

# Much more than just 'progressive'

MiniDV Camcorder  
**Panasonic AG-DVX100**

by Peter Dudar

The prosumer niche has its attention-getters. To achieve this status, a new camcorder has to do everything current attention-getters do but better, or introduce capabilities that have never been available in this cost category. With the introduction of the AG-DVX100 in October 2002, Panasonic has done both by delivering upscale components and the ability to shoot in several progressive scan modes.

Two key predecessors of the DVX100 are the Canon XL1 (later the XL1s) and the Sony DSR-PD150. The Canon model, released in 1997, looked like a real movie camera, had pro-like modular components and provided a relatively high degree of user control. The cam included a 30 fps Movie (frame) mode, and footage displayed the characteristics of film to some degree, so the the XL1s caught the attention of both aspiring moviemakers and established ones working with low budgets.

Debuting in early 2000, the smaller Sony DSR-PD150 with its non-interchangeable lens looked deceptively like a consumer cam. But it proved to be incredibly versatile and remarkably durable. Despite the inclusion of pro XLR inputs, sound was its Achilles heel—but the quality of the PD150's images was unrivaled by any other prosumer cam.

Many figured that the next attention-getter was going to be a multimedia cam—one that would plug into every communication apparatus known to humanity. And JVC gave it a try with its GY-DV300U, a.k.a. the Streamcorder.

## THE PANASONIC DIFFERENCE

But Panasonic has taken a completely different tack with the AG-DVX100. The configuration of the DVX100 (like the

JVC) is based more on the Sony PD150 than the Canon XL1s. But it's not the multimedia device which was envisioned—it's purely a DV cam, sans memory card capacity, USB connectivity or any hint of Web streaming capability. Panasonic is clearly going after the moviemaker constituency, flaunting the term "24p" in its promotional material. Since other true 24p cameras are priced at US\$63,000 and up, most of the talk is about this cam's 24fps progressive scan capability. But the DVX100 also shoots 30p "cinema mode", not an insignificant detail. And it's no slouch in the 60i department either.

Although there are lapses, overall the AG-DVX100 is a sensibly organized cam, and you can get away with pushing the auto button and shooting immediately. But there are enough unique features to make it worth going through the manual before using it. It would have been nice if Panasonic had put more effort into the manual, which runs a mere 66 pages and has no index; however Panasonic does provide it online in PDF format, so you can search for terms through Acrobat.

Instead of powering up the unit with a camera/VCR mode dial, Panasonic provides a separate on/off switch and separate start/stop buttons.

The AG-DVX100 has a chunkier overall profile than the Sony PD150, but it's well balanced and a breeze to use handheld for long periods of time compared to the XL1s. It also sports a lens shade with an open back, ostensibly to enhance your forward vision (I suspect somebody just thought it looked cool).

Like the JVC, there's a slide/rattle sound if the cam is tipped. Apparently, it's caused by the lens assembly shifting on its rails. But don't panic—this is considered normal and doesn't happen when the unit is powered up.

Two features which differentiate the DVX100 from the PD150 are its viewfinder and LCD monitor. Yes, black and white viewfinders (as in the Sony) are superior

for focusing, but Panasonic has opted for color, which is my preference.

Despite its thick barrel, the viewfinder's imager is the usual 180,000 pixels and just .44 inches. The DVX100's viewfinder can be raised to 100 degrees, and because of the large eyepiece it's possible to back off several inches and still see the entire image. Its LCD is 3.5 inches (versus the PD150's 2.5 inches), which is a definite plus. Mind you, the pixel count (200,000 vs. 200,640) is about the same on both. And the LCD rotates 270 degrees, so you can flip it and monitor yourself when on camera. The viewfinder can remain active even when the LCD monitor is open, which is very useful if you're accessing controls inside the LCD enclosure when the display is washed out in bright light. Just make sure the EVF Mode in the Display Setup menu is set to "on".

The tape loading door is beneath the hand strap and tapes are inserted from the top, so loading the cam when it's on a tripod is no problem. The tape transport mechanism performed flawlessly for me. It incorporates the forward cleaning head and automatic head cleaning function employed in Panasonic's DVCPRO line.

## LEICA LENS AND 410K-PIXEL CCDs

What can I say—this cam sports a wide angle Leica Dicomar lens which lives up to the name. The system, employing 15 lens elements in eleven groups, delivers crisp images across its zoom range, and its multicoating effectively minimizes flare.

The 4.5-45mm (F1.6) lens (which is equivalent to 32.5mm-325mm on a 35mm lens) provides a 56-degree viewing angle. As such, it starts wider than the lenses on the Sony PD150 (6-72mm) and the Canon XL1S (5.5-88mm). But the benefit on one end is lost at the other since it's just a 10:1 lens. This lens is a godsend when shooting in close quarters, but just doesn't cut it in more open environments.

The DVX100's 72mm filter diameter has its advantages, but expect to pay proportionally more than for comparable 58mm add-ons for the PD150. Panasonic's

new AG-LA7208G wide angle lens adapter lists for US\$440 (~CDN\$660) and the AG-LA7200G anamorphic lens is US\$880 (~CDN\$1,325). Century Optics ([www.centuryoptics.com](http://www.centuryoptics.com)) offers a 1.6 tele-converter which retails for CDN\$1,470 (~US\$950). For CDN\$700 (~US\$450), there's also a .6x wide angle adapter with partial zoom capability, a .7x wide angle converter with full zoom (CDN\$1,300/~US\$875), and a fisheye adapter (CDN\$800/~US\$550).

Panasonic has put not just one but two neutral density filters (1/8 ND, 1/64 ND) into the AG-DVX100—an excellent decision. It also comes with a decent optical image stabilizer, which is now pretty well mandatory in this class of camcorder.

Behind the lens is a newly-developed 3-CCD imaging system comprised of three 1/3-inch, 410,000 pixel progressive CCDs (versus 380,000 on the PD150 and 270,000 on the XL1s). F11 sensitivity enables the AG-DVX100 to record at light levels below three lux, and a high S/N ratio suppresses both noise in dark areas of an image and smear in bright light.

As far as sharpness goes, it's pretty hard to see a difference between DVX100 and PD150 images. Color-wise, Panasonic's default 60i setting is more neutral—some would say it's more accurate than Sony's, which is more saturated and tends toward red. Keep in mind that the DVX100's color defaults can easily be tweaked.

No one has been able to match the low light performance of the Sony PD-150 in this class of camcorder, and that's still the case. (As with color, I suppose one can argue that the Panasonic cam is more accurate while Sony artificially brightens dark images.) Also, the DVX100's slowest shutter speed is 1/60 sec. in 60i (the PD150 goes down to 1/4). Gain can be boosted to +18 dB on the AG-DVX100, so the cam is certainly not useless in very low light. But the DSR-PD150 still produces cleaner images when used with gain. Instead of putting all available gain settings on a dial, Panasonic provides a selector with three positions—L is fixed at 0 dB, M and H can be set to 0, +3, +6, +9, or +12 dB.



### SERVO/MANUAL ZOOM

The servo/manual zoom on this camcorder is a breakthrough in this price range, but Panasonic has made some iffy compromises in making it happen. The zoom ring feels sloppy and loose in Manual mode and the full rotational span from wide to telephoto is just 90 degrees, so it's dicey to zoom subtly or ease in and out of a zoom. Get used to making transitions using the multi-speed rocker switch, which (thankfully) is pressure-sensitive. But here's a major plus: this is the only prosumer cam with stops marked on the zoom ring.

There's a proprietary CAM REMOTE mini jack on the back of the DVX100 but no LANC connector, so LANC-based zoom controllers are no-go. Two controllers that work with the DVX100 can be found at [www.16xginc.com/zoe/dvx.shtml](http://www.16xginc.com/zoe/dvx.shtml) or [www.varizoom.com/controllers/dvx.htm#dvx](http://www.varizoom.com/controllers/dvx.htm#dvx).

The focus ring is the infinite spin type (sans barrel markings) that one finds on all other prosumer cams. Too bad the Focus/Push Auto switch is right next to it, so it's easy to disrupt the zoom.

Contrary to intuition and convention, Panasonic has not placed the iris dial near the lens. It's a nice dial though, which enables the user to make smooth adjustments on the fly, rather than step-by-step.

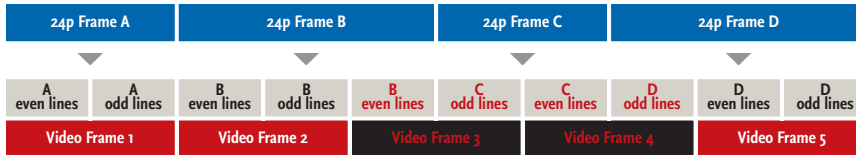
I really like the fact that both zoom position and focal length info is displayed nu-



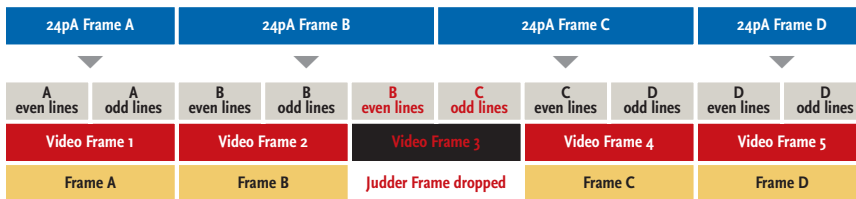
**STANDARD GAMMA** (left) and **CINE-LIKE GAMMA** (right) Cine-Like gamma captures a wider dynamic range, resulting in more detail in highlight and shadow areas.

## Working with progressive output in an interlace environment

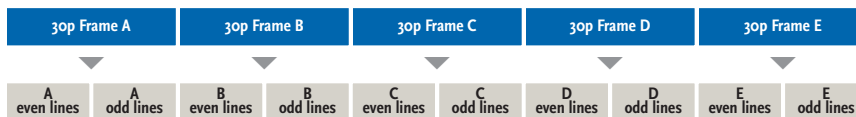
Existing Firewire (IEEE-1394) based non-linear editing systems (NLEs) are compatible with output from the AG-DVX100. No matter which progressive mode you use for shooting, the DVX100 actually transfers your material to tape in standard 60i using the schemes shown below. And progressive recorded tapes can be played back on standard DV VTRs and NTSC monitors. But native 24p editing requires an NLE that understands 2:3:3:2 pulldown and can do reverse conversion from 60i to 24p.



**2:3 Pulldown for 24p to 60i**



**2:3:3:2 Pulldown for 24p Advance to 60i**



**30p Conversion to 60i**

merically (from 00 to 99) on the viewfinder and LCD.

## XLR INPUTS WITH UPSCALE SOUND

Although it markets the DVX100 as a somewhat upscale Proline cam, Panasonic has tacked a microphone into the handle of the camcorder. However, even a mediocre detachable mic would have been more useful than a built-in. The shotgun mic you see attached to the DVX100 in most ads is actually the optional AG-MC 100G (a popular alternative is the Sennheiser ME 66, which retails for about CDN\$320/~US\$210).

Aside from this misstep, Panasonic has provided a relatively superior sound system, including XLR audio input terminals and a 48-V phantom power supply. Independent testers have reported quite positively on the audio system's input performance and wide frequency response. (There have been some complaints about noise in the mic preamps, but we're talking relative here.) The XLR terminals are

positioned on the camera body just in front of the hand grip instead of up top, which is more or less okay.

Initially I was skeptical about the placement of the level-adjustment thumb dials near the back, just below the LCD monitor. But they proved to be easy to find and manipulate while shooting. The dials are marked with glow in the dark pigment, and also recessed to minimize disruption. Audio level meters display clearly on both the LCD and viewfinder.

A mini-joystick, sensibly placed between the LCD and viewfinder, controls VCR and Menu navigation. But while the joystick is a cleverly compact means of carrying out a lot of functions, it's annoyingly easy to tilt when you mean to push, and vice versa—some users resort to using the remote.

The menu configuration is only so-so, with screens buried several levels down (there's a menu chart in the manual)—so Sony still has the edge in this department. But you rarely need to access menus when

shooting—it may not be obvious yet, but this cam certainly doesn't lack controls.

The Record Check button is a nice extra: just pause in Camera mode and press, and it plays back the last several seconds of footage just shot.

## SCENE FILES OFFER CUSTOMIZATION

Image control on the AG-DVX100 is remarkably sophisticated. The Scene File Dial on the back of the camera enables near-instant access to six presets, including Standard settings; FLUO (for fluorescent light); 24P (with a Cine-Like gamma); and ADVANC (advanced 24p with Cine-Like gamma). And take special note: the user can freely change any or all settings. These include Detail Level, Chroma Level, Chroma Phase, Color Temperature, Black Master Pedestal, Iris level, Skin Tone Detail, Matrix (Norm, Flou, Cine-Like), Vertical Detail, Progressive Modes (30p, 24p, 24p ADV), and Set Name. That's empowerment. You can switch from one preset to another while in the menus, which is very useful for comparing how particulars vary between sets.

Additional functions can be called up via two User buttons. The assignable functions, one per button, include SMPTE Color Bar display/hide; Modecheck; and ATW (auto tracking white balance on/off).

This is nice: you can turn off any Auto mode function (Iris, Gain, White Balance, Focus), thereby creating your very own semi-auto mode.

Manual white balancing is done using a three-position white balance switch and an AWB button which is easy to find by touch—just press the AWB button when the switch is set to A or B and the white balance is both adjusted and stored in memory. Position C on the switch lets you toggle between 3200K and 5600K values. The AWB button can also be used to adjust the black balance. Fast and simple.

Two levels of zebra patterning can be preset from a decent list: 80%, 85%, 90%, 95% and 100%. But the camera's button has to be pressed repeatedly to access presets—a switch would be more sensible.

This camcorder has two shutter buttons: a Shutter On/Off and Shutter Speed. The DVX100 60i defaults to 1/60 in 60i and 1/50 in 30p and 24p, so “shutter on” means something different in interlace and progressive modes. Too bad these speeds don’t display on the viewfinder and LCD. Like the Zebra button, you have to press the Shutter Speed button repeatedly to cycle through the available speeds—a dial would be far more sensible.

As mentioned, 1/60 sec. is the slowest shutter speed available in 60i; 30p mode goes to 1/30 and 24p goes to 1/24. Maximum shutter speed is 1/2,000 sec in 60i and 1/1000 in progressive. As well, a synchro scan function for matching the shutter speed to a monitor onscreen can be accessed in the Camera Setup menu.

## 24P, 30P, CINE-LIKE GAMMA

We perceive something as a movie because of its film-like look and its film-like motion—in other words, Cine-like gamma and 24p.

In the Standard shooting defaults, gamma curve and matrix are set to Normal, while detail, chroma, chroma phase, color temp, black master pedestal and iris are at zero. In 24p, gamma curve and matrix are set to Cine-Like, plus the black master pedestal is changed to -5 and the iris target value to -3. As a result, what you see is smoother and more saturated than standard video. Cine-Like gamma captures a wider dynamic range, resulting in more detail in highlight and shadow areas of the image. I quite like it, but be aware that this look may seem kind of dull or underexposed compared to standard video which is deliberately brightened for viewing in high ambient light.

The DVX100 is also designed to work in existing NTSC DV editing environments, even with images captured in 24p mode. So any Firewire (IEEE-1394) based non-linear editing system is compatible with its live camera and taped output.

And 24p recorded tapes can be played back on standard DV VTRs and NTSC monitors. This is because the DVX100 ac-

tually transfers 24p onto tape in standard 60i, using the same sort of 2:3 pulldown conversion used for transferring 24fps film to NTSC video. In 2:3 pulldown, 24p frame A is written to two fields, 24p frame B is written to three fields, 24p frame C is written to two, 24p frame D is written to three, and so on. In other words, four progressive frames yield five video frames (10 interlace fields). As shown in the chart on the page opposite, this sequence ends up with two judder video frames, each containing one field from one frame and one field from an adjacent frame. For instance, video frame 3 consists of even lines generated from 24p frame B and odd lines from 24p frame C. And this creates the judder effect associated with film that’s been transferred to video.

Standard 24p Mode is not the way to go if you intend to edit or output in native 24p. For that, there’s 24p Advance Mode, which uses a 2:3:3:2 pulldown conversion. As one would surmise from the name, 24pA frame A is written to two fields, 24pA frame B is written to three, 24pA frame C is written to three, and 24pA frame D is written to two. In this sequence, there’s just one judder frame—video frame 3, which has one field from 24pA frame B and one field from 24pA frame C. A non linear editing system (NLE) can drop the judder frame and recover the original 24p frames with minimal deterioration.

But in order to do this you need an NLE that understands 2:3:3:2 pulldown and is able to do reverse conversion from 60i to 24p. Currently the only editor that works directly with 24p Advance is In-Sync’s Blade 2 ([www.in-sync.com](http://www.in-sync.com))—and it’s Windows-only. Otherwise, there are reverse telecine applications available that can be used in conjunction with editing software. DVFilm’s DVFilm Maker release 1.06 ([www.dvfilm.com](http://www.dvfilm.com)) converts 24p Advance from 60i to 24p without recompression, and it’s inexpensive—US\$95 (~CDN\$150) plus shipping.

Apple’s Cinema Tools ([www.apple.com/cinematools](http://www.apple.com/cinematools)) works with Final Cut Pro 3, but lists separately for US\$1,000

(~CDN1,500)—however it will be integrated with the Final Cut Pro 4 upgrade due in June. And Avid has committed to supporting 24p Advance in their DV software updates. Some current solutions are convoluted, so look before leaping into 24pA editing immediately.

To appreciate how movie-like 24pA footage is, you really have to see it transferred to film—and there’s some contention that Cine-Like gamma isn’t at all essential for this purpose. The reasoning is that Cine-Like gamma makes 60i look more filmic, but it produces more noise, which is more apparent on the big screen. Need I say it? Run tests prior to shooting for film.

The DVX100’s 410,000-pixel CCDs are progressive scanners, and capturing one complete scan per frame in progressive mode is inherently cleaner than scanning every frame twice to come up with the odd and even fields required for interlaced imaging. You don’t get the edge-tearing

## PROSUMER HIGH DEFINITION ARRIVES

Even before the competition has responded to the AG-DVX100, vanguardists are speculating that DV is becoming obsolete. Rumour had it that prosumer High Definition was going to be huge at Las Vegas NAB, with intros from Panasonic, Sony, Canon and JVC.

Only JVC came through—with its JY-HD10U (below), which records in both HD and standard definition in three resolution modes: HD at 720/30p



and SD at 480/60p or 480/60i. The two progressive modes shoot native 16:9 with MPEG-2 compression.

JVC will have to contend with scepticism about this cam employing just one 1/3in., 1.18-megapixel CCD.

The JY-HD10U ships with proprietary Windows-only non-linear editing (NLE) software for frame-accurate MPEG-2 editing—but according to JVC, several mainstream NLE companies are working on compatible software.

The other camcorder manufacturers, including Panasonic, will of course introduce their own contenders. It’s just a question of how soon.



## PANASONIC AG-DVX100

### Camera/System

- Pick-up Device: 1/3-inch interline transfer type CCD x 3
- Picture Elements: 410K pixels. Effective: 380K pixels
- Leica DICOMAR lens, optical image stabilizer, motorized/manual modes, 10x zoom F 1.6 (f = 4.5 to 45 mm)
- Filter Diameter: 72 mm
- Optical Filter: ND Filters, 1/8ND, 1/64ND
- Gain Selection: 0, +3, +6, +9, +12, +18 dB (60i mode only)
- Shooting Mode: 60i (525i) interlaced fields
- Progressive mode: 30P, 24P or 24P advance
- Preset Shutter Speeds: 60i mode: 1/60 to 1/2000 sec.; 30P mode: 1/30 to 1/1000 sec.; 24P, 24P (ADV) mode: 1/24 to 1/1000 sec.
- Synchro Scan Shutter
- Sensitivity: F11.0 at 2000 lux
- Min. luminance: 3 lux (F 1.6, 18 dB gain, 50 IRE)
- LCD Monitor: 3.5-inch LCD color monitor, 200K pixels
- Viewfinder: 0.44-inch LCD color viewfinder, 180K pixels

### Video

- Sampling Frequencies: Y: 13.5 MHz, PB/PR: 3.375 MHz
- Quantizing: 8 bits
- Video Compression System: DCT + variable length code
- Error Correction: Reed-Solomon product code

### Audio

- Sampling Frequency: 48 kHz/32 kHz
- Quantizing: 16 bits/12 bits
- Frequency Characteristics: 20 Hz to 20 kHz

### Connectors

- VIDEO IN/OUT: Pin jack, analog composite input/output, 1.0 Vp-p, 75 (input/output automatically switched)
- S-VIDEO IN/OUT: S-connector, Y/C separate signal input/output, Y: 1.0 Vp-p, C: 0.286 Vp-p, 75
- AUDIO IN/OUT: Pin jacks a2 (CH1, CH2) Input: 316 mV, high impedance
- Output: 316 mV, 600
- DV: 4-pin, digital input/output, IEEE 1394 standard
- MIC/LINE INPUT: XLR (3 pins) x 2 (CH1, CH2) LINE/MIC switching, high impedance LINE: 0 dBu, MIC: -50 dBu/-60 dBu (menu selection)
- DC INPUT: 7.9 V

### Pricing

CDN\$5,900 (~US\$3,900) street price  
Panasonic Broadcast & Professional Video  
www.panasonic.com/pbds

artefacts (interlace combing) on moving subjects caused by interlace scanning. Consequently you end up with improved apparent resolution.

With 30p to 60i, there's also no pull-down to contend with because each frame is used to create exactly two fields. No judder frames. No editing issues. The film-like motion of 30p is similar to the XL1's Frame Mode but sharper—and 30p mode delivers the best stills from tape. It is also especially well-suited for multimedia output via the Web or DVD and is highly compatible with computer graphics applications (compressing quite nicely), so it's a natural for capturing video that's going to be downloaded, streamed, or embedded in Flash files.

Instead of true 16:9, the AG-DVX100 enables letterboxing, which records black bands at the top and bottom of the 4:3 image. The camcorder's progressive CCDs record 480 lines of resolution, so the letterboxed image ends up with an effective vertical resolution of 360 lines. This is equivalent to the vertical resolution of 4:3 interlace video, so 16:9 shot in progressive mode on this cam is comparable to true interlaced 16:9.

Note that Gain can't be boosted in the progressive scan modes. Apparently, Panasonic had to inhibit bloom (the tendency to whiten or flare in overbright areas) in order to enhance detail in highlights for Cine-Like gamma; the use of gain control in progressive modes would have undermined Panasonic's computations. (However, Gain control is fully available if you use Cine-Like gamma in 60i.) Also, auto focus is disabled and color bars are unavailable in the progressive modes.

The DVX100's power consumption is less than the Canon XL1s, but more than the Sony PD150. It uses 7.8 W with the LCD open, versus the PD150's 5.4 W. Thumbs up to Panasonic for including a battery charger with the camcorder. Panasonic's closest equivalent to the Sony NP-F960 eight-hour battery (which is compact enough to clamp on the back of a PD150) is the CGR-D53 nine-hour battery, which

clips to a belt and connects to the camera via cable (CDN\$225/~US\$150).

Sony users will point out that the PD150 shoots DVCAM, which is supposed to be less prone to dropouts. The Panasonic solution is dry lubricant Panasonic MQ tapes, which they say improves magnetic density over 400%.

### IS IT A PD150-KILLER?

Is the Panasonic AG-DVX100 a PD150-killer? In Canada, the two cams currently retail for exactly the same price (CDN\$5,900/~US\$3,900). Sony still has the edge in designing more logical and efficient user interfaces, but the Panasonic DVX100 is more camcorder for the price. Like many users of the not-so-new Sony DSR-PD150, I had compiled a personal wish list of what I'd like to see in its successor. Well, the DVX100 has lots of what I wanted. I wouldn't trade in a PD150 unless I really wanted to shoot progressive, but if I were buying now, I'd go for the Panasonic.

It appears that Panasonic thinks this cam is competitive even without 24p. The AG-DVC80, which essentially will be a DVX100 without progressive modes, is due to premier in June (and will list for US\$500 less).

The DVX100 is selling so strongly in its niche that other manufacturers must be feeling very pressured to one-up Panasonic. Rumours of upcoming replacements for the PD150 and XL1s have persisted for eons—and finally, representatives are starting to drop hints publicly. Apparently, the Canon XL2 is at least a year away, and should include 24p. Rumour has it that it will have third generation chips, 30p, native 16:9, and manual lens capability. And at least one Sony rep has commented that a replacement for the PD150 is due within the year.

But right now, only the Panasonic AG-DVX100 delivers true progressive shooting modes at a prosumer price. 🍌

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