

Little Labs

MONOTOR

OPERATORS MANUAL

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MANUAL PRINTING & PDF FORMATTING 04/2016.
UPDATED 06/2023
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READ THIS FIRST

BEFORE USING THE MONOTOR

There is lots more in this manual, but please read this even if you do not read manuals; Thanks!

The external power supply for the MONOTOR must be the 16-volt 0.3 amp dc regulated bipolar unit supplied with it. If it is labeled INPHASE engineering, it is our new custom-made for audio switcher, and you don't need to worry about voltages in other countries. If it is labeled Advanced Power Solutions, it is a linear supply and **MUST BE SWITCHED TO THE PROPER VOLTAGE** for the country using it. If you don't change the voltage (obvious to some of you), and it is set for 110 volts, and you plug it into 220 volts, it will **BLOW UP** the supply, possibly damaging the MONOTOR. If you set it to 220 volts and plug it into 110 volts, the performance of the MONOTOR will be severely degraded.

The dc power connector jack used on the MONOTOR looks like a CB microphone connector. Although difficult to misalign because it is keyed, take care to align the plug and jack properly when inserting.

The 3.5 mini jack sums what is plugged into it with the signal from the main trs/xlr jacks but after the MONOTORs level potentiometer and mono functions.

So the volume when using this 3.5 mm jack will be controlled by what is feeding it (e.g., iPod, phone).

Do not place the MONOTOR in close proximity to a Wi-Fi router; the high gain circuitry, although well shielded in the MONOTOR, will pick up Wi-Fi "chirps," which are rectified rf signals. Wi-Fi routers have no place near any high-end audio gear.

The Monotor is vulnerable to failure by extreme static discharge. In dry environments prone to static, use de-stat on carpets and discharge yourself before touching and placing headphones on your head. Metal body headphones and planar magnetic phones are particularly strong static magnets.

The trs/xlr and trs jacks on the MONOTOR are balanced, but the source can be balanced or unbalanced. For rca plugs, you will need a ts (tip-sleeve) to rca adapter or a cable made for the purpose. The adapter will connect the ring of the jack to the sleeve. If making a rca to trs cable, tie the ring and sleeve of the trs to ground and shield with the tip hot. If making a rca to xlr cable, tie pins one and three together of the male xlr, with pin two hot.

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THANKS AND A LITTLE BACKGROUND ON THE MONOTORS DEVELOPMENT

Thank you for purchasing the Little Labs MONOTOR™ source analyzing professional headphone amp.

The MONOTOR is designed to fulfill the need for professional monitoring at the highest resolution possible, allowing long, fatigue-free analytical listening sessions.

Headphone listening amounts to 80% of what the consumer listens with today, and as the world gets more populated, this percentage will increase. For the professional mixer, monitoring on headphones is not only necessary but essential.

As a tech at A&M records recording studios and mastering rooms throughout the '80s and '90s, I found the studio control rooms, although excellent rooms and fine for evaluating a balance, they never came close to having the high-resolution monitoring capabilities of the mastering rooms. Every component in the audio signal chain of the mastering rooms was carefully selected, and anything unnecessary was deleted; compared to the studios large mixing consoles going through (necessarily) dozens of amplifiers before reaching your ears, the resolution between the two was readily apparent.

The mastering rooms were very carefully appointed under the direction of a legendary staff of mastering engineer greats, including Alan Yoshida, Bernie Grundman, Patricia Sullivan, Dave Collins, Stephen Marcussen, and others throughout the years. Much of the electronics used were built in-house. In these rooms, we could analyze minute differences in the sonic signature of components; even different brands of resistors could be detected and evaluated for sonic neutrality. These well-appointed rooms allowed us to have a mastering chain that would allow an engineer to come in and hear details such as edits, hums, hiss, unwanted distortions, and reverb tails, which would often go unnoticed in the studio control room

environment—allowing a final polish to be put on a mix, with the engineer confident that no matter what system the consumer played it on, all that would be heard would be what was intended.

Fast forward to 2016, a much different recording monitoring environment is the norm, often makeshift and acoustically imperfect. Despite huge quality improvements in digital technology, the monitoring environment has, in most cases, become less than ideal, and resolution has suffered.

The Little Labs MONOTOR was designed so two people per MONOTOR (each headphone out is independently powered) could listen deep into a track at the highest resolution possible when paired with a quality set of headphones.

The headphone amp in the pro world has been neglected with few offerings, most of it junk, or the more expensive stuff available includes the gimmick cross-feed circuitry, and quite often is driven by several active stages with unsuitable output drivers, great for old consoles to get a guitar sound, but not for driving high-resolution headphones.

Many audiophile headphone amps exist with often euphonic yet inaccurate reproduction and at a ridiculous price. A trend of digital to analog converters combined with headphone amps is also popular. Some of the digital-to-analog converters are of decent quality. Still, a studio or mastering facility will typically have much better in-house digital-to-analog converters (the MONOTOR makes evaluating converters easy).

The USB-powered headphone amp/digital to analog converters are crippled by default by dc to dc converters used to squeeze every bit of power out of a USB port.

Internally powered and Bluetooth headphones are also crippled by a neutered power supply.

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I'm not saying these headphone amps sound bad; it's just that they are not at a level of resolution found in a properly appointed mastering facility.

The Little Labs MONOTOR is designed with (what I call) a zen circuit topology. Only a single state-of-the-art active stage is used at its optimum gain, in the circuit path of each headphone ear, with all else straight wire passive (this includes all the mono functions as well). All passive components in the audio path were selected for sonic neutrality; this includes Dale/Vishay resistors, Nichicon Muse series caps, and specialized polystyrene film decoupling caps. The MONOTOR uses a full voltage state-of-the-art super low noise internal linear regulation system (4 uVrms) with massive capacitance for power on demand on each rail. Just one internal filter capacitor used (there are 6) is bigger than a whole USB dongle digital to analog converter/headphone amp. This level of component selectivity allows for a noticeably improved dynamic range over other headphone amps. You can drive high-impedance phones to full volume without any strain. The MONOTOR, when I say it is state of the art, it truly is, and could not have been built just a year ago. I'm proud to say this is not a rehashed old analog circuit; with this labor of love, we've taken analog to another level.

The MONOTOR, paired with a good set of headphones, will give you a reference at the highest resolution, so in imperfect environments, you'll quickly be able to evaluate as you only could in the best mastering facilities. You might wonder what I use for headphones (the headphone field has become huge in the last ten years). The reference I use with the MONOTOR is the relatively reasonably cost Sennheiser HD600 with a Cardas cable (cable given to me by Bernie Grundman's Mastering facility and ex-A&M super tech Beno May, thanks, Beno)! This simple setup will set you back less than \$1000 (slightly more with the Cardas cable) and give you the performance you could easily spend ten times that trying to achieve, with most likely worse resolution. Your favorite headphones are more than likely suitable for the MONOTOR. Another popular headphone used with the

Monotor is the Audeze LCD-X which I love the bass response of. Still, I'm partial to the neutral mid-range on the HD600. I use for tracking the closed-back Audio Technica ATH M50. I do not recommend pairing with the monotor, low impedance, super efficient, typically IEMS (but some headphones also), which can get too loud too quickly and not give you adequate volume range on the level control.

So cheers, thank you for your purchase and be sure to look at the rest of the manual (especially the read this first part).

Thanks to all the people for the help, patience, and good insights while developing this product, The late Zack McCormley (DTS), John Caldwell (Texas Instruments), Raymond and George Lui (G&J mfg), and my wonderfully supportive amazing girlfriend, Randi Kory.

Happy Listening,

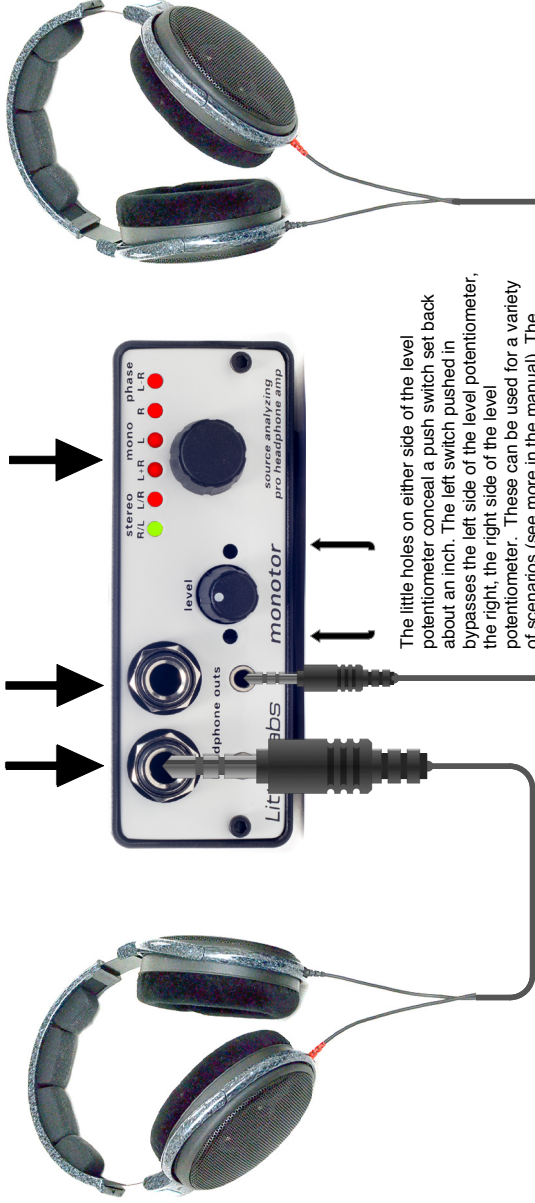
Jonathan Little



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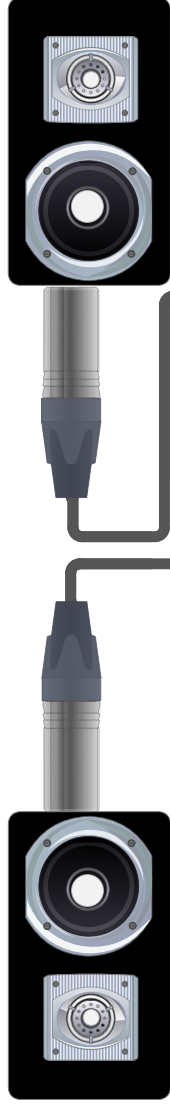
The front of the monitor has four headphone output jacks, two 3.5mm and two 1/4". The two jacks to the left are fed by one stereo amp and the two jacks to the right are fed by a separate stereo amp. For the best performance use one set of phones per stereo amp. But if you need to use all four, you will not damage the output. monitor and performance difference for casual use is minimal.

Stereo / mono function switch selects: stereo reverse (maybe that hi hat sounds better on the right?), regular stereo, mono left plus right, left only (in both ears), right only (in both ears), left minus right for hearing what is out of phase (between what is feeding the left and right in) and also useful for compressed digital audio file artifact analysis.



The little holes on either side of the level potentiometer conceal a push switch set back about an inch. The left switch pushed in bypasses the left side of the level potentiometer, the right, the right side of the level potentiometer. These can be used for a variety of scenarios (see more in the manual). The most common is when using the monitor with a high quality digital to analog converter that has a built in level control (like the Oppo 105). The highest quality level pot is no level pot.

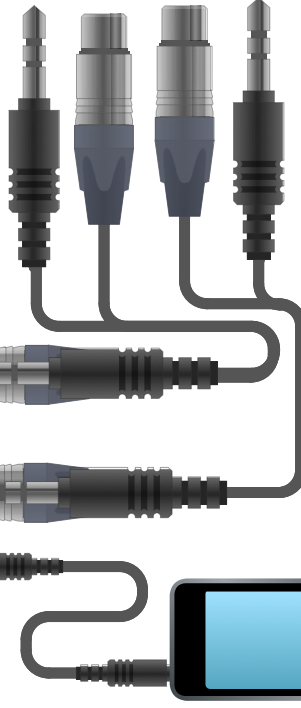
FRONT HOOK UP



The xlr trs combo jacks and trs stack jacks are in parallel with each other. Shown here with powered speakers connected to the trs jacks used as a thru.



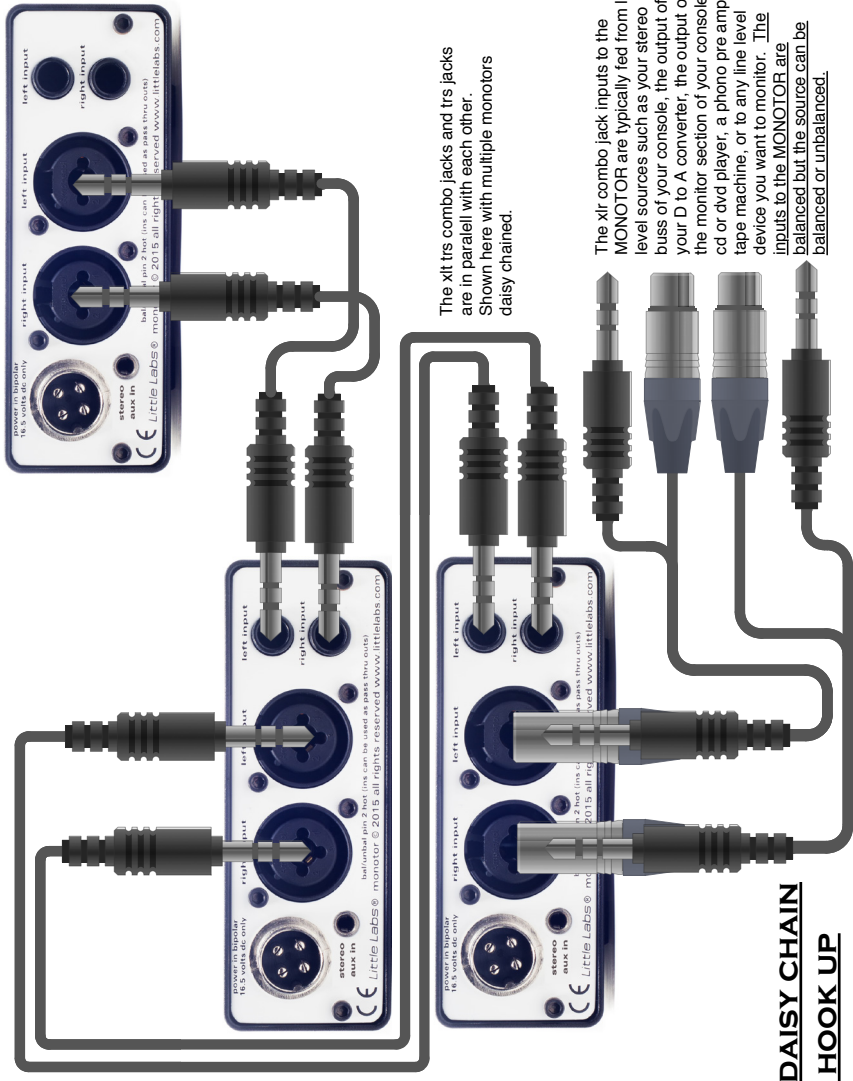
The xlr combo jack inputs to the MONITOR are typically fed from line level sources such as your stereo buss of your console, the output of your D to A converter, the output of the monitor section of your console, a cd or dvd player, a phono pre amp, a tape machine, or to any line level device you want to monitor. The inputs to the MONITOR are balanced, but the source can be balanced or unbalanced.



The stereo aux in mini jack can be fed from a phone or any 3.5mm stereo jack device, including ipods or stereo video camera mic headphone outs (talkback). This input sums with the main inputs post the mono functions and volume control.

REAR HOOK UP

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SPECIAL FEATURES

Dual amplifiers

The front of the monotor has four headphone output jacks (two 1/4" and two 3.5mm). The two jacks to the left are fed by one stereo amp, and the two jacks to the right are fed by a separate stereo amp. Use one set of phones per stereo amp output for the best performance. But if you need to use all four, you will not damage the monotor, and the performance difference is minor for utility use. We use a single volume potentiometer, so when doing serious monitoring with a partner, as in listening on speakers in a room, you will, if wearing the same headphones, be hearing the exact same high-resolution signal.

Little Holes

The little holes on either side of the level potentiometer conceal a push switch set back about an inch. The left switch pushed in bypasses the left side of the level potentiometer, the right, the right side of the level potentiometer. These can be used for a variety of scenarios, but the most common is when using the monotor with a high-quality digital-to-analog converter that has a built-in level control (like a Crane song Solaris and some others). The highest quality level pot is no level pot, and there is no point in being redundant.

A creative scenario is to feed the MONOTOR with it in the mono L+R mode selected and a cue mix from the console feeding the left channel and the artist's mic or instrument feeding the right channel. Then on the left channel, bypass the level control so you control that level from your console, and the artist can use the level on the MONOTOR for a simple more me, or less me, volume control.

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The level control bypass is a great thing to have in certain types of installations and can add another piece to the puzzle to screw things up in other installations; it is for that reason the bypass switches are concealed.

Stereo reverse, Mono functions, Phase

Stereo / mono function switch selects: stereo reverse, regular stereo, mono left plus right, left only (in both ears), right only (in both ears), left minus right for hearing what is out of phase (between what is feeding the left and right in) and also useful for compressed digital audio file artifact analysis.

These are switched using relay and switch contacts to do the job, a big switch, nothing active is added in the process.

As simple as these features are, they are incredibly useful in day-to-day use and far more convenient than using a computer to accomplish the same results.

As Little Labs is known for our IBP (in between phase) phase tool, phase meters frustrated me because they show that something is out of phase but not what is out of phase. The L-R function on the MONOTOR lets you easily hear the audio that's out of phase; everything in phase between the left and right channels is attenuated by more than 45 dB.

In-line monitoring and daisy chaining

Multiple MONOTORS can be used in an installation using trs to trs cables between units. The XLR/TRS combo jacks and the TRS jacks are in parallel with one another. This arrangement allows simple in-line monitoring with no need for special Y-type adaptors.

The mini-jack, phones, and talkback

The stereo aux in mini jack can be fed from a phone or any 3.5mm stereo

jack device. This input sums with the main inputs post the mono functions and volume control.

One scenario to use this is if you have a client who listens to their music on their phone. While you have the MONOTOR connected to your stereo buss, they can plug in their phone and compare your mixes to what they like, easily using their own volume control for their music and separately adjusting the stereo buss signal with the MONOTOR level pot fading each one in and out. It's an incredibly simple way to hear what the client is hearing and get them what they want sonically fast.

Another scenario for this jack is talkback. When demoing products at trade shows, sealed back phones are essential. Trying to explain what you are showing people while wearing phones is difficult. A simple, cheap stereo Lavalier mic with a mute switch and a wireless transmitter and base with a headphone out is a simple solution for talkback. Even a super cheap Behringer micromon ma400 can be used to split out to multiple MONOTOR stereo aux-ins with a mini splitter like a Belkin rockstar multi-headphone splitter. Cheap yet very effective.

This setup can be used obviously in any recording situation, but especially great when tracking without a proper console.

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INTERFACE SPECIFICATIONS

XLR/TRS input impedances:

Measured in stereo mode with TOA ZM-104 impedance meter.

Balanced signal measured between pin 2-3 xlr or tip ring trs.

Balanced input impedance with level control in $5k-11k \Omega^*$

Balanced input impedance with level control out $8k \Omega$

Un-balanced input impedance with level control in $4k-5k \Omega^*$

Un-balanced input impedance with level control out $20k \Omega$

*Front passive level attenuator varies input impedance depending on setting.

Headphone output impedance: 0.5Ω

Crosstalk @ 1khz balanced mode: >102dB

Crosstalk @ 1khz un-balanced mode: >87dB

Gain: 13.8dB

A WORD ON SPECS

A review of the Little Labs Monotor headphone amp came out that was all about measuring the specs. I had no dispute with most of the measurements (one notably was output impedance which I definitively measured at $0.5\ \Omega$, the reviewer says he measured $1\ \Omega$); however, I disagreed strongly with the conclusions drawn by the review writer on some of the measurements. The review and measurements can be found here:

<http://tinyurl.com/y69gkwak>

Doing what I do for 40 years now, I know what specs are important and what specs are either misleading or not important for the product being reviewed.

Below was my response:

I'm the designer of the Monotor.

I appreciate the effort the reviewer put into measuring the monotor. It's interesting and useful. I hope it doesn't discourage people from seriously listening and comparing, using their ears as the final judge when making a headphone amp purchasing decision.

I do not dispute the accuracy of the measurements. I do, however, disagree strongly with the conclusions drawn by the reviewer on some of the measurements. In my 40 years of working professionally designing, maintaining, and manufacturing audio electronics for recording and mastering facilities, I can assure you a layperson audio fan's biggest mistake is judging a unit to purchase on specs alone.

As a designer working with professionals with serious listening chops, you, over time, learn what makes a circuit sound better, what specs matter, and what specs are not useful in judging the sonics of a design.

One can make two identical circuits with different chosen components that measure identically but can sound very different.

One can also add to a circuit to make a noise floor even quieter

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when the noise is already audibly imperceptible.

One can also add to a circuit to make more current available when it will never be used.

Each active addition to a circuit is one step further away from the purity of the source.

My design philosophy is to use minimum active circuitry in the signal path to bring the headphone to a respectable volume and command that headphones dynamically to be as transparent to the source as possible.

There is a reason a power amplifier makes a poor headphone amp. You don't put a dragster engine in a Porsche.

Some notes:

Headphone Imbalance vs. Volume Position.

I challenge anybody who says they can perceive an L/R imbalance of less than 1 dB. Yes, it's nice when you can find a simple analog carbon pot that tracks closer than 1dB top to bottom in the whole logarithmic scale, but if you find one with 30 steps within 1 dB, you're doing great. The monotor pot is not a discrete stepped attenuator, but it tracks pretty damn well for what it is. Of course, you can use an IC-based potentiometer that can track perfectly, but you added another active step further from transparency. Oh, and regarding steps, how many more than 30 are necessary?

How much power is necessary for driving a headphone?

I am using both the HD600 Sennheiser (300 ohms) and an Audeze LCD-X (20 ohms) daily, and both work wonderfully with the monotor and certainly without distortion at a very loud volume.

Those two phones are the two most popular used by professionals paired with the monotor.

I listen to all genres of music, and not once did I notice distortion, even at dangerously high volumes. Now I'm unfamiliar with the Hifiman HE-400i, but I'll take the reviewer's word that the monotor distorted before the HE-400i did.

But, and this is very important, the casual reader of this review would likely overlook this. This HE-400i is a rare case, a new breed of headphones with very low sensitivity and low impedance (FYI, low-impedance phones are typically very sensitive). Another head-

phone with that spec is the Mr. Speaker Aeron (closed back), which I like a lot. I have never pushed it so loud that the monotor distorted, but I don't dispute that you can.

In my experience with headphone amps, voltage gain, which is necessary to drive phones to a respectable level, is far more important a spec than power output. Rarely is over 100mw of power necessary to drive a well-designed headphone happily. The Monotor has 13.8 dB of gain. I chose that gain for a perfect pairing with my most popular headphone, the HD600. That gain with the HD600 gives you a great range from soft to ridiculously loud and oh-so-clean... Now where that gain becomes a problem is with super sensitive phones, mostly IEMS. Some IEMS are crazy sensitive; those IEMs I do not recommend with the monotor.

The monotor is not a one-size-fits-all; you don't use a Porsche for off-roading now, do you?

That said, I have some drummer friends who love it super loud and use the monotor on stage to power their IEMS; they couldn't be happier. I worry about their ear health.

Frequency response:

The monotor is .3 dB down at 20kHz; at 50kHz, it's 1.7dB down; this is on purpose. I can assure you, you cannot only not hear less than 1dB imbalance left to right you sure as hell can't hear .3 dB down at 20kHz. Amplifying stuff that's not music does not add to a sonic experience. Overlooked in this review, the monotor has an excellent low-frequency response, flat to 3Hz (where you can actually feel it).

Mono functions and other pro features and price:

The monotor found its way into audiophile circles, but it is truly a pro device.

The mono functions do add greatly to the cost of the monotor. The phase function makes checking azimuth on tape machines and phono cartridges a breeze.

The monotor remains balanced, completely differential internally through to the output driver. We don't use any balanced to unbalanced buffers.

A single active stage is used, surrounded by top-notch passive compo-

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nents in a hybrid thru-hole/smt component selection. This circuit topology includes Dale Vishay thru-hole resistors, Nichicon Muse bipolar capacitors, polystyrene capacitors, and massive power supply reserve caps using some of the quietest voltage regulators available. None of these components add to what can be measured, but they definitely bring you closer to the source sonically and makes the unit more costly. I laugh when I hear comments of the monotor being overpriced. They wouldn't say that if they saw the BOM (bill of materials).

In closing, I didn't come here to bitch; I came here to enlighten. I appreciate the reviewer's work, but I want to encourage the consumer to look past the spec. Any EE can make textbook audio gear that measures well, but it takes ears and years to learn what really sounds great.

Cheers,

Jonathan Little

ps

Having now heard the reviewer's "reference," I can assure you that your ears will appreciate my circuit design philosophy.



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**MANUAL PRINTING & PDF FORMATTING 04/2016
UPDATED 06/2023**