UNIT–02

UNIT-02/LECTURE-01

Data Transmission:

Data transmission, digital transmission, or digital communications is the physical transfer of data over a point-to-point or point-to-multipoint communication channel. Examples of such channels are copper wires, optical fibres, wireless communication channels, storage media and computer buses. The data are represented as an electromagnetic signal, such as an electrical voltage, radiowave, microwave, or infrared signal.

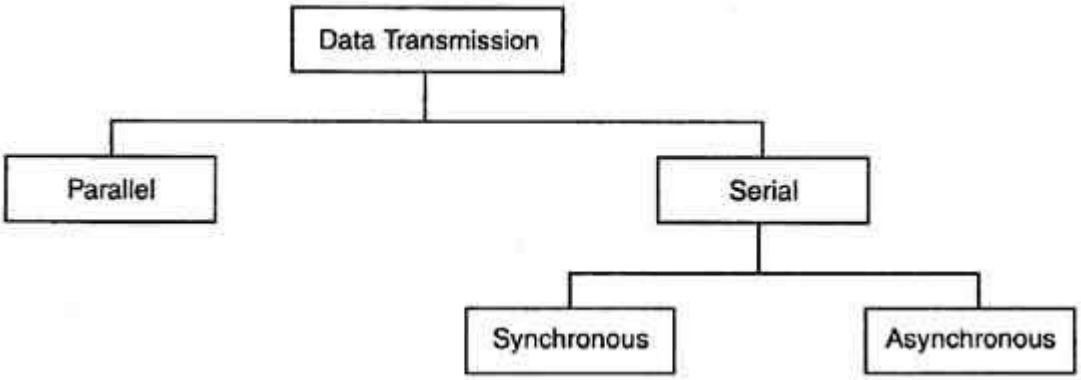
While analog transmission is the transfer of a continuously varying analog signal, digital communications is the transfer of discrete messages. The messages are either represented by a sequence of pulses by means of a line code (baseband transmission), or by a limited set of continuously varying wave forms (passband transmission), using a digital modulation method. The passband modulation and corresponding demodulation (also known as detection) is carried out by modem equipment. According to the most common definition of digital signal, both baseband and passband signals representing bit-streams are considered as digital transmission, while an alternative definition only considers the baseband signal as digital, and passband transmission of digital data as a form of digital-to-analog conversion.

Data transmitted may be digital messages originating from a data source, for example a computer or a keyboard. It may also be an analog signal such as a phone call or a video signal, digitized into a bit-stream for example using pulse-code modulation (PCM) or more advanced source coding schemes. This source coding and decoding is carried out by codec equipment.

When we enter data into the computer via keyboard, each keyed element is encoded by the electronics within the keyboard into an equivalent binary coded pattern, using one of the standard coding schemes that are used for the interchange of information. To represent all characters of the keyboard, a unique pattern of 7 or 8 bits in size is used. The use of 7 bits means that 128 different elements can be represented, while 8 bits can represent 256 elements. A similar procedure is followed at the receiver that decodes every received binary pattern into the corresponding character.

The most widely used codes that have been adopted for this function are the Extended Binary Coded Decimal (EBCDIC) and the American Standard Code for Information Interchange codes (ASCII). Both coding schemes cater to all the normal alphabetic, numeric, and punctuation characters, collectively referred to as printable characters and a range of additional control characters, known as non-printable characters.Data transmission refers to the movement of data in form of bits between two or more digital devices.This transfer of data takes place via some form of transmission media (for example, coaxial cable, fiber optics etc.)

Types of Data Transmission



1. Parallel Transmission

Within a computing or communication device, the distances between different subunits are too short. Thus, it is normal practice to transfer data between subunits using a separate wire to carry each bit of data. There are multiple wires connecting each sub-unit and data is exchanged using a parallel transfer mode. This mode of operation results in minimal delays in transferring each word.

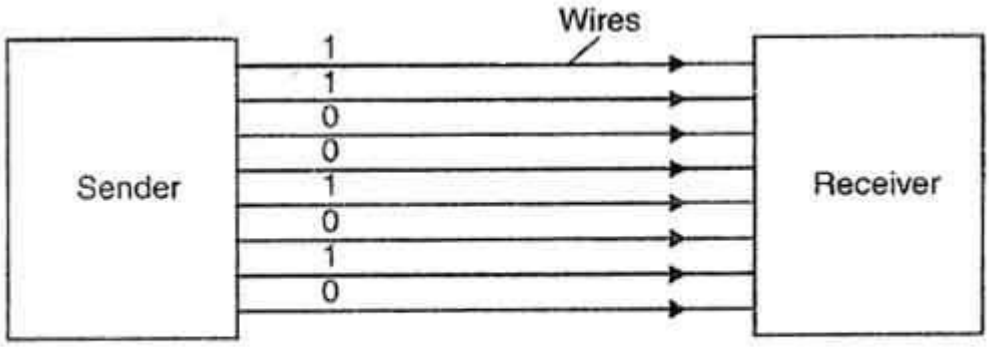
• In parallel transmission, all the bits of data are transmitted simultaneously on separate communication lines.

• In order to transmit n bits, n wires or lines are used. Thus each bit has its own line.

• All n bits of one group are transmitted with each clock pulse from one device to another i.e. multiple bits are sent with each clock pulse.

• Parallel transmission is used for short distance communication.

As shown in the fig, eight separate wires are used to transmit 8 bit data from sender to



receiver. Parallel Transmission

Advantage of parallel transmission

It is speedy way of transmitting data as multiple bits are transmitted simultaneously with a single clock pulse.

Disadvantage of parallel transmission

It is costly method of data transmission as it requires n lines to transmit n bits at the same time.

S.NO	RGPV QUESTIONS	Year	Marks
Q.1	How data transmission occur in data communication.	Dec2012	7
Q.2	Explain the parallel transmission of data.	June2010	5

UNIT-02/LECTURE-02

TRANSMISSION MODES(RGPV DEC-2012)

- Data is transmitted between two digital devices on the network in the form of bits.
- Transmission mode refers to the mode used for transmitting the data. The transmission medium may be capable of sending only a single bit in unit time or multiple bits in unit time.
- When a single bit is transmitted in unit time the transmission mode used is Serial Transmission and when multiple bits are sent in unit time the transmission mode used is called Parallel transmission.

Types of Transmission Modes

There are two basic types of transmission modes Serial and Parallel as shown in the figure below.

Serial transmission is further categorized into Synchronous and Asynchronous Serial transmission

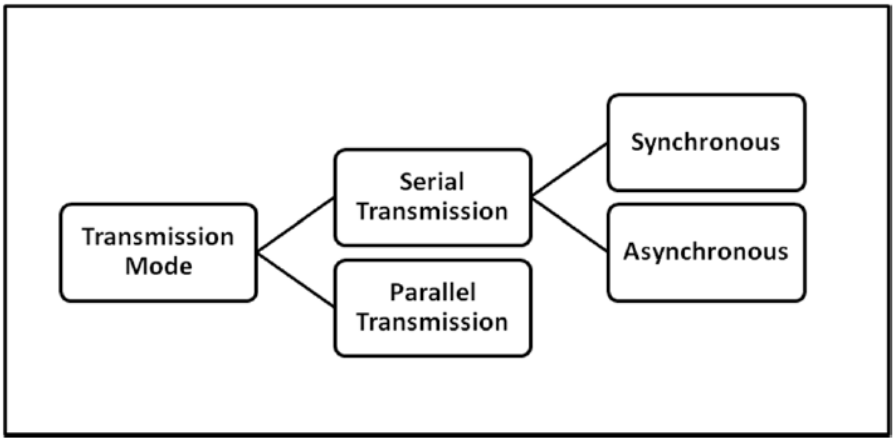


FIG:-Types of Transmission Modes

Serial Transmission (RGPV/ Dec.2012)

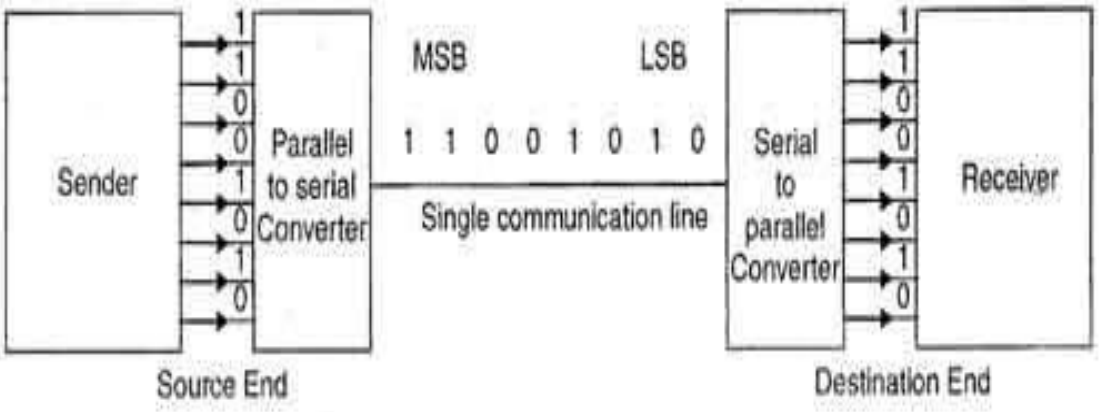
When transferring data between two physically separate devices, especially if the separation is more than a few kilometers, for reasons of cost, it is more economical to use a single pair of lines. Data is transmitted as a single bit at a time using a fixed time interval for each bit. This mode of transmission is known as bit-serial transmission.

- In serial transmission, the various bits of data are transmitted serially one after the other.
- It requires only one communication line rather than n lines to transmit data from

sender to receiver.

- Thus all the bits of data are transmitted on single line in serial fashion.
- In serial transmission, only single bit is sent with each clock pulse.
- As shown in fig., suppose an 8-bit data 11001010 is to be sent from source to destination. Then least significant bit (LSB) i,e. 0 will be transmitted first followed by other bits. The most significant bit (MSB) i.e. 1 will be transmitted in the end via single communication line.
- The internal circuitry of computer transmits data in parallel fashion. So in order to change this parallel data into serial data, conversion devices are used.
- These conversion devices convert the parallel data into serial data at the sender side so that it can be transmitted over single line.
- On receiver side, serial data received is again converted to parallel form so that the interval circuitry of computer can accept it
- Serial transmission is used for long distance communication.

Diagram :



Serial transmission

Advantage of Serial transmission

Use of single communication line reduces the transmission line cost by the factor of n as compared to parallel transmission.

Disadvantages of Serial transmission

1. Use of conversion devices at source and destination end may lead to increase in overall transmission cost.
2. This method is slower as compared to parallel transmission as bits are transmitted serially one after the other.

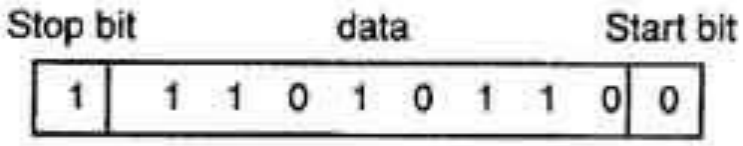
Types of Serial Transmission

- There are two types of serial transmission-synchronous and asynchronous both these transmissions use 'Bit synchronization'

- Bit Synchronization is a function that is required to determine when the beginning and end of the data transmission occurs.
- Bit synchronization helps the receiving computer to know when data begin and end during a transmission. Therefore bit synchronization provides timing control.

Asynchronous Transmission (RGPV/Dec.2013)

- Asynchronous transmission sends only one character at a time where a character is either a letter of the alphabet or number or control character i.e. it sends one byte of data at a time.
- Bit synchronization between two devices is made possible using start bit and stop bit.
- Start bit indicates the beginning of data i.e. alerts the receiver to the arrival of new group of bits. A start bit usually 0 is added to the beginning of each byte.
- Stop bit indicates the end of data i.e. to let the receiver know that byte is finished, one or more additional bits are appended to the end of the byte. These bits, usually 1s are called stop bits.



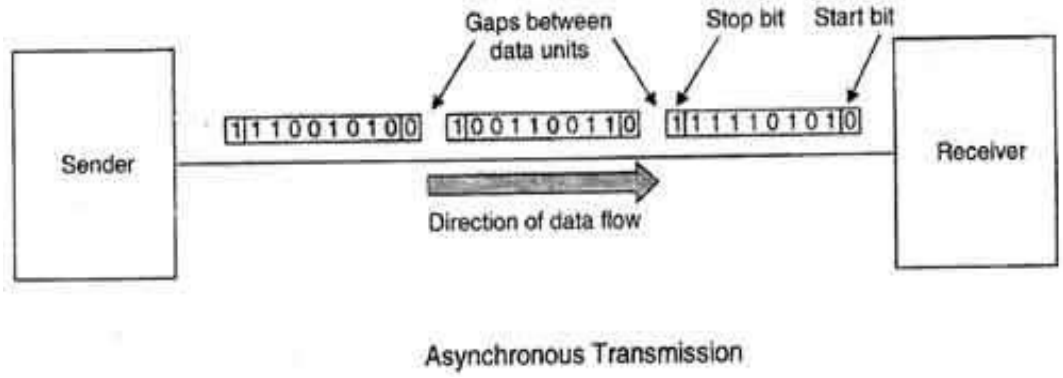
Start and Stop bit

- Addition of start and stop increase the number of data bits. Hence more bandwidth is consumed in asynchronous transmission.
- There is idle time between the transmissions of different data bytes. This idle time is also known as Gap

- The gap or idle time can be of varying intervals. This mechanism is called Asynchronous, because at byte level sender and receiver need not to be synchronized. But within each byte, receiver must be synchronized with the incoming bit stream.

Application of Asynchronous Transmission

1. Asynchronous transmission is well suited for keyboard type-terminals and paper tape devices. The advantage of this method is that it does not require any local storage at the terminal or the computer as transmission takes place character by character.



Asynchronous Transmission

2 Asynchronous transmission is best suited to Internet traffic in which information is transmitted in short bursts. This type of transmission is used by modems.

Advantages of Asynchronous transmission

1. This method of data transmission is cheaper in cost as compared to synchronous e.g. If lines are short, asynchronous transmission is better, because line cost would be low and idle time will not be expensive.
2. In this approach each individual character is complete in itself, therefore if character is corrupted during transmission, its successor and predecessor character will not be affected.
3. It is possible to transmit signals from sources having different bit rates.
4. The transmission can start as soon as data byte to be transmitted becomes available.
5. Moreover, this mode of data transmission in easy to implement.

Disadvantages of asynchronous transmission

1. This method is less efficient and slower than synchronous transmission due to the overhead of extra bits and insertion of gaps into bit stream.
2. Successful transmission inevitably depends on the recognition of the start bits. These bits can be missed or corrupted.

Application

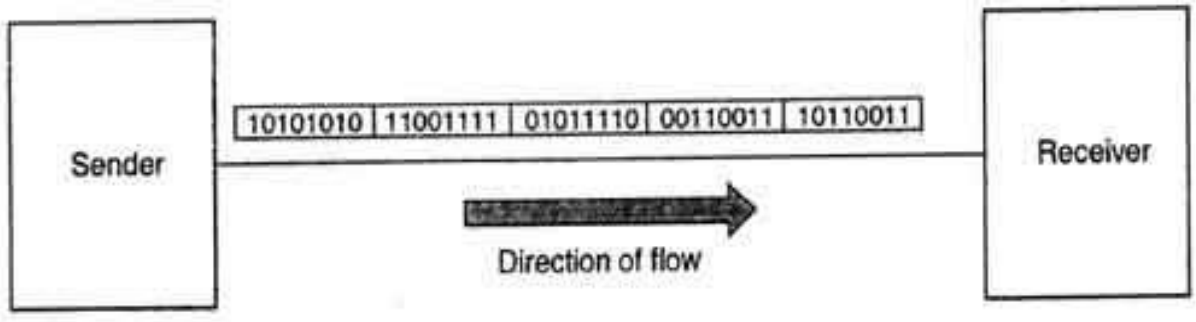
- Keyboard

S.NO	RGPV QUESTIONS	Year	Marks
Q.1	Explain the asynchronous transmission.	Dec.2013	6
Q.2	Explain the serial transmission	Dec.2012	4

UNIT-02/LECTURE-03

Synchronous Transmission

- Synchronous transmission does not use start and stop bits.
- In this method bit stream is combined into longer frames that may contain multiple bytes.
- There is no gap between the various bytes in the data stream.



Synchronous Transmission

- In the absence of start & stop bits, bit synchronization is established between sender & receiver by 'timing' the transmission of each bit.
- Since the various bytes are placed on the link without any gap, it is the responsibility of receiver to separate the bit stream into bytes so as to reconstruct the original information.
- In order to receive the data error free, the receiver and sender operates at the same clock frequency.

Application of Synchronous transmission

- Synchronous transmission is used for high speed communication between computers.

Advantage of Synchronous transmission

1. This method is faster as compared to asynchronous as there are no extra bits (start bit & stop bit) and also there is no gap between the individual data bytes.

Disadvantages of Synchronous transmission

1. It is costly as compared to asynchronous method. It requires local buffer storage at the two ends of line to assemble blocks and it also requires accurately synchronized clocks at both ends. This lead to increase in the cost.
2. The sender and receiver have to operate at the same clock frequency. This requires

proper synchronization which makes the system complicated.

Comparison between Serial and Parallel transmission:

Sr. No.	Factor	Serial	Parallel
1.	Number of bits transmitted at one clock pulse	One bit	*n* bits
2.	No. of lines required to transmit *n* bits	One line	*n* lines
3.	Speed of data transfer	Slow	Fast
4.	Cost of transmission	Low as one line is required	Higher as *n* lines are required.
5.	Application	Long distance communication between two computers	Short distance communication. like computer to printer.

Comparison between Asynchronous and Synchronous. :

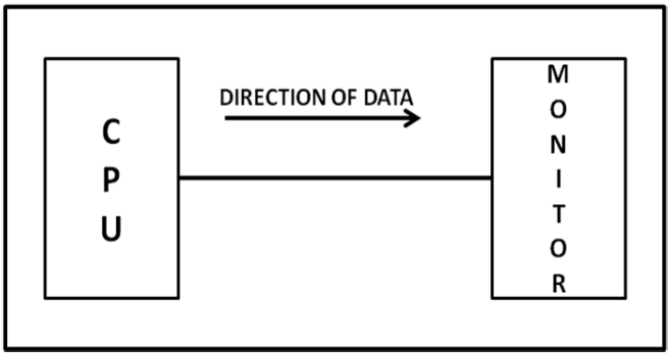
Sr. No.	Factor	Asynchronous	Synchronous
1.	Data sent at one time	Usually 1 byte	Multiple bytes
2.	Start and Stop bit	Used	Not used
3.	Gap between data units	Present	Not present
4.	Data transmission speed	Slow	Fast
5.	Cost	Low	High

DATA FLOW

- The devices communicate with each other by sending and receiving data. The data can flow between the two devices in the following ways.

    1. Simplex
    2. Half Duplex
    3. Full Duplex

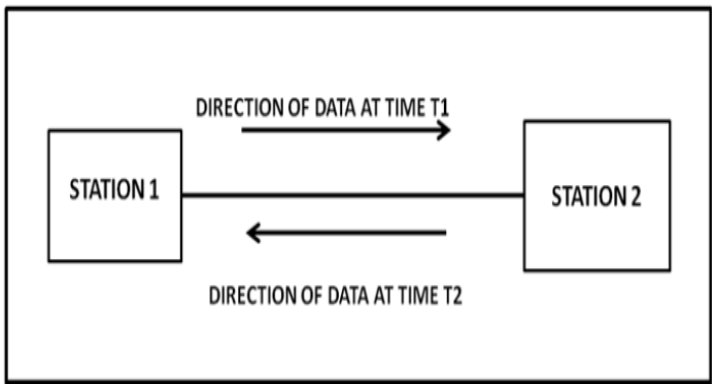
Simplex



- In Simplex, communication is unidirectional Only one of the devices sends the data and the other one only receives the data.
- Simplex communication refers to communication that occurs in one direction only. Two definitions have arisen over time: a common definition, which is used in ANSI standard and elsewhere, and an ITU-T definition.

- Example: in the above diagram: a CPU send data while a monitor only receives data

Half Duplex



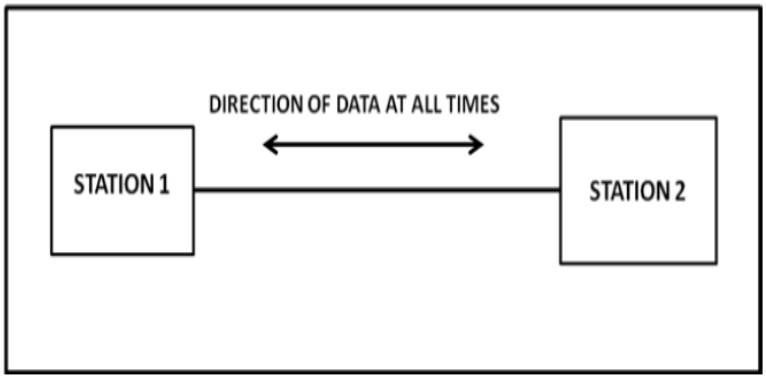
- In half duplex both the stations can transmit as well as receive but not at the same time.
- When one device is sending other can only receive and vice-versa (as shown in figure above.)

- A half-duplex system provides communication in both directions, but only one direction at a time (not simultaneously). Typically, once a party begins receiving a signal, it must wait for the transmitter to stop transmitting, before replying.

- An example of a half-duplex system is a two-party system such as a walkie-talkie, wherein one must use "Over" or another previously designated command to indicate the end of transmission, and ensure that only one party transmits at a time, because both parties transmit and receive on the same frequency.

- Example: A walkie-talkie

Full Duplex



- In Full duplex mode, both stations can transmit and receive at the same time.
- Example: mobile phones

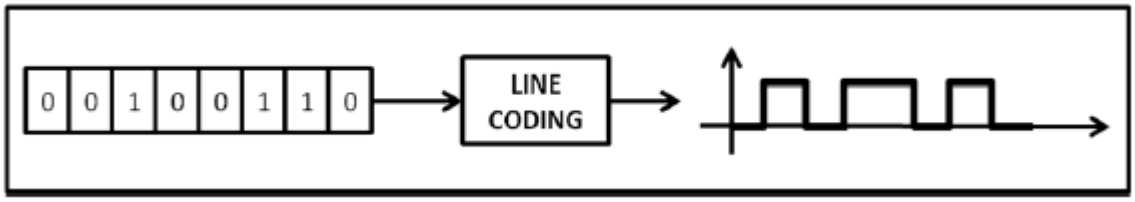
S.NO	RGPV QUESTIONS	Year	Marks
Q.1	**Differentiate between synchronous and asynchronous transmission.**	June 2013 Dec 2012	4 4

UNIT-04/LECTURE-04

ENCODING:-Unipolar, Polar & Bipolar (RGPV JUNE-2011)

Digital Data to Digital Signal Coding methods Coding methods are used to convert digital data into digital signals. There are two types of coding methods:
1 Line Coding
2 Block Coding

Scrambling is also one of the ways to convert digital data to digital signals but is not used. **Line Encoding It is the process of converting Digital data into digital signal.** In other words, it is converting of binary data(i.e. A sequence of bits) into digital signal (i.e. a sequence of discrete, discontinuous voltage pulses)



Classification of Line Codes The following figure shows the classification of Line coding schemes:

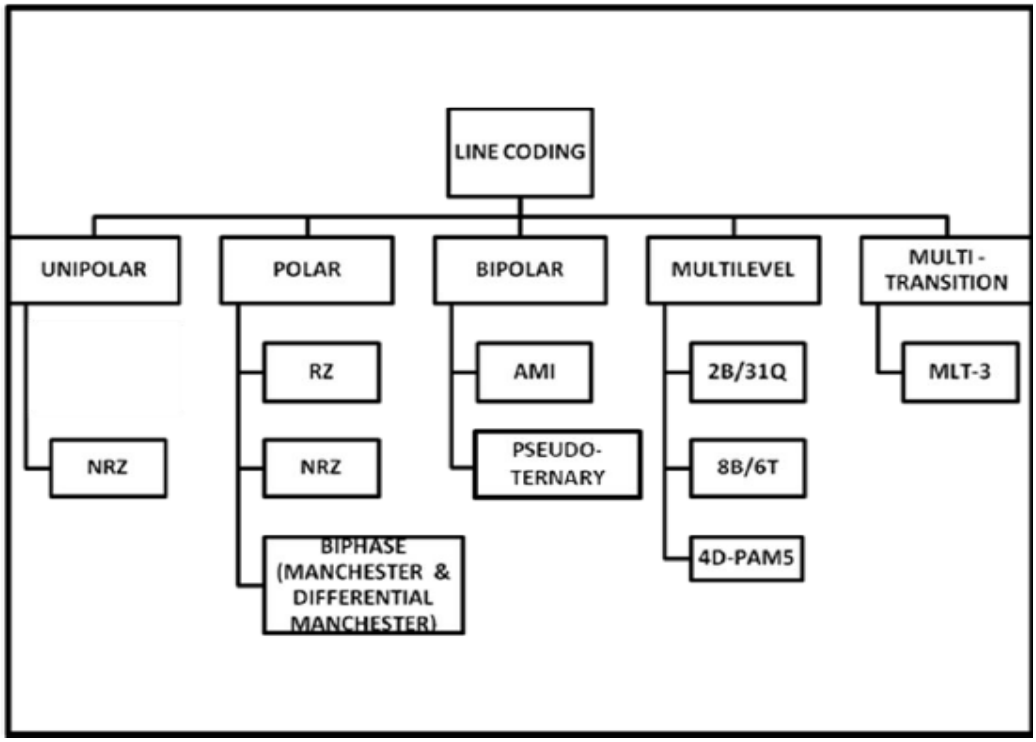


Figure : Classification of line coding schemes

A Unipolar

- All signal levels are either above or below the time axis.
- NRZ - Non Return to Zero scheme is an example of this code. The signal level does not return to zero during a symbol transmission.

B Polar

- **NRZ-voltages** are on both sides of the time axis.
- Polar NRZ scheme can be implemented with two voltages. E.g. +V for 1 and -V for 0.

There are two variations:

- **NZR - Level (NRZ-L)** - positive voltage for one symbol and negative for the other
- **NRZ - Inversion (NRZ**-I) - the change or lack of change in polarity determines the value of a symbol. E.g. a ―1‖ symbol inverts the polarity a ―0‖ does not.

Polar – RZ

- The Return to Zero (RZ) scheme uses three voltage values. +, 0, -.
- Each symbol has a transition in the middle. Either from high to zero or from low to zero
- More complex as it uses three voltage level. It has no error detection capability

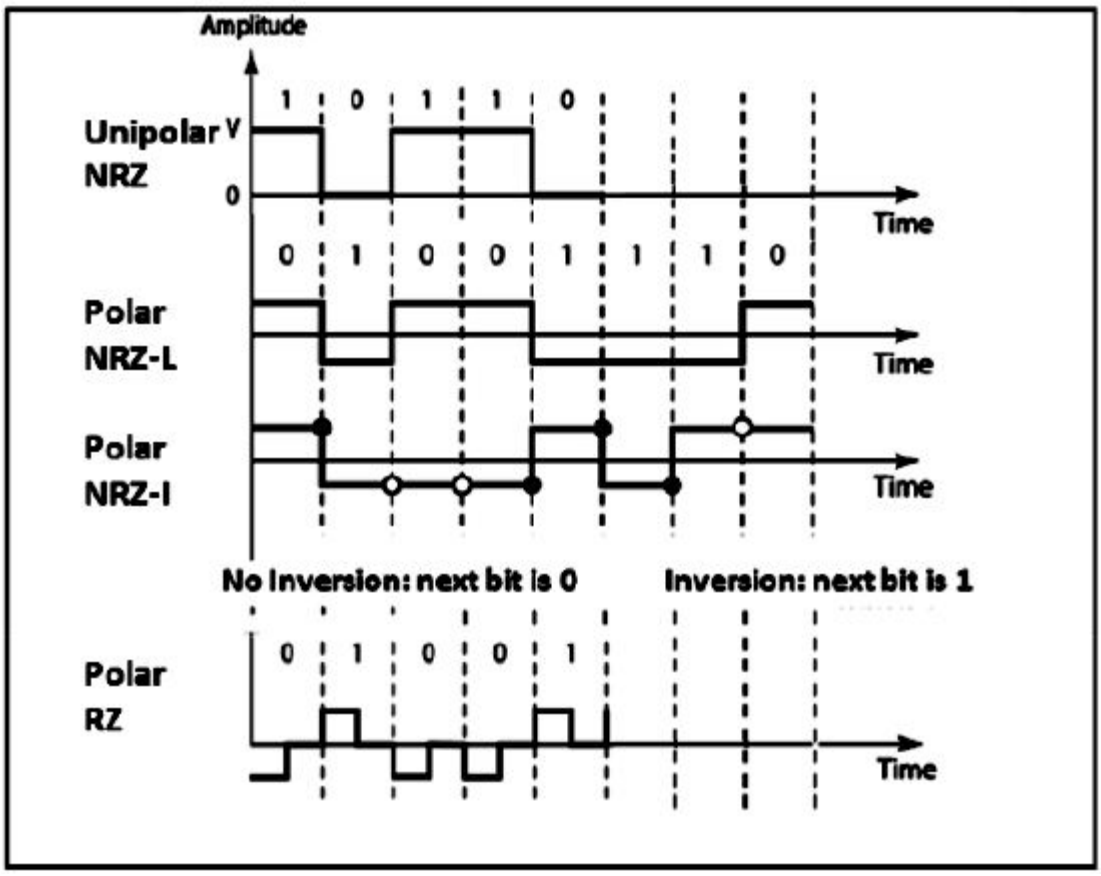


Figure : Unipolar(NRZ) & Polar(RZ & NRZ) Encoding.

Polar - Biphase: Manchester and Differential Manchester

Manchester coding is a combination of NRZ-L and RZ schemes.
Every symbol has a level transition in the middle: from high to low or low to high.
It uses only two voltage levels.

Differential Manchester coding consists of combining the NRZ-I and RZ schemes.
Every symbol has a level transition in the middle. But the level at the beginning of the symbol is determined by the symbol value. One symbol causes a level change the other does not.

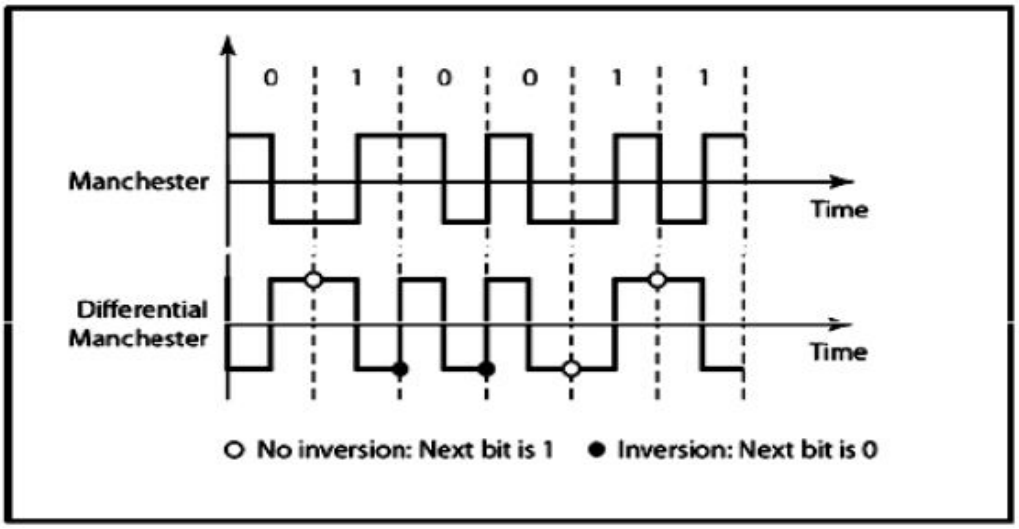


Figure : Polar biphase: Manchester and differential Manchester coding schemes

C Bipolar - AMI and Pseudoternary

- This coding scheme uses 3 voltage levels: - +, 0, -, to represent the symbols
- Voltage level for one symbol is at —0‖ and the other alternates between + & -.

Bipolar Alternate Mark Inversion (AMI) –

- the —0‖ symbol is represented by zero voltage and the —1‖ symbol alternates between +V and -V.

Pseudoternary is the reverse of AMI

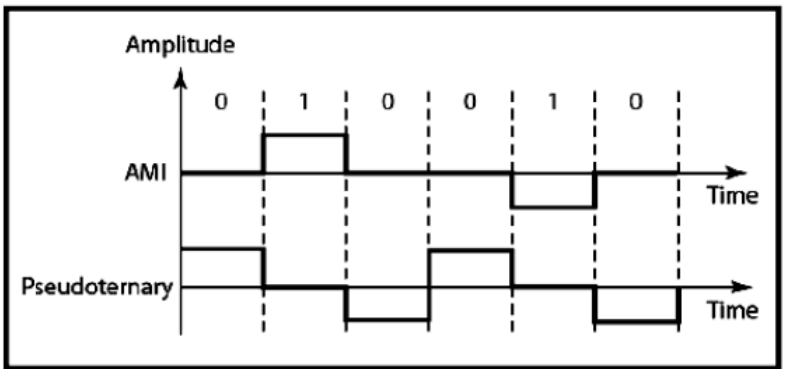
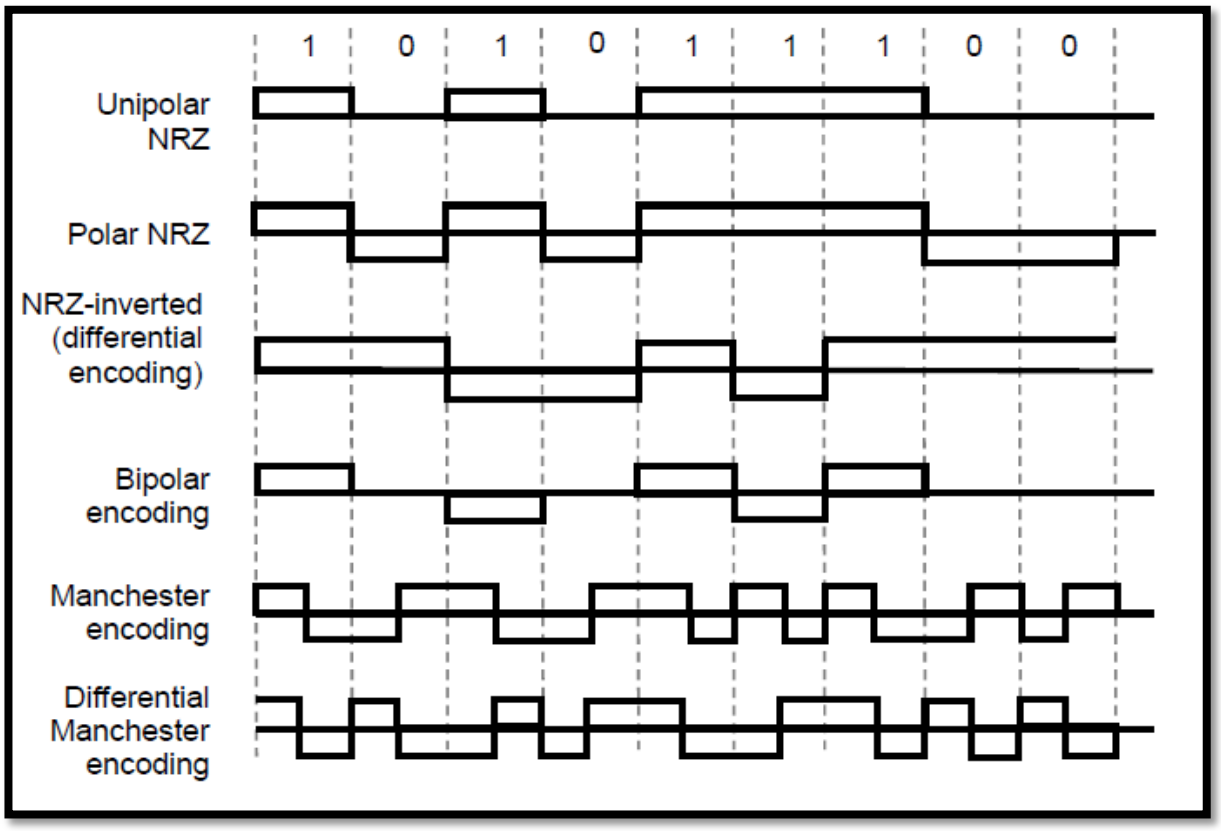


Figure: Bipolar coding scheme - AMI and Pseudoternary



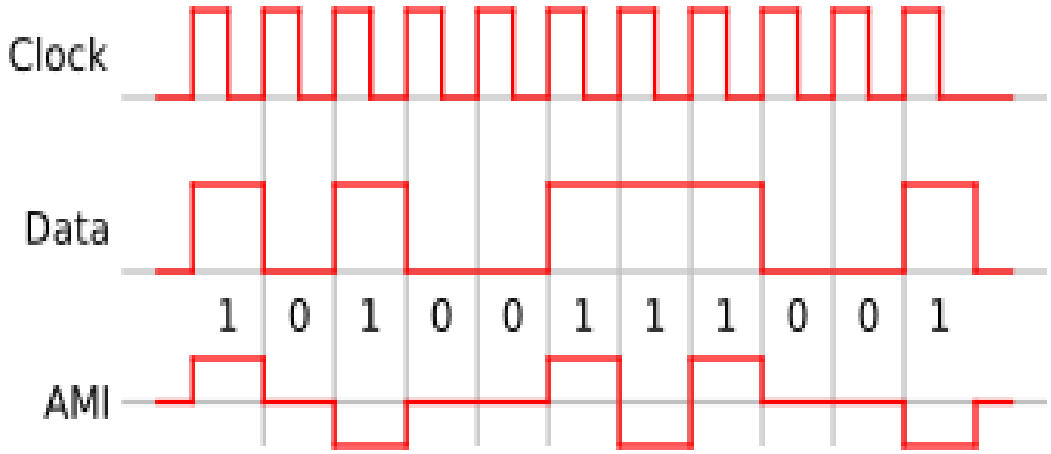
NRZ(Non-Return-Zero) (RGPV/ Dec 2012**)**

- Traditionally, a unipolar scheme was designed as a non-return-to-zero (NRZ) scheme, in which the positive voltage defines bit 1 and the zero voltage defines bit 0. It is called NRZ because the signal does not return to zero at the middle of the bit.
- Compared with its polar counterpart, Polar NRZ, this scheme is very expensive. The normalized power (power required to send 1 bit per unit line resistance) is double that for polar NRZ. For this reason, this scheme is not normally used in data communications today.

Return to zero codes (RGPV/ Dec 2012**)**

- Return-to-zero (RZ) describes a line code used in telecommunications signals in which the signal drops (returns) to zero between each pulse. This takes place even if a number of consecutive 0s or 1s occur in the signal. The signal is self-clocking. This means that a separate clock does not need to be sent alongside the signal, but suffers from using twice the bandwidth to achieve the same data-rate as compared to non-return-to-zero format.
- The "zero" between each bit is a neutral or rest condition, such as a zero amplitude in pulse amplitude modulation (PAM), zero phase shift in phase-shift keying (PSK), or mid-frequency in frequency-shift keying (FSK). That "zero" condition is typically halfway between the significant condition representing a 1 bit and the other significant condition representing a 0 bit.

- Although return-to-zero (RZ) contains a provision for synchronization, it still has a DC component resulting in “baseline wander” during long strings of 0 or 1 bits, just like the line code non-return-to-zero.
- **Bipolar Line Encoding**
- In telecommunication, bipolar encoding is a type of line code, where two nonzero values are used, so that the three values are +,-, and zero. Such a signal is called a duobinary signal. Bipolar encoding typically has at least a rough a balance of +'s and -'s.



- One kind of bipolar encoding is a paired disparity code. The simplest example of this is alternate mark inversion. In this code, a binary 0 is encoded as zero volts, as in unipolar encoding, whereas a binary 1 is encoded alternately as a positive voltage or a negative voltage. The name arose because, in the context of a T-carrier, a binary '1' is referred to as a "mark", while a binary '0' is called a "space".

S.NO	RGPV QUESTIONS(IT)	Year	Marks
Q.1	Explain the RZ and NRZ codes	DEC2013 Dec 2012	4 4
S.NO	RGPV QUESTIONS(CS)	Year	Marks
Q.1	Explain the various encoding schemes briefly.	Dec 2011	7

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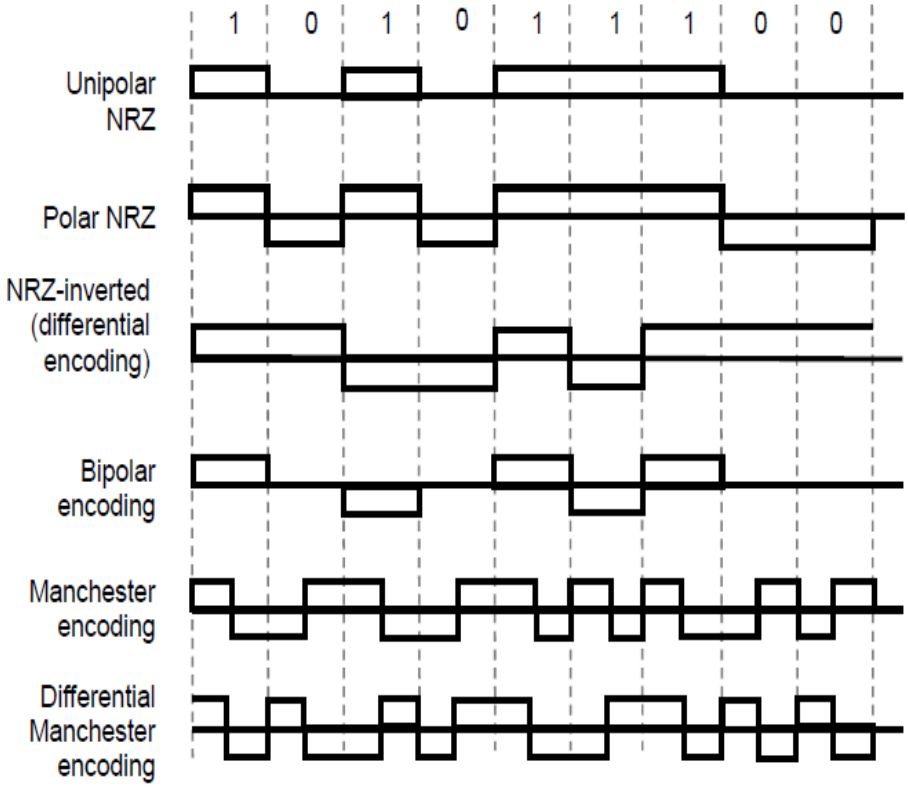
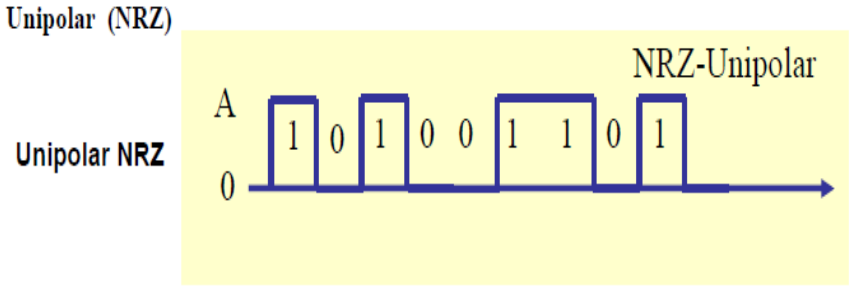
UNIT-02/LECTURE-05

Line Codes (RGPV Dec 2011 / june 2013)

- In base band transmission best way is to map digits or symbols into pulse waveform.
- This waveform is generally termed as Line codes.
- **RZ: Return to Zero [pulse for half the duration of Tb]**
- **NRZ Return to Zero[pulse for full duration of Tb]**

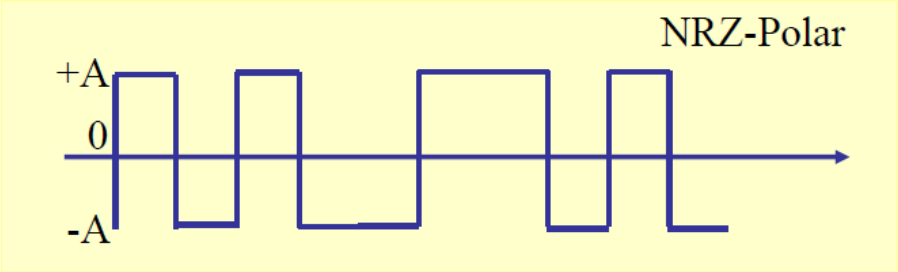




Unipolar NRZ

- "1" maps to +A pulse "0" maps to no pulse
- Poor timing
- Low-frequency content
- Simple

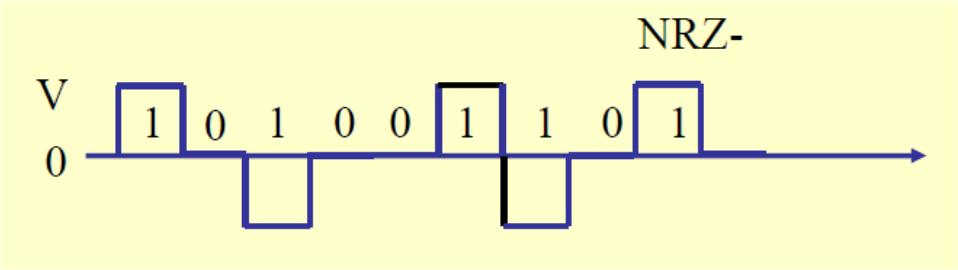
- Long strings of 1s and 0s ,synchronization problem



Polar - (NRZ)

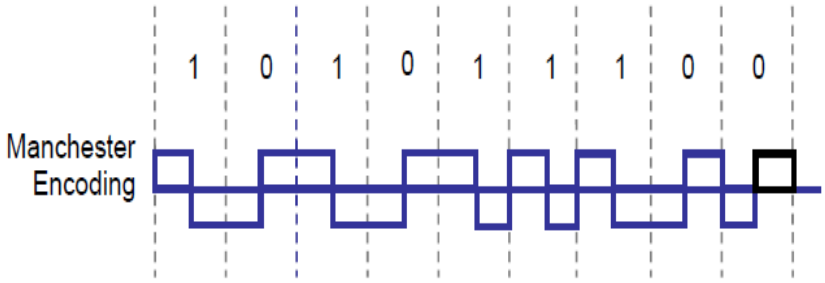
- "1" maps to +A pulse "0" to –A pulse
- Better Average Power
- simple to implement
- Long strings of 1s and 0s ,synchronization problem
- Poor timing

Bipolar Code



- Three signal levels: {-A, 0, +A}
- "1" maps to +A or –A in alternation
- "0" maps to no pulse
- Long string of 0's causes receiver to loose synchronization
- Suitable for telephone systems.

Manchester code



Manchester coding:

- "1" maps into A/2 first for Tb/2, and -A/2 for next Tb/2
- "0" maps into -A/2 first for Tb/2, and A/2 for Tb/2
- Every interval has transition in middle
  - Timing recovery easy
- Simple to implement

Suitable for satellite telemetry and optical communications

UNIT-02/LECTURE-06

Synchronization and Zeroes

1. Bipolar encoding is preferable to non-return-to-zero whenever signal transitions are required to maintain synchronization between the transmitter and receiver. Other systems must synchronize using some form of out-of-band communication, or add frame synchronization sequences that don't carry data to the signal. These alternative approaches require either an additional transmission medium for the clock signal or a loss of performance due to overhead, respectively. A bipolar encoding is an often good compromise: runs of ones will not cause a lack of transitions.
2. However, long sequences of zeroes remain an issue. Long sequences of zero bits result in no transitions and a loss of synchronization. Where frequent transitions are a requirement, a self-clocking encoding such as return-to-zero or some other more complicated line code may be more appropriate, though they introduce significant overhead.
3. The coding was used extensively in first-generation PCM networks, and is still commonly seen on older multiplexing equipment today, but successful transmission relies on no long runs of zeroes being present. No more than 15 consecutive zeros should ever be sent to ensure synchronization.
4. There are two popular ways to ensure that no more than 15 consecutive zeros are ever sent: robbed-bit signaling and bit stuffing.
5. T-carrier uses robbed-bit signaling: the least-significant bit of the byte is simply forced to a "1" when necessary.
6. The modification of bit 7 causes a change to voice that is undetectable by the human ear, but it is an unacceptable corruption of a data stream. Data channels are required to use some other form of pulse-stuffing,such as always setting bit 8 to '1', in order to maintain a sufficient density of ones.
7. If the characteristics of the input data do not follow the pattern that every eighth bit is '1', the coder using alternate mark inversion adds a '1' after seven consecutive zeros to maintain synchronisation. On the decoder side, this extra '1' added by the coder is removed, recreating the correct data. Using this method the data sent between the coder and the decoder is longer than the original data by less than 1% on average. Of course, this lowers the effective data throughput to 56 kbit/s per channel.

Error detection

- Another benefit of bipolar encoding compared to unipolar is error detection. In the T-carrier example, the bipolar signals are regenerated at regular intervals so that signals diminished by distance are not just amplified, but detected and recreated anew. Weakened signals corrupted by noise could cause errors, a mark interpreted as zero, or zero as positive or negative mark. Every single-bit error results in a violation of the bipolar rule. Each such bipolar violation (BPV) is an indication of a transmission error.

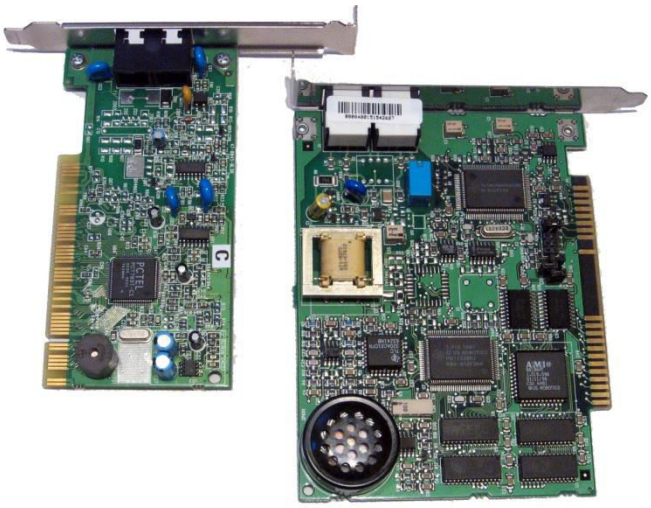
Baud

- Baud is synonymous to symbols per second or pulses per second. It is the unit of symbol rate, also known as baud or modulation rate; the number of distinct symbol changes (signaling events) made to the transmission medium per second in a digitally modulated signal or a line code. Baud is related to but should not be confused with gross bit rate expressed as bits per second, bps, b/s, bit/s or bits/s. However, though technically incorrect, in the case of modem manufacturers baud commonly refers to bits per second. They make a distinction by also using the term characters per second (CPS). In these anomalous cases, refer to the modem manufacturer's documentation to ensure an understanding of their use of the term "baud".
- The symbol duration time, also known as unit interval, can be directly measured as the time between transitions by looking into an eye diagram of an oscilloscope. The symbol duration time T_s can be calculated as:
- $$T_s = \frac{1}{f_s},$$
- where f_s is the symbol rate. There is also a chance of miscommunication which leads to ambiguity.
- example: A baud of 1 kBd = 1,000 Bd is synonymous to a symbol rate of 1,000 symbols per second. In case of a modem, this corresponds to 1,000 tones per second, and in case of a line code, this corresponds to 1,000 pulses per second. The symbol duration time is 1/1,000 second = 1 millisecond.
- In digital systems (i.e., using discrete/discontinuous values) with binary code, 1 Bd = 1 bit/s. By contrast, non-digital (or analog) systems use a continuous range of values to represent information and in these systems the exact informational size of 1 Bd varies

Modem (RGPV/ Dec 2012)

Modem,

- moden short for **modulator-demodulator** is an electronic device that converts a computer's digital signals into specific frequencies to travel over telephone or cable television lines. At the destination, the receiving modem demodulates the frequencies back into digital data. Computers use modems to communicate with one another over a network. The modem has significantly evolved since the 1970s when the 300 baud modem was used for connecting computers to bulletin board systems (BBSs). With this type of modem, each bit, represented digitally by a 1 or 0, was transmitted as a specific tone. The receiving modem responded with its own dedicated frequencies so that the modems could "talk at the same time."
- The technical term for this type of modem is Asynchronous.
- Image of modem:



Types of modem: External modem:

1. External modems.
2. Usb modem
3. Cable modem:
4. Wireless modem
5. Gprs modem
6. High speed modem
7. Null modem

S.NO	RGPV QUESTION	YEAR	MARKS
Q.1	What is modem and explain its type ?	DEC2012	7

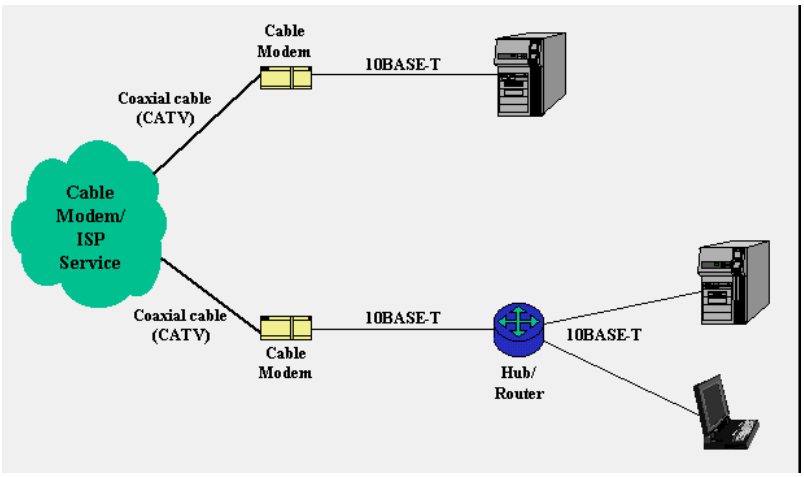
UNIT-02/LECTURE-07

Types of modem: External modem:

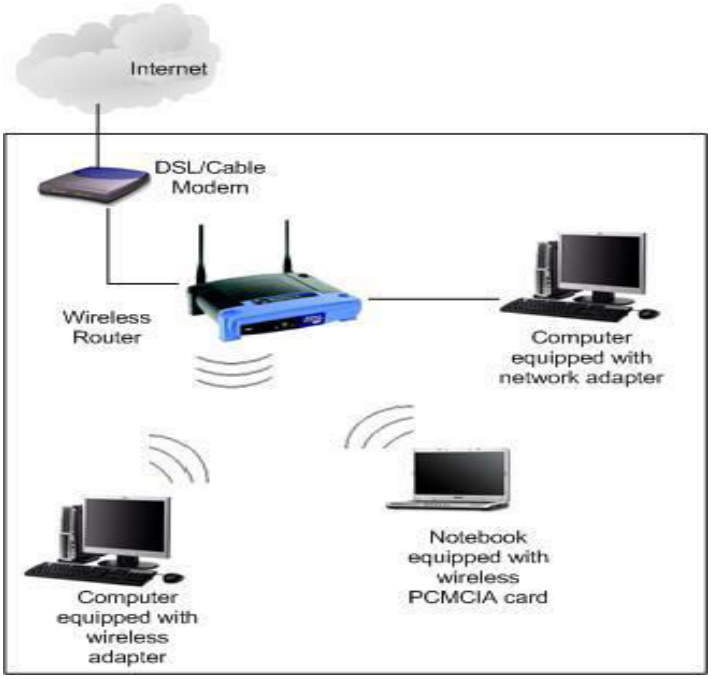
1. External modems. It is the second term we have to consider from different types of computer modem. An External modem can be used to the same purpose and in the same conditions as internal computer modem. However, external modem is a small box that uses other kind of interfaces to be connected to the computer.

2. Usb modem: It could be a serial modem, named thus because it uses the serial port to connect to the computer. Usually installed on the back of the computer, the serial port is an easy-to-install option for the external modem. The same small box, on the other hand, can be an USB modem, which normally uses USB port usually placed on the back or in front of the computer.

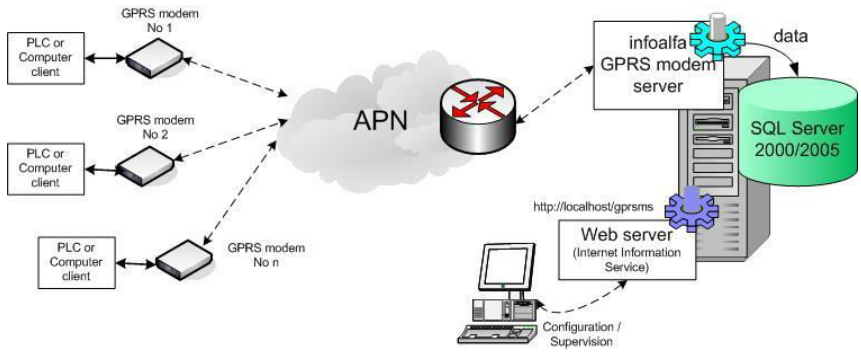
3. Cable modem:
   The cable modem uses a coaxial cable television lines to provide greater bandwidth than the dial-up computer modem. An extremely fast access to the Web is providing by the cable modem with downstream transmission up to 38 Mbits/s and an upstream transmission up to 1 Mbits/s.



4. Wireless modem:
   Some Internet Service Providers supports wireless internet services. The wireless modems are used for this service. These modems work similar to traditional wired modems except its structure.



5. Gprs modem:
   The GPRS modems are used to browser internet and for other communication using the GPRS services. The GPRS (General Packet Radio Signals) service is provided on the cellular networks. If we have cellular connection then we can communicate using the GPRS modems. The GPRS services are costly as compared with other communication services.



6. High speed modem:
   56k modems are designed to take advantage of the new digital telephone networks. These use Pulse Code Modulation (PCM) to convert your voice, fax or modem signal into a digital stream at your local exchange. The amplitude of the analog signal is measured 8000 times per second. Each measurement produces a PCM code in the form of an eight bit byte to represent the amplitude.
7. Null modem:
   Null modem is a communication method to connect two DTEs (computer, terminal, printer etc.) directly using an RS-232serial cable. The RS-232 standard is asymmetrical as to the definitions of the two ends of the communications link so it assumes that one end is a DTE and the other is a DCE e.g. a modem. 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

Advantages:

1. More useful in connecting LAN with the Internet
2. Speed depends on the cost

Disadvantages:

1. Acts just as a interface between LAN and Internet
2. No traffic maintenance is present

S.NO	RGPV QUESTION	YEAR	MARKS
Q.1	Explain the functioning of modem	DEC 2011	7

UNIT-02/LECTURE-08

Point to point (RGPV/ Dec 2012)

- In telecommunications, a point-to-point connection refers to a communications connection between two nodes or endpoints. An example is a telephone call, in which one telephone is connected with one other, and what is said by one caller can only be heard by the other. This is contrasted with a point-to-multipoint or broadcast communication topology, in which many nodes can receive information transmitted by one node. Other examples of point-to-point communications links are leased lines, microwave relay links, and two way radio. Examples of point-to-multipoint communications systems are radio and television broadcasting.
- The term is also used in computer networking and computer architecture to refer to a wire or other connection that links only two computers or circuits, as opposed to other network topologies such as buses or crossbar switches which can connect many communications devices.

Basic point-to-point data link

- A traditional point-to-point data link is a communications medium with exactly two endpoints and no data or packet formatting. The host computers at either end had to take full responsibility for formatting the data transmitted between them. The connection between the computer and the communications medium was generally implemented through an RS-232 interface, or something similar. Computers in close proximity may be connected by wires directly between their interface cards .
- When connected at a distance, each endpoint would be fitted with a modem to convert analog telecommunications signals into a digital data stream. When the connection used a telecommunications provider, the connections were called a dedicated, leased, or private line. The ARPANET used leased lines to provide point-to-point data links between its packet-switching nodes, which were called Interface Message Processors.

Modern point-to-point links

- In 2003, the term point-to-point telecommunications relates to fixed wireless data communications for Internet or voice over IP via radio frequencies in the multi-gigahertz range. It also includes technologies such as laser for telecommunications but in all cases expects that the transmission medium is line of sight and capable of being fairly tightly beamed from transmitter to receiver. The Telecommunications Industry Association's engineering committees develop U.S. standards for point-to-point communications and related cellular tower structures. Online tools help users find if they have such line of sight.
- The telecommunications signal is typically bi-directional, either time division multiple access (TDMA) or channelized.
- In hubs and switches, a hub provides a point-to-multipoint (or simply multipoint)

circuit which divides the total bandwidth supplied by the hub among each connected client node. A switch on the other hand provides a series of point-to-point circuits, via microsegmentation, which allows each client node to have a dedicated circuit and the added advantage of having full-duplex connections.

Q: Find the bandwidth for a signal transmitting at 12 Mbps for QPSK. The value of d=0.

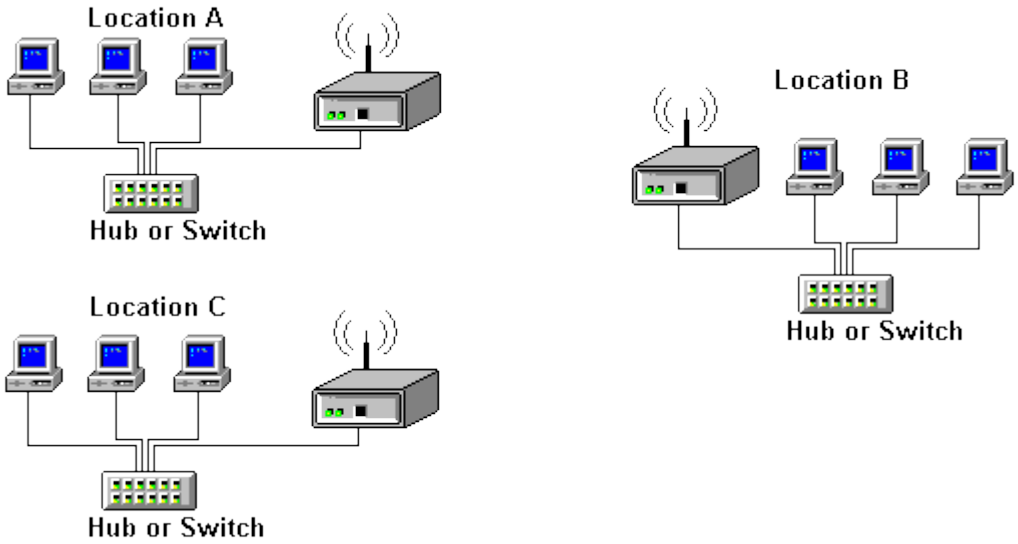
Sol: For QPSK 2 bits is carried by one signal element. This means that r=2.So the signal rate (baud rate) is $S=N \times (1/r) = 6$ Mbaud. With a value of d=0 we have B=S=6 Mhz

S.NO	RGPV QUESTION	YEAR	MARKS
Q.1	Explain the point to point configuration.	Dec2012	7

UNIT-02/LECTURE-09

Point to multipoint configuration (RGPV/ Dec 2012)

Point to Multi-Point Network Diagram



Description:

- Point to multi-point networks are used to connect one location to one or more remote locations. The above diagram shows three connected multi-user networks (using a Hub or Switch). Any location may be configured as a Direct connection (without a Hub or Switch).
- Air-Frame 100 at location B can be used to create many, co-located point to multi-point networks or cells.

- Applications:
- Internet, Intranet or Extranet configurations. ISP access networks. LAN to LAN applications (bridged or routed see below). Remote data capture (Telemetry or SCADA). Remote Control. Remote Monitoring, Security, Hub and Spoke, Conferencing.

Bridged or Routed:

- In a bridged connection (Air-Frame 10 or 100 range) the network traffic is sent from one location to all other locations and consists of:
- Traffic for a PC or system on any other network i.e. traffic from location A to, say, a system at location B, is also received by Location C (but is only sent once over the radio) and is placed on the local LAN at C by the bridging function.
- In effect all the locations operate as a single, fully transparent LAN. Where one or more

locations consist of many PCs or systems the broadcast traffic alone can be considerable and consideration should be given to using a routed network. In addition the redundant traffic

- received at each location can stress the local LAN network and cause security concerns. In this case also a routed solution should be considered.
- In a routed connection (Air-Frame 100 range) the traffic is sent from one location to all other Locations consists and consists only of:
- Traffic for a PC or system on any other network i.e. traffic from location A to, say, a system at location B, is also received by Location C (but is only sent once). The routing function however prevents this redundant traffic from being placed on the local LAN at C.
- In this configuration the LANs operate independently but communication is enabled between them.

S.NO	RGPV QUESTION	YEAR	MARKS
Q.1	Explain the point to multipoint configuration.	Dec2012	7
Q.2	Explain the line configuration	DEC2012	7