Counterpoint I/V Converter

User Manual

Revision 1.0

For PCB Revision 2.0

Twisted Pear Audio

by Sylvain Bergeron

Overview

The Counterpoint is a balanced discrete I/V converter designed for low noise and excellent sound. It is important to read the manual prior to trying to use this I/V converter. Make sure you understand how to connect it before you do anything else. You could easily destroy something if you do not know what you are doing. So be careful, and read the schematic and this manual. This circuit has a very good sound before can be tricky to make it work correctly. If you have oscillation or noise problem, please read the 4.7nF capacitors section.

Note: This is not an official Twisted Pear Audio manual, they never published one. I had problem using my own Counterpoint and had a hard time finding all the secret of this great circuit. All instructions were taken from Russ White forum replies and edited to fit this manual. So there are not my own really.

Default Configuration

The Counterpoint (CP here after) was designed to be used with the Buffalo DAC. It receives the +/- DAC current outputs and the AVCC bias voltage (more on that later), and produces a balanced or single ended output.

Balanced/Single Ended outputs: To use the balanced output simply connect the CP Out +/- & Gnd outputs to the output XLR connector. To use the single ended connects only the Out+ & Gnd. Both outputs can be used at the same time.

Gain: The I/V gain of the Counterpoint is set be the RG1,RG2 resistors. Using the Buffalo II, with a RG resistor of 220R will give you 1VRMS at the single ended output with a 0dB FS signal. The usual CD output is rather 2VRMS. To get it close to 2VRMS SE just change RG1 and RG2 to between 357 and 392R.

AVCC: The CP accepts the Buffalo AVCC bias voltage. It can be use without it, in this case simply connect the CP AVCC pin to gnd, but it will sound better if you supply the AVCC voltage (3.5V) to the CP. In this case the DAC will be able to source and sink its output current instead of only sending it to gnd.

Supplies: The CP needs about +/-15V, 105-125ma per side. It will works without problem with a voltage from 12-15V. You'll need two LCBPS for better results you may need to jumper R1-4 on the LCBPS because of the high current demand from the CP. Or even better use one Placid HD shunt regulator with better noise specs.

Each counterpoint draws about ~120ma from each rail, depending on your rail voltages. So plan your transformer accordingly.

RG1,RG2 resistors to GND pads: RG1 and RG2 should be connected as follows. One leg goes in the pad which is connected to output. The other leg is connected to GND. Originally Russ intended to do the symmetrical feedback (thus the dual pads for that leg) but he found that the compensation required made it not sound great to him. So this is the preferred RG resistors connection, see below:

Figure 1 – RG resistors gnd pads & 4.7nF capacitors

4.7nF capacitors at each input: A not one the schematic says "Add 4.7nF at each input to GND". But there are already on the schematic CF1 & CF2 and on the PCB silkscreen. The note just indicates that you need to add EXTRA caps directly at the PCB Inputs pins and GND as shown on Figure 1. Without these caps the CP may oscillate and will produce a "white noise" at the output.

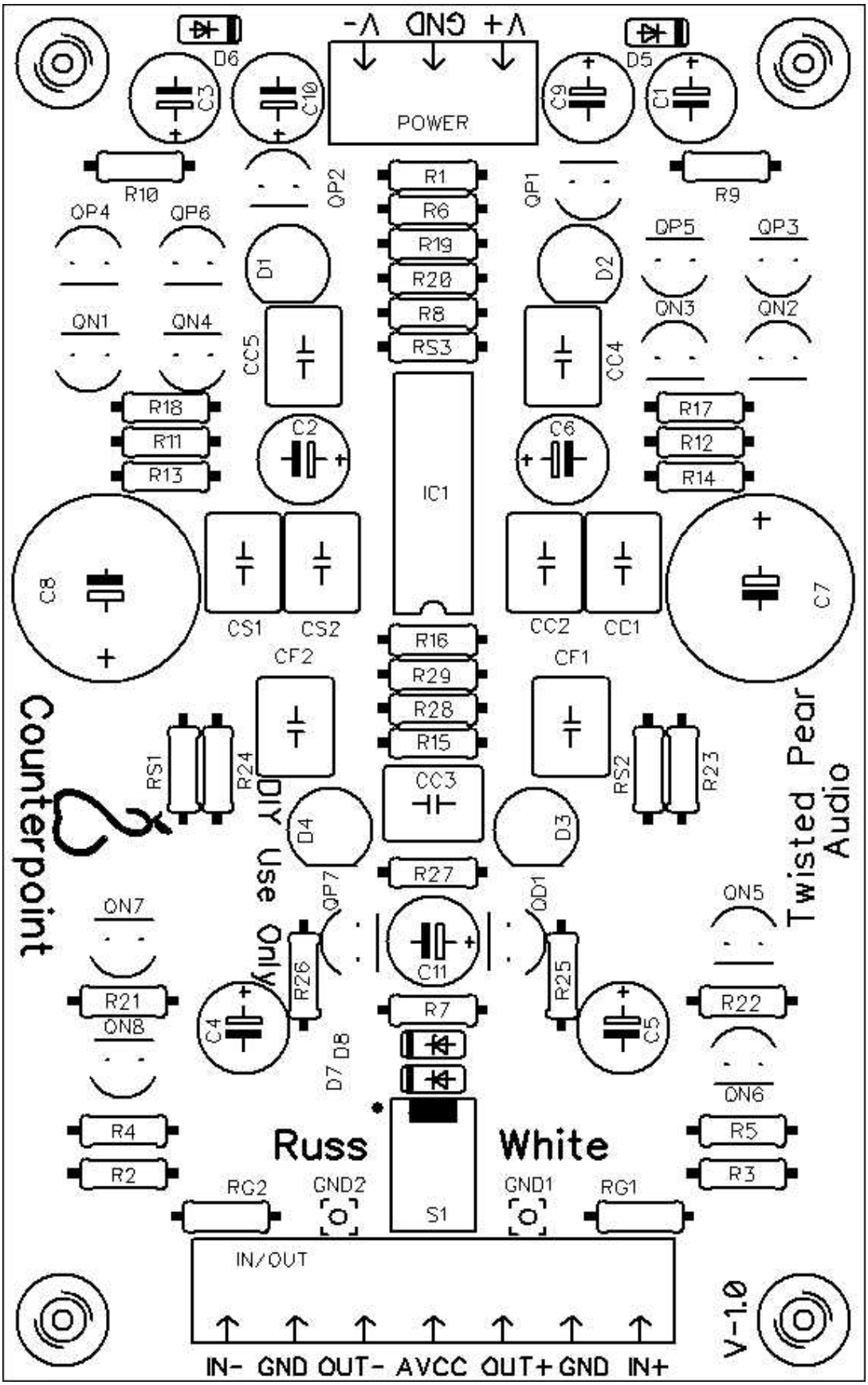
Speaking of CF1, CF2 they are marked 10pF, but you may use up to 1nF, again depending if you have a parasitic oscillation.

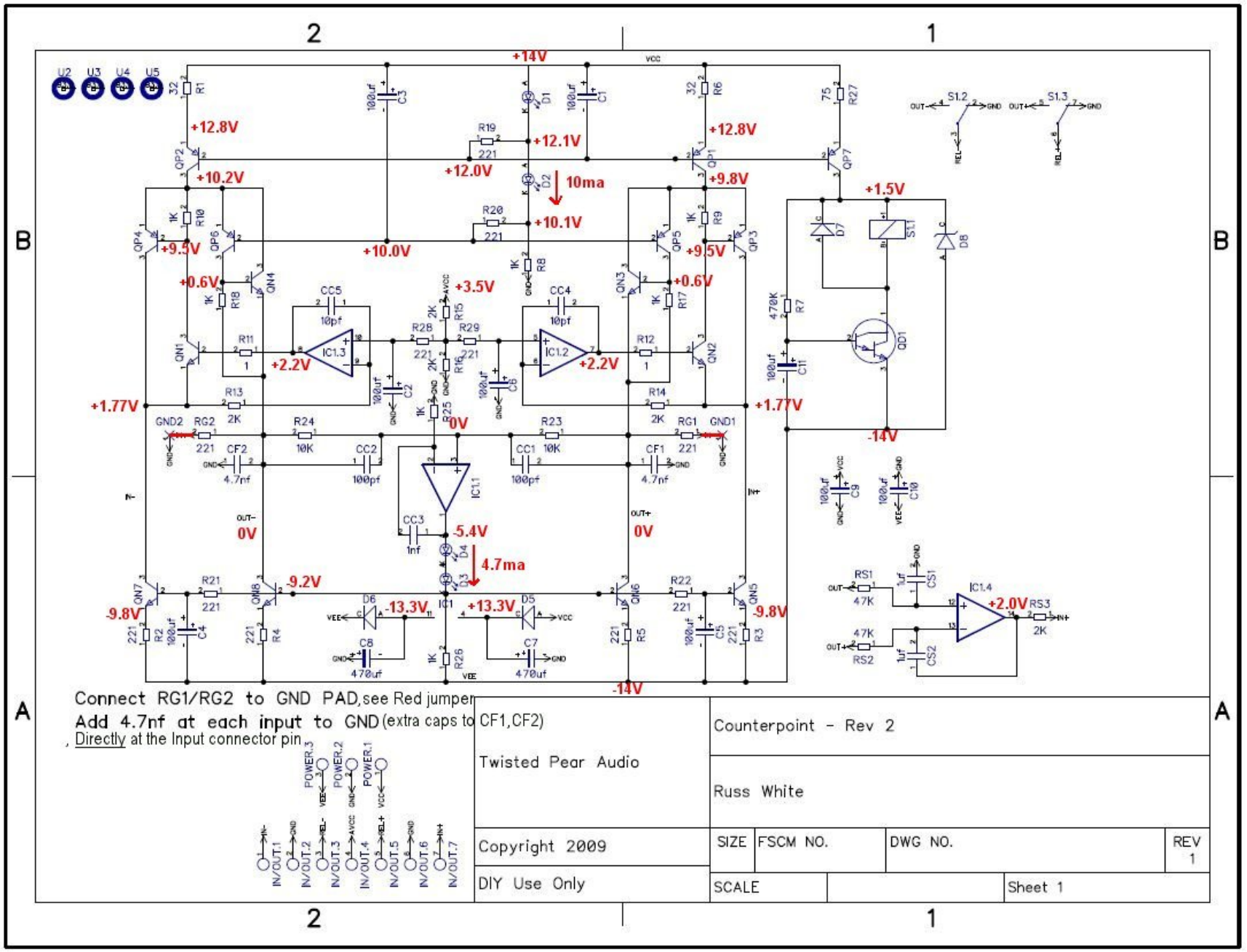
Actual Measurements

To help you verifying your own Counterpoint, here are a few actual measurements that I took on my own boards. Your own installation may be slightly different.

- Supplies: +/-15V, current 120ma per rail, AVCC connected
- Output 1VRMS, single ended using a 0dB FS test signal
- THD: 0.07% at 1Khz, 1V (max Volumite volume)
- DC offset: 1-2 mv dc, usallu less than 1mv
- Noise: <0.1mv ac (using Placid shunt regs)

See the schematic page; I added typical volt readings on it to help you troubleshoot your CP. The test condition for these readings is supply +/-14V, DAC currents inputs and AVCC connected.


V- GND V+
POWER
D6
D5
C3
C10
C9
C1
R10
R9
QP2
QP1
QP4
QP6
QP5
QP3
D1
D2
QN1
QN4
QN3
QN2
CC5
CC4
R18
R11
R13
R17
R12
R14
C2
C6
IC1
C8
C7
CS1
CS2
CC2
CC1
R16
R29
R28
R15
CF2
CF1
RS1
R24
RS2
R23
CC3
D4
D3
R27
QP7
QD1
QN7
QN5
R21
R26
C11
R25
R22
C4
C5
QN8
QN6
D7
D8
R4
R2
R5
R3
Russ
White
RG2
GND2
S1
GND1
RG1
IN/OUT
IN- GND OUT- AVCC OUT+ GND IN+
V-1.0
Counterpoint
DIY use only
Twisted Pear Audio


+14V
VCC
+12.8V
+12.1V
+12.0V
10ma
+10.2V
+9.8V
+10.1V
+10.0V
+9.5V
+9.5V
+0.6V
+0.6V
+3.5V
+2.2V
+2.2V
+1.77V
+1.77V
0V
-5.4V
0V
4.7ma
-9.2V
-9.8V
-9.8V
-13.3V
+13.3V
-14V
+1.5V
-14V
+2.0V
Connect RG1/RG2 to GND PAD,see Red jumper
Add 4.7nf at each input to GND (extra caps to CF1,CF2)
, Directly at the Input connector pin
Twisted Pear Audio
Counterpoint - Rev 2
Russ White
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SIZE
FSCM NO.
DWG NO.
REV 1
SCALE
Sheet 1