BTECH DEGREE EXAMINATION , JAN 2023

Fifth Semester

Information Technology

Elective : COMPUTER HARDWARE AND TROUBLESHOOTING

(2013-14 Regulations)

PART-A

1.Define Microprocessor.

Microprocessor, any of a type of miniature electronic device that contains the arithmetic, logic, and control circuitry necessary to perform the functions of a digital computer's central processing unit. In effect, this kind of integrated circuit can interpret and execute program instructions as well as handle arithmetic operations.

2.How to disable interrupts?

A maskable interrupt can be in two states: masked or unmasked; a masked interrupt is ignored by the control unit as long as it remains masked. Nonmaskable interrupts. Only a few critical events (such as hardware failures) give rise to nonmaskable interrupts. Nonmaskable interrupts are always recognized by the CPU.

3.Summarize IDE.

Integrated Drive Electronics (IDE) interface is a standard way for a storage device to connect to a computer. IDE is actually not the true technical name for the interface standard. The original name, AT Attachment (ATA), signified that the interface was initially developed for the IBM AT computer.

4.List out the types of cables used in computer.

- ✓ POWER CABLE
- ✓ DATA CABLE
- ✓ RIBBON CABLE

INTERNAL CABLE

- ✓ All 4-pin drive power cables.
- ✓ Floppy-drive ribbon cable.
- ✓ Hard-drive ribbon cable.
- ✓ CD-ROM ribbon cable.
- ✓ CD four wire Audio cable.
- ✓ SCSI ribbon cable.

EXTERNAL CABLE

- ✓ AC power cable for the PC.
- ✓ AC power cable for the Monitor.
- ✓ AC power cable to the Printer.
- ✓ Keyboard cable.
- ✓ Mouse cable.

- ✓ Joystick cable.
- ✓ Video cable to the Monitor.
- ✓ Speaker cable for the Sound board.
- ✓ Microphone cable to the External Modem.
- ✓ Serial Port cable to the External Modem.
- ✓ Parallel port cable to the printer.

5.What is scanner and state its types?

• Scanner is a device that analyzes and converts pictures and printed text into digital image or stream of data.

• There are four types of scanners that are used. They are listed below

1. Drum scanners
2. Flatbed scanners
3. Rotary scanners
4. Handheld scanners

6.Differentiate dot matrix printer and laser printer.

Impact printers(dot matrix) involve mechanical components for conducting printing. While in Non-Impact printers(laser printer), no mechanical moving component is used. Impact Printers: It is a type of printer that works by direct contact of an ink ribbon with paper.

7.Define hard disk.

- Hdd is a non-volatile, random access device for digital data.
- It features rotating rigid platters on a motor-driven spindle within a protective enclosure.
- Data is magnetically read from and written to the platter by read, write heads that float of air above the platters.
- Introduced by IBM in 1956.
- HDD have been the dominant device for secondary storage of data in general purpose computers since the early 1960s.
- It is used in mainframe and minicomputers.

8.Mention the advantages of DVD over CD.

A DVD can store a significantly larger amount of space for movie purposes - approximately 4.7 GB of high definition material to be exact. A CD can store 700 MB of data mostly for audio use, although minor video playback or photo storage is possible.

9.Define troubleshooting.

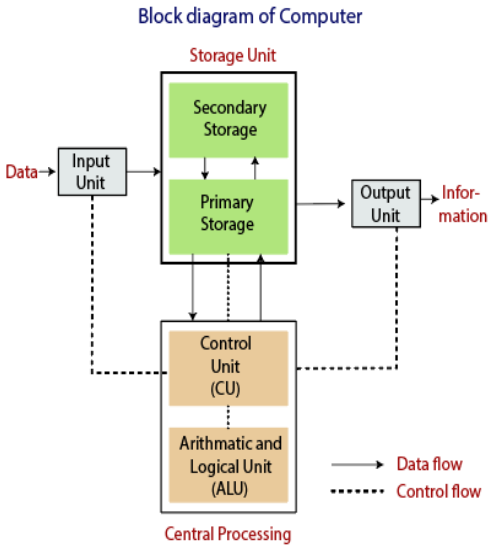
Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and explain how to resolve the problem. The first step in the troubleshooting process is to describe the problem completely.

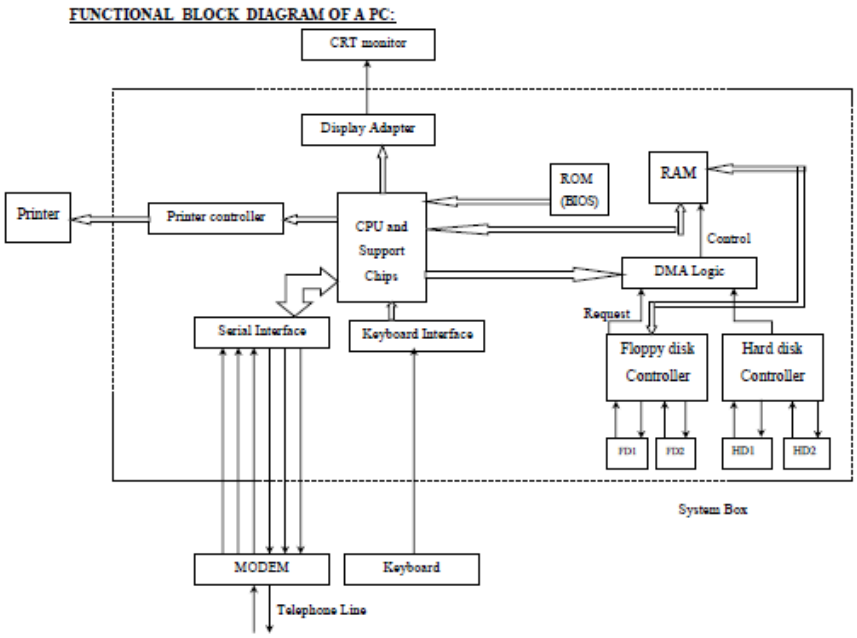
10.What are the benefits of using add on cards?

Computers have expansion slots to give the user the ability to add new devices to their computer. For example, a computer gamer may upgrade their video card to get better performance in their games. An expansion slot allows them to remove the old video card and add a new video card without replacing the motherboard.

PART-B

11.Describe about the functional block diagram of computer.





Computer Block Diagram: Mainly computer system consists of three parts, that are central processing unit (CPU), Input Devices, and Output Devices. The Central Processing Unit (CPU) is divided into two parts again: arithmetic logic unit (ALU) and the control unit (CU). The set of instruction is in the form of raw data.

A large amount of data is stored in the computer memory with the help of primary and secondary storage devices. The CPU is like the heart/brain of the computer. The user does not get the desired output, without the necessary option taken by the CPU. The Central processing unit (CPU) is responsible for the processing of all the instructions which are given by the user to the computer system.

The data is entered through input devices such as the keyboard, mouse, etc. This set of instruction is processed by the CPU after getting the input by the user, and then the computer system produces the output. The computer can show the output with the help of output devices to the user, such as monitor, printer, etc.

- CPU (Central Processing Unit)
- Storage Unit
- ALU(Arithmetic Logic Unit)
- Control Unit

Central Processing Unit (CPU)

The computer system is nothing without the Central processing Unit so, it is also known as the brain or heat of computer. The CPU is an electronic hardware device which can perform different types of operations such as arithmetic and logical operation.

The CPU contains two parts: the arithmetic logic unit and control unit. We have discussed briefly the arithmetic unit, logical unit, and control unit which are given below:

Control Unit

The control unit (CU) controls all the activities or operations which are performed inside the computer system. It receives instructions or information directly from the main memory of the computer.

When the control unit receives an instruction set or information, it converts the instruction set to control signals then; these signals are sent to the central processor for further processing. The control unit understands which operation to execute, accurately, and in which order.

Arithmetic and Logical Unit

The arithmetic and logical unit is the combinational digital electronic circuit that can perform arithmetic operations on integer binary numbers.It presents the arithmetic and logical operation. The outputs of ALU will change asynchronously in response to the input. The basic arithmetic and bitwise logic functions are supported by ALU.

Storage Unit

The information or set of guidelines are stored in the storage unit of the computer system. The storage unit provides the space to store the data or instruction of processed data. The information or data is saved or hold in computer memory or storage device. The data storage is the core function and fundamental of the computer components.

Components of Computer System

The hardware and software exist on the computer. The information which is stored through the device is known as computer software. The hardware components of the computer system are related to electronic and mechanical parts, and the software component is related to data and computer programs. Many elements are connected to the main circuit board of the computer system called a "motherboard."

- Processor.
- Main Memory.
- Secondary Memory.
- Input Devices.
- Output Devices.

These are mainly five components of the computer system. The computer hardware, computer software, and liveware exist in the element of the computer system.

Processor

The processor is an electric circuitry within the computer system. The Central processing unit is the central processor or main processor of the computer system. The processor carries out the instructions of the computer program with the help of basic arithmetic and logic, input/output operations.

Main Memory

The Random Access Memory is the main memory of the computer system, which is known as RAM. The main memory can store the operating system software, application software, and other information. The Ram is one of the fastest memory, and it allows the data to be readable and writeable.

Secondary memory

We can store the data and programs on a long-term basis in the secondary memory. The hard disks and the optical disks are the common secondary devices. It is slow and cheap memory as compare to primary memory. This memory is not connected to the processor directly.

It has a large capacity to store the data. The hard disk has a capacity of 500 gigabytes. The data and programs on the hard disk are organized into files, and the file is the collection of data on the disk. The secondary storage is direct access by the CPU; that's why it is different from the primary storage.

The hard disk is about 100 times the capacity of the main memory. The main difference between primary and secondary storage is speed and capacity. There are several large blocks of data which are copied from the hard disk into the main memory.

Input Devices

The user provides the set of instruction or information to the computer system with the help of input devices such as the keyboard, mouse, scanner, etc. The data representation to the computer system is in the form of binary language after that the processor processes the

converted data. The input unit implements the data which is instructed by the user to the system.

We can enter the data from the outside world into the primary storage as the input through input devices. The input devices are the medium of communication between the outside world and the computer system.

There are some important features of input devices which are given below:

1.The input devices receive or accept the data or instruction from the user, who exist in the outside world.

2.These devices convert the data or instruction into the machine-readable form for further processing.

3.The input device performs like the connection between the outside world and our computer system.

4.The keyboard and mouse are common examples of input devices.

5.When the whole procedure is finished, we get the desired output from the output devices such as monitor, printer, etc.

Output Devices

The output devices produce or generate the desired result according to our input, such as a printer, monitor, etc. These devices convert the data into a human-readable form from binary code.

The computer system is linked or connected to the outside world with the help of output devices. The primary examples of output devices are a printer, projector, etc.

These devices have various features which are given below:

1.These devices receive or accept the data in the binary form.

2.The output devices convert the binary code into the human-readable form.

3.These devices produce the converted result and show to the user

The computer hardware includes the physical parts or components of the computer, such as to monitor, keyboard, mouse, motherboard, etc. We need software for the instructions that can be stored and run by the hardware. The software is always required to execute any command or instruction.

The combination of hardware and software makes a computing system. It is “hard” or rigid to change or modify the hardware system of the computer. The software is easy or “soft” to update or change; that’s why it is known as software.

1. Monitor

The computer monitor is an output device which can display the information in the pictorial form. The modern monitors use the thin film transistor liquid crystal display (LCD) with the LED backlighting, but the older monitors used the cathode ray tubes. The monitors are

connected to the computer with the help of VGA, digital visual interface, HDMI, Display Port.

2. Motherboard

The motherboard is one of the necessary part or element of the computer system which holds together many components. The CPU (Central Processing Unit), memory and connectors for input/output devices are the example of elements which exist in the motherboard.

The firm-sheet of non-conductive material is included in the base of the motherboard. Thin layers of copper or aluminum foil are printed on this firm sheet. The motherboard contains many numbers of sockets and slots to connect the other components or devices.

3. CPU (Central Processing Unit)

The Central Processing Unit is known as the brain of the computer system. The CPU contains a control unit, a logical unit, an arithmetic unit, and registers. It also has a small bit of memory known as a Cache. It can perform different types of functions and contains many processors such as graphics processor unit, etc. The modern central processing systems are the microprocessors where the CPU is included in the single metal oxide semiconductor integrated circuit chip.

4. Microprocessor

The microprocessors consist of the Central Processing Unit. The sound card and network cards are included in the microprocessor. It is made up of millions of transistors. The microprocessor is the primary unit which can execute and manage the logical and computational instructions. It is a basic unit or component in the computer system.

5. Main Memory

Random-access memory (RAM) is the main memory of the computer. The main memory is that part of the computer which can store the operating system software, software applications and other information for the CPU for fast and direct access.

The RAM is one of the fastest memory and can allow data or information to be read and written. There are two types of main memory:

DRAM (Dynamic Random Access Memory)

SRAM (Static Random Access Memory)

The main memory is the memory where programs, data, or information are kept, so when the processor needs that data, the memory can access it easily. If those programs and data are in active mode, it can be copied from secondary memory into the main memory, where the processor can interact with that data. The main memory is connected to the processor; that’s why instructions and data can move very fast inside and outside of the processor.

6. Expansion Card

The Expansion card is the electronic card or board that is used to add extra features or functionality in the computer system. This expansion card is inserted into the expansion slot

on the motherboard of the computer. It contains the edge connectors that are used to create the link between the motherboard and expansion card.

7. Power Supply Unit

The power supply unit converts the main AC to the low voltage regulated DC power for the internal components of the computer system. The modern personal computer system uses switch-mode power supplies. Some power supplies have a manual switch to select the input voltage while other supplies automatically adapt the main voltage.

8. Optical disk drive

The optical disk drive is the type of computer disk drive that can read and write data or information from the optical disk through the laser beam technology. It allows the user to retrieve, edit, and delete the data from the optical disk such as CDs, DVDs, and blue ray disks.

The optical disk drive is an integral part of standalone appliances such as CD players, DVD players, Blue-ray disk players, DVD recorders, etc. It is mainly used as an input device, and its functionality depends on the optical disk.

9. Hard disk drive

The Hard disk drive is the non-volatile storage device of the computer system which contains magnetic disk or platters rotating at high speed. This is the secondary storage device which is used to store the data or information permanently.

The hard disk drive needs the read-only memory controller board to instruct the read and write heads. The read and write heads are controlled by the actuator, which can magnetically read from and write to the platters.

The read and write heads are floated on the film of air above the platters, and both sides of platters are used to store the data. Every side or surface of one disk is known as the head, and each head is divided into sectors and tracks.

10. Keyboard

The keyboard is the input device and the primary way for the user to communicate with the computer system. It is a typewriter-style device which uses the arrangement of buttons or keys.

The keyboard is mainly used to give commands to the operating system. Mostly the desktop computer keyboards connect to the computer system either by USB or Bluetooth to the wireless connection.

11. Mouse

The mouse is an input device and the handheld pointing device that detects two-dimensional motion relative to the surface. It can control the cursor in the GUI and move to select the text, icons, files, and folder on your computer system. The Douglas Engelbart invented the computer mouse in 1964. There are some mouse devices which have integrated features such as extra buttons that may be programmed and assigned with various programming system.

12.Illustrate the concept of IO interface standards.

An I/O interface is required whenever the I/O device is driven by the processor. The interface must have necessary logic to interpret the device address generated by the processor. Handshaking should be implemented by the interface using appropriate commands (like BUSY, READY, and WAIT), and the processor can communicate with an I/O device through the interface. If different data formats are being exchanged, the interface must be able to convert serial data to parallel form and vice-versa. There must be provision for generating interrupts and the corresponding type numbers for further processing by the processor if required.

a) Keyboard Interface

Key board is serial data.

• If we press a key, the keyboard send a scan code for the key by data.(i.e., bit by bit)

• SIPO is used to convert serial bit into parallel bit to form 1 byte.

• After forming byte, it sends IRQ1 to CPU by interrupt controller.

• KB logic receives then scan by PPI(port A)

• Again the PPI converts the scan code into.

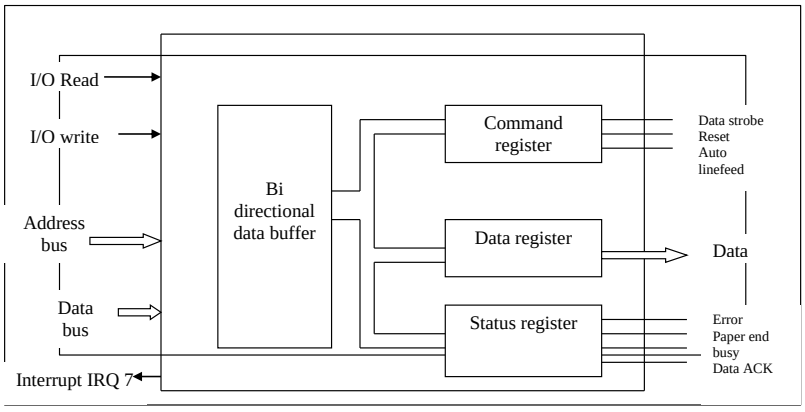
b) Printer Controller

• It is a parallel interface.
• The interface between printer and controller is centronic.
• Printer controller supports 2 modes

1) Programmed mode

2) Interrupt mode

• Recent form of PC is LPT1, LPT2, and LPT3.

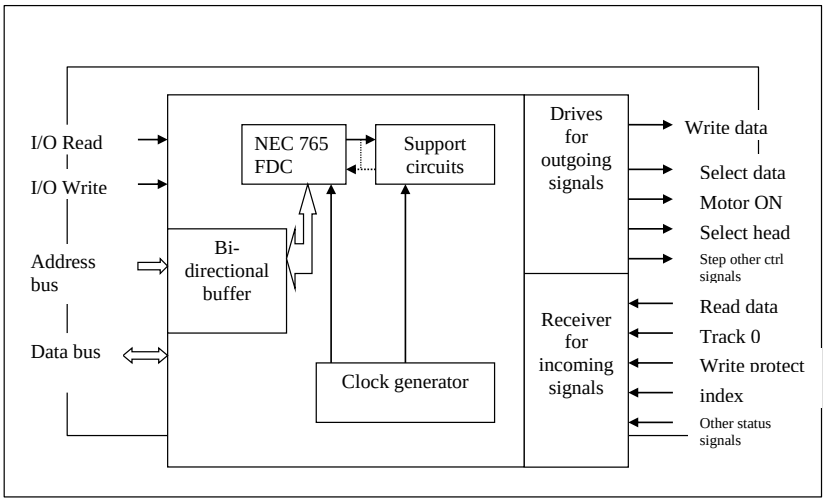


Fig, Printer controller

c). CRT Controller

- CGA supports both text and graphics mode and display or color CRT monitor
- Video buffer acts as memory between CRT and CPU.
- CPU is used to store text and graphics in video buffer.
- CRT monitor retrieves the text and graphics.
- We get dot pattern from ROM.
- We can send video signal to monitor along with the signals HSYNC and VSYNC.

d). Floppy Disk Drive (FDD) Controller



Fig, Floppy Disk Controller

FDC is connected to the SMPS bus and DMA controller.

• Data transfer is done in DMA mode.

• NEC 765 FDC is a programmable IC, is used to convert parallel to serial and serial to parallel.

• It is also used to generate the CRC characteristic.

• FDC is used to control the FDD at different speeds.

• The BIOS is used to supply the command to the FDC.

• FDC supplies the control signal to the IC to IDC.

• For each command, the set of commands is supplied to

• FDC IC has a set of registers to store command.

• ISR is used to read the command from the FDCIC.

• Apart from FDC IC the additional circuits are

1) Address decoder

- It enables FDC

2) Control post

- To supply control signals over FDCIC and FDD.

3) Data separator

-used to separate data and clock pulse.

f). Hard Disk Controller

• This is a block diagram of HDC.
• Similar to FDC

Sector Buffer:

Used to store the data during read and write operation. During write operation read the data from memory in DFA port and store in sector buffer.

• HDC takes data from sector buffer and converts into serial data.

• HDC adds clock pulses into the data and send MFM (Modified Frequency Modulation) write data.

• During RD operation MFM contains data and pulses.

• HDC is used to separate data pulses and clock pulses. It should be converted into parallel data and stored in sector buffer. finally it is stored in memory(DFA mode)

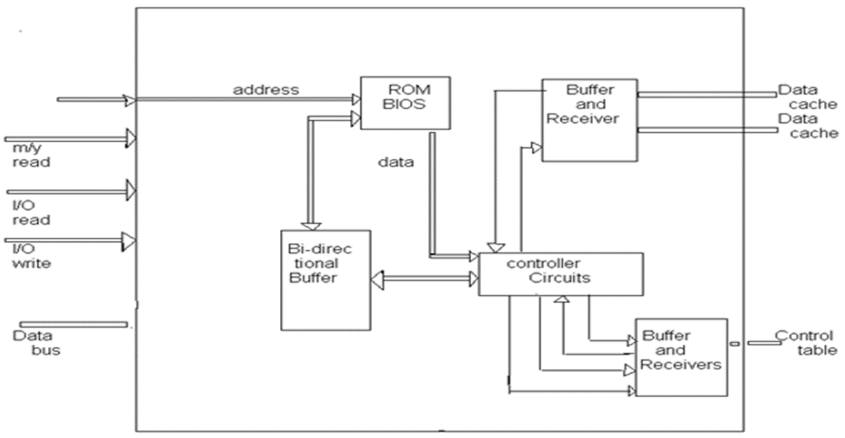


Fig. Hard disk controller

Error checking and correction logic:

• It is used to generate 32 bit pattern.

• Used to check whether an error is occurred or not.

Retry logic:

• Used to retry operation even error is encountered.

Diagnostic logic:

• Used to detect the malfunctions occurred in hard disk drive.

13.Discuss about Universal Serial Bus. How do convert hard drive to USB?

A USB system has an asymmetric design. It is made of a host, several downstream USB ports, and multiple peripheral devices connected in a star topology. Additional USB hubs may be included in the tiers, allowing branching into a tree structure with up to five tier levels.

A USB host can have multiple host controllers. Each host controller provides one or more USB ports. Up to 127 devices, including the hub devices, may be connected to a single host controller.

USB devices are linked in series through hubs. There is always one hub known as the root hub. The root hub is built into to the host controller. There are special hubs, called "sharing hubs". These allow multiple computers to access the same peripheral devices. They work by switching the access between PCs, either manually or automatically. They are popular in small-office environments. In network terms, they converge rather than diverge branches.

A physical USB device can have several logical sub-devices that are referred to as device functions. A single device may provide several functions, for example, a webcam (video device function) with a built-in microphone (audio device function).

USB endpoints are actually on the connected device: the channels to the host are referred to as pipes.USB device communication is based on pipes (logical channels). Pipes are connections from the host controller to a logical entity on the device named an endpoint. The term endpoint is occasionally used to incorrectly refer to the pipe. A USB device can have up to 32 active pipes, 16 into the host controller and 16 out of the controller.

Each endpoint can transfer data in one direction only, either into or out of the device, so each pipe is uni-directional. Endpoints are grouped into interfaces and each interface is associated with a single device function. An exception to this is endpoint zero, which is used for device configuration and which is not associated with any interface.

When a USB device is first connected to a USB host, the USB device enumeration process is started. The enumeration starts by sending a reset signal to the USB device. The speed of the USB device is determined during the reset signaling. After reset, the USB device's information is read by the host, then the device is assigned a unique 7-bit address. If the device is supported by the host, the device drivers needed for communicating with the device

are loaded and the device is set to a configured state. If the USB host is restarted, the enumeration process is repeated for all connected devices.

The host controller polls the bus for traffic, usually in a round-robin fashion, so no USB device can transfer any data on the bus without an explicit request from the host controller.

Converting HDD to USB

should take 2 things into consideration: interface and size. The interface and size of the enclosure to buy must match that of your hard drive.

If the hard drive is taken out from a laptop, it's possible that the interface is SATA (there are also a small number of laptop hard drives equipped with an IDE interface) and the size is 2.5 inch. Therefore, you need a 2.5" SATA enclosure.

If the hard drive was used in a desktop originally, it's possible that it has a PATA interface and 3.5 inch size. At this time, you should look for a 3.5" enclosure that gives support to PATA/IDE.

You can actually convert the old internal hard drive to external and use it for storing files, backing up data, and keeping videos/games that can be used on your TV/PS4.

1. Choose an internal hard drive. You can mix and match almost any hard drive and enclosure, but check the manufacturers' websites to make sure the drive and enclosure are compatible, just in case.

2. Mount the drive into the enclosure. Inside the enclosure, there may be a place to mount the internal hard drive into the enclosure, either by screws or fasteners (some slot into the connector). If you're installing older drives such as EIDE or IDE, you may see several wires to connect the hard drive. For SATA or mSATA drives, you should see a single SATA connection like those inside the PC.

3. Plug in the connections. The connections you need to make differ depending on the type of hard drive connector you have. For most modern drives that use SATA or mSATA, there is a single 7-pin connector that is the interface connection and provides power. For PATA drives (EIDE or IDE), there's a 40-pin connector and a 4-pin power connector.

4. Seal the hard drive enclosure. After it's connected, seal the enclosure tight once again, with the internal hard drive inside. Most hard drive enclosures have screws or simple fasteners that you can use to seal up the drive. You now have an internal hard drive acting as a portable external storage device. All that remains is to connect the enclosure to the PC.

5. Connect the enclosure. The enclosure comes with whatever cords are necessary to connect it to a PC. Usually, it's a USB cable, which provides both connectivity and power to the drive.

6. Connect the enclosure to the PC. Connect the USB cable to the PC, and allow the drive to come on. If it has a power switch, turn it on.

7. Plug and play the hard drive. Once you plug it in and turn it on, your Windows machine should recognize that you added new hardware and let you "plug and play" it. You can browse to the drive, open it, drag files and folders into it, or set it up for receiving security backups and recovery files.

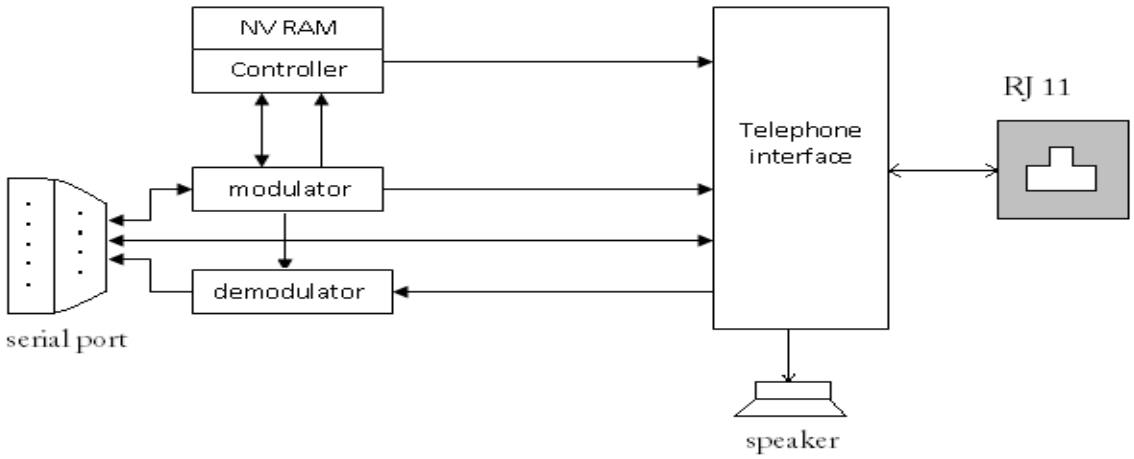
14. Define Modulator Demodulator.Explain in detail about the types of MODEM.

Types of Modem:

1. Internal Modem
2. External Modem

Internal Modem

The internal modem is fabricated as a stand alone board, which plugs directly into the PC expansion bus. The block diagram of an internal modem are given below.



The internal modem contains its own universal Asynchronous Receiver / Transmitter (UAI) which is responsible for manipulating data into and out of serial form. A UART forms the foundation of a serial port. When installing an internal modem, be sure that the IRQ line and I/O address choosen for the UART "Serial Port" does not conflict wih other serial ports already in the system. Before being transmitted over telephone lines, serial data must be converted into audio signals. This process is carried out by a modulator circuit.

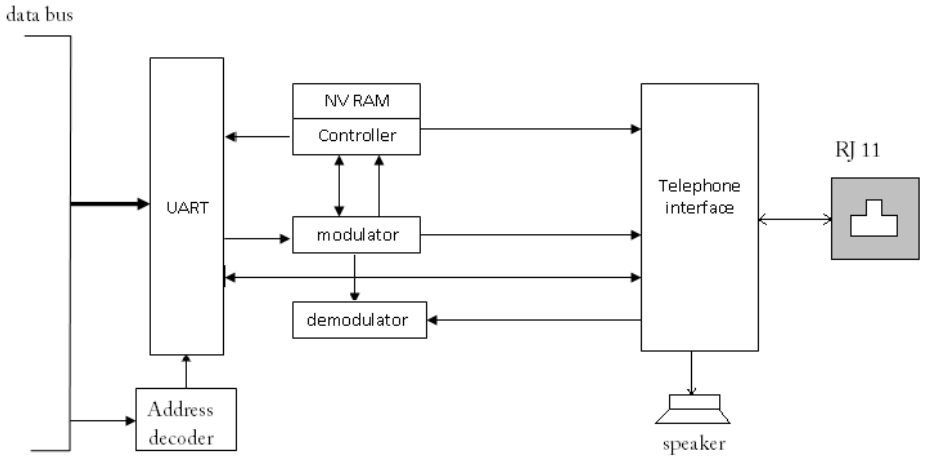
The modulated audio is then coupled to the telephone line is using a circuit vert similar to that used by ordinary telephones to couple voice. Audio signals are made available to a single RJ11-type connector at the rear of the modem. Many modems provide a second RJ11 jack for a telephone, this allows to check the line and make calls while the modem is idle. Signals received from the telephone ine must be translated back into serial data. The telephone interface separates received signals and passes them to the demodulator. After demodulation, the resulting serial data is passed to the UART, which converts the serial bits into parallel words that are placed on the systems data bus sides combinig and separating modulated audio data the telephone interface generates the Dual-One Multi-Frequency (DTME) dialing signals needed to reach a remote modem, much the same may as a touch tone telephone.

When a remote modem dials in, the telephone interface detects the incoming ring, and alerts the UART to begin redialing a connection. Finally, the telephone interface drives a small speaker. During the first stages of modem operation, the speaker is afer to hear dial tone, dialing signals and audion negotiation between the two modems. Once connection is established, the speaker is usually disabled. A controller circuit manages the overall operation

of the modem, but in a more general sens, it switches the modem between its control and data operating modes. The controller accepts commands from the modulator, which allows mode characteristics and operating parameters to be changed. In the event of power loss of reset conditions, default modem parameters can be loaded from NVRAM. The permanent changes to modem parameters are stored in NVRAM.

External modem

The External modem provides virtually all of the essential functions offered by an internal modem. As we can see by the block diagram, many of the external functions are identical to those of an internal modem. The major difference between modems is that the external modem does not include a built in UART to provide a serial port External Moded setup faster and easier than ineternal modem because we need not worry about interrupt line and I/O address.



The main difference between External and Internal modems:

1. The External Modem is the way it is powered where internal modems are powered from the expansion bus, external modems must be powered from a small AC adapter.

2. The External Modems provide a series of signal status LED's. The LED's allow to easily checks the state of serial communication.

15.State the functions of input devices. Explain about features of joystick over other input devices

Following are some of the important input devices which are used in a computer −

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader (MICR)

- Optical Character Reader (OCR)
- Bar Code Reader
- Optical Mark Reader (OMR)

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The keys on the keyboard are as follows −

S.No	Keys & Description
1	Typing Keys

These keys include the letter keys (A-Z) and digit keys (09) which generally give the same layout as that of typewriters.

2 Numeric Keypad

It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.

3 Function Keys

The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.

4 Control keys

These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).

5 Special Purpose Keys

Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Mouse Advantages

- ✓ Easy to use
- ✓ Not very expensive
- ✓ Moves the cursor faster than the arrow keys of the keyboard.

Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Light Pen

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.

Scanner

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Graphic Tablet

Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

Microphone

Microphone is an input device to input sound that is then stored in a digital form.

The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.

Magnetic Ink Card Reader (MICR)

MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader (OCR)

OCR is an input device used to read a printed text.

OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books, etc. It may be a handheld scanner or may be embedded in a stationary scanner.

Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which is then fed to the computer that the bar code reader is connected to.

Optical Mark Reader (OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked.

It is specially used for checking the answer sheets of examinations having multiple choice questions.

Features of the Joystick Interface

- ✓ It has a 4-channel joystick controller.
- ✓ It requires minimal external RC passive components.
- ✓ It uses quad slope integration type A/D converters.
- ✓ It has software controllable integration cycle starts, and automatic hardware terminations.
- ✓ It has simple read access to conversion counters.
- ✓ It has a single external interrupt, with internal interrupt status register for source identification.

The following key features are programmable, allowing:

- combinations of channel interrupts that result in the final external interrupt via an interrupt control register
- individual control of the enable and disable of each of the four conversion counters via a converter control register
- independent control of the discharging of the external RC networks.
- Additional test registers and modes are implemented to provide efficient testing.

16.Paraphrase about CGA and SVGA in detail.

There are different standards developed by different organizations to display the content over various display devices. CGA and SVGA are two such standards that are used for displaying the video data on a suitable display device. CGA supports videos and images of smaller resolution, whereas SVGA supports relatively large resolution videos and images.

Read this article to find out more about CGA and SVGA standards and how they are different from each other.

CGA stands for Computer Graphics Arrays. It is a standard first developed by IBM to display video on a display screen. CGA offers high resolution with 256 colors at a time, which means it enables to conduct the video data to display at maximum 256 colors at a time.

CGA consists of a 6−Bit digital to analog converter to convert analog red, green, and blue signals. CGA supports 640×480 video resolution.

SVGA stands for Super Video Graphics Arrays. SVGA is an extended version of VGA. SCGA was developed by NEC Home Electronics. It offers relatively higher resolution with more colors. SVGA can function in two modes, i.e., "800×600" and "1024×480". Sometimes, SVGA is also referred to as Enhanced VGA or Ultra VGA.

The major advantages of using SVGA over normal VGA include the following− it has high memory utilization, high resolution, and more colors at a time. However, SVGA requires a supplementary memory.

Difference between CGA and SVGA

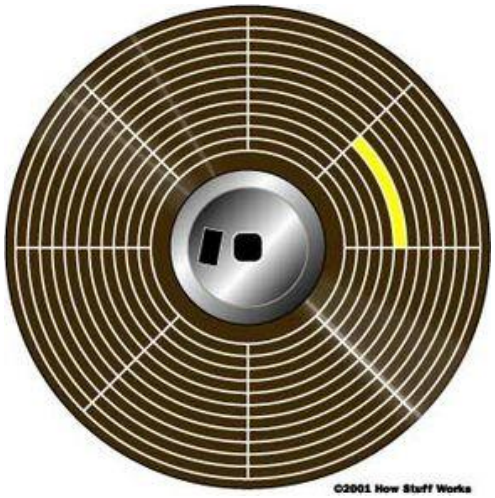
The important differences between CGA and SVGA are highlighted in the following table −

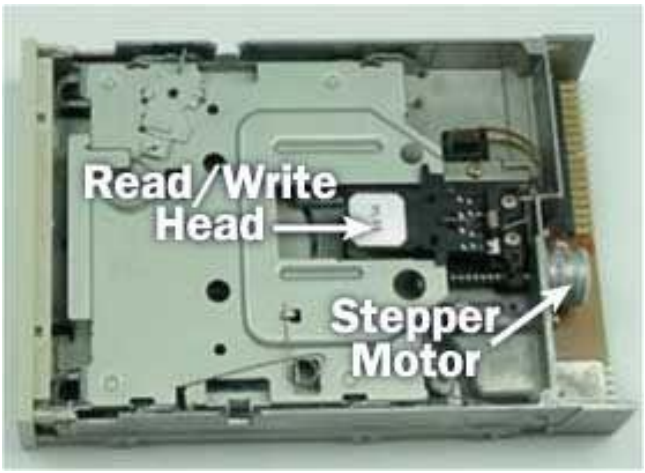
S.No.	CGA	SVGA
1	CGA can be expanded as Computer Graphics Arrays.	SVGA can be expanded as Super Video Graphics Arrays.
2	CGA was developed by IBM	SVGA was developed by NEC Home Electronics.
3	CGA supports small resolution videos and images.	SVGA supports large resolution videos and images.
4	CGA has a maximum resolution of 640×480.	SVGA provides a maximum resolution of 1024×460.
5	CGA has memory of up to 256k.	SVGA has memory of up to 1024k.
6	CGA doesn’t include supplementary memory.	SVGA includes supplementary memory.

From the above discussion, it is clear that CGA supports a maximum resolution of 640×480 pixels, while SVGA supports two resolutions, i.e. 800×600 pixels and 1024×480 pixels. Another key difference between CGA and SVGA is that CGA uses a 6−bit digital to analog converter to convert analog red, green, and blue signals to produce a screen color of 256 colors.

CGA was the original standard for displaying video on personal computers, while SVGA is an improved version of VGA that offers higher resolution. Note that CGA and SVGA are older technologies that are no longer used on modern computers. Most modern computers use HD (High Definition) or UHD (Ultra High Definition) standards that offer significantly higher resolution and improved image quality compared to CGA and SVGA.

17. Discuss the operation of floppy disk controller with neat diagram.





A floppy disk is a lot like a cassette tape:

Both use a thin plastic base material coated with iron oxide. This oxide is a ferromagnetic material, meaning that if you expose it to a magnetic field it is permanently magnetized by the field.

- ✓ Both can record information instantly.
- ✓ Both can be erased and reused many times.
- ✓ Both are very inexpensive and easy to use.

If you have ever used an audio cassette, you know that it has one big disadvantage -- it is a sequential device. The tape has a beginning and an end, and to move the tape to another song later in the sequence of songs on the tape you have to use the fast forward and rewind buttons to find the start of the song, since the tape heads are stationary. For a long audio cassette tape it can take a minute or two to rewind the whole tape, making it hard to find a song in the middle of the tape.

A floppy disk, like a cassette tape, is made from a thin piece of plastic coated with a magnetic material on both sides. However, it is shaped like a disk rather than a long thin ribbon. The tracks are arranged in concentric rings so that the software can jump from "file 1" to "file 19" without having to fast forward through files 2-18. The diskette spins like a record and the heads move to the correct track, providing what is known as direct access storage.

The Drive

The major parts of a FDD include:

Read/Write Heads: Located on both sides of a diskette, they move together on the same assembly. The heads are not directly opposite each other in an effort to prevent interaction between write operations on each of the two media surfaces. The same head is used for reading and writing, while a second, wider head is used for erasing a track just prior to it being written. This allows the data to be written on a wider "clean slate," without interfering with the analog data on an adjacent track.

Drive Motor: A very small spindle motor engages the metal hub at the center of the diskette, spinning it at either 300 or 360 rotations per minute (RPM).

Stepper Motor: This motor makes a precise number of stepped revolutions to move the read/write head assembly to the proper track position. The read/write head assembly is fastened to the stepper motor shaft.

Mechanical Frame: A system of levers that opens the little protective window on the diskette to allow the read/write heads to touch the dual-sided diskette media. An external button allows the diskette to be ejected, at which point the spring-loaded protective window on the diskette closes.

Circuit Board: Contains all of the electronics to handle the data read from or written to the diskette. It also controls the stepper-motor control circuits used to move the read/write heads to each track, as well as the movement of the read/write heads toward the diskette surface.

The read/write heads do not touch the diskette media when the heads are traveling between tracks. Electronic optics check for the presence of an opening in the lower corner of a 3.5-inch diskette (or a notch in the side of a 5.25-inch diskette) to see if the user wants to prevent data from being written on it.

Floppy Disk Drive Terminology

- ✓ Floppy disk - Also called diskette. The common size is 3.5 inches.

- ✓ Floppy disk drive - The electromechanical device that reads and writes floppy disks.
- ✓ Track - Concentric ring of data on a side of a disk.
- ✓ Sector - A subset of a track, similar to wedge or a slice of pie.

18.Explain in detail about MFM and RLL recording standards.

Modified Frequency Modulation

• Modified Frequency Modulation, commonly MFM, is a line coding scheme used to encode information on most floppy disk formats, which include the floppy disk formats used in most CP/M machines as well as PCs running DOS.

• MFM is a modification to the original FM (frequency modulation) scheme for encoding data on single-density floppy disks.

• Because the minimum spacing between flux transitions is a property of the disk and head design, MFM, which guarantees at most one flux transition per data bit, can be written at higher density than FM, which can require two transitions per data bit.

• It is used with a data rate of 250-500 kbit/s (500-1000 kbit/s encoded) on industry standard 5¼" and 3½" ordinary and high density diskettes.

• MFM was also used in early hard disk designs, before the advent of more efficient types of Run Length Limited (RLL) coding. Except for the steadily disappearing 1.44 MB floppy disk drives, MFM encoding is obsolete.

Coding:

• MFM encoding can be thought of as having data bits separated by clock bits. The basic encoding rule is that (x, y) encodes to (x, x NOR y, y).

• On average this means that each data bit is encoded as two bits on disk, but some delimiters are required at the beginning and end of a sequence, so this limit is never quite reached in practice.

Data	MFM Encoding
...00...	...?010?...
...01...	...?0010...
...10...	...0100?...
...11...	...01010...

Note that the surrounding clock bits are sometimes known, but sometimes require knowledge of the adjacent data bits. A longer example:

Data: 0 0 0 1 1 0 1 1

Encoded: 0101001010001010 (The bold bits are the data bits, the others are the

clock bits.)

Notice that there is a minimum of 1 zero bit between adjacent ones (there are never two adjacent one bits), and the maximum number of zeros in a row is 3. Thus, MFM is a (1, 3) RLL code.

This bit stream is then NRZI encoded to be written to disk, a 1 bit representing a magnetic transition, and a 0 bit no transition.

A special "sync mark" is used to allow the disk controller to figure out where the data starts. This sync mark has two important properties: it has no runs of zeros shorter than 1 or longer than 3 (i.e. it follows the (1, 3) RLL rules), and it will never occur in any bit position in any encoded data stream. The sync mark used is called an 'A1 sync' since it is similar to the encoding of the hexadecimal value A1 (10100001).

Run Length Limited

• Run length limited or RLL coding is a technique that is used to store data on recordable media.

• Specifically, RLL prevents long stretches of repeated bits from causing the signal recorded on media to not change for an excessive period, by modulating the data.

• RLL reduces the timing uncertainty in decoding the stored data which would lead to the possible errant insertion or removal of bits when reading the data back.

• Run length limited codes are widely used in hard disk drives, digital optical discs such as CD, DVD and Blu-Ray as the mechanism to ensure that the boundaries between bits can always be accurately found while efficiently using the media to reliably store the maximum amount of data in a given space.

• Generally run-length is the number of bits for which signal remains unchanged. A run-length of 3 for bit 1 represents a sequence of '111'.

• For instance, the run lengths in the string '0111100111000000' are of length 1, 4, 2, 3, and 6.

• Run length limited sequences are characterized by two parameters, (d) and (k), which stipulate the minimum and maximum run length that can, occur in the sequence. So RLL's are generally specified as (d, k) RLL. e.g.: (1, 3) MFM RLL.

• For disk drives the situation is little different. A disk drive stores information by changing the magnetic polarization of the disk surface.

• A change in polarization is considered to be a '1' bit, while if there is no change for a time it is considered to be a '0' bit.

• The actual signal on the disk might be '+−−−−++−−−++++++' but this is usually read as '0100010100100000'. So run length limited coding for a disk is really about the upper and lower limits on how many '0's there must be between consecutive '1's.

• A magnetic tape might be able to support 3,200 flux reversals per inch.

• A Modified Frequency Modulation or (1,3) RLL encoding stores each data bit as two bits on tape, but since there is guaranteed to be one 0 (non fluxreversal) bit between any 1 (flux

reversal) bits then it is possible to store 6,400 encoded bits per inch on the tape, or 3,200 data bits per inch.

• A (1,7) RLL encoding can also store 6,400 encoded bits per inch on the tape, but since it only takes 3 encoded bits to store 2 data bits this is 4,267 data bits per inch.

• A (2,7) RLL encoding can takes 2 encoded bits to store each data bit, but since there is guaranteed to be two 0 bits between any 1 bits then it is possible to store 9,600 encoded bits per inch on the tape, or 4,800 data bits per inch.

• The flux reversal densities on hard drives are significantly greater, but the same improvements in storage density are seen by using different encoding systems.

Coding

In the encoded format a "1" bit indicates a flux transition, while a "0" indicates that the magnetic field on the disk does not change for that time interval.

19. Explain block diagram of logic state analyzer for trouble shooting.

Logic State/Timing Analysers (LSA)

A logic analyzer is an electronic instrument which displays signals in a digital circuit. A logic analyzer may convert the captured data into timing diagrams, protocol decodes, state machine traces, assembly language, or correlate assembly with source-level software.

Presently, there are three distinct categories of logic analyzers available on the market:

• The first is mainframes, which consist of a chassis containing the display, controls, control computer, and multiple slots into which the actual data-capturing hardware is installed.

• The second category is standalone units, which integrate everything into a single package, with options installed at the factory.

• The third category is PC-based logic analyzers. The hardware connects to a computer through a USB or Ethernet connection, and then relays the captured signals to the software on the computer. These devices are typically much smaller and less expensive, because they do not need dedicated displays or hardware input, such as keyboards or knobs.

Mixed-signal oscilloscopes combine the functionality of a digital storage oscilloscope with a logic analyzer. The several benefits of these include the ability to view analog and digital signals together in time, and to trigger on either digital or analog signals and capture on the other.

Operation

A logic analyzer may be triggered on a complicated sequence of digital events, and then capture a large amount of digital data from the system under test (SUT).

When logic analyzers first came into use, it was common to attach several hundred "clips" to a digital system. Later, specialized connectors came into use. The evolution of logic analyzer probes has led to a common footprint that multiple vendors support, which provides added freedom to end users. Introduced in April, 2002, connector less technology (identified by several vendor-specific trade names: Compression Probing; Soft Touch; D-Max) has become popular. These probes provide a durable, reliable mechanical and electrical connection between the probe and the circuit board with less than 0.5 to 0.7 pF loading per signal.

Once the probes are connected, the user programs the analyzer with the names of each signal, and can group several signals together for easier manipulation. Next, a capture mode is chosen, either "timing" mode, where the input signals are sampled at regular intervals based on an internal or external clock source, or "state" mode, where one or more of the signals are defined as "clocks", and data are taken on the rising or falling edges of these clocks, optionally using other signals to qualify these clocks.

After the mode is chosen, a trigger condition must be set. A trigger condition can range from simple (such as triggering on a rising or falling edge of a single signal) to the very complex (such as configuring the analyzer to decode the higher levels of the TCP/IP stack and triggering on a certain HTTP packet).

At this point, the user sets the analyzer to "run" mode, either triggering once, or repeatedly triggering.

Once the data are captured, they can be displayed several ways, from the simple (showing waveforms or state listings) to the complex (showing decoded Ethernet protocol traffic). Some analyzers can also operate in a "compare" mode, where they compare each captured data set to a previously recorded data set, and halt capture or visually notify the operator when this data set is either matched or not. This is useful for long-term empirical testing. Recent analyzers can even be set to email a copy of the test data to the engineer on a successful trigger.

Uses

Many digital designs, including those of ICs, are simulated to detect defects before the unit is constructed. The simulation usually provides logic analysis displays. Often, complex discrete logic is verified by simulating inputs and testing outputs using boundary scan. Logic analyzers can uncover hardware defects that are not found in simulation. These problems are typically too difficult to model in simulation, or too time consuming to simulate and often cross multiple clock domains.

Logic analyzers or logic analysers are widely used for testing digital or logic circuits. They appeared shortly after the first microprocessors were used because to fault find these circuits required the instrument to have access to a large number of lines, more than could be seen using a conventional oscilloscope. Since then the need for logic analyzers has grown, especially as the complexity of circuits has continued to grow.

Although oscilloscopes can perform many of the functions of a logic analyser, the analyzer is more suited to operating in a digital environment because it is able to display relative timing of a large number of signals. Essentially a logic analyser enables traces of logic signals to be seen in such a way that the operation of several lines in a digital circuit can be monitored and investigated.

Logic analysers come in a variety of formats. One of the most popular is a typical test instrument case. However it is also possible to utilise the processing power of a computer and PC based logic analysers are available. The actual choice of logic analyser will depend upon the cost budget and the actual requirements. TH PC logic analyzers are a particularly cost effective method of creating an analyzer. However the main drawback of the PC logic analyzers is that their functionality is not as great as the dedicated logic analyzers, which is only to be expected in view of the cost differential.

One of the main points to note about a logic analyzer is that it does not give a full analogue display of the waveform. Although it shows the logical high and low states as a waveform on the display, it only looks for whether the state of a line is high, i.e. above a certain trigger voltage, or low, i.e. below the trigger voltage

20. Explain about trouble shooting problems of system boards.

System has no power at all. Power light does not illuminate, fan inside the power supply does not turn on, and indicator light on keyboard does not turn on.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Power cable is unplugged.	Visually inspect power cable.	Make sure power cable is securely plugged in.
Defective power cable.	Visual inspection, try another cable.	Replace cable.
Power supply failure.	Power cable and wall socket are OK, but system is still dead.	Contact technical support
Faulty wall outlet;circuit breaker or fuse blown.	Plug device into socket know to work and test.	Use different socket, repair outlet, reset circuit breaker or replace fuse.

System inoperative. Keyboard lights are on, power indicator lights are lit, and hard drive is spinning.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Expansion card is partially dislodged from expansion slot on the motherboard.	Turn off computer. Take cover off system unit. Check all expansion cards to	Using even pressure on both ends of the expansion card, press down firmly on

	ensure they are securely seated in slots.	expansion card.
Defective floppy disk drive or tape drive.	Turn system off. Disconnect the cables from one of the floppy drives. Turn on the system, check to see if the keyboard operates normally. Repeat until you have located defective unit.	Contact Technical Support.
Defective expansion card.	Turn computer off. Remove an expansion card.	Make sure expansion card is secure in expansion socket.

System does not boot from hard disk drive, can be booted from floppy disk drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Connector between hard drive and system board unplugged.	When attempting to run the FDISK utility described in the HARD DISK section of the manual you get a message, INVALID DRIVE SPECIFICATION.	Check cable running form disk to disk controller on the board. Make sure both ends are securely plugged in; check the drive type in the Standard CMOS Setup (in your motherboard manual).
Damaged Hard Disk or Disk Controller.	Format hard disk; if unable to do so, the hard disk may be defective.	Contact Technical Support.
Hard Disk directory or FAT is scrambled.	Run the FDISK program, format the hard drive(See HARD DRIVE section of manual). Copy your backup data back onto hard drive.	Backing up the hard drive is extremely important. All Hard Disks are capable of breaking down at any time.

System only boots from Floppy Disk. Hard Disk can be read and applications can be used, but booting from Hard Disk is impossible.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Hard Disk boot program has been destroyed.	A number of causes could be behind this.	Back up data and applications files. Reformat the Hard Drive as described in the Hard Drive section of the manual. Re-

		install applications and data using backup disks.

Error message reading "SECTOR NOT FOUND" or other error messages indication certain data is not allowed to be retrieved.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
A number of causes could be behind this.	Use a file by file backup instead of an image backup to backup the Hard Disk.	Back up any salvageable data. Then do a low level format, partition, and high level format of the hard drive(see Hard Disk section of your manual for instructions). Re-install all saved data when completed.

Disk formatted on IBM PS/2 will not operate with this system.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
The IBM PS/2 uses a different format than other computers.	IBM PS/2 disk format will not work in an AT type computer.	Format disk in the AT type computer insert disk into the IBM PS/2 and copy the files you wish.

After install an expansion card (network card, tape drive card, etc.) the system no longer works properly.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
No power to monitor.	All or part of the system may be inoperable. The new card may work but a mouse or COM port may not work.	Change the interrupt or RAM address on the new expansion card. See the documentation that came with the new card in order to change pin settings. many expansion devices come with proprietary software that will assist you in doing this.

Screen message says "Invalid Configuration" or "CMOS Failure."

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Incorrect information entered	Check the configuration	Review system's equipment.

into the configuration (setup) program.	program. Replace any incorrect information.	Make sure correct information is in setup.

Screen is blank.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
No power to monitor.	Power connectors may be loose or not plugged in.	Check the power connectors to monitor and to system. Make sure monitor is connected to display card, change I/O address on network card if applicable.
Monitor not connected to computer.		See instructions above.
Network card I/O address conflict.		See instructions above.

System does not boot from hard disk drive, can be booted from floppy disk drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Connector between hard drive and system board unplugged.	When attempting to run the FDISK utility described in the HARD DISK section of the manual you get a message, INVALID DRIVE SPECIFICATION.	Check cable running form disk to disk controller on the board. Make sure both ends are securely plugged in; check the drive type in the Standard CMOS Setup (in your

Problem

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Memory problem, display card jumpers not set correctly.		Reboot computer. Re-install memory, make sure that all memory modules are installed in correct sockets. Check jumper and switch settings on display card. See display card section for information of settings.
Computer virus.		Use anti-virus programs

		(McAfee/PC-cillin, E-port, etc) to detect and clean viruses.

Screen goes blank periodically.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Screen saver is enabled.		Disable screen saver.

Keyboard failure.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keyboard is disconnected.		Reconnect keyboard. Check keys again, if no improvement, replace keyboard.

No color on screen.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Faulty Monitor.		If possible, connect monitor to another system. If no color, replace monitor.
CMOS incorrectly set up.		Call technical support.

Floppy drive lights stays on.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Floppy Drive cable not connected correctly.		Reconnect floppy cable making sure PIN1 on the Floppy Drive corresponds with PIN1 on floppy cable connector.

Error reading drive A:

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Bad floppy disk.		Try new floppy disk.

Floppy disk not formatted		Format floppy disk(type ENTER)

C: drive failure.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
SETUP program does not have correct information.		Boot from drive A: using DOS system disk. Input correct information to SETUP program.
Hard Drive cable not connected properly.		Check Hard drive cable.

Cannot boot system after installing second hard drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Master/Slave jumpers not set correctly.		Set master /Slave jumpers correctly.
Hard Drives not compatible / different manufacturers.		Run SETUP program and select correct drive types. Call drive manufactures for compatibility with other drives.

Missing operating system on hard drive.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
CMOS setup has been changed.		Run setup and select correct drive type.

Certain keys do not function.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keys jammed or defective.		Replace keyboard.

Keyboard is locked, no keys function.

PROBABLE CAUSE	DIAGNOSIS	SOLUTION
Keyboard is locked.		Unlock keyboard