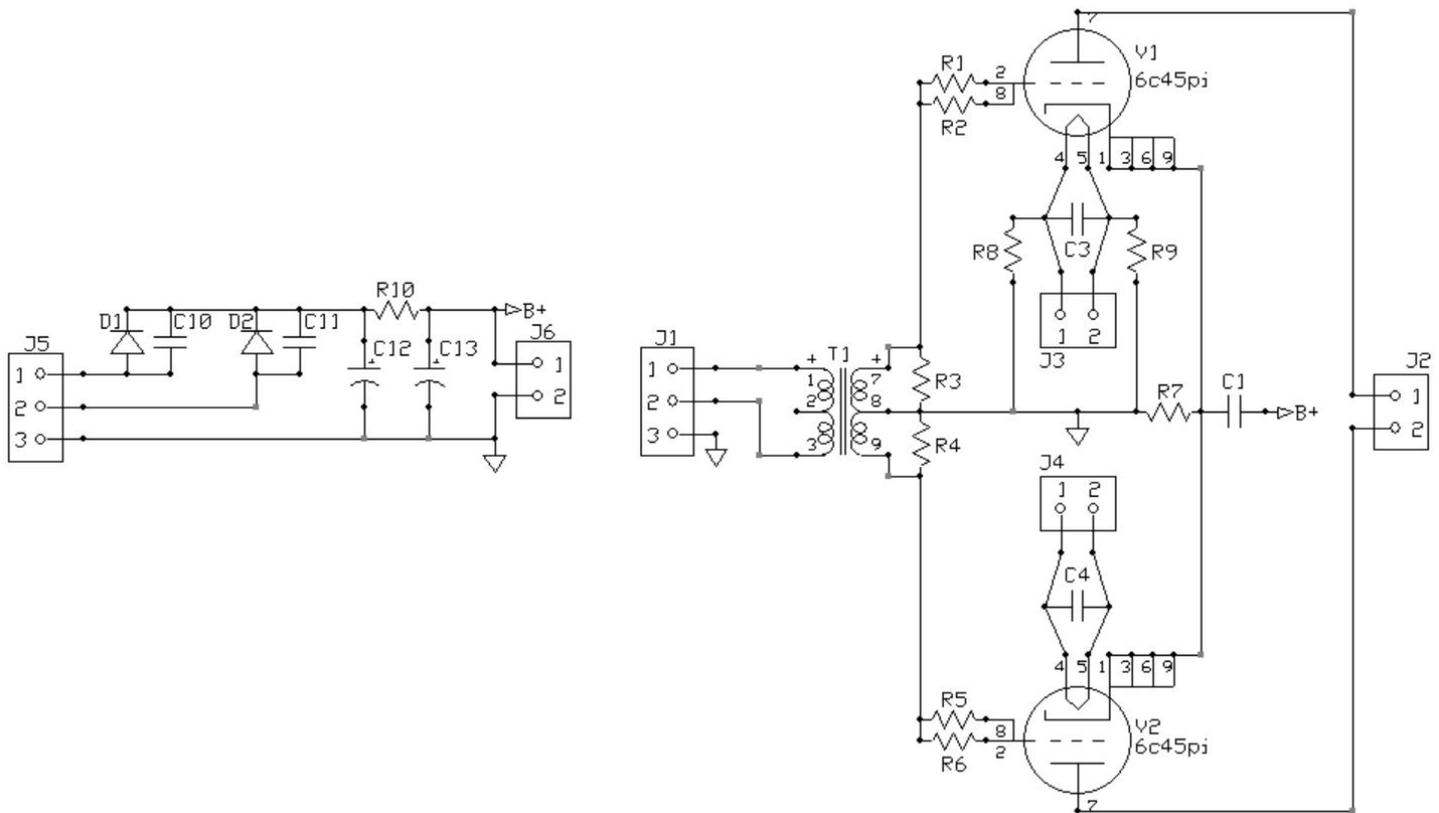


## Boozhound Laboratories 6c45pp Tube Amplifier

A tube amp! Finally! Vacuum tubes are what got me interested in DIY audio. Vacuum tube amplifiers give you the ability to build a simple circuit from amazing and obscure parts and have something that sounds really great. Unfortunately the cost and obscurity of the parts needed made it difficult for me to come up with a viable kit... until now!

This circuit is a push-pull amplifier using the amazing Russian 6c45pi tube, also known as the 6s45p. This indirectly heated triode was developed for Russian military applications and most examples were manufactured in the 80s. It has a very useful combination of high gain and high plate dissipation that allows us to build an amplifier using only one gain stage.



I chose a push-pull topology for this amplifier because it allows the use of affordable output transformers and a super simple transformer phase-inverter. This eliminates all coupling capacitors and the complexity and problems associated with tube based phase inverters. This gives us an incredibly elegant minimalist circuit and a very immediate and distortion free sound.

I am shooting for an operating point around 175V and 30mA per tube, biased at -2V. This exceeds the datasheet maximum plate voltage of 150V, but these tubes are extremely robust so they will be fine. The maximum plate dissipation is 7.8W and many folks have run them much hotter, but this operating point is dissipating around 5W each so they are not working too hard. 6W is a good rough estimate for power output. The transformers specified have both 4 ohm and 8 ohm taps. 8k primary impedance is ideal for this operating point.

## Parts included with the kit

- (2) Circuit boards
- (4) 100uF/400V C12, C13
- (2) 10uF C1
- (4) 0.1uF/400V C10, C11
- (4) 0.1uF/50V C3, C4
- (2) 39.2 R7
- (10) 100 R1, R2, R5, R6, R10
- (8) 100k R3, R4, R8, R9
- (4) UF Diode D1, D2
- (4) 9 Pin Socket V1, V2
- (8) 2-pin Headers J2, J3, J4, J6
- (4) 3-pin Headers J1, J5
- (8) Standoffs

## Additional parts needed

- (2) Output transformers
  - 8k ohm center-tapped primary ~10W+ push-pull
  - Edcor CXPP10-8k
  - <http://www.edcorusa.com/cxpp10-8k>
  - Surplus/vintage transformers also acceptable
  - Many low budget as well as amazing and expensive options available
  - ~\$50 each
- (1) Power Transformer
  - 250VCT @ 125mA, 6.3V @ 2A
  - Edcor XPWR104
  - <http://www.edcorusa.com/xpwr104>
  - Available in 120 and 240VAC primary
  - Feel free to build monoblocks with one transformer per channel
  - ~\$50 each
- (2) Input/phase inverter
  - Edcor PCW Series
  - [http://www.edcorusa.com/pcw\\_series](http://www.edcorusa.com/pcw_series)
  - Use 600:10k for more gain/sensitivity (recommended)
  - Use 600:600 for less gain/sensitivity but higher input impedance
  - ~\$12 each
- (4) 6c45 tubes
  - Any manufacturer is fine. Matched pairs desirable.
  - ~\$30-\$60 each

Note that the Edcor transformers are custom made to order so they may take up to 6 weeks for delivery. Edcor is a New Mexico small business that provides extremely high quality transformers at a great price - they are worth the wait!

## Construction

### **The tube sockets mount on the bottom of the board!**

This board is designed to be mounted on the bottom of a top plate with the tubes sticking up through the plate and all of the other parts on the board hanging down. This means that you need to mount all of the parts except for the sockets as you normally would, on the side of the board with the lettering, and the tube sockets on the bottom/opposite side of the board.

The  $\frac{3}{8}$ " standoffs make it so that the tube sockets are at the perfect height.

### **WARNING: Dangerous/lethal voltages present!**

The screw terminals are good up to 400V but feel free to solder everything to the board directly. It would not be good for a wire to come loose. Make sure all high voltage leads are securely fastened.

You MUST include a fuse between the power cord and the primary of the power transformer. A fuse does not protect against electrical shock, but instead prevents a short from causing a fire. You MUST build this amplifier so that all electrical conductors are insulated and inaccessible.

## Board connections

- B+ connects to the center tap of the output transformer
- Plates 1 and 2 connect to the plate leads on the output transformer.
- Terminals labeled "fil" are the filaments of the tubes, and should connect to the filament winding of the power transformer.
- The ground symbol next to the B+ should connect to the chassis.
- The High voltage winding of the power transformer connects to the header with a ground symbol and 2 AC sine wave symbols. The ground terminal connects to the center tap. The AC leads connect to the AC pins.

## Build Notes

It is easiest to find the center of the tube socket hole by marking 2 opposite pairs of the tube pin holes on the chassis, then making an X to mark the center.

The transformer input makes it possible to use a balanced input. I would suggest using the 600:600 version of the input transformer to match with balanced level signals. If you are using a conventional unbalanced signal, just jumper the negative input terminal to the ground connection on the 3-pin input connector.

If you have any questions, please contact me at [jsn@boozhoundlabs.com](mailto:jsn@boozhoundlabs.com).