

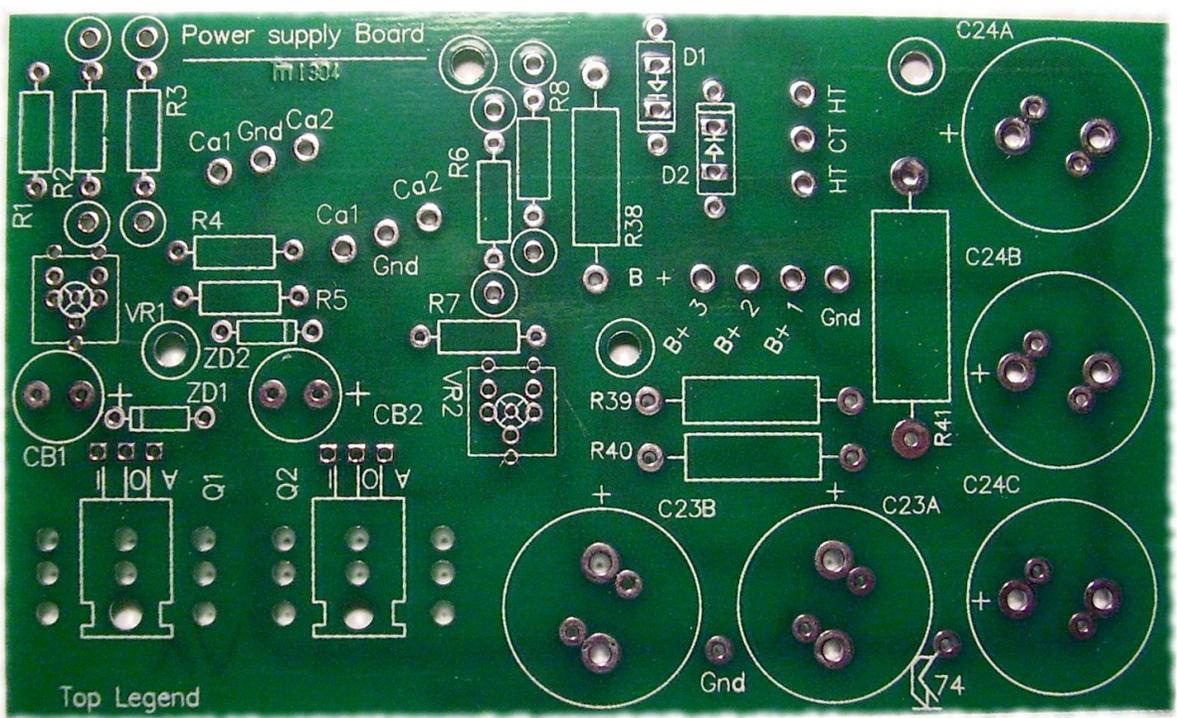
Power Supply Board

with

Constant Current Protected Cathode Bias

for the

Dynaco[®] SCA-35

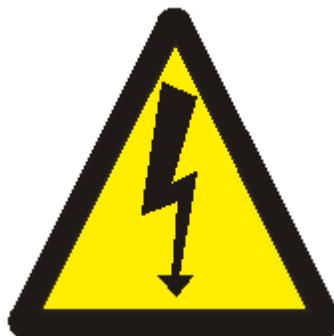


Classic Valve Design



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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.



Circuit Description

This power supply designed for the Dynaco® SCA-35 aims to replace the aged can caps with modern equivalents while still preserving the circuit of the original. Modern electrolytics have a lower ESR (Equivalent Series Resistance) than old can caps and the result is cleaner supply and cleaner sound.

We have also included should you wish to use a constant-current protected cathode bias (CCPCB) for the output tubes that allows balance adjustment of less than perfectly matched pairs.

The constant current is provided by the venerable LM317 adjustable voltage regulator used in constant current mode. It is bypassed with a capacitor to allow an AC return to ground for when the output tubes are pushed into class AB. Without this capacitor, the output stage would clip hard and distortion would be intolerable. A zener diode is bridged across this circuit and remains in an off condition unless the cathode bias exceeds a safe point for the LM317 in the case of temporary overload, or a shorted tube. Hence the term, protected cathode bias.

This circuit functions as a constant current source only and is not to be confused with the copyrighted EFB® circuit available elsewhere.

Balance is obtained through a variable resistor which is adjusted to allow more current to flow through the weaker tube, if present.

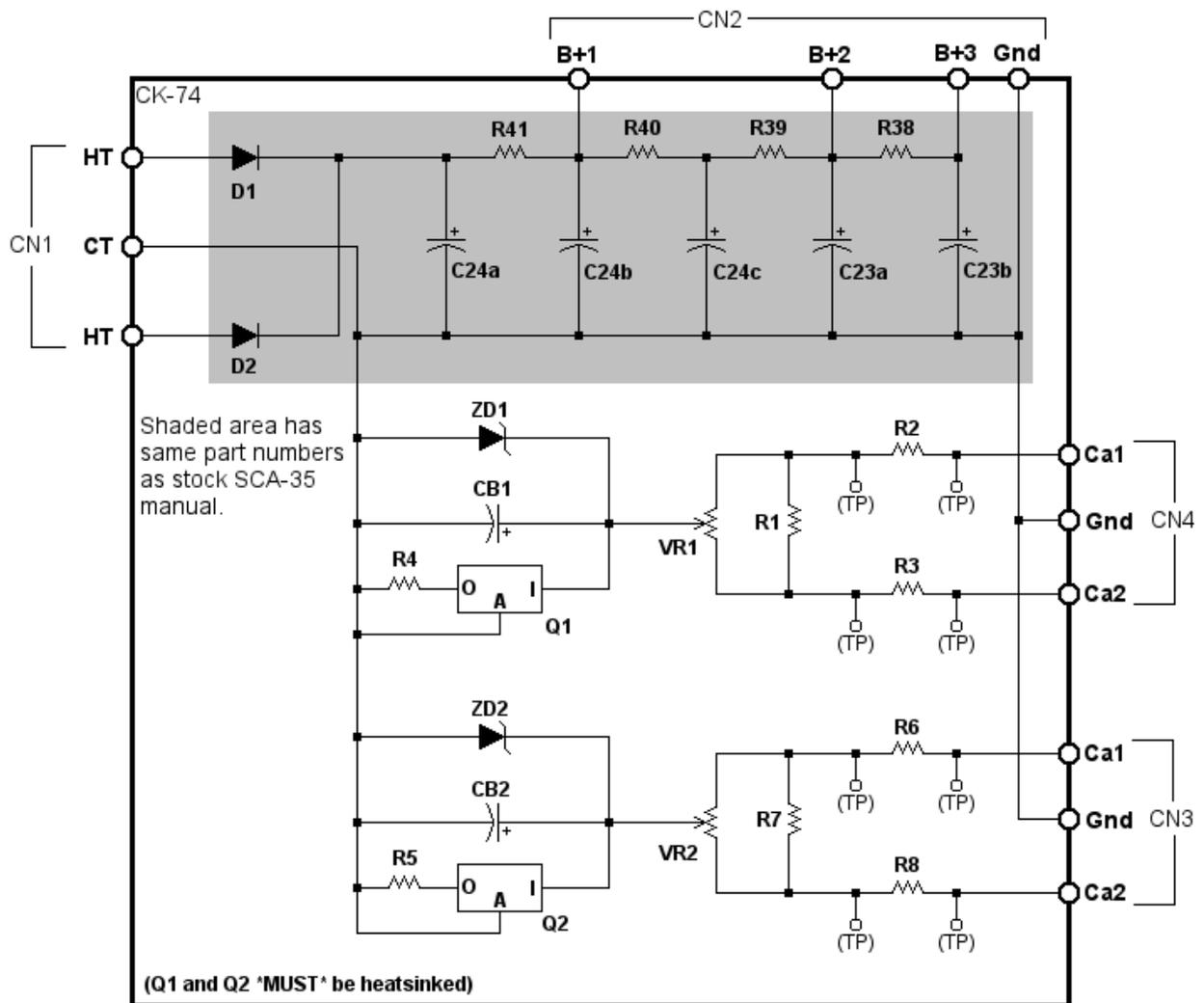
1 ohm resistors (R2, R3, R6 and R8) are provided for a digital multimeter measurement of the current flow through each power tube. current through each tube will read directly as mV. If you do not need to do so, they can be jumped with a component lead as they are not required for balance adjustment.

The 30 ohm resistors across the balance potentiometer (R1 and R7) "slow down" the effect of the trimmer and make adjustment less touchy by limiting the potentiometers effective electrical rotation. If you are unable to balance the power tubes with the 30 ohm resistor in place, remove it (or try before even installing it)

The pads for D1 and D2 will fit a standard 1A diode, like the 1N4007 or UF4007 or you may choose to use a TO-220 cased Schottky type.

We have specified a double TO-220 heatsink over a single for the LM317, because Dynaco® chassis just cook inside! A single heat sink risks the LM317T failure.

Schematic Diagram



Parts List

Resistors:

R1, R7: 30 ohms, 5%, ½ Watt (optional. See text)
R2, R3, R6, R8: 1 ohm, 1%, ½ Watt (optional. See text)
R4, R5: 16.2 ohm, 1%, ½ Watt
R38: 22K, 5%, 2 Watts
R39, R40: 2.2K, 5%, 2 Watts
R41: 50 ohms, 5 Watts
VR1, VR2: 50 ohm, ½ Watt trimmer

Capacitors:

CB1, CB2: 330uF, 50V audio grade electrolytic
C23a, C23b, C24a, C24b, C24c: 68uF, 450V

Semiconductors:

D1, D2: 1A, 1000PIV
ZD1, ZD2: 36V, 1 Watt zener
Q1, Q2: LM317T Adjustable voltage regulator

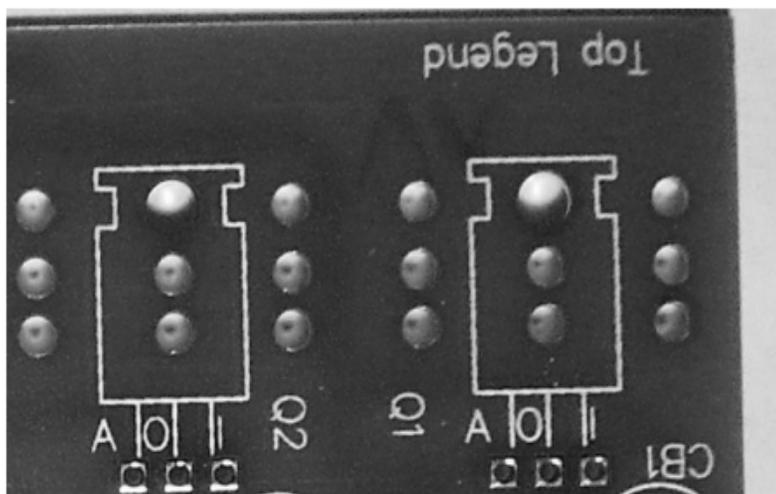
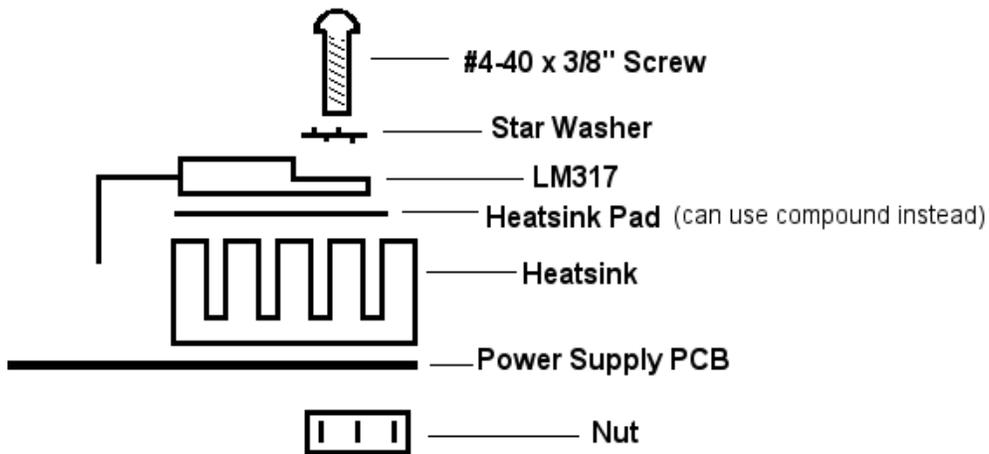
Misc:

CN1, CN3, CN4: 3-position terminal block, wire-to-board (Digikey 277-1578-ND or equivalent)
CN2: 4-position terminal block, wire-to-board (Digikey 277-1579-ND or equivalent) **or** you may use 2 x 2-position terminal block (Digikey 277-1667-ND or equivalent)
- 2 x TO-220 Heat sinks (Digikey HS104-2-ND or equivalent)
- Mounting hardware for above
- 4 x #6-32 x 1" screws
- 4 x #6 x ½ " nylon standoffs
- 4 x #6 flat washers
- 4 x #6 lock washers
- 4 x #6-32 nuts

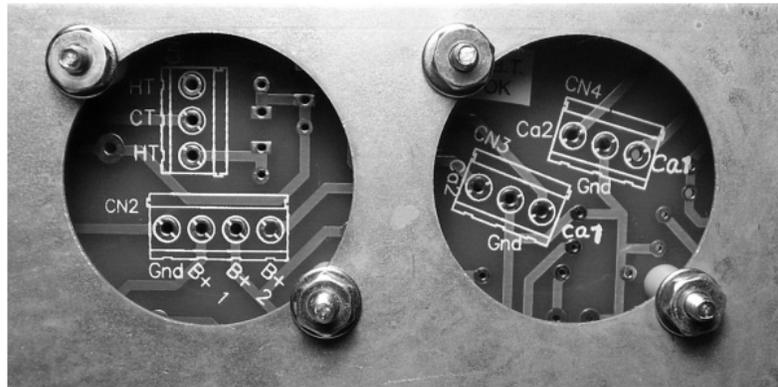
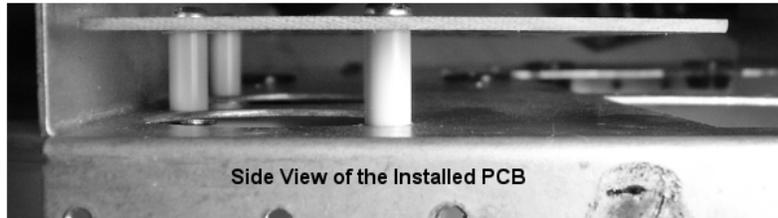
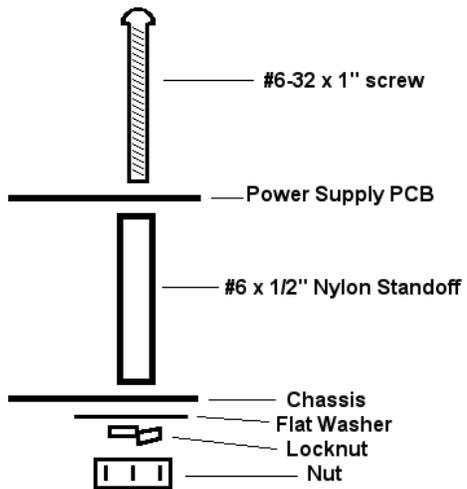
Building

The circuit is fairly straight forward to build, but there are some points to note:

- The power supply filter capacitor pads will accept 7.5mm radial leaded or 10mm snap-in types. Whichever you use, choose ones rated for 105C. operation.
- It is normal for R41 to get very hot in operation. Do not mount with the body of the resistor directly touching the PCB. Leave $\frac{1}{2}$ to $\frac{3}{4}$ of an inch (1 to 2 cm) space and make sure the resistor body doesn't come in contact with the capacitors.
- The heat sinks for the LM317 may be mounted with the device standing or laying down on the board. Due to the low voltage involved, the heat sinks do not require electrical isolation. See the image below for laying them down.



Installation



Installation requires the use of nylon, phenolic or other non-conducting standoff to avoid shorting the pads underneath.

The original SCA-35 has the cathodes of all the power tubes connected together. Those will need to be removed as per the installation schematic below.

Adjustment

Confirm all parts are installed and oriented properly (especially capacitor polarities). Turn the trimmer potentiometers to their centre position.

Power the unit up and with a multimeter, check the voltages between Ca1, Ca2 and ground on both channels. These should not rise to more than 18V with a set of tubes with weak grids and will typically be 12V to 14V. If the voltage exceeds 20V, immediately power down the unit and look for circuit or wiring errors.

Assuming the power up went well, place your multimeter between Ca1 and Ca2 and adjust the trimmer of the respective channel for a 0V reading. Repeat trimmer adjustment after a 20-30 minute warm-up.

Enjoy!