

Receive or only Send data.

for Eg:- A printer & Radio station

-: Half duplex :-

- This is a bidirectional connection with the restriction that data can travel in one direction in same time.
- in half duplex channel message may flow in two direction but never at the same time in a telephone one party speak other listen or pause the other party speak and other party listen

Eg:- Walky-talky.

-: full-duplex :-

- This is a bidirectional connection in which data can travel in both direction at once.
- A full duplex connection relay consist of equivalent to two simplex connection in opposite direction.
- A forward channel and Receiver channel linking the same point.

Eg:- Mobilephone, telephone etc

-: full / full-duplex :-

in full / full duplex mode transmission is possible in both the direction simultaneously but not betn the same two station.

* PSK (Phase Shift Keying): →

→ In phase shift key, Modulation Method of the phase of carrier changes between phase determined by logic state of the input bit stream:

- An alternative to imposing the modulation onto the carrier by varying the instantaneous frequency is to modulate the phase. This can be achieved by defining a relative phase shift from the carrier usually equidistant for each require state. Therefore, two level phase modulated system such as binary phase shift key has two relative phase shift from the carrier i.e., $+90^\circ$ or -90° .

→ PSK describe the Modulation technique that alter the phase of the carrier. Mathematically

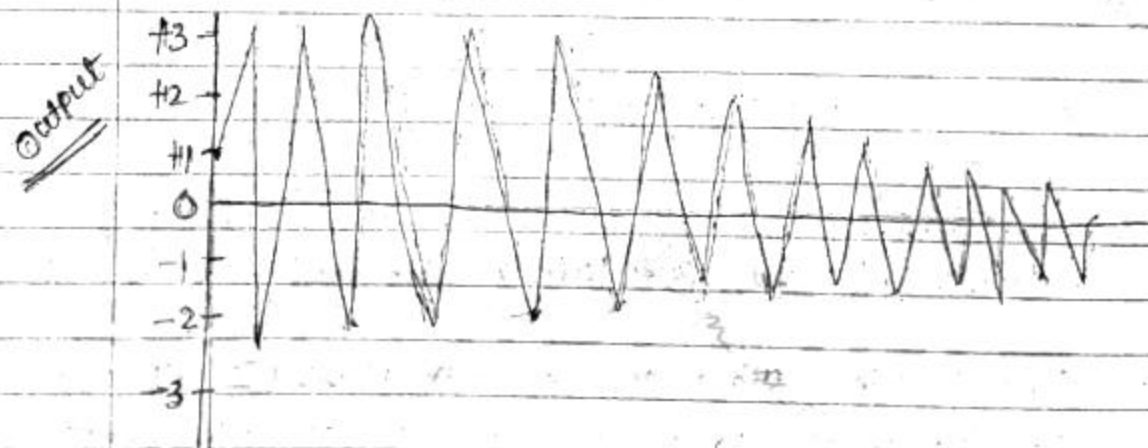
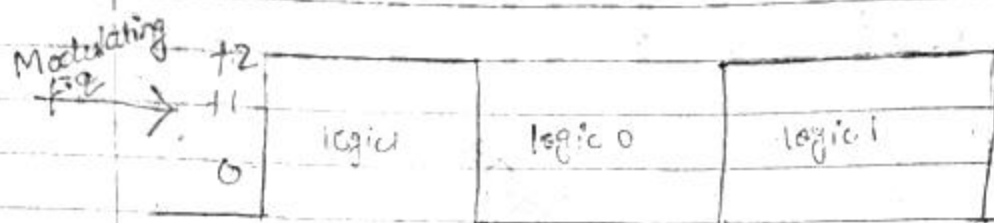
$$s(t) = \sin(2\pi f_c t + \phi(t))$$

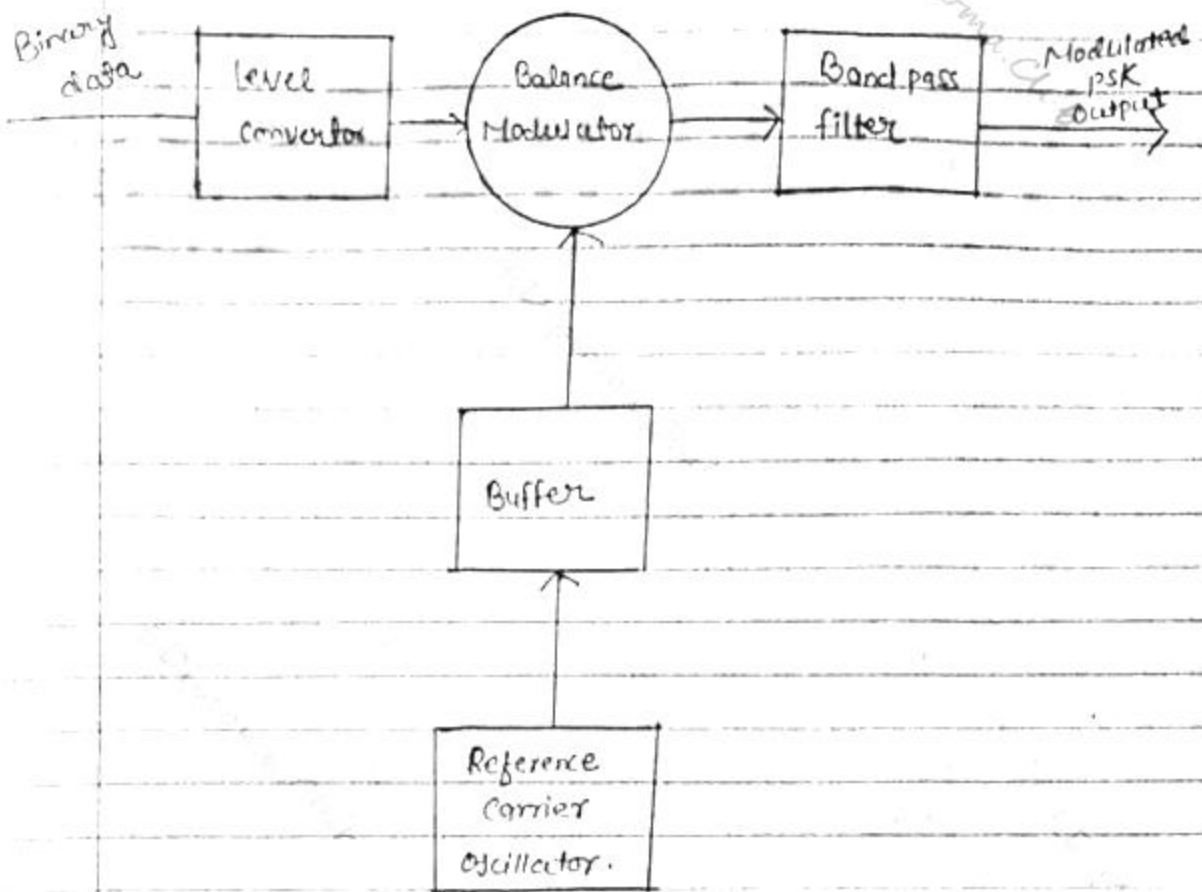
← BPSK (Binary phase Shift key): -

→ The simplest form of phase Modulation is binary phase (1 or 0) Modulation with theoretical BPSK.

→ The carrier phase has only two phase $\pm \frac{\pi}{2}$ it means the transition from a (1 to zero) or vice versa. With the result in Modulated signal Corrosing the original of the contrulation diagram Resulting in 100% AM.

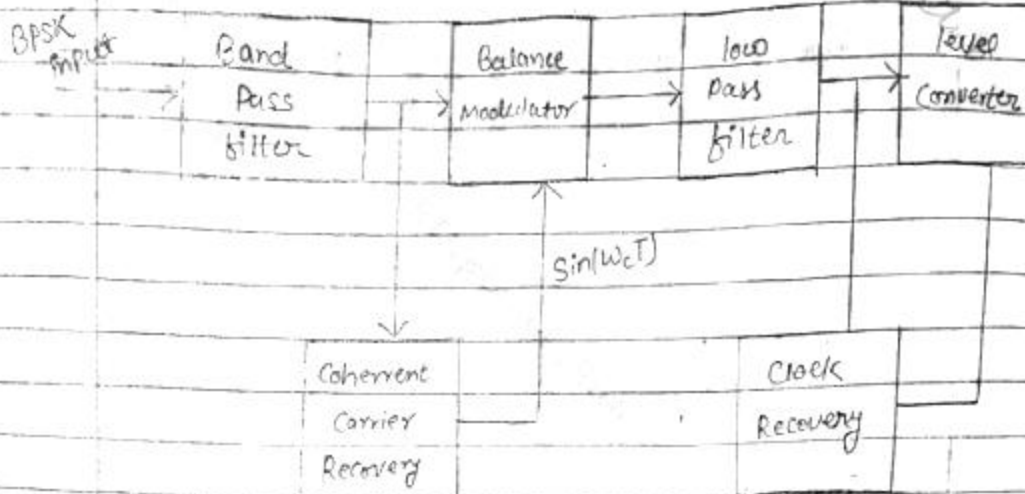
→ logic 1 produces no phase change and logic 0 produce 180° phase change.





- BPSK Signal may be generated by applying carrier to a balance Modulator the binary data signal is converted into NRZ bipolar signal by NRZ encoder.
- The bipolar signal is applied as a Modulating signal to the balance Modulator.
- NRZ level encoder convert the binary data sequence into bipolar NRZ signal.

BPSK Reception :-



→ The input signal may be $\pm \sin(\omega_c T)$. The Coherent Carrier Recovery circuit detects and regenerates a carrier signal that is both phase or frequency coherent with the original transmit carrier.

→ The balance Modulator is the product detector. The output is the product of two inputs (The BPSK signal and Recovered carrier). The two pass filters separate the recovered binary data from the complex demodulator signal.

MODEM :-

- A Modem is a Modulator / demodulator. The analog signal encode the digital information at the time of Modulation and decode it back during demodulation to transmit the data.
- Modem allows digital transmission over analog telephone line they allow people to connect their computers with other computer cooperate office LANs and the internet.

EXTERNAL AND INTERNAL MODEM (physical type) :-

- The external Modem sit next to the computer and connect to serial port using the straight through Serial cable.
- Internal Modem are a plugging circuit board that sit inside the computer.

CLASSIFICATION OF MODEM :-

According to their characteristics.

1. Range

- i) Short haul.
- ii) Voice Grade (VGR)
- iii) Wide band.

2. Line type

- i) dial up
- ii) leased/private
- iii) Two and four lines.

Operation Mode

- I. Half duplex
- II. full duplex.
- III. Simplex.

4. Synchronization

- I. Asynchronization.
- II. Synchronization.

5. Modulation

- i). AM
- ii). FM/FSK
- iii). PM
- iv). TCM

6. Data Rate

I. RANGE :-

i). Short haul :- Short haul are of short range up to 15 km which use private lines and are not part of public system. Short haul Modem are distance sensitive because signal attenuation as a signal travel through the line.

- NO security is included in these Modem to cover for difference b/w the carrier frequency of the demodulator and the frequency of Modulator.

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- No Circuitry is included to reduce a Noise Rejection which is less of a problem over short distance.

II. Voice Grade:-

- Voice Grade Modems are used for unlimited destination using a moderate to high data rate.
- These are expensive.

III. Wide band:-

- Wide band are used in large volume, telephone line multiplexing dedicated computer to computer link.
- These Modem exceed High data Rates.

LINE TYPE:-

I. Dial Up:-

- Dial Up Modem can established point to point connection on the PSTN by an combination of Manual or automatic dialing or answering.

II. Leased & Private:-

leased & private or dedicated lines are for the exclusive used for leased line Modem either pair (point to point connection) or several on a Multi drop Network for pooling or contention system.

III. Two or four line:-

A four wire line is a pair of two wire line one for transmitting one for receiving in which the signal in the two direction are to be kepted totally separate.

I. Asynchronous Modem:-

- The Common Modem used today is asynchronous Modem. In asynchronous transmission data is coded into a series of pulses including a start bit and a stop bit.
- A start bit is sent by the Sending Modem to inform the Receiving Modem that the character is to be same.
- The character is then sent followed by a stop bit designating that the transfer of that bit is complete.
- Each Modem must operate with the same start and stop bit sequence. Each Modem must operate at the same baud rate. In asynchronous transmission priority check is define.

II Synchronous Modem:-

- Synchronous Modem can be faster than asynchronous. They depends on timing to communicate.
- In Synchronous data transmission data sent via bit stream to bit sent a group of character in a single stream data is transmitted in frame with synchronization bit which are used to sure the timing of the transmission and Reception of data is accurate.

- Synchronous data is a combined by a clock signals. The data source and destination expect the transfer to be transparent to this type of data.

∴ DPSK (Differential Phase Shift Keying):-

- DPSK is a alternative form of digital modulation scheme. The binary input information its contains in the difference between two successive signal in element rather than the absolute phase.

Generation of DPSK :-

Encoding technique :-

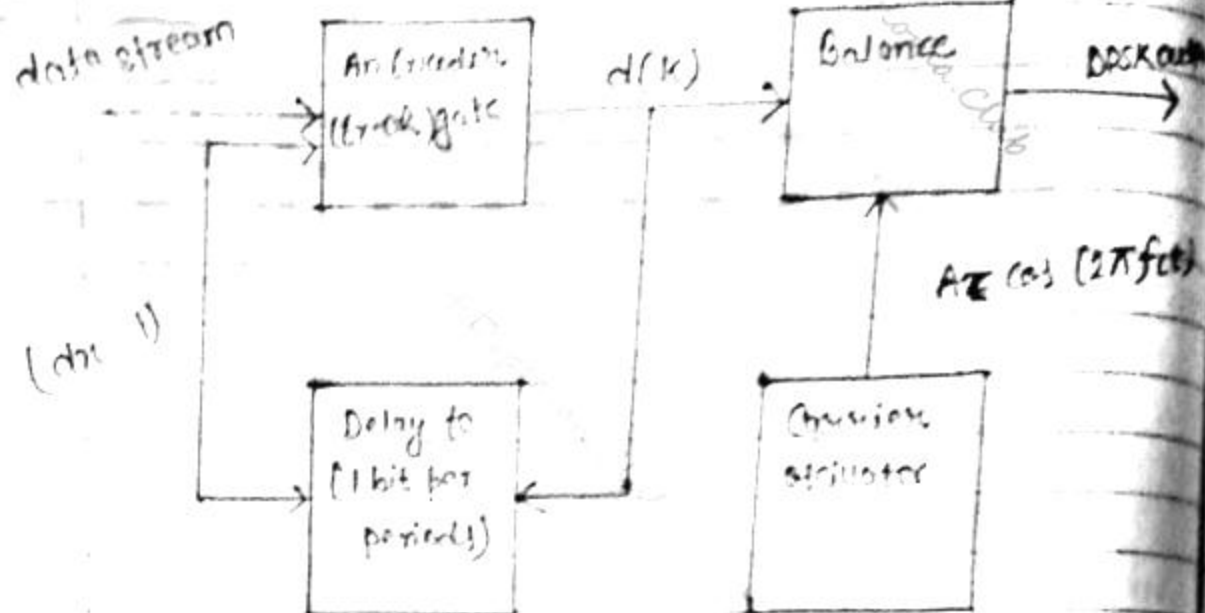
The digital information content of the binary data is encoded in term of signal transition.

for Example :-

Symbol '1' to indicate no transition in a given transition (with respect to the previous encoded weight). This new signal in technique when combine differential encoding with PSK is known as DPSK.

DPSK Transmission

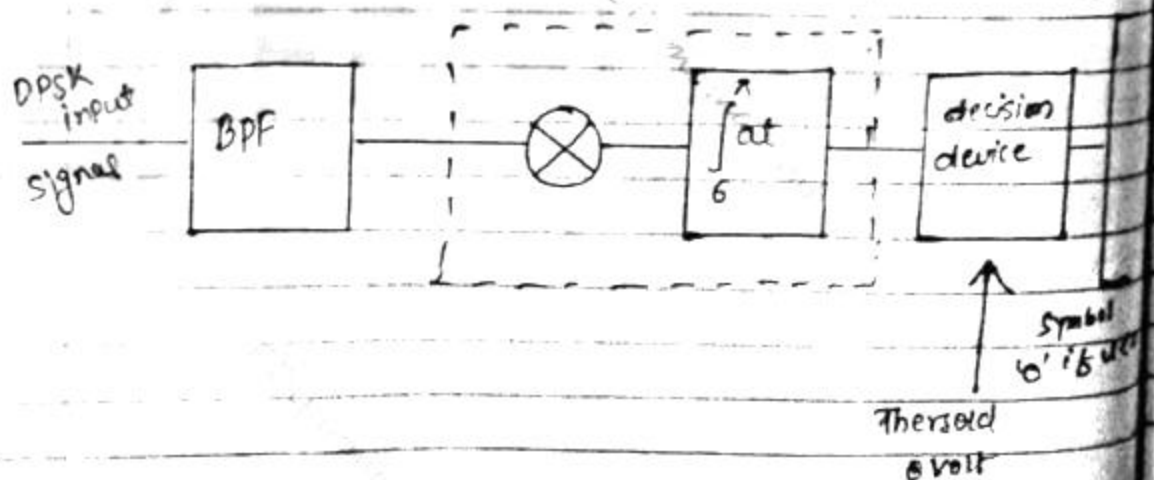
$$S(t) = A \cos(\omega t)$$



DPSK :-

- DPSK is a modification of PSK. The data stream is applied to input of the encoder. The output of encoder is applied to the product modulator as second input signal.

DPSK Receiver :-



- The received DSK signal is applied through a band pass filter and correlator circuit. Inside of the correlator is a device delay version of receive DSK by the time interval T_c is applied.
- The output of difference is proportional to $\cos \phi$ where ϕ is the difference between the carrier phase angle of the received DSK signal and its delay version measured in the same bit interval.