EXPERIMENT NO. 1

Object: Study various Data transmission cables.

Experiment: To identify coaxial cable, UTP cable, STP cable Optical fiber cable and their connectors and study their construction and applications.

1. COAXIAL CABLE

Construction:
It is an electrical cable with mainly four parts:
1. The inner conductor made of a solid copper wire or stranded wires.
2. It is surrounded by a flexible, tubular dielectric layer made of PE (polyethylene) or PF (polyethylene foam).
3. It is again surrounded by a tubular metallic mesh conducting shield which acts as outer conductor.
4. Protective covering made of PE.

Working:
The inner conductor carries the signal while the outer conductor is usually shorted to ground. The electromagnetic field (EM field) exists in the space between the two conductors which is filled with the dielectric. Power is transmitted in form of radial electric field and circumferential magnetic field in TEM00 mode. Therefore there is no radiation or leakage of power from the cable. Also there is no interference from external EM field.The charateristic impedance Zo lies between 40 ohm to 150 ohm. Typical TV coaxial cable has Zo 75 ohm.

Applications:
Coaxial cable is used to carry low power and high power signals upto 1 GHz frequency. It can carry RF, VHF and UHF signals. It is used frequently in following places
1. Cable TV
2. Thicknet Ethernet 10BASE 5
3. Thinnet Ethernet 10 BASE 2
4. CRO input

Connectors:
1. BNC connector: Used in CRO input coaxial cable. Its full name is Boyet Neill Concelmann connector
2. RF connector: It is used in connecting coaxial cable to TV input

Types of coaxial cable:
Various types of cables are available in market such as RG-6, RG-7, RG-8, RG-58,
RG-59 and so on. These differ in characteristic impedance, attenuation, frequency response, cost,

construction and application.

2. UTP (UNSHEILDED TWISTED PAIR)

Construction:
It is an electrical cable with mainly three parts:

1. Twisted pairs of thin, insulated copper wires. There may be two or four pairs. The pairs are twisted to prevent crosstalk from neighboring twisted pairs.
2. The protective PE covering to prevent from temperature, humidity and dust.
3. Inner core made of plastic which has grooves to hold twisted pairs and which provides mechanical strength to the cable.

Working:
Each pair carries forward and reverse current and makes one circuit. Twisting is done so that the induced noise from the neighboring twisted wire is same on both the wires and therefore cancels out as common mode noise. Number of twists per meter is specified and different for each pair. There is no shielding therefore if external EM field is strong, then it will create noise in signal.

Applications:
The UTP cable is quite cheap. It is unanimously used in connecting 100 BASE-Tx Fast Ethernet LAN.

Connectors:
 RJ-45 connector: It is eight-pin connector. It has rectangular shape and made of plastic.

Types of UTP cable:
Various types of cables are available in market such as CAT-3,CAT-4, CAT-5, CAT-6.
and so on. These differ in attenuation, frequency response, cost, construction and application.

3. STP (SHEILDED TWISTED PAIR)
Construction:
It is an electrical cable with mainly four parts:

1. Twisted pairs of thin, insulated copper wires. There may be two or four pairs. The pairs are twisted to prevent crosstalk from neighboring twisted pairs.
2. A tubular metallic shield which surrounds the cable.
3. The protective PE covering to prevent from temperature, humidity and dust.
4. Inner core made of plastic which has grooves to hold twisted pairs and which provides mechanical strength to the cable.

Working:
Each pair carries forward and reverse current and makes one circuit. Twisting is done so that the induced noise from the neighboring twisted wire is same on both the wires and therefore cancels

out as common mode noise. Number of twists per meter is specified and different for each pair. The shield prevents the signals in the twisted pairs from external EM field.

Applications:
The STP cable is costlier as compared to UTP cable. It is used in places where there is lot of EM interference. It is also used in places where better performance or higher data speed is required. STP is used in   1000 BASE-Cx Gigabit Ethernet LAN.

4. OPTICAL FIBER CABLE(OFC)
Construction:
 It is an optical cable with mainly three parts:
1. The inner conductor made of a solid metallic or solid tough plastic to provide mechanical strength and support to cable.
2. Optical fibers arranged around the central member, single or in groups. The space in between the fibers can be empty (loose buffered). It can be filled with some jelly to hold the fibers in fix position (tight buffer).
3. Protective covering made of PVC or Teflon to prevent from atmospheric conditions of temperature, humidity and dust.

Working:
The fibers carry optical signals from one end to another. The optical signal wavelength depends upon the light source used at transmitting end. The optical signal propagates by the principle of internal reflection. The signal is usually digital. Each fiber can be either single-mode or multi-mode. The signal attenuation is very small (typically 0.2 dB/km) therefore repeater spacing is longer. The signal is not affected by external EMF noise.

Applications:
 Optical fibre cable is used in data communication. It is used in Gigabit Ethernet LAN. It is also used in FDDI (Fiber data distribution Interface) for making a MAN. OFC is also used to carry voice and data over long distances (inter-cities).

Connectors:
There are three types of connectors:
SC-connector: Subscriber-Channel connector is used for cable TV. It uses push/pull locking system.
ST-connector: Straight-Tip connector is used for connecting cable to networking device in a LAN. It uses a bayonet locking system and is more reliable than SC.
MT-RJ connector: This connector is same size and shape as RJ-45. It is used in making optical fiber based LAN.

EXPERIMENT NO. 2

**Object:** To study USB cable and USB protocol.

Experiment:
1. To identify and study the structure of USB cable and USB connectors.
2. To study USB protocol.

Construction of USB cable:
The USB cable is an S/FTP cable means Shielded/Foiled Twisted Pair cable. It is an electrical cable with mainly four parts:
1. Twisted pairs of thin, insulated copper wires. There are two pairs. The pairs are twisted to prevent crosstalk from neighboring twisted pairs.
2. An aluminum foil shield around the twisted pairs to prevent microwave interference.
3. A metal braided shield around the foil shield to prevent RF interference.
4. The protective PE covering to prevent from temperature, humidity and dust.
5. The cable length is very short, maximum upto 2 meters.
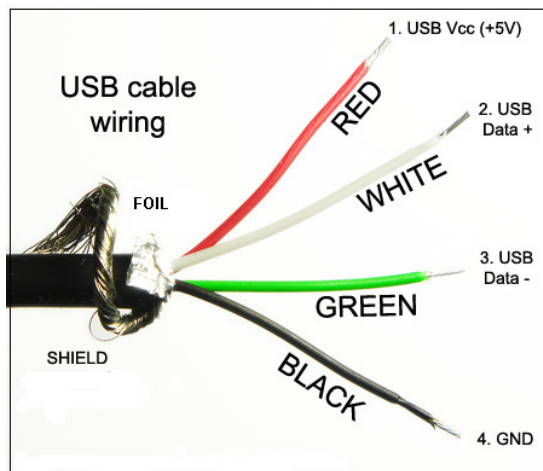
USB connectors:
The USB connector has male (plug) and female (socket) types. There are two types of plug:
1. Type A-Four pins are in one row
2. Type B-Four pins are in two rows
There is a few variations in shape and size of plug i.e micro, mini standard etc.

USB protocol:
Functional specifications:
The four pins on the connector represent following signals:

pins	color	signal
1	Red	+5 volts

2	White	+data
3	Green	-data
4	Black	ground

Electrical specifications:

1. At low speed ,low level is denoted by 0-0.3 volts and high level is denoted by 2.8-3.6 volts
2. At full speed and super speed, low level is denoted by -10mv to +10mv volts and high level is denoted by 3.8-4.4volts.

Features of USB transmission:

1. It is a master-client protocol. The CPU is the master or host and initiates all the operations. The USB peripheral is client and follows commands of CPU.
2. It supports half-duplex, serial, synchronous digital data transmission over short distances.
3. The CPU can address 127 USB devices connected in 3 tiers.
4. It is a plug-n-play device and allows hot swapping.
5. USB supports balanced /differential transmission on two wires (-D and +D) two cancel common mode noise.
6. USB pin 1 provides a current upto 500 mamps.
7. The USB 1.0 supports data speed upto 12 Mbps, USB 2.0 supports data speed upto 480 Mbps, and USB 3.0 supports data speed upto 4.8 Gbps.
8. It allows four types of data transfer
   - a. Control data transfer
   - b. Bulk data transfer
   - c. Isochronous data transfer
   - d. Interrupt data transfer

Applications:

1. USB devices are mainly used to connect peripherals to the CPU. Now–a-days mouse, keyboard, pen drive, mobile data cable, data card, Bluetooth dongle etc have USB connectors.
2. USB is also used as charger for 5volts devices or to supply power of 5 volts.

EXPERIMENT NO. 3

Object: To prepare CAT 5 UTP (Unshielded Twisted Pairs) cable for Star LAN network.

(1)Hardware and Tools Required:

1. CAT 5/CAT6 UTP cable of 2meter length
2. RJ45 connectors (4 no.)
3. Wire stripper
4. Crimping Tool
5. Cable tester

(2) Preparation of RJ 45 Connector:

1. Scrap the cable end, and then untwist the four pairs.
2. For straight cable: Arrange the wires according to 568A at both ends of cable (or 568B at both ends of cable).A straight cable is used to connect a computer (DTE) to a switch (DCE).
3. For cross-cable: Arrange the wires according to 568A at one end and 568B at other end of cable. A cross-cable is used to connect two computers (DTE) directly.
4. Insert the cable inside into RJ45 connector.
5. Press RJ45 connector by Crimping Tool.

Pin no.	Signal name	Color code (568B)	Color code (568A)
1	Tranmit+	White with orange	White with green
2	Transmit-	Orange	Green
3	Receive+	White with green	White with orange
4	NA	Blue	Blue
5	NA	White with blue	White with blue
6	Receive-	Green	Orange
7	NA	White with brown	White with brown
8	NA	Brown	Brown

(3) Testing the cable:

1. Insert one RJ45 connector into the base unit of cable tester.
2. Insert other RJ45 connector into remote unit of cable tester.
3. Switch on the cable tester.
4. Check the sequence of glowing of indicator LEDs.

(4) Conclusion:-
The CAT 5 cable is prepared and tested successfully.

EXPERIMENT NO. 4

Object: To set up a 100 Mbps Ethernet (100 Base-Tx, Star Topology LAN) for four computers and one printer.

Hardware Required:

(1) Four computers (Pentium–processor) with integrated NIC card and RJ45 connector port and loaded with Window XP (Professional version).
(2) HP3600 Printer with NIC card and RJ45 connector port.
(3) CAT 6 Cable - 20m.
(4) 10/100 Mbps, 16 port Ethernet Switch.

(1) Features of 100 Base-Tx LAN:

1. Maximum allowed length between nodes is 100 m.
2. Maximum data rate is 100 mbps.
3. 100 Base-Tx LAN uses two pairs of copper wire in CAT 6 cable as medium.
4. Nodes are connected at a central device called Ethernet switch.
5. IEEE 802.3u is the standard protocol.

(2)Topology of LAN:-

Topology refers to the way the Network components are connected either physically or logically. Various topologies are   Mesh, Star, Tree, Ring & Bus. Star Topology is most commonly used in which each network component has dedicated point to point link to a central controller usually called a SWITCH. We use Star topology to set up LAN.
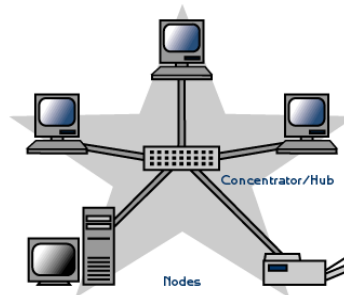
Method of LAN Connection:
1. Prepare five number of straight CAT 6 cables, by crimping RJ-45 connectors at both ends of each cable.
2. Connect the four Computers and one Printer to the ports of Ethernet Switch by CAT 6 cables.

3. Customize the Computers as Network component by following method. On one computer, Open "Control panel". Open "Network Connections". Open "My Network Places". Run the "Setup home or small office network". Create a "workgroup". Copy "Netsetup" file in a pendrive. Run the "netsetup" file on each computer. Now the computers are ready to communicate on LAN.

Testing the LAN:

1. Open <properties> of NETWORK CONNECTIONS. Set the IP address 192.168.1.2.on computer 1 and 192.168.1.3. on computer 2. Set the IP address 192.168.1.4.on computer 3 and 192.168.1.5. on computer 4 .Set subnet mask as 255.255.255.0. on all computers.
2. Ping the computers to check the status of physical connection between them.
3. Type <ping IP address> in RUN window each computer. The IP address must be of any other computer.

Application of LAN:

1. Sharing of folders: - Open "view the workgroup" and find networked computers name in workgroup .Create one "Folder" on any Computer and set its properties for "sharing within network". The "Shared folder" will be visible in the ''My Network Place'' on the other entire computer in workgroup.

2. Printing the file on networked printer:-Run Printer driver CD on any one computer. Install the "printer" as "network printer". Print a testpage on printer.

Conclusion:-
The Ethernet LAN has been installed and tested successfully.

EXPERIMENT NO. 5

Object: To study networking devices used in computer network.

Experiment 1: To study 10/100 Mbps Ethernet switch

Equipments required: D-link 10/100 Mbps Ethernet switch

Description:
1. The model name is DAX 5016 DS ,D-Link
2. It has 16 ports of RJ-45 connector for LAN connection.
3. Data speed supported by switch is maximum upto 100 mbps.
4. The switch provides temporary connection between the ports. The connection is opened when the two computers are not communicating.
5. The switch provides full duplex mode of transmission. It means that the two computers can send and receive data at the same time.
6. 32 indicator LED's are mounted on the front panel, two for each port. These LED's indicate the status of link /port.
7. It is an unmanaged switch. It means that it can not control and manage the data rate of the links.

Experiment 2: To study ZXDSL modem.

Equipments required: ZXDSL 531B modem

Description:
1. The model name is ZTE and supplied by BSNL.
2. It is a three-in-one device. It functions as modem, router and switch.
3. It is used to connect a LAN to Internet.
4. It works on ZXDSL technology.
5. It supports download speed up to 6.1 mbps and upload speed upto 0.5 mbps.
6. It is a two layer device and complies with TCP/IP protocol suite for Internet. The two layers are physical layer and Internet layer.
7. It is a managed and programmable device. The user can login by typing username and password. The IP address is 192.168.1.1 which is private address for setting LAN.
8. It also has four RJ-45 ports for LAN.
9. It has transmitter and receiver for wireless connectivity to internet.

Experiment 3: To study broadband splitter

Equipments required: BSNL broadband splitter

Description:
1. It is filter for separating voice channel and data channel.
2. It has two filters; one is a Low-pass filter, 0-4Khz, for voice channel. Other is band-pass filter, 4 KHz -1.1 MHz, for data channel.
3. This splitter facilitates the user to make a voice call and access internet, simultaneously.

Connection diagram of broadband Internet Router
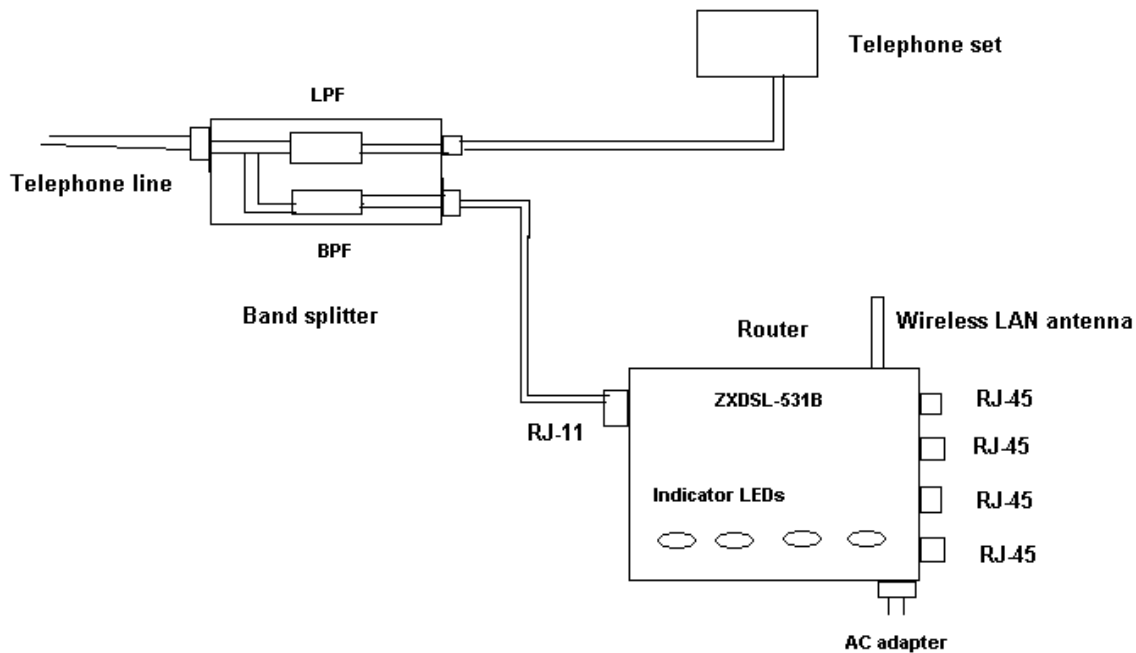
EXPERIMENT NO. 6

Object: Creating a workgroup in Window-07 OS computer for sharing files and folder in star connected LAN.

Hardware Required:

Four computers (Window-07 OS) connected in star LAN through Switch.

Method:

(1) Firstly right click on "Computer" icon. Then click on "properties" in the drop down list. Then click on "change setting" button. After that you can change computer name and work group (if you want). Then click on "OK" button .And close "Computer" icon window.

(2) Right Click on "Network" icon. Then click on "open Network and Sharing Center ".Then select "Change advance sharing setting" option from left side of computer screen. Then select "Turn off password protected sharing" button. Then, click on "save changes "button.

(3) For sharing particular folder within the workgroup computers, copy the folder in "Public documents" inside "Public" folder inside "Administrator". The folder will become visible to all the group members.

(4) Another method for sharing particular folder within the workgroup computers, right click on that folder and select "specific people "and choose "Everyone" option from combo box. Click on "Add" & "Share" button.

Conclusion: We have successfully performed sharing in Window-07 OS   network computer.