

Packing more computing power than the average PC, Meridian's Digital Theatre system promises the ultimate 'being there' experience for serious audiophiles. Beginning our ten-page test of that claim, Malcolm C Steward spends a week enjoying pan-dimensional soundfields...

Quaint it may be, but I like the way that Meridian's founders, Allen Boothroyd and Bob Stuart, refer to their company's hi-fi systems as 'gentlemen's gramophones'. There's something reassuring and homely about the term. Very 'pipe and slippers'. It sounds antiquated but dignified, more Fortnum and Mason than a warehouse club, and seems entirely fitting for such a high-end British product.

But don't for one moment imagine that Boothroyd and Stuart are locked in the same 'warm beer and village green cricket' time-war as the MP for Meridian's Huntingdon base. Far from it. Meridian's latest gramophone positively reeks of modernity, being completely digital and underpinned by a daring, radical philosophy. To use a term much loved by computer journalists, this system represents nothing less than a paradigm shift:

in plain English, it eschews the long-established principle of using two loudspeakers to reproduce stereo recordings.

Welcome to

DIGITAL WO





The price list

508 SUPER CD PLAYER	£1475
562V DIGITAL CONTROLLER	£895
565 SURROUND SOUND DECODER	£1995
MSR REMOTE CONTROL HANDSET	£60
DSP6000 ACTIVE LOUDSPEAKER SYSTEM (PAIR)	£8500
DSP5000C CENTRE CHANNEL SPEAKER (EACH)	£1595
DSP5000 ACTIVE LOUDSPEAKER SYSTEM (PAIR)	£2995
TOTAL	£17515

ONDERLAND

Meridian digital theatre: the experience

Pivotal to this process is a surround sound decoder unit, the Meridian 565, that was designed — in true audiophile tradition — to be transparent and natural-sounding. It aims to satisfy serious music lovers rather than gadget-freaks. Accordingly, it avoids using conventional tricks such as reverberation, and extracts its additional channels only from information present in the

Now I wanted a significantly longer period with the set-up, to discover fully what delights or terrors were in store for the relative novice daring to venture deep into Meridian's multi-channel vision of music.

My quest started encouragingly. Having toyed with the system for about fifteen minutes after its installation, I'd decided that surround sound was

tem's decoding — its ability to resolve detail with uncanny scrupulousness. Orb aficionado Damian McNamara from Mana Acoustics was visiting, and he immediately noticed something in this number that I'd also heard when I first played it on Digital Wonderland. In the welter of motorbike noises traversing the soundstage during the intro, there were a couple of passages where one bike's exhaust note had been sampled and then triggered by a sequencer to provide a backbeat. The system's precision made this musical device abundantly clear.

Arriving at this altered state of euphoria, however, hadn't been at all simple. Getting this system up and running was about as labour-intensive as re-jigging my regular active Naim system after the Mana gang has visited and elevated the rig on yet more platforms. That exercise involves a great deal of unplugging, humping, spike adjusting followed by more humping and plugging-in. Installing Digital Wonderland involves the installer (thankfully, you don't have to do it yourself) humping, spike-twiddling, plugging, listening, measuring, and doing all manner of digital malarkey to get the set-up just-so. The speakers need to be physically positioned in the right places, which is the relatively easy part, but then the fun starts. Subsequently, they need to have their virtual positions tuned, phase response tweaked and processor's delay lines adjusted until the speakers are both physically and virtually in the correct spots. It's fascinating to hear the effects of speakers moving forwards and backwards while their cabinets stay rooted to the floor.

I sat with Bob Stuart, the father of Digital Wonderland, and observed him at work. "I reckon the centre channel needs to come about six inches towards us," he said. "Allow me," I ventured as I started towards the cabinet. "No, no, no; sit down," he chided and started pushing buttons. Displays blinked and, without any physical intervention, sounds moved to take up their rightful positions in the frontal stage. "I could get used to this," I observed, relishing the thought of remote-controlled set-ups, stage-managed digitally from the comfort of my armchair. He deflated this notion by pointing out that this was just fine-tuning. There's still no means for making speakers perform ideally when you've parked them behind a sofa. I'm sure he's working on that, though.

Once installed, the system stacked up something like this. The regular



original recording. To do this successfully requires digital processing, which is why its makers refer to the 565 as 'an eight-channel music computer'. It also offers THX, Pro Logic and all that kind of stuff, but home theatre falls outside the scope of this review. If you really want to know about that side of things, acquire a January 1995 edition of our sister magazine, *Home Entertainment*.

I'd already heard the system in home theatre mode at *Live '94* and was suitably impressed by its ability to sound both dramatic and refined while easily drowning the high level of ambient noise outside Meridian's demonstration booth. Before that, I'd also heard it at last summer's Chicago CES, where a long, spirited session with Rage Against The Machine's eponymous CD overturned my notion that Meridian equipment was fine with classical music but didn't have the balls to be convincing with rock.

This rather innocent looking stack contains the power to blow away: your mind, several floorboards and a sofa, as well as any belief that you're not present at the actual recording venue...

probably the best way to appreciate The Orb's *Live '93* CD. After ten minutes' worth of *Little Fluffy Clouds* on Digital Wonderland, as the rig became known chez Steward, I emerged feeling truly "ripped to the tits on drink and drugs" — to quote Victor Lewis-Smith — even though I'd imbibed nothing stronger than an unsweetened Earl Grey and a Camel Filter. I've no idea what button combination I'd pressed, but amid this PA-level swirl of sound there were voices coming from every direction and bass lines positively tearing up the floorboards. The effect was one of being swept along on an aural magic carpet. By a hurricane.

Let me tell you, man, that if you like, dig psychedelia, then all you need for an awesomely groovy, mind-blowing trip is a comfy sofa, Digital Wonderland and The Orb.

The track *Star 6 & 7 8 9* demonstrated another striking feature of this sys-

Surround Sound Modes

The 565 DSP unit comes equipped with a selection of pre-installed DSP programs. Along with these, there are sixteen user-configurable presets into which you can slot your own custom settings. You install these by first selecting a source component to which you wish to assign a new setting, then selecting one of the supplied programs as a foundation upon which to build your own program. Assign this to your chosen source, then cycle through the menu for the DSP mode you've chosen and adjust parameters such as tonal balance, delay, spread and filtration. When you're happy with the tweaking, you can christen your new creation with an appropriate name. The first thirteen presets are initialised as the basic Music program; presets fourteen, fifteen and sixteen are initialised as *Chamber*, *Chapel* and *Hall*, respectively. These, unsurprisingly, provide appropriate acoustic recreations of the venue sizes and characteristics their names suggest. Descriptions of the main programs follow.

MUSIC mode uses processing specifically designed for "very pure reproduction of well-recorded material, originally intended for replay over a traditional stereo pair of loudspeakers". The 565 handbook informs us that "Most recordings have been balanced so that the sound of the two-speaker spread is the best compromise. One problem ... with two-speaker stereo is that the timbre of a sound passing across the stage (full left through centre to full right) is not constant. This is because the human hearing system does not have a constant frequency-response with direction. In other words, were a real sound to make this traverse, we would 'hear' it differently when it was in the centre, but 'perceive' it as being the same through our native learned adaptation."

Meridian's Music mode extracts the mono and surround elements of the original recording and equalises the mono component — which is the 'phantom' centre in a two-speaker system — to match the tone colour of that to the original sound. The process affords the central image "a huge step forward in consistency, stability and depth".

Three controls tailor the centre image: Level provides a small range trim on the relative loudness of the centre speaker; Depth trims the delay on the centre feed and 'shapes' the perspective of the stereo image; EQ controls the timbre.

The surround component of the original signal — which represents the sounds reaching the recording microphone from the sides — is delayed and played through the rear speakers. There is a Spread control to adjust the 'width' and phasiness of this component.

Meridian recommends this mode particularly for replaying recordings made with spaced omni-directional microphones or those using Mono-Surround techniques, or well-made purist recordings that have a natural perspective.

TRIFIELD mode is broadly similar to Music mode, but the signals for the left, right and centre speakers are calculated in an MST matrix, which is a phase-amplitude shuffler that redistributes the sounds on a constant energy-with-frequency basis. Meridian claims that the process offers significant improvements over the Blumlein stereo system, which converts phase differences between the microphone signals into amplitude differences in the speaker signals. Trifield's major advantages are that "the frontal signals are redistributed to have different stereo widths at low and high frequencies, 'correcting' for the fact that we perceive two-channel stereo width differently according to frequency; the frontal image is constant energy in terms of the input left-right original; the frontal width of the stereo image can be adjusted."

Similar controls to those used in Music mode allow users to obtain the best depth and perspective for individual recordings.

SUPER STEREO is designed to process amplitude-encoded stereo signals, such as those found in multi-tracked — typically pop music — recordings and those using true coincident microphone techniques.

SuperStereo uses the 565's Ambisonic decoder in stereo-synthesis mode, laying out the forward signals "much more uniformly across the stage than conventional two-speaker representations." The rear speakers convey extracted surround information and this can be delayed and filtered. Unlike Trifield, the signals for all the loudspeakers are produced in one phase-amplitude matrix that produces a constant-with-frequency energy balance.

All the above modes effectively synthesise surround sound information from a two-channel recording. The 565's Ambisonic mode deals with recordings



For a proper Digital Wonderland event, the usual budget speakers behind the sofa have been replaced with a pair of DSP5000s.

their piano black finish. Each D6000 consists of two enclosures. The lower box contains the four, sideways-firing bass drive units and all the electronics. Sitting above this, connected to the base enclosure by an umbilical lead, is an asymmetrically shaped head unit, which holds the midrange and treble drivers.

Sitting stage centre, flanked by the D6000s, was a stand-mounted DSP5000C centre channel speaker. Another active device, this contains three drivers — two bass/mids and a tweeter — each powered by 75W amplifiers. Again, the enclosure contains digital-to-analogue conversion, DSP and preamplifier circuitry, as well as electronics to handle system and remote control communications. This speaker was configured as the system controller — the device that relays commands to all the other components. This meant that the entire shooting match could be controlled by simply squirting the remote control handset at the conveniently placed centre channel speaker.

Naturally, you can't have surround sound without surround speakers. Instead of adopting the usual procedure of bunging a pair of budget boxes behind the sofa, Stuart parked a pair of DSP5000s at the back of the room. The irony of using such sophisticated transducers — floor standing versions of the centre channel model — as rears, did not escape him. "It must seem odd to someone with audiophile sensibilities to deploy three grand's worth of active speakers on channels that aren't supposed to be noticed," he said. Not really, Bob; certainly, no odder than wanting to listen to stereo through five speakers in the first place!

The system's 'electronics' — I guess that the speakers deserve that appella-



Get into the right mode — the 565 DSP should work out the rest for a perfect experience...

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Meridian digital theatre: the experience

tion, too — consisted of a 508 CD player, a 565 Digital Surround Processor and a 562V Multimedia Control Unit. On the assumption that

most readers have a fair understanding of what a CD player does, I'll concentrate here on briefly describing the roles of the other units. Both are complex and highly configurable devices; even the MSR system remote control doesn't escape being configurable. The handset can be adapted to drive different combinations of Meridian 500, 200 and 600 Series equipment. In the simplest of systems — one with no more than one analogue and two digital sources — you could use the 565 as the 'pre-amplifier'. The 562V, however, expands your input options, allowing you to connect all the sources, or suitable equivalents, whose legends appear on the MSR remote: a turntable, tuner, CD player, television, two tape recorders, CDR, cable receiver, two VCRs and a LaserDisc player. This, I suspect, will adequately cover most users' requirements. As the system is all-digital, analogue sources have their outputs converted to digital by the 562V's 16-bit, 64-times oversampling Delta-Sigma converter.

The 565 is the true core component in this system, controlling the flow of sonic traffic to each speaker. It employs twin 60MHz Motorola 56002 DSP chips and software to extract multi-channel sound from regular two-channel and matrixed recordings. For detailed descriptions of the various modes on offer, refer to the panel on page 23.

This system, to quote the press release that introduces it, sets out to "significantly advance the art of reproducing recorded music," and to "enhance realism without resorting to 'tricks' or 'spectacle'." I reckon that the 565 broadly achieves those aims. To qualify that, let me say that there were many discs which seemed to benefit from the multi-channel approach. However, with a few, I felt that Digital Wonderland did not quite capture the music's gestalt as convincingly as I would have liked. Whether that was the system's fault or a product of its interaction with my room, I really wouldn't like to say. There were several occasions when I



The DSP5000C centre channel aims to make questions of image strength redundant



The multi-system remote control, working on Meridian 500, 200 and 600 series equipment



The head unit of the D6000 main L/R enclosures — like the DSP5000C, it features Boothroyd-Stuart's proprietary HF unit

felt that my room — which is not especially small — was giving the system a hard time.

The Orb CD was a case in point. Digital Wonderland's prodigious bass output seemed to blur the starts and stops of notes in synthesised bass lines, giving the impression that it couldn't articulate low frequencies. However, playing a recording of a church organ showed that the system could separate two closely pitched lower bass pedals. The ease with which it managed this was nothing less than remarkable.

What was consistently outstanding about this rig was its ability to organise strands in dense recordings.

Without sounding clinical, it provided an extraordinarily well-regimented portrayal of discs that often sound somewhat chaotic and ill-defined on otherwise generally capable systems. Zappa fans, take note: Digital Wonderland really opens up his live recordings. I listened to *You Can't Do That On Stage Vol. 5* in the company of former *Hi-Fi Choice* editor, John Bamford, and we were both struck by the system's eloquent delivery of the music's more convoluted passages. Regardless of their prominence in the mix, it never missed a beat, nor any of the inflections in Scott Thunes' bass guitar lines. And Zappa's solo in *Advance Romance*, in which he uses truckloads of sustain on the guitar, was an unshifting paradigm of clarity. The entire envelope of every note, whether plucked or hammered-on, emerged distinctly. The system conveyed both the mechanical and emotional nuances of Zappa and the band's playing with alacrity. Every note was meaningful. It's hard to convey the significance of such considerations but as Frank once remarked: "This is the final truth; the crux of the biscuit is the apostrophe." I interpret that as meaning that the smallest details tend to decide whether a performance works or doesn't. Here, the music hit home persuasively.

Although the system's spatial abilities weren't fully exercised by such multi-tracked recordings, something tells me that they played a useful rôle in sorting out instrumental lines. Certainly, the frontal soundstage this system developed was unusually well-

defined, unambiguous and stable. However, to appreciate best the 'surround' aspects of this system, I needed to delve into Ambisonic or 'naturally-recorded' material. With such recordings, the effects were often markedly advantageous.

Two cuts from the Nimbus Ambisonic sampler — Copland's *Fanfare for the Common Man*, and Brahms' *Chorale Prelude Opus posth. 122* — although musically rewarding in plain, two-speaker stereo, came to life vividly in Ambisonic mode. I went from being merely a spectator to being immersed in the music — both physically and emotionally. Hearing believable spatial information, such as reflections off the rear wall of the venue, truly enhanced the listening experience. Similarly, a simple 'straight' stereo recording by Dan Fitzgerald of The Voice Squad, an Irish a cappella trio, taped in a small chapel but with the natural ambience replaced by digital atmosphere, proved more convincing and involving on this system with Meridian's proprietary Trifield acoustic program engaged. For example, a solo voice stage left was placed firmly in the left hand speaker cabinet in regular stereo. Switching to Trifield left it in the same relative position, but brought it cleanly out of the speaker. Trifield further enhanced the soundstage's three-dimensionality, making the voice appear more substantial, more clearly positioned within the venue, and conveyed an altogether enhanced impression of the singer's physical presence.

While hard-core audiophiles will appreciate such niceties as improved ambience and enhanced stereo imagery, they're not vital requirements for all listeners. However, Meridian hasn't just aimed this system at hi-fi nuts. The last line of the press release mentioned earlier clearly demonstrates that the company also wants to snare under-achieving, rock-loving low-lives like me. It reads "Effects modes — Full Surround — an all around assault for parties, etc." That's my kind of talk; if I'm listening to Therapy? I want a system that will endanger me physically. Digital Wonderland did. My sound pressure level meter registered 120dB during *Screamager* and the system was showing no signs of distress. I could feel the bass and kick drum coming through my heavily upholstered sofa, which threatened to bounce its way out of the door if I dared to stand up. The impact of rim-shots and chopped guitar chords was equally staggering. 'Fast' wasn't an adequate description. Even at this level, one at

Surround Sound Modes continued

Continued on page 25

encoded in UHJ format, the two-channel stereo compatible encoding found on Ambisonically recorded discs and broadcasts. This includes CDs from Nimbus and York Ambisonics, Enya's Watermark CD, some drama broadcasts by the BBC and others.

The Ambisonic process uses a special microphone technique that captures the sound of a performance in all three dimensions. The microphone signals are then encoded using a phase-amplitude matrix to allow the effect to be captured on a two-channel carrier. The technique aims to provide a coherent soundfield that is not dependent upon the listener sitting in a 'sweet-spot'. In other words, a listener sitting off-centre will still benefit from spatial information.

Ambisonic's effectiveness requires careful speaker positioning. (In a four-speaker set-up, the speakers are toed inwards so that the front left and right rear, and right front and left rear enclosures face each other.) However, given the nature of the recording technique, the 565 can adjust the relative levels of each channel and so alter the perspective of the recording. Meridian's

AMBISONIC mode allows you to control the width of the stereo stage and adjust your position in the recreated venue. The decoder also makes appropriate adjustments for systems using a centre channel speaker.

As the system is also aimed at home theatre users, the 565 naturally incorporates **DOLBY PRO-LOGIC** processing. Meridian is keen to point out that this should only be used for Dolby-encoded film soundtracks and music that is specifically encoded for Pro-Logic replay. The reason is "the steering process (the matrixing that controls the positioning of surround sounds) will tend to give an unnatural — even unsettling — shift of perspective." Unlike other Pro Logic decoders, which use a passive matrix, the 565 uses an active, wholly-digital processing system to steer sounds.

Adventurous film buffs will be pleased to note that the 565 also incorporates **THX** processing which, in case you're not aware, is a technique that aims to provide a more genuine cinema sound in the home than plain Dolby Pro Logic. Again, it's worth pointing out that the THX mode is only suitable for Dolby encoded recordings and broadcasts, which precludes its use with the vast majority of musical recordings. (Also note that the 565 is the only component in the system that carries official THX certification.)

The final film mode is **ACADEMY**. This is designed mainly for replaying mono soundtracks, and provides equalisation (recommended by Lucasfilm, the THX people) to adjust and improve the high frequency balance of old films.

Amid this wealth of sound processing goodies, there are basic modes for die-hard stereo and mono fans. In **STEREO** mode, the processor passes left and right input signals directly to the left and right front speakers. If your system includes mono or front left and right subwoofers, these remain in circuit. The mode also retains left-right balance and tone control options, but there are no special menu options available. The processor also allows you to switch into Stereo from any of the other modes.

Finally, the 565 has a **MONO** mode, in which signals pass directly to the centre channel speaker. This setting can be used for original mono material, mono material on a two-channel carrier, or to select one of two channels where different material or languages are carried on each channel.

While the choice of modes and tailoring possibilities seem limitless and overwhelming at first, I found that I soon became sufficiently familiar with the operation of this system to find my way around it pretty quickly. My advice to anyone who buys it would be to read the manuals carefully. Don't just flick through them as

you would with, say, a CD player's; study them. Resist the temptation to call up a menu and start tweaking everything in sight just to see what happens. That, I reckon, is the most direct route to hi-fi paranoia. If you get yourself into trouble, you can restore the default factory settings by powering up the processor while holding down certain front-panel keys.

While the system is undeniably complex, Meridian has attempted to make configuring it as simple as possible. Industrial designer Allen Boothroyd's ultimate aim is to simplify set-up and use procedures to the point where the software merely presents you with a succession of straightforward yes/no choices, and the remote control has a minimal button count. The present 'interface' doesn't quite realise that ambition, it must be said, but in other hands it could easily have been a whole lot more convoluted.



Vinyl fans! Treat your LPs to the full 16-bit, 64x oversampling digital treatment through the multi-input 562V controller



The rear of the **DSP5000c** speaker is unique: no chunky 4mm binding posts, but plenty of high-tech signal inputs

which most hi-fi systems would be reduced to smoking wrecks, the speakers started and stopped moving with military precision. Unlike most systems, Digital Wonderland coped with PA levels better than most PA rigs are capable of. It was loud — oh boy, was it loud — but all its hi-fi qualities remained wholly intact.

The switch to party animal mode also revealed an interesting phenomenon. The problem I'd perceived with synth bass lines wasn't evident, listening to the generously endowed Tim Simenon twelve-inch mix of Björk's *Play Dead*. The system timed well throughout its bandwidth, and low bass was quick and clean — even at an average 116dB, where any low frequency waffling would have been blatantly obvious.

I have to note that Digital Wonderland is a very different system to my usual Naim active set-up. I'm accustomed to the Naim gear, having lived with it for over a decade, and feel immediately at home with it whenever I play it. It does exactly what I want a hi-fi system to do. Nonetheless, I admit that Meridian's new vision of stereo entertained me greatly. Given another, bigger room and the necessary cash, I could be sorely tempted into owning both systems.

I'm less certain about the obvious question of whether Meridian's system represents the future direction of hi-fi. I'd be surprised to see the technology it embodies trickling down into the mid-fi or budget market places: few real people — as opposed to hi-fi nuts — own traditional, analogue active systems, and I doubt that the price of going active (digitally or otherwise) will ever drop low enough to attract 'ordinary' buyers. Such quality of unintrusive surround sound is unlikely to come cheaply. For that reason, I think this particular gramophone will remain the preserve of affluent gentlepersons only. Which is a shame, because this hi-tech iconoclast demonstrates that a) digital can be musically rewarding, and b) you can have more than one pair of loudspeakers in the room and not screw up the sound!

Lab report

Paul Miller takes his digital tape measure to the Meridian 565 processor.

This processor must really be good,' remarked a friend of mine who had just tried to read the 565's instruction book. 'Because I don't understand a single word of this manual!'

There is little precedence for a signal processor of this versatility. If the 565 were composed entirely of analogue electronics, it would surely occupy an entire room. But the 565 is digital through-and-through: once your analogue source is converted into 16-bit digital data at the 565's input, the signal may be manipulated in every way, shape and form. Here, we'll take a peek at Meridian's music processing options, which include Stereo, Music, Trifield, Ambisonics and Super Stereo surround modes.

The Heart of the Machine

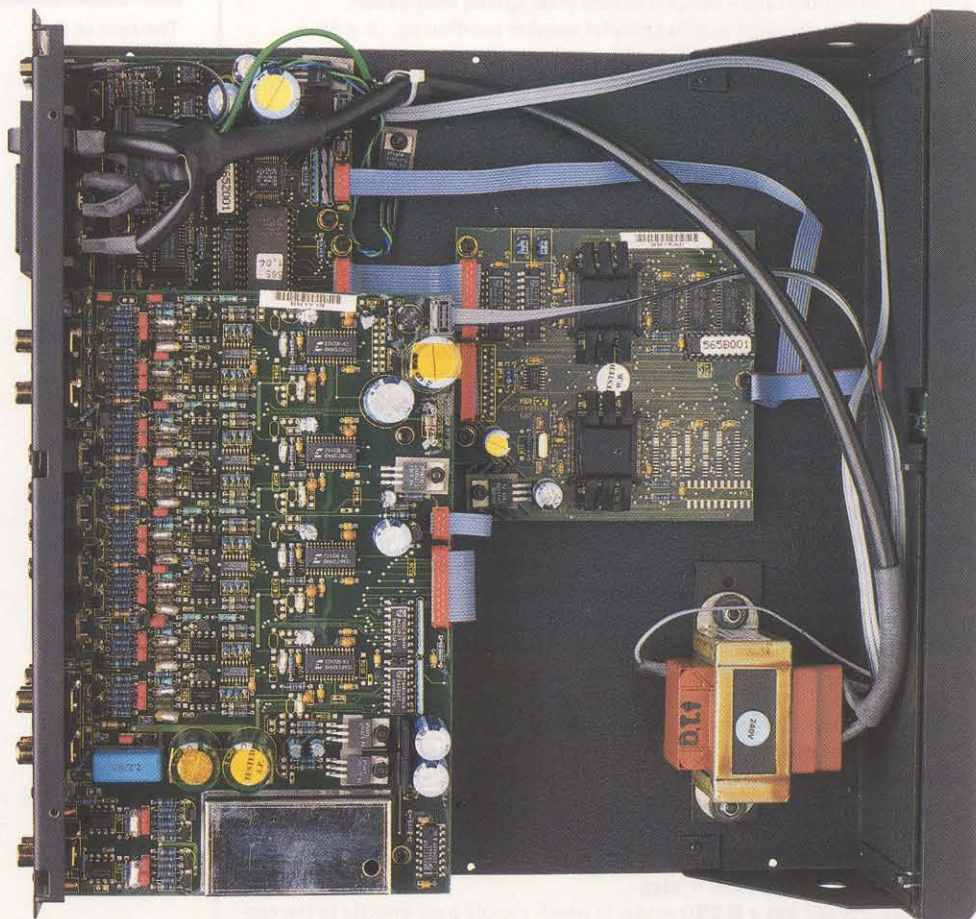
All analogue inputs are fed to a 16-bit Crystal CS5336 ADC, while digital inputs are routed via a Crystal CS8412 ADIC (Audio Digital Input Circuit). The datastream is then passed to a pair of Motorola DSP56002 66MHz processors operating in eight-channel mode. Most of the surround processing occurs in the first LSI, while the second DSP56002 deals with speaker line outputs, volume, balance and tone controls.

Once the respective front left (L), right (R), centre (M) and rear (S) channels have been derived from the stereo (or mono) input, the signals are fed directly to both CS8402 ADOCs (Audio Digital Output Circuits) for the digital output; as well as to CS4328 DACs for the analogue outputs.

1 2 Stereo Mode

This is not a true bypass mode, but one that installs a separate processor algorithm to feed left signals to the L channel and right signals to the R channel, while retaining the subwoofer crossovers, volume, L/R balance and bass/treble tone controls. Meridian's input anti-aliasing filter sets the final response of the processor. The output of the 565 then begins to drop beyond 15kHz, falling further to -2.6dB at 20kHz.

Layout L (accessed via the Configuration Menu) defeats the subwoofer outputs but extends the bass response of all front outputs (-3dB at 2Hz) — just see the 0dB/-60dB response plot. By contrast, layout E, which includes the subwoofer outputs, limits the LF response of its front channels to 78Hz. Double-



Meridian's 565 processor is like Dr Who's Tardis in reverse: who'd have thought that such a big sound could be generated by so few circuits?

Butterworth filtering produces the subwoofer/front channel crossover slopes, which are depicted in the low frequency plot.

3 4 Music Mode

Intended for coincident-miked, acoustical (purist) or mono recordings converted to stereo, Music mode employs a simple matrix to steer L, R, M and S information to four cardinal positions (consider the two rear outputs as a single point).

In Music mode, S information is forced to the rear with an optional 0-30msec delay, 1-7kHz low-pass filtering and a so-called 'width' adjustment. The latter either narrows or widens the rear soundfield by either adding or subtracting mono (M) information.

Pure M information within a recording is steered to the centre with extra control over level, a +/-2.5msec delay (depth) and the option of three EQ curves (default is EQ1). You can see from the Music mode plot that the output levels of front, centre and surround channels are equal, although hard L and R signals will appear some -6dB down on the centre channel.

The EQ plot demonstrates Meridian's various 'timbre matching' curves available for the centre channel. These are intended to reinforce and stabilise the central image, without altering the timbre of the 'phantom' centre image that would otherwise be produced by a conventional two-channel stereo system.

5 Trifield Mode

This is similar to Music mode only in that it offers the same delay, low-pass filter and width adjustments for its rear channel, together with similar level trim, delay and EQ curves for the centre. However, as the response plot for Trifield mode demonstrates, the output levels of front, centre and rear channels vary, both with respect to each other and according to the steering of L, R, M and S information.

In practice, Trifield uses a matrix which generates a frequency-dependent three-speaker stereo effect, designed to offset the psychoacoustic tendency of two-speaker stereo pairs to produce a wider image at progressively higher frequencies. Hence the

variation in response across front and centre channels compared with Music mode.

In Trifield, the front-channel HF boost is matched to a corresponding cut on centre, encouraging a constant energy output. Moreover, hard L information is blended into the right channel and vice-versa. This is different from Music mode, where hard L and R are kept entirely separate.

Specifically, M signals appear -4.5dB lower on the front channels than S signals, but are re-equalised with a +2.8dB treble boost. S information is reproduced some -2dB lower from the rear than from the front, although only the rear can be modified with Meridian's LPF (Low-Pass Filter). Hard L and R signals, meanwhile, appear simultaneously on both front and centre channels while M signals are reproduced at the highest level from the centre.

Meridian's three centre-EQ options are retained (see Music mode), although in Trifield mode these curves are further modified by the treble cut incurred by M signals and the mild treble boost incurred by L or R signals. An additional facility is included to manipulate the image width by blending-in more or less S information into this front matrix. Similarly, the rear spread (width) is determined by altering the degree of M vs S on the rear channel, with the maximum spread containing little or no Mono component.

Ambisonic Mode

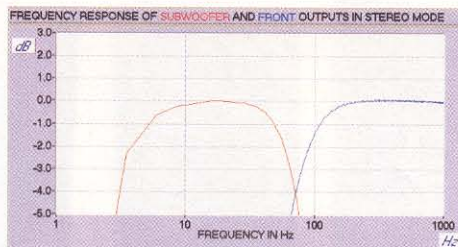
Ambisonic recordings are specifically encoded with four key pieces of information that fully describe a three-dimensional soundfield. These include the absolute sound pressure (mono sound pressure level at microphone/listening position) plus the front-to-back, side-to-side and up/down variations in sound pressure across the three planes.

Meridian's digital Ambisonics decoder deploys very precise low-noise filtering and phase-shifting to reveal a pantophonic soundfield (i.e. horizontal plane only), with additional matrixing to derive an appropriate centre feed. A supplementary 'dominance' facility allows the effective listening position to be moved forwards or backwards with respect to the front 'musical stage'.

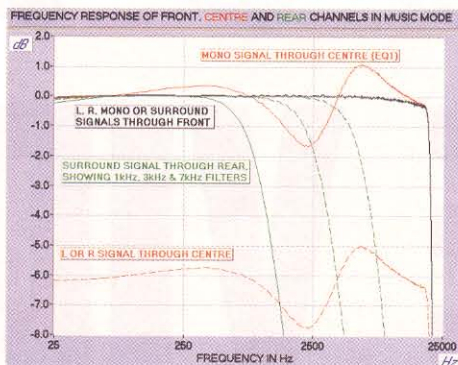
6 Super Stereo Mode

Last but by no means least, Super Stereo surround employs the Ambisonics matrix for what Meridian describes as 'intensity recordings'. In this instance, the front-to-back sound pressure gradient is ignored, though the side-to-side gradient and overall SPL components are activated within the digital matrix. Because this is a synthesised mode (i.e. not a true decoder), Meridian has included a +/-3dB centre trim and +/-2.5msec centre delay plus 0-30msec delay, bypass and 3-9kHz LPF options for the rear.

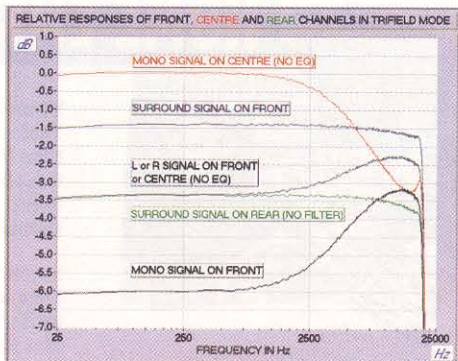
There is no centre EQ facility, but Super Stereo does include a 'width of image' adjustment which modifies the front soundstage by mixing M information into the entire matrix. The relative response plot shows that S and M components are reproduced loudest of all from rear and centre channels respectively, while a mix of S, L and R and finally M components are output at progressively lower levels from the front channels. In contrast with Trifield mode, there is more LF than HF equalisation occurring on both front and centre channels.



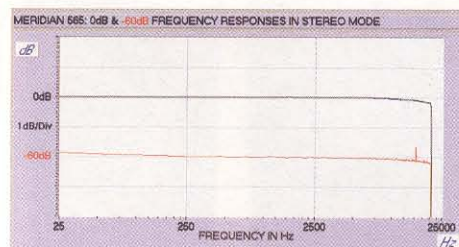
1 Low frequency plot in Stereo mode



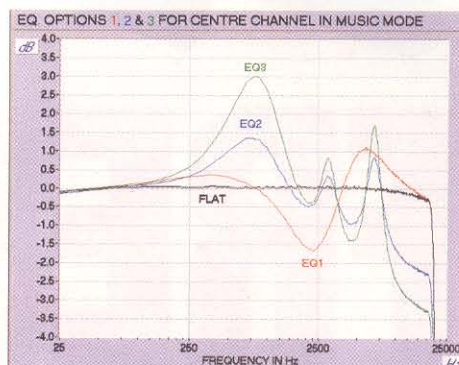
3 Music mode response plot



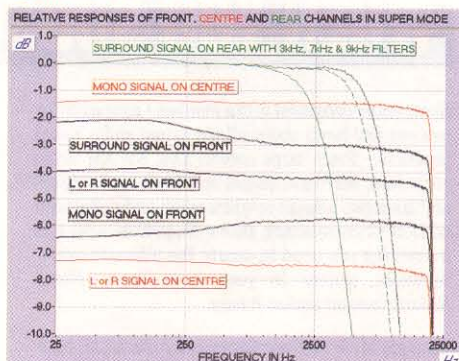
5 Trifield mode response plot



2 0dB/-60dB response plot in Stereo mode



4 Music mode EQ plot



6 Super Stereo mode response plot

Summary lab test results for Meridian 565

PARAMETER	MODE			
	STEREO	MUSIC	TRIFIELD	SUPER STEREO
CHANNEL BALANCE (FRONT L/R)	0.1dB	0.1dB	0.1dB	0.1dB
CHANNEL SEPN.				
(FRONT L/R)	110dB	110dB	11-16dB	15-16dB
(CENTRE/FRONT)	N/A	6.5dB	3-5dB	3-4dB
THD: 1kHz @ 0dB				
(FRONT)	-94dB	90dB	-90dB	-93dB
(CENTRE)	N/A	-93dB	-96dB	-95dB
(SURROUND)	N/A	-97dB	-98dB	-97dB
THD: 1kHz @ -60dB				
(FRONT)	-48dB	-44dB	-44dB	-43dB
(CENTRE)	N/A	-45dB	-47dB	-42dB
(SURROUND)	N/A	-46dB	-46dB	-46dB
CCIR IMD, 0dB	-90dB	-87dB	-84dB	-90dB
RESOLUTION: 1kHz				
@ -60dB	0.0dB	0.0dB	0.0dB	0.0dB
@ -80dB	-0.3dB	-0.2dB	-0.2dB	0.0dB
@ -100dB	-0.5dB	-1.0dB	-1.0dB	-7.6dB
PEAK OUTPUT LEVEL (FRONT)	3.13V	3.13V	3.32V	3.29V
MAXIMUM VOLUME SETTING	93	93	96	97
OUTPUT IMPEDANCE (FRONT)	5Ω	5Ω	5Ω	5Ω
SUPPRESSION OF STOP-BAND	>105dB	>105dB	>105dB	>105dB
0.33Hz NOISE MODULATION	+0.3dB	+0.1dB	+0.5dB	+0.4dB
S/N RATIO, W/O EMP, +1LSB	93.9dB	93.8dB	92.5dB	91.6dB
SERIAL NUMBER	NONE			

Who knows the secret of Bob's black, magic box

Meridian chairman and chief guru, Bob Stuart, has crammed the 565 processor with all manner of amazing psychoacoustic widgets. Here's Alvin Gold with some essential background information.

Originally developed by Bell Labs in the twenties with the cinema in mind, stereo was conceived as a three-channel system in which a mono signal would be reproduced by a centrally placed speaker to reinforce the central image. In the '50s, Paul Klipsch also experimented with a central channel combining the left and right signals. There has never been much dispute that three channels are better than two for stereo, and another proposition in audio suggests that an odd number of channels is always best. But a fundamental weakness of early stereo replay equipment prevented three-channel stereo from taking hold as a viable commercial medium.

Digital Signal Processing (DSP) and a centre speaker allow the Meridian system to provide incredibly realistic imagery

This limitation was in the groove of the LP record, which has only two sides and is thus limited to two channels of reproduction. Multi-channel stereo is technically feasible from a two-channel source, but there is a problem. To unwrap extra channels, there has to be a way of encoding the extra information unambiguously, and the only available way, as deployed in Dolby Surround, makes use of differences in

phase. Vinyl record players cope quite happily with amplitude differences, but are hopeless with phase differences. Phono cartridges have highly specific resonances, often within the audio band, and these have the effect of muddling phase information.

Digital does what vinyl violated

The phase behaviour of digital systems, by contrast, is much better defined. And for spatial processing as inherent to the addition of a central channel, CD



Meridian digital theatre: the theory

is much more transparent than LP. (Not always the case with digitally compressed media.) Though this property of CD has been almost overlooked previously, it has provided the technical framework on which Bob Stuart has crafted Meridian's Digital Theatre. With the addition of sophisticated Digital Signal Processing (DSP), this kind of spatial processing has now been elevated from mere feasibility to outright transparency.

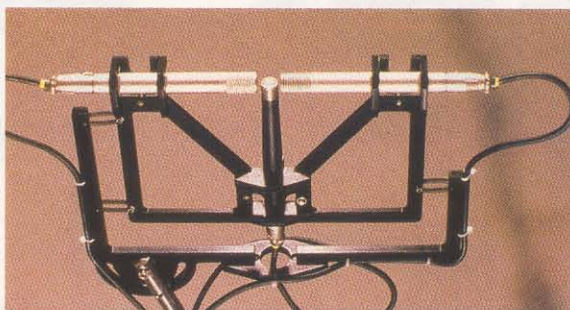
Digital Theatre is a superb system for home cinema; in many ways, it is a class-leading one. However, history will certainly record its arrival as a landmark in the history of audio, for its rôle in helping to redefine the way that stereo is reproduced. However, Meridian concedes that home cinema threw up the opportunity to play around with multi-channel stereo, and it is only growing interest in Dolby Pro-Logic that has domesticated the idea of using more than two speakers.

What performs in the Digital Theatre?

As you'll have read elsewhere in this feature, there are numerous sound processing algorithms in Digital Theatre, and these are drawn from various sources. The notion of extracting the ambience information in a recording comes from David Hafler's early-'70s system, in which a rear speaker was connected across the positive terminals of two stereo channels. In effect, this causes the rear speaker to reproduce the L-R signal, which is primarily ambience. Central reinforcement of the central phantom image emanates from Dolby Stereo, via Klipsch and Bell Labs, as do the concepts of filtering and delay to the rear speakers.

Applied to the rear channel, delay ensures that the front channel is heard first. In other words, it steers the image to non-delayed channels reproducing the same information. In some Meridian Digital Theatre modes, delay is used for the centre channel to add depth to the stereo illusion. It is also used during set-up to restore the apparent position of individual speakers if they have to be arranged asymmetrically. Low pass filtering (usually above 7.9kHz) helps to avoid the fuzz of phase anomalies, and is used extensively.

Digital Theatre also employs 'psychoacoustic filtering', as used in THX timbre-matching, which corrects for the fact that the shape of the ear causes sounds from the sides to sound different to those from the front. Similarly, difference in sound between a phantom central image and a real one is addressed. In two-channel



stereo, the phantom image is generated from about 30 degrees off axis.

Is it a Theatre, or is it a Cinema?

It's hard to miss the extent of the synergy between Dolby and THX on one hand, and stereo reproduction on the other. The only important element of Dolby that has not made the transition is the use of logic-controlled steering to enhance directional information (the 'Pro Logic' element in Dolby Surround). For music, this is not thought to be transparent enough to use without loss of sound quality. Even so, I for one would not be surprised if Meridian has more to say on the subject.

Of all the ideas that have made the transition, the use of a real centre channel is undoubtedly the most important. Anyone used to Dolby Pro Logic will know that the centre speaker firms the central image and stabilises imagery for off-axis listeners. It is not appreciated to the point where it also has a key influence on musical realism. Properly done, this reduces phasiness and enables you to 'hear through' the speakers to the music and the sound-field that the music is part of. In short, the centre channel is the most important of all the channels.

Music, maestro

The main signal processing modes included in Meridian Digital Theatre (Dolby Pro-Logic and THX apart) are Music, Trifield and Ambisonics. Music, which is proprietary to Meridian, is an enhanced version of Hafler using filtering and delay and with a centre L+R channel to stabilise the stereo image. The phasiness of standard Hafler is addressed by filtering, and variable delay is incorporated into the centre speaker to present what Meridian elliptically describes as 'a more intriguing and successful sound-field'. Music mode is not especially fussy about how the source was encoded, which can be multi-mike, spaced-mikes or single stereo mike.

The impressive Trifield algorithm, the work of Ambisonics pioneer Michael Gerzon, could be seen as an elaboration of the Music mode idea. While suitable for a wide range of

The Nimbus-Halliday Ambisonic microphone, used by Nimbus for all their classical recordings

music recordings, it is possible to record specifically for the format, reportedly with much-improved results. The rear channels are similar to the Music mode, but the front channels derive from a more complex matrix redistributing the front sound on a constant energy with bandwidth basis. Said to be a significant improvement on Blumlein stereo, it converts phase differences at the microphones into amplitude differences at the speakers. Again, filtering and delay are applied to the central speaker.

The Ambisonics angle

Ambisonics also uses all five speakers, but more speakers can be used to improve spatial resolution. Although mixed down to a stereo compatible signal when recorded, the Ambisonics decoder recovers the original signals, which are a mono signal and a surround signal defining direction. Early versions of Ambisonics encoded height, but this is no longer the case. The Ambisonics system requires special recordings, which are available from some small specialist record labels, but mostly from Nimbus. They use the UHJ matrix, the engine of Ambisonics, and an Ambisonics microphone for all their recordings.

Who are these Meridian guys, anyway?

Meridian Audio Ltd, one of many high-tech hi-fi manufacturers based in and around Cambridge, was founded by Bob Stuart and Allen Boothroyd in 1975. Bob and Allen had previously produced designs on a freelance basis for Lecson and others. The first Meridian products were the elegantly-designed 100-series electronics, which won a number of industry awards. They were followed by the first self-contained active loudspeaker for the domestic market, the *M1*, in which each drive unit was directly connected to a power amplifier module built into the same box. Based on a conviction that this was the right way to build speakers, it is easy in retrospect to see how the *M1* helped pave the way for Meridian Digital Theatre. This was partly thanks to the opportunity it provided for control over the speaker/room interface.

The first digital project from Bob Stuart, who had worked for Marconi defence electronics in his pre-audio years, was a CD player, the *MCD*. It was the first to be built by a specialist British company, and was based on the original Philips player, the *CD100*. This fuelled an interest in digital electronics generally, and new uses to which it might be put specifically.

Meridian, which now exports to 35 countries, is an independent company with a workforce of about 75 and a turnover in excess of £5m.



Meridian's *MCD* was the first British-built CD player