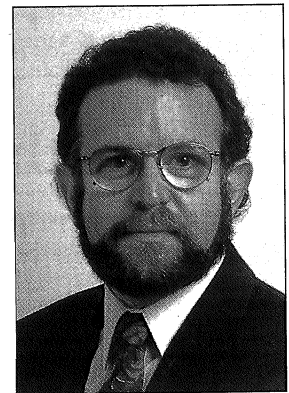


CCTV and the Law

The Digital Difference

Digital surveillance recorders are becoming increasingly popular, but will this hybrid technology lead the alarm and security industry into the future?

By Elliott Goldstein



Q: How do digital (video) surveillance recorders differ from conventional analog time-lapse surveillance recorders?

A: Digital (video) surveillance recorders (DSRs) are hybrid machines. They contain a hard drive disk (like those found in computers) and a tape drive for storage (for example, on a digital videocassette). The video signal generated by the surveillance camera is first recorded and saved on the hard drive of the DSR and then copied to, or backed up (that is, archived) on the DSR's tape drive. It is this digital video (DV) "tape" that is brought to court and tendered in evidence.

The advantages of this method of recording are numerous. The most important being that the "burden" on the tape drive is dramatically reduced, thereby minimizing maintenance and downtime. The tape transports and heads of DSRs are stationary most of the time because DV tape drives work only while recording the image data that is being transferred from the hard disk drive. Therefore, the mechanical transient motion and head running time are substantially (75 per cent) less in a DSR. Whereas the heads of a conventional (analog) VCR would run for one hour, the heads of the DV tape drive would run for only 15 minutes. This distinct benefit boosts reliability and reduces repair and replacement costs.

Images from the video camera are continuously recorded — even while the tape is being changed or rewound — because the image is first recorded on the hard drive, not the tape. Picture breakup and gaps in recording are thus eliminated.

Many DSRs are equipped with a

pre-alarm feature that allows for viewing of events prior to the alarm being triggered. This avoids the problem of information being lost because the trigger signal is received too late or the VCR takes too long to begin recording.

Most DSRs use high-density tapes, which are smaller than standard videocassettes and require less storage space. Many DSRs have a built-in multiplexing capability that allows for independent recording and monitoring of many surveillance cameras. They also offer a choice of various monitoring patterns: full-screen or split screen, for example, commonly with four to 16 divisions.

Time-lapse analog systems record directly onto VHS videotape. They require that the videotape be kept in constant contact with the video (recording) heads. Eventually this causes head clogging and wear, which necessitates frequent cleaning and yearly replacement of video heads (as per the manufacturers' recommendations). As these video heads wear, the signal-to-noise ratio (measured in decibels) becomes lower and the image quality degenerates. To compensate, some manufacturers include circuitry that detects such changes and automatically boosts the video. To avoid dropouts¹ and other problems associated with tape wear, manufacturers recommend that each tape be used no more than 12 times per year (that is, once per month) and then discarded (unless kept for training, evidentiary or archival purposes). Therefore, in 24-hour mode, these tapes are replaced once a day and 31 tapes are used per month.

Some DSRs are equipped with a machine-specific, original "watermark" system that permits the DSR to "identify" image data that has been artificially altered. When the DSR detects an alteration, it displays a message on the screen. This feature can be used in court to verify that the image data has not been altered — an important factor in satisfying the "chain of custody" requirement, which also involves showing who had possession of the tape from the time it was recorded until the trial.

From a legal standpoint, the use of DV tapes recorded by DSRs raises an interesting issue: Is the DV tape admissible given that it does not contain the original recording of the image but merely a copy of it?

The original images are stored on the hard disk drive of the DSR and then transferred internally (usually automatically) to the DV tape.² In some systems, the hard drive is overwritten, erasing the original image recording and leaving only a copy on the DV tape.³

Theoretically, the file containing the original recording of the image could be saved, the entire DSR machine brought to court, and the recorded image played on a monitor for viewing by the court. But this is not possible in systems where the hard drive is overwritten after the automatic transfer has occurred. Also, it is impractical and expensive as no one wants to have a DSR sitting idle on the shelf for months until a trial.

A simpler and more practical solu-

tion is to playback the image that was recorded on the DSR's hard drive directly onto a monitor for viewing by a number of persons (assuming, of course, that the image still remains on the hard drive). The image can then be transferred to a DV tape, which can be viewed by those same persons to verify that both the original and the recorded images are the same.

These individuals could then be called to court as authenticating witnesses. They could testify that the images seen on the monitor in the courtroom — which plays the DV tape — are a true, accurate and fair reproduction of the images they saw during playback of both the original image from the DSR's hard drive and the image on the DV tape. If the original image has been erased or overwritten and only the DV tape can be viewed by authenticating witnesses, their testimony is still necessary to establish that the tape has not been tampered with.⁴

This procedure also offers another advantage. If, for any reason, the DV tape is erased, those people who viewed the original incident can be called as witnesses to testify, from memory, as to what they saw on the monitor when the image was first shown to them.⁵ (Of course, there is an extremely minute possibility that the image may still exist on the hard drive and that another copy could be made and brought to court.)

Any objection to the admission of the DV tape on the grounds that it contains a copy — not the original recorded image — can be met by proving the integrity of the transfer process. This is accomplished in two ways:

- ◆ by proving that the DSR checks whether data is accurately recorded onto a DV tape and, if a recording failure is detected, re-records the same data on the tape; and
- ◆ by explaining how any relevant "watermark" system operates.

When these considerations and the merits of digital recorders are taken into account, DSRs appear to be a sound investment, especially for use in banks, office buildings, airport terminals, stores and shopping malls where

safety and security are of the utmost importance. Based on the information available to date, this author predicts that the digital (video) surveillance recorder will eventually replace the conventional (analog video) time-lapse recorder, ultimately becoming the new standard for the alarm and security industry.

Elliott Goldstein, B.A., LL.B., is a barrister and solicitor in private practice. He is also author of Visual Evidence: A Practitioner's Manual, which can be obtained from Sony of Canada Ltd. by contacting Dean Avola at (416) 495-3389. Or via e-mail at dean_avola@sony.ca.

Author's Notes

1 Dropouts, which appear as flashing streaks in an image on the monitor screen, are caused when the close contact between the tape and heads is obstructed by dust and debris.

2 This transfer feature is automated to provide protection against a hard disk drive failure. If a hard disk drive fails, some DSRs will record the image data directly onto a DV tape. Conversely, if the DV tape drive fails, recording continues on the hard disk drive without automatic transfer.

3 Any time an edited tape is brought to court, it must be accompanied by the original source tape(s), which cannot have been altered. The same rule applies to video "stills" that have been enhanced. The party seeking their admission must tender both the unretouched, original computer file and the altered computer file for the court's inspection and consideration.

4 Note that tapes recorded on some DSRs use a unique recording format and cannot be played on conventional DV equipment.

5 This procedure was followed, with success, in the famous English case of *Taylor v. Chief Constable of Cheshire* (1986), 84 Cr. App. R. 191 (Q.B.D.), discussed in section 13.7 of Goldstein, E., *Visual Evidence: A Practitioner's Manual* (updated three times per year). Carswell, Toronto, 1991.



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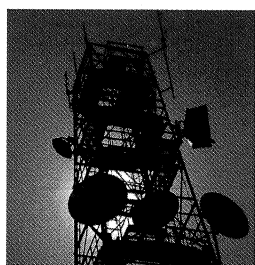
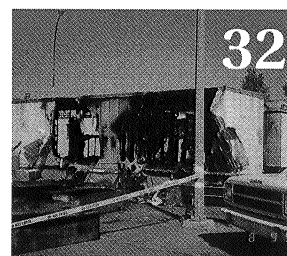
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