



Yamaha CD-S2100

CD PLAYER (...AND SACD PLAYER... AND DAC)

It's great to see a major multi-national company such as Yamaha is still waving the flag for all us die-hards addicted to shiny silvery discs, though with its latest CD-S2100 Yamaha is laying off its bets by including both digital SPDIF and USB inputs on it, so those of you who prefer to listen to the streams of 0s and 1s stored on your computer's hard drive (or NAS) can do so using the CD-S2100 instead of a DAC. Yamaha is also supporting early-adopters who lent their support to the SACD format, because although Yamaha calls the CD-S2100 a 'CD Player', it's actually an SACD player, because it will in fact play back SACDs as well as CDs... albeit only in two-channels.

THE EQUIPMENT

The first thing you'll notice when you see an S2100 'in the flesh', so to speak, (the 'flesh' in this case being your choice of either silver brushed aluminium or black anodised aluminium for the chassis, with beautifully lacquered real wood panels at either side) is the gorgeous half-silvered front panel display that turns into a mirror when it's not being used.

The second thing you'll notice is the ultra-thin disc loading tray below that display. No, it's not a slot-loader, what you're looking at is the same super-thin custom aluminium disc tray that Yamaha developed for its \$7,499 flagship CD player, the C-3000, which it's now fitting to the CD-S2100. And no, it's not a trickle-down, or a re-build, it's exactly the same mechanism and drive that's used on the top-line machine.

It's great to see that all the transport controls you'll need are right there on the front-panel, so you won't ever be hunting for the remote control in order to use the player. The 'Play', 'Pause', 'Stop', 'Track Skip (Forward/Reverse)' and 'Fast Forward/Reverse' controls are all there at the right-hand side of the front panel. At the left of the front panel, alongside the 'Power On/Standby' switch, are buttons marked 'Pure Direct', 'Source', and 'Layer'. The first of these, the 'Pure Direct' button, improves sound quality by deactivating all non-essential internal digital processing plus it also turns off the front panel display (though it will momentarily turn back on whenever you use one of the player's controls, either on the front panel or via the remote control).

Why then is it switchable? Because it also switches off the CD-2100's digital outputs, and in some system implementations you might want these to be active.

The 'Source' button lets you choose which digital source you want converted into analogue and presented at the CD-2100's analogue outputs (after which that signal will appear at both the unbalanced—RCA—and balanced—XLR—outputs). The switch cycles through 'Disc', 'USB', 'Optical' and 'Coaxial'. This means that you can choose to listen to 'Disc' (CD or SACD), USB from your computer, or an SPDIF input delivered optically or coaxially (so you can have two SPDIF inputs if you wish). The USB option permits multiple sampling rates (up to 192kHz), but your computer must have Yamaha's own Steinberg USB driver software loaded. This driver is available for Windows (Vista, 7 and 8) and MAC (OSX 10.5.8 to 10.8.x) as a free download from Yamaha.

Switching between these digital sources can be a bit frustrating because whenever you switch to a particular input, the switch operation is suspended while the player 'looks' to see if there's actually a source available at that input.

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So, for example, when you switch to 'Disc', if there isn't a disc in the tray, the player tries to load one, even though there's not one there. This means you need to wait nine seconds before you can press the button again to switch the player to the USB input. The same happens when you select the USB input: the player will look for a digital signal input for six seconds, after which it displays a 'No Cable' warning in the display. Once again, while it's doing this you'll be 'locked out' of player operation and be unable to skip through to either of the Optical or Coaxial inputs digital inputs. If you switch inputs often, these delays become slightly annoying, but if you listen mainly only to the same source, it won't be an issue.

The 'Layer' button on the front panel allows you to elect whether you want to listen to the 'Super Audio' layer of a hybrid SACD or the lower-quality CD layer... though why anyone would listen to the CD layer of an SACD is beyond me. It's true that some SACDs have content in their CD layer that is not available in the SACD layer, but my guess is that only a dozen or so such discs are available. As for why you'd want to listen to SACDs rather than CDs, that's because SACDs have better sound quality than CDs, due to their more extended frequency response (up to 50kHz, more than twice that of CD), their higher signal-to-noise ratio and their lower levels of distortion. But in addition to their technical advantages, most SACDs sound better than their CD counterparts simply because the recording and mastering engineers took more care when producing SACDs than they did when producing CDs. SACD's other advantage over CD—the ability to deliver a 5.1-channel surround signal—isn't able to be realised by the CD-S2100... it's strictly a two-channel playback device, as I've already mentioned.

In addition to the ability to play both commercially-available SACDs and CDs, the

Yamaha CD-S2100 can also play CD-R and CD-RW discs that you've recorded yourself on your own computer, either with 'Red Book' digital data or by creating MP3 or WMA files. (However, if you play back MP3 or WMA files, many of the CD-S2100's more advanced 'trick' playback modes cannot be used.)

Yamaha uses ESS's ES9016 DAC to decode digital data from disc and the SPDIF inputs. The ES9016 is a very tasty upmarket 32-bit, eight-channel device whose DACs operate in double differential mode, so you're essentially using two DACs per channel connected differentially for improved conversion precision. However, if you're listening via USB, you're instead using a custom low-jitter DAC developed specifically and exclusively for Yamaha that supports digital audio up to 24/192 as well as DSD.

The Yamaha CD-S2100's remote control not only imbues the ability to control the player remotely: it also provides access to additional functions not available from the front panel, including dimming the front-panel display and changing what information is displayed on it (you can choose between showing elapsed time of the current track, remaining time in that track, or total remaining time on the disc) and programming tracks for playback in a pre-determined order. It also allows so-called 'trick' playback modes (repeat track, repeat disc, repeat programmed sequence, play back tracks in random order. Perhaps most importantly, the remote has numeric keys that allow you to access a track directly, by entering a track number rather than having to skip through tracks, which enables instant track access.

As to whether it will fit on your equipment rack, the CD-S2100 measures 435×157×463mm (WHD) and weighs 15.6kg. It comes with a very generous full five year warranty, which is made even more generous by the added condition that if anything goes wrong within the first 12 months of the warranty, Yamaha will take back the faulty player and give you a brand new one. But I can't leave this section of the review without mentioning the 'fit n' finish' of the CD-S2100, which is exceptionally fine—I particularly loved those lacquered real-wood end panels, which add a definite touch of class to a component that already looks a million dollars.

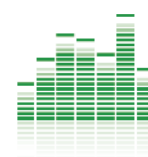
IN USE AND LISTENING SESSIONS

My listening sessions didn't start so well when I mis-loaded the very first disc I tried to play, which resulted in the player not working when

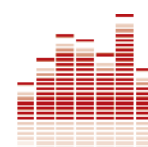
I pressed 'Play' and the Yamaha's display telling me there was 'No Disc' inside. When I opened the disc tray again to see what I'd done wrong, my this-time closer examination of the custom-made disc drawer of the CD-S2100 revealed that it uses four small soft silicone 'arms' to help you correctly position any disc you load. Unlike the hard plastic grooves that usually perform this function, the soft arms don't give any kind of tactile or aural feedback (the 'click' sound of the disc dropping into place on the hard plastic). The use of a soft material is no doubt much kinder to your precious discs, but does make it a tad easier to accidentally mis-load CDs and SACDs in the tray.

YAMAHA CD-S2100 CD PLAYER

Brand: Yamaha
Model: CD-S2100
Category: SACD/CD Player
RRP: \$2,999
Warranty: Five Years (+ One year replacement warranty, see copy)
Distributor: Yamaha Music Australia Pty Ltd
Address: Level 1, 99 Queensbridge St
 Southbank VIC 3006
 ☎ **1300 739 411**
 ☎ **(03) 9693 5111**
 🌐 **www.yamahamusic.com.au**



- CDs & SACDs plus it's a DAC
- Sound quality
- Technical performance



- Source switching delay
- Silicone disc supports
- CD-Text

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Yamaha CD-S2100 CD Player should continue on and read the LABORATORY REPORT published on page 40. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.



Lab Report on page 40

However, once I realised what was going on, it only took a little extra care when loading discs to ensure that it never happened again... which it didn't. The disc-loading process is, however, a little slow, with the CD-S2100 taking around 15 seconds to load an SACD and 20 seconds to load a CD. Fair enough, I thought, it's reading a lot of data when it loads any disc (particularly an SACD), but I don't know why it takes around 10 seconds to unload a CD or SACD. Maybe spinning the discs down slowly extends the life of the drive motor. I was a little surprised to find the CD-S2100 doesn't display CD-Text when this is recorded on a CD, but I suppose you can't have everything.

One of the first discs I played was Rhianon Giddens' solo debut album 'Tomorrow is my Turn' (she's much better known for her work with Carolina Chocolate Drops, a band she founded, and in which plays violin and banjo as well as sings). It's a nice clean recording (produced by T Bone Burnett) with lots of beautifully-recorded instruments, and on the quieter tracks (one of which is *Black is the Colour*, a traditional song she's re-written to reference her husband who, rather confusingly, is actually a ranga!) I was struck by how quiet the backgrounds were... no hiss, no hum, just perfect silence. Yet this lack of noise was not the soulless 'digital black' silence that mars the sound from some CD players, but one that became an organic part of the track's own ambience, and in so doing, sounded completely natural. (It's not generally recognised that a complete lack of noise is absolutely crucial for those 'spaces between the notes' if the music being replayed is to sound truly realistic. Most people just think it's to ensure improved dynamic range—which it also does, of course.)

■ **The main reason for buying an SACD player is that they enable higher-resolution playback of ordinary CDs than standard CD players: Strange but true!**


The Yamaha CD-2100's tonal purity was exceptionally good... perfect in fact. When I listened to the sound of Gabe Witcher's fiddle on *Angel City* (a very nice track written by Giddens herself), as well as to Mike Bub's acoustic bass, not to mention Giddens' own vocals, I was more than impressed not just by the clarity of the sound, and the articulation, but also by how tonally 'correct' everything sounded. The spectral balance is amazingly good. I just loved listening to the slack-stringed sound of the double bass in the right channel on Jacques Wolfe's *Waterboy*, as realised by Giddens (she also covers songs made famous by Dolly Parton, Patsy Cline, and Charles Aznavour), because it was just, so right to the ears.

Indeed the string sound was so right to my ears that I pulled out Move's 'Unfold' album, which has the Kreutzer Quartet playing the works of 'Australian' composers Don Banks, Nigel Butterley, Richard Meale and Felix Werder. The music on this disc is mostly confronting (I love that the liner notes say '*some of the works continue the tradition of cohesive playing*'), but the 'sound' of the disc (as distinct from the 'music') is absolutely wonderful, thanks mainly to Jonathan Haskell of Amazing Sounds, and the acoustic of the Aldbury Parish Church in Herfordshire. And as usual, the playing of the Kreutzer Quartet is stunningly good... but it might have been nice if the CD cover had identified the individual members of the Quartet (Peter Sheppard Skærved, Neil Heyde, Mihailo Trandafilovski, and Morgan Goff) rather than not naming them at all. A strange omission indeed! The Yamaha delivers the sound of the strings of all four players' instruments perfectly, from the deepest funda-

mentals of the cello to the highest harmonics of the violins, with a fidelity that will have you questioning whether there's any call for a higher-res version of this recording (there is one available, apparently, but I have as yet been unable to track one down). One thing I couldn't make up my mind about, even after weeks of experimentation, was how to best go about 'tuning' the DAC inside the Yamaha for best performance. The ES9016 uses a digital phase lock loop to generate internal clock signals to ensure correct synchronisation with any incoming digital signal, and Yamaha has fitted a seven-setting control that allows you to manually adjust the bandwidth of this loop (from 'lowest' to 'highest' with the default setting at 'medium-low') to get the most 'accurate' conversion.

When playing back music from disc (SACD or CD), I found it difficult to hear any differences between any of the seven settings, whereas when playing back SPDIF signals from external sources, I could nearly always find one setting I preferred over the other six (though that setting did—rather annoyingly!—vary from source to source!). You may have more success tuning the Yamaha than I did (or not, but either way you'll have fun trying it out). While I was tuning, I was also able to determine that the CD-S2100 is not only an excellent SACD/CD player, it is also a truly state-of-the-art DAC, so if you have a need or an application for such a device, why not kill two birds with the one stone?

CONCLUSION

I feel remiss for not making it clear previously in this review that the main reason for buying an SACD player—even if you don't own any SACDs to play on it!—is that SACD players give higher-resolution playback of ordinary CDs than standard CD players: strange but true! So if you have a CD player, I'd recommend upgrading it to Yamaha's CD-S2100 SACD player, which has so much going for it that you'd be mad not to.  *Jutta Dziwnik*





LABORATORY TEST RESULTS

Overall, the Yamaha CD-S2100 performed brilliantly on the test bench, returning excellent results in most areas of performance tested and perfect results in others.

Distortion levels were low right across the board. Graph 1 shows THD+N with a 1kHz signal (CD standard) at a recorded level of -10dB and you can see that there's a second harmonic distortion component at -132dB (0.0000251%), a third harmonic at -110dB (0.0003162%), a fifth at -133dB (0.0000224%) and that's pretty much it, with the noise floor down at -140dB . Outstanding!

Graph 2 shows distortion with a test signal recorded at -60dB and although there is distortion present (due to the fact the test signal hasn't been dithered) it's all more than 120dB down, or 0.0001%. This performance is repeated at -80.59dB —as you can see in Graph 3, again without dither, but this time you can see from Graph 4 (a -80.70dB signal this time with dither added), the addition of dither (dither is present on all commercial CDs, but only sometimes on test CDs) removes all distortion components completely, and the noise floor, although slightly elevated due to the dithering, is still hovering down around -140dB .

Reducing the level of the test signal yet again, to around -90dB (as shown in Graph 5 and Graph 6) demonstrates the superb performance on the part of the CD-S2100 at these low levels. In Graph 6 (THD+N for a signal recorded at -90.31dB), no distortion components are visible at all and the noise floor is still down around -140dB . The overall total THD+N result was 0.0018%, as shown in the tabulated result table.

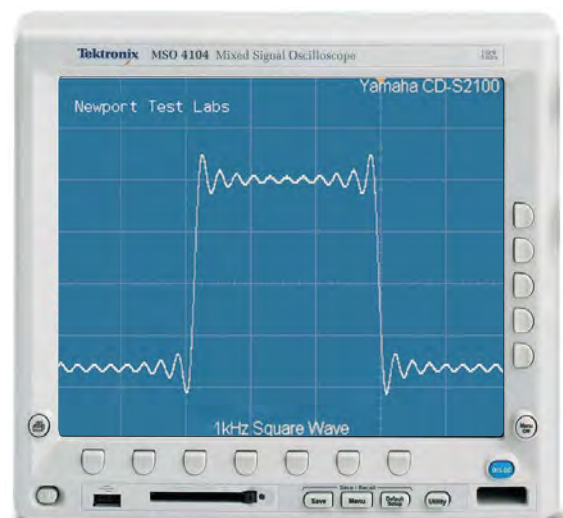
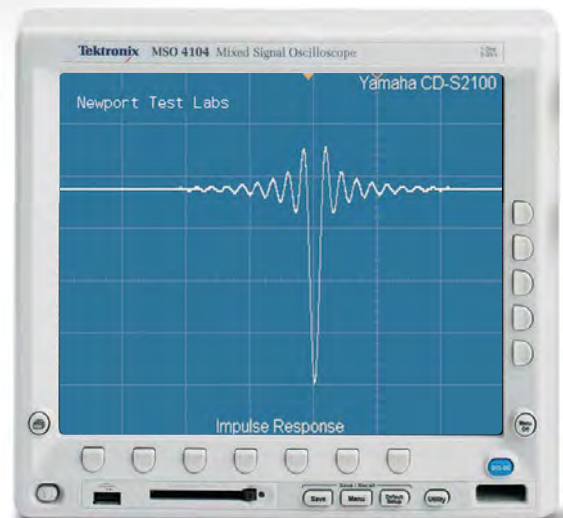
THD+N was also measured for the DAC section of the Yamaha CD-S2100, and the results are shown in Graph 11, with measurements at a level of -1dB (red trace) and -20dB (black trace). You can see that distortion

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levels are very low at both test levels, and almost completely uniform across the tested frequency range. At -1dB , distortion is mostly less than 0.001%. THD+N is plotted against recorded level in Graph 12.

Intermodulation distortion was also extremely low, as you can see from Graph 7. The two test signals (at 19kHz and 20kHz) cause the player to generate sidebands at 18kHz and 21kHz, but they're around 108dB down (0.0003981%). The unwanted signal regenerated at 1kHz was around -117dB down (0.0001413%), where it would be completely inaudible. Note, too, the lack of spurious ultra-sonic frequencies above 21kHz. There are some present, as you can see, but they're all more than 110dB down (0.0003162%). The same is the case with Graph 8, which shows a 20kHz test signal at 0dB . The signal at 40kHz that is 100dB down (0.001%) is the second harmonic, the others are spurious.

The frequency response of the Yamaha CD-S2100 was outstandingly good in all operating modes. When playing back CD sources, response extends from 2Hz to 20kHz $\pm 0.5\text{dB}$, with the lower and upper limits being the lowest and highest frequencies recorded on the test CD. When playing back a test SACD, the Yamaha CD-S2100's frequency response extends from 0.5Hz to 50kHz $\pm 1.5\text{dB}$. When tested using an external digital 24-bit/192kHz frequency sweep, the frequency response extended from 0.5Hz to



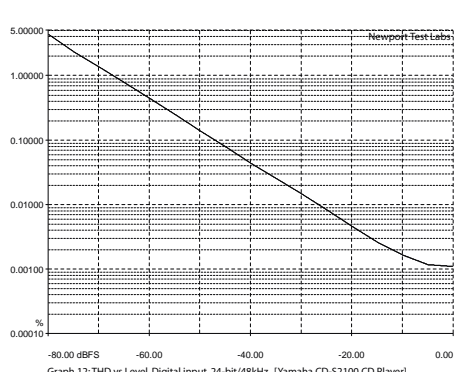
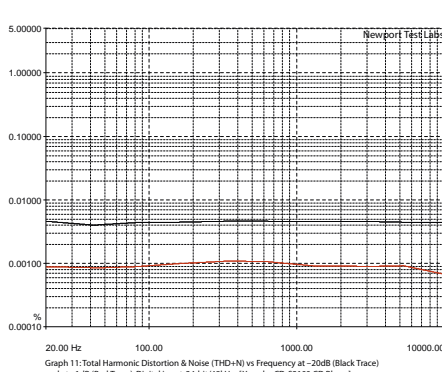
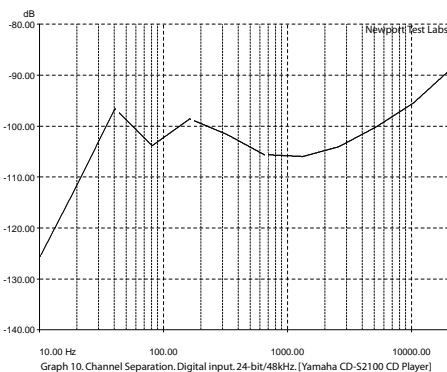
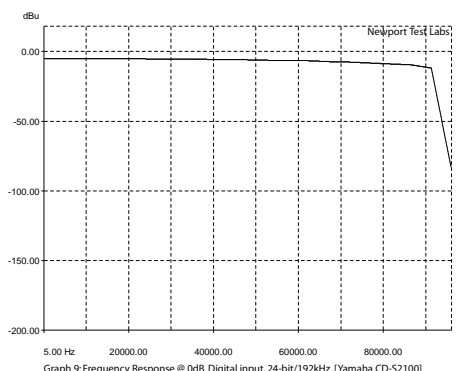
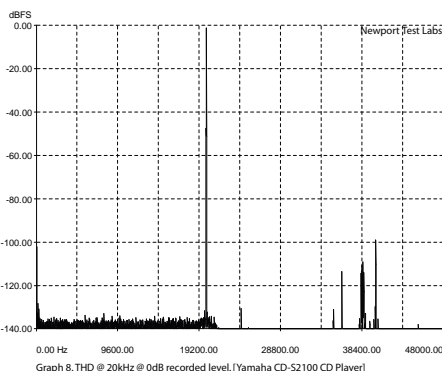
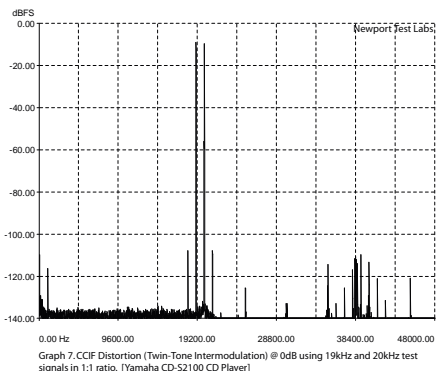
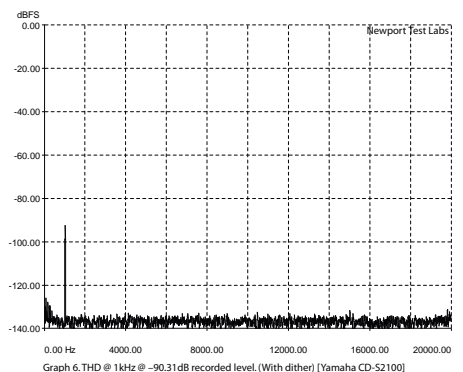
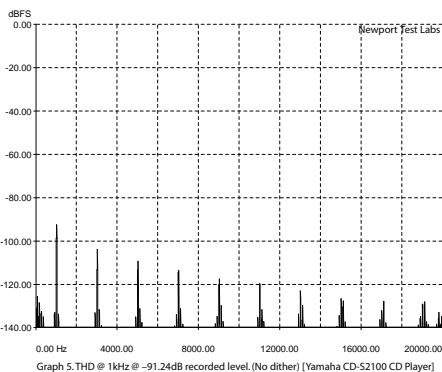
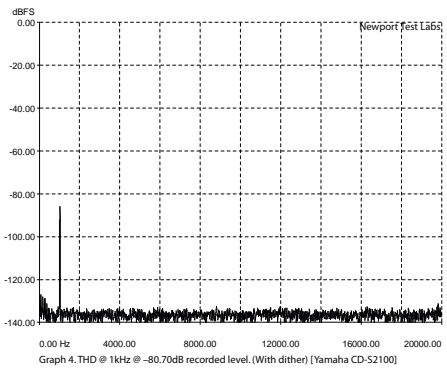
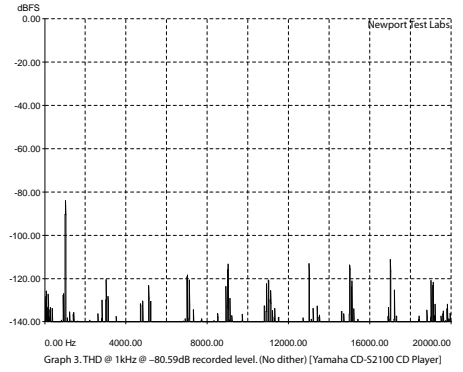
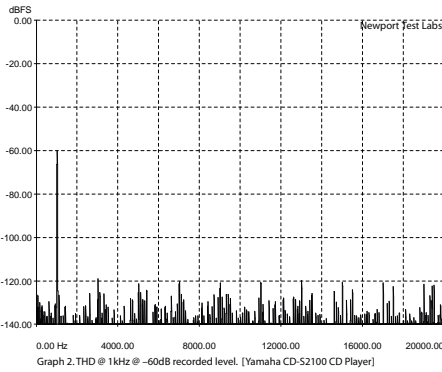
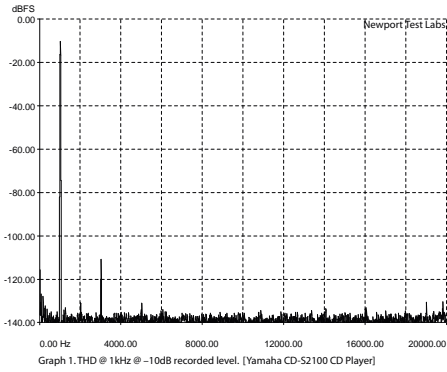
a little over 90kHz -3dB. It is this trace that's shown in Graph 9.

Channel separation was equally good, but varied a little depending on which source was being used for the test. Separation with a CD was excellent, returning a best result of 121dB at 1kHz and diminishing to only 96dB at 20kHz. As you can see from Graph 10, per-

formance with external AES-17 standard test signals was not quite as good, with separation at 1kHz of around -112dB, diminishing to 90dB at 20kHz. These differences would not be audible, since all are far below the limit of the human ear's ability to detect them.

The performance with a square wave was typical of a standard oversampling filter, but

the performance with a pulse showed that the Yamaha CD-S2100 inverts absolute polarity. There is considerable debate in the audiophile community as to whether inverted polarity is audible, and since the absolute polarity of recordings is not guaranteed anyway, establishing an answer is not only difficult, but also shows that worrying about





Yamaha CD-S2100 SACD Player — Test Results (16-bit/44.1k)

Analogue Section	Result	Units/Comment
Output Voltage	2.0960 / 2.0920	volts (Left Ch/ Right Ch)
Frequency Response (CD)	2Hz – 20kHz	-1dB
Frequency Response (SACD)	0.5Hz – 50kHz	-3dB
Channel Separation	117 / 121 / 96	dB at 16Hz/1kHz/20kHz
THD+N	0.0018%	@ 1kHz @ 0dBFS
Channel Balance	0.016dB	@ 1kHz @ 0dBFS
Channel Phase	0.02 / 0.00 / 0.09	degrees at 16Hz / 1kHz / 20kHz
Group Delay	+180.0 / -14.4	degrees (1-20kHz / 20-1kHz)
Signal-to-Noise Ratio (No Pre-emph)	109 / 122	dB (unweighted/weighted)
De-Emphasis Error	0.003 / 0.012 / 0.20	at 1kHz / 4kHz / 16kHz
Linearity Error @ -60.00dB / -70.00dB	0.00 / 0.06	dB (Test Signal Not Dithered)
Linearity Error @ -80.59dB / -85.24dB	0.01 / 0.04	dB (Test Signal Not Dithered)
Linearity Error @ -89.46dB / -91.24dB	0.03 / 0.00	dB (Test Signal Not Dithered)
Linearity Error @ -80.70dB / -90.31dB	0.01 / 0.01	dB (Test Signal Dithered)
Power Consumption	0.27 / 28.86	watts (Standby / On)
Mains Voltage During Testing	239 – 251 volts	(Minimum – Maximum)
Digital Section	Result	Units/Comment
Digital Carrier Amplitude	87.98mV	Audioband
Digital Carrier Amplitude	1.14V / 1.09V	Differential / Common Mode
Audioband Jitter	1.9 / 0.011	nS (p-p) / UI (p-p)
Data Jitter	1.9 / 0.011	nS (p-p) / UI (p-p)
Deviation	+23.9	ppm
Frame Rate	44101.056	
Eye-Narrowing (Zero Cross)	10.0 / 0.056	nS (p-p) / UI (p-p)
Eye-Narrowing (200mV)	20.3 / 0.114	nS (p-p) / UI (p-p)
Absolute Phase	Inverted	Normal / Inverted
Bit Activity at Digital O/P	00	Where Fitted

Yamaha CD-S2100 (AES-17 Standard using 48kHz/24-Bit)


Digital Section	Result	Units/Comment
Out of Band Spurious Components	-117.554dB	
Suppression of Imaging Components	-106.345dB	(Worst Case)
Level Dependent Logarithmic Gain	0.037dB	
Intermodulation Distortion (1)	-113.064dB	18kHz/20kHz 1:1 Ratio
Intermodulation Distortion (2)	-114.797dB	41Hz/7993Hz 4:1 Ratio
Low Level Noise Modulation	2.730dB	Worst Case
Idle Channel Noise	-124.44dB	CCIR-RMS weighting
Signal-to-Noise Ratio	-124.297dB	CCIR-RMS weighting
Power Line Products	-118.349dB	50Hz
Non-Linear Interchannel Crosstalk (a)	-127.298dB	3kHz (2nd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (b)	-128.524dB	6kHz (3rd-order ref 17kHz/20kHz)
Non-Linear Interchannel Crosstalk (c)	-128.876dB	10.040kHz (2nd re 40Hz/10kHz)
Non-Linear Interchannel Crosstalk (d)	-110.779dB	10.080kHz (3rd re 40Hz/10kHz)
Absolute Phase	Inverted	Normal/Inverted

absolute polarity is pointless. If you do want to preserve absolute polarity when using the CD-S2100, you would have to swap over the wires at each of your speakers. (That is, move the wire going to the (+) terminal of the left speaker to the (-) terminal of the left speaker, then move the wire going to the (-) terminal of the left speaker to the (+) terminal of the left speaker. Then do the same for the right-channel speaker.) This will restore absolute polarity. Personally, I wouldn't bother.

Output voltage was about industry average, at a little over 2 volts, but the balance between the two channels was far better than average, at 0.016dB. Channel phase error was also very low, in fact at 1kHz there was absolutely no phase error between the channels at all.

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De-emphasis errors were also very low, plus also show that Yamaha has correctly implemented the de-emphasis circuitry inside the CD-S2100. Many manufacturers omit (or fail to activate) this circuit, since modern CDs do not require de-emphasis. (But if you have CDs manufactured prior to around 1988, their sound will certainly benefit from de-emphasis circuitry.) Linearity errors were very low, as you can see in the tabulated result table, with the Yamaha returning perfect results at -60dB and -91.24dB and a worst-case error of only a tiny 0.06dB at -70dB. Mains power consumption is a fairly low 28.86-watts when the unit is operating, whilst in standby, it meets the current Australian standard by drawing only 0.27-watts.

To conclude, I can only reprise what I wrote in the very first paragraph of this test report, which is that overall, the Yamaha CD-S2100 SACD player performed brilliantly on the test bench.  **Steve Holding**

