

**College of Engineering and Technology
University of Sargodha**

Department of Technical Education



**Data and Computer Communication
ET-322**

Lab Manual



Experiment No. 1

CABLES AND CONNECTORS

OBJECTIVE

How to wire Ethernet Cables?

EQUIPMENT

CAT 5 Cable - bulk Category 5 cable, Crimper for RJ45, Wire Cutters - to cut and strip the cable if necessary, Cable Tester.

THEORY

Twisted Pair Cables:

Twisted pair cables are the most common transmission medium for subscriber loop. These are readily installed in buildings during construction and the most ubiquitous application is local area network. Amplifiers are required after every 2 or 3 kilometers. Twisted pair cables are used where the distance, bandwidth and data rate requirements are limited.

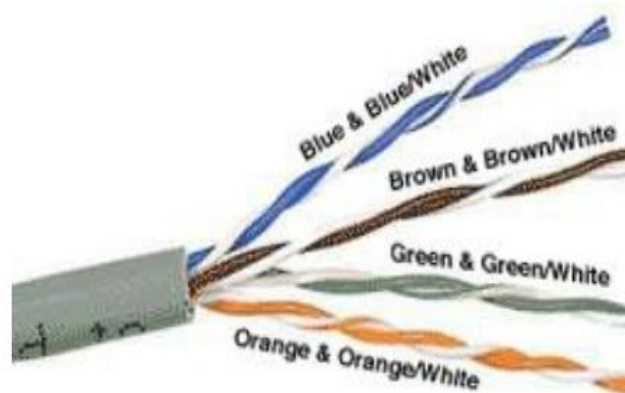


Fig.1.1: Twisted Pair Cable

RJ-45 Connectors:

The RJ45 end is a 8-position modular connector.

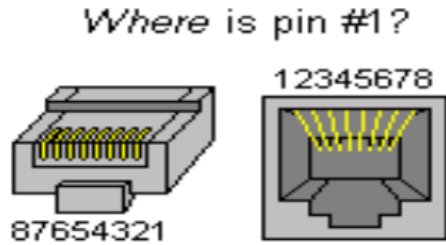


Fig 1.2 : RJ-45 Ends

Color Coding for cables:

The twisted pair is arranged in such a way so as to make it straight-through or cross-over in accordance with the coding provided by the Electronic Industries Association (EIA).

Table 1.1: Color coding for straight through cable.

RJ45 Pin #	Wire Color	10Base-T Signal 100Base-TX Signal	1000Base-T Signal
1	White/Green	Transmit+	BI_DA+
2	Green	Transmit-	BI_DA-
3	White/Orange	Receive+	BI_DB+
4	Blue	Unused	BI_DC+
5	White/Blue	Unused	BI_DC-
6	Orange	Receive-	BI_DB-
7	White/Brown	Unused	BI_DD+
8	Brown	Unused	BI_DD-

Table 1.2: Color coding for a crossover cable.

RJ45 Pin#(End 1)	Wire Color	RJ45 Pin#(End 2)	Wire Color
1	White/Orange	1	White/Green
2	Orange	2	Green
3	White/Green	3	White/Orange
4	Blue	4	White/Brown
5	White/Blue	5	Brown
6	Green	6	Orange
7	White/Brown	7	Blue
8	Brown	8	White/Blue

PROCEDURE

1. Strip off about 2 inches of the cable sheath.
2. Untwist the pairs - don't untwist them beyond what you have exposed.
3. Align the colored wires according to the diagrams above.
4. Trim all the wires to the same length, about 1/2" to 3/4" left exposed from the sheath.
5. Insert the wires into the RJ45 end - make sure each wire is fully inserted to the front of the RJ45 end and in the correct order.
6. Verify the wires ended up the right order and that the wires extend to the front of the RJ45 end and make good contact with the metal contacts in the RJ45 end.
7. Crimp the RJ45 end with the crimper tool.
8. Cut the cable to length - make sure it is more than long enough for your needs.
9. Repeat the above steps for the second RJ45 end.

RESULTS

The cable tester verified that the wire was absolutely right.

EXPERIMENT NO. 02

NETWORK DEVICES

OBJECTIVE:

Understanding of the network devices

APPARATUS:

Modem, hub, switch, Ethernet, repeater, router, RJ-45 connector.

THEORY:

Modem:

It is a computer peripheral that allows you to connect and communicate with other computer via telephone line. Modem changes the digital data from your computer into analog data, a format that can be carried over telephone lines. In the same way the modem receiving the call then changes the analog signal back into digital data that the computer can understand.



Fig. 2.1: Modem

Ethernet card:

The type of Ethernet card given below is developed by Xerox Corp. along with DEC and Intel. It uses a Bus or Star topology. Supports data transfer rates of up to 10 Mbps. It is also called a LAN card. The address assigned to it is called a physical address. It is in a 48 bit address format. e.g. 0F.38.6E.55.4A.AE.



Fig. 2.2: Ethernet Card

RJ-45 Connector:

The Registered Jack-45 connector is commonly used for network cabling and for telephony applications. It is an eight wire connector which is commonly used to connect computers on the local area networks, especially Ethernets. It is similar to telephone connector RJ-11 except that it has eight wires as compared to 4 in RJ-11.

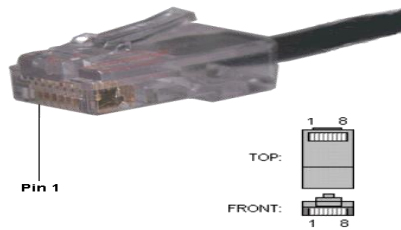


Fig. 2.3: RJ-45 Connector

Hub:

It is used to connect several computers together. In this network device the information flow is accumulated and then distributed to various groups and users. It can be between users on the same LAN and users on different LANs. It is often used in Star or Ring topology. All the devices connected to a hub are said to be in the same collision domain.

Collision domain:

Two devices are said to be in the same collision domain if simultaneous transmission from them results in a collision. In other words, being in the same collision domain, they cannot transmit simultaneously.

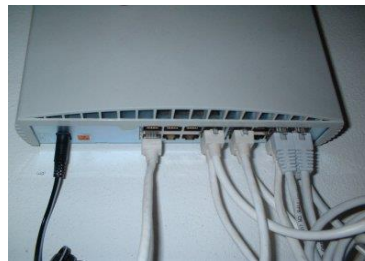


Fig. 2.4: Hub

Switch:

A network switch is a computer networking device that connects network segments. Network switches appear nearly identical to network hubs, but a switch contains more "intelligence" (and comes with a

correspondingly slightly higher price tag) than a network hub. Network switches are capable of inspecting data packets as they are received, determining the source and destination device of that packet, and forwarding it appropriately. By delivering each message only to the connected device it was intended for, a network switch conserves network bandwidth and offers generally better performance than a hub. Switches differ from hubs in that they can have ports of different speed.



Fig. 2.5: Switch

Bridges:

Bridges provide the ability to expand beyond a single LAN. Further they provide interconnection to other LANs/WANs. Bridges are a simpler choice than routers to connect similar LANs and are used with identical protocols for physical and link layers.

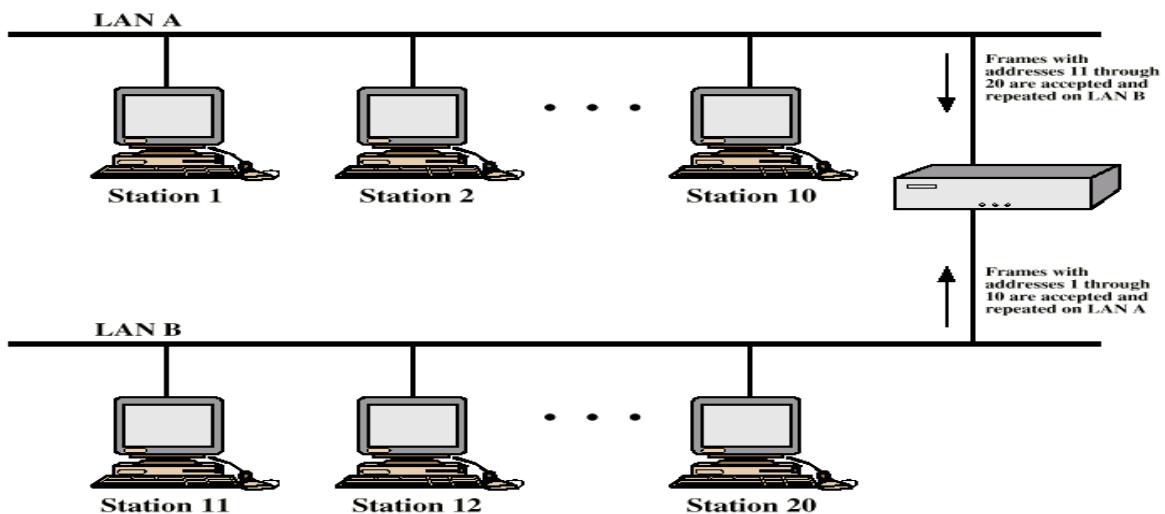


Fig. 2.5: Functionality of a bridge.

Repeater:

It is a device that amplifies and restores the power of a signal being transmitted on the network. It is used in long network lines.

Router:

A router is a computer whose software and hardware are usually tailored to the tasks of [routing](#) and [forwarding](#). This device routes the information packet between two or more physically or logically connected networks. It is different from Bridge as this uses logical address while bridge uses physical address.



Fig. 2.6: Router

Broadcast Domain:

All devices on a network segment that hear all broadcasts sent on that segment are said to be in the same broadcast domain. Routers break broadcast domains by default.

Router Advantages:

There are four basic advantages of routers:

- Packet switching
- Packet Filtering
- Internetwork communication
- Path Selection

Gateway:

This device usually a server is used to communicate between dissimilar networks i.e. networks with different protocols. e.g. to connect a LAN with Novell Netware with another LAN with Microsoft NT. In enterprises, the gateway is the computer that routes the traffic from the workstation to the outside world. In homes, the gateway is the ISP that connects the user to the Internet.

Conclusion and Comments

Lab Report 01

- 1. State the types of Network Topology explain with the help of diagrams.**
- 2. What is an IP address?**
- 3. Why IP addresses are used?**