CCTV Digital Video Recorder (DVR) FAQ
from the Rockpile Security Buyer’s Guide

I - Frequently Asked Questions

The following are some of the questions we are commonly asked regarding digital video recorder (DVR) security systems. If you have a question not answered here, please don’t hesitate to contact us directly. We’d be happy to speak with you.

Rockpile Security has also published a series of white papers that provide significantly more detailed information regarding this and many other subjects including video surveillance, access control and security alarm systems. These white papers, as well as additional FAQs and other relevant information can be found at www.RockpileSecurity.com.

General

What exactly is a digital video recorder?

A digital video recorder, also known as a DVR, is a device used to store video digitally on one or more hard drives. In this respect, a DVR is essentially a computer except that all aspects of it have been optimized to capture, store and playback video. Another way to think of a DVR is as a “video server”. Just like you might have a file server or a print server dedicated to file storage or printing, a DVR is dedicated to handling your video.

Consumer DVRs (like Tivo) are what most people are familiar with and are used to record television programs. Security DVRs are cousins of the consumer DVR but are specifically designed to capture, store and manipulate security video, alarm events, etc. They are highly specialized machines that do one thing and do it very well.

What does a DVR look like?

A DVR looks like any other piece of consumer electronics. They are a little bigger than a VCR with an LCD panel, buttons and (usually) a jog dial on the front. Video, alarm, telemetry, network and power connections are on the back.

Can I use my existing cameras and just replace my old recording system with a DVR?

Yes. Modern security cameras are better than older models, no doubt about it, but as long as your cameras transmit a standard video feed, you can use them with today’s digital video recorders.

Which DVR is the best?

The truth is, there is no perfect DVR. Each DVR has a different set of options, features, storage space, etc. Some are more reliable than others. Some are easier to use than others. Some store more video per Gb of hard drive space than others.
Relying on the advice of a security professional is good advice. Don’t get locked into a dealer that only reps one or two product lines. You need someone who can match a DVR with the right features, reliability and price range for your unique situation while steering you away from the numerous low quality DVRs out there.

If you’re doing it yourself, read spec sheets and then ask your dealer lots of questions as the spec sheets can be confusing and sometimes downright misleading as to frame rate, storage space, etc.

**How complicated is it to use a DVR?**

Once set up and configured DVRs are very easy to use. Most people can be fully trained to use their DVR in less than an hour. Some of the more advanced features (like network setup) may take a bit more effort to get a handle on, but anyone can learn how to view, record and playback video in a minimum amount of time.

**How many cameras can I plug into my DVR?**

Typically DVRs come in 1, 4, 9 and 16 camera models. The reason for these strange numbers is that this allows you to see all your cameras at once on the same screen: 2x2 (4 ch.), 3x3 (9 ch.) and 4x4 (16 ch.). 8 channel and 32 channel models are also commonly available.

For situations where you may have more than 32 cameras, multiple DVRs can be integrated in such a way that they can all be viewed, played-back controlled and administered from the same screen, local (e.g. a guard station) or remotely (via a PC over the Internet). Some systems are capable of integrating 256 32-channel DVRs!

**What's the difference between a VCR and a DVR?**

VCRs record video on tape. DVRs record video digitally on hard drives.

Tapes wear out and must be replaced. DVRs have no tapes to wear out.

Tapes must be regularly changed or video will be lost. There are no tapes to change with a DVR.

When a video tape runs out, recording stops. When the DVR’s hard drive gets full, it automatically overwrites the oldest video.

Tapes record very low quality video. The lowest DVR video quality is better than tape. Higher quality video can be recorded on a camera-by-camera basis.

To find video, tapes must be swapped in and out and manually searched. Finding video with a DVR takes moments and can be searched by time or by event.

VCR based systems have very poor user security. DVRs have sophisticated multi-level user security features.

Images from video tapes degrade upon duplication. Digital video can be replicated without loss of quality.

Remote monitoring of VCR based systems is very limited. DVRs can be remotely monitored and controlled from anywhere there is an Internet connection.

Advanced features such as motion detection and off-site notification are difficult to implement with a VCR. Advanced features are standard with DVRs and many features are available that are not available at all with a VCR based security system.
How do I power my DVR?

DVRs use main line voltage (110/120 or 220/240) and simply plug into the wall like any other electronic appliance.

Can I record and playback at the same time?

That depends on the DVR. Most will allow you to simultaneously record and playback video but you need to check the specs. Note that simultaneous record and playback may reduce the global frame rate (see below).

Do I need a separate computer to use my DVR?

No. DVRs are self-contained. However, if you want to view video and manage your DVR from off-site, you will need another PC to do this.

What operating system does my DVR use?

That depends on the DVR. Many are built on Microsoft operating systems though some use the Linux operating system or a manufacturer’s proprietary operating system. Proprietary operating systems tend to result in higher performance, more reliable machines as the operating system is built specifically to serve video.

Does it matter what processor (CPU) is in my DVR?

While faster processors will result in better performance, it’s not really a choice you have. The manufacturer selects the processor they feel is appropriate for their DVR.

**Video Storage**

How much video will my DVR store?

This is a very complicated question because not only does it depend on many different factors, such as resolution, frame rate of each camera, etc. but it also depends on the compression technology used by the manufacturer to store the video.

In general storage time can be calculated using the following formula:

\[ T = \left( \frac{11574.07 \times S}{H \times V \times F \times C} \right)_{\text{Cam1}} + \left( \frac{11574.07 \times S}{H \times V \times F \times C} \right)_{\text{Cam2}} + \ldots \]

- \( T \Rightarrow \) storage time in days
- \( S \Rightarrow \) storage capacity in Gigabytes
- \( H \Rightarrow \) horizontal resolution in pixels
- \( V \Rightarrow \) vertical resolution in pixels
- \( F \Rightarrow \) frame rate in frames per second
- \( C \Rightarrow \) average video compression rate as a decimal

The difficult part of this calculation (aside from the fact that different cameras may be recording at different frame rates) is determining the average compression rate (C). This is because video is not compressed at a constant rate. The amount of compression achievable depends heavily on how much one frame changes from the next as compression technology relies on the ability to record only the (hopefully) small amount of information that changes from one scene to the next. If very little changes, compression rates will be high. If everything in the scene changes, there will be little to no compression.

Manufacturers will all provide DVR calculators and give statements regarding the storage time their units will provide, but keep in mind a couple of things. One, the times the manufacturer states assumes “normal”
conditions, whatever those are and two, manufacturers are in competition with each other and this causes the statistics they publish to be “optimistic”. An experienced CCTV solutions provider will be able to help you estimate the storage time you will be able to achieve given a particular DVR and your particular situation. Since the DVR is the most important component of your system, it’s usually better to overbuy on storage space a little bit rather than be locked in to solution that doesn’t meet your needs.

For more information on video compression, storage capacity and other related topics, please see Rockpile Security’s white paper entitled *CCTV Digital Video Recorders (DVR)*.

**Where does my DVR store the video?**

DVRs stores video digitally on one or more internal or external hard drives.

**What is meant by "video compression"?**

Video compression is a way to reduce the amount of hard drive space a video file takes up.

Several different video compression technologies exist but they all work in a similar way. Essentially, each video frame is compared to the frame that immediately preceded it and only the information that changed from the previous frame to the current one is recorded.

For scenes that have very little changing from one frame to the next, the compression rate will be high. For scenes where a lot is changing from one scene to the next, the compression rate will be low. This is the primary reason why it is so difficult to precisely predict how many days of storage you will be able to get with a given hard drive size. Blowing leaves, flickering fluorescent lights, etc. can wreak havoc on storage space if the sensitivity of the cameras aren’t set properly.

In addition to compression that works by comparing one frame to the next, each frame is also compressed by identifying areas with the same colors, intensities, etc. and using mathematical representations to consolidate these areas. By combining areas of similar characteristics, compression can be greatly increased but this also results in loss of detail.

Many compression codecs (algorithms) allow you to specify the level of compression but be aware that the more an image is compressed, the greater the loss of detail that will occur.

**What are the different types of video compression?**

MPEG, MPEG2 (most common), MPEG4, MJPEG and WJPEG.

Video compression is a very complicated subject. For more information on video compression as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled *CCTV Digital Video Recorders (DVR)*.

**Can I back up all of my recorded video?**

Theoretically you *could* save every frame of video you record indefinitely - but it would take massive amounts of storage to do this. While in some industries it is important (or even required by law) to archive video for greater lengths of time, for most applications it is sufficient to retain video for between two weeks and a month. Any significant events that occur during this time can be saved to CD, emailed or transferred over the network to a different computer. Almost all DVRs allow video to be backed up in one or more of these ways. If you want full automatic off-site video archiving, a higher-end DVR will be required.

**Does it matter what type of hard drive the DVR uses?**
As with CPUs, while faster hard drives generally result in better performance, other than hard drive size, drive characteristics are not specified when purchasing a DVR but are instead selected by the manufacturer on a model by model basis to meet the engineering requirements of the DVR.

**Recording**

What's the difference between "time lapse" and "event" video recording?

Time lapse recording is another way of saying continuous recording. It’s referred to as time lapse because video recorded continuously is usually recorded at a frame rate significantly lower than full-motion (30 frames per second) video. For most applications, 3-5 frames per second will capture all the action in a scene. Higher frame rates are usually not necessary. For many applications, 1 frame per second is sufficient.

Event recording refers to recording only when motion is detected in a scene. Because virtually all DVRs are capable of motion detection, event recording is usually the way video is recorded using a DVR. Like “time lapse” recording, video recorded using event recording should usually be recorded at 3-5 frames per second.

With the proper combination of event recording, time lapse recording and frame rate settings, DVR recording time can be maximized.

Why can't I just use a video capture card in my PC?

Well you can but the difference is the quality of the video, the reliability of the system, the remote access options and the ease of set up. You can “roll your own” video surveillance system, and if you are particularly adept, you can probably come up with a decent solution. But the odds that you can create a system that can match the quality and reliability available from leading DVR manufacturers, who have staffs of engineers dedicated to designing and testing digital video recorders, are slim to none.

**Terminology**

What is meant by MHz, GHz, Mb, Gb, etc.?

MHz stands for Megahertz and refers to the frequency of an electromagnetic signal. This signal can be a TV broadcast signal, the signal of a wireless phone or the “clock speed” of the CPU of a desktop computer.

GHz stands for Gigahertz. One GHz equals 1,000 MHz.

Mb stands for Megabyte and refers to the amount of data a device is capable of storing. One Mb equals approximately one-million bytes. Kb stands for Kilobyte. 1 Mb equals 1,000 Kb. Gb stands for Gigabyte. 1 Gb equals 1,000 Mb or approximately one-billion bytes. Depending on the resolution, level of compression as well as other factors, a single video image can range from 1 Kb to 30 Kb or more.

As a side note, storage is usually referred to as “volatile” and “non-volatile”. Volatile storage is storage that doesn’t persist after the power is turned off. An example of this is the memory (or RAM) in your computer. Non-volatile memory is storage that persists between power-offs. Your hard drive is considered non-volatile storage.

What is a "computer bus"?

The computer bus is the “data pipeline” inside your computer which allows all of the components to talk to each other. Computers with faster buses can transfer data around internally faster. This is important when dealing with video as so much data must be moved around inside the computer.
What is a “motherboard”?

The motherboard is the heart and soul of a computer. It holds the processor (CPU), the bus, the drive controllers and other important components of a computer.

What is a "video capture card"? A “video display card”?

A video capture card is a card specifically designed to take video signals and convert them to digital information that the computer can process. Video capture cards attach on one end to the security cameras and on the other end to the computer’s bus. All DVRs have some sort of video capture card or cards installed.

Note that even though it’s commonly called a “capture” card, often the video capture card is also responsible for playing the video back. Some higher end DVRs have a separate “video display card” dedicated to the display of live video.

What is "RAM"?

RAM stands for “random access memory” and is the memory a DVR uses to process video data. It is volatile memory and its primary advantage over non-volatile memory (i.e. your hard drive) is that it’s fast. The more video a DVR needs to process, the more RAM will be required to do so successfully. If not enough RAM is available, the computer will begin to use the hard drive to process data that should be processed in RAM (by using a “swap file”). While this is not that much of a problem in a normal desktop computer (the computer will run a little slower), it will result in significant performance issues when dealing with digital video.

What is a “bandwidth throttle”?

A bandwidth throttle is a setting on a digital video recorder which limits the amount of data the DVR can send out over the network. It’s used to prevent the massive amounts of video data a DVR is capable of serving (as might happen if lot of users are trying to simultaneously view video over the network) from overwhelming the network. A bandwidth throttle does not affect the quality of video recorded or viewed live at the DVR, only the remote viewing of video.

Picture Quality

What is meant by "resolution"?

Resolution refers to the level of detail present in an image. The more pixels present in an image, the greater the level of detail and the greater the resolution. For CCTV installations, standard resolution is 320x240 (pixels wide x pixels high) while high resolution is 640x480.

For more information on resolution as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled CCTV Security Cameras.

What resolution should I be recording at?

In most cases, standard resolution (320x240) at 3-5 frames per second will be sufficient. Higher resolution is appropriate when a greater level of detail is required as, for example, at a cash register.

For more information on resolution as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled CCTV Security Cameras.

What is a “CIF”?
CIF stands for Common Intermediate Format and is a measure of resolution. One CIF is equivalent to 352 TVL x 288 dots per line. Digitally, one CIF is equivalent to 320x240 pixels, also known as standard resolution. Full motion, TV resolution video is 4CIF at 30 frames per second.

For more information on resolution as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled *CCTV Security Cameras*.

**What is “TVL”?**

TVL stands for Television Lines and is a measure of resolution for analog devices (such as analog TV sets). One TVL equals one horizontal scan line across a CRT therefore TVL is a measure of vertical resolution only. Horizontal resolution depends on the frequency of the broadcast signal and equates to about 440 dots for each scan line.

A standard television signal in North America is 525 TVL of which 480 are visible. Scaling the horizontal resolution from the equivalent vertical resolution yields an equivalent digital resolution of 640x480 pixels.

For more information on resolution as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled *CCTV Security Cameras*.

**Frame Rate**

**What is meant by “frame rate”?**

Frame rate is the number of images displayed on a video monitor every second. 30 frames per second is considered full motion video. Frame rate is also sometimes used when speaking about how many images a DVR is capturing and writing to disk in a second.

**What is the difference between "frames per second", "pictures per second" and "images per second"?**

Unfortunately this depends almost entirely on who’s speaking! The terms are used interchangeably in the industry to refer to several different ways of expressing video viewing and storage rates and methods. In general, frames per second refers to how many images are captured or displayed per second and is the most generic of the three terms.

Video is written to disk in two primary ways, JPEG and MPEG.

JPEG is “uncompressed” video and is usually referred to as “pictures per second” or PPS; and

MPEG is “compressed” video and is usually referred to as “images per second” or IPS.

For more information on video compression as it relates to video surveillance systems, please see Rockpile Security’s white paper entitled *CCTV Digital Video Recorders (DVR)*.

**What frame rate constitutes "full motion" video?**

The NTSC broadcast standard, which is what television conforms to, specifies full motion video to be 30 frames per second at 4CIF (an equivalent digital resolution of 640x480 pixels).

**What does “global frame rate” mean?**

Global frame rate is the total frame rate of the DVR available to be distributed to the security cameras connected to it. For example, if you have a 6 camera system with a global frame rate of 30 fps, each camera could capture video at 5 fps or two cameras could capture video at 10 fps with the remaining 4 cameras capturing video at 2.5 fps.
What frame rate should I be recording video at?

Full motion video is 30 fps (frames per second). For the vast majority of CCTV video surveillance applications full motion video is not necessary. In fact, in most cases a frame rate of between 3 and 5 frames per second will be acceptable.

**Viewing**

Can I operate my DVR without a monitor?

Many digital video recorders can be fully viewed, controlled and administered remotely in a so-called “headless” configuration. For these types of systems, a local monitor is not required, especially if the system will rarely be accessed locally. It’s still usually a good idea to have an inexpensive monitor installed in the event the DVR isn’t accessible via the network.

What kind of monitor do I need to view video locally?

It depends on the DVR, but most DVRs will support most monitors including traditional CRTs, flat panel LCDs, etc. The DVR will output to the monitor using one or more of the following cable types: RCA, S-Video or Component Video. Check the specs on the DVR and the monitor to insure compatibility.

What's the difference between RCA, S-Video and Component Video?

All three of these technologies are used to transmit analog video signals from a DVR to any monitor(s) directly attached to it. The difference is in the quality of video transmitted. From lowest to highest quality they are: RCA, S-Video and then Component Video.

Can I view my video offsite?

Yes. Most DVRs are networkable and allow you to view, playback, control PTZ cameras and/or administer the DVR remotely from your local network (LAN) or from almost anywhere in the world via the Internet.

Please see the following Rockpile Security documents for more information:

- CCTV Remote Viewing & Control FAQ
- CCTV Digital Video Recorders (DVR) White Paper

**Security**

Can I "lock up" my DVR so someone can't unplug it?

Yes. Special locking enclosures are available which will protect your DVR and it’s power source from vandals.

What prevents someone from logging on to my DVR and changing the settings?

DVRs are protected from unauthorized access using username/password security settings. Some DVRs have only one level of security while others have multiple levels of user security with the ability to specify multiple users with differing access (up to and including full administrative rights) on a camera by camera basis.

Will my system keep working during a power outage?
To keep your system up during a power outage you will need to install an uninterruptible power supply (UPS) which includes a surge protector and a battery. Depending on the UPS model and the size of your security system, backup power can last from a few minutes to 8 hours or longer.

What happens when a camera fails or is disconnected from my DVR?

Most DVRs have the ability to sense when a video signal has been lost and report the failure via a local alarm tone, email, pager, etc.

Integration

Can my video surveillance, access control, lighting, burglar alarm and fire alarm systems be integrated?

Yes. It’s now possible to tie your CCTV video surveillance, motion detection, environmental & burglar alarms, portal control, remote viewing, pan-tilt-zoom security camera control and duplex audio (intercom) systems together. Not only can they be accessed and controlled from a single point, local or remote, they work together to create functionality not previously available.

For example, if an alarm sounds your pan/tilt/zoom camera can swivel to the alarm point, turn on the lights, start recording video and immediately notify you via email, pager, etc.. You can immediately log on to your system from home (or anywhere on the road where you have an Internet connection) and instantly see what’s going on. You can even communicate with the local site in real-time via two-way intercom functions.

II - About Rockpile Security

For more information regarding any information contained in this document, please feel free to contact us.

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We’d be happy to answer any questions you might have, provide you with further information or help you design a security system that meets your exact needs.

III - Notices

DISCLAIMER

IMPORTANT INFORMATION – READ THIS!

This information is provided as-is and is intended solely to assist our customers to make informed buying decisions. It may contain errors and/or omissions of important facts and is not intended to be used to install, operate or maintain any equipment or for any other purpose. Under no circumstance will Rockpile Security be held liable for the information presented herein.

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