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 "talking head" shots so common in multimedia presentations. While 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 Blaster 16, graphics display card drivers, Norton 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 manufacturer's directions. All cards had installation

(continued on page 78)

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 on CD-ROMs or on video server networks where data rates are lim-

NewMedia Lab Test Procedures

(continued from page 77)

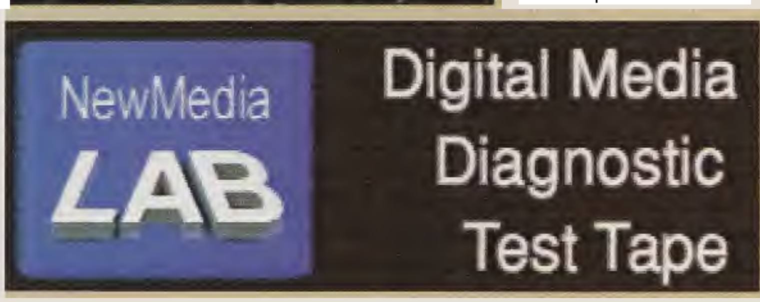
woes (see "Installing and Tuning Windows Capture Cards," page 92).

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.

We captured this test tape with each board in 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.



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.

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 manufacturer, may not be reporting accurately to VidCap.

Windows Video Capture Cards

Company Phone	Alpha Systems Lab (714) 252-0117	ATI (905) 882-2600	Cogent Electronics/ADS (415) 591-6617	Creative Labs (800) 998-1000	Diamond Multimedia (408) 736.2000	Fast Electronic US (415) 802-0772	Hauppauge Computer Works (800) 443.6284	IBM/Intel (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	0	0	0
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

• = Yes, o = No or none.

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.

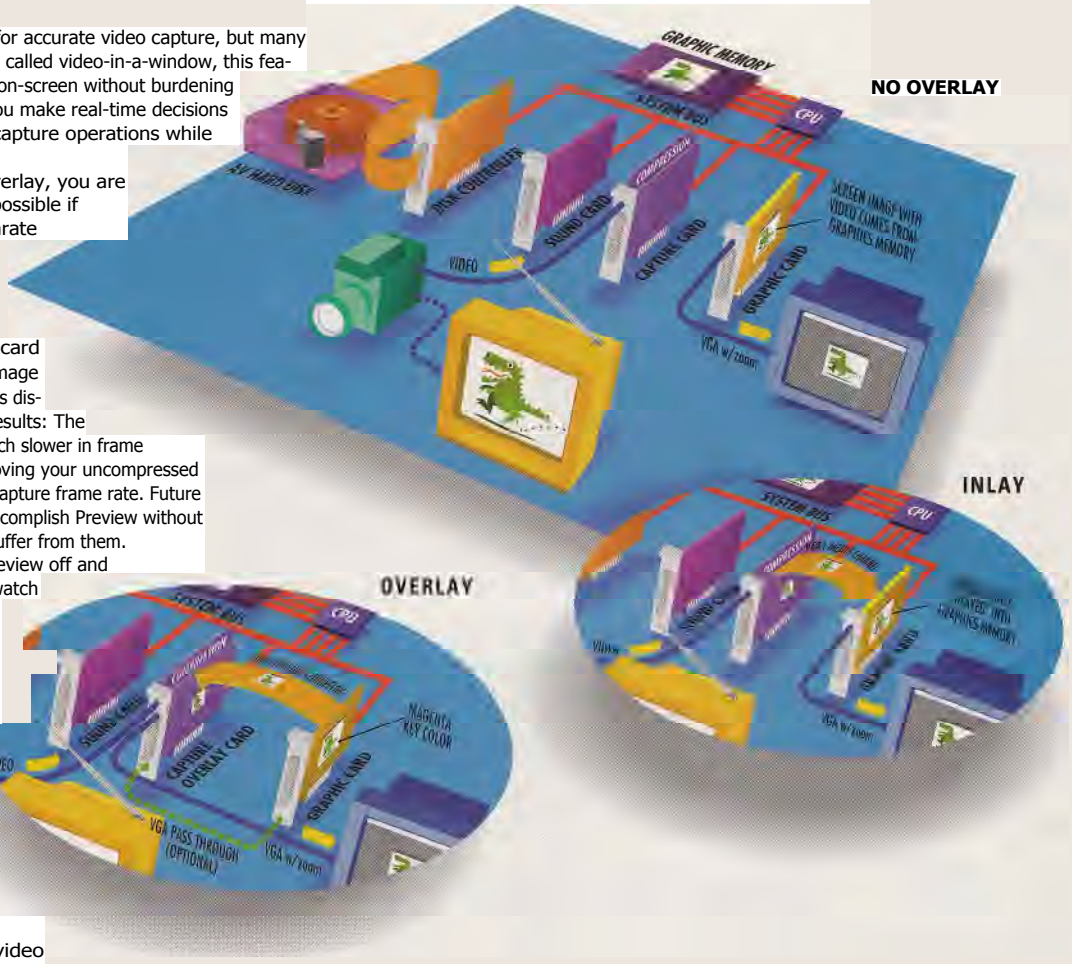
No Overlay (top ►): Without overlay, you are forced to work blind (which is possible if you use time code), use a separate NTSC monitor or use the Preview function in Video for Windows' VidCap, Premiere and other editing packages.

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 cascading Indeo's vector quantization and MPEG's discrete cosine 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 (320-by-240) AVI video with good color and image quality.

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 of still images. One video stream can be compressed video 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 awkward. The Fast Movie Machine Pro is better if you need A/B roll for

videotape production. MegaMotion's NTSC output is limited to straight playback of AVI files.

MegaMotion doubles as a modest-quality VGA display card. Accelerated Windows graphics and video overlay are both done on this card, but it does not include movie acceleration and is not DCI-compliant (see "Video Compression Technology," page 88). If you need good VGA capability along with video capture, the Matrox Marvel II is better and cheaper.

On playback, MegaMotion skipped about 10 percent of frames, making it jerky and unattractive. While we had trouble with skipped frames on many cards, usually we could eliminate the problem after optimizing our systems. Only the Orchid (15 percent drop rate) and Indeo (40-50 percent) cards were worse.

MegaMotion's inputs and output are S-video only; composite adapter cables are supplied. We missed having simultaneous composite output for monitoring and S-video output for recording. The color-bar generator function was useful.

MegaMotion is a very complex and technical card. Unless you really need its powerful features, stick with a simpler card for straight video capturing.

Video Blaster RT300

The Video Blaster RT3 0 0 ($499.95 including Premiere) moves Creative Labs from the bottom level of performance last year to near the top today. The board uses the same advanced Intel i750 PE compression chip found in the Smart Video Recorder Pro. It should be capable of the same 320-by-240 performance at 30fps, but we were only able to look at a prerelease version of this card.

Like the other Indeo cards (from ATI and Intel), the RT300 is not an overlay card. If you want to watch your incoming video carefully during the capture process, you need to hook up an NTSC monitor to an extra output on your camcorder. The Preview function in VidCap and Premiere can display video as you capture, but when the ISA bus is busy it stops updating the Preview display.

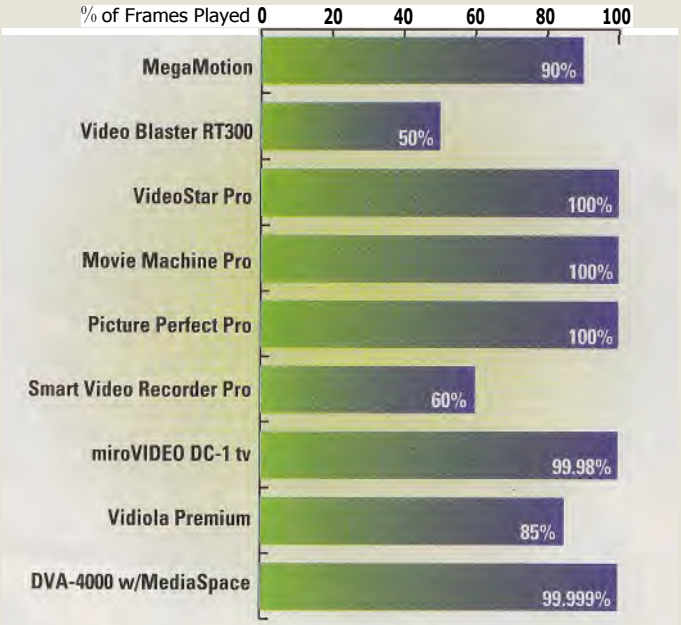
At the highest quality settings, images from the RT300 (and the Intel card) are surprisingly good, even comparable to M-JPEG. The data rates are actually somewhat higher than the M-JPEG cards, because in real-time capture the Indeo algorithm consists entirely of key frames. This is fme for offline editing, but you will have to recompress to get down to CD-ROM data rates. You can set every fourth frame, for example, to be a key frame, and Indeo will store only difference information for the intermediate "delta" frames. This is a very time-consuming process, almost as slow as CinePak recompression.

At these data rates, the Indeo cards are operating at the limit of the ISA bus, so when the time comes for playback the added overhead of the Windows graphics display makes them skip lots of frames. However, the frames have all been captured, so you can edit accurately. Playback relief should come with video-accelerated display cards and the new Windows Display Control Interface.

VideoStar Pro

Diamond's VideoStar Pro ($529 including Premiere) is one of several cards using the Auravision chipset (see "Video Compression Technology," page 88), so it has very smooth scaling of video playback up to full-screen size with no reduction in the frame rate. We could expand clips to full-screen within Media Player and Premiere. The Pro option is a daughtercard with the Zoran 320-by-240 M-JPEG compression chip. VideoStar Pro uses a VESA feature connector and

AVI Playback Performance*



The top nine cards captured 30fps, 320-by-240 video without dropping any frames, but many did not perform as well on playback. The Video Blaster RT300 and Smart Video Recorder Pro rely on software decompression and only play back 60 percent or less of the available frames. By contrast, the M-JPEG cards, which have hardware compression and decompression, all rated 85 percent or better. Thus, there is a tradeoff between the ability to play a file on any machine (software decompression) and maximum frame rate (hardware decompression).

*Playback of 24-bit color, 320x240, 30fps AVI file.

Video Image Quality vs. File Size

	Image Quality	File Size (KB/frame)
miroVIDEO DC-1 tv	Excellent	21
Movie Machine Pro	Very Good	18
DVA-4000/MediaSpace	Very Good	18
Video Blaster RT300	Good	29
Smart Video Recorder Pro	Good	30
MegaMotion	Fair	22
Vidiola Premium	Fair	17
VideoStar Pro	Fair	24
Picture Perfect Pro	Poor	15

There were noticeable differences in image quality among our nine top boards, even those using the same compression chip. The top five cards all produce good results, but steer clear of the bottom four. While one might expect a direct correlation between image quality and file size, the codec also plays a large part. The Indeo codecs are not quite as efficient as the M-JPEG codecs. To compare image quality, we used the maximum quality setting that would still yield 320-by-240, 30fps capture.

Video Image Quality Comparison

To assess image quality, we compared several frames of our Diagnostic Test Tape closely, including frames with animation, text and complex and simple video images. All frames were captured at the highest quality possible while maintaining a 320-by-240, 30tps frame rate and 24-bit color. Some boards may be capable of higher quality at a lesser frame rate, color depth or window size, but these frames reflect realistic results at our recommended capture rate for multimedia work. A summary of image quality of all the frames we saw, along with file sizes, is given on page 84.

A detail from one of our video test frames, including a graphic text overlay, is shown here for the top nine boards in our test. All deliver reasonable quality, but some are clearly superior to others. ASL's MegaMotion card delivered clear numbers and had the best image in the windmill scene, although the MegaMotion's results on other frames did not match this one, and we judged it in the middle of the pack overall. The miroVIDEO and DVA-4000/MediaSpace images were more true to form. Both were very good, matching their overall performance. Next came the Movie Machine Pro and Vidiola Premium, which delivered good results but with obvious JPEG artifacts. The two new Indeo-based boards, the Video Blaster RT300 and Smart Video Recorder Pro, came up with only fair images of the windmill scene that were below their average results in other frames. Color vectoring is evident. The VideoStar Pro also had fair results with bad JPEG artifacts. The Picture Perfect Pro brings up the rear, as it did in our other tests, with bad JPEG artifacts.

Movie Machine Pro

Picture Perfect Pro

Smart Video Recorder Pro

an external connector to pass through the screen graphics from your display card. Three video inputs let you choose from two composite and one S-video source. VideoStar and the other Auravision board have a useful cropping function that expands the image to eliminate noise at the edges of the picture.

When the card was running, we were able to capture at compression ratios up to the highest quality setting of 16:1 without dropping any frames. VideoStar Pro playback was among the three smoothest cards tested. All other cards skipped at least a few of the 6,000 frames in the test.

As expected, picture quality was also high. VideoStar Pro filters incoming video by comparing successive frames for identical information. However, the Zoran codec chip means that making movies in Premiere will take longer with VideoStar Pro than with boards based on the C-Cube or LSI Logic M-JPEG chips that can use their codec hardware to compress transition frames.

vie Machine Pro

4.5 Leal AWESOME

The Movie Machine Pro with the M-JPEG option from Fast Electronic ($940; $995 with Premiere) is quite unusual. In addition to capturing AVI files, it functions as a two-channel video switcher (like its big brother, the Fast Video Machine). It has a built-in time-base corrector that lets you dissolve, wipe and even do digital video effects (DVEs) between two video signals (NTSC or PAL). Your video sources can be analog VTRs, graphics files for titles and overlays, digital AVI files, or even television signals from a built-in cable-ready TV tuner! It only lacks machine control.

The Movie Machine Pro has full luminance keying and chroma keying of video over video, plus color keying of graphics over video. It has easy-to-use controls for setting the key values. If the graphic image is a title, you can have it scroll (move vertically) or crawl (move horizontally).

You can control the speed of transition effects by moving a T-bar fader with the mouse, pressing the up and down arrow keys or just pressing a play button. The play button icon changes to show the effect you've selected. A slider box next to the play button lets you set the rate of the effect.

The Movie Machine Pro has two buses: a background bus for normal video and a foreground bus for the incoming effect. On each bus you choose from Video A, Video B or the TV tuner. For the foreground source, you have two more options. You can playback an AVI file or load one of six graphic or title images in a mini still store displayed across the top of the screen. These can be selected from any number of files on your hard disk. Movie Machine's video encoder outputs recordable NTSC or PAL, making it useful for videotape editing.

While its switching capabilities alone are impressive, the Movie Machine Pro was also tops as an AVI capture and playback card. It never skipped a frame on playback.

Movie Machine Pro does have some drawbacks. The M-JPEG compression option, which enables 320-by-240 capture at 30fps, is a separate card, so it uses up a second ISA slot. Movie Machine Pro also has only composite video inputs and outputs (no S-video). And because it uses the Zoran codec chip, it will be relatively slow making movies in Adobe Premiere. The documentation was also weak; fortunately, installation was not too difficult.

NEEDS WORK

Like the Movie Machine Pro, the In-Motion Picture Perfect Pro with M-JPEG option ($699) is a two-card set taking up two ISA slots. One of the cards has a daughtercard (the "Pro"), and the other, called the Digital VCR companion, is the M-JPEG option. In-Motion provides minimal documentation, but the M-JPEG documentation was the least we've seen. A 2-by-2-inch piece of paper with the IRQ and I/O Base jumper settings for the card fell out

of the box when we opened it. Even worse, the default interrupt settings for both boards were shown as IRQ 10, which could really send beginners around in circles.

The Digital VCR's compression setup dialog box does not have a quality setting. Instead, it gives three different numbers with their typical values—bits per pixel (1.0), compression ratio (24:1), and compressed frame size (10,000). You choose one and it calculates the others, but there is no indication of how they correspond to VidCap's quality settings of 1 to 100.

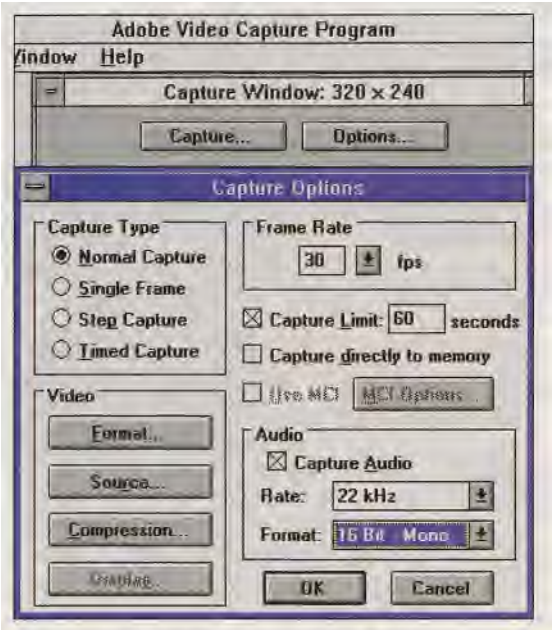
The Picture Perfect Pro has composite video input only. And again it uses the Zoran codec chip, so it will be slower than C-Cube and LSI Logic-based cards rendering transition effects.

AWESOME

the Intel Smart Video Recorder was our top performer a year ago, and the new Pro version ($570) keeps Intel in the front ranks. A capture-only card, it epitomizes the Intel philosophy of leaving most functions to software running on future fast buses like PCI. The new Intel Smart Video Recorder Pro is an ISA card which captures 320-by-240 video at 30fps with zero dropped frames. Since it's not an overlay card, you can't preview video at high frame rates on the computer screen during capture; however, you could use a separate NTSC monitor.

We found image quality to be quite high for real-time Indeo capture and compression. The data rates were also high. At the highest quality setting, each frame had 25KB to 30KB of data, somewhat more than high-quality quarter-screen M-JPEG frames, which are around 20KB. The ISVR Pro can also capture "raw" uncompressed YUV files (at 320 by 240 and 15fps; 30fps is too much for the ISA bus at 80KB per frame for 320 by 240), and run them through the new Indeo 3.2 compressor later for improved overall quality.

The playback artifacts of a vector quantization codec like Indeo are quite different from intraframe M-JPEG artifacts. The most noticeable artifact shows up as blocks of color misregistered up to three pixels to the right and down from a saturated color area.



Premiere for Windows' Capture dialog includes compression and frame rate options. You can also view incoming video in a Preview window.

The ISVR Pro is bundled with Asymetrix's Digital Video Producer, which is the second-best video editing package on the PC, well ahead of ATI's MediaMerge and Ulead's Video Studio. We recommend that you also buy Premiere if you're thinking about videotape productions. ISVR Pro also comes with a CD-ROM of video clips, music and animations. The instruction manual is brief but clear and well illustrated, except for the tricky problem of resolving IRQ and I/O conflicts.

Video Compression Technology

The video capture cards we tested achieve their high frame rates by using hardware-assisted digital video compression techniques. Indeo, MPEG and Motion-JPEG (M-JPEG) are familiar compression/decompression algorithms (see "How Codecs Work," page 52, March), but a new approach from Auravision and others applies a simple reversible (lossless) form of hardware compression, Analog Differential Pulse Code Modulation (ADPCM) in combination with AVI software compression to achieve respectable results at a very low cost.

M-JPEG is by far the most popular algorithm, but quality varies widely among M-JPEG cards, and file formats are not standardized. By contrast, MPEG and Indeo provide much more uniform results, and files can be played back on any other MPEG or Indeo hardware.

Quantization Factors

At the root of the M-JPEG quality variations is a number called the Quantization factor. The (1-factor began life as an 8-bit number between 0 and 255 that characterized the amount of quantization (subsampling), and therefore the amount of compression. Larger numbers mean more compression, less data per frame and consequently lower image quality. Marketeers describing the Q-factor were drawn by the appealing notion that Q equals quality, and engineers responded by reversing the direction of Q, usually changing its range to 0-100, where 100 means highest quality, not highest compression. This scheme is used by VidCap, Premiere and many other editors.

Because the amount of data in a complex and detailed image can be much larger than a picture with a solid-color background, images compressed at the same Q-factor can have widely different amounts of data. Long, complex scenes may exceed the data rate of the CPU bus or hard disk, and the compressor will begin to drop frames at best, or "break" at worst, generating random noise images.

Two of the cards we tested, the miroVIDEO DC1 tv and VideoLogic DVA-4000 w/MediaSpace, have a sophisticated "Dynamic-Quality" feature. This is an adaptive compression technique that estimates the amount of data in the next frame and turns the quality down (and the compression ratio up) in complex scenes to keep the data rate below a preset limit. These boards also come with utility software to calibrate your hard disk's plausible maximum data rate. Dynamic-Q is also used by high-end systems like the Radius VideoVision Studio on the Mac and the Targa 2000 on the PC.

Elusive M-JPEG Standards

If every M-JPEG card could write and read all the parameters in the AVI MJPG file header, and identify the enclosed compressed digital video file with a unique four-character code (FOURCC), it would be possible to decompress one manufacturer's M-JPEG files on another's hardware. While there are detailed differences between the hardware chips used to compress M-JPEG from C-Cube, LSI Logic and Zoran, they are not insuperable. One company, Mediamatics, has developed software codecs that can decode and decompress all of these files. Unfortunately, when we tried to play back AVI files on boards other than their creator in this review, we met with almost universal failure. Only one board, the Miro DC1 tv, successfully opened a competitor's file (from VideoLogic), and played it in real time.

The codec differences show up because board vendors avoid processing the bit stream that comes out of the compressor chip, so they can capture video at the highest possible data rate and image quality. They thus capture into proprietary file formats, rather than the AVI MJPG standard. VideoLogic initially used a proprietary format called MSP, but the latest version of the MIC software, 2.2, captures directly into AVI MJPG format as well. The small speed penalty in conforming to AVI MJPG is well worth the capability of creating a high-quality M-JPEG file that can play back on diverse manufacturers' hardware.

Auravision Codec

The ADPCM technique used by the Auravision chip isn't new; it's widely used in audio compression and is one of the many steps in JPEG and MPEG, but we'll call its marriage with AVI compression Auravision or ADPCM video compression.

The AVI compressed file formats YUV (16 bits), YUV Compressed (12 bits) and Palettized VGA (8 bits) have less information than full 24-bit RGB. This after-the-fact software-only compression, up to 3:1, is often called AVI compression to distinguish it from Indeo, M-JPEG and other techniques requiring hardware.

The Auravision VxP500 chip combines ADPCM with AVI compression to get the data rate low enough to send the digital video over the ISA bus. It also has hardware assistance during "software-only" decompression for popular codecs like Microsoft Video 1, CinePak and Indeo. The VxP500 can smoothly scale video playback up to full-screen displays without obvious aliasing jaggies. This is the basic technology in the Diamond VideoStar, Hauppage Win/TV and Orchid Vidiola capture cards. You may want to save the expense of the "Pro" M-JPEG option daughtercards that we tested with these cards and settle for ADPCM and AVI compression alone. You can apply software compression after capture to make the file sizes manageable; you'll trade compression time and higher frame rates for the money saved. Auravision compression alone does not meet the standard of 24-bit, 30fps 320-by-240 video capture that we set for this article.

The Matrox Marvel II uses a similar approach to the Auravision, but it is based on Tseng Labs' chips and manages to get higher frame rates. Since the Marvel II is also a high-quality graphics display card, nothing has to move over a feature connector.

A number of new graphics display cards (Diamond's Viper Pro, Matrox's Impression Plus and VideoLogic's 928Movie and PCI-Movie) incorporate AVI video acceleration, and we will review them in a future article. Some of them may offer video capture daughter or sister cards, like VideoLogic's Video Catcher. —B.D.

411br AWESOME

The miroVIDEO DC1 tv ($899) is the first card to use a new generation of codec hardware from LSI Logic, a single chip optimized for 320-by-240 capture. Our first impression is of very high image quality. The chip contains multi-tap horizontal and vertical prefilters that smoothly scale down the 640-by-480 picture without introducing aliasing artifacts.

The DC1 tv is primarily for videotape producers. This makes Miro unusual among the leading M-JPEG cards because it does not have a video overlay function. Instead, it passes a real-time output of the incoming video signal being captured out through the same jack that provides video encoder output. You'll need an NTSC or PAL monitor to view it.

The Miro card and VideoLogic's MediaSpace are the only quarter-screen capture cards to employ Dynamic-Quality adjustment and data rate limiting, guaranteeing that no frames will be dropped during capture. With Dynamic-Q, the codec chip automatically reduces the quality for complex frames to keep the data

rate below the limit of your hard disk or to tune it for CD-ROM playback.

Unfortunately, Miro's playback rate could not match its capture performance. The DC1 tv always skipped several frames on playback.

Vidiola Premium Pro/D

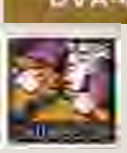
The basic Orchid Technology Vidiola is a remarkably low-cost card ($399) with Auravision's ADPCM compression on capture and SuperZoom video acceleration on playback. SuperZoom takes even a tiny l60-by-l20 image and expands it to full screen using a special algorithm that avoids the pixeli7ation and jaggies that come with ordinary software zooming.

Orchid also offers Vidiola "Pro" cards with NTSC and PAL encoder outputs. The Pro/C card is bundled with Abbate Video Toolkit control cables and logging/editing software for $599. The Pro/D card is bundled with Premiere, multimedia presentation software and a morphing and special-effects program for $699. The Vidiola Premium Pro/D card we tested has an M-JPEG compression daughtercard (with a C-Cube CL-550 codec) for $899.

A VESA feature connector and an external passthrough cable loop regular VGA output through the Vidiola for live video overlays, using a keying technique based on a magenta color. By going into a draw or paint program and using a color other than magenta, you can overlay graphics on top of the Vidiola live video. Like the other Auravision-based products, it can also perform conventional chroma-key effects, making blue backgrounds in your video transparent.

Unfortunately, as with many other cards, between 10 and 20 percent of frames were skipped on playback with the Vidiola Premium Pro, making video look jerky.

DVA-4000 w/MediaSpace



The VideoLogic DVA-4000/-M edia S p ace combination ($2,995) is in the expensive category of board sets for multimedia developers. However, it was also designed from the beginning as a full-motion video capture system and comes with lengthy documentation within the reach of end users. Many of the cards we evaluated that are aimed at developers came with skimpy and highly technical information.

Like the Miro board, VideoLogic's MediaSpace has a data rate calibration function to help you set appropriate compression ratios. A colorful meter demonstrates the varying complexity of passing frames as compared to the calibrated data rate for your system. When the complexity swings into the red, you can opt for dropping frames or reducing quality.

VideoLogic calls its board set and software the Multimedia Interactive Control System. MIC System II v2.2 is a reworking of the original MIC software, which integrates it smoothly and fully into Video for Windows (see "Video Compression Technology," page 88).

The version we tested initially came only with composite video inputs. VideoLogic later sent us an S-video input cable, which improved sharpness, but images were still soft compared to most other boards.

This is a two-card set, but it has very high-quality audio capture and playback built in. It even has a fiber-optic connector for input of direct digital audio from similarly equipped CD and DAT equipment. An onboard "Trans-

puter" chip is used to maintain perfect lip sync between audio and video, but only for MediaSpace's proprietary MSP files and not for AVI files, which need it badly.

The DVA-4000/MediaSpace system works very well. It skipped just a few frames on playback. It's the best of the older multimedia card sets, but has the handicap of a high price compared to newer entries. Since VideoLogic has been at the forefront of both VESA Media Channel and PCI bus development, we expect well-built new products from them soon.

e Jo rarks

The following nine cards didn't meet our review criteria of 320-by-240, 30fps AVI image capture or had unacceptable image quality. In some cases they have redeeming features or prices that may make them attractive to those with less demanding requirements or limited budgets.

Matrox Marvel II

The Matrox Marvel II ($795) is a brand-new board that integrates onto a single PCI card the functions of last year's expensive two-card sets aimed at multimedia kiosk and training system developers. As such, it does very high quality video-in-a-window and still-frame captures, and it is a good VGA card. It also has the latest features, thanks to its Tseng Labs chipset: video acceleration (scaling and color space conversion), Windows graphics acceleration, MPEG video and audio playback, digital audio WAV file playback, and a digital video expansion bus for an optional 640-by-480, 60-field-per-second M-JPEG compression card (the same Studio Xpress card used in the Matrox Studio nonlinear editing system).

We were especially impressed with the quality of the live video-in-a-window playthrough. It is visibly better than other overlay cards. (We have not had a chance to test the quality of MPEG playback, but hope to cover that in a future review.)

Like the other cards aimed at developers, AVI capture is not the the Marvel II's first priority, but an early version captures 160-by-120 video at 30fps, and when software is optimized, Marvel II may become an all-in-one solution for your video editing, multimedia and demonstrations of MPEG playback. The beta version we tested captures in an RGB format. If the final release software captures in one of the AVI formats that are naturally compressive, like YUV or YUV Compressed (4:1:1), as do the Auravision cards, Marvel II should

NewMedia LAB

	MegaMotion	Video-It!	Video Wizard	Video Blaster RT300
OVERALL VALUE	**3**	**3**	**2**	**4**
FEATURES	4	3	3	3
PERFORMANCE	3	3	2	4
USER INTERFACE	1	5	2	3
LEARNING CURVE	1	5	2	3
PRICE	$1,095	$499	$1,950	$499.95

Ratings Key: 5=Excellent, 4=Very Good, 3=Good, 2=Fair, 1 =Poor. Overall Value takes price and cc

*5995 with Adobe Premiere.

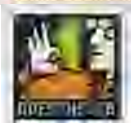
eoStar Pro	Movie Machine Pro	WIN/TV Cinema	ActionMedia II	Picture Perfect Pro	Smart Video Recorder Pro	Marvel II	miroVIDEO DC1 tv	M&M Pro II	Vidiola Premium Pro/D	Triumphony Visual Forge	Video Packer	DVA-4000/MediaSpace	Xinglt!
4	5	2	2	2	5	4	5	2	4	3	1	4	2
3	5	3	3	3	3	4	4	2	4	3	2	4	2
3	4	3	3	3	4	4	4	2	4	2	2	3	3
3	3	3	2	2	4	3	4	2	3	2	1	3	2
3	3	3	2	1	4	3	3	1	3	3	2	3	3
$529	$940-	$349	$995	$699	$570	$195	$899	$995	$899	$540	$1,995	$2,995	$499

into account.

be capable of 320 by 240 at 30fps. Since our board was still an early version, we do not include image quality and performance data for it in our charts. The rating may go up on final release.

The optional XPress M-JPEG card ($2,195) provides CCIR-601 4:2:2 capture at a full 720 by 486 in NTSC (720-by-576 PAL). This combination should yield 60fps performance at half the price of a Targa 2000, and we will test it as soon as possible. It would dramatically lower the cost of videotape production in the Video for Windows environment. The Marvel II will have an optional NTSC encoder chip for video output. Matrox also sells a separate Video Pro Encoder (a $599 ISA card) that works with the feature connector on Marvel II.

Video-It!



ATI's Video-It ($499) was the easiest card to install and use, in large part because of very well-written illustrated manuals and the excellent design of its proprietary capture utility called MediaCapture.

While all Windows video capture programs have similar functions, such as Video Format, Video Source, Video Display and Compression (since they all use basic software building blocks provided by Microsoft's Video for Windows software development kit), one of the great confusions for beginners is that the "Compression" option in Video for Windows is not what you choose to select your compression method for capture. VidCap compression is for post-capture and recompression only. Compression methods for capture are selected in the Video Format dialog box, along with image size. ATI has eliminated this confusion by renaming the Video Format dialog Compression.

We would also like to cite ATI as having the best tech-support utility we've seen. Viditest examines your system configuration, then creates a document you can save or print that contains almost all the tidbits other manuals ask you to look up before you call for support (if they even mention tech support). It even creates listings of your config.sys and autoexec.bat files. We suggest they add system.ini and win.ini.

ATI Video-It encourages you to use the Preview function to provide an on-screen video-in-a-window version of incoming video. When you're not capturing video, this ATI TV works reasonably well, but remember that you are degrading CPU system performance by putting all that video data on the bus.

Although we give the ATI Video-It top marks for ease of installation, interface design, documentation and tech support, its performance fell short of our benchmark because it uses an ear-

Executive Summary

The past year has seen an avalanche of development in Video for Windows products. Truevision Targa 2000 capture hardware and Adobe Premiere 4.0 for Windows editing software now equal the top nonlinear editing performers on the Macintosh platform, and the number of "multimedia-quality" cards far exceeds offerings on the Mac. If you are not timid about PC hardware, now is the time to get into PC video.

If your objective is high-quality video on a PC monitor, such as for presentations or kiosk applications, any of the top three Motion-JPEG cards fill the bill (Fast, Miro and VideoLogic). These cards capture 24-bit, 320-by-240 video at 30fps and play back with few or no dropped frames, with very good image quality. The DVA-4000/Media Space combination is very expensive, however. The Diamond, Orchid and In-Motion M-JPEG cards also capture with no dropped frames, but have only fair image quality or drop many frames on playback. Note that these M-JPEG systems are not cross-compatible.

For multimedia distribution on CD-ROMs or video server networks, you can recompress your final 320-by-240 M-JPEG files with SuperMac's CinePak or Intel's Indeo 3.2 compressor, both of which come with most of these cards. However, watch carefully for artifacts resulting from cascading different compression methods. Original M-JPEG material may look better in MPEG than Indeo, but playback will require dedicated MPEG hardware.

If your goal is 320-by-240 "VHS-quality" videotape output from the desktop, take a look at the Miro or Fast cards, which include video encoding. For "offline" nonlinear editing in Premiere, and later batch recapture on a broadcast-quality system like the Targa 2000, your best buy is one of the Indeo cards from Creative Labs or Intel, which also produce digital video playable on any PC.

For multiple applications, the Fast card is unique and a best buy. It has excellent capture, playback, encoding and linear switching capabilities that make it a multimedia workhorse. The Matrox Marvel II is another all-around card with unique MPEG playback capabilities. (We will review it in more depth when the final version ships.)

Steer clear of the older generation of cards. Omnicomp's M&M Pro, VIC Hi-Tech's Video Packer and CEI's Video Wizard are expensive developer boards that have been eclipsed by the new generation of more capable, less expensive cards. These, and others, include PC Video chips, which have severe RAM limitations.

lier version of the i750 chipset and does not work with the 3.2 release of Indeo, except for recompression of already-captured files. One year ago it would have walked away with top honors, and we hope ATI issues a new card with the revised chipset. Video-It comes with a CD-ROM of video clips, music and still images called MediaMontage.

Video Wizard

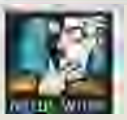
CEI's Video Wizard ($1,950) is aimed at Windows developers and describes itself as a professional-quality, full-motion capture card that provides "broadcast-quality multimedia." It also has onboard audio capture. Unfortunately, it's an expensive older card that the manual says is compatible with two types of PC386/33 motherboard chipsets, and it did not work at all with our Pentium systems. Video Wizard also uses the old Chips & Technologies PC Video chipset and requires a machine with 8MB or less of RAM.

Even in an 8MB 486 we had a number of bizarre problems. Technical support got us past wildly colored, and some black-and-white, Windows interfaces. We eventually captured video, but playback showed multiple images offset from one another in Media Player. With tech support on the line, we systematically tried every address from 9 to 16MB, without being able to play back succesfully. When they asked us to pull out memory and try 4MB, we decided this wasn't a card that would satisfy many Windows multimedia users.

WIN/TV Cinema

The Hauppauge WIN/TV Cinema ($349) is the least expensive capture card we looked at that incorporates the Auravision technology. However, it does not have an M-JPEG option and thus could not meet our capture rate requirements. If you want to start with just Auravision YUV 4:1:1 compressed capture, look at the Orchid Vidiola card at $399. You'll then have the option of upgrading to M-JPEG capture and achieving our multimedia-quality criterion of 30fps.

ActionMedia II



The IBM/Intel ActionMedia II card ($995) has been a workhorse in compressed video for the past few years. Although CinePak, Indeo and now MPEG are better known among consumers, the majority of compressed digital video used to be DVI (Digital Video Interactive), and this card has done most of the compressing. Unfortunately, although the ActionMedia II card can easily capture 320-by-240 images at 30fps, it lacks support for Video for Windows and AVI, making it unsuitable for general multimedia use and dropping it out of the top rank.

We're surprised that newer and faster versions of the i750 chip have not led to new versions of the ActionMedia card. It may be that Intel is trying to draw attention away from "hardware-hardware" codecs like DVI (where the card is also required for playback) to "hardware-software" codecs like Indeo. The Duck Corp.'s TrueMotion and new TrueMotion S are hardware-software algorithms that run on the ActionMedia II and promise to breathe new life into this card for multimedia.

The product we received for testing came in a Developer Kit version only. IBM appears not to be marketing the ActionMedia II card to end users. (We reviewed its performance in the June issue along with TouchVision's CineWorks nonlinear editor.) It is also the basis for the Montage Picture Processor. However, both Montage and TouchVision are reportedly considering moving to Truevision's Targa 2000 M-JPEG hardware to upgrade performance of their popular editing software to 60 fields per second.

Installing and Tuning Windows Capture Cards

Getting a PC video capture card installed and operating at peak efficiency is an enormously daunting task. Even our crew of expert testers did not successfully install a single one of the 20 cards on the first try. And many boards still had conflicts on our third and fourth attempts.

Why is installation so difficult? To an installer, the PC looks like a combination lock with multiple dials called 160 (interrupt), I/O Port Address, Memory Base Address, DMA Channel, BIOS Shadow RAM Area and EMM Memory Exclusion. Each of these must be set by hardware jumpers or values in the BIOS setup and the config.sys and autoexec.bat files. Identical values must be set in the software for the installed video capture card, and these values must be unique.

We spent many hours on the phone with tech support installing some of these cards; we recommend that you get your dealer to install your video capture card. To be fair, many of our conflicts stemmed from the Pentiums with high-end PCI graphics cards that we used; standard 486s with ISA bus graphics cards would likely have not given us so much trouble.

But even conflict-free installation does not guarantee optimal video capture performance. In our September review of Macintosh capture boards, we listed steps for optimizing video capture. Very few steps apply to both platforms. The shared advice includes:

>Use a video-ready, defragmented hard disk.

>Pre-allocate your capture file to ensure contiguous memory blocks.

>Close all other applications and screen savers, and turn off networking.

>Turn on dynamic quantization, if available, and limit the data rate to match your hard disk's sustained throughput.

>Don't capture audio simultaneously at the full-frame, full-motion, highest-quality settings. The extra 175KB per second of data and processing overhead will break these systems. Capture sound with time code in a second pass, then link the video and audio tracks in an editing program.

>If your board can't match our 320-by-240, 30fps standard for multimedia-quality video, we recommend you use 160 by 120 at 30fps instead of 320 by 240 at 15fps for people talking, and vice versa for shots with lots of detail but not a lot of motion.

>Video, of course, looks best in 24-bit color, but you'll have to trade off capture rates. Eight-bit color may be optimal, and 16-bit is a popular trade-off. Standard VGA (16-color) video looks terrible.

>Light your video properly. Material shot in low light is noisy and does not compress well. Avoid simple single-color backgrounds. Although easier to compress, they also show blockiness artifacts.

>Buy a faster hard disk, more RAM or a faster CPU, in that order.

The PC has many more complications, mostly due to the hardware installation idiosyncrasies. If you don't know what all the following mean, cross your fingers or buy a Macintosh:

>Don't use disk compression software (such as Doublespace or Stacker) on your video files.

(continued on page 94)

Installing and Tuning Windows Capture Cards

(continued from page 92)

Use Windows for Workgroups for its faster file handling.

).-Enable 32-bit file access in the virtual memory control panel, but not 32-bit disk access with SCSI.

>Set a permanent swap file for your boot disk, but not your video disk.

>Use Smartdry carefully (/R) or turn it off. Turn off Double Buffer.

>Optimize your SCSI BIOS, set sync negotiation and the highest DMA transfer rate that doesn't crash your computer.

>-Shadow the ROM BIOS of your graphics display and SCSI adapter to RAM, but watch out for conflicts with your capture card memory exclusion.

>Get rid of TSRs that may cause interrupts. Create a special boot sequence for video work.

>Once you've optimized your hardware setup for video, run MEMMAKER to load devices into upper memory blocks and free up conventional memory.

>Use EMM386.exe with NOEMS, and carefully set memory exclusions required by your video card. X=D000- is often best. Look for conflicts with the SCSI and graphics BIOS, typically around C000.

>IRO conflicts are the most common problem. Make a list of every IRO used in your system. Best IRQs for capture cards: 10, 12, 15.

>In Pentium machines, go into the motherboard BIOS and disable the same memory areas there to prevent plug-and-play cards from grabbing them. Also, mark the IRQs for your video cards as USED or ISA.

>-Always use the latest drivers. Check the dates on DOS and Windows and use the later one for Smartdry, EMM386, etc. Get the latest drivers for your graphics card and VFW.

>If you don't have video acceleration, set your display size to 640 by 480 to get the biggest picture, or use the full-screen option in Media Player.

>Don't use the modeswitch feature on advanced graphics cards that lets you change resolution without rebooting Windows. It eats memory.

>Make sure you're in turbo mode and enhanced mode.

>Turn off energy conservation features in Green PCs.

M&M Pro w/M-JPEG option

Omnicomp's M&M Pro ($995) has been around for two years now, and its age shows. It was originally designed for 24-bit frame grabbing and live video-in-a-window overlays on VGA graphics via the VESA feature connector. Omnicomp has written MCI and AVI drivers to make M&M Pro work with Video for Windows, but the board retains its expensive design.

M&M Pro's similarly expensive M-JPEG daughtercard ($1,920) uses the advanced C-Cube CL-550 compression chip. Unfortunately, like the CEI Video Wizard, it is designed around the Chips & Technologies PC Video chip, with an 8-12MB RAM limitation.

This card was out of its element in our Pentium PCI machines. Tech support said some 486 machines have novel ways of mapping the M&M Pro 14MB memory location on the ISA bus into physical memory at 30MB, but we were unable to test this workaround. M&M Pro also does not support the Microsoft AVI MJPG standard, but Omnicomp says it plans to release a new capture and playback utility for use with Adobe Premiere. It is also looking at licensing M-JPEG conversion software from Mediamatics.

Visual Forge suite

The basi c Triumphony Visual Forge V-10 from Triumph Logistic is a new-generation PCI VGA card that uses a Tseng Labs chip to provide video in a- window and still-frame capture. The V-20 daughtercard has a Philips 7194 video chip, providing what the company calls full-screen, scalable full-motion video. While this board set ($336) advertises an AVI motion-video capture capability, the capture rate was below our standard, and the video-in-a-window was fuzzy.

The Visual Forge V-30, a companion ISA card, provides MPEG video and audio playback capabilities. The most amazing thing about these cards is the low price for features that so recently cost thousands of dollars. The V-30 MPEG card is only $214, and all three cards sell for $540. Cost-conscious multimedia end users should check them out, but all this functionality and more can be found with very high quality in the $795 PCI-based Matrox Marvel II.

Video Packer

The VIC Hi-Tech Video Packer ($1,995) overlays video-in-a-window and performs still-image capture using the VFSA Feature Connector. It is another developer/OEM card like the M&M Pro and Video Wizard. Like them, it combines the C-Cube CL-550 compression chip with the Chips & Technologies PC Video chip on an M-JPEG daughtercard. It has the usual memory aperture problem, so the Video Packer must be run in a machine with 8MB or less of RAM. Video Packer is newer than the other cards, having been released a year ago, and has monophonic audio capture and playback.

Xinglt

We looked at Xing's Xinglt MPEG capture board ($499) because of its innovative approach, which captures just I-frames and therefore makes editable MPEG AVI files. Normal MPEG files consist mostly of frames that carry only the interframe difference information needed to predict them (P- and B-frames) from the I-frames (intraframes). An edit at one of these P- or B-interframes would lack the necessary information to play forward, so the MPEG is not normally an editing format.

While it plays at 320 by 240, Xinglt actually captures 160-by-120 images that are very soft and filled with a diffuse random noise; we judged this image quality unacceptable. Although Xinglt has made editable MPEG possible, this is probably not the best way to edit or capture MPEG video. Xing has a much better product in XingCD, software that lets you take any AVI files captured with other cards, or edited movies, and recompress them as full MPEG files with I-frames, P-frames and B-frames. While XingCD does not work in real time, it produces much better results. Combine XingCD with a low-cost MPEG playback card or a multi-function card like the Marvel II, and you're an MPEG producer. M

Research and testing was conducted for the NewMedia Lab by the Desktop Video Group, an educational organization focusing on desktop video and multimedia authoring in Cambridge, Massachusetts. Director Bob Doyle and associate director Jeff Sauer prepared the feature table and supervised testing by Mike Bergman, Ted Carroll, Leo Cierpial, Peter Pinch, Will Martins, Peter Stassa and other DVG members.