Instruction and Installation Manual

Megalith
Minilith
Gladius
The Deuce
Draconia

Welcome to the world of Zed Audio amplifiers. Designed for mobile use, these amplifiers are the cumulation of more than 25 years of cutting edge design. This is not to say that these new products took 25 years to design, but rather that they have the “experience” of 25 years of manufacturing and design. Car stereo has come a long way since the early days in the late seventies and early eighties. Cassettes have disappeared from the high end and CD rules in this department. Loudspeaker technology has advanced with new materials and designs. The rigors of the car environment have forced speaker designers and manufacturers to reinvent the proverbial wheel. Today’s speakers are a quantum leap ahead of those we used 20 years ago.

Similar leaps have been made in power amplifier technology. Early amplifiers were plagued by unreliable power supplies and shoddy mechanicals. The audio amplifiers were also not a model of reliability and sonic delight. High power amplifiers was the name given to 50 watt per channel designs (If in fact they delivered 50 watts per channel). Power ratings were done at 14.4v battery levels so that inflated figures could be quoted. Most amplifiers of 20+ years ago contained only a full range pre-amplifier which allowed the unit to accept the very low output voltages of head units from that era. (Typically 100mV was a norm) Built in processing was almost unheard of and if one required crossovers and equalizers they had to be outboard units, again of dubious design and audio quality.

Today’s amplifiers normally contain crossovers and equalizers with variable controls which allow the installer to match the electronics to the speakers and car interior. A 50 watt per channel amplifier today is probably on the lowest rung of the food chain. This kind of power is entry level and large amplifiers are now in the Kilowatt range. Mono blocks, two channel and multi channel amps each fill a particular need for the installer and of course the end consumer. Zed Audio has experience designing and building all of these amplifiers.

After some research we designed products which we wanted to present to the world. The power points, audio quality, features and of course the cosmetics each has a role to play. Power is not everything but today’s inefficient speakers demand higher powered amplifiers. Of course all speakers are not power hungry and so we have smaller amplifiers in the line up. Audio quality was of prime consideration and the designs we have used reflect our philosophy on sound quality. The amplifiers all have outstanding feature sets without going overboard with superfluous buttons and knobs. Last but not least the amplifiers have to look good. Who would buy a picture that was not attractive to the eye. We hope that our designs please all who see them.

Please read this manual in it’s entirety before installing and operating your new amplifier. Thank you for purchasing our product and we at Zed Audio shall do our best to ensure that you enjoy this product for many years.

Index

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 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

Installation Instructions

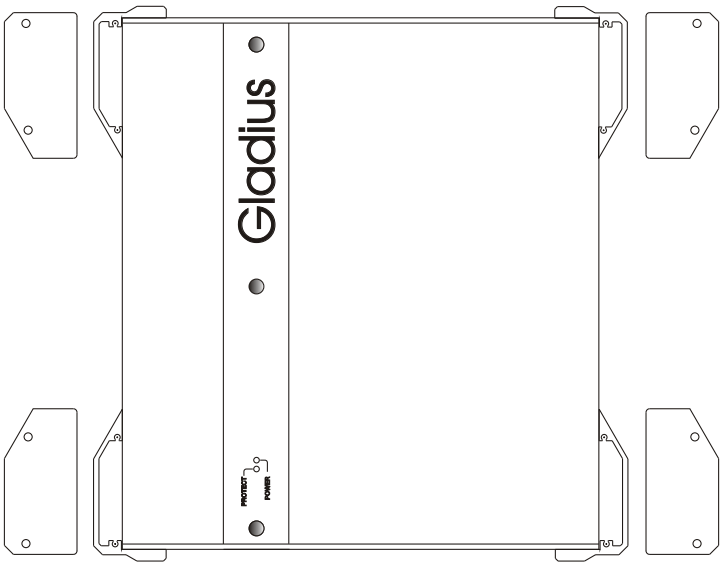
Location:

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. DO NOT mount the amplifier upside down as this reduces the ability of the heatsink to dissipate heat effectively.

Mounting the amplifier(s)-Fig 1

These amplifiers have a unique method of mounting which allows the installation to look attractive. At each corner of the amplifier is a pillar and the bottom plate at each pillar has been punched with a 5mm hole. You will also notice that the top covers are packaged separately and these are only bolted on once the amplifier has been screwed down. Using the supplied washer set bolt the amplifier into position. DO NOT MOUNT WITHOUT USING THE WASHERS as the bottom plates may be damaged. This damage is NOT covered under warranty. Once the amplifier has been bolted down, place and bolt each corner top panel using the supplied hardware (M4x6 SHC machine screws) and hex tool. Please keep this tool in a safe place for future use. The size of this hex tool is 3mm and these are available from any hardware store. Note that each pair of top corner panels can ONLY fit in their unique positions. Please be careful when bolting these top panels so as not to cross thread the tapped bosses.

Fig 1



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 (-) 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 (+) 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 supplied 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 9mm (0.35").

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 a medium size amplifier such as Draconia. Let us assume that we are playing it such that all four channels(into 4 ohms each) are just clipping on the loudest musical peaks. This means that we are delivering 300 watts on peaks. The amplifier's average efficiency is about 45%. The peak to average power ratio is about 20% so average power is 20% of 300 = 60 watts. The input power is therefore 133 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 0.54 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 0.54 seconds! So what good is a 1 Farad capacitor? Assign the above example to a Megalith playing into a 1 ohm load. Going through the mathematics the 1 Farad capacitor would keep the amplifier playing for 0.14 seconds. So if the voltage at the amplifier's power terminal dropped by say 1volt the amplifier's power supply will correct for this on a continuous basis. The stiffening capacitor however has nowhere close to the energy reserve to compensate for a 1 volt drop.The main internal power supply capacitors hold 100 Joules of energy and these are more effective than any stiffening capacitor since they do not have to contend with the in-efficiencies of the amplifier's power supply.

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!!

Output 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.

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 look at 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.

Specifications

Specification	Gladius	The Deuce	Draconia
Output Voltage (volts into 2 ohm) per channel	17.32	28.28	16.73
Output Voltage (volts into 4 ohms) per channel	17.32	28.28	16.73
Output Current (amps into 2 ohm) per channel	8.66	14.14	8.36
Output Current (amps into 4 ohms) per channel	4.33	7.07	4.18
Continuous Output Power into 2 ohm per channel	150wx2	400wx2	140wx4
Continuous Output Power into 4 ohm per channel	75wx2	200wx2	70wx4
Typical Output Power into 4 ohm per channel (0.8% THD)	95wx2	250wx2	85wx4
Continuous Output Power 2 channels bridged into 4 ohm	300wx1	800wx1	280wx2
Continuous Output Power 2 channels bridged into 8 ohm	150wx1	400wx1	140wx2
Minimum Speaker Impedance per channel	2 ohm	2 ohm	2 ohm
Minimum Speaker Impedance in Bridge Mode	4 ohm	4 ohm	4 ohm
Power Response at any power into 4 ohms/channel	10-100KHz -3dB	10-100KHz -3dB	10-100KHz -3dB
Frequency Response at rated power into 4 ohms/channel	10Hz-25KHz -0.1dB	10-25KHz -0.1dB	10-25KHz -0.1dB
Input Voltage range for rated power into 4 ohms	0.26-8 volt	0.26-8 volt	0.26-8 volt
Input Impedance	47K ohm	47K ohm	47K ohm
Noise below rated output (30KHz limited)	-98dB	-101dB	-98dB
Channel separation at 2KHz	>80dB	>80dB	>80dB
Damping Factor at 20Hz with 4 ohms	>180	>200	>180
Total Harmonic Distortion with 4 ohm 20Hz-20KHz From 1 watt to rated power. Typically less than 0.05%	<0.08%	<0.08%	<0.08%
Intermodulation Distortion	<0.08%	<0.08%	<0.08%
Phase response at 20KHz	Lagging 10 deg	Lagging 10 deg	Lagging 10 deg
Slew rate (volts per micro second)-In"Flat" mode	15	15	15
Low Pass Crossover (all are 24dB/octave)	46Hz-3.5KHz	46Hz-3.5KHz	46Hz-3.5KHz
High Pass Crossover (all are 24dB/octave)	46Hz-3.5KHz	46Hz-3.5KHz	46Hz-3.5KHz
Equalization (Zero to +18dB variable control)	Bass Boost @44Hz	Bass Boost @44Hz	Bass Boost @44Hz
Remote Level Port with control	N/A	N/A	N/A
Line Output	Yes	Yes	Yes
Protection - Short Circuit, DC, Thermal	Yes	Yes	Yes
Power Source	----------10-14.5v DC Negative Ground ----------		
Current Consumption with Sinewave at 4 ohms	20A	54A	40A
Current Consumption with Music at 4 ohms	6A	17A	12A
Idling Current	<1.5A	<2A	<2A
Fuse rating with 4 ohm load/channel	25A	60A	50A
Fuse rating with 2 ohm load/channel ****	35A	80A	70A
Size W x H (302.22mmx74mm/11.9"x2.91") x L	314.4mm/12.4"	444mm/17.48"	444mm/17.48"
Shipping Weight (Kg/Lbs)	7.3/16	11.8/26	11.8/26

**** 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.

Specifications

Specification	Megalith	Minilith
Output Voltage (volts into 1 ohm)	45	24.5
Output Voltage (volts into 2 ohm)	52	28.3
Output Voltage (volts into 4 ohms)	54	28.3
Output Current (amps into 1 ohm)	45	24.5
Output Current (amps into 2 ohm)	26	14.15
Output Current (amps into 4 ohms)	13.5	7.075
Continuous Output Power into 1 ohm	2,000wx1	600wx1
Continuous Output Power into 2 ohm	1,350wx1	400wx1
Continuous Output Power into 4 ohm	730wx1	200wx1
Typical Continuous Output power into 1 ohm	2,200wx1	650wx1
Typical Continuous Output Power into 2 ohm	1,560wx1	480wx1
Typical Continuous Output Power into 4 ohm	750wx1	260wx1
Continuous Output Power 2 channels bridged into 2 ohm	4,000w x 1 *	1,200w x 1 *
Continuous Output Power 2 channels bridged into 4 ohm	2,700w x1 *	800w x 1 *
Continuous Output Power 2 channels bridged into 8 ohm	1,400w x 1 *	400w x 1 *
* With TWO Miniliths or Megaliths bridged		
Minimum Speaker Impedance	1 ohm	1 ohm
Minimum Speaker Impedance in Bridge Mode	2 ohm	2 ohm
Frequency Response at 1 watt into 4 ohms/channel	11-150Hz -3dB	11-150Hz -3dB
Frequency Response at rated power into 4 ohms/channel	11-150Hz-3dB	11-150Hz -3dB15
Input Voltage range for rated power into 4 ohms	0.22-7.4 volt	0.22-7.4 volt
Input Impedance (10K ohm on “mono-bridge” input)	39K ohm	39K ohm
Noise below rated output (30KHz limited)	-95dB	-89dB
Channel separation at 2KHz	Infinite	Infinite
Damping Factor at 20Hz with 4 ohms	>150	>100
Total Harmonic Distortion with 4 ohm 20Hz-150Hz From 1 watt to 2dB below rated power ** Frequency range 20-150Hz only	<0.5% **	<0.5% **
Low Pass Crossover (24dB/octave)	40-235Hz	40-235Hz
High Pass Crossover (24dB/octave)	11-48Hz	11-48Hz
Equalization	Parametric 26-160Hz	Parametric 26-160Hz
Remote Level Port with control	Yes	Yes
Line Output	Yes	Yes
Protection - Short Circuit, DC, Thermal	Yes	Yes
Power Source	----10-14.5v DC Negative Ground ----	
Current Consumption with Sinewave at 4 ohms	70A	20A
Current Consumption with Music at 4 ohms	15A	6A
Idling Current	<5A	<3A
Size W x H (302.22mmx74mm/11.9”x2.91”) x L	494mm/19.45”	314.4mm/12.4”
Shipping Weight (Kg/Lbs)	13.6/30	7.3/16
Fuse rating ***	150A	35A

*** May have to be increased by 40% when driving high power into 1ohm loads

Megalith

For those of you acquainted with ancient history we know that the Egyptians amongst others built massive temples and monoliths. These monoliths were single massive stone structures, wider at the base and tapering at the top and exuded a feeling of power and mass. We wanted our new mono block to do the same and we believe that we have succeeded. With an output capability of 2Kw into a 1 ohm load, Megalith takes it's place as one of the most powerful amplifiers available today.

Megalith is the culmination of more than 2 years of development. We asked ourselves what consumers want in a subwoofer amplifier. Requirements are for sharp cut off low pass and high pass filters, good quality equalization, the ability to bridge two amps together, a remote level control and multiple inputs. We incorporated ALL of these features into this amplifier.

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. A total of 10 high current, high voltage Mosfets are used. Each has a current capability of 50 amps in a circuit limited to less than 50 amps. With an output stage having a current capability of 500 amps there is a substantial safety factor built in. The output filter utilizes low loss iron cores and high quality film capacitors.

A servo control amplifier monitors the DC conditions at the speaker terminals and keeps the DC offset at less than 3mV (0.003v).

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.

Our power supplies use massive amounts of capacitance on the 12 volt side and this capacitance is spread over 19 capacitors in parallel. A total of 41,800mfd is used. Fourteen (14) high current low Rds on Mosfets are used as the main switching elements. Each is rated at 110 amps but we derate them to 50 amps for safety and each has an “on” resistance of 0.01 ohms at 80 deg C. With seven Mosfets in parallel on each half of the supply the total on resistance is 0.0014 Ohm (One point four thousandths of an ohm!)

We further temperature derate this for a final on resistance of 0.002 ohms. With 14 Mosfets each rated at a theoretical 110 amps we have a reserve of 1,540 amps. Well this number is wishful thinking and the figure we work with is 50 amps per Mosfet for a total current capability of 700 amps in a circuit limited to about 240 amps. So we have a large safety factor built in. This does not tell the whole story about how the switching Mosfets behave. We must turn them on and off quickly, minimize the overshoot and make sure their junction temperature remains in the safety zone. We achieve some of these parameters by using the Mosfets as source followers, which means that they operate without any voltage gain and only current gain. Pretty much all car amplifiers use their Mosfets with voltage gain which causes various ills. Our Mosfets operate with maximum bandwidth and due to the circuit design the main power transformer (of which there are two in Megalith) has it’s design greatly simplified. Less turns are required, which means lower copper losses and we can minimize leakage inductance in the transformer(s) by better winding methods.

The above describes what happens on the primary side of the power supply. The secondary side has some equally impressive specs. Two pairs of high current fast recovery diodes are used to rectify each transformer’s secondary voltages to the required rails used by the output stages of the amplifier. A total of 22,400 mfd of capacitance is used for the main rails and this stores 71 Joules of energy. A pair of fully regulated +/- 14 volt supplies feeds all the small signal stages of the PWM amplifier.

A separate transformer supplies the isolated supplies for the pre-amplifiers. These are again fully regulated. The grounding system for the pre-amplifiers is 100% floating from the rest of the circuits. This ensures that no ground loops can be formed which in turn will reject alternator whine. A fully balanced differential drive circuit is used to couple the pre-amplifier’s outputs to the inputs of the PWM amplifier section.

The protection circuits are extensive and incorporate DC sensors on the speaker terminals, a thermal shut down should the heatsink reach 80 deg C, a muting circuit which ensures quiet turn on/off of the PWM amplifier. The PWM section incorporates the short circuit protection. Lastly a battery level monitor shuts down the amplifier if the battery voltage exceeds 15 volts.

The pre-amplifier has 5 inputs, four of them allow the front and rear outputs from a head unit to mixed to mono. The fifth input does double duty. When the MODE switch is in the "normal" position the fifth input (mono) accepts a mono input, such as the mono sub outs from some head units. The sensitivity is 4 times that of each of the individual inputs 1-4 so that the level range remains the same. When this input is used the user may choose to use either the low pass crossover in the head unit, in which case turn Megalith's low pass crossover to 240Hz or if Megalith's crossover is used, turn the low pass crossover on the head unit to the highest frequency (This keeps the unused crossover out of the usable passband - typically up to 100Hz). When the mode switch is in the "Bridge" position, the fifth input receives signal from the MASTER amplifier when two amps are run in the bridged configuration. (See Fig 5 on bridging two of our mono blocks)

The high pass crossover functions as a variable subsonic filter with a Butterworth curve at 24dB/octave. Setting this control at the appropriate frequency for the woofer prevents unwanted cone excursions at frequencies which we cannot hear.

A one band parametric equalizer was incorporated because we feel that it gives the installer more control than a simple bass control.

The remote port allows the signal level to be varied from the dash area of the vehicle. Two Megaliths may be bridged for super high power of up to 4Kw into 2 ohms. (Turn the level control on the amplifier more sensitive and then use the remote control)

Minilith

This amplifier has a little humour attached to it's name. It is a sort of "Lith" but of course much smaller, so what better than to name it as the mini version of Megalith. With an output capability of 600w into a 1 ohm load, Minilith takes it's place beside it's larger sibling.

All the same good technical goodies apply to this small Lith. It would be pointless to repeat it all here so just read the technical stuff under Megalith. Of course this amplifier has less parts and so the input capacitance totals only 11,000mfd. The circuit accommodates various types of power supply mosfets. We typically use twelve 17 amp mosfets or six 35 amp versions. In either case we have a large current reserve for total reliability.
The class D amplifier uses six power mosfets each rated at 33 amps (for a total of 99 amps) in a circuit with a maximum current requirement of 24.5 amps.
Minilith uses the identical front end as Megalith so this mini-mite has no disadvantage in terms of it's versatility.
Two Miniliths may be bridged for up to 1.2Kw into a 2 ohm load

Typical Systems

System 1: This shows a Megalith connected to a subwoofer (1 or more speakers) and driven from a head unit with front and rear outputs(Fig 3) OR a head with a MONO output (Fig 4).

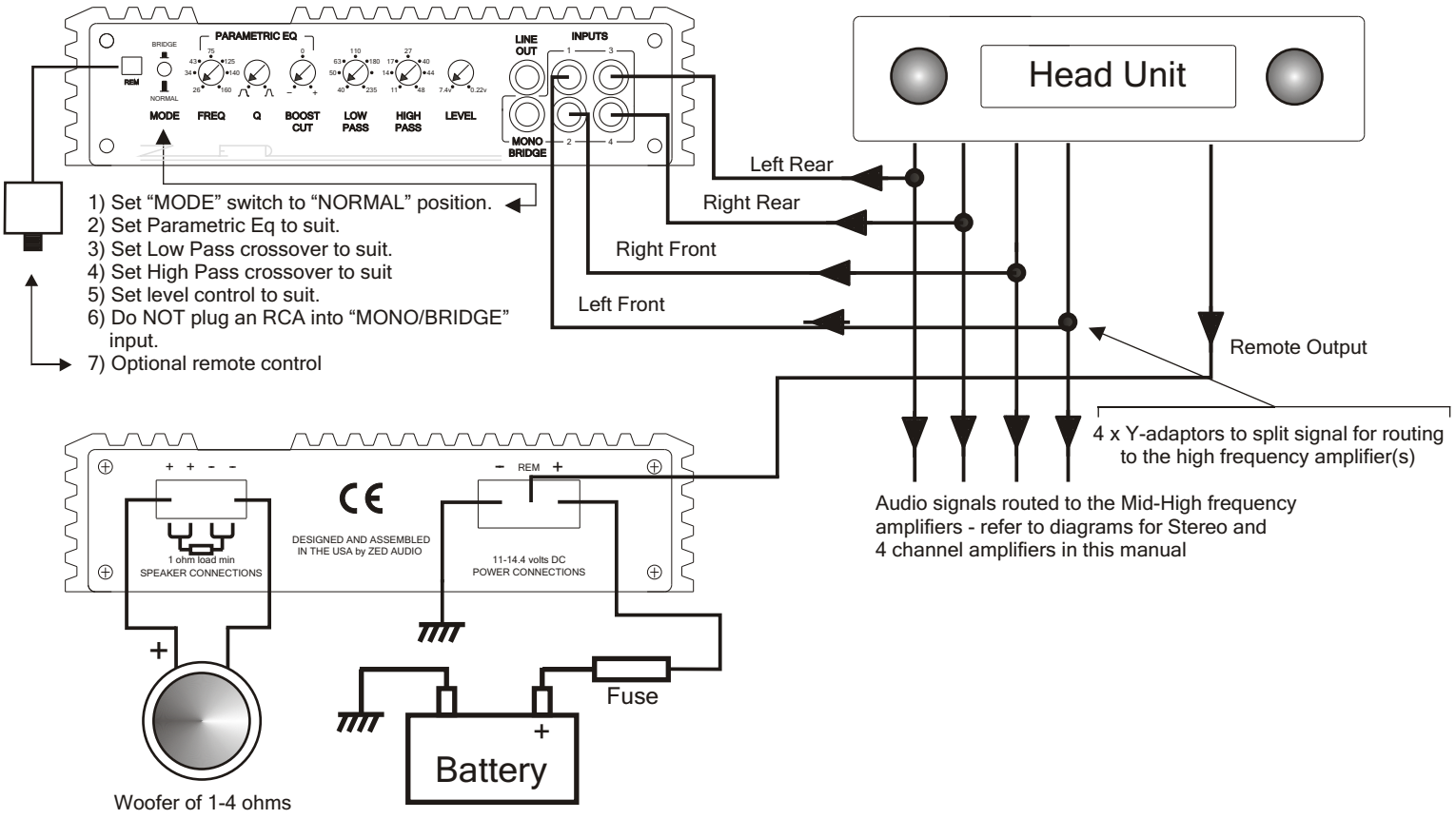
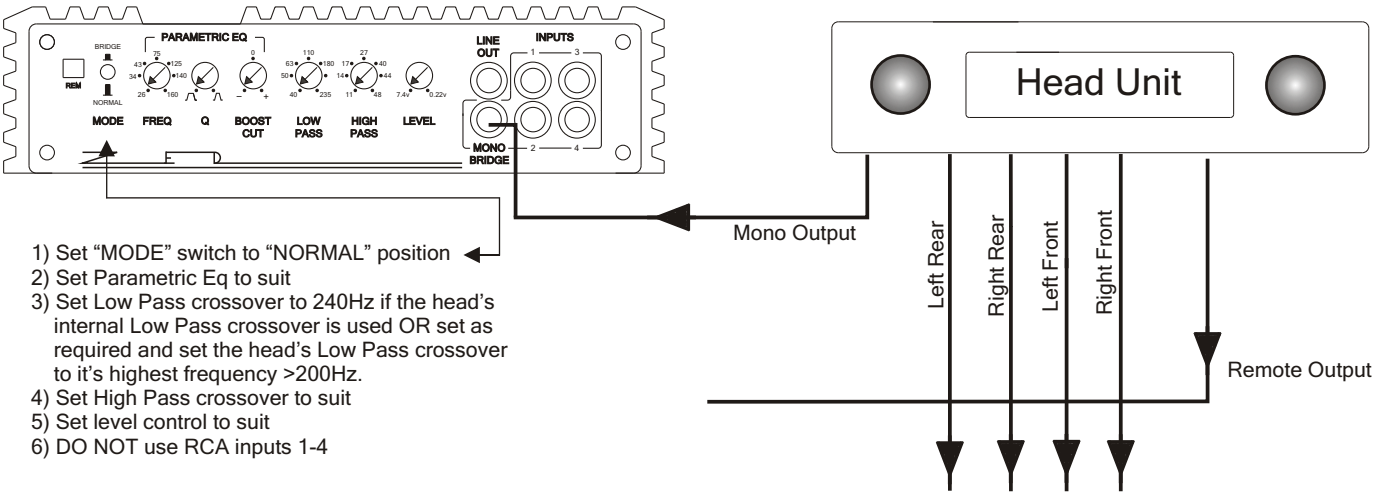


Fig 3



Rear panel not shown for clarity - same as Fig 3.

Fig 4

System 2: This shows the connections on how to bridge two Megaliths to form one super high power amplifier capable of 4Kw into 2 ohms. Fig 5

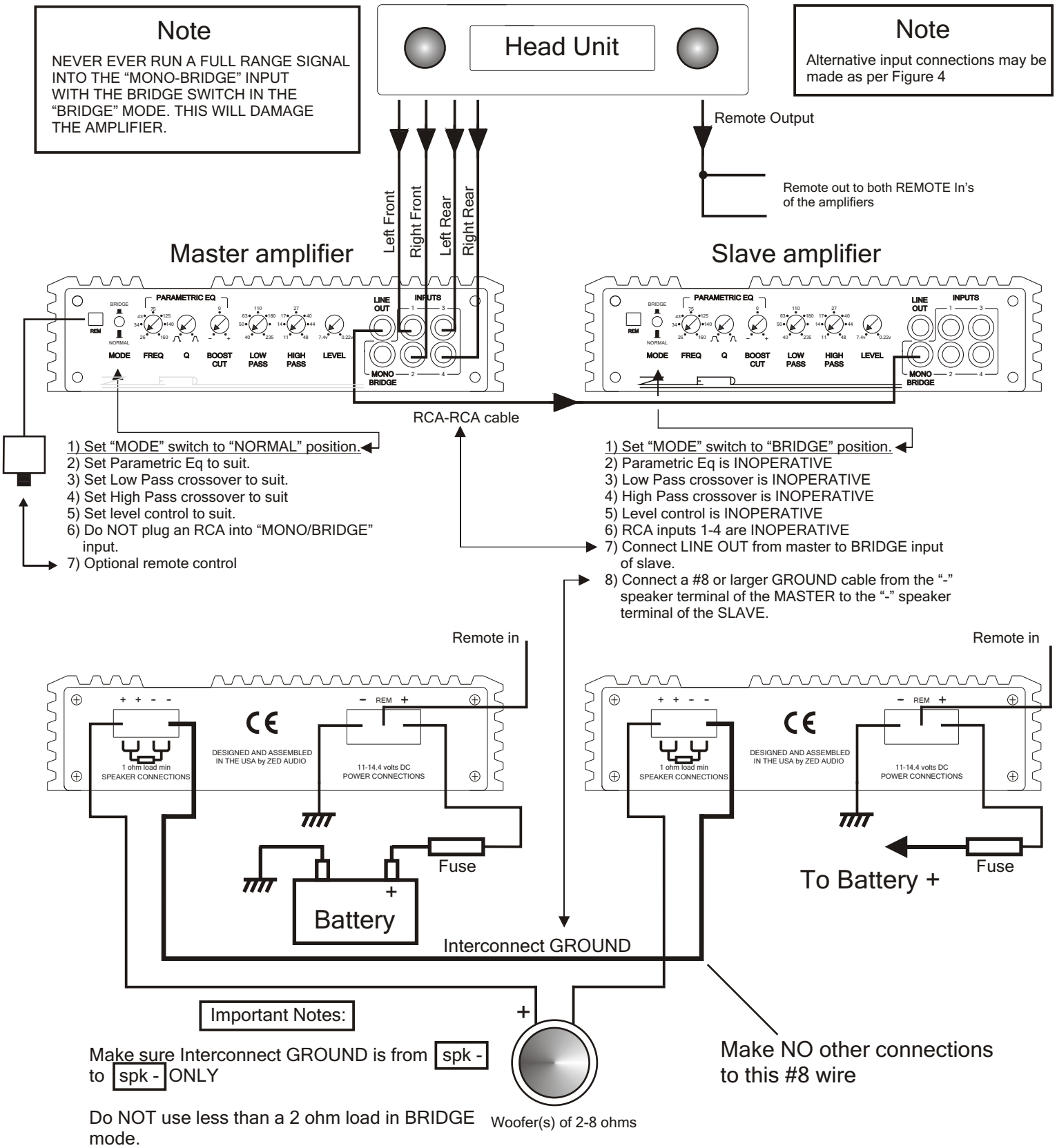


Fig 5

Gladius and The Deuce

What a combination these two are. Gladius,(which is Latin for sword) was the famous Roman short sword used by the Romans. Between 18 and 27 inches (455 to 685mm) in length and made from hardened steel attached to a wooden handle it was a deadly weapon in the hands of a soldier. The design of the short sword was copied from the Iberian Celts. Roman gladiators were also specialists in the use of this weapon. Our version of the Gladius is equally as deadly in the hands of a good installer. Somewhat shorter than the sword but of course a lot heavier. At 75w/ch it packs a punch which belies it's modest power rating.

The deck of cards originally came from China and entered the Western world in the 13th century. Many forms of cards exist but all have the same number in each suit and all have a deuce. Thirteen cards in each suit, the second being the 2 or deuce. The Deuce from Zed signifies our second amplifier in the line up which is a two channel amplifier of powerful proportions. Whilst not a monster power house, at 400w/ch @ 2 ohms it will certainly do justice to any system in which it is installed.

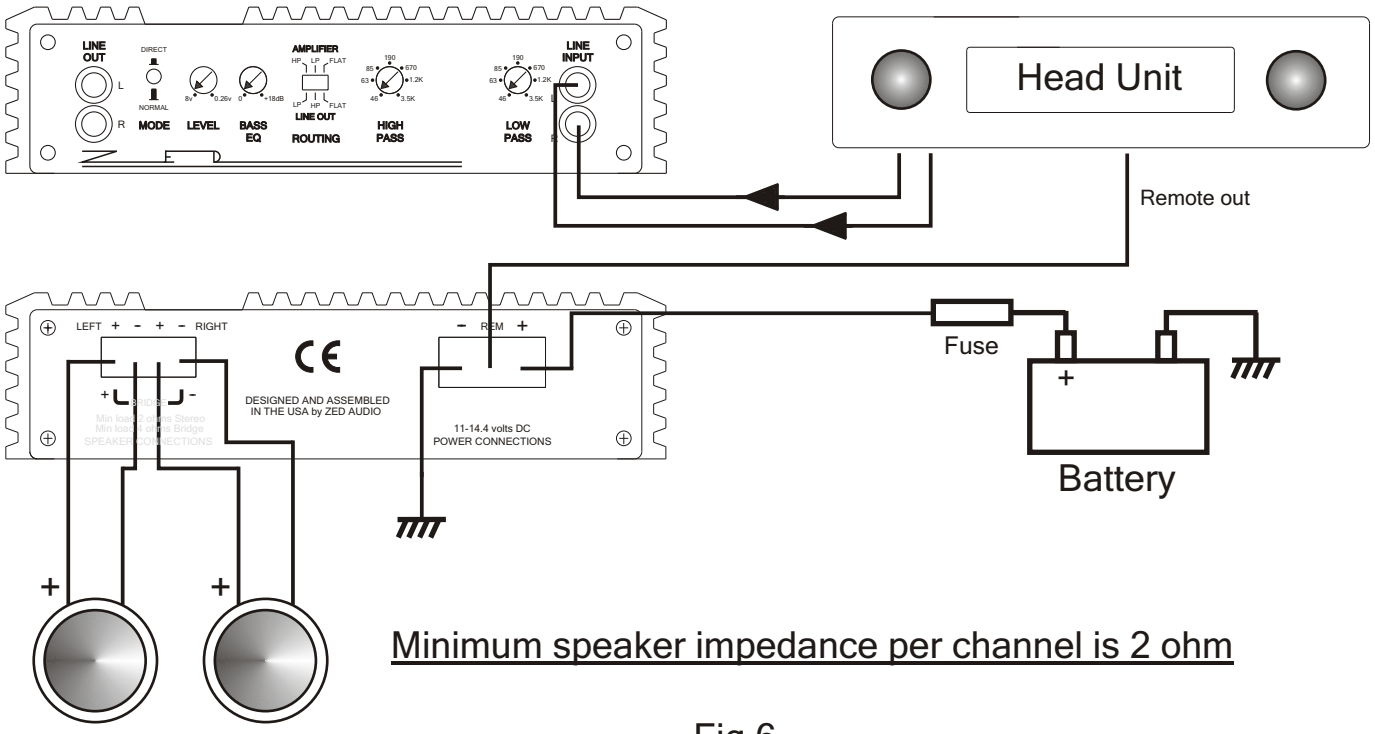
As in Megalith, these two amplifiers have all the same power supply technology but of course on a smaller scale. Gladius employs 6 high current Mosfets in the power supply together with 8,800 mfd of capacitance whilst The Deuce has 8 ultra high current Mosfets with 22,000 mfd. Each Mosfet in Gladius is limited to a maximum current of 9 amps and in The Deuce to 18 amps. The same extensive protection system as used in Megalith is used in these two babies. The secondary side of Gladius has fast recovery diodes delivering the rectified AC to a bank of capacitors totaling 8,800 mfd. The Deuce has 18,800 mfd worth of capacitance.

Both Gladius and The Deuce use the same topology in their amplifier circuits. Fully complementary from input to output, they use temperature compensated constant current sources to drive the differential input transistors. This ensures that with varying temperature the DC conditions within the amplifier are kept constant. The inputs are fully balanced, using our Differential Drive circuit, which allows us to float the pre-amplifier 100% from ground. Noise is thus a thing of the past. The circuits employ substantial amounts of local feedback which allows us to use very little global feedback. Low THD was not our goal, rather sound quality. The output stages use high frequency Bipolar output transistors. These have an Ft of 20MHz and are very linear with respect to gain. Gladius has four, 100 watt devices per channel whilst The Deuce has ten,100 watt devices per channel. Zed has always been a strong proponent of having output stages vastly over rated. The reliability of the amplifier is improved when output devices are run at fractions of their capability.

Pre-amplification is such an important part of any mobile amplifier. We incorporate a pair of high and low pass crossovers both with 24dB/octave slopes. The frequency range covered is sufficient to allow these crossovers to be used in tri-amplified systems. The amplifiers may of course be run full range. A variable bass boost control allows for up to 18dB of boost to be applied at 44Hz. The level control has a range from 0.26 to 8 volts. When the MODE switch is in the “direct” position, all pre-amplifier features are bypassed except the gain control and this is the purest signal path.. A selector switch allows for flat, low or high pass functions to both the amplifiers and the line output.

Typical Systems

System 1 - One amplifier to a speaker system



Minimum speaker impedance per channel is 2 ohm

Fig 6

Notes

1) Set the Routing switch to suit the speakers being used
2) Set the Low or High pass crossovers to suit the speakers being used
3) If the ROUTING switch is set to “flat” then the low and high pass crossovers do not function but the Bass control is operative.
4) Set the Bass boost control to suit.
5) Set the level control to the specific head unit.
6) Set the MODE switch to the desired position, “Direct” will bypass ALL controls except the Level control. This is the purest signal path.

System 2 - One amplifier bridged to mono

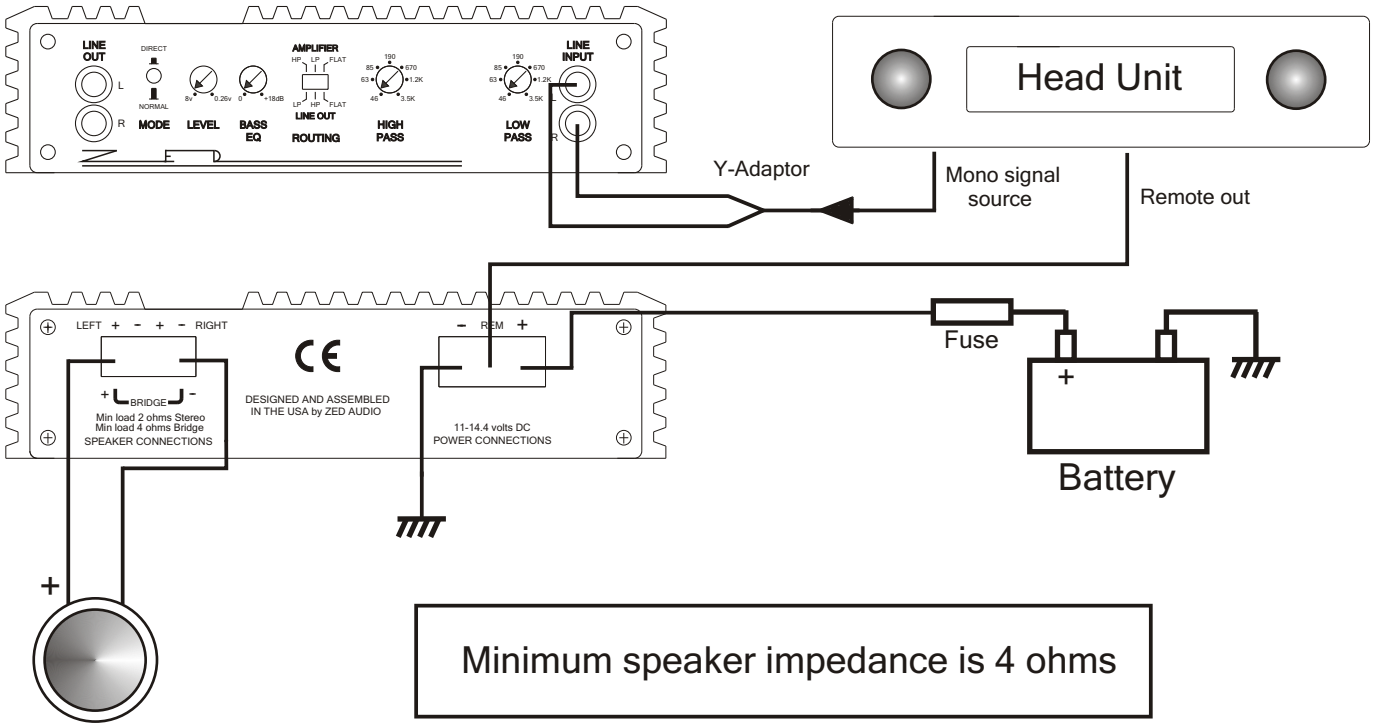
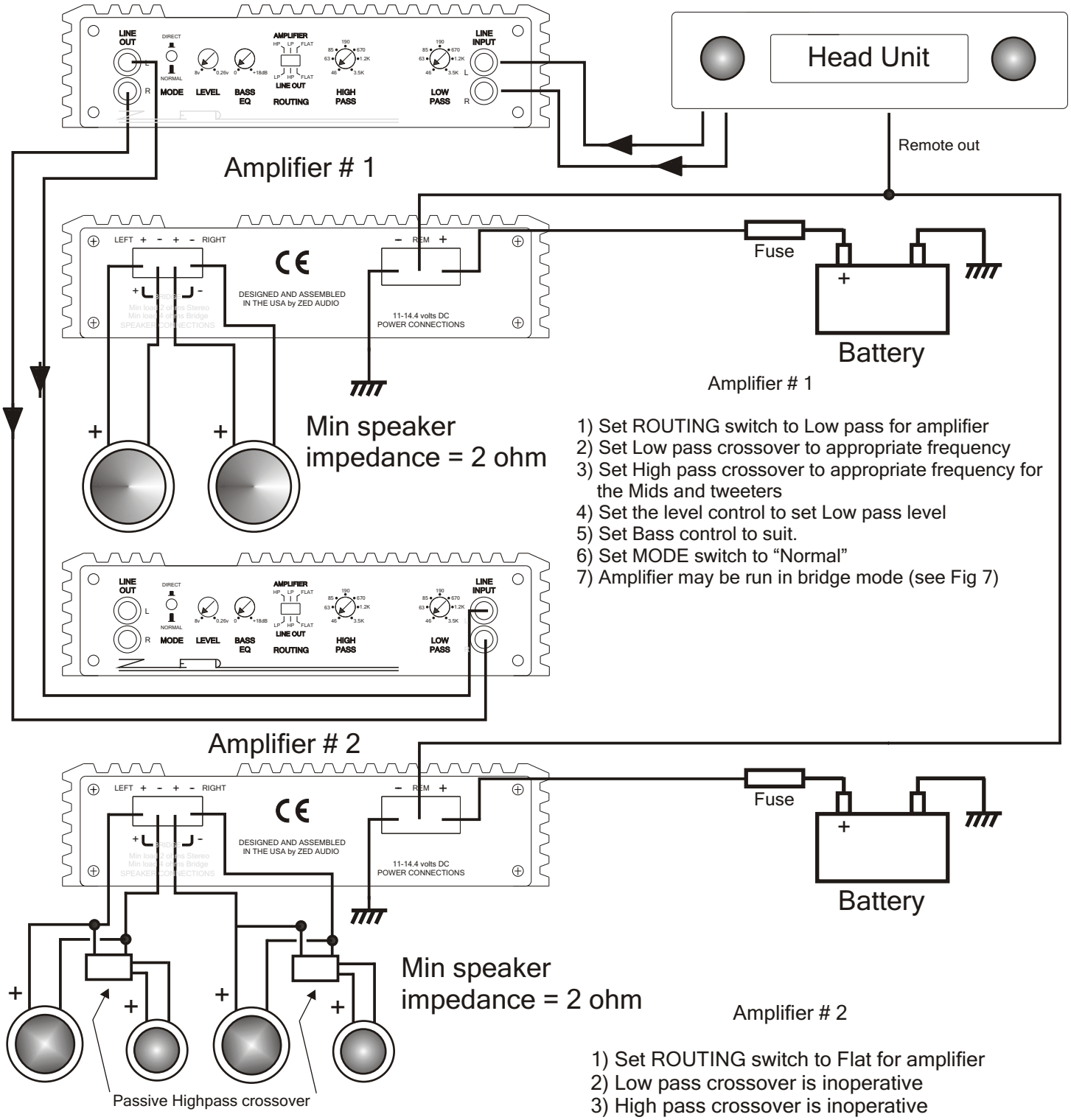


Fig 7

Notes

1) Set the Routing switch to suit the speaker being used
2) Set the Low or High pass crossovers to suit the speaker being used
3) If the ROUTING switch is set to “flat” then the low and high pass crossovers do not function but the Bass control is operative.
4) Set the Bass boost control to suit.
5) Set the level control to the specific head unit.
6) Set the MODE switch to the desired position, direct will bypass ALL controls except the Level control. This is the purest signal path.
7) The MONO SIGNAL SOURCE is not necessarily the head unit.

System 3 - Two amplifiers Bi-amplified



Amplifier # 1

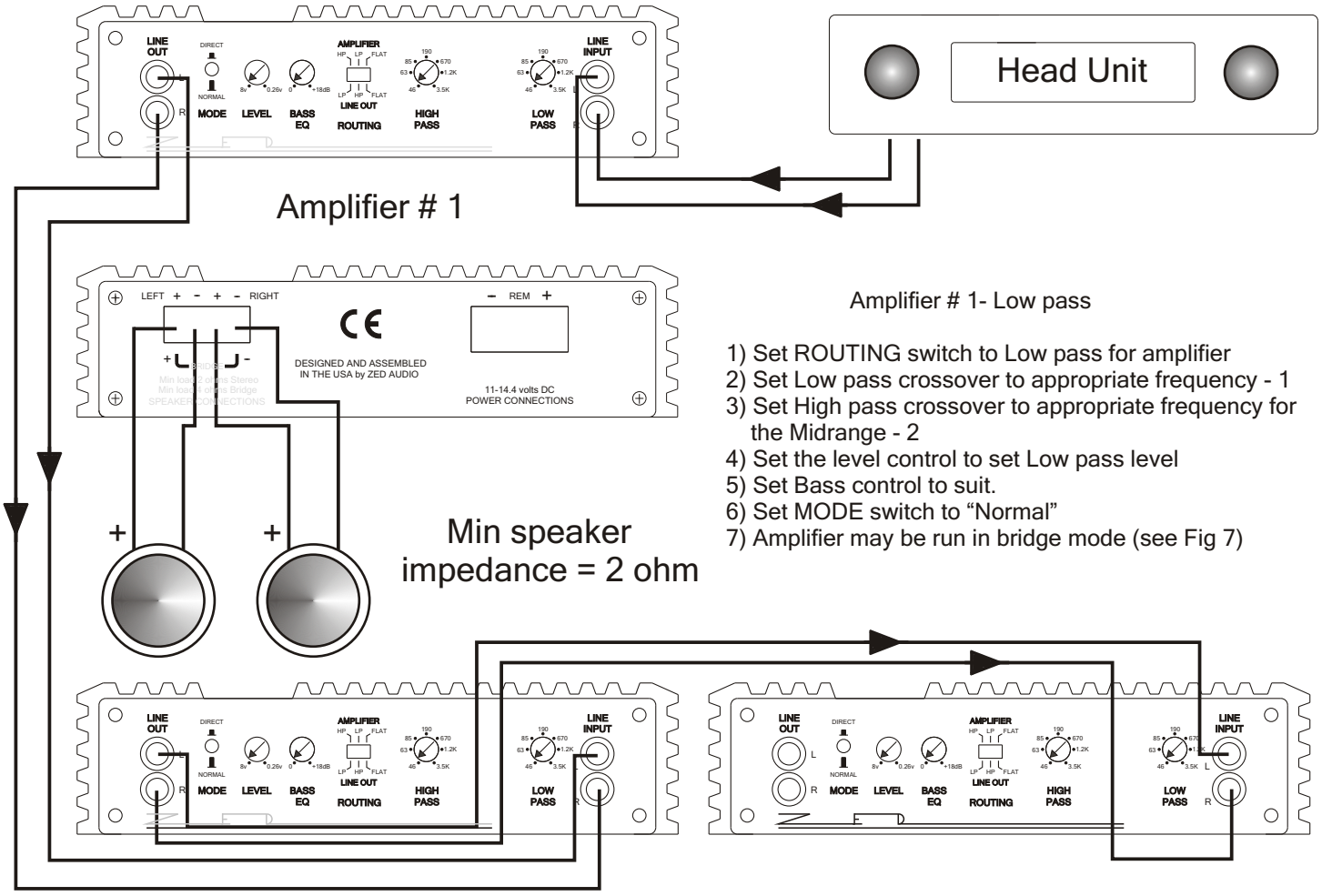
1) Set ROUTING switch to Low pass for amplifier
2) Set Low pass crossover to appropriate frequency
3) Set High pass crossover to appropriate frequency for the Mids and tweeters
4) Set the level control to set Low pass level
5) Set Bass control to suit.
6) Set MODE switch to “Normal”
7) Amplifier may be run in bridge mode (see Fig 7)

Amplifier # 2

1) Set ROUTING switch to Flat for amplifier
2) Low pass crossover is inoperative
3) High pass crossover is inoperative
4) Set the level control to set High pass level
5) Bass control is inoperative
6) Set MODE switch to “Normal” or “Direct”
7) If set to “Direct” this is the purest signal path and all other controls/switches are inoperative except for the LEVEL control. (recommended)

Fig 8

System 4 - Three amplifiers Tri-amplified (Batt/remote connections not shown for clarity)



Amplifier # 1- Low pass

1) Set ROUTING switch to Low pass for amplifier
2) Set Low pass crossover to appropriate frequency - 1
3) Set High pass crossover to appropriate frequency for the Midrange - 2
4) Set the level control to set Low pass level
5) Set Bass control to suit.
6) Set MODE switch to “Normal”
7) Amplifier may be run in bridge mode (see Fig 7)

Amplifier # 2 - Midrange

1) Set ROUTING switch to Low pass for amplifier
2) Set Low pass crossover to the appropriate frequency
   This sets the LP of the Midrange - 3
3) Set High pass crossover to the appropriate frequency
   This sets the HP of the tweeters - 4
4) Set the level control to set Bandpass/Midrange level
5) Bass control is inoperative
6) Set MODE switch to “Normal”

Amp 1’s crossovers set the split between LP and BP
Amp 2’s crossovers set the split between BP and HP

Amplifier # 3 - High pass

1) Set ROUTING switch to Flat for amplifier
2) Low pass crossover is inoperative
3) High pass crossover is inoperative
4) Set the level control to set High pass level
5) Bass control is inoperative
6) Set MODE switch to “Normal” or “Direct”
7) “Direct” is the purest signal path. If in “Direct” all controls/switches except LEVEL are inoperative

Fig 9

Draconia

Greece, the ancient land where the modern day Olympics was born and from where Alexander the great ruled a vast empire for 33 years. 300 years before Alexander was born, a guy named Draco, instituted a code of laws so harsh that they became known as Draconian laws. Zed Audio also has a law, it is called Draconia and this new amplifier sets a new standard in multi-channel amplification. Draconia is a 4 channel amplifier of modest power but let this not fool you. With pre-amplifier features that are somewhat unique this puppy can do some cool things.

Power supplies of course follow the same theme as all Zed amplifiers. Eight ultra high current Mosfets provide the switching power in the supply and there is 22,000mfd of input capacitance. The secondary side has 18,800mfd of capacitance and supplied by two ultra fast 20 amp recovery diodes. Once again the pre-amplifiers have their own fully isolated power supply which completely eliminates any chance of ground loops.

The power amplifiers are identical to those used in Gladius except of course there are four of them. Turn and off cycles are controlled via optically isolated control circuits.

The pre-amplifiers are what sets Draconia apart from other four channel amplifiers. Whilst we could have put in multitudes of switches and controls just for the sake of having lots of “toys” on the front panel, we opted for a system which allows maximum flexibility without being overly complex.

Channels 1 and 2 may be run in either FLAT, HIGH PASS or LOW PASS generated from channels 3 and 4. A little more about this LOW PASS function in a moment. The HP crossover is variable from 46Hz to 3.5KHz. In the “flat” position (On all four channels) all pre-amplifier functions are bypassed for the purest signal path

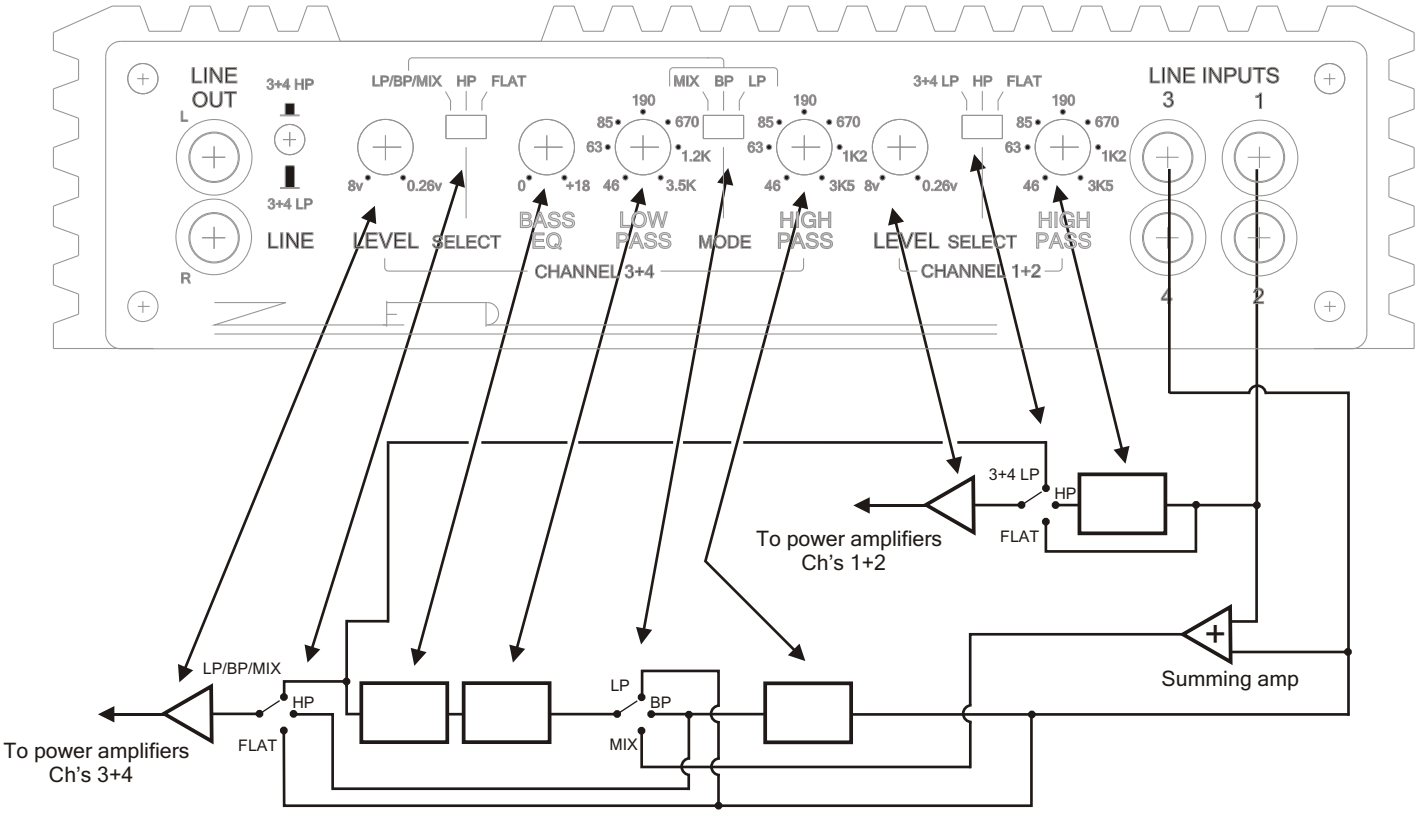
Channels 3 and 4 are more flexible. When the SELECTOR switch is in the FLAT position then all crossover/eq functions are bypassed. When in the HP position then the high pass crossover functions as usual. Now when moved to the LP position a whole new ball game begins. The Low pass crossover with it’s bass boost control are put into circuit, but along with this comes the MODE switch. What the MODE switch does is allow the user some further options. When in the LP position channels 3 and 4 function in low pass mode and this low pass signal is also routed to the SELECTOR switch on channels 1 and 2 (see above note). So Draconia can then be run with all channels in low pass and all running off inputs 3 and 4. The channels may be bridged or run as stereo pairs.

When set to the BP position, the LOW and HIGH PASS crossovers are in cascade and channels 3 and 4 are in bandpass mode to be used as part of a tri-amplified system.

The bandpass crossover frequencies are variable over a wide range and will accommodate all midrange drivers. The last position is MIX and in this mode all of the four inputs are mixed into a single mono signal and then run through the low pass crossover. Thus it is possible to have the front and rear outputs from a head run into Draconia and then all 4 channels are run as low pass. Thus Draconia can be run as a sub amplifier and again the channels can be run individually or in bridge mode. Sounds like quite a mouthful but it is actually simple.

The line output has it's own selector switch and this allows the line out to choose between channels 3 and 4 low pass or channels 3 and 4 high pass. More about this when typical systems are shown after this section.

Both sets of level controls allow the use of a wide range of input levels from 0.26v to 8v.



Draconia front panel and signal flow diagram (Only one channel is shown for clarity)

Fig 10

Typical Systems

System 1 - Draconia driving four speakers (with or without line out driving a sub amplifier)

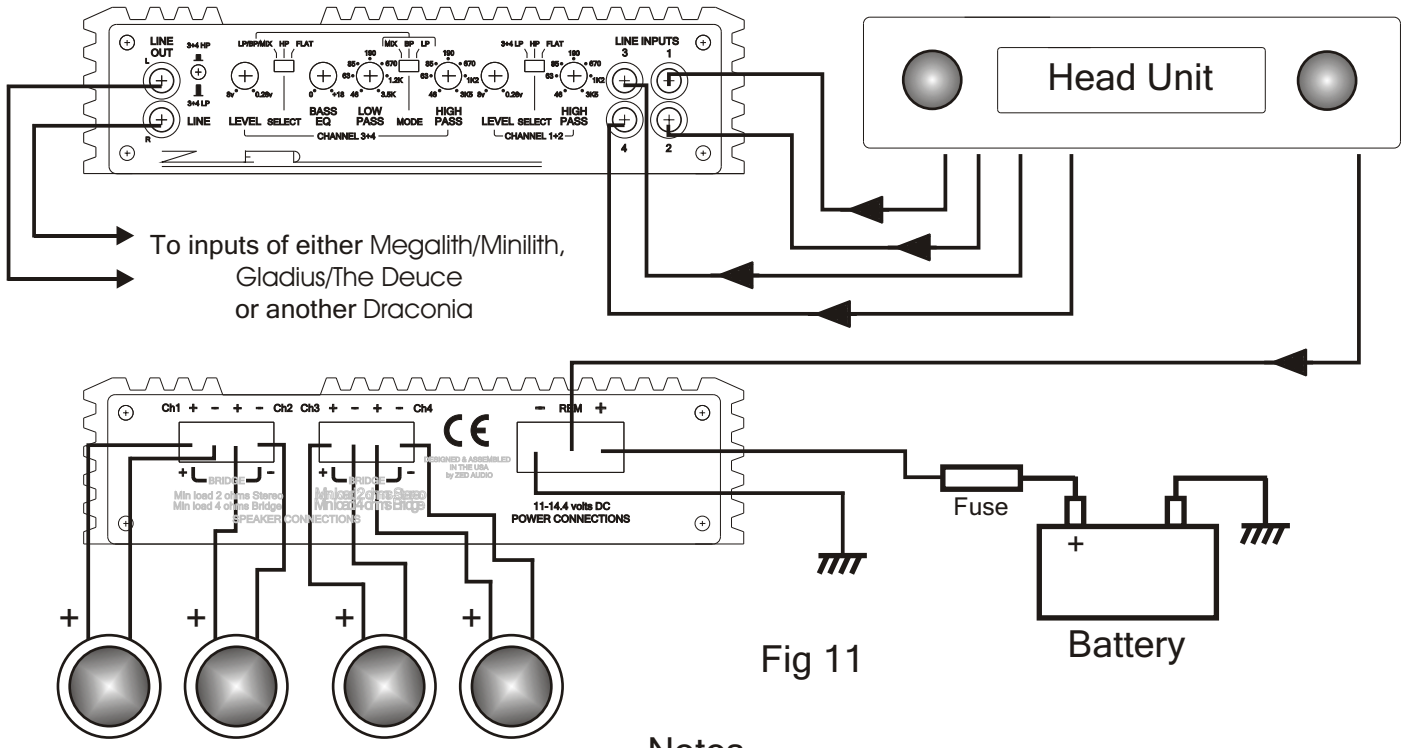


Fig 11

Notes

1) This system is for four full range satellite speakers or high pass if a sub amplifier is added.
2) If used in full range, set both SELECT switches to the FLAT positions. All crossovers and the Bass control are non operational. The LEVEL controls are then used to set amplifier sensitivity.
3) If the satellites are mid/tweeter combos and a sub amplifier is used then set the SELECT switches for Chs 1+2 and Chs 3+4 to the HP positions. Then set each of the HP crossovers to suit the speaker being used. The LINE SELECT switch must be set to 3+4 LP and the MODE switch to MIX or to LP. If set to MIX then the LINE OUT shall receive a mono low pass signal derived from each of the four line inputs and controlled by the LP crossover and bass control. If set to 3+4 LP then the LINE out shall receive a stereo signal derived from the line inputs of channels 3+4 only. Again the LP crossover and bass boost control shall affect the line output.
4) If the LP crossover on the sub amp is preferred over that of Draconia then simply turn the LP crossover to 3.5KHz and this removes the LP crossover of Draconia from the pass band.
5) The sub amp chosen can be either Megalith,Minilith,Gladius,The Deuce or Draconia. Which ever is chosen please refer to the relevant diagram for hook up.
6) The LP crossovers in all Zed amplifiers are identical in function, so in (4) above it makes no difference which LP crossover is used.

System 2 - Draconia driving two HP speakers on Chs1+2, subs on Chs3+4 and LINE OUT to High Pass speakers

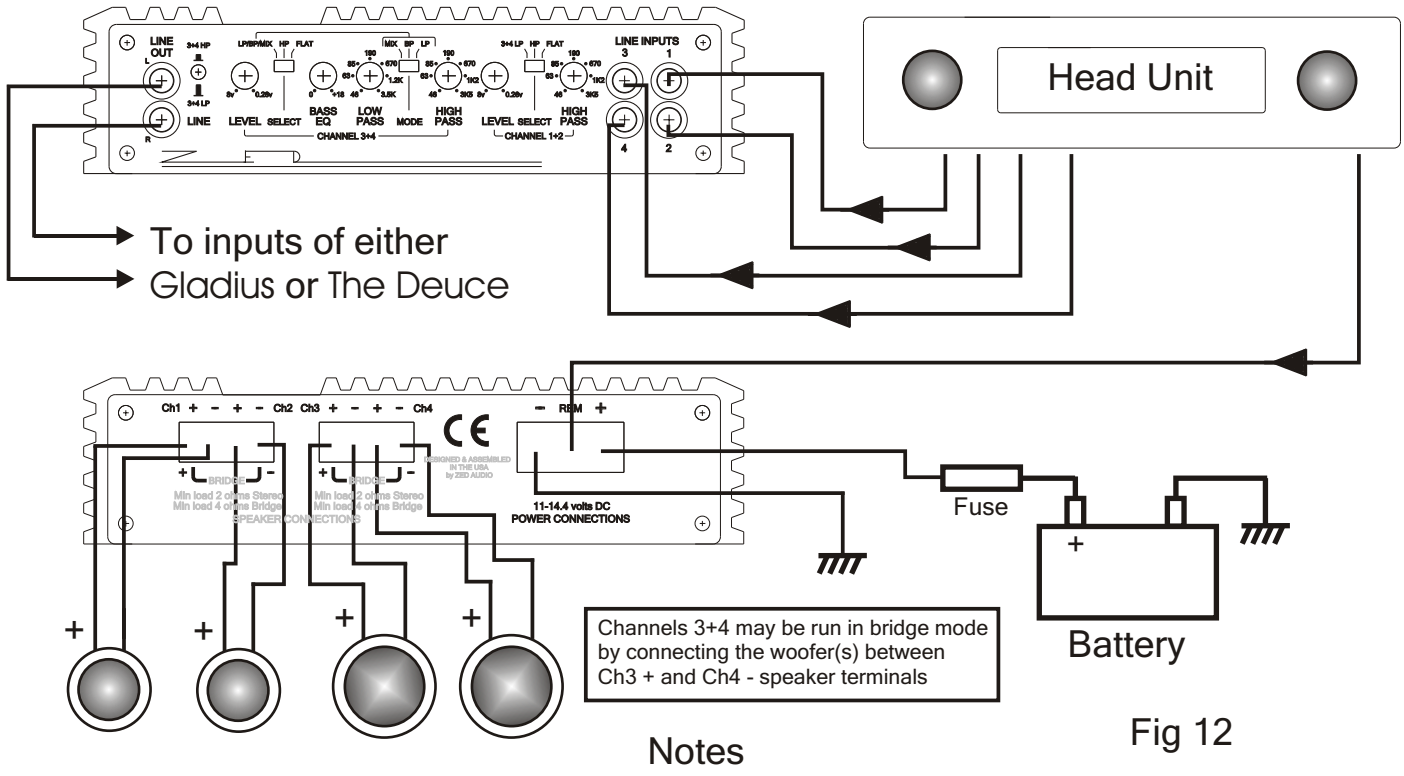


Fig 12

Notes

1) Set the HP and level controls for ch's 1+2 to suit the Mid/Hi front speakers
2) Set the SELECTOR switch for Ch's 1+2 to HP
3) Set the LP, Bass and level controls for Ch's 3+4 to suit the woofers.
4) Set the SELECTOR switch for Ch's 3+4 to LP/BP/MIX and the MODE switch to MIX.
5) Set the LINE SELECT switch to 3+4 HP. The high pass crossover for Ch's 3+4 now controls the high pass function on the line outputs. The line outputs are fed into either a Gladius or The Deuce which is run as a two channel amplifier driving the rear satellite speakers. Gladius/The Deuce ROUTING switch is set to FLAT. Because the crossovers in all our amplifiers are the same type, using the HP on Draconia shall perform the same function as those on the two channel amplifiers.
6) Since the two channel amplifier is running in the flat mode it is a good idea to set the MODE switch to the DIRECT position and thus all pre-amplifier functions are bypassed except for the level control. This allows for the purest signal path.
7)Please refer to the diagrams under Gladius/The Deuce on how to connect these amplifiers.

System 3 - Draconia driving two HP speakers on Chs 1+2 and Midrange on Chs 3+4.

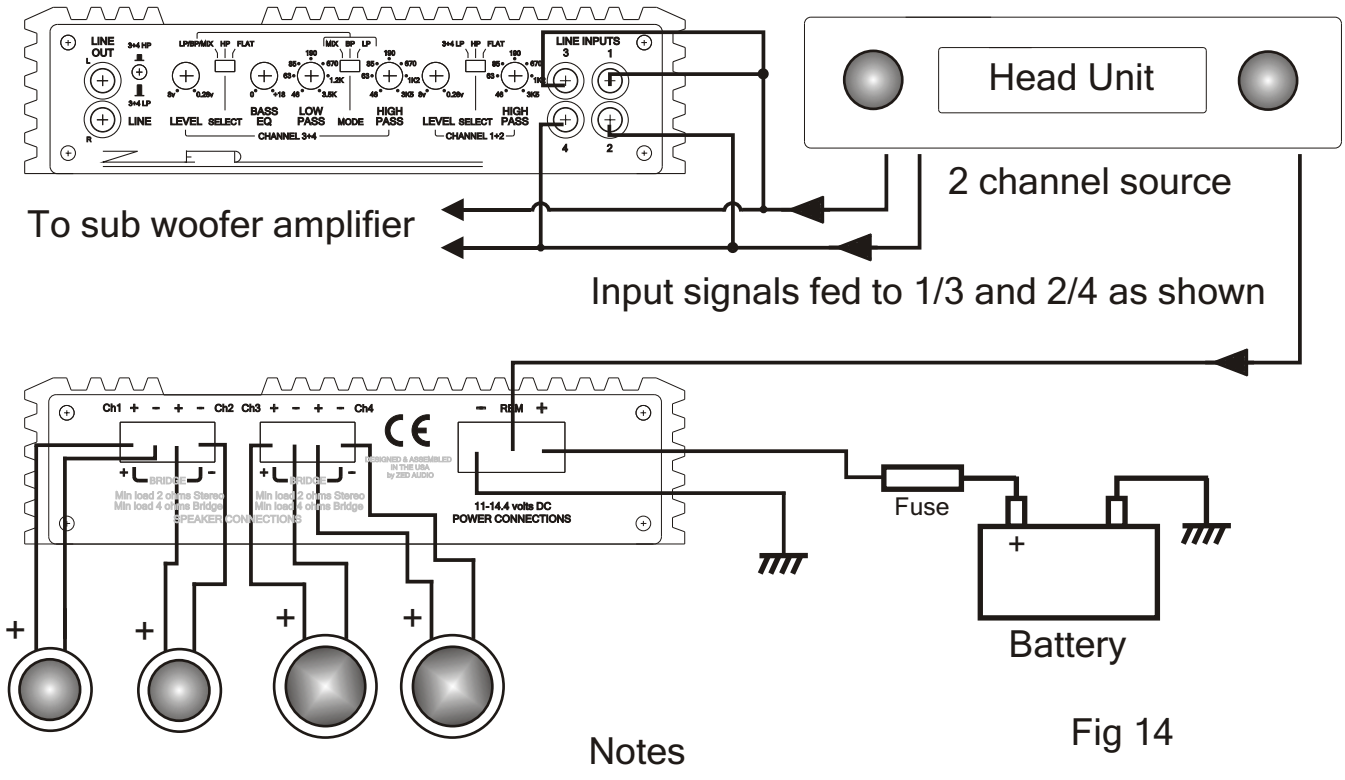
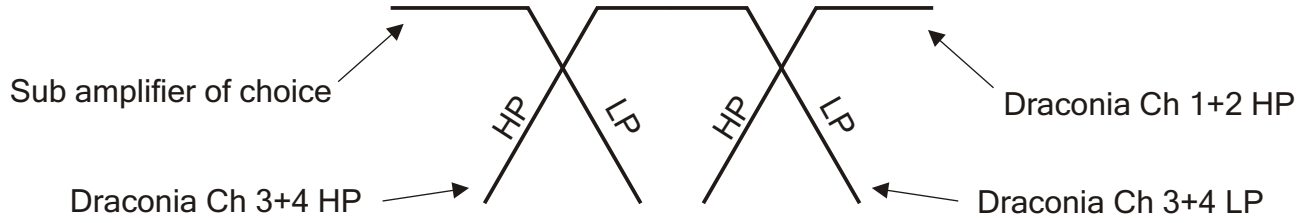


Fig 14

Notes

1) Set the HP and level controls for ch's 1+2 to suit the high frequency speakers
2) Set the SELECTOR switch for Ch's 1+2 to HP
3) Set the LP, HP and level controls for Ch's 3+4 to suit the midrange speakers..
4) Set the SELECTOR switch for Ch's 3+4 to LP/BP/MIX and the MODE switch to BP.
5) The LP crossover sets the high end of the bandpass/midrange passband and the HP crossover sets the low end of the bandpass/midrange passband.
6) The low frequency amplifier is driven from the same signal source via Y-adaptors.
7) Any amplifier of this series may be used for the low frequencies. To use Draconia, see the next system.



Note that when Draconia is configured this way, it is only part of the tri-amplified system. It only performs the high pass and bandpass/midrange functions in a TWO CHANNEL FORMAT.

System 4 - Draconia configured as a sub woofer amplifier

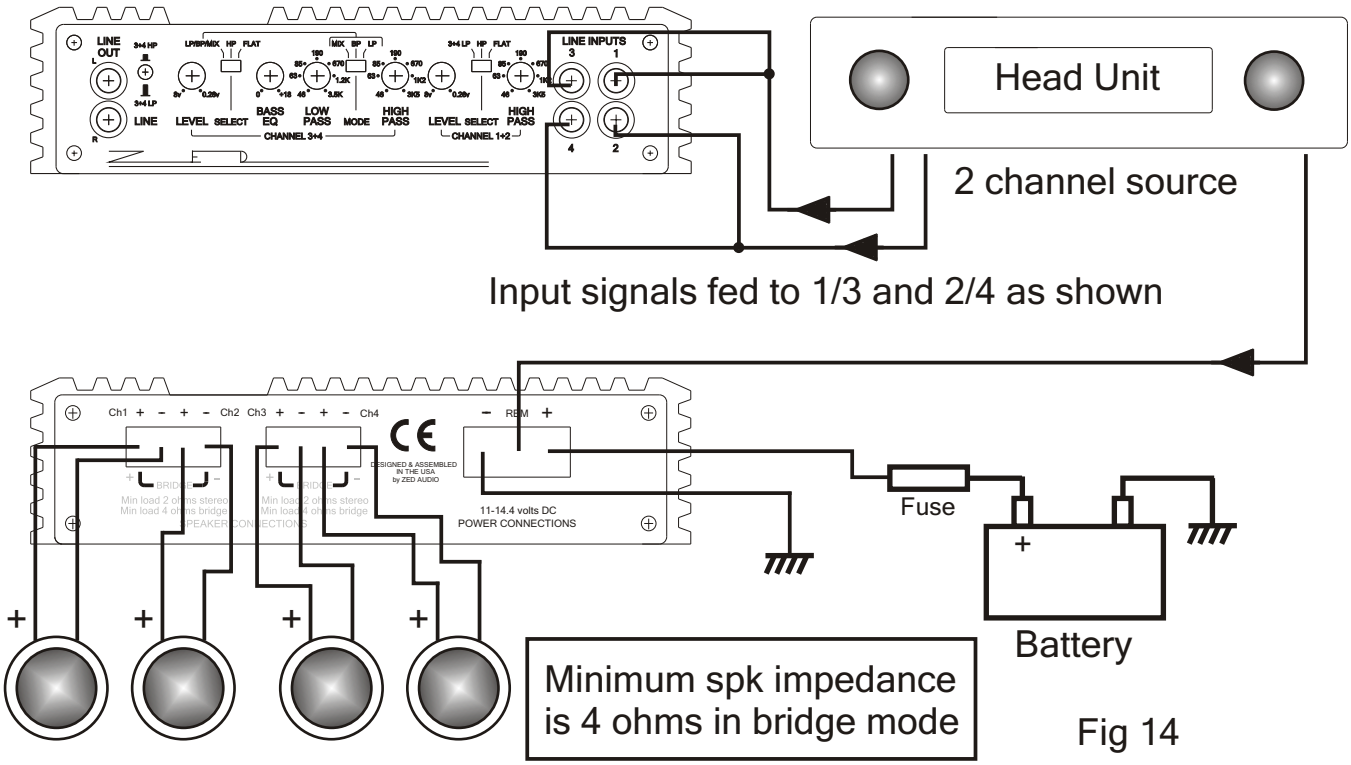


Fig 14

Notes

1) Set the level control on Ch's 1+2 to suit the woofers connected to those channels.
2) Set the SELECTOR switch for Ch's 1+2 to 3+4 LP position.
3) Set the level control on Chs 3+4 to suit the woofers connected to those channels.
4) Set the SELECTOR switch for Ch's 3+4 to the LP/BP/MIX position.
5) Set the MODE switch to the MIX position.
6) Set the LOW PASS crossover and BASS control to suit the woofers used.
7) Setting the controls as above allows the following to occur: All 4 inputs are mixed.
8) This mixed mono signal is fed to the low pass/bass circuits of Ch's 3+4.
9) This low pass signal is fed to the level amplifiers of all four channels.
10) All four channels thus have the same signal content - a mono low pass signal.
11) A woofer may be run off each channel as shown in the diagram above - Min 2 ohms
12) Each pair of channels may be bridged by simply connecting the woofers from the + speaker of the odd numbered channels to the - speaker of the even numbered channels. Bridging on all Zed's two and four channel amplifiers is accomplished in the same manner
14) The signal drive from the head unit must use Y-adaptors to route the signals to the High pass amplifiers

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 one (1) year from date of purchase from Zed Audio Corporation. This warranty is valid in the country in which it was purchased and is non-transferable.

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 form 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.

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.

Zed Audio Corporation,
759 Cochran Street
Suites A/B
Simi Valley
Ca 93065 USA

Email Zedaudio@aol.com
Website www.zedaudio.com
Fax (805) 526-8572
Tel (805) 526-5315

30 day return policy

Zed Audio Corporation offers an unconditional money back guarantee for any of the products described in this manual. This 30 day money back guarantee has the following stipulations attached.

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, the replacement thereof shall be deducted from the refund amount including the labour to replace these parts..
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.