01 AIM: To demonstrate and study various networking devices like switch, router etc.

02 SOCOPE:

- To encompasses a hands-on exploration of several key networking devices used in modern computer networks.
- The demonstration aims to elucidate the functionalities, configurations, and roles of these devices within a network infrastructure, facilitating a deeper understanding of how data is transmitted and managed across networks.

03 FACILITIES

Hardware : Hub, Switch, router, modem, wireless access point

04 THEORY

Networking Devices Overview:

1. Routers

Functionality: Routers are devices that route data packets between different networks, making decisions based on the destination IP address contained in the packets. They are used to connect multiple networks together, such as a local network to the Internet.

Key Features: Routers can support both wired and wireless connections and often include built-in firewalls and software features to manage network traffic, prioritize certain types of traffic, and provide security.

Use Cases: Home Internet connections, enterprise networks, and interconnecting network segments.

2. Switches

Functionality: Switches operate within a single network segment, directing data at the data link layer (Layer 2) of the OSI model. They use MAC addresses to forward data to the appropriate device within the LAN.

Key Features: Switches can greatly improve network efficiency by reducing unnecessary traffic.

Managed switches offer advanced features like VLANs (Virtual Local Area Networks), QoS (Quality of Service), and network management.

Use Cases: Office networks, data centers, and anywhere a network needs segmentation and efficient traffic management.

3. Hubs

Functionality: A hub is a basic networking device that connects multiple Ethernet devices, making them act as a single network segment. It broadcasts incoming packets to all ports, regardless of the intended destination.

Key Features: Hubs operate at the physical layer (Layer 1) and are considered less intelligent than switches, leading to more network congestion and collisions.

Use Cases: Small, simple networks or in situations where network traffic and performance are not critical issues.

4. Modems

Functionality: Modems (modulator-demodulator) are devices that modulate digital data from a computer into an analog signal for transmission over telephone lines or coaxial cables and demodulate incoming signals back into digital data.

Key Features: Modems are essential for connecting to the Internet, especially in residential settings. They can be standalone devices or integrated into routers.

Use Cases: Home internet access, connecting to an ISP (Internet Service Provider), and bridging local networks to the Internet.

5. Wireless Access Points (WAPs)

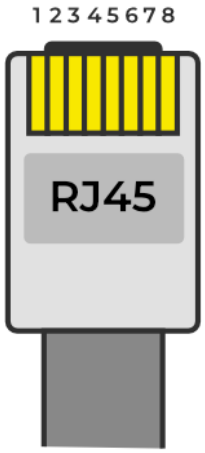
Functionality: Wireless Access Points provide wireless connectivity to a wired network. They allow Wi-Fi-enabled devices to connect to the network without needing a physical connection.

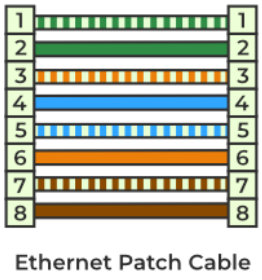
Key Features: WAPs extend the reach of an existing wired network, offer various encryption and security features to protect the wireless network, and support different Wi-Fi standards (like 802.11b/g/n/ac/ax).

Use Cases: Providing Wi-Fi in homes, offices, and public spaces; extending the range of existing networks; and offering guest network access.

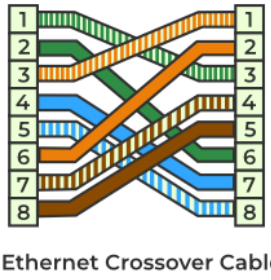
RJ45

RJ45 is a well-known ethernet connectivity connector that allows users to connect through wired internet. there are other ports also which do the same, but RJ45 is widely used and most common in wired internet connection interfaces. It is an ethernet cable consisting of 8 wires(4 pairs of wires). These cables follow a specific color code with respect to the arrangements of the wires. RJ45 Connector:



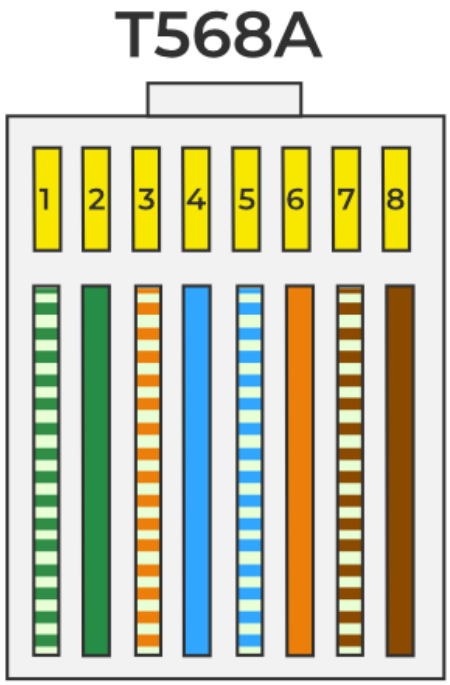


Ethernet Patch Cable



Ethernet Crossover Cable

RJ45 cable Pin Out color code T568A:



This connector RJ45 is available in two standards i.e. T568A and T568B. each of these works as pin IN and pin Out for ethernet cable to perform data transfer. The only difference between these two cables is the wiring of green and orange pairs.

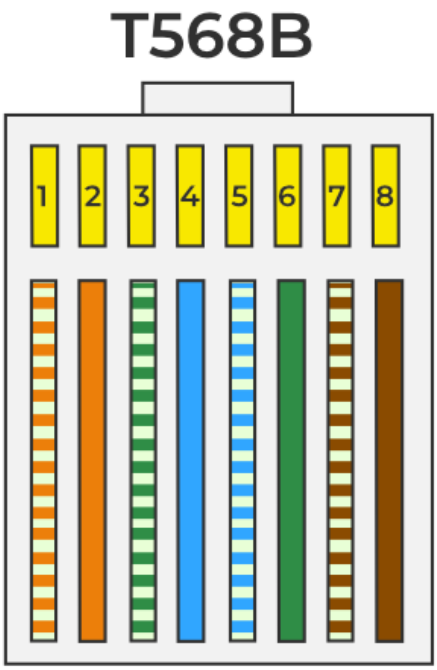
T568A is a commonly used pinout standard for ethernet cables. The highlight of this standard is that it is backward compatible with one-pair as well as two-pair USOC (Universal service ordering code).

Here is the color code table for the T568A standard:

Pin	Wire Color	Signal	Description
1	white/Green	TX1+	Transmit +

2	Green	TX1-	Transmit –
3	White/Orange	RX+	Receive +
4	Blue	TX2+	Bi-Directional Transmit +
5	White/Blue	TX2-	Bi-Directional Transmit –
6	Orange	RX-	Receive –
7	White/Brown	TX3+	Bi-Directional Transmit +
8	Brown	TX3-	Bi-Directional Transmit –

RJ45 cable Pin Out color code T568B:

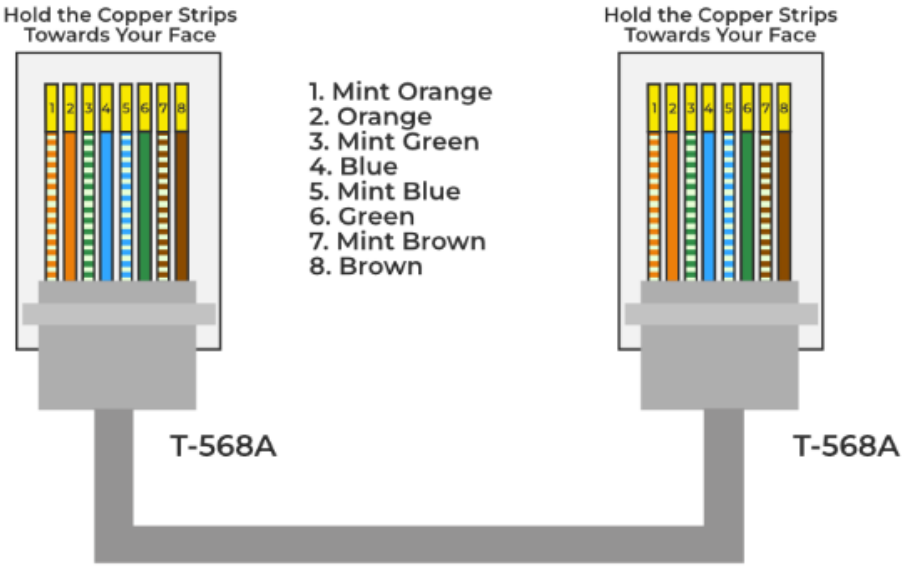


T568B

This standard gives better protection from noise, It also isolates the signal more effectively as compared to T568A. It is only backward compatible with a one-pair USOC wiring scheme.

Here is the color code table for the T568B standard:

Pin	Wire color	Signal	Description
1	White/Orange	TX1+	Transmit +
2	Orange	TX1-	Transmit –
3	White/Green	RX+	Receive +
4	Blue	TX2+	Bi-Directional Transmit +
5	White/Blue	TX2-	Bi-Directional Transmit –
6	Green	RX-	Receive –
7	White/Brown	TX3+	Bi-Directional Transmit +
8	Brown	TX3-	Bi-Directional Transmit –



Characteristics of RJ45 Connector:

Excellent sealing and waterproof performance to ensure that the RJ45 connector can be used in multiple environments.

- Provides strong signal Transmission due to complete shielding system.
- Provides safety locking system that ensures that connector is not detached while in use.
- Transfers information at a very high-speed that helps to achieve maximum data transmission function in the shortest time possible.

05 CONCULSION

The practical demonstration provided valuable insights into the operation and significance of various networking devices in managing and facilitating network communication.