

# Pass Laboratories

## Aleph 3 Service Manual

**rev 0      2/1/96**

Aleph 3 Service Manual.

The Aleph 3 is a stereo 30 watt per channel audio power amplifier which operates in single-ended class A mode.

The Aleph 3 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 25 volts, and each channel draws approximately 100 watts.

Figure 2 shows the actual schematic for the power supply and one channel.

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 wire 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 170,000 uF of capacitance to form a plus and minus 25 volt supply.

Referring to the channel itself, Q101 and Q102 form the differential input pair of Mosfets. They are biased by the current source formed by Q103. Q103 is biased to about 20 ma by the reference Zener diode Z103 which sets about 5 volts across R106.

Z101 and Z102 protect the input from static spikes. R101-104 form the input networks and feedback loops.

The output of the differential input pair drives the gates of output devices Q108 and Q109. These parallel devices are matched as close as .01 volts, however variations as high as .1 volts will not impede operation.

The voltage across R108 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 Q108 and Q109. Q108 and Q109 are provided a bias current by the current source circuitry of Q106 and Q107, also a matched pair of n channel Mosfets.

Q106 and Q107 are set at 2 amps DC by the network consisting of Q105 and the components surrounding it. Q105 is biased by R111 and R112 in series. A capacitor C103 is used to reduce supply noise. R115 serves to sense the current running through Q106, and feeds that to the base of Q105, forming a loop that holds the output current at 2 amps. The pn junction drop of Q105 forms the reference voltage for the system.

R113 is a fixed resistor which trims the DC current value. R114 and C103 adjust the current against output current as sensed by the voltage across R124-127.

Fig. 3 shows the component layout of the central circuit board. This board holds the power supply components and connects the power stages together.

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

Fig 4 and 5 show the component layout of the board assembly forming the input stage and the active (negative) portion of the output stage.

Fig 6 and 7 show the component layout of the board assembly forming the positive half of the output stage, the current source.

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 matched  $V_{gs}$  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 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 25 degrees C. above ambient, for a typical temperature of 50 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   |
| Freq. Response    | - 0.5 dB at 2 Hz, 100 KHz   |
| Power Output      | 30 watts/ch 8 ohms<br>60 watts/ch 4 ohms<br>60 watts/ch 2 ohms            |
| Maximum Output    | 23 volts, 8 amps  |
| Distortion (1KHz) | 0.2% @ 30 watts, 8 ohms<br>1% @ 60 watts, 4 ohms<br>1% @ 60 watts, 2 ohms |
| Input Impedance   | 23 Kohm   |
| Damping factor    | 100   |
| Crosstalk         | > -80 dB 20-20 KHz  |
| Output Noise      | 500 uV unweighted   |
| DC offset         | < 100 mv  |
| Power Consumption | 250 watts   |
| Temperature       | 25 degrees C. above ambient   |

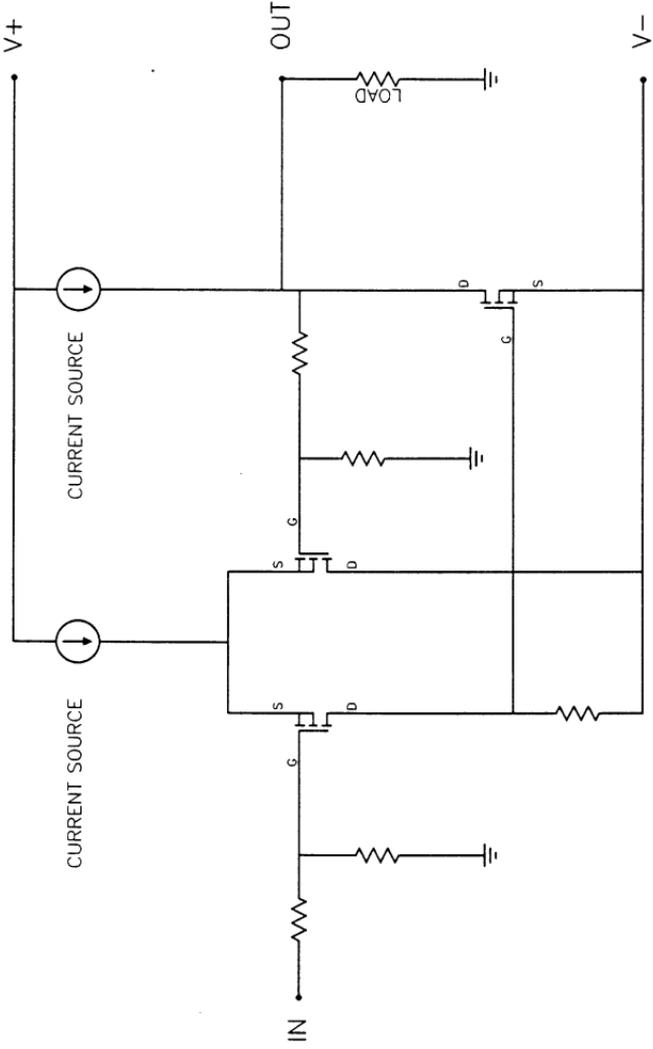
Dimensions 12 " W x 12" D x 6" H

Shipping Weight 38 lb.



**Pass Laboratories**  
**21555 Limestone**  
**Foresthill CA 95631**

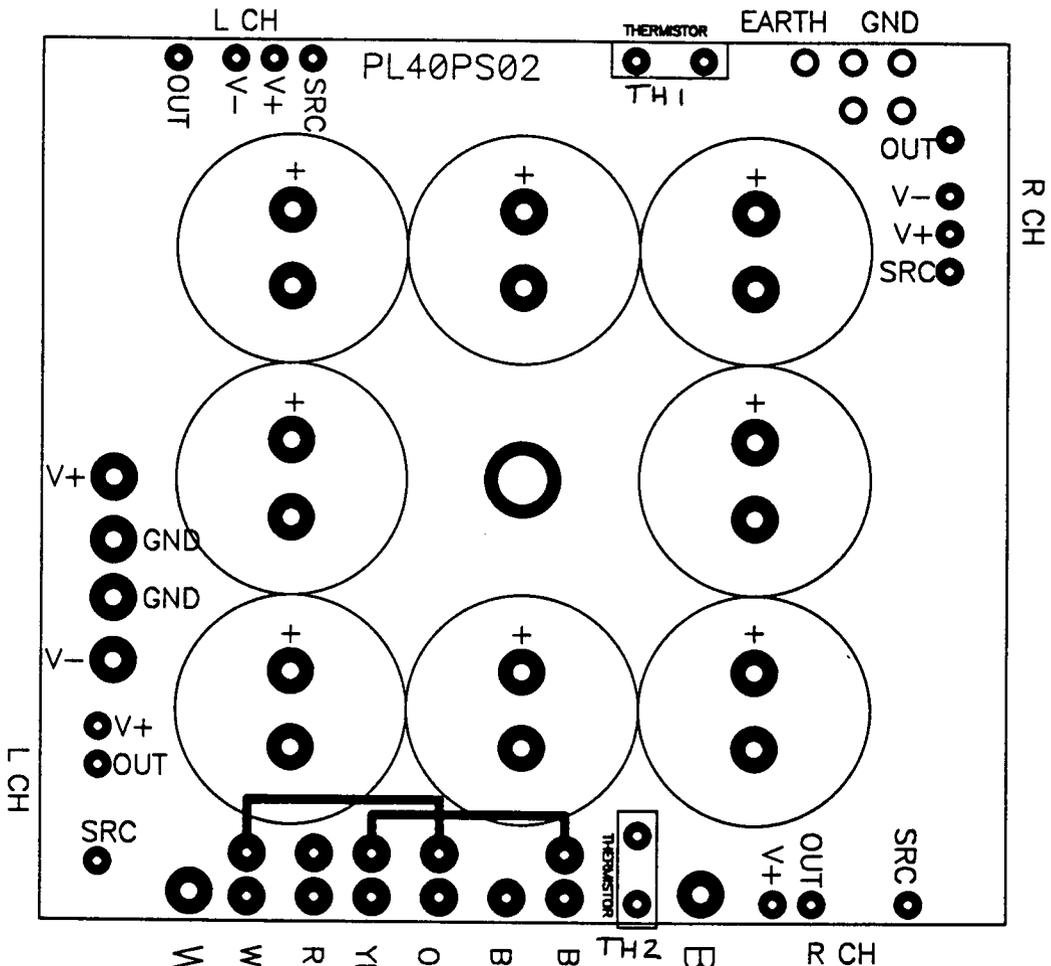
**tel (916) 367 3690**  
**fax (916) 367 2193**



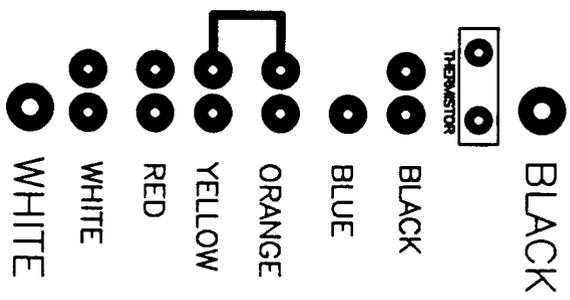
SIMPLIFIED SCHEMATIC  
 TWO GAIN STAGE  
 SINGLE-ENDED CLASS A  
 POWER AMPLIFIERS

|          |            |                   |      |
|----------|------------|-------------------|------|
| Title    |            | PASS LABORATORIES |      |
| Size     | Number     | Rev               |      |
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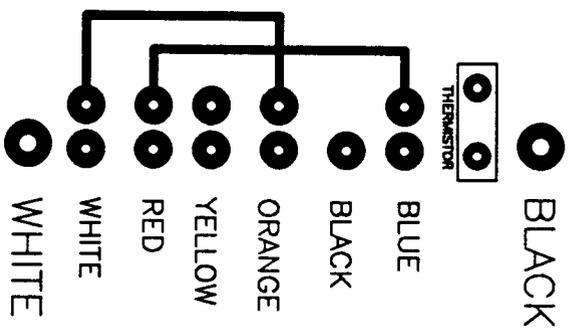




WIRED FOR 120V

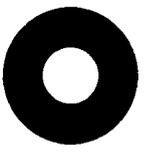
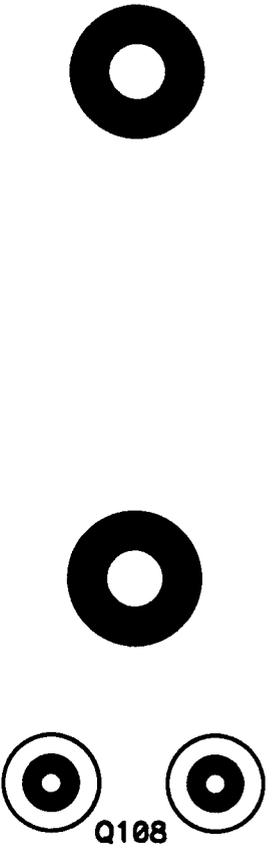
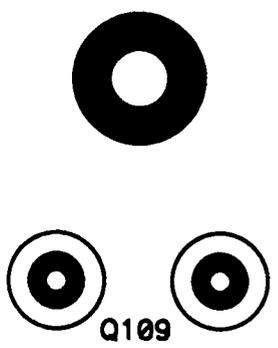
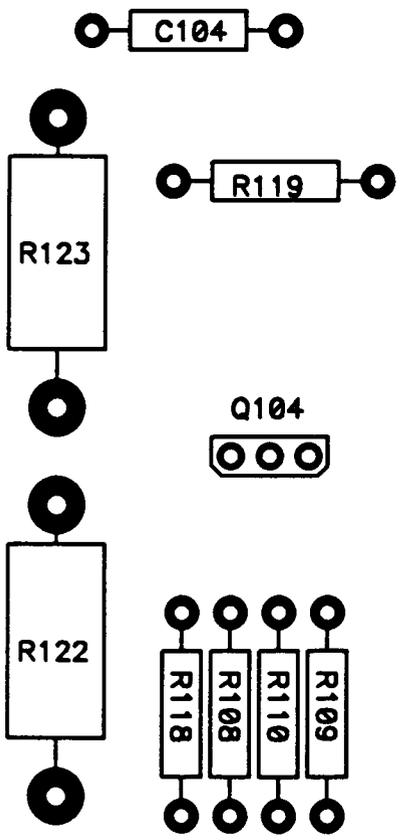
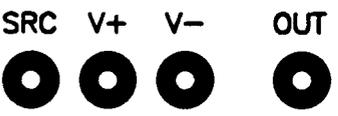
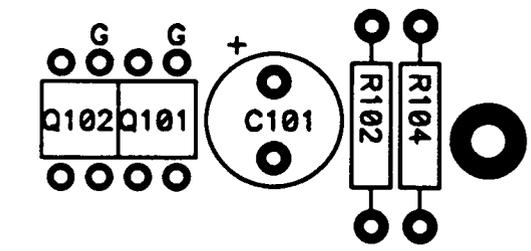
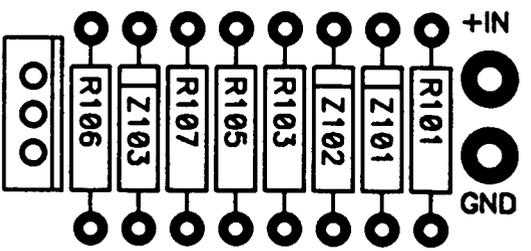


WIRED FOR 240V

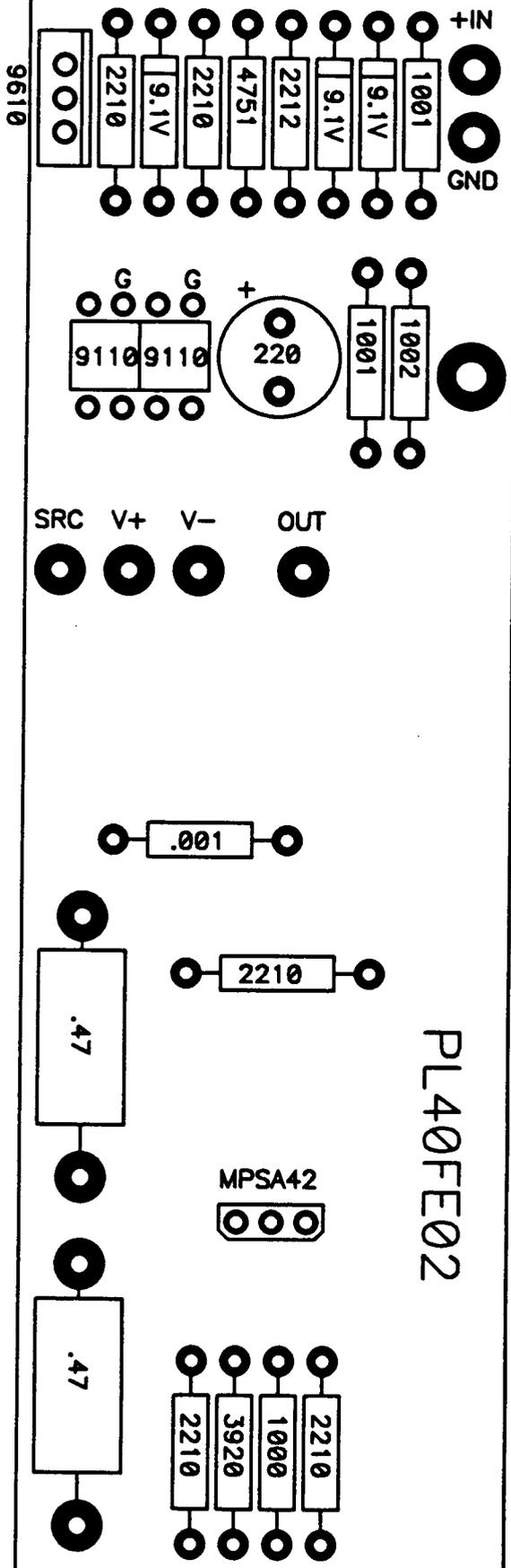


WIRED FOR 100V

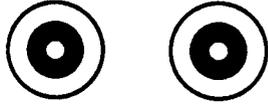
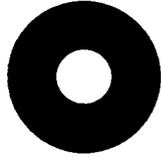
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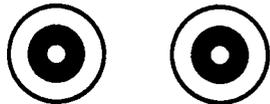
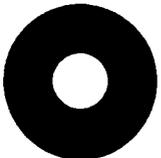
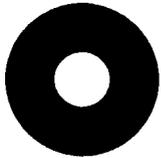
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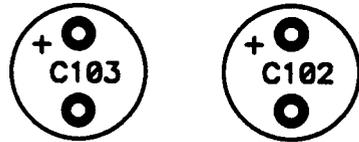
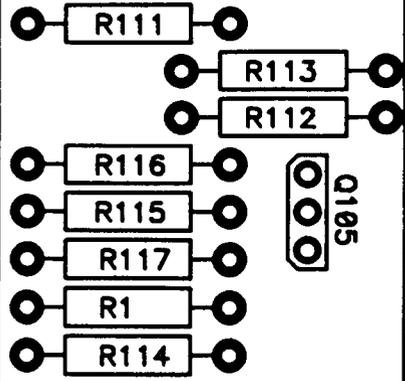
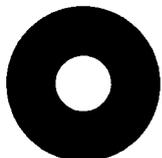
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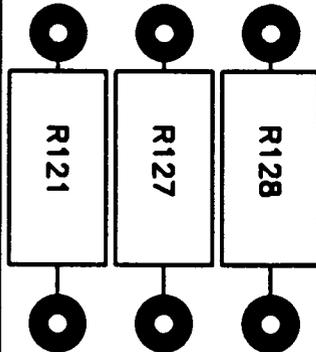
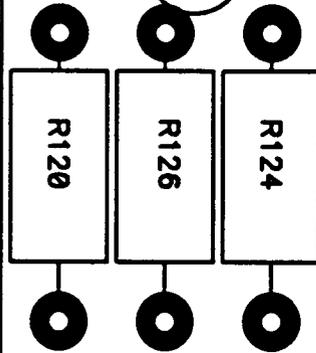
Q106



Q107



LED



PL400S02

