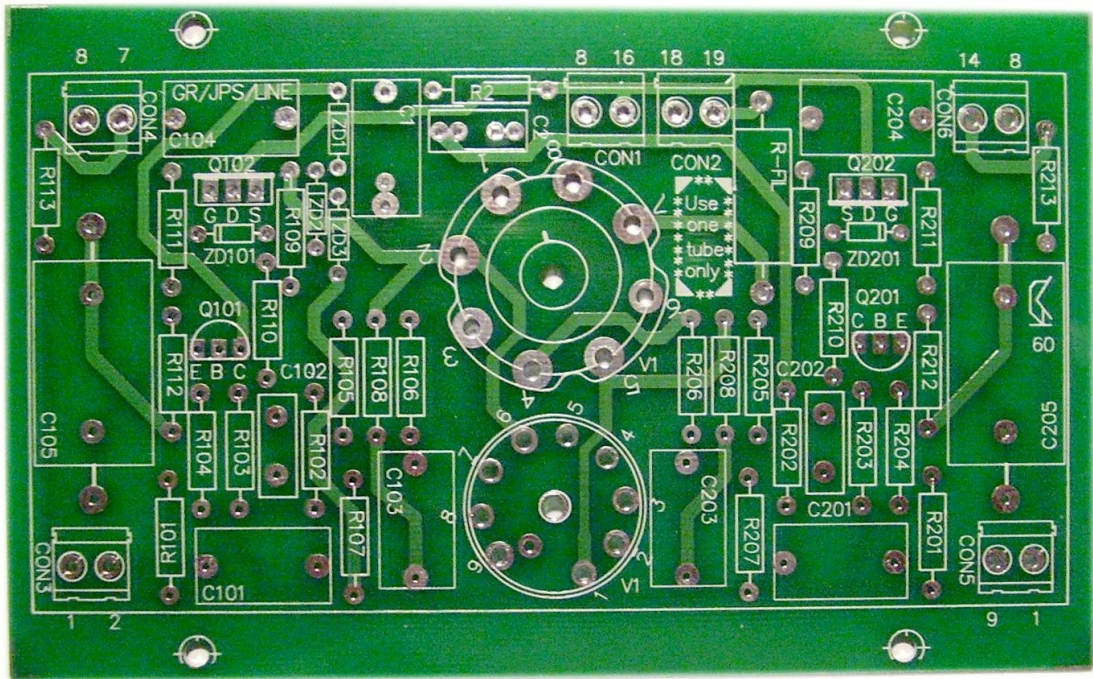


Single Tube Line Stage

by *Classic Valve Design*
for the
Dynaco® PAS2, PAS3, PAS3X

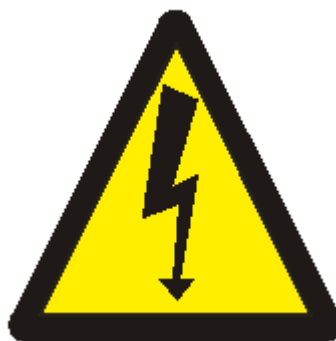


Classic Valve Design



Classic Valve Design assumes no responsibility for circuit or user damage from the use or misuse of these boards or any other product. We simply provide these on an AS-IS basis with workmanship quality as the only thing guaranteed at this time.

This product is designed for and use around **LETHAL VOLTAGES**. We assume the user has a reasonably competent grasp of line operated electronics at the time of sale.



* Dynaco is a registered trademark of Panor Corporation *

* Board design is © Classic Valve Design *

The Dynaco PAS series of preamplifiers has been one of the most successful and popular preamplifiers in history. They are reliable, hold their resale value and are incredibly popular “blank slates” to modify.

The Classic Valve Design single tube stage line board is an upgrade for the original PAS series of pre amplifiers. It has in our opinion, clear and punchy sonics and are easy to roll different types of tubes with.

**** The stock Dynaco tone controls are not compatible with this unit ****

This is a "drop in and go" board once assembled by you that requires no additional modification to your PAS preamplifier. The current draw by the single tube is that of the original 2-tube Dynaco.

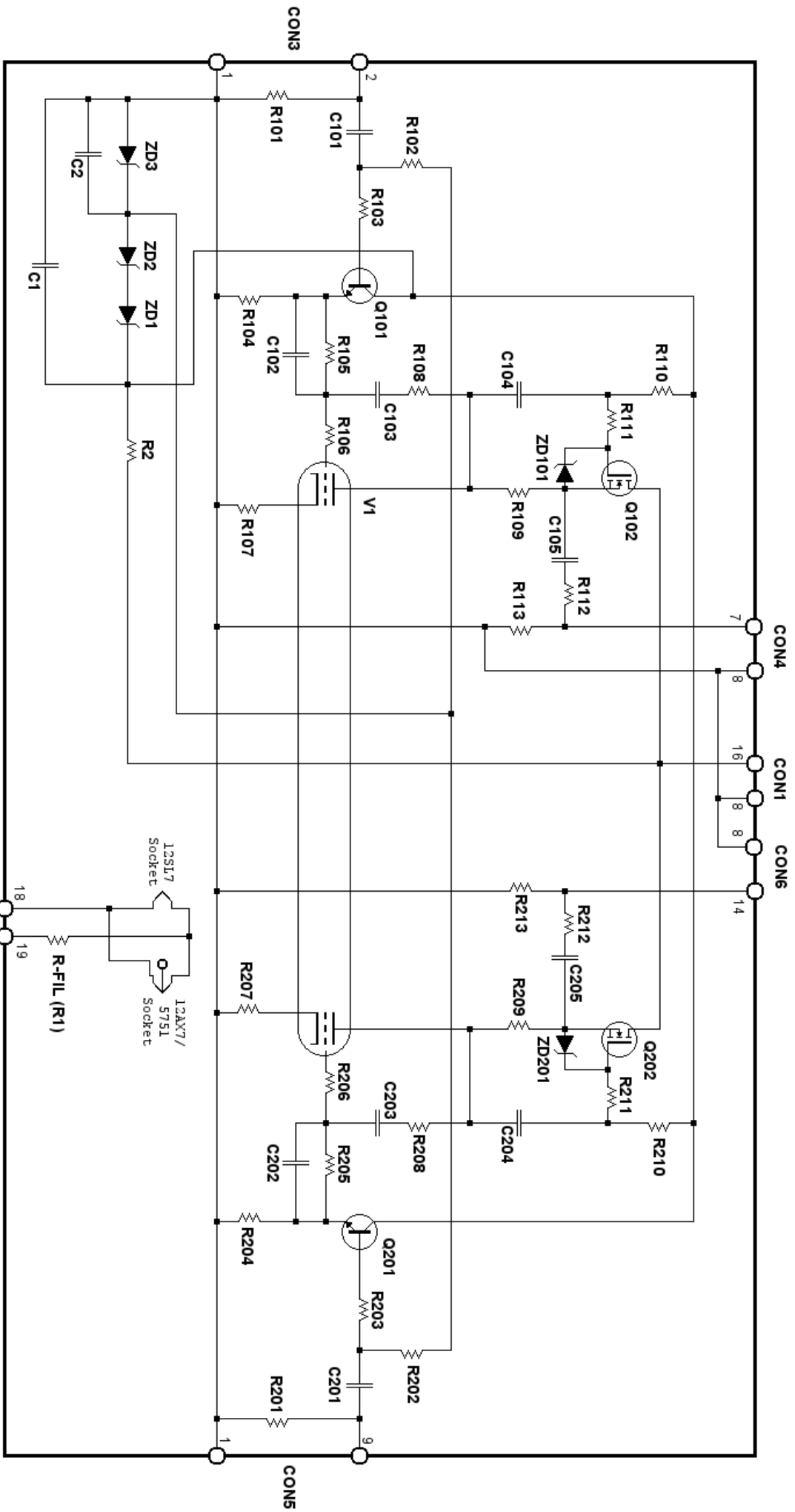
The Classic Valve Design single tube stage line board is based on the hybrid-mu-anode-follower topology to control tube gain and deliver a low output impedance. The required low-impedance drive is supplied by the bipolar emitter follower for very low noise (compared to a jFET or MOSFET) and high input impedance and low output impedance is derived from the MOSFET source-follower output stage. Input impedance of the line stage is approximately 300K.

This line stage also allows you to select the overall gain at time of build. We have tested it from a voltage gain of 1 (unity) to 9.5.

The tubes we have tested it with are the 12SL7, 12AX7/ECC88/7025 and 5751 and are the three recommended types to be used with this board. In keeping with the Dynaco tradition, 12V tubes are used (6V heater types will draw too much current from the stock PAS power supply).

The use of fixed voltages to the solid-state devices guarantees three important features:

- 1) Regardless of the health of the tube, the proper operating voltages will be maintained.
- 2) Superior power supply ripple rejection compared with a standard circuit.
- 3) Circuit stability with fluctuating line and or supply voltages.



- Small numbers by connector are the original PAS PC-5 designations. Extra pads by connector labeled as such may be added for clarity.

Parts List

Resistors:

R-FIL (R1): 68 ohms, 5 watts

R2: 56K, 1 watt

R101, R201: 1Meg, ½W

R102, R202: 470K, ½W

R103, R111, R203, R211: 220 ohms, ½W carbon film or composition

R104, R204: 47K, ½W

R105, R205: 100K, ¼ or ½W metal oxide or metal film

R106, R206: 1K, ½W carbon film or composition

R107, R207: 22K, ½W

R108, R208: ½W. See Table 1

R109, R209: 10K, ½W

R110, R210: 4.7 Meg, ¼ or ½W metal oxide or metal film (4.75 Meg OK)

R112, R212: 470 ohms, ½W

R113, R213: 100K, ½W

- Resistors specified for carbon are parasitic oscillation snubbers (no metal film or wire wound to be used here).
- Resistors specified for metal film or metal oxide are critical to noise figure (no carbon composition to be used here).
- Resistors with ¼W option are for suppliers that do not typically carry ½W in the material or value (no worries about heat).

Capacitors:

C1: 1uF, 250V film

C2: 100n, 50V film

C101, C201: 100n, 50V polypropylene film

C102, C202: 500V Silver mica type. See table 1.

C103, C203: 450V Polypropylene film type. See table 1.

C104, C204: 100n, 450V polypropylene film

C105, C205: 470n, 450V polypropylene film

- Capacitors with higher voltage ratings here are OK and are usually more economical to get all of a single value at the highest voltage rating.
- Where polypropylene film is specified, capacitor is in the audio signal line.

Semiconductors:

Q101, Q201: MPSA42

Q102, Q202: STP2NK60Z or IRF710 (former preferred for noise considerations)

ZD1: 1N5953B, 150V, 3W

ZD2: 1N4746A, 18V, 1W

ZD3: 1N4752A, 33V, 1W

ZD101, ZD201: 1N4739A, 9.1V, 1W

- Heat sinks are not required for this circuit

Misc:

CON1 through CON6: Terminal blocks, 5mm or 5.08mm, 2 position PCB.

Octal and/or noval (9-pin miniature) PCB tube socket

Table 1

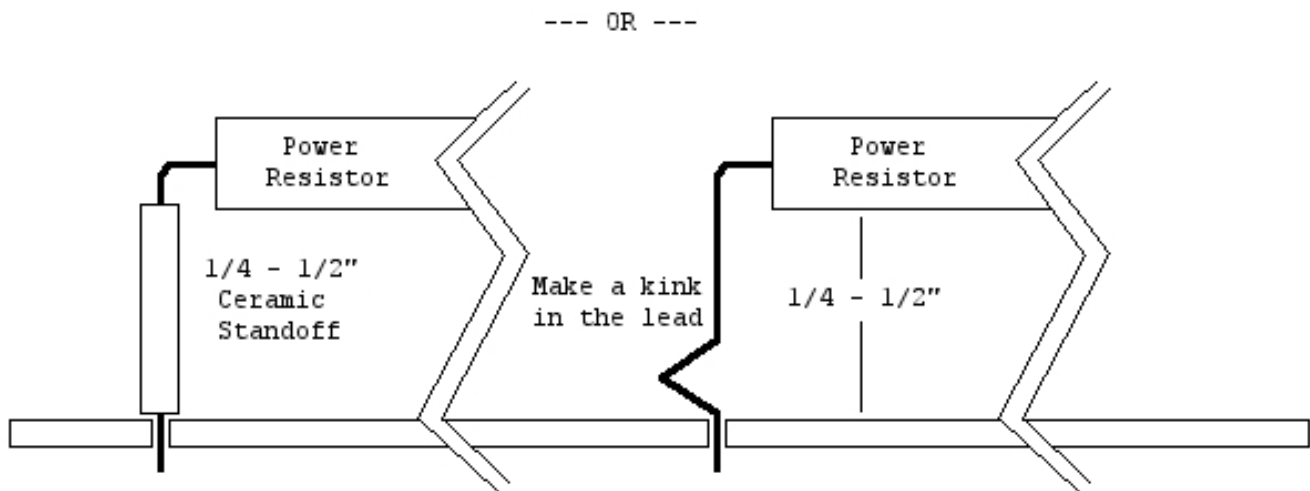
<u>Desired Voltage Gain</u>	<u>R108/ R208</u>	<u>C102/ C202</u>	<u>C103/ C203</u>	<u>Tested F3*</u>
1	150K	10pF	220n	3Hz - 134KHz
1.5	220K	15pF	220n	4Hz - 113KHz
2.5	330K	18pF	100n	9Hz - 87KHz
3.5	470K	27pF	100n	11Hz - 77KHz
4	560K	33pF	100n	12Hz - 67KHz
4.5	680K	36pF	100n	12Hz - 57KHz
5.8	820K	47pF	100n	13Hz - 48KHz
7	1Meg	62pF	100n	14Hz - 43KHz
7.9	1.2Meg	68pF	100n	14Hz - 39KHz
9.5	1.5Meg	82pF	100n	15Hz - 34KHz

* = Your results may differ

Assembly

Assembly is straight forward, though there is a couple items of note:

- You can add two tube sockets to the circuit, but USE ONLY ONE TUBE at a time. You may otherwise damage the MOSFET.
- R-FIL (R1) and R2 dissipate heat. It is best to mount them off the PCB a little by "kinking" their leads:



Method of mounting power resistors to the PCB for maximum life
and minimum damage from resistor heating.

If you are unsure of the gain level to use, we would recommend beginning with 2.5 and varying it from there.

Typically PAS lovers request from us line stage builds with a gain of 1.5 to 3. It has been inevitable that gains of 4 or more result in us lowering it later for the client.

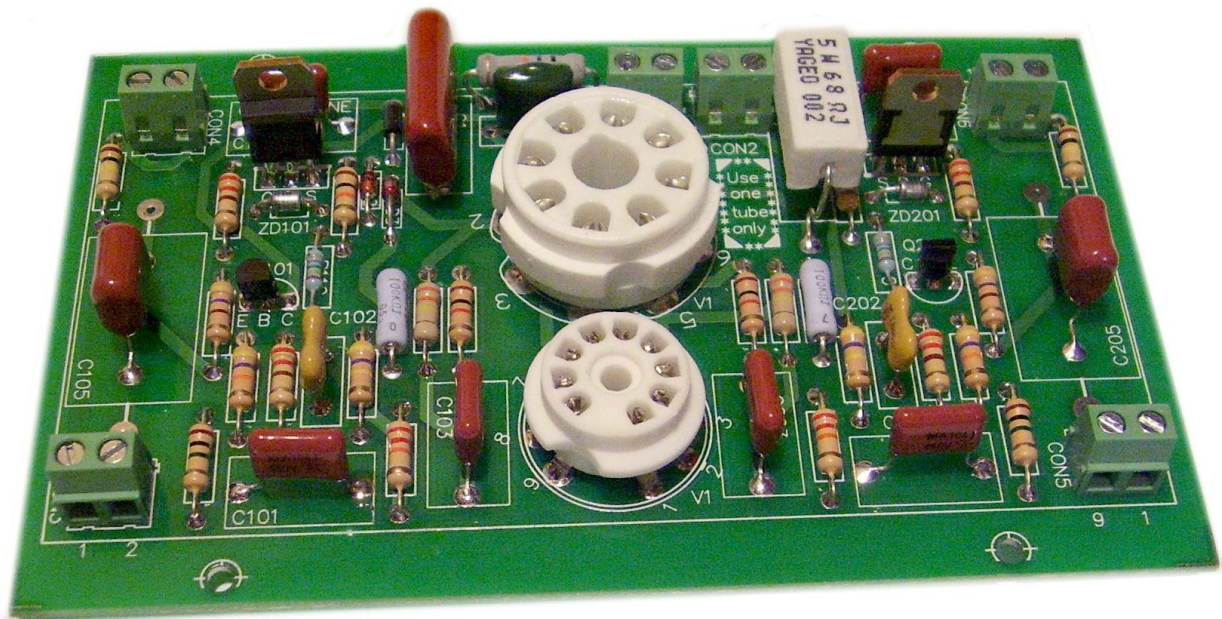
Hooking It All Up

As mentioned earlier, this board is a "drop in and go" with no special considerations other than those outlined above.

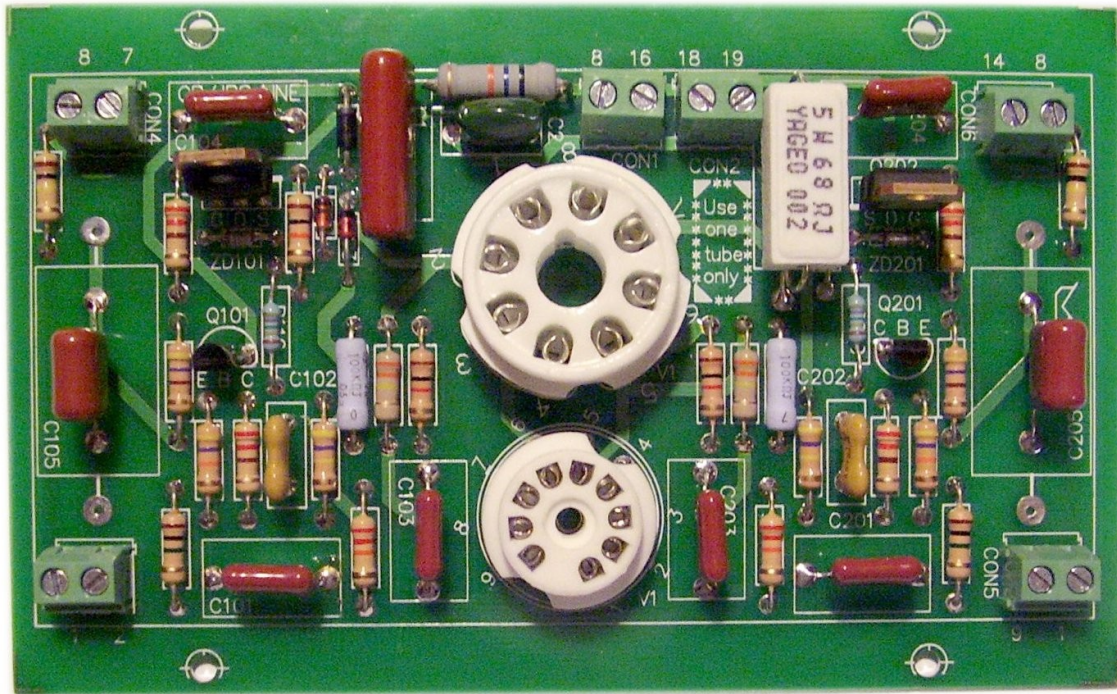
Numbers by the specific connectors are as the original Dynaco PC-5 board. Eyelet #20 is missing, because it's not to be used. Numbers 1 and 8 are ground, but do keep in mind to avoid ground loops (just because lots of ground positions are there, doesn't mean you have to use them).

CON4 and CON6 are to go to the left and right output RCA jacks. A twisted pair of leads will suffice, since it's a low impedance line. CON3 and CON5 are the left and right input jacks from the volume control. Hook a ground lead to one of the other, but not both. CON1 is the power connection and CON2 is the heater input.

Our Completed Prototype



Note transistor orientation vs. channels



In our prototype, we used Panasonic ECWF(A) polypropylene capacitors for audio coupling, $\frac{1}{4}W$ metal film for R110, R210 and Matsushita (Panasonic) metal oxide resistors for R105 and R205, Yageo metal oxide power resistors for R1 and R2. Yageo carbon films elsewhere with no detrimental effect on noise performance over special types in those positions (that we could hear or measure via FFT).

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