VIDEO DEVICE INFORMATION

The terms "monitor", "crt", and "display" are often used to mean the same thing - the screen on which you are seeing this text.

They are actually different things - the crt or display is the image producing device (the cathode ray tube (CRT)), and the monitor is the the box containing the controls and support circuitry to the display. The monitor contains the buttons, yoke, connectors for electric power and to connect to the video card in your PC.

This graphic shows you the monitor (the case) and the CRT (the picture screen). The CRT is a large vacumn tube filled with some type of gas that can be activated to make images appear on the CRT. The monitor controls can be used to adjust the contrast, brightness, image alignment, etc.

To a user who looks at the CRT, the most important things are generally size of the display and the quality of the images projected on the CRT.

The size of CRT viewing area varies, usually from about 11 inches up to 21 inches for most computers (I feel a 17 inch screen is perfect.). You can purchase very large screens of up to 40 or more inches (All these measurements are diagonal measurements from upper left to lower right corners.).

The resolution of a screen is normally the number of pixels that used to display a full screen image, or you might say the "fineness" of the detail that it can display. It is really a function of both screen size and something called "dot-pitch".

The "Bus" is a problem with video - originally with the ISA bus, we could only move about 8 MB/s over the 16 bit ISA bus to a video card. With the advent of the VESA Local Bus, we could move a theoretical 132MB/s if we had a 33MHz system bus interface. Then the PCI bus allowed much higher speeds and could handle system bus speeds of 66MHz. A VESA Local Bus interface was common on many 486 processors, and the PCI bus is most commom on Pentium and later systems. Just remember: The slower the expansion bus, the poorer the quality. The bus is on the motherboard, so if you want to upgrade, you may need a new motherboard!

Resolution is often referred to as a type of standard (the first number means horizontal pixels (640), the second means vertical pixels (200)):

Array Type	**Pixels**
CGA	640 x 200
CGA(Double Scanned)	640 x 400
EGA	640 x 350
VGA	640 x 350 640 x 400 640 x 480

SVGA	1024 x 768
XGA	1024 x 768
VESA	1280 X 1024
8515/a	1024 X 768

The Video Adapter Card is another component that helps with total picture quality. The information going to the monitor or CRT must pass through the video adapter, and the the video adapter must be able to send information to the screen in the format required and at the proper speeds. However, for a video card to work properly, you must have a high quality monitor.

What we really want is exceptional "picture quality". I mentioned resolution and "dot-pitch" above, but that is only part of total picture quality.

1. Screen Resolution is the number of pixels on a screen.

2. Color Resolution is the number of bits used for color and how many colors you can create.

3. Sharpness

4. Brightness

5. Stability.

6. are other factors that determine the picture quality.

NOTE: The above figures are pertinent to CRTs, but are not the same for the LED, LCD, or Gas-Plasma screens used on laptop computers.

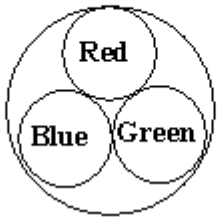
PC MONITORS

How do monitors work? Well first, lets say that there are color guns in the monitor that can regulate the intensity of a given color. There are normally three guns - RED, BLUE, and GREEN. Combinations of color and intensities of the colors can be mixed to represent any color desired. Some monitors are capable of only 2 colors, others 4, 16, 256, and even some that can represent "true" color (or over 16 million colors). Actually, you have no need for true color since you can't possible distinguish that many colors with your eyes, and it takes a tremendous processing power to calculate and display so many colors.

The color guns project beams of light (color) to various parts in a mix. These beams of light are called beams of electrons. They pass thru the deflection yoke in order to display them at the proper location on the screen. Your video card is responsible for sending the signals to the three color guns.

The beams from the color guns activate phospor dots on your screen. The amount of power in each beam determines the intensity of that color. Remember, a pixel is a single dot on a screen, but the pixel is made up of the three colors. Different amounts of power for each of the three guns determines the color displayed as the three dots mix for the pixel color.

- **Color monitors use red, green and blue phosphor pigments to form pixel dots**



A Pixel

Now, we can review the levels of resolution and the acronyms for them that have been developed over the years.

In the beginning there was very low resolution (300 x 200 pixels), but it has changed over time to reach the high levels of today! This resolution began even before the PC revolution; however, it was the PC revolution and evolution that caused the high resolution displays (monitors) to be made available to the general public at a reasonable (or affordable) cost.

DISPLAY STANDARDS

1. **CGA - Color Graphics Array** (1982) had several versions. The original concept was a 640 x 200 pixel screen, and later evolved to 640 x 400 (double-Scanned CGA) pixel screen resolution. These figures (640 x 200) means that there are 640 columns and 200 rows of pixels on the screen, or about 128,000 pixels on a early CGA screen! That is a lots of little lights to turn on!

   The CGA standard had the ability to display 16 bright colors, assuming you understood that black, dark grey, light grey, and white were "bright" colors at 640 x 200 pixel resolution.

   Later the double-scanned version of CGA had a resolution of 640 x 400 pixels. This allowed for sharper images, but still used the CGA standard. Double-scanned CGA is great for characters; however, it gave no increase in sharpness with graphics.

2. **VGA - Video Graphics Array** (1987 by IBM) basically was intended to improve the capabilities of the CGA or EGA standards by going to a 640 x 480 pixel resolution. It was backward compatible with all previously defined video standards.

   In text mode, you use 16 foreground colors and 8 background colors, make characters blink with 8 extra background colors. In text mode, each character was 9 x 16 dot boxes, so at 80 columns x 25 rows, the screen display was 720 x 400 pixels.

3. **SVGA - Super Video Graphics Array**. SVGA is a term used by the Video Electronics Standards Association to refer to all modes and resolutions beyond the basic 640 x 480 graphics mode of VGA.

   VESA specifies standards for how your software to determine what the display adapter does. The VESA does not tell a manufacturer how to build a display adapter. It does tell how your programs connect to your display adapter, and how the rules for connecting your monitor.

   These VESA standards include standards at resolution levels of 800 x 600,1024 x 768, 1280 x 1024, 1600 x 1200

A term called "dot-pitch" will also be very important to you. The "dot pitch" is a term used to specify the distance (in millemeters) between dots of the same color on the screen. Dot Pitch is used with something called a "shadow mask". This is a thin film of metal which has tightly spaced holes in it. It determines how the color dots in a pixel are aligned. The lower the number for dot-pitch, the better resolution you will have. A "shadow mask" works something like this:

1. The shadow mask is located inside the display tube, a short distance behing the phosphor coating of the screen.

2. The mask and the phospor coating are arranged so that the electron beam can only hit the phospor dots of one color.

3. The other two colors of the BGR group are in the "shadow" of the mask, and cannot be seen by the beam.

4. The phosphor dots must be spaced at the same distance as the holes in the mask.

5. The hole spacing of the mask determines the "dot-pitch" of the CRT.

6. The lower the dot-pitch number the better the resolution. The dot-pitch number specifies the spacing between the dots. So, the lower the number, the closer the holes, and the more dots that can be concentrated on a particular of the screen; consequently, the higher (better) the resolution or picture quality.

Remember, the smaller the dot pitch number, the better the quality!