



X2 SERVICE MANUAL

REV 2,3

PASS LABORATORIES
24449 FORESTHILL RD.
FORESTHILL, CA 95631

TEL (530) 367-3690
FAX (530) 367-2193
www.passlabs.com

The Pass Labs X2 is a high performance audio preamplifier, intended for maximum performance in reproduction of music. It is a simple design, consisting of dual complementary input JFET transistors driving dual complementary MOSFET output transistors connected in the patented Super-Symmetry topology.

Figure 1 shows the block diagram of one channel of the preamplifier. There are three unbalanced inputs and one balanced input. The balanced input is converted to single-ended via a differential amplifier. The signal from all four inputs is presented to the Select and Tape Mon switches. The wiper of the Select switch attaches to the input volume control, and its wiper feeds one input of a balanced gain stage. The output of the balanced gain stage is the output of the preamp.

The balanced input and balanced output active stages of the circuitry are made of circuits UGS3 or UGS4. The UGS circuits are the subject of a different service manual, separate from this one.

Fig. 2 shows the schematic of Rev 2 of the balanced input circuit. Resistors 101, 102, 103, 105, 106 and 107 form the input and feedback circuits for the stage. R104 and 108 are used to control absolute DC offset of the circuit outputs.

The gain of the circuit is approximately unity. It accepts balanced differential inputs, and outputs a single-ended signal through the + output. The – output is grounded.

When using the preamplifier with a single-ended input, the negative input should be shorted to ground for best performance. This is accomplished by using shorting plug between pins 1 and 3 on the XLR input connector.

Fig 3 shows the schematic of Rev 3 of the balanced input circuit. R108 and R104 have been removed, C103, C104, C107 have been added.

Fig 4 shows the schematic of Rev 2 of the balanced output stage. It operates with a single-ended input, and the negative signal input is grounded. The gain of the circuit is approximately 12 dB.

Fig 4 shows the schematic of Rev 3 of the balanced output stage. It has added bypass and compensation capacitor.

The Relay switches shown in this schematic are controlled by the power supply and are used to mute the output on turn-on and when the supply voltage goes to low to regulate. A common problem which occurs in the X2 is when the preamp does not operate due to low line voltage. To fix this, either get a higher line voltage or remove R14 on the relay control circuit.

For best performance with single-ended outputs, short across the SE OUT jumper terminals next to the balanced output stage. The preamplifier will work well without this jumper, but will give better performance with single-ended outputs with this shorted. The preamplifier is shipped with the jumper open.

Fig 6 shows the power supply schematic to Rev 2 and 3.

The supply transformer each has dual primary windings which can be set up for 115 or 230 volts AC. These primary windings are shown in Fig 5 as parallel for 115 volts, but they may be wired in series on each transformer for 230 volts.

The power supply is rated down to approximately 100 volts AC and 200 volts AC before the supply unregulates.

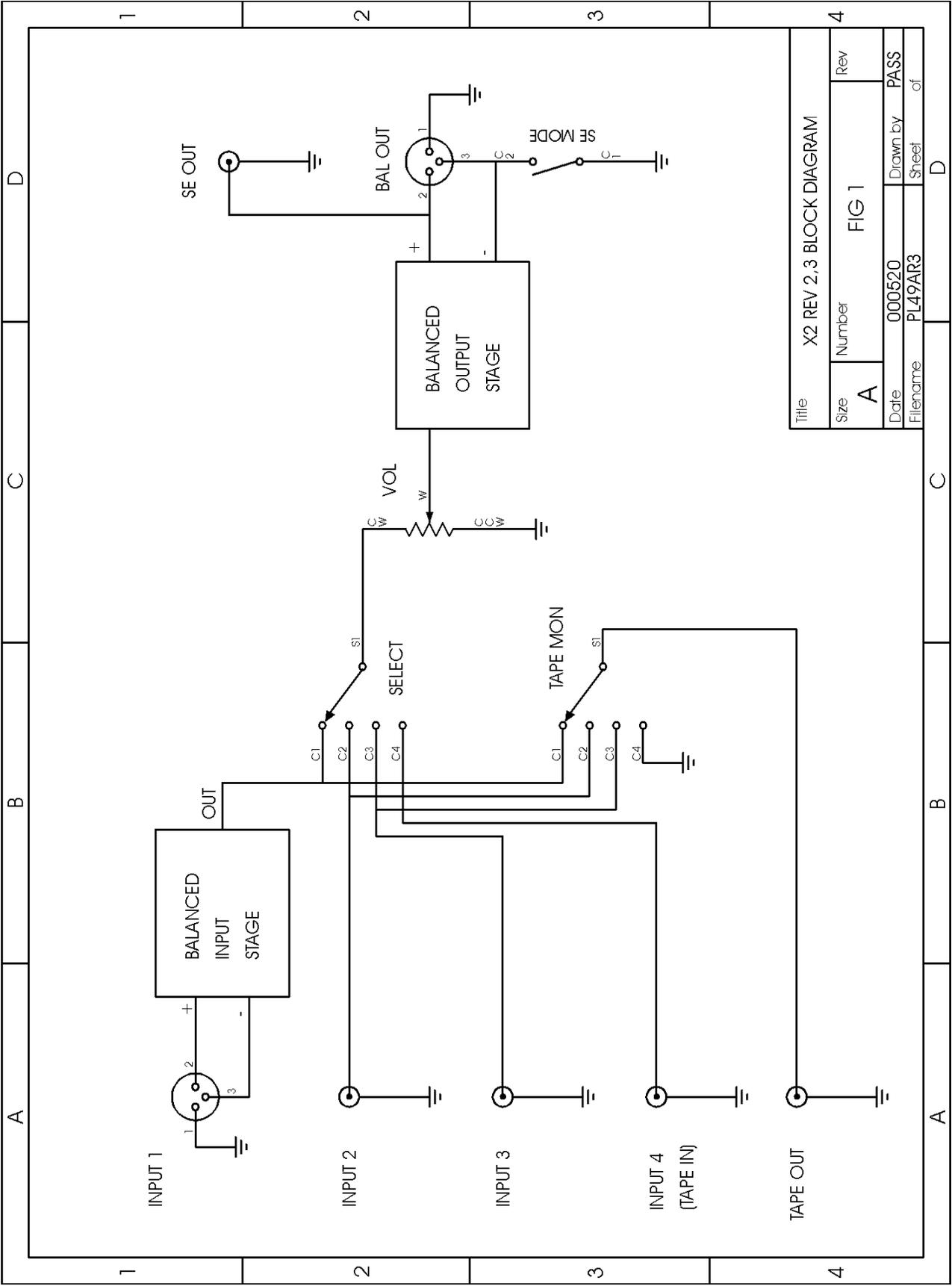
The positive supply is regulated to +33 volts by Zener diodes 1-4 and N channel MOSFET Q1. The negative supply is regulated to -33 volts by Zener diodes 5-8 and P channel MOSFET Q2.

The output muting relay is controlled by the circuit of Q3 and the surrounding components. Q3 conducts only when there is approximately 8 volts more unregulated voltage than unregulated output, insuring that the output relays will open only when adequate rail voltage exists for proper regulation.

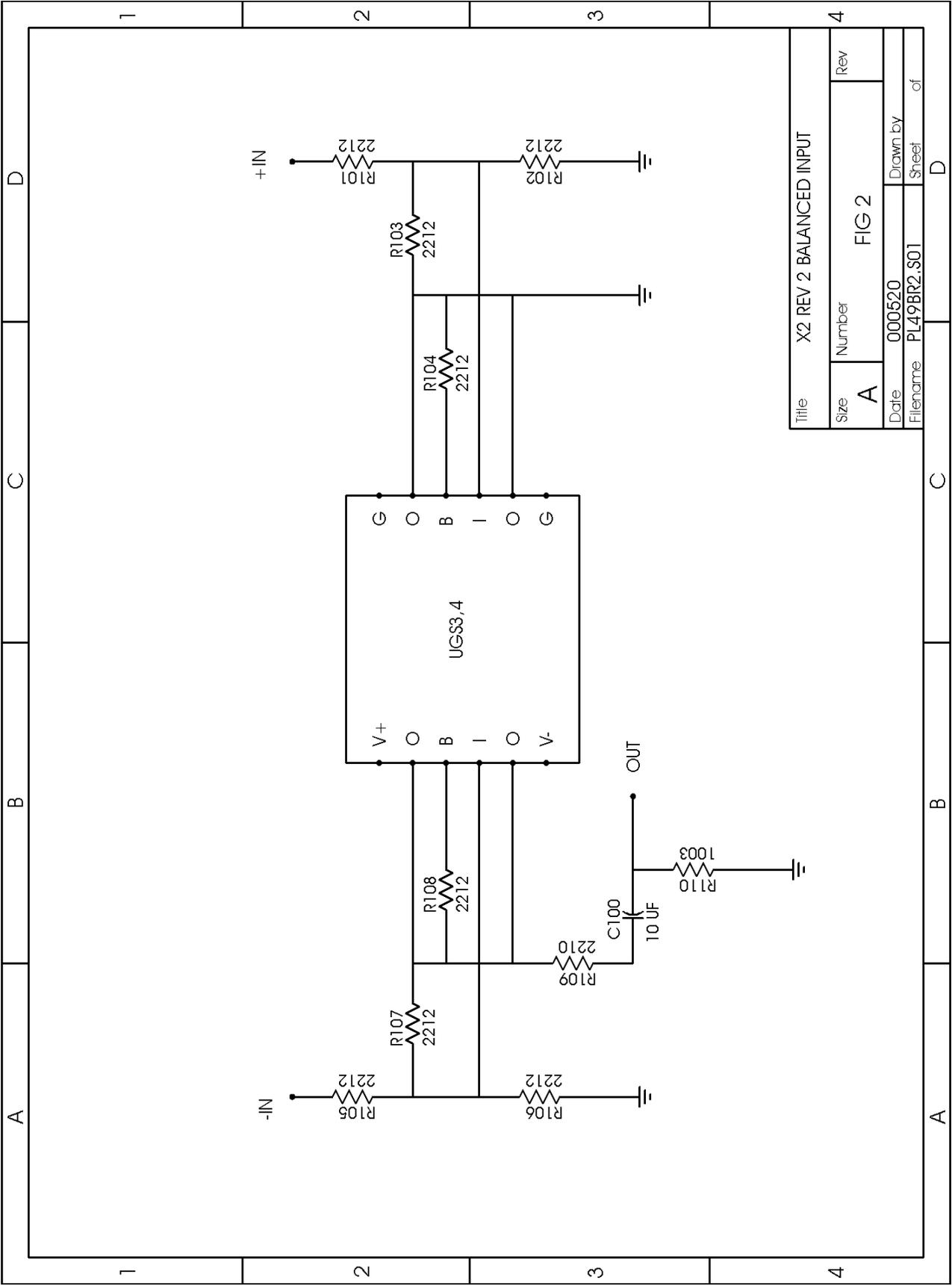
Fig 7 shows the detail of the wiring of the volume control. The volume control consists of a two pole selector switch with 23 positions which is wired with precision resistors to form an attenuating network for the input to the gain circuit.

Fig 8 shows the board layout for Rev 2. Components 1-99 are power supply components. Components in the 100-199 range are the left channel circuits, 200-299 are the right channel circuits.

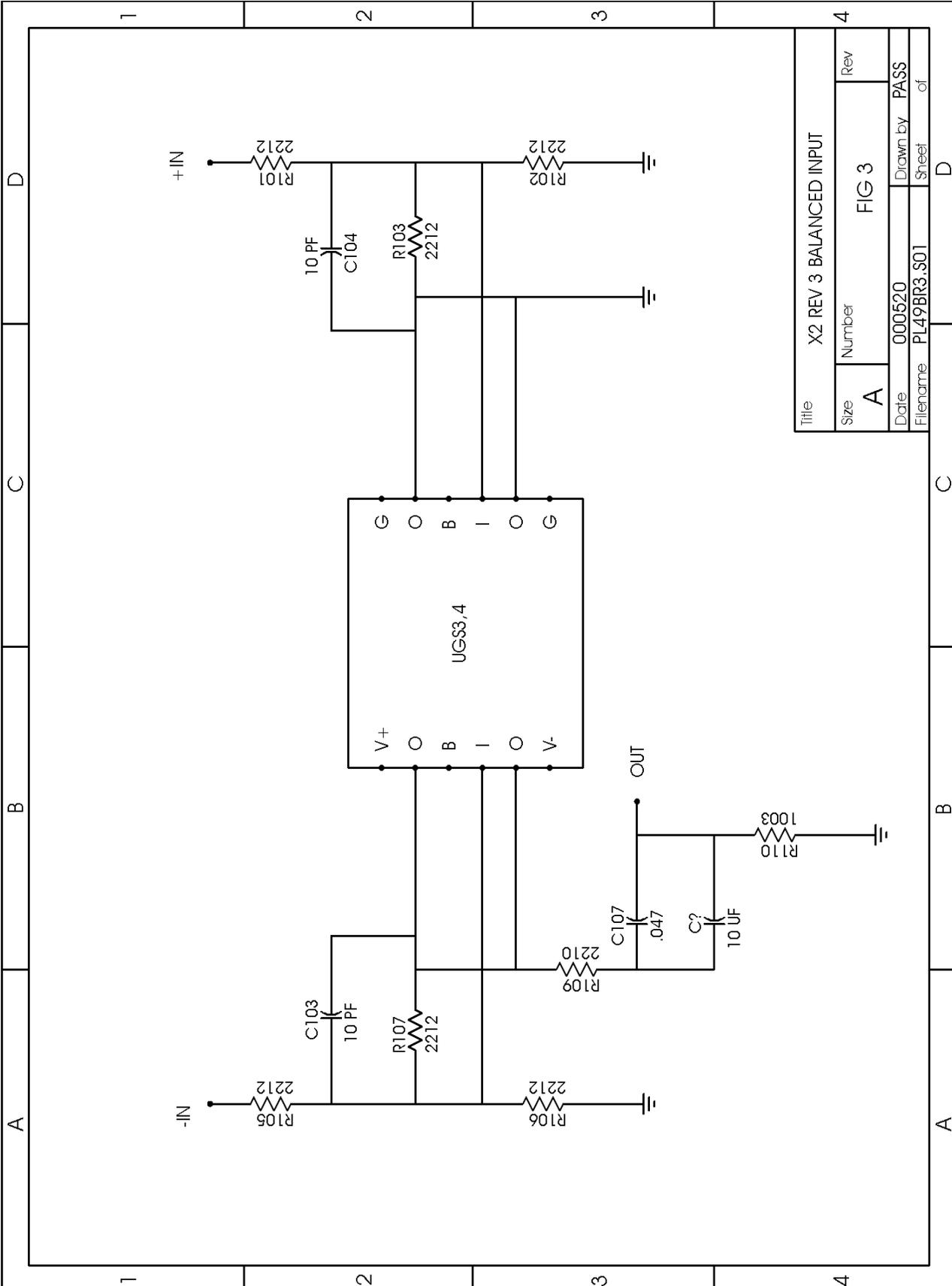
Fig 9 shows the board layout for Rev 3, where the same numbering scheme applies.



Title		X2 REV 2,3 BLOCK DIAGRAM	
Size	Number	FIG 1	
Date	000520	Drawn by	PASS
Filename	PL49AR3	Sheet	of



Title		X2 REV 2 BALANCED INPUT	
Size	Number	Rev	
A	FIG 2		
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		1	4



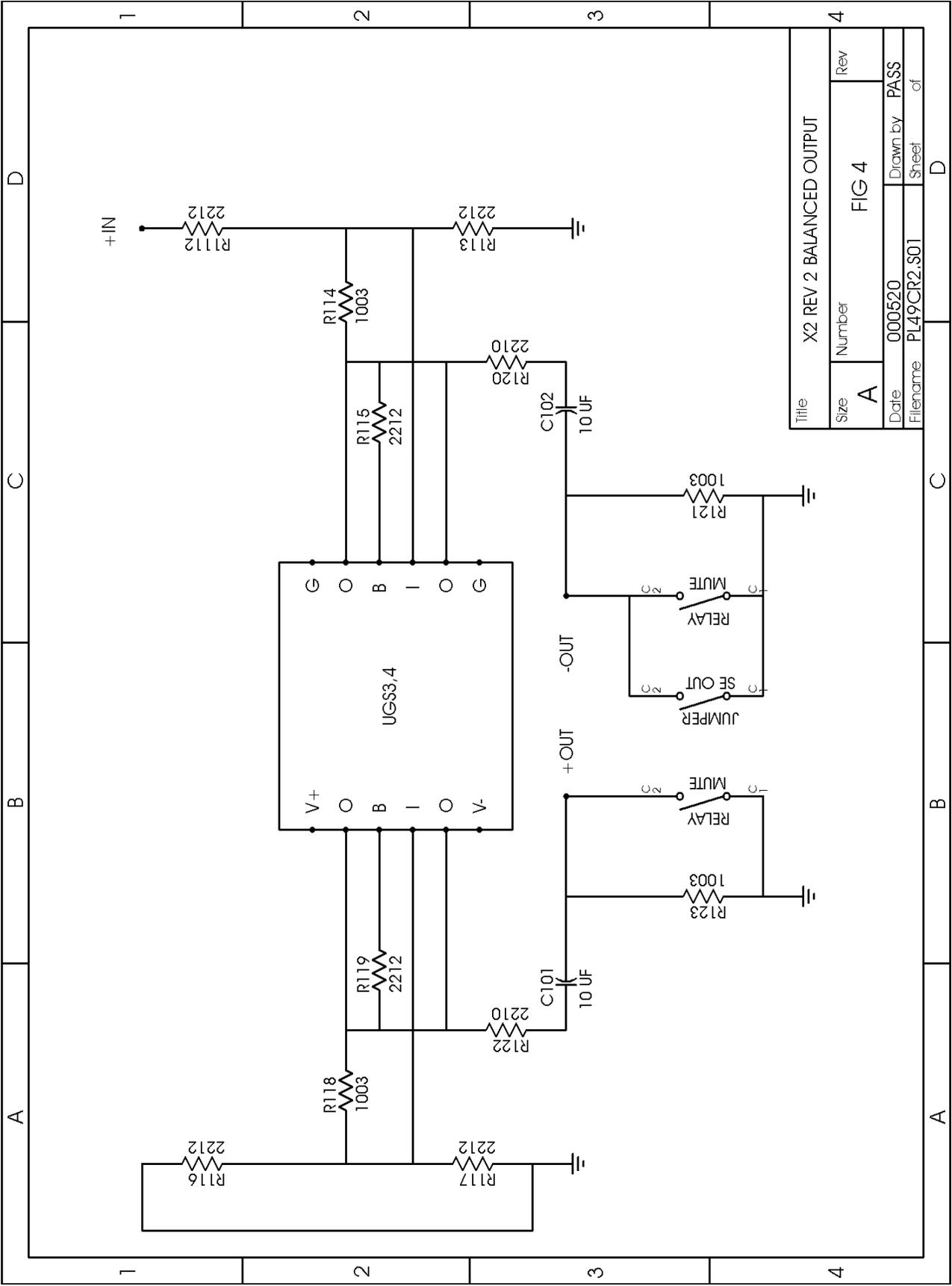
Title		X2 REV 3 BALANCED INPUT	
Size	Number	Rev	
A	FIG 3		
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A B C D

1 2 3 4

A B C D

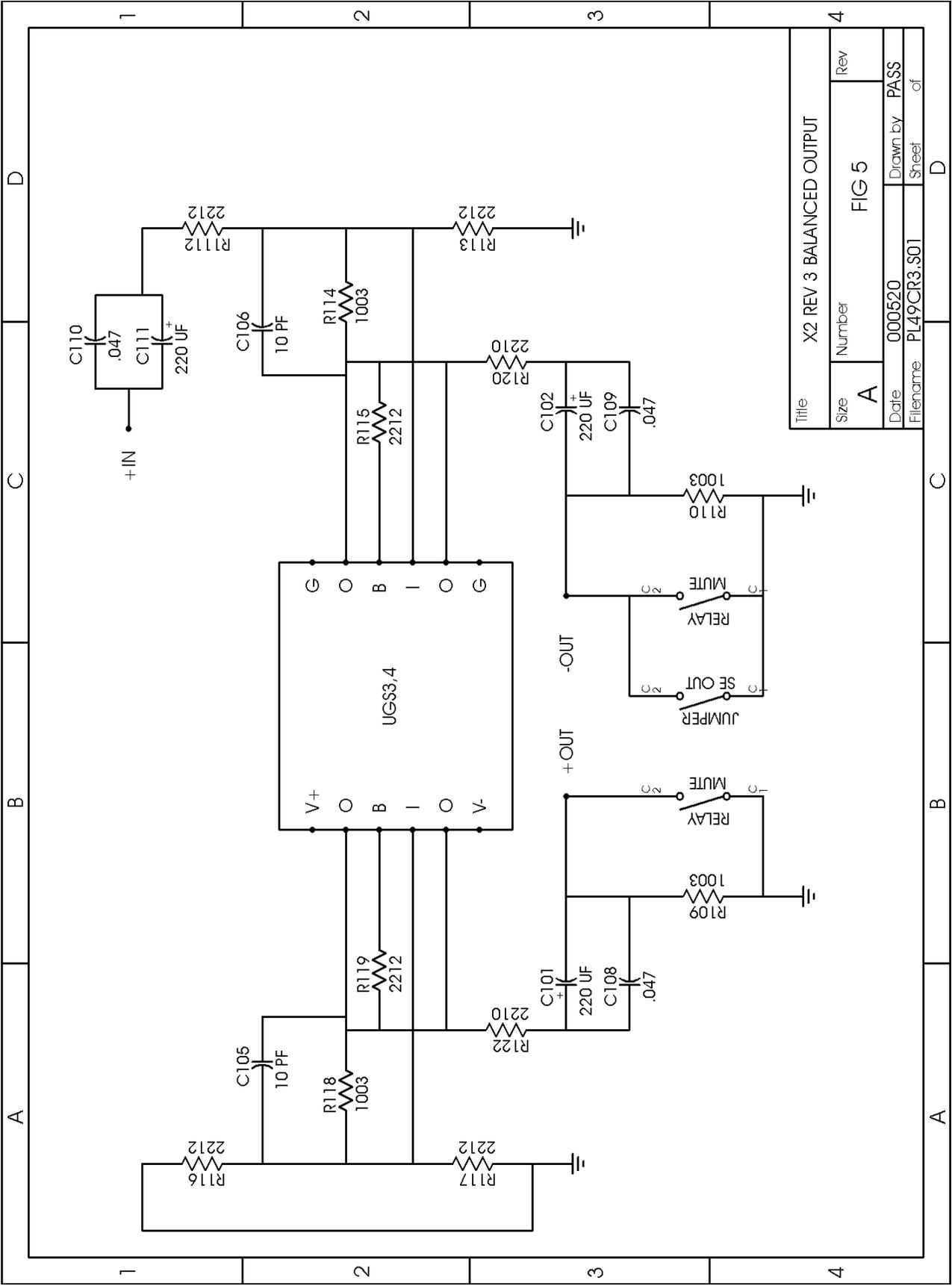
1 2 3 4



Title		X2 REV 2 BALANCED OUTPUT	
Size	Number	Rev	
A	FIG 4		
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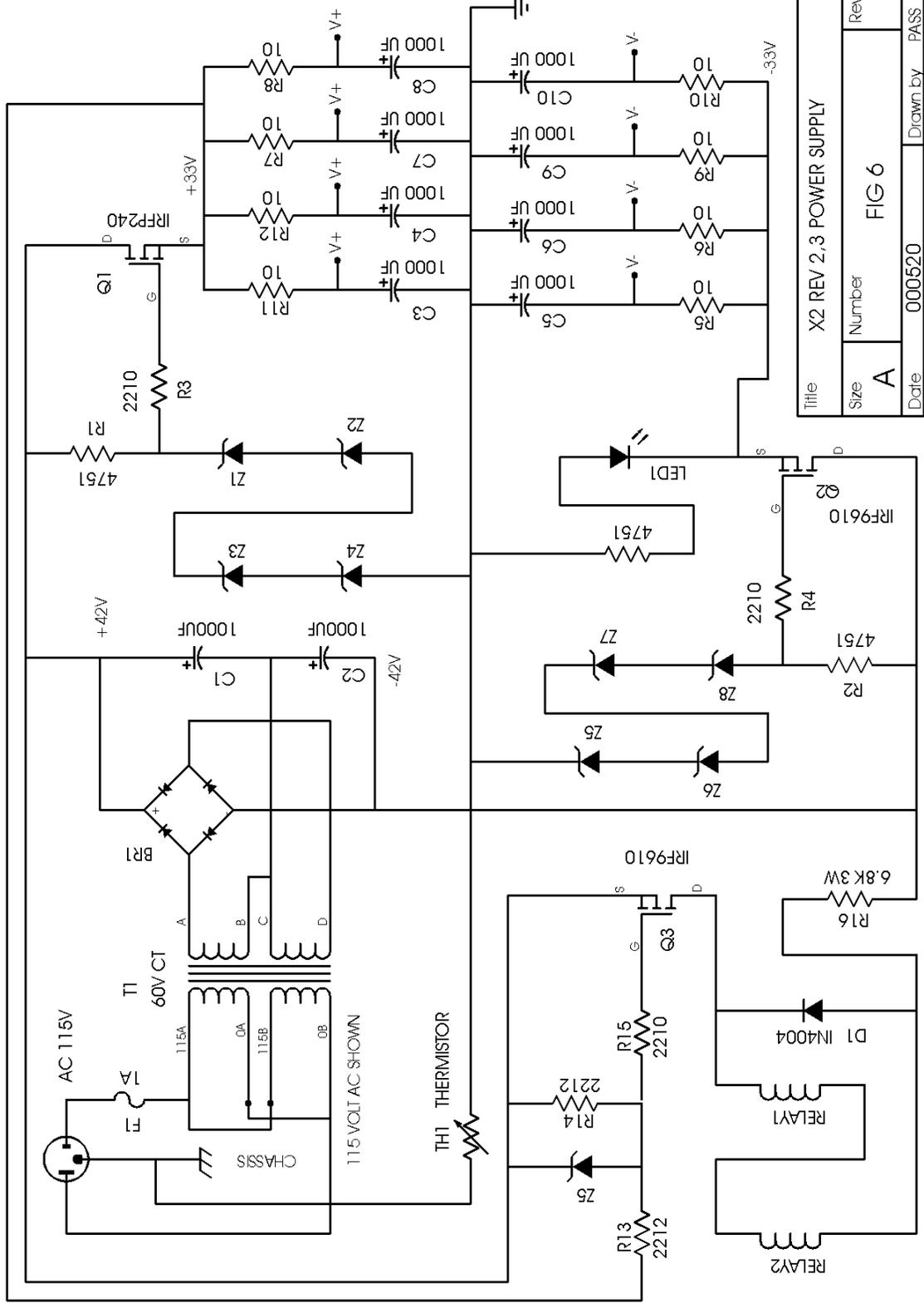
A B C D

1 2 3 4

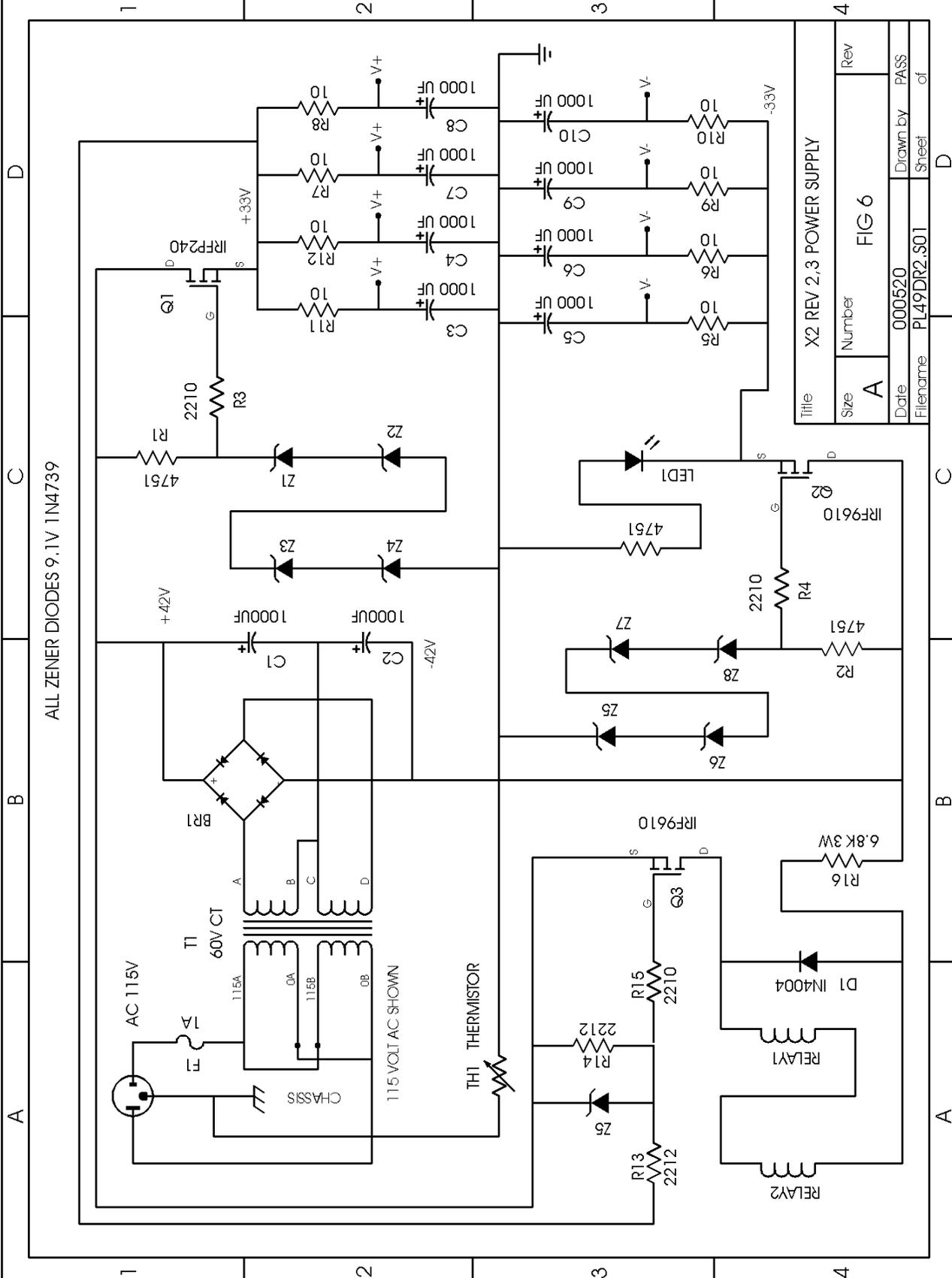


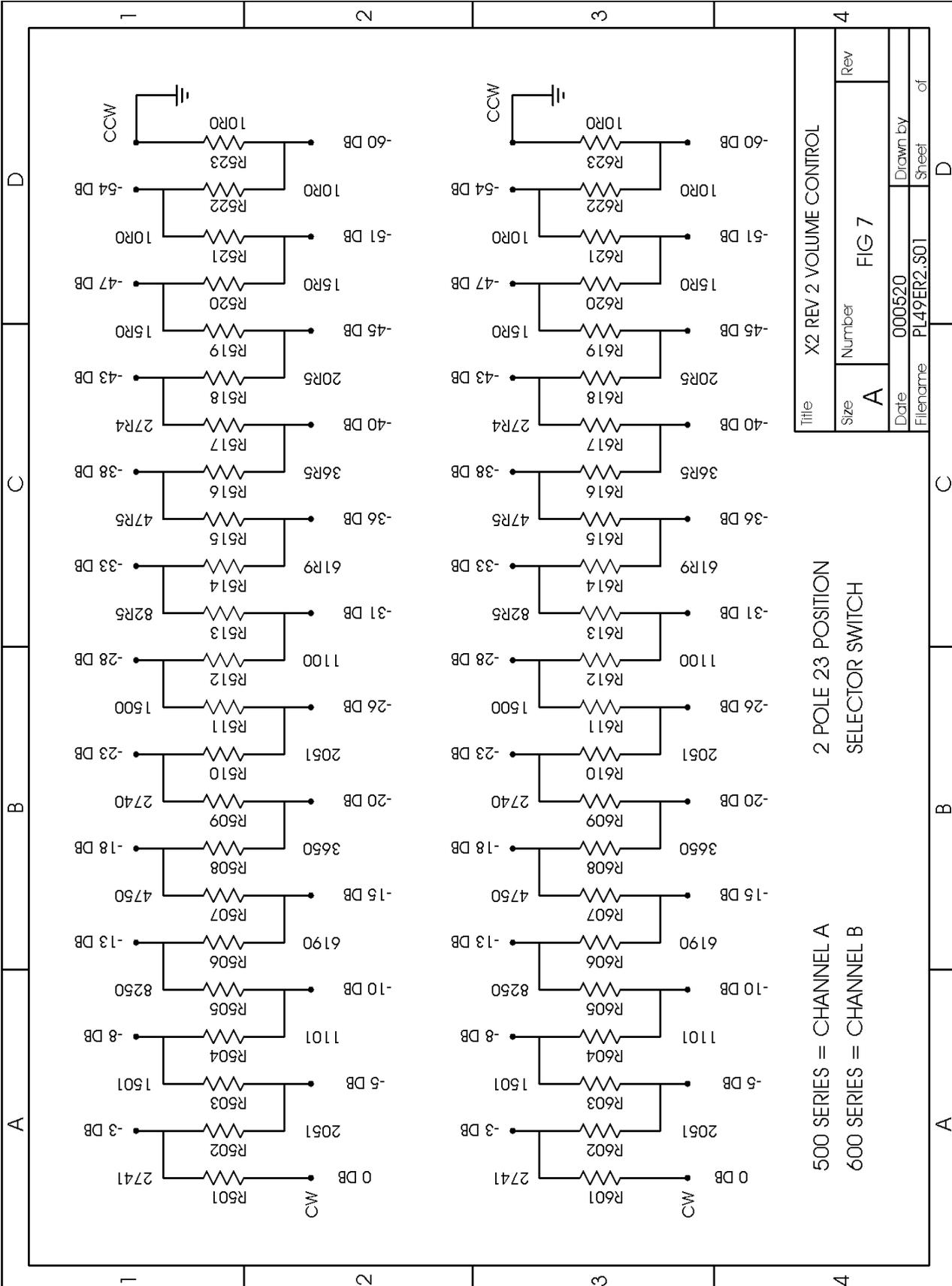
Title		X2 REV 3 BALANCED OUTPUT	
Size	Number	Rev	
A	FIG 5		
Date	000520	Drawn by PASS	
Filename	PL49CR3.S01	Sheet	of

ALL ZENER DIODES 9.1V 1N4739



Title		X2 REV 2,3 POWER SUPPLY	
Size	Number	FIG 6	
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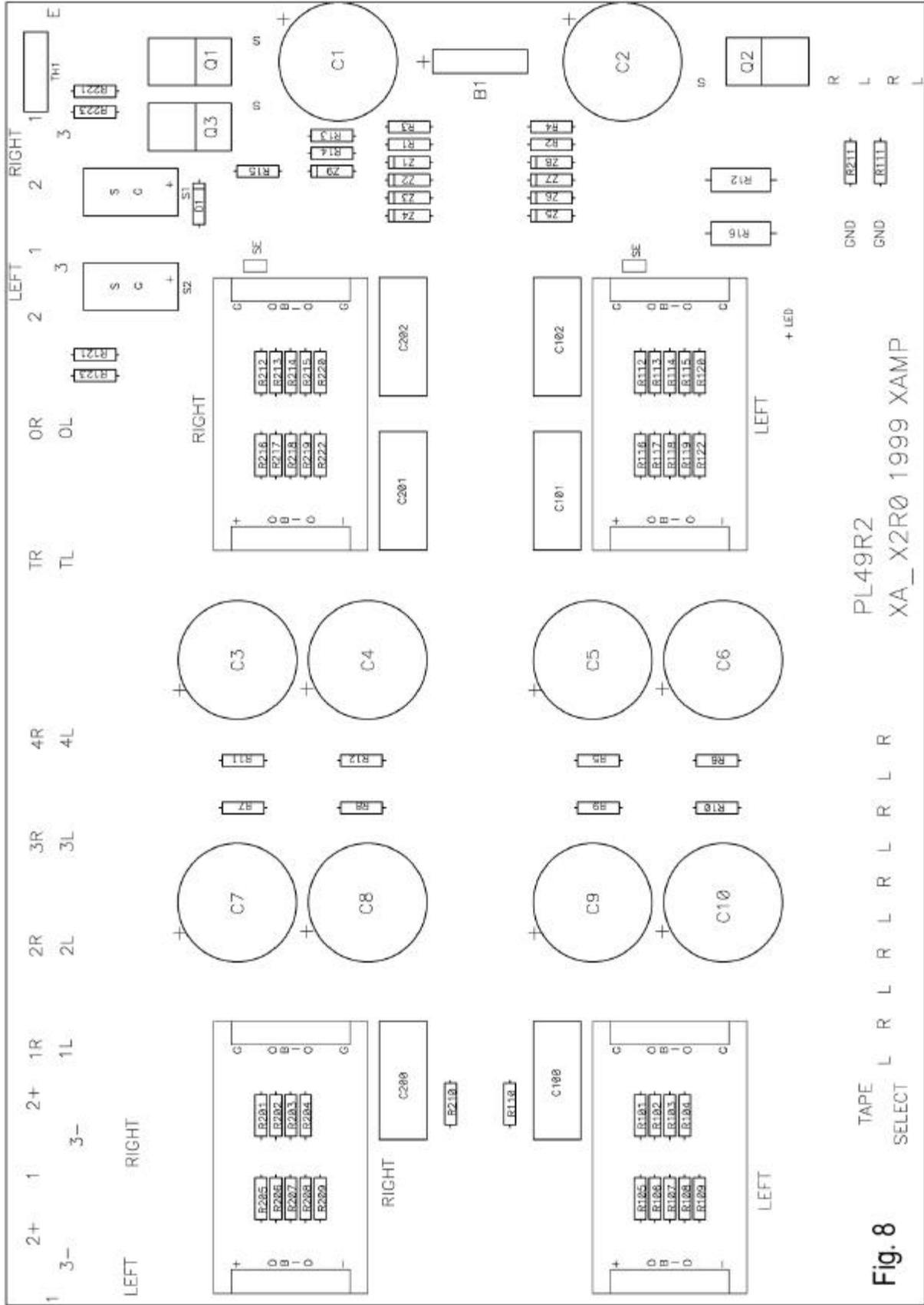




Title		X2 REV 2 VOLUME CONTROL	
Size	Number	Rev	
A	FIG 7		
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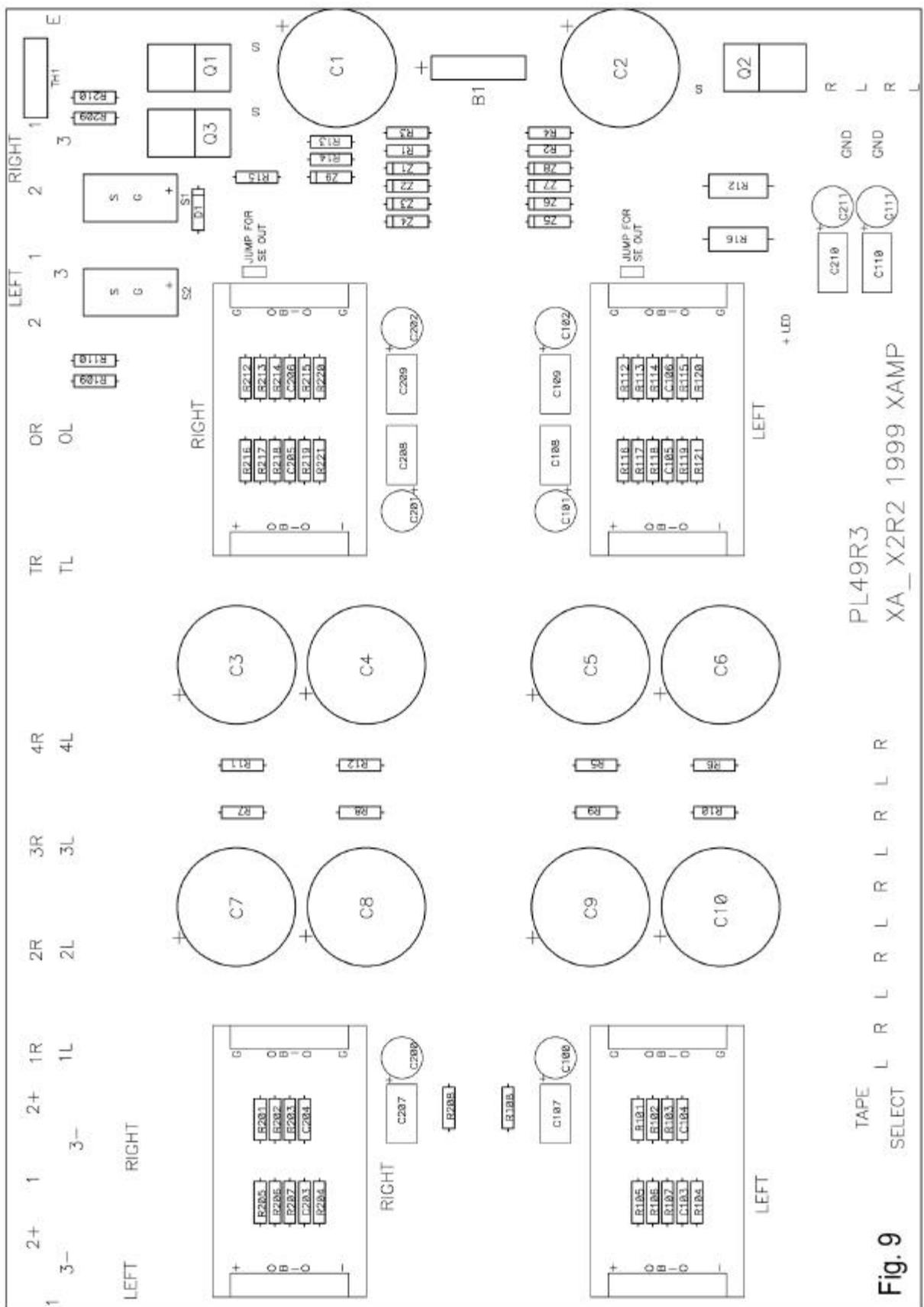
2 POLE 23 POSITION
SELECTOR SWITCH

500 SERIES = CHANNEL A
600 SERIES = CHANNEL B



PL49R2
XA_X2R0 1999 XAMP

Fig. 8



PL49R3
XA_X2R2 1999 XAMP

TAPE SELECT L R L R L R L R L R L R

Fig. 9