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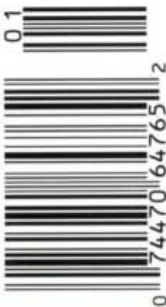
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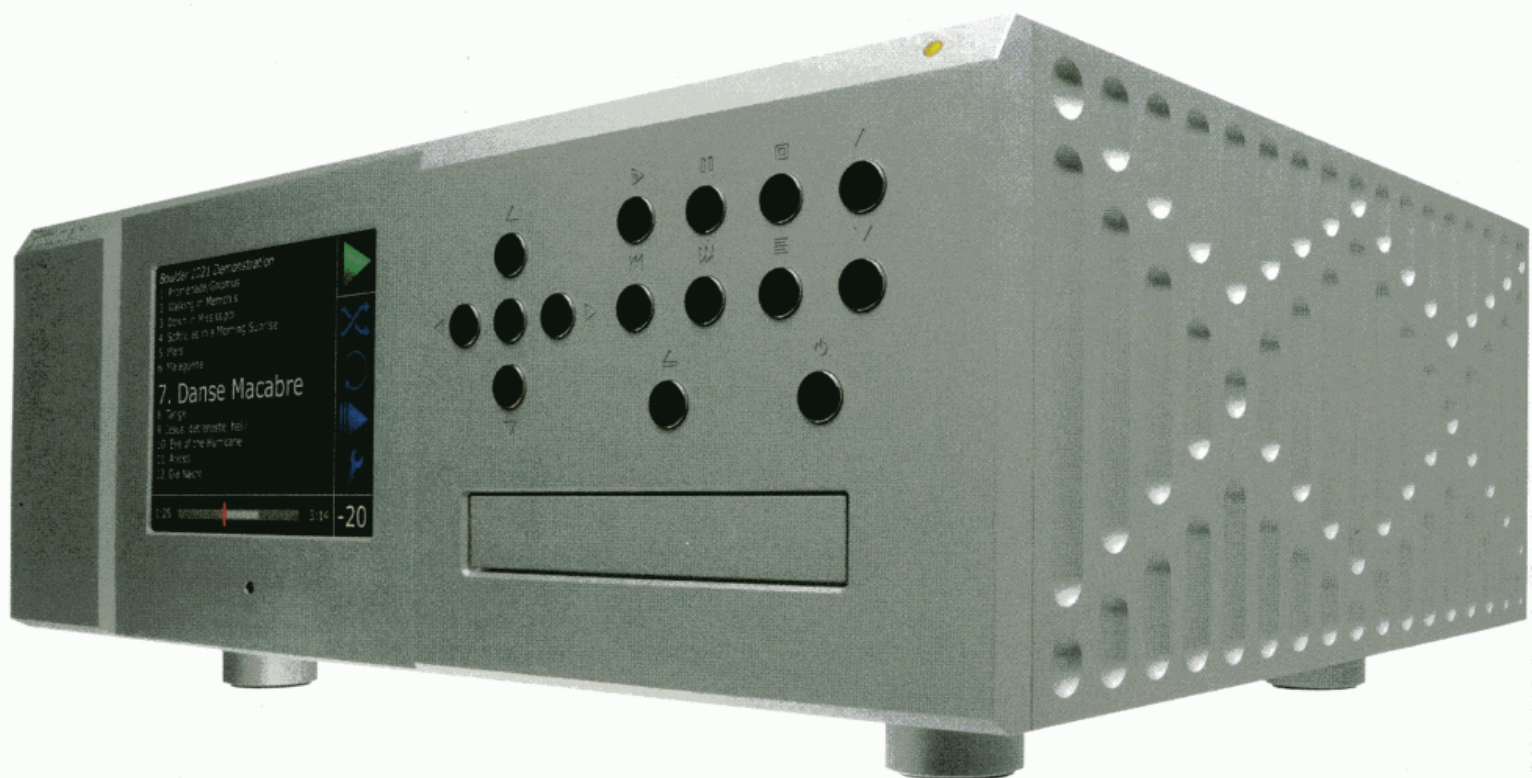
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EQUIPMENT REPORT



Boulder 1021 CD Player

As Good as It Gets

Anthony H. Cordesman

I can't say that the Boulder 1021 is *the* best CD player in the world. I haven't heard them all, and I have not had the opportunity to audition top competitors from Accuphase, Meridian, and dCS at sufficient length and in my reference system. My reference unit from Meitner, the EMM SACD/CD player, has prototype circuitry in it and this makes any kind of direct comparison unfair. What I can say is that the 1021 is an absolutely superb sounding unit, with superb ergonomics and display capabilities. It provides equally excellent performance with both the oldest, roughest Phillips and Sony CDs in my collection, and from the new 192/24 high-res discs that are coming out from Chesky and Reference Recordings, and the other high-res material you can download by going to HDTracks.

As you read this review, however, you also need to be aware of several facts. This is a \$24,000 player. That price puts the 1021 into the category that only the very rich or the very serious audiophile can afford. Second, its superiority is a matter of nuances that come through most clearly in its ability to resolve the upper midrange and treble in a musically natural and realistic way and in its ability to handle music with wide dynamic range where low-level detail is critical. It does not revolutionize CD sound; no product can. Third, the Boulder 1021 is coming out at a time when the high end may be shifting to the use of computers

and music servers and away from packaged media. Fourth, it is a stereo unit and not a multichannel unit, and it will not play music recorded on DVD-A, SACD, or any video format.

These latter issues are serious enough to merit a sidebar to this review, contrasting my views with comments by Rich Marez of Boulder. All of the same issues and caveats apply to investing in any top-quality, high-cost CD player, but they are particularly important when you are considering an investment in a true state-of-the-art unit.

Accordingly, I would suggest that if you are lucky enough to be able to actually buy, rather than dream about, investing in a unit like the Boulder, you begin by taking a quick look at the size of your CD music collection. Some audiophiles may be wealthy and status-oriented enough to buy the Boulder 1021 simply for the best front-panel and music-content display I've ever seen. The 1021's visual impact is a model for the industry. The key reasons to buy the 1021, however, are that you have a really large library of CDs, you want to get the best out of any quality of CD, and you care enough about musical realism that this is the type of nuance you are willing to invest in. In many ways, the Boulder 1021 is like a great phono front end. You buy it for the music and the collection you now have, not for the media that may or may not emerge in the years to come.

Ergonomics and Styling

The Boulder 1021 shows the beauty that form and function can have in a great design. I'm always leery about describing any piece of audio equipment as "sexy" or seductive. First, the implied imagery gets weirdly kinky and, second, it is even more overstretched than wine analogies and metaphors. This kind of praise also tends to cheapen the product, particular when it is as truly musical as the Boulder 1021. The fact is, however, that form doesn't really follow function in the best designs; it inevitably transcends it.

The overall styling of the Boulder 1021 is the same as in other Boulder units, a kind of restrained luxury using a machined aluminum case and panels. Nonetheless, you are not going to walk into a showroom and *not* be seduced by the 6.5" LCD VGA display on the 1021's front panel. It almost forces you to become involved in the music. You see the contents of the recording, the key performers, the album name, and the movements. If you have CDs that lack metadata or CD text, you can even obtain these data using an Ethernet connection to a computer with an active high-speed Internet connection. It takes a strong act of will to look at this kind of display and not press the play button, and if you are into video, you can even transfer this display to a computer, video monitor, or projector.

If you read the instruction manual—which is compulsory in the intelligent use of the 1021—you will also find the display provides an usually useful range of data, including set-up options, volume display, monitoring of the Boulder 1021's progress in playing back a given track, and an initial display of word length and sample rate. There is also an unusually wide range of control options on both the front panel and remote, although here styling has led Boulder to etch the title or symbol of each control into the metal of the panel and the remote, rather than provide a sharper visual contrast. This is not a problem once you've had a few hours with the unit, but it's not immediately user-friendly unless there is a lot of light.

The Boulder 1021 is capable of an exceptional number of advanced operating functions—look under "Advanced Options" in the manual. The best include the ability to set up a playlist to only play the tracks you really want and that the 1021 will remember in the future unless you cancel the list. There are a lot of great recordings mixed with mediocre ones on the same disc. Editing the playlist really helps.

If you are only into your digital front end, the Boulder 1021 also has another ergonomic advantage: You can set it for either fixed or variable output. This means you can bypass the preamp and an extra set of interconnects, albeit at the cost of giving up the balance control and ability to fine-tune imaging and soundstaging if the recording and your system are not perfectly balanced. The 1021 makes this feature exceptionally easy to use because you can also use the "Step Up" features (the manual again) to alter the volume as you scan.

Technology

If you are wondering why I put ergonomics and operating features first in this review, it is in the hope that these practical considerations will interest you enough to actually pay attention to some of the technology inside the Boulder 1021. I realize that many TAS readers are not heavily into technobabble, and that

The Future of High-Res: An Exchange with Rich Maez of Boulder Amplifiers

AHC: My deepest concern with high-res is that there are so many competing approaches at a time of severe economic pressure, competing media, and a troubled and unstable music market.

Maez: While it may seem like there are a number of competing formats, we see it as really just a number of interchangeable variants on a single format—the computer-based music file. DVD-A died a painful death a few years ago, SACD is on its way out (Sony Studios in NYC is no longer even using the format), and the Classic Records HDAD was a variation on the DVD-Video spec that was utilized for the audiophile community only, meaning that hardware-based music is likely going to become a minor source of new music (though everyone has a large collection of older albums, meaning that backwards-compatibility with them will be required for any realistic product). Even SACD tracks can easily be converted to very high resolution WAV files via a rather inexpensive piece of gear manufactured by Tascam.

AHC: We already have too many formats. Music in the form of straight digital, CD, DVD, DVD-A, SACD, DVD-V, Blu-ray, and within that Dolby and DTS lossless or high-res, plus emerging downloads for digital servers.

Maez: The CD, DVD and Blu-ray recordable formats can all hold music files that can easily be transferred from computers where they have been downloaded or tracks that have been converted from existing discs. The standard DVD format may go away in the future, as Blu-ray discs can hold all of their content and then some. With the added storage space that DVD and Blu-ray recordables offer, there's no reason to utilize Dolby or DTS lossless, especially if they require a license—a Blu-ray disc can hold enormous amounts of music.

AHC: Will there be a need for new forms of universal players that are CD-based, CD/DVD-capable, and can play DVD/DVD-A, SACD, and Blu-ray in stereo and multichannel?

Maez: Those players that utilize a bespoke dimension-and-connection disc-reading mechanism (i.e., Philips, TEAC, Pioneer, etc.) have two disadvantages here: First, the mechanism does not apply to a standardized size and mounting format, and thus, second, the mechanism will

EQUIPMENT REPORT - Boulder 1021 CD Player

digital technology is all Geek to even more. It also takes Boulder six dense pages in a white paper on the 1021 to even survey its design features in summary form—much less get into technical detail.

This, however, is not your father's CD player. It can play back digital recordings up to 192kHz/24-bit—the highest standard of high-res around. While it can't play back DVD-A, SACD, or audio recordings using video formats, it can playback CD, CD-R, DVD-R, DVD+R, FLAC, WAV (PCM), AIFF, MP3, and OGG Vorbis. This means you not only can play the new high-res discs, you can download high-res content and make your own high-res discs in the future.¹

The Boulder 1021 also has some basic advances in technology that are important enough that you should at least be aware of them if you audition it and consider investing in a top player. The 1021 processes digital data in a fundamentally different way than virtually all other players, and in a form that does much to eliminate jitter and clocking problems. The Boulder White Paper on the 1021 summarizes this technology as follows:

“The disc mechanism is an extremely accurate, high-speed data retrieval unit with particularly low bit-error rates. Data is transmitted within the player in packets and is buffered once before (hardware) and once (software) after DSP to eliminate any jitter artifacts. The data is never converted to an AES or S/PDIF data stream at any point prior to analog conversion.”

“Digital signal processing in the 1021 is carried out by an Analog Devices SHARC DSP module. Incoming musical data is ‘packeted’ and asynchronous, instead of an AES or S/PDIF serial data stream. This eliminates any susceptibility to timing- or jitter-related clocking variances. Raw data is buffered when received by DSP and is manipulated entirely in the digital domain.

“All incoming data is sample-rate-converted to a minimum of 352.8kHz and bit-rate-converted to a minimum of 24 bits in DSP. Higher bit and sample rates are advantageous by way of enabling the use of gentler digital filtering, as well as providing the maximum data rate for the DACs.

“Digital filtering is accomplished via Boulder's own Eigen-value algorithm. Eigen-value filtering is the best option for balancing frequency response and phase coherence and features the best known digital impulse response with regards to pre- and post-impulse ringing.

“A very important feature in Boulder's digital processing scheme is the use of floating-point math for all DSP calculations. Floating-point math enables the processor to perform complex calculations without overflowing the processor. This eliminates product truncation and maintains absolute accuracy when data is processed or fed to the DAC section.

“Upon exit from the DSP section, the data packets are converted to a serial data stream (without a clock reference) for transmission to the D/A conversion section...

“The 1021 features a custom master clocking system that prevents timing inaccuracies (or jitter) from affecting the sound quality of the audio output. The traditional method of dealing with jitter has simply been to use a more accurate clock in order to sync and re-clock the data from its transmission from the

¹ Be aware that this is not an entirely glitch-free process, but the minor problems that occurred in my use of such material with the Boulder 1021 also occurred in using such discs on computers other than the one on which they were recorded, and generally seemed to be problems in the streaming process.

be obsolete when formats change—SACD and CD-only mechanisms are already heading that way. While they offer convenience for some designers (they come with a pre-packaged set of user interface, servo, and decoding boards), they are in no way future-proof.

AHC: What about “channel confusion”? Will we go stereo or multichannel, and if we go multichannel, will it be 5.1 channels or 7.1 channels?

Maez: Multichannel will always be around for the theater experience, but we haven't seen a multichannel-audio format succeed yet. Even the marginal success SACD had a few years ago was primarily based on two-channel sound. This is more likely due to the fact that most people simply don't have a properly set up multichannel system—and they're much more expensive. Poor or poorly set up multichannel systems just don't sound good, regardless of the quality of the recording. This is too bad, as the potential for much more realistic sound is right there.

AHC: What about honesty in marketing? Will there be enough to show if a recording being sold as “high-res” was actually made with high-res equipment?

Maez: We agree there is a problem. It is perfectly easy to convert a 16/44.1 music file to a higher bit and sample rate with no real gain in resolution and no way to really know what the original file resolution was.

AHC: How high is high-res? Today, there are competing 88/24, 96/24, 192/24, SACD, and Dolby/DTS standards for what is actually high-res, and no credible scientific listening tests to show the gain as rates increase, or what process sounds best.

Maez: We've done a lot of listening, and we prefer the very high data rate (176.4kHz or 192kHz) WAV files, though that may be just a function of the particular tracks we've been listening to being better recorded or engineered than those of other file types. SACDs we haven't listened to, as we don't have a high-quality SACD player because we think that the format will slowly disappear relatively soon and there's not much motivation for us to invest in a player. It's a great format, but without acceptance and support from the general public, it's doomed. The audiophile community has really never been able to sustain a format by itself.

AHC: How do we achieve some agreement on the media to be used? Will this be discs? Will there be standardization of download sales and transfer coupled to evolving and competing storage concepts for digital storage—the post-player, digital-library market?

Maez: Any downloadable file can be filed on a computer or burned and backed up on a disc. Much like the millions and millions of MP3 tracks downloaded every year, the high-res file download will be stored wherever the user chooses.

EQUIPMENT REPORT - Boulder 1021 CD Player

mechanism in an AES or S/PDIF data stream all the way to the DAC section. Boulder's engineers identified this as a particularly flawed methodology. Since the data is always embedded with a clock signal, any errors in the embedded clock signal as well as opportunities for jitter to infect the signal become compounded and more and more audible as the data travels from place to place. Boulder's solution was to handle and transmit the data in a packetized, asynchronous format that has no embedded clock signal and is therefore not susceptible in any way to timing errors. The data is simply processed as necessary and is only clocked or timed in the digital-to-analog conversion section, specifically right at the DACs themselves. Since the Precise Interval Clock is located directly adjacent to the DACs, there is no opportunity for jitter to affect the accuracy of the clock signal to the DACs and clock timing is always accurate. Low-frequency modulation noise and jitter are thus reduced to immeasurable levels.

"In order to maintain proper data rates and processing speeds, the clock signal is then simply fed back to the DSP as necessary in order to sync the operation of all portions of hardware within the player without affecting data timing."

If this is a bit too complex, Boulder does make its points more simply: "DSP operates on the floating-point math principle to eliminate any mathematical overflow and truncation. Data clocking is handled by Boulder's own Precise Interval Clock, located directly adjacent to the D/A conversion section to eliminate noise-related jitter. Analog Devices AD1955A converters handle digital-to-analog conversion in a circuit yielding a significant reduction in distortion.

"Gain stages for the 1021 are the proprietary Boulder 983, based on the modular and discrete 993 gain stage used in all Boulder 2000 Series products. The 983 is a circuit board-implemented, high-current output gain stage featuring a mix of discrete and microcircuit parts which provide the best possible distortion figures and exceptionally low noise in a compact, board-mounted design . . . Balanced operation assures low noise in tandem with the use of the 983 gain stage. The 1021 is true differentially balanced at the outputs for optimal common-mode noise rejection. Lower distortion, and in particular, lower noise, contribute to much greater resolution."

This summary is only part of the story. There are exceptionally sophisticated power supplies. There is a very high quality drive that can read DVDs as well as CDs. The analog sections use the best of Boulder analog preamp circuitry and components—and that is one hell of a "best." Great attention is paid to layout and eliminating vibration.

The operating features I have described earlier are also made possible by putting a powerful host CPU in the player that is directly connected to the disc mechanism, RAM, front-panel buttons, and the 6.5" LCD VGA display. Boulder states that "this host CPU also provides a one-minute data buffer for all musical data received from the disc drive mechanism before passing the data along to DSP." In practice, this allows the 1021 to check its read of the digital data on a disc and make sure that it is correct.

The Sound

I'll get to sound quality with good-to-great recordings in a moment. If you really love music, however, you already know that these are a relatively small part of a large CD collection—

much of which you may tend to consciously or unconsciously sideline because great music and great performances often do not correlate with great CD sound. Like many audiophiles, you may also find that bad-to-mediocre recordings are normally more fatiguing, if not annoying, on CD than on LP.

The Boulder 1021 can't make bad CD recordings into good ones, anymore than the best plastic surgeon can turn a pig into a silk purse.² It does, however, consistently get the cleanest and most musical result out of older and lower-quality CDs that I have heard from any player to date. The dynamics of the original recording and basic limits of the soundstage will not be markedly different than what you hear with other good players. Low-level detail and upper midrange and treble clarity and musicality will be. It may seem strange to encourage you to take a bad CD, or even an MP3, with you when you audition the Boulder 1021, but let's focus on the music. One of the great strengths of this player is that it broadens the range of recordings you can really enjoy.

As you might expect, the Boulder 1021's greatest strengths are with the best recordings, including those that pose some of the greatest challenges in resolving musically realistic sound from acoustic instruments—music with very-wide-range dynamics, and music with extended low-level passages.

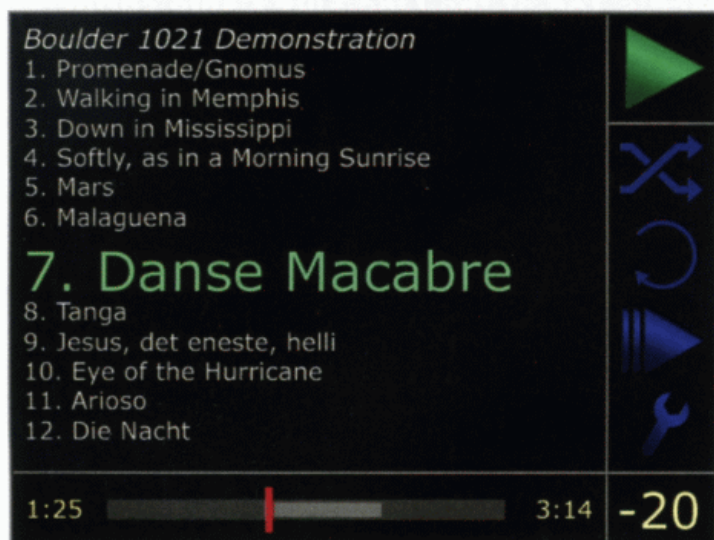
One key test was playing the CD version of a recording through the Boulder 1021 while playing the SACD version through the EMM Labs SACD/CD player. I am not going to tell you that CD equaled SACD with the best SACDs. If you are listening to an SACD recording as good as the Boston Symphony Chamber Players recording of Mozart's Chamber Music for Winds and Strings [BSO Classics 0601], you will hear cleaner upper octaves, more harmonics on string tones, slightly better low-level detail, and a very slightly more detailed soundstage. These differences are consistent with the best modern Telarc recordings and with the best European classical SACD from firms like Etcetera. (Try the Walter Boeykens Ensemble's Mozart Clarinet Concerto in A [Etcetera KTC 5261].) The same will be true of the few jazz and pop SACDs that are truly great recordings.

You will find, however, that such differences between CD and SACD are slim to non-existent when you compare the sound of the CD track on the 1021 with that of most SACDs on other players, particularly those SACDs based on remastered older analog and digital tapes (You also will not hear the problem in the top octaves of some SACDs, where something strange seems to happen in the upper treble. I can see no technical reason for this to be part of the SACD process, but not every SACD has cleaner and more realistic upper octaves than CD.)

The Boulder 1021 also offers advantages that no SACD or DVD-A player has in dealing with the future of digital sound. The 1021 did a superb job with new high-res recordings. I had my son make a number of discs from 88kHz/24-bit and 96kHz/24-bit recordings downloaded from HDTracks. The Boulder 1021's performance was consistently as good or better with such recordings than the best SACDs played back through any SACD player I have heard, including my reference EMM Labs SACD/CD player.

I don't suggest that you go mad downloading your own high-res recordings. Some of the material on HD Tracks is not based on good enough recordings to justify the "high-res" label. Some of the downloads seem erratic and present problems in conversion

² I've been waiting to mix in and metaphorize this analogy for years.



to a DVD-R. The sound of the best high-res recordings, however, is superb. Not only is there a steadily expanding range of 88kHz/24-bit and 96kHz/24-bit recordings, but even higher 192kHz/24-bit sampling rates are available from Chesky and Reference Recordings. I particularly liked the Chesky *Hancock Island* [HR341] and *Jazz Side of the Moon* [HR338] recordings. These have a degree of natural harmonic detail, low-level clarity, and dynamic definition that is truly exceptional.

The same was true of the tracks on Reference Recordings classical recordings like *Arnold Overtures* [HR-48], and on a wide range of classical, jazz, rock, and blues tracks on a Boulder high-res sampler. I found that really high sampling rates opened a whole level of detail and musical realism for every form of music and musical taste. As I say in the sidebar to this review, it is not yet clear that high-res will win enough acceptance to dominate the future of digital stereo, but from all my listening to date, it should!

This did not, however, make me ignore the merits of the 1021 in reproducing good CDs. In fact, I wish I could have somehow obtained the high-res version of a relatively early (1992) Keith Johnson recording of Albert Fuller playing Bach for Harpsichord [RR-51CD]. I have always found the harpsichord to be a brutal test of digital CD, and the Boulder did the best job I have yet heard of getting what seems to be an exceptional recording out of the regular CD. The midrange and upper octave harmonics of the music were more detailed and more realistic, without any added upper-octave emphasis. I would love to hear a 192kHz/24-bit version of the same recording to know if that would make a major difference.

And while we're on Bach, the Boulder 1021 did equally well with demanding piano recordings. Daniel Barenboim did a live recording of the Bach *Goldberg Variations* in Buenos Aires in 1989 [Erato 2292-45468]. The recording is as valuable for its natural life as for the sheer quality of the performance, but it also seems to put exceptional demands on a CD player to get the best sound and, particularly, to capture the fine details of the hall that sometimes can be heard in the background. Once again, the Boulder provided the most musically realistic sound I've heard from this CD to date and the most natural overall timbre.

More broadly, clarinet, flute, violin, massed strings, and soprano voice also seem to put exceptional demands on CD, particularly

if they are close-miked. I won't walk you through the list of recordings with such instruments I used to audition the Boulder 1021, but it consistently provided better sound than I have heard previously from the same CDs. This was true regardless of whether I was listening to solo instruments, chamber music, or full orchestra. It was equally true of pops to opera in the case of female voice, and the Boulder 1021 was as gentle as any player when the singer pushed her limits at the top of her range, had poor breath control, or tried to eat the microphone.

As might be expected, the Boulder did an excellent job with more "digital-friendly" instruments like the guitar. It is remarkably realistic with really good recordings of solo acoustic guitar, and particularly in maintaining timbre with sudden sweeps in musical dynamics. It also does an exceptional job of reproducing percussion detail from soft brushes to cymbal to really demanding jazz drumming. This superiority was consistent with the full range of other acoustic instruments and with male voice, and with realistically reproducing soundstage and crowd effects on recordings made under concert hall and live conditions.

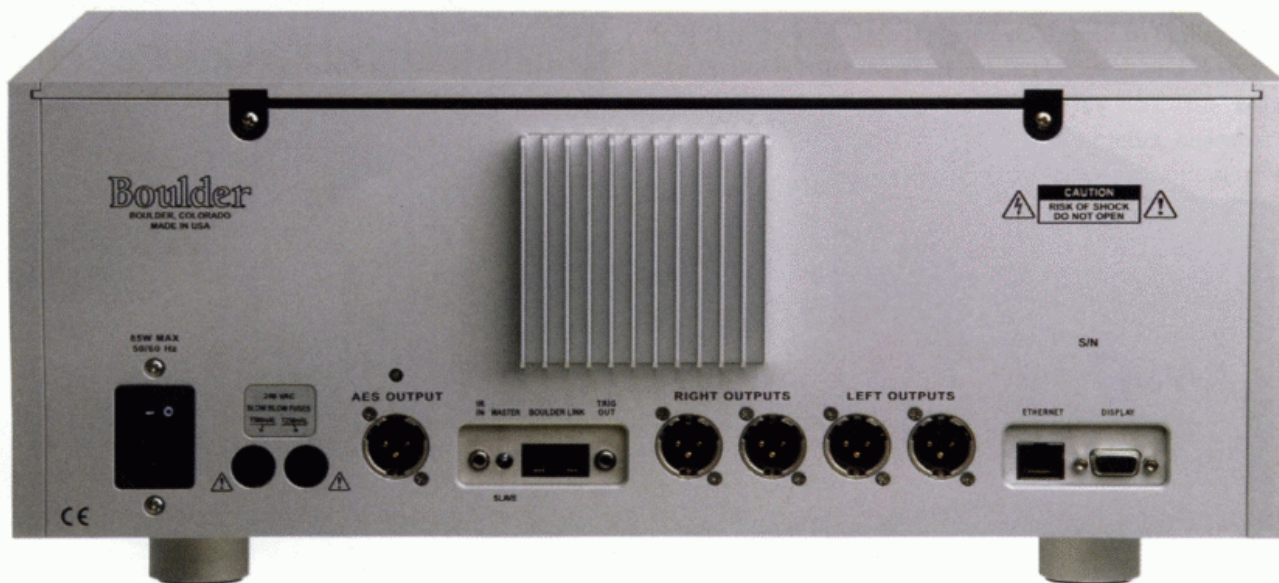
The 1021 did not favor "small music." If you are into orchestra, opera, and big band, it is as open and exciting as any player around without sacrificing detail and subtlety. This included demanding, complex orchestral music that does not always fare well with even top-quality CD players. You can pick any recording of Mahler's Eighth to hear this, and the 1021 does the cleanest and most detailed job I've yet heard of handling the two Telarc CDs of Saint-Saëns' Third Symphony.

As for the ability to accurately reproduce deep powerful bass... my sons assure me that its rock performance is excellent. Speaking for myself, you can trust the 1021 to explore the limits of CD sound in detail, timbre, and open and lifelike dynamics. I have a mild addiction to testing the limits of bass and dynamics using the Jean Guillou organ transcription of Mussorgsky's *Pictures at an Exhibition* [Dorian-90117]. The Boulder 1021 showed just how good and demanding this recording could be.

The overall timbre of the Boulder 1021 is slightly warmer and perhaps a bit stronger in the deep bass to midbass than a number of top competitors. This produces what I regard as a more natural, more musical balance, particularly in terms of lower midrange and upper-bass energy. It also means that the Boulder does not tend to spotlight the upper midrange and treble. It does not have less detail in these areas, but it does have less energy. The choice is essentially one between musical realism and apparent information, and I prefer music.

Let me stress, however, that this praise should be kept in proportion. I am talking about superiority in fine musical nuance, and I don't mean to hype the Boulder 1021 into some form of miracle machine. Like every other CD player, it cannot transform the sound of inadequate recordings and it cannot overcome the inherent limits of 44.1kHz/16-bit by defying the laws of physics. What it will do, however, is get the best out of the music that is actually on the recording.

Above all, the Boulder is subtly and consistently more real in harmonic detail than the competition I have heard to date, and it provides that detail without spotlighting the upper octaves or shifting the imaging. This consistently reduced listening fatigue. And, yes, if I am getting too analytic, it also made the Boulder 1021 one hell of a lot of fun to listen to with the right track: Try



“The Well” (track one) on the Jennifer Warnes recording of the same name [The Music Force SD8960]. Ms Warnes obviously had fun in playing around with the sound on this track; so will you!

Setup and Compatibility

As for setup, you need to be functionally literate enough not to just pop the 1021 out of the box without going through the manual. Setup is then very easy. As for compatibility, every manufacturer tends to voice its equipment to a given standard, and mixing components from different manufacturers can sometimes mask part of the nuances you will hear if you keep your components consistent. I did not, however, hear these kinds of colorations from the Boulder 1021. Its merits showed up just as clearly on my Pass Labs reference units as they did on the Boulder 1010 preamp and 1050 preamp; it was also fully compatible with tube amps and preamps. There was no need to search for interconnects with some kind of matching or corrective coloration. Any neutral interconnect will work just fine. In short, any compatibility problem will be in the rest of your system.

You will, however, have to make one trade-off in using the Boulder 1021. Its built-in volume control allows you to feed its output directly into Boulder, Pass, and other power amplifiers. Eliminating the preamp does remove a minor set of veils from the sound. I can easily see why some audiophiles would prefer it. However, even if you are willing to do without other front-end sources or to keep switching connectors, eliminating the preamp also eliminates the balance control. I feel this control is an essential part of any competent preamp design. I find many recordings need at least slight balance adjustment to get soundstage width exactly right, avoid channel imbalances from slightly altering the imaging, and get maximum depth. This is a trade-off that will be highly personnel, however, and I leave the choice to you.

Summing Up

The Boulder 1021 is good as a CD player gets in sound, features ergonomics, and style—and you can use it to go modern and

upscale and listen to high-res. You do need to consider cost and the technical issues regarding the shifts in high-end technology. But if you have a large CD collection and are truly serious about music, the Boulder 1021 is an absolute must-audition. Even if you can only dream about buying it, you should hear this kind of reference standard. If you are among the lucky few who can buy, rather than dream, this player has to be on your short list. **tas**

SPECS & PRICING

Formats: CD, CD-R, DVD-R, DVD+R, FLAC, WAV, AIFF, MP3, OGG Vorbis

Signal-to-noise ratio: 120dB

Analog outputs: Two pairs 3-pin balanced XLR, adaptable to RCA

Digital outputs: One AES/EBU, adaptable to S/PDIF

Volume: 80dB range in 1.0 dB steps

Dimensions: 18.00" x 9.25" x 15.25"

Weight: 46 lbs.

Price: \$24,000

BOULDER AMPLIFIERS

3235 Prairie Avenue
Boulder, CO 80301
(303) 449-2987
boulderamp.com

REVIEWER REFERENCE
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Dynavector 20X, Sumiko
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