Modem

When data are transmitted using the transmission lines, it is first necessary to convert the electrical signal output into a form that acceptable to the computer. It mean the binary data convert into a form compatible with a speech signal, at the Sending end of the line and to reconvert this signal back into its binary form at the receiver. The circuit that performs the first operation is known as a

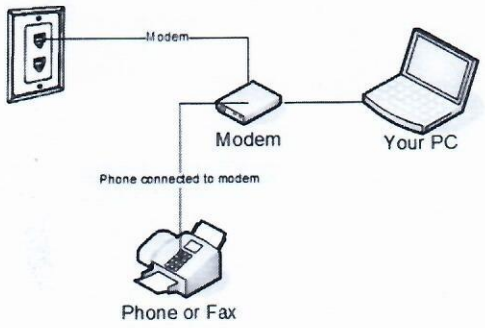
Modulator and the circuit performing the reverse function a **Demodulator.**

Since each side of a data link must normally both send and receive data, the combined device is known as a **Modem.**

Def://

A device that accept a serial stream of bits as input and produces a modulated carrier as output is called a Modem (vice versa).

Using modems, data can be transmitted either by first dialing and thereby setting up a switching path through the network, as with a normal telephone call, or by leased line.



1.1 Modulation:

There are three basic types of modulation that may be employed for the Conversion of a binary signal into a form suitable for transmission on a Lines. These are:

1. Amplitude modulation (AM)

2. Frequency modulation (FM)

3. Phase modulation (PM)

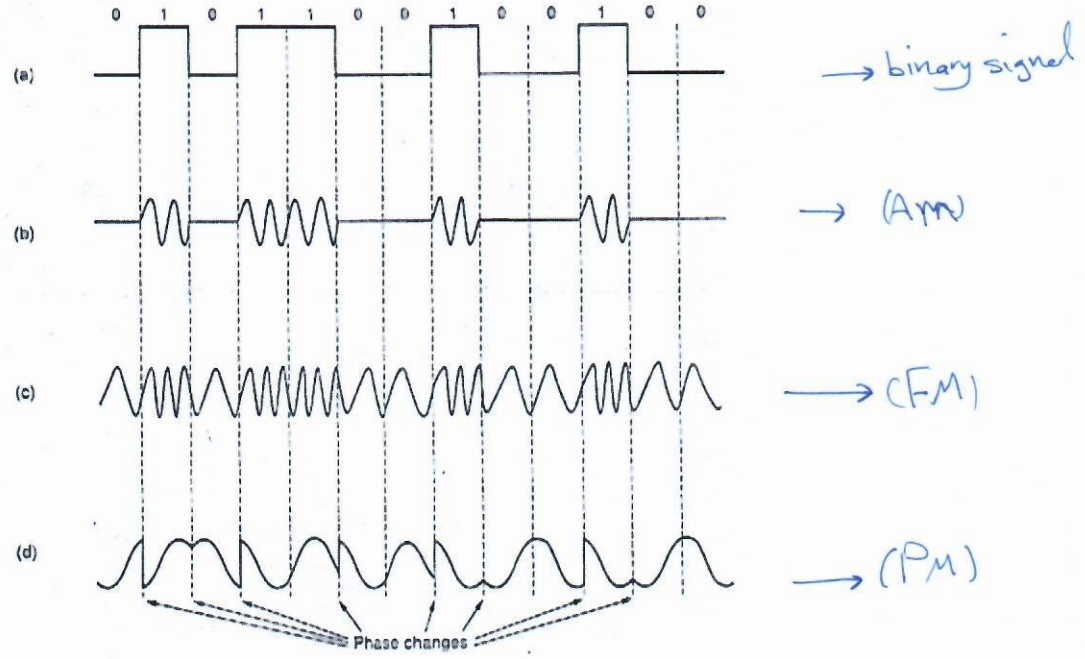


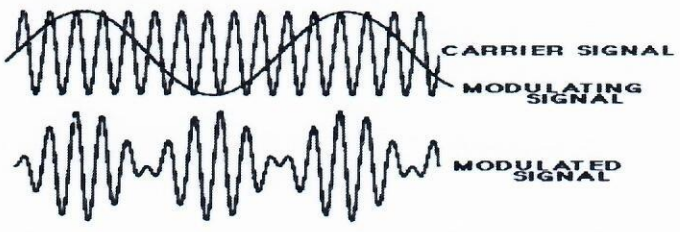
Fig. 2-18. (a) A binary signal. (b) Amplitude modulation. (c) Frequency modulation. (d) Phase modulation.

1. Amplitude modulation (AM)

The different voltage levels are used to represent 0 or 1, respectively, **or** the level or amplitude of a single frequency audio tone is switched or keyed between two levels at a rate determined by the transmitted binary data signal.

يستخدم هذا النوع مستويات مختلفة من الفولت = تمثل اما (0 او 1)
مستوى او سعة التردد للاشارة ا (audio) تكون محددة او مفقولة بين مستويين بمعدل محدد بناءه
ال binary المرسلة .

This type of modulation is not often used, although it is utilized in conjunction with phase modulation.

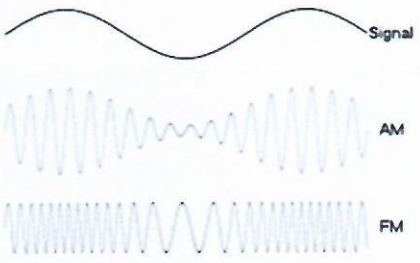


هذا النوع لا يستخدم كثيراً .
ولكنه يستخدم عند الاقتران او الدمج مع (PM).

2. Frequency modulation (FM)

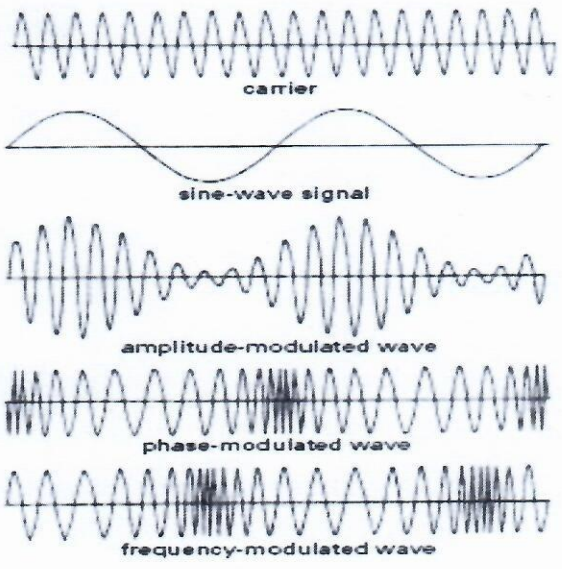
The frequency of a fixed amplitude carrier signal is changed according to the binary stream to be transmitted. It used two (or more) different tons required for binary data. This type of modulation is known as **Frequency Shift Keying FSK).**

This type is the method most frequency used with lower bit rate modems designed with switched connection.



3. Phase modulation (PM)

The frequency and amplitude of this carrier signal are kept constant while the carrier is shifted in phase, as each bit in the data stream is transmitted.



1.2 Demodulation:

It is the operations of reconvert the signal at receiver site to reproduce the transmitted data stream.

Attenuation and distortion sources:

The various attenuation and distortion effects that can occur to a signal during transmission. A signal transmitted across any form of transmission medium will be affected by:

هنالك العديد من التأثيرات والتشويش التي تحدث على الـ signal خلال عملية الارسال
- لذا قد تتعرض الاشارة المنتقلة عبر اي شكل من وسائل الارسال للتالي :-

1. Attenuation — ضعف او توهين
2. limited bandwidth, — سعة قليلة
3. Delay distortion and — تشويش
4. Noise. — ضوضاء

1. Attenuation:

As a signal propagates along a transmission medium line its amplitude decreases. This is known as signal attenuation.

تقل سعة الاشارة المرسلة خلال وسط الارسال , حيث يدعى هذا النوع بضعف الاشارة او (توهين)

2. Limited bandwidth:

A typical digital signal is comprised of a large number of different frequency components, then only those frequency components that are within the bandwidth of the transmission medium are received.

- الاشارة الرقمية (digital signal) تتألف عادة من اعداد مختلفة من الترددات (frequency).
- لذا سوف يتم استلام فقط الترددات المتوافقة في سعتها مع اجهزة الارسال.

3. Delay distortion:

The rate of propagation of a sinusoidal signal along a transmission line varies with the frequency of the signal. Consequently, when transmitting a digital signal the various frequency components making up the signal arrive at the receiver with varying delays between them. The effect of this is that the received signal is distorted and this is known as delay distortion.

- معدل انتشار الاشارة الجيبية (sinusoidal signal) عبر خطوط الاتصال يختلف من التردد للاشارة.
- لذا عند ارسال اشارة رقمية (digital signal) فان العديد من الترددات تجعل الاشارة الواصلة للاستلام تحمل بمقترنات تأخير مختلفة ومتفاوتة ,
- هذا النوع من التأثيرات سوف يجعل الاشارة الواصلة مشوهة (distorted) وهذا ما يعرف بـ (delay distortion)

4. Echoes:

Even when modem are used, the problem can occur on telephone liens, it is **Echoes**, on a long line ,when the signal gets to the final destination , some of the energy may be reflected back, analogous to acoustic echoes in the mountains. The same thing happens on transmission lines, especially at the point where the local loop terminates in the end office

- على الرغم من استخدام الـ Modem ، فان العديد من المشاكل على خطوط الهاتف قد تحدث وهنا ما يسمى بـ (Echoes)
- عند وصول الاشارة الى الطرف المستلم بعض طاقتها سوف ترتد او تنعكس بالاتجاه المعاكس وهنا مثاله كرجع الصدى في الجبال .
- نفس الشيء يحدث في خطوط الاتصال خصوصاً عندما يتدخل الاتصال حلقه عند نقطة في الطرف المستلم (end-office).