

Tech Talk

With Bob Dolph

Tools and Tips to Ease Your Transition to Digital CCTV

Digital video, particularly digital video recorders (DVRs), is the most exciting CCTV technology to come along since the introduction of CCD chip cameras. With the speed of modern microprocessors and networks in the gigahertz range, along with dropping prices on 100GB+ hard drive storage, this market is just beginning to explode.

On the surface, digital appears easier and more versatile than older analog CCTV technology. However, as with many new technologies, looking below the surface shows it necessary to learn some valuable tips and resources to make life a bit easier for all of us.

Chart Helps in Testing and Evaluating CCTV Performance

Currently, there are hundreds of new and exciting digital cameras and recorders on the market, all making

claims that they have the best product with the best features. So how does one go about knowing if a camera or recorder performs as claimed?

One valuable evaluation and testing tool a dealer or technician can use is a CCTV test chart (*see diagram below*).

Normally, a laboratory test chart could easily cost hundreds of dollars. This one is actually part of a well-written book, called simply "CCTV," by Vlado Damjanovski. The chart is from the back cover of the book and is useful as a small test chart for assessing camera and DVR performance. I recommend the book for any serious video person. It is available from Butterworth-Heinemann (www.bh.com).

"OK, what can I do with this chart?" you ask. Let's take a look. Many of the chart measurements can be applied to DVRs as well as cameras, as follows:



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BOB'S TIPS

- Use a CCTV test chart to determine if a camera or DVR performs as claimed.
- You don't have to be a network IT specialist, but should be comfortable in a computer network environment.
- A strategy of compressing digital data is needed to get the best picture with the available storage medium.
- Find out what type of system is preferred by your local law enforcement or the forensic expert in your installation jurisdiction.

(A) Camera resolution can be determined by the sets of four triangulated horizontal lines.

(B) Video signal bandwidth can be checked with these sets of black lines. The higher the bandwidth the better the quality of the picture. This includes DVR recording.

(C) Camera focus and back-focusing adjustments can be made from the small square target of concentric lines in the middle of the chart.

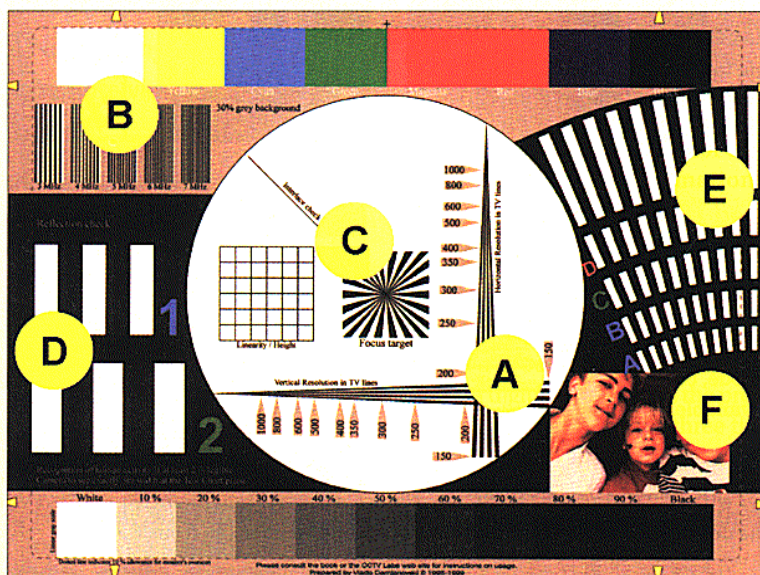
(D) The large bars on the left can test for correct line impedance matching and sufficient human details for holdup cameras and recorders.

(E) The tilted small white and black bars on the right give more detailed information on the recognizable human information for specifying security camera/lens combinations and DVR playback.

(F) On the right, the picture of the three children is used to check colors, such as human flesh, which is one of most difficult for color cameras to get correct. Be aware that this will change depending on the light source (tungsten, fluorescent, etc.) used at the actual CCTV installation.

Recording digital images of the

CCTV Labs Test Chart



This chart, from Vlado Damjanovski's book, "CCTV," can be used for assessing camera and DVR performance.

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chart and then playing them back can test digital image compression file formats such as MPEG, JPEG and WAVELET. Along with the above

test, there are some additional high-end tests that can be made if you have access to an oscilloscope or video vectorscope.

9 Key Facets of Digital CCTV Installations

1. Frame Speeds

Calculate frames per second (FPS) based on the processor power and number of inputs. For example, a typical processor that can support 30 FPS/NTSC (25 FPS/PAL) may have four BNC inputs. That calculates to 6.25 FPS (25/4), but in reality may give nearer to 2.5 FPS per input or 10 FPS across the card. Be careful to calculate true FPS per input.

2. Camera Positions

Prioritize camera positions on a 16-channel DVR. A suggestion would be four cameras on 1,5,9, 13 and the next set on 2,5, 10, 14, etc. This way, when you open up a quad screen, you can remotely deactivate the other cameras and get a full 30 FPS.

3. Check Cables

Some camera pictures bounce up and down slightly. The cause could be power near coax ; loss of impedance; coax cable kinks; poor termination; or reduced power at the camera.

4. Picture Lines

There are several different types:

- A. Ground Loop (horizontal line, normally scrolling shadow lines). Check phases and power points;
- B. Low power (horizontal line, with color change in lines);
- C. Noise (horizontal line, normally 0.5 mm thick scrolling), check cable runs and BNCs;
- D. Induction (vertical line), check cable run, power cable too close.

5. Static Electricity

Unexplained errors, DVR crashes every time you touch it. Check anti-static measures.

6. Slow Performance

Hard drive may need defragging. Run Scandisk or reformat hard drive.

7. Insufficient Airflow

This causes the DVR to reboot or shutdown. Relocate, possibly to an air conditioned environment. This appears to be more of a problem than with previous VCR devices.

8. Remote, LAN,WAN, Dial-up, etc. Setups

This is simple but often overlooked. Observe all manual instructions and the system help (FI) guide that is sometimes on the hard drive. RTFM gang!

9. DVR Problems Closing a Program or Hanging Up

This is possibly a hardware problem with either the power supply or random accessible memory (RAM). Try swapping RAM first, it's the easiest. Next, check the binary input output system (BIOS) for PC health and voltage status. The power supply may need to be swapped out.

Source: Electronic Security Distributors Association (ESDA)

I encourage experimenting with this chart and some evaluation equipment to better understand the products you are installing. You may want to check with various manufacturers to see if they have test results from using similar charts. Some BMP samples of product tests and the CCTV chart instruction can be viewed at www.cctvlab.com.

You Don't Have to Be a Network Expert, But...

CCTV installers and dealers do not need to be a network information technology (IT) specialist, but should be familiar with working in a computer network environment.

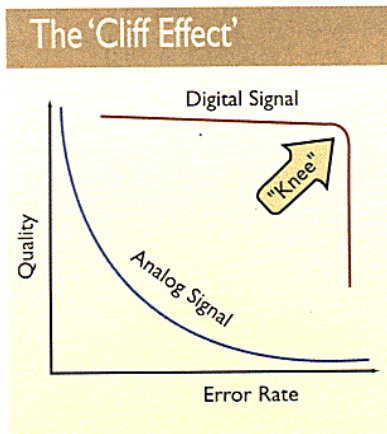
While many DVRs currently use analog camera inputs, more and more full digital systems will be used. Network addressing terminology such as subnet masking and static IP addressing should be understood (*for more on this topic, see October 2002's "Tech Talk"*).

In the old analog CCTV world, if a video signal was weak or noisy it could be amplified or filtered. We do not have this luxury in the digital world. Instead, we have to rely on the quality of the network and minimize the amount of signal errors. A digital video signal can tolerate only so many errors, and then the signal is gone — period. This sudden signal drop-off is referred to as the *cliff effect* (*see diagram on next page*).

When coordinating a CCTV installation with an IT manager, the dealer may run into some new terms, such as quality of service (QoS) and cabling certification. Because so many products, such as DVRs and digital IP cameras, are now being tied into computer networks, IT managers need additional performance guarantees. They need to know that the products and services connected to their network, and the network itself, will perform reliably, and as specified by manufacturers and installation companies.

Tech Talk

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Too many errors in a digital video signal results in a sudden drop-off known as the cliff effect.

Compression Method Affects the Resolution

In the United States, real-time video is typically 30 frames per second (FPS). However, a strategy of compressing digital video/audio data is needed in order to get the best picture with the storage medium available.

So what are some good guidelines for compressing this data and what are the consequences if not followed? Here are some suggestions:

- Keep compression rates at 20:1 or lower
- Use a full-frame resolution of 720 X 486 pixels

- Keep frame rates above 10 FPS for a single camera and 20 FPS for a fourcamera application.

Several compression standards are currently being used by DVRs. Keep in mind that JPEG compression is for still images, while MPEG is for motion video. If digital video data is compressed too much, it will lose too much data when uncompressed for viewing.

Data compression has a quality breaking point, which is sometimes called a *knee* point, and is similar to the earlier-mentioned cliff effect. The knee for JPEG is 8:1; MPEG, FRACTAL and WAVELET is 15-30:1 and >100:1 when provided with motion inter-frames. A new proprietary compression, called Super Motion Image Compression Technology (SMICT), claims to have an overall compression ratio of 2400:1.

Work Hand in Hand With Law Enforcement

With all of these compression schemes, a dealer must always keep one thing in mind: What is the final product and what are we going to do with it? Let's use a convenience store application as an example. We want to end up with a good viewable image of a robber, which can

then be used to identify the perpetrator and then possibly serve as evidence in court.

The first thing to do would be specifying camera and lens placement. It should allow a person's features to fill as much of the frame and monitor as possible. Having to drastically enlarge a digital image of a subject can have serious effects on picture quality.

Mike Fergus, executive vice president of the Law Enforcement and Emergency Services Video Association (www.leva.org) suggests the following:

- Have a DVR that can easily convert compressed proprietary digital video to a common format (AVI) for investigative purposes.
- High compression ratios can lose valuable data and make video useless to an investigator.
- Plan CCTV systems carefully. Simply adding a DVR in place of an analog VCR will not work. Look at the whole system.

I suggest you pay a visit to your local law enforcement video investigator or the forensic expert in your installation jurisdiction and see what they like working with. Remember, this is the person who may eventually be reviewing and trying to digitally enhance your customer's video footage after a holdup.