LESSON 5

PERIPHERALS DEVICES

CONTENTS

5.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Explain the Peripheral devices
- Discuss the importance of keywords
- Describe the significance of video displays-the CRT deflection, video amplifier and color video.

5.1 INTRODUCTION

A computer must have a system to get information from the outside world and must be able to communicate results to the external world. Programs and data should be entered into computer memory for processing and results obtained from computations must be recorded or displayed for the user. The most familiar method of entering information into a computer is using a typewriter like keyboard that allows a person to enter alphanumeric information directly. Every time a key is depressed, the terminal sends a binary coded character to the computer. When input information is transferred to the processor via a keyboard, the processor will be idle most of the time while waiting

for the information to arrive. To use a computer efficiently, a large amount of programs and data must be prepared in advance and transmitted into a storage medium. The information in the disk is then transferred into computer memory at a rapid rate. Results of programs are also transferred into a high-speed storage, which can be transferred later to output device for results.

Devices are said to be connected online that are under the direct control of the computer. These devices are designed to read information into or out of the memory unit when the CPU gives a command. Input or output devices connected to the computer are also called peripherals. Among the most common peripherals are keyboards, display units and printers. Peripherals that provide auxiliary storage for the system are magnetic disks. Other input and output devices are digital incremental plotters, optical and magnetic character readers, analog-to-digital converters etc. Not all input comes from people, and not all output is intended for people. Computers are used to control various processes in real time, such as machine tooling, assembly line procedures, and chemical and industrial processes. For such applications, a method must be provided for sensing status conditions in the process and sending control signals to the process being controlled. Any peripheral that receives and/or displays output from a computer is known as output device.

5.2 KEYBOARD

One of the main input devices used on a computer, a PC's keyboard looks very similar to the keyboards of electric typewriters, with some additional keys.

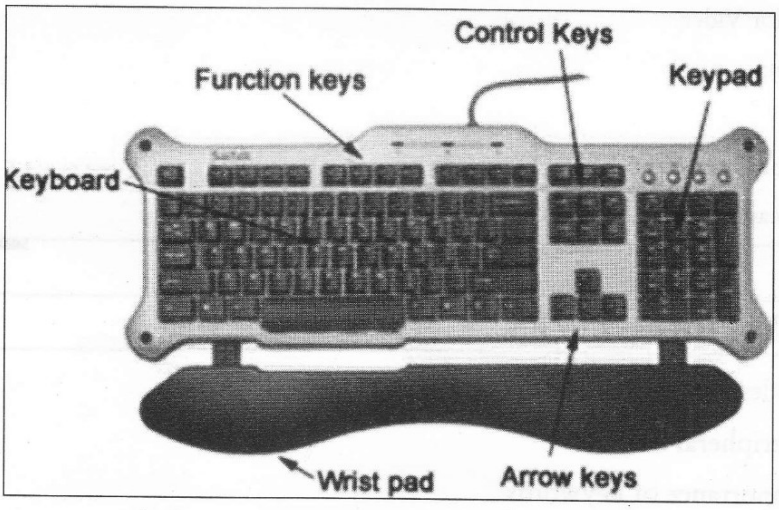


Figure 5.1: Keyboard

Most input data is entered into the computer by using a keyboard. This input method is similar to typing on a typewriter.

Most typewriters and computer keyboards are QWERTY KEYBOARDS. The alphabetic keys are arranged so that the upper-left row of letters begins with the six letters Q W E R T Y. Designers of other keyboards claim that their boards are easier to learn than the QWERTY keyboard. The Dvorak keyboard is one example. It is not widely accepted, however, because most people have already learnt the QWERTY keyboard. In different parts of the world, we find different types of keyboards. The coding used on the QWERTY and Dvorak keyboards works with an 8-bit code, which accommodates 256 different characters. Asian languages have many more characters. The Kanji alphabet (Japanese

language), for example, has 50,000 characters. Japanese keyboards have to work with a 16-bit code to accommodate all the characters.

Computer keyboards include keys that are designed to perform specific tasks. These special keys include function keys, directional keys and special-purpose keys such as Alt, Ctrl, Enter, Ins, and Esc. These keys enable the user to perform complex tasks easily when using the application. For example, many applications use a special key to access online help for the user.

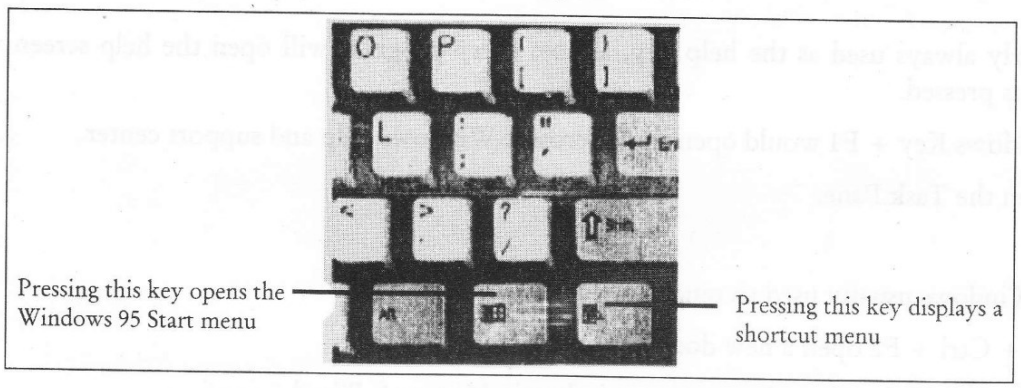


Figure 5.2: Special Keys

Some new keyboards have even 110 keys, with three new keys designed to simplify working with Windows 98. Two of these keys, next to the Alt key, bring up the Start menu. The third key, next to the right Ctrl key, brings up a menu of functions that are frequently accessed in whichever application is currently being used.

One special type of keyboard construction is the MEMBRANE-SWITCH KEYBOARD, in which the keyboard is covered by a protective film. Membrane-switch keyboards are reliable, durable and resistant to such hazards as liquids or grease. However, membrane keys require more pressure than keys on a standard computer keyboard. You have probably seen membrane-switch keyboards in fast-food restaurants. Membrane-switch keyboards are ideal in situations that require little actual keying.

A tiny chip called the keyboard controller, notes that a key has been pressed. They keyboard controller places a code into a part of its memory, called the keyboard buffer, indicating which key is pressed. This code is called the keys scan code. The keyboard controller then signals the computer's system software that something has happened at the keyboard. It does not specify what has occurred. The signal that the keyboard sends to the computer in a special kind of message is called an interrupt request. The keyboard controller sends an interrupt request to the system software when it receives a complete keystroke. For example, it you type the letter D, the controller immediately issues an interrupt request. When the system software receives an interrupt request, it evaluates the request to determine the appropriate response. When a key press has occurred the system reads the memory location in the keyboard buffer that contains the scan code of the key that was pressed. It then passes the key scan code to the CPU.

5.2.1 Function Keys

Usually known as "function keys", F1 through F12 may have a range of different uses or no use at all. Depending on the installed operating system and the software program presently open will change how each of these keys operate. A program is proficient of not only using each of the function keys,

but also combining the function keys with the ALT and/or CTRL keys, for example, Microsoft Windows users can press ALT + F4 to close the program currently active.

Some of the regular functions of the functions keys on computers running Microsoft Windows are mentioned below. As stated above not all programs support function keys and/or may perform different tasks then those mentioned below.

- *F1*

  Nearly always used as the help key, almost every program will open the help screen when this key is pressed.

  Windows Key + F1 would open the Microsoft Windows help and support center.

  Open the Task Pane.

- *F2*

  In Windows usually used to rename a highlighted icon or file.

  Alt + Ctrl + F2 open a new document in Microsoft Word.

  Ctrl + F2 display the print preview window in Microsoft Word.

- *F3*

  Often opens a search characteristic for many programs including Microsoft Windows.

  Shift + F3 will change the text in Microsoft Word from upper to lower case or a capital letter at the beginning of every word.

- *F4*

  Open find window.

  Repeat the last action performed (Word 2000+)

  Alt + F4 will close the program at present active in Microsoft Windows.

  Ctrl + F4 will close the open window within the current active window in Microsoft Windows.

- *F5*

  In all modern Internet browsers pressing F5 will refresh or reload the page or document window.

  Open the find, replace, and go to window in Microsoft Word.

  Starts a slideshow in PowerPoint.

- *F6*

  Shift the cursor to the Address bar in Internet Explorer and Mozilla Firefox.

  Ctrl + Shift + F6 open to another open Microsoft Word document.

- *F7*

  Frequently used to spell check and grammar check a document in Microsoft programs such as Microsoft Word, Outlook, etc.

Shift + F7 runs a Thesaurus check on the word highlighted.

Turns on Caret browsing in Mozilla Firefox.

- *F8*

Function key used to enter the Windows startup menu, commonly use to get into Windows Safe Mode.

- *F9*

Opens the Measurements toolbar in Quark 5.0.

- *F10*

In Microsoft Windows activates the menu bar of an open application.

Shift + F10 are the similar as right-clicking on a highlighted icon, file, or Internet link.

- *F11*

Full-screen mode in all modern Internet browsers.

- *F12*

Open the Save as window in Microsoft Word.

Shift + F12 save the Microsoft Word document.

Ctrl + Shift + F12 print a document in Microsoft Word.

5.2.2 Control Keys

Not to be puzzled with the "CTRL key", control keys are a section of keys on your keyboard that enable additional control over a document and the computer. Print Screen, Scroll Lock, Pause, Break, Insert, Home, Page Up, Delete, End, and Page down are all instance of control keys. Below is an examples of where the control keys are commonly located on the keyboard.

- ***Print Screen:*** Sometimes abbreviated as PRTSC or Prt Scrn, the print screen key is a keyboard key found on most computer keyboards. When pressed, the key either sends the current screen image to the computer clipboard or the computer printer depending on the operating system or software program the key is pressed in.
- ***Scroll Lock:*** A key originate on a computer keyboard regularly located close to the keyboard pause key. The scroll lock key is intended to temporarily stop the scrolling of text or halt the operation of a program. There are not many software programs today that take advantage or have a use for this key.

  Microsoft Excel is a good example of a software program that uses this key. If scroll lock is enabled on the keyboard when you press any of the arrow keys the screen will move in that direction but the selected cell will not change.
- ***Pause:*** Keyboard key generally found near the top right of a computer keyboard. This key allows a user to provisionally halt the action of the program being run. For example, in computer games, the pause key is commonly used to temporarily stop the game while the user steps away from his or her computer and is shared with the break key.

- *Break:* A key typically located on the same key as the pause key that enables a user to break the computer from a pause or other halt state. To use the break either press the break key alone or press CTRL at the same time as the break key. For example, press the pause key to stop the computer as it boots, pressing it again, to break out of that pause.
- *Insert:* Sometimes displayed as **INS** on the keyboard, the **Insert key** is a keyboard key located on the majority of all computers that allows text to be inserted. When insert is enabled, the text inserted in a document will not overwrite any other text. However, when disabled, text will be overwritten.
- *Home:* Key on the keyboard generally above the end key on the IBM compatible keyboard. This key is often used to return the user to the beginning of the line or the beginning of a document.
- *Page up:* Short for Page Up key, the PGUP, PU, PgUp, or Pg Up key is a computer keyboard key usually situated between the keyboard and the numeric pad or on the numeric pad number 9 on most QWERTY U.S. keyboards. When this key is pressed, if the page currently being viewed has more than one page, the page view will be moved up one page.
- *Delete:* In general delete refers to removing a file, text, or other object from the computer. Files that are **deleted** in Microsoft Windows 95 are sent to the recycling bin, other operating systems have a similar location called the trash. A command that is used to **delete**/remove data or files. Below is a listing of different methods of deleting a file.
- *End:* A key establish on most computer keyboards indicated by the word: End that moves the cursor to the end of the line, paragraph, page, screen, cell, or document depending on the program and where your cursor is currently positioned. An example of how this could be used is to move the cursor to the middle of a line of text and press the End key, which would move to the end of the line of text. Using a key combination such as pressing the Shift key and the End key together would highlight the text from the cursor to the end of the line. Additional key combinations using the End key can also be found on our keyboard shortcut page.
- *Page Down:* Short for Page Down key, the PGDN, PD, PgDn, or Pg Dn key is a key usually located between the keyboard and the numeric pad or on the numeric pad number 3 on most QWERTY U.S. keyboards. When this key is pressed, if the page currently being viewed has more than one page, the page view will be moved down one page.

5.3 VIDEO DISPLAYS

Visual Display Unit (VDU), commonly called as monitor is the main output device of a computer. It consists of a Cathode Ray Tube (CRT), which displays characters as an output. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image (screen resolution) depends upon the number of pixels.

Types of Monitor

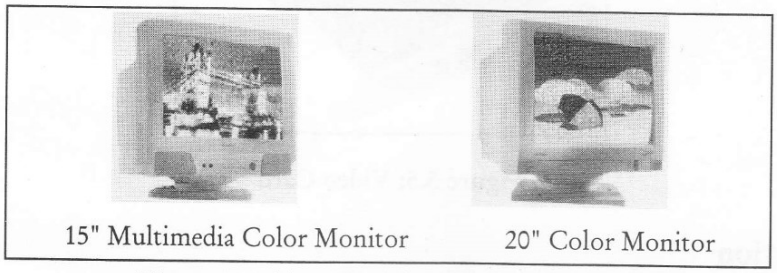
There are different kinds of monitor depending upon the number of pixels they use. The number of pixels per unit area of the monitor is called its resolution. More the resolution better is the quality of the picture. Depending upon the resolution, monitors can be classified as follows:

- CGA (Color Graphics Adapter)
- MDA (Monochrome Display Adapter)

- HGA (Hercules Graphics Adapter)
- EGA (Enhanced Graphics Adapter)
- VGA (Video Graphics Adapter)
- SVGA (Super VGA)

The differences between these monitors are summarized in Table 5.1.

Depending upon the color of display, monitors can be classified as Monochrome (with single color black/white display) and Color (with all colors display) Monitors.



15" Multimedia Color Monitor 20" Color Monitor

Figure 5.3: Two Models of Color Monitors

Table 5.1: Comparison Among Different types of Monitors

Type of Monitor	Display Type	Text Resolution	Graphics Resolution(Pixels)
CGA	Text & Graphics	Fair quality	320 × 200
MDA	Text only	Good quality	-
HGA	Text & Mono Graphics	Fair quality	320 × 200
EGA	Text & Enhanced Graphics	Good quality	640 × 350
VGA	Text & Video Graphics	Much better than all the above	640 × 480
SVGA	Text & Video Graphics	Best quality	1600 × 1280

Monitor: Also called a Video Display Terminal (VDT) a monitor is a video display screen and the hard shell that holds it. In its most common usage, monitor refers only to devices that contain no electronic equipment other than what is essentially needed to display and adjust the characteristics of an image.

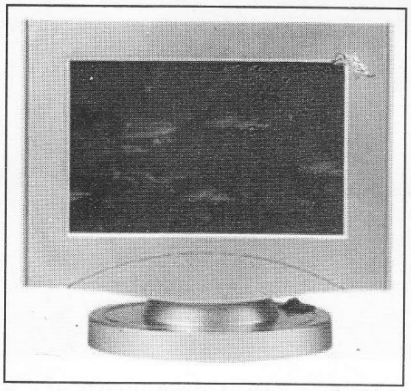


Figure 5.4: Monitor

Video card: Also known as a graphics card, video card, video board, or a video controller, a video adapter is an internal circuit board that allows a display device, such as a monitor, to display images from the computer.

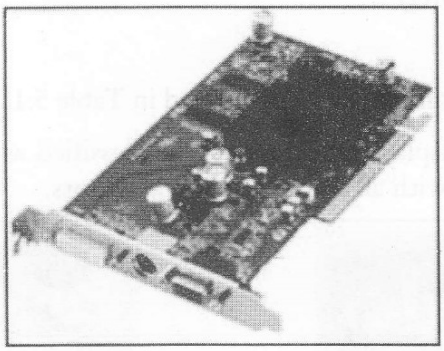


Figure 5.5: Video Card

5.3.1 CRT Deflection

A Cathode Ray Tube (CRT) is a particular vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. The majority desktop computer displays make use of CRTs. The CRT in a computer display is similar to the "picture tube" in a television receiver.

A cathode ray tube consists of several basic components, as illustrated in Figure 5.6. The electron gun produces a narrow beam of electrons. The anodes speed up the electrons. Deflecting coils generate an extremely low frequency electromagnetic field that allows for constant adjustment of the direction of the electron beam. There are two sets of deflecting coils: horizontal and vertical. (In Figure 5.6, only one set of coils is shown for simplicity.) The strength of the beam can be varied. The electron beam produces a tiny, bright visible spot when it strikes the phosphor-coated screen.

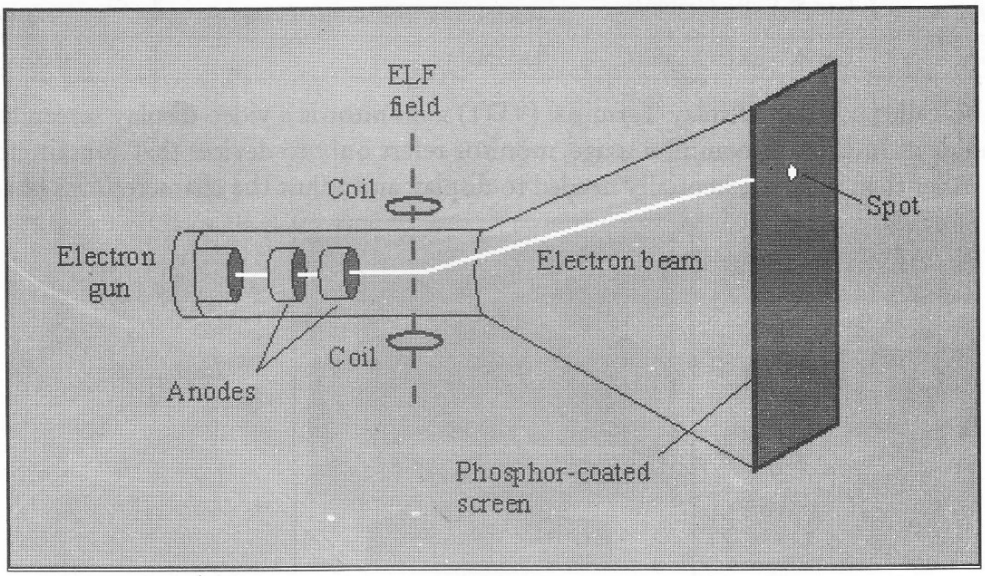


Figure 5.6: Basic Components of CRT

To create an image on the screen, complex signals are applied to the deflecting coils, and also to the equipment that controls the intensity of the electron beam. This causes the spot to race across the screen from right to left, and from top to bottom, in a sequence of horizontal lines called the raster. As viewed from the front of the CRT, the spot move in a pattern like the way your eyes move when you read a single-column page of text. But the scanning takes place at such a rapid rate that your eye sees a constant image over the entire screen.

The figure 5.7 shows only one electron gun. This is classic of a monochrome, or single-color, CRT. However, virtually all CRTs today make color images. These devices have three electron guns, one for the primary color red, one for the primary color green, and one for the primary color blue. The CRT thus creates three overlapping images: one in Red (R), one in Green (G), and one in Blue (B). This is the so-called RGB color model.

In computer systems, there are some display modes, or sets of specifications according to which the CRT operates. The most ordinary specification for CRT displays is known as SVGA (Super Video Graphics Array). Notebook computers typically use liquid crystal display. The skills for these displays are much different than that for CRTs.

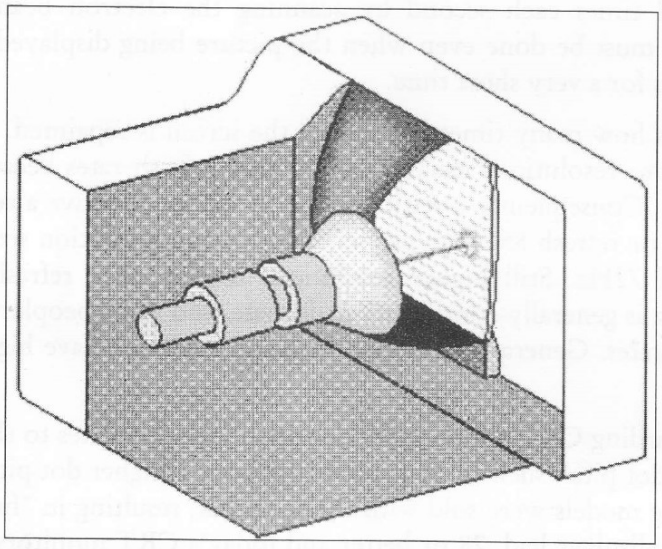


Figure 5.7: Single-color, CRT

Short form of cathode-ray tube, the technology used in most televisions and computer display screens. A CRT works by moving an electron beam back and forth across the back of the screen. Each time the beam makes a pass across the screen, it lights up phosphor dots on the inside of the glass tube, thereby illuminating the active portions of the screen. By drawing many such lines from the top to the bottom of the screen, it creates an entire screenful of images.

CRT stands for cathode ray tube, describing the expertise inside an analog computer monitor or television set. A CRT monitor or TV is readily familiar by its bulky form. LCD monitors and plasma television sets, or flat panel displays, use newer digital technologies.

The CRT monitor generates a picture out of many rows or lines of tiny colored dots. These are technically not the similar thing as pixels, but the terms are often used interchangeably. The more lines of dots per inch, the higher and clearer the resolution. Therefore 1024 × 768 resolutions will be

sharper than 800 × 600 resolutions because the former uses more lines creating a denser, more thorough picture. Higher resolutions are important for displaying the subtle detail of graphics. For text, resolution isn't as significant.

In a CRT monitor there is a picture tube that narrows at the rear into a bottleneck. In the bottleneck is a negative charged filament or cathode enclosed in a vacuum. While electricity is supplied, the filament heats up and a stream or "ray" of electrons pours off the element into the vacuum. The negatively charged electrons are attracted to positively charged *anodes* which focus the particles into three narrow beams, accelerating them to strike the phosphor-coated screen. Phosphor will glow when exposed to any kind of radiation, absorbing ultraviolet light and emitting visible light of fluorescent color. Phosphors that emit red, green and blue light are used in a color monitor, arranged as "stripes" made up of dots of color. The three beams are used to excite the three colors in combinations needed to create the various hues that form the picture.

To exactly direct the beams, copper steering coils are used to create magnetic fields inside the tube. The fields move the electron beams vertically or horizontally. By relating varying voltages to the steering coils, a beam can be positioned at any point on the screen. Each image is highlighted on the screen – and repainted – several times each second by scanning the electron beams across the screen at unbelievable rates. This must be done even when the picture being displayed is unchanging, because the phosphor only glows for a very short time.

The revive rate indicates how many times per second the screen is repainted. Though monitors differ in their capabilities, lower resolutions usually have higher refresh rates because it takes less time to paint a lower resolution. Consequently a setting of 800 × 600 might have a refresh rate of 85Hz, (the screen will be repainted or refresh 85 times per second), while a resolution setting of 1024 × 768 may have a energize rate of 72Hz. Still higher resolutions usually have refresh rates closer to 60Hz. Anything less than 60Hz is generally considered inadequate, and some people will detect "flicker" even with acceptable refresh rates. Generally speaking, high-end monitors have higher refresh rates overall than lower-end models.

A new specification regarding CRT monitors is "dot pitch" which relates to the tightness or sharpness of the picture. A lower dot pitch such as .25 is preferable over a higher dot pitch. In the CRT monitor this was an issue as some models were sold with .32 dot pitch, resulting in "fuzzy" text. By the end of the CRT era, almost all displays had .28 or better and today's CRT monitors can have dot pitches as low as .21.

The CRT monitor comes in 15-inch to 21-inch sizes (38 – 53 cm) and bigger, though the actual viewing screen is about 1 inch (2.5 cm) smaller than the rated size. Screens are measured transversely from corner to corner, including the case.

Cathode Ray Tube or CRT monitors are the aged form of display for PC computer systems. Many of the earliest computers had their displays output to a standard complex video signal to be displayed on a regular TV. As time improves, so did the level of technology used for computer displays. With the advent of LCD flat screen monitors, the days of the CRT monitor are numbered except for specialized request.

CRT Deflection

Magnetic field formers in a Cathode Ray Tube (CRT) deflection yoke for calculating the position of an electron beam in the CRT are secured to and preserved in position on the yoke by means of a foamed

hot melt adhesive. An inert gas such as nitrogen or carbon dioxide is initiated in a volumetrically metered manner into a hot melt adhesive which may be polyethylene, polypropylene or any number of other thermoplastics to form a foamed adhesive containing a large volume of gas bubbles. The foamed hot melt fluid is then deposited between the magnetic field formers and various other portions of the deflection yoke to provide magnetic field former support and yoke strength, eliminate deflection yoke hot spots, dampen out yoke vibration modes, and reduce the cost of the deflection yoke.

5.3.2 Video Amplifier

A video amplifier is used to amplify video from TVs, cameras, computer graphic devices, etc. Away from having sufficient bandwidth and the capability to drive long cables: they cannot invert the signal's polarity; if they did: unless you were using an even number of amplifiers in cascade, the image would end up a negative. If you wanted a gain stage, but didn't want the signal to be inverted, you would drive the emitter instead of the base. This works, but as you might imagine, the input impedance is quite low.

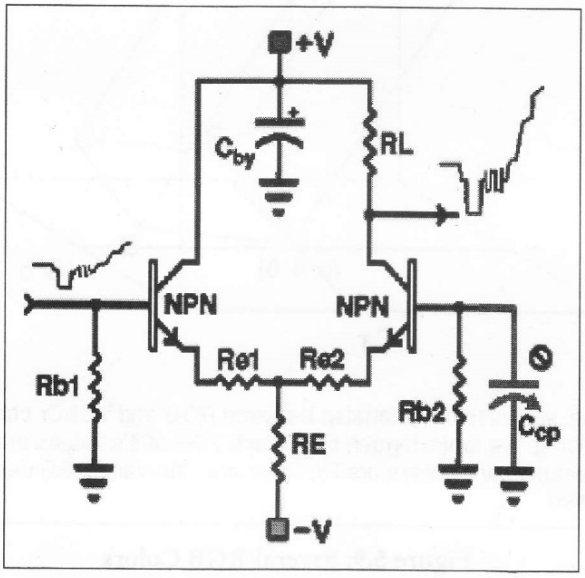


Figure 5.8: Non-inverting Video Amplifier

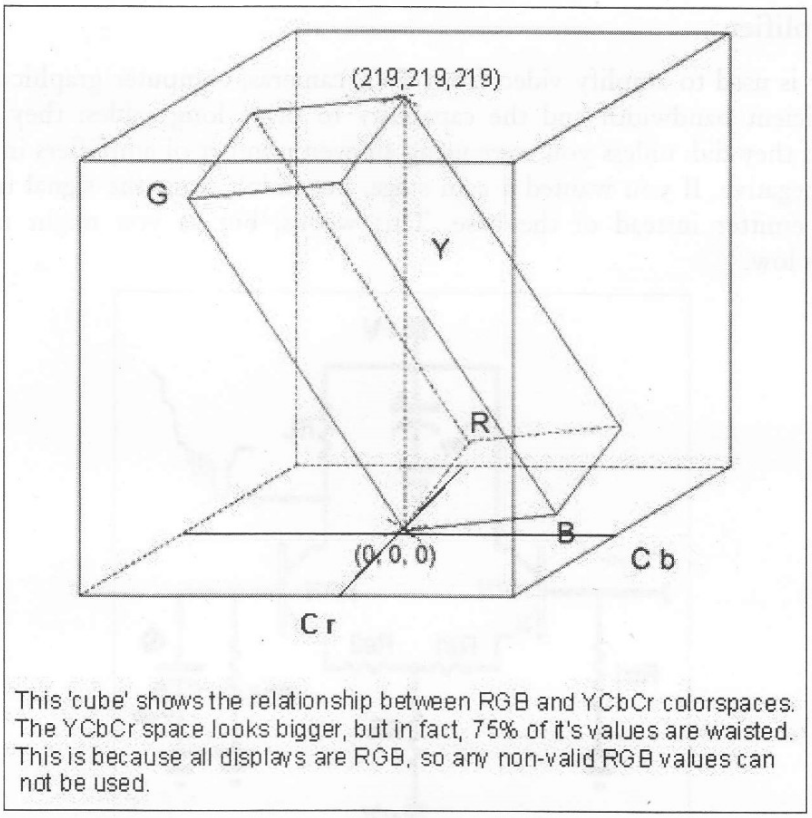
5.3.3 Color Video

Appropriately adjusted color can have as much effect on video quality as an augment in size. The process of basic color correction is simple; adjust the range of black to white (tonality), and the color balance (hue and saturation) so that the image shows clear and bright details. Matches a good standard sample (like a commercial DVD). Looks the way you want it.

Some adjustments can be measured by charts and graphs, but other requires a true preview of the video. The charts and graphs are covered in the tools for adjusting subsection below. If your end product is to be viewed on your PC monitor, preview is easy (as long as you have a reasonably adjusted decent quality monitor). If you are producing for TV viewing, there are no easy answers. You must output your preview to be seen on a TV type monitor. Some ways to do this are to use a graphics card with TV out, a scan converter, DV out to a DV device, or an XCard type of device. If you don't

have one of these, don't give up. The charts, graphs, and a good commercial sample can take you a long way. But a final check on a TV is really a must.

Digital video is symbolized in either *RGB* or in *YCbCr* (often called YUV) color space. A color space is only a way of representing a color. Both the RGB and the YCbCr colorspace formulas contain three variables, also known as components or channels. RGB's are red, green and blue. YCbCr's are Y = luma (or black and white or lightness) and CbCr = chroma (or color), where Cb = Blue minus 'black and white', and Cr = Red minus 'black and white'.



This 'cube' shows the relationship between RGB and YCbCr colorspaces. The YCbCr space looks bigger, but in fact, 75% of it's values are waisted. This is because all displays are RGB, so any non-valid RGB values can not be used.

Figure 5.9: Several RGB Colors

The Figure 5.9 shows that several RGB colors symbolize the same YUV color. This implies that a lossless RGB → YCbCr → RGB is not possible. (Note that the YCbCr value [16,128,128] is translated to [0,0,0].)

Bit depth explains the number of bits used to encode each color channel of the video signal. 8 bits is the consumer standard. This provides for 256 (= 2^8) shades of a given color. While you adjust a given channel (such as red or luma) of a given pixel, you are simply changing the value within a range of 0-255.

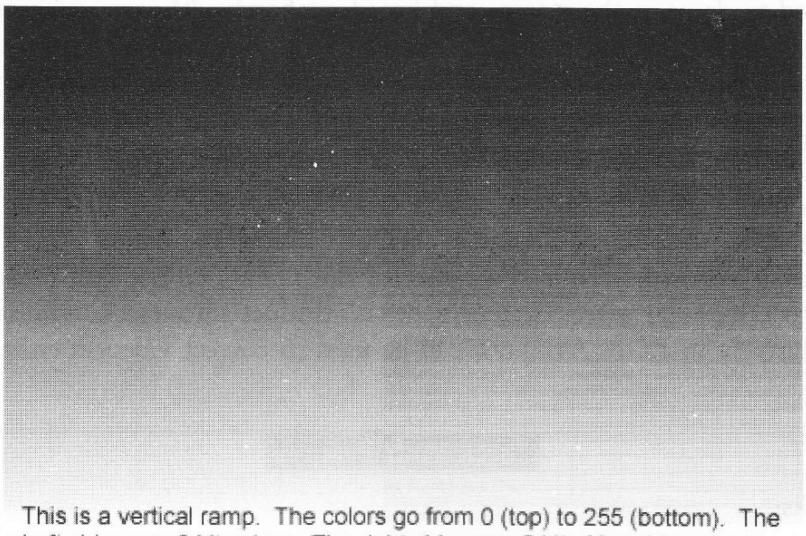


Figure 5.10

Sub sampling is a orientation for keeping less detail for the color components in digital Video. Subsampling is only used in the YCbCr colorspace. 4:2:2 subsampling describes keeping color information (CbCr) for only every other pixel, on every line. YUY2 is a PC storage reference to YCbCr 4:2:2. 4:1:1 is keeping color for every 4th pixel on every line. NTSC DV is 4:1:1 YCbCr. 4:2:0 is keeping color for every other pixel on the odd lines, and no color for the pixels on the even lines. MPEG and PAL DV use YCbCr 4:2:0. YV12 is a PC storage reference to 4:2:0 YCbCr.

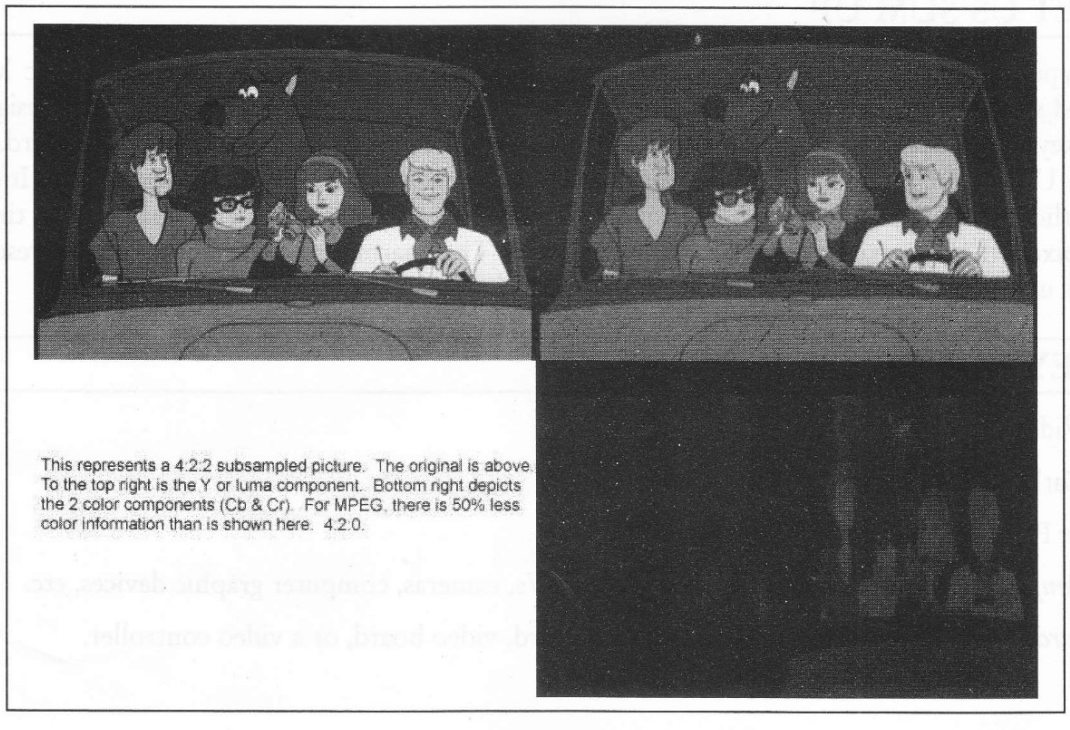


Figure 5.11

Subsampling is used to decrease the storage and broadcast bandwidth requirements for digital video. This is effective for a YCbCr signal because the human eye is more responsive for changes in black and white than for changes in color. So radically reducing the color info shows very little difference. Composite analogue video signals such as PAL YUV or NTSC YIQ, use a similar technique to reduce analog storage and broadcast requirements.

Though you can capture an analogue source in a few different formats, YUY2 is the most sensible. This is because the analogue source is already in a YCbCr like format (namely YUV for PAL and YIQ for NTSC), and YUY2 provides the least amount of sub sampling. You can perform corrections in either the RGB or YUY2 color space. Each provides it's distinct advantages and disadvantages. Virtual Dub operates exclusively in RGB. AviSynth can be used to correct video in either RGB or YCbCr (YUY2).

Check Your Progress

Fill in the blanks:

1. Most typewriters and computer keyboards are ..... keyboards.
2. A program is capable of not only using each of the ..... keys, but also combining the function keys with the ALT and/or CTRL keys.
3. A ..... key found on a computer keyboard often located close to the keyboard pause key.
4. Visual Display Unit (VDU), commonly called as ..... is the main output device of a computer.

5.4 LET US SUM UP

Most typewriters and computer keyboards are QWERTY KEYBOARDS. The alphabetic keys are arranged so that the upper-left row of letters begins with the six letters Q W E R T Y. Designers of other keyboards claim that their boards are easier to learn than the QWERTY keyboard. Visual Display Unit (VDU), commonly called as monitor is the main output device of a computer. It consists of a Cathode Ray Tube (CRT), which displays characters as an output. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image (screen resolution) depends upon the number of pixels.

5.5 KEYWORDS

VDU: Video Display Unit

CRT: Cathode Ray Tube

Prt Scrn: Print Screen Key

Video Amplifier: It is used to amplify video from TVs, cameras, computer graphic devices, etc.

Video card: Also known as a graphics card, video card, video board, or a video controller.

5.6 QUESTIONS FOR DISCUSSION

1. Explain the various peripheral devices used for input and output operation.
2. What is the use of function keys in keyboard?
3. What is the difference between Page up and Page down control keys?
4. Discuss video display unit with an example and diagram.
5. Describe the role of CRT (Cathode Ray Tube) in video display.

Check Your Progress: Model Answers

1. QWERTY
2. Function
3. Scroll lock
4. Monitor

5.7 SUGGESTED READINGS

William Stallings, *Computer Organization and Architecture*, 6th edition, Pearson Education, 2002.

A.S.Tannenbaum, *Structured Computer Organization*: Prentice-Hall of India, 1999.

R. P. Beales, *PC Systems, Installation and Maintenance*, Second Edition.

Ron Gilster, *PC Upgrade and Repair Black Book.*

Peter Norton's, *Inside the PC.*

LESSON

6

IBM PC DISPLAY

CONTENTS

6.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Explain the concept printers
- Discuss interface standards
- Describe the significance of modems
- Identify and explain the acoustic couplers

6.1 INTRODUCTION

The IBM PC Model 5150 was initially introduced in August 1981. Price at Introduction: $1,995.00. Standard Memory: 16k bytes. Built at a new, automated factory in Boca Raton, Fl. Initially introduced with a massive (insert many smilies here!) 16k of memory, (expandable to 64k on the main board) monochrome (green) display capable of only rudimentary line-character graphics, a cassette I/O port

for program storage, and a price tag just under $2000.00US, this machine set the bar for the second age of the personal computer.

Comments from James Willigen: "Yes, the creature from Boca! The beginning of the end for the first age of the personal computer. Initially introduced with a massive (insert many similes here!) 16k of memory, (expandable to 64k on the main board) monochrome (green) display capable of only rudimentary line-character graphics, a cassette I/O port for program storage, and a price tag just under $2000.00US, this machine set the bar for the second age of the personal computer. The basic machine had no I/O capability beyond its keyboard, display, and cassette data port, but it did seem to have two things going for it... You did not have to build it, and it had a name tag - I.B.M. However, it did come with some baggage associated with its parentage... Add-on items (memory, floppy drives, etc.) cost a lot! And IBM did not want to tell you anything about the machine. The prime example of this was the 40 pin socket located next to the 8088 microprocessor. While it was generally accepted that this socket was destined for the 8087 math co-processor that Intel had developed as a companion to the 8086/8088 microprocessors, IBM went out of their way to deny this and warn (in no uncertain terms) that should you ever plug something into this socket it would bring death and destruction to your poor unsuspecting computer (not to mention that it would void your warranty).

Perhaps its saving grace was that the specification for the expansion bus was made available and this allowed the rapid development of third-party add-on cards that were compatible with the unit. Once that began, the march to fully compatible 'clones' was inevitable. (in a rapid repeat of the history that surrounded the 'Altair'). This lesson describes display attributes for text-based environments or for text emulation within a graphical environment. It does not relate to graphical objects or text within graphical objects.

6.2 IBM PC DISPLAY

Text Attributes

Every time a text character is displayed on the terminal it has a set of attributes associated with it which describes how the text character appears on the screen. The character might show in color with specific foreground and background colors; it might appear as brighter as or dimmer than normal text, with upturned foreground and background colors, flashing or some other attributes. The attributes obtainable depend on the hardware and software associated with the terminal, but many usually available attributes can be displayed by a portable COBOL application without any knowledge of the physical terminal characteristics.

The COBOL programs can display text with these attributes using COBOL ACCEPT and DISPLAY statements that identify the attributes in associated clauses. COBOL programs can also specify display attributes via various call interfaces, such as that for Panels.

Attribute Encoding

While specifying attributes via a call interface, it is convenient to encode the attributes for each text character into a corresponding attribute byte. In the IBM PC setting, the one-byte encoding is interpreted directly by the hardware. In the UNIX environment, the COBOL RTS interprets the attribute byte and controls the terminal via the term info entry values for the terminal.

The screen attribute is the abstract attribute byte that is associated with a particular text character, one for each character position on the screen. Some call interfaces have a physical array of screen attributes that can be set straight.

Whenever Adis accesses the screen or Panels it inform the screen attribute for each text character referenced. If the ACCEPT or DISPLAY statement state any attributes for the referenced text then those are used for the screen attributes. If no attributes are precise, then Adis uses the default RTS attribute or the user attribute, if permit, for the screen attribute for each referenced text character. If Adis clears the screen, for example using the BLANK SCREEN clause, or when Panels initializes a panel or a scrolled line, the screen attributes are set to the default or user attribute.

6.2.1 Types of Encoding

There are four types of encoding for the attribute byte:

1. Ordinary PC monochrome attributes encoding. This is the default encoding on DOS, Windows and OS/2 for systems with a monochrome display.
2. Normal PC color attributes encoding. This is the default encoding on DOS, Windows and OS/2 for systems with a color display.
3. Default UNIX monochrome attribute encoding. This is the default encoding on UNIX in spite of whether the term info description for the terminal specifies color or not.
4. User chosen or generic attributes encoding for all types of display.

6.3 PRINTERS

Printer is the most important output device, which is used to print information on paper. The output is called hard copy. Printers are essential for getting output of any computer-based application. An external hardware device responsible for taking computer data and generating a hard copy of that data. Printers are one of the most used peripherals on computers and are commonly used to print text, images, and/or photos.

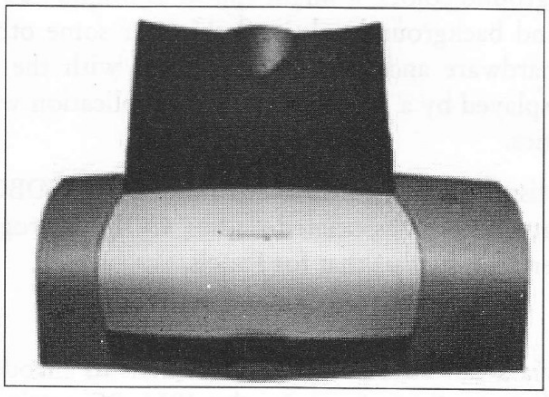


Figure 6.1: Printer

6.3.1 Types of Printers

There are many types of printers, which are classified based on various criteria as illustrated in Figure 6.2. Printers can be broadly categorized into the following two types:

Impact Printers

The printers that print the characters by striking against the ribbon and onto the paper are called Impact Printers. These printers are of two types – (i) Character; and (ii) Line printers.

- ***Character Printers:*** These printers print one character at a time. These printers are again of two types - Daisy Wheel and Dot Matrix Printers.
  - *Daisy Wheel Printers:* These printers print the characters by a mechanism that uses a plastic or metal hub with spokes, called daisy wheel. The characters are embossed on the radiating spokes and printed by striking these spokes against the ribbon and paper. Daisy Wheel printers give a good quality but they are more expensive than Dot Matrix printers.
  - *Dot Matrix Printers:* These printers print the characters by putting dots onto the paper. They do not give better printing quality than daisy wheel printers, but are faster in speed. The printing speed of a dot matrix printer can be up to 360 cps (characters per second). They are widely used with microcomputers in most of the offices.
- ***Line Printers:*** These printers print one line at a time. Their printing speed is much more than character printers. They are again of two types - Drum Printers and Chain Printers.
  - *Drum Printers:* These printers print the line by a rotating drum having a ring of characters for each print position. The hammers strike each character of the drum simultaneously, so that entire line is printed for one full rotation of the drum. These printers are also called as Barrel Printers. The printouts obtained from these printers, have even character spacing but uneven line height.
  - *Chain Printers:* These printers print the line by a rotating chain having ring characters for each print position. Their printing mechanism is similar to drum printers. The printouts obtained from these printers, have uneven character spacing but even line height.

Non-Impact Printers

The printers that print the characters without striking against the ribbon and onto the paper are called Non-Impact Printers. These printers print a complete page at a time, therefore, also called as Page Printers. Page printers are of three types– (i) Laser Printers, (ii) Ink Jet Printers, and (iii) Thermal Printers.

- ***Laser Printers:*** These printers look and work like photocopiers. They are based on laser technology, which is the latest development in high speed & high quality printing. In these printers, a laser beam is used to write the image on a paper. First, the image is formed by electrically charging thousands of dots on a paper by laser beam. Then, the paper is sprayed with a toner having the opposite charge and is passed over a heated roller to make the image permanent.

  Laser printers are very popular and have become an essential part of Desk Top Publishing (DTP). Although laser printers are costlier than dot matrix, they are generally preferred in all offices due to their high quality of printing. There are many models of laser printers depending upon the speed and number of dots printed. The latest model of laser printer is 1200 DPI (Dots Per Inch), which can print 10 pages/minute. Some high-speed laser printers give a speed of up to 100 pages/minute.

- *Ink Jet Printers:* These printers print the characters by spraying the paper with electrically charged ink. These printers give better quality than character printers but not better than laser printers. They are cheaper than laser printers, hence used widely in many offices. They also offer an option of using color cartridges for multi-color printing.
- *Thermal Printers:* These printers print the characters by melting a wax-based ink off a ribbon onto a special heat sensitive paper. They give Letter-quality printing but are relatively expensive in maintenance than other printers.

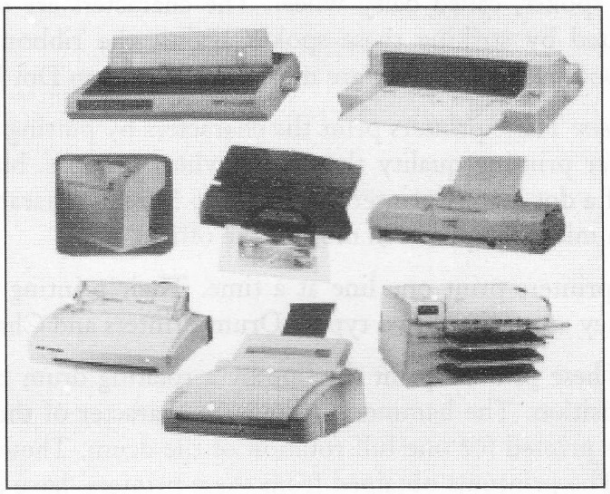


Figure 6.2: Various Types of Printers

6.3.2 Classification of Printers

Printers are also classified by the following characteristics:

- *Quality of type:* The output produced by printers is said to be either letter quality (as good as a typewriter), near letter quality, or draft quality. Only daisy-wheel, ink-jet, and laser printers produce letter-quality type. Some dot-matrix printers claim letter-quality print, but if you look closely, you can see the difference.
- *Speed:* Measured in characters per second (cps) or pages per minute (ppm), the speed of printers varies widely. Daisy-wheel printers tend to be the slowest, printing about 30 cps. Line printers are fastest (up to 3,000 lines per minute). Dot-matrix printers can print up to 500 cps, and laser printers range from about 4 to 20 text pages per minute.
- *Impact or non-impact:* Impact printers include all printers that work by striking an ink ribbon. Daisy-wheel, dot-matrix, and line printers are impact printers. Non-impact printers include laser printers and ink-jet printers. The important difference between impact and non-impact printers is that impact printers are much noisier.
- *Graphics:* Some printers (daisy-wheel and line printers) can print only text. Other printers can print both text and graphics.
- *Fonts:* Some printers, notably dot-matrix printers, are limited to one or a few fonts. In contrast, laser and ink-jet printers are capable of printing an almost unlimited variety of fonts. Daisy-wheel printers can also print different fonts, but you need to change the daisy wheel, making it difficult to mix fonts in the same document.

6.4 INTERFACE STANDARDS

In telecommunications, an interface standard is a standard that explain one or more functional characteristics (such as code conversion, line assignments, or protocol compliance) or physical characteristics (such as electrical, mechanical, or optical characteristics) essential to allow the exchange of information between two or more (usually different) systems or pieces of equipment. An interface standard may comprise operational characteristics and acceptable levels of performance. In the military community, interface standards allow command and control functions to be performed using communication and computer systems.

Small Computer System Interface, or SCSI, is a set of standards for actually connecting and transferring data between computers and peripheral devices. The SCSI standards describe commands, protocols, and electrical and optical interfaces. SCSI is mainly used for hard disks and tape drives, but it can connect a wide range of other devices, as well as scanners and CD drives. The SCSI standard defines command sets for specific peripheral device types; the occurrence of "unknown" as one of these types means that in theory it can be used as an interface to almost any device, but the standard is highly pragmatic and addressed toward commercial requirements.

SCSI is an intellectual, peripheral, buffered, peer to peer interface. It hides the complexity of physical format. Every device attaches to the SCSI bus in a related manner. Up to 8 or 16 devices can be attached to a single bus. There can be any number of hosts and peripheral devices but there should be at least one host. SCSI uses hand shake signals between devices, SCSI-1, SCSI-2 have the option of equality error checking. Starting with SCSI-U160 (part of SCSI-3) all commands and data are error checked by a CRC32 checksum. The SCSI protocol classifies communication from host to host, host to a peripheral device, and peripheral device to a peripheral device. Though most of the peripheral devices are exclusively SCSI targets, incapable of acting as SCSI initiators—unable to initiate SCSI transactions themselves. Consequently peripheral-to-peripheral communications are uncommon, but possible in most SCSI applications.

A hard drive interface signifies the connection method used by the hard drive to communicate with the computer. A computer's performance is openly related to the speed of the hard drive unit, so the development of hard drive interface standards symbolize a key element in the PC evolution process. Speed and ease of use were the two main things the producers kept in mind when developing new interface standards.

Heritage

The primary hard drive interfaces were the so called hard-cards. These cards consisted of a hard drive mounted directly on a controller board which was inserted into an ISA port. Their main advantage was their ease of mount, as you just had to insert the whole hard-card into a free ISA slot.

Development

At one point, manufacturers understand that they didn't have to keep the hard drive on the board, and that's how the ATA emerged. IBM first used it in 1986. The name ATA comes from their IBM PC/AT computer, ATA standing for AT Attachment. They enthused the hard drive away from the board and integrated the controller into the drive, connecting the drive to the board with a 40-pin cable.

- *ATA*

  Diverse standards meant different speeds. Starting with the first generation of ATA, which only gave a 4.3 Mb/s data-transfer rate, the speeds kept increasing. Future versions of ATA reached 13.3 Mb/s, 16.6 Mb/s, 33 Mb/s, 66 Mb/s, 100 Mb/s, and finally 133 Mb/s with the last version. After the last ATA version, formerly known as ATA7, the SATA Standard was introduced by the Serial ATA Working Group in 2002.

- *SATA*

  The SATA Standards used only a 4-pin cable but their speeds were much superior compared to the ATA standard. The first version of SATA gave speeds of 150 Mb/s, while the next generation went up to a 300 Mb/s transfer rate. The third generation, released in 2009, brings a transfer rate of 600 Mb/s. A immense feature introduced with the SATA Standard is the ability to hot-swap, which meant a hard drive could be added or removed without having to shut down the PC.

- *SCSI*

  Another standard, begin in the same period as the ATA, is the SCSI interface. Delivering higher speeds and performance than the ATA, SCSI was frequently used at that time by enterprises because of its higher price.

6.5 MODEMS

The local loop

The use of both analog and digital transmission for a computer to computer call. Conversion is done by the modems and codes.

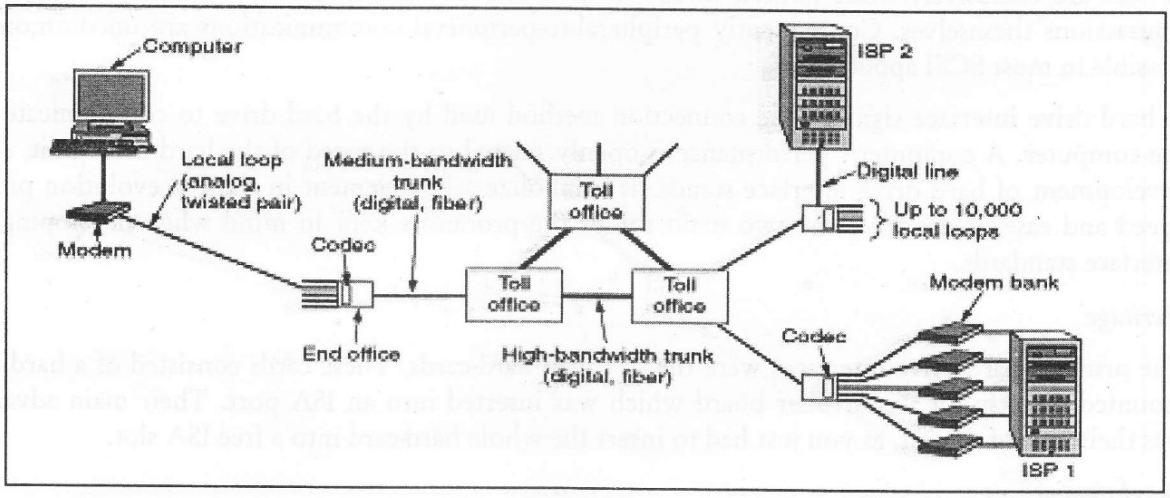


Figure 6.3

Modems

- To transmit signals over the local loop, a continuous tone in the 1000 to 2000 Hz range is used, called a **sine wave carrier**. There are three ways of modulating it (to transmit information):
- ***Amplitude modulation:*** Two different voltage levels are used to represent 0 and 1, respectively.
- ***Frequency modulation:*** Two (or more) different tones are used.

- *Phase modulation:* The carrier wave is systematically shifted certain degrees at uniformly spaced intervals.

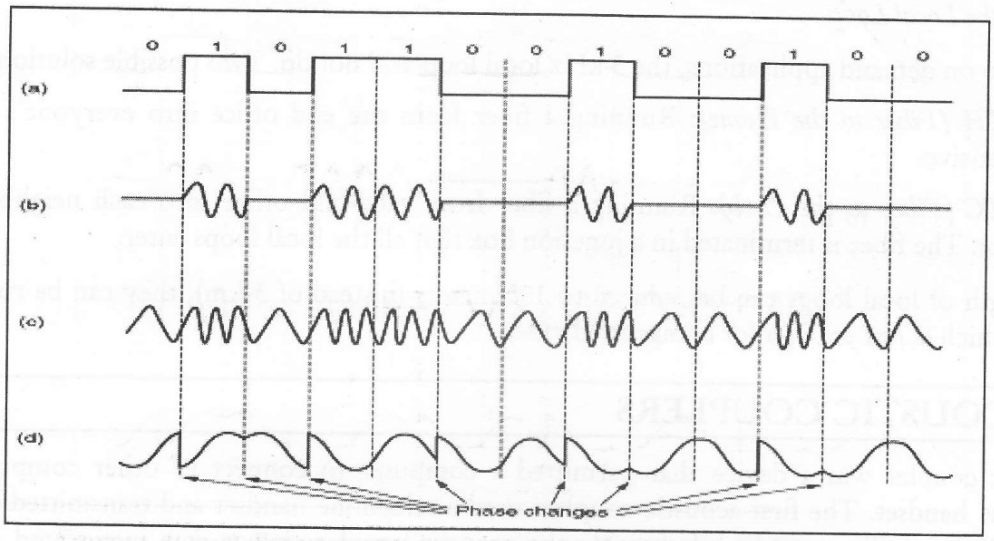


Figure 6.4: (a) A Binary Signal (b) Amplitude Modulation (c) Frequency Modulation (d) Phase Modulation

A **modem** (modulator-demodulator) is a device which accepts a serial stream of bits as input and produces a modulated signal as output (or vice versa). It is inserted between the digit computer and the analog telephone system.

Most advanced modems use a combination of modulation techniques to transmit multiple bits per baud. Over a standard 2400-baud line, a modem can run at the following speeds:

- 9600 bps (a V.32 modem) by transmitting 4 bits per baud.
- 14,400 bps (a V.32 bis modem) by transmitting 6 bits per baud.
- 28,800 bps (a V.34 modem) by transmitting 12 bits per baud.

Many modems now have compression (e.g., run-length encoding) and error correction built into the modems to improve the effective data rate without requiring any changes to existing software.

RS-232-C and RS-449

The interface between the computer (or terminal) and the modem is an example of a physical layer protocol.

The RS-232-C (or V.24) standard:

Mechanical specification: the sizes and numbering of the 25 pin connector.

Electrical specification: 1: -3 volts. 0: +4. Data rates: 20 kbps. Cable length: 15 meters.

Functional specification: which circuits are connected to which pins.

specification: the legal sequence of events (protocol). Based on action-reaction pairs.

connected using RS-232-C but with a **null modem**, which connects the transmit ceive line of the other.

RS-449 is a new standard which was introduced to overcome the limitations of the RS-232-C standard, e.g., data rates up to 2 Mbps over 60 meter cables.

Fiber in the Local Loop

For video on demand applications, the 3-kHz local loop will not do. Two possible solutions:

5. *FTTH (Fiber to the Home):* Running a fiber from the end office into everyone's house. Too expensive.
6. *FTTC (Fiber to the Curb):* Running a fiber from each end office into each neighborhood (the curb). The fiber is terminated in a junction box that all the local loops enter.

The length of local loops can be reduced to 100 meters (instead of 3 km), they can be run at about 1 Mbps, which is just enough for compressed video.

6.6 ACOUSTIC COUPLERS

Acoustic coupler was a device that permitted a computer to connect to other computers using a telephone handset. The first acoustic couplers used a telephone handset and transmitted at a speed of up to 300 baud. To transmit information the acoustic coupler change data into sound signals sends those signals over the phone line, and then the receiving acoustic coupler interpreted those signals.

Nowadays, to transmit data over phone lines customers use a modem instead of the acoustic coupler because of the dependability, speed, and ease of use. Although acoustic couplers are not commonly used today, they may still a solution for travelers who do not have access to a modem or network connection.

A device against which a telephone handset is placed to connect a computer with a network. The acoustic coupler might also contain a modem, or the modem could be a separate device.

Figure 6.5: Acoustic Couplers

Admired in the 1970s, acoustic couplers are no longer widely used. Nowadays, telephones connect directly to a modem via modular telephone connectors. This creates better connections than acoustic couplers and avoids the problems produced by irregularly shaped telephones. Still, acoustic coupler modems are useful in some situations, such as in hotel rooms where the telephone cable is anchored to the wall. Modems that do not use an acoustic coupler are sometimes called direct-connect modems.

An acoustic coupler is a device which sends and receives computer data during a telephone line using sounds rather than electrical signals. The devices were popular in the early days of internet use when

traditional modems were not always practical. Today, they are mainly seen in countries with less advanced telecommunications networks and in equipment used by deaf people to make telephone calls.

At one time, it was not possible in many places to use a standard modem which plugged into a telephone wall socket. This could sometimes be a physical problem where telephone cables went directly into the wall, meaning there was no socket. In other cases, there were laws banning anyone from connecting electrical equipment directly into the phone system.

An acoustic coupler is a hardware device that allow a modem (a device that converts signals from analog to digital and from digital back to analog) to connect to a voice circuit. A handset adapter is used to receive modem tones through the handset's mouthpiece, and the earpiece is used to transmit these tones to the modem.

Check Your Progress

State weather the following statements are true or false:

1. Whenever a text character is displayed on the terminal it has a set of attributes associated with it which describes how the text character appears on the screen.
2. The printers that print the characters by striking against the ribbon and onto the paper are called Drum Printers.
3. Small Computer System Interface, or SCSI, is a set of standards for physically connecting and transferring data between computers and peripheral devices.
4. In Amplitude modulation two different voltage levels are used to represent 0 and 1, respectively.

6.7 LET US SUM UP

Whenever a text character is displayed on the terminal it has a set of attributes associated with it which describes how the text character appears on the screen. The character might appear in color with specific foreground and background colors; it might appear as brighter as or dimmer than normal text, with reversed foreground and background colors, flashing or some other attributes. An external hardware device responsible for taking computer data and generating a hard copy of that data. Printers are one of the most used peripherals on computers and are commonly used to print text, images, and/or photos. In telecommunications, an **interface standard** is a standard that describes one or more functional characteristics (such as code conversion, line assignments, or protocol compliance) or physical characteristics (such as electrical, mechanical, or optical characteristics) necessary to allow the exchange of information between two or more (usually different) systems or pieces of equipment. Acoustic coupler was a device that allowed a computer to connect to other computers using a telephone handset.

6.8 KEYWORDS

SCSI: Small Computer System Interface

Acoustic Coupler: It was a device that allowed a computer to connect to other computers using a telephone handset.

Sine Wave Carrier: To transmit signals over the local loop, a continuous tone in the 1000 to 2000 Hz range.

Printer: An external hardware device responsible for taking computer data and generating a hard copy of that data.

6.9 QUESTIONS FOR DISCUSSION

1. Explain the PC Display of IBM.
2. What is the difference between impact and non-impact printers?
3. Explain how printers are classified by there characteristics.
4. What are interface standards and acoustic couplers?

Check Your Progress: Model Answers

1. True
2. False
3. True
4. True

6.10 SUGGESTED READINGS

William Stallings, *Computer Organization and Architecture*, 6th edition, Pearson Education, 2002.

A.S.Tannenbaum, *Structured Computer Organization*: Prentice-Hall of India, 1999.

R. P. Beales, *PC Systems, Installation and Maintenance*, Second Edition.

Ron Gilster, *PC Upgrade and Repair Black Book.*

Peter Norton's, *Inside the PC.*

UNIT IV

LESSON

7

SETUP SERVING AND CUSTOMER RELATIONS

CONTENTS

7.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Explain the concept of setup servicing and customer relations
- Discuss PC XT configuration
- Describe the switch setting
- Identify and explain the cables and connections
- Discuss the various operations
- Explain the power on self test and preventive maintenance

7.1 INTRODUCTION

This is an interactive program that allows users to specify the attached hardware and to set various parameters with which the PC must run. One can invoke this program by pressing some predefined key - very often DEL key or F10 key. If you do not run the program yourself, it will be skipped.

The data about the parameters of the PC are stored in a type of memory called CMOS (Complementary Metal Oxide Semiconductor). It is this set of data that the PC uses while running POST program. CMOS loses the data stored in it when power is switched off. Therefore, an internal battery is provided to it on the motherboard.

Customer Relationship Management (CRM) is a widely-implemented strategy for managing a company's interactions with customers, clients and sales prospects. It involves using technology to organize, automate, and synchronize business processes—principally sales activities, but also those for marketing, customer service, and technical support. The overall goals are to find, attract, and win new clients, nurture and retain those the company already has, entice former clients back into the fold, and reduce the costs of marketing and client service. Customer relationship management describes a company-wide business strategy including customer-interface departments as well as other departments.

7.2 PC XT CONFIGURATION

The IBM PC/XT (also written PC-XT or PC XT), usually referred to as the XT, was IBM's successor to the original IBM PC. It was unconfined on March 8, 1983, and was one of the first computers to come standard with a hard drive. The XT at first came with 128K of memory, a 360K double-sided 5 1/4" full-height floppy disk drive, and a 10M hard drive, a serial port, eight 8-bit ISA growth slots (although three were taken up by the floppy drive adapter, the hard drive adapter, and the serial card), and Intel 8088 microprocessor (with a socket for an 8087 math coprocessor). Later models came with 256K of memory standard, and finally models with 640K and a 20M hard drive were sold.

The XT initially came only in a standard configuration with the hard disk. It was not until 1985 that a model without the hard drive became available. Other models came with two half-height floppy drives as well as the hard drive.

Like the original PC, the XT came with a BASIC interpreter in ROM. Since this predictor was meant to be used with a cassette drive (which wasn't offered on the XT), the only ways to access it were by separate all of the disk drives, or using the BASICA program, included on a floppy disk, which added extensions for using the disk drives.

The IBM Personal Computer XT, frequently shortened to the IBM XT, PC XT, or simply XT, was IBM's successor to the unique IBM PC. It was released as IBM product number 5160 on March 8, 1983, and came standard with a hard drive. It was based on basically the same architecture as the original PC, with only incremental improvements; new 16-bit bus architecture would follow in the AT. The XT was mostly intended as an enhanced machine for business use, and a matching 3270 PC featuring 3270 terminal emulation was released later in October 1983. XT stands for X-tended Technology.

The normal XT originally came with 128kB of memory, a 360kB double-sided 5.25" full-height floppy disk drive, a 10MB Seagate ST-412 hard drive with Xebec 1210 MFM controller, an Asynchronous Adapter (serial card with 8250 UART) and a 130W PSU. The motherboard had eight 8-bit ISA development slots, and an Intel 8088 microprocessor running at 4.77 MHz (with a socket for an 8087 math coprocessor); the operating system typically sold with it was PC-DOS 2.0 and above. The eight expansion slots were an enlarge over the five in the IBM PC, although three were taken up by the floppy drive adapter, the hard drive adapter, and the Async card. The essential specification was soon upgraded to have 256kB of memory as standard. Slot 8 on the XT motherboard was wired slightly different than the other slots, making it mismatched with some cards. This was done for cards designed

to allow the XT to be connected to IBM mainframes. Video cards originally comprised the MDA and CGA, with EGA and PGC becoming available in 1984.

There were two extensively used configurations of the XT motherboard. The first could support up to 256kB on the motherboard itself (four banks of 64kB chips), with a maximum of 640kB achieved by using expansion cards. This was the pattern the XT originally shipped in. The next configuration – introduced in stock units in 1986 – could support the whole 640kB on the motherboard (two banks of 256kB chips, two banks of 64kB), had the later revision AT-compatible BIOS with a earlier booting time, as well as support for 101-key keyboards and 3.5" floppy drives. The previous configuration could be adapted to 'late' configuration after a couple of minor modifications.

There were also two or three review of the motherboard; however there is only minor disparity between them. Most prominent is that the first revision is missing U90 and has some parts located at another place on the motherboard.

Launched in 1985, the XT was obtainable in floppy-only models without a hard disk (sub model 068 and 078). XTs with the 256kB-640kB motherboard configuration came normal with half-height floppy drives in place of the full-height drives, as well as the alternative for a 20MB ST-225 half-height hard disk and 'enhanced' keyboard (essentially a Model M without the LED panel, and cross-compability between the AT and XT keyboard transfer protocol). The XT was discontinued in the spring of 1987, replaced by the PS/2 Model 30.

7.3 SWITCH SETTINGS

Net Profile Switch is a network switcher, aka network settings administrator for notebook/laptop users. It switches between network settings (profiles) on the fly, keeping notebook users from having to reconfigure their network settings every time (browser settings, printer settings etc).

A network profile includes:

- Network settings (IP address, DNS, gateway)
- Web browser proxy settings (supports IE, Firefox and Opera)
- Network drive mappings
- Default printer
- SMTP-server for email software and many more
- Switch between network configurations.

For instance you can switch a laptop computer between two networks: one with a fixed IP address and another with a DHCP assigned IP address. Or switch one static IP address to another. Switch a proxy server, switch SMTP-server and more.

Switch a notebook/laptop among multiple networks with this network switcher.

This network profile executive is ideal for mobile people that connect to different networks all the time. Assume you have a DHCP-enabled network at your office, and a static IP address allocate to your network card at home. Moreover, you have a web proxy server in your office and no proxy at home. Every time you connect your notebook or laptop to a new local network you have to change

the network-adapter settings and switch proxy settings physically. But, wouldn't it be easier to store two profiles (called "office" and "home") and switch between networks with one click?

If you deal with two or more network position, you can benefit from this network switcher utility that creates a profile with your configuration settings. Then you can easily switch between locations by activating a profile without restarting.

7.4 CABLES AND CONNECTIONS

Terminal Blocks and PCB Terminals

Terminal blocks are frequently supplied in 12-way lengths but they can be cut into smaller blocks with a sharp knife, large wire cutters or a junior hacksaw. They are now and then called 'chocolate blocks' because of the way they can be easily cut to size.

PCB mounting terminal blocks offer an easy way of making semi-permanent connections to PCBs. Many are designed to interlock to provide more connections.

Crocodile Clips

The 'standard' crocodile clip has no cover and a screw contact. Though, small insulated crocodile clips are more suitable for many purposes including test leads. They have a solder contact and lugs which fold down to grip the cable's insulation, increasing the strength of the joint. Remember to feed the cable through the plastic cover *before* soldering! Add and remove the cover by fully opening the clip, a piece of wood can be used to hold the jaws open.

4mm Plugs, Sockets and Terminals

These are the average single pole connectors used on meters and other electronic equipment. They are able for passing high currents (typically 10A) and most designs are very robust. Shrouded plugs and sockets are available for use with high voltages where there is a risk of electric shock. A wide variety of colours is available from most suppliers.

Plugs

Plugs may have a screw or solder terminal to hold the cable. Ensure if you need to thread the cable through the cover before connecting it. Some plugs, such as those exposed, as 'stackable' which means that they include a socket to accept another plug, allowing several plugs to be connected to the same point - a very useful feature for test leads.

Sockets

These are typically described as 'panel mounting' because they are designed to be fitted to a case. Most sockets have a solder contact but the picture shows other options. Fit the socket in the case before attaching the wire otherwise you will be unable to add the mounting nut.

Terminals

In totaling to a socket these have provision for attaching a wire by threading it through a hole (or wrapping it around the post) and tightening the top nut by hand. They usually have a threaded stud to fit a solder tag inside the case.

2mm Plugs and Sockets

These are minor versions of the 4mm plugs and sockets, but terminals are not readily available. The plugs demonstrate are stackable. In spite of their small size these connectors can pass large currents and some are rated at 10A.

DC Power Plugs and Sockets

These 2-pole plugs and sockets make sure that the polarity of a DC supply cannot be accidentally reversed. The normal sizes are 2.1 and 2.5mm plug diameter. Standard plugs have a 10mm shaft; 'long' plugs have a 14mm shaft. Sockets are obtainable for PCB or chassis mounting and most include a switch on the outer contact which is normally used to disconnect an internal battery when a plug is inserted.

Miniature versions with a 1.3mm diameter plug are used where small size is essential, such as for personal cassette players.

Jack Plugs and Sockets

These are planned for audio signals so mono and stereo versions are available. The sizes are resolute by the plug diameter: ¼" (6.3mm), 3.5mm and 2.5mm. The 2.5mm size is only available for mono.

Screened plugs have metal bodies connected to the COM contact. Most connections are soldered, remember to thread cables through plug covers *before* soldering! Sockets are designed for PCB or chassis mounting.

¼" plug connections are similar to those for 3.5mm plugs. ¼" socket connections are COM, R and L in that order from the mounting nut, ignore R for mono use. Most ¼" sockets have switches on all contacts which open as the plug is inserted so they can be used to isolate internal speakers for example.

Plugs have a lug which should be folded down to grip the cable's insulation and increase the strength of the joint. 3.5mm mono sockets have a switch contact which can be used to switch off an internal speaker as the plug is inserted. Ignore this contact if you do not require the switching action.

Phono Plugs and Sockets

These are used for screened cables moving audio and video signals. Stereo connections are made using a pair of phono plugs and sockets. The centre contact is for the signal and the outer contact for the screen (0V, common). Screened plugs have metal bodies connected to the outer contact to give the signal additional protection from electrical noise. Sockets are available for PCB or chassis mounting, singly for mono, or in pairs for stereo. Line sockets are available for making extension leads.

Coax Plugs and Sockets

These are comparable to the phono plugs and sockets described above but they are designed for use with screened cables carrying much higher frequency signals, such as TV aerial leads. They provide better screening because at high frequencies this is essential to reduce electrical noise.

BNC Plugs and Sockets

These are intended for screened cables carrying high frequency signals where a factual and noise free signal is necessary, for example oscilloscope leads. BNC plugs are connected with a push and twist action, to disconnect you need to twist and pull.

Plugs and sockets are rated by their impedance (50Ω or 75Ω) which must be the same as the cable's impedance. If the connector and cable impedances are not matched the signal will be distorted because it will be partly reflected at the connection, this is the electrical equivalent of the weak reflection which occurs when light passes through a glass window.

DIN Plugs and Sockets

These are planned for audio signals but they can be used for other low-current purposes where a multi-way connector is required. They are obtainable from 3 way to 8 way. 5 way is used for stereo audio connections. The contacts are numeral on the connector, but they are not in numerical order! For audio use the 'common' (0V) wire is connected to contact 2. 5 way plugs and sockets are accessible in two versions: 180° and 270° (the angle refers to the arc formed by the contacts).

Plastic covers of DIN plugs (and line sockets) are detached by depressing the retaining lug with a small screwdriver. You may also need small pliers to extract the body from the cover but do not pull on the pins themselves to avoid damage. Keep in mind to thread the cable through the cover *before* starting to solder the connections!

Soldering DIN plugs is easier if you clamp the insert with the pins. Wires should be pressed into the hollow pins – first 'tin' the wires (coat them with a thin layer of solder) then melt a little solder into the empty pin and insert the wire while keeping the solder molten. Take care to keep away from melting the plastic base, stop and allow the pin to cool if necessary.

Mini-DIN connectors are used for computer equipment such as keyboards and mice but they are not a good choice for common use unless small size is essential.

D Connectors

These are multi-pole connectors with condition for screw fittings to make semi-permanent connections, for example on computer equipment. The D shape avoids incorrect connection. Standard D-connectors have 2 rows of contacts; 9, 15 and 25-way versions are the most popular. High Density D-connectors have 3 rows of contacts; a 15-way version is used to connect computer monitors for example.

Note that covers are usually sold unconnectedly because both plugs and sockets can be fitted to cables by fitting a cover to a chassis mounted connector. PCB mounting versions of plugs and sockets are also accessible. The contacts are regularly numbered on the body of the connector, although you may need a magnifying glass to see the very small markings. Soldering D-connectors requires a steady hand due to the closeness of the contacts, it is easy to accidently unsolder a contact you have just completed while attempting to solder the next one!

IDC Communication Connectors

These multi-pole insulation displacement connectors are used for computer and telecommunications equipment. They repeatedly cut through the insulation on wires when installed and special tools ar required to fit them. They are available as 4, 6 and 8-way versions.

The 8-way RJ45 is the standard connector for modern computer networks. If you frequently use these you may be interested in our network lead tester project.

Standard UK telephone connectors are comparable in style but a slightly different shape. They are called BT (British Telecom) connectors.

7.4.1 Cables

Cable... flex... lead... wire... what do all these terms mean?

A cable is an congregation of one or more conductors (wires) with some flexibility.

A flex is the proper name for the flexible cable fixed to mains electrical appliances.

A lead is a absolute assembly of cable and connectors.

A wire is a single conductor which may have an outer layer of insulation (usually plastic).

Single Core Equipment Wire

This is a solid wire with a plastic coating available in a wide variety of colors. It can be bent to shape but will break if repeatedly flexed. Use it for connections which will not be disturbed, for example links between points of a circuit board.

Typical specification: 1/0.6mm (1 strand of 0.6mm diameter), maximum current 1.8A.

Stranded Wire

This consists of many fine strands of wire enclosed by an outer plastic coating. It is flexible and can withstand repeated bending without breaking. Use it for connections which may be disturbed, for example wires outside cases to sensors and switches. A very flexible version ('extra-flex') is used for test leads.

Speaker Cable

This cable consists of two stranded wires. One wire is typically marked with a line. It is suitable for low voltage, low current (maximum 1A) signals where screening from electrical interference is not required. It is a popular choice for connecting loudspeakers and is often called 'speaker cable'.

Signal Cable

Signal cable consists of numerous color-coded cores of stranded wire housed within an outer plastic sheath. With a typical maximum current of 1A per core it is suitable for low voltage, low current signals where screening from electrical interference is not required.

Screened Cable

In screened cable the central wire carries the signal and the screen is connected to 0V (common) to shield the signal from electrical interference. Screened cable is used for audio signals and dual versions are available for stereo.

Co-axial Cable

This type of screened cable is intended to carry high frequency signals such as those found in TV aerials and oscilloscope leads.

Mains Flex

Flex is the correct name for the flexible cable used to connect appliances to the mains supply. It contains 2 cores (for live and neutral) or 3 cores (for live, neutral and earth). Mains flex has thick insulation for the high voltage (230V in UK) and it is accessible with various current ratings: 3A, 6A and 13A are popular sizes in the UK.

7.5 OPERATIONS

An operating system is the most important program in a computer system. This is one program that runs all the time, as long as the computer is operational and exits only when the computer is shut down.

In general, however, there is no completely adequate definition of an operating system. Operating systems exist because they are a reasonable way to solve the problem of creating a usable computing system.

The fundamental goal of computer systems is to execute user programs and to make solving user's problems easier. Hardware of a computer is equipped with extremely capable resources - memory, CPU, I/O devices etc. All these hardware units interact with each other in a well-defined manner. Bare hardware alone is not enough to solve a problem. To solve users' problems programs are developed. These programs require certain common operations, such as those controlling the I/O devices. The common functions of controlling and allocating resources are then brought together into one piece of software – the operating system.

It is easier to define operating systems by their functions, i.e., by what they do than by what they are. The computer becomes easier for the users to operate – is the primary goal of an operating system. Operating systems exist because they are supposed to make it easier to compute with them than without them. This view is particularly clear when you look at operating systems for small personal computers.

Efficient operation of the computer system is a secondary goal of an operating system. This goal is particularly important for large, shared multi-user systems. These systems are typically expensive, so it is desirable to make them as efficient as possible.

Operating systems and computer architecture have had a great deal of influence on each other. To facilitate the use of the hardware, operating systems were developed. As operating systems were designed and used, it became obvious that changes in the design of the hardware could simplify them.

Operating systems are the programs that make computers operational, hence the name.

Without an operating system, the hardware of a computer is just an inactive electronic machine, possessing great computational power, but doing nothing for the user. All it can do is to execute fixed number of instructions (firmware) stored into its internal memory (ROM: Read Only Memory), each time you switch the power on, and nothing else.

Operating systems are programs (fairly complex ones) that act as interface between the user and the computer hardware. They sit between the user and the hardware of the computer providing an operational environment to the users and application programs. For a user, therefore, a computer is nothing but the operating system running on it. It is extended machine.

Users do not interact with the hardware of a computer directly but through the services offered by the operating system. This is because the language that users employ is different from that of the hardware. Whereas users prefer to use natural language or near natural language for interaction, the hardware uses machine language. It is the operating system that does the necessary translation back and forth and lets the user interact with the hardware. The operating system speaks users' language on one hand and machine language on the other. It takes instructions in the form of commands from the user and

translates into machine understandable instructions, gets these instructions executed by the CPU and translates the result back into user-understandable form.

A user can interact with a computer if only he/she understands the language of the resident operating system. You cannot interact with a computer running UNIX operating system, for instance, if you do not know 'UNIX language' or UNIX commands. A UNIX user can always interact with a computer running UNIX operating system, no matter what type of computer it is. Thus, for a user operating system itself is the machine – an extended machine.

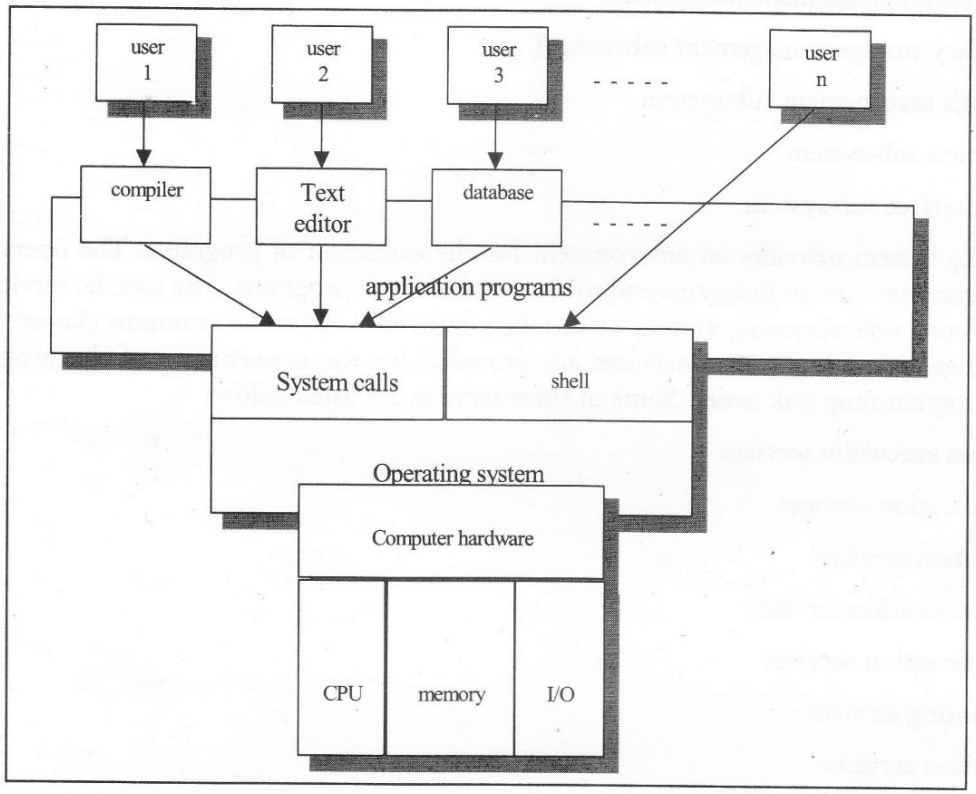


Figure 7.1

Operating systems are computers' resource manager.

The computer hardware is made up of physical electronic devices, viz. memory, microprocessor, magnetic disks and the like. These functional components are referred to as resources available to computers for carrying out their computations. All the hardware units interact with each other in terms of electric signals (i.e. voltage and current) usually coded into binary format (i.e. 0 and 1) in digital computers, in a very complex way.

In order to interact with the computer hardware and get a computational job executed by it, the job needs to be translated in this binary form called machine language. Thus, the instructions and data of the job must be converted into some binary form, which then must be stored into the computer's main memory. The CPU must be directed at this point, to execute the instructions loaded in the memory. A computer, being a machine after all, does not do anything by itself. Which resource is to be allocated to which program, when and how, is decided by the operating system in such a way that the resources are utilized optimally and efficiently.

An operating system performs large number of functions. Each function is carried out by a component of the operating system. Some typical components of an operating system are:

1. Process management sub-system
2. Memory management sub-system
3. File management sub-system
4. I/O system management sub-system
5. Secondary storage management sub-system
6. Network management sub-system
7. Protection sub-system
8. User-interface sub-system

An operating system provides an environment for the execution of programs. The operating system provides certain services to programs and to the users of those programs. The specific services provided will differ from one operating system to another, but there are some common classes that we can identify. These operating system services are provided for the convenience of the programmer, to make the programming task easier. Some of these services are listed below:

1. Program execution services
2. I/O operation services
3. File system services
4. Communication services
5. Error detection services
6. Accounting services
7. Protection services

You would require the operating system services for the following tasks:

1. ***File manipulation***

   create file,

   delete file

   open file,

   close file

   read file,

   write file,

   get file attributes,

   set file attributes

2. ***Device manipulation***

   request device,

   release device

   read device,

   write device,

   get device attributes,

   set device attributes

   logically attach or detach devices

3. ***Information maintenance***

   get time or date,

   set time or date

Almost all the components of an operating system are grouped into a core module called kernel. A user is allowed to interact with this kernel through command interpreter or shell.

7.6 POWER-ON SELF TEST

POST or Power on Self Test is the first program that the BIOS runs when the PC is switched on. It is a built-in diagnostic program that checks the various hardware components attached to the PC. You must have seen POST checking memory, keyboard and other hardware units at the start of the PC.

If no error is found then next BIOS program is executed else an error message is issued often accompanied by a beep of sound. Try starting your PC while keyboard has been removed to see how POST complains you about that.

Typically you shall be using the computer in the following manner each time:

1. Switch the computer on.
2. POST routines will execute. You do nothing. (Advanced users may interact with the SETUP routine to configure the hardware).
3. After the POST routines finish executing, operating system will load in the memory usually from the hard disk. You still wait.
4. After operating system has successfully loaded, it is executed. As a result the operating system takes control of the entire computer system. It displays on the monitor a command prompt specific to the operating system.
5. Once you get the prompt, you can start using the computer through operating system by issuing appropriate commands.
6. When you are finished with your work, command the operating system to shut down. Operating system obliges you by shutting the computer down.
7. You switch the computer off.

You must know which commands need be executed to get a task done. Alternatively, you must know which command does what. You can take either of the approaches to learn the commands.

7.7 PREVENTIVE MAINTENANCE

Prevention is always better than cure. It's a universal law and also very much applicable to IT Equipments, personnel and Industry. Our PC's two mortal enemies are heat and moisture. Excess heat accelerates the deterioration of the delicate circuits in our system. The most common causes of overheating are dust and dirt: Clogged vents and CPU cooling fans can keep heat-dissipating air from moving through the case, and even a thin coating of dust or dirt can raise the temperature of our machine's components.

Any dirt, but particularly the residue of cigarette smoke, can corrode exposed metal contacts. That's why it pays to keep our system clean, inside and out.

If your PC resides in a relatively clean, climate-controlled environment, an annual cleaning should be sufficient. But in most real-world locations, such as dusty offices or shop floors, our system may need a cleaning every few months.

All we need are lint-free wipes, a can of compressed air, a few drops of a mild cleaning solution such as Formula 409 or Simple Green in a bowl of water, and an antistatic wrist strap to protect our system when we clean inside the case.

By Definition, Preventive Maintenance (PM) has the following meanings:

"The care and servicing by workers for the purpose of maintaining equipment and facilities in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects."

Maintenance, including tests, capacity, adjustments, and parts replacement, performed specifically to prevent faults from happening.

Check Your Progress

Fill in the blanks:

1. The data about the parameters of the PC are stored in a type of memory called.....
2. The standard XT originally came with ..... of memory.
3. These are multi-pole connectors with provision for screw fittings to make ..... connections, for example on computer equipment.
4. A cable is an assembly of one or more conductors (wires) with some .....
5. The fundamental goal of computer systems is to ..... user programs and to make solving user's problems easier.

7.8 LET US SUM UP

The data about the parameters of the PC are stored in a type of memory called CMOS (Complementary Metal Oxide Semiconductor). It is this set of data that the PC uses while running POST program. CMOS loses the data stored in it when power is switched off. Therefore, an internal battery is provided to it on the motherboard. The XT originally came only in a standard configuration with the hard disk. It was not until 1985 that a model without the hard drive became available. Other models came with two half-height floppy drives as well as the hard drive. Flex is the proper name for

the flexible cable used to connect appliances to the mains supply. It contains 2 cores (for live and neutral) or 3 cores (for live, neutral and earth). An operating system is the most important program in a computer system. This is one program that runs all the time, as long as the computer is operational and exits only when the computer is shut down. POST or Power On Self Test is the first program that the BIOS runs when the PC is switched on.

7.9 KEYWORDS

CRM: Customer Relationship Management

CMOS: Complementary Metal Oxide Semiconductor

DNS: Domain Name Server

IP: Internet Protocol

PM: Preventive Maintenance

7.10 QUESTIONS FOR DISCUSSION

1. Discuss the configuration of PC XT.
2. What is the switch setting of PC?
3. Explain the cables and connections used for setting up the PC.
4. Describe the operating system.
5. How POST is used PC?

Check Your Progress: Model Answers

1. CMOS
2. 128kB
3. semi-permanent
4. flexibility
5. execute

7.11 SUGGESTED READINGS

William Stallings, *Computer Organization and Architecture*, 6th edition, Pearson Education, 2002.

A.S.Tannenbaum, *Structured Computer Organization*: Prentice-Hall of India, 1999.

R. P. Beales, *PC Systems, Installation and Maintenance*, Second Edition.

Ron Gilster, *PC Upgrade and Repair Black Book.*

Peter Norton's, *Inside the PC.*

LESSON

8

DIAGNOSTICS AND TROUBLESHOOTING

CONTENTS

8.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Discuss the concept of diagnostics
- Discuss the start up concept
- Discuss test sub menus and error codes
- Understand home menu diagnostics

8.1 INTRODUCTION: DIAGNOSTICS AND TROUBLESHOOTING

Troubleshooting is an approach of common sense and technical knowledge to the unavoidable problems that comes up in a fallen world. If it could codified then it starts with answers to simple questions like: Why? How? What? In simple terms, it's a reactionary approach, to rectify a problem. In this lesson, we will cover some of the common startup errors and there possible solutions in both hardware and software terms. Numerous types of integral diagnostic and service tests are located in the DesignJet 650C plotters. In addition, worded error messages; system error codes; and internal service menu tests are discussed.

8.2 STARTUP PROBLEMS

If we try to bifurcate the Computer System working procedure since we switched on till we closes this, then it has:

- Phase 1 = Startup Module
- Phase 2 = Operating System Interface
- Phase 3 = Applications Software
- Phase 4 = Peripherals or external Communication
- Phase 5= Shut Down

All this phases is very much prone to errors. For this course module, we need to focus only on Start up Issues.

Sometimes, windows may fail to start for a multiplicity of reasons, and generally speaking in order of decreasing likelihood they could be enlisted in following manner:

- Hardware failure
- Bad driver
- Corrupt file or volume
- System misconfiguration
- Virus infection

If we explore them in a depth then we can say that, common reason they fail to start is because some portion of either system's hardware or software has corrupted. This might range from the straightforward (someone kicked the power cord out of its socket) to the understandable (smoke emitting from the machine) to the inexplicable (something transitory that happens only when the moon is full or during sunspot minimum). Next comes with updation of the driver for some piece of hardware (or the BIOS for that matter) and the system won't boot afterwards. After that comes those strange mail/messages usually indicate some key operating system file that has somehow become corrupt or gone missing. Misconfiguration is another possible source of boot problems, but this is somewhat rare as in most cases you'll still be able to boot but one or more services may fail to start or your applications may not function as expected. Finally, virus infection can cause a system to fail to boot.

8.2.1 Identification of Problem

This is the biggest test of our understanding and expertise towards computer system. We have to carefully enlist all the potential causes of errors. Some of the generic causes are like:

- Something burning
- Plugging or Unplugging
- System Fan issue
- Power cord
- RAM port etc

Or, if black screen is coming and giving us an error like:

- "NTLDR is missing"
- "A disk read error occurred"
- "Invalid partition table"
- "Error loading operating system"
- "Could not read from selected boot disk"
- "Windows could not start because the following file is missing or corrupt"

Or you might get a blue screen (called a STOP screen) with some unclear messages on it. And, then suddenly get a dialog box saying "One or more services failed to start". Or your mouse pointer might freeze and your system hangs either before or immediately after logon. Following table tries to enlist all the potential symptoms regarding startup errors and its causes.

Symptom	Causes
"Invalid Partition Table" "Missing Operating System" "Invalid Partition Table"	Master boot record is corrupt due to hard disk errors or virus infection
"NTLDR is missing" "A disk read error occurred" System hangs after BIOS POST finishes	Boot sector is corrupt due to hard disk errors or virus infection
"Windows could not start because of a computer disk hardware configuration problem" "Could not read from selected boot disk" "Check boot path and disk hardware"	Boot.ini file is corrupt, missing, or needs updating.
"Windows could not start because the following file is missing or corrupt"	Boot volume is corrupt or the referenced system file is missing.

In addition to these error messages, a variety of other startup problems can occur including:

- *Blue screens:* These are typically caused by hardware failure or driver problems but can also be due to virus infection.
- *Hung system:* These are typically caused by buggy drivers or by registry corruption but can also be due to virus infection.

- *Dialog box saying "One or more services failed to start":* This is typically caused by misconfiguration or registry corruption but can also be caused by application incongruity of some form.

8.2.2 Problem Resolution

Expert software professional or a system administrator should have an in depth experience in technical troubleshooting and diagnosing. In a nutshell, here's a quick checklist of the main tools:

- *Last known good:* Restores the HKLM\System\CurrentControlSet portion of the registry its version during the last successful logon to the system.
- *Safe mode:* Starts Windows with a minimal set of drivers and creates a record of which drivers load in %windir%\Ntbtlog.txt.
- *System Restore:* Windows XP only feature to restore system to previously saved configuration.
- *Recovery Console:* Boots to a command line that allows you to run various commands.
- *Automated System Recovery (ASR):* Restores the boot volume from backup
- *Repair:* Run Windows Setup from your product CD and select the option to try and repair your installation.

Now, the issue is which tool should we use to address each of the symptoms described earlier? Here's the list of potential Symptoms and the associated action points to handle some of the most frequent problems or symptoms.

Problem/Symptom	Tool(s) to Use/Action Points
Corrupt master boot record	Recovery Console (fixmbr)
Corrupt boot sector	Recovery Console (fixboot)
Corrupt or missing boot.ini	Recovery Console (bootcfg /rebuild)
Corrupt system file	Recovery Console (chkdsk) Restore from ASR backup Perform a Repair install
Corrupt registry	Recovery Console (chkdsk) System Restore (XP only) Restore system state from backup Perform a Repair install
Blue screen	See this resource first Last known good System Restore (XP only) Safe mode (roll back suspect driver using Device Manager)
Hung system	Last known good System Restore (XP only) Safe mode (roll back suspect driver using Device Manager)
"One or more services failed to start"	Don't logon! Reboot and select last known good, log on, undo the last configuration steps you performed. Safe mode (undo last configuration steps you performed)

8.2.3 Startup Messages - Error

Start up message is a text window that pops up during a startup procedure .It generally contains an instruction text in following forms:

1. *Error in CONFIG.SYS line XX:* This error is usually caused by a syntax error in the CONFIG.SYS file line XX is the line number that the error occurred. Just edit the file using any text editor, and correct the problem.
2. *Himem.sys not loaded:* A line in config.sys to load a himem.sys is missing: You need to insert the command such as the following in config.sys file: DEVICE=C:\WINDOWS\HIMEM.SYS
3. *Missing or corrupt Himem.sys:* 9x will load without Himem.sys. If the file is missing, copy it. If the file is corrupt, run scandisk to detect and correct any disk errors.
4. *Device/Service has failed to start:* The error is usually associated with the Operating System failing to start a device or a service. The error may lead to a blue screen, and go no further.

The device errors are caused due to IRQ/IO conflicts or due to mismatched driver software. Service errors are linked with newly installed software (such as protocols, applications, etc.) or due to missing/corrupt files. If you have problem booting normally due to failed device/service, boot to the advanced start up modes, say safe mode, safe mode with command prompt etc. Once in the Safe Mode, you can un-install any freshly installed software, run scandisk or any antivirus program. You can also check for any device conflicts, and correct the same (Use appropriate Device Manager). In very rare cases, you may need to resort to system recovery using installation CD.

A device referenced in SYSTEM.INI, WIN.INI, Registry is not found.

The referenced device is no longer installed, or its drivers are missing/corrupted. Try un-installing and then reinstalling the device. Alternatively, remove the referenced lines from the above files.

8.2.4 Event Viewer - Event Log is Full

Event log has finite size, and it may stop recording new events if the log is full. When an event log is full, you will have three options:

1. Clear the existing log, so that new events will get recorded.
2. Overwrite the existing log.
3. Increase the event log size.

To free an event log,

- Open Event Viewer, click Start, point to Settings, and click Control Panel. Double-click Administrative Tools, and then double-click Event Viewer.
- In the console tree, click the log you want to free.
- On the Action menu, click Clear all Events.

To overwrite events,

- On the Action menu, click Properties, and then click Overwrite events. This ensures that all new events are written to the log, even when the log is full.

To increase the log size,

- On the Action menu, click Properties, and then increase the Maximum log size.

Note that you need administrator privileges to effect the above changes.

Failure to start GUI : Explorer.exe could be missing or corrupted

Windows Protection Error: General Protection Errors (GPF): Is caused when a program tries to access a portion of memory that is already being used by another program or TSR. When this happens the screen turns blue with the GPF error message.

Solutions:

- Run scandisk/defrag
- Remove any TSRs or programs which were running before the GPF.
- Un-install and re-install the program that caused the GPF.
- If you regularly receive GPF errors frequently, try adding more memory. In extreme cases, you may need to re-install the Operating System.

8.2.5 Invalid Page Fault

This is caused when Windows or an application tries to call a block of memory segment that does not exist. This could happen because of bad memory or the application is incompatible or corrupt Illegal Operation. This is an operation requested, not understood by Windows or the CPU. Illegal Operations can be caused by:

- Corrupt files
- Bad Memory
- Bad hard drive blocks
- Incorrect Drivers
- TSRs

These faults are generally caused by program incompatibility, memory faults, etc.

8.2.6 Windows Registry Corruption

There are many factors that can corrupt Windows Registry; Starting from deleting certain software to being infected with viruses is most common causes. If Windows registry becomes unstable then gradually, we will get lot of warnings, and our computer will start to slow down.

However, the worst part of this problem, it is very easy to corrupt Windows registry. Even layman, not so expert in windows intricacies can do it themselves in there or anybody system. We should always make a backup of Windows registry, and the process is pretty easy.

Most of the application software once installed prompts for a restart or reboot. When it reboots, though, what if you get an error message? This is one of the many possible Windows registry corruption scenarios. What you have likely done is deleted a file in the Windows registry that is associated with some other program. Now, as a replacement for of having more space like you'd

planned, your Windows system is giving you an error problem that makes a successful computing experience impracticable.

Computer Viruses and its Consequence

Another issue could be that someone has hacked into your computer and changed things within your Windows registry. Alternately, you have downloaded a virus. The easiest way to avoid both of these problems is to get an anti-virus program as well as a firewall. These methods aren't always foolproof, though. Hackers and viruses could still get in and mess with your registry. This is why it is always best to do a backup of your Windows registry, and burn it on a CD for safekeeping.

As we know, it isn't hard to corrupt Windows registry. If you install a new driver, add a new game, or uninstall a program like a game, things are added and removed from your registry. This can cause errors within the Windows registry that can slow down or crash your computer. All in all, these tiny registry problems will accumulate to become a big problem with your system's performance.

Moreover, if you choose to edit your own registry, this can also cause a corrupt Windows registry. You may delete something you shouldn't have or added something that conflicts with the other programs. The best way to avoid a corrupt registry is to make a backup using a registry repair utility and then proceed to scan and clean your registry using the best registry cleaner you can find, a descent registry cleaner will include both cleaning and backup features.

Registry Corruption

In the case of Windows registry becomes corrupted, then you may have to reformat your hard disk and reinstall Windows, this is only in extreme cases, in most situations you should be able to clean and repair your registry. A complete format will cause you to lose some of those precious files and documents, but this is why it is also extremely important to always backup your files on a weekly or monthly basis.

There are a few ways to backup your Windows Registry. If you are using an older version of Windows, then you can find a program on your Windows CD to make a backup for you. On the newer versions of Windows, a backup is usually done automatically. Reading your computer manual or a quick visit to the Windows website will help you learn more about whether or not your registry is automatically backed up.

Windows XP and Vista create restore points, use this feature before you make any major changes to your system, as any problems that arise can easily be resolved by simply reverting back to a previous restore point.

Alternatively you can click on your windows 'Start Menu,' then go to 'Run' and type in 'regedit.exe', an editor should start up. With the Windows registry editor, you can make a copy and burn it onto a CD for safe keeping in case your registry does become corrupted.

To restore your corrupted Windows registry from a backed up file is incredibly easy. If you are using Windows XP, all you have to do is open the .REG file that you created using the registry editor, and Windows will merge it into the Windows registry automatically. If you are using an older version of Windows, then you will have to restart your computer into DOS mode and load the .REG file that way. There are many software programs you can buy to help fix your Windows registry. Just do a little research to find one that works for you.

A Registry Cleaner

To take any concern you may have about creating a backup of your registry, it may be a safer option to purchase a competent registry cleaner, it will create a registry backup and restore your registry with one simple mouse click. They also identify invalid entries within your registry, when removed these can have a dramatic effect on system performance.

Himem.Sys

HIMEM is an extended-memory manager-a program that coordinates the use of your computer's extended memory, including the High Memory Area (HMA), so that no two applications or device drivers use the same memory at the same time.

You install HIMEM by adding a <DEVICE> command for HIMEM.SYS to your CONFIG.SYS file. The HIMEM.SYS command line must come before any commands that start applications or device drivers that use extended memory; for example, the HIMEM.SYS command line must come before the EMM386.EXE command line.

Syntax

DEVICE=[drive:][path]HIMEM.SYS

[/A20CONTROL:ON|OFF] [/CPUCLOCK:ON|OFF]

[/EISA] [/HMAMIN=m] [/INT15=xxxx] [/NUMHANDLES=n] [/MACHINE:xxxx]

[/SHADOWRAM:ON|OFF] [/TESTMEM:ON|OFF] [/VERBOSE]

In most cases, you won't need to specify command-line options. The default values for HIMEM.SYS are designed to work with most hardware.

Parameter

[drive:][path]

Specifies the location of the HIMEM.SYS file. HIMEM.SYS should always be located on the same drive that contains your MS-DOS files. If the HIMEM.SYS file is in the root directory of your startup drive, you don't need to include a path. However, you must always include the complete filename (HIMEM.SYS).

Switches

/A20CONTROL:ON|OFF

Specifies whether HIMEM is to take control of the A20 line even if A20 was on when HIMEM was loaded. The A20 handler gives your computer access to the HMA. If you specify /A20CONTROL:OFF, HIMEM takes control of the A20 line only if A20 was off when HIMEM was loaded. The default setting is /A20CONTROL:ON.

/CPUCLOCK:ON|OFF

Specifies whether HIMEM is to affect the clock speed of your computer.If your computer's clock speed changes when you install HIMEM, specifying /CPUCLOCK:ON may correct the problem; however, enabling this option slows down HIMEM. The default setting is /CPUCLOCK:OFF.

/EISA

Specifies that HIMEM should allocate all available extended memory. This switch is necessary only on an EISA (Extended Industry Standard Architecture) computer with more than 16 MB of memory; on other computers, HIMEM automatically allocates all available extended memory.

/HMAMIN=m

Specifies how many kilobytes of memory an application must require for HIMEM to give that application use of the HMA. Only one application can use the HMA at a time; HIMEM allocates the HMA to the first application that meets the memory-use requirements set by this option. You can specify a value from 0 to 63.

Set /HMAMIN to the amount of memory required by the application that uses the most HMA memory.

The /HMAMIN option is not required; the default value is zero. Omitting this option (or setting it to zero) specifies that HIMEM assign the HMA to the first application that requests it, regardless of how much of the HMA the application is going to use.

The /HMAMIN option has no effect when Windows is running in 386 enhanced mode.

/INT15=xxxx

Allocates the amount of extended memory (in kilobytes) to be kept for the Interrupt 15h interface. Some older applications use the Interrupt 15h interface to allocate extended memory rather than using the XMS (eXtended-Memory Specification) method provided by HIMEM. If you use these applications, you can ensure enough memory is available to them by setting xxxx to 64 KB larger than the amount required by the application.

You can specify a value from 64 to 65535; however, you cannot specify more memory than your system has available. If you specify a value less than 64, the value becomes 0. The default value is 0.

/NUMHANDLES=n

Specifies the maximum number of extended-memory block (EMB) handles that can be used simultaneously. You can specify a value from 1 to 128; the default value is 32. Each additional handle requires an additional 6 bytes of memory.

The /NUMHANDLES option has no effect when Windows is running in 386 enhanced mode.

/MACHINE:xxxx

Specifies what type of computer you are using. Usually, HIMEM can detect your computer type successfully; however, there are a few computers that HIMEM cannot detect. On such systems, HIMEM uses the default system type (IBM AT or compatible). You might need to include the /MACHINE option if your computer is a type that HIMEM cannot detect and if HIMEM does not work properly on your system by using the default system type.

Currently, systems that require this option include Acer 1100, Wyse, and IBM 7552.

The value for xxxx can be any of the codes or their equivalent numbers listed in the following table.

Code	Number	Computer type
At	1	IBM AT or 100% compatible
ps2	2	IBM PS/2
ptlcascade	3	Phoenix Cascade BIOS
hpvectra	4	HP Vectra (A & A+)
att6300plus	5	AT&T 6300 Plus
acer1100	6	Acer 1100
toshiba	7	Toshiba 1600 & 1200XE
wyse	8	Wyse 12.5 Mhz 286
tulip	9	Tulip SX
zenith	10	Zenith ZBIOS
at1	11	IBM PC/AT (alternative delay)
at2	12	IBM PC/AT (alternative delay)
css	12	CSS Labs
at3	13	IBM PC/AT (alternative delay)
Philips	13	Philips
Fasthp	14	HP Vectra
ibm7552	15	IBM 7552 Industrial Computer
bullmicral	16	Bull Micral 60
dell	17	Dell XBIOS

/SHADOWRAM: ON|OFF

Specifies whether to disable shadow RAM (SHADOWRAM: OFF) or to leave the ROM code running from RAM (SHADOWRAM: ON).

Some computers make ROM code run faster by "shadowing" it in RAM—that is, by copying the ROM code into faster RAM memory at startup, which uses some extended memory. On computers that use shadow RAM and have less than 2 MB of RAM, HIMEM usually attempts to disable shadow RAM to recover additional extended memory for Windows to use. (HIMEM can disable shadow RAM only on certain types of systems.) When HIMEM disables shadow RAM, the ROM code runs in the slower ROM instead of RAM; therefore, your computer might run slightly slower than it did before.

/TESTMEM:ON|OFF

Determines whether HIMEM performs a memory test when your computer starts. By default, HIMEM tests the reliability of your computer's extended memory each time your computer starts. This test can identify memory that is no longer reliable; unreliable memory can cause system instability or loss of data. HIMEM's memory test is more thorough than the standard power-up memory test performed by most computers. To prevent HIMEM from performing the memory test, specify /TESTMEM:OFF.

Disabling the memory test will shorten the startup process. (The default setting is /TESTMEM:ON.)

/VERBOSE

Directs HIMEM to display status and error messages while loading. By default, HIMEM does not display any messages unless it encounters an error. You can abbreviate /VERBOSE as /V. (To display status messages without adding the /VERBOSE switch, press and hold the ALT key while HIMEM starts and loads.)

8.2.7 Failure to Start GUI

Sometimes Windows does not boot to the GUI after it finishes loading. Instead the system might gives:

Boot to a black screen with a blinking cursor on the top left corner of the screen right after the Windows logo.

Even load to the wallpaper without a taskbar or any icons on the screen.

Such an issue can be categorized as *failure to start GUI*. This is caused when the explorer file is missing or corrupted. Most of the times, a simple restart of the system can resolve the issue.

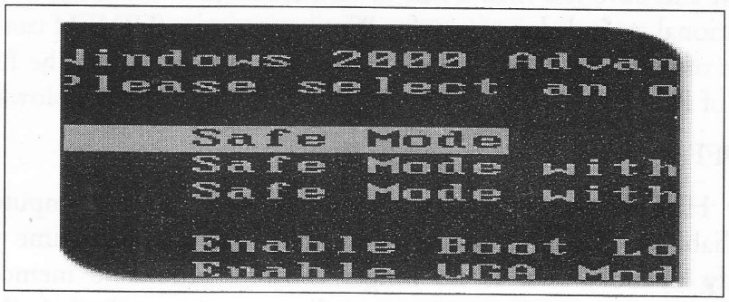
There are many possible reasons for failure of the Windows explorer file. The file can fail due to a power surge or sometimes even due to Windows updates when the update goes wrong during its installation or due to viruses.

The next logical troubleshooting step that should be followed after a system restart is to try the Windows advanced startup options.

Pressing the F8 key on the Windows logo or tapping the F8 key just before the logo will bring up the Windows advanced options screen. This screen will have the non-GUI options like *safe mode with command prompt* or command prompt (Windows XP, Me & 2000 will not have the command prompt option only the Safe mode with command prompt option would be available).

Once at the command prompt the Scanreg utility (scanreg/restore) in the Windows >> command folder can be used to restore Windows in case of Windows 98. The rstrui.exe (%sysdir%\restore\rstrui.exe) utility can be used in case of Windows XP.

Few antivirus software's, provide options to boot to the command prompt to run a virus scan to identify and remove any potential viruses.

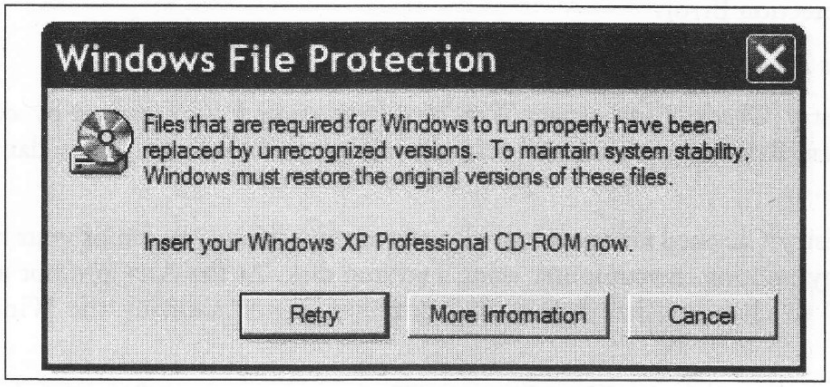


The black screen after the Windows logo can also be caused due to video driver failure. The drivers may need to be reinstalled or updated from Safe mode.

If none of the above steps work, the last possible resort would be an operating system reinstallation.

8.2.8 Windows Protection Error

A Windows Protection Error such as "Initializing device <device name> Windows Protection Error" can be received when either first starting Microsoft Windows or when shutting down your computer. The computer might then ask you restart the system.



Windows Protection Errors are usually received by users of Windows 95, 98, and ME and these errors can occur for a number of reasons:

- An error resulting from damage to the system's registry
- An incompatibility occurring between the BIOS and a device attached to the computer
- A problem with the cache system
- A problem with memory
- A Virus
- An address conflict or virtual driver conflict

These are just some of the main reasons why a Windows Protection Error might occur.

Repairing Windows Protection Errors caused by Installing Hardware or Software

When a Windows Protection Error is received after changing the software or hardware on a computer, the first thing to do is reboot the computer, and enter Safe Mode. In Safe Mode, try to undo the last task completed. This can be achieved by deleting recently installed software, or by removing a recently attached hardware device. While in Safe Mode it is highly recommended to run your anti-virus program to clean up any viruses, which may be present. Then, reboot the computer and see if the Windows Protection Error recurs.

Repairing Windows Protection Errors caused by Drivers and Startup Software

- It is also possible to repair Windows Protection Errors using the "msconfig" command.
- Click the <Start> button
- Click the <Run> button
- Type "msconfig" into the Run window that opens
- Click <OK>
- Select the General tab when the System Configuration Utility window opens

- Go to Selective Startup at the bottom of the window
- Select or deselect each option one by one and reboot the computer as each option is selected of particular importance is the "Load Startup Group Items" selection. Deselecting this option and having the computer boot properly can narrow the problem down to startup software causing the Windows Protection Error.

Repairing Windows Protection Errors caused by problems with the Registry

The System Registry Checker can repair Windows Protection Errors caused by corruption in the registry. The System Registry Checker will scan the registry and alert you to any damage or problems within the registry.

If the System Registry Checked fails, you can also restore a previous version of your registry. This can be accomplished by booting the computer using a startup disk. At the A:> prompt use the command "scanreg /restore" to choose a date before the computer started showing the Windows Protection Error.

Note: Registry: It's a repository used by Microsoft Windows to store configuration information about the software installed on a computer. The Windows registry consists of the following six parts:

- HKEY_User - contains the user information for each user of the system.
- HKEY_Current_User - has all the preferences for the current user.
- HKEY_Current_Configuration - stores settings for the display and printers.
- HKEY_Classes_Root - includes file associations and OLE information.
- HKEY_Local_Machine - has the settings for the hardware, operating system, and installed applications.HKEY_Dyn_Data - includes performance data.

When you install a program, it will usually write some data to the computer's registry. If you want to manually edit the registry for some reason, you can use the "regedit.exe" program, which comes with the Windows operating system. But be very careful while editing registry as it has a cascading impact which generally leads to Windows crash.

8.2.9 Data Recovery

Data recovery is the methodology of retrieving data from damaged, failed, corrupted, or inaccessible secondary storage media when it cannot be accessed normally. Often the data are being salvaged from storage media such as hard disk drives, storage tapes, CDs, DVDs, RAID, and other electronics. Recovery may be required due to physical damage to the storage device or logical damage to the file system that prevents it from being mounted by the host operating system.

The most common "data recovery" situation involves an Operating System (OS) failure (classically on a single-disk, single-partition, single-OS system), in which case the goal is simply to copy all wanted files to another disk. This can be easily accomplished with a Live CD, most of which provide a means to mount the system drive and backup disks or removable media, and to move the files from the system disk to the backup media with a file manager or optical disc authoring software. Such cases can often be mitigated by disk partitioning and consistently storing valuable data files (or copies of them) on a different partition from the replaceable OS system files.

Another option comes to us like a disk-level failure, such as a compromised file system or disk partition or a hard disk failure. In either of these cases, the data cannot be easily read. Depending on the situation, solutions involve repairing the file system, partition table or master boot record, or hard disk recovery techniques ranging from software-based revival of corrupted data to hardware replacement on a physically damaged disk. If hard disk recovery is necessary, the disk itself has typically failed enduringly, and the focus is rather on a one-time recovery, salvaging whatever data can be read.

In a third situation, files have been "deleted" from a storage medium. Typically, deleted files are not erased immediately; instead, references to them in the directory structure are removed, and the space they occupy is made available for later overwriting. In the meantime, the original file may be restored. Although there is some uncertainty over the term, "data recovery" may also be used in the context of forensic applications or espionage.

Data Recovery Methodology

A wide variety of failures can cause physical damage to storage media. CD-ROMs can have their metallic substrate or dye layer scratched off; hard disks can suffer any of several mechanical failures, such as head crashes and failed motors; tapes can simply break. Physical damage always causes at least some data loss, and in many cases the logical structures of the file system are damaged as well. Any logical damage must be dealt with before files can be salvaged from the failed media.

Most physical damage cannot be repaired by end users. For example, opening a hard disk in a normal environment can allow airborne dust to settle on the platter and become jammed between the platter and the read/write head, causing new head crashes that further injure the platter and thus compromise the recovery process. Furthermore, end users usually do not have the hardware or technical expertise required to make these repairs. Consequently, costly data recovery companies are often employed to retrieve important data.

Recovery Techniques

Recovering data from damaged hardware can involve numerous techniques. Some damage can be repaired by replacing parts in the hard disk. This alone may make the disk functional, but there may still be logical damage. A particular disk-imaging procedure is used to recover every readable bit from the outside. Once this image is acquired and saved on a dependable medium, the image can be safely analysed for logical damage and will possibly allow for much of the original file system to be reconstructed.

Online Data Recovery

"Online" or "Remote" data recovery is yet another method to restore the lost or deleted data. It is same as performing the usual software based recoveries except that this kind of recovery is performed over the Internet without physically having the drive or computer in ownership. The recovery technician sitting somewhere else gains access to user's computer and complete the recovery job online. In this situation, the user doesn't have to travel or send the media to anywhere physically.

Although online data recovery is suitable and useful in many cases, it still carries some points making it less popular than the classic data recovery methods. First of all, it requires a stable broadband Internet connection for it to be performed correctly, which many third world countries still not have. Also, it cannot be performed in case of physical damage to media and for such cases, the traditional in-lab recovery has to take place.

8.2.10 Home Menu Diagnostics

FiOS and STB that is cable TV and Set-Top Box is an equipment which is used to process signals in real-time, record(in case DVR is available), reply to your remote, and send video and audio out to your display and stereo in many different ways.

There is no need to know about the diagnostic menu. Set Top Box involves lot of information that exists in the Diagnostic menu. If there is a requirement to troubleshoot something or for some having a technical curiosity, this menu is the right option for you.

If you want to change your STB's output resolution, closed captioning, aspect ratio or HDMI advanced settings; that is the setup menu. By keeping the STB On, press "Power, Select, Menu" in quick sequence.

To enter the diagnostics menu: By keeping your STB On, press "Power, Select" quickly in series from the front panel. To turn off the STB, hit "Power". This will exit the menu. The next power up will return back to normal.

8.2.11 System Error Codes

System error codes are defined as hexadecimal-based numbers which are usually caused by internal system errors. A list of system error codes and their respective descriptions and recommended corrective actions have been defined in table below:

Table 8.1: System Error Codes

Error Code	Problem Description	Corrective Actions
010001	Window sensor circuitry not operating correctly.	Check window sensor switch. Check that the sensor cable is connected to the front panel PCA. Disconnect the sensor cable connector from the front panel PCA and read the resistance between the pins. Values should read as follows: Window Pins Up Down 1–2 ∞ Ω ∞ Ω 1±3 0 Ω ∞ Ω 2±3 ∞ Ω 0 Ω Replace defective wires or assembly. Replace front panel-to-main PCA cable. Replace front panel PCA. Replace the main PCA.
010011	Bail sensor indicates the bail is up when it should be down.	Use the bail sensor test to help troubleshoot.
010012	Bail sensor indicates the bail is down when it should be up.	Use the bail sensor test to help troubleshoot. Check for a sticky sensor flag.
010013	Bail is falling down (missing the detent).	Check for Mechanical problems. Perform the Bail Calibration.
010020	ROM test failure.	Replace EPROMs. Replace main PCA.

Contd...

010021	DRAM test failure.	Replace main PCA.
010022	Swath RAM test failure.	Replace main PCA.
010023	EEROM test failure.	Replace EEROM. Replace main PCA.
010024	Pen interface ASIC test failure.	Replace main PCA.
010025	Communication failure between the main and servo processors. Communication occurs through the processor support ASIC.	Replace main PCA.
010026	Servo interrupts not occurring or not reaching the main processor through the processor support ASIC.	Replace main PCA.
010027	Error in servo drive calculations.	Replace main PCA.
010028	Error in EEROM checksum calculations.	Replace or clear EEROM. Replace main PCA. Perform all calibrations. Press Enter to temporarily clear.
010029	Error in EEROM write.	Replace or clear EEROM. Replace main PCA. Perform all calibrations.
01002a	RS-232-C loopback test failure.	Replace main PCA.
01002b	Centronics test failure.	Replace main PCA.
01002c	Servo processor communication error.	Replace main PCA.
01002f	DRAM test failure.	Replace main PCA.
010030 010031	Failed communications between the carriage and main processors.	For all 01003X codes, check trailing cable Connections and continuity. If needed, replace the main PCA or the carriage assembly.
010032	Carriage ASIC test failure.	Refer to 010030.
010033	Pen interface ASIC and carriage ASIC link test failure.	Refer to 010030.
010040	Error detected in X-axis servo feedback loop.	Check X-encoder, encoder cable, main PCA.
010041	Error detected in Y-axis servo feedback loop.	Check encoder strip, carriage assembly, trailing cable, main PCA.
010050	Uppermost SIMM indicates a failure.	Replace uppermost SIMM.
010051	Next to uppermost SIMM indicates a failure.	Replace next to uppermost SIMM.
010052	Both upper and lower SIMMs indicate a failure.	Replace both upper and lower SIMMs.
010080	RS-232-C data overflow.	Data byte was not read before another was entered into the UART. Replace main PCA. If problem remains report the firmware problem to the HP Response Center or the nearest HP Sales and Support Office.

Contd...

020001 020002	Firmware problem. Bad EPROMS.	For all 2XXXX errors, report the firmware problem to the HP Response Center or the nearest HP Sales and Support Office. Note conditions before the error occurred. Include system configuration in the report.
030000	X-axis shutdown.	All 300XX errors indicate a failure of hardware or electronics of the X- or Y-Axis. Refer to SERVO CONTROL. SYSTEM FAILURES in this chapter.
030001 030002 030003	Y-axis shutdown. Y-axis friction too high. Y-axis failure	Refer to code 030000.
030010	Excess friction in pen capping assembly	Check mechanical parts in pen capping assembly for binding.
04xxxx	MIO interface error.	If an MIO is installed, check the MIO setup. Then replace the MIO.
05xxxx	Plotter system errors found.	MIO problem is indicated. The most likely cause is the main PCA or the interconnect PCA. Replace the interconnect PCA. Replace the main PCA.
060111	Line sensor LED not bright enough.	The optical sensor on the carriage has failed to locate lines drawn during the pen calibration routine. Reduce the ambient light. If the media is not clean and reflective, change the media. If the lines are faint, replace the pens. Clean lenses. Replace LED. Use the Edge detect test, found in the service menu, to help troubleshoot.
060302	Large final residual correction.	Refer to code 060111.
0700xx	Could not calibrate for the drop detect sensor location.	Check that the sensor and the sensor housing are properly aligned. Check that the service station cover is correctly seated over the sensor housing. Check that the sensor housing opening is clear of obstructions. Use the Pen nozzle and Drop detect tests, found in the service menu, to help troubleshoot. Use the Drop detect calibration, found in the service menu to recalibrate the position of the sensor. Check the drop sense cable connections. Replace the drop sensor.
0f0000	Firmware error.	Notify the HP Response Center or the nearest HP Sales and Support Office.

Source: http://www.partshere.com/Models/C2858A/DJ_650Adjustments_Calibrations.PDF

8.2.12 Test Submenu

There is a need to follow the below mentioned points to scroll through numbered test menus:

- Ensure that ignition switch is OFF.
- Push and grasp left cluster button.
- Rotate ignition switch to "radio". Test 1 main menu will be shown.

- Do nothing and display will automatically scroll through Test 1 submenus.
- Push instrument cluster left button. This signals cluster to display submenus or continue on to next main test menu.

Note:

- Tests 1 and 2 are unlocked forever.
- Tests 3 - 21 are only available after unlocking the test function.
- Test 19 is the unlock function for accessing the displays.
- If correction is required, go into Test 20 using the cluster button. The rectification factor number is altered by using the sub-menus for the 1s, 10s and 100s of the factor number. The digits will robotically scroll through 0 - 9 in each group (1s, 10s, 100s).

Table 8.2: Instrument Cluster Test Functions

Menu	Submenu	Sample output	Meaning
Test 1: Vehicle specific data (see Note below)	1.0	12345	Vehicle Identification Number (VIN)
	1.1	4812	Body Number
	6_1.2	834762	Part Number of Cluster
	1.3	010203	Coding/Diagnosis/Bus Index
	1.4	3499	Manufacturing Date (Calendar Week/Year)
	1.5	04_600	Hardware/software version of cluster (hardware = 04, software = 6.00)
	3_1.6	415_06	Injection status, number of cylinders, engine factor
	1.7		
Test 2: Cluster system test - activates gauge drivers, indicators and LEDs to confirm function (see Note)			
Test 3: SI data	3.0	1500	Liters
	3.1	0	Periodic inspection days (not applicable for US)
Test 4: Fuel consumption data (current)	4.0	0267	26.7 liters/1000km
	4.1	0073	7.3 liters/hour
Test 5: Fuel consumed/distance traveled	5.0	0195	9.5 liters/100 km
	5.1	226	Distance left to go (226 km)
Test 6: Fuel level sensor input in liters	6.0	237415	Fuel level averaged • Left side fuel sensor input = 23.7 liters • Right side fuel sensor input = 41.5 liters
	6.1	0652	Total tank level averaged = 65.2 liters
	1_6.2	0667	Indicated value and tank phase • 1 = Both sensors OK • 2 = One sensor faulty • 3 = Implausible input

Contd...

Test 7: Temperature and speed	7.0	032	Coolant temperature input = 32°C
	7.1	245	Outside temperature input = 24.5°C
	7.2	5283	Engine speed = 5,283 RPM
	7.3	058	Vehicle speed = 58 km/h
Test 8: Input values in HEX code	8.0 - 8.3	XXX	HEX code, instrument cluster inputs
Test 9: Battery voltage	9.0	125	12.5 volts
Test 10: Country coding	10.0	02	US (= 02)
Test 11: Cluster code	11.0	000003	Cluster code
Test 12: Not used			
Test 13: Gong test	13.0	"Gong"	Activate gong by pressing button (gong response is delayed).
Test 14 Fault memory (not for diagnosis)			
Tests 15 - 18: Not used			
Test 19: Lock/unlock (see Note)		L-ON	Display changes from L-ON to L-OFF every second. To unlock test functions, press cluster button immediately when it changes to L-OFF. Tests are automatically locked when exiting test functions.
	19.0	L-OFF	
Test 20: Average fuel consumption correction factor (see Note)	20.0	XXX9	Press button when correct 1s position is attained.
	20.1	XX5X	Press button when correct 10s position is attained.
	20.2	12XX	Press button when correct 100s position is attained.
Test 21: Software reset	21.0	reset	Reset software

Source: http://jbbeach.com/files/documents/bmw323ci/620-2_Instrument_Cluster.pdf

8.3 TROUBLESHOOTING TIPS

Certain failures, such as the media sensor and pinchwheel sensor, will not allow access to the service menu after the normal initialization process occurs. The front panel will be locked at this point. To alleviate this situation, perform the following steps:

1. Unload media (if present).
2. Switch OFF the plotter.
3. Simultaneously press the ENTER and UP ARROW buttons while switching ON the plotter.

Performing the above steps will cause the plotter to stop short of complete initialization. The display will read "STATUS: Initializing". The "Service Tests" menu can now be accessed from the "Utilities" menu in the normal way. After a repair has taken place, consider if any calibrations were affected.

The demonstration plot and configuration plot can be used to help diagnose problems. The demonstration plot has no special diagnostic features built in, but can be used to look at overall print quality including smoothness and straightness of lines, arcs, circles, and characters.

Check Your Progress

1. What are Start-Up messages?
2. Define Windows Protection Error.

8.4 LET US SUM UP

Troubleshooting is merely the methodical application of common sense and technical knowledge to the unavoidable problems that crop up in a fallen world. It's a reactionary approach, to rectify a problem. We got Start up messages due to Hardware failure, Bad driver, corrupt file or volume, System misconfiguration, Virus infection and installation of pirated software. For diagnosing these problems, we have to dive them deeper to discover the associated causes and there potential remedy. We have discussed the most frequent causes its symptoms and potential solution for each and every Start up errors. Most generic among them are and it's due to - Error in CONFIG.SYS line XX, Himem.sys not loaded, Missing or corrupt Himem.sys, Device/Service has failed to start; There are many factors that can corrupt Windows Registry; Starting from deleting certain software to being infected with viruses is most common causes. Most of the application software once installed prompts for a restart or reboot. This is one of the many possible Windows registry corruption scenarios? Sometimes Windows does not boot to the GUI after it finishes loading.Instead the system might gives certain errors in this case we need to do is reboot the computer, and enter Safe Mode. In Safe Mode, try to undo the last task completed activity.

8.5 KEYWORDS

Troubleshooting: Troubleshooting is merely the methodical application of common sense and technical knowledge to the unavoidable problems that crop up in a fallen world. It's a reactionary approach, to rectify a problem.

Registry: This is a database used by Microsoft Windows to store configuration information about the software installed on a computer.

Data Recovery: The systematic approach or method for retrieving lost data from corrupted or damaged source or repository.

8.6 QUESTIONS FOR DISCUSSION

1. If you are a database administrator and suddenly you found that your hard disk got crashed. Then please enlist the action points being taken by you for retrieving the same. And define the methodology adopted by yourself.
2. What is technical Troubleshooting? How it might be correlated with technical helpdesk used in BPO sector? Explain this in your own words.
3. What are the potential causes for Startup errors, its symptoms and remedial actions? Make a note for this.

4. What is windows registry and windows registry corruption? Elaborate this in your own words.
5. What do you understand by Failure to start GUI and Windows protection clause?
6. Once you found - Error in CONFIG.SYS line XX, Himem.sys not loaded, Missing or corrupt Himem.sys, Device/Service has failed to start then what are your action points?

Check Your Progress: Modal Answers

1. Start up message is a text window that pops up during a startup procedure. It generally contains an instruction text in following forms:
   (a) ***Error in CONFIG.SYS line XX:*** This error is usually caused by a syntax error in the CONFIG.SYS file line XX is the line number that the error occurred. Just edit the file using any text editor, and correct the problem.
   (b) ***Himem.sys not loaded:*** A line in config.sys to load a himem.sys is missing: You need to insert the command such as the following in config.sys file: DEVICE=C:\WINDOWS\HIMEM.SYS
   (c) ***Missing or corrupt Himem.sys:*** 9x will load without Himem.sys. If the file is missing, copy it. If the file is corrupt, run scandisk to detect and correct any disk errors.
   (d) ***Device/Service has failed to start:*** The error is usually associated with the Operating System failing to start a device or a service. The error may lead to a blue screen, and go no further.
2. Windows Protection Errors are usually received by users of Windows 95, 98, and ME and these errors can occur for a number of reasons:
   (a) An error resulting from damage to the system's registry
   (b) An incompatibility occurring between the BIOS and a device attached to the computer
   (c) A problem with the cache system
   (d) A problem with memory
   (e) A Virus
   (f) An address conflict or virtual driver conflict.

8.7 SUGGESTED READINGS

William Stallings, *Computer Organization and Architecture*, 6th edition, Pearson Education, 2002.

A.S.Tannenbaum, *Structured Computer Organization*: Prentice-Hall of India, 1999.

R. P. Beales, *PC Systems, Installation and Maintenance*, Second Edition.

Ron Gilster, *PC Upgrade and Repair Black Book*.

Peter Norton's, *Inside the PC*.

UNIT V

LESSON

9

PS/2 SYSTEM PROCESSOR

CONTENTS

9.0 AIMS AND OBJECTIVES

After studying this lesson, you will be able to:

- Understand ps/2 system
- Discuss micro channel which is used in ps/2 system
- Discuss various test equipments such as logic probes, pulsars, meters, analyzers and oscilloscopes, PROM burners, and power line monitor.

9.1 INTRODUCTION

The Personal System/2 or PS/2 was the designation for IBM's second generation of personal computers. The PS/2 keyboard and mouse ports were introduced with it. The IBM Micro Channel Architecture [MCA] bus was released around 1987 operating on the Intel 286 processor, then later on the 386 series of processors within the IBM PS2 series of computers. The MCA bus was an IBM proprietary interface. The MCA (Micro Channel Architecture) bus was used as a PC expansion bus, allowing expansion cards to be plugged into MCA slots on the Mother Board. Micro Channel has been discussed in detail in this lesson.

We have discussed various test equipments in this lesson such as logic probes, pulsars, meters, analyzers and oscilloscopes, PROM burners, and power line monitor.

9.2 PS/2

The Personal System/2 or PS/2 was the label for IBM's second production of personal computers. The PS/2 keyboard and mouse ports were introduced with it. PS/2 ports connect the keyboard and mouse to a computer and are generally color-coded on today's systems –that is purple is used for keyboards and green is used for mice. PS/2 ports are still provided by most of the desktop motherboards, but many keyboards and mice are using USB ports.

9.2.1 Micro Channel

There are four types of computer bus architectures in the personal computer environment: ISA, EISA, Micro Channel, and PCI. Each type of bus is physically different from the others.

IBM introduced MCA (Micro Channel Architecture) standard in 1988 at the time it released its PS/2 computer. Micro Channel was introduced as a key to the shortage of the ISA bus. However, because Micro Channel (MCA) was prohibitively costly, and since it was not backward compatible with older systems, the bus never trapped on. Micro Channel Architecture is electrically and physically mismatched with the ISA bus. The Micro Channel works as either a 16-bit or a 32-bit bus and can be driven separately by multiple bus master processors.

Micro Channel Architecture (MCA) is an expansion bus formed by IBM that was used in the company's PS/2 desktop computers. An expansion bus permits additional cards to be associated to the computer's motherboard, expanding the number of I/O ports. These comprise SCSI, USB, Firewire, AGP, and DVI connections, and also many others.

ISA stands for Industry Standard Architecture. It is the industry standard BUS in IBM compatible computers. A bus is defined as a subsystem that transfers data among computer components inside a computer, and is handled by device driver software. In 1983 a quicker 16-bit architecture was developed called the XT bus architecture. The 8-bit bus ran at 4.77 MHz, while the 16-bit bus operated at 8 MHz. IBM in a bold move in 1987 produced yet another architecture the MCA Micro Channel Architecture in an effort to take back control of the PC architecture, and market.

The MCA standard was intended to take the position of the AT and ISA buses used in earlier IBM PC/AT compatible computers. While the MCA bus architecture was an enhancement in both size and speed over AT and ISA, it was kept as a proprietary standard by IBM. This discouraged other developers from adopting the standard, since the MCA architecture was not compatible with other

standards. Most PC companies incorporated the more universal PCI and AGP expansion buses into their computers, which are both widely used today.

The MCA bus is outmoded; running at a 10MHz bus speed using either a 16 or 32 bit wide data bus, up independent, asynchronous. With bus improvements the speed reaches 80MBps, by clock doubling. The MCI bus only occurred on IBM PS2 series of computers which have been off the market for many years now. The MCA bus was not backwards compatible with the original ISA bus, and was only formed by IBM; however the MCA bus was licensed to a few other companies. The MCA bus was in contest with the EISA bus, but was rendered obsolete by the introduction of the PCI bus. The MCA interface is outmoded and should not be used for new designs. However, legacy systems may still include MCA boards.

9.3 TEST EQUIPMENTS (NET)

Some of the test equipments which are used in troubleshooting are discussed below:

9.3.1 Multimeter (DMM or VOM)

Multimeter is used for the examination of power supply voltages and voltages on the pins of ICs or other apparatus – service literature like the SAMs Photofacts described elsewhere in this document contain voltage dimensions at almost every circuit tie point for correctly functioning equipment. The multimeter is also be used to test components like transistors, resistors, and capacitors for correct value and for shorts or opens. There is no need of fancy instrument. A basic DMM – as long as it is dependable – will suffice for most troubleshooting. Consider Fluke, if you want one that will last for many years. However, even the mid range DMMs from Radio Shack have proven to be reliable and of acceptable accuracy. For some kinds of dimensions – to figure out trends for instance – an analog VOM is chosen.

9.3.2 Oscilloscopes and Logic Analyzers

While multimeter is used to solve many problems, a 'scope will be necessary as you get more into advanced troubleshooting. Basic necessities are: dual trace, 10-20 MHz minimum vertical bandwidth, delayed clean enviable but not important. Higher vertical bandwidth is enviable but most consumer electronics work can be done with a 10 MHz scope. A storage scope or digital scope might be desirable for certain tasks but is by no means necessary for basic troubleshooting.

Logic analyzers are the devices used to observe the performance of computers or to diagnose problems in other electronic systems. They use an oscilloscope to display complicated digital data to a user, permitting the user to check specific operations of the electronic system.

Troubleshooting the computer hardware itself as well as low-level software, drivers and firmware, instruments such as logic analyzers, oscilloscopes or In-circuit Emulators (ICEs) are common. ICEs may do much of the software debugger's work on low-level software or firmware.

The right choice of logic analyzers needs an understanding of application necessities and an analysis of performance specifications. Logic analyzer suppliers are situated across North America and around the world. Logic analyzers are used in growth of computer systems and networks to locate the source of hardware or software design errors. They conform to a number of approvals and certifications. For example, in Europe, logic analyzers usually put up with the CE Mark.

Use of logic analyzer through the manufacture phase can decrease the probability that serious problems with hardware or software will come up after a product goes to market. Logic analyzers are used to provide opinion on the number of computer parameters or systems, involving memory testing, testing input and output bandwidth, processor and bus support, networking, serial data validation and compliance, and signal integrity.

A logic analyzer is a device used in combination with a personal computer to troubleshoot and verify performance parameters of digital circuits. Logic analyzers are used to check circuits in surrounded systems and microcontrollers, robotics, and automotive computers. Logic analyzers may also work in mixed signal systems that use both analog and digital signals. A PC logic analyzer is typically a small profile tool that connects to the PC during a parallel port or a Universal Serial Bus (USB) port. PC logic analyzers use unique connectors or probes to check different circuits. These signals are then interpreted by the logic analyzer device attached to the PC. The PC interprets this data using a logic analyzer software package that creates a virtual analyzer or oscilloscope on the computer monitor.

9.3.3 A Video Signal Source

You may need both computer and television signals, depending on what type of monitor you are repairing.

- *Computer Monitors:* A test PC is of use as a video source. It will require supporting whatever scans rates and video types the monitor is intended to accept. Software programs exist to show purity, union, focus, color, and other test patterns. Or create your own test patterns using a program like Windows Paint.
- *Studio Monitors:* A baseband video source such as a VCR or camcorder is of use in case of a test pattern generator. These will permit you to manage the program material.

9.3.4 Color Bar/Dot/Crosshatch Signal Generator

This is a useful piece of equipment if you are doing a lot of TV or studio monitor repair and is required to perform CRT union and chroma adjustments. There are options that are almost as good: a VHS recording of these test patterns will work for TVs. A PC programmed to output a suitable set of test patterns will be fine for monitors (and TVs if you can set up the video card to produce an NTSC/PAL signal. This can be put through a VCR to produce the RF (Channel 3/4) input to your TV if it does not have direct video inputs (RCA jacks).

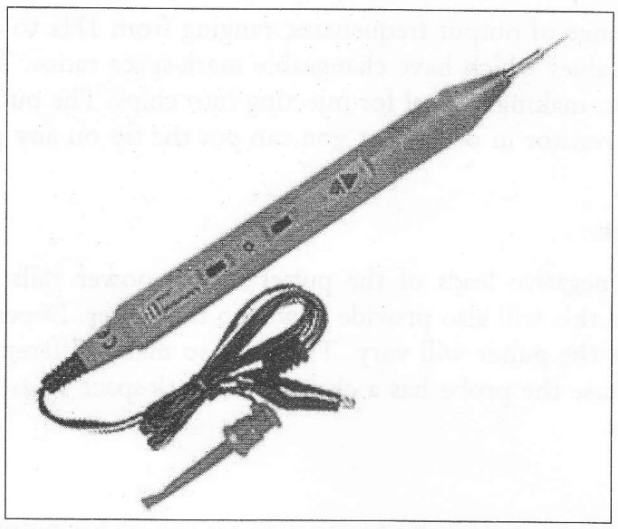
Complicated worldwide test pattern generators are available that will handle any possible monitor scan rate.

9.3.5 Logic Probe

A logic probe is a low cost test equipment which is used to diagnose about ninety percent of the faults without the requirement of any tool.

The internal circuit in a logic probe is so influential that it can identify even vary arrow pulses.

It is a hand held equipment that is very easy to work with and is very valuable. It appears as a large pen having an electrode at the tip instead of an ink cartridge and is used to identify the presence, absence or proper operation of the signal lines, both an external and internal connectors. It is used to locate the logic state of any node of the circuit with the help of pulses and the stable states.



The values of the cycles of digitals circuits voltages changes so rapidly that it can not be calculated by a standard multi-meter where as the logic probe is sufficient talented to identify these changes. It is also used in PC design process. Logic probe can be used to trace a printer problem, to show IRQ and DMA operations on I/O cards or some other problem just by clicking the signal changes by it.

The Logic Probe is perfect for troubleshooting and analysis of logic circuits. It works as a level detector, a pulse detector, a pulse stretcher, and a pulse memory. It features include

- Circuit powered
- LED indicators: HI (red LED), LO (green LED) and PULSE/MEMORY (yellow LED).
- Logic HI; LO; PULSER with different beeper tone.
- Switch-selectable pulse detection or pulse memory function
- Switch-selectable TTL or CMOS circuits.

9.3.6 Logic Pulsars

LOGIC PULSER is competent of delivering pulses of various compositions, to any type of circuit you wish to test. Basically it is intended to balance the LOGIC PROBE and can be used in situations where the LOGIC PROBE is not so efficient. It is an enhancement over a multimeter such that it has an audible output and is not triggered when measuring across a diode. Don't undervalue the relevance of this item of test equipment. It is required to properly test and set a fault in digital circuits. The time when you appreciate it most is when a tricky fault comes along. We have had a number of these and know how hard it is to improvise. A multimeter and CRO are all right for some applications but when it comes to testing digital circuits, they can give a readout which can be incorrectly interpreted and cause you to branch in the wrong direction. The correct tool for the correct job is the solution and this is particularly designed for digital circuits.

The value of a logic pulsar is not instantly obvious. A probe can be considered sufficient for all situations. This is not so. Some circuits needs to be examined in sections. This means the input waveform is not present and you need to know if the circuit will process the signals when it all goes jointly. This is the situation for a logic pulser. It is competent of delivering pulses to a circuit so that the result(s) can be identified, even though the circuit may not be complete.

The pulser has a broad range of output frequencies, ranging from 1Hz to 800Hz. Within these there are a number of output values which have changeable mark-space ratios. The waveform, in all cases, has a fast rise and fall trait, making it ideal for injecting into chips. The output transistor in the probe is confined through a 1k resistor in order that you can put the tip on any pin of an IC and not harm either chip or probe.

How to use the Logic Pulser

Attach the positive and negative leads of the pulser to the power rails of the project under test. Turn the project ON and this will also provide power to the pulser. Depending on the error you are tracing, the occurrence of the pulser will vary. There are so many different effects that we could not list them all. This is because the probe has a changeable mark-space ratio which will create different effects in different circuits.

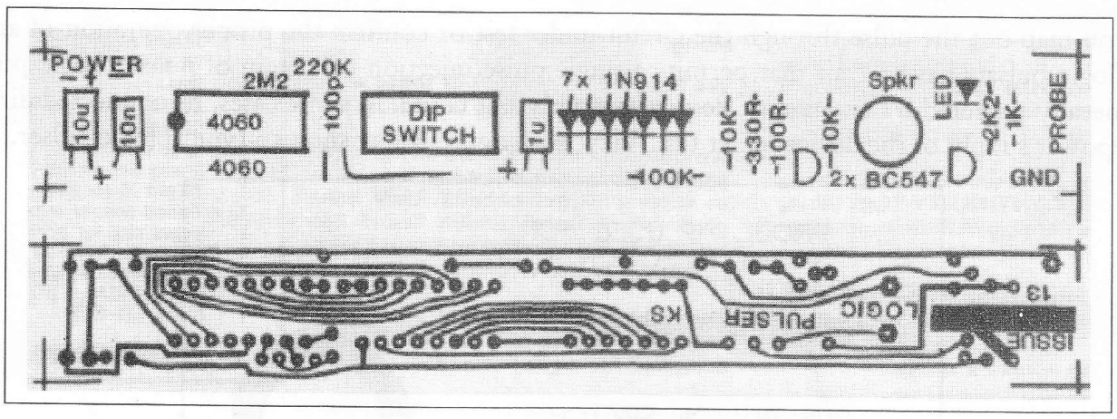
Using the Pulser

The logic pulser can be used by itself if the project you are testing has output devices which shows the results of the signals. If output indicators are not existing, you will have to use the logic probe. The basic method of using the logic pulser is as follows: Position the pulser on each of the pins of the chip and identify the effect on the output through the logic probe. You may or may not get a reading. This will depend on how strongly the input lines are attached to the rails. This may sound strange but it is an unpleasant fact for digital circuits. If you take the simple case of a chip being clocked by the output of another, the clock line is being taken HIGH and then LOW through the function of the circuit.

If you stop the circuit when the output is LOW, it will be very hard to pull the line HIGH as it is being kept LOW by the output transistors of the driving chip. These transistors have a certain amount of capability to keep the line LOW and this is known as SINKING ABILITY. The output transistors would not like this and having a ability of delivering 45mA to a circuit could prove to be harmful to lots of other parts of the circuit. The LOGIC PULSER is built around a CD 4060, 14-stage divider chip which has an intrinsic oscillator. With the addition of 3 components, the oscillator drives a series of 14 flip flops. The first output pin comes from the output of the 4th flip flop and this means the clock frequency is divided by 8. From there it is divided more and an output is available from flips flops 5 to 14 (except 12). Each output of the chip is taken to a switch on the 8-way DIP switch package and then diode gated together to form an OR gate. A transistor buffer passes the signal to the probe tip where a 1k resistor is present to prevent damage to the probe if probing a power rail etc. By turning ON various combinations of switches, you can generate a wide range of tones from a whistle to a 1Hz pulse. You can adjust the tone by tuning on additional switches to generate 'chirping' or 'phone-ringing' tones. This has the result of delivering a HIGH pulse modulated by LOW pulses, at the same time.

Construction

The PULSER is constructed on a single-sided PC board and assembled in the usual way. As the PC must be inserted into a toothbrush case, its parts must be small and any big parts must be curved over to lay flat in opposite to the board.



Source: http://talkingelectronics.com/projects/LogicPulser/LogicPulser.html

There is nothing 'particular' or 'remarkable' about assembly and construction is clear-cut provided you have a fine tipped soldering iron.

The IC lands are rounded because of the compact nature of the layout and you must be cautious when inserting the IC socket.

All the parts must be pressed hard against the PC board before soldering so that they take the least height possible. The two electrolytics, however, and 10n greencap must be kept a little above the board so that they can be bent over and lay flat. Start assembly by inserting the IC socket. If the socket has a cut-out signifying pin 1, put this over the 'dot' on the overlay.

Now fit the two links. They are positioned near the end of the 1C socket. The next link is not straight but formed like the letter 'L'. This has been essential due to the dense nature of the layout. Next fit the 7 gating diodes. These all face the same way and are pressed firmly against the board before soldering. Between the diodes and the end of the board are 7 resistors (and a mini speaker). The resistors fit flat against the board and are soldered in place.

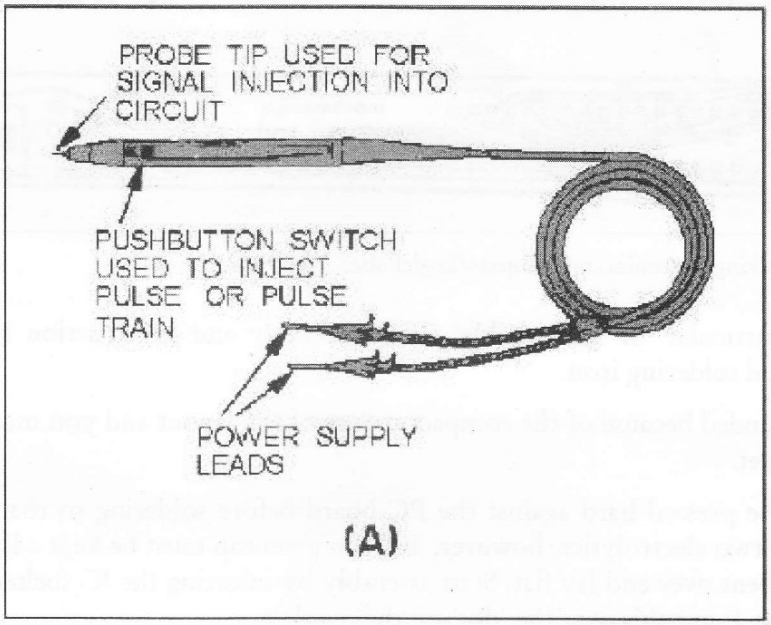
The two BC 546 or 547 or 548 transistors are pressed nearly up to the board and soldered in place. The 3mm LED is the next to be positioned on the board and it must be inserted in the correct way for it to operate. Put the mini speaker and solder in its position. It can be fixed in any way. Only a few parts remain. Start with the DIP switch. It is soldered straight to the board so that the numbers on the switches can be read according to the photo.

Join the two electrolytics so that the leads can be curved over and permit them to lay flat in opposite to the board. The 10u electrolytic fits near the end of the board and the 1mfd near the middle. The 10n greencap also lays flat against the board. Ensure that there is sufficient lead for this to be done. Lastly the two resistors and 100pf ceramic are fixed to the board. The resistors stand on end to occupy the least space.

The power leads which supply the pulser with energy should be about 50cm long to supply the plenty of freedom while using the unit. Link alligator clips or E-Z clips to the ends. Prior to connecting the leads to the board, press them through two holes in the end of the case and then join to the board. Straighten a paper clip and join it to the end of the board to create a probe. Insert the 4060 IC and the project is prepared for testing.

Logic pulsar is analogous in shape to the logic probe and is intended to inject a logic pulse into the circuit under test. Logic pulsars are usually used in combination with a logic clip or a logic probe to

help you map out the pulse through the circuit under test or confirm the proper operation of an IC. Some logic pulsars have a trait that permits a single pulse injection or a train of pulses. Logic pursers are generally powered by an exterior dc power supply but could, in some cases, be connected directly to the power supply of the device under test. View A of figure below shows a typical logic pulser.



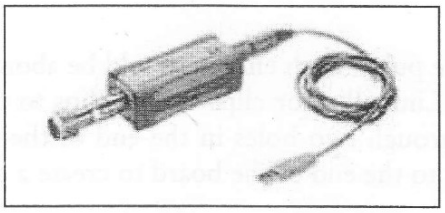
Source: http://www.tpub.com/content/neets/14193/css/14193_71.htm

Figure 9.1: Logic Pulsar

The Logic Pulser is very efficient tool for inspecting and repairing the logic circuits. It can be used directly to insert a signal into the logic circuits without removing the IC or breaking the circuits. The 100mA pulse output ensures that the device under test will be pulsed while the short 10μs duration of the output pulse makes sure that no harm will be done to the path under test. The Logic Pulsar output is switchable between 0.5 and 400Hz, making it appropriate for use with either a logic probe or with an oscilloscope; also has an external sync input, which enables the user to coordinate the pulse output with an outer signal, like a computer clock circuit.

9.3.7 Logic Meters

Meters are test equipments intended to make dimensions of specific parameters and show the results numerically. Meters are found for many tests including but not limited to: voltage, current, LCR, resistance, noise figure, power and power.



Source: http://www.trs-rentelco.com/Category/Meters.aspx

Figure 9.2: Logic Meters

9.3.8 Prom Burners

PROM, stands for a programmable read-only memory A PROM is defined as a memory chip on which data can be written only once. Once a program has been written onto a PROM, it remains there always. PROM's keep their filling when the computer is switched off. The difference between a PROM and a ROM (read-only memory) is that a PROM is developed as a blank memory, whereas a ROM is programmed in the manufacturing process. To write data onto a PROM chip, there is a need of a particular device called a PROM programmer or PROM burner. The course of programming a PROM is sometimes called burning the PROM.

An EPROM (erasable programmable read-only memory) is a unique type of PROM that can be erased by enlightening it to ultraviolet light. After it is erased, it can be reprogrammed. An EEPROM is related to a PROM, but requires only electricity to be erased.

PROM is a unique memory chip that appears to be blank when first purchased. It can be written to by the user by using a special hardware programmer. After inserting the data into it, it cannot be erased or changed.

9.3.9 Power Line Monitors

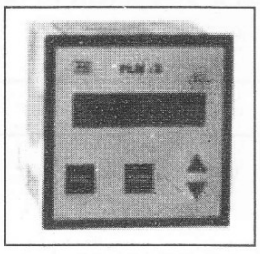
If you are not proficient to get an image on your monitor, first verify that the essential cables are attached appropriately and that the proper drivers are installed.

Some LCD monitors use a VGA input whereas others take benefit of the newer DVI interface to supply a connection to PCs. while connecting your monitor for the first time, there is a requirement of the right form of cable for both your monitor and computer. In various cases an adapter may be needed to transform the DVI signal from your monitor to work in a VGA input on your PC.

Make sure that the VGA or DVI cable is tightly attached to the back of your monitor and to the back of your PC. Use the small thumb screws on the ends of the connectors to keep everything tightened in place, which will avoid the cable from getting loose.

Monitors also use a power cable to plug into a power source. If the power light does not comes on, confirm that the power cable is inserted fully into the back of the monitor and that it is plugged into a working wall outlet or a dependable surge defender.

It uses an highly developed microcontroller, which samples voltage & current signals and computes True RMS voltage, current, power factor, powers and energies. It is used as a sub-meter for energy group. It appears as a stand - alone unit for manual monitoring. It can also be used with SCADA system through RS 485 port.



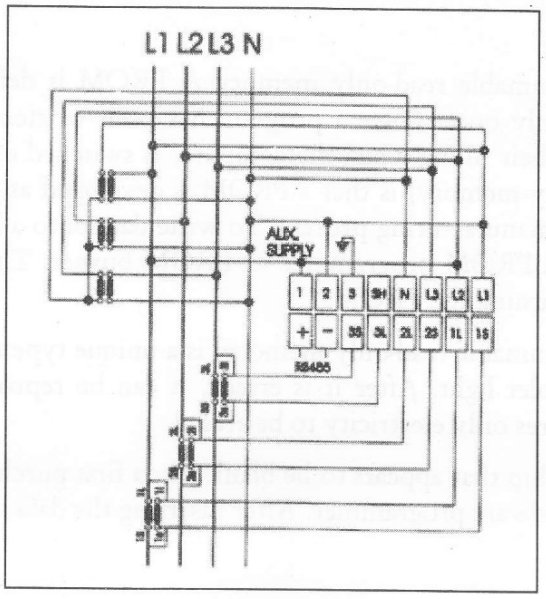


Figure 9.3: Typical Wiring Diagram

Check Your Progress

1. What is Color bar signal generator?
2. How computer and television signals are used as a video signal source?

9.4 LET US SUM UP

The Personal System/2 or PS/2 was the label for IBM's second production of personal computers. Micro Channel Architecture (MCA) is an expansion bus formed by IBM that was used in the company's PS/2 desktop computers. An expansion bus permits additional cards to be associated to the computer's motherboard, expanding the number of I/O ports. Multimeter is used for the examination of power supply voltages and voltages on the pins of ICs or other apparatus. Logic analyzers are the devices used to observe the performance of computers or to diagnose problems in other electronic systems. They use an oscilloscope to display complicated digital data to a user, permitting the user to check specific operations of the electronic system. A logic probe is a low cost test equipment which is used to diagnose about ninety percent of the faults without the requirement of any tool. A logic probe is a low cost test equipment which is used to diagnose about ninety percent of the faults without the requirement of any tool. LOGIC PULSER is competent of delivering pulses of various compositions, to any type of circuit you wish to test.

9.5 KEYWORDS

PS/2: The Personal System/2 or PS/2 was the label for IBM's second production of personal computers

Micro Channel Architecture (MCA): It is an expansion bus formed by IBM that was used in the company's PS/2 desktop computers.

Multimeter: It is used for the examination of power supply voltages and voltages on the pins of ICs or other apparatus.

Logic Analyzers: These are the devices used to observe the performance of computers or to diagnose problems in other electronic systems.

Oscilloscope: It is used to display complicated digital data to a user, permitting the user to check specific operations of the electronic system.

Logic Probe: It is defined as a low cost test equipment which is used to diagnose about ninety percent of the faults without the requirement of any tool.

Logic Pulsar: It is competent of delivering pulses of various compositions.

9.6 QUESTIONS FOR DISCUSSION

1. What is PS/2 system processor? Discuss how micro channel is used in it.
2. Discuss the following terms:
   (a) Micro Channel
   (a) Logic Analyzers and Oscilloscopes
   (b) Logic meters
3. Discuss how logic probe test equipment is used for troubleshooting.
4. What is logic pulsar? Discuss the process of using it. Also discuss the construction of logic pulsar equipment.
5. What are PROM burners? Differentiate between PROM, ROM, and EPROM.
6. What are Power Line Monitors? Discuss.

Check Your Progress: Modal Answers

1. Color bar or dot signal generator is a useful piece of equipment if you are doing a lot of TV or studio monitor repair and is required to perform CRT union and chroma adjustments. There are options that are almost as good: a VHS recording of these test patterns will work for TVs. A PC programmed to output a suitable set of test patterns will be fine for monitors (and TVs if you can set up the video card to produce an NTSC/PAL signal. This can be put through a VCR to produce the RF (Channel 3/4) input to your TV if it does not have direct video inputs (RCA jacks).
2. Computer and television signals are needs, depending on type of monitor which is being repairing.
   (a) *Computer Monitors:* A test PC is of use as a video source. It will require supporting whatever scans rates and video types the monitor is intended to accept. Software programs exist to show purity, union, focus, color, and other test patterns. Or create your own test patterns using a program like Windows Paint.
   (b) *Studio monitors:* A baseband video source such as a VCR or camcorder is of use in case of a test pattern generator. These will permit you to manage the program material.

9.7 SUGGESTED READINGS

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Ron Gilster, *PC Upgrade and Repair Black Book*.

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