Apogee Symphony

Audio Interface System

Apogee's Symphony system aims to bring professional hardware to users who want to work with native digital audio workstations on a Mac, whether they're in the studio with a Mac Pro or on the road with a Macbook Pro.

SOUND ON SOUND

Apogee Symphony

pros

- Achieves very low latency while maintaining native compatibility with Core Audio.
- Apogee's converters are among the best available.
- The VBus channel routing adds a feature that's sorely missing in many native audio workstations.
- Symphony Mobile provides all the functionality of a single Symphony PCI card.

cons

- If you want to take advantage of the Symphony system's feature set, but require more digital I/O instead of high-quality analogue converters, having to buy Apogee's converters can work out expensive.
- Fully understanding how all the parts of the Symphony system work together can take a bit of time.

summary

Apogee's Symphony is an impressive system that truly brings professional-quality audio converters, combined with good performance and low latency, to Core Audio-based applications on both desktop and mobile platforms.

Mark Wherry

As computers have become more powerful over the last few years, especially with the introduction of multi-core processors, it really has become possible to do all of your audio processing, recording, mixing, and playing virtual instruments on one system, without the aid of external processing power. Accordingly, the market for higher-quality audio hardware to be used with computer-based workstations has grown tremendously, although many of the products available are targeted at home or project-level situations rather than the demanding professional. And by using the word 'professional' I'm talking about those who require a large number of inputs and outputs (32 or more) with high-quality analogue converters at very low latency — and are willing to pay for such a system.

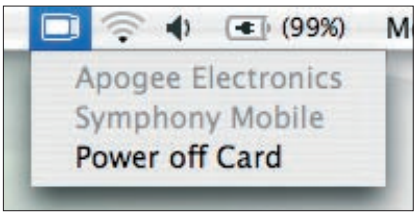
It used to be that higher-end users would buy Digidesign's Pro Tools system, although often not necessarily for the *Pro Tools* software itself. While many popular products from developers such as MOTU, Opcode and Steinberg supported Digidesign hardware directly at one time or another, perhaps the most popular example is the way in which pro *Logic* users would run *Logic* as front-end software for the Pro Tools hardware. And although it's still possible to use Pro Tools hardware in conjunction with *Logic*, from my own experience this seems to be a far less desirable workflow than it was several years ago.

Other than Pro Tools, if you need a large number of inputs and outputs (Pro Tools currently supports up to 160 inputs and outputs) for a Mac-based audio workstation, with low latency and quality converters, but want to stay within the world of your workstation's native abilities, there haven't

been too many options. Planning to address this need, Apogee, a respected manufacturer of high-end audio converters, realised that they already had half of the solution: the converters. Since the company's latest converters already had the option of accommodating an expansion card that would allow them to connect directly to a Pro Tools system, it seemed logical to create a system that would make it possible to integrate Apogee converters with native audio software instead. And that's exactly what Apogee have done.

First Movement

Symphony is the name given to a number of Apogee products used together to create



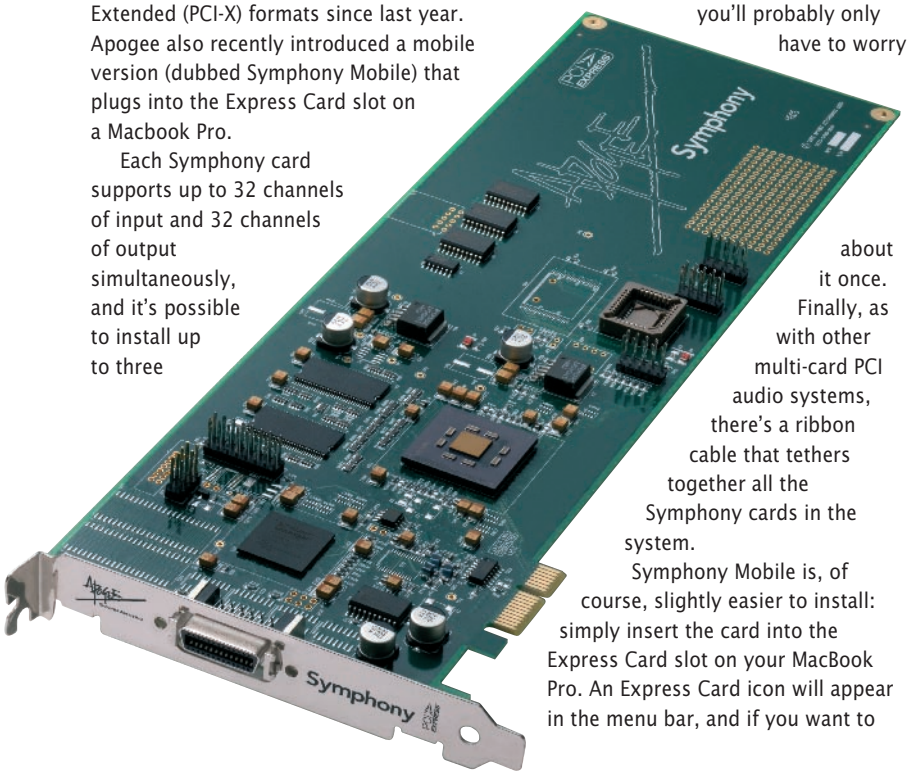
When the Symphony Mobile card is inserted in the Macbook Pro, you'll see this icon appear in the menu bar. The pop-up menu provides a power-off option that should be used before ejecting the card from the system.

one system for high-quality, low-latency audio input and output, designed exclusively for Mac users — there's no Windows version, and Apogee apparently have no plans to release one either. The heart of the Symphony system is the Symphony PCI card, which has been available in PCI Express (PCIe) and PCI Extended (PCI-X) formats since last year. Apogee also recently introduced a mobile version (dubbed Symphony Mobile) that plugs into the Express Card slot on a Macbook Pro.

Each Symphony card supports up to 32 channels of input and 32 channels of output simultaneously, and it's possible to install up to three Symphony cards in your Mac, for a maximum of 96 inputs and 96 outputs. Since a Macbook Pro only has one Express Card slot, you can only use one Symphony Mobile card in it, for a maximum of 32 inputs and 32 outputs.

Installing the PCIe or PCI-X cards inside a Mac Pro or older Power Mac (you'll need at least a G5 to handle Symphony) is fairly easy. As is usually the case with PCI cards, Apogee recommend that the first Symphony card be installed in the lowest-numbered slot available (usually this will be as close to the graphics card as possible), and if you're installing additional cards, these should be placed in adjacent slots. The only thing to be aware of is that each Symphony card has a set of onboard jumpers that need to be configured according to how many cards you're going to use.

The first card doesn't require any jumpers and Apogee supply each Symphony card with the jumper attached to only the first pin, for safekeeping — so if you're only using one Symphony card there's nothing to worry about. However, if you're installing a second or third card you'll need to make sure the jumper is configured uniquely for each card, as described in the manual. While the jumper configuration isn't a big deal, it does seem a shame that a more automatic method of configuration couldn't be found, although you'll probably only have to worry about it once.



Finally, as with other multi-card PCI audio systems, there's a ribbon cable that tethers together all the Symphony cards in the system.

Symphony Mobile is, of course, slightly easier to install: simply insert the card into the Express Card slot on your MacBook Pro. An Express Card icon will appear in the menu bar, and if you want to

Maestro (see overleaf for details) provides access to the two hardware mixers on each Symphony PCI card that allow you to create low-latency monitor mixes when recording.

eject the card you need to choose the 'Power off Card' option first, from the Express Card icon's pop-up menu, before removing the card from the slot.

This was the first time I'd used an Express Card with my Macbook Pro, and I was surprised at just how ineffective Apple's spring-latch was for keeping the Express Card in the slot. As you insert the card you feel the spring-latch engage, but it requires very little effort for the card to be pulled from the slot without disengaging the latch. To remove the card, you're supposed to push it in again, to unlatch the spring that releases the card, but again I found it too easy to pull the card from the slot without having to unlatch the spring. You have to be careful when plugging in the PC32 cable that connects the Symphony Mobile card to your converters, since the pressure of plugging in the cable will easily unlatch the card. For this reason, you might want to connect the lead to the card before inserting it into your Macbook Pro.

This small criticism isn't Apogee's fault, of course, but it is something to be aware of when using Express Cards with a Macbook Pro. Apogee do supply a little rubber foot that can be attached to the bottom of the card, to hold it in place and prevent the weight of the cable pulling down on the card in the slot.

'X' Marks The Converter

The Symphony PCI card can be used with any of Apogee's converters that support X-Series expansion cards, including the AD16X and DA16X converters (which, as their names suggest, offer 16 channels of analogue-to-digital and digital-to-analogue conversion respectively) and the Rosetta 800 and 200 (which give you either eight channels of A-D and D-A conversion or two). The really nice aspect of having a choice of converters available is that you can also mix and match them in a single system, meaning that you can start off with a Rosetta 800 and one Symphony card (giving you eight ins and eight outs), and later add either additional Rosetta 800s or AD16s or DA16s, as your budget allows. For the review, Apogee provided me with two AD16Xs and two DA16Xs, details of which are given in the box above. (Hugh Robjohns has previously reviewed the Rosetta converters; see the 'Apogee Reviews in *SOS*' box for more information.)

The only down side to the X-Series expansion cards is that you do have to buy them separately and install them yourself, although this is really simple and Apogee provide clear and nicely illustrated instructions. While on the subject of instructions, all of Apogee's products are supplied with good printed documentation that's well written and provides plenty of illustrations (PDF versions can be downloaded from Apogee's web site), which is always a pleasant surprise.

Once you've installed the Symphony PCI card (or cards) in your computer, the X-Symphony cards in your converters, and Apogee's supplied driver software on your computer, it's time to wire everything up. If you've ever worked with a Pro Tools system, wiring up a Symphony system is pretty much the same, and very easy to do. Each Symphony card has a PC32 connector, and each X-Symphony card has two PC32 connectors, marked Main and Thru; so to connect your first converter to the Symphony system, connect a PC32 cable from the first

Symphony PCI card to the Main PC32 connector on the X-Symphony card of the converter.

Additional converters can be daisy-chained from the first, via the Thru PC32 connector, and you can keep on daisy-chaining converters in this way until you reach the maximum of 32 input and 32 output channels supported by the Symphony PCI card to which all of the converters are attached. To connect additional converters, you would move onto the second or third Symphony PCI cards in your system and repeat the process until you'd connected

enough I/O channels to cover the supported 96 inputs and 96 outputs.

If you have a master clock in your system (such as Apogee's own Big Ben), you can obviously slave all of the converters to that clock. However, if you don't have a master clock you can use the first converter as your master, and slave the other converters by connecting the word-clock output from the first converter to the word-clock input of the additional converters, using T-connectors and terminating after the last one. As a rule of thumb, if the converters in use in the Symphony system are the only digital devices in your studio requiring a clock input, using the first converter as the master will be absolutely fine; but if you're going to be connecting other devices, via a digital interface, to your converters, such as an effects unit or the output from another computer's soundcard, it would definitely be worth investing in a master clock to avoid potential problems.

If You Please, *Maestro*

Apogee supply both a Core Audio driver and a software application called *Maestro* that allows you to configure the Symphony system and make use of the onboard routing and mixing features on the Symphony PCI card itself. The *Maestro* software consists of two windows: a Settings window that allows you to configure the Symphony PCI card and attached converters, and a Routing/Mixer window that lets you assign which hardware inputs and outputs are routed to the Core Audio inputs and outputs.

The routing part of the Routing/Mixer window is laid out in a familiar-looking grid, and by default hardware channel one is routed to software channel one, hardware channel two is routed to software channel two, and so on. There are separate pages for Input and Output, and if you're used to the I/O Setup window in *Pro Tools* the *Maestro* Input and Output pages feel a little bit quirky initially, but provide mostly the same functionality. Channels have a stereo mode where pairs of outputs are moved together, although you can also ungroup these pairs to assign mono channels individually. However, instead of dragging the channel routing elements around, you click where you want them to go. One thing that would be nice in the Outputs page of *Maestro* would be the ability to route a software output to more than one hardware output, as you can with RME's *Total Mix* system.

The Mixer page provides access to the two hardware monitor mixers available on each Symphony PCI card, which allow you to create latency-free monitor mixes when recording. Each mixer allows you to set how much of the input signals are sent to a mix output of your choosing, and you also have the option to blend in a stereo output from your audio workstation software as well. Because these mixers are provided on the Symphony PCI card, you can route inputs from one converter to outputs on another, so long as both converters are attached to the same card. If you're using multiple Symphony cards, you can't route inputs from a converter attached to one card to the outputs of a converter attached to a different card. This is perhaps a shame, but one of the goals of Symphony is, of course, to allow you to work with your audio workstation at low latencies, which means you might be able to create your monitor mixes from within software like *Logic Pro*, enabling you to route anything anywhere.

One of the neatest parts of the whole Symphony system is the VBus channels that allow you to route audio channels within the Symphony card itself. This can be pretty

The AD16X & DA16X Converters

Released in 2004, the AD16X and DA16X were the successors to Apogee's previously popular 24-bit AD16 and DA16 converters, with the 'X' in the names denoting support for the X-Series cards that were originally introduced for the Rosetta 800. Other significant improvements included support for 192kHz sampling and the inclusion of the same C777 clock technology used in Apogee's Big Ben digital master clock, famous for its low jitter.

The AD16X and DA16X each support either 16 channels of A-D or D-A conversion, respectively, and, accordingly, each unit has 16 analogue connections (from two 25-pin D-connectors that require breakout cables), along with both ADAT and AES connections (the latter via a 25-pin D-connector). Each converter has four ADAT ports (only two are used at 44.1/48kHz rates) to support S/MUX (sample multiplex) modes that allow either 16 channels at 88.2/96kHz or eight channels at 192kHz. To allow all 16-channels of A-D or D-A conversion to operate at 192kHz you either need to use the AES ports in stand-alone mode, or an X-Series card, such as an X-Symphony, as described in the main text.

Once you use an AD16X or DA16X with an X-Series card, the digital ports effectively become redundant, because either the digital input to or output from the converter will being handled by the X-series card instead of the converter's own digital interface. To take advantage of this redundancy, Apogee added an extra mode of operation to the converters, called Advanced mode — the regular, default mode is referred to as Standard mode — that allows you to make use of both the digital and analogue connections simultaneously when the converter is using an X-Series card. With the AD16X, for example, you can get 16 channels of A-D (input) conversion, and 16 channels of digital output via the onboard digital connections. With the DA16X you get 16 channels of D-A (output) conversion with 16 channels of digital input.

As you can imagine, Advanced mode is pretty useful when these converters form part of a Symphony system; if you don't require analogue input and output for every channel in the system, using the AD16X and DA16X converters in Advanced mode provides a number of digital inputs or outputs for connecting to other digital devices in your studio. It also means you need fewer converters. In Standard mode each converter provides either 16 channels of input or 16 channels of output, so four converters (two AD16Xs and two DA16Xs) are required to handle the 32 channels of input and output supported by a single Symphony PCI card. In Advanced mode, however, because each converter now offers both 16 channels of input and 16 channels of output, only two converters are required to provide 32 channels of input and output.

Sonically, the AD16 and DA16 converters are, as you would imagine and hope given Apogee's pedigree, pretty good. Judging A-D and D-A converters is always highly subjective, especially at the higher end of the market, and having listened to many converter shoot-outs over the years, one thing you notice about high-end converters is that, quite honestly, the differences between competing units can be very small indeed. Personally, I've found the AD16 gives a certain clarity to the sound that I like, especially at higher sampling rates, maintaining the detail of what's being recorded in a very flattering way.

Talking about the high end of the market, it's worth noting that the AD16 and DA16 converters are priced quite affordably compared to far more expensive models from companies like Prism and Genex, and many engineers I know prefer the AD16s to more expensive offerings from other companies. A friend of mine recently did a blind test on a scoring stage with the AD16s competing against more expensive converters from another reputable company, and everyone on the stage apparently preferred the Apogees. While the quality of converters can be highly subjective, and other engineers may disagree with my assessment and anecdotes, that the AD16 and DA16s fall into the category where we can discuss them subjectively rather than technically is perhaps the highest compliment.

useful, since one of the big limitations of the mixer found in many native workstations, such as *Logic Pro* and *Cubase* or *Nuendo*, is that it's impossible to route the output of a bus or group to the input of an audio track. There are many situations where you would want to do this; for example, in the media world it's quite common to submit your final mix as a series of so-called 'stems', where, instead of supplying the whole mix as one stereo file, you provide a number of stereo mixes for the different groups that make up the track. While it's possible to do this in any program, by using the bounce or export feature to record each stem one pass at a time, with a more flexible bussing system you can create all of your stems in a single pass. Apogee's VBus channels give you exactly this feature.

Each Symphony card provides up to 32 VBus channels that show up as additional physical audio inputs and outputs in your audio workstation. And because the VBus channels are part of the Core Audio driver, you can easily use them to route audio between different applications as well, which could be useful. *Logic* users might want to switch to the driver's own I/O label via the Audio Configuration window, so the VBus channels can easily be differentiated from the actual hardware inputs and outputs on the converters.

Perhaps the best thing about the VBus channels is that it's possible to make a sample-accurate recording from the ouput of one track to the input of another. I tested this in *Logic Pro*, recording the output of a mono track via a VBus to the input of another mono track; and when I looked at both recordings in *Logic*'s Sample Editor window (see the diagram above) both audio files started at exactly the same sample.

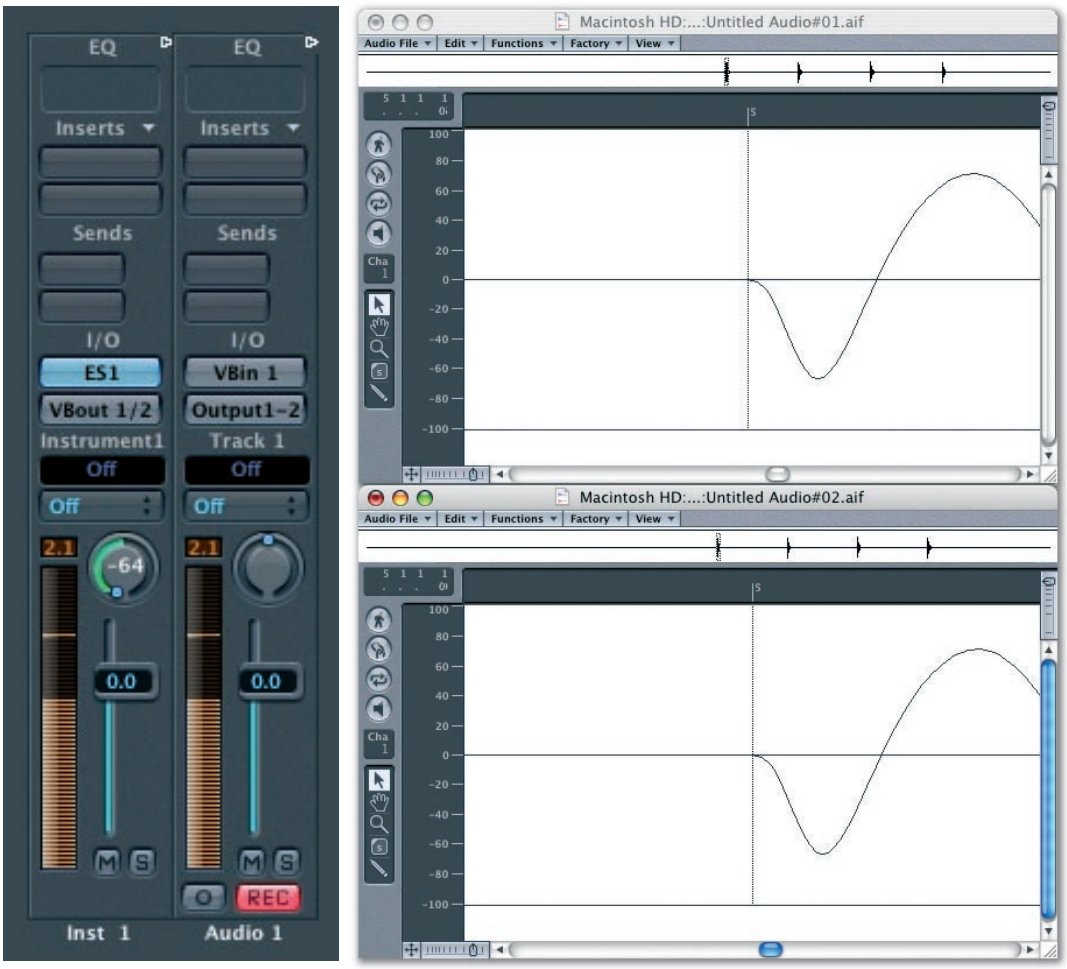
How Low Can You Go?

One of Apogee's big claims for the Symphony system is its performance, especially with regard to latency. To test this, I used *Logic Pro* 7.2.3 with a Symphony system installed in a Mac Pro (featuring two dual-core 3GHz processors, 3GB memory, and a 500GB SATA-II drive) and also with a Symphony Mobile system on a first-generation Macbook Pro (with a 2.16GHz Core Duo processor, 2GB memory and a 100GB, 7200rpm drive). The test was kept fairly simple: I created 32 mono audio tracks and used Activity Monitor to measure *Logic*'s CPU usage when all 32 tracks were enabled, and then when all 32 tracks were in record. It should be noted that the Mac Pro percentages should be read on the assumption that 400 percent is the theoretical maximum performance achievable, while 200 percent is the maximum for the Macbook Pro (100 percent represents the theoretical maximum of one processing core).

With the Mac Pro, *Logic* usage was 13 percent when the tracks were record enabled and 20 percent during recording. On the Macbook Pro, *Logic* usage was 26 percent when the tracks were enabled and 29 percent when recording. I repeated the same test with larger buffer sizes (and thus greater latencies), but I've put these figures in a separate chart, so as not to fill up a paragraph with tedious numbers.

By way of a comparison, I tried the same test with a Fireface 800, to see how *Logic*'s CPU load compared. Admittedly, this isn't a technically fair comparison on the Mac Pro, since one system is PCI-based and the other Firewire, but at the time of writing I didn't have access to any other PCIe audio cards (except for Pro Tools) to make the test more fair. The other caveat in the comparison is that the Fireface has a maximum of 28 inputs at 44.1kHz, so the four-channel difference should also be considered.

Using the Fireface 800 with a 32-sample buffer on the Mac Pro, *Logic* reported a 15 percent usage when idle and a 22 percent usage when recording 28 mono tracks. It's a subtle difference, of course, but shows that the Symphony card (perhaps aided by the fact that it's PCI-based) is working slightly more efficiently. I expected a more dramatic difference on the Macbook Pro, but *Logic*'s usage was almost identical.



Here you can see the output of an Audio Instrument track being recorded by an Audio Track using Symphony's VBus channels. The window in the background shows that a recording made via a VBus is sample accurate. The upper window shows the original audio file, while the lower window shows the file that has been recorded via the VBus.

A nice feature of the Symphony system is its support for high sample rates: up to 192kHz, even with Symphony Mobile on a Macbook Pro. To give you some idea of the performance hit when running the system at 96 and 192kHz, I repeated the same test. At 96kHz the Mac Pro reported 24 percent *Logic* usage when record-enabled and 34 percent while recording; the Macbook Pro showed 50 percent when enabled and 64 percent while recording. At 192kHz, the Mac Pro indicated 50 percent *Logic* usage when record-enabled and 66 percent during recording; the Macbook Pro, on the other hand, reported 75 percent when enabled but gave all manner of *Logic* errors when I tried to put the system into record.

Given the way the CPU usage was increasing, I figured that my Macbook Pro simply wasn't up to the task. Fortunately, I happened to have a new, top-of-the-line 17-inch Macbook Pro to hand (with a 2.4GHz Core 2 Duo processor, 4GB memory and a 160GB, 7200rpm drive — reviewed elsewhere in this issue) and decided to try the same test on that. Putting all 32 tracks into a record-enabled state again (staying at 192kHz), the new Macbook showed 51 percent usage, while during recording the usage was 67 percent. However, the internal disk would occasionally not be able to keep up (it would be fine using an external drive, but I wanted to see what could be achieved using only the Macbook Pro), so I reduced the track count to 24 tracks (which also stalled the old Macbook Pro, incidentally) and this time registered a *Logic* usage of 59 percent.

The advantage of using a small 32-sample buffer is, of course, to achieve low latency. At 44.1kHz, a 32-buffer sample gives a latency of less than a millisecond (0.73ms, to be more precise), although this doesn't take into account converter latency or any additional buffers that might be used by the hardware. Symphony actually provides two Performance Tuning modes: Standard and High Performance. Standard mode basically adds extra hardware buffers to make the audio performance a little more stable. Apogee recommend Standard mode for Power Mac G5 users and High Performance mode for everyone else (all the results in this review are based on High Performance mode).

To measure latency, I made a round-trip recording at 44.1kHz with a 32-sample buffer, connecting an analogue audio output to an analogue audio input. I measured approximately an 80-sample difference between the original and the new recording, which is a round-trip latency of around 1.81ms — not bad at all, with just 16 samples incurred over and above the two 32-sample buffers for the I/O 'journey'.

Conclusion

Apogee have largely achieved what they set out to achieve with Symphony, offering Mac users a professional system that provides high-quality audio conversion and low-latency performance at high sample rates, with a large number of I/O channels. On the whole, the system is pretty stable and, given its highly configurable nature, it deals with 'state changes' rather well. Occasionally you'll see an error pop-up saying that Symphony isn't properly configured, but this usually happens when the clock is set wrong or you've changed the state of the system (unplugging and re-plugging converters or changing between Standard and Advanced modes on the AD16X or DA16X, for example). The alert is usually followed by another to let you know that everything's been reconfigured correctly.

As mentioned in the introduction of this article, since Apogee are aiming the Symphony system at an area of the market that wasn't previously catered for, there aren't that many alternatives in terms of direct competition. At the lower end of the market, there's hardware such as MOTU's PCI offerings, which can also provide a large number of I/O channels, although not with the same quality as Apogee's converters, and I've never witnessed quite the same low-latency performance from other systems either. Also, you don't get the VBus channels.

The only other option would be to buy one or more digital I/O cards, such as RME's HDSP 9652 or MADI series (shortly to be released in PCIe format) and add your own stand-alone audio converters, be they Apogees or something similar. This gives you more choice, but requires a little more effort to pick out the components. And while you could get similar (or potentially and subjectively better) audio converters and good latency performance, you'd still miss the VBus channels and the consistency of buying one system from one manufacturer. While the Symphony system can occasionally be a little confusing, bearing in mind all the various routing options with the different converters, it does at least come together as one system, with a single number to call if you have questions.

Perhaps the deciding factor for most people will be cost. Although the Symphony and Symphony Mobile PCI cards are quite affordable, priced at £558 and £393 respectively, Apogee's converters are definitely in the 'you get what you pay for category' (ie. high quality) and you have to budget an additional £145 per converter for an X-Symphony card. On the plus side, the fact that you can mix and match converters, as mentioned earlier, really means you can start somewhat affordably, by buying either a Rosetta 200 or 800, and add more converters later. However, if you go down this road, it's only cost-effective if you plan on upgrading later: if two or eight channels is all you'll ever need, buying a Symphony system means justifying the additional expense in terms of the quality of Apogee's converters, the good performance at high sampling rates and features like the VBus channels. It can be a great deal if these are indeed the features you're looking for, and, at the high end, if you invest in a 96 I/O system, it obviously works out cheaper than investing in Pro Tools. To sum up, if *Logic Pro* (or another Core Audio-based workstation) is the centre of your music and audio activities, Apogee's Symphony system has a great deal to offer. SOS

Apogee Reviews In *SOS*

- **Rosetta 800**
  www.soundonsound.com/sos/mar04/articles/apogee.htm
- **Rosetta 200**
  www.soundonsound.com/sos/mar06/articles/apogeerosetta.htm
- **Big Ben**
  www.soundonsound.com/sos/aug05/articles/apogeebigben.htm

Symphonic Options

Cards

- **Symphony PCIe/PCI-X card £558. A Mac Pro will give best results, but you can also use Symphony with a Power Mac G5.**
- **Symphony Mobile Express Card £393.**
- **X-Symphony card (one required for each converter) £145.**

Converters

- **AD16X £2344.**
- **DA16X £2344.**
- **Rosetta 200 £1345.**
- **Rosetta 800 £2026.**

Prices include VAT.

information

£	See the 'Symphonic Options' box.
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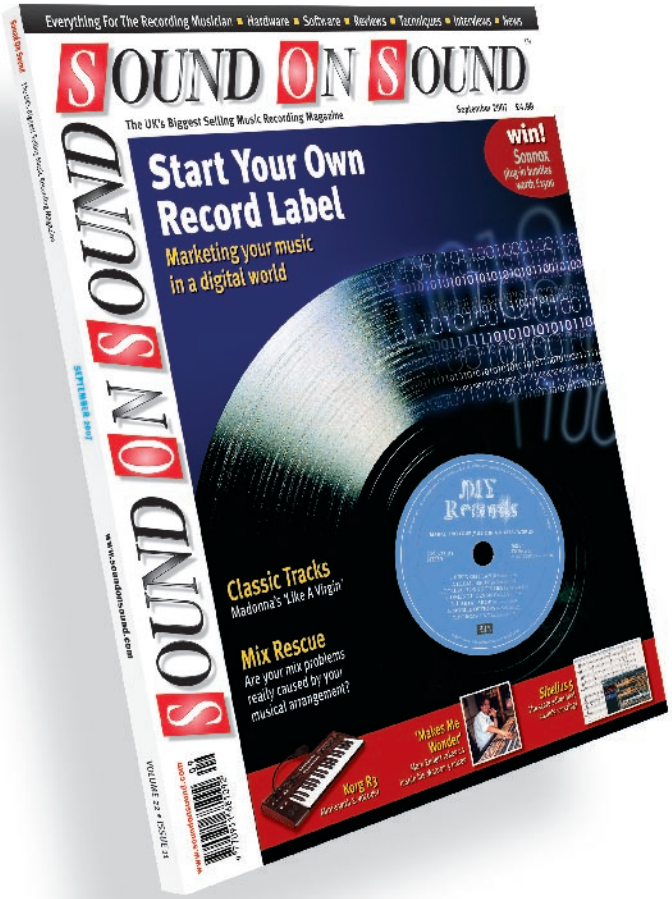

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