

## MODEL 213 KIT INSTRUCTIONS

Read Method of Assembly Instructions completely before starting on kit to become familiar with the general procedure. Then when actually starting the construction, check off each operation as it is performed to make sure nothing was omitted.

Unpack the kit and check each item against the parts list to familiarize yourself with the parts.

Make sure that you are using solder that is plainly marked "Rosin Core."

Any other type of solder, paste flux or acid will cause corrosion and short circuits. The use of any such solder paste flux or acid will void all guarantees for this kit.

Since this instrument is very compact, it is very important that the soldering be very neat. Otherwise loose bits of wire or solder may cause shorts and inoperation or damage to the instrument. Check very carefully for this.

### TOOLS REQUIRED

- 1 - Pair of wire cutters
- 1 - Pair of long nose pliers
- 1 - Screw driver
- 1 - Soldering iron

In the wiring instructions, connections followed by the letter (S) are to be soldered. Connections followed by the letters (NS) are not to be soldered as yet as there are more wires to be connected to the same point.

In order to assemble this kit in the most efficient manner, we suggest that you follow the instructions given below and check off each operation as it is performed to make sure nothing was omitted.

### METHOD OF ASSEMBLY

#### REFER TO DRAWING #1

1. Mount the Octal, Octal, 10 Pin, 7 Pin, Nuvistor (5 pin), Compactron (12 pin), and Novar (9 pin) sockets in the positions shown on Drawing #1 using 2-4/40 screws and nuts for each socket. Make sure the socket keyways are in the positions shown.
2. Mount the 2-double pole double throw slide switches S10 and S13 using 2-4/40 screws.
3. Mount the 12- single pole double throw slide switches S1, S2, S3, S4, S5, S6, S7, S8, S9, S11, S12, and S14 using 2-4/40 screws.
4. Mount the control to the panel in the position shown on Drawing #1
5. Mount selector switches A and B to panel using a 3/8" lock washer under the panel and a 3/8" locknut over the panel to fasten switches to panel. Make sure the long clips on each switch are in the positions shown on Drawing #1.
6. Mount the meter to the panel using a U clamp as shown. Fasten the 3 terminal mounting strip under the lower mounting nut in the position shown on Drawing #1. Mount the 5 lug terminal mounting strip under the upper mounting nut in the position shown. Use 2-6/32 nuts to fasten clamp to meter.
7. Mount the transformer to the panel in the position shown using

## CORRECTION TO KIT INSTRUCTIONS

With reference to Paragraph 5 disregard the mention of the long clips on the switches. Mount the switches so that when the set screws on the knobs are tightened against the flats on the shafts, the pointers of the knobs point to the No. 1 position of the markings on the front of the panel, when the switches are in the extreme counter clockwise position.

The meter supplied with this kit is different from the type shown in the kit instructions. It uses a round cover instead of a bracket to mount the meter to the panel. To assemble the meter to the panel proceed as follows:

1. Remove the 2 nuts in the rear of the meter and slip off the meter cover.
2. Insert meter into the meter hole of the panel and replace the meter cover which was removed.
3. Tighten meter to panel by replacing the 2 nuts which were removed. Be careful not to over-tighten as this may cause the meter to stick. The 5 lug terminal strip should be placed under the left nut and the 3 lug terminal strip under the right nut before the nuts are tightened.

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- 2-6/32 screws and nuts to tighten.
8. Insert the 2 rubber grommets into the panel holes provided for them. The third grommet directly over the Nuvisitor socket is used on the Model 213P only.
- REFER TO DRAWING #2
9. Connect a wire from " + " lug on meter (NS) to lug #1 on control (NS).
10. Connect a wire from lug #1 on control (S) to lug #2 on switch S10 (S).
11. Connect a wire from lug #4 on switch S13 (S) to lug #1 on switch S13 (NS).
12. Connect a wire from lug #1 on switch S13 (S) to lug #1 on switch A (S).
13. Connect a wire from lug #2 on switch S13 (S) to lug #3 on switch S14 (S).
14. Connect a wire from lug #3 on switch S13 (NS) to lug #4 on 5 lug terminal strip (NS).
15. Connect a wire from lug #1 on Nuvisitor socket (S) to lug #1 on Novar (9 pin) socket (NS).
16. Connect a wire from lug #1 on Novar socket (S) to lug #1 on Compactron (12 pin) socket (NS).
17. Connect a wire from lug #1 on Compactron socket (S) to lug #1 on 10 pin socket (NS).
18. Connect a wire from lug #1 on 10 pin socket (S) to lug #1 on loctal socket (NS).
19. Connect a wire from lug #1 on loctal socket (S) to lug #1 on octal socket (NS).
20. Connect a wire from lug #1 on 7 pin socket (S) to lug #1 on octal socket (NS).
21. Connect a wire from lug #1 on octal socket (S) to lug #2 on switch S1 (S).
22. Connect a wire from lug #2 on selector switch B (S) to lug #1 on switch S1 (S).
- REFER TO DRAWING #3
23. Connect a wire from lug #4 on 5 lug terminal strip (NS) to lug #2 on control (S).
24. Connect a wire from lug #3 on switch S13 (S) to lug #6 on switch S13 (S).
25. Connect a wire from lug #5 on switch S13 (S) to lug #1 on switch B (S).
26. Connect a wire from lug #3 on switch B (S) to lug #1 on switch S2 (S).
27. Connect a wire from lug #2 on 5 pin socket (S) to lug #2 on 9 pin socket (NS).
28. Connect a wire from lug #2 on 9 pin socket (S) to lug #2 on 12 pin socket (NS).
29. Connect a wire from lug #2 on 12 pin socket (S) to lug #2 on 10 pin socket (NS).
30. Connect a wire from lug #2 on 10 pin socket (S) to lug #2 on loctal socket (NS).
31. Connect a wire from lug #2 on loctal socket (S) to lug #2 on octal socket (NS).
32. Connect a wire from lug #2 on 7 pin socket (S) to lug #2 on octal socket (NS).
33. Connect a wire from lug #2 on octal socket (S) to lug #2 on switch S2 (S).
- REFER TO DRAWING #4
34. Connect a wire from lug #2 on 3 lug terminal strip (NS) to lug #1

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- on switch S14 (S).
- 35. Connect a wire from lug #2 on switch S14 (S) to lug #3 on switch S4 (NS).
- 36. Connect a wire from lug #4 on switch B (S) to lug #1 on switch S3 (S).
- 37. Connect a wire from lug #2 on switch S12 (S) to lug #12 on 12 pin socket (S).
- 38. Connect a wire from lug #2 on switch S11 (S) to lug #11 on 12 pin socket (S).
- 39. Connect a wire from lug #3 on 9 pin socket (S) to lug #3 on 12 pin socket (NS).
- 40. Connect a wire from lug #3 on 12 pin socket (S) to lug #3 on 10 pin socket (NS).
- 41. Connect a wire from lug #3 on 10 pin socket (S) to lug #3 on loctal socket (NS).
- 42. Connect a wire from lug #3 on loctal socket (S) to lug #3 on octal socket (NS).
- 43. Connect a wire from lug #3 on 7 pin socket (S) to lug #3 on octal socket (NS).
- 44. Connect a wire from lug #3 on octal socket (S) to lug #2 on switch S3 (S).
- REFER TO DRAWING #5
- 45. Connect a 1.5 ohm resistor from lug 2 on switch A (S) to lug #3 on switch A (NS).
- 46. Connect red wire from transformer to lug #8 on switch A (NS).
- 47. Connect blue wire from transformer to lug #7 on switch A (NS).
- 48. Connect a bare wire from lug #1 on switch S12 (S) to lug #1 on switch S11 (NS).
- 49. Connect a wire from lug #1 on switch S11 (S) to lug #12 on switch B (NS).
- 50. Connect a wire from lug #5 on switch B (S) to lug #1 on switch S4 (S).
- 51. Connect a wire from lug #4 on 5 pin socket (S) to lug #4 on 9 pin socket (NS).
- 52. Connect a wire from lug #4 on 9 pin socket (S) to lug #4 on 12 pin socket (NS).
- 53. Connect a wire from lug #4 on 12 pin socket (S) to lug #4 on 10 pin socket (NS).
- 54. Connect a wire from lug #4 on 10 pin socket (S) to lug #4 on loctal socket (NS).
- 55. Connect a wire from lug #4 on loctal socket (S) to lug #4 on octal socket (NS).
- 56. Connect a wire from lug #4 on 7 pin socket (S) to lug #4 on octal socket (NS).
- 57. Connect a wire from lug #4 on octal socket (S) to lug #2 on switch S4 (S).
- REFER TO DRAWING #6
- 58. Connect green and tracer wire from transformer to lug #3 on A switch (S).
- 59. Connect grey wire from transformer to lug #12 on B switch (S).
- 60. Connect a wire from lug #6 on B switch (S) to lug #1 on switch S5 (S).
- 61. Connect a 1 meg resistor from lug #1 on 3 lug terminal strip (NS) to lug #2 on 3 lug terminal strip (NS).
- 62. Connect a wire from lug #5 on 5 pin socket (S) to lug #5 on 9 pin socket (NS).
- 63. Connect a wire from lug #5 on 9 pin socket (S) to lug #5 on 12 pin socket (NS).

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64. Connect a wire from lug #5 on 12 pin socket (S) to lug #5 on 10 pin socket (NS).
65. Connect a wire from lug #5 on 10 pin socket (S) to lug #5 on loctal socket (NS).
66. Connect a wire from lug #5 on loctal socket (S) to lug #5 on octal socket (NS).
67. Connect a wire from lug #5 on 7 pin socket (S) to lug #5 on octal socket (NS).
68. Connect a wire from lug #5 on octal socket (S) to lug #2 on switch S5 (S).
69. Connect a wire from lug #10 on B switch (S) to lug #1 on switch S9 (S).
70. Connect a wire from lug #2 on switch S9 (S) to lug #9 on 9 pin socket (NS).
71. Connect a wire from lug #9 on 9 pin socket (S) to lug #9 on 12 pin socket (NS).
72. Connect a wire from lug #9 on 12 pin socket (S) to lug #9 on 10 pin socket (S).
73. REFER TO DRAWING #7  
Connect the green wire from transformer to lug #5 on A switch (S).
74. Connect yellow wire from transformer to lug #4 on A switch (S).
75. Connect a wire from lug #11 on B switch (S) to lug #4 on S10 switch (S).
76. Connect a wire from lug #5 on S10 switch (S) to lug #10 on 12 pin socket (NS).
77. Connect a wire from lug #10 on 12 pin socket (S) to lug #10 on 10 pin socket (NS).
78. Observe proper polarity and connect 50 mfd condenser from "+ " of meter (S), to "-" of meter (NS).
79. Insert neon bulb into grommet shown and connect the leads to lug #2 (S) on 3 lug terminal strip and to lug #1 (NS) as shown.
80. Connect wire from lug #6 on 9 pin socket (S) to lug #6 on 12 pin socket (NS).
81. Connect wire from lug #6 on 12 pin socket (S) to lug #6 on 10 pin socket (NS).
82. Connect wire from lug #6 on 10 pin socket (S) to lug #6 on loctal socket (NS).
83. Connect wire from lug #6 on loctal socket (S) to lug #6 on octal socket (NS).
84. Connect wire from lug #6 on 7 pin socket (S) to lug #6 on octal socket (NS).
85. Connect wire from lug #6 on octal socket (S) to lug #2 on switch S6 (S).
86. Connect wire from lug #7 on B switch (S) to lug #1 on switch S6 (S).
87. REFER TO DRAWING #8  
Connect wire from lug #8 on B switch (S) to lug #1 on switch S7 (S).
88. Connect wire from lug #9 on B switch (S) to lug #1 on switch S8 (S).
89. Connect red wire and tracer from transformer to lug #6 on switch A (S).
90. Connect wire from #2 lug on switch S8 (S) to lug #8 on 9 pin socket (NS).
91. Connect wire from lug #8 on 9 pin socket (S) to lug #8 on 12 pin socket (NS).
92. Connect wire from lug #8 on 5 pin socket (S) to lug #8 on 12

- pin socket (NS).
93. Connect wire from lug #8 on 12 pin socket (S) to lug #8 on 10 pin socket (NS).
  94. Connect wire from lug #8 on 10 pin socket (S) to lug #8 on loctal socket (NS).
  95. Connect wire from lug #8 on loctal socket (S) to lug #8 on octal socket (S).
  96. Connect wire from lug #7 on 9 pin socket (S) to lug #7 on 12 pin socket (NS).
  97. Connect wire from lug #7 on 12 pin socket (S) to lug #7 on 10 pin socket (NS).
  98. Connect wire from lug #7 on 10 pin socket (S) to lug #7 on loctal socket (NS).
  99. Connect wire from lug #7 on loctal socket (S) to lug #7 on octal socket (NS).
  100. Connect wire from lug #7 on 7 pin miniature (S) to lug #7 on octal socket (NS).
  101. Connect wire from lug #7 on octal socket (S) to lug #2 on switch S7 (S).
  102. REFER TO DRAWING #9  
Use bare wire and connect lug #3 on switch S1 (S) to lug #3 on switch S2 (S) to lug #3 on switch S3 (S) to lug #3 on switch S4 (S) to lug #3 on switch S5 (S) to lug #3 on switch S6 (S) to lug #3 on switch S7 (S) to lug #3 on switch S8 (S) to lug #3 on switch S9 (S). Put a piece of spaghetti over the bare wire and connect to lug #6 on switch S10 (S). Put another piece of spaghetti over the bare wire and connect to lug #3 on switch S11 (S) and then to lug #3 on switch S12 (S).
  103. Put spaghetti over the pigtails of 1.2K resistor and connect it from lug #8 on switch A (NS) to lug #3 on switch S10 (S).
  104. Put spaghetti over the pigtails of 270 ohm resistor and connect it from lug #1 on switch S10 (S) to lug #7 on switch A (S).
  105. Connect .02 mfd condenser from lug #8 on switch A (S) to lug #1 on 3 lug terminal strip (S).
  106. Connect variable resistor from lug #4 on 5 lug terminal strip (S) to " - " meter lug (S).
  107. Connect one black wire from transformer to lug #1 on 5 lug terminal strip (NS).
  108. Connect other black wire from transformer to lug #2 on 5 lug terminal strip (NS).
  109. Insert grid cap lead through grommet shown, tie a knot in it, and solder free end to lug #10 on 10 pin socket (S).
  110. For portable model insert line cord through grommet in panel and for the open face model insert line cord through hole in case. Knot it to prevent it from pulling back. Connect and solder line cord to lug 1 and 2 on 5 lug terminal strip.
  111. Turn the two selector switches to the extreme counter clockwise position and mount the two bar knobs so that the pointers face toward "a" and "1" positions on the selector switches.
  112. Turn the control to extreme clockwise position and mount the bar knob so that it points towards "0".

#### CHECKING AND ADJUSTMENT

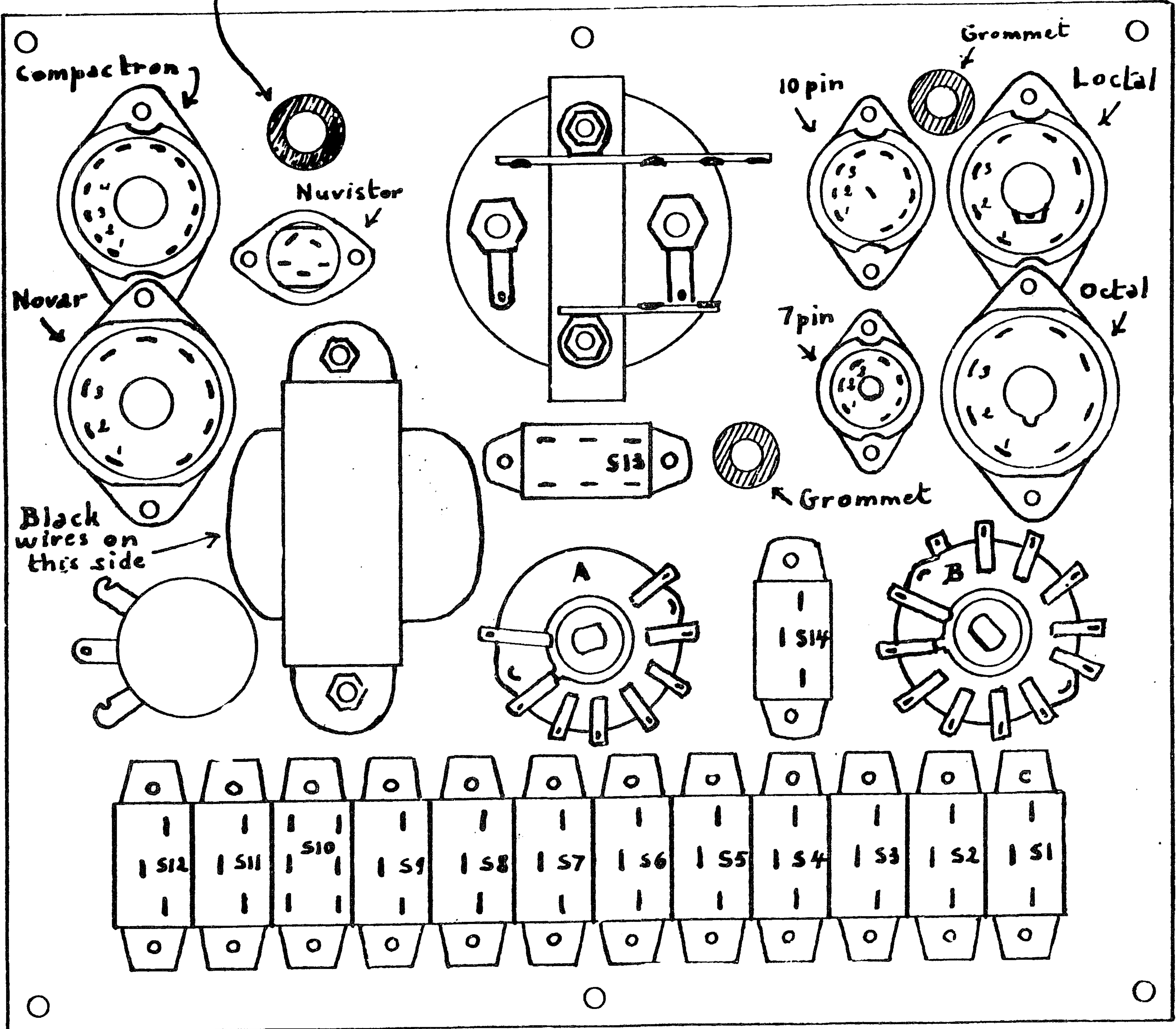
1. Double check all your wiring and connections to make sure they are right and that there are no unsoldered or poorly soldered joints. Remove any excess solder or loose bits of wire or solder.
2. Plug line cord into 105-130 volt 60 cycle AC outlet.

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3. Set the QUALITY-SHORT slide switch to "SHORT" position. Take a piece of wire or test lead and connect it temporarily across pins 1 and 3 of the octal socket. Press #1 or #3 slide switch to "P" position. The neon bulb should glow. If it does not, recheck wiring for "SHORT" position with wiring diagram. If no error is found try replacing the NE2 neon bulb.
4. Set the QUALITY-SHORT slide switch to "QUALITY" position. Take a tube that you are certain is a good tube. Set the switches for the quality check of the tube as per operating instructions. Adjust the meter reading to 36 on the 0-50 scale by inserting a screw driver into the variable resistor and adjusting it until the meter reads 36. This completes the adjustment.

Grommet USED on 213P only

Drawing # 1



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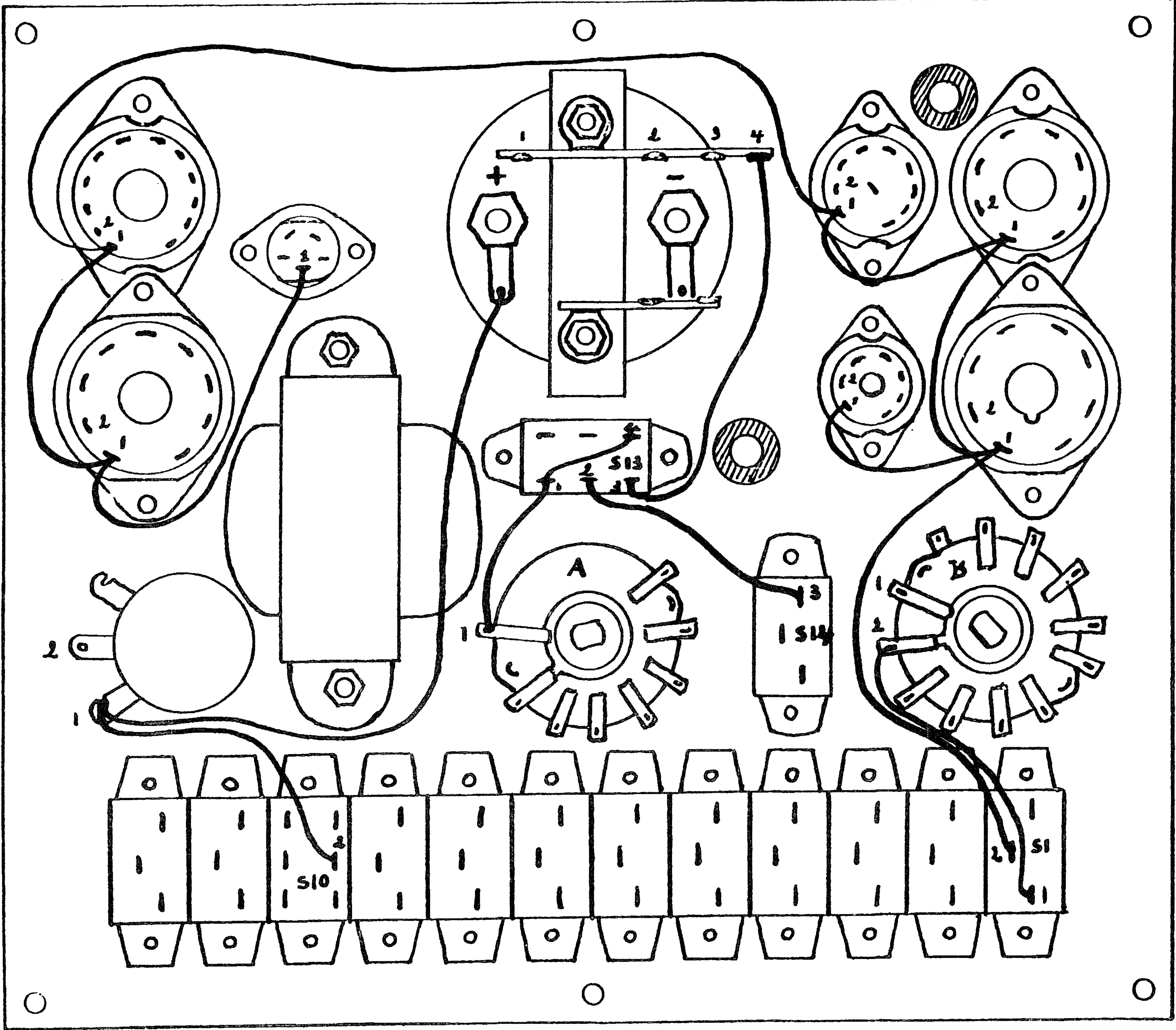
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TITLE Rear View of Model 213 Panel

COMPANY Electronic Measurements Corp.

Drawing # 2



TITLE

Rear View of Model 213 Panel

COMPANY

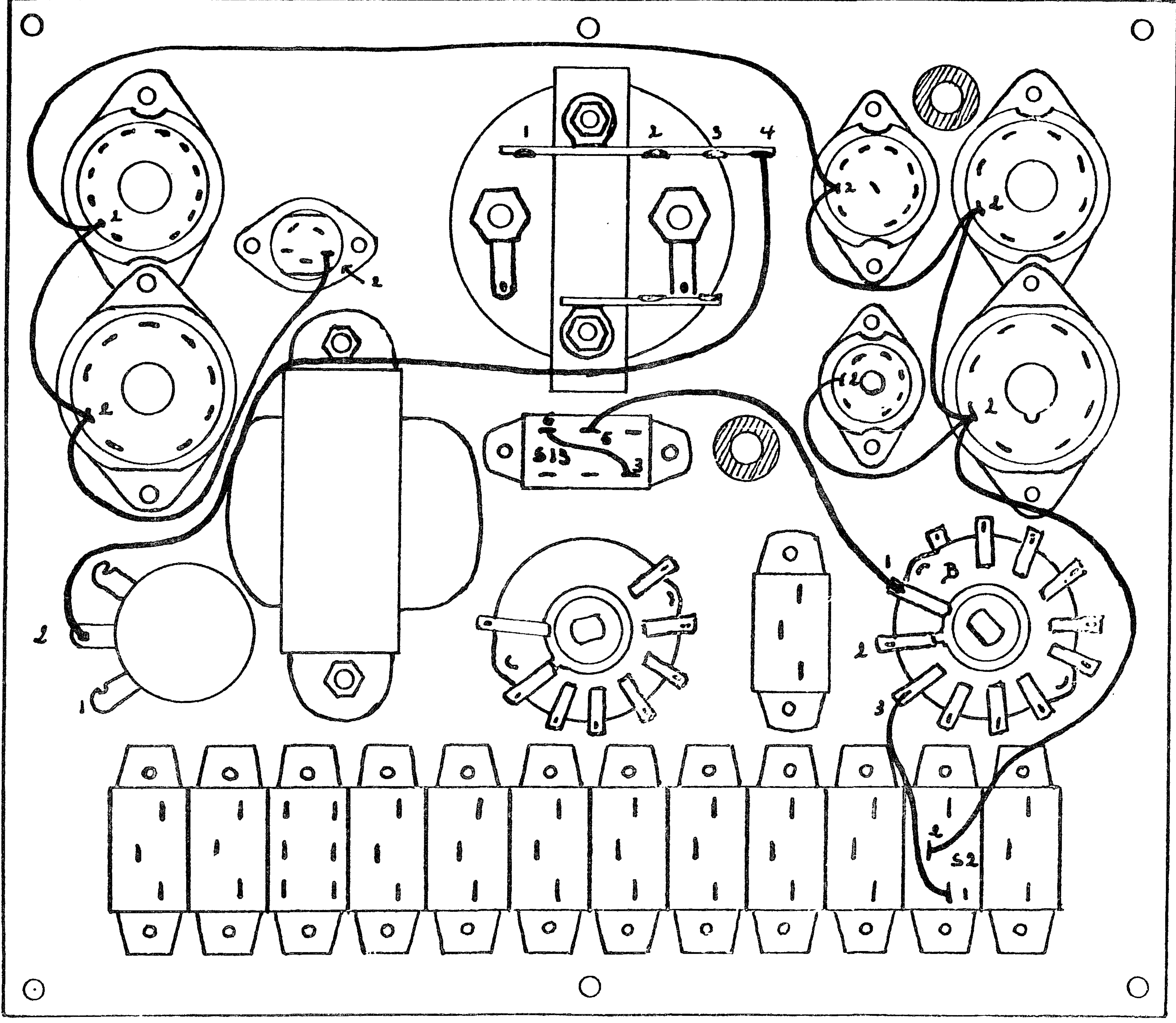
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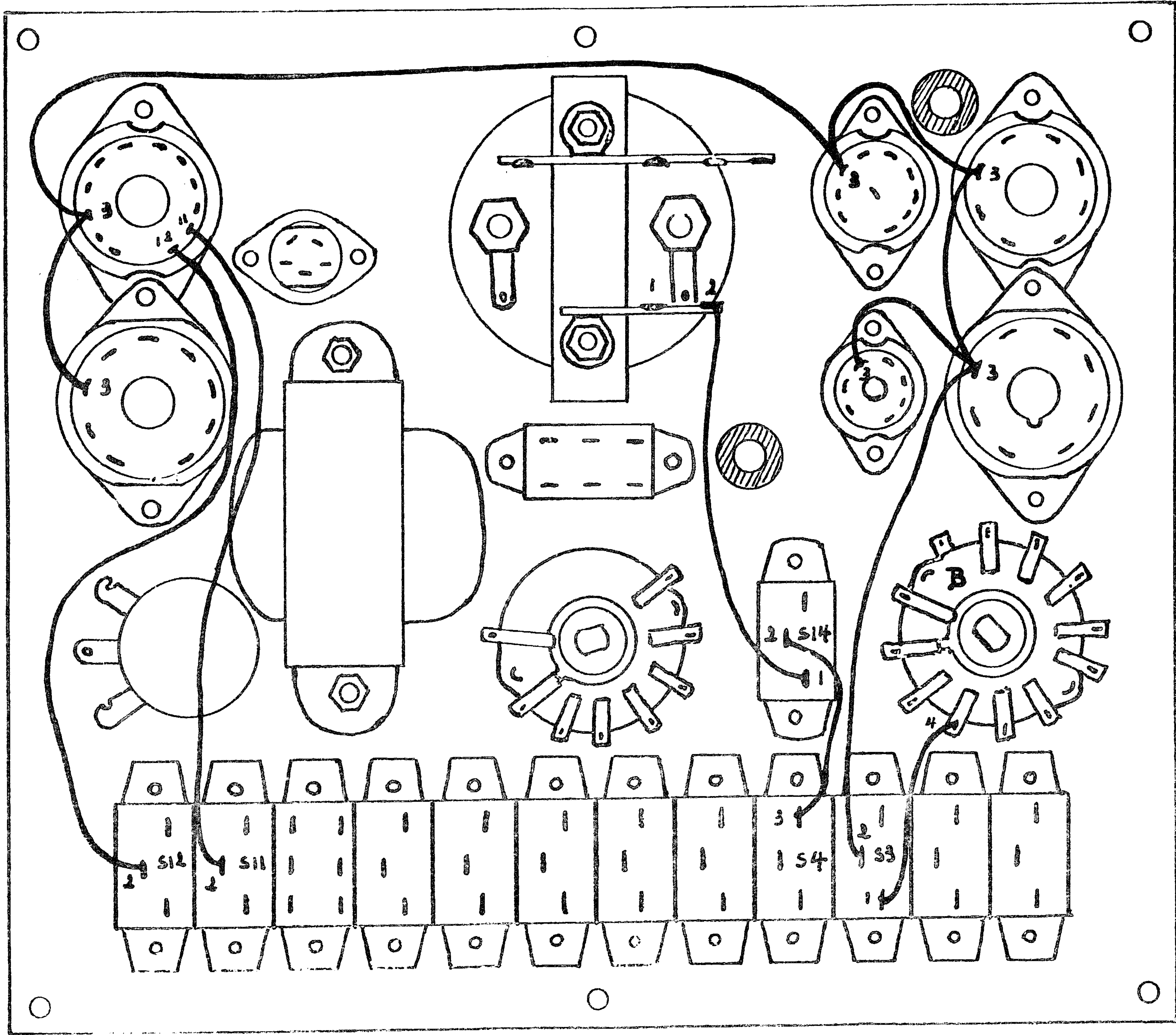


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COMPANY  
Electronic Measurements Corp.



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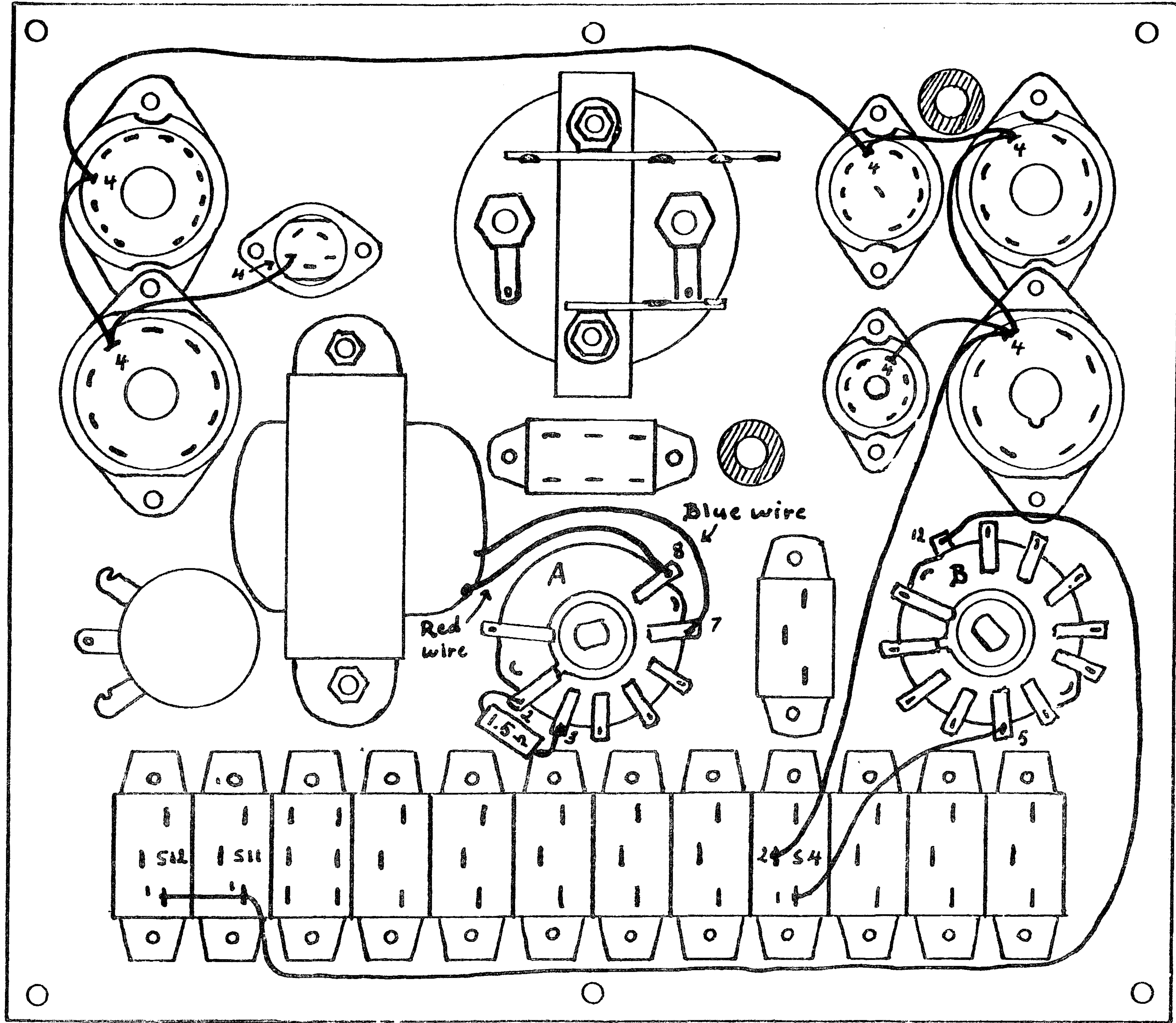
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COMPANY

Electronic Measurements Corp.



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Rear View of Model 213 Panel

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*Alan*

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*J.C.H.*

DATE

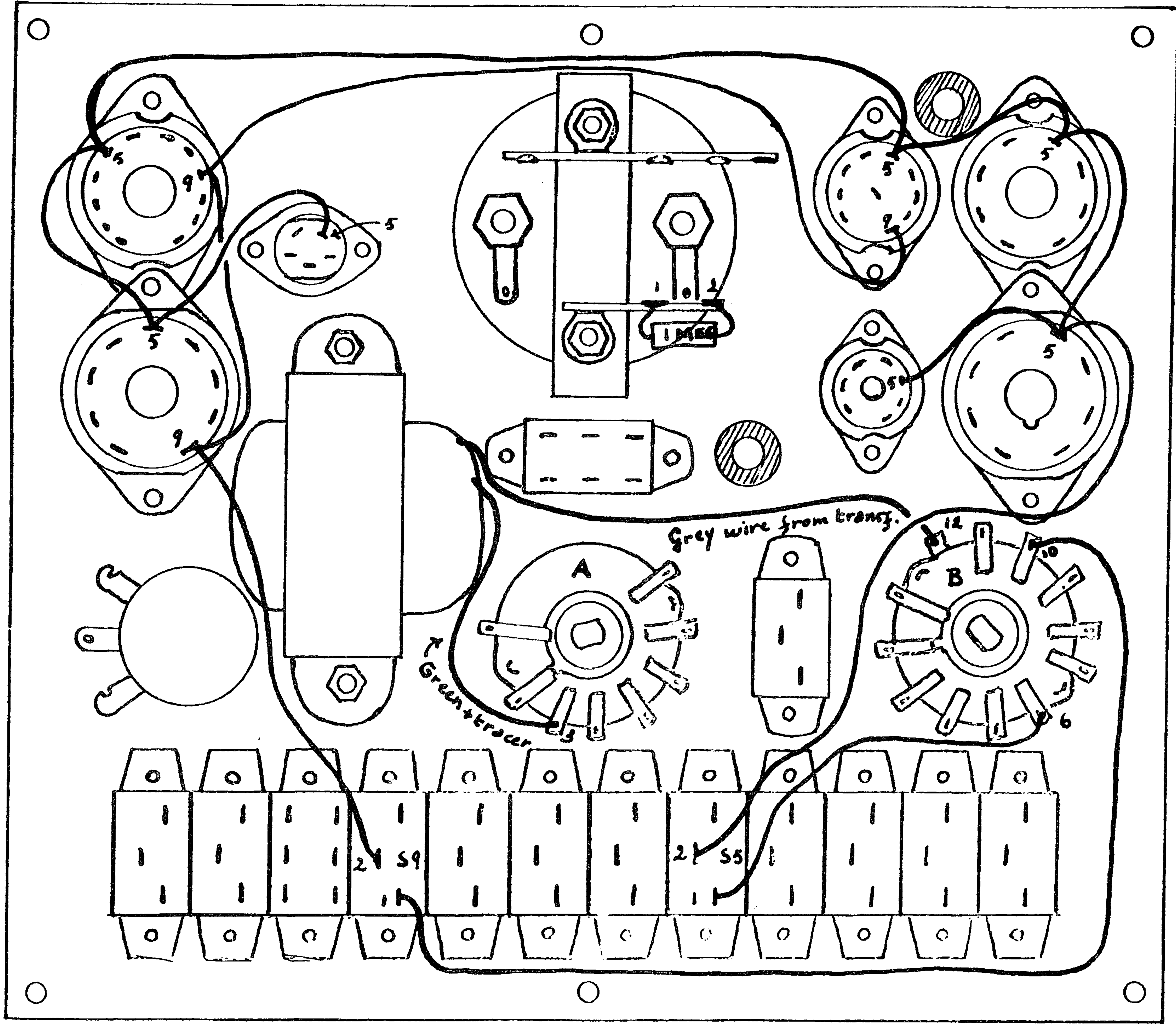
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Rear View of Model 213 Panel

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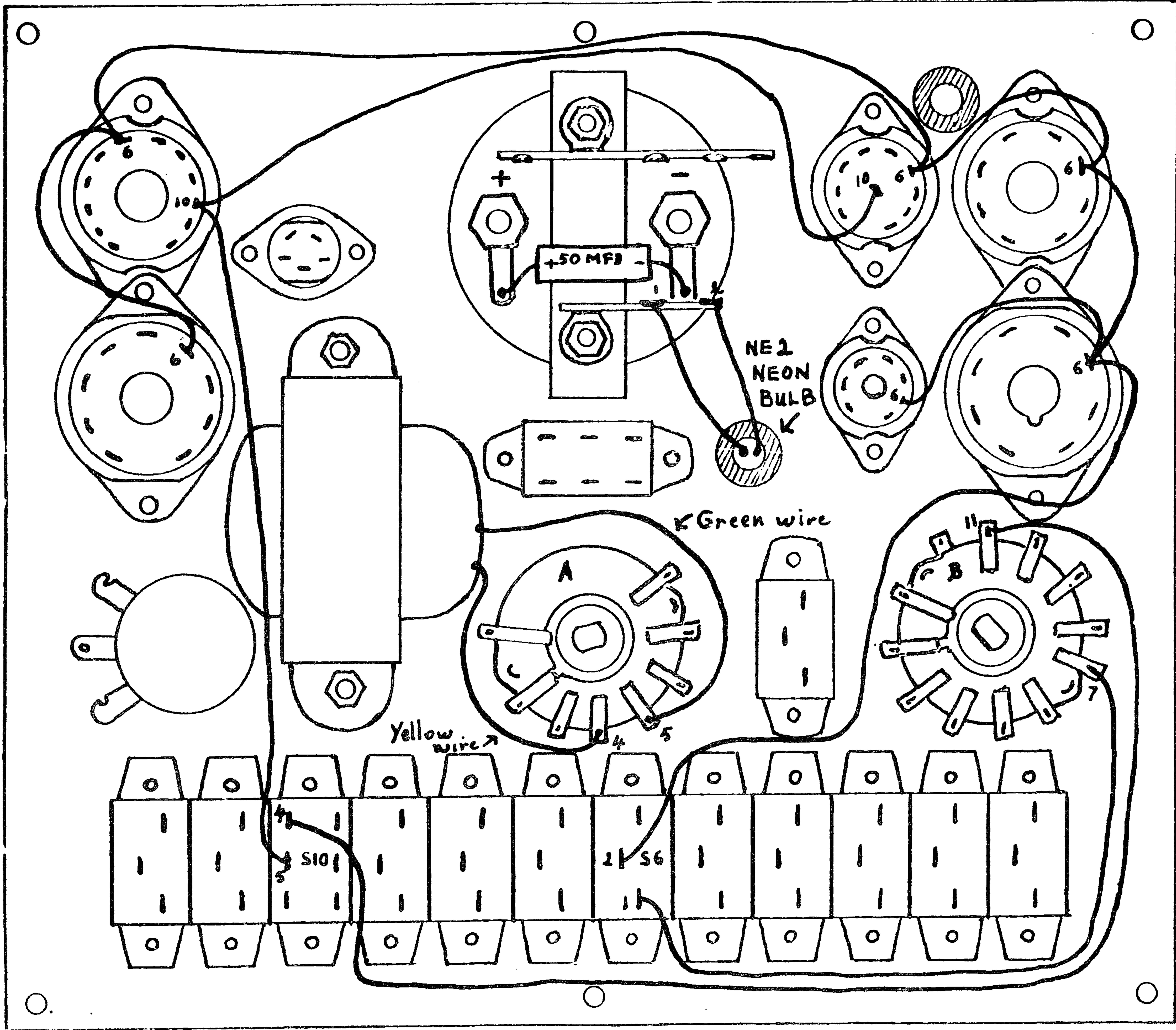
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Rear View of Model 213 Panel

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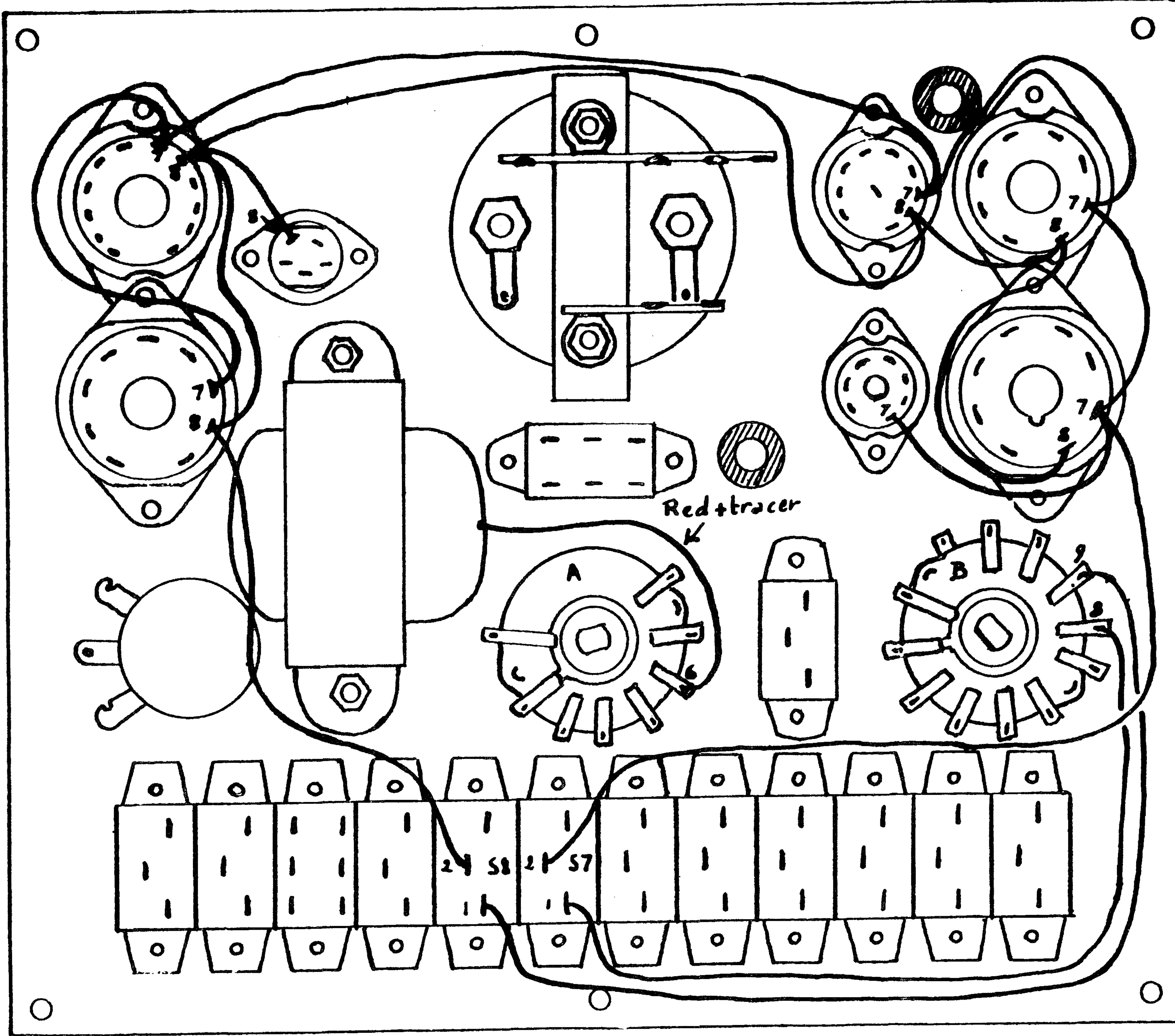
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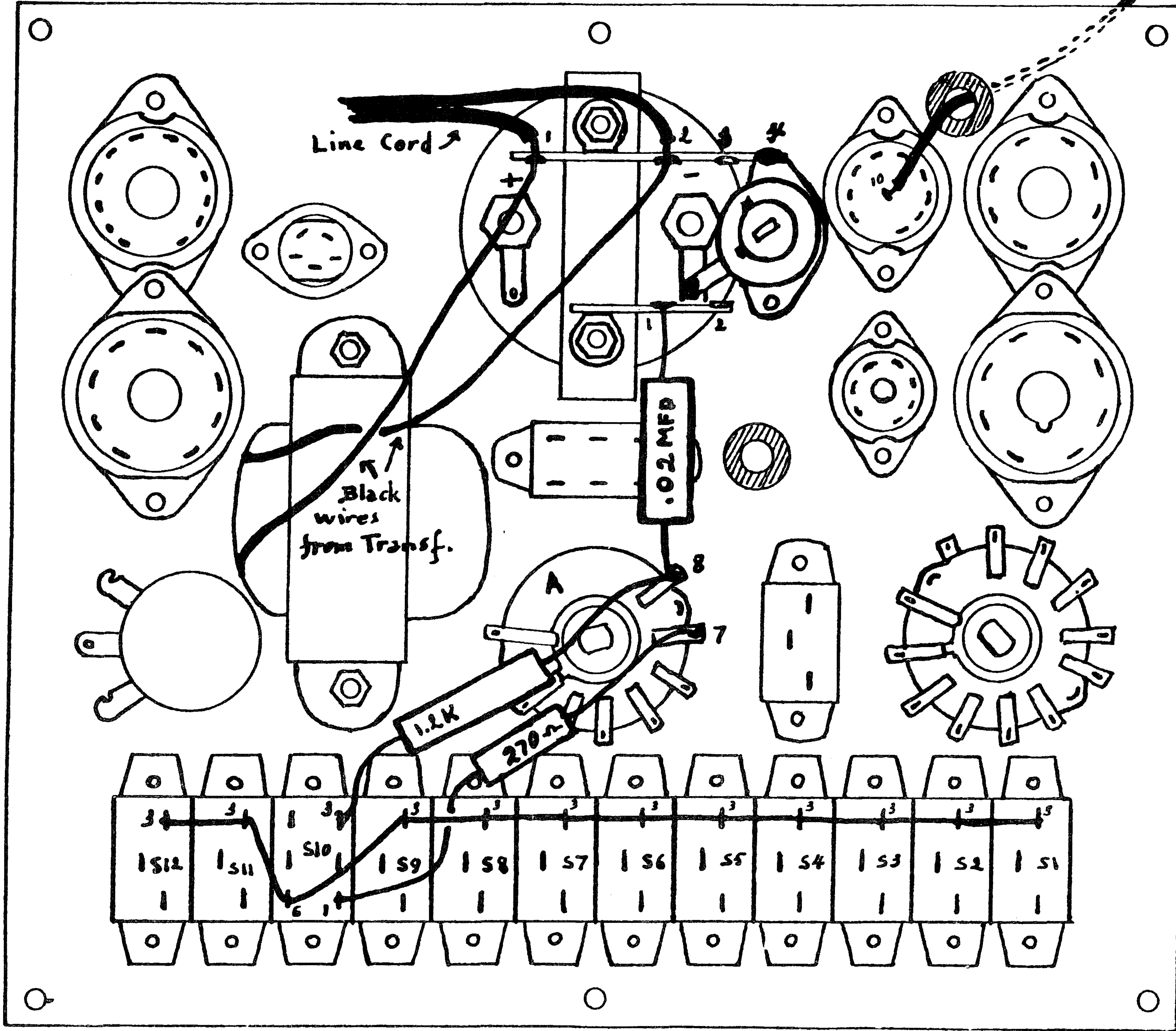
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COMPANY

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Drawing # 9



TITLE

Rear View of Model 213 Panel

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PARTS LIST FOR MODEL 213 KIT

<u>PART NO</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
1.	Meter	1	23.	.02 Mfd Condenser	1
2.	Panel	1	24.	50 Mfd Electrolytic Condenser	1
3.	Case	1	25.	1 Megohm (brown-Black-green*) resistor	1
4.	Transformer	1	26.	U Mounting Bracket-for Meter	1
5.	Fil. Volts Switch	1	27.	5 Terminal Strip	1
6.	Fil. Selector Switch	1	28.	3 Terminal Strip	1
7.	2000 ohms Shunt Control	1	29.	6/32 Nuts	4
8.	Loctal Socket	1	30.	4/40 Nuts	12
9.	Octal Socket	1	31.	4/40 Screws	40
10.	10 pin socket	1	32.	6/32 Screws, 5/16" Long	8
11.	7 pin socket	1	33.	#4 Wood Screws	6
12.	DPDT Slide Switch	2	34.	3/8 Nuts	3
13.	SPDT Slide Switch	12	35.	3/8 Lock Washers	3
14.	Line Cord	1	36.	Wire	25 ft
15.	Large Pointer Knob	3	37.	Operating Manual	1
16.	Rubber Grommet (large)	1	38.	Kit Instructions	1
17.	Rubber Grommet (small)	2	39.	Bare Wire	12 ft
18.	Neon Bulb, NE2	1	40.	Nuvistor Socket	1
19.	Grid Cap Connector	1	41.	Novar (Large 9 pin socket)	1
20.	600 ohm Variable Resistor	1	42.	Compactron (12 pin socket)	1
20a.	1.5 ohm resistor (brown-green-gold)	1	43.	Spaghetti	1 ft
21.	270 ohm, 1W (red-purple-brown) resistor	1			
22.	1200 ohm (brown-red-red) resistor	1			

GUARANTEE

IMPORTANT - READ CAREFULLY

Electronic Measurements Corporation will replace any defective part or part within a period of 90 days from the date of purchase if in the judgment of Electronic Measurements Corporation any such defect was not caused by tampering, electrical overload, or damage due to excessive mechanical shock.

The guarantee does not include any labor. All defective part or parts must be removed from the instrument by the consumer and sent Post Paid to us for inspection and replacement.

If, for any reason, the kit in a completely wired or partially wired form is sent back to us, there will be a \$4.00 minimum labor charge plus the cost of any parts or extra labor required because of damage or excessive errors in wiring.