

# Pass Laboratories

## Aleph 5 Service Manual

Rev 0      9/20/96

Aleph 5 Service Manual.

The Aleph 5 is a stereo 60 watt audio power amplifier which operates in single-ended class A mode.

The Aleph 5 has only two gain stages which are biased by current sources. Because of the inherent simplicity of the circuit, it is easy to understand and repair. There are no adjustments.

Figure 1 shows the simplified schematic of the amplifier. Two p channel Mosfets form an input differential pair biased by a current source operating at about 20 ma. The drain of the input Mosfet is attached to the gate of an n channel power Mosfet which forms the active output stage. It is biased by a current source at slightly greater than 2 amps.

The voltage rails of the supply are at 34 volts, and each channel draws approximately 150 watts.

Figure 2 shows the actual schematic for the amplifier.

F1 is a slow blow fuse, set at 4 amps for 100-120 volt operation, and 2 amps for 220-240 volt operation.

S1 is the power switch, which has two sets of 25 amp contacts wired in parallel.

T1 is a thermostatic switch rated at 75 degrees Centigrade. It is mounted to the rear heat sink.

TH1 is a power thermistor used to connect the circuit and chassis ground to the AC outlet ground. It will normally operate at 5 ohms, suppressing ground loops in the system, but will drop to a low impedance if significant current is passed through it.

TH2 is a power thermistor (Keystone CL-60) which is used to suppress inrush current.

The power transformer drives a high current bridge and 120,000 uF of capacitance to form a plus and minus 34 volt supply.

Referring to the channel itself, Q1 and Q2 form the differential input pair of Mosfets. They are biased by the current source formed by Q3. Q3 is biased to about 20 ma by the reference Zener diode Z5 which sets about 5 volts across R11.

Z1-4 protect the input from static spikes. R2-8 form the input networks and feedback loops.

The output of the differential input pair drives the gates of output devices Q18-29. These parallel devices are matched gate to source voltages as close as .01 volts, however variations as high as .1 volts will not impede operation.

The voltage across R114 shows the drive voltage for the output stage, and it should have 4-5 volts across it.

The output of the amplifier is taken from the drains of Q18-20. Q18-20 are provided a bias current by the current source circuitry of Q6-8, also a matched set of n channel Mosfets.

Q6-8 are set at 2 amps DC by the network consisting of Q5 and the components surrounding it. Q5 is biased by R17 and R18 in series. A capacitor C9 is used to reduce supply noise. R20 serves to sense the current running through Q6, and feeds that to the base of Q5, forming a loop that holds the output current at 2 amps. The pn junction drop of Q5 forms the reference voltage for the system.

R19 is a fixed resistor which trims the DC current value. R21 and C10 adjust the current against output current as sensed by the voltage across R22-27 and R100.

Fig. 3 and 4 show the component layout of the central circuit board. This board holds the power supply components, the front end circuitry, and connects the power stages together.

On this diagram you can see the wiring arrangements for the various AC line voltages: 100-120, and 220-240 volts.

The two large pads at either side of the AC wiring area have a black and white wire going back to the AC input system. The black wire is hot AC, and the white is cold AC.

The pads between these go to the transformer primaries.

There are no adjustments to the amplifier. Values for biasing various components are taken from physical constants, such as pn junctions and zener voltages, and through matching of Mosfet transistors.

The input Mosfets are match  $V_{gs}$  to within .01 volts, and the output Mosfets are in matched pairs within .1 volt, although production tolerance is typically .01 volt.

For a 120 volts AC line, the amplifier will draw about 2.5 amps RMS. If you measure current draw with an averaging meter, you will get a smaller number.

The amplifier is designed so that the heat sinks will operate approximately 30 degrees C. above ambient, for a typical temperature of 55 degrees C. Temperature protection occurs at 75 degrees C.

The amplifier will not be damaged by driving a short circuit, and it is probable that the only failures you will see will be random component failure.

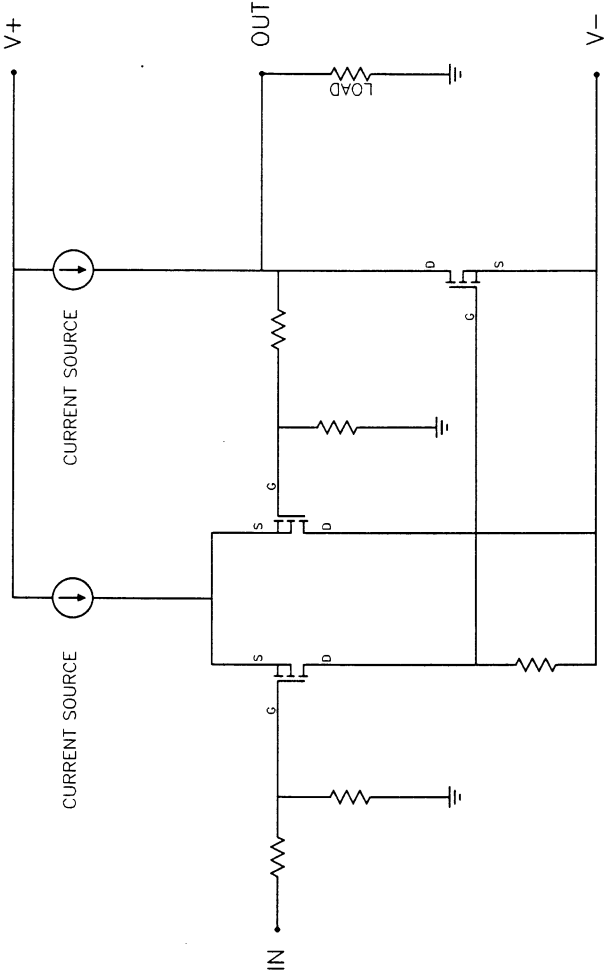
## SPECIFICATIONS

Gain	20 dB balanced
Freq. Response	- 3 dB at 0.3 Hz, -3 dB at 100 KHz
Power Output	60 watts/ch 8 ohms
Distortion (1KHz)	<1%THD
Output Impedance	0.1ohm
Input Impedance	10 Kohm unbalanced 25 Kohm differential
Input CMRR	> -50 dB Typical
Power Consumption	300 watts
Dimensions	12 " W x 12" D x 10.5" H
Shipping Weight	60 lb.



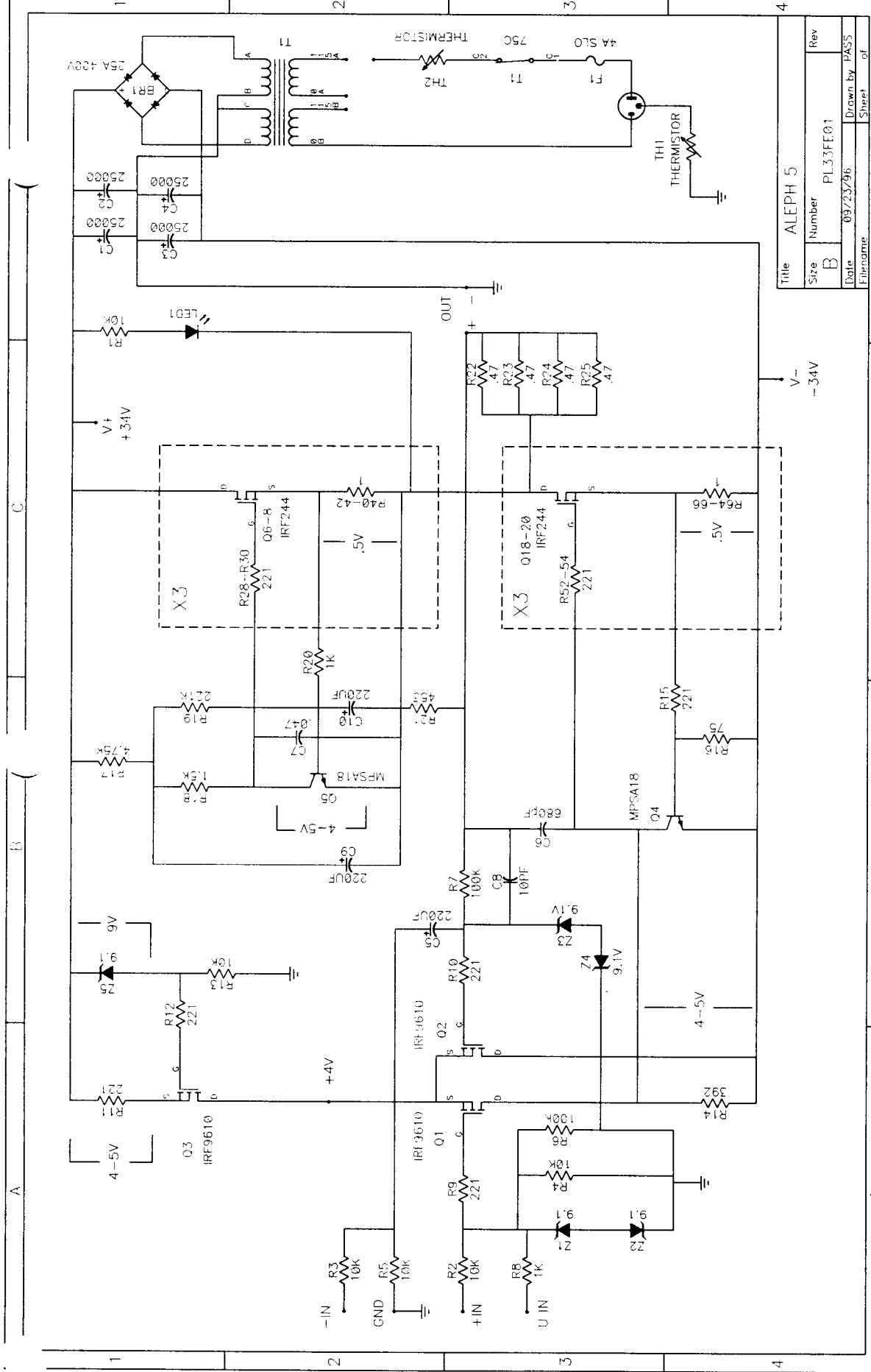
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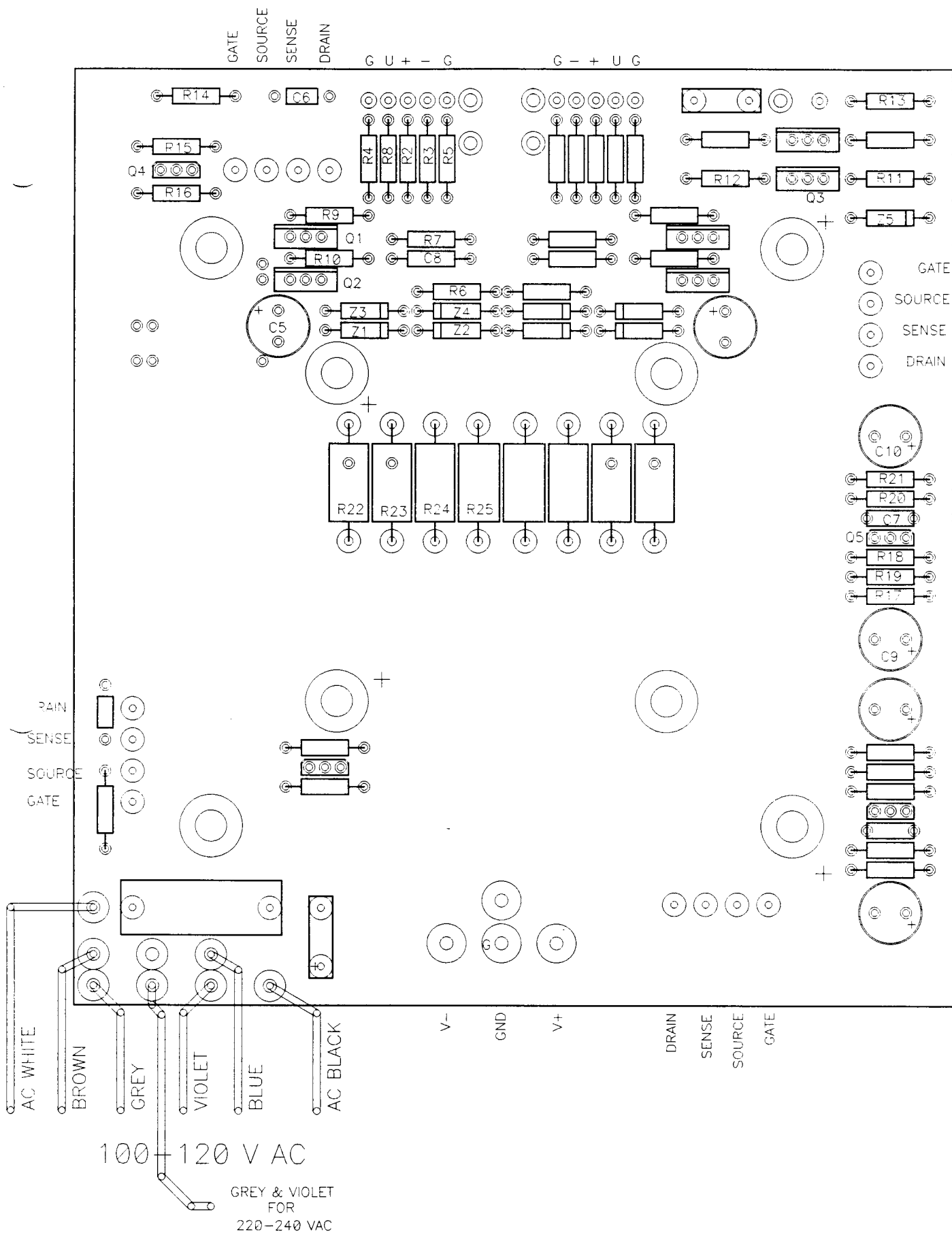
SIMPLIFIED SCHEMATIC  
TWO GAIN STAGE  
SINGLE-ENDED CLASS A  
POWER AMPLIFIERS

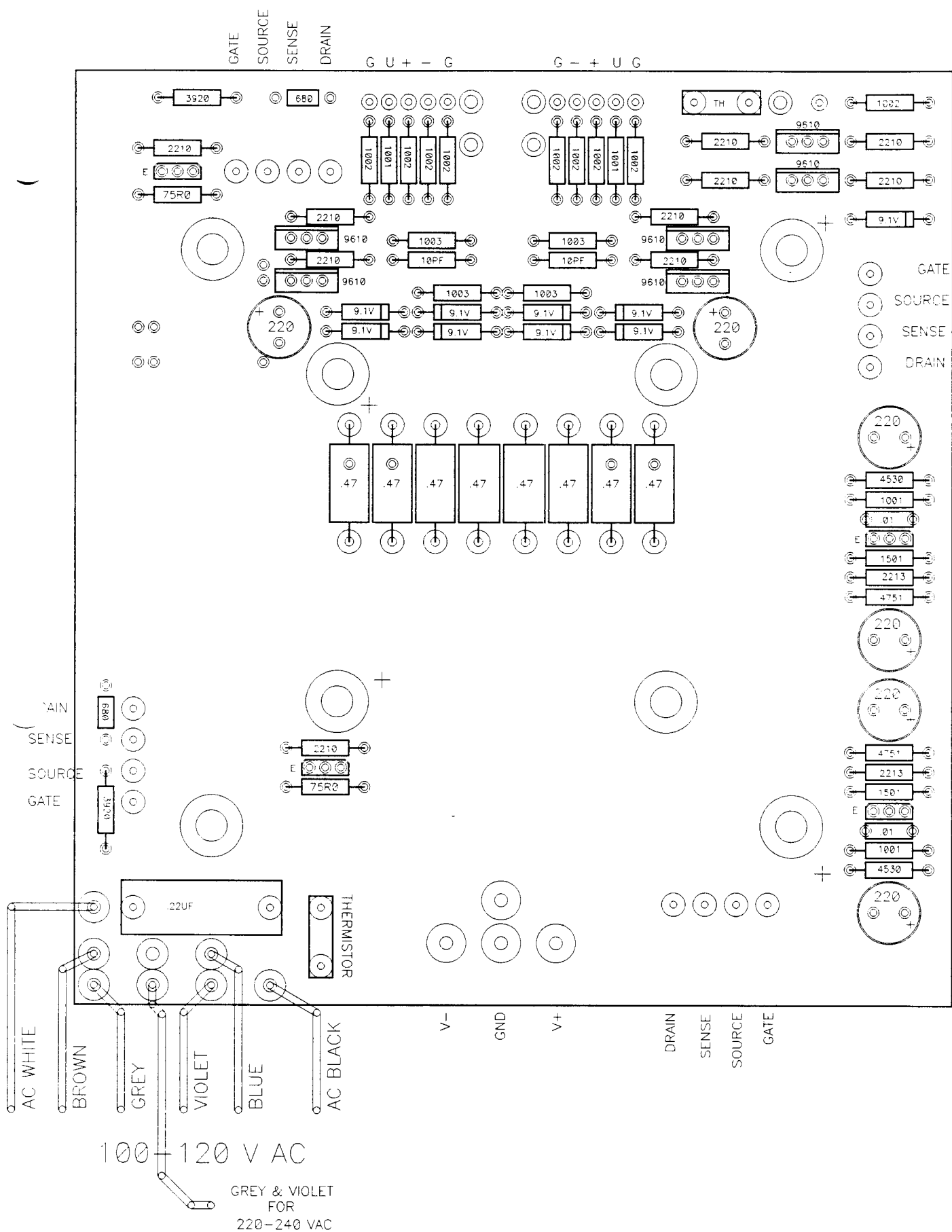
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