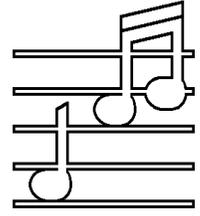


AUDIO BASICS



A MONTHLY NEWSLETTER OF AUDIO INFORMATION
VOLUME TEN NUMBER TWELVE DECEMBER, 1991

Once More, the Limitations of Bitstream and DCC.

We have had several calls and letters regarding last month's *Audio Basics* editorial regarding the limitations of Bitstream and DCC formats. People still are confused and still think that Bitstream "sounds good." We need to simplify our message. Here goes.

With a Bitstream (one-bit) compact disc player as available with present day technology (an 11MHz clock) the maximum number of bits that can be recognized in one second is eleven million (the maximum crystal controlled clock speed). If we have an audio signal of 10,000 cycles per second we can determine how many discrete steps each cycle has, given an 11MHz one-bit CD player. The answer is simply 11 million divided by 10000 which equals 1100 (we only need third grade math to solve this problem). This means that each cycle of a 10000 Hz tone can be divided into no more than 1100 steps. A 16-bit CD player (and the information on the CD disc itself) divides each cycle of the signal into 64,000 steps (2 to the 16th power). 1100 is a much cruder result than 64000. At 20,000 Hz, the problem is even worse, the 1-bit machine can only produce 550 steps per cycle which is actually 8-bit resolution (2 to the 8th power), not 16-bit resolution.

The 1-bit CD player loses much of the musical material at any frequency over about 170 cycles per second because its 11MHz clock frequency is 256 times too slow to accurately play back the music.

You may like the sonic result, but it is not music (if we define the music as being what was originally captured on the CD). Actually, because the last analog filter stages of so many CD players are so awful (using slew rate limited and unity gain unstable circuits totally inappropriate for the application) they may actually get in less trouble with the information sparse signal from a 1-bit DAC than if they have all the music to contend with. The end result may be that the overall musicality of a 1-bit CD player with a horrible audio stage likely will sound less awful than a 16-bit CD player with the same horrible audio stage. Sometimes two wrongs are less obnoxious than one wrong.

But the 1-bit machine is never right and cannot be. When compared to a true 16-bit system with a well engineered audio filter stage the 1-bit system is soundly defeated (unless the rest of the system cannot handle a full range audio signal either - but that is another problem altogether - stay tuned).

The DCC (Digital Compact Cassette) format only allows 4-bits per cycle at high frequencies (the 20,000 Hz waveform can only be represented by 16 steps instead of the 64,000 steps necessary for true 16-bit performance). In every respect its performance potential is much worse than even a 1-bit CD player. No we don't like DCC better - we don't "like" DCC at all because it is not high fidelity - it has no chance at all of preserving all the music.

Big Metal Speaker Posts?? Shocking!!

Some of you keep nagging us because we refuse to kowtow to the prevalent audiophile whims and equip our power amplifiers with giant all-metal speaker posts.

We don't supply our big power amplifiers with giant all-metal speaker posts because we have some common sense.

We don't supply our big power amplifiers with giant all-metal speaker posts for the same reason that the electrical outlets in your house have the sockets going into the wall plates and the exposed AC plugs on the cords that attach thereto and not vice-versa.

It is so you won't electrocute yourself when you grab the exposed bare plugs!

A big amplifier can easily put 60 volts AC at any frequency from 10 Hz to 20 KHz across its speaker terminals. This is more than half of your AC power line potential and nearly as lethal!

We don't supply big all-metal speaker posts on our big power amplifiers because we are not irresponsible fools. We really want you as a live client, not an electrocuted one. Keep your fingers (and those of your children) away from the terminals – at both the amp and the speakers – when the system is energized. The electricity doesn't know its purpose. Be safe, not trendy.

Do Not Leave CDs in Your Player.

When you are finished using your CD player for a listening session, make sure you remove the CD and shut the drawer and turn it off.

If you leave a CD parked in the player long term, you compress the hub clamp assembly unnecessarily, adversely loading the top bearing, which deforms the bearing plate. If the bearing plate is deformed (dimpled) then the CD will no longer self center when it is loaded and the likelihood of mistracking is increased. Fortunately, the cure is usually inexpensive (a new top bear-

ing plate) but prevention is even easier – keep the player unloaded when not in use.

On some older players, leaving the unit sit on with the drawer trayed out is hard on the tray drive transistors. They get hot and eventually fail. The fix is simple – new tray drive transistors. But taking care of the machine in the first place is even simpler. Remove the CD, shut the drawer, and turn the machine off when you are not using it.

We have had panic calls from some clients when other repair shops have told them they needed a complete transport, a new drawer motor, or “throw it away” when all that was wrong was a dimpled top bearing plate or a easy to replace drawer transistor. Many shops simply cannot properly service CD players. We had to go to Philips school and pass their tests to become an authorized warranty station even though we have an electrical engineer on staff. Check with us first before making a heavy investment in repairs elsewhere. You may be spending too much.

Power Line Filters.

Are after-market power line filters useful for your high fidelity and/or video system? Yes they are. Should you pay several hundred dollars for a “real good sounding” power line filter from an audio salon? Only if you believe in real good sounding power lines (the best are found out west - the giant 800KVDC transmission lines – stand under one of these towers in a east Wyoming cross-wind and the lines will sing a really pretty song).

Our suggestion is to stop by your friendly local personal computer store. They will have 6 outlet 15 ampere power line filters such as my EPD Orange EMI-RFI filtered AC surge protector for less than \$50.00 list price (and widely discounted). One may help save your system from a over-voltage transient and keep the radio stations out and the distortion lower. But should you pay a big fat price for a “good sounding” RFI filter? I certainly hope not.



*Sanus
Systems
Speaker
Stands*

*(from left to
right)*

*B&W DM310 on
Sanus Basic S17
Stand.*

*Phred the Phuma
on B&W DM640*

*B&W V201 on
Sanus Basic S24
Stand.*

Sanus Systems Stands.

We have been pleasantly surprised to discover a Minnesota company building a very good and rationally priced line of speaker and equipment stands. The company is Sanus Systems of 3178 Ryan Lane, Little Canada, Minnesota 55117 (phone 1-800-359-5520).

They make several lines of speaker stands, and even the lowest priced (two examples shown above) are very well built and finished. They work great with several of the smaller B&W models.

The S17 Basic Foundation lists for \$42.99 a pair and is perfect for the B&W DM310 speaker. The S24 is great for V201s and works well with CM1 B&Ws too. Its list price is \$51.99 a pair. There is also a S10 (10" high) stand in this series that,

at \$42.99 a pair, would be a good match for the DM620s.

They offer several series of more expensive and highly finished stands of very high quality, with walnut, oak, black lacquer, and even stone or marble-like materials of non-resonant construction. They also make very useful TV turntables (their low profile TT30 holds up to 200 pounds and allows my 32" Sony to swivel easily and matches its size exactly). Finally they make TV and speaker wall mounting brackets and modular, expandable equipment racks.

Sanus Systems does not sell to the public directly, but you can call them for the name of a dealer near you and for product literature. We like their stands and will have them available for several of the B&W models. Call us for prices.

If Only Our Directions Were Heeded.

Then we could serve our clients better, and at lower cost to them and to us, and the relationships would be more enjoyable for all.

The following is information from a letter I had to prepare informing a client that the efforts I put into his Super Pas Four kit to repair its problems exceeded the bounds of "free checkout" and that there would need to be a charge for our services. *The charges would have been absolutely unnecessary if only our advice had been followed.*

There is good reason for our simple requests that clients call us first if they have questions about our products. The reason is that we desire that you get the best value and the most satisfaction from our products and our relationships. I hope that is not an unreasonable goal.

In this case, we had to be a circuit detective instead of simply smiling and shipping replacements for a couple of customer damaged parts. The old adage "haste makes waste" struck again. Yes, we know it might be embarrassing to call us and admit that a mistake had been made in the building or hookup of the equipment. Somehow today's society seems to teach that mistakes make one "a bad person" and that admitting an error depreciates one's own self worth. What a bunch of baloney! Everyone makes mistakes now and then. We are all human beings, not machines, and we don't function perfectly all the time. Hey, even the best hitters in professional baseball screw up two-thirds of the time they come to the plate! What is important is that we understand that an occasional error does not depreciate our self worth. And important too is to understand that proceeding as if the error had not occurred (when you know it is going to have to be fixed) almost always will cost more (in both dollars and in relationships).

Enough philosophy, let's look at the specifics of the case.

The builder of the Super Pas Four kit called us to inform us that his recently completed preamplifier sounded just wonderful and worked great but that he thought he might need tone controls with some of his records so could he trade it up for a factory wired Fet-Valve preamp and pay the difference in price. We informed him, "Sure," but observed that there might be a charge to put the Super Pas Four kit into good working order if his wiring work was too sloppy or if the unit had serious problems. He agreed and immediately shipped the Super Pas Four to us for the trade-up.

Superficially it looked like the kit builder had done a very nice job. The wiring was tidy, the mechanical assembly looked good, all the parts were neatly placed on the PC card, and his soldering techniques were just fine. Or - so it seemed until we inspected more carefully. Then the anomalies started appearing.

First there was the power switch. This is a snap-in rocker switch that easily and firmly seats into the faceplate. His didn't. It was sticking partially out on one side and mushed loosely when we attempted to re-seat it. We couldn't let the unit go back out with a defective power switch. A careful examination of the mounting fingers for the switch showed that they were all damaged - deformed with pry marks from a pliers or screwdriver blade. Obviously the client had installed the switch upside down the first time and then had become frustrated in removing it from the panel. Excess force in the wrong place had been used to remove the switch, damaging its mounting fingers. Gee we wish the client had called us then and asked for our help. We could have told him how to remove the switch without damaging it. Or we would have simply sent a new switch. Now not only did we have to install a new switch, but we had to unwire the old one and rewire the new one into circuit, a more time consuming process.

Next we observed that the headphone jack could never have worked because its wiring connections were reversed, shorting out one channel. This occurred because the jack had been mounted upside down. Oh well, the correct installation seems to be a bit tricky (about half of the jacks we see mounted in old Dyna Pat-5 kits are done wrong too in spite of a clear diagram) and that was an easy fix and a problem we have learned to always look for from our Dyna service experience.

Then things started to get more unhappy. We noticed that one of the power resistors on the circuit board had been seriously overheated. Its pretty powder blue body had turned smoky tan with a big char mark in the middle. This 10,000 ohm 3 watt resistor is in series with the main power supply feed to the four vacuum tube sections and if it fails, the preamplifier cannot work at all. This resistor simply cannot fail all by itself. *The only way to overheat it is to pull far too much power through it.* The only way to pull too much power through it is if something after the resistor (a power supply capacitor or a vacuum tube) is defective (shorted) and is drawing too much current. This didn't jibe with the customer's telephone observation that the preamp sounded just great. Did we have a serious intermittent problem? Why didn't the client smell the overheating part(s)?

Obviously the preamp had to go on the test bench and we monitored all the power supply circuits while slowly bringing up the power with an AC Variac. (This lets us find problems at low voltage before they can do serious damage).

The power supply circuits to the four vacuum tube sections worked just fine! There was no overheating at all. All the B+ voltages for the tubes were right on the button. The tubes all tested out fine. There were no signs of any problem that could have caused the overheating.

But - unfortunately we did find another problem - a problem that would have kept the preamp from ever sounding good - actually it was just barely working. The problem was that the one side of the low voltage ± 18 volt power supply to the headphone amplifier was not connected. This unbalanced the power supply to the headphone amplifier and forced its output to 18V DC and its input to half that, 9V DC. Essentially because one power supply feed was missing the headphone amp thought it was a single ended circuit instead of a balanced circuit and it did exactly what it was told. *But, since the inputs to the headphone amplifier are connected to the main line outputs of the preamp, this forced the main line outputs of the preamp to a DC offset of 9 volts too - not a nice thing to do!* This was not an intermittent problem. It was a real, solid, all the time problem that prevented the preamp from ever sounding good as its output was sitting at half the supply rail and was grossly distorting.

At this point we noticed fatal circuit board error number three - one of the feedback capacitors to the headphone amplifier had never been installed. The part was missing from the board. This did make us wonder why we had never been called about what to do with the part left over - or to ask us for the part if we had left it out of the kit. Now there were three reasons to pull the main circuit card so of course we did. Actually, with the Super Pas Four it is a bit easier than that. Instead of removing the board from the bottom of the preamp, one removes the bottom of the preamp from the board - keeping the board wired in place - we have succeeded in making an accessible design.

Servicing a kit that has never worked, and for which you have no original hints as to what went wrong, is much more difficult than simply repairing a unit that did once work correctly. This is because with the repair to a previously working unit, you know that all the parts were in the right place. With a non-functional kit you can make no assumptions at all.

The detective work started.

The first thing that we noticed is that although the underside of the PC board was clean underneath the overheated 10,000 ohm resistor, the PC card showed signs of excess heat under the neighboring 100,000 ohm power resistor. And from the top, that neighboring resistor was in perfect condition. If when the kit was built those two resistors had been swapped, the 10,000 ohm 3 watt resistor would have had the full 330 volt power supply voltage across it. Since power is V^2/R , then the power forced through the 10,000 ohm 3 watt resistor would have been 11 watts, enough to account for the damage. Of course the preamp would not have worked and the smell of cooking resistor would have been obvious. The evidence was that the resistors had indeed been first incorrectly installed and that the client did notice the problem after powering it up (instead of sending it back first for our free check-out). Impatiently, a quick fix was made by the kit builder, with the resistors removed and reinstalled in their proper locations, unfortunately re-using the obviously overheated 10,000 ohm resistor and giving us a false damage trail to chase. Oh how much less troubleshooting time would have been necessary if the client had only called us and asked for a new part. The resistor only cost 24¢ and we would have supplied a replacement free, unfortunately our unnecessary bench time investment cost much more.

Then came the search for the missing power supply feed. The actual power supply voltages were just fine when measured at the main supply capacitors. But the power was not getting to the headphone circuit. The connection was a heavy foil trace on the top of the board running from the power supply capacitor lead to the decoupling resistor for the headphone amp isolated supply. This trace measured open circuit - no connection at all. There was only one possible place where this circuit could have become disconnected and that was at one of the plated through holes used for mounting the power supply capacitor. I designed the Super Pas Four with a double sided board with plated through holes to eliminate all jumper wires, to optimize the layout, to allow final interconnect wiring connections to be made from the top, and to make all component connections more reliable. The actual circuit foil extends from the top to the bottom of the board through all the holes. But, it is possible to damage plated through holes by use of excessive force in removing components from the board (too little heat and too much force can result in pulling the holes right out). It is pretty obvious when you do this because a little "donut" of copper will be stuck to the component lead which you must

remove before you can possibly re-use the lead. You have to fix the circuit board too, as removal of critical holes disconnects parts of the circuit.

I carefully removed the power supply capacitor in question and sure enough, the plating from both of its mounting holes was missing - including the connection to the headphone amplifier. If the plating from one hole had been damaged I would have suspected an original defect in the board, but with both gone completely, excessive force in removal of the part *the first time* was the problem. This of course raised the question, "Why had the part been removed and re-installed?" The answer to that question is that the part was a polarized electrolytic capacitor and installing it backwards causes it to short out - and that would have cut off the tube heater circuits for the whole preamp. If the capacitor had been installed backwards, the entire preamp would not have lit up - no sound at all. The first time around, the B+ supply would have been smoking because of the swapped resistors, and the tubes would not have lit up because of the shorted backwards supply capacitor - an exciting time indeed! The client got the preamp working by swapping the resistors and removing and turning the capacitor around, but only at the expensive of damaging its connection to the headphone amplifier circuit and never getting the musical quality he had paid for.

Installing a polarized electrolytic power supply capacitor backwards most likely damages it. Obviously we replaced this capacitor and regret that we had not been informed of the problem. We certainly would not have wanted that capacitor re-used and we could have informed the client how to look for and make an easy fix for his broken foil path if we had known the cap had been removed.

We installed a new power supply capacitor, repaired the headphone amp power supply connection, and installed the missing headphone amp feedback capacitor. We refurbished the wiring a bit, and ended up with a very nice looking unit (and with all the circuits working it sounded great too).

So we have a client trading the unit in "to get one with tone controls" and who will have a repair bill to pay too. A phone call or two when the difficulties occurred could have gotten the builder a perfectly working preamp at no additional cost to him at all.

But we cannot give the best help when we don't get the facts. Then, after the fact help costs us and you too much and makes nobody happy. Please tell us when your batting average is not perfect. We don't care that it isn't (nobody's is). We care only that we get the best possible information so that we can give you the best possible service. That makes all of us happy.

We Have a Special Price on a Super Pas Three Ω mega Preamplifier

There is only one piece of used equipment available for you this month so far, but it is a real bargain. It is a clean used Super Pas Three Ω mega preamplifier for just \$395.00 and \$10.00 shipping in the continental U.S.A.

It is a trade-up on a Super Pas Four. It has our black faceplate and knob set, our selector switch, and our ground plane jack set (but not the gold plated ones). It was built here into a good used Pas chassis in 1988 and upgraded here with the Ω mega line and phono buffers a few months ago. It has all our current circuit upgrades including the relocated power transformer and most recent grounding layout. It has good Chinese 12AX7A tubes and a brand new black cover.

It sounds and plays just like a new one and we can offer a 6 months parts and labor warranty (not on tubes) in addition to our usual 30 day satisfaction guarantee policy. Call us now for a great musical preamp at a greatly reduced price.

Last Month We Informed You that You Could Buy B&W CM-1s and Get the B&W Acoustitune Free!

We can offer one and only one more CM-1 and Acoustitune set because we are running out of woofers. First come, the only one served!

When you order a set of B&W CM-1 mini-matrix speakers (black only) from us at the \$800/pair retail price, we will throw in the \$350.00 list price B&W Acoustitune sub-woofer at no extra charge and pay shipping to you in the continental USA. The Acoustitune is a perfect match for the CM-1s, the result is 801 like performance in a small space - the combination I am using myself right now in my video system (along with a Super Pas Four preamp, an Ω mega 150 power amplifier, and a Hughes SRS system).

If you don't need the sub-woofer (and the CM-1s are very impressive all by themselves) then take \$250 off the price - you pay \$550 for the CM-1s alone - the best price we have ever had on them. Call us about them now.

It Is Time To Renew *Audio Basics*

Check your mailing label. There is a very good chance that the four digit number to the right of your name reads 9112, or 9201. If so your subscription to *Audio Basics* is running out.

We are holding the price to \$16.00 US, \$20.00 Canada, and \$24.00 Foreign for another year as the post office has not increased rates yet. (Annual back issues are still available for \$15.00 per year in the US - add \$4.00 per year for back issue sets to foreign countries).

This issue represents the end of a decade - ten continuous years of publication of Audio Basics. Thanks for your continued support. We will try and make *Audio Basics* informative and interesting again for you in 1992.

Frank and Darlene Van Alstine