Instruction and Installation Manual

KRONOS LEVIATHAN

Designed and manufactured in the
United States of America

Index

Features of KRONOS and LEVIATHAN

* Super high quality RCA sockets
* Pre amplifiers use Burr Brown chipsets standard.
* Every audio IC has its own rail decoupling components for minimal RF interference.
* All coupling capacitors are bypassed with film types for superior high frequency response and detail.
* All power supply capacitors are low ESR types rated at 105 deg C.
* All gain dependent circuits use 1% low noise metal film resistors.
* Almost all resistors and capacitors are SMD types (Surface mount) for higher reliability.
* Clipping LEDs on every channel allows set up and help prevent amplifier clipping.
* Power supplies use TO-247 packaged MOSFETs each with 110A capability.
* Front end pre amplifiers use their own fully ground isolated power supply for ultimate S/N ratio and noise rejection.
* The pre amplifiers run fully balanced to the class D power amplifiers.
* The class D amplifiers utilize our DELTA BRIDGE feed back design.
* KRONOS has additional circuits which monitor the impedance of the speaker and if the impedance drops to an unsafe value the power supply is instructed to limit the power.
* All level controls use parallel elements for lower wiper noise and redundancy.
* KRONOS has a total of five regulated power supplies and LEVIATHAN has seventeen, yes 17 regulated power supplies.
*The main high current supplies use the MOSFETS in the follower mode for higher efficiency and wider bandwidth.

For those of you who have used our previous products, much of the information in this manual will be familiar. We have added some new interesting titbits. Over the past four years since the first Zed amplifiers were introduced, several events have occurred which have moved us into a new dimension of mobile amplification.

The cost of gasoline has skyrocketed and for those of you who believe that $2.50 gasoline is here to stay, well there is a big shock waiting just around that little corner. The world's car manufacturers are now forced to make smaller cars, as they have done for many years in Europe and the far East. This means smaller electrical systems due to the smaller engines are being used. Hybrids are cut from the same cloth in terms of the available electrical power.

Well you may ask, what has this got to do with mobile amplifiers? Everything! The electronics now must smaller, lighter, more efficient and of course less expensive. Unfortunately these things do not always go hand in hand. The need for high powered amplifiers has not diminished. Power hungry speakers and power hungry consumers prowl the back alleys of mobile sound.

So what is required are amplifiers that use the available electrical power more efficiently BUT with no loss of fidelity or power. Several options are available. Class B amplifiers are notoriously inefficient due to the fact that they are linear devices and in their traditional form waste about 70-80% of the power supplied to them as heat. Class A amplifiers do not even think about for mobile use as their efficiency is even worse. So what options are available? Class D is the one of them. For most audio buffs, class D has been given a bad rap owing to the rash of really bad class D amplifiers which have been introduced to the mobile market over the years. There are several reasons why these amplifiers sounded bad and were unreliable. The bad sound was due to the fact that the designers/copycats had no idea on how a class D amplifier functions. The reliability was due to bad design and almost zero knowledge of class D amplifiers.

This technology has made leaps and bounds over the past 5 odd years. New semiconductor devices have become available as well as a better understanding of this type of amplifier.

OK let's get into some real "deep" issues. ALL amplifiers are basically power supplies! This will shock almost all who read this. Audio amplifiers are really a valve between the actual power supply and the speaker. This valve is "told" by the incoming audio signal to allow a given amount of the voltage + current from the power supply to reach the loudspeaker dependent solely on the amplitude and polarity of the incoming signal. This may blow away the pre conceptions of all who read this of what amplifiers really are. Remember there are two main components in any amplifier, a power supply which is the sole source of power and the "amplifier" which channels the power from the power supply by virtue of "commands" given by the driving audio signal. With this said let's see what's cookin' inside our black boxes.

So with these facts established our class A or class B amplifiers channel power supply energy to the speaker but waste a lot of energy performing this feat.

Please read this paragraph very carefully. When typical bench testing of amplifiers is performed we generally use sine waves, a quite severe torture test for almost all amplifiers. The stress on both the power supply and the actual amplifier is far greater than with music or speech. Typically any amplifier driven to 1/8th of its absolute clipped power (1% THD) with sine waves, expends the same energy as music driving the amplifier to clip occasionally. Easy to verify, We use pink noise (Google it and see what it really is) to simulate music and this proves, at least to us that pink noise driving the amplifier to clip occasionally is the same as that 1/8th power deal. What this is all about is that the peak to average ratio of music is between 10 to 15 percent. In other words your 1,000w brand spanking new mega Dollar amplifier is only a very good 100 to 150w amplifier which is capable of musical peaks of 1000 watts ASSUMING that just occasional peaks of the musical waveform are clipped! You have all been duped over the years by the power issue. Now I must add this: When playing certain types of music there are times where the musical signal is remarkably similar to those brute force sine waves us engineers like to use for testing. Pipe organ music, of which I am a fan is one of these. A sustained organ note drives the amplifier much harder than typical music almost like a sine wave.

Class B amplifiers can be made more efficient by using some smart power supply technology. The “enemy” of the class B amplifier is the value of the power supply voltage required to deliver the specified output for that particular power.

The technologies available are beyond the scope of this manual but more about this issue Is available on our website at www.zedaudiocorp on the Techtalk link.

Now back to our class D (not digital) amplifiers. These, as our analog cousins, are again power supplies BUT with a difference. They are Pulse Width Modulated (PWM) power supplies whose reference voltage is the incoming analog signal, ie a variable signal being music or sine waves which changed the width of the pulses. Sounds nice of course but due to the fact that the PWM operates at a very high frequency of typically greater than 250KHz in full range class D amplifiers, we use a reconstructive filter to remove the carrier frequency.

Now for another “bombshell”. Class D amplifiers are NOT 90+% efficient as advertised by pretty much all companies who tout their wares. A well designed class D amplifier will be 90+% efficient based on two conditions. First that the amplifier is driven into some optimum impedance (typically greater than 2 ohms) and secondly that the amplifier be driven with a sine wave at just below clipping (typically 1% THD). Mmmmmm well this now opens a new can of worms, does it not?

I would like to find the people who listen to sine waves. I am still looking! We all listen to music. Well music is transient in nature and the average signal level varies over quite a wide dynamic range. Thus our cuddly class D amplifier is NOT being driven at its optimum

Output level all the time, in fact very rarely. So referring back to the fact that the average level is about 10-15% of the maximum or peak power of the amplifier, the efficiency is substantially lower than the 90+%. Typically with a class D amplifier this figure is around 75-85% which is an order of magnitude better than class B amplifiers. This ability of a class D amplifier makes it a far more viable choice than class B amplifiers for producing efficient or green (might I say?) amplifiers.

The impedance of the speaker also determines the point at which the efficiency is optimized. Well as was said on a famous TV show “FOREGETABOUTIT”, this is a pipe dream. Speaker’s impedance curves are all over the map and too many car audio buffs love to drive their megawatt class D amplifiers into low impedances, like 1 and 2 ohms.

Well now that I mention “1 ohm”, I cannot resist getting into this subject. Scenario: Kid buys gizzilion watt amplifier with manufacturer’s specifications of x watts into 4 ohm, y watts into 2 ohm and z watts into 1 ohm. Well let’s take a wild guess and I bet you all that the vast majority will drive the amplifier into 1 ohm. Why? Easy, he feels that he is getting his “moneys worth” by doing this. OK let’s see what reality is. Said amplifier is maybe rated at say 600w into 4 ohm, 1000w into 2 ohm and 1500w into 1 ohm. We will assume that the speaker impedance is resistive. The difference between the 4 and 2 ohm power is 2.2dB, the difference between the 2 and 1 ohm power is 1.76dB and the difference between 4 and 1 ohm power is 3.9dB. So what do these numbers tell us. First if the speaker is 4 ohms vs 2 ohms, no way you can hear any difference. Same issue comparing 2 as to 1 ohm. I grant you that between 4 and 1 ohm there is almost 4dB difference BUT at what price. Two issues. Low impedance loads affect the amplifier’s sound quality adversely and this is quite easy to prove. Load an amplifier with a 4 ohm woofer and listen. Add parallel resistors to the speaker to make the amplifier “think” that it is driving a low impedance speaker and listen to the difference in sound quality. You will be surprised. This test is not 100% valid in fact as the resistive loads added, let the amplifier off the hook as the reactive components of the load are confined to the 4 ohm part. The idea of this test is to keep the loudness about constant but load down the amplifier.

The average person can just perceive a 3dB (doubling of power) difference and to actually double the sound pressure on your eardrum, you require TEN TIMES the amplifier power. Yes TEN TIMES no kidding!

The other consequence of driving amplifiers into these ridiculously low impedances is that the amplifier is stressed substantially more as compared to when driven into more sane impedances. Efficiency drops as the losses in the output stages increase dramatically even with “super efficient” class D amplifiers.

We at Zed are absolutely against these silly loads of less than 4 ohm.

It serves ONLY to boost the ego of the owner of the car so he can quote numbers to his buddies.

Our design philosophies have been influenced by both the professional and home audio markets. Traditionally the professional market has been driven by reliability with sound quality as second. The home market was the reverse. Today however both reliability and sound quality carry equal weight in both sectors. Cosmetics for obvious reasons are important in any sector. My experience in designing and building professional amplifiers has helped me in taking a similar approach in the design of mobile audio amplifiers. No matter how pretty or good sounding an amplifier may be, if it fails then it is a bad amplifier. The lesson learned many years ago was “silicon”, and use lots of it. All things being equal, if an amplifier drive circuit is stable, then adding an output stage (itself stable as well) with enough power devices will make the amplifier reliable. This assumes of course that mechanical issues are taken care of. Zed has always been a proponent of using a generous amount of power transistors in the output stages of our amplifiers. In addition we design at temperatures of 80 degrees Celsius. All semiconductors must be derated at these elevated temperatures and we use enough power devices for safe operation into the lowest load impedance the particular amplifier has been designed to drive.

Our personal opinion about “fancy” cables and exotic passive components may shock some of you. I have never been able to hear the difference between a cheap or an expensive RCA patch cord. My listening has been done using double blind A-B comparisons. Electrons are not very clever things and they have no knowledge of the type of material through which they are flowing at the speed of light (312,000 Km/second). The ONLY reason we recommend high quality double shielded RCA patch cords in mobile installations is to reject noise. My opinion about speaker cables is the same. As long as the wire is thick enough, it’s construction makes no difference. As long as the amplifier is stable into reactive loads with phase angles of up to 60 degrees, the amplifier is none the wiser what type of speaker cable is used.

The use of teflon, polypropylene, tantalum or other capacitors does not make a good sounding amplifier. There are too many other variables in the audio chain that one capacitor can make a difference. The use of metal film resistors is only of use in low noise circuits and where tolerance is of an issue. Never forget what the music signal had to go through to get onto your CD or vinyl. The signal began as a micro volt specimen at the microphone, sent through a high gain pre-amplifier, passed through equalization circuits, possible compressors, limiters or other processing gear and then mixed with all the other tracks. In analog days and today still, this signal was sent to a 24 track tape recorder again through a multitude of transformers, pre-amplifiers, equalizers and yikes the tape heads themselves. Then the signals were passed back through the tape deck’s playback circuits including the equalizer for playback, then back into the mixing console for mix-down to two track and then this was repeated again onto a two track tape recorder, then sent to the cutting head amplifier where the masters were then cut. A torturous journey one could say for this fragile audio signal.

Semiconductors have more tolerance in their specifications than any capacitor or resistor.
A well known fact is that different types of capacitors work better at certain jobs than others.
Example, disc ceramic capacitors are better in high frequency compensation circuits than film types. Film types work better in audio frequency selective circuits than ceramics. So we at Zed choose our components to suit the application.

Our quality control (QC) program and testing procedures work well for us. Over the years we have refined these processes to what we have today.
Our philosophy is to design around potential or real problems. If we feel that a particular item could cause a problem now or in the future, we either change the design or improve upon it. The goal is ZERO defects.

QC begins with the initial design. The electronic design goes through as many prototype iterations as is necessary to make sure it is working the way we want.
These prototypes are bench tested, put in to vehicles, listened to both in the vehicle and at home then retested on the bench. We bake them in ovens and retest again. Heat is the enemy and we want to make sure that it will not hurt our products.
Mechanicals of course do not have to be put in an oven (we do anyway).
Fit and finish must be to our standard. Samples are minutely inspected for fit and finish. Once we approve them only then can the hard tooling be done.

Each and every product manufactured at Zed is tested using Audio Precision test equipment. Software is written for each type of amplifier and then on final test the amplifier must pass these rigorous tests. If not it is rejected and returned to the production line for repair. Samples are pulled from the line for further testing.

Mechanical inspection is done throughout the manufacturing process. Before each amplifier is packed it is fully inspected again for any cosmetic flaws. Any damaged or any part which is out of specification is replaced.

Zed takes pride in what we design and manufacture and we trust that this shows in the final product.

Stephen Mantz

Zed does not recommend the use of power distribution blocks for the purpose of distributing the +12volt voltage to several amplifiers. The reason is that the vehicle's battery is the lowest AC impedance point in the power grid of the vehicle. We want each amplifier to draw it's current from this low impedance point. Thus any modulation on any +12v power cable (which is inevitable) is then shunted to ground by the massive capacitance of the battery. This is the reason that "star" grounding is used in grounding circuits/equipment so that ground current is drawn from a common point and thus no ground loop can occur. Fortunately for us, the body of a vehicle made of steel is so large, and is thus a very low impedance path for ground currents, that it is not necessary to ground all equipment at one point. In fact we do not advocate it at all as this would then necessitate the head unit's ground running all the way to the battery location and the amplifier's ground(s) also running all the way to the battery.

If multiple amplifiers are being used we highly recommend the use of separate ground points at the amplifiers' location. This spreads out the amount of current being drawn through one bolt connection.

Stiffening capacitors - These are of NO use with our amplifiers due to the fact that the amplifiers have fully regulated power supplies. The power supplies will compensate for small volt drops which exist on the +12v power cable. The amount of current drawn by a particular amplifier would drain a fully charged 1 Farad capacitor almost instantly. Consider the theory. Energy(Joules) = Power(Watts) x Time(Seconds). The energy in a 1 Farad capacitor = 0.5CV.V = 0.5x1x12x12= 72 Joules. Let us assume an amplifier such as KRONOS. Let us assume that we are playing it such that the channels(into 4 ohms each) are just clipping on the loudest musical peaks. This means that we are delivering 500 watts on peaks. The amplifier's average efficiency is about 60%. The peak to average power ratio is about 10% so average power is 10% of 500 = 50 watts. The input power is therefore 83 watts. If the 1 Farad capacitor was charged to 12 volt and we remove the main source of power -- the battery, the amp would remain playing for 0.86 seconds! (Put the numbers in the formula (E=PxT above and solve for time T). Now compare this to the battery. The amplifier will play for some hours (depends on actual battery of course) as compared to 0.86 seconds! So what good is a 1 Farad capacitor?

SETTING THE CONTROLS ON AMPLIFIERS

Level control - This control is the most misunderstood control on any amplifier. It's sole purpose in life is to level match the head unit's output voltage to the gain structure of the amplifier so that the user can use the head unit's volume control in the "best physiological position". To best understand this let us look at a simple example. Assume that the head unit is rated at 1 volt output. Now what this means is rather ambiguous. Does the head deliver 1volt with the volume control at maximum, at 75% or where? Unfortunately no head manufacturers supply this information. Also it depends on the modulation level of the program material. Be it a CD/Mini Disc or FM we have no control of this specification. Most consumers never want the volume control to be turned past 3 o'clock (We use a traditional rotary control for reference since all digital controls do not have the same amount of digits or "little blocks" on their LCD displays to show relative volume level). On head units which we have tested the results are all over the page so we shall assume the 3 o'clock position as the maximum we want the control to be turned to. So far you can see that the need for level matching is critical indeed as there are no standards from head manufacturers. So we now have this 1 volt level. What this means is that the output voltage from the head will approach 1 volt on musical peaks. Let assume we have an amplifier of 100 watts. This implies that we can deliver 20 volts across a 4 ohm load. Let us assume that the amplifier needs 1 volt in for the 20 volt out - a gain structure of 20x. So in this case with the head delivering 1 volt on peaks, the amplifier will deliver 100 watts into 4 ohms on the same musical peaks. Well this sounds all well and good but we have a small problem and it is that all heads are not rated at 1 volt, and all amplifiers have variable level controls. This actually means we can change the gain structure of the amplifiers from "x" to "y". With no standard levels we have to set the level control on the amplifier to "match" to that of the head. We have tested no head units whose output level corresponds with that of the printed specifications. Typically the output level is substantially lower than the specification. Here is our recommendation. With your favorite music playing set the amplifier's level control to minimum (CCW) and set the head unit's volume control to 3 o'clock. Assuming all crossover controls have been set, advance the level control on the amplifier until the music is as loud as desired. This is the only way to do this without the use of an oscilloscope.

Crossover and equalizer controls - The crossover controls must be set to suit the speakers being used.
The equalizer controls can be set by ear or with instruments. This is a personal preference. Most users only have ears and not instruments so ears must suffice!

Damping Factor - This amplifier specification has been blown out of all proportion. What it means is the ability of the amplifier to resist a change in it's output voltage. The formula is DF= Speaker Z / Amplifier output Z (where Z is impedance). So many manufacturers have claimed ridiculous, and often false damping factors. A damping factor of 1000 implies that the output impedance of the amplifier is 0.004 ohms (4 ohm load). The only way to attain this figure is to apply masses of negative feedback (or use positive feedback) and too much feedback makes amplifiers sound harsh and clinical. Also damping factor changes with frequency. The lower the frequency the higher the DF number. Typically the DF can be ten times larger at higher frequencies.

Let us take this amplifier whose output impedance is 0.004 ohms (Zout). The speaker circuit is a series circuit and the following impedances(resistances) are in series with this 0.004 ohms. Let us assume that this DF measurement was made at the amplifier's speaker terminal. The first extra contact resistance is the speaker wire to the speaker terminal (WT ohms). Then there is that of the wire itself for two conductors (W). Next is the contact resistance of the wire to the speaker terminal (WS). Next there is the contact resistance of the wire from the speaker terminal to the voice coil (WV) and lastly there is the DC resistance of the voice coil itself (DCR). So what we have is a series circuit with the following resistances in series and adding up. WT+W+WS+WV+DCR+Zout. WT,W,WS,WV and Zout are very small indeed. Certainly less than 0.1 ohms. Whoa, look what has happened the EFFECTIVE DAMPING FACTOR has been reduced from 1000 to 40 by just taking into account those pesky unavoidable contact resistances. Now for the cruncher, remember that the DCR is also in series and is typically 3.2 ohms for a nominal 4 ohm speaker. So we must add 0.1+3.2 = 3.3 ohms and now EFFECTIVE DAMPING FACTOR is now a magnificent 1.212! (4 divided by 3.3)This is the real world. We see that the DCR of the speaker swamps all other resistances in the speaker circuit and the 0.004 ohms amplifier output impedance is almost meaningless. It has been found that a DF of about 20 is quite sufficient to dampen the voltage spikes from the speaker. An eye opener this one is it not? Good tube amps sound marvelous - low damping factors!!

Outpput Power of Amplifiers - This spec has been so badly abused it is not even funny. Peak power, Maximum power, Transient power, RMS power these are titles that have been given to the power spec of amplifiers. The above all mean nothing. Peak power needs to be associated with a time period, Maximum power is just nonsense, Transient power is even more nonsense and RMS power is just not a specification. The ONLY meaningful way to specify an amplifier's output power in watts is CONTINUOUS POWER. The formula for power is: (RMS volts x RMS amps) or (RMS volts x RMS volts/Impedance) or (RMS amps x RMS amps x Impedance). In each of these formulae there is an RMS number multiplied by another RMS number (or by itself) and RMS x RMS cannot = RMS. So THERE IS SIMPLY NO SUCH THING AS RMS POWER. RMS means root mean square and it is the same as saying $\sqrt{4} \times \sqrt{4} = \sqrt{4}$ Which we know is not true. The answer is just 4 with no root sign attached.

Bridging two channels of an amplifier is not a magical thing. Most are mystified by the power figures quoted under the “bridge” column. It is actually very simple. When two channels are driving a common load, one channel is out of phase with the other by 180 degrees. So when one channel swings positive the other swings negative. There is a catch however. Each channel “sees” fifty percent of the common load and that means that each channel of the bridged pair must be capable of delivering current to this lower load impedance. Thus a 4 ohm bridged load presents a 2 ohm load to each of the bridged channels. The power into a 4 ohm load in bridged mode is twice the rated 2 ohm power per channel.

Total Harmonic Distortion - This specification has for years been a benchmark with which to compare one amplifier to another. This is all fine on the test bench where pure resistive loads are used and sinewaves are amplified. Unfortunately it tells us very little about the audible performance of an amplifier. Today it is relatively easy to build an amplifier with THD figures in the “triple oh” region, but what do they sound like. Normally not very good. To obtain these low THD numbers all we do is design an amplifier with high open loop gain. That is before negative feedback is applied. Once we apply a lot of global feedback, we improve all measured parameters such as THD, Noise, Frequency response, Damping factor. Our amplifiers are designed a little differently. We use very little global feedback but rather optimize each stage with local feedback. This allows us to design an amplifier with lower open loop gain and thus we only have to apply about 8dB of global feedback. Ultra low THD was not our goal but rather an amplifier which sounds the way we want it to. Other factors affect THD such as PCB layout, grounding and power distribution to the amplifier channels. Our class A/B amplifier do however achieve very low distortion due to the fact that we follow the “rules” and their circuit design is conduscive to low distortion.

Decibel is a unit of measurement. A 100w amplifier has 3dB more power than a 50 watt amplifier. This difference is just discernable. A 100 watt amplifier has 1.54dB more power than a 70watt amplifier. This is not audible. I has been determined that to hear a difference in “loudness” between to like designed amplifier, one must double the power. To hear a doubling in loudness one must have TEN TIMES the power (10dB).

Headroom - This term does not refer to how much room there is above your head! Rather it is a specification that signifies how good or bad the power supply is. Zed Audio has NEVER quoted a headroom specification. Why you may ask? Simple our amplifiers have no headroom, zero dB, zip dB, nada dB however you say it. A regulated power supply does not allow the amplifier to have any headroom. A quote from a well respected designer who said that amplifiers with many dB of headroom simply have poorly designed power supplies, either through ignorance or to save costs. When one sees a specification of an amplifier quoting a headroom figure of 3dB this means that the droop of the power supply is such that when unloaded it is capable of twice the power as compared to it’s loaded condition.

So a 100w/ch amplifier running into 4 ohms must develop 20 volts across the speaker terminal. This requires a net (under load) rail voltage of about +/- 33 volts. Now for it to have 3dB of headroom it must be capable of delivering 28.28 volts across the speaker terminal. This requires a rail voltage of +/- 43 volts. So the above power supply will droop a total of +/- 10 volts (a 23% droop!). This puts additional stress on the output devices (Mosfets or Bipolars) because they still have to deal with this higher rail voltage . To us this kind of power supply sounds like the amplifier is “breathing” and not the kind of amplifier we want to listen to. Regulated power supplies are more expensive to manufacture, are less efficient but we feel those are tradeoffs we can live with!

If one examines the specification of an amplifier, it is relatively easy to tell apart those with well regulated power supplies and those with sloppy unregulated power supplies. The ratio of 4 ohm as to 2 ohm power will readily inform us of the quality of that power supply. Typically if the amplifier can double or almost double it’s continuous power rating from 4 ohm to 2 ohm at ALL battery voltages this is indicative of a well regulated power supply. There are a few manufacturers who manipulate the rail voltages at lower speaker impedances so that the 4,2 and 1 ohm power specs are the same. We believe that this is a cop out to save putting in a beefy power supply which is capable of the higher currents needed for these low impedance loads.

Subsonic filters and CLIPPING. The former are simply steep slope high pass filters with a frequency range between 10 to 50Hz. Their only function is to filter out those frequencies which lie below audibility. The woofer’s cone will not “flop” around as it does without the use of the filter and because all the low frequency energy that we cannot hear is filtered out, the amplifier runs more efficiently since it does not have to amplify all those inaudible low frequencies. Remember one fact, ALL amplifiers are pretty dumb. They will amplify anything you put into them (assuming the amplifier’s frequency response is wide enough) and whether we can hear a particular frequency range is not the amplifier’s concern. Put in an inaudible frequency and the amplifier dutifully does it’s thing. It does not care about the load. This is why tweeters are easily burnt when amplifiers are clipping. The amplifier generates high frequency harmonics and this energy is thrown to the unsuspecting tweeter. When an amplifier is driven into clipping it basically generates a square wave. This contains a large amount of energy but also due to the fact that the square wave sits at a positive (or negative) state for a “long” period of time, the natural cooling effect of a continuously moving cone/voice coil is inhibited and can lead to failure of a speaker. Typically woofers are more tolerant of clipped power than mids and tweeters due to the fact that they are more robust and that they do not respond to those high frequency harmonics very well (but do not be fooled, woofers can be hurt by these harmonics even if we cannot hear them). The inductive reactance is (2 x 3.14 x freq x inductance) and so the higher the frequency the higher the inductive reactance of the speaker becomes. However it’s DCR does not change with frequency.

INSTALLATION INSTRUCTIONS

Location:
Choose a suitable location in the vehicle which will allow sufficient airflow over the amplifier. The preferred mounting direction is with the heatsink fins in a vertical direction. However we do recognize that this is not always possible.

Mounting the amplifier(s)

These amplifiers can be mounted in one of two ways. The first is by using the supplied mounting feet. Each foot is bolted to the underside of the chassis using the supplied metric M4 bolts. Please use a phillips screwdriver which fits the head of the bolts correctly. Make sure that the bolts are tight but DO NOT over tighten them as you may strip the threads in the bottom of the heat sink.

Depending on the surface to which the amplifier is mounted use either wood screws or a machine screw with nut of either M5 or 10/32" size.

The second method is to forego the use of the four mounting feet and use metric M4 bolts to bolt directly into the threaded holes on the underside of the heat sink. This method requires that you determine the thickness of the mounting board and add 6mm (0.23") to it. Then select the correct length M4 bolt. If the bolt is too long you will feel it bottom out in the threaded holes. Please be careful so as not to damage the threads in the bottom of the heat sink. We supply four longer M4 bolts with each amplifier.

Fusing of amplifiers. Almost every amplifier I have worked on is OVER FUSED - period! Over fusing is just a stupid thing to do in the first place as it affords ZERO protection and only results in printed circuit cards being burnt together with a bunch of expensive silicon. The formula is quite simple. For class A/B amplifiers add up the total wattage of all channels into the impedance into which they are driven. Divide this number by 18 and use the closest value fuse. Example a 100w x 4 at 4 ohm amplifier is 400w total. Divide by 18 = 22.22 so use a 25A fuse. A 1500w amplifier requires a 90A fuse. I prefer to make up a final fuse value by using several lower amperage fuses in parallel. This results in better thermal efficiency as the current flow is spread over several pieces of metal.

We advocate strongly to under fuse and if you find under hard drive that the fuses occasionally open up then it is way less drag on your wallet to replace some fuses with a slightly higher value.

A repeat here for those who did not read the "low impedance" point I made. The higher the impedance of the speaker (>4 ohm) the better the sound quality. These amplifiers are NOT SPL tools, they are for listening to good music at reasonable levels - protect your ears!

Use 4 or 8 ohm speakers and you will be surprised at the results.

CONNECTING THE AMPLIFIER

Once the amplifier has been correctly mounted the electrical connections can now be made. The first step is to connect the loudspeakers. Using the appropriate size of wire (we recommend a min of #14) connect the speakers as shown in later diagrams, depending on which amplifier(s) are being installed. The next step is to connect the line inputs using high quality RCA-RCA cables. The source to which the line inputs are connected depends on the amplifier type and the particular installation. Again refer to later diagrams.

The next step is to connect the power inputs. The first is the ground wire. This wire is connected to the (-) connection on the 3 terminal power connector. Using #8 wire or larger(#4 max) insert one end into the connector's GROUND terminal after stripping off about 19mm (0.75") of insulation. Trim the wire to a maximum length of 1 metre (39") this ground wire (normally BLACK in colour) is then crimped (and preferably soldered) into an appropriate size ring lug. This lug is then bolted to the chassis of the car (normally in the trunk). The hole to which the lug shall be bolted must be rust and paint free. It is also a good idea to use a star washer between the lug and the chassis of the vehicle. We prefer the use of a machine bolt and nut rather than a self tapper. The torque that the machine bolt can exert is greater than that of a self tapper and due to the large currents flowing through this ground connection the contact resistance shall be lower with the machine screw.

Next is the remote turn on wire. This is normally connected to the remote output of the head unit. Using #14 wire, stripping one end to 19mm (0.75"), insert one end into the smaller centre hole of the power connector. Run this cable to the head unit's location and connect to the "remote out" terminal of the head. Please be sure to use a 0.25A fuse at the head. This fuse will blow if any portion of the remote wire is accidentally shorted to chassis ground.

Last is the +12volt connection. Using #8 (#4 max)or larger, strip the wire to 19mm (0.75") and insert in to the hole marked BATT (+) on the power connector. Run the cable (away from all audio cables) to the location of the vehicle's battery. At the battery location install the a fuse holder no further away from the battery (+) terminal than 300mm (12"). Insert this end of the +12volt power cable into the fuse holder. Making sure that the fuse is removed, connect the other end of the fuse holder to the battery's (+) terminal using appropriate high quality battery connectors. Insert the supplied fuse. DO NOT OVERFUSE as this can be a fire hazard.

The power connector on our amplifiers can accommodate wire with a copper diameter of up to 7mm (0.275").

SPECIFICATIONS

Specification	KRONOS	LEVIATHAN
Continuous Output Power into 2 ohm per channel ++	500wx2	250wx6
Continuous Output Power into 4 ohm per channel ++	250wx2	150wx6
Typical Output Power into 4 ohm per channel (1% THD) ++	290wx2	175wx6
Continuous Output Power 2 channels bridged into 4 ohm ++	1000wx1	500wx3
Continuous Output Power 2 channels bridged into 8 ohm ++	500wx1	300wx3
Minimum Speaker Impedance per channel	2 ohm	2 ohm
Minimum Speaker Impedance in Bridge Mode	4 ohm	4 ohm
Power Response at any power into 4 ohms/channel	10-30KHz -3dB	10-30KHz -3dB
Frequency Response at rated power into 4 ohms/channel	10Hz-25KHz -0.5dB	10-25KHz -0.5dB
Input Voltage range for rated power into 4 ohms	0.25-8.6 volt	0.25-8.6 volt
Input Impedance at 2KHz	37K ohm	37K ohm
Noise below rated output (30KHz limited)	-101dB	-98dB
Channel separation at 2KHz	>80dB	>80dB
Damping Factor at 20Hz with 4 ohms	>80	>80
Total Harmonic Distortion with 4 ohm 20Hz-20KHz From 1 watt to rated power. Typically less than 0.05%	<0.2%	<0.2%
Intermodulation Distortion	<0.2%	<0.2%
Phase response at 20KHz	Lagging 12 deg	Lagging 12deg
Slew rate (volts per micro second)-In"Flat" mode	12	12
Low Pass Crossover (all are 24dB/octave)	46Hz-3.4KHz	80Hz-4KHz 40Hz-240Hz
High Pass Crossover (all are 24dB/octave)	46Hz-3.4KHz	80Hz-4KHz
Subsonic Crossover24dB/octave	11Hz-48Hz	11hz-48Hz
Equalization (Zero to +12dB variable control)	Bass Boost @40Hz	No
Line Output	Yes	No
Protection - Short Circuit, DC, Thermal	Yes	Yes
Power Source	----------10-14.5v DC Negative Ground ----------	
Current Consumption with Sinewave at 4 ohms	50A	105A
Current Consumption with Music at 4 ohms	16A	30A
Idling Current	<1.5A	<2A
Fuse rating with 4 ohm load/channel	20A	20-25A
Fuse rating with 2 ohm load/channel ****	40A	60A
Size W x H (247mmx55mm/9.7"x2.1") x L	272mm/10.7"	410mm/16.1"
Shipping Weight (Kg/Lbs)	5.9/13	6.8/15

++ Driving amplifiers with continuous sine wave power is very stressful and is not indicative of an amplifier's real world performance. We actually prefer to use PINK NOISE as our test signal as it very closely replicates typical music which is what our amplifiers were intended for in the first place. Our amplifiers will double the 4 ohm power at 2 ohm when driven with pink noise

**** Under normal operating conditions the fuse rating for 4 ohm loads will suffice for 2 ohm loads. If the amplifier is driven for long periods of time into 2 ohm loads per channel the fuse rating may be increased as shown. DO NOT OVER FUSE ANY AMPLIFIER.

KRONOS

This, the first of our new full range high quality class D amplifiers has been in development for the past 15 months. The switch to class D was not taken lightly and the target of these new amplifiers was quite simple. Perform as well as our “traditional” class A/ B amplifiers. This target was achieved and of course with the added advantage of the higher efficiency of class D.

The idea of producing KRONOS was to have a relatively high powered amplifier which would fill the role of both a regular two channel unit as well as fulfill the duties of a mono block. KRONOS has some very unique features never seen before on any mobile amplifier.

Oh! Did I forgot to mention that KRONOS comes standard with Burr Brown chip sets in the front end.

The idea of incorporating a BALANCE control was that we had so many requests due to the fact that ganged level controls do not track perfectly and the BALANCE control allows you to compensate for this. This is especially useful when running KRONOS in bridge mode as the two channels can be balanced for perfect symmetry.

The high and low pass crossovers are Linkwitz 24dB/octave types. Their frequency ranges are sufficient to allow KRONOS to be part of tri-amplified systems. The addition of an extra switch allows KRONOS to be run as a bandpass amplifier with the high and low pass crossovers setting the upper and lower frequency cut off points of the band pass.

So with KRONOS running as a two channel amplifier, the RCA sockets marked “3” and “4” are simple loop throughs or line outs. This allows easy daisy chaining of amplifiers.

The heart of any great amplifier is the power supply. After all this is where all the energy is derived from. A well regulated power supply with low noise is essential for good audio performance. We at Zed have been building regulated power supplies for over 25 years and feel that they sound superior to unregulated or “sloppy” power supplies. A small lesson here. The audio section of an amplifier is only a variable valve from the power supply to the speaker. How the valve is varied depends on the class of amplifier. In this case we use a Pulse Width Modulated system (Class D). Any voltage fluctuations on the power supply rails will manifest themselves as a form of distortion. So if the source of energy is poor, sound quality will be poor no matter how well the audio amplifier (valve) is designed. It is synonymous with adding a poor quality fuel to your automobile. It will perform poorly if the source of energy is poor. The same argument applies to amplifiers.

The PWM amplifier utilizes a high frequency carrier which is modulated by the incoming audio signal. The resultant series of variable width pulse trains are switched by the main high current switching amplifier. This section uses ultra high speed precision integrated circuits to precisely control the on and off times of the output Mosfets. Two high current, high voltage Mosfets are used. Each has a current capability of 65 amps in a circuit limited to less than 16 amps. The output filter utilizes low loss iron cores and high quality film capacitors.

The turn on/off function of the audio section is done with opto-isolators which allows us to keep the control circuits fully isolated from the audio circuits.

Important note: Do NOT power up KRONOS with the volume level high. The internal initializing circuits will “see” this as a fault condition and shut the amplifier down. The AMBER protection LED will light and the amplifier will have to be powered down for >5 seconds and then reset. This has been done to protect all components in the system, including YOUR ears!

Please we aware that ALL class D amplifiers have high frequency emissions and therefore the amplifier must be kept well away from the antenna.

Converting KRONOS to run as a subwoofer amplifier is simple. Push in the switch from "2ch LP" to "Mono LP. KRONOS has some added features. The RCA sockets "3" and "4" are now another pair of inputs and so all four inputs can accept signals from the head unit's front and rear outputs. This allows for constant subwoofer fading. Some additional circuitry is added to the mix (no pun intended). The four inputs are mixed to mono, routed into a 24dB/octave Linkwitz high pass crossover (subsonic) and passed through a nifty new low eq circuit. This allows for up to 12dB of boost with a centre frequency of 40Hz. The signal then passes onto the low pass crossover where we only use one channel (remember the signal is mono now) and then it flows onto the balance and level controls. Please note that all FOUR inputs are required for the level control's sensitivity to be correct. The loss of each RCA input means a 6dB reduction in signal level

The final drive from the preamplifiers to the power amplifiers is done in the balanced domain. Our amplifiers all have the preamplifiers running on their own 100% fully ground isolated power supplies. This design guarantees no ground loops and thus no engine/alternator noise.

The main class D amplifiers are a new design which incorporate the output filter within the feedback loop. This method guarantees a flat response no matter the load impedance. We use a pair of 65 amp TO-247 MOSFETs per channel. These are low gate charge types which are utilized for their unique characteristics which are beneficial for class D full range amplifiers.

The power supply is almost an all new design. Fully regulated, yes of course, as this is the only way to build a good amplifier. A bad power supply is like putting bad fuel in your auto's gas tank. The PWM controller drives a brand new driver circuit which ensures rapid turn and turn off of the eight high current MOSFETs. This is a four stage drive circuit incorporating some novel features. The MOSFETs I have chosen are each rated at 110 amps....well in the real world I would never dream of running that kind of current through the relatively skinny leads of each MOSFET. Rather I chose these devices because they are fast, high current and are in TO-247 packages which allows them to dissipate heat better than traditional TO-220 packages. A custom autoformer converts the switched battery voltage to the higher supplies we require.

Each of the eight MOSFETs has its own bypass capacitor which helps to reduce the current spikes due to PCB and busbar inductance. The MOSFETs are run in a unity gain configuration thus their bandwidth is maximized.

When the amplifier is powered up, the power supply takes several seconds to initialize itself for high current operation. The most dangerous time for a power supply is when it powers on. Big old electrolytic capacitors must be charged and these present a virtual dead short to the power supply. To reduce turn on current and stress to the power supply an innovative circuit controls the ramp up of the supply to limit stresses to a minimum.

WE ARE ABSOLUTELY 100% AGAINST THESE LOW IMPEDANCE LOADS. There is no reason to run a “daily driver” or SQ system into these loads. The aim is quality after all and not sound pressure. The ego trip of boasting that you have “x mega watts” in the car is just that, an ego trip and serves no other purpose besides boosting the ego of the owner.

We believe that the person who chooses to own one of our amplifiers has one interest only and that is sound quality. The flexibility, weight, size and cosmetics are to a small degree secondary concerns.

Clip LEDs are there for a reason, when they light DO NOT TURN THE VOLUME HIGHER! Clipping is the arch enemy of loudspeakers and amplifiers. Sure the occasional clipped waveform is fine but when the music becomes square waves that is when all the trouble begins.

Let’s get back to the balance control. Here is some technical information for those of you who wish to get the best out of **KRONOS**. When a pair of channels of an amplifier are bridged, the process is: One channel is in phase with the incoming signal and the other is 180 degrees out of phase. So a positive going incoming signal will drive the non-inverting channel’s output in a positive direction and the inverting in a negative direction. So what we have achieved is essentially a doubling of the power supply voltage. So bridging **KRONOS** into an 8 ohm load outputs 500 watts, a 4 ohm load outputs 1000 watts and DO NOT EVEN THINK ABOUT BRIDGING INTO 2 OHMS. More about this later.

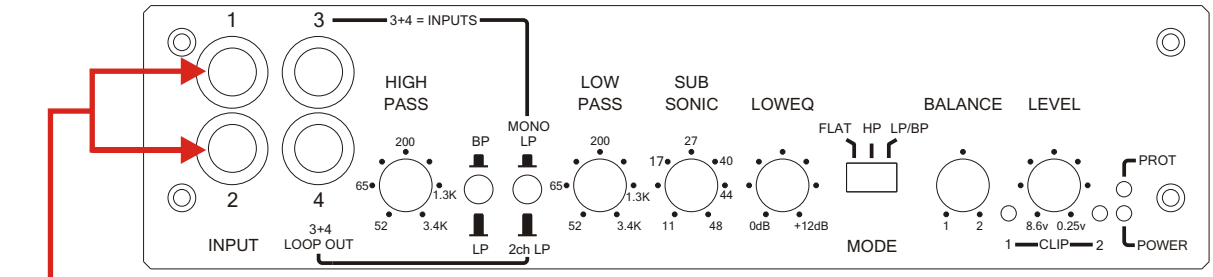
The balance control allows precise setting of the gain of each of the bridged channels so that in bridge mode you have a symmetrical waveform. The process to adjust is relatively simple. On line their are many sources to obtain sine wave signals. Burn a CD which now becomes your signal source. If you have a signal generator well that is of course the easiest way. 100Hz -1KHz signals are best for this test.

Establish the setting of the LEVEL control which you will use. This is important as the channel tracking does change slightly as you change the settings of the LEVEL control.

NO SPEAKER IS REQUIRED FOR THIS TEST AND SHOULD NOT BE USED AT ALL.

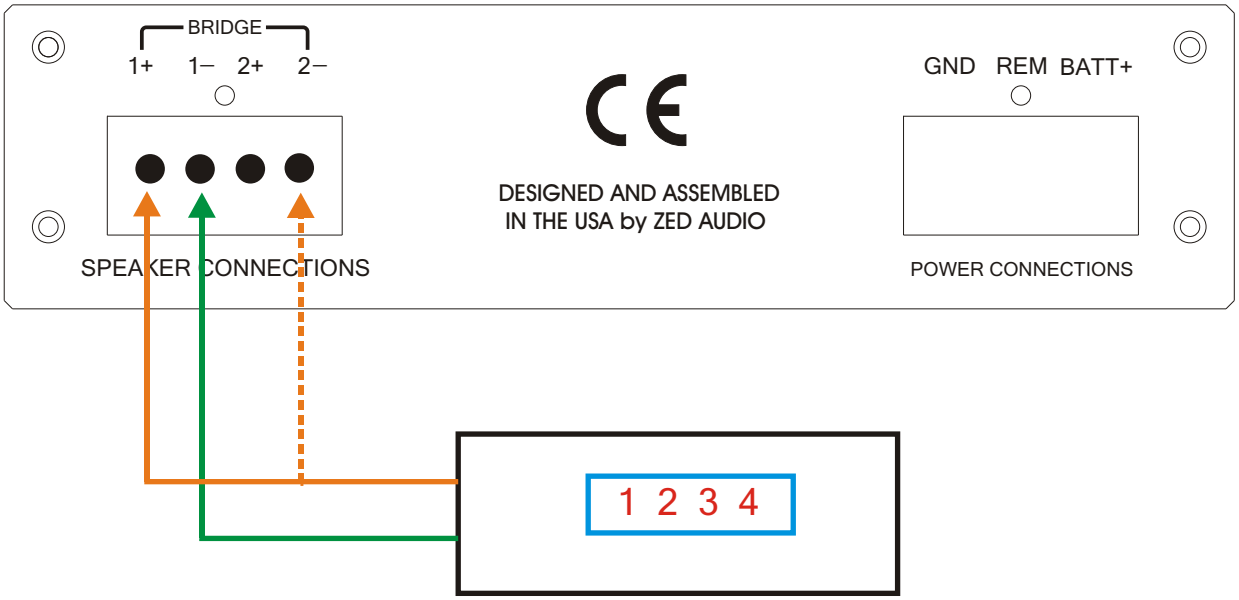
Feed the test signal into BOTH inputs. Using an AC voltmeter connect it to one channel of the amplifier and note the reading. Set the balance control to centre. Then connect the voltmeter to the other channel. Hint keep one lead of the meter to either ch1 - or ch 2 + speaker terminals as these are common ground. Then you can simply “poke” the other meter lead into each of ch 1+ or ch2 - speaker terminals.

Then set the BALANCE control until the readings on the meter are the same when “switching” between ch1 and ch 2.



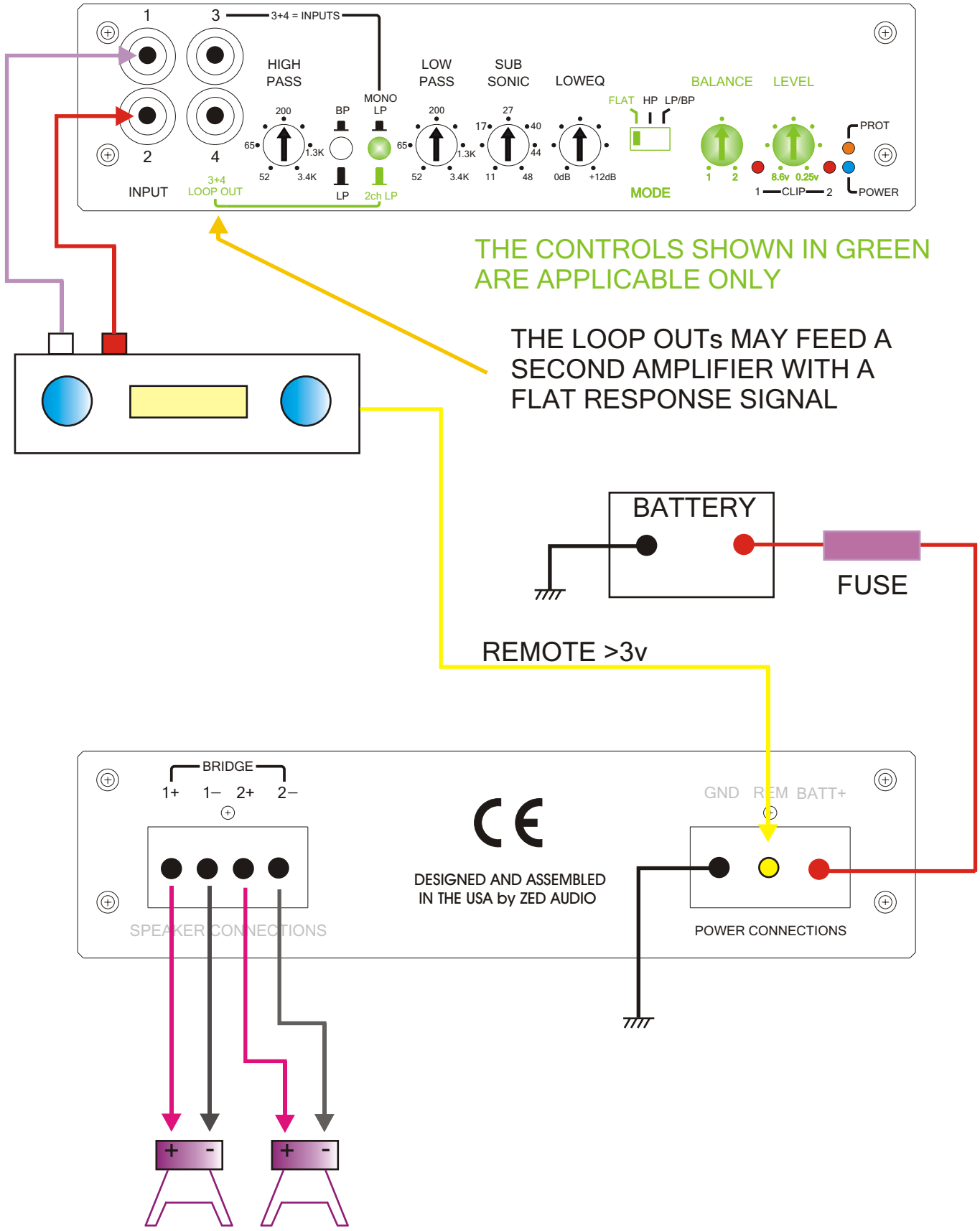
SET ALL CONTROLS AS THEY WILL BE USED

SIGNAL SOURCE

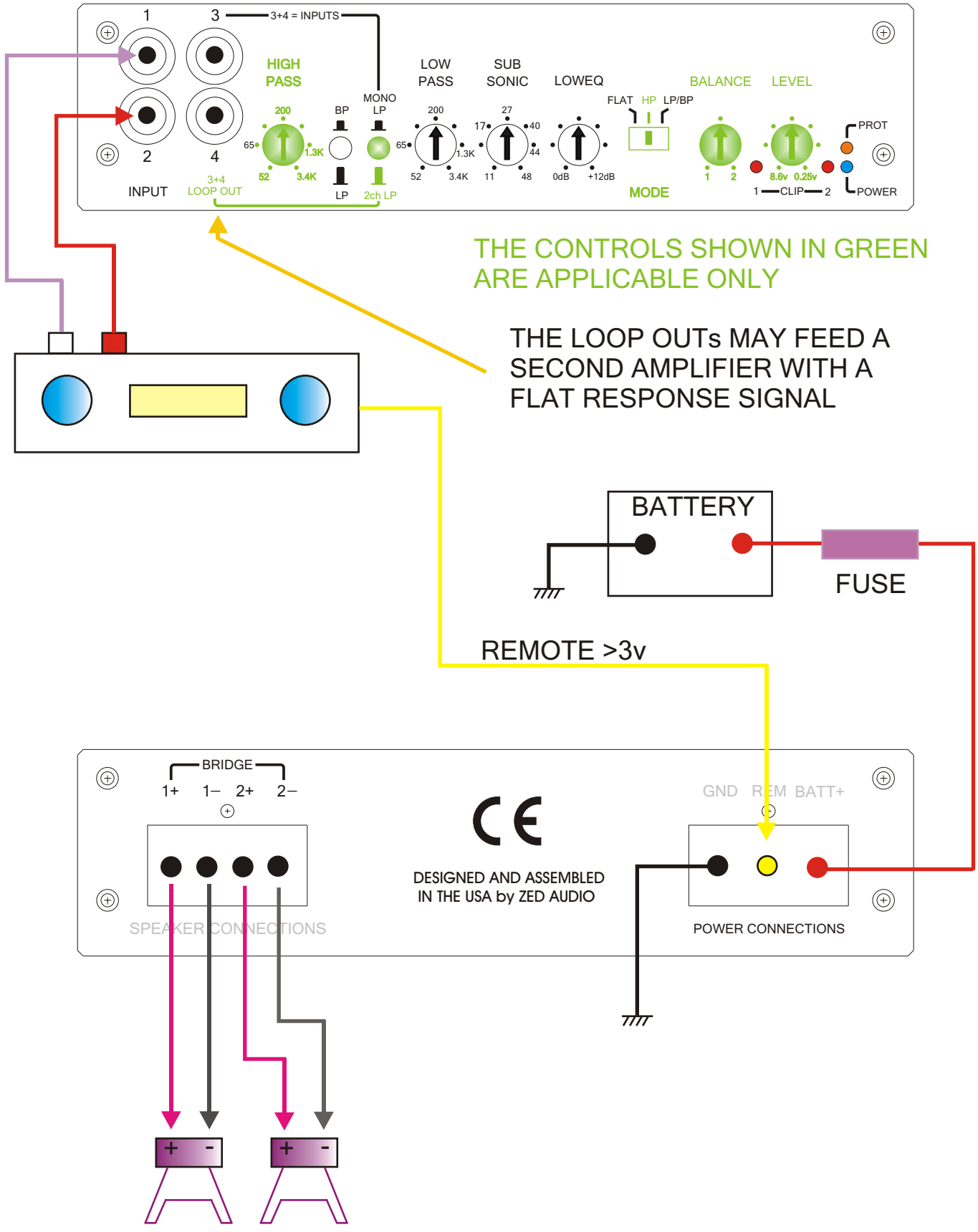


AC VOLT METER

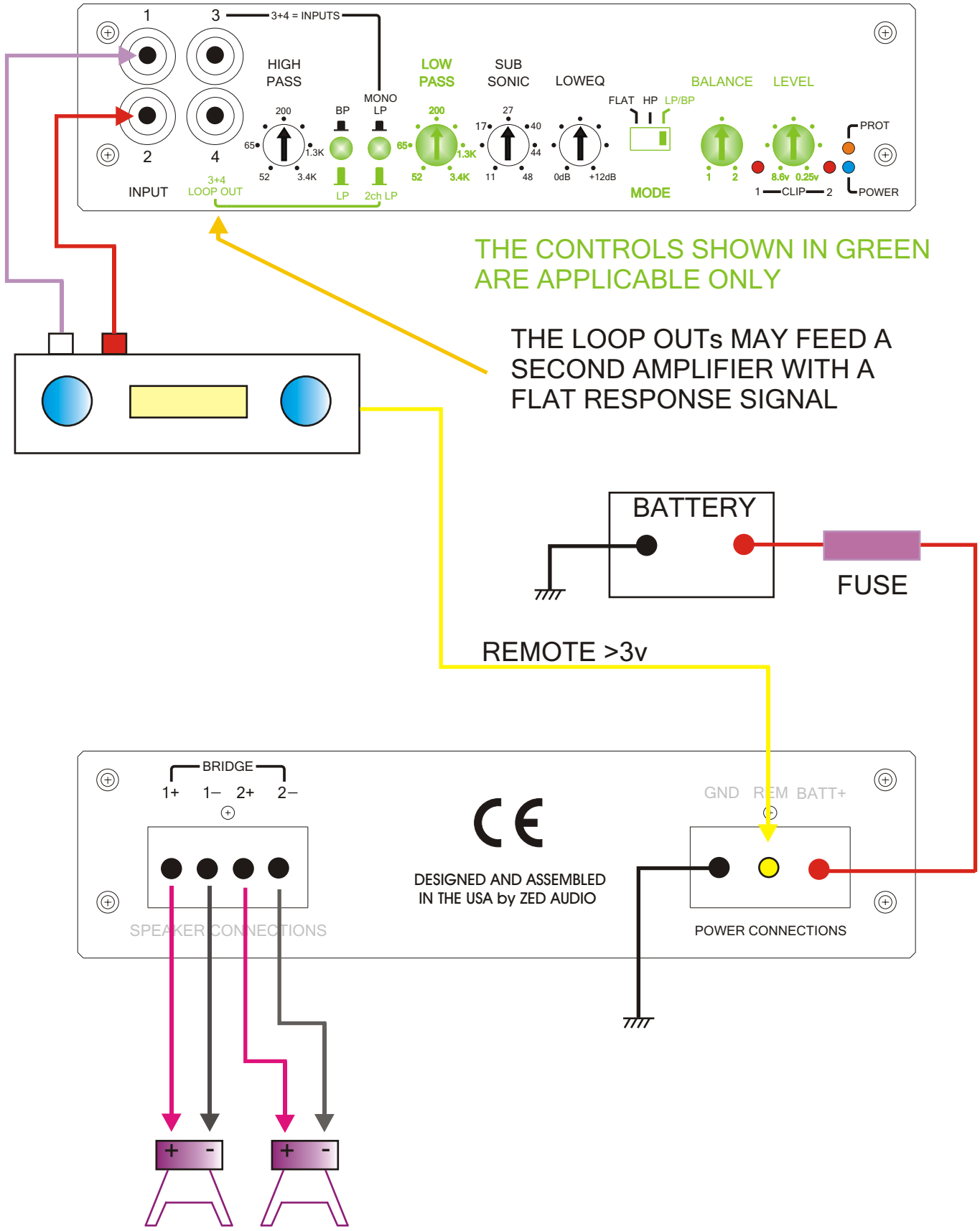
KRONOS run in two channel mode with FLAT response



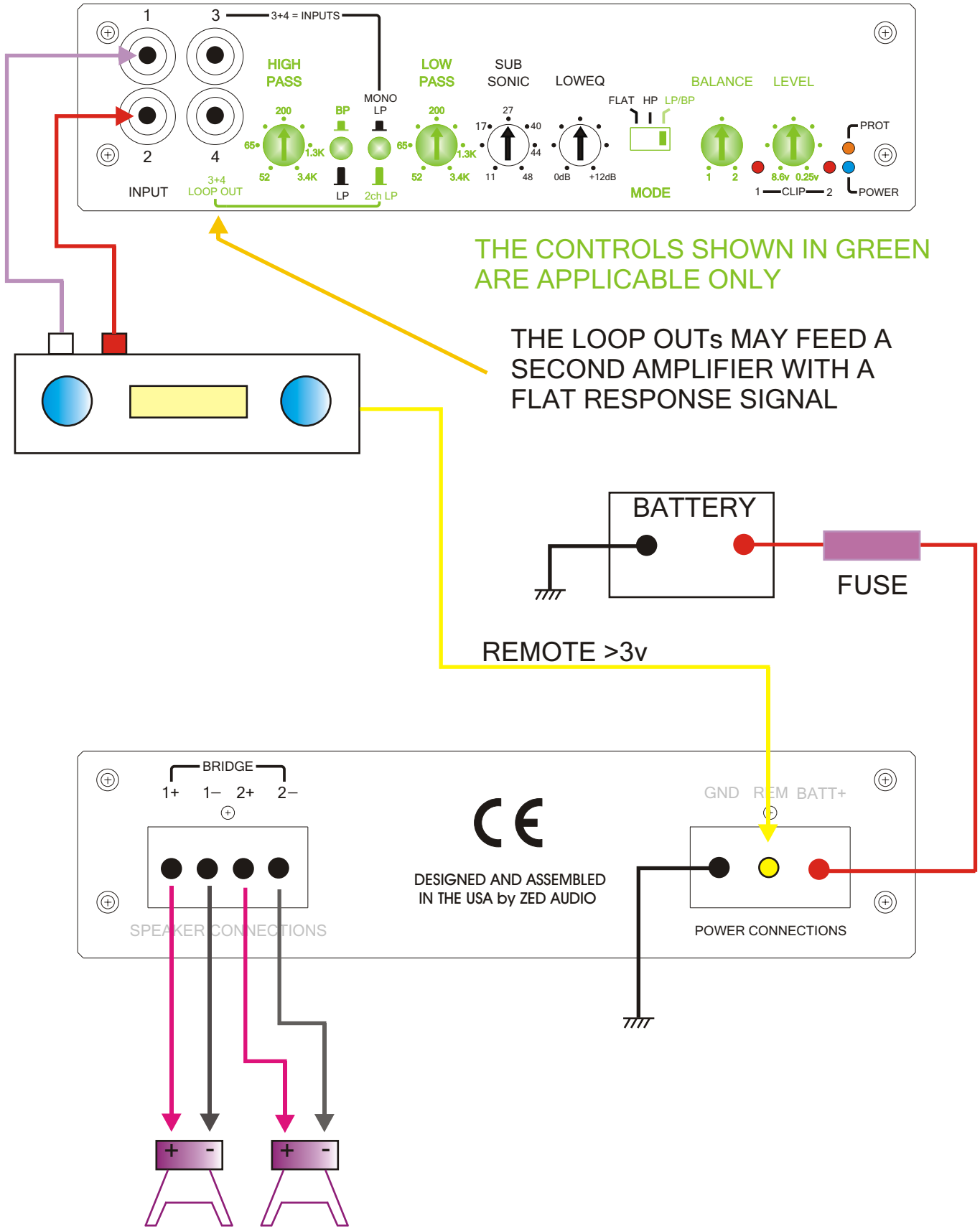
KRONOS run in two channel mode with HIGH PASS response



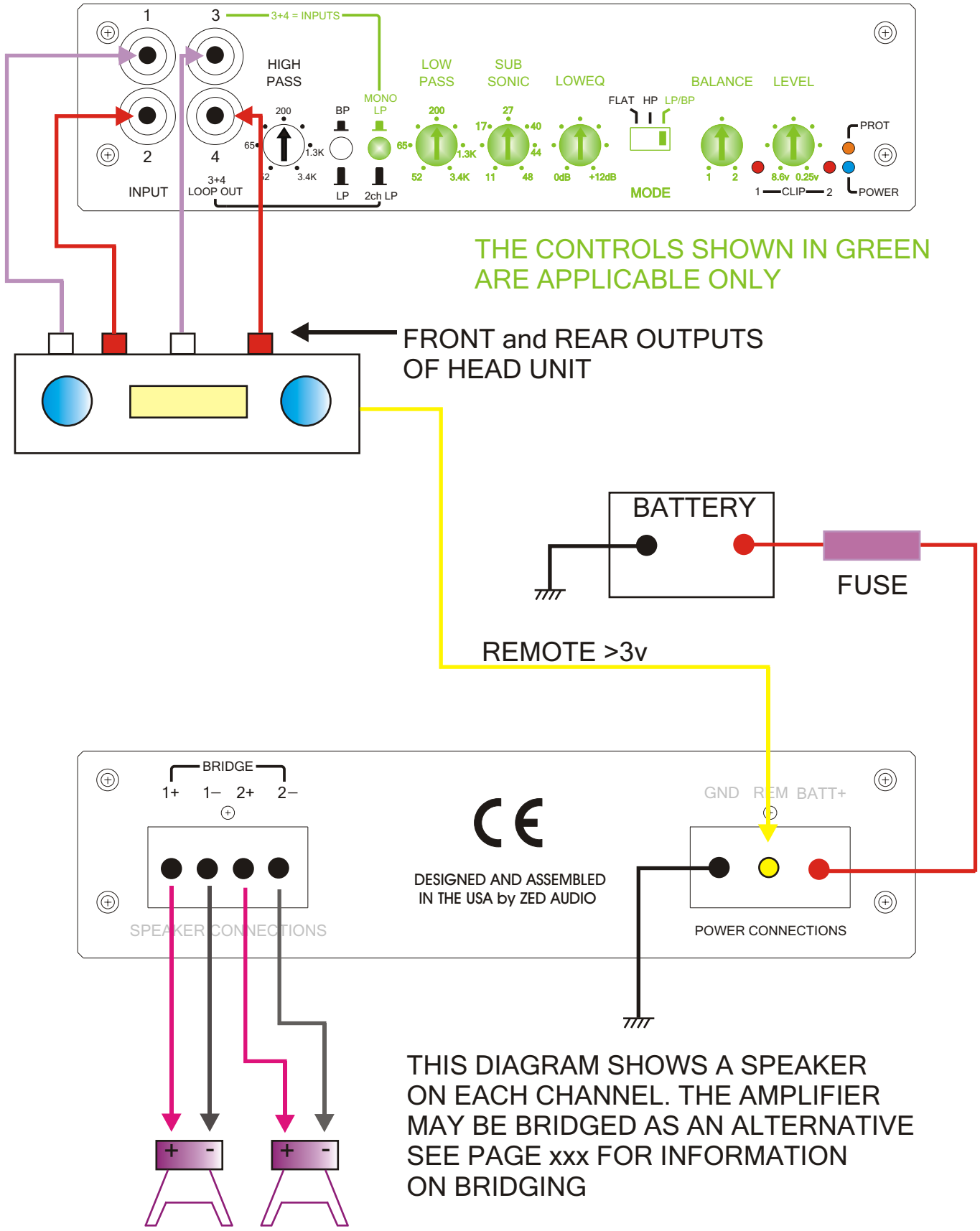
KRONOS run in two channel mode with LOW PASS response



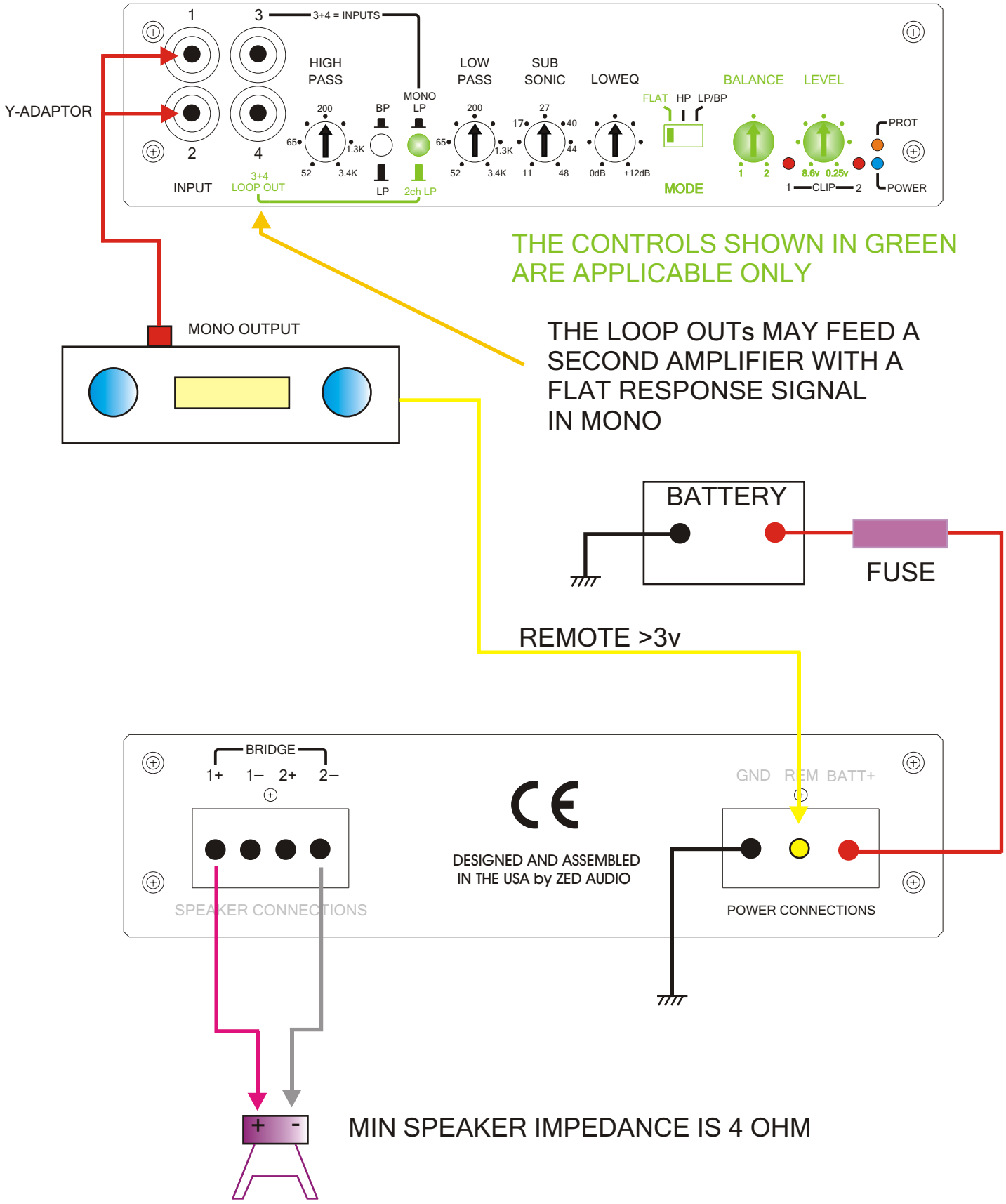
KRONOS run in two channel mode with BANDPASS response



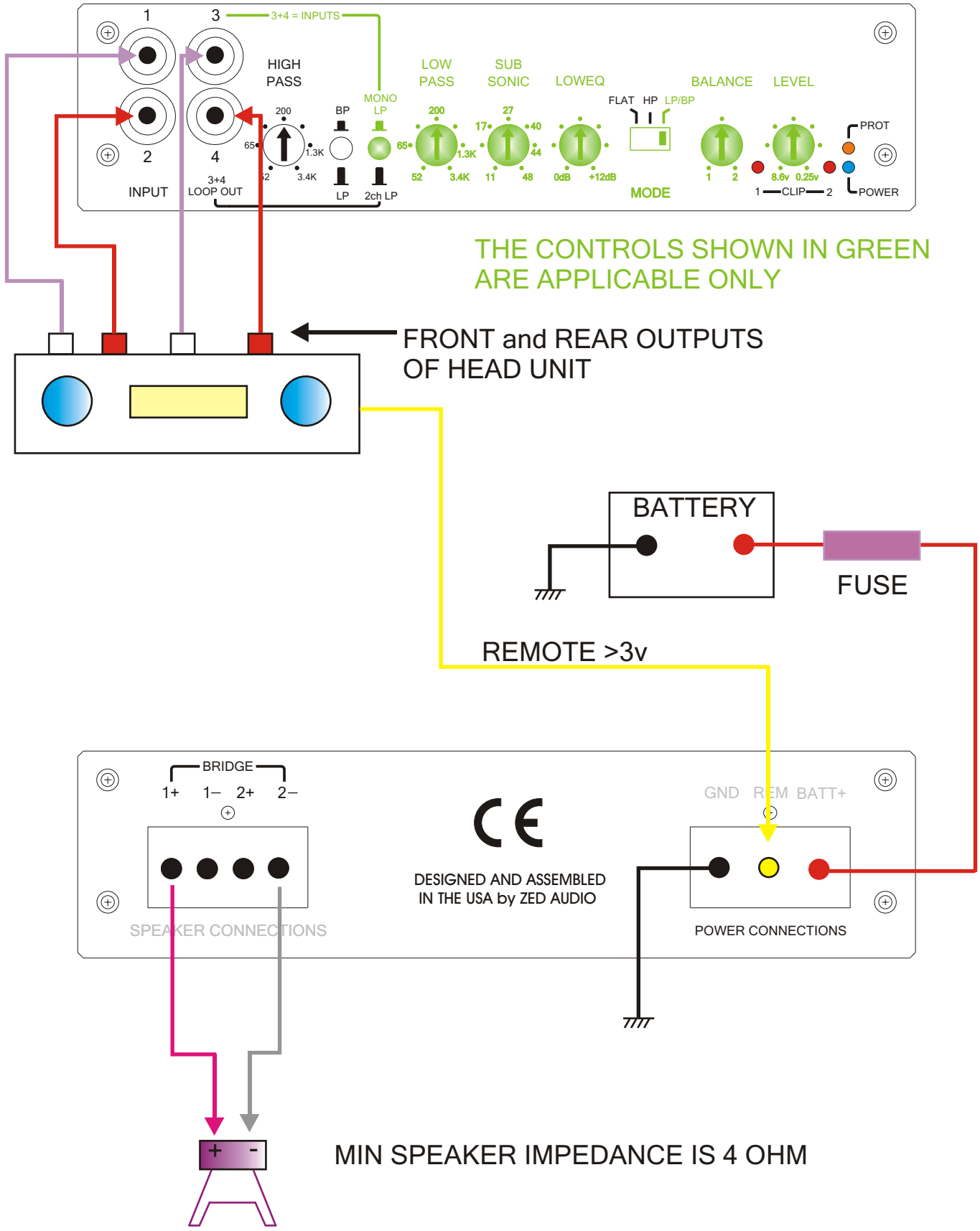
KRONOS run as a sub-woofer amplifier



KRONOS run in two channel mode with FLAT response in bridge mode



KRONOS run as a sub-woofer amplifier bridged



LEVIATHAN

Some history and thoughts behind the development of LEVIATHAN.

Mobile amplifiers have traditionally come in 3 flavours, mono blocks which are typically sub woofer amplifiers, two channel and four channel. There has been a smattering of five, six and eight channel amplifiers from various manufacturers. Today's systems are more sophisticated than systems of yesteryear but one thing remains the same. The need for a sub amplifiers and some midrange and high frequency ones as well. Of course if one had an amplifier with say twenty channels it would be relatively simple to cover the requirements of every conceivable system. OK well let's get back to reality. After much thought, research and asking questions a six channel seemed to be the best compromise between flexibility and functionality. Most systems it seems have a sub woofer and four satellite channels. Others have a sub woofer with only front stage and no rear fill. Some or active bi-amp, some are active tri-amp and some are active/passive tri-amp.

In the past 5 and 6 channel amplifiers have always had a modest power output, dictated by several factors. Size, weight and cost. Zed Audio has been able to overcome all three obstacles. With our full range class D technology and an intelligent power supply we have been able to eliminate the first two obstacles. One could of course build a class A/B amplifier with six channels and 150w per channel BUT it would be big, heavy and expensive. The expensive part has been eliminated with the higher efficiency obtained with class D and our power supply technology.

LEVIATHAN comes standard with Burr Brown chip sets in the front end.

Leviathan can perform in many roles. We shall now go through these permutations and see how they all stack up.

1) Run all six channels in FLAT mode. This will enable you to use an outboard processor of your choice including our upcoming full tube electronic crossover.
2) Run all channels in flat mode and bridge any or all of the 3 pairs of channels.
3) Run channels 1+2 in high pass independently of the other channels
4) Run channels 3+4 in high, low or band pass independently of the other channels. There are two crossovers available on channels 3+4 and switching the high and low pass to be in cascade allows for a band pass mode.
5) Run channels 5+6 in low pass mode using the dedicated RCA inputs.
6) Run channels 5+6 in low pass mode using the summed inputs of channels 1-4. The signal is now MONO and this mono signal is routed to the main channel 5+6 amplifiers.
7) Channels 1+2 can be switched to receive the mono low pass signal from channels 5+6
8) Channels 3+4 can be switched to receive the mono low pass signal from channels 5+6
9) For a tri-amplified system, channels 1+2 are run high pass, channels 3+4 bandpass and channels 5+6 low pass.
10) All six channels can be run mono low pass for those systems where there are many single woofers.

11) Run channels 1+2 as high pass and channels 3,4,5 and 6 as low pass for a typical front stage system.
12) Run channels 1+2 in high pass for the front stage, channels 3+4 in high pass for the rear fill and channels 5+6 for the subs.
14) Run channels 1+2 in high pass for the front stage tweeters, channels 3+4 in band pass for the front stage midrange and channels 5+6 for the subs.
15) A high power front stage system. Run Chs 1+2 as high pass in bridge (300w @ 8 ohm/600w @ 4 ohm), Chs 3+4 as high pass in bridge (300w @ 8 ohm/600w @ 4 ohm) and channels 5+6 as low pass.

So as can be seen this amplifier can do quite a few things. For those of you who only choose to use four of the six channels, just leave all connections free to the channels you have chosen not use.

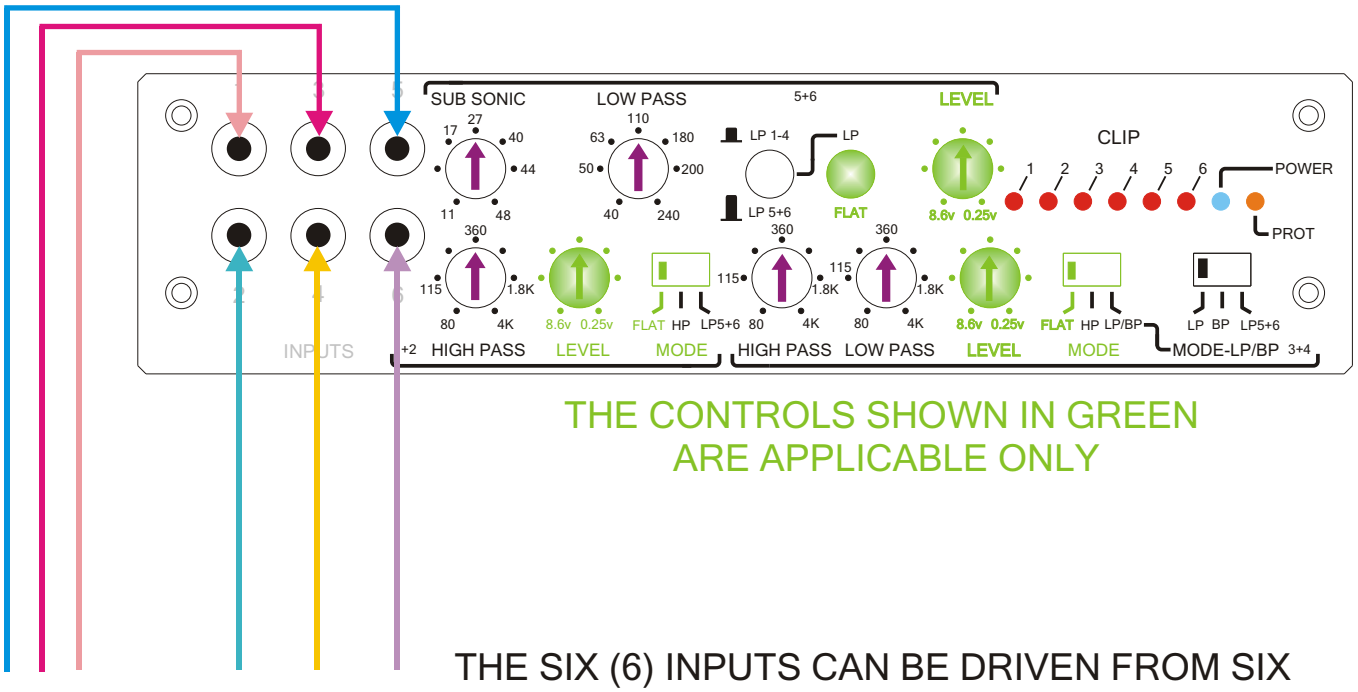
Some will ask why there are no switches to parallel the RCA input sockets. The answer is quite simple.....there is no place to add these switches! So those of you who may use LEVIATHAN as a two channel tri-amplified system you will have to use Y-adaptors or if you are bridging a pair of channels and need to feed both inputs with the same signal.

The same technology which went into KRONOS is in LEVIATHAN. LEVIATHAN does not incorporate the load impedance measurement system owing to the fact that there are six channels and one power supply. LEVIATHAN uses ultra fast MOSFETs in each channel rated at 29A. The power supply incorporates the same 110A MOSFETs as are used in KRONOS except that 12 are used. The power supply in LEVIATHAN has the same smart technology as KRONOS. This increases the efficiency of the amplifier. The same isolated ground pre amplifier with balanced drive is used.

The following diagrams show the many options available with LEVIATHAN. Referring to the above 14 options we believe that the following diagrams will allow most installers to configure LEVIATHAN correctly for each particular system. Should you have any question regarding a particular type of installation please email us a zedaudio@aol.com or contact us via voice mail at (805) 526-5315 or international at 011-805-526-5315.

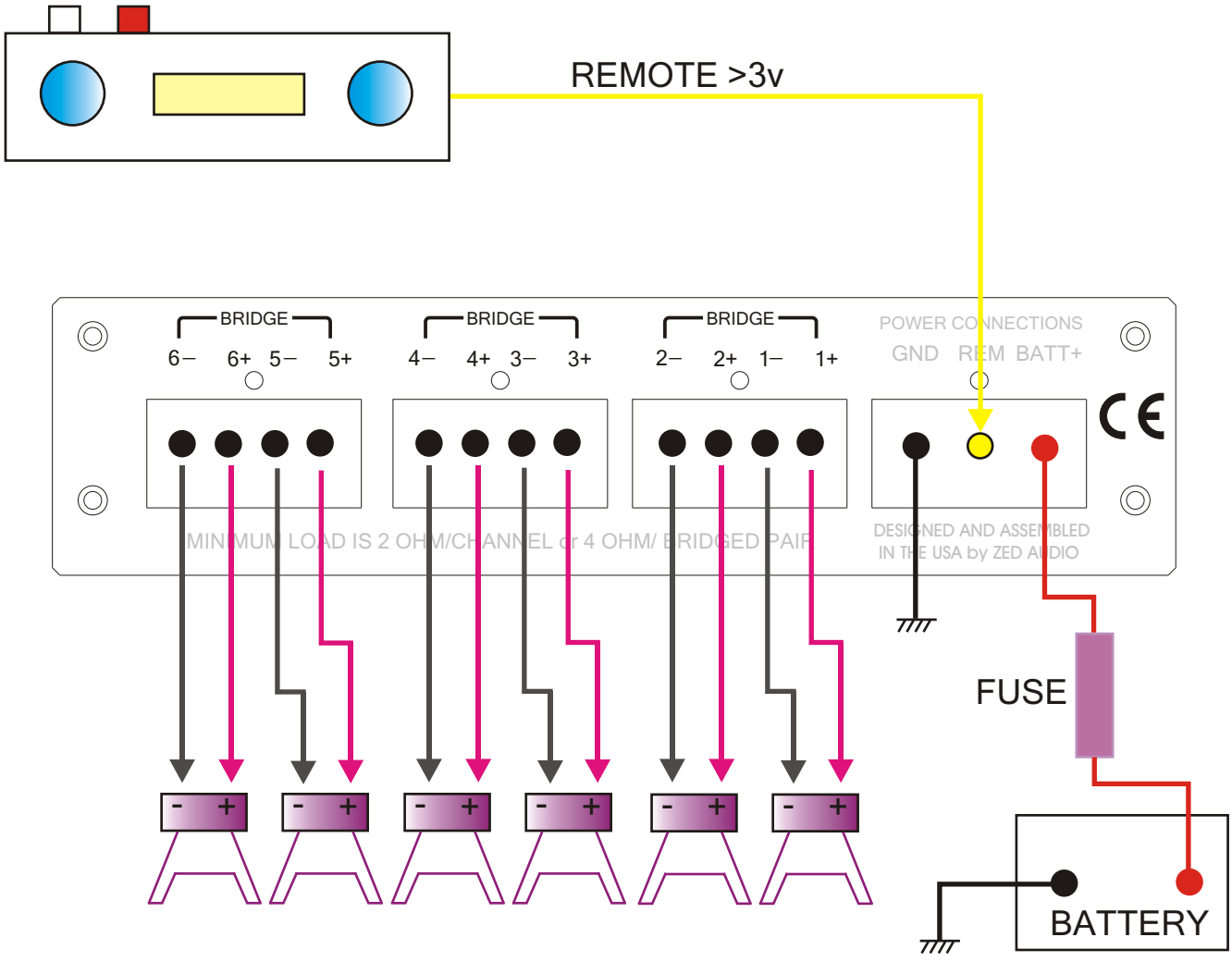
Important note: Do NOT power up LEVIATHAN with the volume level high. The internal initializing circuits will “see” this as a fault condition and shut the amplifier down. The AMBER protection LED will light and the amplifier will have to be powered down for >5 seconds and then reset. This has been done to protect all components in the system, including YOUR ears!

LEVIATHAN run with all 6 channels with FLAT response

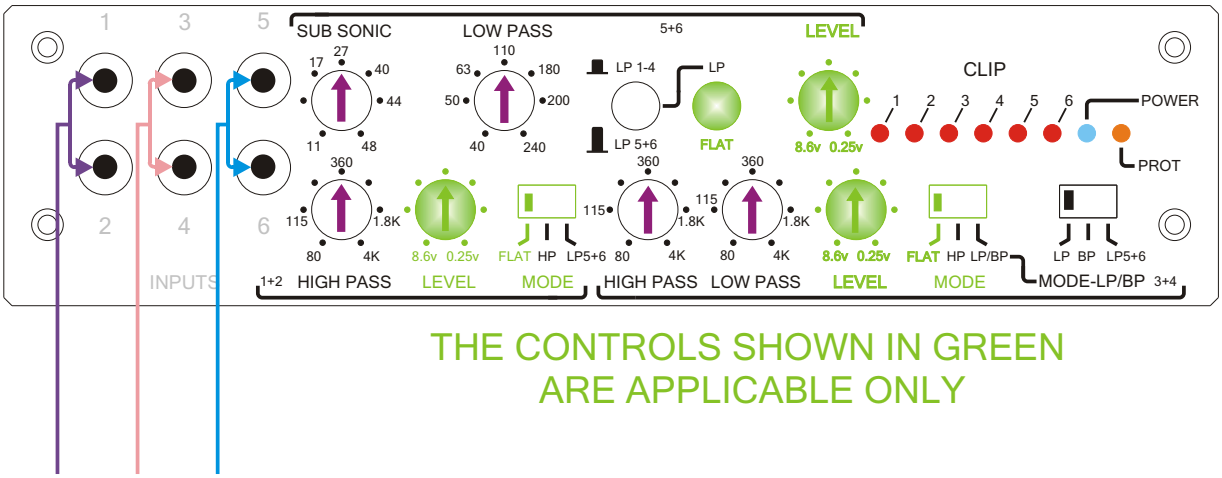


THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

THE SIX (6) INPUTS CAN BE DRIVEN FROM SIX
DIFFERENT SOURCES OR Y ADAPTED AS REQUIRED

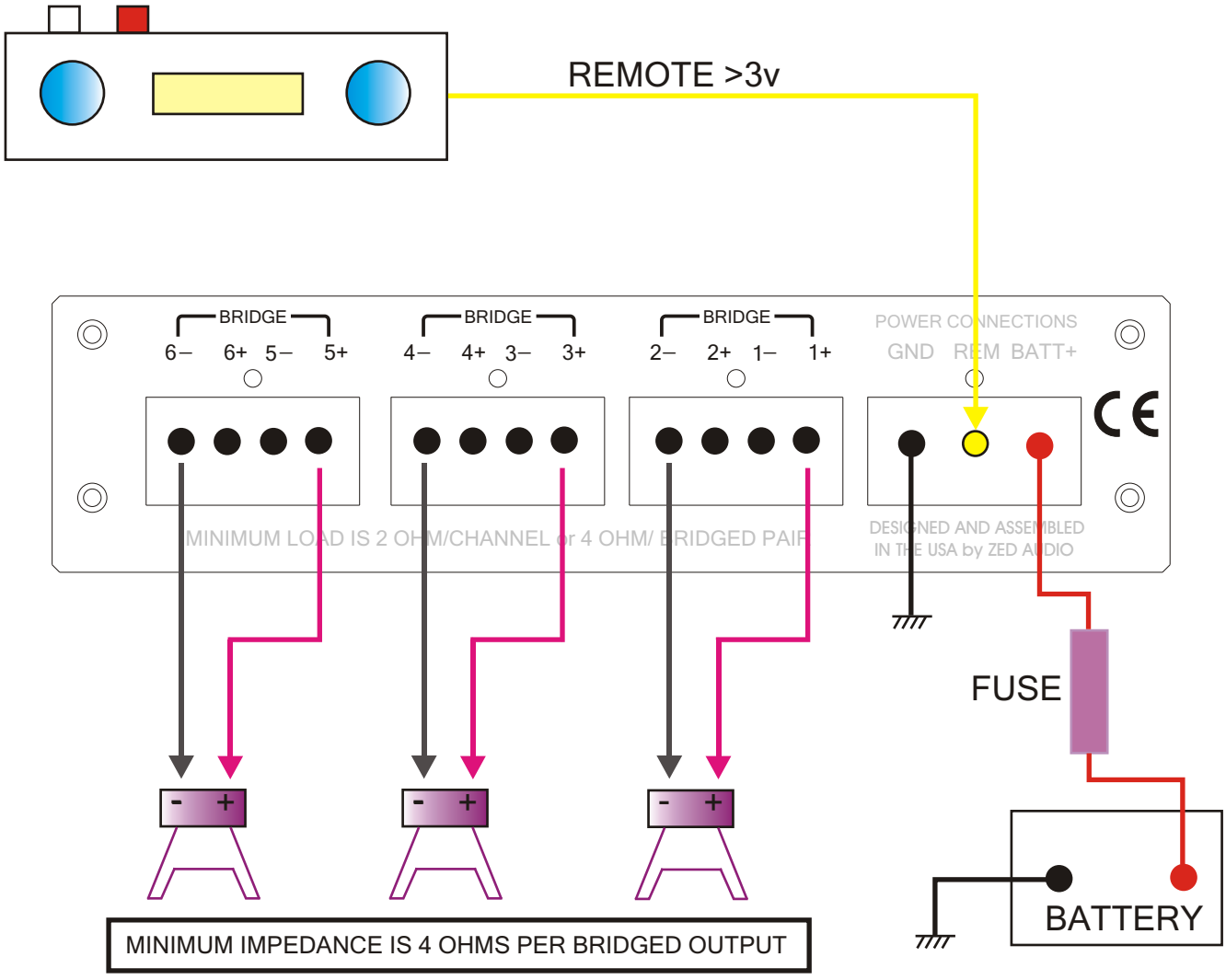


LEVIATHAN with 6 channels in FLAT response and bridged

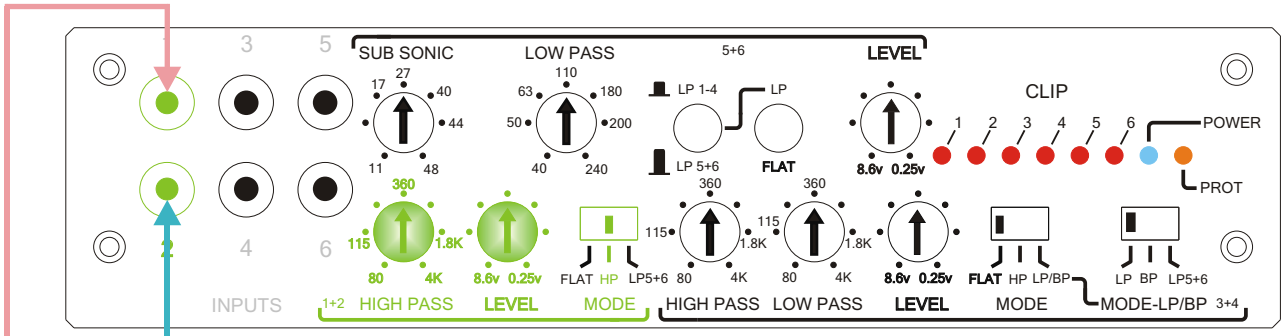


THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

THE THREE (3) INPUTS CAN BE DRIVEN FROM THREE DIFFERENT SOURCES OR Y ADAPTED AS REQUIRED

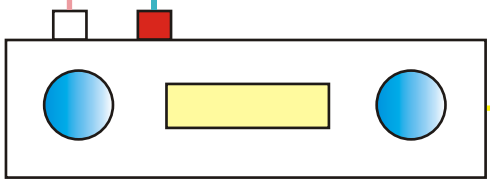


LEVIATHAN with Chs 1+2 in high pass

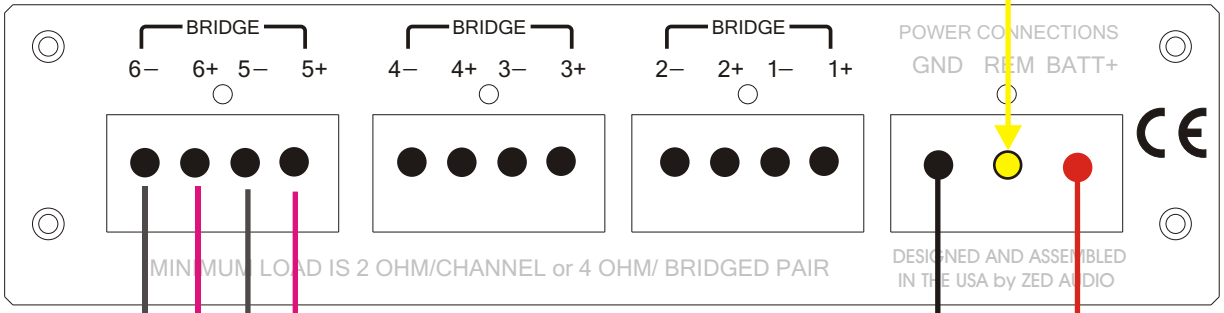


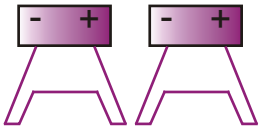
THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

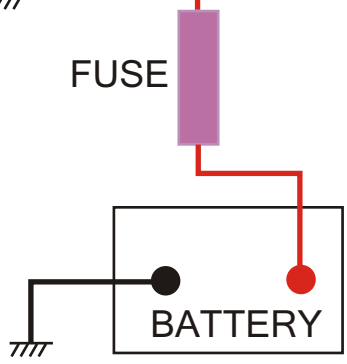
THESE TWO INPUTS ARE DRIVEN FROM AN
APPLICABLE SOURCE



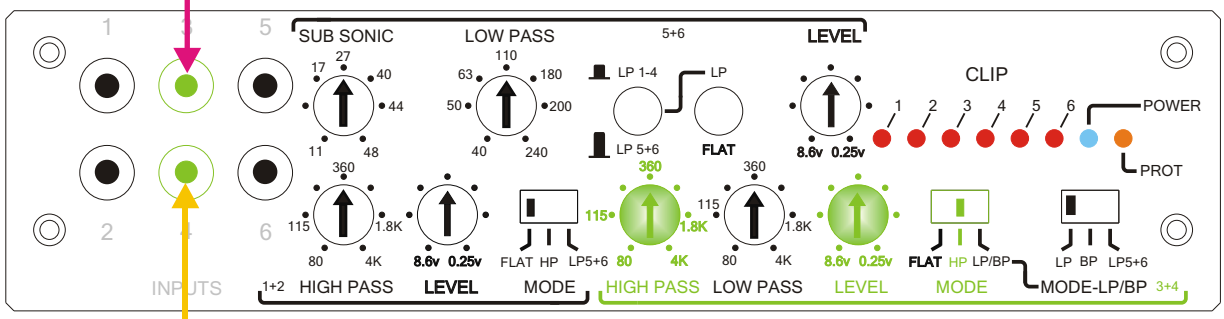
REMOTE >3v







LEVIATHAN with Chs 3+4 in high pass



THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

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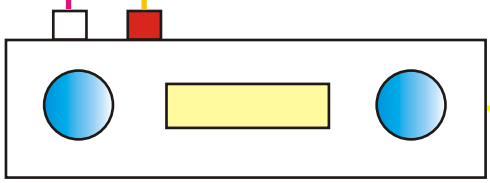
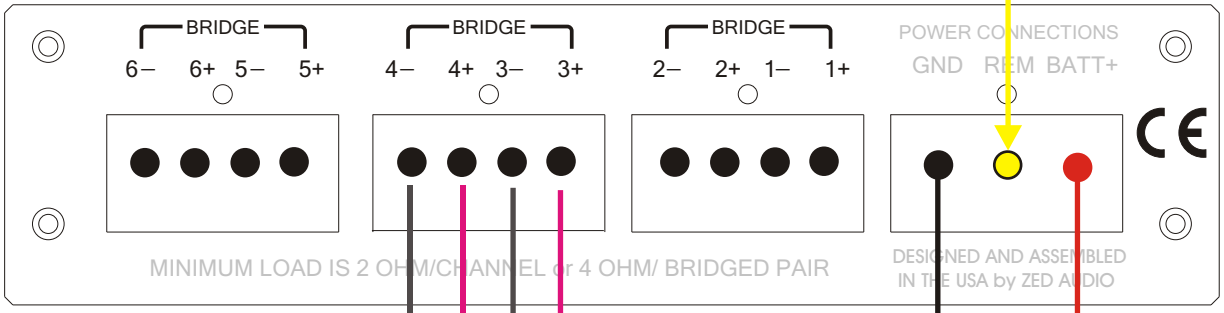
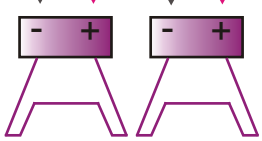
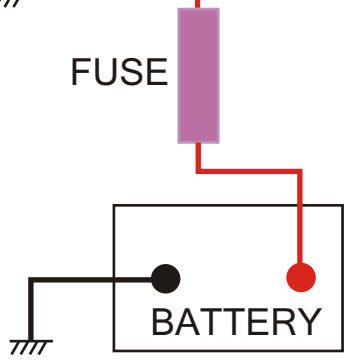
APPLICABLE SOURCE



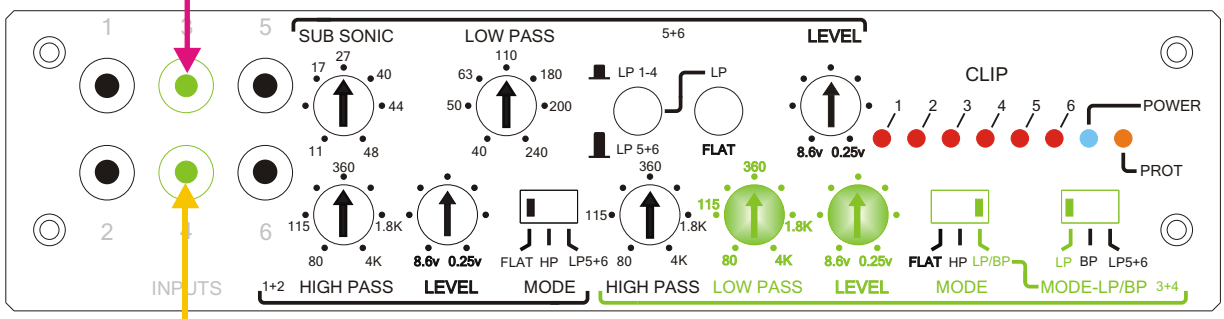
REMOTE >3v





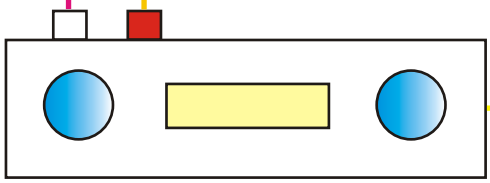


LEVIATHAN with Chs 3+4 in low pass

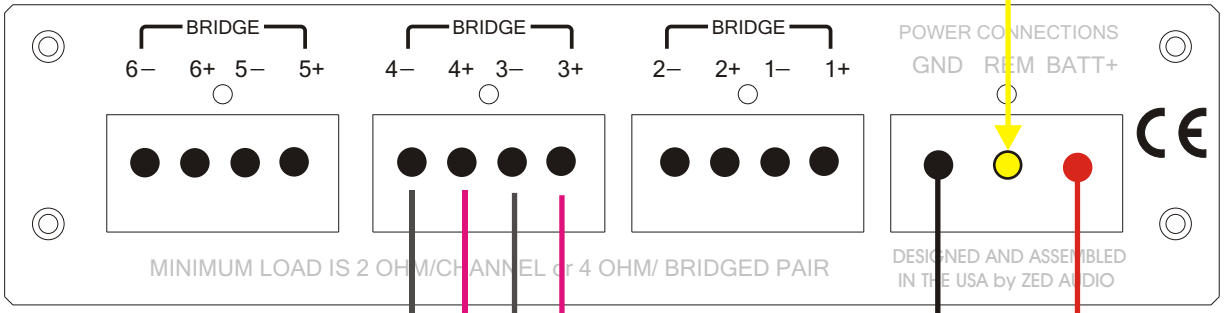


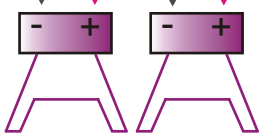
THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

THESE TWO INPUTS ARE DRIVEN FROM AN
APPLICABLE SOURCE



REMOTE >3v

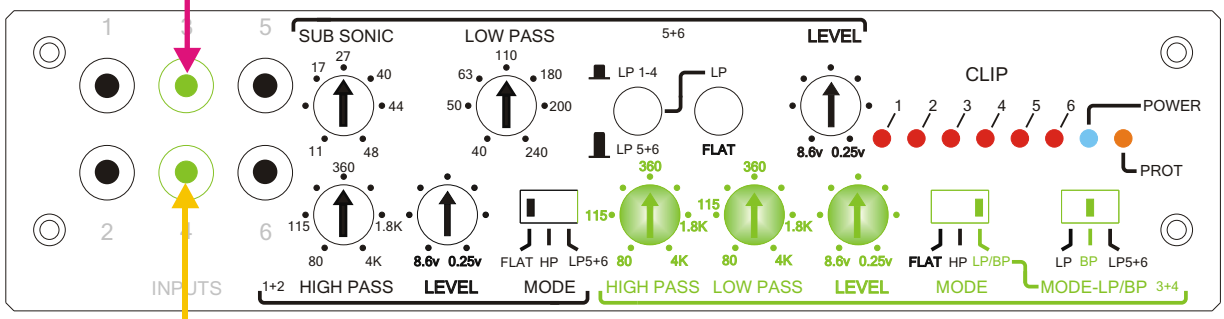




FUSE

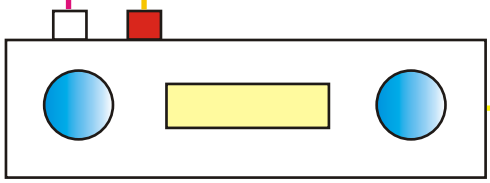
BATTERY

LEVIATHAN with Chs 3+4 in band pass

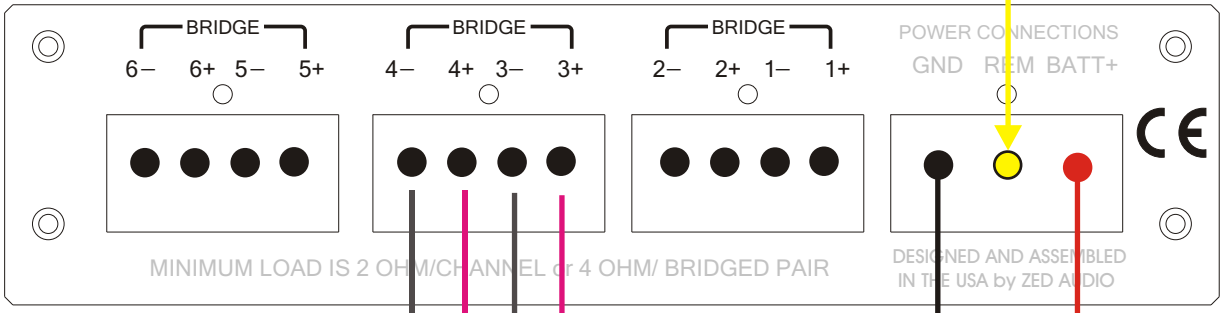


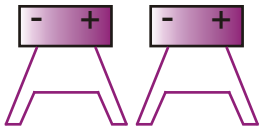
THE CONTROLS SHOWN IN GREEN
ARE APPLICABLE ONLY

THESE TWO INPUTS ARE DRIVEN FROM AN
APPLICABLE SOURCE

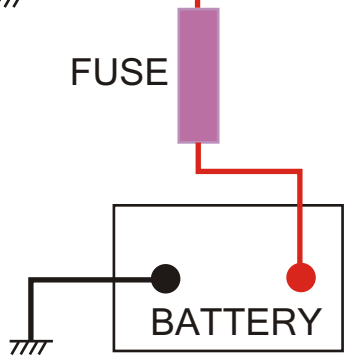


REMOTE >3v

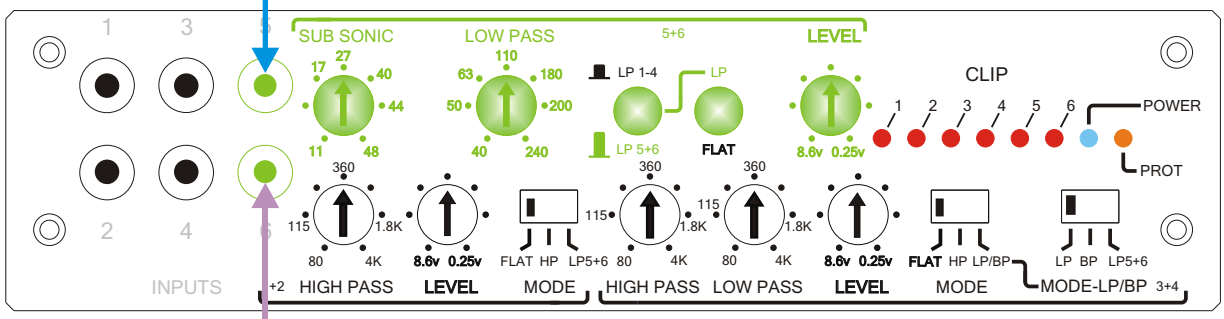




FUSE



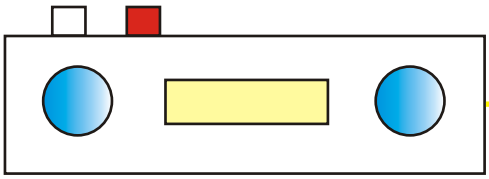
LEVIATHAN with Chs 5+6 in low pass using 5+6 inputs



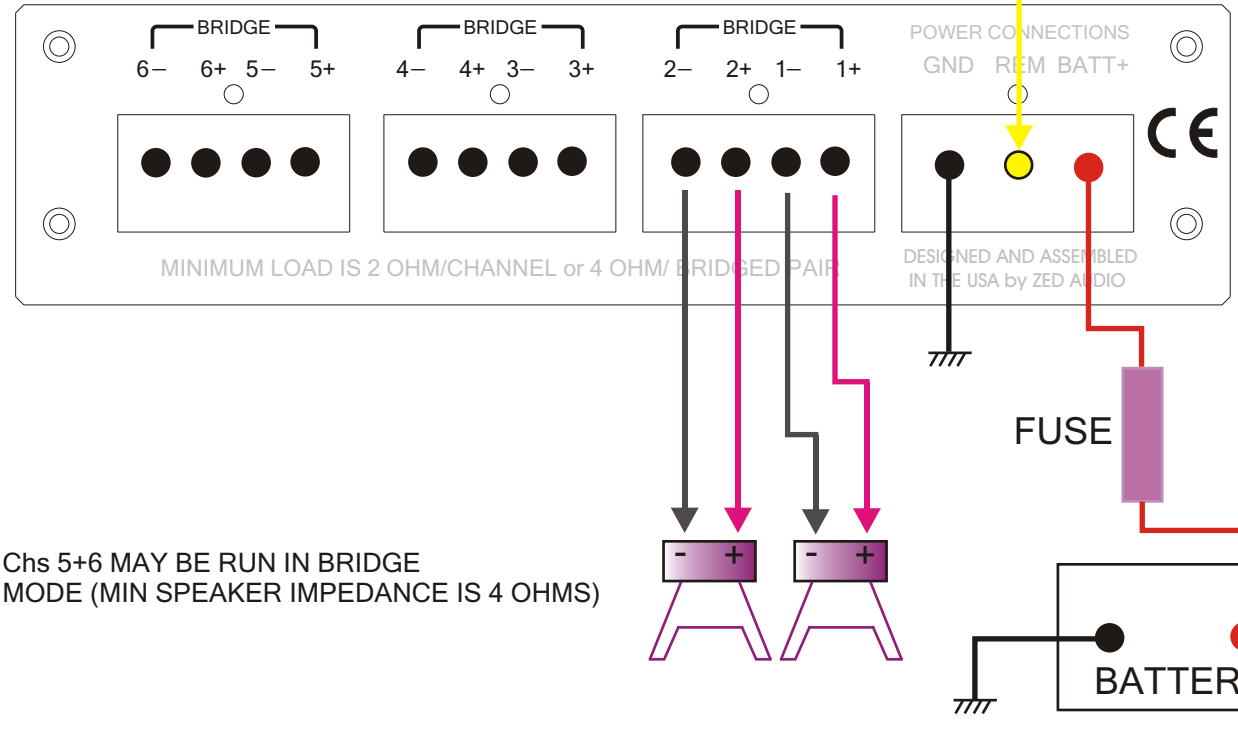
THE CONTROLS SHOWN IN GREEN ARE APPLICABLE ONLY

THESE TWO INPUTS MAY BE Y-ADAPTED AND THE CHANNELS RUN IN BRIDGE MODE

THESE TWO INPUTS ARE DRIVEN FROM AN APPLICABLE SOURCE

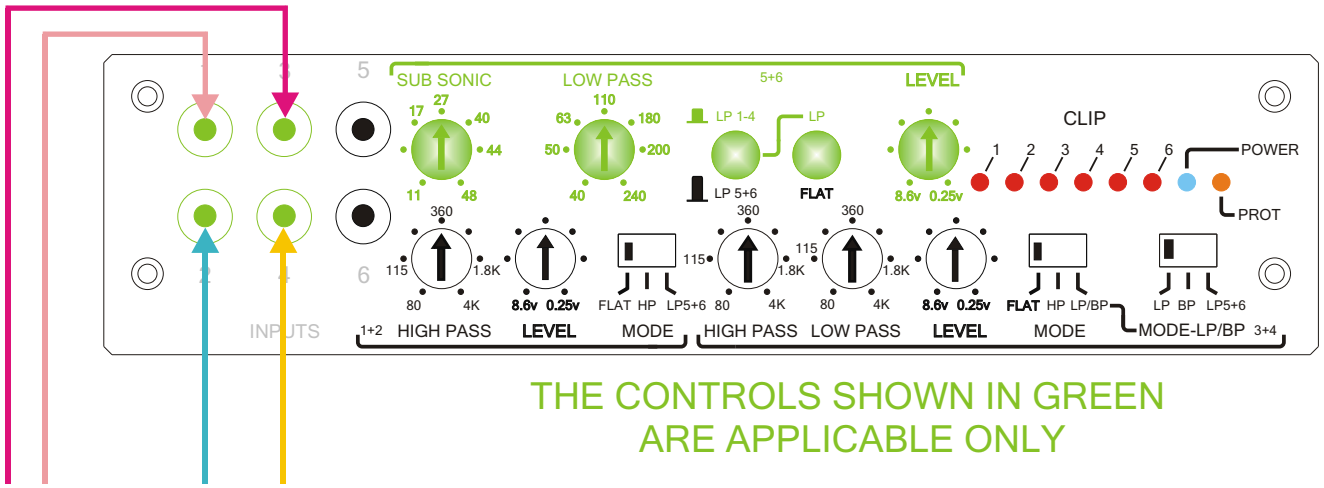


REMOTE >3v



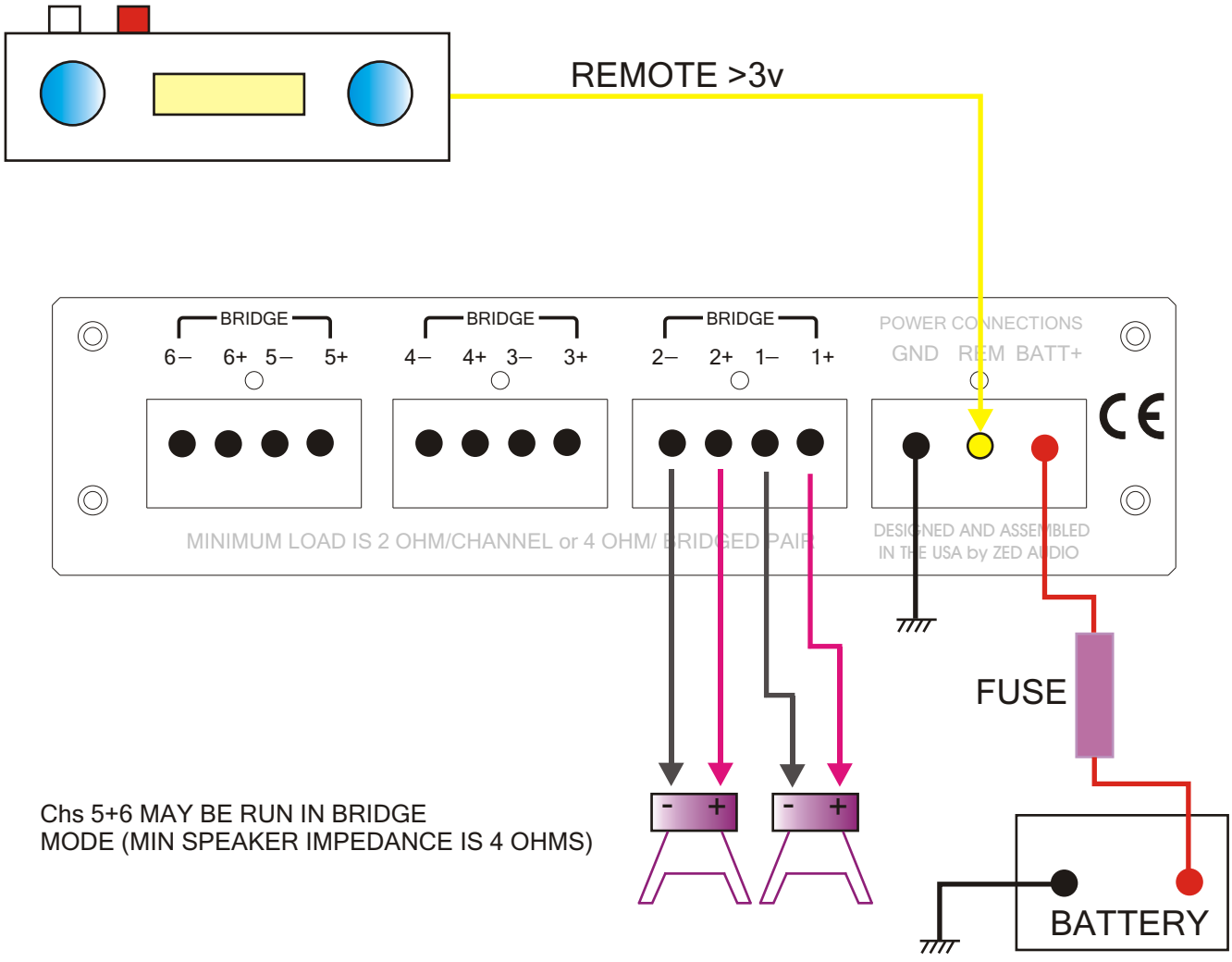
Chs 5+6 MAY BE RUN IN BRIDGE MODE (MIN SPEAKER IMPEDANCE IS 4 OHMS)

LEVIATHAN with Chs 5+6 in low pass using INPUTS 1,2,3 and 4



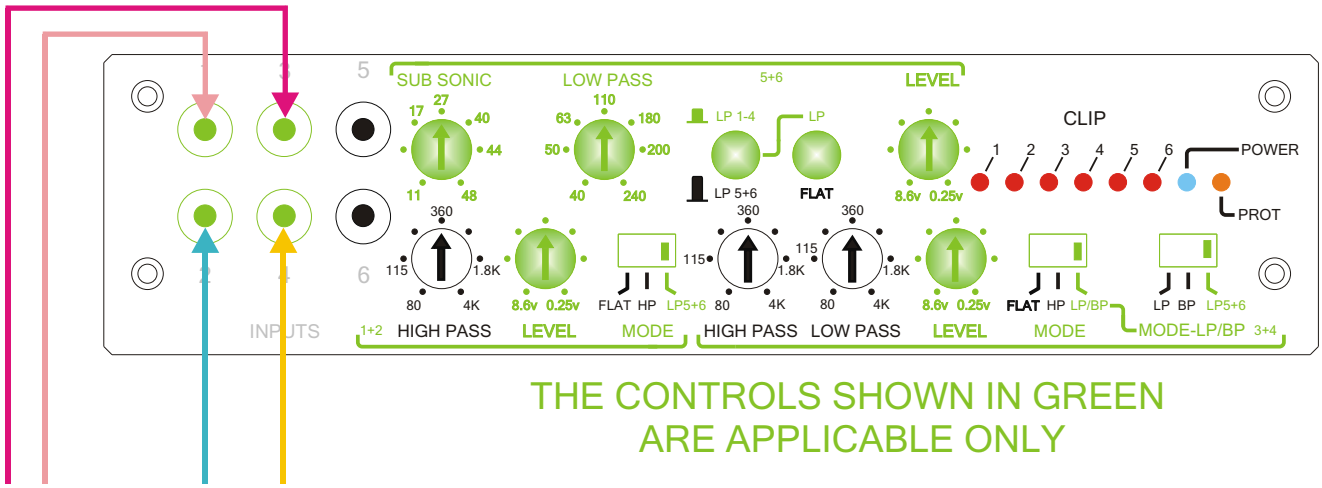
THE CONTROLS SHOWN IN GREEN ARE APPLICABLE ONLY

THESE FOUR INPUTS CAN BE DRIVEN FROM EITHER SEPARATE SIGNAL SOURCES (FRONT+REAR OUTPUTS FROM HU) OR FROM A MONO SIGNAL SOURCE



Chs 5+6 MAY BE RUN IN BRIDGE MODE (MIN SPEAKER IMPEDANCE IS 4 OHMS)

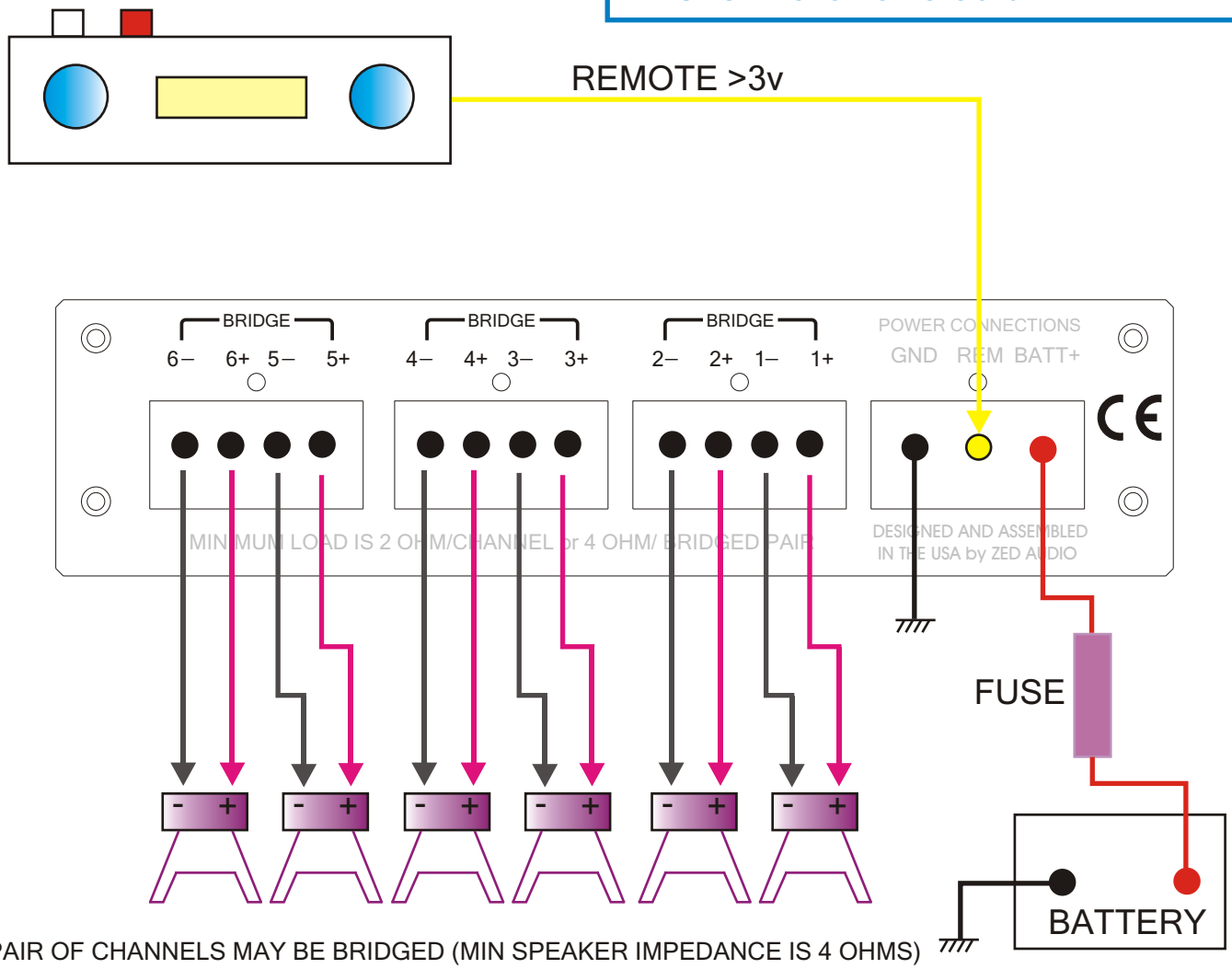
LEVIATHAN with Chs 5+6 in low pass using inputs 1,2,3 and 4 and Ch 1,2,3 and 4 switched to LP5+6



THE CONTROLS SHOWN IN GREEN ARE APPLICABLE ONLY

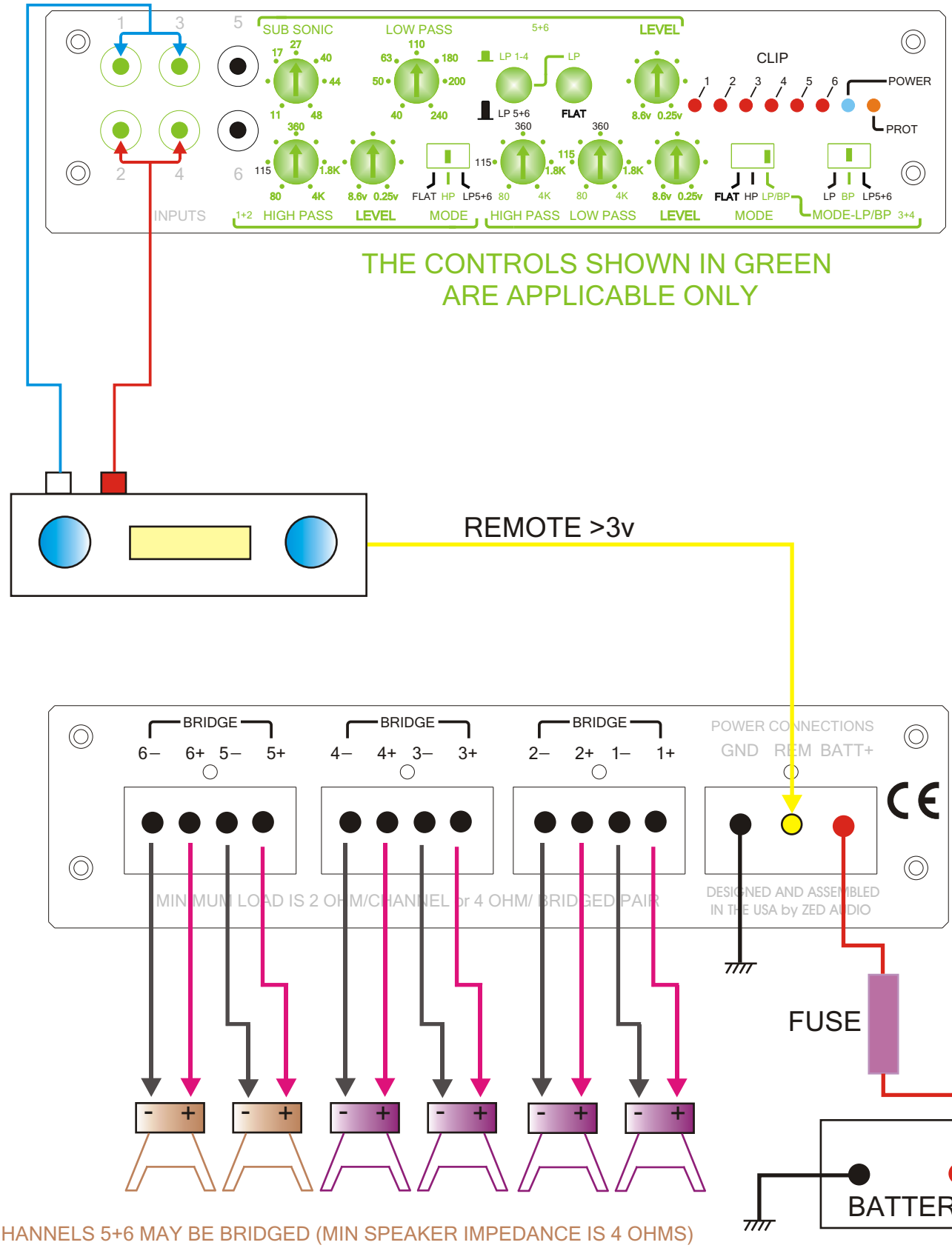
THESE FOUR INPUTS CAN BE DRIVEN FROM EITHER SEPARATE SIGNAL SOURCES (FRONT+REAR OUTPUTS FROM HU) OR FROM A MONO SIGNAL SOURCE

THIS DIAGRAM SHOWS LEVIATHAN AS A 6 CHANNEL SUB WOOFER AMPLIFIER DRIVEN FROM INPUTS 1-4. YOU MAY USE INPUTS 5+6 BY CHANGING THE POSITION OF THE INPUT SELECTOR ON Chs 5+6



ANY PAIR OF CHANNELS MAY BE BRIDGED (MIN SPEAKER IMPEDANCE IS 4 OHMS)

LEVIATHAN as a 2 channel tri-amplified system



CHANNELS 5+6 MAY BE BRIDGED (MIN SPEAKER IMPEDANCE IS 4 OHMS)

Troubleshooting

Amplifier will not power up.	Check for battery power at amplifier's power terminals. Check for voltage at REMOTE terminal must be greater than 3 volts Make sure protection LED is off. If it is on, turn the amplifier off for 5 seconds and then power up again. If LED comes on Again refer to notes below.
Amplifier gets hot	The amplifier is OK if you can keep your hand on the chassis with no discomfort. Make sure the speaker impedance is correct.
High "hiss" heard in speakers	Remove the RCA plugs from the amplifier. If hiss disappears the problem is the source. Set the amplifier's level control as insensitive as possible. It is best to drive the highest signal level from the head unit as possible. The higher this signal level the better the subjective S/N ratio is.
Protection LED comes on	Remove speaker connections from amplifier. Turn amplifier off for 5 seconds. Turn on again, if LED is off the problem is with the speakers. Check for shorts on the cables and on each speaker. If the LED comes on, the amplifier is faulty.
Engine noise	Check spark plug wires. Check that RCA cables run away from power cables. Use only high quality RCA cables.
Alternator whine	Check grounding of head unit. Run head unit's +12 connections directly to the battery +12v terminal. Make sure all ground connections are rust free. Check that RCA cable grounds are not shorted to the chassis in their run from the amplifier to the head unit. Disconnect the RCA cables from the amplifier. If whine disappears the problem is upstream.
Sound is distorted	Check RCA cables for shorts Check speakers and cables Check amp level is matched to that of head unit.

Limited Warranty

This Zed Audio product is warrantied to the ORIGINAL purchaser against defects in material and workmanship from the factory. This warranty is for a period of 90 days from date of purchase from Zed Audio Corporation or an authorised dealer. This warranty is valid in the country in which it was purchased and is non-transferable. To obtain the two (2) year warranty requires the user to register the product with Zed Audio Corp. This registration must be mailed to us at the address on page 39 OR a scan of the information can be done and emailed to us at zedaudio@aol.com. Please refer to this registration form on the last page of this manual. You may print that page and use it to send to us.

This warranty covers only the product purchased from Zed Audio Corporation and does not cover damage to any other associated equipment or the vehicle(s) in which the equipment is/was installed.

This warranty does NOT cover damage due to incorrect installation, faulty or bad equipment associated with the installation.
This warranty does NOT cover any charges associated with removing the equipment from the vehicle.
If this product is tampered with or altered in any way by unauthorized personnel, or the serial number is removed/altered/defaced the warranty is null and void. There are NO exceptions to this.

To obtain factory service under the terms of this warranty, the purchaser must contact Zed Audio Corporation or an appointed service centre to obtain a Return Merchandise number which shall be issued by Zed Audio Corporation or an authorized agent. No product shall be accepted without this number. A copy of the original purchase receipt must be included with the product. This procedure must be followed otherwise the product shall NOT be repaired under warranty. There are NO exceptions to this.

Product returned for repair either out of warranty or if no receipt is included shall be charged at the current hourly rate.

Equipment returned under warranty shall have the return freight prepaid by the service centre. Any freight and insurance costs in sending the product in for service is the responsibility of the end user.

Equipment returned out of warranty shall have the return freight and insurance charges added to the cost of the service bill.

All incoming equipment is carefully inspected before any service or repair is attempted. The condition of the equipment is noted on the invoice. Please make sure that you pack your unit well before sending it back for repair/service.

All warranty claims shall be decided at the discretion of Zed Audio Corporation or an appointed representative.

Zed Audio Corporation reserves the right to make changes and/or improvements upon it's products. We do not assume any obligation to install such changes and/or improvements to existing equipment previously manufactured.

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Suite D
Simi Valley
Ca 93065 USA
Email Zedaudio@aol.com
Website www.zedaudiocorp.com
Tel (805) 526-5315

15 day return policy

Zed Audio Corporation offers a money back guarantee for any of the products described in this manual. This 15 day money back guarantee has the following stipulations attached and we shall not deviate:

The product must be returned with a copy of the original sales invoice.
The full purchase price shall be refunded less the original freight amount.
For any damaged or missing parts on the amplifier, including packaging materials the replacement thereof shall be deducted from the refund amount including the labour to replace these parts.
Amplifiers cannot be returned for reasons other than non performance of the amplifier.

PLEASE READ THIS CAREFULLY AND BE SURE THAT IF AN AMPLIFIER IS RETURNED AND WE FIND DAMAGED PARTS, THESE CHARGES WILL APPLY

So please retain all packaging materials and documents in case the product is returned for a refund.
Zed Audio is not responsible for the freight from the consumer to Zed Audio when our refund option is exercised.
Every product built by Zed Audio goes through a series of exhaustive tests and so we are 100% sure that each and every product meets the advertised specifications. Please have a qualified person check the installation if for some reason there seems to be something not functioning correctly, or feel free to contact us and we shall attempt to solve the problem.

Upcoming products from Zed Audio

We have some new products which will be introduced in late early 2010. We urge our customers to send us their requests for products which they would like to see in the line up.

The first is a 4 channel amplifier, rated at 150w per channel at 4 ohms. It has some unique features never seen on a multi channel amplifier.

A mono block will also be added to the line up with some unusual features. Power output into 4 ohms will be 1000 watts

A hybrid amplifier incorporating my favourite amplifying devices namely TUBES. Since I was brought up on tubes, no I did not eat them as a child, but I “cut my teeth” in electronics on these wonderful glowing glass bottles. This amplifier will feature a complete 100% tube front end and the power amplifier will incorporate tubes right up to the output stage. The output devices will be high speed Sanken or Toshiba devices which in my opinion are the best bi-polar devices around. Cost will be an object as part of my philosophy is to bring reasonably prices gear to the market. Power will approximately 125w per channel and the name of this amplifier is... Well we have not come up with a suitable name yet. All suggestions are welcome. This amplifier is not intended for sub woofer duty and so will incorporate crossovers with a 12dB/octave slope. The consumer who will use this type of amplifier will typically not be a “bass head” and so steep slope crossovers are not required. Never forget one thing, the best sounding crossover is, “no crossover at all”.

The last product is a stand alone TUBE crossover. This will be a four (4) channel unit with low, band and high pass functions. Again all at 12dB/octave. The name of this crossover is “TubeX”

REGISTRATION FORM

Name of owner:

Address:

Name of product purchased:

Serial number:

Name and address from whom this product was purchased.

Date of purchase

Please do not forget to mail a copy of the retail invoice OR scan it an email to us.

If you are mailing us your registration, you may print a copy of this page