Berkeley Audio Design Alpha USB Review

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- The Berkeley Audio Design® Alpha USB® converter was one of the most highly anticipated computer audio products of 2011. Fueling the anticipation were several delays during development and initial production. Many computer audiophiles wondered what Berkeley Audio Design was doing since early 2010 when rumors of the product started circulating. During that time the perfectionists at Berkeley Audio Design fine tuned the Alpha USB using unique design approaches, the best measuring techniques available, and extensive listening sessions. Shortly before production began Berkeley Audio Design rejected critical components from suppliers for quality unbecoming of a true reference converter. Following many months of research and development 'Berkeley' wasn't about to rush the Alpha USB to market. Fortunately good things come to those who wait. Sonically the Alpha USB is extremely impressive. After four months using the Alpha USB, in combination with the Alpha DAC® Series 2, I'm continually astonished by its level of performance. In fact, the Alpha USB is so good I've yet to hear a better digital interface. Period.

The Alpha USB Interface

The Alpha USB from Berkeley Audio Design is an external asynchronous USB to AES or S/PDIF interface. It's strictly a D to D converter accepting USB digital audio input and delivering AES or S/PDIF digital audio output. Because humans can't hear digital signals a Digital to Analog Converter (DAC) is also required to reproduce music in one's home. A simple audio playback flow chart consists of a PC -> Alpha USB -> DAC -> Preamplifier -> Amplifier -> Speakers. Such an interface can play a critical role in presenting the cleanest audio signal to a DAC or may be necessary in order to use a DAC without a next generation interface such as USB or FireWire. Plenty of wonderful DACs without USB or FireWire interfaces are as good or better than new DACs with interfaces for every source imaginable. When users find a sound they like there is no need to change. Fortunately these users can add a device like the Alpha USB to extend the life of their already great digital to analog converter.

There are a couple competing schools of thought when it comes to the best place for a USB interface. Just as in everyday life, there is no free lunch with either design approach. One school advocates for the USB interface to exist within the digital to analog converter. This allows the DAC chip to receive data using its native I^2S protocol. In theory this design is capable of lower jitter if implemented without an intermediate conversion to S/PDIF before I^2S. This USB implementation can also incorporate such methods as opto-isolators and grounding to isolate an internal USB interface from the sensitive DAC circuitry. The other school of thought insists USB interfaces must be completely separate from the chassis of the DAC. Physical separation allows for an otherwise unobtainable level of isolation between the noisy computing environment and the delicate digital audio environment. This isolation eliminates any direct

electrical connection to the DAC's chassis and is required to reach the highest levels of USB audio performance according to proponents of the separate chassis design. In addition these proponents believe the benefits of a direct I^2S data path are not worth the tradeoffs of reduced isolation and increased noise from a single chassis design. Needless to say Berkeley Audio Design believes strongly in separating the USB interface from the chassis of the DAC.

No matter what USB interface school of thought is most appealing one mustn't hyper focus on this single element of component design. Each design element or internal part selection only equates to a certain level of potential. Reaching that potential is what separates the armchair engineers and the component assemblers from the truly brilliant designers. The bottom line is not about numbers and theories. It's about the component as a whole being much more than the sum of its parts and the sound it helps reproduce in one's audio system.

Separating The Alpha USB From The Pack

The Alpha USB's retail price of $1,895 is the most readily visible item that distinguishes it from much of the competition. This interface is expensive and that fact is not lost on Berkeley Audio Design. The company is intent on producing products with great value. As such the wholesale margin on the Alpha USB is lower than the Alpha DAC which is already one of the lowest in the industry. Berkeley Audio Design is a humble, down to Earth company. Trust me these guys won't be retiring to a private island with the spoils collected from Alpha USB and Alpha DAC sales. The fact remains that it's expensive to build components that achieve the highest levels of performance. The Alpha USB is no exception.

The Alpha USB is all about clocking and isolation. This sounds fairly straight forward at first blush. Upon closer inspection and research it appears the Alpha USB is in a class all by itself. The Alpha USB employs clocking components that weren't available prior to its development and isolation techniques that may be unique in all of high end audio. Now comes the part where I, and every journalist, grow frustrated. Because of the highly competitive nature of consumer electronics and the value placed on intellectual property, manufacturers are unwilling to divulge too many technical details in public. This is a fact of life. Fortunately consumers have the option of listening to the end product to decide if any of the public or private details really matter. In my conversations with Berkeley Audio Design's Michael Ritter I was able to glean some details worth noting.

Design work on the Alpha USB began in 2009. At that time the clocking components used in the final production version of the Alpha USB weren't available. Berkeley Audio Design knew it wanted to use dual fixed crystal oscillators that performed to a certain level not seen in any digital audio interface product. Thus, 'Berkeley' was involved in co-developing new oscillators not yet commercially available. New computer audiophiles should understand that crystal oscillators are used to generate the clock signals for 44.1, 88.2, 176.4 kHz and 48, 96, 192 kHz audio. These components are critical to accurate sound reproduction. The entire Alpha USB development process was fraught with delays and less than desirable results. After rejecting early components from the vendor, "Everything just came together." said Michael Ritter. The final production version of the Alpha USB contains dual fixed oscillators. One for each sample rate family of 44.1, 88.2, 176.4 kHz and 48, 96, 192 kHz. Only a single oscillator is operational at a time. Even very good low jitter oscillators can produce relatively high levels of low frequency phase noise. Not so inside the Alpha USB. I was unable to obtain actual numbers for these specific oscillators, but I talked to an engineer from a competing high end audio company who was familiar with the products in use by Berkeley Audio Design. He stated a couple times that the low phase noise from these oscillators was unique and remarkable.

Adding to the Alpha USB's excellent clocking is the use of Streamlength™ asynchronous USB code in conjunction with the XMOS USB receiving chip. Small companies such as Berkeley Audio Design need to leverage design talent. In this case there was no reason to reinvent the wheel. The Streamlength code was selected because it was already well developed and was very robust. Streamlength asynchronous USB code controls the data flow from the computer or music server and the newly developed crystal

oscillators take control as the master clock generators. No matter what one believes about the importance, or lack thereof, of asynchronous USB and its oscillator design "requirements" it would be hard to second guess the Alpha USB's design approach.

The Alpha USB's non-standard 2.3”H X 10.5”W x 5”D dimensions (2.55”H including feet) serve one purpose: function. According to Berkeley Audio Design the Alpha USB's unprecedented level of isolation can't be accomplished in a smaller chassis. "The unit is the size it has to be" says Michael Ritter. Mr. Ritter explained that the unique isolation techniques used in the Alpha USB are very difficult to implement and theorized that this difficulty is a major reason nobody else in high end audio has gone to this level. I gathered that many isolation design choices are like a balloon in that pushing in on one side causes the opposite side to stick out. Reduce the measured numbers in one area and increase the numbers in another as a result. All engineers have dealt with similar phenomena in other design endeavors. Michael Ritter hinted that tracing secondary and tertiary coupling paths in addition to minimizing capacitive coupling by surrounding the USB input connector with an inch of plastic were just a few of the isolation elements addressed. The inch of plastic on the rear of the chassis is one item I noticed as being unaesthetic the first time I saw the Alpha USB. It's good to know the Alpha USB's form entirely follows function and there's a good reason for every design decision.

Another major contributing factor to isolation is how the USB interface is powered. Berkeley Audio Design elected to power the USB receiving chip in the Alpha USB via USB bus power from the computer. Power emanating from the computer's USB port doesn't traverse any further than the USB receiving chip inside the Alpha USB. 'Berkeley' uses its proprietary isolation techniques that are said to provide much better performance than traditional opto-isolation methods while keeping computer generated noise away from the sensitive output clocking and driver circuitry. Powering the audio output side of the Alpha USB is a low noise linear power supply. This noise filtered linear supply feeds clean power to the oscillators and the digital audio output circuitry.

On the rear of the Alpha USB are two outputs; balanced AES (XLR) and coaxial S/PDIF (BNC), and an output selection switch. Many devices with more than one digital output keep all the outputs live continuously no matter what output is in use. According to Berkeley Audio Design the highest levels of performance simply cannot be reached without deactivating the unused output(s). Thus, the reason for the Alpha USB output selection switch. The user must toggle either the balanced AES or the coaxial S/PDIF output on/off.

Berkeley Audio Design strongly recommends using the balanced AES output of the Alpha USB when possible. In theory a true coaxial 75 ohm S/PDIF connection is better, all things being equal. However, all things are not equal in practice. Given that balanced AES does not use true 110 ohm connectors I inquired into this recommendation a bit further. The answer I received from Michael Ritter was mainly voltage, and some noise rejection. Even though S/PDIF when implemented with 75 ohm BNC connectors is a true 75 ohm coaxial connection its limitation is that it delivers .5 volts peak to peak. Balanced AES on the other hand benefits from a 2 to 7 volt signal amplitude. In fact the Alpha USB's AES output delivers 4 volts or eight times the signal level of the S/PDIF output. This higher voltage is key to maximizing data receiver performance and reducing effective jitter. The balanced AES connection also offers common mode noise rejection. In addition to recommending the balanced AES output Berkeley Audio Design also recommends using a 1.5 meter AES cable and USB cable when possible. This recommendation has everything to do with reflected versus original digital signal energy caused by return loss. A cable and its connectors is not a perfect transmission line as it suffers from reflected energy. When a 1.5 meter cable, 3 meters round trip internally, is used this reflected energy is delayed enough to minimize confusion with the original signal at the data receiver. These may be small or insignificant details to some, but are important and critical details for those seeking the highest level audio reproduction.

All of the aforementioned design elements including oscillators, isolation, asynchronous USB transfer mode, USB bus power, and linear power are only equivalent to potential. Data sheets and application notes for each internal component contain nothing for designers seeking to push the boundaries of what's possible. A brilliant engineer and a holistic design approach are required to master the interaction

between all the potentially excellent internal components. All of this must come together to produce an excellent product such as the Alpha USB.

Where The Rubber Meets The Road

After all design and engineering is complete any product can still be a colossal failure if the sound quality doesn't meet expectations. The Alpha USB is far from a failure. Its unprecedented design is commensurate with its astounding sound quality. The Alpha USB has opened the door to use almost any DAC with any computer or music server source. The old formula of using a Lynx AES16 audio card in a desktop computer to feed an AES signal to my Alpha DAC now seems antiquated and mid-fi at best. The Alpha USB works flawlessly with desktops and laptops running Windows, OS X, and Linux. It also works perfectly in combination with the Aurender S10 and SOtM sMS-1000 Music Servers. All sample rates from 44.1 kHz through 192 kHz are supported on all platforms. Because Windows does not support Class 2 audio, users are required to install the supplied device driver for proper operation. The driver in use today is the same driver I received when the unit was first delivered to my house. This is a good sign that the driver is stable and developed by people who know what they are doing. The same can't be said for all USB device drivers used in other products.

The Alpha USB paired with the Alpha DAC Series 2 is possibly the best digital I've heard in my listening room. At the time of this writing the Alpha USB alone is the best external audio interface I've heard anywhere bar none. During the extended four month review period I used the Alpha USB with numerous sources and DACs from many different manufacturers. The standard AES and S/PDIF digital outputs on the Alpha USB make it compatible with almost any DAC. Even the BNC output can be connected to a coaxial RCA input through the use of an adapter. I compared the Alpha USB to a few different D to D converters I had on hand between November 2011 and early March 2012. Most of the compared interfaces were fairly inexpensive ranging from around $200 to $500 with one interface retailing for near $1,000. The results were unambiguous. Only the $1,000 interface came close to the performance of the Alpha USB. However, close isn't good enough for those of us seeking the ultimate interface.

The Alpha USB provided an immaculate digital audio stream to my Alpha DAC Series 2. The result was incredible detail and extremely controlled bass. This was very evident listening to both Ray LaMontagne's Are We Really Through [Link] and the Kansas City Symphony's performance of Passacaglia at 24 bit / 176.4 kHz [Link]. The detail I heard in Ray LaMontagne's voice made me giggle. When something is so good I tend to respond in abnormal ways. I was almost in disbelief because of the incredible breathy detail. Changing styles with the Kansas City Symphony I was again thrilled by what I heard. I've used Passacaglia (track #6) many times to evaluate components and I've never heard more detail or better controlled bass from my system. The entire 7:16 track is full of low level detail and wonderfully powerful bass. Less patient readers may want to jump ahead to the 4 minute and 25 second mark for a minute and a half of serious dynamics that will test the quality of any component. Don't get me wrong, this is not an audiophile demonstration disc. I simply love this recording more every time I listen.

Over the course of four months I listened to a fair bit of music. A few recordings played through the Alpha

USB really grabbed my attention. Ottmar Liebert's One Guitar at 24 bit / 96 kHz [Link] can really demonstrate the sound of an unamplified acoustic guitar. If I were a guitar player I'm sure I could identify the strings and model of guitar he used on this album simply by listening. Near the end of the review period I started listening to the newly released Leonard Cohen album Old Ideas [Link] and a Blu-ray rip of Leonard's Songs From The Road at 24 bit / 96 kHz [Link] (both albums Mastered by Doug Sax and Robert Hadley at The Mastering Lab). Leonard's 77 year old baritone has wonderful texture on both albums but more so on Old Ideas. Using the Alpha USB this texture was palpable. The tones of his voice and the bass guitar weren't smeared in the least as can happen with less refined digital interfaces. I felt like Leonard was singing / talking right in my ear. Either that or the microphone used to record him was placed directly in front of his larynx.

Conclusion

Slow and steady wins the race and good things come to those who wait. Alpha USB design work started in 2009, before some components used in the final product existed. Production units began shipping in September 2011. The many months in between were filled with more R&D than many high end audio products. During this time Berkeley Audio Design participated in development of highly accurate oscillators with incredibly low phase noise. In addition 'Berkeley' mastered the balancing act required when using the unprecedented methods of isolation found in the Alpha USB. All of this isolation, clocking accuracy, and low noise design means nothing without proportional sonic performance. Fortunately the Alpha USB was well worth the wait. As it stands now I know of no better digital interface converter. The sonic purity heard through the Alpha USB is something to behold. In fact there is no way I'm giving up the review sample. This level of design and sound quality comes at a price above that which most people are willing to spend. Audiophiles prepared to part with $1,895 will no doubt be delighted with the Alpha USB connected to any source or any DAC. The Alpha USB has solidified my view that a reference level digital interface will play a critical role in achieving all that computer audio can deliver.

Product Information:

- Product - Berkeley Audio Design Alpha USB
- Price - $1,895 (black only)
- Product Page - Link
- Where To Buy - For U.S. Customers | For International Customers
- User Guide - Link (PDF)
- Data Sheet - Link (PDF)

Associated Equipment:

- Source: Aurender S10, C.A.P.S. v2.0 Server, MacBook Pro, SOtM sMS-1000

- DAC: Berkeley Audio Design Alpha DAC Series 2 , *dCS* Debussy
- Preamp: Spectral Audio DMC-30SS Series 2
- Amplifier: Spectral Audio DMA-260
- Loudspeakers: TAD Labs CR1 Compact Reference
- Remote Control Software: Aurender iPad App , JRemote, MPaD
- Remote Control Hardware: iPhone 4, iPad
- Playback Software Windows 7: J River Media Center 17
- Playback Software: Mac OS X 10.7.x, Pure Music
- Cables: Spectral Audio MH-770 Ultralinear CVTerminator Series II Loudspeaker Cable , Spectral Audio MI-350 Ultralinear CVTerminator Series II Analog Interconnects (RCA), Mogami W3173 Heavy Duty AES 110 ?, MIT Oracle ZIII Power Cables, Wire World Silver Starlight USB Cable , AudioQuest Diamond USB Cable, Kimber Kable B Bus Ag USB Cable , WireWorld Ultraviolet 5 S/PDIF Coax Cable (BNC), Baaske MI-1005 Ethernet Isolator, Micro Connectors Augmented Cat6A Ethernet Cable