



2020VISION  
TECHNOLOGY

## Analogue vs. Digital Recording

### Introduction

A case can be made that analogue VCRs will be around for many years to come, but the advantages of digital recording are now so overwhelming that analogue systems may disappear far more quickly than some think.

This issue is a crucial one for those making investments in CCTV now and in the near future. As a company installing both digital and analogue systems, the views of **2020 Vision Systems Ltd** are un-biased in all but the ease of installation and management of any subsequent system.

### Scope

Firstly, in comparing analogue and digital technologies, there is much more to consider than just the recording aspects. Consideration must be given to the many true advantages and flexibilities of digital systems. Furthermore, digital technology is leading us down a path which will result in quite radical changes, not only in system performance and capability, but in the very structure of the industry. The benefits of all-digital systems will be so overwhelming that analogue systems may virtually disappear altogether. What you should focus on now are the benefits and limitations of systems which are available currently.

### Image quality

Images that are captured and stored digitally **do not** provide better quality. Digital recorders and well-maintained analogue VCRs with new tapes are both capable of recording high-quality images. Any recording system is only as good as its weakest link, and so often poor lighting, inadequate lenses/cameras, worn video tapes and poor quality cabling are responsible for most unacceptable quality images.

The advantage of an entirely automatic digital system in this respect is that you will always get consistent quality with effectively zero-maintenance, no matter how often the system is used or how often the images are copied.

### Tape management, hard disks and & storage capacity

Video tape management problems are not discussed in this document, however, the labour cost of tape management and incident locating on tape can be costly.

So how long can you record on a digital set-up? Now that very large hard disks are available cheaply, digital systems can offer very long recording times. Ignoring the fact that digital systems are capable of considerably better image resolution, there are major differences in storage capacities between the two technologies. The comparison of analogue video tape versus digital storage is not a straightforward matter. The reason is that you have to look at the wider operational picture of archiving, image management, and system application to appreciate the flexibility and added benefits of digital storage. Digital storage, therefore, depends on many factors, such as the number of cameras, the average frame rate, the image quality required, and the number of hours recorded per day.

A single video tape will store approximately 500,000 fields, and it is accepted that this would be equivalent to about 10 Gigabytes of storage on a digital system.

Taking a simplistic approach to storage capacity comparison then, we might say that a video tape costs perhaps £1 in bulk, and a 10Gb hard disk costs about £100. However, considering that a digital system might contain 100Gb of on-line hard disk space and store 10 to 15 days worth of recording at a rate equivalent to the 24-hour mode of video tapes, it can be seen that a digital system could run automatically with no changing of tapes. After 10 days, the digital system will simply record over the oldest files. At any particular time, the previous 10 days are always available. (Note: some digital systems are capable of storing even greater time periods).

It is worth noting at this point that using fast SCSI drives, instead of the standard EIDE is still relatively expensive. EIDE drives are low-cost and more than fast enough for digital recording.

### **The 24hrs-a-day, 30-days archive mindset**

One of the main advantages of digital recording is that it can free the user from the need for regular archiving, or tape-changing. For this, there must be sufficient disk capacity to give the user adequate recording buffer time. Recording buffer time could be defined as the time required to know when an event has occurred. This event can be copied onto a permanent-archive (e.g. for a prosecution). In reality a few days is enough for most applications, although there is a mind-set in the industry that 7, 14 or even 30 days must be archived at 24hrs per day. Digital systems can provide instant playback, free the customer from problems of video tape management, and provide other advantages.

### **The wider view**

The benefits offered by the power and flexibility of a well-designed digital recording system, such as event-driven recording, variable frame rates per camera, many and varied recording schedules, instant on-line playback, remote access, and playback-while-record offer a huge advantage over traditional tape recording.

### **Event-driven recording**

Event-recording illustrates the flexibility of a digital system and in contrast, shows up the limitations in analogue tape systems. The poor start/stop characteristics of analogue tape systems are the reason we have 24hr taping. There are many good reasons for event-driven recording, and as many ways to achieve it. Event or alarm-driven systems can provide a higher frame rate of the activity you want, and a more efficient use of storage capacity so avoiding archiving. Most importantly, the filtering of all the hours of non-events means a far more efficient and less tedious task of retrieving a particular incident. This dramatically increases the usability of the security system as a whole.

The combination of event-driven and time-lapse recording further illustrates the flexibility of a good digital system and should be exploited. In a large shopping centre, it makes sense to time-lapse cameras covering the main car parks and the shopping halls during the day, but at night when the shopping centre is closed these cameras could be recorded only when triggered by simple motion detectors, door sensors or burglar alarm systems.

## **Recording schedule flexibility**

A properly-designed digital system will provide a simple and efficient way of setting up different recording schedules for different times of the day and different days of the week. Each recording schedule can vary in terms of the cameras included or excluded, the frame rates for each, the active alarm channels, and the period for which each schedule is valid. The CCTV recording system can respond to alarms, to varying levels of activity, and record exactly what is required, every hour of the day and every hour of the week, completely automatically. This is vastly more flexible than traditional analogue multiplexer/VCR combinations. This way of doing things is so powerful, and so efficient, that a security manager need never go near the recording system, except when important events occur.

## **Playback**

With a tape system, you must first find the right tape, and then either stop recording on a VCR which is in use, or have a separate playback system (including multiplexer). You then wind the tape forwards or backwards to index the camera and time which you want to view. With a digital system, simply choose your date, time and camera on screen, press a button, and you are playing back within seconds. Furthermore, with a good system, designed for use with standard personal computers, you can playback from any location within networking distance of the recording systems, all without interrupting recording. A digital system will allow all the usual playback controls: Play, Pause, Fast-forward, Play backwards, Frame forward etc, but also very powerful features to help find particular sequences such as : Skip to next event, Next day, Previous Day, or even to show a list of recordings, dates and times. Not every digital system will have all of these features, however, but most provide some useful functions over and above analogue systems.

## **System compatibility**

Many digital system manufacturers use their own proprietary hardware and software formats which prevents playback on anything but another identical system. This may suit the interests of these manufacturers, but hardly meets the needs of the users. Any digital system could, and should, produce files which can be played back on common Windows-based desktop computers.

## **Which digital system?**

As with analogue systems, there are good and bad digital systems, however, any prospective user of digital recording systems must carefully go through the features and benefits of the systems on offer, and judge whether it meets their own specific requirements, perhaps using the comparative table shown here as a checklist.

## **Trends**

Analogue systems have a huge installed base, and so will be around for some time yet. Digital systems as yet account for a smaller percentage of the market for CCTV recording systems in the UK.

## **Conclusions**

Analogue systems have their place and are still cheaper than digital systems, but the gap is closing rapidly. The power and flexibility of good digital systems will more than pay for the extra cost, by reducing tape management problems, lowering maintenance costs and improving overall operational efficiency. Digital storage capacity is increasing dramatically and prices are coming down.

## Summary of Analogue versus Digital Systems

Operation	Analogue	Digital
Search and replay	Labour intensive	Instant
Copying	Quality loss	Identical copies
Initial quality	Poor to very good	Poor to very good indeed
Picture resolution	Limited by VCR bandwidth to 300 tv lines or 400 (S-video)	Limited only by video standard itself max 768 pixels horizontal
Quality over time	Quality loss through poor maintenance	Good, no loss
Storage capacity	500,000 fields (1 tape)	5 million fields (100Gb) or better
Archiving	Video tape	DAT, DVD, CD ROM
Archiving of important sequences	Video tape / lower quality copy / not robust	CD-Rom / identical copy / very robust
Printing	Expensive - video printer	Cheap - ink jet or laser
Playback compatibility	Some multiplexer problems	Any Windows PC (for good system)
Evidential robustness	Traditional & accepted	New but is being accepted
Automated features	Few	Many, varied, flexible
Event-driven recording	Limited	YES, many & varied programs
Time-lapse recording	YES	YES, many & varied programs
Variable camera sequencing	Fixed	Automatically variable program
Variable frame rates	Fixed time-lapse or real-time	Automatically variable program
Dial-up & download recordings	NO	YES
Playback over network	NO	YES
Replay while record	NO	YES

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