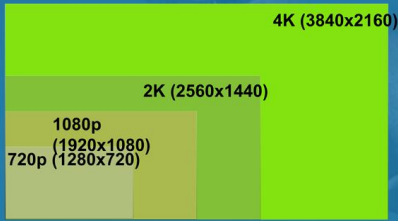


ITFreeTraining



Display Device Settings and Features

For the free video please see
<http://itfreetraining.com/ap/2a40>

In this video, from ITFreeTraining I will look at some of the display settings and features that you may come across when purchasing or using a display device. Understanding how these settings work will help you get the most out of your display devices.

Topics Covered in this Video

- Resolution
- Aspect ratio
- Refresh rate
- Response rate
- Luminance and contrast ratio
- Privacy filters

0:13 In this video, I will look at a number of topics, but regardless of what sort of display device you are using, whether it be a monitor, projector or mobile device, it will have these characteristics. It is important to understand each topic to assist you configuring your display device or if you are considering purchasing a display device.

Resolution

- Total number of pixels on screen
 - Measured using width and height
- Color depth (Number of colors supported)



Difference screen sizes and resolutions will have different picture quality and sharpness

0:33 The resolution of the monitor is essentially the number of pixels on the screen, but generally we measure it using width and height. The width will come first followed by the height. These numbers are difficult to remember so common resolutions will often be called something else. For example, 2560x1440 will often be called 2K.

The resolution also includes the color depth, which is the number of colors the screen can show for each pixel. The first screens had a limited number of colors, and in fact some could only support two colors. As time went on, the number of colors increased. Modern screens will support 18-bit color or 24-bit color; however, some monitors can support even more than this.

When purchasing a screen, the things to consider are different screen sizes will have different resolutions. This will affect the image quality and the sharpness of the image. For example, in a large screen, the image will generally appear less sharp as it has been spread out over a larger area. Sometimes it is better to get a smaller screen with a higher resolution than a larger screen with a lower resolution. The choice, however, comes down to what you think is more important.

The video card or device that is supplying the video will be able to output a maximum resolution. If your screen does not support that resolution, the resolution will need to be reduced. Also, another consideration is the amount of bandwidth a resolution requires. For example, a resolution that support more colors will need more bandwidth. In some cases, the cables used to connect a device will have a rating of how much bandwidth they will support. In order to support a higher resolution or more colors you, may need to upgrade the cable.

In the old days of Cathode Ray Tubes or CRTs, these monitors would be able to display lower resolutions than the maximum resolution. Newer monitors like LCD screens have a native resolution that they are designed to display at. They will support a lower resolution, however in order to do this they will scale the image. This will cause the image to look fuzzy.

Aspect Ratio

- Is a measure of the width/height, e.g. 16:9

4:3 (1.33:1)

640x480
1440x1080
2048x1556

Commonly used in old computers and cameras

21:9 (2.35:1)

2560x1080
3440x1440

Used in film making

Some monitors available in this aspect ratio

16:9 (1.78:1)

1280x720 (720p)
1920x1080 (1080p)
3840x2160 (4k)

Halfway between the two

Can play either 4:3 or 21:9 with limited cropping/scaling

2:51 The next specification I will look at is aspect ratio. An aspect ratio is a measure or ratio between the width and height. There have been many different aspect ratios over the years, but I will look at the three most common ones.

The first one, 4:3, was commonly used in the old days of computers and in old video cameras. It has a pretty square look. You don't see it used that much nowadays. If you want to shoot a video and make it look like it was shot 20 years ago, you would use this format.

An aspect ratio can also be written as a ratio to one. For example, in the case of 4:3 it can be written as 1.33:1. They are both the same thing, however you don't see it written this way very much. I can only assume that it is not written this way because it is harder to say.

The next aspect ratio is 21:9. This started being used in the early days of film making. One of the key marketing terms was to go see a movie at the cinema in wide screen rather than a box like image on a TV at home. Wide screen gives you that extra field of vision which is good to have when watching a movie. You can purchase a screen that uses this aspect ratio; this is useful for certain applications. For example, in flight and space simulations it is helpful to have this extra space on either side.

You now have two standards that are in wide use 4:3 and 21:9. The problem is that neither will display the other without some cropping or scaling. To get around this, a common aspect ratio of 16:9 started to be used. This aspect ratio is mathematically halfway between the other two. Because of this, it can play either 4:3 or 21:9 with limited cropping or scaling.

16:9 has become very popular and, because of this, became the dominant aspect ratio for high definition TVs and monitors. You will now find that a lot of high definition broadcasts are recorded in 16:9 and sites like YouTube also use this aspect ratio. If you do decide to go with a 16:10 aspect ratio, you also have the added advantage that when playing 16:9 videos there will be some room at the bottom of the screen for player controls. Some people will prefer 16:9 and some will prefer a wider screen, the choice is ultimately the consumers' preference.

In some cases, you may find that the monitor can be turned 90 degrees. This will make the monitor thin but quite long. This is generally used for people who are creating text documents and want to have the monitor more like what the document would look like in portrait mode. Sometimes you may see it used for electronic menus or advertisements. Although these kinds of aspect ratio may be used for specific purposes like these, they are not used for anything mainstream.

Refresh Rate

- The number of times per second an image is updated
- Frame rate is the speed a computer updates the screen
- Frame rate should match refresh rate
- Refresh rate measured in Hertz (Hz)
- Frame rate/Frames per second (FPS)
- Multiples, e.g. 30fps with 120Hz
 - Works well
- FreeSync/G-Sync
 - Adaptively changes refresh rate



Screen tear
Image updated while refresh occurring

5:57 The next specification I will look at is the refresh rate. The refresh rate is the number of times per second that the screen image is updated. The refresh rate differs from the frame rate in that the frame rate is how often the computer updates the image being displayed on the screen.

It is important to understand that although refresh rate and frame rate are used synonymously, they are not the same thing. When possible, the frame rate should match the refresh rate. When this does not occur, there may be problems displaying the image. One of the more common problems is what is referred to as screen tear; screen tear occurs when the monitor is refreshing the image and the image changes while this process is occurring. When this occurs, you will see a line somewhere in the image where the image appears to be shifted either left or right. What has occurred is the image was updated while the screen refresh was occurring.

Having screen tear like this can be very annoying. Some software will use a buffer to draw the images from. When the image drawing is complete, this buffer will be swapped to the screen. This helps to prevent problems like screen tearing from occurring. However, this does add an extra step and can slow down performance.

The refresh rate of a monitor is measured in Hertz (Hz) and is a direct measure of how fast a display can refresh an image. When purchasing a monitor, you will see the Hertz in the specifications for it. When looking for a monitor, 60Hz or above is a good place to start. Lower than this may not be a problem if you are only running software like MS Office, however if you are playing videos or playing games you want to start looking for at least 60Hz.

Frame rate is measured in frames per second or FPS. If your hardware is good enough, the frame rate should be able to match the refresh rate. However, a multiple of the refresh rate also works well. For example, a frame rate of 30 FPS works well with a refresh rate of 120Hz. If the computer is attempting to do an update on a non-multiple the image will not look as smooth.

To combat problems like these, there is technology such as FreeSync and G-Sync. This technology will adaptively change the refresh rate for the monitor as the frame rate changes. The problem with technologies like these is that your monitor and hardware will need to support it. Often this will increase the cost of the hardware, but it will give you a better experience.

Response Rate

- Time for pixel to change colors
- Generally measured from Gray to Gray (GtG)
- Independent measurements <https://displaylag.com/>
- 20 millisecond (ms) or less leads to ghosting or trails
- Higher refresh rates can help



8:41 The next specification that I will look at is response rate. The response rate is the time for a pixel to change colors, and this is generally measured in the time it takes for a pixel to change from one pre-chosen color of gray to another pre-chosen color of gray.

The response rate is provided by the manufacturer and since there is no standard on how to measure it they are free to choose any two colors of gray to measure between, so this makes it difficult to measure response rates between displays from different manufacturers. You may want to consider visiting an independent web site like DisplayLag to get more accurate measurements between different monitors.

If the monitor response rate is above 20 milliseconds, you most likely will see some ghosting or trails on the image when it updates. The problem can still occur at lower response rates but is not as noticeable. If you are playing fast video games, you typically want a fast response rate. A fast refresh rate can also help. Increasing the refresh rate from 60Hz to 144Hz for example will increase how quickly the images on the screen can be updated. This can help with ghosting and trails when the monitor is displaying fast moving objects.

Luminance and Contrast Ratio



- Brightness (Measured in cd/m^2 or lumens)
- Brighter is generally better
- Important for projectors and mobile devices

- Measure of luminance
 - From white to black (Ratio)
- Above 600:1
 - Better displays true blacks and colors



10:00 The next specifications that I will look at are luminance and contrast ratio. Luminance is a measurement of how bright the device is. It is measured in Candela per square meter or lumens. Candela is essentially a measure of how bright a candle looks from one meter away. Lumens, by contrast, measures how much visible light the light source is emitting – that is essentially how much light a human eye can see. Lumens tends to be a give a better idea about how a light source will look, since a light source could emit light such as ultraviolet which we can't see, but is nonetheless included in the measurement of how bright a light source is.

Generally, brighter is better. However, brighter also normally means that you will pay more for the device. Brightness is particularly important if you are purchasing a projector or a mobile device. Mobile devices will generally work well indoors, however if you use them outside and the device is not very bright you will not be able to see the screen.

Contrast ratio is essentially a measure of the difference between white and black. This is measured as a ratio, for example 600 to 1. Once you start getting above 600 to 1 you get better true blacks and better colors. True black essentially means the black on the screen looks black rather than a gray color. Generally, you will get a gray color because the device cannot block all the light coming through. Having a good contrast ratio also makes the bright colors look more intense on the screen. A high contrast ratio for a monitor is good for people who work in graphic design and video work.

Being able to see the image on the screen is important in most cases, but if security is important to you, you may want to prevent people other than the user of the computer seeing the screen.

Privacy Screen

- Prevents viewing of screen from the side



11:54 If you wish to prevent viewing of the screen, except for the person sitting directly in front, you may want to get a privacy screen. A privacy screen prevents viewing of the screen from the side. To understand how this works, consider this monitor without a privacy screen.

I will now apply a privacy screen to this monitor. In some cases, the privacy screen will need to be stuck onto the screen. In this case the privacy screen is reusable, so is simply placed on top of the monitor. You will notice that once the privacy screen is applied the monitor looks a little darker, but there is not much difference when the monitor is viewed from directly from the front.

You will however notice that if I turn the monitor on an angle, the image goes black. This prevents viewing of the contents of the screen from the side. Privacy screens are often used in environments where privacy is important, for example in banks where they don't want customers seeing what is on the screen.

To see the difference a little bit better, notice if I move the privacy screen so it is covering only half the monitor. When the privacy screen is moved you will notice that the part not covered can now be seen.

Privacy screens can also help with anti-glare and ambient light making it a little easier for the user to look at the monitor, particularly when doing so for long periods. You will find that some users may like the privacy screen and other anti-glare devices and some may not.

That concludes this video on display settings and features that you may come across when you use display devices. I hope you have found this video helpful and I hope to see you in the next video from us. Until the next video, thanks for watching.

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