

UNIT-3

→ Physical layer

Transmission of digital information from one device to another is the basic function for the devices to be able to communicate.

① Physical Interface:-

The physical layers need to exchange protocol control information between known as physical interface.

The physical layer use the interconnecting medium for sending the protocol control signals.

specifications:-

- Mechanical specifications of the connector.
- type of connector (male or female) Function Specification.
- Electrical characteristics of the signals.
- Procedural specifications.

② Physical layer Standards:-

Standards are essential in creating and maintaining an open and competitive market for equipment manufacturers and in guaranteeing national and international interoperability of data and telecommunications technology and processes.

Some of physical layer standards are EIA-232-D, EIA-449 etc.

③ EIA-232-D Digital Interface:-

The EIA-232-D digital interface of Electronics Industries Association (EIA) is the most widely used physical medium interface. It is applicable to the following modes of transmission:-

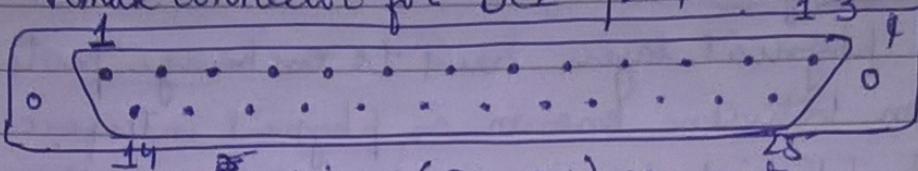
- Serial transmission of data.
- Synchronous and asynchronous transmission.
- Point-to-Point and point-to-multipoint working.
- Half duplex and full duplex transmission.

Specifications :-

EIA - 232-D defines all the four sets of specifications for the physical layer interface between a DTE and a DCE (Mechanical specifications). (ISO 2110 standard)

Male connector for DTE port

Female connector for DCE port . 13



25-pin (DB-25) connector

Electrical specification (V.28 standard)

Wire code used is NRZ-L

Nominal voltage level +12 V for binary '0'.

Nominal voltage level -12 V for binary '1'.

$\pm 25\text{-V}$ limit is the open circuit or no load voltage.

-3V to +3V is the transition region and is not assigned any state.

Upper limit

+25 V

Nominal Binary 0, On, Space +12 V

+3 V

-3 V

Nominal Binary 1, Off, Mark -12 V

Upper limit -25 V

Function specification (V.28 standard)

25 functions of 25 pins.

Procedural specification (V.28 standard)

Sequence of events which comprise the complete procedure for data transmission can be divided into the following four phases:-

- Equipment readiness phase
- Circuit assurance phase
- Data transfer phase
- Disconnection phase

Limitations of EIA-232-D:

→ low data rates

→ short distance data transmission applications.

Above limitations are due to unbalanced transmission mode of its signals and shared common ground for all signals flowing in both the directions.

④

EIA-449 interface:

EIA-449 interface overcomes the limitation of of EIA-232-D.

Procedural specifications are same as EIA-232-D

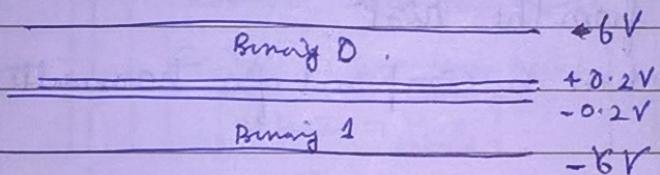
Mechanical specifications → (ISO 4302 standard)

37 pins connector

Electrical specification → (~~ISO 4302 standard~~)

line code used is NRZ-L.

Same as EIA-422-A and EIA-423-A specifications

Function specifications:

37 functions of 37 pins

⑤

RJ45 (Registered Jack - 45) & RJ11

→ Most common UTP (unshielded Twisted pair) connectors.

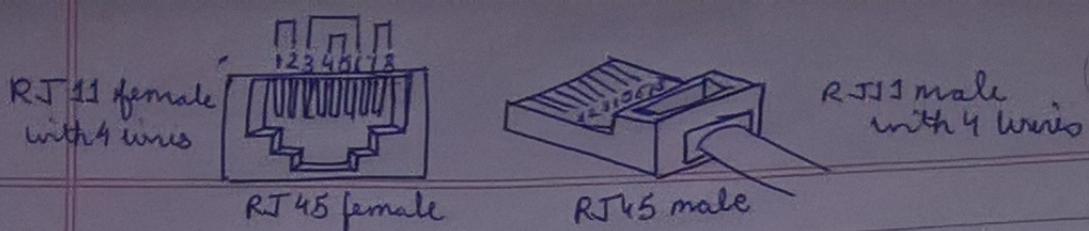
RJ45 is a keyed connector, meaning the connector can be inserted in only one way.

Used in computer networking,

RJ45 contain more pins than RJ11

RJ45 is physically bigger than RJ11

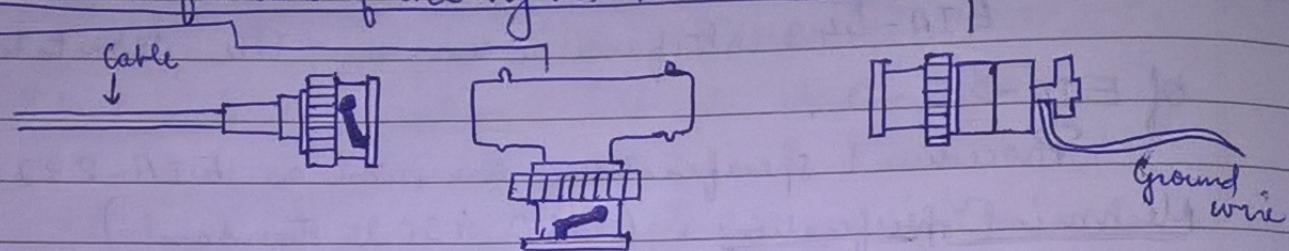
RJ11 → shielded twisted pair, and used in connecting telephone units.



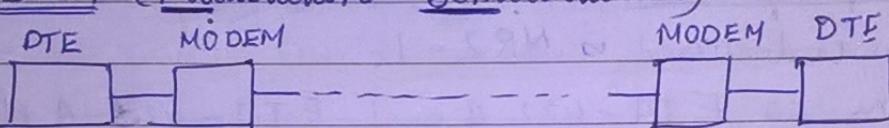
⑥ BNC Connector (Bayonet-Neill-Concelman) :-

Most common coaxial connector. Three types are:-

- BNC connector - It is used to connect the end of the cable to a device such as a TV set.
- BNC T connector - It is used in Ethernet network to branch out to a connection to a computer or other device.
- BNC Terminator - It is used at the end of the cable to prevent the reflection of the signal.

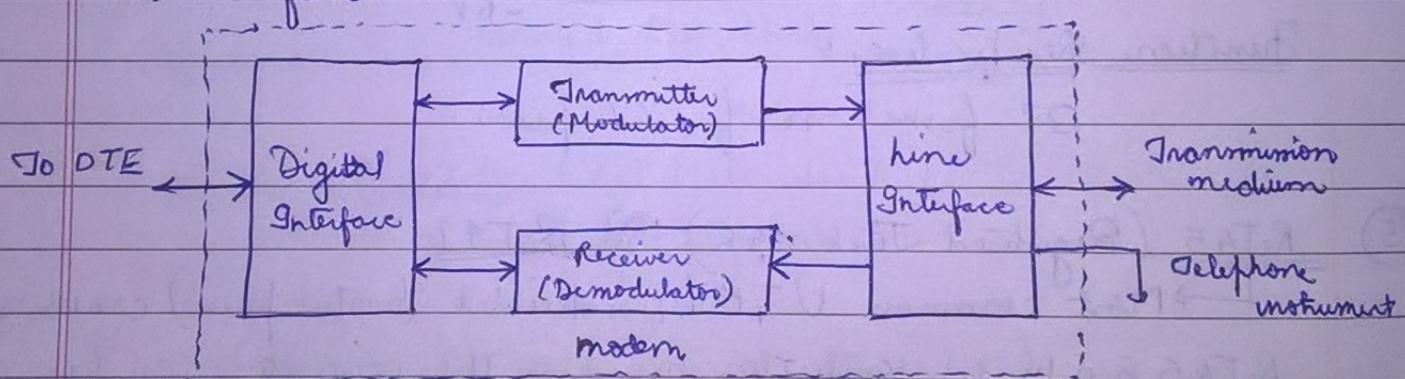


→ MODEM (Modulation-Demodulation)



15 meters from the host

Broadly, a modem is composed of a transmitter, a receiver, and two interfaces



Types of Modem :-

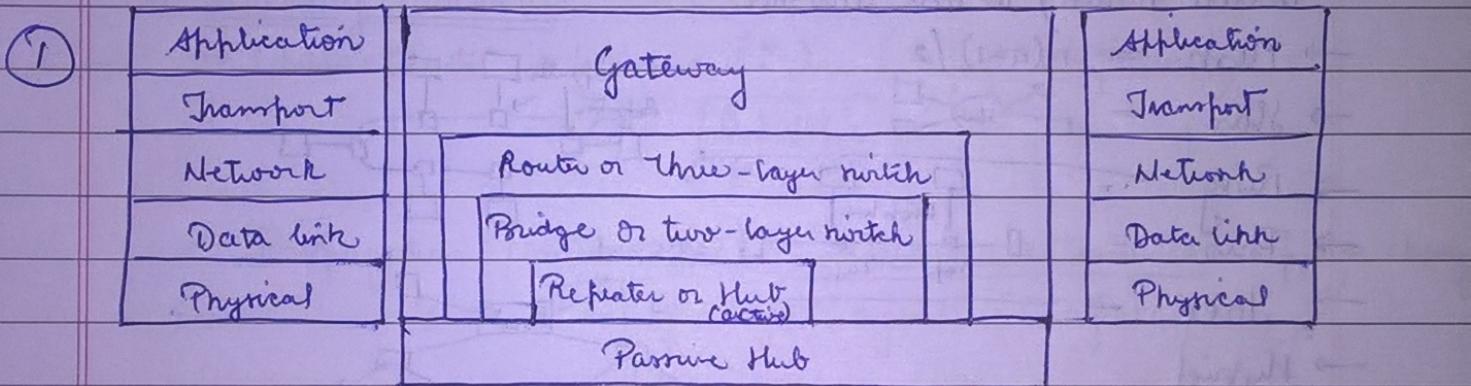
- (1) Directional Capability → half duplex and full duplex modem
- (2) Connection to the line → 2-wire modem and 4-wire modem
- (3) Transmission mode → asynchronous and synchronous modem.

requires a clock signal

Features of modem:-

- (1) High speed (bits per second) → 300, 600, 1200, 2400 etc
- (2) Auto Dial / Redial a phone number
- (3) Auto Answer
- (4) Self-testing
- (5) Voice over data
- (6) Synchronous and asynchronous transmission
- (7) Echo cancellers
- (8) Secondary Channel
- (9) Test loops → locating faults
- (10) Compression and Error control

→ Connecting devices :-



Passive Hub → It is just a connector

Repeater :- A repeater connects segments of a LAN. It forwards every frame. It has no filtering capability. A repeater is a regenerator, not an amplifier.

(Hub) Active Hub :- It actually a multiport repeater

Bridge :- As a physical layer device, it regenerates the signal it receives. As a data link layer device, the bridge can check the physical (MAC) address (source and destination) in the frame. A bridge has filtering capability.

Two-layer switch- It is a bridge with many ports and a design that allows better(faster) performance.

Routers - It is a three layer device that routes packets based on their logical address.

Three-layer switch- It is a router, but a faster and more sophisticated. It allows faster table lookup and forwarding.

Gateway- It is normally a computer that operates in all five layers of the Internet or seven layers of OSI model.

Gateway can provide security.

② Network topologies :-

The topology of a network is the geometric representation of the relationship of all the links and linking devices (usually called nodes) to one another.

→ Mesh = $n(n-1)/2$

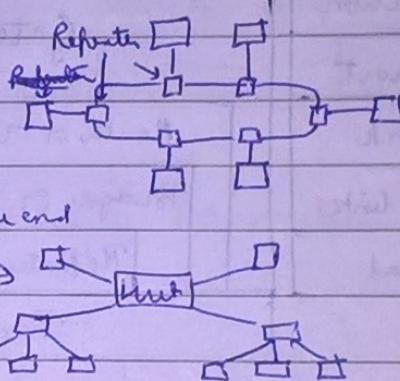
→ Star =

→ Ring

→ Bus =

→ Tree

→ Hybrid



Types of connection- Point-to-Point and multipoint (multidrop) connection.

③ Null Modem :-

It is a communication method to connect two DTE's directly using an EIA-232-D (RS-232) serial cable. With a null modem connection, the transmit and receive lines are crosslinked. Depending on the purpose, sometimes also one or more handshake lines are crosslinked. Several wiring layouts are in use because the null modem connection is not covered by a standard.