Integrated Multiplexers
– Digital Recorders

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For the second time already, we have shown, on the pages of TWIERDZA No 1/05, a specification of the parameters for the most popular digital video recorders (DVR) on the Polish market, which are designed to work in video surveillance systems (the 47 latest models). The previous report was published two years ago. Has there been a big change since then? A very big change, actually.

The number of devices offered, is rather similar, and the prices have gone down a little bit, however, the capabilities of the devices have definitely increased. For example, the capacity of the internal HDD - one of the most essential parameters of DVR's - has seen a nearly ten-fold increase over the past two years! In addition to that, new techniques of video compression have emerged which are much more economical as far as the size of files is concerned. As a result, the time of recording has been considerably extended, practically eliminating one of the biggest inconveniences of the older digital recorders – a relatively short total registration time when compared to time-lapse video recorders (VCR) with their virtually unlimited archive of cassettes and, resulting from this inconvenience, the relatively high cost of the device when calculated per hour of recording. And you don't need a bookcase to store your archive of videocassettes anymore.

Comparing the old and the new range on offer shown by TWIERDZA you can also notice a significant differ-ence in the standard set of accessories. For example, practically all the new recorders are equipped with a network port, enabling (at different levels, of course), remote access to the configuration parameters, as well as the normal operation of the device. Most of the recorders, presented today, are also equipped with built-in systems, enabling very convenient archiviza-tion of the recorded material to CD or DVD and/or on a cheaper Compact Flash Card which is becoming more and more popular. In short, there is a completely new quality for the same price.

Before you make a choice – what parameters should be given your special attention? A device with 4, 6, 8, 9, 16 or 32 inputs?

Of course, the basic criterion for a future user will always be the price of a device. Budget is budget. However, while planning the budget of your CCTV sys-tem you should, in addition to basic criteria such as the number of supported cameras, take into account the fact that usually, in the systems supporting several to more than a dozen cameras, the heart of the system in the long-run is its digital recorder-multiplexer, and that its efficiency, quality and reliability will set the security standards for the protected facility. The differences in prices of 4-, 6-, 9-, 10-, 16- or 32-channel recorders are usually one of the less important components of the total equipment cost (including cameras, lenses, transmitting and powering devices), and, most of all, the cost of the installation (wiring) of the system. You should remember that, as a rule, a DVR with a bigger-than-you-need-today number of supported cameras

is equally well or even better (usually there are more available functionalities) configurable than the less capacious one. And should the need arise, there will be no problem with connecting another camera – add one more wire, reconfigure the recorder, and you are done. Most of the manufacturers, whose products are presented on our ranking list, offer a range of devices with varying (usually 4, 8 or 16) numbers of camera inputs. You should be far-sighted. We recommend that you choose a DVR of a size at least one point bigger than you need at the moment, because it can simply pay in the future.

Compression

The next crucial parameter of a DVR is the type of video compression it uses. MJPEG, MPEG and Wavelet are the most common algorithms appearing in the table shown. What is the difference, which one to choose and why? We should, at this point, refer to the detailed descriptions of the pros and cons of the various compression methods, discussed in the previous editions of TWIERDZA. However, for your convenience, without browsing through the back issues of the magazine, note that all the compression algorithms can be divided into two basic types: the intraframe compression and the interframe compression. The first type includes Wavelet, MJPEG with all its variations (ML- JPEG, MJPEG 2000 and others) and some, so called, own compression methods which are usually modifications of those listed above (for details, refer to the distributors of respective devices), and the second includes all the variations of MPEG compression, with the most common MPEG2 and MPEG4 types. The practical difference between these two types is that in the first case every frame of the recorded material is accessible for editing, printing or saving, while in the second case only one in the sequence of twelve is accessible, as the subsequent ones are produced artificially by the system on the basis of the changes in their contents (see TWIERDZA No1/2003).

The intra-frame compression usually produces larger image files, using more hard-disk space. However, it is so far the only compression method that enables access to every single frame, and makes it possible to establish the reliability of the recording without any doubt. The interframe compression, known for its economical use of transmission bandwidth (the size of a so-called average frame is less than 4 kB), is commonly used by professional digital TV, where a single frame of a movie doesn't matter. For example, the subscribers of digital Polsat or Cyfra+ don't care about "squares", popping up from time to time on their screens, or for the image freezing for a few seconds. However, for a security system it can sometimes be a really serious problem. The ideal solution would be to have the material recorded locally (our DVR) with the use of the best and most reliable quality provided by the intraframe compression – the prices of hard disks have a per-manent tendency to decline, while their capacities grow, don't they? – and remotely, via LAN, WAN or the Internet; due to the transmission bandwidth limitations, the economical interframe compression of the transmitted image should be applied. This favours those of the devices shown that write the images to their local disks with the use of not-so-very-economical Wavelet or MJPEG or similar compression technologies and transmit them, using efficient MPEG2 or MPEG4 methods. However, the fact that a device creates different file formats for the video files saved on its internal hard disk and for the files transmitted to the remote users, requires appropriate procedures. These are not the same files. In case of any legal action there might be a problem. The transmitted images should, as a rule, play only an illustrative role. Should any accident happen, we must always have access to a reliable source image.

Recording speed

The next parameter, specific to digital video recorders is the number of frames recorded per second by a given device. Previously, as most of the manufacturers of DVR's used standard circuits common in TV technology, most of the stand-alone devices enabled recording of up to 50 fps (PAL). Only the recorders based on personal computers, equipped with special cards, offered a higher recording speed. Today the situation is different: many new encoding circuits have been designed especially for the CCTV industry, and the devices have several channels, working in parallel with codecs controlled by one dedicated processor. Recording even up to 400 frames per second (25 fps for each of the 16 cameras) is no longer a problem. With file sizes of about 4 kB and a disk space of 1 TB, such a device ensures a recording time of more than a week. With the use of – already standard – possibilities to program recording schedules, motion detection, external alarms and more, this period can be made at least several times longer.

Of course, for most of the typical security systems, such recording speed is completely unnecessary. Usually, the absolutely sufficient speed of recording the image from a camera is 3-5 fps in an alarm situation (for an alarm induced manually, as a result of motion detection or from an alarm input, e.g. an external motion detector; while in a normal situation it is 1 frame per 10-20 seconds), as its main purpose is to provide evidence that the system is operating all the time. It is different with observation systems or so-called video surveillance or video monitoring, where the image from most of the cameras should be recorded at the maximum speed all the time.

In the next issues we are going to continue on the subject of DVR's, we will also bring up the subject of HDD capacity and describe some interesting functionalities and network features, as well as archivization methods. ■