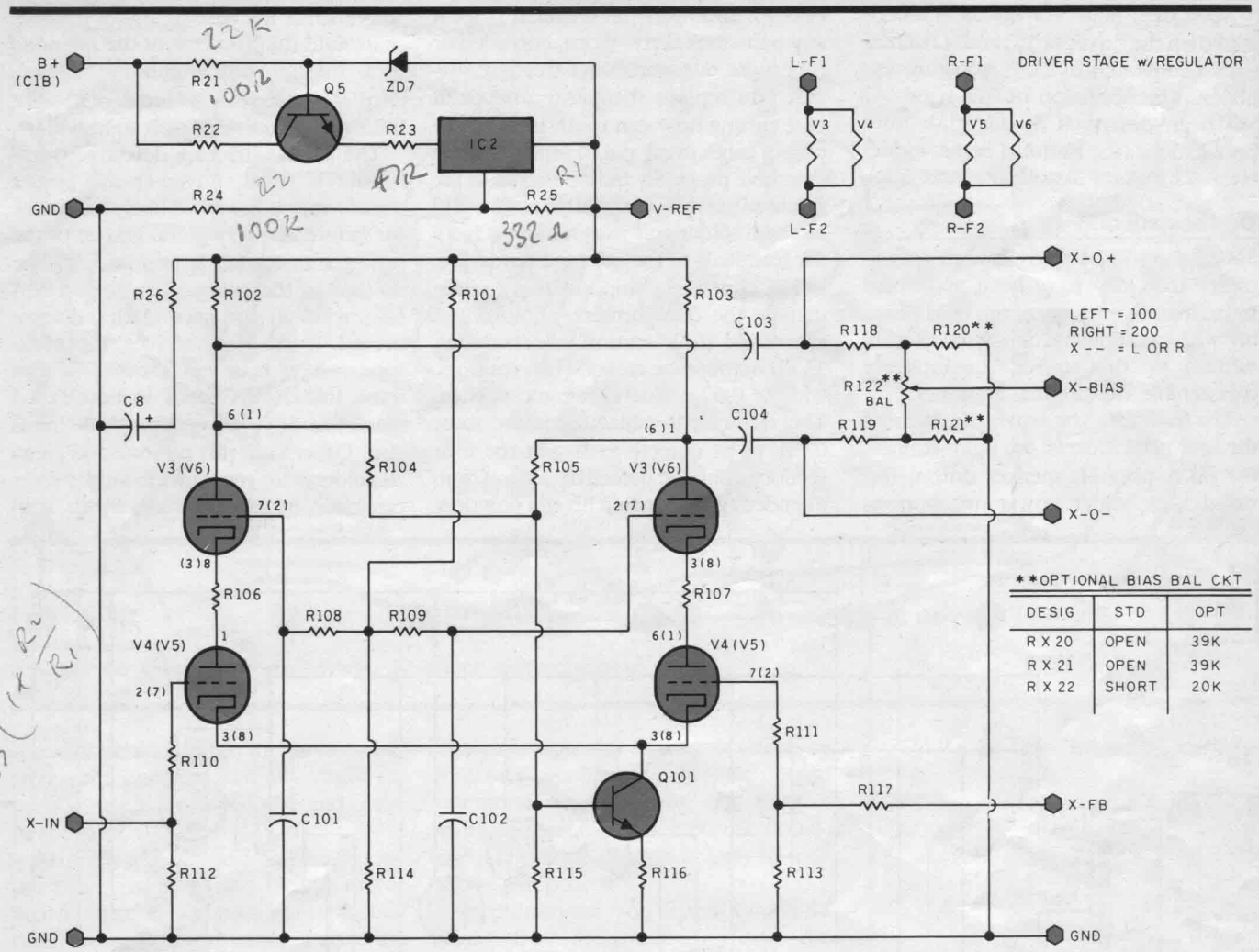

FIGURE 2: Schematic—driver stage with regulator.

ply which feeds two possible bias control circuits. Both circuits provide control of the operating current of the output tubes, however, the optional circuit allows current trimming/balance of each output tube. If you wish to incorporate the optional bias balance circuitry, cut the foil shorting R122 and R222 on the driver circuit board and follow the charts indicating the correct use of R120/R220, R121/R221 and R17/R18 (*Fig. 2*). In addition, you must include R123/R223 and R124/R224 at the cathode of *each* output tube to independently measure each output tube.

Power

The original Dynaco power transformer is retained. A full-wave center-tapped rectifier feeds a capacitor/inductor filter to provide the primary "raw" B + power. All high-voltage regulator inputs are supplied from this point. This is identical to the original ST-70 circuit with the exception of solid-state rectification.

A tap on the high-voltage secondary winding feeds a half-wave capacitor input filter. This negative supply (approximately 60V DC) is zener-regulated to provide the fixed output tube bias.

Filaments are energized by two separate, identical center-tapped windings; one for each channel with the center tap referenced to ground through a small value capacitor. The respective right and left channel driver stage tube filaments are also fed from these windings.

Three regulators control high voltage for the output tube plates, output tube screens and the driver board. The "plate" and "screen" regulators are nearly identical, differing only by the series pass element and, therefore, current capacity. They are servo-controlled op amp configurations differing from my previous designs—the circuit operational current is not derived from the high voltage bias, but rather, from a separate "floating" supply. The original rectifier tube filament windings are used in a voltage doubler configuration to provide the plus/minus supply voltage for the dual op amp. R9 references the "zero" point of the plus/minus supply to the output of the screen regulator so the op amp always sees an operational voltage that is centered about its own output voltage.

Reference voltage for the plate and screen regulators can be either "zener" derived or obtained from the output of the independent driver regulator. You should use the driver regulator as a reference in this application. In other designs of perhaps higher voltage, use the zener string configuration (the circuit board has provisions for the components). In either case, the chosen reference is filtered through a long time-constant RC filter to reduce low-frequency modulation. The diodes and series resistors surrounding the op amps either redirect or provide limiting to the high-voltage currents surrounding the low-voltage active devices (*Fig. 3*). This is especially important in redirecting high voltage capacitor charge or discharge paths.