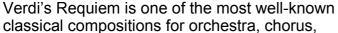# Verdi's Requiem in 5.1

As part of its Pioneer Classics series, Pioneer Entertainment is releasing works by Beethoven, Verdi, Wagner, and other composers on DVD-Video with remastered surround sound tracks. For Verdi's Requiem, Pioneer tapped L.A.-based Media Hyperium, Inc. to produce the DVD. Herbert Waltl, Media Hyperium's president, in turn, called on Future Disc System's Steve Hall to remaster the original stereo recording for 5.1 release. Verdi's Requiem is one of the most well-known classical compositions for orchestra, chorus, and vocal soloists. Frankfurt's Alte Oper, one of Europe's premiere concert halls, was the site of the 1990 concert recorded in a multi-camera shoot.

"The original source tape was a Digital Betacam with 16-bit, 48 kHz 2-channel audio track," states Hall. "The first thing I did was to view the video and listen carefully to the recording while transferring it into my Sonic Solutions system. At that point, I started to formulate a plan to expand what was there on the stereo master. The hall itself had a nice even decay, so, by working with delays, I was able to enhance the original recording's decays and re-create a surround ambience." Hall cleaned up the original audio with the No Noise functions of the Sonic system, then transferred and up-sampled the Sonic's output via a Pacific Microsonics HDCD converter at 24/96. The program was then converted to analog and fed into an AGM TSS-1. The TSS-1 accepts an analog stereo input and provides a left, center, and right output.

"The AGM's a great box in that it widens the left and right image and creates a reasonable center channel. I've found this method to be much more accurate than other methods using phase reversal or multing of the original stereo mix," says Hall. "It creates a wider sweet spot to allow better 5.1 reproduction in homes, since many home theater speaker systems are not set up symmetrically due to space or installation limitations."
For classical recordings such as the Verdi, Hall uses the TC 6000 to create

additional space and ambience that he then feeds to the left and right surround. He carefully shifts the time and directionality of non-musical elements such as the applause into the surrounds. "That way, the listener is still getting the majority of his auditory cues from the L-C-R speakers, but the position of the listener in the hall, as well as the hall's size and geometry, can be re-created. When and where the applause begins gives a listener his/her auditory reference. It takes a bit of experimentation, but the results are believable."

Verdi took full advantage of the tremendous dynamic range that orchestra, 80-voice choir, and four soloists produce. By careful filtering, Hall created a LFE track for this project, but rather than simply sending some of the original low-frequency program to the subwoofer, he prefers to add weight and size to the acoustic environment, in this case, the wonderful sounding Alte Oper venue. "For classical recordings, even one as dramatic as the Requiem, a little goes a long way when it comes to LFE," advises Hall.

Now that Hall had a 6-channel version he was happy with, it was time to master it for DVD-Video. First he ran the 6-channel output of his Sonic system into a Dolby DP569 encoder to create a Dolby Digital bit stream. At the same time, he made an uncompressed stereo version of the newly restored audio for inclusion on the final disc. "I check the 5.1 Dolby Digital and the Dolby Surround (4.0) versions, as well as 2-channel and mono playback ones, to make sure that the music will translate acceptably, no matter what type of speaker setup the listener has."

Future Disc is now offering complete DVD authoring, so Hall's colleague, Dave Conrad, then married Hall's digital audio files with the MPEG-encoded video in Future Disc's DVD authoring suite in close consultation with project producer, Herbert Waltl. At that point, a reference DVD-R is burned that includes the new audio, remastered video, and the liner notes. On Verdi's Requiem, these include bios of the conductor and soloists, plus the orchestra's and chorus' respective histories. The DVD also features a "music analysis" feature with either Latin or English lyrics displayed on screen.

Once the DVD-R was approved, then the project is mixed to DLT and sent to Pioneer's replication facility.

"About half of the surround work we're doing now is re-purposing recordings that are in the can," Hall concludes. "An incredibly convincing multichannel mix can be created for DVD if the original recordings are carefully analyzed and processed correctly. On some of the rock and pop DVD-Audio projects that I've been mastering, there's some very creative use of the 6-channel soundfield. The original artists and producers are excited to hear their tracks come to life in this new format. I'm looking forward to working on some new tracks that have been conceived and recorded in surround, but in the here and now, there's no shortage of great music like the Verdi Requiem that can benefit from a new 5.1 version."

A PERENNIAL CHALLENGE faced by film-dubbing mixers, and others concerned with multispeaker reproduction systems, is how to deal with stereo material. The stereo format attempts to create the illusion of sounds emerging from 'phantom' sound sources located between the 'real' left and right loudspeakers. Generally, this only works acceptably for listeners located in the central 'sweet spot' listening position. Off to either side these phantom images are pulled towards the nearest speaker, destroying the illusion.

In the cinema, and increasingly in 'home cinema' systems, three separate channels of sound are used to feed an array of left, centre and right loudspeakers intended to provide (among other things) a better experience for listeners outside the sweet spot.

When films are mixed using the analogue Dolby Surround matrix system, the encoding process can be relied on to bleed onto the centre speaker, not to mention the surround. However, the effect is not always predictable and often has a deleterious effect on the music balance. With digital multichannel surround systems there is no encoder matrix to help. Although Dolby do not condone the practice some mixers use the Dolby Surround encoder to produce a centre channel. Apart from this wheeze, the only option has been to use delays and filters to produce a hard centre.

AGM Digital's TSS process uses a Trifield-Gerzon, patented, frequency dependent, matrix-decoding method for feeding three loudspeakers. Michael Gerzon, a brilliant theoretician, did a considerable amount of research into how the ears and brain localise sounds. The theory is highly mathematical, based on orthogonal matrix theory, and a velocity-sound intensity theory of sound localisation. In Gerzon's words 'this leads to horrendously complex systems of nonlinear equations'. I do not pretend to understand the maths involved, but the bottom line is it appears to work. According to AGM, 'by careful optimisation, the stereo from the three speakers is balanced according to the various different methods used by the ears and brain to localise sounds at different frequencies.' Consequently, the German-based AGM operation has produced two 1U-high rackmount units using the theory to convert stereo source material for 3-speaker reproduction.

The TSS 1 and the TSS-1D Processors (equipped with a programmable centre-channel delay board) have balanced I-O on XLR connectors and a centre channel thru facility. The TSS1D also has an RS 232 interface and is supplied with a PC software package. The delay is there to compensate for the position of the centre speaker. Settings can be stored and downloaded to a unit. Once programmed the computer can be dispensed with as the unit remembers the previous settings with the power off. For convenience of installation there is a jumper on the processing board that makes the unit switchable via the RS232 interface using ASCII commands or the supplied software. Without the jumper, the unit goes into dumb

mode, and the processing-delay is switched on or off by simply linking two of the RS232 pins. The unit then passes left, centre and right signals unprocessed, removing the requirement for external patching.

These AGM processors work, and they are ridiculously easy to use, what more is there to say about a box you simply plug in? Well, the programmability was added to offer ease of installation for live sound-reinforcement applications. The Windows software allows comparison between alternative settings using 8 memory locations, and an area where a sequence of two or more locations can be switched by simply toggling the space bar. In practice, subjective evaluation tends to produce slightly different optimum values for the centre-channel delay than mathematics would indicate. There is also a toggle between two test modes. Left input routed to both left and right outputs, attenuated -3dB, compared to left input routed to the centre output with no attenuation. This allows the user to balance levels on live systems before allocating the centre-channel delay.

AGM claims to have adopted an analogue form over a DSP: 'There is no sonic penalty for having the unit purely analogue. It was decided to make it analogue and invest in making the boards small enough to enable some larger company to make a processor for domestic computer usage. It does rather a good job on a desktop PC. Apart from this, the unit boots faster than a digital equivalent and is inherently, with the right convertors, 96kHz, 24-bit ready. And yes, the delay-board option is digital.'

With multichannel sound-only delivery systems such as audio DVD looming large the TSS1 will find other uses converting stereo material when remastering. It also has a number of sound reinforcement applications. In fact units are already installed in some 20 German fixed installations, mostly handling reproduction in conjunction with a video screen.

Ultimately, if you need to convert stereo material for 3-channel reproduction this unit may be the simplest possible way of approaching the problem.