
# the absolute sound

## BUYER'S GUIDE TO DIGITAL SOURCE COMPONENTS


FLOW


W20




# Contents



## Auralic Aries Mini

The Aries Mini offers advanced wireless streaming, including quad-rate DSD/DXD, a built-in DAC, plus effortless connectivity to a much broader market of consumers, not just audiophiles. The highly compact unit, with its built-in DAC and analog/digital outputs, shares most software and hardware functions with the original Aries—plus the addition of Bluetooth—at a fraction of the previous model's cost. Setup is uncomplicated, and with its built-in ESS Sabre DAC chip, analog and digital outputs, and optional 2.5" hard-drive slot (for the NAS averse), it represents a simple way of adding high-resolution music to a system, accessing one's own music library (for users of existing stereo and AV-receiver-based audio systems), or using it with high-quality powered speakers. The Aries Mini also comes with a free one-year subscription to Tidal HiFi's lossless music library of 35 million tracks, a $240 value. (U.S. and Canada only)

**Price: $549. auralic.com**

## Aurender N10

Designed to be used with high-performance digital-to-analog converters, the Aurender N10 is the only music player to support on-the-fly DSD-to-PCM on SPDIF and AES/EBU outputs with user-selectable choice of an 88.2 or 176.4 output sampling rate. You can thus play DSD files even if your DAC isn't capable of native DSD playback. With 4TB (2TB x 2) of internal hard disk drives and one 240GB solid-state drive cache for playback, the N10 is a great solution for even the most extensive high-resolution music collections. The Aurender N10 is equipped with various SPDIF outputs (BNC, AES/EBU, coaxial, optical) and one dedicated USB Audio Class 2.0 output. For network connectivity and file transfers, the N10 comes with a Gigabyte Ethernet port and two USB 2.0 data ports. Aurender's award-winning Conductor app turns an iPad or Android (Lite Version) into a versatile user interface for Aurender Music Server/Players and the Aurender app comes with extensive features to make managing, viewing, and playing high-resolution music collections—including Tidal—a breeze. Available in silver or black.

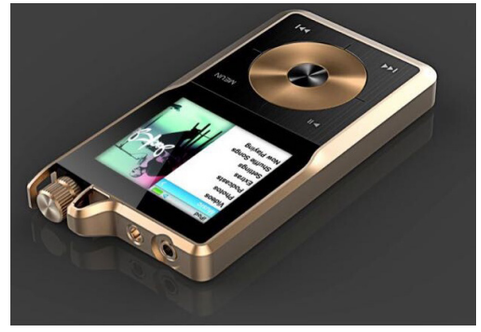
**Price: $7999. aurender.com**



## Simaudio Moon 780D

The Moon 780D is the company's most lifelike sounding and technologically advanced digital audio product to date. This achievement is realized through the use of a fully balanced differential dual-mono design using two DAC chips, each with 16 unique DAC circuits, that can decode virtually all digital audio formats (up to DSD quad and PCM 32-bit/384kHz). Amongst the various digital inputs is the MiND (Moon intelligent Network Device) network player that allows for DSD streaming over Ethernet, and access to the Tidal music service—a gateway to the largest online library of uncompressed music. There's connectivity for nine digital inputs include USB (for hi-res audio), AES/EBU, SPDIF, Optical, aptX Bluetooth, Ethernet, and Wi-Fi. Like all Evolution products, the 780D's chassis is made of aircraft-grade aluminum, with careful attention paid to minimizing vibrations.

**Price: $15,000. simaudio.com**



## Questyle Audio QP1 & QPR1

Questyle Audio's QP1 and QP1R up the ante for portable music servers with its patented Current Mode amplification technology incorporated into a built-in, high-end headphone amplifier. The player offers two Micro SD Card storage expansion slots that support up to 128GB each for a potential 256GB over the stock internal memory (16GB for the QP1 and 32GB for the QP1R). Both players are presented in elegant machined-aluminum and glass casings, available in champagne gold or space gray. With a simple and intuitive GUI interface the QP1 and QP1R offer high-resolution music on the go. Playing time is approximately 8-10 hours. Charge time is only about three hours with the 5V/2A adapter.

**Price: QP1, $599; QP1R, $899. questyleaudio.com**

# UNDERSTANDING DIGITAL MUSIC SYSTEMS

Table 2 (a more complete version of Table 2 is available on-line at theabsolutesound.com)

| | | |
|---|---|---|
| 3beez | Wax Box 2 Music Management System | player (direct) |
| Antipodes | DX Music Server | bridge (direct) |
| | DXe Music Server | bridge (direct) |
| | DS Music Server | player (direct) |
| Auralic | ARIES Wireless Streaming Bridge | bridge (network) |
| Auraliti | L1000 Music File Player | bridge (network) |
| | PK100 PCM and DSD File Player | bridge (network) |
| Aurender | S10 Music Player | bridge (combo) |
| | W20 Music Player | bridge (combo) |
| | X100S Music Player | bridge (combo) |
| | X100L Music Player | bridge (combo) |
| Ayon Audio | S-3 Network Player | player (network) |
| | S-5 Network Player | player (network) |
| | NW-T Network Transport | bridge (network) |
| Baetis Audio | Reference Media Server | bridge (combo) |
| | Reference NAS/Ripper | server (network) |
| | XR2 Media Server | bridge (combo) |
| Bryston | BDP-2 Digital Player | bridge (network) |
| Cambridge Audio | Stream Magic 6 v2 Upsampling Network Music Player & Preamplifier | player (network) |
| | Minx Xi Digital Music System | player (network) |
| | NP30 Network Music Player | player (network) |
| Cocktail Audio (Novatron) | X40 Music Server | player (network) |
| | X30 Music Server/Network Streamer | player (network) |
| | X12 Music Server/Network Streamer | player (network) |
| | X10 Music Server/Music Streamer | player (network) |
| Core Audio Technology | Kryptos SE Music Server | bridge (direct) |
| Cyrus | Lyric 05 All In One System | player (network) |
| | Lyric 09 All In One System | player (network) |
| DigiBit | Aria Music Server | bridge (combo) |
| Linn | Klimax Exackt DSM Network Music Player | player (network) |
| | Klimax DSM Network Music Player | player (network) |
| | Klimax DS Network Music Player | player (network) |
| Lumin | S1 Music Player | player (network) |

for products whose sole purpose is to play media from the Internet.

The naming scheme in Table 1 has elegant symmetries. They are also evident in the block diagram (Fig. 2). If there is a DAC, then the system is a player; otherwise it is a bridge. If samples come from the network, then we use the qualifier "network"; if they come from a directly-attached disk, then we use the qualifier "direct."

There is, alas, a small ambiguity in the naming scheme. A bridge has digital outputs; encapsulate it with a DAC and it becomes a player. Does the player still have digital outputs? If you look through Table 2, you will see that almost every player does still have digital outputs, but there are exceptions. If this issue is important to you, check the specifications.

## The Terminology Data

The full version of Table 2 (available on TAS's website) summarizes the salient features of every digital music system I could find. In the print version to the left, I've listed 36 manufacturers (and 79 products) in alphabetical order, even though doing so suspiciously places my company first. The table demonstrates that the proposed terminology is necessary and sufficient: Every product category has at least a few products assigned and every product has a suitable assignment. There are 28 products that already use the correct term in the product name, so the proposed terminology is well short of radical.

Extensive research went into the preparation of Table 2. Readers should appreciate that manufacturers rarely publish all the specifications I sought. Indeed, there were times when the specifications were so elusive that they seemed to have been intentionally hidden. Sometimes they were buried in user manuals. Sometimes I found them in product reviews. Despite my efforts, I would not be surprised to learn that I did not get everything right. Before hurling brickbats, manufacturers who find an error should ask themselves whether their websites present information as clearly as they could. For any bona fide mistakes, I apologize. I do have an ax to grind, but I am not grinding it in this article.

## One More Term

I wasn't sure what to name this article because we don't even have a good term for the product category. Many people use "computer audio." The products that we are discussing are basically computers, but I feel that the term "computer audio" triggers inappropriate associations with desktop or laptop systems. Prior to the advent of computer-based systems purpose-built for audio, "computer audio" actually did refer to computers with keyboard and monitor attached. Sometimes it still does: Some audiophiles use a desktop system or laptop in their audio system; some computer users—especially gamers—have computer systems with surround sound and a subwoofer. Does it make sense to extend the term now to products that look and feel like audio products? Computers are present in other audio products—portable media players, portable digital recorders, and even CD players—that are not called computer audio. I find the term atavistic.

I thought "digital music system" was a better choice. "Music systems" are what we listen to at home, so I figured that we are talking about a digital one of those. Well, no. That term is not quite right either. "Music system" is the whole of many components that we use to play music, most of which are analog. We want to refer only to the part that is digital. "Digital music system" is too encompassing, but "digital music *sub*system" is abominable.

One other possibility is the name that I use for the product that my company manufacturers: "music management system." The product makes music; it manages the music by storing it, cataloging it, and playing it; and it is a complete system. I like that term


# Aurender Flow

## Desktop Delight

**Steven Stone**

**When I first laid eyes on the Aurender Flow, I didn't get it. Taken from its form-fitting leather case it looked like another portable player, albeit big and sorta on the heavy side. It also looked 90s-ish with a big ol' center knob, a wiggly curve to its chassis resembling a logo for a hydro-spa, and one lone single-ended headphone output. Paging Forrest Gump: We got your portable player, right here. But I was completely wrong.**

**First, let me make one thing perfectly clear, the Aurender Flow is not a portable player. It is, in fact, a DAC and headphone amplifier capable of being used as a preamplifier and external drive (if a drive is installed in it), that makes it ideally suited for nearfield high-performance desktop use. That large knob I mocked earlier...well, its size and feel make it one of the most accommodating volume knobs I've ever had the occasion to fondle while hunting for that ideal SPL.**

### Tech Tour

With its footprint measuring only approximately 5 1/2" by 3" by 1", Aurender packs a lot of technology into the Flow's one-pound chassis. The DAC uses an XMOS USB interface and Sabre ESS9018K2M chips, and has its own internal 4450mAh battery power supply. The Flow can handle any digital data stream up to 384/32 PCM and 128x DSD via USB and 192/24 PCM via its TosLink input. Although the Flow has only a single-ended 1/4" 'phone-jack output, it can be configured in several ways. It can be variable output in 0.5dB increments up to 2 volts or you can configure the Flow for fixed output at either 2 or 5 volts. No, that was not a typo—5 volts. Output impedance is only 0.06 ohms.

The first time I saw the Flow I was confused by its m-SATA drive capability. You can add a drive to the Flow, and most people would assume it is for storing music to be played on it. They would be correct, but unlike a portable player where you could access the drive on the go, the Flow's drive can only be used when it is connected to a computer. But using an Apple camera connection cable, one can also access the contents of an iPad or iPhone.

In function, this is similar to the Auralic 2000 DAC/headphone stand that I reviewed in Issue 246. It, too, had provisions for tethering a drive that could only be accessed while the Auralic was connected to a computer. The difference is that the Flow holds the drive internally while the Auralic uses external drives.

The Flow is the first USB DAC I've seen that is USB 3.0-compatible. If your computer only supports USB 2.0, no worries, the Flow has provisions within its menu for several different "host modes" optimized for various computer systems. The options include USB2, USB3, Mac, IOS, and Android.

The Flow also has user-selectable digital filters. For PCM it has, by default, a PCM1 filter (which is a slow roll-off, in-band filter), and a PCM2 (which is a minimum-phase PCM filter). DSD users have the option of moving the DSD cut-off filter from the default, DSD at 47.7kHz, to 50, 60, or even 70kHz. There are three charging options: CHG+ is constant charging mode; CHG- turns off the charger; and CHGA- configures the Flow for automatic charging whenever music is not playing.

### Setup and Ergonomics

Unless you intend always to use the Flow as a fixed-output device, its ideal location should be somewhere within arm's reach. Heck, even if you never intend to use its volume control, the Flow is much easier to operate when it's close to you, so you can see its display. Yes, the Flow has a display in the circular area inside its volume knob. Given the small area of this display, it is remarkably complete. Not only can you see the current volume level but also the USB mode, the current format being played, the battery condition, the output mode, and even whether a headphone is connected.

The Flow can be placed so it lays flat on its back (there are four small rubber bumpers to protect its rear surface), or you can lay it on its side so the control buttons are all located on the top. The only controls in addition to the large circular volume knob are along one side of the Flow. They consist of a power on/off, menu, move up, move down, and play buttons. The menu button has two modes, one for commonly changed settings and another push-and-hold mode for the settings that you will only need to alter occasionally.

Upon initial installation you are supposed to designate which kind of computer or smartphone the Flow will be connected to via the push-and-hold menu button. But if you're the kind of person who doesn't read the owner's manual cover-to-cover and assumes that if you're using a Mac, the Flow will be plug-and-play, the Flow *will* work, although I found performance to be better if you do set it up optimally for the device it is going to be tethered to. On a Mac, once designated, I found that the play, pause, move forward, and move backward buttons will operate iTunes as well as Aurdirvana+, Pure Vinyl, Pure Music, and Amarra Symphony. Keyboard and mouse controls also remained

# EQUIPMENT REVIEW - Aurender Flow

fully operable with all these apps.

The review sample of the Flow came with a 250GB mSATA drive mounted in it (it is sold *sans* drive, which is easily user-installable). My MacPro recognized the drive immediately and mounted it on the desktop. As with any mounted desktop drive, if you remove the drive without first unmounting (or ejecting) it, you will get an error message, and if you turn off or disconnect the Flow you get that same error message. This error warning gets old. Because a 250GB drive was too small for my entire music library (the Flow holds up to a 1TB mSATA drive) and I didn't need another set of back-ups, I turned the drive off via Flow's menu—after ascertaining that it could be written to and read from successfully.

Manufacturers of battery-powered devices will always face the dilemma of figuring out how and when they should be recharged. The Flow gives you the three options that I noted earlier. For optimal sound, I recommend turning off the recharging completely. When used as a preamp I could hear some low-level noise generated by the Flow's charging circuits even in the "charge only when not playing" mode. When attached to an analog preamplifier the noise levels were the lowest in fixed-output mode with charging turned off.

I used the Flow with a wide variety of earphones from highly sensitive in-ear monitors to my least efficient full-sized headphones, and I was pleasantly surprised that they all worked well. Even with the most sensitive Westone ES-5 there was only the very faintest bit of low-level hiss. At the other end of the efficiency spectrum, the Flow had more than enough power to drive Beyer Dynamic DT-990 600-ohm version well past *loud*. The Flow is the first headphone amplifier I've experienced that didn't need multiple gain settings to successfully accommodate a full range of headphone options.

One feature I've never given much thought to (but will in the future) is how a headphone amplifier interfaces with a new headphone. When you unplug and then plug in a new headphone, an amplifier can handle the new headphone in several ways: The amplifier can merely reproduce the previous volume settings. Or it can mute the output until the volume level is adjusted by hand, at which point the previous volume level manifests itself. Or it can mute the output and then reset the volume to maximum attenuation. After being blasted by more than my fair share of headphones, I much prefer the last method. Especially with the Flow's 0.5dB volume increments, matching levels when comparing two headphones—even allowing for the opportunity to linger over that wicked-cool volume knob—was rapid and repeatable, and I never had to worry about lowering the volume before installing a different pair of cans. A further nice ergonomic touch is that the Flow's display has an outer ring that shows you the volume level—when you remove a pair of earphones, you can watch the that volume ring drop, reassuringly, back to -90dB.


## Sound

In the short time it's been around, Aurender has already garnered a reputation for making excellent-sounding gear. The Flow should enhance its already sterling character. I used a wide variety of headphones with it and couldn't find a mismatch. Unlike some headphone amplifiers that favor a particular set of headphones or type of 'phone, the Flow was very much an equal opportunity amplifier; everything I threw at it worked fine and sounded good. Also, the Flow allowed each headphone to produce its own unique sound signature. Grado RS1s still presented a different soundstage and imaging characteristics than Mr. Speaker's Alpha Dogs.

Flow users have several PCM digital filter options that I mentioned earlier. Listening to Sia's "Chandelier" off Tidal, I liked the PCM2 filter better than the PCM1 default. PCM2 produced better decipherability of her phrase "can't feel anything" and more precise imaging on the background singers located hard left and hard right. Also in this mode, the intentionally added distortion bed was a hair less aggressive. In the past I've found that many PCM filters are more software than hardware dependent, and this was true with the Flow. Some music will benefit more from one PCM filter setting than another, so it's not a question of which filter is overall the "best," but rather, which one suits the music better. Too bad the Flow can't remember and employ whichever filter setting you find is preferable for a particular track, but as of now you still must change the filter settings manually via the menu.

I also used the Flow as a DAC/preamp by feeding its output to the analog input of the NuForce DAC-10H. Although it required using a 1/4" headphone-to-female RCA adapter and then a 1 meter length of interconnect (I

## SPECS & PRICING

Sample rates: Up to 192kHz via SPDIF; up to 384kHz, DSD128x via USB
Compatible bit depths: 16-24 (SPDIF), 16-32 (USB)
Internal storage: Up to 1TB total via mSATA bus
Output impedance: 0.06 ohm
Output power (0.1 percent THD): 43mW/600 ohms, 87mW/300 ohms, 384mW/56 ohms, 570mW/32 ohms
THD+N: -114dB
THD (1kHz, 5.1V RMS output): 0.0002 percent
Dynamic range: 122dB
Damping factor: >130
Power supply: 4450mAh Li-ion rechargeable battery
Dimensions: 3.1" x 5.4" x 1.1"
Weight: 1 lb.
Price: $1295 without mSATA drive

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# EQUIPMENT REVIEW - Aurender Flow

recommend something flexible such as the Kimber KCAG for this task), the setup worked nicely. I found the Flow's noise levels were lowest when I used the 2V fixed-output mode coupled with no battery charging. I used the NuForce ST-10 power amplifier tethered to a pair of Audience 1+1 speakers in my desktop system for these listening sessions. I also had a Velodyne DD10+ subwoofer tethered to the DAC-10H. I was impressed by how close the sound quality of the Flow was to the NuForce DAC-10H. Once levels were matched—which was pretty easy with the DAC-10H's numbered volume settings—the DAC-10H had a slightly wider soundstage, but the Flow's soundstage was deeper. The DAC-10H also had better low-level detail due to its somewhat quieter base noise level, but the Flow matched the DAC-10H's dynamics and pace.

I also compared the Flow with the Oppo HA-1, once more using the Oppo's analog inputs so I could compare the two in a matched-level A/B test. Again it was a close call with the Flow having better dimensionality and upper-midrange energy and the HA-1 having more relaxed transient response. The Flow produced a more three-dimensional soundstage, but the HA-1 produced better lateral delineation and separation between instruments in the soundstage.

Neither the Oppo HA-1 nor the NuForce DAC-10H could successfully handle as wide a range of different headphones as the Flow. Even with its different gain ranges, the NuForce DAC-10H could not go from high sensitivity to low with the same equanimity as the Flow. With the DAC-10H, you have to hunt and peck for the best combination of gain and volume; with the Flow, you merely turn the volume knob to the right point. And while both the Oppo HA-1 and the NuForce DAC-10H offer far more flexibility in input and output options, if your primary use will be with headphones and not as a preamplifier for a speaker-based system, the Flow's feature set and sound make it a better option than the other two.

## Summary

I've heard there are some audiophiles who like an uncluttered desk. For someone who wants great sound, smooth ergonomics, and a compact footprint, the Aurender Flow offers an elegant solution for headphone and nearfield listening. Put a large mSATA hard drive in it and you have a clever rig for a traveling audiophile. Although the Flow will work in portable applications, in my view its one-pound weight and form factor make it more suitable for desktop service. Also, The Flow could easily find a place with music professionals, carrying it from studio to studio to ensure monitoring consistency.

Never before have audiophiles had so many fine options for DAC/preamps in the $1000 to $1500 range. I've mentioned several with which I'm familiar during this review. But the Flow's physical dimensions and its ability to drive everything I could throw at it headphone-wise make it special. Yes, my first impression of the Flow was wrong, but after giving it a chance to strut its stuff, I have to admit that it has become my current go-to headphone listening rig. If headphone listening from a computer source is your thing, you need to hear the Flow because it was made for you. tas



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# Aurender W20 Music Server
# Not Just a Pretty Interface

Robert Harley

Photography by Dennis Burnett

# EQUIPMENT REVIEW - Aurender W20

**As I describe in *The Absolute Sound* Issue 258's From The Editor, beneath every music server's audio-component-like exterior lurks a computer. Do-it-yourself servers based on a Mac or Windows PC make no attempt to hide this fact from their users. But the *raison d'être* of "turnkey" music servers is to provide listeners with the benefits of file-based music without the hassles of computers. If you want instant access to thousands of albums with a couple of finger taps, but abhor the thought of drilling down through multiple sub-menus of arcane software settings, a turnkey server is for you. Our reviewer Steven Stone once wrote, only half jokingly, that DIY servers are for the ultra-geeky and turnkey servers are for the ultra-rich.**

But there's another reason beyond convenience to buy a turnkey music server: sound quality. Building a server from the ground up allows the designer to incorporate techniques that optimize sonic performance—techniques that are unavailable in general-purpose computers. Most turnkey-server manufacturers, however, build their systems around a stock commodity-grade computer-motherboard to which they add custom digital outputs with more precise clocking, improved power supplies, and some measure of electrical isolation between the motherboard and the audio output. Although these are steps in the right direction, creating the state of the art in music servers requires designing and building an entire computer from a blank sheet of paper. This approach obviously requires a much greater investment of time and money, as well as considerable technical expertise.

That's what the Korean firm Aurender has done in creating the flagship W20 reviewed here. Nothing in the W20 is based on stock computer subsystems. Rather, every aspect of the W20's design is aimed solely at delivering state-of-the-art sound quality. As you'll see, the company has gone to extraordinary lengths in the pursuit of better sound.

The W20 is designed to do one thing and do it well: store music, allow you to access that music, and then present the highest possible quality digital-output signal to your DAC. The W20 has no integral DAC and no native CD ripping capability, and offers no metadata editing. The product's ambition is reflected in the substantial $17,600 price.

The W20 is housed in a handsome, robust chassis machined from aluminum plate with extruded aluminum heatsinks along the sides. The front panel houses two displays, a power button, and four buttons that provide rudimentary control over playback, as well as certain housekeeping functions. The display can switch between showing the name of the music track in play, the playlist menu, or signal-level meters (with a blue or brown background). In practice, you'll rarely interact with the W20 through these front-panel buttons and displays; instead, you'll use Aurender's Conductor app for the iPad to control the system. (More on this later.)

The rear panel showcases the W20's manifold capabilities. The two AES/EBU outputs can be configured either as two separate single-wire outputs or one dual-wire AES/EBU. This latter format is provided for those few DACs that require dual-wire inputs for accepting sampling frequencies above 96kHz. A clock input appears on a BNC jack, allowing the W20 to lock to DACs with a clock output, or to an external clock that sends a master clock to the W20 and a DAC. In addition to the two AES/EBU jacks, the W20 provides digital outputs via coaxial-on-RCA, coaxial-on-BNC, TosLink optical, and a dedicated audio USB connector. Two additional USB jacks are provided, but these are strictly data ports for connecting external drives. Finally, an Ethernet port connects the W20 to your network. I know of no other server with an array of features this extensive.

The W20 connects wirelessly to the iPad, but adding the server to your network and enabling Tidal streaming is best realized with an Ethernet connection. You can rip CDs directly to the W20's drives (by specifying those drives as the target in a ripping program such as XLD

# EQUIPMENT REVIEW - Aurender W20

AutoRip) or download hi-res files directly to the W20. A better method is to rip CDs and download hi-res files to a network attached storage drive (NAS) that's on the same network as your PC or Mac and the W20. You then drag and drop music files from the NAS to the W20's disk drives. It's a bit of a hassle to go through this procedure if you just want to listen to a single, recently purchased CD. Transferring music to the W20 is best done in batches. (Just as I was finishing this review, Aurender announced a software update, available by the time you read this, that allows you to transfer music from the NAS to the W20 directly without a PC or Mac via the Conductor app for the iPad, but the update wasn't ready in time for me to try it.)

Adding a NAS should be considered mandatory because it provides a backup of your music library. Note that although the W20 has dual disk drives (6TB x 2), the second drive isn't a redundant backup; if a drive fails you'll need to reconstruct as much of your library as was on that drive. The Synology DS214 NAS I use ($557 with two 3TB drives) comes with software that performs automatic backup of any other drive on the network, including the W20's drives. A single NAS, however, shouldn't be your only backup. For true security, you should have a second NAS stored in a remote location that is periodically backed up. This may seem like an extreme measure, but not when you consider how much time, effort, and money your stored files represent, particularly if you've edited the metadata.

## TECHNICAL TOUR

Removing the thick, heavy aluminum top plate reveals a chassis compartmentalized into several aluminum sub-chassis. The fanless switching-mode that powers the computer motherboard is encased in an isolated block just behind the display. The dual 6TB disk drives are mounted on compliant platforms to reduce noise and vibration. I never heard the sound of drives spinning during my entire time with the W20. The audio-output board is separated from the other circuitry by an aluminum plate. The critical audio-output circuits are powered by two of the three separate banks of lithium-ion-phosphate rechargeable batteries that consume a big chunk of the interior real estate. By powering the audio-output electronics with batteries, the digital audio signal is made completely immune to power-supply noise or fluctuation. The two banks are redundant: One set is being charged as the other is being used. The batteries also protect the computer from sudden loss of power; when the W20 detects that the AC power has been disconnected, it safely powers down the system, protecting the stored data.

Another design feature aimed at delivering a pristine digital output to your DAC is a 240GB cache memory, which serves as a buffer between the disk drives and the audio output. When you select music and create a playlist, the W20 reads the audio data from the spinning disk drive into this cache memory, after which the disk drive is spun down to sleep, eliminating noise and vibration. This also minimizes wear and tear on the hard drives. The audio data are then clocked out of the cache with a high-precision, oven-controlled crystal oscillator. An oven-controlled crystal oscillator is encased in a small heated chamber that maintains a precise and optimal temperature for the crystal. These expensive devices are much more precise than the ubiquitous crystal oscillators found in virtually all digital products. Both the clocking circuit and the cache memory feature proprietary techniques for reducing noise and jitter on the output signal feeding your DAC.

Unlike many computer-audio products, the W20 comes with an excellent and well-illustrated "Quick Start Guide." A full owner's manual is offered on the Aurender website. Should you encounter problems with any current Aurender model server, you can request Remote Internet Support right from the app. An Aurender technician can then access your network and probably diagnose and resolve




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# EQUIPMENT REVIEW - Aurender W20

any problems with the W20 or its setup.

## THE CONDUCTOR APP

A server lives or dies by its control app. The app can be a constant source of frustration or a joy to live with on a daily basis. I'm happy to report that the Aurender Conductor app is by far the best I've used. It's fast, visually appealing, stable, intuitive, capable, and uncluttered, and its features have been clearly refined through actual use. The app runs much faster on a 64-bit iPad (I tried it on an older iPad 2 as well as a new iPad Air 2.) The 64-bit iPads are required for rendering album art in high resolution. If you spend ten minutes with someone who knows the app (your dealer, for example) and then begin using it yourself, you'll feel like an expert half an hour later.

The majority of the app screen shows your library by album, artist, or song, with a smaller playlist section on the left. Tapping a track from the main display moves the track to the playlist. Entire albums can be moved to the playlist with one tap. A nice feature allows you to slide back the main display to show the playlist in greater detail. Another thoughtful design element is the way tapping a button brings up the additional controls you need in the context associated with that button. For example, I just mentioned that you can add an entire album with one tap. When you tap the album name, a menu appears that offers you the option of adding the entire album, and where in the playlist to do so. This structure keeps the interface clean and simple, presenting you with additional choices only when you need them. Moreover, the interface's colors, shapes, and organization are easy on the eyes. You can filter your library view by sample rate (showing you only hi-res titles, for example), DSD files, recently added titles, and those albums you've marked as favorites.

With two finger-taps the view switches from your music library to the Tidal streaming service. (A Tidal subscription is required: $19.95 per month for unlimited lossless streaming.) You can create playlists with tracks mixed from your library and Tidal. Its integration is so seamless that it's easy to forget where your library ends and Tidal starts. The Aurender Conductor app's Tidal interface is better than Tidal's own app. The best software is powerful yet simple to use, and that is a good way to describe the Aurender Conductor.

As I mentioned, the W20 offers no way to edit metadata directly. You can, however, edit metadata with a program such as JRiver Media Center. Speaking of metadata errors, I discovered a couple of funny and interesting ones. I ripped a CD by the Western swing band Asleep at the Wheel and the band's name showed up in my library as "A Sheep at the Wheel." The double CD of John Mayall's 70th birthday concert appeared as two separate albums, one by John Mayall and one by John Mayall & the Bluesbreakers.

## SETUP

Setting up the W20 in my system wasn't without glitches. After using the system for a couple of weeks I powered it down to rearrange my equipment rack, and when I powered it back up the W20 wouldn't connect to my iPad Air 2. Oddly, it *would* connect to an older iPad 2. Aurender had not encountered this issue before, but I figured out the solution. (The W20 and iPad Air 2 weren't on the same network; resetting the router fixed the problem.)

On another occasion, after the W20 was turned back on, it wouldn't boot up. Previously unbeknownst to me (or to Aurender), the W20 won't boot up when certain DACs are connected to it. (I was using the DAC in the Hegel H160 at the time.) Aurender had not seen this problem with any other DACs.

I should add, however, how wonderful it was to connect different DACs to the W20 and have them instantly recognized, with their names shown in the W20's display. Anyone with a PC- or Mac-based server who has struggled to get his software to recognize the DAC will appreciate the W20's ease and reliability in this regard.

## LISTENING

Does the W20's $17,600 price tag buy you merely the convenience of a turnkey server





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# EQUIPMENT REVIEW - Aurender W20

and a nice interface, or does it sound considerably better than, say, a fully tricked-out MacBook Pro? (There's no question that the user experience is vastly better with the Aurender than with the Mac-based server. In fact, the comparison's not even close.)

To answer that question I first assessed the W20's sound quality by auditioning its various digital outputs to find the best interface. I found that the best-sounding configuration was with the W20's USB output driving a Berkeley Alpha USB (a USB-to-AES/EBU or SPDIF converter), which in turn fed the Berkeley Alpha DAC Reference via a 1m run of AudioQuest Wild Digital AES/EBU cable.

The W20 was put under the extremely powerful microscope of the state-of-the-art in digital conversion, the Berkeley Alpha DAC Reference connected to some of the most transparent and resolving electronics extant—the Constellation Audio Altair 2 and Hercules 2, or the Soulution 725 and 701 combos. These, in turn, drove the Magico Q7 Mk2 and MartinLogan Neolith loudspeakers, all connected with MIT's best cables. The listening room's AC power, supplied via four dedicated 20-amp AC circuits, was conditioned by an all-out Shunyata system with the new Shunyata Sigma AC cords. This system's resolution immediately revealed exactly what was happening at the digital source. (I'm reviewing the new Constellation electronics and the Neoliths in the next issue. Shortly thereafter, I'll write a feature article on building this entire system and what I learned along the way.)

Listening to the W20 on a daily basis, after living with a MacBook Pro as a server for the past year, I was immediately aware that Aurender's extraordinary efforts in clocking, buffering, and lowering noise paid off in the musical experience. The W20's "sound" was characterized by a natural and organic quality that came closer to the "feel" of analog than any digital source I've experienced. The presentation had a dimensionality, life, bloom, and illumination that one doesn't associate with digital. I was repeatedly amazed by just how much space and depth were encoded on 44.1kHz/16-bit sources, just waiting to be revealed by playback hardware of this quality. I thought that we had long ago bumped up against the limits of standard-resolution digital sources, but the W20 feeding the Berkeley Alpha Reference DAC showed that the flatness, hard timbres, lack of air and depth, and absence of fine detail were not purely attributable to the standard-resolution digital format. Of course, there are many inferior-sounding CDs, but the W20 still managed to get the most music out of them. The W20 not only revealed new depth and dimensionality on well-recorded CDs I had ripped (in AIFF), but also rendered instruments as separate objects in the mix. The W20 "de-homogenized" the soundstage, allowing me to hear each instrumental line with startling clarity and focus. Reverberation decay was longer and deeper, adding to the impression of space and dimensionality. The recording *Live in America* by flamenco guitarist Paco de Lucia was a particularly vivid example: Paco's guitar was focused in the center of the stage, surrounded by the hall's dense reverberation, with the thrilling *zapateo* (percussive footwork) and handclaps at the far left and right boundaries "lighting up" the acoustic space with each sharp transient. I've listened to this track many times, but never before felt I was hearing the recorded acoustic this clearly. The experience was mesmerizing.

In addition to greatly increased dimensionality, another salient characteristic of the W20 was its very quiet background. It was as though the W20 cleaned up a bit of low-level hash that was diminishing the impression of hearing instruments in space. Presented against a dead-silent backdrop, instruments took on more palpability, realism, and life. This low-level hash had also set a noise floor below which no information was being resolved. The Aurender's deeper silence allowed very fine details of timbre, micro-dynamics, and ambience to emerge. The W20 was so adept at resolving the lowest levels of information that I consistently heard new musical nuances on albums I'd been listening to for decades. Treble through the W20 was cleaner and purer, with less grit, hardness, and unnatural sheen. The top end had greater delicacy, air,




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# EQUIPMENT REVIEW - Aurender W20

and detail—qualities that were rewarding on Jack DeJohnette's wonderful cymbal work on the live Keith Jarrett recording *My Foolish Heart*. Cymbals seemed to float in air rather than being painted on a flat canvas; their airiness and decay approached that of analog with some recordings.

There was a sense of precision and order that made the music tight, defined, detailed, and dynamic. Bass was tauter and more tuneful, with greater pitch articulation and dynamic impact. This precision was particularly impressive on 44.1kHz/16-bit sources. Although the best hi-res material sounded spectacular, what impressed me even more was how the W20 reproduced standard-res material day after day. It was as though the Aurender had remastered my entire CD library, giving me new and improved versions of old favorites. In some respects, realizing great sound from standard-resolution sources is a greater technical challenge than performing the same trick with hi-res ones; on Red Book CD, the digital source and DAC have much less information to work with, leaving no room for error.

The W20 was significantly better sounding than the MacBook, even though both sources' USB outputs were being buffered, isolated, and reclocked by the same Berkeley Alpha USB. (I suspect that the difference in sound quality between the MacBook and the W20 would be even greater if the latter were driving DACs directly, without the Berkeley Alpha USB interface.) It did not take hours of back-and-forth comparisons to hear the W20's superiority. I started by listening to "Back Row Politics" from *Act Your Age* by Gordon Goodwin's Big Phat Band, first on the W20 and then through the MacBook Pro. The tune starts with few bars of piano intro. Switching to the MacBook Pro was almost like hearing a different piece of music. Through the MacBook the left- and right-hand piano lines were blurred into a single musical statement. Through the W20, the two lines were clearly distinct, and much more musically involving, the interesting meter generated by the left and right hands setting the stage for the rest of the tune. When the band came in, I heard a much tighter and deeper bottom end, a more open and spacious soundstage, and far more detail. Small percussive details smeared by the MacBook were rendered with pristine clarity by the W20. I had been listening to the MacBook Pro for about a year, and was surprised by just how much better my system sounded with the W20 as the source.

## CONCLUSION

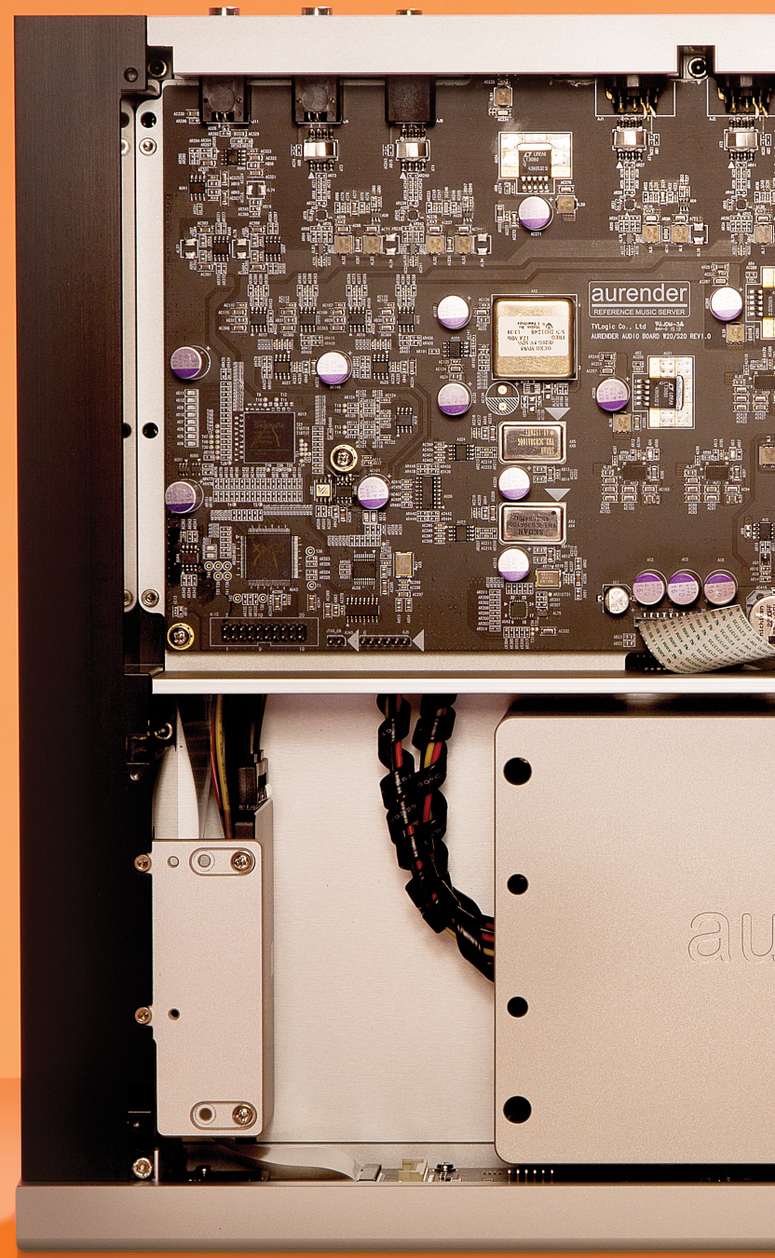
The Aurender W20 is in my experience the current state of the art in music servers. It excels in every parameter; its array of features is unmatched, the 12TB of available storage will accommodate virtually any library; its interface is wonderful and intuitive; and most importantly, it delivers sound quality unmatched by any other digital source I've heard. The W20 brought out the best in my system, delivering the greatest dimensionality, timbral purity, resolution, and freedom from hash I've heard from digital sources. Of course, a great digital-to-analog converter is required for realizing the sound quality I've described, but I can say that the combination of the W20 and the Berkeley Alpha DAC Reference sets a benchmark in performance.

Although many listeners will be drawn to the Aurender W20 by its capabilities and outstanding iPad control app, it's really the sound quality that makes the W20 special. The Aurender W20 is not just a pretty interface. tas

## SPECS & PRICING

Storage capacity: 12TB (6TB x 2)
Formats supported: DSD (DSF, DFF), WAV, FLAC, AIFF, ALAC, M4A, APE, and others
Outputs: AES/EBU (x 2, single-wire or dual-wire mode), USB 2.0 (dedicated audio output), USB data ports (x 2), TosLink optical, Ethernet, coaxial (RCA), coaxial (BNC)
Inputs: Clock on BNC
Network: Ethernet
Dimensions: 16.93" x 4.17" x 14.57"
Weight: 41.9 lbs
Price: $17,600

**AURENDER (Division of TVLOGIC AMERICA CO. LTD.)**
209 N. Victory Blvd.
Burbank, CA 91502
aurender.com



EQUIPMENT REVIEW - Aurender W20

# A More Affordable Alternative

I'm happy to report that much of the Aurender experience is available in Aurender's far less expensive N100H server, priced at $2695 with 2TB of integral storage. You don't get features such as dual-wire AES and the clock input, but most users don't need those capabilities anyway. Although the audio output circuitry is powered by a conventional power supply rather than by batteries, the circuit is based on the design developed for the W20. The N100H's much smaller chassis provides less isolation between subsections than that of the W20, but the N100H's chassis-work is still first-rate. It's like a miniature version of the W20. The N100H's cache memory is 120GB rather than the W20's 240GB. Nonetheless, you still get the same outstanding Conductor app, Tidal integration, and Remote Support.

I was able to compare the W20 with the N100H by creating playlists of the same music on both servers, and then switching between them by selecting the server I wanted to hear from the Conductor app (and moving the USB cable). I also compared the two Aurenders to the MacBook Pro described in the review.

The N100H was much closer in sound to the W20 than it was to the MacBook Pro, which came in a distant third. The N100H had much of the W20's expansive soundstage, dimensionality, purity of timbre, separation of individual instrumental lines, bass definition and dynamics, and resolution of low-level detail. In absolute terms, the N100H was not quite as clean in the treble as the W20, slightly less resolving of low-level information, and not as dimensional. I should stress that the differences between the W20 and the N100H were ones of degree, not of fundamental character. The N100H was significantly superior to the MacBook Pro in every sonic criterion, and inferior in none. I suspect that the N100H would be a major sonic upgrade to just about any digital front end. And the user experience is absolutely identical. The N100H strikes me as a compelling solution for many listeners—and a terrific value. tas


I suspect that the N100H would be a major sonic upgrade to just about any digital front end.

# OUR TOP PICKS DIGITAL SOURCE COMPONENTS

## DACS


### Berkeley Audio Design Alpha DAC Series 2

**$4995**

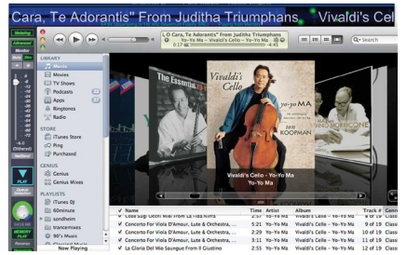
The Product of the Year Award-winning Alpha DAC is not only one of the best-sounding digital-to-analog converters, it's also an amazing bargain. In addition to world-class decoding of CD sources, the Alpha DAC can handle any sampling rate to 192kHz and word lengths to 24 bits. Its robust analog output stage and variable output level allow it to drive a power amplifier directly. This feature is significant, because the Alpha DAC is capable of such resolution, timbral purity, and dynamics you'll want to hear it without the limitations of a preamp in the signal path. When used at its best—fed by true high-res sources from a music server, and driving an amplifier directly—the Alpha DAC delivers stunning resolution of the finest musical detail, throws a spectacularly large and well-defined soundstage, and plays back music with gorgeous tone color and purity. berkeleyaudiodesign.com (189)


### Berkeley Alpha DAC Reference Series

**$16,000**

Berkeley's Alpha DAC Reference redefines what we can expect from digital playback. The Reference is simply stunning in its ability to render instruments as real-sounding objects in three-dimensional space. But it doesn't just nail dimensionality; it also excels in timbral vividness and delivers extraordinarily high resolution of micro-details. What's more, the Reference performs this trick on all instruments simultaneously, even in the most complex passages. This unprecedented resolution allowed RH to easily follow individual musical lines in a way he'd never thought possible from digital. The build-quality is many steps up from the original Alpha DAC. The Alpha DAC Reference is an unqualified triumph. berkeley-audiodesign.com (246)

## MUSIC SERVERS




### Channel D Pure Music2

**$129**

Pure Music is a great piece of software at a price that even a flea market-scrounging hobbyist audiophile can afford. Combine Pure Music with any recent Mac computer and you have a front end that will play back any digital file from FLACs to lowly MP3s on up to 192/24 high-resolution files with ease. Mate this front end with a top-flight DAC and you have a digital playback system that will catapult you to the forefront of the new computer-playback revolution. channld.com (211)

### Sony HAP-Z1ES

**$1999**

As the poster boy for Sony's "High Definition Music Initiative" the new Sony HAP-Z1ES defines what Sony sees as the future of two-channel audio. It attempts to be easy for a naïve user to operate, yet capable of the highest audio quality. As SS put the HAP-Z1ES through its paces he looked for reasons it might be not be considered a true high-performance component—and found none. If you plan to spend more than $2000 on any digital front end—be it an audio-computer, CD player, DAC, network player, or any other front end that uses digital files as a source—and you don't audition a HAP-Z1ES, you are ignoring what may well be a benchmark digital product. sony.com (242)


### Lumin A1 Audiophile Network Player

**$7200**

For those looking to quit the computer, there's the Lumin A1. Capable of pulling audio media from most external digital sources—and (ideally) over a network with a NAS—the A1 is equipped with dual-mono Wolfson DACs that can play back a multitude of formats, up to and including 32-bit/384kHz PCM/DXD and standard DSD. Operating wirelessly through its own terrific iPad app, the A-1 releases all the reins of tension, dryness, and constriction that accompany most digital recordings, adding the warm, weighty presence and velvety textures that are hallmarks of great analog. The L1, an external, preconfigured, 2TB storage HDD, is optional for $1200. luminmusic.com (248)

# OUR TOP PICKS DIGITAL SOURCE COMPONENTS

## MUSIC SERVERS


### Aurender W20

**$17,600**

Aurender's top-of-the-line W20 is one of the most feature-laden and capable turnkey music servers on the market. It also happens to have the best music-management app, an important consideration when choosing a server. Load the W20's internal hard drive (up to a whopping 12TB) with music, connect one of its many digital outputs to a DAC, link a tablet to your wireless network, and you've got virtually unlimited music. Seamless integration with streaming service Tidal greatly expands the W20's functionality. You'll need, however, a Mac or PC with an optical drive to rip to the W20. The W20's sound quality is outstanding, perhaps in part due to its 240GB internal cache memory and other performance-oriented design tricks. aurender.com (258)

### Naim NDS

**$13,800–$22,150 depending on power supply**

In the NDS Naim has designed a network player that can handle a wide variety of sources and, with the addition of Naim's UnitiServe and a NAS drive, becomes a full-fledged, highly capable music server. The best news is that Naim has created for the NDS (and all Uniti-series products) a fabulous music-management iPad app. The NDS/UnitiServe is the perfect solution for many music lovers who want to transition to computer-based audio without the limitations of turnkey music servers or the confusion of do-it-yourself systems. Fortunately, Naim has imbued this highly capable system with a terrific-sounding DAC section. The NDS is high in resolution but without hyped "detail," voluptuous and rich in tone color without euphonic coloration, and musically vivid without being sonically vivid. The NDS also has a particularly powerful and appealing expression of music's rhythmic flow. It's the kind of sound that lets you become quickly and deeply immersed in the music, not the sound. audioplusservices.com (240)

### Meridian Sooloos System

**(Price varies with configuration)**

When RH had the Meridian music server for review, he gave a visiting speaker manufacturer a two-minute crash course in how to use it. Five minutes later the manufacturer exclaimed: "I'm getting one!" Such is the power of having instant access to your entire music library with the tap of a finger on the album art. But the Meridian also anticipates from your browsing what you might want to hear and suggests alternatives. That's just the tip of the iceberg in how Meridian's server revolutionizes the way you interact with your music library. The Meridian Sooloos system offers the state-of-the-art in user interface. After you've lived with a Meridian, it's hard to go back to searching for CDs. meridian-audio.com (204)

### Burmester MC151

**$25,000**

This elegant and capable music server beautifully blends high technology with luxury. It combines in one chrome-plated chassis a CD ripper and 2TB of storage, and has the ability to play music from a streaming service, USB stick, or external drive. What's more, the MC151 has variable output levels and source switching, making it a fully capable preamplifier. Burmester's iOS app is outstanding; it is easy to find and play back music. Music stored on the MC151 can be accessed by any other UPnP device on the network. The crowning glory of the Burmester MC151, however, is not its features, but its sound quality. It brings out exceptional upper-octave life and air, but still keeps the midrange warm and natural. Bass is equally excellent. burmester.de/en (255)

## PORTABLE PLAYERS


### Astell&Kern AK100 II and AK120 II

**$699, $1299**

These portable players are best thought of as iPods on steroids. With their finely-brushed black aluminum cases and intuitive controls, they give up nothing to Apple in industrial engineering. But iPods max out at a tepid 48/16 resolution, whereas the AKs go to 192/24. The AK120 will even play DSD files! Sonically, these players simply stomp modern-day iPods and iPhones, which sound dull and dreary by comparison. Even on moderate-resolution material, the AKs deliver high-end qualities like timbral richness, airiness, detail, and pace. And once you have held hi-res in your hands, you will never settle for less. The AK120 boasts dual Wolfson DACs and twice the memory capacity (a precious resource when storing hi-res material) of the AK100. The flagship also has marginally more air, a smidge less grain, and stronger bass. Both players constitute wild successes, bringing true high-end sensibility and performance to portable music. astellnkern.com (236)

### Sony NW-ZX2 Music Player

**$1199**

Sony, which created the first "Walkman" portable player, has been involved with portable audio since its inception, but lately has not been the dominant player it was in the early days. This could change with the NW-ZX2. This Android-based player can reproduce any commercially available music file including 128x DSD; plus, it also plays videos from YouTube, Hulu, and Facebook. It also comes with WiFi and Bluetooth support. The NW-ZX2 reestablishes Sony as one of the preeminent manufacturers of portable audio playback devices. And, yes, Sony has succeeded masterfully in achieving its design goals—the NW-ZX2 delivers excellent sound and looks, and it feels and responds like a high-performance product should. If you had any doubts about Sony's commitment to high-quality audio, the NW-ZX2 will put them to rest. sony.com (252)