High Definition Video

HD basics, a primer for home and business by Randy Gunter

By now everybody has heard of HD video and many people have gone out and purchased that big LCD or plasma HD television for their home or office. Yet, many people don't really know the difference between SD (480i), ED (480p), and HD (720p, 1080i and 1080p.)

On the business side, people who use video are wondering about HD and how to make it work in their television commercials, on their website, and for long-format video.

Resolution Basics
Most people understand that better picture quality is primarily created by more lines of resolution. (We'll explain lines of resolution later on.) But there's more to the story than just that.

There are actually two resolutions that come into play with HD. There is the source resolution–where the video is coming from (cable, broadcast, DVD, BluRay, etc.) And then there is also the monitor's resolution.

(Please note, when we refer to monitor, you can substitute the word TV. When we're talking about resolution, there is no difference.)

The Monitor Resolution
A pixel (picture element) is a dot on the screen that is actually made up of three little lights, one red, one green, and one blue–that's where the acronym "RGB" comes from. In theory, by changing the intensity of the three different colors, practically any color can be made.

If you count the number of pixels per square inch (PPI), you get a number that indicates the resolution of the monitor. Most monitor manufacturers do not prominently list their PPI, instead they translate that into a number referred to as "native resolution". This is the number of pixels in width multiplied by the number in height on the entire screen.

The larger the number of the native resolution, the better. For example a monitor with a resolution of 1440 x 900 is higher resolution than a monitor of 1366 x 768.

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Source Resolution
Now to try to make things more confusing, you have a completely different resolution to contend with. This is the resolution of the source video, often known as the video feed.

The source video is made up of lines of resolution. Common lines of resolution are 480, 720, and 1080. The resolution number is determined by counting the number of horizontal lines. (A line being a string of dots across the screen.) To get the number, you simply count how many lines you have stacked up on top of each other.

So if you have a 720 source feed, you can count 720 lines up and down on the screen.

Upconversion and Downconversion
The signal, the video information supplied to your monitor, is coming from your source, typically your cable or satellite feed, your DVD player, your computer, or the signal broadcast over the air.

Even if you have a high definition monitor, if your source is broadcasting in standard definition (SD), you won't be getting that high resolution picture. (Recent studies have shown that 50% of consumers who own HD TVs aren't even sure if they are watching in HD format!)

There are devices that can take a standard definition signal and "upconvert", where it will interpolate the image to make it look better on a high definition monitor. It won't be true high def, but it will help sharpen an otherwise blurry image. You will probably want to upconvert the signal when watching old DVDs on a newer, larger HD monitor.

If your monitor is lower resolution than the source, it will automatically downconvert a higher resolution source.

For optimum picture quality, a source and monitor that are the same resolution will provide the best results.

Mind your "i's" and "p's"
So we now know that there are different monitor resolutions, and different source feed resolutions. So what are those "i's" and "p's" that you see after the numbers? To understand that, we need a quick TV history lesson.

TV video signals are really still images flashed onto the screen so fast that they give the appearance of moving. On a standard TV, for every second of video there are 30 pictures, or frames, that are flashed up on the screen during that second's worth of time.

But, these images are "interlaced". (That's where the "i" comes from.) Interlacing means that you divide the picture's image in half into what are called fields. Each field is made up of every other line of resolution. Counting up and down, every odd numbered line is one field, every even numbered line is another field.

By taking the 30 frames, you actually show one frame in the odd fields mixed with the next frame in the even fields. In this way you are actually showing only 50 percent of the image, which gets mixed (interlaced) with the next image.

Why this is important is that, if you think about it, at no point in time are all of the lines of resolution being used for a single image.

So what would happen if you could flash each frame up using the entire screen? It obviously would show more information on the screen, which would in turn create a higher resolution image. (Remember with interlaced you are only seeing 50% of that same information.)

The newer digital technology allows us to do exactly that, and it is referred to as "progressive scan" –that's where the "p" comes in.

(And to be technically accurate, as progressive scan indicates, images are "scanned" in on the screen a line at a time, but this happens so fast that for our purposes saying that they are "flashed" on the screen is easier to envision.)

So if you compare a resolution that has an "i" in it, such as 1080i, and one that has a "p" in it, such as 1080p, you can easily figure out that for every second of video that you watch, the "p" version has twice as much information being flashed on the screen. (And along with that, a much clearer picture.)

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So what is better, 1080i or 720p? That's a toss up, since the 1080i has more lines of resolution, but the 720p has the advantage of progressive scan. To a majority of consumers, this won't make much difference at all. There may be a slight advantage to the 720p image for high speed action, like sporting events, because interlacing of a fast image won't be as sharp.

What to stay away from
Manufacturers came out with what they called ED sets–Enhanced Definition. This is the same thing as your Standard Definition (SD) TV but it is progressive scan technology instead of interlaced. (It's 480p instead of 480i.) When you see them on display in the stores, they are going to look better than your regular standard definition TV when playing from a progressive scan device.

But if you later switch over to a broadcast HD signal, the ED sets are not going to show the higher resolution picture. Our advice is to stay away from ED sets. The good news is that they aren't as prevalent out there as they have been over the last few years. But beware, there are still ED sets being sold and they really aren't true HD quality.

High Def "DVD" Players
So if you have a high definition monitor, you also need a high definition source. Your regular DVD player won't supply that information, although you can find some that will "interpolate" the lower resolution to look better on an HD screen. (Once again, this is referred to as upconversion.)

Anybody remember the VHS-beta wars? There are currently two formats that are fighting it out to be the standard in high definition to replace your old DVD format. Those are BluRay and HD-DVD. Since Sony is a motion picture company and one of the owners of the BluRay technology, you will find their movies exclusively on BluRay.

The good news is there are devices out there that will play both formats. The bad news is that these

devices are extremely expensive. (At least right now they are. Like every other electronic device, they should go down in price in time.)

Broadcast in HD
As far as broadcast signals, the cable and satellite companies will both sell you a package that will broadcast channels in the HD format.

But you can also receive HD signals with a basic set of rabbit ears. Since the networks are broadcasting HD digitally, it is very common to be able to get a good looking HD signal with a simple antenna where you normally would only get a snowy picture with the analog signal. For those of us who live out in the country, that is really nice.

Pillarboxing
As one more note on HD televisions, there seems to be a preponderance of stretched images. (As I have observed in quite a few stores that sell wide screen TVs.) What we are referring to are 'aspect ratios' and how people evidently don't know that they can simply change their television to adapt to the different sized images.

A typical standard definition screen size is a 4:3 ratio, which means that the height of the screen is 3/4ths its width. A typical wide screen image has a 16:9 ratio. (14:9 and 16:10 ratios also show up at times, although less common.)

When you have a widescreen television and you are watching a image that was originally created as a 4:3 ratio, you can either stretch the image across the screen, distorting it into unnatural shapes. Or you can click on the 'aspect ratio' button on your remote to fix the problem. Pillarboxing simply centers the original 4:3 image in the middle of your wider screen, creating black "pillars" on either side of the image.

Digital Broadcasting in 2009
As you are probably aware, the United States is switching over to a digital broadcast signal in 2009. But this isn't an issue of standard definition versus HD. Many people are confused about this and think that their old TVs will be obsolete at that time. This simply isn't true. (Although I am sure the TV manufacturers don't have any problem if people believe that they have to go out and buy a new TV.)

This change simply means that the signal will be digital, not analog. If you have cable or a satellite feed, this is a total non-issue. Your current receiver/box already takes the digital signal and converts it to an analog one.

The only people that this will affect are people that watch old TVs with rabbit ears or an outside antenna. Those people will have to get a converter box. (Estimated price will be around $50.)

A government website has good information on this subject at www.dtv.gov.

HD in the business world
Let's take a look at where HD fits into the business world. It seems that everyone is moving towards HD, as they should. It will be the standard in just a few years.

If you are considering a new video project, should you shoot it in HD format, even though you may not need it in that format right away?

In our opinion, any project that is being produced at this point in time probably should be shot in an HD format. The simple reason is that you can always "dumb it down", making it lower resolution. But there is absolutely nothing you can do to take a standard resolution file and turn it into high definition.

In most local markets, it seems that a majority of television commercials are still produced in standard resolution, even on the HD channels. But we feel that will change as HD becomes more common and the fact that HD video equipment is coming down in price.

Prosumer equipment (named because both professionals and consumers who want high end equipment are targeted for these items) is coming out that makes it more affordable to capture high definition video.

On the editing side, faster computers and cheaper, bigger hard drives also make editing HD something where smaller businesses can now afford to compete.

Distributing the HD signal
As far as video projects go, the biggest obstacle for HD is the lack of true HD quality players. It's one thing to have a HD quality video, it is another to actually play it for other people. Until businesses are equipped with BluRay or HD-DVD players, you may be stuck running it from your own playback device.

There are hard drive solutions and you can also run the video from digital tape.

The other current problem is the expense of BluRay or HD-DVD equipment to burn your own copies for distribution. In time, as the technology develops and becomes even more common, these issues will resolve themselves.

HD technology is here today and will only become more prevalent. Isn't it time that you made the jump to HD for your next video project?

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