APOGEE PSX-100

Apogee Electronics are addressing the 24-bit/96k market with this combined A/D and D/A converter. William Bowden samples the outcome.

Apogee Electronics have specialised in building high quality A/D and D/A converters for some time now, but the PSX-100 is their first foray into the emerging 24-bit/96k domain. With an asking price of $5795 the Australian market may be tough to crack, but for the money you get plenty of features and some nice extras.

The PSX-100 is an unassuming looking 1U rackmount box that sports quite an array of features: an A/D converter (24-bit with 44.1k, 48k, 88.2k and 96k sample rates), a D/A converter (24-bit with a 32k to 106k range), stereo PPM-style metering, an analogue limiter, extensive format conversion, and 'Bit Splitting' (which allows 24-bit material to be recorded on 16-bit machines), all controlled via 11 front panel function buttons. It's powered by a 25W internal supply connected via an IEC lead. The interface looks good and offers a variety of input and output formats: S/PDIF (optical or coaxial), TDIF, AES/EBU and ADAT. You can also sync the unit via BNC wordclock or export wordclock and take advantage of Apogee's low jitter (no more than a quoted 22 picoseconds RMS) internal clock. A rear panel DIP switch (10 by two-way) offers further functions and tweaks.

It's a well built unit in terms of layout and useability, and almost any configuration is only two or three button presses away. Each button has a status LED beside it, so at a glance you usually know what's what. The unit runs warm due to the power supply's toroidal transformer. This is not unusual and the left hand side of the casing is dominated by a large anodised purple heatsink which warms up in operation but is certainly not as hot as previous Apogee designs. Looking inside the box reveals a spartan layout, comprising two boards. Next to the power supply is a large digital board (with a promising looking ROM OS chip) and on the far right is a separate analogue circuit board. The casing is very strong and heavy and, no doubt, would easily survive a fall or the rigours of life outside the studio.

A unit of this calibre will normally offer plenty of features and customisable parameters, and the PSX-100 is no different. The first notable feature is Apogee's well known UV22 dither process. You'll be needing this because 24-bit audio involves more information than a CD burner or most DAT recorders can handle, and UV22 will reprocesses the output resolution of the A/D from 24-bit to 20- or 16-bit wordlengths, so you can master to 16-bit formats. It's an effective and good sounding system, but it only works on the lower sampling rates. The manual states that, "sample rate conversion is a tricky business at best and you need the maximum resolution to do it". I must confess I was a little disappointed to find that I couldn't record at 96k/24-bit and output it at 44.1k/16-bit all in the one box (for example, dbx's Quantum mastering processor will do this). I can only guess Apogee assume this level of accuracy requires specialised resampling, and one box really can't do everything as precisely as a dedicated unit.

On the positive side, you can record a 96k/24-bit stereo program onto a 44.1k/16-bit multitrack recorder by using the PSX-100's Bit Splitting option. This only works via the TDIF or ADAT multichannel interfaces as it requires four tracks on your digital recorder. Because there are only two AES/EBU outputs, you can only record and bit split at lower sample rates through those interfaces (bad luck for owners of the Sony PCM800, which doesn't offer the TDIF or ADAT interfaces). Nevertheless, Apogee's Bit Splitting makes 24-bit recording a viable option.

Soft Limiting is another feature that has made Apogee famous. On board (but bypassable) is a dedicated analogue limiter circuit with a soft-knee style approach to attenuating transients. It is factory set to begin its action at -4dB FS and gets progressively busier

as you pump more level into the converter. If you want to vary the threshold you can, but not via the front panel. You have to journey inside the unit and adjust variable resistors, and to avoid a L/R mismatch you'll need some test gear. Apogee did make a user adjustable front panel mod for their AD-500 converter, so here's hoping they do the same for the PSX-100.

In practice this limiter works rather well – at times much better than its digital counterparts in my mastering studio. But like anything, it's highly 'program dependant' and too much limiting is usually way too much. I'd like to have seen a metering mode that displayed the amount of limiting occurring, or even just a simple LED to show limiter action.

The front panel meters are small but very fast. They only go down to -50dB, but half the steps are devoted to the last 10dB before 0dB so they are most informative about the transient nature of the upper range of your signals. The 'Digital Over' indicator is resettable with a push of the Meter button, and you can choose between one to four consecutive full-scale samples as constituting an 'over' (via the rear panel DIP switches).

Piano Role

I had this converter for several weeks and was able to do quite a number of different tests. I guess the most obvious (and one of the most revealing) was to mic up a piano and listen to single notes being played at various volumes and lengths. This has long been one of my favourite tests because a piano provides such complex waveforms, replete with harmonics and overtones. I performed this test in Festival Records' Studio A, with two house engineers and one technician present. Going 24-bit/96k all the way, the PSX-100 was set up against an Apogee AD-500 and DA-1000 (16-bit/44.1k) combination and, of course, the piano itself. We miked the piano with a Neumann U69 FET stereo microphone – it's not the quietest microphone we have, but it is certainly one of the most popular and provided a good reality check for the two engineers present.

After the laborious process of lining up the converters with test tones, we were ready. The PSX-100 had quite a 'smooth' sound to it and revealed the evolving harmonics in the midrange strings quite well. In this area the older AD-500 was a little more 'honky' sounding in comparison. The PSX-100 also had excellent characteristics in the bottom end of the piano. In regards to the top end though, we began to notice that notes were slightly less present, and, while this sounded quite appealing at times, it definitely sounded less open and 'airy' than the AD-500/DA-1000 combination or the original.

Listening to the tails of notes, everyone noticed that the PSX-100 was not reproducing the extreme top end (mainly hiss from the mic) as well as expected. When we just listened to studio ambience (mainly the air conditioner) the difference was just as apparent in the tops but some of the low rumble seemed a bit attenuated as well. The notes did seem to sound well into the noise floor, but the sound of the reproduced noise attracted the most comment. While listening to the background noise, one of the engineers, Matt Lovell, immediately volunteered for a blind test which he passed 100%. He correctly identified all three sources, though he found the difference revealed by the PSX-100's sound was the easiest to spot. Hmm… I retreated to the controlled environment of my mastering studio and began to test the PSX-100 further. Recording solo instruments is one thing but mastering complex program material is another. I wondered how the PSX-100 would perform in this environment.

Tonally, what I heard in the studio was repeated in the mastering room but with some interesting results. For example, I was required to deal with a particularly nasty sounding track that I had been excitedly told was "all digital" in its recording and mixing, and of course it was on DAT – a budget job with no budget. In this case the PSX-100 provided me with an ideal finishing touch after tape, EQ and some 'retro' style processing had got me 95% there. Additionally, this was done by the PSX-100 at 44.1k using the UV22 process.

On the subject of UV22, I recorded the input noise of an AD-500 and the PSX-100, both calibrated to the same reference level. Despite the fact that the PSX-100 exhibited noise that was roughly 4dB louder than the AD-500 (they were in the region

of -76.3dB and -80.8dB respectively – see waveform picture) the sound the UV22 produced was far more pleasing to the ear than the AD-500. It sounded more like tape hiss, had almost no rumble, and (when the gains were matched) UV22 came out sounding quieter than its forebear. Very interesting. I also recorded an identical program into both units at the lowish level of -70dB (peak) to simulate low level resolution on something other than noise, which is generally more or less 'stable state'. I'd suggest that the PSX-100 performed best of all on this test, subjectively sounding more coherent and less 'zippered' than the AD-500. While few CDs possess a dynamic range of this magnitude and remain listenable (apart from their fade outs, of course), most live (studio or location) recordings have plenty of information at these lower realms and when you finally come to mix or master them, the increased resolution will come into its own. The imaging of this converter is solid and generally the subtle lack of bite sounds very pleasant on a wide range of programs. I must admit that I found it was not as dynamic as it could have been, especially in the centre image. Dance music sometimes benefited from the capable bass and sub-bass response of PSX-100 but most 'four on the floor' kick drums were not quite as punchy as they were on some other (admittedly more expensive) converters.

Conclusion

Throughout this review I have been comparing the PSX-100 to Apogee's previous AD-500 A/D converter and DA-1000 D/A converter, and I must point out that, in its day, the AD-500 alone cost around $9000 (with power supply). The DA-1000 wasn't cheap, either. In contrast, the PSX-100 retails at $5795 and offers both A/D and D/A conversion, along with 24-bit/96k resolution.

There simply isn't room here to go into all the possible applications and strengths/weaknesses of the PSX-100. All converters colour the sound in some way, as do so many other highly sought after bits of kit, from consoles to microphones to cables. The PSX-100 has its own flavour but you may find that, if most of your work is entirely digital, it will help smooth off some of those rough edges. (If you're want total purity then start saving: you might just find an A/D converter that will get you close for about $10,000 or so, and just as much again for a similar quality D/A converter.)

My tests were largely based on a single pass with stereo program material. Of course, the 24-bit conversion would really come into its own when you are adding multiple signals together – the better the resolution the more accurate those mathematical approximations of mixing, bouncing and processing become. With the new breed of workstations capable of 24-bit/96k recording appearing everywhere (and the possibility of DVD high resolution recording), expect to see a host of 24/96 converters appearing throughout the next couple of years.

Apogee has clearly aimed the PSX-100 at pro and semi-pro users, and, by including ADAT and TDIF interfaces (and the bit splitting feature), has opened up 24-bit/96k recording to the masses. A very wise move considering the high market penetration of these digital interfacing protocols in the new breed of digital consoles, existing recorders and processors.

Choosing a converter is a bit like choosing a brand of beer. It's a matter of taste and your specific requirements are entirely up to you. Personally, I enjoyed working with the PSX-100 because it added another colour to my mastering palette, but I'm on borrowed time – this review unit has someone else's name on it.

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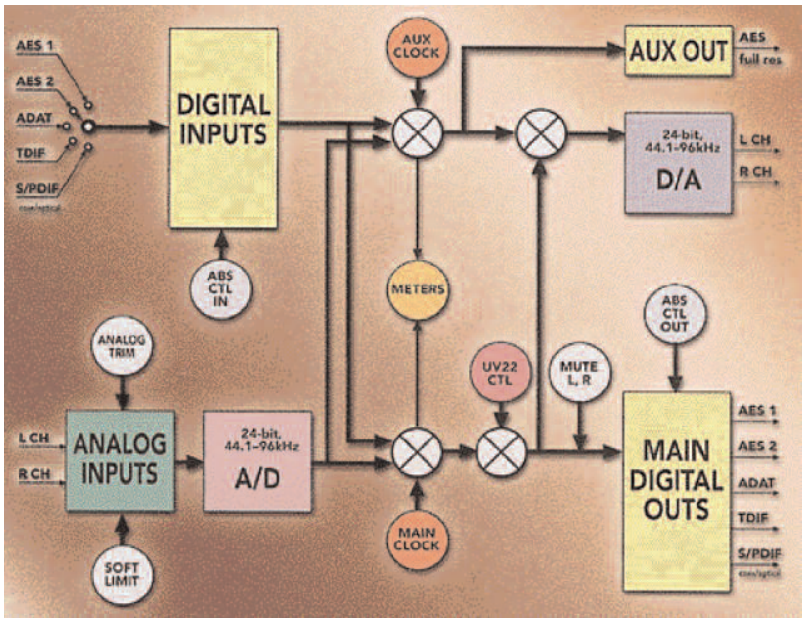
Price

- *RRP: $5795*



The PSX-100 consists of four main sections: digital inputs, digital outputs, A/D converter, plus additional functions such as aux outputs, UV22HR and Soft Limit. The way in which the main blocks are interconnected is determined by the current mode of operation. In Confidence Monitor mode, the A/D and D/A are essentially separate, the D/A deriving its input from the digital inputs and the A/D driving all the main outputs. Digital Copy takes the selected digital input and delivers it to all the unit's outputs, analogue and digital. This is intended for digital copying and format conversion without repatching. Analogue Monitor mode takes the A/D output and feeds it to all system outputs and to the D/A, which therefore monitors the conversion carried out in tht A/D section.

Apogee's reply

William mentions some of the limitations of the Soft Limit function. Here at Apogee we tend to view Soft Limit as an extension of the available dynamic range, not as a full-featured limiter. Thus, we've resisted the temptation to add the various features which are requested from time to time. The Soft Limit threshold is adjustable only from the interior. In my experience, external calibration has proved to be of limited use. If the threshold is raised above -4dB FS the gain reduction curve doesn't offer much protection against overs, while lowering the threshold may engender artefacts.

On the point of sample rate conversion: we have considered manufacturing a sample rate converter on a number of occasions. However, we have never been happy with the quality offered by available solutions for handling non-integral values (e.g. 44.1k to 48k, or 96k to 44.1k). This is almost certainly due to the fact that a very complex digital filter is required to handle non-integral sample rate conversion – and it's hard to get them to sound good.

Do bear in mind, however, that while in 'fast' mode, the Aux AES output on the PSX-100 gives you every other sample – so at 96k it gives you 48k, and at 88.2k it gives you 44.1k. Many people report that this sounds excellent, even though, strictly speaking, the filter coefficients are not correct for this application.

To address the issue of the 'sound' of the PSX-100: we do not deliberately 'flavour' our converters. However, it is a fact that the higher the quality of the conversion, the more like analogue it will sound. If you add in our proprietary technologies such as Soft Limit and then use UV22 on the result, you will end up with a signal that sounds very much like the analogue original. In the final analysis, however, the sound of a converter is very much in the ear of the beholder. Technology has changed a great deal since the days of our original AD-500, and we believe that our current converters provide far higher quality digital signals than our designs of a decade ago.

It's also worth noting that in the very near future we will release a firmware update adding single-wire 96k capability to the PSX-100. Thus you'll be able to interface the PSX-100 with virtually any 96k product on the market.

Roger Robindore
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