are the pairs twisted together? Because the two conductors carry the same signal but opposite each other, a pair can cause crosstalk to other pairs and the effect becomes stronger along the length of the cable. This is not conducive to signal transmission. The twisting of pairs reduces crosstalk between strings. Twisted pair cables are often used in data networks for short and medium connections, because of lower costs than optical and coaxial cables.

STP (Shielded Twisted Pair) cable and UTP cable (Unshielded Twisted Pair)

The twisted pair cable is usually protected to prevent electromagnetic interference. The twisted pair cable shielded by the anti-interference casing is called the shielded twisted cable (STP). In contrast to STP, the twisted pair is not covered by the anti-interference casing (UTP) that will be bare, unprotected.

STP cables are also divided into categories with common interference housing and separate interference housing. STP cable with its own noise-resistant casing has aluminum foil for each twisted pair or two twisted pairs. This anti-interference case protects the cable from external electromagnetic interference (EMI) entering or leaving the cable, and also protects neighboring twisted pairs from crosstalk. Overall shielded twisted pair cable (OSTP) has a common noise shield or a separate interference housing on all pairs in twisted pair cable. This anti-jamming case prevents EMI from entering or leaving the cable. An STP cable can have both separate and separate interference enclosures.



UTP cables without interference-proof covers are easily affected by external interference. For that reason, this cable is often found in indoor phone applications. Outdoor telephone cables contain hundreds or thousands of pairs. Pairs with the same twisting speed in the cable may suffer from some degree of crosstalk, so these pairs are usually carefully selected in a large cable to reduce crosstalk.

Most UTP cables use RJ45 connectors, which look like telephone connectors (RJ11) but have 8 wires instead of 4 wires.

Ethernet cable - The most common twisted pair cable

Ethernet cable is a typical twisted pair, and probably the most familiar cable for all of us. The following table provides basic information about some Ethernet cables.

NameClassic structureBuilt tapeCat 3 UTP 16 MHz Ethernet cable 10BASE-T and 100BASE-T4 Cat 4 UTP 20 MHz Token Ring 16Mbit / s Cat 5 UTP 100 MHz Ethernet Cable 100BASE-TX & 1000BASE-T Cat 5e UTP 100 MHz Ethernet Cable 100BASE-TX & 1000BASE-T Cat 6 STP 250 MHz Ethernet Cable 10GBASE-T Cat 6a STP 500 MHz Ethernet Cable 10GBASE-T Cat 7 STP 600 MHz 10GBASE-T Ethernet cable or POTS / CATV / 1000BASE-T via Cat 7a STP 1000 MHz single cable 10GBASE-T Ethernet cable or POTS / CATV / 1000BASE-T via single cable Cat 8 / 8.1 STP 1600-2000 MHz 40GBASE-T Ethernet cable or POTS / CATV / 1000BASE-T via single cable Cat 8.2 STP 1600-2000 MHz 40GBASE-T Ethernet cable or POTS / CATV / 1000BASE-T via single cable

Category 3

Cable Category 3, commonly known as Cat 3, is a twisted pair cable without interference (unshielded twisted pair - UTP) designed for reliable data transfer up to 10 Mbit / s, with bandwidth possible. to 16 MHz. It is part of copper cable standards defined by the Electronic Industry Alliance and the Telecommunications Industry Association. The Cat 3 was a popular cable format in the early 1990s, but since then, it has been almost completely replaced by the same Cat 5 standard, but offers higher speeds.

Category 5

Cable Category 5, commonly known as Cat 5, is a type of anti-interference twisted-pair twisted pair cable designed to ensure high signal integrity. The actual standard of Cat 5 determines the specific electrical properties of a wire, but it is usually evaluated by the Ethernet capability of 100 Mbit / s. Its specific standard designation is EIA / TIA-568. Cat 5 cables usually have three twisted pairs per inch, each twisted pair of 24 copper wires. Cable twisting reduces electrical interference and crosstalk.

Another important feature is that the insulated plastic conductor (FEP) has a low dispersion, which means that the dielectric constant of the resin is not very dependent on frequency. Special care is needed to minimize impedance mismatch at the connection points.

Cat 5 cables are commonly used in structured cables for computer networks such as Fast Ethernet, although they are also used to transmit many other signals such as basic voice service, token ring and ATM (up to 155 Mbit / s).).

Category 5e

Category 5e cable is an advanced version of Cat 5 for use with 1000BASE-T (gigabit) networks, or for 100 Base-T long distance links (350 m, compared to 100 m for Cat 5). It must meet the EIA / TIA 568A-5 standards. Almost all cables sold under Cat 5's name are actually Cat 5e. Signs on the cable can tell you the exact cable type.

Category 6

Standards for Gigabit Ethernet and other connections are backward compatible with Cat 5, Cat 5e and Cat 3. Cat 6 cables with more stringent specifications to prevent crosstalk and system noise. Cable standards are suitable for 10BASE-T, 100BASE-TX and 1000BASE-T connections (Gigabit Ethernet).

1. What is CAT 6 network cable and how is it different from the CAT 5e network cable?

The cable has 4 twisted-pair copper wires, similar to the previous copper cable standards, although each twisted pair is made up of slightly larger copper wire than the 24 wires of Cat 5. When used as a patch cable (Patch cable), Cat 6 usually uses RJ-45 connectors. If the components of different cable standards are mixed, the performance of the signal line will be limited to the lowest level. Distance without making data loss is 220m.

Category 7

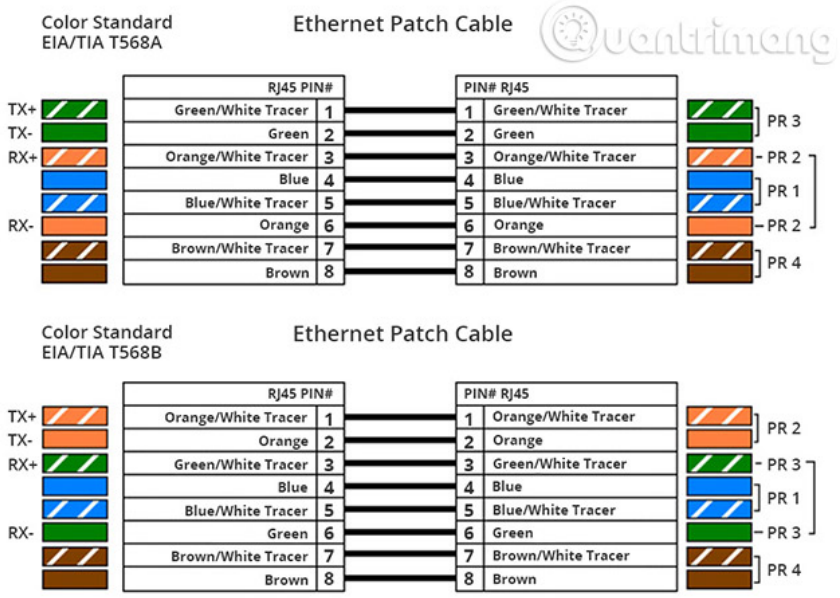
Category 7 (CAT7), (ISO / IEC 11801: 2002 category 7 / class F), is a super-fast Ethernet cable standard and other connection technologies can be backward compatible with traditional CAT5 and CAT6 Ethernet cables. CAT7 has a more stringent specification to prevent crosstalk and system noise than CAT6. To achieve this, the anti-interference casing has been added for each pair of wires and all cables

The CAT7 cable standard was created to allow 10 gigabit Ethernet signals to be transmitted over 100m copper cables. The cable has 4 pairs of twisted copper wires, similar to previous standards. CAT7 has GG45 compatible RJ-45 connectors that incorporate the RJ-45 standard and a new type of connection to enable smoother data transfer according to the new standard. When combined with a GG-45 connector, CAT7 cable has a transmission frequency of up to 600 MHz.

Double twisted cable T568A and T568B

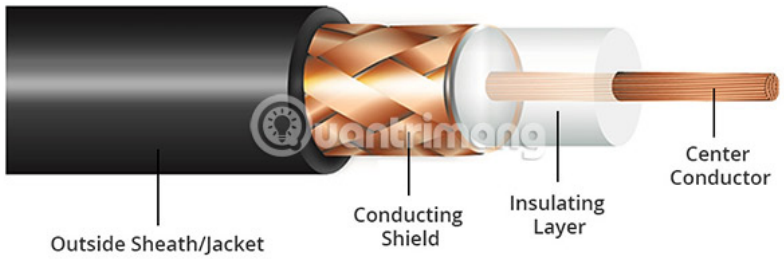
Two standard wires are commonly used with twisted-pair cable is T568A and T568B. These are telecom standards from TIA and EIA that assign the battery to the connector (usually RJ45) on UTP or STP cable. The number 568 refers to the order in which the wires in the twisted pair cable are attached to the connector. The signal is identical for both standards.

The battery number is read from left to right and the connectors are in top-down order. Note that the output of the battery remains the same, and the only difference is the color coding of the wiring.



Coaxial cable - Not just a video cable

Coaxial cable is a cable with inner conductor surrounded by a pipe insulation, and the outermost is a tubular noise shield. The inner conductors and the outer guide shield have the same axis. Many coaxial cables have outer covers or insulation.



Why is coaxial cable suitable for transmitting radio waves?

Coaxial cable is used as a link for radio frequency (RF) signals. Its application includes links to radio transmitters and receivers with antennas, computer network connections, digital audio and cable television signals. Coaxial cables have a clear advantage over other cables. In a good coaxial cable, the electromagnetic field carries a signal in the space only between the inner conductor and the outer guide. For this reason, coaxial cables are allowed to be installed next to metal objects without the loss of power as in other types of radio signal cables.

Various types of coaxial connectors are widely used

Many types of coaxial connectors are available in the audio, digital, video, RF and microwave industries, each designed for a specific purpose and application. Consider the number of disconnection cycles that a pair of connectors can withstand while still operating normally. Here are some common coaxial connectors.

Connector typeOther namesFirst FemaleTop MaleMaximum frequency, applicationType F Video

250 MHz to 1 GHz. The 'F' series connectors are mainly used in cable and television antennas. Type N /

12 GHz or more. The type N connector was originally designed for military systems operating below 5 GHz, then improved to 12 GHz and higher. Type N connector complies with military standard MIL-C-39012. Phone plugs and sockets TS, TRS

100 kHz or less. As its name suggests, the phone plug is Male's head, the phone jack is Female head. RCA plug

and socket phono

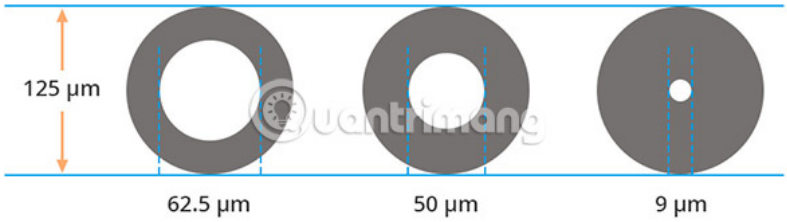
10 MHz. Circular connector, press type is often used for standard video and audio video connection. 7/16 DIN /

5 GHz. A relatively new connector is commonly used as a connection in cell and other 'wireless' applications, especially on towers. APC-7 7 mm

Same as 18 GHz. The APC-7 connector (Amphenol Precision Connector - 7 mm) provides the lowest reflectivity and most measurements like 18 GHz connectors, specifically used for measurement and calibration.

Cable Capable Optical Fiber (COF)

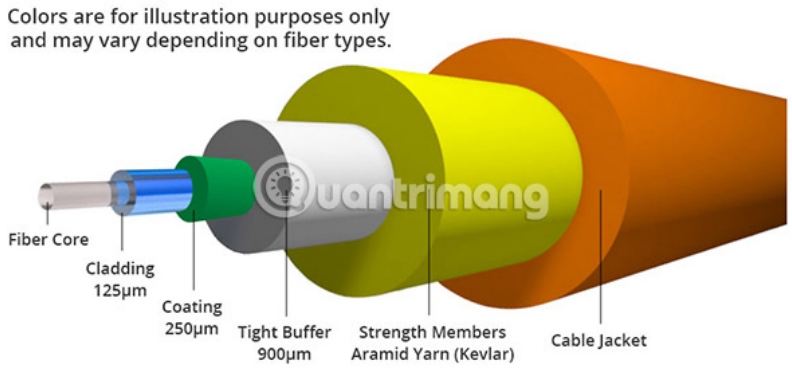
Fiber optic cable is an excellent transmission medium for high data capacity and long distance support. It is an indispensable component in any fiber optic network. It has an inner glass fiber core and a rubber coating, using light beams instead of electrical signals to relay data. Because light is not wasted by the same distance as an electrical signal, this cable can transmit signals within a distance of kilometer with a transmission rate of 10 Mbps up to 100 Gbps or higher.



Problems of fiber core size: SMF and MMF

The inner yarn can be a single mode or include multiple fibers (multimode). In general, a single fiber core has a radius of 9 / 125µm, while a multi-core core has a radius of up to 62.5 / 125µm or 50 / 125µm. Only OM1 is 62.5 / 125µm fiber, while generations after OM2, OM3, OM4, OM5 are 50 / 125µm fibers. The letters "OM" stands

for optical multimode. Both multimode fiber (MMF) and single mode fiber (SMF) fibers can be used for high-speed transmission. MMF is often used in short distances, and SMF is used for longer distances.



Multi-fiber connector

Fiber optic cables can have many types of connectors to plug in different ports of the device. The figure below shows some common fiber optic connectors, of which LC, SC and ST are the three most used.

In addition, there is a multimode connector called MTP / MPO (Multi-fiber Push On). It is designed for higher bandwidth applications such as 40GbE and 100GbE. 12 and 24 fiber versions are currently used to connect directly to 40G and 100G transceivers. It is also used in high density fiber distribution areas. Higher fiber versions are also available (48, 72 fibers) but their use and deployment are currently limited.

This is a quick guide to popular network cables and communication cables. You can learn more about each type on the Internet. A little understanding of network cables and communication cables will bring benefits both in daily life and in the work, because the scope of use of cables is huge.

Some cable installation principles

When running the cable, it is best to follow some simple rules as follows:

1. Always keep the cable length greater than the distance you need. Do not let the cable get too tight.
2. Check every part of the network when you install. Even if the network contains all the new components, it can still generate problems and it will be difficult to resolve later.
3. Keep away from fluorescent light boxes and other electrical noise sources for at least 1 meter.
4. If you need to run cables on the floor, use a cable protector.
5. Label both ends of each cable.
6. Tie the cables (not with tape) to keep them from moving.

Wireless LAN

More and more networks are operating without cables, ie in wireless mode. Wireless LAN uses high frequency radio signals, infrared or laser beams to communicate between workstations, servers or hubs. Each workstation and server on a wireless network has several types of transceiver / antenna devices to send and receive data. Information is forwarded between transceivers as if they were physically connected. For longer distances, wireless communication can also take place through cell phone technology, microwave transmission or via satellite.

Wireless networks are a great way to allow laptops, mobile devices or remote computers to connect to LANs. Wireless networks are also beneficial in older buildings, where it may be difficult or impossible to install cables.

The two most common types of communication used in schools are broadcast line-of-sight and scattered. Broadcasting a straight line means that there must be a direct line that is not blocked between the workstation and the transceiver. If a person transmits data in the line-of-sight area, the information will need to be resubmitted. This congestion may slow down the wireless network. Distributed broadcast is an infrared broadcast sent in many directions, bouncing on walls and ceilings until it reaches the receiver. Laser networking is almost the same as straight line broadcast.

1. How is wired (Ethernet) better than wireless (Wi-Fi)?

Standard and wireless speed

Wi-Fi Alliance is a global, non-profit organization that helps ensure standards and interoperability for wireless networks. Wireless networks are often called WiFi (Wireless Fidelity). The original Wi-Fi standard (IEEE 802.11) was adopted in 1997. Since then many variants have appeared (and will continue to appear in other future versions). Wi-Fi network uses Ethernet protocol.

StandardMaximum speed Typical range 802.11a54 Mbps 150 feet (about 46m) 802.11b11 Mbps 300 feet (about

92m) 802.11g54 Mbps 300 feet (about 92m) 802.11n100 Mbps Over 300 feet

Wireless security

Wireless networks are more vulnerable to unauthorized use than cable networks. Wireless network devices use radio waves to communicate with each other. The biggest flaw for networks is that counterfeit machines can attack radio communications. Unencrypted information can be monitored by third parties. With the right tools (free to download), third parties can quickly access your entire network, steal valuable passwords for local servers and online services, change or destroy data and / or access personal information, as well as secrets stored in your network server. To minimize this possibility, all access points and modern devices have configuration options to encrypt the signal transmission. These encryption methods are still developing, and so are the tools used by hackers, so always use the strongest encryption possible at the access point and for your connected devices.

Encryption notes : According to this document, encrypted WEP (Wired Equivalent Privacy) can be easily attacked with free tools available on the internet. WPA and WPA2 (WiFi Protected Access versions 1 and 2) are much better at protecting information, but using weak passwords or passphrases when triggering these encryption can also make them vulnerable to attack. . If your network is running WEP, you must be very careful when using passwords or other sensitive data.

1. Upgrade Wi-Fi security from WEP to WPA2

Three basic techniques are used to protect the network from unauthorized wireless use. Use any and all of these techniques when setting up your wireless access points:

1. **Encryption** : Enables the strongest encryption supported by devices you will connect to the network. Use strong passwords (strong passwords are often defined as passwords that contain symbols, numbers and mixed letters, at least 14 characters long).
2. **Isolation** : Use a wireless router to place all wireless connections on a subnet independent of the main network. This protects your private network data from Internet traffic.
3. **Hide SSID** : Each access point has a Service Set IDentifier - the SSID (service set identifier) ??by default is broadcast to client devices so that access points can be found. By turning off this feature, the standard client connection software will not be able to "view" the access point. However, the eavesdropping programs discussed earlier can easily find these access points, so it is better to keep the access point name out of sight of ordinary users.

For more advantages and disadvantages of wireless networks, please refer to the article: Basic knowledge of wireless networks and some typical wireless products

See more:

1. Distinguish common types of computer cables
2. These are the types of printer cables needed to connect to the computer
3. HDMI cable classification