

EICO MODEL 400
5" OSCILLOSCOPE

ASSEMBLY INSTRUCTIONS

The assembly of the Model 400 Oscilloscope is not difficult and if care is used, no trouble should be encountered. First unpack all the parts, checking them against the parts list, identifying each one to make sure no parts are thrown away with the packing. The standard manufacturers values may be interchangeable etc. We are forced to order from several sources in order to assure the supply of these kits. You may therefore find that a value may vary within the permissible circuit tolerance, e.g., a resistance of 470,000 may be substituted or may measure 510,000 etc. All parts supplied will work just as well as the part for which it is substituted. Most parts have a tolerance rating of 20% and the circuit is designed to take these variations into account.

The tools needed for the work are a cleaned and tinned soldering iron, screwdrivers, pliers, and side cutters. Use a good grade of rosin cored solder. Do not use acid core solder or flux. When making solder connections, wrap the wire securely around the joint and then solder, making sure solder flows into the joint.

Before starting the actual construction, study the schematic and pictorial wiring diagrams thoroughly getting all the steps clear in your mind. Do not rush the assembly. Care will pay dividends. When the oscilloscope is completed, it represents a fine piece of laboratory test equipment. Most troubles in building kits can be traced to wrong connections or reversed parts.

Assemble the panel first. Mount all parts with lock washers behind the panel and put flat washers under the nuts to keep from marring the panel. Some single pole double throw toggle switches may have a different arrangement of lugs than that shown. In that case the connections number 18 and 24 are the center arms of the switches. Those wires which are to be connected and not soldered are shown. Other wires will be connected to this point later. **DO NOT INSULATE THE CONTROLS FROM THE PANEL.** In event of control failure, an uninsulated control will blow the fuses, while an insulated control might convey the full negative voltage to the operator with serious consequences.

Assemble the chassis next. All parts and wires shown in dotted lines are assembled on the top of the chassis. (The view in assembly print is from below the chassis). Mount the indicated ground lugs and terminal strips, all under the chassis. Mount the transformer as indicated twisting the leads. Keep the leads to the deflection plates away from leads carrying AC. Observe polarity on condensers, the can being common ground for part #11. Oil filled condensers have no polarity and if there is only one terminal on the condenser, the can is ground. Mount the CR tube socket on the tube support with pin 4 toward the base. This will give approximately the proper position for the tube. Ground pin 6, 7, and 8 as shown in inset on print #3. Wire as shown on diagram.

(2)

Assemble the chassis to the panel and wire as shown in assembly print #3. Dotted wires go to top of chassis. Check all wiring and soldering carefully. Put the knobs on.

DANGER: HIGH VOLTAGE! EXTREME CARE SHOULD BE EXERCISED WHEN WORKING WITH THE OSCILLOSCOPE.

Before plugging into the line, check the resistance from B+ to ground. This should be over 75,000 ohms. Now insert the tubes and connect to 110 volts 60 cycle AC. Turn the unit on and allow a minute for tubes to heat up. Turn the positioning controls to approximate center. Turn the intensity control nearly full on and a trace should appear. Focus to a spot or thin line. Set course frequency control between the 15 and 80 position in its extreme counter-clockwise position. Thus the fine frequency control will vary the frequency between 15 and 80 cycles per second.

Before placing the oscilloscope in its cabinet, check the voltages on the tubes. Below is a list of the voltages taken from the tube pins to ground. The readings were taken with a vacuum tube voltmeter but variations up to 15% can be expected.

	<u>6SJ7</u>	<u>884</u>	<u>5BP1</u>
Pin 1	0	0	over 1000 volts negative
2	0	0	0
3	4-6 volts	30-40 volts	varies with signal
4	0	30-40 volts	negative 600-1000 volts
5	4-6 volts	0-3 volts	negative 1000 volts or 0
6	100-150 volts	0-3 volts	0
7	6.3v AC	6.3v AC	0
8	220-280 volts	5-6 volts	0
9			varies with signal
10			over 1000 volts negative
11			over 1000 volts negative

The Controls

1. **INTENSITY** - adjusts the brilliance of the trace. Use as low an intensity as you can. The lower the intensity, the sharper the trace.
2. **FOCUS** - makes the trace sharp and clear. In focusing, it will be noted that the trace can be focused to a thinner line at the center than is possible at the outer edges. This is characteristic of single stage scope amplifiers which amplify for one plate only, the other plate being grounded. Push pull amplification to both plates eliminates this but adds greatly to the cost of the scope and is not justified for general use.
3. **POSITION CONTROLS** - locates the trace on the screen and can be moved from one side for examination of one portion of a trace.
4. **COURSE FREQUENCY** - sets the approximate frequency of the horizontal sweep. When the knob is set between two numbers, the fine frequency control will vary the frequency from the left hand value to the right hand value.

5. FINE FREQUENCY - varies the sweep frequency throughout the range shown on the course frequency.
6. SYNC AMP - The synchronization amplifier is used to lock the sweep generator to the frequency being observed. Use as little synchronization as possible. Too high a setting will distort the trace.
7. GAIN CONTROL - adjust the amount of internal amplification necessary to obtain a bigger trace on the screen. When these controls are switched to direct (DIR) position the amplifiers are bypassed and connections are made direct to the plates of the CR tube. This is used in transmitter modulation checking RF work.
8. SYNC SWITCH - switches the synchronization amplifier from internal synchronization to the SYNC input binding posts for connection to an external source of synchronizing voltage.
9. HORIZONTAL INPUT SWITCH - connects the horizontal amplifier to either the internal sweep generator or the horizontal input binding post.
10. INTENSITY MODULATION JACK - on rear of chassis is used to provide timing indications in the trace. When adjusting the scope, never leave the trace as a small spot on the screen, as this will burn the fluorescent material of the screen and leave a spot where no trace will be obtained.

Check the amplifiers by applying one volt of RMS AC to the input posts with the gain full on. The deflection of the trace should be about 2". This gives a deflection sensitivity of about 2 volts per inch.

If the CR tube is replaced, a 5BP1A can be substituted for the 5BP1. The trace will be more intense and focusing should be improved. The 884 can be replaced with a 6Q5.

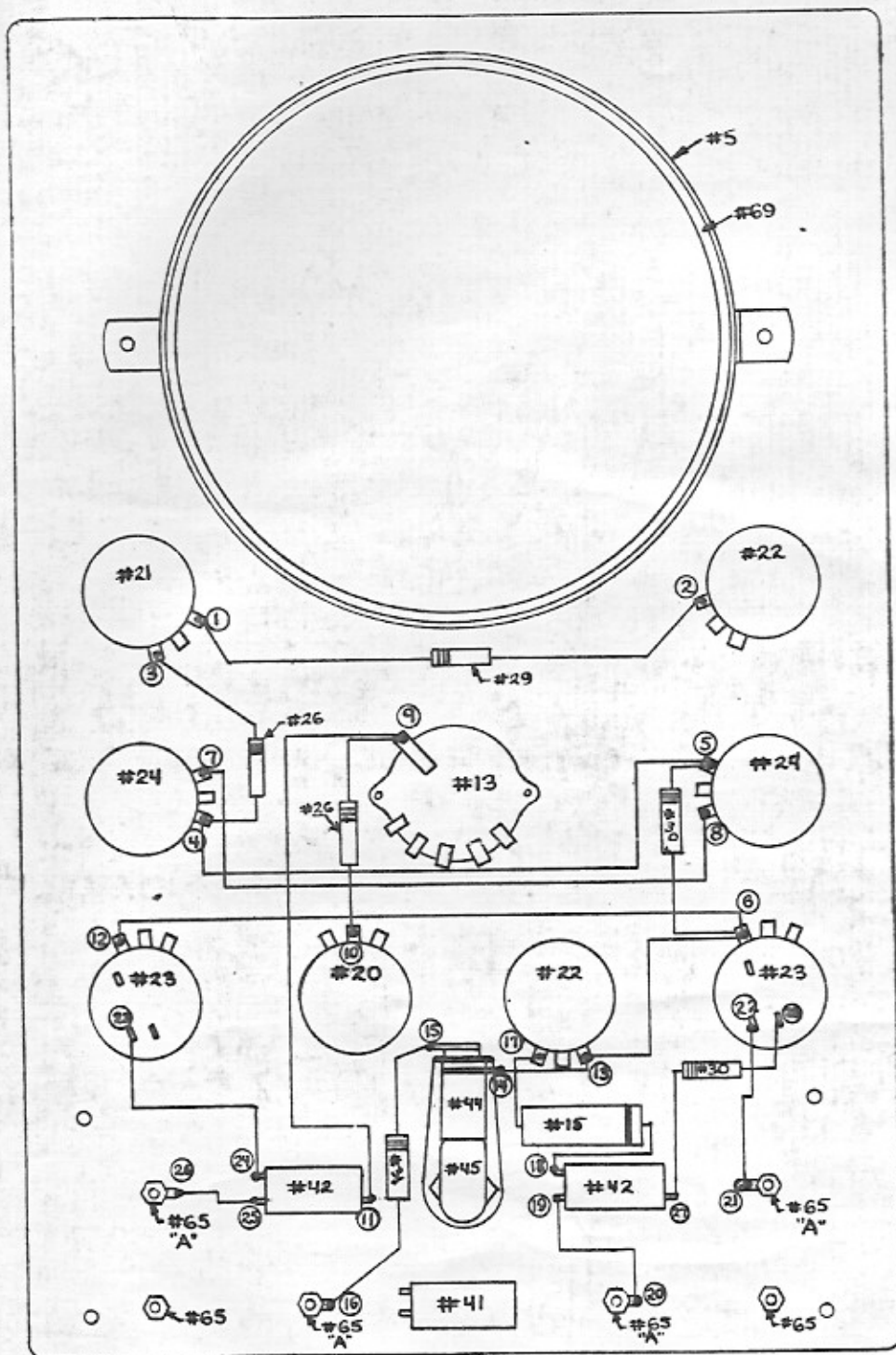
The uses of the oscilloscope are so varied and many, that it would be impossible to list them all. Every radio magazine publishes many articles with new uses of the oscilloscope. Besides this, it would be beneficial to obtain the following publications:

In case of trouble

1. Check all voltages. If they do not agree, find out why.
2. Check all parts and resistors to see that they have been placed in their proper places.
3. Trace out the entire wiring using a colored pencil over the wiring diagram. Nearly all cases of trouble we have checked have been wired incorrectly.
4. If you still cannot find the trouble, write our engineering department giving the voltages obtained, the indications if any, and all other information which may be helpful. We will gladly try to help you find the trouble.
5. If desired, you may return the instrument to the factory where it will be put into operating condition for a charge of \$5.00 plus any parts or alterations required due to damaged construction. Ship with tubes packed separately. **WARNING!** Pack unit well and ship prepaid Railway Express. Scope will be returned express collect.

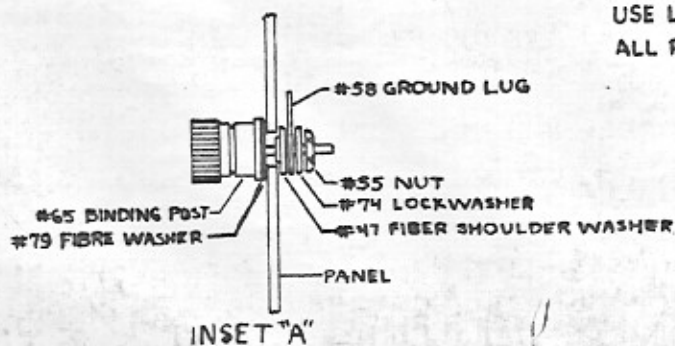
PARTS LIST - MODEL 400

1. Chassis.....	1	40. Rotary switch 1 pole	
2. Chassis bracket (left).....	1	5 position.....	1
3. Chassis bracket (right).....	1	41. SPST toggle switch.....	1
4. Tube support.....	1	42. SPDT toggle switch.....	2
5. CR tube (light) shield.....	1	43. Line cord.....	1
6. Panel.....	1	44. Pilot light assembly.....	1
7. Cabinet.....	1	45. Pilot light bulb.....	1
8. Handle.....	1	46. Condenser mounting wafer.....	1
9. Power transformer.....	1	47. Fibre shoulder washers.....	4
10. High voltage filter con-		48. 3/8" panel washers.....	9
denser 1 mfd. or over.....	1	49. 3/8" potentiometer nuts.....	9
11. 10-10-10 mfd. 450v con-		50. 7/16" toggle switch nuts.....	6
denser.....	1	51. 3/8" lock washers.....	9
12. .25 mfd bathtub condenser..	2	52. #6 self tapping screws.....	14
13. .5 mfd bathtub condenser...	3	53. 10/24 handle screws.....	2
14. .1 mfd tubular condenser...	1	54. 6/32 - 1/4" screws.....	40
15. .02 tubular condenser.....	2	55. 6/32 nuts.....	48
16. .01.1000v condenser.....	1	56. 3/8" rubber grommet.....	2
17. .003 mfd condenser.....	1	57. 3/4" rubber grommet.....	1
18. .005 mfd condenser.....	2	58. Ground lugs.....	9
19. 270 mmfd mica condenser.....	1	59. 1 lug terminal strip.....	3
20. 5 meg potentiometer.....	1	60. Pin jack.....	1
21. 250,000 potentiometer.....	1	61. Pin jack lock washer.....	1
22. 100,000 potentiometer.....	2	62. CR tube socket.....	1
23. 1 meg pot SPDT switch.....	2	63. CR tube socket retaining	
24. 1 meg potentiometer.....	2	ring.....	1
25. 5.1 meg 1/2w resistor.....	2	64. Octol sockets.....	5
26. 510K ohm 1/2w resistor.....	3	65. Binding posts.....	6
27. 150K ohm 2w resistor.....	1	66. Knobs.....	9
28. 100K ohm 2w resistor.....	1	67. Fuse mount.....	1
29. 100K 1/2w resistor.....	3	68. Fuses.....	2
30. 1 megohm 1/2w resistor.....	2	69. Felt strip.....	1
31. 10K ohm 1/2w resistor.....	2	70. Roll wire.....	1
32. 2000 ohm 1/2w resistor.....	2	71. Spagetti.....	1
33. 1100 ohm or 1200 ohm		72. Grid screen.....	1
1/2w resistor.....	1	73. Instructions.....	1
34. 510 ohm 1/2w resistor.....	1	74. #6 lock washer.....	46
35. Filter choke.....	1	75. 2 lug terminal strip.....	1
36. 6SJ7 tube.....	2	76. Bare wire strip.....	1
37. 884 tube.....	1	77. Mounting hardware (for high	
38. 5Y3-GT tube.....	2	voltage filter condenser).....	1
39. Cathode ray tube.....	1	78. 6/32 1/2" screws.....	2
		79. Flat washers (fibre).....	4



VIEW FROM REAR OF PANEL

USE LOCKWASHERS UNDER ALL POTENTIOMETERS



INSET "A"

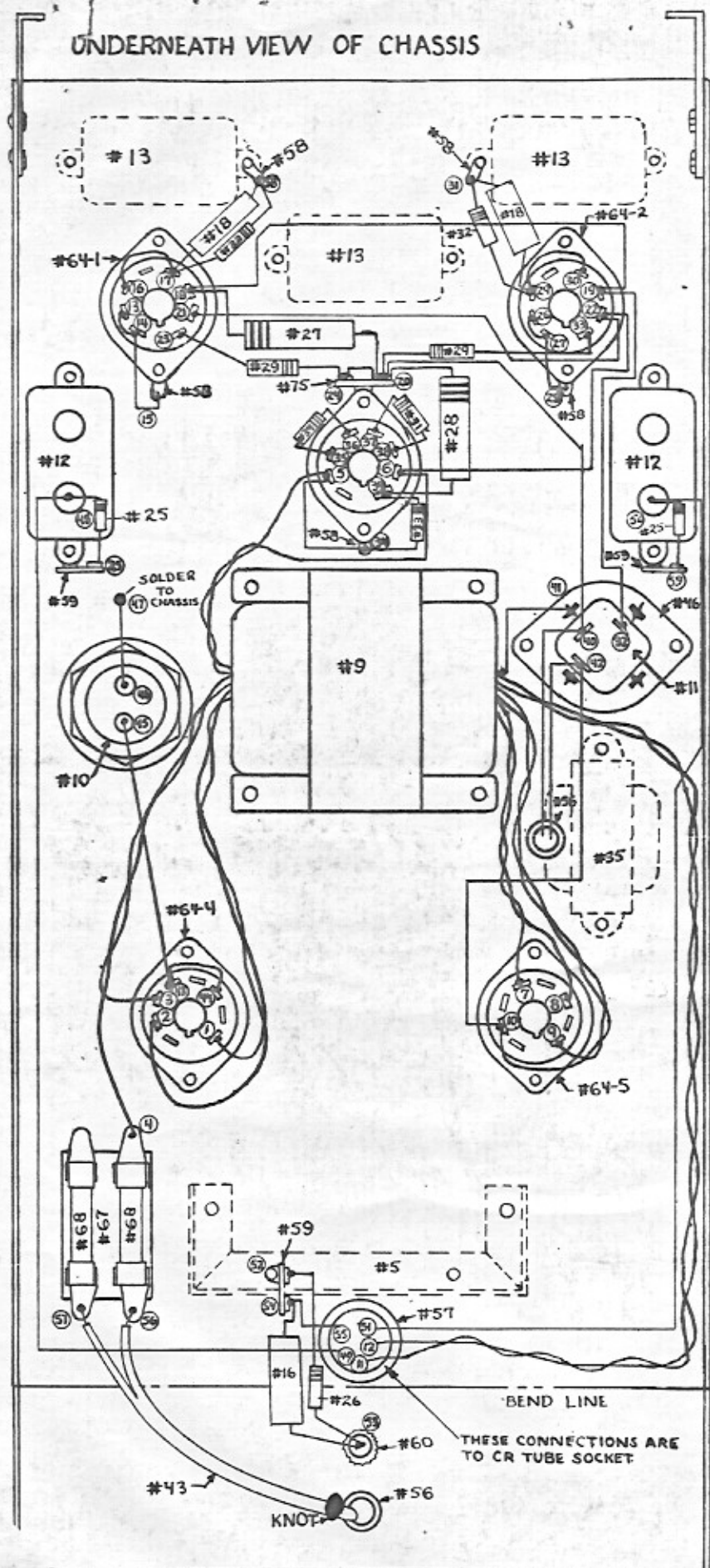
MOUNTING		
PART	DESCRIPTION	REMARKS
#5	TUBE SHIELD	2 PK SCREWS
69	FELT	GLUE ON
21	250,000 OHM POT	
22	100,000 OHM POT	
13	1 POLE 5 POS. SW.	
24	1 MEGOHM POT	
24	1 MEGOHM POT	
20	5 MEGOHM POT	
22	100,000 OHM POT	
23	1 MEGOHM POT	WITH SWITCH
23	1 MEGOHM POT	WITH SWITCH
44	PILOT LIGHT ASSEM.	
45	PILOT LIGHT BULB	
42	SPDT SWITCH	
42	SPDT SWITCH	
41	SPST SWITCH	
65	BINDING POST	SEE INSET "A"
65	BINDING POST	SEE INSET "A"
65	BINDING POST	SEE INSET "A"
65	BINDING POST	SEE INSET "A"
65	BINDING POST	GROUND
65	BINDING POST	GROUND

WIRING			
PART	DESCRIPTION	FROM	TO
29	100,000- Ω RESIST.	1S	2C
26	510,000- Ω RESIST.	3S	4C
	WIRE	4S	5C
30	1 MEGOHM RES.	5S	6C
	WIRE	7S	8C
26	510,000- Ω RESIST.	9C	10S
	WIRE	9S	11C
	WIRE	6C	12S
	WIRE	6S	13C
	WIRE	13C	14S
31	10,000- Ω RESISTOR	15C	16S
15	.02 MFD COND.	17S	18S
	WIRE	19S	20S
	WIRE	21S	22C
	WIRE	23C	24S
	WIRE	25S	26S
30	1 MEGOHM RESIST	27S	28C

C-CONNECT
S-SOLDER

MODEL 400 OSCILLOSCOPE ASSEMBLY DIAGRAM 1

UNDERNEATH VIEW OF CHASSIS



MBLY PRINT #2

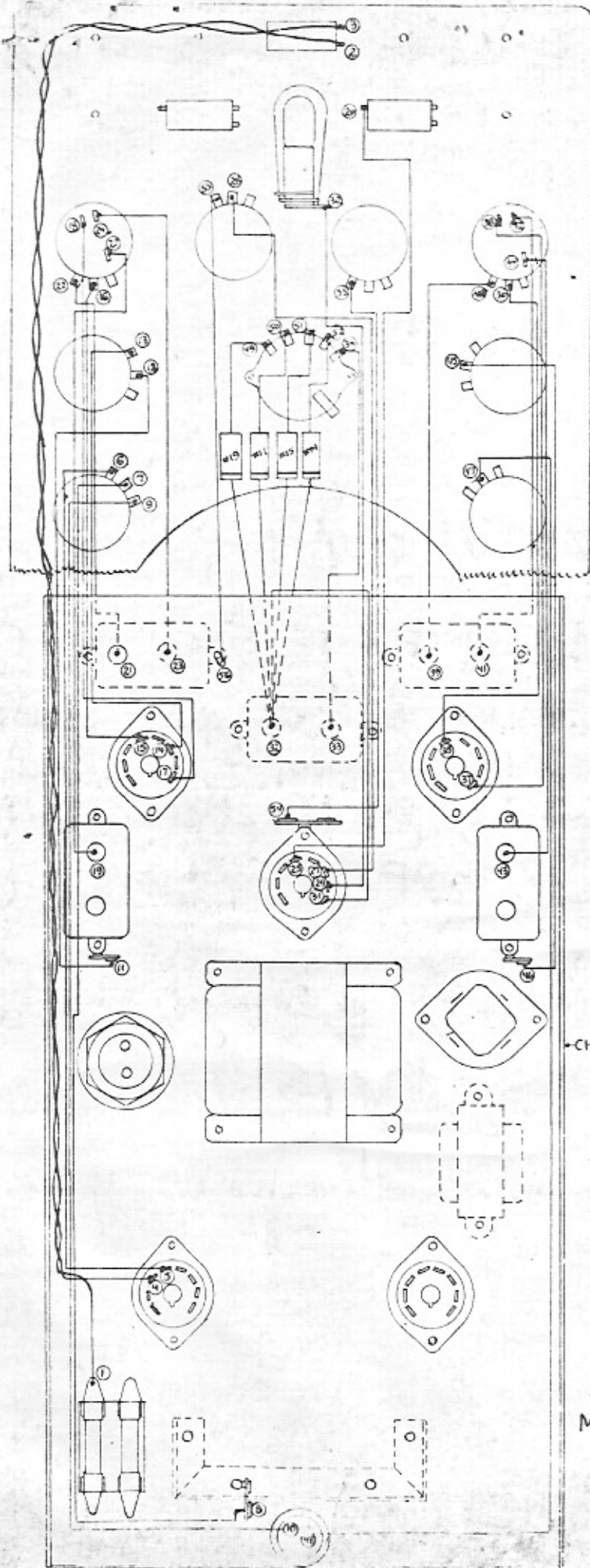
MODEL 400

MOUNTING		
PART	DESCRIPTION	REMARKS
13	.5 CONDENSER	
13	.5 MFD COND.	
13	.5 MFD COND.	
12	.25 MFD COND.	
12	.25 MFD COND	
64-1	OCTAL SOCKET	
64-2	OCTAL SOCKET	
64-3	OCTAL SOCKET	
64-4	OCTAL SOCKET	
64-5	OCTAL SOCKET	
46	COND. WAFER	
11	CAN COND.	
10	2MFD 1000V COND	
35	CHOKE	WITH 3/8" GROMMET
5	TUBE SUPPORT	WITH CR TUBE SOCKET
67	FUSE MOUNT	WITH FUSES - 1/2" SCREW
60	PIN JACK	
56	RUBBER GROMMET	
57	RUBBER GROMMET	
9	POWER TRANSFORMER	

WIRING				
PART	DESCRIPTION	FROM	TO	REMARKS
TRANS	BLACK-YEL LEAD	TRANS	1 S	
TRANS	BLUE LEAD		2 S	
TRANS	BLACK LEAD		3 C	
TRANS	BLACK LEAD		4 S	
TRANS	BROWN LEAD		5 C	
TRANS	BROWN LEAD		6 C	
TRANS	RED LEAD		7 S	
TRANS	ORANGE LEAD		8 S	
TRANS	GREEN LEAD		9 S	
TRANS	GREEN LEAD		10 C	
TRANS	YELLOW LEAD		11 S	PIN 1 CRTUBE
TRANS	YELLOW LEAD		12 C	PIN 2 CRTUBE
	BARE WIRE	13 S	14 C	
	BARE WIRE	14 S	15 S	GROUND
	BARE WIRE	16 S	17 C	
18	.005 MFD COND	17 C	58 C	GROUND
32	2,000Ω RESISTOR	17 S	58 C	GROUND
	WIRE	18 C	19 C	
27	150,000Ω 2W	18 C	20 C	
	WIRE	21 S	22 C	
	WIRE	6 C	22 S	
29	100,000Ω RESIST	23 C	24 C	
25	3 MEGOHM RESIST.	48 C	25 C	
	BARE WIRE	26 S	27 C	
	BARE WIRE	27 S	28 S	GROUND
	BARE WIRE	29 C	30 S	
18	.005 COND.	29 C	31 C	GROUND
32	2,000Ω RESIST	29 S	31 S	GROUND
	WIRE	19 S	32 S	
29	100,000Ω RESIST	20 C	33 C	
	BARE WIRE	20 C	24 C	
	BARE WIRE	5 S	34 C	GROUND
34	510Ω RESISTOR	35 S	36 C	
31	10,000Ω RESISTOR	37 S	38 C	
28	100,000Ω 2W	20 C	39 C	
33	1200Ω	39 C	34 S	GROUND
	WIRE	20 S	40 C	
	CHOKE LEAD		40 S	
TRANS	CHOKE LEAD		41 S	GROUND
	WIRE	10 S	42 S	
	BARE WIRE	43 C	44 S	
	WIRE	43 C	45 S	
	BARE WIRE	46 S	47 S	GROUND
	WIRE	48 S	49 S	PIN 3 CRTUBE
	WIRE	50 C	51 S	PIN 9 CRTUBE
26	510,000Ω RESIST	52 S	53 C	GROUND
16	.01MFD COND	53 S	54 C	
	WIRE	54 C	55 S	PIN 10 CRTUBE
43	LINE CORD		56 S	
43	LINE CORD		57 S	
25	51 MEGΩ RESIST	50 S	59 C	

C-CONNECT
S-SOLDER

VIEW OF COMPLETED
ASSEMBLY UPSIDE DOWN

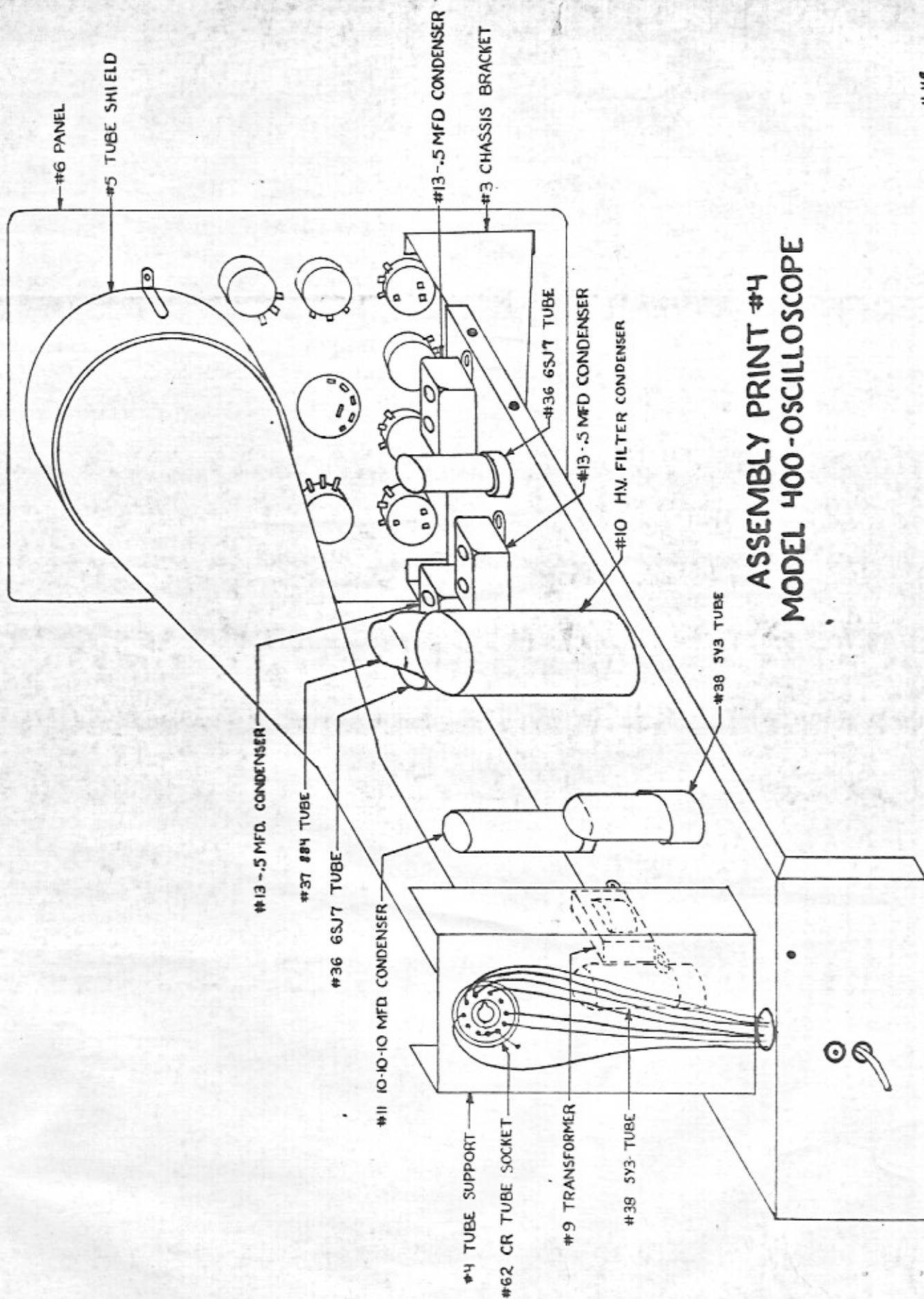


WIRING				
PART	DESCRIPTION	FROM	TO	REMARKS
	WIRE	1	2	
	WIRE	3	4	
	WIRE	5	6	
	WIRE	7	8	
	WIRE	9	10	PIN II CR TUBE
	WIRE	11	12	
	WIRE	13	14	
	WIRE	15	16	
	WIRE	17	18	
	WIRE	19	20	
	WIRE	21	22	
	WIRE	23	24	
	WIRE	25	26	
	WIRE	27	28	
	WIRE	29	30	
	WIRE	31	32	
	WIRE	33	34	
	WIRE	35	36	
	WIRE	37	38	
	WIRE	39	40	
	WIRE	41	42	
	WIRE	43	44	
	WIRE	45	46	
	WIRE	47	48	PIN 4 CRTUBE
19	270 MFD COND.	32	49	
17	.003 MFD. COND.	32	50	
15	.02 MFD COND.	32	51	
14	1 CONDENSER	32	52	
	WIRE	53	54	
	WIRE	55	56	GROUND
	WIRE	PIN 6	CR1	} CR TUBE } SOCKET
	WIRE	PIN 7	CR2	
	WIRE	PIN 8	CR3	

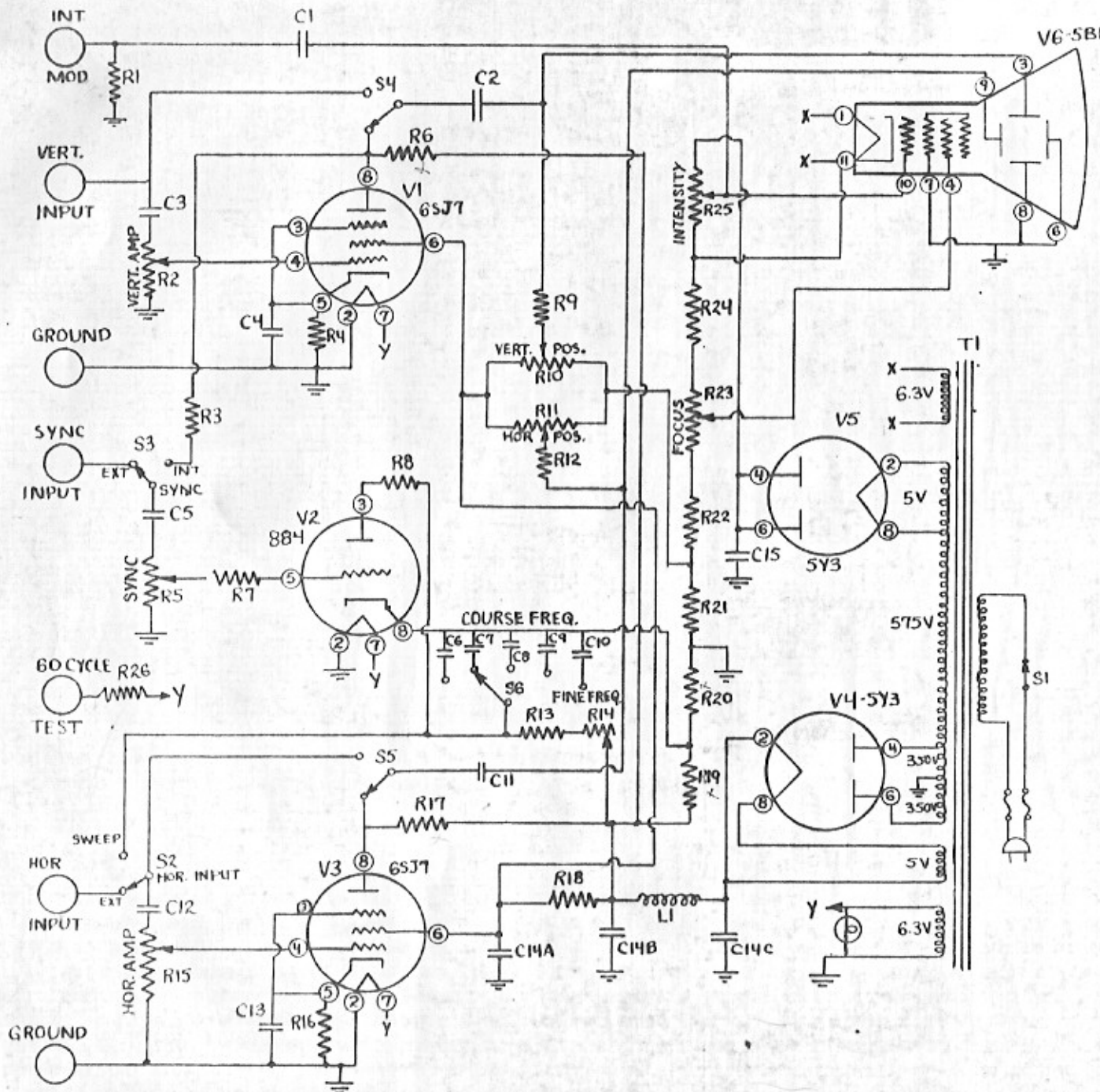


CR TUBE SOCKET - REAR VIEW

ASSEMBLY PRINT #3
MODEL 400-OSCILLOSCOPE



ASSEMBLY PRINT #4
MODEL 400-OSCILLOSCOPE



ITEM	PART	SPLIFICATION
R1	26	510,000 Ω ½W RESISTOR
R2	23	1 MEG. POT WITH SWITCH
R3	30	1 MEGOHM RESISTOR
R4	32	2,000 OHM RESISTOR
R5	22	100,000 OHM POT
R6	29	100,000 OHM RESISTOR
R7	31	10,000 OHM RESISTOR
R8	34	510 OHM RESISTOR
R9	25	5.1 MEGOHM RESISTOR
R10	24	1 MEGOHM POT
R11	24	1 MEGOHM POT
R12	25	5.1 MEGOHM RESISTOR
R13	26	510,000 OHM RESISTOR
R14	20	5 MEGOHM POT
R15	23	1 MEGOHM POT WITH SWITCH
R16	32	2,000 OHM RESISTOR
R17	29	100,000 OHM RESISTOR
R18	27	150,000 OHM 2W RESISTOR
R19	28	100,000 OHM RESISTOR 2W
R20	33	1,200 OHM RESISTOR
R21	30	1 MEGOHM RESISTOR
R22	26	510,000 OHM RESISTOR
R23	24	250,000 OHM POT
R24	29	100,000 OHM RESISTOR
R25	22	100,000 OHM POT
R26	31	10,000 OHM RESISTOR
C1	16	.01 MFD 1000 V CONDENSER
C2	12	.25 MFD CONDENSER
C3	13	.5 MFD CONDENSER
C4	18	.005 MFD CONDENSER
C5	15	.02 MFD CONDENSER
C6	13	.5 MFD CONDENSER
C7	14	.1 MFD CONDENSER
C8	15	.02 MFD CONDENSER
C9	17	.003 MFD CONDENSER
C10	19	270 MMFD CONDENSER
C11	12	.25 MFD CONDENSER
C12	13	.5 MFD CONDENSER
C13	18	.005 MFD CONDENSER
C14	11	10-10-10Mfd CONDENSER
C15	10	1 MFD 1000V CONDENSER
T1	9	POWER TRANSFORMER
L1	35	CHOKE
S1	41	SPST ON-OFF SWITCH
S2	42	SPDT SWITCH
S3	42	SPDT SWITCH
S4	23	PART OF R2
S5	23	PART OF R15

MODEL 400 OSCILLOSCOPE-CIRCUIT DIAGRAM

ELECTRONIC INSTRUMENT CO. INC. BROOKLYN, N.Y.