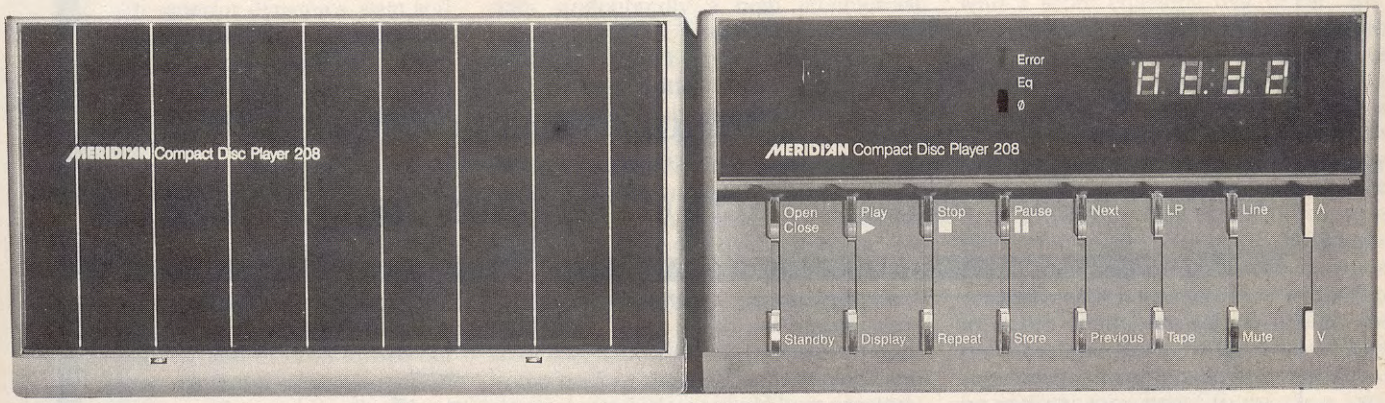
# FIRST WITH PDM:




# MERIDIAN'S 208

**By a short head, Meridian's 208 is the first PDM Bit Stream CD player to come on the market**

*by Martin Colloms*

This has been a good year for compact disc. Silver disc sales exceeded black for the first time, while the quantity and variety of new players continued unabated. Purchasers have understandably shown a lack of confidence when recently introduced models may be outclassed in a matter of months rather than years, and some have adopted a 'wait and see' approach to the medium.

In the Meridian 206 review (*HFN/RR* Nov '89) I noted that the player had mildly embarrassed the more costly 207 by delivering a better sound. However, designer Bob Stuart had another card up his sleeve: a top-secret replacement for the 207 would soon be ready. To be called the 208, this would improve on both the 206 and the 207, thereby restoring order to the range. The technology chosen for this development is the PDM Bit Stream system from Philips, and the 208 claims to be the first commercial player so equipped to be put into production. Moreover, it uses the most up-to-date 'B' implementation of the DAC3 devices (as they are called generically), applied in a unique circuit configuration.

Like the 206, the 208 comprises two extruded box sections in the familiar Meridian style, permanently bolted together. The 208 does everything the 207 did, including provision of the full remote-control line pre-amplifier function, while analogue disc input is a further option, with both m-m and m-c cartridges competently catered for.

As a digital transport the 208 promises a still higher standard than the 206 (and most certainly the 207). The superior transport would upgrade many a digital processor, but I suspect that very few decoders are yet worthy of it, since the quality of the 208's main output is itself likely to pre-empt such applications for the time being.

If the 208 is chosen as an audiophile CD component to be used with a pre-amp of superior quality, the fixed audio output is the option, the remotely controlled variable socket being regarded as a valuable extra option for use when convenient or appropriate. The electronic volume control is a particularly good one, well developed ergonomically and offering 64 accurate 1dB steps.

## Technology

Bit Stream it is, but used in a unique manner with proprietory Meridian circuitry. One Philips design proposal involves using two DAC3s (each is stereo) in a simple differential mode, adding some 6dB of dynamic range and in theory providing a linearity improvement. In this system, DAC-A carries the L and R signals, while DAC-B is fed digitally inverted data providing -L and -R. Op-amps then add R and -R differentially, producing 2R and 2L.

The Meridian exploits the valuable concept of common-mode rejection within the individual DAC by uniquely processing the digital data to provide L and -L code to one DAC and R and -R code to the other. By nulling the errors in the DACs individually, much better rejection of linearity aberrations and suppression of power-supply problems is achieved. The output op-amps are 5534 types, employed in a special non-unity-gain differential configuration, with a direct-coupled DC servoed output. The 3rd-order C-L-C Butterworth filters are passive and come between the DACs and these output buffers. The best use of the low-voltage op-amps within DAC3s is achieved by running them at lower than recommended signal levels, while the DAC3s' second-stage op-amps are not used at all in this design. The 208 sound quality probably owes as much to this special configuration, and to the higher grade of digital data it recovers from the CD, as to the use of a Bit Stream converter.

Other technology features include a central, discrete quartz-locked oscillator with four buffered outputs, intended to drive the main circuit sections without interaction. Described as 'third generation', the servo-control and error-correction circuits work to greater precision, with a capability of dealing with burst-errors double the previous length. Drop-out strategy is improved, while Meridian uses its own central control microprocessor to give additional design flexibility and an opportunity for fine-tuning the control system micro-code.

With so much packed into the '7321' M3B DAC, no digital output is provided, the old 7220 output in the player serving simply to generate the buffered SPDIF digital outputs, twin optical, and transformer-coupled balanced coaxial. By using two linked screened boxes, good electromagnetic shielding is achieved between the transport/power-supply and processor/analogue sections. It was a surprise to find advanced 4-layer board practice in a consumer product, but the designer indicated that this technique was essential to help extract the most from the difficult-to-use DAC3 chip. The latter benefits greatly from good grounding and power-supply practice. Minor improvements have been made to the 207 pre-amp section for use in the 208; it uses solid-state switching for inputs and volume setting, always running under optimum conditions – as the fine distortion results confirm.

The 208's implementation of Bit Stream has confirmed the preliminary results achieved with the D/A section of the Sony 630 amplifier, but at a much higher quality level. The important point is that the Bit Stream character is clearly identifiable, as noted in the following subjective

report. As regards the older 4 times 16-bit Philips DAC (the 1541A), it has been shown that very high standards can still be achieved, but with a different character: more solid perhaps, less sweet and natural, but with superior dynamics, slam and timing. I suspect that such differences will cause considerable argument, but for the future we have to look to designs in the audiophile sector achieving the best of *both* conversion methods.

## Sound quality

The listening tests were prolonged and great care was taken to achieve the best consistency with regard to earlier reviews. Every possible reference was brought into use, with both listening rooms employed, and the 208 turned out to be a most significant design – one of true audiophile calibre and worthy of the finest replay systems. The listening covered several aspects, the digital audio output, the remotely controlled pre-amplifier, the CD player used with both its fixed and variable outputs into a top-class pre-amp, and also in direct connection to the power amplifiers (for this test, bi-amped Krell KS-A80 and also Musical Fidelity P140).

The first and most important listening test was with the CD player auditioned via its fixed output. From the outset it was clear that the 208 was superior to both the 207 and the 206 (essential in any case to preserve its top-of-the-line position). Moreover, it proved to be substantially superior in almost every subjective respect! Entirely new standards have been achieved by the 208 for low-level detail, ambience, the recovery of recorded acoustic, tonal subtlety, purity, neutrality, and treble liquidity.

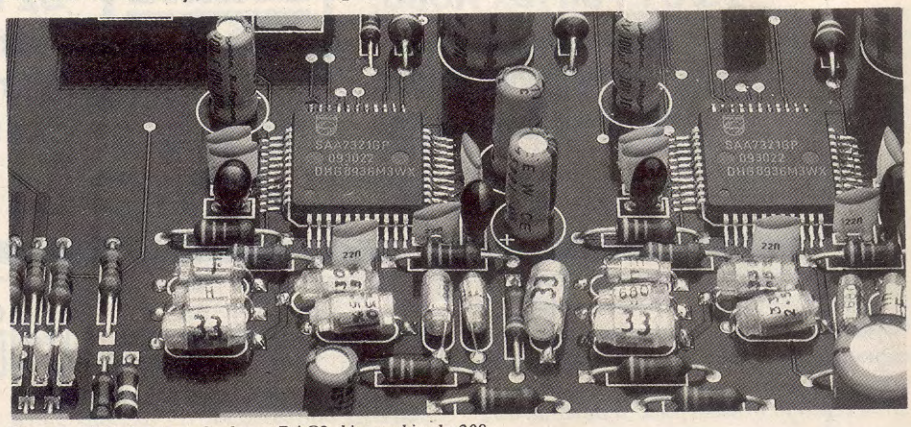
After much deliberation and comparative checking, the player was rated somewhat above the Wadia decoder which caused so much head-scratching last month by shooting well above our established reference standard. As mentioned earlier, that set us on a rethink of sound-quality scaling procedures. But for the moment it should be noted that while the Meridian 206 just pipped the old Accuphase reference, with the Wadia 2000 going higher still, the new 208 has reached even further. I shudder to think what the final equivalent score might have been if the 208 had come out at better than just 'very good' in three admittedly contentious subjective departments: transient attack, dynamics, and bass rhythm/timing. By normal standards few would find fault with this machine, but its very high attainment in other respects left these areas somewhat behind, and thus subject to critical attack.

The bass was undeniably very good – articulate, informative, lively and fast, delivered with good LF weight and extension. However, it held back a little on that feeling that the tonal soundstage is resting on a solid foundation; the bass was a touch light and lacking in slam as well as absolute authority. This was partly a dynamic effect, and the overall sound was considered a trifle polite, even slightly rounded on explosive transients. The more powerful and dynamic effects also sounded a little muted. On rhythm and timing the 208 was certainly in the Wadia class, undoubtedly a high commercial standard but one nonetheless known to fall short of the best possible. However, only the more critical rock enthusiasts are likely to find fault in this area.

Having cleared that hurdle, let's look at the 208's strengths. First impressions are of an elegantly relaxed presentation, a highly spacious soundstage full of accessible detail and subtle nuance. It would not be an exaggeration to describe the effect on many established recordings as a revelation. Stage width and depth were first-class, with width well preserved right to the back of the hall. On both rock and classical material you could hear precisely where the performers were positioned in terms of both placement and local acoustic. Stereo perspective was considered excellent and was accompanied by an impressive degree of orchestral layering. Stereo focus was very precise, with excellent positional coherence observed between fundamentals, formants and treble harmonics. And what treble! Here the standard was magical, the best I have ever heard – and then by a considerable margin. I simply had not realized how much depth and sheer believability was possible from my Krell/Apogee system in the treble. Vocal sibilants, flute and violin sounds were all reproduced with exceptional naturalness and precision.

The mid-range was also exceptional. Vocals were significantly more natural than usual, while massed strings were reproduced with great clarity and separation. In fact, the mid-range sound was the least hard, the least congested and the most totally articulate yet auditioned. This decisively 'correct' quality can be heard from as little information as that contained in a single piano note! Full-level climaxes were a little subdued, but the player suffered no loss of information on complex passages, its highly revealing exposition remaining intact throughout – very largely compensating for the slight loss of dynamic expression. It is hard to argue with the 208's performance. One can play it loudly without the sound turning aggressive, while the fatigue factor was also very low.

The other services come next, I hope more concisely assessed! Via the variable socket there was some loss of CD sound quality, yet the basic standard is so high that the variable output is still impressive, with a score equalling that of the 206. Now dispense with the auxiliary pre-amp and connect the 208's variable output directly to your power amplifiers – an option for which it is designed. Here, a significantly higher rating was attained, in fact far and away the best remotely variable CD output available, alone in the Krell KSA80 and ARC Classic 30 class! In this output mode much of the characteristic mid purity and treble sweetness were retained, with just a moderate reduction in stereo depth, musical detail, and bass precision and drive. In the absence of a top-class high-end pre-amplifier it would be entirely appropriate to use these variable facilities and not feel that the 208 was being unduly compromised.



*The crux of Bit Stream technology – DAC3 chips used in the 208*

There was an interesting apparent inconsistency between our merit rating for the 208 line pre-amplifier alone and for the 208 used on CD to drive power amplifiers directly. This difference arises because the internally generated CD signal is directly routed inside the 208, benefiting sonically from an absence of the usual discrete switches, interconnect cables and their associated paraphernalia of plugs and sockets. In addition, historic ratings for line amplifier quality are based on the use of older references, while the exceptional quality of the 208's CD source helped mask the rating for any line stage used with it. As regards other line sources, the basic performance was ample for existing tuner and tape signals (bar open-reel master-tapes), while the analogue disc performance was compatible with analogue players costing up to the £1000 level, although clearly not to the standard delivered by the CD section.

Used just as a digital transport, the 208 also set a new standard, improving significantly upon the reference level set by the 206. If used as transport in the wired coaxial mode, it is important to release the ground connection in the mains cable. This may also be a factor when used as a fixed-output player with some models of pre-amp. But when employed as a complete CD player/preamplifier, it should have the ground connected as is usual with all pre-amps.

## Lab report

Taking the line pre-amplifier section first, the volume control showed excellent tracking over its wide and even control range, while up to 9Vrms was available from a low 12-ohm source impedance, DC-coupled and with an LF resposne flat to well below 1Hz. Long cables and the more difficult amplifier input impedances may easily be driven. At HF the response showed some tailoring, −0.5dB by 12.6kHz and −3dB at 33kHz, perhaps *just* enough to 'sweeten' line sources for an ultra-acute listener, but an effect reduced at settings below maximum.

Tested at 2V output, both harmonic and intermodulation distortion were negligible, with little change even when a heavy 600-ohm output loading was applied. Channel separation was excellent and signal-to-noise very satisfactory. The input impedance was on the low side at 10k-ohms, which will load line sources to some degree, but for a 1V output the line gain was sensibly chosen at approximately 13dB, requiring 220mV input.

Moving to the CD fixed output, this delivered 1.3dB more than the 2V standard (but will be adjusted to 2V on the next batch) from the 12-ohm, DC-coupled output impedance mentioned above. The question everyone will be asking concerns Bit Stream linearity – can the Meridian circuit achieve the theoretical promise? 'Yes' is the answer. Both channels were well matched and are seen to be quite free from bit-level non-linearity right down to the observed noise-floor at −112dB (Fig.1). Deviation from the dotted theoretical line is negligible, better than ±0.5dB down to −100dB, an excellent linearity performance.

While full-level distortion was not state-of-the-art, the −90.5dB (0.003%) at 1kHz is nonetheless fine. Channel balance was a little better than 0.5dB, but I would prefer to see a 0.2dB tolerance here. Channel separation was fine, while the output was polarity-correct, essentially to a linear-phase impulse characteristic of the usual FIR form. Low levels if spuriae both in and out of the audio band were seen. At −10dB the 1kHz distortion held at −89dB, while good low-level linearity was confirmed by the state-of-the-art result at −70dB of −48dB for the relevant harmonics on a dithered 1kHz (Fig.2). In fact this spectrogram barely shows any distortion at all, while the same test plotted to 100kHz confirmed the low spurious levels, the worst being at around −100dB (ref peak modulation) centred at 44.1kHz, the prime sampling rate. Another good indicator was the low HF intermodulation, excellent at −96dB for both 0dB and −10dB levels, the latter displayed in Fig.3 to reveal remarkable freedom from spuriae, rather better than for the older 7220/1541A system.

No loss in waveform linearity was noted at −90dB, where a pure (albeit slightly noisy) sinewave was recovered (Fig.4), while the associated spectrogram showed no audio-band harmonics higher than −20dB, *ie* the distortion was held to 10%. An excellent overall dynamic range of 108dB was indicated. The frequency response was almost perfectly flat within the tolerance of a mild peak-to-peak digital filter ripple of 0.15dB, but my impression is that this is not quite as smooth as the '7220-1541A' chip combination can achieve.

Shock and vibration were resisted well, while the gap error-correction extended to better than 1.5mm but began to 'click' at 2mm. This performance was well beyond the required standard. Fine signal-to-noise ratios were demonstrated, 101dB unweighted and 96dB CCIR (1kHz) weighted, and the CD transport was quiet. Track-access was quite fast, particularly for jumps at high-number entries, and de-emphasis was highly accurate.

These results show that with innovative circuit design, the DAC3 Bit Stream can be licked into shape, and the 208 has certainly delivered an excellent set of figures which help support the fine sound quality described.

## Conclusion

This player is easy to recommend, and is worth buying if only to provide the best method of supplying digital audio to the D600 loudspeaker. Of particular relevance to the D600 speaker is the 208's provision of dual optical outputs in a digital format, allowing the speaker to be driven in what I find to be its optimum audiophile mode: used fully floating electrically, with connection made via two isolating optical fibre cables. Digital signals are also available from the 208 via the usual wired phono-socket connection.

Any decoder would also benefit from this source, while it has review application as a digital data reference. I look forward to a separate decoder processor which would be worth adding to the 208, although on present experience such an addition would be pointless in view of the very high audio quality delivered by the Meridian as it stands. That high performance was obvious using an audiophile system via the fixed output terminal, and from a musical viewpoint was of reference standard. Nevertheless, the 208 can also be viewed differently, and is obviously successful when used via its variable output and still more so when an auxiliary preamplifier is omitted and the 208 allowed to take control of the system. Here, the remote facilities are an undoubted convenience.

In the 208 we can see the 207 grown to full maturity, from its original 14-bit design and early reliability and quality-control problems, through 16-bit, to 256x1 Bit Stream, and now with all aspects refined; mechanics, structure, operating system, digital control, decoding, and above all sound quality. Strongly recommended. √

# MERIDIAN 208 CD PLAYER

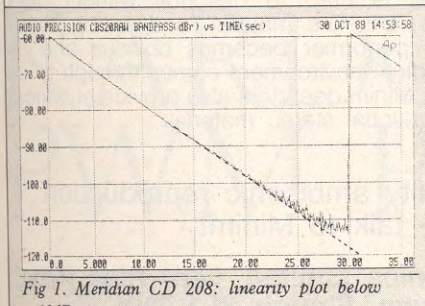



*Fig 1. Meridian CD 208: linearity plot below −60dB*

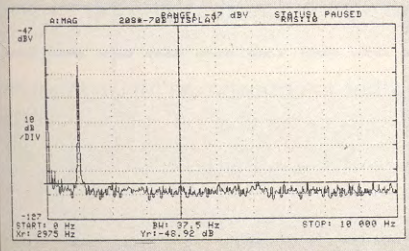



*Fig 2. Meridian CD 208: spuriae up to 10kHz associated with 1kHz tone at −70dB*

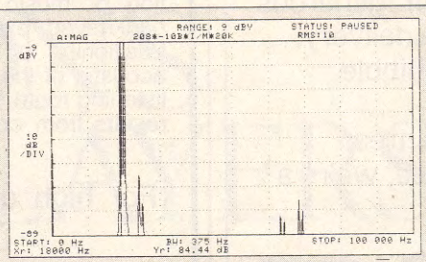



*Fig 3. Meridian Cd 208: intermodulation spuriae from 19/20kHz tones at −10dB*

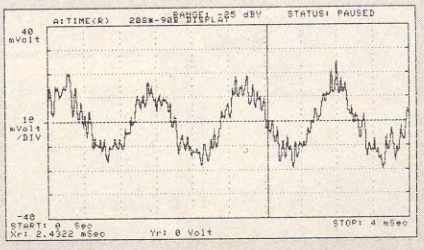



*Fig 4. Meridian CD 208: dithered 1kHz sinewave at −90dB*

**Test results**

| | 20Hz | 1kHz | 20kHz |
|---|---|---|---|
| Channel balance | 0.35dB | 0.45dB | 0.46dB |
| Stereo separation | 96dB | 95dB | 83dB |
| Channel phase difference | 0° | 0° | 0° |
| THD 0dB | −96dB | −90.5dB | −88dB |
| THD −10dB | — | −89dB | — |
| THD −70dB | — | −48dB | — |
| Intermod 19kHz/20kHz,0dB | | −96dB | |
| Intermod 19kHz/20kHz,−10dB | | −96dB | |
| Frequency response, left | −0.1dB | | −0.15dB |
| Frequency response, right | −0.1dB | | −0.16dB |
| S/N 20Hz-20kHz unweighted | | 101dB | |
| S/N CCIR/ARM, 1kHz ref | | 96dB | |
| Output level, 0dB, L/R | | 2.27/2.36V | |
| Output impedance | | 12ohms | |

| | 1kHz | 5kHz | 16kHz |
|---|---|---|---|
| De-emphasis (error in dB) | 0 | −0.04 | −0.31 |

| | |
|---|---|
| Track access time (Tr 15) | 3.6secs |
| Error correction capability | gap >1.5mm |
| Mechanical noise | low |
| Spuriae up to 100kHz | −100dB |
| Resolution at −90dB, left/right | see text and Fig 1 |
| Dimensions (wdh) | 32.2×33.5×9.6cm |
| Typical price (inc VAT) | £1490 inc remote |

**Supplier:**
*Meridian Audio, Ecclestone Road, Tovil, Maidstone, Kent. ME15 6QP*

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