Ventus Discrete Buffered Amplifier

Circuit Version 2.0.0 User Manual

Revision 1.0

Twisted Pear Audio

Overview

Ventus is a discrete folded cascode type buffered amplifier that is suitable for many roles. It was first conceived as a low distortion high power headphone amplifier and it is very well suited to that role; it will easily drive any headphone we have ever encountered.

It quickly became apparent to us that it was also very useful for other purposes: it can be setup as an inverting amplifier, a non-inverting amplifier, or a balanced to single ended converter all while being able to deliver up to 250mA of driving current.

Because it can easily accept balanced or single-ended input, it is a natural choice for use with any of our balanced output (voltage or current) DACs. It is unity gain stable and gain can easily be adjusted to your needs.

Power Requirements

The Ventus kit is designed to operate with a $\pm 15V_{DC}$ power supply. The LCBPS and Placid BP are both excellent choices here. If you use the Placid BP please consider the maximum load you will place on the Ventus while adjusting the shunt current.

Operation

The simplified schematic in **Figure1** should be referenced when setting up the Ventus:

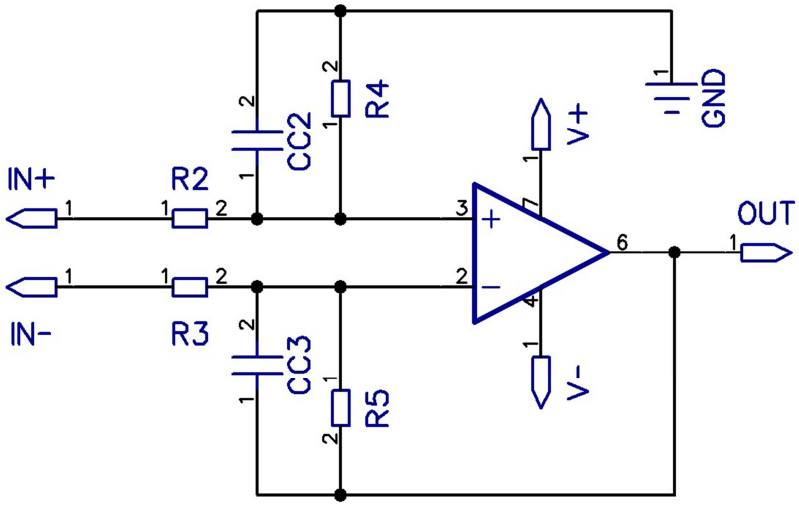

Figure 1

Configuration

Advanced users will be able to look at Figure 1 and set the Ventus up as desired. All that is required is to adjust the components to your needs. If you need to, please take some time and research operational amplifiers.

All of the configurations have one thing in common: once they are done you should use the “offset” potentiometer to adjust out any DC offset voltage at the output prior to connecting the amplifier output to any other gear.

The offset should be adjusted with either the inputs of the amplifier connected to your source (preferred) or

with both of the inputs connected to GND. If your source has a DC component, please use a capacitor at the input as needed.

Balanced to Singled Ended Conversion

This configuration is used for balanced input signals. The Ventus can handle common mode DC at the input is fine, and has tested up to $8V_{DC}$.

DC-coupling Legato's outputs requires trimming out any differential DC offset; if you cannot then you will need to AC couple.

R2 and R3 will set the input impedance. For use with Legato or IVY, a minimum value of 1K is recommended for these resistors, and a maximum value of 10K. R2 and R3 should have the same value. Use resistors matched to 1% or better.

R4 and R5 provide feedback, and along with R2 and R3, control the gain of the amplifier. R4 and R5 should have the same value. Suggested values range from 1K to 10K, depending on the gain desired. Use resistors matched to 1% or better.

$$G = (R4 / R2) = (R5 / R3)$$

Connect the balanced input as usual. The output will be (G x Input) and the same phase as the input (non-inverted).

CC2 and CC3 are generally not required. Use them only if you find you need them or wish to add some low pass filtering. The corner frequency will depend on the resistor values.

Inverting amplifier

Inverting configuration is used for single-ended input signals and has a relatively low input impedance, which is dictated by the value of R4.

$$G = R5 / R3$$

Suggested values are between 1K and 10K for both R5 and R3.

In this configuration, R2 and CC2 are omitted and R4 is a jumper (simply a wire shunt).

CC3 is optional and only used if you want to filter the signal.

Connect the SE input to -IN and GND. The output will be (G x Input) and opposite phase of the input (inverted).

Using a very low value for R5 and a jumper for R3 allows you to use the Ventus as a single-ended I/V converter.

Non-Inverting amplifier

The non-inverting configuration is used for single-ended input signals and has a relatively high input impedance, which is dictated by the value of R4.

$$G = 1 + (R5 / R3)$$

Suggested values are between 1K and 10K for both R5 and R3.

R2 can either be a jumper or a low value (something like 100R).

CC2 is optional, but 22pf – 220pF if recommended if you use R2, as this will filter out unwanted RF noise.

CC3 is also optional and only used if you wish to further filter the signal.

R4 in series with R2 sets the input impedance. Suggested values are between 47K and 100K.

Connect the SE input to +IN and GND. The output will be (G x Input) and the same phase as the input. ,

The IN- terminal should be connected to GND.

If you wish to use unity gain then omit R3 (or use a very high value such as 100K which will get you slightly more than unity gain).