

MASTER FIDELITY NADAB D DAC AND C CLOCK

# The D/A converter that



# doesn't want to be a DAC

DACs, or rather digital to analog converters, are available in abundance. You can get them for a few hundred euros, rising to astronomically high amounts that can easily exceed a hundred thousand euros. Although it initially appears to be purely applied science and physics, manufacturing a good DAC turns out to be quite difficult. Completely unknown to many at first glance, Canadian Master Fidelity wants to take over the world leadership in the field of DACs with the two products discussed in this test. Fortunately, this is not an empty slogan and this extremely driven "new" company with an enormous amount of experience, which will be discussed later, has a very well-founded explanation as to why they ultimately succeeded.



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To put this test in the right context, it is necessary to go back to the very beginning. A search that eventually led to the ultimate in digital music reproduction and that started a long time ago with the Swiss designer Dominique Brulhart. A man with a great track record, who was present at the birth of digital audio. This arose mainly because Dominique joined Merging Technologies, which is well-known among professional studio users, 33 years ago. He subsequently worked on the creation of the famous Pyramix workstation and later worked on the associated Horus and Hapi (son of Horus from Egyptian mythology) interfaces. On the other side of the world, recording engineer Weishen Xu, who comes from China and now lives in Canada, started working in the recording community in the early 1980s. A period in which he still used analog tape recorders such as the Studer A80 and Ampex ATR102. But when the transition to digital audio began not long after, Weishen quickly realized that, while digital offered great convenience, the subjective sound quality could not match that of analog tape recorders. Unfortunately, you cannot turn back time and the path of digitalization was simply the future. Weishen also encountered the Merging product line as a professional and that explains how the contact with Dominique arose. The Canadian branch of the company was baptized Merging Fidelity.

### Consumer product line

Due to the continued success of the professional Merging products, there was increasing demand for the same quality, but tailored for home use.

This turned out to be the start of the MERGING NADAC concept. A mini product line, consisting of the network-ready MERGING+NADAC DAC, the Roon-oriented MERGING+PLAYER streamer, the MERGING+POWER power supply and finally the MERGING+CLOCK low phase noise master clock unit. (<https://hifi.nl/artikelen/25512/Review-Merging-Technologies-NADAC.html>) Merging Fidelity, mentioned in the previous paragraph, was responsible for the design of this trio, which quickly became so successful that it became the Canadian branch of MERGING NADAC. Yet at some point a division emerged when Sennheiser took over Merging Technologies a few years ago. A situation in which the German company felt that Merging should fully focus on the professional studio market again. And what about the beautiful NADAC consumer product series? The Canadian Merging Fidelity didn't think twice and, after careful consultation with Sennheiser, not only managed to "save" the existing consumer ideas, but also completely redesigned it according to its own insights, both technologically and in terms of styling. Although the name Merging was no longer allowed, the NADAC family name was retained, and "Master Fidelity" was chosen as the new brand name. But how do you get real analog qualities from a digital DAC?

### Why 1 bit?

To understand this, we must go back to 1988. The year in which Philips introduced the famous TDA1547 chip with 1-bit technology. This chip has also been cherished for a long time in

the years that followed because of its exceptional qualities, including unprecedented, good linearity for that time. A feature that characterizes 1-bit technology, together with the very high sample rate (which results in greater accuracy of reproduction of audio signals). Other advantages of the 1-bit principle are that a technique called noise shaping is used. This shifts the quantization noise beyond the audible range, resulting in a lower noise floor in the audio output. A further advantage is that the architecture of 1-bit DACs is simpler than that of multi-bit DACs. This leads to fewer distortion artifacts, with the linear nature of the output signal helping to maintain fidelity. A final item concerns the dynamic range. 1-bit DACs can offer a greater dynamic range than other principles. This allows both very soft and very loud sounds to be accurately reproduced without clipping or causing other artifacts. In short, it was completely logical for the Master Fidelity design team to make maximum use of the most modern 1-bit technology for the new NADAC D.

### Technological struggle

But that also opens Pandora's technological box. Because to apply this so purely without any compromise, the team faced numerous technological challenges. This starts with the fact that a 1-bit sample, unlike multibit, is only able to realize two values. Non-linear operations such as adjusting the volume, equalization, etc. can quickly cause distortion or malfunctions. Ultimately, and that is a small miracle, they managed to turn it into a beautiful sounding DAC, although one last small restriction remains. It has almost





been eliminated, but unlike multibit DACs, with this 1-bit DAC you will still hear a soft pop through the speakers when starting and stopping each individual song, because the interruption of the bitstream cannot be immediately faded out without conversion to PCM. This is the price that must be paid if you go that far in realizing such a principle to the maximum extent. However, Master Fidelity continues to strive for improvement and there now appears to be a permanent solution for this last drawback. This will soon be implemented in the upcoming firmware upgrade.

#### **NADAC D**

However, the 1-bit story is still not entirely complete, because the implementation can be divided into two groups. The first concerns mainstream HiFi decoders that we can divide into two types of technologies: the first is the direct use of commercially available DAC ICs. These are digital-to-analog audio converter chips that come from major manufacturers such as AKM, ESS and CS. The second option is less often used and here self-programmable FPGA/CPLD circuits with discrete components are used. Although the former product group has good performance,

it cannot be exceptional and ultimate, which is explained by the limitations in cost and semiconductor technology. Furthermore, there must be a balance between performance and costs because this ensures that the end-product remains attractive to a wide audience. For the second group, the discrete component FPGA/CPLD scheme often allows the use of high-performance, high-density logic chips without considering cost. However, conversion to analog signals requires lower density, but higher performance circuits suitable for audio applications. The problem is that companies making these types of ICs won't develop "discrete chips" specifically for the HiFi industry, so we'll still end up running into the same limitations as the previous solution.

#### **The Master Fidelity solution**

The Native Sound True 1-bit DAC in the NADAC D DAC (43.5 cm wide, 9.5 cm high, 39 cm deep and 9.2 kilos heavy) overcomes this limitation, according to manufacturer Master Fidelity. This is because they say they have opted for a truly pure 1-bit solution. In itself very nice and close to the theoretical ideal, but the problem is that this solution is highly dependent on hardware performance. This

includes the quality of the clock, the power supply and the high-quality components involved. Therefore, as the ultimate uncompromising step, the team chose to have some professional





IC manufacturers create Audiophile Grade components. This is commendable but has increased the costs so much that I have been informed that there is a strong possibility that the investment amount will never be recovered. Yes, that probably leaves you a bit speechless, just like me. The reason to do it anyway, is pure passion. Weishen Xu sees this DAC as his life's work and the most beautiful thing he can leave behind to the music-loving community!

**Volume control**

Just like the entire NADAC concept, the volume control is also special. This has to do with the fact that an analog circuit is used. A control consisting of a digitally controlled circuit with 20 volume steps of 3dB.

Although these can be seen as rough steps, they also turn out to be super uncompromising. Because behind these 20 jumps there are also 20 relays with related active control circuits. This is not only expensive to manufacture, but also takes up a lot of space. By comparison, the volume control of a multibit PCM/DSD DAC is typically implemented with only one standard IC. That is a much simpler path and often includes many smaller steps. But it is also significantly less good aurally and any loss of quality is intolerable for the Master Fidelity team. To achieve an accuracy of  $\pm 1\text{dB}$  with the NADAC D, 60 relays and associated active control circuits would be required. An aim that was not yet feasible at the time this test was written and entails challenges in

terms of size and costs. But the latest news is that the company plans to develop a preamplifier to match the NADAC D and control the volume with an accuracy of  $\pm 0.5\text{dB}$ . Digitally controlled analog circuits containing no fewer than 120 relays are used! But that is not yet the case and in conclusion, despite its different technology, the NADAC D is primarily a widely applicable D/A converter. In addition to unbalanced analog RCA outputs, there is of course also a balanced (XLR) pair. In terms of digital inputs, in addition to USB, there are also Toslink, coaxial S/PDIF and AES/EBU on board. As a legacy of the original NADAC back then from Merging Technologies, the Master Fidelity NADAC D offers an optional RAVENNA network audio



expansion slot, allowing this DAC to be integrated into existing RAVENNA or AES67 networks.

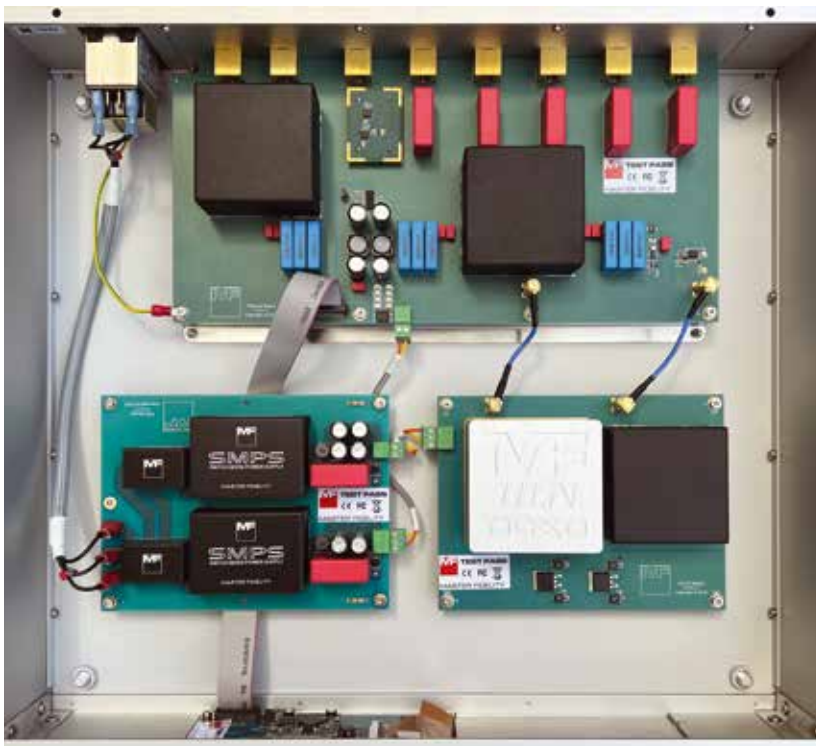
### NADAC C

Because the pure 1-bit architecture of the NADAC D DAC is extremely sensitive to clock jitter, it was literally a given that the NADAC clock should provide the best possible jitter suppression of basically anything else on the market. Within digital audio circuitry, clock jitter performance varies not only due to the different quality of a digital device, but also due to the accumulation of quality differences in multiple digital devices in the system. Clock jitter has a negative impact on subjective listening experiences, such as relatively vague imaging, less obvious looseness and reduced power in the low frequency range. There may also be a lack of transparency in certain cases. An observation that many audio enthusiasts have probably experienced more than once. The most common engineering methods are to improve the clock synchronization performance of each device itself (such as phase-coupled loops or crystal oscillators) or to develop an independent synchronization reference device called a master clock. Today, the master clock is a standard configuration in a Hi-End

system playing digital audio sources. Having a master clock in their own system has also been a dream of many audio enthusiasts for years.

### The NADAC solution

The crystal oscillator core of the NADAC C (43.5 cm wide, 9.5 cm high, 39 cm deep and 9.2 kilos heavy) is based on a very stable SC-cut crystal. This is pre-aged and screened for up to 120 days before being assembled into a crystal oscillator. After assembly of the crystal oscillator, a long-term aging test is performed to ensure that the quality of the final installed crystal oscillator meets the standards required by Master Fidelity. The peripheral components, such as resistors and capacitors, are models for high-performance pulse applications and serve to ensure the perfect transmission of the 10 MHz synchronization signal. In the NADAC C, in addition to the use of a constant temperature system in the crystal oscillator itself, the power source of the clock signal distribution circuit is also provided with a power system with an ultra-low interference floor. Everything is aimed at guaranteeing the purity of the 10 MHz signal even after distribution. Both low and high frequency.



### Special output

The NADAC C also has a 625 kHz clock output port, specifically designed to provide an external sync source for audio devices that use a 625 kHz clock (such as the previous NADAC). In short, this clock not only has excellent properties of the crystal oscillator itself, but also high-quality transmission characteristics thanks to its overall design. For this reason, this clock with its five 10 MHz clock outputs can ensure that the sync signal sent to every digital device in the system is of the highest possible quality.

### Preparations

Due to the different way of thinking and the revolutionary design, the preparation of this test also takes more effort than normal. That starts with collecting the best possible streamers, including the Synergistic Research Voodoo, Aurender N30SA and Euphony Summus 4C (which is also used by Master Fidelity itself at the NADAC). These were then connected with the best possible digital and analog audio cables from Siltech (Royal Crown series), Crystal Cable (Monet series) and Audio-Quest (Dragon). A row of beautifully high-resolution and natural-sounding integrated amplifiers such as the Souldution 331, CH Precision I1, Daniel Hertz Maria 350 and Zanden 6000 provided the amplification. After which, finally, speakers such as the YG Carmel 3, Sigma Acoustics Ouverture 20th Anniversary, Boenicke W8 SE+ and Master Contemporary C provided the final tangible sound.

### First meeting

And there they are, two in my opinion truly beautifully designed devices with an appearance and pride of ownership that I have never encountered before with DACs and external clocks. It is a special cross-pollination that integrates the former professional Merging products and understated high-end appearance into one style. In addition to the rock-solid housing made of thick blank aluminum panels, in which the Master Fidelity logo and the type name are milled on the front, **NEXT**

the large and particularly sharp and colorful display on both devices immediately demands attention. It turns out to be a so-called MIPI display architecture and that is another name for a display type that is mainly used in smartphones! I have never seen this before in an audio design and that is quite strange. Especially because the benefits are countless. Because the image is not only beautifully colorful and razor-sharp, but it also cannot burn in and even better, works as a touch screen, just like in our smartphone and tablet. So apart from the physical on/off switch on the back, you can control everything else with this touchscreen. The only other additional functionality can be found on the front of the NADAC D (DAC) and it concerns one 4.4 mm mini jack plug for balanced control of headphones, and another 6.35 mm one for unbalanced control. Finally, an infrared eye for the accompanying metal remote control rounds off the front. It is also worth mentioning that the maximum resolution can only be used with the RAVENNA protocol and the USB input. In PCM this is 32-bit 384 kHz and in DSD it is 512. If you want to use AES, S/PDIF or Toslink, the maximum format is 24-bit 192 kHz in PCM and DSD 64.

**Bert van der Wolf -  
Oude Avenhuis**

New test products, especially at this high price level, usually require quite a long period of acclimatization and listening after delivery. Because esthetics define the performance, how do the devices sound their best, which streamer fits best, which cables provide maximum synergy

and so on. The NADAC set does not appear to be difficult or too fussy but does let you know immediately when the performance level of the chain increases. The most difficult thing is that with these types of products you eventually reach a higher level than you are used to. On the one hand, this is why I started doing this work, but it also creates an unpredictability because you don't know what else might ultimately be possible. Fortunately, I received a lot of support from distributor, recording engineer and producer Bert van der Wolf of the Edison Production Company. With his production company and trade name The Spirit of Turtle, Bert has been responsible for a huge series of extremely natural-sounding recordings in the fields of pop (a little), jazz (a bit more) and classical (a lot) for many years. The big difference with many other producers is that he not only records everything in multi-channel playback, but that his listening room is really packed with real high-end audio speakers and amplifiers in a completely free setup. He is also stubborn in his recordings and uses a microphone setup that he completely invented himself. Finally, it is worth mentioning that Bert has carried out evaluation work for world-renowned digital companies such as dCS and Merging since the early years and is also active at Master Fidelity in further perfecting new and existing products.

**Listen**

Although I have of course also tried the Master Fidelity NADAC D without the accompanying NADAC C clock in the weeks that I have had the combi-

nation, this does not detract from the special performance, because the first thing I experience with the properly warmed-up combination (please only allow 3 days for the clock to perform at its maximum level) is a completely new signature. I am already used to a high DAC level with the (much less expensive) Mola Mola Tambaqui and in the near past I have regularly visited top DACs from, among others: Ideon, dCS, MSB, Esoteric, CH-Precision and Soulution. Without detracting from all these wonderful brands and products, the Master Fidelity duo appears to add three new parameters. These are 1.) obviousness, 2.) continuity and 3.) bass reproduction. You should see it as such, that the sound is immediately complete. But isn't that the case with every DAC? No, not so much, because the two NADAC components present music with the spontaneity and naturalness that I normally only experience with the best analog sources. Everything plays as if it doesn't require the slightest effort. And not only with simple music with just a few voices or instruments, but also with the most complete works. Stress is therefore completely foreign to these components. Even more striking is the degree of continuity and once again I end up with beautiful analog sources. It is not that you literally hear that digital reproduction quickly "chops" the music stream into many small pieces, but as soon as you hear the same music over this digital combination, you are almost floored by the experience that music comes across as one holistic entity. Once again, a feature that analog manages like no other. A continuous flow of musical information.





### Influence NADAC C

The third striking parameter concerns the bass reproduction. I now know from many years of experience that this area is extremely difficult to get truly optimal with digital. Yes, of course, digital is less colored, more stable, more broadband and more effortless than analog at this part of the frequency range. But digital also has its problems and that has to do with the aspects of timbre, expression, definition, depth and effortlessness. Especially if there is low-frequency jitter in the spectrum, the bass can become thick, too full and somewhat distant. The timing is then affected, and the feet move with difficulty or not at all to the beat of the music. The use of the NADAC C proves to be extremely valuable here. Because while the NADAC D still manages to make beautiful music without an external clock, the already extraordinary level becomes even (much) better with the clock. This will make it even more obvious, continuity will benefit relatively little, but the low range will score enormously. Because what bizarre quality and relaxed expressiveness is on display here! The tricky thing here is that a clock of this extreme level (also in terms of price) always must stabilize for a while. This is indicated in the display of the clock and the warmup time shown actually matches what I audibly experience. Very nicely done and therefore meaningful.

### Streamer sensitivity

The fact that the DAC level is at the highest I have experienced at home to date (the difference sometimes does not seem that big until you

switch back) also comes to light in terms of the match and synergy with the streamers used. I still think the Grimm MU1 is a fantastic streamer for the price asked and it is not without reason that I have been using it as a personal reference/workhorse for four years now. But even with the up sampling of this MU1 turned off and connected using the best Siltech AES/EBU cable, there was still a mediocre match at best. This may be partly due to the fact that AES/EBU as standard cannot process more than 24-bit 192 kHz and that the studio master supplied by Bert contained DXD files (24 or 32 bit 352 kHz) that had to be downsampled in order to be played. Be that as it may, the other streamers present, which all have a USB connection, simply performed better here and combined sonically without any problems. Of course there were also noticeable sonic differences here, but they were all usable and at a certain point personal preferences and synergy of the whole chain also starts to play a role. But as a combination, the NADAC D and C know how to set new standards here in merging analog and digital within one innovative concept.

### Conclusion

My intro header talks about a D/A converter that doesn't want to be a DAC. Of course, a DAC is just a device and is not a living being. But damn, this text makes a lot of sense as far as I'm concerned. Because yes, this NADAC D is certainly a DAC and does and can do all the things that other DACs do. The big difference is the remarkably continuous and super self-explanatory perfor-

mance. Aspects that have been and still are analog's strengths to this day. Combine that with strong digital aspects such as tranquility, purity, freedom from distortion, "endless" dynamic contrasts and definition and you have a unique product. If you then add the NADAC C to that, we enter a new musical world where few even expensive DACs have ever existed. Is this now the world's best DAC? No, and it doesn't exist either. For the simple reason that subjectivity and the combinations in the set-up, always have a lot of influence. But what can be confirmed in any case is that as far as I am concerned, this is a new DAC category. Not so much a completely different sound or tonal balance, because that is not so much different from the other market leaders, but more about a naturalness and continuity in the reproduction that I have not experienced before with digital. This makes owner Weishen Xu's gift to the group of critical music lovers a fact and that is an incredibly impressive achievement. This duo is certainly precious, but has your own dream always been to unite the analog virtues with digital. Then these two devices could become very popular.

**Text:** Werner Ero

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along



### Master Fidelity Nadac-D & Nadac-C

“This technology will revive 40 years of acquired CD collections to an unprecedented quality level and show the full potential of high resolution content even more”



### The Spirit of Turtle

Fully endorses the groundbreaking “True 1-bit” technology of Master Fidelity

“For the first time, a DAC reveals the true potential of our recordings, as if listening directly to the microphone signal”

*Bert van der Wolf-Oude Avenhuis, the Spirit of Turtle*

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