

# paX Amplifier Construction Guide

By Jan Didden

The paX amplifier is not particularly difficult to build. You can, of course, build it up completely, connect the power supply, the source and your speakers, and turn it on. But if you have made a small error somewhere during construction, the consequences could be expensive. Even if they are not, it is much more difficult to find faults in completed amplifiers than in a small part of it. So, to avoid unnecessary problems, it is best to proceed in an orderly manner, and to test each part when completed.

As you saw in Part 1, there are two pairs of output devices. Each pair has its own bias current source and bias setting trimmer. The best way is to build up a single pair, then complete and check the amplifier, and put in the second pair last.

Connections to the power supply, inputs and outputs as well as between the amp and the output/protection module are given in **Fig. A**. I will recommend a way to build and test the amp step by step so that success becomes almost inevitable. I assume that at the very least you have a multimeter to perform the simple tests described at each step. If you don't have a multimeter, now

may be a good time to get one!

## POWER AMPLIFIER

**Power supply.** Build up the power supply using the following components: mains switch, filter, varistor and transformer; rectifiers; reservoir capacitors.

When the power supply is completed, insert a 6.3A slow-blow fuse in the fuse holder. Connect a multimeter **between the pos and neg supply voltage** (not to ground) and set the scale to 100V. Turn on the power switch with an eye to the multimeter. You should see a DC voltage between 80 and 90V. If the output voltage of the power supply is much lower or higher, turn off the power switch again.

Repeat the check measuring first the positive supply and then the negative supply against ground. Each should indicate between 40 and 45V. If any part is wrong or you see other indications of problems such as smoke or a burning smell, turn off the power immediately. Carefully check all connection and parts orientations: the transformer connections, the diode polarities as well as the capacitor polarity. Check the secondary voltages directly on

the transformer for correct AC voltage. In any case, make sure you have an error-free power supply before proceeding to the power amp boards. If this is OK, set aside the power supply and start with the amplifier boards.

**Output Stage, First Pair.** Mount a single pair of output devices and all related components:

Q11, Q18, Q19, Q20.

R40, R41, R42, R43, R44, R19, R20  
R35, R36, R37, R38, R21, R22, R23, R24.

C11, C12, C17, C18;

Q15, Q16, R54, R55

C15, C16; D10, D11; R34, R60, R25; C3,

C6, C7, C8, C13;

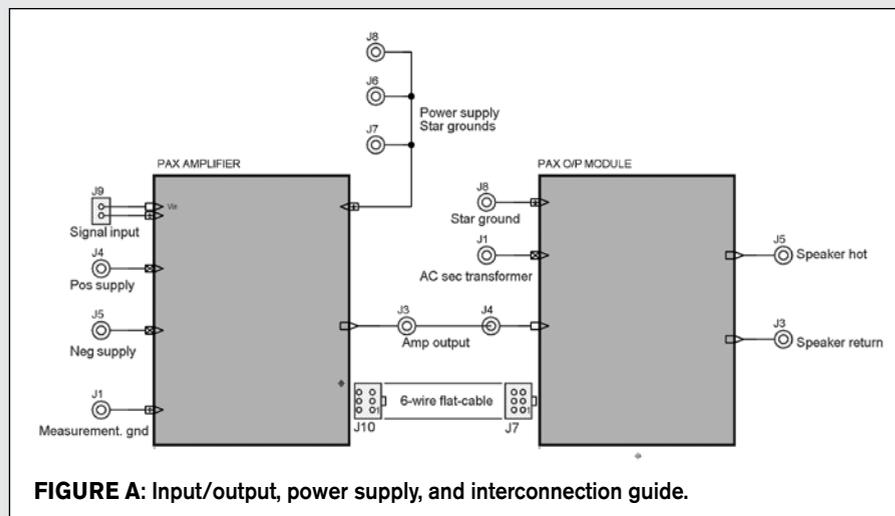
RV1, C9, R64, R65, C10, L1

IC socket U4 (**do not yet insert U4**).  
D7, D8.

Solder these parts. Check off each completed step on the circuit diagram so you keep track of what is done. Make sure you orient RV1 exactly as shown in the stuffing guide and turn it completely clockwise (you hear a ticking sound at the end of the wiper travel). Be sure to use isolation pads for the power transistors, and verify with the multimeter that none of the transistor leads has a short to ground or to the metal of the chassis or heat-sink.

Make the output inductor L1 from three layers of eight windings of 1.2mm magnet wire, for an inductance of around 5 $\mu$ H. Make sure to scrape off the insulation of the wire ends and tin them to get a good solder connection.

Do *not* insert U4 at this time, but ground pin 6 of the U4 socket with a jumper to the power supply ground. Connect a load resistor (50 to 100 $\Omega$  is fine) to the amplifier output. Connect the power supply (observe cor-



**FIGURE A:** Input/output, power supply, and interconnection guide.

rect polarity!) positive and negative leads via a resistor of 10Ω 5W. Connect the DC multimeter to the output. Switch on the power supply and verify that the output of the amplifier is less than a volt, and that there are no signs of smoke or heat. Verify that the voltage to ground at pins 4 and 7 of U4 is around -15 and +15V, respectively.

Next, switch the supply off and connect the multimeter to the Vbias test pins shown in the stuffing guide. Switch on and turn up RV1 to get an indication of around 20mV on the multimeter; this is not critical as you will fine tune it at the end. If all is well, switch off again, remove the jumper from pin 6, and insert U4. Ground the end of R25 shown as Vdrive on the schematic, switch on and verify that the output is at only a few mV DC, and that the voltage at Vbias is still around 20mV.

**Voltage Amplifier Stage.** Mount all the Vas components shown in Fig. 4 as well as the sockets only for U2 and U3.

When finished with the Vas, insert U1 in its socket. Do *not* insert U2 or U3. Ground pin 6 of socket U2 via a jumper. Switch on the amp and verify that the output DC voltage is not more than a few 100mV. Verify that the voltage at pin 7 and pin 4 of U1 is about +15 and -15V, respectively.

**Input Buffer and Servo.** Mount all the components shown in Fig. 5.

Insert U2 and U3 in their sockets. Ground the amplifier input. Switch on the amp. Verify that the output DC is not more than a few mV. Verify that the voltage at pin 7 and pin 4 of U2 and U3 is about +15 and -15V, respectively. If all is good, switch off the amplifier. If you have a tone generator and a scope, connect an input signal of about 100mV, 1kHz to the input, switch on the amplifier, and observe the output signal, which should be a nice sine wave at around 3V peak.

You're almost done. Next, mount

all the remaining components for the output stage. Make sure you orient RV2 exactly as shown in the stuffing guide and turn it completely clockwise (you hear a ticking sound at the end of the wiper travel). Be sure to use isolation pads for the power transistors, and verify with the multimeter that none of the transistor leads has a short to ground or to the metal of the chassis or heatsink.

Switch on the amplifier and verify that the output voltage (no signal) is still only a few mV. Connect the multimeter across the bias sense points for the second pair (see stuffing guide). Turn up the trimmer for an indication of around 20mV.

Last, after some warmup time, perform the final adjustment of the bias for each pair as described to 24mV. This completes the construction of the power amp. ■

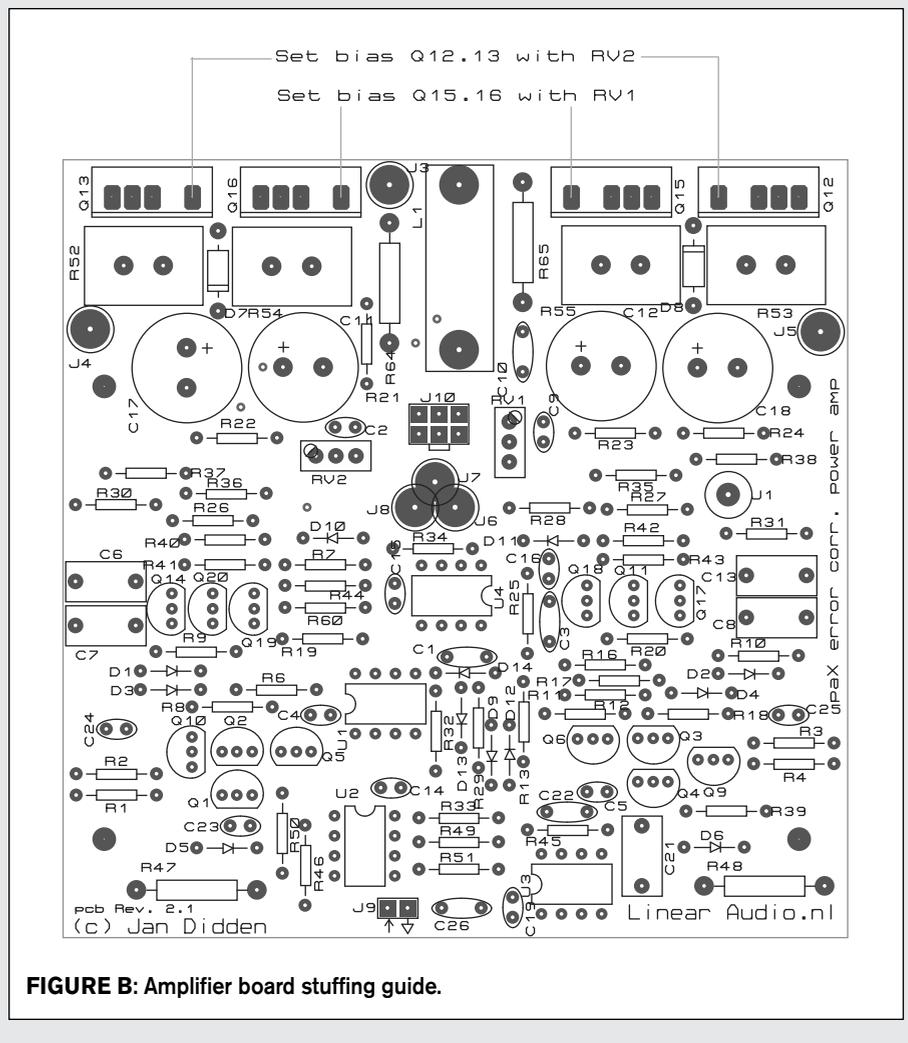


FIGURE B: Amplifier board stuffing guide.