# Windows Video Capture Cards

By Bob Doyle

PC users who need to capture video for corporate presentations, CD-ROM games, kiosks or educational applications used to be at a decided disadvantage compared to their Mac peers. Just one year ago we tested 14 Video for Windows capture cards, and only half could even achieve 8-bit color, capture at 15 frames per second. (Intel's Smart Video Recorder was a notable exception.) Furthermore, no editing software was then available for the PC. Adobe's Premiere was at version 2.0 on the Mac, but only just about to appear for Windows.

Today, there are more than 40 PC capture cards that do better than last year's standard, and at least 20 include hardware compression chips enabling full-color (24-bit) capture, many at full motion (defined as 30fps) and some at full-screen (640 by 480). Several new editing packages are also available, including Premiere 4.0 for Windows, the undisputed champ.

For this review we looked for boards that were supposed to be able to capture and compress full-color (24-bit), full-motion (30fps), quarter-screen (320 by 240) video in real time on Level 2 multimedia PCs. This size is appropriate for computer screen presentations, and the data rates are small enough to play back from CD-ROMs and over video server networks. Thirty frames per second can also eliminate lip-sync problems in the "talk-

we started out with 22 cards, only 11 met this standard and nine are top-rated. Eighteen are reviewed here.

Full-motion video capture should not be confused with still-frame capture. All these cards can capture very high-quality 640-by-480 still frames for use in image processing.

Prices for the top-rated boards range from $500 to $3,000. We do not include two boards from Matrox and Truevision in the $6,000 range that are capable of 60-field, full-screen capture, the standard for broadcast-quality nonlinear video editing. (We reviewed these cards in the August issue.)

Surprisingly, many of the more expensive cards do not provide better performance. These are generally cards of older design, some taking up two full-length ISA slots and originally intended for high-quality JPEG still-frame capture and video-in-a-window overlay. M-JPEG video capture capability was added to these cards to take advantage of the emerging desktop video market, and capture performance is generally poor. Some older cards also use the Chips & Technologies PC Video chip, which requires less than 16MB of RAM, a severe limitation for work in Windows. Newer cards are usually 3/4- or 1/2-length ISA and PCI cards that exploit compression chips from LSI Logic and Zoran optimized for 320-by-240 capture or integrate the C-Cube CL-550 chip onto much smaller cards or daughtercard options. Despite their small size and lower prices, many newer cards provide video overlay functions, excellent 640-by-480 still-frame capture and even NTSC video encoding.

## NewMedia Lab Test Procedures

**Testing Platform:** To test Windows video capture cards we used a state-of-the-art Dell 90MHz Pentium with PCI and ISA buses as our principal test machine along with two similarly configured clones. We chose the P90 because it has enough horsepower to play back software-only codec files like Indeo and CinePak at their top rates. Each machine had 16MB of RAM, an internal 440MB IDE hard drive, an Adaptec AHA 1542CF SCSI adapter/controller and a 1.7GB Micropolis Microdisk AV-ready removable hard drive. Creative Labs Sound Blaster 16 cards were installed with double-speed CD-ROM players. We also used a 486DX2/66 with 8MB of RAM to test the cards with PC Video chips, which require less than 16MB of memory to be present.


Our standard software included DOS 6.2.1, Windows for Workgroups 3.11, Video for Windows 1.1a, Adobe Premiere 1.1, Adaptec EZ-SCSI, Sound Utilities and a number of hard disk speed test and video playback test utilities. We loaded standard config.sys and other boot files with the baseline system. The Adaptec BIOS settings were set to the same shadow RAM and DMA transfer rates, and the motherboards' BIOS used the same shadow RAM for graphics display. We restored the entire boot disk before installing each new card for a permanent 50MB Windows swap file on the boot drive. We then installed each card according to the

Feature'.

Choosing the right capture card has become a lot more complicated than last year. Major decisions include:

>Which compression algorithm to use—Motion-JPEG, Indeo, DVI, Auravision, MPEG or software-only;

>Which slot and system bus type—ISA, EISA, VLB, PCI;

>Connection to your VGA card for video overlay—VESA Feature Connector, VESA Advanced Feature Connector, VESA Media Channel or external passthrough connector (see page 82);

>Whether you want movie playback acceleration and scaling features—these can reside on your capture/overlay card or on your graphics display card;

>Whether you want the card to double as a VGA graphics card;

>Whether you want NTSC encoding (output) for videotape recording; and

>Whether you want audio capture on the video capture card or on a separate sound card.

Other options include TV tuners for video-in-a-window, MPEG playback and A/B switchers with wipes and dissolves between two video input sources.

As you might expect, average video image quality is much better than last year, and the range of quality is narrower. There is less color variation from card to card, and quarter-screen images (320 by 240) are the same quality as the user interfaces of current high-end nonlinear editing systems such as the Avid Media Composers. This quality is fine for "offline" video editing in which you capture with time code, edit in Premiere and later take the batch list of your Premiere project to a higher-end system for broadcast-quality 60-field capture. (Premiere is the only program offering time code support and batch recapture on the PC.)

For multimedia distribution

## NewMedia Lab Test Procedures

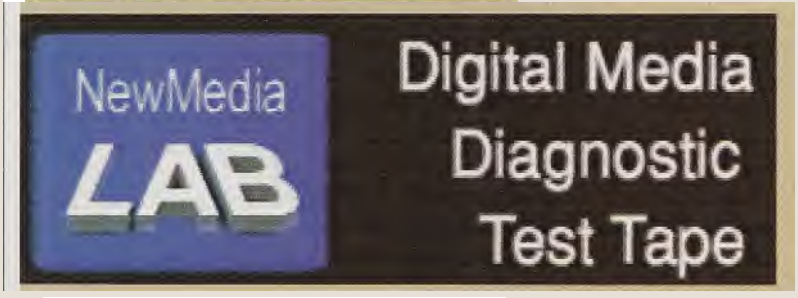
(continued from page 77)

woes (see "Installing and Tuning Windows Capture Cards," page 92).

**Capture Procedures:** To provide identical source media for each card, and a challenge for their video compression chips, we created a four-minute digital media diagnostic test on Betacam SP tape with the Matrox Studio 2300 nonlinear editing system. Our tape sources were top-quality (i.e., low-noise) Beta SP materials.

Each section of the tape was designed to highlight typical compression problems. One section emphasized motion to test interframe compressors like Indeo, another section had little motion but complex scenes and another had still frames. White frames and beep tones at one-minute intervals tested audio-video synchronization. We recorded standard video test signals generated by a Truevision VIDI/0 Workbench, and five seconds of a resolution test chart were shot with an Ikegami studio camera. We also generated random video noise alternating with black-and-white frames and a number of wipes and DVE moves of checkerboard black/white/-color/noise patterns, using Inscriber CG software and the Matrox Studio's DVE capability.


NewMedia Lab's Digital Media Test Tape is designed to evaluate the image and motion quality achieved by video compression products. A variety of text, animation and complex motion video sequences are included on the tape.




several combinations of compression quality, window size and color depth, and determined the maximum frame rate that could be obtained with each one. So that we could quickly detect dropped frames upon playback of captured video, our test tape had an animated time code display with a sweeping bar.

The Micropolis AV drives were defragmented with Norton Speed Disk before each capture to ensure optimum performance. We then used the Video for Windows VidCap utility as the capture software whenever possible. Contiguous sectors could be pre-allocated for the video capture file in VidCap or in the card's own capture utility. We color-calibrated our three 17-inch monitors with a standard SMPTE color-bar pattern stored as a disk file and made video adjustments for each capture card's video input with the SMPTE color bars on our test tape.

**Analysis:** Our test results varied widely in image quality and frame rates achieved. (For image-quality results, see page 84.) As far as frame rates, only 11 of the 18 cards we tested met our standard of 24-bit color, 30fps capture of a 320-by-240 video window. The other cards dropped lots of frames—if they could capture at this level at all.

We also tested how well the cards played back a captured video file on disk and found that few could play back as well as they could capture—a surprising result, since M-JPEG compression takes longer than decompression (although both tasks are completed in real time with appropriate chips). Most would occasionally skip frames.

Video for Windows apparently has trouble producing smooth playback. This may be caused by Windows and DOS software servicing higher-priority interrupt handlers and not coming back in time. We also found that VidCap's status line was inaccurate in some cases. VidCap would report zero frames dropped during capture when there were actually missing frames. The capture driver, written by the card manu-

# Windows Video Capture Cards

| Company<br>Phone | Alpha Systems Lab<br>(714) 252-0117 | ATI<br>(905) 882-2600 | Cogent Electronics/ADS<br>(415) 591-6617 | Creative Labs<br>(800) 998-1000 | Diamond Multimedia<br>(408) 736.2000 | Fast Electronic US<br>(415) 802-0772 | Hauppauge Computer Works<br>(800) 443.6284 | IBM/Intel<br>(800) 241-1620 |
|---|---|---|---|---|---|---|---|---|
| Product | MegaMotion | Video-Itl | Video Wizard | Video Blaster RT300 | VideoStar Pro | Movie Machine Pro | WIN/TV Cinema | ActionMedia II |
| Tested with | 2MB VRAM | | | | M-JPEG option | M-JPEG option | | Capture option |
| Slot type, size | ISA, full | ISA, 1/2 | ISA, full | ISA, 3/4 | ISA, 3/4 | 2 slots, ISA 3/4 | ISA, 1/2 | ISA (also MC) |
| Minimum system | 386, 4MB RAM, sound card | 486/33, 8MB RAM | 386/33, 4MB RAM | 386DX/33, 4MB RAM, Sound Blaster | 486SX/25, 8MB RAM | 386/25, 4MB RAM | 386 | 386/25, 6-8MB RAM |
| Memory limit | o | o | 8MB | o | o | ) | 0 | 0 |
| Configuration needs | 2 IRQ, ¦ I/O address, 2 memory base addresses | ¦ 1/0 address | ¦ IRQ, 2 DMA, ¦ I/O address, ¦ memory address, ¦ buffer address | ¦ I/O address, ¦ IRQ | 2I/0 addresses, 2 IRQ, 1 memory address | 2 IRQ, 2 DMA, 2 I/O addresses, ¦ memory address | ¦ IRQ, ¦ I/O address, I memory address | ¦ IRQ, ¦ I/O, I memory address |
| VESA/Passthrough connectors | *t• | o/o | bib | oh | •i• | e/• | •/• | °t• |
| VIDEO CAPTURE | | | | | | | | |
| **Standards** | **NTSC, PAL** | **NTSC, PAL** | **NTSC, PAL** | **NTSC, PAL** | **NTSC, PAL** | **NTH, PAL** | **NTSC, PAL** | **NTSC, PAL** |
| **Connectors** | ¦ **S-video** | **2 RCA,** ¦ S-video | 3 RCA, 3 audio | 3 RCA, ¦ S-video | 2 RCA, ¦ S-video | 2 RCA in, ¦ out | 2 RCA | Splitter cable |
| **Sampling** | **YUV** 4:2:2 | Selectable | YUV 4:2:2 | YUV 4:2:2 | YUV 4:1:1 | **YUV 4:1:1** | **YUV** 2:1:1 | **YUV** |
| **Compression chip** | **C-Cube CL-550** | **Intel 8275OPD** | **C-Cube CL-550** | **Intel i750** | Zoran/Auravision | loran | Auravision | Intel i750 |
| **Compression scheme** | **M-JPEG** | **Index** | **M-JPEG** | **Indeo** | **M-JPEG** | **M-/PEG** | **Auravision** | **DVI** |
| **Dynamic•Q control** | **o** | **o** | o | o | 3 | 'D | o | |
| **Video controls** | **Brightness, Contrast,** Hue, Saturation | **Brightness,** Contrast, Color, Tint | Brightness, Hue, Red, Green, Blue | Brightness, Contrast, Tint, Saturation | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Saturation, **Tint** |
| **Capture to AVI file** | • | • | o | • | • | • | • | DVI only |
| VIDEO PLAYBACK | | | | | | | | |
| **Live overlay** | o | 0 | • | o | • | • | • | • |
| **Onboard VGA** | Optional | | o | o | o | o | o | o |
| **Analog output** | • | | • | o | Optional | • | o | o |
| **Video acceleration** | **0** | o | o | 0 | • | 0 | • | |
| Audio capture | o | o | • | 0 | 0 | o | 0 | o |
| Other options | **o** | **o** | o | 0 | o | **TV tuner** | **TV tuner** | **o** |
| BUNDLED SOFTWARE | | | | | | | | |
| **Editing** | Premiere | MediaMerge | | Premiere | Premiere | o | o | o |
| **Video for Windows** | • | • | **o** | • | • | • | o | 3 |
| **Other** | ASL Utilities | Media Capture | o | Compel PE | **0** | **Premiere option $SS** | **o** | **a** |
| Uninstall feature | o | • | o | .D | D | o | o | o |
| Warranty (years) | 2 | 5 | ¦ | ¦ | 5 | ¦ | ¦ | ¦ |
| Price (w/test options) | $1,095 | $499 | **$1,950** | **$499.95** | **$529** | **$940** | **$349** | **$995** |
| Reader Service No. | 580 | 599 | 582 | 583 | 584 | 585 | 586 | S87 |

# TEST DRIVE



| In-Motion echnologies 415) 968-6363 | Intel (800) 538-3373 | Matrox (800) 810-2550 | Miro Computer Products (800) 249-6476 | Omnicomp Graphics (713) 464.2990 | Orchid Technology (800) 767-2443 | Triumph Logistic Computers (818) 858-S700 | VIC Hi-Tech (310) 643-S193 | VideoLogic (800)S78.5644 | Xing Technology (800) 294-6448 |
|---|---|---|---|---|---|---|---|---|---|
| icture erfect Pro | Smart Video Recorder Pro | Marvel II | miroVIDEO DC1 tv | M&M Pro | Vidiola Premium Pro/D | Triumphony Visual Forge | Video Packer | DVA-4000 | XingItl |
| igital :R option | | Studio %Press M-JPEG card | | 11 -JPEG option | M-JPEG option | V-20 8 V-30 options | | MediaSpace M-JPEG card | |
| A, 2 slots | ISA | PCI | ISA, full | ISA, full | ISA, full | ISA, PCI slot | ISA, full | ISA, 2 slots | ISA, full |
| 86, 4MB RAM | 386/25, 4MB | 386, 8MB RAM | 486, 8MB RAM | 386 | 386, 4MB RAM | 486, 4MB RAM | 386/33, 4MB RAM | 386 | 386, 4MB RAM |
| | D | 0 | | 8MB | 3 | o | | o | 3 |
| IRQ, I/O idress, emory address | IRQ, I/O address | memory address | I/O address, memory address | I/O address, DMA, IRQ | IRQ, 2 I/O addresses, memory address | 2 IRQ, I/O address, DMA | 2 IRQ, video DMA, audio DMA, memory address | 2 IRQ, 2 memory addresses | IRQ, I/O address |
| I.• | o/o | 0/0 | o/3 | If SVGA not installed/3 | •/• | •/• | 3/3 | •/• | o/o |
| SSC, PAL | RISC, PAL | NTSC, PAL | NTSC, PAL, SECAM | NTSC, PAL SECAM | NTSC, PAL | NTSC, PAL SECAM | RISC, PAL | NTSC, PAL | NTSC, PAL SECAM |
| RCA | RCA, S-video | Splitter options | RCA, S-video | RCA, 3 S-video in, S-video out | RCA, S-video | RCA, 1 S-video | RCA, audio | 2 RCA | RCA |
| 16 4:1:1 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:2:2 | YUV 4:1:1 | 4:2:0 |
| Tan | Intel i150 | C-Cube CL-450 | LSI 64702 | C-Cube CL-550 | C-Cube CL-550 | a | C-Cube CL-550 | C-Cube CL-550 | DSP |
| PEGI ndeo | | M-JPEG | M-JPEG | M-JPEG | M-JPEG | o | M-/PEG | M-JPEG | M PEG |
| | | o | | 3 | D | o | o | o | o |
| ightness, mtrast, Hue | Brightness, Contrast, Saturation, Tint | Brightness, Hue, Contrast, Saturation, Sharpness | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Hue, Saturation, Red, Green, Blue | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Hue, Saturation | Brightness, Contrast, Hue | Brightness, Hue, Contrast, Saturation, Sharpness | Brightness, Saturation |
| | • | • | • | • | • | • | o | • | Converts to AVI |
| | o | • | • | • | • | • | • | • | • |
| | o | • | | Optional SVGA | 3 | • | J | o | o |
| | | • | • | • | • | O | D | • | o |
| | a | • | • | o | • | o | D | o | o |
| | | | | • | o | o | o | • | o |
| Her memory grade | ,) | | miroMov e Pro | 0 | Orchid Wave | o | Win/DOS API $99 | 0 | o |
| | Digital Video Producer | Premiere | Ulead V-Studio | 0 | Premiere | 0 | ~ | Premiere | XingIt |
| | • | • | • | o | • | o | | • | |
| nel Multimedia, dia Capture | Compel, Gatekeeper TriDigital CD, MediaBlitz | | Premiere option $100 | 0 | Asymetrix Compel, PhotoMorph | iPhoto Plus | D | 3 | Xing CD |
| | • | o | ) | 0 | 0 | o | D | o | o |
| | I | I | 2 | I | 4 | 2 | I | I | 2 |
| 99 | 8570 | $195 | $899 | $995 | $899 | $540 | $1,995 | $2,995 | $499 |
| 9 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 |

# Do You Need Video Overlay?

Video overlay is very useful for accurate video capture, but many cards don't include it. Often called video-in-a-window, this feature lets you see live video input on-screen without burdening your CPU. The live display lets you make real-time decisions about when to start and stop capture operations while watching the overlay image.

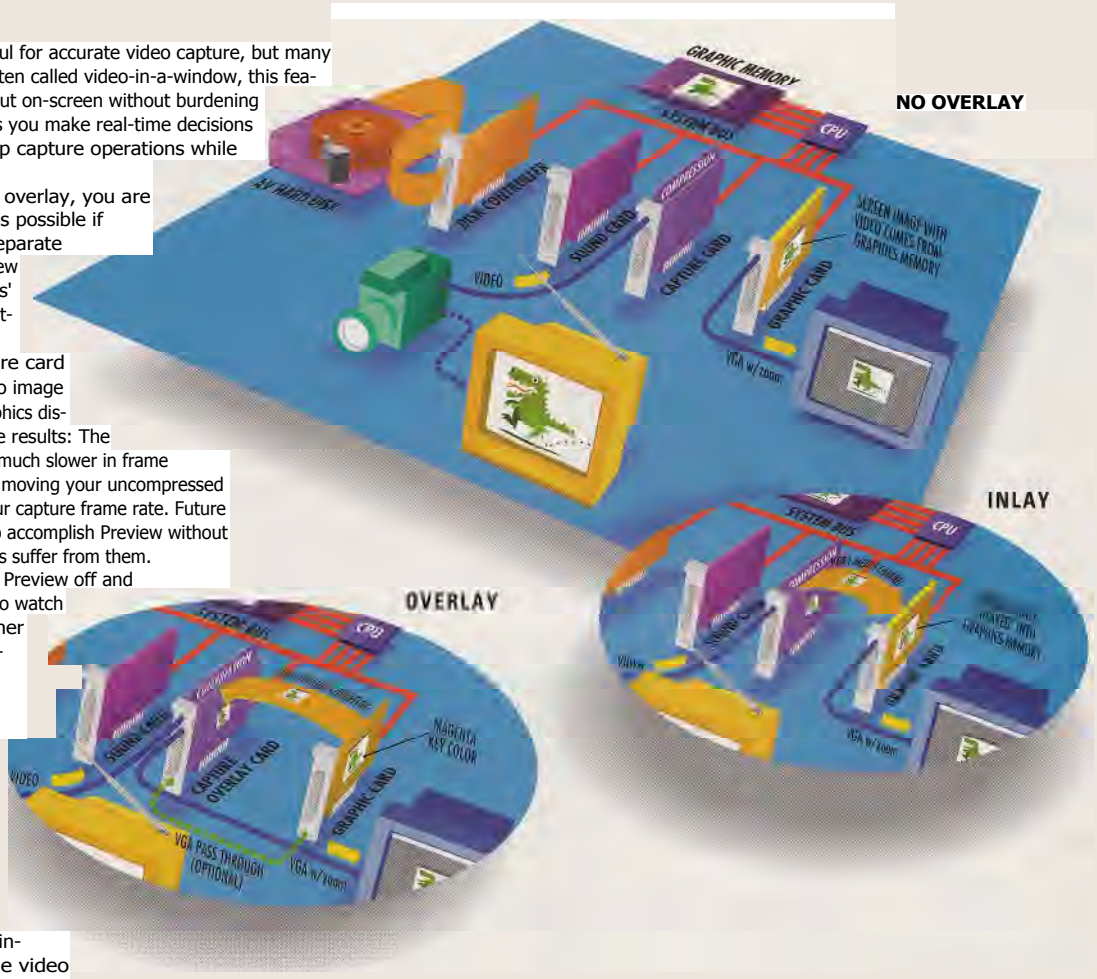
**No Overlay (top ►):** Without overlay, you are forced to work blind (which is possible if you use time code), use a separate NTSC monitor or use the Preview function in Video for Windows' VidCap, Premiere and other editing packages.

With Preview, the capture card sends the decompressed video image over the system bus to the graphics display card with two unfortunate results: The pictures are poorer quality and much slower in frame rate, and the CPU cycles spent moving your uncompressed preview images may reduce your capture frame rate. Future PCI bus cards should be able to accomplish Preview without these penalties, but all ISA cards suffer from them.

A better solution is to turn Preview off and use a separate NTSC monitor to watch the video input. You can either loop the video through the monitor or use a VCR/camcorder source with two outputs.

**Video Overlay (bottom left►):** Most video overlay cards take the VGA signal from your graphics display card via the VESA Feature Connector (a ribbon cable to your overlay card), put it in a RAM frame buffer on the overlay card, replace a part of the Windows screen image with the video image and output the combined signal to the computer monitor. Your capture card frame buffer therefore should have the same amount of RAM as your VGA card for peak performance. Some cards switch the signal through an external passthrough cable when not doing video overlay, which eases performance problems. Overlay is much faster than preview since compressed video moves over the system bus.

**Video Inlay (bottom right►):** A more efficient overlay method used in newer cards sends the video image, usually limited to 640 by 480, from your video card to the graphics display card for "inlay" there. Only one large frame buffer is needed. A new board connector, the VESA Advanced Feature Connector (VAFC), has been developed for this purpose. It is 32 bits wide instead of 16. VESA Media Channel is a multi-card version of VAFC that uses over-the-top ribbon cables to connect cards. Inlay is as fast as overlay and less expensive, and any video acceleration circuitry on the graphics card can be used to scale up video and perform color space conversion.




ited, you can recompress 320-by-240 program material with SuperMac's CinePak or Intel's new Indeo 3.2 software compressors, both of which come with most of these cards. Quarter-screen M-JPEG images should compress nicely on the new low-cost, real-time MPEG compression engines, since MPEG and M-JPEG are related compression methods, but be on the lookout for unusual artifacts from transform quantization.

Disappointingly, QuickTime for Windows 2.0 drivers were not provided with any of these cards. A utility called SmartCap, available from Intel, allows some of these cards to capture directly into QuickTime for Windows format, using Indeo coders.

The top nine cards in our review were all able to capture full-motion (30fps), quarter-screen

## MegaMotion

DOES THE JOB

ASL's MegaMotion ($1,095 including Premiere) is one of the most unusual cards we tested. It's aimed at sophisticated kiosk and teleconferencing applications in which developers want to display up to four resizable, repositionable videos simultaneously, along with a number from the hard disk. The others must be live video inputs, which requires a $70 auxiliary video input adapter that takes up a slot.

A serious drawback is that the simultaneous videos are limited to a combined total of 30fps. Three videos would each play at only 10fps. MegaMotion offers some transitions between source videos and special effects, but the choices are limited and the controls awk-

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