

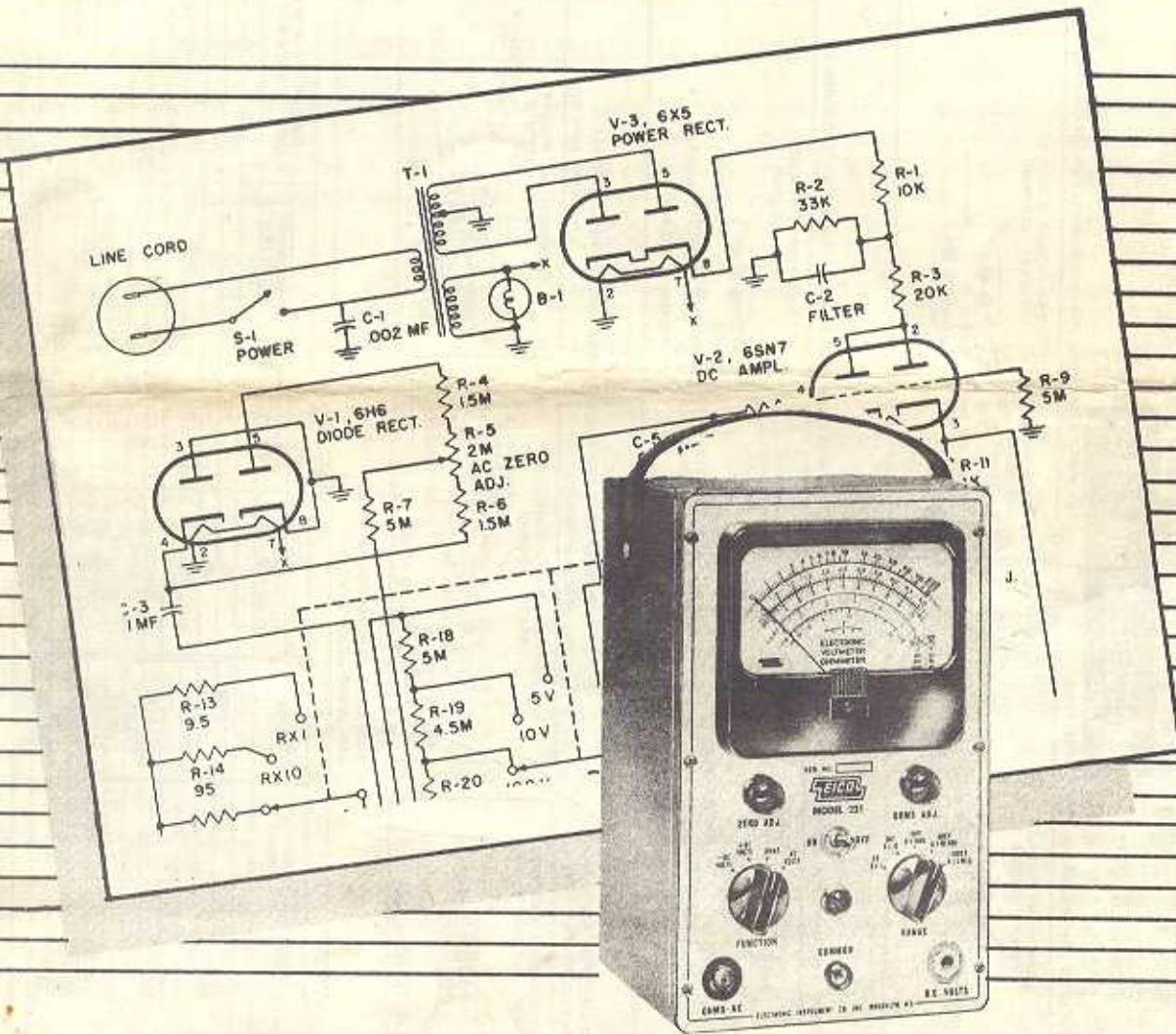
VE6KQ



CONSTRUCTION MANUAL

Model 221

ELECTRONIC VOLT-OHM METER

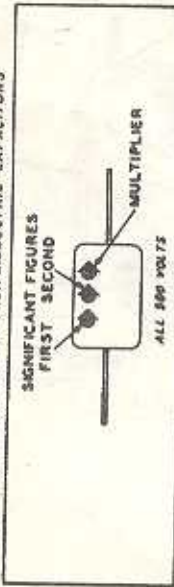


ELECTRONIC INSTRUMENT CO.,

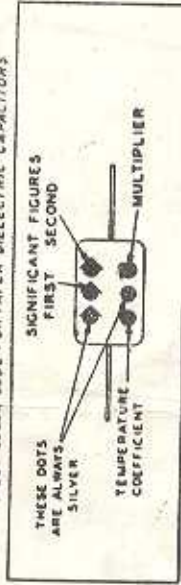
Reg. U. S. Pat. Off.

CAPACITOR COLOR CODES

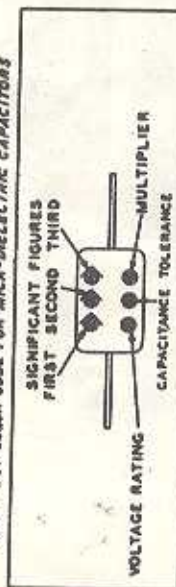
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



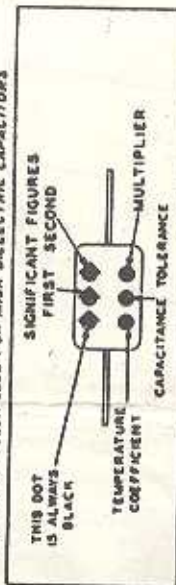
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



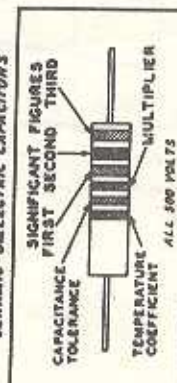
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



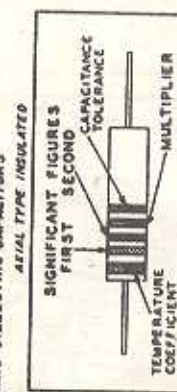
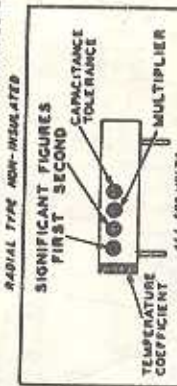
JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS



JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

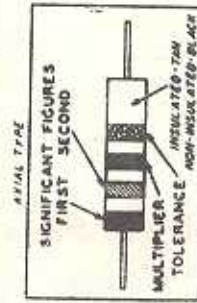


RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

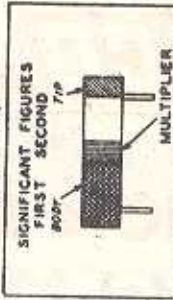
RESISTORS		CAPACITORS						
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		
	10	1	BROWN	10	10	10	100	A
	100	2	RED	100	100	100	200	B
	1000	3	ORANGE	1000	1000	1000	300	C
	10000	4	YELLOW	10000	10000	10000	400	D
	100000	5	GREEN	100000	100000		500	E
	1000000	6	BLUE	1000000			600	F
	10000000	7	VIOLET	10000000			700	G
	100000000	8	GRAY	100000000		0.01	800	
5	0.1	9	WHITE	1000000000		0.1	1000	
10	0.01		GOLD	0.1			2000	
20	0.01		SILVER	0.01			500	
			NO COLOR					

RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

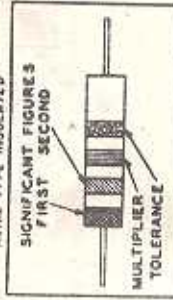


RADIAL TYPE

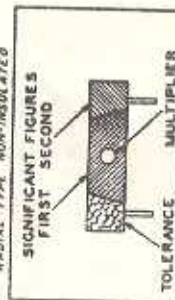


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED



GENERAL INSTRUCTIONS

1) The Model 221 Electronic Volt-Ohm Meter is constructed very easily with the aid of fully detailed perspective drawings and step-by-step instructions. Before starting the actual construction, it is advisable to study the schematic and pictorial wiring diagrams until all of the steps are clear in your mind. Do not rush the construction, as careful work will result in a properly constructed instrument in the shortest time. In addition, it is suggested that you run all leads exactly as shown on the pictorial wiring diagrams, as this will make the wiring an easier job and insure proper operation of the instrument.

2) USE A GOOD GRADE OF ROSIN CORE SOLDER ONLY. UNDER NO CIRCUMSTANCES USE ACID CORE SOLDER OR ACID FLUX inasmuch as the acid flux can cause serious corrosion. Before soldering, make certain there is a good mechanical connection. The solder must flow before you remove the soldering iron as this will prevent rosin joints which are poor electrical conductors. If you are soldering close to a part, hold the ends of a pair of longnose pliers between the part and the solder joint. The pliers will conduct the heat away and prevent the component from being unduly overheated.

3) Carefully unwrap all the parts and check them in the space provided on the parts list. Note: In order to maintain the supply of kits and insure prompt delivery, we are forced to buy the same component from several sources (standard manufacturers' parts are interchangeable). You may find that the value of a component will vary within the allowable circuit tolerance. This means a resistance of 470,000 ohms may be substituted for, or may measure 510,000 ohms, etc. Any part supplied will work as well as the part for which it was substituted. No substitutions will be made on precision components.

CONSTRUCTION PROCEDURE

For your convenience, the construction of the instrument has been broken down into a logical series of Assembly Prints. Each Assembly Print consists of a detailed drawing and a table of step-by-step instruction so that no step can be overlooked. Space has been provided on the tables to check off each step as it is completed. Follow the order of the Assembly Prints to finish the mechanical assembly and the wiring quickly and easily.

PARTS LIST FOR MODEL 221

St. #	Sym.	Description	Amt.	St. #	Sym.	Description	Amt.	St. #	Sym.	Description	Amt.
100	B1	pilot light.....	1 ✓	130	H25	meter washer.....	4 ✓	158	R9	5M ohm res. <i>5.1M</i>	1 ✓
101	BT1	1.5 v battery.....	1 ✓	131	H26	ground lug.....	5 ✓	159	R10	1K ohm res.....	1 ✓
102	C1	.002 mfd cond.....	1 ✓	132	H27	pot ground lug.....	1 ✓	159	R11	1K ohm res.....	1 ✓
103	C2	filter cond.....	1 ✓	133	H28	1/4" standoff.....	2 ✓	160	R12	2K ohm pot adj....	1 ✓
104	C3	.1 mfd cond.....	1 ✓	134	H29	#10-24 nut.....	2 ✓	161	R13	9.5 ohm 1% res....	1 ✓
105	C4	.01 mfd cond.....	1 ✓	135	H30	3/8" lock washer..	10 ✓	162	R14	95 ohm 1% res....	1 ✓
102	C5	.002 mfd cond.....	1 ✓	136	H31	3/8" flat washer...4	✓	163	R15	9.5K ohm 1% res....	1 ✓
106	H1	panel.....	1 ✓	137	H32	3/8" hex nut.....	9 ✓	164	R16	95K ohm 1% res....	1 ✓
107	H2	chassis.....	1 ✓	138	H33	wire.....	roll ✓	165	R17	9.5M ohm 1% res....	1 ✓
108	H3	cabinet.....	1 ✓	139	H34	test lead wire.....	2 ✓	166	R18	5M ohm 1% res....	1 ✓
109	H4	handle.....	1 ✓	140	H35	shielded wire.....	pc. ✓	167	R19	4.5M ohm 1% res....	1 ✓
110	H5	pilot light ass'y...	1 ✓	141	H36	#6 lock washer....	7 ✓	168	R20	400K ohm 1% res....	1 ✓
111	H6	line cord.....	1 ✓	142	H37	bare wire.....	pc. ✓	169	R21	50K ohm 1% res....	1 ✓
112	H7	wafer socket.....	3 ✓	143	H38	nut, shldr. washer..	1 ✓	169	R22	50K ohm 1% res....	1 ✓
113	H8	battery bracket....	1 ✓	144	H39	nut, washer.....	1 ✓	170	R23	2M ohm res. <i>2.2M</i>	1 ✓
114	H9	red test prod.....	1 ✓	145	H40	#6 fibre washer....	2 ✓	171	R24	3.3M ohm res.....	1 ✓
115	H10	black test prod....	1 ✓	146	J1	phone jack.....	1 ✓	172	R25	500K ohm res. <i>500K</i>	1 ✓
116	H11	alligator clip.....	1 ✓	147	J2	pin jack.....	1 ✓	173	R26	5.6M ohm res.....	1 ✓
117	H12	bar knob.....	2 ✓	148	J3	banana jack.....	1 ✓	174	R27	1K ohm pot cal....	1 ✓
118	H13	round knob.....	2 ✓	149	M1	meter.....	1 ✓	175	R28	1K ohm pot adj....	1 ✓
119	H14	3/8" grommet.....	1 ✓	150	P1	phone plug.....	1 ✓	174	R29	1K ohm pot cal....	1 ✓
120	H15	1 lug term. strip...1	✓	151	P2	pin plug.....	1 ✓	174	R30	1K ohm pot cal....	1 ✓
121	H16	3 lug term. strip...1	✓	152	P3	banana plug.....	1 ✓	176	R31	15M ohm res.....	1 ✓
122	H17	7/16" nut (S1)....	2 ✓	153	R1	10K ohm res. 2W...1	✓	177	S1	SPST switch.....	1 ✓
123	H18	#6-32 screw.....	4 ✓	154	R2	33K ohm res. 2W...1	✓	178	S2	3 pole, 5 pos. sw...1	✓
124	H19	#6-32 nut.....	8 ✓	155	R3	20K ohm res. <i>2.2K</i>	1 ✓	179	S3	6 pole, 4 pos. sw...1	✓
125	H20	#10-24 screw.....	2 ✓	156	R4	1.5M ohm res.....	1 ✓	180	T1	transformer.....	1 ✓
126	H21	spaghetti.....	pc. ✓	157	R5	2M ohm pot.....	1 ✓	181	V1	6H6 tube.....	1 ✓
127	H22	#6 P.K. screw.....	7 ✓	156	R6	1.5M ohm res.....	1 ✓	182	V2	6SN7 tube.....	1 ✓
128	H23	meter lug.....	2 ✓	158	R7	5M ohm res. <i>5.1M</i>	1 ✓	183	V3	6X5 tube.....	1 ✓
129	H24	meter nut.....	2 ✓	159	R8	1M ohm res.....	1 ✓	184		instruction book...1	✓

Notes: 1) All resistors 1/2 watt unless noted differently. 2) WHEN ORDERING A PART FOR REPLACEMENT, please include the stock number of the part and the serial number of your instrument.

WHEN ORDERING A PART FOR REPLACEMENT, please include the stock number of the part and the serial number of your instrument.

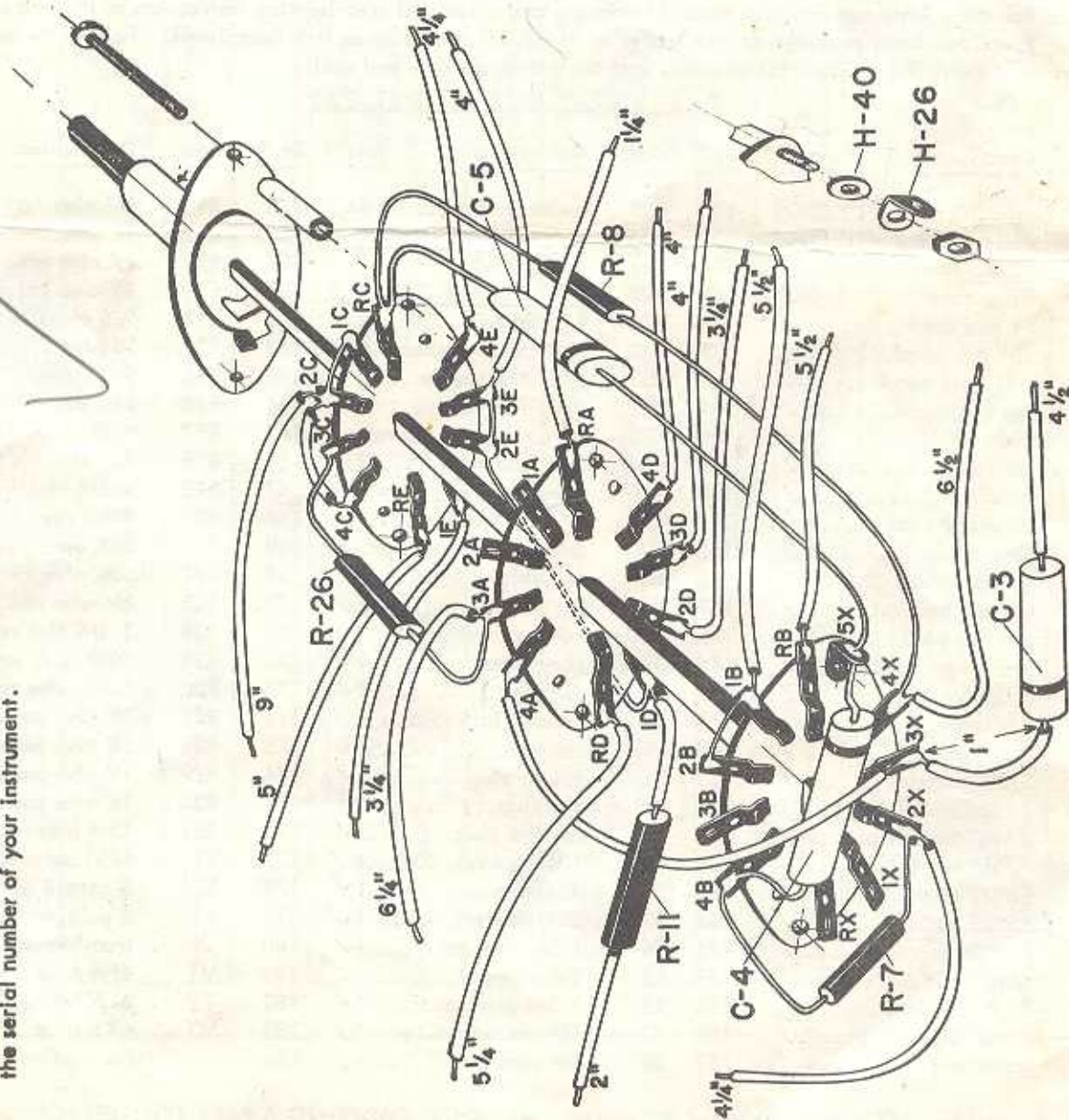
Step #1-1 Assembly: Remove the nut and lockwasher from the switch assembly screw (at 5X). Replace the lockwasher with the #6 fibre washer (H40) and the ground lug (H26). Fasten with the nut previously removed. See detail sketch.

PREWIRING OF FUNCTION SWITCH S3

(S) means solder, (C) means connect but do not solder.

Step	Sym.	Description	From	To (Length)
✓ 1-2	C-5	.002 mfd cond.	(C) RC	(C) 5X
✓ 1-3	R-8	1M ohm res.	(S) 4C	(C) 4X
✓ 1-4	H-37	bare wire	(S) 1C	(C) 2C
✓ 1-5	H-33	wire	(C) 2C	9"
✓ 1-6	H-33	wire	(S) 2C	(S) 4C
✓ 1-7	R-26	5.8M ohm res.	(S) 3C	(C) 3A
✓ 1-8	H-33	wire	(S) RE	9"
✓ 1-9	H-33	wire	(S) 1E	3 1/4"
✓ 1-10	H-37	bare wire	(C) 2E	(C) 1D
✓ 1-11	H-37	bare wire	(S) 2E	(C) 3E
✓ 1-12	H-33	wire	(S) 3E	4 1/4"
✓ 1-13	H-33	wire	(S) 4E	1 1/4"
✓ 1-14	H-33	wire	(S) RA	1 1/4"
✓ 1-15	H-33	wire	(S) 3A	6 1/4"
✓ 1-16	H-33	wire	(S) 4A	(C) 3X
✓ 1-17	H-33	wire	(S) RD	5 1/4"
✓ 1-18	R-11	*1K ohm res.	(S) 1D	2"
✓ 1-19	H-33	wire	(S) 2D	3 1/4"
✓ 1-20	H-33	wire	(S) 3D	4"
✓ 1-21	H-33	wire	(S) 4D	4"
✓ 1-22	H-33	wire	(S) RB	5 1/2"
✓ 1-23	H-33	wire	(C) 7B	5 1/2"
✓ 1-24	H-37	bare wire	(S) 1B	(S) 2B
✓ 1-25	C-4	.01 mfd cond.	(C) 4B	(S) 5X
✓ 1-26	R-7	5M ohm res.	(S) 4B	(C) 2X
✓ 1-27	H-33	wire	(S) 2X	4 1/4"
✓ 1-28	C-3	*.1 mfd cond.	(S) 3X	4 1/2"
✓ 1-29	H-33	wire	(S) 4X	6 1/2"

*With spaghetti



Step #2-1 Assembly: Remove the nut and lockwasher from the switch assy, screw (next to 6A). Replace the lockwasher with the #6 fibre washer (H40) and the 1 lug terminal strip (H15). Fasten with the nut previously removed. See drawing.

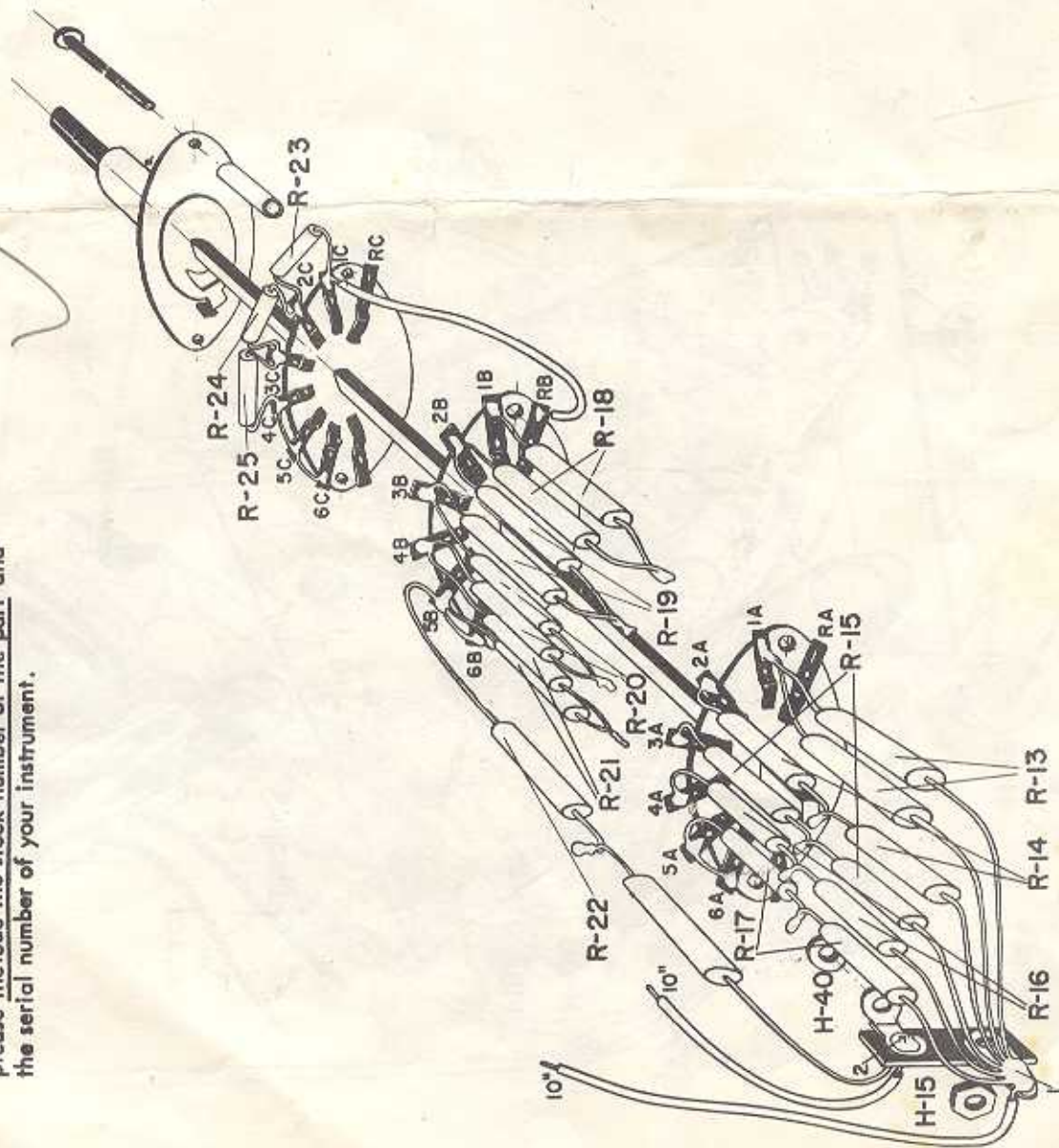
PREWIRING OF RANGE SWITCH S2

(S) means solder, (C) means connect but do not solder.

✓ Step#	Sym.	Description	From	To (Length)
✓ 2-2	H33	wire	(C) 1C	(S) 1B
✓ 2-3	R23	2M/ohm res.	(S) 1C	(C) 2C
✓ 2-4	R24	3.3M/ohm res.	(S) 2C	(C) 3C
✓ 2-5	R25	500K/ohm res.	(S) 3C	(C) 4C
✓ 2-6	H37	bare wire	(S) 4C	(C) 5C
✓ 2-7	H37	bare wire	(S) 5C	(S) 6C
✓ 2-8	R18	5M/ohm res.	(C) 1B	(C) 2B
✓ 2-9	R19	4.5M/ohm res.	(S) 2B	(C) 3B
✓ 2-10	R20	400K/ohm res.	(S) 3B	(C) 4B
✓ 2-11	R21	50K/ohm res.	(S) 4B	(C) 5B
✓ 2-12	H37	bare wire	(C) 5B	(S) 6B
✓ 2-13	R22	50K/ohm res.	(S) 5B	(C) H15#2
✓ 2-14	R13	9.5/ohm res.	(S) 1A	(C) H15#1
✓ 2-15	R14	95/ohm/ res.	(S) 2A	(C) H15#1
✓ 2-16	R15	9.5K/ohm. res.	(S) 3A	(C) H15#1
✓ 2-17	R16	95K/ohm res.	(S) 4A	(C) H15#1
✓ 2-18	R17	9.5M/ohm res.	(C) 5A	(C) H15#1
✓ 2-19	H37	bare wire	(S) 5A	(S) 6A
✓ 2-20	H33	wire	(S) H15#2	10"
✓ 2-21	H33	wire	(S) H15#1	10"

NOTE: Each of the resistors R13, R14, R15, R16, R17, R18, R19, R20, R21, and R22 is actually a matched pair as shown in the drawing. The two resistors that form a matched pair will be found inserted together in one sleeve marked with the resistance value. All of the matched pairs are to be wired in series except R13, which is wired in parallel. In the case of the series matched pairs, twist two ends together and solder as shown.

WHEN ORDERING A PART FOR REPLACEMENT, please include the stock number of the part and the serial number of your instrument.



The drawing at the left is an exploded view of the chassis mounting. To keep the drawing uncrowded, unnecessary repetition is avoided. For example, the method of mounting is shown only for potentiometer R5, as potentiometers R12, R27, R28, R29, and R30 are mounted in exactly the same way.

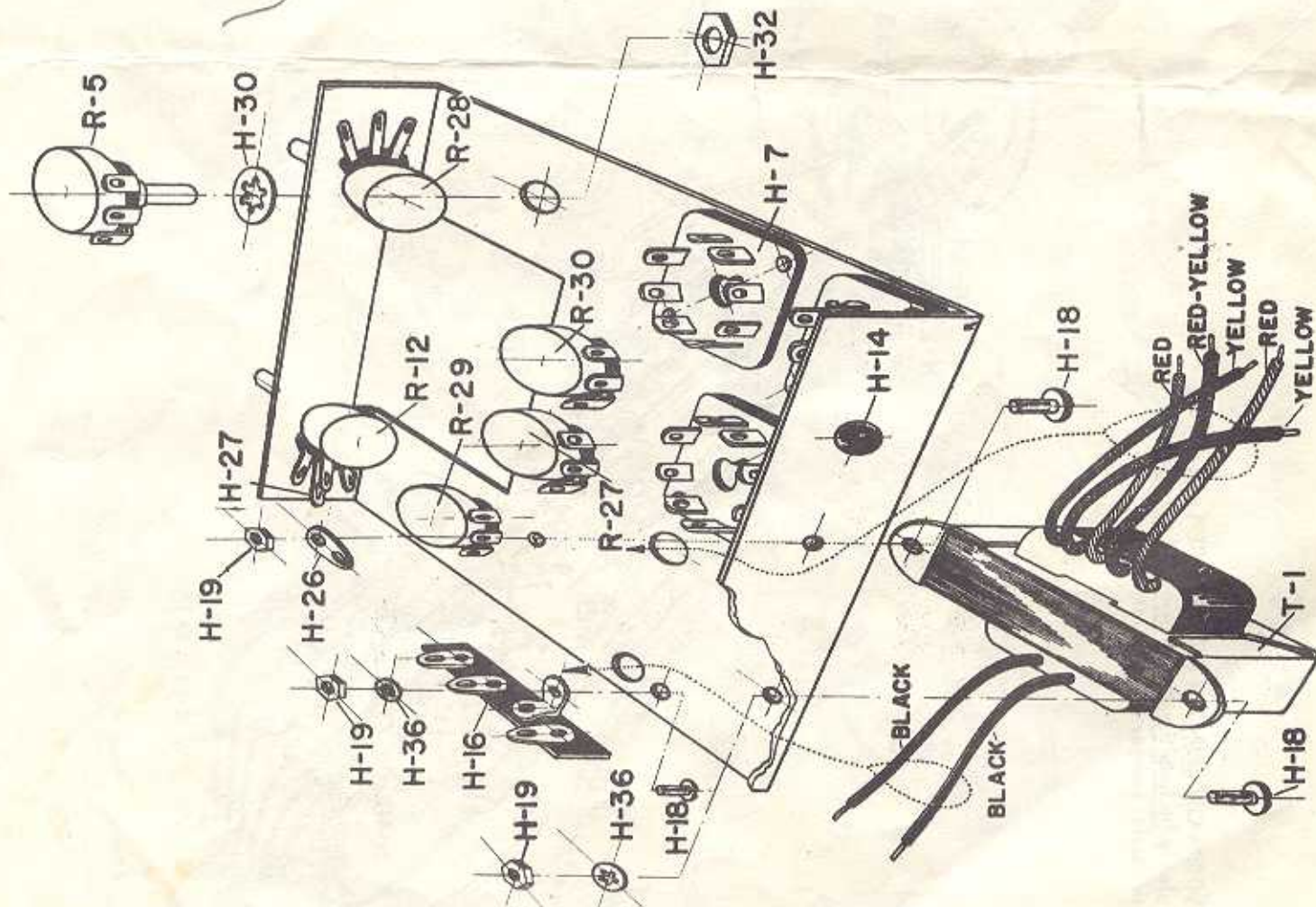
MOUNTING TO THE CHASSIS

Step #	Sym.	Description	Mounted With
✓ 3-1	R5	2M ohm pot	1#H30, 1#H32
✓ 3-2	R30	1K ohm pot	1#H30, 1#H32
✓ 3-3	R27	1K ohm pot	1#H30, 1#H32
✓ 3-4	R29	1K ohm pot	1#H30, 1#H32
✓ 3-5	*R12	2K ohm pot	1#H30, 1#H27
✓ 3-6	*R28	1K ohm pot	1#H30, 1#H32
✓ 3-7	H16	3 lug term. str.	1#H18, 1#H36
✓ 3-8	T1	power xfmr.	1#H19
✓ 3-9	H14	3/8 grommet	2#H78, 2#H19 1#H36, 1#H26

*The 3/8 hex nuts (H32) on the 1K ohm pots (R12 & R28) must be temporarily removed later on to attach the chassis to the panel.

ASSEMBLY PRINT 3

Model 221

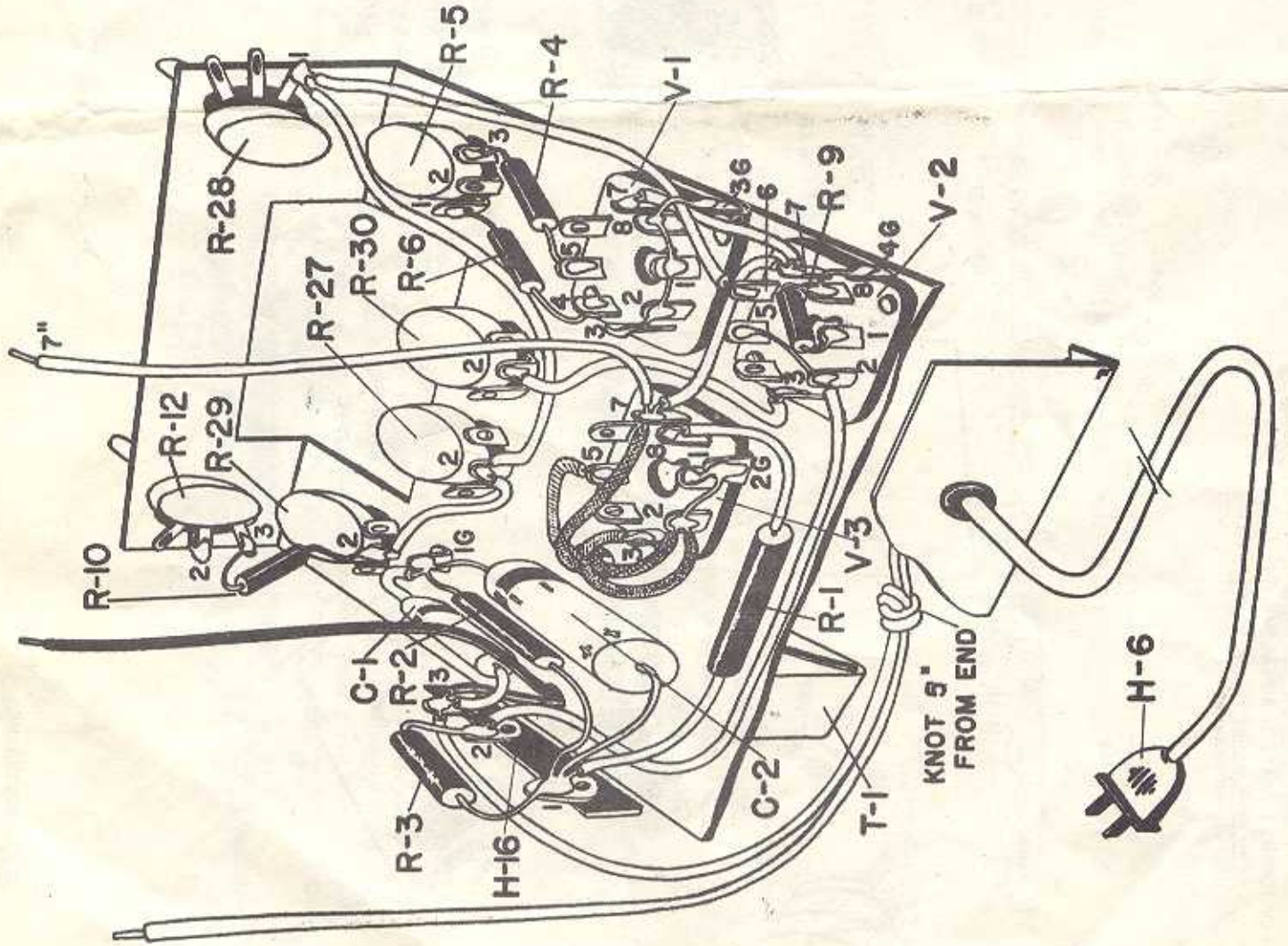


CHASSIS WIRING

(S) means solder, (C) means connect but do not solder.

Step	Sym.	Description	From	To (Length)
✓ 4-1	H33	wire	(C) H76#2	(C) V2#2
✓ 4-2	H37	*bare wire	(S) V2#2	(S) V2#5
✓ 4-3	T1	red wire	T1	(S) V3#3
✓ 4-4	T1	red wire	T1	(S) V3#5
✓ 4-5	T1	red-yellow wire	T1	(C) V3#2
✓ 4-6	T1	yellow wire	T1	(C) V3#2
✓ 4-7	H37	bare wire	(S) V3#2	(C) 2G
✓ 4-8	H37	bare wire	(S) V3#1	(S) 2G
✓ 4-9	T1	yellow wire	T1	(C) V3#7
✓ 4-10	H33	wire	(C) V3#7	T1
✓ 4-11	H33	wire	(S) V3#7	(S) V1#7
✓ 4-12	H33	wire	(S) V2#7	(C) V1#2
✓ 4-13	H37	bare wire	(S) V1#3	(C) V1#1
✓ 4-14	H37	bare wire	(S) V1#2	(C) V1#8
✓ 4-15	H37	bare wire	(S) V1#1	(S) 3G
✓ 4-16	H37	bare wire	(S) V1#8	(S) R5#3
✓ 4-17	R4	1.5M ohm res.	(S) V1#5	(C) V1#4
✓ 4-18	R6	1.5M ohm res.	(S) R5#1	(C) R2#1
✓ 4-19	H33	wire	(S) V2#6	(C) R2#2
✓ 4-20	H33	wire	(S) R28#1	(C) R30#2
✓ 4-21	H33	wire	(S) V2#3	(C) R2#2
✓ 4-22	R10	*1K ohm res.	(S) R12#3	(C) R27#2
✓ 4-23	H33	wire	(S) R2#2	(C) V2#8
✓ 4-24	R9	5M ohm res.	(S) V2#1	(S) 4E
✓ 4-25	H37	bare wire	(S) V2#8	(C) H16#1
✓ 4-26	R3	20K ohm res.	(S) H16#2	(C) H16#1
✓ 4-27	R1	*10K ohm res.	(S) V3#8	(C) H16#3
✓ 4-28	T1	black wire	T1	(C) 1G
✓ 4-29	C1	.002 mfd cond.	(C) H76#3	(C) 1G
✓ 4-30	R2	*33K ohm res.	(C) H16#1	(C) 1G
✓ 4-31	C2	*filter cond.	(S) H76#1	(S) 1G
✓ 4-32	H6	line cord (1 lead)	(S) H16#3	(S) H16#3
✓ 4-33	H27	pot grounding lug	(S) R12#2	(S) R12#2

*With spaghetti



ASSEMBLY PRINT 4
Model 221

WHEN ORDERING A PART FOR REPLACEMENT, please include the stock number of the part and the serial number of your instrument.

MOUNTING ON PANEL*

Step#	Sym.	Description	Mounted With
✓ 5-1	H5	pilot light	associated hdwre.
✓ 5-2	J2	pin jack	1# H38 nut & shldr. washer
✓ 5-3	J3	banana jack	1# H39 nut & lock washer
✓ 5-4	S1	SPST toggle switch	2# H17
✓ 5-5	J1	phone jack	2# H30, 1# H32
✓ 5-6	M1	meter movement	4# H36, 4# H19
✓ 5-7	H23	meter lugs	4# H25, 2# H24
✓ 5-8	H2	chassis	2# H31, 2# H32**

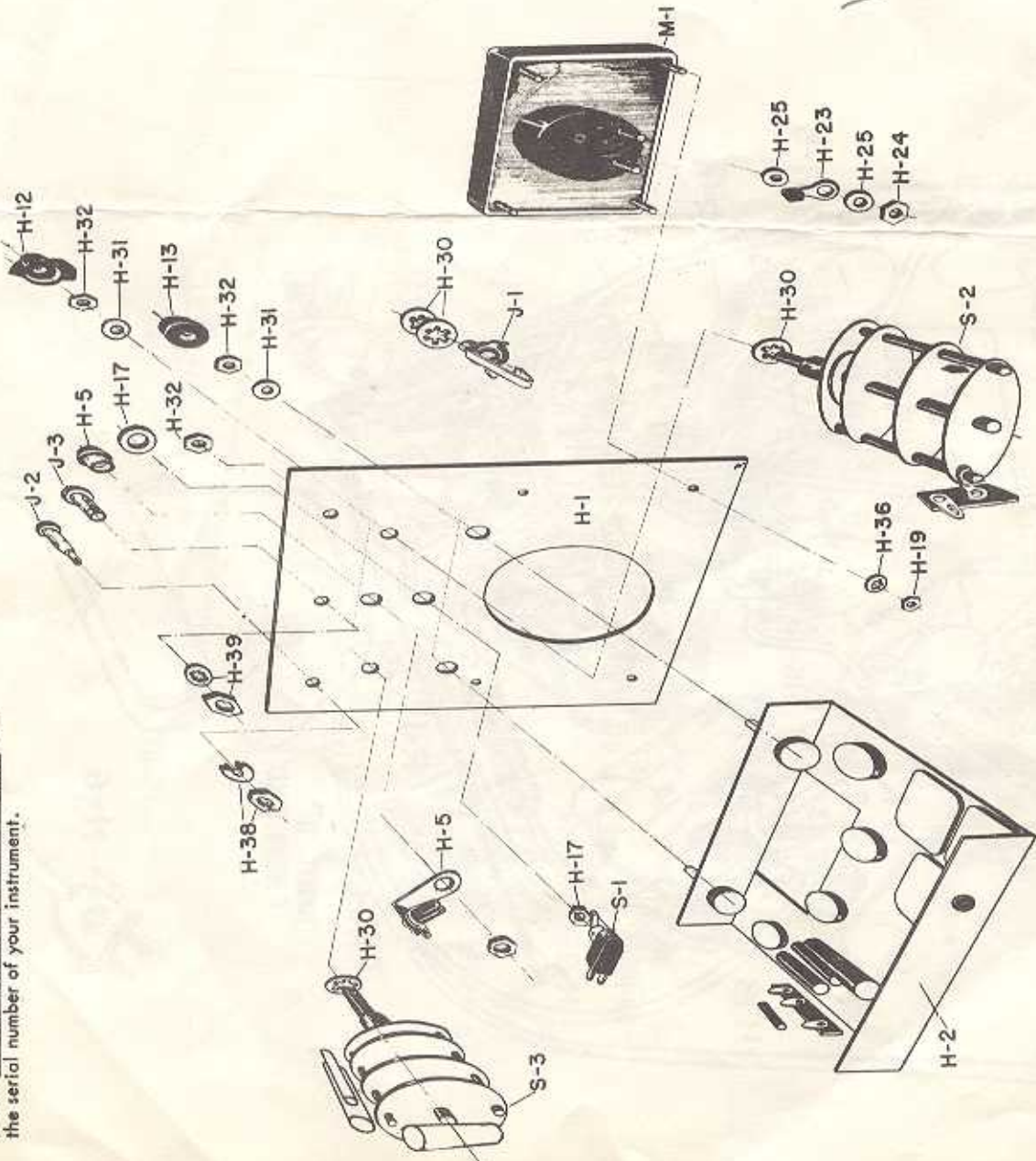
*For convenience in wiring, switches S2 and S3 are mounted later.
 **3/8 hex nuts previously mounted - remove temporarily and replace after the pot shafts are through the panel.

KNOB PLACEMENT - STEP #7-26

(To be done after switches S2 and S3 have been mounted as part of "FINAL MOUNTING AND WIRING", the table accompanying Assembly Print 7).

Place the small round knobs (H13) on the shafts of the OHMS ADJ. and ZERO ADJ. potentiometers respectively, and tighten the set screws.

Place the bar knobs (H12) on the shafts of the FUNCTION switch, S3, and the RANGE switch, S2, and tighten the set screws. Rotate the switches counter-clockwise as far as they will go. Loosen the set screws, and line up the FUNCTION switch and RANGE switch knobs with the markers for the "-DC VOLTS" and "5V, RX1" positions respectively. Tighten the set screws. The knobs now indicate properly.

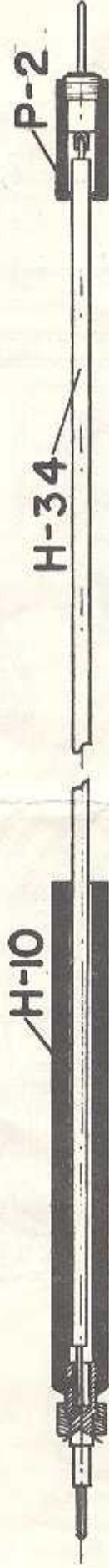


DC TEST LEAD



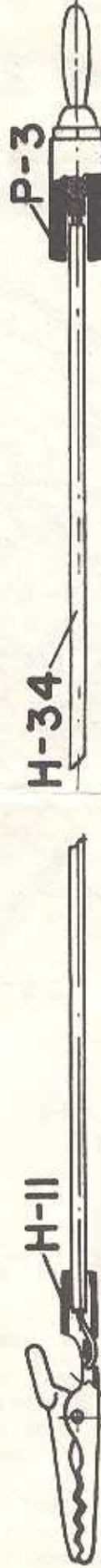
Strip ends of shielded wire, H35, as shown. Solder one end of inner conductor to 15M ohm resistor, R31. Be sure that shielding is well separated from exposed inner conductor. Unscrew ring nut from tip of test prod, H9. Slide cable through prod, resistor first, until resistor lead protrudes from small hole in prod tip. Wind protruding lead once around tip and secure with ring nut. Unscrew cover from phone plug, P1, and slide other end of the shielded wire through it. Solder inner conductor to short terminal lug of P1. Insert exposed shielding in clamp at the end of the long terminal. Crimp it so that the cable is held securely. Solder shielding to clamp. Make sure that shielding is well separated from exposed end of inner conductor. Slide cover to end of plug and screw tight.

AC TEST LEAD



Strip ends of test lead wire, H34. Remove ring nut from black test prod, H10. Slide wire through prod until one stripped end protrudes from small hole in prod tip. Wind exposed wire around prod tip and secure with ring nut. Unscrew cover from pin plug, P2, and slide other end of wire through it. Solder end of wire to terminal on pin plug. Slide cover to end of plug and screw tight.

COMMON TEST LEAD



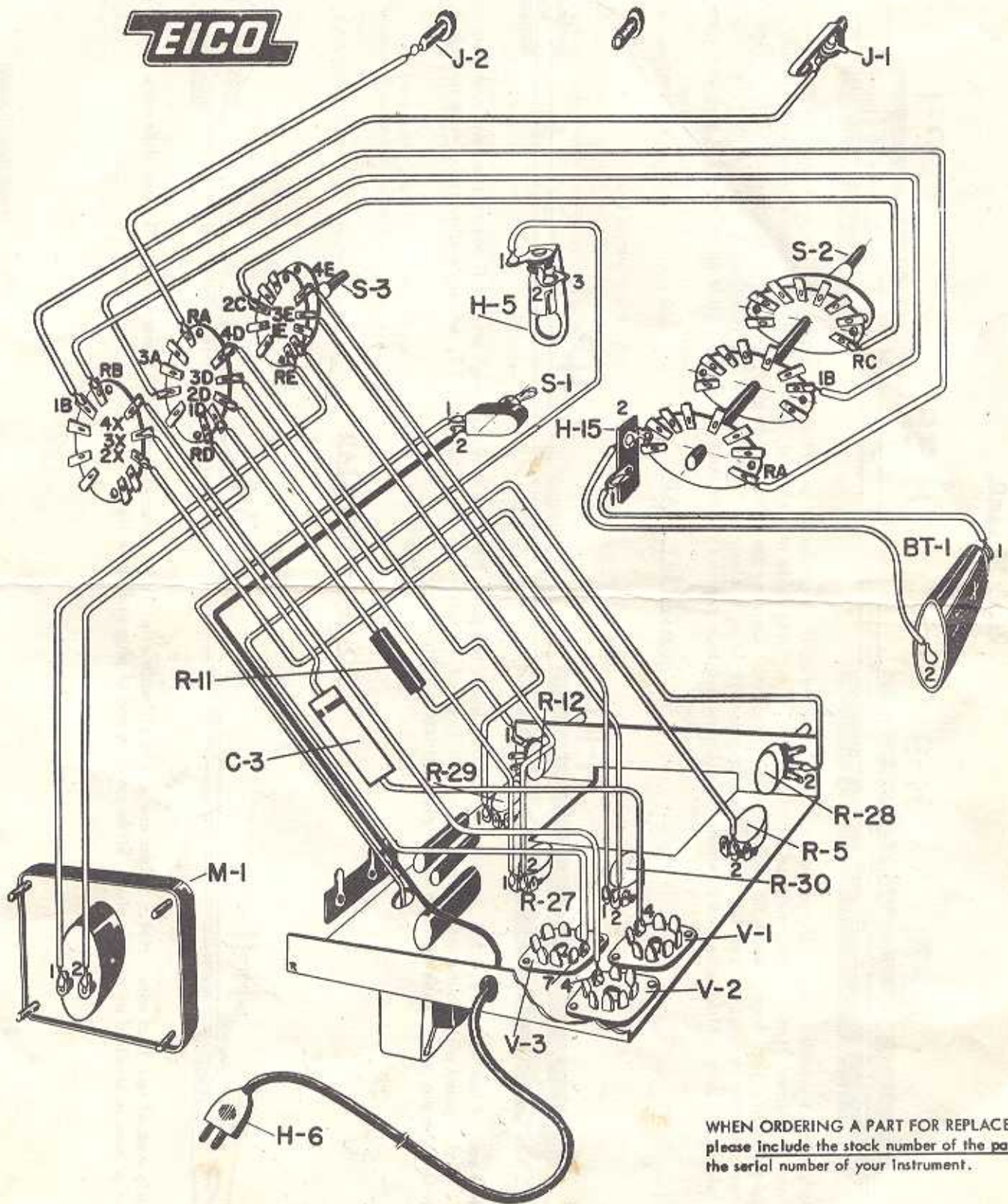
Strip ends of test lead wire, H34. Solder one end to alligator clip, H11. Unscrew cover from banana plug, P3, and slide other end of wire through it. Solder end of wire to terminal on banana plug. Slide cover to end of plug and screw tight.



ASSEMBLY PRINT 7

Model 221

EICO



WHEN ORDERING A PART FOR REPLACEMENT,
please include the stock number of the part and
the serial number of your instrument.

FINAL MOUNTING AND WIRING

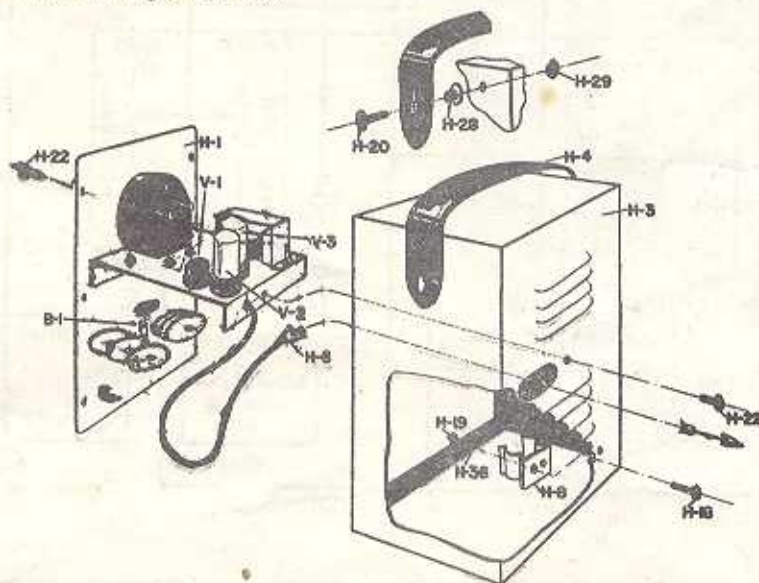
✓ Step [#]	Sym.	Description	From	To	✓ Step [#]	Sym.	Description	From	To
✓ 7-1	T1	power xfmr.	black	(S) S1 ^{#1}	✓ 7-14	H33	wire	*S3 ^{#1B}	(S) J1
✓ 7-2	H6	line cord	lead	(S) S1 ^{#2}	✓ 7-15	H33	wire	*S3 ^{#RA}	(S) J2
✓ 7-3	**Mount	switch S3 with 1 [#] H30, 1 [#] H31, 1 [#] H32			✓ 7-16	H33	wire	*S3 ^{#RE}	(S) M1 ^{#1}
✓ 7-4	H33	wire	*S3 ^{#3E}	(S) R30 ^{#2}	✓ 7-17	**Mount	switch S2 with 1 [#] H30, 1 [#] H31, 1 [#] H32		
✓ 7-5	H33	wire	*S3 ^{#4E}	(S) R30 ^{#1}	✓ 7-18	H33	wire	*S3 ^{#2C}	(S) S2 ^{#RC}
✓ 7-6	H33	wire	*S3 ^{#4X}	(S) V2 ^{#4}	✓ 7-19	H33	wire	*S3 ^{#RD}	(S) M1 ^{#2}
✓ 7-7	H33	wire	*S3 ^{#4D}	(S) R27 ^{#2}	✓ 7-20	H33	wire	*S3 ^{#3A}	(S) S2 ^{#RA}
✓ 7-8	H33	wire	*S3 ^{#2D}	(S) R27 ^{#1}	✓ 7-21	H33	wire	*S3 ^{#RB}	(S) S2 ^{#1B}
✓ 7-9	H33	wire	*S3 ^{#3D}	(S) R28 ^{#2}	✓ 7-22	H33	wire	*H15 ^{#1}	(S) BT1 ^{#1}
✓ 7-10	H33	wire	*S3 ^{#1E}	(S) R29 ^{#1}	✓ 7-23	H33	wire	*H15 ^{#2}	(S) BT1 ^{#2}
✓ 7-11	H33	wire	*S3 ^{#2X}	(S) R5 ^{#2}	✓ 7-24	H37	bare wire	(S) H5 ^{#2}	(S) H5 ^{#3}
✓ 7-12	C3	.1 mfd cond.	*S3 ^{#3X}	(S) V1 ^{#4}	✓ 7-25	H33	wire	*V3 ^{#7}	(S) H5 ^{#1}
✓ 7-13	R11	1K ohm res.	*S3 ^{#1D}	(S) R12 ^{#1}	✓ 7-26	Knob Placement - Instructions on Ass'y. Print 5			

*Connection soldered previously. **Mount to panel as shown on Ass'y. Print 5.

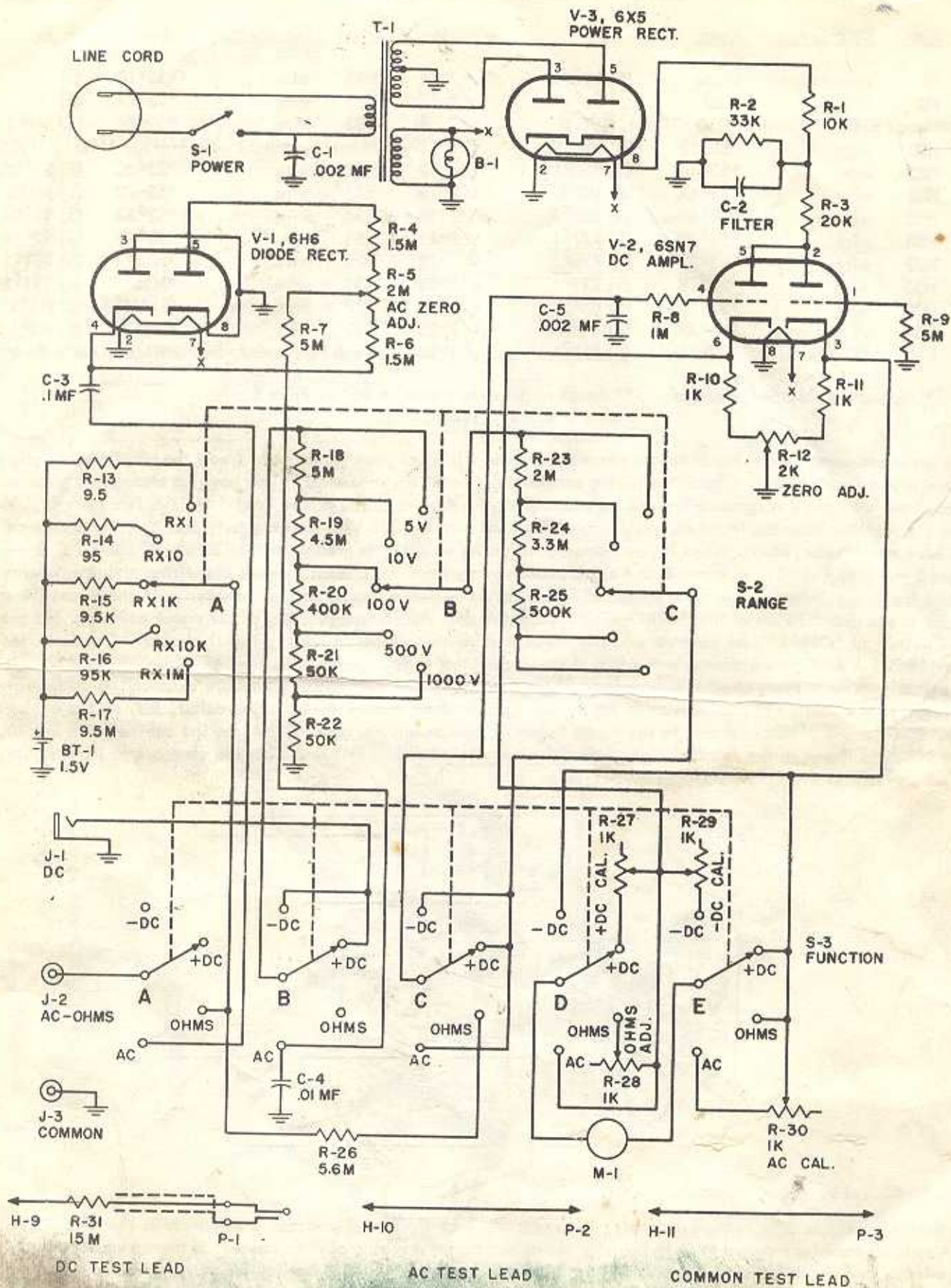
FINAL STEPS

You have now completed the mechanical assembly and the wiring of your instrument. Insert the tubes and the pilot light as shown in the figure below. Check the wiring carefully for errors or omissions. If you have an ohmmeter, measure the resistance from V3, pin 8 to ground (before connecting the instrument to the power line). If it is less than 40,000 ohms, check the rectifier circuit. Insert the plug on the line cord into the 115 VAC power supply and turn the instrument on. If you have a voltmeter, check to see if you have the following voltages to ground (within 20%): V2, pins 2 & 5 — 90v; V2, pin 3 — 3 to 4v; V2, pin 6 — 3 to 4v. If these voltages are not present, check the wiring and components in the circuits involved. Whether you have made the voltage and resistance checks or not, proceed with these remaining steps. Check to see that rotation of the "ZERO ADJ." potentiometer results in movement of the meter pointer. Set the FUNCTION switch at "OHMS" and observe whether the meter pointer swings to the right as it should. Check to see whether the "OHMS ADJ." potentiometer can adjust the meter pointer to full-scale deflection.

After you have made these checks, proceed with the calibration. The calibration procedure is described completely in the MAINTENANCE section of the Instruction Book. After calibration, mount the battery bracket, H8, on the cabinet with 2[#]H18, 2[#]H19, and 2[#]H36 as shown in the figure below. Then mount the handle, H4, on the cabinet with 2[#]H20, 2[#]H28, and 2[#]H29 as shown in the detail sketch. Insert the battery in bracket H4, and slide the chassis into the cabinet, securing it with 7[#]H22 as shown in the figure below.



If the instrument fails to operate properly, make certain that the wiring and the components in the circuit are correct. Almost all troubles reported to us in the past, have had improper wiring as their cause. If the wiring is correct, test for continuity and check individual components for breakdown. If you are still having difficulty, write to our engineering department (Electronic Instrument Co., Inc., 33-00 Northern Blvd., L.I.C. 1, New York) listing all indications which might be helpful. The serial number of your instrument should be included in any correspondence. If desired, you may return the instrument to our factory, where it will be placed in operating condition and calibrated for \$4.00 plus the cost of parts replaced due to their being damaged in the construction of the instrument. Pack the unit very carefully; in the original shipping carton, if possible. Send it to the above address, prepaid Railway Express. The instrument will be returned as soon as possible, express collect.



Model 221

ELECTRONIC VOLT-OHM METER

