WSR's Holosonic™ Home Theatre System
Part V — The Video System

GARY REBER

Widescreen Review's New State-Of-The-Art Reference Theatre At New Facility

This is Part V of a series of articles on the design, development, and execution of a new state-of-the-art Reference Holosonic™ Home Theatre Laboratory at *WSR's* new office facility in Temecula, California (north of San Diego, southeast of Los Angeles), that serves as *Widescreen Review's* and Surround Music.net's review laboratory. Part I appeared in Issue 48. Part VII will conclude in Issue 53 (October 2001).

As defined in previous parts of this series, the size of the room was determined by the requirements for optimal audio reproduction using truly full-range loudspeakers that were time- and phase-correct, and measurably accurate throughout the full 20 Hz to 20 kHz range. (See the review of the "Dunlavy Signature Series SC-V Full Range Loudspeaker, HRCC Center Channel Loudspeaker, TSW-V Tower Subwoofer & SM-I Studio Monitor—A No-Compromise Reference Holosonic Home Theatre System" in this issue.) This set the parameters of the "sweet spot" listening and "viewing" position (which optimally should be one-in-the-same). Once determined, I used a factor of "listening distance divided by two" (or conversely "screen width times two") to determine what the "optimal" screen width should be for the highest picture resolution using 9-inch CRT projectors in a mirrorless rear projection setup with a seven-foot-wide screen. That puts our "eyes in the chair" position at 14-feet from the screen, which produces a desired 30-degree viewing angle in the *WSR* Reference Holosonic Home Theatre Lab using a Stewart Filmscreen AeroView 100® rear projection screen. As previously stated in Part IV and other past *WSR* issues, home theatre installations often don't look really good because the real capability of the projector was ignored. Too often, home theatres are built with screens far wider than seven-feet, and this presents a light output problem for CRT-based projectors, not to mention a dimming of performance long-term. If you want a much wider screen size, then a high-output DLP™ or D-ILA® projector would be a better choice. However, I opted for CRT projectors, because this technology still provides the best picture quality with the richest color and blacks. Since the magazine is "the essential home theatre resource" for reviews of picture and sound quality relating to DVD and HDTV formats, as well as the equipment to deliver the video and audio of those formats, I insisted on optimizing the parameters necessary for the end result to be truly reference quality.

Rear Screen vs. Front Screen

As we've indicated in past *Widescreen Review* issues, the potential for picture quality in a rear screen configuration is as good as anything we can accomplish in front screen. Done right, it will actually have a slight advantage in contrast ratio over the front screen configuration, yet still have all of the picture quality assets associated with a front screen. After all, the only difference in mirrorless-based rear-projection is the screen. And that's just the image advantage. Having the projector behind the screen has a potential acoustic advantage. It's easier to control the noise of the projector, keeping it out of the room. Unlike most rear screen installations that do not have the distance necessary between the projector and screen to accommodate the high-quality projectors that are used in front screens, I designed the projection room with plenty of depth to accommodate the largest, high-quality 9-inch CRT projectors—14-feet, 6-inches long x 8-feet wide interior.

I have always felt that rear screen installations can be superior to front-projection because of the slightly better picture and possible improvements in sound quality. (See Issue 35, November/December 1999, for a more in-depth treatise on rear projection in the article "The Runco DTV-991RP—High-Performance 66-Inch Widescreen HDTV Reference System.")

Projectors & Lenses

Our primary CRT projectors are the 9-inch CRT-based Runco DTV-1101, coupled with Runco's VHD-4404 Ultra multi-function video processor, and the 9-inch CRT-based Sony VPH-G90U, coupled with Faroudja's DVP-5000 digital video processor/scaler. These two projectors represent the "top-of-the-line" models from Runco and Sony. These projectors with their large 9-inch raster areas are remarkably close in performance when driven correctly. The Runco exhibits superior color fidelity, but the Sony has

Runco DTV-1101 (Top) & Sony VPH-G90U

exhibits just slightly better resolution. Each represent absolute reference quality in a component projector.

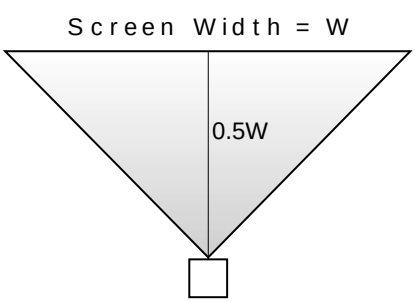
Both the Runco and Sony projectors use long focal length lenses. The lenses of the projector determine the distance it must be placed away from the screen. In most rear-projection installations (such as single box rear-projection sets) the short throw distance between the screen and projector requires a short focal length lens. That distance is usually in the order of 0.5 times the width of the screen. It can be less than 0.5 in really thin sets, or bigger than that in thick sets. Short throw lenses can have a throw distance as high as 1.1. The short distance between the lens and the projector puts some serious constraints on the lens' capability to focus over the entire picture area. In front screen systems, the distance between the two is usually larger, on the order of 1.3 to 1.5 times the width of the screen. In our installation, the distance between the two is on the order of 1.3 for the Sony VPH-G90U, and 1.43 for the Runco DTV-1101.

The question to why are there focus problems with short throw lenses was posed in the previously referenced article published in Issue 35. Take a look at the size of a **V** shape of the light coming out of the lens in Figure 1a as it draws a single line in the raster across the width of the screen. At 0.5 times the width of the screen, the **V** is wide. In a projector that is 1.5 times the width of the screen away from the screen, as represented in Figure 1b, the **V** is narrow. Note that in the 1.5 focal length drawing, the distance from the lens to the sides of the screen are about the same as to the center of the screen. Not so in the case of the short focal length, it is much further to the sides than it is to the center of the screen, making focus across the width of the screen difficult. In theory, the quality of the lens required to accomplish a short focal length has to be a lot better than that needed to accomplish the longer focal length. In practice, the short focal length lenses are put on inexpensive projectors, therefore they must be inexpensive. The longer focal length lenses are put on expensive projectors so they can cost a lot more. Making matters worse for the short focal lens in competing with the longer lenses, the longer lenses have independent focus of the outside versus the center. In short, there are no high-quality lens options for the short focal length configurations (except the ones offered on our other rear screen component projector/screen) Reference System L—the Runco DTV-991RP). In that application, short throw lenses work quite well, but the size of the AeroView 100 screen was limited to 66 inches in width, well within the 58-70-inch recommended screen width for the particular lens design. In that configuration, the edge focus is still good, though not as perfect as that achieved with the Runco VHD-1101 and Sony VPH-G90U installation.

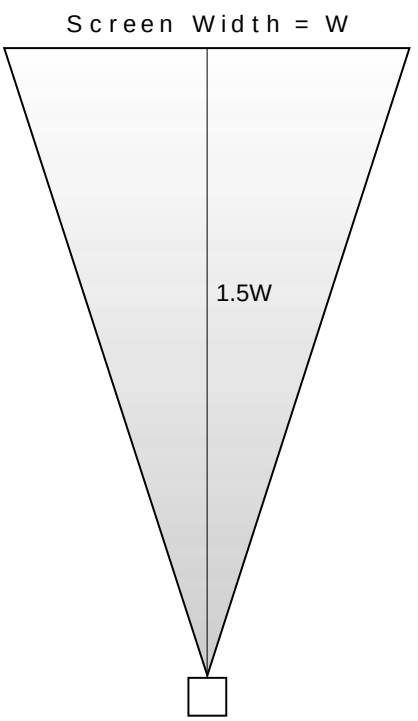
Faroudja DVP 5000 Digital Video Processor/Scaler

Runco VHD-4404 Ultra Multi-Function Video Processor

View From Projectors To Stewart Filmscreen AeroView 100® Rear Screen



Short Focal Length Lens
0.5W
Figure 1a



Long Focal Length Lens
1.5W
Figure 1b

Video Equipment Review Editor Robert Bush reviewed the Sony VPH-G90U in Issue 36 (January/February 2000) of *Widescreen Review*. Both a DWIN® Tri-Scanner and Faroudja DVP-3000 scalers were used to evaluate its high-resolution performance. Robert summed up the performance of the VPH-G90U as follows: "...the VPH-G90U is capable of producing superb definition, contrast and image depth, surpassing the best 8-inch or smaller CRT projectors on the market. It ranks amongst the elite projectors that are capable of displaying the full resolution of HDTV. I can highly recommend the Sony VPH-G90U as the best performance value on the market in a 9-inch CRT projector—a real deal in widescreen displays."

In our hyper-critical viewing environment, we couple the VPH-G90U with Faroudja's state-of-the-art DVP-5000 digital video processor/scaler. This processor/scaler is capable of scaling video to 1080p with remarkable picture quality. Video Technical Editor Greg Rogers will report on the performance of the DVP-5000 in Issue 53.

The Runco DTV-1101 projector has been Runco's flagship projector for video performance for a few years now, but will be replaced with the Runco DTV-1200, a truly new state-of-the-art 9-inch CRT projector. This projector has virtually no competition in terms of picture performance from a CRT-based video projector. Rather than focus on the DTV-1101, Video Technical Editor Greg Rogers reviews the new Runco DTV-1200

Extron Matrix 128 HV
Crosspoint/Component Converter

and the VHD-4404 Ultra multi-function video processor elsewhere in this issue. The VHD-4404 Ultra is an upconverter that can line double, triple, quadruple, or scale video to increase the number of scan lines in an image. The DTV-1200 improves on the DTV-1101 in several important parameters. We will soon replace the DTV-1101 in our Reference Holosonic Home Theatre Laboratory with the DTV-1200 as soon as projection units become available.

We use a professional Extron Matrix 128 HV/Crosspoint/Component Converter to run all our video signals, switched through to either the Runco DTV-1101 or Sony VPH-G90U.

Screens

I specified three screens from Stewart Filmscreen Corporation, the leading manufacturer of advanced film and video projection screens—two front screens and a primary rear screen.

For the sake of discussion, a front screen is an imaging surface designed to reflect light, whether it is genuine picture information or merely stray light. A luminous picture is reflected off the screen toward the viewers, but at the same time, the light reflects around the room and back into the screen. The higher the Average Picture Level (APL), the more light that returns to the screen. This has the effect of contaminating the entire picture, most noticeably raising the black threshold. Therefore, as APL changes throughout a given scene, the threshold of black shifts dynamically in a direct relationship to APL.

In Issue 34, September/October 1999, Video Equipment Review Editor Nicholas Grieco provided the following example: “Imagine a scene with a great deal of low level information. We can see our hero strolling, passing in and out of the shadows. We also see the subtle textures in the ground and surroundings. As the shot progresses, the camera cranes up and a light from a lamp momentarily occupies a significant portion of the frame. This bright picture area illuminates the room—you may be able to see the outline of your speakers against the wall, or what have you. The brief increase in ambient light in turn reflects into the front screen, raising the “light floor,” and generally contaminating the picture. Low level information previously having subtle delineation is now washed out, lacking in shadow detail. When the offending lamp exits the frame, the darker ambient conditions prevail and our shadow detail returns.”

Stewart Filmscreen AeroView100® Flat Black Screen Wall

As you can surmise from the above, the home theatre room itself is a factor when considering the true contrast ratio of your installation. That is why I insisted on a flat “black” room—walls, ceiling, floor, furniture—but accentuated with neutral gray tones that impart dramatically less contamination. Black or dark charcoal wall covering or acoustical treatment is recommended to reduce this effect. Otherwise, you will have a compromised home theatre, though from an interior decorator’s viewpoint, a colorfully appointed room. Too bad for all the home theatre installations that are covered in reds, blues, greens, and other unsuitable colors, whose reflectivity contaminates the picture. A “black” environment may be deemed intolerable in rooms serving multiple functions, as is the case with most home living environments without a dedicated home theatre. In such situations, you need to pay particular attention to light that can enter the room, and use various methods to control light to the extent that the room is completely dark when used for critical viewing. But when you have the opportunity, as with most in-wall rear projection systems in new construction projects or rooms undergoing extensive remolding, insure that you allocate considerable space for the projector behind the screen. If you can’t afford the space required for a mirrorless projection system as ours, then consider using a Stewart Filmscreen or other brand of optical mirror system to fold the light path of the projection, and reduce the required throw distance by approximately half. This is the approach I took with our Reference System L using the Stewart Filmscreen OptaKong Rear Projection Mirror System. The OptaKong is a rear-projection first-surface, 94 percent reflective glass mirror assembly, which facilitates the folding of projection image paths to reduce the amount of space required for rear-projection installations.

Stewart Filmscreen OptaKong
Rear Projection Mirror System

A rear screen installation is dramatically less subject to this continuously varying ambient light level. In our application, the entire rear projection room is treated with Owens Corning Black Acoustic Board from

the SelectSound™ product family and covered with Guilford of Maine 408 Black Panel Fabric (FR 701 Style 2100), the same acoustically transparent fabric used on the RPG Diffusor Systems' VariScreen® acoustical panels in the theatre. Additionally, the Dunlavy Signature Series HRCC center channel loudspeaker is draped with 16-ounce black "commando cloth" (available through a local supplier named Rose Brand (www.rosebrand.com). Thus, the entire projection path is lined with black fabric-covered acoustical treatment, which, in addition to preventing stray reflections from behind the screen, serves to silence any noise from the projectors escaping into the home theatre room. While bright areas of the picture still do illuminate the theatre room, most stray light returning to the screen is not reflected, as an efficient front screen does. Instead, only a fraction of this light contaminates the picture.

The foundation of any projection system, be it video, film, digital cinema, or what have you, is the screen. Long after you've had the bulb or tubes changed, or replaced the projector altogether, a good screen will still be rewarding you with the best pictures your system can deliver.

Stewart Filmscreen has been in the business of manufacturing projection screens since the 1940's. First catering to the motion picture production and exhibition industries, and subsequently expanding into the business market, home theatre, and other special venues such as aerospace, the Stewart name has become synonymous with state-of-the-art screen material, hardware, and customer support. Stewart has two Academy Awards® for Science and Technological Achievement.

AeroView 100

The 1.78:1 (16:9) aspect ratio 84-inch wide by 47-1/4-inch high (96.5 inches diagonal) AeroView 100 in the system is a 1.0 unity gain (non-"hot spotting"), flexible rear screen with a diffusion membrane for an extremely wide viewing angle for wide seating.[1] The screen is washable and fully flame retardant. The "snapper" frame is covered in the customary Stewart VeLux® flocking, a black velvet-like non-reflective material which soaks up light, minimizing stray reflections in the edges of the picture. With the theatre ambient lights turned on the screen is milky gray in appearance. The screen takes on the color of the light which comes through it. This seemingly insignificant attribute means that the screen does not shade or tint the picture, and indeed this is reinforced by measurements of the spectral transmittance of the material.

Since a rear screen is designed to pass light through it rather than reflect light off it, there is the potential for a slight reduction in resolution. But the AeroView 100 has virtually the same detail rendering capability of the best front screens, such as Stewart Filmscreen's StudioTek® 130, which we also use in the theatre when required for a projector review. The AeroView 100 was developed in conjunction with the aerospace industry, which needed high quality virtual reality imaging in a rear screen format that equaled or exceeded the performance of front-projection screens. That application was used to name the AeroView screen. Low gain, true flat spectral uniformity, and a membrane thick screen are all part of what makes this technology work.

As previously stated, the AeroView is unity gain (1.0) throughout the visible spectrum. It does not introduce "hot spotting" into the picture, and does not emphasize any one color more than the others. Even from extreme off-axis viewing angles, the luminance and color characteristics do not differ dramatically from on-axis viewing. This means that everybody in an audience will see essentially the same bright picture, regardless of his or her individual viewing angle.

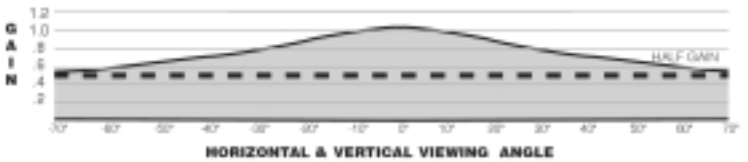
Without any optical elements or clear substrate to interfere with high frequency picture information, the detail-handling capability of this screen is well beyond that of mainstream contemporary electronic imagers.

The flexible nature of the screen means that it will tend to wobble like a diaphragm with the pressure exchange if there is air movement around the screen. That happens when someone slams our 300-plus-pound Industrial Acoustics Corporation (IAC) isolation door entrance to the theatre, but otherwise the Dunlavy Signature Series speakers are position so as not to impact the air movement around the screen.

The importance of controlling ambient light cannot be overemphasized. This screen will only be as "black" as the light which comes through it or reflects off of it. In high ambient light, which is never a condition in our theatre, the deepest black can only be as dark as the stray light being diffused at the screen path. In such conditions, a picture on the AeroView would be washed out. Thus, if you plan on watching pictures in a higher ambient environment, this is NOT the screen for you. There are other types of rear screens designed specifically for less than ideal ambient light cir-

1 Note: Reducing the screen gain, from the popular flat screen values of 2.0 and 1.5 diminishes the amount of light fall off as you move around the screen. Ideally, screen gain should be at unity (0.0) to eliminate "hot spotting," the image artifact that comes from focusing the light in a particular direction. From any viewing angle there will appear to be an area of the screen that is brighter than any other. The position of the hot spot will depend on your viewing angle. It will change as you move around the screen. Some projectors still require help from the screen in obtaining a usable amount of light. Screens with gain factor above 1.0 will have some degree of hot spotting.

Aeroview 100 Gain Performance

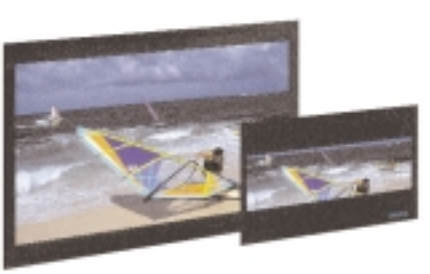


Specification Chart

Performance	*Response*
Projection Screen	Flexible Rear Projection
Perforations	n/a
Framing and Design	Available in fixed screens and motorized retractable screen models
Masking	Available
Gain	1.0
Half Gain	.5
Viewing Angle	180 Degrees
Seams	None
Reflective/ Back Scatter	.27
Half Gain Viewing Angle	70 Degrees

Specifications are subject to change at anytime.

AeroView 100® Specifications



Stewart Filmscreen's Model LVC Horizontal Screen Wall ElectriMask

cumstances, such as Stewart's Filmscreen 100. This screen is made of a new flexible rear diffusion projection material, composed of a dark tint for additional contrast in rooms where moderate ambient light is a concern. In our theatre, ambient light is not a concern as the environment with the lights off is essentially "black." These types of more ambient-friendly screen designs make the best of fundamentally compromised conditions.

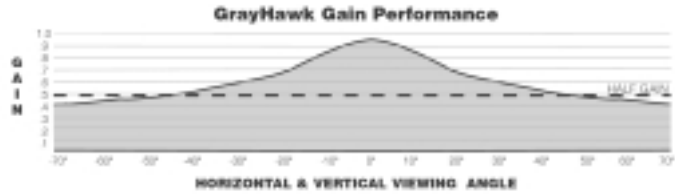
Thus, when selecting your screen, you must first consider a number of varying factors, such as projector type and model, front or rear screen installation, viewing angles, ambient light conditions, seating layout, and screen size. Visit Stewart Filmscreen's Web site (www.stewartfilm.com) to learn about their full line of products to handle a variety of difficult situations.

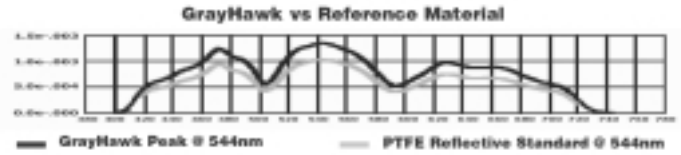
The Stewart AeroView is the performance choice when extremely demanding picture requirements are the criteria for home theatre excellence, in a tightly-controlled ambient environment. Superb color uniformity, spectral transmittance and resolution handling put it in a class by itself.

The AeroView 100 is fitted with Stewart Filmscreen's Model LVC Horizontal Screen Wall ElectriMask electric motorized aspect ratio masking panel system. This was custom-made by Stewart for our screen dimensions, with top and bottom masking panels motor-driven upward or downward out of the screen frame. Lowering and retracting of the masking panels may be controlled by a variety of wall mounted or remote control systems. With the ElectriMask System we can perfectly frame for every widescreen aspect ratio wider than 1.78:1 (HDTV)—typically 1.85:1 and 2.39:1 theatrical aspect ratios.

GrayHawk

Above the AeroView 100 is a Stewart motorized roller-drop front-projection screen of the same aspect ratio dimensions, housed in a black batten Stewart Luxus Model A ElectriScreen enclosure. The quiet screen operation can be activated by a switch, infrared or remote control, or a projector screen trigger. Stewart's Tab-Guy tension system is standard in order to maintain screen flatness and control edge-curl. The screen material is made of Stewart Filmscreen's newest screen fabric, GrayHawk® 088. This material was solely designed and engineered to maximize the "image fidelity" and contrast of images projected from fixed-pixel displays. Thus, we are able to review both CRT projectors in rear-screen mode and fixed-pixel projectors, such as those based on LCD, DLP, D-ILA, LCoS (Liquid Crystal on Silicon) and Grading Light Value™ (GLV™) MEMS technologies in front-projection mode.



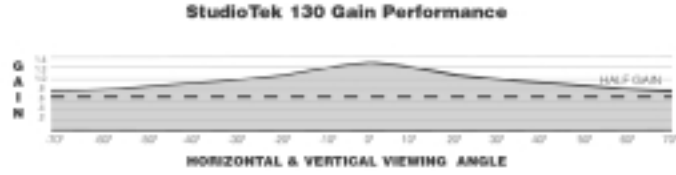


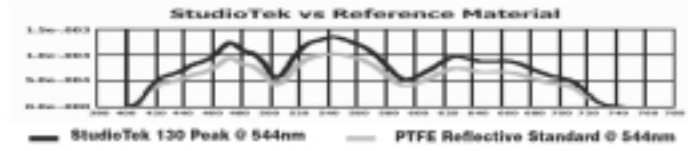
Specification Chart

Performance	*Response*
Projection Screen	Flexible Front Projection
Perforations	Available in Microperf
Framing and Design	Available in fixed screens and motorized retractable screen models
Masking	Available
Gain	.95
Half Gain	.48
Viewing Angle	160 Degrees
Seams	None

Specifications are subject to change at anytime.

GrayHawk® Specifications





Specification Chart

Performance	*Response*
Projection Screen	Flexible Front Projection
Perforations	Available in Microperf
Framing and Design	Available in fixed screens and motorized retractable screen models
Masking	Available
Gain	1.3
Half Gain	.65
Viewing Angle	160 Degrees
Seams	None

Specifications are subject to change at anytime.

StudioTek 130® Specifications

A third six-foot-wide (54 inches x 72 inches 1.33:1 aspect ratio) Stewart Filmscreen Studio Tek 130 is available as a roll-in for front-projection reviews of other CRT projectors.

GrayHawk features a unique translucent optical coating, combined with a neutral density gray-based undercoating to enhance black levels, shadow detailing, and overall color saturation. With the advent of the now widely-available high lumen light projectors, the role of the projection screen has dramatically changed. Traditionally, with past CRT projector technologies, a screen manufacturer's main mission and objective was to get sufficient image brightness back to the viewing audience. This no longer is the case. Digital projectors now create extreme image brightness without the help of a white screen with gain. There is a downside to these digital single-lens projection systems. They introduce light spillage within the projector's internal optical path and cross-reflection in the viewing room. The end result is bright images with very poor image black levels and contrast. Projectors do not project black. The screen itself creates the

Sony DVP-S9000ES DVD-Video Players

black level. Unlike white screens, the GrayHawk's viewing surface is a neutral density gray-biased surface with a 160-degree viewing angle and a gain of 0.95. A reflective translucent optical fiber is applied over the gray-based surface to maintain white light. Also, the room cross-reflection ambient light is now dampened. The end result encompasses high contrast, bright vivid images with very deep black levels and shadow detailing. A secondary bonus of the GrayHawk is that viewers can now enjoy images with more ambient light in the viewing environment, though for best picture performance a controlled ambient light, if not a fundamentally "black" environment is recommended. We'll be using the GrayHawk screen with various leading-edge fixed-pixel projectors. Reports to follow in upcoming *WSR* issues.

StudioTek 130

Stewart Filmscreen's StudioTek 130 screen is the choice for the best picture performance in a front-projected CRT image. StudioTek revolutionized the quality of the large screen video imaging market and significantly improved projection video image quality. The image quality produced by this screen adheres to the strictest color and white field uniformity standards. This material is over 30 percent brighter than standard matte white surface materials, yet the screen gain factor is a modest 1.3. It provides a wide 160-degree viewing angle for wide seating. It was developed under the direction of industry guru and our previous Video Technical Editor, Joe Kane, and certified by the Imaging Science Foundation (ISF).

Video Sources

As previously mentioned in Issue 48, Part I, our current reference source video machinery consists of two Sony DVP-S9000ES progressive scan DVD players with two-channel SACD capability, and a Pioneer Elite CLD-99 LaserDisc player, which is used for comparison reviews with DVDs. Also installed is a Panasonic TU-DST51 digital television decoder and a Panasonic PV-HD1000 D-VHS recorder. (Our equipment used for playback sourcing, audio processing, and amplification was covered in Issue 51, Part IV.) The Sony DVP-S9000ES progressive scan DVD players were reviewed by *WSR's* Video Technical Editor, Greg Rogers, in Issue 45.

Panasonic PV-HD1000 D-VHS

We use the Panasonic PV-HD1000 D-VHS recorder to showcase 1080i D-VHS tapes provided to us primarily by New Line Home Video. This is the second-generation iteration of D-VHS—the first was designed to be used only with DBS satellite receivers. A third-generation D-VHS format will be introduce by JVC at the September CEDIA (Custom Electronic Design & Installation Association) Expo 2001. The new JVC HMDH30000 D-VHS Player/Recorder ($1,999) and D-VHS format is rumored to be supported with a slate of pre-recorded movies from major studios. (Too bad the major studios have not yet committed to supporting high-definition DVD.) The HMDH30000 will ship at the end of September and will use the IEEE 1394 (FireWire®) interface to connect to an outboard set-top decoder. This new generation D-VHS uses the 5C Digital Transmission Content Protection (DTCP) copy protection standard to protect material transmitted via IEEE 1394 digital interface connections. JVC's HMDH30000 is fully backward compatible with VHS and S-VHS. In addition to an HD record mode, the recorder features an extended record mode for up to 28 hours in standard VHS.

As a second-generation format, the Panasonic is a major improvement over the first DBS models. For the PV-HD1000 D-VHS to process high-definition (whether 720p or 1080i) a Panasonic HDTV set-top box (STB), either the original TU-DST50 or the later TU-DST51, is required—coupled via IEEE 1394 interconnect, which is included with the VCR. The PV-HD1000 D-VHS has been used to record off the air a number of high-definition broadcasts in both 720i and 1080i, but primarily to play one-off studio pictures provided to us in the D-VHS format. The picture always is stunning, and especially spectacular when compared to the same movie on DVD. The only other machines available that can deliver the same picture quality are professional video cassette recorders such as Panasonic's D5, and they sell for over $50,000.

The "D" in D-VHS stands for Digital Data. With D-VHS data, 0s and 1s, are recorded, just like on a computer hard drive or any other digital recording device. The PV-HD1000 D-VHS records at a rate of 25 megabits per second (mbps). The audio

Panasonic PV-HD1000 D-VHS Player/Recorder & TU-DST51 Set-Top Box

EchoStar DISH 6000 HD Satellite Receiver

soundtrack is part of the MPEG-2 data stream. If the audio on the broadcast or pre-recorded tape is 5.1-channel discrete Dolby® Digital, that is how it is recorded or reproduced.

As Video Equipment Review Editor, Gary Merson, concluded in his review in Issue 34, September/October 1999: "The Panasonic PV-HD1000 is a one-of-a-kind VCR. Combined with the Panasonic TU-DST50 or TU-DST51 set-tops, the combination creates a very compelling reason to choose Panasonic as your HDTV reception solution."

DISH 6000 HD Satellite System

As an early HDTV advocate, *Widescreen Review* has had the opportunity to evaluate several HDTV delivery formats. With over-the-air network HD programming still spotty, HDTV remains slow to capture an audience. The EchoStar DISH Network™ offers films, drama series, special events and pay-per-view in HD. At present, DISH provides the East Coast HD feeds of HBO and Showtime plus a continuous, repeating HD demo tape about ten minutes in length, which we use on a regular basis to demonstrate HDTV. Some of the sequences in this demo are, in a word, dazzling. Of the two services, HBO (AOL/TimeWarner) programs more true 1080i program material than Showtime (Viacom) or the terrestrial broadcast networks, in the form of movies and HBO-produced specials. HBO sometimes airs as many as ten films in true 1080i during a 24-hour period. DISH and CBS announced on July 12 that starting with the Fall 2001-2002 season, DISH will carry East/West Coast DT feeds of WCBS-DT in New York and KCBS-DT in Los Angeles. In the 30-plus markets where the station is owned and operated,

CBS will allow direct reception by satellite of their New York/Los Angeles HD stations.

The DISH 6000 receiver provides both 15-pin RGB output and component output via RCA jacks. It will deliver either 720p (without upconversion) or 1080i output from satellite or over-the-air terrestrial (with an optional tuner module). The DISH 6000 also provides both Dolby Digital or PCM optical output, though the airing of Dolby Digital 5.1 audio remains a technical issue with program suppliers.

The DISH 6000 HD installation on our building's roof consists of two small dishes, one 20 inches in diameter aimed at EchoStar satellites located at 110 and 119 degrees, and a second 18-inch dish aimed at the EchoStar HD satellite at 61.5 degrees. The two dishes are coupled by a diplexer switchbox that transparently changes to the correct dish as you flip through the channels. A single coaxial cable feeds each receiver you install in your home. In our case, we have installed a single DISH 6000 in our Reference Holosonic Home Theatre Laboratory.

In terms of performance, the DISH Network delivers exemplary HD video. Contributing Editor Charles Wood observed the performance in his review in Issue 43 (November 2000): "DISH Network's HD demonstration loop on channel 9443 features some closeups of flowers that are best described as 'nearly photographic' in quality in terms of detail and color rendition. The images look very much like projected 35mm color transparencies... well-done HD film transfers are immensely enjoyable, with the potential of delivering a better-than-theatre viewing experience if you have a large projection system... the DISH 6000 revealed the fine film grain very well... the DISH 6000 [does] a spectacular job—especially considering [it] is a first generation product."

When we do have the opportunity to compare a 1080i HBO film to its DVD counterpart, there is strikingly more resolution available in the broadcast. The DISH Network makes for a convincing HDTV demonstration and the programming is reference quality, as is the over-the-air terrestrial HD programming, and that sourced for us on D-VHS pre-recorded HD tape.

Video Cable

While the subject of video cable was covered in Part IV (Issue 51), it bears repeating here in Part V as an integral part of a discussion of the *WSR* video system.

Cables are typically one of the weakest links in one's home theatre system, but not at *WSR*. We use premium, high-end video cable from Extron, Monster Cable®, and Transparent Audio® that have been meticulously engineered and quality-built. From Extron, we use their component and RGB video interconnects. From Monster Cable, we use *M*1000RGB and *M*2000HDSV video interconnects. From Transparent Audio, we use Transparent Video Datalink RGB video interconnects and Premium Transparent Component Video interconnects.

A high-quality video cable should be 75 ohms, which the Monster, Transparent, and Extron measure (the Dunlavys are strictly audio cables), including the connectors used. The characteristic impedance of the cable/connectors must match the 75-ohm input and output impedances of the video components to prevent signal reflections at the ends of the cable. Signal reflections will appear in the picture as ringing or edge outlining artifacts, and also create frequency response aberrations.

Adapters are never a good idea when compared to direct terminations. RCA connectors are an unfortunate consequence of the consumer world. BNC terminations have a more consistent impedance. But note that BNCs are available in 50-ohm versions, often used for RF power transmission applications, and 75-ohm versions for video. All of our connectors are true 75-ohm BNCs, as they should be in a video system. (See *WSR's* special edition *Imaging Science Theatre 2000*, which features our extensive "Video Cable Survey.")

Long cable runs to a projector from a scaler or switcher should use larger diameter, lower-loss video cables to avoid frequency response losses. HDTV and highly-scaled picture formats require flat frequency response to 30 MHz or more to avoid a loss of picture definition. It is also important to match cable lengths when using RGB or YPbPr component video signals. Otherwise, time delays between video signal components may create a variety of effects, including color smearing on the edges of objects, or what appears to be picture misconvergence in RGB systems. The low-loss video cables we use in our reference system are carefully matched, and exhibit none of these picture degradations.

Electrical System

One last mention about the dedicated electrical system we put in the theatre. This subject was covered in Part IV (Issue 51) but bears mention again here. Power distribution is provided by Equi=Tech's Model ET 12.5W SIF balanced power hard-wired AC system. Balance power is essentially a 120-volt circuit that has 60 volts to ground on each side, instead of 120 volts on one side and zero, or neutral, on the other. The design virtually eliminates electrical noise in an audio and video system. The Equi=Tech system is the quietest electrical system I have ever experienced, and results in a sonic and picture improvement that is nothing less than startling, with much tighter and deeper bass response, as well as better imaging, and blacker blacks, whiter whites, and fewer digital artifacts.

Additionally, numerous (14 Model 400S and two Model 1200S) Richard Gray's Power Company AC power optimizers run in parallel to the various electrical outputs distributed by the Equi=Tech. All of our equipment is connected directly into the Richard Gray's units, except for our California Audio Labs' power amplifiers, which are connected directly to the wall Equi=Tech electrical socket with a Richard Gray unit running in parallel. As reviewed in Issue 36 of *Widescreen Review*, the Richard Gray units deliver a "jaw-dropping improvement in surround sound quality and picture definition."

For articles that are in-depth on the subject of video, see the *Widescreen Review* special edition *Imaging Science Theatre 2000*—"The Essential Resource Guide For Optimizing Picture Quality." This edition is extremely comprehensive and features the writings of Joe Kane, Imaging Science Practitioner Extraordinaire.

We'll cover aesthetics and lighting and wrap the series up with "The End Result" in *WSR's* Issue 53. ■

Equi=Tech Model ET 12.5W SIF
Balanced Power Hard-Wired AC System

Richard Gray's Power Company
Model 400S And Model 1200S

Acknowledgements

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Runco's Mike Woods Calibrating DTV-1101

Runco's Mike Woods Calibrating DTV-1101