Unit 10 Serial Port

Structure:

10.1 Introduction

Unit 9 acquainted you with parallel port, its trouble shooting and the different types of modes in port operation. You also got to know the significance of signals and timing diagrams with respect to parallel port which is used to connect printer with the computer.

Serial port is a device that is used to connect and communicate between the low-bandwidth devices like modem and keyboard and mice. It uses two data lines; one to transmit data and another to receive data. Right from the beginning the serial port has been a bidirectional port making it possible to interact between a computer and other peripheral devices other than

printers. As it used very few signal lines, it made the cable less expensive and reduced potential connector problems.

In this unit you will study the essential concepts of serial port and its operation and the guidelines to troubleshoot serial port problems.

Objectives:

After studying this unit you will be able to:

- Discuss the essential concepts of serial communication.
- Explain the set up and working of modems devices.
- Resolve the serial port problems through troubleshooting.

10.2 Asynchronous Communication

Asynchronous communication is a type of communication in which a start signal is initiated before a data byte or character and a signal is sent after each code. The serial port has to send and receive the data on a single data line. This poses a challenge in receiving the data from the device.

It is very easy to send the synchronizing clock signal through the data wire. The method by which the clock is used by the receiving device to detect each data bit is known as *synchronous communication*.

On the other hand, when the stream of data bits reaches the receiving end, the original data is retained by eliminating the synchronization bits. Asynchronous communication is that communication which does not depend on the clock. In section 10.2.1, 10.2.2 and 10.2.3 you will be able to identify the different concepts of asynchronous communication. Major concepts include the following they are,

- **The data Frame**

In order to use the asynchronous communication the data bits need to be combined with the synchronization bits before transmission. These synchronization bits have three types of information at the receiving device like:

where the data starts

where the data ends

whether the data is correct.

Synchronization bits combined with data byte are called as *Data Frame*. A data frame format is as shown in the figure 10.1.

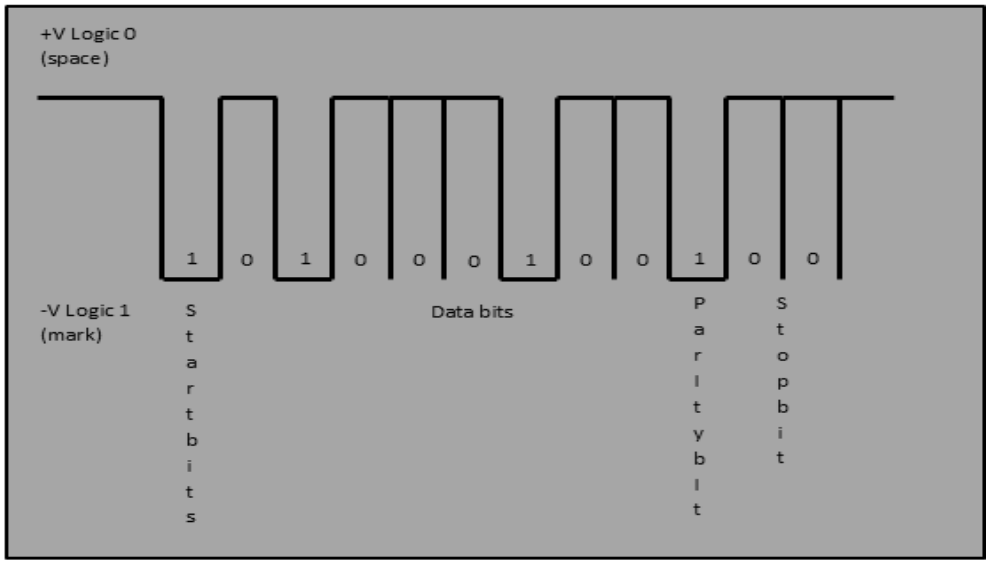


Figure 10.1: Typical diagram of asynchronous data frame.

Serial port is bipolar port which means that it has 2 voltages; both positive and negative. The positive voltage represents logic 0 which indicates *space* and negative voltage represents logic 1 which indicates *mark*. You can observe in the diagram that the first element in the asynchronous data frame is start bit. This start bit is always logic 1 or mark. Whenever the receiver identifies the logic 1 that means that the data frame has started. From 2nd to 8th bit are data bits. The number of bits can be altered or set by the communication software. Parity bit, an error checking bit can be included after the 8th bit. It is calculated by both sending and receiving device. The data is correct only when both parity match otherwise an error is flagged. Serial communication has five types of parity.

They are:

None: None indicates word is not added with parity bits.

Even: if the data bits contain odd number of 1s, then the parity is set to 1 to make the number of 1s even.

Odd: if the data bits contain even number of 1s, the parity is set to 1 to make the number of 1s odd.

Mark: parity is always set to 1

Space: parity is always set to 0.

The last part is the *stop bit* which is always logic 0. Stop bit indicates the receiving device that the device has to remain idle until it receives the next subsequent start bit. Framing is represented as data/parity/stop. For example, the connection to a BBS(Bulletin Board system) that is a application dedicated to sharing or exchange of information or messages in the telecommunications network) typically uses 8/N/1 framing which means that it has 8 data bits/ no parity bit and 1 stop bit.

- **Signal Levels**

As the serial port uses bipolar signalling, it is able to support very long cabling with less noise. Positive voltage is represented by logic 0 (space) between +3 Vdc and + 15 Vdc. Negative voltage is represented by logic 1 (mark) between -3 Vdc and -15 Vdc. Serial ports can also use +/- 5 Vdc or +/- 12 Vdc since power supply directly produces those voltages.

Baud vs BPS

Baud is defined as the number of signal events in the transmitted signal. When the bits are transferred from serial port through a modem then modem will modulate the data through different series of phase, frequency and amplitude transitions. While a transition is referred to as a *baud the total* number of frequency or voltage signals per second existing on a communications line is the *Baud rate*. Sometimes it is also referred to as switching speed. Bit per second or Bps refers to the number of data bits that can pass through a specific point in one second. For example, if we have a serial port, we consider 1 bit = -12 volts and 0 bit = +12 volts. If bps of the serial port is 38,400, a sequence of 010101 would also be 38,400 baud. As the voltage fluctuates between negative to positive and vice-versa, there are 38,400 shifts/sec. Considering another sequence 111000111, for this there will be less fluctuations of voltage as the number of 1's in sequence stays at -12 volts but still we can say that there are 38,400 baud because there is a chance of increase in the number of changes/sec.

The modems like voice band digital modem (are modern modems that does not require much time to transfer data as it is not dependent on modem – to-modem speed and can use serial port speed for the data transfer) can encode more than one bit per second in every transition. Therefore, the bps of a modern modem is several times higher than its baud rate. For example

a modem which operates at 2400 baud might transmit data at a speed of 9,600 bits per second.

Self Assessment Questions

1. _____ is a device that is used to connect and communicate between the low bandwidth devices.
2. The method of receiving device with the help of clock to detect each data bit is known as _____ communication.
3. The combination of synchronisation bits and the data byte is called as _____.
4. _____ is defined as the total number of frequency or voltage signals per second existing in a communication line.

10.3 Serial Port Functioning

Serial port performs many important functions. Some of them are:

- Parallel data needs to be converted into a series of serial bits; appropriate framing bits needs to be added and the data line is to be provided with those bits at the proper rate.
- It must also work in the reverse process i.e. the serial data must be accepted at a known rate; framing bit must be removed and the serial data converted to bus form.
- The key component part of serial port is a single chip which is known as universal asynchronous receiver/transmitter (UART). It is the controller that takes bytes of data and transmits each data bit in a sequential fashion. At the destination end there is another UART controller which reassembles the individual bits into complete byte. UART is used in modems as well as for non-networked communication between computers, terminals and other devices.

10.3.1 DTE vs DCE

DTE stands for data terminal equipment and is considered to be a dumb terminal or a serial port of a computer. DCE stands for data carrier communication and is normally a modem or any other piece of data communication equipment. There is an important distinction between DTE and DCE because data and handshaking signals are swapped at the DCE end. For example, the transmit pin which exists on the 3rd pin of a DTE cannot be directly connected to the same pin of the DCE. Rather, it must be

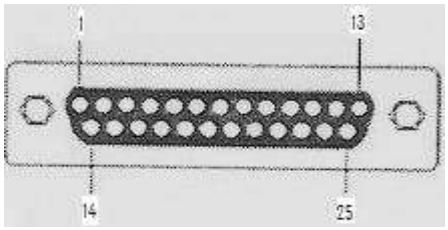
routed through receive pin. DCE is responsible for such swaps so that the 3rd pin on the transmit pin connector gets connected to related pin on the receive pin.

Two DTEs cannot be connected with a straight-through cable. However, null modem is used to swap the signals and connect the transmit lines between the two DTE.

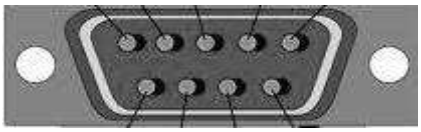
10.3.2 Serial Port Signals

Serial post signals are very helpful in easily turning on and off by a switch. Signals can also be sued to monitor external devices without exchanging the serial data. Signals provide messages like loss of power, battery low alarm and status information with the help of power supply model.

Serial port uses either 25-pin connector or 9-pin subminiature D-type connector to be used in the PC. These connectors look like the ones shown in figure 10.2.



25-Pin M



9-pin M

Figure 10.2: 25-pin M and 9-pin M

Serial cables are identical at both the ends. Like parallel port, serial connections also have three types of signals namely, data lines, control lines, and ground lines. *Data signals* are the conductors that carry information from the serial port to or from the modem or other peripheral. *Control signals* are bidirectional protocol used between sender and receiver to acknowledge the sender that the data is received *Ground signal* is used to reduce the noise effects in the signal. The data signals and control signals are bipolar in nature. Bipolar signals are also called as bipolar transmission. It is a method of sending binary data over cable or wire. These

signals are represented by 2 logic states high and low and denoted by logic 1 and logic 0.

Tx and Rx: These are the kind of data lines which are responsible for sending and receiving the data in the serial port. Tx stands for transmit line which sends the serial data from the computer. Rx stands for Receive line which accepts serial data from the serial port device. A peripheral device consists of both Tx and Rx signals. Its working is as shown in Figure 10.3.

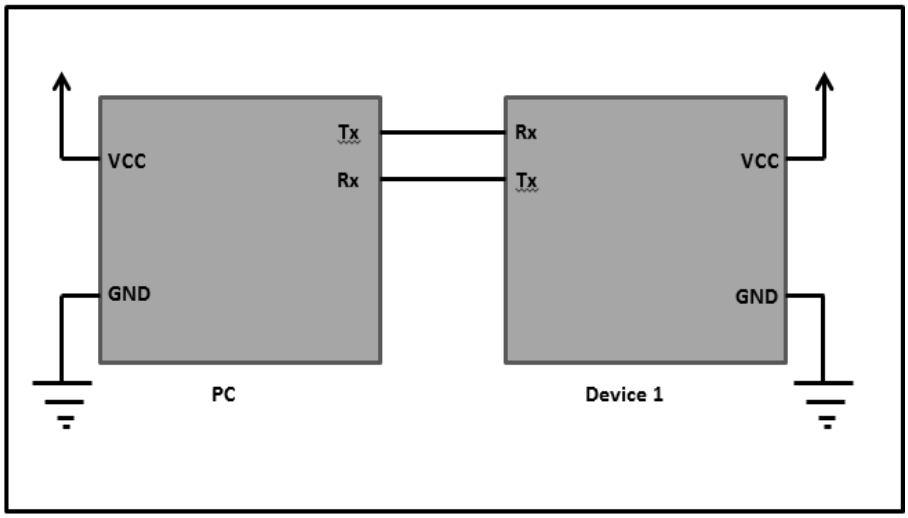


Figure 10.3: working of Tx and Rx in the computer system

When the computer is connected to a peripheral, then one device sends the data to the other using Tx line and the other device receives the same data using Rx data line and vice-versa. In the Figure, Vcc is the common collector voltage which supplies power to the device and GND is the grounding of the device. Only one device can have control over the data lines at a time.. If more than one device tries to send data to the single Rx line then it gives error message stating “bus contention”. This message means, rather than communicating among devices to a single device, no data will be sent or received correctly. The figure 10.4 shows how the bus contention message is obtained.

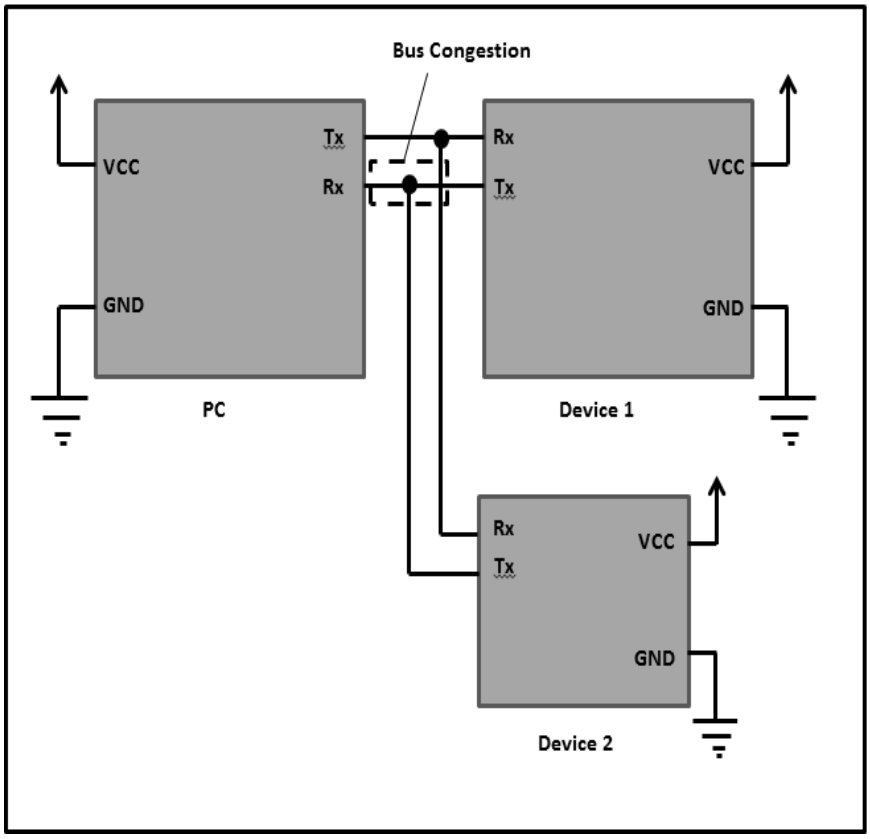


Figure 10.4: bus contention messages between more than two devices.

In the above figure you can see that the computer will not receive any data since the two devices peripheral 1 and peripheral 2 are sending the data on the same line at the same time creating contention.

RTS and CTS: RTS stands for Request to send which is a signal that is generated by the DTE (Data terminal equipment). This signal informs DCE(Data carrier equipment) that it will receive a data. But this does not mean that DTE can unload the data to DCE because DCE must be ready to receive the data. Therefore, once the DCE receives the RTS signal DTE waits for CTS signal back from the DCE. CTS stands for Clear to send are a signal that tells the DTE that the receiver node is ready to receive the data. Then DTE starts sending the data. This RTS/CTS signal is responsible for control data flow through the system hardware.

DTR and DSR: DTR stands for Data Terminal Ready is a signal that tells the DCE that the DTE is ready to establish a connection. This signal is asserted when the DTE is initialized and ready to start the serial operation. After the DTE informs the DCE that connection is ready to be established, the DCE will initialize itself and when it is ready sends DSR signal back to DTE. DSR which stands for Data Set Ready is a signal which tells DTE that DCE also has established the connection and DTE can send the data. The DTR/DSR signal is established when the DTE and DCE are initialized and are active through the connection. If any of these signals fail then the connection is disconnected and the RTS/CTS signal will have no existence.

The major difference between DTR/DSR and RTS/CTS is that the RTS/CTS signal informs the DTE/DCE that the data is being sent or received by them while the DTR/DSR establishes connection between DTE and DCE and initializes both of them.

DCD: DCD which stands for Data Carrier Detect is particularly used with modem. It generates this signal when a carrier is detected from a remote device and when it is ready to establish the communication pathway. DCD signal is sent back to the DTE so that DTE remains active as long as the connection is established.

RI: RI which stands for Ring Indicator is a signal asserted by DCE and particularly used in modems. This signal which is generated when it detects a telephone ring is important if a remote user wants to call in to seek your permission to access your computer from a remote machine. Ring indicator is also important when the computer gives a “wake on ring” in case of power management configuration.

Self Assessment Questions

5. UART stands for _____.
6. _____ is a data communication equipment.
7. Bipolar signals are also called as bipolar _____.
8. _____ is a transmit line which outputs the serial data from the computer.
9. RTS stands for _____.
10. _____ Signal is asserted when the DTE is initialised and ready to start the serial operation.

10.4 Modems

A combination of modulator and Demodulator, is shortly known as Modem. Modem is a device that is used to modulate analog signals to digital signal and demodulate the digital information to corresponding analog signal. It is also used to communicate the data from one computer to another computer through a telephone line.

10.4.1 Constructing and Operating a Modem

Modems are fabricated with specialized chips and discrete parts. Working of a modem can be summarized as follows:

- First parallel form data must be translated to serial form and vice-versa. That means the serial data must be converted to an audio signal so that it can pass through a telephone line. This audio signal contains the transmitted signals. this is called as data compression. It is easy to transmit the data from computer to modem than the modem transmitting to computer. Modem collects all the bits of information together and converts to send the data over the telephone line. Audio signals received from the telephone line must be separated from transmitted signals, and reconverted to serial data.
- Whenever the data is converted from one form to another they are prone to cause errors may be with loss of data or adding some unwanted data. Error checking technique in modem verifies that the data receives has no damage in its data.
- It is common that the speed rate of the network is not the same. Suppose the dial up network at the sending end is faster than the other end which receives it, then the control flow tells the sending end to pause the data till the receiving end receives the already sent data. The flow control is done either by using software or hardware. Software controller has specific noise which generates a character that sounds pause. The sending data is paused until it gets next proper character for sending the data. Hardware controller use wires in the modem cable.
- Finally, the modem uses non-volatile RAM (NVRAM) to store the list of set up parameters.

Construction of Modem: The construction of the modem is explained by differentiating the types of modems. There are two types of modems: internal modem and external modem.

*Internal modem***:** the internal modem is a stand-alone board that plugs in with ISA or PCI Buses. The design of the internal modem is as shown in the figure 10.5

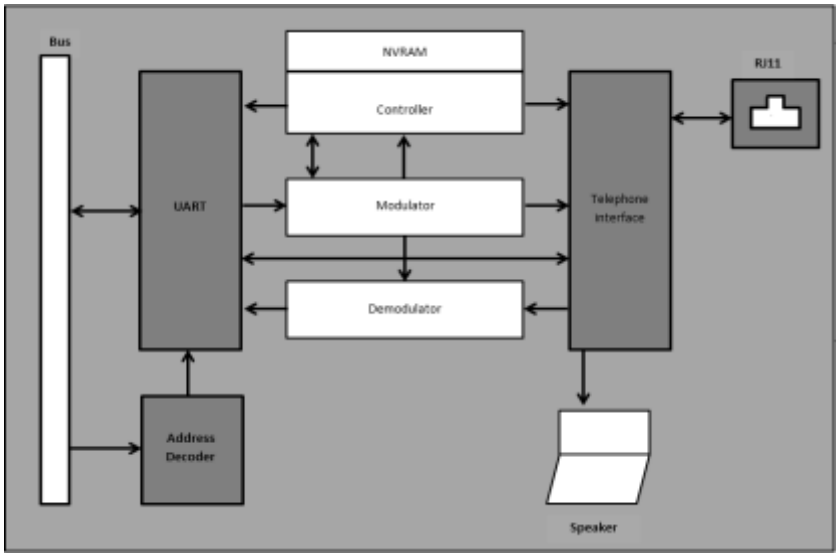


Figure 10.5: Block diagram of an Internal Modem

The internal modem consists of one UART (universal asynchronous receiver/transmitter) device that is responsible for converting data from parallel form to serial form and vice-versa. UART forms the basics of serial port and it is very important to set the UART in the computer properly. The serial data is converted into audio signals before sending through the telephone lines. The audio signal is made to pass through the telephone interface through RJ11 (registered Jack) connector which is a telephone jack that allows you to check the line and make calls when modem is idle. The signal is sent to the demodulator by the telephone interface and is freed from transmitted line by it. The demodulated data is sent to UART which again converts the serial data into parallel words which are placed on the system bus.

In the initial stages of modem operation, the speaker is used to check the dial tone for connectivity. Overall operation of the modem is managed by the controller which accepts the command from the modulator and some parameters which are to be changed. NVRAM is the non-volatile random access memory which stores the default loaded parameters. During a power cut you can load the default parameter from the NVRAM. The internal modem gets power supply directly from the expansion bus.

External modem: external modems are the devices that are used to connect computers with public network. The external modem is not present as built in device inside the serial port but is connected from outside the computer. The block diagram of the external modem is as shown in the Figure 10.6.

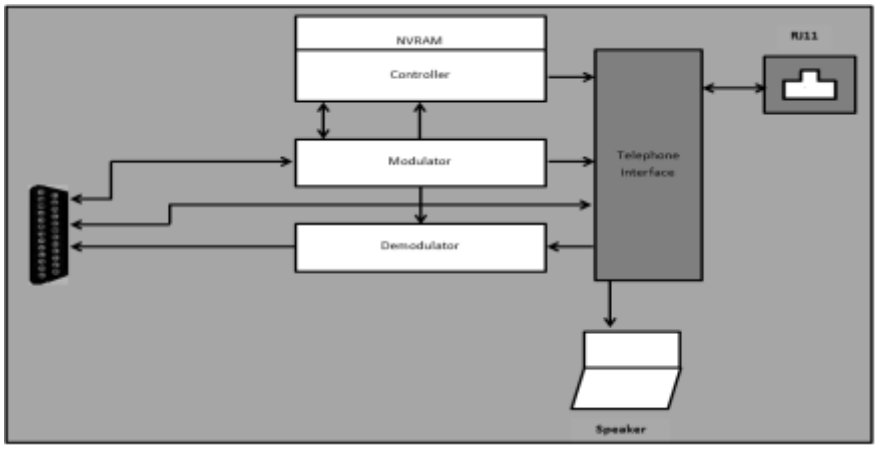


Figure 10.6: Block diagram of an external modem

The working of the external modem is similar to the internal modem except that the device is connected to the serial port of the system rather than being connected directly to the expansion bus. An external modem is connected to computer through the already configured serial port in the computer. 9-pin or 25-pin serial cable is used to connect modem to the computer externally which makes the set up easier and faster because you need not bother about the interrupt lines and I/O address settings. In external modems hardware conflicts are rare.

The external devices are powered using a small AC adapter. External modem provides LEDs which states the series of signal status which allows you to check the communication status.

10.4.2 Signal Modulation

Modulation is the method of conveying a message signal inside another signal that can be physically transmitted. Modulation is the addition of information (or the signal) to an electronic or optical signal carrier. Modulation can be applied to direct current to alternating current, and to optical signals.

Once the bipolar signal is accepted by the modem from a serial port, the carrier signal being generated on the telephone must be modulated so that it reflects the logical levels of the transmission. Therefore, the two ends of the modem must be capable of executing the same modulation scheme (about which you will be studying later in this section).

Modulation schemes: modulation is a process of changing the properties of high frequency wave form with respect to the modulating signal. Wave form is also called as carrier signal which is the property of the signal such as shape and form. Example: wave moving in a solid, liquid or gaseous medium. There are three physical characteristics of a wave form namely, amplitude, frequency and phase which are adjusted to represent a bit.

Amplitude is the magnitude of the wave which is measured in volts peak-to-peak or volts RMS (Root Mean Square). It represents the distance travelled by the wave form above and below the zero axis.

Frequency is the number of times that a single wave will repeat in any given time. It is measured as cycles-per-second or hertz. 1800 Hz signal repeats 1800bps. Phase is the time reference of the signal which is measured in degrees. For example: 90 degrees is the time taken to travel 25 percent of a wave, 180 degrees is the time taken to travel 50 percent of the wave, 270 degrees is the time taken to travel 75 percent of the wave, etc.

Frequency Shift Keying (FSK) is the method of transmitting digital signals. It is similar to frequency modulation where only the carrier frequency is changed. This is one of the oldest modulation schemes. FSK has two binary states logic zero and logic one. Logic 1 represents the wave at different frequency and logic 0 represents the wave at a particular frequency. In this technique baud is equal to bps. For example: if frequencies are sent at 300 baud and each baud can carry one bit so FSK can send 300 bps.

Phase shift keying (PSK) is digital modulations signal that changes or modulates the phase of a reference signal. This is similar to FSK but only the phase timing of a carrier wave is changed. Logic o or logic 1 is represented by a carrier change. PSK can encode 1, 2, 3 or more bits per baud because phase can be shifted in several specific increments. For example, 1400 baud modem can transmit 2800bps over 1800 Hz carrier using PSK.

Quadrature Amplitude Modulation (QAM) technique is a combination of amplitude modulation and phase shift keying. It uses the amplitude modulation and phase shift keying to encode 6 bits data onto the baud in which 4 bits are reserved for data. In this method QAM represents 2 bits by four phase states and another 2 bits by four levels of amplitude. For example, if the base rate of carrier signal is 2400 baud, it carries 9600 bps.

10.4.3 Installing a modem

The modem is a PnP device. The motherboard is designed such that the system automatically detects the device and resource assignments. You must be very careful while installing because problem may arise due to incorrect installation of the hardware or software of the device.

When you are replacing the modem, you should ensure that the device is initialized and check for the correct operating strings which usually depend on the modem manufacturers. The applications software must be installed properly and care should be taken to ensure that the new modem software too is installed correctly and the old modem if present is removed.

Hardware installation:

You need to be concerned about installing internal modem rather than external modem since external modem is directly connected to serial port from outside. While installing internal modem you should be very careful as you have to open the case and fit the device inside. The following are the general steps to be taken to install the internal modem:

1. First you have to shut down the windows and unplug the computer.
2. Remove the bolts of the case and keep it in a safe place.
3. If you are replacing the modem then carefully separate old modem by removing the bolt and detach the modem from the chassis and place it in an antistatic place.
4. Identify the availability of expansion slot for the new modem card.

5. Insert the modem card by pushing it firmly and evenly inside the slot. Ensure that the card is seated properly in the slot and replace the screws to secure the bracket of the modem card to the computer chassis.
6. Reconnect the modem with the telephone jack.
7. If you want to use the phone on the same line then you should plug the phone to the phone jack. You must also have a microphone to avail simultaneous voice and data feature.

Software installation

Once the hardware is installed it needs the support of device drivers and application software. The following are the steps to be taken to install the software:

1. The modem must be automatically detected when the Windows restarts. If the device is PnP complaint then you need to use the Add New Hardware wizard to execute the installation process.
2. Select the “Driver from disk provided by hardware manufacturer” and then click OK.
3. Insert the CD to install the device drivers, and the select the drive letter.
4. After you Click OK modem’s drivers will be loaded by the Windows.
5. Verify the modem installation for success once it is loaded. When your desktop returns, then click start, select settings and then click control panel.
6. Double click the modem icon.
7. The suitable description of the modem is obtained in the modems properties dialog box as shown in Figure 10.7. This means your modem installation is done properly.

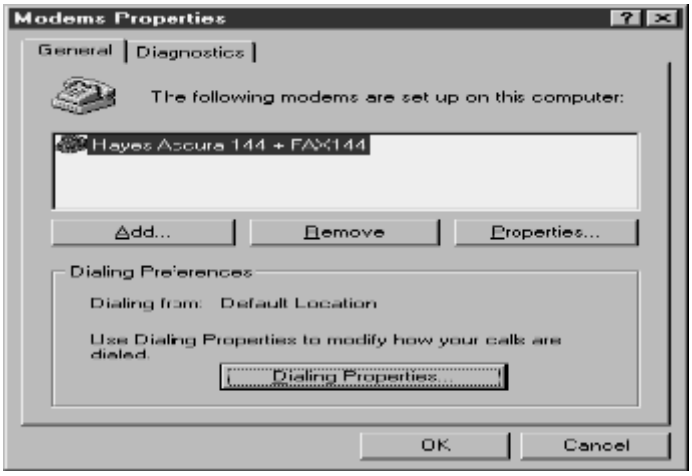


Figure 10.7: modem properties dialog box under windows XP

8. To test the modem click the diagnostics tab. Select the modem and click for more info button.
9. After a few minutes, you should see the more info dialog box as shown in the Figure 10.8 which lists the modem's port information as well as series of standard modem commands.

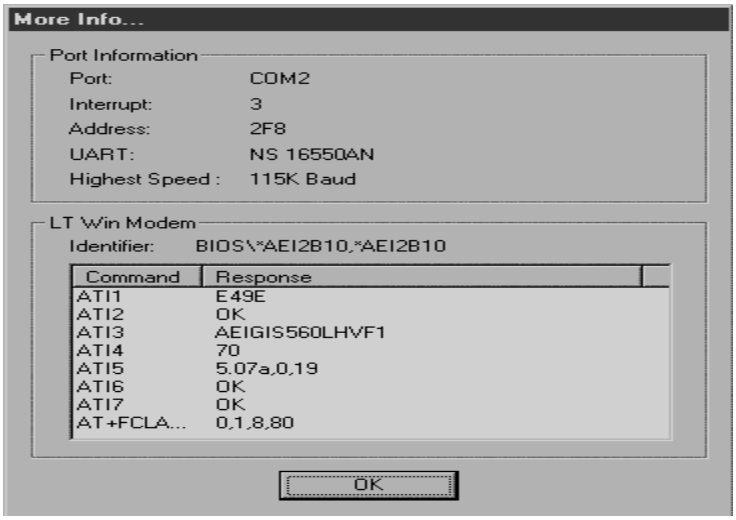


Figure 10.8: More Info Dialog box of the Modem

10. Once the modem is working you can install any other applications that accompany the modem.

10.4.4 Modem troubleshooting

Although the failure rate of modem installation is very small, it is time consuming and difficult. Therefore, it is very necessary to install the modem from the beginning. When a modem fails there are number of factors which should be checked as described below:

- *Incorrect hardware resources:* unique IRQ line and I/O port is to be set up by an internal modem. If another serial device uses the assigned resources, the modem or the device will result in conflicts and will not function properly. In that case you will have to remove the modem and check for available resources. External modems make use of the existing COM ports. You must reconfigure the internal modem to clear the conflict so that the modem can use its resources.
- *Defective telecommunication resources:* telephone lines are used by the modems to establish connections among the computers. If the modem is not correctly hooked up or if there is a defect in the telephone jack then even though the modem may work well there will not be a connection. In that case separate the telephone line cord from the modem and try the line on an ordinary telephone device. You should hear a dial tone when you lift the receiver. Try to call a local number. If the line rings then telephone line is working properly. Check the RJ11 jack on the modem.
- *Improper cabling*: the external modem is connected to the serial port of the computer through a cable. You must ensure that there is a “straight-through” type cable and it is connected between PC and modem. You must also check that the two ends of the cable are installed evenly and there is no bend pins otherwise use a new cable.
- *Improper power*: The external modems receive the power supply from the small ac adapter. Therefore, ensure that the ac adapter is connected to the modem properly. If batteries are used they must be fresh and completely installed.
- *Incorrect software settings:* Before the connection is established both internal and external modems must be initialized. If these settings are absent or incorrect then it is expected that the modem will not respond to the computer. Check the communication software and ensure that the comment strings are appropriate for the modem and ready to be used.

- *Suspect the modem itself:* you need to check for modem settings so that the jumpers or DIP switches are placed correctly with each setting. The most susceptible point is the telephone interface which is very sensitive to high voltage spikes that might enter the telephone line.
- *Command processor*: You must check for the command processor which is the controller that manages the operation of the modem in the command mode and interrupts command strings. When a new model installation fails to behave as intended you must check the working of command processor of the modem.

Self Assessment Questions

11. Modulator and demodulator are together known as _____.
12. The telephone interface is connected to _____ to receive audio signal.
13. _____ is digital modulation signal that changes the phase of the reference signal.
14. COM is a _____ port.

Activity 1:
How do you troubleshoot when your modem is detected on the wrong COM port on your PC?
Hint: Refer the concept of symptom of modem in the book on troubleshooting, maintaining, and repairing PCs by S. J. Bigelow

10.5 Troubleshooting

The serial port mechanism is a very simple I/O device. Even then it shows some of the special challenges. Older PC used an 8-bit bus therefore it was convenient to just replace the board outright in case of failure. In today's computer however, as there is an integrated component on the motherboard, you have to be more careful. When you detect a failure on the serial port you have three choices:

UART replacement: with the help of surface mount soldering tools and replacement chips UART can be replaced in an economical way.

Motherboard jumpers can be set and an expansion slot be installed to take the place of the defective port as by doing this the computer will assume that there is a port available.

Motherboard outright replacement: this technique is simple it is very expensive.

10.5.1 Configuration change

When you need to change the configuration of the serial port you need to do so, on the DOS mode. In order to make the changes you can use the MODE command and type it in the command line prompt,

Mode comX: /<parameters>

Where X is the COM (communication) port number that you need to change. Suppose if you want to change the port number from already exiting one you need to use the above command to specify which communication port you require. If you specify Mode COM2 then you will the changing the communication port of your modem to COM2.

<Parameters> represents the features of the port that need alterations such as baud rate, parity data bit and stop bits. You can refer to Table 10.1 to know the complete list of serial port parameters that you can change using MODE command.

Table 10.1: list of serial port parameters and its description

Parameter	Description
BAUD	Sets the data transmission rate in bits per second
PARITY	Sets how the system checks for transmission errors using the parity bit. The value can be one of the following: N(none), E(even), O(odd), M(mark), or S(space)
DATA	Sets the number of data bits in a frame
STOP	Sets the number of stop bits that define the end of a frame
TO=ON/OFF	Turns the infinite timeout processing option on or off
X=ON/OFF	Turns the XON/XOFF protocol on or off
DTR=ON/OFF	Turns the DTR circuit on or off
ODSR=ON/OFF	Turns the output handshaking using DSR circuit on or off
OCTS=ON/OFF	Turns the output handshaking using CTS circuit on or off
RTS=ON/OFF|HS|TG	Specifies the settings for the RTS circuit to on, off, handshake or toggle
IDSR=ON/OFF	Turns the DSR circuit sensitivity of or off

For example, MODE COM1: BAUD=2400, PARITY=N DATA=5 STOP=1 TO=OFF XON=ON ODSR=OFF OCTS=ON DTR=OFF IDSR=OFF

10.5.2 Serial Port Conflicts

Hardware and software conflicts are the most common in serial port and it is a frequent problem in troubleshooting. Though there are four communication ports in today's PC and BIOS, there are only 2 IRQ available for serial port. When external modems need to be connected, they are connected through serial ports which are also known as COM ports. COM stands for communication ports used for serial port that is responsible for communication between the computers. There are four types of COM. The different COM port and its respective IRQ availability is shown in Table 10.2

Table 10.2: the COM and its IRQ Occupancy

COM port	I/O addresses	IRQ
COM1	0x3F8	IRQ4
COM2	0x2F8	IRQ3
COM3	0x3E8	IRQ4
COM4	0x2E8	IRQ3

Therefore, it means only two IRQ; IRQ3 and IRQ4 are available for the COM port.

0x3F8: This address number (1111111000) is used to refer whether the COM port will be even or odd. In this case, the number after 0 is 3 which refer to an odd number. So the COM port will be odd. For example COM1 or COM3. The letter "F" stands for first i.e. the first of the even communication port. That means COM1.

0x2F8: this address number is represented by binary number 1011111000. Here, the first number after 0 is 2, refers to an even number. So, the COM port will be even. For example COM2 or COM4. The letter "F" stands for first i.e. the first of the even communication port. That means COM2.

0x3E8: the address number is represented by binary number 11111101000. Here it refers to odd number indicating odd COM port. And the letter E indicates the next eliminating the first. Therefore in this case it is COM3.

0x2E8: the address number is denoted by binary number 10111101000. Here it refers to odd number indicating even COM port. And the letter E indicates the next eliminating the first. Therefore in this case it is COM4

This can be used to memorize the allotment of COM port.

When you try to upgrade the PC by adding I/O adapters you may normally encounter problems. If the computer has two COM ports from the motherboard manufacturers, adding a third port will result in hardware conflict. This can be rectified by disabling the new COM port or one of the existing among the two ports or by setting the jumper of the new COM port.

Sometimes device drivers may also be a cause for the problem. If a new COM port is installed and problem arises, disable the driver reference in the CONFIG.SYS and try to install a new protected driver using ADD New Hardware Wizard under windows XP.

Activity 2:
What step will you take when you see an 11xx or 12xx serial adapter error displayed on your system?

Hint: Refer the concept of symptom of serial port in the book on troubleshooting, maintaining, and repairing PCs by S. J. Bigelow

Self Assessment Questions

15. State whether the following statements are True/False:
    a. Motherboard outright replacement is an economical way to replace the modem.
    b. By setting the motherboard jumpers and installing an expansion slot in the place of defective port, the computer will assume that there is a port available.

10.6 Summary

Serial port is a device that is used to connect and communicate between the low-bandwidth devices like modem and keyboard. Serial port used two data lines; one to transmit data and another to receive data. It is a bidirectional port. Asynchronous communication is a type of communication in which a start signal is initiated before a data byte or character and a signal is sent after each code. Clock can be used by receiving device to detect each data bit. This method is known as *synchronous communication*. The combination

of synchronization bits and data byte is called as *Data Frame*. Serial port uses either 25-pin connector or 9-pin subminiature D-type connector to be used in the PC.

DTE stands for data terminal equipment. DCE stands for data carrier communication and is normally a modem or any other piece of data communication equipment. The distinction becomes very important between DTE and DCE because data and handshaking signals are swapped at the DCE end.

RTS which stands for Request to send is a signal that is generated by the DTE which informs DCE that it will receive a data. CTS which stand for Clear to send is a signal that tells the DTE that the receiver node is ready to receive the data.

Modem is the combination of modulator or demodulator which converts analog signals to digital and vice-versa. Construction of internal modem needs to be undertaken carefully as you have to open the case of the computer and work inside the system. Though the rate of failure of modem and serial port is minimal, you have to be a bit more careful while troubleshooting.

10.7 Glossary

Term	Description
COM	Communication port is a serial port which is serial port that is responsible for communication between the computers.
IRQ	IRQ stands for Interrupt ReQuest, and refers to special numbered *channels* that are used by devices to get the processors attention.
25-pin D type connector	D-sub contains two or more parallel rows of pins or sockets usually surrounded by a D-shaped metal shield that provides mechanical support, some screening against electromagnetic interference, and ensures correct orientation. It consists of 25 pinouts.
9-pin connector.	Similar to 25-pin connector but it consists of 9 pinouts
GND	Grounding is a direct connection to the earth to prevent contact with a dangerous voltage if electrical insulation fails.
VCC	Common collector voltage is a power supply connected to a transistor.

10.8 Terminal Questions

1. Explain in detail the concept of asynchronous communication.
2. Describe the working of serial port functioning.
3. Describe the construction and the operation of a modem with a neat diagram.
4. What are the guide lines in installing a modem?
5. How do you the resolve the problems in the serial port through troubleshooting?

10.9 Answers

Self Assessment Questions

1. Serial Port
2. Synchronous
3. Data Frame
4. Baud rate
5. Universal Asynchronous Receiver/Transmitter
6. DCE
7. Transmission
8. Tx
9. Request to send
10. DTR
11. Modem
12. RJ11 Telephone Jack
13. Phase Shift Keying
14. Serial
15. a. False
    b. True

Terminal Questions

1. Refer Section 10.2, Asynchronous Communication
2. Refer Section 10.3, Serial Port
3. Refer Section 10.4.1, Constructing and Operating a Modem
4. Refer Section 10.4.3, Installing a Modem
5. Refer Section 10.5, Troubleshooting

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