The boys are back on set

In part two of their 1/3in chip camera test, Rodney Charters and Taylor Wigton introduce the Canon XL H1 and Panasonic HVX200 to the rigours of high-end drama production on the set of 24.

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Last issue DPs Taylor Wigton and Rodney Charters, who has been the DP on Fox's hit show *24* since season one, took the Sony Z1 and the JVC HD100 on to the set of *24* season five to assess whether the new wave of higher quality 1/3in chip cameras have what it takes to make it in high-end television drama. Fox isn't planning to switch to HDV any time soon, but pressure on TV budgets and advances in acquisition technology mean that TV execs everywhere are shopping around for alternatives to film, and these cameras offer huge potential savings and a quality that has, frankly, surprised almost everyone.

Both cameras gave very pleasing results, and the two DPs concluded part one of their test by acknowledging the undoubted quality of the images – certainly good enough for HDTV production in the areas of news, current affairs and reality TV, for instance. But when it came to big budget movies and high-end TV drama, there were some reservations, the main two being the quality of the optics and the problem of over-wide depth of field (DOF). There are also possible question marks over the robustness of the heavily compressed HDV signal once it has undergone significant post processing (to be dealt with in detail in part three).

The depth of field issue is to do with the size of the chip and is a difficult limitation to overcome. Very narrow depth of field is a hallmark of high-end film production and quality drama. Rodney himself uses very narrow focus shots throughout 24. Of course, DOF can be narrowed considerably by using telephoto focal lengths and exposing to ensure the iris is wide open, but shooting telephoto is not always desirable or even practical, so some other method needs to be employed to ensure more readily available narrow DOF if these cameras are going to make serious headway into high-end drama.

One such option is to use cine adaptors, which enable you to use cine or even 35mm stills lenses with the cameras. Although this adds to the cost of the system, as do any additional lenses, they are designed to combat the 'everything in focus' situation.

In part two of their tests, Rodney and Taylor throw the Canon XL H1 HDV camera and the Panasonic HVX200 HD P2 camera into the mix. The XL H1, like the HD100, is an HDV camera featuring interchangeable lenses. However, it records using the 1080i flavour of HDV favoured by Sony, rather than the 720p flavour used by JVC. The HVX200 brings an awful lot to the table. Like the Z1, it's a 1/3in chip fixed lens camera, but rather than using HDV (Panasonic is not a signatory to the consortium), it uses Panasonic's flavour of HD recorded on to proprietary P2 flash cards. Tape recording is catered for too, but only in DV mode.

In addition to assessing the new camera, Rodney and Taylor have now tested four cine adaptors and have taken some of the shots from the *24* shoot into post. The main post tests will be included next issue.

Rodney Charters: Getting back on the set of *24* with the cameras was somewhat of a challenge because in the time since we had carried out the first tests the whole tenor of the production had become more intense and I had to carefully pick days when we were on the set of CTU (counter-terrorist unit). I told Keifer we were testing more small cameras for drama use and he said again that he doesn't feel he can perform as intensely in front of a small camera as when he faces a large Panaflex. So I'll start by reiterating a point I made last time: it's a good idea to use large matte boxes if you intend to use HDV for drama, so that the actors feel there is something of substance there they can address – obviously not for taking an eyeline down the lens, but at least to act as an audience.

From the start it had been my plan to shoot alongside our large cameras and then take our D5 dailies and the HDV cassettes and blow them up through a Miranda HD-Bridge. We were so far ahead of ourselves last issue that Miranda had yet to write the software for 24-frame support. Although I am told the Miranda works at 24p, we were unable to either get a unit from them or upgrade the one we had been given, so perhaps this will wait until the next issue so that we can include the Sony up -and down-rez box that we used to downconvert and make dailies HDV tapes from our D5 masters.

We did manage to get footage out of the Canon and upload it to the D5 no problem. And it was this footage that we viewed at Level 3 post, where it made an amazing comparison against the 35mm dailies. The imagery was almost identical except for that nagging problem of almost infinite DOF. It confirmed our belief that this was the sharpest and best picture of the bunch. However, when I said no problem, I meant if you are happy to deliver at 30p. But as all drama indies want to break into Sundance and have Harvey lay down big bucks and book a delivery schedule involving 1000 prints on 35mm, then you had best be on 24p. Of course, if enough money is thrown at the problem of getting interlaced footage out to 24p, then there are solutions. Sony does claim that its new, as yet unnamed, box will be able to do it. It does the same job as the Miranda. Testing that claim, among others, is one of the reasons that a full analysis of the footage in post will have to wait until next issue.

For the time being I simply pulled frames from the HDV and that in itself proved interesting in cementing our thoughts about the cameras. Our modus operandi was to shoot a scene from somewhere where we weren't in the way of the A or B cameras we were using to shoot the scene, which is a challenge in itself, and then just roll a shot that would give us a similar frame size across all the cameras. We then both operated each of the cameras to get a feel for them.

In blowing every thing up to D5, I felt we would put everything on an even footing. Essentially, if you're going to do broadcast drama in HDV you have to take it to D5 for distribution and archiving. Any kind of anomalies that creep in at that stage will let you know whether or not it's going to be viable. The Miranda box works remarkably well in blowing up footage from the 1080i at 50 or 60. To get 24p out of the Sony you need to do a little bit of fiddling. Use the 50i (25fps), then extract the additional frame in either a software engine or on HDCAM by playing at a variable speed to get it back to 23.98fps. Or use the new up- and down-rez box from Sony. These are fiddly things, to do, so obviously it is somewhat easier to shoot with a camera that does 24p natively.

Ultimately, you do need 24p, and it might be easier to get there on another camera system. Sony is about to launch the 1/2in chip XDCAM HD for around $20,000, and that will represent something to be reckoned with and at price point for people who want to get into HD at a more professional level. All the cameras have very complex menus that allow complete adjustments and alterations in colorimetry, skintones and detail levels. All of those settings have variables and each individual will want them shifted in different ways depending on what they're shooting.

I used the Astro monitors made by Astro Systems of Australia to view the images. They have various sizes depending on how much you want to spend. They come with and without waveform monitoring; the straight monitors being the 6in DM3005 display and the 8in DM3008 display. The models with waveform monitors are the 6in WM3004 and the 8in WM3007. They have power on the back of them and they do an incredible job, with very high resolution.

What we were able to do was find a shot that would be repeated with the motion picture cameras and then shoot the cameras set-up for 24p or best equivalent frame rate in the best resolution they were capable of, before evaluating the results in D5 or in HDV. The handling of the cameras, how they mounted, was all pretty subjective, but we discovered a lot.

Each manufacturer has taken a different approach, and the results are all extraordinary; some of them are better than others and some aspects of some of the cameras are also better than others. Some of the limitations differ in importance depending on whether you are shooting documentary, drama or commercials.

I was recently reminded how times have changed in the months since we started this test. Even Kiefer has now shot over 100 hours of HDV on the Sony Z1, shooting footage in six countries, following himself and a band he is breaking called Rocco DeLuca. At 60I he will get a great product for HD-DVD release.

Behind the scenes

It's significant that Spark Hill, 24's behind-the-scenes DVD guys, were told to go to HD because we'll probably output our season five DVDs in blu-ray later in the year. As a consequence, they have to have all their behind-the-scenes materials shot in HD, so they have been using four Sony Z1s and a Sony HC1 that the producer works with.

They all showed up on-set for a behind-the-scenes session about the camera department – during a big stunt shoot-out – and they brought with them the Sony cameras, but they'd also bought two Panasonic HVX200s. Because of problems in getting hold of the HVX200 to coincide with the shoot, we borrowed theirs.

Taylor Wigton: As each day has passed during these tests, it has become clear that the important issue is low-cost 1/3inch HD acquisition in general, rather than which of the four 1/3inch, 3-chip cameras we are specifically looking at is the best for high-end drama acquisition. Some of the differences between these cameras are important if you're looking to buy one now – and we've assessed that – but I'm less concerned with the short-term contest over which is currently the best system on the market than what might be the best combination of elements from all the cameras – as well as where we might be going in the future. This means we are particularly interested in those aspects that are less easy to change on subsequent models, particularly the optics and overcoming the DOF issues inherent in 1/3in chip cameras.

We believe the 1/3inch HD CCD and CMOS sensors are already extraordinarily good and will only get better. What remains uncertain is whether affordable 1/3inch HD lenses will match the higher quality/lower price development of the recording formats, as no-one wants to shoot with substandard optics.

Depth of field

The next issue is that the tremendous DOF inherent in the tiny 1/3in sensor rules out the possibility of shooting high-end drama without a 35mm DOF 'workaround'. Technology can evolve, but the laws of optics are less willing to deviate from their inherent nature, regardless of how smart an engineer might be. But first, why narrow depth of field is so important in drama.

Rodney Charters: To the drama cinematographer, DOF is an indispensable tool for the telling of stories. Check out this chart at www.panavision.co.nz/main/kbase/reference/calcFOVform.asp

Let's say I use my 35mm stills camera and shoot with my 50mm Nikkor lens at f/2.8. I focus on a face 5ft (1.52m) from the lens – a normal working distance and image size for a modest CU portrait. This will give me a 27deg field of view and my depth of focus is just 5in (12.7cm). With 35mm motion picture cameras, my lens needs to be a 28mm, and at that same 5ft, I have a total DOF of 16.7in (42cm). This is the standard way we see our world in the movies. On 24 I work at T2.8, because of the need to use Primo zooms, which are both at 2.8, so the 16.7in is manageable and still masking 90 per cent of what is annoying in the background. If I want to draw attention to someone or something in the background, then a focus rack will be the most effective way of doing it.

With the Sony F900 HDCAM camera, for a 27deg angle of view I need to use an 11mm lens. With the subject at 5ft, I now get a DOF range of 14.5ft (4.4m) – eight times greater. With 1/3in chip cameras, the equivalent lens to give a field of view of 27deg is a 7.5mm, which gives a whopping 28ft (8.53m) DOF. Even with this lens opened all the way to f/1.4 the DOF is still 5ft (1.52m). Suddenly the whole world behind the subject appears as sharp as a tack and my eyes keep being distracted by it. And my ability to draw your attention to something interesting in the frame by focus alone or a rack is impossible. Which is why Taylor and I think it crucial to examine these cameras with the range of cine adaptors on the market.

The contenders

But before moving onto the cine adaptors, it's worth taking a look at each camera's suitability for drama production out of the box.

Sony Z1: The first camera we tested was the Sony Z1, which records at 1080i, and with a chipset of 960x1080 it does a pretty good job. Up-rezzed, it looks pretty amazing. It doesn't have a true progressive mode, but as a documentary camera, I can see why it's a bestseller – especially as its size enables you to shoot clandestinely, something that would be difficult with the Canon or particularly the JVC. It's robust and has years of that well designed Sony thing behind it. The mechanisms are all in the right place and I particularly like the viewfinder being upfront. All round it's a pretty decent camera, although it lacks variable frame rate.

Rodney Charters: It doesn't allow you to focus back to a predetermined mark, which limits its use in drama, if you're trying to follow an actor. What we've done with the PD150 is really stab away at the autofocus device when you think you've got somebody in the target. This is not a way to focus drama and it can be deeply frustrating because you only know when you are out of focus by watching the Astro monitor or something similar. You can't really tell focus through these viewfinders: none of them is good enough for that. The lens also breathes. It's not the only lens in the test that exhibits breathing, and while this isn't an issue when the lens is shooting at a fixed focal length, if you want to rack focus it can cause small changes in the image size during the shot, and this is unacceptable for serious drama.

It offers Firewire out and most NLEs completely embrace it. Battery life is great. I would say that for the cameras that don't have the HD-SDI out option (that is, everything except the Canon) the Miranda bridge is a great $2400 accessory, allowing you to come out the camera's Firewire and then out of the HD-Bridge's HD-SDI port and into a Decklink or something similar. A great introduction to the HD world, with its negatives being a fixed lens and a lack of proper focus controls. Great for docos, but it's probably not your first choice if you want to shoot drama with an HDV camera.

Taylor Wigton: The camera is also truly menacing for stock footage. The underscan and ultra-bright LCD screen should be copied and implemented on every other camera. With its ability to shoot both PAL and NTSC 1080 50/60i, this is a sweet little unit overall.

JVC HD100: The progress of the HD100 has been an interesting story to follow. When we first received the camera back in September last year, the split-screen effect (SSE) was in full effect and JVC had a serious problem on its hands. As we mentioned in part one, JVC decided to take the progressive route with its 1/3in CCDs, which meant packing a lot of pixels into a small area and requiring all the data to be collected simultaneously, rather than the alternate even/odd collection of interlace capture. The tremendous workload on the chips resulted in overheating, and the solution chosen was to use two circuits and devote half of the information coming from the CCDs to each circuit. Unfortunately, there were slight discrepancies in callibration between the two circuits, leading to the SSE.

Rodney and I had essentially ruled out the camera after seeing the SSE ourselves, so we only half-heartedly brought it on set to test against the Z1. Oddly, the SSE was not overly pervasive during our first set of tests, as JVC had already started implementing firmware that would help calibrate the two signals. Assuming this firmware could only get better, we contacted JVC to get hold of a newer version of the camera. With this camera there were no perceptible signs of the SSE, so the HD100 was back in contention and hats off to JVC for sorting out a serious problem.

Rodney Charters: The HD100 is extremely solid and I was impressed by it right away. It is very quiet and it's built in metal, with almost no plastic. The drawback is that it only records 1280x720, so you don't have that extra pixel capture of the Canon (1440x1080). However, as Denny Clairmont of Clairmont Cameras told me at the ASC open house, of all of the shooters who rent from him aiming to do a film-out, the majority choose the Varicam after testing against the F900 because it gives a more pleasing film-out look.

The HD100 is of course an interchangeable lens camera. The lens it ships with is cheap and adequate for documentary, but I wouldn't want to use it for drama as it breathes like crazy. However, you can use bigger chip lenses on it, which we did using the cine adaptors, and this makes it more attractive for drama, as well as being pretty reasonably priced at $5,500. The HD100 has true 24p, but no variable frame rate. The viewfinder's not bad – the focus assist is a very useful invention – and you can get professional batteries for it that will give you as much recording time as you like.

It is designed very well for hand-holding and has a proper broadcast quality viewfinder. However, if you wanted to hide as a documentary maker, it's the camera that looks the most professional. Equipped with an Astro viewfinder this would be a formidable beast. But again you're restricted to 1280x720 and that's barely enough resolution in this age. When you see it up against the Canon XL H1, the Canon has better picture sharpness but does so at the expense 24P. I liked the camera, and certainly JVC has been very responsive to both our and other people's feedback. It is the one to watch.

Canon XL H1: The Canon camera was somewhat of a surprise: it came in at $10K, but in a way I think it's probably worth it. First off, you can take an HD-SDI signal out, so you don't need the Miranda box, which is a $2400 device.

The XL H1 offers 1080i recording or else 24p at 720 (although it's not true 24p off the chip, which is why it is designated 24f). The lens is very sharp, but useless for drama because of the degree of breathing and the fact that focus is driven by micro motor and is not repeatable. The good news is that you can take it off, so hopefully someone's going to come out with a lens that will allow you to shoot relatively breathe-less so you can rack focus dependably back and forward. It could also use a decent focus control with it and matte box. I don't think it's a very good hand-holding camera, although I'm sure there are XL fans out there who will yell at me for saying so. One of the biggest problems we found was that the viewfinder is pretty much useless and, as it doesn't have a flipout, you absolutely have to use something like an Astro.

Having said that, the lens is a 20:1 zoom, which is an amazing range. But I would love it if they sold the camera body only, which they may do eventually. The construction is a bit tinny – I think the JVC is a lot better made – and it needs a mechanical lens. It shoots DV and HDV, but I think the preferred option would be to combine it with something like a Wafian DDR to do hard-drive capture at HD-SDI resolution. The HD chipset is 1440x1080, so they record in a much better codec (cineform) and their compression algorithms are far more sophisticated than the MPEG2.

Panasonic HVX200: The HVX200 was rather a wild card. We didn't know at the time of the test how big the chipset was, but we didn't believe it was 1440 because I had enormous problems getting the 1080 60p through the system.

Steve Parker: Just before going to press, we discovered that it uses 960x540 chips; however, it uses horizontal and vertical pixel shift on one of the CCDs. You can read about the technology behind this approach at http://toshpit.blogs.com/, but in essence the claim is that this technology will, in a best-case scenario where poor optics doesn't intervene, improve the resolution by 1.5x because of the spatial offset of the pixels, and with a fair wind this could give you an effective resolution of 1440x810 pixels (according to this formula, as the Canon and Sony use horizontal but not vertical pixel shift, but are also interlace, this would alter their effective resolution to

2160x756 and 1440x756 respectively). However, Rodney and Taylor didn't see this degree of improvement in the picture comparisons, so clever mathematics aside, we're going to have to carry out detailed independent tests to see the effect of this technology in **Rodney Charters:** The only way to get the 100MB HD signal with the HVX200 is by using the P2 flashcards; it only records DV to tape. But the flashcards are really neat. I was able to load them into my 17in Powerbook and pull them into FCP, and this was the first footage I actually saw because the others required a deck and a desktop CPU. I hope that by NAB Apple will have worked this out with both JVC and Canon to get the rest of the system online.

Recording to P2 cards is a completely different way of working. Filmwise, it's fine for us; we have always changed magazines after 4 or 6 minutes in the 400ft loads and 10 and 16 minutes in the 3-perf version in 1000ft loads, so we're used to that, so the idea of having three flashcards and exchanging them – one in the camera, one being downloaded and one on standby – is totally acceptable. We have enough people to do that, and that's the way the big cameras are doing it; the Arri D20 does exactly that with a $60,000 200GB flash RAM card from Grass Valley. And I think it's the way of the future. Gone are the days of having tape around: it gets in the way. However, not being able to use tape made Sparkhill reconsider their purchase. Mass storage in the aftermath of that is coming online fast.

In particular, I think that blu-ray's just around the corner, and even by NAB I think you'll find blu-ray and HDV recorders available that will allow you to archive to 30, 40 or 50GB at a time. I'm really looking forward to that because they are claiming much longer shelf-life than the tape, and I've had a couple of documentaries go South because they were shot almost 20 years ago and that's the end of their tape life.

Taylor Wigton: We did find the HVX200 the noisiest of the cameras, so I suspect the reason it requires the 100Mbs data rate allowed by the P2 cards is less to do with obtaining higher resolution than HDV and more to do with the extremely useful ability to shoot at variable frame rates. This means you can shoot slomo straight in the camera – an extremely welcome pro facility on a camera in this price range.

I'd speculate that they needed a progressive chip to do variable frame rate. They do this very impressively and I'd like to check it out further. The fact that it has fewer pixels means more noise and lower resolution, but less heat – so no split-screen effect. But it does give variable frame rate, and I think the resolution decrease is worth it in this case.

Rodney Charters: There are of course good uses in drama for variable frame rate – explosions in particular are often expanded 4x to slow down the action on playback. But VFR is also very useful for commercials and pop promo work, where slowing and speeding up the action is far more widespread.

Cine adaptors

Taylor Wigton: Regardless of how great the off-the-chip quality of these cameras is, until the problem of poor optical performance is resolved – and as long as the physical limitations of a tiny chip equate to near infinite depth of field – a lot of pros, particularly those working in drama, are going to steer clear of them. The ideal situation would be for there to be a healthy market in dedicated 1/3in chip lenses, and hopefully this will come. But for the time being, the only viable solution is to use better quality optics designed for S16 or 35mm stills and cine cameras.

There are a number available, and even though they may not be optically perfect, they are also likely to increase in quality daily. With the prevalence of 1/3in HD cameras, cine adaptors are likely to be used by anyone from prosumers to top cinematographers.

The four units we brought on set for our second round of tests were: the Movietube from South London Filters in the UK, the Cinemek (Guerilla 35), the P+S Technik Mini35 and the Red Rock Micro M2.

When attaching these units to the front of the cameras, it is worth noting that the cameras' existing lenses (where required) remain at a fixed focusing distance (basically, they are used to focus the image that passes through the 35mm lens on to the ground glass inside the cine adaptor, then on to the 1/3in CCDs. This means all focusing 'in the field' is carried out on the cine or SLR lens you use, so weaknesses in focusing control inherent in the lenses supplied with the cameras is no longer an issue. Similarly, because the supplied lenses don't change focal length, this also overcomes any breathing issues. However, I don't want to oversimplify the cine adaptor situation, as they can require some training to get the best results.

Movietube: The most impressive unit from a construction standpoint is the German-made Movietube supplied to us by South London Filters in the UK. It looks like it was made by the same team who constructed the ArriCam series of 35mm cameras. The Movietube uses a patented static film screen rather than ground glass, and it seems so well protected that you feel it would take a shoulder-fired missile to crack it open and get dust and hair into it. The Movietube is a 35mm adaptor that can only be used with fixed lens cameras at this point, making it suitable for the Sony Z1 and Panasonic HVX200. When a 35mm lens is attached, the iris has a minimum stop of T5.6 before the ground glass can be seen, making it a solid yet limited system (although I know Rodney would rarely stop down further than this). I would happily combine this with the HVX200 at 60fps if I were shooting a commercial or music video and wanted both shallow DOF and high frame rates (as the HVX offers variable frame rates). I would also use it in any environment where there was a possibility of being knocked about.

The current limitation is that the Movietube would not allow me to use the entire range of T-stops, so while I could achieve a shallow DOF (at T1.2 the DOF is a focus puller-challenging 2in), it would be difficult to shoot wide DOF shots using the same optics.

Mini35: At $10,000 without 35mm lenses or any accessories, I was certain the P+S Technik Mini35 would be able to demolish even 2/3inch HD cameras. Like the Movietube, it has the advantage over the other adaptors of shooting an upright image, whereas with the other two the viewfinder (and footage) has to be flipped. This isn't that much of a problem to overcome, though, and hopefuly the camera manufacturers will add 'flip' functions to their cameras sooner rather than later.

The Mini35 was kindly loaned to us by Eric MacIver of Indie Rentals in LA, who also supplied us with a set of Zeiss Superspeeds to test with the Movietube. Given how impressive the HDV images alone were proving themselves to be – even without the results pouring in from Canon XL H1's HD-SDI-out, which bypasses the MPEG2 encoder and sends out 4:2:2 10bit HD at 100mbs – the first year of 1/3inch HD was looking menacing when you put the P+S Technik into the picture.

We did find one or two issues, though. First, you have to be aware that the Mini35 loses quite a bit of light. In addition, with the HDV signals we could detect the oscillating movement of the ground glass grains – this swirling was most noticeable in the dark areas of the frame, but becomes discernible in the lighter areas the further the lens is stopped down. This was evident even before we captured to tape, as we were looking at live component-out images, so we fervently hope P+S can fix this – and soon.

Cinemek: Our thoughts on this unit (the Guerilla 35, which is now called Cinemek) have to remain inconclusive. The unit we had proved to be unusable for HD/HDV shooting. Although we didn't see the hair and dust on the G35 static ground glass straight away, it was there when we looked at footage on a 17in HD monitor. However, we had an early (probably preproduction) model, and the company is now completely redesigning the adaptor, and in the absence of it providing technical specs, photos or uncompressed frame grabs from its new design, we have to rule it out for the time being.

M2: This $500 unit was something of a shock. Who would have thought an engineering genius from Texas could design and set in motion a patent for his M2 adaptor that is actually quite suited to drama – and which is designed to work with old Nikon and Canon SLR lenses, of which there are legion sitting round the world gathering dust since the advent of digital photography, but which still feature exceptionally good optics?

The Redrock M2 is the only 35mm cine adaptor that exhibits a nearly lossless resolution and no image degradation, as there are no visible grains to throw a wrench into the MPEG2 HDV encoder. There is no artifacting and no soft edges.

The M2 can be notched down to T16, and I have even closed down to T22 with a Nikon 80-200mm SLR lens. No grain visible, no breakdown from MPEG and grain battling it out, and no visual loss of resolution.

Faux progressive

The other issue with these cameras is interlace/progressive recording. The JVC and Panasonic shoot true progressive, and both the Canon and Sony offer a faux progressive mode: the 24f on the Canon and the Cineframe mode on the Sony. Canon's 24f mode is superior to the Sony's 24cf, and the filmic cadence of the Z1's 30cf lies somewhere in between. So although the XL H1 did a decent job generating a 24p feel when there is movement in the frame, there is still an interlace feel when the movement comes to a standstill. None of them match the filmic feel of the HD100's true progressive mode.

There is more information contained in the Sony and Canon camera when in interlace mode than in their faux progressive modes, so we decided to carry out a test shooting in interlace mode and converting the signals to progressive using Magic Bullet Editors.

This is a good little piece of software. The Magic Bullet Look Suite is an impressive tool for DPs, allowing us to test out different looks. Of course, FX guys will probably have access to higher level FX software, but I would definitely have it in my bag of tricks, and I would recommend it to film schools too. There is an issue here, though. We were running it on a powerful Mac, but the render times to convert to 24p were just too long for anything that requires a fast turnaround, which limited us to converting the various shooting permutations in 10 second bursts only. Of course, it works a lot faster in DV mode than in HDV, but we were hoping for a little more speed. The resulting images had a progressive look about them, but we both agreed that the true progressive coming out of the JVC had the edge.

Conclusion

HDV is an excellent compression system for allowing cost-effective HD shooting, and thus a bullet-like catalyst for the HD migration to come. I suspect that in the next year or so, MPEG2 implementation in HDV cameras is going to remain in the new prosumer and consumer models, but that at the pro end of the market, the 19/25/35mbs bit rate and 4:2:0 colour space will likely be replaced by less expensive on-camera storage devices that can capture more data by recording straight off the CCD – something where Canon is pointing the way with its HD-SDI out. It may seem odd that first we raved about the quality of these camera, with the proviso that we want better optics, and now we're saying that they're great, but we want to record onto data media rather than tape. Yet that's the nature of the rapid evolution that is taking place in the camera market: any test is merely a snapshot of where we are at the moment.

So where are we? Well, HDV is an ingenious format that can record stunning HD pictures onto a $2 miniDV tape. After shooting at least 100 sixty-minute MiniDV tapes, I have used every brand of tape shooting 1080 60i, 50i, 24f, 30f, and 720 24p and 30p, and to this day, I have yet to have a dropout ruin a take, shot or scene (knock on wood).

Of course, there are differences between the three HDV offerings, but each of the three MPEG2 compressed HD cameras are crystal clear. From our limited tests so far, the Panasonic HVX200 is the noisiest camera of the four, but it has other saving graces.

So if all four cameras were at your disposal, you would have some serious options. The kicker to all of this is that to discover how good these cameras are was entirely unexpected, and still remains a bizarre reality.

Rodney Charters: I would say that all of the cameras have strong merits, as I've outlined, but currently I think JVC is the one to watch, because the company will respond really well, and if you couple it with one of the cine adaptors and use a set of old Nikons, you're going to be way ahead of the pack in terms of the ability to select your lenses carefully and control the depth of focus and rack when you need to – and accurately follow people through the frame with great precision.

Taylor Wigton: I agree with Rodney. My current choice for narrative drama out of the systems currently available would be: the JVC HD100 (in large part because of its true progressive mode) combined with a Redrock M2 and a nice new set of 35mm Nikon SLR primes. We came close to writing off the JVC initially because of the split-screen effect, but the company has done a fine job in eliminating the problem. The results from Redrock Micro's M2 adaptor speak for themselves, and of course Nikon SLR lenses are tried and true.

If there is something to be understood from JVC's experiences with progressive scan imagers, it's that it's going to take some sophisticated engineering to record true 1080p on 1/3in chips. In the meantime, JVC has taken a tremendous risk and overcome a nearly devastating obstacle, but it generates the most filmic, cinematic image of the cameras tested, reminding me of Kodak Vision 7218 that has been telecine transfered to HD.

Box copy

Where film still scores

So far we have only tested HDV cameras only on sets with carefully controlled lighting. But just because Annie Leibovitz shoots digital now does not mean that the same slam-dunk has taken place in the motion picture industry. Although the last sitcom to shoot film has finally shut its doors and all are now shot on HD, this is not the case with one-hour drama. Of the 30 to 40 pilots being prepped for shooting at this moment, and of those considered by the networks to have the most potential, all are being shot on film.

Of the three reasons we chose not to go with the Genesis camera in season 5, the most important was that in a daylight test against the Panavision XL/Kodak 5429 Vision2 Expression combination we were able to resolve many more stops of latitude in a bright southern California sunlit exterior, being able to easily hold a black actor in the shadow foreground and still retain the detail across the road at a construction site with its hot bare earth and concrete. For the *24* Season 5 Ontario Airport interior/exterior, I was able to hold our terrorist in the foreground one stop down at f/2, exposing at T2.8 while behind him I could see the parking lot and the cars passing on the approach to the airport terminal. Then the sliding doors opened and the ND9 on these doors slide back to reveal a sunny exterior. Now I have lost that three stops of ND on the glass and the exterior exposure jumps to between T45 and T64 and all of it was still intact on the negative. It looked burnt out, but perfectly naturally so. I don't believe I could have done that shot on video, whether Genesis or Viper or HDV. So in an uncontrolled world I think at the moment that films still gives me an advantage when shooting *24*.

In part three, Rodney and Taylor will report on how the various flavours of HD/HDV hold up to post processing – the final major hurdle to overcome to assess their suitability for high-end drama. Of course, with these tests you have to bear in mind that these cameras represent the first wave of hi-res 1/3in chip cameras. The second generation will be with us imminently: NAB is in April, so expect some pretty interesting announcements.

Rodney Charters/Taylor Wigton

Rodney Charters ASC (pictured) has been the DP on 24 for all five seasons. He hails from New Zealand, and his extensive credits include Roswell and recent TV movies Pixel Perfect and Sounder.

Taylor Wigton attended Connecticut College where he earned a living as a

photographer and in his final year made a documentary about a pizza delivery guy. After leaving college he shot three low-budget features in New England, before uprooting to LA where he now works as a DP.