SUPPLEMENT No. 6

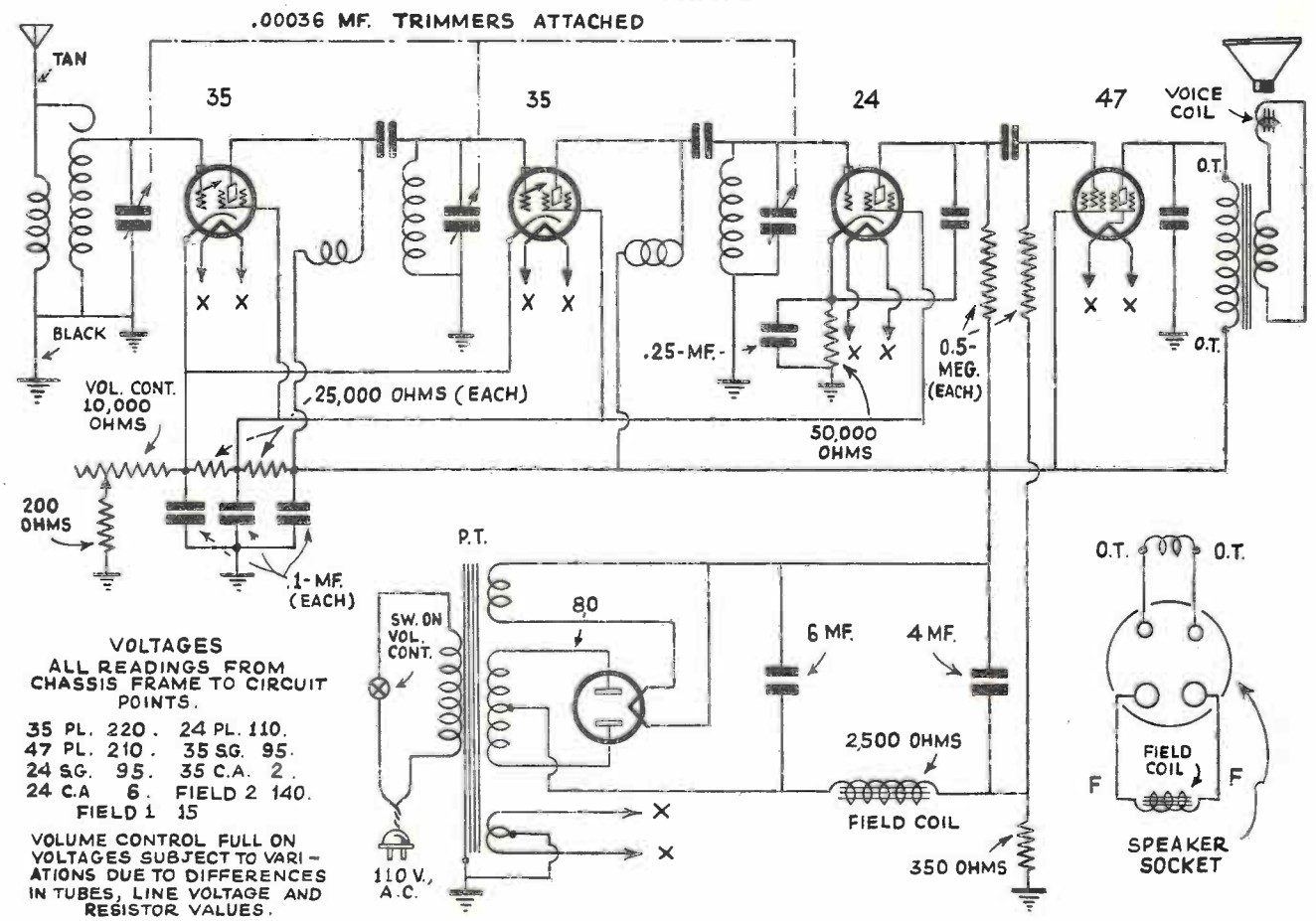
Index and Incidental Information

This is the sixth and final supplement to the 1932 OFFICIAL RADIO SERVICE MANUAL. Insert this sheet directly after page 4H and distribute the others in the proper numerical order.

Users of the MANUAL are again requested to read the rules of the free question service, published on page 578F. Observance of these rules will save a lot of time for every one concerned. We wish particularly to emphasize the fact that service data on some sets—even the simplest kinds of diagrams — is not available because the manufacturers have been out of business for years, or, if they are still in existence, they have no records of their older products.

In all cases it is absolutely necessary for us to know the model number of any receiver under consideration. We again repeat that we are not mind readers or magicians, and cannot identify sets from such meagre descriptions as "a seven tube Majestic" or "a Crosley battery model brought out in 1927". If you want us to help you, give us some information to work on.

BELMONT RADIO CO.



VOLTAGES
ALL READINGS FROM CHASSIS FRAME TO CIRCUIT POINTS.

35 PL. 220 . 24 PL. 110.
47 PL. 210 . 35 SG. 95.
24 SG. 95. 35 C.A. 2.
24 C.A 6. FIELD 2 140.
FIELD 1 15

VOLUME CONTROL FULL ON VOLTAGES SUBJECT TO VARIATIONS DUE TO DIFFERENCES IN TUBES, LINE VOLTAGE AND RESISTOR VALUES.

BELMONT MODELS 560 & 525

CAPEHART CORP.

CAPEHART MODELS 200 AND 300 DE LUXE 11-TUBE AUTOMATIC PHONO-RADIO

(Visual tuning meter; phono. pickup pre-amplifier; tone control; silent-tuning control; automatic record-changer; delayed A.V.C.; superheterodyne circuit.)

The Model CK chassis incorporated in this automatic record-changer phonograph and superheterodyne radio receiver combination, manufactured by The Capehart Corporation, is produced by Howard Radio Corp. as their Model K chassis, the "C" designation indicating that the circuit has been modified by the Capehart concern to include a separate tube, V10 in the diagram, as a phono, pickup pre-amplifier. The "200" uses a Jensen 12 in. D-9 speaker and the "300" a 14 in. "Mastodon," and the cabinets and record changers are different. The sensitivity is 6 microvolts-per-meter; undistorted power output, 5 W., and; power consumption, 142 W. (set, 115 W.; motor, 17 W.; cabinet light, 10 W.).

Tube No.	Fil. Volts	Cath. Volts	S.G. Volts	Sup. G. Volts	Plate Volts
1	2.5	3	90	3	180
2	2.5	7	90	7	180
3	2.5	7	—	—	90
4	2.5	3	70	3	180
5	2.5	70	—	—	180
6	2.5	95	180	—	180
7	2.5	95	180	—	180
8*	2.5	—	—	—	—
9**	2.5	—	85	3	32
10	2.5	7	—	—	160
11	5.0	—	—	—	300

Voltages indicated at a line potential of 115 V. All readings taken between tube element and chassis, with R3 in the least effective position. *No data available for a 56 as V8: for a 57 [used in late models], the following figures are given: C.G., 90V.; Cath., 115V.; S.G. [grounded], zero V.; Sup. G. [tied to C.G.], 90V.; Plate, 3V. **The C.G. of V9 is 3V.

Condensers C1 to C3, tuning units shunted by trimmers; C4, padding condenser; C5 to C8, I.F. trimmers; C9, C15, C17, C18, C19, C20, 0.1-mf.; C10, C11, C12, C13, C14, 1.2 mf.; C16, C21, .001-mf.; C22, C23, 1.4-mf.; C24 to C26, 8 mf.; C27, 1. mf.; C28, .01-mf.

Resistors R1, R2, .125-meg.; R3, 10,000 ohms; R4, .25-meg.; R5, R8, R13, R16, R17, 0.2-meg.; R6, R20, 3,000 ohms; R7, R14, 500 ohms; R9, 2 megs.; R10, 2,500 ohms; R11, R12, .15-meg.; R15, R23, 10 ohms, center-tapped; R18, 30,000 ohms; R19, 0.1-meg.; R21, 4,150 ohms; R22, R25, 2,000 ohms; R24, 210 ohms. Choke coil section A 2,575 ohms, section B 170 ohms; phono pickup 40,000 ohms (at 1,000 cycles); field coil Ch. 220 ohms.

The Model 10-12-C automatic record changer used in this phono-radio combination operates at 78 r.p.m. To adjust the pickup change lever for playing 10 in. records, loosen the forward lever stop and hold it in such a position that the needle will come down onto a 10 in. record exactly 4 11/16 ins. from the edge of the center pin. When the correct location of the pickup change lever has been ascertained the front stop may be set snug against this lever and the screw tightened, which will allow the lever to always be thrown over to that exact position when playing 10 in. records. To adjust the playing for 12 in. records, loosen the back lever stop and hold the lever in such a position that the needle will come down exactly 5 11/16 ins. from the edge of the centering pin.

Adjust the weight of the pickup with only one record on the turntable. With a delicate pair of scales, having a range of 0 to 12 ozs., catch the needle screw and lift the pickup from the record until the A.F. quality breaks, at which time a reading of 5½ to 6 ozs. should be indicated.

There are five steps in adjusting the oscillating and spiral trip lever and the pickup silencer. (1). Turn the master cam until the large timing mark is exactly above the timing mark on the tone arm lifting lever; (2), Hold the switch lever and cam assembly against the driven clutch so that the radius of the cam will center against the clutch; (3), Set the pickup silencer switch against the casting bearing so that the shaft of the cam cannot be moved further toward the automatic switch; (4). Hold the tail of the cam against the lug on the inside of the master cam and adjust the trip lever until it is 1/16-in. beyond the catch in the oscillating trip lever; (5), Adjust the pickup silencer switch so that a good contact is made on the pickup short-circuiting switch *when the needle is on the record and the automatic switch has been tripped.*

Failure to correctly adjust the spiral trip cam, so that the automatic trip operates when the needle is 1 49/64 ins. from the edge of the turntable spindle, will cause the instrument to change records before the music is finished, or not to change records automatically.

The correct clearance for the needle to feed into the music groove, between the cork insert and the tone arm base is .015-in.

The record magazine pin must be so placed that the offset at the bottom extends directly away from the record support shelf, and the pin must have a clearance of exactly 4⅞ ins. between the back center of the offset, and the extreme right and left corners of the record support shelf, with the magazine in the 10 in. record playing position.

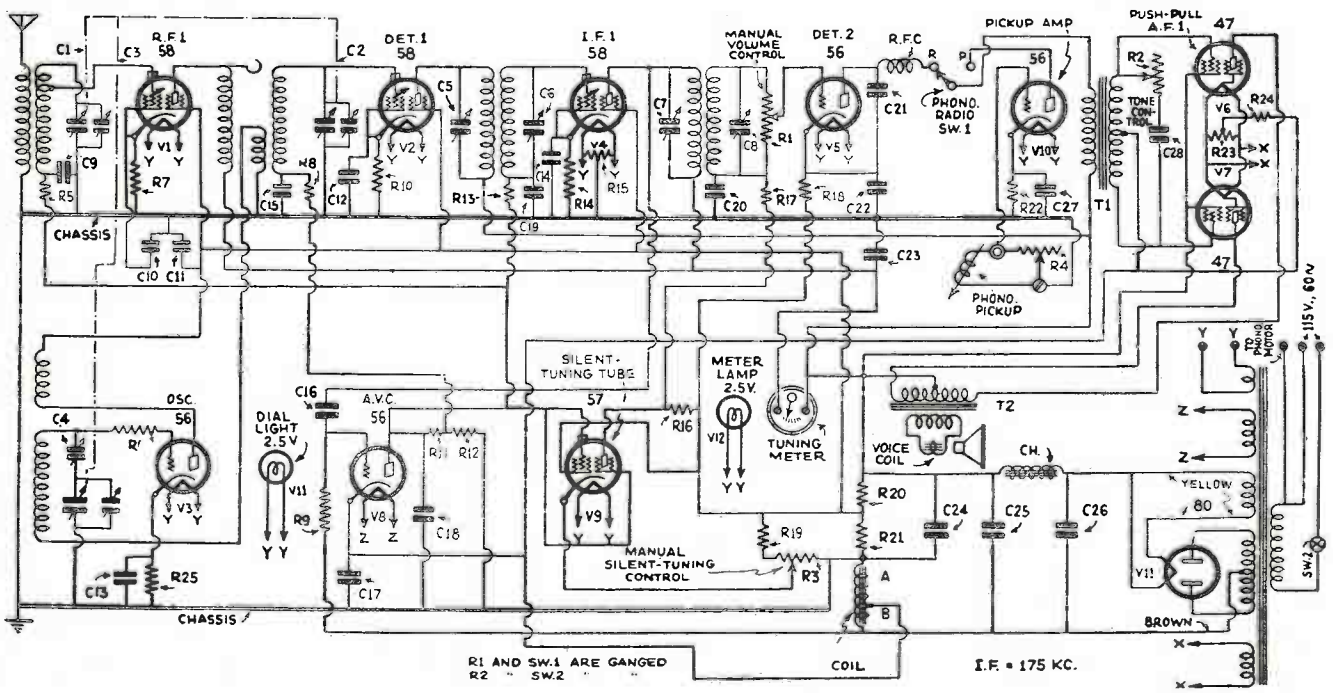
Adjust the record weight (at the bearing pivot) so that the lower edge clears the record slide shelf while in the 10 in. position but holds one record in correct position for the slide plate to unload it onto the turntable.

The receiver chassis incorporates a special A.V.C. circuit so that at low signal levels the A.V.C. is inoperative, due to the high bias on the grid of V10, and only when the received signal exceeds 50 microvolts input does the A.V.C. circuit operate, after which point it holds the output of the receiver substantially constant up to an input as high as 4 volts.

During the condition of "no signal," there is no current flow through R11, R12, and therefore the control-grid of V9 has zero potential, causing a large current to flow through R16, producing a blocking potential on the control-grid of V5. During the condition of "signal," V8 operates and develops a voltage across R11, R12, applying a negative potential on the control-grid of V9, reducing its plate current to zero and thus restoring the control-grid potential of V5 to normal. (For more positive noise suppressor action the control-grid and suppressor-grid of V9 are tied together.)

Use a low value of service oscillator output in realigning the circuits to counteract the apparent detuning effect due to the action of the A.V.C. circuit. Padding condenser C4 is accessible through a hole in the upper part of the variable condenser shield can.

Transformer color code: winding X, X, (3.5 A.) blk. & maroon; Y, Y, (1 A.) and Z, Z, (5 A.) yel.



ATWATER KENT RADIO

ELECTRICAL VALUES OF RESISTORS and CONDENSERS IN ALL RECEIVERS 1924—1932 INCLUSIVE

This Service Manual supplement contains a numerical list, with values, of all Atwater Kent condensers and resistors in receivers produced up to and including 1932.

It also includes simplified parts-list tables, with values, for each model. In using these tables, please note the following:—

1—The value of each part is printed in **heavy type** under the part number. The value is given in ohms unless otherwise specified. In cases where a resistor is tapped, the total over-all resistance is given. This also applies to tapped windings on audio transformers.

2—Tubular resistors are not listed in the table for each model. To find the value of a tubular resistor it is necessary to refer to page 7, which contains a complete list of tubular resistors with resistance values and identifying color.

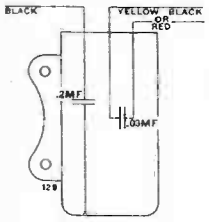
3—In these tables we give only the part number and code marking of by-pass and filter condensers. To find the values inside these condensers, it is necessary to refer to pages 2, 3 and 5. Owing to production changes, there are a few exceptions to the listing of by-pass condensers in the tables.

4—In the list of flexible and wire-wound resistors, we show illustrations of the early-style resistors that were actually used in the sets. In many cases the resistors supplied for replacement are of late-style with die-cast lugs. Replacement resistors are usually furnished without leads.

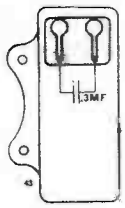
ATWATER KENT MFG. CO.

VALUES OF BY-PASS CONDENSERS

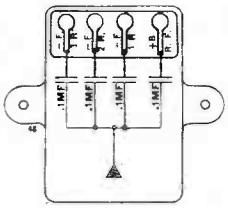
Numbers in circles refer to note on page 3.



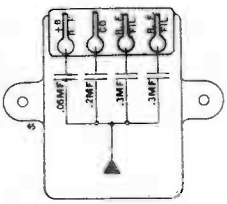
13956
200-Volts



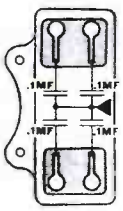
14902
450-Volts



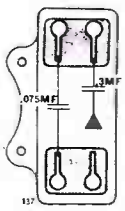
15157
450-Volts



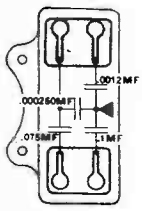
15158
.3MF, 200-Volts
.2 & .05, 400-Volts



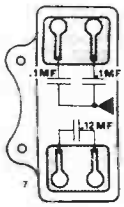
15262 ①
B-1, H-1
H-9, H-20



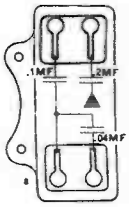
15263
B2-H-2
②



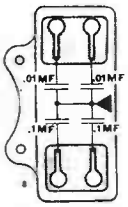
15640
H-16
400-Volts



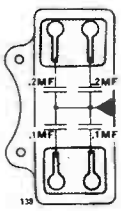
15770
H-15
③



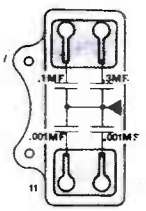
15780
H-17
④



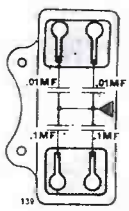
15790
H-18, H-21
400-Volts



15837
B-3
Superseded by
16233

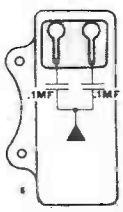


16060
H-24
Superseded by
18350

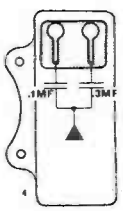


16233
H-4, H-10
⑤

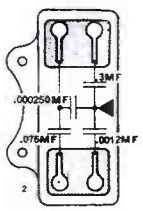
16318
450-Volts



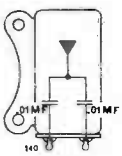
16461
H-6, H-12
400-Volts



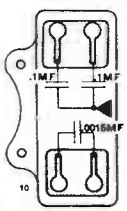
16462
H-5, H-11
400-Volts



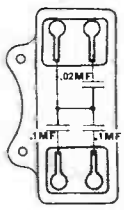
16745
H-7, H-8, H-13
⑥



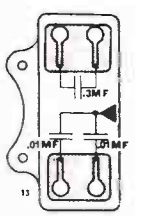
16828
B-5
450-Volts



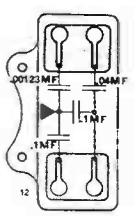
16880
H-23
400-Volts



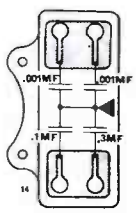
16940
H-22
400-Volts



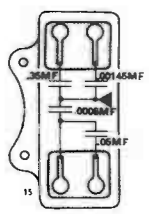
17360
H-27
400-Volts



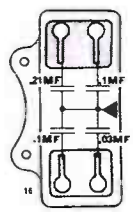
17370
H-25, H-26
400-Volts



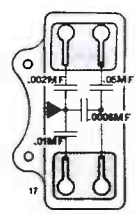
18350
H-28
⑦



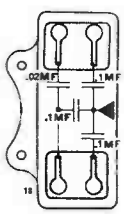
19150
H-29
400-Volts



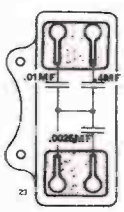
19160
H-30
400-Volts



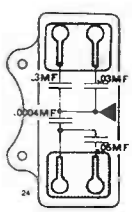
19560
H-31
400-Volts



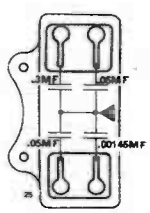
19690
H-32
400-Volts



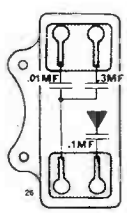
19710
H-33
400-Volts



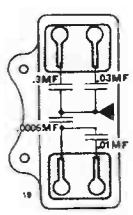
19980
H-34
400-Volts



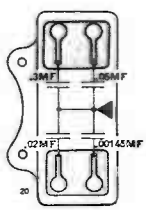
19990
H-35
400-Volts



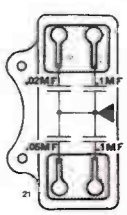
20350
H-36
400-Volts



21170
H-37
400-Volts



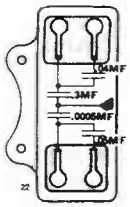
21180
H-38
400-Volts



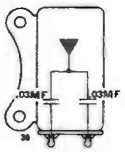
21430
H-39
400-Volts

ATWATER KENT MFG. CO.

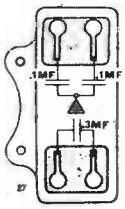
VALUES OF BY-PASS CONDENSERS (Continued)



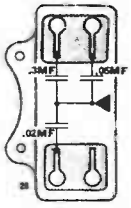
21440
H-40
400-Volts



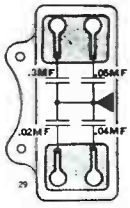
21450
B-10
450-Volts



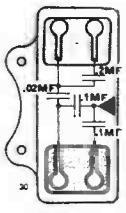
22050
H-41
200-Volts



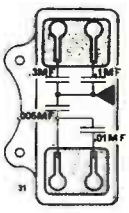
23310
H-42
Superseded by
21180



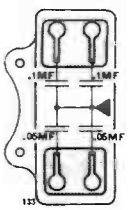
23330
H-43
200-Volts



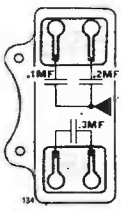
23590
H-44
200-Volts



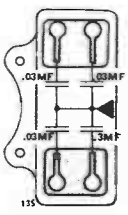
23610
H-45
400-Volts



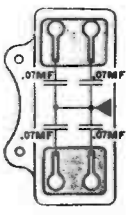
27120
H-46
400-Volts



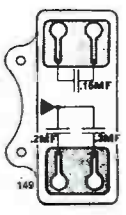
27140
H-47
200-Volts



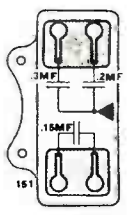
27580
H-48
200-Volts



29560
H-49
400-Volts



30290
H-50
Superseded by
30310

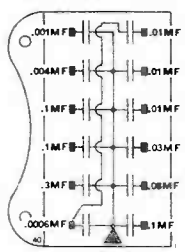


30310
H-51
200-Volts

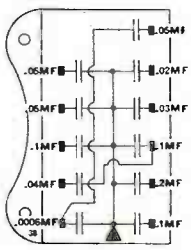
NOTES

1. In B-1, H-1, and H-9, the two top condensers are 150 volts; the two bottom condensers are 400-volts. In H-20, all four condensers are 400-volts. H-20 may be used in place of B-1, H-1, or H-9, but do not use B-1, H-1, or H-9 in place of H-20.
2. In 15263, the .3 MF condenser is 150-volts; the .075 MF is 400-volts.
3. In 15770, the .12 MF condenser is 400-volts; the others are 150-volts.
4. In 15780, the .2 MF condenser is 400-volts; the others are 150-volts.
5. In 16233, the .1 MF condensers are 150-volts; the others are 400-volts.
6. In 16745, the .3 MF condenser is 150-volts; the others are 400-volts.
7. In 18350, the top-right and lower-left condensers are 150-volts; the others are 400-volts.

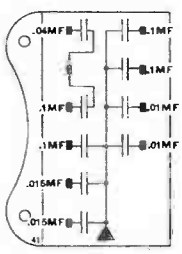
MULTIPLE TYPE BY-PASS CONDENSERS



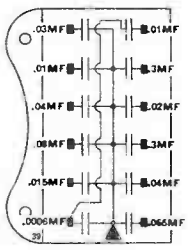
20830
J-1, J-2
200-Volts



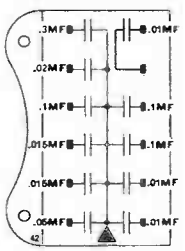
22570
J-3
200-Volts



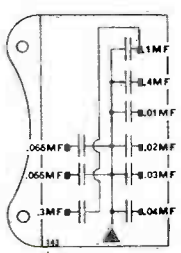
23140
J-4
200-Volts



24250
J-5
200-Volts

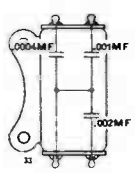


25690
J-6
200-Volts

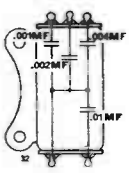


28140
J-7
200-Volts

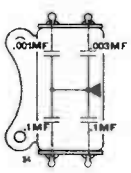
TONE CONTROL CONDENSERS



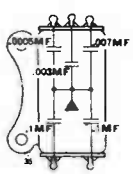
15870
B-7
100-Volts



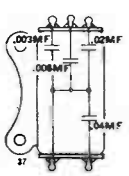
16490
B-6
100-Volts



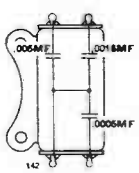
20010
B-8
100-Volts



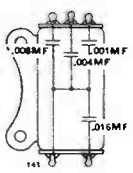
21250
B-9
200-Volts



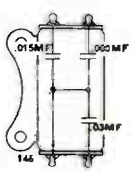
21530
B-11
200-Volts



27390
B-14
200-Volts



29690
B-15
200-Volts



30270
B-16
200-Volts

ATWATER KENT MFG. CO.

VALUES OF FIXED CONDENSERS AND DRY ELECTROLYTICS

‡4465

‡8112

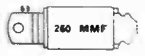
‡8241

‡8590

‡8593

‡9598

‡14072



‡14861

‡15540

‡15792

‡15919

‡16088

‡16323

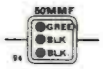
‡16360

16788

†22365

†22366

†23250

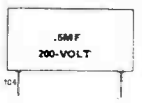


†23282

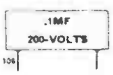
§26040

26050

§26490



26550



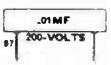
26650

‡26670

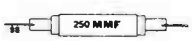
26690

26820

‡27130

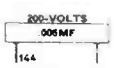


27630



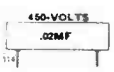
‡27640

‡27650



28040

28130

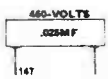


29030

29360

†29890

§30240



30250

†17440
7 plates. Copper washers, or letter A.

† 17470
4 plates. "X" scratched on fibre, or letter F.

†17974
4 plates. Aluminum washers, or letter G.

†21160
4 plates. Black washers, or letter B.

†22220
3 plates. Brass washers or letter C.

† 25650
6 plates. Black washers, or letter D.

†26440
4 plates. Black washers, or letter B.

†30260
Letter E stamped on washer.

†23411

§21624
K-4

§23260
K-1

†26620
K-5

*29550
K-6

‡ 500-Volts.
† 450-Volts.
§ 200-Volts.
* 100-Volts.

DRY ELECTROLYTICS AND TRIMMERS

22397

22472

22646

23479

23981

17230
10 to 85 MMF

17240
70 to 225 MMF

18150
45 to 115 MMF

19330
25 to 150 MMF

20190
25 to 190 MMF

20340
30 to 250 MMF

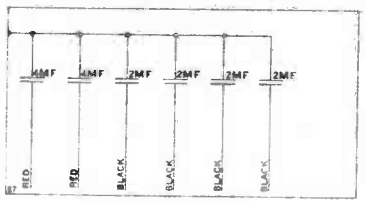
24760
30 to 125 MMF

27860
30 to 140 MMF

30110
20 to 130 MMF

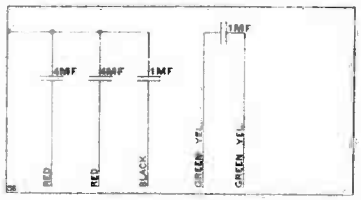
ATWATER KENT MFG. CO.

VALUES OF FILTER CONDENSER ASSEMBLIES

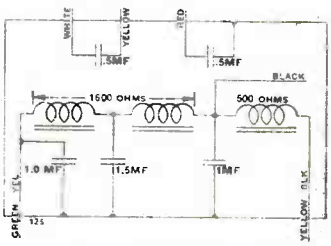


8875 and 9505

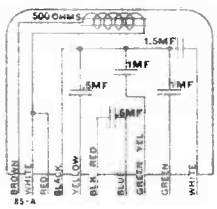
9511



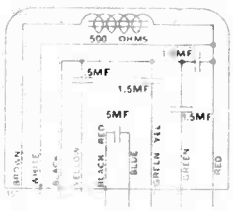
9704



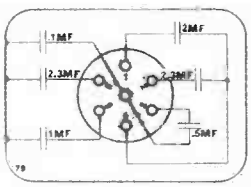
13315 (Late Type)



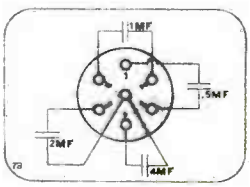
14247



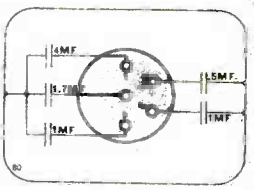
14256



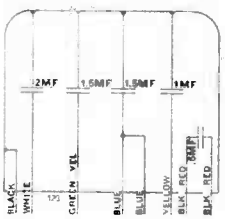
14340
A-3



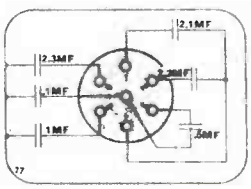
14710
C-1



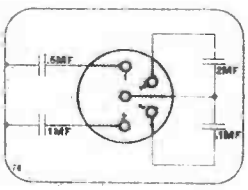
14720
D-2



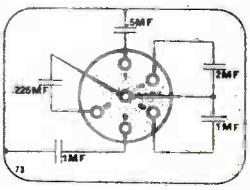
14743



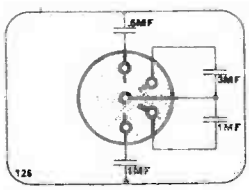
14880
E-1



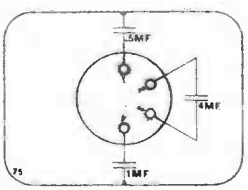
15480
A-5



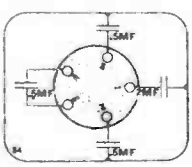
15850
C-7



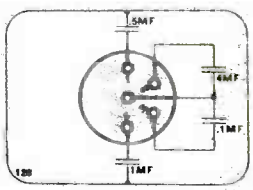
16520 (Early Type)
A-6



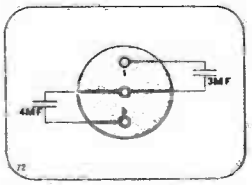
16520 (Late Type)
D-3



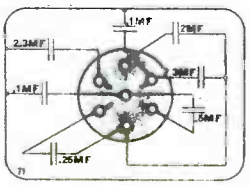
17159
C-6



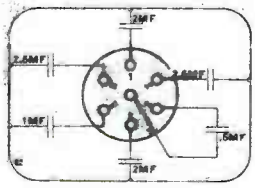
17480
E-3



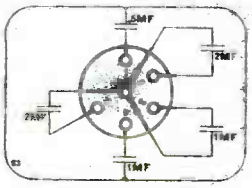
20370
F-1



21520
A-7



25130
F-3



25190
F-4

ATWATER KENT MFG. CO.

VALUES OF ELECTROLYTIC CONDENSERS

19060, superseded by 22538.

19728, superseded by 23146.

20049, 24MF, 120 volts.

22538, 8MF, 475 volts. Yellow paint.

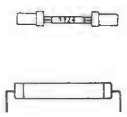
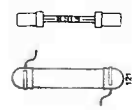
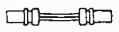
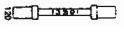
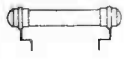
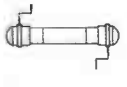
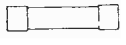
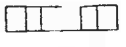
23146, 8MF, 475 volts. Yellow paint.

23394, superseded by 22538.

23498, 4MF, 475 volts. Green paint.

23481, 12MF, 475 volts. Red paint.

VALUES OF EARLY-TYPE TUBULAR RESISTORS

PART NO.	RESISTANCE	USED AS	USED IN MODELS	ILLUSTRATIONS (⅓ FULL SIZE)		SUPERSEDED BY
4782	2 megohms	Grid leak	20-4640 & 24			15892
4814	2 megohms	Grid leak	Board sets		YELLOW PAPER UNDER GLASS	15892
7639	2 megohms	Grid leak	20-7570 & 21		WHITE GLASS	15892
7724	.1 megohm	A.F. grid resistor	12-4910		BLUE PAPER UNDER GLASS	16282
8195	2 megohms	Grid leak	20-7960, 30, 32, 33, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53, 56 & 57			15892
8796	12,500 ohms	No. 1 R.F. resistor	50		YELLOW GLASS	——
8919	.1 megohm	Detector plate resistor	"B" power unit, 36, early 37 & 38		GREEN PAINT	——
9424	12,500 ohms	1st-A.F. plate resistor. Detector plate resistor.	36, 37, 38, 40, 42, 43, 44, 45, 52, 56 & 57 41			15941 or 16472
13047	65,000 ohms	Detector plate resistor	Late 37 & 38, 40, 42, 43, 44, 45, 52, 56 & 57			15592
13901	5000 ohms	1st-R.F. plate resistor	41			——
14565	65,000 ohms	Detector plate resistor	46, 47 & 53		BLACK PAINT	15592
14575	12,500 ohms	1st-A.F. plate resistor	46, 47 & 53		RED PAINT	15941 or 16472
15286A	6000 ohms	Bleeder resistor	Early 55		ALL PURPLE	16330
15286B	4000 ohms	Bleeder resistor	Early 55		PURPLE BAND	16295

ATWATER KENT MFG. CO.

VALUES OF ½, 1, and 1½ WATT TUBULAR RESISTORS

(When replacing a tubular resistor, use a resistor of the same value and size.)

These three illustrations are full size.

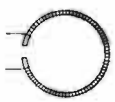
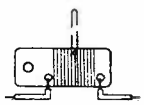
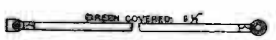
RESISTANCE IN OHMS	RESISTANCE IN MEGOHMS	IDENTIFYING COLOR	½ WATT SIZE	1 WATT SIZE	1½ WATT SIZE
3,300	.0033	GREEN AND RED	26410	19346	——
4,000	.004	GREEN AND BLUE	——	18049	——
5,000	.005	BLUE AND YELLOW	28050	——	——
6,000	.006	PURPLE	——	20151	28770
7,500	.0075	YELLOW	——	15544	——
10,000	.01	MAROON	20950	15545	27210
12,500	.0125	PURPLE AND YELLOW	——	15941	——
		PURPLE AND RED	——	16472	——
		RED	——	15802	——
15,000	.015	GRAY AND YELLOW	20960	22211	27220
		GRAY AND GREEN	——	21784	——
20,000	.02	BLACK AND RED	23120	15891	28030
30,000	.03	GRAY	20970	15285	29710
40,000	.04	WHITE	26160	16724	28750
		BLACK AND YELLOW	——	16725	——
50,000	.05	BLACK, YELLOW AND RED	——	22407	——
65,000	.065	BLACK	21040	15592	——
		BLACK AND GREEN	——	17558	——
100,000	.1	BLUE	——	15287	——
		RED AND BLUE	20980	16282	28760
250,000	.25	RED AND YELLOW	20920	19581	——
500,000	.5	BLACK AND PURPLE	20930	19649	——
800,000	.8	RED AND GRAY	23130	20223	——
900,000	.9	GREEN AND YELLOW	23170	——	——
1,000,000	1	BLUE AND GRAY	21050	——	——
2,000,000	2	GREEN	20940	15892	——

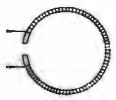
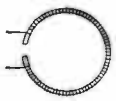
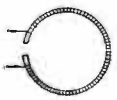
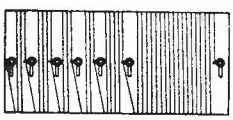
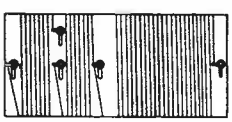
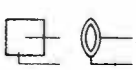
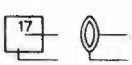
No. 21143 Plug suppressor
Used in Models 81 & 91
RESISTANCE 15,000 OHMS

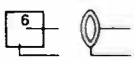
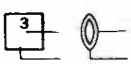
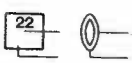
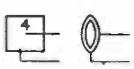
No. 21144 Distributor suppressor
Used in Models 81 & 91
RESISTANCE 15,000 OHMS

ATWATER KENT MFG. CO.

VALUES OF FLEXIBLE AND WIRE-WOUND RESISTORS

Part No. and Ohms	Illustrations ⅓ Full Size
3849 4	
4011 200	
4497 10	
4662 20	
4690 10	
4879 600	
4949 600	
4953 10	
4960 2.5 & 2.5	
4977 600	
8092 500	
8126 1	
8190 180 & 270	
8225 500	
8256 1.5	
8284 865	

Part No. and Ohms	Illustrations ⅓ Full Size
8303 1	
8308 5	
8310 20	
8439 350	
8599 5	
8627 1.5	
8915 800, 800, 800, 800, 1800&5000	
8996 800	
9434 10 & 10	
9515 1700, 1100, & 5000	
9597 25 & 25	
9691 1100	
9692 1750	
9781 425	

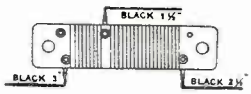
Part No. and Ohms	Illustrations ⅓ Full Size
9782 425	
9788 400	
(Superseded by 13604)	
13128 625	
13138 550	
13289 2200	
13296 1500	
(Superseded by 16253)	
13303 550	
13323 0.3	
13324 0.05	
13369 3000	
13383 1500	
(Superseded by 16253)	
13538 625 and 2200	
13604 400	
13645 28	
13755 21	

ATWATER KENT MFG. CO.

VALUES OF FLEXIBLE AND WIRE-WOUND RESISTORS (Continued)

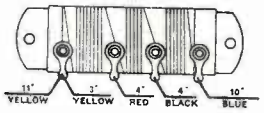
Part No. and Ohms — **Illustrations ⅓ Full Size**

13756 — 500 and 2200

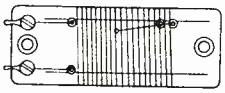


13961 — 4

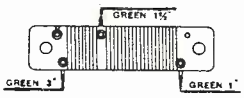
14039 — 235, 125 and 175



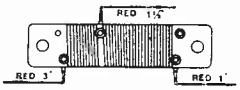
14041 — 242



14427 — 625 and 1000



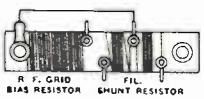
15063 — 550 and 1000



15272 — 1050

(Superseded by 15660)

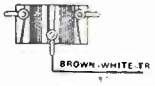
15274 — 160 & 30 (30-ohm has tap at 15)



(Superseded by 16988 and 17077)

15297, 6000 ohms

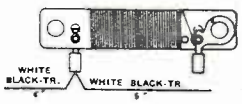
15547 — 15 and 15



(Superseded by 17077)

15660 — 1050

15670 — 1050



(Superseded by 15660)

15720 — 425

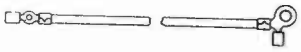
(Superseded by 15830)

15747 — 2

15810 — 1050

(Superseded by 16320)

15820 — 1050



(Superseded by 16320)

15830 — 425

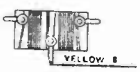
15904 — 160

(Superseded by 16988)

16055 — 1050

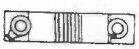
(Superseded by 15660)

16056 — 15 & 15

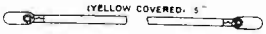


(Superseded by 17077)

16077 — 19



16081 — 0.6



16175 — 160

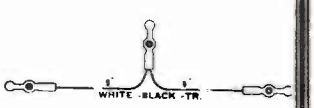
(Superseded by 16988)

16176 — 8.5 & 11.5

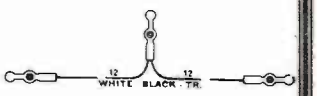
(Superseded by 16302)

16253 — 1500

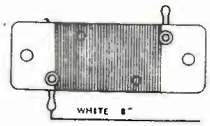
16280 — 8 & 8



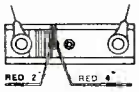
16290 — 11 & 11



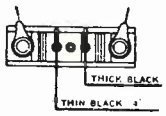
16295 — 4000



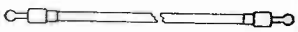
16299 — 11.5



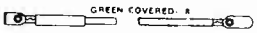
16302 — 8.5 & 11.5



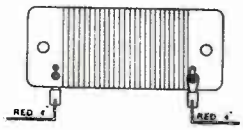
16320 — 1050



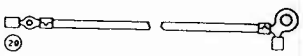
16322 — 4



16330 — 6000

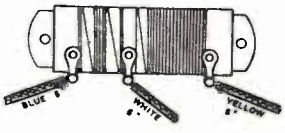


16340 — 850

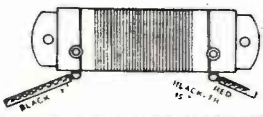


16350 — 200

16432 — 35 & 250



16433 — 680

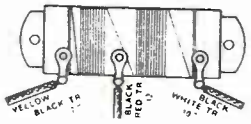


ATWATER KENT MFG. CO.

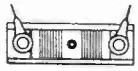
VALUES OF FLEXIBLE AND WIRE-WOUND RESISTORS (Continued)

Part No. and Ohms — **Illustrations ⅓ Full Size**

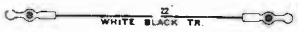
16434 300 & 300



16522 22.5



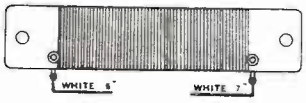
16610 19



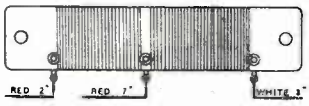
16638 1050

(Superseded by 15660)

16639 8500

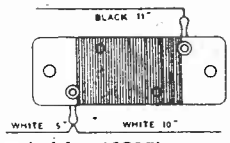


16641 3000 & 4000



16643 2000

16644 4000



(Superseded by 16295)

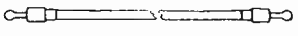
16759 1050

(Superseded by 15660)

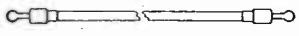
16768 115

(Superseded by 16987)

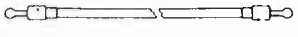
16840 22



16850 11



16860 35

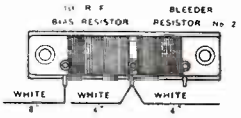


16868 160 & 850

(Superseded by 16988 and 16989)

Part No. and Ohms — **Illustrations ⅓ Full Size**

16872 1500 & 1050

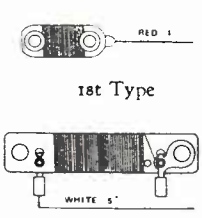


(Superseded by 16253 and 15660)

16905 3000 & 3000

(Superseded by 17041)

16987 115

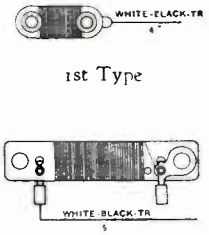


1st Type

2nd Type

16988 160

16988 was also made in flexible type, but only the 2nd type is now supplied.



1st Type

2nd Type

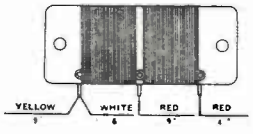
16989 850

(Superseded by 16340)

17016 1050

(Superseded by 15660)

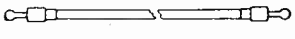
17041 3000 & 3000



17077 5 & 5

(Now Rubber Covered)

17090 1200

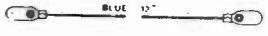


Part No. and Ohms — **Illustrations ⅓ Full Size**

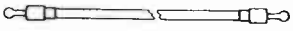
17155 7.5 & 7.5

(Superseded by 17077)

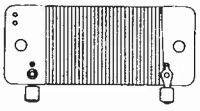
17299 2



17380 425

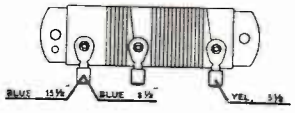


17610 4000

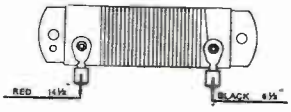


18236 1

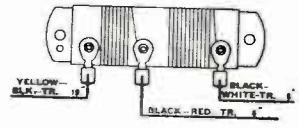
18354 35 & 250



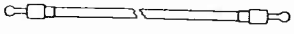
18355 645



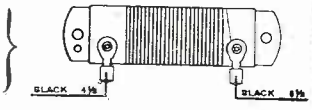
18356 300 & 300



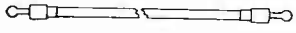
18520 70



19180 1100 19180X 600



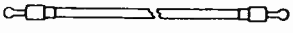
19190 3300



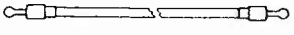
(Superseded by 19346 tubular)

19610 .452

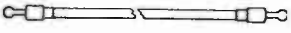
19820 48



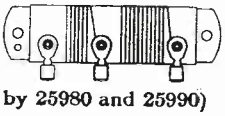
19830 8



19840 35



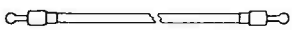
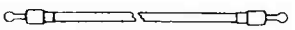
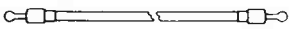
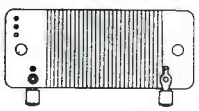
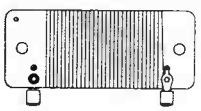
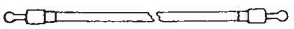
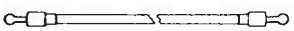
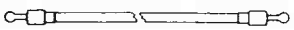
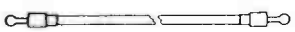
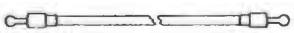
19850 60 & 160

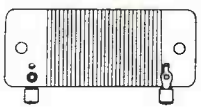
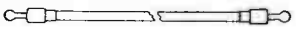
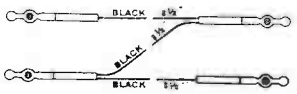
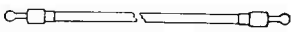
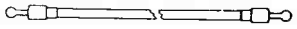
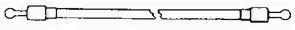
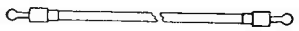
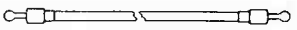
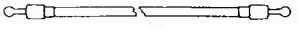
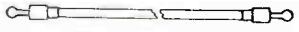


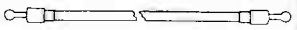
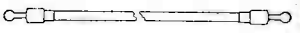
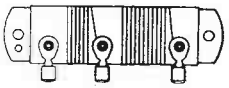
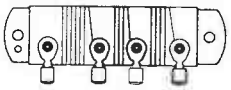
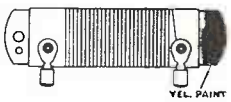
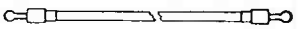
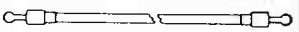
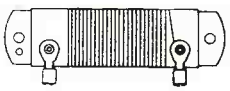
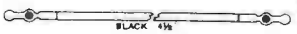
(Superseded by 25980 and 25990)

ATWATER KENT MFG. CO.

VALUES OF FLEXIBLE AND WIRE-WOUND RESISTORS (Continued)

Part No. and Ohms	Illustrations ⅓ Full Size
20040 **100**	
20050 **355**	
20120 **800**	
20140 **6400**	
20150 **8000**	
20320 **200**	
20380 **1500**	
20520 **670**	
21030 **2000**	
21420 **250**	

Part No. and Ohms	Illustrations ⅓ Full Size
22660 **6000**	
23780 **550**	
23840 **8, 8 & 8**	
(Superseded by 26360)	
24340 **8000**	
24450 **6400**	
24470 **4000**	
24530 **2500**	
24980 **300**	
25720 **35**	
25840 **300**	

Part No. and Ohms	Illustrations ⅓ Full Size
25850 **2500**	
25950 **200**	
25980 **110**	
25990 **50 & 60**	
26360 **8, 8 & 8**	
27930 **500**	
28470 **3000**	
28950 **160**	
29220 **300**	
30030 **.352**	

INSULATORS FOR WIRE-WOUND RESISTORS

No. 13306 Fibre insulator

No. 16147 Fibre insulator

No. 17232 Fibre insulator

RESISTANCE VALUES OF R. F. AND I. F. CHOKES

8062, superseded by 8232.
8232, 35 ohms.
8660, 36 ohms.
13482, superseded by 13668.
13668, 25 ohms.
15271, 38 ohms.
16286, superseded by 17254.
16659, 70 ohms.
17015, 89 ohms.
17254, 1.4 ohms.
17390, 350 ohms.
17410, 46 ohms.
17420, superseded by 18220.
17820, superseded by 18220.
18160, 75 ohms.
18220, 70 ohms.
19210, 66 ohms.
19250, 130 ohms.
19571, 79 ohms.
20307, 84 ohms.
22494, 2.9 ohms.
26510, 2.7 ohms.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS
20, 24, 30, 32, 33, 35, 48, 49 and 50

	20-4640 24-4920	20 No. 7570	20 No. 7960	Early 30	Late 30 and 48	32	33 and 49	Early 35	Late 35	50
RESISTORS										
R.F. rheostat resistor	4690 10	4690 10	4690 10	4690 10	4690 10	8308 5	4690 10	4690 10	4690 10	8599 5
Detector rheostat resistor	4690 10	4690 10	8310 20	8310 20	8310 20	8310 20	8310 20			8310 20
Fixed A.F. filament resistor			8303 1	8256 1.5	8256 1.5	8256 1.5	8256 1.5	8126 1	8126 1	8627 1.5
Detector grid bias resistor			8190 450	8190 450	8190 450	8190 450	8190 450	8190 450	8190 450	
Detector grid leak	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.
1st-R.F. plate resistor										8796 12500
No. 1 grid resistor	4949 600	4949 600	4949 600	8092 500	8439 350	8284 865	8996 800	8225 500	8439 350	
No. 2 grid resistor	4949 600	4949 600	4949 600	8092 500	8439 350	8284 865	8996 800	8225 500	8439 350	
No. 3 grid resistor						8284 865	8996 800			
Antenna Choke				8232 35	8232 35	8232 35		8232 35	8232 35	
A.F. TRANSFORMERS										
No. 1 A.F.T. Part No.	4779	7661	8060	8060	8060	8060	8060	8060	8060	8650
Primary Resistance	1700	1700	1000	1000	1000	1000	1000	1000	1000	1000
Secondary Resistance	3250	3250	7000	7000	7000	7000	7000	7000	7000	7000
No. 2 A.F.T. Part No.	4779	7661	7661	7661	7661	7661	7661	7661	7661	8940
Primary Resistance	1700	1700	1700	1700	1700	1700	1700	1700	1700	1400
Secondary Resistance	3250	3250	3250	3250	3250	3250	3250	3250	3250	7000
FIXED CONDENSERS										
"Single" By-pass	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF
Phone Condenser	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8241 .002 MF	8590 .002 MF
Grid Condenser	4465 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8593 250 MMF

VALUES OF CHASSIS PARTS IN MODELS
36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 52, 53, 56 and 57

	44 and 45	36	Early 37	Late 37	Early 38	Late 38	40, 42 52, 56 and 57	** 41	43	46 and 53	47
RESISTORS											
No. 1 grid resistor	8439 350	8996 800	8439 350	8439 350	8996 800	8996 800	8439 350	8439 350	8439 350	8439 350	8439 350
No. 2 grid resistor	8225 500	8996 800	8439 350	8439 350	8996 800	8996 800	8439 350	8439 350	8439 350	8439 350	8225 500
No. 3 grid resistor	8439 350	8996 800			8996 800	8996 800					8439 350
1st-R.F. plate resistor								13901 5000			
1st-R.F. bias resistor								13961 4			
R.F. plate resistor	16253 1500			13369 3000		16253 1500	13369 3000		13369 3000	13369 3000	16253 1500
Detector grid leak	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.	15892 2 Megs.
Detector cathode resistor									13369 3000	13369 3000	13369 3000
Filament shunt resistor		9597 50	9597 50		9597 50			14039 535			
A.F. TRANSFORMERS											
No. 1 A.F.T.	8060	8060	8060	8060	8060	8060	8060	8060	14016	14721	14721
Primary resistance	1000	1000	1000	1000	1000	1000	1000	1000	1800	1500	1500
Secondary resistance	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
No. 2 A.F.T.	7661	7661	7661	7661	7661	7661	7661	14015	14013	14722	14722
Primary resistance	1700	1700	1700	1700	1700	1700	1700	900	1300	1100	1100
Secondary resistance	3250	3250	3250	3250	3250	3250	3250	7000	7000	7000	7000

ATWATER KENT MFG. CO.

VALUES OF CHASSIS PARTS IN MODELS
36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 52, 53, 56 and 57 (Continued)

	44 and 45	36	Early 37	Late 37	Early 38	Late 38	40, 42 52, 56 and 57	** 41	43	46 and 53	47
FIXED CONDENSERS											
"Double" by-pass	15158	15158	15158	15158	15158	15158	15158	15157	15158	15158	15158
Speaker filter condenser	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF	14902 .3 MF				
Phone condenser	9598 .002 MF	9598 .002 MF	9598 .002 MF	9598 .002 MF	9598 .002 MF	9598 .002 MF	9598 .002 MF	14072 .002 MF	9598 .002 MF	9598 .002 MF	9598 .002 MF
Grid condenser	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	8112 250 MMF	14861 250 MMF	14861 250 MMF
VOLUME CONTROL	13320	9490	9510	13020	13020	13020		13550	13320		13320
Volume control resistor	13604 .400	*	13604 .400	13604 .400	13604 .400	13604 .400	13604 .400	13604 .400	13604 .400	13604 .400	13604 .400

*Early 36 used a condenser type volume control No. 9561. In late 36, the volume control has two resistors, No. 9781 and 9782, each 425 ohms.

**In Model 41, the detector filament by-pass and the volume control condenser is No. 13956.

VALUES OF PARTS IN POWER UNITS FOR MODELS
36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 52, 53, 56 and 57

FOR VALUES IN BY-PASS AND FILTER CONDENSERS, SEE PAGES 2 AND 5

	Type "R" B Power Unit	Early 36	Late 36	Early 37	Late 37	Early 38	Late 38	40, 42, 52, 56 and 57	41	44 and 45	43	46 and 53	47
RESISTORS													
Detector plate resistor	8919 .1 Meg	8919 .1 Meg	8919 .1 Meg	8919 .1 Meg	15592 65000	8919 .1 Meg	15592 65000	15592 65000	15941 12500	15592 65000	15592 65000	15592 65000	15592 65000
1st-A.F. plate resistor		15941 12500	15941 12500	15941 12500	15941 12500	15941 12500	15941 12500	15941 12500		15941 12500	15941 12500	15941 12500	15941 12500
R.F.-1st-A.F. bias		9515 1100	9691 1100	9691 1100	13128 625	13138 550	13303 550	13538 625		13756 500	14427 625	14427 625	15063 550
2nd-A.F. bias		9515 ② 1700	9692 1750	9692 1750	13289 2200	9692 1750	13289 2200	13538 ③ 2200		13756 ③ 2200	14427 ③ 1000	14427 ③ 1000	15063 ③ 1000
Load resistor	8915 ①	9515 5000											
Line voltage regulator								13645 ④ 28	14041 242	13755 ⑤ 21	13645 28		
Filament shunt resistor		9434 20	9434 20	9434 20	9434 20	9434 20	9434 20	9434 20		9434 20	9434 20	9434 20	9434 20
Filament shunt potentiometer		9486 20											
Detector filament series res.		13323 .3											
R.F.-1st-A.F. filament series res.		13324 .05											
FILTER CHOKES													
No. 1 choke ohms		400	400	400									
No. 2 choke ohms		400	400		1600	1600	1600	1600	1350	90	1400	300	300	300
Speaker choke ohms		500	500	500	500	500	500	550	550 ⑥	500			
FILTER CONDENSER (Replaceable type only)	8875	9505	9704	13315	13315	13315	13315	17159 ⑧		14247		14743	14743
OUTPUT TRANSFORMER													
Primary resistance											1000	900	900
Secondary resistance											.7	.4	.4
SPEAKER FIELD COIL										14361		15629	15629
Speaker field resistance										2500		⑦ 1700	1700

①—See drawing of 8915 on Page 8. ②—These three resistors are combined in one unit No. 9515. ③—The 2nd-A.F. bias and the R.F.-1st-A.F. bias are combined in one unit, and the number of the complete unit is listed. ④—Used only in Models 42 and 52 ⑤—Used only in Model 44. ⑥—This is the output choke in Model 41. ⑦—Early 53 uses No. 14361, 2500 ohms. Late 53 uses No. 15631, 1700 ohms. No. 15631 is long and narrow. ⑧—In 40-F, 42-F, and 44-F, the replaceable condenser unit is No. 14256.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 55, 55-F, 60, 61, 66, and 67

	Early 55	Late 55	Early 55-F	Late 55-F	Early 60	Late 60	Early 61	Late 61	66	Early 67	Late 67
RESISTORS											
Bleeder resistor	16330 6000		16330 6000		16295 4000		16295 4000	16295 4000			
Bleeder resistor No. 1		16295 4000		16295 4000		17041 6000			16641 7000		
Bleeder resistor No. 2		16989 850		16989 850		15660 1050			15660 1050		
1st-R.F. bias resistor					16253 1500	16253 1500			15660 1050		
2nd-R.F. bias resistor							16299 11.5	16299 11.5			
3rd-R.F. bias resistor							16322 4	16322 4			
R.F. bias resistor	16988 160	16988 160	16988 160	16988 160	16988 160	16988 160			16987 115		
R.F. resistor									16639 8500		
1st-A.F. bias resistor	15660 1050	15660 1050	15660 1050	15660 1050	15660 1050	15660 1050	16322 4	16322 4	16643 2000		
2nd-A.F. bias resistor			15660 1050	15660 1050							
2nd-A.F. grid filter resistor									16295 4000		
1st or 2nd-R.F. filament res.										16302 20	16302 20
Detector and A.F. filament res.										16081 6	16081 6
Filament series resistor No. 1							16433 680	16433 680			
Filament series resistor No. 2							16432 285	16432 285			
A.F. filament shunt resistor							16434 600	16434 600			
3rd Filament shunt resistor							16522 22.5	16522 22.5		16077 19	16077 19
Filament shunt resistor	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10			17077 10		
Dial-light resistor	15747 2	15747 2	15747 2	15747 2	15747 2	15747 2			15747 2		
VOLUME CONTROL	14250	15160	14250	15160	14250	15160	14250	14250	15160	14630	14630
Wire-wound section	6000	6000	6000	6000	6000	6000	6000	6000	6000		
Carbon section		10000		10000		10000			10000	.1 Meg	.1 Meg
CONDENSERS											
Double phone condenser	15792 .002 MF		15792 .002 MF		15792 .002 MF		16323 .002 MF			16082 .002 MF	16082 .002 MF
Detector grid condenser							16088 250 MMF	16088 250 MMF		16088 250 MMF	16088 250 MMF
Local-distance switch condenser		16788 28 MMF		16788 28 MMF		16788 28 MMF		16788 28 MMF			16788 28 MMF
Filter Condenser	14340	14340	14720	14720	14340	14340	14710	14710	14880		
R.F. by-pass	15262 H-1	15262 H-1	15262 H-1	15262 H-1							
R.F. by-pass No. 1					15262 H-1	15262 H-1	15262 H-1	15262 H-1	15262 H-1	15262 H-1	15262 H-1
R.F. by-pass No. 2					16233 H-4	16233 H-4	15262 H-1	15262 H-1	16233 H-4	16461 H-6	16461 H-6
Detector by-pass	15263 H-2	16745 H-7	15263 H-2	16745 H-7	15263 H-2	16745 H-7	15263 H-2	16745 H-7	16745 H-7	16462 H-5	16462 H-5
Line condenser		16828 B-5		16828 B-5							
NO. 1 A. F. T.											
Primary resistance							1500	1500		1500	1500
Secondary resistance							7000	7000		7000	7000
2nd A.F. Input Transformer											
Primary resistance	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
Secondary resistance	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
2nd A.F. Output Transformer											
Primary resistance	300	300	300	300	300	300	300	300	300	900	900
Secondary resistance	2	2	2	2	2	2	2	2	2	2	2
FILTER CHOKES											
No. 1 choke	300	300	300	300	300	300	45	45	250		
No. 2 choke	2500	2500	2500	2500	2500	2500	45	45	2500		
Field Coil	15635	15635	15629	15629	15635	15635	15854	15854	15854	15863	15863
Field resistance	1100	1100	1700	1700	1100	1100	700	700	700	8	8

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODEL 60-C, 3rd TYPE

RESISTORS		
Volume control	17736	
Resistance of screen section		6000
Resistance of antenna section		2500
R.F. bias resistor	17380	425
1st-R.F. bias resistor	16320	1050
1st-A.F. bias resistor	16320	1050
Filament shunt resistor	17077	10
Dial light resistor	17299	2
AUDIO TRANSFORMERS		
Input A.F. transformer	15520	
Primary resistance		2000
Secondary resistance		6000
Output A.F. transformer	15530	
Primary resistance		300
Secondary resistance		.1
FILTER CHOKE		
Filter choke assembly	15450	
Resistance of No. 1 choke		600
Resistance of No. 2 choke		6000
FIELD COIL		
Speaker field coil	17551	1100
CONDENSERS		
Filter condenser assembly	15480	
R.F. by-pass No. 1	15790	(H-21)
R.F. by-pass No. 2	15770	(H-15)
R.F. by-pass No. 3	15780	(H-17)
Detector by-pass	15640	(H-16)
Stopping or compensating condenser	15540	8 MMF

VALUES OF PARTS IN MODELS 70, 72, 74, 75, and 76

(TYPE L, F, P, H, D, and Q CHASSIS)

	L, F, P	H	D	Q
RESISTORS				
Volume control	16270	17270	16630	16010
Resistance of screen section	5600	.1 Meg**	6000	.1 Meg
Resistance of antenna section	2500	.25 Meg	2500	2500
Phonograph volume control (P)	19077 500			
Bleeder resistor No. 1	16330 6000			
Bleeder resistor No. 2	17090 1200			
R.F. bias resistor	16350 200			
1st-R.F. bias resistor	16320 1050		16860 35	
1st-2nd R.F. bias resistor				16290 22
1st-2nd R.F. filament resistor				16280 16
2nd-R.F. bias resistor			16850 11	
3rd-R.F. bias resistor			16322 4	16610 19
3rd R.F. filament shunt resistor			16840 22	
Detector-A.F. filament resistor				16081 6
1st-A.F. bias resistor	16320 1050	16320 1050	16322 4	
I.F. bias resistor		17380 425		
Dial light resistor	18236 1	18236 1		
Filament shunt resistor	17077 10	17077 10		
Filament series resistor No. 1			18355 645	
Filament series resistor No. 2			18354 285	
A.F. filament shunt resistor			18356 600	
AUDIO TRANSFORMERS				
No. 1 A.F. transformer			17070	15960
Primary resistance			1500	1600
Secondary resistance			6000	7000
2nd-A.F. input transformer	15520	17280	16640	18020
Primary resistance	2000	1900	1100	1000
Secondary resistance	6000	5500	7000	7000
Output filter choke				350
Output transformer	16390	16390	16390	
Primary resistance	300	300	300	
Secondary resistance	.1	.1	.1	
FILTER CHOKE				
Filter choke assembly	16680*	17290	16890	
Resistance of No. 1 choke	560	500	45	
Resistance of No. 2 choke	3000	6000	45	
Resistance of No. 3 choke		100		
Resistance of output choke			100	
FIELD COIL				
Speaker field coil	16410 1100	16410 1100	17020 650	
CONDENSERS				
Filter condenser assembly	15850*	15850	14710	
R.F. by-pass No. 1	15790* H-21	17360 H-27	16940 H.22	15262 H-20
R.F. by-pass No. 2	15770 H-15	15262 H-20	15262 H-20	18350 H-28
R.F. by-pass No. 3	15780 H-17	16745 H-13	16880 H-23	15262 H-20
R.F. by-pass No. 4		17370 H-26	15262 H-20	
R.F. by-pass No. 5		15262 H-20		
Detector by-pass	15640 H-16			
Tone control condenser	16490 B-6	16490 B.6	15870 B-7	15870 B-7
Stopping or compensating condenser	15540 8 MMF		11 MMF	16360 11 MMF
Detector grid condenser			16088 250 MMF	16088 250 MMF
1st-I.F. stopping condenser		17440 500 MMF		
1st-detector plate condenser		17470 200 MMF		
2nd-detector or 2nd-I.F. stopping cond.		17974 200 MMF		

*In type L chassis below 6234881, the filter condenser is No. 15480.
In type F chassis, the filter condenser is No. 16520, and filter choke is No. 16260.
In type F chassis above 5802566, R.F. by-pass No. 1 is No. 15262.

**In type H chassis, the .25 meg section of the control is in the grid circuit of the 1st-I.F. tube. In type H-1 chassis, the .1 meg section of the control is in the plate circuit of the I.F. tubes. In type H-2 chassis, the .1 meg section controls the screen voltage of the I.F. tubes.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 82-D, 84-D, 87-D, and 228-D

	1st Type 82-D	228-D and 2nd Type 82-D	84-D	87-D
RESISTORS				
Volume control	23228 .5 MEG	23228 .5 MEG	23228†† .5 MEG	21816 *
Filament series resistor No. 1	25980 110	25980 110	25980 110	25980 110
Filament series resistor No. 1A	25990 110	25990 110	25990 110	25990 110
Filament series resistor No. 2	19840 35	19840 35	19840 35	19840 35
Filament series resistor No. 3				26360 24
2nd-A.F. filament shunt resistor	19820 48	19820 48	19820 48	19820 48
R.F.-I.F. bias resistor				23780 550
1st-detector bias resistor				21030 2000
I.F. bias resistor	19830 8	19830 8	19830 8	
1st-A.F. bias resistor				16320 1050
AUDIO TRANSFORMERS				
Audio input transformer	19870	19870	19870	23760
Primary resistance	1500	1500	1500	500
Secondary resistance	7000	7000	7000	1000
Audio output transformer	19697	19697	19697	24040
Primary resistance	500	500	500	450
Secondary resistance	.25	.25	.25	.04

	1st Type 82-D	228-D and 2nd Type 82-D	84-D	87-D
FILTER CHOKE				
Filter choke unit	19770 30	19770 30	19770 30	19770 30
FIELD COIL				
Field coil	19860 1200	19860 1200	19860 1200	19860 1200
CONDENSERS				
Electrolytic filter condenser	20049 24 MF	20049 24 MF	20049 24 MF	20049 24 MF
By-pass No. 1	19690 H-32	19690 H-32	19690 H-32	23590 H-44
By-pass No. 2	19150 H-29	15262 H-20	19150 H-29	15770 H-15
By-pass No. 3	20350 H-36	20350 H-36	20350** H-36	23610 H-45
By-pass No. 4				15262 H-20
Tone control condenser	16490 B-6	16490 B-6	16490† B-6	21530 B-11
R.F. screen by-pass				23250 .01 MF
I.F. stopping condenser	21160 200 MMF	21160 200 MMF	17440 500 MMF	21160 200 MMF
Phone condenser**			17440 500 MMF	
2nd-detector-1st A.F. coupling condenser		23250 .01 MF		
Oscillator grid condenser				21160 200 MMF

*The volume control in 87-D is a dual type. The wire-wound section is 5000 ohms and controls the screen voltage. The carbon section is 2500 ohms and controls the antenna input.

**The phone condenser is used only in early type 84-D and in these sets, by-pass No. 3 is 19710.

†The tone-control condenser is used only in late type 84-D.

††In early type 84-D, the volume control is No. 19040, .5 meg.

VALUES OF PARTS IN MODELS 81, 81-B, 81-C, 91, 91-B, and 91-C

	Model 81, 81-B, and 81-C	Model 91, 91-B, and 91-C
RESISTORS		
Volume control	21496 .65 MEG	21496 .65 MEG
Distributor suppressor (long)	21144 15000	21144 15000
Plug suppressor (short)	21143 15000	21143 15000
CONDENSERS		
Condenser for ignition filter	21624 (2) .5 MF	21624 (2) .5 MF
Generator condenser	23260 1 MF	23260 1 MF
Electrolytic condenser	22538 8 MF	22472 8 MF
Multiple by-pass condenser	23140 J-4	25690 J-6
R.F. by-pass condenser		26040 (3) .02 MF

	Model 81, 81-B, and 81-C	Model 91, 91-B, and 91-C
1st-R.F. grid circuit by-pass	23250 .01 MF	
Phone condenser	21160 200 MMF	17440 500 MMF
Control coupling condenser	21160 200 MMF	26440 200 MMF
Tracking condenser		26050 800 MMF
Oscillator grid condenser		21160 200 MMF
Audio input transformer	22810	26280
Primary resistance	2000	300
Secondary resistance	6000	250
Audio output transformer	22830	22830
Primary resistance	450	450
Secondary resistance	.02	.02
Field coil	22440 3	22440 3

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 82-Q, 84-Q, 85-Q and 228-Q

	82-Q 1st Type	82-Q 2nd Type and 228-Q	84-Q	85-Q
	16122	16122	19040	16122
Volume control	.1 MEG.	.1 MEG.	.5 MEG.	.1 MEG.
Filament series resistor	19610 .452	19610 .425	19610 .452	19610 .452
AUDIO TRANSFORMERS				
Audio input transformer	23510	23510		23440
Primary resistance	1450	1450		1450
Secondary resistance	6000	6000		6000
Audio output transformer	19697	19697	19697	19697
Primary resistance	500	500	500	500
Secondary resistance	.25	.25	.25	.25
CONDENSERS				
Filter condenser (electrolytic)	23146 .8 MF	23146 .8 MF	23146 .8 MF	22538 .8 MF
	21170	15262	19560	19980**
R.F. by-pass No. 1	H-37	H-20	H-31	H-34
	15262	15262	19150	19150
R.F. by-pass No. 2	H-20	H-20	H-29	H-29
	19150	19160	15262	15262
R.F. by-pass No. 3	H-29	H-30	H-20	H-20
	15262		16461	15262
R.F. by-pass No. 4	H-20		H-12	H-20
R.F. by-pass No. 5				15262 H-20
Tone control condenser	16490 B-6	16490 B-6	16490* B-6*	16490 B-6
SMALL FIXED CONDENSERS				
R.F.-1st-detector stopping cond.	21160 200 MMF	21160 200 MMF	17974* 270 MMF	21160* 200 MMF
Oscillator grid condenser	21160 200 MMF	21160 200 MMF		21160 200 MMF
I.F. stopping condenser	21160 200 MMF	21160 200 MMF	17440 500 MMF	21160 200 MMF
Phone condenser	17440 500 MMF	17440 500 MMF	17440 500 MMF	17440 500 MMF
2nd-detector-1st-A.F. coupling cond.		23250 .01 MF		
Oscillator plate filter condenser		23250 .01 MF		

*Used only in late type sets.

**In late 85-Q, R. F. by-pass No. 1 is 21170, H-37.

VALUES OF PARTS IN MODEL 93 SHORT-WAVE CONVERTER

	Part No.	Value
RESISTORS		
Antenna resistor	25720	35
Bleeder resistor No. 1 or No. 2	24450	6400
Bleeder resistor No. 3	21030	2000
I.F. bias resistor	16320	1050
CONDENSERS		
Electrolytic condenser No. 1	22538	8 MF
Electrolytic condenser No. 2	23146	8 MF
R.F. by-pass	15262	——
Compensating condenser	16360	11 MMF
Oscillator tracking condenser No. 1	25650	300 MMF
Oscillator tracking condenser No. 2	22365	.0025MF
Oscillator tracking condenser No. 3	22366	.0035 MF
Antenna condenser	22220	100 MMF
S.W. detector grid condenser	22220	100 MMF
Detector-I.F. stopping condenser	21160	200 MMF
Oscillator plate condenser	17440	500 MMF
Converter coupling condenser	21160	200 MMF
FILTER CHOKE		
Filter choke unit	25810	180

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 80, 82, 83, 84, 85, 86, 87, and 89

	80	82	83	84 Early Type	84 Late Type	85 Early Type	85 Late Type	86	87	89
Volume control	20840 6000	20990 550	22330 6000	19040 .5 MEG	20180 3500	19040 .5 MEG	20030 550	23410 550	22650 3500	23228 .5 MEG
RESISTORS										
Bleeder resistor No. 1		20150 8000		16330 6000	16330 6000	16330 6000	20150 8000	20150 8000	22660 6000	20150 8000
Bleeder resistor No. 2		20140 6400		16330 6000	17610 4000	16330 6000	16330 6000	20140 6400	22660 6000	20150 8000
Bleeder resistor No. 3		20050 355			18520 70		20050 355	16320 1050	20040 100	21030 2000
Bleeder resistor No. 3A								23780 550	17380 425	16320 1050
Bleeder resistor No. 4	20040 100	20040 100	20040 100				20040 100	20050 355		17380 425
Bleeder resistor No. 5		20150 8000					20150 8000	20150 8000		20150 8000
Bleeder resistor No. 6		20120 800					20120 800	20120 800		20120 800
Bleeder resistor No. 7		20520 670					20520 670	20520 670		17610 4000
1st-detector bias resistor	21030 2000		21030 2000	19346 3300	20380 1500					
1st-detector plate resistor					20320 200					
I.F. bias resistor				16320 1050		16320 1050				
A.F. bias resistor									21420 250	21420 250
Filter resistor		19180 1100		19180 1100	19180 1100	19180 1100	19180 1100	19180 1100		
Filament shunt resistor	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10
Dial light resistor								18236 1	18236 1	18236 1
AUDIO TRANSFORMERS										
A.F. Input transformer									21670	21670
Primary resistance									2000	2000
Secondary resistance									1800	1800
A.F. output transformer*	19697	19697	19697	19697	19697	19697	19697	21672	21370	21370
Primary resistance	500	500	500	500	500	500	500	500	450	450
Secondary resistance	25	25	25	25	25	25	25	25	05	05
FILTER CHOKE UNIT									21680	21680
No. 1 choke, ohms									480	480
No. 2 choke, ohms									1500	1500
No. 3 choke, ohms									90	90
FIELD COIL	18870	18870	18870	18870	18870	18870	18870	18870	21260	21260
Field coil resistance	2000	2000	2000	2000	2000	2000	2000	2000	1100	1100
CONDENSERS										
Filter condenser unit, paper and foil type			20370 F-1				20370 F-1	20370 F-1	21520 A-7	21520 A-7
Filter condenser No. 1 (electrolytic)	23146 8 MF	23146. 8 MF		23146 8 MF	23146 8 MF	23146 8 MF				
Filter condenser No. 2 (electrolytic)	22538 8 MF	22538 8 MF		22538 8 MF	22538 8 MF	23146 8 MF				

*In late type 83 and 85 the output transformer is enclosed in a metal case; part No., less case, is 21672.
In late type 87 and 89 the output transformer is enclosed in a metal case; part No., less case, is 21693.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 80, 82, 83, 84, 85, 86, 87, and 89 (Continued)

	80	82	83	84 Early Type	84 Late Type	85 Early Type	85 Late Type	86	87	89
Filter condenser No. 3 (electrolytic)			22538 8 MF			22538 8 MF	22538 8 MF	22538 8 MF		
By-pass condenser No. 1		21180 H-38		19160 H-30	19160 H-30	19160 H-30	19980 H-34	21170 H-37		21440 H-40
By-pass condenser No. 2		15262 H-20		19150 H-29	19150 H-29	19150 H-29	19990 H-35	23330 H-43		22050 H-41
By-pass condenser No. 3		21170 H-37		15262 H-20	15262 H-20	15262 H-20	15262 H-20	15262 H-20		21430 H-39
Tone control condenser		21250 B-9			16490 B-6	16490 B-6	20010 B-8	20010 B-8	21530 B-11	21530 B-11
Quality condenser										21450 B-10
Multiple type by-pass	20830 J-1, J-2		20830 J-1, J-2						22570 J-3	
SMALL FIXED CONDENSERS										
Oscillator grid condenser	21160 **200 MMF**	21160 **200 MMF**	21160 **200 MMF**		17470 **200 MMF**		21160 **200 MMF**	21160 **200 MMF**	21160 **200 MMF**	21160 **200 MMF**
I.F. stopping condenser	21160 **200 MMF**	21160 **200 MMF**	21160 **200 MMF**	17440 **500 MMF**	17440 **500 MMF**	17440 **500 MMF**	31160 **200 MMF**			
Phone condenser				17440 **500 MMF**	17440 **500 MMF**	17440 **500 MMF**	17440 **500 MMF**			
A.F. grid condenser									22220 **100 MMF**	22220 **100 MMF**

VALUES OF PARTS IN MODELS 90, 92, 94, 96, 99, 228, and 567

	90 and 567	92 and 228	94	96-F, 1st and 2nd Type 96	96 3rd Type	99 1st and 2nd Types	99-F and 3rd Type 99
Volume control	20840 **6000**	23228 **.5 MEG**	22650 **3500**	23228 **.5 MEG**	23228 **.5 MEG**	23228 **.5 MEG**	23228 **.5 MEG**
Tonebeam adjustment potentiometer				22152 **40000**	22345 **8000**	22152 **40000**	22344 **14000**
RESISTORS Bleeder resistor No. 1		24340 **8000**	24470 **4000**	24340 **8000**	24340 **8000**	24340 **8000**	24340 **8000**
Bleeder resistor No. 2		24450 **6400**	24450 **6400**	24450 **6400**	18520 **70**	24340 **8000**	
Bleeder resistor No. 3		23780 **550**	18520 **70**	17380 **425**	18520 **70**	24340 **8000**	16320 **1050**
Bleeder resistor No. 4	20040 **100**	20040 **100**		20050 **355**	21420 **250**	21030 **2000**	20040 **100**
Bleeder resistor No. 5		17380 **425**		20040 **100**	25850 **2500**	23780 **550**	20050 **355**
Bleeder resistor No. 6		24340 **8000**		24340 **8000**		20040 **100**	24470 **4000**
Bleeder resistor No. 7		21030 **2000**		21030 **2000**		24340 **8000**	25950 **200**
Bleeder resistor No. 8					24450 **6400**	20120 **800**	25840 **300**
Bleeder resistor No. 9						24530 **2500**	
1st-detector bias resistor	21030 **2000**		21030 **2000**		16320 **1050**		
R.F. bias resistor			19820 **48**				
1st-A.F. bias resistor							24470 **4000**
A.F. bias resistor				24980 **300**	25840 **300**	21420 **250**	

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS 90, 92, 94, 96, 99, 228, and 567 (Continued)

	90 and 567	92 and 228	94	96-F, 1st and 2nd Type 96	96 3rd Type	99 1st and 2nd Types	99-F and 3rd Type
Filter resistor		19180 1100	19180 1100				
Filament shunt resistor	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10
AUDIO TRANSFORMERS							
Audio input transformer							
Primary resistance						21670 2000	21670 2000
Secondary resistance						1800	1800
Audio output transformer							
Primary resistance	19697 500	19697 500	21672 500	21672 500	21672 500	21693 450	21693 450
Secondary resistance	.25	.25	.25	.25	.25	.07	.07
FILTER CHOKE UNIT							
No. 1 choke, ohms				24930 480	24930 480	21680 480	21680 480
No. 2 choke, ohms				90	90	90	90
No. 3 choke, ohms						1500	1500
FIELD COIL							
Field coil resistance	18870 2000	18870 2000	18870 2000	18870 2000	18870 2000	21260 1100	18870* 2000
CONDENSERS							
Filter condenser unit, paper and foil type			20370 F-1	15850† C-7	15850 C-7	21520 A-7	21520** A-7
Filter condenser No. 1 (electrolytic)	23146 8 MF	23146 8 MF	22538 8 MF	22538 8 MF	22538 8 MF		
Filter condenser No. 2 (electrolytic)	22538 8 MF	22538 8 MF					
Dry electrolytic condenser		22397†† 8 MF					22646 8 MF
By-pass condenser No. 1				15262 H-20	22050 H-41	21440 H-40	21440 H-40
By-pass condenser No. 2				23330 H-43	23330 H-43	22050 H-41	22050 H-41
By-pass condenser No. 3				21170 H-37	21170 H-37	15262 H-20	15262 H-20
By-pass condenser No. 4						21430 H-39	15262 H-20
Tone control condenser		20010 B-8	20010 B-8	20010 B-8	20010 B-8	21530 B-11	21530 B-11
Quality condenser						21450 B-10	21450 B-10
Multiple type by-pass	20830 J-1, J-2	24250 J-5	24250 J-5				
SMALL FIXED CONDENSERS							
R.F.-1st-detector stopping condenser				21160 200 MMF	21160 200 MMF		
Oscillator grid condenser	21160 200 MMF	21160 200 MMF	21160 200 MMF	21160 200 MMF	21160 200 MMF	21160 200 MMF	21160 200 MMF
I.F. stopping condenser	21160 200 MMF	21160 200 MMF	21160 200 MMF				
Phone condenser		17440 500 MMF		17440 500 MMF	17440 500 MMF		
A.F. grid condenser						22220 100 MMF	22220 100 MMF
Control grid condenser					22220 100 MMF		
Grid circuit by-pass condenser	26490 .07 MF		26490 .07 MF				
Control plate by-pass condenser		23250 .01 MF		23250 .01 MF	23250 .01 MF		

*Field coil in 99-F is 21260, 1100 ohms.
**Filter condenser for 99-F is 25130, F-3.

†Filter condenser for 96-F is 25190, F-4.
††22397 is used only in 92-F.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS

188, 260, 469, 469-D, 469-Q, 480, 558, 558-D, 558-Q, 612, 627, and 812

	1st Type 188	2nd Type 188	1st and 2nd Type 260	3rd Type 260	1st Type 469	2nd Type 469	469-D 558-D	469-Q 558-Q	480	558	612	627	812
CONTROLS													
Volume control	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23482 .5 Meg.	23376 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg	23228 .5 Meg
Tonebeam adjustment			26540 15000	29020 20000	27190 8000	29020 20000			27190 8000		29020 20000		29020 20000
Silencing adjustment		28220 20000		28220 20000		28220 20000	28220 20000			28220 20000	28220 20000		28220 20000
RESISTORS													
Bleeder resistor No. 1		24450 6400					29220 300			24450 6400			
Bleeder resistor No. 2						24470 4000							
Bleeder resistor No. 3					20520 670				20380 1500				
Bleeder resistor No. 4	20380 1500				20380 1500						20380 1500		
R.F.-I.F. bias resistor		28950 160				20040 100	20050 355			20040 100	21420 250		25950 200
R.F.-I.F. bias resistor No. 1	20040 100		17380 425	20040 100	20040 100				25950 200			20040 100	
R.F.-I.F. bias resistor No. 2	21030 2000		25950 200	20040 100					23780 550			20380 1500	
2nd-I.F. screen resistor													28470 3000
1st-detector bias resistor	16320 1050	16320 1050	20120 800	25950 200	16320 1050	16320 1050			16320 1050	16320 1050	25950 200	16320 1050	25950 200
2nd-I.F. bias resistor			20040 100								20040 100		20040 100
2nd-I.F. bias resistor No. 1									16320 1050				
2nd-I.F. bias resistor No. 2									24470 4000				
Oscillator plate resistor						23780 550							
Oscillator plate compensating resistor									23780 550				
Control bias resistor No. 1		21030 2000		20380 1500		16320 1050	19820 48			21030 2000	16320 1050		16320 1050
Control bias resistor No. 2		25850 2500				24470 4000	19820 48			25850 2500	24470 4000		
A.F. bias resistor	25840 300				25840 300				25840 300				
1st-A.F. bias resistor			21030 2000										
Driver bias resistor											16320 1050		20380 1500
2nd-A.F. bias resistor		21420 250	21420 250	25950 200		25950 200	28950 160						
Screen resistor		24470 4000								24470 4000			
Filter resistor	19180 1100	27930 500								27930 500		27930 500	
Filament shunt resistor	17077 10	17077 10	17077 10	17077 10	17077 10	17077 10			17077 10	17077 10	17077 10	17077 10	17077 10
Filament series resistor								30030 352					

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS

188, 260, 469, 469-D, 469-Q, 480, 558, 558-D, 558-Q, 612, 627, and 812 (Continued)

	1st Type 188	2nd Type 188	1st and 2nd Type 260	3rd Type 260	1st Type 469	2nd Type 469	469-D 558-D	469-Q 558-Q	480	558	612	627	812
AUDIO TRANSFORMERS													
Audio input transformer		28490	26940	26940	26950	26940	29380	29390	27760	28290	28670		29960
Primary resistance		1900	1900	1900	2600	1900	2000	650	2500	1300	450		230
Secondary resistance		1700	1700	1700	6000	1700	6000	350	6000	1400	400		130
Audio output transformer	21672	21672	21693	21693	21693	21693	30020	23701	21693	19697	28630	19697	28630
Primary resistance	500	500	450	450	450	450	100	500	450	500	200	500	200
Secondary resistance	.25	.25	.05	.05	.05	.05	.08	.04	.05	.25	.03	.25	.03
FILTER CHOKES			26960	26960	26970	26970	29370		26970		29410		28640
Resistance of 1st choke			160	160	550	550	30		550		160		70
Resistance of 2nd choke			1500	1500							550		1500
SPEAKER FIELD COIL	18870	18870	21260	21260	21260	21260	19860		21260	18870	*	18870	*
Speaker field resistance	2000	2000	1100	1100	1100	1100	1200		1100	2000	*	2000	*
FILTER CONDENSERS													
Electrolytic filter No. 1	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF			22538 .8 MF	22538 .8 MF	23498 .4 MF	22538 .8 MF	23498 .4 MF
Electrolytic filter No. 2	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF			22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF	22538 .8 MF
Electrolytic filter No. 3											22538 .8 MF		23481 .12 MF
Electrolytic filter No. 4											22538 .8 MF		22538 .8 MF
Filter condenser unit (paper and foil type)	26620 .7 MF	26620 .7 MF			26620 .7 MF	26620 .7 MF			26620 .7 MF				
Dry electrolytic condenser							23981 .8 MF	22472 .8 MF			23479 .20 MF		23479 .20 MF
BY-PASS CONDENSERS													
Multiple type by-pass	24250 J-5	28140 J-7					28140 J-7			28140 J-7		24250 J-5	
By-pass No. 1			23330 H-43	23330 H-43	23330 H-43	23330 H-43		15262 H-20	15262 H-20		15262 H-20		15262 H-20
By-pass No. 2			15262 H-20	15262 H-20	15262 H-20	15262 H-20			23330 H-43		23330 H-43		23330 H-43
By-pass No. 3			22050 H-41	27140 H-47	23330 H-43	22050 H-41			27580 H-48		27140 H-47		27140 H-47
By-pass No. 4			27120 H-46	27120 H-46	21450 B-10	21450 B-10			15262 H-20		27120 H-46		27120 H-46
By-pass No. 5											15262** H-20		15262** H-20
TONE CONTROL CONDENSER	20010 B-8	28040 .005 MF	21530 B-11	21530 B-11	27390 B-14	21530 B-11	27390 B-14	21530 B-11	27390 B-14	28040 .005 MF	30270 B-16	28040 .005 MF	30270 B-16
SMALL FIXED CONDENSERS													
Antenna condenser									27130 500 MMF				
R.F. bias by-pass										26660 .1 MF			
R.F. grid filter condenser		26820 .05 MF					26820 .05 MF	26820 .05 MF	27630 .01 MF	26820 .05 MF		26820 .05 MF	
R.F.-I.F. bias by-pass		26660 .1 MF										26660 .1 MF	

*The field coil of the 4-prong speaker is No. 18870, 2000 ohms. The field coil of the 5-prong speaker is No. 28550, 6500 ohms.

**By-pass No. 5 in late models is No. 29560, H-49.

ATWATER KENT MFG. CO.

VALUES OF PARTS IN MODELS

188, 260, 469, 469-D, 469-Q, 480, 558, 558-D, 558-Q, 612, 627, and 812 (Continued)

	1st Type 188	2nd Type 188	1st and 2nd Type 260	3rd Type 260	1st Type 469	2nd Type 469	469-D 558-D	469-Q 558-Q	480	558	612	627	812
SMALL FIXED CONDENSERS (Continued)													
1st-detector grid filter or screen by-pass				26660 .1 MF		26820 .05 MF			27630 .01 MF				
Oscillator-1st-detector coupling condenser									26670 125 MMF				
Oscillator grid condenser	26670 125 MMF	26670 125 MMF			26670 125 MMF					26670 125 MMF		26670 125 MMF	
Tracking condenser	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF		26690 1450 MMF	26690 1450 MMF	26690 1450 MMF	26690 1450 MMF
Tracking condenser No. 1									23411				
Tracking condenser No. 2									25650 300 MMF				
Oscillator plate filter condenser	26820 .05 MF				26820 .05 MF		26670 125 MMF						
2nd-detector plate-to grid condenser			26820 .05 MF										
2nd-detector-1st-A.F.-coupling condenser		23250 .01 MF	23250 .01 MF	23250 .01 MF		23250 .01 MF	23250 .01 MF	23250 .01 MF		27630 .01 MF	23250 .01 MF	27630 .01 MF	23250 .01 MF
Phone condenser	17440 500 MMF	17440 500 MMF	26670 125 MMF	17440 500 MMF	17440 500 MMF	17440 500 MMF	22220 100 MMF	21160 200 MMF	17440 500 MMF	17440 500 MMF	30260 45 MMF	17440 500 MMF	30260 45 MMF
Diode plate condenser		30240 250 MMF		30240 250 MMF		30240 250 MMF	30240 250 MMF			30240 250 MMF	30240 250 MMF	30240 250 MMF	30240 250 MMF
Control coupling condenser					16360 11 MMF			30240 250 MMF	27650 8 MMF				
Control plate by-pass or control bias by-pass	23250 .01 MF	26550 .5 MF			26820 .05 MF			26660 .1 MF	27630 .01 MF	26550 .5 MF		26550 .5 MF	
2nd-detector bias by-pass			26550 .5 MF										
Screen by-pass or 1st-A.F. screen by-pass	26660 .1 MF						26660 .1 MF	26660 .1 MF		26660 .1 MF			
Compensating or stopping condenser		16360 11 MMF							27650 8 MMF	16360 11 MMF		16360 11 MMF	
Stopping condenser (1 green dot, 2 black)									23282 50 MMF				
Quality condenser			21450 B-10	21450 B-10			26820 .05 MF	21450 B-10			30250 .025 MF		30250 .025 MF
110-volt line condenser							29550 2.2 MF						
R.F. or I.F. grid filter condenser, 1st-A.F.—driver coupling condenser, or control filter condenser								27630 .01 MF					
R.F. line by-pass							26660 .1 MF						
2nd-I.F. screen by-pass								29030 .02 MF					
1st-A.F. plate by-pass								22220 100 MMF					

In late type 612 and 812, the audio coupling unit between the 1st-A. F. and driver tubes consists of an audio choke (3000 ohms) in the plate circuit of the 1st-A. F. tube, a coupling condenser (.05 MF) and a driver grid leak (¼ MEG). These parts are all sealed inside the audio transformer unit together with the audio input transformer. In early type 612 and 812, an audio transformer is used to couple the 1st-A. F. and driver tubes. The primary resistance is 2000 ohms and the secondary is 1800 ohms.

ATWATER KENT MFG. CO.

RESISTANCE OF FIELD COILS IN ELECTRO-DYNAMIC SPEAKERS

Model Number of Set	Speaker Type Number	Speaker Part Number	Part No. of Field Coil	Resistance of Field Coil (Ohms)
43	F	9890	14361	2500
46, 47	F-2 F-2A F-2C	14200 14760 14300	15629	1700
53 (Early type)	F-3	13990	14361 (short)	2500
53 (Late type)	F-3	14190	15631 (long)	1700
55	F-4 F-4A	14380 14770	15635 15635	1100 1100
55-C	F-4C	14410	15635	1100
55-F	F-2 F-2A	14200 14760	15629 15629	1700 1700
55-F-C	F-2C	14300	15629	1700
60	F-4 F-4A	14380 14770	15635 15635	1100 1100
60-C	F-4C	14410	15635	1100
60-C, 3rd type	F-4C	14410	17551	1100
61	F-6 F-6A	14480 14780	15854 15854	700 700
61-C	F-6C	14490	15854	700
66 (made in console type only)	F-6C	14490	15854	700
67	F-7 F-7A	14510 14790	15863 15863	8 8
67-C	F-7C	14520	15863	8
70 with L chassis	N	16400	16410	1100
70 with F chassis	N	16400	16410	1100
70 with D chassis	N-3	16900	17020	650
70 with Q chassis	J*	15920	——	——
72 with H chassis	N	16400	16410	1100
74 with L chassis	N	16400	16410	1100
74 with F chassis	N	16400	16410	1100
74 with D chassis	N-3	16900	17020	650
75 with P chassis	N	16400	16410	1100
76 with L chassis	N	16400	16410	1100
76 with F chassis	N	16400	16410	1100
76 with D chassis	N-3	16900	17020	650
76 with Q chassis	J*	15920	——	——
80, 80-F	S	17300	18870	2000
81, 81-B, 81-C	—	22600	22440	3
82, 82-F	S	17300	18870	2000
82-D**	—	18600	19860	1200
82-Q***	—	18400	——	——
83, 83-F (early type)	—	18100	18870	2000
83, 83-F (late type)	—	24600	18870	2000
84, 84-F	S	17300	18870	2000
84-D**	—	18600	19860	1200
84-Q***	—	18400	——	——
85, 85-F (early type)	—	18100	18870	2000
85, 85-F (late type)	—	24600	18870	2000
85-Q***	—	19900	——	——
86, 86-F	—	24600	18870	2000
87	—	19800	21260	1100
87-D	—	25000	19860	1200
89, 89-F, 89-P	—	19800	21260	1100
90, 90-F	S	17300	18870	2000
91, 91-B, 91-C	—	27900	22440	3
92, 92-F	S	17300	18870	2000
94, 94-F	—	26300	18870	2000
96, 96-F	—	26300	18870	2000
99 below 4884901	—	26400	21260	1100
99 above 4884901	—	26400	18870	2000
99-F	—	26400	21260	1100
99-P	—	26400	18870	2000
188, 188-F	368	28700	18870	2000
228, 228-F	S	17300	18870	2000
228-D**	—	18600	19860	1200
228-Q***	—	18400	——	——
260, 260-F	380	28800	21260	1100
469, 469-F	380	28800	21260	1100
469-D	—	31600	19860	1200
469-Q***	—	31500	——	——
480, 480-F	380	28800	21260	1100
558, 558-F	S	17300	18870	2000
558-D	—	31800	19860	1200
558-Q***	—	31700	——	——
567, 567-F	S	17300	18870	2000
612	324† 326††	30200 30300	18870 28550	2000 6500
627, 627-F	S	17300	18870	2000
812	336 338††	30400 30600	18870 28550	2000 6500

*The J speaker is an inductor-dynamic with two coils connected in series; resistance of each coil is about 275 ohms. Only three prongs on the four-prong plug are used. See diagram on page 241.

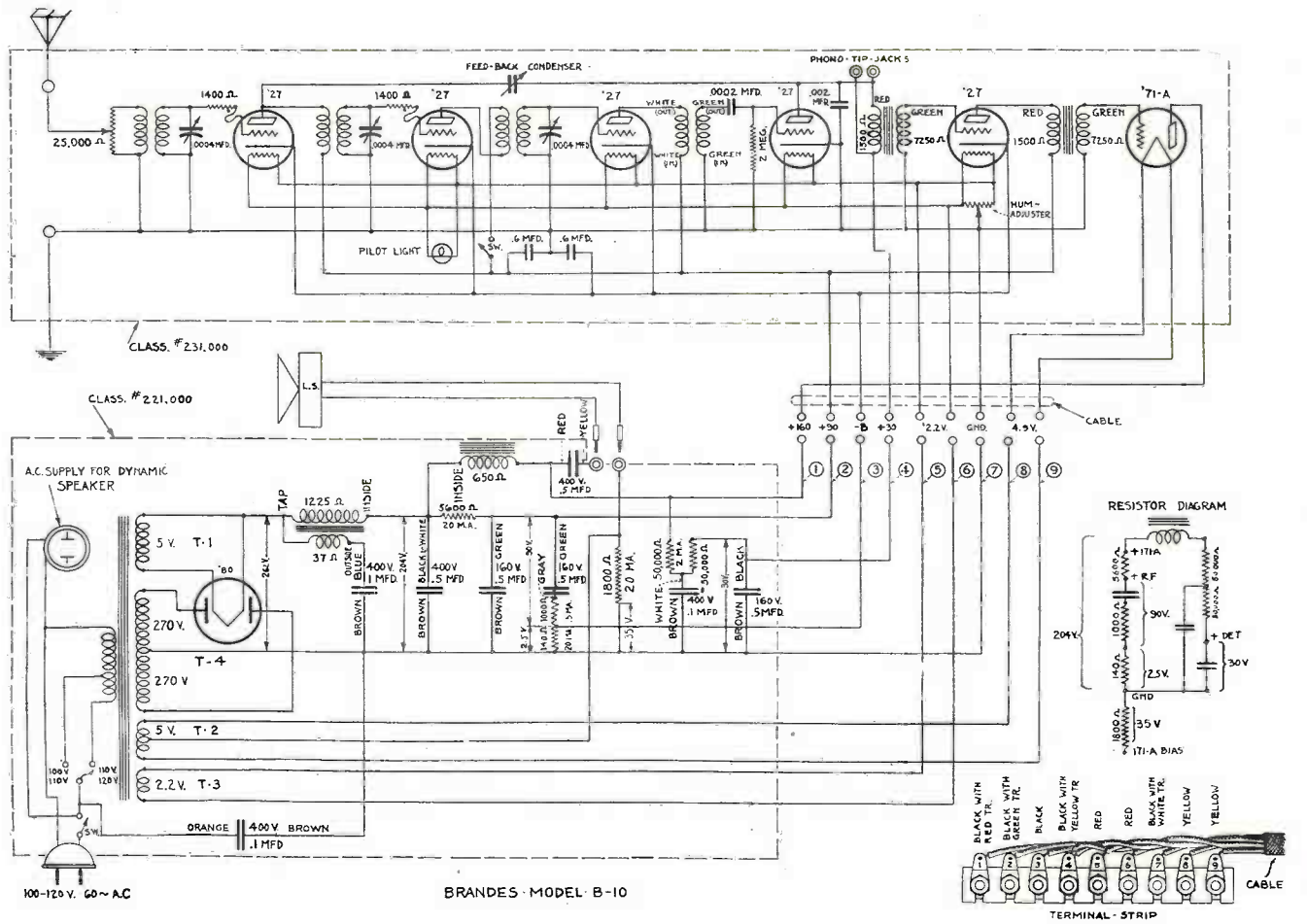
**The speakers in Models 82-D, 84-D and 228-D have a protective lamp mounted on the speaker housing. See diagram on page 307.

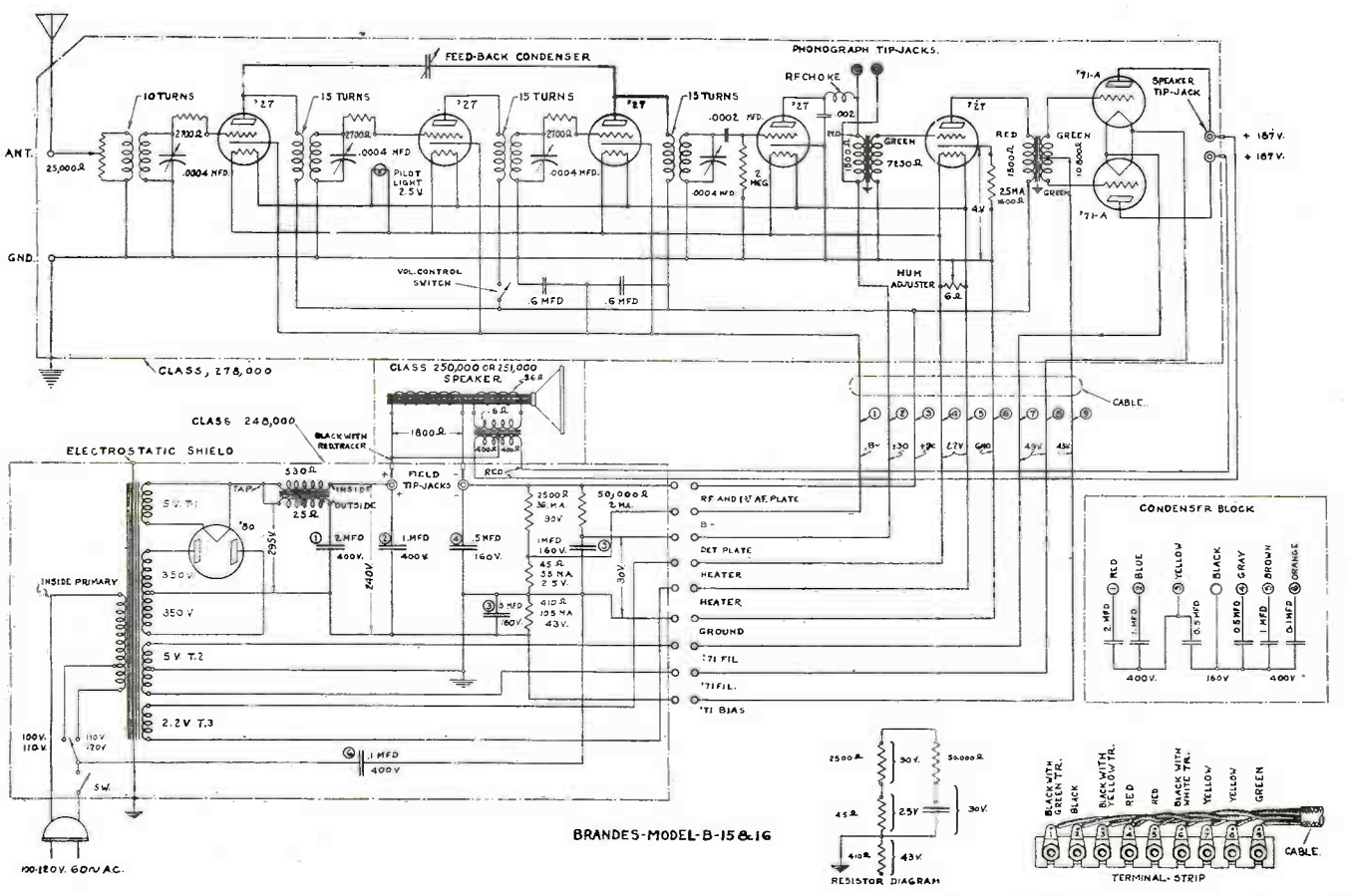
***The speakers in Models 82-Q, 84-Q, 85-Q, 228-Q, 469-Q and 558-Q are permanent-magnet electro-dynamics without field coils. In the 469-Q and 558-Q only three prongs on the four-prong plug are used.

†Type 324 speaker has a hum-bucking coil connected in series with the voice coil.

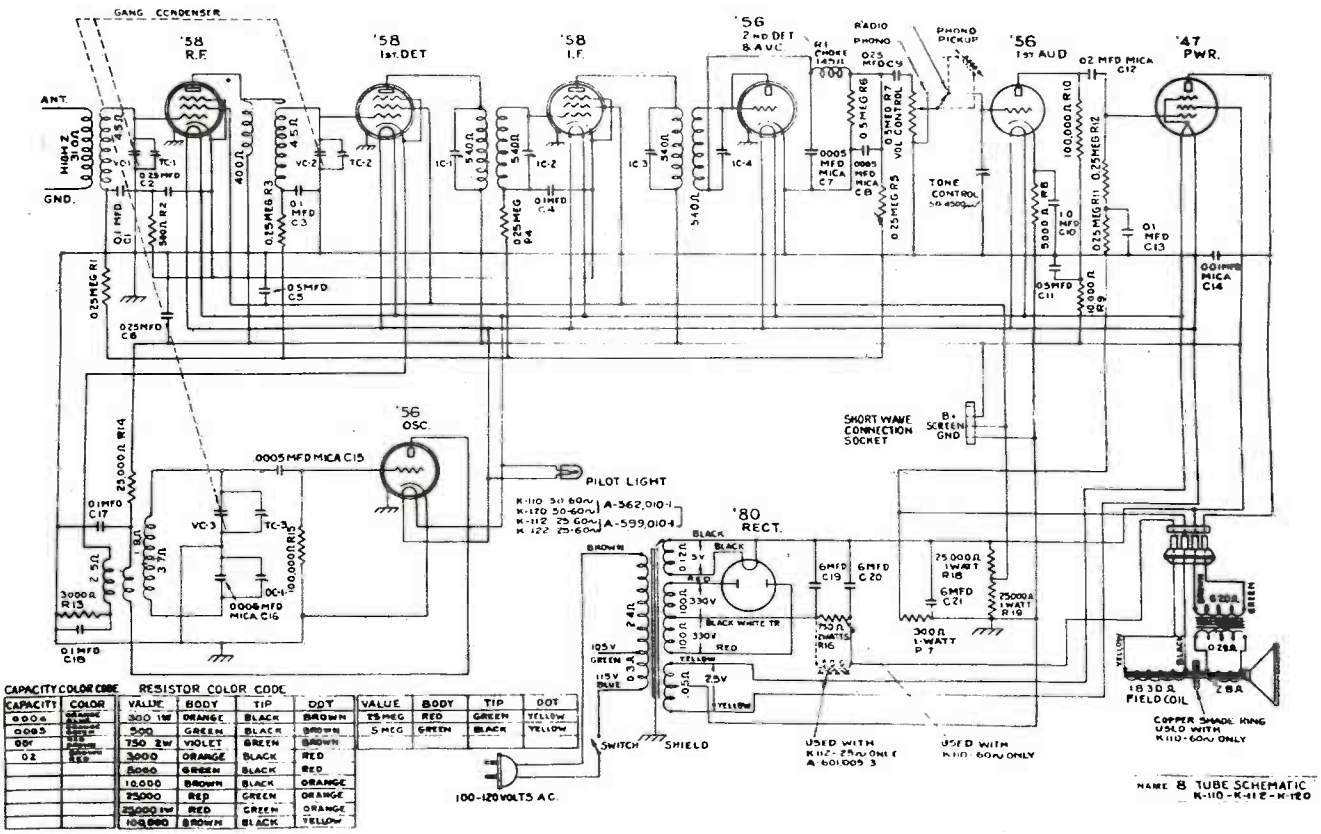
††In type 326 and 338 speakers, only four prongs on the five-prong plug are used.

BRANDES PRODUCTS CORP.





BRANDES PRODUCTS CORP.



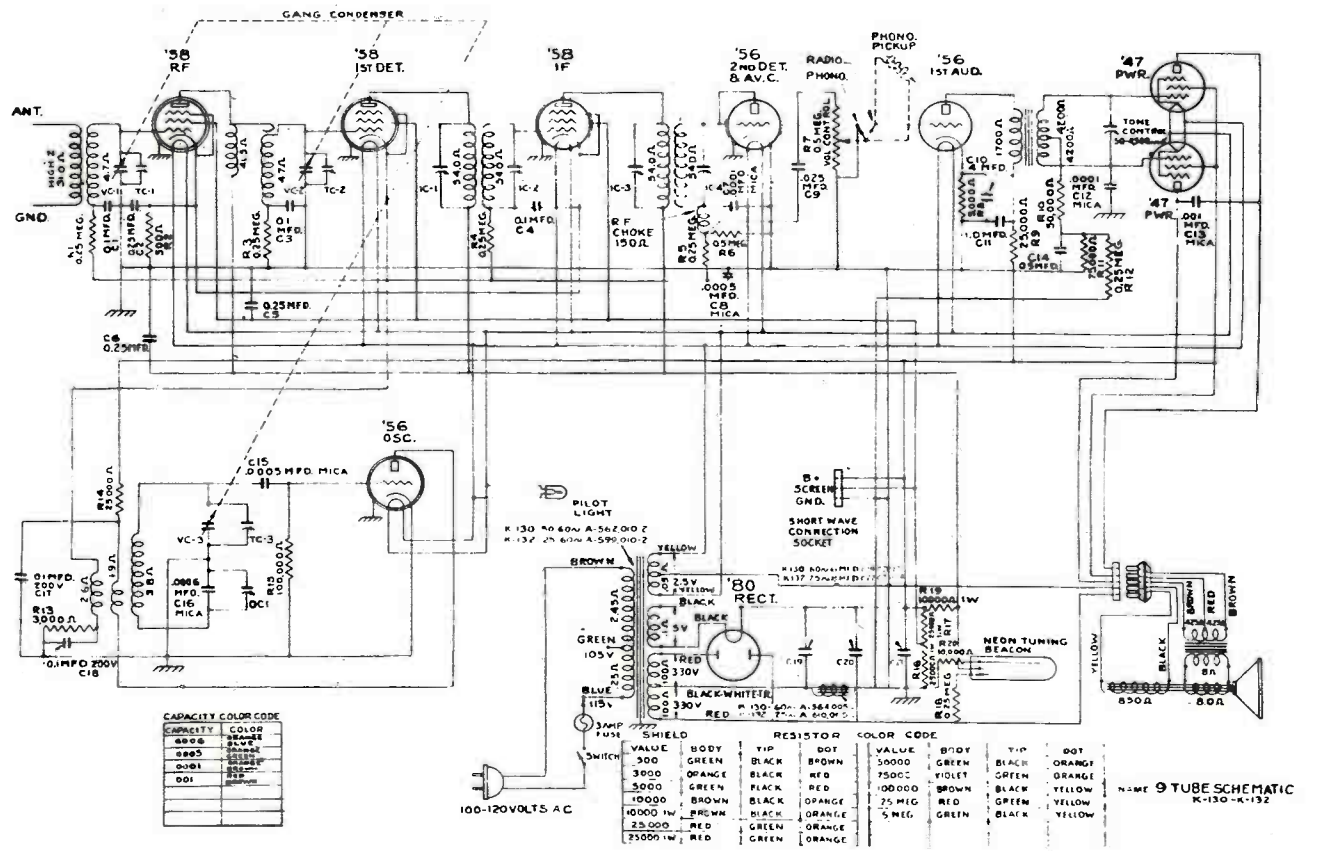
CAPACITY COLOR CODE

CAPACITY	COLOR
.0004	ORANGE
.0005	BLACK
.001	BROWN
.02	RED

RESISTOR COLOR CODE

VALUE	BODY	TIP	DOT
300 1W	ORANGE	BLACK	BROWN
500	GREEN	BLACK	BROWN
750 2W	VIOLET	GREEN	BROWN
3000	ORANGE	BLACK	RED
5000	GREEN	BLACK	RED
10,000	BROWN	BLACK	ORANGE
25000	RED	GREEN	ORANGE
25000 1W	RED	GREEN	ORANGE
100,000	BROWN	BLACK	YELLOW

VALUE	BODY	TIP	DOT
2.5 MEG	RED	GREEN	YELLOW
.5 MEG	GREEN	BLACK	YELLOW



CAPACITY COLOR CODE

CAPACITY	COLOR
.0004	ORANGE
.0005	BLACK
.001	BROWN

RESISTOR COLOR CODE

VALUE	BODY	TIP	DOT
500	GREEN	BLACK	BROWN
3000	ORANGE	BLACK	RED
5000	GREEN	BLACK	RED
10000	BROWN	BLACK	ORANGE
10000 1W	BROWN	BLACK	ORANGE
25,000	RED	GREEN	ORANGE
25000 1W	RED	GREEN	ORANGE

VALUE	BODY	TIP	DOT
50000	GREEN	BLACK	ORANGE
75000	VIOLET	GREEN	ORANGE
100000	BROWN	BLACK	YELLOW
.75 MEG	RED	GREEN	YELLOW
5 MEG	GREEN	BLACK	YELLOW

CROSLEY RADIO CORP.

CROSLEY ROAMIO AUTOMOTIVE T.R.F. RECEIVER MODELS 90, 91 AND 92

(The T.R.F. series of Crosley Roamio sets; Radio Service Data Sheet No. 88 describes the superheterodyne series.)

Model 90

Average operating potentials are given below. These values are measured with the reproducer connected and the tubes in place. For plate and grid voltages, use a high-resistance meter; measure from tube element to negative filament.

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts
V1	2.0	2.5	90	135
V2	2.0	2.5	90	135
V3	2.0	3.0	---	22.5
V4	4.7	12	---	135
V5	4.7	12	....	135

The A.V.C. potential is derived as the drop across R2. With increased signal, more current flows through the plate circuit of the combination detector and A.V.C. tube, V3, increasing the drop across R2 and thereby increasing the bias voltage applied to the control-grids of V1 and V2. This results in a reduction of the R.F. amplification, and thus maintains constant the A.F. output determined by tbe setting of R1.

Battery D supplies plate potential for V3. The negative "B" and positive "C" lead returns to the center-tap of two 25 ohm resistors, to secure the same plate potentials regardless of whether the car-battery positive or negative terminal is grounded.

Model 91

Average operating potentials are given in the tabulation below. Measure, with a high-resistance meter, to the negative filament contact.

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts
V1	2.0	1.5	100	170
V2	2.0	1.5	100	170
V3	2.0	2.5	7.5	45
V4	4.7	10*	.....	170
V5	4.7	10*	.....	170

*With volume control "off."

If a signal of sufficient strength is received to cause current to flow in the grid circuit of V3 (biased by R6), the resultant drop across R2 decreases the amplification of V1, V2. Resistors R3, R4, R5 are R.F. filters.

Manual volume control R1 determines the A.F. input to the control-grid of A.F. amplifier V4.

Model 92

Operating potentials appear in the table.

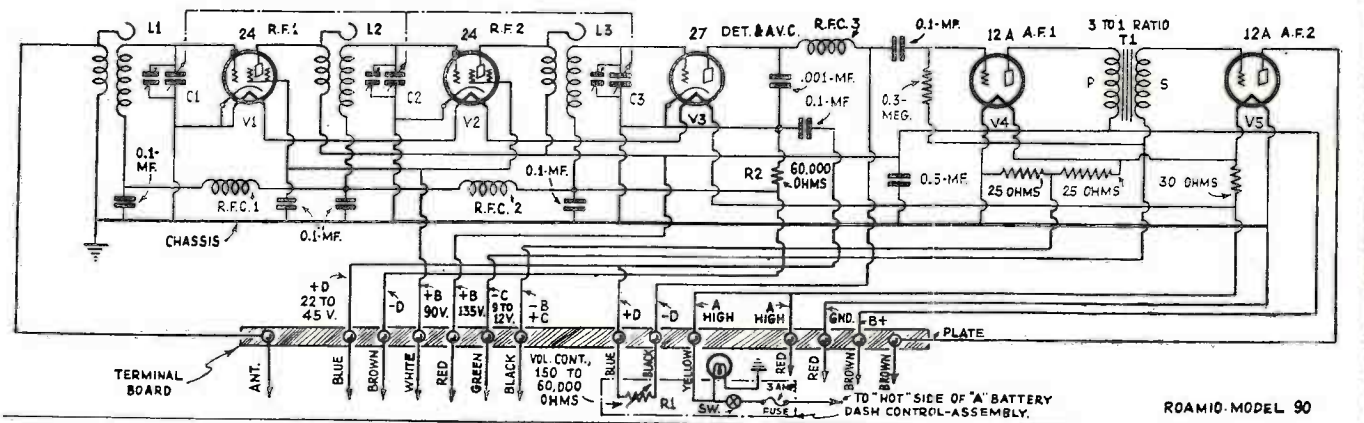
Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts
V1	5.9	3	75	170
V2	5.9	3	40	170
V3	5.9	3	40	45
V4	5.9	20	.....	170
V5	4.7	40	.....	170
V6	5.9	----	.....	3

The circuit is adjusted for zero current flow in the circuit of A.V.C. tube V6, with normal signal input; at the same time resistor R3 establishes the normal bias required by the control-grids of V1, V2. Now, an incoming signal of increased strength causes diode V6, in conjunction with load-resistor R2, to develop across R2 an increased D.C. negative potential which reduces the amplification of V1, V2. Resistors R4, R5 are R.F. filters.

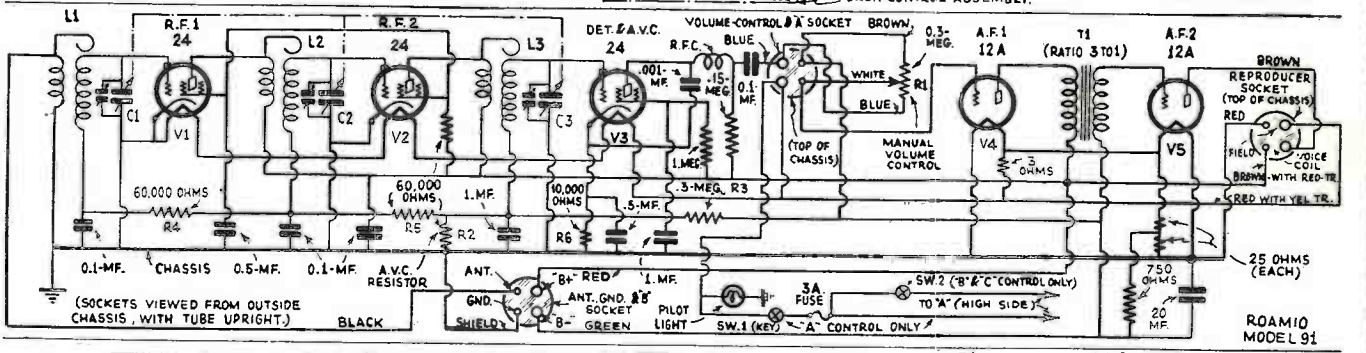
The A.F. input to the first-A.F. tube, V4, is determined by the setting of the manual volume control, R1.

Manual volume control resistor R1 has a value of 0.3-meg. Since Crosley Service Bulletin No. A8 does not include the tube operating voltages for the model 92, estimated values are given.

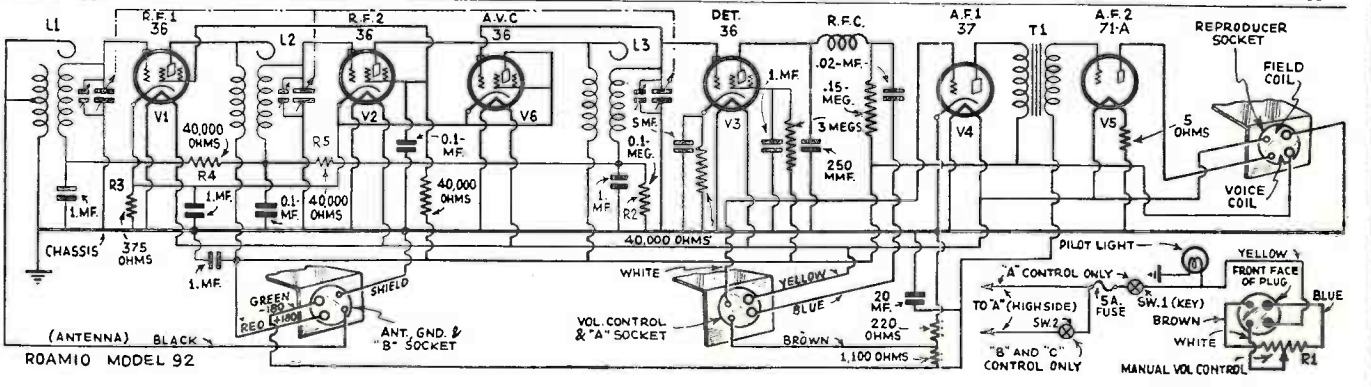
At the present time there are no Roamio models 93 or 94 receivers.



ROAMIO-MODEL 90



ROAMIO MODEL 91



ROAMIO MODEL 92

CROSLEY RADIO CORP.

CROSLEY ROAMIO AUTOMOTIVE SUPERHETERODYNE MODELS 95 AND 96

(The superheterodyne series of Crosley Roamio sets; Radio Service Data Sheet No. 87 describes the T.R.F. series.)

Model 95

Average operating potentials are given in the following tabulation. These figures are measured with the speaker connected; a high-resistance meter will be required to obtain correct readings.

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts
V1	5.9	8	75	170
V2	5.9	*	75	170
V3	5.9	*	.....	170
V4	5.9	.....	.....	.....
V5	5.9	5.5	.....	85
V6	5.9	17	170	160

*A. V. C. only.

The pole of the "A" battery which is not directly connected to the frame of the car connects through the insulated battery cable lead to the cable connector of the receiver, and thence to one pole of the power switch; this D. P. D. T. unit controls both the "A" and "B" circuits. After going through the switch, the "A" circuit branches, one branch going to the heaters (connected in parallel) and through them to the chassis, another going through the dial light to the chassis, and the third going through the speaker field, to the speaker cable shield, and then through the battery cable shield to the other side of the "A" battery which connects to the frame of the car.

Tube V1 incorporates the dual action of oscillator and first-detector. Tube V4 is connected as a diode and serves the dual functions of automatic volume control and A.V.C.

The grid of the output pentode, V6, is connected to the chassis through a grid leak of 0.3-meg. (in models using a type 38 pentode this resistor has a value of 0.5-meg.). The output volume is determined by the setting of the 3-meg, potentiometer, R1.

The A.V.C. potential is developed across resistors R2, R3, which connect to the plate of the second-detector, V4. The maximum negative potential (the total drop across R2, R3) is applied to the control-grid of the pentode I.F. amplifier, V2, through filter resistor R4. A lower potential is obtained at the center-tap of resistors R2, R3, and this voltage is applied to the control-grid of the screen-grid I.F. amplifier, V3, through filter resistor R5. Thus, resistors R2, R3 serve the dual functions of supplying A.V.C. potential, and at the same time acting as the load resistor combination across which is developed the A.F. potential which is applied to the .03-mf. coupling condenser and thence to the combination grid-leak and manual volume control potentiometer R1.

The two 8 mf. condensers are electrolytic units and are contained in one can.

To re-align the set, turn the station selector to 550 kc., and adjust the service oscillator to 181.5 kc., after first connecting it, through a condenser of 0.1-mf., to the control-grid of V1. Ground the other side of the service oscillator, and do not remove the control-grid clip-wire (of the set) from V1. Next, adjust the I.F. trimming condensers of I.F.T.1 for maximum reading, and then adjust the trimmers in shunt to the secondaries of I.F.T.2 and I.F.T.3, respectively, for maximum output-meter reading.

After this step has been completed, the antenna and oscillator circuits, respectively, may be aligned.

Police Roamio model 951 is the same as the model 95, except for the coils which are designed for the police band.

Model 96

Following are the average operating potentials to be measured with a high-resistance meter.

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts
V1	5.9	4	95	180
V2	5.9	7	95	180
V3	5.9	4	95	180
V4	5.9	2	95	180
V5	5.9	6	....	80
V6	5.9	14	180	170

The aligning procedure in connection with this receiver is the same as for the Model 95 chassis, except that the high side of the service oscillator connects through a condenser of 0.1-mf., not to the first tube in the set, V1, but to the first-detector, V2, for making the I.F. adjustments. After setting the station-selector dial to 550 kc., adjust the service oscillator to 181.5 kc., and proceed as previously described.

Then, tune the service oscillator to 1,400 kc., set the station-selector dial to 1,400 kc., and connect the high side of the service oscillator, through a condenser of 250 mmf., to the antenna lead of the receiver; the low side of the service oscillator connects to the chassis.

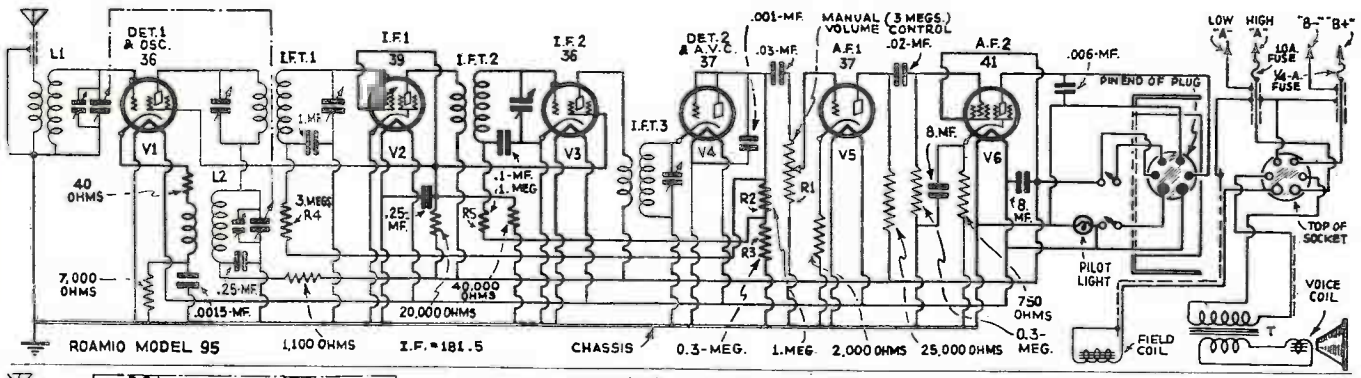
It is preferable to use a dummy antenna in making these adjustments. Align the I.F. and R.F. circuits for maximum reading on the output meter. The circuits of L1, L2 and L3 should not be adjusted until the I.F. circuits have been aligned.

The action of the A.V.C. section of this receiver model is a bit more complicated than that of the previously-described Roamio A.V.C. circuits. Consequently, the interested Service Man is referred to the September, 1932 issue of RADIO-CRAFT, which contains a lengthy description of the diode-triode tube, in the article; "Still More New Tubes"; fundamental data regarding A.V.C. circuits in general are discussed at considerable length in the article, "Operation and Service of Automatic Volume Control Systems" (in the same issue).

The manual volume control resistor, R1, has a value of 3 megs.

Variation in tube current supplied by the automobile storage battery, due to fluctuations caused by the generator and load on the battery, is a cause of so-called "interference" in many automobile receivers. Although these Roamio models are designed to eliminate this effect as much as possible, in order to insure the best reception it may be advisable to pay particular attention to the connection of the yellow "A" lead, running it *direct to the car battery* rather than to other possible locations to the "A" supply.

Whether filter condensers will be required in shunt to the electric horn, electric windshield wiper, electric fan, etc., may be determined by shunting these units with a test condenser of about 2 mf.



CROSLEY RADIO CORP.

CROSLEY "CHIEF" 12-TUBE MODEL 132-1 12-TUBE SUPERHETERODYNE

(Dual reproducers, class B push-push A.F. power output fed by a class A push-pull driver stage, meter tuning, A.V.C., tone control, static control.)

The Crosley Chief, 12-tube superheterodyne console model radio receiving set, is the most recent addition to the line. This receiver incorporates the model 132-1 chassis. Although incorporating a large number of tubes, the power line current consumption is held to a minimum by use of the new tubes which consume much less current than the older types.

Resistors R1A, R1B, 1.5 megs. (per section); R2, 0.4-meg.; R3, 80,000 ohms; R4, 0.15-meg.; R5, R6, 60,000 ohms; R7, 2,000 ohms; R8, 1. meg.; R9, 7,000 ohms; R10, 40 ohms; R11, 750 ohms; R12, R13, R24, 0.5-meg.; R-14, R23, 0.3-meg.; R15, 450 ohms; R16, 3 megs.; R17, 30,000 ohms; R18, 20 ohms center-tapped; R19, 3,500 ohms; R20, 6,000 ohms; R21, 10,000 ohms; R22, 5 megs.

Condensers C1 to C4, tuning units; C5 to C8, I. F. trimmers; C9, C25, C26, .02-mf.; C10, C11, C13, C14, C16, C30, C31, C32, 0.1-mf.; C17, C15, 4 mf.; C18, 150 mmf.; C19, 100 mmf.; C20, C23, .006-mf.; C21, C22, C28, 8 mf.; C24, .05-mf.; C27, .003-mf.; C29, 12 mf.

Tube Type	Fil. Volts	Bias Volts	S.-G. Volts	Plate Volts
V1	2.4	0.5	60	200
V2	2.4	2.5	60	200
V3	2.4	13.5	—	170
V4	2.4	0.5	60	200
V5	2.4	8	165	220
V6	2.4	—	—	—
V7	5.6	23.5	220	200
V8	5.6	23.5	220	200
V9	5.6	28.5	—	405
V10	5.6	28.5	—	405
V11	2.4	77.5	—	70
V12	2.5	—	—	415

With a line potential of 117.5 V. the above figures may be taken as average readings; for "220 V." sets a line voltage of 235 is taken as standard. Bias (unless otherwise stated), screen-grid, and plate readings are taken between these tube contacts and the emitter; bias for V3, V5, V7 to V11, cathode to chassis.

Late chasses of this model have a 1,400-ohm resistor shunted across the visual tuning meter. Also, these later chasses may have two 1. meg. resistors (total) in the manual volume control circuit, connected from the moving arms to the ground ends of R1A and R1B.

The tuning meter of this receiver has a resistance of approximately 440 ohms and the deflection is approximately 10 ma.

The A. F. output of V6 actuates tube V11 which, in turn, controls the bias on the amplifier tubes for A.V.C. operation. By manual adjustment of R2 the degree of background noise is controlled to suit individual preference of sensitivity.

Note that the transformer secondary supplying tubes V1, V2, V3 is bypassed by a dual-section condenser, C30-C31. Another unusual circuit arrangement is the use of a double choke coil arrangement comprising Ch1-Ch2. and field coils 1 and 2. The first two choke coils are connected in the positive high-voltage lead in the usual manner, while the second two chokes, the field coils of the dynamic reproducers, are connected as an "inductive voltage divider," one terminal of the two coils in series being connected to the positive output of the regular filter system, and the other end being grounded to the chassis; the center-tap of these field coils supplies voltage to the screen-grids of V1, V2, V4, and to the plate of V5.

The tone correction furnished by C25-C26 applies equally to V9 and V10, the center-tap of these two condensers being grounded to the chassis. If any portion of the tone control R3, C24, becomes grounded the A. F. portion of the receiver will become inoperative as the entire tone control operates at the potential of the plates of V7, V8.

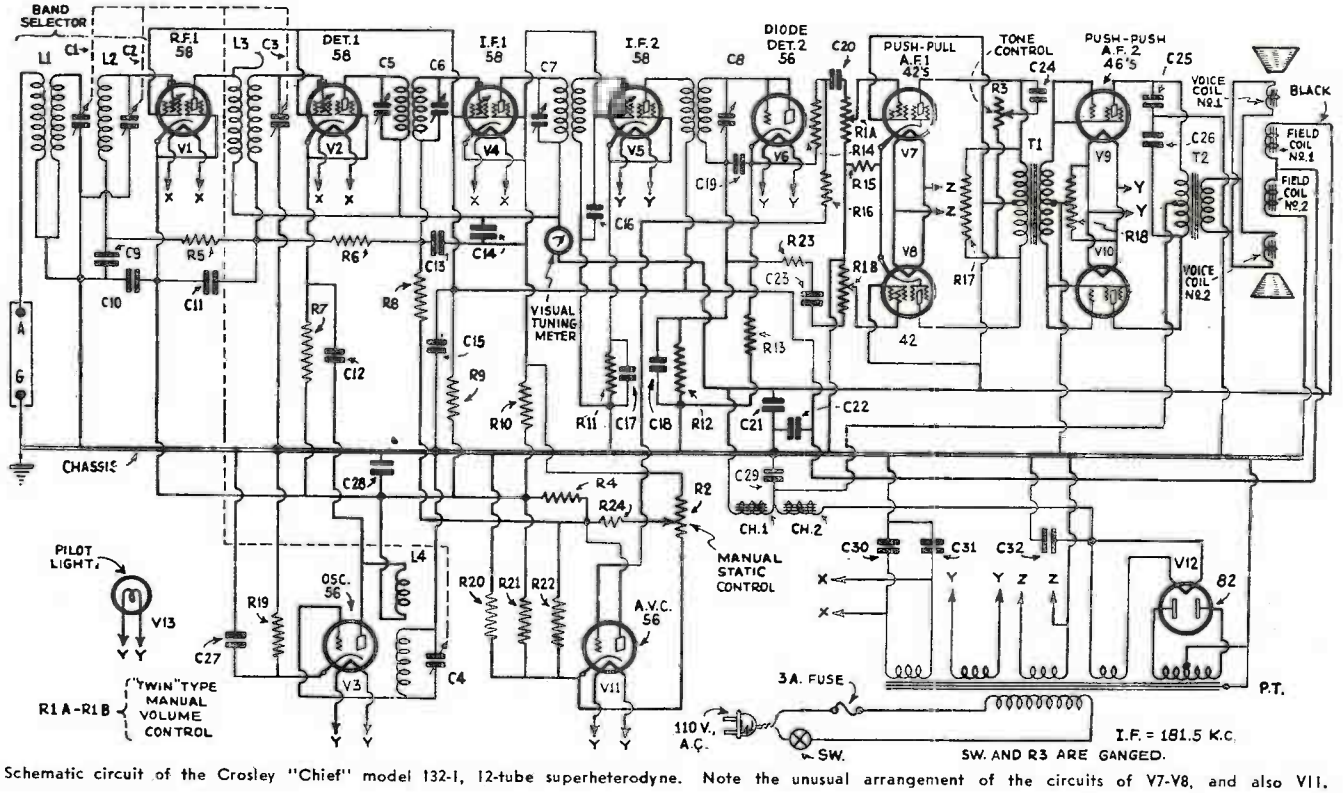
The manual volume control operates in the input circuit of the push-pull driver stage, V7-V8. The two sections of this volume control, R1A, R1B, operate simultaneously as a dual unit.

The first A.F. stage, V7, V8, is driven by a so-called split-diode circuit furnishing A.F. voltage from both the cathode and plate circuits, which are out of phase (in push-pull relationship).

The input circuit of V1 is preceded by a band-selector which must be carefully aligned in order to maintain the required degree of selectivity at all points in the tuning band.

The A.V.C. action is obtained through the voltage drop across resistor R4. There is an initial current flowing through this unit and the 5 meg. grid leak, R22, furnishing a normal bias for the R.F. and I.F. stages. The A.V.C. tube V11 is delayed by means of a positive potential on the cathode of about 60 V. When an R.F. signal of sufficient intensity is applied to make this A.V.C. tube (D.C. amplifier) draw plate current, its plate current also flows through R4 and furnishes an additional A.V.C. bias.

The "static" control is also connected to change the current flowing through R4, thus changing the initial bias on the controlled tubes, so that the overall sensitivity of the set is reduced.



Schematic circuit of the Crosley "Chief" model 132-1, 12-tube superheterodyne. Note the unusual arrangement of the circuits of V7-V8, and also V11.

RCA-VICTOR, INC.

R.C.A. VICTOR R-27 AND PHILCO 53 ULTRA-MIDGET A.C.-D.C. RADIO RECEIVERS

R.C.A. Victor R-27 Universal

This small radio set carries the following specifications: Line voltage rating, 105 to 120 V., D.C., or 25 to 133 cycles A.C. Power consumption, 40 W. A feature of this set is the extremely wide tuning range of 540 to 1,700 kc. Operating voltages at maximum volume, on a 115 V. A.C. line (on D.C., slightly less) are as follows:

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts	Plate Ma.
1	6.0	3.0	105	105	7
2	6.0	0.75*	11.0	60*	.025
3	6.0	11.0	100	95	5
4	6.0	.....	.....	115	15

*Impossible to measure on ordinary voltmeter.

The left-hand knob is a combined volume control and power switch; the station selector is at the right. If the set does not work within a minute, reverse the position of the line plug in the socket. This particular type of set should be so positioned as to permit full ventilation at all times.

The most satisfactory length of aerial for this set is to be determined by individual trial. In general, a length of about 20 ft. should be quite sufficient: this length is the dimension of the lead which is supplied with the set. If the antenna lead is bunched, or coiled, too near the set, circuit oscillation may occur. A similar effect may be produced if the volume control is advanced too far. When tuned to a local station with the volume control fully advanced, a condition may be observed where a certain amount of counter-clockwise rotation of the control will improve the quality of reproduction and actually increase the volume. This condition is caused by overloading and may be corrected simply by setting the volume control below the readily-apparent critical point.

Philco 53 Universal Compact

Operating voltages at a line potential of 120 V., D.C., are given below:

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Cath. Volts	Plate Volts
V1	*	8	93	7-14	95
V2	*	3	34	6-12	14
V3	*	4	100	3-26	94
V4	*	..	—	58-73	10

*The total voltage applied to the filaments is 51 V.

All of these readings were taken from the underside of the chassis, using test prods and leads with a suitable high resistance meter; the volume control is set at maximum and the station selector at 550 kc.

The following data concerning the operation of this set on 115 V. A.C. are furnished:

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Cath. Volts	Plate Volts
V1	*	7	94	18	95
V2	*	4	34	12	15
V3	*	4	102	10	94
V4	*	..	....	112	112

*The total voltage applied to the filaments is 49.9 V.

These readings are taken in the manner described for making D.C. tests.

To obtain maximum sensitivity through the use of the 30 ft. of antenna wire furnished with the set, it will be necessary to adjust the antenna compensating condenser, the L.F. compensating condenser and the sensitivity condenser in the following manner; unroll the 30 ft. of antenna wire to its full length (do not connect it to another aerial or ground while the following adjustments are being made). Tune to a station near the H.F. end of the dial (between 1400 and 1500 kc.). With a fibre adjusting wrench, adjust the antenna condenser for maximum volume. (This condenser is the second one from the front control.) After this is completed, tune to a station near the L.F. end of the dial (as near 600 kc. as possible) and then adjust the L.F. condenser for maximum volume (looking at the back of the set, this is the unit at the extreme left); retune to the H.F. station and do any necessary fine readjusting so as to bring in the station with maximum volume.

Now check the adjustment of the sensitivity condenser (at the immediate right of the L.F. condenser) with the receiver tuned to a station near the H.F. end of the dial; turn this condenser to the right as far as possible without causing circuit oscillation or a squeal. Repeat this adjustment on a station near the L.F. end of the dial; if circuit oscillation occurs, turn the condenser to the left until this disappears.

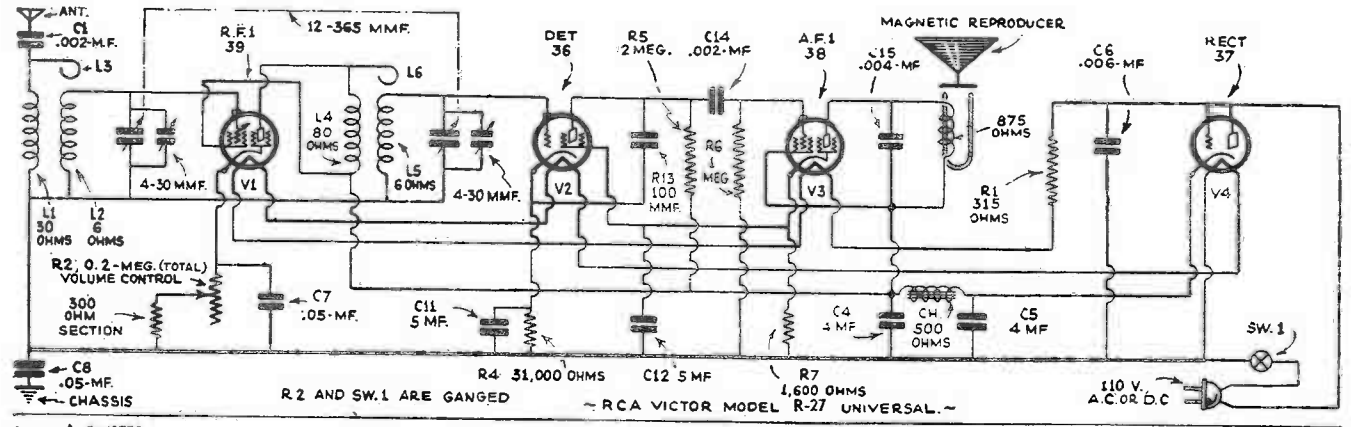
At the rear of the chassis are four condenser controls, as follows (starting from the left): L.F. condenser; sensitivity; I.F. primary, 450 kc.; and I.F. secondary, 450 kc.

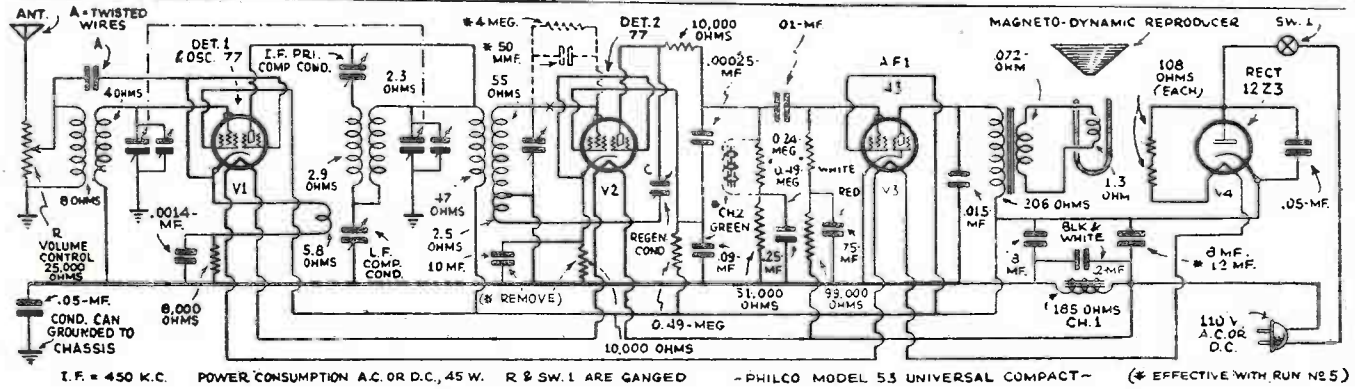
Of exceptional interest is the use of the new, type 77 tube, the externally-connected suppressor-grid 6.3 V. R.F. pentode. The type 1223 rectifier has a 12 V. filament. The second-detector, V2, is made slightly regenerative at the I.F. In order to secure adequate filtration on A.C. circuits, the single filter-choke has connected to it not only the usual input and output filter condensers, but also a shunt tuning condenser which, with the choke coil, forms a trap circuit. The chassis does not connect directly to the light line.

The filter condenser bank is color coded as follows: Black, common; green, .09-mf.; white, .25-mf.; red, .75-mf.; black and white, 0.2-mf.; the common lead connects to the shield can only through a condenser of .05-mf.

The fiber screw at the back of the chassis should be adjusted at the time of installation. Place the set in operation, tune in a station near the middle of the dial, and adjust this screw, which controls the regeneration condenser, C_4 until, by turning clockwise, a swishing sound is heard where different stations are tuned in. Now turn the screw counter-clockwise until the swishing sound just ceases. Continue to turn in the same direction about one-quarter turn. When correctly adjusted, the circuit will not break into oscillation at any point in the tuning range.

As indicated in the schematic circuit, several changes have been incorporated in models starting with run 5.





I.F. = 450 K.C. POWER CONSUMPTION A.C. OR D.C., 45 W. R 8 SW. 1 ARE GANGED ~PHILCO MODEL 53 UNIVERSAL COMPACT~ (* EFFECTIVE WITH RUN NO. 5)

CANADIAN MARCONI CO.

MODELS 32-B, 33, 33-AW, 34, 35, 36, & 37

ALIGNMENT OF TRIMMING CONDENSERS

Before attempting to adjust the R.F. trimmers, be sure that the Intermediate Frequency trimmers are properly adjusted. The procedure is as follows:—

I.F. TRIMMERS:—(1) Connect the output meter to the voice coil terminals of the speaker.
(2) See that the receiver chassis is properly grounded.
(3) Remove the oscillator tube from the receiver.
(4) Connect the Test Oscillator to the grid of the 1st detector tube and the chassis.
(5) Turn the volume control on full and reduce the output of the test oscillator to give a low reading on the output meter.
(6) Adjust the I.F. Trimmers in the following order:—

Models 32-B, 33, 33-AW and 34:—(a) 2nd Det. Grid. (b) I.F. Plate. (c) I.F. Grid. (d) 1st Det. Plate.

Models 35-36-37:—(a) 2nd I.F. Transformer, Secondary. (b) 1st I.F. Transformer, Secondary. (c) 1st I.F. Transformer, Primary. (d) Band pass coil. The position of these trimmers is shown on the data sheet for each receiver.

Model 33-AW 175 KC Plate Coil:—In addition to the regular I.F. Transformers the oscillator plate coil is tuned to 175 KC. After aligning the I.F. Transformers, connect the 175 KC Oscillator to "A" and "G," switch to the 125 meter band (Mauve) and adjust the S/W I.F. trimmer for maximum output.

See that the output of the Test Oscillator is kept as low as possible at all times, in order to avoid overloading any of the tubes or causing the Automatic Volume Control to function.

R.F. TRIMMERS:—With all tubes in place and the receiver grounded, connect the output meter as above and proceed as follows:—(1) Connect the Test Oscillator to the aerial and ground terminals. (2) Set the oscillator at 1,400 KC and the dial of the receiver to the same frequency. (3) Reduce the output of the oscillator to give a low reading on the output meter with the volume control on full. (4) Adjust the R.F. trimmers in the following order:—(a) Oscillator, (b) 1st Detector, (c) R.F. Amplifier. Reduce the output of the Test Oscillator as the sensitivity of the receiver is increased. (5) Set Oscillator at 600 KC and tune the receiver to this frequency. (6) Adjust the Oscillator tracking condenser for maximum output while rocking the tuning condenser back and forth.

ALIGNMENT OF SHORT WAVE TRIMMERS

The "All Wave" A.C. Models may be tuned to any frequency from 1,500 KC to 26,000 KC, as well as the broadcast band. Incoming signals of these frequencies are heterodyned by the S/W Oscillator to produce a resultant frequency of 1,520 KC which is applied to the grid of the R.F. amplifier. In order that the circuits of the broadcast receiver may be at maximum efficiency at this frequency (1,520 KC), adjustable condensers are substituted for the three sections of the gang tuning condenser. These condensers are located alongside of the first three sections of the tuning condenser and may be adjusted with a long screw-driver through holes in the top of the condenser shield. The procedure is as follows:—

1,520 KC TRIMMERS:—(1) Turn the selector switch to the 60-200 meter (Green) band. See that the receiver is grounded. (2) Remove the S/W Oscillator tube and connect the Test Oscillator to the grid of the S/W Detector and to chassis. (3) Set the Test Oscillator at exactly 1,520 KC and adjust the trimmers in the following order:—(a) Oscillator, (b) 1st Det., (c) R.F. Amplifier. If the Test Oscillator will not tune to 1,520 KC, set it at exactly 760 KC, the second harmonic of this frequency is 1,520 KC.

S/W TRACKING CONDENSERS:—The S/W Oscillator circuit is provided with three adjustable tracking condensers, one for each of the three short wave bands. We do not advise attempting to adjust these unless a calibrated S/W Oscillator is available. The procedure is similar to adjusting the 600 KC Tracking condenser. With the S/W Test Oscillator connected to "A" and "G," adjust for maximum output while rocking the tuning condenser back and forth at the following frequencies:—

Band	Alignment Frequency	Dial Reading	Trimmer
(1) S. S/W Red	12,000 KC	81° Approx.	Left
(2) M. S/W Yellow	4,500 KC	93° "	Center
(3) L. S/W Green	1,650 KC	90° "	Right

Trimmer position shown when looking at back of chassis.

CANADIAN MARCONI CO.

MODELS 32-B, 33, 33 AW, 34, 35, 36 & 37

It is absolutely essential that both the receiver and the S/W Test Oscillator be properly grounded.

If no short wave oscillator is available it may be possible to pick up a harmonic of a broadcast band oscillator. At all times the signal should be kept as low as possible to avoid picking up the image frequency.

In order to obtain a sufficiently weak signal it may be necessary to remove the Oscillator to some distance from the receiver.

ACTION OF DIODE (2nd) DETECTOR—MODELS 35, 36 and 37

Half wave rectification of the signal takes place in this tube between the cathode and each of the three other elements (counting the screen and suppressor grids as one). This pulsating direct current flows from each of these elements to the cathode. The rectified signal current flowing to the grid is applied to the grid of the 1st Audio tube through condenser C28. The rectified current flowing to the plate produces a voltage drop in resistor R17 which increases the bias on the R.F. Amplifier tube and automatically controls the sensitivity of the receiver The current flowing to the screen and suppressor grids is used for Automatic Silent Tuning.

In **Model 34** a separate tube is used for automatic volume control. The grid of this tube is coupled to the 2nd Detector grid circuit by a small condenser (C17). The incoming signal causes the tube to draw more or less plate current which causes a voltage drop in resistor R14 which varies the bias on the grids of the R.F. and I.F. amplifiers, thus controlling the sensitivity of the receiver.

AUTOMATIC SILENT TUNING:—MODELS 35-37:—Silencing the receiver is accomplished by making the bias on the grid of the 1st Audio tube sufficiently negative to prevent this tube from operating. The action is as follows:—The grid of the Suppressor tube is at the same potential as the cathode due to the fact that it is connected to it through resistors R18 and R19, consequently, current flows to the plate through resistor R22. The voltage drop across this resistor produces the extra bias necessary to prevent the 1st Audio tube functioning and no sound is heard from the speaker. When a carrier wave is tuned in, current flows to the screen and suppressor grids of the detector through R19. The voltage drop across this resistor makes the grid of the Suppressor tube negative with respect to its cathode and prevents plate current from flowing, this in turn allows the bias on the 1st Audio grid to drop to normal and allows this tube to amplify the signal applied to its grid by the detector.

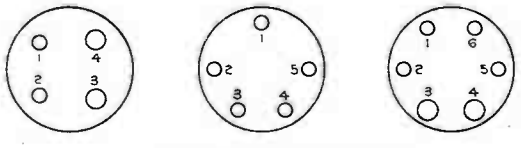
A three position switch is provided for controlling the action of this tube. In the FULL position the tube is actuated only by fairly powerful stations. In the MEDIUM position, stations of moderate power can be received. This position of the switch should be used wherever the noise level is sufficiently low to permit satisfactory reception.

Throwing the switch to the OFF position makes the grid of the Suppressor tube sufficiently negative to prevent plate current flowing at any time, consequently the bias on the 1st Audio tube remains normal and the receiver is not silenced.

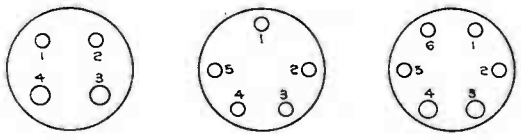
SPEAKERS:—A.C. MODELS. It is not feasible to replace the cone in these speakers, consequently, the entire head of the speaker must be replaced. In Model 37, twin speakers are used. These speakers are identical electrically but differ slightly in the construction of the cone and are therefore **not** interchangeable. The speakers are distinguished by marking one type with a Red spot.

In ordering speakers or cones, be sure to specify which type is required.

CAUTION:—Care should be taken not to turn on the Power switch (left hand knob) immediately after turning it off. Allow about twenty seconds for the tubes to cool off before turning the receiver on again in order to avoid possible damage to the Rectifier Tube.



TUBE BASES (BOTTOM VIEW)



SOCKETS (TOP VIEW)

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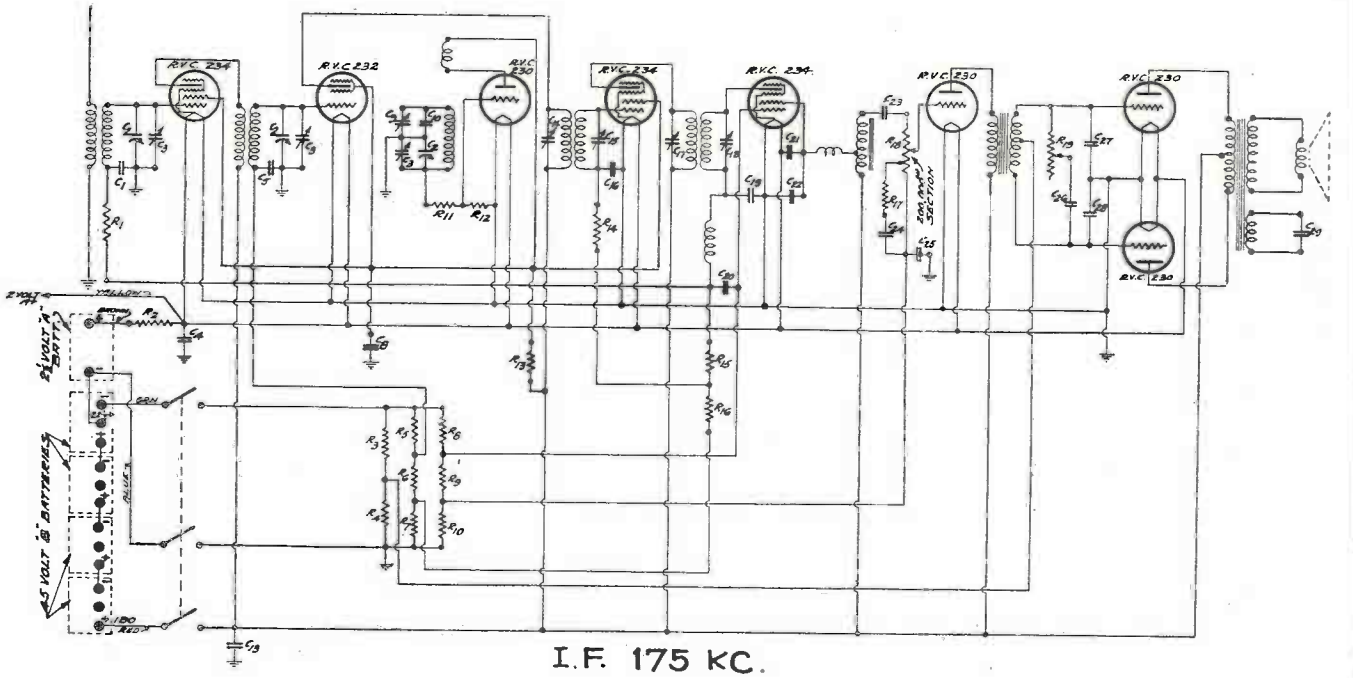
32-B SET



I.F. 175 KC.

CONDENSERS FOR MODEL 32-B

Ref. No.	Part No.	Capacity	Type	List Price
C1	1001	.05 Mf	6317	1.20
C2	1002	18–325 Mmf 3 gang	7501	9.60
C3		4–50 " Trimmer for C2		
C4	1003	.75 Mf Bypass block	7525	10.00
C5	1003	.1 " " "	"	10.00
C8	1003	.25 " " "	"	10.00
C9	1004	15–75 Mmf Osc. Tracking	7062	1.20
C10	1005	670 "	6320	.90
C13	1003	8. Mf Bypass block	7525	10.00
C14 C15	1006	15–75 Mmf 140–220 " I. F. Trimmers	7062	1.20
C16	1003	.05 Mf Bypass block	7525	10.00
C17 C18	1006	140–220 Mmf 15–75 " I. F. Trimmers	7062	1.20
C19	1007	400 "	3085	.75
C20	1008	.005 Mf	2962	1.25
C21	1009	1200 Mmf	2012	.85
C22	1009	1200 "	2012	.85
C23	1008	.005 Mf	2962	1.25
C24	1003	.025 " Bypass block	7525	10.00
C25	1003	.5 " " "	7525	10.00
C26	1003	.025 " " "	"	10.00
C27	1003	.005 " " "	"	10.00
C28	1003	.005 " " "	"	10.00
C29	1010	2400 Mmf	2749	1.80

RESISTORS FOR MODEL 32-B

Ref.	Part No.	Resistance	Type No.	List Price
R1	1011	500,000 Ohms ¼ Watt	S–1067	.60
R2	1012	.8 " Wire Wound	3043	.80
R3	1013	500 " ½ Watt	3383	.70
R4	1014	750 " ½ "	3382	.70
R5	1015	700,000 " ¼ "	6244	.60
R6	1016	140,000 " ¼ "	6241	.60
R7	1017	65,000 " ¼ "	6245	.60
R8	1018	1 Meg. " ¼ "	3033	.60
R9	1018	1 " " ¼ "	"	.60
R10	1019	2 " " ¼ "	6242	.60
R11	1020	3,000 " ½ "	3358	.70
R12	1021	40,000 " ¼ "		.60
R13	1022	15,000 " ½ "	S–1116	.60
R14	1011	500,000 " ¼ "	S–1067	.60
R15	1011	500,000 " ¼ "	"	.60
R16	1011	500,000 " ¼ "	"	.60
R17	1023	10,000 " ¼ "	3381	.60
R18	1056	1 Meg. " Vol. Control	6328	2.75
R19	1055	150,000 " Tone "	6329	3.50

VOLTAGE READINGS—MODEL 32-B

Radiotron No.	Control Grid to Filament Volts	Screen Grid to Filament Volts.	Plate to Filament Volts	Screen Current M.A.	Plate Current M.A.	Filament Volts
1. R.F.	0.2	65	157	1.0	3.0	2.0
2. 1st Detector	0.5	65	157	0.1	0.2	2.0
3. Oscillator	1.0	..	65	...	4.0	2.0
4. I.F.	0.5	65	157	1.0	3.0	2.0
5. 2nd Detector	2.0	155	0	4.0	0	2.0
6. 1st A.F.	1.0	..	155	...	2.5	2.0
7. Power	14.0	..	155	...	1.2	2.0
8. Power	14.0	..	155	...	1.2	2.0

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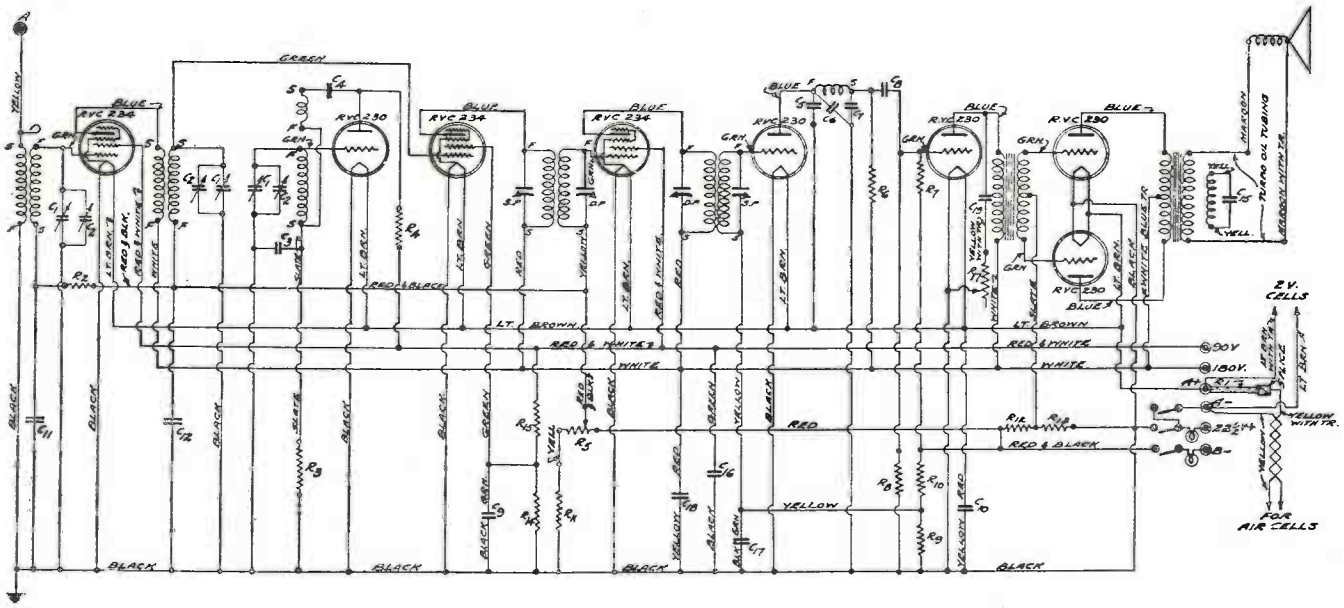
MODEL 33



TRIMMER ADJUSTMENTS—MODEL 33

I.F.—175 K.C. adjust in order—No. 1, No. 2, No. 3, No. 4
R.F.—Trim at 1,400 K.C. in order—Osc., Det., R.F.
Oscillator Tracking Condenser—Adjust at 600 K.C.

CONDENSERS FOR MODEL 33

Ref.	Part No.	Capacity	Type	List Price
C1	1101	17–360 Mmf 3 gang	32948	5.00
C2	..	Trimmer for C1	....	....
C3	1102	950 Mmf Osc. Tracking	36078	.75
C4	1103	.002 Mf Mica		.50
C5	1104	.001 " "		.50
C6	1105	.001 " "		.50
C7	1106	.00025 " "		.50
C8	1107	.02 " "		.50
C9	1108	.3 " Bypass block	36109	3.50
C10	1108	1 " " "	36109	3.50
C11	1109	.1 " 200v. Tubular		.50
C12	1110	.1 " " "		.50
C15	1113	.002 " Mica		.50
C16	1108	.3 " Bypass block	36109	3.50
C17	1108	.3 " " "	36109	3.50
C18	1108	1 " " "	36109	3.50
C19	1114	.04 " 200v. Tubular		.50

NOTE:—Bypass block Part No. 1108 contains condensers C9, C10, C16 and C17.

RESISTORS FOR MODEL 33

Ref.	Part No.	Resistance	Type	List Price
R1	1116	.525 Ohms	36112	.50
R2	1117	1,000 " ½ Watt	..	.50
R3	1118	500,000 " ½ "	..	.50
R4	1119	10,000 " ½ "	..	.50
R5	1189	50,000 " Vol. Control	..	1.20
R6	1120	450,000 " ½ Watt	..	.50
R7	1118	500,000 " ½ "	..	.50
R8	1118	500,000 " ½ "	..	.50
R9	1121	350,000 " ½ "	..	.50
R10	1122	600,000 " ½ "	..	.50
R11	1124	7,700 " ½ "	..	.50
R12	1125	650 " ½ "	..	.50
R13	1126	1,300 " ½ "	..	.50
R14	1127	34,000 " ½ "	..	.50
R15	1128	16,500 " ½ "	..	.50
R17	1188	250,000 " Tone Control	..	1.20

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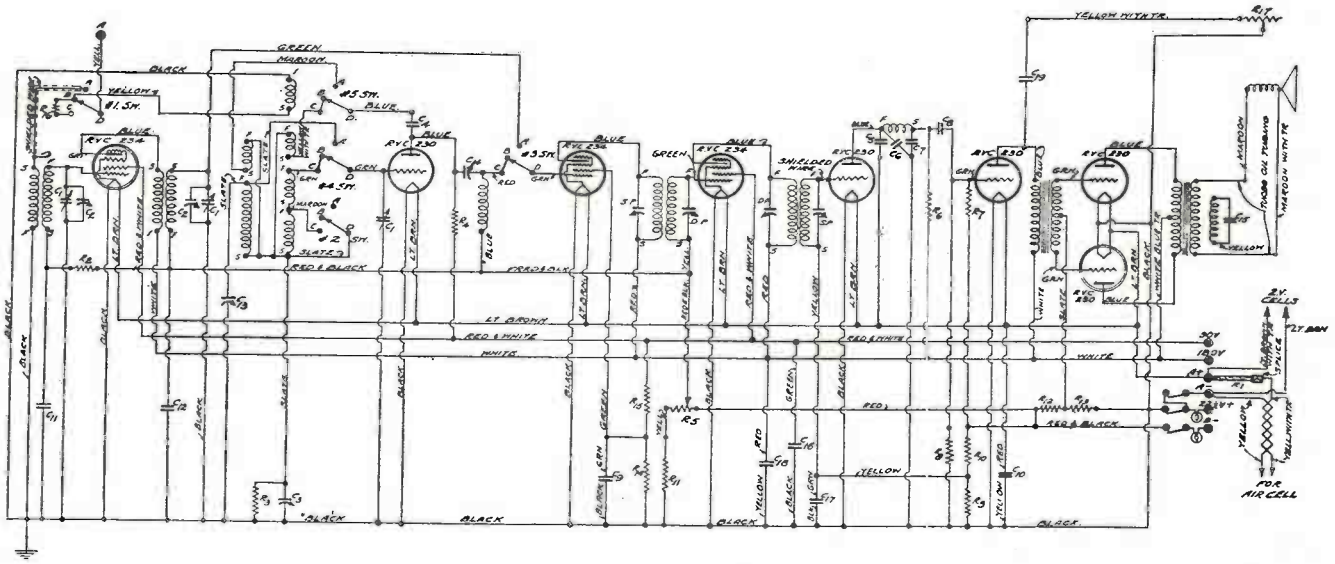
MODEL 33-AW



TRIMMER ADJUSTMENTS—MODEL 33-AW

I.F.-175 K.C. adjust in order—No. 1, No. 2, No. 3, No. 4.
R.F. Trim at 1,400 K.C. in order—Osc., Det., R.F.
Oscillator Tracking Condenser—Adjust at 600 K.C.
S/W I.F. Trimmer—Switch to 125 meter band, connect 175 K.C. oscillator to A. & G., adjust for maximum output.

CONDENSERS FOR MODEL 33-AW

Ref.	Part No.	Capacity	Type No.	List Price
C1	1201	17 –360 Mmf 3 gang	32948	5.00
C2	..	Trimmer for C1	..	..
C3	1202	950 Mmf Osc. Tracking	36078	.75
C4	1203	.002 Mf Mica		.50
C5	1204	.001 " "		.50
C6	1205	.001 " "		.50
C7	1206	.00025 " "		.50
C8	1207	.02 " "		.50
C9	1208	.3 " Bypass block	36109	3.50
C10	1208	1. " " " "	"	3.50
C11	1209	.1 " 200v. Tubular		.50
C12	1210	.1 " " "		.50
C13	1211	4–20 Mmf Osc. Trimmer	36123	.60
C14	1212	60–140 Mmf S/W.I.F. Trim	36161	.60
C15	1213	.002 Mf Mica		.50
C16	1208	.3 " Bypass block	36109	3.50
C17	1208	.3 " " " "	"	3.50
C18	1208	1. " " " "	"	3.50
C19	1214	.04 " 200v. Tubular		.50

NOTE:—Bypass block Part No. 1208 contains condensers C9, C10, C16 and C17.

RESISTORS FOR MODEL 33-AW

Ref.	Part No.	Resistance	Type No.	List Price
R1	1216	.525 Ohms	36112	.50
R2	1217	1,000 " ½ Watt	..	.50
R3	1218	500,000 " ½ "	..	.50
R4	1219	10,000 " ½ "	..	.50
R5	1289	50,000 " Volume Control	..	1.20
R6	1220	450,000 " ½ Watt	..	.50
R7	1218	500,000 " ½ "	..	.50
R8	1218	500,000 " ½ "	..	.50
R9	1221	350,000 " ½ "	..	.50
R10	1222	600,000 " ½ "	..	.50
R11	1224	7,700 " ½ "	..	.50
R12	1225	650 " ½ "	..	.50
R13	1226	1,300 " ½ "	..	.50
R14	1227	34,000 " ½ "	..	.50
R15	1228	16,500 " ½ "	..	.50
R16	1229	400 " ½ "	..	.50
R17	1288	250,000 " Tone Control	..	1.20

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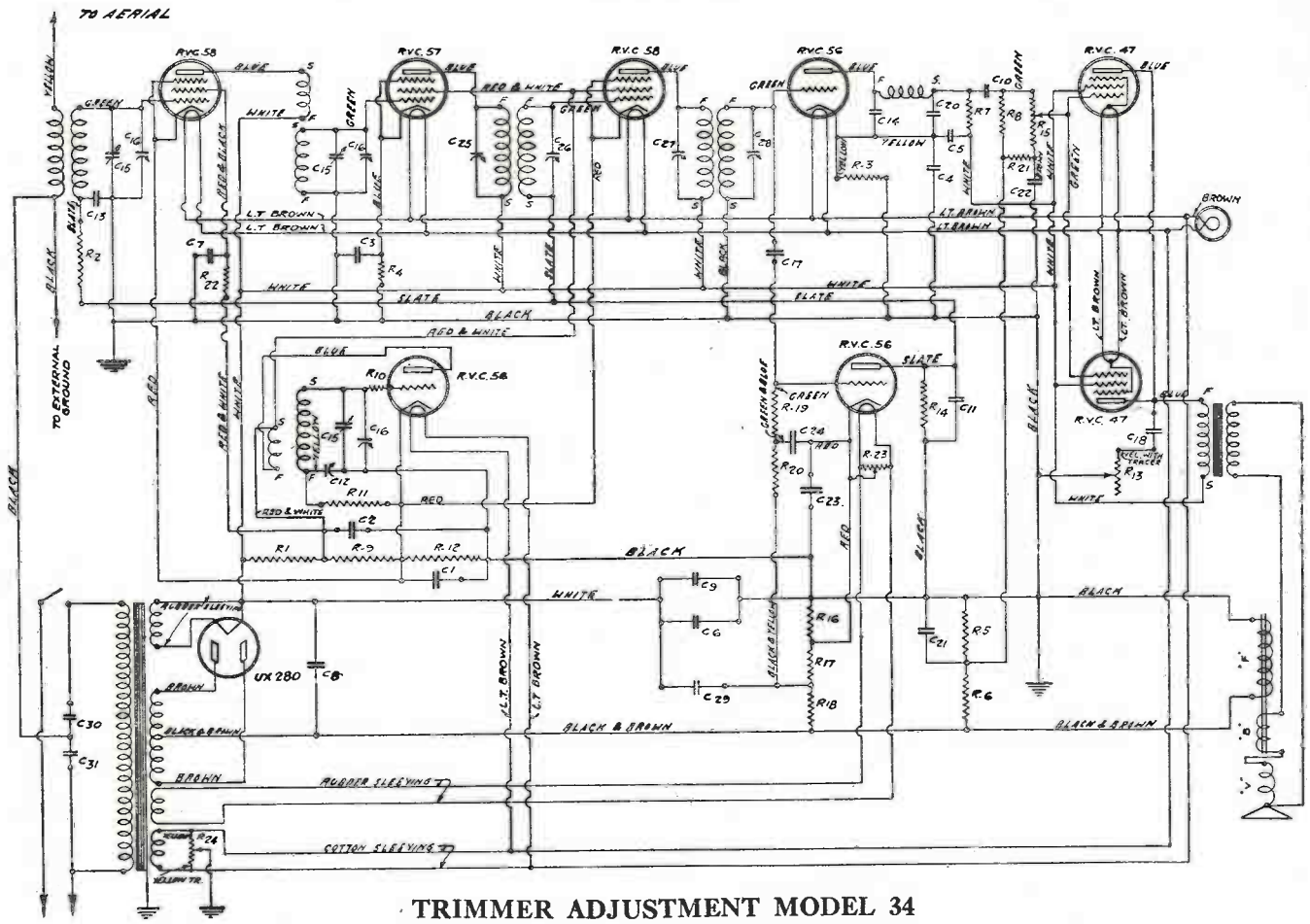
MODEL 34



TRIMMER ADJUSTMENT MODEL 34

I.F.—175 K.C. Adjust in order No. 1, No. 2, No. 3, No. 4.
R.F.—Trim at 1,400 K.C. in order—Osc., Det., and R.F.
Oscillator Tracking Condenser—Adjust at 600 K.C.

CONDENSERS FOR MODEL 34 RECEIVER

Ref.	Part No.	Capacity	Type No.	List Price
C1	1301	.5 Mf 200 Volt Bypass Block...	35942	5.00
C2	1301	1. " " " " " "	"	5.00
C3	1302	.1 " " " Tubular.....		.50
C4	1301	1. " " " Bypass Block...	35942	5.00
C5	1301	.25 " 400 " " " " "	"	5.00
C6	1301	.5 " " " " " " "	"	5.00
C7	1301	.1 " 200 " " " " "	"	5.00
C8	1303	8. " 400 " Electrolytic.....		1.50
C9	1304	6. " 250 " "		1.50
C10	1305	.006 " Mica.....		.50
C11	1301	.04 " 200 " Bypass Block...	35942	5.00
C12	1306	850 Mmf Osc. Tracking...	34517	.80
C13	1307	.04 Mf 200 " Tubular.....		.50
C14	1308	.001 " Mica.....		.50
C15	1309	21-325 Mmf 3 gang.....	35533	5.00
C16		60 Mmf Trimmer for C15		
C17	1310	100 " Mica.....		.50
C18	1311	.15 Mf 400 " Tubular.....		.50
C20	1312	250 Mmf Mica.....		.50
C21	1313	.03 Mf 200 " Tubular.....		.50
C22	1301	.25 " 200 " Bypass Block...	35942	5.00
C23	1301	.1 " " " " " " "	"	5.00
C24	1301	.1 " " " " " " "	"	5.00
C25	1314	6-70 Mmf I.F. Trimmer No. 4		..
C26	1314	70-140 " " " " No. 3		
C27	1315	70-140 " " " " No. 2		..
C28	1315	6-70 " " " " No. 1		
C29	1301	.25 Mf Bypass Block...	35942	5.00
C30	1316	.02 " Line Filter.....	35248	1.00
C31	1316	.02 " " " "	"	

NOTE:—Bypass block, Part No. 1301, contains condensers C1, C2, C4, C5, C6, C7, C11, C22, C23, C24 and C29.

RESISTORS FOR MODEL 34 RECEIVER

Ref.	Part No.	Resistance	Type No.	List Price
R1	1318	16,000 Ohms 3 Watt.....		.75
R2	1319	25,000 " ½ "		.50
R3	1320	50,000 " ½ "		.50
R4	1321	10,000 " ½ "		.50
R5	1320	50,000 " ½ "		.50
R6	1322	380,000 " ½ "		.50
R7	1323	100,000 " ½ "		.50
R8	1324	750,000 " ½ "		.50
R9	1325	15,000 " 1 "		.50
R10	1326	2,500 " ½ "		.50
R11	1327	40,000 " ½ "		.50
R12	1328	300 " ½ "		.50
R13	1390	100,000 " Tone Control.....	35926	1.75
R14	1329	1 Meg. " ½ Watt.....		.50
R15	1391	800,000 " Volume Control.....	35927	1.20
R16	1330	525,000 " ½ Watt.....		.50
R17	1323	100,000 " ½ "		.50
R18	1323	100,000 " ½ "		.50
R19	1331	2 Meg. " ½ "		.50
R20	1329	1 Meg. " ½ "		.50
R21	1332	200,000 " ½ "		.50
R22	1326	2,500 " ½ "		.50
R23	1333	20 " Center Tapped.....		.50
R24	1334	6 " " "		.50

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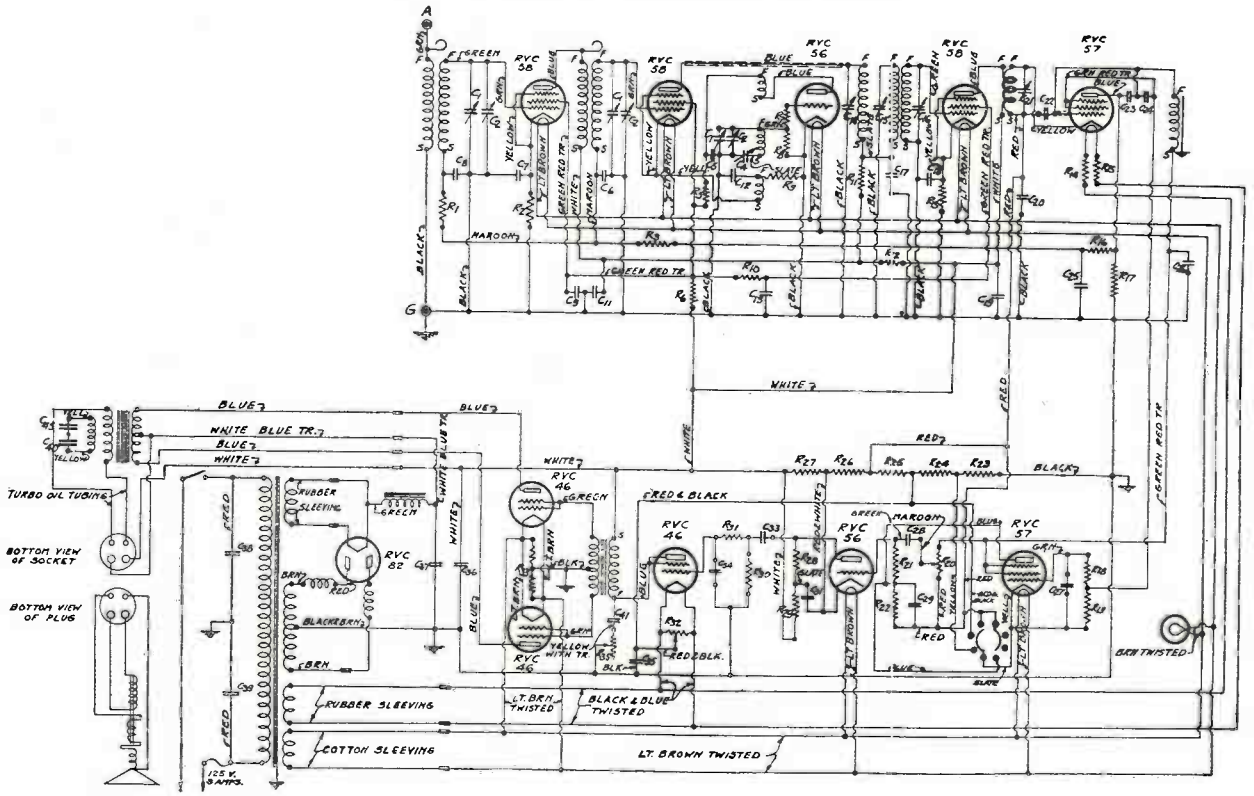
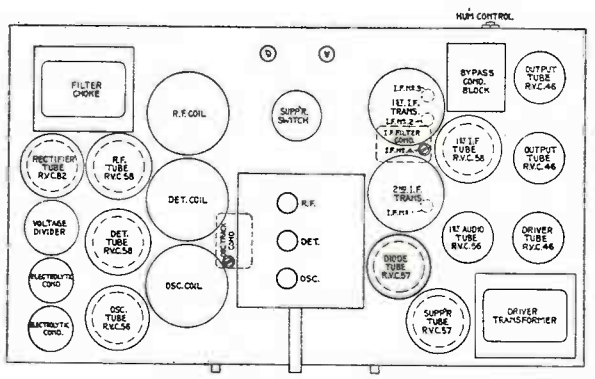
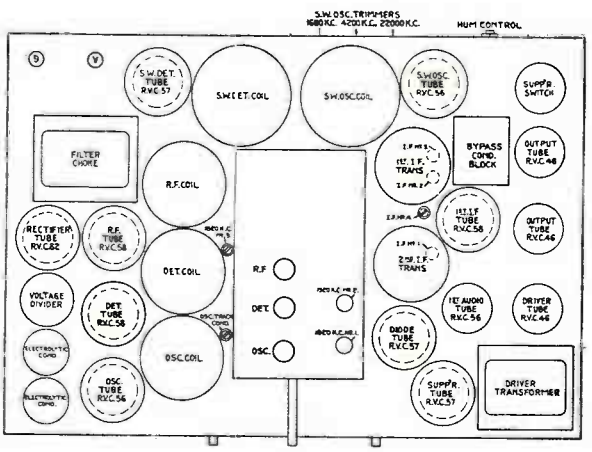
SERVICE DATA—MODELS 35, 36-37



Model 35



Model 35



Model 36 and 37

VOLTAGE READINGS—MODELS 35, 36-37

	VOLTAGES to Cathode			VOLTAGES to Chassis				VOLTAGES to Cathode or Fil.			
	Grid	Pl.	Scr.	Sup.	Cath.	Htr.		Grid	Pl.	Scr.	Sup.
B.C.-R.F.	0	215	90	0	..	..	*S/W R.F.	.5	230	30	0
1st Det.	0	185	85	0	6	..	*S/W Osc.	25	165	..	..
B.C. Osc.	0	90	..	..	..	..	Driver	18	230	225	..
I.F.	0	230	90	0	3	..	Power	0	380	0	..
Diode	+13	−18	−18	−18	40	25	Rect.	..	420	..	..
Suppressor	0	9	9	9	15						
1st. A.F.	.1	130	..	..	44	.1					

*Models 36-37 only.

TRIMMER ADJUSTMENTS—MODELS 35, 36-37

I.F.—175 K.C. Adjust in order—No. 1, No. 2, No. 3, No. 4.
R.F.—Trim at 1400 K.C. in order—Osc., Det., and R.F.
Oscillator Tracking Condenser—Adjust at 600 K.C.

(MODELS 36-37 ONLY)

S/W I.F.—1520 K.C. Adjust in order—No. 1, No. 2, No. 3.
S/W Oscillator Tracking Condensers. Adjust at following frequencies—(1) Red Band—12,000 K.C. (Approx. 81° on dial) (2) Yellow band—4,500 K.C.(Approx. 93° on dial) (3) Green Band—1,650 K.C. (Approx. 90° on dial).

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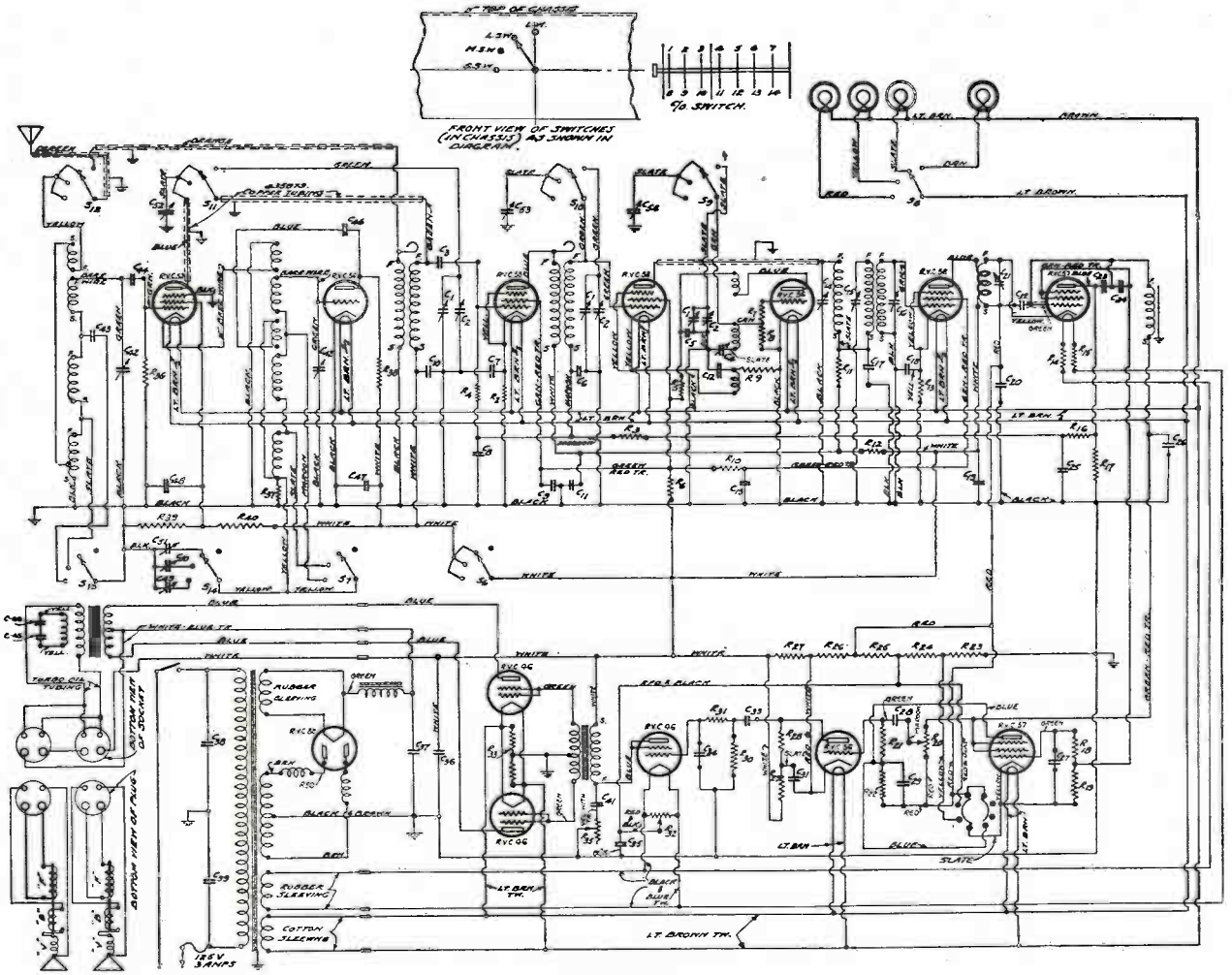


MODEL 37

Model 36 is identical except for output transformer and speaker connections which are as in Model 35.

CONTINUITY TESTS—MODELS 35, 36-37

Resistance from Socket Pins to Chassis with Speaker connected

SOCKET	PIN	No.	OHMS	SWITCH
*SW-DET 57	g	C	1,000,000	
	g_1	1	29,000	
	g_2	6	0	
	p	2	Open	B.C.
	p	2	6,500	S.W.
	k	5	0	
*SW-OSC. 56	g	1	250,000	
	p	2	12,500	S.W.
	p	2	239,000	B.C.
	k	5	0	
BC-R.F. 58	g	C	6,600,000	
	g_1	1	22,585	B.C.
	g_1	1	20,000	S.W.
	g_2	6	400	
	k	5	400	
	p	2	21,000	
BC-1st. Det. 58	g	C	1,600,000	
	g_1	1	22,585	
	g_2	6	2,500	
	k	5	2,500	
	p	2	18,585	
BC-OSC. 56	g	1	42,500	
	p	2	23,585	
	k	5	0	
I.F. 58	g	C	130	
	g_1	1	23,585	
	g_2	6	400	
	p	2	7,585	
	k	5	400	

*Models 36 and 37 only.

SOCKET	PIN	No.	OHMS	SUPPRESSOR SWITCH
DIODE DET. 57	g	C	101,000	
	g_1	1	2,000,000	
	g_2	6	2,000,000	
	p	2	1,000,000	
	k	5	1,050	
	h	3	500	
SUPPRESSOR 57	g	C	3,000,000	
	g_1	1	100,000	
	g_2	6	100,000	
	p	2	1,000,000	Full and Med.
	p	2	900	Off
	k	5	275	Full
	k	5	800	Med.
	k	5	900	Off
1st A.F. 56	g	1	2,000,000	
	p	2	27,585	
	k	5	1,235	
DRIVER 46	g_1	1	250,000	
	g_2	5	7,585	
	p	2	7,585	
	f	3	525	
POWER 46	g_1	1	100	
	g_2	5	100	
	p	2	9,500	
	f	3	10	
	p to	p	400	
RECT. 82	p	1	75	
	f	3	9,000	
	p to	p	150	
SPEAKER FIELD	M-36		1,500	
	M-37		750	Each

g=Control Grid, g_1=Screen Grid, g_2=Suppressor Grid, C=Cap.

CANADIAN MARCONI CO.

CONDENSERS FOR MODELS 35, 36-37

Ref.	Part No.	Capacity	Type No.	List Price
C1	1401	21–370 Mmf, 5 Gang Tuning	*35122	7.00
C1	1402	21–370 " 3 " "	†35193	5.00
C2		60 " Trimmer for C1		
C3	1403	250 " Mica	*	.50
C4	1404	850 " Osc. Tracking	35681	.75
C5	1405	.1 Mf 300 V. Tubular		.50
C6	1406	.05 " 200 V. "		.50
C7	1407	.1 " 200 V. "		.50
C8	1406	.05 " 200 V. "		.50
C9	1408	.1 " 300 V. "		.50
C10	1408	.1 " 300 V. "	*	.50
C11	1408	.1 " 300 V. "		.50
C12	1407	.1 " 200 V. "		.50
C13	1408	.1 " 300 V. "		.50
C14	1409	6–70 Mmf I.F. Trimmer No. 4	35233	.60
C15	1410	6–70 " " " No. 3	35217	.75
C16	1411	6–70 " " " No. 2	35217	.75
C17	1412	.004 Mf 300 V. Tubular		.50
C18	1413	.1 " 200 V. Bypass block	35699	2.50
C19	1408	.1 " 300 V. Tubular		.50
C20	1406	.05 " 200 V. "		.50
C21	1414	6–70 Mmf I.F. Trimmer No. 1	35700	.75
C22	1403	250 " Mica		.50
C23	1414	.01 Mf 200 V. Tubular		.50
C24	1414	.01 " 200 V. "		.50
C25	1415	.001 " Mica		.50
C26	1403	250 Mmf "		.50
C27	1414	.01 Mf 200 V. Tubular		.50
C28	1415	.02 " Mica		.75
C29	1416	.05 " 300 V. Tubular		.50
C31	1413	1. " 300 V. Bypass block	35699	2.50
C33	1415	.02 " Mica		.50
C34	1417	500 Mmf "		.50
C35	1413	1. Mf 200 V. Bypass block	35699	2.50
C36	1418	8 " 450 V. Electrolytic	2251	1.50
C37	1418	8 " 450 V. "	2251	1.50
C38, C39	1419	.02 " Line filter; .02 " "	35248	1.00
C40	1420	.004 " Mica		.50
C41	1421	.2 " 300 V. Tubular		.50
C42	1401	13–268 Mmf 5 gang tuning	*35122	7.00
C43	1422	360 " Mica	*	.50
C44	1403	250 " "	*	.50
C45	1423	.004 Mf "		.50
C46	1424	.002 " "	*	.50
C47	1408	.1 " 300 V. Tubular	*	.50
C48	1408	.1 " " "	*	.50
C49	1425	308 Mmf 22,000 K.C. Tracking	*	.75
C50	1426	665 " 4,200 K.C. "	*	.75
C51	1427	248 " 1,680 K.C. "	*	.75
C52	1428	4–20 " 1,520 Trimmer No. 1	*36241	.60
C53	1429	6–70 " 1,520 " No. 2	*35844	.75
C54	1430	6–70 " 1,520 " No. 3	*35844	.75

Bypass block, Part No. 1413, contains condensers C18, C31, C35. *Models 36, 37 only. †Model 35 only.

RESISTORS FOR MODELS 35, 36-37

Ref.	Part No.	Resistance	Type No.	List Price
R1	1441	100.000 Ohms ½ Watt	Model 35 only	.50
R2	1442	400 " ½ "		.50
R3	1441	100,000 " ½ "		.50
R4	1443	5 Meg. " ½ "	Models 36-37 only	.50
R5	1444	1,000 " ½ "		.50
R6	1445	15,000 " 1 "		.50
R7	1446	25,000 " ½ "		.50
R8	1447	40,000 " ½ "		.50
R9	1448	2,500 " ½ "		.50
R10	1444	1,000 " ½ "		.50
R11	1449	10,000 " ½ "		.50
R12	1444	1,000 " ½ "		.50
R13	1442	400 " ½ "		.50
R14	1450	.525 "	35841	.60
R15	1450	.525 "	35841	.60
R16	1451	500,000 " ½ "		.50
R17	1452	1 Meg. " ½ "		.50
R18	1452	1 Meg. " ½ "		.50
R19	1453	2 " " ½ "		.50
R20	1589	100,000 "	Vol. Control	1.20
R21	1452	1 Meg. Ohms ½ Watt		.50
R21	1452	1 " " ½ "		.50
R23	1454	315 " 1 "		.50
R24	1455	210 " 1 "		.50
R25	1456	485 " 1 "		.50
R26	1457	225 " 1 "		.50
R27	1525	6,350 "	Pot. Divider	1.00
R28	1449	10,000 " ½ "		.50
R29	1449	10,000 " ½ "		.50
R30	1458	200,000 " ½ "		.50
R31	1459	50,000 " ½ "		.50
R32	1531	6 "	Hum Control	1.00
R33	1460	20 "	Center tapped	.50
R35	1588	100,000 "	Tone control	1.75
R36	1452	1 Meg. " ½ "	Models 36-37 only	.50
R37	1461	250,000 " ½ "	" " "	.50
R38	1449	10,000 " ½ "	" " "	.50
R39	1462	29,000 " ½ "	" " "	.50
R40	1458	200,000 " ½ "	" " "	.50

FADA RADIO & ELECTRIC CORP.

FADA 103 FADALETTE, STEWART-WARNER SERIES 108, AND DE WALD 54 DYNETTE SETS

Fada 103 Fadalette

A tabulation of voltages in this set on D.C.:

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts	Plate Ma.
V1	6.3	2.5	97.5	97.5	4.5
V2	6.3	....	7.5	....	....
V3	6.3	7.5	92.5	95.5	4.8
V4	2.5	....	....	....	37

A set of figures for A.C. line operation:

Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts	Plate Ma.
V1	6.3	2.6	110	110	6
V2	6.3	....	9	....	....
V3	6.3	9	104	102	7
V4	6.3	....	....	....	40

The D.C. and A.C. readings are for a 110 V. line. Bias readings are taken across respective bias resistors. The D.C. input is 34 W., and the A.C., 36 W.

Stewart-Warner Companion Chassis Series 108 and 108-X, Models 10 to 20

With the volume control tuned full on, the following approximate voltages should be read to the frame of unit C. (using a high resistance voltmeter).

Tube Type	Fil. Volts	Cath. Volts	S.G. Volts	Plate Volts
V1	6.3	1.5	107	107
V2	6.3	1.3	9	1.3
V3	6.3	9	107	103
V4	12.6	122	....	....

These figures are for a 115 v., A.C. line; on D.C., the values will be slightly lower.

Circuit oscillation may be due to the antenna being too close to the set; oscillation at low signal volume with maximum set sensitivity is normal. The power cord is naturally warm. Do not force V4 into its socket. This set is designed to be operated on 110, 32, 12, or 6 V. current-supply systems.

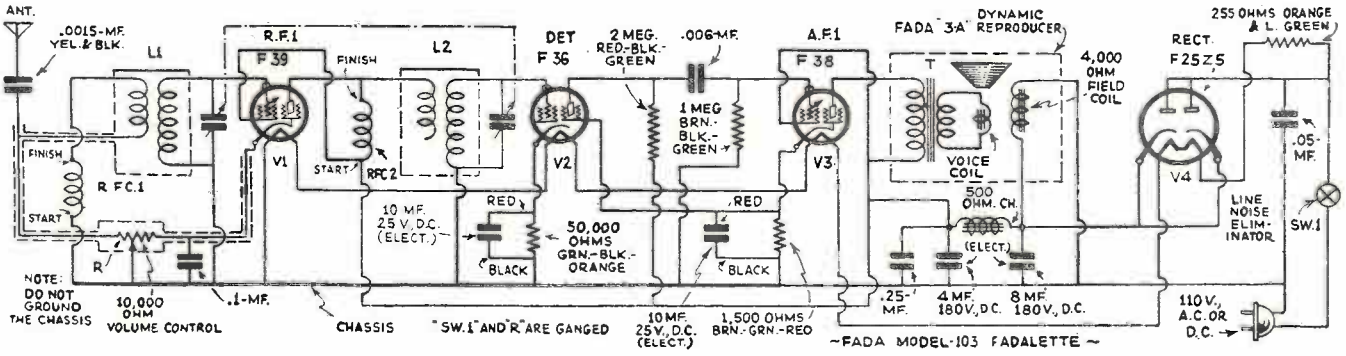
Pierce-Airo De Wald Model 54 Dynette

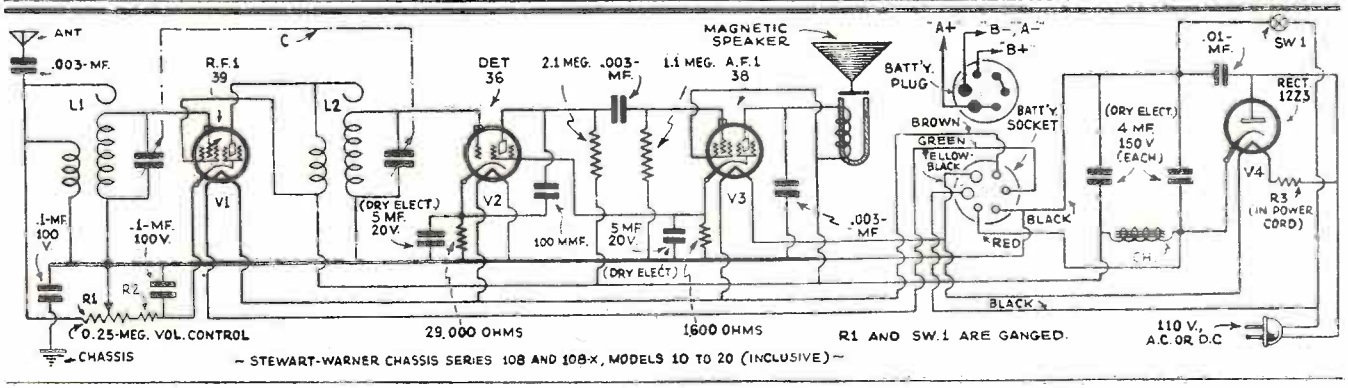
The following tabulation of operating voltages is furnished by the manufacturer:

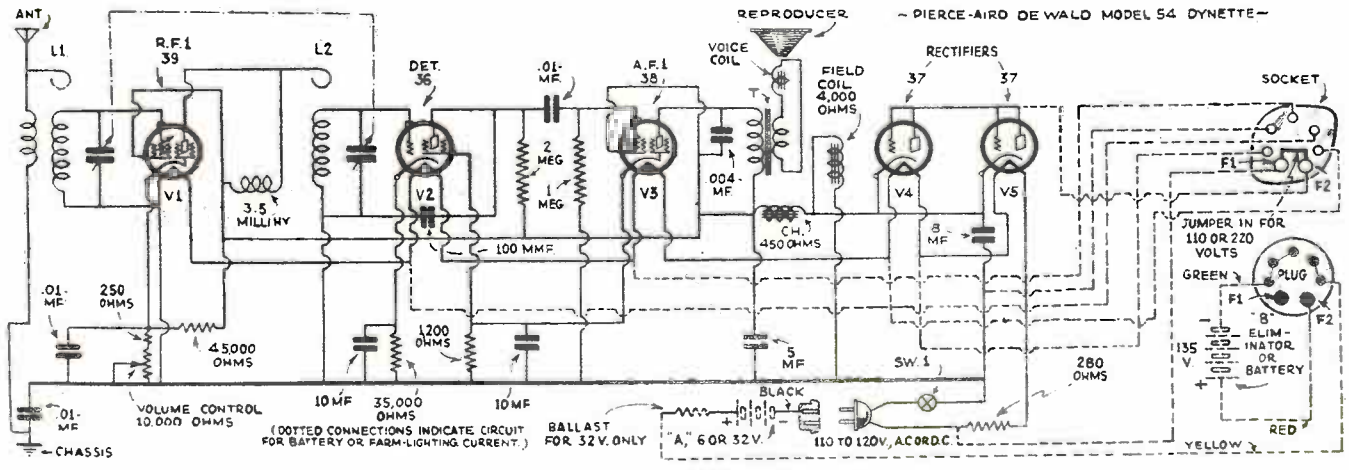
Tube Type	Fil. Volts	C.-G. Volts	S.-G. Volts	Plate Volts	Plate Ma.
V1	6.3	2.15	103	103	2
V2	6.3	3	9	39	.1
V3	6.3	9	103	98	10
V4, V5	6.3	....	....	....	15

By means of suitable line resistors, or adapters, this set may be operated on light-line or battery power.

All sets of the "universal current" type now on the market require that the Service Man check the position of the power plug in its socket to determine whether it is correctly poled. It is seldom that the chassis frame connects directly to the power line. Circuit oscillation at the high-sensitivity setting of the volume control is normal in many models. The results obtained with ultra-midget sets will greatly depend upon local reception conditions.







DE FOREST CROSLEY, Ltd.

902 A-B-F

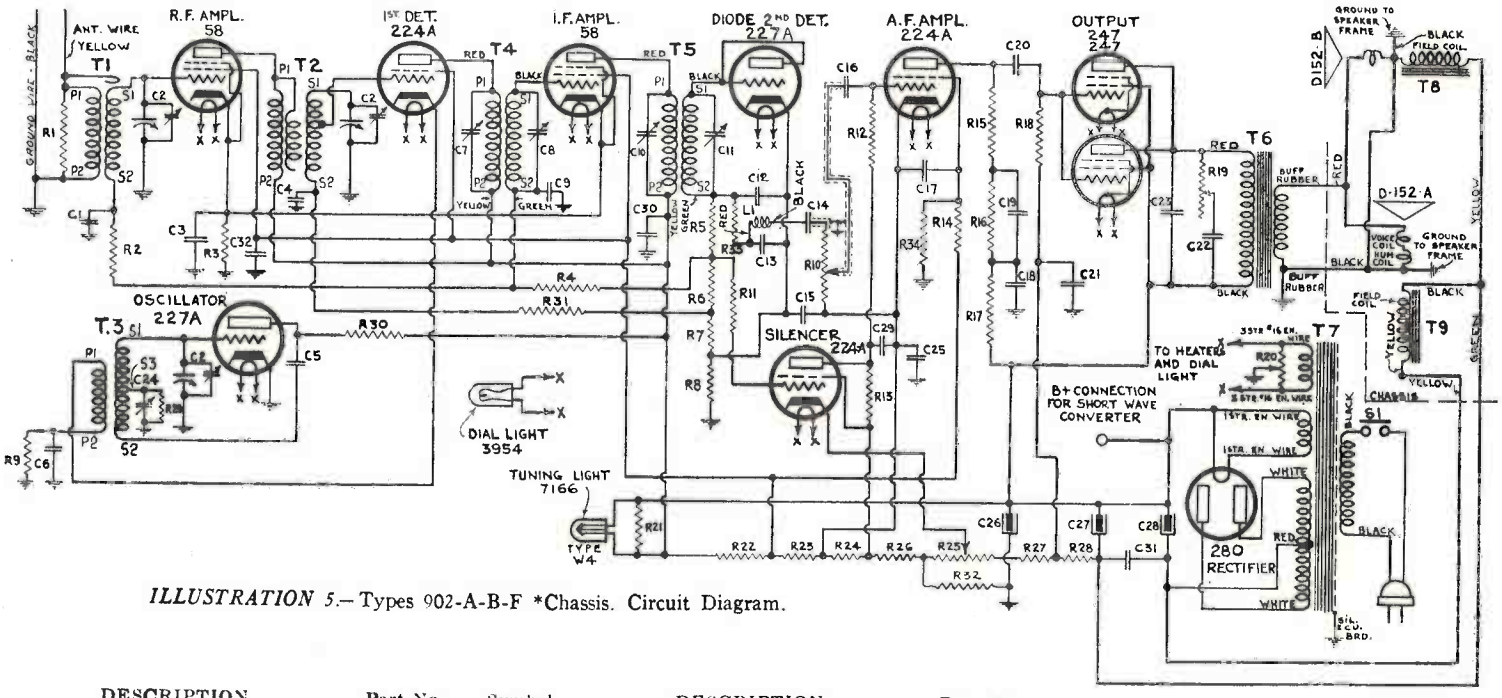


ILLUSTRATION 5.— Types 902-A-B-F *Chassis. Circuit Diagram.

Symbol	DESCRIPTION	Part No.
C1	R. F. by-pass condenser, .05 mfd. (200 v.)	7213
C2	Tuning (gang) condenser	7178
C3	R. F. by-pass condenser, .25 mfd. (200 v.)	7214
C4	R. F. by-pass condenser, .05 mfd. (200 v.)	7213
C5	Osc. coupling condenser, .00035 mfd. (M)	7216
C6	Det. by-pass condenser, .05 mfd. (200 v.)	6978
C7	I. F. tuning condenser, (Part of T4)	7069
C8	I. F. tuning condenser, (Part of T4)	7069
C9	I. F. by-pass condenser, .05 mfd. (200 v.)	7213
C10	I. F. tuning condenser, (Part of T5)	7071
C11	I. F. tuning condenser, (Part of T5)	7071
C12	Diode by-pass condenser, .0001 mfd. (M)	6556
C13	Diode by-pass condenser, .0001 mfd. (M)	6556
C14	A. F. coupling condenser, .1 mfd. (200 v.)	7220
C15	A. F. By-pass condenser, .5 mfd. (200 v.)	7221
C16	A. F. coupling condenser, .05 mfd. (200 v.)	7217
C17	A. F. filter condenser, .5 mfd. (200 v.)	7221
C18	A. F. filter condenser, .25 mfd. (400 v.)	7228
C19	A. F. filter condenser, .05 mfd. (200 v.)	7213
C20	Output coupling condenser, .05 mfd. (400 v.)	7225
C21 (1)	Output filter condenser, .25 mfd. (200 v.)	7226
C21 (2)	Output filter condenser, .04 mfd. (200 v.)	6948
C22	A. F. tone control condenser, .2 mfd. (400 v.)	7309
C23	A. F. resonating condenser, .005 mfd. (400 v.)	6941
C24	Osc. aligning condenser, .00082 mfd. (600 kcs.)	6790
C25	A. F. by-pass condenser, 1.0 mfd. (200 v.)	7174
C26	Power filter condenser, 8.0 mfd. (435 v.)	7336
C27	Power filter condenser, 8.0 mfd. (435 v.)	7336
C28	Power filter condenser, 8.0 mfd. (435 v.)	7336
C29	Silencer by-pass condenser, .1 mfd. (200 v.)	7239
C30	I. F. by-pass condenser, .25 mfd. (400 v.)	7228
C31	Hum filter condenser, .3 mfd. (200 v.)	7229
C32	R. F. by-pass condenser, .5 mfd. (200 v.)	7221

Symbol	DESCRIPTION	Part No.
R1	Antenna resister, 10,000 ohms (½ w.)	6911
R2	R. F. filter resister, 25,000 ohms (½ w.)	7187
R3	R.F.-I.F. min. bias resistor, 190 ohms (w.w.)	7188
R4	I. F. filter resistor, 500,000 ohms (½ w.)	7142
R5	A. V. C. resistor, 100,000 ohms (½ w)	7219
R6	A. V. C. resistor, 300,000 ohms (½ w.)	7191
R7	A. V. C. resistor, 50,000 ohms (½ w.)	7192
R8	A. V. C. resistor, 100,000 ohms (½ w.)	7219
R9	Det. (first) bias resistor, 10,000 ohms (½ w.)	7194
R10	Level control (potentio) resistor, 500,000 ohms (var. c.)	6887
R11	Silencer filter resistor, 900,000 ohms (½ w.)	7189
R12	A. F. grid leak resistor, 1,000,000 ohms (½ w.)	7196
R13	Silencer plate resistor, 1,000,000 ohms (½ w.)	7196
R14	A. F. screen resistor, 50,000 ohms (½ w.)	7145
R15	A. F. plate resistor, 40,000 ohms (½ w.)	6901
R16	A. F. plate resistor, 35,000 ohms (½ w.)	6902
R17	A. F. filter resistor, 25,000 ohms (½ w.)	6909
R18	Output grid leak resistor, 250,000 ohms (½ w.)	7198
R19	A. F. tone control (rheo.) resistor, 50,000 ohms (var. c.)	7199
R20	Hum adjusting (potentio.) resistor, 20 ohms (var. w.)	7200
R21	Voltage divider resistor, 3,440 ohms (1 w.)	7304
R22	Voltage divider resistor, 13,000 ohms (2 w.)	7202
R23	Voltage divider resistor, 11,000 ohms (1 w.)	7203
R24 (x)	Voltage divider resistor, 340 ohms (w.w.)	6916
R25	Silencer control (potentio.) resistor, 35,000 ohms (var. c.)	6479
R26 (x)	Voltage divider resistor, 800 ohms (w.w.)	6916
R27	Output bias divider resistor, 83,000 ohms (½ w.)	7206

Symbol	DESCRIPTION	Part No.
R28	Output bias divider resistor, 180,000 ohms (½ w.)	7207
R29	Osc. grid leak resistor, 100,000 ohms (½ w.)	6898
R30	Osc. plate resistor, 60,000 ohms (1 w.)	7208
R31	Det. (first) filter resistor, 200,000 ohms (½ w.)	7209
R32 (x)	Voltage divider resistor, 340 ohms (w.w.)	6916
R33	Det. (Diode) resistor, 100,000 ohms (½ w.)	7219
R34	A. F. bleeder (screen) resistor, 100,000 ohms (1 w.)	3799
T1	R. F. transformer, antenna stage	6509
T2	R. F. transformer, interstage	6510
T3	Oscillator coil	7061
T4	I. F. transformer, 1st stage	7069
T5	I. F. transformer, 2nd stage	7071
T6	A. F. transformer, output	7157
T7 (1)	Power transformer, 25 cycle	7162
T7 (2)	Power transformer, 60 cycle	7138
T8 (3)	Type D152A speaker, (field 420 ohms)	7170
T9 (4)	Type D152B speaker, (field 420 ohms)	7171
L1	R. F. choke	7370
S1	On-off switch (Part of tone control assembly)	7199

*For revised silencer circuit of types 902-A and B see Illust. 3. For 902-F silencer circuit see Illust. 4.

(x) R24, 26 and 32 single unit.
(1) Used in 25 cycle chassis only (902-A—902-F).
(2) Used in 60 cycle chassis only (902-B).
(3) Indicates upper unit.
(4) Indicates lower unit.
(M) Indicates mica condensers.
(400 v.) Indicates voltage rating of condensers.
(½ w.) Indicates watts rating of resistor.
(var. c.) Indicates variable carbon resistors.
(var. w.) Indicates variable wirewound resistors.
(w.w.) Indicates wirewound resistors.

DE FOREST CROSLEY, Ltd.

DATA ON THE TYPE 902 CHASSIS

INTRODUCTION

Type 902 is a ten tube chassis of the superheterodyne type incorporating the following features:

(1) Automatic volume control.
(2) Automatic silencer.
(3) Visual tuning indicator.
(4) Extended frequency range of 1,500 to 520 kcs.
(5) Dual speakers.
(6) Dual pentode output.
(7) Converter "B" terminal.

This chassis is made in three types, viz.: 902-A, 902-B and 902-F, corresponding to 25 cycle, 60 cycle, and universal consoles. The differences in these three chassis are caused mainly by the difference in supply frequency and are three in number: (1) power transformer; (2) value of condenser C22 and (3) silencer circuit. These differences will be discussed later in the text.

In the paragraphs that follow circuit elements will be designated as in the circuit diagrams of illustrations 3, 4 and 5, and to intelligently read the following discussion frequent reference to these circuit diagrams will be necessary.

ANTENNA STAGE

The incoming signal is applied to the grid of the first tube through a tuned radio frequency coupling transformer T1, having uniform gain throughout the broadcast band. The primary coil of this transformer is mounted inside the secondary coil at its low potential end and terminates in the antenna and ground lead wires coded yellow and black respectively. This primary is coupled to the secondary both inductively and capacitively. The secondary of this transformer is tuned by section of the variable tuning (gang) condenser C2.

Transformer T1 is so designed as to maintain alignment with the radio frequency coupling transformer T2 and oscillator coil T3 with any reasonable value of antenna capacity. *In this connection it may be pointed out that most shielded lead-in installations do not constitute a reasonable antenna capacity, the capacity usually being sufficient to almost constitute a primary short circuit and seriously impairing alignment*, unless a condenser of .0002 to .0005 mfd. is inserted in series with the antenna lead at the receiver end. The resistance R1 of 10,000 ohms shunting primary of T1 is for the purpose of giving improved alignment and is of particular value with low capacity antennae.

RADIO FREQUENCY AMPLIFICATION

A single stage of tuned radio frequency amplification employing a type 58 R.F. pentode is used preceding the first detector. The input circuit to this tube consists of the secondary of transformer T1, described in preceding paragraph, and condenser C1 which completes the radio frequency path to ground (chassis). The primary of transformer T2 is connected in the plate circuit of this tube and thus couples the output to the grid circuit of the first detector.

Transformer T2 is similar to transformer T1, being of the uniform gain type with primary both inductively and capacitively coupled to the secondary. A glance at the circuit diagram will show that the primary has two sections, one section of which consists of an open ended winding. This winding, over the lower portion of the secondary, provides capacitive coupling between primary and secondary. The other (main) section of the primary is mounted inside the secondary, and also at the low end. While this latter section of the primary has been called the main section, it is only because through it the plate voltage is supplied to the tube. Both sections are essential to satisfactory transformer characteristics. The secondary of this transformer is tuned by a section of the gang condenser C2. It will be noticed that the grid of the first detector tube is connected to a tap in the secondary of transformer T2 rather than to its high potential end. While this results in somewhat lower gain in this stage than would otherwise be obtainable, it gives improved selectivity 350 kilocycles "off resonance" and, therefore, greatly increased image suppression over that which would be possible under alternative of connecting the control grid to the high potential end of transformer T2 secondary.

Adequate by-passing of the radio frequency energy in cathode, screen and plate circuits of the R.F. amplifier is provided by the condensers C3, C32 and C30 respectively. These condensers also provide by-passing for the first detector and I.F. amplifier. The R.F. amplifier tube (type 58) in common with I.F. amplifier tube, (type 58) obtains its initial bias by self bias through resistor R3 in series from their connected cathodes to ground.

FIRST DETECTOR

In the first detector stage the incoming signal is heterodyned by a locally generated voltage, 175 kilocycles higher in frequency than signal frequency, to produce a new or intermediate frequency of 175 kilocycles. The first detector tube in this set is a type 224A. The input to this tube is obtained from transformer T2, as described in preceding section "Radio Frequency Amplification", condenser C4 providing the radio frequency path to ground. The heterodyne voltage, referred to previously, is introduced into the cathode circuit of the first detector tube by that winding of the oscillator coil T3 (pick up coil) which is connected between cathode of the first detector tube and the junction of resistor R9 and condenser C6.

The first detector tube obtains its initial bias voltage by self bias from resistor R9 connected from the "pick up" coil (referred to above) to ground. The radio frequency and intermediate frequency by-passing for this resistor, R9, is provided by the con-

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Data on the Type 902 Chassis—Continued

denser C6. Screen grid by-passing is provided by condenser C32 and plate circuit by-passing by condenser C30.

OSCILLATOR

The locally generated heterodyning voltage, mentioned under section "First Detector", is obtained from a vacuum tube oscillator utilizing a 227A tube. Coil T3 is termed the oscillator coil and in conjunction with C24 provides the necessary coupling between plate and grid circuits of the tube to produce sustained oscillations of the frequency to which the grid circuit of the tube is tuned. The "pick up" coil, connected in cathode circuit of the first detector tube, is coupled to coil T3, connected in grid and plate circuits of the oscillator tube. Thus a voltage is induced in the "pick up" coil and through it fed into the cathode circuit of the first detector tube.

The constants in this oscillator circuit are so proportioned, that the oscillator voltage introduced into the first detector circuit, is practically constant throughout the broadcast band. Coil T3 consists of tapped solenoid coil with the "pick up" coil wound over it at the plate end. The grid circuit of the tube consists of a section of gang condenser C2, C24 and portion of coil T3. The plate circuit of the tube consists of the condenser C5, C24 and portion of coil T3. Thus the grid and plate circuits are coupled inductively by coil T3 and capacitively through the common condenser C24. The inductive coupling is most effective at the high frequency end of the broadcast range, and the capacitive coupling at the low end so that throughout the tuning range, the coupling and, therefore, the oscillator output is uniform.

The tuned portion of coil T3 is that portion connected between grid of oscillator tube and condenser C24, and is tuned by a section of gang condenser C2 in series with C24. The cathode of the oscillator tube is grounded, the tube being grid leak biased by resistor R29. Thus condenser C24 serves a triple purpose.

(1) By-passing resistor R29.
(2) Providing coupling between grid and plate circuits.
(3) In series with section of gang condenser C2 and being variable is adjusted to maintain oscillator frequency 175 kilocycles above signal frequency.

The 227A oscillator tube receives its plate voltage through resistor R30 which is sufficiently high in value to serve as a radio frequency filter increasing oscillator efficiency and preventing undesirable coupling between oscillator and other parts of circuit.

INTERMEDIATE FREQUENCY AMPLIFICATION (175 kcs.)

The output of the 224A first detector contains the resultant 175 kilocycle voltage produced through heterodyning of the incoming signals by the locally generated oscillator voltage. This component of the output is retained by means of an intermediate frequency transformer T4 which is tuned to 175 kilocycles. The primary is connected in the plate circuit of the first detector and is tuned to 175 kilocycles by condenser C7. The secondary of this transformer T4 is also tuned to 175 kilocycles by condenser C8. Amplification at 175 kilocycles is accomplished by means of a type 58 R.F. pentode. The input circuit of this tube consists of the secondary of transformer T4 and condenser C9 which provides the intermediate frequency path to ground. In the plate circuit of this tube is the primary of T5 and this provides the coupling to the diode second detector. Primary and secondary of T5 are both tuned to 175 kilocycles by means of condensers C10 and 11 respectively.

As mentioned under section "Radio Frequency Amplification", the intermediate frequency amplifier tube obtains its initial bias by the voltage drop across R3. The associate by-pass in this case being C3. Adequate by-passing of screen and plate circuits is provided by C32 and 30 respectively.

SECOND DETECTOR (Diode)

A type 227A tube with plate and grid connected together is used as a diode second detector providing linear detection over a wide range of voltages. The cathode of this tube is connected to junction of R7 and 8, while the grid and plate are connected to the high potential end of the secondary of transformer T5.

The useful component voltages of the diode output are obtained: (1) from the voltage drop across resistors R5, 6, 7 and 33; (2) condensers C14, 15 and resistor R10. These useful components are: (1) d.c. voltage which is used for automatic volume control and silencer purposes; and (2) audio frequency voltage which is retained and amplified in the succeeding amplifier stages. There is a third component of the diode output consisting of current at a frequency of 175 kilocycles or its harmonics. This output is undesirable and is rejected by filters comprising condensers C12, 13, resistors R5, 33 and the choke L1. Good filtering at this point is necessary to ensure stability and to minimize the beats which might occur at harmonics of the intermediate frequency, when the radio frequency component of the second detector output is permitted to couple back into the radio frequency circuits of the receiver.

It may appear that this diode circuit is unduly complicated, but these apparent complications are occasioned by the fact that the cathode of the first audio amplifier tube is not at ground potential. To avoid degeneration, the cathode of the diode must be at the same audio frequency potential as the cathode of the audio frequency amplifier tube. This has been very closely approached by making the direct audio frequency path from diode cathode to ground high by means of resistor R8, while the audio frequency path to the cathode of first audio tube has been made relatively low by means of condenser C15.

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OBSERVED VOLTAGE AND CURRENT READINGS*

(Types 902-A, 902-B and 902-F Chassis)

58 R. F. AMPLIFIER					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		220-225
	Plate Current	(Ip)	(a)		4-6 mils
	Screen Grid Volts	(Esg)	(a)		90-100
	Screen Grid Current	(Isg)	(a)		Not over 1/3 of Ip.
	Control Grid Volts	(Ecg)	(a)	(b)	2.5-3
	Suppressor Grid Volts	(Esug)	(a)	(b)	2.5-3
	Cathode Volts	(Ek)	(a)		2.5-3
224A DETECTOR (FIRST)					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		220-225
	Plate Current	(Ip)	(a)		.6-.8 mils
	Screen Grid Volts	(Esg)	(a)		90-100
	Screen Grid Current	(Isg)	(a)		Not over 1/3 of Ip.
	Control Grid Volts	(Ecg)	(a)		4-6
	Cathode Volts	(Ek)	(a)		7.5-8.5
58 I.F. AMPLIFIER					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		220-225
	Plate Current	(Ip)	(a)		4-6 mils
	Screen Grid Volts	(Esg)	(a)		90-100
	Screen Grid Current	(Isg)	(a)		Not over 1/3 of Ip.
	Control Grid Volts	(Ecg)	(a)	(b)	2.5-3
	Suppressor Grid Volts	(Esug)	(a)	(b)	2.5-3
	Cathode Volts	(Ek)	(a)		2.5-3
227 DIODE DETECTOR (SECOND)					
	Heater Volts *(Only voltage which can be measured.)*	(Ef)	(a)		2.4 a.c.
224A or 57 SILENCER					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		Indication only
	Plate Current	(Ip)	(f)		0
	Screen Grid Volts	(Esg)	(a)	(e)	5.5-7.5
	Screen Grid Current	(Isg)	(a)		0
	Control Grid Volts	(Ecg)	(a)		.4-.5
	Cathode Volts	(Ek)	(a)	(e)	0-3.0
224A A.F. AMPLIFIER					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		140-150
	Plate Current	(Ip)	(a)		.75-.85 mils
	Screen Grid Volts	(Esg)	(a)		40-50
	Screen Grid Current	(Isg)	(a)		Not over 1/3 of Ip.
	Control Grid Volts	(Ecg)	(a)	(c)	Indication only.
	Cathode Volts	(Ek)	(a)		12-14
247 OUTPUT AMPLIFIER					
	Filament Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		215-225
	Plate Current	(Ip)	(a)		22-30 mils
	Screen Volts	(Esg)	(a)		240-250
	Screen Current	(Isg)	(a)		5-7 mils
	Grid Volts	(Ecg)	(a)	(d)	Indication only
227A OSCILLATOR					
	Heater Volts	(Ef)	(a)		2.4 a.c.
	Plate Volts	(Ep)	(a)		40-50
	Plate Current	(Ip)	(a)		2.5-3 mils
	Grid Volts	(Eg)	(a)	(c)	Indication only
	Cathode Volts	(Ek)	(a)		0

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280 RECTIFIER

Filament Volts	(Ef)	(a)		4.8 a.c.
Plate Volts	(Ep	(a)	(g)	680-700 a.c.
Plate Current	(Ip)	(a)	(h)	45-50 mils

PRIMARY DRAIN

120 volts, 25 cycles (902-A-F)	108 watts
120 volts, 60 cycles (902-B)	105 watts
120 volts 60 cycles (902-F)	102 watts

**IMPORTANT*: The observed values in this table are for reference only and are subject to considerable variation because of tube and primary voltage variation. It is impossible to obtain reasonable readings at certain sockets because of extremely high values of resistances across which measurements must be made. Under such conditions plate current readings may be used as some indication of proper voltage values being present.

Refer to the following table when taking readings and *set the silencer control for minimum effect.* The volume control may be adjusted to "full on" position.

Use only a high resistance voltmeter for direct current readings. (1,000 ohms per volt or better).

All measurements should be taken at 120 volts line.

(a) Read with tube in analyzer and analyzer adapter in chassis tube socket.
(b) Read as positive (+) cathode volts.
(c) Value of resistance in circuit will not allow reading at socket. Use plate current as indication of bias. (Control grid voltage.)
(d) Actually 16.5 volts. Value of resistance in circuit will not allow reading at socket. Use plate current as indication of bias. (Control grid voltage).
(e) Varies with setting of silencer control (R25).
(f) Actually 6-7 microamperes. Value too low to read on analyzer.
(g) Plate to plate of 280 socket, tube in position and under load.
(h) 40 to 50 mils per plate, making total of 90-100 mils.

ALIGNMENT

It is essential, of course, in aligning the various chassis to have available a calibrated service oscillator capable of producing a signal at points throughout the broadcast band as well as at 175 kilocycles, which is the frequency of the intermediate frequency stages.

The following is the recommended method of making alignment adjustments on the type 902 chassis and should be closely adhered to, to avoid the probability of mis-alignment.

(1) Connect the output meter across the voice coil terminals of the speaker. These terminate at two lugs on the speaker frame to which the chassis leads are attached. See symbol "Y" in Illustration 1.

(2) Connect oscillator output lead to control grid cap of first detector tube at point indicated by "X" in Illustration 1. Control grid lead should be removed. Connect shield of oscillator lead to chassis ground.

(3) Set receiver tuning at point near 550 kilocycles which is entirely free from interference or incoming signals.

(4) Place set in operation and set volume control at maximum. Adjust the silencer lever to full counter-clockwise position (no silencer action).

(5) Adjust service oscillator to 175 kilocycles (exactly), and place in operation.

(6) Align adjusting screws C11, C10, C8 and C7 in that order for maximum reading on output meter.*

(7) Transfer oscillator output lead to antenna wire of chassis.

(8) Reconnect grid clip to first detector tube cap.

(9) Adjust both receiver and oscillator in tune at 1400 kilocycles. If difficulty is encountered in securing sufficient attenuation with service oscillator output control directly connected to antenna lead, a 100,000 ohm resistance connected in series with antenna lead will reduce the signal sufficiently.

(10) Adjust oscillator trimming condenser indicated by symbol "C" in Illustration 1 or 2. This condenser peaks at a point approximately three-quarters of minimum capacity setting, (i.e., the adjusting screw turned almost "full out").

(11) Align adjusting screws "B" and "A" in that order for maximum increase on output meter. "B" is the R.F. stage trimming or aligning condenser and "A" is a similar unit for adjusting the antenna stage.

(12) Adjust service oscillator and receiver in tune at 600 kilocycles. Adjust the padding condenser "D" (Illustration 1) for maximum indication on output meter.* The tuning condenser should be varied slightly while peaking this padding condenser "D." If the gang condenser is left stationary a false peak will be obtained and the receiver will be weak at or near 550 kilocycles.

*Always have service oscillator output at lowest possible value, which will give readable indication on output meter. When aligning I. F. stages, if sufficient attenuation is not available on service oscillator output control, the volume control of the receiver may be reduced slightly. When aligning at broadcast frequencies, lack of sufficient attenuation in service oscillator output control can be overcome by inserting 100,000 ohm resistance in series between oscillator and antenna lead of receiver. As an alternative to this, the antenna lead of the receiver may be wound around the oscillator output lead instead of directly connected to it, thus giving a capacitive coupling.

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PARTS LIST

"MONTROSE" MODEL
TYPE 902-A CHASSIS (25 CYCLE)

Part No.	Code	Description	List Price
6120	HABIT	Bracket, dial light	$ .25
7166	ALERT	Bulb, tuning indicator W4	.70
3954	BALLY	Bulb, dial	.20
7370	ALLOY	Choke, R. F., L1	1.75
7178	BAFFY	Condenser, gang C2	8.50
7214	BRAWN	Condenser, tubular, .25 mfd., C3	.75
7216	BREAK	Condenser, mica, .00035 mfd., C5	.35
6978	BRAZE	Condenser, tubular, .05 mfd., C6	.50
7213	BEGUN	Condenser, tubular, .05 mfd., C9, C1, C4, C19	.50
6556	BEGET	Condenser, mica, .0001 mfd., C12, C13	.35
7220	BOSKY	Condenser, tubular, .1 mfd., C14	.50
7221	BOSOM	Condenser, tubular, .5 mfd., C15, C17, C32	.60
7217	BATHE	Condenser, tubular, .05 mfd., C16	.50
7228	BASTE	Condenser, tubular, .25 mfd., C18, C30	.75
7225	BOLUS	Condenser, tubular, .05 mfd., C20	.50
7226	BOTCH	Condenser, tubular, .25 mfd., C21	.75
7309	BOUGH	Condenser, tubular, .2-.15 mfd., C22	.60
6941	BREAD	Condenser, tubular, .005 mfd., C23	.30
6790	BAIZE	Condenser, oscillator padding, C24	1.00
7174	BOSCH	Condenser, 1 mfd., C25	1.00
7336	BLIND	Condenser, electrolytic, 8 mfd., C26, C27, C28	2.00
7239	BRAXY	Condenser, tubular, .1 mfd., C29	.50
7229	BOUND	Condenser, tubular, .3 mfd., C31	.80
6850	BONNE	Drive assembly, gang	.45
7182	BAHAR	Drive assembly, tone color	.50
7121	BESOT	Drive gear, silencer, (Fibre)	.20
7179	BAIRN	Drive pinion, tone color (Rubber)	.10
7348	BETEL	Driven gear assembly, silencer	.25
6887	BANAL	Potentiometer, level control, R10	2.00
7200	BERTH	Potentiometer, centre tap resistor, R20	.70
6479	BOURN	Potentiometer, silencer control, R25	2.00
6911	BELLY	Resistor, carbon, 10,000 ohms, R1	.35
7187	BOOTH	Resistor, carbon, 25,000 ohms, R2	.35
7188	BRASH	Resistor, carbon, 190 ohms, R3	.35
7142	BEAUT	Resistor, carbon, 500,000 ohms, R4	.35
7219	BLOAT	Resistor, carbon, 100,000 ohms, R5, R8, R33	.35
7191	BRASS	Resistor, carbon, 300,000 ohms, R6	.35
7192	BRAVE	Resistor, carbon, 50,000 ohms, R7	.35
7194	BRANT	Resistor, carbon, 10,000 ohms, R9	.35
7189	BRAND	Resistor, carbon, 900,000 ohms, R11	.35
7196	BLISS	Resistor, carbon, 1 meg., R12, R13	.35
7145	BEDIN	Resistor, carbon, 50,000 ohms, R14	.35
6901	BLOOM	Resistor, carbon, 40,000 ohms, R15	.35
6902	BRACT	Resistor, carbon, 35,000 ohms, R16	.35
6909	BOXER	Resistor, carbon, 25,000 ohms, R17	.35
7198	BLOND	Resistor, carbon, 250,000 ohms, R18	.35
7304	BUTTE	Resistor, carbon, 3,440 ohms, R21	.40
7202	BRAIL	Resistor, carbon, 13,000 ohms, R22	.40
7203	BRAID	Resistor, carbon, 11,000 ohms, R23	.40
6916	BOVIN	Resistor, tapped candohm, R24, R26, R32	.70
7206	BRAIN	Resistor, carbon, 83,000 ohms, R27	.40
7207	BRAKE	Resistor, carbon, 180,000 ohms, R28	.40
6898	BOWIE	Resistor, carbon, 100,000 ohms, R29	.35
7208	BRACE	Resistor, carbon, 60,000 ohms, R30	.40
7209	BRAVO	Resistor, carbon, 200,000 ohms, R31	.35
3799	AMEER	Resistor, carbon, 100,000 ohms, R34	.40
7199	BOWER	Rheostat, tone control R19 and switch	2.50
7176	BAGGS	Scale, dial	.50
7092	BRAWL	Shield, pentode	.12
7112	BABEL	Sockets, (24-27)	.35
7094	BABOO	Sockets, (58)	.40
7113	BACON	Sockets, (280)	.30
7297	BUNCO	Socket, tuning indicator	.55
7162	BREAM	Transformer, power 25 cycle, T7	12.00
7157	BREED	Transformer, output, T6	4.00

"MONTROSE" MODEL
TYPE 902-A CHASSIS (25 CYCLE)—*Continued*

Part No.	Code	Description	List Price
7069	BRENT	Transformer, 1st I. F., T4	3.50
7071	BREVE	Transformer, 2nd I. F., T5	3.50
6509	BRIAR	Transformer, R. F. antenna stage, T1	2.75
6510	BRIBE	Transformer, R. F. interstage, T2	3.50
7061	BORON	Transformer, osc. stage, T3	3.50

"MONTROSE" MODEL
TYPE 902-B CHASSIS (60 CYCLE)

All parts same as 902-A with the following exceptions:

6948	BRIEF	Condenser, tubular, .04 mfd., C21	.50
7138	BRIDE	Transformer, power, 60 cycle, T7	10.00

"MONTROSE" MODEL
CABINET FITTINGS

6744	BRIER	Cabinet, console	on app.
5291	HOCUS	Channels, chassis mounting	.50
7165	BRILL	Chassis, 25 cycle (902-A)	75.00
6949	BROAD	Chassis, 60 cycle (902-B)	75.00
5331	HOLLY	Escutcheon plate	1.00
5411	ADVER	Knobs, small	.20
4747	PODGY	Knobs, large	.20
5309	HOIST	Pads, chassis mounting	.10
5327	ADDER	Shield, tube	.20
7167	BIFUR	Shield, W58 (base)	.10
7168	BORAX	Shield, W58 (top)	.15
7120	BIBLE	Silencer, control lever	.25
7170	BRING	Speaker D152A dynamic	11.00
7171	BRINK	Speaker D152B dynamic	11.00
7295	BRINY	Tuning indicator, lens and bezel	.25
7292	BRISK	Tuning indicator, reflector	.15

SILENCER CIRCUIT REVISION
TYPES 902-A, B CHASSIS

All parts same as for type 902-A, B, except following:

7219	BLOAT	Resistor, carbon, 100,000 ohms	.35
7822	BROCK	Resistor, carbon, 217,000 ohms	.35

"MONTROSE" MODEL
TYPE 902-F CHASSIS (UNIVERSAL)

All items the same as 902-A with following additions:

7414	BRUIT	Potentiometer, silencer control, R25	2.00
7478	BUXOM	Resistor, carbon, 500,000 ohms, R11	.35
7844	AMICE	Resistor, carbon, 250,000 ohms, R13	.35
7823	AMISS	Resistor, carbon, 100,000 ohms, R27	.35

The following is omitted:

6916	.....	Resistor R26-32	

All prices are f.o.b. the Company's warehouse, and are subject to change without notice.

D-152-A SPEAKER (Upper)

7211	ANELE	Coil, field, 420 ohms	3.50
6824	BLADE	Coil, hum neutralizing	.50
7360	ANISE	Cone and voice coil assembly	4.25
7288	BORIC	Cone frame and pole plate assembly	2.00
6822	BLANK	Pot and pole assembly	1.50
7369	BLARE	Terminal panel assembly	.50

D-152-B SPEAKER (Lower)

7212	ANGLE	Coil, field, 420 ohms	3.50
7361	ANKLE	Cone and voice coil assembly	4.25
7289	BLEAR	Cone frame and pole plate assembly	2.00
6822	BLANK	Pot and pole assembly	1.50
7369	BLARE	Terminal panel assembly	.50

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